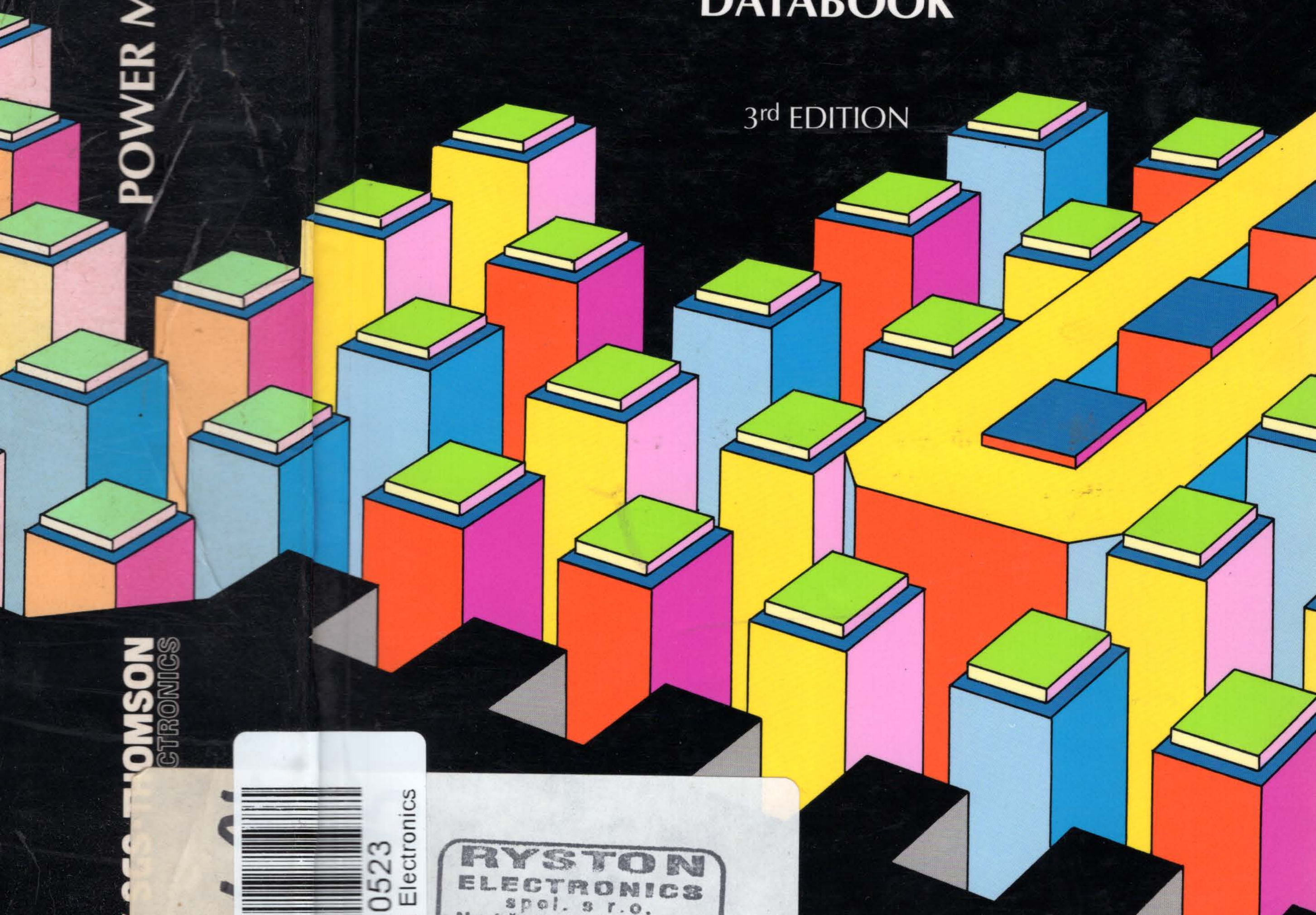
POWER MOS DEVICES

DATABOOK

3rd EDITION



SGS-THOMSON
MICROELECTRONICS

POWER MOS DEVICES 3rd EDITION

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DATABOOK

3rd EDITION

JULY 1993

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INTRODUCTION

This databook contains new and updated data sheets covering the whole range of SGS-THOMSON Power MOSFET devices for use in Industrial, Automotive, Computer, Telecommunication, Professional and Consumer electronics.

The Power MOS devices presented in this databook are made using well proven SGS-THOMSON technology.

The SGS-THOMSON Power MOSFET portfolio complements the company's wide range of devices in Power BIPOLAR, IGBT and VIPower technologies. New products are continually being produced and existing products are constantly being improved in line with our continuing efforts in research and in accordance with the market evolution.

New innovations in both silicon technology and power packaging are to be found in the data presented. A great deal of progress has been made in Power MOSFET technology in recent years. Optimized cell densities for the best device characteristics over low and high voltage ranges are used; special edge terminations for high voltage devices have been developed; avalanche ruggedness has been designed-in. All are features to ensure cost effectiveness and reliability.

Power MOSFET packages have also improved. This includes our user friendly isolated packages: ISOWATT220, ISOWATT221, ISOWATT218 and the ISOTOP power package. Many of the standard products in these isolated packages are UL recognized.

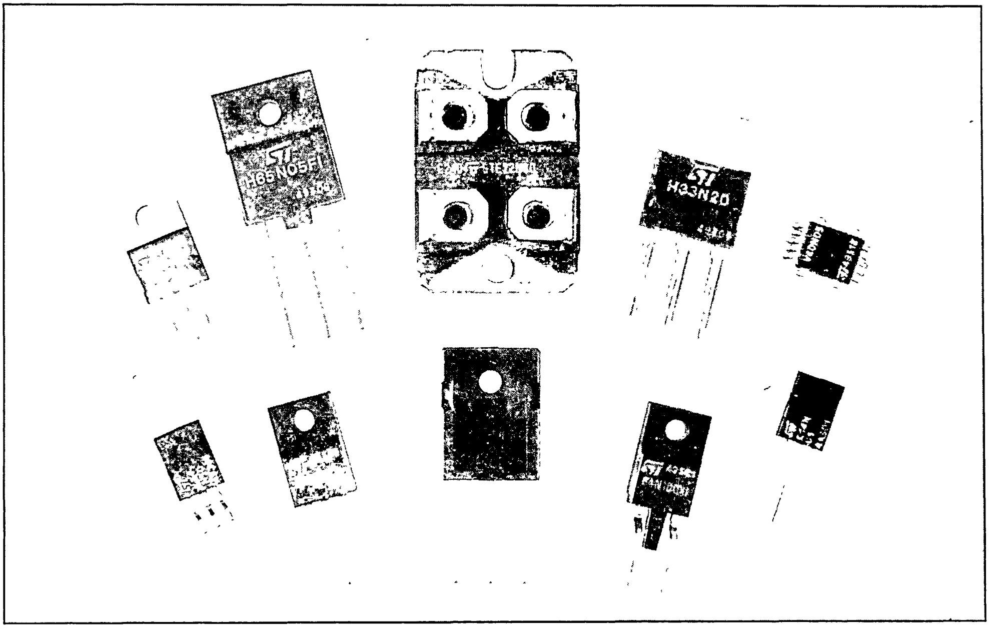
Selection guides are provided in the following pages to facilitate rapid identification of the most suitable device for the intended use.

The extensive information in the datasheets makes it easy to evaluate the performance of the product within any required equipment design.

UL Recognized Devices.
ISOTOP and ISOWATT218 are already U.L. 1557 recognized. ISOWATT220 and ISOWATT221 are expected to be recognized soon.

For all the above isolated packages U.L. recognition applies with $T_J = 150\ ^{o}C$ max.

SGS-THOMSON Power Packages



Following its long tradition of innovative power devices, SGS-THOMSON has continued to introduce new Power MOSFET technologies and products.

This has been helped by to the company's leading and well established expertise already acquired in the bipolar transistor field.

Designed in advanced R&D centers Power MOS transistors are diffused in Catania, Italy. Dedicated MOS front-end capabilities exist in the plant for standard production as well as for advanced products.

All the technological steps involved in the fabrication of MOSFETs, from the simple diffusion to the most complex processes like metal ion implantation used for IGBTs are carefully monitored internally so that complete control of the entire process is maintained.

The front end capabilities of the plant in Catania are now reinforced with the addition of a second source diffusion line in Carrollton, Texas. This is similar to the dual capabilities of Catania and Singapore for bipolar devices.

Thanks to the long experience in all power devices SGS-THOMSON has, in its Muar and Casablanca factories, all the expertise needed for world-class packaging.

Power MOSFETs also benefiting from the company's recognized leadership in packaging.

Silicon innovation cannot be complete if appropriate housing is not provided.

SGS-THOMSON was a pioneer in the introduction of isolated ISOWATT218 and ISOWATT220. The new ISOWATT221 is the natural evolution of our package innovation in that it is an upgrade of ISOWATT220 conforming the international safety norms for clearance and creepage like the bigger ISOWATT218.

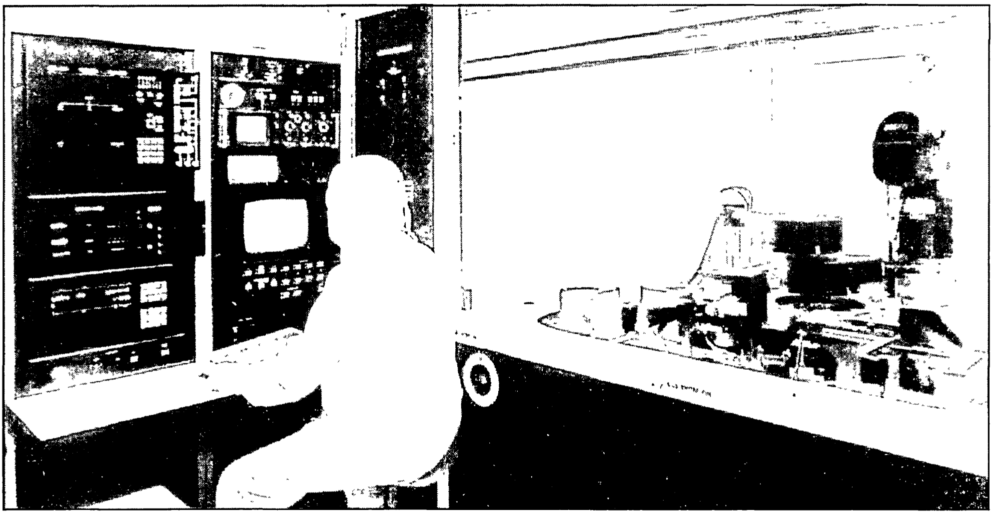
The new PowerSO-10 package, specifically developed for surface mounting applications represents a milestone in power packaging owing to its superior performance with respect to any surface mount version of TO-220. It gives real power dissipation capability, versatility and flexibility in providing the most convenient pc board layout, compatibility with most surface mount processes, and excellent reliability.

TO-247 is also available now to expand the company's already large package range while DPAK will be introduced by the end of 1993.

Other existing packages have been upgraded to guarantee 175°C maximum junction temperature at low voltage: ISOWATT220, SOT-82, and SOT-194. Even if improved versions of these packages are to be introduced in Q3 '93, the datasheets here presented already reflect this change.

Computerized SPC control is applied to all critical process steps to enable us to continually monitor and improve our product performance and quality.

Ion implantation

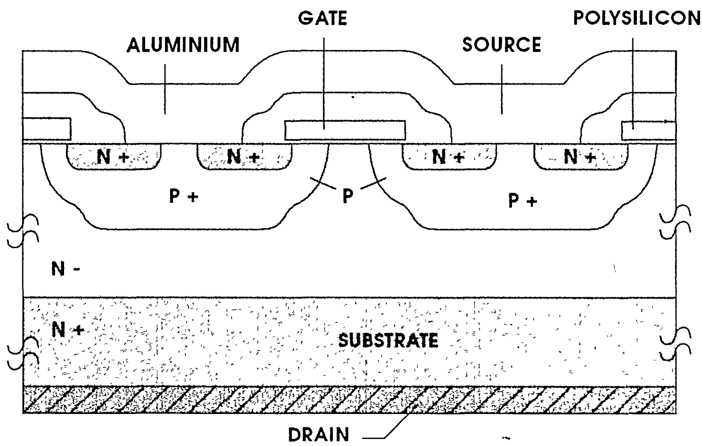


N-CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

SGS-THOMSON series of POWER MOS transistors offers an extremely broad variety of devices covering the voltage range from 50 V to 1000 V with low on-resistance $R_{DS(on)}$ in different package and die size options.

A POWER MOS transistor is a combination of thousands of different cells connected in parallel each using a DMOS (Double Diffused MOS) structure where the channel is realized by lateral diffusion of two impurity distributions: N+ for the source and P- for the body (Fig.1).

Figure 1. POWER MOSFET Structure



This VLSI technique in fact allows shorter channel lengths to be obtained with resulting higher current capabilities. The use of polycrystalline silicon for the gate is also effective in maintaining a high stability of the threshold voltage, $V_{GS(th)}$.
This basic stucture is used to manufacture standard MOS devices as well as low threshold transistors.

The main advantages of SGS-THOMSON POWER MOSFETs include:

- ULTRA FAST SWITCHING
  - Unipolar conduction mechanism
  - Square Reverse Bias Safe Operating Area (RBSOA)
  - Very short delay time at turn-off
- EASY DRIVE
  - Voltage driven input
  - Low drive power requirements
  - Less component count in the drive circuit
- POSITIVE TEMPERATURE COEFFICIENT OF $R_{DS(on)}$
  - Easy to parallel
  - Wide Forward Bias Safe Operating Are (FBSOA)

POWER MOSFET OPERATION

The output characteristics of a POWER MOSFETs provide information about how the drain current I_D varies as a function of drain-to-source voltage V_{DS} when applied gate-to-source voltage V_{GS} is used as an additional parameter.

Fig. 2 shows the output characteristics of SGS-THOMSON STP5N80 (800V, 2Ohm). From an observation of these curves we can identify two distinct areas of operation: a) an ohmic region where on-resistance $R_{DS(on)}$ is almost constant and b) a saturation region (not to be confused with saturation in bipolar transistors) where I_D no longer varies as V_{DS} varies.

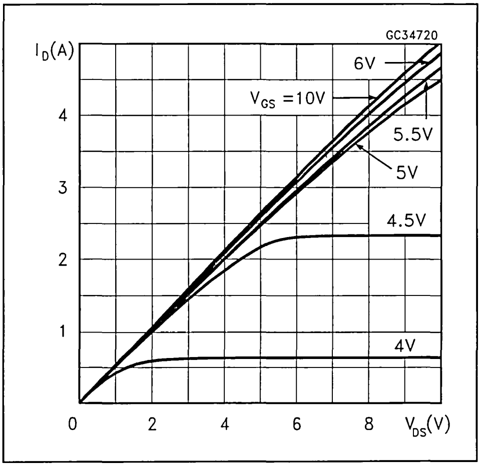
In the first region where I_D increases linearly for small values of VDS we can use the following equation:

(1) $I_D = V_{DS}/R_{DS(on)}$

In the saturation region equation (2) holds:

(2) $I_D = \frac{W \mu C_{ox}}{L} [V_{GS} - V_{GS}(th)]^2$

Figure 2



where:

$V_{GS(th)}$ = gate to source threshold voltage
W = channel width
L = channel length
μ = carrier mobility in the conductive channel
C_{ox} = gate oxide capacitance per unit area

On-resistance $R_{DS(on)}$

$R_{DS(on)}$ is defined as the overall resistance that I_D encounters when flowing from drain to source and depends on several factors.
For low voltage the dominant component of $R_{DS(on)}$ is the channel resistance. To minimize the on-resistance in that range it is necessary to maximize the channel perimeter per unit area with a high packing density. At high voltage it is the resistance of the epi layer that imposes the $R_{DS(on)}$ value.

High Voltage POWER MOSFETs

In manufacturing high voltage devices, from 800 to 1000V, special care has to be taken in designing the appropriate edge termination. The goal of the edge termination is to optimize the electric field in the vicinity of silicon surface in such a manner that the electric field never reaches its critical value at which local breakdown occurs which can deteriorate the device voltage capability. Ideally, breakdown should take place in the bulk silicon.

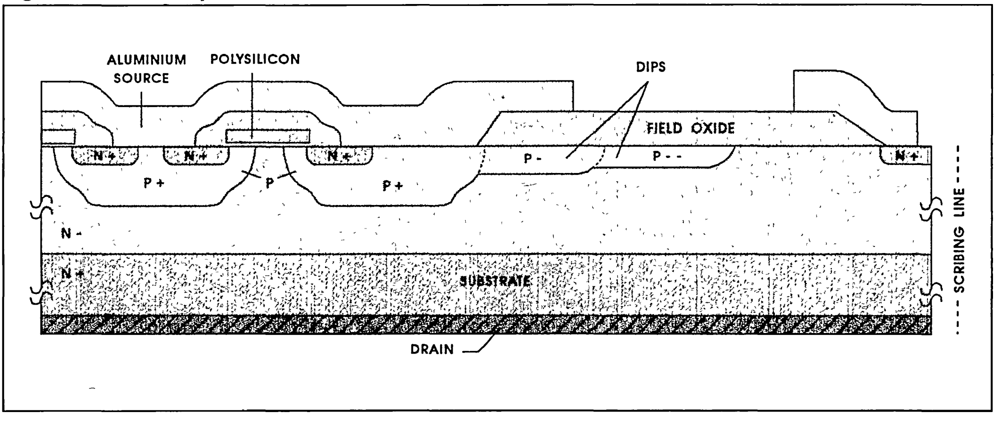
SGS-THOMSON has introduced very advanced structures for the high voltage series which on one hand improve production efficiency, while on the other translate into real benefits for the customer:

- 100% avalanche energy testing to ensure full ruggedness
- Lowest $R_{DS(on)}$ * active area
- Reduced gate charge.

All these advantages are complemented now by increased V_{GS} rating, ± 30 V instead of ± 20 V, reduced spread on $V_{GS(th)}$, lower intrinsic capacitances and very low gate charge, in the new series of high voltage devices such as STP5NA50, STP8NA50, STP3NA80, STP5NA80, etc.

These advanced devices are already available for production and some more are being introduced.

Figure 3. Double Implanted Planar Structure



Statistical Process Control (SPC) represents the use of statistical tools in the design, development, and production phases to control and minimise process variability, improve yields and quality resulting in a more efficient manufacturing and shorter cycle times. All this translates into higher quality, better service and lower costs for the customers.

Special on-line techniques include the adoption of control charts in the production areas which influence directly the process/production parameters. A control chart shows upper and/or lower control limits as well as the plot of some statistical measures for a series of samples or sub-groups. It often has a central line to detect the trend of the plotted values with respect to both control limits. The underlying idea of any control chart is to compare each successive output with the previous ones and also to compare the entire set of outputs with the target; if the process is under control, the trend of the measured output will be centered around the target.

The most popular control chart is the Stewhart chart ($\bar{X}$, R). CUSUM (Cumulative Sum) and EWMA (Exponentially Weighted Moving Average) control charts are also used to detect small gradual drifts in process average which could not be highlighted in conventional charts.

Simplified concepts have been introduced to make the statistical tools accessible to most people; they are based on two indexes, C_p and C_{pk} process capabilities.

C_p is defined as the ratio between the specification limit range (USL-LSL) fixed by Upper Specification Limit and Lower Specification Limit, to the conventional process variability, i.e., 6σ. C_p therefore expresses how adequate the process is in meeting the specification.

C_{pk} combines the information of C_p with the measurement of the process centering around the target and is defined as minimum value between

$$C_{pu} = \frac{(USL - AVG)}{3\,\sigma} \text{ and}$$

$$C_{pl} = \frac{(AVG - LSL)}{3\,\sigma}$$

where AVG is the process average.

From the above it follows that:

1. C_{pk} gives emphasis on the possible distribution tails which are out of the specification.

2. The definition of C_{pk} implies that the corresponding distribution be Gaussian (normal).

In some cases the normality condition on the distribution is not met, this is the case for $V_{(BR)DSS}$, so the resulting C_{pk} values could not seem appropriate.

Any device selection which cuts the distribution results in C_{pk} values falling to less than 1. Factory and market requests often lead to power discretes having some degree of selection, for example the availability of both 50V and 60V versions of the same die.

The typical C_{pk} indexes for the main electrical parameters of SGS-THOMSON Power MOSFETs are listed in the following table:

$V_{(BR)DSS}$	$R_{DS(on)}$	$V_{GS(th)}$	g_{fs}	C
> 1.3	> 1	> 4 for one lot	> 3	>3
		> 3 for total population		

N.B. These values are assuming use of the 'worst case' limits for the line and not any selected device.

It is shown essentially that the continuous drain current as specified in the datasheet by most suppliers is limited by maximum junction temperature, therefore by the device power dissipation rating P_D. Any value shown by some suppliers which does not match this functional dependence results in a tricky expedient to artificially upgrade the datasheet specification. It is also demonstrated that the only real comparison that can be made on paper is $V_{(BR)DSS(min)}$ and $R_{DS(on)(max)}$ for a similar package, therefore similar power dissipation.

The ability of Power MOSFETs to safely absorb power pulses is greater than that of bipolar transistors due to their inherent structure. In fact there is no h_{FE} effect in a MOSFET leading to secondary breakdown phenomena (resulting in current crowding and hot spots) and therefore degrading their current capability versus applied voltage like bipolars.

A more detailed comparison between the current capabilities in both MOSFETs and bipolars will elucidate the problem behind the drain current specification for a correct comprehension of their ratings.

One key parameter of bipolar transistors is the collector-emitter saturation voltage V_{CEsat}. The manufacturer guarantees that at given collector current I_{Csat} when a base current I_{Bsat} is injected, the actual collector-emitter voltage will be equal or lower than V_{CEsat}. The ratio of I_{Csat} to I_{Bsat} is referred to as forced gain. The continuous and peak collector current ratings are also specified in a datasheet based on the condition that other limits like maximum junction temperature be not exceeded. Even if these ratings can be tolerated by the transistor nevertheless their values cannot be used in practise mainly due to excessive base drive current otherwise required (lower h_{FE}) and high values of V_{CEsat} reached. For this reasons the power bipolar transistor should be operated whith its nominal current below the specified I_{Csat} value.

Unlike bipolars whose current capability is limited by h_{FE}, MOSFETs base theirs on different considerations. In fact looking at the 'gain' of Power MOSFETs, namely g_{fs}, the opposite phenomenon occurs as this parameter increases as I_D increases. The only valid criterion established in the industry on which the continuous rating of a MOSFET is based is solely thermal. This simply implies that SGS-THOMSON Power MOSFETs are capable of supplying as much current as the heat evacuation from heatsinking will permit so as to keep the junction temperature below its maximum value.

The operating drain current can therefore be calculated from the well known formula giving power dissipation across a resistor:

$$P_D = R_{DS(on)} \times I_D^2$$

with power dissipation:

$$P_D = (T_{jmax} - T_c)/R_{th(j-c)}.$$

$R_{DS(on)}$ is the on-state resistance at T_{jmax}; T_c is the case temperaure and $R_{th(j-c)}$ is the maximum junction-case thermal resistance. For a worst case maximum $R_{DS(on)}$ is used. From the above

$$I_D = \sqrt{\frac{(T_{jmax} - T_c) \times R_{th(j-c)}}{R_{DS(on)}}}$$

As an example we can consider STH4N90:
$R_{DS(on)}$ (150^{o}C) = 2.2 x $R_{DS(on)}$(25^{o}C) from the on-resistance versus temperature plot. Subsituting we get I_D = 4.2 A
The theoretical continuous drain current is not in practise a selection criterion for a Power MOSFETs as some competitors publicize, because in most switching applications the device is operated at duty cycles smaller than 1. In other words the MOSFET could carry a current higher than I_{Dcont} (4.2 A for STH4N90) so long as the maximum junction temperature is not exceeded. This check can easily be made using the thermal impedance curves given in the datasheets for both single pulse and repetitive pulses.

There exists however another current rating not to be exceeded, I_{DM}. For SGS-THOMSON Power MOSFETs this value is 4 times the continuous current at 25 ^{o}C, sufficiently high for any working peak currents. The dimensioning of bonding wires is chosen for their current handling capability to be well above I_{DM}. Also in most real world applications T_{case} is 25 ^{o}C; ambient temperatures are higher and heatsinks are not infinite, so continuous I_{Dmax} cannot be used.

V_{DSS} (V)	R_{DSon} (max) (Ω)	Package	Sales Type	I_D cont (A)	P_{tot} (W)	Page
1000	0.700	ISOTOP	STE16N100	16	400	283
1000	0.770	ISOTOP	STE15N100	15	400	277
1000	2.000	TO-218	STH6N100	6	180	389
1000	2.000	ISOWATT218	STH6N100FI	3.7	70	389
1000	3.500	TO-218	STHV102	4.2	150	525
1000	3.500	ISOWATT218	STHV102FI	2.6	60	525
1000	3.500	TO-220	STP4N100	4	125	789
1000	3.500	ISOWATT220	STP4N100FI	2.2	40	789
1000	3.500	PowerSO-10	STV4N100	3.3	125	*
1000	4.000	ISOWATT221	STP4N100XI	2	35	797
1000	5.000	TO-220	STP3N100	3.5	100	749
1000	5.000	ISOWATT220	STP3N100FI	2	40	749
1000	6.000	ISOWATT221	STP3N100XI	1.6	30	757
900	1.400	TO-218	STH7N90	7.5	180	397
900	1.400	ISOWATT218	STH7N90FI	4.5	70	397
900	2.400	TO-218	STH5N90	5.3	150	377
900	2.400	ISOWATT218	STH5N90FI	3.5	60	377
900	2.400	TO-220	STP5N90	5	125	861
900	2.400	ISOWATT220	STP5N90FI	2.8	40	861
900	3.200	TO-218	STH4N90	4.2	125	369
900	3.200	ISOWATT218	STH4N90FI	2.7	55	369
900	3.500	TO-220	STP4N90	3.6	100	781
900	3.500	ISOWATT220	STP4N90FI	2.3	40	781
900	4.500	TO-220	STP3N90	3.2	100	741
900	4.500	ISOWATT220	STP3N90FI	1.9	40	741
800	0.400	ISOTOP	STE22N80	22	400	289
800	1.000	TO-218	STH9N80	9	180	413
800	1.000	ISOWATT218	STH9N80FI	5.6	70	413
800	1.200	TO-218	STH8N80	8.2	180	405
800	1.200	ISOWATT218	STH8N80FI	5.1	70	405
800	1.200	TO-247	STW8N80	8.2	180	405
800	2.000	TO-218	STHV82	5.5	150	517
800	2.000	ISOWATT218	STHV82FI	3.6	60	517
800	2.000	TO-220	STP5N80	5.5	125	841
800	2.000	ISOWATT220	STP5N80FI	3.1	40	841
800	2.400	TO-218	STH6NA80 ▲	5.8	150	385
800	2.400	ISOWATT218	STH6NA80FI ▲	3.7	60	385
800	2.400	ISOWATT221	STP5N80XI	2.6	35	853
800	2.400	TO-220	STP5NA80 ▲	4.8	125	849
800	2.400	ISOWATT220	STP5NA80FI ▲	2.7	40	849

For I_D cont definition see introductory note ▲ High switching speed and low gate charge * Available on request

V_{DSS} (V)	R_{DSon} (max) (Ω)	Package	Sales Type	I_D cont (A)	P_{tot} (W)	Page
800	2.400	PowerSO-10	STV5N80 ▲	4.8	125	*
800	3.000	TO-220	BUZ80A	3.8	100	127
800	3.000	ISOWATT220	BUZ80AFI	2.4	40	127
800	3.000	TO-218	STH4N80	4.3	125	361
800	3.000	ISOWATT218	STH4N80FI	2.8	55	361
800	3.500	ISOWATT221	STP4N80XI	2	30	773
800	3.500	PowerSO-10	STV4N80	3.8	110	*
800	4.000	TO-220	BUZ80	3.4	100	119
800	4.000	ISOWATT220	BUZ80FI	2.1	40	119
800	4.500	ISOWATT221	STP3N80XI	1.7	28	733
800	4.500	PowerSO-10	STV3N80	3.2	100	*
800	7.000	SOT-82	STK2N80	2.1	70	549
800	7.000	TO-220	STP2N80	2.4	90	701
800	7.000	ISOWATT220	STP2N80FI	1.5	35	701
600	0.150	ISOTOP	STE38N60	38	450	307
600	0.600	TO-218	STH12N60	12	180	421
600	0.600	ISOWATT218	STH12N60FI	7	70	421
600	0.600	TO-247	STW12N60	12	180	421
600	1.200	TO-220	MTP6N60	6.8	125	263
600	1.200	ISOWATT220	STP6N60FI	3.8	40	885
600	1.200	PowerSO-10	STV6N60	6.8	125	*
600	1.600	TO-220	STP5N60	5.6	100	833
600	1.600	ISOWATT220	STP5N60FI	3.4	40	833
600	2.200	TO-220	IRFBC30	4.3	100	215
600	2.200	ISOWATT220	STP3N60FI	2.7	35	717
600	2.500	TO-220	MTP3N60	3.9	100	255
600	2.500	ISOWATT220	MTP3N60FI	2.5	35	255
600	2.500	ISOWATT221	STP3N60XI	2.4	28	725
600	2.500	PowerSO-10	STV4N60	4	100	*
600	3.500	TO-220	STP2N60	2.9	70	693
600	3.500	ISOWATT220	STP2N60FI	2.2	35	693
600	8.000	SOT-82	STK2N60	1.7	50	541
550	0.120	ISOTOP	STE40N55	40	450	*
500	0.100	ISOTOP	STE47N50	47	450	319
500	0.110	ISOTOP	STE45N50	45	450	313
500	0.140	ISOTOP	STE36N50	36	410	301
500	0.200	ISOTOP	STE26N50	26	300	295
500	0.400	TO-218	IRFP450	14	180	243
500	0.400	ISOWATT218	IRFP450FI	9	70	243
500	0.400	TO-247	IRFW450	14	180	243

For I_D cont definition see introductory note ▲ High switching speed and low gate charge * Available on request

VDSS (V)	RDSon (max) (Ω)	Package	Sales Type	ID cont (A)	Ptot (W)	Page
500	0.400	TO-218	STH15N50 ▲	15	180	437
500	0.400	ISOWATT218	STH15N50FI ▲	9.3	70	437
500	0.400	TO-247	STW15N50 ▲	15	180	437
500	0.450	TO-218	STH14N50 ▲	14.1	180	429
500	0.450	ISOWATT218	STH14N50FI ▲	8.8	70	429
500	0.450	TO-247	STW14N50 ▲	14.1	180	429
500	0.850	TO-220	IRF840	8	125	207
500	0.850	ISOWATT220	IRF840FI	4.5	40	207
500	0.850	ISOWATT221	STP8N50XI	4.5	35	905
500	0.850	TO-220	STP8NA50 ▲	8	125	901
500	0.850	ISOWATT220	STP8NA50FI ▲	4.5	40	901
500	0.850	PowerSO-10	STV8NA50 ▲	8	125	*
500	1.100	TO-220	STP6N50	6	100	877
500	1.100	ISOWATT220	STP6N50FI	3.8	40	877
500	1.500	TO-220	IRF830	4.5	100	199
500	1.500	ISOWATT220	IRF830FI	3	35	199
500	1.600	TO-220	STP5NA50 ▲	5	100	829
500	1.600	ISOWATT220	STP5NA50FI ▲	3.1	35	829
500	1.600	TO-220	STP5N50	4.5	100	821
500	1.600	ISOWATT220	STP5N50FI	3	35	821
500	1.600	PowerSO-10	STV5NA50 ▲	5	100	*
500	3.000	TO-220	IRF820	3	75	193
500	3.000	ISOWATT220	IRF820FI	2.2	35	193
500	3.800	SOT-82	STK3N50	2.7	60	557
500	4.000	TO-220	IRF822	2.8	75	193
500	4.000	ISOWATT220	IRF822FI	1.9	35	193
500	4.000	ISOWATT221	STP3N50XI	1.7	25	709
500	6.000	SOT-82	STK2N50	2	50	533
450	0.400	TO-218	IRFP451	14	180	*
450	0.400	ISOWATT218	IRFP451FI	9	70	*
450	0.850	TO-220	IRF841	8	125	207
450	0.850	ISOWATT220	IRF841FI	4.5	40	207
450	1.500	TO-220	IRF831	4.5	100	199
450	1.500	ISOWATT220	IRF831FI	3	35	199
400	0.075	ISOTOP	STE50N40	50	450	325
400	0.300	TO-218	IRFP350	16	180	235
400	0.300	ISOWATT218	IRFP350FI	10	70	235
400	0.550	TO-220	IRF740	10	125	185
400	0.550	ISOWATT220	IRF740FI	5.5	40	185
400	0.550	PowerSO-10	STV10N40	10	125	*

For ID cont definition see introductory note ▲ High switching speed and low gate charge * Available on request

V_{DSS} (V)	R_{DSon} (max) (Ω)	Package	Sales Type	I_D cont (A)	P_{tot} (W)	Page
400	1.000	TO-220	IRF730	5.5	100	177
400	1.000	ISOWATT220	IRF730FI	3.5	35	177
400	1.000	PowerSO-10	STV6N40	6.3	100	*
400	1.800	TO-220	IRF720	4.2	75	169
400	1.800	ISOWATT220	IRF720FI	3	35	169
400	2.100	TO-220	STP4N40	4	75	765
400	2.100	ISOWATT220	STP4N40FI	3	35	765
400	2.200	SOT-82	STK4N40	3.7	60	581
400	2.500	TO-220	BUZ76A	3.8	75	113
300	1.400	SOT-82	STK4N30	4.2	50	565
300	1.400	SOT-82	STK4N30L ■	4.2	50	565
300	1.400	TO-220	STP5N30	5	75	805
300	1.400	ISOWATT220	STP5N30FI	3	35	805
300	1.400	TO-220	STP5N30L ■	5	75	813
300	1.400	ISOWATT220	STP5N30LFI ■	3.5	35	813
250	0.110	TO-218	STH26N25	26	180	445
250	0.110	ISOWATT218	STH26N25FI	16	70	445
250	1.100	TO-220	STP6N25	6	75	869
200	0.021	ISOTOP	STE100N20	100	450	331
200	0.085	TO-218	STH33N20	33	180	453
200	0.085	ISOWATT218	STH33N20FI	20	70	453
200	0.085	TO-247	STW33N20	33	180	453
200	0.180	TO-220	IRF640	18	125	163
200	0.180	ISOWATT220	IRF640FI	10	40	163
200	0.180	TO-218	IRFP240	20	150	229
200	0.180	ISOWATT218	IRFP240FI	12	55	229
200	0.180	PowerSO-10	STV18N20	18	125	*
200	0.400	TO-220	IRF630	10	100	159
200	0.400	ISOWATT220	IRF630FI	6	35	159
200	0.400	PowerSO-10	STV10N20	10	100	*
200	0.650	TO-220	STP7N20	7	75	893
200	0.650	ISOWATT220	STP7N20FI	4.5	30	893
200	0.800	TO-220	IRF620	5	70	153
200	0.800	ISOWATT220	IRF620FI	4	30	153
200	0.700	SOT-82	STK6N20	6	60	589
100	0.007	ISOTOP	STE180N10	180	450	349
100	0.009	ISOTOP	STE150N10	150	410	337
100	0.025	TO-218	STH60N10	60	200	447
100	0.025	ISOWATT218	STH60N10FI	38	80	447
100	0.025	TO-247	STW60N10	60	200	447

For I_D cont definition see introductory note ■ Logic level * Available on request

V_{DSS} (V)	R_{DSon} (max) (Ω)	Package	Sales Type	I_D cont (A)	P_{tot} (W)	Page
100	0.030	TO-218	STH55N10	55	200	469
100	0.030	ISOWATT218	STH55N10FI	34	80	469
100	0.030	TO-247	STW55N10	55	200	469
100	0.040	TO-218	STH45N10	45	180	461
100	0.040	ISOWATT218	STH45N10FI	27	65	461
100	0.040	TO-220	STP40N10	40	150	1073
100	0.040	ISOWATT220	STP40N10FI	22	45	1073
100	0.040	PowerSO-10	STV40N10	40	150	*
100	0.055	TO-218	IRFP150	40	180	223
100	0.055	ISOWATT218	IRFP150FI	23	65	223
100	0.060	TO-220	STP33N10	33	150	1025
100	0.060	ISOWATT220	STP33N10FI	18	45	1025
100	0.060	PowerSO-10	STV33N10	33	150	*
100	0.077	TO-220	IRF540	30	150	147
100	0.077	ISOWATT220	IRF540FI	16	45	147
100	0.100	TO-220	BUZ21	21	105	89
100	0.110	SOT-82	STK17N10	17	65	637
100	0.120	SOT-82	STK16N10L ◘	16	65	629
100	0.120	TO-220	STP20N10	20	105	945
100	0.120	ISOWATT220	STP20N10FI	12	40	945
100	0.120	TO-220	STP20N10L ◘	20	105	953
100	0.120	ISOWATT220	STP20N10LFI ◘	12	40	953
100	0.140	SOT-82	STK14N10	14	65	621
100	0.140	TO-220	STP18N10	18	90	929
100	0.140	ISOWATT220	STP18N10FI	11	40	929
100	0.160	TO-220	IRF530	16	90	141
100	0.160	ISOWATT220	IRF530FI	10	40	141
100	0.250	TO-220	BUZ72A	11	70	107
100	0.270	TO-220	IRF520	10	70	135
100	0.270	ISOWATT220	IRF520FI	7	35	135
100	0.300	SOT-82	STK9N10	9	50	597
60	0.014	TO-218	STH75N06	75	200	501
60	0.014	ISOWATT218	STH75N06FI	50	80	501
60	0.014	TO-247	STW75N06	75	200	501
60	0.016	TO-220	STP60N06-16	60	150	1153
60	0.020	TO-218	STH65N06	65	180	493
60	0.020	ISOWATT218	STH65N06FI	38	65	493
60	0.020	TO-220	STP60N06	60	150	1145
60	0.020	ISOWATT220	STP60N06FI	32	45	1145
60	0.020	PowerSO-10	STV60N06	60	150	*

For I_D cont definition see introductory note ◘ Logic level * Available on request

V_{DSS} (V)	R_{DSon} (max) (Ω)	Package	Sales Type	I_D cont (A)	P_{tot} (W)	Page
60	0.023	TO-220	STP55N06L ■	55	150	1129
60	0.023	ISOWATT220	STP55N06LFI ■	30	45	1129
60	0.025	TO-220	STP53N06	53	150	1113
60	0.028	TO-220	STP50N06	50	150	1089
60	0.028	ISOWATT220	STP50N06FI	27	45	1089
60	0.028	TO-220	STP50N06L ■	50	200	1097
60	0.028	ISOWATT220	STP50N06LFI ■	24	40	1097
60	0.028	PowerSO-10	STV50N06	50	150	*
60	0.040	TO-220	STP36N06	36	120	1041
60	0.040	ISOWATT220	STP36N06FI	21	40	1041
60	0.040	TO-220	STP36N06L ■	36	120	1049
60	0.040	ISOWATT220	STP36N06LFI ■	21	40	1049
60	0.040	PowerSO-10	STV36N06	36	120	*
60	0.050	TO-220	STP30N06	30	105	1001
60	0.050	ISOWATT220	STP30N06FI	19	40	1001
60	0.055	SOT-82	STK23N06L ■	23	65	677
60	0.055	TO-220	STP32N06L ■	32	105	1017
60	0.055	ISOWATT220	STP32N06LFI ■	19	40	1017
60	0.065	SOT-82	STK22N06	22	65	669
60	0.065	TO-220	STP25N06	25	90	985
60	0.065	ISOWATT220	STP25N06FI	16	40	985
60	0.085	SOT-82	STK18N06	18	60	645
60	0.085	SOT-82	STK18N06L ■	18	60	653
60	0.085	TO-220	STP20N06	20	80	937
60	0.085	ISOWATT220	STP20N06FI	13	35	937
60	0.085	TO-220	STP21N06L ■	21	80	969
60	0.085	ISOWATT220	STP21N06LFI ■	14	35	969
60	0.120	SOT-82	STK14N06	14	50	613
60	0.150	TO-220	MTP3055E	14	70	271
60	0.150	ISOWATT220	MTP3055EFI	10	35	271
60	0.150	SOT-82	STK12N06L ■	12	50	605
60	0.150	SOT-82	STK3055E	12	50	685
60	0.150	TO-220	STP15N06L ■	15	70	921
60	0.150	ISOWATT220	STP15N06LFI ■	10	35	921
50	0.004	ISOTOP	STE250N05	250	450	355
50	0.006	ISOTOP	STE180N05	180	360	343
50	0.012	TO-218	STH80N05	80	200	509
50	0.012	ISOWATT218	STH80N05FI	52	70	509
50	0.012	TO-247	STW80N05	80	200	509
50	0.016	PowerSO-10	STV60N05-16	60	150	*

For I_D cont definition see introductory note ■ Logic level * Available on request

V_{DSS} (V)	R_{DSon} (max) (Ω)	Package	Sales Type	I_D cont (A)	P_{tot} (W)	Page
50	0.020	TO-218	STH65N05	65	180	485
50	0.020	ISOWATT218	STH65N05FI	38	65	485
50	0.020	TO-220	STP60N05	60	150	1137
50	0.020	ISOWATT220	STP60N05FI	32	45	1137
50	0.020	PowerSO-10	STV60N05	60	150	*
50	0.023	TO-220	STP55N05L ■	55	150	1121
50	0.023	ISOWATT220	STP55N05LFI ■	30	45	1121
50	0.025	TO-220	STP53N05	53	150	1105
50	0.028	TO-220	IRFZ40	50	150	249
50	0.028	ISOWATT220	IRFZ40FI	27	45	249
50	0.028	TO-220	STP50N05L ■	50	200	1081
50	0.028	ISOWATT220	STP50N05LFI ■	24	40	1081
50	0.028	PowerSO-10	STV50N05	50	150	*
50	0.035	TO-220	STP40N05	40	120	1057
50	0.035	ISOWATT220	STP40N05FI	23	40	1057
50	0.035	PowerSO-10	STV40N05	40	120	*
50	0.040	TO-220	BUZ11	36	120	77
50	0.040	ISOWATT220	BUZ11FI	21	40	77
50	0.040	TO-220	STP36N05L ■	36	120	1033
50	0.040	ISOWATT220	STP36N05LFI ■	21	40	1033
50	0.050	TO-220	STP30N05	30	105	993
50	0.050	ISOWATT220	STP30N05FI	19	40	993
50	0.055	TO-220	BUZ11A	27	90	83
50	0.055	SOT-82	STK23N05L ■	23	65	677
50	0.055	TO-220	STP32N05L ■	32	105	1009
50	0.055	ISOWATT220	STP32N05LFI ■	19	40	1009
50	0.065	SOT-82	STK22N05	22	65	661
50	0.065	TO-220	STP25N05	25	90	977
50	0.065	ISOWATT220	STP25N05FI	16	40	977
50	0.070	TO-220	BUZ10	20	80	71
50	0.085	SOT-82	STK18N05	18	60	653
50	0.085	SOT-82	STK18N05L ■	18	60	653
50	0.085	TO-220	STP21N05L ■	21	80	961
50	0.085	ISOWATT220	STP21N05LFI ■	14	35	961
50	0.100	TO-220	BUZ71	18	80	95
50	0.100	ISOWATT220	BUZ71FI	12	35	95
50	0.120	TO-220	BUZ71A	13	40	101
50	0.120	ISOWATT220	BUZ71AFI	11	35	101
50	0.120	SOT-82	STK14N05	14	50	613
50	0.150	SOT-82	STK12N05L ■	12	50	605
50	0.150	TO-220	STP15N05L ■	15	70	913

For I_D cont definition see introductory note ■ Logic level * Available on request

Sales Type	V_{DSS} (V)	R_{DSon} (max) (Ω)	Package	I_D (cont) (A)	P_{tot} (W)	Page
BUZ10	50	0.070	TO-220	20	80	71
BUZ11	50	0.040	TO-220	36	120	77
BUZ11A	50	0.055	TO-220	27	90	83
BUZ11FI	50	0.040	ISOWATT220	21	40	77
BUZ21	100	0.100	TO-220	21	105	89
BUZ71	50	0.100	TO-220	18	80	95
BUZ71A	50	0.120	TO-220	13	40	101
BUZ71AFI	50	0.120	ISOWATT220	11	35	101
BUZ71FI	50	0.100	ISOWATT220	12	35	95
BUZ72A	100	0.250	TO-220	11	70	107
BUZ76A	400	2.500	TO-220	3.8	75	113
BUZ80	800	4.000	TO-220	3.4	100	119
BUZ80A	800	3.000	TO-220	3.8	100	127
BUZ80AFI	800	3.000	ISOWATT220	2.4	40	127
BUZ80FI	800	4.000	ISOWATT220	2.1	40	119
IRF520	100	0.270	TO-220	10	70	135
IRF520FI	100	0.270	ISOWATT220	7	35	135
IRF530	100	0.160	TO-220	16	90	141
IRF530FI	100	0.160	ISOWATT220	10	40	141
IRF540	100	0.077	TO-220	30	150	147
IRF540FI	100	0.077	ISOWATT220	16	45	147
IRF620	200	0.800	TO-220	5	70	153
IRF620FI	200	0.800	ISOWATT220	4	30	153
IRF630	200	0.400	TO-220	10	100	159
IRF630FI	200	0.400	ISOWATT220	6	35	159
IRF640	200	0.180	TO-220	18	125	163
IRF640FI	200	0.180	ISOWATT220	10	40	163
IRF720	400	1.800	TO-220	4.2	75	169
IRF720FI	400	1.800	ISOWATT220	3	35	169
IRF730	400	1.000	TO-220	5.5	100	177
IRF730FI	400	1.000	ISOWATT220	3.5	35	177
IRF740	400	0.550	TO-220	10	125	185
IRF740FI	400	0.550	ISOWATT220	5.5	40	185
IRF820	500	3.000	TO-220	3	75	193
IRF820FI	500	3.000	ISOWATT220	2.2	35	193
IRF822	500	4.000	TO-220	2.8	75	193
IRF822FI	500	4.000	ISOWATT220	1.9	35	193
IRF830	500	1.500	TO-220	4.5	100	199
IRF830FI	500	1.500	ISOWATT220	3	35	199
IRF831	450	1.500	TO-220	4.5	100	199

For I_D cont definition see introductory note

Sales Type	V_{DSS} (V)	R_{DSon} (max) (Ω)	Package	I_D (cont) (A)	P_{tot} (W)	Page
IRF831FI	450	1.500	ISOWATT220	3	35	199
IRF840	500	0.850	TO-220	8	125	207
IRF840FI	500	0.850	ISOWATT220	4.5	40	207
IRF841	450	0.850	TO-220	8	125	207
IRF841FI	450	0.850	ISOWATT220	4.5	40	207
IRFBC30	600	2.200	TO-220	4.3	100	215
IRFP150	100	0.055	TO-218	40	180	223
IRFP150FI	100	0.055	ISOWATT218	23	65	223
IRFP240	200	0.180	TO-218	20	150	229
IRFP240FI	200	0.180	ISOWATT218	12	55	229
IRFP350	400	0.300	TO-218	16	180	235
IRFP350FI	400	0.300	ISOWATT218	10	70	235
IRFP450	500	0.400	TO-218	14	180	243
IRFP450FI	500	0.400	ISOWATT218	9	70	243
IRFP451	450	0.400	TO-218	14	180	*
IRFP451FI	450	0.400	ISOWATT218	9	70	*
IRFW450	500	0.400	TO-247	14	180	243
IRFZ40	50	0.028	TO-220	50	150	249
IRFZ40FI	50	0.028	ISOWATT220	27	45	249
MTP3N60	600	2.500	TO-220	3.9	100	255
MTP3N60FI	600	2.500	ISOWATT220	2.5	35	255
MTP6N60	600	1.200	TO-220	6.8	125	263
MTP3055E	60	0.150	TO-220	14	70	271
MTP3055EFI	60	0.150	ISOWATT220	10	35	271
STE15N100	1000	0.770	ISOTOP	15	400	277
STE16N100	1000	0.700	ISOTOP	16	400	283
STE22N80	800	0.400	ISOTOP	22	400	289
STE26N50	500	0.200	ISOTOP	26	300	295
STE36N50	500	0.140	ISOTOP	36	410	301
STE38N60	600	0.150	ISOTOP	38	450	307
STE40N55	550	0.120	ISOTOP	40	450	*
STE45N50	500	0.110	ISOTOP	45	450	313
STE47N50	500	0.100	ISOTOP	47	450	319
STE50N40	400	0.075	ISOTOP	50	450	325
STE100N20	200	0.021	ISOTOP	100	450	331
STE150N10	100	0.009	ISOTOP	150	410	337
STE180N05	50	0.006	ISOTOP	180	360	343
STE180N10	100	0.007	ISOTOP	180	450	349
STE250N05	50	0.004	ISOTOP	250	450	355
STH4N80	800	3.000	TO-218	4.3	125	361

For I_D cont definition see introductory note * Available on request

Sales Type	V_{DSS} (V)	R_{DSon} (max) (Ω)	Package	I_D (cont) (A)	P_{tot} (W)	Page
STH4N80FI	800	3.000	ISOWATT218	2.8	55	361
STH4N90	900	3.200	TO-218	4.2	125	369
STH4N90FI	900	3.200	ISOWATT218	2.7	55	369
STH5N90	900	2.400	TO-218	5.3	150	377
STH5N90FI	900	2.400	ISOWATT218	3.5	60	377
STH6NA80 ▲	800	2.400	TO-218	5.8	150	385
STH6NA80FI ▲	800	2.400	ISOWATT218	3.7	60	385
STH6N100	1000	2.000	TO-218	6	180	389
STH6N100FI	1000	2.000	ISOWATT218	3.7	70	389
STH7N90	900	1.400	TO-218	7.5	180	397
STH7N90FI	900	1.400	ISOWATT218	4.5	70	397
STH8N80	800	1.200	TO-218	8.2	180	405
STH8N80FI	800	1.200	ISOWATT218	5.1	70	405
STH9N80	800	1.000	TO-218	9	180	413
STH9N80FI	800	1.000	ISOWATT218	5.6	70	413
STH12N60	600	0.600	TO-218	12	180	421
STH12N60FI	600	0.600	ISOWATT218	7	70	421
STH14N50 ▲	500	0.450	TO-218	14.1	180	429
STH14N50FI ▲	500	0.450	ISOWATT218	8.8	70	429
STH15N50 ▲	500	0.400	TO-218	15	180	437
STH15N50FI ▲	500	0.400	ISOWATT218	9.3	70	437
STH26N25	250	0.110	TO-218	26	180	445
STH26N25FI	250	0.110	ISOWATT218	16	70	445
STH33N20	200	0.085	TO-218	33	180	453
STH33N20FI	200	0.085	ISOWATT218	20	70	453
STH45N10	100	0.040	TO-218	45	180	461
STH45N10FI	100	0.040	ISOWATT218	27	65	461
STH55N10	100	0.030	TO-218	55	200	469
STH55N10FI	100	0.030	ISOWATT218	34	80	469
STH60N10	100	0.025	TO-218	60	200	477
STH60N10FI	100	0.025	ISOWATT218	38	80	477
STH65N05	50	0.020	TO-218	65	180	485
STH65N05FI	50	0.020	ISOWATT218	38	65	485
STH65N06	60	0.020	TO-218	65	180	493
STH65N06FI	60	0.020	ISOWATT218	38	65	493
STH75N06	60	0.014	TO-218	75	200	501
STH75N06FI	60	0.014	ISOWATT218	50	80	501
STH80N05	50	0.012	TO-218	80	200	509
STH80N05FI	50	0.012	ISOWATT218	52	70	509
STHV82	800	2.000	TO-218	5.5	150	517

For I_D cont definition see introductory note ▲ High switching speed and low gate charge

Sales Type	V_{DSS} (V)	R_{DSon} (max) (Ω)	Package	I_D (cont) (A)	P_{tot} (W)	Page
STHV82FI	800	2.000	ISOWATT218	3.6	60	517
STHV102	1000	3.500	TO-218	4.2	150	525
STHV102FI	1000	3.500	ISOWATT218	2.6	60	525
STK2N50	500	6.000	SOT-82	2	50	533
STK2N60	600	8.000	SOT-82	1.7	50	541
STK2N80	800	7.000	SOT-82	2.1	70	549
STK3N50	500	3.800	SOT-82	2.7	60	557
STK4N30	300	1.300	SOT-82	4.2	50	565
STK4N30L ■	300	1.400	SOT-82	4.2	50	573
STK4N40	400	2.200	SOT-82	3.7	60	581
STK6N20	200	0.700	SOT-82	6	60	589
STK9N10	100	0.300	SOT-82	9	50	597
STK12N05L ■	50	0.150	SOT-82	12	50	605
STK12N06L ■	60	0.150	SOT-82	12	50	605
STK14N05	50	0.120	SOT-82	14	50	613
STK14N06	60	0.120	SOT-82	14	50	613
STK14N10	100	0.140	SOT-82	14	65	621
STK16N10L ■	100	0.120	SOT-82	16	65	629
STK17N10	100	0.110	SOT-82	17	65	637
STK18N05	50	0.085	SOT-82	18	60	645
STK18N05L ■	50	0.085	SOT-82	18	60	653
STK18N06	60	0.085	SOT-82	18	60	645
STK18N06L ■	60	0.085	SOT-82	18	60	653
STK22N05	50	0.065	SOT-82	22	65	661
STK22N06	60	0.065	SOT-82	22	65	669
STK23N05L ■	50	0.055	SOT-82	23	65	677
STK23N06L ■	60	0.055	SOT-82	23	65	677
STK3055E	60	0.150	SOT-82	12	50	685
STP2N60	600	3.500	TO-220	2.9	70	693
STP2N60FI	600	3.500	ISOWATT220	2.2	35	693
STP2N80	800	7.000	TO-220	2.4	90	701
STP2N80FI	800	7.000	ISOWATT220	1.5	35	701
STP3N50XI	500	4.000	ISOWATT221	1.7	25	709
STP3N60FI	600	2.200	ISOWATT220	2.7	35	717
STP3N60XI	600	2.500	ISOWATT221	2.4	28	725
STP3N80XI	800	4.500	ISOWATT221	1.7	28	733
STP3N90	900	4.500	TO-220	3.2	100	741
STP3N90FI	900	4.500	ISOWATT220	1.9	40	741
STP3N100	1000	5.000	TO-220	3.5	100	749
STP3N100FI	1000	5.000	ISOWATT220	2	40	749

For I_D cont definition see introductory note ■ Logic level

Sales Type	V_{DSS} (V)	R_{DSon} (max) (Ω)	Package	I_D (cont) (A)	P_{tot} (W)	Page
STP3N100XI	1000	6.000	ISOWATT221	1.6	30	757
STP4N40	400	2.100	TO-220	4	75	765
STP4N40FI	400	2.100	ISOWATT220	3	35	765
STP4N80XI	800	3.500	ISOWATT221	2	30	773
STP4N90	900	3.500	TO-220	3.6	100	781
STP4N90FI	900	3.500	ISOWATT220	2.3	40	781
STP4N100	1000	3.500	TO-220	4	125	789
STP4N100FI	1000	3.500	ISOWATT220	2.2	40	789
STP4N100XI	1000	4.000	ISOWATT221	2	35	797
STP5N30	300	1.400	TO-220	5	75	805
STP5N30FI	300	1.400	ISOWATT220	3	35	805
STP5N30L ◘	300	1.400	TO-220	5	75	813
STP5N30LFI ◘	300	1.400	ISOWATT220	3.5	30	813
STP5N50	500	1.600	TO-220	4.5	100	821
STP5N50FI	500	1.600	ISOWATT220	3	35	821
STP5NA50 ▲	500	1.600	TO-220	4.5	100	829
STP5NA50FI ▲	500	1.600	ISOWATT220	3	35	829
STP5N60	600	1.600	TO-220	5.6	100	833
STP5N60FI	600	1.600	ISOWATT220	3.4	40	833
STP5N80	800	2.000	TO-220	5.5	125	841
STP5N80FI	800	2.000	ISOWATT220	3.1	40	841
STP5N80XI	800	2.400	ISOWATT221	2.6	35	853
STP5NA80 ▲	800	2.400	TO-220	4.8	125	849
STP5NA80FI ▲	800	2.400	ISOWATT220	2.7	40	849
STP5N90	900	2.400	TO-220	5	125	861
STP5N90FI	900	2.400	ISOWATT220	2.8	40	861
STP6N25	250	1.100	TO-220	5	75	869
STP6N50	500	1.100	TO-220	6	100	877
STP6N50FI	500	1.100	ISOWATT220	3.8	40	877
STP6N60FI	600	1.200	ISOWATT220	3.8	40	885
STP7N20	200	0.650	TO-220	7	75	893
STP7N20FI	200	0.650	ISOWATT220	4.5	30	893
STP8N50XI	500	0.850	ISOWATT221	4.5	35	905
STP8NA50	500	0.850	TO-220	8	125	901
STP8NA50FI	500	0.850	ISOWATT220	4.5	40	901
STP15N05L ◘	50	0.150	TO-220	15	70	913
STP15N05LFI ◘	50	0.150	ISOWATT220	10	35	913
STP15N06L ◘	60	0.150	TO-220	15	70	921
STP15N06LFI ◘	60	0.150	ISOWATT220	10	35	921
STP18N10	100	0.140	TO-220	18	90	929

For I_D cont definition see introductory note ▲ High switching speed and low gate charge ◘ Logic level

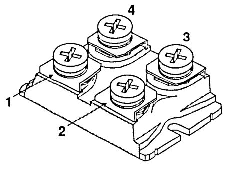
Sales Type	V_{DSS} (V)	R_{DSon} (max) (Ω)	Package	I_D (cont) (A)	P_{tot} (W)	Page
STP18N10FI	100	0.140	ISOWATT220	11	40	929
STP20N06	60	0.085	TO-220	20	80	937
STP20N06FI	60	0.085	ISOWATT220	13	35	937
STP20N10	100	0.120	TO-220	20	105	945
STP20N10FI	100	0.120	ISOWATT220	12	40	945
STP20N10L ■	100	0.120	TO-220	20	105	953
STP20N10LFI ■	100	0.120	ISOWATT220	12	40	953
STP21N05L ■	50	0.085	TO-220	21	80	961
STP21N05LFI ■	50	0.085	ISOWATT220	14	35	961
STP21N06L ■	60	0.085	TO-220	21	80	969
STP21N06LFI ■	60	0.085	ISOWATT220	14	35	969
STP25N05	50	0.065	TO-220	25	90	977
STP25N05FI	50	0.065	ISOWATT220	16	40	977
STP25N06	60	0.065	TO-220	25	90	985
STP25N06FI	60	0.065	ISOWATT220	16	40	985
STP30N05	50	0.050	TO-220	30	105	993
STP30N05FI	50	0.050	ISOWATT220	19	40	993
STP30N06	60	0.050	TO-220	30	105	1001
STP30N06FI	60	0.050	ISOWATT220	19	40	1001
STP32N05L ■	50	0.055	TO-220	32	105	1009
STP32N05LFI ■	50	0.055	ISOWATT220	19	40	1009
STP32N06L ■	60	0.055	TO-220	32	105	1017
STP32N06LFI ■	60	0.055	ISOWATT220	19	40	1017
STP33N10	100	0.060	TO-220	33	150	1025
STP33N10FI	100	0.060	ISOWATT220	18	45	1025
STP36N05L ■	50	0.040	TO-220	36	120	1033
STP36N05LFI ■	50	0.040	ISOWATT220	21	40	1033
STP36N06	60	0.040	TO-220	36	120	1041
STP36N06FI	60	0.040	ISOWATT220	21	40	1041
STP36N06L ■	60	0.040	TO-220	36	120	1049
STP36N06LFI ■	60	0.040	ISOWATT220	21	40	1049
STP40N05	50	0.035	TO-220	40	120	1057
STP40N05FI	50	0.035	ISOWATT220	23	40	1057
STP40N10	100	0.040	TO-220	40	150	1073
STP40N10FI	100	0.040	ISOWATT220	22	45	1073
STP50N05L ■	50	0.028	TO-220	50	200	1081
STP50N05LFI ■	50	0.028	ISOWATT220	24	40	1081
STP50N06	60	0.028	TO-220	50	150	1089
STP50N06FI	60	0.028	ISOWATT220	27	45	1089
STP50N06L ■	60	0.028	TO-220	50	200	1097

For I_D cont definition see introductory note ■ Logic level

Sales Type	V_{DSS} (V)	R_{DSon} (max) (Ω)	Package	I_D (cont) (A)	P_{tot} (W)	Page
STP50N06LFI ■	60	0.028	ISOWATT220	24	40	1097
STP53N05	50	0.025	TO-220	53	150	1105
STP53N06	60	0.025	TO-220	53	150	1113
STP55N05L ■	50	0.023	TO-220	55	150	1121
STP55N05LFI ■	50	0.023	ISOWATT220	30	45	1121
STP55N06L ■	60	0.023	TO-220	55	150	1129
STP55N06LFI ■	60	0.023	ISOWATT220	30	45	1129
STP60N05	50	0.020	TO-220	60	150	1137
STP60N05FI	50	0.020	ISOWATT220	32	45	1137
STP60N06	60	0.020	TO-220	60	150	1145
STP60N06FI	60	0.020	ISOWATT220	32	45	1145
STP60N06-16	60	0.016	TO-220	60	150	1153
STV3N80	800	4.500	PowerSO-10	3.2	100	*
STV4N60	600	2.500	PowerSO-10	4	100	*
STV4N80	800	3.500	PowerSO-10	3.8	110	*
STV4N100	1000	3.500	PowerSO-10	3.3	125	*
STV5NA50 ▲	500	1.600	PowerSO-10	5	100	*
STV5NA80 ▲	800	2.400	PowerSO-10	4.6	125	*
STV6N40	400	1.000	PowerSO-10	6.3	100	*
STV6N60	600	1.200	PowerSO-10	6.8	125	*
STV8NA50 ▲	500	0.850	PowerSO-10	8	125	*
STV10N20	200	0.400	PowerSO-10	10	100	*
STV10N40	400	0.550	PowerSO-10	10	125	*
STV18N20	200	0.180	PowerSO-10	18	125	*
STV33N10	100	0.060	PowerSO-10	33	150	*
STV36N06	60	0.040	PowerSO-10	36	120	*
STV40N05	50	0.035	PowerSO-10	40	120	*
STV40N10	100	0.040	PowerSO-10	40	150	*
STV50N05	50	0.028	PowerSO-10	50	150	*
STV50N06	60	0.028	PowerSO-10	50	150	*
STV60N05	50	0.020	PowerSO-10	60	150	*
STV60N05-16	50	0.016	PowerSO-10	60	150	*
STV60N06	60	0.020	PowerSO-10	60	150	*
STW8N80	800	1.200	TO-247	8.2	180	405
STW12N60	600	0.600	TO-247	12	180	421
STW14N50	500	0.450	TO-247	14.1	180	429
STW15N50	500	0.400	TO-247	15	180	437
STW33N20	200	0.085	TO-247	33	180	453
STW55N10	100	0.030	TO-247	55	200	469
STW60N10	100	0.025	TO-247	60	200	477
STW75N06	60	0.014	TO-247	75	200	501
STW80N05	50	0.012	TO-247	80	200	509

For I_D cont definition see introductory note   ▲ High switching speed and low gate charge   ■ Logic level   * Available on request

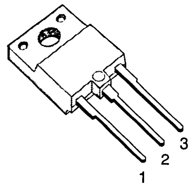
ISOTOP



V_{DSS} (V)	R_{DSon} (max) (Ω)	Sales Type	I_D cont (A)	P_{tot} (W)	Page
1000	0.700	STE16N100	16	400	283
1000	0.770	STE15N100	15	400	277
800	0.400	STE22N80	22	400	289
600	0.150	STE38N60	38	450	307
550	0.120	STE40N55	40	450	*
500	0.100	STE47N50	47	450	319
500	0.110	STE45N50	45	450	313
500	0.140	STE36N50	36	410	301
500	0.200	STE26N50	26	300	295
400	0.075	STE50N40	50	450	325
200	0.021	STE100N20	100	450	331
100	0.007	STE180N10	180	450	349
100	0.009	STE150N10	150	410	337
50	0.004	STE250N05	250	450	355
50	0.006	STE180N05	180	360	343

For I_D cont definition see introductory note * Available on request

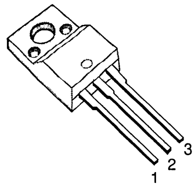
ISOWATT218



V_{DSS} (V)	R_{DSon} (max) (Ω)	Sales Type	I_D cont (A)	P_{tot} (W)	Page
1000	2.000	STH6N100FI	3.7	70	389
1000	3.500	STHV102FI	2.6	60	525
900	1.400	STH7N90FI	4.5	70	397
900	2.400	STH5N90FI	3.5	60	377
900	3.200	STH4N90FI	2.7	55	369
800	1.000	STH9N80FI	5.6	70	413
800	1.200	STH8N80FI	5.1	70	405
800	2.000	STHV82FI	3.6	60	517
800	2.400	STH5NA80FI ▲	3.5	60	849
800	3.000	STH4N80FI	2.8	55	361
600	0.600	STH12N60FI	7	70	421
500	0.400	STH15N50FI ▲	9.3	70	437
500	0.400	IRFP450FI	9	70	243
500	0.450	STH14N50FI ▲	8.8	70	429
450	0.400	IRFP451FI	9	70	*
400	0.300	IRFP350FI	10	70	235
250	0.110	STH26N25FI	16	70	445
200	0.085	STH33N20FI	20	70	453
200	0.180	IRFP240FI	12	55	163
100	0.025	STH60N10FI	38	80	447
100	0.030	STH55N10FI	34	80	469
100	0.040	STH45N10FI	27	65	461
100	0.055	IRFP150FI	23	65	223
60	0.014	STH75N06FI	50	80	501
60	0.020	STH65N06FI	38	65	493
50	0.012	STH80N05FI	52	70	509
50	0.020	STH65N05FI	38	65	485

For I_D cont definition see introductory note ▲ High switching speed and low gate charge * Available on request

ISOWATT220



V_{DSS} (V)	R_{DSon} (max) (Ω)	Sales Type	I_D cont (A)	P_{tot} (W)	Page
1000	3.500	STP4N100FI	2.2	40	789
1000	5.000	STP3N100FI	2	40	749
900	2.400	STP5N90FI	2.8	40	861
900	3.500	STP4N90FI	2.3	40	781
900	4.500	STP3N90FI	1.9	40	741
800	2.000	STP5N80FI	3.1	40	841
800	2.400	STP5NA80FI ▲	2.7	40	849
800	3.000	BUZ80AFI	2.4	40	127
800	4.000	BUZ80FI	2.1	40	119
800	7.000	STP2N80FI	1.5	35	701
600	1.200	STP6N60FI	3.8	40	885
600	1.600	STP5N60FI	3.4	40	833
600	2.200	STP3N60FI	2.7	35	717
600	2.500	MTP3N60FI	2.5	35	255
600	3.500	STP2N60FI	2.2	35	693
500	0.850	IRF840FI	4.5	40	207
500	0.850	STP8NA50FI ▲	4.5	40	201
500	1.100	STP6N50FI	3.8	40	877
500	1.500	IRF830FI	3	35	199
500	1.600	STP5NA50FI ▲	3.1	35	829
500	1.600	STP5N50FI	3	35	821
500	3.000	IRF820FI	2.2	35	193
500	4.000	IRF822FI	1.9	35	193
450	0.850	IRF841FI	4.5	40	207
450	1.500	IRF831FI	3	35	199
400	0.550	IRF740FI	5.5	40	185
400	1.000	IRF730FI	3.5	35	177
400	1.800	IRF720FI	3	35	169
400	2.100	STP4N40FI	3	35	765
300	1.400	STP5N30FI	3	35	805

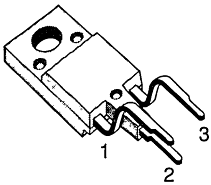
For I_D cont definition see introductory note ▲ High switching speed and low gate charge

ISOWATT 220 (Cont'd)

V_{DSS} (V)	R_{DSon} (max) (Ω)	Sales Type	I_D cont (A)	P_{tot} (W)	Page
300	1.400	STP5N30LFI ■	3.5	35	813
200	0.180	IRF640FI	10	40	163
200	0.400	IRF630FI	6	35	159
200	0.650	STP7N20FI	4.5	30	893
200	0.800	IRF620FI	4	30	153
100	0.040	STP40N10FI	22	45	1073
100	0.060	STP33N10FI	18	45	1025
100	0.077	IRF540FI	16	45	147
100	0.120	STP20N10LFI ■	12	40	953
100	0.120	STP20N10FI	12	40	945
100	0.140	STP18N10FI	11	40	929
100	0.160	IRF530FI	10	40	135
100	0.270	IRF520FI	7	35	135
60	0.020	STP60N06FI	32	45	1145
60	0.023	STP55N06LFI ■	30	45	1129
60	0.028	STP50N06FI	27	45	1089
60	0.028	STP50N06LFI ■	24	40	1097
60	0.040	STP36N06FI	21	40	1041
60	0.040	STP36N06LFI ■	21	40	1049
60	0.050	STP30N06FI	19	40	1001
60	0.055	STP32N06LFI ■	19	40	1017
60	0.065	STP25N06FI	16	40	985
60	0.085	STP20N06FI	13	35	937
60	0.085	STP21N06LFI ■	14	35	969
60	0.150	STP15N06LFI ■	10	35	921
60	0.150	MTP3055EFI	10	35	271
50	0.020	STP60N05FI	32	45	1137
50	0.023	STP55N05LFI ■	30	45	1121
50	0.028	IRFZ40FI	27	45	249
50	0.028	STP50N05LFI ■	24	40	1081
50	0.035	STP40N05FI	23	40	1057
50	0.040	BUZ11FI	21	40	77
50	0.040	STP36N05LFI ■	21	40	1033
50	0.050	STP30N05FI	19	40	993
50	0.055	STP32N05LFI ■	19	40	1009
50	0.065	STP25N05FI	16	40	977
50	0.085	STP21N05LFI ■	14	35	961
50	0.100	BUZ71FI	12	35	95
50	0.120	BUZ71AFI	11	35	101
50	0.150	STP15N05LFI ■	10	35	913

For I_D cont definition see introductory note ■ Logic level

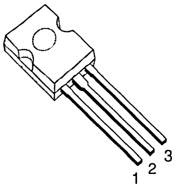
ISOWATT221

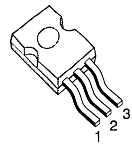


V_{DSS} (V)	R_{DSon} (max) (Ω)	Sales Type	I_D cont (A)	P_{tot} (W)	Page
1000	4.000	STP4N100XI	2	35	797
1000	6.000	STP3N100XI	1.6	30	757
800	2.400	STP5N80XI	2.6	35	853
800	3.500	STP4N80XI	2	30	773
800	4.500	STP3N80XI	1.7	28	733
600	2.500	STP3N60XI	2.4	28	725
500	0.850	STP8N50XI	4.5	35	205
500	4.000	STP3N50XI	1.7	25	709

For I_D cont definition see introductory note

SOT-82



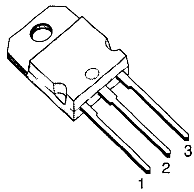


SOT-194 OPTION

V_{DSS} (V)	R_{DSon} (max) (Ω)	Sales Type	I_D cont (A)	P_{tot} (W)	Page
800	7.000	STK2N80	2.1	70	549
600	8.000	STK2N60	1.7	50	541
500	3.800	STK3N50	2.7	60	557
500	6.000	STK2N50	2	50	533
400	2.200	STK4N40	3.7	60	581
300	1.400	STK4N30	4.2	50	565
300	1.400	STK4N30L ■	4.2	50	565
200	0.700	STK6N20	6	60	589
100	0.110	STK17N10	17	65	637
100	0.120	STK16N10L ■	16	65	629
100	0.140	STK14N10	14	65	621
100	0.300	STK9N10	9	50	597
60	0.055	STK23N06L ■	23	65	677
60	0.065	STK22N06	22	65	699
60	0.085	STK18N06	18	60	645
60	0.085	STK18N06L ■	18	60	653
60	0.120	STK14N06	14	50	613
60	0.150	STK12N06L ■	12	50	605
60	0.150	STK3055E	12	50	685
50	0.055	STK23N05L ■	23	65	677
50	0.065	STK22N05	22	65	661
50	0.085	STK18N05	18	60	653
50	0.085	STK18N05L ■	18	60	653
50	0.120	STK14N05	14	50	613
50	0.150	STK12N05L ■	12	50	605

For I_D cont definition see introductory note ■ Logic level

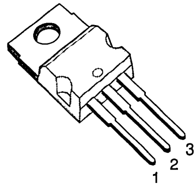
TO-218



V_{DSS} (V)	R_{DSon} (max) (Ω)	Sales Type	I_D cont (A)	P_{tot} (W)	Page
1000	2.000	STH6N100	6	180	389
1000	3.500	STHV102	4.2	150	525
900	1.400	STH7N90	7.5	180	397
900	2.400	STH5N90	5.3	150	377
900	3.200	STH4N90	4.2	125	369
800	1.000	STH9N80	9	180	413
800	1.200	STH8N80	8.2	180	405
800	2.000	STHV82	5.5	150	517
800	2.400	STH6NA80	5.8	150	385
800	3.000	STH4N80	4.3	125	361
600	0.600	STH12N60	12	180	421
500	0.400	STH15N50 ▲	15	180	437
500	0.400	IRFP450	14	180	*
500	0.450	STH14N50 ▲	14.1	180	429
450	0.400	IRFP451	14	180	*
400	0.300	IRFP350	16	18	235
250	0.110	STH26N25	26	180	445
200	0.085	STH33N20	33	180	453
200	0.180	IRFP240	20	150	229
100	0.025	STH60N10	60	200	447
100	0.030	STH55N10	55	200	469
100	0.040	STH45N10	45	180	461
100	0.055	IRFP150	40	180	223
60	0.014	STH75N06	75	200	501
60	0.020	STH65N06	65	180	493
50	0.012	STH80N05	80	200	509
50	0.020	STH65N05	65	180	485

For I_D cont definition see introductory note ▲ High switching speed and low gate charge * Available on request

TO-220



V_{DSS} (V)	R_{DSon} (max) (Ω)	Sales Type	I_D cont (A)	P_{tot} (W)	Page
1000	3.500	STP4N100	4	125	789
1000	5.000	STP3N100	3.5	100	749
900	2.400	STP5N90	5	125	861
900	3.500	STP4N90	3.6	100	781
900	4.500	STP3N90	3.2	100	741
800	2.000	STP5N80	5.5	125	841
800	2.400	STP5NA80 ▲	4.8	125	849
800	3.000	BUZ80A	3.8	100	127
800	4.000	BUZ80	3.4	100	119
800	7.000	STP2N80	2.4	90	701
600	1.200	MTP6N60	6.8	125	263
600	1.600	STP5N60	5.6	100	833
600	2.200	IRFBC30	4.3	100	215
600	2.500	MTP3N60	3.9	100	255
600	3.500	STP2N60	2.9	70	693
500	0.850	STP8NA50 ▲	8	125	901
500	0.850	IRF840	8	125	207
500	1.100	STP6N50	6	100	877
500	1.500	IRF830	4.5	100	199
500	1.600	STP5NA50 ▲	5	100	829
500	1.600	STP5N50	4.5	100	821
500	3.000	IRF820	3	75	193
500	4.000	IRF822	2.8	75	193
450	0.850	IRF841	8	125	207
450	1.500	IRF831	4.5	100	199
400	0.550	IRF740	10	125	185
400	1.000	IRF730	5.5	100	177
400	1.800	IRF720	4.2	75	169
400	2.100	STP4N40	4	75	765
400	2.500	BUZ76A	3.8	75	113

For I_D cont definition see introductory note ▲ High switching speed and low gate charge

TO-220 (Cont'd)

V_{DSS} (V)	R_{DSon} (max) (Ω)	Sales Type	I_D cont (A)	P_{tot} (W)	Page
300	1.400	STP5N30	5	75	805
300	1.400	STP5N30L ■	5	75	813
250	1.100	STP6N25	6	75	869
200	0.180	IRF640	18	125	163
200	0.400	IRF630	10	100	159
200	0.650	STP7N20	7	75	893
200	0.800	IRF620	5	70	153
100	0.040	STP40N10	40	150	1073
100	0.060	STP33N10	33	150	1025
100	0.077	IRF540	30	150	147
100	0.100	BUZ21	21	105	89
100	0.120	STP20N10	20	105	945
100	0.120	STP20N10L ■	20	105	953
100	0.140	STP18N10	18	90	929
100	0.160	IRF530	16	90	141
100	0.250	BUZ72A	11	70	107
100	0.270	IRF520	10	70	135
60	0.016	STP60N06-16	60	150	1153
60	0.020	STP60N06	60	150	1145
60	0.023	STP55N06L ■	55	150	1129
60	0.025	STP53N06	53	150	1113
60	0.028	STP50N06	50	150	1089
60	0.028	STP50N06L ■	50	200	1097
60	0.040	STP36N06L ■	36	120	1049
60	0.040	STP36N06	36	120	*
60	0.050	STP30N06	30	105	1001
60	0.055	STP32N06L ■	32	105	1017
60	0.065	STP25N06	25	90	985
60	0.085	STP20N06	20	80	937
60	0.085	STP21N06L ■	21	80	969
60	0.150	MTP3055E	14	70	271
60	0.150	STP15N06L ■	15	70	921
50	0.020	STP60N05	60	150	1137
50	0.023	STP55N05L ■	55	150	1121
50	0.025	STP53N05	53	150	1105
50	0.028	STP50N05L ■	50	200	1081
50	0.028	IRFZ40	50	150	249
50	0.035	STP40N05	40	120	1057
50	0.040	BUZ11	36	120	77
50	0.040	STP36N05L ■	36	120	1033

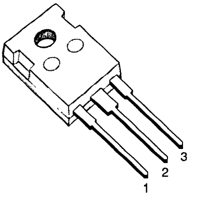
For I_D cont definition see introductory note ■ Logic level * Available on request

TO-220 (Cont'd)

V_{DSS} (V)	R_{DSon} (max) (Ω)	Sales Type	I_D cont (A)	P_{tot} (W)	Page
50	0.050	STP30N05	30	105	993
50	0.055	BUZ11A	27	90	83
50	0.055	STP32N05L ■	32	105	1009
50	0.065	STP25N05	25	90	977
50	0.070	BUZ10	20	80	71
50	0.085	STP21N05L ■	21	80	961
50	0.100	BUZ71	18	80	95
50	0.120	BUZ71A	13	40	101
50	0.150	STP15N05L ■	15	70	913

For I_D cont definition see introductory note ■ Logic level

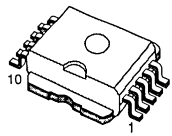
TO-247



V_{DSS} (V)	R_{DSon} (max) (Ω)	Sales Type	I_D cont (A)	P_{tot} (W)	Page
800	1.200	STW8N80	8.2	180	405
600	0.600	STW12N60	12	180	421
500	0.400	IRFW450	14	180	243
500	0.400	STW15N50	15	180	437
500	0.450	STW14N50	14.1	180	429
200	0.085	STW33N20	33	180	453
100	0.025	STW60N10	60	200	447
100	0.030	STW55N10	55	200	469
60	0.014	STW75N06	75	200	501
50	0.012	STW80N05	80	200	509

For I_D cont definition see introductory note

PowerSO-10



V_{DSS} (V)	R_{DSon} (max) (Ω)	Sales Type	I_D cont (A)	P_{tot} (W)	Page
1000	3.500	STV4N100	3.3	125	*
800	2.400	STV5NA80 ▲	4.6	125	*
800	3.500	STV4N80	3.8	110	*
800	4.500	STV3N80	3.2	100	*
600	1.200	STV6N60	6.8	125	*
600	2.500	STV4N60	4	100	*
500	0.850	STV8NA50 ▲	8	125	*
500	1.600	STV5NA50 ▲	5	100	*
400	0.550	STV10N40	10	125	*
400	1.000	STV6N40	6.3	100	*
200	0.180	STV18N20	18	125	*
200	0.400	STV10N20	10	100	*
100	0.040	STV40N10	40	150	*
100	0.060	STV33N10	33	150	*
60	0.020	STV60N06	60	150	*
60	0.028	STV50N06	50	150	*
60	0.040	STV36N06	36	120	*
50	0.016	STV60N05-16	60	150	*
50	0.020	STV60N05	60	150	*
50	0.028	STV50N05	50	150	*
50	0.035	STV40N05	40	120	*

For I_D cont definition see introductory note ▲ High switching speed and low gate charge * Available on request

V_{DSS} (V)	R_{DSon}(max) (Ω)	Package	Sales Type	I_D cont (A)	P_{tot} (W)	Page
300	1.400	SOT-82	STK4N30L	4	50	565
300	1.400	TO-220	STP5N30L	4.5	72	813
300	1.400	ISOWATT220	STP5N30LFI	4.5	33	813
100	0.120	SOT-82	STK16N10L	16	65	629
100	0.120	TO-220	STP20N10L	20	105	953
100	0.120	ISOWATT220	STP20N10LFI	12	40	953
60	0.023	TO-220	STP55N06L	55	150	1129
60	0.023	ISOWATT220	STP55N06LFI	30	45	1129
60	0.028	TO-220	STP50N06L	50	200	1097
60	0.028	ISOWATT220	STP50N06LFI	24	40	1097
60	0.040	TO-220	STP36N06L	36	120	1049
60	0.040	ISOWATT220	STP36N06LFI	21	40	1049
60	0.055	SOT-82	STK23N06L	23	65	677
60	0.055	TO-220	STP32N06L	32	105	1017
60	0.055	ISOWATT220	STP32N06LFI	19	40	1017
60	0.085	SOT-82	STK18N06L	18	60	653
60	0.085	TO-220	STP21N06L	21	80	969
60	0.085	ISOWATT220	STP21N06LFI	14	35	969
60	0.150	SOT-82	STK12N06L	12	50	605
60	0.150	TO-220	STP15N06L	15	70	921
60	0.150	ISOWATT220	STP15N06LFI	10	35	921
50	0.023	TO-220	STP55N05L	55	150	1121
50	0.023	ISOWATT220	STP55N05LFI	30	45	1121
50	0.028	TO-220	STP50N05L	50	200	1081
50	0.028	ISOWATT220	STP50N05LFI	24	40	1081
50	0.040	TO-220	STP36N05L	36	120	1033
50	0.040	ISOWATT220	STP36N05LFI	21	40	1033
50	0.055	SOT-82	STK23N05L	23	65	677
50	0.055	TO-220	STP32N05L	32	105	1009
50	0.055	ISOWATT220	STP32N05LFI	19	40	1009
50	0.085	SOT-82	STK18N05L	18	60	653
50	0.085	TO-220	STP21N05L	21	80	961
50	0.085	ISOWATT220	STP21N05LFI	14	35	961
50	0.150	SOT-82	STK12N05L	12	50	605
50	0.150	TO-220	STP15N05L	15	70	913
50	0.150	ISOWATT220	STP15N05LFI	10	35	913

For I_D cont definition see introductory note

INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST	INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST
2N7054		IRFP150	APT40M75JN	STE50N40	
2N7055		STH33N20	APT40M90JN		STE50N40
2N7058		IRFP450	APT801R2BN		STH8N80
2SK724		STH14N50	APT801R4BN		STH8N80
2SK725		IRFP450	APT802R4BN		STHV82
2SK727		STH5N90	APT802R8BN		STH4N80
2SK903		BUZ80FI	APT901R3BN		STH7N90
2SK904	BUZ80		APT902R4BN		STH5N90
2SK905		STH65N05	APT902RBN		STH7N90
2SK906		IRFP150	APT904RBN		STH4N90
2SK949		IRF840FI	APT1002R4BN		STH6N100
2SK951		STP2N80FI	APT1002RBN		STH6N100
2SK952		STP2N80	APT1004R2BN		STHV102
2SK952-01		STP2N80	APT1004RBN		STHV102
2SK954		STH4N80	APT4030BN		IRFP350
2SK955		STHV82	APT4540BN		IRFW450
2SK956		STH8N80	APT5010JN	STE47N50	
2SK956-01		STH8N80	APT5012JN		STE45N50
2SK960		STP3N90FI	APT5040BN	STW15N50	
2SK961		STP3N90	APT5050BN		STW15N50
2SK962		STH7N90	APT5085BN		STW15N50
2SK1010-01	STP5N50		APT6015JN	STE38N60	
2SK1016-01		STH14N50	APT6018JN		STE38N60
2SK1018-01		IRFP450	APT6060BN		STH12N60
2SK1023		BUZ80	APT6070BN		STH12N60
2SK1023-01		BUZ80	APT8030JN		STE22N80
2SK1024		STP3N90	APT8035JN		STE22N80
2SK1024-01		STP3N90	APT8090BN		STH9N80
2SK1081		STHV82	APT10050JN		STE16N100
2SK1081-01		STHV82	BUK416-1000AE		STE15N100
2SK1082		STH5N90	BUK416-1000BE		STE15N100
2SK1082-01		STH5N90	BUK416-100AE		STE150N10
2SK1105		STH4N80FI	BUK416-100BE		STE150N10
2SK1384		STHV82FI	BUK416-200AE		STE100N20
2SK1385		STH8N80FI	BUK416-200BE		STE100N20
2SK1385-01		STH8N80FI	BUK417-500AE		STE45N50
2SK1503-01		IRF840	BUK417-500BE		STE36N50
2SK1507-01		STP6N60FI	BUK426-1000A		STHV102FI
2SK1511		STH6N100	BUK426-100A		IRFP150FI
2SK1512		STH7N90	BUK426-100B		IRFP150FI
2SK1547-01		BUZ80FI	BUK426-200A		IRFP240FI
2SK1548		STP3N90FI	BUK426-200B		IRFP240FI
2SK1550		STP5N60FI	BUK426-800A	STH4N80FI	
APT20M40JN		STE100N20	BUK426-800B		STH4N80FI
APT20M45JN		STE100N20	BUK428-1000A	STH6N100FI	

INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST	INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST
BUK428-1000B		STH6N100FI	BUK452-100A	BUZ72A	
BUK428-500B		IRFP450FI	BUK452-100B		IRF520
BUK428-800A		STH8N80FI	BUK452-60A		MTP3055E
BUK428-800B	STHV82FI		BUK452-60B	MTP3055E	
BUK436-1000A		STHV102	BUK453-100A	IRF530	
BUK436-100A		IRFP150	BUK453-100B		IRF530
BUK436-100B		IRFP150	BUK453-60A		STP20N06
BUK436-200A		IRFP240	BUK453-60B		STP20N06
BUK436-200B		IRFP240	BUK454-200A	IRF630	
BUK436-800A	STH4N80		BUK454-200B		IRF630
BUK436-800B		STH4N80	BUK454-400B		STP4N40
BUK437-500B		STH14N50	BUK454-500B		IRF820
BUK438-1000A	STH6N100		BUK454-600B		STP2N60
BUK438-1000B		STH6N100	BUK454-800A		STP2N80
BUK438-500B		STH14N50	BUK454-800B		STP2N80
BUK438-800A		STH8N80	BUK455-100A		IRF540
BUK438-800B	STHV82		BUK455-100B	BUZ21	
BUK439-60A		STH75N06	BUK455-200A		IRF640
BUK442-100A		IRF520FI	BUK455-200B		IRF640
BUK442-100B		IRF520FI	BUK455-400B	IRF730	
BUK442-60A		MTP3055EFI	BUK455-500B	IRF830	
BUK442-60B		MTP3055EFI	BUK455-600B	MTP3N60	
BUK443-100A		IRF530FI	BUK455-60A		STP36N06
BUK443-100B		IRF530FI	BUK455-60B		STP36N06
BUK443-60A		STP20N06FI	BUK456-1000A		STP4N100
BUK443-60B		STP20N06FI	BUK456-1000B	STP3N100	
BUK444-400B		STP4N40FI	BUK456-100B		IRF540
BUK444-500B		IRF820	BUK456-200A		IRF640
BUK444-600B		STP2N60FI	BUK456-200B		IRF640
BUK444-800A		STP2N80FI	BUK456-60A	STP50N06	
BUK444-800B		STP2N80FI	BUK456-60B		STP50N06
BUK445-100A		IRF540FI	BUK456-800A	BUZ80A	
BUK445-100B		IRF540FI	BUK456-800B	BUZ80	
BUK445-200A		IRF640FI	BUK457-400B		IRF740
BUK445-200B		IRF640FI	BUK457-500B		IRF840
BUK445-400B		IRF730FI	BUK457-600B	MTP6N60	
BUK445-500B		IRF830FI	BUK472-100A		IRF520FI
BUK445-600B		STP3N60FI	BUK472-100B		IRF520FI
BUK445-60A		STP36N06	BUK472-60A		MTP3055EFI
BUK445-60B		STP36N06FI	BUK472-60B	MTP3055EFI	
BUK446-1000A		STP4N100FI	BUK473-100A	IRF530FI	
BUK446-1000B		STP3N100FI	BUK473-60A		STP20N06FI
BUK446-800A		BUZ80AFI	BUK473-60B		STP20N06FI
BUK446-800B		BUZ80FI	BUK474-400B		STP4N40FI
BUK451-100A		IRF520	BUK474-500B		IRF820FI

INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST	INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST
BUK474-600B		STP2N60FI	BUZ12AL		STP40N05L
BUK474-800A		STP2N80FI	BUZ20		BUZ72A
BUK474-800B		STP2N80FI	BUZ21	BUZ21	
BUK475-100A		IRF540FI	BUZ22	STP33N10	
BUK475-100B	IRF540FI		BUZ30A		IRF640
BUK475-200A		IRF640FI	BUZ31		IRF640
BUK475-200B		IRF640FI	BUZ32	IRF630	
BUK475-400B	IRF730FI		BUZ41A	IRF830	
BUK475-500B	IRF830FI		BUZ42		STP5N50
BUK475-600B		STP3N60FI	BUZ50A	STP3N100	
BUK475-60A		STP36N06FI	BUZ50B		STP3N100
BUK475-60B		STP36N06FI	BUZ50C		STP3N100
BUK476-1000A		STP4N100FI	BUZ60	IRF730	
BUK476-1000B	STP3N100FI		BUZ70	MTP3055E	
BUK476-800A		BUZ80AFI	BUZ70L	STP15N06L	
BUK542-60A		STP15N06LFI	BUZ71	BUZ71	
BUK542-60B		STP15N06LFI	BUZ71A	BUZ71A	
BUK543-60A		STP20N06FI	BUZ71AFI	BUZ71AFI	
BUK543-60B		STP20N06FI	BUZ71AL	STP21N05L	
BUK545-100B		STP20N10LFI	BUZ71FI	BUZ71FI	
BUK545-60A		STP36N06LFI	BUZ71L	STP21N05L	
BUK552-60A	STP15N06L		BUZ71S2		STP20N06
BUK552-60B		STP15N06L	BUZ72		IFR530
BUK553-60A		STP21N06L	BUZ72A		IRF530
BUK553-60B		STP21N06L	BUZ73	IRF630	
BUK555-100B		STP20N10L	BUZ74	IRF820	
BUK555-60A		STP36N06L	BUZ76A	BUZ76A	STP4N40
BUK556-60A		STP55N06L	BUZ80	BUZ80	
BUK572-60A	STP15N06LFI		BUZ80A	BUZ80A	
BUK572-60B		STP15N06LFI	BUZ80AFI	BUZ80AFI	
BUK573-60A		STP32N06LFI	BUZ80FI	BUZ80FI	
BUK573-60B		STP21N06LFI	BUZ307	STH4N80	
BUK575-100B		STP20N10LFI	BUZ308		STH4N80
BUK575-60A		STP36N06LFI	BUZ310		STHV102
BUZ10	BUZ10		BUZ311		STHV102
BUZ10A	BUZ71A		BUZ323	IRFP350	
BUZ10L		STP32N05L	BUZ325		IRFP350
BUZ10S2	STP25N06		BUZ326		IRFP350
BUZ11	STP36N06	BUZ11	BUZ330		STH14N50
BUZ11A	BUZ11A	STP30N05	BUZ331		STH14N50
BUZ11AL	STP32N05L		BUZ332A		STH12N60
BUZ11FI	BUZ11FI		BUZ338	STH15N50	
BUZ11S2	STP36N06		BUZ339	STH14N50	
BUZ12	IRFZ40		BUZ341		STH33N20
BUZ12A		IRFZ40	BUZ345		STH55N10

INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST	INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST
BUZ346		STH80N05	IRF641FI		IRF640FI
BUZ347		STH65N05	IRF642		IRF640
BUZ349		IRFP150	IRF643		IRF640
BUZ350		STH33N20	IRF720	IRF720	STP4N40
BUZ351		IRFP350	IRF720FI	IRF720FI	
BUZ353		STH14N50	IRF721	IRF720	STP4N40
BUZ355		STH8N80	IRF722	IRF720	STP4N40
BUZ356	STHV82		IRF723	IRF720	STP4N40
BUZ357	STH6N100		IRF730	IRF730	
BUZ358		STH6N100	IRF730FI	IRF730FI	
IRF510		IRF520	IRF731		IRF730
IRF511		IRF520	IRF732		IRF730
IRF512		IRF520	IRF733		IRF730
IRF513		IRF520	IRF740	IRF740	
IRF520	IRF520		IRF740FI	IRF740FI	
IRF520FI	IRF520FI		IRF741		IRF740
IRF521		IRF520	IRF742		IRF740
IRF522		IRF520	IRF743		IRF740
IRF523		IRF520	IRF820	IRF820	
IRF530	IRF530	STP18N10	IRF820FI	IRF820FI	
IRF530FI	IRF530FI		IRF821		IRF820
IRF531		IRF530	IRF822	IRF822	IRF820
IRF532		IRF530	IRF822FI	IRF822FI	
IRF533		IRF530	IRF823		IRF820
IRF540	IRF540		IRF830	IRF830	
IRF540FI	IRF540FI		IRF830FI	IRF830FI	
IRF541		IRF540	IRF831	IRF831	IRF830
IRF542		IRF540	IRF831FI	IRF831FI	IRF830FI
IRF543		IRF540	IRF832		IRF830
IRF614		STP5N30	IRF833		IRF830
IRF620	IRF620		IRF840	IRF840	
IRF620FI	IRF620FI		IRF840FI	IRF840FI	
IRF621		IRF620	IRF841	IRF841	IRF840
IRF622		IRF620	IRF841FI	IRF841FI	IRF840FI
IRF623		IRF620	IRF842	IRF842	IRF840
IRF624		STP5N30	IRF843		IRF840
IRF630	IRF630		IRFBC20		STP2N60
IRF630FI	IRF630FI		IRFBC30	IRFBC30	
IRF631		IRF630	IRFBC32		MTP3N60
IRF632		IRF630	IRFBC40	MTP6N60	
IRF633		IRF630	IRFBC42		STP5N60
IRF634		STP5N30	IRFBE20		STP2N80
IRF640	IRF640		IRFBE22		STP2N80
IRF640FI	IRF640FI		IRFBE30		BUZ80A
IRF641		IRF640	IRFBE32		BUZ80

INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST	INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST
IRFBF20		STP3N90	IRFP452		STW14N50
IRFBF22		STP3N90	IRFP453		IRFP450
IRFBF30		STP4N90	IRFPC50	STW12N60	STH12N60
IRFBF32		STP3N90	IRFPE30		STH4N80
IRFBG20		STP3N100	IRFPE40		STHV82
IRFBG22		STP3N100	IRFPE42		STHV82
IRFBG30		STP3N100	IRFPE50	STW8N80	STH8N80
IRFBG32		STP3N100	IRFPE52	STW8N80	STH8N80
IRFI530	IRF530FI		IRFPF30		STH4N90
IRFI540	IRF540FI		IRFPF40		STH5N90
IRFI630	IRF630FI		IRFPF42		STH4N90
IRFI640	IRF640FI		IRFPF50		STH7N90
IRFI730	IRF730FI		IRFPF52		STH7N90
IRFI740	IRF740FI		IRFPG30		STHV102
IRFI820	IRF820FI		IRFPG40		STHV102
IRFI830	IRF830FI		IRFPG42		STHV102
IRFI840	IRF840FI		IRFPG50		STH6N100
IRFIP044		STH65N06FI	IRFPG52		STH6N100
IRFIP054	STH75N06FI	STW75N06	IRFS150		IRFP150FI
IRFIP150	IRFP150FI		IRFS240	IRFP240FI	
IRFIP240	IRFP240FI		IRFS242		IRFP240FI
IRFIP250	STH33N20FI		IRFS350	IRFP350FI	
IRFIP350	IRFP350FI		IRFS450	IRFP450FI	
IRFIZ24		STP20N06FI	IRFS451	IRFP451FI	
IRFIZ34		STP30N06FI	IRFW450	IRFW450	
IRFIZ44		STP50N06FI	IRFZ20	BUZ71	
IRFP044		STH65N06	IRFZ22	BUZ71A	
IRFP054		STW75N06	IRFZ24		STP20N06
IRFP064		STW75N06	IRFZ25		STP20N06
IRFP140		IRFP150	IRFZ30	STP30N05	
IRFP150	IRFP150	STW55N10	IRFZ32		BUZ11A
IRFP150	IRFP150		IRFZ34	STP30N06	
IRFP150FI	IRFP150FI		IRFZ35	STP25N06	
IRFP240	IRFP240		IRFZ40	IRFZ40	
IRFP240FI	IRFP240FI		IRFZ40FI	IRFZ40FI	
IRFP250	STW33N20		IRFZ42		IRFZ40
IRFP254		STH26N25	IRFZ44		STP50N06
IRFP264		STH26N25	IRFZ45		STP36N06
IRFP350	IRFP350		IRFZ48		STP60N06-16
IRFP350FI	IRFP350FI		IRL530		STP20N10L
IRFP448		STW14N50	IRLZ14		STP15N06L
IRFP450	IRFP450	STW15N50	IRLZ24		STP21N06L
IRFP450FI	IRFP450FI		IRLZ34	STP32N06L	STP36N06L
IRFP451	IRFP451	STW15N50	IRLZ44	STP50N06L	
IRFP451FI	IRFP451FI		IXT36N50		STE45N50

INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST	INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST
IXTH5N100		STH6N100	IXTP7N50		IRF840
IXTH5N100A		STH6N100	IXTP7N50A	IRF840	
IXTH6N80		STHV82	MTA2N60E		STP3N60FI
IXTH6N80A		STH8N80	MTA4N50E	IRF830FI	
IXTH6N90		STH5N90	MTA4N60E	STP6N60FI	
IXTH6N90A		STH7N90	MTA5N50E		IRF840FI
IXTH10N60		STH12N60	MTA6N40E	IRF740FI	
IXTH10N60A		STH12N60	MTA8N10E		IRF520FI
IXTH10N80		STH9N80	MTA11N10EL		STP20N10LFI
IXTH11N80		STH9N80	MTA15N06		STP20N06FI
IXTH12N45		IRFP450	MTA3055E	MTP3055EFI	
IXTH12N45A		IRFP450	MTA30N06E	STP50N06FI	
IXTH12N50		IRFP450	MTG20N20		STH33N20FI
IXTH12N50A		IRFP450	MTG4N100E	STH6N100FI	
IXTH12N80		STH9N80	MTG7N60E		STH12N60FI
IXTH15N45	STW15N50		MTG9N50E	IRFP450FI	
IXTH15N50A	STW15N50	IRFP450	MTH5N100		STH6N100
IXTH15N60		STH12N60	MTH6N100	STH6N100	
IXTN15N100		STE16N100	MTH6N90		STH4N90
IXTN36N45		STE45N50	MTH7N50		STH14N50
IXTH67N08		STH60N10	MTH8N60		STH12N60
IXTH67N10		STH60N10	MTH8N90		STH7N90
IXTN79N20		STE100N20	MTH13N50	IRFP450	
IXTP2N100		STP3N100	MTH15N20		IRFP240
IXTP2N100A		STP3N100	MTH15N35		IRFP350
IXTP3N80		BUZ80	MTH15N40	IRFP350	
IXTP3N80A		BUZ80	MTH25N10		IRFP150
IXTP3N90		STP3N90	MTH30N20		STH33N20
IXTP3N90A		STP3N90	MTH40N05		STH65N05
IXTP4N100		STP4N100	MTH40N06		STH65N06
IXTP4N100A		STP4N100	MTH40N10		STH55N10
IXTP4N45	IRF830	IRF831	MTH50N05E		STH65N05
IXTP4N45A	IRF830	IRF831	MTP2N60E	STP2N60	
IXTP4N50		STP5N50	MTP2N85		STP3N90
IXTP4N50A	IRF830		MTP2N90		STP3N90
IXTP4N60		MTP3N60	MTP3N100E		STP4N100
IXTP4N60A		IRFBC30	MTP3N50E	IRF820	
IXTP4N80	BUZ80A		MTP3N60	MTP3N60	
IXTP4N80A		STP5N80	MTP3N60E	MTP3N60	
IXTP4N90		STP4N90	MTP3N60FI	MTP3N60FI	
IXTP4N90A	STP5N90		MTP4N40E		STP4N40
IXTP6N60	STP5N60		MTP4N50E	IRF830	
IXTP6N60A	MTP6N60		MTP4N80E	BUZ80A	
IXTP7N45	IRF840	IRF841	MTP4N85		STP4N90
IXTP7N45A	IRF840	IRF841	MTP4N90		STP4N90

INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST	INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST
MTP5N20		IRF620	RFH10N45		STH14N50
MTP5N40E	IRF730		RFH10N50		STH14N50
MTP6N60	MTP6N60		RFH12N40		IRFP350
MTP6N60E	MTP6N60		RFH25N20		IRFP240
MTP7N20		IRF620	RFH35N08		IRFP150
MTP8N20	IRF630		RFH35N10	IRFP150	
MTP10N10E	BUZ72A		RFH45N05		STH65N05
MTP10N40E	IRF740		RFH45N06		STH65N06
MTP12N05E	BUZ71A		RFH75N05E		STH80N05
MTP12N10E	IRF530		RFP3N45		IRF820
MTP12N10EL		STP20N10L	RFP3N50		IRF820
MTP12N20		IRF630	RFP4N100		STP4N100
MTP15N05E	BUZ71		RFP6N45		IRF830
MTP15N05EL	STP15N05L		RFP6N50		IRF830
MTP15N06E		MTP3055E	RFP7N40		IRF740
MTP15N08EL		STP18N10	RFP8N20		IRF630
MTP15N15		IRF640	RFP12N10		IRF530
MTP20N06	STP20N06		RFP12N10L		STP20N10L
MTP20N20E		IRF640	RFP12N20		IRF640
MTP25N05E		STP25N06	RFP14N05	BUZ71	
MTP30N05E	STP30N05		RFP14N05L		STP15N05L
MTP30N06EL		STP36N06L	RFP15N05		BUZ71
MTP33N10E	STP33N10		RFP15N05L		STP15N05L
MTP36N06	STP36N06		RFP15N06	MTP3055E	
MTP45N05E		IRFZ40	RFP17N06L		STP21N06L
MTP50N05E	IRFZ40		RFP18N10	STP18N10	
MTP50N06E	STP50N06		RFP22N10		IRF540
MTP50N06EL	STP50N06L		RFP25N05		STP30N05
MTP3055A	MTP3055E		RFP25N05L		STP40N05L
MTP3055E	MTP3055E		RFP25N06	STP25N06	
MTP3055EFI	MTP3055EFI		RFP25N06L		STP36N06L
MTP3055EL	STP15N06L		RFP40N10		IRF520
MTW4N80E		STH4N80	RFP50N05		STP60N06
MTW6N100		STH6N100	RFP50N05L		STP55N05L
MTW7N80E	STW8N80		RFP50N06		STP60N06
MTW8N60E		STW12N60	RFP50N06L		STP55N06L
MTW14N50E	STW15N50		SGSIP474		IRFP451FI
MTW16N40E		IRFP350	SGSIP475		IRFP451FI
MTW22N20E		IRFP240	SGSIP476		IRF740FI
MTW32N20E	STW33N20		SGSIP477		IRFP240FI
MTW36N10E		STW55N10	SGSIP479		STH14N50
MTW45N10E		STW55N10	SGSP201		STK9N10
MTW54N05E		STH80N05	SGSP202		STK9N10
RFG40N10		IRFP150	SGSP211		STK9N10
RFG50N05		STH65N05	SGSP217		STK6N20

INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST	INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST
SGSP219		STK3N50	SMP60N06-14		STP60N06-16
SGSP221		STK14N05	SMP60N06-18		STP60N06-16
SGSP222	STK14N05		SMW45N10		STH55N10
SGSP230		STK3N50	SMW60N06-18		STH75N06
SGSP231		STK3N50	SMW60N10	STW60N10	
SGSP232		STK3N50	SMW70N06-14	STW75N06	STH75N06
SGSP238		STK2N50	SSH8N60		STH12N60
SGSP239		STK2N50	SSH15N60		STH12N60
SGSP301		IRF520	SSH40N20A		STH33N20
SGSP302		IRF520	SSH60N10		STH55N10
SGSP311		IRF520	SSH60N10A		STH60N10
SGSP312		IRF520	SSM40N20		STH33N20
SGSP317		IRF620	SSP3N70		STP2N80
SGSP319		IRF820	SSP3N70A		BUZ80
SGSP321		MTP3055E	SSP4N45		IRF830
SGSP322		BUZ71A	SSP4N50	IRF830	
SGSP330		IRF820	SSP4N55		MTP3N60
SGSP331		STP4N40	SSP4N60		MTP3N60
SGSP332		STP4N40	SSP4N70		BUZ80A
SGSP351		IRF520	SSP4N70A		STP5N80
SGSP358		BUZ71A	SSP5N35		IRF730
SGSP361		IRF530	SSP5N40	IRF730	
SGSP362		BUZ21	SSP6N55		STP5N60
SGSP364	IRF830	IRF831	SSP6N60		STP5N60
SGSP367		IRF630	SSP7N20		IRF620
SGSP368		IRF830	SSP8N20		IRF630
SGSP369	IRF830		SSP10N05		BUZ71A
SGSP381		STP25N06	SSP10N06		MTP3055E
SGSP382		STP25N05	SSP10N08		IRF520
SGSP471	IRFP150		SSP10N10		IRF520
SGSP472		IRFP150	SSP12N05		BUZ71A
SGSP473		IRFP240	SSP12N06		MTP3055E
SGSP474		STH14N50	SSP12N08		IRF530
SGSP475		STH14N50	SSP12N10		IRF530
SGSP477		IRFP240	STE15N100	STE15N100	
SGSP478		STH14N50	STE16N100	STE16N100	
SGSP479		STH14N50	STE22N80	STE22N80	
SGSP491		STH65N06	STE26N50	STE26N50	
SGSP492		STH65N06	STE36N50	STE36N50	
SGSP3055	MTP3055E		STE38N60	STE38N60	
SMP20N20		IRF640	STE40N55	STE40N55	
SMP25N06		STP30N06	STE45N50	STE45N50	
SMP30N10	STP33N10		STE47N50	STE47N50	
SMP40N10		STP33N10	STE50N40	STE50N40	
SMP50N06-25	STP50N06		STE100N20	STE100N20	

INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST	INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST
STE150N10	STE150N10		STH80N05FI	STH80N05FI	
STE180N05	STE180N05		STHV82	STHV82	
STE180N10	STE180N10		STHV82FI	STHV82FI	
STE250N05	STE250N05		STHV102	STHV102	
STH4N80	STH4N80		STHV102FI	STHV102FI	
STH4N80FI	STH4N80FI		STK2N50	STK2N50	
STH4N90	STH4N90		STK2N60	STK2N60	
STH4N90FI	STH4N90FI		STK2N80	STK2N80	
STH5N100		STH6N100	STK3N50	STK3N50	
STH5N90	STH5N90		STK4N30	STK4N30	
STH5N90FI	STH5N90FI		STK4N30L	STK4N30L	
STH5NA80	STH5NA80		STK4N40	STK4N40	
STH5NA80FI	STH5NA80FI		STK6N20	STK6N20	
STH6N100	STH6N100		STK9N10	STK9N10	
STH6N100FI	STH6N100FI		STK12N05L	STK12N05L	
STH7N90	STH7N90		STK12N06L	STK12N06L	
STH7N90FI	STH7N90FI		STK14N05	STK14N05	
STH8N80	STH8N80		STK14N06	STK14N06	
STH8N80FI	STH8N80FI		STK14N10	STK14N10	
STH9N80	STH9N80		STK16N10L	STK16N10L	
STH9N80FI	STH9N80FI		STK17N10	STK17N10	
STH12N60	STH12N60		STK18N05	STK18N05	
STH12N60FI	STH12N60FI		STK18N05L	STK18N05L	
STH14N50	STH14N50		STK18N06	STK18N06	
STH14N50FI	STH14N50FI		STK18N06L	STK18N06L	
STH15N50	STH15N50		STK22N05	STK22N05	
STH15N50FI	STH15N50FI		STK22N06	STK22N06	
STH26N25	STH26N25		STK23N05L	STK23N05L	
STH26N25FI	STH26N25FI		STK23N06L	STK23N06L	
STH33N20	STH33N20		STK3055E	STK3055E	
STH33N20FI	STH33N20FI		STLT19	STP15N05L	
STH45N10	STH45N10		STLT19FI	STP15N05LFI	
STH45N10FI	STH45N10FI		STLT20	STP15N06L	
STH55N10	STH55N10		STLT20FI	STP15N06LFI	
STH55N10FI	STH55N10FI		STLT29		STP32N05L
STH60N10	STH60N10		STLT29FI		STP32N05LFI
STH60N10FI	STH60N10FI		STLT30		STP32N06L
STH60N05		STH65N05	STLT30FI		STP32N06LFI
STH65N05	STH65N05		STP2N60	STP2N60	
STH65N05FI	STH65N05FI		STP2N60FI	STP2N60FI	
STH65N06	STH65N06		STP2N80	STP2N80	
STH65N06FI	STH65N06FI		STP2N80FI	STP2N80FI	
STH75N06	STH75N06		STP3N100	STP3N100	
STH75N06FI	STH75N06FI		STP3N100FI	STP3N100FI	
STH80N05	STH80N05		STP3N100XI	STP3N100XI	

INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST	INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST
STP3N50XI	STP3N50XI		STP18N10	STP18N10	
STP3N60FI	STP3N60FI		STP18N10FI	STP18N10FI	
STP3N60XI	STP3N60XI		STP19N05L		STP21N05L
STP3N80XI	STP3N80XI		STP19N06L		STP21N06L
STP3N90	STP3N90		STP20N06	STP20N06	
STP3N90FI	STP3N90FI		STP20N06FI	STP20N06FI	
STP4N100	STP4N100		STP20N10	STP20N10	
STP4N100FI	STP4N100FI		STP20N10FI	STP20N10FI	
STP4N100XI	STP4N100XI		STP20N10L	STP20N10L	
STP4N40	STP4N40		STP20N10LFI	STP20N10LFI	
STP4N40FI	STP4N40FI		STP21N05L	STP21N05L	
STP4N80XI	STP4N80XI		STP21N05LFI	STP21N05LFI	
STP4N90	STP4N90		STP21N06L	STP21N06L	
STP4N90FI	STP4N90FI		STP21N06LFI	STP21N06LFI	
STP5N30	STP5N30		STP25N05	STP25N05	
STP5N30FI	STP5N30FI		STP25N05FI	STP25N05FI	
STP5N30L	STP5N30L		STP25N06	STP25N06	
STP5N30LFI	STP5N30LFI		STP25N06FI	STP25N06FI	
STP5N50	STP5N50		STP30N05	STP30N05	
STP5N50FI	STP5N50FI		STP30N05FI	STP30N05FI	
STP5N60	STP5N60		STP30N06	STP30N06	
STP5N60FI	STP5N60FI		STP30N06FI	STP30N06FI	
STP5N80	STP5N80		STP32N05L	STP32N05L	
STP5N80FI	STP5N80FI		STP32N05LFI	STP32N05LFI	
STP5N80XI	STP5N80XI		STP32N06L	STP32N06L	
STP5N90	STP5N90		STP32N06LFI	STP32N06LFI	
STP5N90FI	STP5N90FI		STP33N10	STP33N10	
STP5NA50	STP5NA50		STP33N10FI	STP33N10FI	
STP5NA50FI	STP5NA50FI		STP36N05L	STP36N05L	
STP5NA80	STP5NA80		STP36N05LFI	STP36N05LFI	
STP5NA80FI	STP5NA80FI		STP36N06	STP36N06	
STP6N25	STP6N25		STP36N06FI	STP36N06FI	
STP6N50	STP6N50		STP36N06L	STP36N06L	
STP6N50FI	STP6N50FI		STP36N06LFI	STP36N06LFI	
STP6N60FI	STP6N60FI		STP40N05	STP40N05	
STP7N20	STP7N20		STP40N05FI	STP40N05FI	
STP7N20FI	STP7N20FI		STP40N06L	STP36N06L	
STP8N50XI	STP8N50XI		STP40N06LFI	STP36N06LFI	
STP8NA50	STP8NA50		STP40N10	STP40N10	
STP8NA50FI	STP8NA50FI		STP40N10FI	STP40N10FI	
STP15N05L	STP15N05L		STP45N05L		STP50N05L
STP15N05LFI	STP15N05LFI		STP45N05LFI		STP50N05LFI
STP15N06L	STP15N06L		STP50N05L	STP50N05L	
STP15N06LFI	STP15N06LFI		STP50N05LFI	STP50N05LFI	
STP17N05L		STP21N05L	STP50N06	STP50N06	

INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST	INDUSTRY STANDARD	SGS-THOMSON EQUIVALENT	SGS-THOMSON NEAREST
STP50N06FI	STP50N06FI		STW80N05	STW80N05	
STP50N06L	STP50N06L		TSD2M450V	STE36N50	
STP50N06LFI	STP50N06LFI		TSD4M250V	STE100N20	
STP53N05	STP53N05		TSD4M350V	STE50N40	
STP53N06	STP53N06		TSD4M450V	STE47N50	
STP55N05L	STP55N05L		TSD5MG40V	STE16N100	
STP55N05LFI	STP55N05LFI		TSD14N100V	STE15N100	
STP55N06	STP60N06	STP53N06	TSD17N100V	STE15N100	
STP55N06FI	STP60N06FI	STP50N06FI	TSD18N80V	STE22N80	
STP55N06L	STP55N06L		TSD22N80V	STE22N80	
STP55N06LFI	STP55N06LFI		TSD23N50V	STE26N50	
STP60N05	STP60N05		TSD30N60V	STE38N60	
STP60N05FI	STP60N05FI		TSD33N50V	STE36N50	
STP60N06	STP60N06		TSD40N50V	STE45N50	
STP60N06FI	STP60N06FI		TSD40N55V	STE40N55	
STP60N06-16	STP60N06-16		TSD45N50V	STE45N50	
STV3N80	STV3N80		TSD90N20V	STE100N20	
STV4N60	STV4N60		TSD135N10V	STE150N10	
STV4N80	STV4N80		TSD150N10V	STE180N10	
STV4N100	STV4N100		TSD160N05V	STE180N05	
STV5N50	STV5N50		TSD180N10V	STE180N10	
STV5N80	STV5N80		TSD200N05V	STE180N05	
STV6N40	STV6N40		TSD250N05V	STE250N05	
STV6N60	STV6N60				
STV8N50	STV8N50				
STV10N20	STV10N20				
STV10N40	STV10N40				
STV18N20	STV18N20				
STV33N10	STV33N10				
STV36N06	STV36N06				
STV40N05	STV40N05				
STV40N10	STV40N10				
STV50N05	STV50N05				
STV50N06	STV50N06				
STV60N05	STV60N05				
STV60N05-16	STV60N05-16				
STV60N06	STV60N06				
STW8N80	STW8N80				
STW12N60	STW12N60				
STW14N50	STW14N50				
STW15N50	STW15N50				
STW33N20	STW33N20				
STW55N10	STW55N10				
STW60N10	STW60N10				
STW75N06	STW75N06				

C_{DB}	Parasitic capacitance between drain and body
C_{DS}	Parasitic capacitance between drain and source
C_{GD}	Parasitic capacitance between gate and drain
C_{GS}	Parasitic capacitance between gate and source
C_{iss}	Input capacitance
C_{oss}	Output capacitance
C_{rss}	Reverse transfer capacitance
D.U.T.	Device Under Test
E_{AS}	Single pulse avalanche energy
E_{AR}	Repetitive avalanche energy
I_{AR}	Avalanche current
I_D	Drain current
I_{DLM}	Drain peak current, inductive load
I_{DM}	Drain peak current
I_{DSS}	Zero gate voltage drain current
I_G	Gate current
I_{GSS}	Gate-body leakage current with drain short circuited to source
I_{RRM}	Source drain diode reverse recovery current
I_{SD}	Source-drain diode current
I_{SDM}	Source-drain diode peak current
L	Load inductance of a specified circuit
Q_g	Gate charge
Q_{gs}	Gate-source charge
Q_{gd}	Gate-drain charge
Q_{rr}	Source drain diode reverse recovery charge
PW	Pulse width
P_{tot}	Total power dissipation
$R_{DS\,(on)}$	Static drain-source on resistance
R_G	Generator internal resistance
R_L	Load resistance
$R_{th\text{-}jamb}$	Thermal resistance junction-to-ambient
$R_{th\,j\text{-}case}$	Thermal resistance junction-case
T_l	Maximum lead temperature for soldering purpose
T_{amb}	Ambient temperature
T_{case}	Case temperature
T_j	Junction temperature
T_{stg}	Storage temperature
UIS	Unclamped inductive switching
$V_{(BR)DSS}$	Drain-source breakdown voltage with gate short circuited to source
V_{DG}	Drain-gate voltage
V_{DGR}	Drain-gate voltage with specified resistance between gate and source

V_{DS}	Drain-source voltage
$V_{DS(on)}$	Drain-source on state voltage
V_{GS}	Gate-source-voltage
$V_{GS(th)}$	Gate threshold voltage
V_I	Input voltage of a specified circuit
V_{ISO}	Insulation Withstand Voltage (DC)
V_{SD}	Source-darin diode forward on voltage
V_{clamp}	Drain clamping voltage
$(di/dt)_{on}$	Turn-on current slope
$(dv/dt)_{off}$	Turn-off voltage slope
f	Frequency
g_{fs}	Forward trasconductance
t_c	Cross-over time
$t_{d\ (off)}$	Turn-off delay time
$t_{d\ (on)}$	Turn-on delay time
t_f	Fall time
t_{on}	Turn-on time
t_r	Rise time
$t_{r(Voff)}$	Off-Voltage rise time
t_{rr}	Source Drain Diode Reverse Recovery time

A. DEFINITIONS OF TERMS USED

a. **Electronic device.** An electronic tube or valve, transistor or other semiconductor device. Note: This definition excludes inductors, capacitors, resistors and similar components.

b. **Characteristic.** A characteristic is an inherent and measurable property of a device. Such a property may be electrical, mechanical, thermal, hydraulic, electro-magnetic, or nuclear and can be expressed as a value for stated or recognized conditions. A characteristic may also be a set of related values, usually shown in graphical form.

c. **Bogey electronic device.** An electronic device whose characteristics have the published nominal values for the type. A bogey electronic device for any particular application can be obtained by considering only those characteristics which are directly related to the application.

d. **Rating.** A value which establishes either a limiting capability or a limiting condition for an electronic device. It is determinate for specified values of environment and operation, and may be stated in any suitable terms.
Note: Limiting conditions may be either maxima or minima.

e. **Rating system.** The set of principles upon which ratings are established and which determines their interpretation.
Note: The rating system indicates the division of responsibility between the device manufacturer and the circuit designer, with the object of ensuring that the working conditions do not exceed the ratings.

B. ABSOLUTE MAXIMUM RATING SYSTEM

Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electronic device of a specified type as defined by its published data, which should not be exceeded under the worst probable conditions.
These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environmental variations, and the effects of changes in operating conditions due to variations in the characteristcs of the device under consideration and of all other electronic devices in the equipment.
The equipment manufacturer should design so that, initially and throughout life, no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variations, signal variation, environmental conditions, and variation in characteristics of the device under consideration and of all other electronic devices in the equipment.

C. DESIGN - MAXIMUM RATING SYSTEM

Design-maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.
These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in the characteristics of the electronic device under consideration.
The equipment manufacturer should design so that, initially and throughout life, no design-maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply-voltage variation equipment, component variation, variation in characteristics of all other devices in the equipment, equipment control adjustment, load variation, signal variation and environmental conditions.

D. DESIGN - CENTRE RATING SYSTEM

Design-centre ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under normal conditions.
These values are chosen by the device manufacturer to provide acceptable serviceability of the device in average applications, taking responsibilty for normal changes in operating conditions due to rated supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all electronic devices.
The equipment manufacturer should design so that, initially, no design-centre value for the intended service is exceeded with a bogey electronic device in equipment operating at the stated normal supply-voltage.

The Absolute Maximum Rating System is commonly used for semiconductor devices.

PRECAUTIONS FOR PHYSICAL HANDLING OF POWER PLASTIC TRANSISTOR [TO-220, ISOWATT220, TO-218 (SOT-93), ISOWATT218, TO-126 (SOT-32), SOT-82, SOT-194]

When mounting power transistors certain precautions must be taken in operations such as bending of leads, mounting of heatsink, soldering and removal of flux residue. If these operations are not carried out correctly, the device can be damaged or reliability compromised.

1. Bending and cutting leads
The bending or cutting of the leads requires the following precautions:

1.1. When bending the leads they must be clamped tightly between the package and the bending point to avoid strain on the package (in particular in the area where the leads enter the resin) (fig. 1). This also applies to cutting the leads (fig. 2).

1.2. The leads must be bent at a minimum distance of 3 mm from the package (fig. 3a).

1.3. The leads should not be bent at an angle of more than 90° and they must be bent only once (fig. 3b).

1.4. The leads must never be bent laterally (fig. 3c).

1.5. Check that the tool used to cut or form the leads does not damage them or ruin their surface finish.

2. Mounting on printed circuit
During mounting operations be careful not to apply stress to the power transistor.

2.1. Adhere strictly to the pin spacing of the transistor to avoid forcing the leads.

2.2. Leave a suitable space between printed circuit and transistor, if necessary use a spacer.

2.3. When fixing the device to the printed circuit do not put mechanical stress on the transistor. For this purpose the device should be soldered to the printed circuit board after the transistor has been fixed to the heatsink and the heatsink to the printed circuit board.

Fig. 1 - Bending the leads

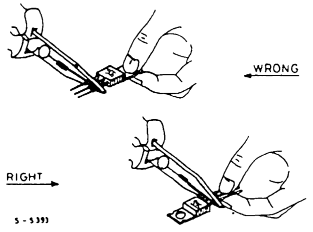


Fig. 2 - Lead forming or cutting mechanism

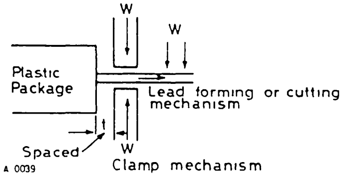
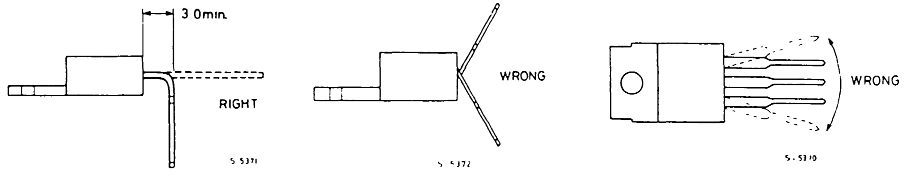


Fig. 3 - Angles for lead wire bending



a *b* *c*

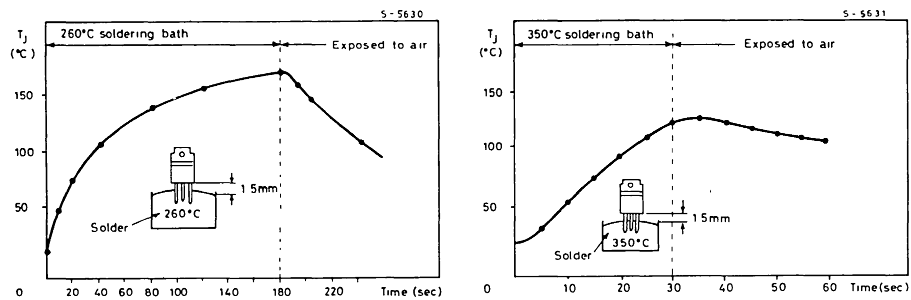
3. Soldering

In general a transistor should never be exposed to high temperature for any length of time. It is therefore preferable to use soldering methods where the transistor is exposed to the lowest possible temperatures for a short time.

3.1. Tolerable conditions are 260°C for 10 sec or 350° for 3 sec. The graphs in fig. 4 give an idea of the excess junction temperature during the soldering process for a TO-220 (Versawatt). It is also important to use suitable fixes for the tin baths to avoid deterioration of the leads or of the package resin.

3.2. An excess of residual flux between the pins of the transistor or in contact with the resin can reduce the long-term reliability of the device. The solvent for removing excess flux must be chosen with care. The use of solvents derived from trichloroethylene is not recommended on plastic packages because the residue can cause corrosion.

Fig. 4 - Junction temperatures during soldering



4. Mounting at heatsink

To exploit best the performance of power transistor a heatsink with R_{th} suitable for the power that the transistor will dissipate must be used.

4.1. The plastic packages used by SGS-THOMSON for its power transistor (SOT-32, SOT-82, SOT-194, TO-220, ISOWATT220, TO-218, ISOWATT218) provide for the use of a single screw to fix the package to the heatsink. A compression spring (clip) can be sufficient as an alternative (fig. 5).

The screw should be properly tightened to ensure good contact between the back of the package and the heatsink but should not be too tight to avoid deformation of the copper part (tab) of the package causing breaking of the die or separation of the resin from the tab.

4.2. The contact R_{th} between device and heatsink can be improved by inserting a thin layer of silicone grease with fluidity sufficient to guarantee perfectly uniform distribution on the surface of the tab. The thermal resistance with and without silicone grease is given in fig. 6. An excessively thick layer or an excessive viscosity of the grease can degrade the R_{th}.

Fig. 5 - SOT-93 mounting examples

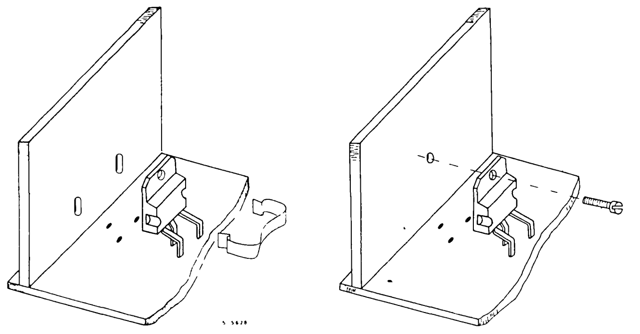
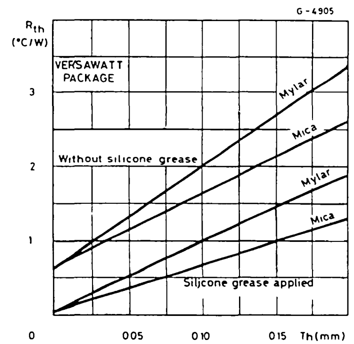


Fig. 6 - Contact thermal resistance vs. insulator thickness.



5. **Heatsink problems**
The most important aspect from the point of view of reliability of a power transistor is that the heatsink should be dimensioned to keep the T_j of the device as low as possible. From the mechanical point of view, however, the heatsink must be realized so that it does not damage the device.

5.1. The planarity of the contact surface between device and heatsink must be $<25\mu m$ for TO-220, ISOWATT220, TO-218, ISOWATT218, TO-126 (SOT-32), SOT-82, SOT-194.

5.2. If self threading screws are used there must be an outlet for the material that is deformed during formation of the thread. The diameter ∅ 1 (fig. 7) must be large enough to avoid distortion of the tab during tightening. For this purpose it may be useful to insert a washer or use of the type shown in fig. 8 where the pressure on the tab is distributed on a much larger surface. Sometimes when the hole in the heatsink is formed with a punch, around the hole or hollow there may be a ring which is lower than the heatsink surface.
This is dangerous because it may lead to distortion of the tab as mentioned before.

5.3. A very serious problem is that of the rigidity between heatsink, device and printed circuit board. Once the device and the heatsink are mechanically connected, and the heatsink is fixed to the apparatus frame, the device and the PCB are bound together by the leads of the devices. A solution of this type is extremely dangerous.

Fig. 8 - Suggested screw

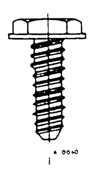
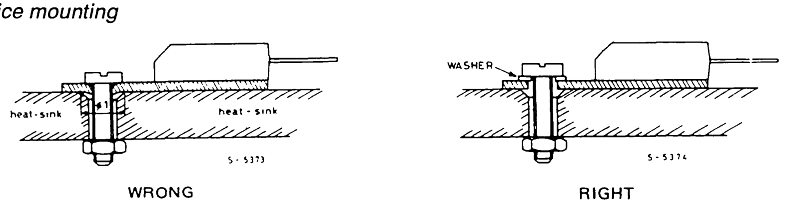


Fig. 7 - Device mounting

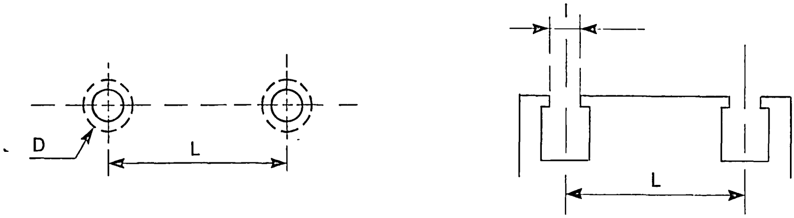


WRONG RIGHT

ISOTOP

ISOTOP package is designed for high mechanical robustness and optimum heat removal. The basic mounting procedures are as follows.

I - MOUNTING ON HEATSINK



I1 - HEATSINK SPECIFICATION:

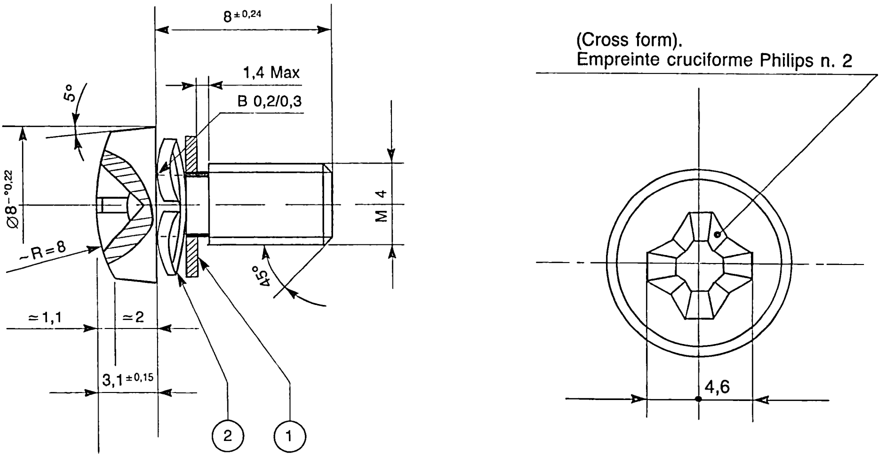
Flatness (max concavity or convexity between fixing holes)	≤ 20 microns (0.78 mils)
Surface Finish	± 1.2 microns (± 0.05 mils)
Fixing Holes	D = M4 L = 30 +3 mm (1.181 + 0.012 Inches)

I2 - MOUNTING SPECIFICATION:

Fixing Screw	M4 + lock washer
Torque	1.3 ± 0.2 N • m suggested (MAX 3.0) (7.6 ± 1.2 LBS • Inches)
R_{th} Case/Heatsink (with thermal compound)	≤ 0.05 °C/W

II - CONNECTIONS

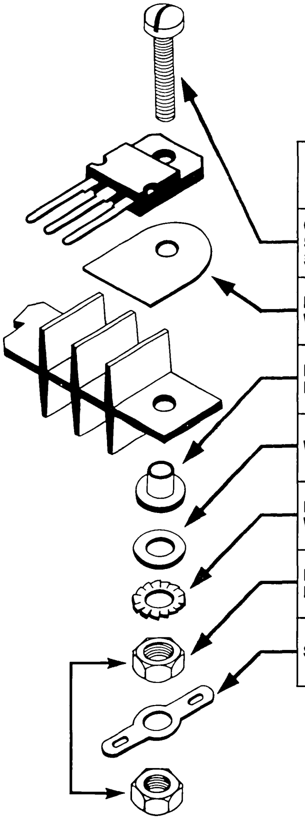
Screws	See Drawing
Torque	1.3 ± 0.2 N • m (7.6 ± 1.2 LBS • Inches)
Twist Test	Not applicable
Contact Area (screw version)	45 mm^2
Lead Inductance	≤ 5 nH



III - INSULATION

Insulation Material dice to base	Ceramic
Insulation Voltage pins to base	2500 V.RMS 1 minute
Stray capacitance	90 pF.
Creepage and Clearance Distance pins to base-heatsink	≥ 9.5 mm (0.374 Inches)
Creepage and clearance distance pin to pin	≥ 4.5 mm (0.177 Inches)
Resin: Flammability UL 94 V-O	UL Recognized
UL Qualification	File E817344

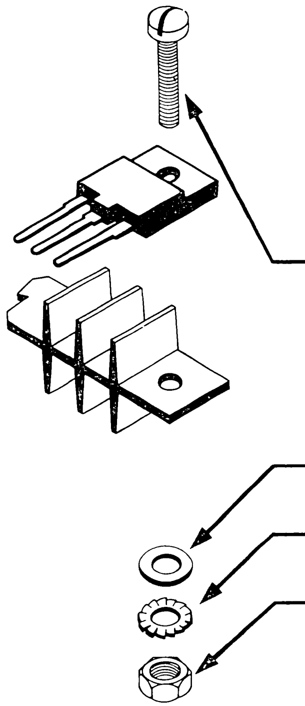
TO-218 (SOT-93)



ACCESSORY TYPE	Q.ty	ASSEMBLY NUMBER	MATERIAL
CHEESE HEAD SCREWS SLOTTED	1	NOT AVAILABLE FROM SGS-THOMSON	
MICA WASHER	1	CDA 3154	MICA
INSULATING BUSHES	1	CDA 3155 C	NYLON
WASHERS	1	NOT AVAILABLE FROM SGS-THOMSON	
LOCK WASHERS	1	NOT AVAILABLE FROM SGS-THOMSON	
HEXAGON NUTS	2	NOT AVAILABLE FROM SGS-THOMSON	
SOLDER LUG	1	NOT AVAILABLE FROM SGS-THOMSON	

Maximum torque (applied to mounting flange)
Recommended: 0.55 Nm
Maximum: 1 Nm.

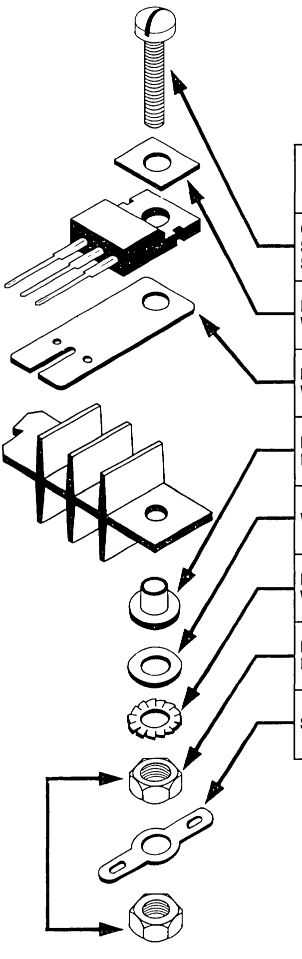
ISOWATT218



ACCESSORY TYPE	Q ty	ASSEMBLY NUMBER	MATERIAL
CHEESE HEAD SCREWS SLOTTED	1	NOT AVAILABLE FROM SGS-THOMSON	
WASHERS	1	NOT AVAILABLE FROM SGS-THOMSON	
LOCK WASHERS	1	NOT AVAILABLE FROM SGS-THOMSON	
HEXAGON NUTS	1	NOT AVAILABLE FROM SGS-THOMSON	

Maximum torque (applied to mounting flange)
Recommended: 0.55 Nm
Maximum: 1 Nm.

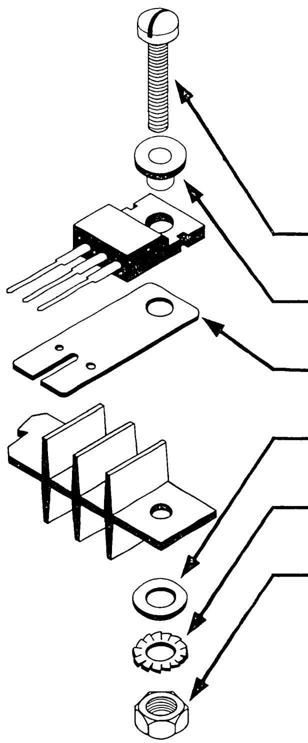
TO-220



ACCESSORY TYPE	Q ty	ASSEMBLY NUMBER	MATERIAL
CHEESE HEAD SCREWS SLOTTED	1	NOT AVAILABLE FROM SGS-THOMSON	
RECTANGULAR WASHER	1	CDA 3163	
MICA WASHER	1	CDA 3159	MICA
INSULATING BUSHES	1	CDA 3155 B	NYLON
WASHER	1	NOT AVAILABLE FROM SGS-THOMSON	
LOCK WASHER	1	NOT AVAILABLE FROM SGS-THOMSON	
HEXAGON NUTS	2	NOT AVAILABLE FROM SGS-THOMSON	
SOLDER LUG	1	NOT AVAILABLE FROM SGS-THOMSON	

Maximum torque (applied to mounting flange)
Recommended: 0.55 Nm
Maximum: 0.7 Nm.

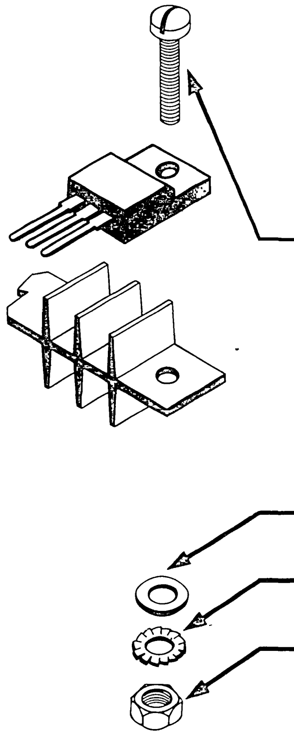
TO-220



ACCESSORY		ASSEMBLY NUMBER	MATERIAL
TYPE	Q ty		
CHEESE HEAD SCREWS SLOTTED	1	NOT AVAILABLE FROM SGS-THOMSON	
INSULATING BUSHES	1	CDA 3155 B	NYLON
MICA WASHER	1	CDA 3159	MICA
WASHER	1	NOT AVAILABLE FROM SGS-THOMSON	
LOCK WASHER	1	NOT AVAILABLE FROM SGS-THOMSON	
HEXAGON NUTS	1	NOT AVAILABLE FROM SGS-THOMSON	

Maximum torque (applied to mounting flange)
Recommended: 0.55 Nm
Maximum: 0.7 Nm.

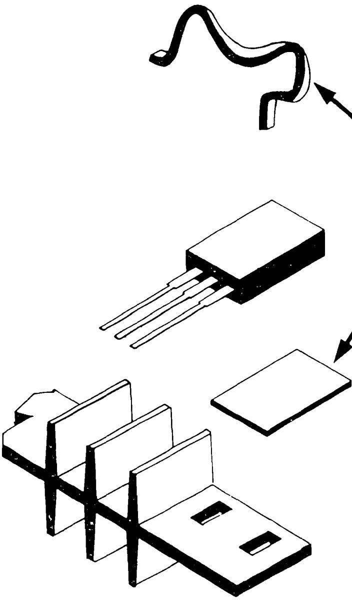
ISOWATT220, 221



ACCESSORY TYPE	Q.ty	ASSEMBLY NUMBER	MATERIAL
CHEESE HEAD SCREWS SLOTTED	1	NOT AVAILABLE FROM SGS-THOMSON	
WASHER	1	NOT AVAILABLE FROM SGS-THOMSON	
LOCK WASHER	1	NOT AVAILABLE FROM SGS-THOMSON	
HEXAGON NUTS	1	NOT AVAILABLE FROM SGS-THOMSON	

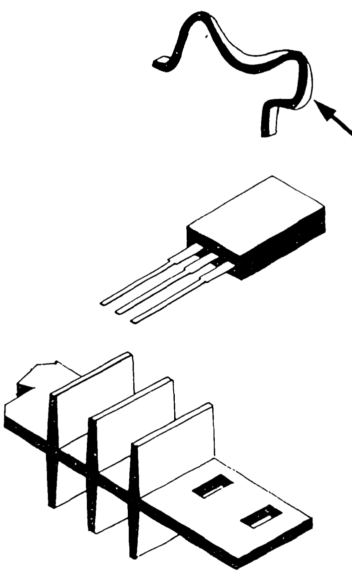
Maximum torque (applied to mounting flange)
Recommended: 0.55 Nm
Maximum: 0.7 Nm.

TO-126, SOT-82, SOT-194, TO-220, TO-218



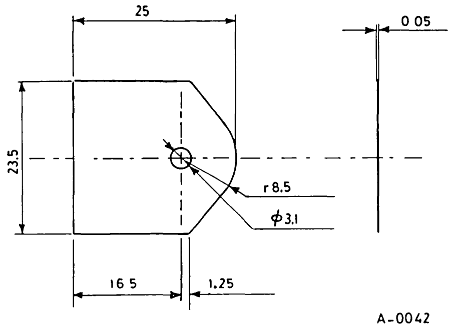
ACCESSORY TYPE	Q ty	ASSEMBLY NUMBER	MATERIAL
SPRING CLIP	1	NOT AVAILABLE FROM SGS-THOMSON	
MICA WASHER	1	TO-126, SOT-82, SOT-194 } NOT AVAILABLE FROM SGS-THOMSON TO-220 CDA3159 TO-218 CDA3154	MICA

ISOWATT220, ISOWATT218

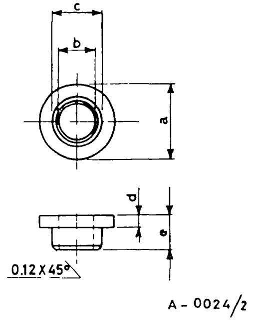


ACCESSORY TYPE	Q ty	ASSEMBLY NUMBER	MATERIAL
SPRING CLIP	1	NOT AVAILABLE FROM SGS-THOMSON	

CDA 3154



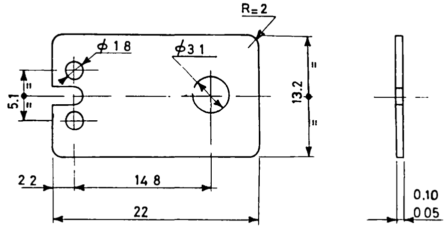
CDA 3155



Suffix	Package	a	b	c	d	e
B	TO-220	5.30 to 5.50	3.00 to 3.10	3.83 to 3.88	0.60 to 0.65	1.70 to 1.80
C	SOT-93	6.40 to 6.60	3.00 to 3.10	4.00 to 4.05	1.3 to 1.4	2.7 to 2.9

Material: Nylon Dimensions: mm

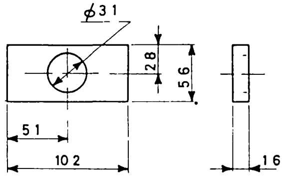
CDA 3159



A-0026/ 3

TYPE	MATERIAL	NOTE
CDA3159	MICA	✓

CDA 3163



A-00 23/ 3

TYPE	MATERIAL	NOTE
CDA3163	Steel nickel plated	

Electronic components have to be protected from the hazard of static electricity, from the manufacturing stage down to where they are utilized.

MOS devices are typically voltage and electrical field sensitive; the thin oxide layers can be destroyed by an electric field.

Fig. 1

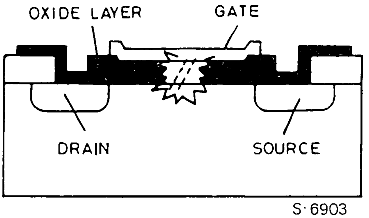
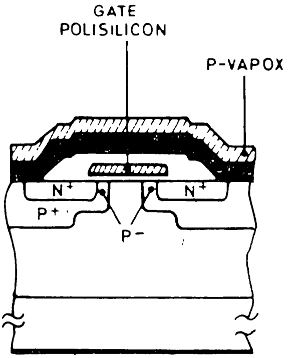


Fig. 2



This happens mostly because a charged conductor, typically a person, is rapidly discharged through the device.

There will be no net charge on any portion of the MOS structure when the induced high field exceeds the breakdown voltage of the MOS capacitor we may have a self-healing break-down, degradation or catastrophic failure.

The failure hazard is not limited to the gate region but it could occur wherever two conductive areas are separated by a thin insulator.

POWER MOS devices can generally be considered less ESD sensitive than MOS I/Cs.

The input capacitance of a POWER MOS device is typically 10 to 200 times larger, and the gate oxide thickness is similar in size to that of the largest MOS I/Cs used.

As a result, it is common practice not to consider the ESD as dangerous for POWER MOS, but this is not alway true, even though they are less sensitive than MOS I/Cs

HANDLING

SGS-THOMSON has chosen a no-compromise strategy in the MOS ESD protection. From the wafer level to the shipping of finished units, each work station and processing of the parts is guaranteed. This is achieved through total adoption of shielding and grounding media. Our final shipping of the parts is performed in antistatic tubes, bags or boxes. The suppliers greatest efforts are in vain if the end user does not provide the same level of protection and care in application.

Here are the basic static control protection rules:

A - Handle all components in a static-safe work area.

B - Transport all components in static shielding containers.

To comply with the rules the following procedures must be set up.

1 - Static control wrist strap (from a qualified source) used and connected properly.

2 - Each table top must be protected with a conductive mat, properly grounded.

3 - Extensive use of conductive floor mats.

4 - Static control shoe straps, wearing typically insulating footwear, such as with crepe or thick rubber soles.

5 - Ionized air blowers are a necessary part of the protective system, to neutralize static charges on conductive items.

6 - Use only the grounded tip variety of soldering iron.

7 - Single components, tubes, printed circuit cards should always be contained in static shielding bags; keep our parts in the original bags up to the very last moment on the production line.

8 - If bigger containers (tote box) are used for in-plant transport of devices or PC boards they must be electrically conductive, like the carbon loaded ones.

9 - All tools, persons, testing machines, which could contact device leads must be conductive and grounded.

10 - Avoid using high dielectric materials (like polystyrene) for sub-assembly construction, storing and transportation.

11 - Follow a proper power supply sequence in testing and application. Supply voltage should be applied before and removed after input signals; insertion and removal from sockets should be done with no power applied.

12 - Filtration, noise suppression, slow voltage surges should be guaranteed on the supply lines.

13 - Any open (floating) input pin is a potential hazard to your circuit: ground or short them to V_{DD} whenever possible.

DATASHEETS

SGS-THOMSON
MICROELECTRONICS

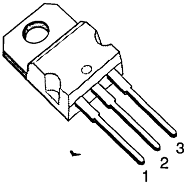
BUZ10

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
BUZ10	50 V	< 0.07 Ω	20 A

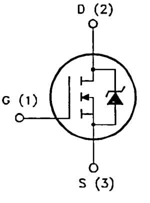
- TYPICAL $R_{DS(on)}$ = 0.06 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



TO-220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	20	A
I_{DM}	Drain Current (pulsed)	80	A
P_{tot}	Total Dissipation at T_c = 25 °C	80	W
T_{stg}	Storage Temperature	-65 to 175	°C
T_j	Max. Operating Junction Temperature	175	°C
	DIN Humidity Category (DIN 40040)	E	
	IEC Climatic Category (DIN IEC 68-1)	55/150/56	

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1.88	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5	°C/W

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	20	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	80	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	20	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	14	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	50			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating T_j = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 1 mA	2.1	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 13 A		0.06	0.07	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	V_{DS} = 25 V I_D = 13 A	6	11		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		520 250 80	700 350 120	pF pF pF

SWITCHING

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 30 V I_D = 3 A R_{GS} = 50 Ω V_{GS} = 10 V		45 65 115 80	65 95 160 120	ns ns ns ns

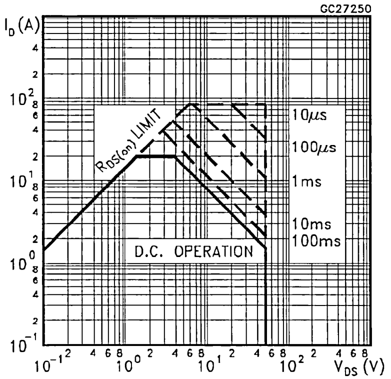
ELECTRICAL CHARACTERISTICS (continued)

SOURCE DRAIN DIODE

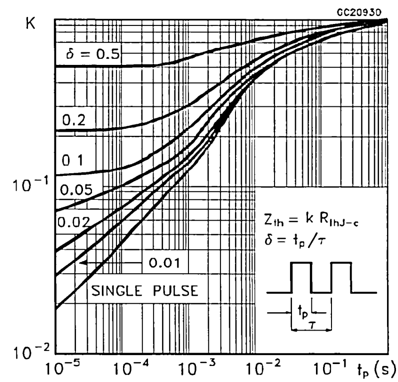
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}	Source-drain Current Source-drain Current (pulsed)				20 80	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 40 A V_{GS} = 0			2	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 20 A di/dt = 100 A/µs V_{DD} = 15 V T_j = 150 °C		85 0.13		ns µC

(*) Pulsed Pulse duration = 300 µs, duty cycle 1 5 %

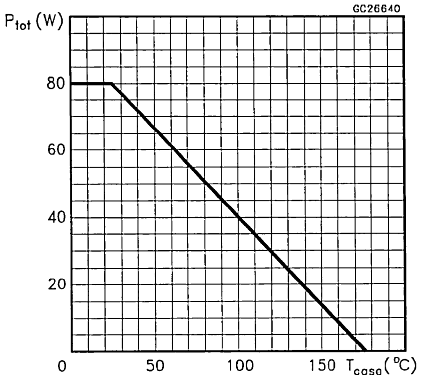
Safe Operating Area



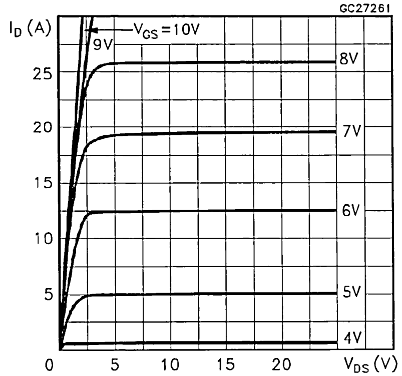
Thermal Impedance



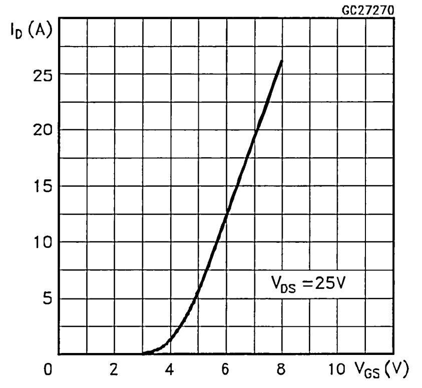
Derating Curve



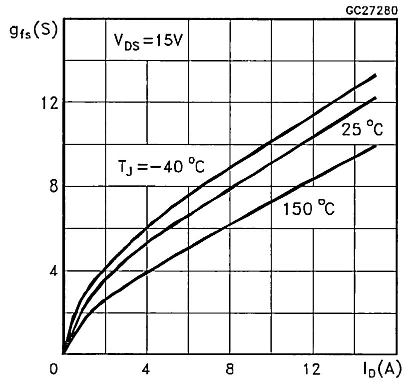
Output Characteristics



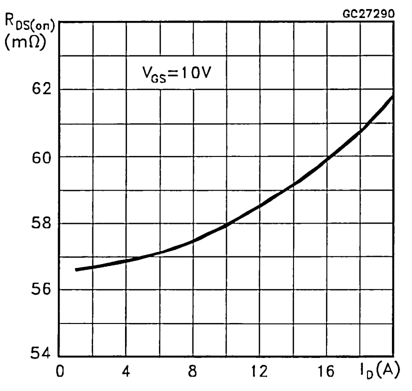
Transfer Characteristics



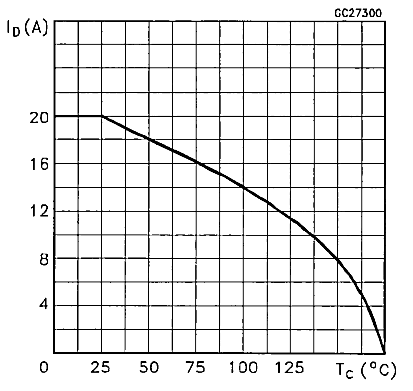
Transconductance



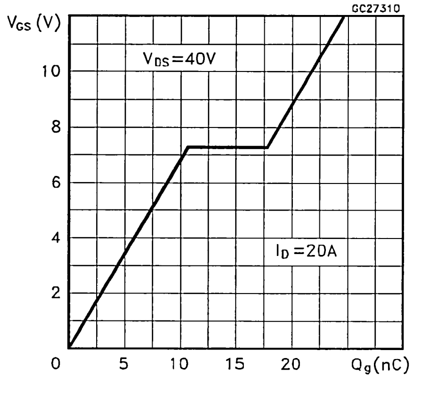
Static Drain-Source On Resistance



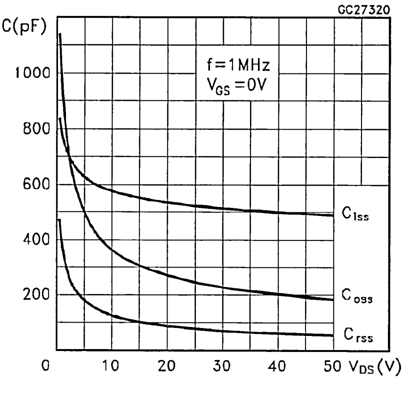
Maximum Drain Current vs Temperature



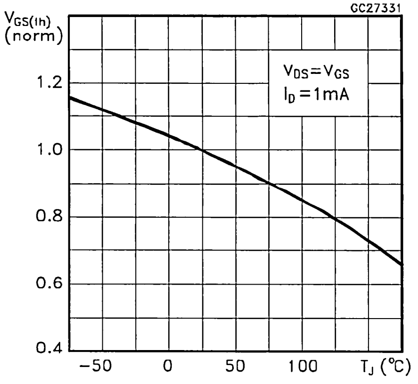
Gate Charge vs Gate-Source Voltage



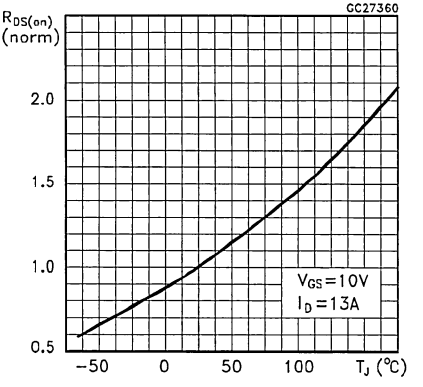
Capacitance Variation



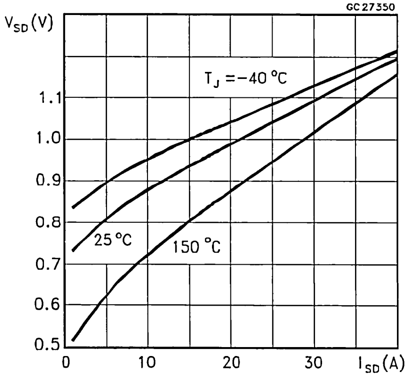
Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-Drain Diode Forward Characteristics

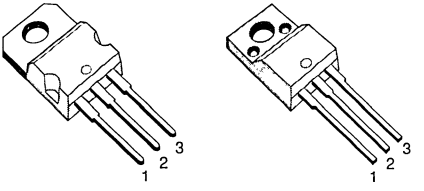


BUZ11
BUZ11FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
BUZ11	50 V	< 0.04 Ω	36 A
BUZ11FI	50 V	< 0.04 Ω	21 A

- TYPICAL $R_{DS(on)}$ = 0.03 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE

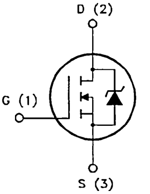


TO-220 ISOWATT220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		BUZ11	BUZ11FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	36	21	A
I_{DM}	Drain Current (pulsed)	144	144	A
P_{tot}	Total Dissipation at T_c = 25 °C	120	40	W
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C
	DIN Humidity Category (DIN 40040)	E		
	IEC Climatic Category (DIN IEC 68-1)	55/150/56		

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.25	3.75	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	36	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	240	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	60	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	25	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	50			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating $T_j = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 1$ mA	2.1	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10$V $I_D = 18$ A		0.03	0.04	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} = 15$ V $I_D = 18$ A	10	16		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		1130 480 140	1500 650 200	pF pF pF

SWITCHING

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	$V_{DD} = 30$ V $I_D = 3$ A $R_{GS} = 50$ Ω $V_{GS} = 10$ V		40 145 220 135	60 210 320 200	ns ns ns ns

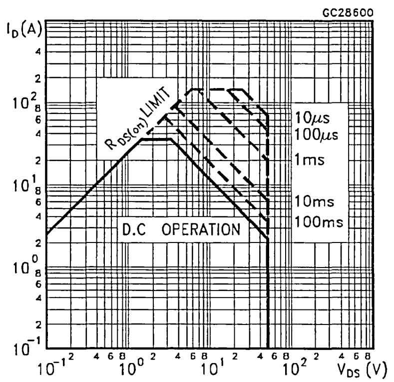
ELECTRICAL CHARACTERISTICS (continued)

SOURCE DRAIN DIODE

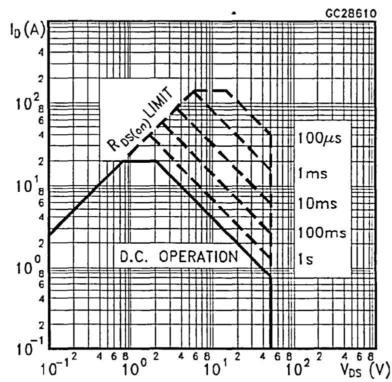
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}	Source-drain Current Source-drain Current (pulsed)				36 144	A A
V_{SD} (∗)	Forward On Voltage	I_{SD} = 72 A V_{GS} = 0			2.2	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 36 A di/dt = 100 A/μs V_{DD} = 30 V T_j = 150 °C		90 0.2		ns μC

(∗) Pulsed. Pulse duration = 300 μs, duty cycle 1.5 %

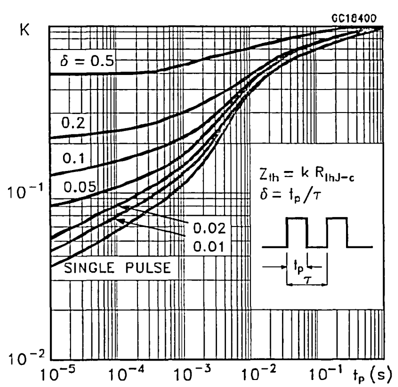
Safe Operating Area For TO-220



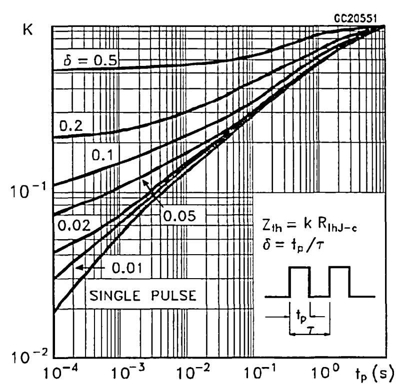
Safe Operating Area For ISOWATT220



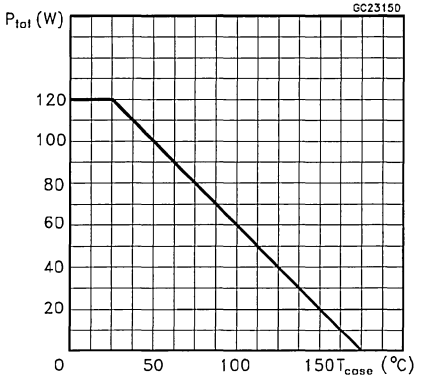
Thermal Impedance For TO-220



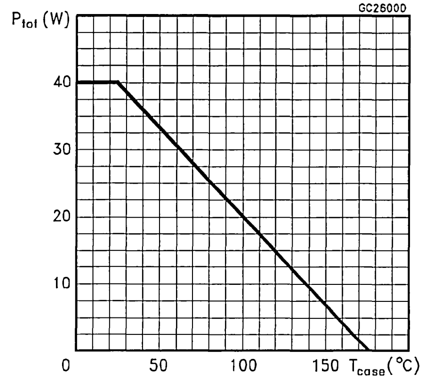
Thermal Impedance For ISOWATT220



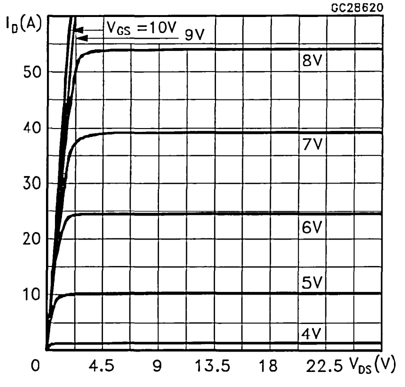
Derating Curve For TO-220



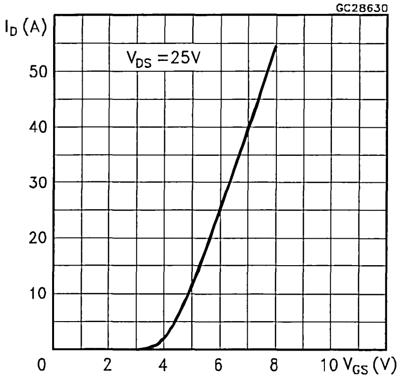
Derating Curve For ISOWATT220



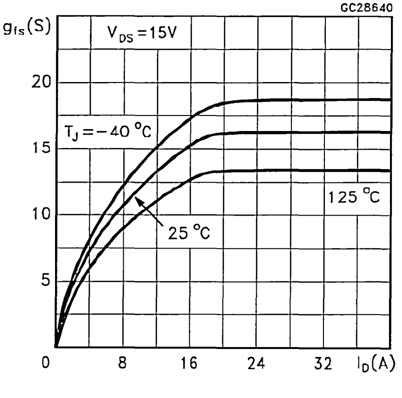
Output Characteristics



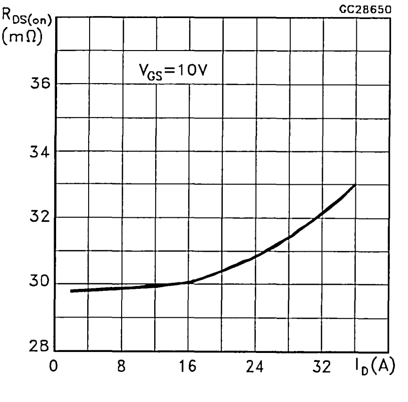
Transfer Characteristics



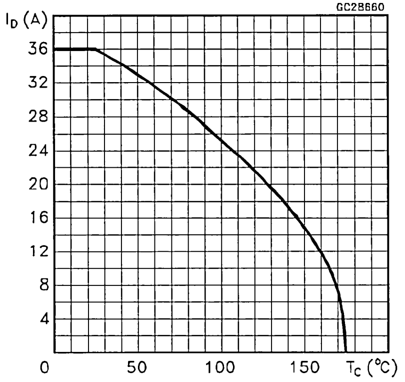
Transconductance



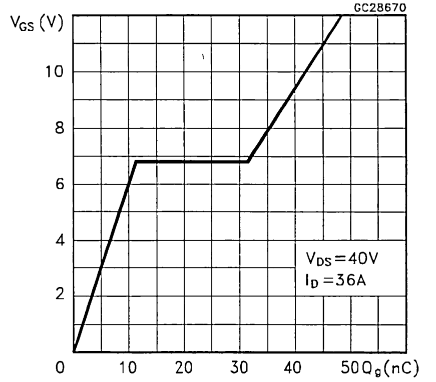
Static Drain-Source On Resistance



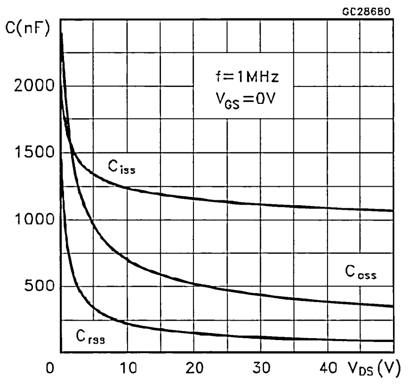
Maximum Drain Current vs Temperature



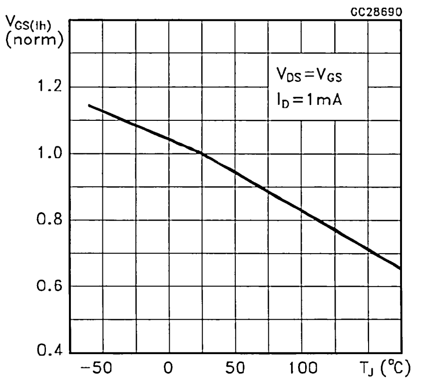
Gate Charge vs Gate-Source Voltage



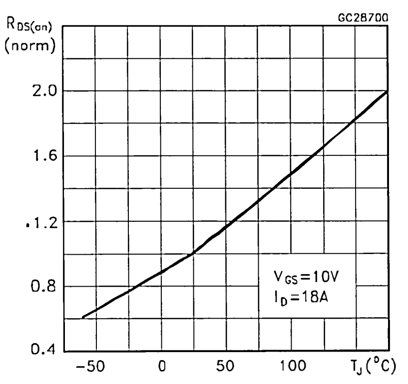
Capacitance Variation



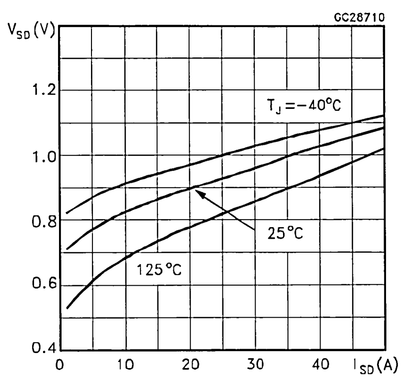
Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-Drain Diode Forward Characteristics



BUZ11A

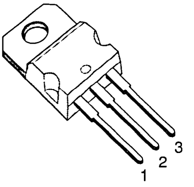
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
BUZ11A	50 V	< 0.055 Ω	27 A

- TYPICAL $R_{DS(on)}$ = 0.048 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE

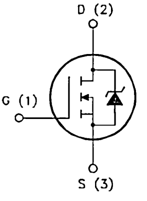
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



TO-220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	27	A
I_{DM}	Drain Current (pulsed)	108	A
P_{tot}	Total Dissipation at T_c = 25 °C	90	W
T_{stg}	Storage Temperature	-65 to 175	°C
T_j	Max. Operating Junction Temperature	175	°C
	DIN Humidity Category (DIN 40040)	E	
	IEC Climatic Category (DIN IEC 68-1)	55/150/56	

THERMAL DATA

$R_{thj\text{-}case}$ $R_{thj\text{-}amb}$	Thermal Resistance Junction-case Max Thermal Resistance Junction-ambient Max	1.67 62.5	°C/W °C/W

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	27	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	140	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	35	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	19	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	50			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating T_j = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 1 mA	2.1	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10 V I_D = 15 A		0.048	0.055	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	V_{DS} = 25 V I_D = 15 A	8	13		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		700 320 90	900 450 150	pF pF pF

SWITCHING

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 30 V I_D = 3 A R_{GS} = 50 Ω V_{GS} = 10 V		30 90 210 105	45 130 300 150	ns ns ns ns

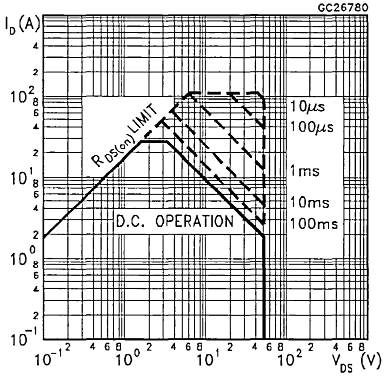
ELECTRICAL CHARACTERISTICS (continued)

SOURCE DRAIN DIODE

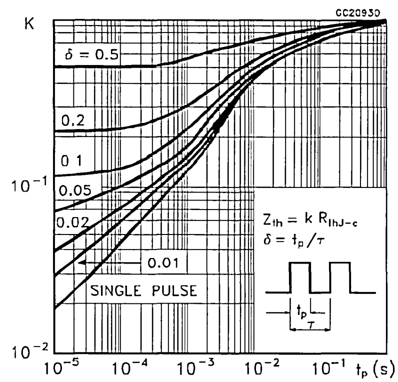
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}	Source-drain Current Source-drain Current (pulsed)				27 108	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 54 A V_{GS} = 0			2.5	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 27 A di/dt = 100 A/μs V_{DD} = 30 V T_j = 150 °C		100 0.25		ns μC

(*) Pulsed. Pulse duration = 300 μs, duty cycle 1 5 %

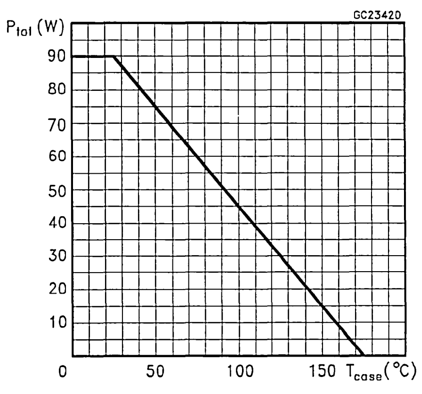
Safe Operating Area



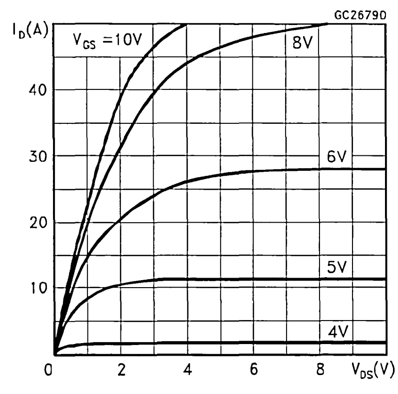
Thermal Impedance



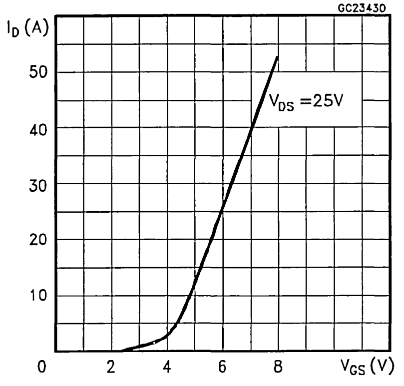
Derating Curve



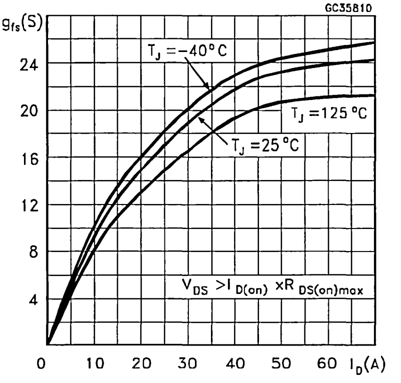
Output Characteristics



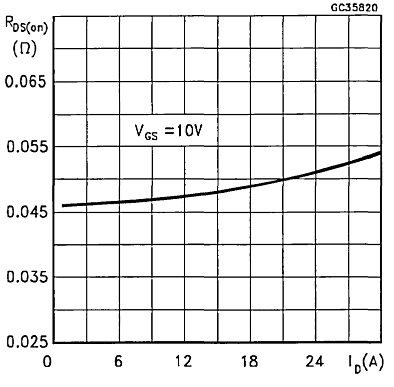
Transfer Characteristics



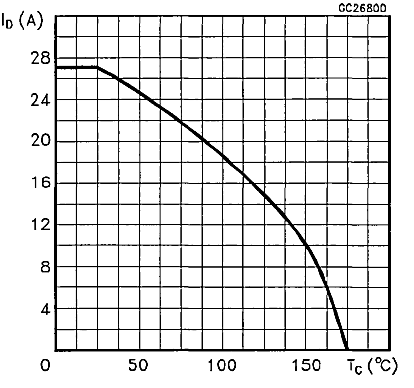
Transconductance



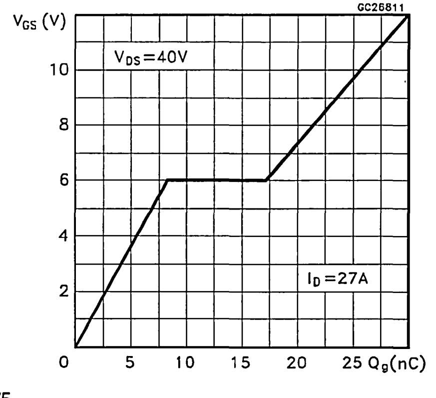
Static Drain-Source On Resistance



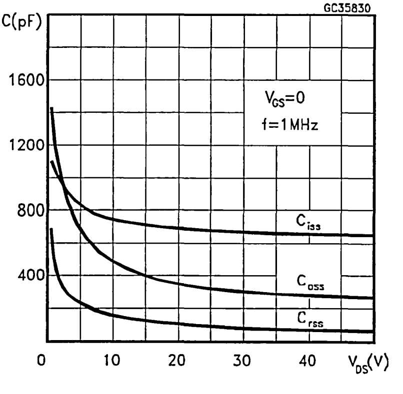
Maximum Drain Current vs Temperature



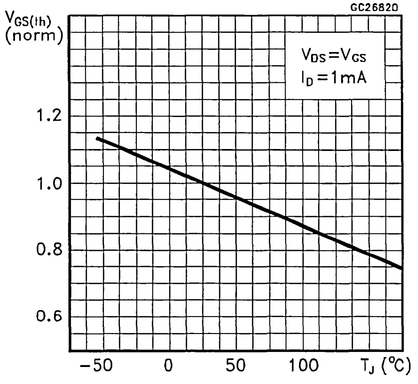
Gate Charge vs Gate-Source Voltage



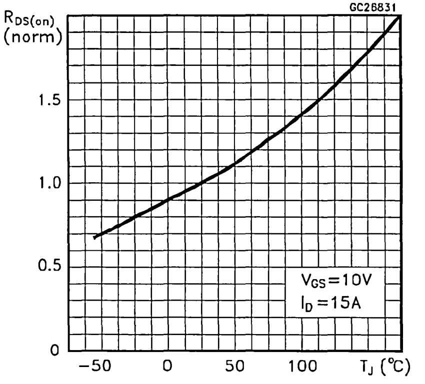
Capacitance Variation



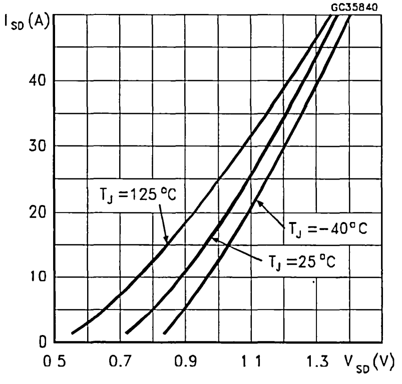
Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-Drain Diode Forward Characteristics



SGS-THOMSON
MICROELECTRONICS

BUZ21

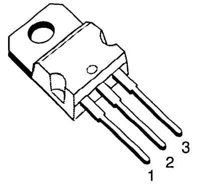
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
BUZ21	100 V	< 0.1 Ω	21 A

- TYPICAL $R_{DS(on)}$ = 0.09 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE

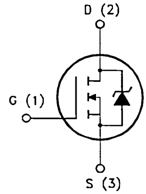
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



TO-220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	100	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	100	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	21	A
I_{DM}	Drain Current (pulsed)	84	A
P_{tot}	Total Dissipation at T_c = 25 °C	105	W
T_{stg}	Storage Temperature	-65 to 175	°C
T_j	Max. Operating Junction Temperature	175	°C
	DIN Humidity Category (DIN 40040)	E	
	IEC Climatic Category (DIN IEC 68-1)	55/150/56	

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1.43	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5	°C/W

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	21	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	60	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	15	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	14	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	100			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating T_j = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 1 mA	2.1	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10 V I_D = 9 A		0.09	0.1	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	V_{DS} = 15 V I_D = 9 A	4	11		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		800 200 40	1100 300 60	pF pF pF

SWITCHING

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 30 V I_D = 3 A R_{GS} = 50 Ω V_{GS} = 10 V		25 75 200 80	35 110 280 120	ns ns ns ns

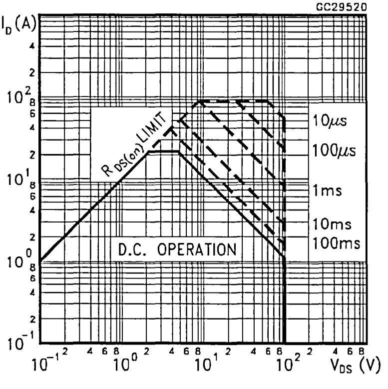
ELECTRICAL CHARACTERISTICS (continued)

SOURCE DRAIN DIODE

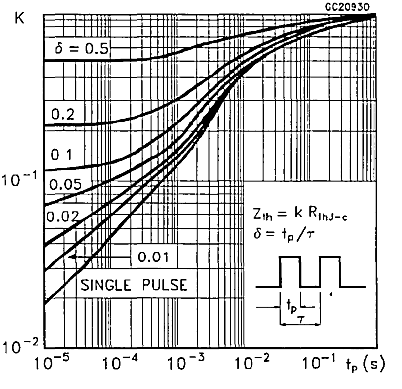
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}	Source-drain Current Source-drain Current (pulsed)				21 84	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 38 A V_{GS} = 0			2.1	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 19 A di/dt = 100 A/μs V_{DD} = 20 V T_j = 150 °C		125 0.44		ns μC

(*) Pulsed. Pulse duration = 300 μs, duty cycle 1.5 %

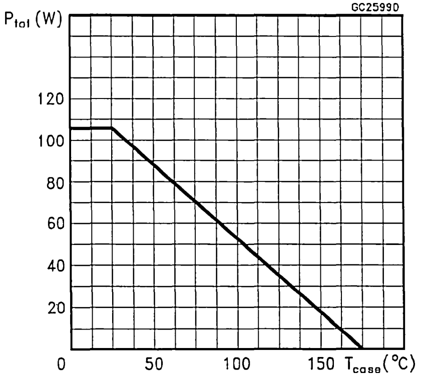
Safe Operating Area



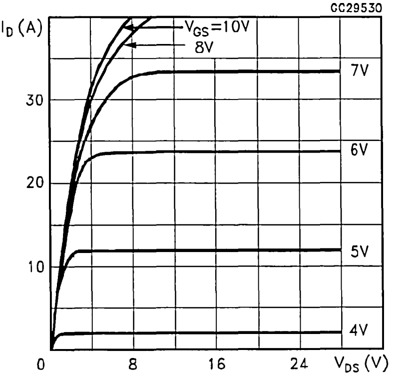
Thermal Impedance



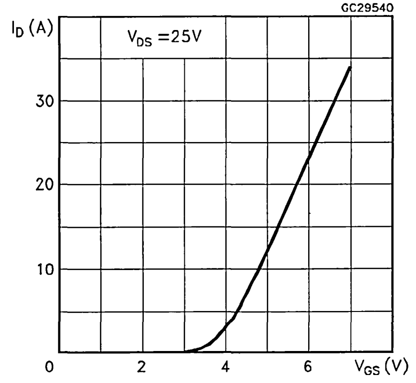
Derating Curve



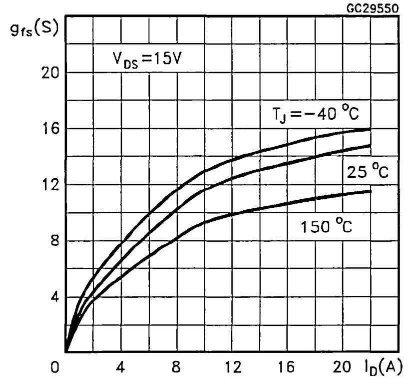
Output Characteristics



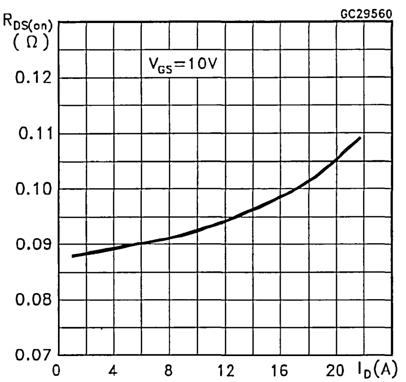
Transfer Characteristics



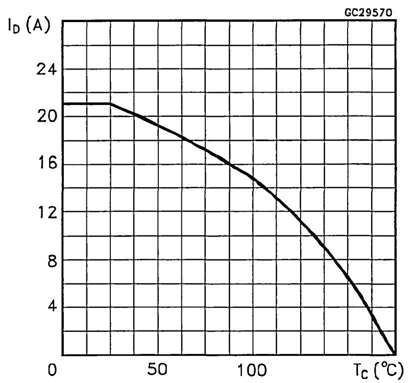
Transconductance



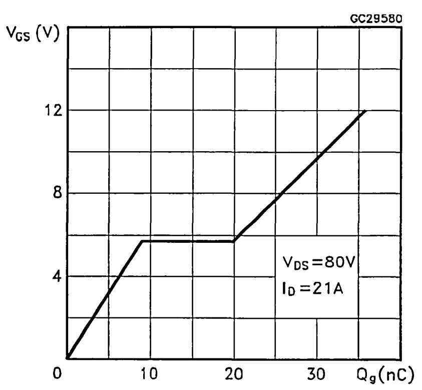
Static Drain-Source On Resistance



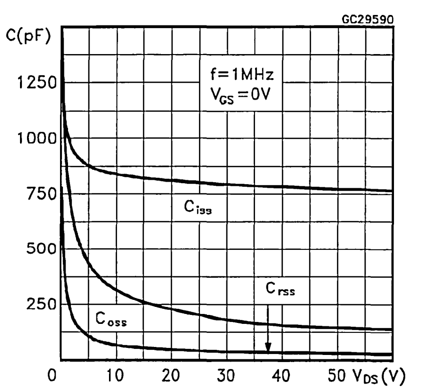
Maximum Drain Current vs Temperature



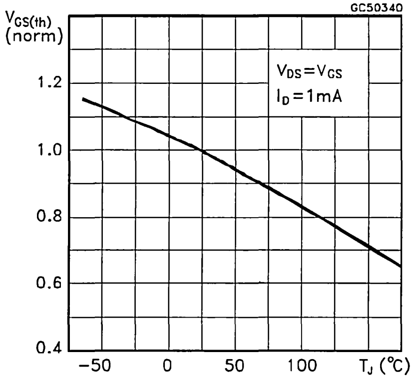
Gate Charge vs Gate-Source Voltage



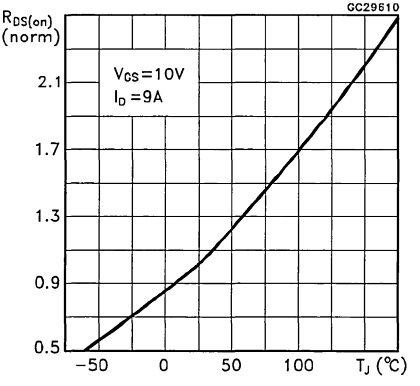
Capacitance Variation



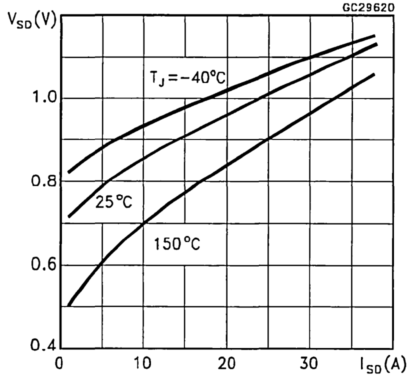
Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-Drain Diode Forward Characteristics



SGS-THOMSON MICROELECTRONICS

BUZ71 BUZ71FI

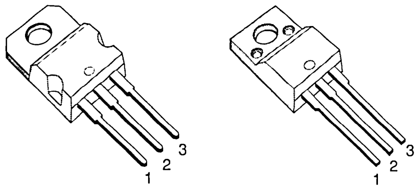
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
BUZ71 BUZ71FI	50 V 50 V	< 0.1 Ω < 0.1 Ω	18 A 12 A

- TYPICAL $R_{DS(on)}$ = 0.06 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE

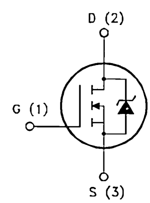
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



TO-220 **ISOWATT220**

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		BUZ71	BUZ71FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	18	12	A
I_{DM}	Drain Current (pulsed)	72	72	A
P_{tot}	Total Dissipation at T_c = 25 °C	80	35	W
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C
	DIN Humidity Category (DIN 40040)	E		
	IEC Climatic Category (DIN IEC 68-1)	55/150/56		

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case Max	1.88	4.29	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient Max	62.5		°C/W

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	18	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	60	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	15	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	12	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	50			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating T_j = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 1 mA	2.1	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10 V I_D = 9 A		0.06	0.1	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	V_{DS} = 25 V I_D = 9 A	5	8		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		520 250 80	700 350 120	pF pF pF

SWITCHING

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 30 V I_D = 3 A R_{GS} = 50 Ω V_{GS} = 10 V		45 65 115 80	65 95 160 120	ns ns ns ns

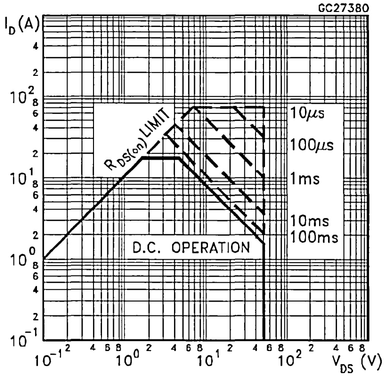
ELECTRICAL CHARACTERISTICS (continued)

SOURCE DRAIN DIODE

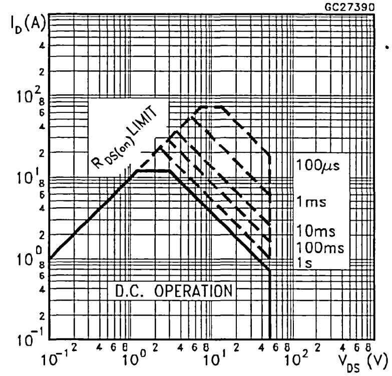
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}	Source-drain Current Source-drain Current (pulsed)				18 72	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 36 A V_{GS} = 0			2	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 18 A di/dt = 100 A/µs V_{DD} = 15 V T_j = 150 °C		85 0.13		ns µC

(*) Pulsed. Pulse duration = 300 µs, duty cycle 1 5 %

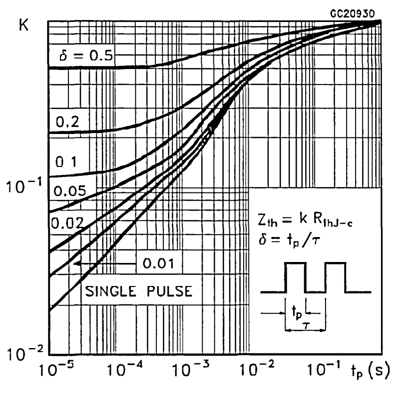
Safe Operating Area For TO-220 Package



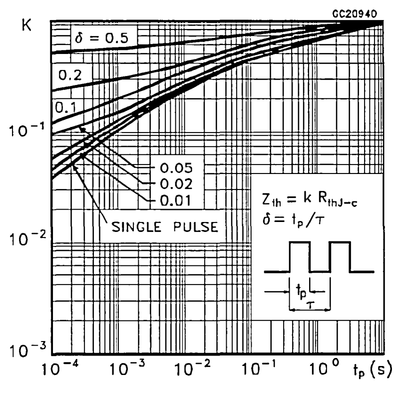
Safe Operating Area For ISOWATT220 Package



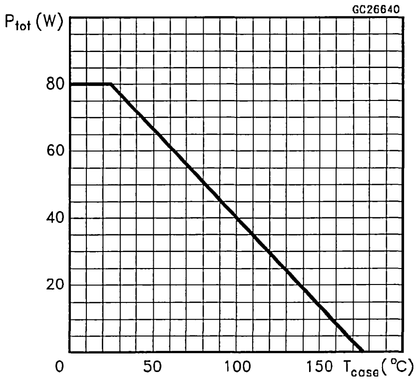
Thermal Impedance For TO-220 Package



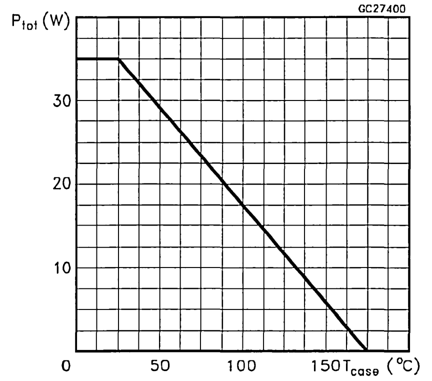
Thermal Impedance For ISOWATT220 Package



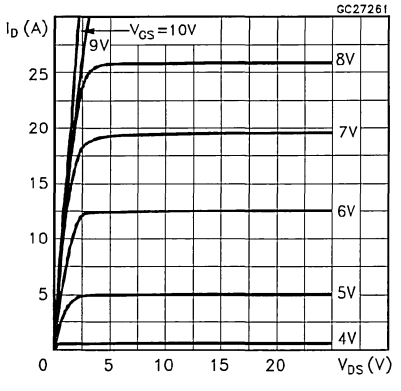
Derating Curve For TO-220 Package



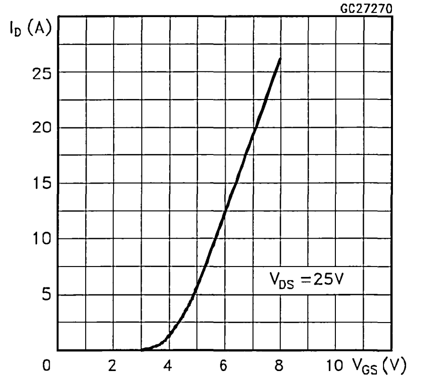
Derating Curve For ISOWATT220 Package



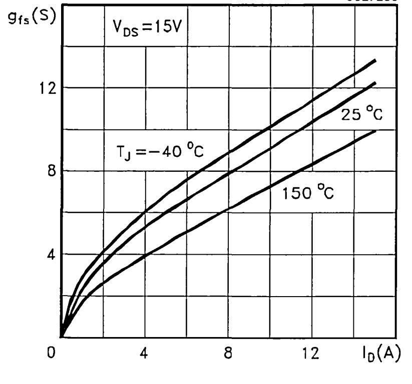
Output Characteristics



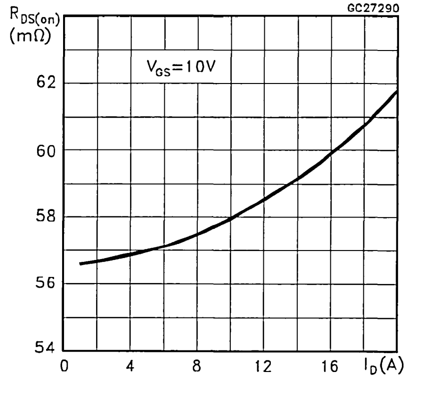
Transfer Characteristics



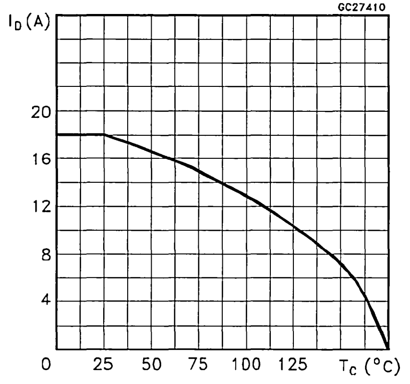
Transconductance



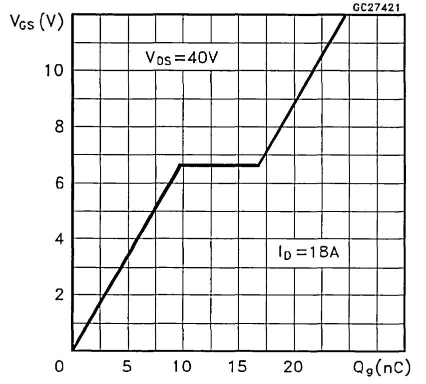
Static Drain-Source On Resistance



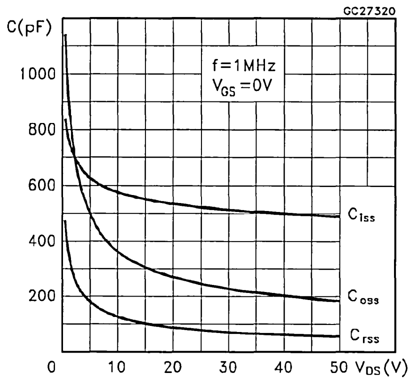
Maximum Drain Current vs Temperature



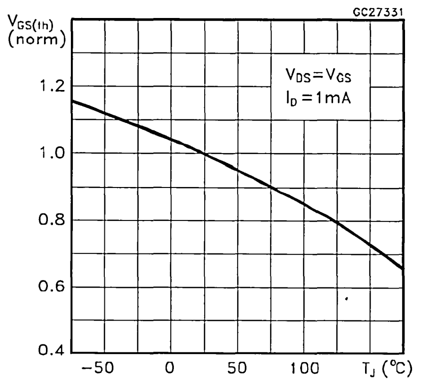
Gate Charge vs Gate-Source Voltage



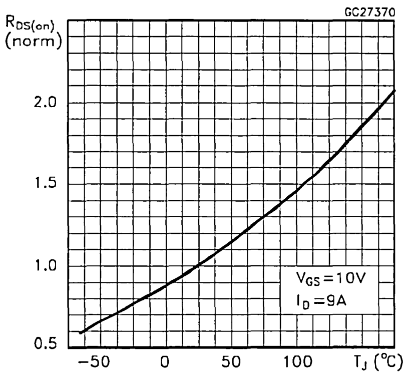
Capacitance Variation



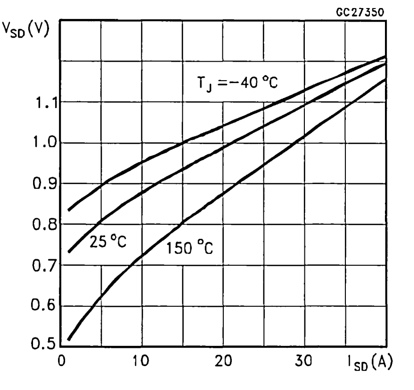
Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-Drain Diode Forward Characteristics



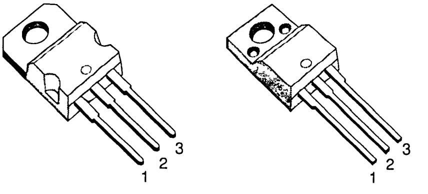
SGS-THOMSON
MICROELECTRONICS

BUZ71A
BUZ71AFI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
BUZ71A	50 V	< 0.12 Ω	16 A
BUZ71AFI	50 V	< 0.12 Ω	11 A

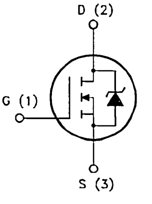
- TYPICAL $R_{DS(on)}$ = 0.1 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE



TO-220 ISOWATT220

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		BUZ71A	BUZ71AFI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	16	11	A
I_{DM}	Drain Current (pulsed)	64	64	A
P_{tot}	Total Dissipation at T_c = 25 °C	70	35	W
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C
	DIN Humidity Category (DIN 40040)	E		
	IEC Climatic Category (DIN IEC 68-1)	55/150/56		

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	2.14	4.29	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	16	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	50	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	10	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	11	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	50			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating $T_j = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 1$ mA	2.1	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10$ V $I_D = 8$ A		0.1	0.12	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} = 25$ V $I_D = 8$ A	3	6.5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		330 150 40	450 250 60	pF pF pF

SWITCHING

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	$V_{DD} = 25$ V $I_D = 8$ A $R_{GS} = 50$ Ω $V_{GS} = 10$ V		50 100 40 45	70 140 60 65	ns ns ns ns

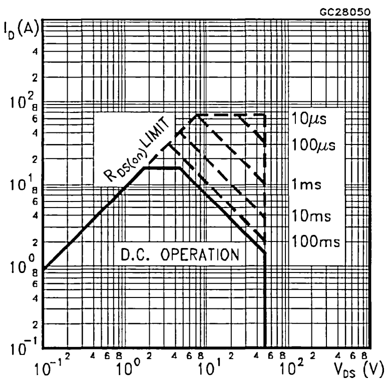
ELECTRICAL CHARACTERISTICS (continued)

SOURCE DRAIN DIODE

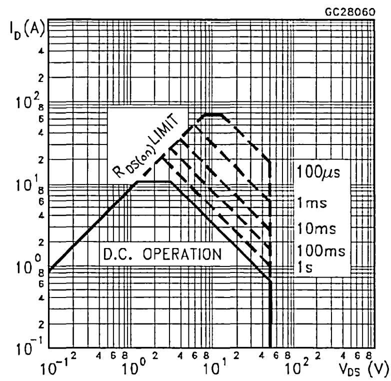
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}	Source-drain Current Source-drain Current (pulsed)				16 64	A A
V_{SD} (∗)	Forward On Voltage	I_{SD} = 32 A V_{GS} = 0			2.2	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 16 A di/dt = 100 A/μs V_{DD} = 25 V T_j = 150 °C		70 0.14		ns μC

(∗) Pulsed. Pulse duration = 300 μs, duty cycle 1.5 %

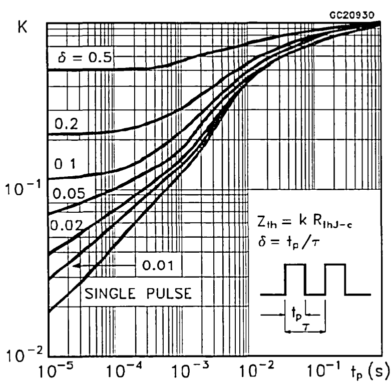
Safe Operating Area For TO-220



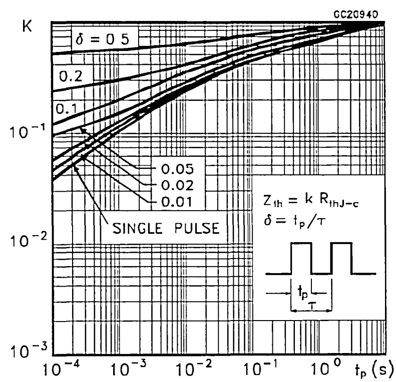
Safe Operating Area For ISOWATT220



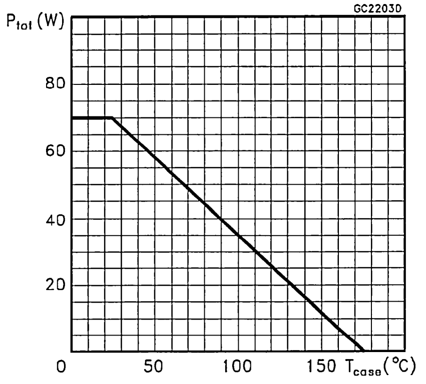
Thermal Impedance For TO-220



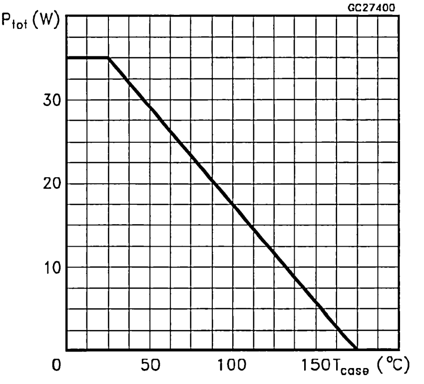
Thermal Impedance For ISOWATT220



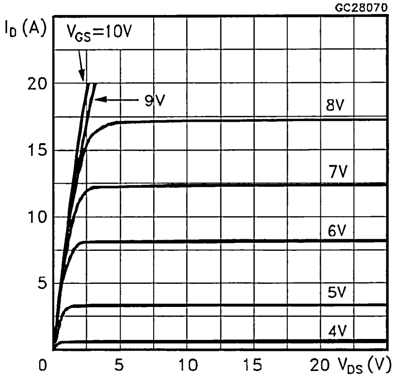
Derating Curve For TO-220



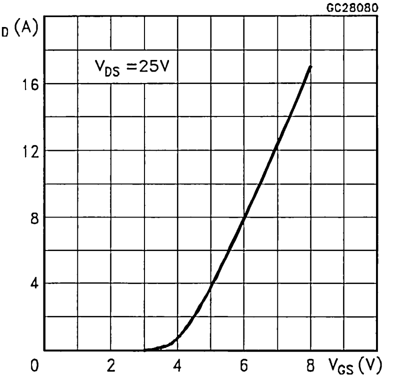
Derating Curve For ISOWATT220



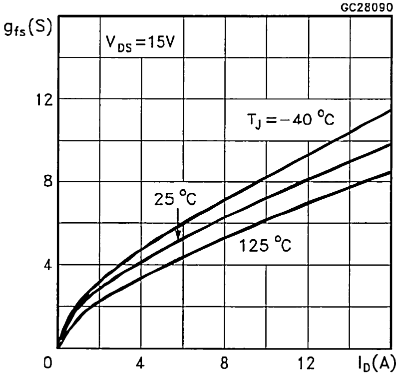
Output Characteristics



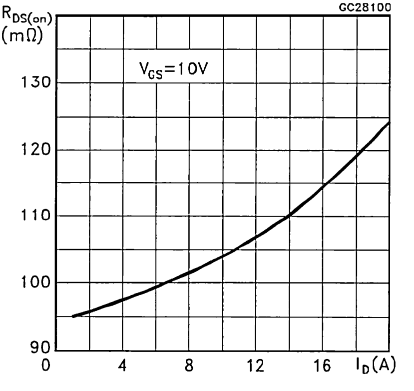
Transfer Characteristics



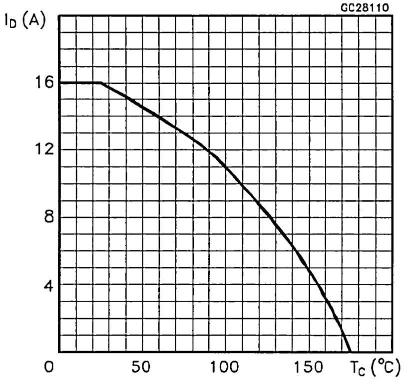
Transconductance



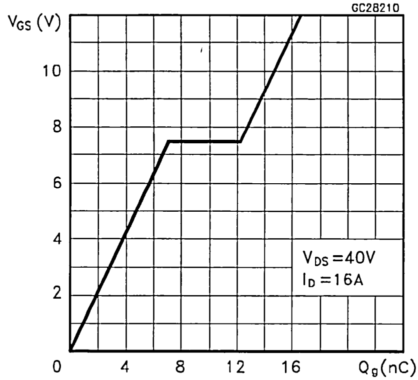
Static Drain-Source On Resistance



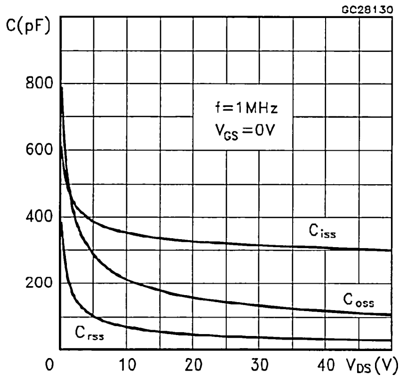
Maximum Drain Current vs Temperature



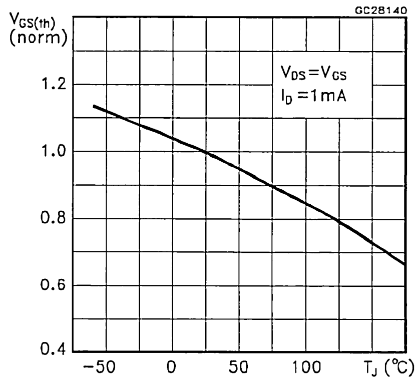
Gate Charge vs Gate-Source Voltage



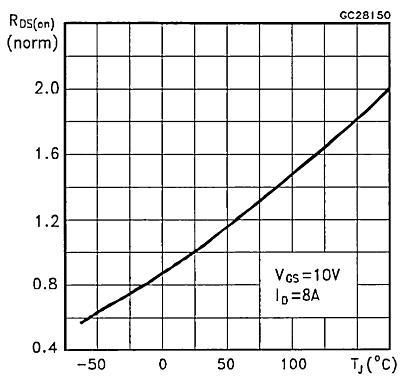
Capacitance Variation



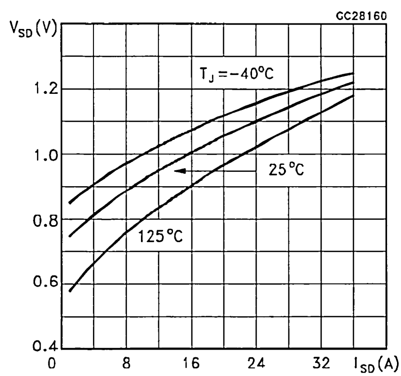
Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-Drain Diode Forward Characteristics



SGS-THOMSON
MICROELECTRONICS

BUZ72A

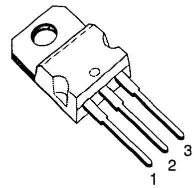
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
BUZ72A	100 V	< 0.25 Ω	11 A

- TYPICAL $R_{DS(on)}$ = 0.23 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE

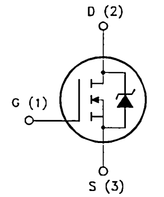
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



TO-220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	100	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	100	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	11	A
I_{DM}	Drain Current (pulsed)	44	A
P_{tot}	Total Dissipation at T_c = 25 °C	70	W
T_{stg}	Storage Temperature	-65 to 175	°C
T_j	Max. Operating Junction Temperature	175	°C
	DIN Humidity Category (DIN 40040)	E	
	IEC Climatic Category (DIN IEC 68-1)	55/150/56	

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	2.14	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	°C/W

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	11	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	36	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	9	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	7	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	100			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating $T_j = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10$ V $I_D = 5$ A		0.23	0.25	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} = 25$ V $I_D = 5$ A	2.7	4.5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		330 90 25	450 120 40	pF pF pF

SWITCHING

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	$V_{DD} = 50$ V $I_D = 5.5$ A $R_{GS} = 4.7$ Ω $V_{GS} = 10$ V		10 50 25 20	15 75 40 30	ns ns ns ns

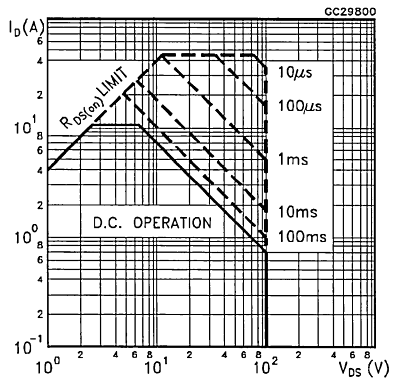
ELECTRICAL CHARACTERISTICS (continued)

SOURCE DRAIN DIODE

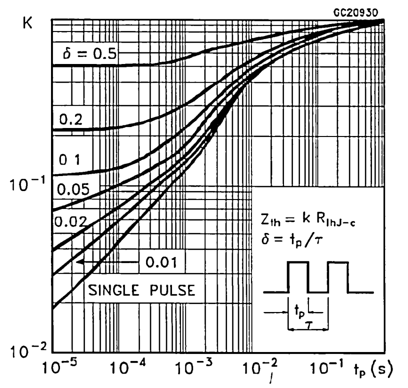
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}	Source-drain Current Source-drain Current (pulsed)				11 44	A A
V_{SD} (∗)	Forward On Voltage	I_{SD} = 22 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 11 A di/dt = 100 A/μs V_{DD} = 20 V T_j = 150 °C		80 0.22		ns μC

(∗) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %

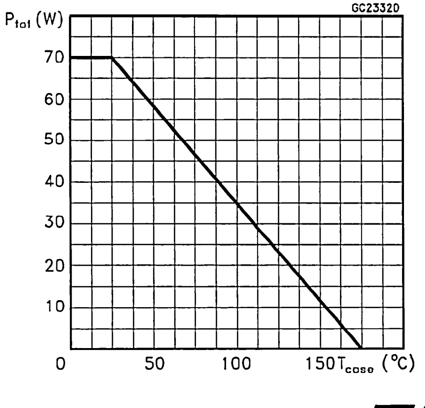
Safe Operating Area



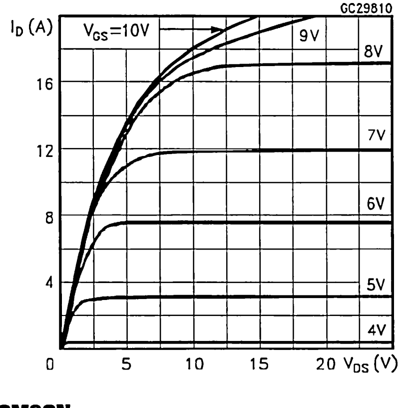
Thermal Impedance



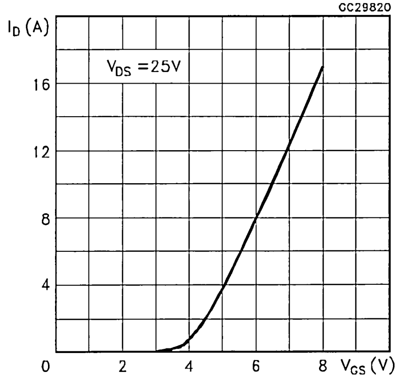
Derating Curve



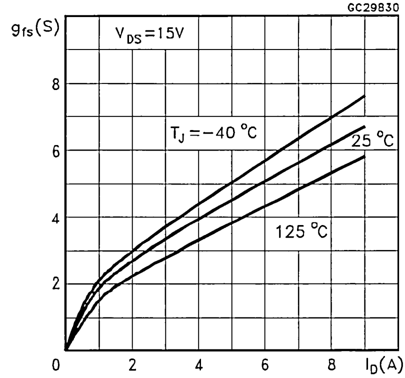
Output Characteristics



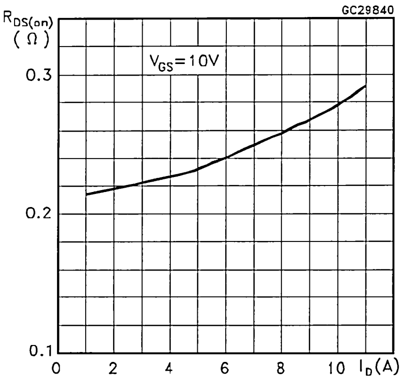
Transfer Characteristics



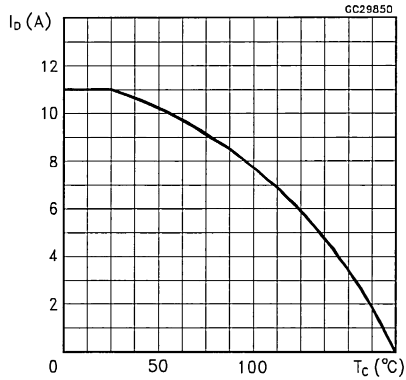
Transconductance



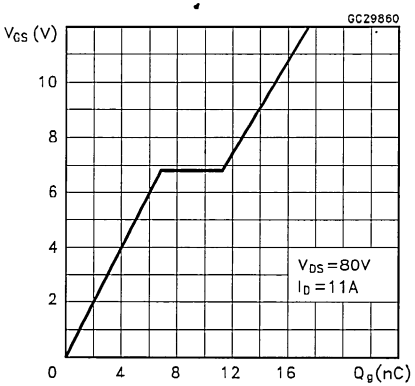
Static Drain-Source On Resistance



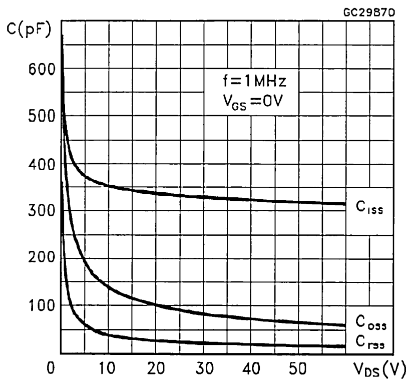
Maximum Drain Current vs Temperature



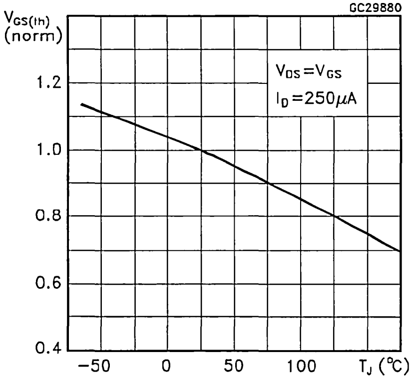
Gate Charge vs Gate-Source Voltage



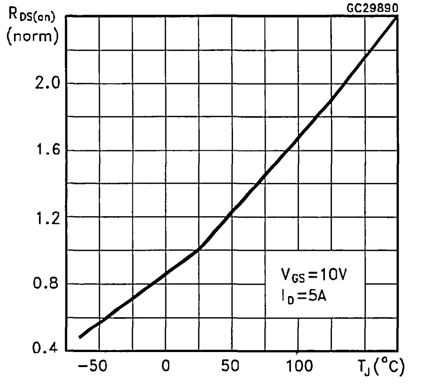
Capacitance Variation



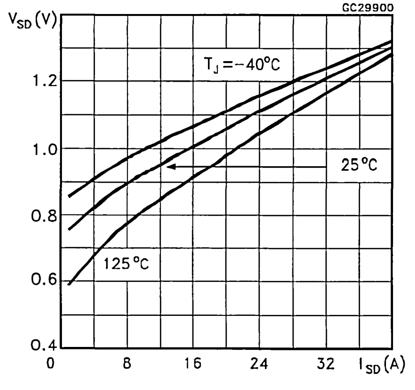
Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-Drain Diode Forward Characteristics



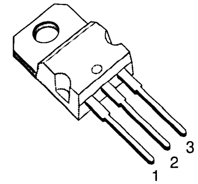
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
BUZ76A	400 V	< 2.5 Ω	3.8 A

- TYPICAL $R_{DS(on)}$ = 1.65 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C

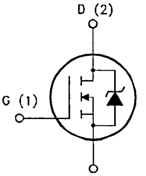
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



TO-220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	400	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	400	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 30 °C	3.8	A
I_{DM}	Drain Current (pulsed)	16	A
P_{tot}	Total Dissipation at T_c = 25 °C	75	W
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C
	DIN Humidity Category (DIN 40040)	E	
	IEC Climatic Category (DIN IEC 68-1)	55/150/56	

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	3.57	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	°C/W

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	3.8	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 50$ V)	100	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	6.8	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	2.3	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	400			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating $T_j = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 1$ mA	2.1	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10$ V $I_D = 1.5$ A		1.65	2.5	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} = 25$ V $I_D = 1.5$ A	0.8	1.5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		360 68 32	450 90 45	pF pF pF

SWITCHING

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	$V_{DD} = 175$ V $I_D = 2$ A $R_{GS} = 50$ Ω $V_{GS} = 10$ V		25 70 145 50	33 90 190 65	ns ns ns ns

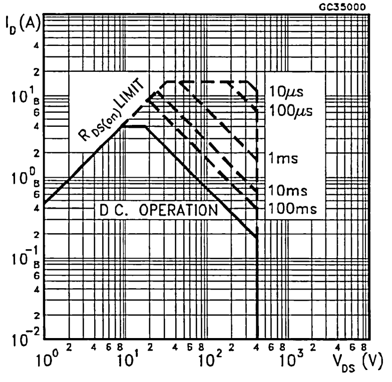
ELECTRICAL CHARACTERISTICS (continued)

SOURCE DRAIN DIODE

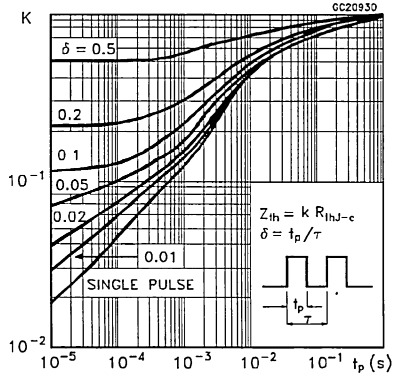
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}	Source-drain Current Source-drain Current (pulsed)				3.8 16	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 5.2 A V_{GS} = 0			1.4	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 4 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C		400 5.9		ns µC

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %

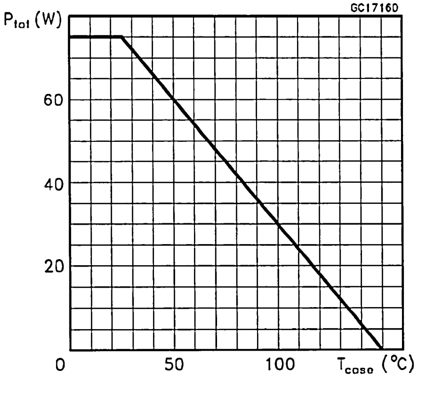
Safe Operating Area



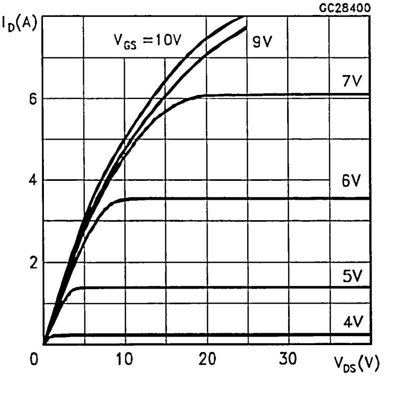
Thermal Impedance



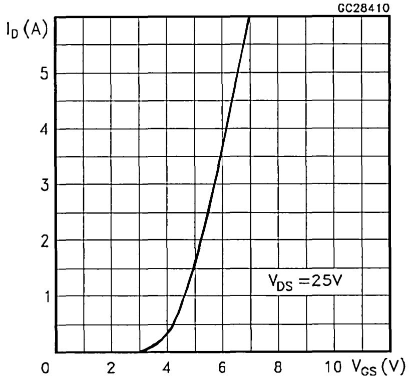
Derating Curve



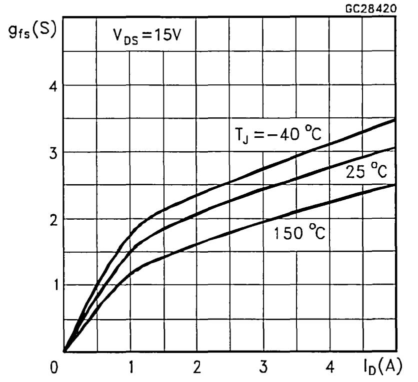
Output Characteristics



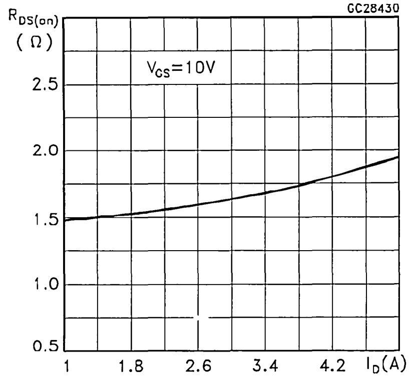
Transfer Characteristics



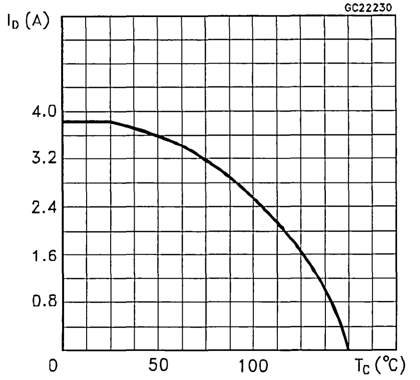
Transconductance



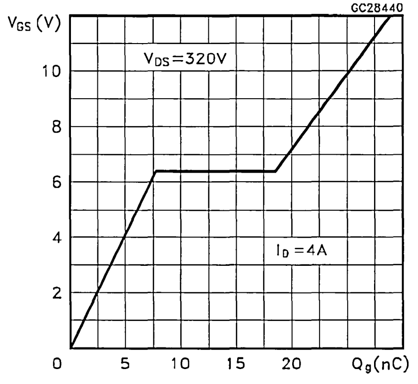
Static Drain-Source On Resistance



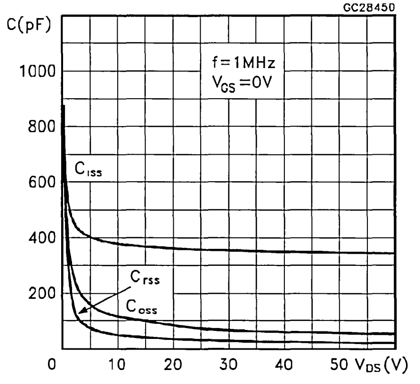
Maximum Drain Current vs Temperature



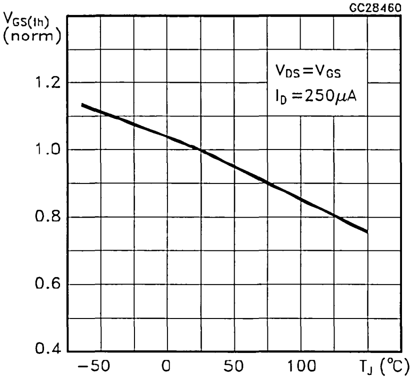
Gate Charge vs Gate-Source Voltage



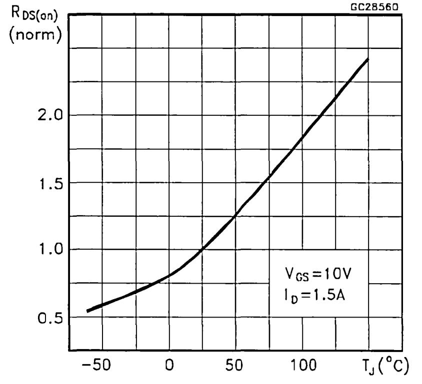
Capacitance Variation



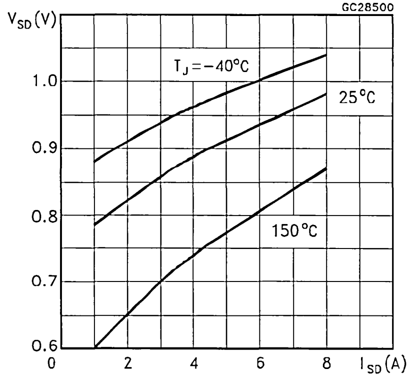
Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-Drain Diode Forward Characteristics



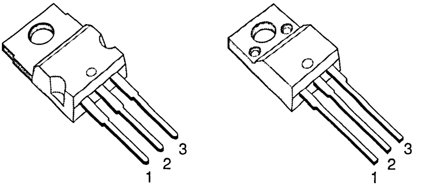
BUZ80
BUZ80FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
BUZ80	800 V	< 4 Ω	3.4 A
BUZ80FI	800 V	< 4 Ω	2.1 A

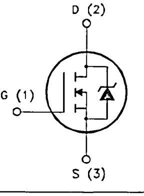
- TYPICAL $R_{DS(on)}$ = 3.3 Ω
- AVALANCHE RUGGEDNESS TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)



TO-220 ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		BUZ80	BUZ80FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	800		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	800		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	3.4	2.1	A
I_D	Drain Current (continuous) at T_c = 100 °C	2.1	1.3	A
I_{DM}(•)	Drain Current (pulsed)	13	13	A
P_{tot}	Total Dissipation at T_c = 25 °C	100	40	W
	Derating Factor	0.8	0.32	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case Max	1.25	3.12	°C/W
$R_{thj\text{-}amb}$ $R_{thc\text{-}sink}$ T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	3.4	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	180	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	4.8	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	2.1	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	800			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 1 mA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10 V I_D = 1.7 A V_{GS} = 10 V I_D = 1.7 A T_c = 100°C		3.3	4 8	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	3.4			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 1.7 A	1	3.5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		650 82 28	850 105 40	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 2.1 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)			50 110	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 640 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		170		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 3 A V_{GS} = 10 V		42 6 17	55	nC nC nC

SWITCHING OFF

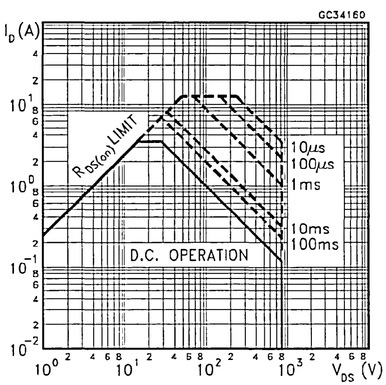
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 640 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		95 20 120	120 25 165	ns ns ns

SOURCE DRAIN DIODE

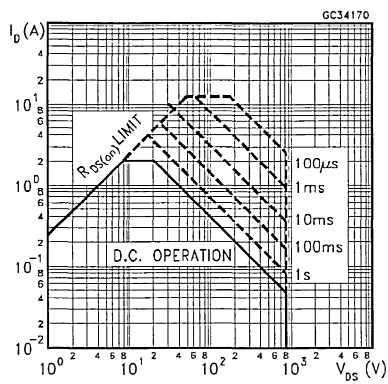
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				3.4 13	A A
V_{SD} (∗)	Forward On Voltage	I_{SD} = 6 A V_{GS} = 0			2.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 3 A di/dt = 100 A/µs V_{DD} = 80 V T_j = 150 °C (see test circuit, figure 5)		700 8.8 25		ns µC A

(∗) Pulsed Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

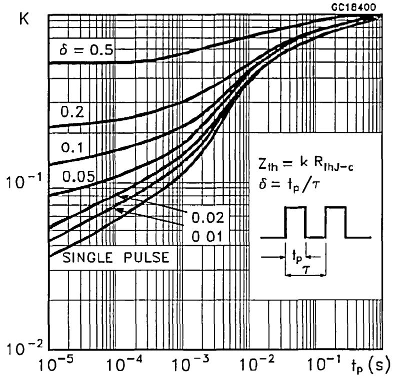
Safe Operating Areas For TO-220



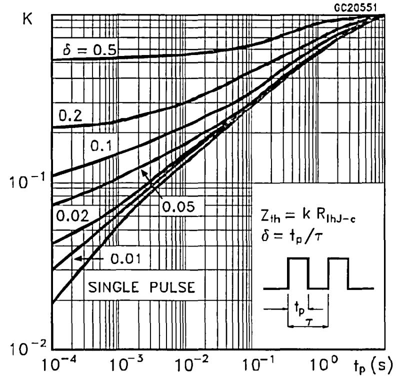
Safe Operating Areas For ISOWATT220



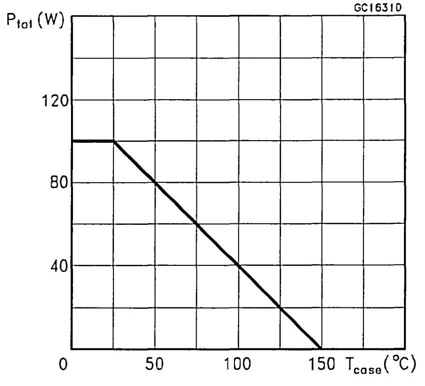
Thermal Impedeance For TO-220



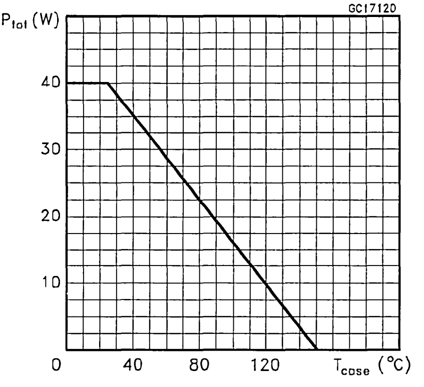
Thermal Impedance For ISOWATT220



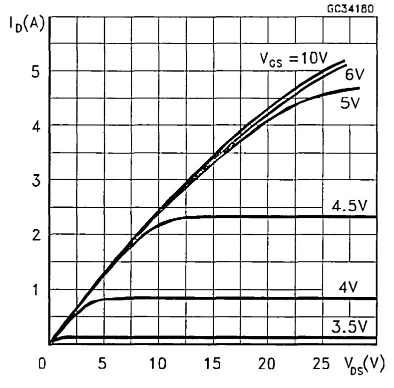
Derating Curve For TO-220



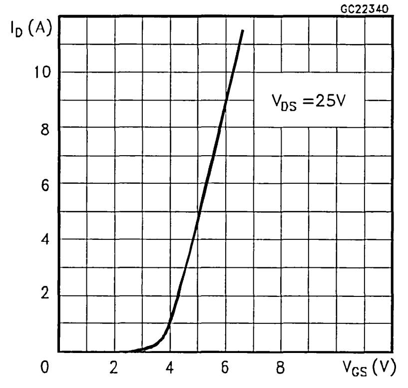
Derating Curve For ISOWATT220



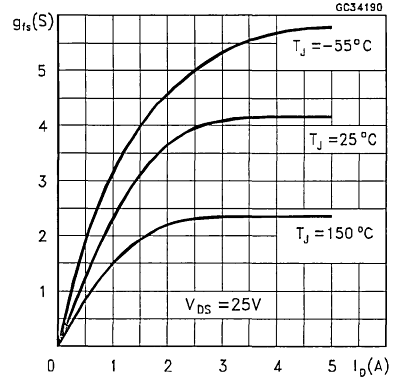
Output Characteristics



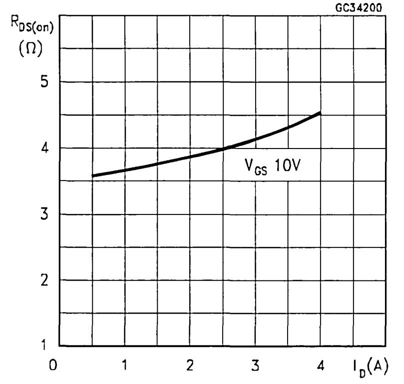
Transfer Characteristics



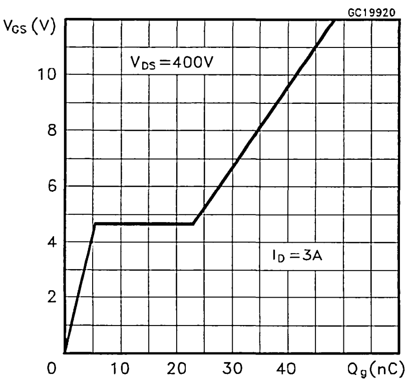
Transconductance



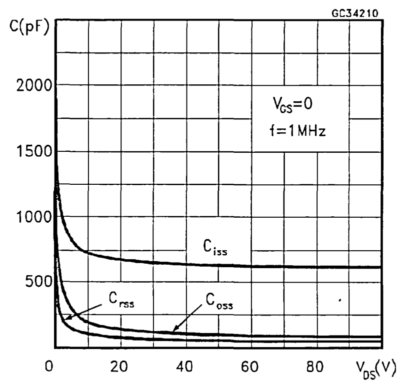
Static Drain-source On Resistance



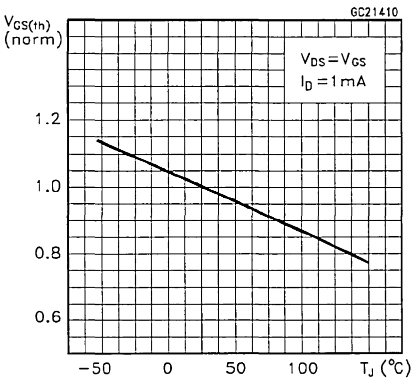
Gate Charge vs Gate-source Voltage



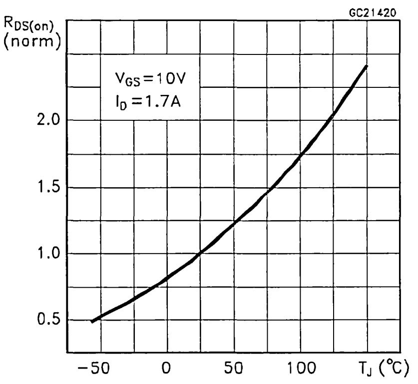
Capacitance Variations



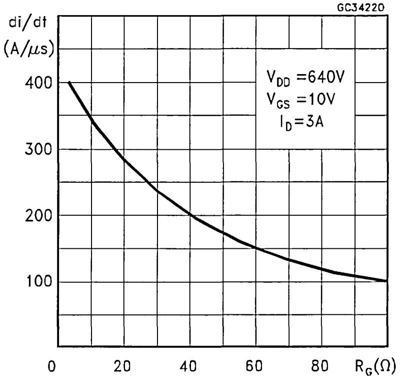
Normalized Gate Threshold Voltage vs Temperature



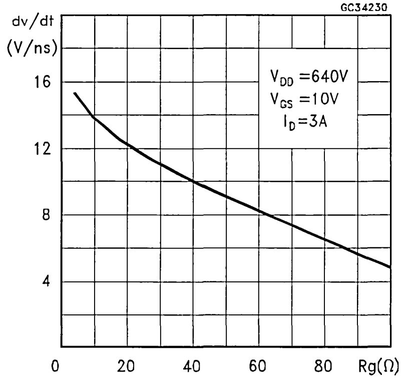
Normalized On Resistance vs Temperature



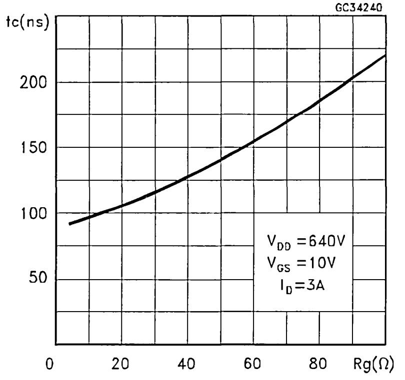
Turn-on Current Slope



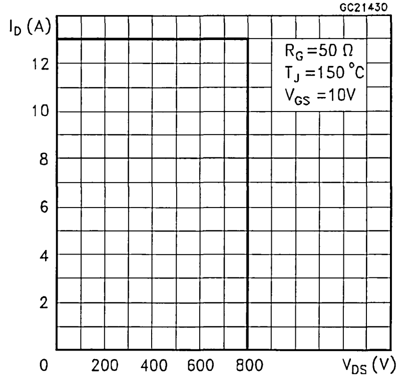
Turn-off Drain-source Voltage Slope



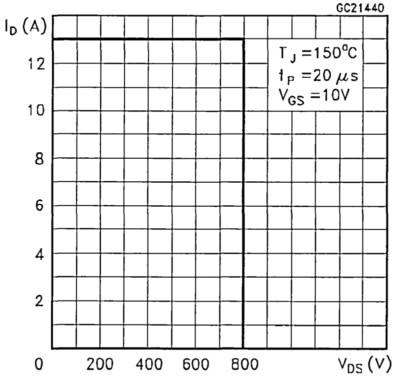
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

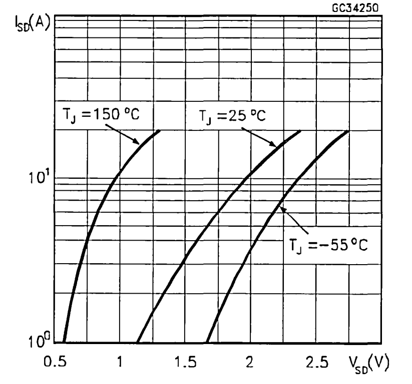


Fig. 1: Unclamped Inductive Load Test Circuits

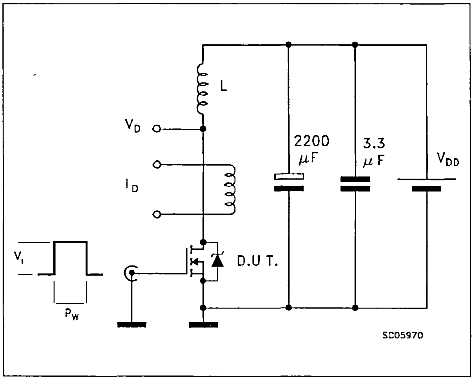


Fig. 2: Unclamped Inductive Waveforms

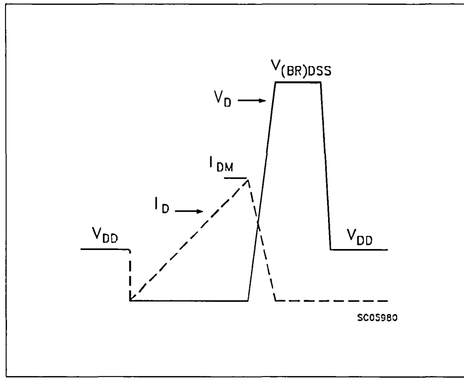


Fig. 3: Switching Times Test Circuits For Resistive Load

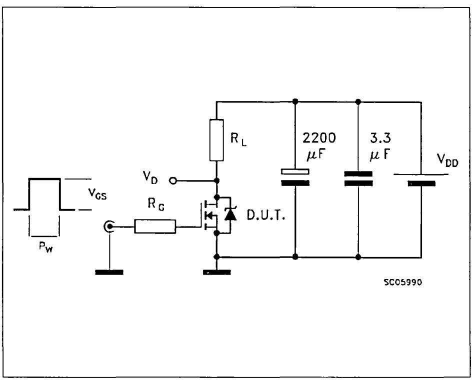


Fig. 4: Gate Charge Test Circuit

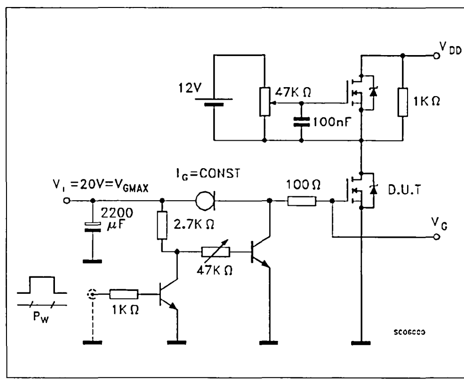
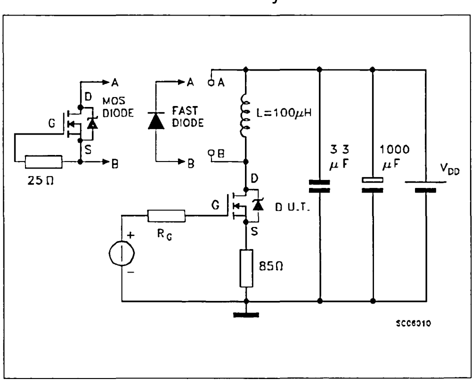


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON MICROELECTRONICS

BUZ80A
BUZ80AFI

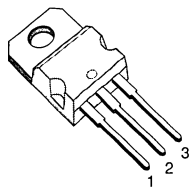
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
BUZ80A	800 V	< 3 Ω	3.8 A
BUZ80AFI	800 V	< 3 Ω	2.4 A

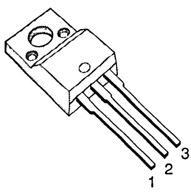
- TYPICAL $R_{DS(on)}$ = 2.5 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)

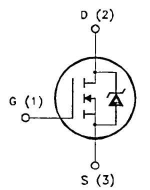


TO-220



ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		BUZ80A	BUZ80AFI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	800		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	800		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	3.8	2.4	A
I_D	Drain Current (continuous) at T_c = 100 °C	2.3	1.4	A
I_{DM}(•)	Drain Current (pulsed)	15	15	A
P_{tot}	Total Dissipation at T_c = 25 °C	100	40	W
	Derating Factor	0.8	0.32	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case Max	1.25	3.12	°C/W
$R_{thj\text{-}amb}$ $R_{thc\text{-}sink}$ T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	3.8	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	200	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	8	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	2.2	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	800			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 1 mA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10 V I_D = 1.7 A V_{GS} = 10 V I_D = 1.7 A T_c = 100°C		2.5	3 6	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	3.8			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 1.7 A	1			S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0			1100 150 55	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 2.3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		65 150	90 200	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 600 V I_D = 3.8 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		80	110	A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 5 A V_{GS} = 10 V		55 8 26	70	nC nC nC

SWITCHING OFF

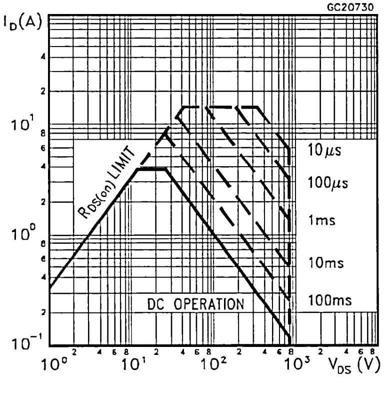
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 600 V I_D = 3.8 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		110 140 150	145 190 200	ns ns ns

SOURCE DRAIN DIODE

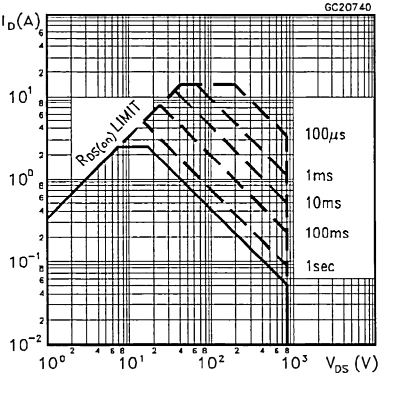
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				3.8 15	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 7.6 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 3.8 A di/dt = 100 A/µs V_R = 100 V T_j = 150 °C (see test circuit, figure 5)		500 4.3 17		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

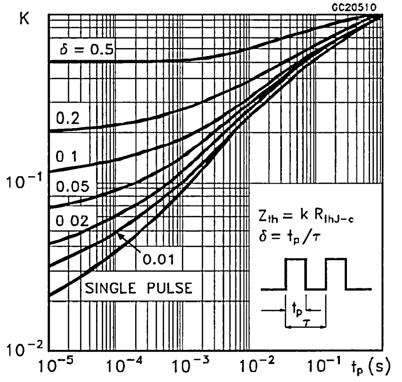
Safe Operating Areas For TO-220 Package



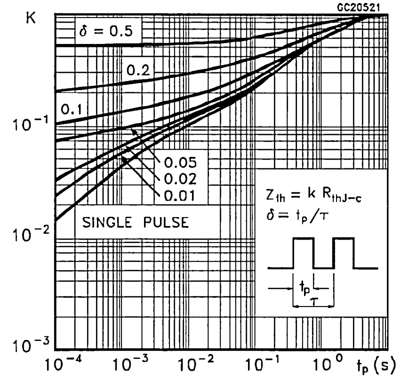
Safe Operating Areas For ISOWATT220 Package



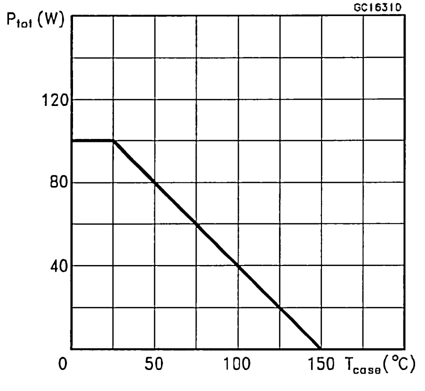
Thermal Impedeance For TO-220 Package



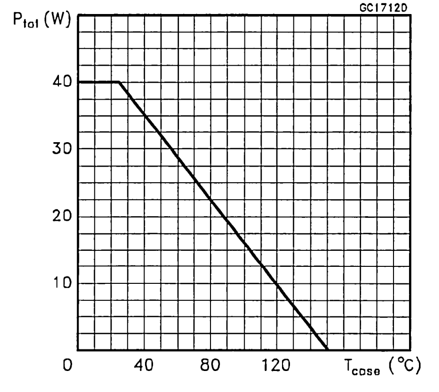
Thermal Impedance For ISOWATT220 Package



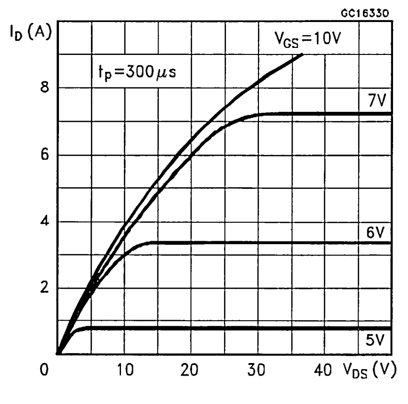
Derating Curve For TO-220 Package



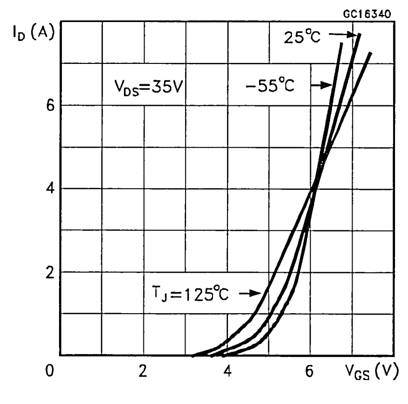
Derating Curve For ISOWATT220 Package



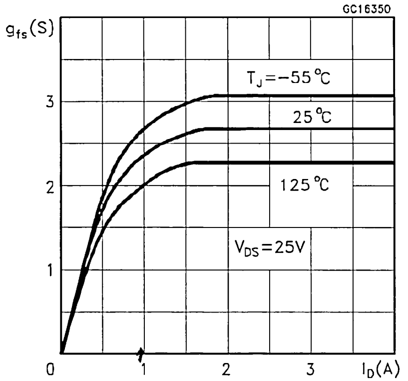
Output Characteristics



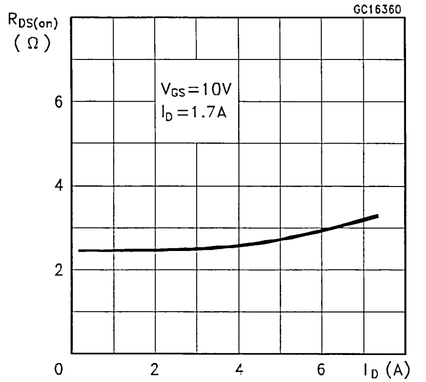
Transfer Characteristics



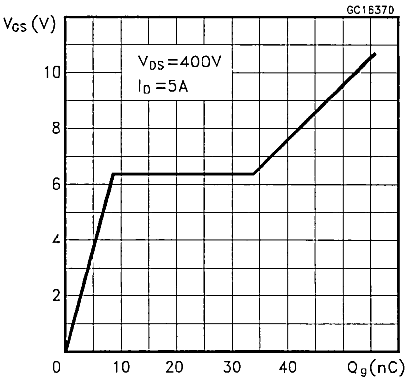
Transconductance



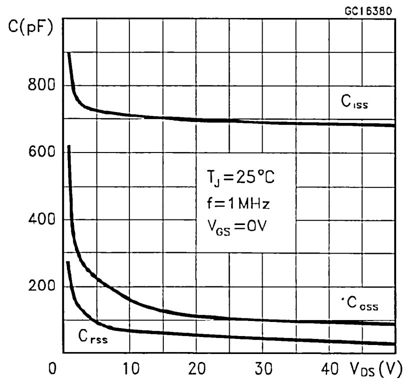
Static Drain-source On Resistance



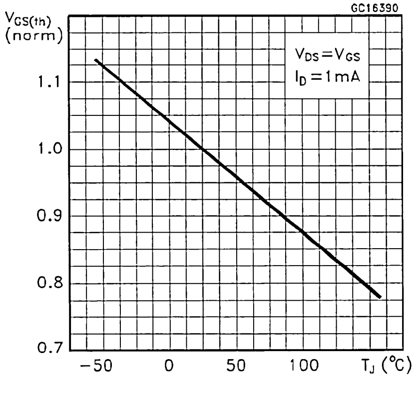
Gate Charge vs Gate-source Voltage



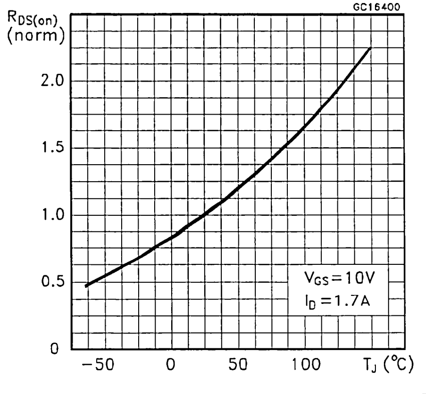
Capacitance Variations



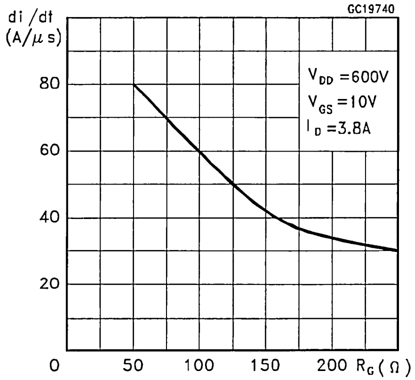
Normalized Gate Threshold Voltage vs Temperature



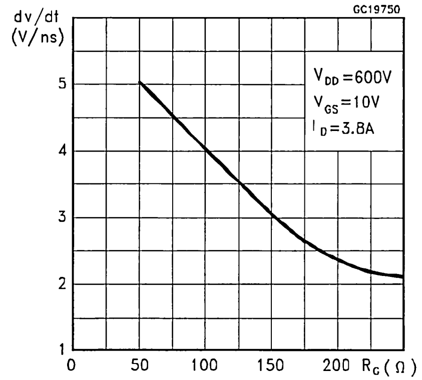
Normalized On Resistance vs Temperature



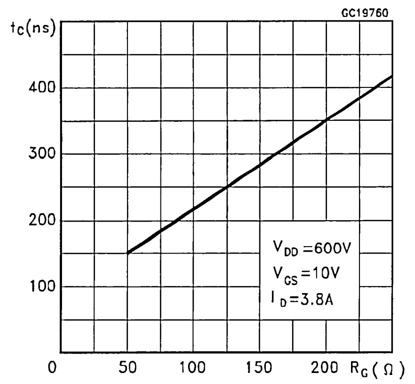
Turn-on Current Slope



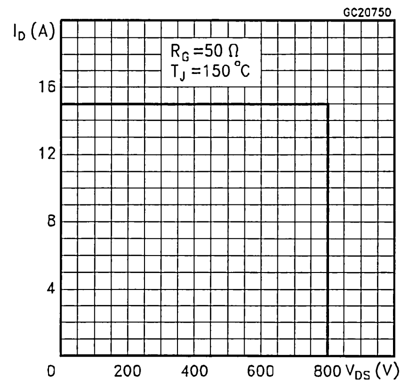
Turn-off Drain-source Voltage Slope



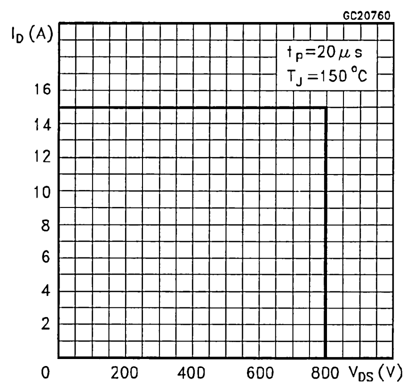
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

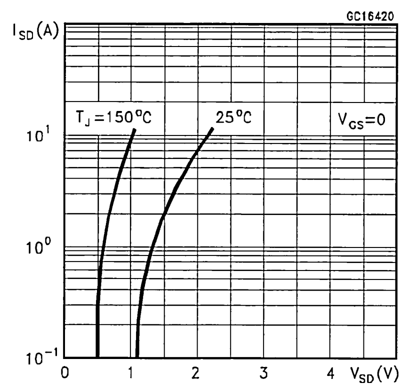


Fig. 1: Unclamped Inductive Load Test Circuits

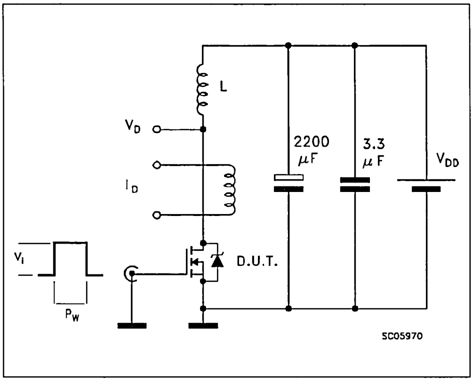


Fig. 2: Unclamped Inductive Waveforms

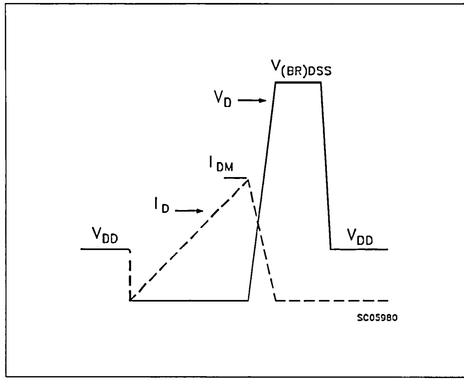


Fig. 3: Switching Times Test Circuits For Resistive Load

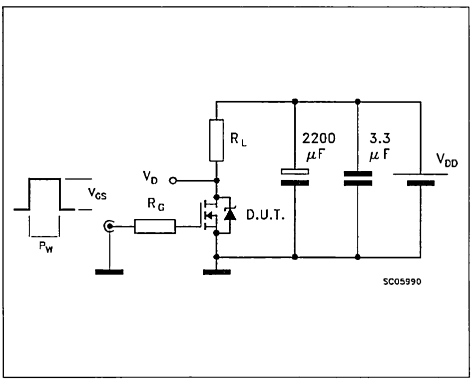


Fig. 4: Gate Charge Test Circuit

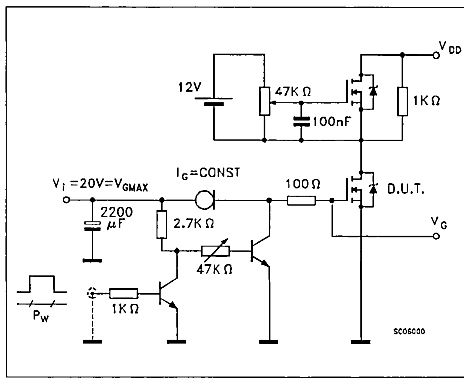
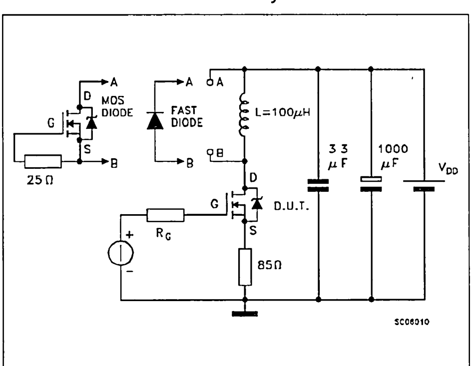


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



IRF520
IRF520FI

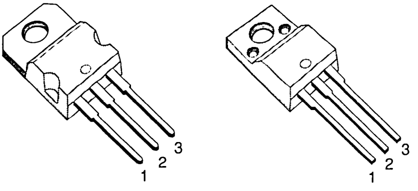
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
IRF520	100 V	< 0.27 Ω	10 A
IRF520FI	100 V	< 0.27 Ω	7 A

- TYPICAL $R_{DS(on)}$ = 0.23 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE

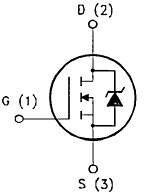
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



TO-220 ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		IRF520	IRF520FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	100		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	100		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (cont.) at T_c = 25 °C	10	7	A
I_D	Drain Current (cont.) at T_c = 100 °C	7	5	A
$I_{DM}(\bullet)$	Drain Current (pulsed)	40	40	A
P_{tot}	Total Dissipation at T_c = 25 °C	70	35	W
	Derating Factor	0.47	0.23	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case Max	2.14	4.29	°C/W
$R_{thj-amb}$ R_{thc-s} T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	10	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	36	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	9	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	7	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	100			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 5$ A		0.23	0.27	Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	10			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 5$ A	2.7	4.5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		330 90 25	450 120 40	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING RESISTIVE LOAD

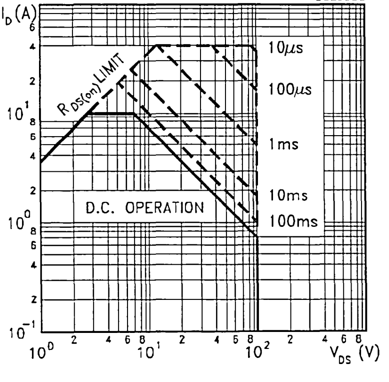
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 50 V I_D = 5 A R_{GS} = 4.7 Ω V_{GS} = 10 V (see test circuit)		10 50 25 20	15 75 40 30	ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	I_D = 10 A V_{GS} = 10 V V_{DD} = Max Rating x 0.8 (see test circuit)		15 7 4	25	nC nC nC

SOURCE DRAIN DIODE

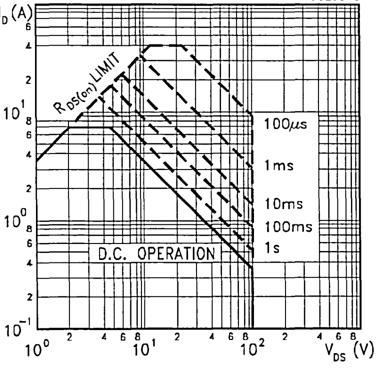
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				10 40	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 10 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 10 A di/dt = 100 A/µs V_{DD} = 20 V T_j = 150 °C		80 0.22		ns µC

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

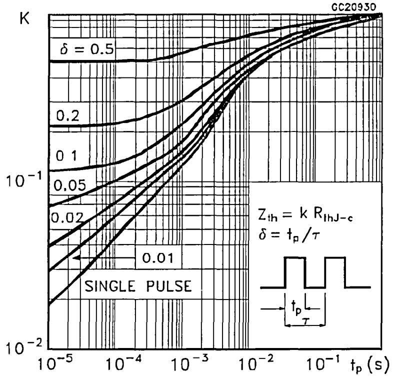
Safe Operating Area for TO-220



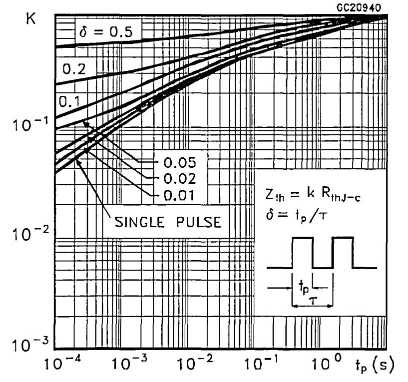
Safe Operating Area for ISOWATT220



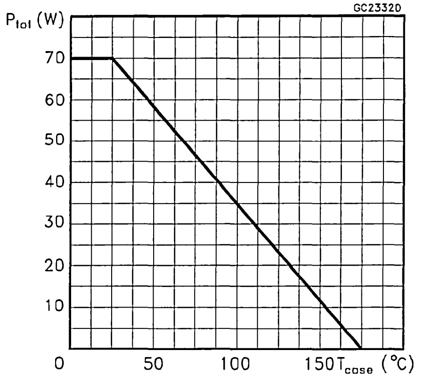
Thermal Impedance for TO-220



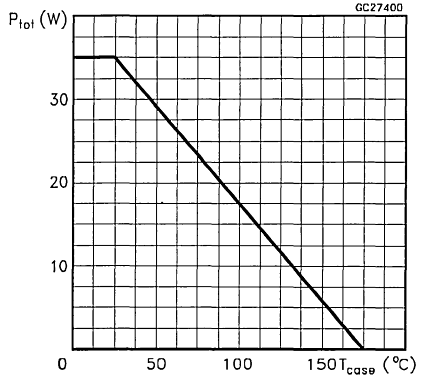
Thermal Impedance for ISOWATT220



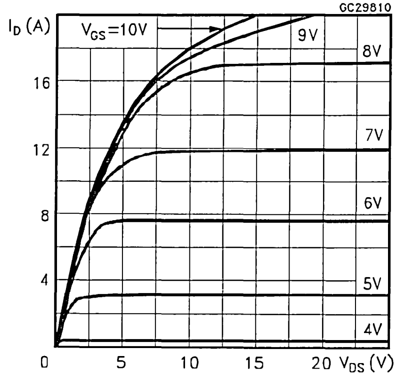
Derating Curve for TO-220



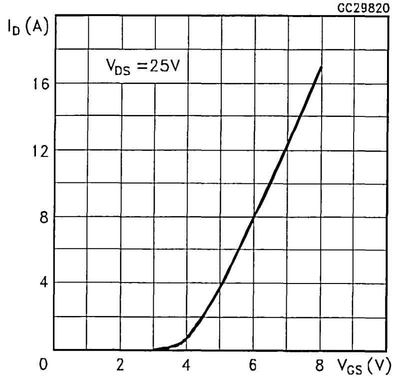
Derating Curve for ISOWATT220



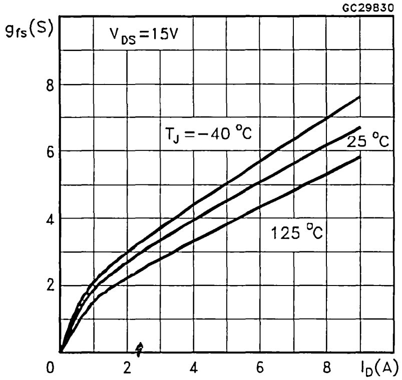
Output Characteristics



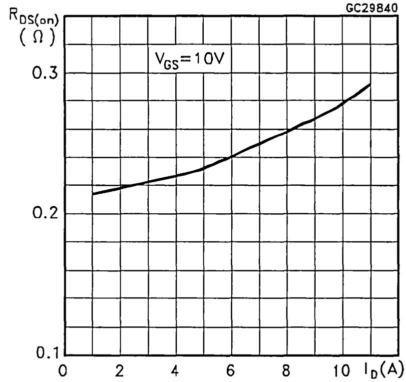
Transfer Characteristics



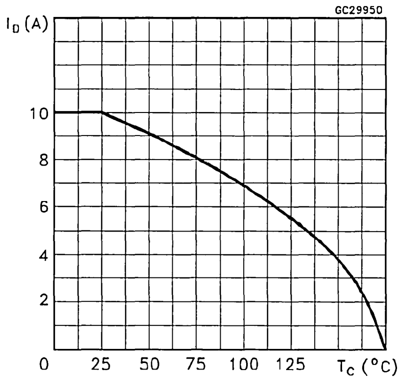
Transconductance



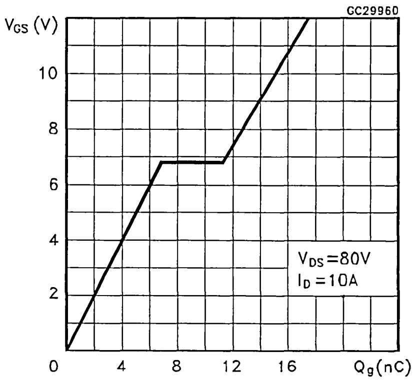
Static Drain-source On Resistance



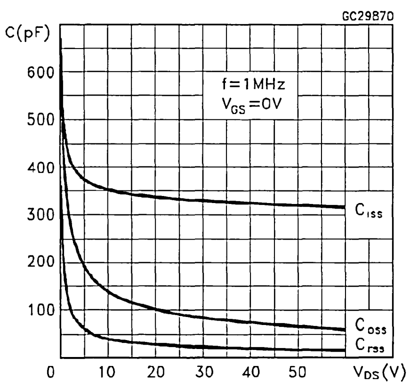
Maximum Drain Current vs Temperature



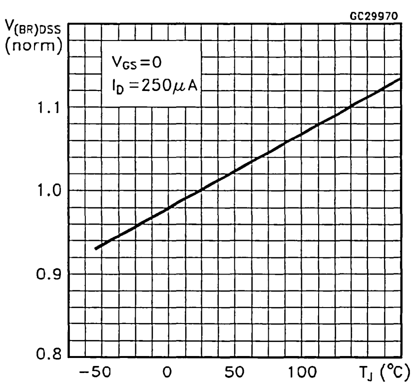
Gate Charge vs Gate-source Voltage



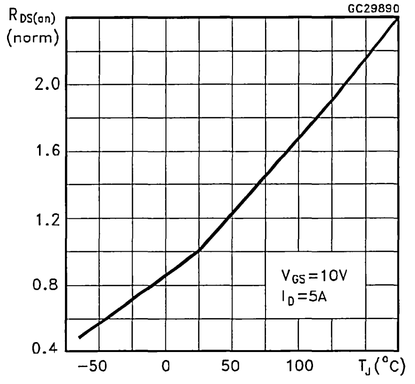
Capacitance Variations



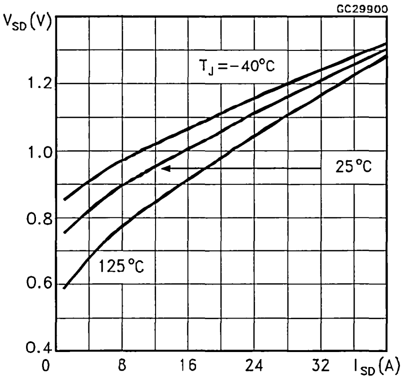
Normalized Breakdown Voltage vs Temperature



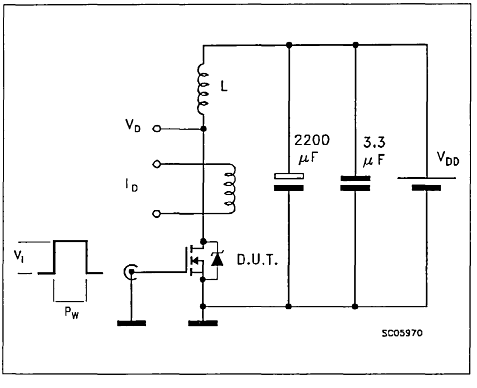
Normalized On Resistance vs Temperature



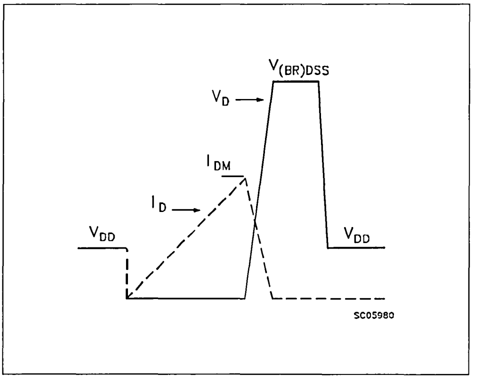
Source-drain Diode Forward Characteristics



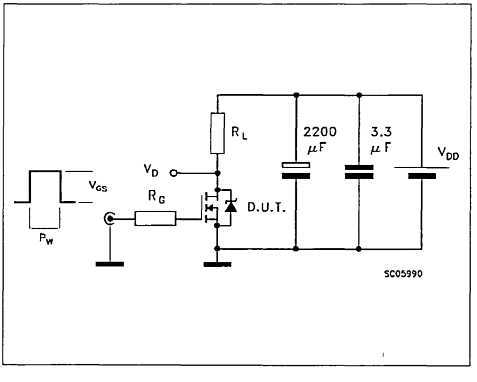
Unclamped Inductive Load Test Circuit



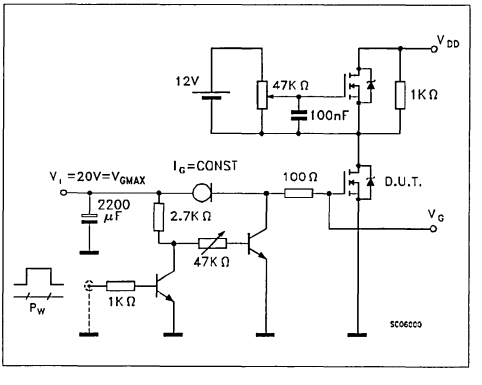
Unclamped Inductive Waveforms



Switching Time Test Circuit



Gate Charge Test Circuit



IRF530
IRF530FI

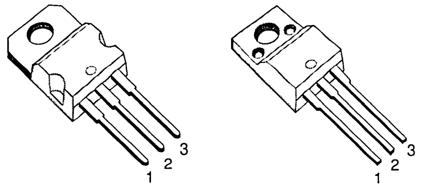
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
IRF530 IRF530FI	100 V 100 V	< 0.16 Ω < 0.16 Ω	16 A 10 A

- TYPICAL $R_{DS(on)}$ = 0.095 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE

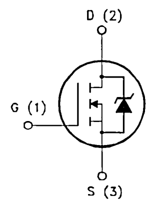
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



TO-220 ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		IRF530	IRF530FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	100		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	100		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (cont.) at T_c = 25 °C	16	10	A
I_D	Drain Current (cont.) at T_c = 100 °C	11	7	A
I_{DM}(•)	Drain Current (pulsed)	64	64	A
P_{tot}	Total Dissipation at T_c = 25 °C	90	40	W
	Derating Factor	0.6	0.27	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.67	3.75	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
R_{thc-s}	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	16	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	60	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	15	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	11	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	100			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 8 A V_{GS} = 10V I_D = 8 A T_c = 100 °C		0.095	0.16 0.32	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	16			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 8 A	4	8		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		650 180 40	900 250 60	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING RESISTIVE LOAD

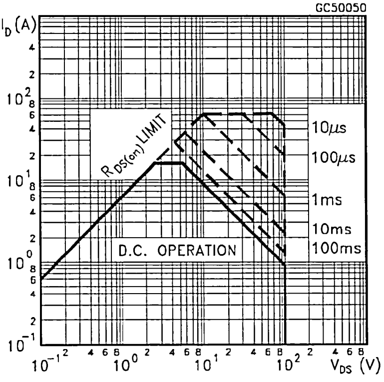
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 36 V I_D = 8 A R_G = 15 Ω V_{GS} = 10 V (see test circuit)		20 125 110 65	30 180 160 95	ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	I_D = 16 A V_{GS} = 10 V V_{DD} = Max Rating x 0.8 (see test circuit)		27 9 11	40	nC nC nC

SOURCE DRAIN DIODE

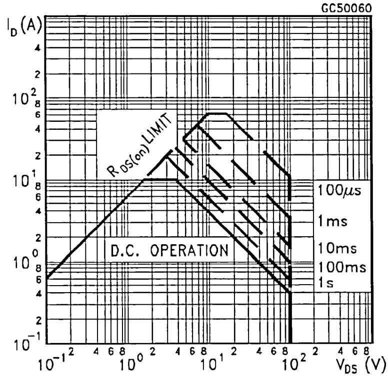
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				16 64	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 16 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 16 A di/dt = 100 A/μs V_{DD} = 30 V T_j = 150 °C		100 0.4		ns μC

(*) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

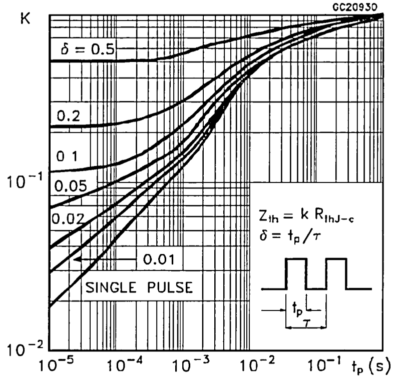
Safe Operating Areas for TO-220



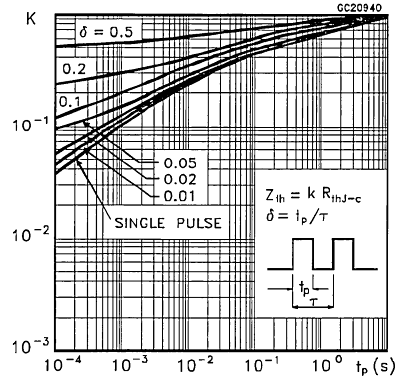
Safe Operating Areas for ISOWATT220



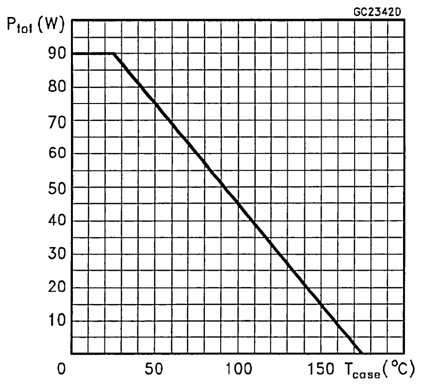
Thermal Impedance for TO-220



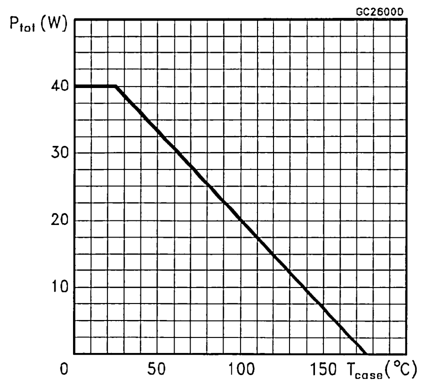
Thermal Impedance for ISOWATT220



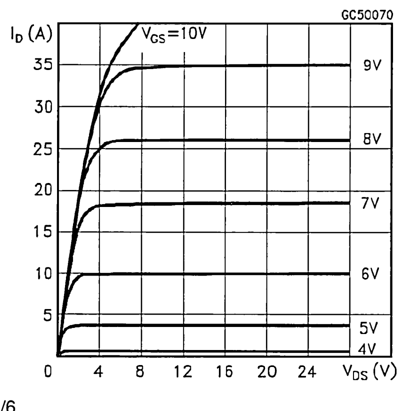
Derating Curve for TO-220



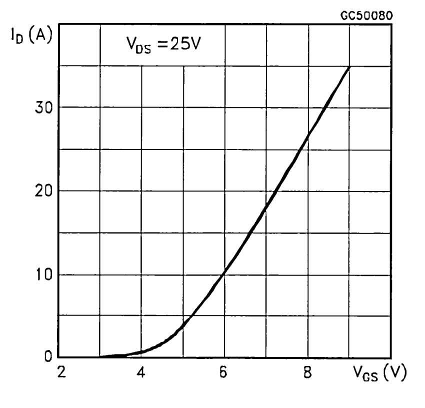
Derating Curve for ISOWATT220



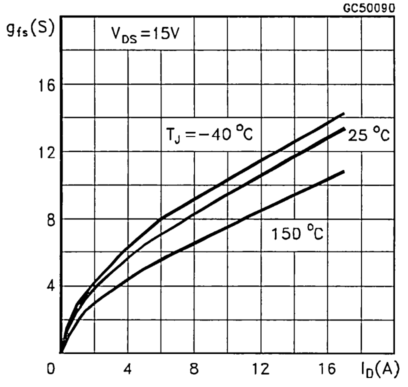
Output Characteristics



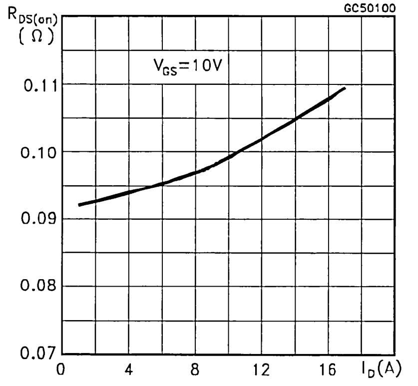
Transfer Characteristics



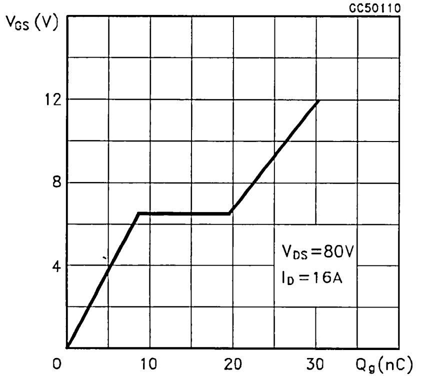
Transconductance



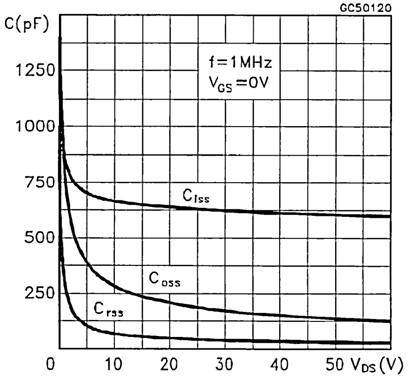
Static Drain-source On Resistance



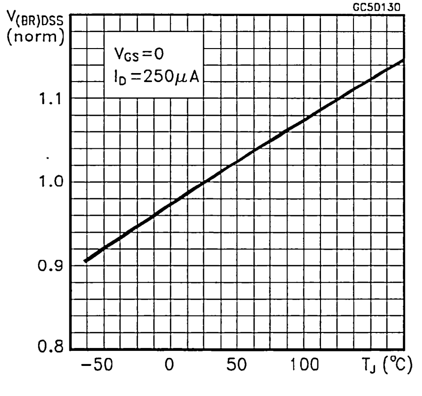
Gate Charge vs Gate-source Voltage



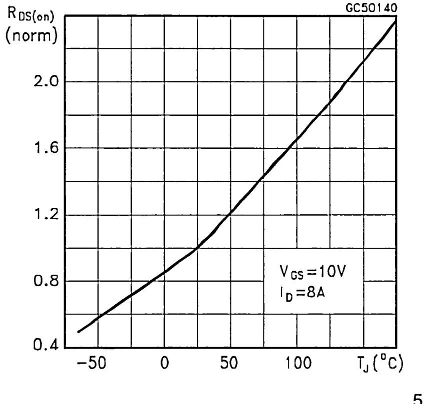
Capacitance Variations



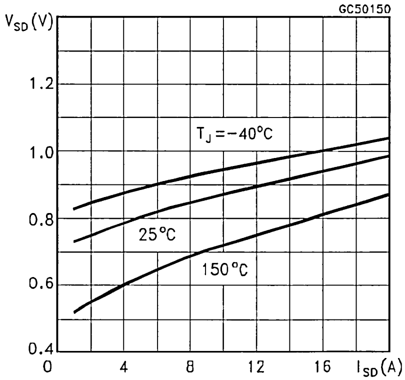
Normalized Breakdown Voltage vs Temperature



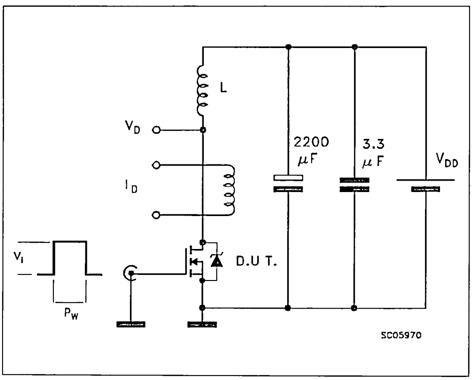
Normalized On Resistance vs Temperature



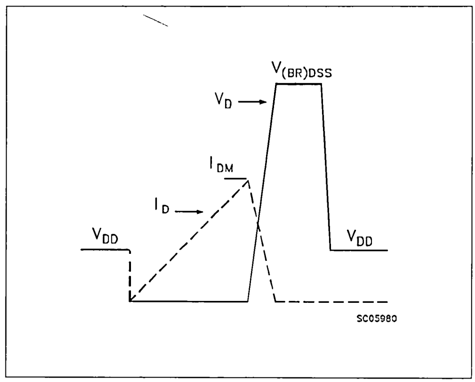
Source-drain Diode Forward Characteristics



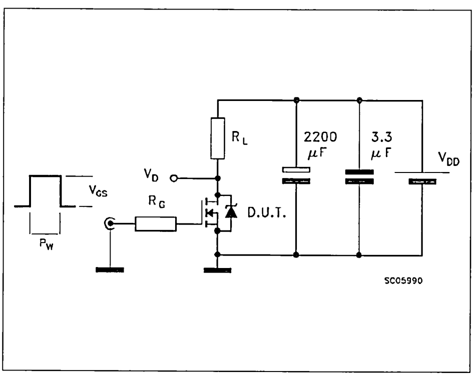
Unclamped Inductive Load Test Circuit



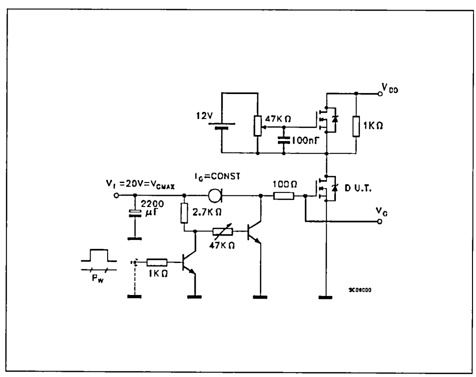
Unclamped Inductive Waveforms



Switching Time Test Circuit



Gate Charge Test Circuit



SGS-THOMSON MICROELECTRONICS

IRF540
IRF540FI

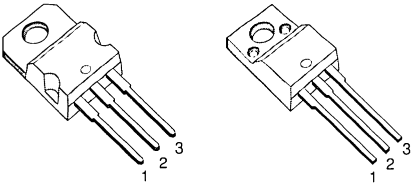
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
IRF540	100 V	< 0.077 Ω	30 A
IRF540FI	100 V	< 0.077 Ω	16 A

- TYPICAL $R_{DS(on)}$ = 0.045 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE

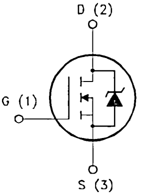
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



TO-220 ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		IRF540	IRF540FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	100		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	100		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (cont.) at T_c = 25 °C	30	16	A
I_D	Drain Current (cont.) at T_c = 100 °C	21	11	A
I_{DM}(•)	Drain Current (pulsed)	120	120	A
P_{tot}	Total Dissipation at T_c = 25 °C	150	45	W
	Derating Factor	1	0.3	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	3.33	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
R_{thc-s}	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	30	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25\ ^oC$, $I_D = I_{AR}$, $V_{DD} = 25$ V)	200	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	50	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100\ ^oC$, pulse width limited by T_j max, $\delta < 1\%$)	21	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25\ ^oC$ unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250\ \mu A$ $V_{GS} = 0$	100			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125\ ^oC$			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250\ \mu A$	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 17$ A		0.045	0.077	Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	30			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 17$ A	10	18		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		1600 460 140	2100 600 200	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING RESISTIVE LOAD

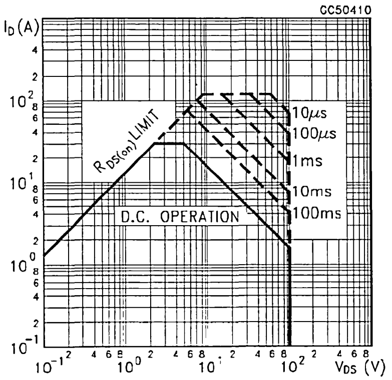
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 50 V I_D = 5 A R_i = 50 Ω V_{GS} = 10 V (see test circuit)		55 110 290 125	80 160 410 180	ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	I_D = 30 A V_{GS} = 10 V V_{DD} = Max Rating x 0.8 (see test circuit)		55 11 26	80	nC nC nC

SOURCE DRAIN DIODE

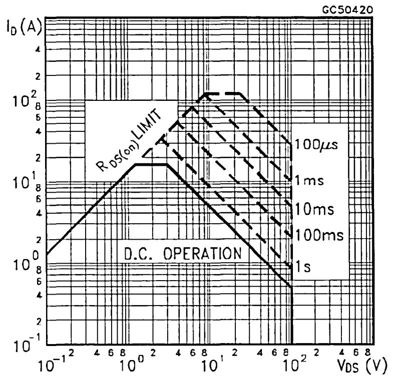
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				30 120	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 30 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 30 A di/dt = 100 A/µs T_j = 150 °C V_{DD} = 50 V		140 0.7		ns µC

( ) Pulsed Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

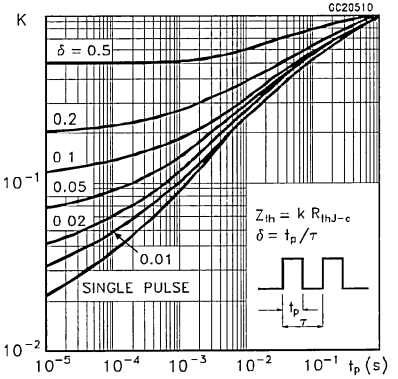
Safe Operating Area for TO-220 Package



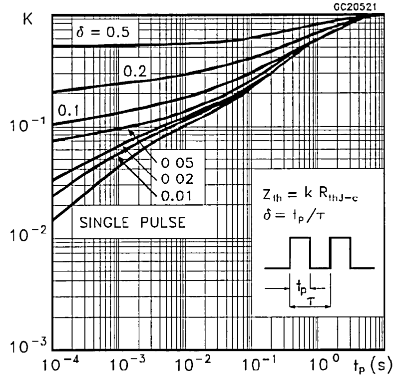
Safe Operating Area for ISOWATT220 Package



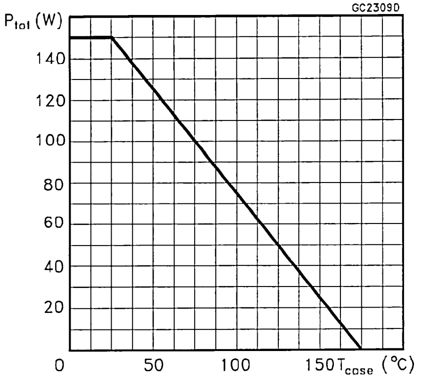
Thermal Impedance for TO-220 Package



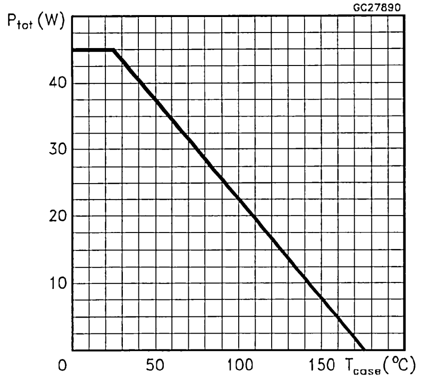
Thermal Impedance for ISOWATT220 Package



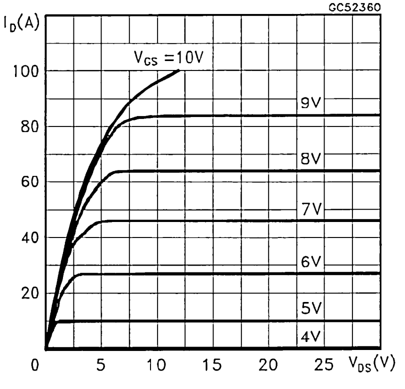
Derating Curve for TO-220 Package



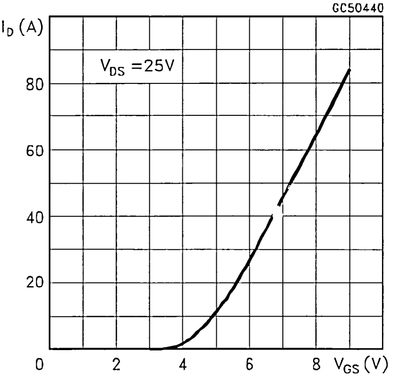
Derating Curve for ISOWATT220 Package



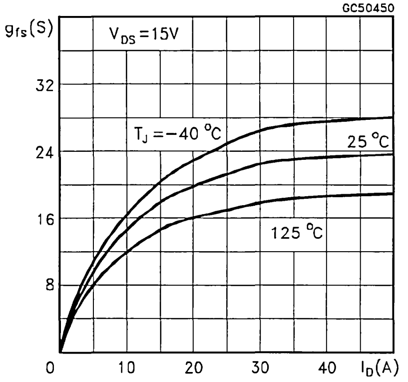
Output Characteristics



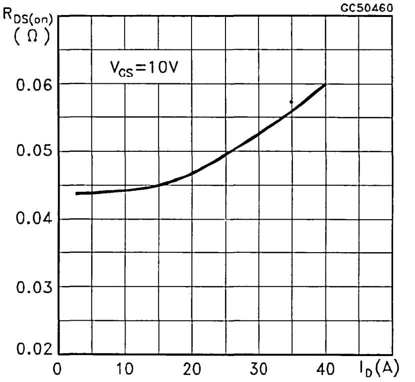
Transfer Characteristics



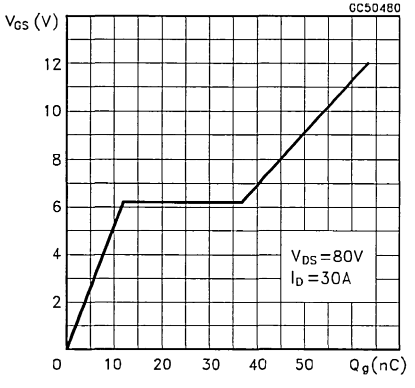
Transconductance



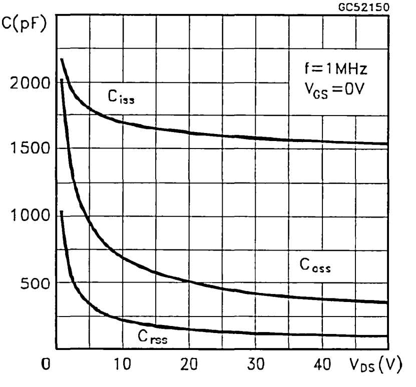
Static Drain-source On Resistance



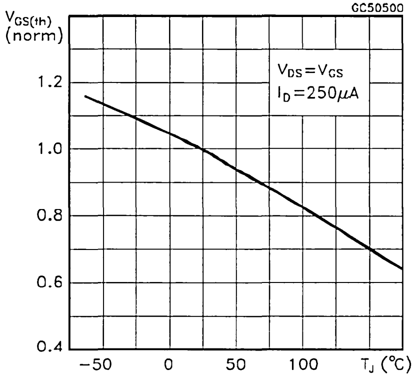
Gate Charge vs Gate-source Voltage



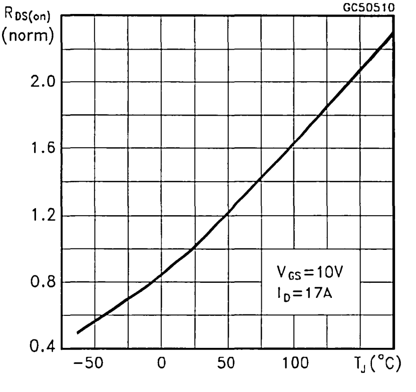
Capacitance Variations



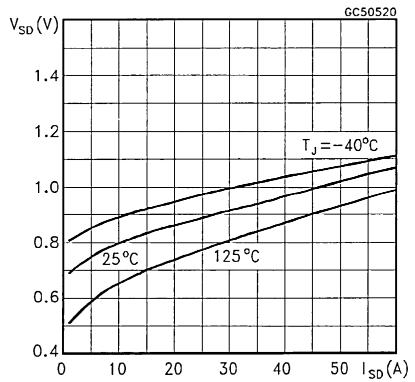
Normalized Gate Threshold Voltage vs Temperature



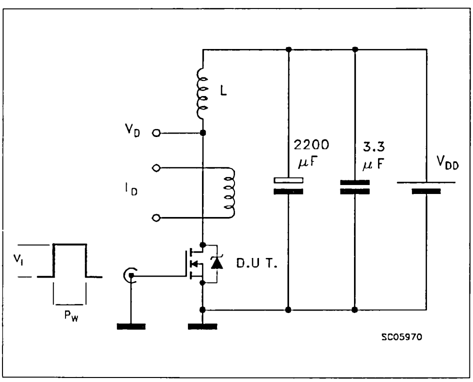
Normalized On Resistance vs Temperature



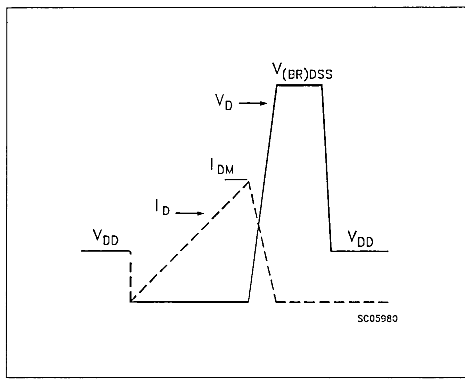
Source-drain Diode Forward Characteristics



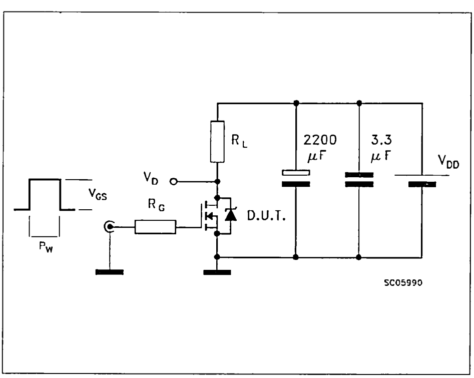
Unclamped Inductive Load Test Circuit



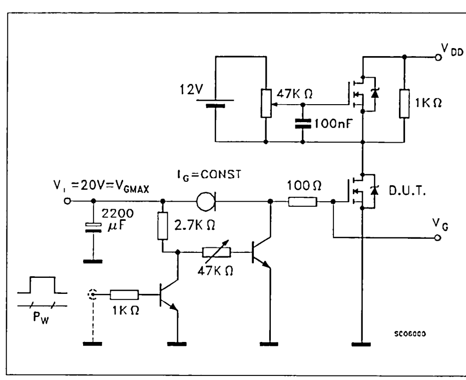
Unclamped Inductive Waveforms



Switching Time Test Circuit



Gate Charge Test Circuit



SGS-THOMSON
MICROELECTRONICS

IRF620
IRF620FI

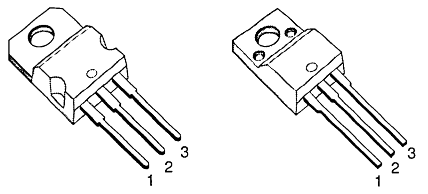
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
IRF620	200 V	< 0.8 Ω	6 A
IRF620FI	200 V	< 0.8 Ω	4 A

- TYPICAL $R_{DS(on)}$ = 0.55 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C

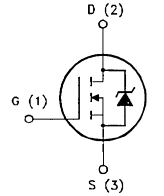
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- UNINTERRUPTIBLE POWER SUPPLY (UPS)
- MOTOR CONTROL, AUDIO AMPLIFIERS
- INDUSTRIAL ACTUATORS
- DC-DC & DC-AC CONVERTERS FOR TELECOM, INDUSTRIAL AND CONSUMER ENVIRONMENT



TO-220 ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		IRF620	IRF620FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	200		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	200		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (cont.) at T_c = 25 °C	6	4	A
I_D	Drain Current (cont.) at T_c = 100 °C	4	2	A
I_{DM}(•)	Drain Current (pulsed)	24	24	A
P_{tot}	Total Dissipation at T_c = 25 °C	70	30	W
	Derating Factor	0.56	0.24	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1.79	4.17	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc\text{-}s}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	6	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	20	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	5	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	4	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	200			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 3$ A		0.55	0.8	Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	6			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 3$ A	1.5	3.5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		460 90 20	600 120 30	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING RESISTIVE LOAD

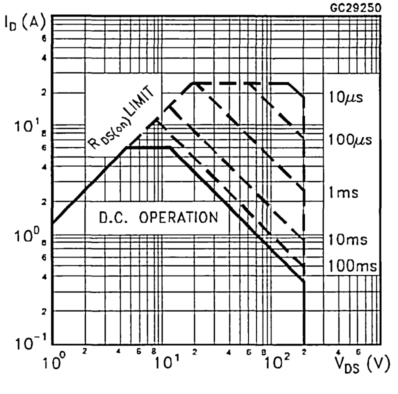
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 100 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit)		30 70 135 45	45 100 190 65	ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	I_D = 6 A V_{GS} = 10 V V_{DD} = Max Rating x 0.8 (see test circuit)		20 6 8	30	nC nC nC

SOURCE DRAIN DIODE

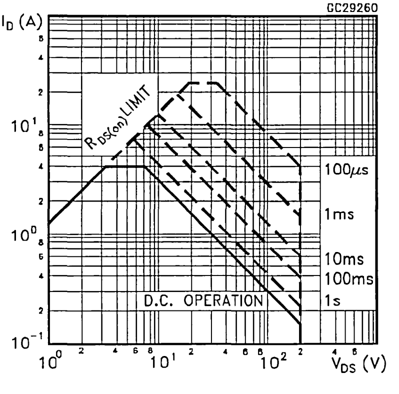
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				6 24	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 6 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 6 A di/dt = 100 A/μs V_{DD} = 100 V T_j = 150 °C		170 1		ns μC

(*) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

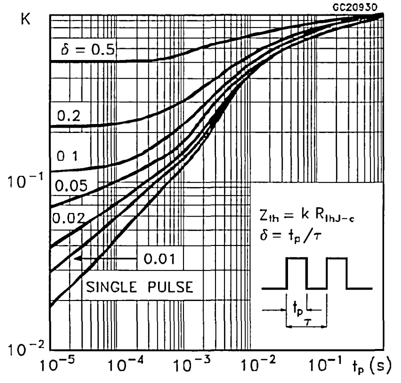
Safe Operating Area for TO-220



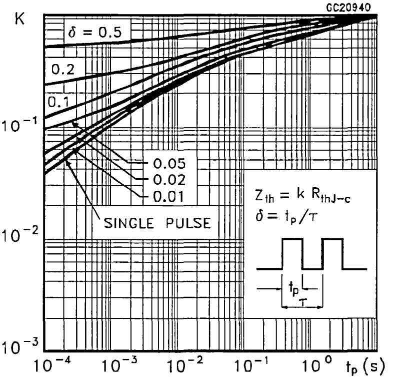
Safe Operating Area for ISOWATT220



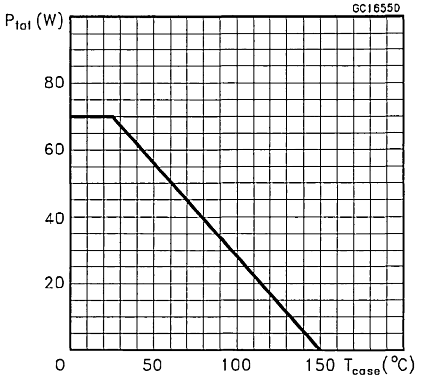
Thermal Impedance for TO-220



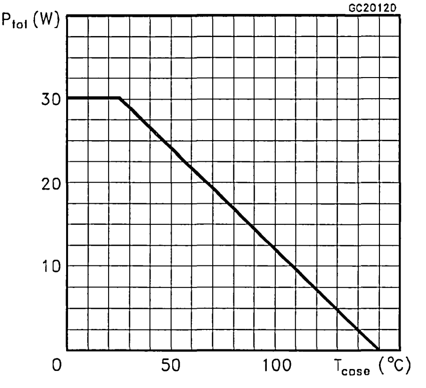
Thermal Impedance for ISOWATT220



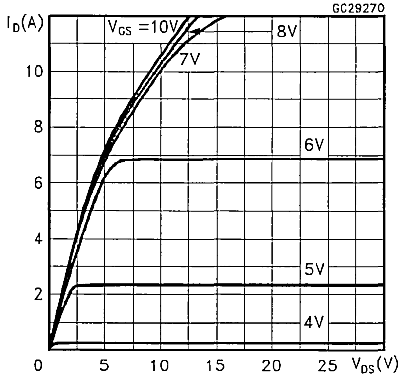
Derating Curve for TO-220



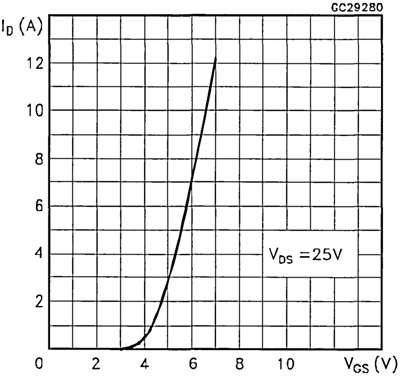
Derating Curve for ISOWATT220



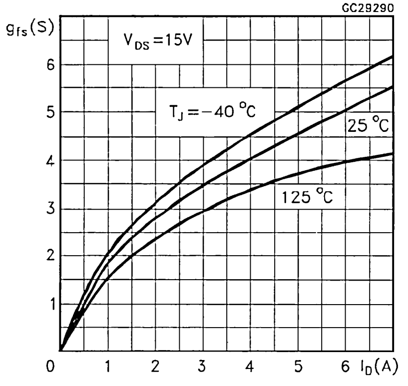
Output Characteristics



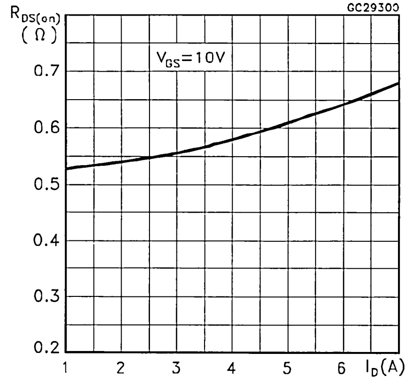
Transfer Characteristics



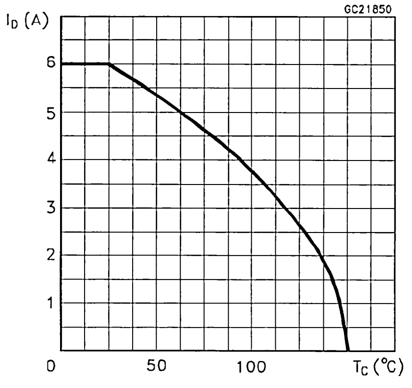
Transconductance



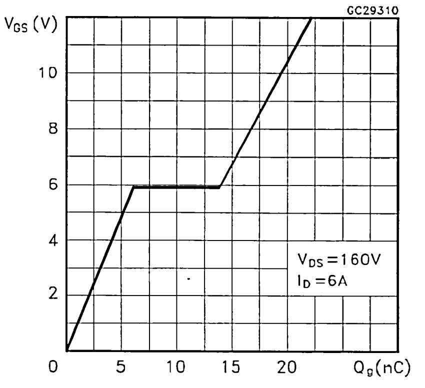
Static Drain-source On Resistance



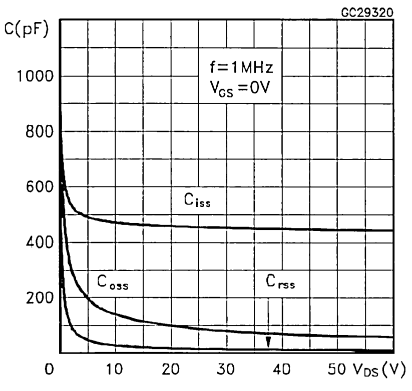
Maximum Drain Current vs Temperature



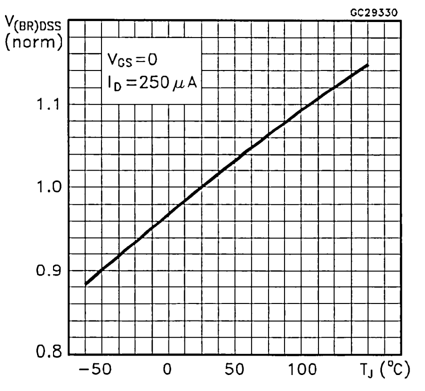
Gate Charge vs Gate-source Voltage



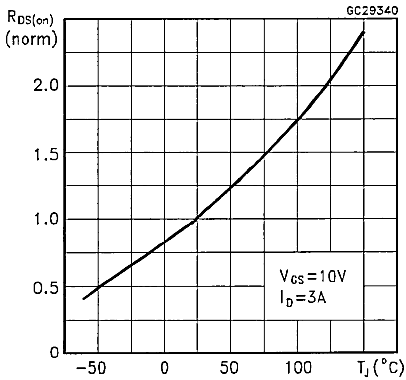
Capacitance Variations



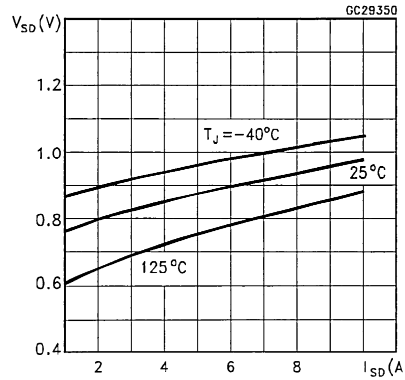
Normalized Breakdown Voltage vs Temperature



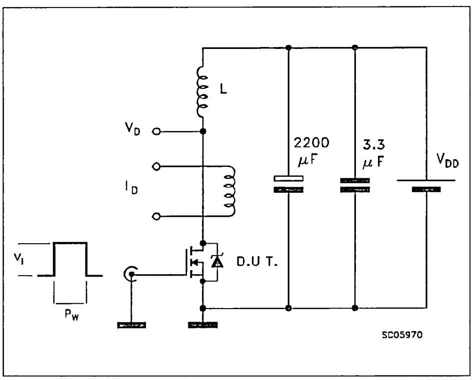
Normalized On Resistance vs Temperature



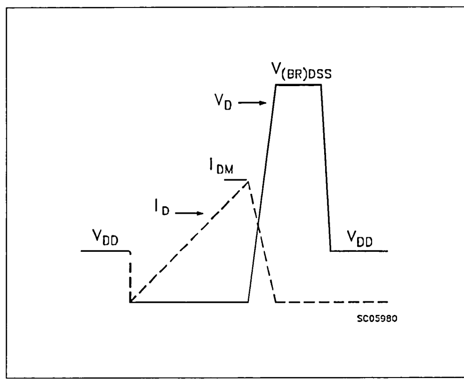
Source-drain Diode Forward Characteristics



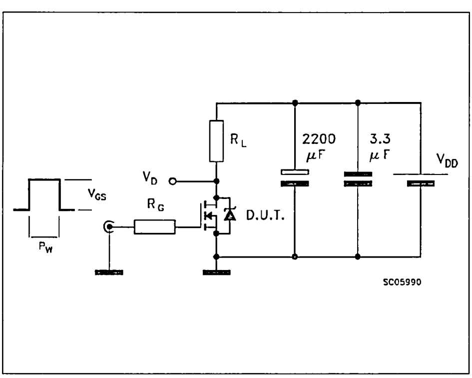
Unclamped Inductive Load Test Circuit



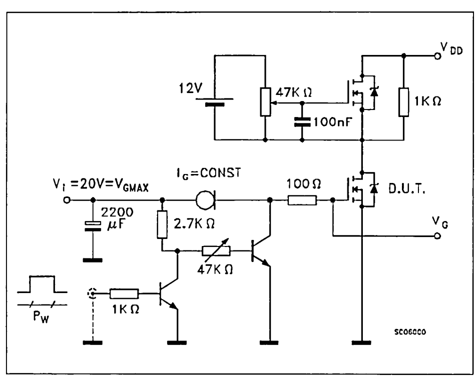
Unclamped Inductive Waveforms



Switching Time Test Circuit



Gate Charge Test Circuit



SGS-THOMSON MICROELECTRONICS

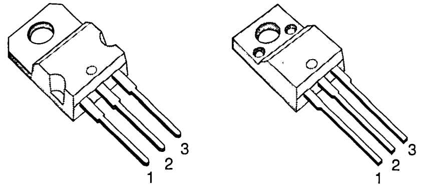
IRF630
IRF630FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

PRELIMINARY DATA

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
IRF630	200 V	< 0.4 Ω	10 A
IRF630FI	200 V	< 0.4 Ω	6 A

- TYPICAL $R_{DS(on)}$ = 0.25 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

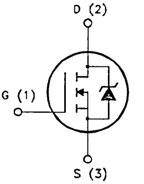


TO-220 ISOWATT220

APPLICATIONS

- HIGH SPEED SWITCHING
- UNINTERRUPTIBLE POWER SUPPLY (UPS)
- MOTOR CONTROL, AUDIO AMPLIFIERS
- INDUSTRIAL ACTUATORS
- DC-DC & DC-AC CONVERTERS FOR TELECOM, INDUSTRIAL AND CONSUMER ENVIRONMENT
- PARTICULARLY SUITABLE FOR ELECTRONIC FLUORESCENT LAMP BALLASTS

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		IRF630	IRF630FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	200		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	200		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	10	6	A
I_D	Drain Current (continuous) at T_c = 100 °C	6	3	A
I_{DM}(•)	Drain Current (pulsed)	40	40	A
P_{tot}	Total Dissipation at T_c = 25 °C	100	35	W
	Derating Factor	0.8	0.28	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1.25	3.57	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	10	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	60	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	15	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	6	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	200			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 5 A V_{GS} = 10V I_D = 5 A T_c = 100°C		0.25	0.4 0.8	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	10			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 5 A	3	7		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1100 160 30	1500 250 50	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 100 V I_D = 5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		40 80	60 120	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 200 V I_D = 10 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		250		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 200 V I_D = 10 A V_{GS} = 10 V		40 8 10	60	nC nC nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 200 V I_D = 10 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		50 30 80	80 50 130	ns ns ns

SOURCE DRAIN DIODE

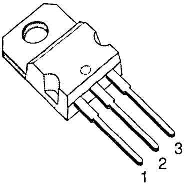
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				10 40	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 10 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 10 A di/dt = 100 A/μs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		300 3 20		ns μC A

(*) Pulsed· Pulse duration = 300 μs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

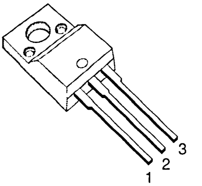
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
IRF640	200 V	< 0.18 Ω	18 A
IRF640FI	200 V	< 0.18 Ω	10 A

- TYPICAL $R_{DS(on)}$ = 0.145 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C



TO-220

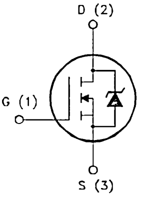


ISOWATT220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- UNINTERRUPTIBLE POWER SUPPLY (UPS)
- MOTOR CONTROL, AUDIO AMPLIFIERS
- INDUSTRIAL ACTUATORS
- DC-DC & DC-AC CONVERTERS FOR TELECOM, INDUSTRIAL AND CONSUMER ENVIRONMENT

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		IRF640	IRF640FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	200		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	200		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (cont.) at T_c = 25 °C	18	10	A
I_D	Drain Current (cont.) at T_c = 100 °C	11	6	A
I_{DM}(•)	Drain Current (pulsed)	72	72	A
P_{tot}	Total Dissipation at T_c = 25 °C	125	40	W
	Derating Factor	1	0.32	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case Max	1	3.13	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max	62.5		°C/W
R_{thc-s}	Thermal Resistance Case-sink Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	18	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	50	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	10	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	11	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	200			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 9 A		0.145	0.18	Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	18			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 9 A	6.5	13		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1600 270 50	2100 350 70	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING RESISTIVE LOAD

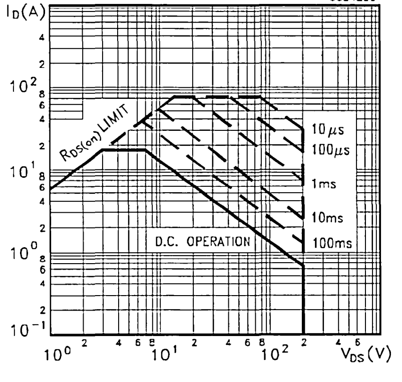
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 100 V I_D = 18 A R_G = 9.1 Ω V_{GS} = 10 V (see test circuit)		20 75 60 50	30 105 85 70	ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	I_D = 18 A V_{GS} = 10 V V_{DD} = Max Rating x 0.8 (see test circuit)		57 11 26	80	nC nC nC

SOURCE DRAIN DIODE

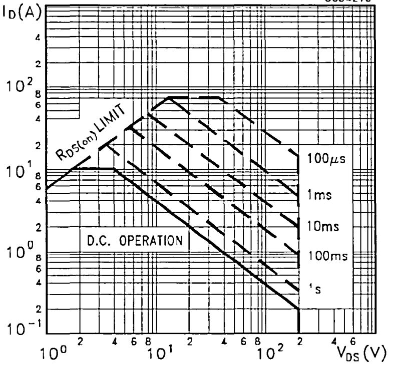
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				18 72	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 18 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 18 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C		300 3.3		ns µC

(*) Pulsed. Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

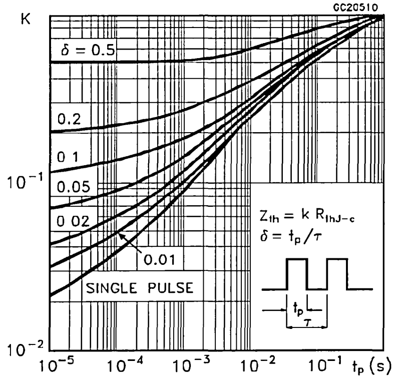
Safe Operating Area for TO-220



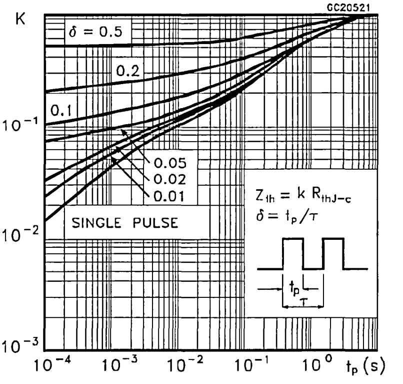
Safe Operating Area for ISOWATT220



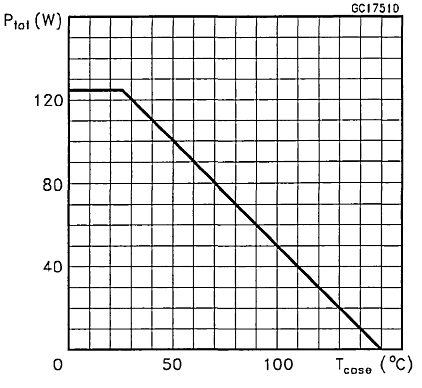
Thermal Impedance for TO-220



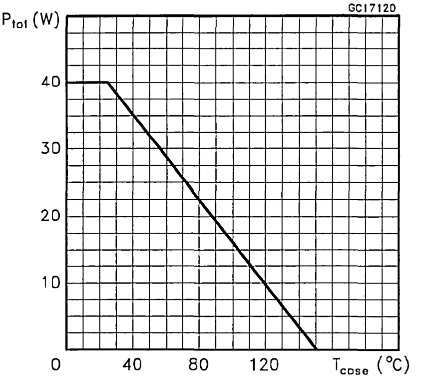
Thermal Impedance for ISOWATT220



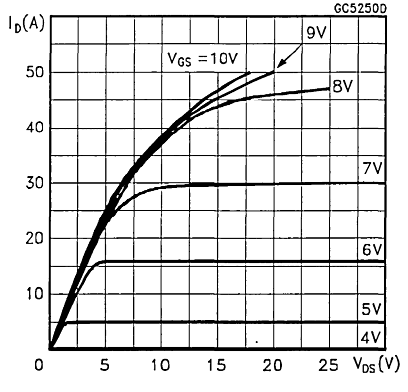
Derating Curve for TO-220



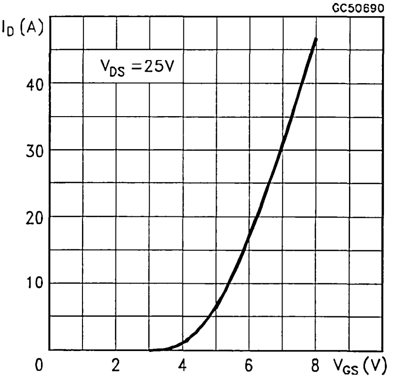
Derating Curve for ISOWATT220



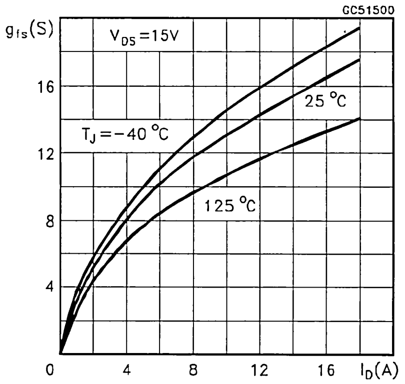
Output Characteristics



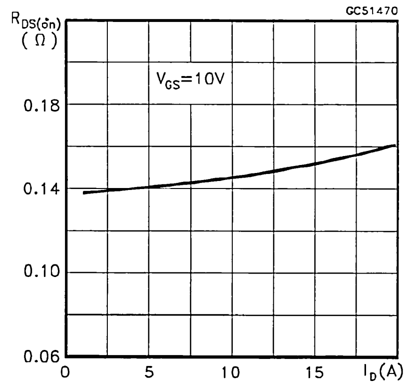
Transfer Characteristics



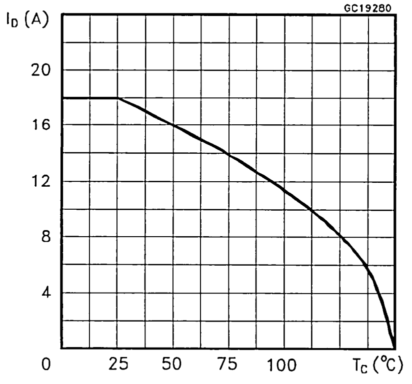
Transconductance



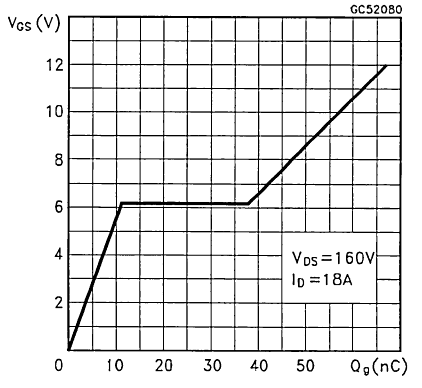
Static Drain-source On Resistance



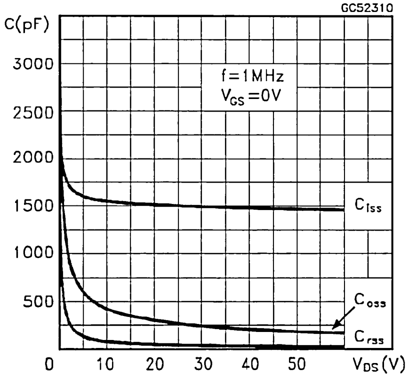
Maximum Drain Current vs Temperature



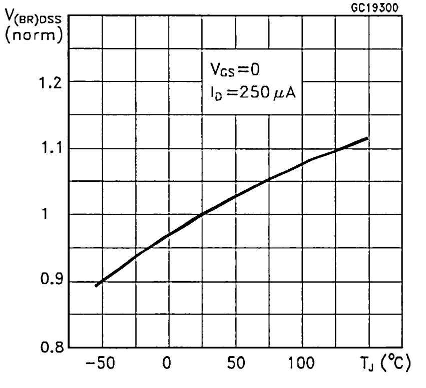
Gate Charge vs Gate-source Voltage



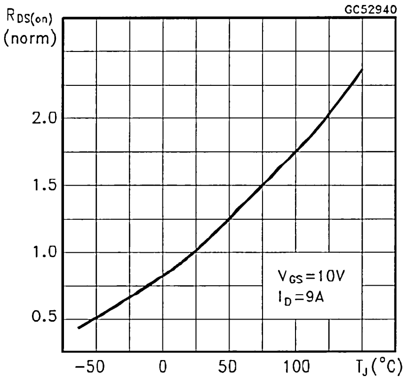
Capacitance Variations



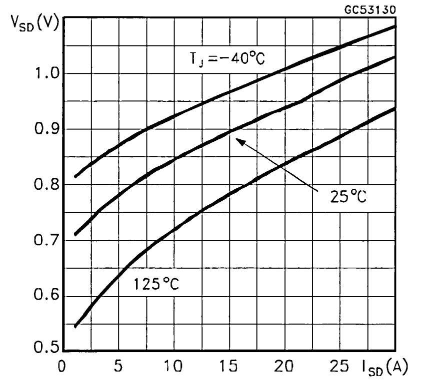
Normalized Breakdown Voltage vs Temperature



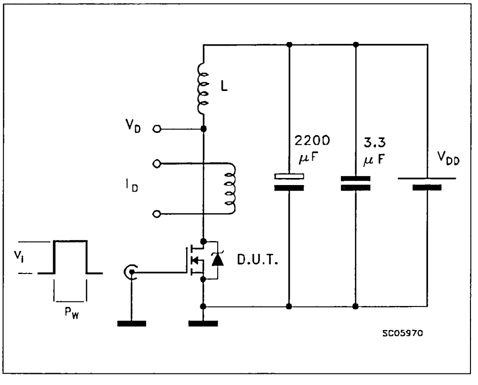
Normalized On Resistance vs Temperature



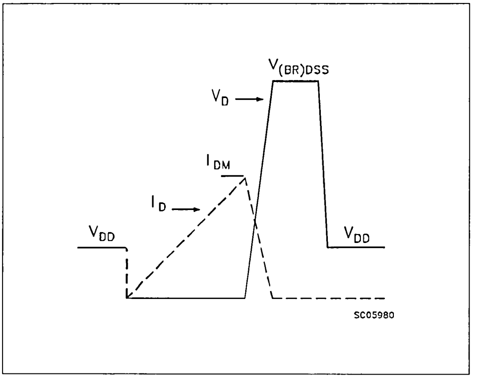
Source-drain Diode Forward Characteristics



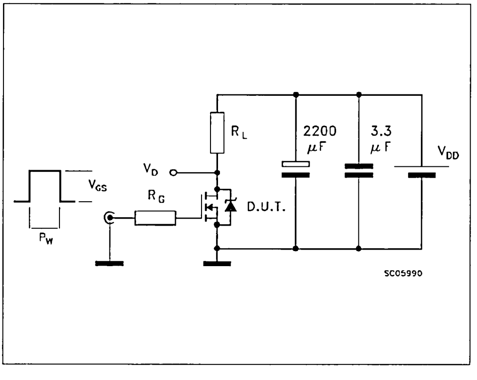
Unclamped Inductive Load Test Circuit



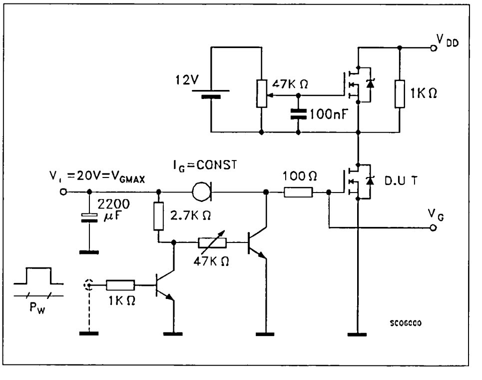
Unclamped Inductive Waveforms



Switching Time Test Circuit



Gate Charge Test Circuit



SGS-THOMSON
MICROELECTRONICS

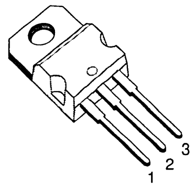
IRF720
IRF720FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

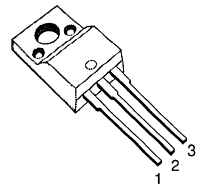
TYPE	V_{DSS}	$R_{DS(on)}$	I_D
IRF720	400 V	< 1.8 Ω	4.2 A
IRF720FI	400 V	< 1.8 Ω	3 A

- TYPICAL $R_{DS(on)}$ = 1.65 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT

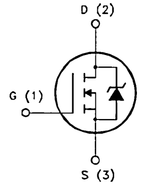


TO-220



ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		IRF720	IRF720FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	400		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	400		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	4.2	3	A
I_D	Drain Current (continuous) at T_c = 100 °C	2.6	1.9	A
I_{DM}(•)	Drain Current (pulsed)	16.8	16.8	A
P_{tot}	Total Dissipation at T_c = 25 °C	75	35	W
	Derating Factor	0.6	0.28	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1.67	3.57	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	4.2	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	120	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	7	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	2.6	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	400			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 2 A V_{GS} = 10V I_D = 2 A T_c = 100°C		1.65	1.8 3.6	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	4			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 2 A	1	2.1		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		350 68 32	450 90 45	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 175 V I_D = 2 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		25 70	33 90	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 320 V I_D = 4 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		110		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 320 V I_D = 4 A V_{GS} = 10 V		25 7 11	35	nC nC nC

SWITCHING OFF

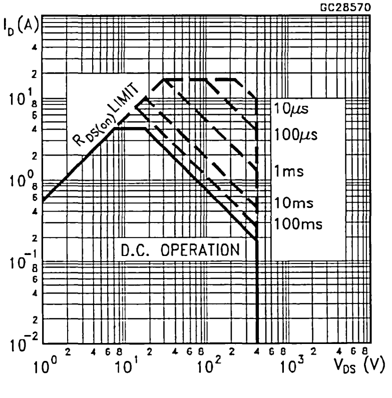
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 320 V I_D = 4 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		50 28 75	65 35 95	ns ns ns

SOURCE DRAIN DIODE

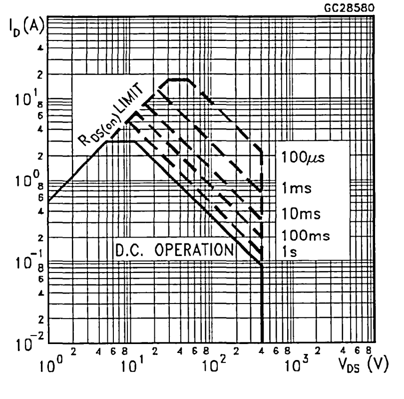
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				4 16	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 4 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 4 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		400 5.9 29.5		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

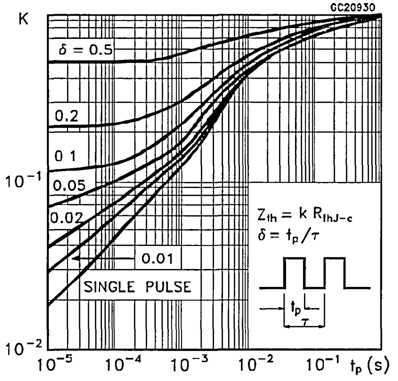
Safe Operating Areas For TO-220



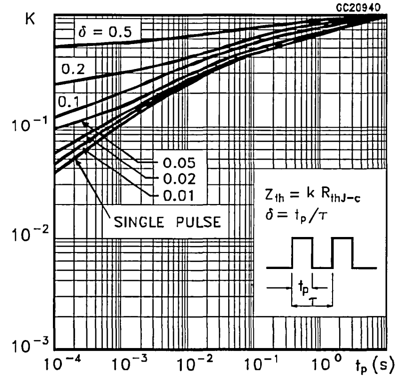
Safe Operating Areas For ISOWATT220



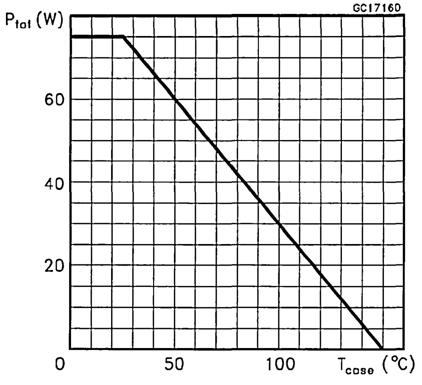
Thermal Impedeance For TO-220



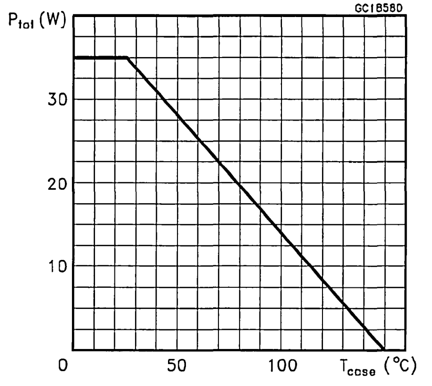
Thermal Impedance For ISOWATT220



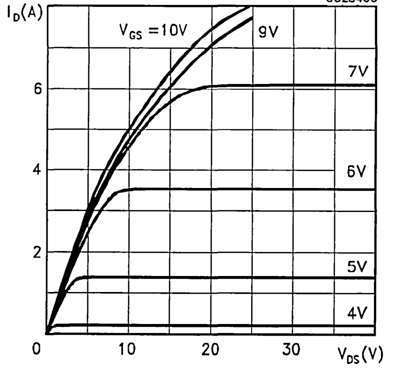
Derating Curve For TO-220



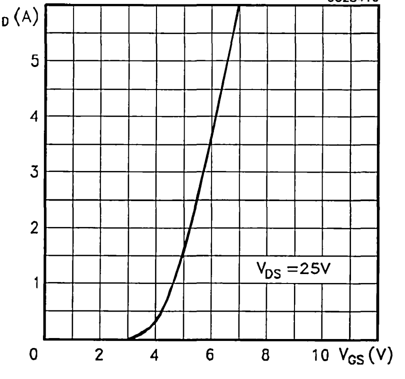
Derating Curve For ISOWATT220



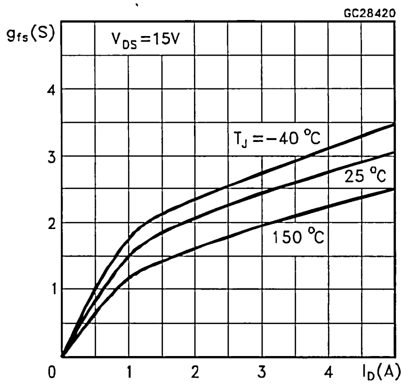
Output Characteristics



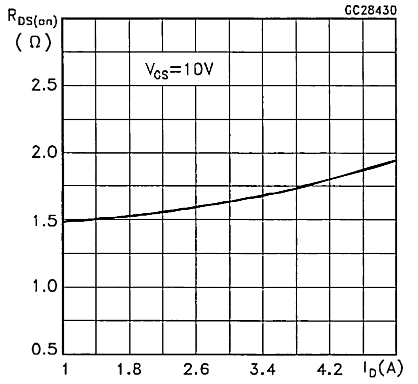
Transfer Characteristics



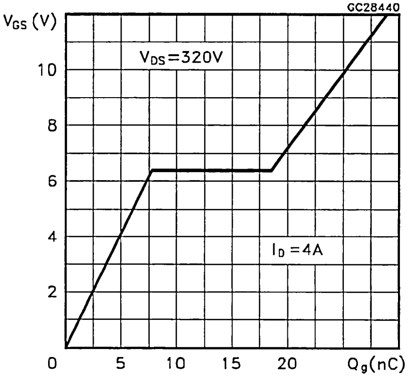
Transconductance



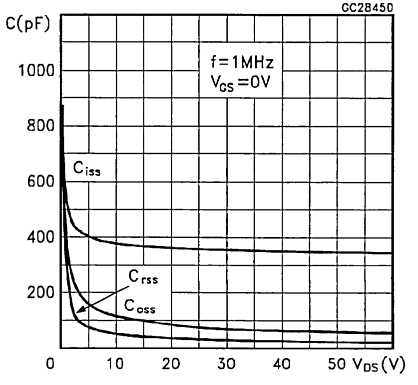
Static Drain-source On Resistance



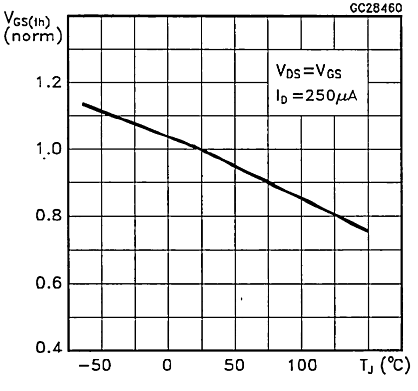
Gate Charge vs Gate-source Voltage



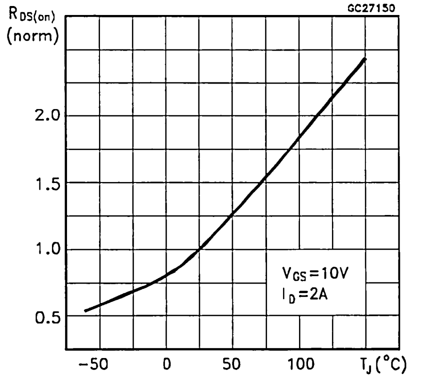
Capacitance Variations



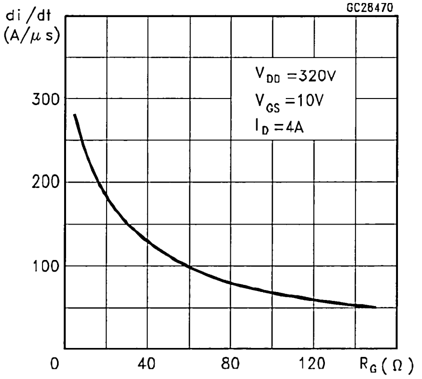
Normalized Gate Threshold Voltage vs Temperature



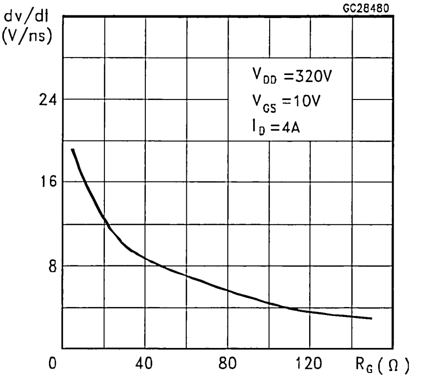
Normalized On Resistance vs Temperature



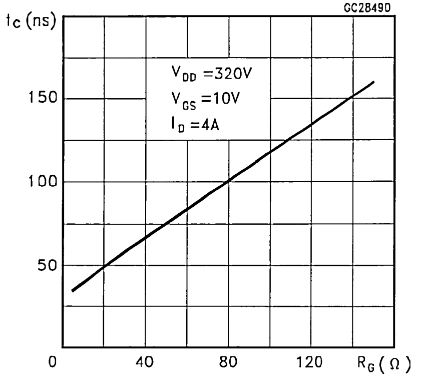
Turn-on Current Slope



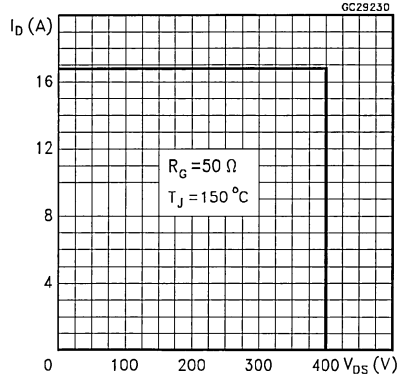
Turn-off Drain-source Voltage Slope



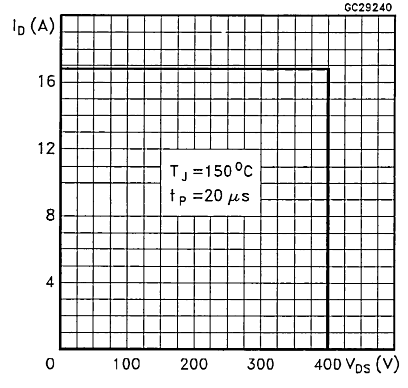
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

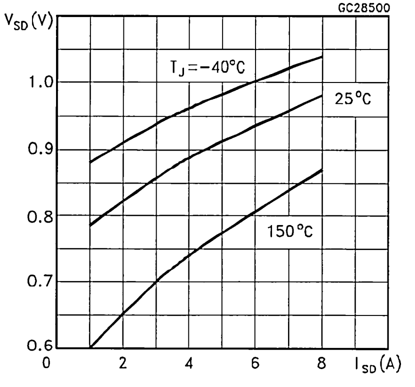


Fig. 1: Unclamped Inductive Load Test Circuits

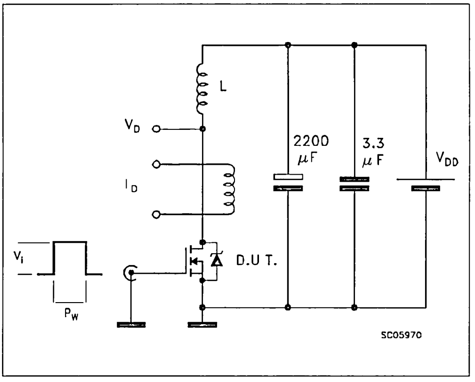


Fig. 2: Unclamped Inductive Waveforms

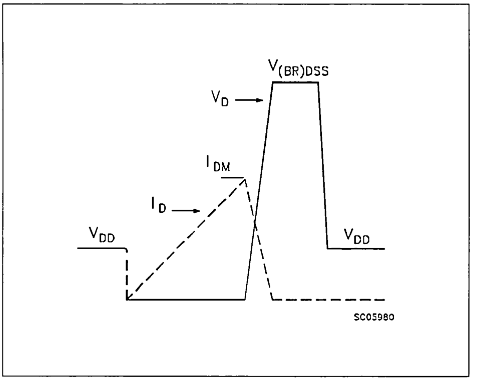


Fig. 3: Switching Times Test Circuits For Resistive Load

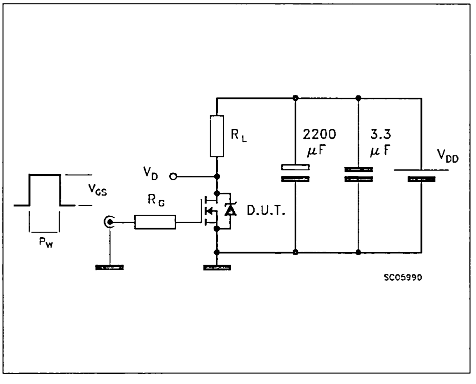


Fig. 4: Gate Charge Test Circuit

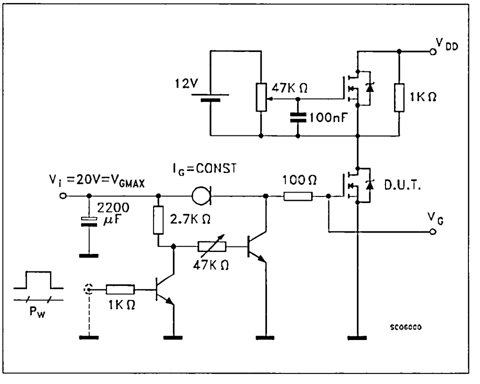
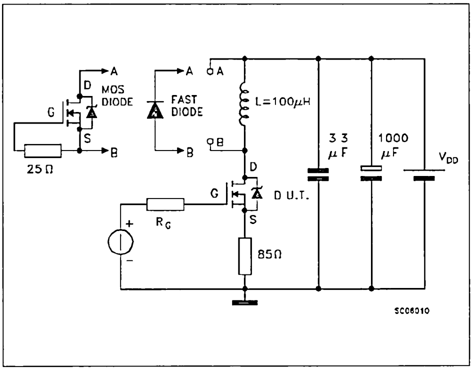


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON MICROELECTRONICS

IRF730
IRF730FI

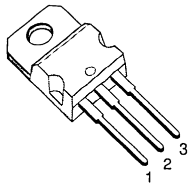
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
IRF730	400 V	< 1 Ω	5.5 A
IRF730FI	400 V	< 1 Ω	3.5 A

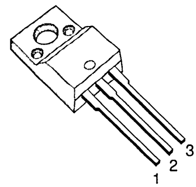
- TYPICAL $R_{DS(on)}$ = 0.82 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT

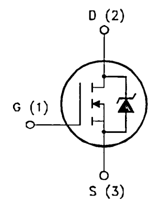


TO-220



ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		IRF730	IRF730FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	400	400	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	400	400	V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (cont.) at T_c = 25 °C	5.5	3.5	A
I_D	Drain Current (cont.) at T_c = 100 °C	3.1	2.2	A
I_{DM}(•)	Drain Current (pulsed)	22	22	A
P_{tot}	Total Dissipation at T_c = 25 °C	100	35	W
	Derating Factor	0.8	0.32	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.25	3.57	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
R_{thc-s}	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	5.5	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	290	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	7.6	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	3.1	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	400			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 3 A		0.82	1	Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	5.5			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 3 A	2.9	3.5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		640 120 50	800 150 65	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING RESISTIVE LOAD

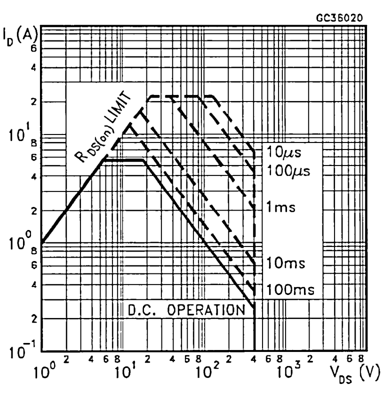
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 175 V I_D = 3 A R_{GS} = 15 Ω (see test circuit)		47 35 120 30	62 45 155 38	ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	I_D = 5.5 A V_{GS} = 15 V V_{DD} = Max Rating x 0.8 (see test circuit)		44 6 20	55	nC nC nC

SOURCE DRAIN DIODE

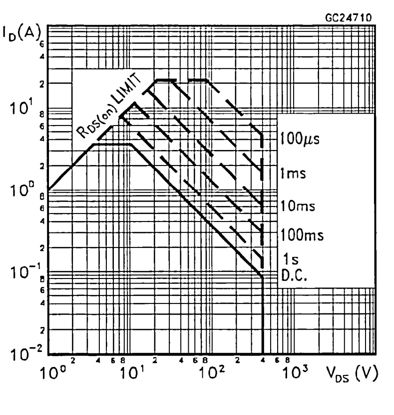
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				5.5 22	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 5.5 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 5.5 A di/dt = 100 A/μs V_{DD} = 100 V T_j = 150 °C		470 6.3		ns μC

(*) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

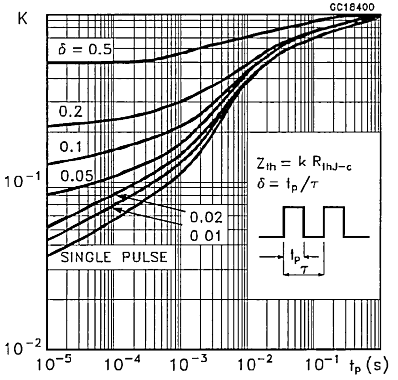
Safe Operating Area for TO-220



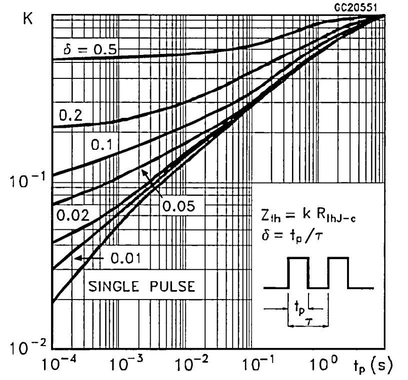
Safe Operating Area for ISOWATT220



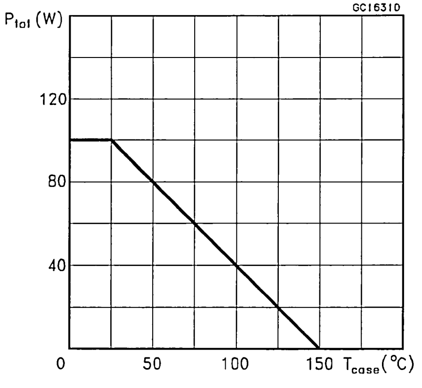
Thermal Impedance for TO-220



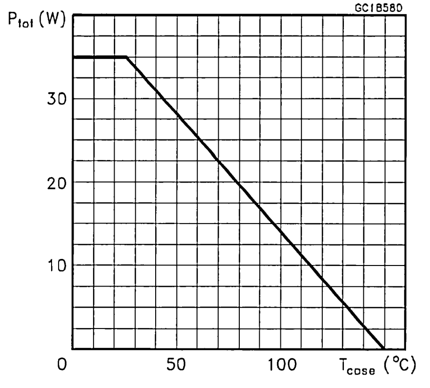
Thermal Impedance for ISOWATT220



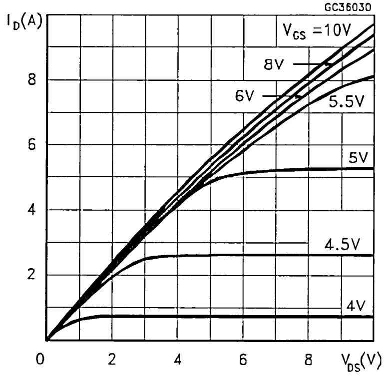
Derating Curve for TO-220



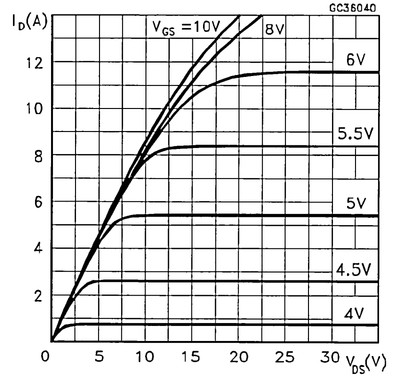
Derating Curve for ISOWATT220



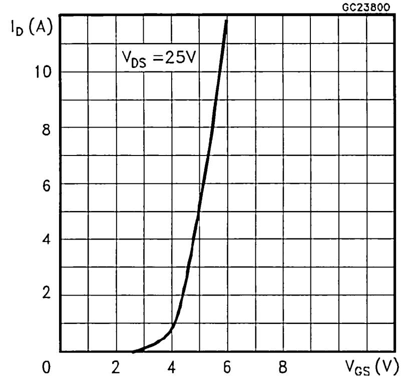
Output Characteristics



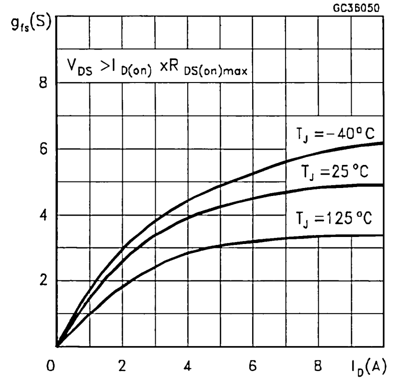
Output Characteristics



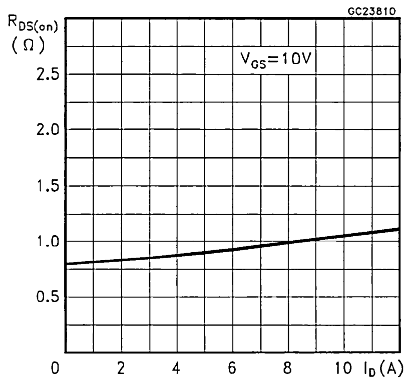
Transfer Characteristics



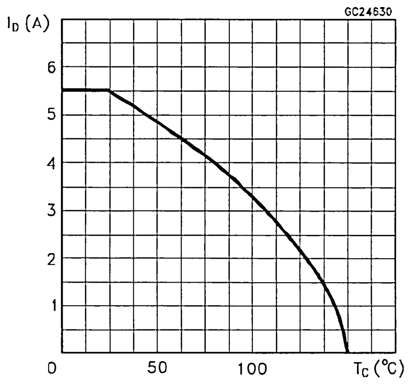
Transconductance



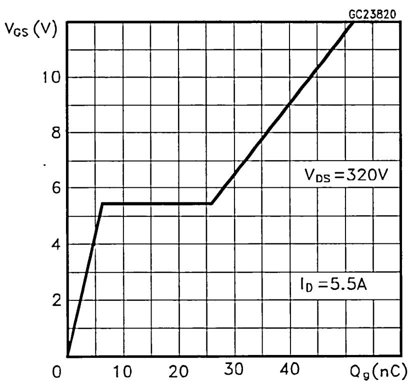
Static Drain-source On Resistance



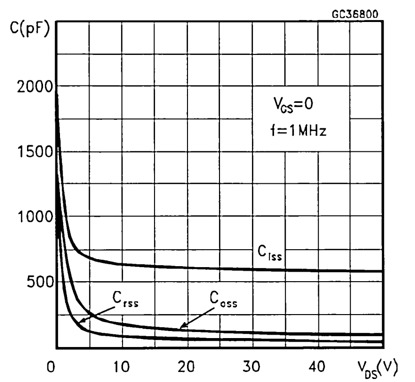
Maximum Drain Current vs Temperature



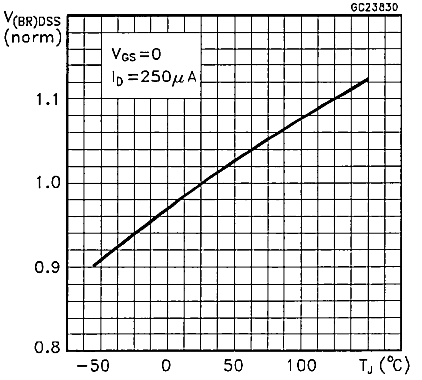
Gate Charge vs Gate-source Voltage



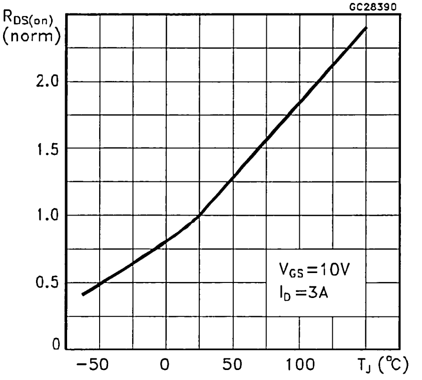
Capacitance Variations



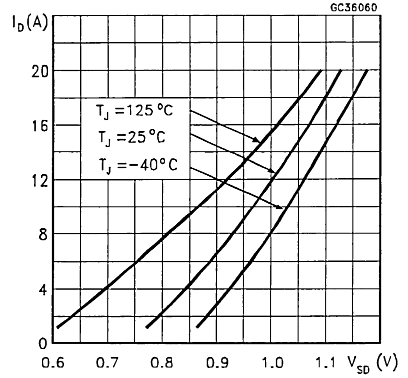
Normalized Breakdown Voltage vs Temperature



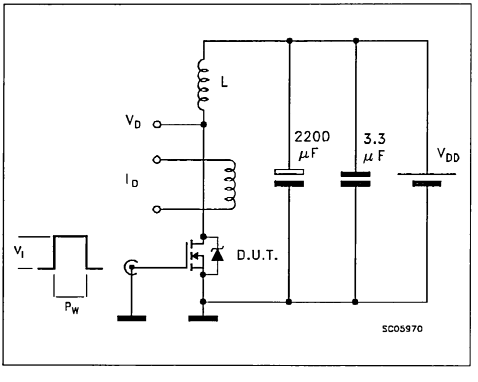
Normalized On Resistance vs Temperature



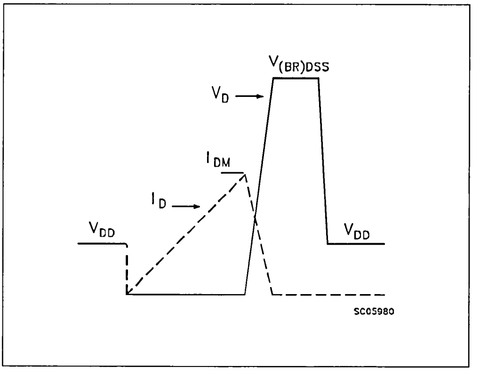
Source-drain Diode Forward Characteristics



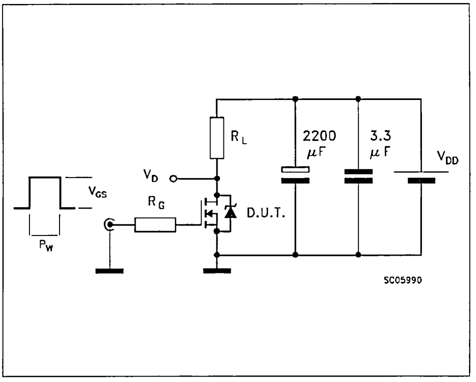
Unclamped Inductive Load Test Circuit



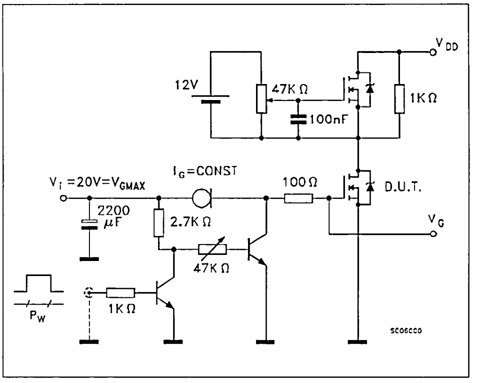
Unclamped Inductive Waveforms



Switching Time Test Circuit



Gate Charge Test Circuit



SGS-THOMSON
MICROELECTRONICS

IRF740
IRF740FI

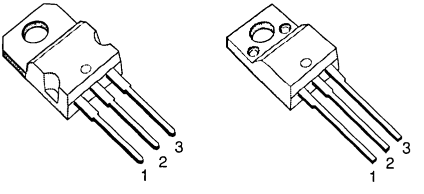
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
IRF740 IRF740FI	400 V 400 V	< 0.55 Ω < 0.55 Ω	10 A 5.5 A

- TYPICAL $R_{DS(on)}$ = 0.42 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C

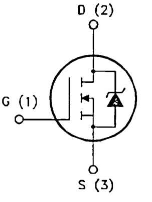
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



TO-220 ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		IRF740	IRF740FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	400	400	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	400	400	V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (cont.) at T_c = 25 °C	10	5.5	A
I_D	Drain Current (cont.) at T_c = 100 °C	6.3	3	A
I_{DM}(•)	Drain Current (pulsed)	40	40	A
P_{tot}	Total Dissipation at T_c = 25 °C	125	40	W
	Derating Factor	1	0.32	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1	3.12	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc\text{-}s}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	10	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	520	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	13	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	5.8	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	400			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 5 A		0.42	0.55	Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	10			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 5 A	4	6		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1150 220 100	1450 260 120	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING RESISTIVE LOAD

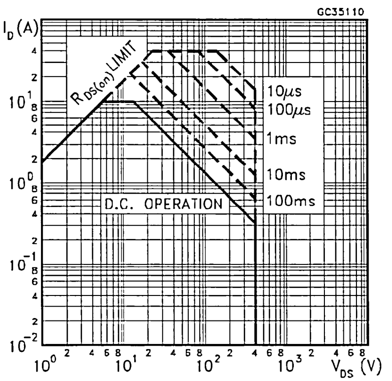
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 175 V I_D = 5 A R_I = 4.7 Ω (see test circuit)		25 37 120 30	32 48 155 38	ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	I_D = 10 A V_{GS} = 10 V V_{DD} = Max Rating x 0.8 (see test circuit)		72 10 40	90	nC nC nC

SOURCE DRAIN DIODE

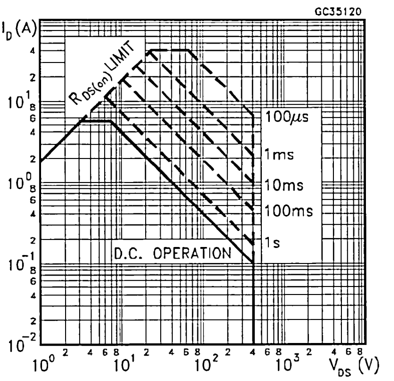
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				10 40	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 10 A V_{GS} = 0			2	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 10 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C		530 7.7		ns µC

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

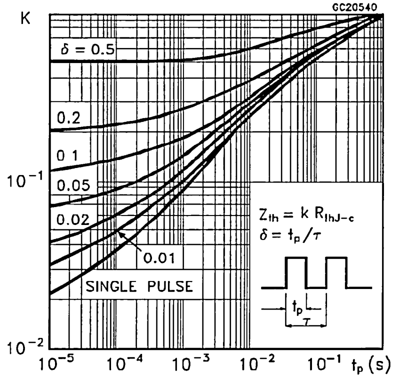
Safe Operating Area for TO-220



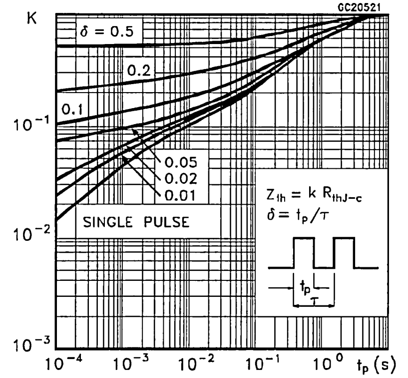
Safe Operating Area for ISOWATT220



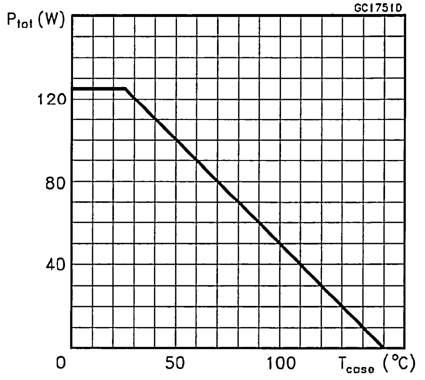
Thermal Impedance for TO-220



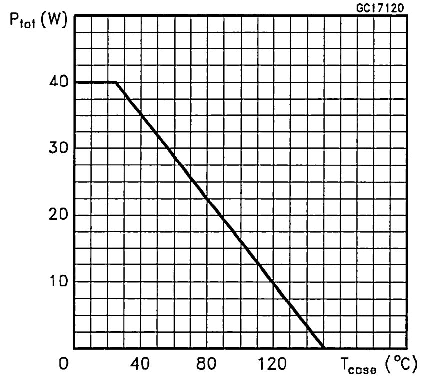
Thermal Impedance for ISOWATT220



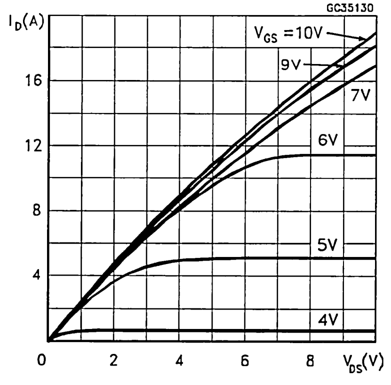
Derating Curve for TO-220



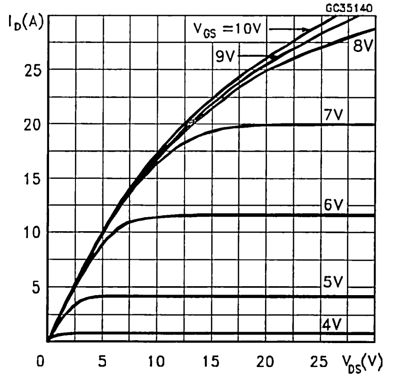
Derating Curve for ISOWATT220



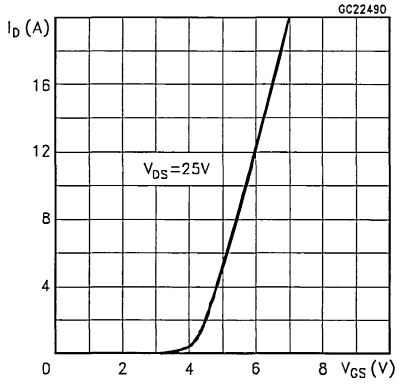
Output Characteristics



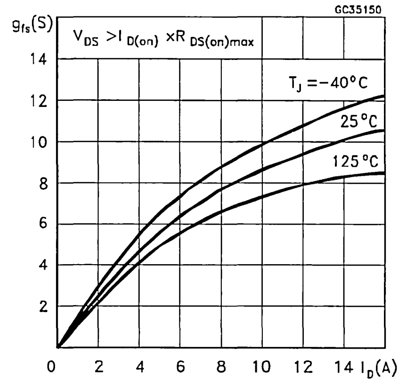
Output Characteristics



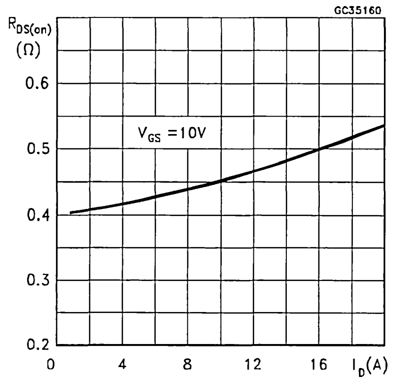
Transfer Characteristics



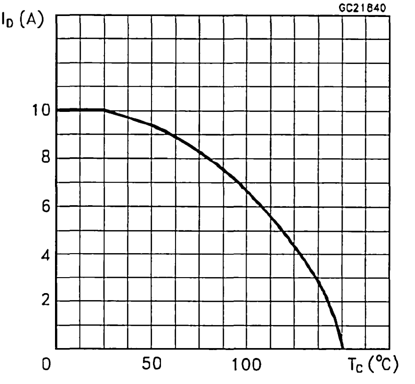
Transconductance



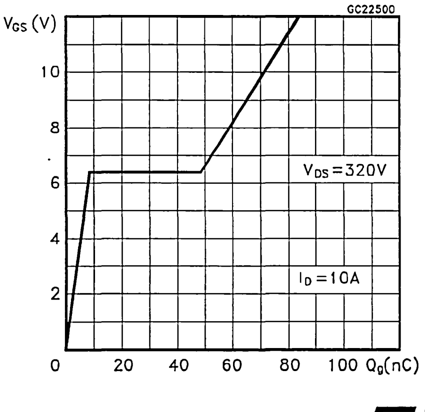
Static Drain-source On Resistance



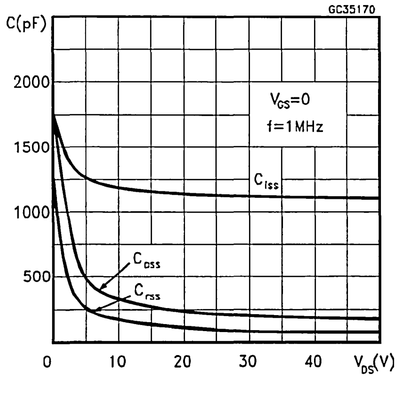
Maximum Drain Current vs Temperature



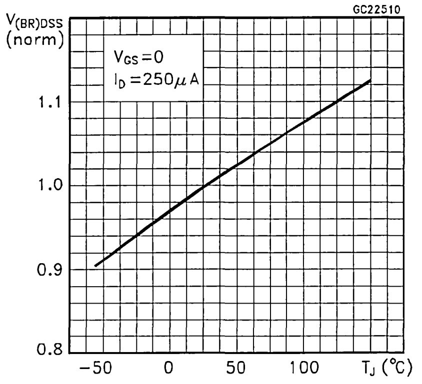
Gate Charge vs Gate-source Voltage



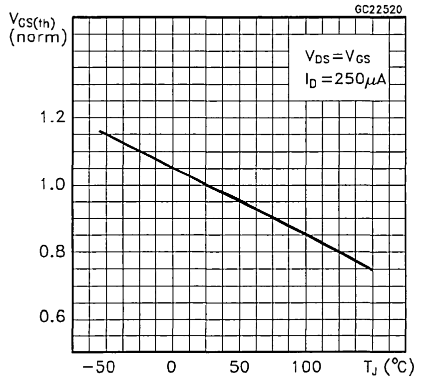
Capacitance Variations



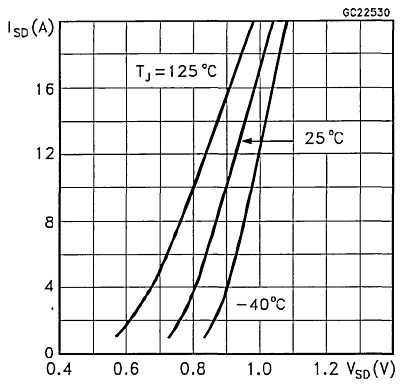
Normalized Breakdown Voltage vs Temperature



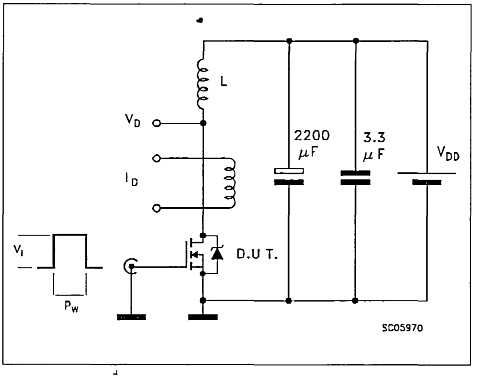
Normalized On Resistance vs Temperature



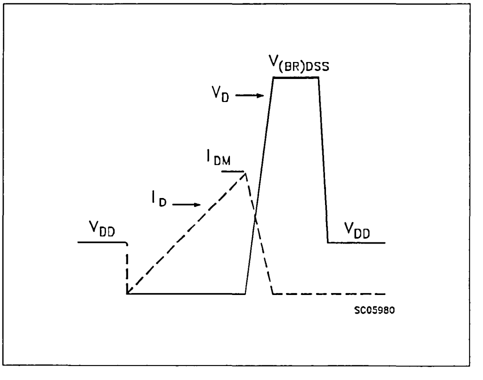
Source-drain Diode Forward Characteristics



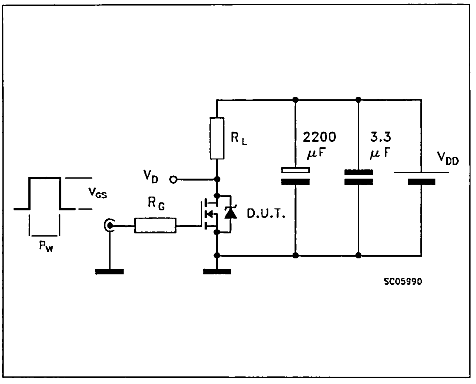
Unclamped Inductive Load Test Circuit



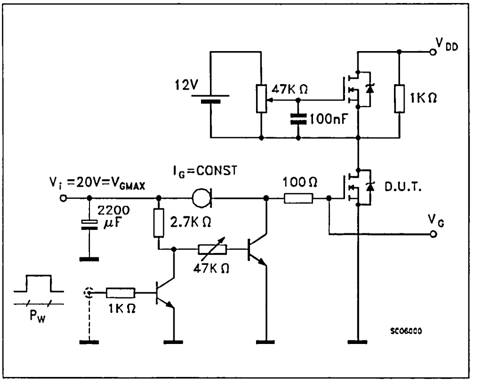
Unclamped Inductive Waveforms



Switching Time Test Circuit



Gate Charge Test Circuit



SGS-THOMSON MICROELECTRONICS

IRF820/FI
IRF822/FI

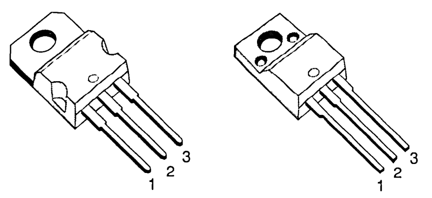
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
IRF820	500 V	< 3 Ω	3 A
IRF820FI	500 V	< 3 Ω	2.2 A
IRF822	500 V	< 4 Ω	2.8 A
IRF822FI	500 V	< 4 Ω	1.9 A

- TYPICAL $R_{DS(on)}$ = 2.5 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C

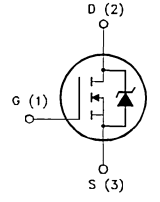
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



TO-220 ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value IRF 820	822	820FI	822FI	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	500	500	500	500	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	500	500	500	500	V
V_{GS}	Gate-source Voltage	± 20				V
I_D	Drain Current (cont.) at T_c = 25 °C	3	2.8	2.2	1.9	A
I_D	Drain Current (cont.) at T_c = 100 °C	1.9	1.7	1.4	1.2	A
$I_{DM}(\bullet)$	Drain Current (pulsed)	12	12	12	12	A
P_{tot}	Total Dissipation at T_c = 25 °C	75		35		W
	Derating Factor	0.6		0.28		W/°C
T_{stg}	Storage Temperature	-65 to 150				°C
T_j	Max. Operating Junction Temperature	150				°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.66	3.57	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
R_{thc-s}	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	3	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	225	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	6	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	1.9	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	500			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 1.5 A for **IRF820/820FI** for **IRF822/822FI**		 2.5 2.5	 3 4	 Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V for **IRF820/820FI** for **IRF822/822FI**	 3 2.8			 A A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 1.5 A	0.8	1.93		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		350 60 25	460 80 35	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING RESISTIVE LOAD

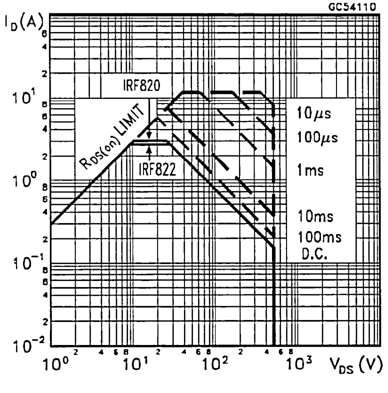
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 250 V I_D = 1.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit)		35 85 165 60	45 110 215 80	ns ns ns ns
Q_g	Total Gate Charge	I_D = 3 A V_{GS} = 10 V V_{DD} = Max Rating x 0.8 (see test circuit)		25 6 11	35	nC nC nC

SOURCE DRAIN DIODE

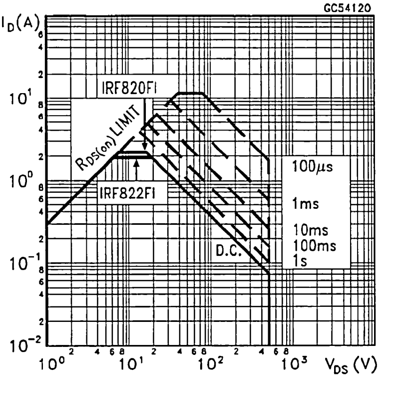
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				3 12	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 3 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 3 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C		380 3.8		ns µC

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

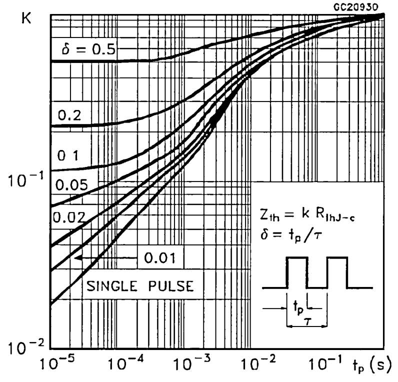
Safe Operating Area for TO-220



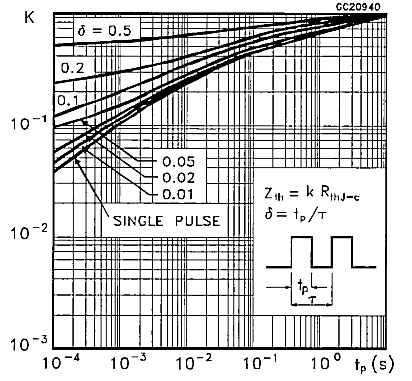
Safe Operating Area for ISOWATT220



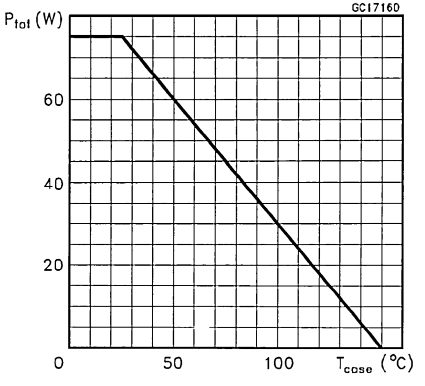
Thermal Impedance for TO-220



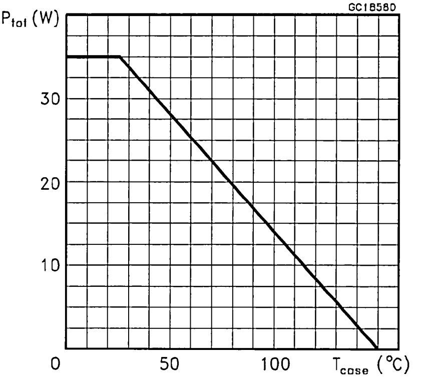
Thermal Impedance for ISOWATT220



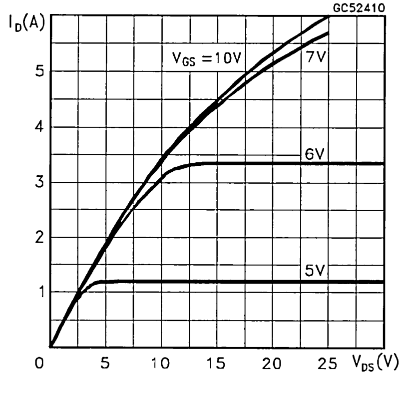
Derating Curve for TO-220



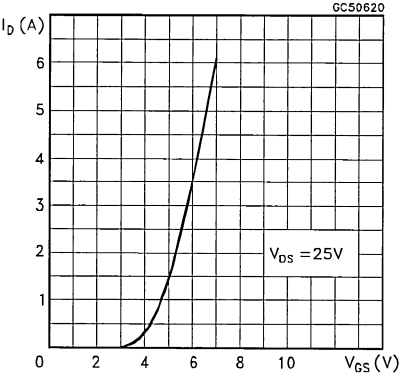
Derating Curve for ISOWATT220



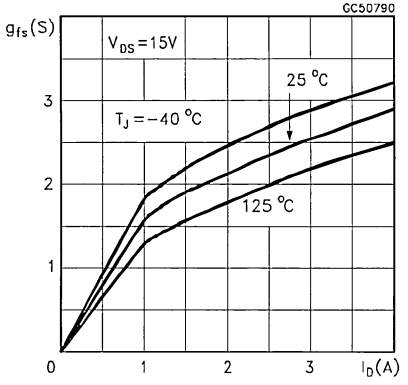
Output Characteristics



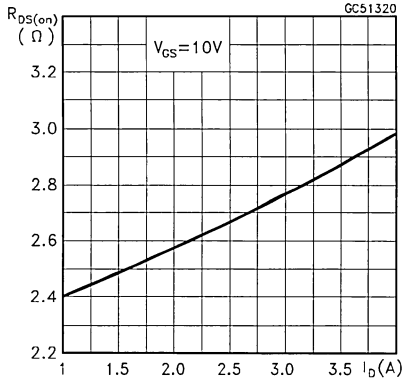
Transfer Characteristics



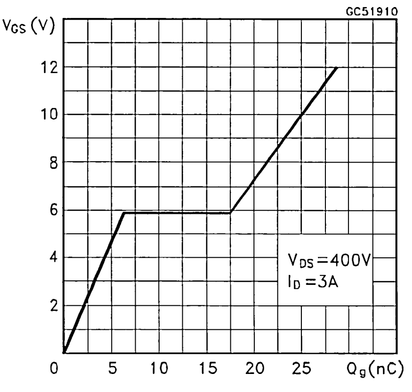
Transconductance



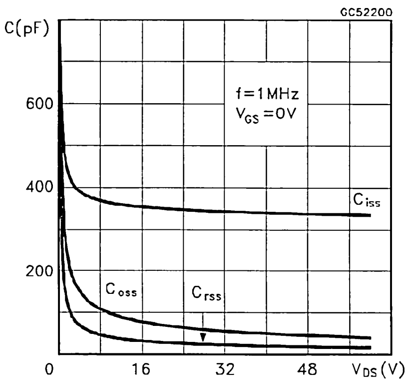
Static Drain-source On Resistance



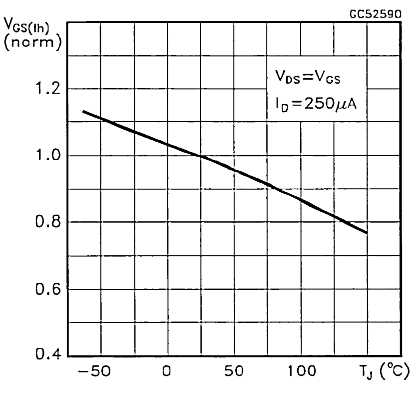
Gate Charge vs Gate-source Voltage



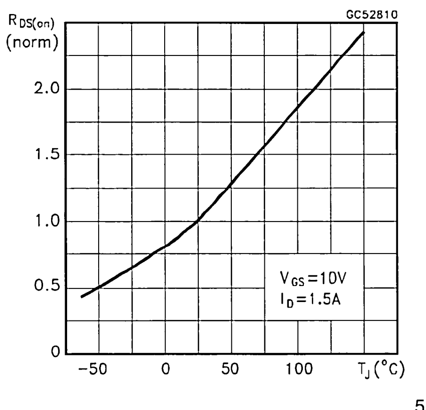
Capacitance Variations



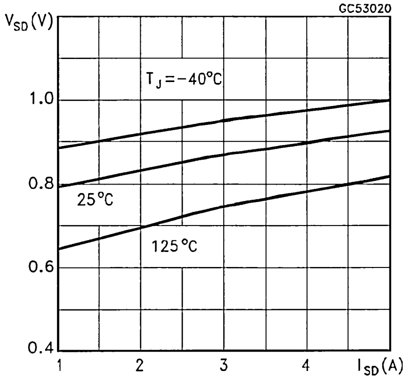
Normalized Gate Threshold Voltage vs Temperature



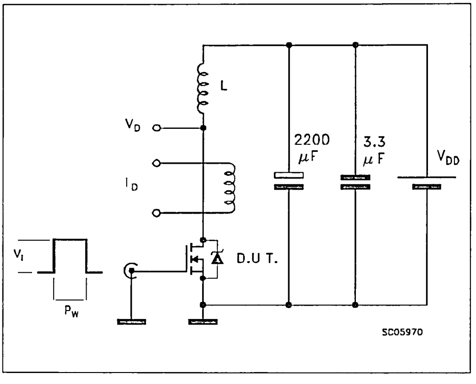
Normalized On Resistance vs Temperature



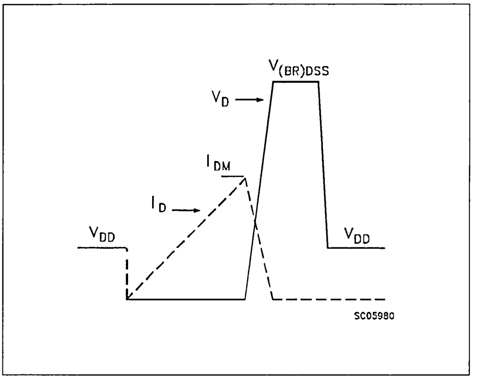
Source-drain Diode Forward Characteristics



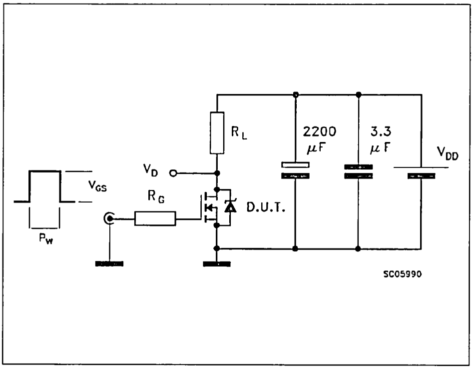
Unclamped Inductive Load Test Circuit



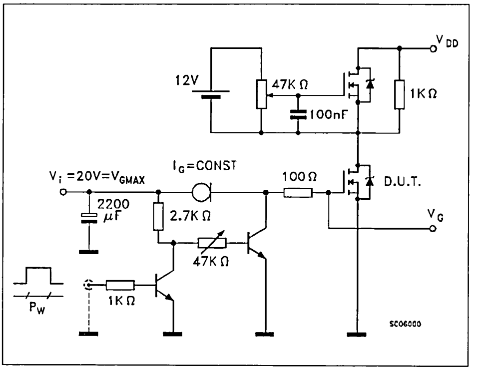
Unclamped Inductive Waveforms



Switching Time Test Circuit



Gate Charge Test Circuit



SGS-THOMSON MICROELECTRONICS

IRF830/FI
IRF831/FI

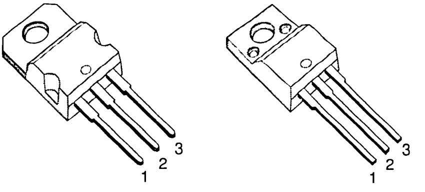
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
IRF830	500 V	< 1.5 Ω	4.5 A
IRF830FI	500 V	< 1.5 Ω	3 A
IRF831	450 V	< 1.5 Ω	4.5 A
IRF831FI	450 V	< 1.5 Ω	3 A

- TYPICAL $R_{DS(on)}$ = 1.35 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C

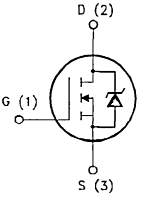
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



TO-220 ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value				Unit
		IRF				
		830	831	830FI	831FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	500	450	500	450	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	500	450	500	450	V
V_{GS}	Gate-source Voltage	± 20				V
I_D	Drain Current (cont.) at T_c = 25 °C	4.5	4.5	3	3	A
I_D	Drain Current (cont.) at T_c = 100 °C	3	3	1.8	1.8	A
$I_{DM}(\bullet)$	Drain Current (pulsed)	15	15	15	15	A
P_{tot}	Total Dissipation at T_c = 25 °C	100		35		W
	Derating Factor	0.8		0.28		W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—		2000		V
T_{stg}	Storage Temperature	-65 to 150				°C
T_j	Max. Operating Junction Temperature	150				°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case Max	1.25	3.57	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max	62.5		°C/W
R_{thc-s}	Thermal Resistance Case-sink Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	4.5	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	280	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	7.4	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	2.5	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0 for **IRF830/830FI** for **IRF831/831FI**	 500 450			 V V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 2.5 A		1.35	1.5	Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	4.5			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 2.5 A	2.7	3.4		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		600 100 40	800 130 55	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING RESISTIVE LOAD

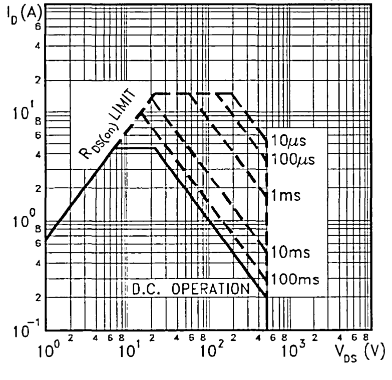
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 225 V I_D = 2.5 A R_G = 15 Ω (see test circuit)		45 34 125 39	60 42 155 50	ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	I_D = 4.5 A V_{GS} = 10 V V_{DD} = Max Rating x 0.8 (see test circuit)		42 6 20	52	nC nC nC

SOURCE DRAIN DIODE

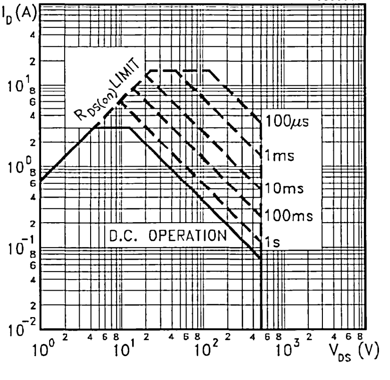
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				4.5 15	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 4.5 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 4.5 A dI/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C		430 3.8		ns µC

(*) Pulsed Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

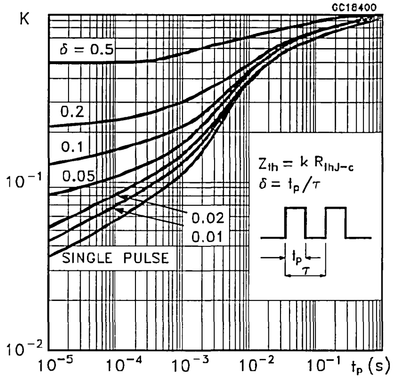
Safe Operating Area for TO-220



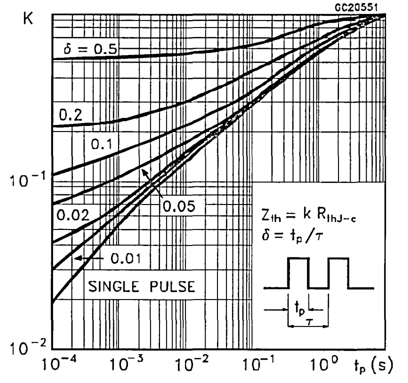
Safe Operating Area for ISOWATT220



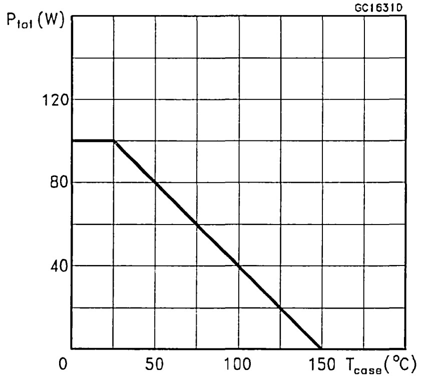
Thermal Impedance for TO-220



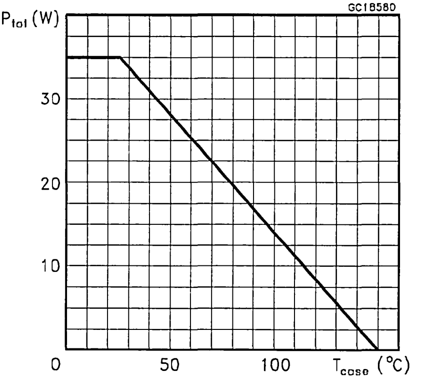
Thermal Impedance for ISOWATT220



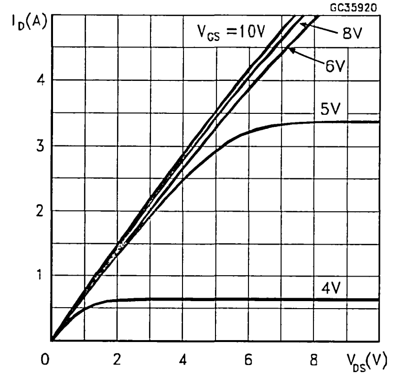
Derating Curve for TO-220



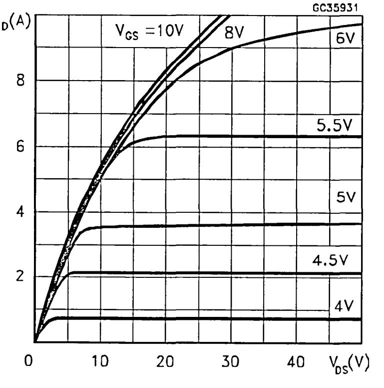
Derating Curve for ISOWATT220



Output Characteristics

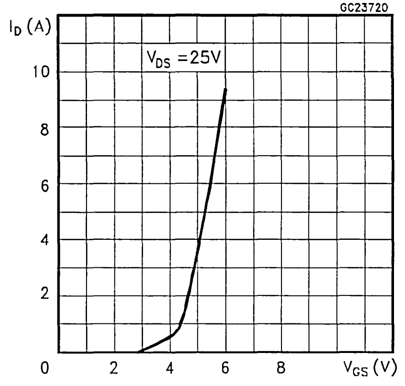


Output Characteristics

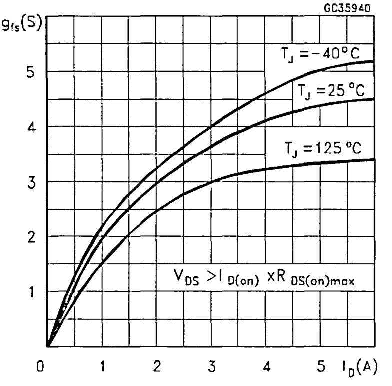


SGS-THOMSON MICROELECTRONICS

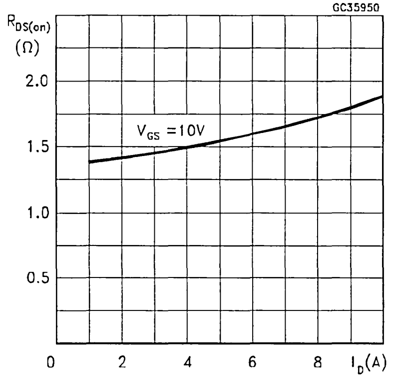
Transfer Characteristics



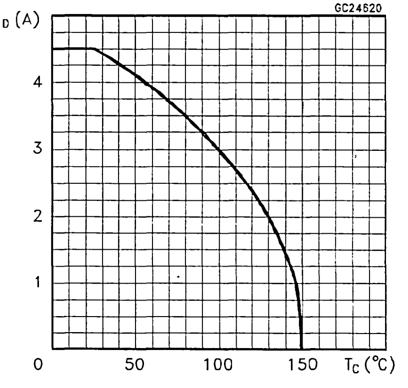
Transconductance



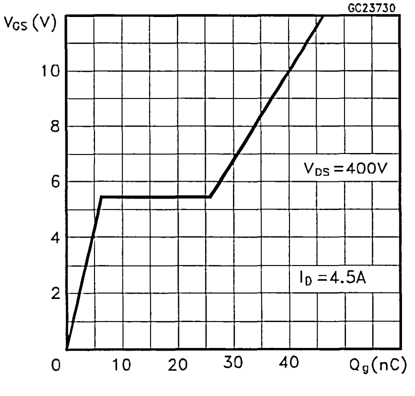
Static Drain-source On Resistance



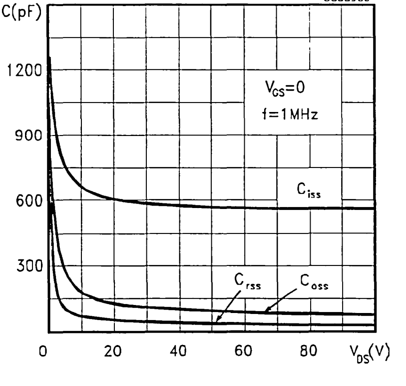
Maximum Drain Current vs Temperature



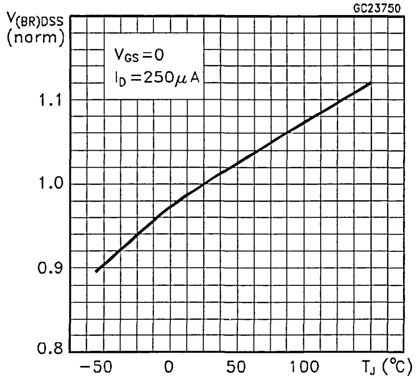
Gate Charge vs Gate-source Voltage



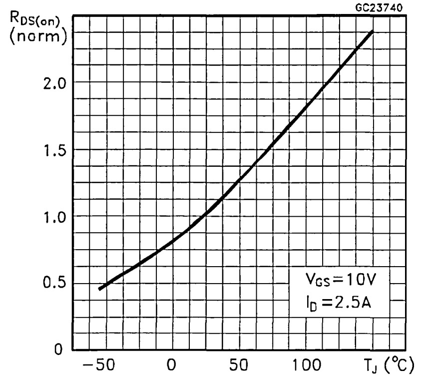
Capacitance Variations



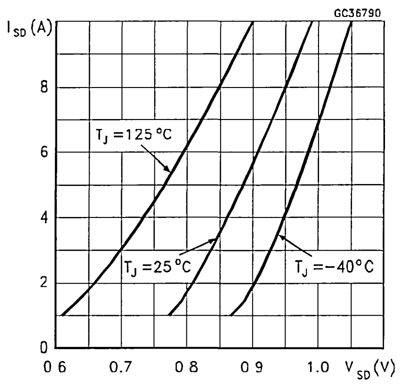
Normalized Breakdown Voltage vs Temperature



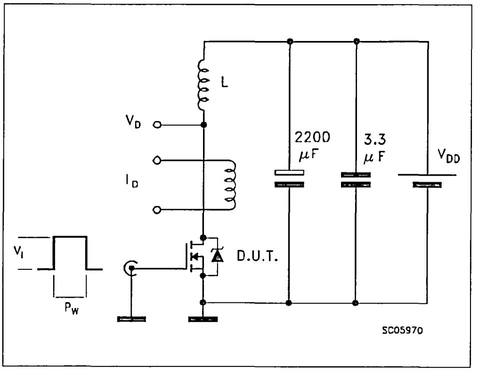
Normalized On Resistance vs Temperature



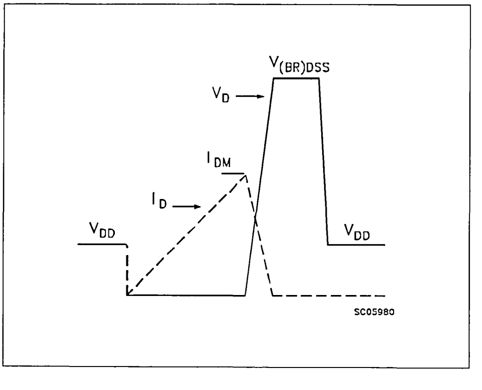
Source-drain Diode Forward Characteristics



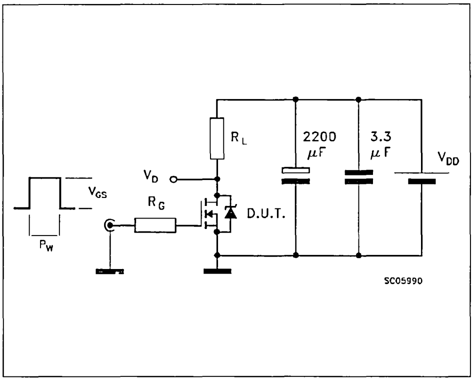
Unclamped Inductive Load Test Circuit



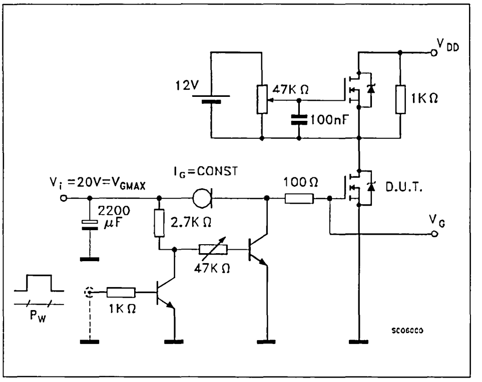
Unclamped Inductive Waveforms



Switching Time Test Circuit



Gate Charge Test Circuit



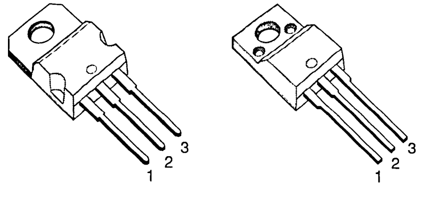
IRF840/FI
IRF841/FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
IRF840 IRF840FI	500 V 500 V	< 0.85 Ω < 0.85 Ω	8 A 4.5 A
IRF841 IRF841FI	450 V 450 V	< 0.85 Ω < 0.85 Ω	8 A 4.5 A

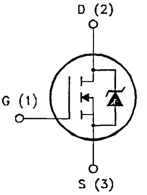
- TYPICAL $R_{DS(on)}$ = 0.74 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



TO-220 ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value				Unit
		IRF				
		840	841	840FI	841FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	500	450	500	450	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	500	450	500	450	V
V_{GS}	Gate-source Voltage	± 20				V
I_D	Drain Current (cont.) at T_c = 25 °C	8	8	4.5	4.5	A
I_D	Drain Current (cont.) at T_c = 100 °C	5.1	5.1	2.8	2.8	A
I_{DM}(•)	Drain Current (pulsed)	32	32	32	32	A
P_{tot}	Total Dissipation at T_c = 25 °C	125		40		W
	Derating Factor	1		0.32		W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—		2000		
T_{stg}	Storage Temperature	-65 to 150				°C
T_j	Max. Operating Junction Temperature	150				°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	3.12	°C/W
$R_{thj-amb}$ R_{thc-s} T_l	Thermal Resistance Junction-ambient Thermal Resistance Case-sink Maximum Lead Temperature For Soldering Purpose	Max Typ 	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	8	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	510	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	13	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	5.1	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0 for **IRF840/840FI** for **IRF841/841FI**	 500 450			 V V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 4.4 A		0.74	0.85	Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	8			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 4.4 A	4.9	6		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1100 190 80	1500 240 110	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING RESISTIVE LOAD

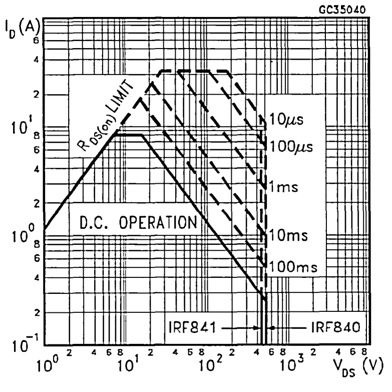
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 200 V I_D = 4 A R_i = 4.7 Ω (see test circuit)		40 35 80 20	50 43 100 25	ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	I_D = 8 A V_{GS} = 10 V V_{DD} = Max Rating x 0.8 (see test circuit)		75 9 39	95	nC nC nC

SOURCE DRAIN DIODE

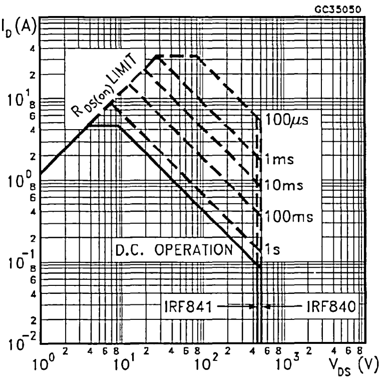
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				8 32	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 8 A V_{GS} = 0			2	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 8 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C		700 12		ns µC

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

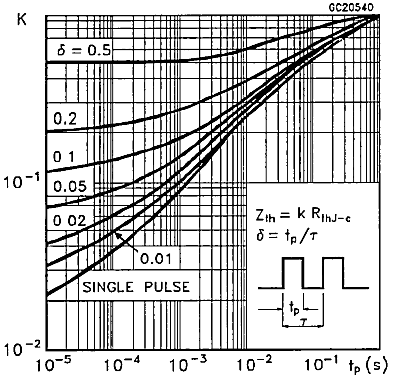
Safe Operating Area for TO-220



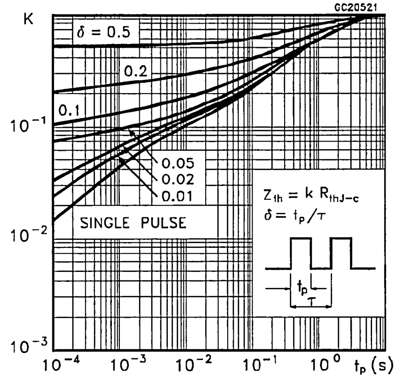
Safe Operating Area for ISOWATT220



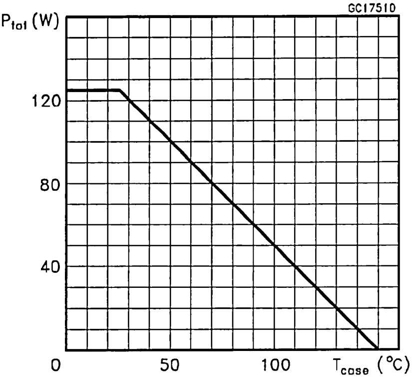
Thermal Impedance for TO-220



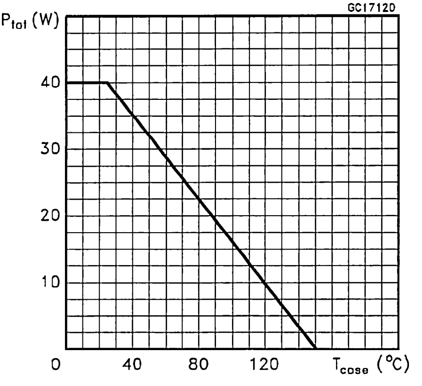
Thermal Impedance for ISOWATT220



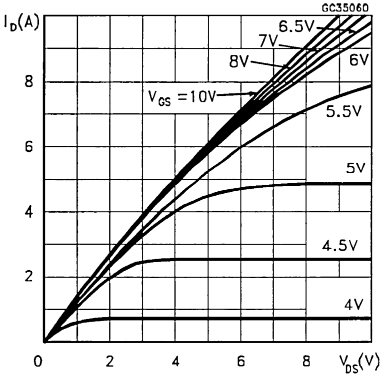
Derating Curve for TO-220



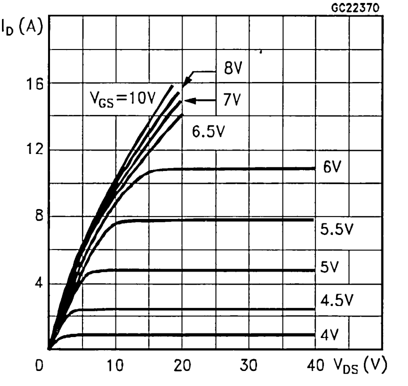
Derating Curve for ISOWATT220



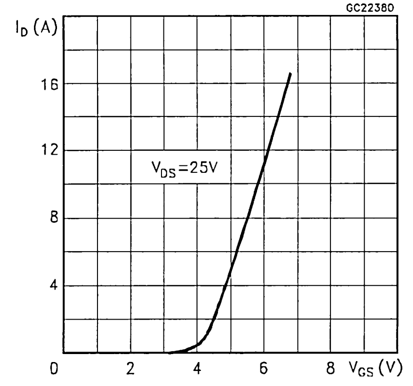
Output Characteristics



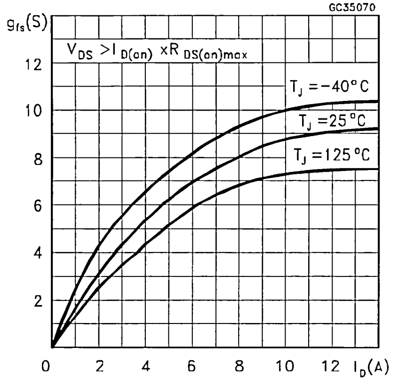
Output Characteristics



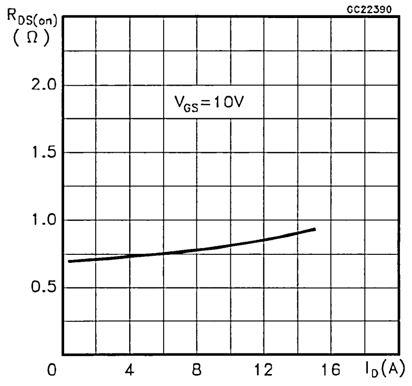
Transfer Characteristics



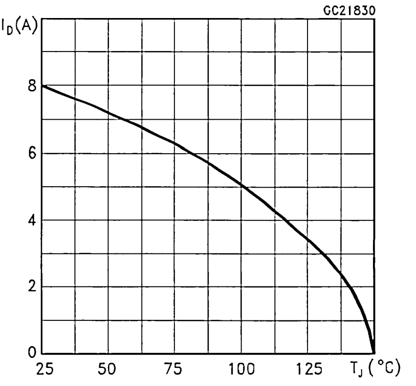
Transconductance



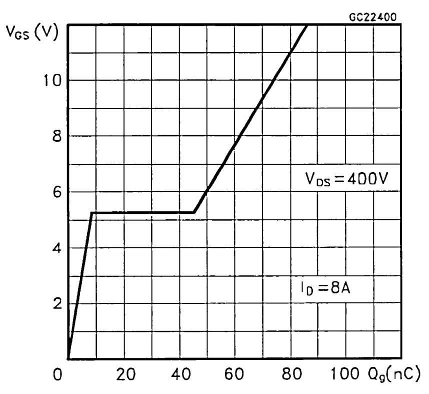
Static Drain-source On Resistance



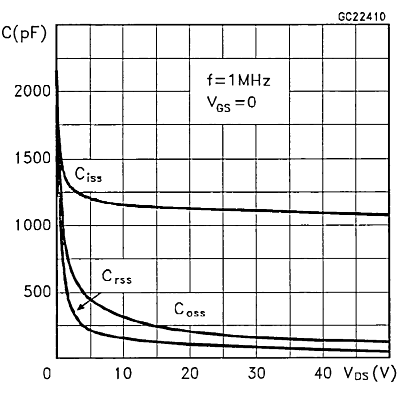
Maximum Drain Current vs Temperature



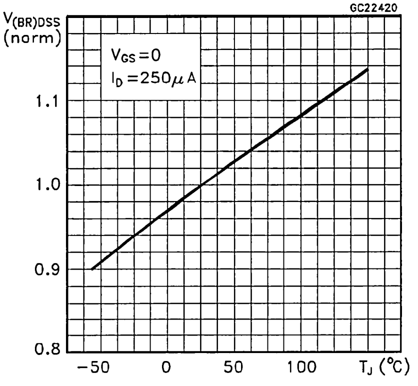
Gate Charge vs Gate-source Voltage



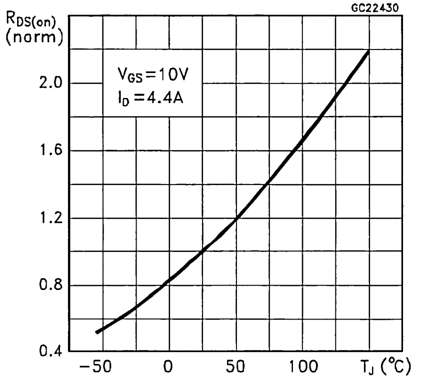
Capacitance Variations



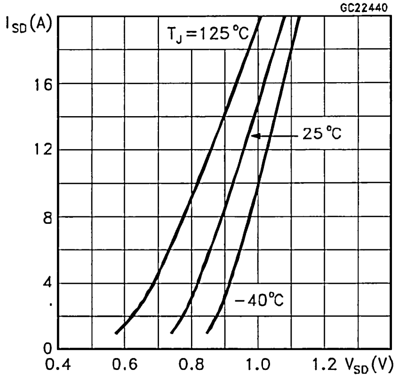
Normalized Breakdown Voltage vs Temperature



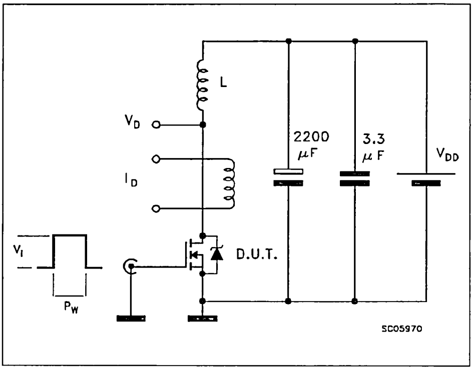
Normalized On Resistance vs Temperature



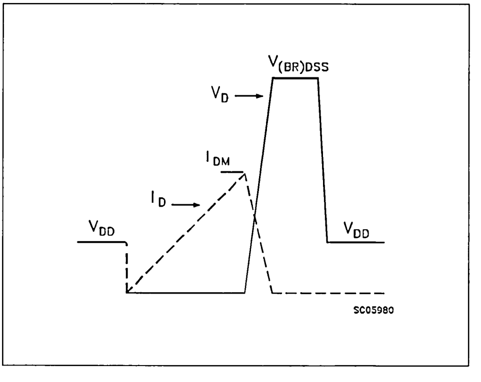
Source-drain Diode Forward Characteristics



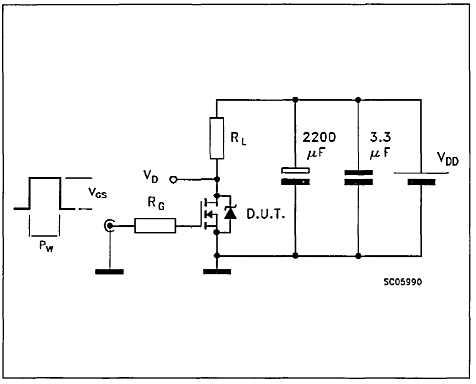
Unclamped Inductive Load Test Circuit



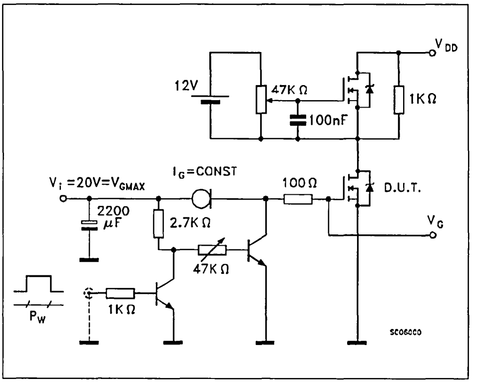
Unclamped Inductive Waveforms



Switching Time Test Circuit



Gate Charge Test Circuit



SGS-THOMSON
MICROELECTRONICS

IRFBC30

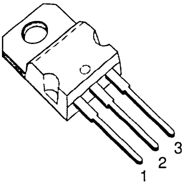
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
IRFBC30	600 V	< 2.2 Ω	4.3 A

- TYPICAL $R_{DS(on)}$ = 2 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

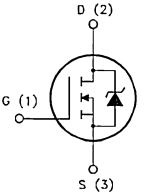
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



TO-220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	600	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	600	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	4.3	A
I_D	Drain Current (continuous) at T_c = 100 °C	2.7	A
I_{DM}(•)	Drain Current (pulsed)	15	A
P_{tot}	Total Dissipation at T_c = 25 °C	100	W
	Derating Factor	0.8	W/°C
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.25	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	°C/W
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.5	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	4.3	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	370	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	9.8	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	2.7	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	600			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10$V $I_D = 2$ A $V_{GS} = 10$V $I_D = 2$ A $T_c = 100$°C		2	2.2 4.4	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	4.3			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 2$ A	2.4	3		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V $f = 1$ MHz $V_{GS} = 0$		560 90 40	820 130 50	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 225 V I_D = 2.5 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 3)		45 33	60 42	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 480 V I_D = 4 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 5)		200		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 480 V I_D = 4 A V_{GS} = 10 V		43 6 21	55	nC nC nC

SWITCHING OFF

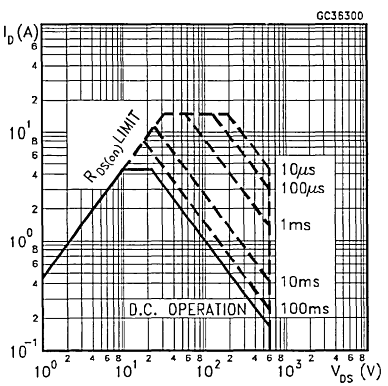
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 480 V I_D = 4 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 5)		35 40 60	45 55 75	ns ns ns

SOURCE DRAIN DIODE

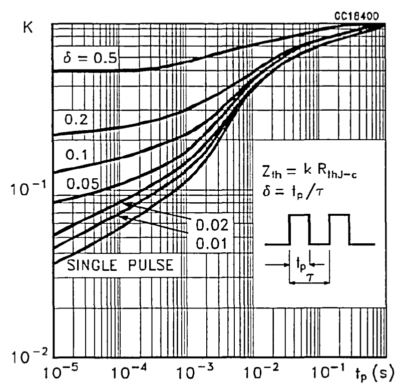
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				4.3 15	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 4.3 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 4 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		420 3.7 18		ns µC A

(*) Pulsed Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

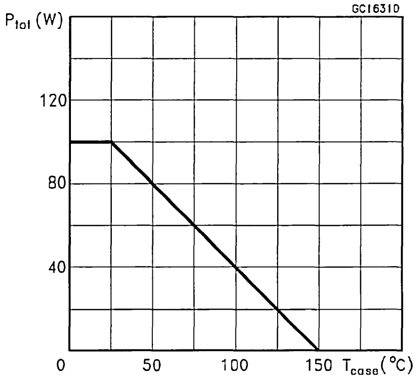
Safe Operating Area



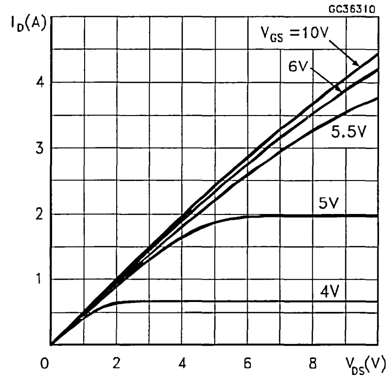
Thermal Impedance



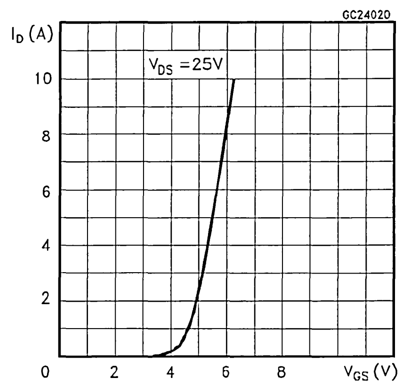
Derating Curve



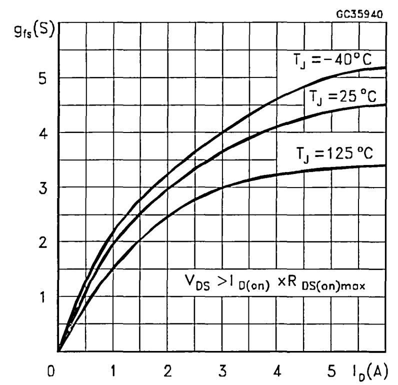
Output Characteristics



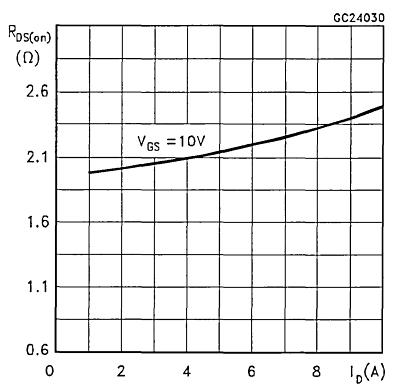
Transfer Characteristics



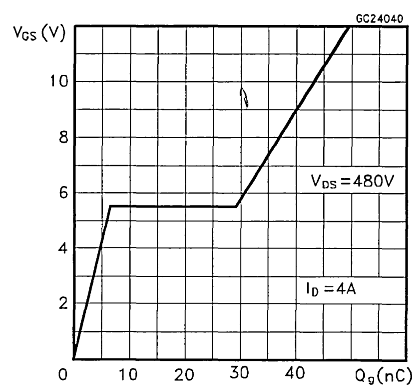
Transconductance



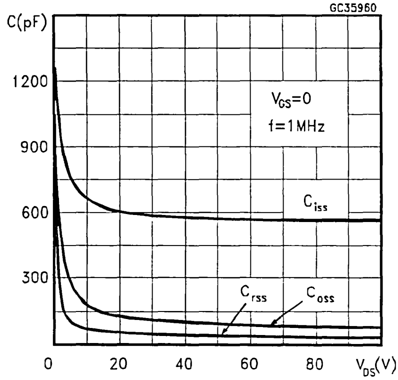
Static Drain-source On Resistance



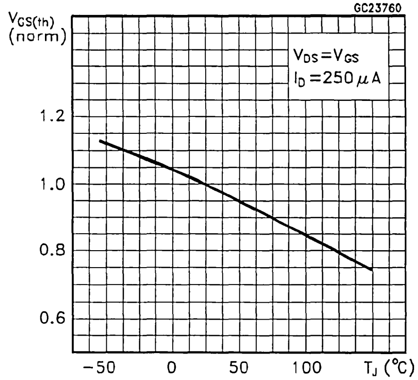
Gate Charge vs Gate-source Voltage



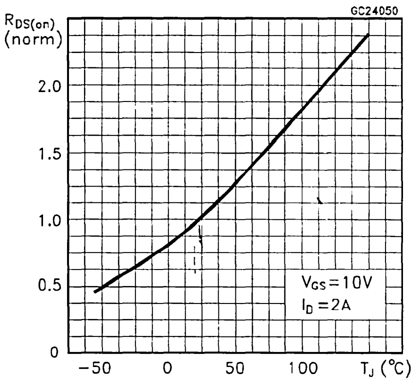
Capacitance Variations



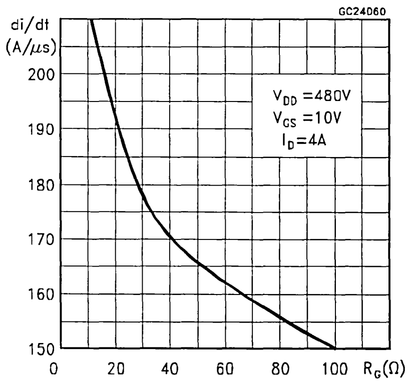
Normalized Gate Threshold Voltage vs Temperature



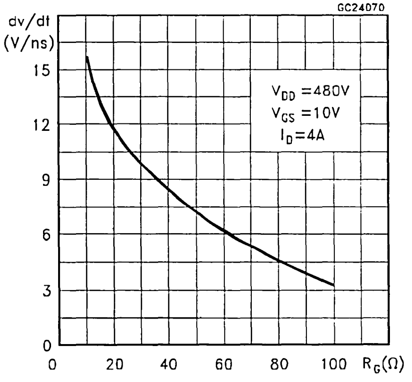
Normalized On Resistance vs Temperature



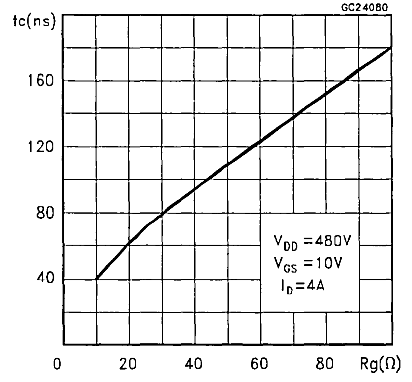
Turn-on Current Slope



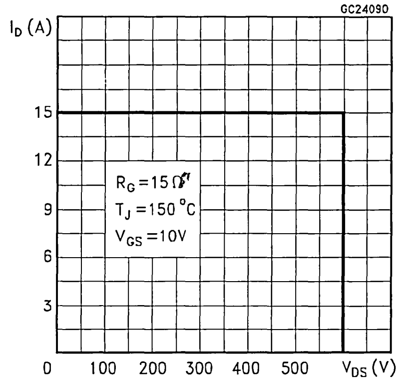
Turn-off Drain-source Voltage Slope



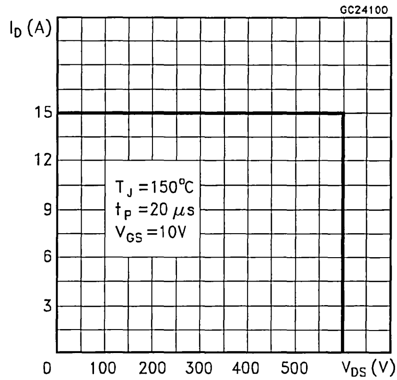
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

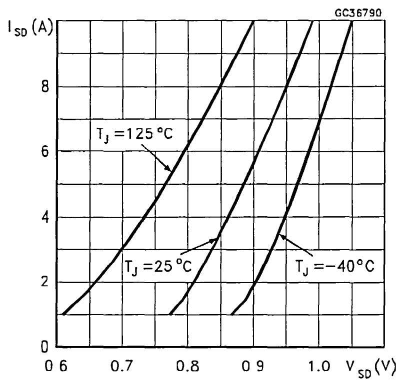


Fig. 1: Unclamped Inductive Load Test Circuits

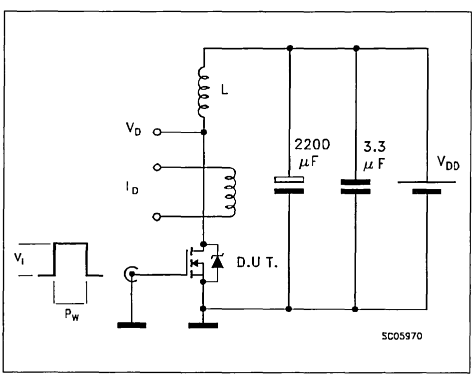


Fig. 2: Unclamped Inductive Waveforms

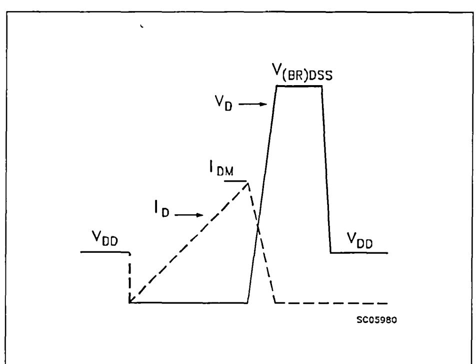


Fig. 3: Switching Times Test Circuits For Resistive Load

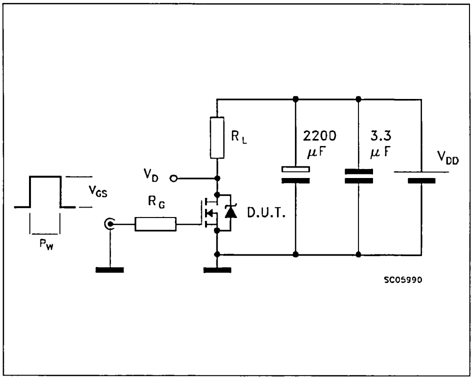


Fig. 4: Gate Charge Test Circuit

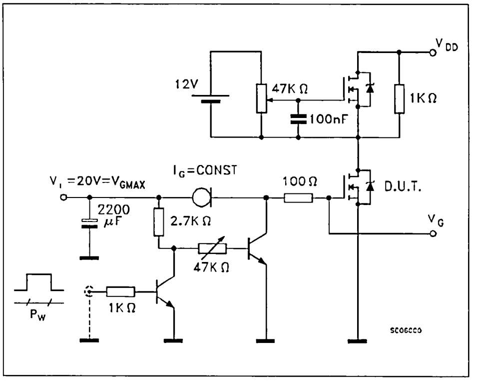
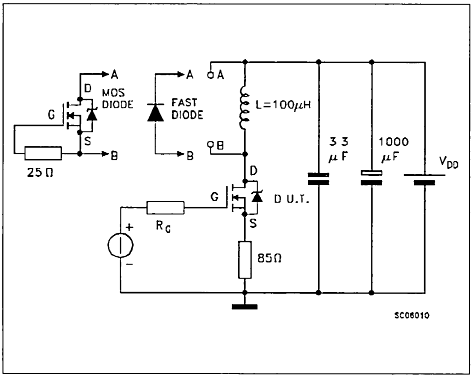


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



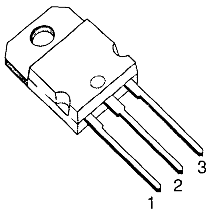
SGS-THOMSON MICROELECTRONICS

IRFP150
IRFP150FI

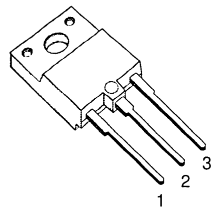
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
IRFP150	100 V	< 0.055 Ω	40 A
IRFP150FI	100 V	< 0.055 Ω	23 A

- TYPICAL $R_{DS(on)}$ = 0.035 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE FOR STANDARD PACKAGE
- APPLICATION ORIENTED CHARACTERIZATION



TO-218

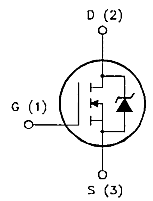


ISOWATT218

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		IRFP150	IRFP150FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	100		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	100		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (cont.) at T_c = 25 °C	40	23	A
I_D	Drain Current (cont.) at T_c = 100 °C	28	14	A
I_{DM}(•)	Drain Current (pulsed)	160	160	A
P_{tot}	Total Dissipation at T_c = 25 °C	180	60	W
	Derating Factor	1.2	0.48	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 175	-65 to 150	°C
T_j	Max. Operating Junction Temperature	175	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-218	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case Max	0.83	2.08	°C/W
$R_{thj-amb}$ R_{thc-s} T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	30 0.1 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	40	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	210	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	50	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	28	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	100			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 22 A		0.035	0.055	Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	40			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 22 A	12	26		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		2150 600 150	2800 800 200	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING RESISTIVE LOAD

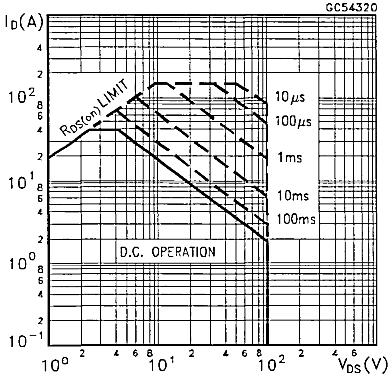
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 24 V I_D = 20 A R_i = 4.7 Ω V_{GS} = 10 V (see test circuit)		20 130 80 80	30 190 120 120	ns ns ns ns
Q_g	Total Gate Charge	I_D = 40 A V_{GS} = 10 V V_{DD} = Max Rating x 0.8 (see test circuit)		70 12 30	100	nC

SOURCE DRAIN DIODE

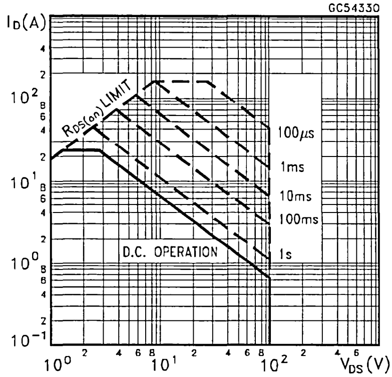
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				40 160	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 40 A V_{GS} = 0			2	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 40 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C		130 0.65		ns µC

(*) Pulsed Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

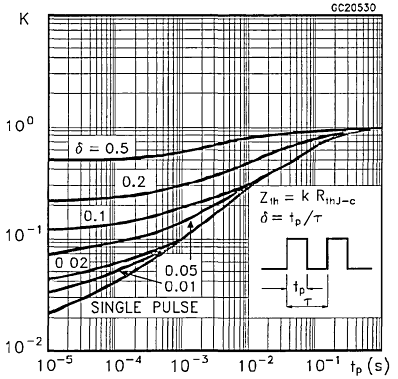
Safe Operating Area for TO-218



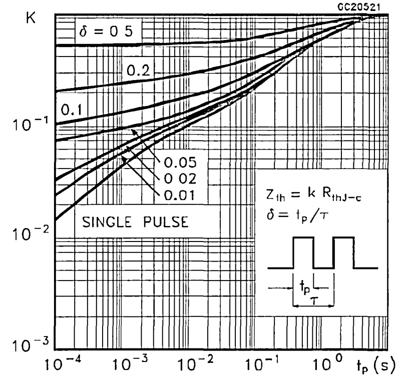
Safe Operating Area for ISOWATT218



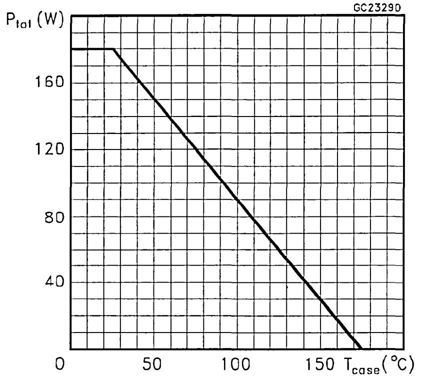
Thermal Impedance for TO-218



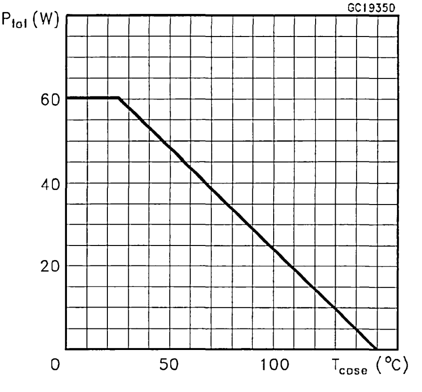
Thermal Impedance for ISOWATT218



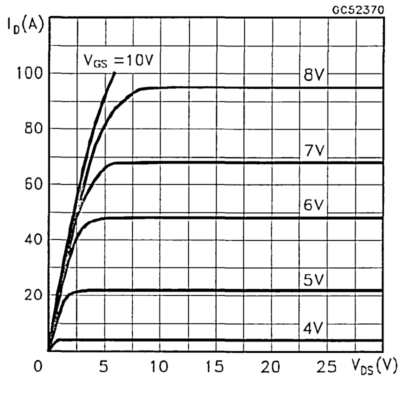
Derating Curve for TO-218



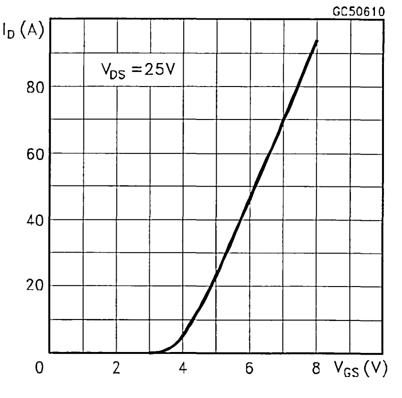
Derating Curve for ISOWATT218



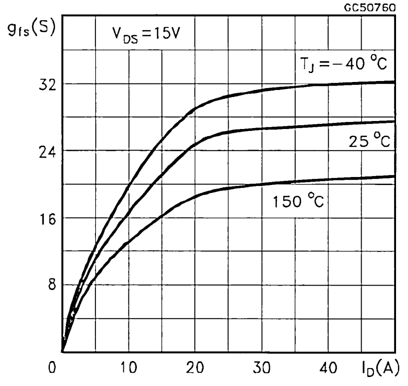
Output Characteristics



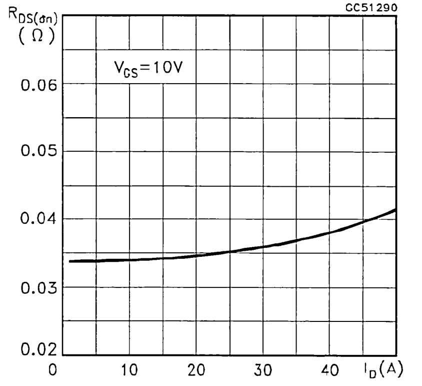
Transfer Characteristics



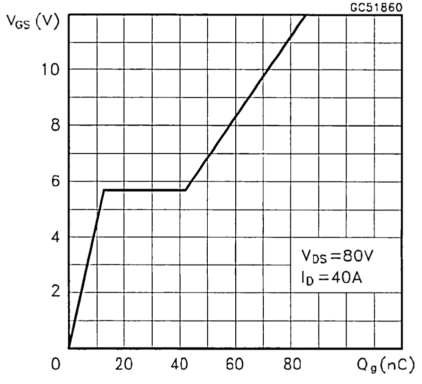
Transconductance



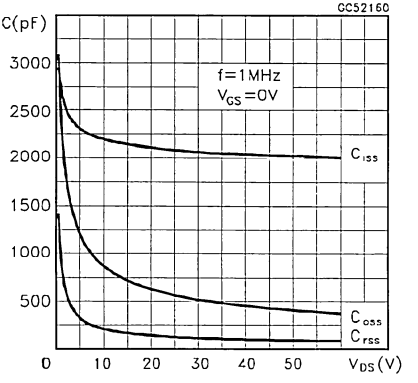
Static Drain-source On Resistance



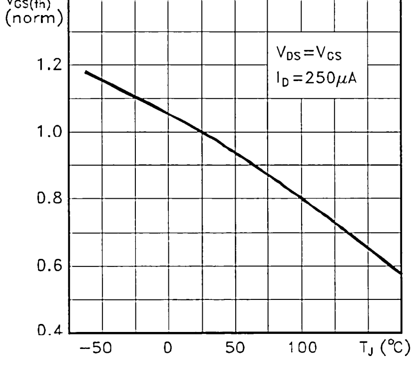
Gate Charge vs Gate-source Voltage



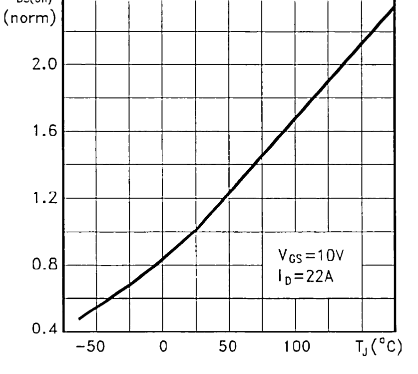
Capacitance Variations



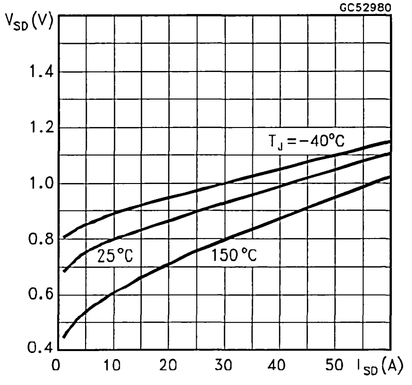
Normalized Gate Threshold Voltage vs Temperature



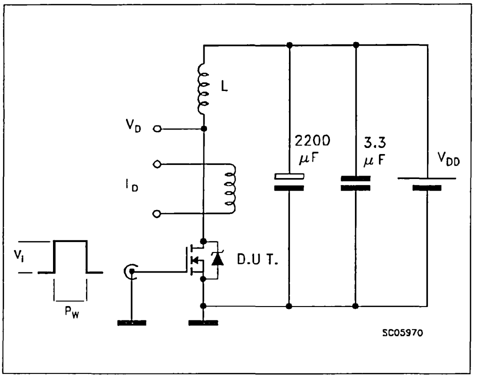
Normalized On Resistance vs Temperature



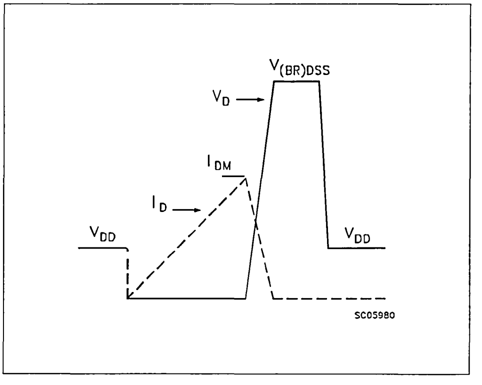
Source-drain Diode Forward Characteristics



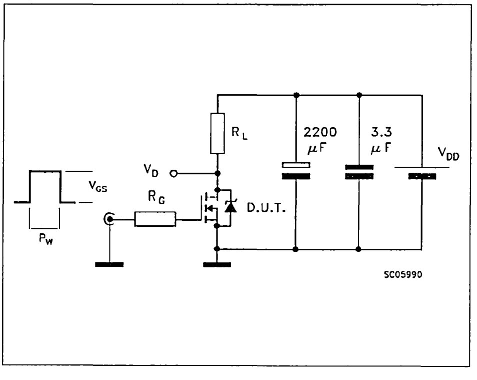
Unclamped Inductive Load Test Circuit



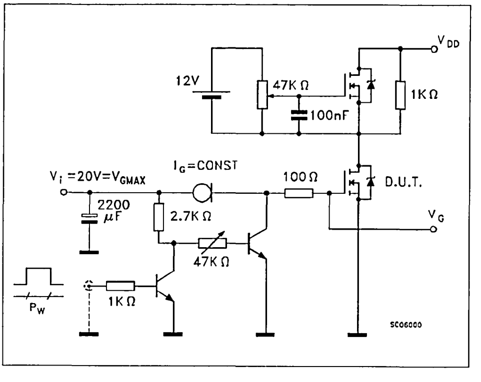
Unclamped Inductive Waveforms



Switching Time Test Circuit



Gate Charge Test Circuit



SGS-THOMSON
MICROELECTRONICS

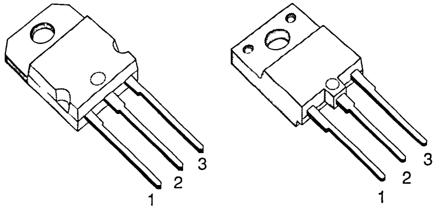
IRFP240
IRFP240FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
IRFP240	200 V	< 0.18 Ω	20 A
IRFP240FI	200 V	< 0.18 Ω	12 A

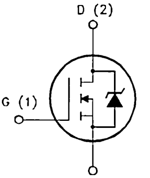
- TYPICAL $R_{DS(on)}$ = 0.145 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- UNINTERRUPTIBLE POWER SUPPLY (UPS)
- MOTOR CONTROL, AUDIO AMPLIFIERS
- INDUSTRIAL ACTUATORS
- DC-DC & DC-AC CONVERTERS FOR TELECOM, INDUSTRIAL AND CONSUMER ENVIRONMENT



TO-218 **ISOWATT218**

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		IRFP240	IRFP240FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	200		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	200		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (cont.) at T_c = 25 °C	20	12	A
I_D	Drain Current (cont.) at T_c = 100 °C	12	7	A
I_{DM}(•)	Drain Current (pulsed)	80	80	A
P_{tot}	Total Dissipation at T_c = 25 °C	150	55	W
	Derating Factor	1.2	0.44	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-218	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case Max	0.83	2.27	°C/W
$R_{thj-amb}$ R_{thc-s} T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	30 0.1 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	20	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	50	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	10	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	12	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	200			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 10 A		0 145	0.18	Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	20			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 10 A	6.5	13		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1600 270 50	2100 350 70	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING RESISTIVE LOAD

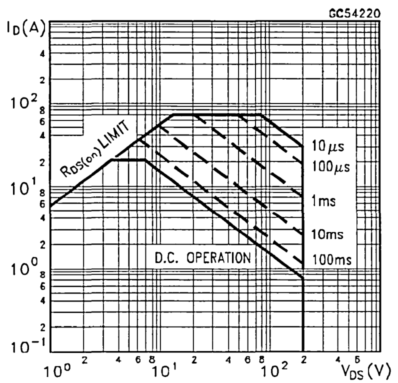
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 100 V I_D = 20 A R_G = 9.1 Ω V_{GS} = 10 V (see test circuit)		25 85 65 60	35 120 90 85	ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	I_D = 20 A V_{GS} = 10 V V_{DD} = Max Rating x 0.8 (see test circuit)		57 11 26	80	nC nC nC

SOURCE DRAIN DIODE

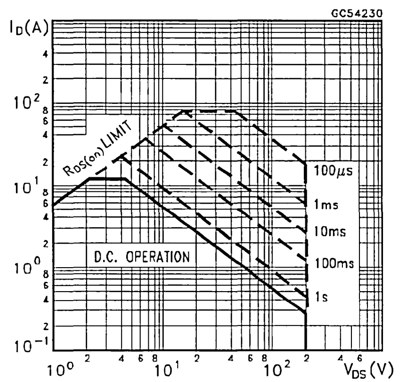
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				20 80	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 20 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 20 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C		310 3.4		ns µC

(*) Pulsed. Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

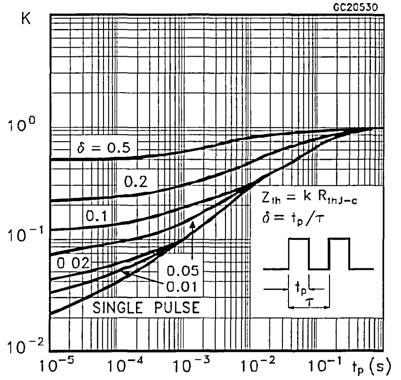
Safe Operating Area for TO-218



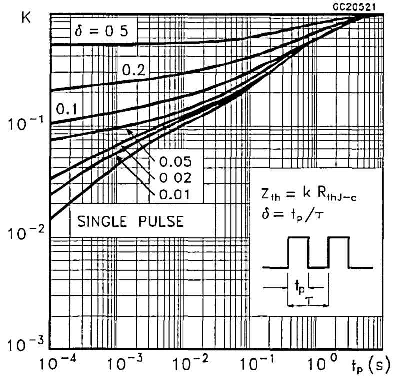
Safe Operating Area for ISOWATT218



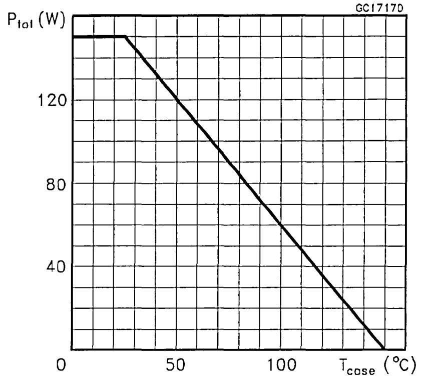
Thermal Impedance for TO-218



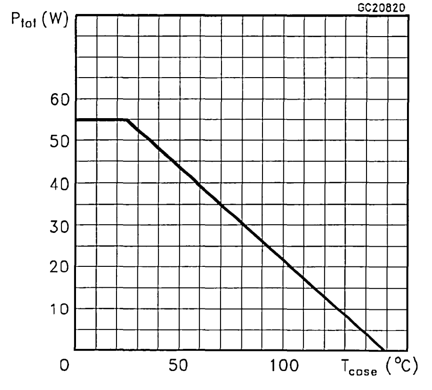
Thermal Impedance for ISOWATT218



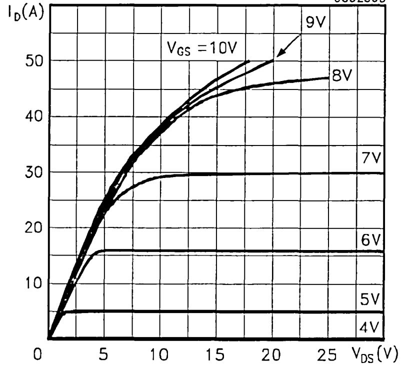
Derating Curve for TO-218



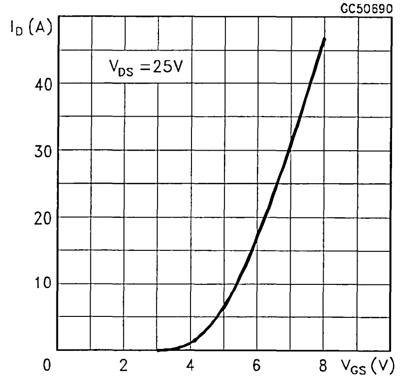
Derating Curve for ISOWATT218



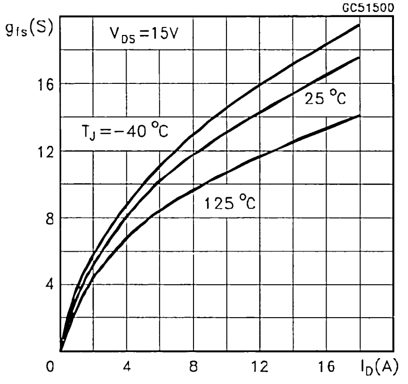
Output Characteristics



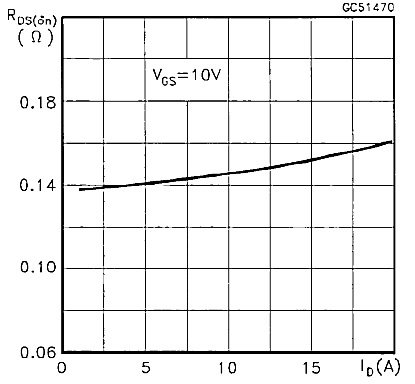
Transfer Characteristics



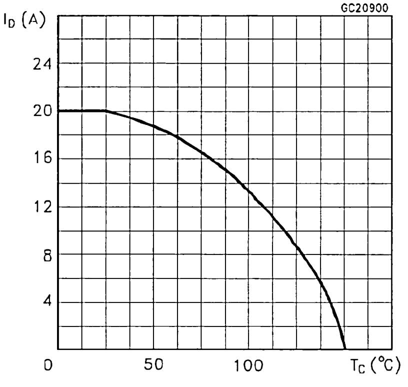
Transconductance



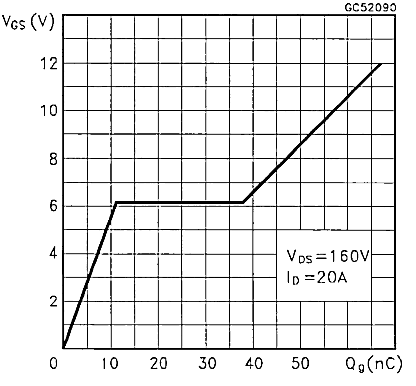
Static Drain-source On Resistance



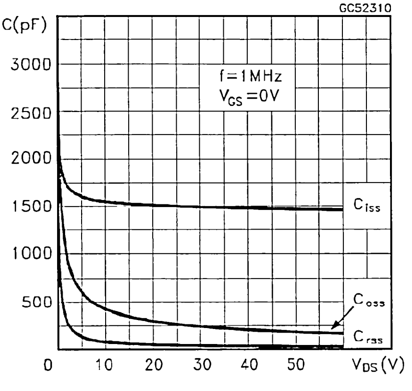
Maximum Drain Current vs Temperature



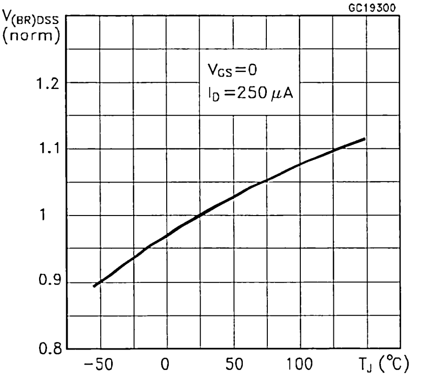
Gate Charge vs Gate-source Voltage



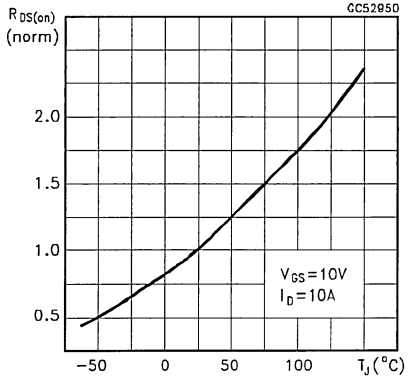
Capacitance Variations



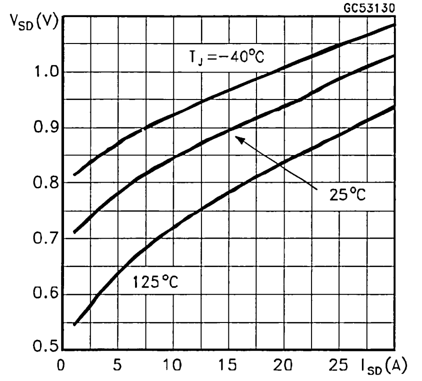
Normalized Breakdown Voltage vs Temperature



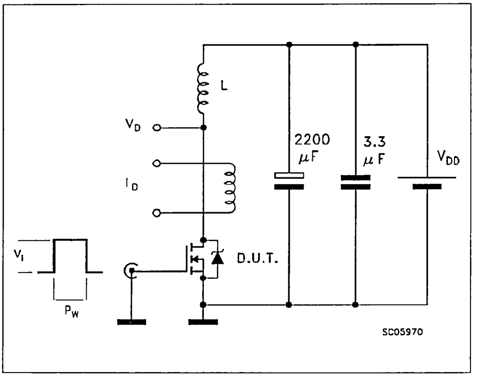
Normalized On Resistance vs Temperature



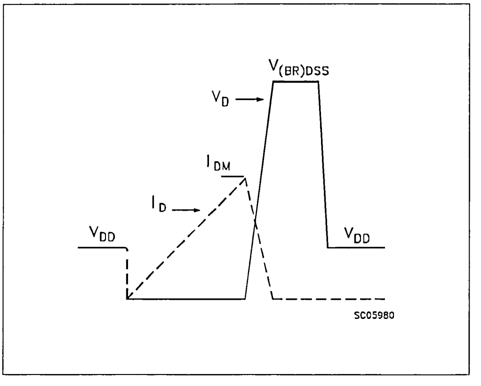
Source-drain Diode Forward Characteristics



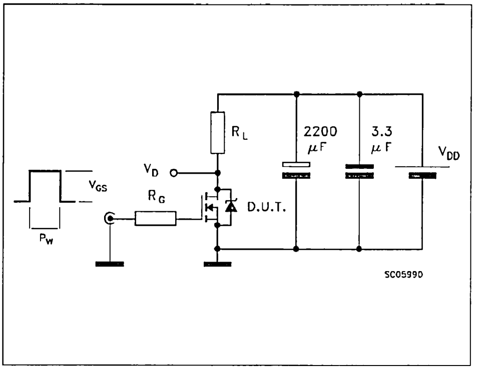
Unclamped Inductive Load Test Circuit



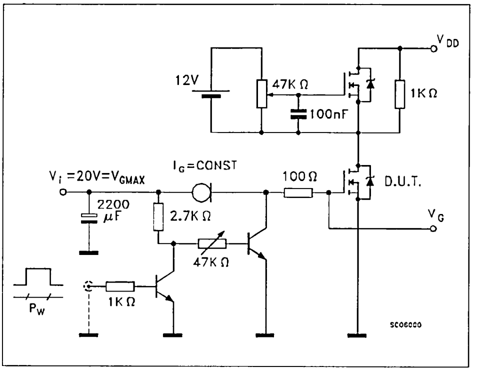
Unclamped Inductive Waveforms



Switching Time Test Circuit



Gate Charge Test Circuit



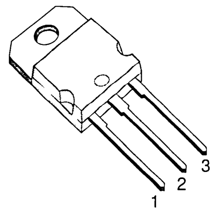
SGS-THOMSON
MICROELECTRONICS

IRFP350
IRFP350FI

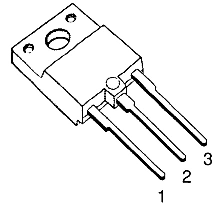
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
IRFP350 IRFP350FI	400 V 400 V	< 0.3 Ω < 0.3 Ω	16 A 10 A

- TYPICAL $R_{DS(on)}$ = 0.21 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION



TO-218

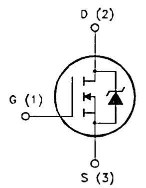


ISOWATT218

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		IRFP350	IRFP350FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	400		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	400		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	16	10	A
I_D	Drain Current (continuous) at T_c = 100 °C	10	7	A
I_{DM}(•)	Drain Current (pulsed)	64	64	A
P_{tot}	Total Dissipation at T_c = 25 °C	180	70	W
	Derating Factor	1.44	0.56	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-218	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case Max	0.69	1.78	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	30 0.1 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	16	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 50$ V)	435	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	23	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	10	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	400			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10$ V $I_D = 8$ A $V_{GS} = 10$ V $I_D = 8$ A $T_c = 100$°C		0.21	0.3 0.6	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	16			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 8$ A	6	12		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		2200 400 205	2900 550 270	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 200 V I_D = 8 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		25 85	35 115	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 320 V I_D = 16 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		350		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 320 V I_D = 16 A V_{GS} = 10 V		145 15 80	190	nC nC nC

SWITCHING OFF

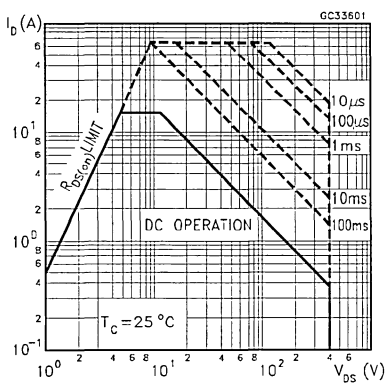
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 320 V I_D = 16 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		105 35 150	140 50 200	ns ns ns

SOURCE DRAIN DIODE

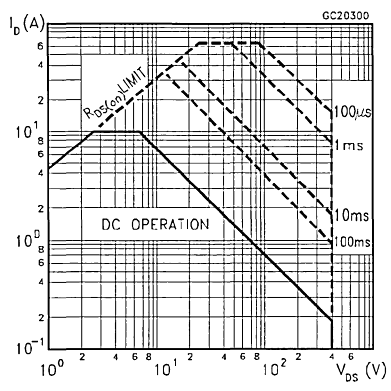
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				16 64	A A
V_{SD} (·)	Forward On Voltage	I_{SD} = 16 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 16 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		620 10.9 35		ns µC A

(·) Pulsed Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

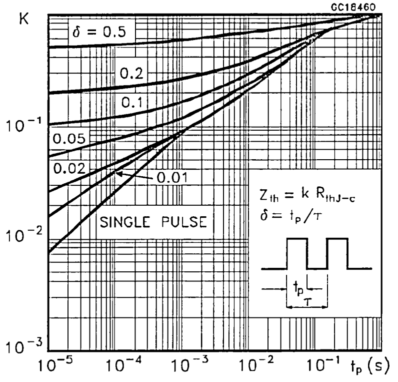
Safe Operating Areas For TO-218



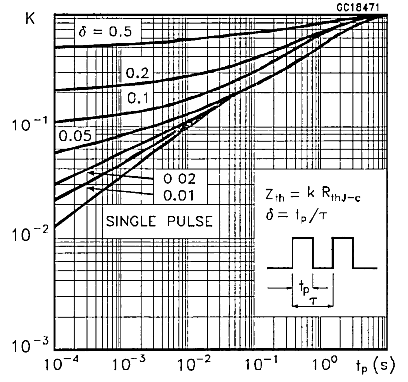
Safe Operating Areas For ISOWATT218



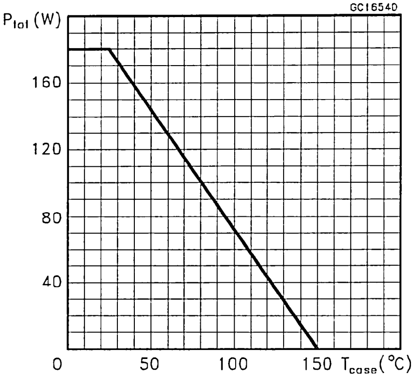
Thermal Impedeance For TO-218



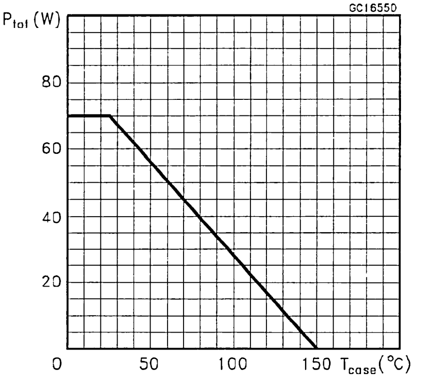
Thermal Impedance For ISOWATT218



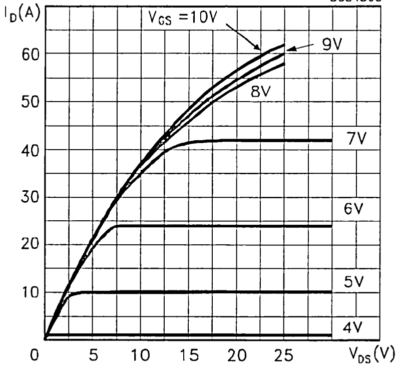
Derating Curve For TO-218



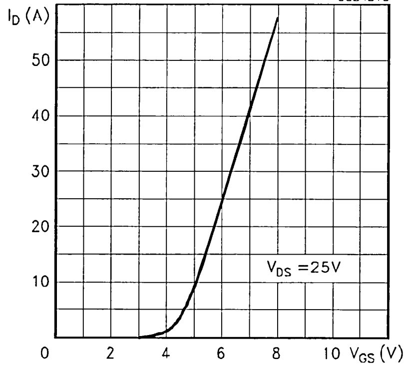
Derating Curve For ISOWATT218



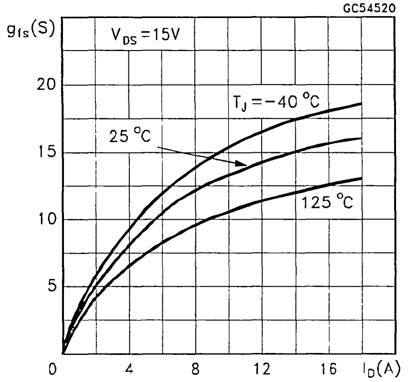
Output Characteristics



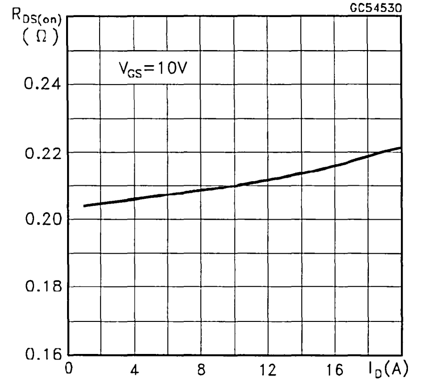
Transfer Characteristics



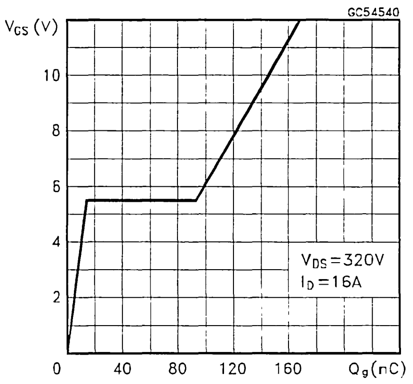
Transconductance



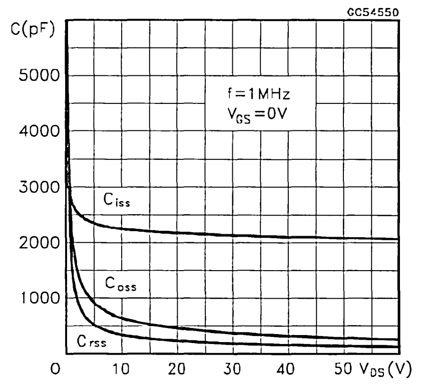
Static Drain-source On Resistance



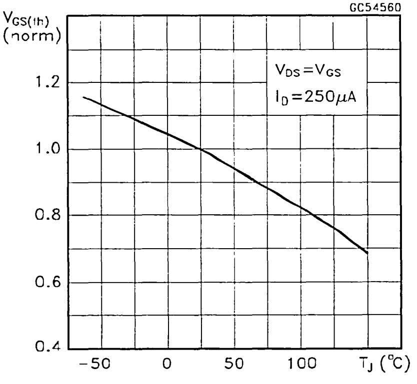
Gate Charge vs Gate-source Voltage



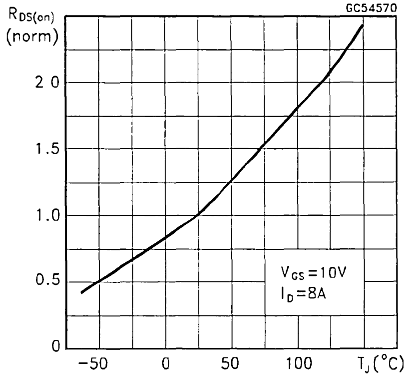
Capacitance Variations



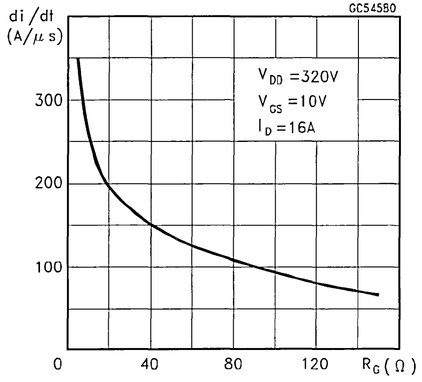
Normalized Gate Threshold Voltage vs Temperature



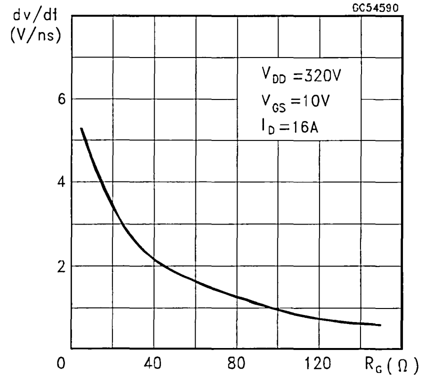
Normalized On Resistance vs Temperature



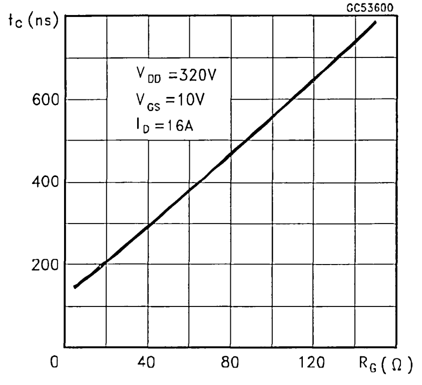
Turn-on Current Slope



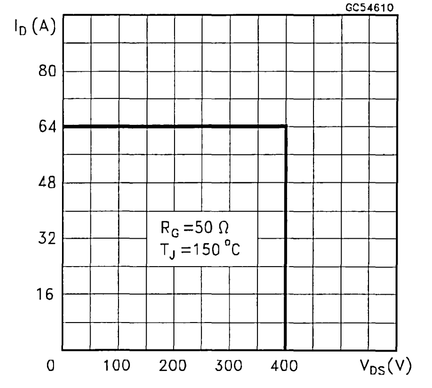
Turn-off Drain-source Voltage Slope



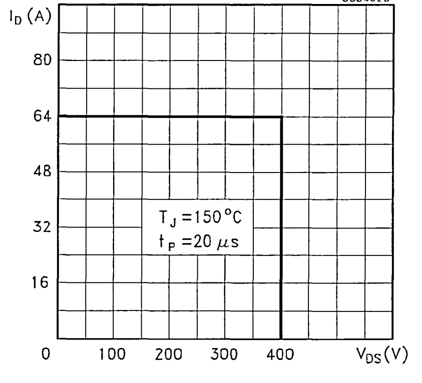
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

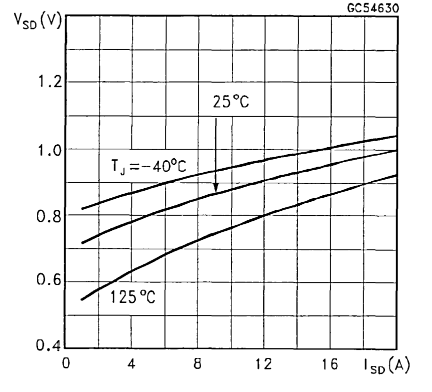


Fig. 1: Unclamped Inductive Load Test Circuits

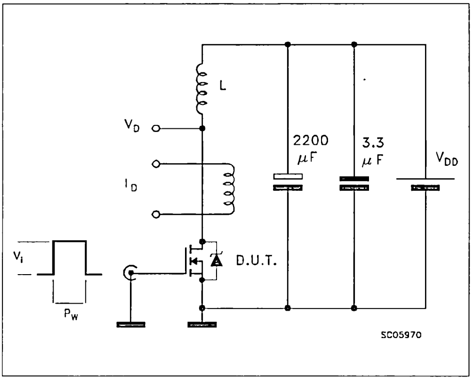


Fig. 2: Unclamped Inductive Waveforms

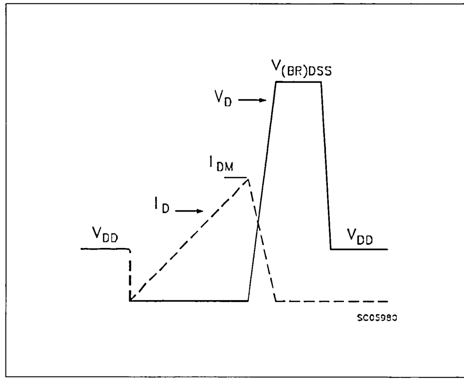


Fig. 3: Switching Times Test Circuits For Resistive Load

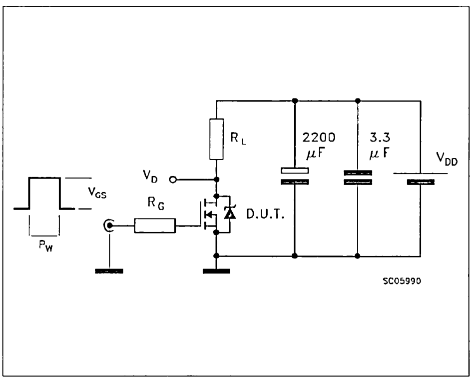


Fig. 4: Gate Charge Test Circuit

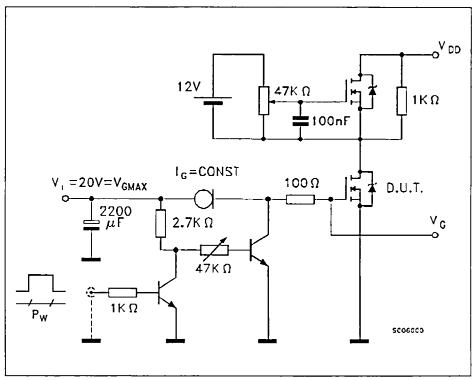
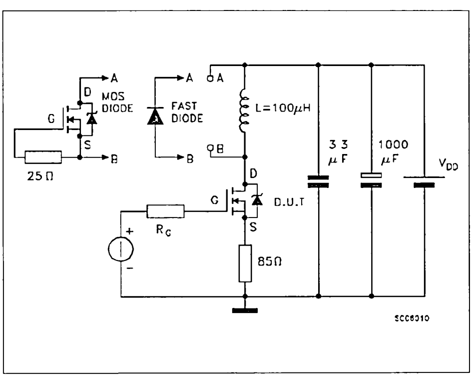


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON
MICROELECTRONICS

IRFP450/FI
IRFW450

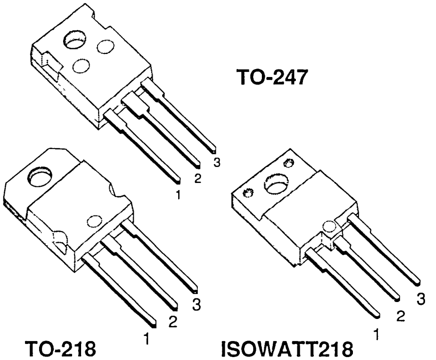
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

PRELIMINARY DATA

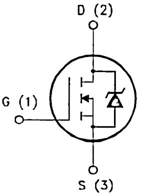
TYPE	V_{DSS}	$R_{DS(on)}$	I_D
IRFP450	500 V	< 0.4 Ω	14 A
IRFP450FI	500 V	< 0.4 Ω	9 A
IRFW450	500 V	< 0.4 Ω	14 A

- TYPICAL $R_{DS(on)}$ = 0.33 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		IRFP/IRFW450	IRFP450FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	500	500	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	500	500	V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (cont.) at T_c = 25 °C	14	9	A
I_D	Drain Current (cont.) at T_c = 100 °C	8.8	5.6	A
$I_{DM}(\bullet)$	Drain Current (pulsed)	56	56	A
P_{tot}	Total Dissipation at T_c = 25 °C	180	70	W
	Derating Factor	1.44	0.56	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-218/TO-247	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.69	1.78	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	30		°C/W
R_{thc-s}	Thermal Resistance Case-sink	Typ	0.1		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	14	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 50$ V)	760	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	18	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	8	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	500			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10$ V $I_D = 7.9$ A		0.33	0.4	Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	14			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 7.9$ A	6	10		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V $f = 1$ MHz $V_{GS} = 0$		2200 340 165	3000 440 220	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING RESISTIVE LOAD

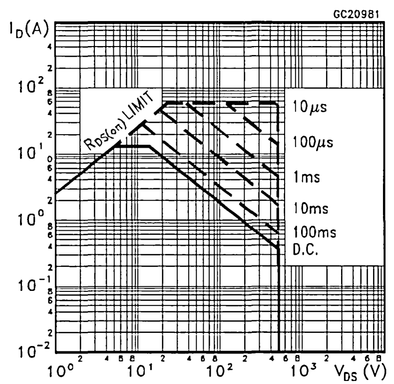
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 210 V I_D = 7 A R_I = 4.7 Ω (see test circuit)		25 55 170 100	35 75 225 135	ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	I_D = 13 A V_{GS} = 10 V V_{DD} = Max Rating x 0.8 (see test circuit)		145 15 75	190	nC nC nC

SOURCE DRAIN DIODE

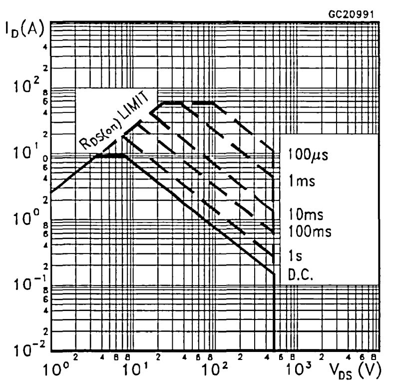
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				14 56	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 14 A V_{GS} = 0			1.4	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 14 A di/dt = 100 A/μs V_{DD} = 100 V T_j = 150 °C		700 17		ns μC

(*) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

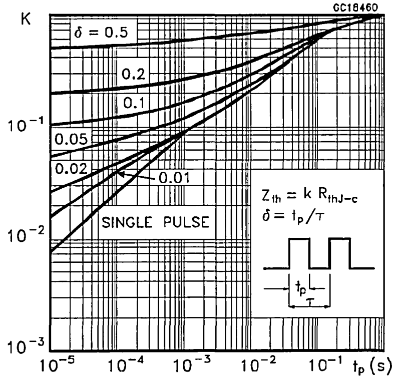
Safe Operating Area for TO-218 and TO-247



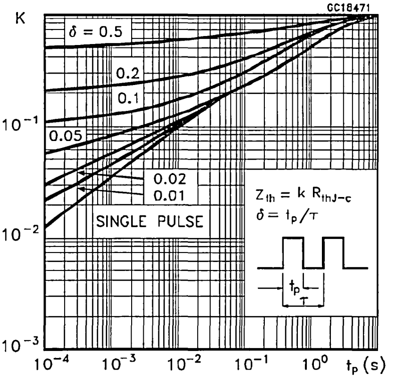
Safe Operating Area for ISOWATT218



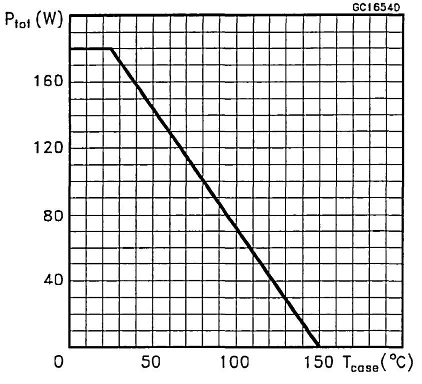
Thermal Impedance for TO-218 and TO-247



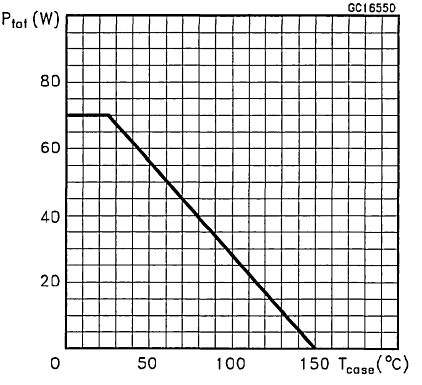
Thermal Impedance for ISOWATT218



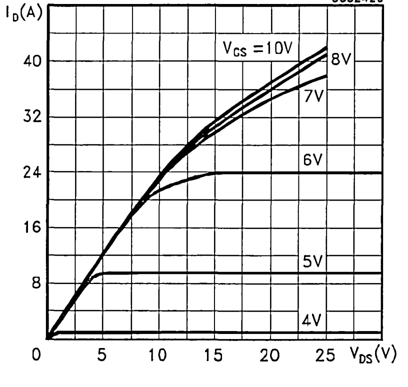
Derating Curve for TO-218 and TO-247



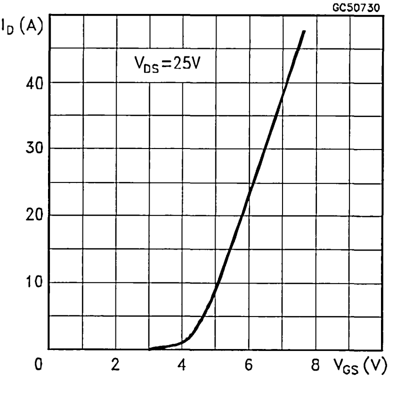
Derating Curve for ISOWATT218



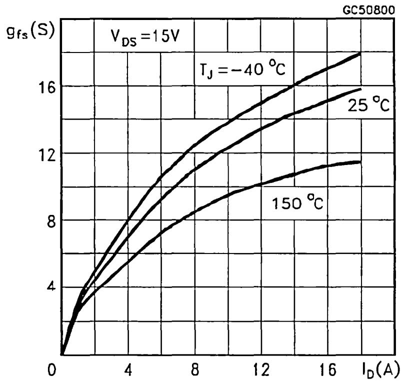
Output Characteristics



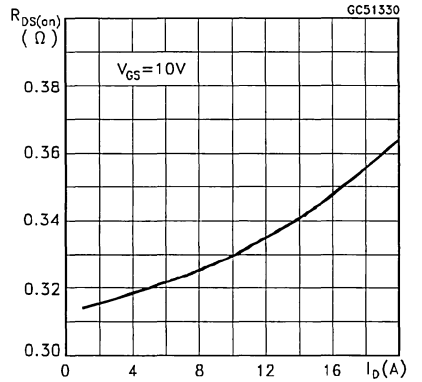
Transfer Characteristics



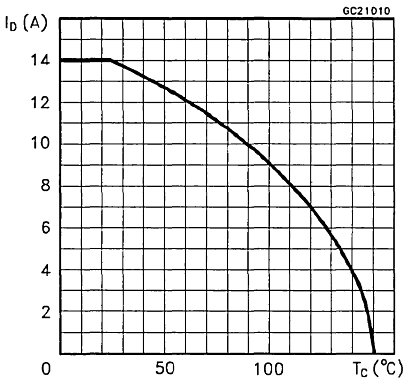
Transconductance



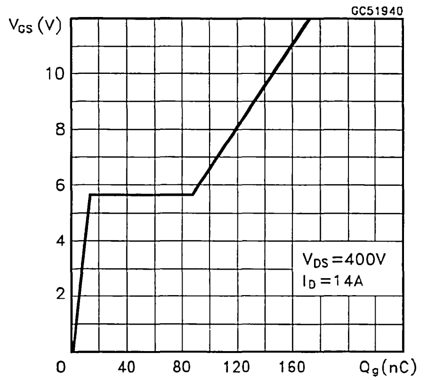
Static Drain-source On Resistance



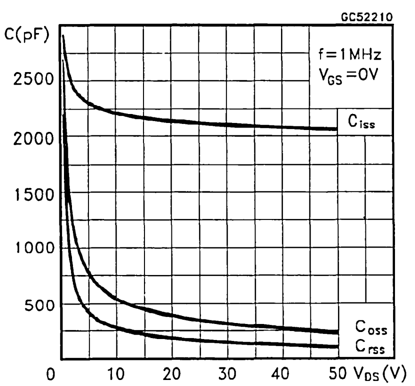
Maximum Drain Current vs Temperature



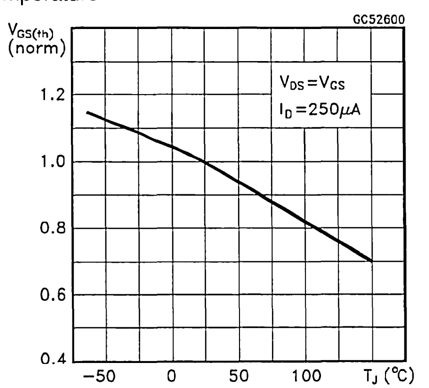
Gate Charge vs Gate-source Voltage



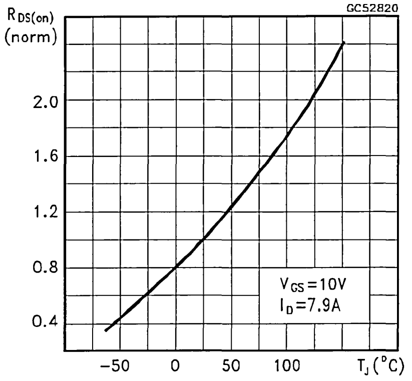
Capacitance Variations



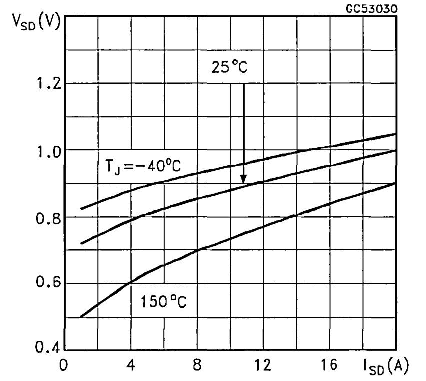
Normalized Gate Threshold Voltage vs Temperature



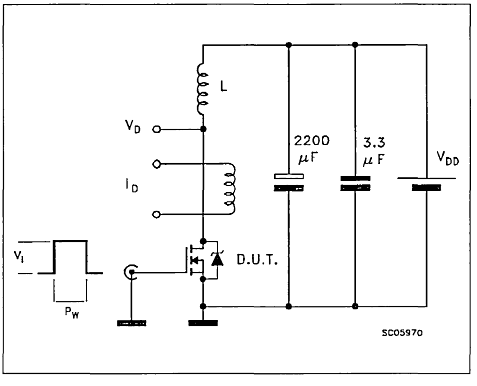
Normalized On Resistance vs Temperature



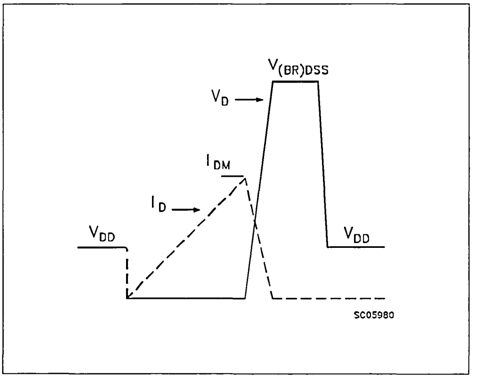
Source-drain Diode Forward Characteristics



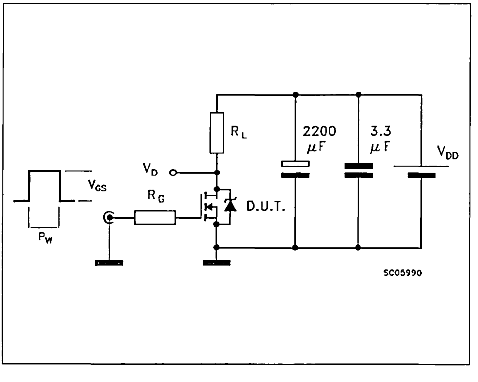
Unclamped Inductive Load Test Circuit



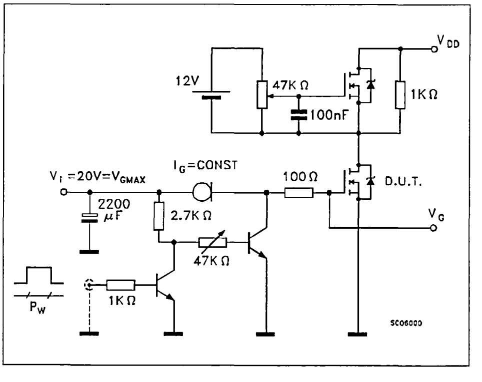
Unclamped Inductive Waveforms



Switching Time Test Circuit



Gate Charge Test Circuit



SGS-THOMSON MICROELECTRONICS

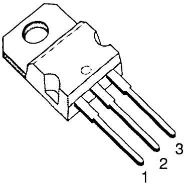
IRFZ40 IRFZ40FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

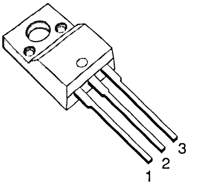
TYPE	V_{DSS}	$R_{DS(on)}$	I_D
IRFZ40	50 V	< 0.028 Ω	50 A
IRFZ40FI	50 V	< 0.028 Ω	27 A

- TYPICAL $R_{DS(on)}$ = 0.022 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

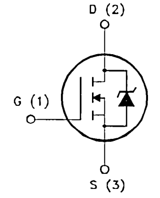


TO-220



ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		IRFZ40	IRFZ40FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50	50	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50	50	V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (cont.) at T_c = 25 °C	50	27	A
I_D	Drain Current (cont.) at T_c = 100 °C	35	19	A
I_{DM}(•)	Drain Current (pulsed)	200	200	A
P_{tot}	Total Dissipation at T_c = 25 °C	150	45	W
	Derating Factor	1	0.3	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case Max	1	3.33	°C/W
$R_{thj-amb}$ R_{thc-s} T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	50	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	400	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	100	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	35	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	50			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	2 9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 29$ A		0.022	0.028	Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	50			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 29$ A	17	22		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		1700 630 200	2200 850 260	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING RESISTIVE LOAD

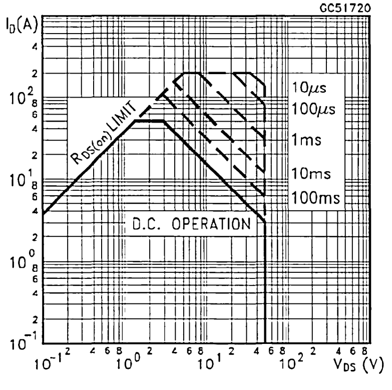
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	V_{DD} = 25 V I_D = 29 A		50	70	ns
t_r	Rise Time	R_G = 4.7 Ω V_{GS} = 10 V		110	160	ns
$t_{d(off)}$	Turn-off Delay Time	(see test circuit)		60	90	ns
t_f	Fall Time			25	35	ns
Q_g	Total Gate Charge	I_D = 64 A V_{GS} = 10 V		50	70	nC
Q_{gs}	Gate-Source Charge	V_{DD} = Max Rating x 0.8		15		nC
Q_{gd}	Gate-Drain Charge	(see test circuit)		27		nC

SOURCE DRAIN DIODE

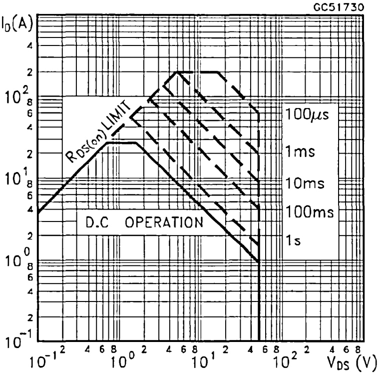
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				50	A
I_{SDM}(•)	Source-drain Current (pulsed)				200	A
V_{SD} (··)	Forward On Voltage	V_{GS} = 0 I_{SD} = 50 A			2	V
t_{rr}	Reverse Recovery Time	I_{SD} = 50 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C		150		ns
Q_{rr}	Reverse Recovery Charge			0.45		µC

(··) Pulsed Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

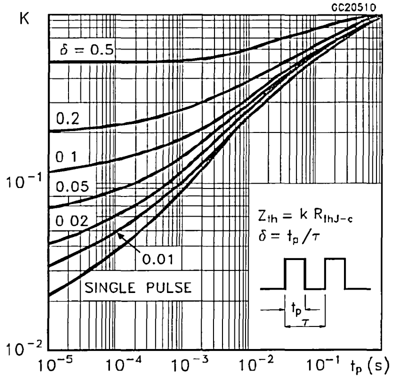
Safe Operating Area for TO-220



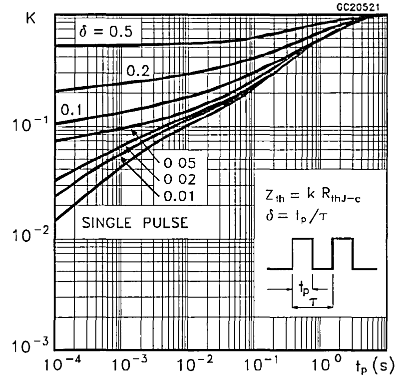
Safe Operating Area for ISOWATT220



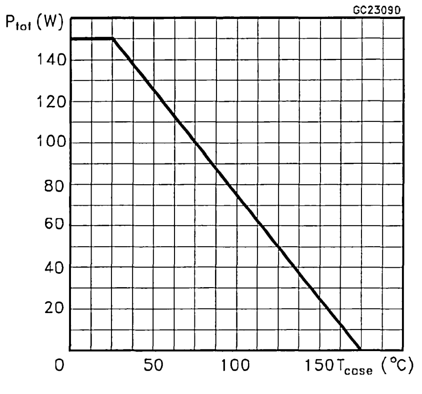
Thermal Impedance for TO-220



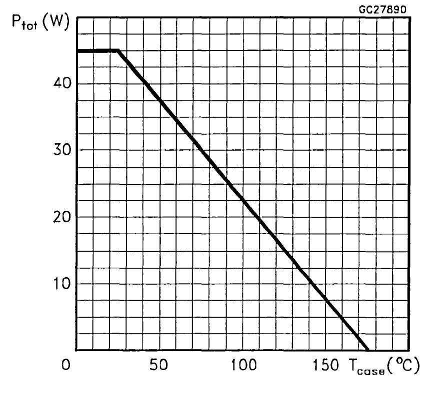
Thermal Impedance for ISOWATT220



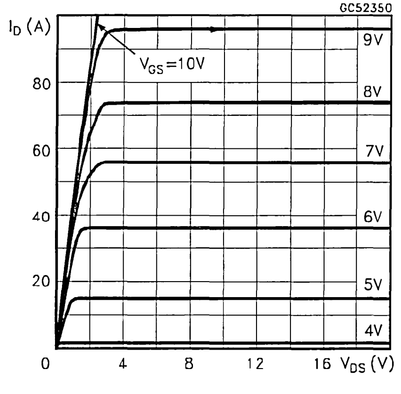
Derating Curve for TO-220



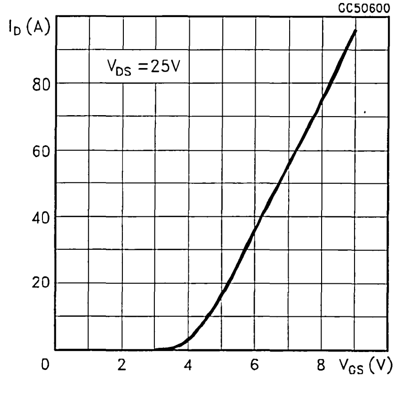
Derating Curve for ISOWATT220



Output Characteristics

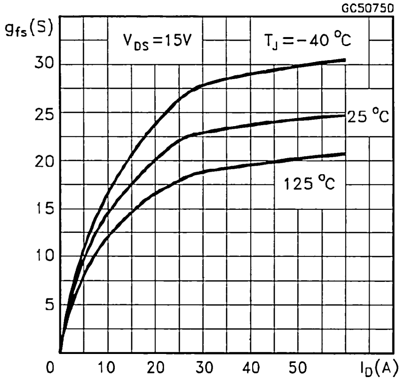


Transfer Characteristics

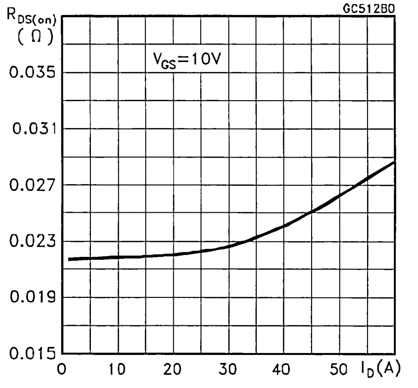


SGS-THOMSON MICROELECTRONICS

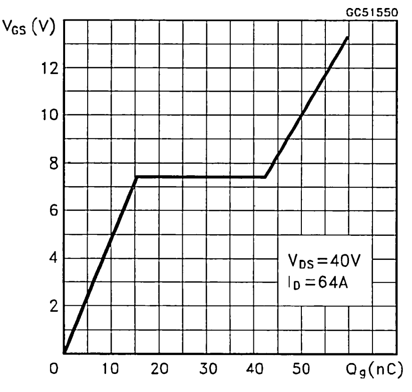
Transconductance



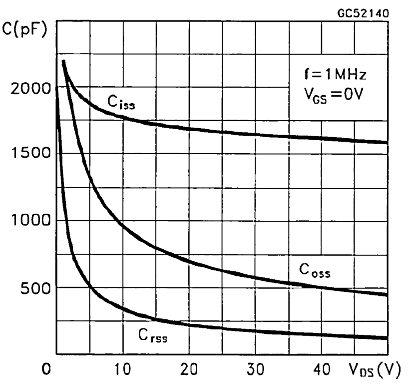
Static Drain-source On Resistance



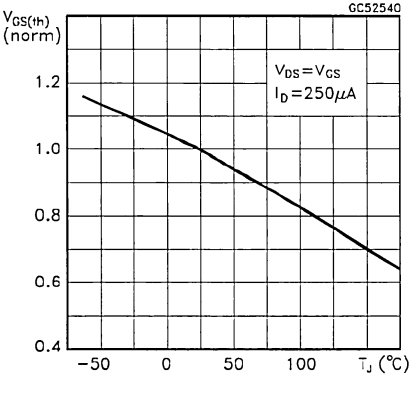
Gate Charge vs Gate-source Voltage



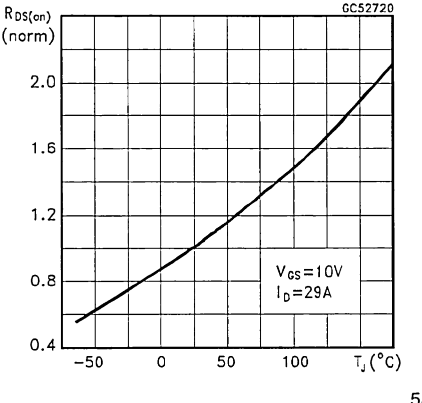
Capacitance Variations



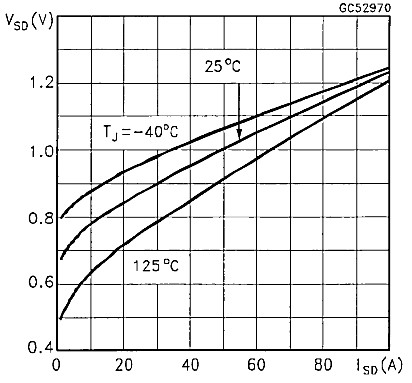
Normalized Gate Threshold Voltage vs Temperature



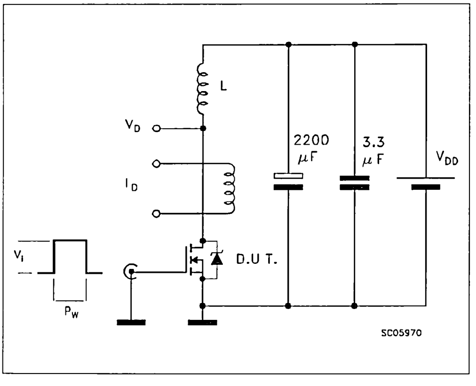
Normalized On Resistance vs Temperature



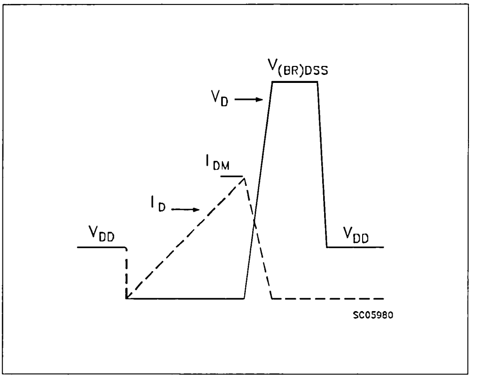
Source-drain Diode Forward Characteristics



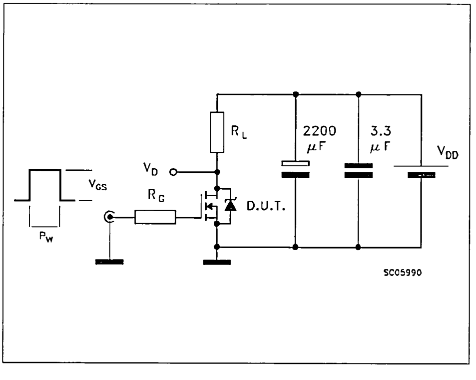
Unclamped Inductive Load Test Circuit



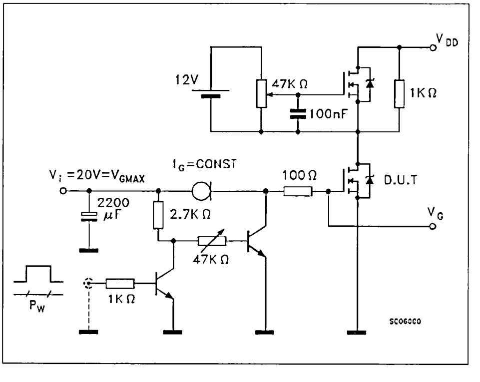
Unclamped Inductive Waveforms



Switching Time Test Circuit



Gate Charge Test Circuit



SGS-THOMSON MICROELECTRONICS

MTP3N60
MTP3N60FI

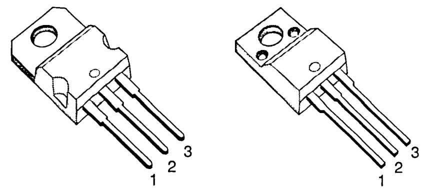
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
MTP3N60 MTP3N60FI	600 V 600 V	< 2.5 Ω < 2.5 Ω	3.9 A 2.5 A

- TYPICAL $R_{DS(on)}$ = 2 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

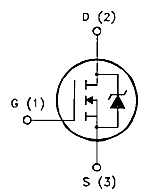
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



TO-220 ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		MTP3N60	MTP3N60FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	600		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	600		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	3.9	2.5	A
I_D	Drain Current (continuous) at T_c = 100 °C	2.4	1.5	A
I_{DM}(•)	Drain Current (pulsed)	14	14	A
P_{tot}	Total Dissipation at T_c = 25 °C	100	35	W
	Derating Factor	0.8	0.28	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.25	3.57	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Thermal Resistance Case-sink Maximum Lead Temperature For Soldering Purpose	Max Typ 	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	3.9	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	300	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	7.7	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	2.4	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	600			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			200 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 1 mA	2	3	4.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 1.5 A V_{GS} = 10V I_D = 1.5 A T_c = 100°C		2	2.5 5	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	3.9			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 1.5 A	1.5	2.6		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		560 90 40	800 130 55	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 225 V I_D = 2.5 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 3)		45 33	60 42	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 480 V I_D = 4 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 5)		200		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 480 V I_D = 4 A V_{GS} = 10 V		43 6 21	55	nC nC nC

SWITCHING OFF

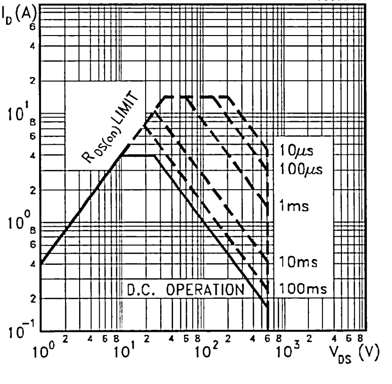
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 480 V I_D = 4 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 5)		35 40 60	45 55 75	ns ns ns

SOURCE DRAIN DIODE

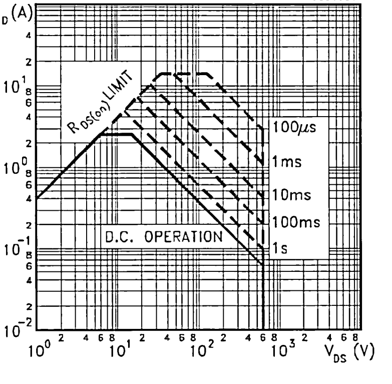
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				3.9 14	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 3.9 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 4 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		420 3.7 18		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

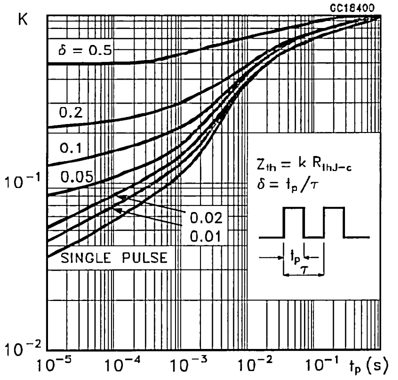
Safe Operating Areas For TO-220



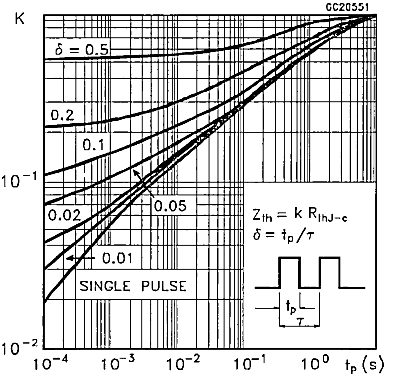
Safe Operating Areas For ISOWATT220



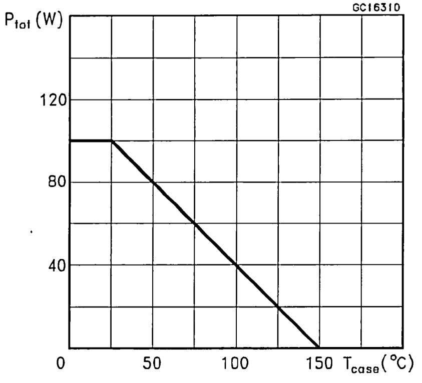
Thermal Impedeance For TO-220



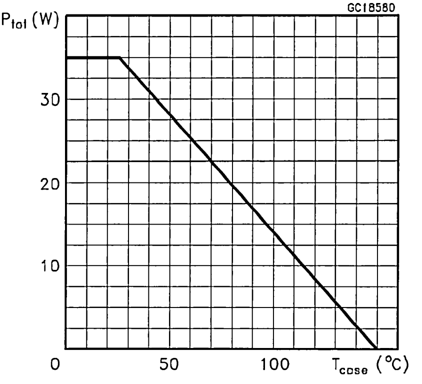
Thermal Impedance For ISOWATT220



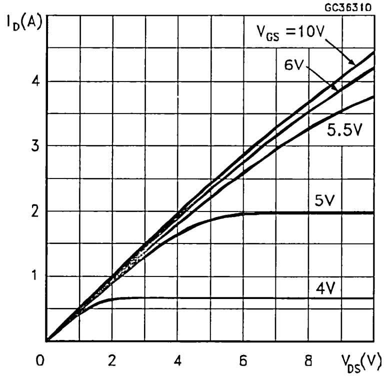
Derating Curve For TO-220



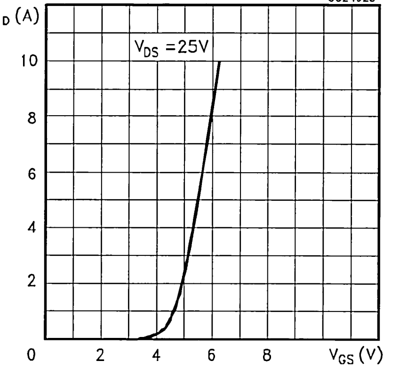
Derating Curve For ISOWATT220



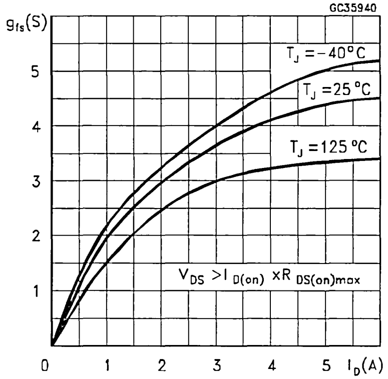
Output Characteristics



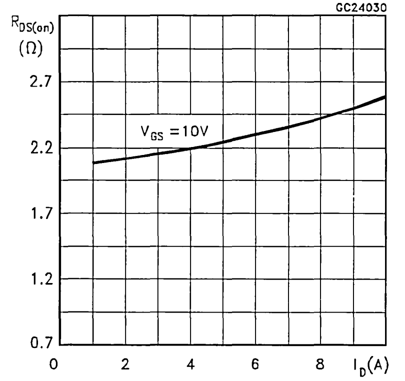
Transfer Characteristics



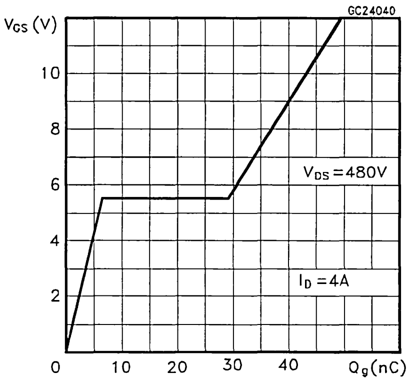
Transconductance



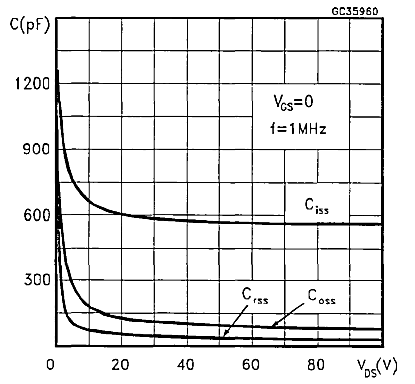
Static Drain-source On Resistance



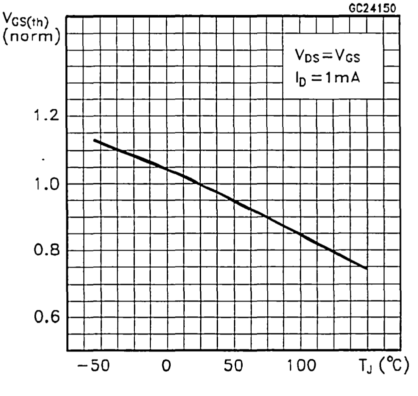
Gate Charge vs Gate-source Voltage



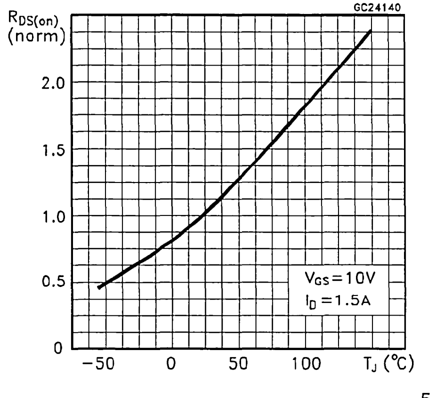
Capacitance Variations



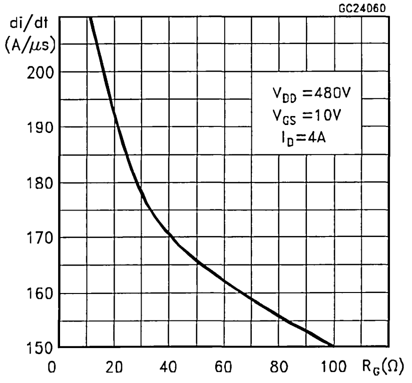
Normalized Gate Threshold Voltage vs Temperature



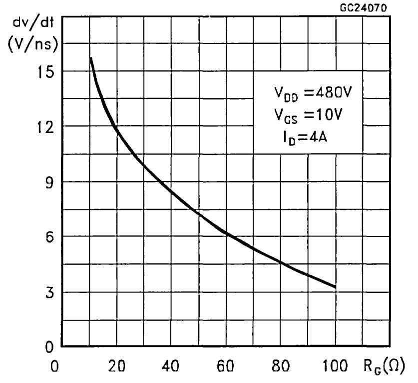
Normalized On Resistance vs Temperature



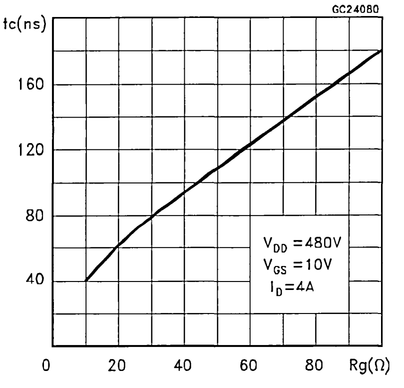
Turn-on Current Slope



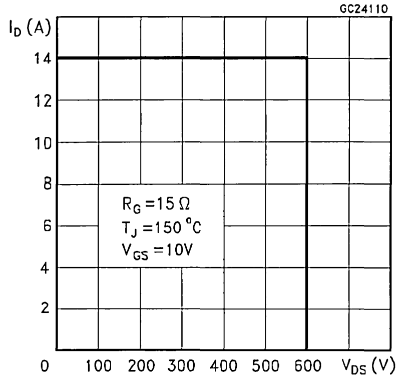
Turn-off Drain-source Voltage Slope



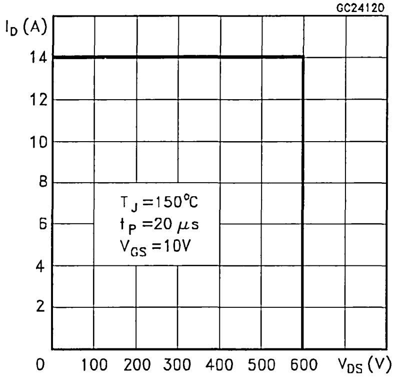
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

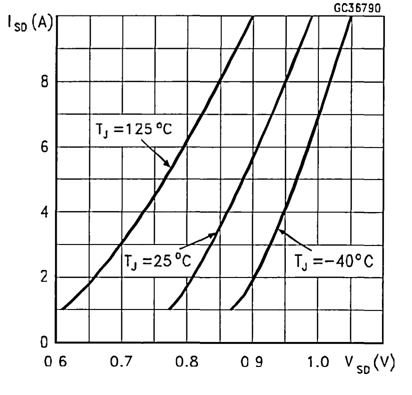


Fig. 1: Unclamped Inductive Load Test Circuits

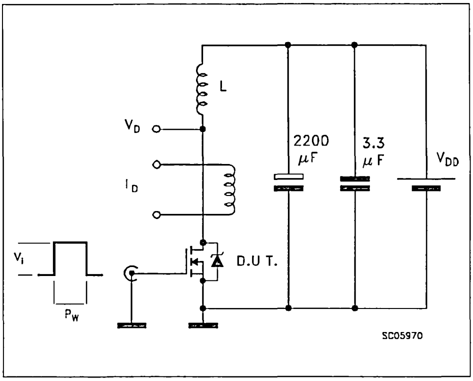


Fig. 2: Unclamped Inductive Waveforms

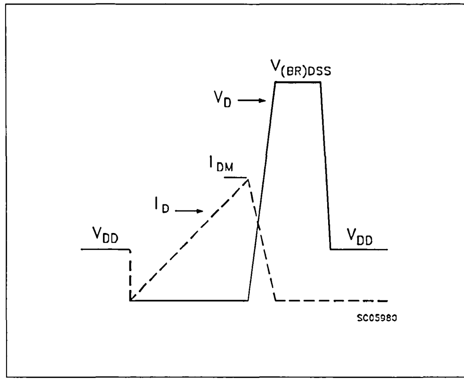


Fig. 3: Switching Times Test Circuits For Resistive Load

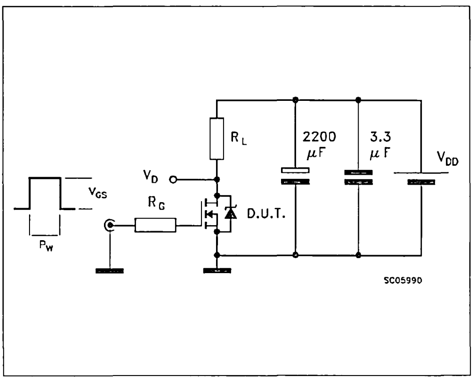


Fig. 4: Gate Charge Test Circuit

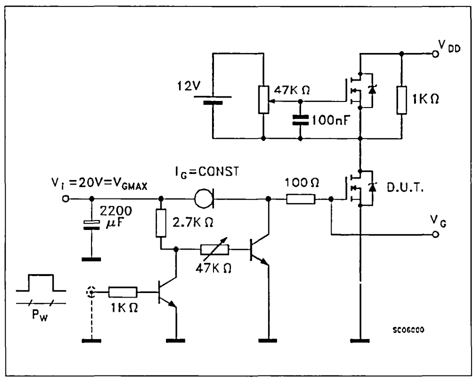
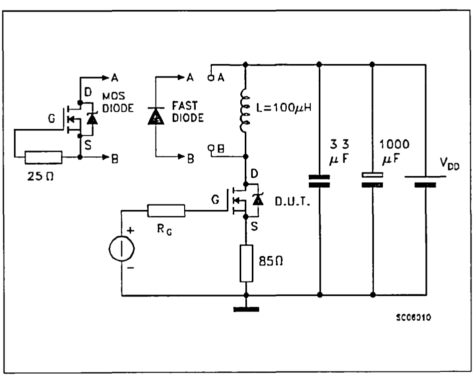


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



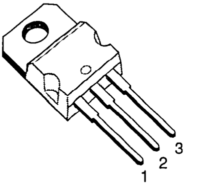
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
MTP6N60	600 V	< 1.2 Ω	6.8 A

- TYPICAL $R_{DS(on)}$ = 1 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

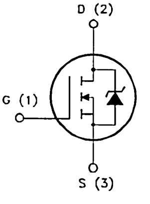
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



TO-220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	600	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	600	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	6.8	A
I_D	Drain Current (continuous) at T_c = 100 °C	4.2	A
I_{DM}(•)	Drain Current (pulsed)	30	A
P_{tot}	Total Dissipation at T_c = 25 °C	125	W
	Derating Factor	1	W/°C
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	°C/W
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.5	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	6.8	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	460	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	21	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	4.2	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	600			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			200 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 1 mA	2	3.1	4.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 3 A V_{GS} = 10V I_D = 3 A T_c = 100°C		1	1.2 2.4	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	6.8			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 3 A	2	4.8		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1150 160 75	1500 240 110	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 300 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		50 140	65 175	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 480 V I_D = 6 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		240		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 480 V I_D = 6 A V_{GS} = 10 V		78 8 41	98	nC nC nC

SWITCHING OFF

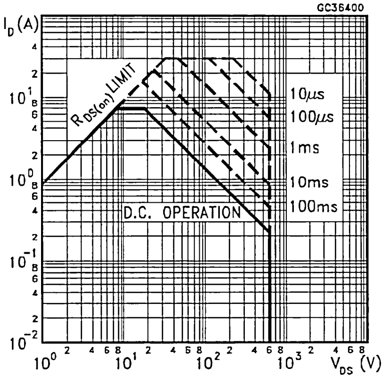
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 480 V I_D = 6 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		100 27 145	125 34 180	ns ns ns

SOURCE DRAIN DIODE

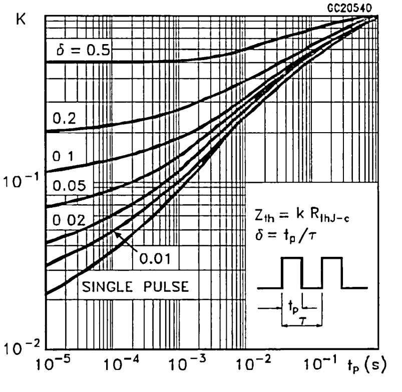
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				3.8 24	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 6 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 6 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		750 13.5 38		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

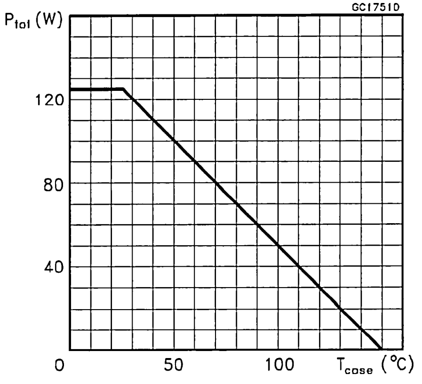
Safe Operating Area



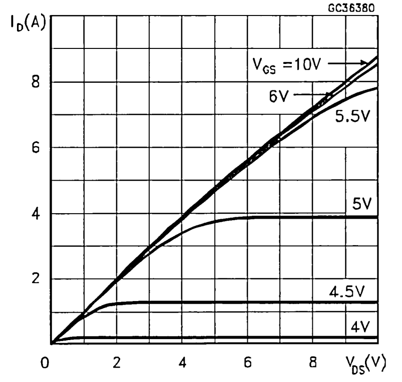
Thermal Impedance



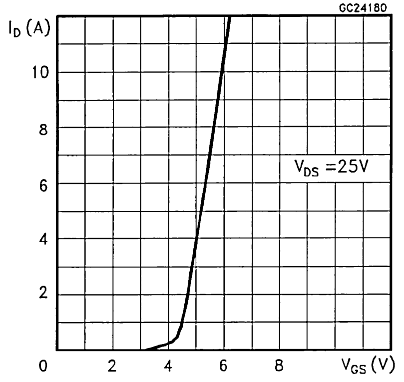
Derating Curve



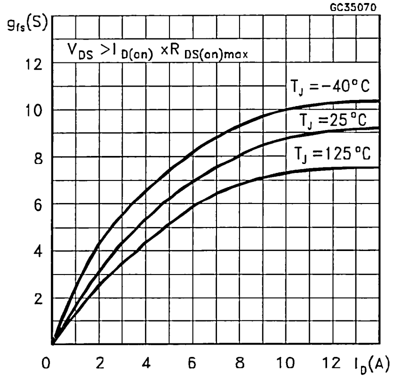
Output Characteristics



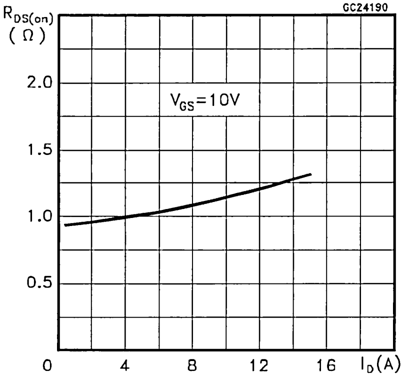
Transfer Characteristics



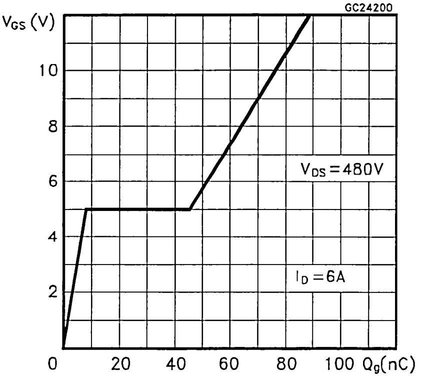
Transconductance



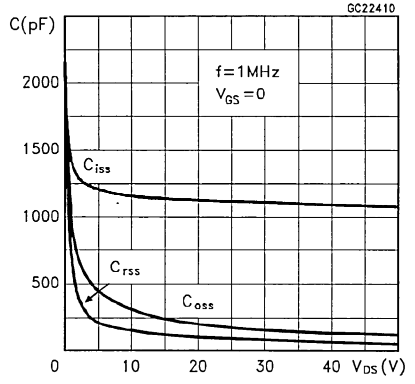
Static Drain-source On Resistance



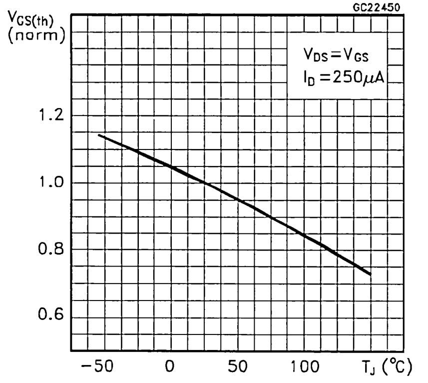
Gate Charge vs Gate-source Voltage



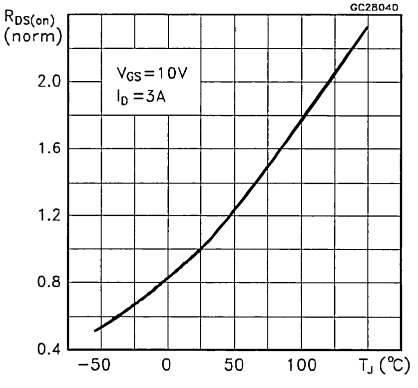
Capacitance Variations



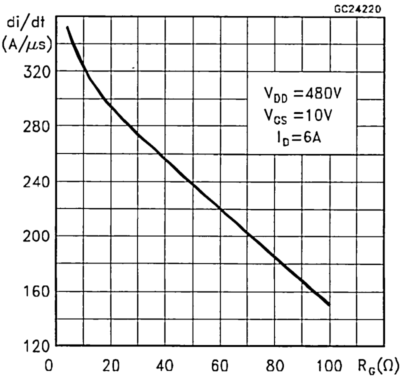
Normalized Gate Threshold Voltage vs Temperature



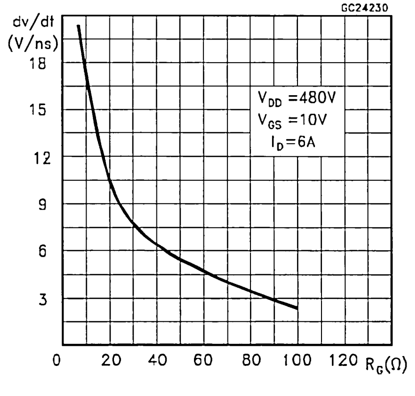
Normalized On Resistance vs Temperature



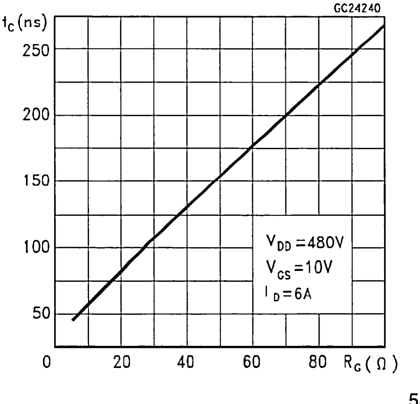
Turn-on Current Slope



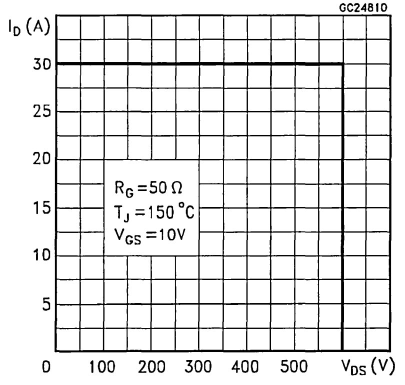
Turn-off Drain-source Voltage Slope



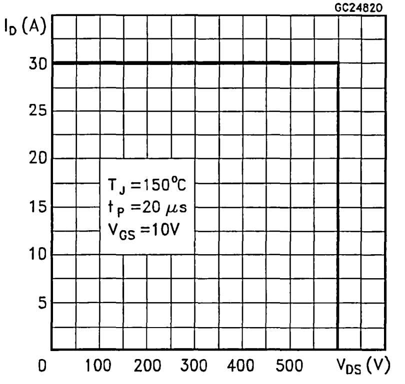
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

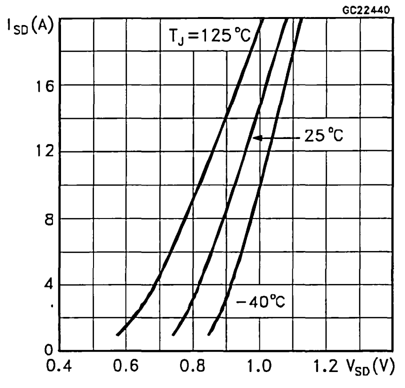


Fig. 1: Unclamped Inductive Load Test Circuits

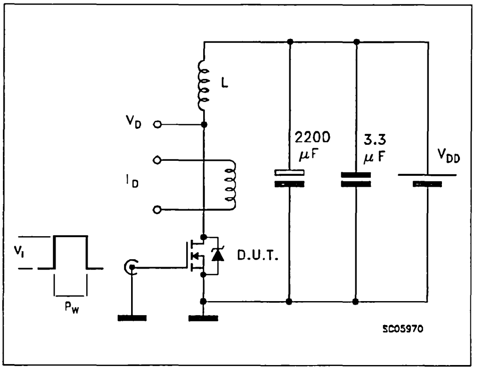


Fig. 2: Unclamped Inductive Waveforms

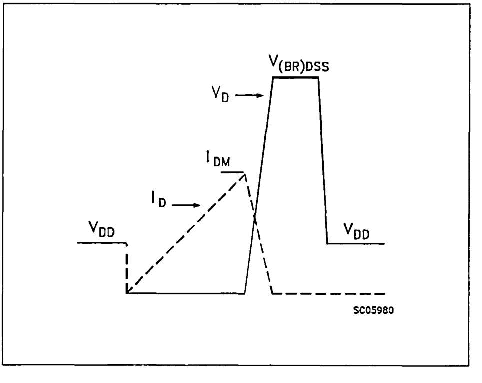


Fig. 3: Switching Times Test Circuits For Resistive Load

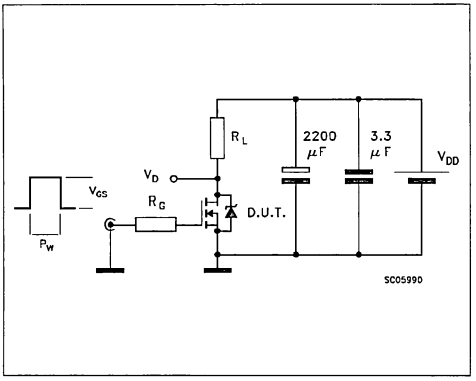


Fig. 4: Gate Charge Test Circuit

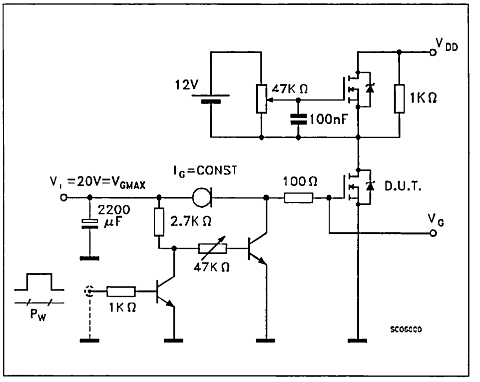
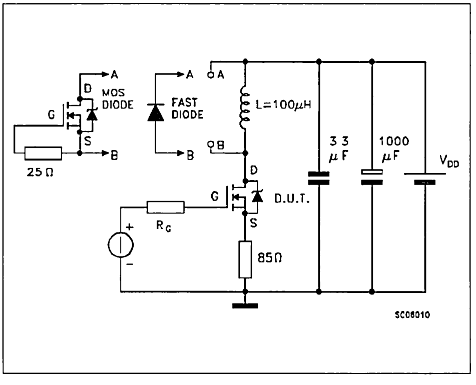


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



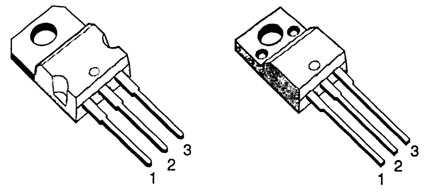
SGS-THOMSON MICROELECTRONICS

MTP3055E
MTP3055EFI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
MTP3055E	60 V	< 0.15 Ω	14 A
MTP3055EFI	60 V	< 0.15 Ω	10 A

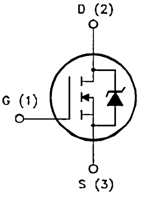
- TYPICAL $R_{DS(on)}$ = 0.1 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION



TO-220 ISOWATT220

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		MTP3055E	MTP3055EFI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	60		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	60		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (cont.) at T_c = 25 °C	14	10	A
I_D	Drain Current (cont.) at T_c = 100 °C	10	7	A
I_{DM}(•)	Drain Current (pulsed)	56	56	A
P_{tot}	Total Dissipation at T_c = 25 °C	70	35	W
	Derating Factor	0.47	0.23	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case Max	2.14	4.29	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient Max	62.5		°C/W
$R_{thc\text{-}s}$	Thermal Resistance Case-sink Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	14	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	40	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	10	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	10	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	60			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			50 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 7 A		0.1	0.15	Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	14			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 7 A	3	6		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		330 150 40	450 250 60	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING RESISTIVE LOAD

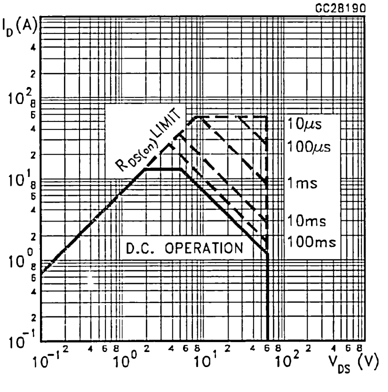
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on Time Rise Time Turn-off Delay Time Fall Time	V_{DD} = 25 V I_D = 7 A R_G = 50 Ω V_{GS} = 10 V (see test circuit)		45 90 40 40	65 130 60 60	ns ns ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	I_D = 14 A V_{GS} = 10 V V_{DD} = 40 V (see test circuit)		15 7 5	25	nC nC nC

SOURCE DRAIN DIODE

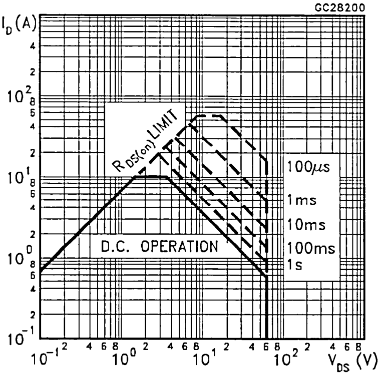
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				14 56	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 14 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr}	Reverse Recovery Time Reverse Recovery Charge	I_{SD} = 14 A di/dt = 100 A/μs V_{DD} = 25 V T_j = 150 °C		60 0.12		ns μC

(*) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

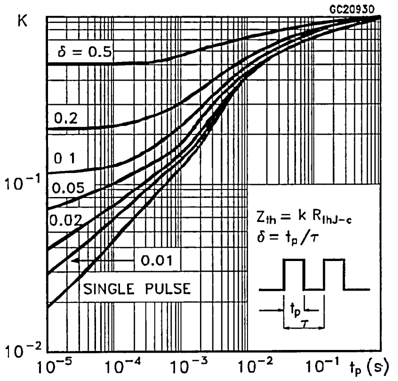
Safe Operating Area for TO-220



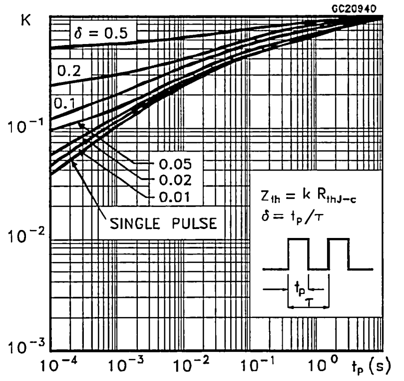
Safe Operating Area for ISOWATT220



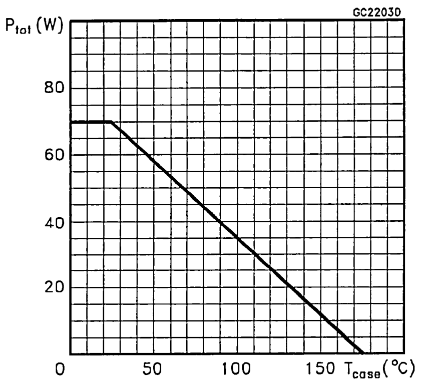
Thermal Impedance for TO-220



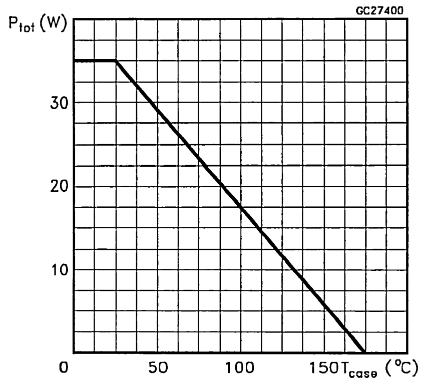
Thermal Impedance for ISOWATT220



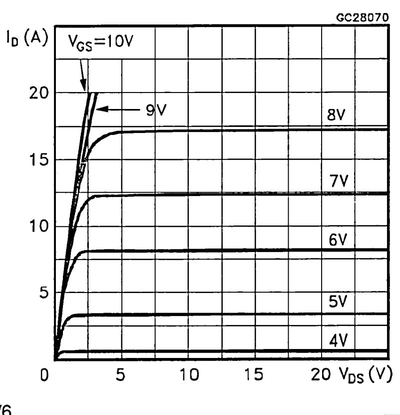
Derating Curve for TO-220



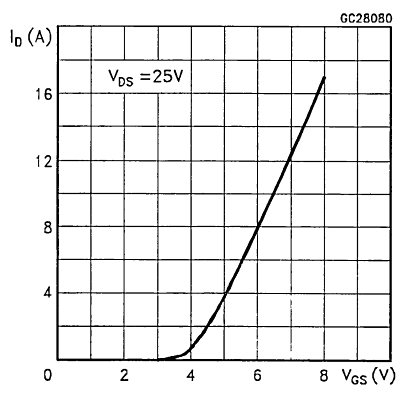
Derating Curve for ISOWATT220



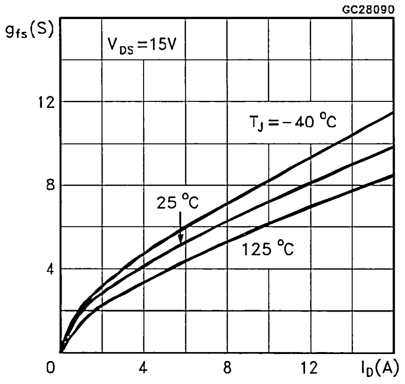
Output Characteristics



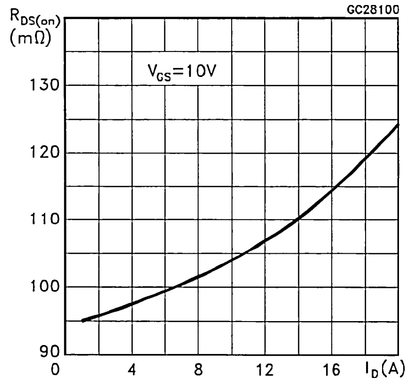
Transfer Characteristics



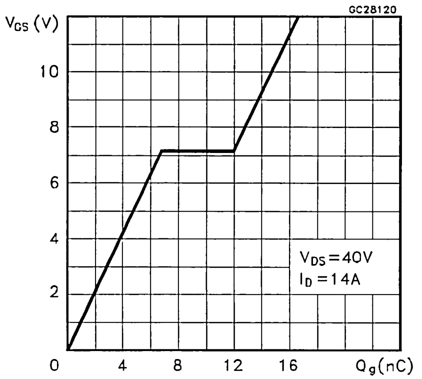
Transconductance



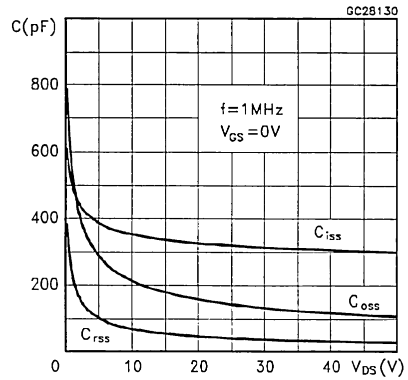
Static Drain-source On Resistance



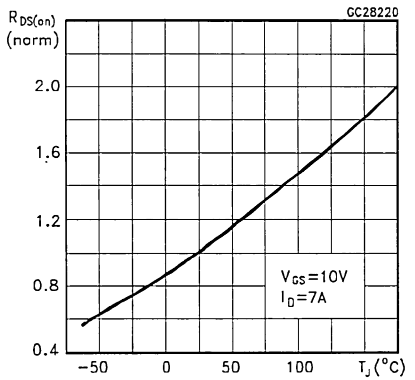
Gate Charge vs Gate-source Voltage



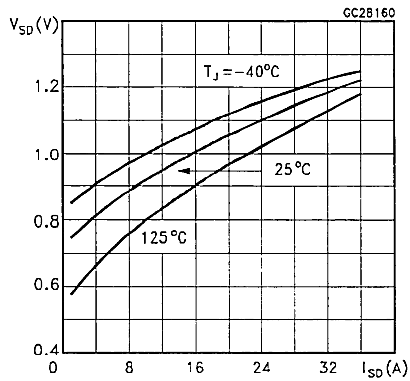
Capacitance Variations



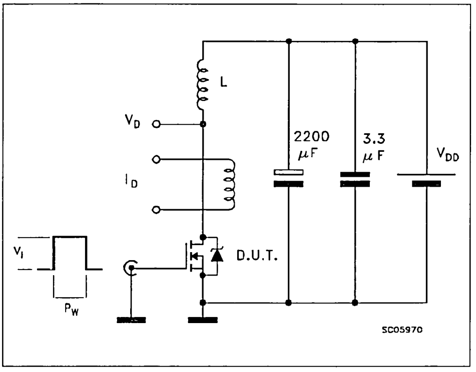
Normalized On Resistance vs Temperature



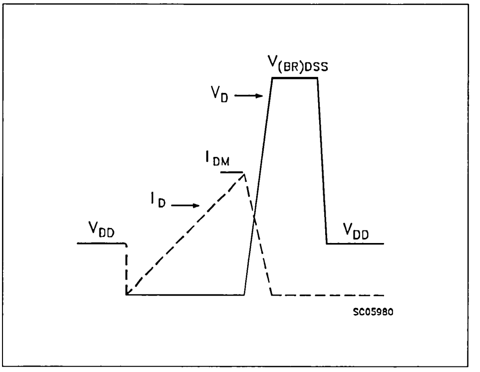
Source-drain Diode Forward Characteristics



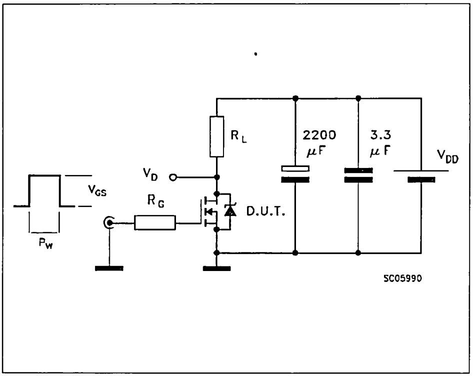
Unclamped Inductive Load Test Circuit



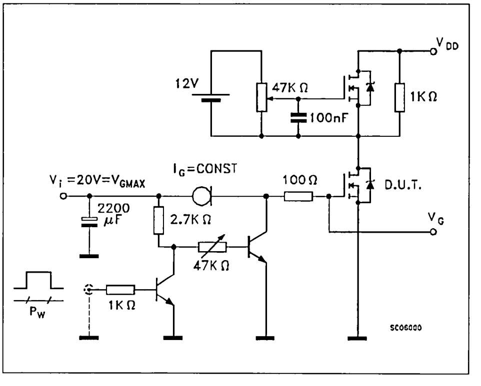
Unclamped Inductive Waveforms



Switching Time Test Circuit



Gate Charge Test Circuit



SGS-THOMSON
MICROELECTRONICS

STE15N100

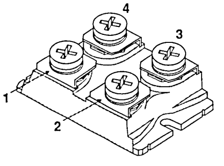
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR IN ISOTOP PACKAGE

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STE15N100	1000 V	< 0.77 Ω	15 A

- HIGH CURRENT POWER MODULE
- AVALANCHE RUGGED TECHNOLOGY (SEE STH6N100 FOR RATING)
- VERY LARGE SOA - LARGE PEAK POWER CAPABILITY
- EASY TO MOUNT
- SAME CURRENT CAPABILITY FOR THE TWO SOURCE TERMINALS
- EXTREMELY LOW R_{th} JUNCTION TO CASE
- VERY LOW DRAIN TO CASE CAPACITANCE
- VERY LOW INTERNAL PARASITIC INDUCTANCE (TYPICALLY < 5 nH)
- ISOLATED PACKAGE UL RECOGNIZED (FILE No E81743)

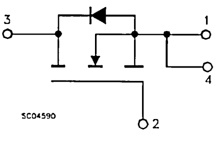
INDUSTRIAL APPLICATIONS:

- SMPS & UPS
- MOTOR CONTROL
- WELDING EQUIPMENT
- OUTPUT STAGE FOR PWM, ULTRASONIC CIRCUITS



ISOTOP

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage (V_{GS} = 0)	1000	V
V_{DGR}	Drain-Gate Voltage (R_{GS} = 20 kΩ)	1000	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	15	A
I_D	Drain Current (continuous) at T_c = 100 °C	9.5	A
I_{DM}(•)	Drain Current (pulsed)	60	A
P_{tot}	Total Dissipation at T_c = 25 °C	400	W
	Derating Factor	3.2	W/°C
T_{stg}	Storage Temperature	-55 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C
V_{ISO}	Insulation Withstand Voltage (AC-RMS)	2500	V

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$ R_{thc-h}	Thermal Resistance Junction-case Thermal Resistance Case-heatsink With Conductive Grease Applied	Max Max	0.31 0.05	°C/W °C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 1 mA V_{GS} = 0 V	1000			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			500 1.5	μA mA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 300	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS} I_D = 1 mA	2		4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 9 A			0.77	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	V_{DS} = 15 V I_D = 9 A	8			S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0 V			7 850 250	nF pF pF

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 500 V I_D = 9 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 1)		65 78		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 800 V I_D = 15 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		570		A/μs
Q_g	Total Gate Charge	V_{DD} = 800 V I_D = 15 A V_{GS} = 10 V		375		nC

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING OFF

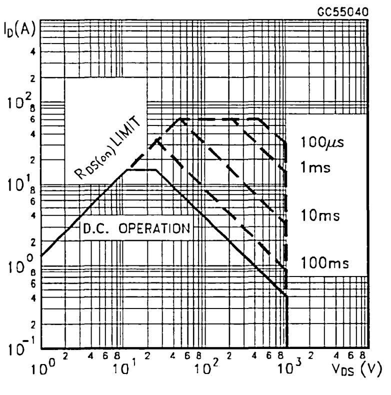
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 800 V I_D = 15 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		75 18 105	95 25 136	ns ns ns

SOURCE DRAIN DIODE

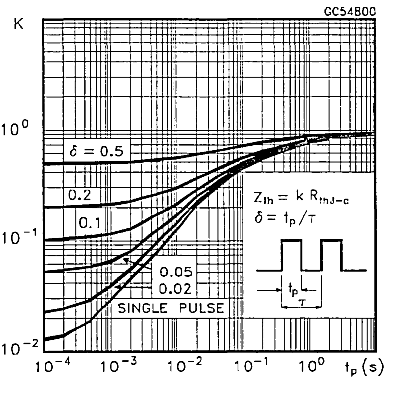
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				15 60	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 15 A V_{GS} = 0			2.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 15 A di/dt = 100 A/μs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 3)		1150 30 52		ns μC A

(*) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

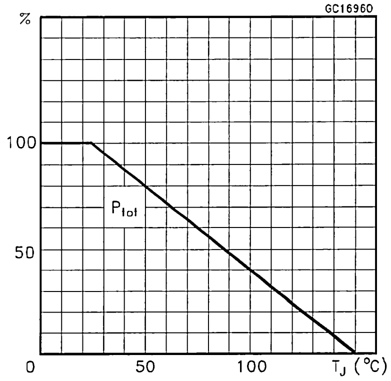
Safe Operating Area



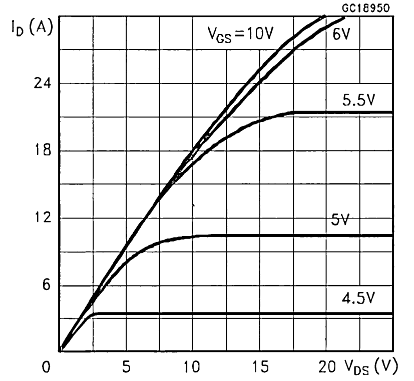
Thermal Impedance



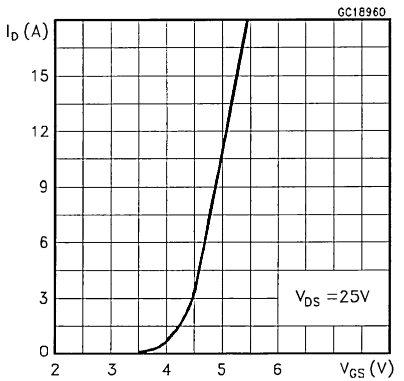
Derating Curve



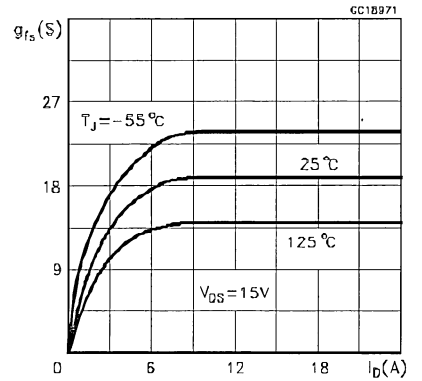
Output Characteristics



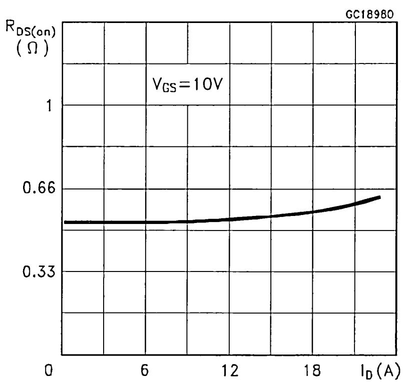
Transfer Characteristics



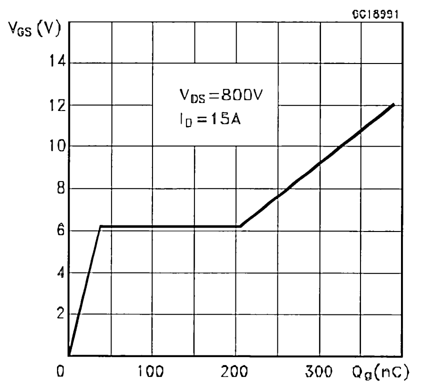
Transconductance



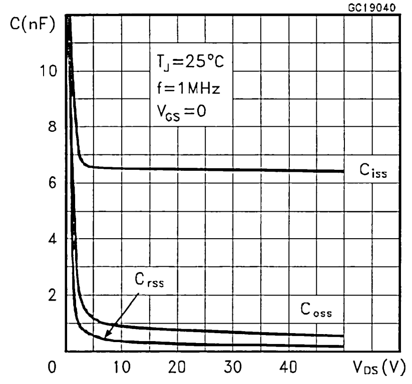
Static Drain-source On Resistance



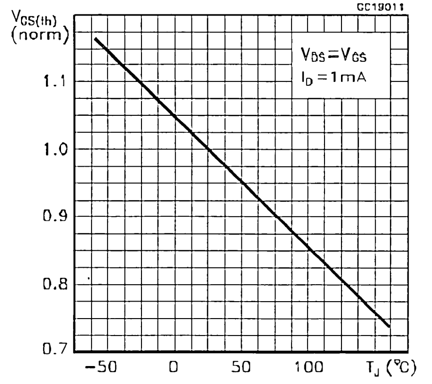
Gate Charge vs Gate-source Voltage



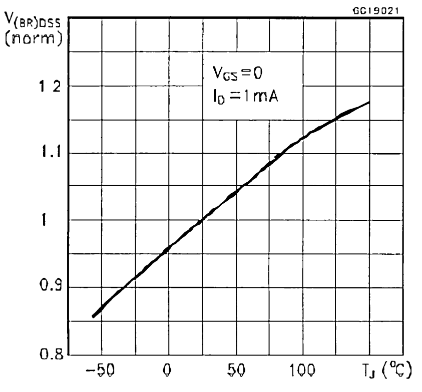
Capacitance Variations



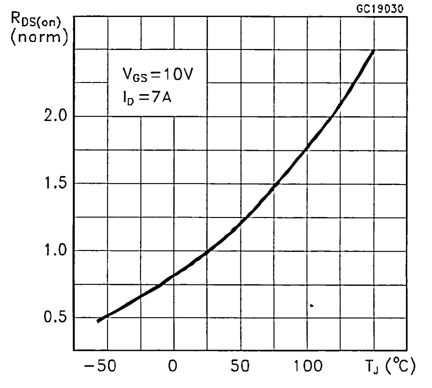
Normalized Gate Threshold Voltage vs Temperature



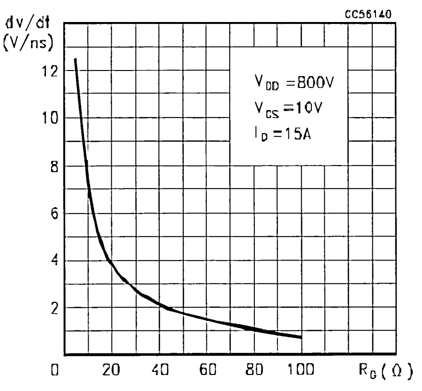
Normalized Breakdown Voltage vs Temperature



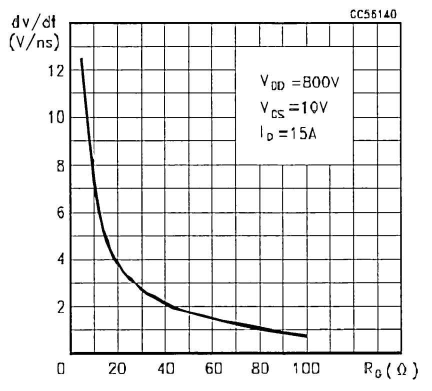
Normalized On Resistance vs Temperature



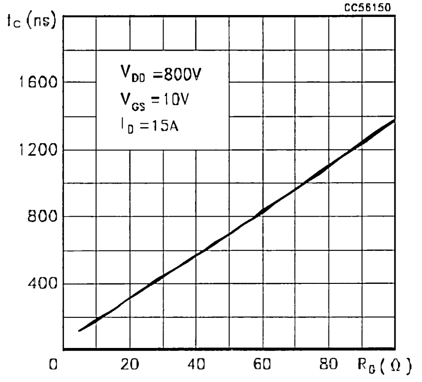
Turn-on Current Slope



Turn-off Drain-source Voltage Slope



Cross-over Time



Source-drain Diode Forward Characteristics

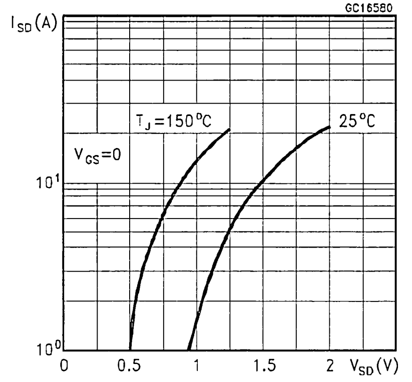


Fig. 1: Switching Times Test Circuits For Resistive Load

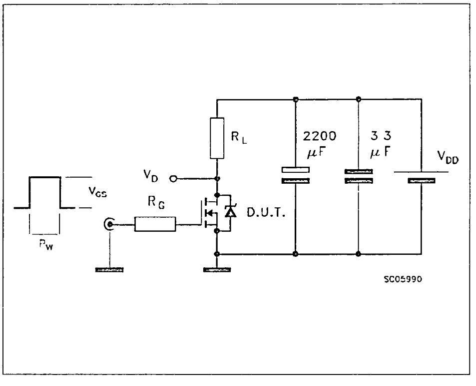


Fig. 2: Gate Charge Test Circuit

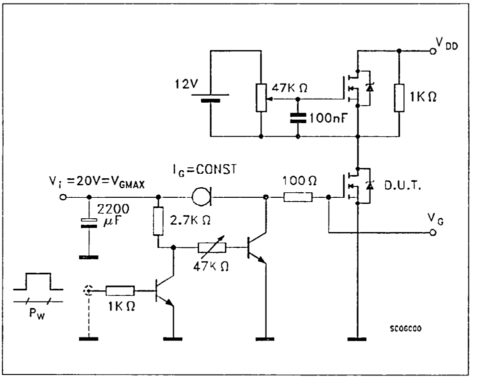
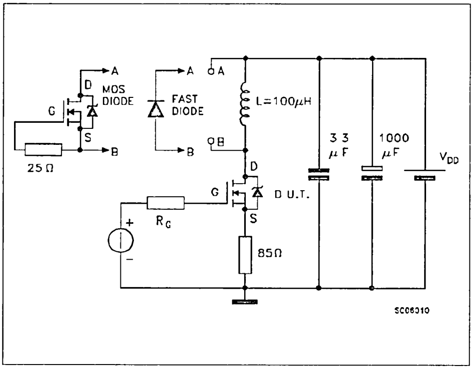


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON
MICROELECTRONICS

STE16N100

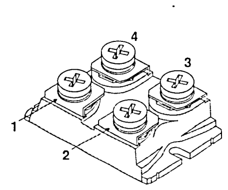
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR IN ISOTOP PACKAGE

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STE16N100	1000 V	< 0.7 Ω	16 A

- HIGH CURRENT POWER MODULE
- AVALANCHE RUGGED TECHNOLOGY (SEE STH6N100 FOR RATING)
- VERY LARGE SOA - LARGE PEAK POWER CAPABILITY
- EASY TO MOUNT
- SAME CURRENT CAPABILITY FOR THE TWO SOURCE TERMINALS
- EXTREMELY LOW R_{th} JUNCTION TO CASE
- VERY LOW DRAIN TO CASE CAPACITANCE
- VERY LOW INTERNAL PARASITIC INDUCTANCE (TYPICALLY < 5 nH)
- ISOLATED PACKAGE UL RECOGNIZED (FILE No E81743)

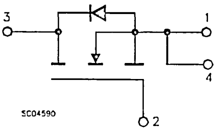
INDUSTRIAL APPLICATIONS:

- SMPS & UPS
- MOTOR CONTROL
- WELDING EQUIPMENT
- OUTPUT STAGE FOR PWM, ULTRASONIC CIRCUITS



ISOTOP

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage (V_{GS} = 0)	1000	V
V_{DGR}	Drain-Gate Voltage (R_{GS} = 20 kΩ)	1000	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	16	A
I_D	Drain Current (continuous) at T_c = 100 °C	10	A
I_{DM}(•)	Drain Current (pulsed)	64	A
P_{tot}	Total Dissipation at T_c = 25 °C	400	W
	Derating Factor	3.2	W/°C
T_{stg}	Storage Temperature	-55 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C
V_{ISO}	Insulation Withstand Voltage (AC-RMS)	2500	V

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$ R_{thc-h}	Thermal Resistance Junction-case Thermal Resistance Case-heatsink With Conductive Grease Applied	Max Max	0.31 0.05	°C/W °C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 1 mA V_{GS} = 0 V	1000			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			300 1.5	µA mA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 300	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS} I_D = 1 mA	2		4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 9 A			0.7	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	V_{DS} = 15 V I_D = 9 A	8			S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0 V			7 850 250	nF pF pF

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 500 V I_D = 9 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 1)		65 78		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 800 V I_D = 16 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		570		A/µs
Q_g	Total Gate Charge	V_{DD} = 800 V I_D = 16 A V_{GS} = 10 V		375		nC

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING OFF

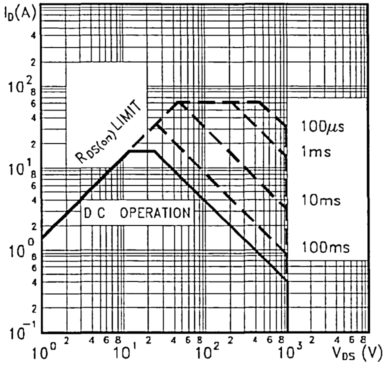
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 800 V I_D = 16 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		75 20 112	95 28 144	ns ns ns

SOURCE DRAIN DIODE

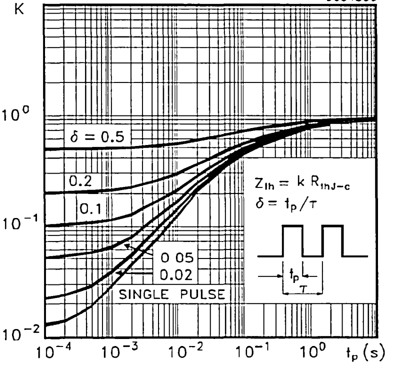
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				16 64	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 16 A V_{GS} = 0			2.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 16 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 3)		1250 37 59		ns µC A

(*) Pulsed Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

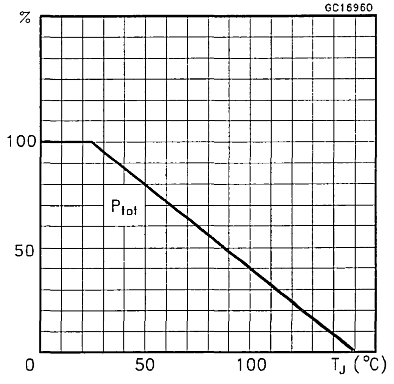
Safe Operating Area



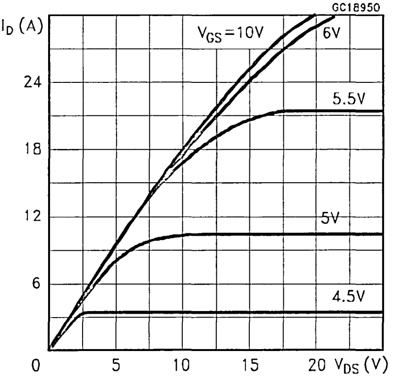
Thermal Impedance



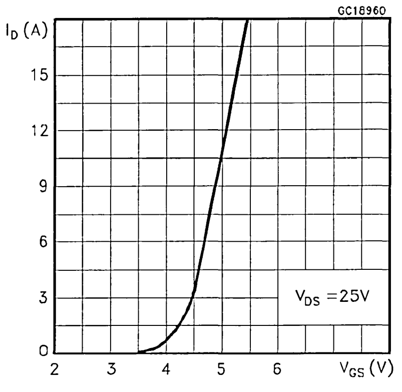
Derating Curve



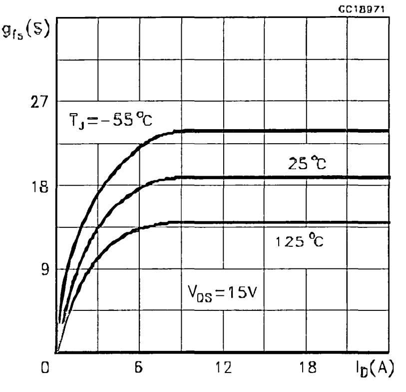
Output Characteristics



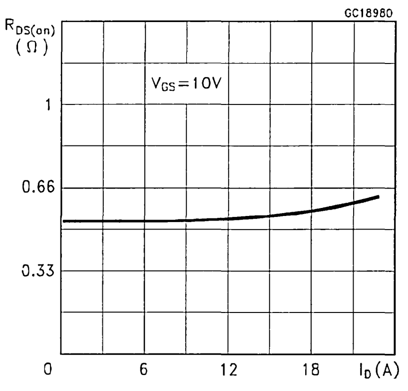
Transfer Characteristics



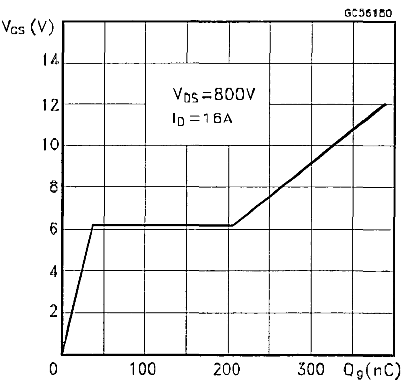
Transconductance



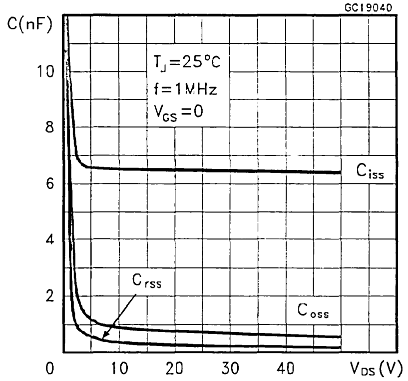
Static Drain-source On Resistance



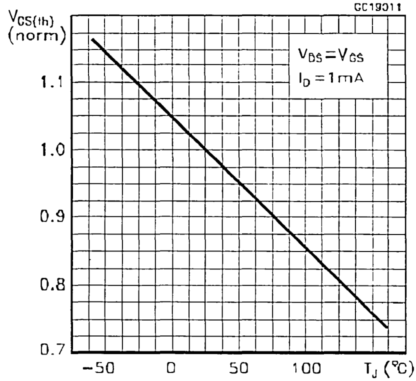
Gate Charge vs Gate-source Voltage



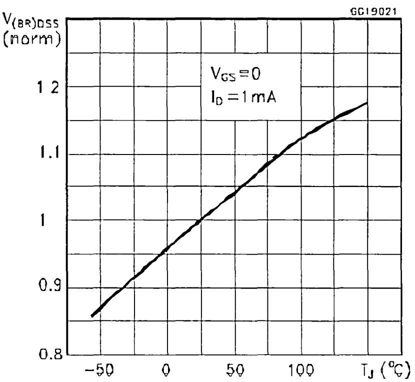
Capacitance Variations



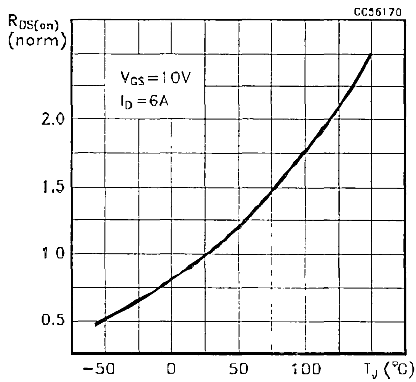
Normalized Gate Threshold Voltage vs Temperature



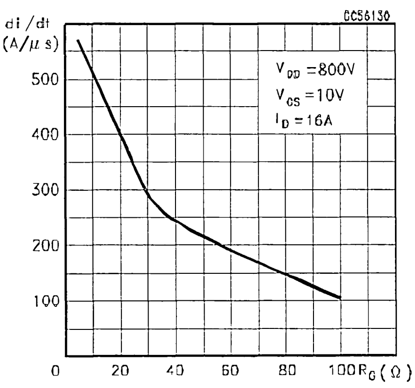
Normalized Breakdown Voltage vs Temperature



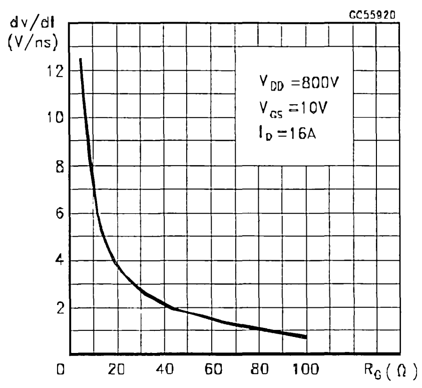
Normalized On Resistance vs Temperature



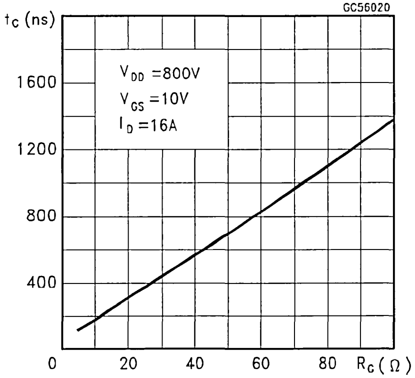
Turn-on Current Slope



Turn-off Drain-source Voltage Slope



Cross-over Time



Source-drain Diode Forward Characteristics

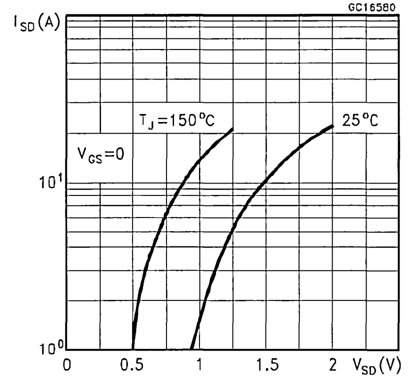


Fig. 1: Switching Times Test Circuits For Resistive Load

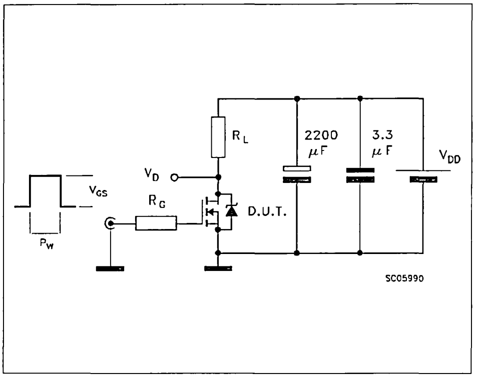


Fig. 2: Gate Charge Test Circuit

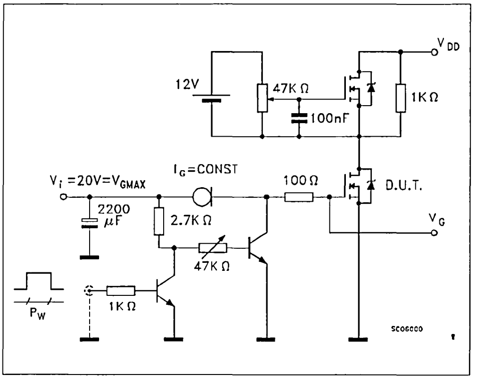
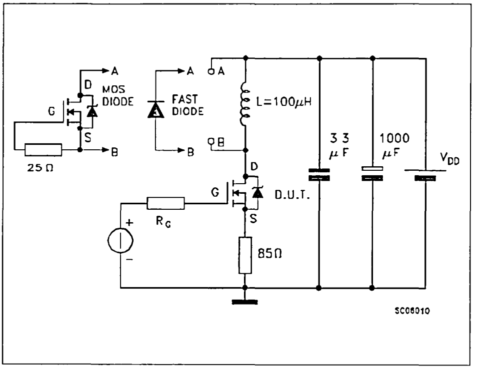


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times



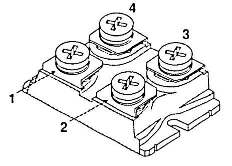
STE22N80

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR IN ISOTOP PACKAGE

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STE22N80	800 V	< 0.4 Ω	22 A

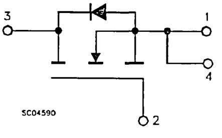
- HIGH CURRENT POWER MODULE
- AVALANCHE RUGGED TECHNOLOGY (SEE STH8N80 FOR RATING)
- VERY LARGE SOA - LARGE PEAK POWER CAPABILITY
- EASY TO MOUNT
- SAME CURRENT CAPABILITY FOR THE TWO SOURCE TERMINALS
- EXTREMELY LOW R_{th} JUNCTION TO CASE
- VERY LOW DRAIN TO CASE CAPACITANCE
- VERY LOW INTERNAL PARASITIC INDUCTANCE (TYPICALLY < 5 nH)
- ISOLATED PACKAGE UL RECOGNIZED (FILE No E81743)

INDUSTRIAL APPLICATIONS:
- SMPS & UPS
- MOTOR CONTROL
- WELDING EQUIPMENT
- OUTPUT STAGE FOR PWM, ULTRASONIC CIRCUITS



ISOTOP

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage (V_{GS} = 0)	800	V
V_{DGR}	Drain-Gate Voltage (R_{GS} = 20 kΩ)	800	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	22	A
I_D	Drain Current (continuous) at T_c = 100 °C	13.5	A
I_{DM}(•)	Drain Current (pulsed)	88	A
P_{tot}	Total Dissipation at T_c = 25 °C	400	W
	Derating Factor	3.2	W/°C
T_{stg}	Storage Temperature	-55 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C
V_{ISO}	Insulation Withstand Voltage (AC-RMS)	2500	V

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$ R_{thc-h}	Thermal Resistance Junction-case Thermal Resistance Case-heatsink With Conductive Grease Applied	Max Max	0.31 0.05	°C/W °C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 1 mA V_{GS} = 0 V	800			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			300 1.5	µA mA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 300	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS} I_D = 1 mA	2		4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 12 A			0.4	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	V_{DS} = 15 V I_D = 12 A	9			S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0 V			8.1 1100 500	nF pF pF

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 400 V I_D = 12 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 1)		75 88	100 115	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 640 V I_D = 22 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		660		A/µs
Q_g	Total Gate Charge	V_{DD} = 640 V I_D = 22 A V_{GS} = 10 V		400		nC

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING OFF

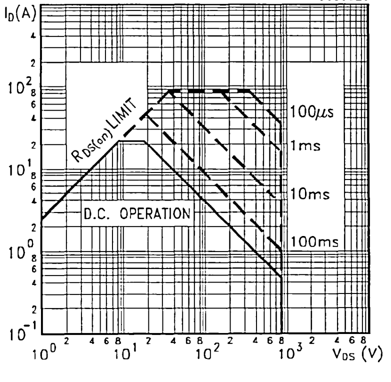
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 640 V I_D = 22 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		62 23 95	85 33 125	ns ns ns

SOURCE DRAIN DIODE

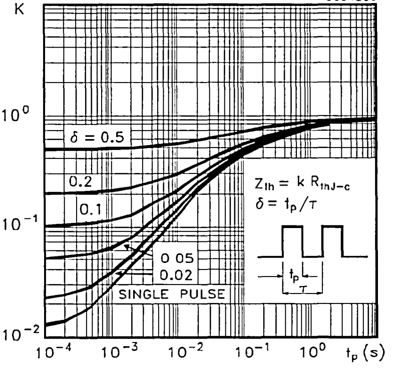
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				22 88	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 22 A V_{GS} = 0			2.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 22 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 3)		1400 60 85		ns µC A

(*) Pulsed Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

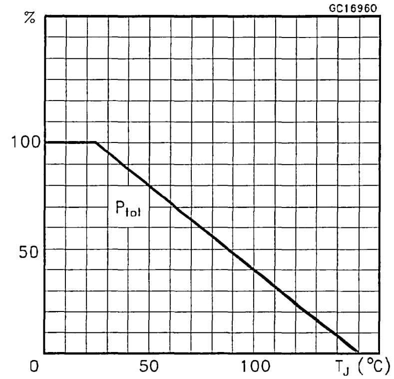
Safe Operating Area



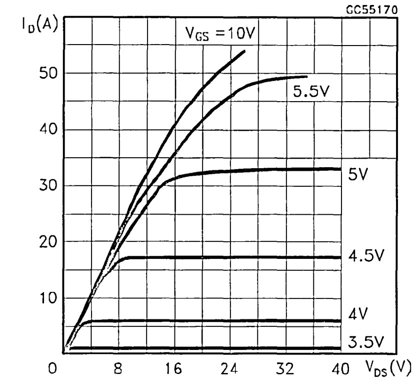
Thermal Impedance



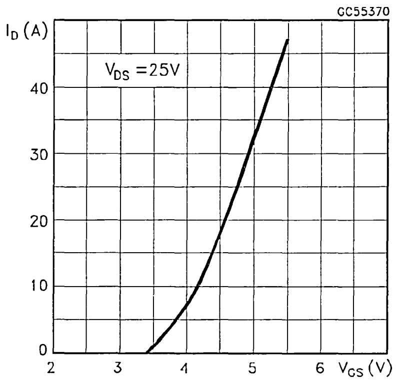
Derating Curve



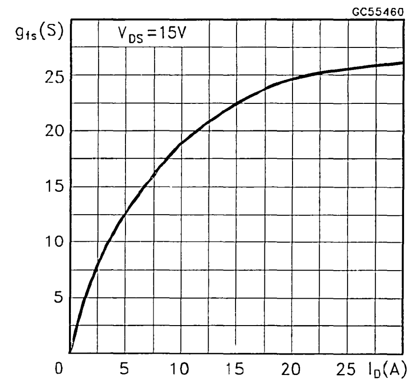
Output Characteristics



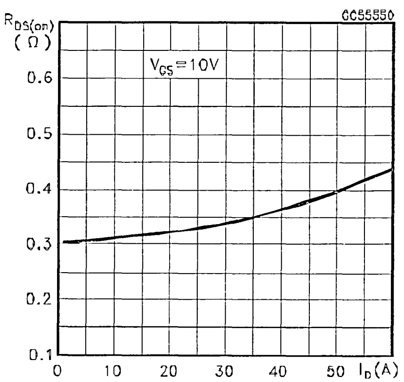
Transfer Characteristics



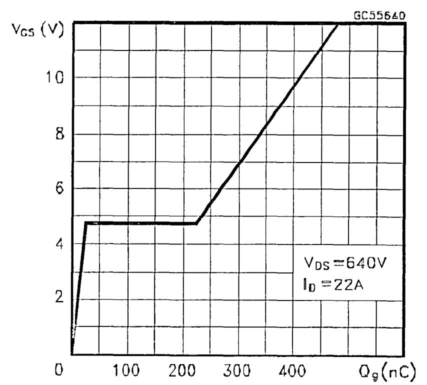
Transconductance



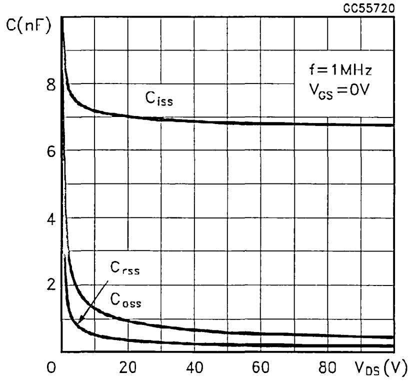
Static Drain-source On Resistance



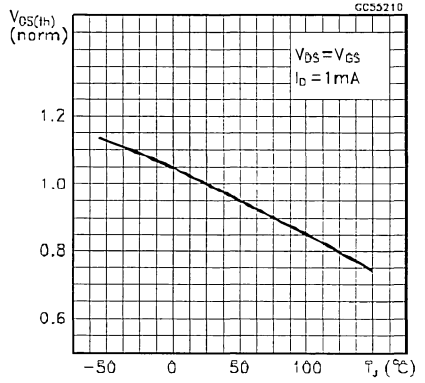
Gate Charge vs Gate-source Voltage



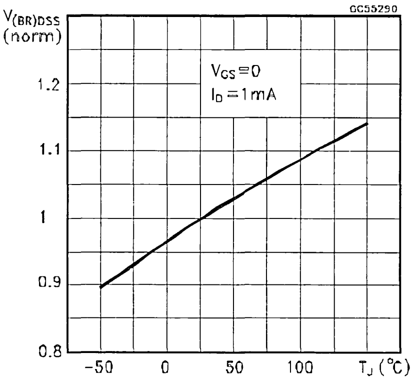
Capacitance Variations



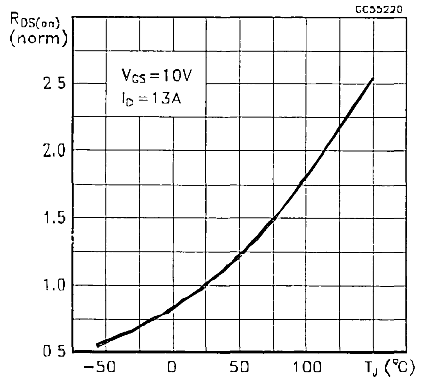
Normalized Gate Threshold Voltage vs Temperature



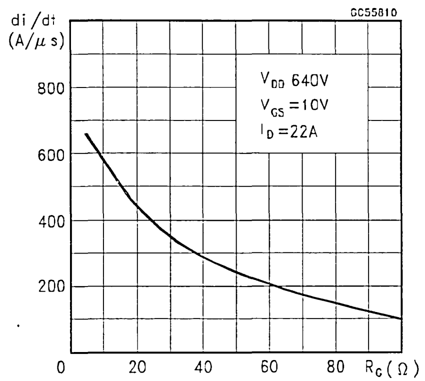
Normalized Breakdown Voltage vs Temperature



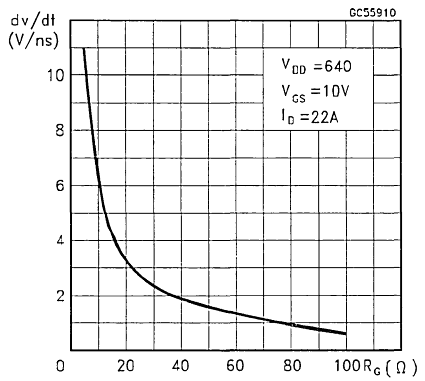
Normalized On Resistance vs Temperature



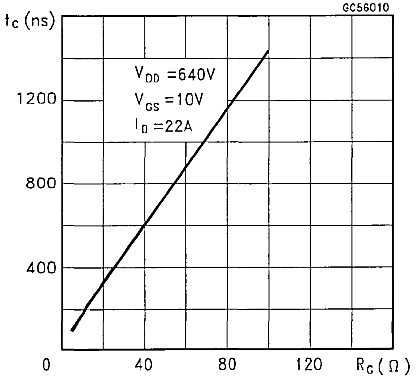
Turn-on Current Slope



Turn-off Drain-source Voltage Slope



Cross-over Time



Source-drain Diode Forward Characteristics

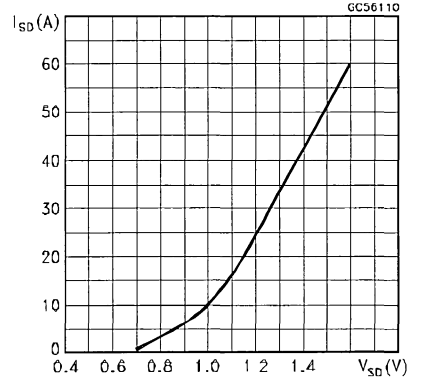


Fig. 1: Switching Times Test Circuits For Resistive Load

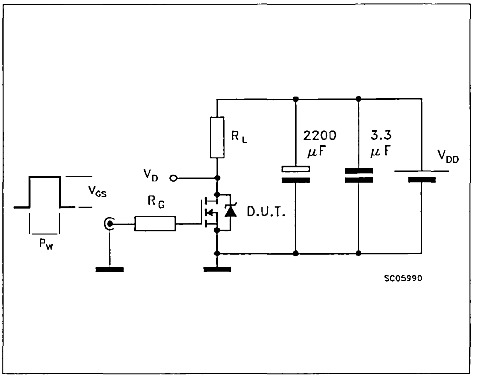


Fig. 2: Gate Charge Test Circuit

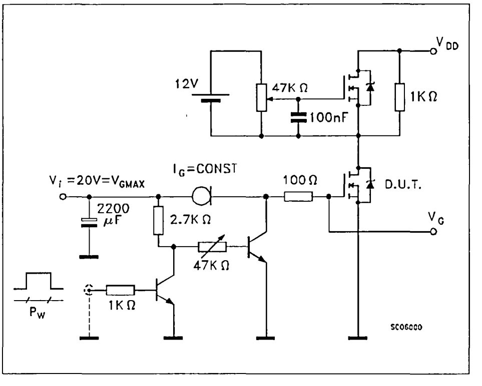
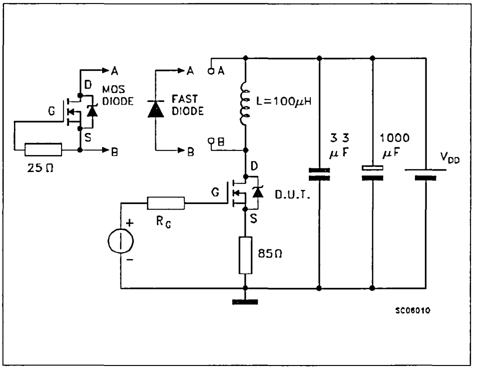


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON MICROELECTRONICS

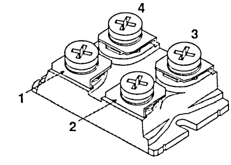
STE26N50

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR IN ISOTOP PACKAGE

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STE26N50	500 V	< 0.2 Ω	26 A

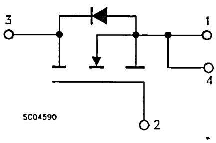
- HIGH CURRENT POWER MODULE
- AVALANCHE RUGGED TECHNOLOGY (SEE IRFP450 FOR RATING)
- VERY LARGE SOA - LARGE PEAK POWER CAPABILITY
- EASY TO MOUNT
- SAME CURRENT CAPABILITY FOR THE TWO SOURCE TERMINALS
- EXTREMELY LOW R_{th} JUNCTION TO CASE
- VERY LOW DRAIN TO CASE CAPACITANCE
- VERY LOW INTERNAL PARASITIC INDUCTANCE (TYPICALLY < 5 nH)
- ISOLATED PACKAGE UL RECOGNIZED (FILE No E81743)

INDUSTRIAL APPLICATIONS:
- SMPS & UPS
- MOTOR CONTROL
- WELDING EQUIPMENT
- OUTPUT STAGE FOR PWM, ULTRASONIC CIRCUITS



ISOTOP

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage (V_{GS} = 0)	500	V
V_{DGR}	Drain-Gate Voltage (R_{GS} = 20 kΩ)	500	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	26	A
I_D	Drain Current (continuous) at T_c = 100 °C	17	A
I_{DM}(•)	Drain Current (pulsed)	104	A
P_{tot}	Total Dissipation at T_c = 25 °C	300	W
	Derating Factor	2.4	W/°C
T_{stg}	Storage Temperature	-55 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C
V_{ISO}	Insulation Withstand Voltage (AC-RMS)	2500	V

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$ R_{thc-h}	Thermal Resistance Junction-case Thermal Resistance Case-heatsink With Conductive Grease Applied	Max Max	0.42 0.05	°C/W °C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 1 mA V_{GS} = 0 V	500			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			200 1	µA mA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 200	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS} I_D = 1 mA	2		4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 13 A			0.2	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} ( )	Forward Transconductance	V_{DS} = 15 V I_D = 13 A	12			S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0 V			6 1200 500	nF pF pF

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 250 V I_D = 13 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 1)		60 80		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 400 V I_D = 26 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		450		A/µs
Q_g	Total Gate Charge	V_{DD} = 400 V I_D = 26 A V_{GS} = 10 V		275		nC

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING OFF

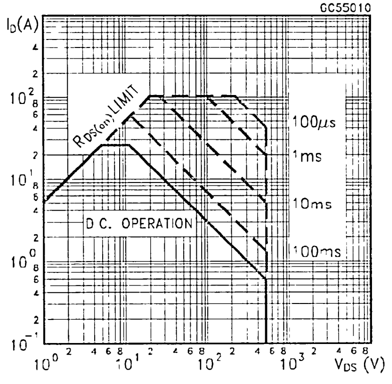
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	V_{DD} = 400 V I_D = 26 A		63		ns
t_f	Fall Time	R_G = 4 7 Ω V_{GS} = 10 V		25		ns
t_c	Cross-over Time	(see test circuit, figure 3)		85		ns

SOURCE DRAIN DIODE

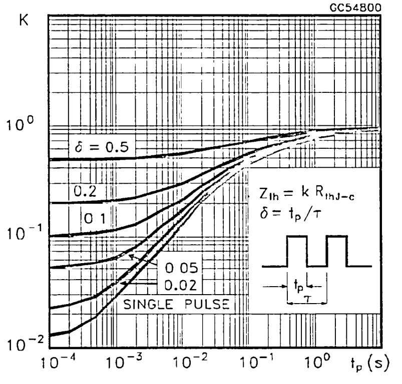
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				26	A
I_{SDM}(•)	Source-drain Current (pulsed)				104	A
V_{SD} ( )	Forward On Voltage	I_{SD} = 26 A V_{GS} = 0			1.4	V
t_{rr}	Reverse Recovery Time	I_{SD} = 26 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C		850		ns
Q_{rr}	Reverse Recovery Charge	(see test circuit, figure 3)		23.5		µC
I_{RRM}	Reverse Recovery Current			55		A

( ) Pulsed Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

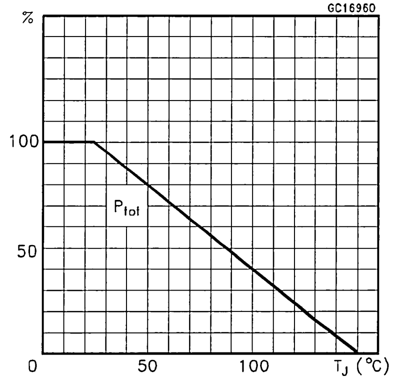
Safe Operating Area



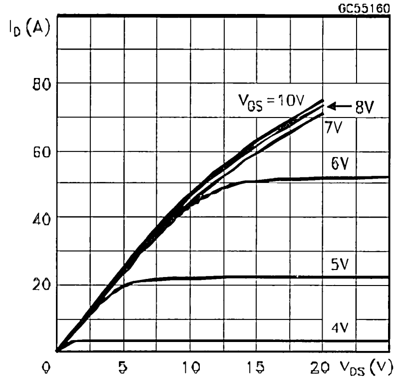
Thermal Impedance



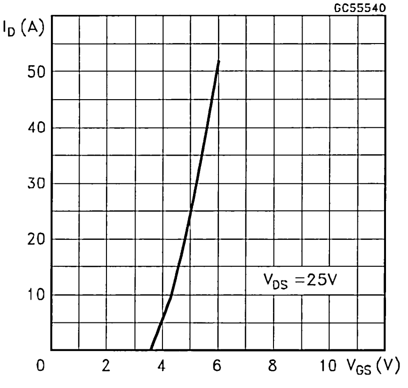
Derating Curve



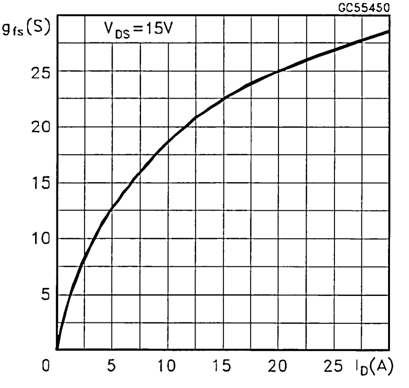
Output Characteristics



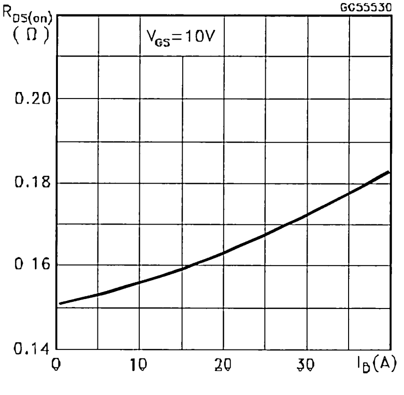
Transfer Characteristics



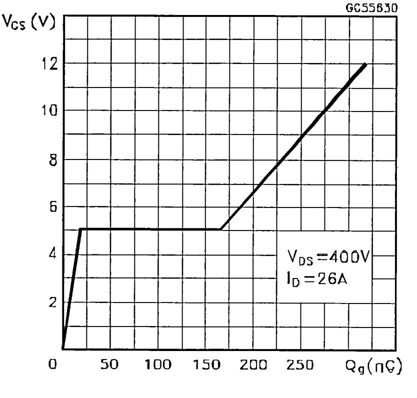
Transconductance



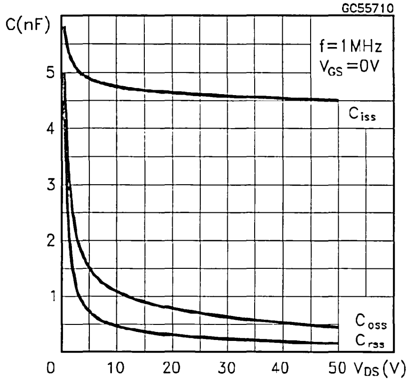
Static Drain-source On Resistance



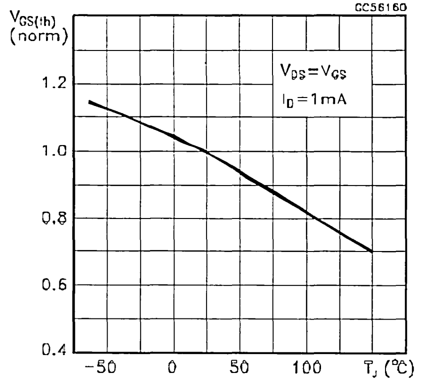
Gate Charge vs Gate-source Voltage



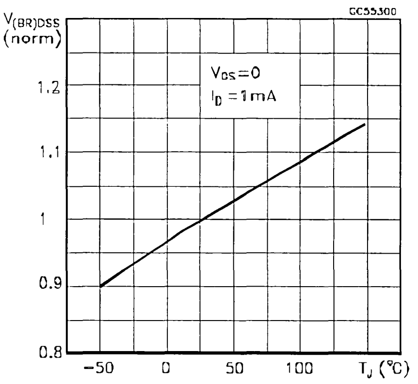
Capacitance Variations



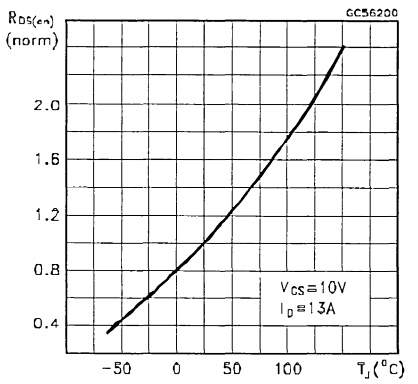
Normalized Gate Threshold Voltage vs Temperature



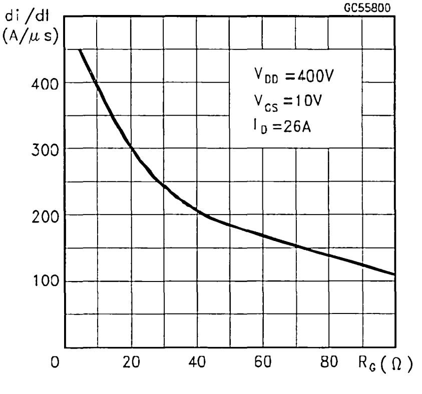
Normalized Breakdown Voltage vs Temperature



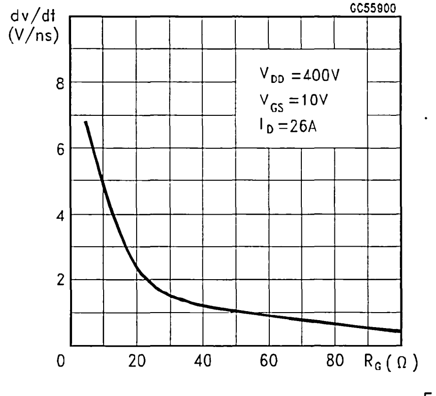
Normalized On Resistance vs Temperature



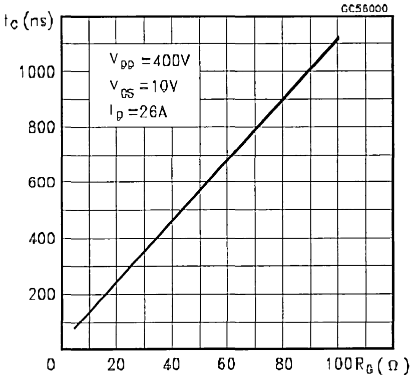
Turn-on Current Slope



Turn-off Drain-source Voltage Slope



Cross-over Time



Source-drain Diode Forward Characteristics

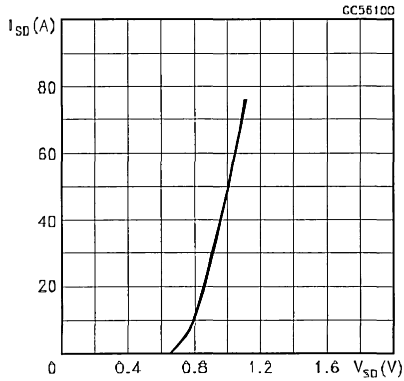


Fig. 1: Switching Times Test Circuits For Resistive Load

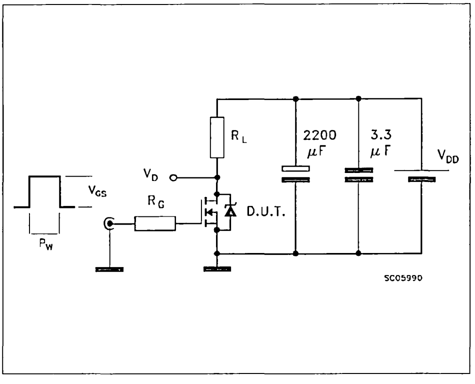


Fig. 2: Gate Charge Test Circuit

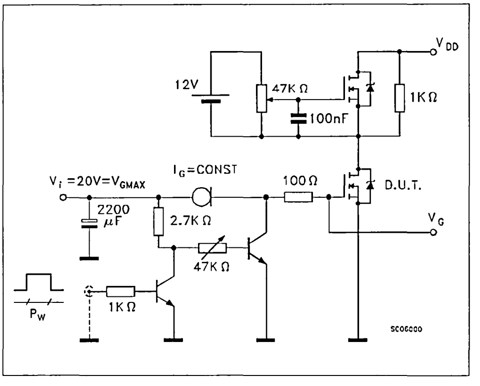
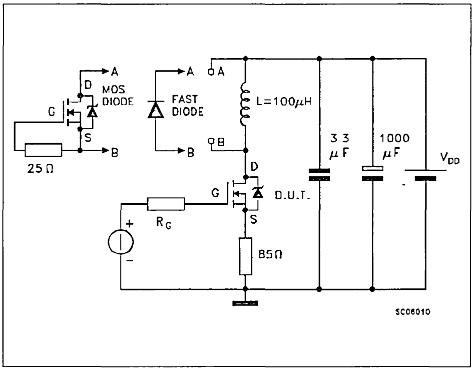


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON MICROELECTRONICS

SGS-THOMSON
MICROELECTRONICS

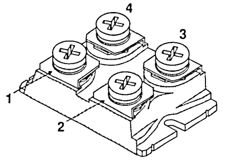
STE36N50

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR IN ISOTOP PACKAGE

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STE36N50	500 V	< 0.14 Ω	36 A

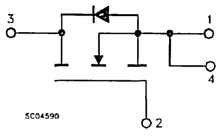
- HIGH CURRENT POWER MODULE
- AVALANCHE RUGGED TECHNOLOGY (SEE IRFP450 FOR RATING)
- VERY LARGE SOA - LARGE PEAK POWER CAPABILITY
- EASY TO MOUNT
- SAME CURRENT CAPABILITY FOR THE TWO SOURCE TERMINALS
- EXTREMELY LOW R_{th} JUNCTION TO CASE
- VERY LOW DRAIN TO CASE CAPACITANCE
- VERY LOW INTERNAL PARASITIC INDUCTANCE (TYPICALLY < 5 nH)
- ISOLATED PACKAGE UL RECOGNIZED (FILE No E81743)

INDUSTRIAL APPLICATIONS:
- SMPS & UPS
- MOTOR CONTROL
- WELDING EQUIPMENT
- OUTPUT STAGE FOR PWM, ULTRASONIC CIRCUITS



ISOTOP

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage (V_{GS} = 0)	500	V
V_{DGR}	Drain-Gate Voltage (R_{GS} = 20 kΩ)	500	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	36	A
I_D	Drain Current (continuous) at T_c = 100 °C	24	A
I_{DM}(•)	Drain Current (pulsed)	144	A
P_{tot}	Total Dissipation at T_c = 25 °C	410	W
	Derating Factor	3.3	W/°C
T_{stg}	Storage Temperature	-55 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C
V_{ISO}	Insulation Withstand Voltage (AC-RMS)	2500	V

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case Max	0.3	°C/W
$R_{thc\text{-}h}$	Thermal Resistance Case-heatsink With Conductive Grease Applied Max	0.05	°C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 1 mA V_{GS} = 0 V	500			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			300 1.5	μA mA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 300	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS} I_D = 1 mA	2		4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 18 A			0.14	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	V_{DS} = 15 V I_D = 18 A	16			S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0 V			9 1800 750	nF pF pF

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 250 V I_D = 18 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 1)		95 107		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 400 V I_D = 36 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		500		A/μs
Q_g	Total Gate Charge	V_{DD} = 400 V I_D = 36 A V_{GS} = 10 V		410		nC

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING OFF

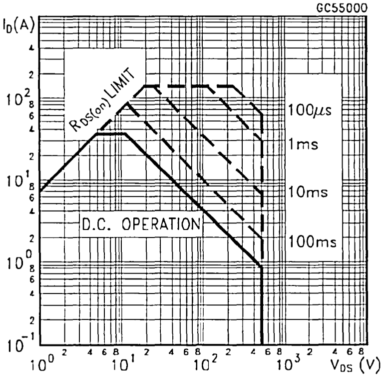
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 400 V I_D = 36 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		70 30 100		ns ns ns

SOURCE DRAIN DIODE

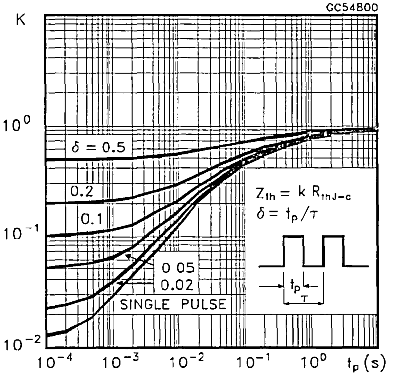
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				36 144	A A
V_{SD} ( )	Forward On Voltage	I_{SD} = 36 A V_{GS} = 0			1.4	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 36 A di/dt = 100 A/μs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 3)		1100 38.5 70		ns μC A

( ) Pulsed Pulse duration = 300 μs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

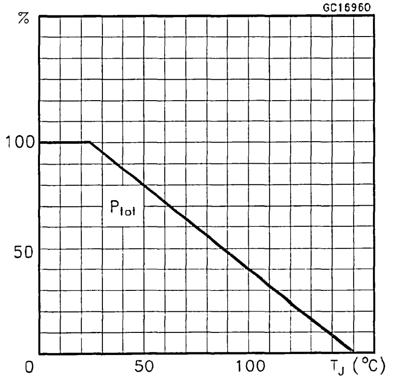
Safe Operating Area



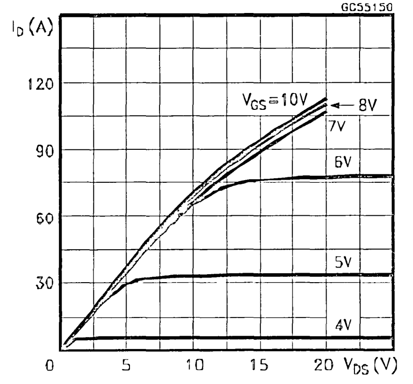
Thermal Impedance



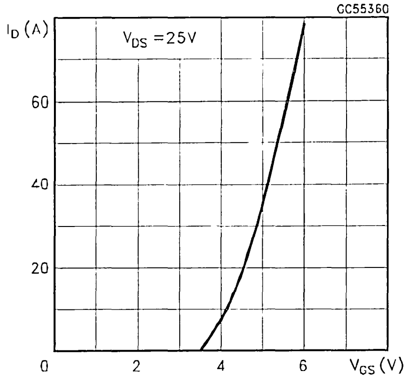
Derating Curve



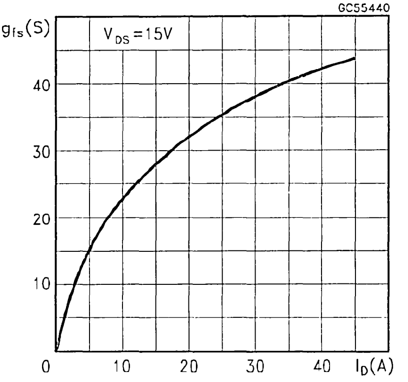
Output Characteristics



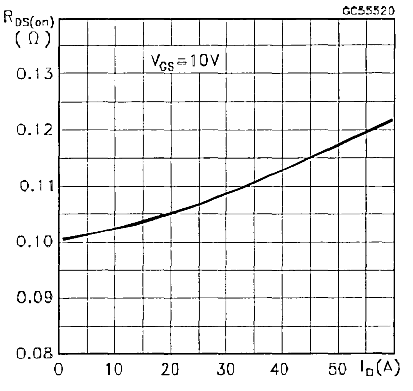
Transfer Characteristics



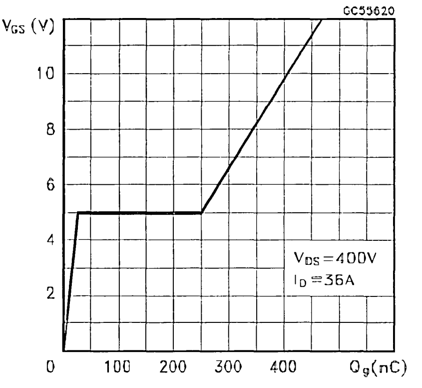
Transconductance



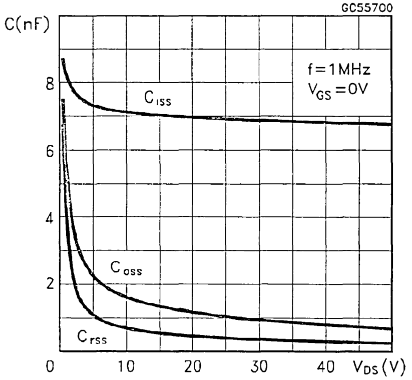
Static Drain-source On Resistance



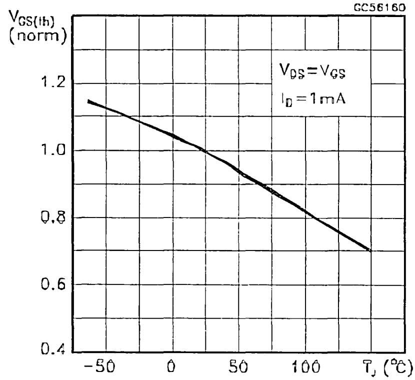
Gate Charge vs Gate-source Voltage



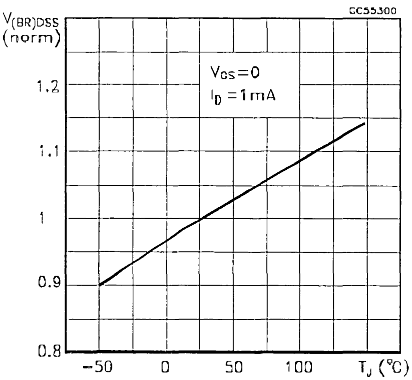
Capacitance Variations



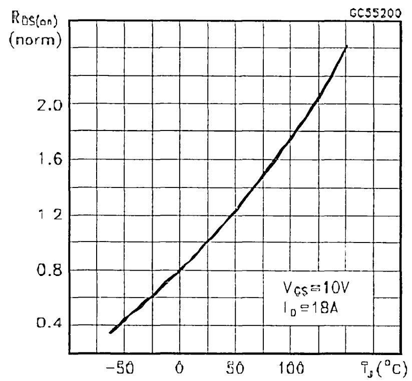
Normalized Gate Threshold Voltage vs Temperature



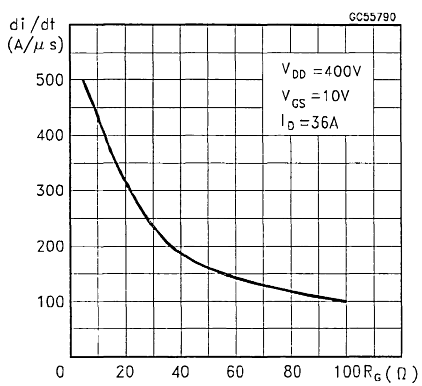
Normalized Breakdown Voltage vs Temperature



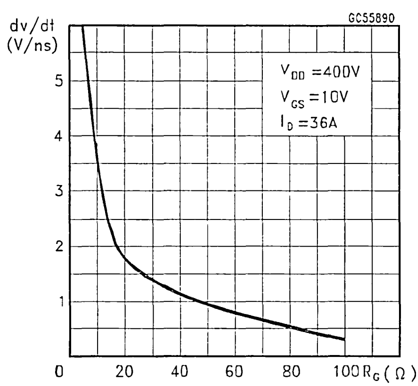
Normalized On Resistance vs Temperature



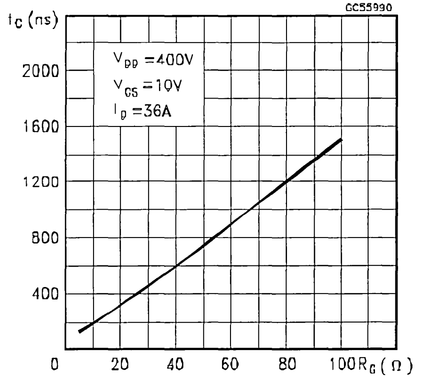
Turn-on Current Slope



Turn-off Drain-source Voltage Slope



Cross-over Time



Source-drain Diode Forward Characteristics

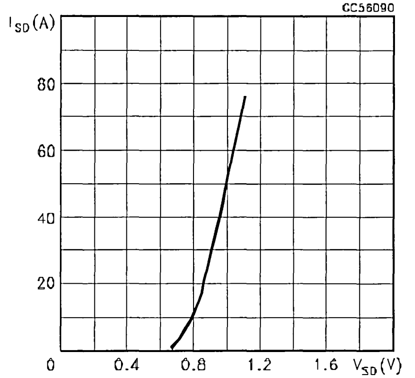


Fig. 1: Switching Times Test Circuits For Resistive Load

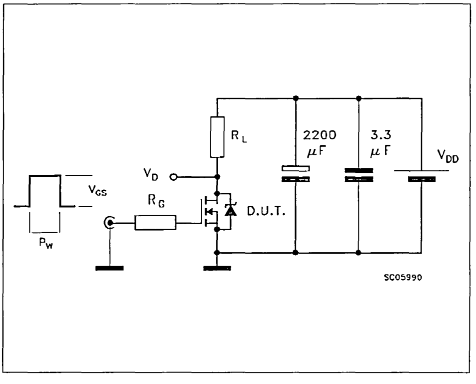


Fig. 2: Gate Charge Test Circuit

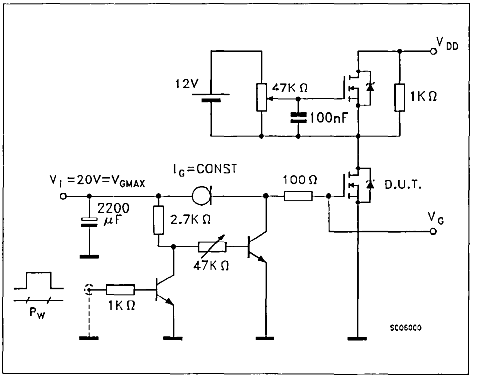
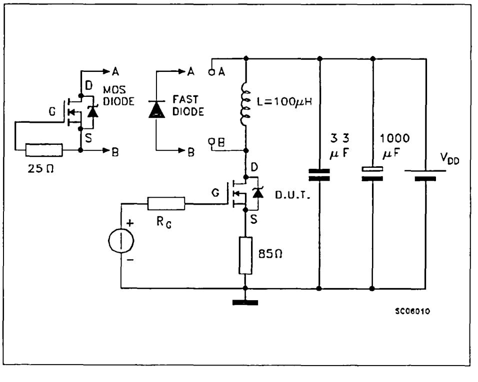


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON MICROELECTRONICS

SGS-THOMSON
MICROELECTRONICS

STE38N60

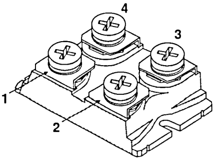
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR IN ISOTOP PACKAGE

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STE38N60	600 V	< 0.15 Ω	38 A

- HIGH CURRENT POWER MODULE
- AVALANCHE RUGGED TECHNOLOGY (SEE STH12N60 FOR RATING)
- VERY LARGE SOA - LARGE PEAK POWER CAPABILITY
- EASY TO MOUNT
- SAME CURRENT CAPABILITY FOR THE TWO SOURCE TERMINALS
- EXTREMELY LOW R_{th} JUNCTION TO CASE
- VERY LOW DRAIN TO CASE CAPACITANCE
- VERY LOW INTERNAL PARASITIC INDUCTANCE (TYPICALLY < 5 nH)
- ISOLATED PACKAGE UL RECOGNIZED (FILE No E81743)

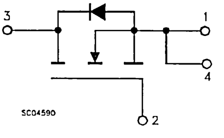
INDUSTRIAL APPLICATIONS:

- SMPS & UPS
- MOTOR CONTROL
- WELDING EQUIPMENT
- OUTPUT STAGE FOR PWM, ULTRASONIC CIRCUITS



ISOTOP

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage (V_{GS} = 0)	600	V
V_{DGR}	Drain-Gate Voltage (R_{GS} = 20 kΩ)	600	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	38	A
I_D	Drain Current (continuous) at T_c = 100 °C	24	A
I_{DM}(•)	Drain Current (pulsed)	152	A
P_{tot}	Total Dissipation at T_c = 25 °C	450	W
	Derating Factor	3.6	W/°C
T_{stg}	Storage Temperature	-55 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C
V_{ISO}	Insulation Withstand Voltage (AC-RMS)	2500	V

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.27	°C/W
R_{thc-h}	Thermal Resistance Case-heatsink With Conductive Grease Applied	Max	0.05	°C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 1 mA V_{GS} = 0 V	600			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			400 2	μA mA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 400	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS} I_D = 1 mA	2		4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 23 A			0.15	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	V_{DS} = 15 V I_D = 23 A	18			S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0 V			10 1600 600	nF pF pF

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 300 V I_D = 19 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 1)		65 200		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 480 V I_D = 38 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		390		A/μs
Q_g	Total Gate Charge	V_{DD} = 400 V I_D = 38 A V_{GS} = 10 V		460		nC

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 480 V I_D = 38 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		145 55 215		ns ns ns

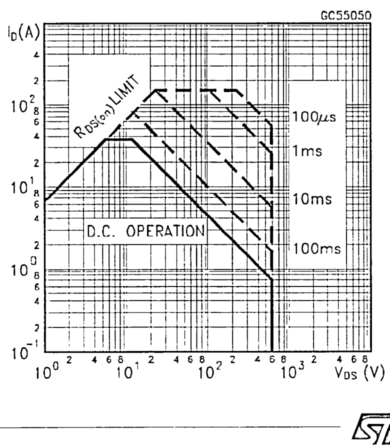
SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				38 152	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 38 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 38 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 3)		1200 43 76		ns µC A

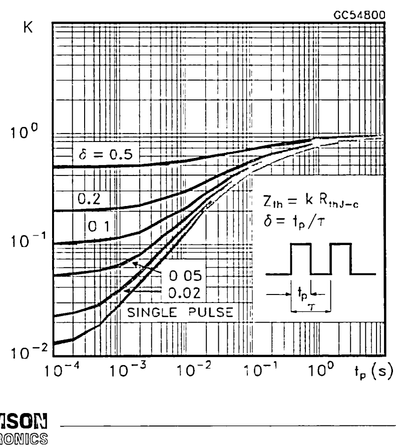
( ) Pulsed Pulse duration = 300 µs, duty cycle 1 5 %

(•) Pulse width limited by safe operating area

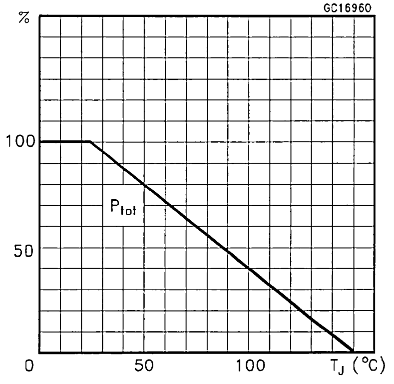
Safe Operating Area



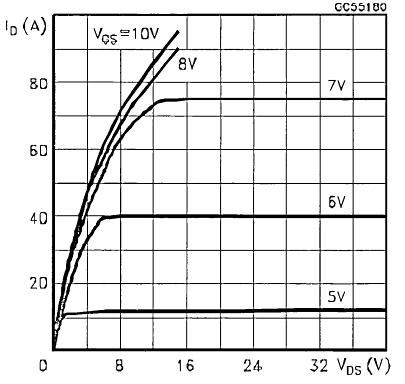
Thermal Impedance



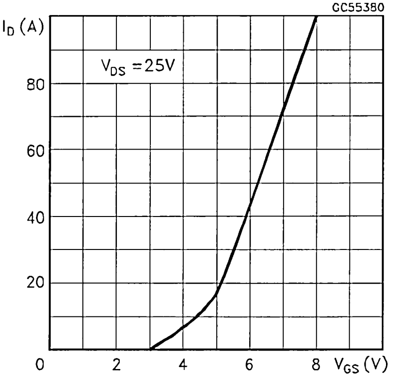
Derating Curve



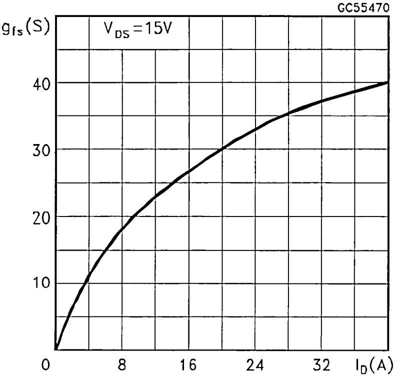
Output Characteristics



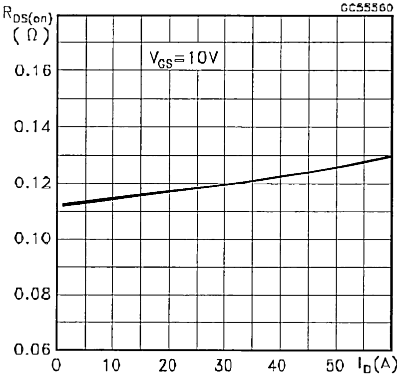
Transfer Characteristics



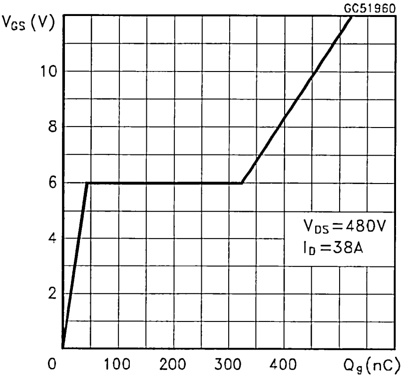
Transconductance



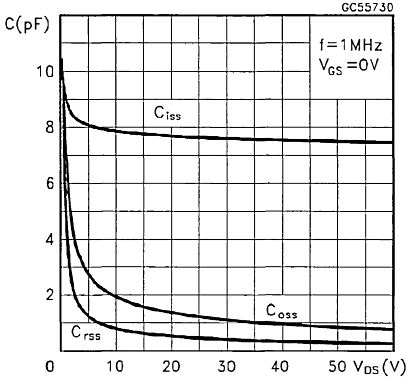
Static Drain-source On Resistance



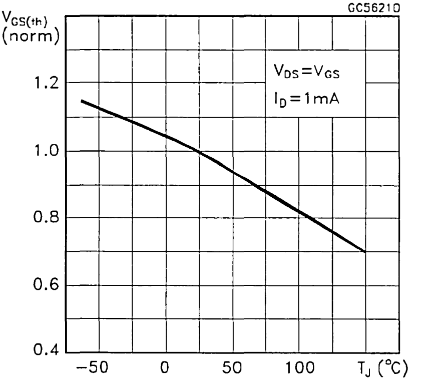
Gate Charge vs Gate-source Voltage



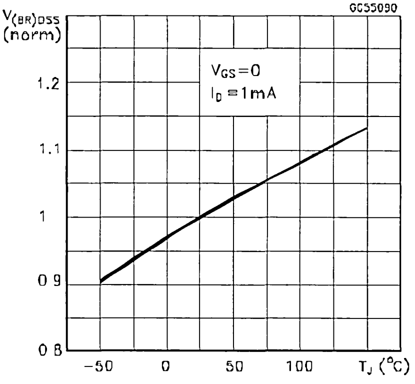
Capacitance Variations



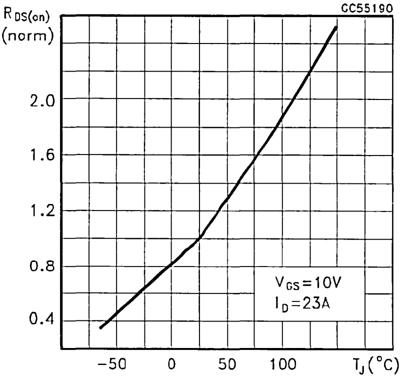
Normalized Gate Threshold Voltage vs Temperature



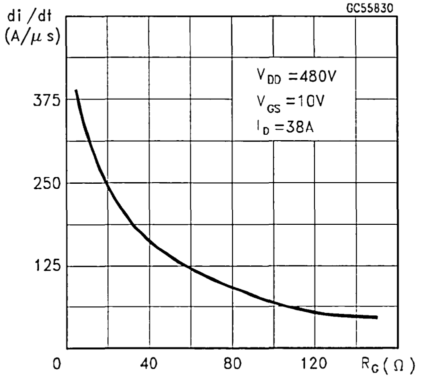
Normalized Breakdown Voltage vs Temperature



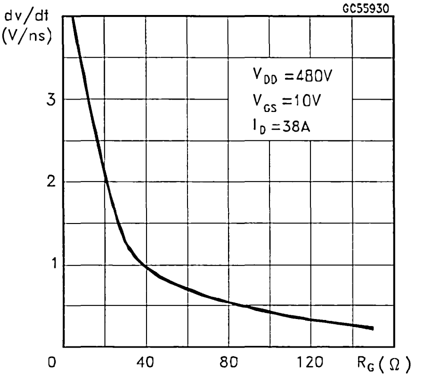
Normalized On Resistance vs Temperature



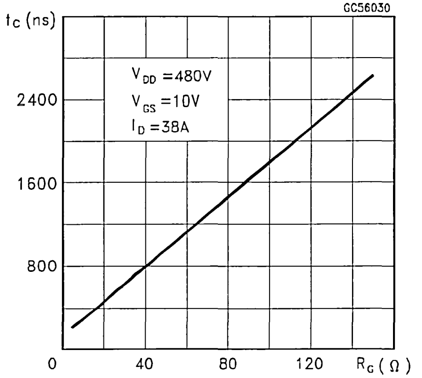
Turn-on Current Slope



Turn-off Drain-source Voltage Slope



Cross-over Time



Source-drain Diode Forward Characteristics

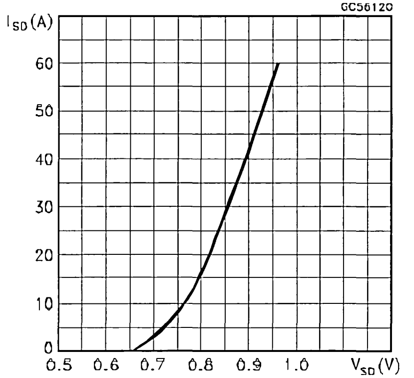


Fig. 1: Switching Times Test Circuits For Resistive Load

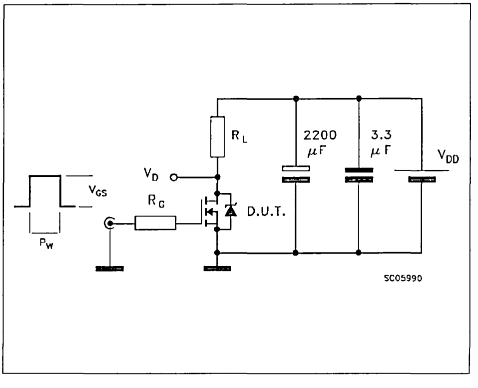


Fig. 2: Gate Charge Test Circuit

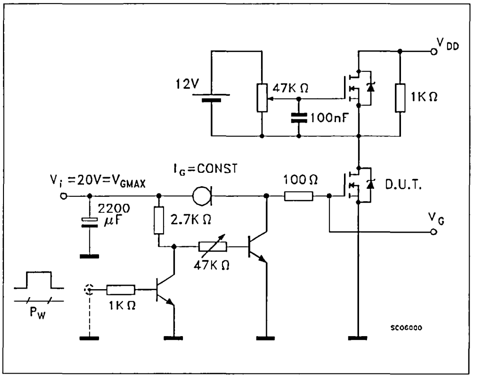
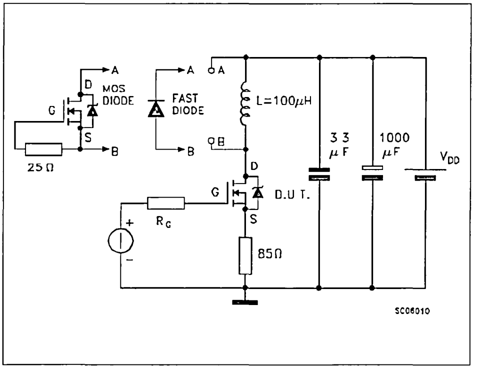


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON
MICROELECTRONICS

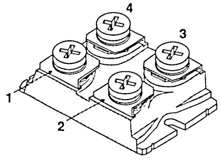
STE45N50

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR IN ISOTOP PACKAGE

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STE45N50	500 V	< 0.11 Ω	45 A

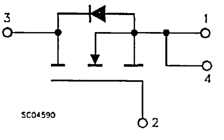
- HIGH CURRENT POWER MODULE
- AVALANCHE RUGGED TECHNOLOGY (SEE IRFP450 FOR RATING)
- VERY LARGE SOA - LARGE PEAK POWER CAPABILITY
- EASY TO MOUNT
- SAME CURRENT CAPABILITY FOR THE TWO SOURCE TERMINALS
- EXTREMELY LOW R_{th} JUNCTION TO CASE
- VERY LOW DRAIN TO CASE CAPACITANCE
- VERY LOW INTERNAL PARASITIC INDUCTANCE (TYPICALLY < 5 nH)
- ISOLATED PACKAGE UL RECOGNIZED (FILE No E81743)

INDUSTRIAL APPLICATIONS:
- SMPS & UPS
- MOTOR CONTROL
- WELDING EQUIPMENT
- OUTPUT STAGE FOR PWM, ULTRASONIC CIRCUITS



ISOTOP

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage (V_{GS} = 0)	500	V
V_{DGR}	Drain-Gate Voltage (R_{GS} = 20 kΩ)	500	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	45	A
I_D	Drain Current (continuous) at T_c = 100 °C	28.6	A
I_{DM}(•)	Drain Current (pulsed)	180	A
P_{tot}	Total Dissipation at T_c = 25 °C	450	W
	Derating Factor	3.6	W/°C
T_{stg}	Storage Temperature	-55 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C
V_{ISO}	Insulation Withstand Voltage (AC-RMS)	2500	V

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	0.27	°C/W
$R_{thc\text{-}h}$	Thermal Resistance Case-heatsink With Conductive Grease Applied	Max	0.05	°C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 1 mA V_{GS} = 0 V	500			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			400 2	µA mA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 400	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS} I_D = 1 mA	2		4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 28 A			0.11	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	V_{DS} = 15 V I_D = 28 A	28			S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0 V			12 2400 1000	nF pF pF

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 250 V I_D = 28 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 1)		90 130		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 400 V I_D = 45 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		550		A/µs
Q_g	Total Gate Charge	V_{DD} = 400 V I_D = 45 A V_{GS} = 10 V		550		nC

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING OFF

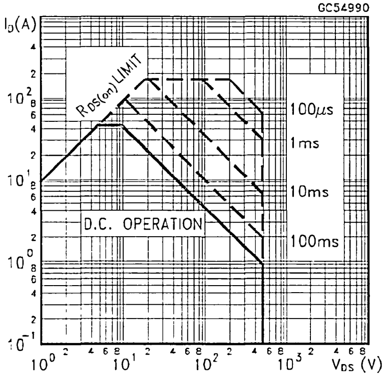
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 400 V I_D = 45 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		120 55 170		ns ns ns

SOURCE DRAIN DIODE

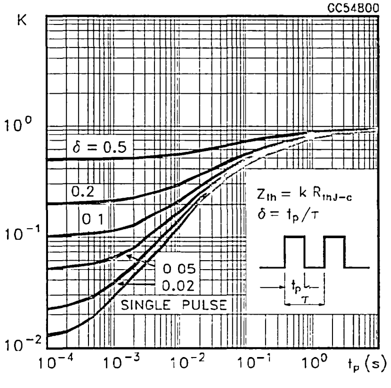
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				45 180	A A
V_{SD} (·)	Forward On Voltage	I_{SD} = 45 A V_{GS} = 0			1.4	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 45 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 3)		1100 40 73		ns µC A

( ) Pulsed Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

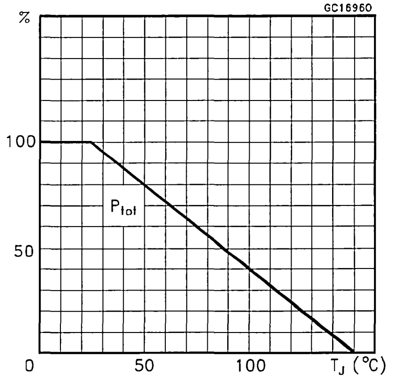
Safe Operating Area



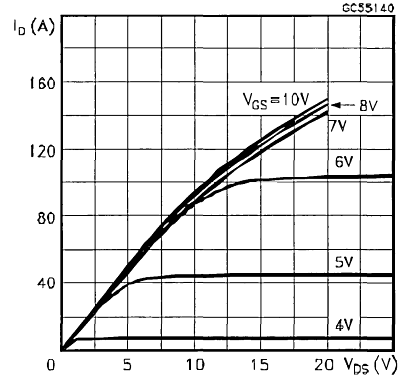
Thermal Impedance



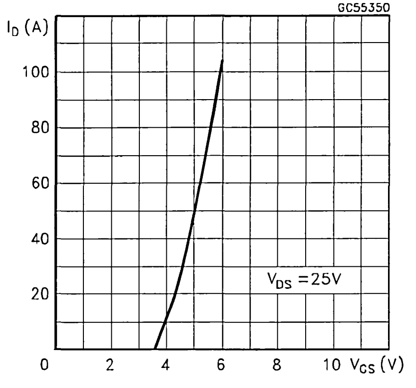
Derating Curve



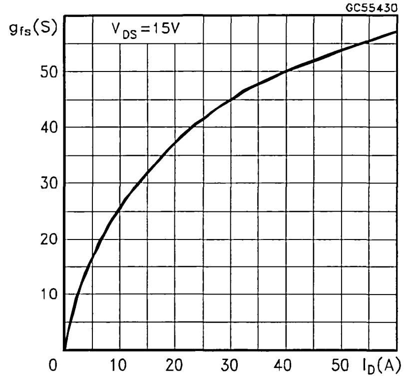
Output Characteristics



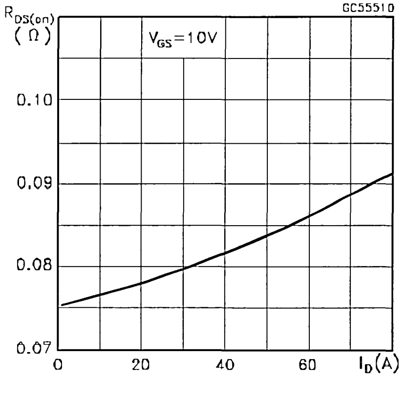
Transfer Characteristics



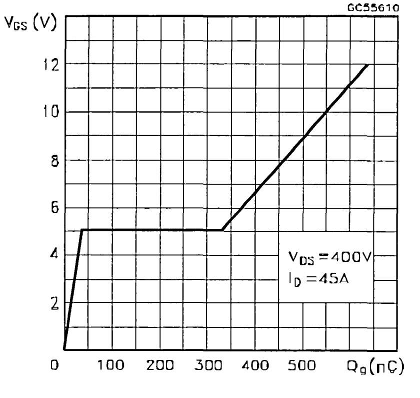
Transconductance



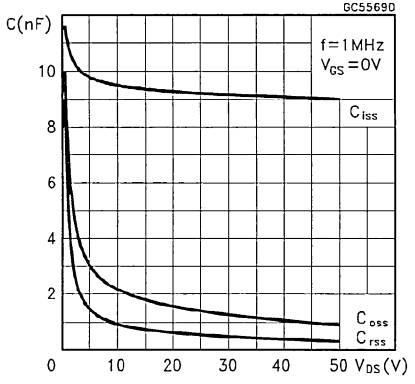
Static Drain-source On Resistance



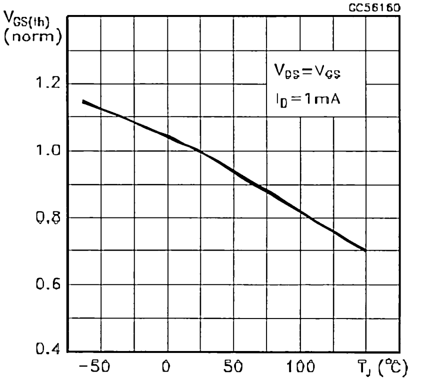
Gate Charge vs Gate-source Voltage



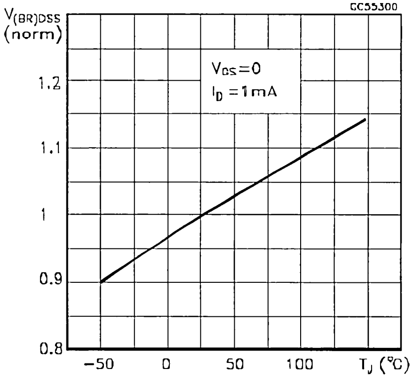
Capacitance Variations



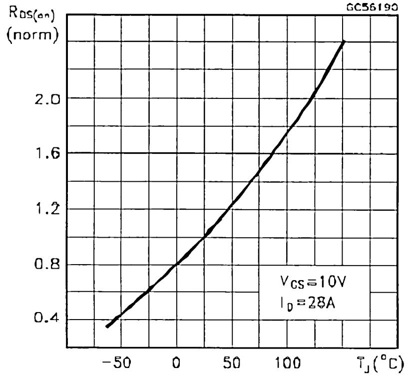
Normalized Gate Threshold Voltage vs Temperature



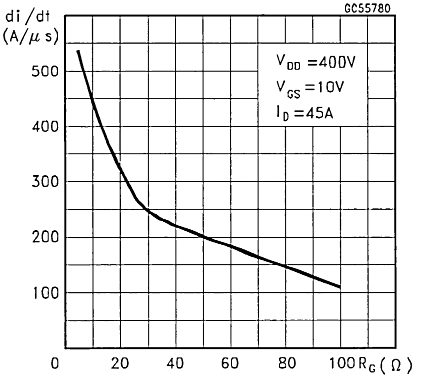
Normalized Breakdown Voltage vs Temperature



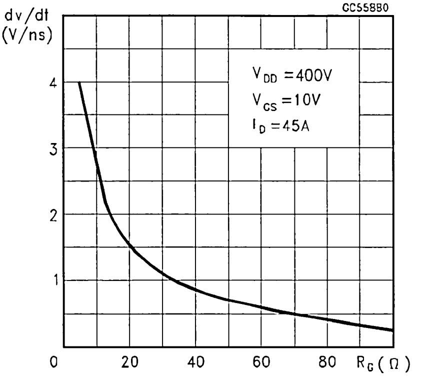
Normalized On Resistance vs Temperature



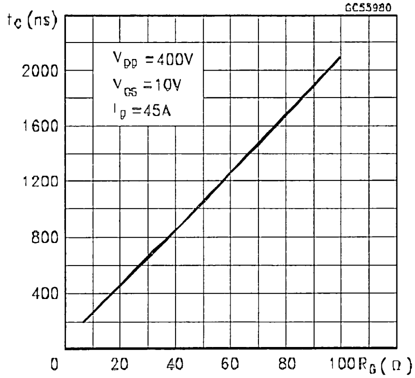
Turn-on Current Slope



Turn-off Drain-source Voltage Slope



Cross-over Time



Source-drain Diode Forward Characteristics

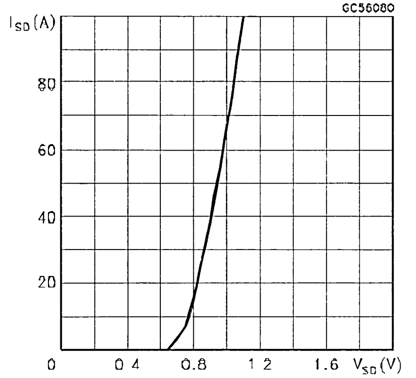


Fig. 1: Switching Times Test Circuits For Resistive Load

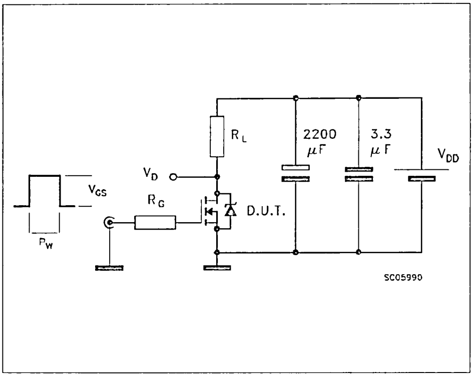


Fig. 2: Gate Charge Test Circuit

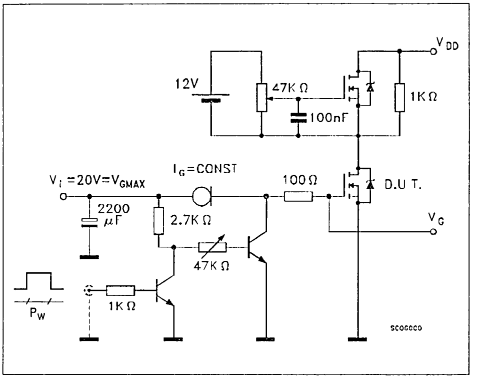
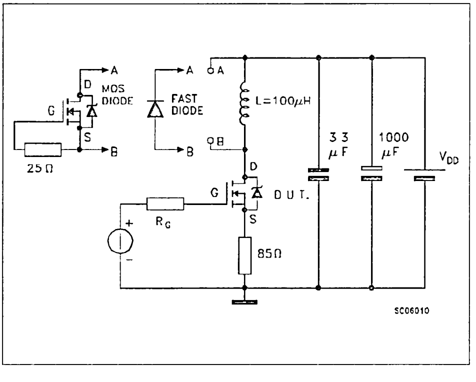


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON MICROELECTRONICS

STE47N50

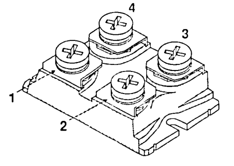
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR IN ISOTOP PACKAGE

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STE47N50	500 V	< 0.1 Ω	47 A

- HIGH CURRENT POWER MODULE
- AVALANCHE RUGGED TECHNOLOGY (SEE IRFP450 FOR RATING)
- VERY LARGE SOA - LARGE PEAK POWER CAPABILITY
- EASY TO MOUNT
- SAME CURRENT CAPABILITY FOR THE TWO SOURCE TERMINALS
- EXTREMELY LOW R_{th} JUNCTION TO CASE
- VERY LOW DRAIN TO CASE CAPACITANCE
- VERY LOW INTERNAL PARASITIC INDUCTANCE (TYPICALLY < 5 nH)
- ISOLATED PACKAGE UL RECOGNIZED (FILE No E81743)

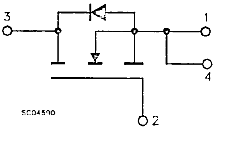
INDUSTRIAL APPLICATIONS:

- SMPS & UPS
- MOTOR CONTROL
- WELDING EQUIPMENT
- OUTPUT STAGE FOR PWM, ULTRASONIC CIRCUITS



ISOTOP

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage (V_{GS} = 0)	500	V
V_{DGR}	Drain-Gate Voltage (R_{GS} = 20 kΩ)	500	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	47	A
I_D	Drain Current (continuous) at T_c = 100 °C	30	A
I_{DM}(•)	Drain Current (pulsed)	188	A
P_{tot}	Total Dissipation at T_c = 25 °C	450	W
	Derating Factor	3.6	W/°C
T_{stg}	Storage Temperature	-55 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C
V_{ISO}	Insulation Withstand Voltage (AC-RMS)	2500	V

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case Max	0.27	°C/W
$R_{thc\text{-}h}$	Thermal Resistance Case-heatsink With Conductive Grease Applied Max	0.05	°C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 1 mA V_{GS} = 0 V	500			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			400 2	µA mA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 400	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS} I_D = 1 mA	2		4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 28 A			0.1	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	V_{DS} = 15 V I_D = 28 A	28			S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0 V			12 2400 1000	nF pF pF

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 250 V I_D = 28 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 1)		90 130		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 400 V I_D = 45 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		550		A/µs
Q_g	Total Gate Charge	V_{DD} = 400 V I_D = 45 A V_{GS} = 10 V		550		nC

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING OFF

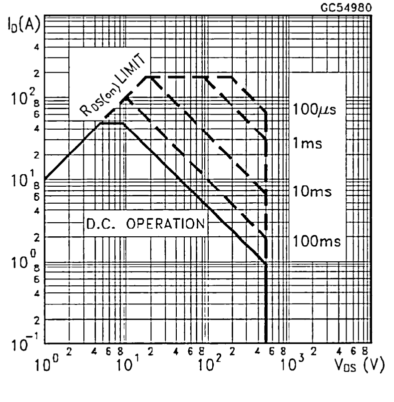
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 400 V I_D = 45 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		120 55 170		ns ns ns

SOURCE DRAIN DIODE

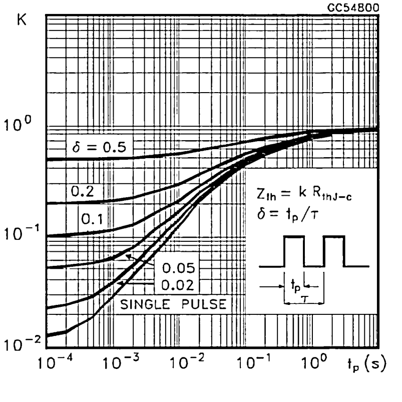
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				47 188	A A
V_{SD} (∗)	Forward On Voltage	I_{SD} = 47 A V_{GS} = 0			1.4	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 47 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 3)		1100 40 73		ns µC A

(∗) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

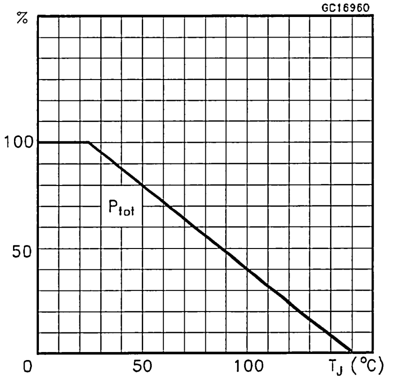
Safe Operating Area



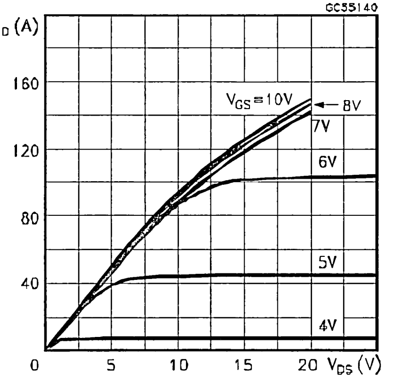
Thermal Impedance



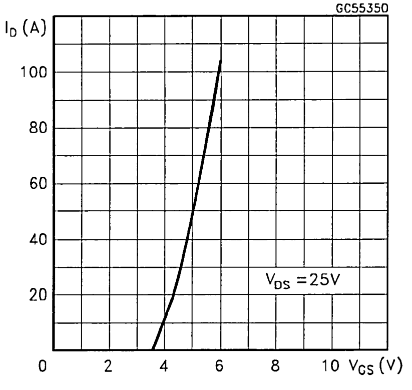
Derating Curve



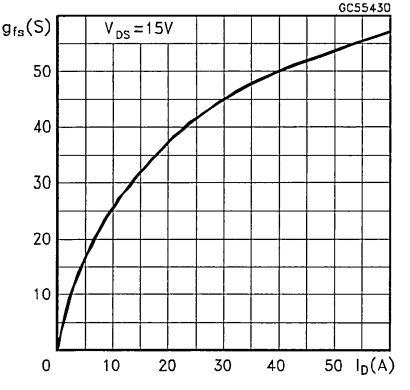
Output Characteristics



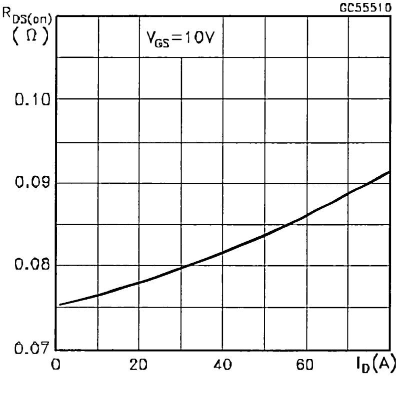
Transfer Characteristics



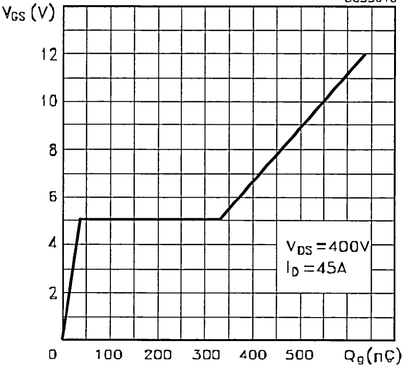
Transconductance



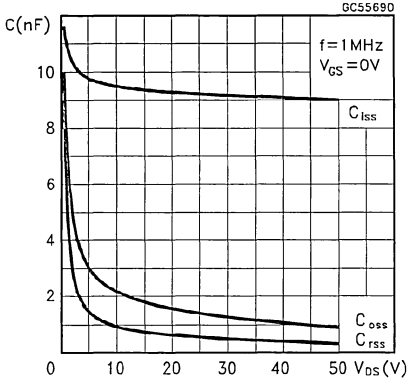
Static Drain-source On Resistance



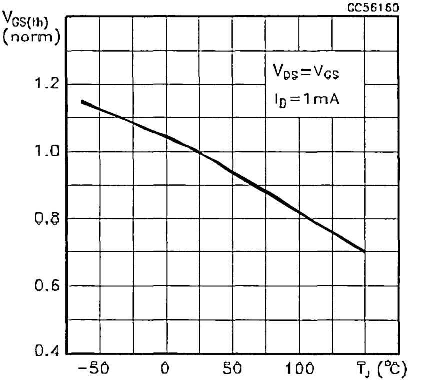
Gate Charge vs Gate-source Voltage



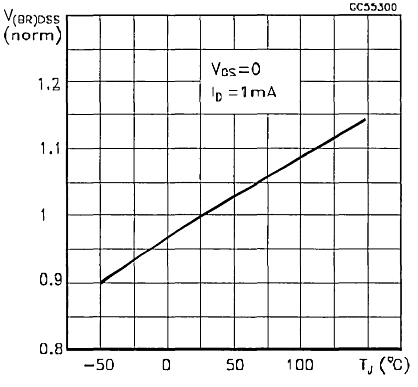
Capacitance Variations



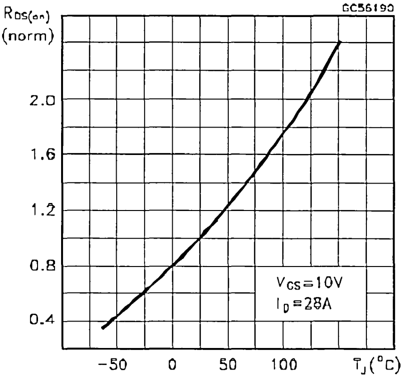
Normalized Gate Threshold Voltage vs Temperature



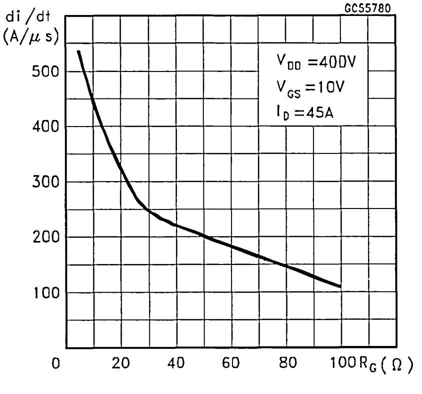
Normalized Breakdown Voltage vs Temperature



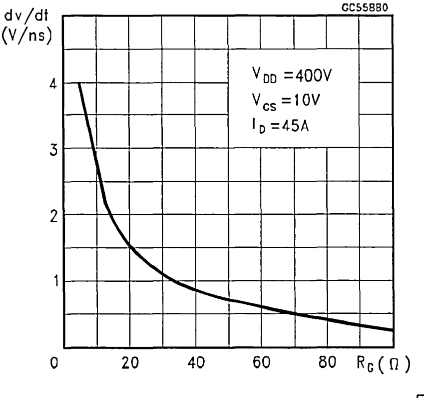
Normalized On Resistance vs Temperature



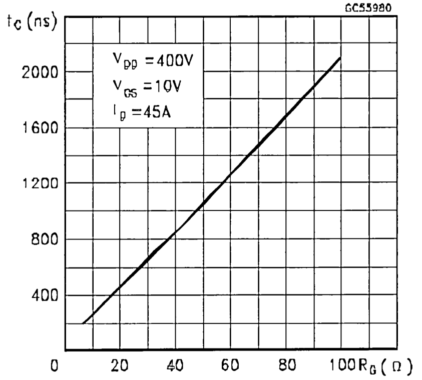
Turn-on Current Slope



Turn-off Drain-source Voltage Slope



Cross-over Time



Source-drain Diode Forward Characteristics

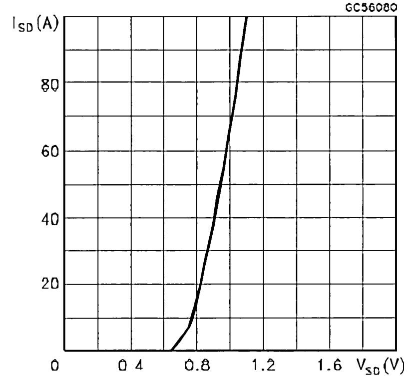


Fig. 1: Switching Times Test Circuits For Resistive Load

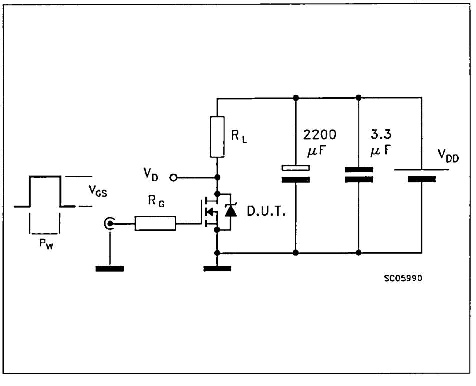


Fig. 2: Gate Charge Test Circuit

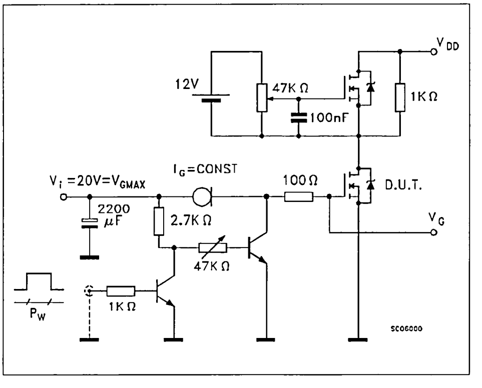
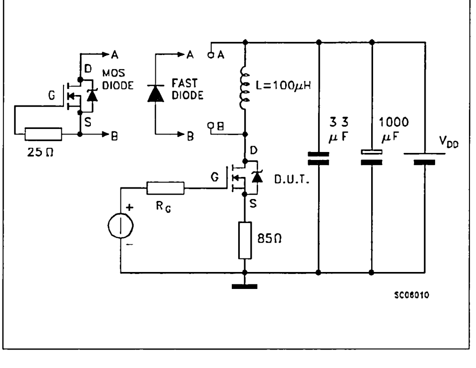


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON
MICROELECTRONICS

STE50N40

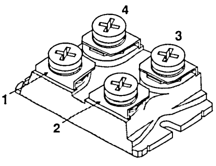
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR IN ISOTOP PACKAGE

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STE50N40	400 V	< 0.075 Ω	50 A

- HIGH CURRENT POWER MODULE
- AVALANCHE RUGGED TECHNOLOGY (SEE IRFP350 FOR RATING)
- VERY LARGE SOA - LARGE PEAK POWER CAPABILITY
- EASY TO MOUNT
- SAME CURRENT CAPABILITY FOR THE TWO SOURCE TERMINALS
- EXTREMELY LOW R_{th} JUNCTION TO CASE
- VERY LOW DRAIN TO CASE CAPACITANCE
- VERY LOW INTERNAL PARASITIC INDUCTANCE (TYPICALLY < 5 nH)
- ISOLATED PACKAGE UL RECOGNIZED (FILE No E81743)

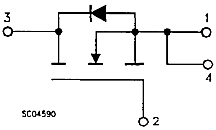
INDUSTRIAL APPLICATIONS:

- SMPS & UPS
- MOTOR CONTROL
- WELDING EQUIPMENT
- OUTPUT STAGE FOR PWM, ULTRASONIC CIRCUITS



ISOTOP

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage (V_{GS} = 0)	400	V
V_{DGR}	Drain-Gate Voltage (R_{GS} = 20 kΩ)	400	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	50	A
I_D	Drain Current (continuous) at T_c = 100 °C	34	A
I_{DM}(•)	Drain Current (pulsed)	200	A
P_{tot}	Total Dissipation at T_c = 25 °C	450	W
	Derating Factor	3.6	W/°C
T_{stg}	Storage Temperature	-55 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C
V_{ISO}	Insulation Withstand Voltage (AC-RMS)	2500	V

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	0.27	°C/W
$R_{thc\text{-}h}$	Thermal Resistance Case-heatsink With Conductive Grease Applied	Max	0.05	°C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 1 mA V_{GS} = 0 V	400			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			400 2	µA mA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 400	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS} I_D = 1 mA	2		4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 30 A			0.075	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	V_{DS} = 15 V I_D = 30 A	28			S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0 V			12 2400 1000	nF pF pF

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 200 V I_D = 30 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 1)		80 120		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 320 V I_D = 50 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		1000		A/µs
Q_g	Total Gate Charge	V_{DD} = 320 V I_D = 50 A V_{GS} = 10 V		580		nC

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING OFF

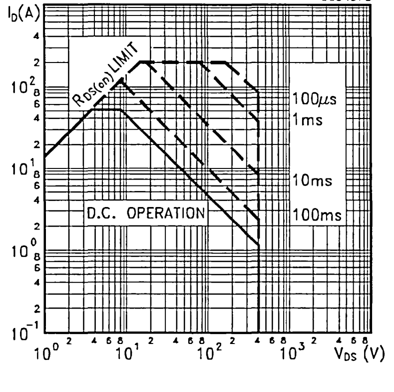
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 320 V I_D = 50 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		90 40 135		ns ns ns

SOURCE DRAIN DIODE

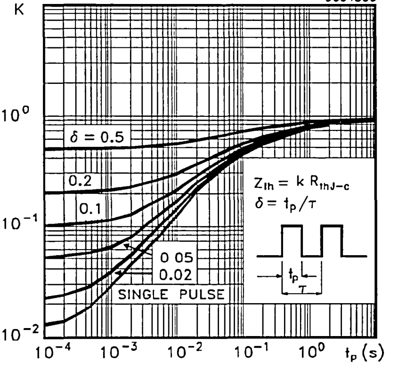
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				50 200	A A
V_{SD} (∗)	Forward On Voltage	I_{SD} = 50 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 50 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 3)		980 31.8 65		ns µC A

(∗) Pulsed Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

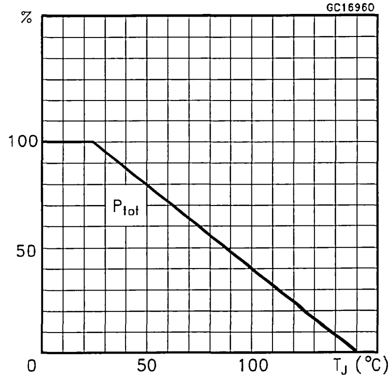
Safe Operating Area



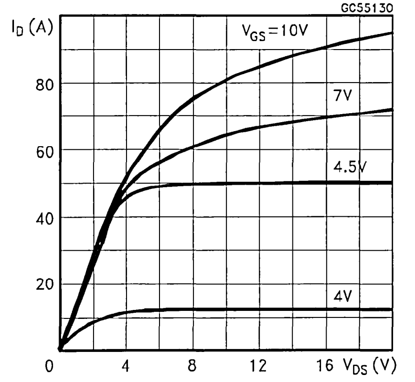
Thermal Impedance



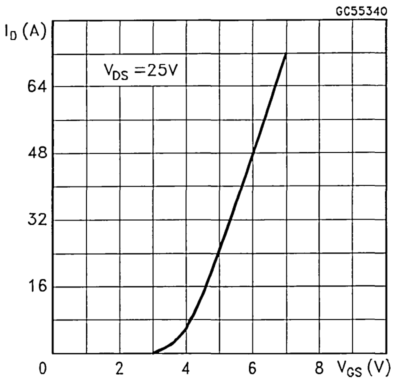
Derating Curve



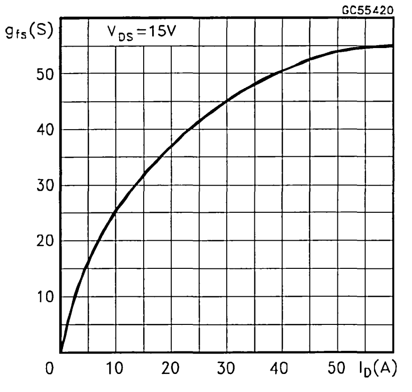
Output Characteristics



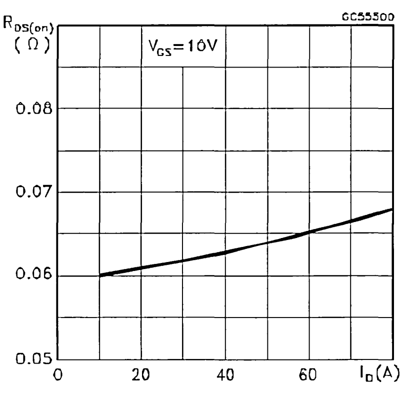
Transfer Characteristics



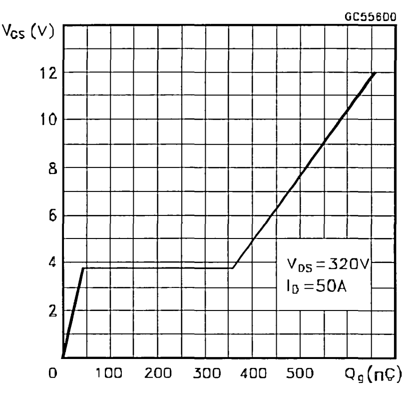
Transconductance



Static Drain-source On Resistance

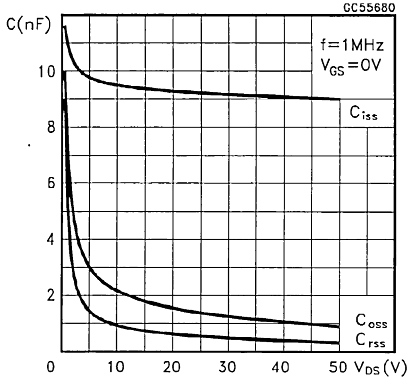


Gate Charge vs Gate-source Voltage

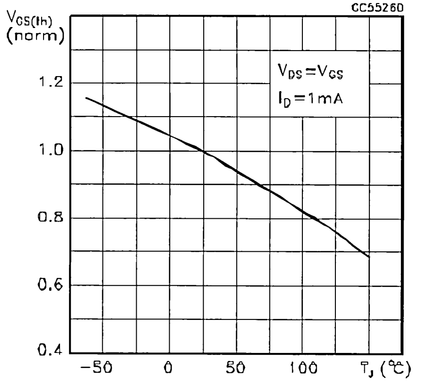


SGS-THOMSON MICROELECTRONICS

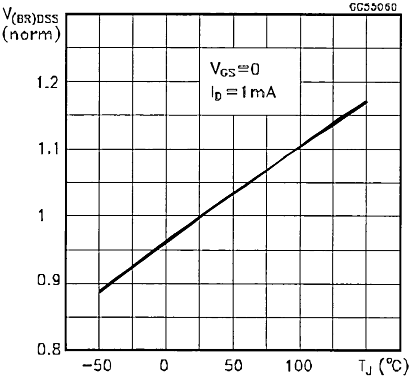
Capacitance Variations



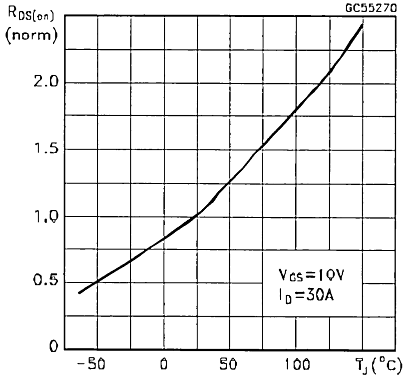
Normalized Gate Threshold Voltage vs Temperature



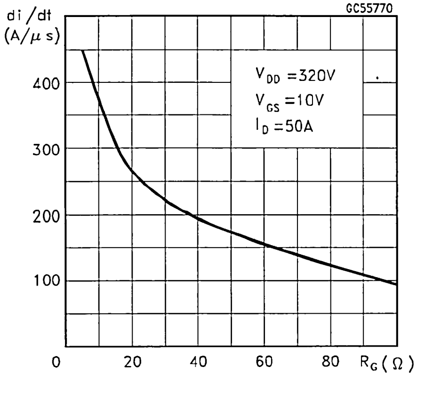
Normalized Breakdown Voltage vs Temperature



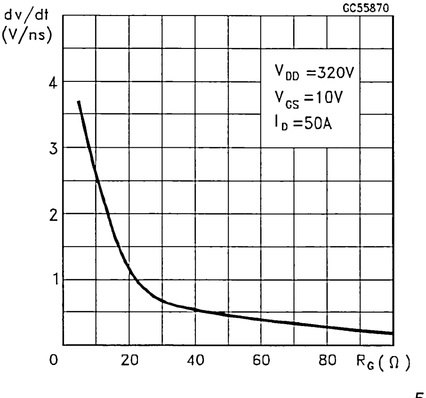
Normalized On Resistance vs Temperature



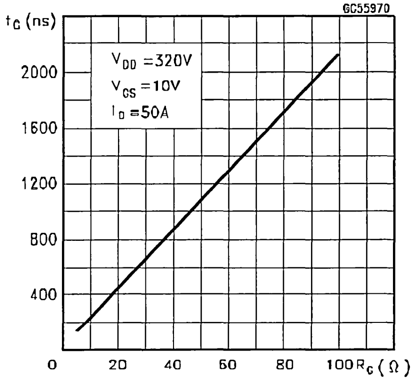
Turn-on Current Slope



Turn-off Drain-source Voltage Slope



Cross-over Time



Source-drain Diode Forward Characteristics

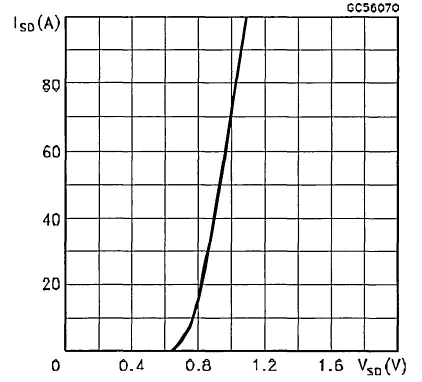


Fig. 1: Switching Times Test Circuits For Resistive Load

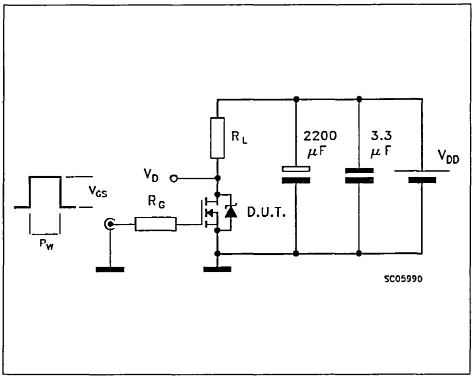


Fig. 2: Gate Charge Test Circuit

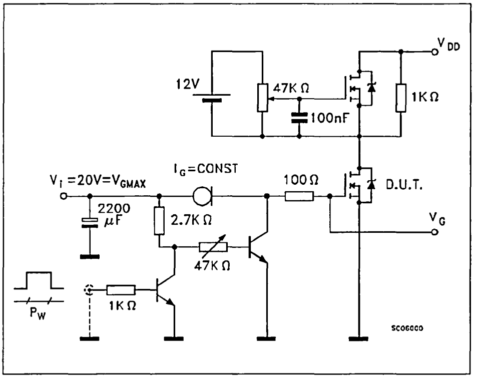
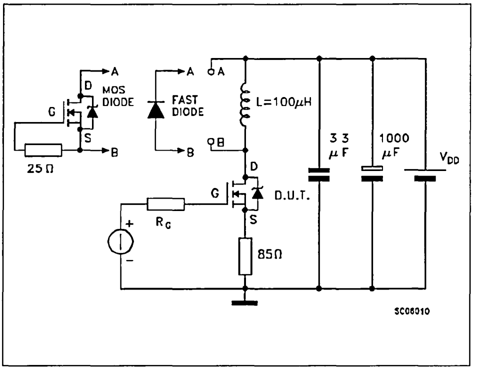


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON MICROELECTRONICS

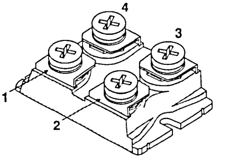
STE100N20

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR IN ISOTOP PACKAGE

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STE100N20	200 V	< 0.021 Ω	100 A

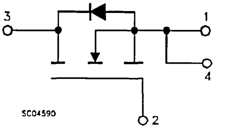
- HIGH CURRENT POWER MODULE
- AVALANCHE RUGGED TECHNOLOGY (SEE STH33N20FI FOR RATING)
- VERY LARGE SOA - LARGE PEAK POWER CAPABILITY
- EASY TO MOUNT
- SAME CURRENT CAPABILITY FOR THE TWO SOURCE TERMINALS
- EXTREMELY LOW R_{th} JUNCTION TO CASE
- VERY LOW DRAIN TO CASE CAPACITANCE
- VERY LOW INTERNAL PARASITIC INDUCTANCE (TYPICALLY < 5 nH)
- ISOLATED PACKAGE UL RECOGNIZED (FILE No E81743)

INDUSTRIAL APPLICATIONS:
- SMPS & UPS
- MOTOR CONTROL
- WELDING EQUIPMENT
- OUTPUT STAGE FOR PWM, ULTRASONIC CIRCUITS



ISOTOP

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage (V_{GS} = 0)	200	V
V_{DGR}	Drain-Gate Voltage (R_{GS} = 20 kΩ)	200	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	100	A
I_D	Drain Current (continuous) at T_c = 100 °C	65	A
I_{DM}(•)	Drain Current (pulsed)	400	A
P_{tot}	Total Dissipation at T_c = 25 °C	450	W
	Derating Factor	3.6	W/°C
T_{stg}	Storage Temperature	-55 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C
V_{ISO}	Insulation Withstand Voltage (AC-RMS)	2500	V

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	0.27	°C/W
$R_{thc\text{-}h}$	Thermal Resistance Case-heatsink With Conductive Grease Applied	Max	0.05	°C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 1 mA V_{GS} = 0 V	200			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			400 2	µA mA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 400	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS} I_D = 1 mA	2		4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 60 A			0.021	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	V_{DS} = 15 V I_D = 60 A	38			S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0 V			12 3200 1200	nF pF pF

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 100 V I_D = 50 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 1)		75 140		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 160 V I_D = 100 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		480		A/µs
Q_g	Total Gate Charge	V_{DD} = 160 V I_D = 100 A V_{GS} = 10 V		505		nC

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING OFF

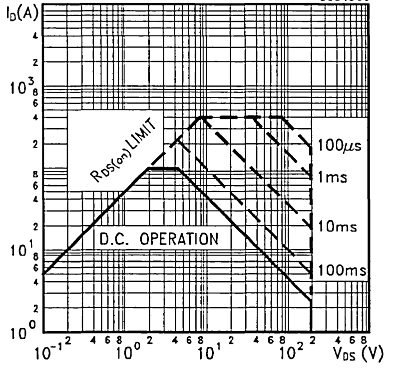
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 160 V I_D = 100 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		230 155 370		ns ns ns

SOURCE DRAIN DIODE

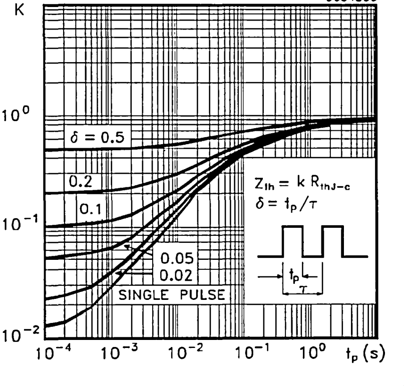
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				100 400	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 100 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 100 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 3)		580 3.5 12		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

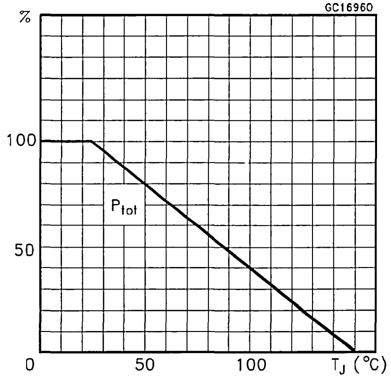
Safe Operating Area



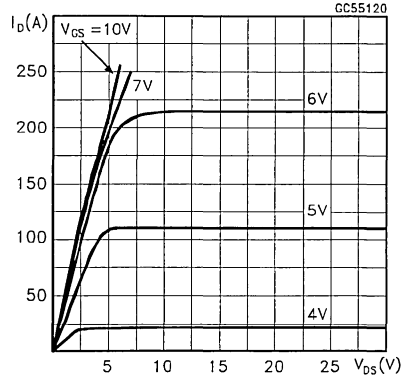
Thermal Impedance



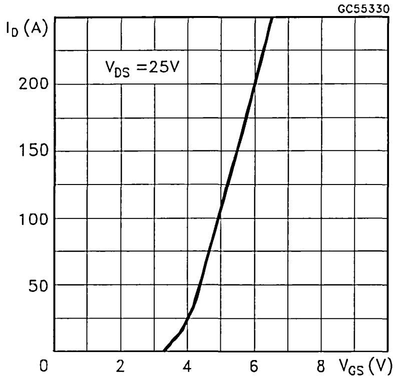
Derating Curve



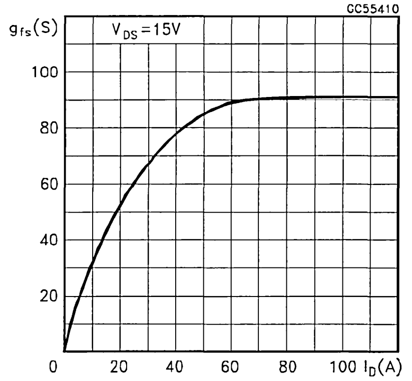
Output Characteristics



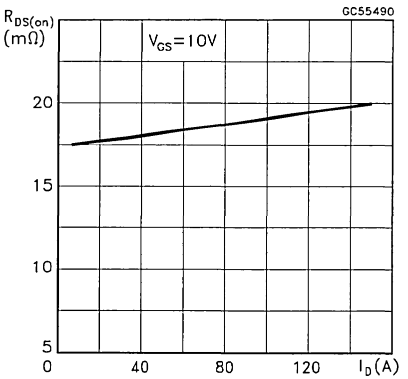
Transfer Characteristics



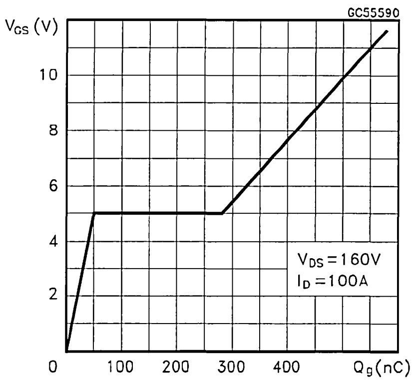
Transconductance



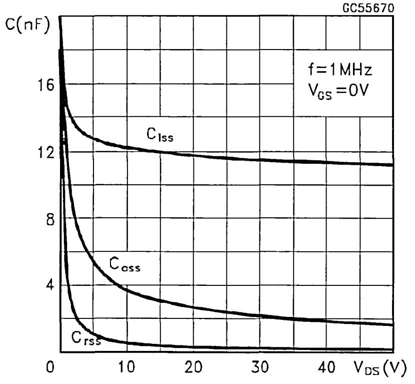
Static Drain-source On Resistance



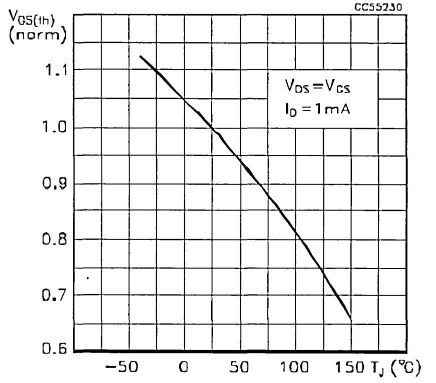
Gate Charge vs Gate-source Voltage



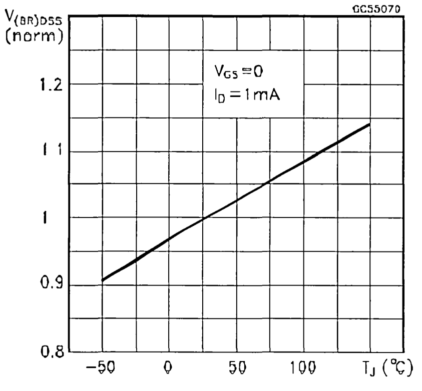
Capacitance Variations



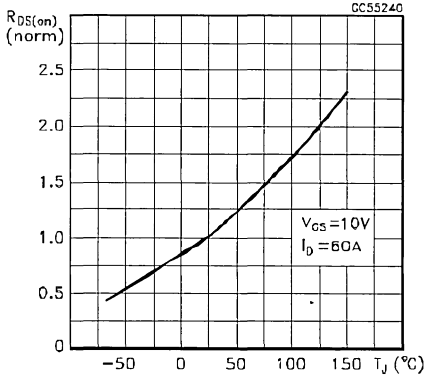
Normalized Gate Threshold Voltage vs Temperature



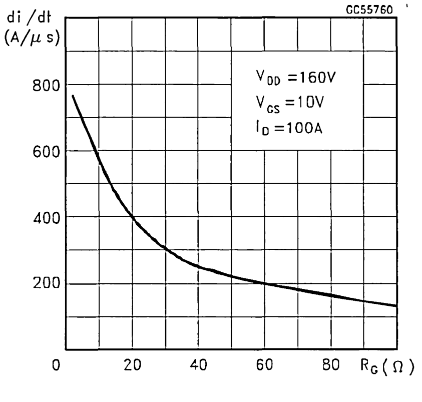
Normalized Breakdown Voltage vs Temperature



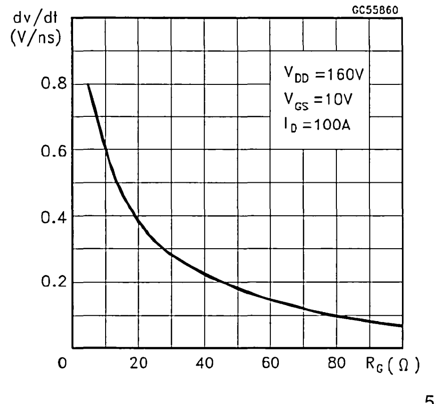
Normalized On Resistance vs Temperature



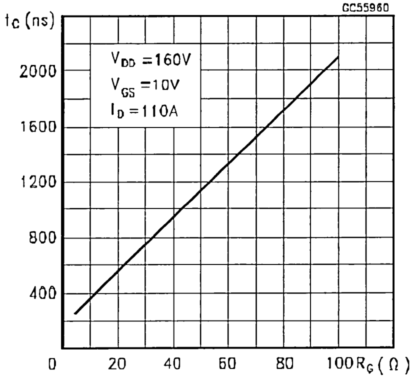
Turn-on Current Slope



Turn-off Drain-source Voltage Slope



Cross-over Time



Source-drain Diode Forward Characteristics

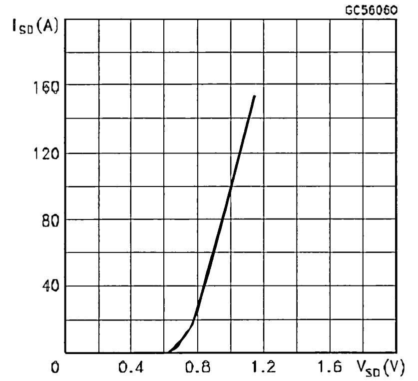


Fig. 1: Switching Times Test Circuits For Resistive Load

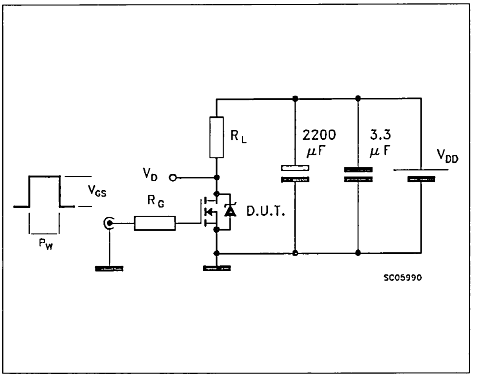


Fig. 2: Gate Charge Test Circuit

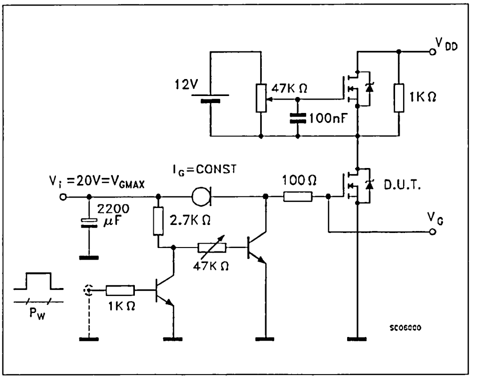
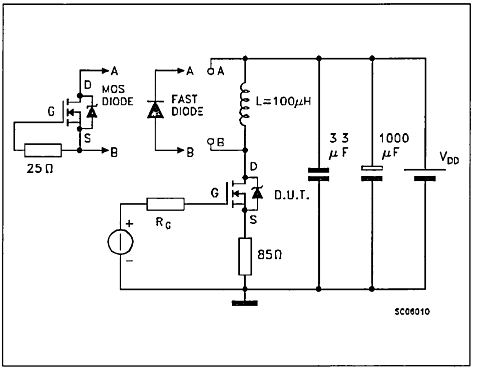


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON MICROELECTRONICS

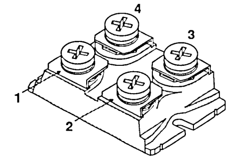
STE150N10

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR IN ISOTOP PACKAGE

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STE150N10	100 V	< 0.009 Ω	150 A

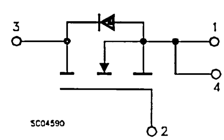
- HIGH CURRENT POWER MODULE
- AVALANCHE RUGGED TECHNOLOGY (SEE STH60N10 FOR RATING)
- VERY LARGE SOA - LARGE PEAK POWER CAPABILITY
- EASY TO MOUNT
- SAME CURRENT CAPABILITY FOR THE TWO SOURCE TERMINALS
- EXTREMELY LOW R_{th} JUNCTION TO CASE
- VERY LOW DRAIN TO CASE CAPACITANCE
- VERY LOW INTERNAL PARASITIC INDUCTANCE (TYPICALLY < 5 nH)
- ISOLATED PACKAGE UL RECOGNIZED (FILE No E81743)

INDUSTRIAL APPLICATIONS:
- SMPS & UPS
- MOTOR CONTROL
- WELDING EQUIPMENT
- OUTPUT STAGE FOR PWM, ULTRASONIC CIRCUITS



ISOTOP

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage (V_{GS} = 0)	100	V
V_{DGR}	Drain-Gate Voltage (R_{GS} = 20 kΩ)	100	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	150	A
I_D	Drain Current (continuous) at T_c = 100 °C	100	A
I_{DM}(•)	Drain Current (pulsed)	450	A
P_{tot}	Total Dissipation at T_c = 25 °C	410	W
	Derating Factor	3.3	W/°C
T_{stg}	Storage Temperature	-55 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C
V_{ISO}	Insulation Withstand Voltage (AC-RMS)	2500	V

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$ $R_{thc\text{-}h}$	Thermal Resistance Junction-case Max Thermal Resistance Case-heatsink With Conductive Grease Applied Max	0.3 0.05	°C/W °C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 1 mA V_{GS} = 0 V	100			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			300 1.5	µA mA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 300	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS} I_D = 1 mA	2		4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 90 A			0.009	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	V_{DS} = 15 V I_D = 90 A	85			S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0 V			13.5 3600 900	nF pF pF

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 50 V I_D = 75 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 1)		80 140		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 80 V I_D = 150 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		700		A/µs
Q_g	Total Gate Charge	V_{DD} = 80 V I_D = 150 A V_{GS} = 10 V		320		nC

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING OFF

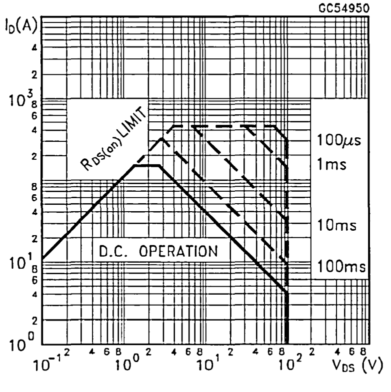
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 80 V I_D = 150 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		90 340 400		ns ns ns

SOURCE DRAIN DIODE

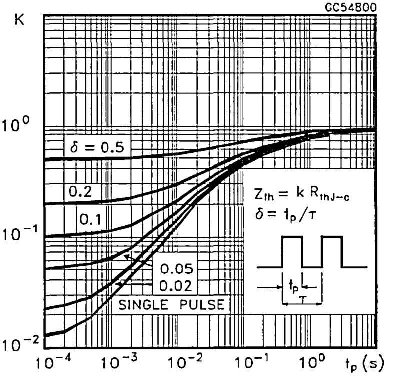
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				150 450	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 150 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 150 A di/dt = 100 A/µs V_{DD} = 50 V T_j = 150 °C (see test circuit, figure 3)		230 1750 15		ns µC A

(*) Pulsed. Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

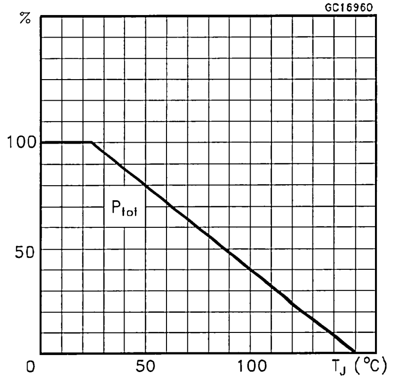
Safe Operating Area



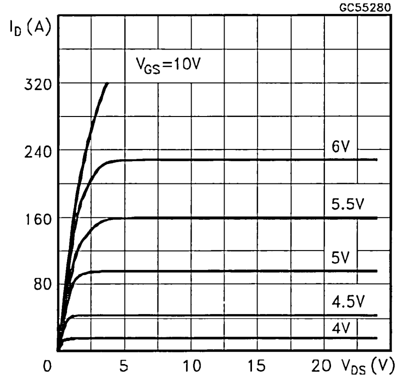
Thermal Impedance



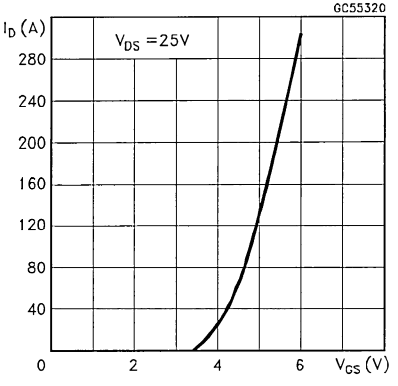
Derating Curve



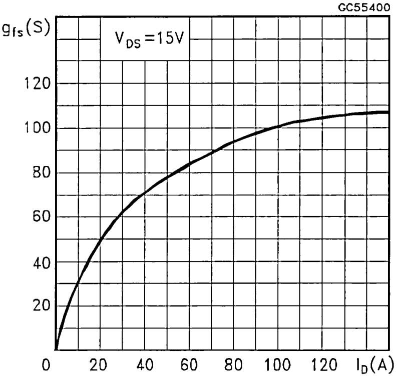
Output Characteristics



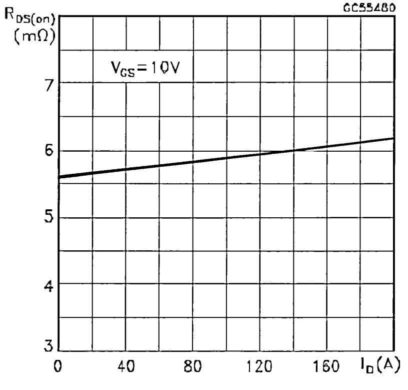
Transfer Characteristics



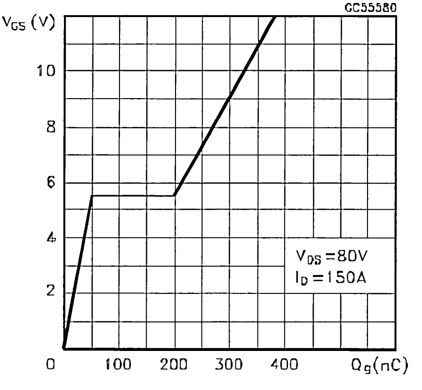
Transconductance



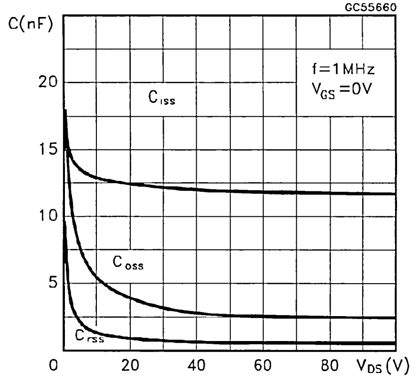
Static Drain-source On Resistance



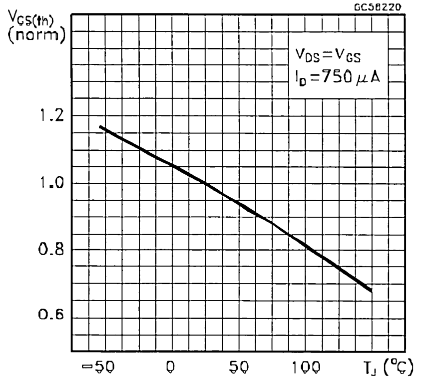
Gate Charge vs Gate-source Voltage



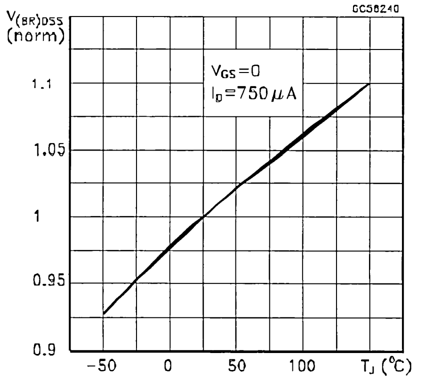
Capacitance Variations



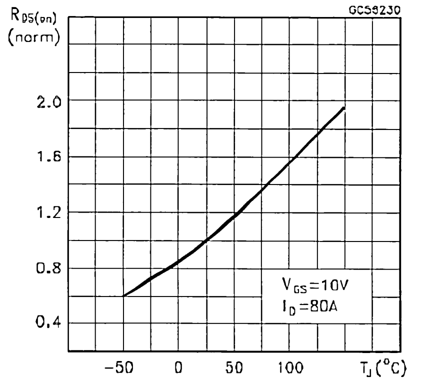
Normalized Gate Threshold Voltage vs Temperature



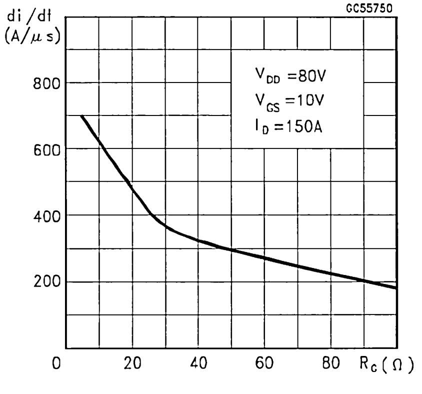
Normalized Breakdown Voltage vs Temperature



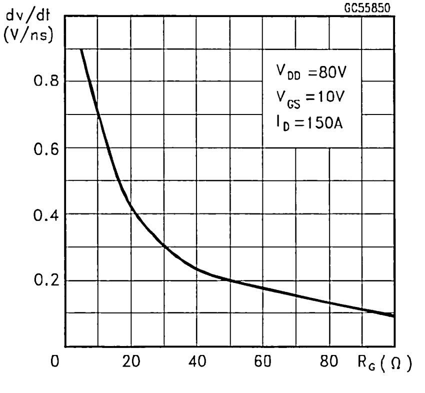
Normalized On Resistance vs Temperature



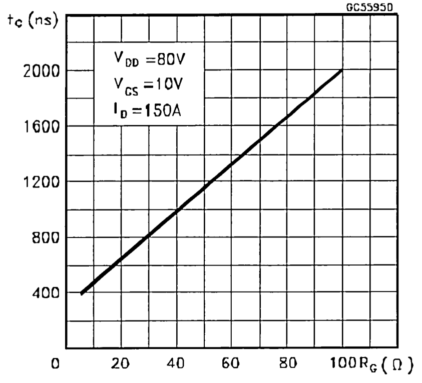
Turn-on Current Slope



Turn-off Drain-source Voltage Slope



Cross-over Time



Source-drain Diode Forward Characteristics

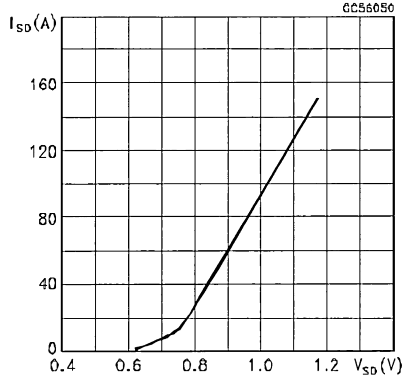


Fig. 1: Switching Times Test Circuits For Resistive Load

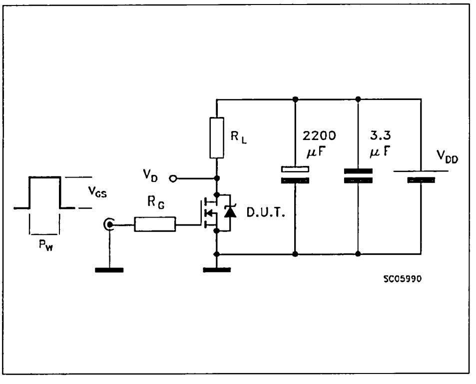


Fig. 2: Gate Charge Test Circuit

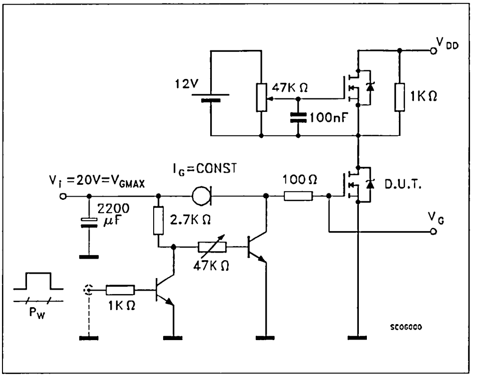
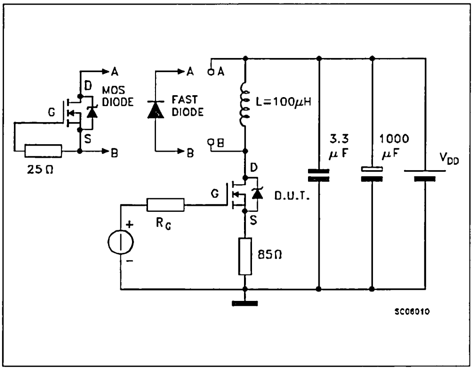


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON MICROELECTRONICS

SGS-THOMSON MICROELECTRONICS

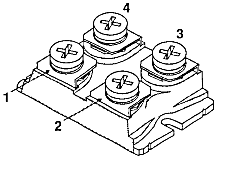
STE180N05

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR IN ISOTOP PACKAGE

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STE180N05	50 V	< 0.006 Ω	180 A

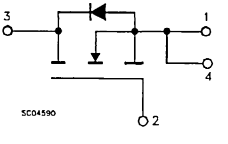
- HIGH CURRENT POWER MODULE
- AVALANCHE RUGGED TECHNOLOGY (SEE STH65N05 FOR RATING)
- VERY LARGE SOA - LARGE PEAK POWER CAPABILITY
- EASY TO MOUNT
- SAME CURRENT CAPABILITY FOR THE TWO SOURCE TERMINALS
- EXTREMELY LOW R_{th} JUNCTION TO CASE
- VERY LOW DRAIN TO CASE CAPACITANCE
- VERY LOW INTERNAL PARASITIC INDUCTANCE (TYPICALLY < 5 nH)
- ISOLATED PACKAGE UL RECOGNIZED (FILE No E81743)

INDUSTRIAL APPLICATIONS:
- SMPS & UPS
- MOTOR CONTROL
- WELDING EQUIPMENT
- OUTPUT STAGE FOR PWM, ULTRASONIC CIRCUITS



ISOTOP

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage (V_{GS} = 0)	50	V
V_{DGR}	Drain-Gate Voltage (R_{GS} = 20 kΩ)	50	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	180	A
I_D	Drain Current (continuous) at T_c = 100 °C	115.5	A
I_{DM}(•)	Drain Current (pulsed)	540	A
P_{tot}	Total Dissipation at T_c = 25 °C	360	W
	Derating Factor	2.9	W/°C
T_{stg}	Storage Temperature	-55 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C
V_{ISO}	Insulation Withstand Voltage (AC-RMS)	2500	V

(•) Pulse width limited by safe operating area

July 1993

THERMAL DATA

$R_{thj\text{-}case}$ $R_{thc\text{-}h}$	Thermal Resistance Junction-case Thermal Resistance Case-heatsink With Conductive Grease Applied	Max Max	0.35 0.05	°C/W °C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 1 mA V_{GS} = 0 V	50			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			400 2	µA mA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 400	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS} I_D = 1 mA	2		4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 90 A		0.004	0.006	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	V_{DS} = 15 V I_D = 90 A		100		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0 V			12 5200 1200	nF pF pF

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 90 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 1)		55 210		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 180 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		900		A/µs
Q_g	Total Gate Charge	V_{DD} = 40 V I_D = 180 A V_{GS} = 10 V		270		nC

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING OFF

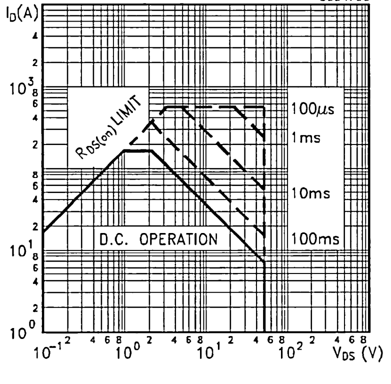
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 180 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		40 315 440		ns ns ns

SOURCE DRAIN DIODE

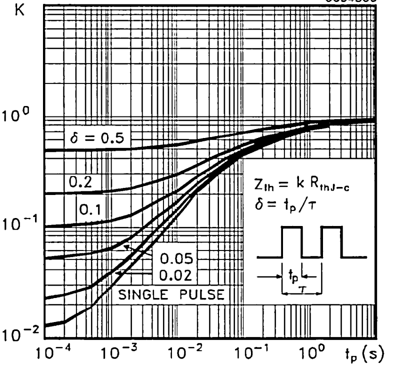
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				180 540	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 180 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 180 A di/dt = 100 A/μs V_{DD} = 25 V T_j = 150 °C (see test circuit, figure 3)		160 480 6		ns nC A

(*) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

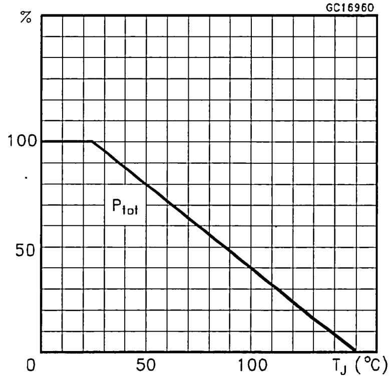
Safe Operating Area



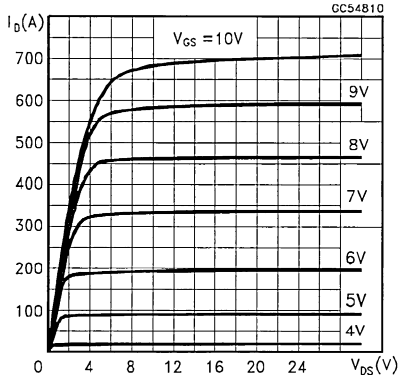
Thermal Impedance



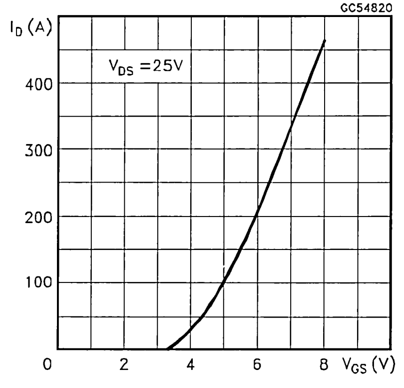
Derating Curve



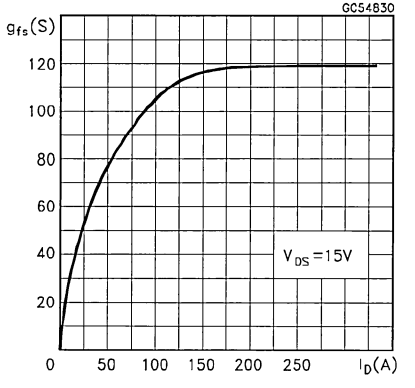
Output Characteristics



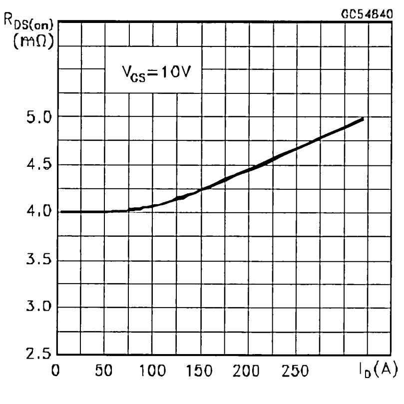
Transfer Characteristics



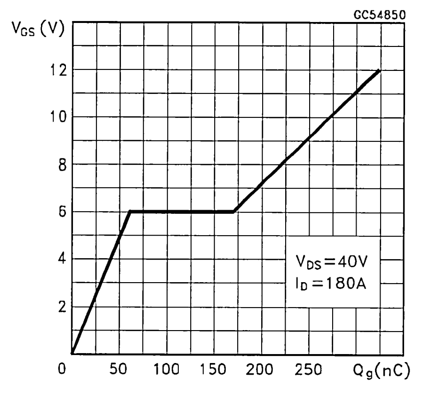
Transconductance



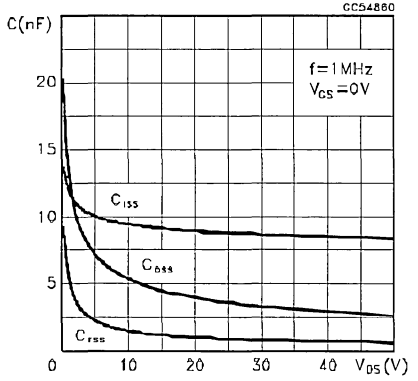
Static Drain-source On Resistance



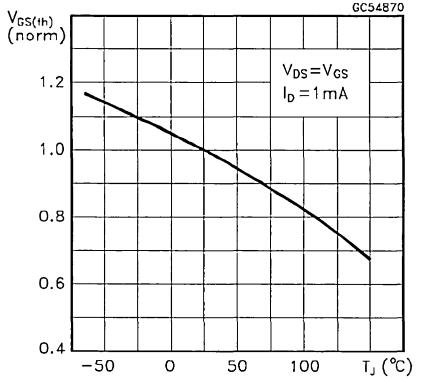
Gate Charge vs Gate-source Voltage



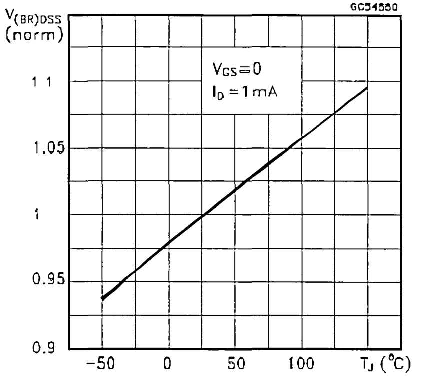
Capacitance Variations



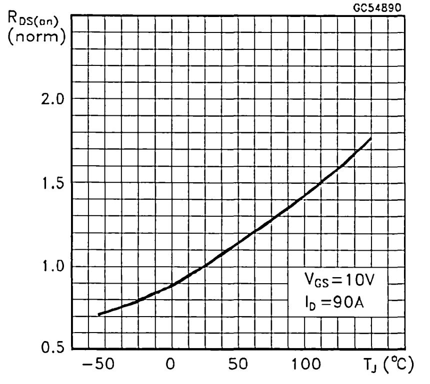
Normalized Gate Threshold Voltage vs Temperature



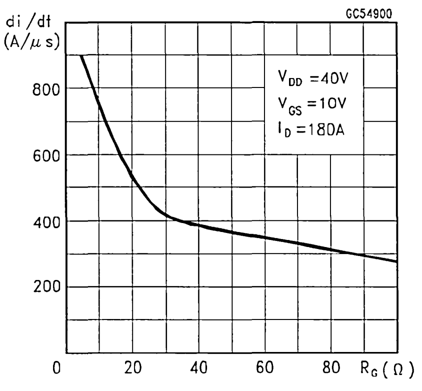
Normalized Breakdown Voltage vs Temperature



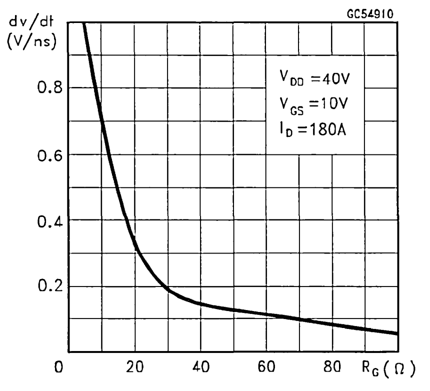
Normalized On Resistance vs Temperature



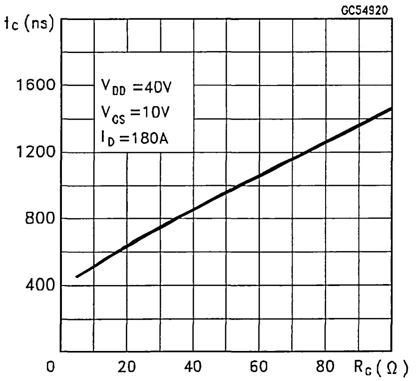
Turn-on Current Slope



Turn-off Drain-source Voltage Slope



Cross-over Time



Source-drain Diode Forward Characteristics

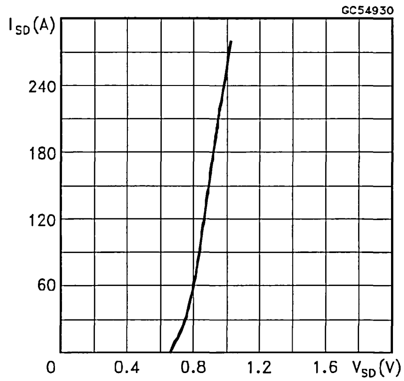


Fig. 1: Switching Times Test Circuits For Resistive Load

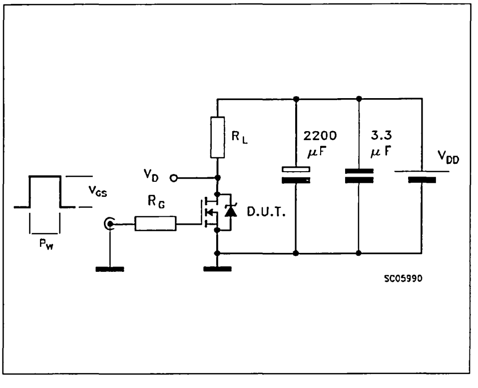


Fig. 2: Gate Charge Test Circuit

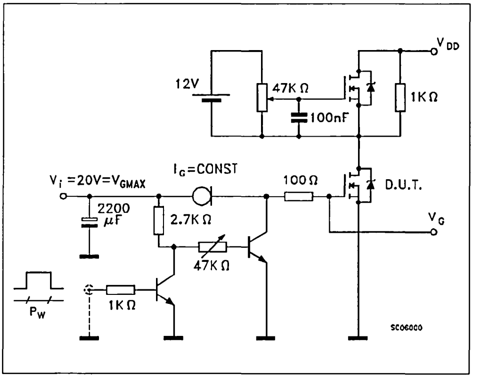
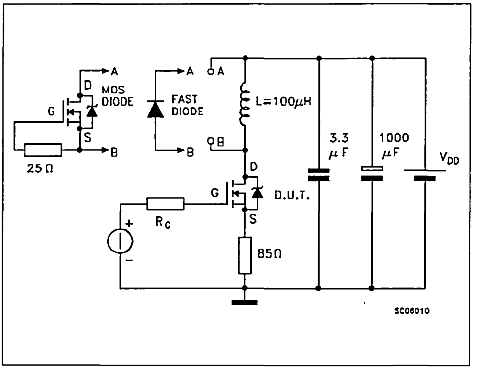


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times



![SGS-THOMSON MICROELECTRONICS]

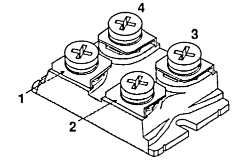
STE180N10

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR IN ISOTOP PACKAGE

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STE180N10	100 V	< 0.007 Ω	180 A

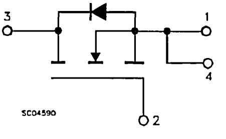
- HIGH CURRENT POWER MODULE
- AVALANCHE RUGGED TECHNOLOGY (SEE STH60N10 FOR RATING)
- VERY LARGE SOA - LARGE PEAK POWER CAPABILITY
- EASY TO MOUNT
- SAME CURRENT CAPABILITY FOR THE TWO SOURCE TERMINALS
- EXTREMELY LOW R_{th} JUNCTION TO CASE
- VERY LOW DRAIN TO CASE CAPACITANCE
- VERY LOW INTERNAL PARASITIC INDUCTANCE (TYPICALLY < 5 nH)
- ISOLATED PACKAGE UL RECOGNIZED (FILE No E81743)

INDUSTRIAL APPLICATIONS:
- SMPS & UPS
- MOTOR CONTROL
- WELDING EQUIPMENT
- OUTPUT STAGE FOR PWM, ULTRASONIC CIRCUITS



ISOTOP

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage (V_{GS} = 0)	100	V
V_{DGR}	Drain-Gate Voltage (R_{GS} = 20 kΩ)	100	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	180	A
I_D	Drain Current (continuous) at T_c = 100 °C	119	A
I_{DM}(•)	Drain Current (pulsed)	540	A
P_{tot}	Total Dissipation at T_c = 25 °C	450	W
	Derating Factor	3.6	W/°C
T_{stg}	Storage Temperature	-55 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C
V_{ISO}	Insulation Withstand Voltage (AC-RMS)	2500	V

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case Max	0.27	°C/W
R_{thc-h}	Thermal Resistance Case-heatsink With Conductive Grease Applied Max	0.05	°C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 1 mA V_{GS} = 0 V	100			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			400 2	μA mA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 400	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS} I_D = 1 mA	2		4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 110 A			0.007	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	V_{DS} = 15 V I_D = 110 A	100			S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0 V			18 4800 1200	nF pF pF

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 50 V I_D = 90 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 1)		80 140		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 80 V I_D = 180 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		750		A/μs
Q_g	Total Gate Charge	V_{DD} = 80 V I_D = 180 A V_{GS} = 10 V		425		nC

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING OFF

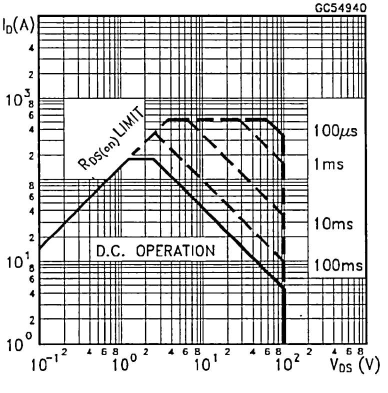
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 80 V I_D = 180 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		95 350 490		ns ns ns

SOURCE DRAIN DIODE

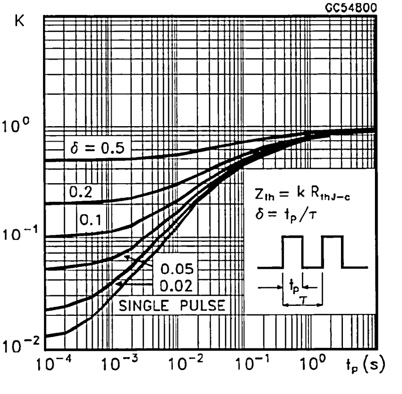
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				180 540	A A
V_{SD} (∗)	Forward On Voltage	I_{SD} = 180 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 180 A di/dt = 100 A/μs V_{DD} = 50 V T_j = 150 °C (see test circuit, figure 3)		250 1875 15		ns μC A

(∗) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

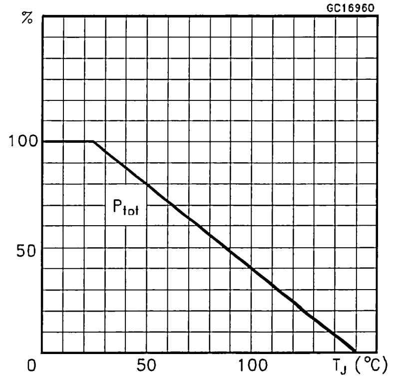
Safe Operating Area



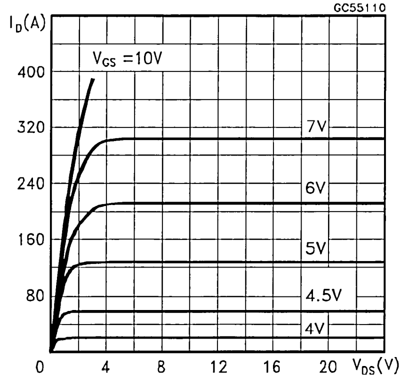
Thermal Impedance



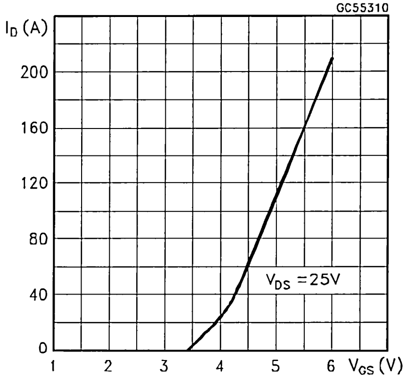
Derating Curve



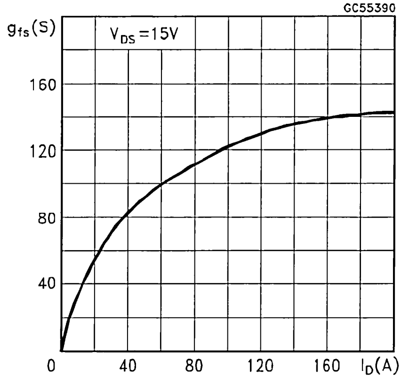
Output Characteristics



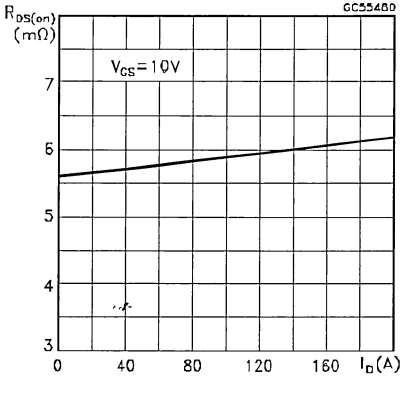
Transfer Characteristics



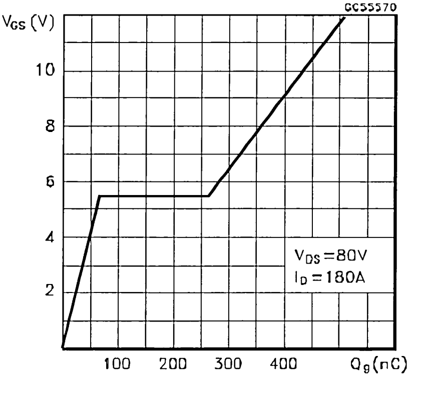
Transconductance



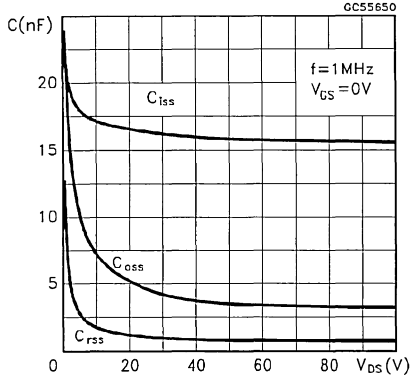
Static Drain-source On Resistance



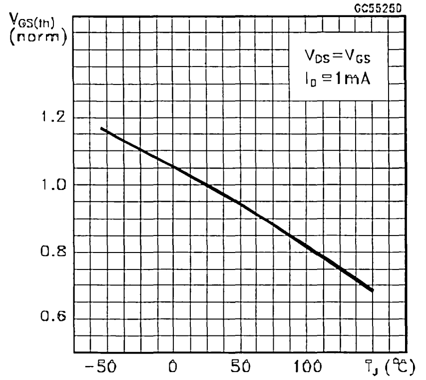
Gate Charge vs Gate-source Voltage



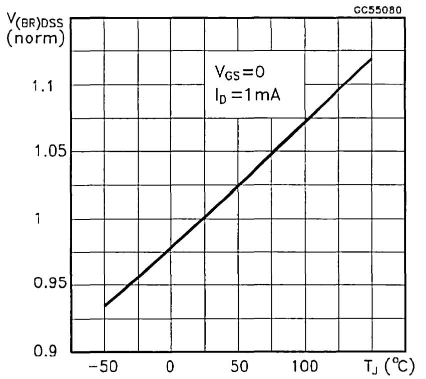
Capacitance Variations



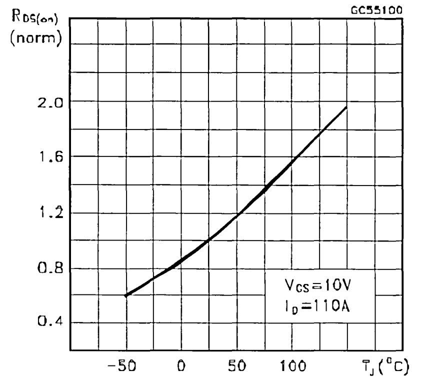
Normalized Gate Threshold Voltage vs Temperature



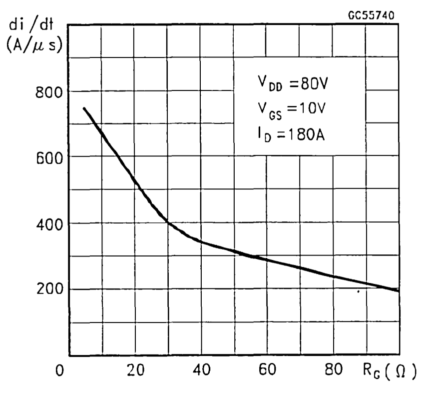
Normalized Breakdown Voltage vs Temperature



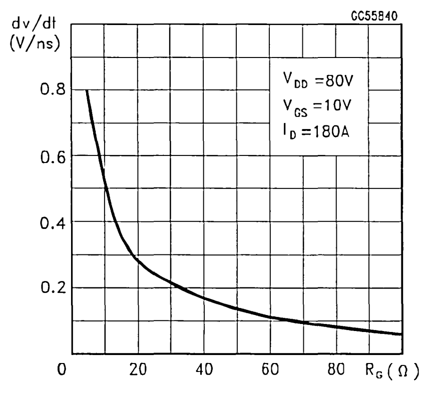
Normalized On Resistance vs Temperature



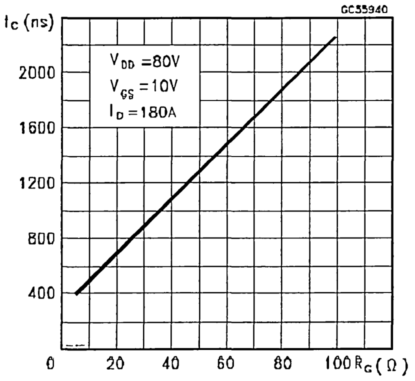
Turn-on Current Slope



Turn-off Drain-source Voltage Slope



Cross-over Time



Source-drain Diode Forward Characteristics

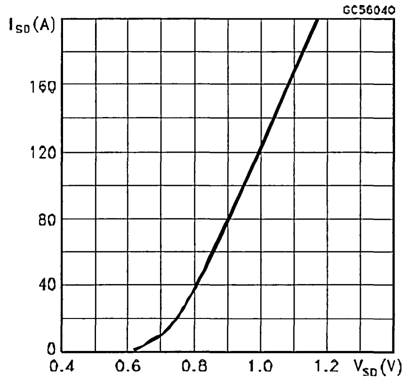


Fig. 1: Switching Times Test Circuits For Resistive Load

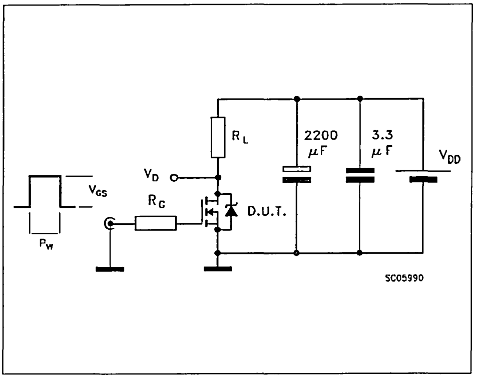


Fig. 2: Gate Charge Test Circuit

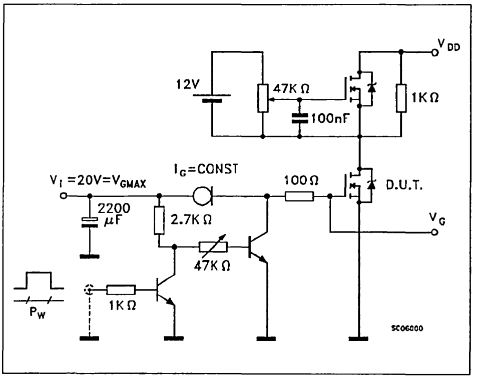
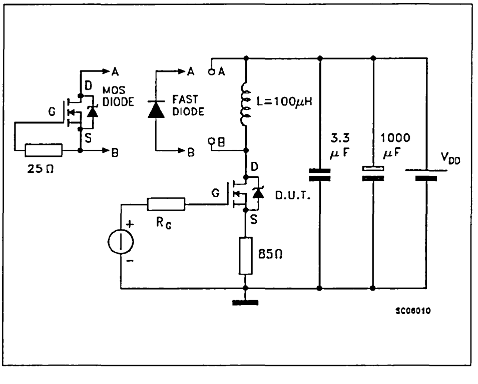


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON MICROELECTRONICS

SGS-THOMSON
MICROELECTRONICS

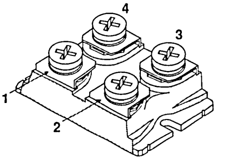
STE250N05

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR IN ISOTOP PACKAGE

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STE250N05	50 V	< 0.004 Ω	250 A

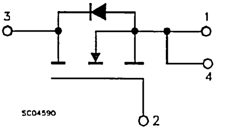
- HIGH CURRENT POWER MODULE
- AVALANCHE RUGGED TECHNOLOGY (SEE STH80N05 FOR RATING)
- VERY LARGE SOA - LARGE PEAK POWER CAPABILITY
- EASY TO MOUNT
- SAME CURRENT CAPABILITY FOR THE TWO SOURCE TERMINALS
- EXTREMELY LOW R_{th} JUNCTION TO CASE
- VERY LOW DRAIN TO CASE CAPACITANCE
- VERY LOW INTERNAL PARASITIC INDUCTANCE (TYPICALLY < 5 nH)
- ISOLATED PACKAGE UL RECOGNIZED (FILE No E81743)

INDUSTRIAL APPLICATIONS:
- SMPS & UPS
- MOTOR CONTROL
- WELDING EQUIPMENT
- OUTPUT STAGE FOR PWM, ULTRASONIC CIRCUITS



ISOTOP

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage (V_{GS} = 0)	50	V
V_{DGR}	Drain-Gate Voltage (R_{GS} = 20 kΩ)	50	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	250	A
I_D	Drain Current (continuous) at T_c = 100 °C	155	A
I_{DM}(•)	Drain Current (pulsed)	750	A
P_{tot}	Total Dissipation at T_c = 25 °C	450	W
	Derating Factor	3.6	W/°C
T_{stg}	Storage Temperature	-55 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C
V_{ISO}	Insulation Withstand Voltage (AC-RMS)	2500	V

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$ $R_{thc\text{-}h}$	Thermal Resistance Junction-case Max Thermal Resistance Case-heatsink With Conductive Grease Applied Max	0.27 0.05	°C/W °C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 1 mA V_{GS} = 0 V	50			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			400 2	µA mA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 400	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS} I_D = 1 mA	2		4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 125 A			0.004	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	V_{DS} = 15 V I_D = 125 A	100			S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0 V			25 10000 3000	nF pF pF

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 125 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 1)		95 300		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 250 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		440		A/µs
Q_g	Total Gate Charge	V_{DD} = 40 V I_D = 250 A V_{GS} = 10 V		475		nC

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING OFF

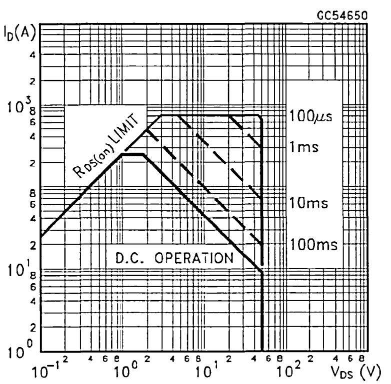
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 250 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		140 745 1000		ns ns ns

SOURCE DRAIN DIODE

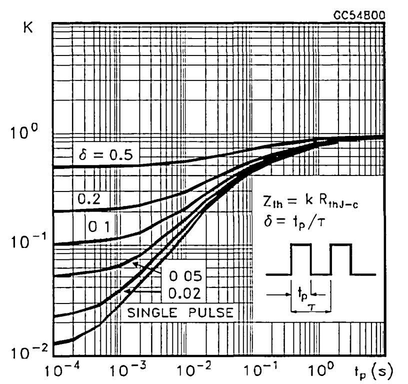
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				250 750	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 250 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 250 A di/dt = 100 A/µs V_{DD} = 25 V T_j = 150 °C (see test circuit, figure 3)		210 1.31 12.5		ns µC A

(*) Pulsed Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

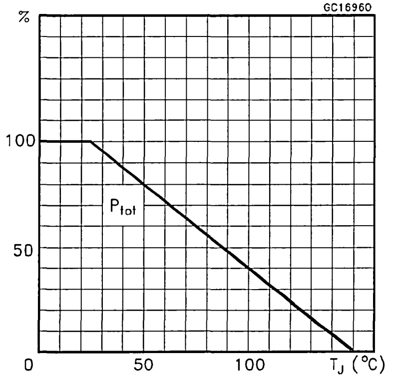
Safe Operating Area



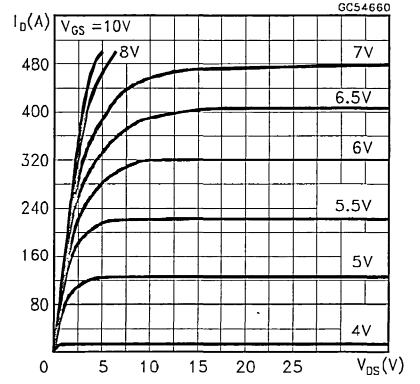
Thermal Impedance



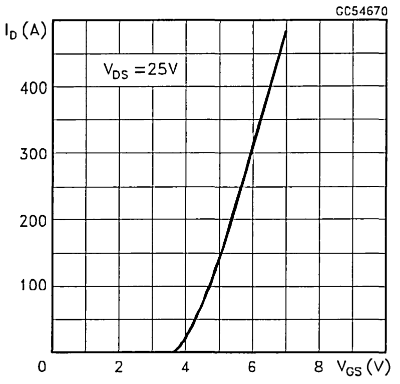
Derating Curve



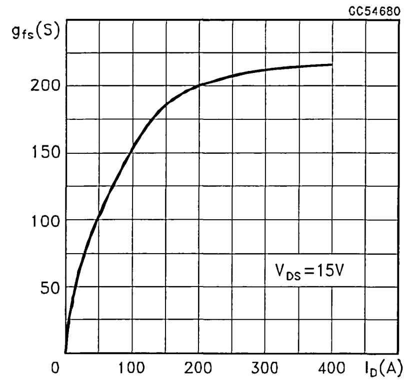
Output Characteristics



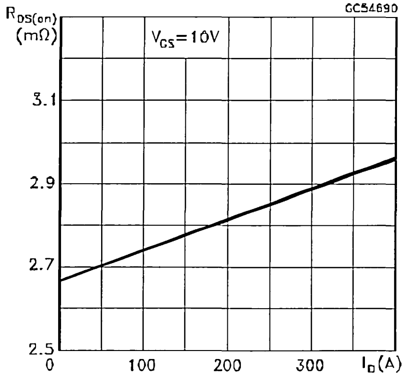
Transfer Characteristics



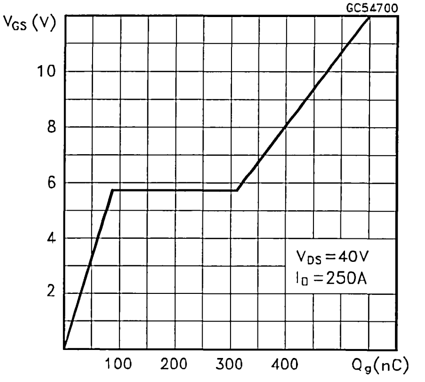
Transconductance



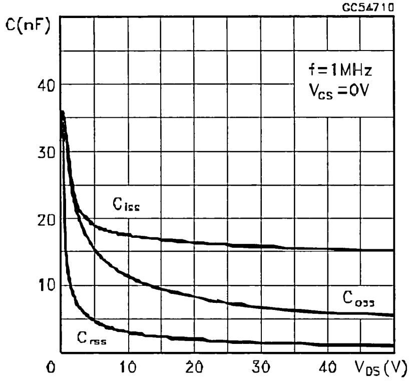
Static Drain-source On Resistance



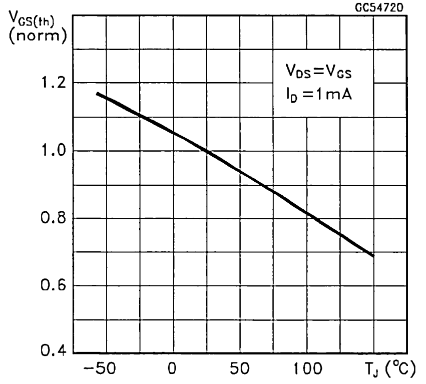
Gate Charge vs Gate-source Voltage



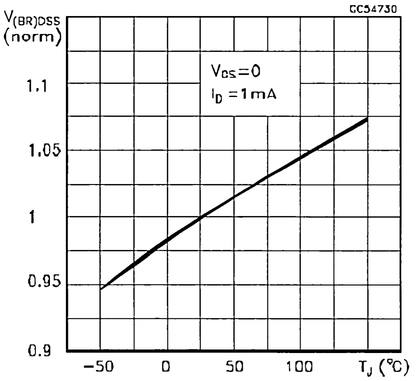
Capacitance Variations



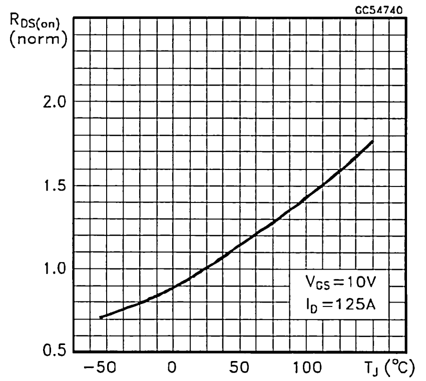
Normalized Gate Threshold Voltage vs Temperature



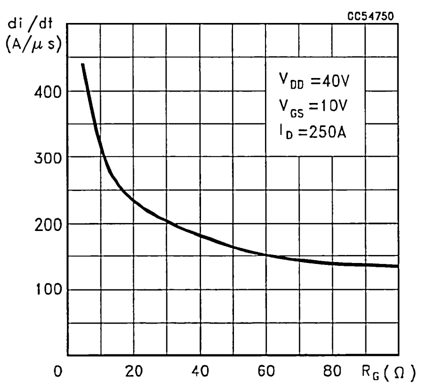
Normalized Breakdown Voltage vs Temperature



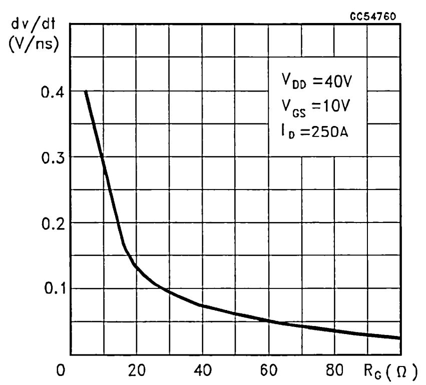
Normalized On Resistance vs Temperature



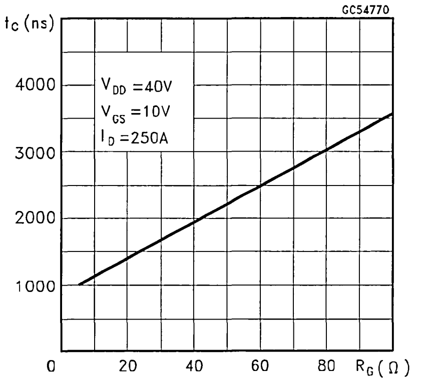
Turn-on Current Slope



Turn-off Drain-source Voltage Slope



Cross-over Time



Source-drain Diode Forward Characteristics

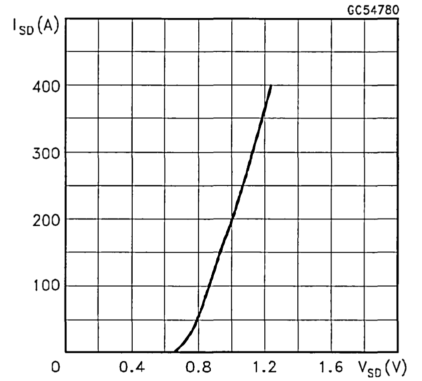


Fig. 1: Switching Times Test Circuits For Resistive Load

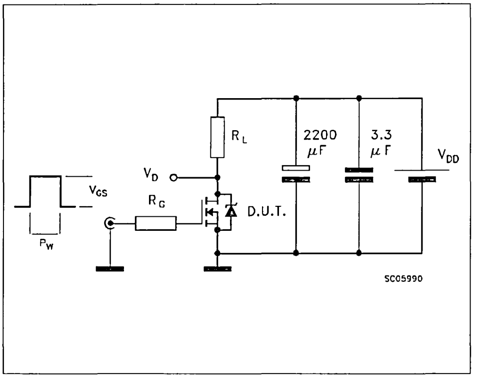


Fig. 2: Gate Charge Test Circuit

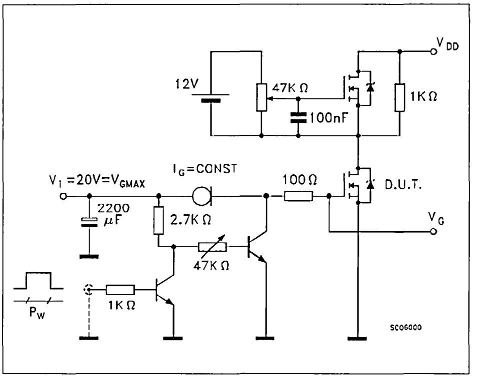
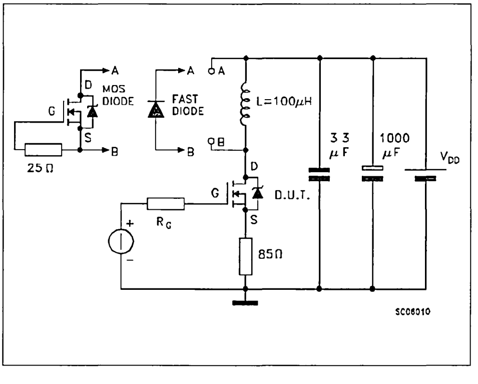


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times

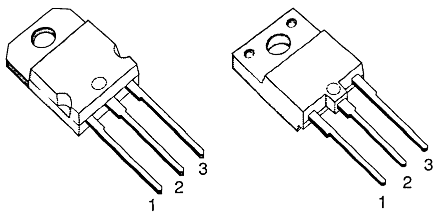


STH4N80
STH4N80FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH4N80	800 V	< 3 Ω	4.3 A
STH4N80FI	800 V	< 3 Ω	2.8 A

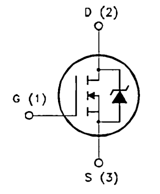
- TYPICAL $R_{DS(on)}$ =2.5 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION



TO-218 ISOWATT218

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STH4N80	STH4N80FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	800		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	800		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	4.3	2.8	A
I_D	Drain Current (continuous) at T_c = 100 °C	2.6	1.7	A
I_{DM}(•)	Drain Current (pulsed)	16	16	A
P_{tot}	Total Dissipation at T_c = 25 °C	125	55	W
	Derating Factor	1	0.44	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-218	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	2.27	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	30		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.1		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	4.3	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	230	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	10	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	2.6	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	800			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 1.7 A V_{GS} = 10V I_D = 1.7 A T_c = 100°C		2.5	3 6	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	4.3			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 1.7 A	1			S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0			1100 150 55	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 2.3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		65 150	90 200	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 600 V I_D = 3.8 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		80	110	A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 5 A V_{GS} = 10 V		55 8 26	70	nC nC nC

SWITCHING OFF

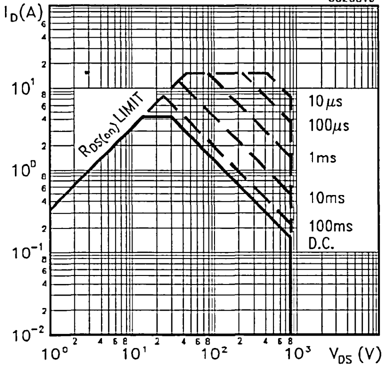
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 600 V I_D = 3.8 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		110 140 150	145 190 200	ns ns ns

SOURCE DRAIN DIODE

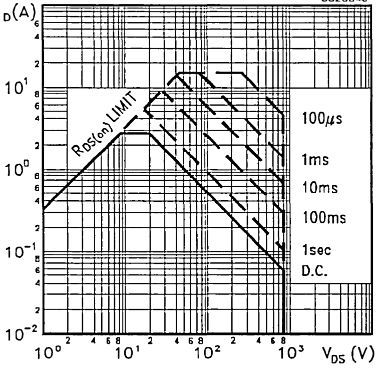
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				4.2 16	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 4.3 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 3.8 A di/dt = 100 A/µs V_R = 100 V T_j = 150 °C (see test circuit, figure 5)		500 4.3 17		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

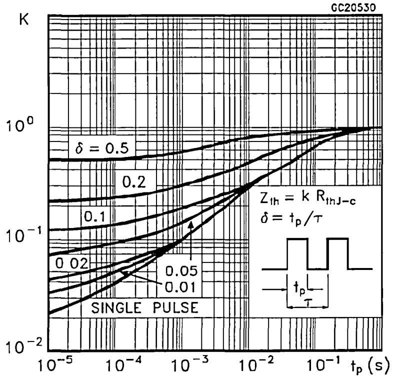
Safe Operating Areas For TO-218



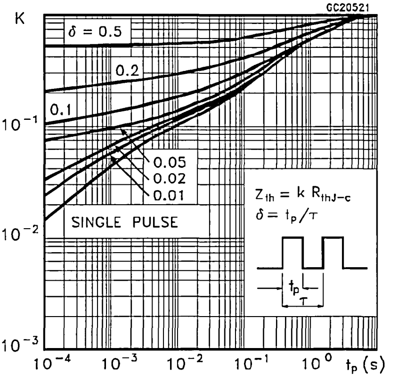
Safe Operating Areas For ISOWATT218



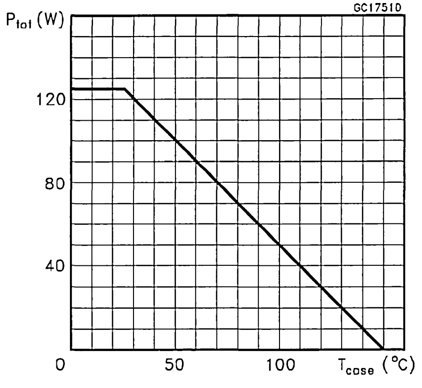
Thermal Impedeance For TO-218



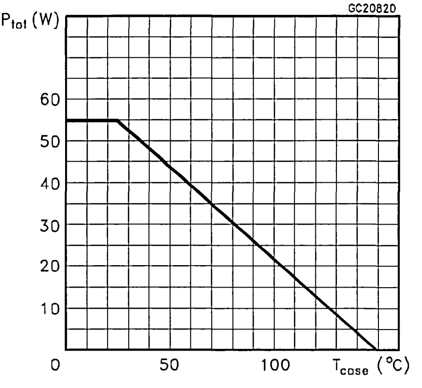
Thermal Impedance For ISOWATT218



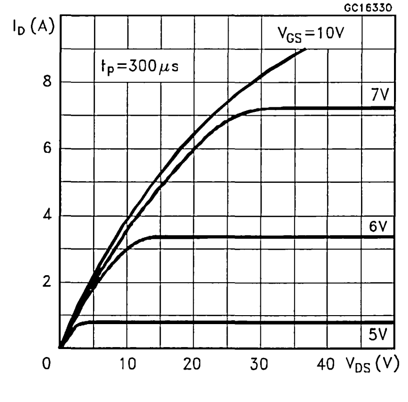
Derating Curve For TO-218



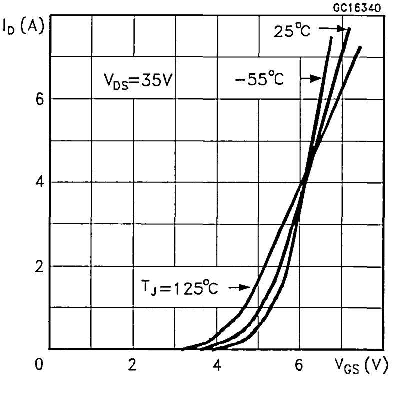
Derating Curve For ISOWATT218



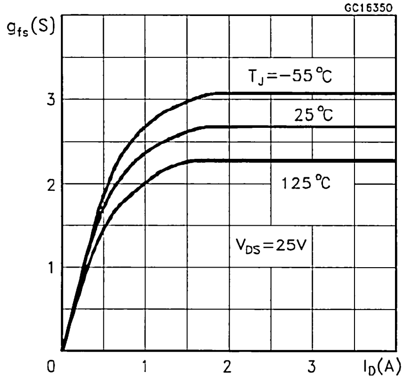
Output Characteristics



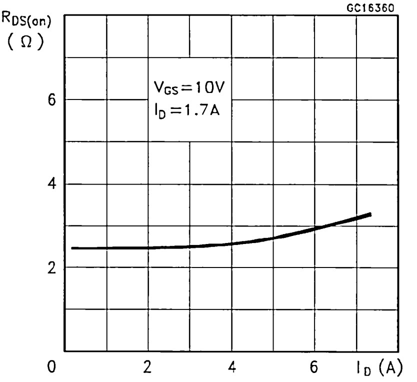
Transfer Characteristics



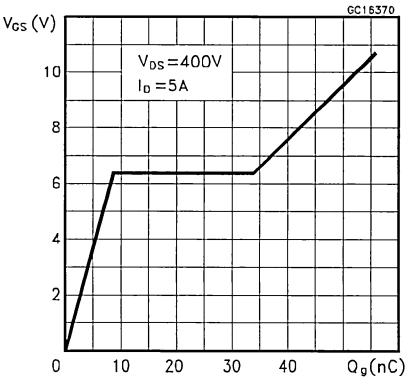
Transconductance



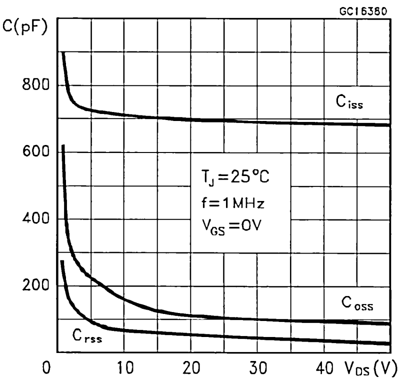
Static Drain-source On Resistance



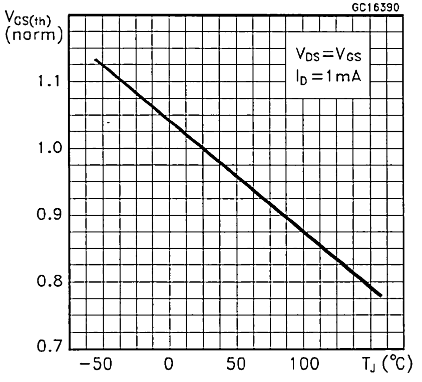
Gate Charge vs Gate-source Voltage



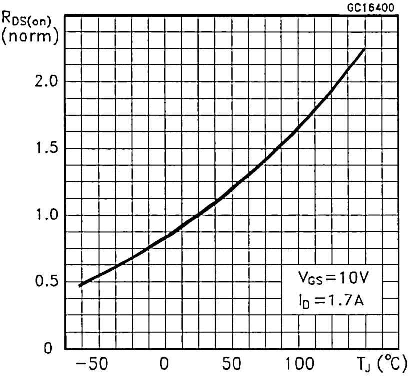
Capacitance Variations



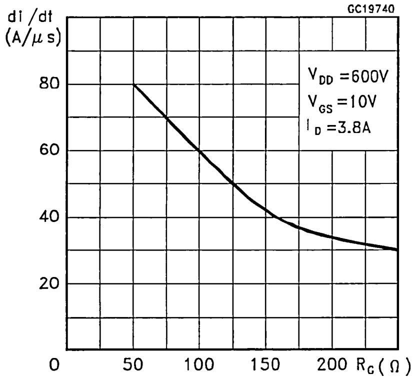
Normalized Gate Threshold Voltage vs Temperature



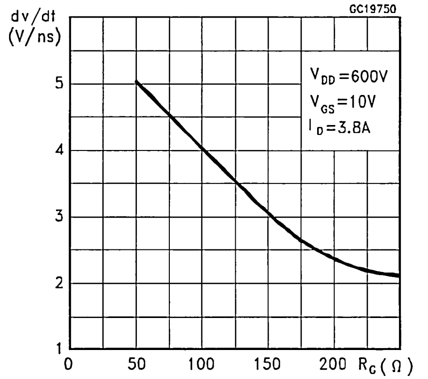
Normalized On Resistance vs Temperature



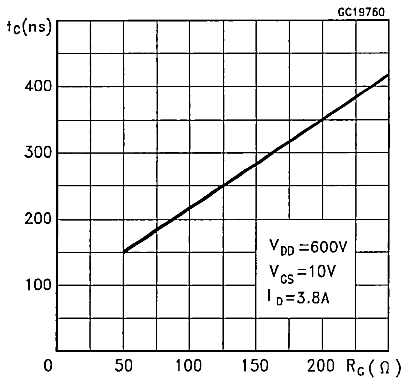
Turn-on Current Slope



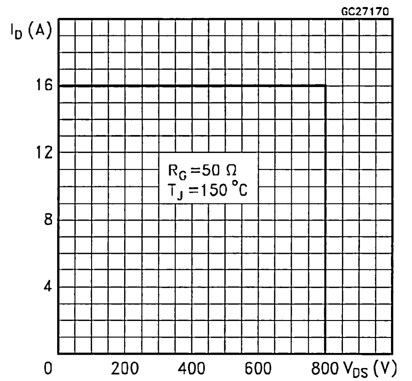
Turn-off Drain-source Voltage Slope



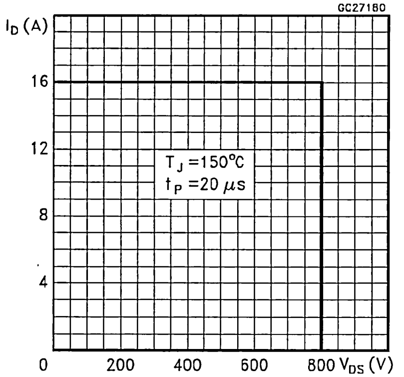
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

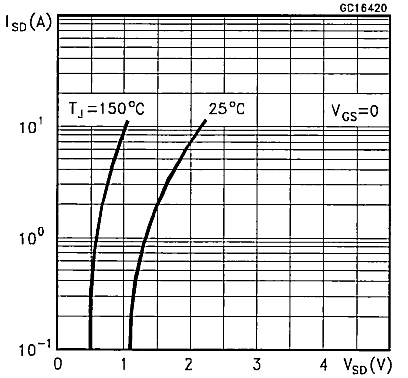


Fig. 1: Unclamped Inductive Load Test Circuits

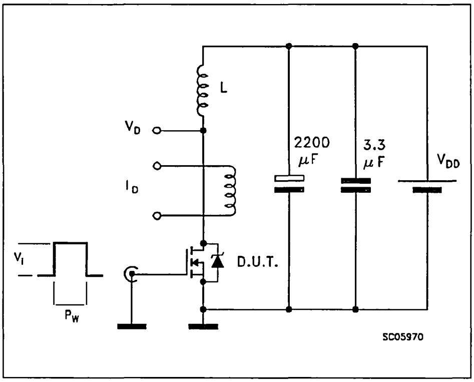


Fig. 2: Unclamped Inductive Waveforms

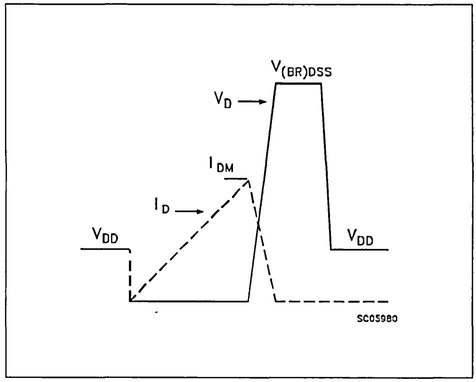


Fig. 3: Switching Times Test Circuits For Resistive Load

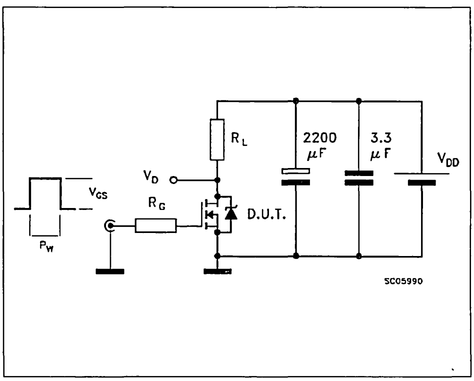


Fig. 4: Gate Charge Test Circuit

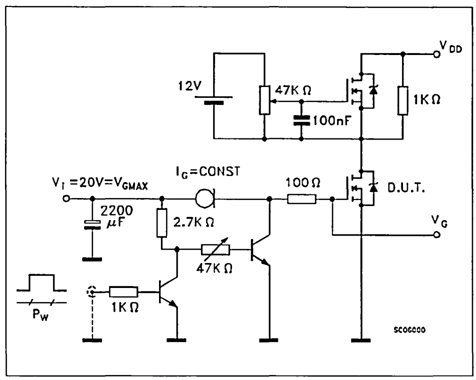
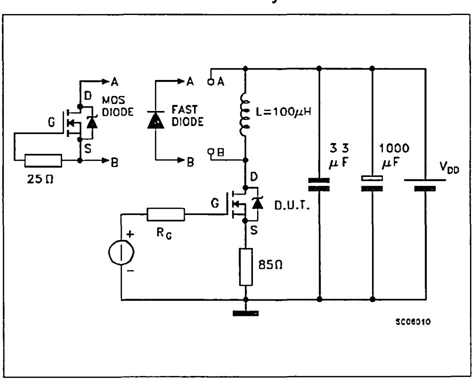


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



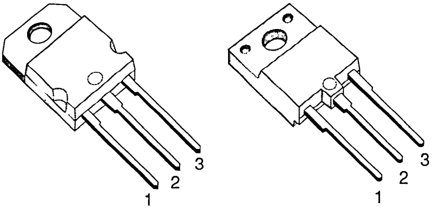
SGS-THOMSON MICROELECTRONICS

STH4N90
STH4N90FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH4N90 STH4N90FI	900 V 900 V	< 3.2 Ω < 3.2 Ω	4.2 A 2.7 A

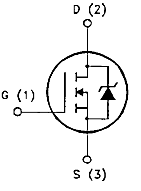
- TYPICAL $R_{DS(on)}$ = 2.9 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION



TO-218 ISOWATT218

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STH4N90	STH4N90FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	900		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	900		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	4.2	2.7	A
I_D	Drain Current (continuous) at T_c = 100 °C	2.6	1.6	A
I_{DM}(•)	Drain Current (pulsed)	16	16	A
P_{tot}	Total Dissipation at T_c = 25 °C	125	55	W
	Derating Factor	1	0.44	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-218	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	2.27	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	30		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.1		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	4.2	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 50$ V)	230	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	10	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	2.6	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	900			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (∗)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10$V $I_D = 1.7$ A $V_{GS} = 10$V $I_D = 1.7$ A $T_c = 100$°C		2.9	3.2 6.4	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	4.2			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (∗)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 1.7$ A	1			S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$			1100 150 55	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 2.3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		65 150	90 200	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 600 V I_D = 3.8 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		80	110	A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 5 A V_{GS} = 10 V		55 8 26	70	nC nC nC

SWITCHING OFF

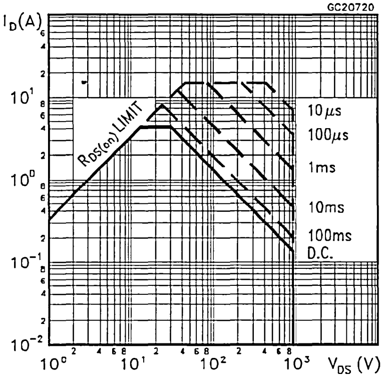
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 600 V I_D = 3.8 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		110 140 150	145 190 200	ns ns ns

SOURCE DRAIN DIODE

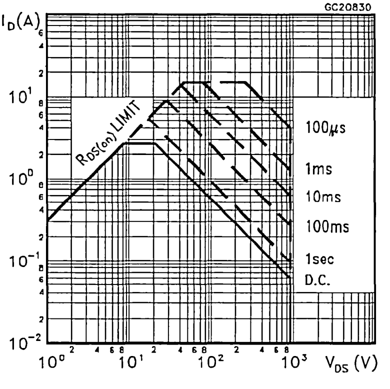
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				4.2 16	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 4.2 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 3.8 A di/dt = 100 A/µs V_R = 100 V T_j = 150 °C (see test circuit, figure 5)		500 4.3 17		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

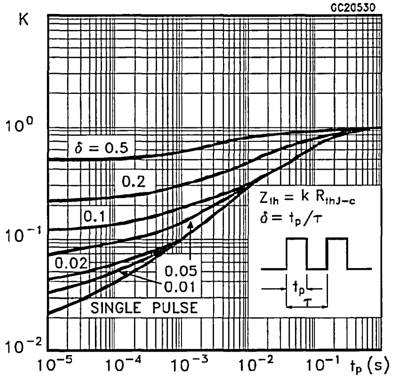
Safe Operating Areas For TO-218



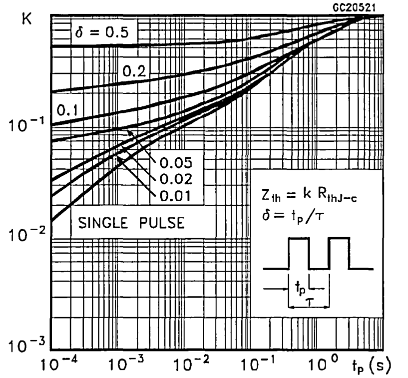
Safe Operating Areas For ISOWATT218



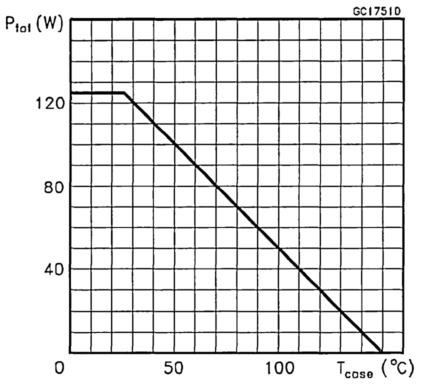
Thermal Impedeance For TO-218



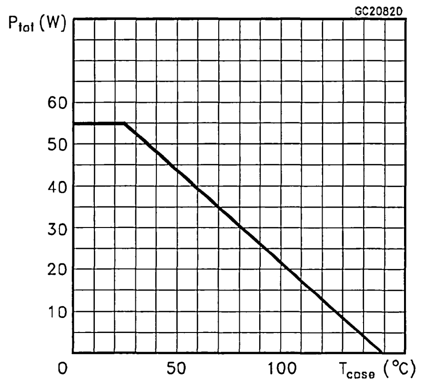
Thermal Impedance For ISOWATT218



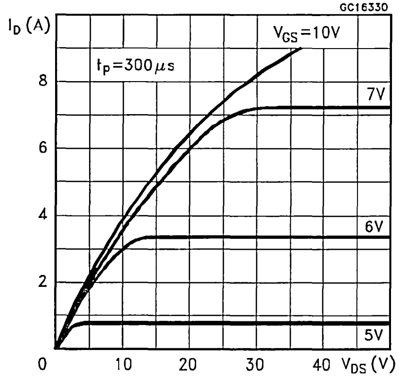
Derating Curve For TO-218



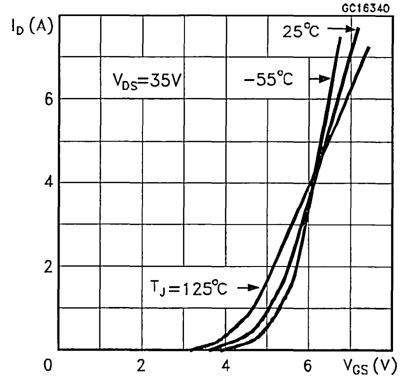
Derating Curve For ISOWATT218



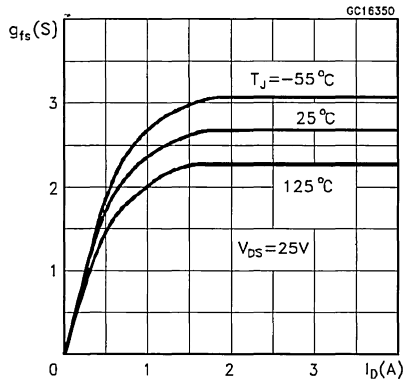
Output Characteristics



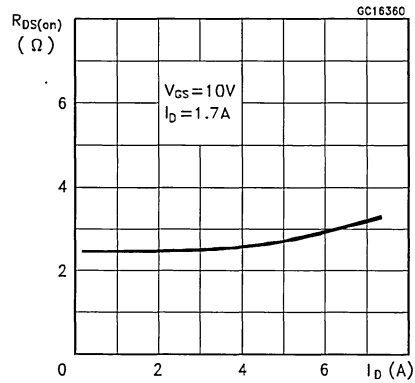
Transfer Characteristics



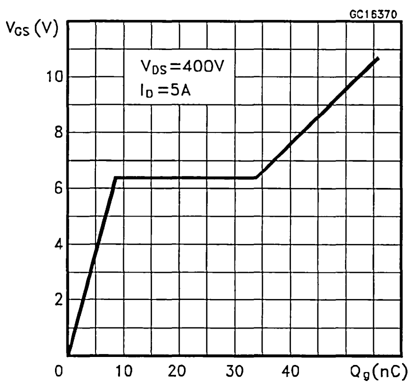
Transconductance



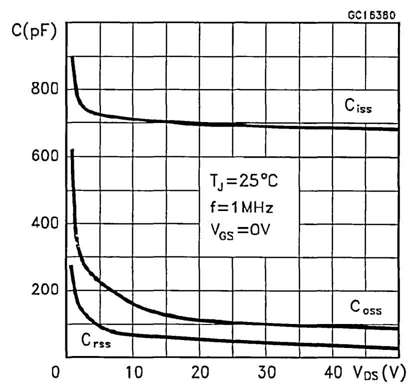
Static Drain-source On Resistance



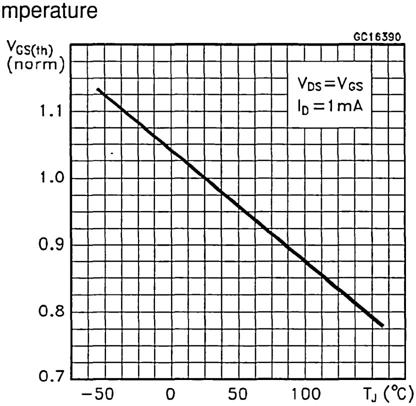
Gate Charge vs Gate-source Voltage



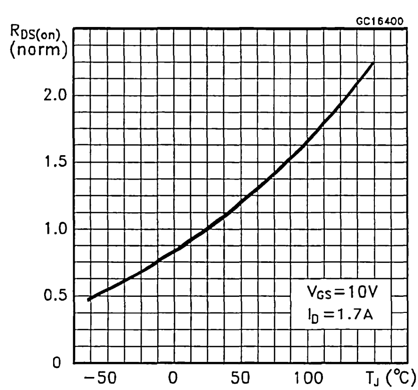
Capacitance Variations



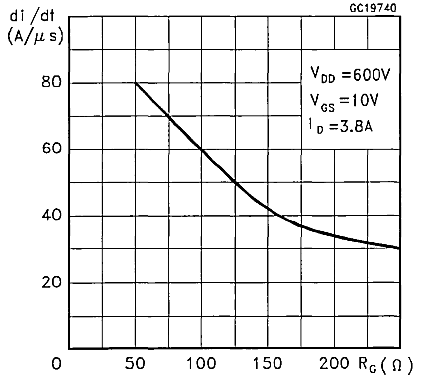
Normalized Gate Threshold Voltage vs Temperature



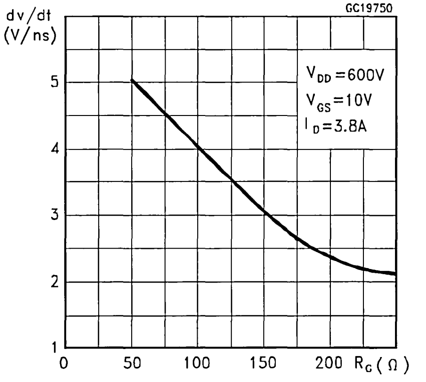
Normalized On Resistance vs Temperature



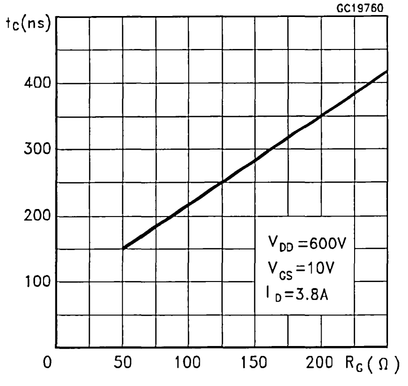
Turn-on Current Slope



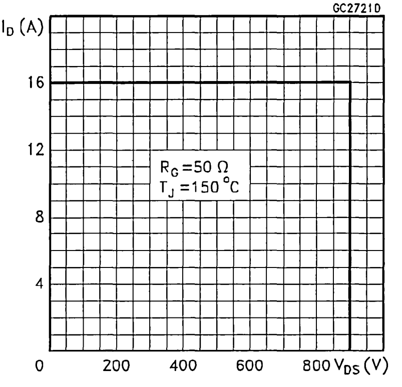
Turn-off Drain-source Voltage Slope



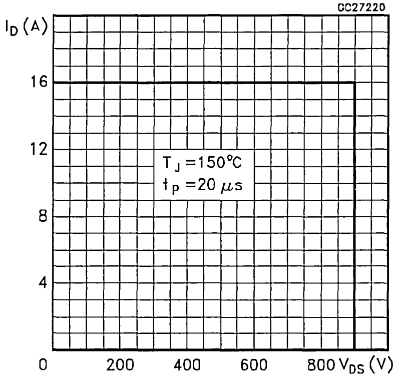
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

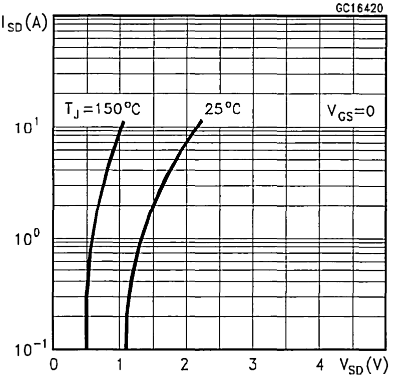


Fig. 1: Unclamped Inductive Load Test Circuits

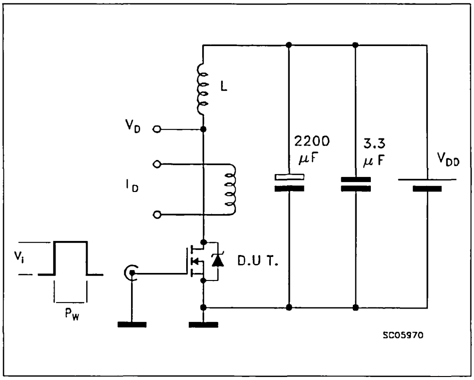


Fig. 2: Unclamped Inductive Waveforms

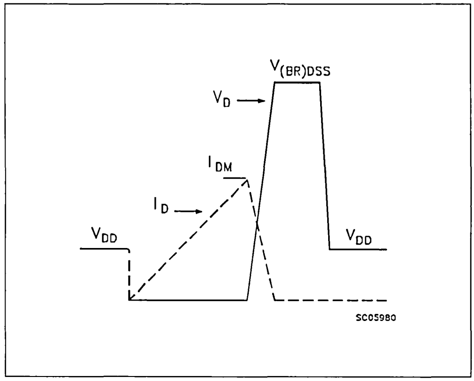


Fig. 3: Switching Times Test Circuits For Resistive Load

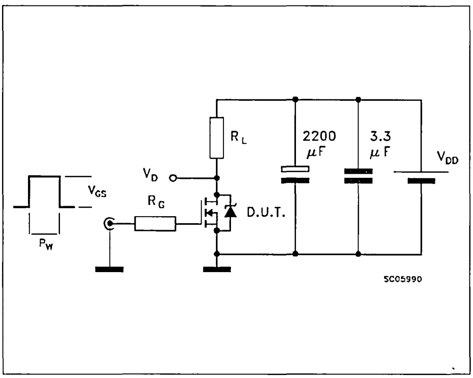


Fig. 4: Gate Charge Test Circuit

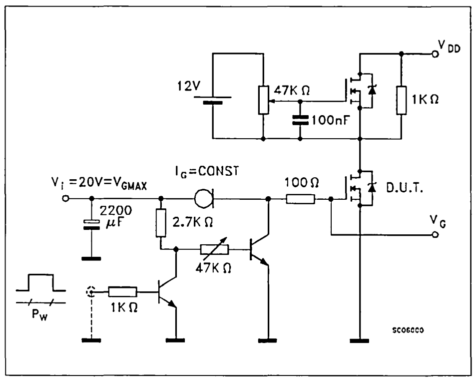
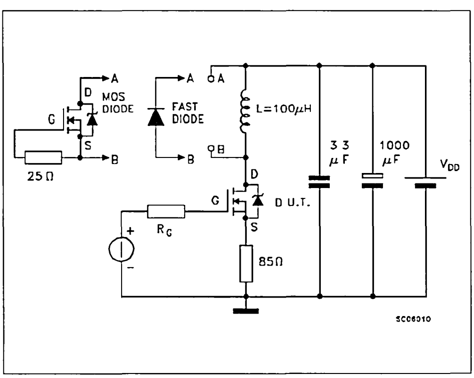


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



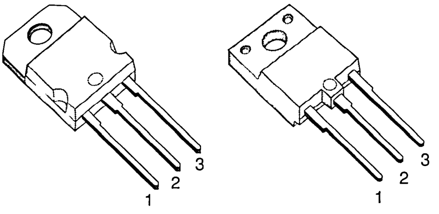
SGS-THOMSON MICROELECTRONICS

STH5N90
STH5N90FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH5N90	900 V	< 2.4 Ω	5.3 A
STH5N90FI	900 V	< 2.4 Ω	3.5 A

- TYPICAL $R_{DS(on)}$ = 1.9 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION



TO-218 ISOWATT218

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)

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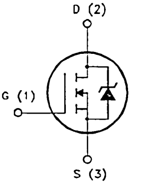


ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STH5N90	STH5N90FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	900		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	900		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	5.3	3.5	A
I_D	Drain Current (continuous) at T_c = 100 °C	3.3	2.2	A
I_{DM}(•)	Drain Current (pulsed)	20	20	A
P_{tot}	Total Dissipation at T_c = 25 °C	150	60	W
	Derating Factor	1.2	0.48	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-218	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case Max	0.83	2.08	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	30 0.1 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	5.3	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	300	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	14	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	3.1	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	900			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 2.5 A V_{GS} = 10V I_D = 2.5 A T_c = 100°C		1.9	2.4 4.8	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	5.3			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 2.5 A	2	4		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1190 165 70	1450 200 85	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 400 V I_D = 2.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		50 85	65 105	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 640 V I_D = 5.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		200		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 500 V I_D = 6 A V_{GS} = 10 V		75 9 33	95	nC nC nC

SWITCHING OFF

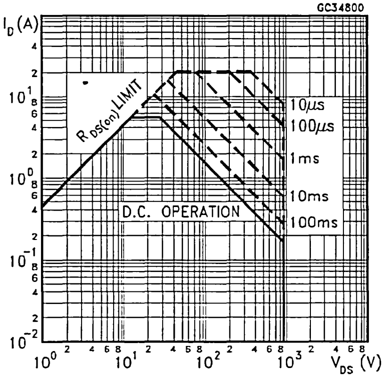
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 640 V I_D = 5.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		120 30 160	150 40 200	ns ns ns

SOURCE DRAIN DIODE

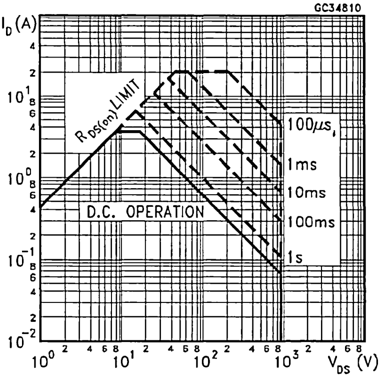
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				5.3 20	A A
V_{SD} (∗)	Forward On Voltage	I_{SD} = 5.3 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 5.3 A di/dt = 100 A/µs V_{DD} = 80 V T_j = 150 °C (see test circuit, figure 5)		700 7.7 22		ns µC A

(∗) Pulsed Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

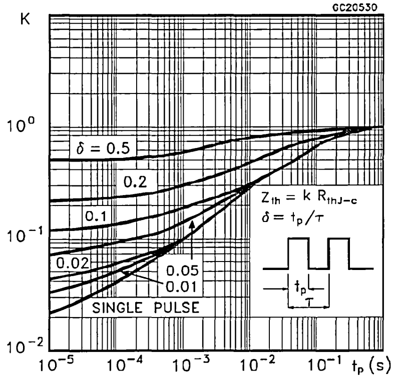
Safe Operating Areas For TO-218



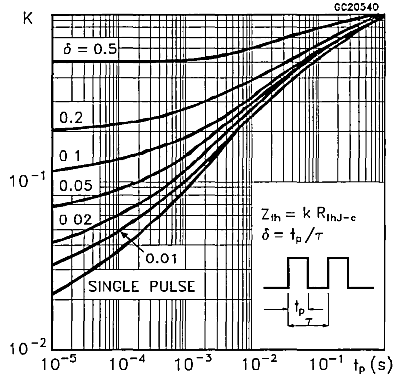
Safe Operating Areas For ISOWATT218



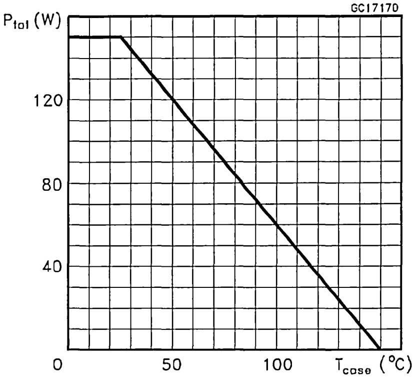
Thermal Impedeance For TO-218



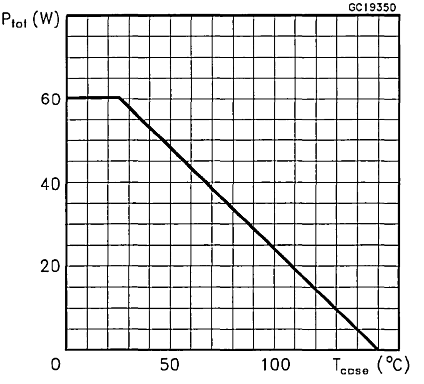
Thermal Impedance For ISOWATT218



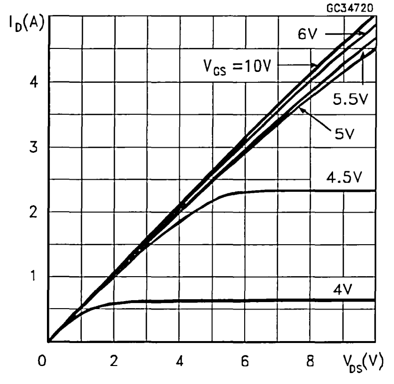
Derating Curve For TO-218



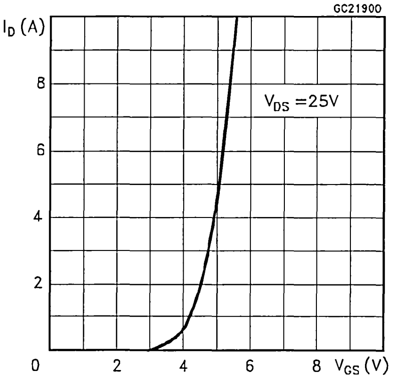
Derating Curve For ISOWATT218



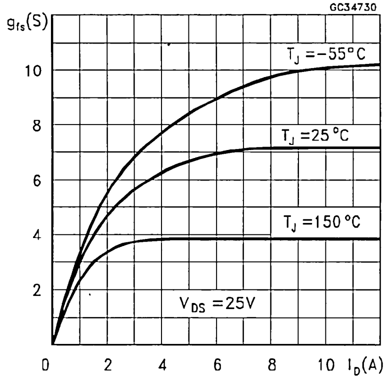
Output Characteristics



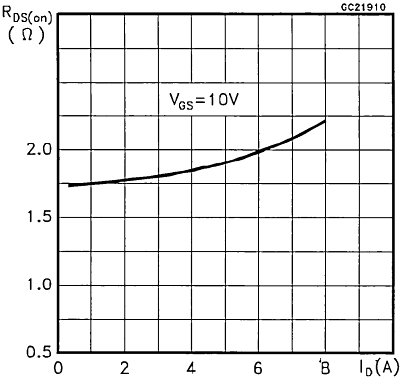
Transfer Characteristics



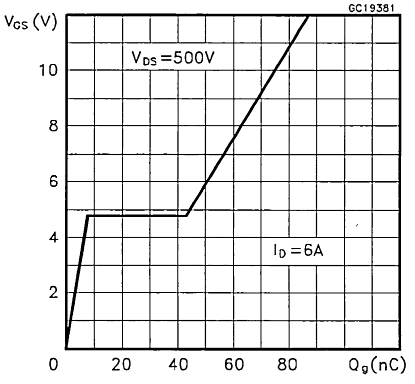
Transconductance



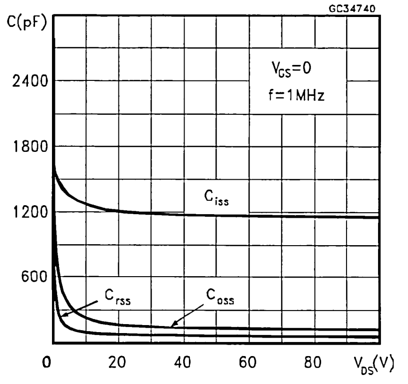
Static Drain-source On Resistance



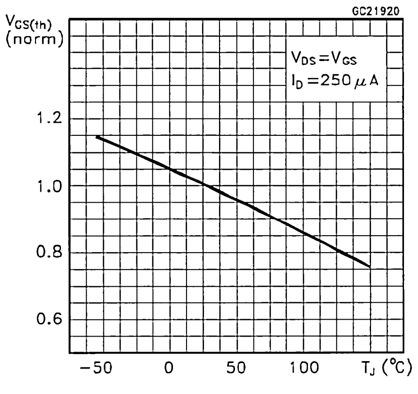
Gate Charge vs Gate-source Voltage



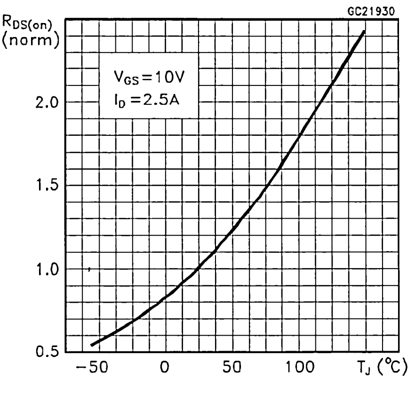
Capacitance Variations



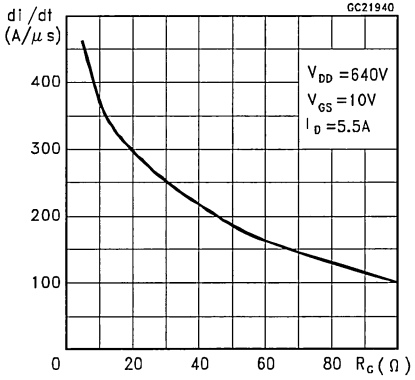
Normalized Gate Threshold Voltage vs Temperature



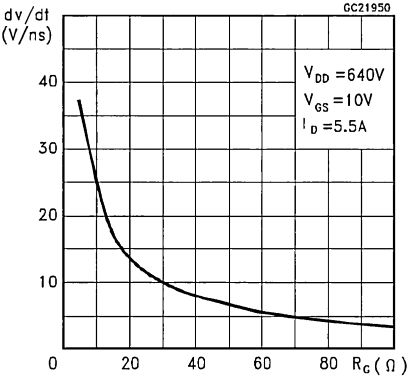
Normalized On Resistance vs Temperature



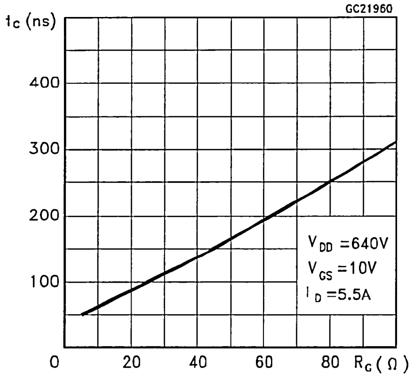
Turn-on Current Slope



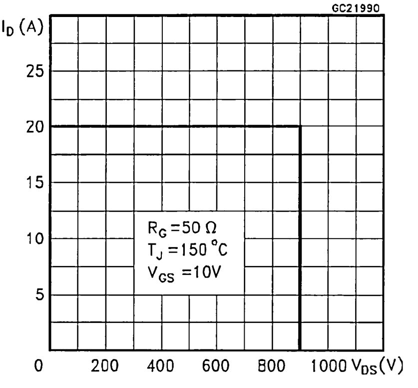
Turn-off Drain-source Voltage Slope



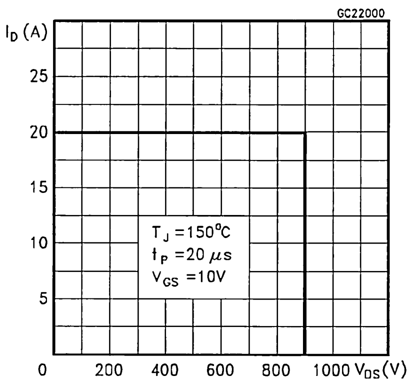
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

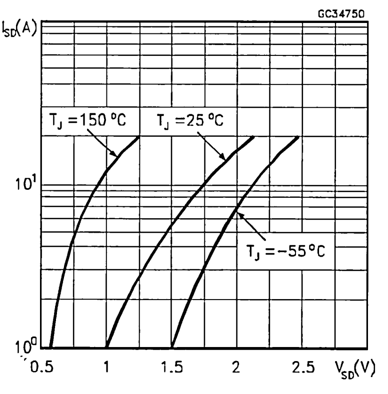


Fig. 1: Unclamped Inductive Load Test Circuits

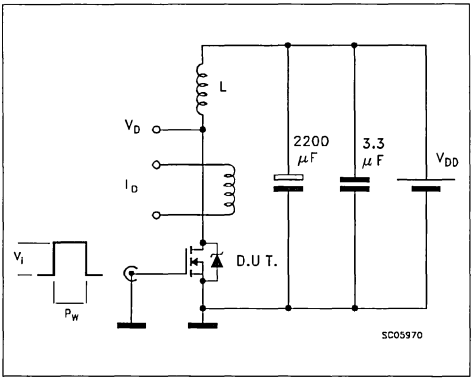


Fig. 2: Unclamped Inductive Waveforms

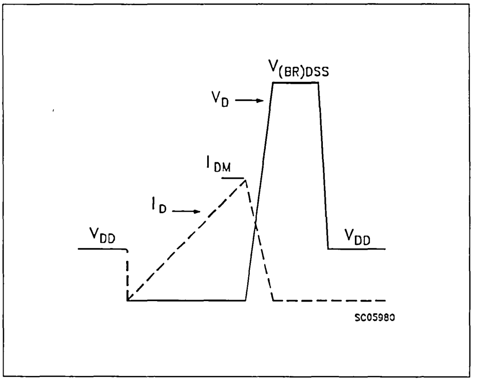


Fig. 3: Switching Times Test Circuits For Resistive Load

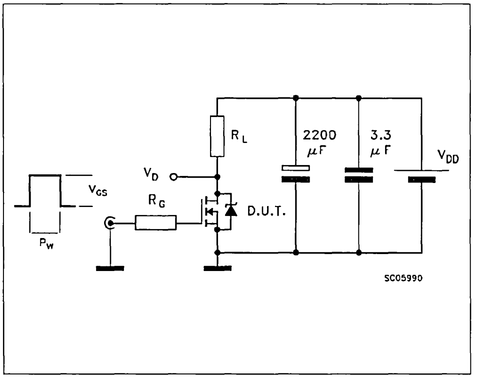


Fig. 4: Gate Charge Test Circuit

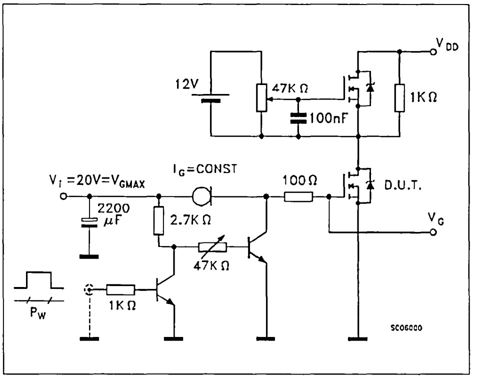
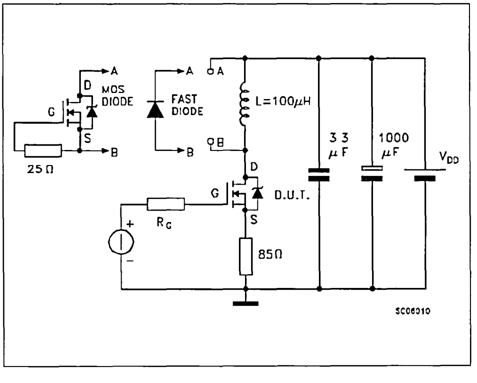


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON MICROELECTRONICS

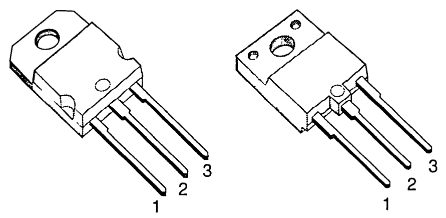
STH6NA80
STH6NA80FI

N - CHANNEL ENHANCEMENT MODE FAST POWER MOS TRANSISTOR

ADVANCE DATA

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH6NA80	800 V	< 2.4 Ω	5.8 A
STH6NA80FI	800 V	< 2.4 Ω	3.7 A

- TYPICAL $R_{DS(on)}$ = 2 Ω
- ± 30V GATE TO SOURCE VOLTAGE RATING
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INTRINSIC CAPACITANCES
- GATE GHARGE MINIMIZED
- REDUCED THRESHOLD VOLTAGE SPREAD



TO-218 ISOWATT218

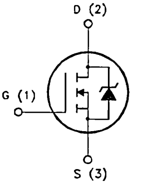
DESCRIPTION

This series of POWER MOSFETS represents the most advanced high voltage technology. The optimized cell layout coupled with a new proprietary edge termination concur to give the device low $R_{DS(on)}$ and gate charge, unequalled ruggedness and superior switching performance.

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- DC-AC CONVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLIES AND MOTOR DRIVE

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STH6NA80	STH6NA80FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	800		V
V_{DGR}	Drain-gate Voltage (R_{GS} = 20 kΩ)	800		V
V_{GS}	Gate-source Voltage	± 30		V
I_D	Drain Current (continuous) at T_c = 25 °C	5.8	3.7	A
I_D	Drain Current (continuous) at T_c = 100 °C	3.8	2.4	A
I_{DM}(•)	Drain Current (pulsed)	23	23	A
P_{tot}	Total Dissipation at T_c = 25 °C	150	60	W
	Derating Factor	1.2	0.48	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-218	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case Max	0.83	2.08	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max	30		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink Typ	0.1		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	5.8	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 50$ V)	180	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	5.4	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	3.8	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	800			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 30$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2.25	3	3.75	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 3$ A $V_{GS} = 10V$ $I_D = 3$ A $T_c = 100$°C		2	2.4 4.8	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	5.8			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 3$ A	3	5.5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		1215 145 35		pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 400 V I_D = 3 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		15 25		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 640 V I_D = 6 A R_G = 47 Ω V_{GS} = 10 V (see test circuit, figure 5)		200		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 640 V I_D = 6 A V_{GS} = 10 V		53 7 25		nC nC nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 640 V I_D = 6 A R_G = 47 Ω V_{GS} = 10 V (see test circuit, figure 5)		70 25 110		ns ns ns

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				5.8 23	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 6 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 6 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		800 10 40		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

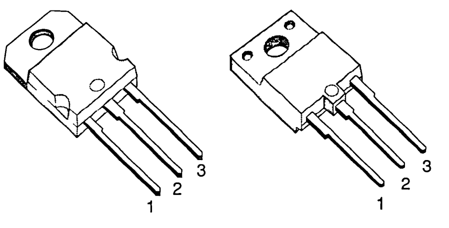
SGS-THOMSON MICROELECTRONICS

STH6N100
STH6N100FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH6N100	1000 V	< 2 Ω	6 A
STH6N100FI	1000 V	< 2 Ω	3.7 A

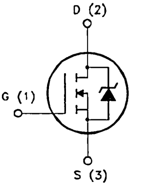
- TYPICAL $R_{DS(on)}$ = 1.75 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION



TO-218 ISOWATT218

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STH6N100	STH6N100	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	1000		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	1000		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	6	3.7	A
I_D	Drain Current (continuous) at T_c = 100 °C	3.7	2.3	A
I_{DM}(•)	Drain Current (pulsed)	24	24	A
P_{tot}	Total Dissipation at T_c = 25 °C	180	70	W
	Derating Factor	1.44	0.56	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-218	ISOWATT218	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case Max	0.69	1.78	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient Max	30		°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink Typ	0.1		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	6	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	850	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	16	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	3.7	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	1000			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (∗)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 3 A V_{GS} = 10V I_D = 3 A T_c = 100°C		1.75	2 4	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	6			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (∗)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 3 A	4	5.5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		2150 260 105	2800 330 130	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 500 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		70 210	90 280	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 800 V I_D = 6 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		180		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 6 A V_{GS} = 10 V		125 15 55	150	nC nC nC

SWITCHING OFF

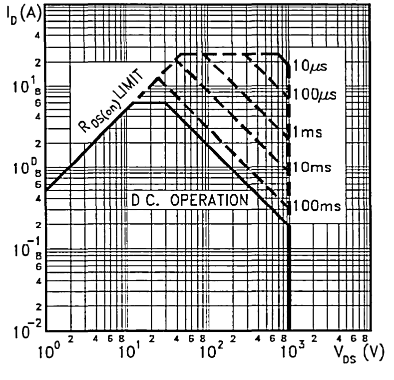
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 800 V I_D = 6 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		190 50 265	250 65 345	ns ns ns

SOURCE DRAIN DIODE

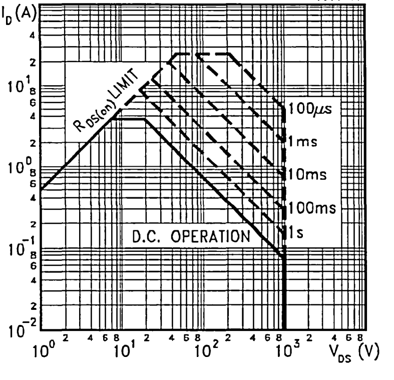
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				6 24	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 6 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 6 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		1100 31 57		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

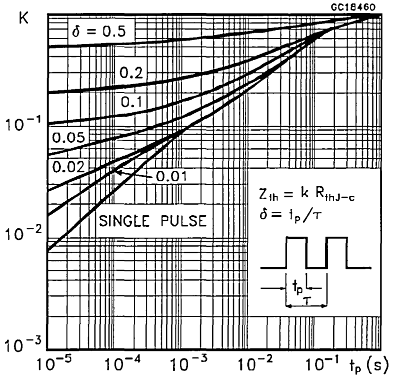
Safe Operating Areas For TO-218



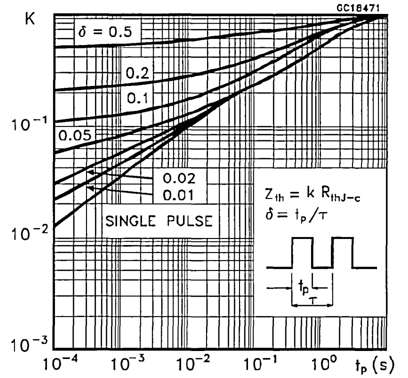
Safe Operating Areas For ISOWATT218



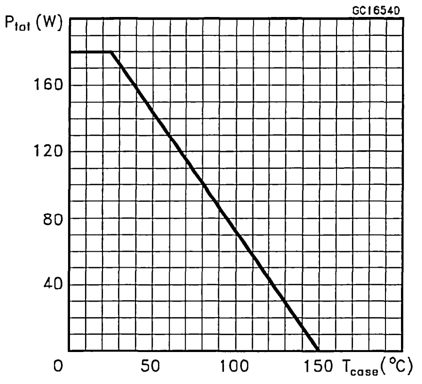
Thermal Impedeance For TO-218



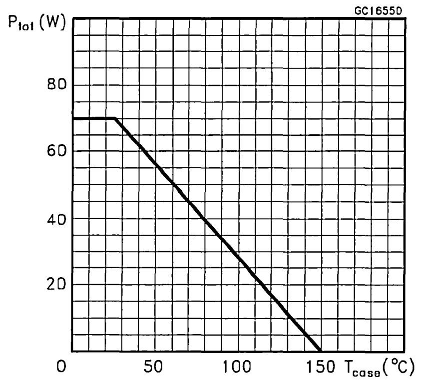
Thermal Impedance For ISOWATT218



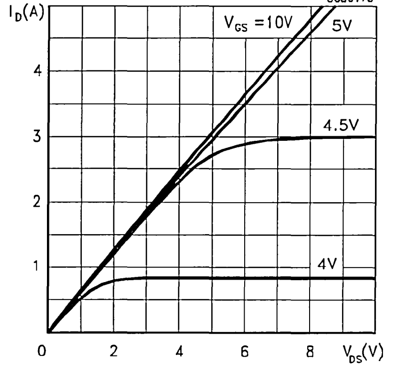
Derating Curve For TO-218



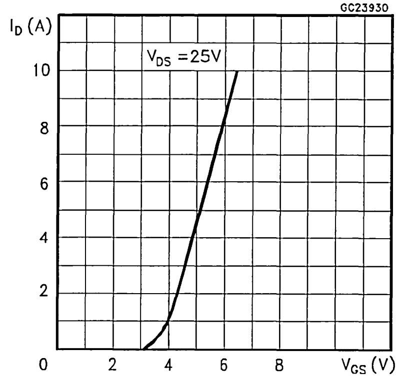
Derating Curve For ISOWATT218



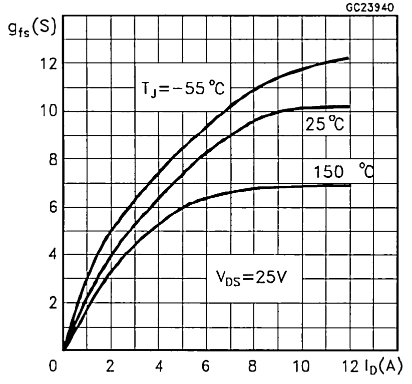
Output Characteristics



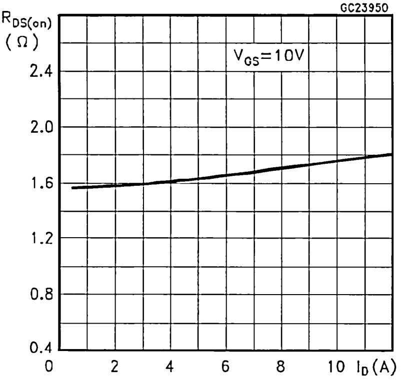
Transfer Characteristics



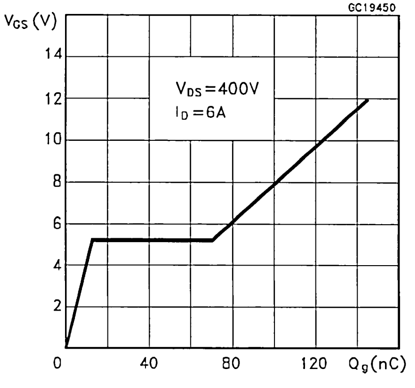
Transconductance



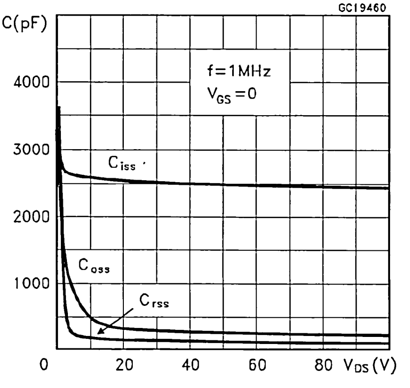
Static Drain-source On Resistance



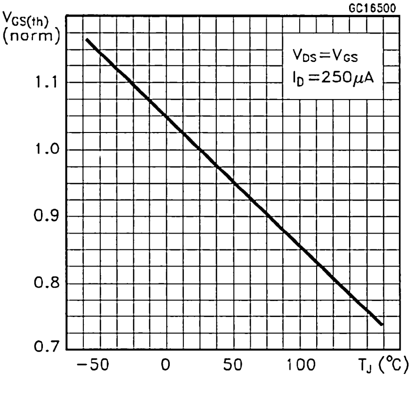
Gate Charge vs Gate-source Voltage



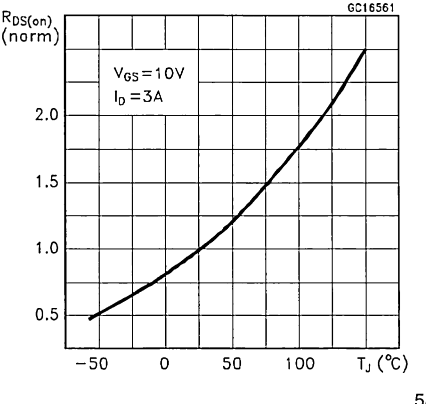
Capacitance Variations



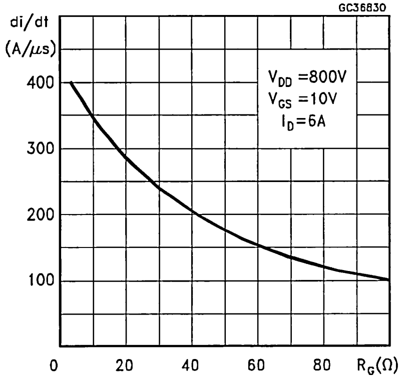
Normalized Gate Threshold Voltage vs Temperature



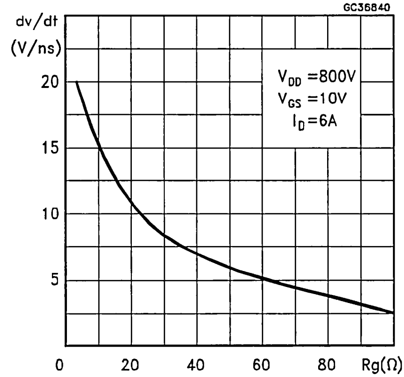
Normalized On Resistance vs Temperature



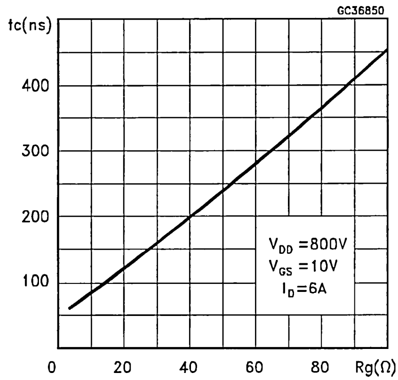
Turn-on Current Slope



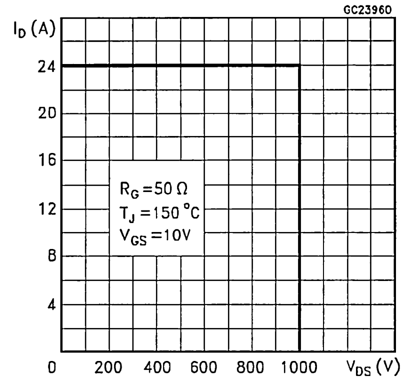
Turn-off Drain-source Voltage Slope



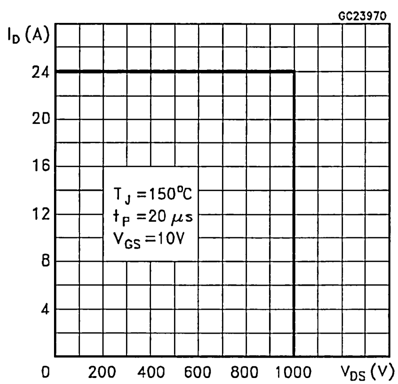
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

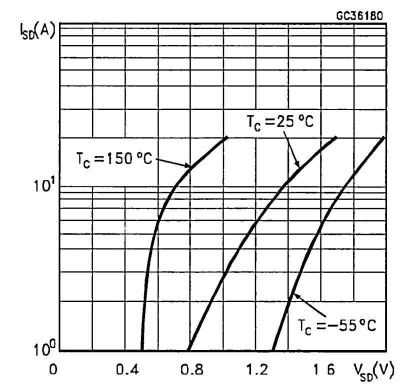


Fig. 1: Unclamped Inductive Load Test Circuits

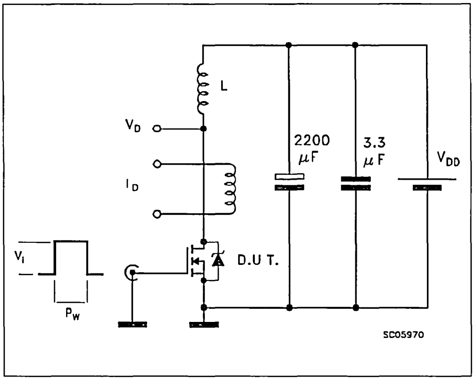


Fig. 2: Unclamped Inductive Waveforms

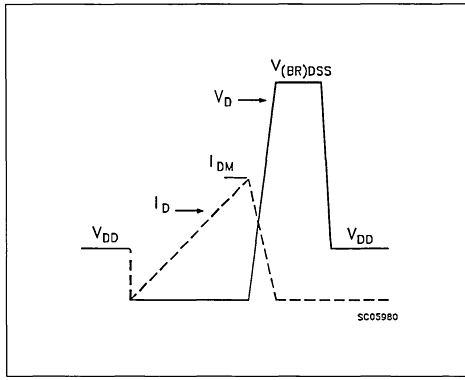


Fig. 3: Switching Times Test Circuits For Resistive Load

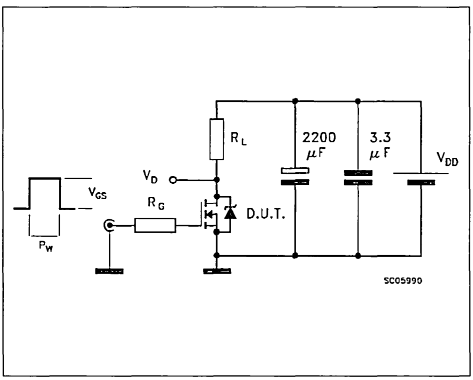


Fig. 4: Gate Charge Test Circuit

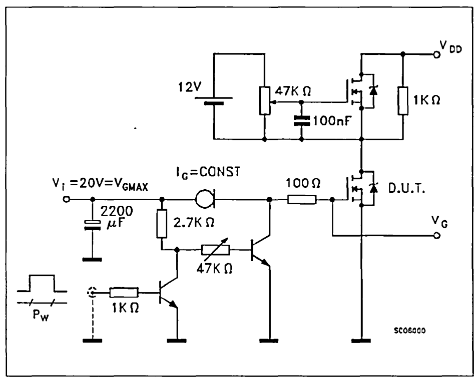
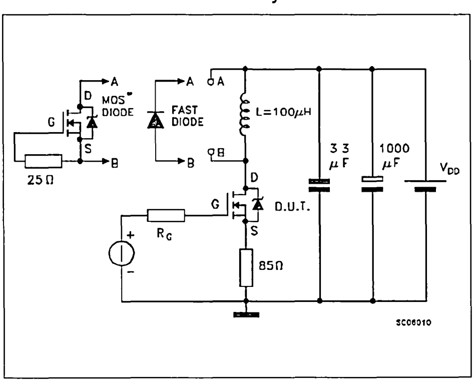


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time

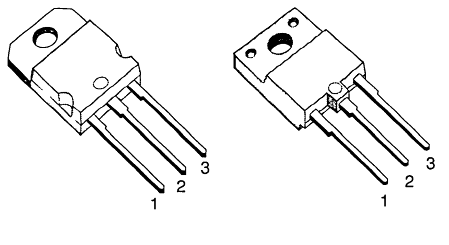


STH7N90
STH7N90FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH7N90	900 V	< 1.4 Ω	7.5 A
STH7N90FI	900 V	< 1.4 Ω	4.5 A

- TYPICAL $R_{DS(on)}$ = 1.05 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

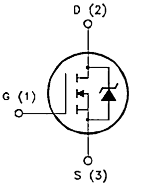


TO-218 ISOWATT218

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STH7N90	STH7N90FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	900		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	900		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	7.5	4.5	A
I_D	Drain Current (continuous) at T_c = 100 °C	4.7	2.8	A
I_{DM}(•)	Drain Current (pulsed)	35	35	A
P_{tot}	Total Dissipation at T_c = 25 °C	180	70	W
	Derating Factor	1.44	0.56	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-218	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.69	1.78	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Thermal Resistance Case-sink Maximum Lead Temperature For Soldering Purpose	Max Typ 	30 0.1 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	7.5	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	700	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	17	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	4	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	900			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 3.5 A V_{GS} = 10V I_D = 3.5 A T_c = 100°C		1.05	1.4 2.8	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	7.5			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 3.5 A	4	6.5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		2100 270 115	2700 350 150	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 400 V I_D = 4 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		90 280	120 350	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 640 V I_D = 8 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		145		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 8 A V_{GS} = 10 V		125 12 65	170	nC nC nC

SWITCHING OFF

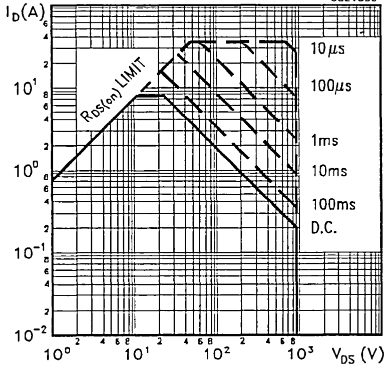
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 640 V I_D = 8 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		160 50 235	200 65 300	ns ns ns

SOURCE DRAIN DIODE

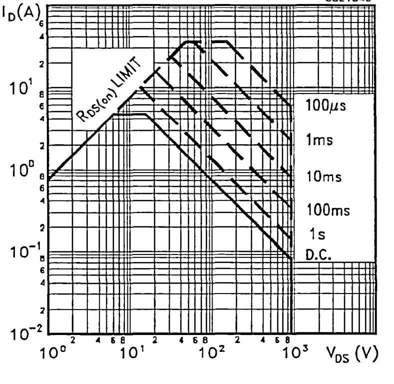
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				7.5 35	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 7.5 A V_{GS} = 0			2.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 7 A di/dt = 100 A/µs V_R = 100 V T_j = 150 °C (see test circuit, figure 5)		900 24.8 55		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

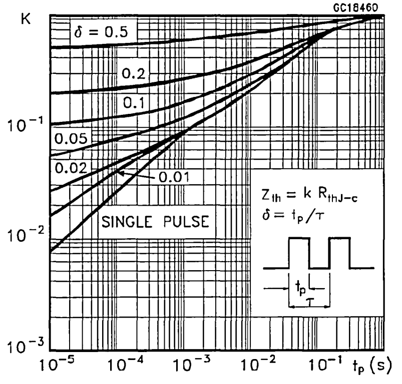
Safe Operating Areas For TO-218



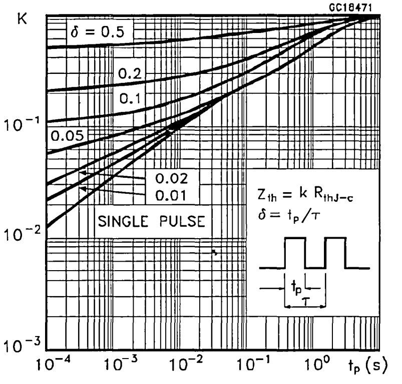
Safe Operating Areas For ISOWATT218



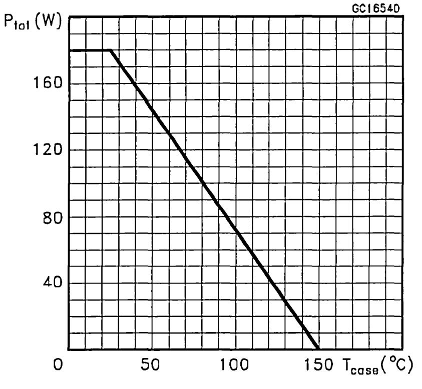
Thermal Impedeance For TO-218



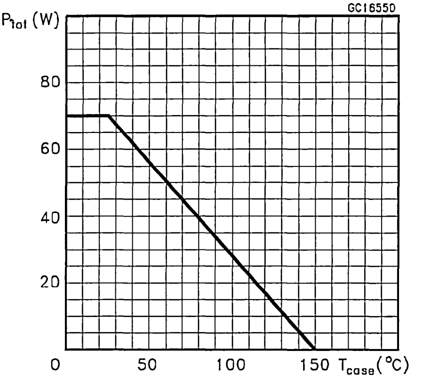
Thermal Impedance For ISOWATT218



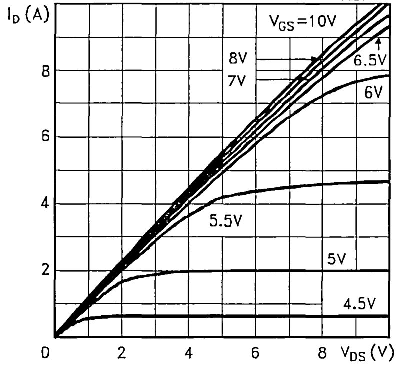
Derating Curve For TO-218



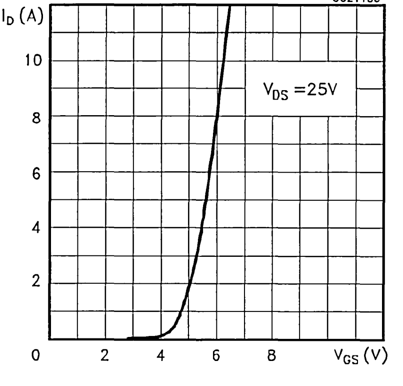
Derating Curve For ISOWATT218



Output Characteristics

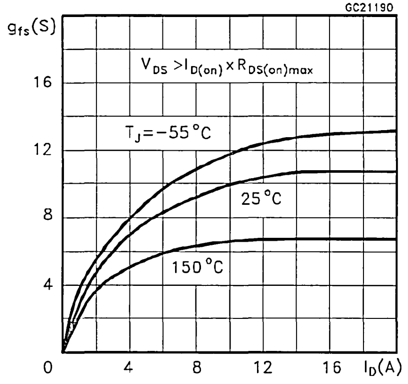


Transfer Characteristics

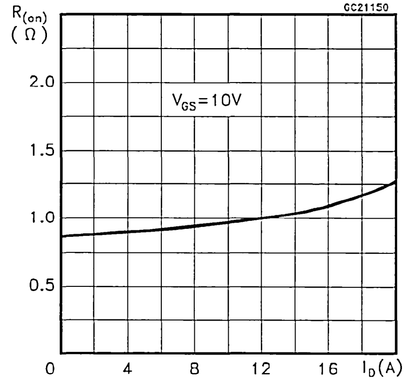


SGS-THOMSON MICROELECTRONICS

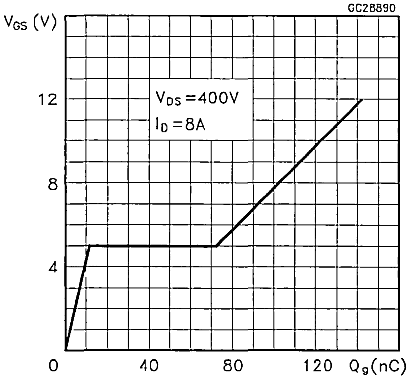
Transconductance



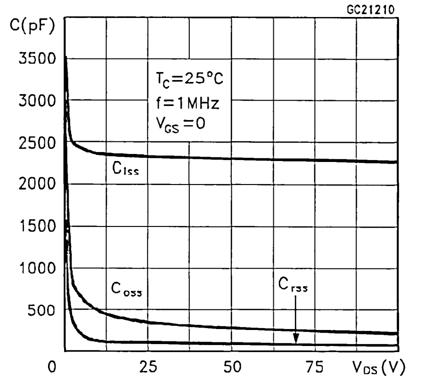
Static Drain-source On Resistance



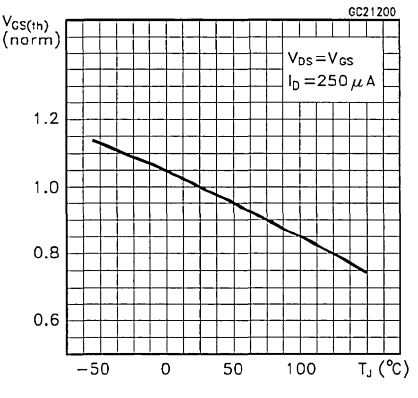
Gate Charge vs Gate-source Voltage



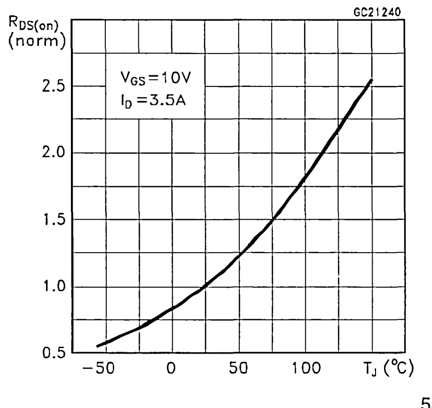
Capacitance Variations



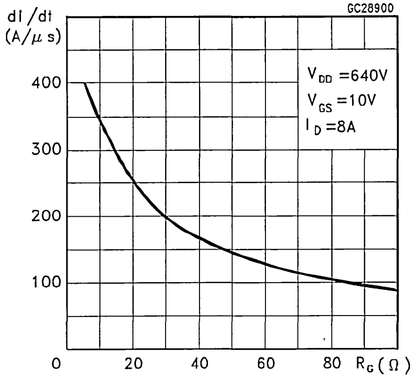
Normalized Gate Threshold Voltage vs Temperature



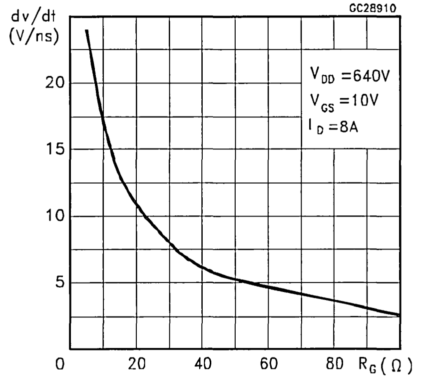
Normalized On Resistance vs Temperature



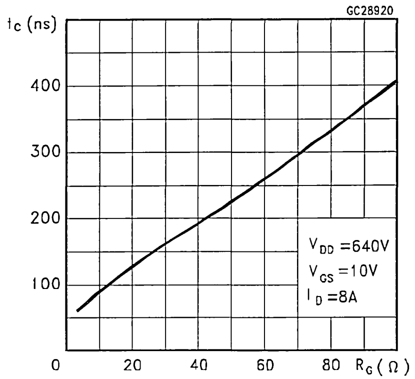
Turn-on Current Slope



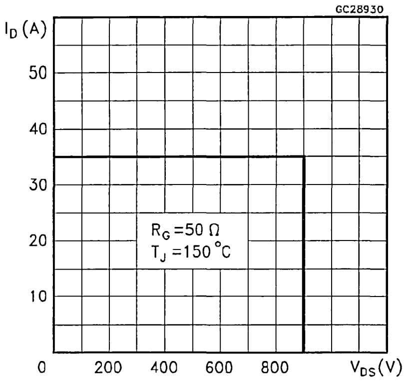
Turn-off Drain-source Voltage Slope



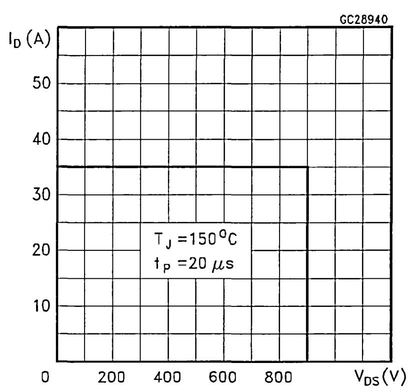
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

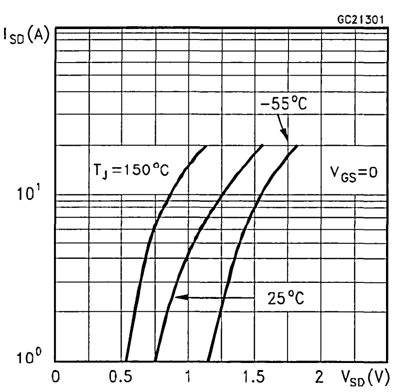


Fig. 1: Unclamped Inductive Load Test Circuits

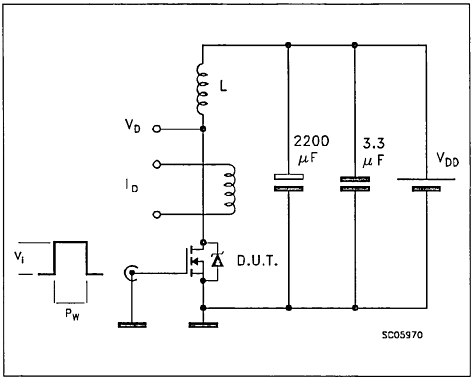


Fig. 2: Unclamped Inductive Waveforms

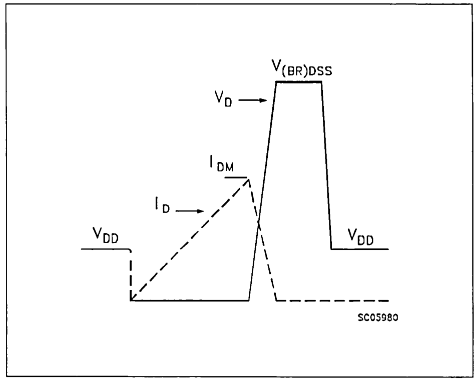


Fig. 3: Switching Times Test Circuits For Resistive Load

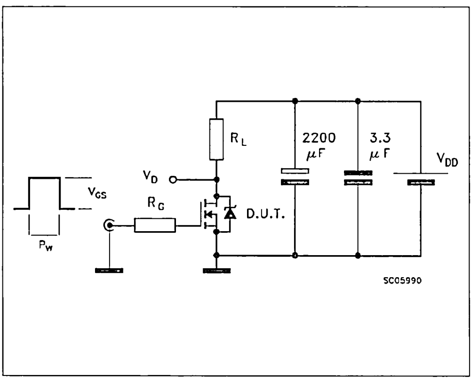


Fig. 4: Gate Charge Test Circuit

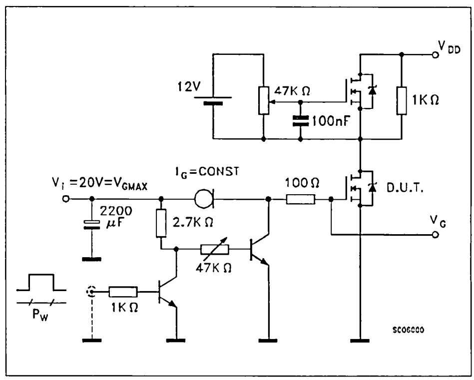
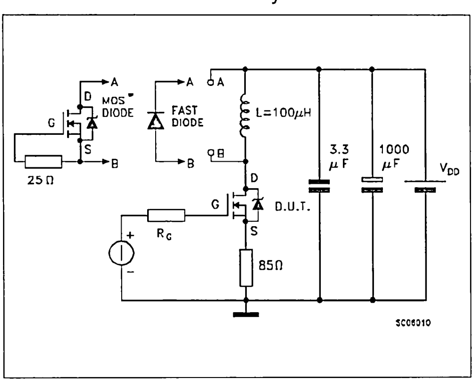


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON
MICROELECTRONICS

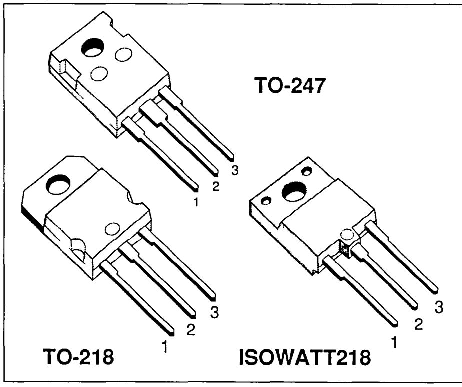
STH8N80/FI
STW8N80

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

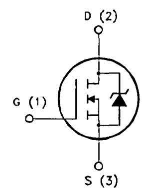
TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH8N80	800 V	< 1.2 Ω	8.2 A
STH8N80FI	800 V	< 1.2 Ω	5.1 A
STW8N80	800 V	< 1.2 Ω	8.2 A

- TYPICAL $R_{DS(on)}$ = 0.98 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STH/STW8N80	STH8N80FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	800		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	800		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	8.2	5.1	A
I_D	Drain Current (continuous) at T_c = 100 °C	5.1	3.2	A
I_{DM}(•)	Drain Current (pulsed)	35	35	A
P_{tot}	Total Dissipation at T_c = 25 °C	180	70	W
	Derating Factor	1.44	0.56	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-218/TO-247	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.69	1.78	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	30		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.1		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	8.2	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	800	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	18	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	4.5	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	800			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (∗)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 4 A V_{GS} = 10V I_D = 4 A T_c = 100°C		0.98	1.2 2.4	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	8.2			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (∗)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 4 A	4	7		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		2100 270 115	2700 350 150	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 400 V I_D = 4 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		90 280	120 350	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 640 V I_D = 8 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		145		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 8 A V_{GS} = 10 V		125 12 65	170	nC nC nC

SWITCHING OFF

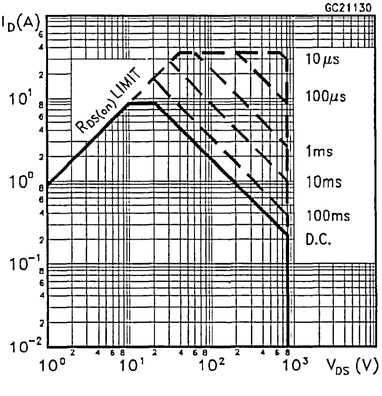
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 640 V I_D = 8 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		160 50 235	200 65 300	ns ns ns

SOURCE DRAIN DIODE

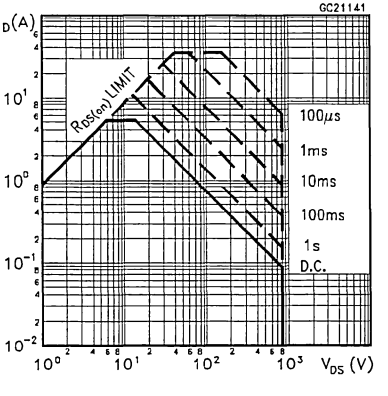
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				8.2 35	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 8.2 A V_{GS} = 0			2.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 8.2 A di/dt = 100 A/µs V_R = 100 V T_j = 150 °C (see test circuit, figure 5)		900 24.8 55		ns µC A

(*) Pulsed. Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

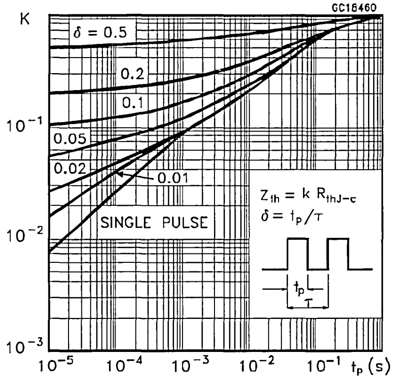
Safe Operating Areas For TO-218 and TO-247



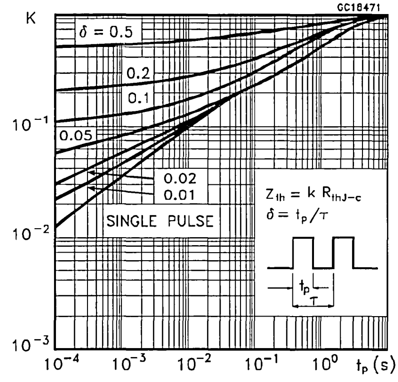
Safe Operating Areas For ISOWATT218



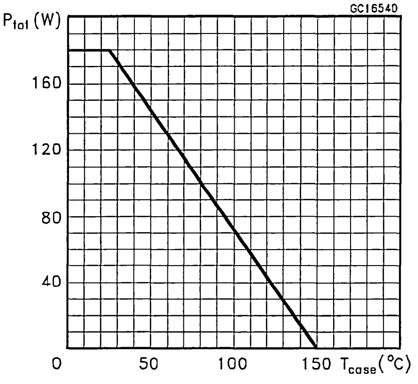
Thermal Impedeance For TO-218 and TO-247



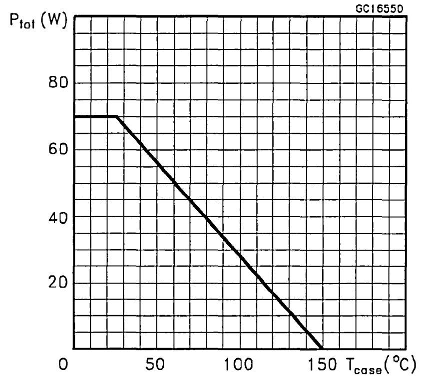
Thermal Impedance For ISOWATT218



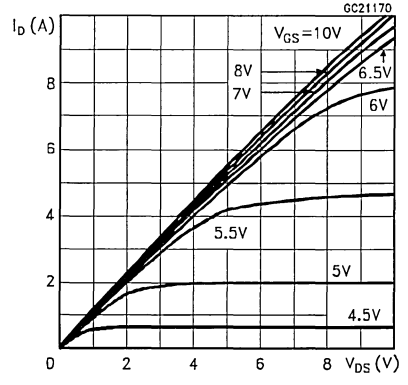
Derating Curve For TO-218 and TO-247



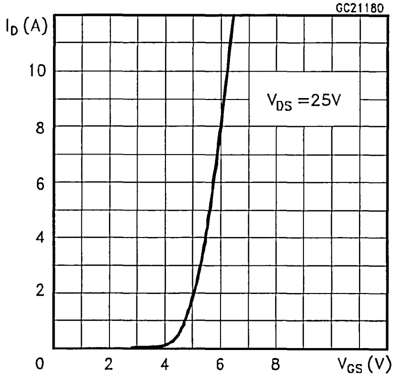
Derating Curve For ISOWATT218



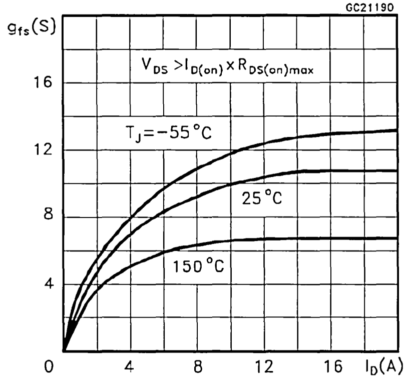
Output Characteristics



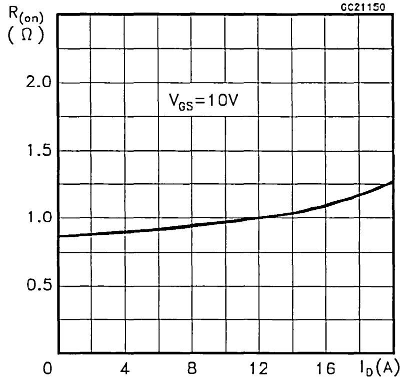
Transfer Characteristics



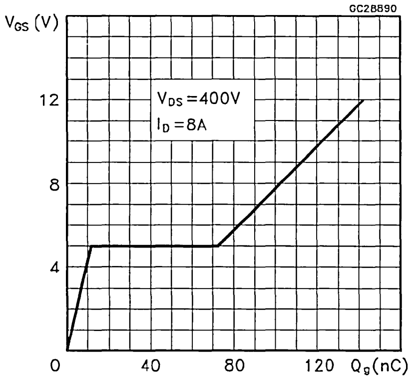
Transconductance



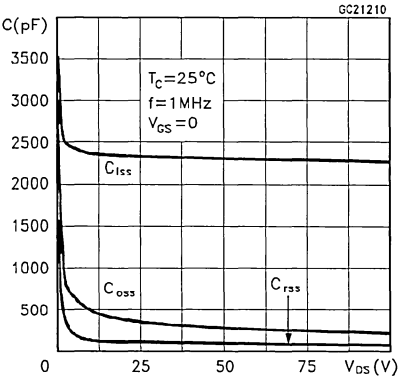
Static Drain-source On Resistance



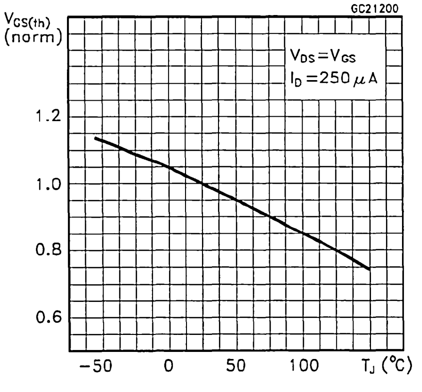
Gate Charge vs Gate-source Voltage



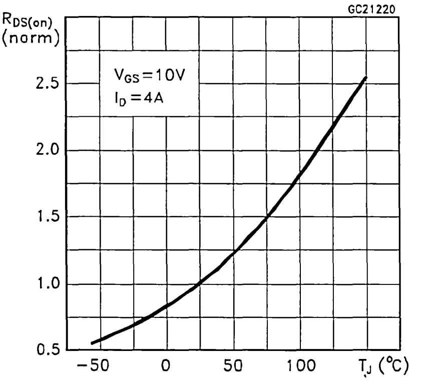
Capacitance Variations



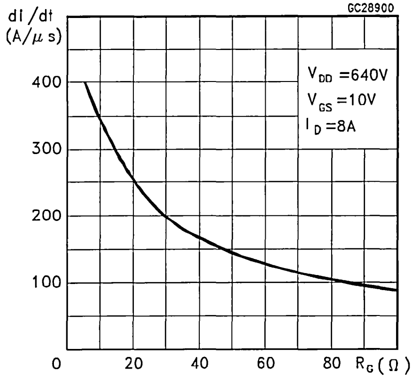
Normalized Gate Threshold Voltage vs Temperature



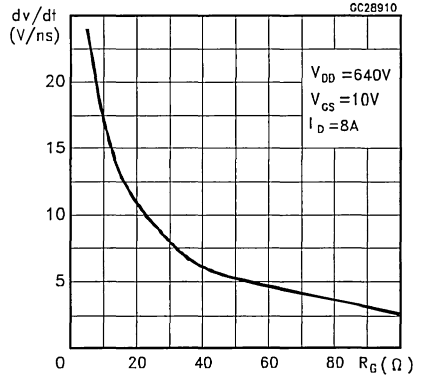
Normalized On Resistance vs Temperature



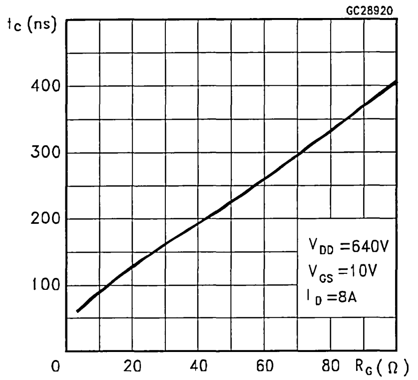
Turn-on Current Slope



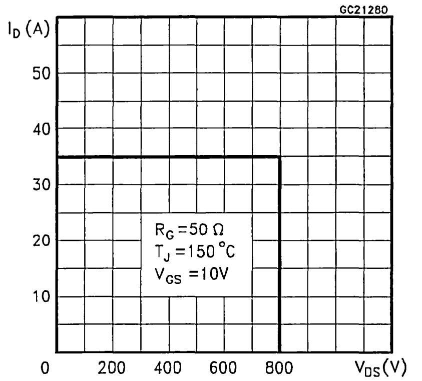
Turn-off Drain-source Voltage Slope



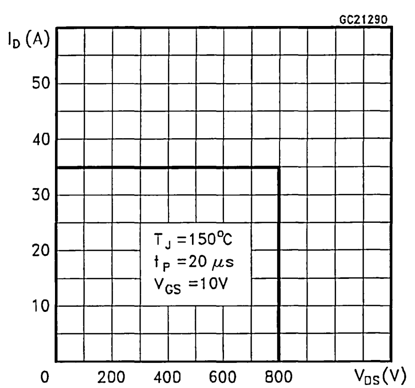
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

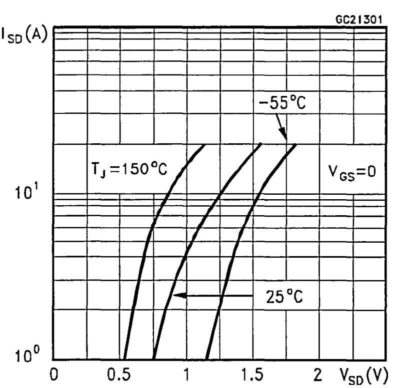


Fig. 1: Unclamped Inductive Load Test Circuits

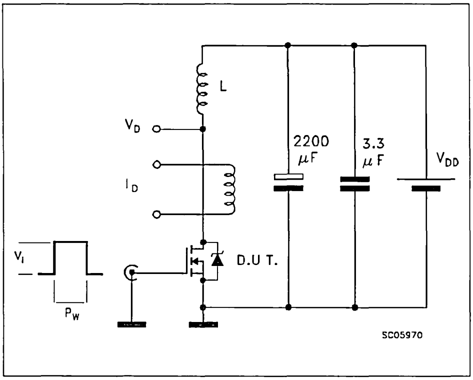


Fig. 2: Unclamped Inductive Waveforms

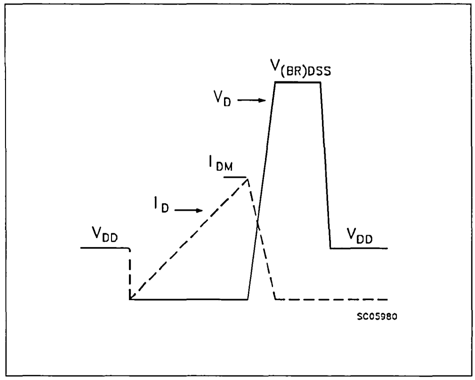


Fig. 3: Switching Times Test Circuits For Resistive Load

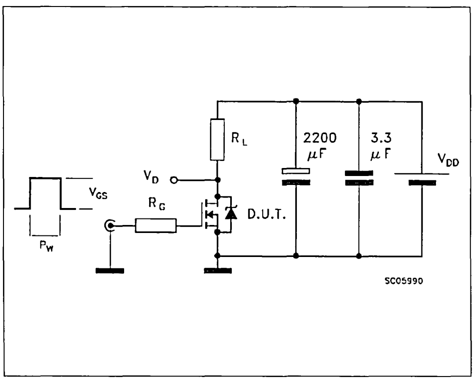


Fig. 4: Gate Charge Test Circuit

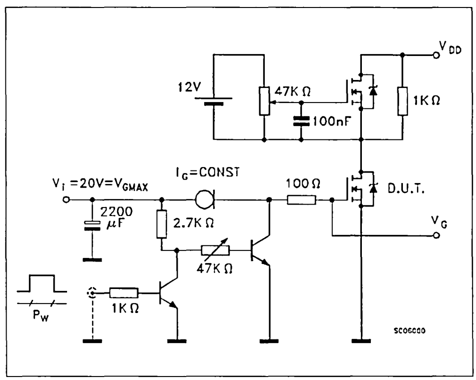
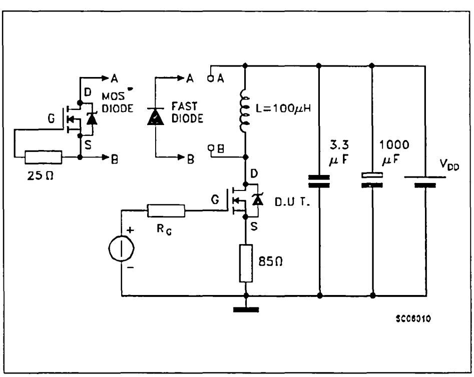


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time

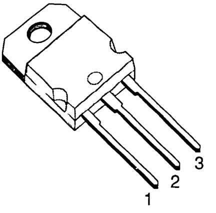


STH9N80
STH9N80FI

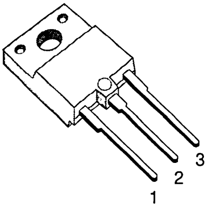
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH9N80	800 V	< 1 Ω	9 A
STH9N80FI	800 V	< 1 Ω	5.6 A

- TYPICAL $R_{DS(on)}$ = 0.87 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION



TO-218

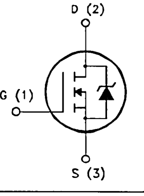


ISOWATT218

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	VALUE		Unit
		STH9N80	STH9N80FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	800		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	800		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	9	5.6	A
I_D	Drain Current (continuous) at T_c = 100 °C	5.7	3.5	A
I_{DM}(•)	Drain Current (pulsed)	35	35	A
P_{tot}	Total Dissipation at T_c = 25 °C	180	70	W
	Derating Factor	1.44	0.56	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-218	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case Max	0.69	1.78	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	30 0.1 300		°C/W °C/W °C

AVALANCHE CHARACTERiSTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	9	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	1000	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	22	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	5	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	800			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 4.5 A V_{GS} = 10V I_D = 4.5 A T_c = 100°C		0.87	1 2	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	9			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 4.5 A	4	7.5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		2100 270 115	2700 350 150	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 400 V I_D = 4 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		90 280	120 350	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 640 V I_D = 8 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		145		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 8 A V_{GS} = 10 V		125 12 65	170	nC nC nC

SWITCHING OFF

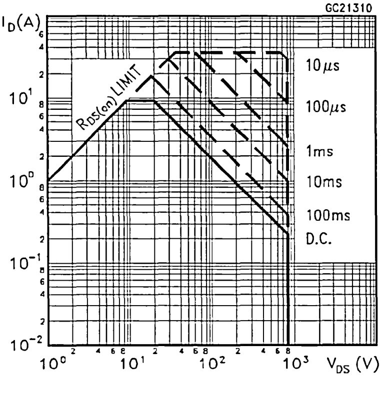
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 640 V I_D = 8 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		160 50 235	200 65 300	ns ns ns

SOURCE DRAIN DIODE

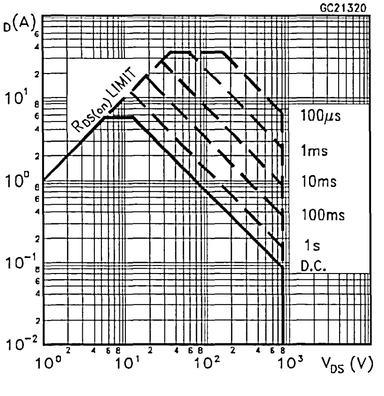
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				9 35	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 9 A V_{GS} = 0			2.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 9 A di/dt = 100 A/µs V_R = 100 V T_j = 150 °C (see test circuit, figure 5)		900 24.8 55		ns µC A

(*) Pulsed. Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

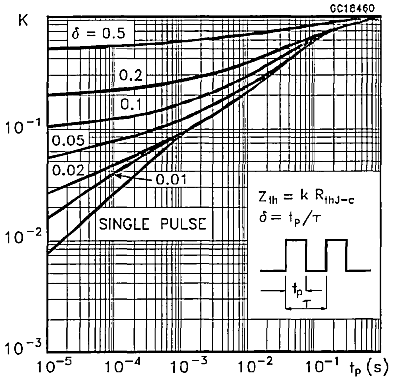
Safe Operating Areas For TO-218



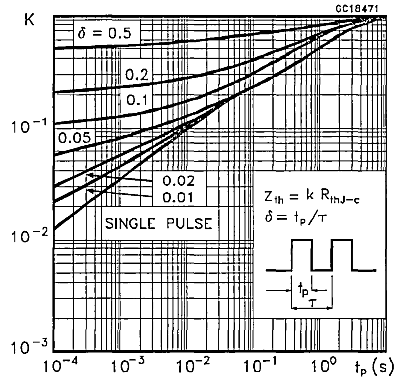
Safe Operating Areas For ISOWATT218



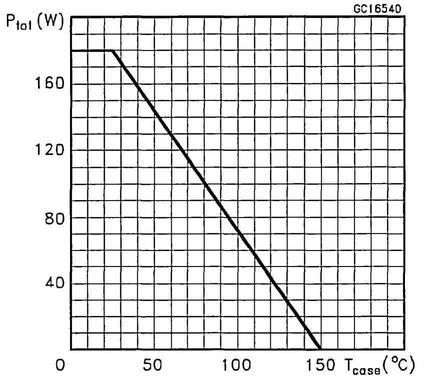
Thermal Impedeance For TO-218



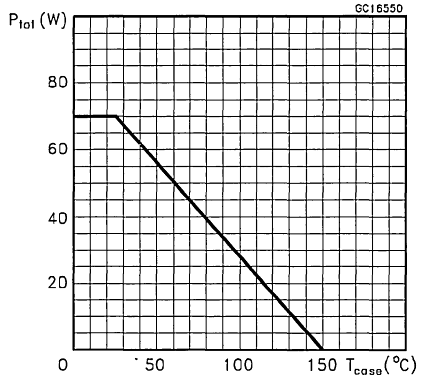
Thermal Impedance For ISOWATT218



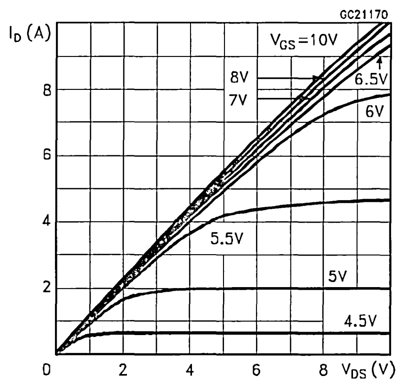
Derating Curve For TO-218



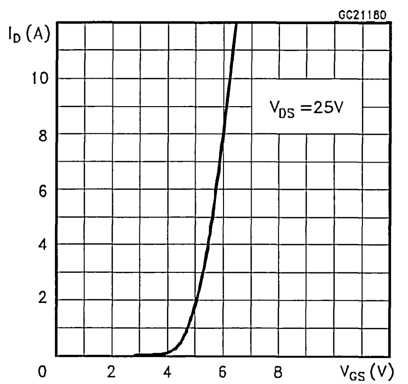
Derating Curve For ISOWATT218



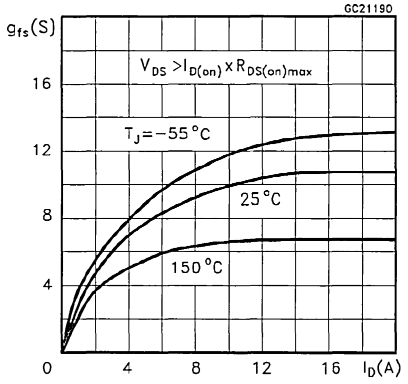
Output Characteristics



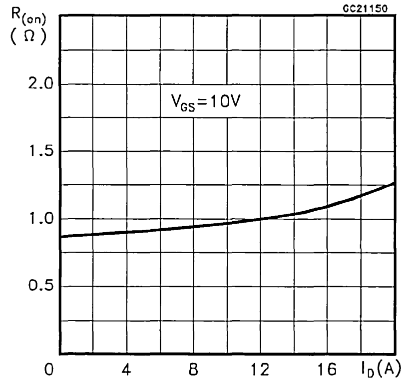
Transfer Characteristics



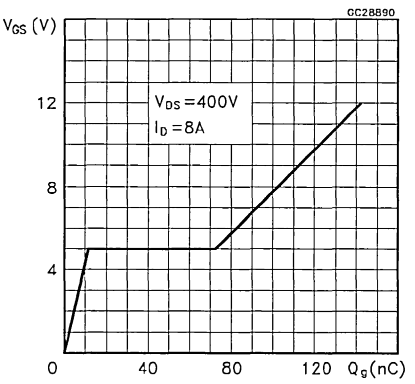
Transconductance



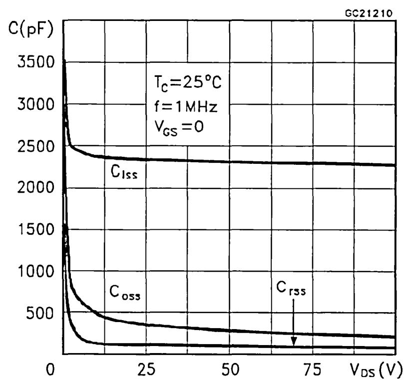
Static Drain-source On Resistance



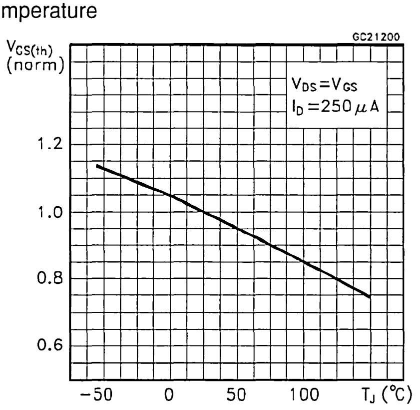
Gate Charge vs Gate-source Voltage



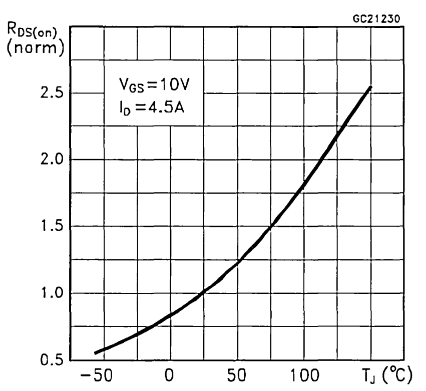
Capacitance Variations



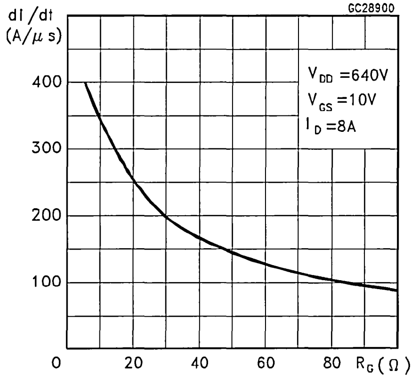
Normalized Gate Threshold Voltage vs Temperature



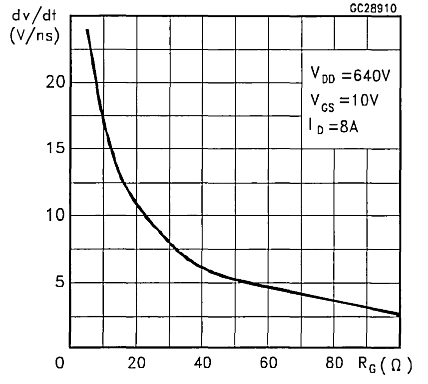
Normalized On Resistance vs Temperature



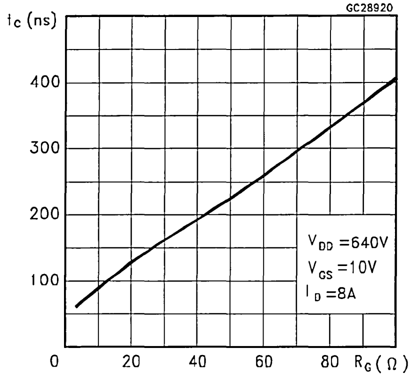
Turn-on Current Slope



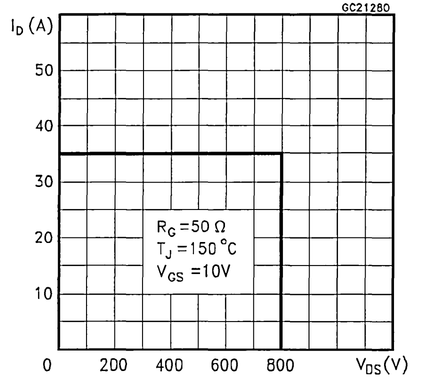
Turn-off Drain-source Voltage Slope



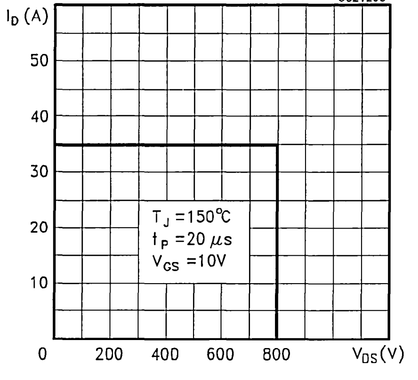
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

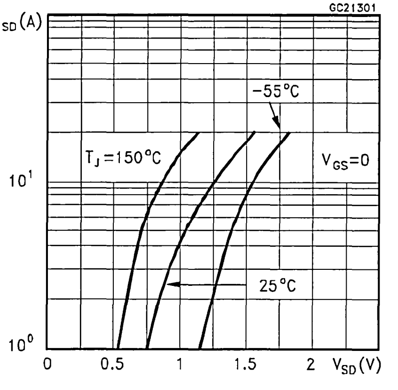


Fig. 1: Unclamped Inductive Load Test Circuits

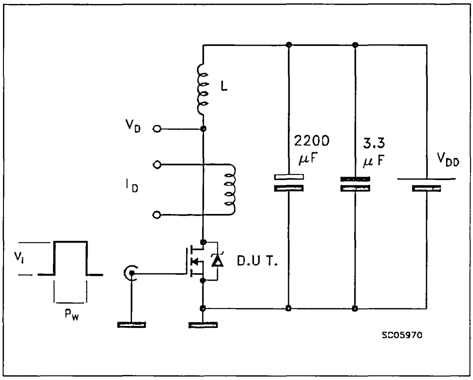


Fig. 2: Unclamped Inductive Waveforms

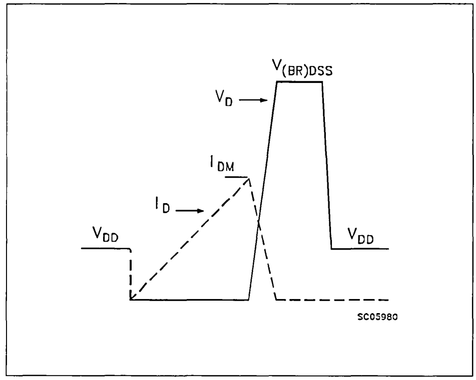


Fig. 3: Switching Times Test Circuits For Resistive Load

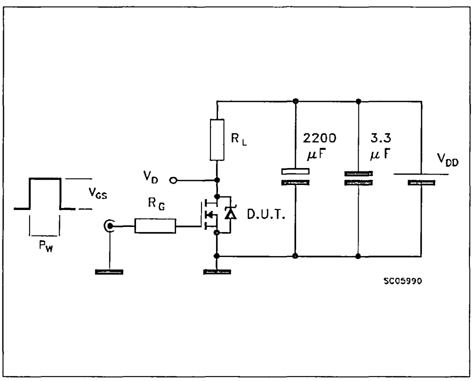


Fig. 4: Gate Charge Test Circuit

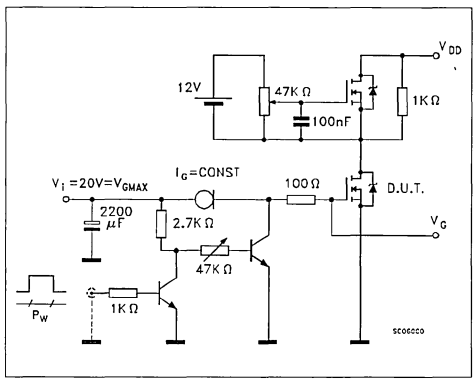
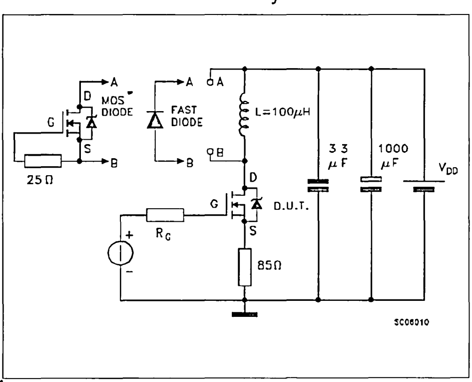


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON MICROELECTRONICS

STH12N60/FI
STW12N60

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

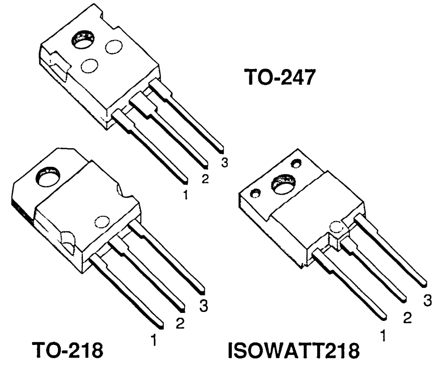
PRELIMINARY DATA

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH12N60	600 V	< 0.6 Ω	12 A
STH12N60FI	600 V	< 0.6 Ω	7 A
STW12N60	600 V	< 0.6 Ω	12 A

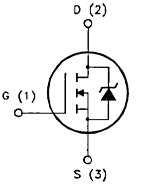
- TYPICAL $R_{DS(on)}$ = 0.47 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	VALUE		Unit
		STH/STW12N60	STH12N60FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	600		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	600		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	12	7	A
I_D	Drain Current (continuous) at T_c = 100 °C	7.5	4	A
I_{DM}(•)	Drain Current (pulsed)	48	28	A
P_{tot}	Total Dissipation at T_c = 25 °C	180	70	W
	Derating Factor	1.44	0.56	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-218/TO-247	ISOWATT218	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case Max	0.69	1.78	°C/W
$R_{thj\text{-}amb}$ $R_{thc\text{-}sink}$ T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	30 0.1 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, δ < 1%)	12	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	550	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, δ < 1%)	14	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, δ < 1%)	7.2	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	600			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 6 A V_{GS} = 10V I_D = 6 A T_c = 100°C		0.47	0.6 1.2	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	12			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 6 A	5	7.8		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1900 300 145	2500 390 190	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 300 V I_D = 6 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		25 85	35 115	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 480 V I_D = 12 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		430		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 12 A V_{GS} = 10 V		118 15 70	155	nC nC nC

SWITCHING OFF

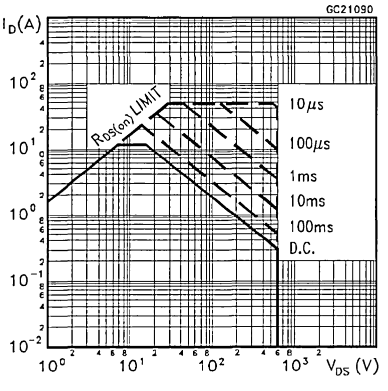
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 480 V I_D = 12 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		105 35 145	140 48 190	ns ns ns

SOURCE DRAIN DIODE

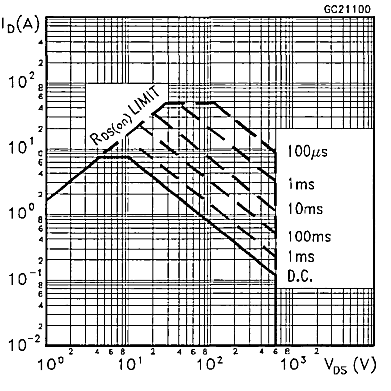
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				12 48	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 12 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 12 A di/dt = 100 A/µs V_R = 100 V T_j = 150 °C (see test circuit, figure 5)		730 15.3 42		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

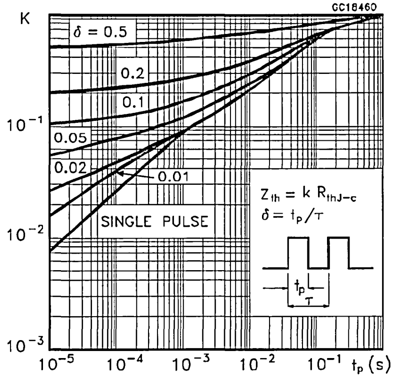
Safe Operating Areas For TO-218 and TO-247



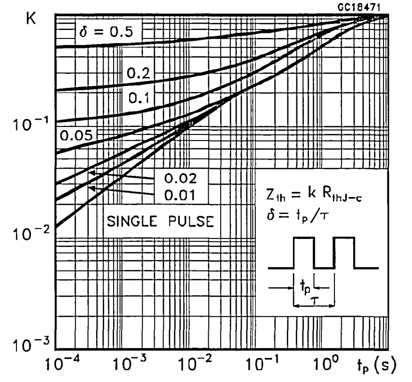
Safe Operating Areas For ISOWATT218



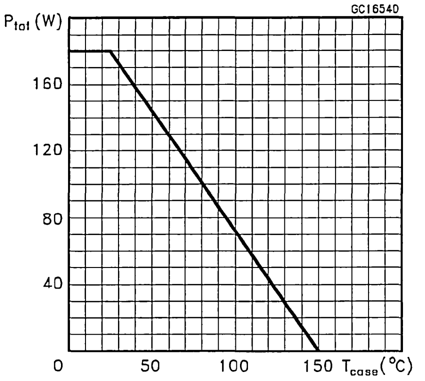
Thermal Impedeance For TO-218 and TO-247



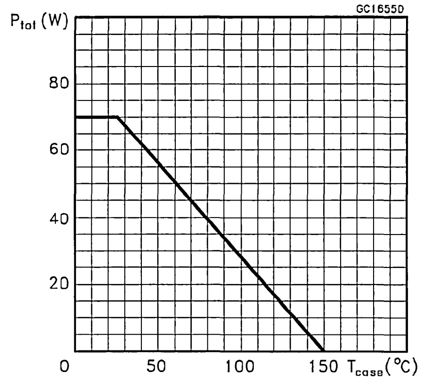
Thermal Impedance For ISOWATT218



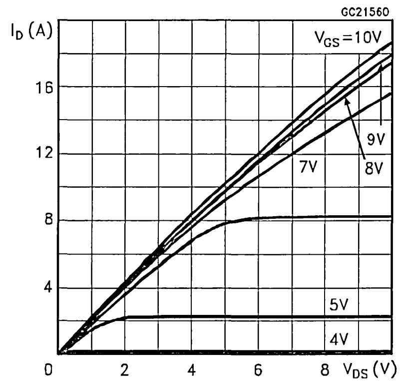
Derating Curve For TO-218 and TO-247



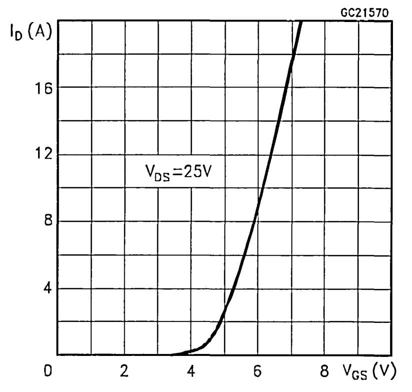
Derating Curve For ISOWATT218



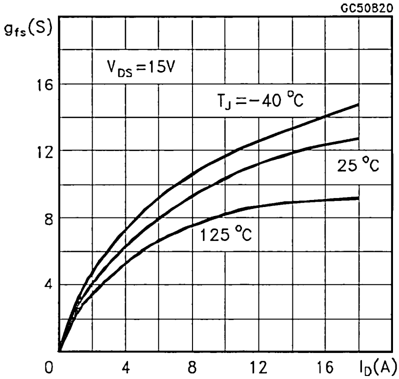
Output Characteristics



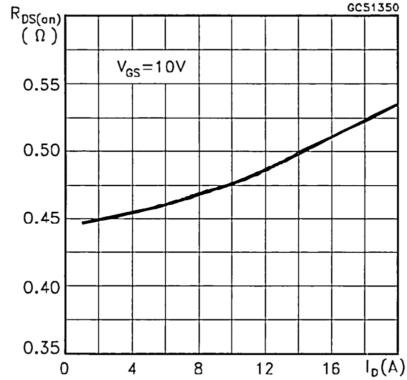
Transfer Characteristics



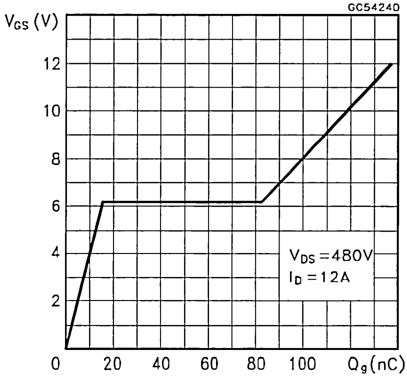
Transconductance



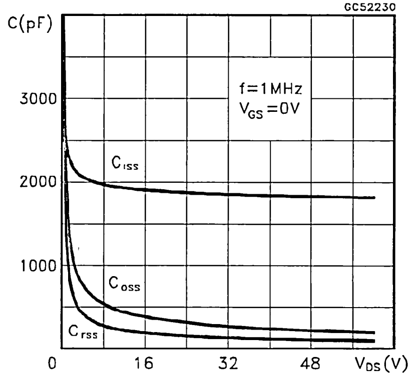
Static Drain-source On Resistance



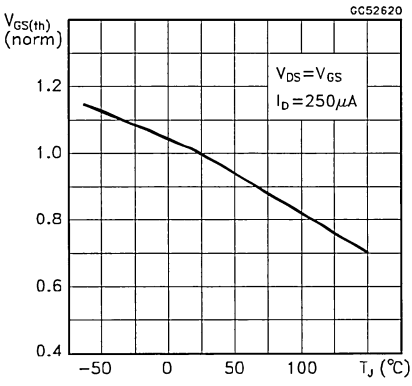
Gate Charge vs Gate-source Voltage



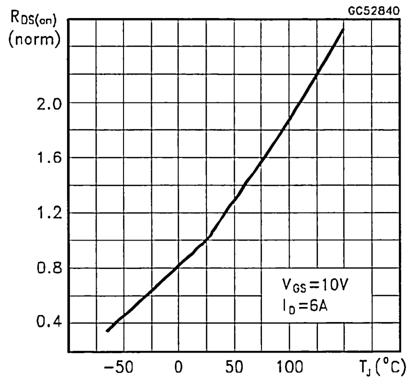
Capacitance Variations



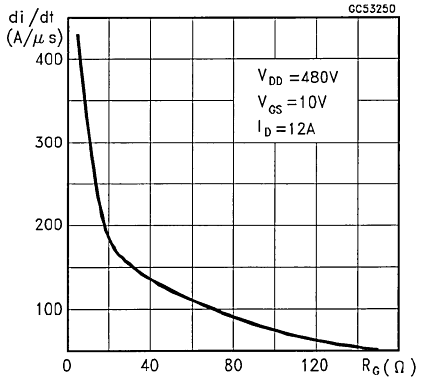
Normalized Gate Threshold Voltage vs Temperature



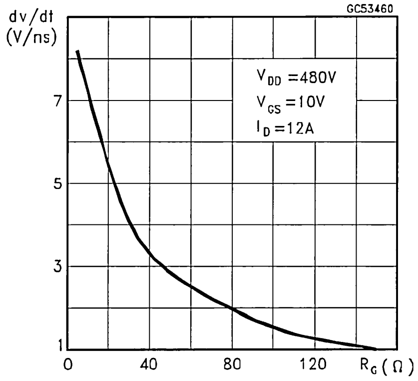
Normalized On Resistance vs Temperature



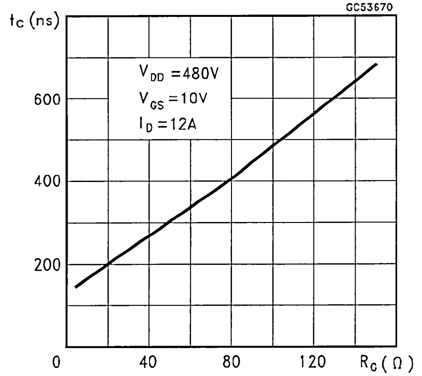
Turn-on Current Slope



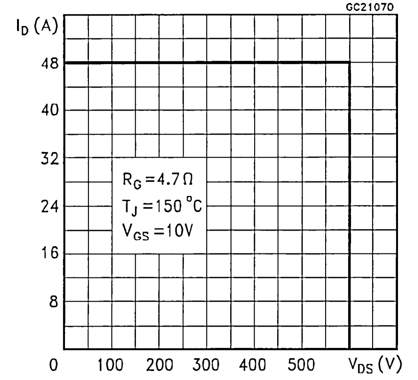
Turn-off Drain-source Voltage Slope



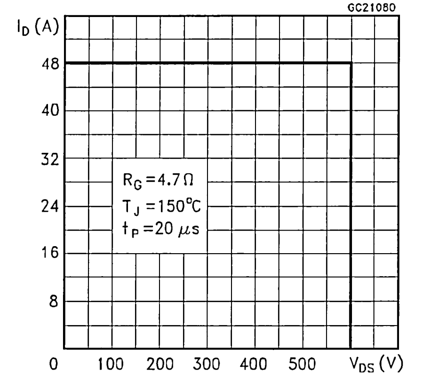
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

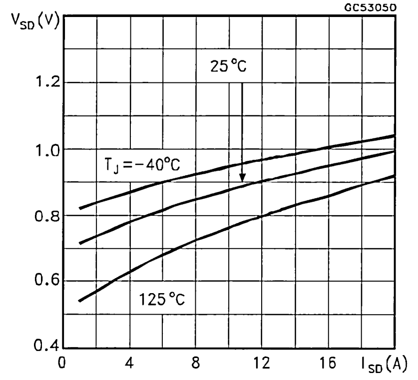


Fig. 1: Unclamped Inductive Load Test Circuits

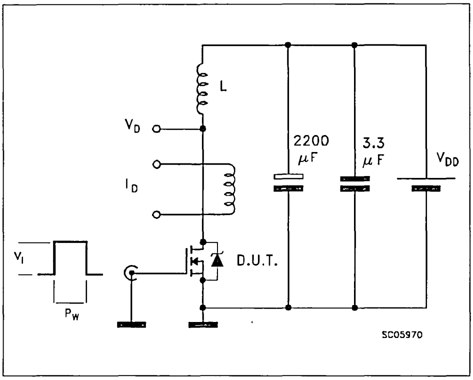


Fig. 2: Unclamped Inductive Waveforms

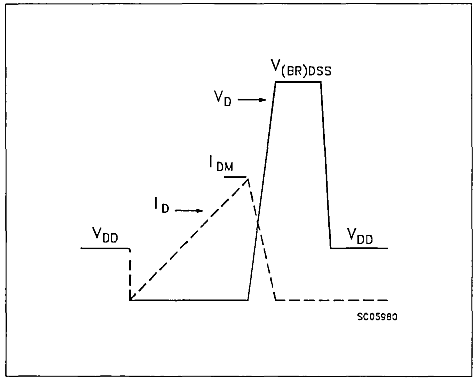


Fig. 3: Switching Times Test Circuits For Resistive Load

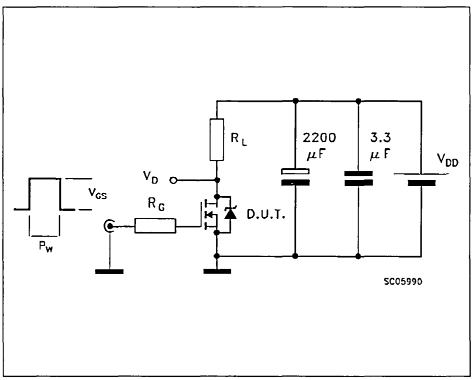


Fig. 4: Gate Charge Test Circuit

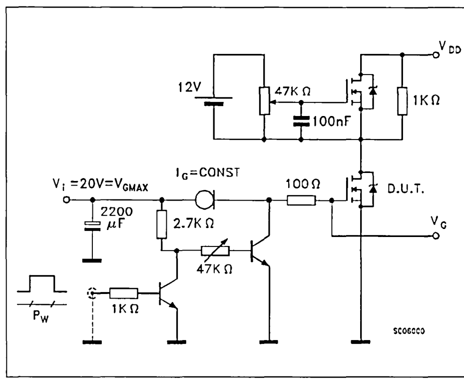
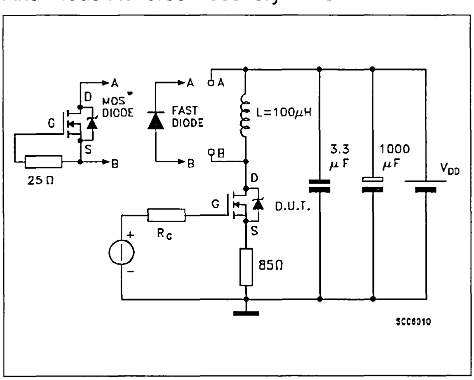


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time

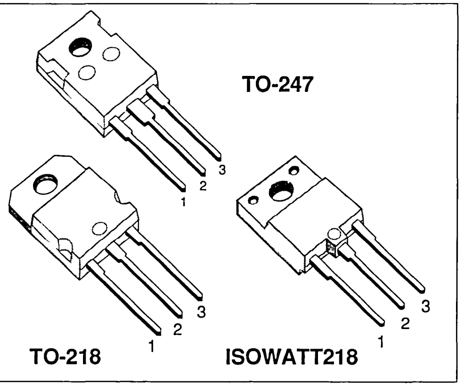


STH14N50/FI
STW14N50

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

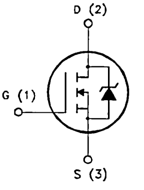
TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH14N50	500 V	< 0.45 Ω	14.1 A
STH14N50FI	500 V	< 0.45 Ω	8.8 A
STW14N50	500 V	< 0.45 Ω	14.1 A

- TYPICAL $R_{DS(on)}$ = 0.34 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- REDUCED GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION



APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STH/STW14N50	STH14N50FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	500		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	500		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	14.1	8.8	A
I_D	Drain Current (continuous) at T_c = 100 °C	8.8	5.5	A
I_{DM}(•)	Drain Current (pulsed)	60	60	A
P_{tot}	Total Dissipation at T_c = 25 °C	180	70	W
	Derating Factor	1.44	0.56	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-218/TO-247	ISOWATT218	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case Max	0.69	1.78	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient Max	30		°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink Typ	0.1		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	14.1	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	800	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	26	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	8.8	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	500			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 7.5 A V_{GS} = 10V I_D = 7.5 A T_c = 100°C		0.34	0.45 0.9	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	14.1			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 7.5 A	8.5	11.2		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		2350 340 75	3000 440 100	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 210 V I_D = 7 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		60 55	80 70	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 400 V I_D = 15 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		270		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 15 A V_{GS} = 10 V		90 12 48	110	nC nC nC

SWITCHING OFF

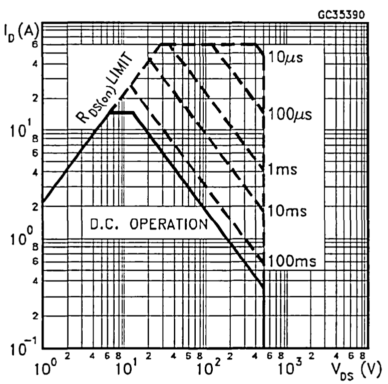
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 400 V I_D = 15 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		35 45 65	45 60 85	ns ns ns

SOURCE DRAIN DIODE

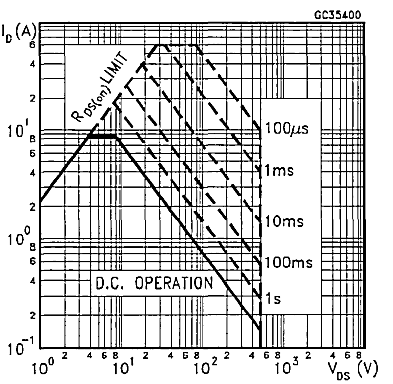
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				14.1 60	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 14 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 15 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		630 10.7 34		ns µC A

(*) Pulsed. Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

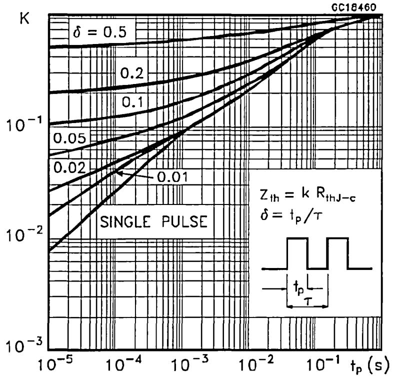
Safe Operating Areas For TO-218 and TO-247



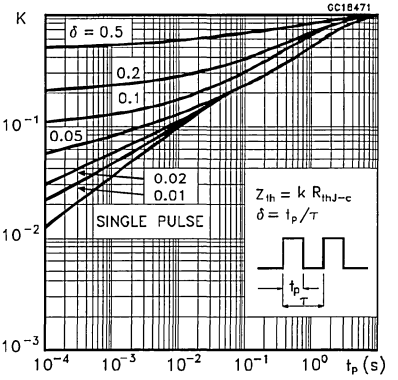
Safe Operating Areas For ISOWATT218



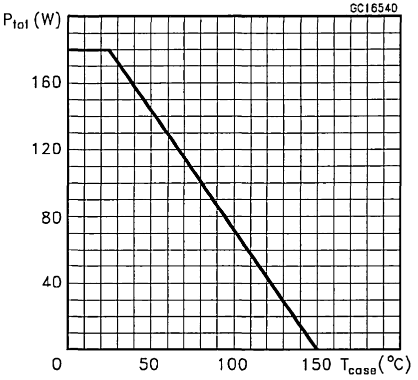
Thermal Impedeance For TO218 and TO-247



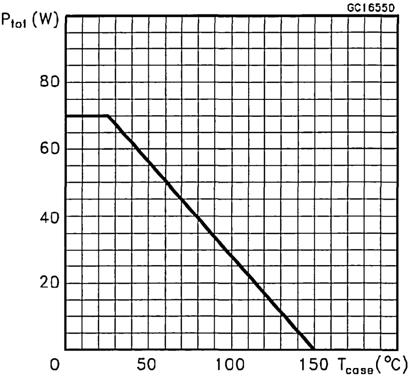
Thermal Impedance For ISOWATT218



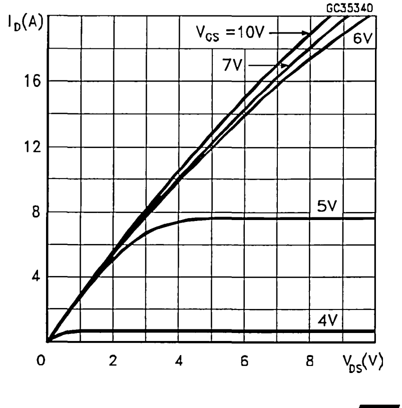
Derating Curve For TO-218 and TO-247



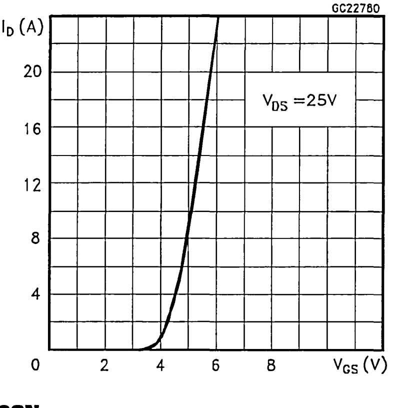
Derating Curve For ISOWATT218



Output Characteristics

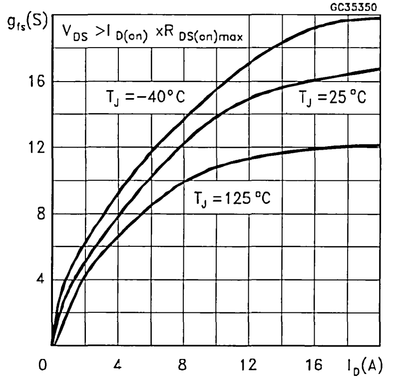


Transfer Characteristics

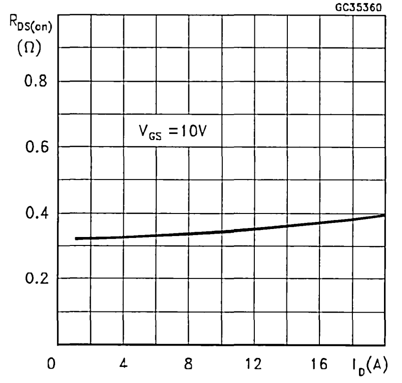


SGS-THOMSON MICROELECTRONICS

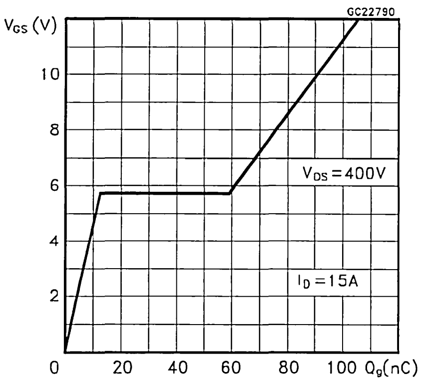
Transconductance



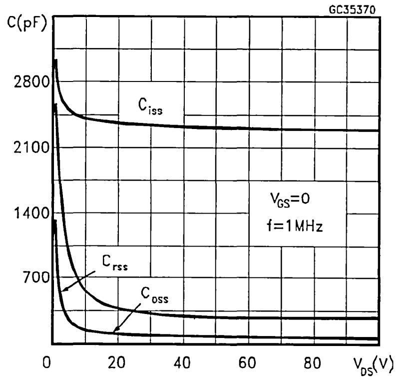
Static Drain-source On Resistance



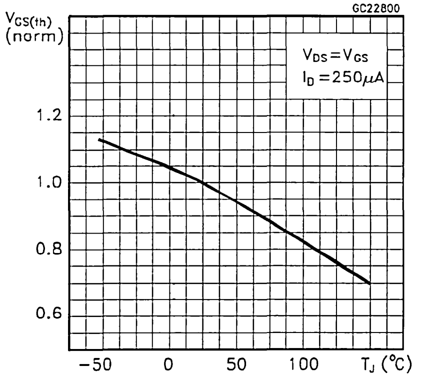
Gate Charge vs Gate-source Voltage



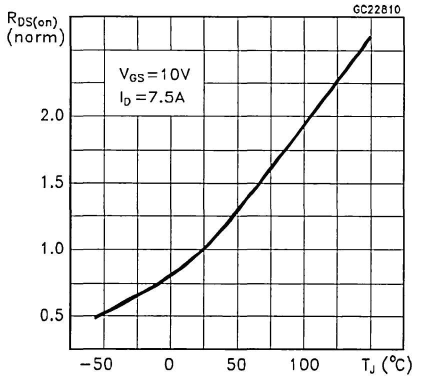
Capacitance Variations



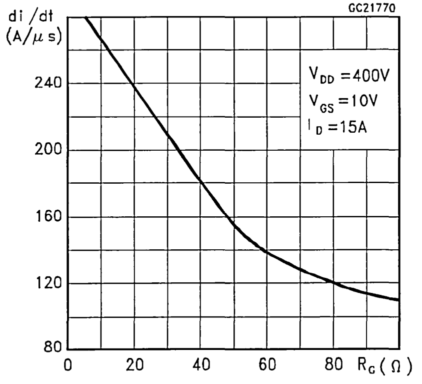
Normalized Gate Threshold Voltage vs Temperature



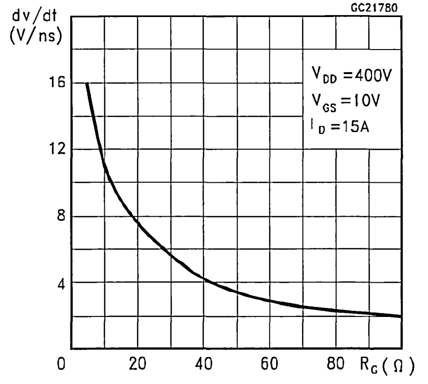
Normalized On Resistance vs Temperature



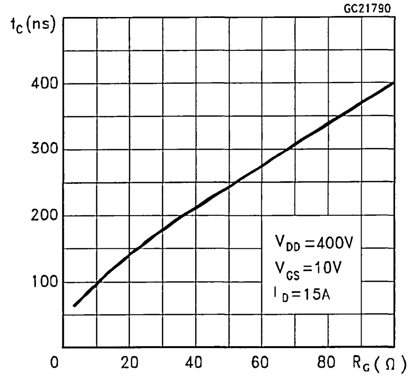
Turn-on Current Slope



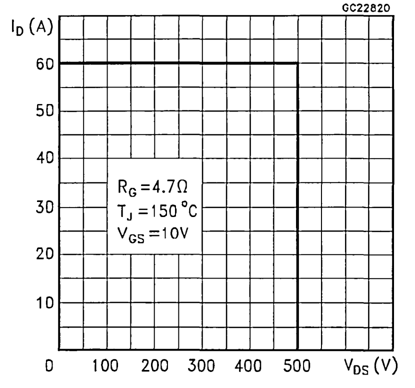
Turn-off Drain-source Voltage Slope



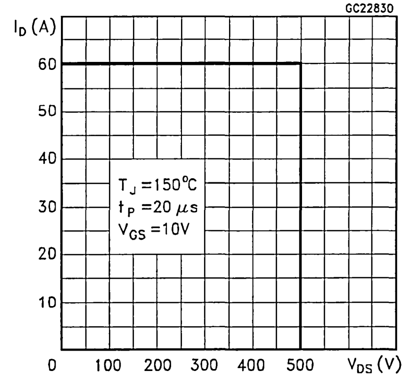
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

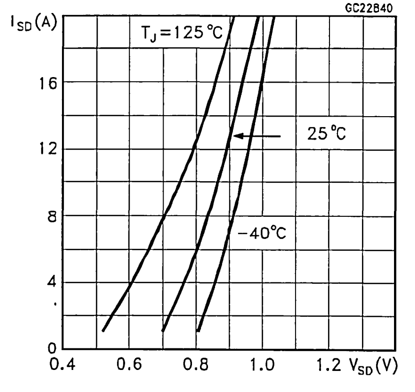


Fig. 1: Unclamped Inductive Load Test Circuits

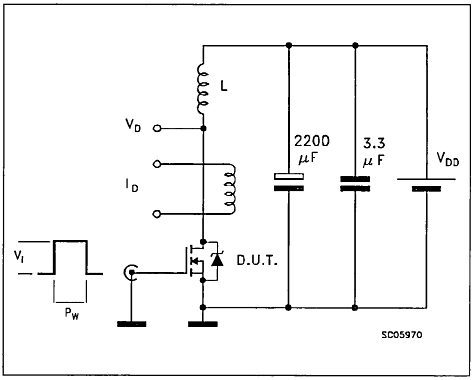


Fig. 2: Unclamped Inductive Waveforms

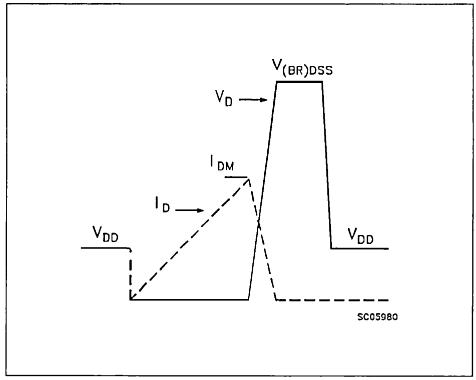


Fig. 3: Switching Times Test Circuits For Resistive Load

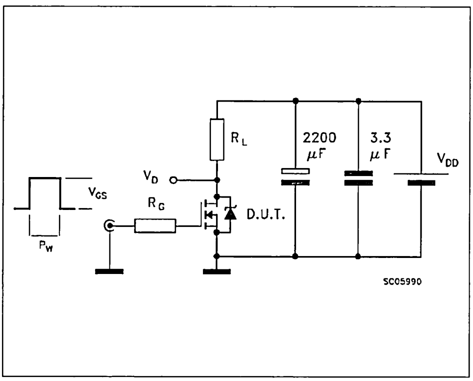


Fig. 4: Gate Charge Test Circuit

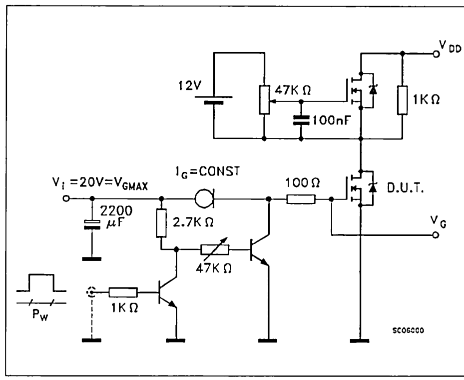
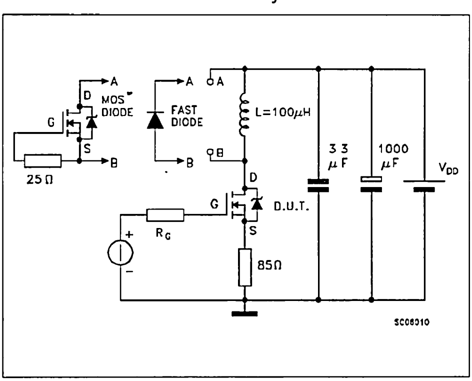


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON
MICROELECTRONICS

STH15N50/FI
STW15N50

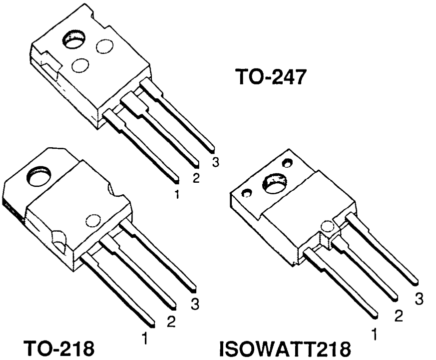
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH15N50	500 V	< 0.4 Ω	15 A
STH15N50FI	500 V	< 0.4 Ω	9.3 A
STW15N50	500 V	< 0.4 Ω	15 A

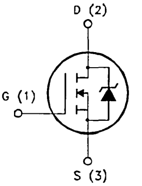
- TYPICAL $R_{DS(on)}$ = 0.34 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- REDUCED GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STH/STW15N50	STH15N50FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	500		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	500		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	15	9.3	A
I_D	Drain Current (continuous) at T_c = 100 °C	9.4	5.8	A
$I_{DM}(\bullet)$	Drain Current (pulsed)	60	60	A
P_{tot}	Total Dissipation at T_c = 25 °C	180	70	W
	Derating Factor	1.44	0.56	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-218/TO-247	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.69	1.78	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Thermal Resistance Case-sink Maximum Lead Temperature For Soldering Purpose	Max Typ 	30 0.1 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	15	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	900	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	30	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	9.4	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	500			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 7.5 A V_{GS} = 10V I_D = 7.5 A T_c = 100°C		0.34	0.4 0.8	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	15			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 7.5 A	8.5	11.2		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		2350 340 75	3000 440 100	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 210 V I_D = 7 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		60 55	80 70	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 400 V I_D = 15 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		270		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 15 A V_{GS} = 10 V		90 12 48	110	nC nC nC

SWITCHING OFF

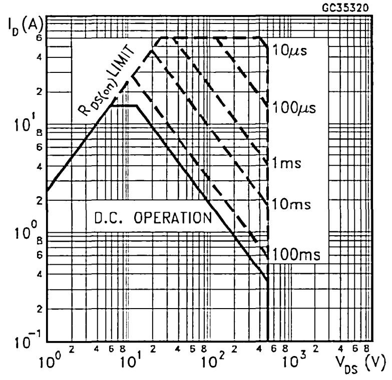
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 400 V I_D = 15 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		35 45 65	45 60 85	ns ns ns

SOURCE DRAIN DIODE

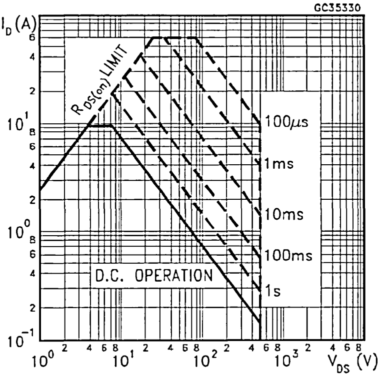
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				15 60	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 15 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 15 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		630 10.7 34		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

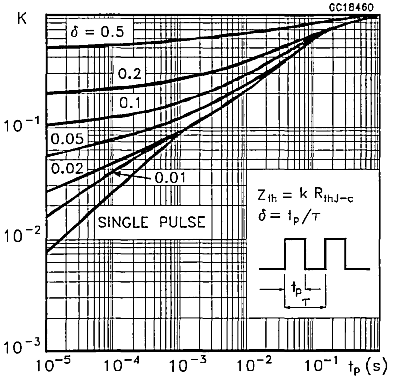
Safe Operating Areas For TO-218 and TO-247



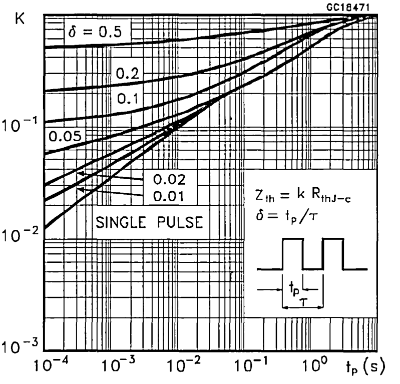
Safe Operating Areas For ISOWATT218



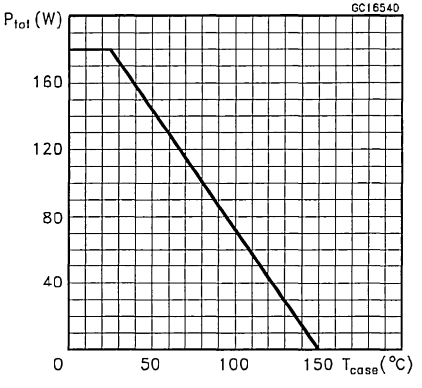
Thermal Impedeance For TO-218 and TO-247



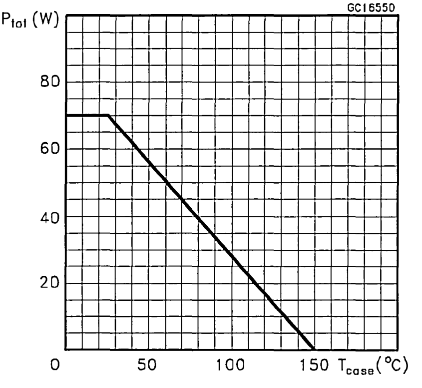
Thermal Impedance For ISOWATT218



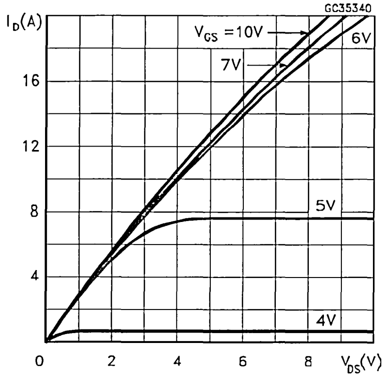
Derating Curve For TO-218 and TO-247



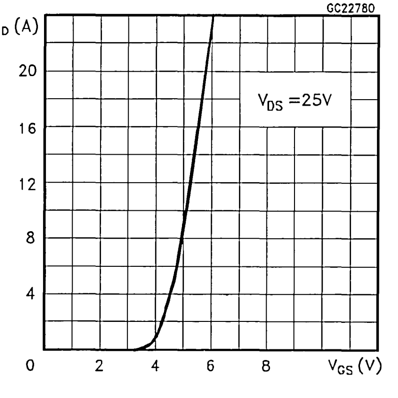
Derating Curve For ISOWATT218



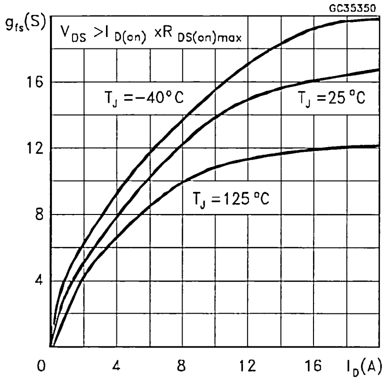
Output Characteristics



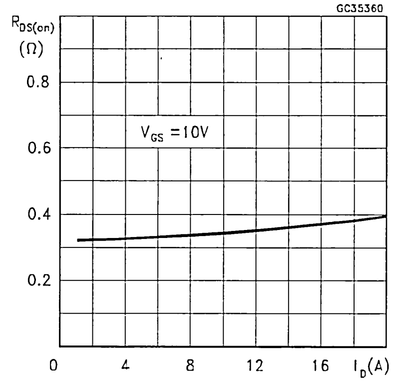
Transfer Characteristics



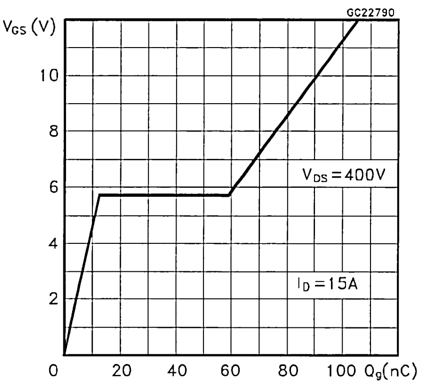
Transconductance



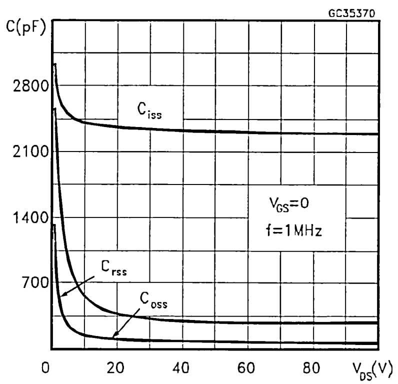
Static Drain-source On Resistance



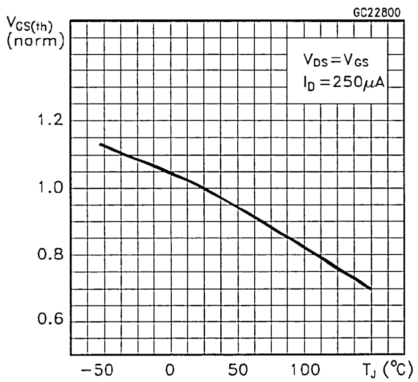
Gate Charge vs Gate-source Voltage



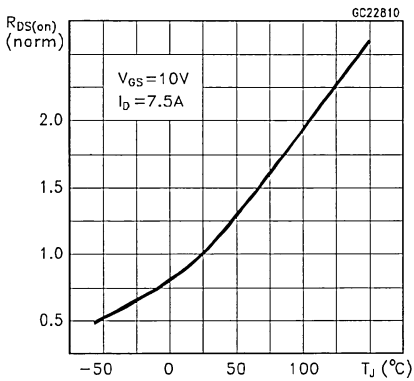
Capacitance Variations



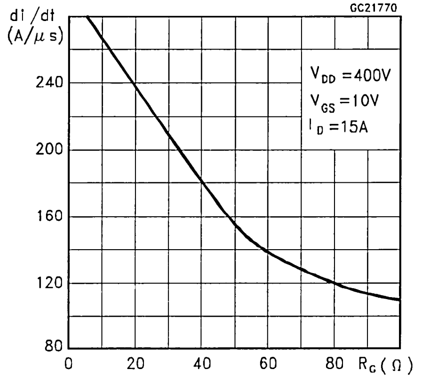
Normalized Gate Threshold Voltage vs Temperature



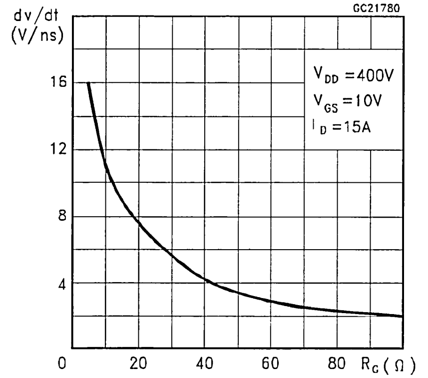
Normalized On Resistance vs Temperature



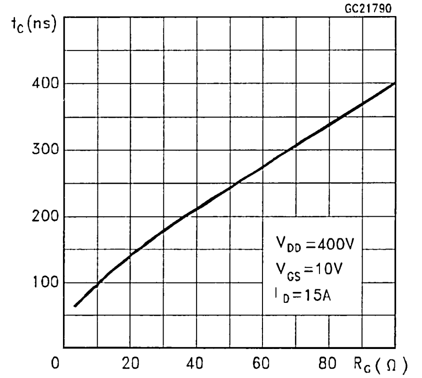
Turn-on Current Slope



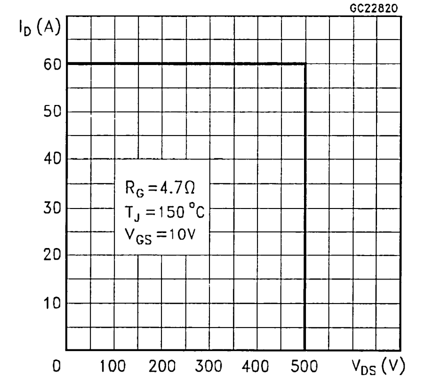
Turn-off Drain-source Voltage Slope



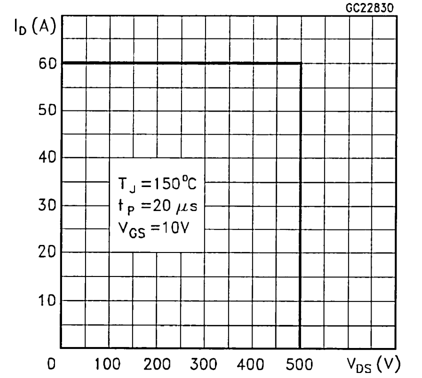
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

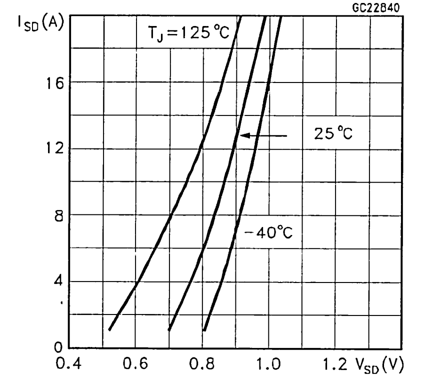


Fig. 1: Unclamped Inductive Load Test Circuits

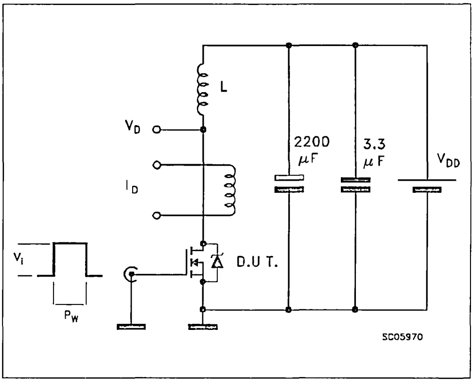


Fig. 2: Unclamped Inductive Waveforms

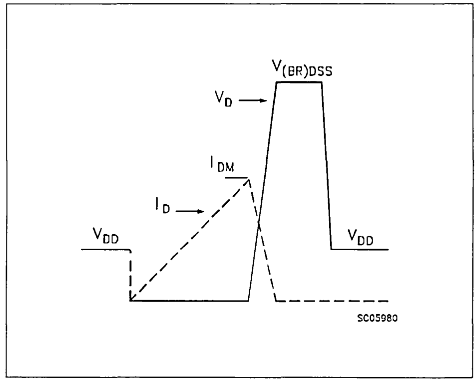


Fig. 3: Switching Times Test Circuits For Resistive Load

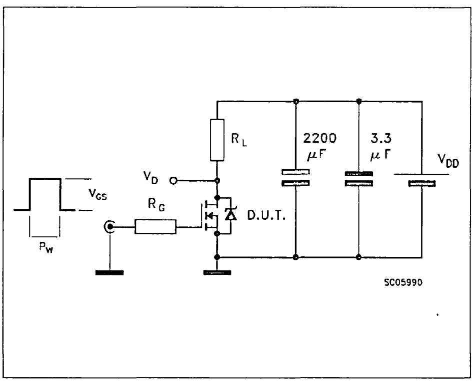


Fig. 4: Gate Charge Test Circuit

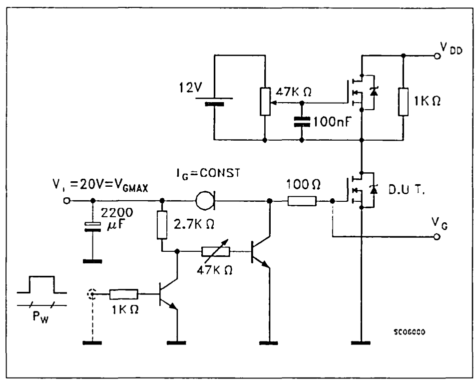
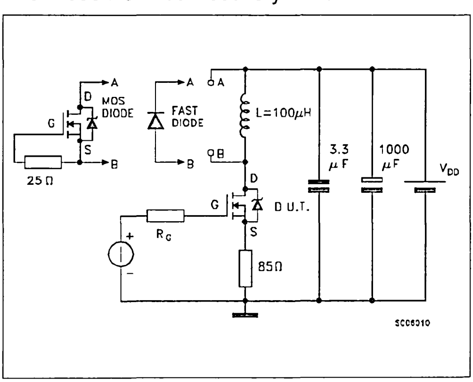


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



STH26N25
STH26N25FI

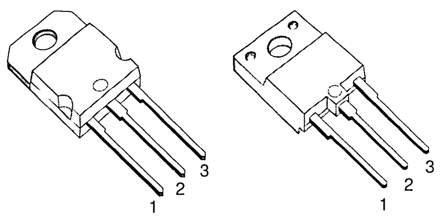
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH26N25	250 V	< 0.11 Ω	26 A
STH26N25FI	250 V	< 0.11 Ω	16 A

- TYPICAL $R_{DS(on)}$ = 0.085 Ω
- AVALANCHE RUGGEDNESS TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

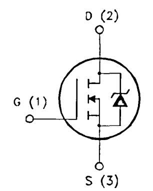
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- UNINTERRUPTIBLE POWER SUPPLY (UPS)
- MOTOR CONTROL, AUDIO AMPLIFIERS
- INDUSTRIAL ACTUATORS
- DC-DC & DC-AC CONVERTERS FOR TELECOM, INDUSTRIAL AND CONSUMER ENVIRONMENT



TO-218 ISOWATT218

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STH26N25	STH26N25FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	250		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	250		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	26	16	A
I_D	Drain Current (continuous) at T_c = 100 °C	16	10	A
I_{DM}(•)	Drain Current (pulsed)	104	104	A
P_{tot}	Total Dissipation at T_c = 25 °C	180	70	W
	Derating Factor	1.44	0.56	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-218	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.69	1.79	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Thermal Resistance Case-sink Maximum Lead Temperature For Soldering Purpose	Max Typ 	30 0.1 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	26	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	160	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	40	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	16	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	250			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 13 A V_{GS} = 10V I_D = 13 A T_c = 100°C		0.085	0.11 0.22	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	26			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 13 A	9	18		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		2900 600 180	3800 800 250	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 125 V I_D = 13 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		25 80	35 120	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 200 V I_D = 26 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		200		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 200 V I_D = 26 A V_{GS} = 10 V		125 15 65	180	nC nC nC

SWITCHING OFF

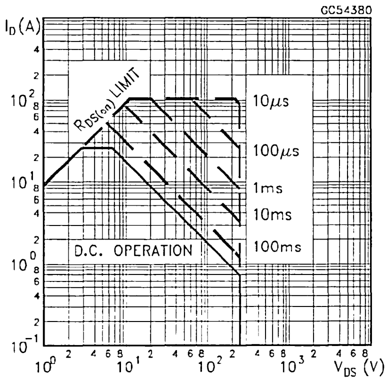
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 200 V I_D = 26 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		170 80 260	250 120 380	ns ns ns

SOURCE DRAIN DIODE

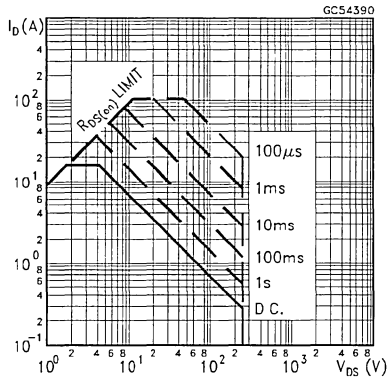
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				26 104	A A
V_{SD} (:)	Forward On Voltage	I_{SD} = 26 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 26 A di/dt = 100 A/µs V_{DD} = 50 V T_j = 150 °C (see test circuit, figure 5)		400 5.2 26		ns µC A

( ) Pulsed. Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

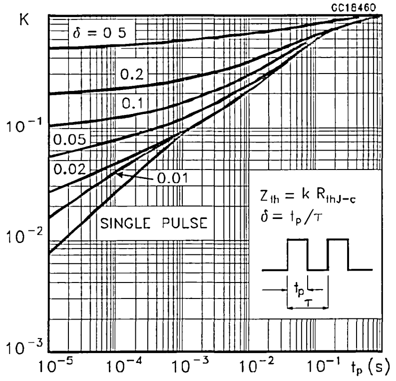
Safe Operating Areas For TO-218



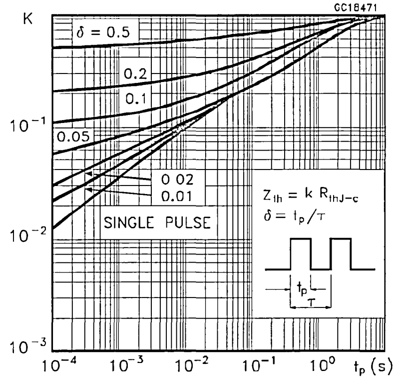
Safe Operating Areas For ISOWATT218



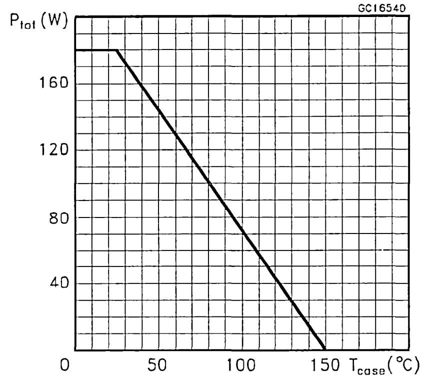
Thermal Impedeance For TO-218



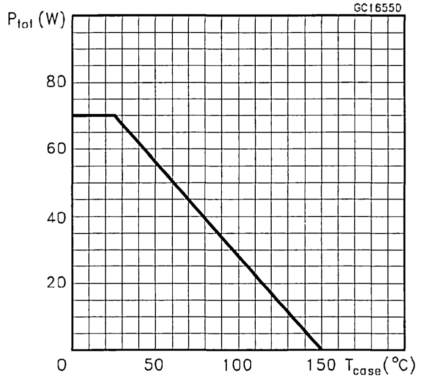
Thermal Impedance For ISOWATT218



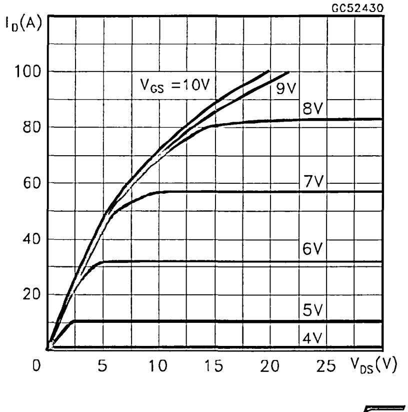
Derating Curve For TO-218



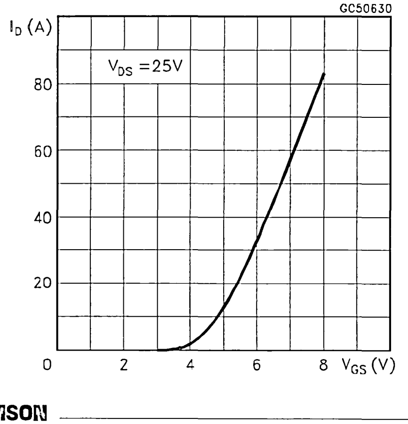
Derating Curve For ISOWATT218



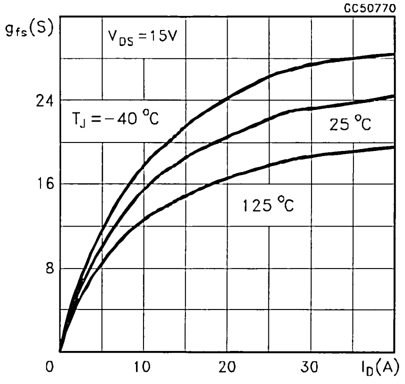
Output Characteristics



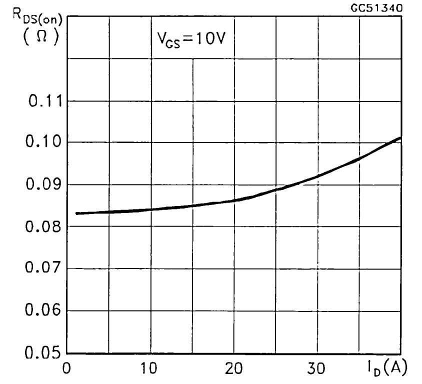
Transfer Characteristics



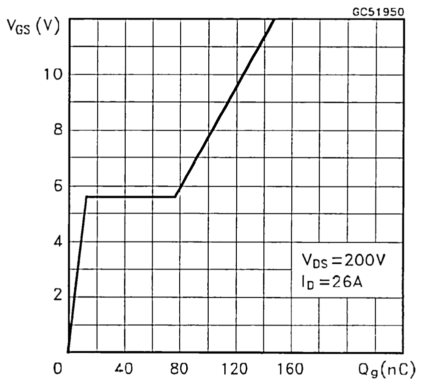
Transconductance



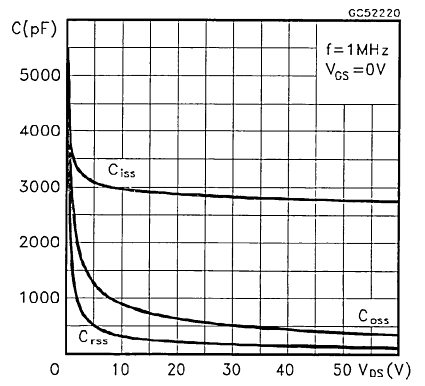
Static Drain-source On Resistance



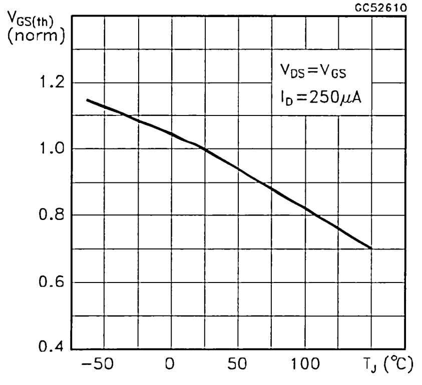
Gate Charge vs Gate-source Voltage



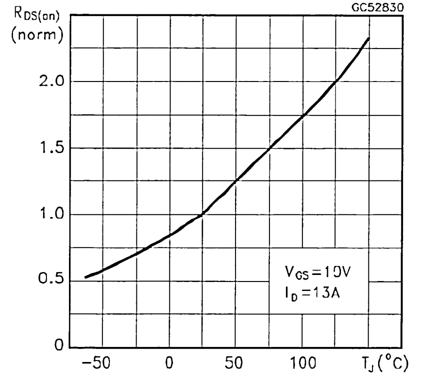
Capacitance Variations



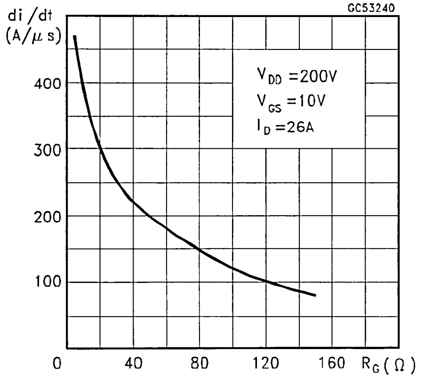
Normalized Gate Threshold Voltage vs Temperature



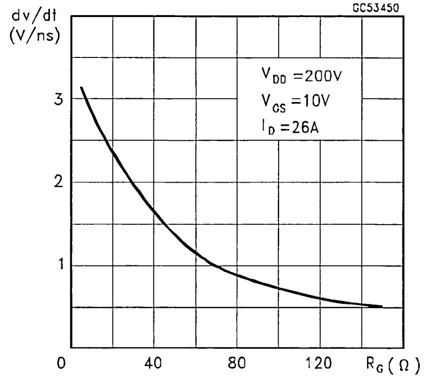
Normalized On Resistance vs Temperature



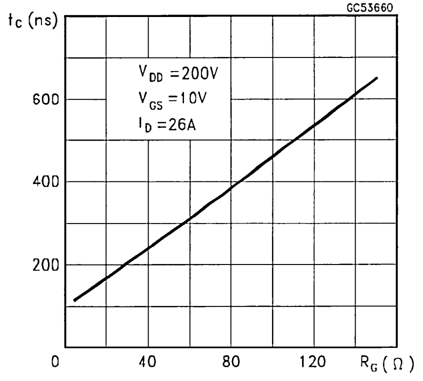
Turn-on Current Slope



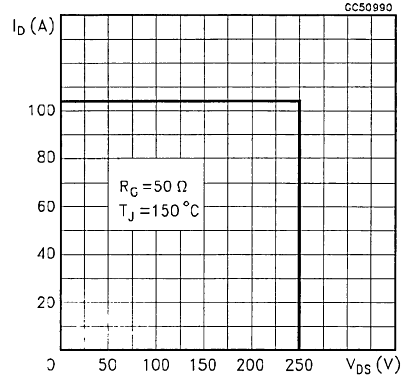
Turn-off Drain-source Voltage Slope



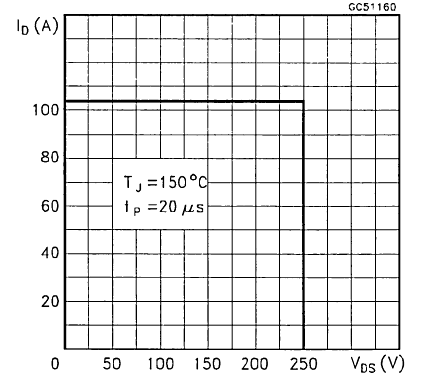
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

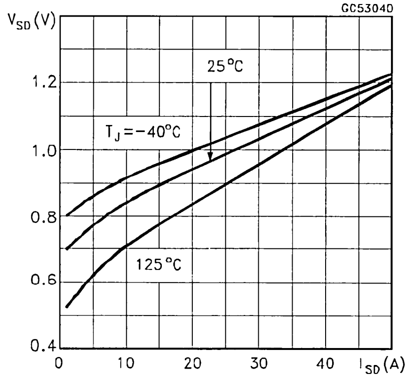


Fig. 1: Unclamped Inductive Load Test Circuits

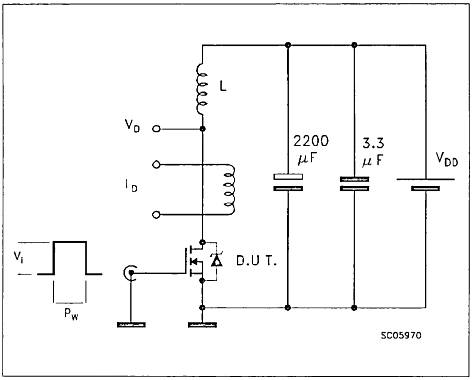


Fig. 2: Unclamped Inductive Waveforms

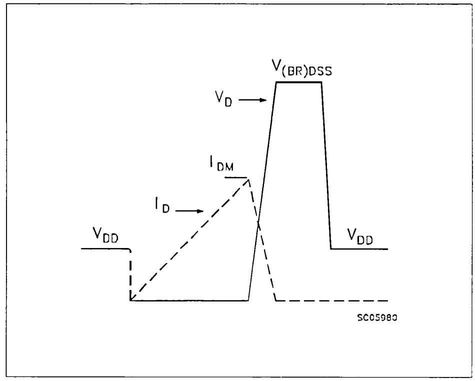


Fig. 3: Switching Times Test Circuits For Resistive Load

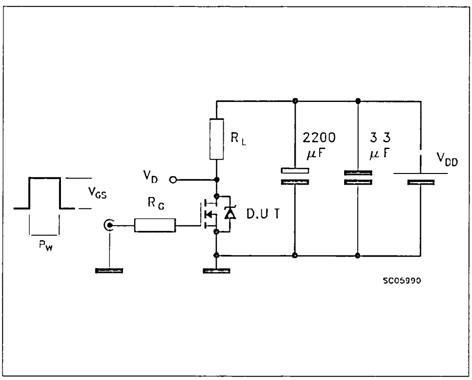


Fig. 4: Gate Charge Test Circuit

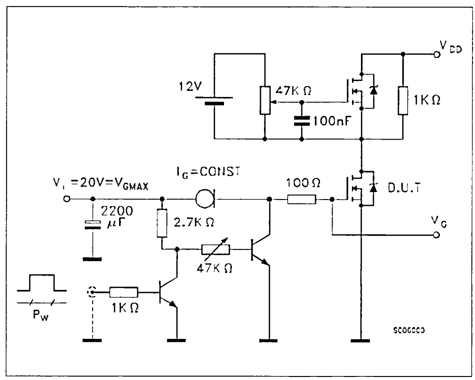
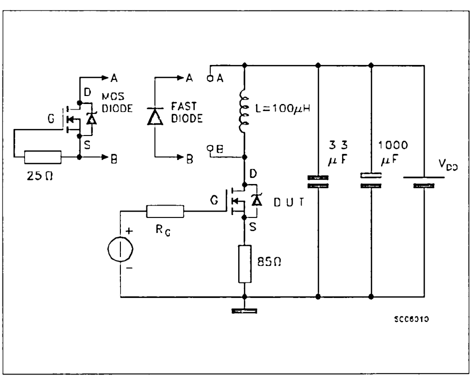


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON MICROELECTRONICS

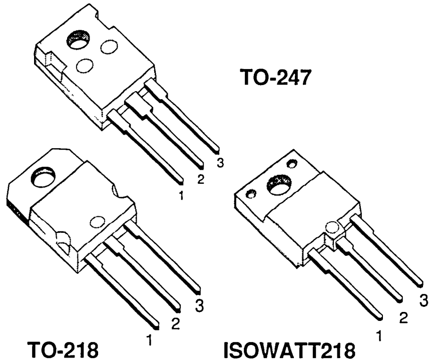
STH33N20/FI
STW33N20

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

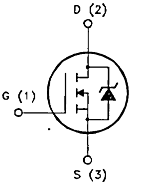
TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH33N20	200 V	< 0.085 Ω	33 A
STH33N20FI	200 V	< 0.085 Ω	20 A
STW33N20	200 V	< 0.085 Ω	33 A

- TYPICAL $R_{DS(on)}$ = 0.073 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- UNINTERRUPTIBLE POWER SUPPLY (UPS)
- MOTOR CONTROL, AUDIO AMPLIFIERS
- INDUSTRIAL ACTUATORS
- DC-DC & DC-AC CONVERTERS FOR TELECOM, INDUSTRIAL AND CONSUMER ENVIRONMENT



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STH/STW33N20	STH33N20FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	200		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	200		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	33	20	A
I_D	Drain Current (continuous) at T_c = 100 °C	20	12	A
I_{DM}(•)	Drain Current (pulsed)	132	132	A
P_{tot}	Total Dissipation at T_c = 25 °C	180	70	W
	Derating Factor	1.44	0.56	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-218/TO-247	ISOWATT218	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case Max	0.69	1.79	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient Max	30		°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink Typ	0.1		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	33	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	150	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	40	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	20	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	200			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 16 A V_{GS} = 10V I_D = 16 A T_c = 100°C		0.073	0.085 0.170	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	33			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 16 A	10	22		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		2800 600 190	3600 800 250	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 95 V I_D = 16 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		25 65	40 95	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 160 V I_D = 33 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		200		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 160 V I_D = 33 A V_{GS} = 10 V		125 15 62	180	nC nC nC

SWITCHING OFF

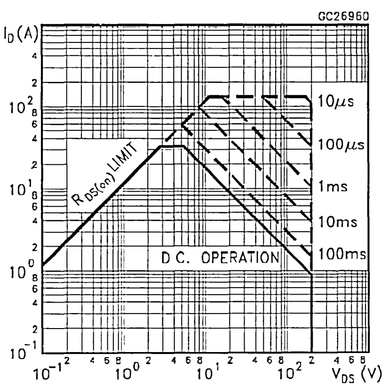
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 160 V I_D = 33 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		180 105 285	250 150 400	ns ns ns

SOURCE DRAIN DIODE

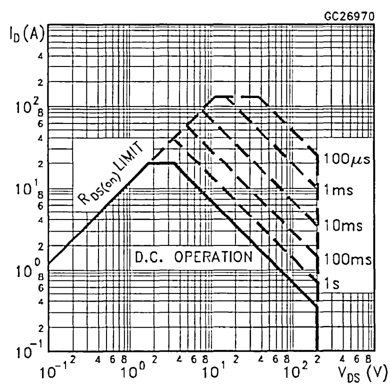
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				33 132	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 33 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 33 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		450 5 22		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

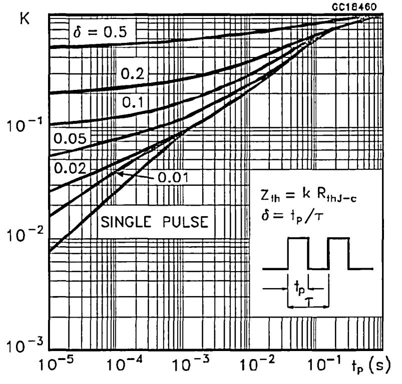
Safe Operating Areas For TO-218 and TO-247



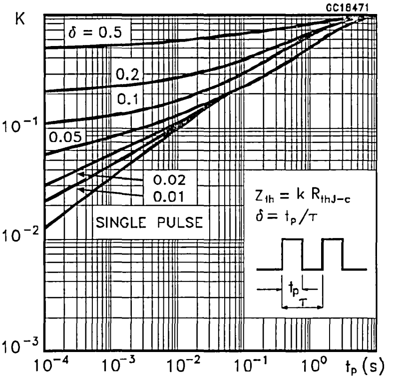
Safe Operating Areas For ISOWATT218



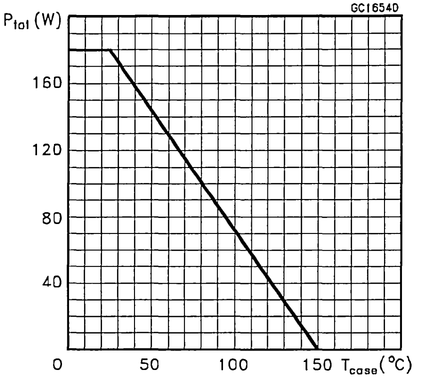
Thermal Impedeance For TO-218 and TO-247



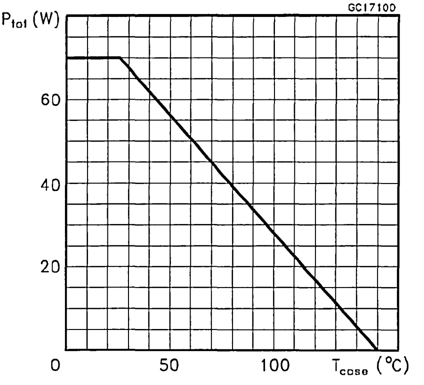
Thermal Impedance For ISOWATT218



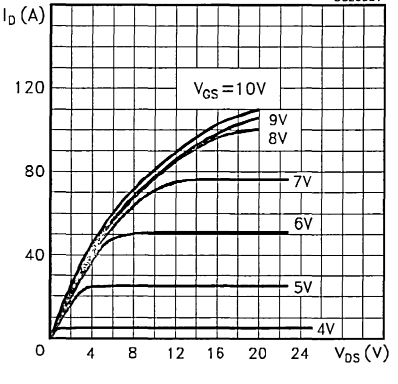
Derating Curve For TO-218 and TO-247



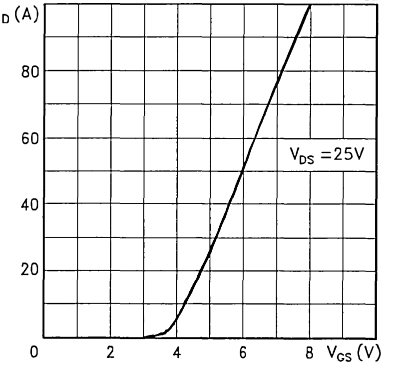
Derating Curve For ISOWATT218



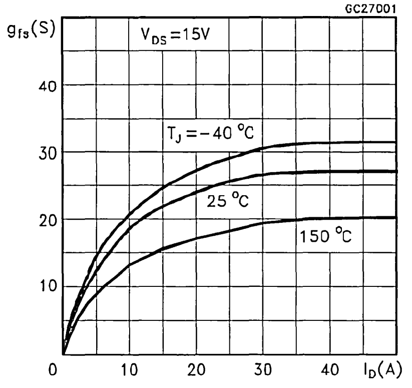
Output Characteristics



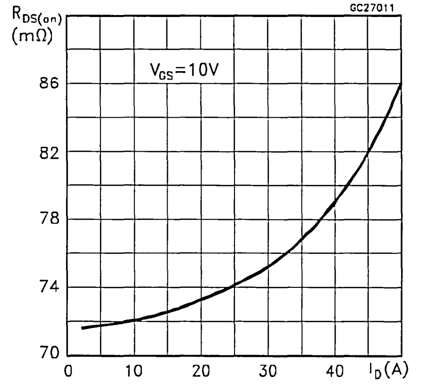
Transfer Characteristics



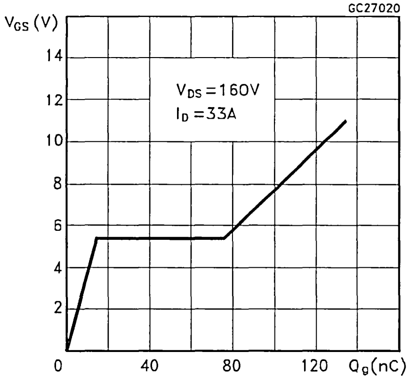
Transconductance



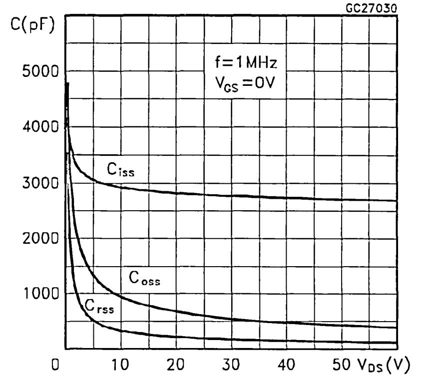
Static Drain-source On Resistance



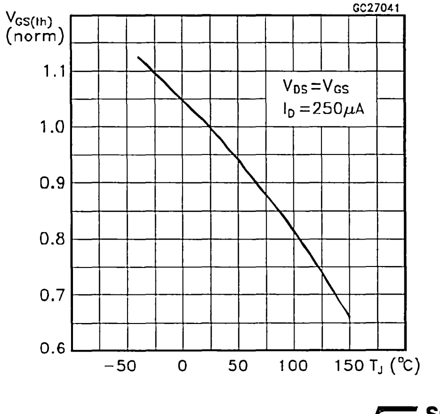
Gate Charge vs Gate-source Voltage



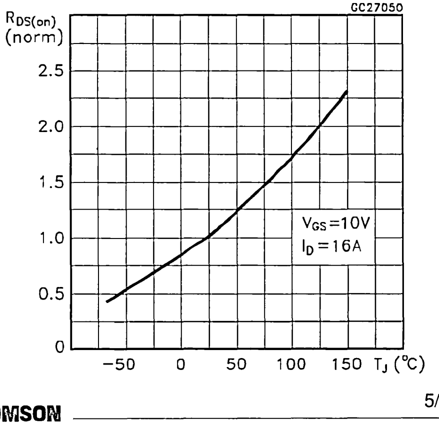
Capacitance Variations



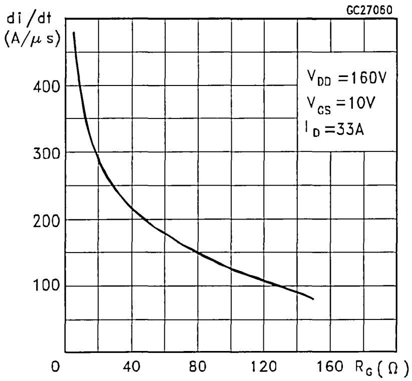
Normalized Gate Threshold Voltage vs Temperature



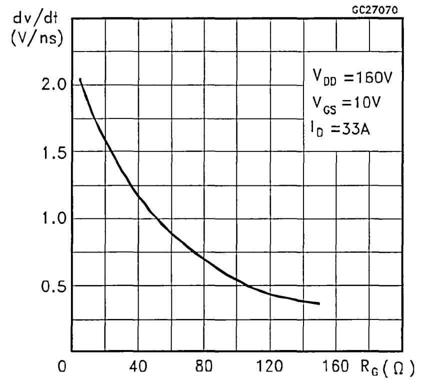
Normalized On Resistance vs Temperature



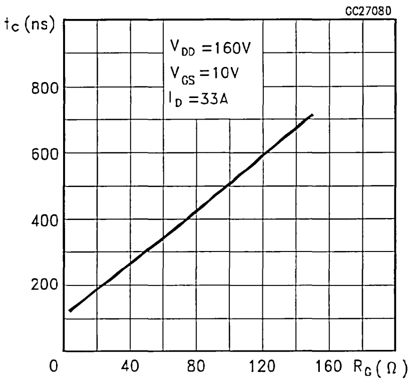
Turn-on Current Slope



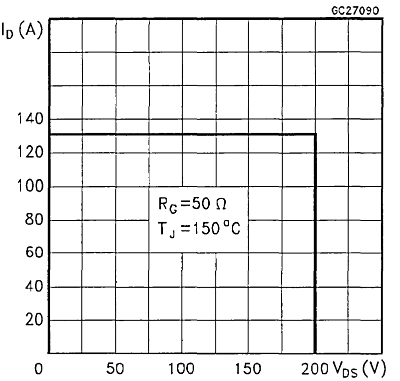
Turn-off Drain-source Voltage Slope



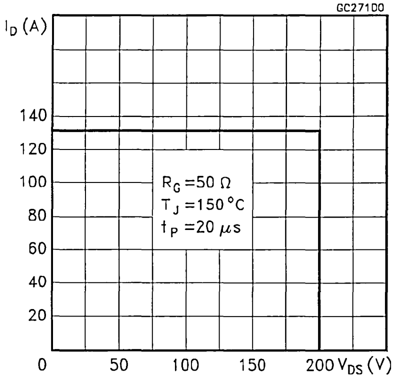
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

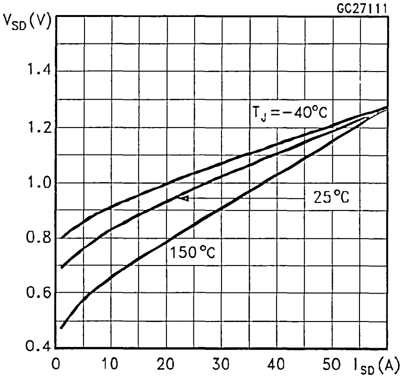


Fig. 1: Unclamped Inductive Load Test Circuits

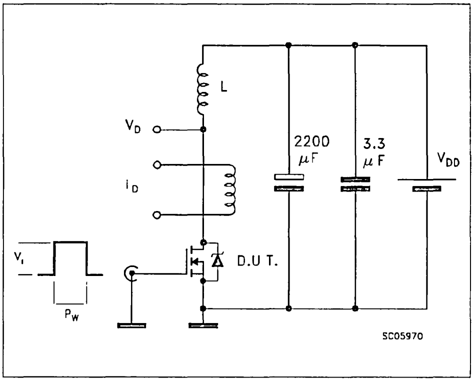


Fig. 2: Unclamped Inductive Waveforms

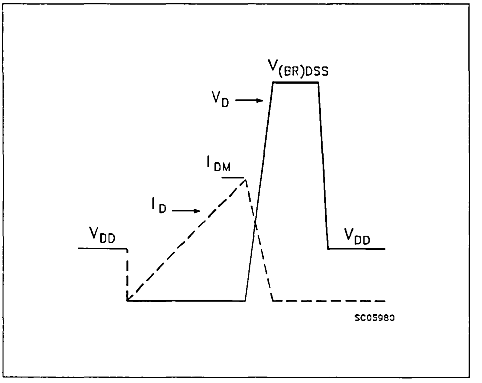


Fig. 3: Switching Times Test Circuits For Resistive Load

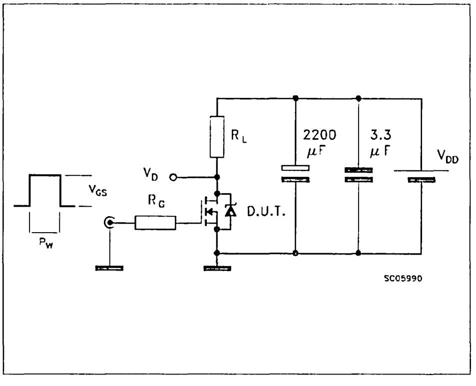


Fig. 4: Gate Charge Test Circuit

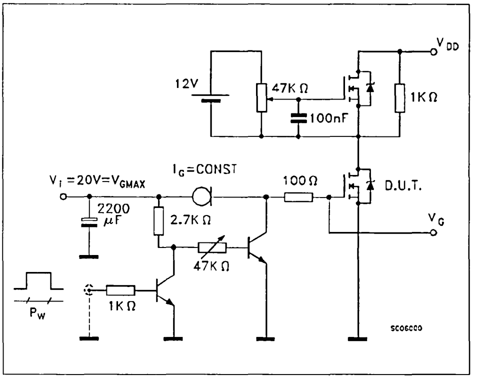
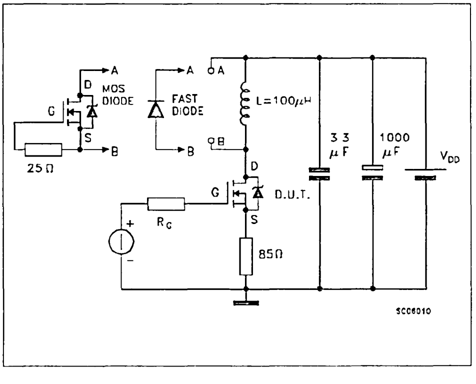


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



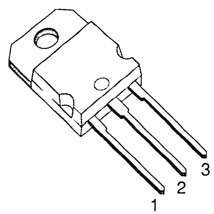
SGS-THOMSON MICROELECTRONICS

STH45N10
STH45N10FI

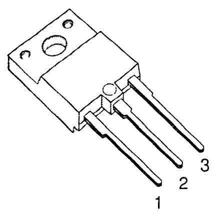
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH45N10	100 V	< 0.04 Ω	45 A
STH45N10FI	100 V	< 0.04 Ω	27 A

- TYPICAL $R_{DS(on)}$ = 0.035 Ω
- AVALANCHE RUGGEDNESS TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE FOR STANDARD PACKAGE
- APPLICATION ORIENTED CHARACTERIZATION



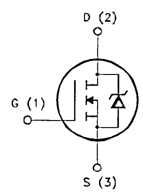
TO-218



ISOWATT218

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STH45N10	STH45N10FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	100		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	100		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	45	27	A
I_D	Drain Current (continuous) at T_c = 100 °C	31	17	A
I_{DM}(•)	Drain Current (pulsed)	180	180	A
P_{tot}	Total Dissipation at T_c = 25 °C	180	60	W
	Derating Factor	1.2	0.48	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 175	-65 to 150	°C
T_j	Max. Operating Junction Temperature	175	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-218	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case Max	0.83	2.08	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max	30		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink Typ	0.1		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	45	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	240	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	60	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	31	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	100			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 22.5 A V_{GS} = 10V I_D = 22.5 A T_c = 100°C		0.035	0.04 0.08	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	45			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 22.5 A	14	26		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		2150 600 150	2800 800 200	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 22.5 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		20 130	30 190	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 80 V I_D = 45 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		500		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 80 V I_D = 45 A V_{GS} = 10 V		70 12 30	100	nC nC nC

SWITCHING OFF

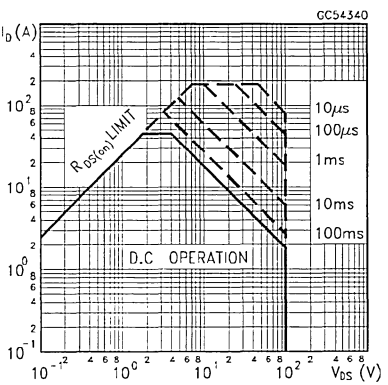
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 80 V I_D = 45 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		50 70 140	70 100 200	ns ns ns

SOURCE DRAIN DIODE

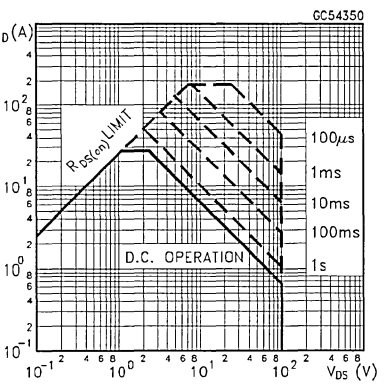
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				45 180	A A
V_{SD} ( )	Forward On Voltage	I_{SD} = 45 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 45 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		130 0.65 10		ns µC A

( ) Pulsed Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

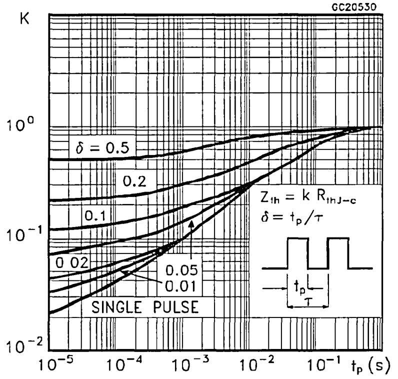
Safe Operating Areas For TO-218



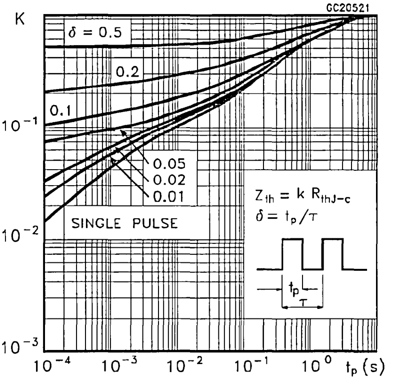
Safe Operating Areas For ISOWATT218



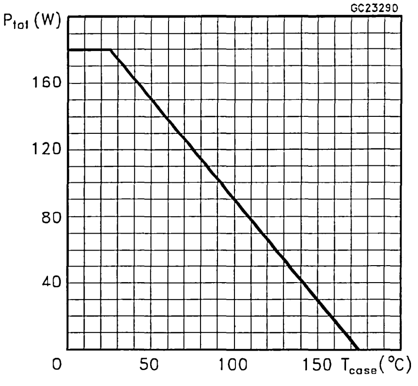
Thermal Impedeance For TO-218



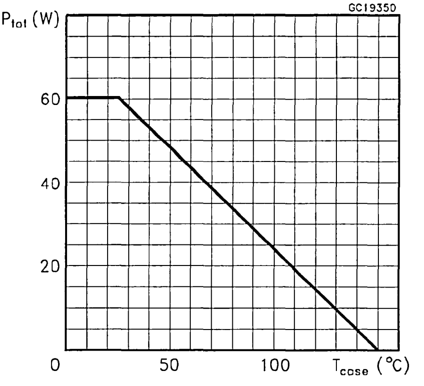
Thermal Impedance For ISOWATT218



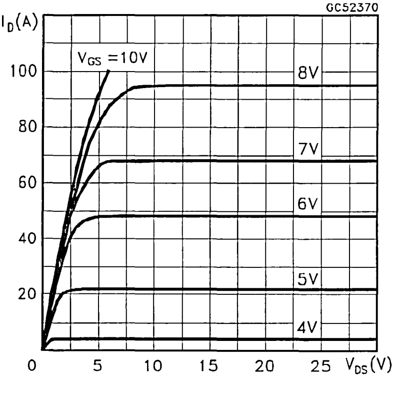
Derating Curve For TO-218



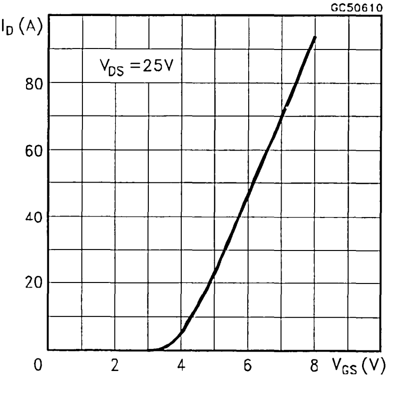
Derating Curve For ISOWATT218



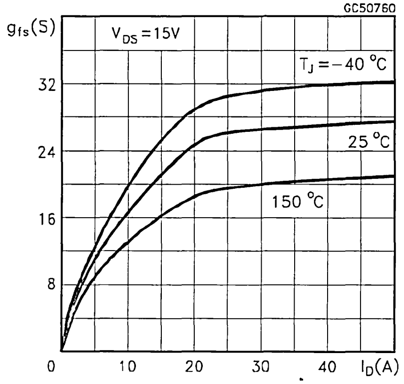
Output Characteristics



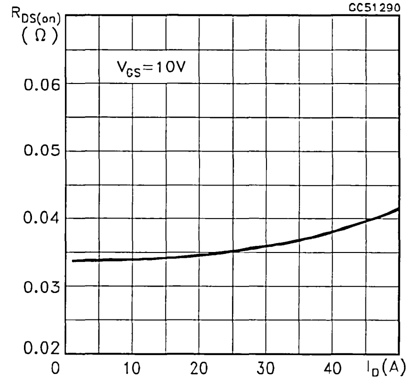
Transfer Characteristics



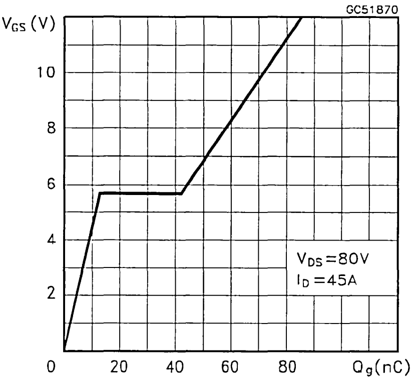
Transconductance



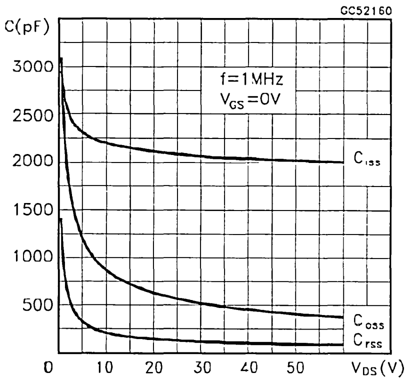
Static Drain-source On Resistance



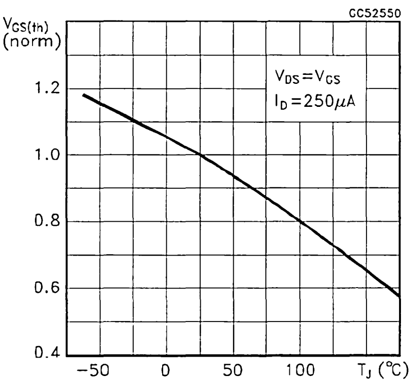
Gate Charge vs Gate-source Voltage



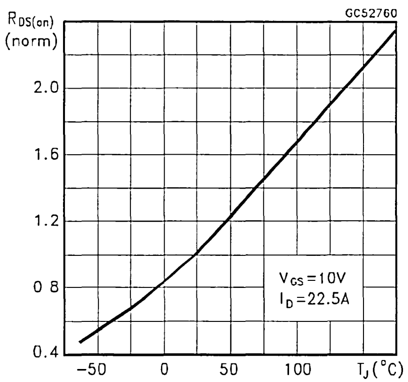
Capacitance Variations



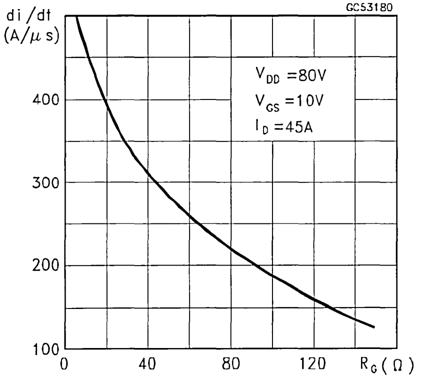
Normalized Gate Threshold Voltage vs Temperature



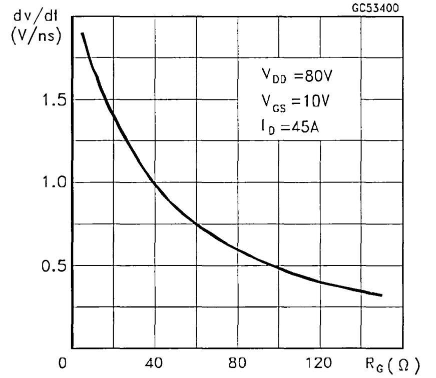
Normalized On Resistance vs Temperature



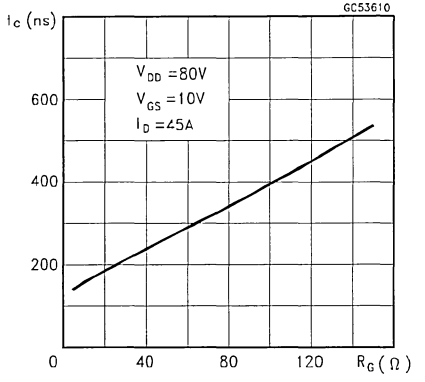
Turn-on Current Slope



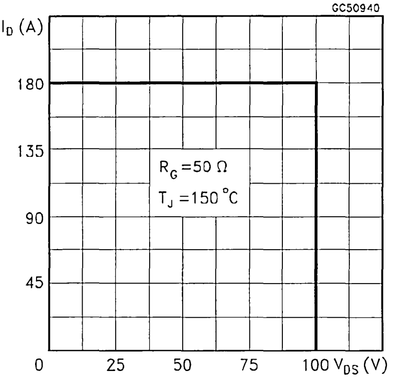
Turn-off Drain-source Voltage Slope



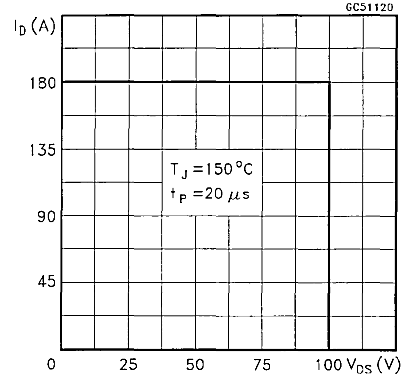
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

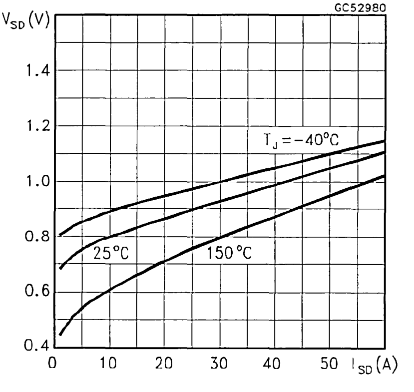


Fig. 1: Unclamped Inductive Load Test Circuits

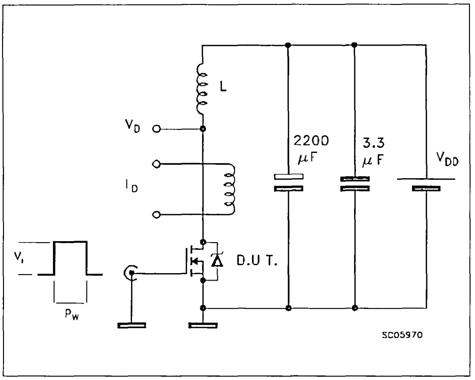


Fig. 2: Unclamped Inductive Waveforms

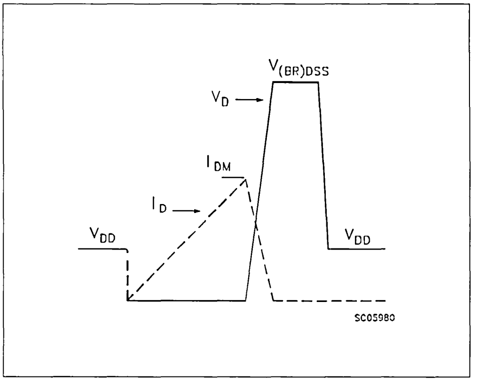


Fig. 3: Switching Times Test Circuits For Resistive Load

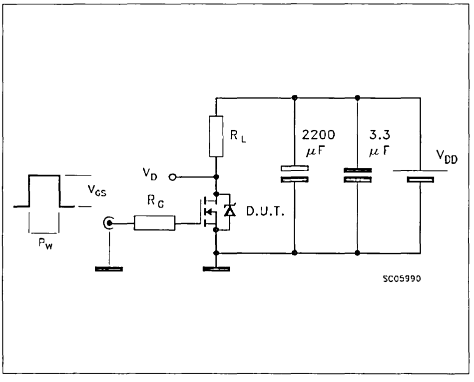


Fig. 4: Gate Charge Test Circuit

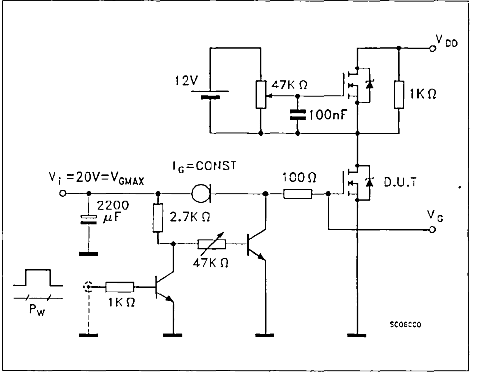
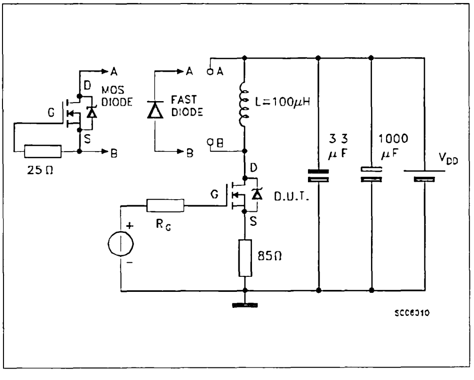


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



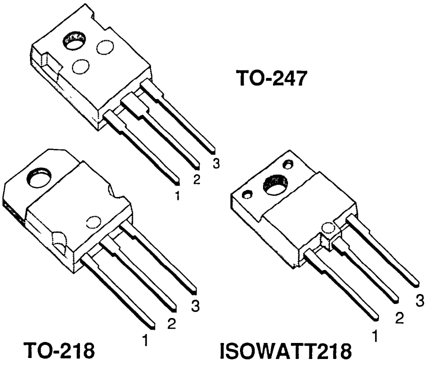
SGS-THOMSON
MICROELECTRONICS

STH55N10/FI STW55N10

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH55N10	100 V	< 0.030 Ω	55 A
STH55N10FI	100 V	< 0.030 Ω	33 A
STW55N10	100 V	< 0.030 Ω	55 A

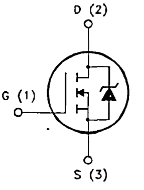
- TYPICAL $R_{DS(on)}$ = 0.02 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- VERY HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION



APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STW/STH55N10	STH55N10FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	100		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	100		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	55	33	A
I_D	Drain Current (continuous) at T_c = 100 °C	38	20	A
I_{DM}(•)	Drain Current (pulsed)	220	220	A
P_{tot}	Total Dissipation at T_c = 25 °C	200	70	W
	Derating Factor	1.33	0.56	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 175	-65 to 150	°C
T_j	Max. Operating Junction Temperature	175	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-218/TO-247	ISOWATT218	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case Max	0.75	1.79	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient Max	30		°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink Typ	0.1		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	55	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	600	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	150	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	34	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	100			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10 V I_D = 30 A V_{GS} = 10 V I_D = 30 A T_c = 100°C		0.02	0.03 0.06	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	55			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 30 A	25	35		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		4000 1100 250	5000 1400 350	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 80 V I_D = 30 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		90 270	130 380	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 80 V I_D = 55 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		270		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 80 V I_D = 30 A V_{GS} = 10 V		120 16 60	170	nC nC nC

SWITCHING OFF

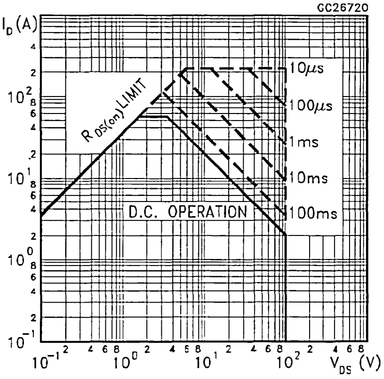
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 80 V I_D = 55 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		200 210 410	280 290 570	ns ns ns

SOURCE DRAIN DIODE

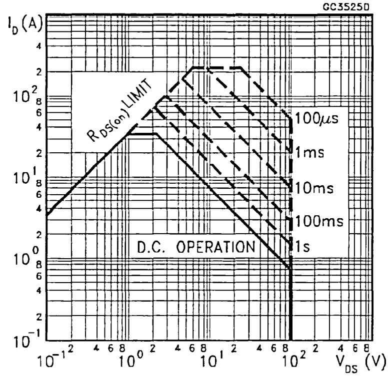
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				55 220	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 55 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 55 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		180 1 11		ns µC A

(*) Pulsed Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

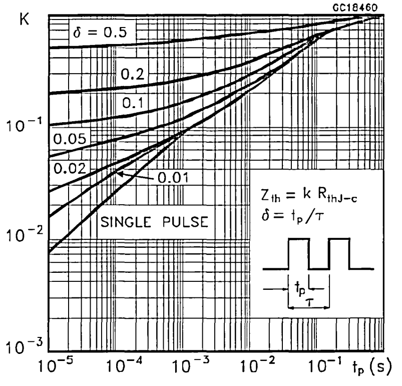
Safe Operating Areas For T0-218 and TO-247



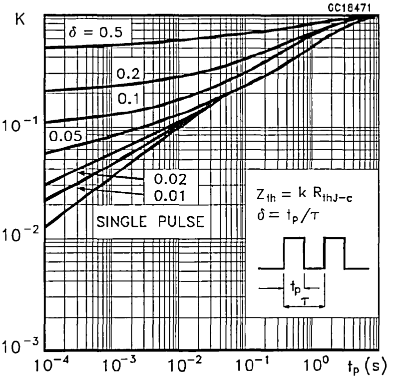
Safe Operating Areas For ISOWATT218



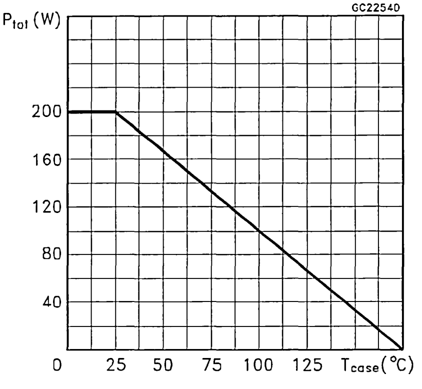
Thermal Impedeance For TO-218 and TO-247



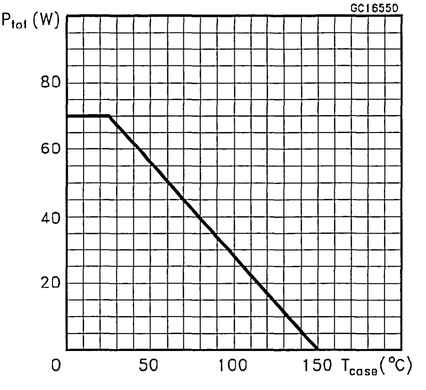
Thermal Impedance For ISOWATT218



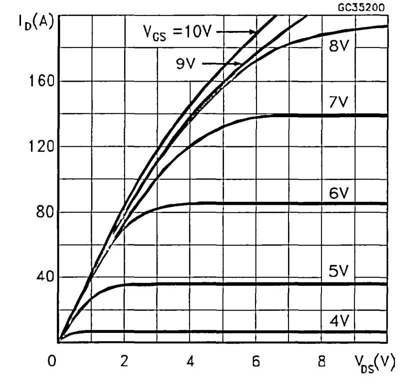
Derating Curve For TO-218 and TO-247



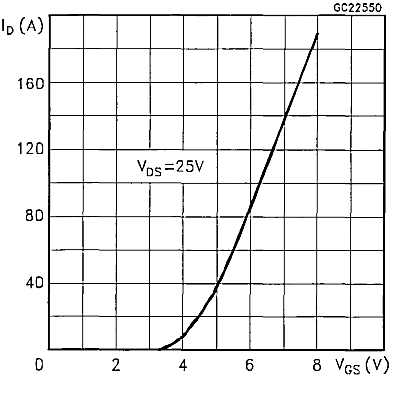
Derating Curve For ISOWATT218



Output Characteristics

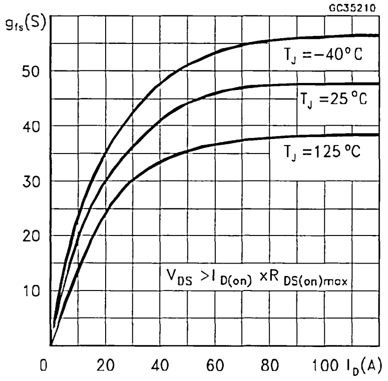


Transfer Characteristics

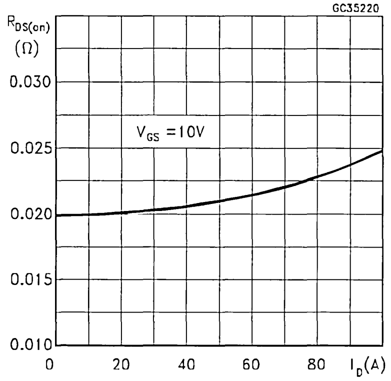


SGS-THOMSON MICROELECTRONICS

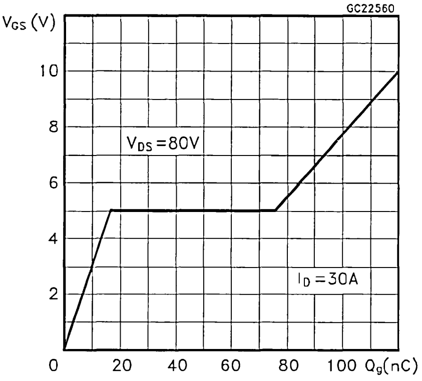
Transconductance



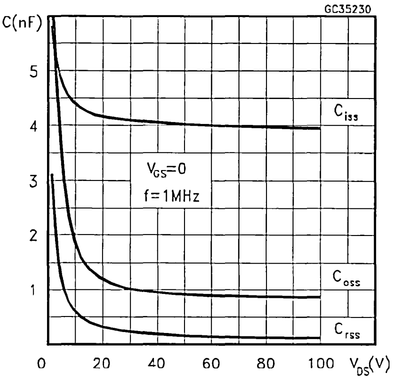
Static Drain-source On Resistance



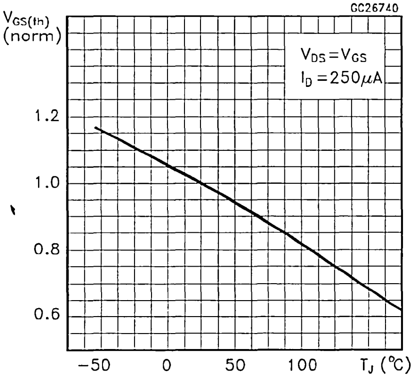
Gate Charge vs Gate-source Voltage



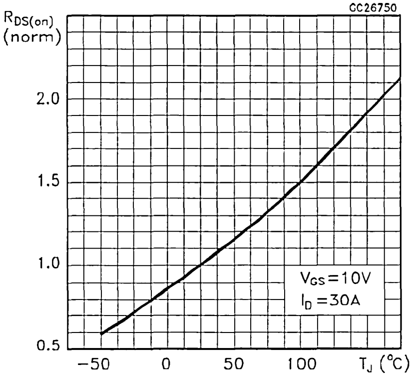
Capacitance Variations



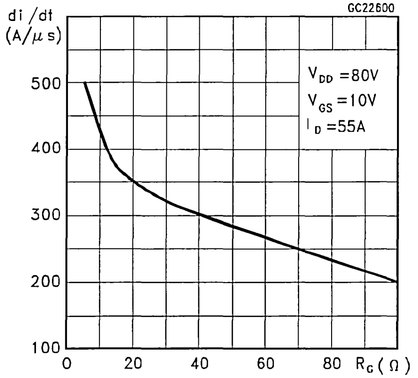
Normalized Gate Threshold Voltage vs Temperature



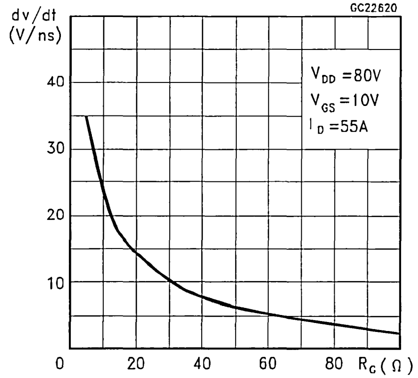
Normalized On Resistance vs Temperature



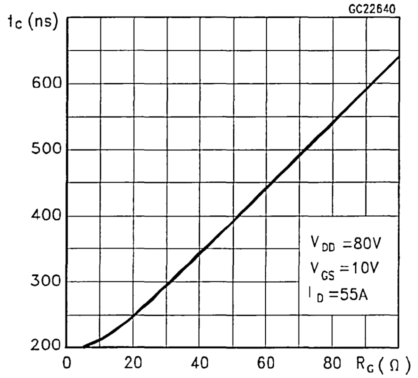
Turn-on Current Slope



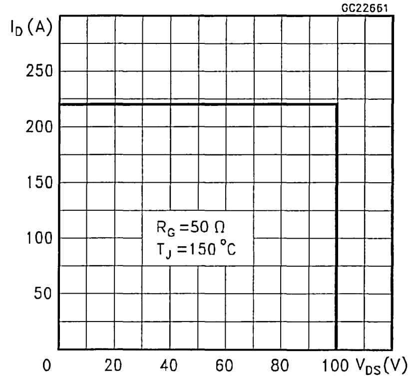
Turn-off Drain-source Voltage Slope



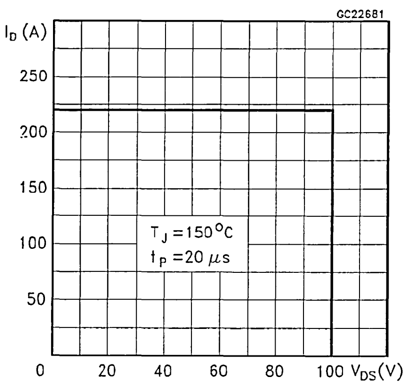
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

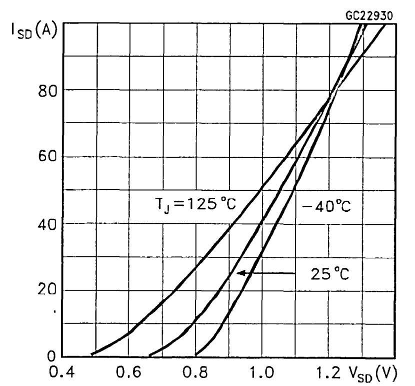


Fig. 1: Unclamped Inductive Load Test Circuits

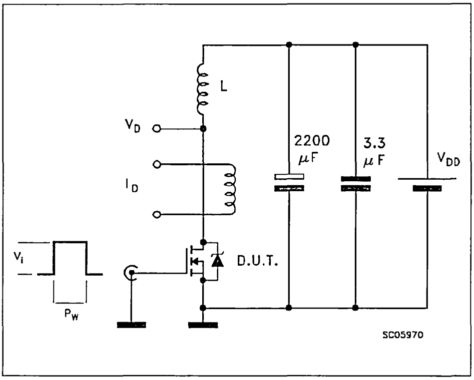


Fig. 2: Unclamped Inductive Waveforms

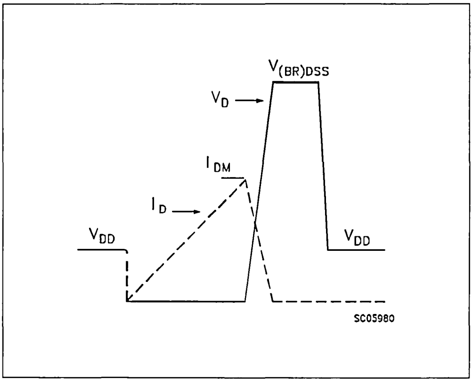


Fig. 3: Switching Times Test Circuits For Resistive Load

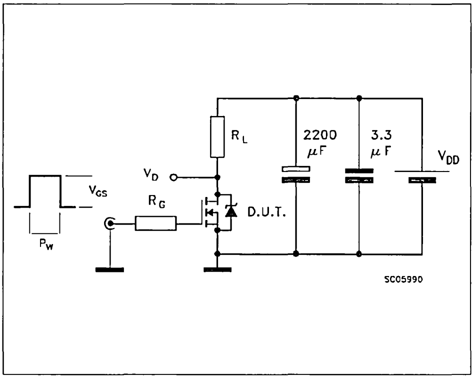


Fig. 4: Gate Charge Test Circuit

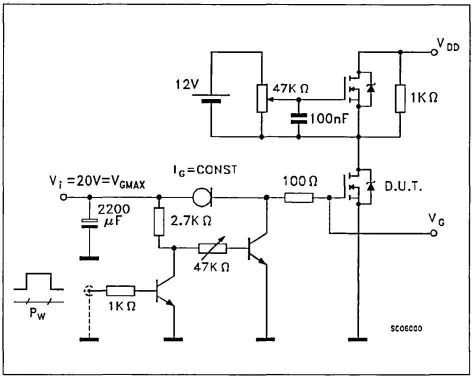
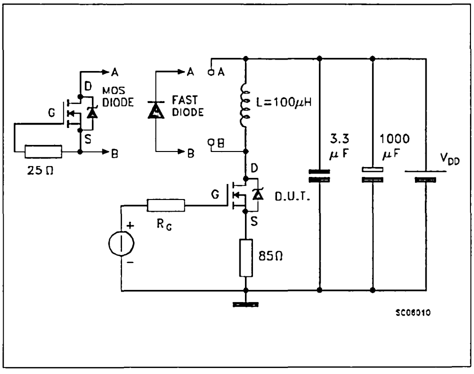


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time

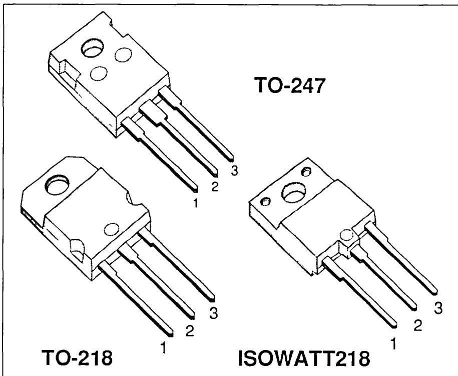


STH60N10/FI
STW60N10

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH60N10	100 V	< 0.025 Ω	60 A
STH60N10FI	100 V	< 0.025 Ω	36 A
STW60N10	100 V	< 0.025 Ω	60 A

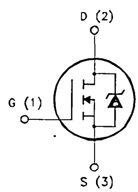
- TYPICAL $R_{DS(on)}$ = 0.02 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- VERY HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION



APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STH/STW60N10	STH60N10FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	100		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	100		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	60	36	A
I_D	Drain Current (continuous) at T_c = 100 °C	42	22	A
I_{DM}(•)	Drain Current (pulsed)	240	240	A
P_{tot}	Total Dissipation at T_c = 25 °C	200	70	W
	Derating Factor	1.33	0.56	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 175	-65 to 150	°C
T_j	Max. Operating Junction Temperature	175	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-218/TO-247	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.75	1.79	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	30		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.1		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	60	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	720	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	180	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	37	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	100			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10 V I_D = 30 A V_{GS} = 10 V I_D = 30 A T_c = 100°C		0.02	0.025 0.05	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	60			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 30 A	25	35		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		4000 1100 250	5000 1400 350	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 80 V I_D = 30 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		90 270	130 380	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 80 V I_D = 60 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		270		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 80 V I_D = 30 A V_{GS} = 10 V		120 16 60	170	nC nC nC

SWITCHING OFF

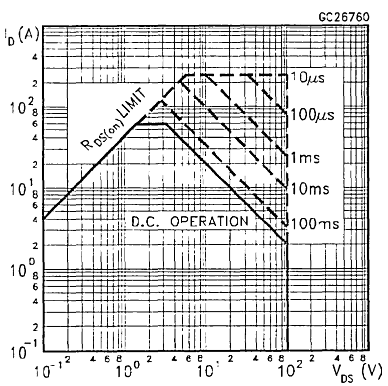
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 80 V I_D = 60 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		200 210 410	280 290 570	ns ns ns

SOURCE DRAIN DIODE

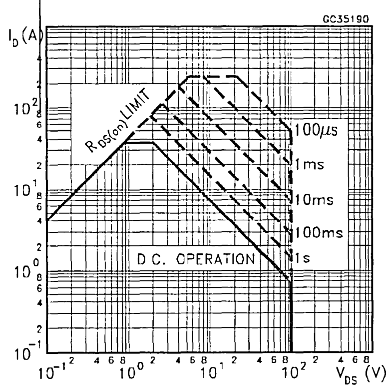
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				60 240	A A
V_{SD} (·)	Forward On Voltage	I_{SD} = 60 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 60 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		180 1 11		ns µC A

(·) Pulsed. Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

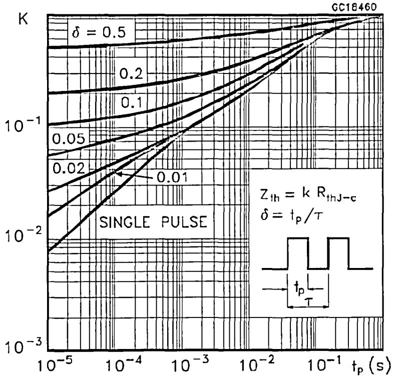
Safe Operating Areas For TO-218 and TO-247



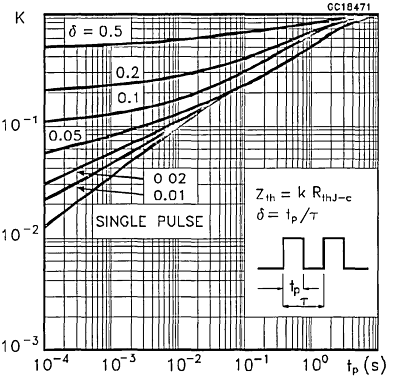
Safe Operating Areas For ISOWATT218



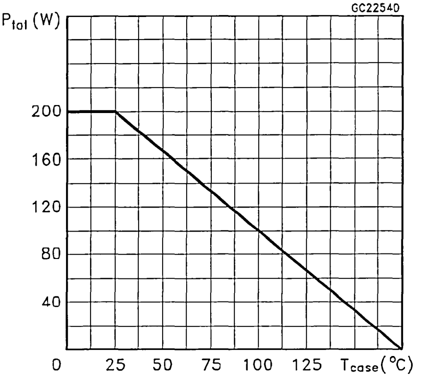
Thermal Impedeance For TO-218 and TO-247



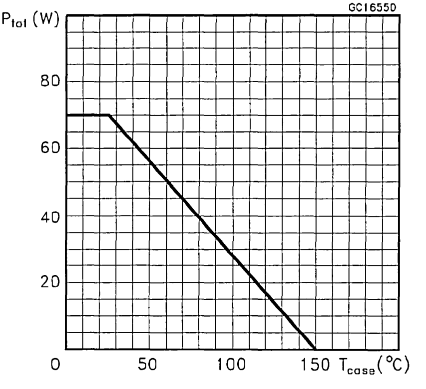
Thermal Impedance For ISOWATT218



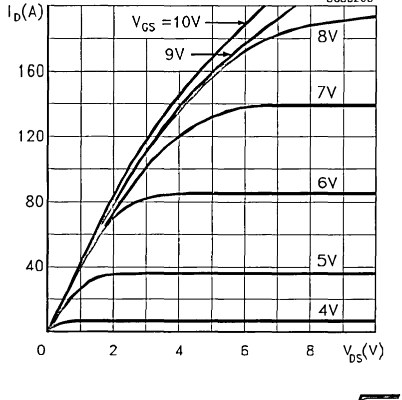
Derating Curve For TO-218 and TO-247



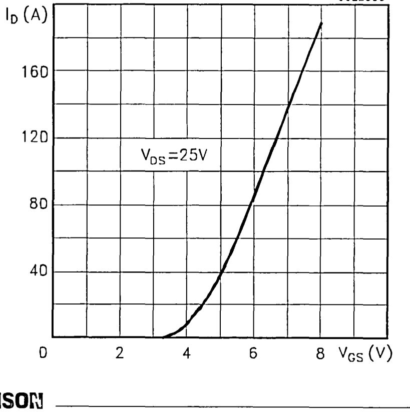
Derating Curve For ISOWATT218



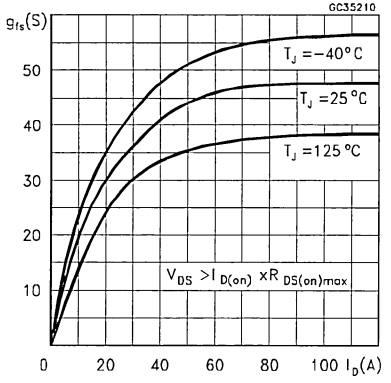
Output Characteristics



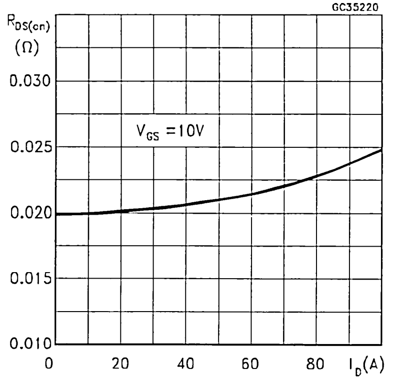
Transfer Characteristics



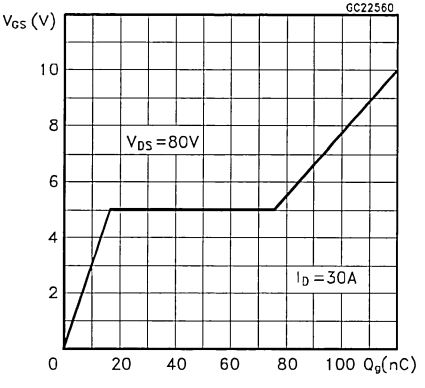
Transconductance



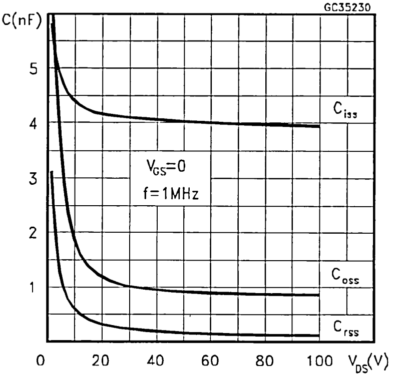
Static Drain-source On Resistance



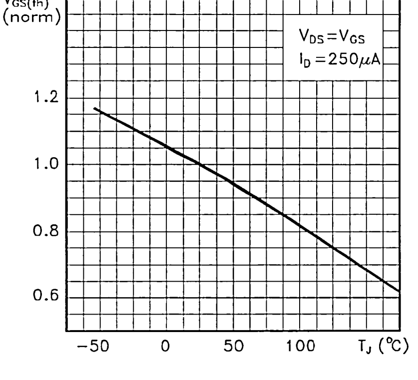
Gate Charge vs Gate-source Voltage



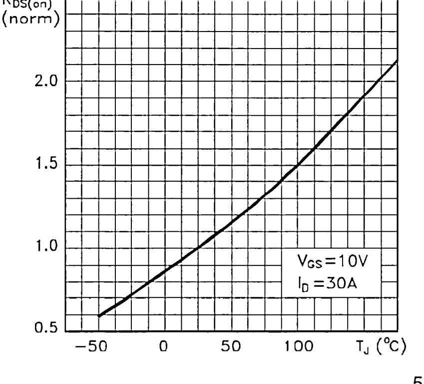
Capacitance Variations



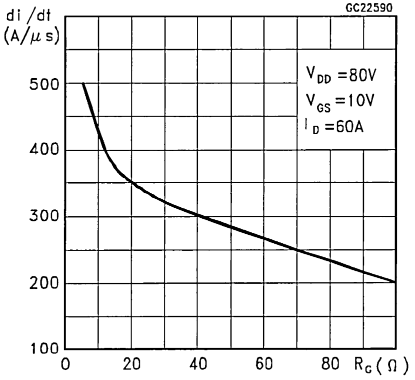
Normalized Gate Threshold Voltage vs Temperature



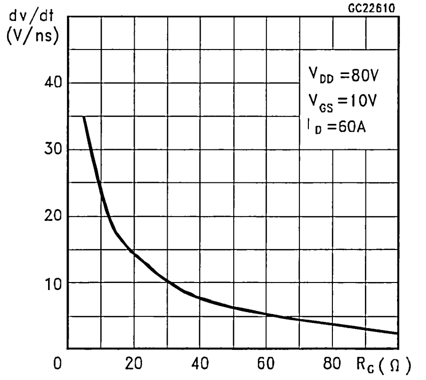
Normalized On Resistance vs Temperature



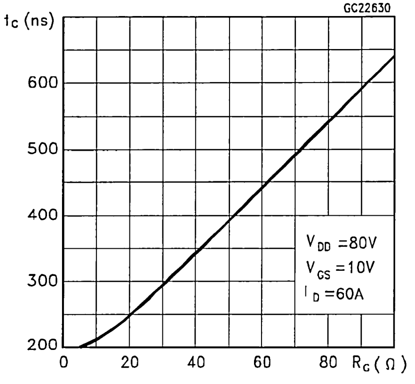
Turn-on Current Slope



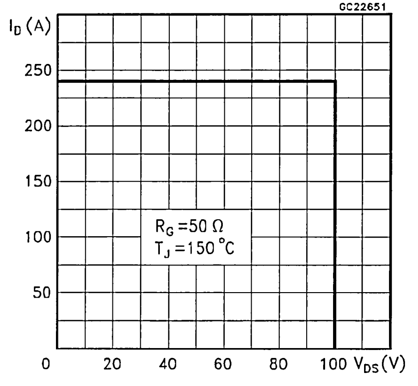
Turn-off Drain-source Voltage Slope



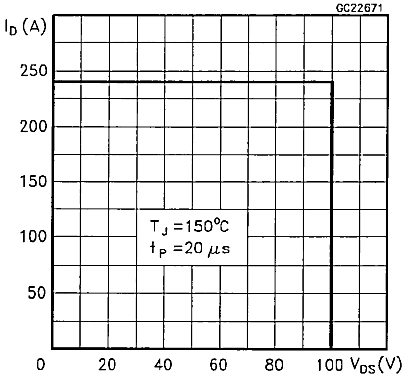
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

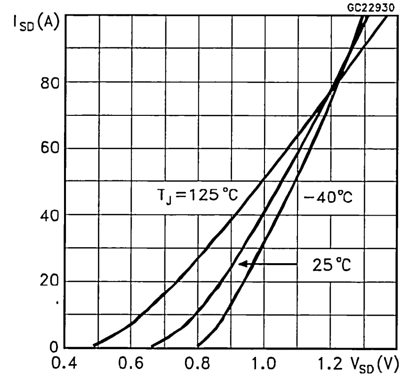


Fig. 1: Unclamped Inductive Load Test Circuits

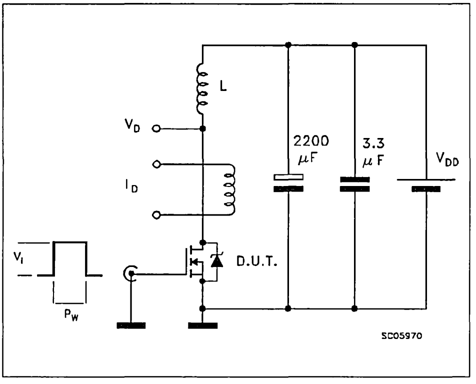


Fig. 2: Unclamped Inductive Waveforms

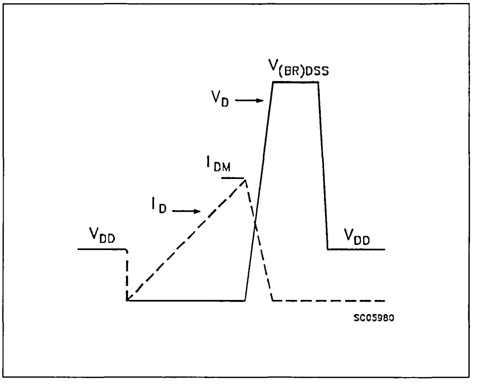


Fig. 3: Switching Times Test Circuits For Resistive Load

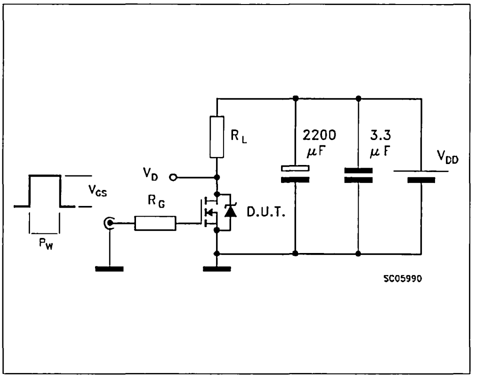


Fig. 4: Gate Charge Test Circuit

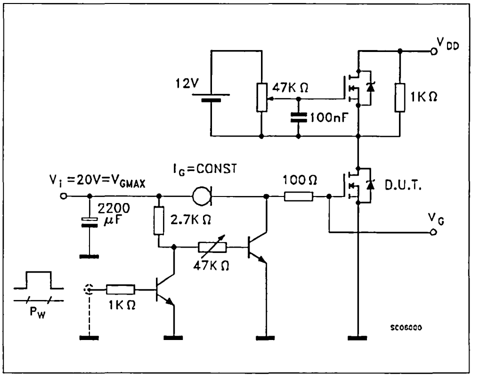
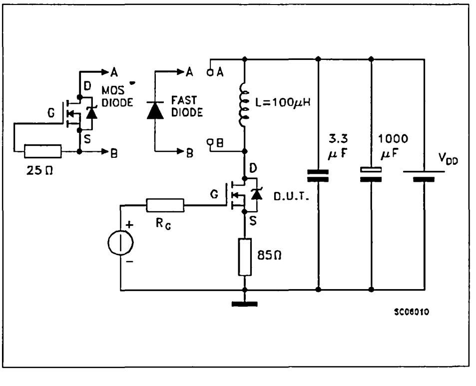


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



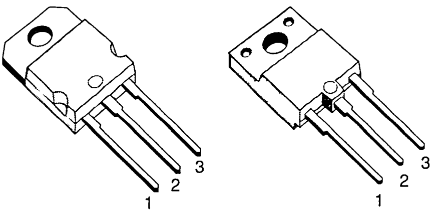
SGS-THOMSON MICROELECTRONICS

STH65N05
STH65N05FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH65N05 STH65N05FI	50 V 50 V	< 0.02 Ω < 0.02 Ω	65 A 37 A

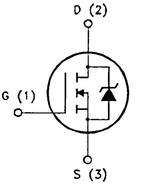
- TYPICAL $R_{DS(on)}$ = 0.017 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- VERY LOW $R_{DS(on)}$
- APPLICATION ORIENTED CHARACTERIZATION



TO-218 ISOWATT218

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STH65N05	STH65N05FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	65	37	A
I_D	Drain Current (continuous) at T_c = 100 °C	45	23	A
I_{DM}(•)	Drain Current (pulsed)	260	260	A
P_{tot}	Total Dissipation at T_c = 25 °C	180	60	W
	Derating Factor	1.2	0.48	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 175	-65 to 150	°C
T_j	Max. Operating Junction Temperature	175	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-218	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case Max	0.83	2.08	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max	30		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink Typ	0.1		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	65	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	800	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	200	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	41	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	50			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 32.5$ A $V_{GS} = 10V$ $I_D = 32.5$ A $T_c = 100$°C		0.017	0.02 0.04	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	65			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 32.5$ A	18	29		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		2200 950 250	2900 1300 350	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 40 V I_D = 65 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		70 550	100 750	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 65 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		185		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 65 A V_{GS} = 10 V		68 15 27	95	nC nC nC

SWITCHING OFF

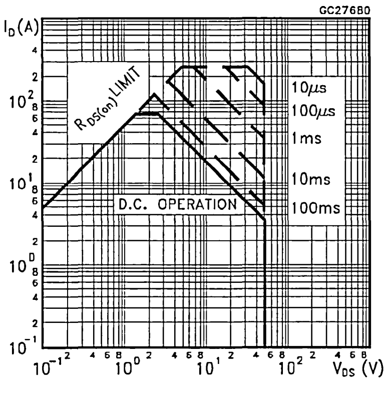
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 65 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		170 200 380	240 280 530	ns ns ns

SOURCE DRAIN DIODE

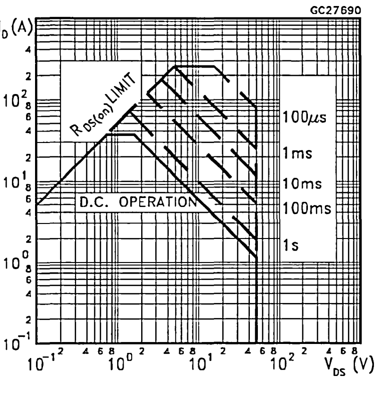
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				65 260	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 65 A V_{GS} = 0			1.7	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 65 A di/dt = 100 A/µs V_{DD} = 25 V T_j = 150 °C (see test circuit, figure 5)		120 0.27 4.5		ns µC A

(*) Pulsed Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

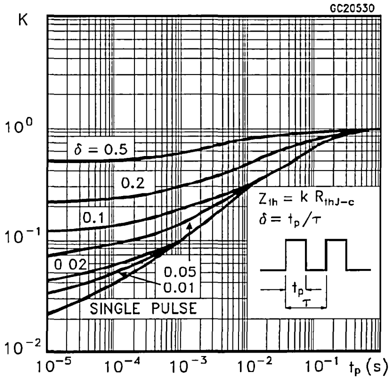
Safe Operating Areas For TO-218



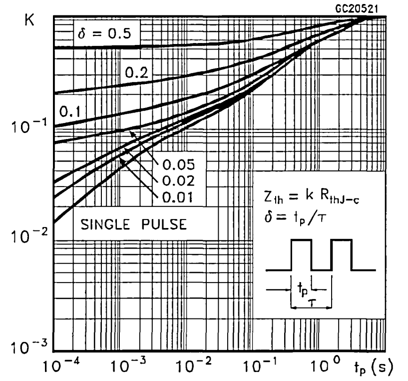
Safe Operating Areas For ISOWATT218



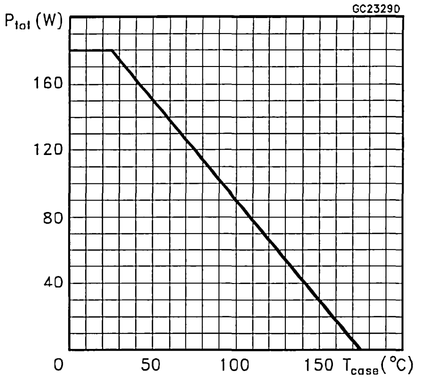
Thermal Impedance For TO-218



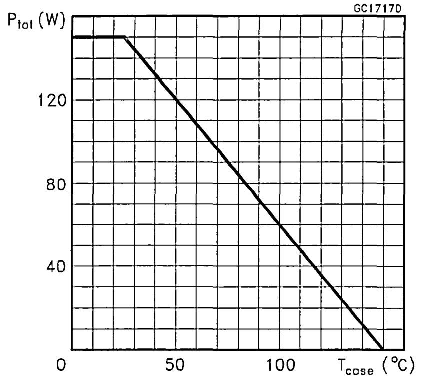
Thermal Impedance For ISOWATT218



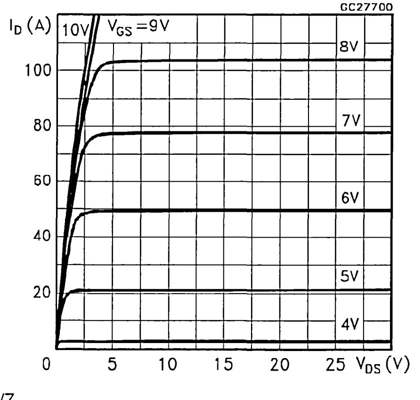
Derating Curve For TO-218



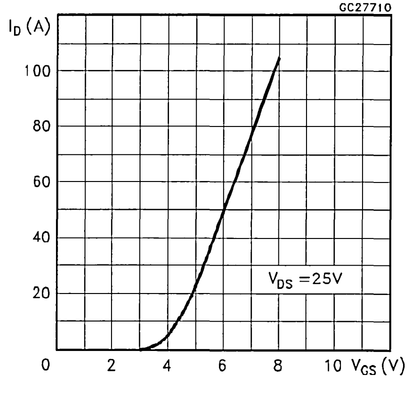
Derating Curve For ISOWATT218



Output Characteristics

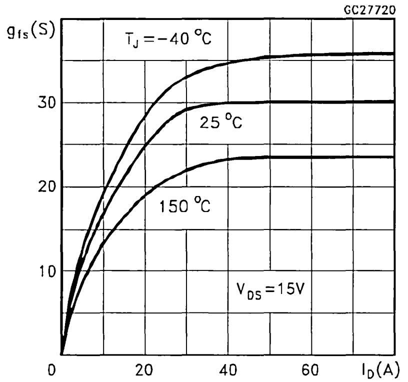


Transfer Characteristics

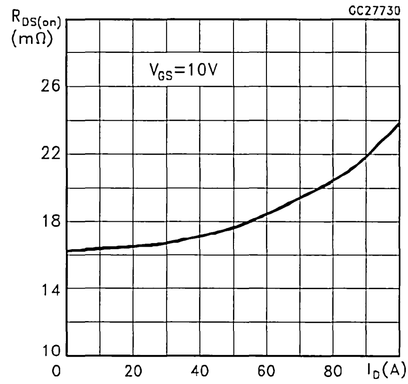


SGS-THOMSON MICROELECTRONICS

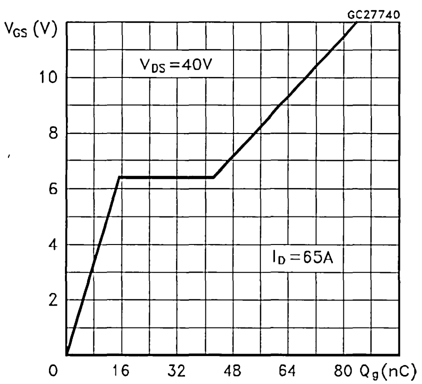
Transconductance



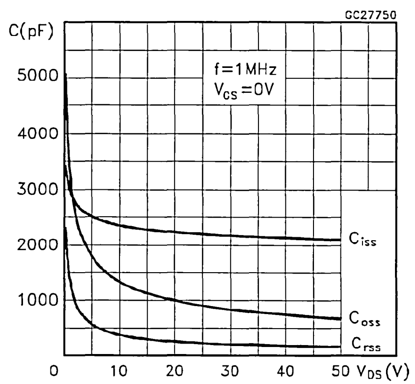
Static Drain-source On Resistance



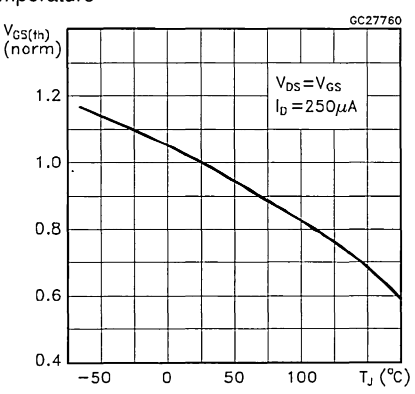
Gate Charge vs Gate-source Voltage



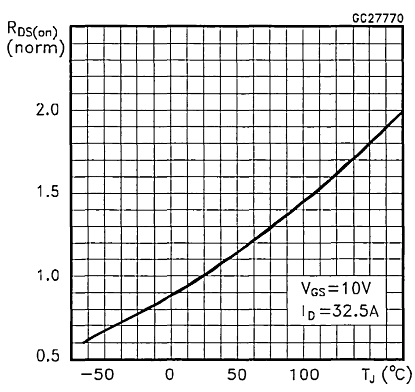
Capacitance Variations



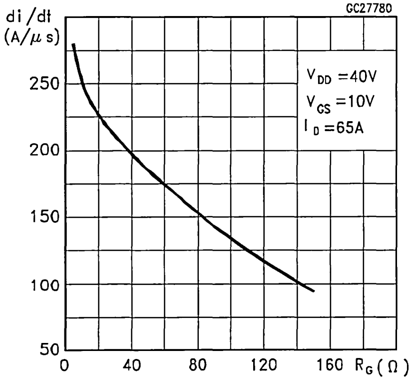
Normalized Gate Threshold Voltage vs Temperature



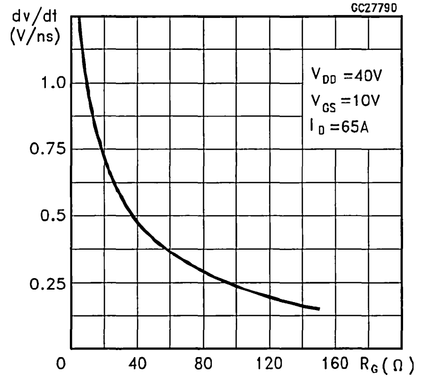
Normalized On Resistance vs Temperature



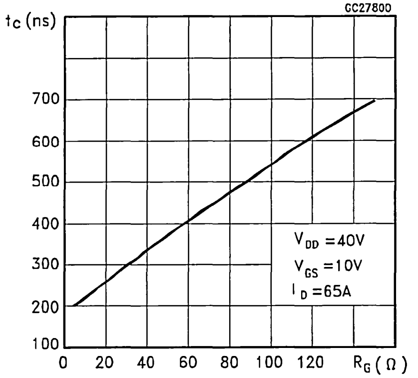
Turn-on Current Slope



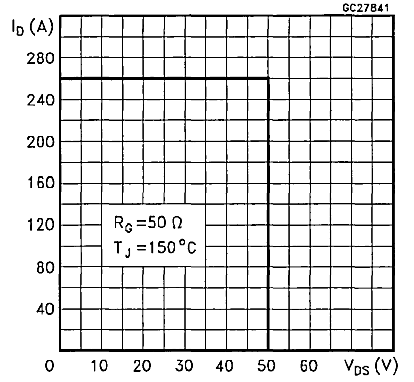
Turn-off Drain-source Voltage Slope



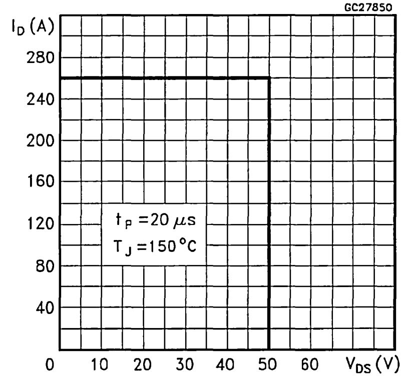
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

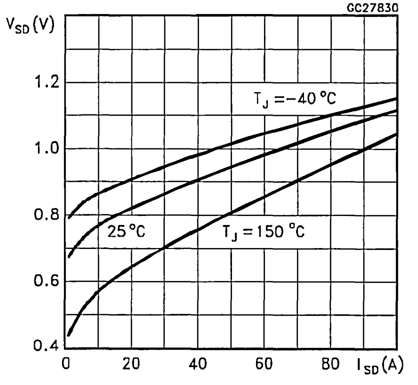


Fig. 1: Unclamped Inductive Load Test Circuits

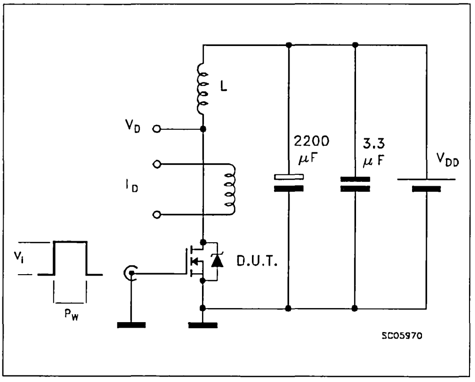


Fig. 2: Unclamped Inductive Waveforms

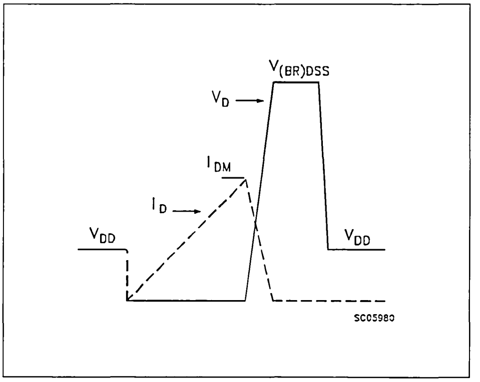


Fig. 3: Switching Times Test Circuits For Resistive Load

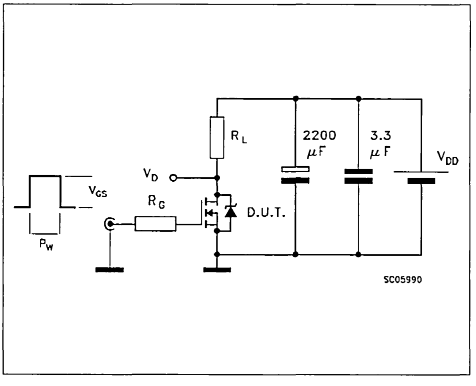


Fig. 4: Gate Charge Test Circuit

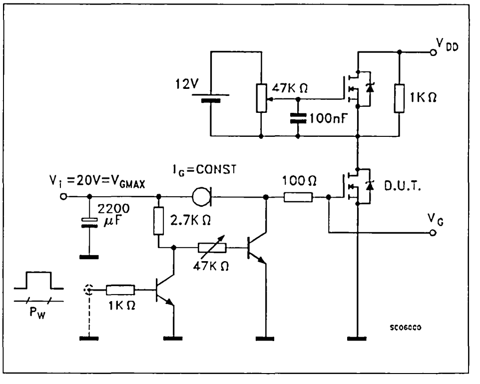
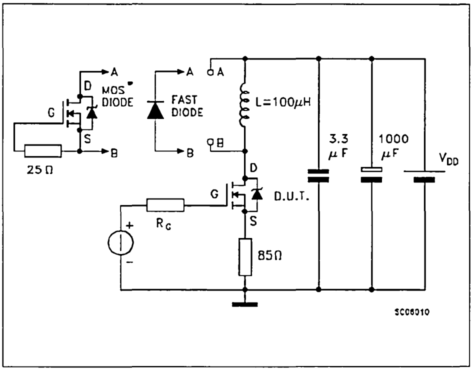


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



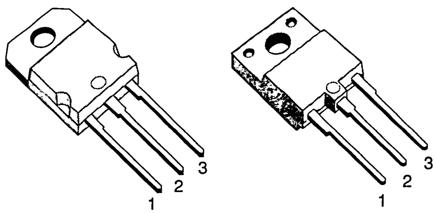
SGS-THOMSON MICROELECTRONICS

STH65N06
STH65N06FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH65N06	60 V	< 0.02 Ω	65 A
STH65N06FI	60 V	< 0.02 Ω	37 A

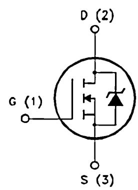
- TYPICAL $R_{DS(on)}$ = 0.017 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- VERY LOW $R_{DS(on)}$
- APPLICATION ORIENTED CHARACTERIZATION



TO-218 ISOWATT218

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STH65N06	STH65N06FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	60		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	60		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	65	37	A
I_D	Drain Current (continuous) at T_c = 100 °C	45	23	A
I_{DM}(•)	Drain Current (pulsed)	260	260	A
P_{tot}	Total Dissipation at T_c = 25 °C	180	60	W
	Derating Factor	1.2	0.48	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 175	-65 to 150	°C
T_j	Max. Operating Junction Temperature	175	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-218	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case Max	0.83	2.08	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max	30		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink Typ	0.1		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	65	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	720	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	180	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	41	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	60			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 32.5 A V_{GS} = 10V I_D = 32.5 A T_c = 100°C		0.017	0.02 0.04	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	65			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 32.5 A	18	29		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		2200 950 250	2900 1300 350	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 40 V I_D = 65 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		70 550	100 750	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 65 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		185		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 65 A V_{GS} = 10 V		68 15 27	95	nC nC nC

SWITCHING OFF

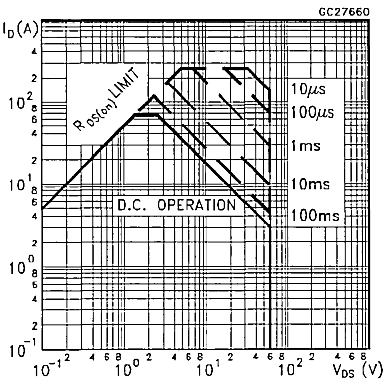
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 65 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		170 200 380	240 280 530	ns ns ns

SOURCE DRAIN DIODE

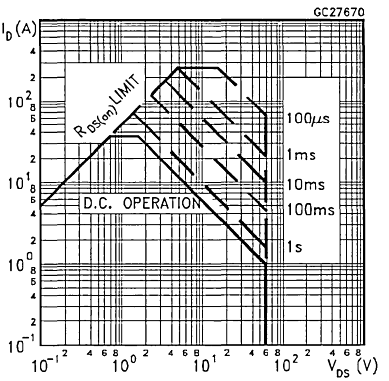
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				65 260	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 65 A V_{GS} = 0			1.7	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 65 A di/dt = 100 A/μs V_{DD} = 25 V T_j = 150 °C (see test circuit, figure 5)		120 0.27 4.5		ns μC A

(*) Pulsed. Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

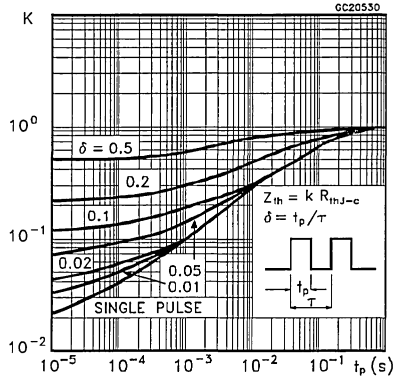
Safe Operating Areas For TO-218



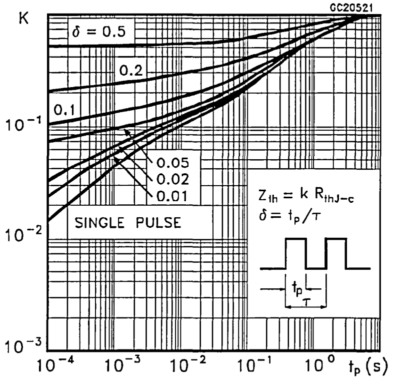
Safe Operating Areas For ISOWATT218



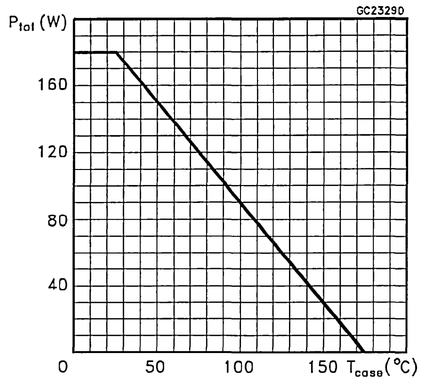
Thermal Impedance For TO-218



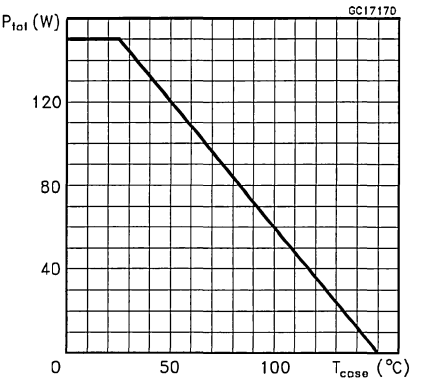
Thermal Impedance For ISOWATT218



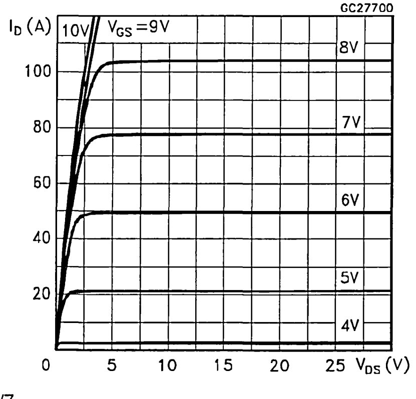
Derating Curve For TO-218



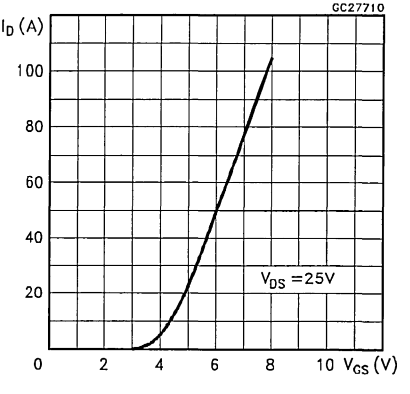
Derating Curve For ISOWATT218



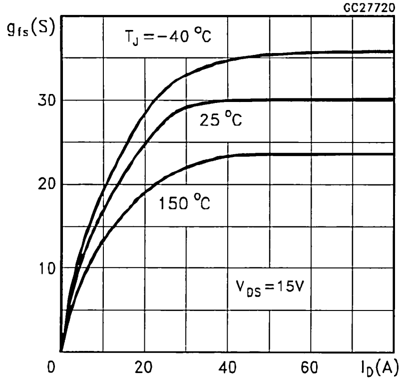
Output Characteristics



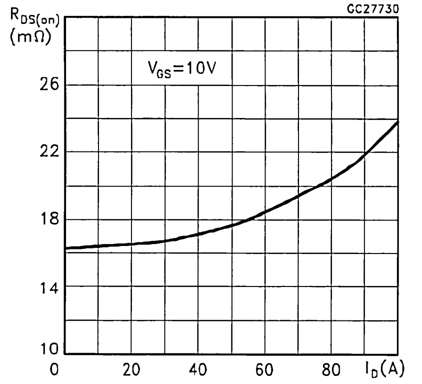
Transfer Characteristics



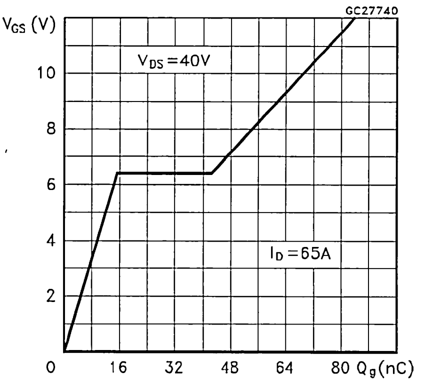
Transconductance



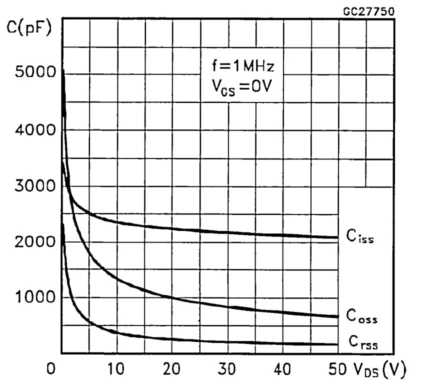
Static Drain-source On Resistance



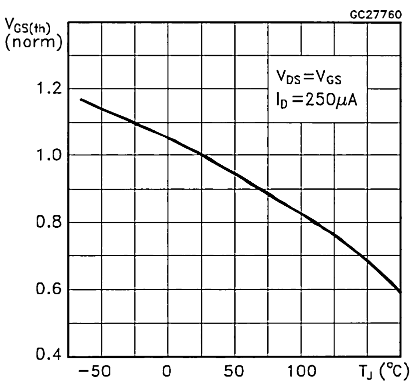
Gate Charge vs Gate-source Voltage



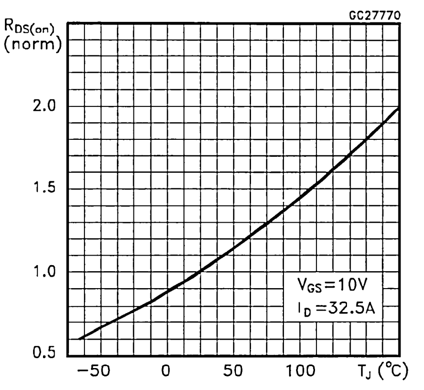
Capacitance Variations



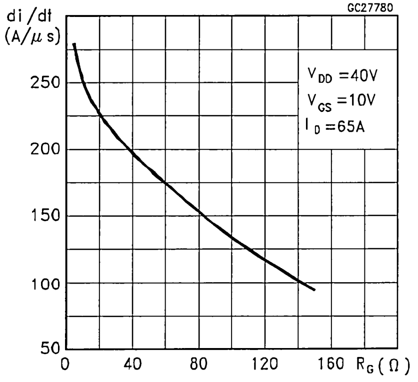
Normalized Gate Threshold Voltage vs Temperature



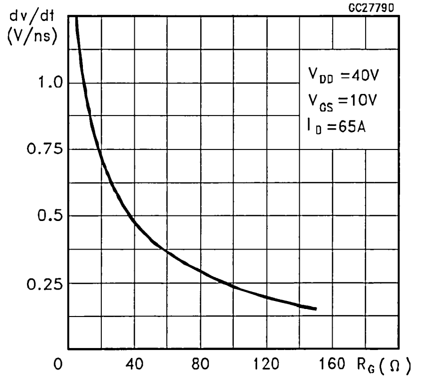
Normalized On Resistance vs Temperature



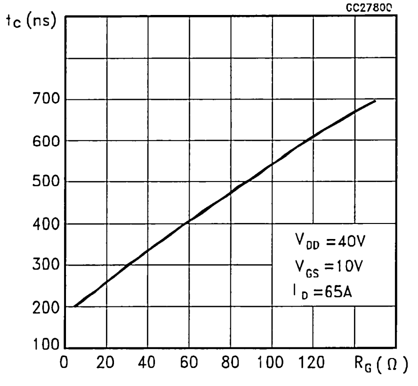
Turn-on Current Slope



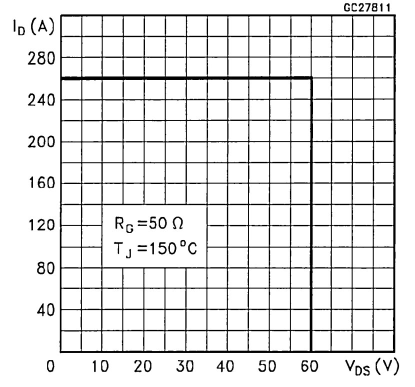
Turn-off Drain-source Voltage Slope



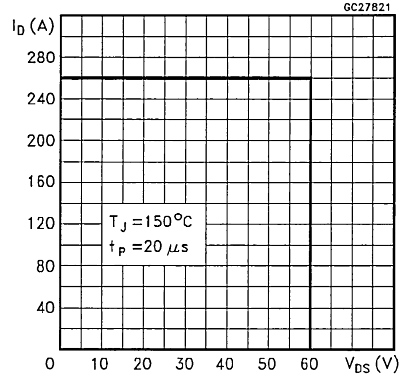
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

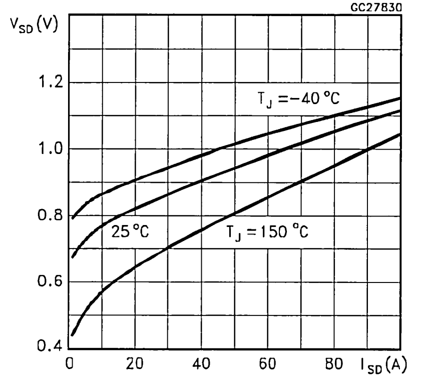


Fig. 1: Unclamped Inductive Load Test Circuits

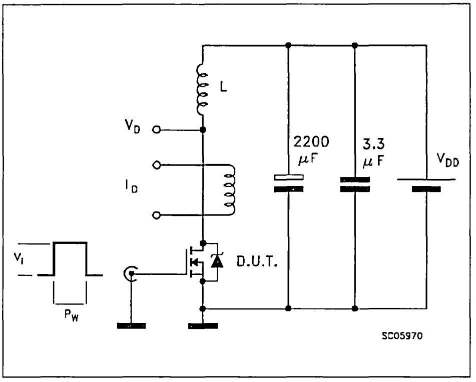


Fig. 2: Unclamped Inductive Waveforms

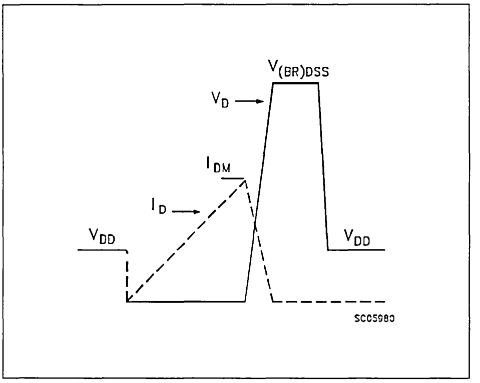


Fig. 3: Switching Times Test Circuits For Resistive Load

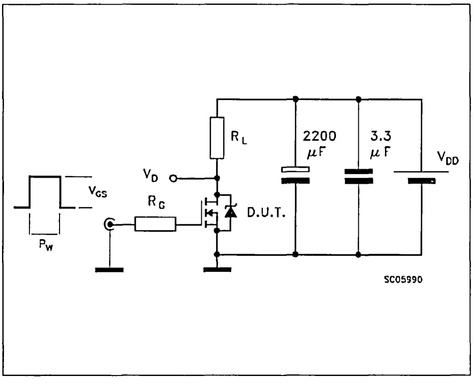


Fig. 4: Gate Charge Test Circuit

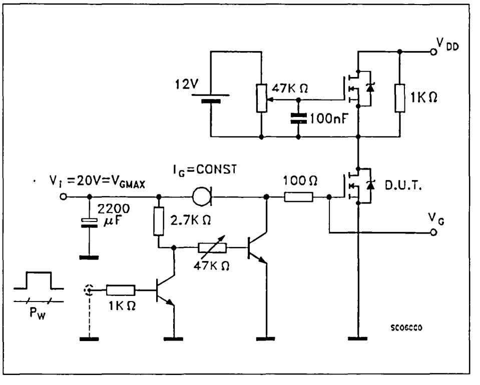
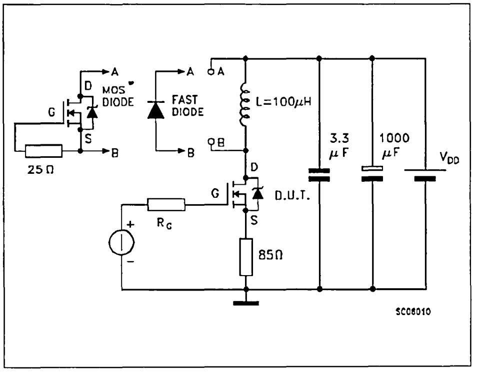


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



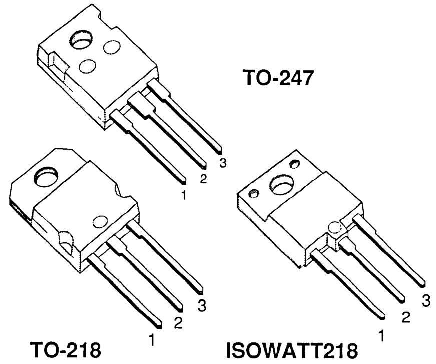
SGS-THOMSON
MICROELECTRONICS

STH75N06/FI
STW75N06

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH75N06	60 V	< 0.014 Ω	75 A
STH75N06FI	60 V	< 0.014 Ω	48 A
STH75N06	60 V	< 0.014 Ω	75 A

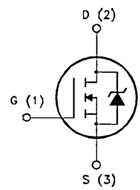
- TYPICAL $R_{DS(on)}$ = 0.011 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- VERY HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION



APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STW/STH75N06	STH75N06FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	60		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	60		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	75	48	A
I_D	Drain Current (continuous) at T_c = 100 °C	53	30	A
I_{DM}(•)	Drain Current (pulsed)	300	300	A
P_{tot}	Total Dissipation at T_c = 25 °C	200	70	W
	Derating Factor	1.33	0.56	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 175	-65 to 150	°C
T_j	Max. Operating Junction Temperature	175	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-218/TO-247	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.75	1.79	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	30		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.1		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	70	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	900	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	200	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	45	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	60			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 40 A V_{GS} = 10V I_D = 40 A T_c = 100°C		0.011	0.014 0.028	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	75			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 40 A	25	45		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		4000 1800 500	5200 2300 650	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 40 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		190 900	270 1300	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 75 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		150		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 25 V I_D = 40 A V_{GS} = 10 V		130 27 48	180	nC nC nC

SWITCHING OFF

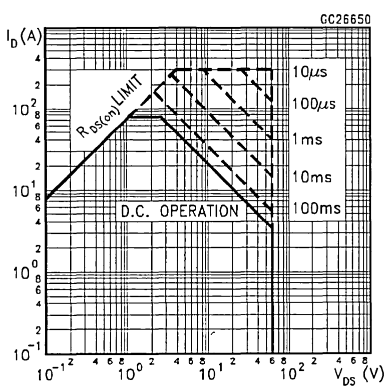
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 75 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		400 300 650	550 420 900	ns ns ns

SOURCE DRAIN DIODE

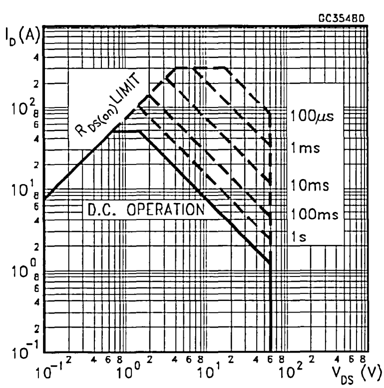
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				75 300	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 75 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 75 A di/dt = 100 A/µs V_{DD} = 35 V T_j = 150 °C (see test circuit, figure 5)		130 0.45 7		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

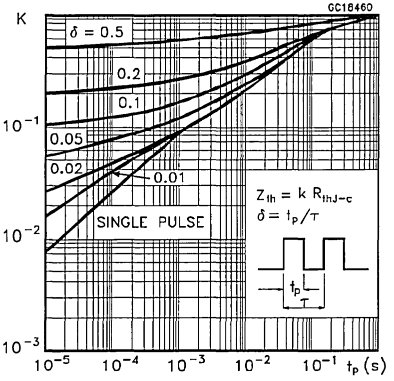
Safe Operating Areas For TO-218 and TO-247



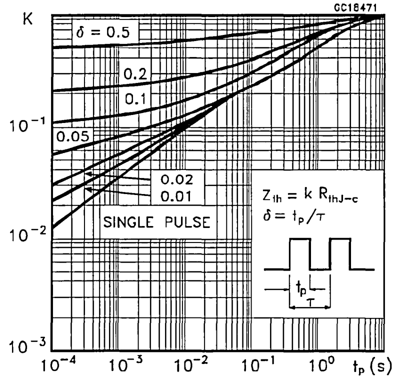
Safe Operating Areas For ISOWATT218



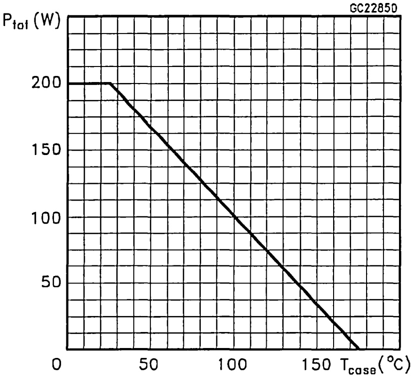
Thermal Impedance For TO-218 and TO-247



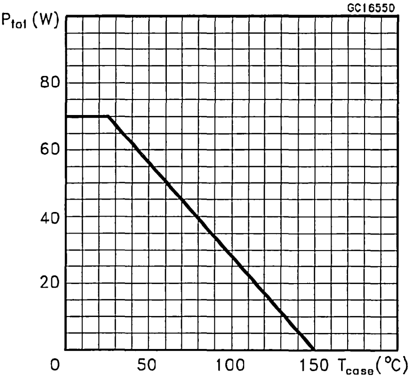
Thermal Impedance For ISOWATT218



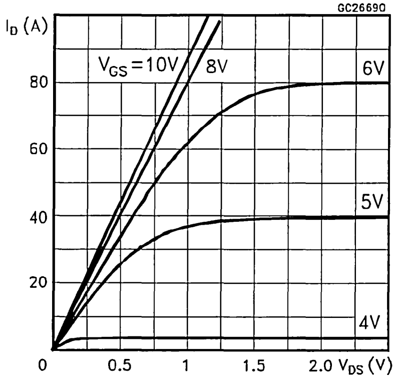
Derating Curve For TO-218 and TO-247



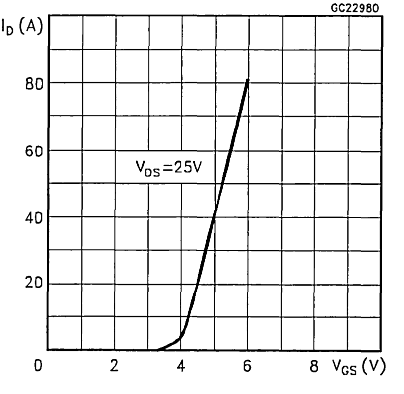
Derating Curve For ISOWATT218



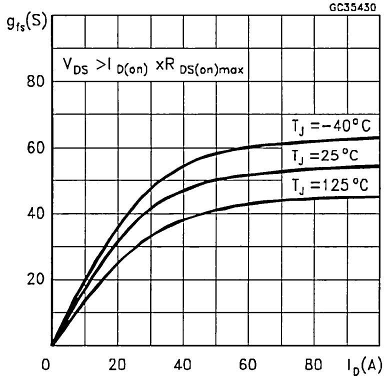
Output Characteristics



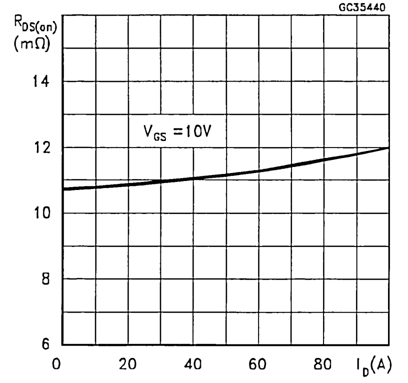
Transfer Characteristics



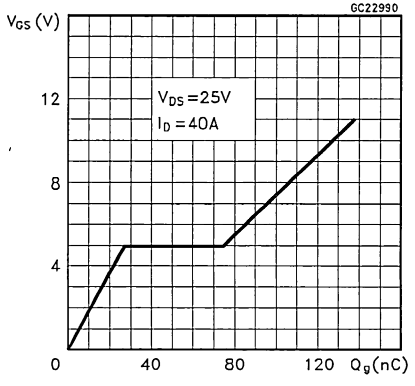
Transconductance



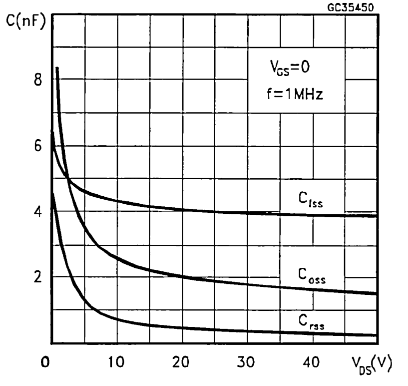
Static Drain-source On Resistance



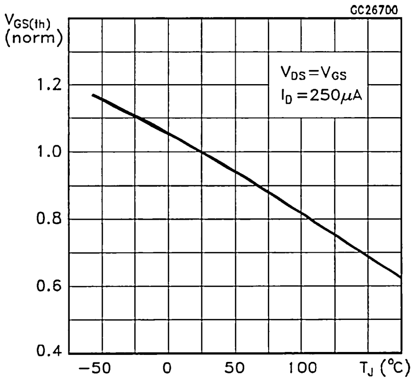
Gate Charge vs Gate-source Voltage



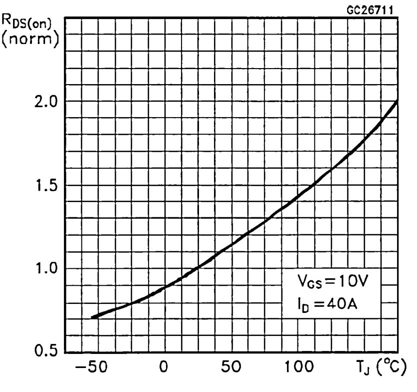
Capacitance Variations



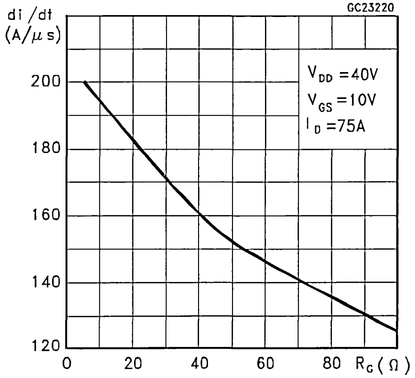
Normalized Gate Threshold Voltage vs Temperature



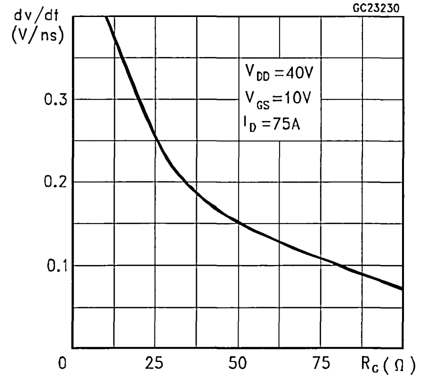
Normalized On Resistance vs Temperature



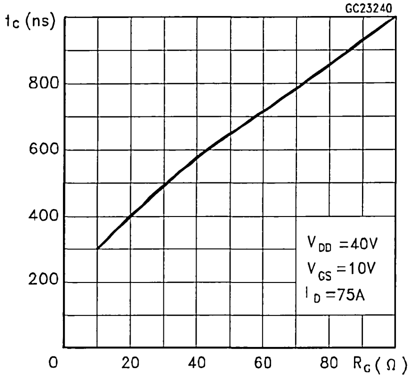
Turn-on Current Slope



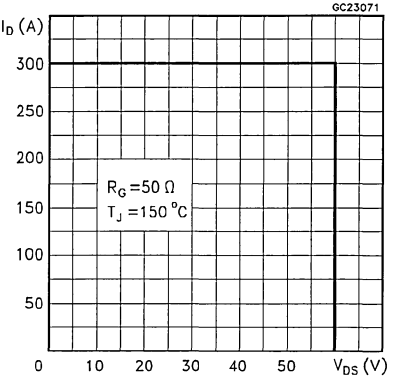
Turn-off Drain-source Voltage Slope



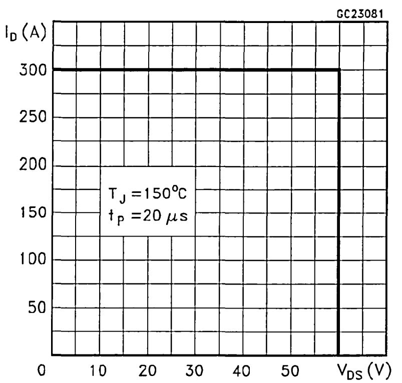
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

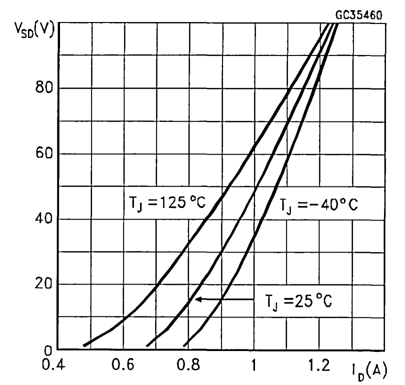


Fig. 1: Unclamped Inductive Load Test Circuits

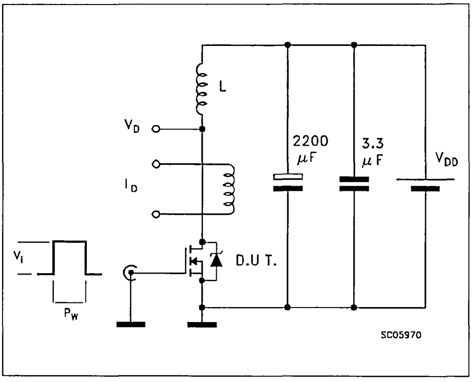


Fig. 2: Unclamped Inductive Waveforms

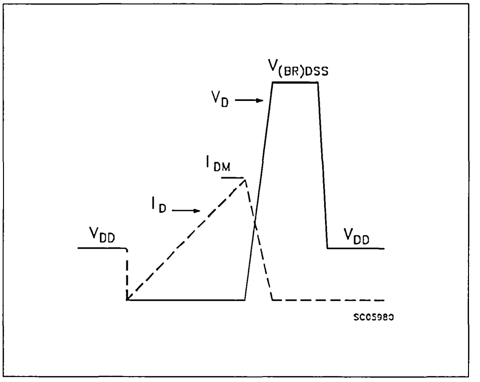


Fig. 3: Switching Times Test Circuits For Resistive Load

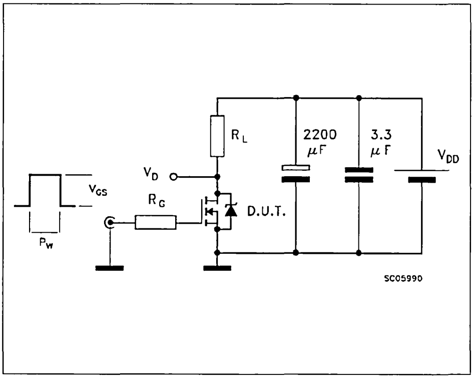


Fig. 4: Gate Charge Test Circuit

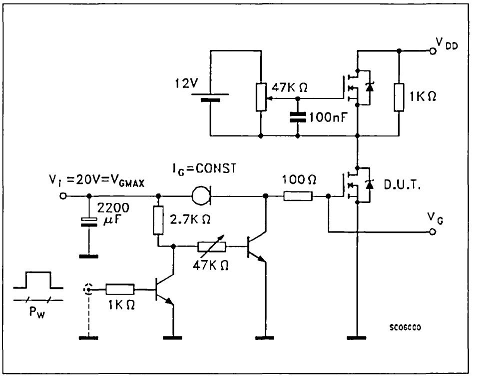
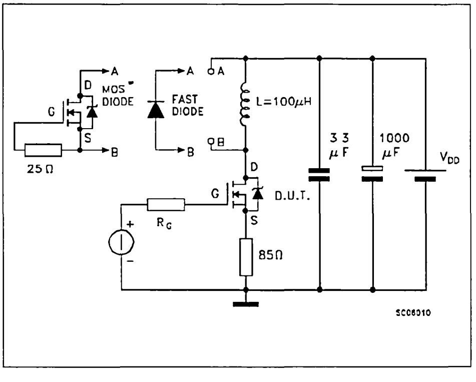


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



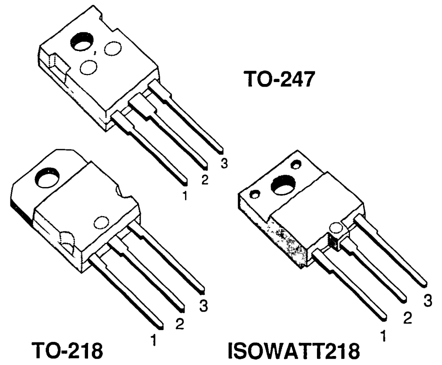
SGS-THOMSON MICROELECTRONICS

STH80N05/FI STW80N05

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STH80N05	50 V	< 0.012 Ω	80 A
STH80N05FI	50 V	< 0.012 Ω	52 A
STW80N05	50 V	< 0.012 Ω	80 A

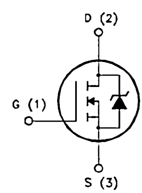
- TYPICAL $R_{DS(on)}$ = 0.011 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- VERY HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION



APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STW/STH80N05	STH80N05FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	80	52	A
I_D	Drain Current (continuous) at T_c = 100 °C	56	32	A
I_{DM}(•)	Drain Current (pulsed)	320	320	A
P_{tot}	Total Dissipation at T_c = 25 °C	200	70	W
	Derating Factor	1.33	0.56	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 175	-65 to 150	°C
T_j	Max. Operating Junction Temperature	175	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-218/TO-247	ISOWATT218	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case Max	0.75	1.79	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient Max	30		°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink Typ	0.1		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	70	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	900	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	200	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	45	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	50			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 40 A V_{GS} = 10V I_D = 40 A T_c = 100°C		0.011	0.012 0.024	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	80			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 40 A	25	45		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		4000 1800 500	5200 2300 650	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 40 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		190 900	270 1300	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 80 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		150		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 25 V I_D = 40 A V_{GS} = 10 V		130 27 48	180	nC nC nC

SWITCHING OFF

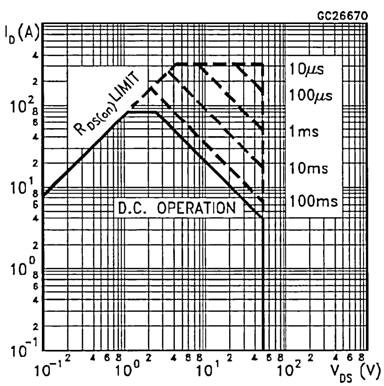
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 80 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		450 350 700	600 480 950	ns ns ns

SOURCE DRAIN DIODE

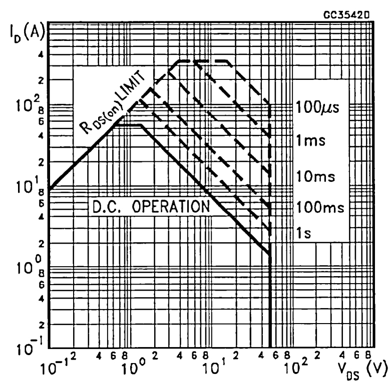
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				80 320	A A
V_{SD} (∗)	Forward On Voltage	I_{SD} = 80 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 80 A di/dt = 100 A/µs V_{DD} = 35 V T_j = 150 °C (see test circuit, figure 5)		130 0.45 7		ns µC A

(∗) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

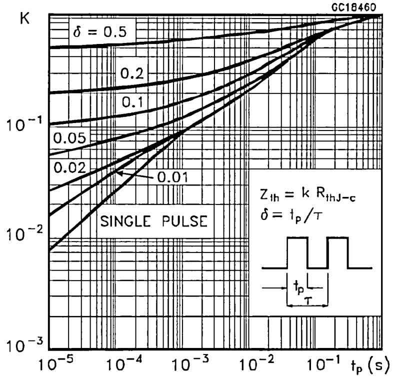
Safe Operating Areas For TO-218 and TO-247



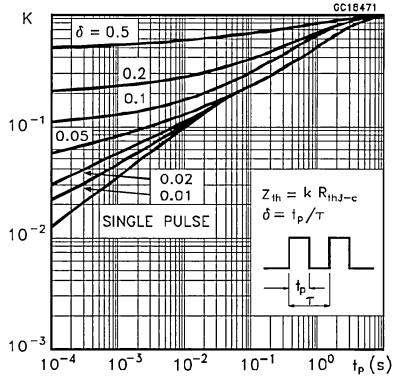
Safe Operating Areas For ISOWATT218



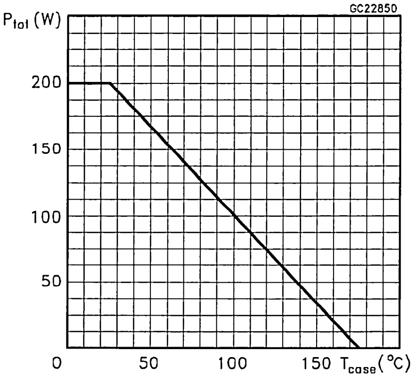
Thermal Impedance For TO-218 and TO-247



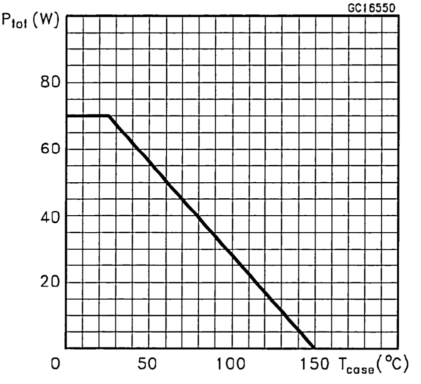
Thermal Impedance For ISOWATT218



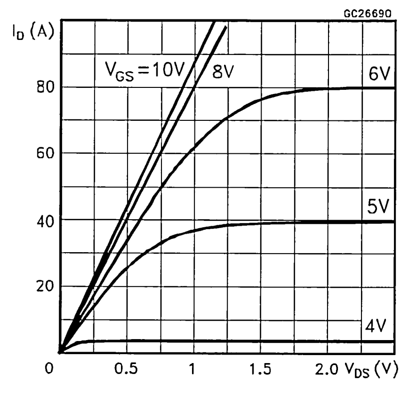
Derating Curve For TO-218 and TO-247



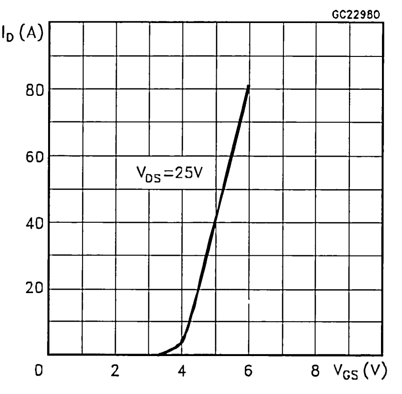
Derating Curve For ISOWATT218



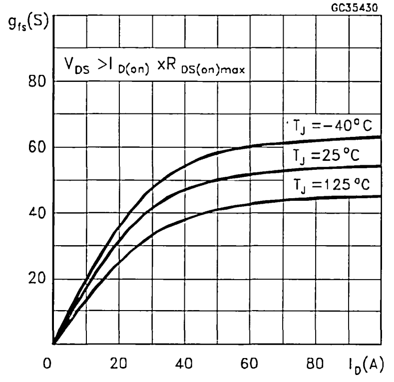
Output Characteristics



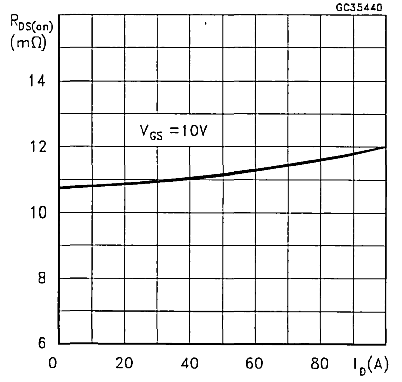
Transfer Characteristics



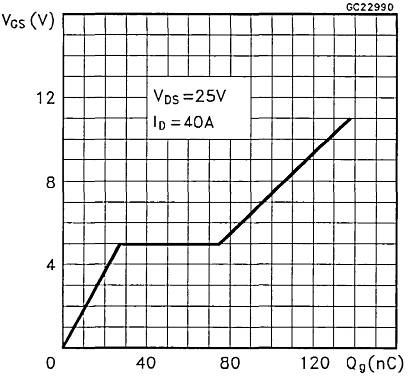
Transconductance



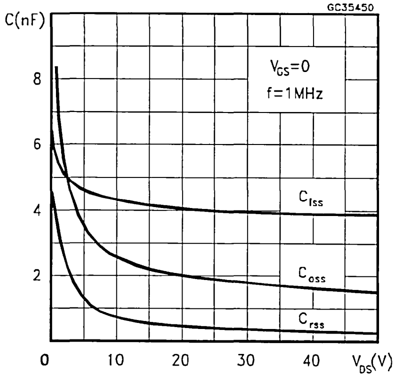
Static Drain-source On Resistance



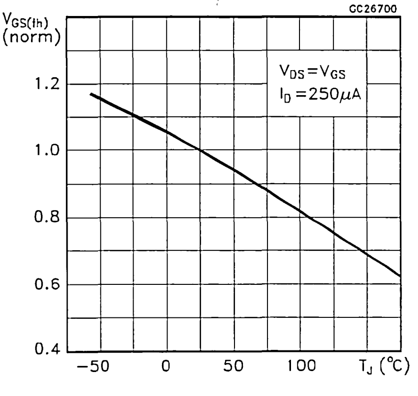
Gate Charge vs Gate-source Voltage



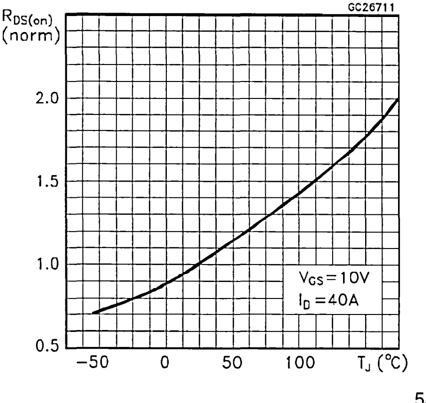
Capacitance Variations



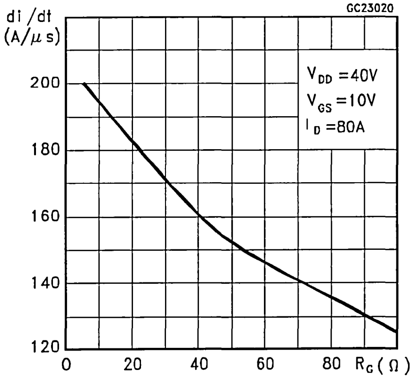
Normalized Gate Threshold Voltage vs Temperature



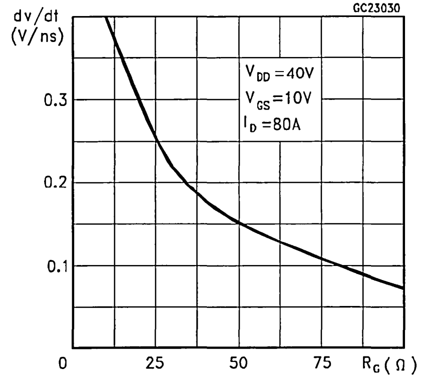
Normalized On Resistance vs Temperature



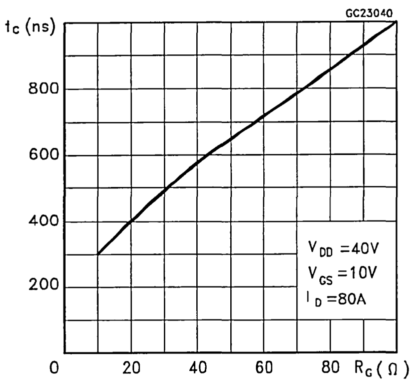
Turn-on Current Slope



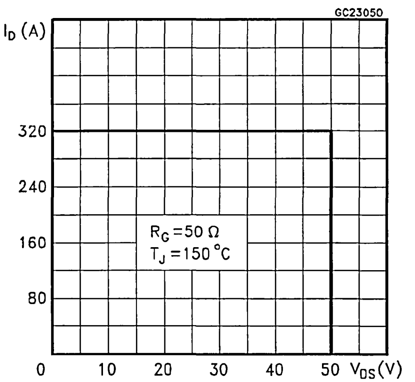
Turn-off Drain-source Voltage Slope



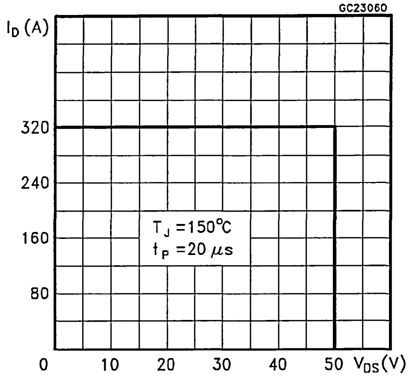
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

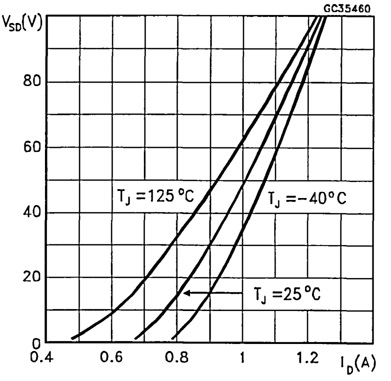


Fig. 1: Unclamped Inductive Load Test Circuits

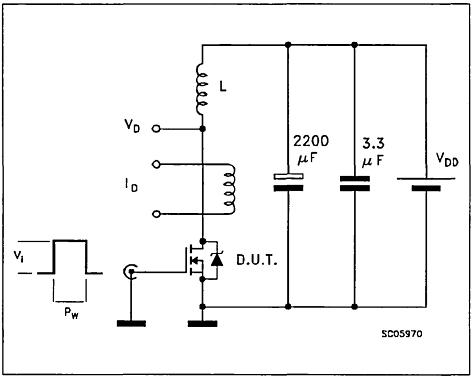


Fig. 2: Unclamped Inductive Waveforms

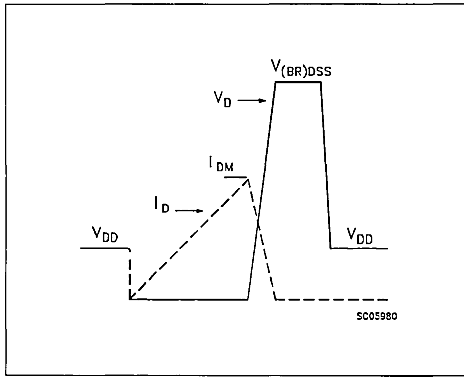


Fig. 3: Switching Times Test Circuits For Resistive Load

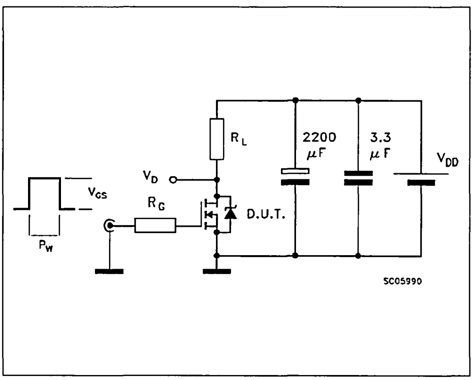


Fig. 4: Gate Charge Test Circuit

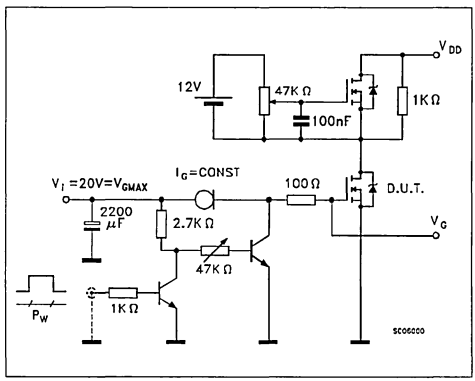
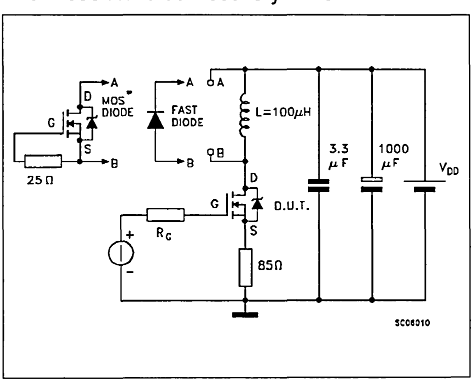


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON
MICROELECTRONICS

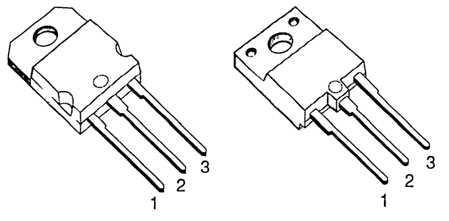
STHV82
STHV82FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STHV82	800 V	< 2 Ω	5.5 A
STHV82FI	800 V	< 2 Ω	3.6 A

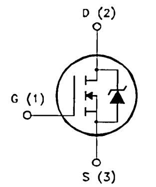
- TYPICAL $R_{DS(on)}$ = 1.65 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)



TO-218   ISOWATT218

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STHV82	STHV82FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	800		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	800		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	5.5	3.6	A
I_D	Drain Current (continuous) at T_c = 100 °C	3.4	2.3	A
I_{DM}(•)	Drain Current (pulsed)	20	20	A
P_{tot}	Total Dissipation at T_c = 25 °C	150	60	W
	Derating Factor	1.2	0.48	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-218	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.83	2.08	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	30		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.1		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	5.5	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	320	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	16	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	3.2	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	800			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 2.5A V_{GS} = 10V I_D = 2.5 A T_c = 100°C		1.65	2 4	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	5.5			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 2.5 A	2	4		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1190 165 70	1450 200 85	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 400 V I_D = 2.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		50 85	65 105	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 640 V I_D = 5.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		200		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 500 V I_D = 6 A V_{GS} = 10 V		75 9 33	95	nC nC nC

SWITCHING OFF

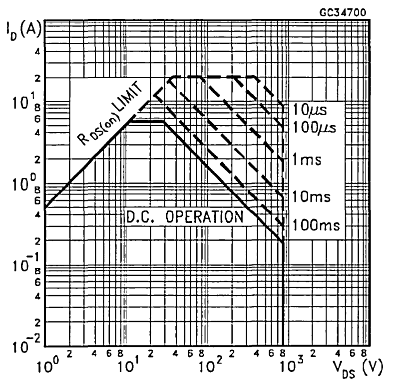
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 640 V I_D = 5.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		120 30 160	150 40 200	ns ns ns

SOURCE DRAIN DIODE

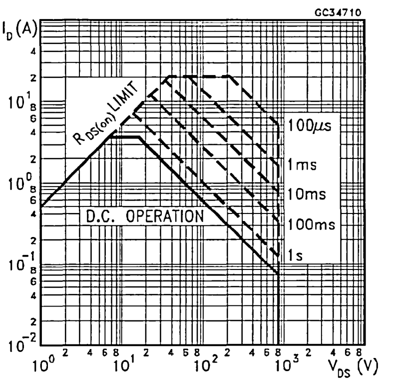
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				5.5 20	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 5.5 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 5.5 A di/dt = 100 A/µs V_{DD} = 80 V T_j = 150 °C (see test circuit, figure 5)		700 7.7 22		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

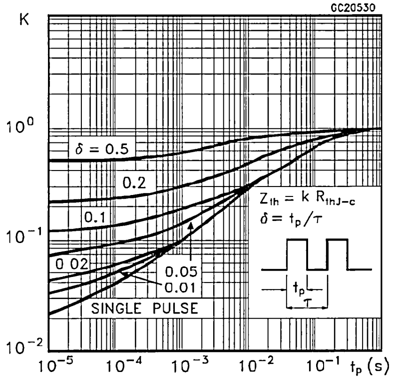
Safe Operating Areas For TO-218



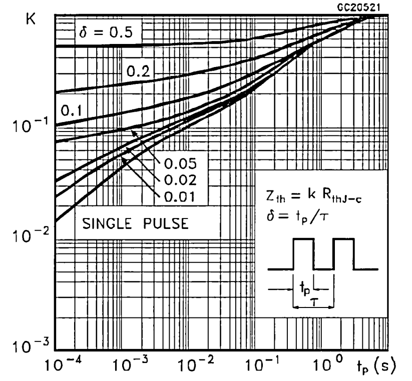
Safe Operating Areas For ISOWATT218



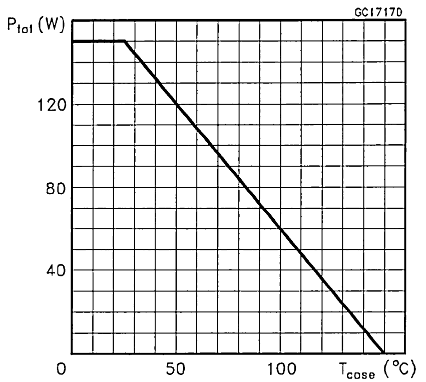
Thermal Impedeance For TO-218



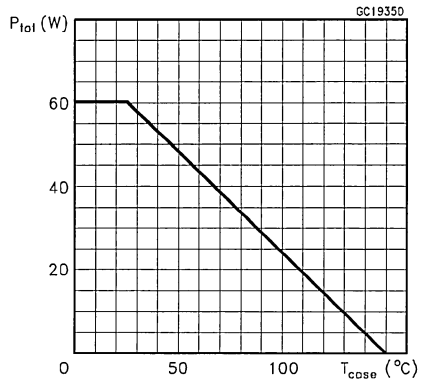
Thermal Impedance For ISOWATT218



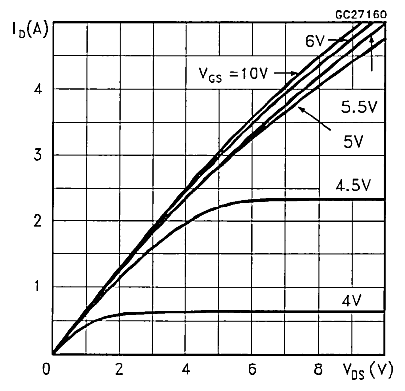
Derating Curve For TO-218



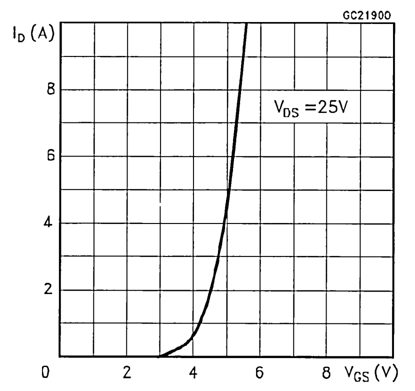
Derating Curve For ISOWATT218



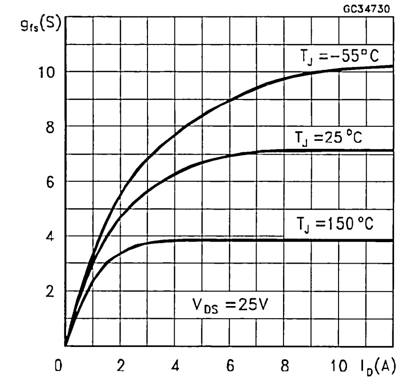
Output Characteristics



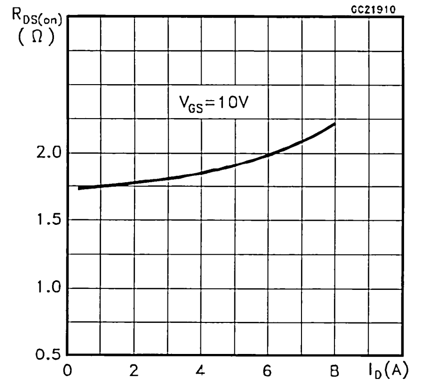
Transfer Characteristics



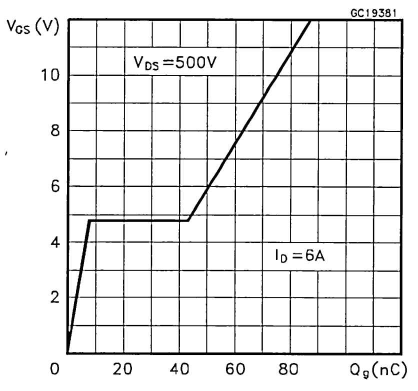
Transconductance



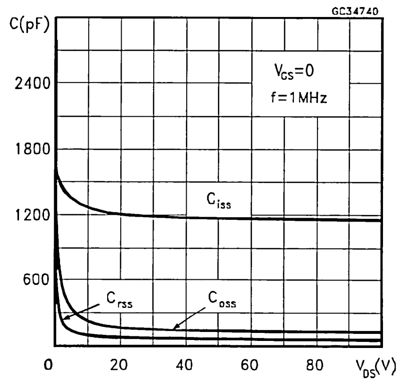
Static Drain-source On Resistance



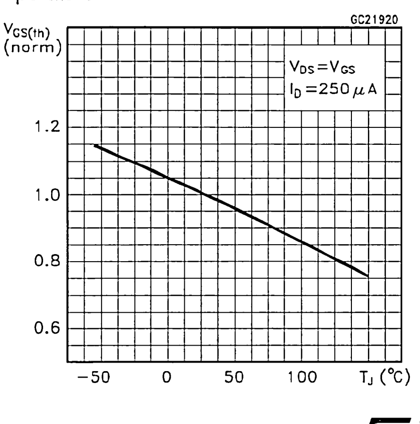
Gate Charge vs Gate-source Voltage



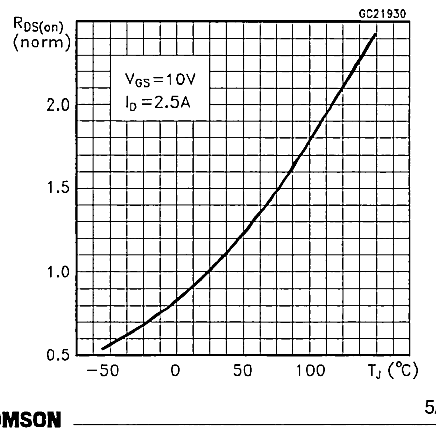
Capacitance Variations



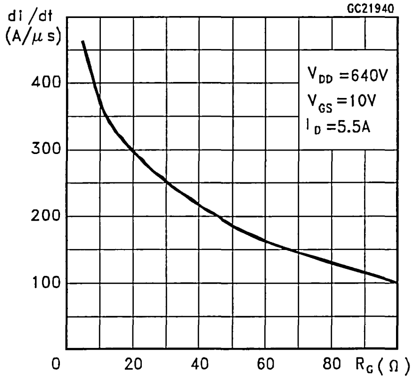
Normalized Gate Threshold Voltage vs Temperature



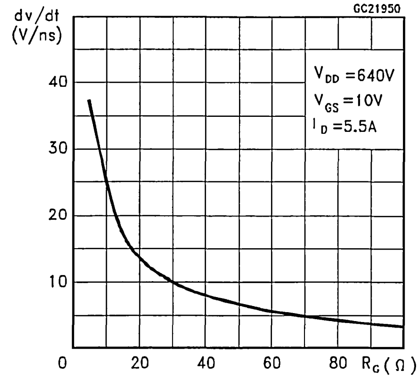
Normalized On Resistance vs Temperature



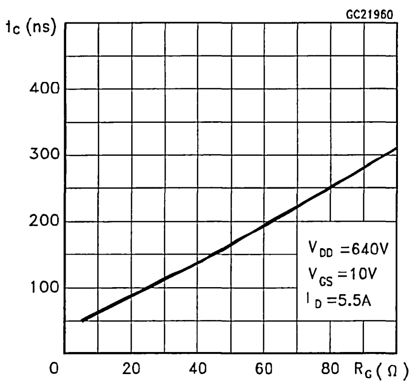
Turn-on Current Slope



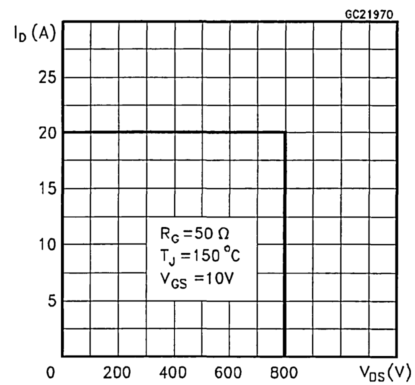
Turn-off Drain-source Voltage Slope



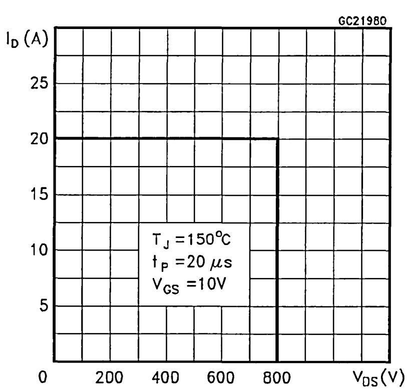
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

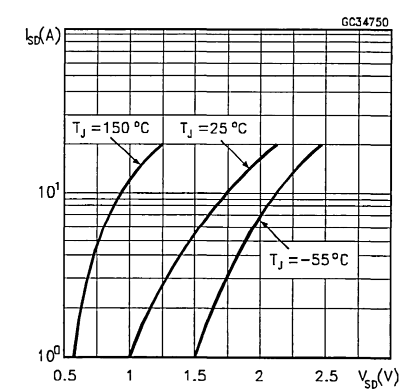


Fig. 1: Unclamped Inductive Load Test Circuits

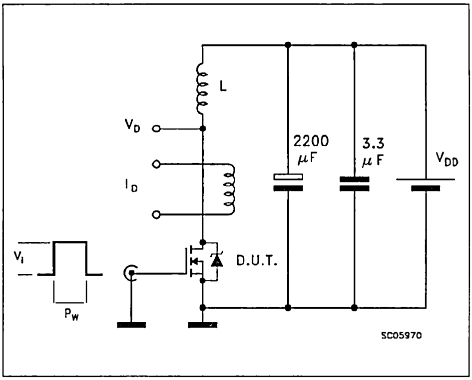


Fig. 2: Unclamped Inductive Waveforms

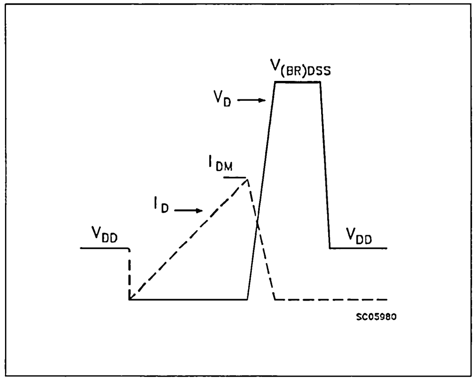


Fig. 3: Switching Times Test Circuits For Resistive Load

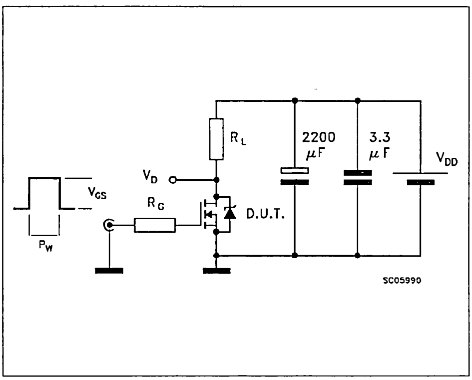


Fig. 4: Gate Charge Test Circuit

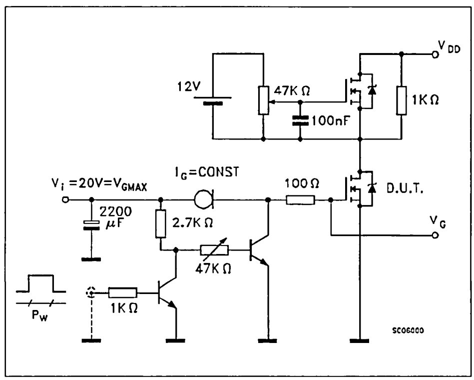
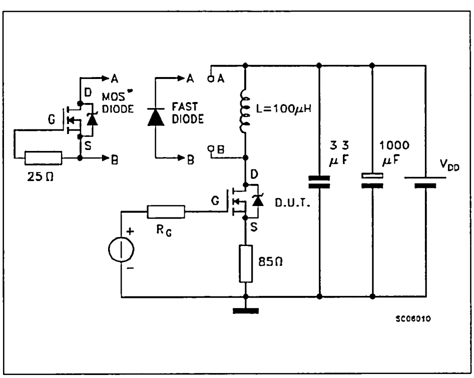


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON MICROELECTRONICS

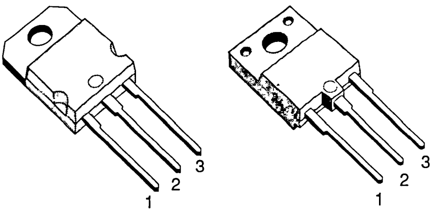
STHV102
STHV102FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STHV102	1000 V	< 3.5 Ω	4.2 A
STHV102FI	1000 V	< 3.5 Ω	2.6 A

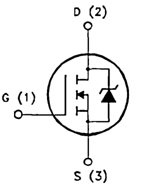
- TYPICAL $R_{DS(on)}$ = 3.1 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)



TO-218 ISOWATT218

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STHV102	STHV102FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	1000		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	1000		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	4.2	2.6	A
I_D	Drain Current (continuous) at T_c = 100 °C	2.6	1.6	A
I_{DM}(•)	Drain Current (pulsed)	16	16	A
P_{tot}	Total Dissipation at T_c = 25 °C	150	60	W
	Derating Factor	1.2	0.48	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	4000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-218	ISOWATT218	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.83	2.08	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	30		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.1		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	4.2	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	180	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	9.2	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	2.5	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	1000			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 2 A V_{GS} = 10V I_D = 2 A T_c = 100°C		3.1	3.5 7	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	4.2			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 2 A	2	4		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1230 165 70	1500 200 85	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 800 V I_D = 2 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		36 130	45 165	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 800 V I_D = 4 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		180		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 800 V I_D = 4 A V_{GS} = 10 V		80 8 40	100	nC nC nC

SWITCHING OFF

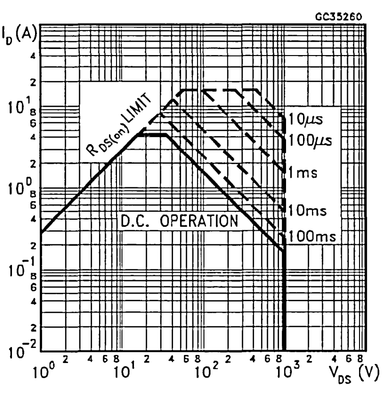
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 800 V I_D = 4 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		100 25 155	125 32 190	ns ns ns

SOURCE DRAIN DIODE

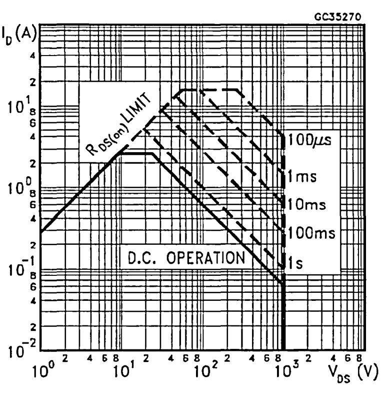
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				4.2 16	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 4.2 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 4.2 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		1200 30 50		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

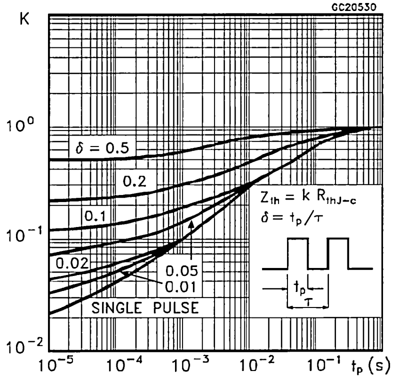
Safe Operating Areas For TO-218



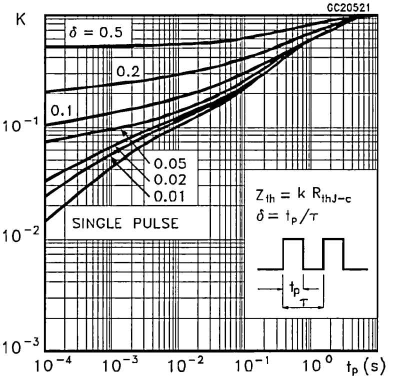
Safe Operating Areas For ISOWATT218



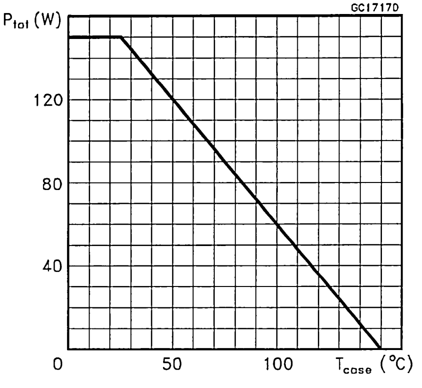
Thermal Impedeance For TO-218



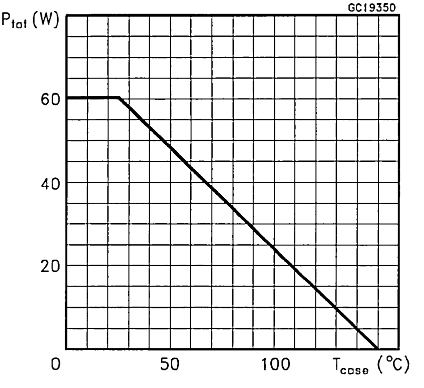
Thermal Impedance For ISOWATT218



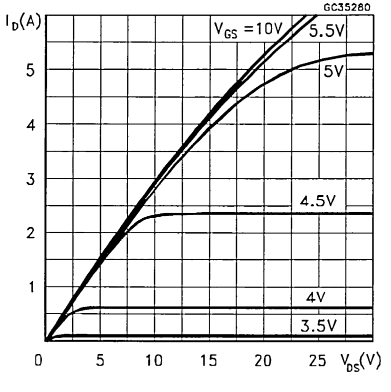
Derating Curve For TO-218



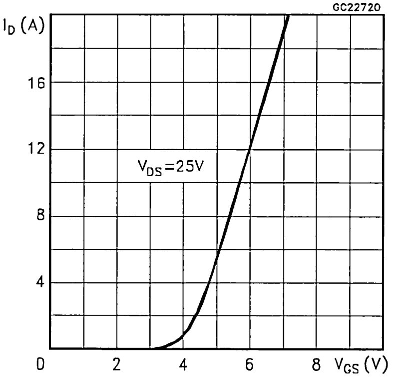
Derating Curve For ISOWATT218



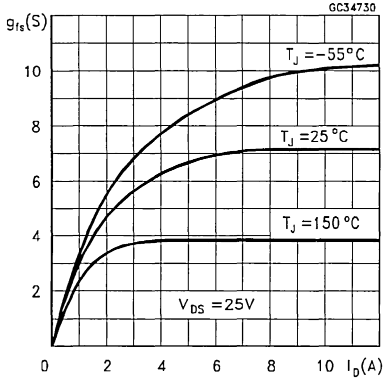
Output Characteristics



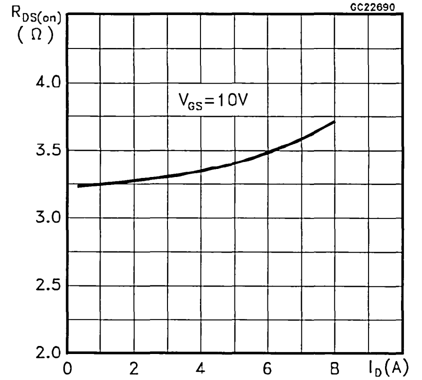
Transfer Characteristics



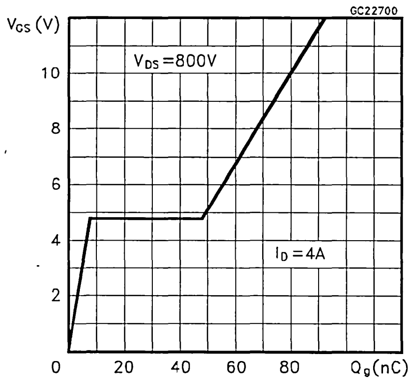
Transconductance



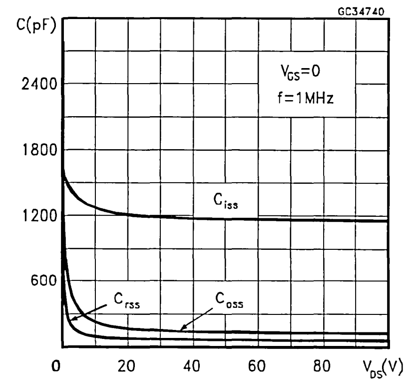
Static Drain-source On Resistance



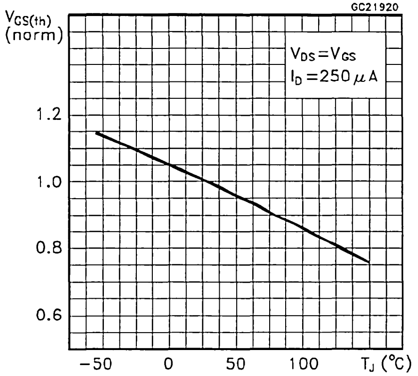
Gate Charge vs Gate-source Voltage



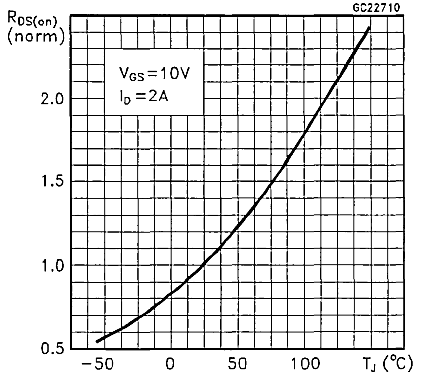
Capacitance Variations



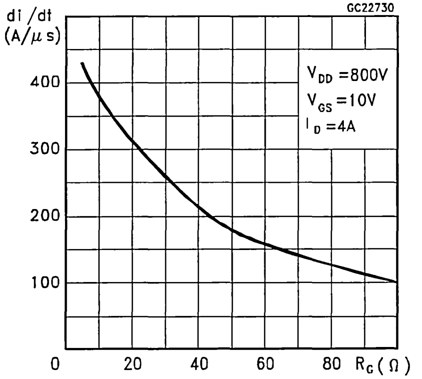
Normalized Gate Threshold Voltage vs Temperature



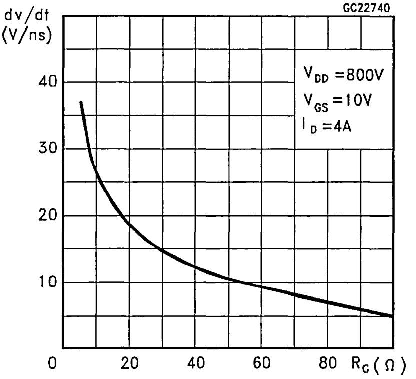
Normalized On Resistance vs Temperature



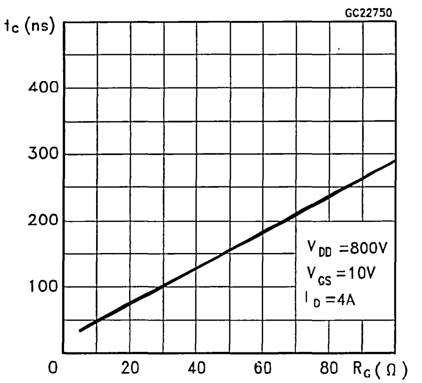
Turn-on Current Slope



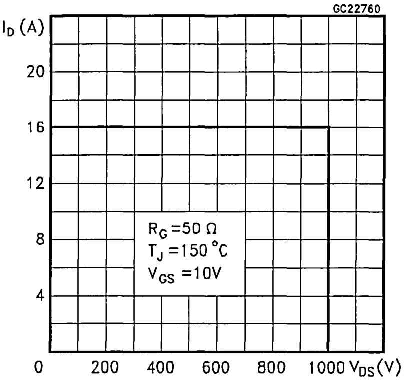
Turn-off Drain-source Voltage Slope



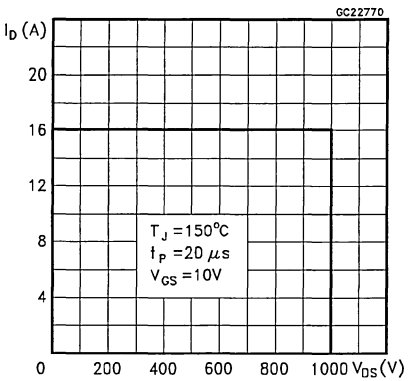
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

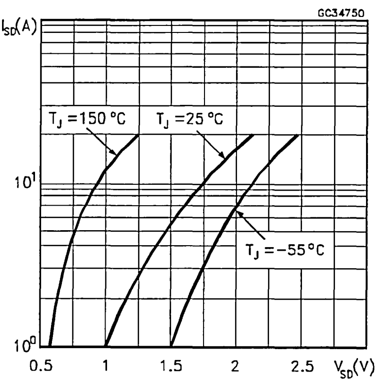


Fig. 1: Unclamped Inductive Load Test Circuits

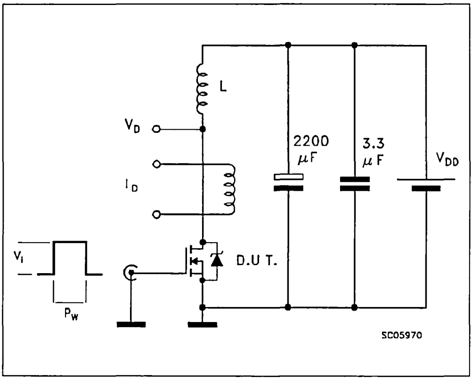


Fig. 2: Unclamped Inductive Waveforms

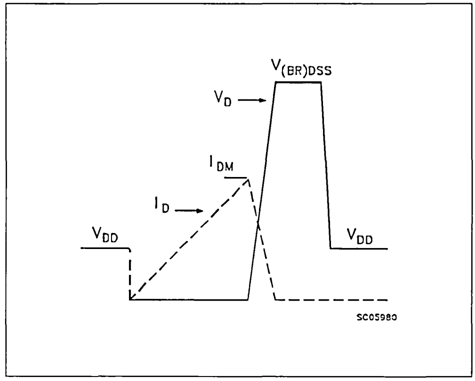


Fig. 3: Switching Times Test Circuits For Resistive Load

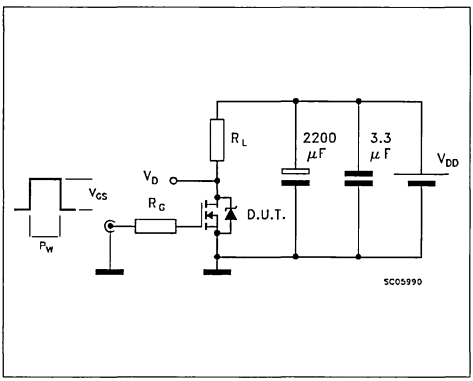


Fig. 4: Gate Charge Test Circuit

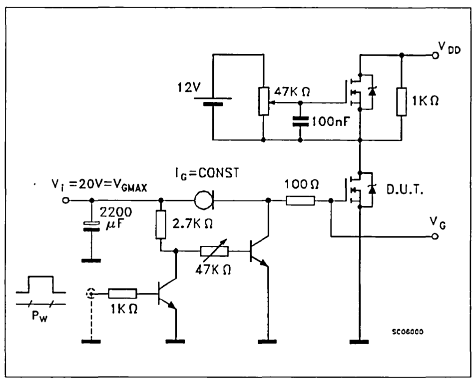
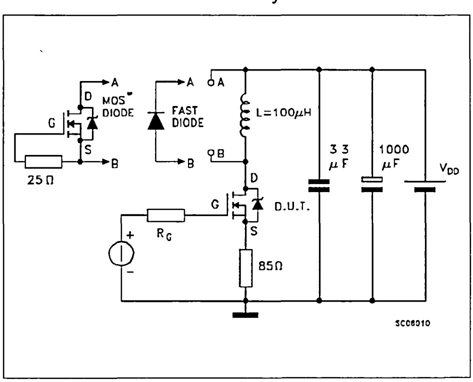


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON
MICROELECTRONICS

STK2N50

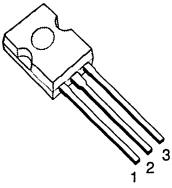
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK2N50	500 V	< 6 Ω	2 A

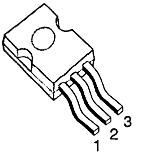
- TYPICAL $R_{DS(on)}$ = 4.6 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT

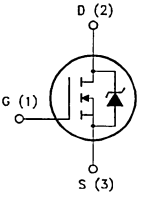


SOT-82



SOT-194 (option)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	500	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	500	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	2	A
I_D	Drain Current (continuous) at T_c = 100 °C	1.25	A
I_{DM}(•)	Drain Current (pulsed)	8	A
P_{tot}	Total Dissipation at T_c = 25 °C	50	W
	Derating Factor	0.4	W/°C
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	2.5	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	80	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Case-sink	Typ	0.7	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		275	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	2	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	20	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	1.5	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	1.2	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	500			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 1 A V_{GS} = 10V I_D = 1 A T_c = 100°C		4.6	6 12	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	2			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 1 A	0.65	1		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		200 35 12	270 50 18	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 200 V I_D = 1 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		35 85	48 115	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 400 V I_D = 2 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		28		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 2 A V_{GS} = 10 V		18 5 8	25	nC nC nC

SWITCHING OFF

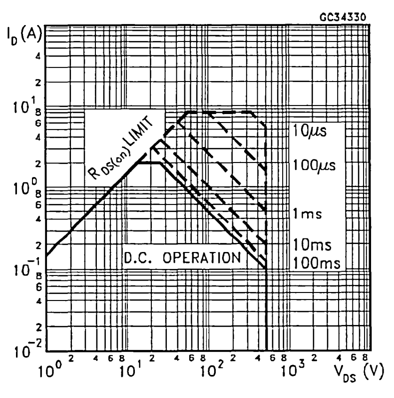
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 400 V I_D = 2 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		28 15 45	40 25 60	ns ns ns

SOURCE DRAIN DIODE

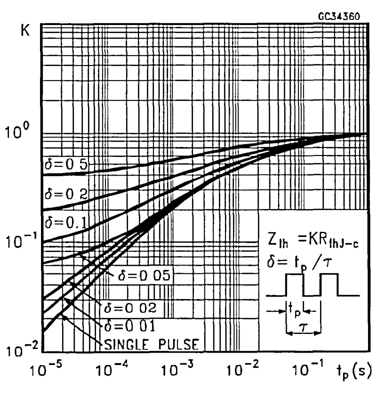
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				2 8	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 2 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 2 A di/dt = 100 A/μs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		330 3.5 15		ns μC A

(*) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

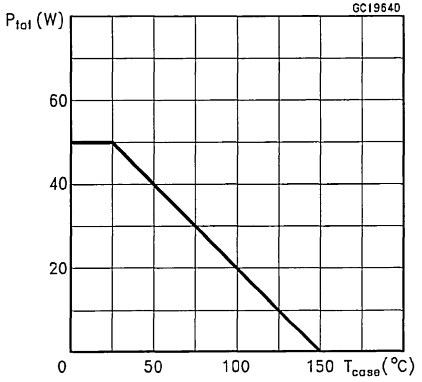
Safe Operating Area



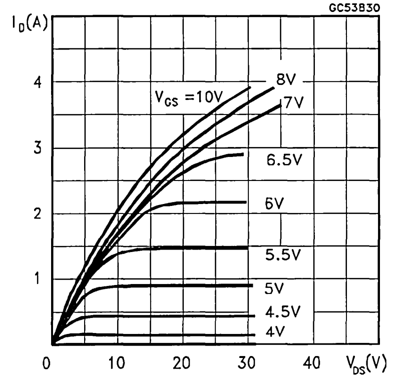
Thermal Impedance



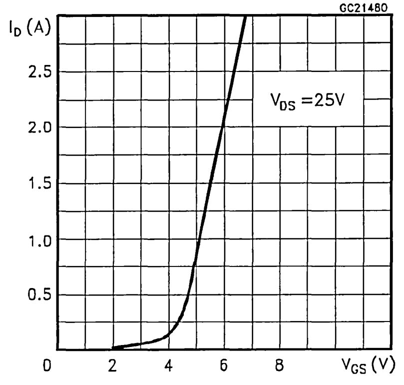
Derating Curve



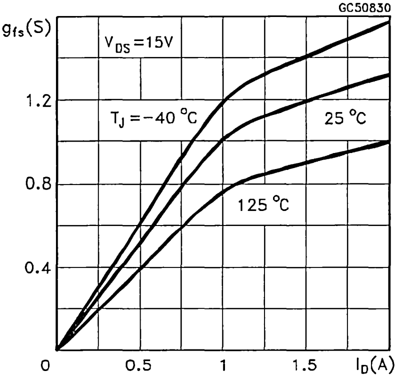
Output Characteristics



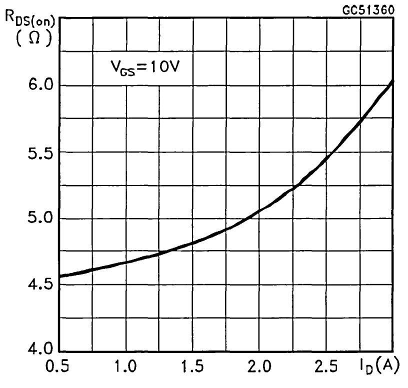
Transfer Characteristics



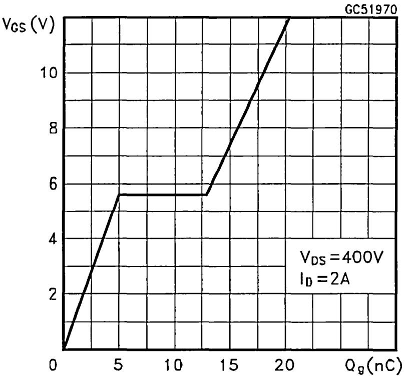
Transconductance



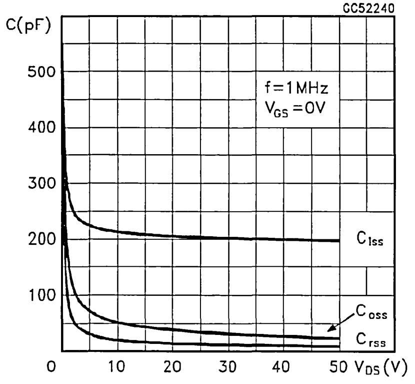
Static Drain-source On Resistance



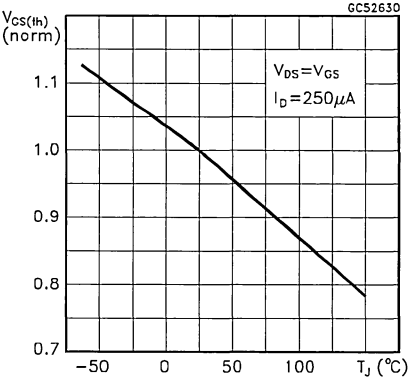
Gate Charge vs Gate-source Voltage



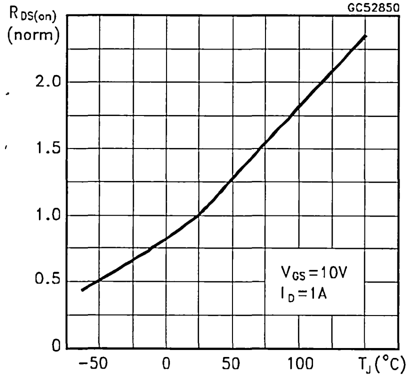
Capacitance Variations



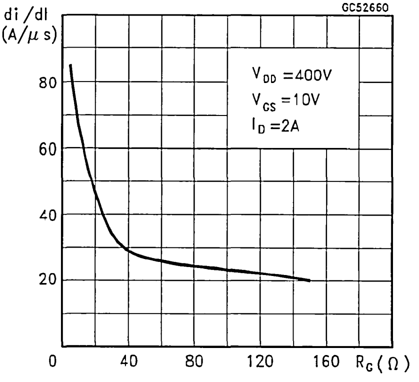
Normalized Gate Threshold Voltage vs Temperature



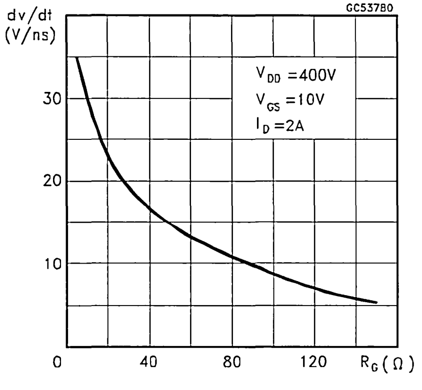
Normalized On Resistance vs Temperature



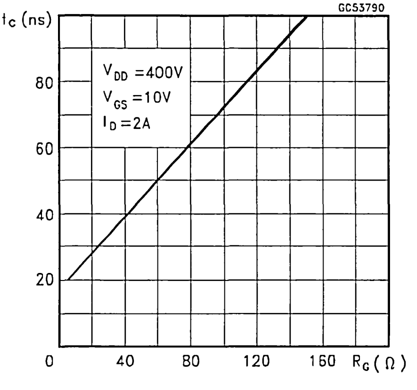
Turn-on Current Slope



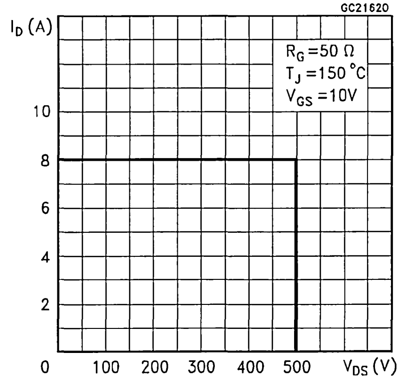
Turn-off Drain-source Voltage Slope



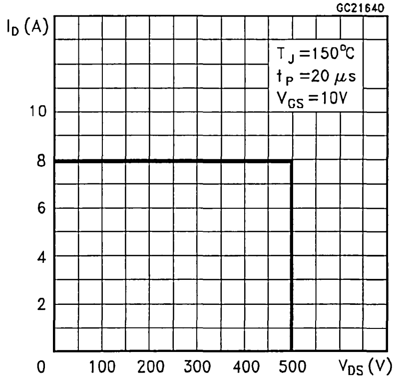
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

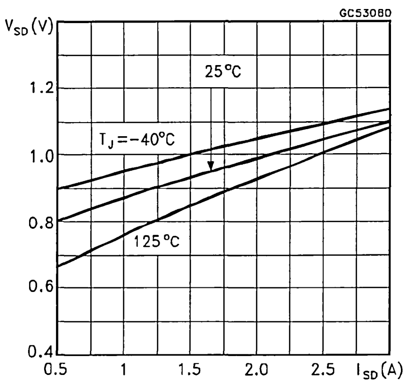


Fig. 1: Unclamped Inductive Load Test Circuits

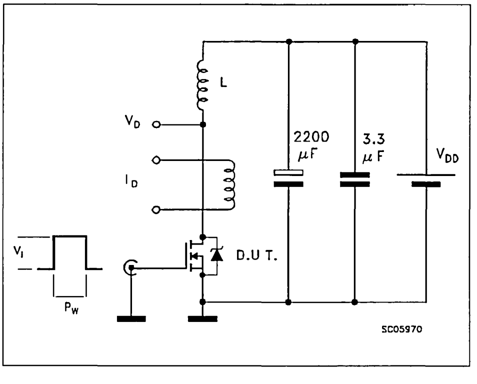


Fig. 2: Unclamped Inductive Waveforms

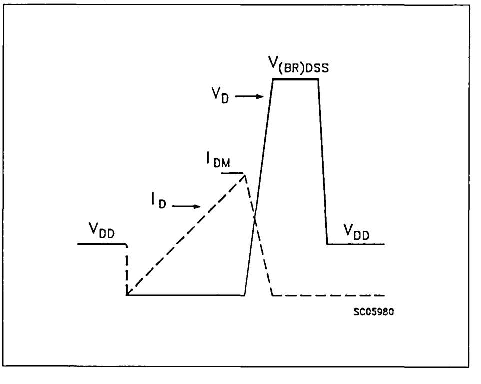


Fig. 3: Switching Times Test Circuits For Resistive Load

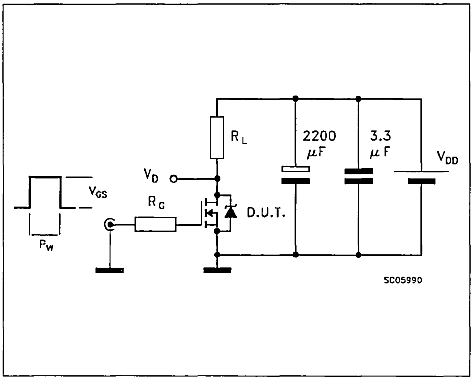


Fig. 4: Gate Charge Test Circuit

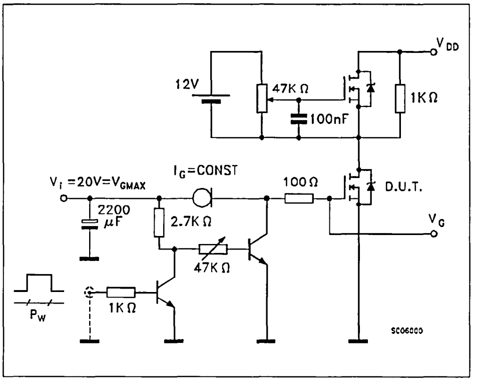
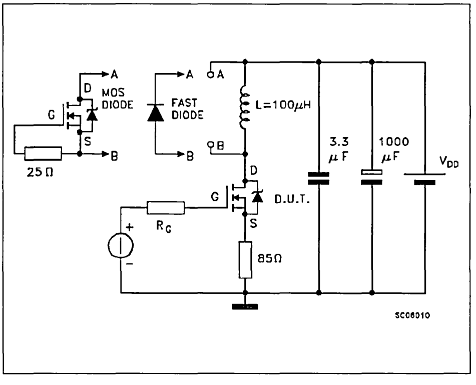


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON
MICROELECTRONICS

STK2N60

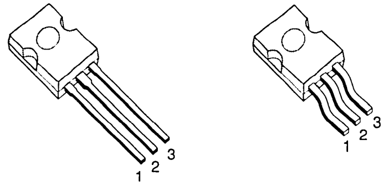
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK2N60	600 V	< 8 Ω	1.7 A

- TYPICAL $R_{DS(on)}$ = 5.7 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS

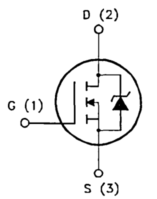
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



SOT-82

SOT-194 (option)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	600	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	600	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	1.7	A
I_D	Drain Current (continuous) at T_c = 100 °C	1.1	A
I_{DM}(•)	Drain Current (pulsed)	6.8	A
P_{tot}	Total Dissipation at T_c = 25 °C	50	W
	Derating Factor	0.4	W/°C
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	2.5	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	80	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Case-sink	Typ	0.7	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		275	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	1.7	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	15	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	1.2	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	1.1	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	600			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 1 A V_{GS} = 10V I_D = 1 A T_c = 100°C		5.7	8 16	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	1.7			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 1 A	0.65	1		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		200 35 12	270 50 18	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 200 V I_D = 1 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		35 85	48 115	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 400 V I_D = 2 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		28		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 2 A V_{GS} = 10 V		18 5 8	25	nC nC nC

SWITCHING OFF

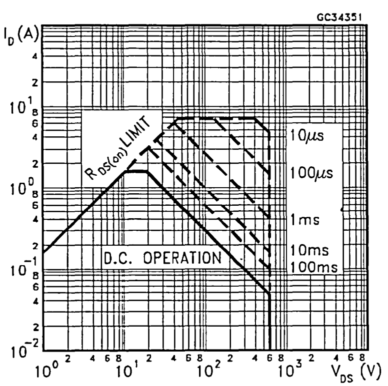
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 400 V I_D = 2 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		28 15 45	40 25 60	ns ns ns

SOURCE DRAIN DIODE

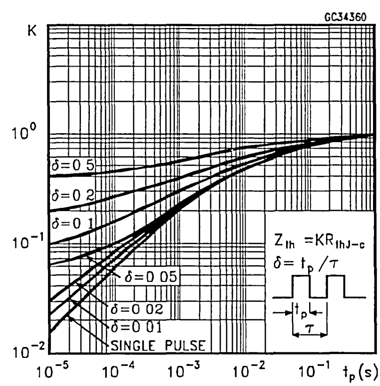
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				1.7 6.8	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 1.7 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 2 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		330 3.6 15		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

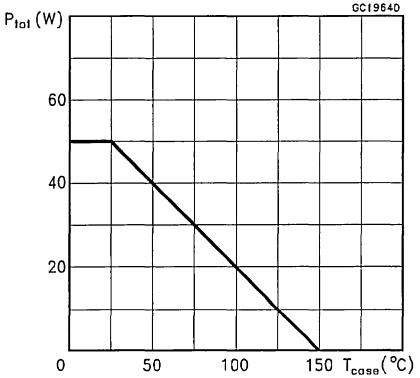
Safe Operating Area



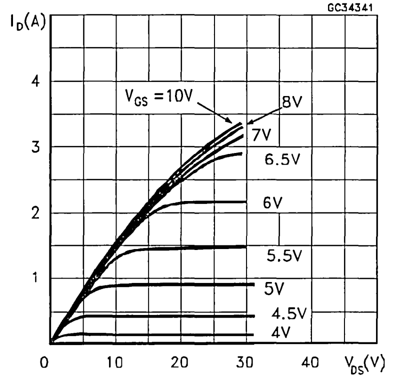
Thermal Impedance



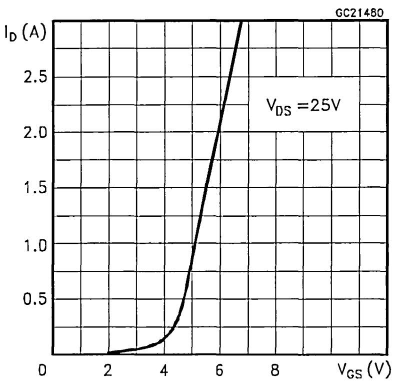
Derating Curve



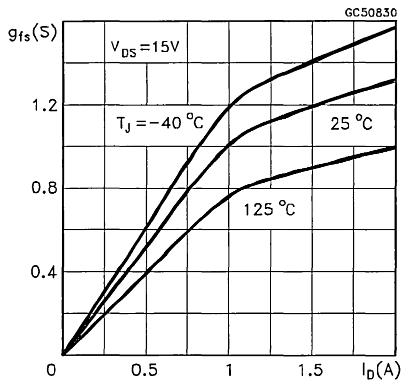
Output Characteristics



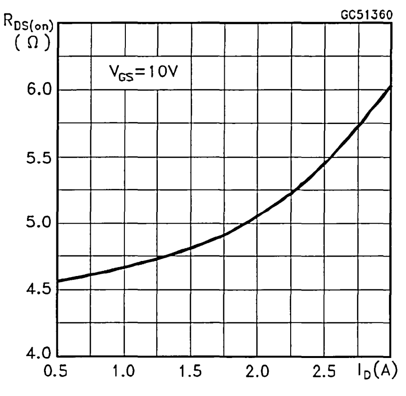
Transfer Characteristics



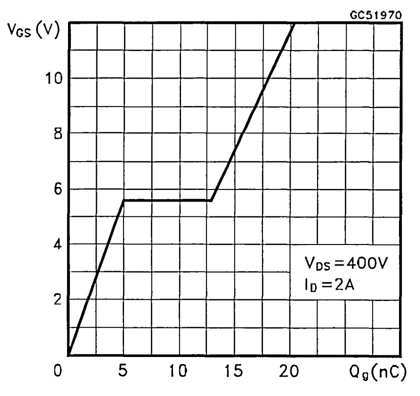
Transconductance



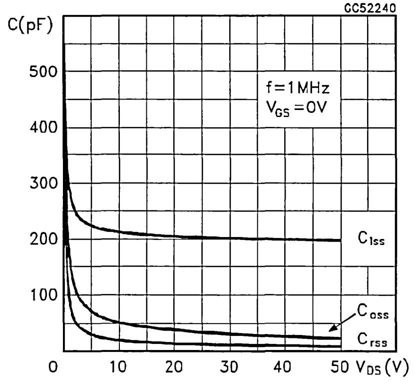
Static Drain-source On Resistance



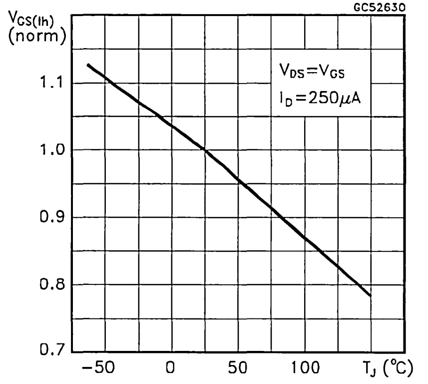
Gate Charge vs Gate-source Voltage



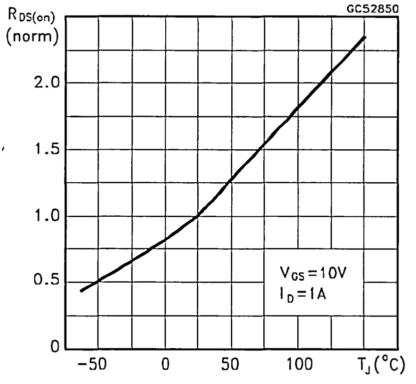
Capacitance Variations



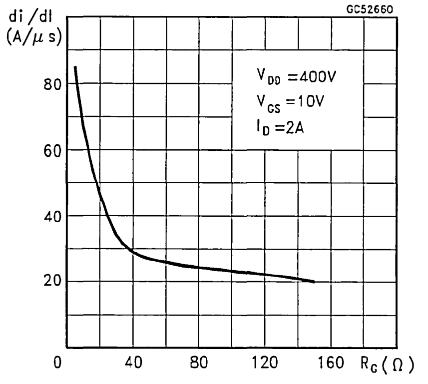
Normalized Gate Threshold Voltage vs Temperature



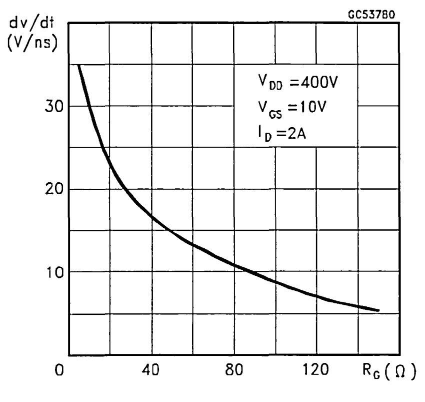
Normalized On Resistance vs Temperature



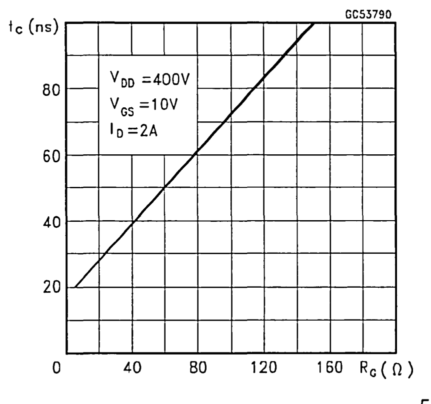
Turn-on Current Slope



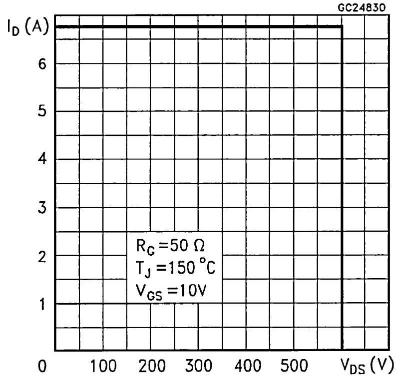
Turn-off Drain-source Voltage Slope



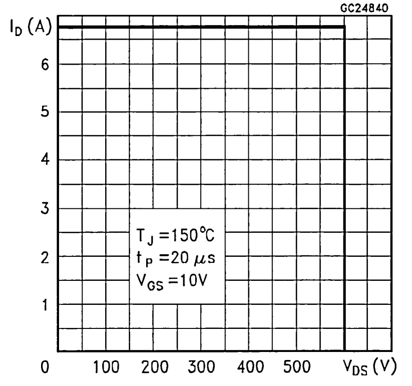
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

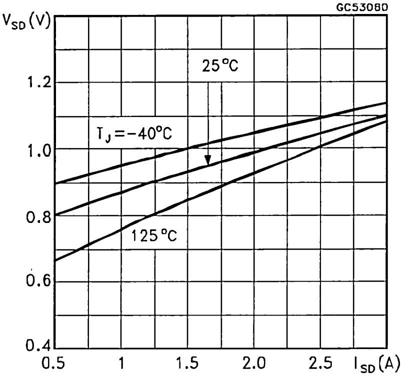


Fig. 1: Unclamped Inductive Load Test Circuits

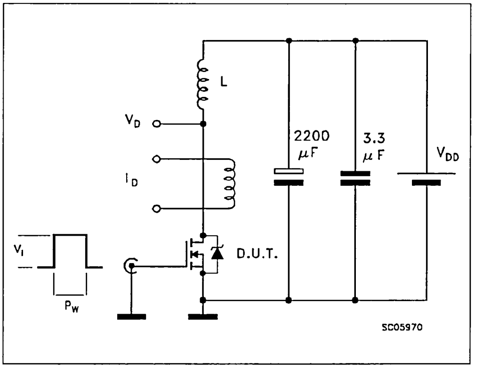


Fig. 2: Unclamped Inductive Waveforms

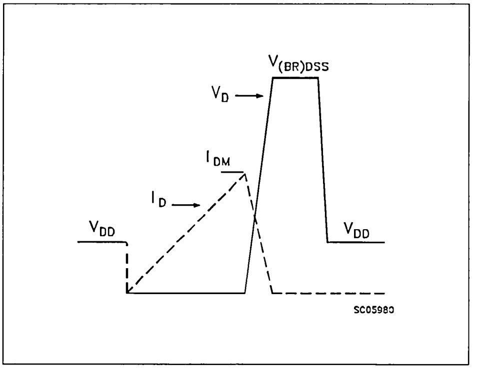


Fig. 3: Switching Times Test Circuits For Resistive Load

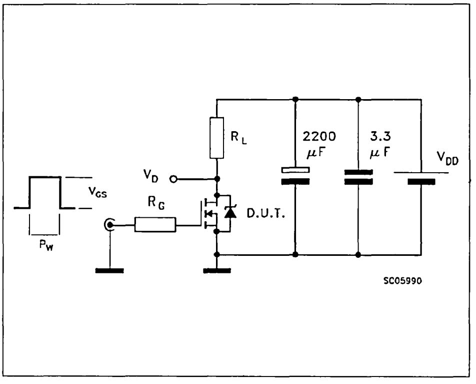


Fig. 4: Gate Charge Test Circuit

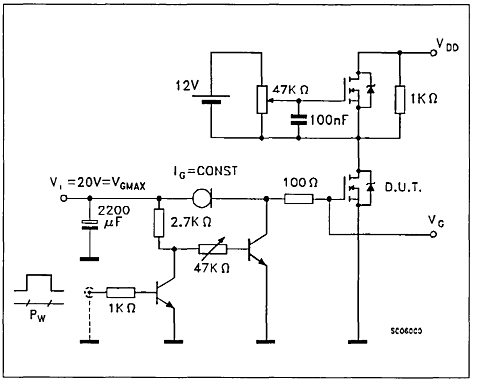
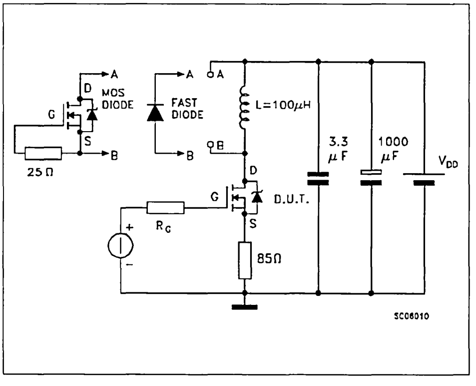


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times

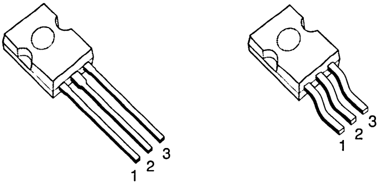


N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK2N80	800 V	< 7 Ω	2.1 A

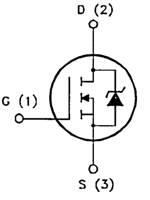
- TYPICAL $R_{DS(on)}$ = 5 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING



SOT-82 **SOT-194 (option)**

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	800	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	800	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	2.1	A
I_D	Drain Current (continuous) at T_c = 100 °C	1.3	A
I_{DM}(•)	Drain Current (pulsed)	9.6	A
P_{tot}	Total Dissipation at T_c = 25 °C	70	W
	Derating Factor	0.56	W/°C
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1.78	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	80	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Case-sink	Typ	0.7	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		275	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	2.1	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	80	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	2.8	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	1.3	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	800			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 1 A V_{GS} = 10V I_D = 1 A T_c = 100°C		5	7 14	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	2.1			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 1 A	1.2	1.9		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		460 55 22	600 70 30	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 400 V I_D = 1.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		38 42	50 57	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 640 V I_D = 2 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		160		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 640 V I_D = 2 A V_{GS} = 10 V		31 6 14	40	nC nC nC

SWITCHING OFF

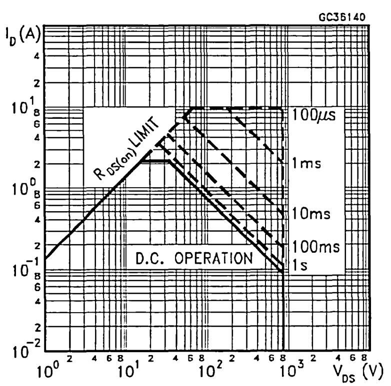
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 640 V I_D = 2 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		70 25 108	90 32 140	ns ns ns

SOURCE DRAIN DIODE

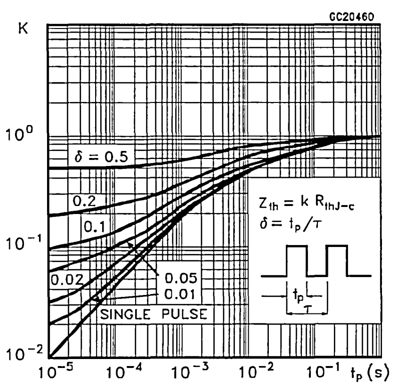
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				2.1 9.6	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 2.1 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 2 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		920 18.4 40		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

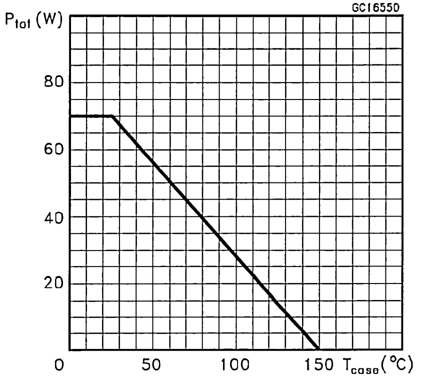
Safe Operating Area



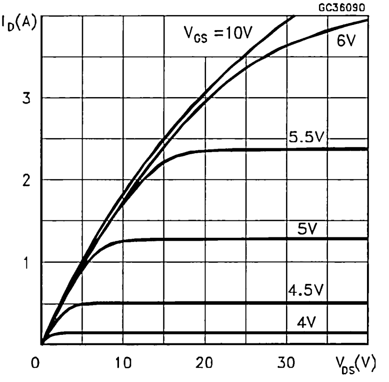
Thermal Impedance



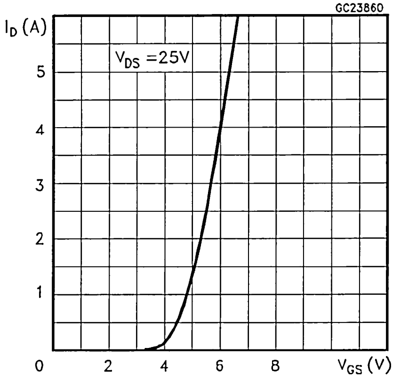
Derating Curve



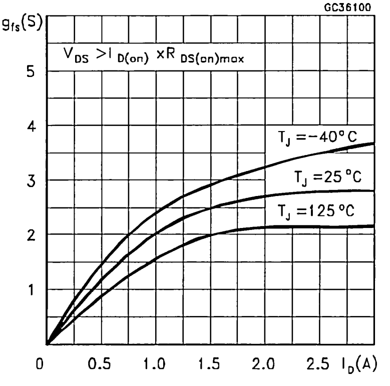
Output Characteristics



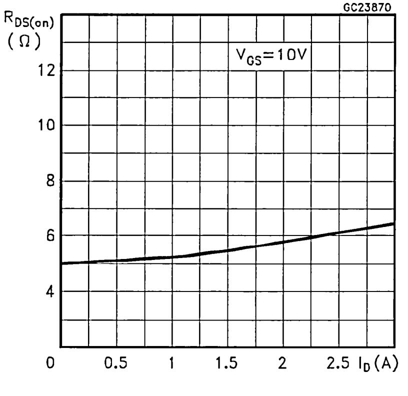
Transfer Characteristics



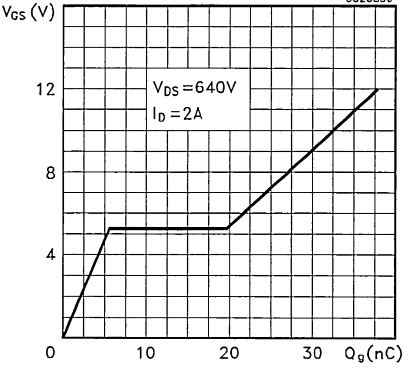
Transconductance



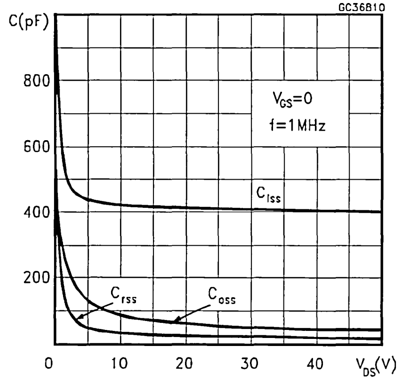
Static Drain-source On Resistance



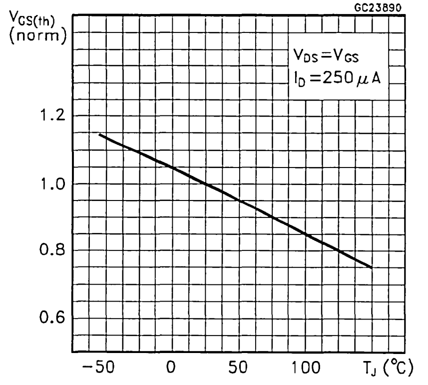
Gate Charge vs Gate-source Voltage



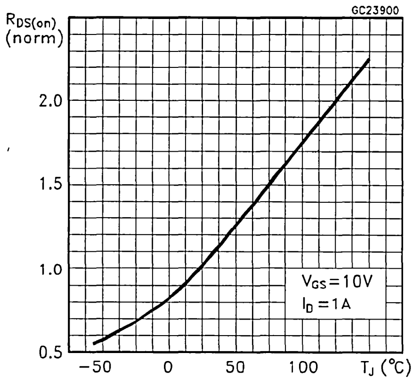
Capacitance Variations



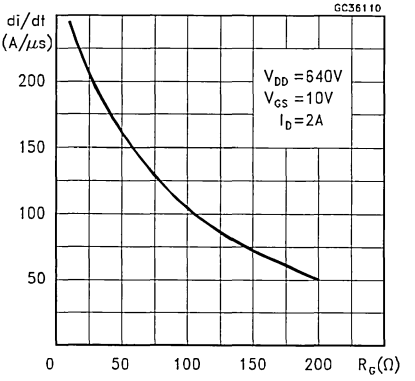
Normalized Gate Threshold Voltage vs Temperature



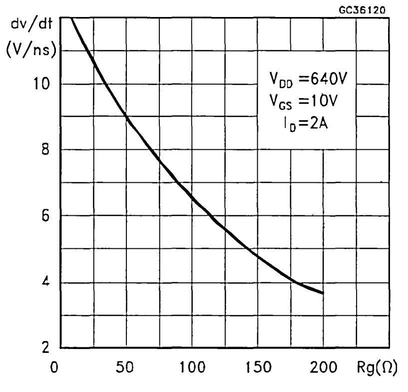
Normalized On Resistance vs Temperature



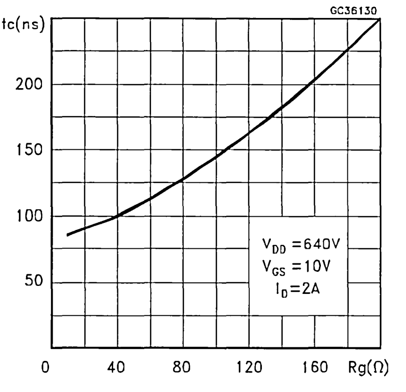
Turn-on Current Slope



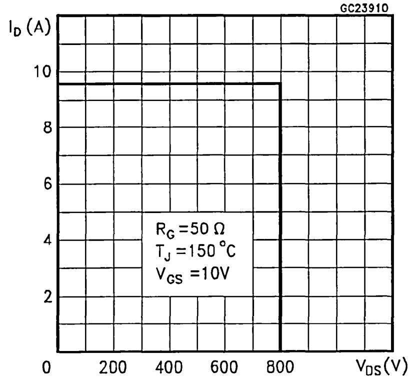
Turn-off Drain-source Voltage Slope



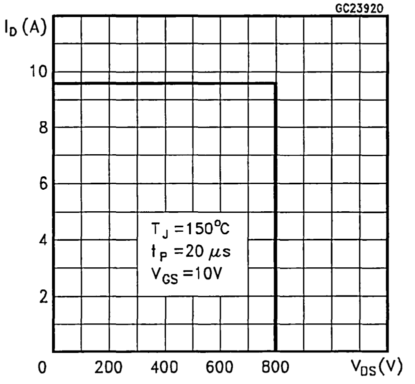
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

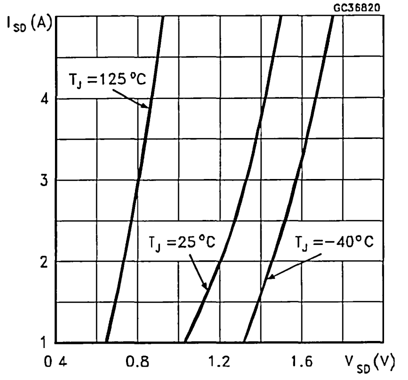


Fig. 1: Unclamped Inductive Load Test Circuits

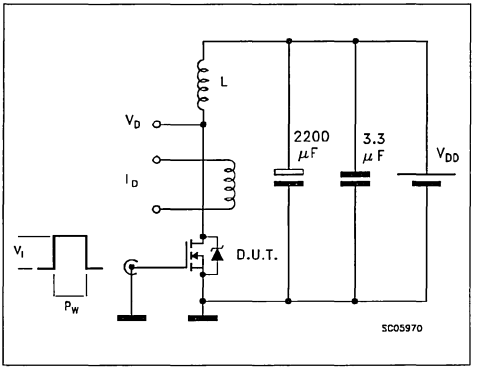


Fig. 2: Unclamped Inductive Waveforms

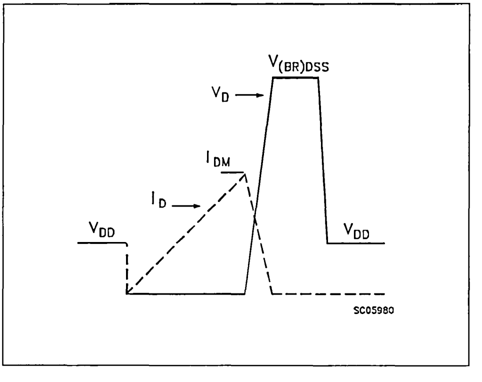


Fig. 3: Switching Times Test Circuits For Resistive Load

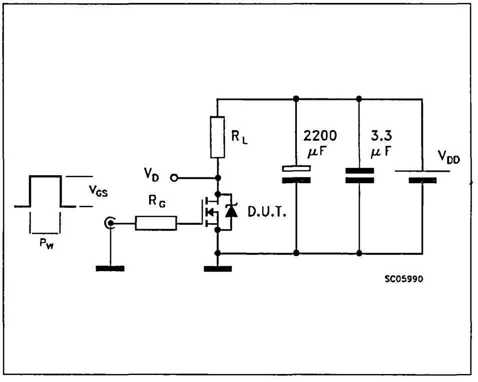


Fig. 4: Gate Charge Test Circuit

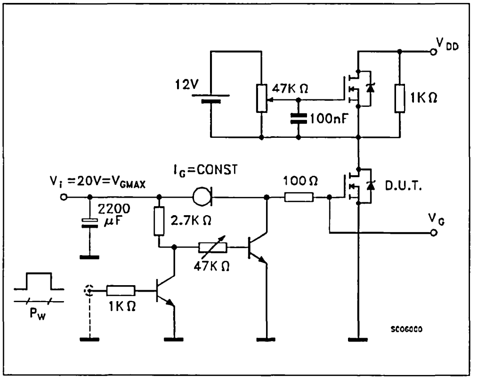
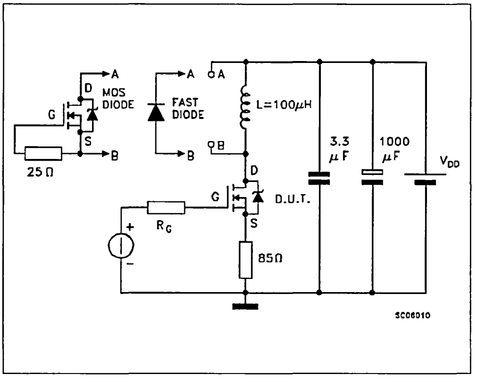


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON
MICROELECTRONICS

STK3N50

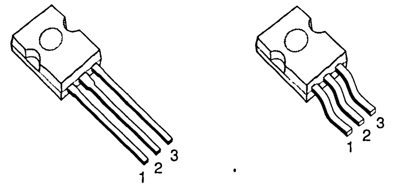
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK3N50	500 V	< 3.8 Ω	2.7 A

- TYPICAL $R_{DS(on)}$ = 2.5 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

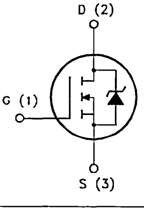
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



SOT-82 **SOT-194 (option)**

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	500	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	500	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	2.7	A
I_D	Drain Current (continuous) at T_c = 100 °C	1.7	A
I_{DM}(•)	Drain Current (pulsed)	12	A
P_{tot}	Total Dissipation at T_c = 25 °C	60	W
	Derating Factor	0.48	W/°C
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	2.08	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	80	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Case-sink	Typ	0.7	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		275	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current (repetitive or not-repetitive, T_j = 25 °C)	2.8	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	200	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, δ < 1%)	5	mJ
I_{AR}	Avalanche Current (repetitive or not-repetitive, T_j = 100 °C)	1.6	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	500			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (∗)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 1.5 A V_{GS} = 10V I_D = 1.5 A T_c = 100°C		2.5	3.8 7.6	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	2.7			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 1.5 A	0.8	1.93		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		350 60 25	460 80 35	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 250 V I_D = 1.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		35 85	45 110	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 400 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		120		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 3 A V_{GS} = 10 V		25 6 11	35	nC nC nC

SWITCHING OFF

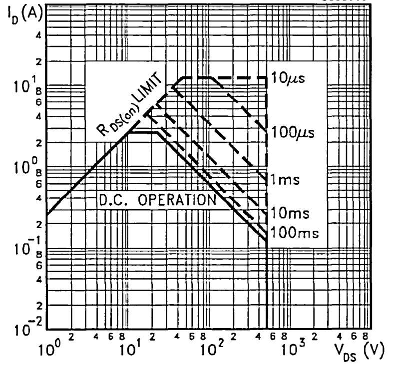
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 400 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		50 20 80	65 30 105	ns ns ns

SOURCE DRAIN DIODE

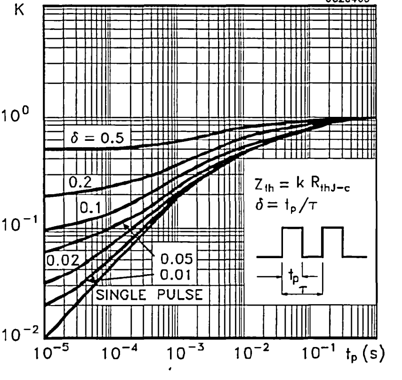
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				2.8 12	A A
V_{SD}	Forward On Voltage	I_{SD} = 2.8 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 2.8 A di/dt = 100 A/μs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		380 3.8 20		ns μC A

(∗) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

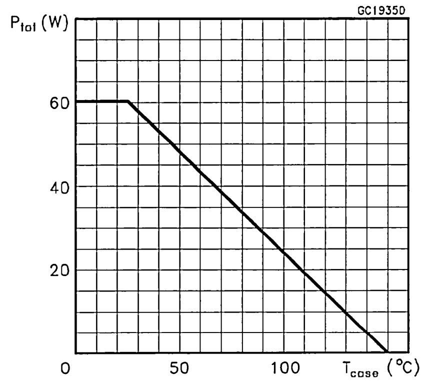
Safe Operating Area



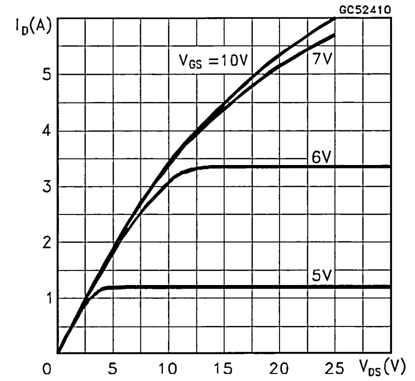
Thermal Impedance



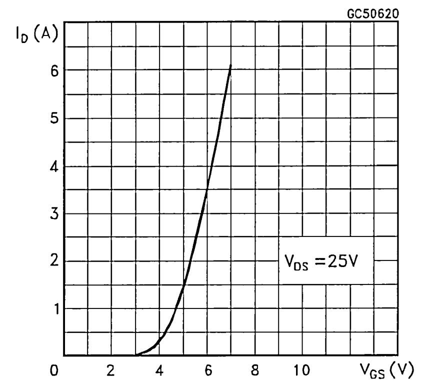
Derating Curve



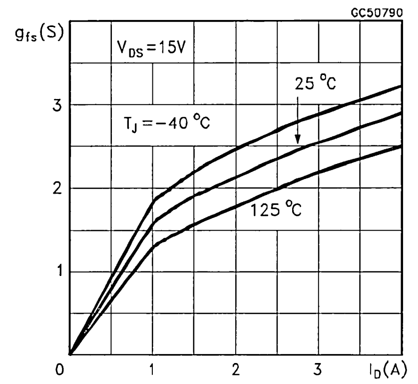
Output Characteristics



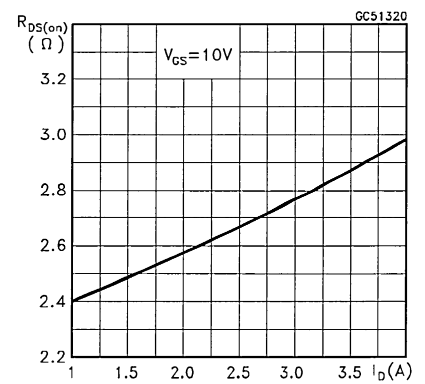
Transfer Characteristics



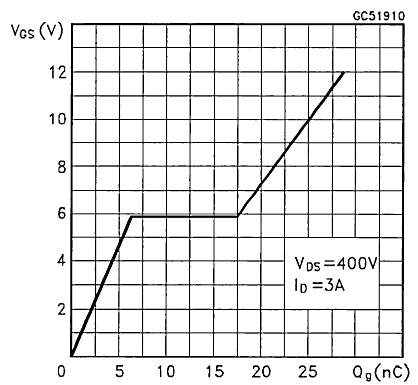
Transconductance



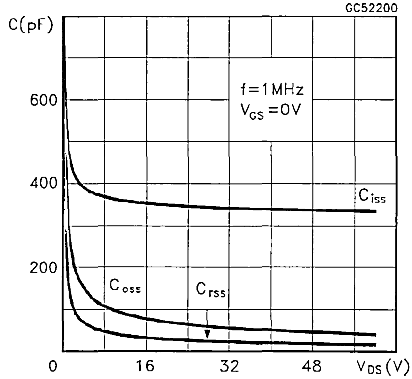
Static Drain-source On Resistance



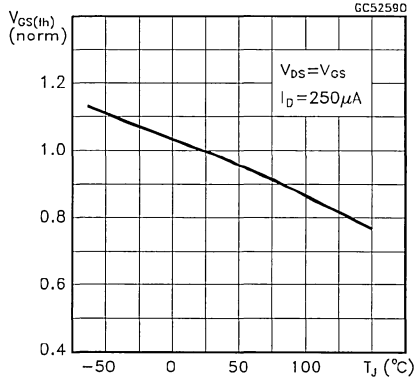
Gate Charge vs Gate-source Voltage



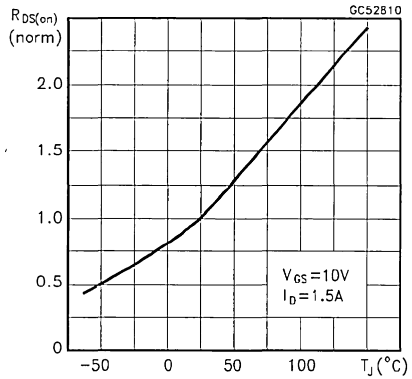
Capacitance Variations



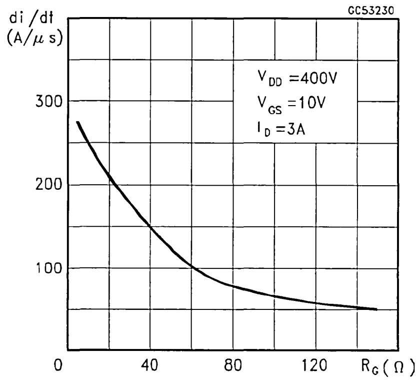
Normalized Gate Threshold Voltage vs Temperature



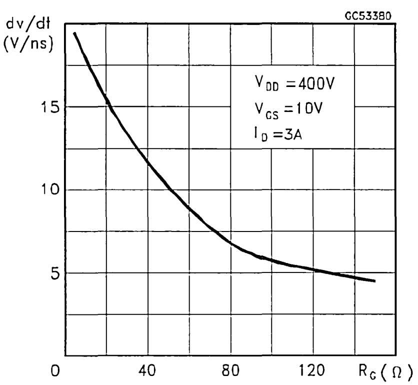
Normalized On Resistance vs Temperature



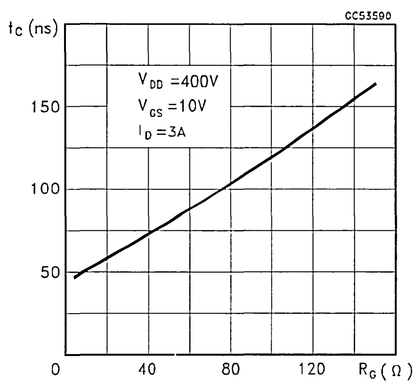
Turn-on Current Slope



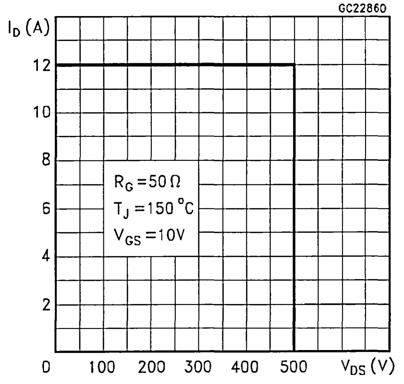
Turn-off Drain-source Voltage Slope



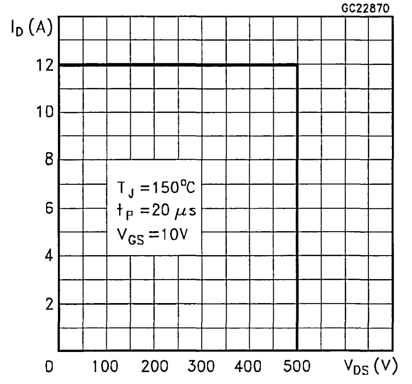
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

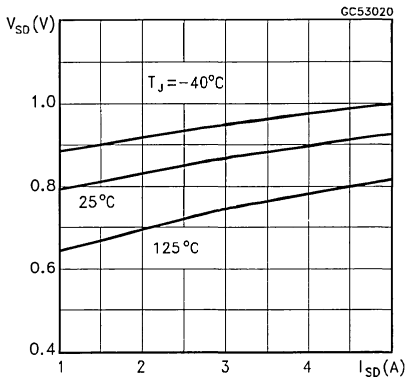


Fig. 1: Unclamped Inductive Load Test Circuits

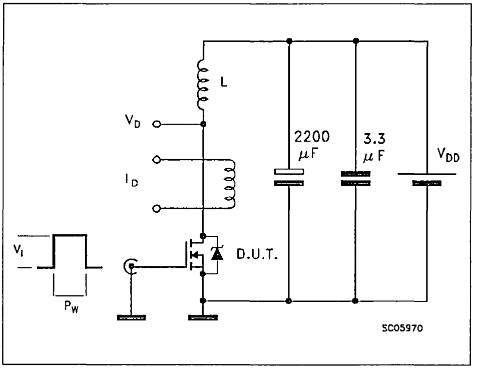


Fig. 2: Unclamped Inductive Waveforms

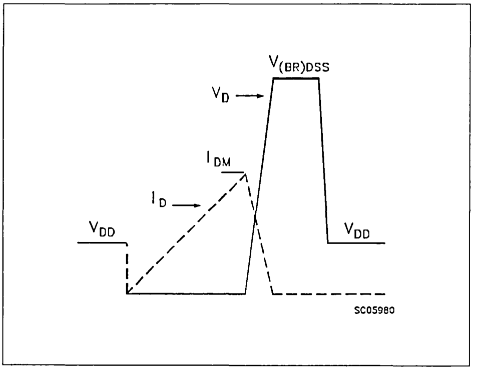


Fig. 3: Switching Times Test Circuits For Resistive Load

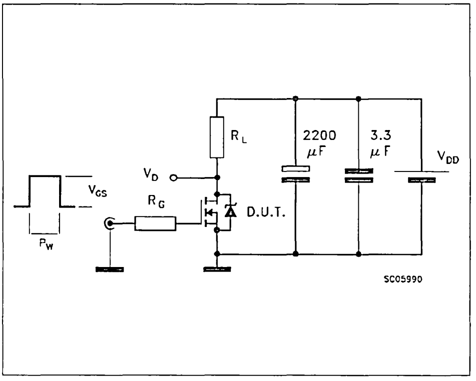


Fig. 4: Gate Charge Test Circuit

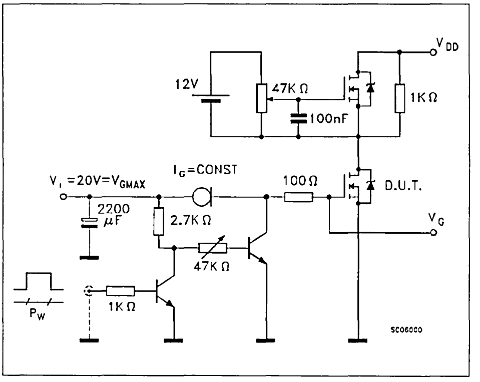
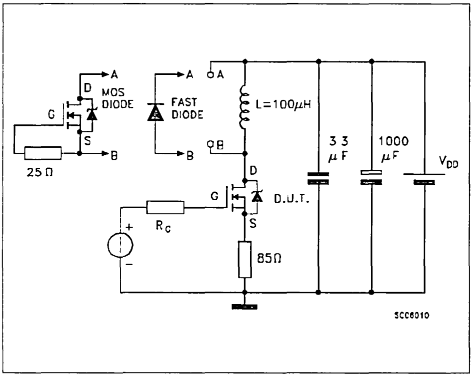


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON
MICROELECTRONICS

STK4N30

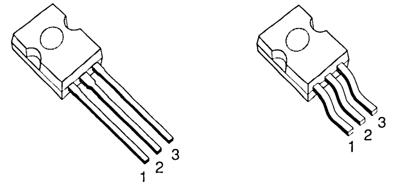
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK4N30	300 V	< 1.4 Ω	4.2 A

- TYPICAL $R_{DS(on)}$ = 1.2 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

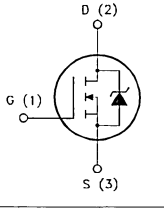
APPLICATIONS

- HIGH SPEED SWITCHING
- UNINTERRUPTIBLE POWER SUPPLY (UPS)
- MOTOR CONTROL, AUDIO AMPLIFIERS
- INDUSTRIAL ACTUATORS
- DC-DC & DC-AC CONVERTERS FOR TELECOM, INDUSTRIAL AND CONSUMER ENVIRONMENT
- PARTICULARLY SUITABLE FOR ELECTRONIC FLUORESCENT LAMP BALLASTS



SOT-82 SOT-194 (option)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	300	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	300	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	4.2	A
I_D	Drain Current (continuous) at T_c = 100 °C	2.6	A
I_{DM}(•)	Drain Current (pulsed)	16	A
P_{tot}	Total Dissipation at T_c = 25 °C	60	W
	Derating Factor	0.48	W/°C
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	2.08	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	80	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Case-sink	Typ	0.7	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		275	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	4.2	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	32	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	1	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	2.6	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	300			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 2 A V_{GS} = 10V I_D = 2 A T_c = 100°C		1.2	1.4 1.8	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	4			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 2 A	1.5	2.3		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		500 80 16	700 110 25	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 150 V I_D = 2 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		45 30	60 40	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 240 V I_D = 4 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		330		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 240 V I_D = 4 A V_{GS} = 10 V		20 6 8	30	nC nC nC

SWITCHING OFF

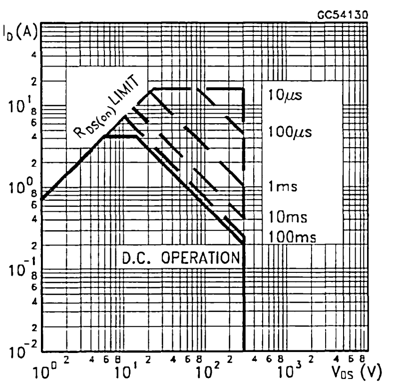
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 240 V I_D = 4 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		35 20 60	50 30 80	ns ns ns

SOURCE DRAIN DIODE

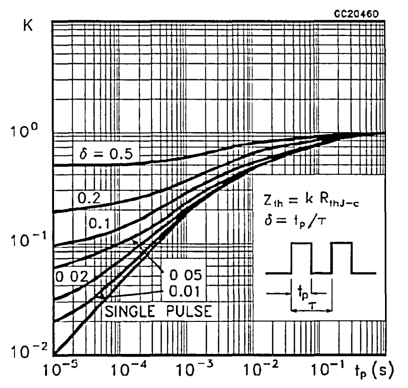
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				4 16	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 4 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 4 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		300 1.7 13		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

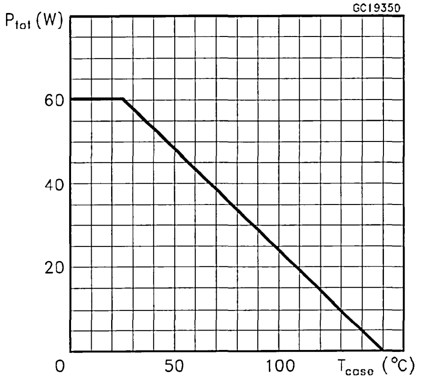
Safe Operating Area



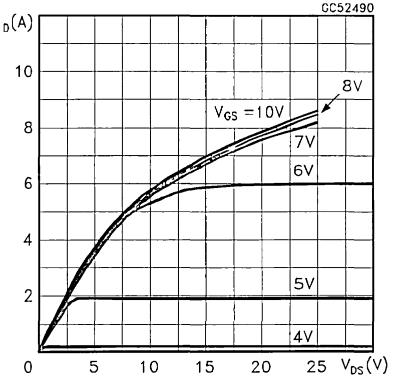
Thermal Impedance



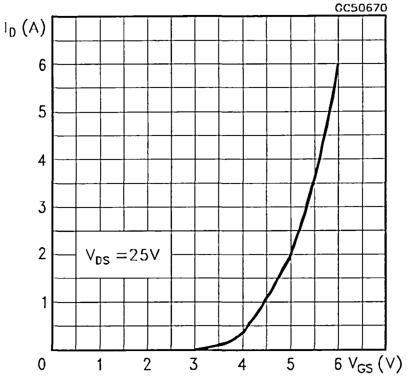
Derating Curve



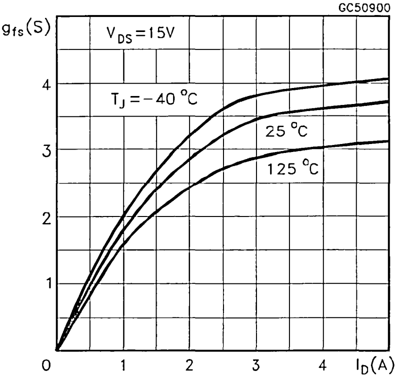
Output Characteristics



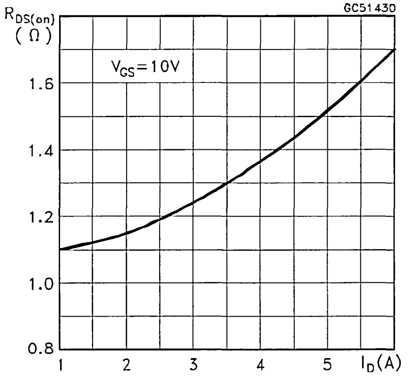
Transfer Characteristics



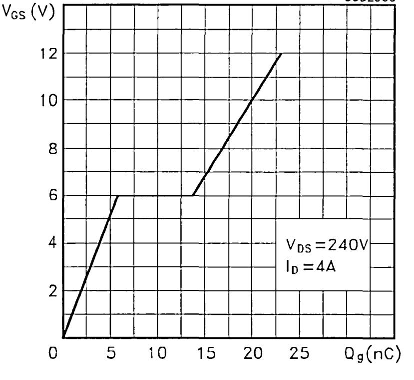
Transconductance



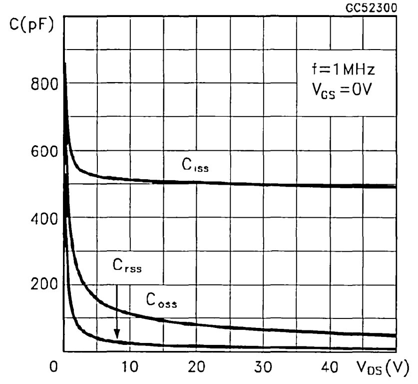
Static Drain-source On Resistance



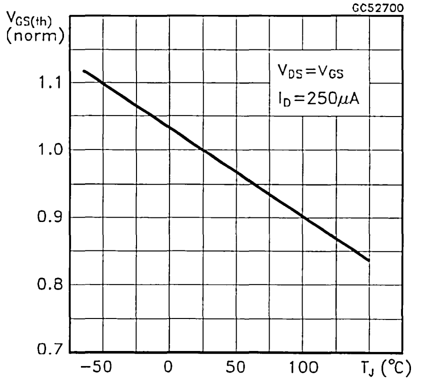
Gate Charge vs Gate-source Voltage



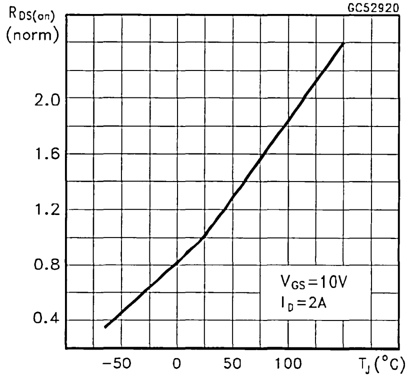
Capacitance Variations



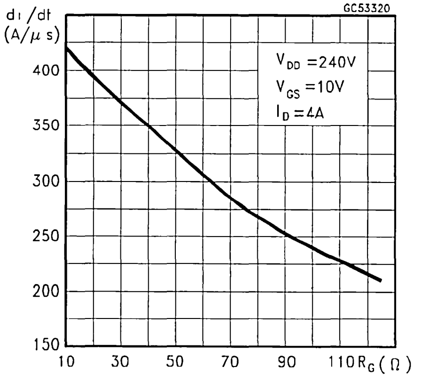
Normalized Gate Threshold Voltage vs Temperature



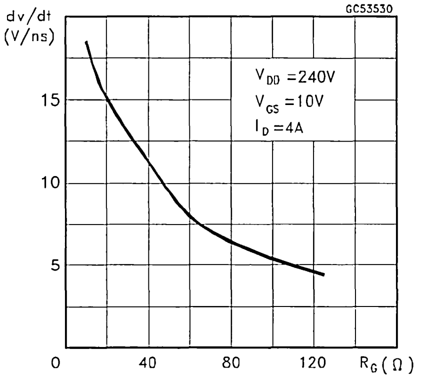
Normalized On Resistance vs Temperature



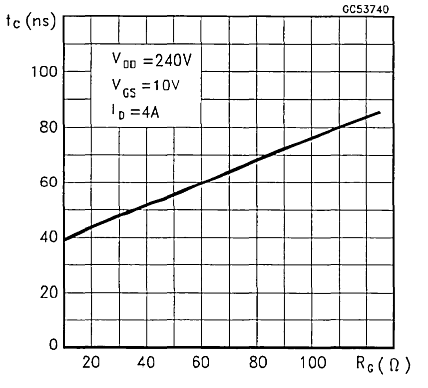
Turn-on Current Slope



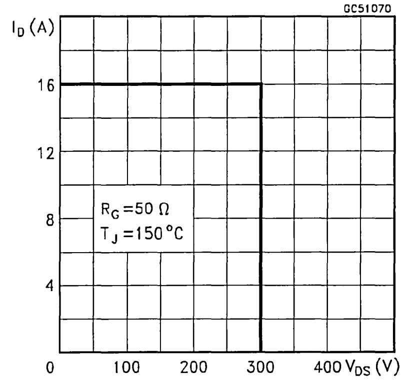
Turn-off Drain-source Voltage Slope



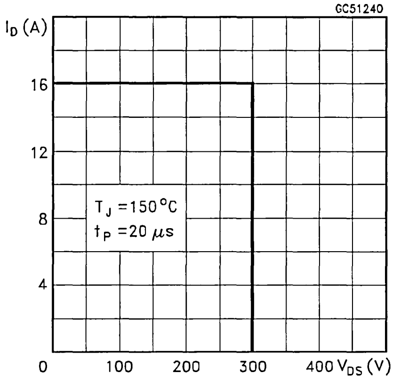
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

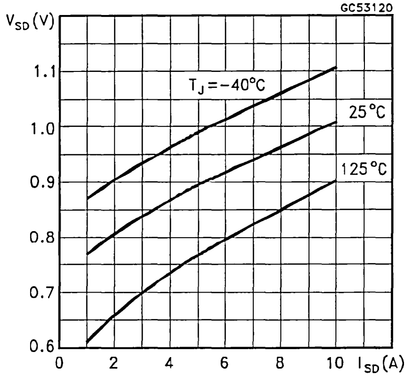


Fig. 1: Unclamped Inductive Load Test Circuits

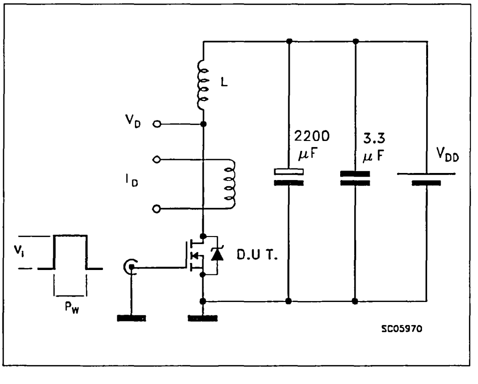


Fig. 2: Unclamped Inductive Waveforms

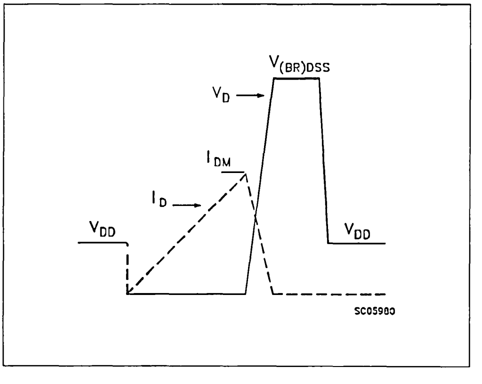


Fig. 3: Switching Times Test Circuits For Resistive Load

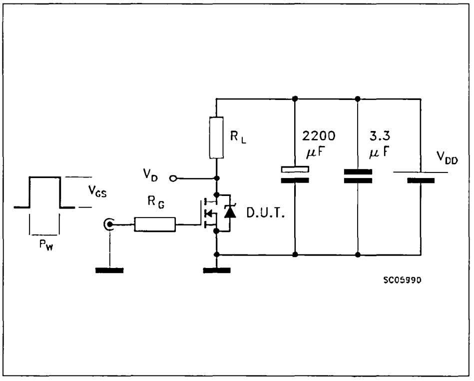


Fig. 4: Gate Charge Test Circuit

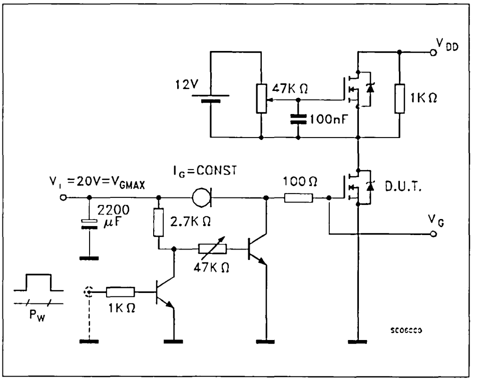
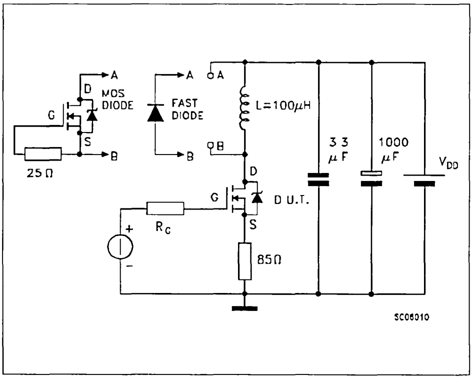


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



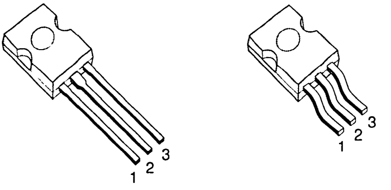
SGS-THOMSON
MICROELECTRONICS

STK4N30L

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK4N30L	300 V	< 1.4 Ω	4.2 A

- TYPICAL $R_{DS(on)}$ = 1.25 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

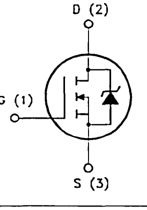


SOT-82 SOT-194 (option)

APPLICATIONS

- HIGH SPEED SWITCHING
- UNINTERRUPTIBLE POWER SUPPLY (UPS)
- MOTOR CONTROL, AUDIO AMPLIFIERS
- INDUSTRIAL ACTUATORS
- DC-DC & DC-AC CONVERTERS FOR TELECOM, INDUSTRIAL AND CONSUMER ENVIRONMENT
- PARTICULARLY SUITABLE FOR ELECTRONIC FLUORESCENT LAMP BALLASTS

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	300	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	300	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	4.2	A
I_D	Drain Current (continuous) at T_c = 100 °C	2.6	A
I_{DM}(•)	Drain Current (pulsed)	16	A
P_{tot}	Total Dissipation at T_c = 25 °C	60	W
	Derating Factor	0.48	W/°C
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	2.08	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	80	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Case-sink	Typ	0.7	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		275	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	4.2	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	32	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	1	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	2.6	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	300			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	1	1.6	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 5 V I_D = 2.5 A V_{GS} = 5 V I_D = 2.5 A T_c = 100°C		1.25	1.4 1.8	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	4			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 2.5 A	2	5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		580 75 14	780 120 25	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 150 V I_D = 2 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 3)		70 165	90 215	ns ns
$(dI/dt)_{on}$	Turn-on Current Slope	V_{DD} = 240 V I_D = 4 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		115		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 240 V I_D = 4 A V_{GS} = 5 V		16 5 7	22	nC nC nC

SWITCHING OFF

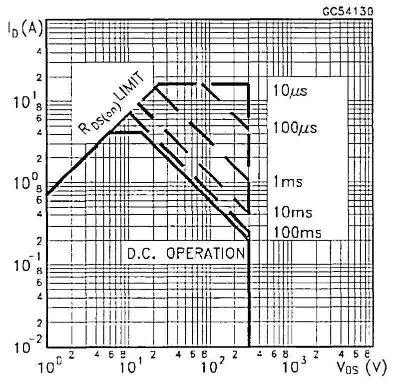
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 240 V I_D = 4 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		60 50 120	80 65 160	ns ns ns

SOURCE DRAIN DIODE

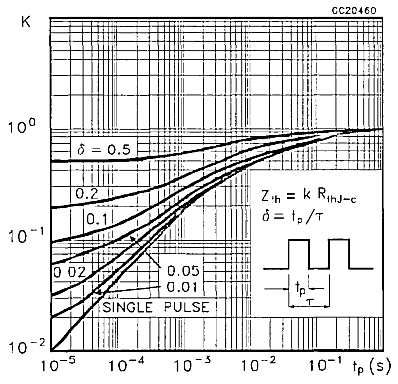
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				5 20	A A
V_{SD} (∗)	Forward On Voltage	I_{SD} = 5 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 5 A dI/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		360 2.4 13		ns µC A

(∗) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

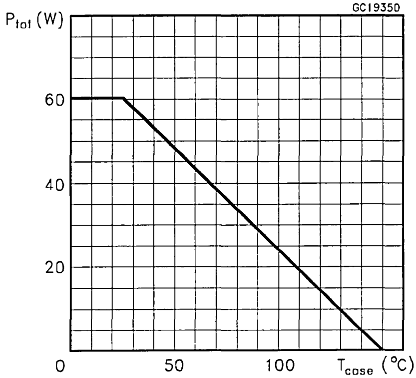
Safe Operating Area



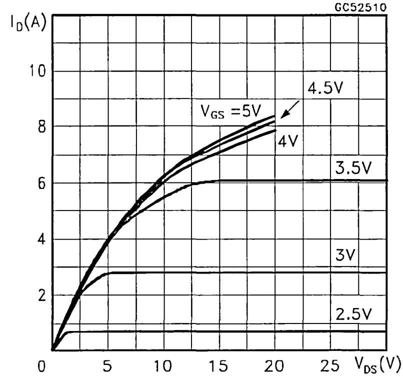
Thermal Impedance



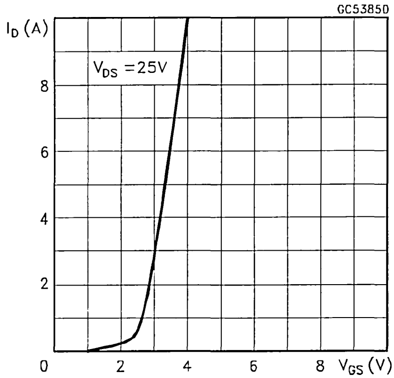
Derating Curve



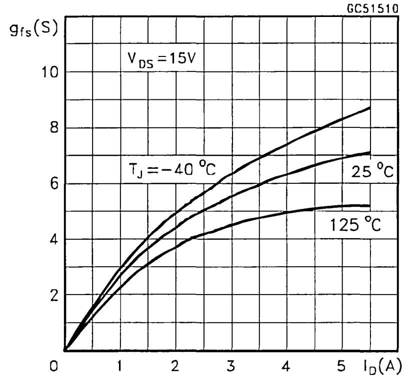
Output Characteristics



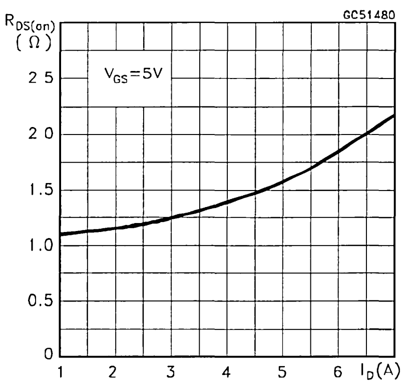
Transfer Characteristics



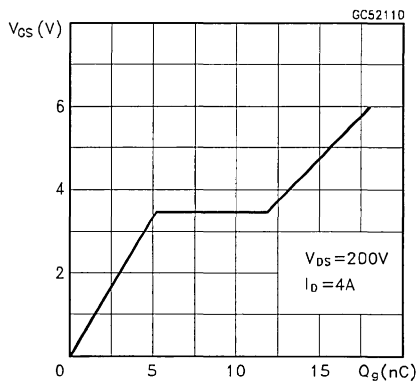
Transconductance



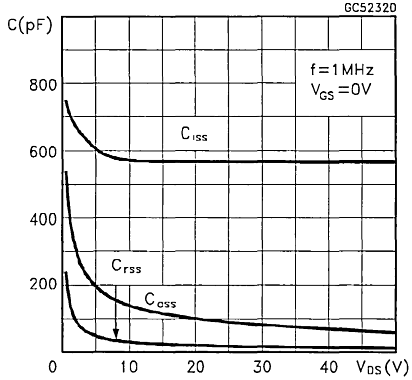
Static Drain-source On Resistance



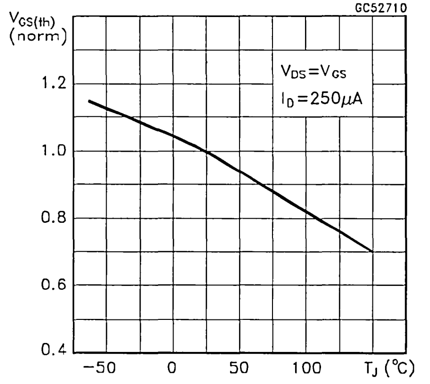
Gate Charge vs Gate-source Voltage



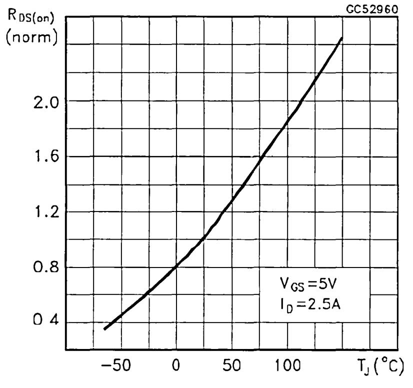
Capacitance Variations



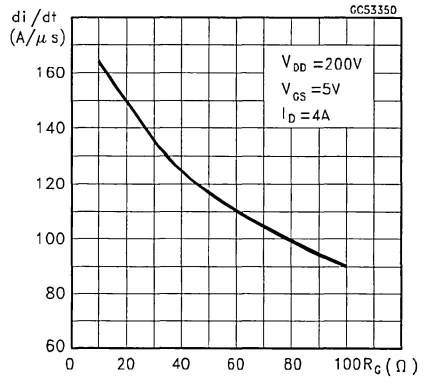
Normalized Gate Threshold Voltage vs Temperature



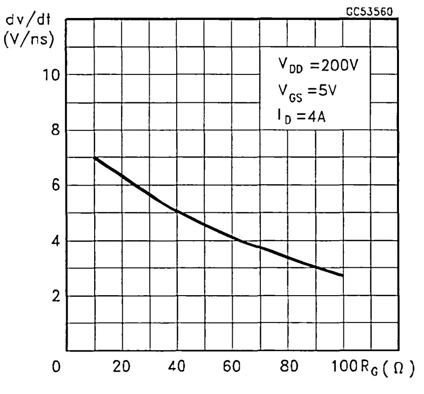
Normalized On Resistance vs Temperature



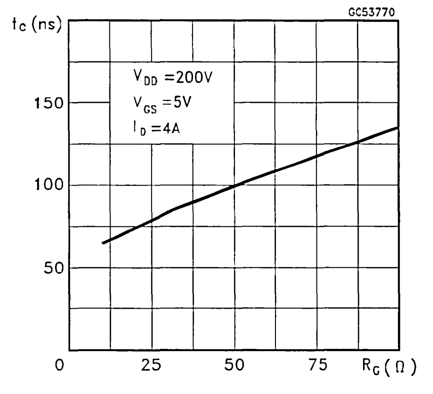
Turn-on Current Slope



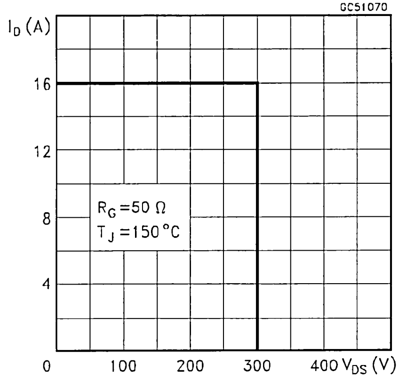
Turn-off Drain-source Voltage Slope



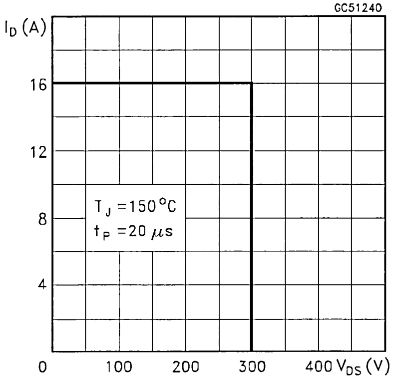
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

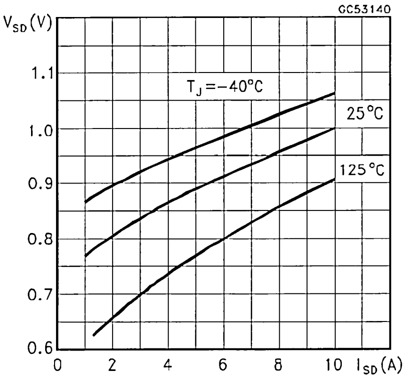


Fig. 1: Unclamped Inductive Load Test Circuits

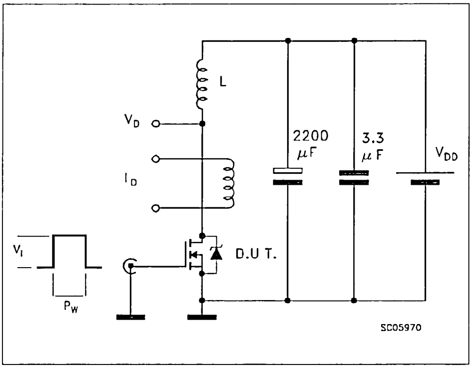


Fig. 2: Unclamped Inductive Waveforms

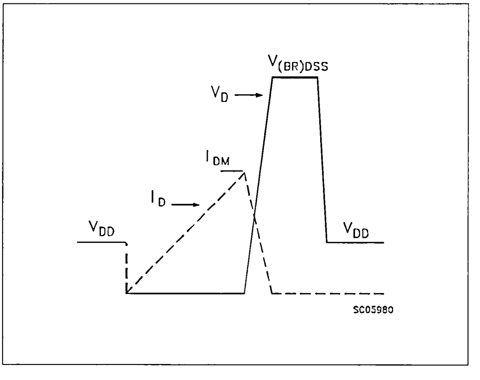


Fig. 3: Switching Times Test Circuits For Resistive Load

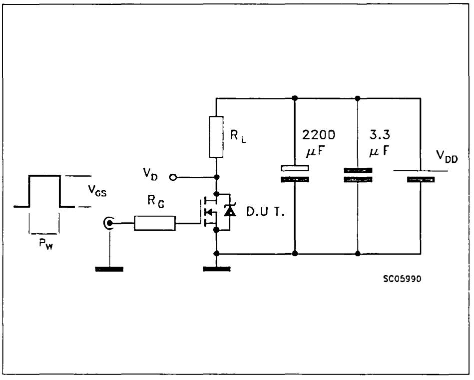


Fig. 4: Gate Charge Test Circuit

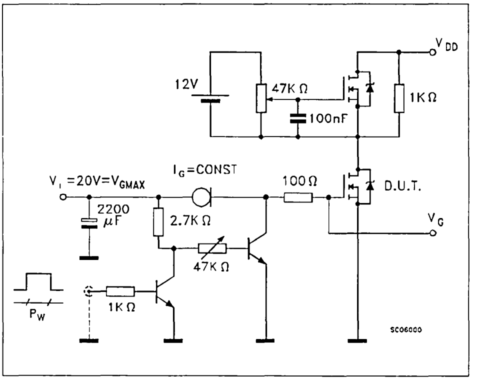
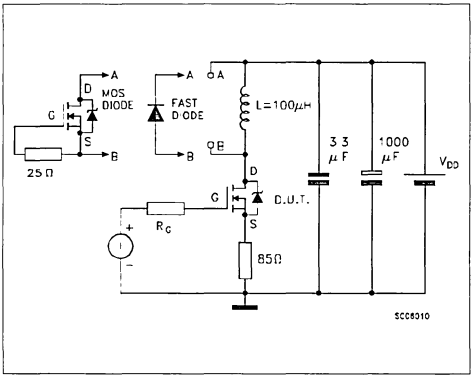


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON MICROELECTRONICS

STK4N40

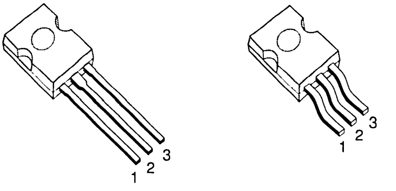
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK4N40	400 V	< 2.2 Ω	3.7 A

- TYPICAL $R_{DS(on)}$ = 1.65 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS

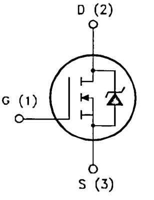
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



SOT-82

SOT-194 (option)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	400	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	400	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	3.7	A
I_D	Drain Current (continuous) at T_c = 100 °C	2.3	A
I_{DM}(•)	Drain Current (pulsed)	16	A
P_{tot}	Total Dissipation at T_c = 25 °C	60	W
	Derating Factor	0.48	W/°C
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	2.08	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	80	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Case-sink	Typ	0.7	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		275	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	3.7	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	95	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	6.7	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	2.3	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	400			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 2 A V_{GS} = 10V I_D = 2 A T_c = 100°C		1.65	2.2 4.4	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	3.7			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 2 A	1	2.1		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		350 68 32	450 90 45	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 175 V I_D = 2 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		25 70	33 90	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 320 V I_D = 4 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		110		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 320 V I_D = 4 A V_{GS} = 10 V		25 7 11	35	nC nC nC

SWITCHING OFF

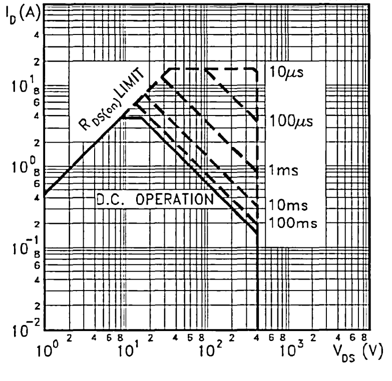
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 320 V I_D = 4 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		50 28 75	65 35 95	ns ns ns

SOURCE DRAIN DIODE

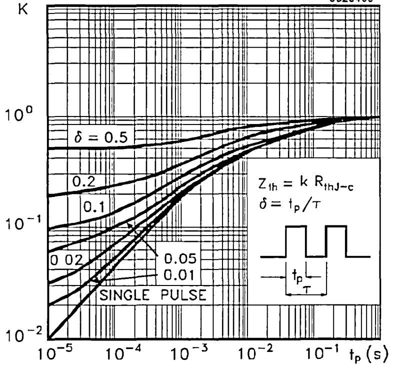
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				3.7 16	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 3.7 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 3.7 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		400 5.9 29.5		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

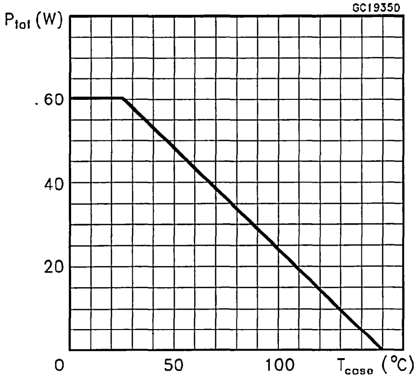
Safe Operating Area



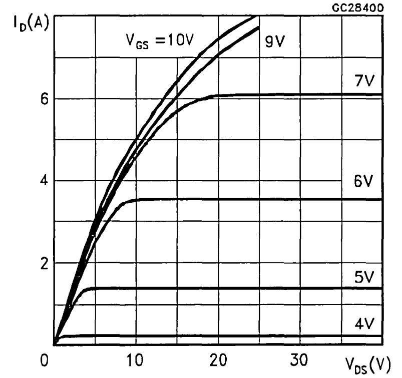
Thermal Impedance



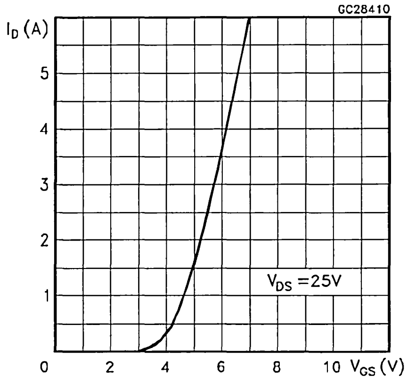
Derating Curve



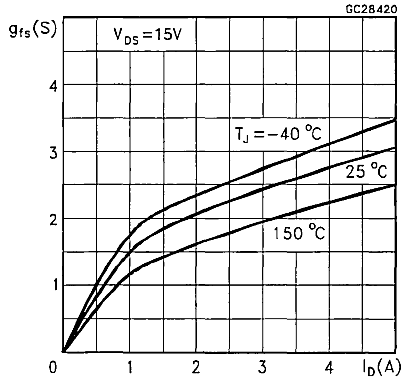
Output Characteristics



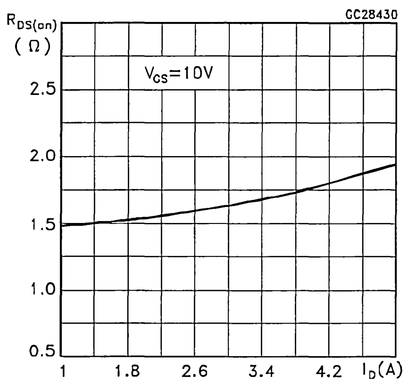
Transfer Characteristics



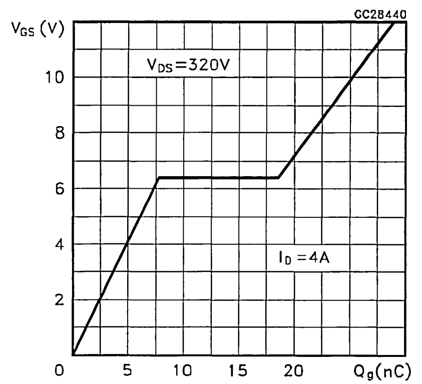
Transconductance



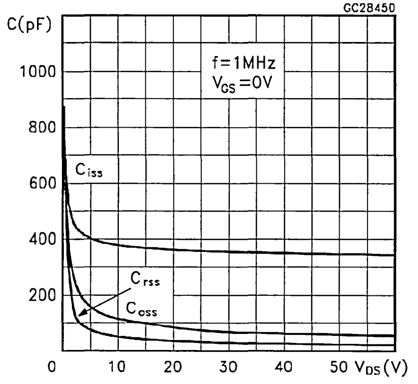
Static Drain-source On Resistance



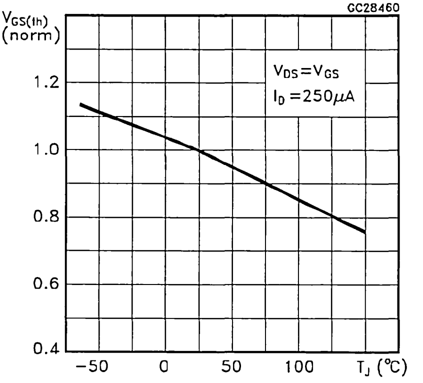
Gate Charge vs Gate-source Voltage



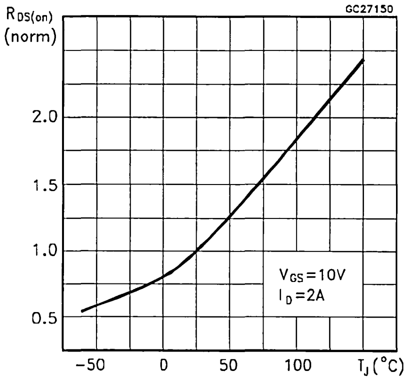
Capacitance Variations



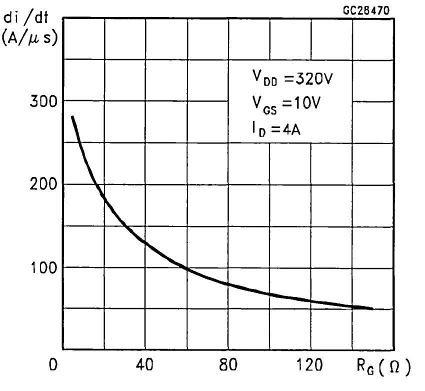
Normalized Gate Threshold Voltage vs Temperature



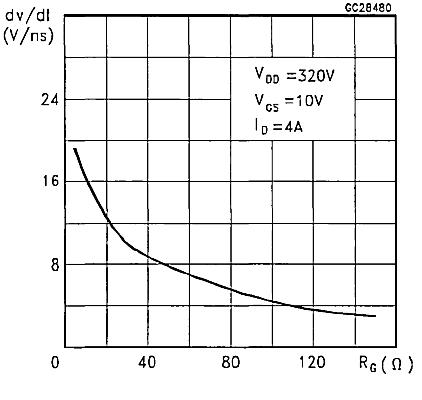
Normalized On Resistance vs Temperature



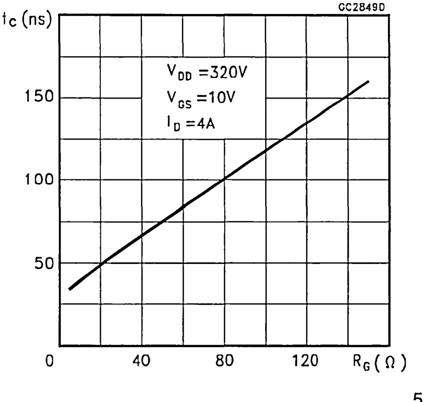
Turn-on Current Slope



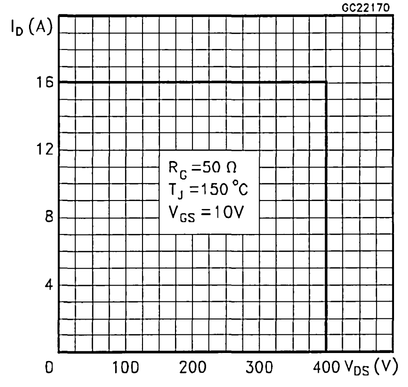
Turn-off Drain-source Voltage Slope



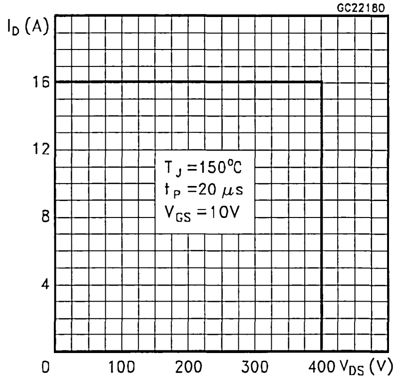
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

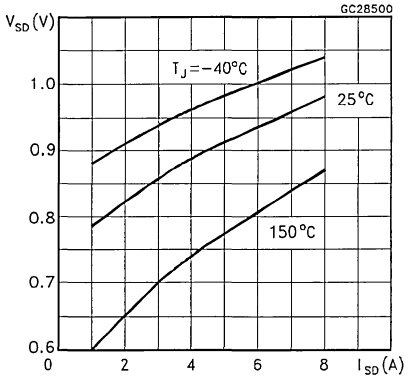


Fig. 1: Unclamped Inductive Load Test Circuits

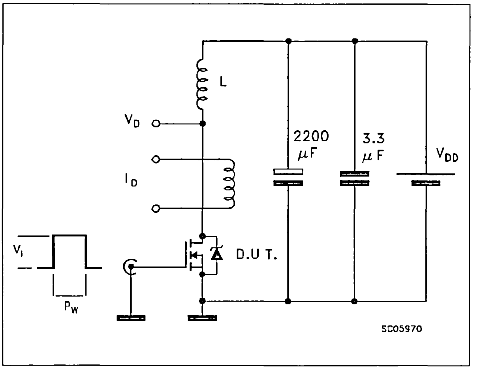


Fig. 2: Unclamped Inductive Waveforms

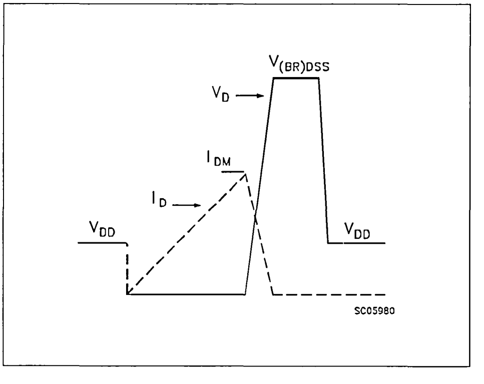


Fig. 3: Switching Times Test Circuits For Resistive Load

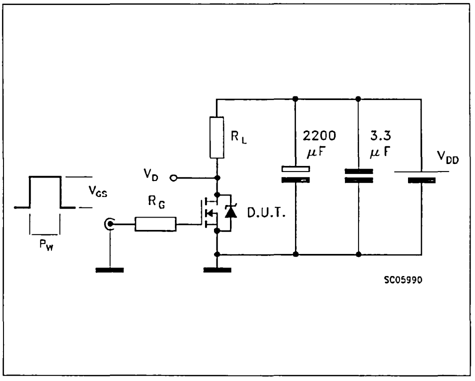


Fig. 4: Gate Charge Test Circuit

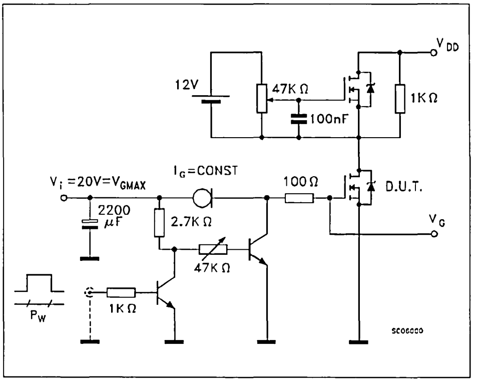
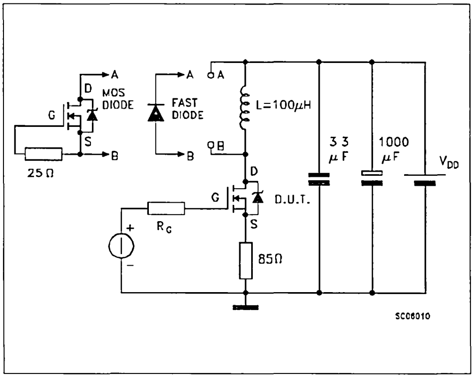


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON
MICROELECTRONICS

STK6N20

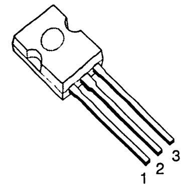
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK6N20	200 V	< 0.7 Ω	6 A

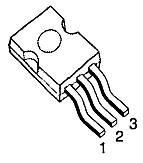
- TYPICAL $R_{DS(on)}$ = 0.55 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- UNINTERRUPTIBLE POWER SUPPLY (UPS)
- MOTOR CONTROL, AUDIO AMPLIFIERS
- INDUSTRIAL ACTUATORS
- DC-DC & DC-AC CONVERTERS FOR TELECOM, INDUSTRIAL AND CONSUMER ENVIRONMENT

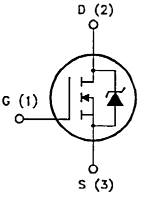


SOT-82



SOT-194 (option)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	200	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	200	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	6	A
I_D	Drain Current (continuous) at T_c = 100 °C	4	A
I_{DM}(•)	Drain Current (pulsed)	24	A
P_{tot}	Total Dissipation at T_c = 25 °C	55	W
	Derating Factor	0.44	W/°C
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	2.27	$^oC/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	80	$^oC/W$
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.7	$^oC/W$
T_l	Maximum Lead Temperature For Soldering Purpose		275	^oC

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	6	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25\ ^oC$, $I_D = I_{AR}$, $V_{DD} = 50$ V)	20	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	5	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100\ ^oC$, pulse width limited by T_j max, $\delta < 1\%$)	4	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25\ ^oC$ unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250\ \mu A$ $V_{GS} = 0$	200			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125\ ^oC$			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250\ \mu A$	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 3$ A $V_{GS} = 10V$ $I_D = 3$ A $T_c = 100^oC$		0.55	0.7 1.4	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	6			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 3$ A	1.5	3.5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		460 90 20	600 120 30	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 100 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		30 70	45 100	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 160 V I_D = 6 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		155		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 160 V I_D = 6 A V_{GS} = 10 V		20 6 8	30	nC nC nC

SWITCHING OFF

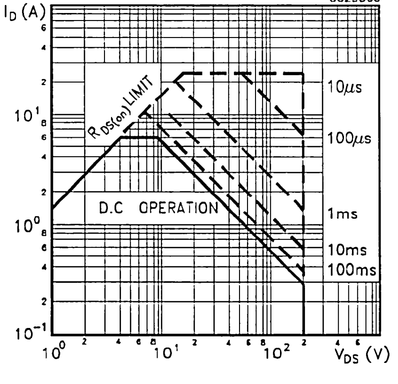
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 160 V I_D = 6 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		40 25 65	60 35 95	ns ns ns

SOURCE DRAIN DIODE

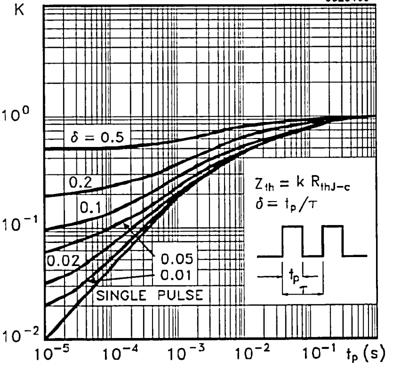
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				6 24	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 6 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 6 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		170 1 12		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

Safe Operating Area

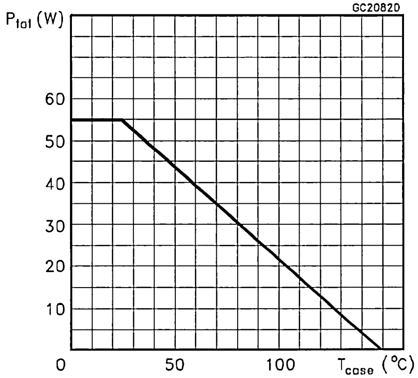


Thermal Impedance

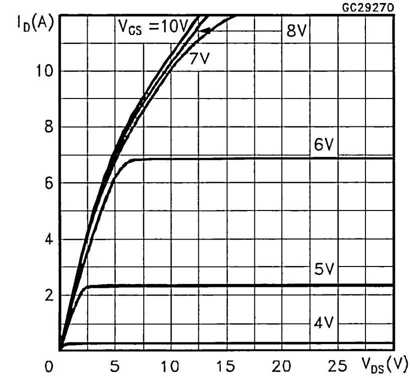


SGS-THOMSON MICROELECTRONICS

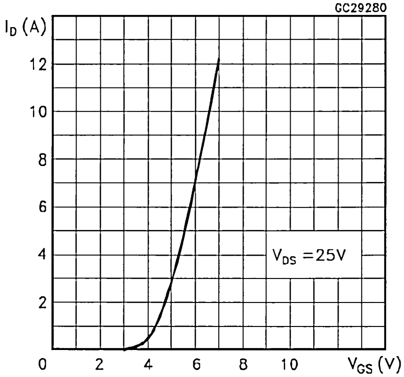
Derating Curve



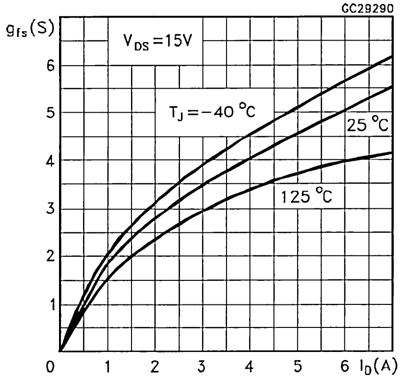
Output Characteristics



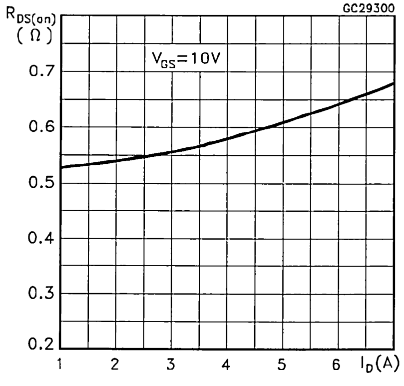
Transfer Characteristics



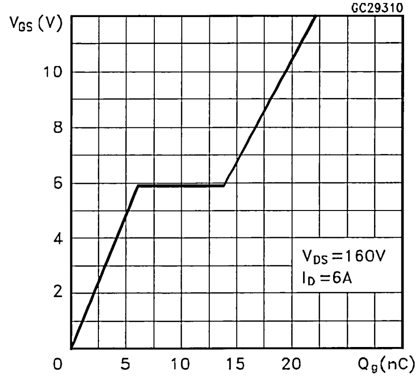
Transconductance



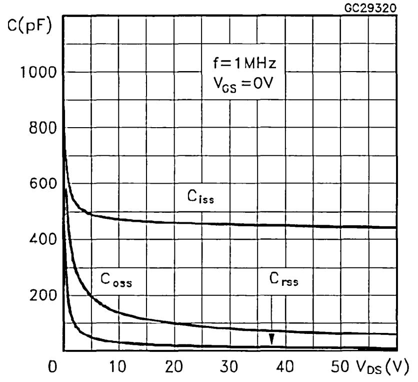
Static Drain-source On Resistance



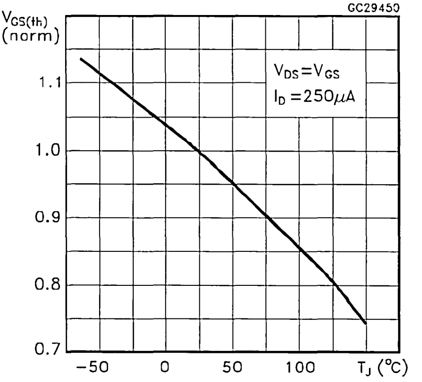
Gate Charge vs Gate-source Voltage



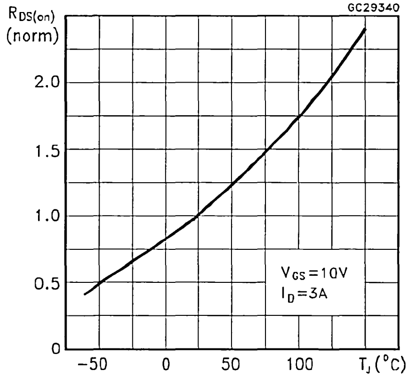
Capacitance Variations



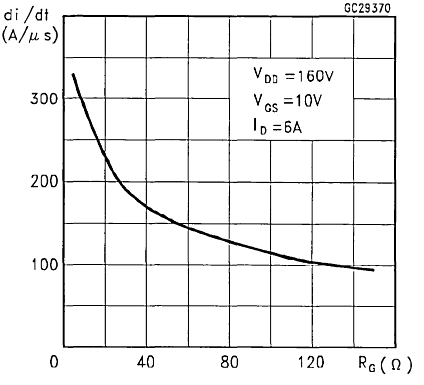
Normalized Gate Threshold Voltage vs Temperature



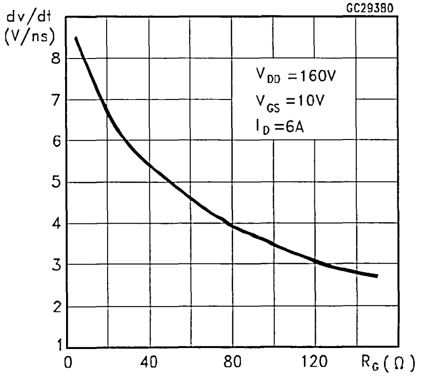
Normalized On Resistance vs Temperature



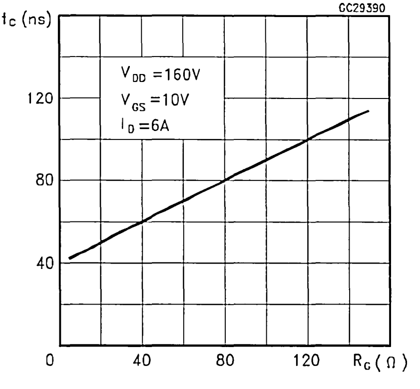
Turn-on Current Slope



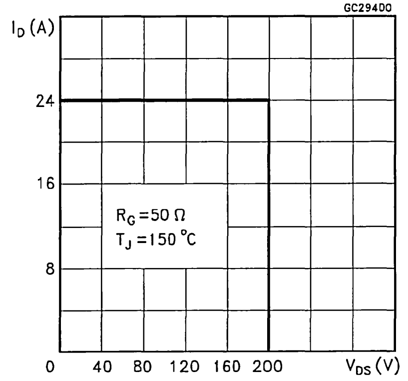
Turn-off Drain-source Voltage Slope



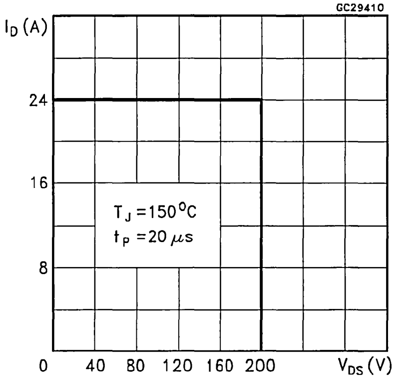
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

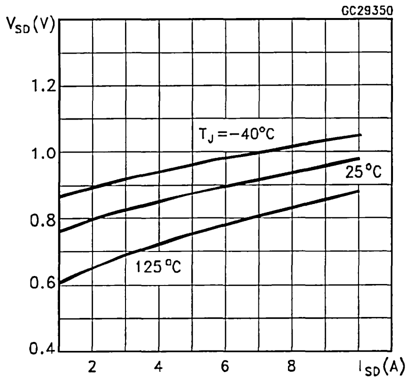


Fig. 1: Unclamped Inductive Load Test Circuits

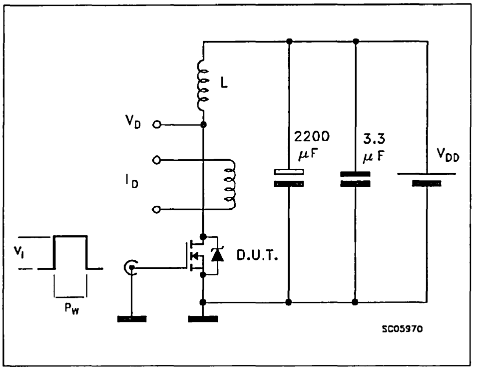


Fig. 2: Unclamped Inductive Waveforms

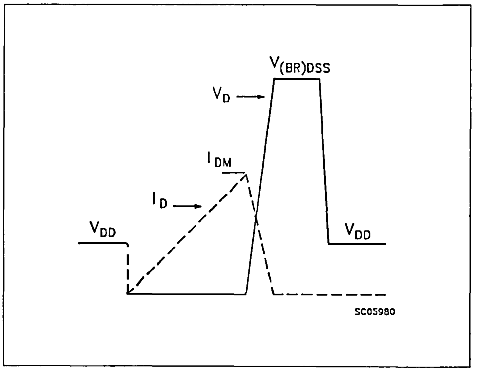


Fig. 3: Switching Times Test Circuits For Resistive Load

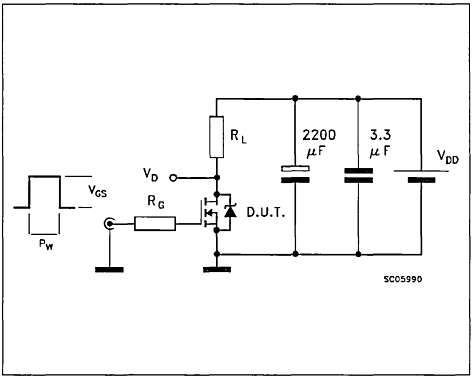


Fig. 4: Gate Charge Test Circuit

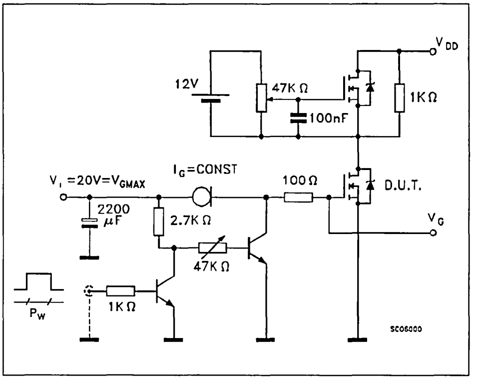
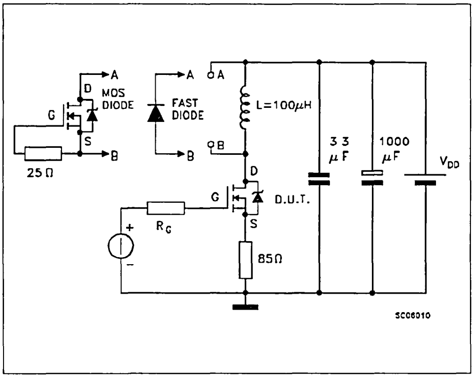


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



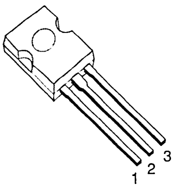
SGS-THOMSON
MICROELECTRONICS

STK9N10

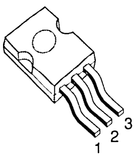
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK9N10	100 V	< 0.3 Ω	9 A

- TYPICAL $R_{DS(on)}$ = 0.23 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION



SOT-82

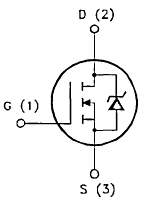


SOT-194 (option)

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	100	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	100	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	9	A
I_D	Drain Current (continuous) at T_c = 100 °C	6	A
I_{DM}(•)	Drain Current (pulsed)	36	A
P_{tot}	Total Dissipation at T_c = 25 °C	50	W
	Derating Factor	0.33	W/°C
T_{stg}	Storage Temperature	-65 to 175	°C
T_j	Max. Operating Junction Temperature	175	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	3.0	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	80	°C/W
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.7	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		275	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, δ < 1%)	9	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	30	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, δ < 1%)	7	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, δ < 1%)	6	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	100			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 4.5 A V_{GS} = 10V I_D = 4.5 A T_c = 100°C		0.23	0.3 0.6	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	9			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 4.5 A	2	4		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		330 90 25	450 120 40	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 50 V I_D = 4.5 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		10 50	15 75	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 80 V I_D = 9 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		440		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 80 V I_D = 9 A V_{GS} = 10 V		15 7 4	25	nC nC nC

SWITCHING OFF

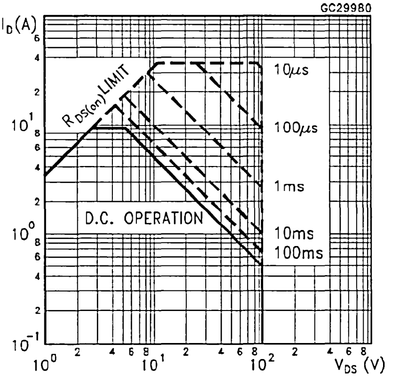
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 80 V I_D = 9 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		15 25 50	25 35 70	ns ns ns

SOURCE DRAIN DIODE

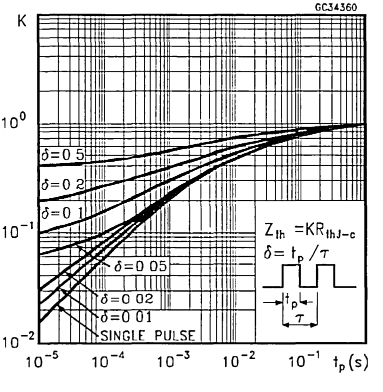
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				9 36	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 9 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 9 A di/dt = 100 A/µs V_{DD} = 20 V T_j = 150 °C (see test circuit, figure 5)		80 0.2 5		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

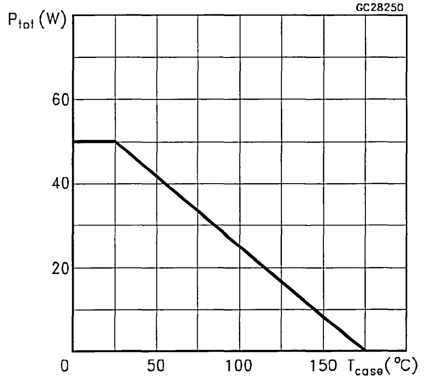
Safe Operating Area



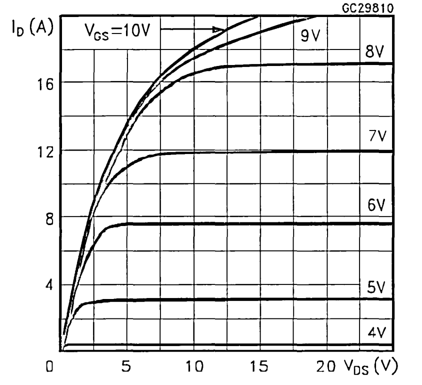
Thermal Impedance



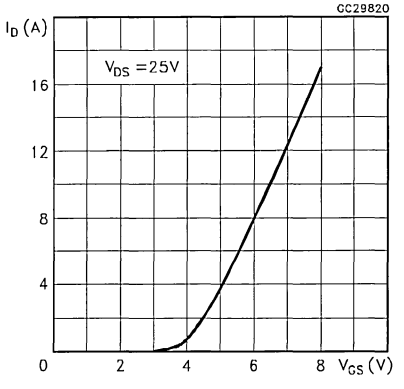
Derating Curve



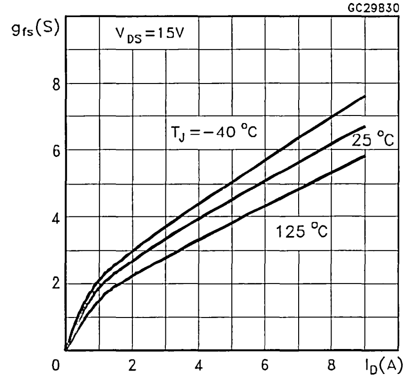
Output Characteristics



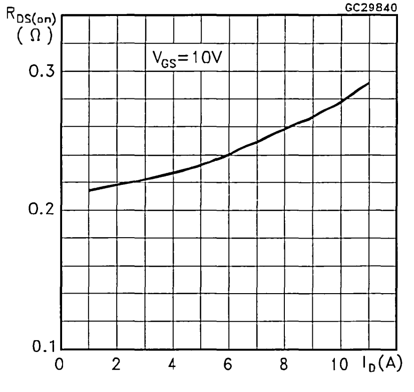
Transfer Characteristics



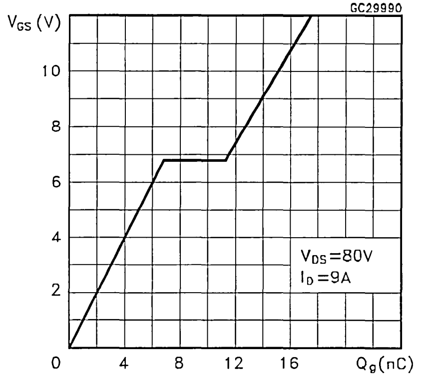
Transconductance



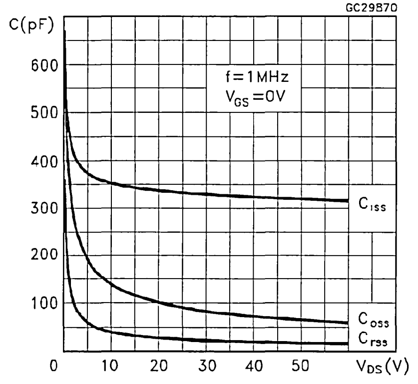
Static Drain-source On Resistance



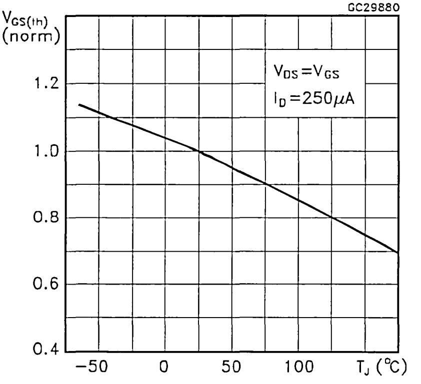
Gate Charge vs Gate-source Voltage



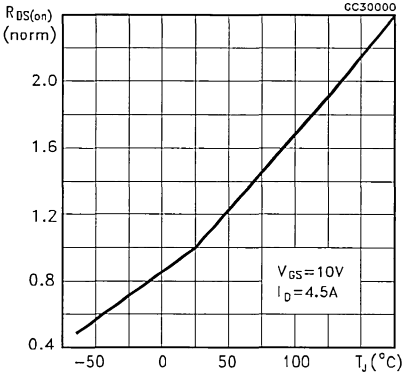
Capacitance Variations



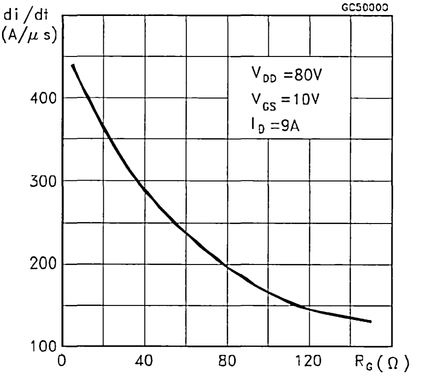
Normalized Gate Threshold Voltage vs Temperature



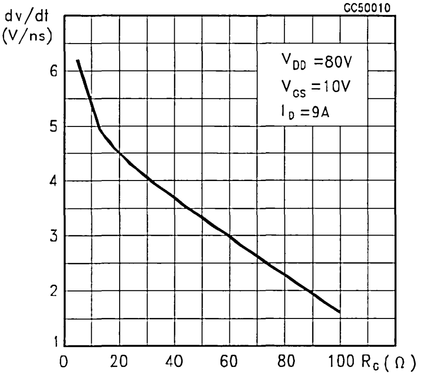
Normalized On Resistance vs Temperature



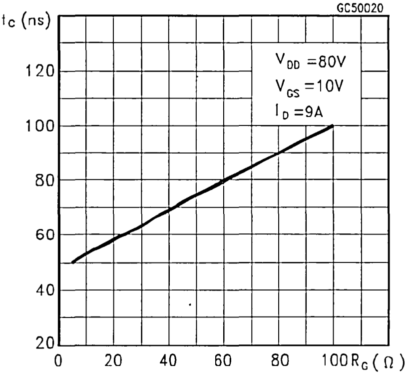
Turn-on Current Slope



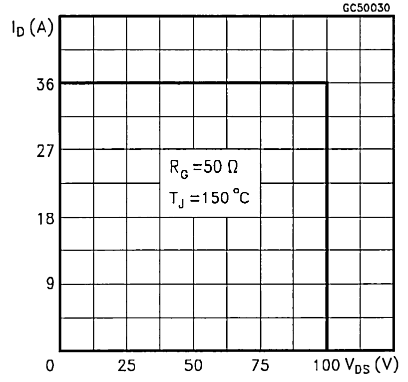
Turn-off Drain-source Voltage Slope



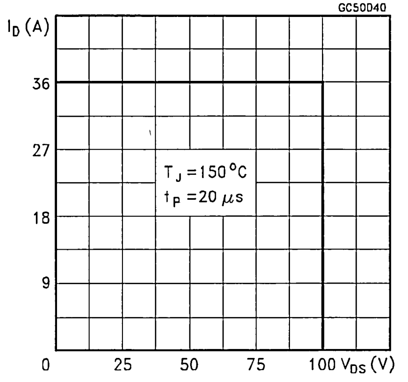
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

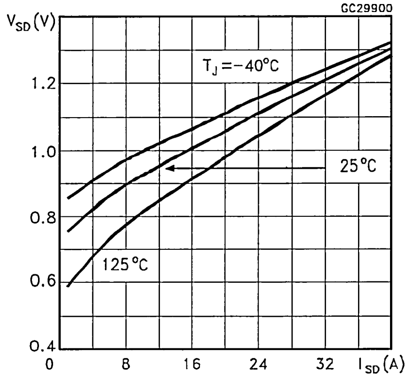


Fig. 1: Unclamped Inductive Load Test Circuits

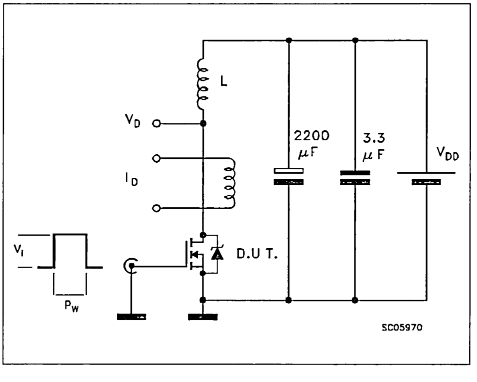


Fig. 2: Unclamped Inductive Waveforms

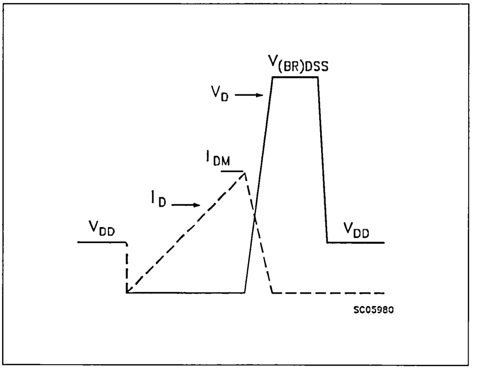


Fig. 3: Switching Times Test Circuits For Resistive Load

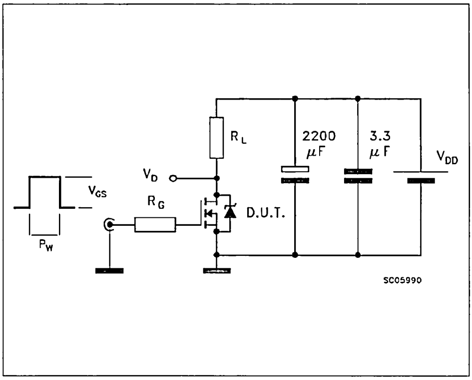


Fig. 4: Gate Charge Test Circuit

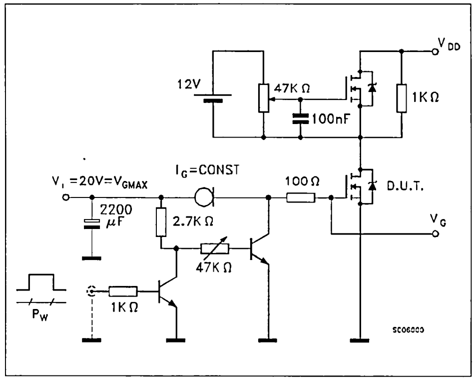
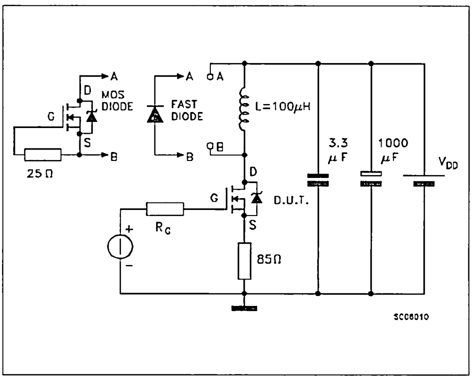


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



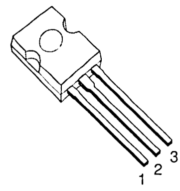
SGS-THOMSON MICROELECTRONICS

STK12N05L
STK12N06L

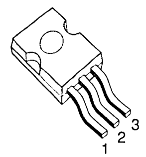
N - CHANNEL ENHANCEMENT MODE LOW THRESHOLD POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK12N05L	50 V	< 0.15 Ω	12 A
STK12N06L	60 V	< 0.15 Ω	12 A

- TYPICAL $R_{DS(on)}$ = 0.115 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- LOGIC LEVEL COMPATIBLE INPUT
- 175°C OPERATING TEMPERATURE FOR STANDARD PACKAGE
- APPLICATION ORIENTED CHARACTERIZATION



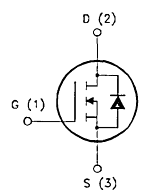
SOT-82



SOT-194 (option)

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STK12N05L	STK12N06L	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50	60	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50	60	V
V_{GS}	Gate-source Voltage	± 15		V
I_D	Drain Current (continuous) at T_c = 25 °C	12		A
I_D	Drain Current (continuous) at T_c = 100 °C	8		A
I_{DM}(•)	Drain Current (pulsed)	48		A
P_{tot}	Total Dissipation at T_c = 25 °C	50		W
	Derating Factor	0.33		W/°C
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	3	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	80	°C/W
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.7	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		275	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	12	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	30	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	7	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	8	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0 for **STK12N05L** for **STK12N06L**	 50 60			 V V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 15 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	1	1.6	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 5 V I_D = 6 A V_{GS} = 5 V I_D = 6 A T_c = 100°C		0.115	0.15 0.3	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	15			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 6 A	4	8		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		350 150 50	500 200 80	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 6 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 3)		55 180	80 260	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 12 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		120		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 12 A V_{GS} = 5 V		12 6 4	18	nC nC nC

SWITCHING OFF

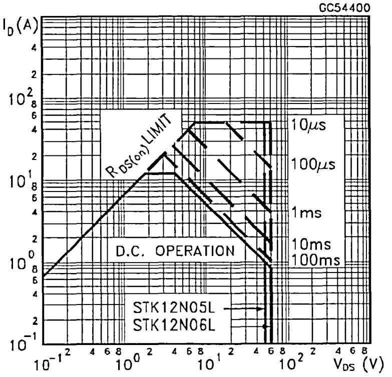
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 12 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		40 60 110	60 90 160	ns ns ns

SOURCE DRAIN DIODE

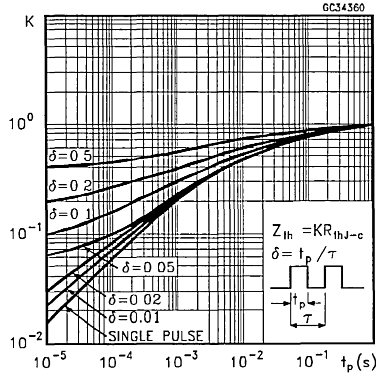
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				12 48	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 12 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 12 A di/dt = 100 A/µs V_{DD} = 25 V T_j = 150 °C (see test circuit, figure 5)		75 0.15 4		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

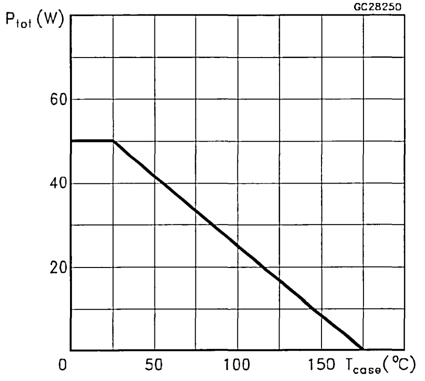
Safe Operating Areas



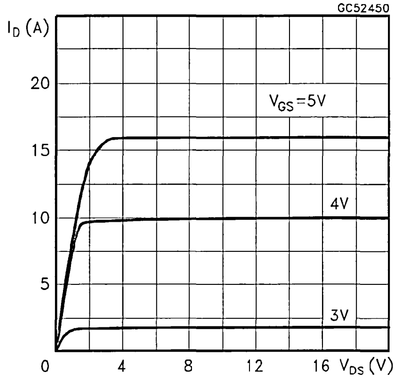
Thermal Impedance



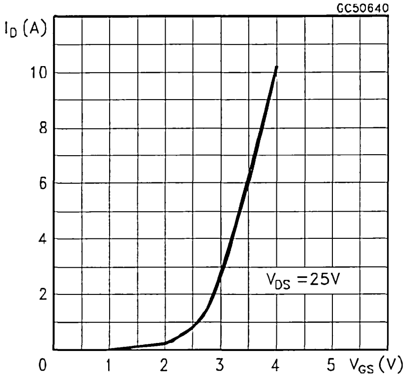
Derating Curve



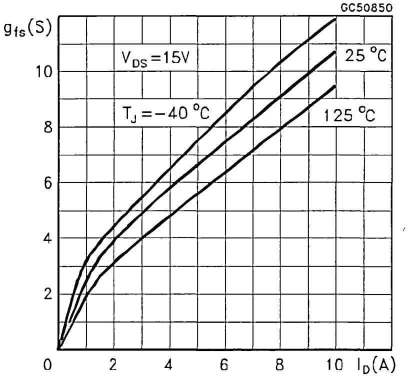
Output Characteristics



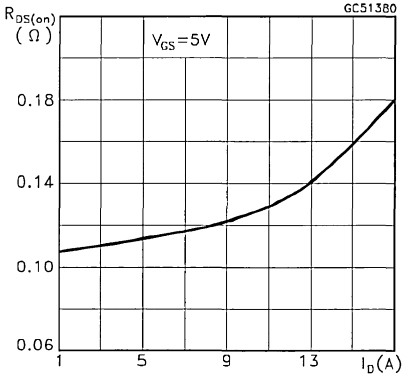
Transfer Characteristics



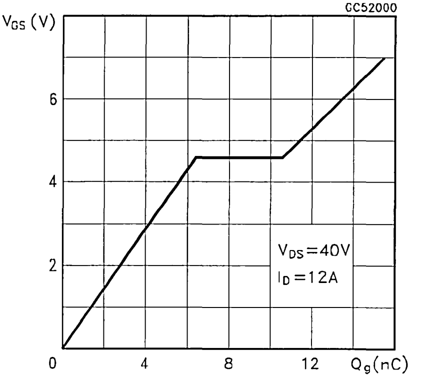
Transconductance



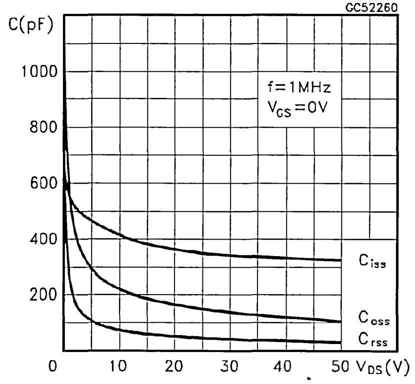
Static Drain-source On Resistance



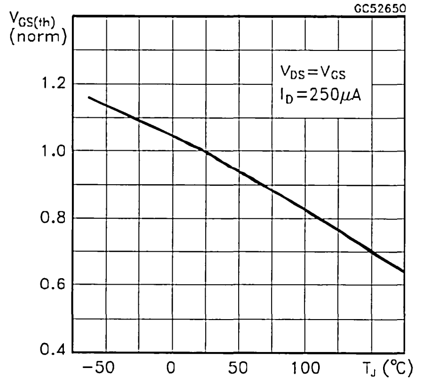
Gate Charge vs Gate-source Voltage



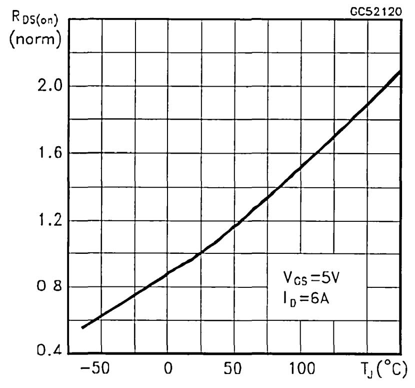
Capacitance Variations



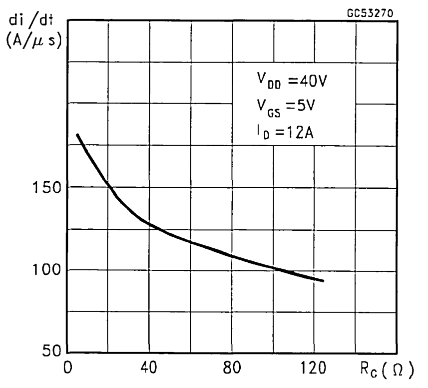
Normalized Gate Threshold Voltage vs Temperature



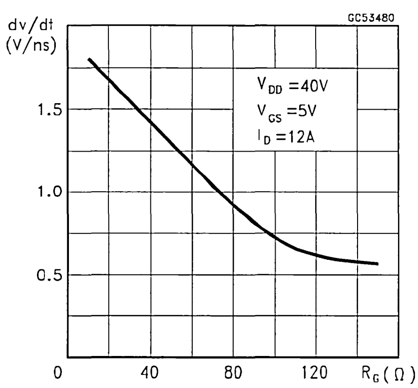
Normalized On Resistance vs Temperature



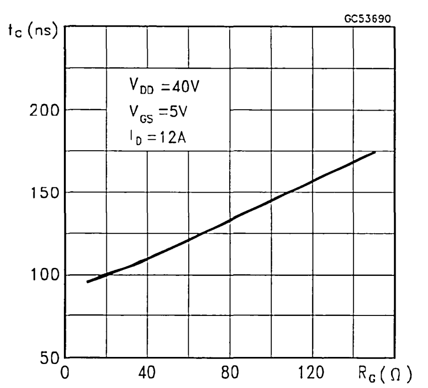
Turn-on Current Slope



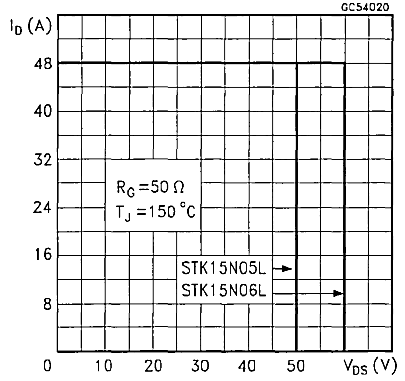
Turn-off Drain-source Voltage Slope



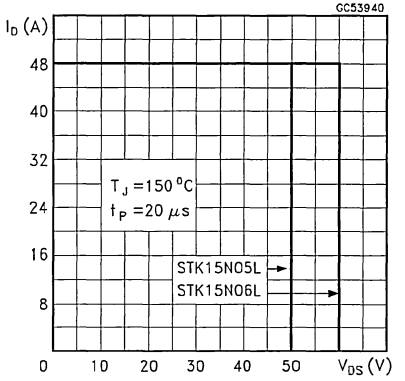
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

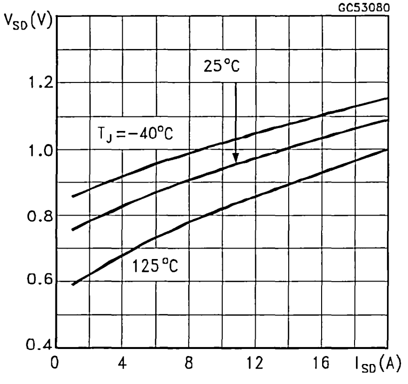


Fig. 1: Unclamped Inductive Load Test Circuits

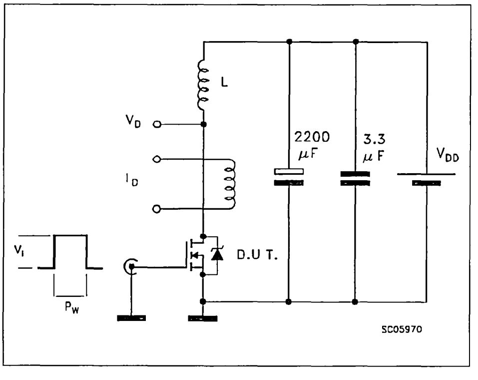


Fig. 2: Unclamped Inductive Waveforms

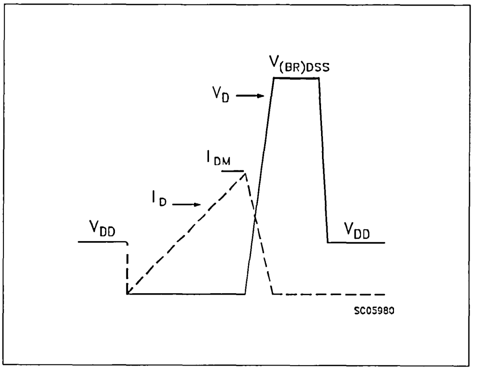


Fig. 3: Switching Times Test Circuits For Resistive Load

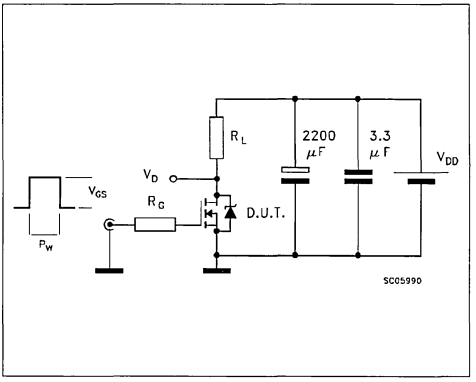


Fig. 4: Gate Charge Test Circuit

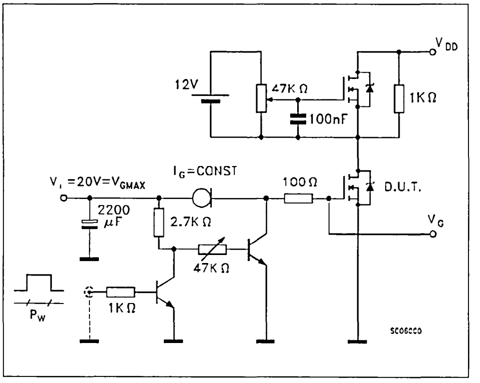
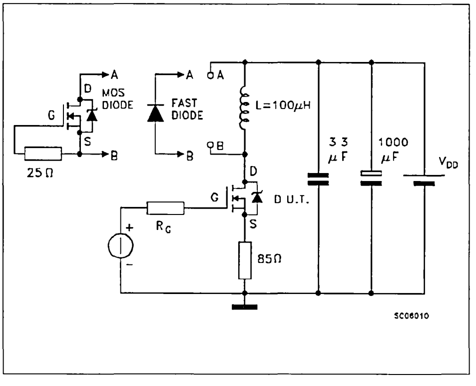


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON
MICROELECTRONICS

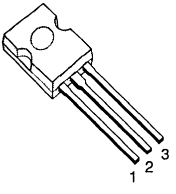
STK14N05
STK14N06

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

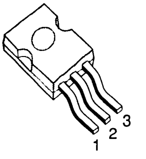
PRELIMINARY DATA

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK14N05	50 V	< 0.12 Ω	14 A
STK14N06	60 V	< 0.12 Ω	14 A

- TYPICAL $R_{DS(on)}$ = 0.1 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION



SOT-82

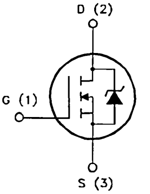


SOT-194 (option)

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STK14N05	STK14N06	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50	60	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50	60	V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	14		A
I_D	Drain Current (continuous) at T_c = 100 °C	10		A
I_{DM}(•)	Drain Current (pulsed)	56		A
P_{tot}	Total Dissipation at T_c = 25 °C	50		W
	Derating Factor	0.33		W/°C
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case Max	3.0	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient Max	80	°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink Typ	0.7	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	275	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	14	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	40	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	10	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	10	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0 for **STK14N05** for **STK14N06**	 50 60			 V V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 7 A V_{GS} = 10V I_D = 7 A T_c = 100°C		0.1	0.12 0.24	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	14			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 7 A	3	6		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		330 150 40	450 250 60	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 7 A R_G = 50 Ω V_{GS} = 10 V (see test circuit figure)		45 90	65 130	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 14 A R_G = 50 Ω V_{GS} = 10 V (see test circuit figure)		210		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 14 A V_{GS} = 10 V		15 7 5	25	nC nC nC

SWITCHING OFF

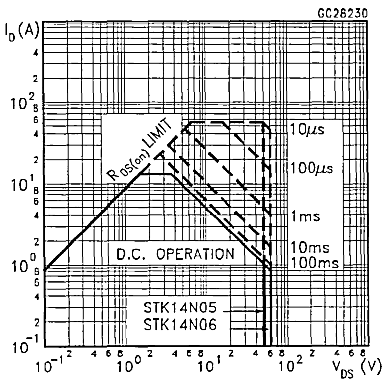
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 14 A R_{GS} = 50 Ω V_{GS} = 10 V (see test circuit figure)		35 45 85	50 65 120	ns ns ns

SOURCE DRAIN DIODE

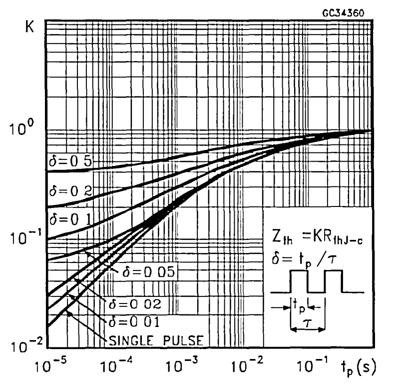
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				14 56	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 14 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 14 A di/dt = 100 A/μs V_{DD} = 25 V T_j = 150 °C		60 0.12 4		ns μC A

(*) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

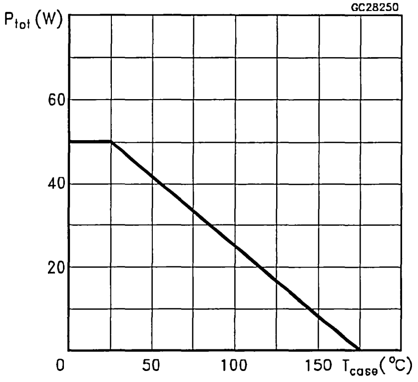
Safe Operating Area



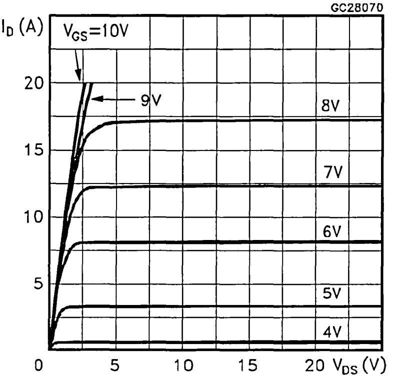
Thermal Impedance



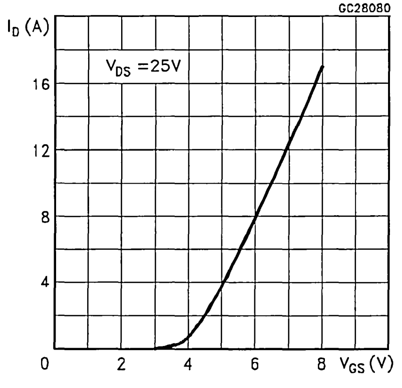
Derating Curve



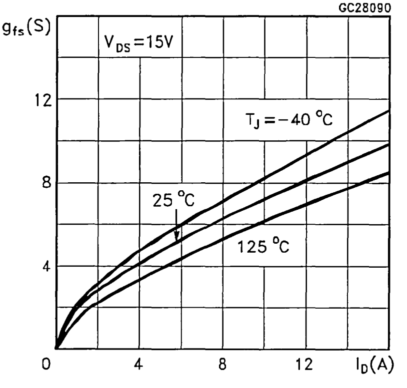
Output Characteristics



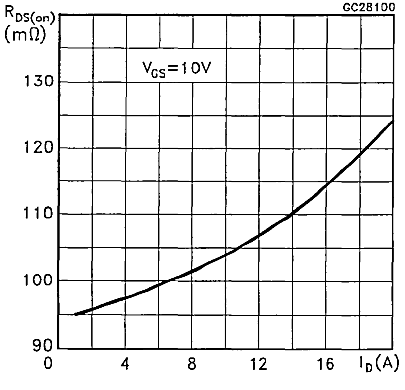
Transfer Characteristics



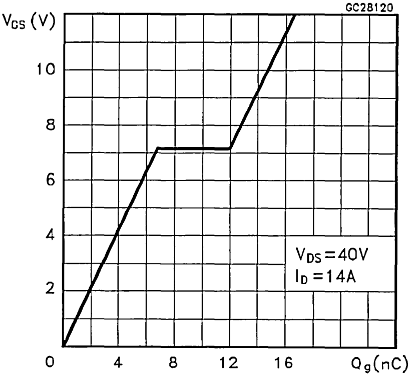
Transconductance



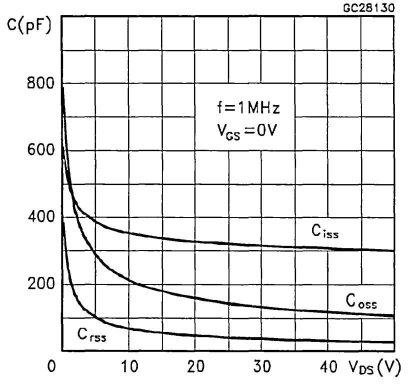
Static Drain-source On Resistance



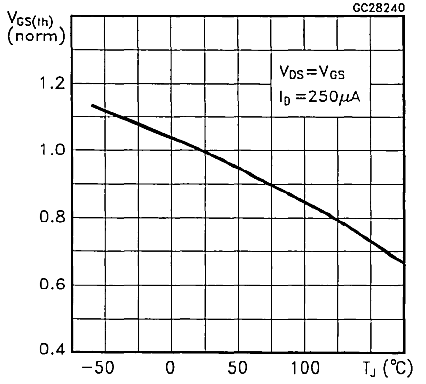
Gate Charge vs Gate-source Voltage



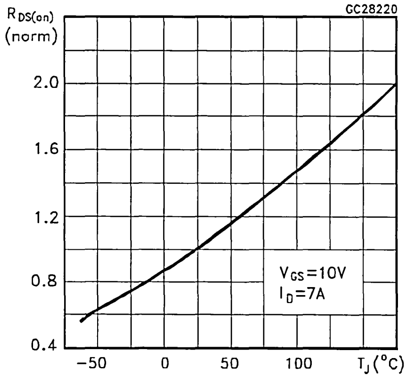
Capacitance Variations



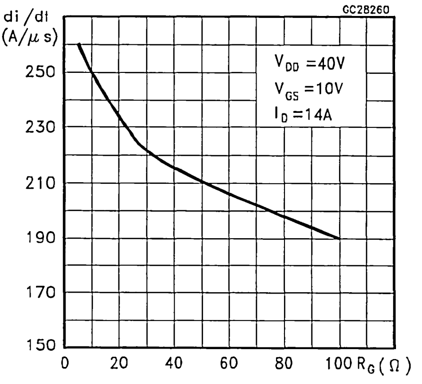
Normalized Gate Threshold Voltage vs Temperature



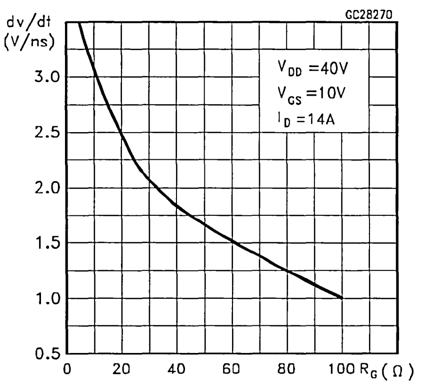
Normalized On Resistance vs Temperature



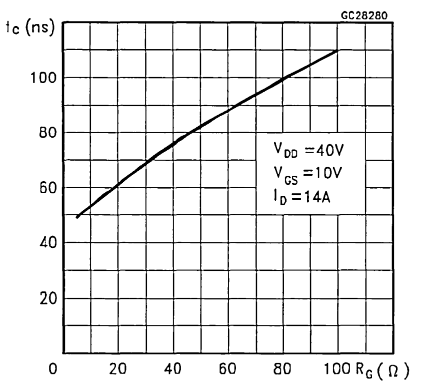
Turn-on Current Slope



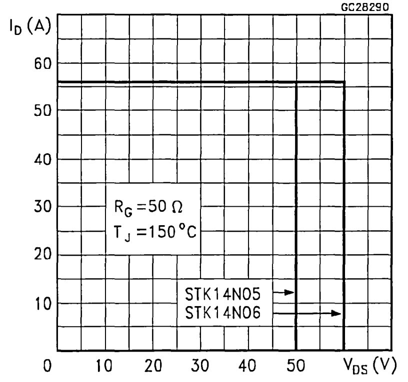
Turn-off Drain-source Voltage Slope



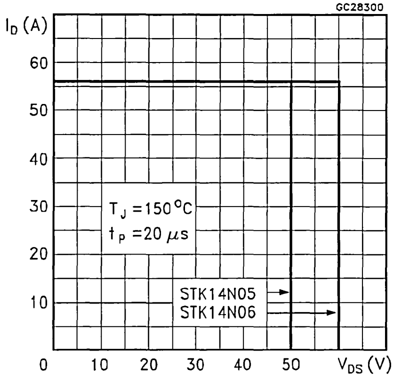
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

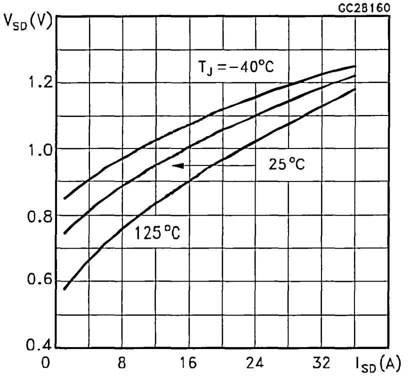


Fig. 1: Unclamped Inductive Load Test Circuits

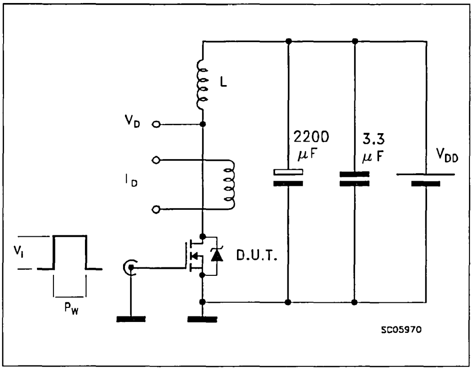


Fig. 2: Unclamped Inductive Waveforms

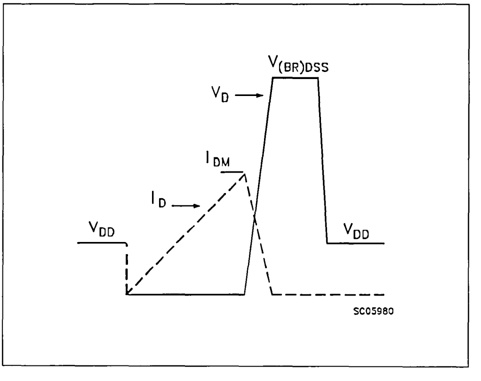


Fig. 3: Switching Times Test Circuits For Resistive Load

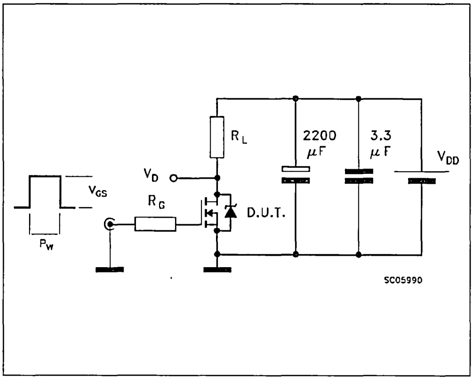


Fig. 4: Gate Charge Test Circuit

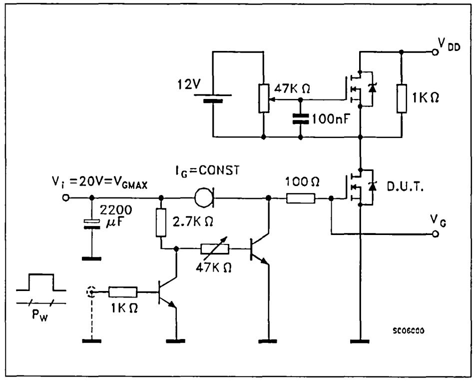
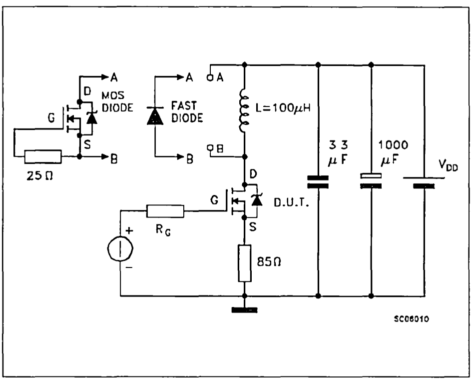


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



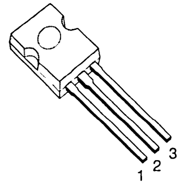
SGS-THOMSON MICROELECTRONICS

STK14N10

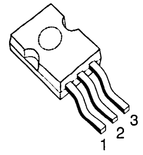
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK14N10	100 V	< 0.14 Ω	14 A

- TYPICAL $R_{DS(on)}$ = 0.095 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION



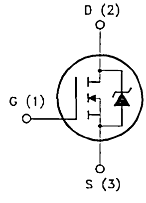
SOT-82



SOT-194 (option)

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	100	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	100	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	14	A
I_D	Drain Current (continuous) at T_c = 100 °C	9	A
I_{DM}(•)	Drain Current (pulsed)	56	A
P_{tot}	Total Dissipation at T_c = 25 °C	65	W
	Derating Factor	0.43	W/°C
T_{stg}	Storage Temperature	-65 to 175	°C
T_j	Max. Operating Junction Temperature	175	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	2.31	$^oC/W$
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	80	$^oC/W$
$R_{thj\text{-}amb}$	Thermal Resistance Case-sink	Typ	0.7	$^oC/W$
T_l	Maximum Lead Temperature For Soldering Purpose		275	^oC

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	14	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25\ ^oC$, $I_D = I_{AR}$, $V_{DD} = 25$ V)	60	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	15	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100\ ^oC$, pulse width limited by T_j max, $\delta < 1\%$)	9	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25\ ^oC$ unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250\ \mu A$ $V_{GS} = 0$	100			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125\ ^oC$			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (∗)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250\ \mu A$	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 7$ A $V_{GS} = 10V$ $I_D = 7$ A $T_c = 100^oC$		0.095	0.14 0.28	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	14			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (∗)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 7$ A	4	8		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		650 180 40	900 250 60	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 36 V I_D = 7 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 3)		20 120	30 170	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 80 V I_D = 14 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 5)		180		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 80 V I_D = 14 A V_{GS} = 10 V		27 8 11	40	nC nC nC

SWITCHING OFF

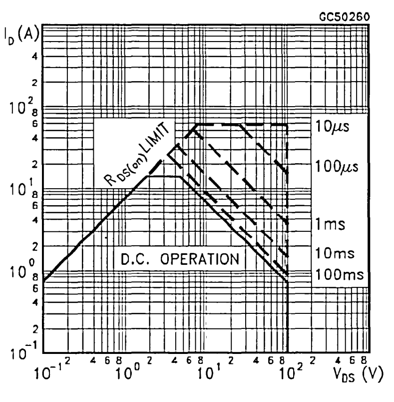
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 80 V I_D = 14 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 5)		50 40 90	70 60 130	ns ns ns

SOURCE DRAIN DIODE

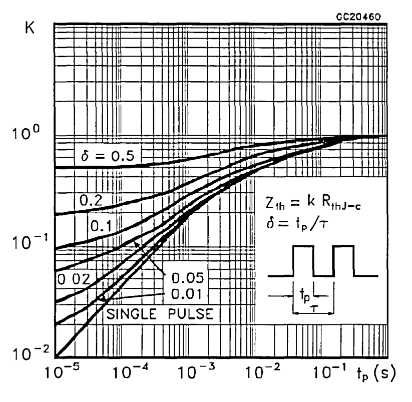
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				14 56	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 14 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 14 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		100 0.35 7		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

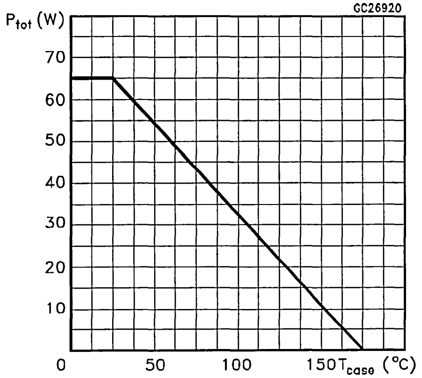
Safe Operating Areas



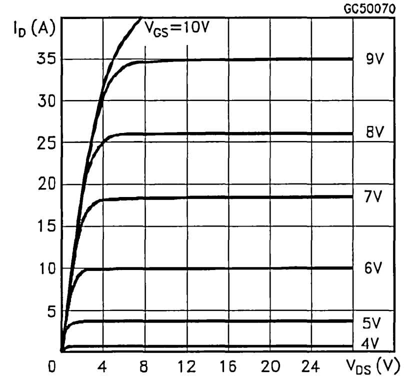
Thermal Impedance



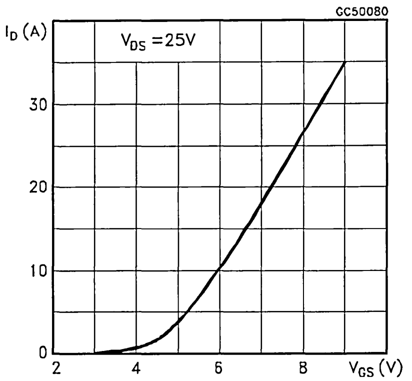
Derating Curve



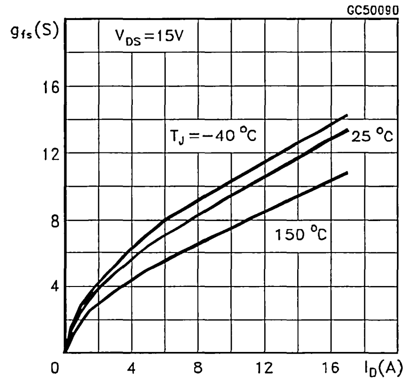
Output Characteristics



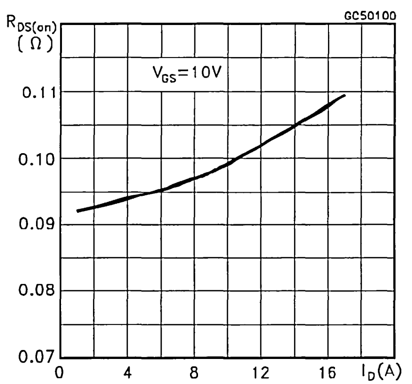
Transfer Characteristics



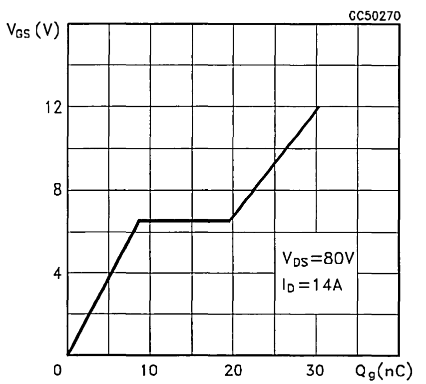
Transconductance



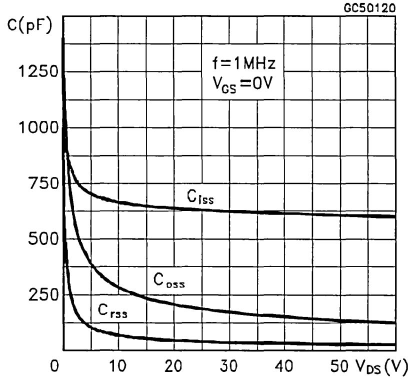
Static Drain-source On Resistance



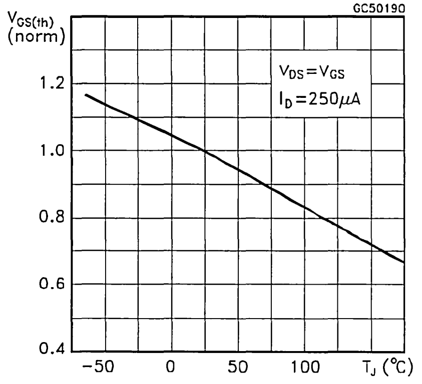
Gate Charge vs Gate-source Voltage



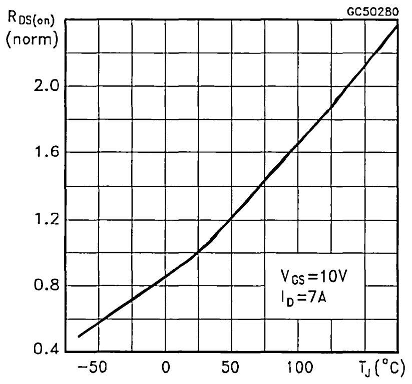
Capacitance Variations



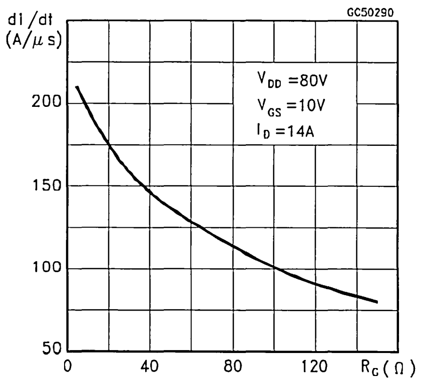
Normalized Gate Threshold Voltage vs Temperature



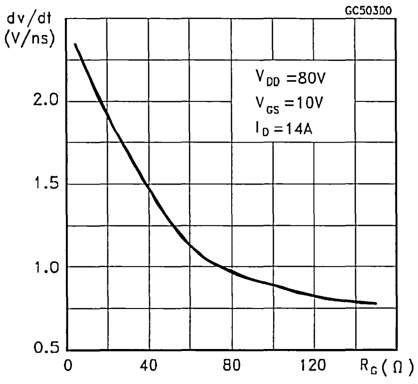
Normalized On Resistance vs Temperature



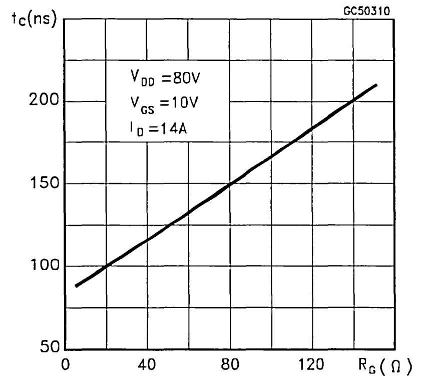
Turn-on Current Slope



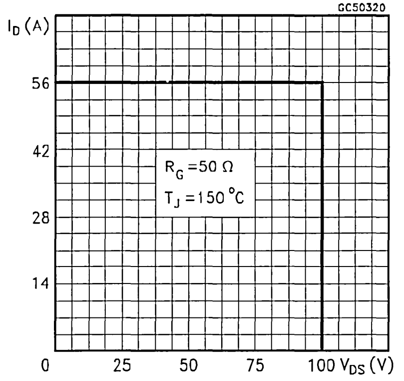
Turn-off Drain-source Voltage Slope



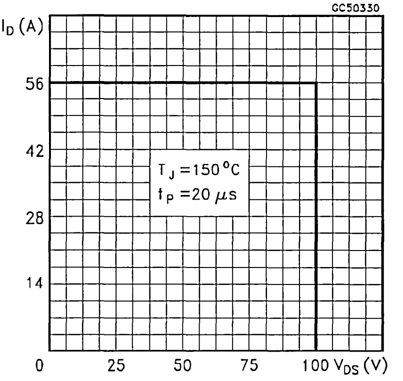
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

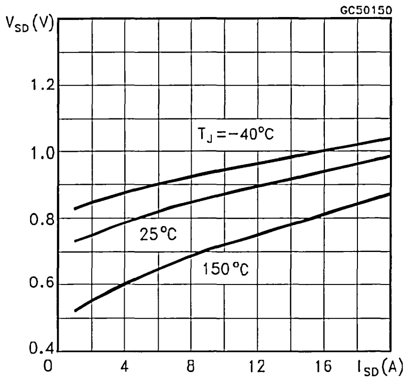


Fig. 1: Unclamped Inductive Load Test Circuits

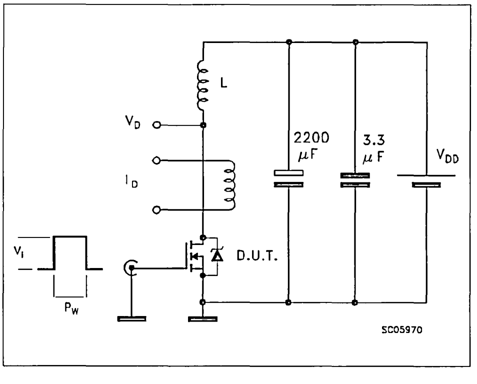


Fig. 2: Unclamped Inductive Waveforms

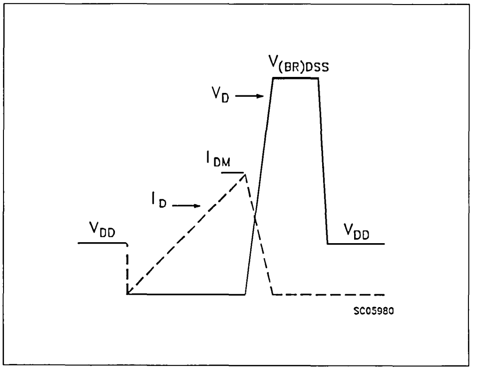


Fig. 3: Switching Times Test Circuits For Resistive Load

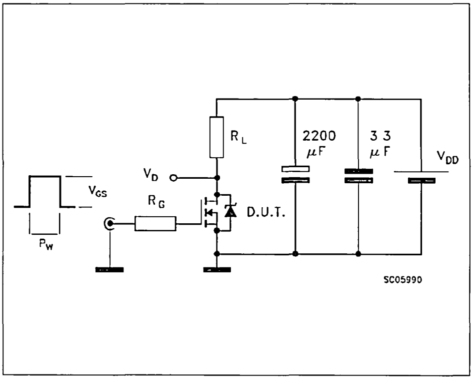


Fig. 4: Gate Charge Test Circuit

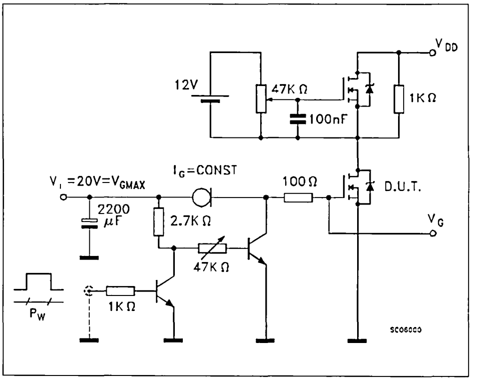
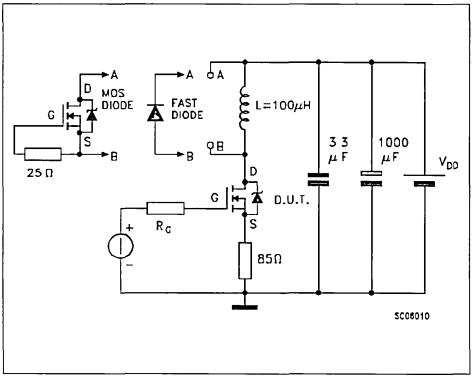


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



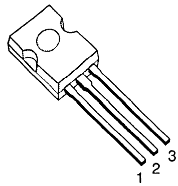
SGS-THOMSON MICROELECTRONICS

STK16N10L

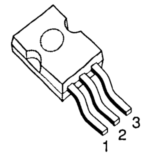
N - CHANNEL ENHANCEMENT MODE LOW THRESHOLD POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK16N10L	100 V	< 0.12 Ω	16 A

- TYPICAL $R_{DS(on)}$ = 0.09 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- LOGIC LEVEL COMPATIBLE INPUT
- APPLICATION ORIENTED CHARACTERIZATION



SOT-82

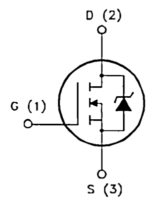


SOT-194 (option)

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	100	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	100	V
V_{GS}	Gate-source Voltage	± 15	V
I_D	Drain Current (continuous) at T_c = 25 °C	16	A
I_D	Drain Current (continuous) at T_c = 100 °C	11	A
I_{DM}(•)	Drain Current (pulsed)	64	A
P_{tot}	Total Dissipation at T_c = 25 °C	65	W
	Derating Factor	0.43	W/°C
T_{stg}	Storage Temperature	-65 to 175	°C
T_j	Max. Operating Junction Temperature	175	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	2.31	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	80	°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink	Typ	0.7	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		275	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	16	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	40	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	10	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	11	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	100			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 15 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	1	1.6	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 5 V I_D = 8 A V_{GS} = 5 V I_D = 8 A T_c = 100 °C		0.09	0.12 0.24	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	16			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 8 A	7	14		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1200 250 60	1500 350 90	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING RESISTIVE LOAD

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 8 A R_{GS} = 25 Ω V_{GS} = 5 V (see test circuit, figure 3)		50 95	70 130	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 80 V I_D = 16 A R_{GS} = 25 Ω V_{GS} = 5 V (see test circuit, figure 5)		170		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 80 V I_D = 16 A V_{GS} = 5 V		22 6 11	30	nC nC nC

SWITCHING INDUCTIVE LOAD

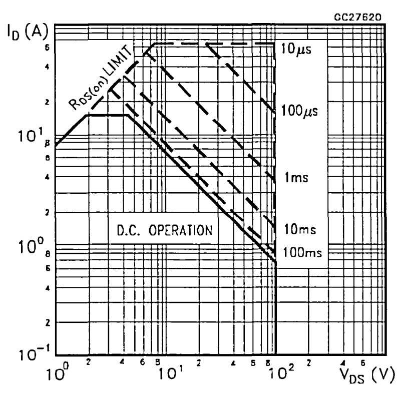
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 80 V I_D = 16 A R_{GS} = 25 Ω V_{GS} = 5 V (see test circuit, figure 5)		55 55 110	80 80 160	ns ns ns

SOURCE DRAIN DIODE

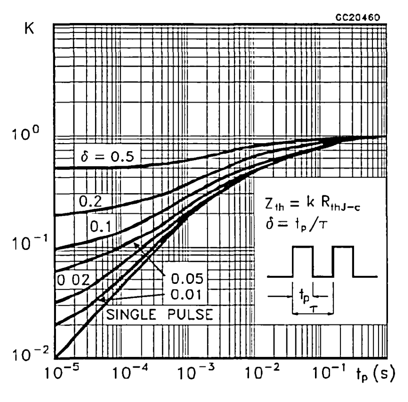
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				16 64	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 16 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 16 A di/dt = 100 A/μs V_{DD} = 50 V T_j = 150 °C (see test circuit, figure 5)		120 0.4 7		ns μC A

(*) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

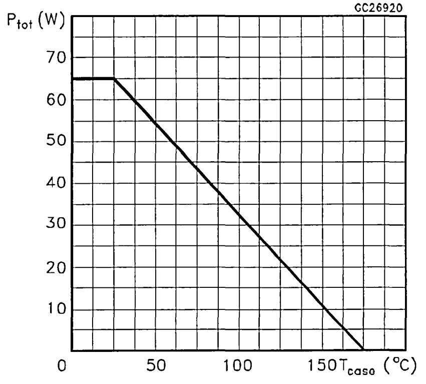
Safe Operating Area



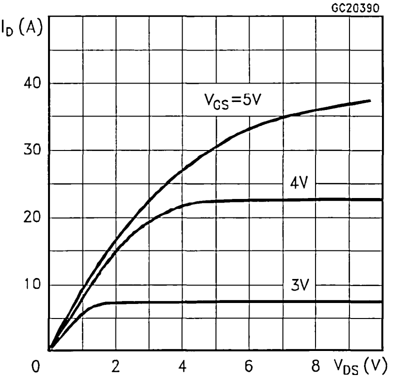
Thermal Impedance



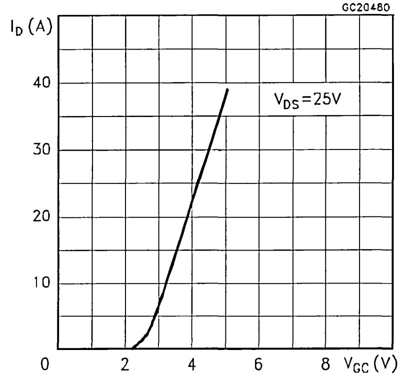
Derating Curve



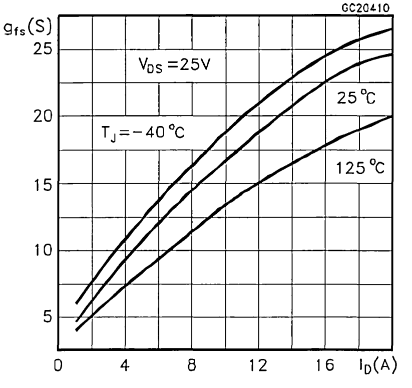
Output Characteristics



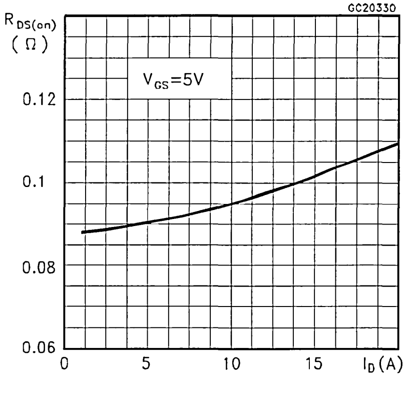
Transfer Characteristics



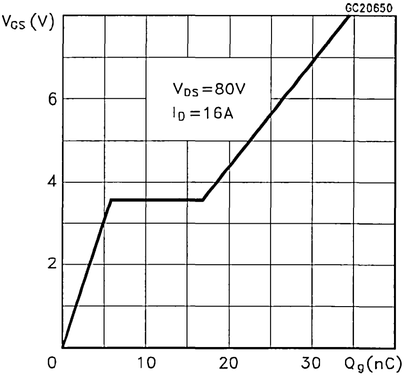
Transconductance



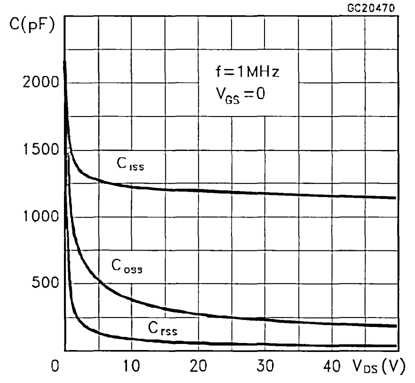
Static Drain-source On Resistance



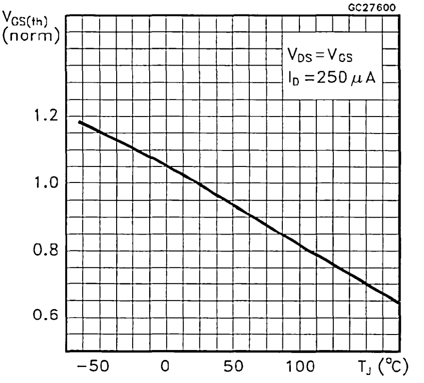
Gate Charge vs Gate-source Voltage



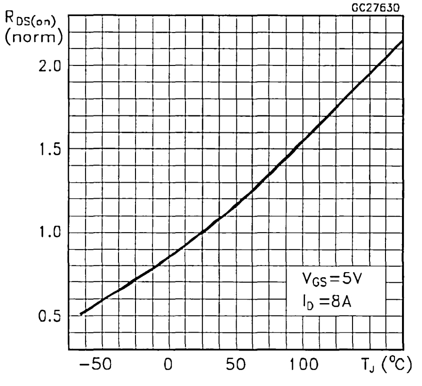
Capacitance Variations



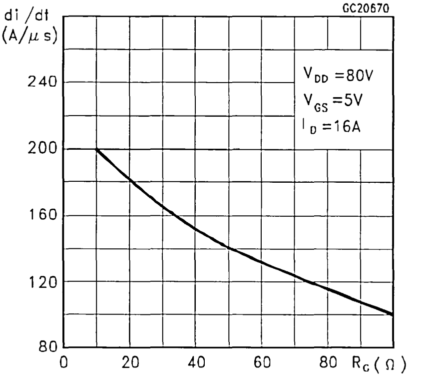
Normalized Gate Threshold Voltage vs Temperature



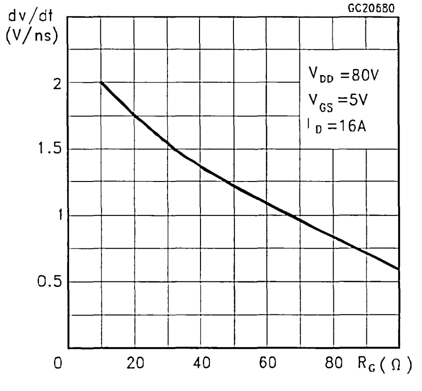
Normalized On Resistance vs Temperature



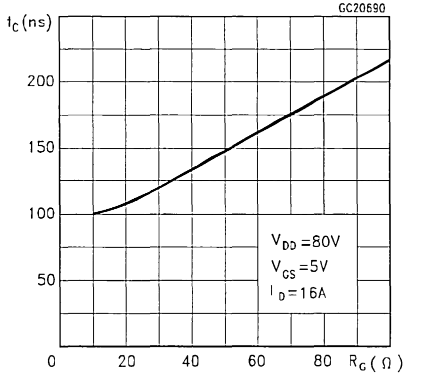
Turn-on Current Slope



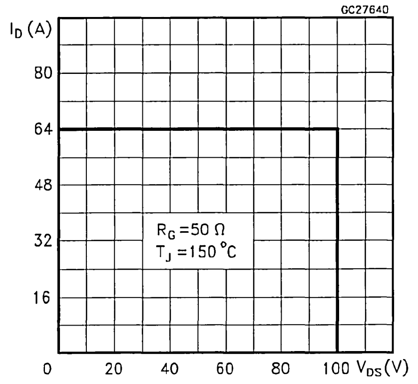
Turn-off Drain-source Voltage Slope



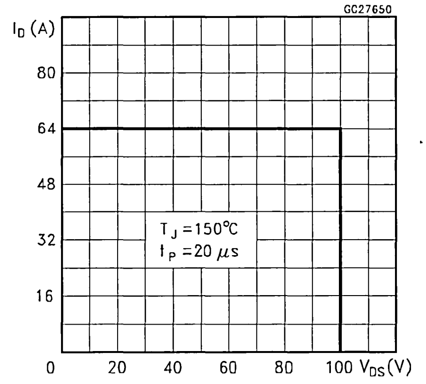
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

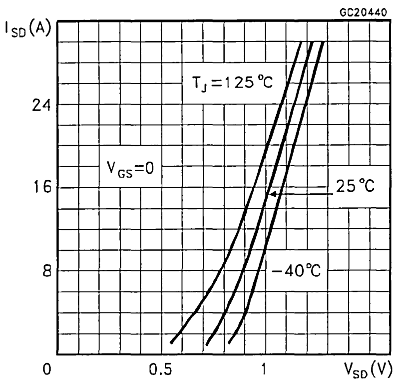


Fig. 1: Unclamped Inductive Load Test Circuits

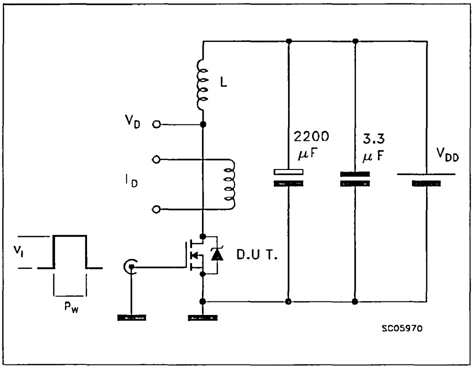


Fig. 2: Unclamped Inductive Waveforms

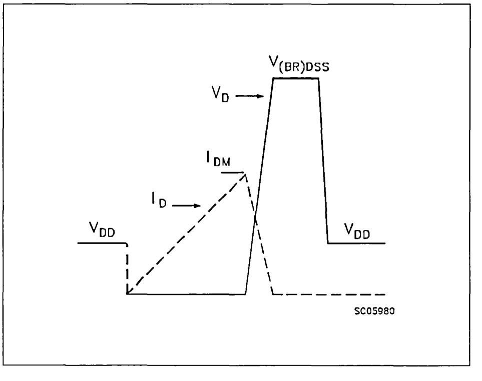


Fig. 3: Switching Times Test Circuits For Resistive Load

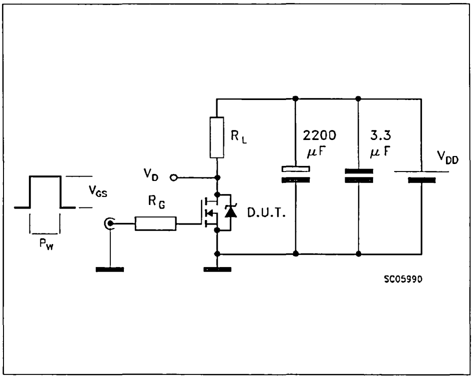


Fig. 4: Gate Charge Test Circuit

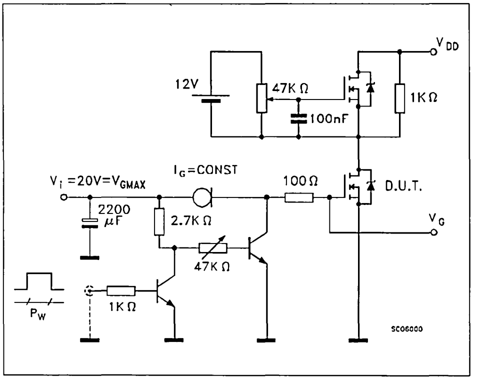
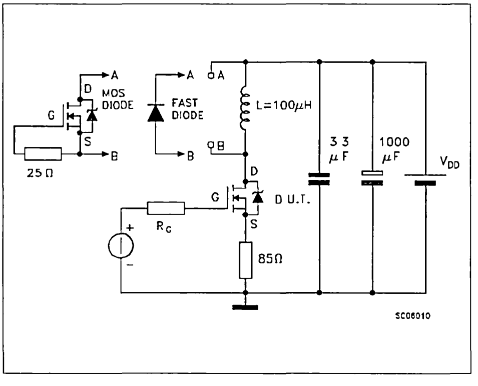


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON
MICROELECTRONICS

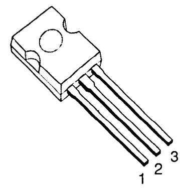
STK17N10

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

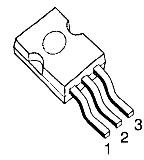
TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK17N10	100 V	< 0.11 Ω	17 A

- TYPICAL $R_{DS(on)}$ = 0.09 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

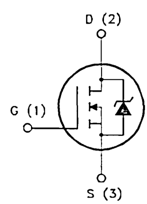


SOT-82



SOT-194 (option)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	100	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	100	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	17	A
I_D	Drain Current (continuous) at T_c = 100 °C	12	A
I_{DM}(•)	Drain Current (pulsed)	68	A
P_{tot}	Total Dissipation at T_c = 25 °C	65	W
	Derating Factor	0.43	W/°C
T_{stg}	Storage Temperature	-65 to 175	°C
T_j	Max. Operating Junction Temperature	175	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	2.31	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	80	°C/W
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.7	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		275	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	17	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	60	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	15	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	12	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	100			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 8.5 A V_{GS} = 10V I_D = 8.5 A T_c = 100°C		0.09	0.11 0.22	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	17			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 8.5 A	5	10		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		800 200 40	1100 300 60	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		25 75	35 110	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 80 V I_D = 17 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		300		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 80 V I_D = 17 A V_{GS} = 10 V		30 9 11	45	nC nC nC

SWITCHING OFF

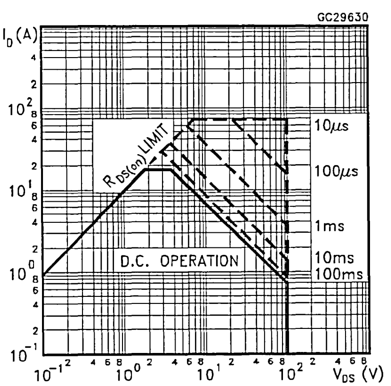
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 80 V I_D = 17 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		65 50 125	90 70 175	ns ns ns

SOURCE DRAIN DIODE

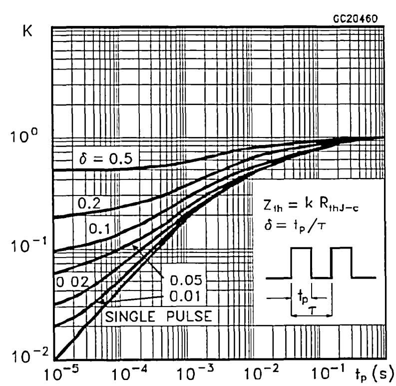
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				17 68	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 17 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 17 A di/dt = 100 A/μs V_{DD} = 20 V T_j = 150 °C (see test circuit, figure 5)		125 0.44 7		ns μC A

(*) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

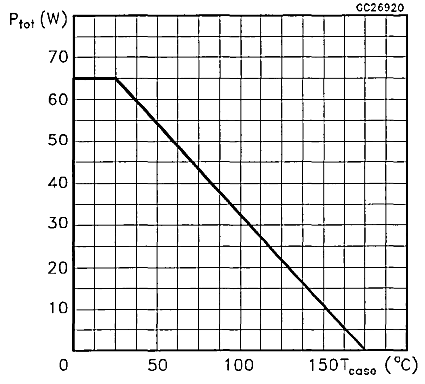
Safe Operating Areas



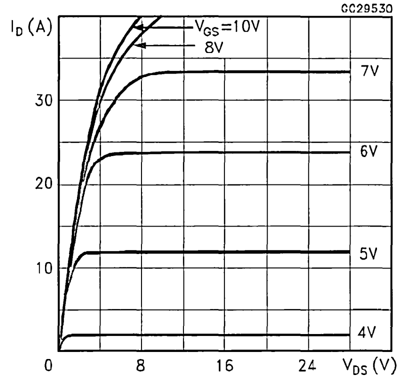
Thermal Impedance



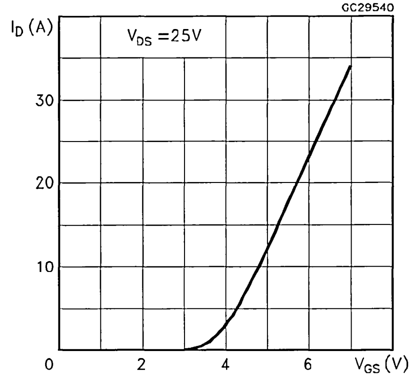
Derating Curve



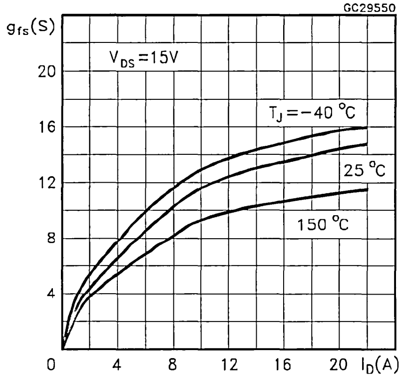
Output Characteristics



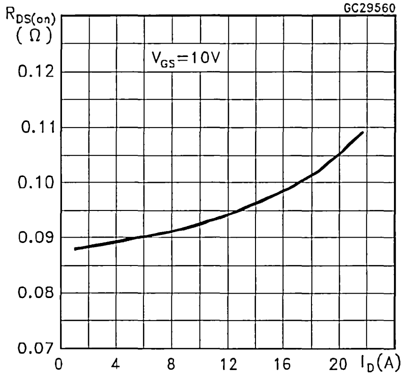
Transfer Characteristics



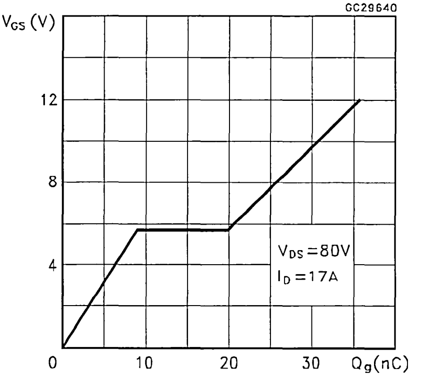
Transconductance



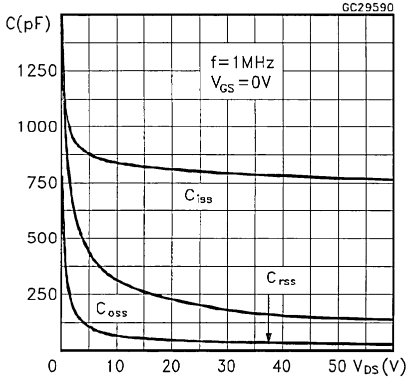
Static Drain-source On Resistance



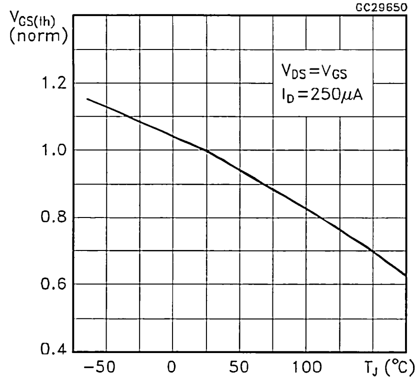
Gate Charge vs Gate-source Voltage



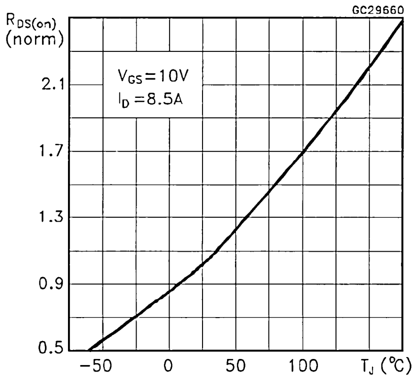
Capacitance Variations



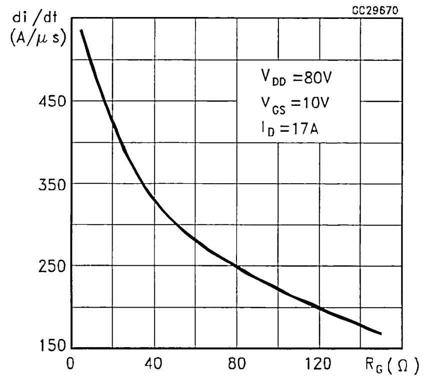
Normalized Gate Threshold Voltage vs Temperature



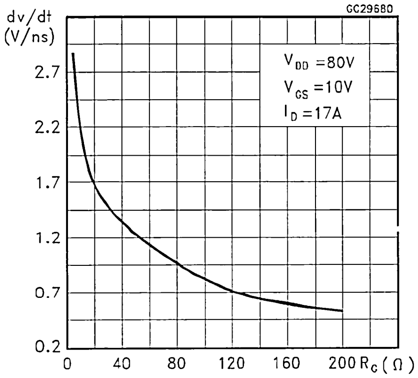
Normalized On Resistance vs Temperature



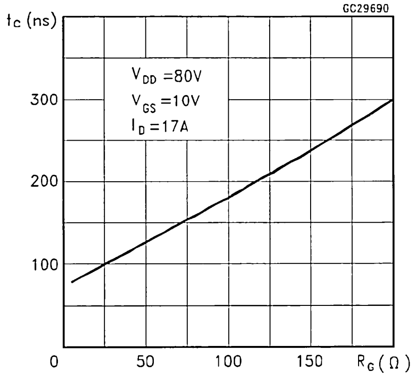
Turn-on Current Slope



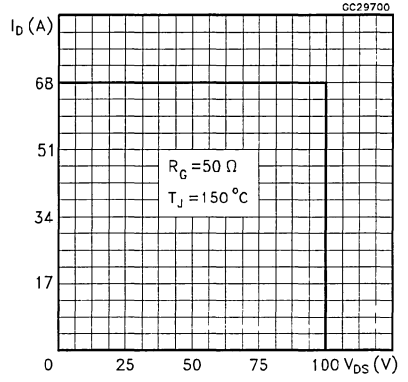
Turn-off Drain-source Voltage Slope



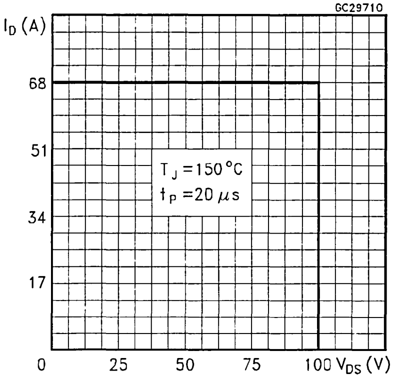
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

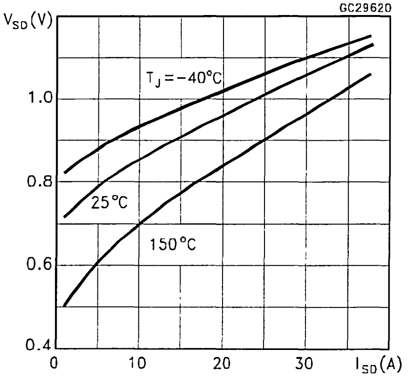


Fig. 1: Unclamped Inductive Load Test Circuits

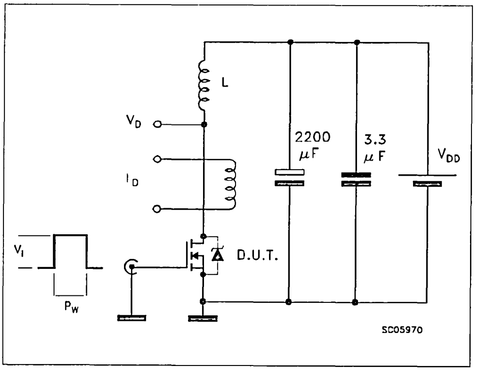


Fig. 2: Unclamped Inductive Waveforms

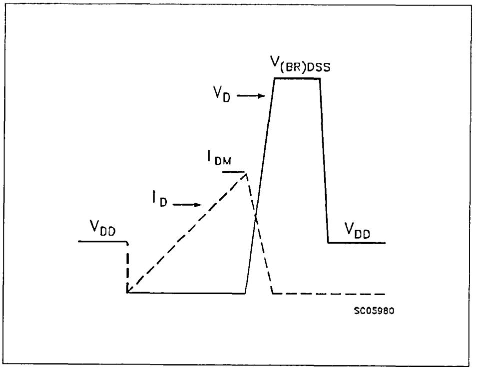


Fig. 3: Switching Times Test Circuits For Resistive Load

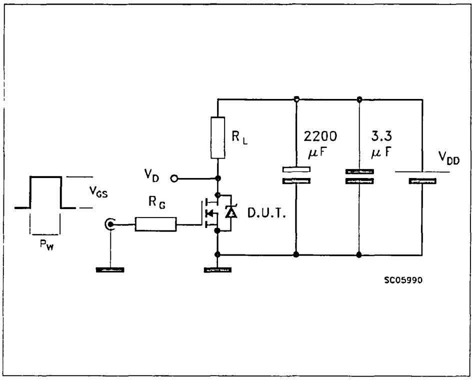


Fig. 4: Gate Charge Test Circuit

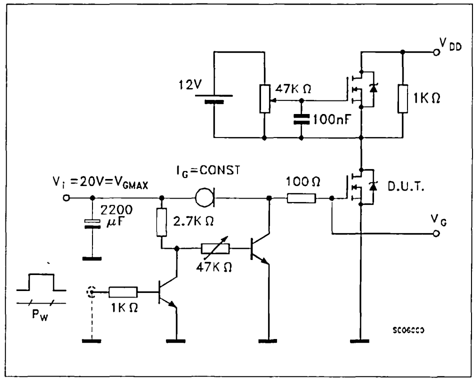
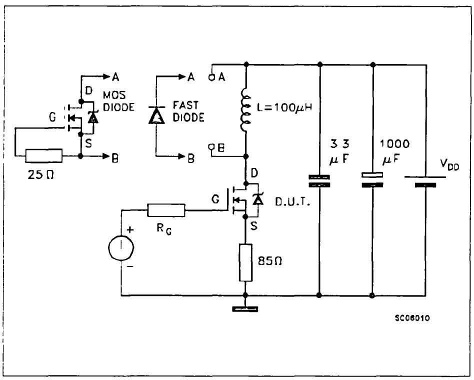


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



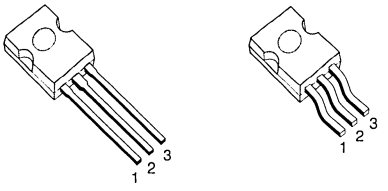
SGS-THOMSON
MICROELECTRONICS

STK18N05
STK18N06

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK18N05	50 V	< 0.085 Ω	18 A
STK18N06	60 V	< 0.085 Ω	18 A

- TYPICAL $R_{DS(on)}$ = 0.06 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

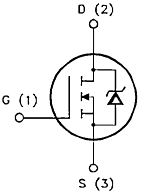


SOT-82

SOT-194 (option)

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STK18N05	STK18N06	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50	60	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50	60	V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	18		A
I_D	Drain Current (continuous) at T_c = 100 °C	12		A
$I_{DM}(\bullet)$	Drain Current (pulsed)	72		A
P_{tot}	Total Dissipation at T_c = 25 °C	60		W
	Derating Factor	0.4		W/°C
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	2.5	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	80	°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink	Typ	0.7	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		275	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	18	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	60	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	15	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	12	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0 for **STK18N05** for **STK18N06**	 50 60			 V V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10 V I_D = 9 A V_{GS} = 10 V I_D = 9 A T_c = 100°C		0.06	0.085 0.17	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	18			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 9 A	5	8		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		520 250 80	700 350 120	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit figure)		45 65	65 95	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 18 A R_G = 50 Ω V_{GS} = 10 V (see test circuit figure)		240		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 18 A V_{GS} = 10 V		22 10 7	30	nC nC nC

SWITCHING OFF

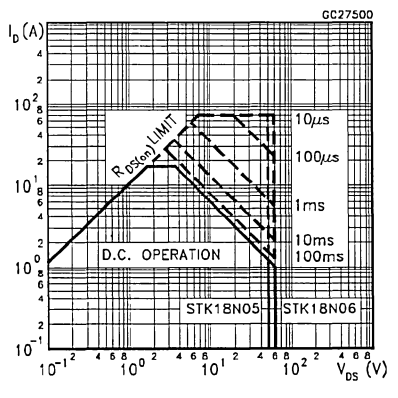
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 18 A R_{GS} = 50 Ω V_{GS} = 10 V (see test circuit figure)		80 60 140	120 90 210	ns ns ns

SOURCE DRAIN DIODE

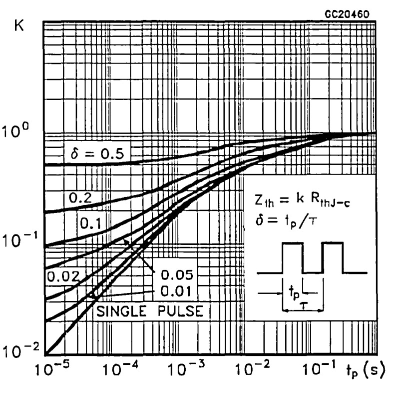
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				18 72	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 18 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 18 A di/dt = 100 A/µs V_{DD} = 15 V T_j = 150 °C		85 0.13 3		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

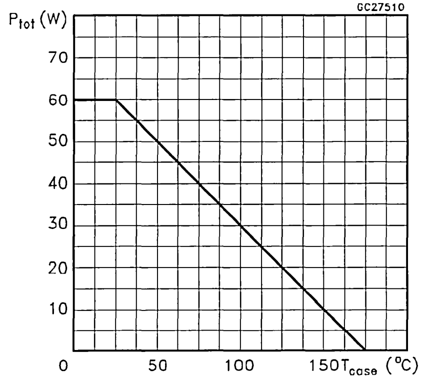
Safe Operating Area



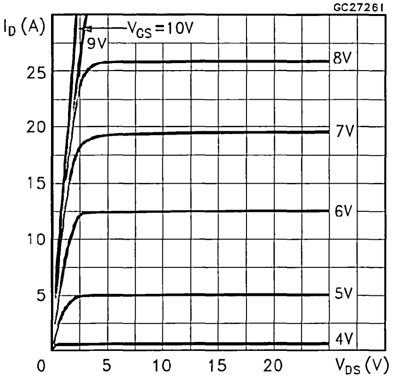
Thermal Impedance



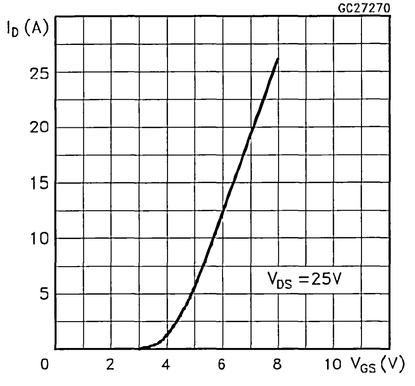
Derating Curve



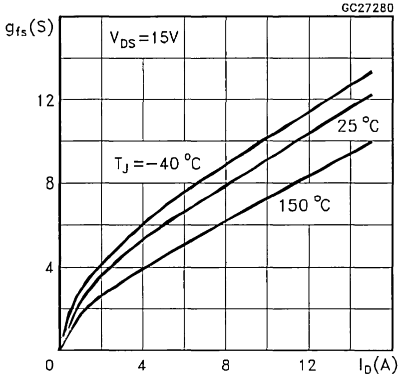
Output Characteristics



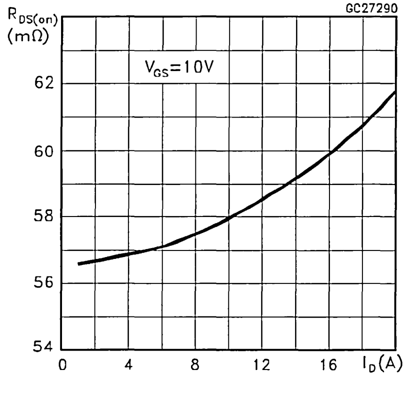
Transfer Characteristics



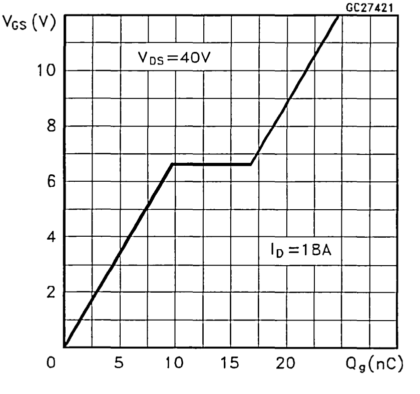
Transconductance



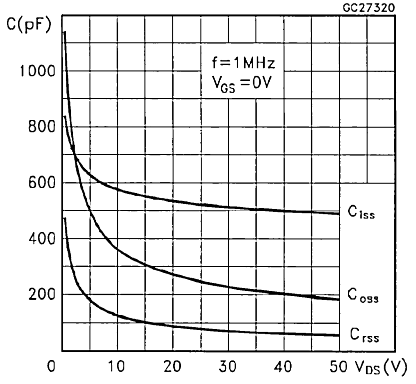
Static Drain-source On Resistance



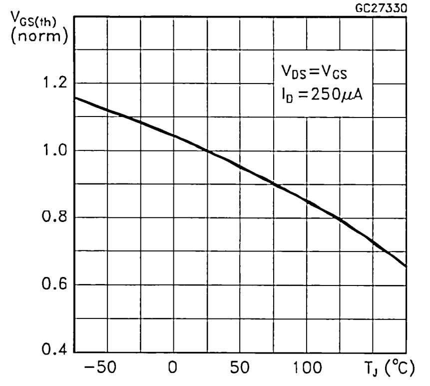
Gate Charge vs Gate-source Voltage



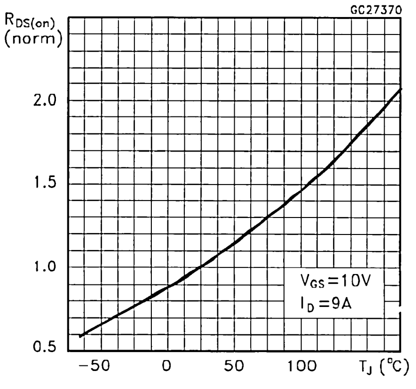
Capacitance Variations



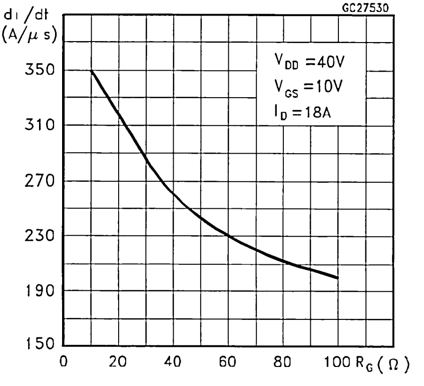
Normalized Gate Threshold Voltage vs Temperature



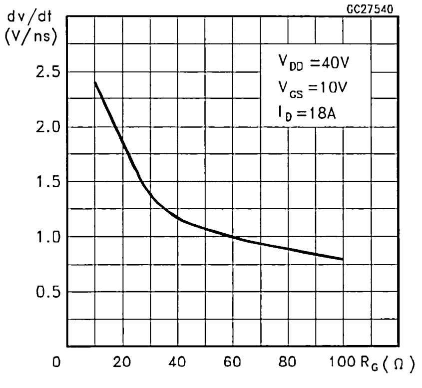
Normalized On Resistance vs Temperature



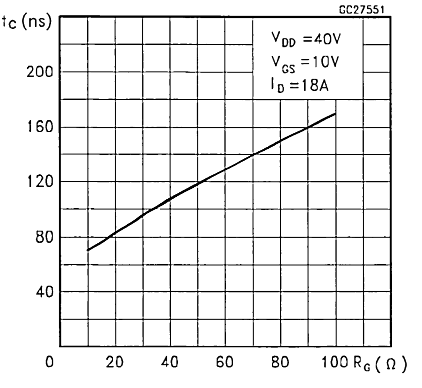
Turn-on Current Slope



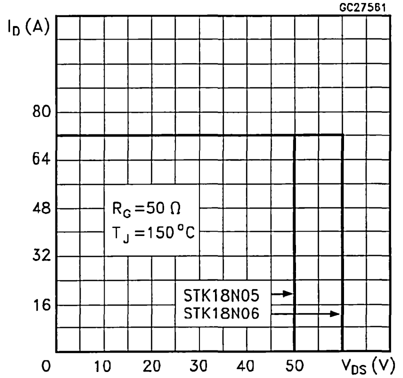
Turn-off Drain-source Voltage Slope



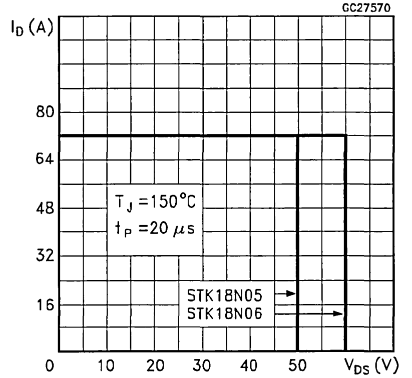
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

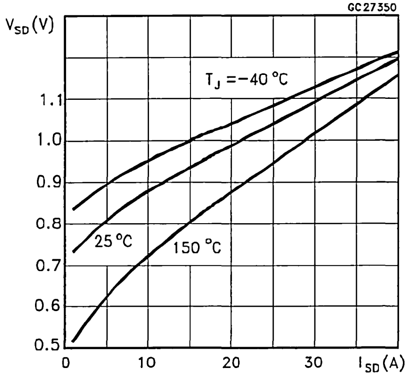


Fig. 1: Unclamped Inductive Load Test Circuits

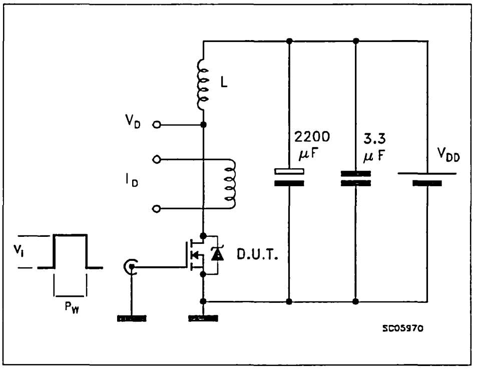


Fig. 2: Unclamped Inductive Waveforms

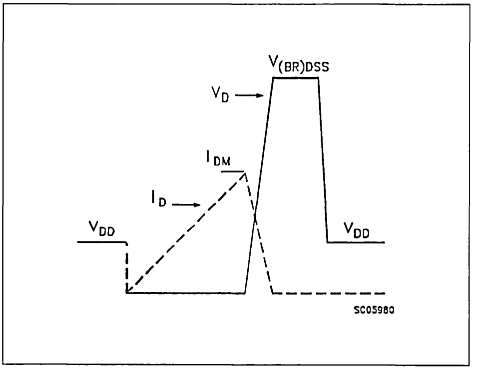


Fig. 3: Switching Times Test Circuits For Resistive Load

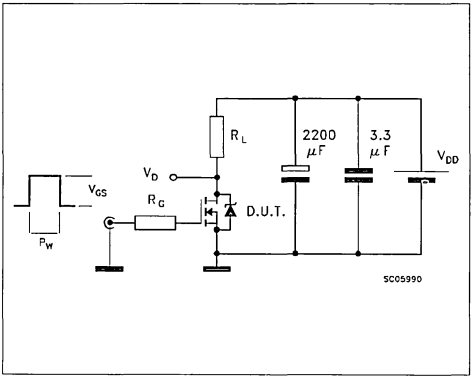


Fig. 4: Gate Charge Test Circuit

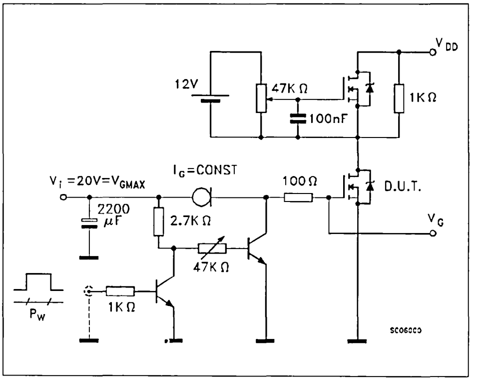
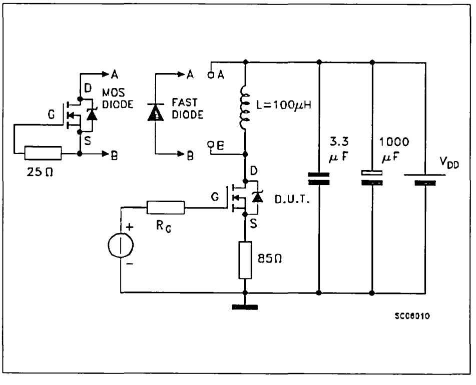


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



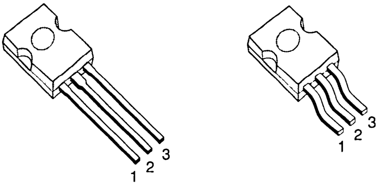
SGS-THOMSON MICROELECTRONICS

STK18N05L
STK18N06L

N - CHANNEL ENHANCEMENT MODE LOW THRESHOLD POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK18N05L	50 V	< 0.085 Ω	18 A
STK18N06L	60 V	< 0.085 Ω	18 A

- TYPICAL $R_{DS(on)}$ = 0.065 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- LOGIC LEVEL COMPATIBLE INPUT
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

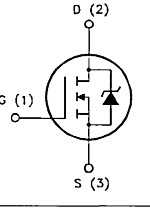


SOT-82

SOT-194 (option)

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STK18N05L	STK18N06L	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50	60	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50	60	V
V_{GS}	Gate-source Voltage	± 15		V
I_D	Drain Current (continuous) at T_c = 25 °C	18		A
I_D	Drain Current (continuous) at T_c = 100 °C	12		A
I_{DM}(•)	Drain Current (pulsed)	72		A
P_{tot}	Total Dissipation at T_c = 25 °C	60		W
	Derating Factor	0.4		W/°C
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case Max	2.5	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max	80	°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink Typ	0.7	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	275	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	18	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	60	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	15	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	12	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$ for **STK18N05L** for **STK18N06L**	 50 60			 V V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 15$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	1	1.6	2 5	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 5$ V $I_D = 9$ A $V_{GS} = 5$ V $I_D = 9$ A $T_c = 100$ °C		0.065	0.085 0.17	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	18			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 9$ A	5	13		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		700 250 70	1000 350 100	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING RESISTIVE LOAD

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 9 A R_{GS} = 50 Ω V_{GS} = 5 V (see test circuit, figure 3)		60 360	90 520	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 18 A R_{GS} = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		130		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 18 A V_{GS} = 5 V		18 6 10	26	nC nC nC

SWITCHING INDUCTIVE LOAD

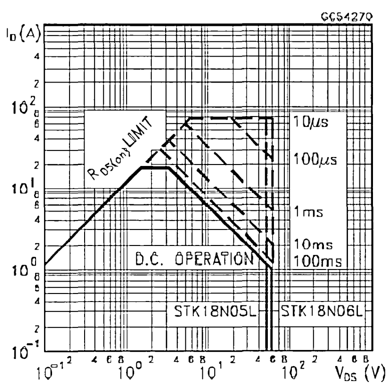
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 18 A R_{GS} = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		70 100 180	100 150 260	ns ns ns

SOURCE DRAIN DIODE

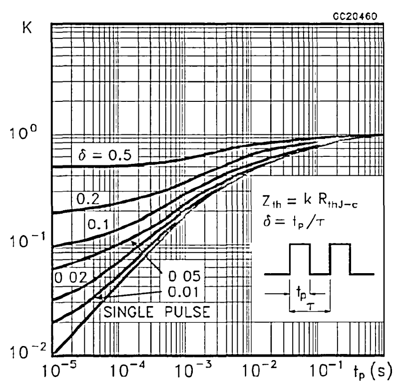
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				18 72	A A
V_{SD} ( )	Forward On Voltage	I_{SD} = 18 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 18 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		65 0.13 4		ns µC A

( ) Pulsed Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

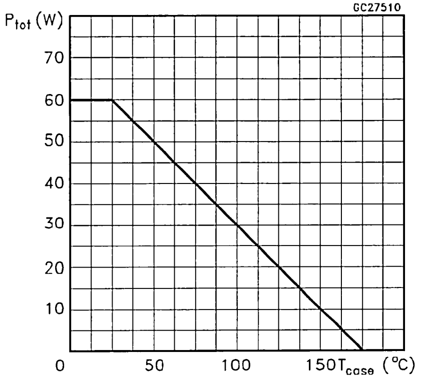
Safe Operating Area



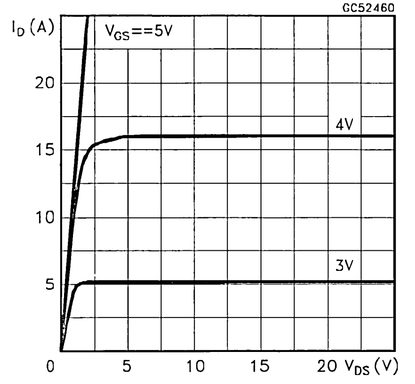
Thermal Impedance



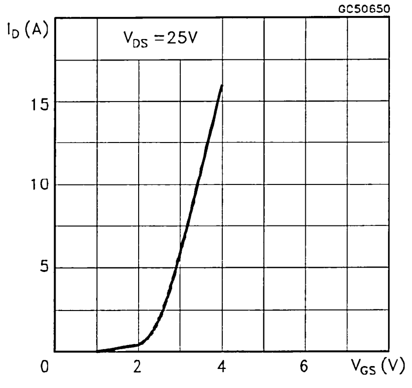
Derating Curve



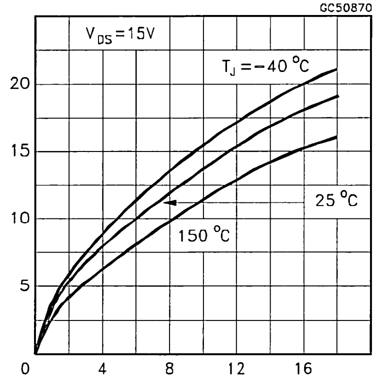
Output Characteristics



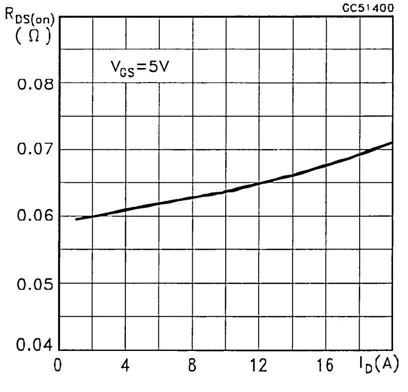
Transfer Characteristics



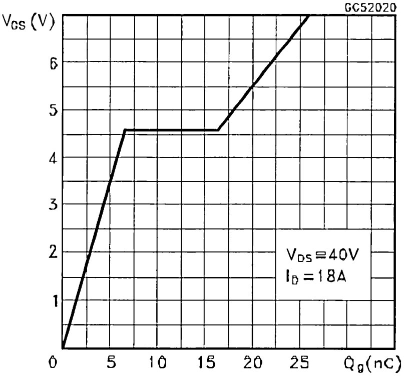
Transconductance



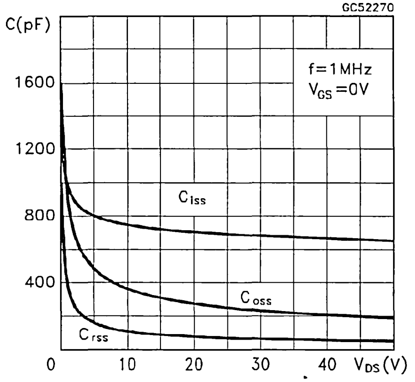
Static Drain-source On Resistance



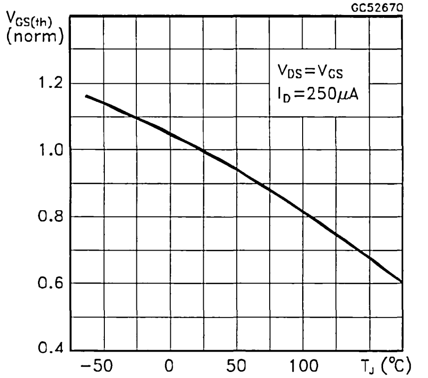
Gate Charge vs Gate-source Voltage



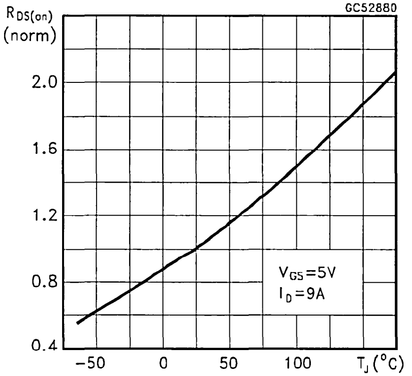
Capacitance Variations



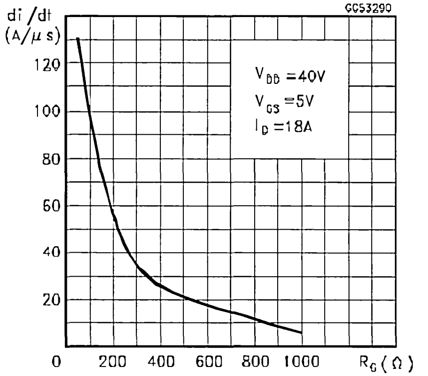
Normalized Gate Threshold Voltage vs Temperature



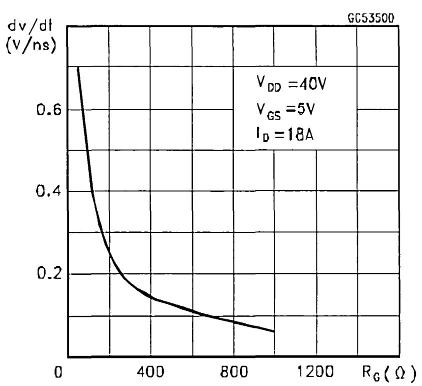
Normalized On Resistance vs Temperature



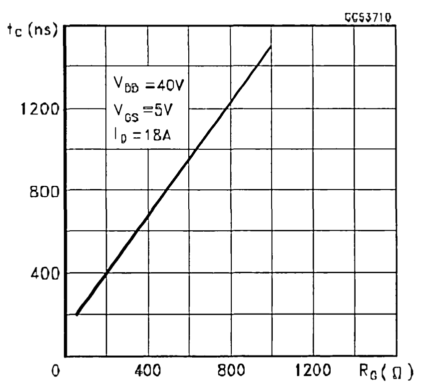
Turn-on Current Slope



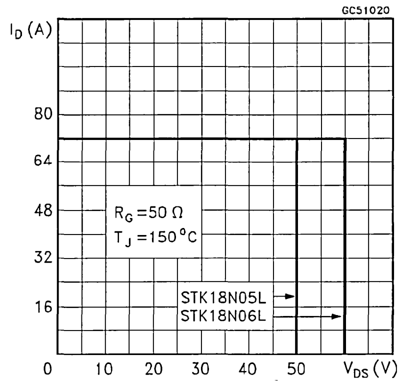
Turn-off Drain-source Voltage Slope



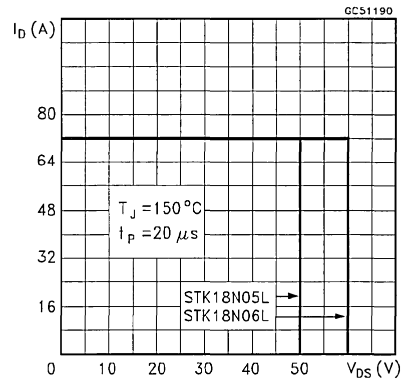
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

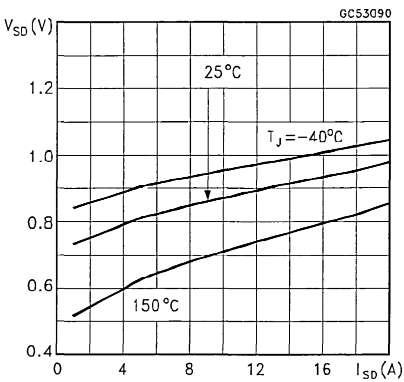


Fig. 1: Unclamped Inductive Load Test Circuits

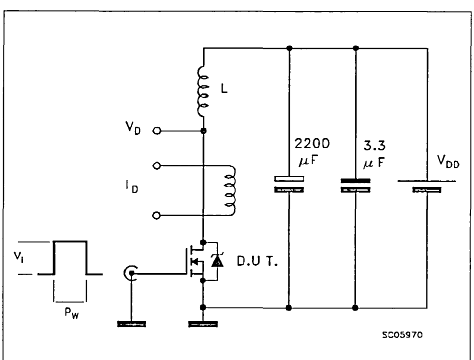


Fig. 2: Unclamped Inductive Waveforms

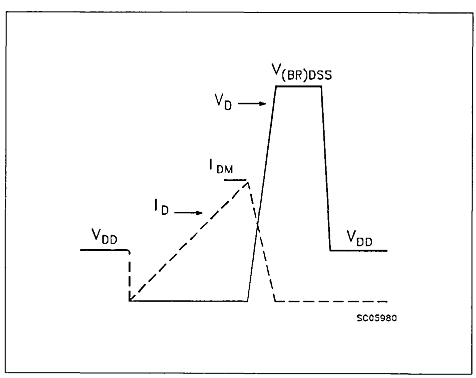


Fig. 3: Switching Times Test Circuits For Resistive Load

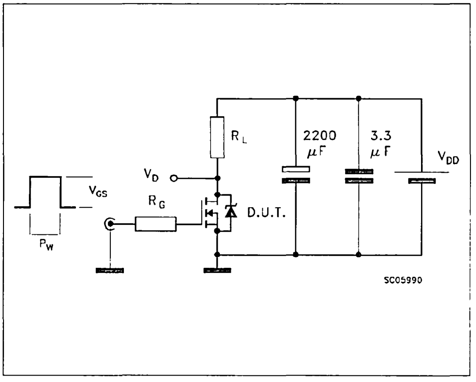


Fig. 4: Gate Charge Test Circuit

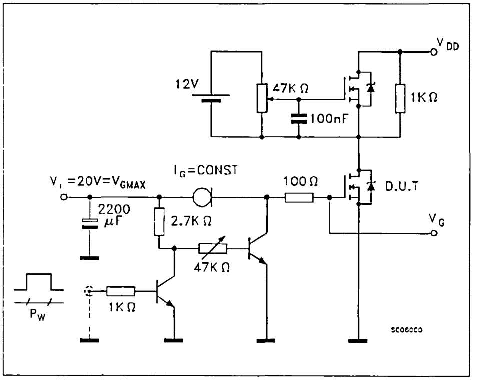
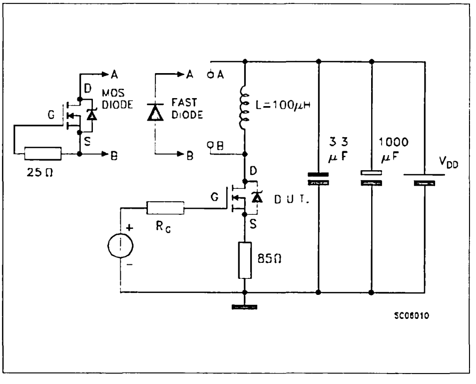


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times

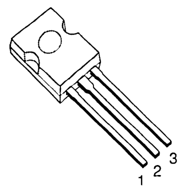


STK22N05

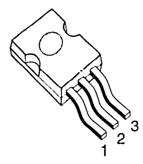
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK22N05	50 V	< 0.065 Ω	22 A

- TYPICAL $R_{DS(on)}$ = 0.048 Ω
- AVALANCHE RUGGEDNESS TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION



SOT-82

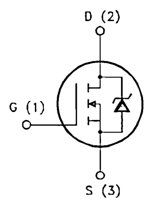


SOT-194 (option)

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	22	A
I_D	Drain Current (continuous) at T_c = 100 °C	15	A
I_{DM}(•)	Drain Current (pulsed)	88	A
P_{tot}	Total Dissipation at T_c = 25 °C	65	W
	Derating Factor	0.43	W/°C
T_{stg}	Storage Temperature	-65 to 175	°C
T_j	Max. Operating Junction Temperature	175	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	2.31	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	80	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Case-sink	Typ	0.7	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		275	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	22	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25\ ^oC$, $I_D = I_{AR}$, $V_{DD} = 25$ V)	100	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	25	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100\ ^oC$, pulse width limited by T_j max, $\delta < 1\%$)	15	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25\ ^oC$ unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250\ \mu A$ $V_{GS} = 0$	50			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125\ ^oC$			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250\ \mu A$	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 11$ A $V_{GS} = 10V$ $I_D = 11$ A $T_c = 100^oC$		0.048	0.065 0.13	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	22			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 11$ A	6	10		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		700 320 90	900 450 150	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		30 90	45 130	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 22 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		230		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 22 A V_{GS} = 10 V		26 8 9	40	nC nC nC

SWITCHING OFF

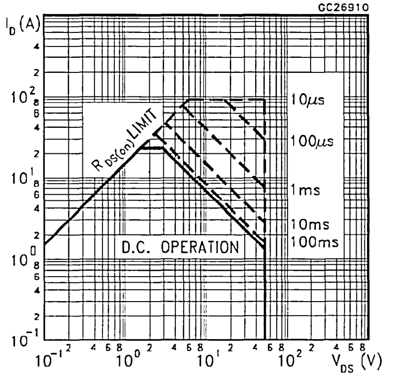
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 22 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		80 80 170	120 120 250	ns ns ns

SOURCE DRAIN DIODE

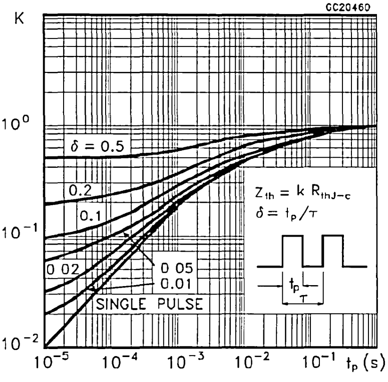
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				22 88	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 22 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 22 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		80 0.22 5.5		ns µC A

(*) Pulsed. Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

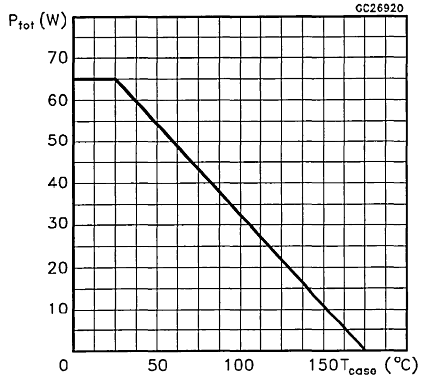
Safe Operating Area



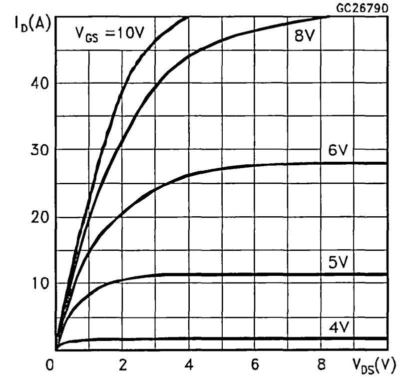
Thermal Impedance



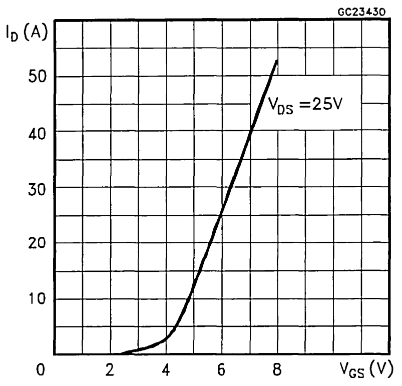
Derating Curve



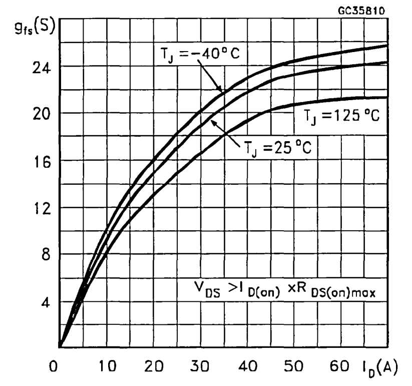
Output Characteristics



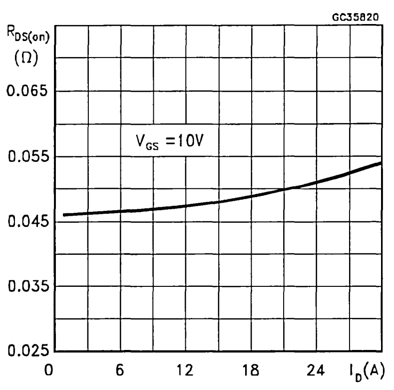
Transfer Characteristics



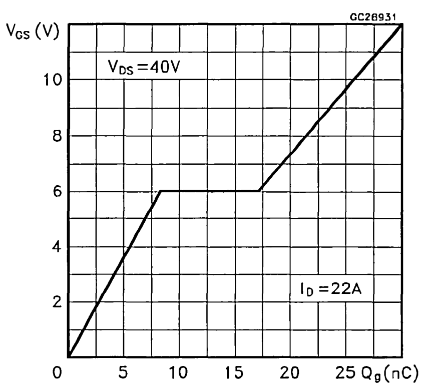
Transconductance



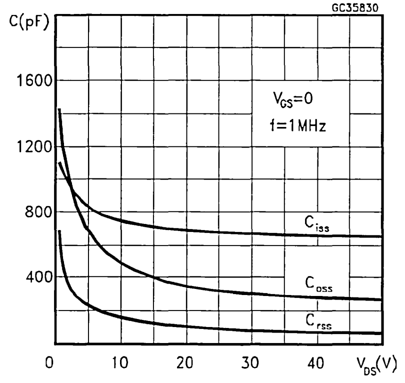
Static Drain-source On Resistance



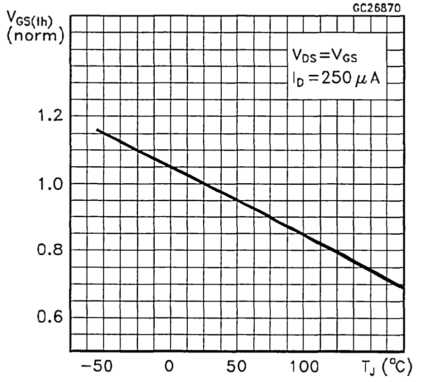
Gate Charge vs Gate-source Voltage



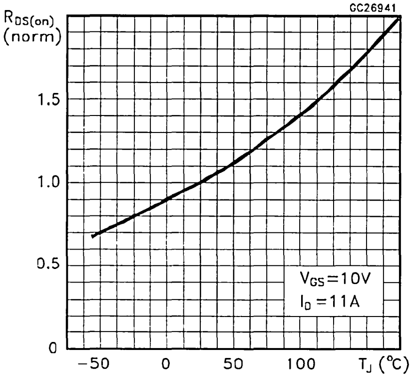
Capacitance Variations



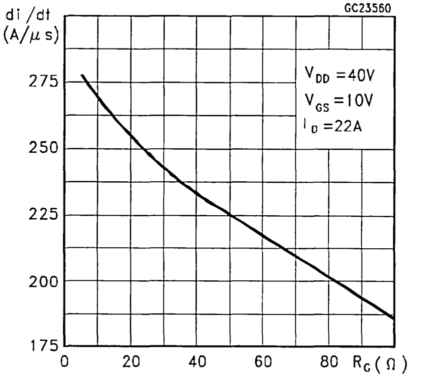
Normalized Gate Threshold Voltage vs Temperature



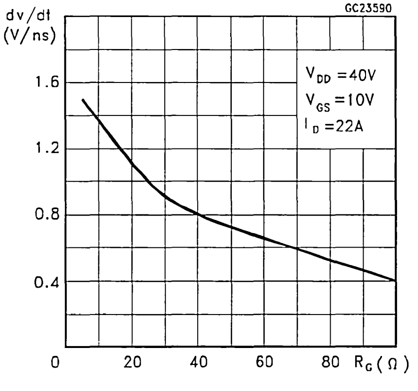
Normalized On Resistance vs Temperature



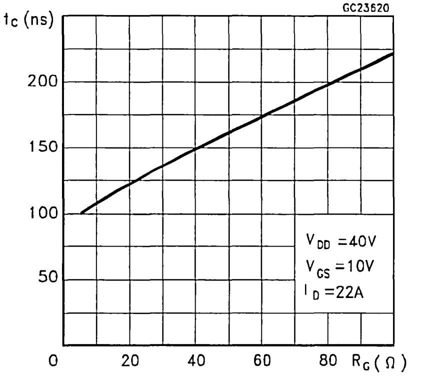
Turn-on Current Slope



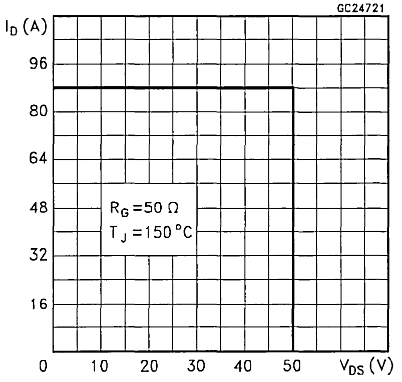
Turn-off Drain-source Voltage Slope



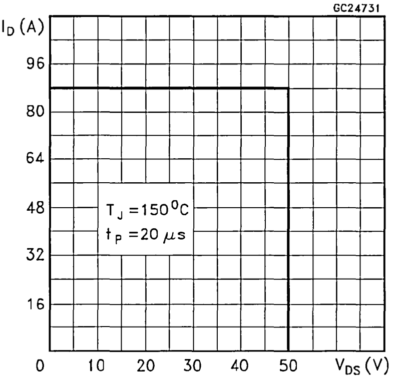
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

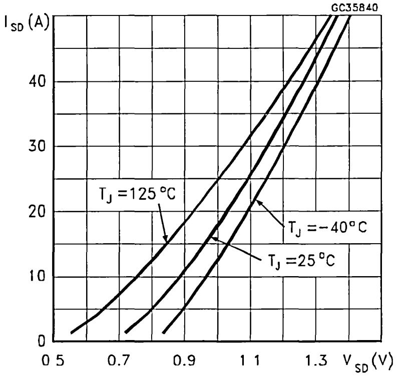


Fig. 1: Unclamped Inductive Load Test Circuits

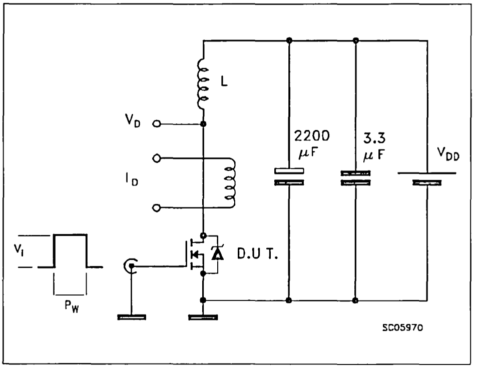


Fig. 2: Unclamped Inductive Waveforms

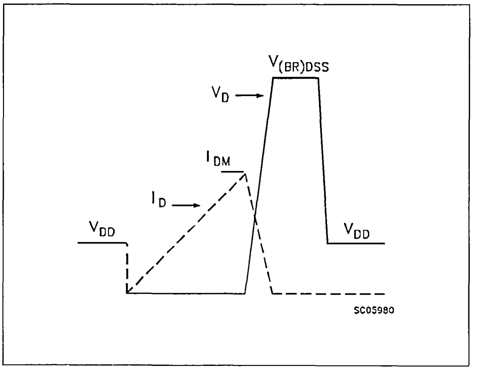


Fig. 3: Switching Times Test Circuits For Resistive Load

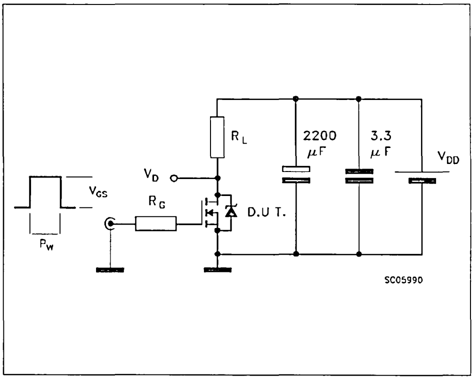


Fig. 4: Gate Charge Test Circuit

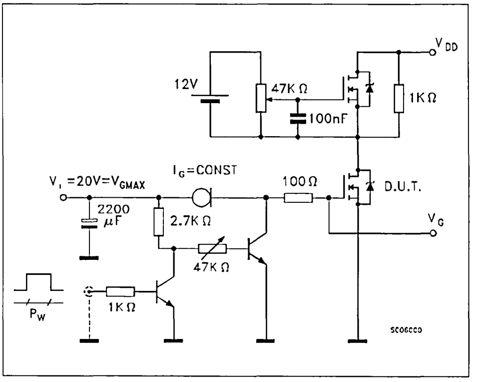
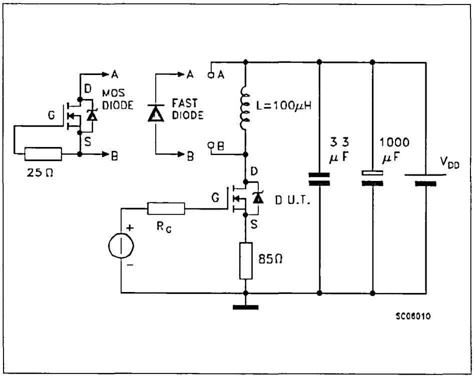


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



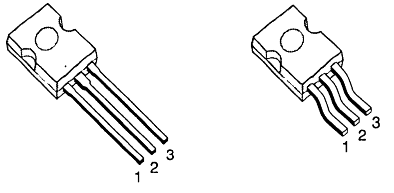
SGS-THOMSON
MICROELECTRONICS

STK22N06

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK22N06	60 V	< 0.065 Ω	22 A

- TYPICAL $R_{DS(on)}$ = 0.048 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION



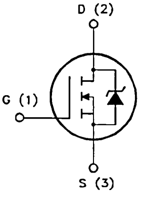
SOT-82

SOT-194 (option)

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	60	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	60	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	22	A
I_D	Drain Current (continuous) at T_c = 100 °C	15	A
I_{DM}(•)	Drain Current (pulsed)	88	A
P_{tot}	Total Dissipation at T_c = 25 °C	65	W
	Derating Factor	0.43	W/°C
T_{stg}	Storage Temperature	-65 to 175	°C
T_j	Max. Operating Junction Temperature	175	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	2.31	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	80	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Case-sink	Typ	0.7	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		275	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	22	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	100	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	25	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	15	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	60			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10$V $I_D = 11$ A $V_{GS} = 10$V $I_D = 11$ A $T_c = 100$°C		0.048	0.065 0.13	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	22			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 11$ A	6	10		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		700 320 90	900 450 150	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		30 90	45 130	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 22 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		230		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 22 A V_{GS} = 10 V		26 8 9	40	nC nC nC

SWITCHING OFF

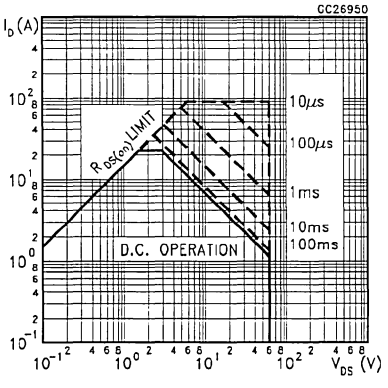
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 22 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		80 80 170	120 120 250	ns ns ns

SOURCE DRAIN DIODE

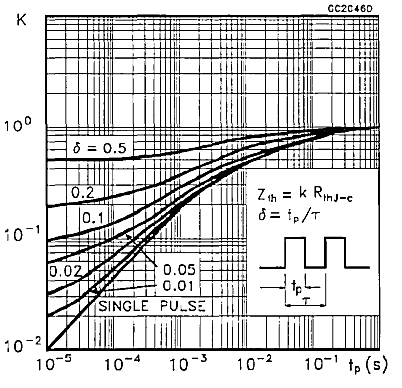
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				22 88	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 22 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 22 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		80 0.22 5.5		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

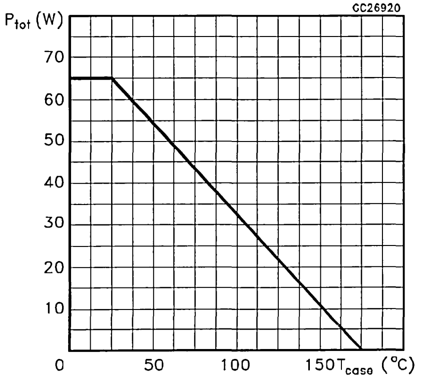
Safe Operating Area



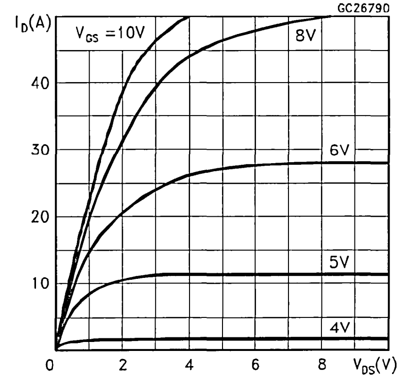
Thermal Impedance



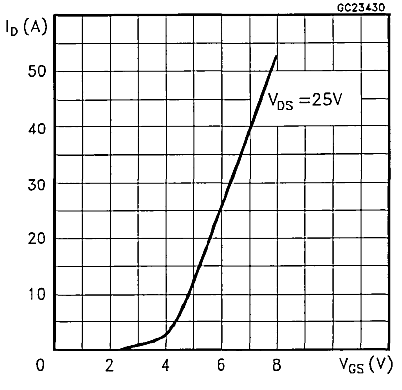
Derating Curve



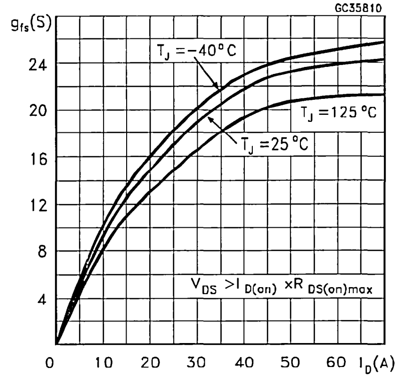
Output Characteristics



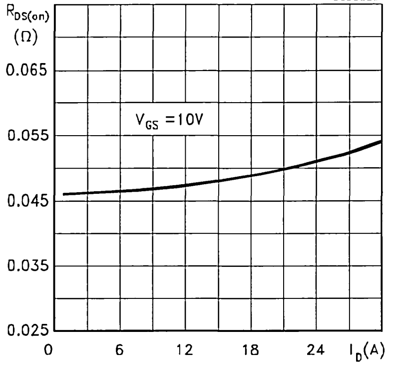
Transfer Characteristics



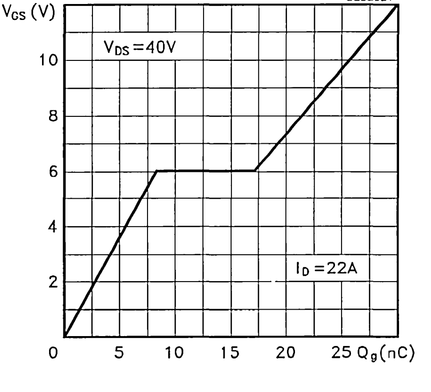
Transconductance



Static Drain-source On Resistance

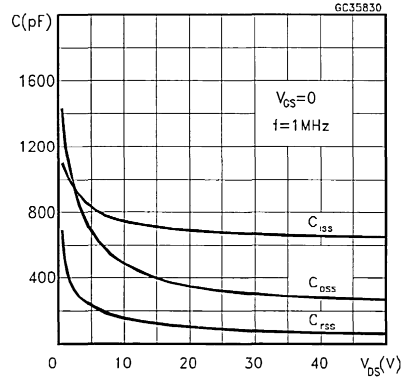


Gate Charge vs Gate-source Voltage

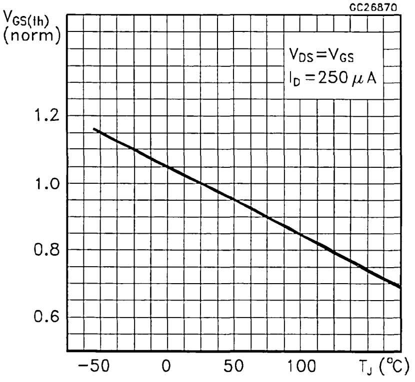


SGS-THOMSON MICROELECTRONICS

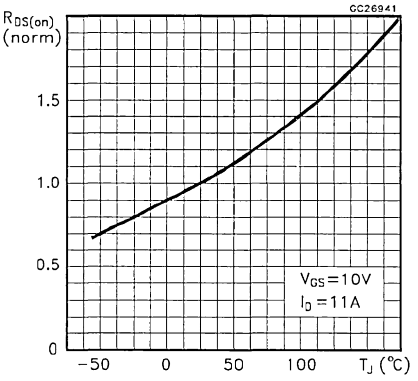
Capacitance Variations



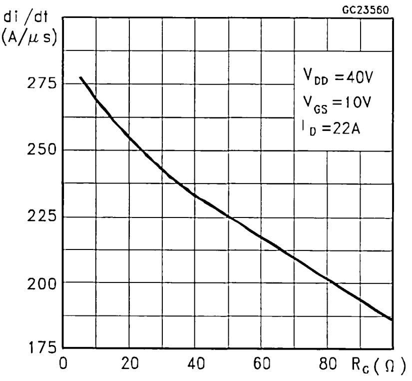
Normalized Gate Threshold Voltage vs Temperature



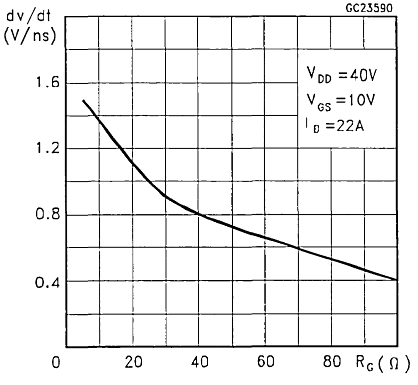
Normalized On Resistance vs Temperature



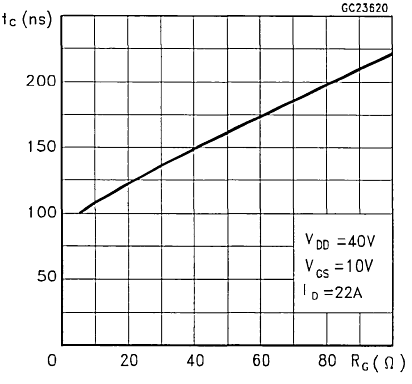
Turn-on Current Slope



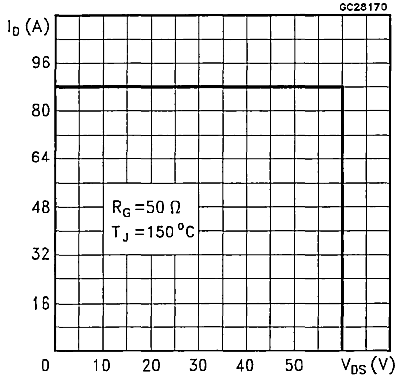
Turn-off Drain-source Voltage Slope



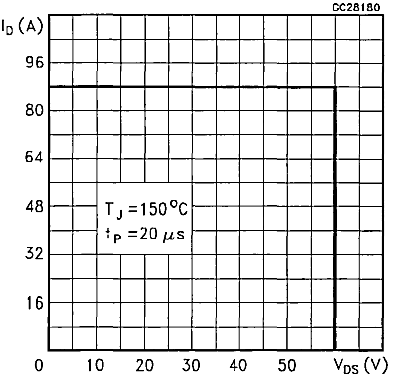
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

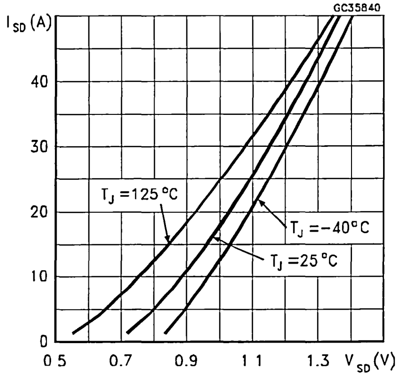


Fig. 1: Unclamped Inductive Load Test Circuits

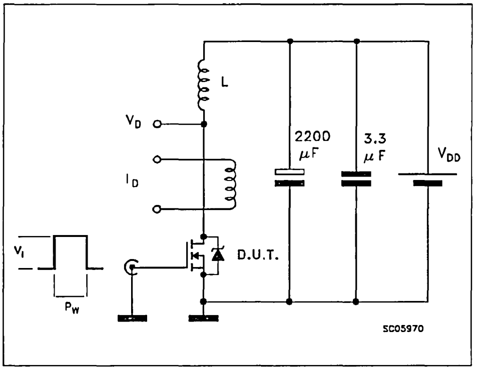


Fig. 2: Unclamped Inductive Waveforms

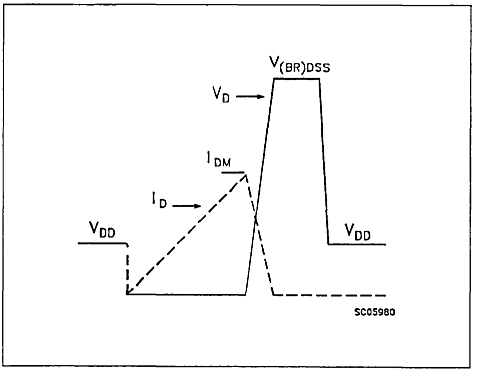


Fig. 3: Switching Times Test Circuits For Resistive Load

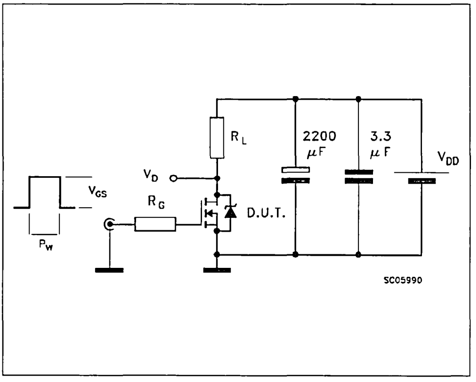


Fig. 4: Gate Charge Test Circuit

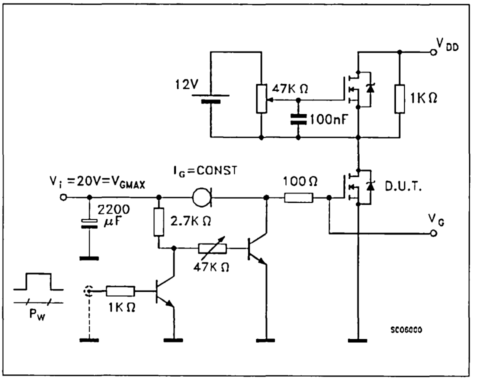
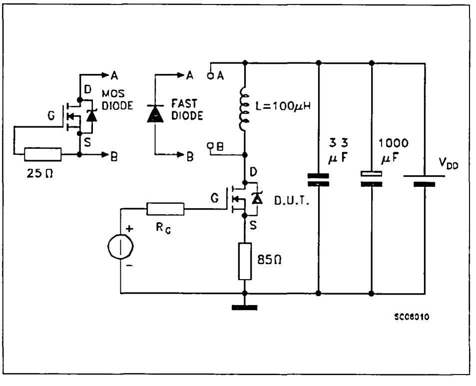


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON
MICROELECTRONICS

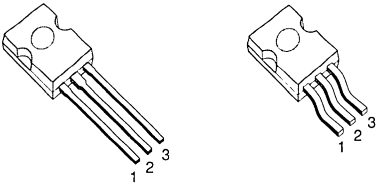
STK23N05L
STK23N06L

N - CHANNEL ENHANCEMENT MODE LOW THRESHOLD POWER MOS TRANSISTOR

PRELIMINARY DATA

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK23N05L	50 V	< 0.055 Ω	23 A
STK23N06L	60 V	< 0.055 Ω	23 A

- TYPICAL $R_{DS(on)}$ = 0.044 Ω
- AVALANCHE RUGGEDNESS TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- LOGIC LEVEL COMPATIBLE INPUT
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION



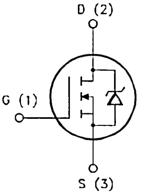
SOT-82

SOT-194 (option)

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STK23N05L	STK23N06L	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50	60	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50	60	V
V_{GS}	Gate-source Voltage	± 15		V
I_D	Drain Current (continuous) at T_c = 25 °C	23		A
I_D	Drain Current (continuous) at T_c = 100 °C	16		A
I_{DM}(•)	Drain Current (pulsed)	92		A
P_{tot}	Total Dissipation at T_c = 25 °C	65		W
	Derating Factor	0.43		W/°C
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case Max	2.31	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max	80	°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink Typ	0.7	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	275	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	23	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	90	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	20	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	16	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0 for **STK23N05L** for **STK23N06L**	 50 60			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 15 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	1	1.6	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 5 V I_D = 11.5 A V_{GS} = 5 V I_D = 11.5 A T_c = 100 °C		0.044	0.055 0.11	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	23			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 11.5 A	9	19		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		980 320 80	1300 450 110	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING RESISTIVE LOAD

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 11.5 A R_{GS} = 50 Ω V_{GS} = 5 V (see test circuit, figure 3)		45 380	65 550	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 23 A R_{GS} = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		130		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 23 A V_{GS} = 5 V		25 8 12	35	nC nC nC

SWITCHING INDUCTIVE LOAD

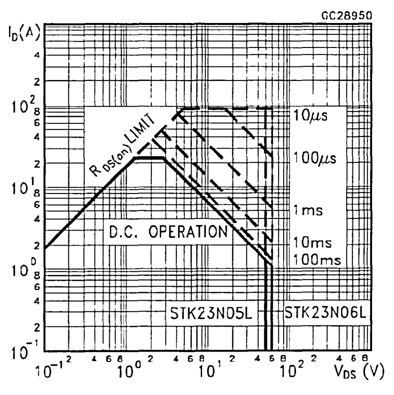
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 23 A R_{GS} = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		80 130 230	120 190 330	ns ns ns

SOURCE DRAIN DIODE

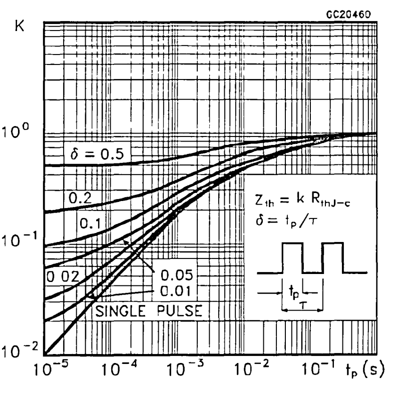
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				23 92	A A
V_{SD} (∗)	Forward On Voltage	I_{SD} = 23 A V_{GS} = 0			1 6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 23 A di/dt = 100 A/µs V_{DD} = 25 V T_j = 150 °C (see test circuit, figure 5)		100 0.2 4		ns µC A

(∗) Pulsed Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

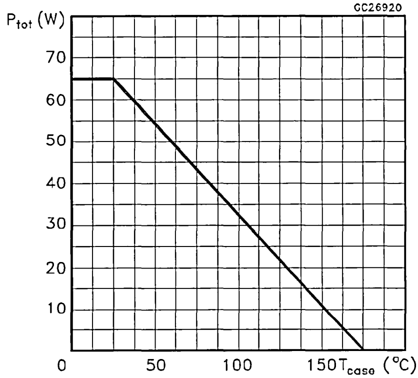
Safe Operating Area



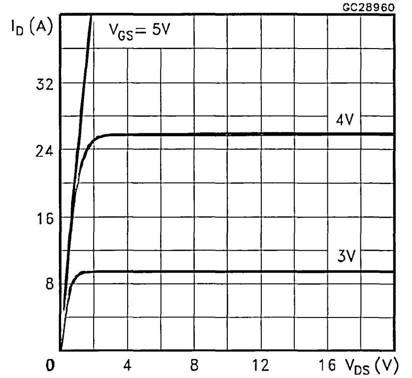
Thermal Impedance



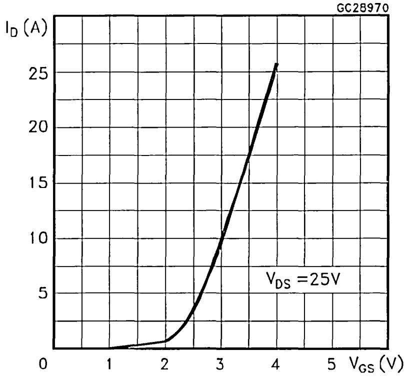
Derating Curve



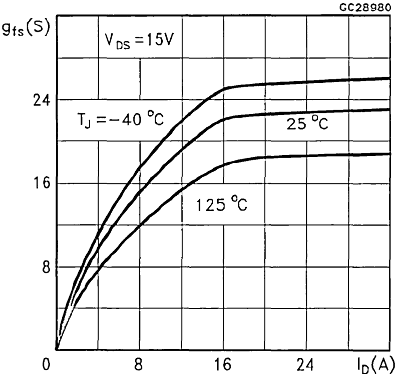
Output Characteristics



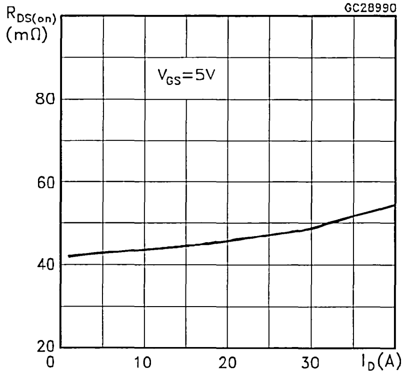
Transfer Characteristics



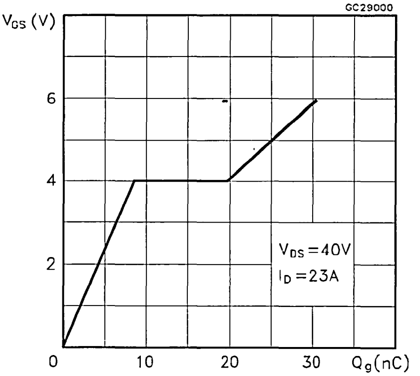
Transconductance



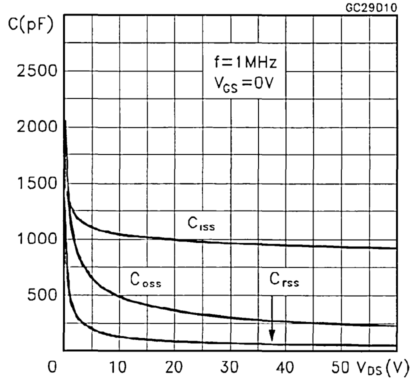
Static Drain-source On Resistance



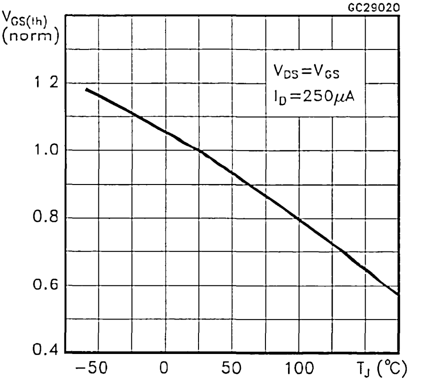
Gate Charge vs Gate-source Voltage



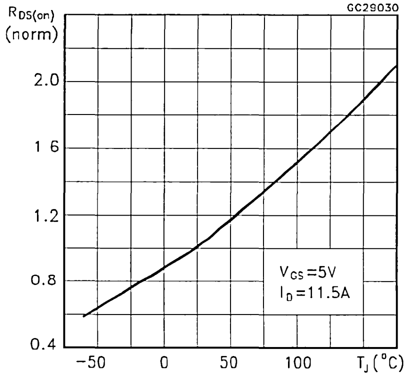
Capacitance Variations



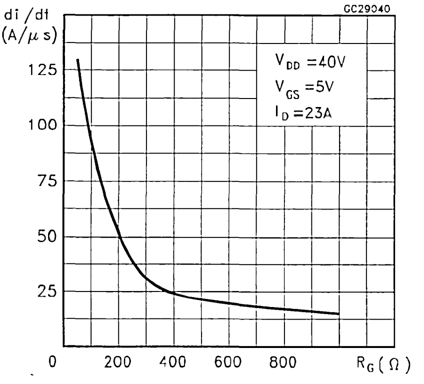
Normalized Gate Threshold Voltage vs Temperature



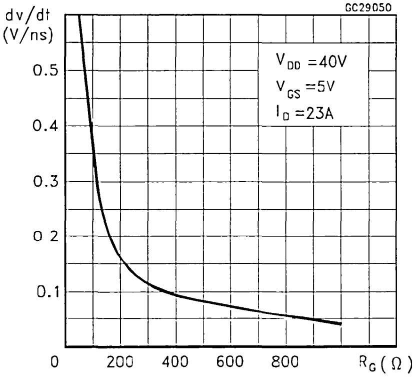
Normalized On Resistance vs Temperature



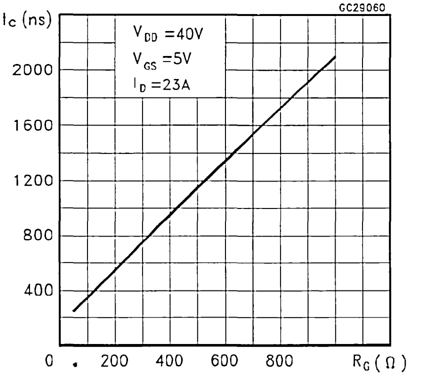
Turn-on Current Slope



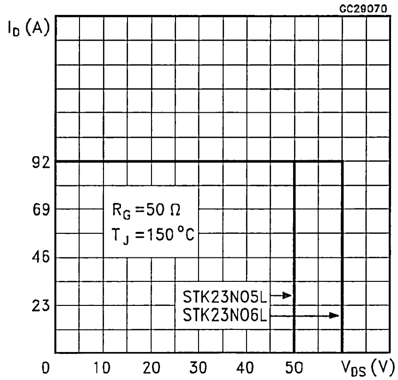
Turn-off Drain-source Voltage Slope



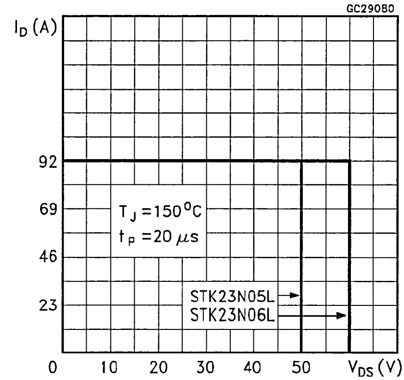
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

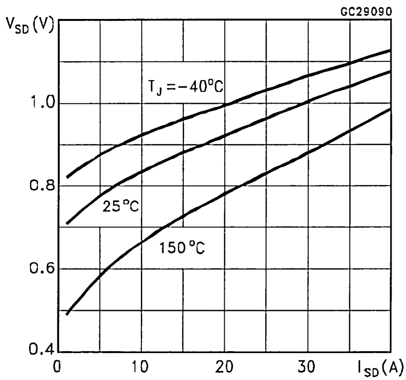


Fig. 1: Unclamped Inductive Load Test Circuits

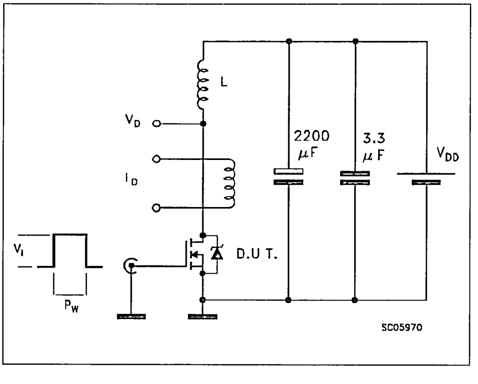


Fig. 2: Unclamped Inductive Waveforms

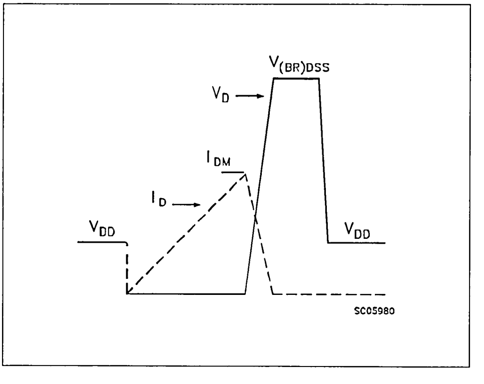


Fig. 3: Switching Times Test Circuits For Resistive Load

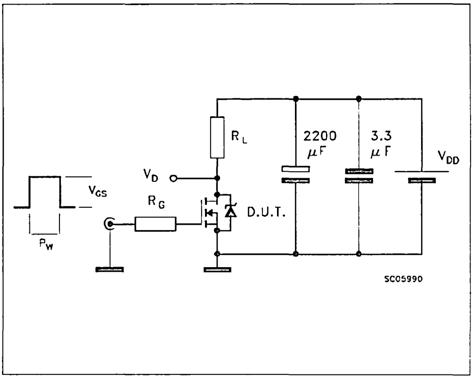


Fig. 4: Gate Charge Test Circuit

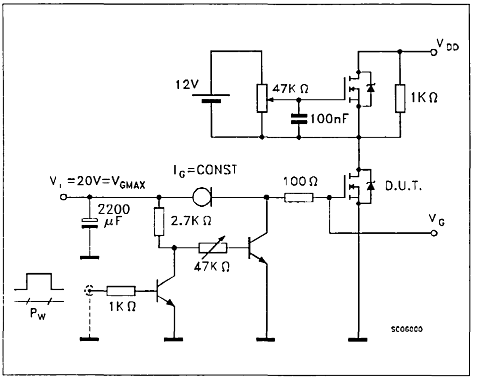
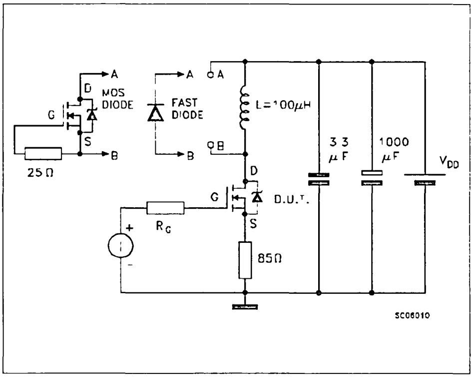


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



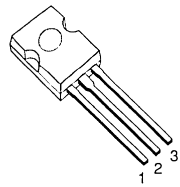
SGS-THOMSON
MICROELECTRONICS

STK3055E

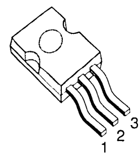
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK3055E	60 V	< 0.15 Ω	12 A

- TYPICAL $R_{DS(on)}$ = 0.1 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION



SOT-82

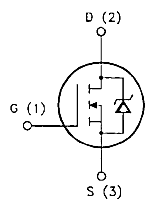


SOT-194 (option)

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	60	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	60	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	12	A
I_D	Drain Current (continuous) at T_c = 100 °C	8	A
I_{DM}(•)	Drain Current (pulsed)	48	A
P_{tot}	Total Dissipation at T_c = 25 °C	50	W
	Derating Factor	0.33	W/°C
T_{stg}	Storage Temperature	-65 to 175	°C
T_j	Max. Operating Junction Temperature	175	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	3.0	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	80	°C/W
R_{thc-s}	Thermal Resistance Case-sink	Typ	0.7	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		275	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	12	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	30	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	7	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	8	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	60			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 6 A V_{GS} = 10V I_D = 6 A T_c = 100°C		0.1	0.15 0.3	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	12			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 6 A	3	5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		330 150 40	450 250 60	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 6 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		40 80	60 120	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 12 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		210		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 12 A V_{GS} = 10 V		15 7 5	25	nC nC nC

SWITCHING OFF

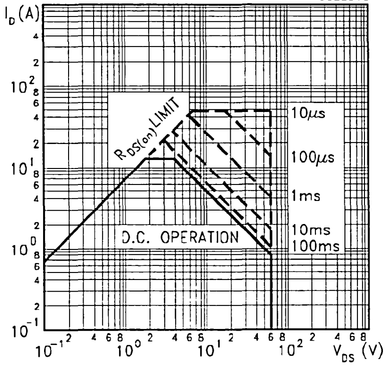
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 12 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		30 40 80	45 60 120	ns ns ns

SOURCE DRAIN DIODE

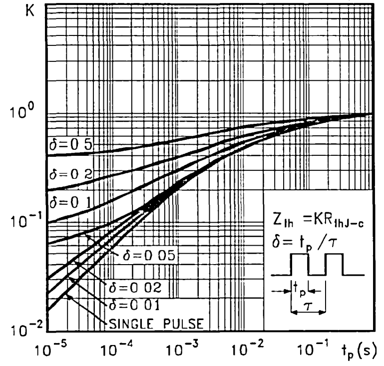
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				12 48	A A
V_{SD} (∗)	Forward On Voltage	I_{SD} = 12 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 12 A di/dt = 100 A/μs V_{DD} = 25 V T_j = 150 °C (see test circuit, figure 5)		60 0.12 4		ns μC A

(∗) Pulsed Pulse duration = 300 μs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

Safe Operating Area

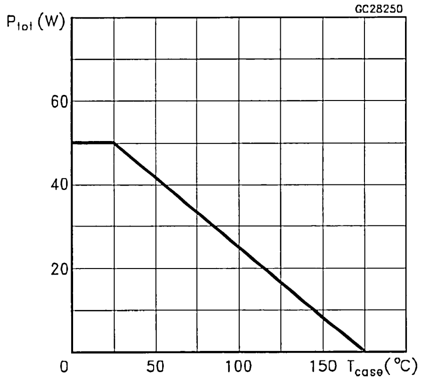


Thermal Impedance

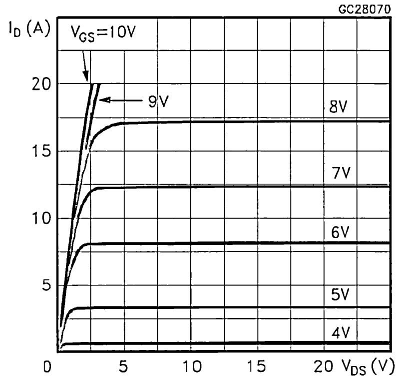


SGS-THOMSON MICROELECTRONICS

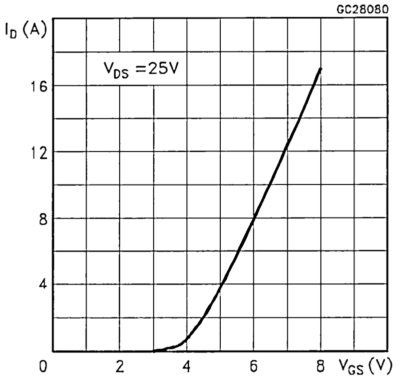
Derating Curve



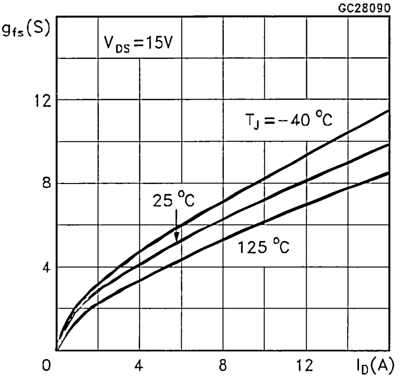
Output Characteristics



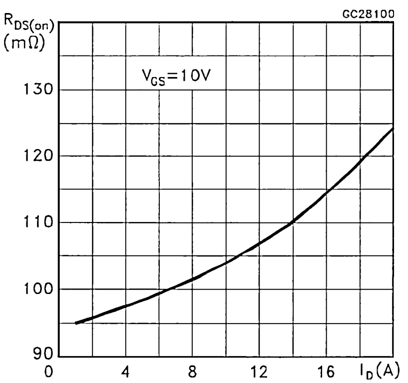
Transfer Characteristics



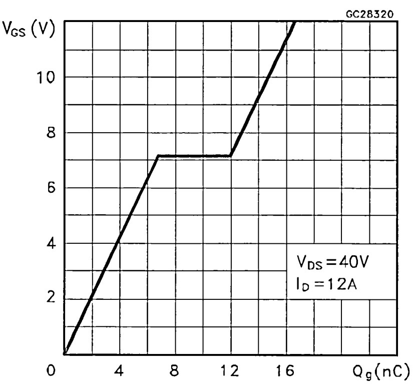
Transconductance



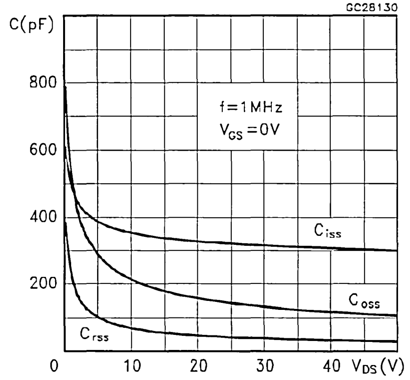
Static Drain-source On Resistance



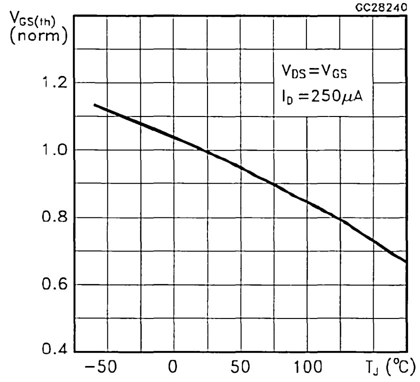
Gate Charge vs Gate-source Voltage



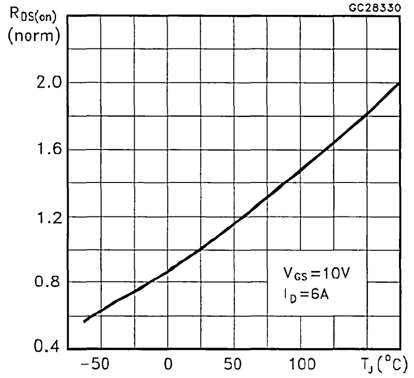
Capacitance Variations



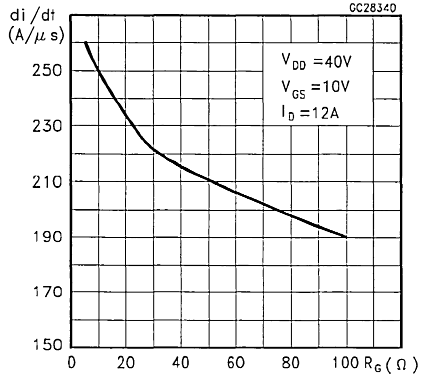
Normalized Gate Threshold Voltage vs Temperature



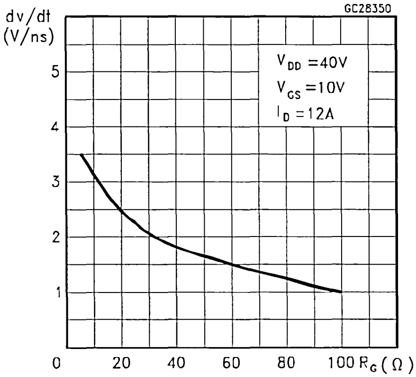
Normalized On Resistance vs Temperature



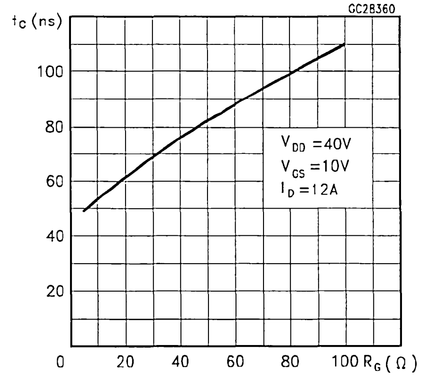
Turn-on Current Slope



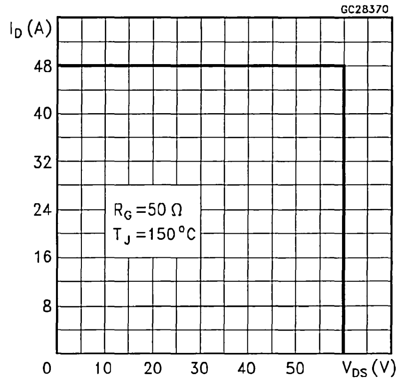
Turn-off Drain-source Voltage Slope



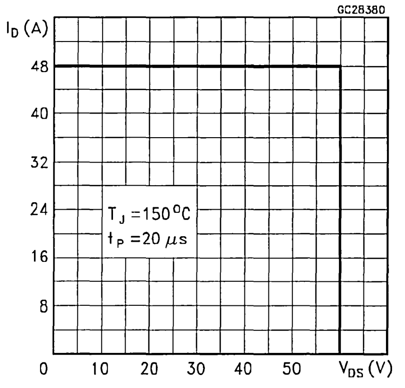
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

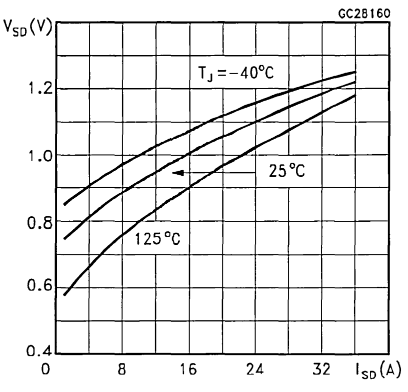


Fig. 1: Unclamped Inductive Load Test Circuits

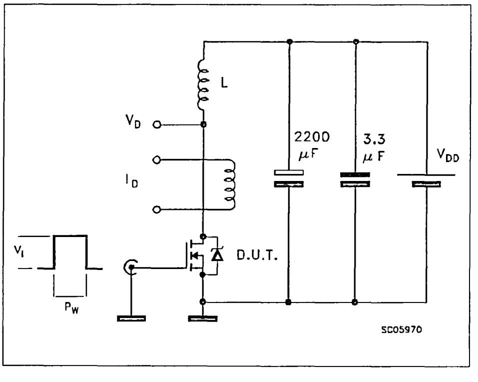


Fig. 2: Unclamped Inductive Waveforms

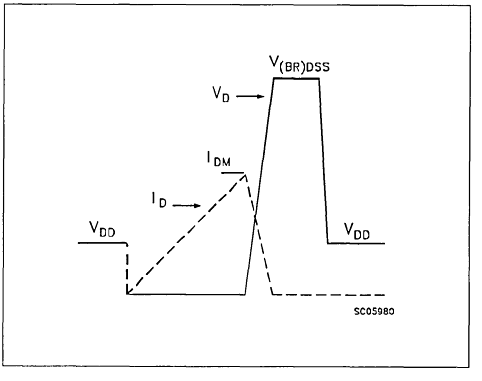


Fig. 3: Switching Times Test Circuits For Resistive Load

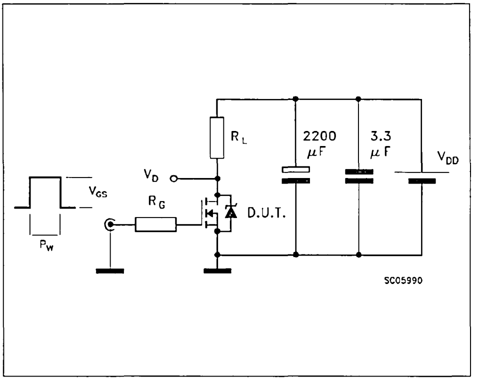


Fig. 4: Gate Charge Test Circuit

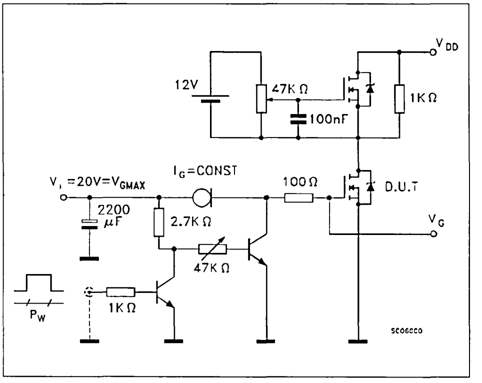
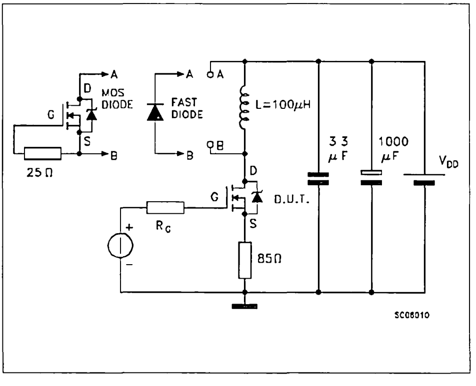


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



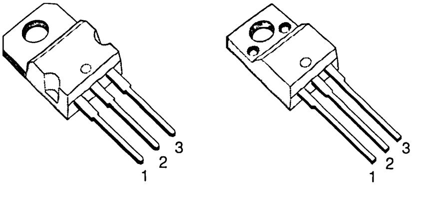
STP2N60
STP2N60FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP2N60 STP2N60FI	600 V 600 V	< 3.5 Ω < 3.5 Ω	2.9 A 2.2 A

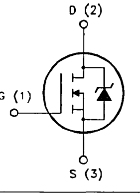
- TYPICAL $R_{DS(on)}$ = 3.2 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



TO-220 ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP2N60	STP2N60FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	600		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	600		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	2.9	2.2	A
I_D	Drain Current (continuous) at T_c = 100 °C	1.7	1.3	A
I_{DM}(•)	Drain Current (pulsed)	11	11	A
P_{tot}	Total Dissipation at T_c = 25 °C	70	35	W
	Derating Factor	0.56	0.28	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case Max	1.78	3.57	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max	62.5		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	2.9	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	105	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	3.5	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	1.7	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	600			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 1.5 A V_{GS} = 10V I_D = 1.5 A T_c = 100°C		3.2	3.5 7	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	2.9			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 1.5 A	1	2.4		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		450 62 23	600 85 35	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 35 V I_D = 2 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		25 110	40 150	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 480 V I_D = 2.9 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		75		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 480 V I_D = 2.9 A V_{GS} = 10 V		33 7 13	45	nC nC nC

SWITCHING OFF

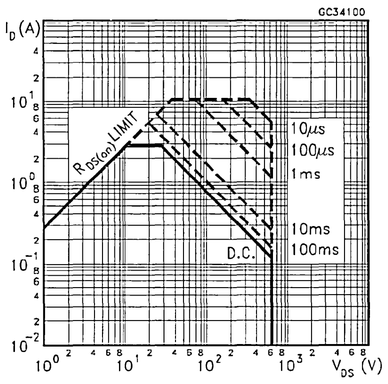
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 480 V I_D = 2.9 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		70 20 100	95 30 130	ns ns ns

SOURCE DRAIN DIODE

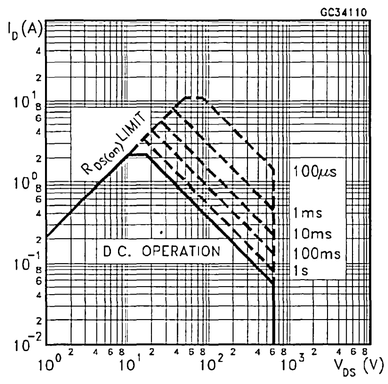
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				2.9 11	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 2.9 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 2.9 A di/dt = 100 A/µs V_{DD} = 80 V T_j = 150 °C (see test circuit, figure 5)		500 7 28		ns µC A

(*) Pulsed. Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

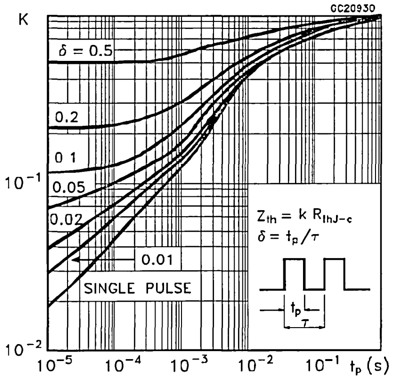
Safe Operating Areas For TO-220



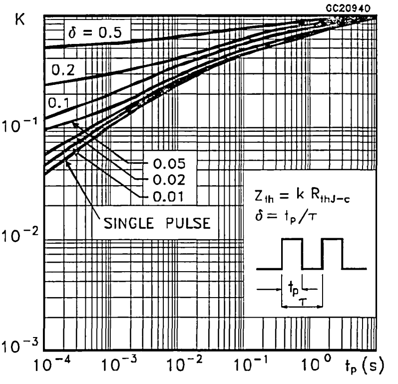
Safe Operating Areas For ISOWATT220



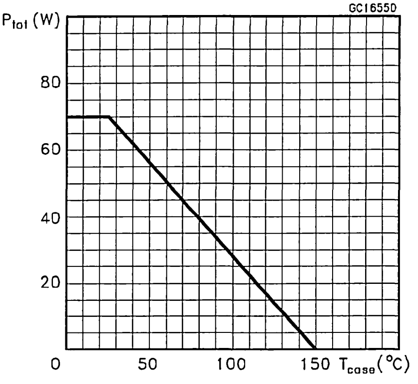
Thermal Impedeance For TO-220



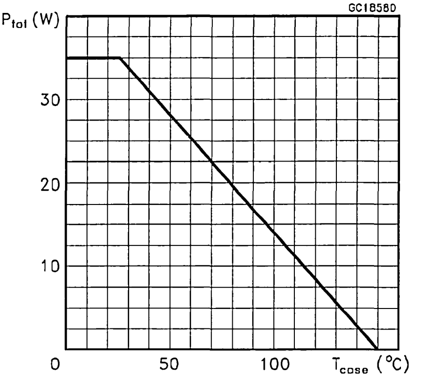
Thermal Impedance For ISOWATT220



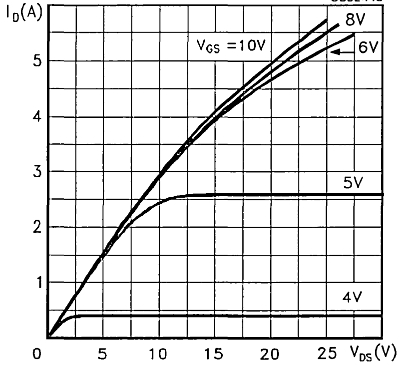
Derating Curve For TO-220



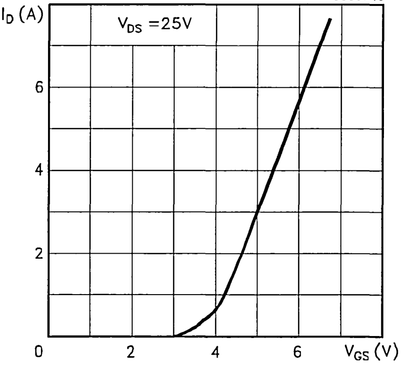
Derating Curve For ISOWATT220



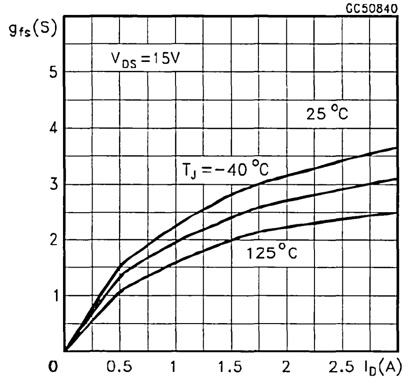
Output Characteristics



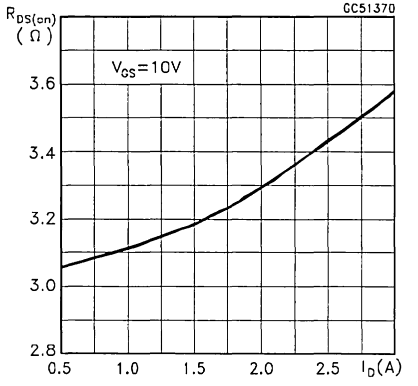
Transfer Characteristics



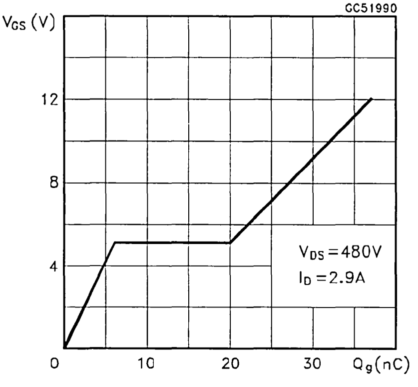
Transconductance



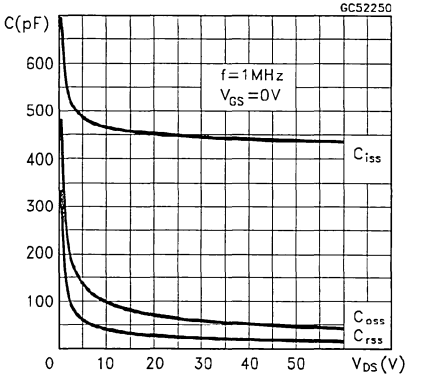
Static Drain-source On Resistance



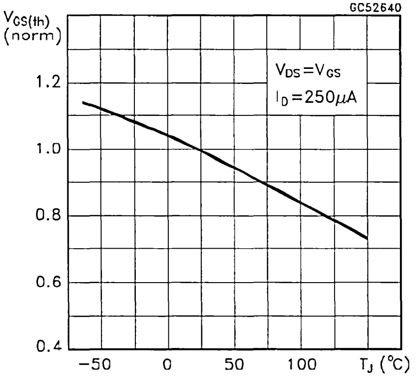
Gate Charge vs Gate-source Voltage



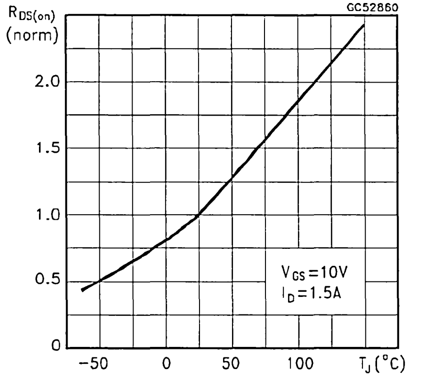
Capacitance Variations



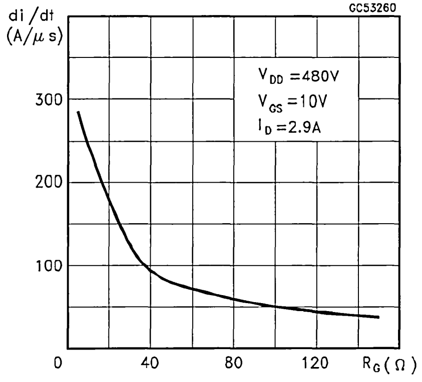
Normalized Gate Threshold Voltage vs Temperature



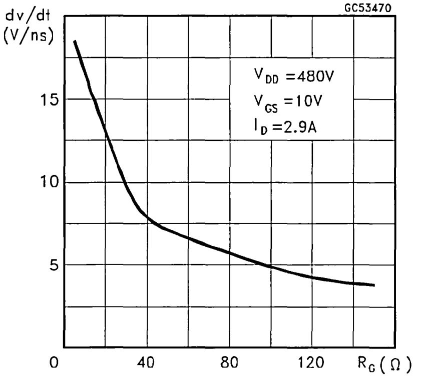
Normalized On Resistance vs Temperature



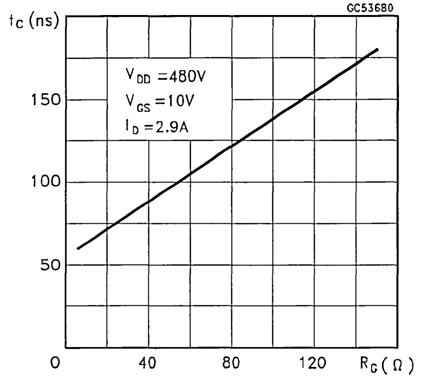
Turn-on Current Slope



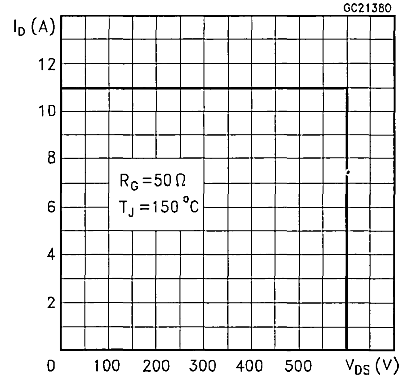
Turn-off Drain-source Voltage Slope



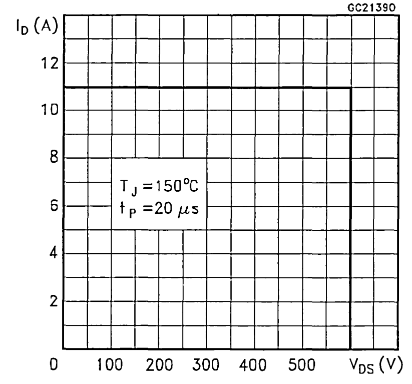
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

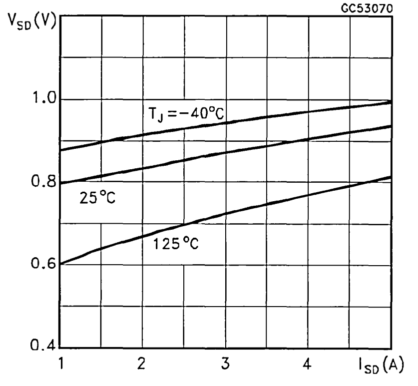


Fig. 1: Unclamped Inductive Load Test Circuits

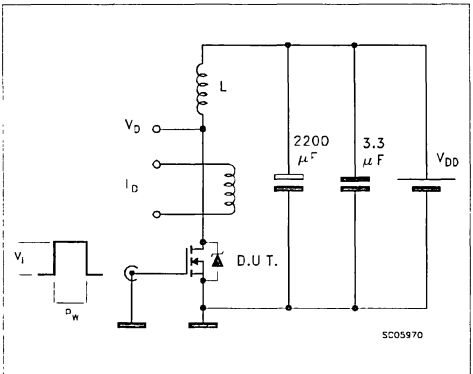


Fig. 2: Unclamped Inductive Waveforms

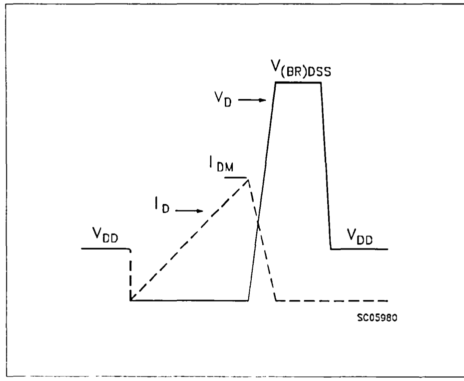


Fig. 3: Switching Times Test Circuits For Resistive Load

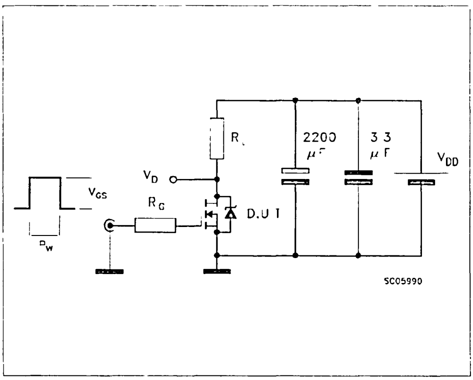


Fig. 4: Gate Charge Test Circuit

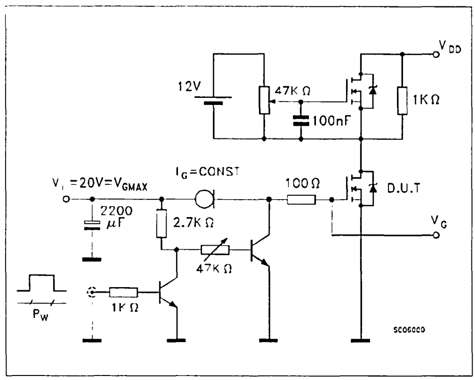
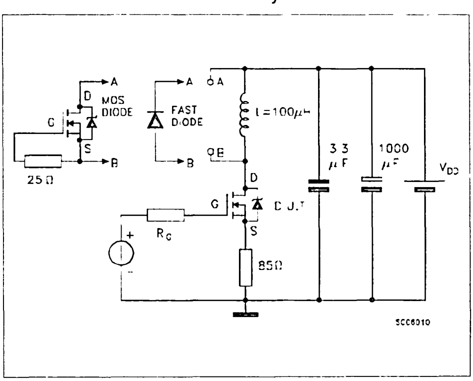


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON
MICROELECTRONICS

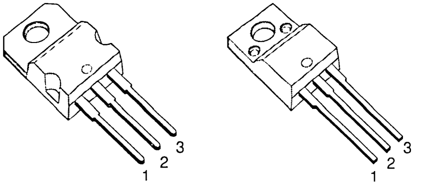
STP2N80
STP2N80FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP2N80 STP2N80FI	800 V 800 V	< 7 Ω < 7 Ω	2.4 A 1.5 A

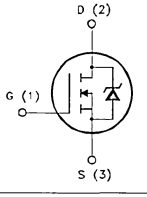
- TYPICAL $R_{DS(on)}$ = 5 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING



TO-220 **ISOWATT220**

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP2N80	STP2N80FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	800		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	800		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	2.4	1.5	A
I_D	Drain Current (continuous) at T_c = 100 °C	1.5	0.95	A
I_{DM}(•)	Drain Current (pulsed)	9.6	9.6	A
P_{tot}	Total Dissipation at T_c = 25 °C	90	35	W
	Derating Factor	0.72	0.28	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1.38	3.57	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	2.4	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	85	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	3	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	1.5	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	800			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 1 A V_{GS} = 10V I_D = 1 A T_c = 100°C		5	7 14	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	2.4			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 1 A	1.2	1.9		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		460 55 22	600 70 30	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 400 V I_D = 1.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		38 42	50 57	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 640 V I_D = 2 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		160		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 640 V I_D = 2 A V_{GS} = 10 V		31 6 14	40	nC nC nC

SWITCHING OFF

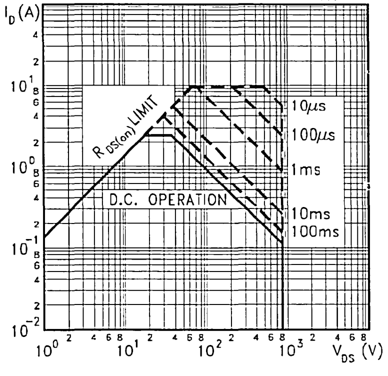
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 640 V I_D = 2 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		70 25 108	90 32 140	ns ns ns

SOURCE DRAIN DIODE

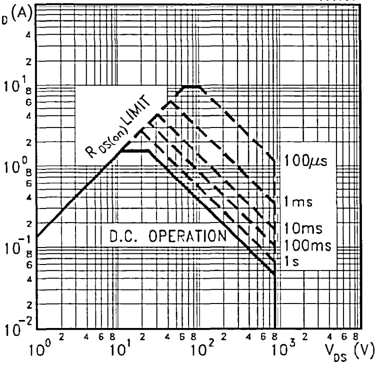
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				2.4 9.6	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 2.4 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 2 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		920 18.4 40		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

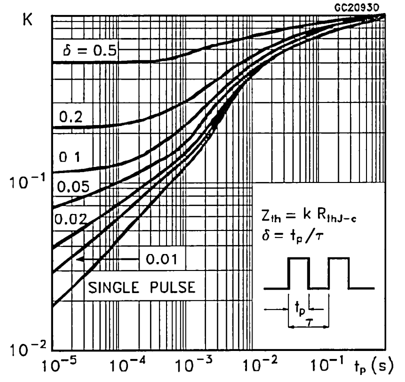
Safe Operating Areas For TO-220



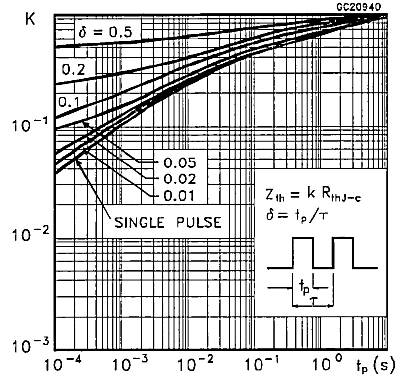
Safe Operating Areas For ISOWATT220



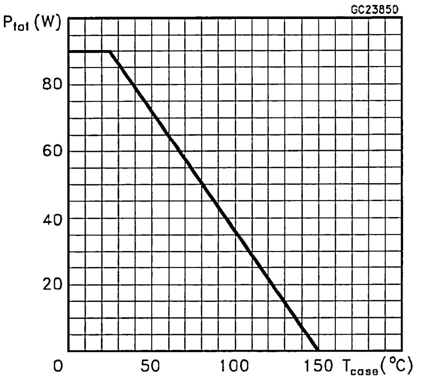
Thermal Impedeance For TO-220



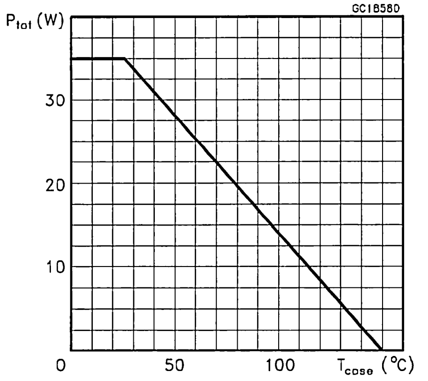
Thermal Impedance For ISOWATT220



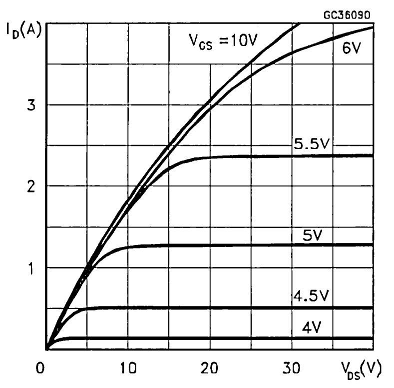
Derating Curve For TO-220



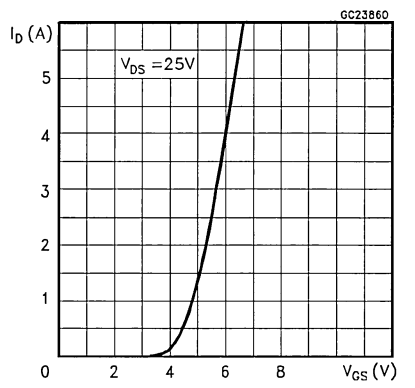
Derating Curve For ISOWATT220



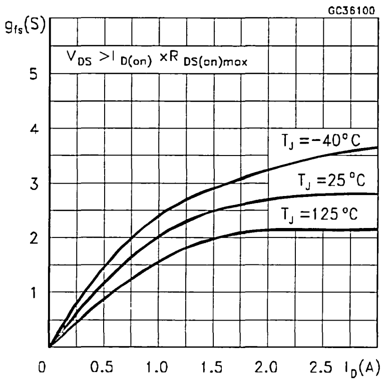
Output Characteristics



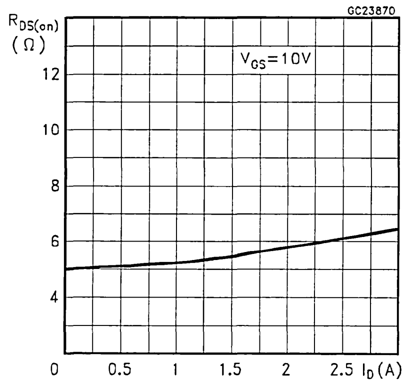
Transfer Characteristics



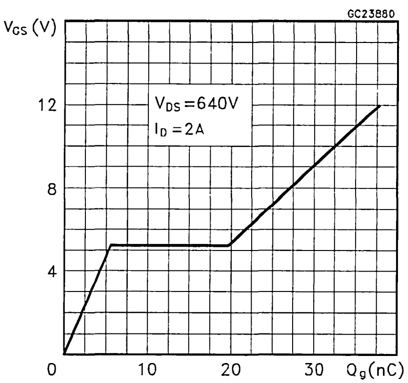
Transconductance



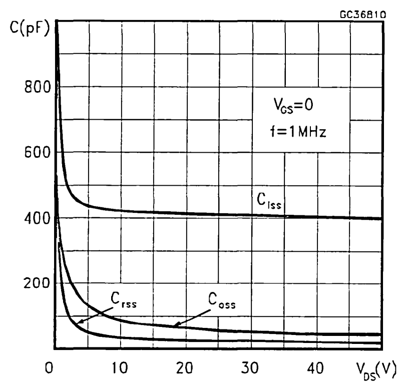
Static Drain-source On Resistance



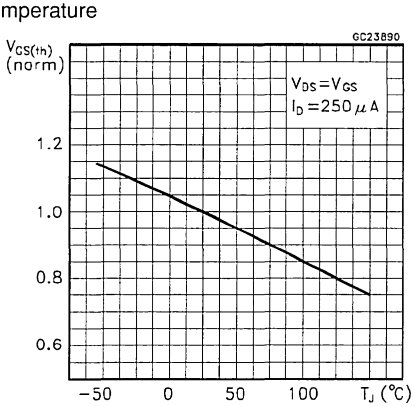
Gate Charge vs Gate-source Voltage



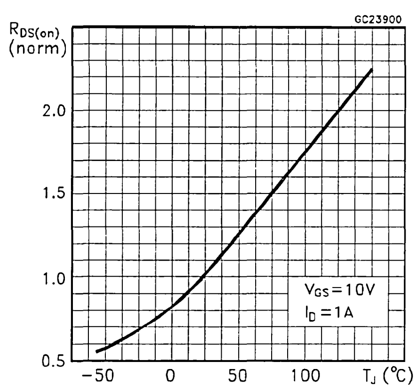
Capacitance Variations



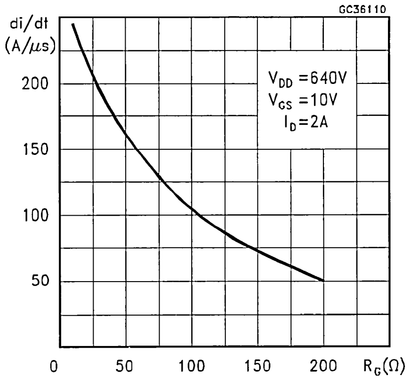
Normalized Gate Threshold Voltage vs Temperature



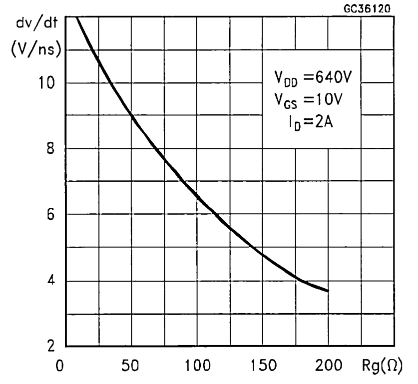
Normalized On Resistance vs Temperature



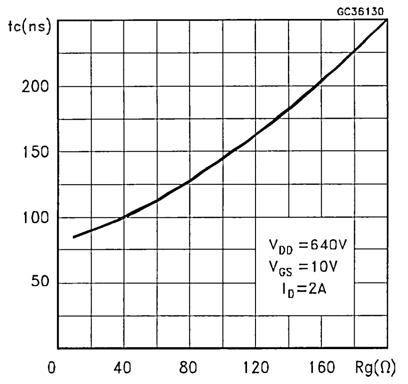
Turn-on Current Slope



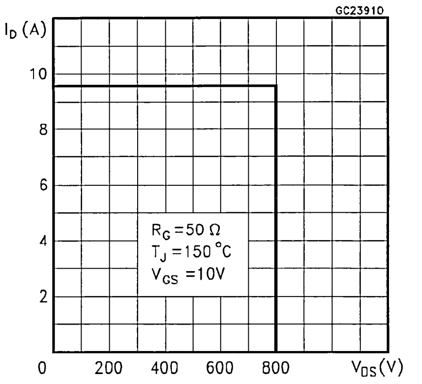
Turn-off Drain-source Voltage Slope



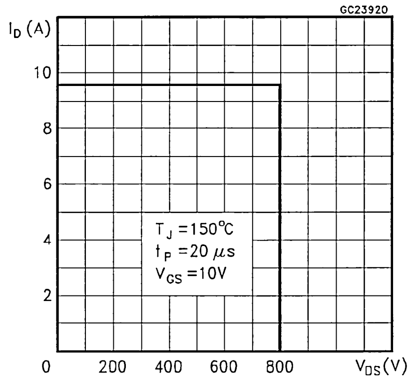
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

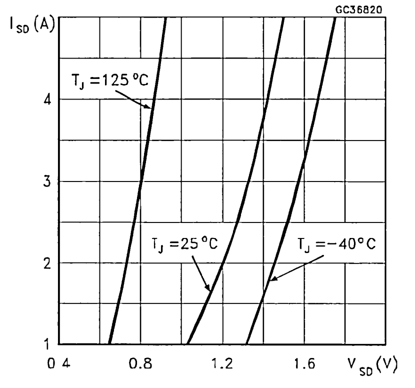


Fig. 1: Unclamped Inductive Load Test Circuits

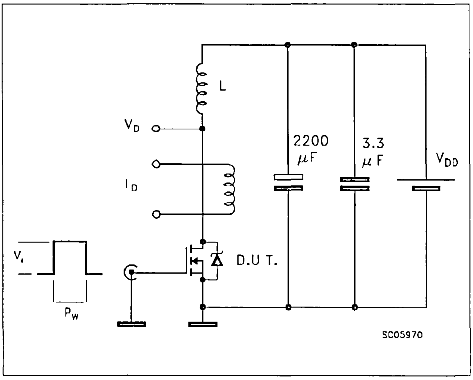


Fig. 2: Unclamped Inductive Waveforms

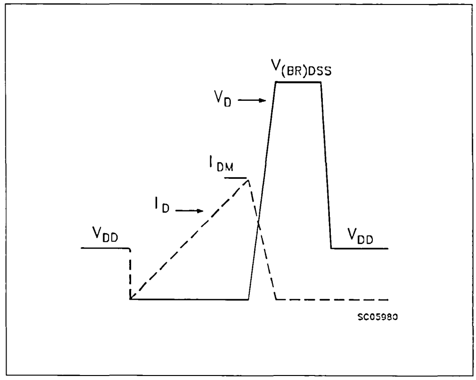


Fig. 3: Switching Times Test Circuits For Resistive Load

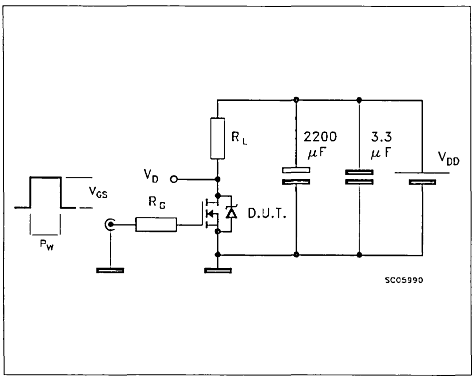


Fig. 4: Gate Charge Test Circuit

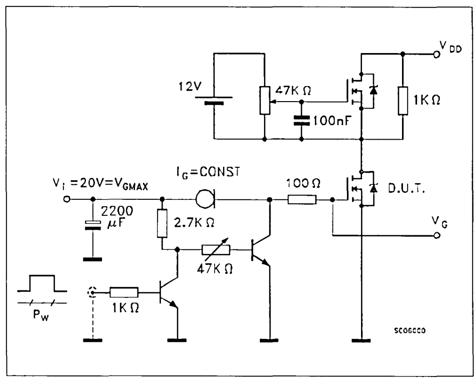
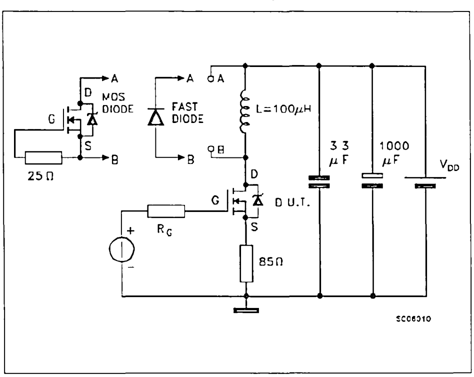


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



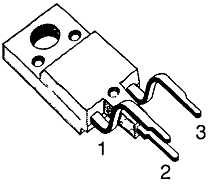
STP3N50XI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP3N50XI	500 V	< 4 Ω	1.7 A

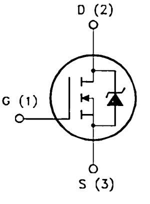
- TYPICAL $R_{DS(on)}$ = 2.5 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



ISOWATT221

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	500	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	500	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	1.7	A
I_D	Drain Current (continuous) at T_c = 100 °C	1.1	A
I_{DM}(•)	Drain Current (pulsed)	6.8	A
P_{tot}	Total Dissipation at T_c = 25 °C	25	W
	Derating Factor	0.2	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	4000	V
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	5	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	60	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Case-sink	Typ	0.5	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	2.7	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	200	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	5	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	1.6	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	500			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 1.5 A V_{GS} = 10V I_D = 1.5 A T_c = 100°C		2.5	4 8	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	1.7			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 1.5 A	0.8	1.93		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		350 60 25	460 80 35	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 250 V I_D = 1.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		35 85	45 110	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 400 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		120		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D =3 A V_{GS} = 10 V		25 6 11	35	nC nC nC

SWITCHING OFF

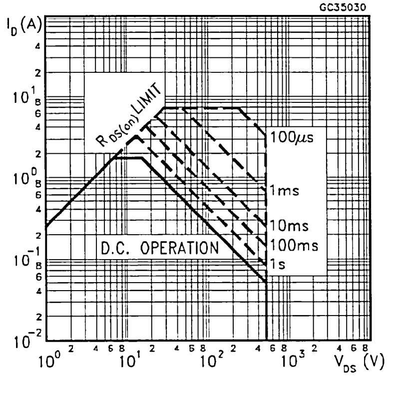
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 400 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		50 20 80	65 30 105	ns ns ns

SOURCE DRAIN DIODE

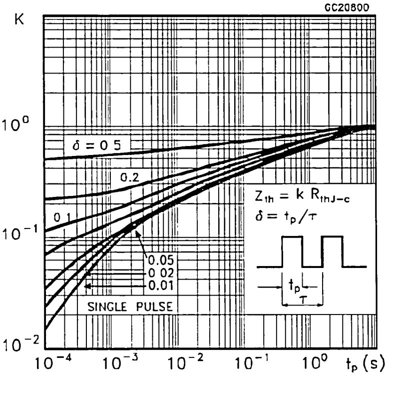
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				1.7 6.8	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 1.7 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 2.8 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		380 3.8 20		ns µC A

(*) Pulsed. Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

Safe Operating Area

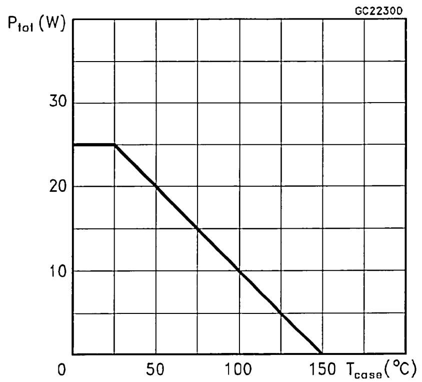


Thermal Impedance

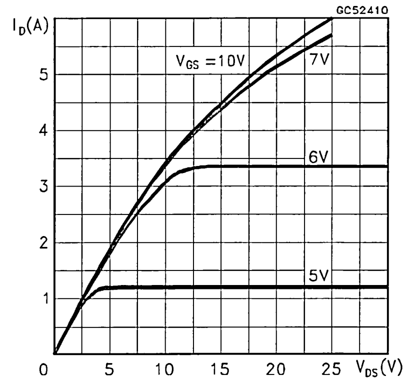


SGS-THOMSON MICROELECTRONICS

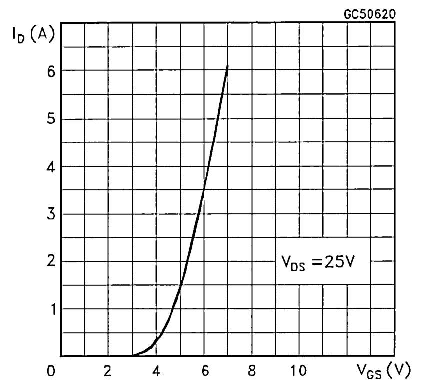
Derating Curve



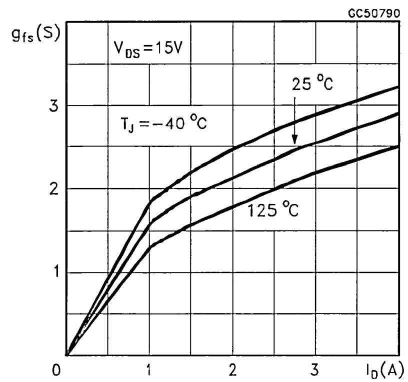
Output Characteristics



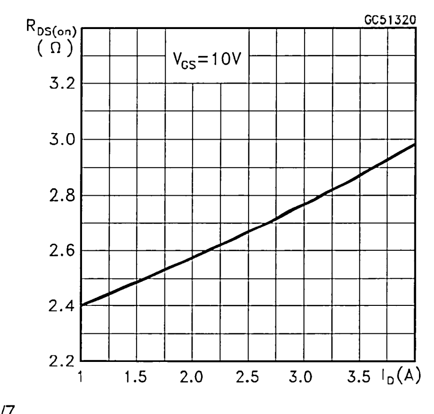
Transfer Characteristics



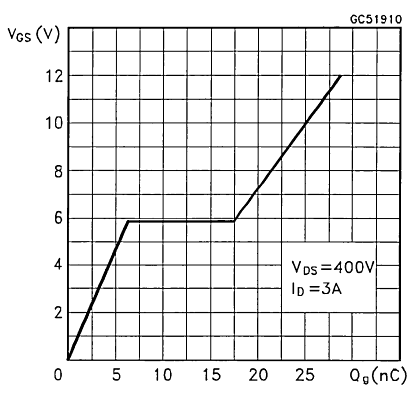
Transconductance



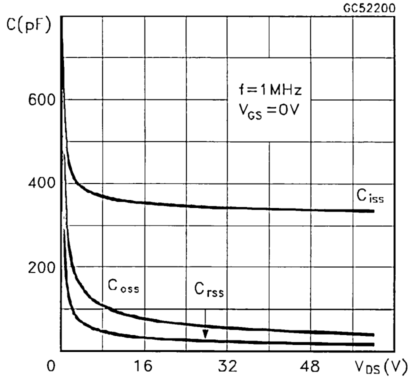
Static Drain-source On Resistance



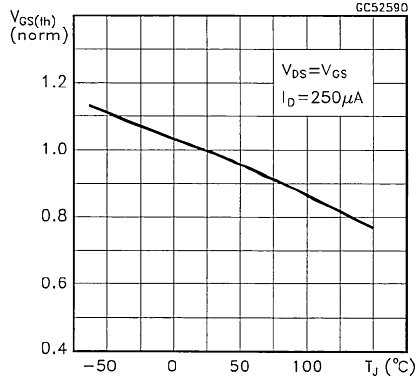
Gate Charge vs Gate-source Voltage



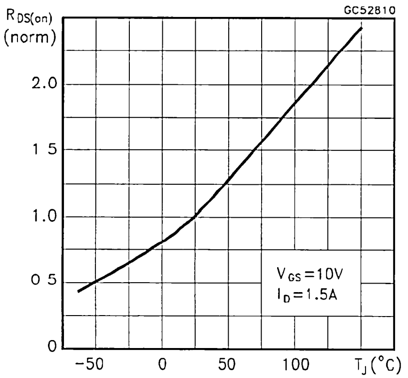
Capacitance Variations



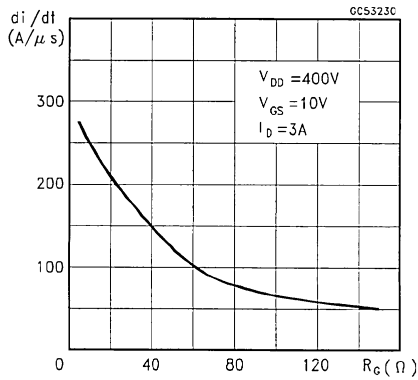
Normalized Gate Threshold Voltage vs Temperature



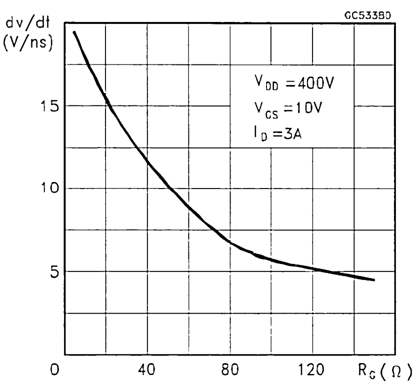
Normalized On Resistance vs Temperature



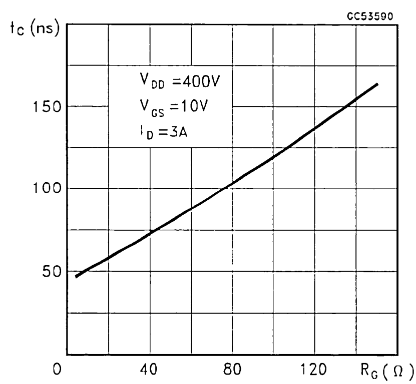
Turn-on Current Slope



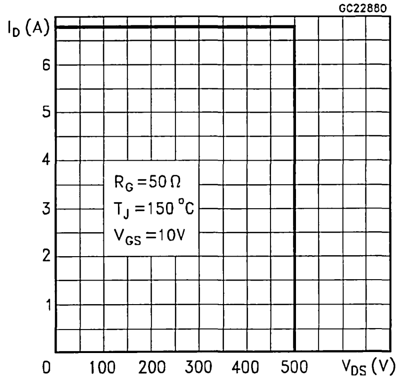
Turn-off Drain-source Voltage Slope



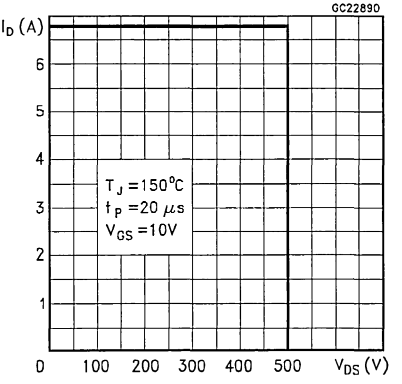
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

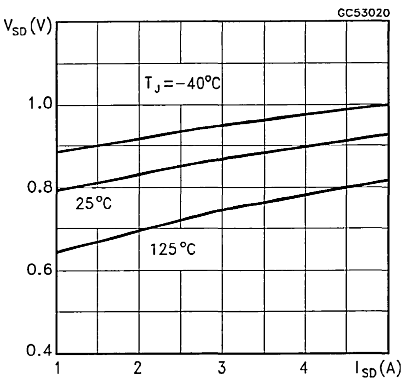


Fig. 1: Unclamped Inductive Load Test Circuits

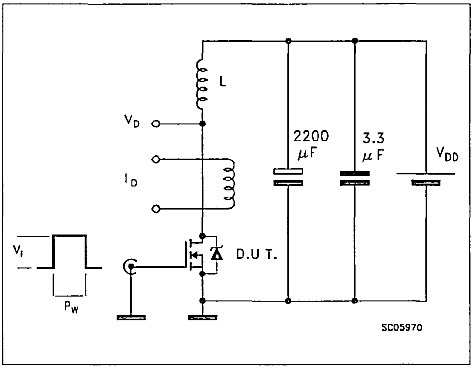


Fig. 2: Unclamped Inductive Waveforms

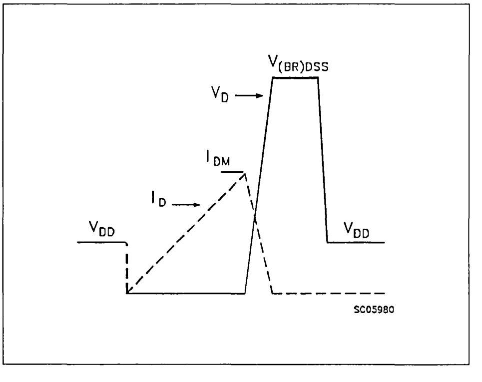


Fig. 3: Switching Times Test Circuits For Resistive Load

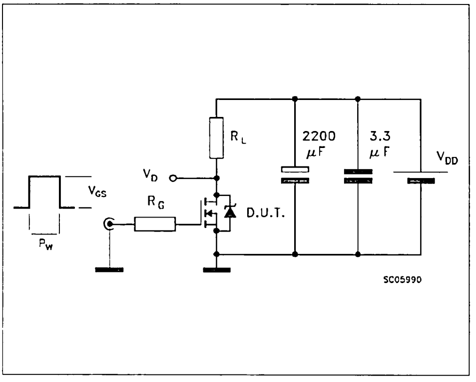


Fig. 4: Gate Charge Test Circuit

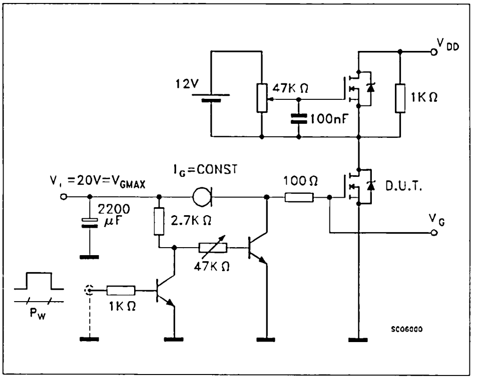
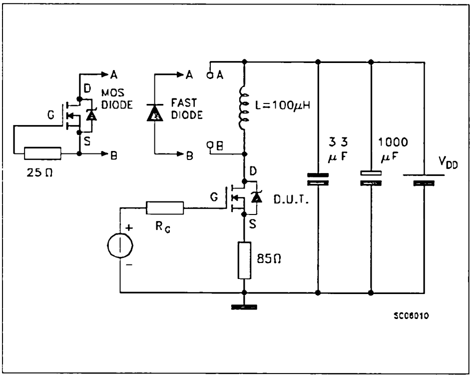


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



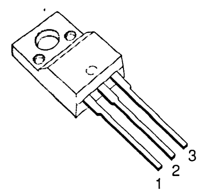
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP3N60FI	600 V	< 2.2 Ω	2.7 A

- TYPICAL $R_{DS(on)}$ = 2 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

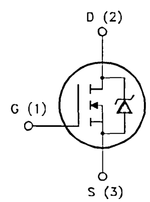
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	600	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	600	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	2.7	A
I_D	Drain Current (continuous) at T_c = 100 °C	1.7	A
I_{DM}(•)	Drain Current (pulsed)	14	A
P_{tot}	Total Dissipation at T_c = 25 °C	35	W
	Derating Factor	0.28	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	2000	V
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	3.57	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	°C/W
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.5	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	4.3	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	370	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	9.8	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	2.7	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	600			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 1.5 A V_{GS} = 10V I_D = 1.5 A T_c = 100°C		2	2.2 4.4	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	3			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 1.5 A	1.5	2.6		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		560 90 40	800 130 50	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 225 V I_D = 2.5 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 3)		45 33	60 42	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 480 V I_D = 4 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 5)		200		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 480 V I_D = 4 A V_{GS} = 10 V		43 6 21	55	nC nC nC

SWITCHING OFF

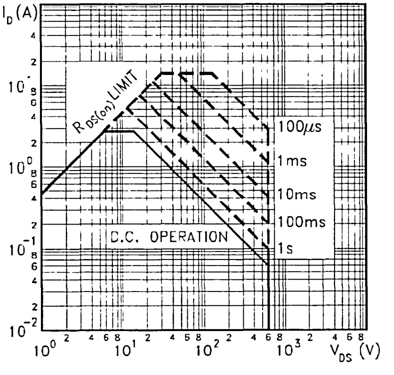
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 480 V I_D = 4 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 5)		35 40 60	45 55 75	ns ns ns

SOURCE DRAIN DIODE

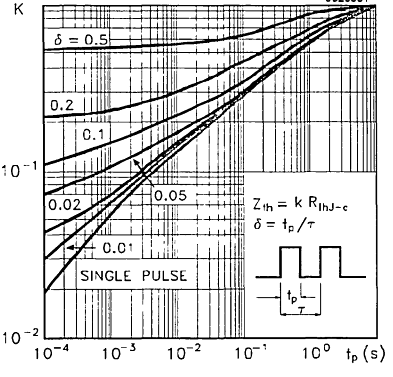
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				2.7 14	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 3 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 4 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		420 3.7 18		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

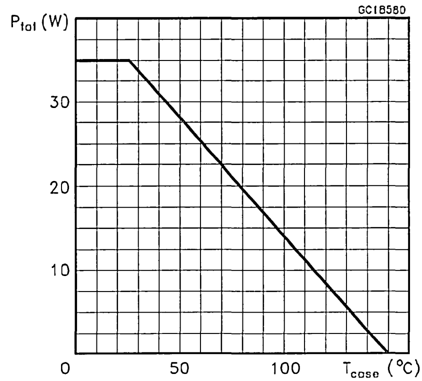
Safe Operating Area



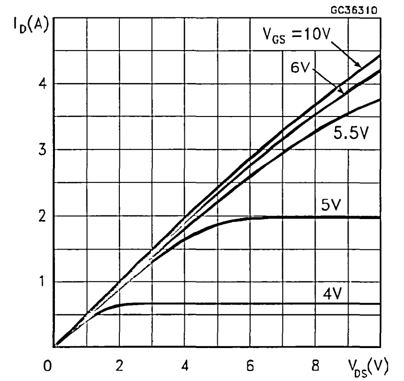
Thermal Impedance



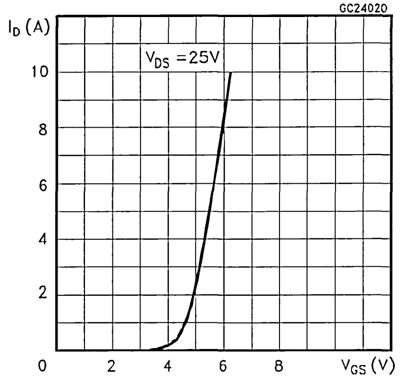
Derating Curve



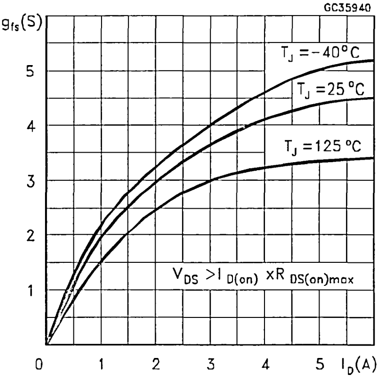
Output Characteristics



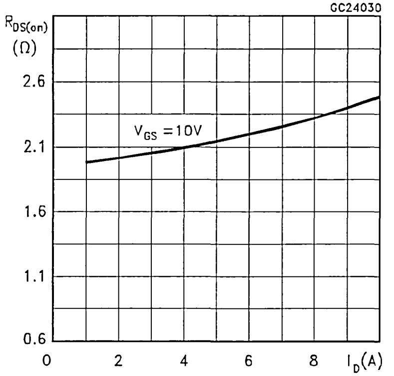
Transfer Characteristics



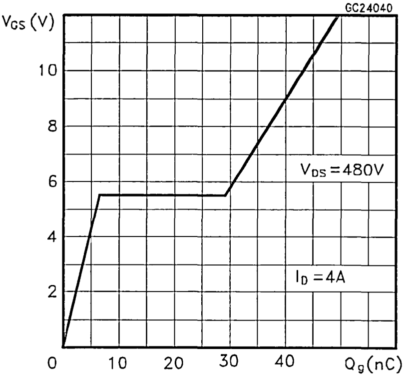
Transconductance



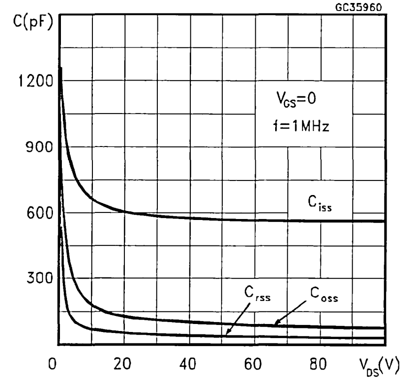
Static Drain-source On Resistance



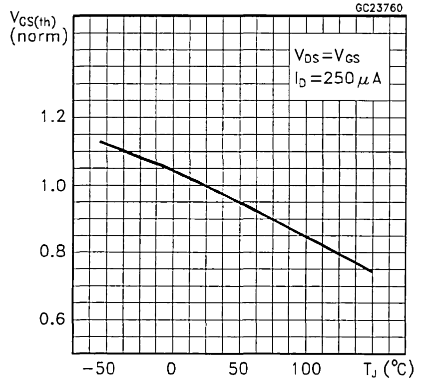
Gate Charge vs Gate-source Voltage



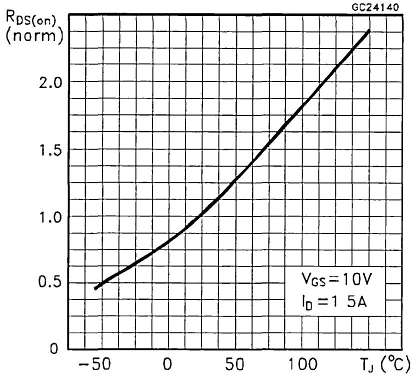
Capacitance Variations



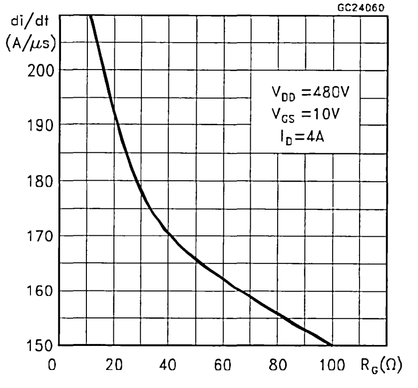
Normalized Gate Threshold Voltage vs Temperature



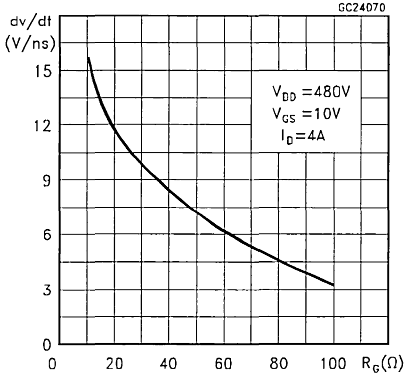
Normalized On Resistance vs Temperature



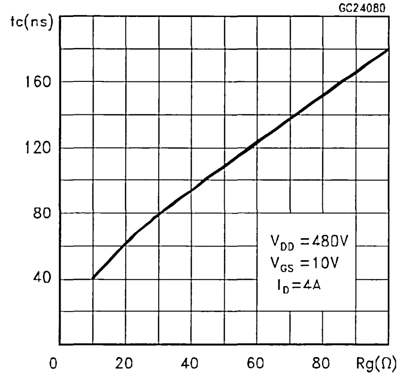
Turn-on Current Slope



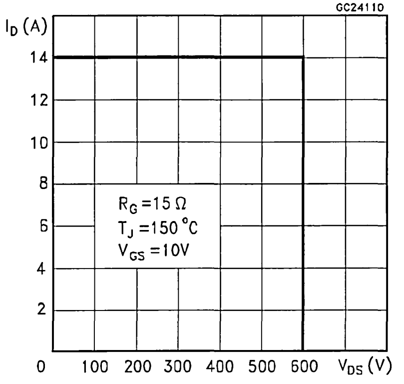
Turn-off Drain-source Voltage Slope



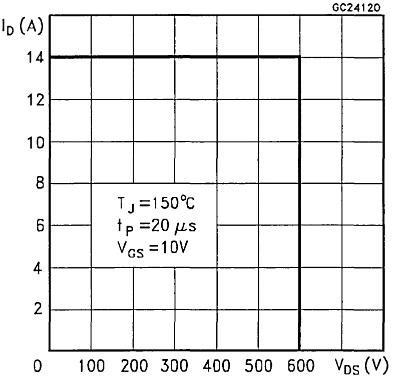
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

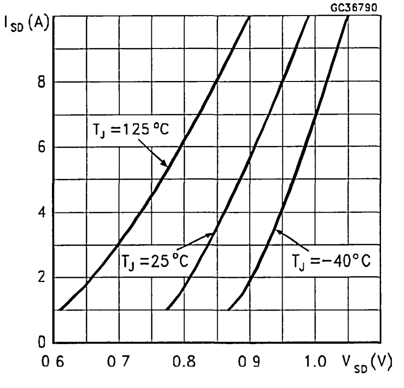


Fig. 1: Unclamped Inductive Load Test Circuits

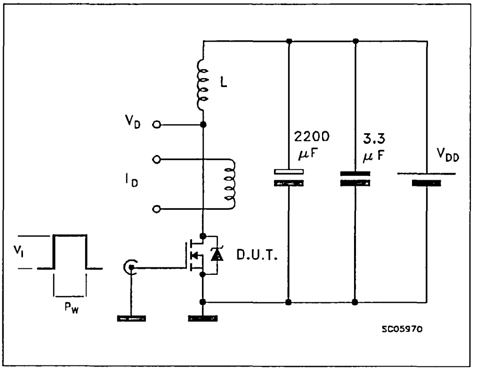


Fig. 2: Unclamped Inductive Waveforms

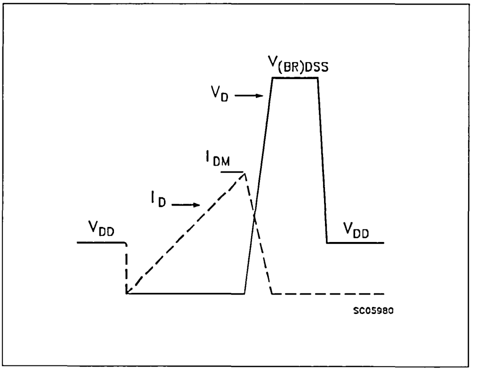


Fig. 3: Switching Times Test Circuits For Resistive Load

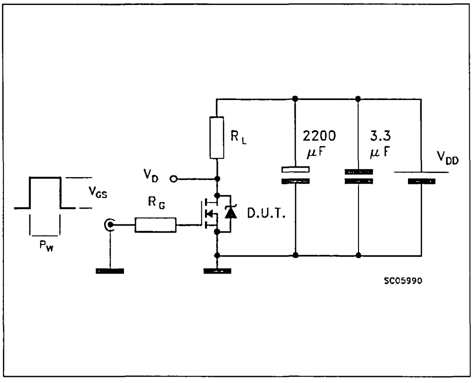


Fig. 4: Gate Charge Test Circuit

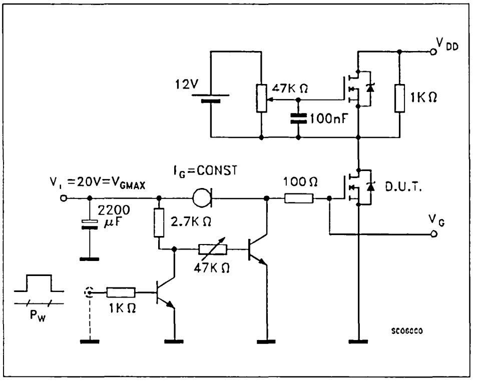
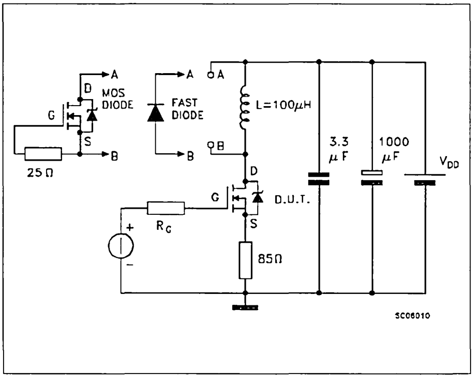


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON MICROELECTRONICS

STP3N60XI

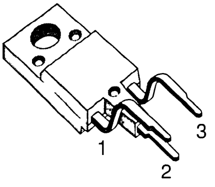
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP3N60XI	600 V	< 2.5 Ω	2.4 A

- TYPICAL $R_{DS(on)} = 2\ \Omega$
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



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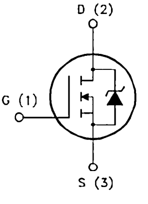
INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	600	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	600	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	2.4	A
I_D	Drain Current (continuous) at T_c = 100 °C	1.6	A
I_{DM}(•)	Drain Current (pulsed)	9.6	A
P_{tot}	Total Dissipation at T_c = 25 °C	28	W
	Derating Factor	0.22	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	4000	V
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	4.46	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	60	°C/W
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.5	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	3	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 50$ V)	180	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	3.5	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	1.6	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	600			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10$V $I_D = 1.5$ A $V_{GS} = 10$V $I_D = 1.5$ A $T_c = 100$°C		2	2.5 5	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	2.4			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 1.5$ A	1.5	2.6		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		560 90 40	800 130 50	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 225 V I_D = 2.5 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 3)		45 33	60 42	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 480 V I_D = 4 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 5)		200		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 4 A V_{GS} = 10 V		43 6 21	55	nC nC nC

SWITCHING OFF

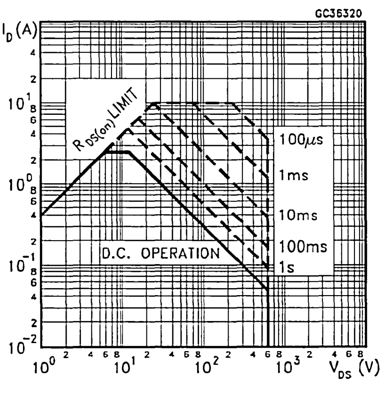
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 480 V I_D = 4 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 5)		35 40 60	45 55 75	ns ns ns

SOURCE DRAIN DIODE

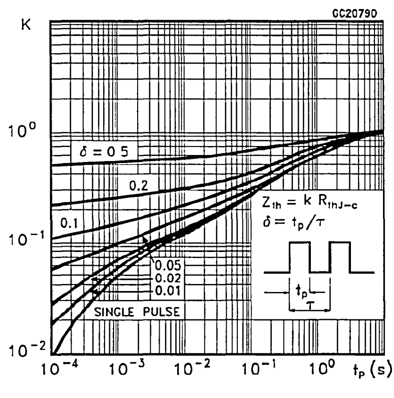
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				2.4 9.6	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 2.4 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 4 A di/dt = 100 A/µs V_R = 100 V T_j = 150 °C (see test circuit, figure 5)		420 3.7 18		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

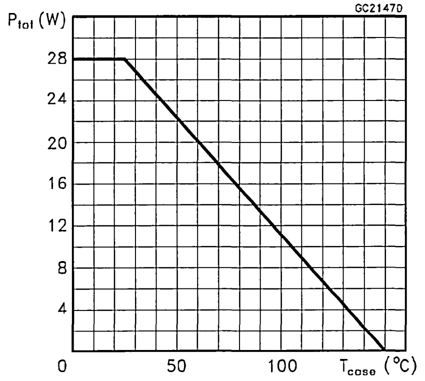
Safe Operating Area



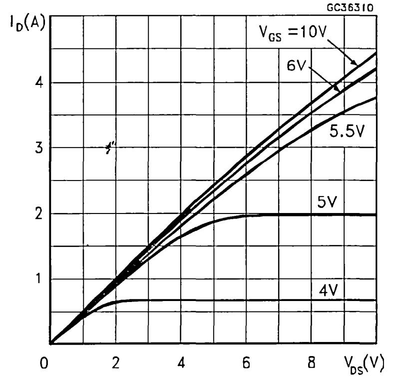
Thermal Impedance



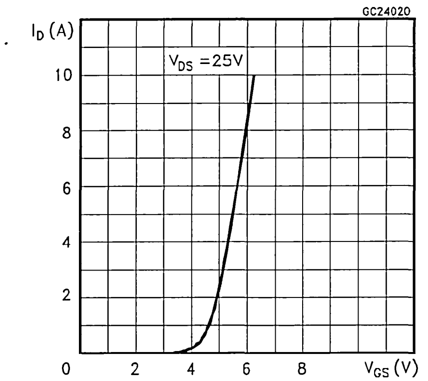
Derating Curve



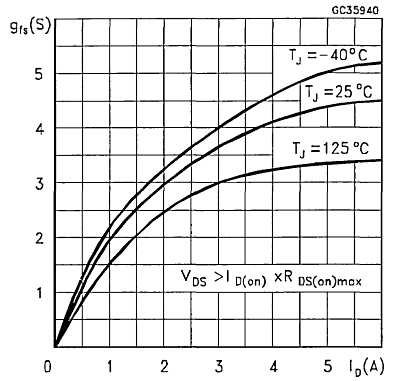
Output Characteristics



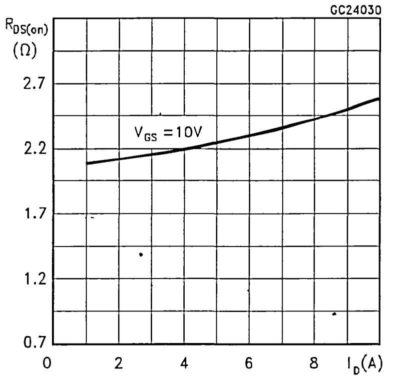
Transfer Characteristics



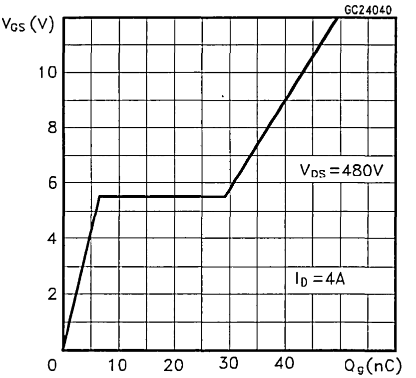
Transconductance



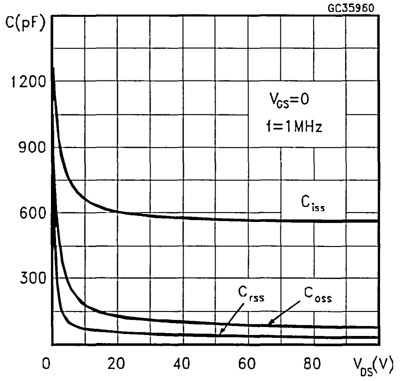
Static Drain-source On Resistance



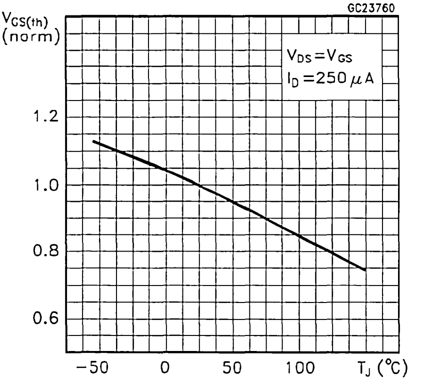
Gate Charge vs Gate-source Voltage



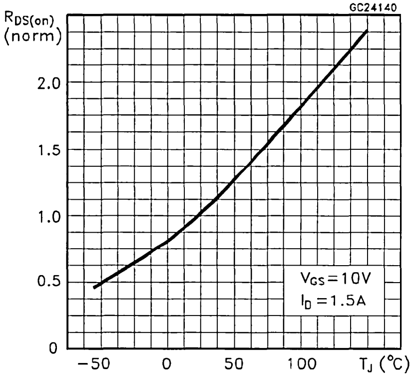
Capacitance Variations



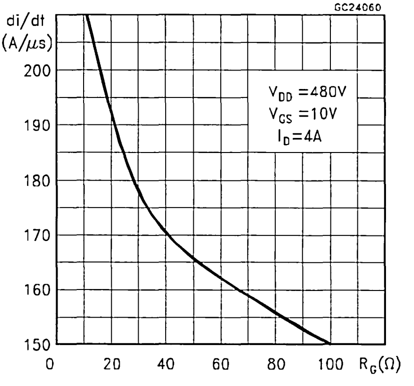
Normalized Gate Threshold Voltage vs Temperature



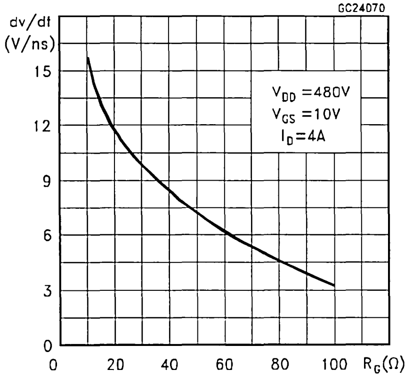
Normalized On Resistance vs Temperature



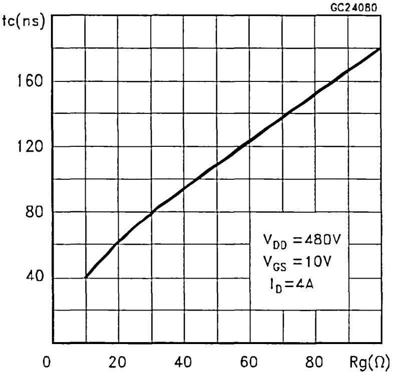
Turn-on Current Slope



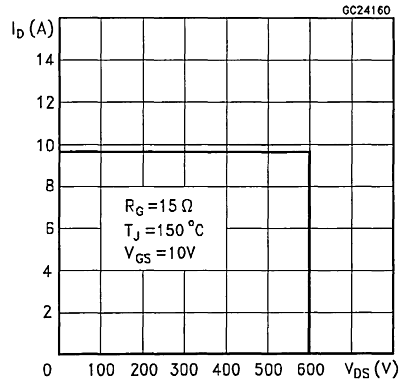
Turn-off Drain-source Voltage Slope



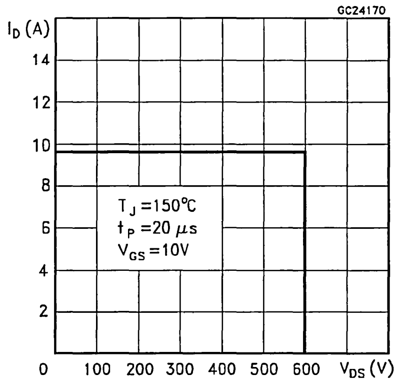
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

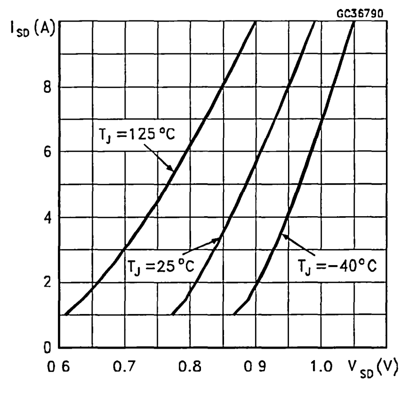


Fig. 1: Unclamped Inductive Load Test Circuits

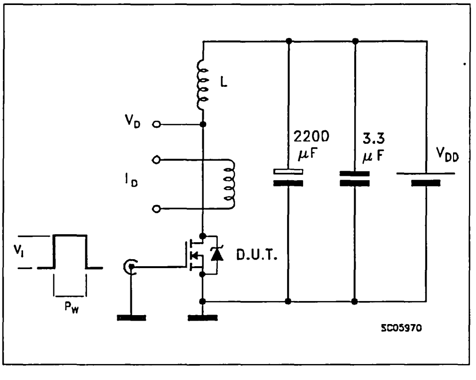


Fig. 2: Unclamped Inductive Waveforms

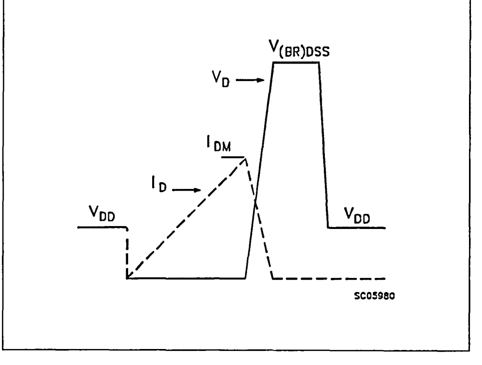


Fig. 3: Switching Times Test Circuits For Resistive Load

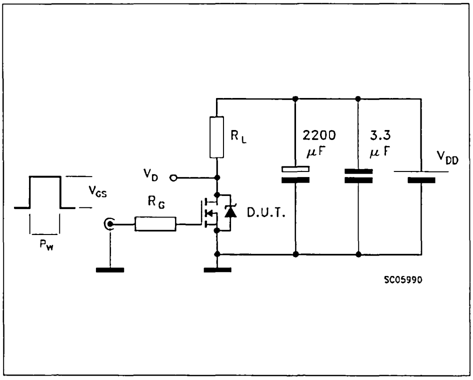


Fig. 4: Gate Charge Test Circuit

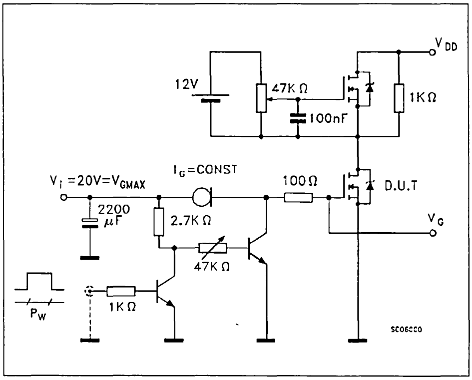
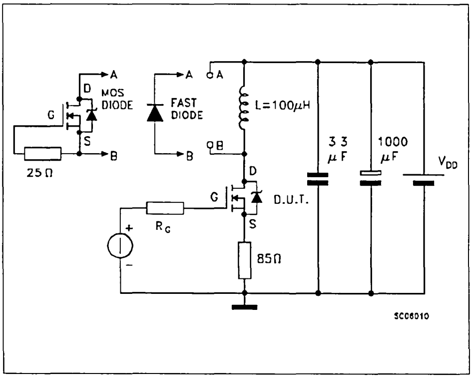


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



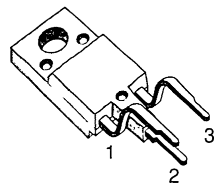
SGS-THOMSON
MICROELECTRONICS

STP3N80XI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP3N80XI	800 V	< 4.5 Ω	1.7 A

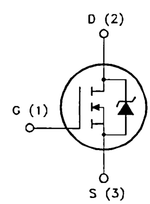
- TYPICAL $R_{DS(on)}$ = 3.9 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION



ISOWATT221

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	800	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	800	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	1.7	A
I_D	Drain Current (continuous) at T_c = 100 °C	1.1	A
I_{DM}(•)	Drain Current (pulsed)	6.8	A
P_{tot}	Total Dissipation at T_c = 25 °C	28	W
	Derating Factor	0.22	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	4000	V
T_{stg}	Storage Temperature	-65 to 150	°C

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	4.46	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	60	°C/W
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.5	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	3.2	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	160	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	4.2	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	2	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	800			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 1.7 A V_{GS} = 10V I_D = 1.7 A T_c = 100°C		3.9	4.5 9	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	1.7			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 1.7 A	1	3.5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		650 82 28	850 105 40	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 2.1 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		40 90	50 115	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 640 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		170		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 3 A V_{GS} = 10 V		42 6 17	55	nC nC nC

SWITCHING OFF

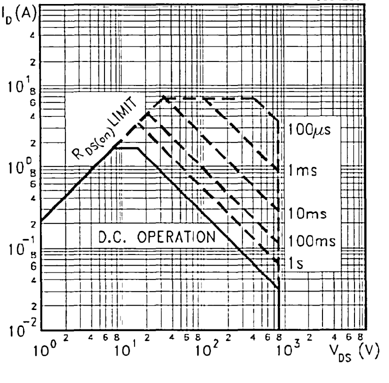
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 640 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		95 20 120	120 25 150	ns ns ns

SOURCE DRAIN DIODE

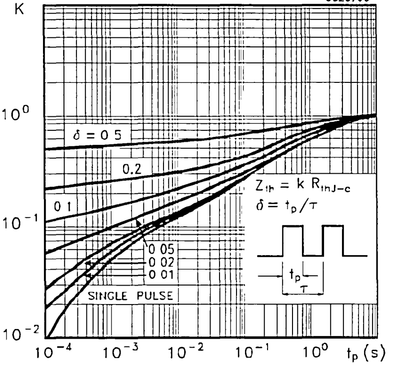
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				1.7 6.8	A A
V_{SD} ( )	Forward On Voltage	I_{SD} = 1 7 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 3 A di/dt = 100 A/μs V_{DD} = 80 V T_j = 150 °C (see test circuit, figure 5)		700 8 8 25		ns μC A

( ) Pulsed Pulse duration = 300 μs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

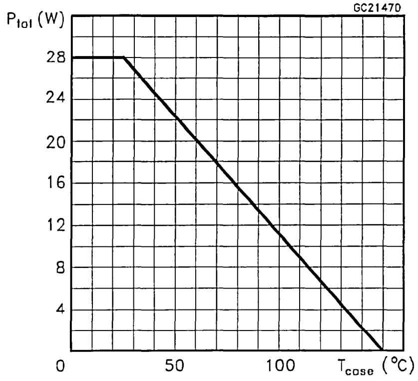
Safe Operating Area



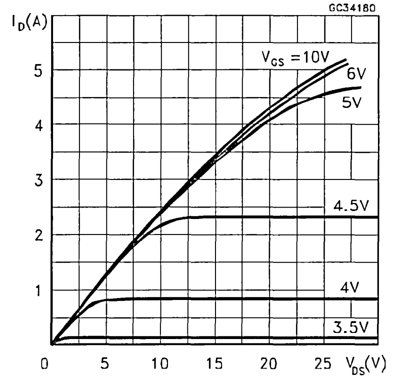
Thermal Impedance



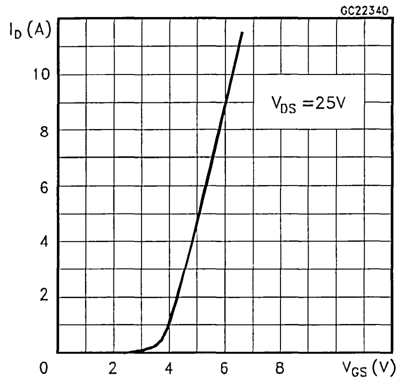
Derating Curve



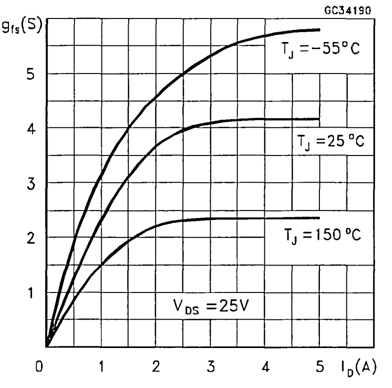
Output Characteristics



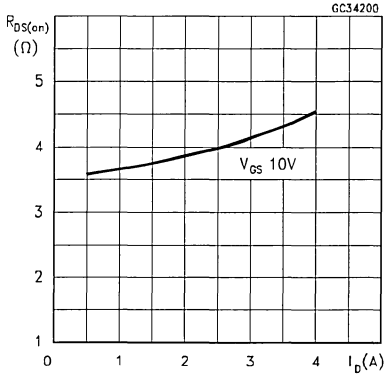
Transfer Characteristics



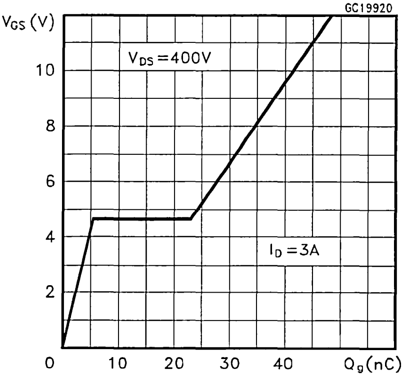
Transconductance



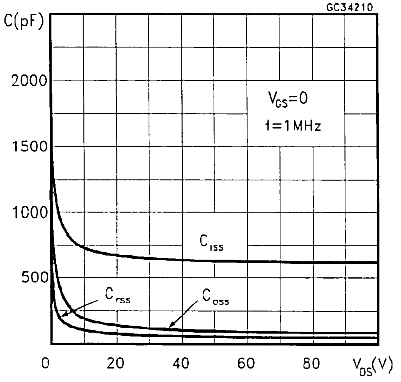
Static Drain-source On Resistance



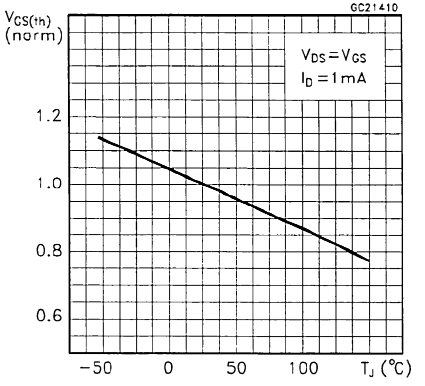
Gate Charge vs Gate-source Voltage



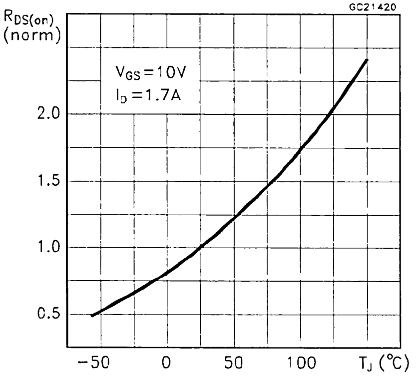
Capacitance Variations



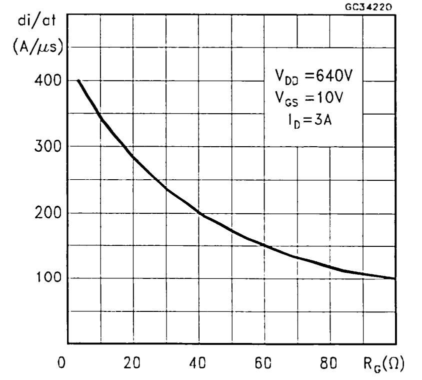
Normalized Gate Threshold Voltage vs Temperature



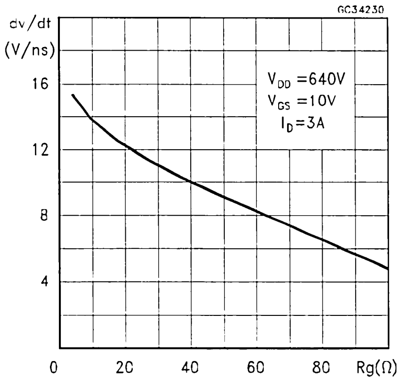
Normalized On Resistance vs Temperature



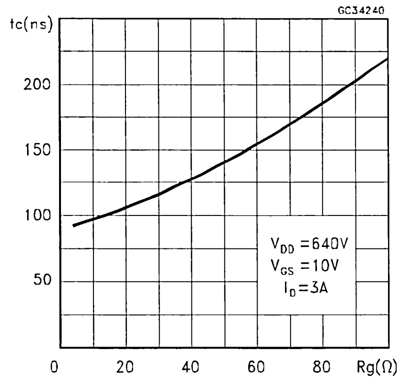
Turn-on Current Slope



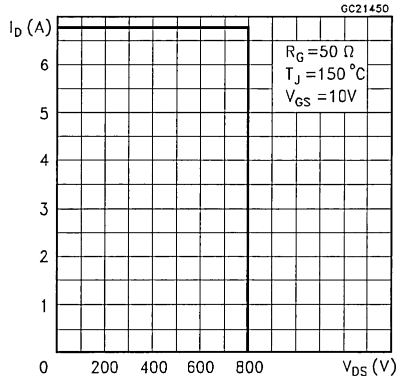
Turn-off Drain-source Voltage Slope



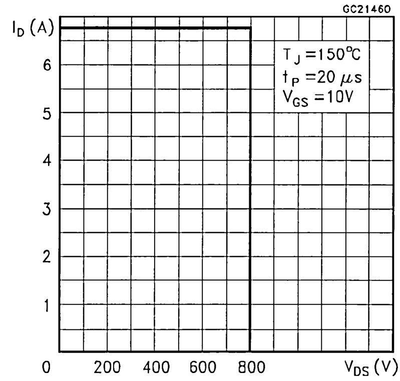
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

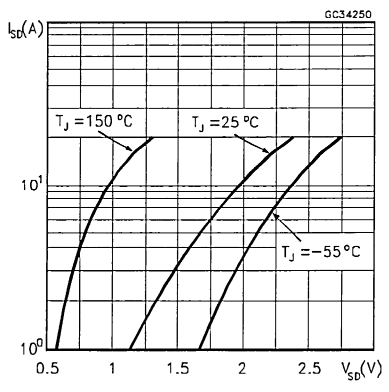


Fig. 1: Unclamped Inductive Load Test Circuits

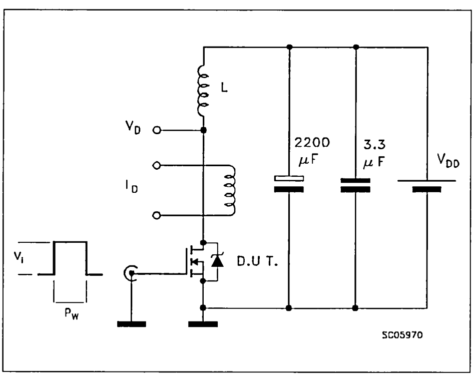


Fig. 2: Unclamped Inductive Waveforms

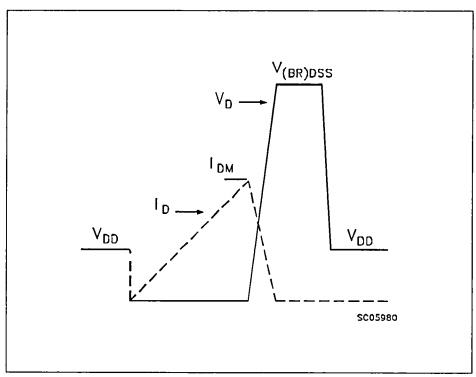


Fig. 3: Switching Times Test Circuits For Resistive Load

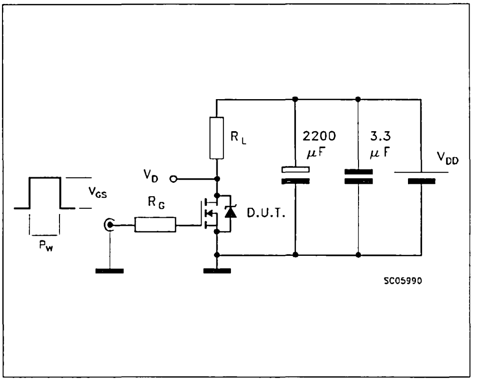


Fig. 4: Gate Charge Test Circuit

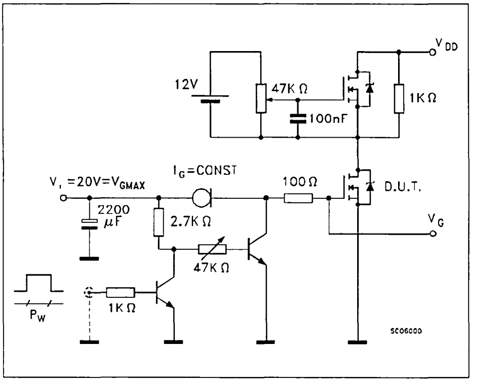
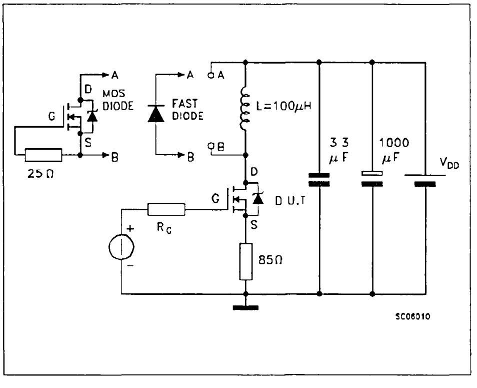


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



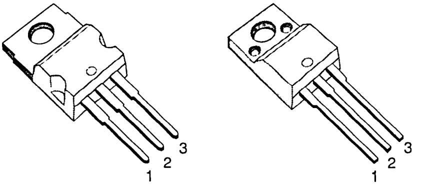
STP3N90
STP3N90FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP3N90	900 V	< 4.5 Ω	3.2 A
STP3N90FI	900 V	< 4.5 Ω	1.9 A

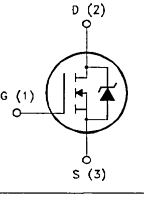
- TYPICAL $R_{DS(on)}$ = 3.9 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)



TO-220 **ISOWATT220**

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP3N90	STP3N90FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	900		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	900		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	3.2	1.9	A
I_D	Drain Current (continuous) at T_c = 100 °C	2	1.2	A
I_{DM}(•)	Drain Current (pulsed)	13	13	A
P_{tot}	Total Dissipation at T_c = 25 °C	100	40	W
	Derating Factor	0.8	0.32	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1.25	3.12	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	3.2	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 50$ V)	160	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	4.2	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	2	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	900			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 1.7$ A $V_{GS} = 10V$ $I_D = 1.7$ A $T_c = 100$°C		3.9	4.5 9	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	3.2			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 1.7$ A	1	3.5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		650 82 28	850 105 40	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 2.1 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)			50 110	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 640 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		170		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 3 A V_{GS} = 10 V		42 6 17	55	nC nC nC

SWITCHING OFF

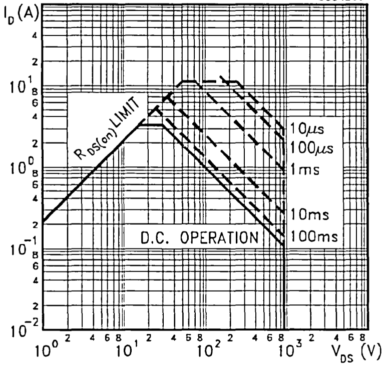
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 640 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		95 20 120	120 25 165	ns ns ns

SOURCE DRAIN DIODE

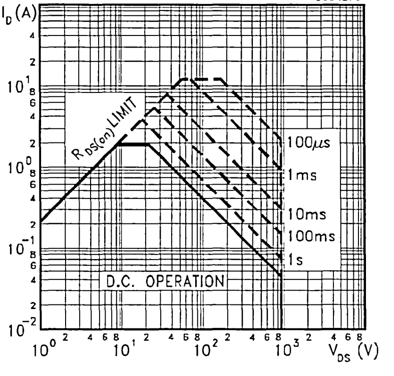
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				3.2 13	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 3.2 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 3 A di/dt = 100 A/µs V_{DD} = 80 V T_j = 150 °C (see test circuit, figure 5)		700 8.8 25		ns µC A

(*) Pulsed Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

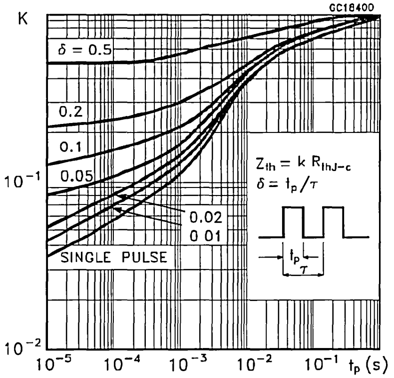
Safe Operating Areas For TO220



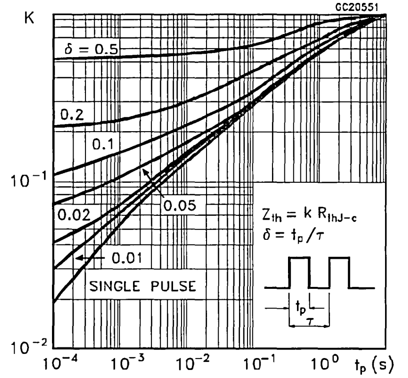
Safe Operating Areas For ISOWATT220



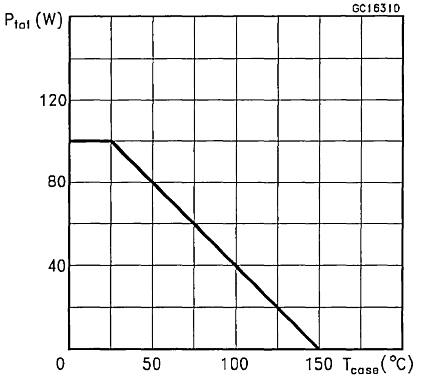
Thermal Impedeance For TO-220



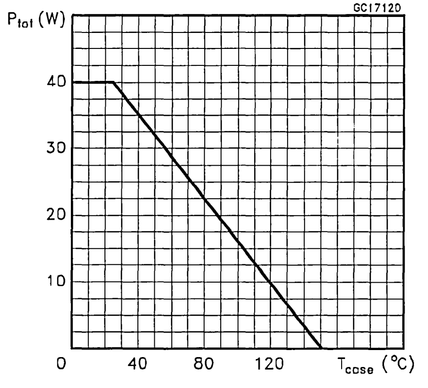
Thermal Impedance For ISOWATT220



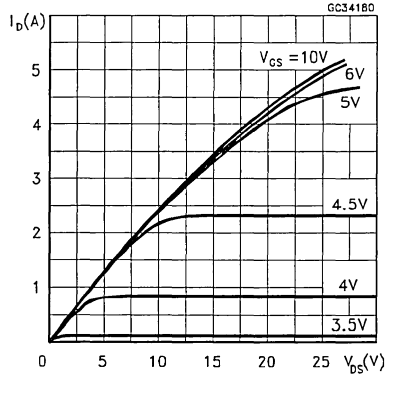
Derating Curve For TO-220



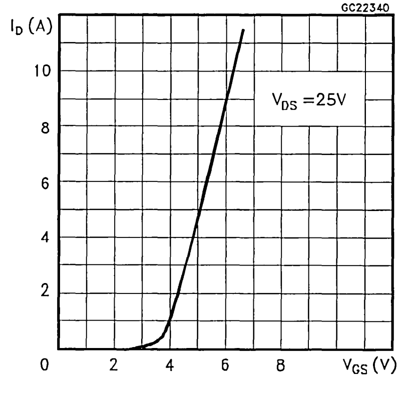
Derating Curve For ISOWATT220



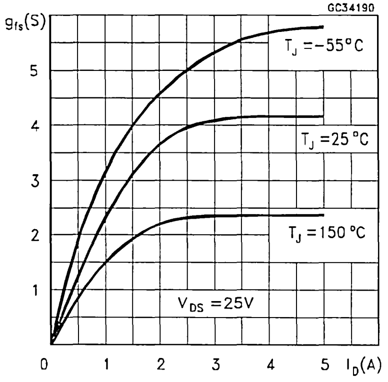
Output Characteristics



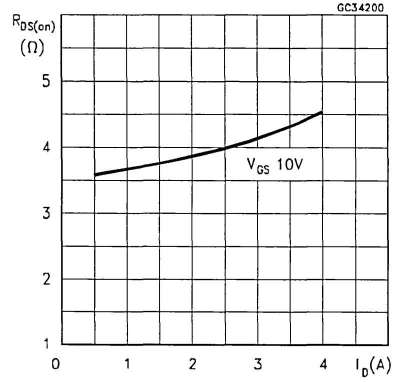
Transfer Characteristics



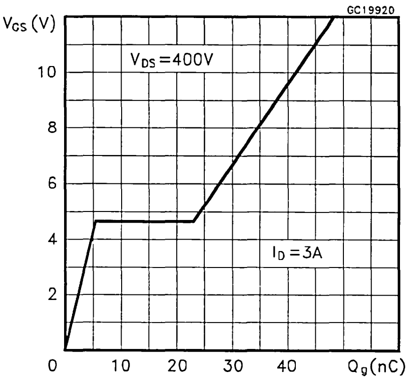
Transconductance



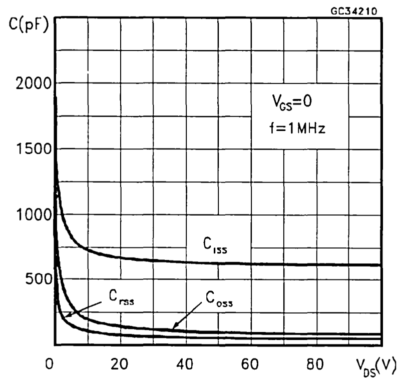
Static Drain-source On Resistance



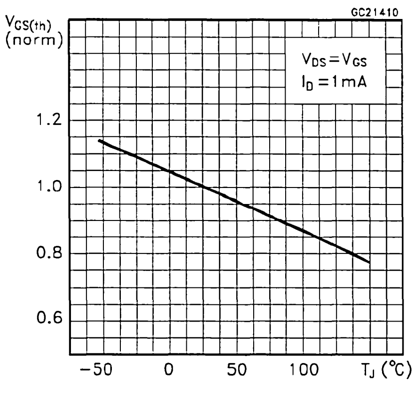
Gate Charge vs Gate-source Voltage



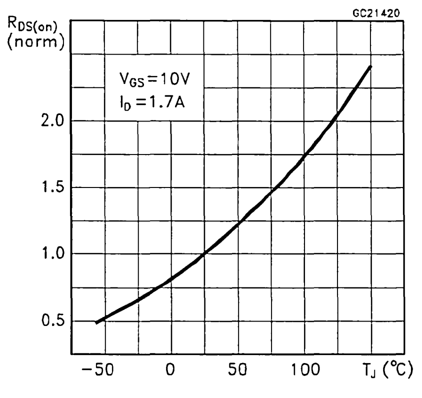
Capacitance Variations



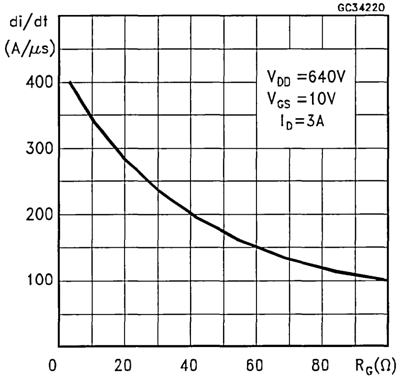
Normalized Gate Threshold Voltage vs Temperature



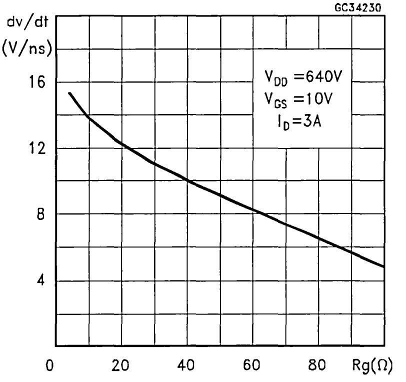
Normalized On Resistance vs Temperature



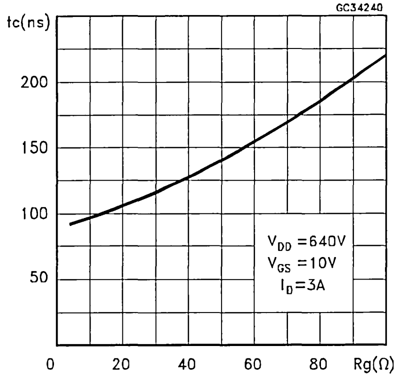
Turn-on Current Slope



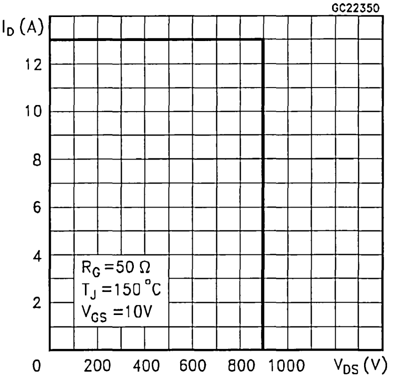
Turn-off Drain-source Voltage Slope



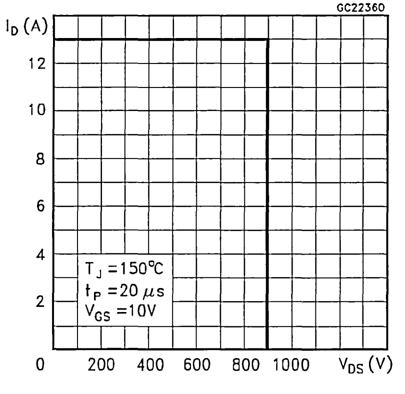
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

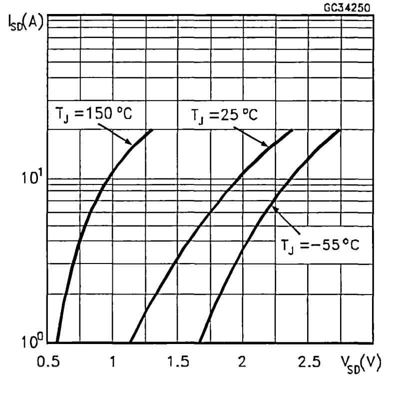


Fig. 1: Unclamped Inductive Load Test Circuits

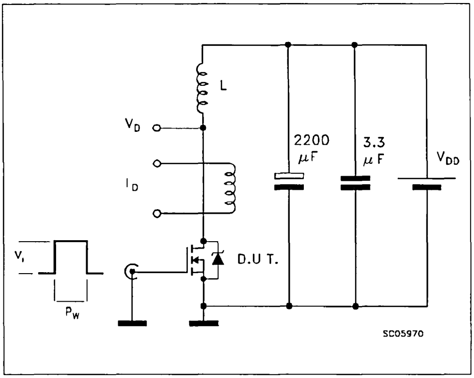


Fig. 2: Unclamped Inductive Waveforms

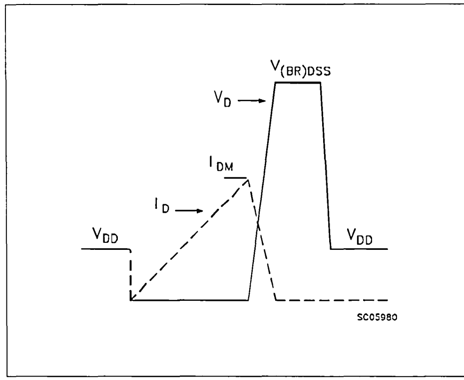


Fig. 3: Switching Times Test Circuits For Resistive Load

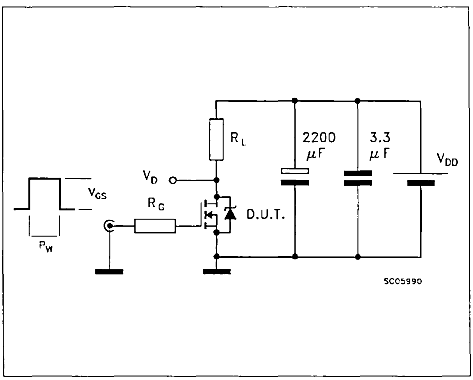


Fig. 4: Gate Charge Test Circuit

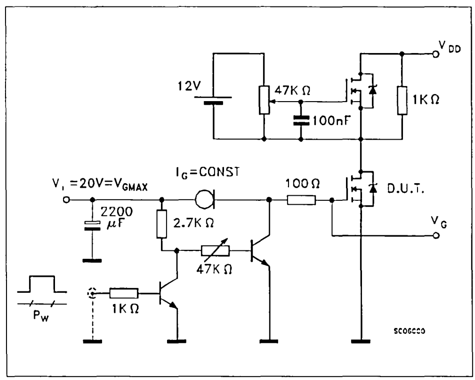
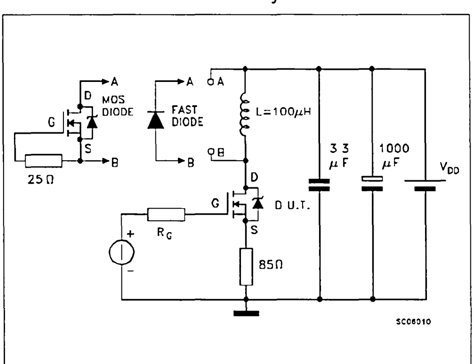


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON MICROELECTRONICS

STP3N100
STP3N100FI

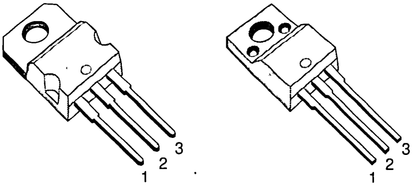
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP3N100 STP3N100FI	1000 V 1000 V	< 5 Ω < 5 Ω	3.5 A 2 A

- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

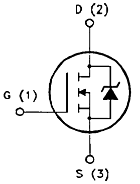
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)



TO-220 ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP3N100	STP3N100FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	1000		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	1000		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	3.5	2	A
I_D	Drain Current (continuous) at T_c = 100 °C	2	1.2	A
I_{DM}(•)	Drain Current (pulsed)	14	14	A
P_{tot}	Total Dissipation at T_c = 25 °C	100	40	W
	Derating Factor	0.8	0.32	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case Max	1.25	3.12	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max	62.5		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current (repetitive or not-repetitive, T_j = 25 °C)	3.5	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	130	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, δ < 1%)	6	mJ
I_{AR}	Avalanche Current (repetitive or not-repetitive, T_j = 100 °C)	2	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	1000			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 1.5 A V_{GS} = 10V I_D = 1.5 A T_c = 100°C			5 10	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	3.5			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 1.5 A	1	1.8		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		750 80 25	950 110 40	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 400 V I_D = 1.8 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		70 70	90 90	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 600 V I_D = 3.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		100		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 3.5 A V_{GS} = 10 V		48 7 24	60	nC nC nC

SWITCHING OFF

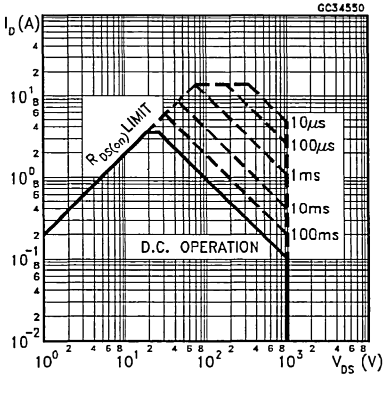
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 600 V I_D = 3.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		90 60 130	115 75 165	ns ns ns

SOURCE DRAIN DIODE

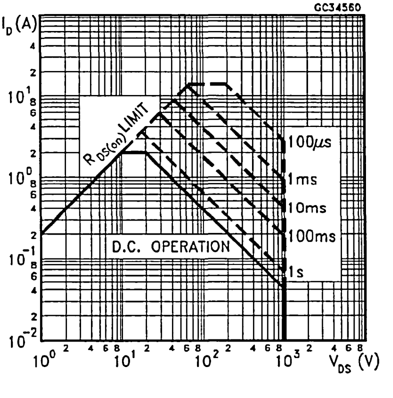
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				3.5 14	A A
V_{SD}	Forward On Voltage	I_{SD} = 3.5 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 3.5 A di/dt = 100 A/μs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		900 10 23		ns μC A

(∗) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

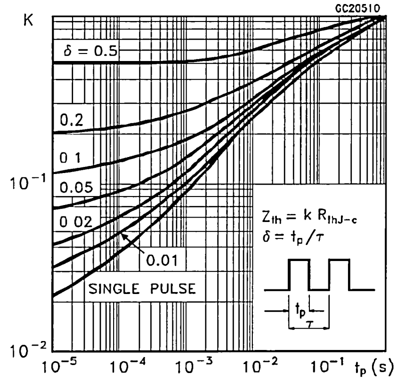
Safe Operating Areas For TO-220



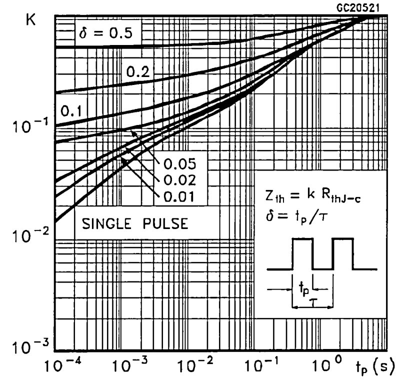
Safe Operating Areas For ISOWATT220



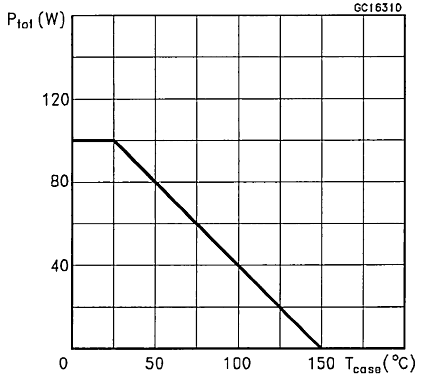
Thermal Impedeance For TO-220



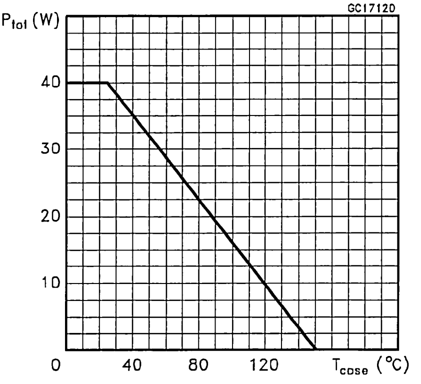
Thermal Impedance For ISOWATT220



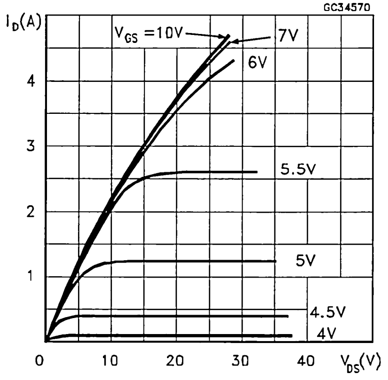
Derating Curve For TO-220



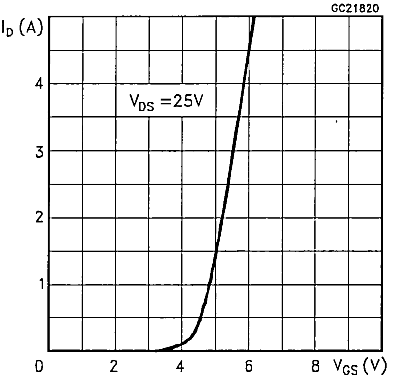
Derating Curve For ISOWATT220



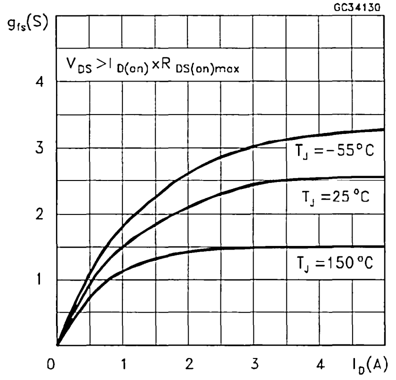
Output Characteristics



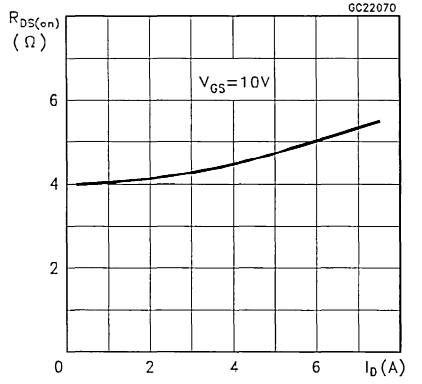
Transfer Characteristics



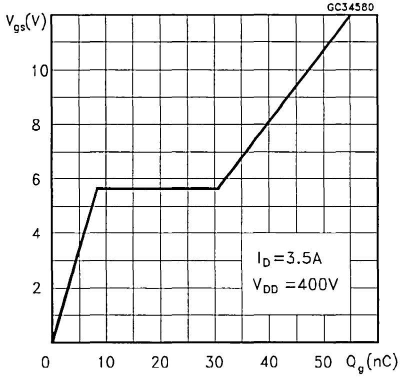
Transconductance



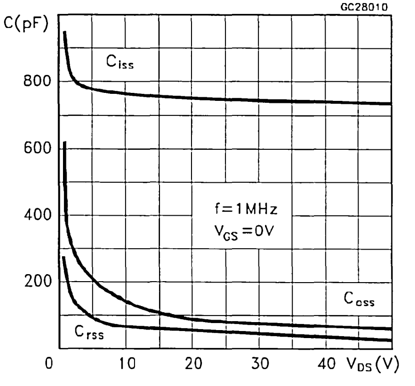
Static Drain-source On Resistance



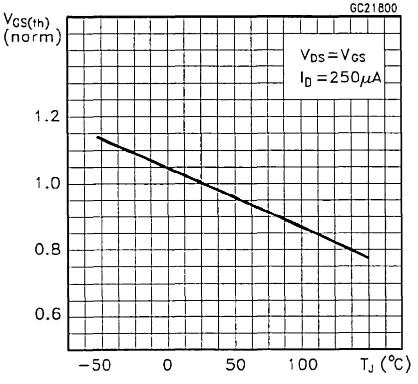
Gate Charge vs Gate-source Voltage



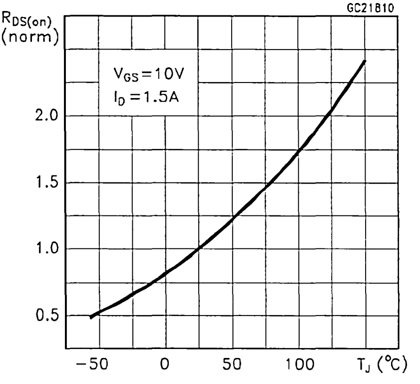
Capacitance Variations



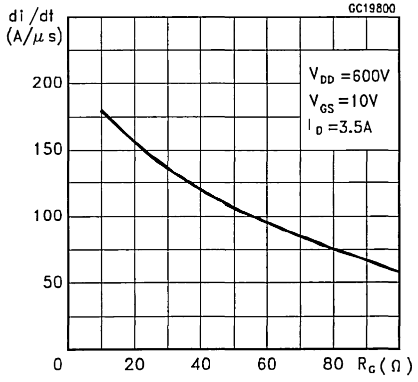
Normalized Gate Threshold Voltage vs Temperature



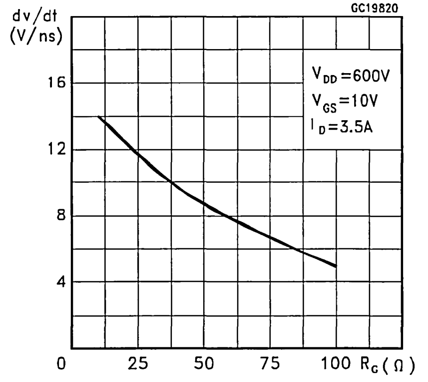
Normalized On Resistance vs Temperature



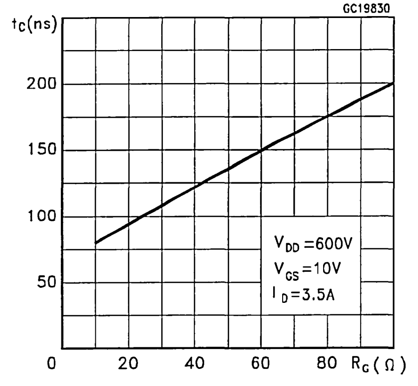
Turn-on Current Slope



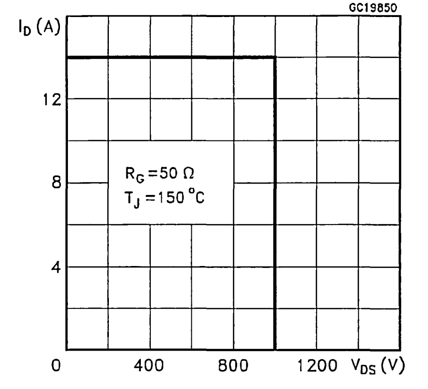
Turn-off Drain-source Voltage Slope



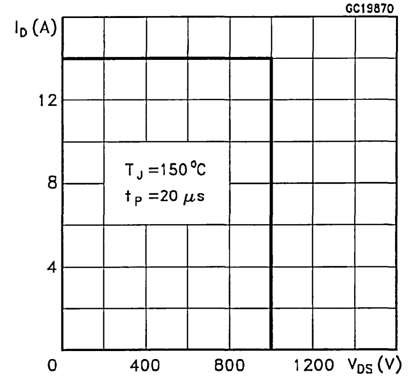
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

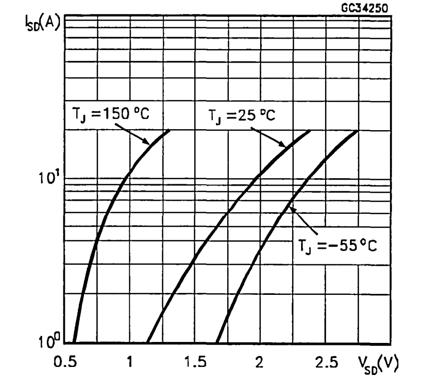


Fig. 1: Unclamped Inductive Load Test Circuits

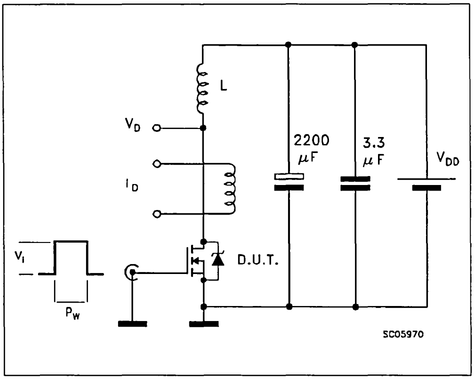


Fig. 2: Unclamped Inductive Waveforms

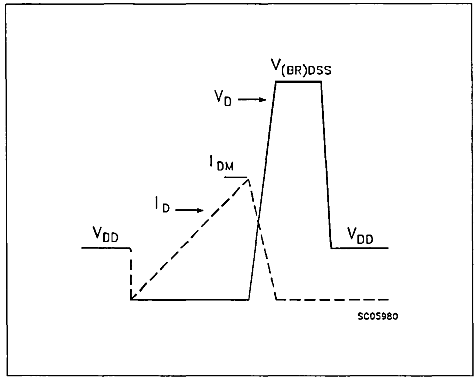


Fig. 3: Switching Times Test Circuits For Resistive Load

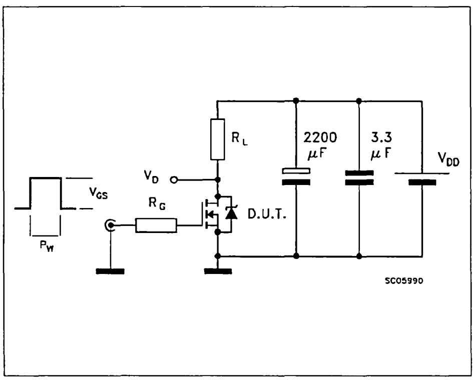


Fig. 4: Gate Charge Test Circuit

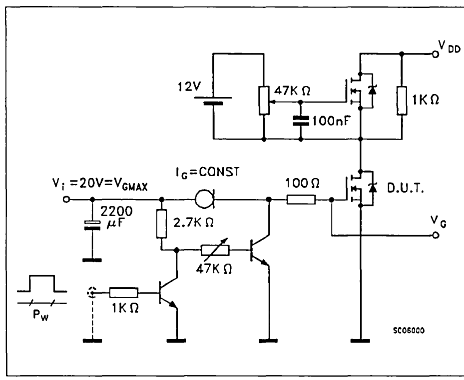
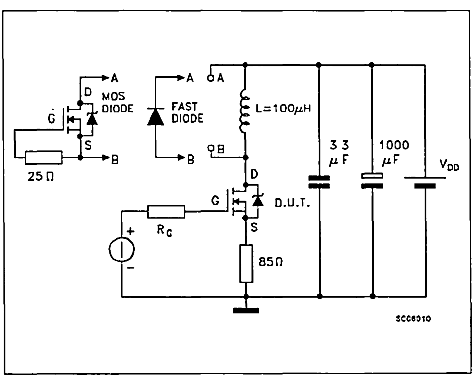


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON
MICROELECTRONICS

STP3N100XI

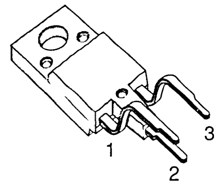
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP3N100XI	1000 V	< 6 Ω	1.6 A

- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

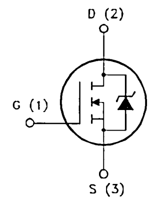
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)



ISOWATT221

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	1000	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	1000	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	1.6	A
I_D	Drain Current (continuous) at T_c = 100 °C	1	A
I_{DM}(•)	Drain Current (pulsed)	6.4	A
P_{tot}	Total Dissipation at T_c = 25 °C	30	W
	Derating Factor	0.24	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	4000	V
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	4.16	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	60	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Case-sink	Typ	0.5	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	3	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	100	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	4.5	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	1.8	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	1000			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (∗)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 1.5 A V_{GS} = 10V I_D = 1.5 A T_c = 100°C			6 12	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	1.6			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (∗)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 1.5 A	1	1.8		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		750 80 25	950 110 40	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 400 V I_D = 1.8 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		70 70	90 90	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 600 V I_D = 3.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		100		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 3.5 A V_{GS} = 10 V		48 7 24	60	nC nC nC

SWITCHING OFF

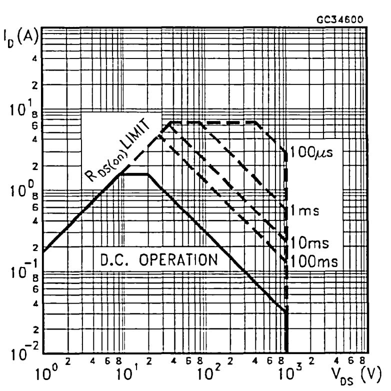
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 600 V I_D = 3.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		90 60 130	115 75 165	ns ns ns

SOURCE DRAIN DIODE

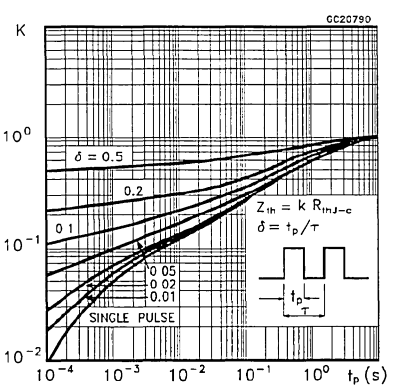
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				1.6 6.4	A A
V_{SD} (∗)	Forward On Voltage	I_{SD} = 1.6 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 3.5 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		900 10 23		ns µC A

(∗) Pulsed. Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

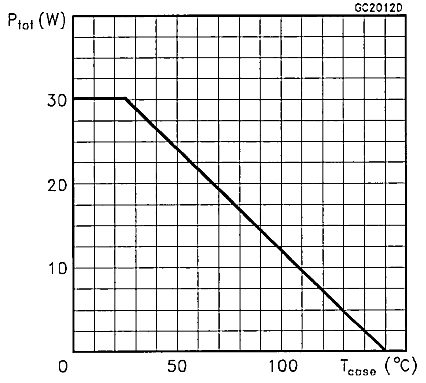
Safe Operating Area



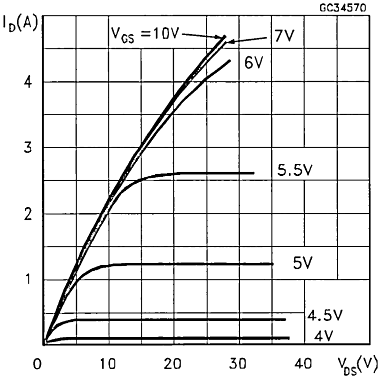
Thermal Impedance



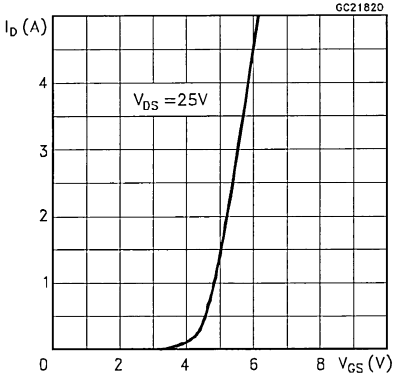
Derating Curve



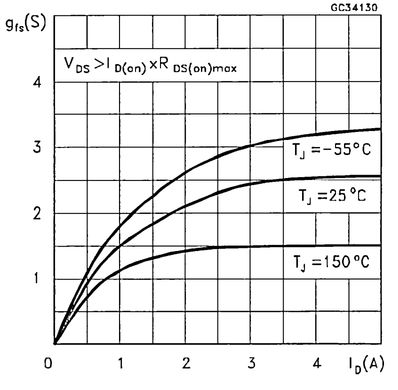
Output Characteristics



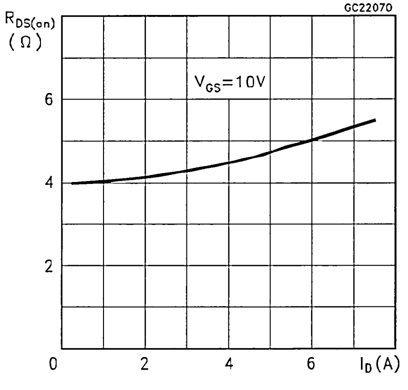
Transfer Characteristics



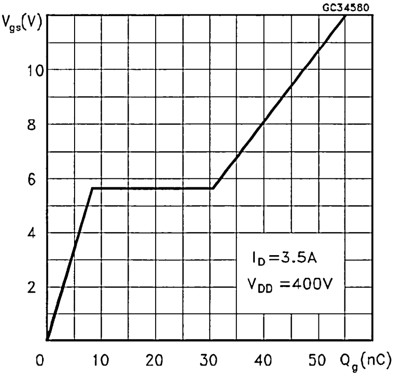
Transconductance



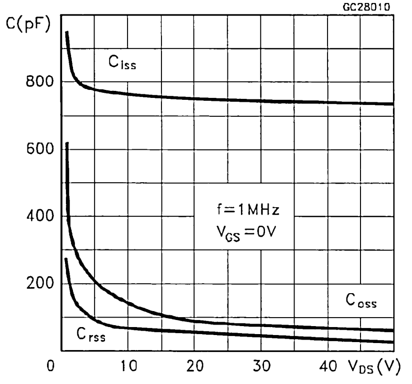
Static Drain-source On Resistance



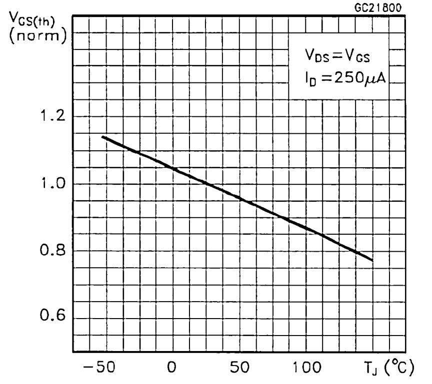
Gate Charge vs Gate-source Voltage



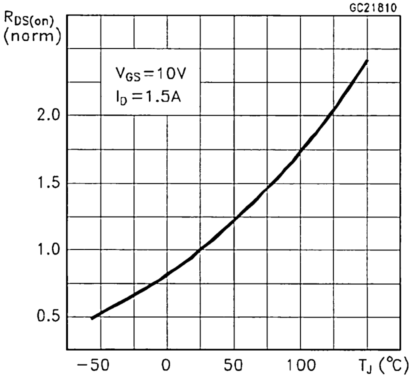
Capacitance Variations



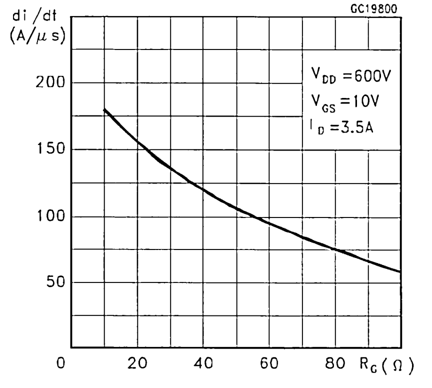
Normalized Gate Threshold Voltage vs Temperature



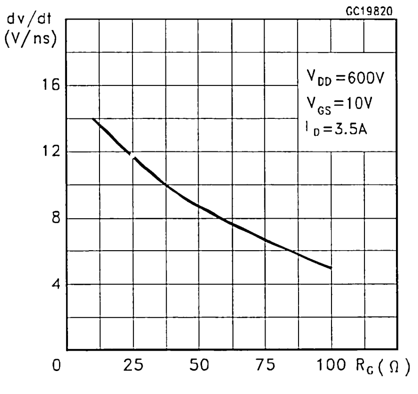
Normalized On Resistance vs Temperature



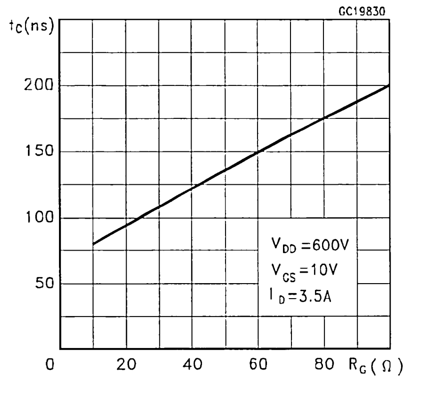
Turn-on Current Slope



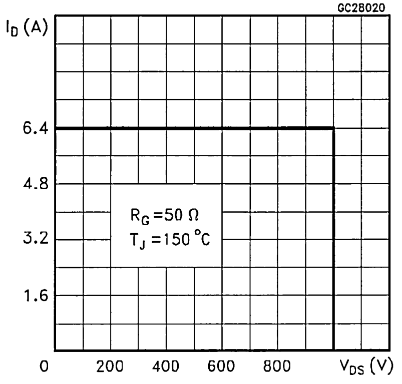
Turn-off Drain-source Voltage Slope



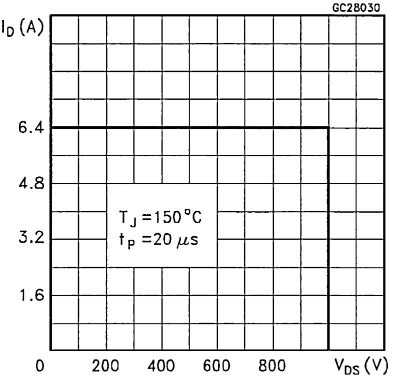
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

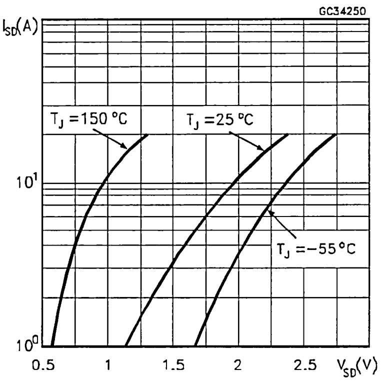


Fig. 1: Unclamped Inductive Load Test Circuits

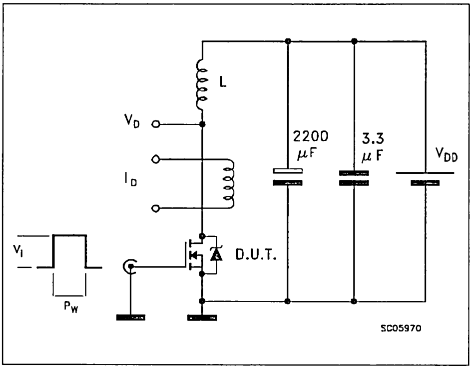


Fig. 2: Unclamped Inductive Waveforms

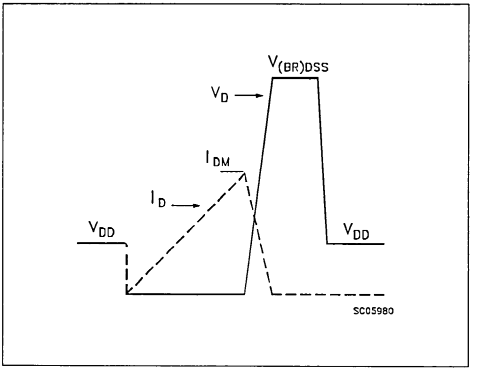


Fig. 3: Switching Times Test Circuits For Resistive Load

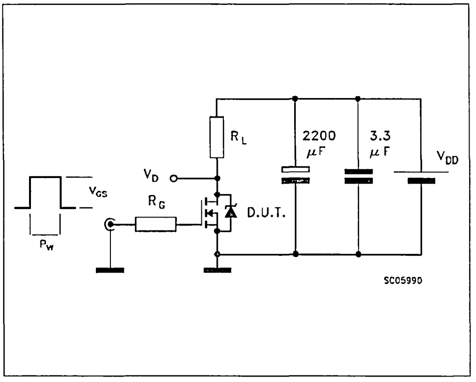


Fig. 4: Gate Charge Test Circuit

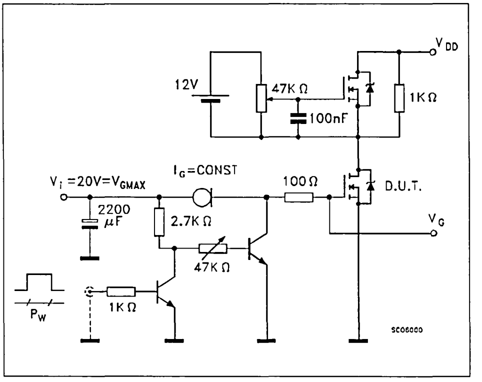
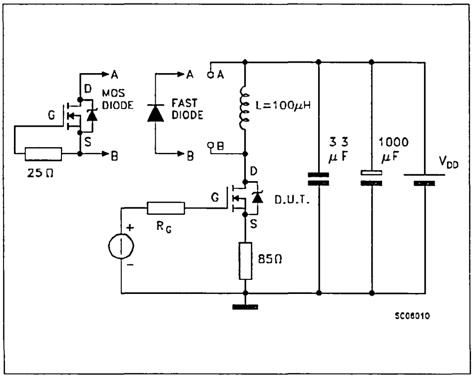


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON
MICROELECTRONICS

STP4N40
STP4N40FI

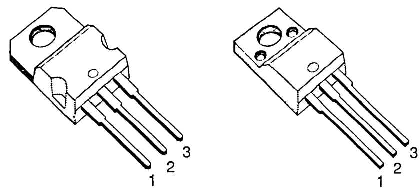
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP4N40	400 V	< 2.1 Ω	4 A
STP4N40FI	400 V	< 2.1 Ω	3 A

- TYPICAL $R_{DS(on)}$ = 1.65 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

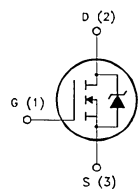
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



TO-220 ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP4N40	STP4N40FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	400		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	400		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	4	3	A
I_D	Drain Current (continuous) at T_c = 100 °C	2.5	1.9	A
I_{DM}(•)	Drain Current (pulsed)	16	16	A
P_{tot}	Total Dissipation at T_c = 25 °C	75	35	W
	Derating Factor	0.6	0.28	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.67	3.57	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	4	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 50$ V)	110	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	7	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	2.5	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	400			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 2$ A $V_{GS} = 10V$ $I_D = 2$ A $T_c = 100$°C		1.65	2.1 4.2	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	4			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 2$ A	1	2.1		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		350 68 32	450 90 45	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 175 V I_D = 2 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		25 70	33 90	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 320 V I_D = 4 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		110		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 320 V I_D = 4 A V_{GS} = 10 V		25 7 11	35	nC nC nC

SWITCHING OFF

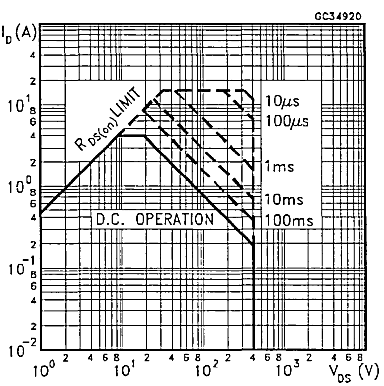
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 320 V I_D = 4 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		50 28 75	65 35 95	ns ns ns

SOURCE DRAIN DIODE

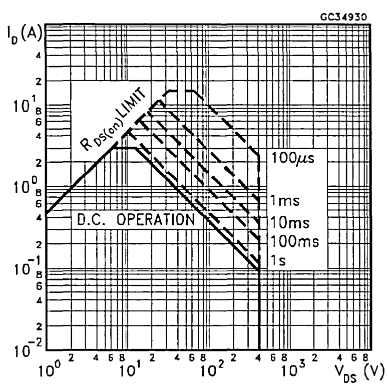
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				4 16	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 4 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 4 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		400 5.9 29.5		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

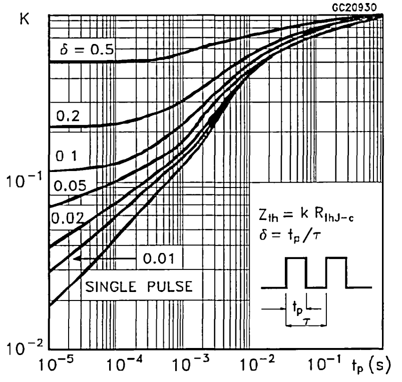
Safe Operating Areas For TO-220



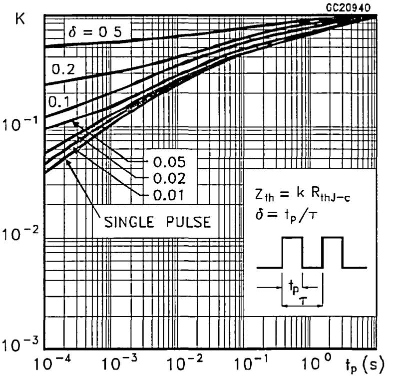
Safe Operating Areas For ISOWATT220



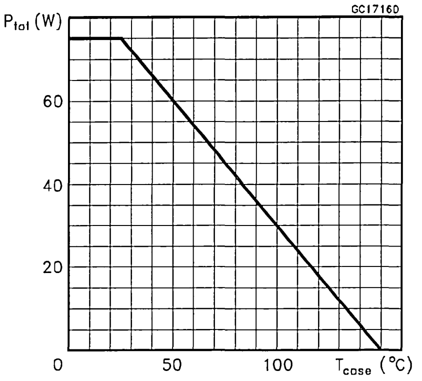
Thermal Impedeance For TO-220



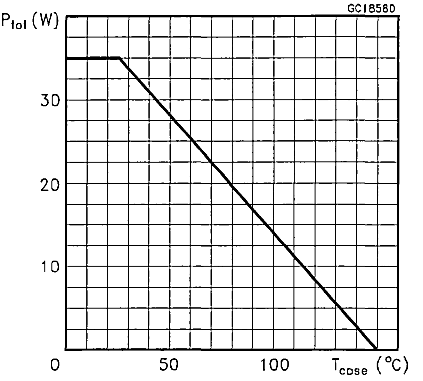
Thermal Impedance For ISOWATT220



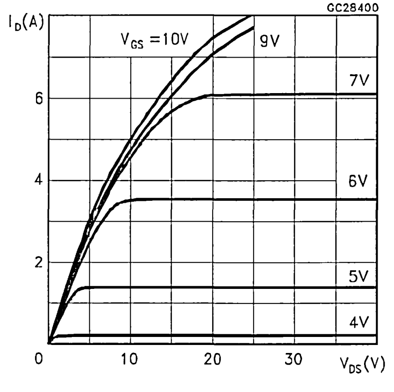
Derating Curve For TO-220



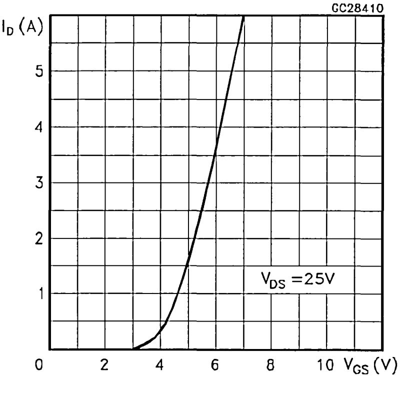
Derating Curve For ISOWATT220



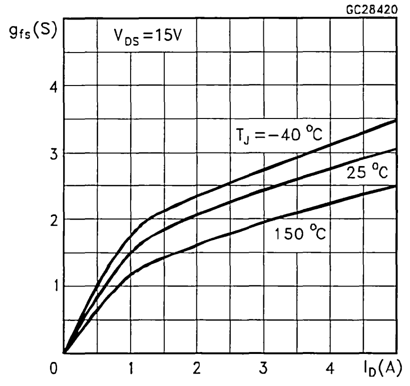
Output Characteristics



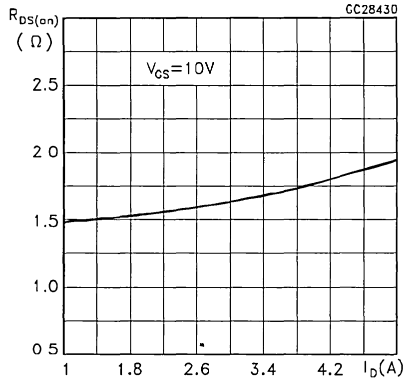
Transfer Characteristics



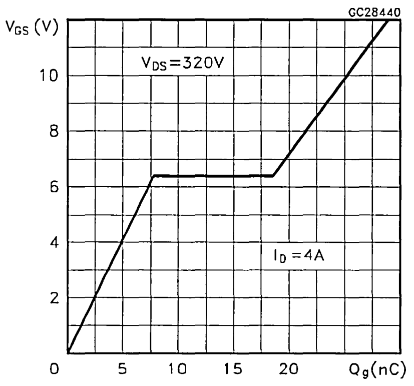
Transconductance



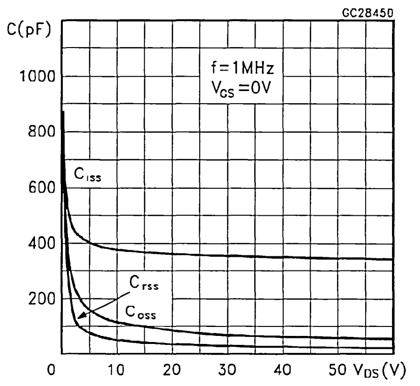
Static Drain-source On Resistance



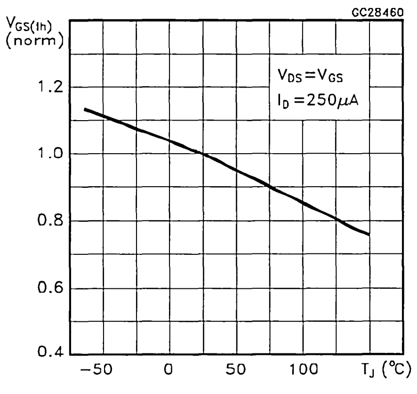
Gate Charge vs Gate-source Voltage



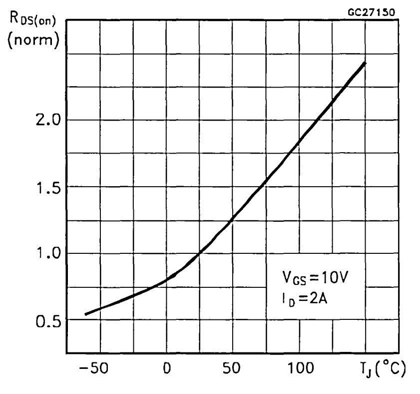
Capacitance Variations



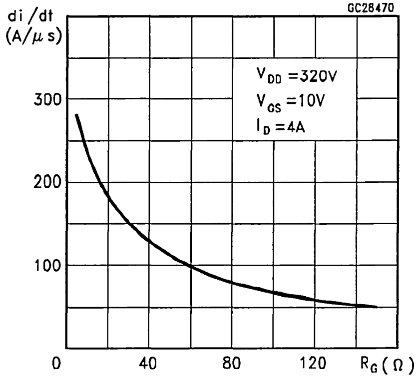
Normalized Gate Threshold Voltage vs Temperature



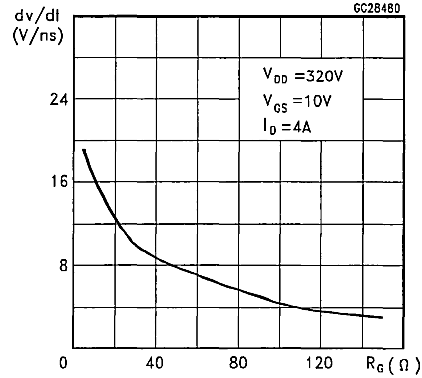
Normalized On Resistance vs Temperature



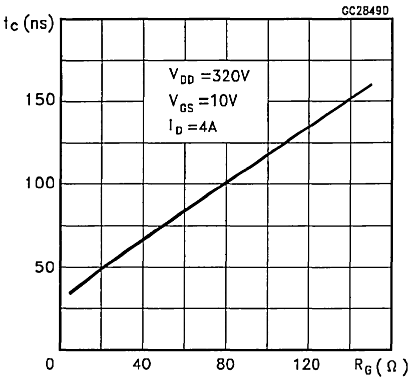
Turn-on Current Slope



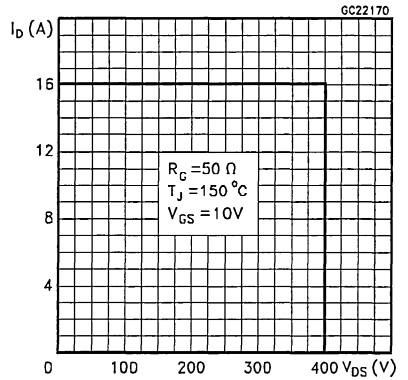
Turn-off Drain-source Voltage Slope



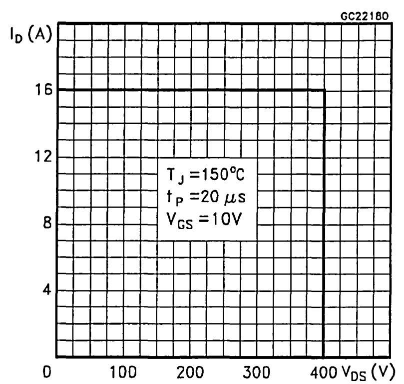
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

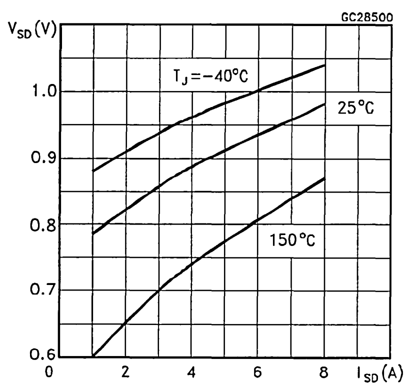


Fig. 1: Unclamped Inductive Load Test Circuits

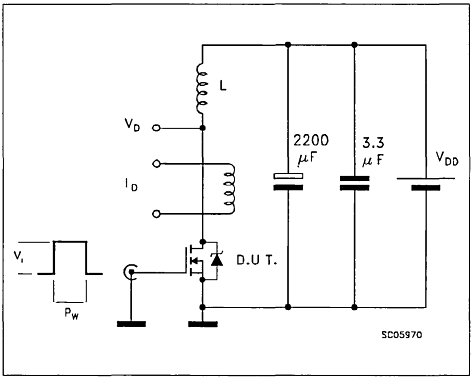


Fig. 2: Unclamped Inductive Waveforms

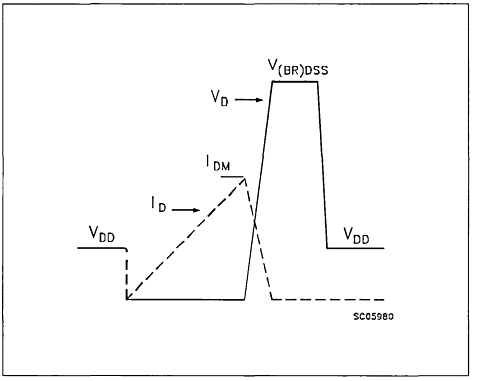


Fig. 3: Switching Times Test Circuits For Resistive Load

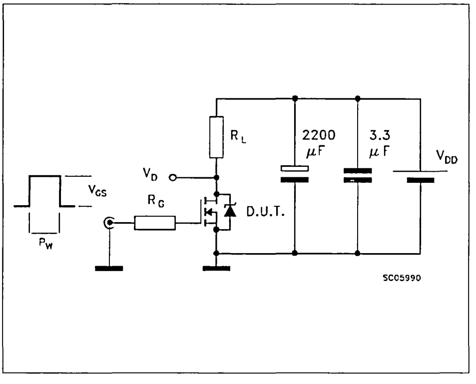


Fig. 4: Gate Charge Test Circuit

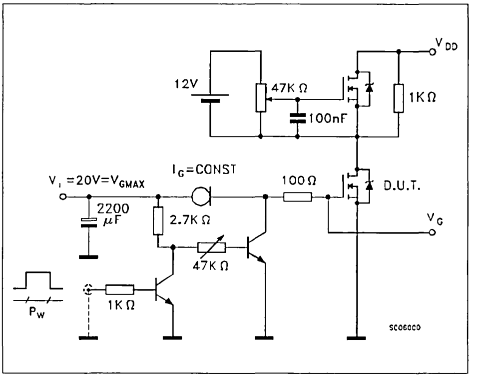
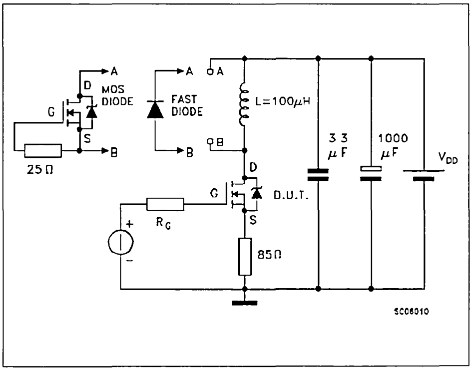


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



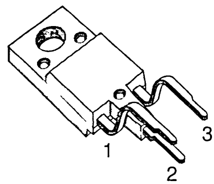
SGS-THOMSON
MICROELECTRONICS

STP4N80XI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP4N80XI	800 V	< 3.5 Ω	2 A

- TYPICAL $R_{DS(on)}$ = 2.9 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

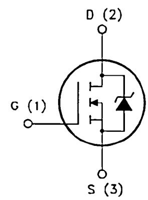


ISOWATT221

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	800	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	800	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	2	A
I_D	Drain Current (continuous) at T_c = 100 °C	1.3	A
I_{DM}(•)	Drain Current (pulsed)	8	A
P_{tot}	Total Dissipation at T_c = 25 °C	30	W
	Derating Factor	0.24	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	4000	V
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	4.16	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	60	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Case-sink	Typ	0 5	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	4	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	210	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	5	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	1.8	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	800			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 1.7 A V_{GS} = 10V I_D = 1.7 A T_c = 100°C		2.9	3.5 7	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	2			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 1.7 A	1			S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0			1100 150 55	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 2.3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		65 150	90 200	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 600 V I_D = 3.8 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		80	110	A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 5 A V_{GS} = 10 V		55 8 26	70	nC nC nC

SWITCHING OFF

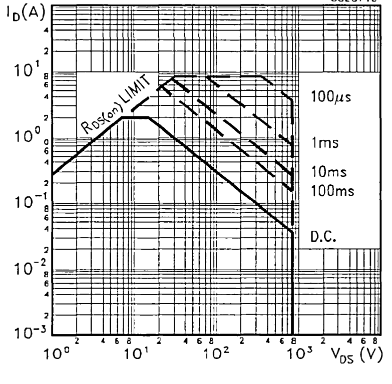
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 600 V I_D = 3.8 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		110 140 150	145 190 200	ns ns ns

SOURCE DRAIN DIODE

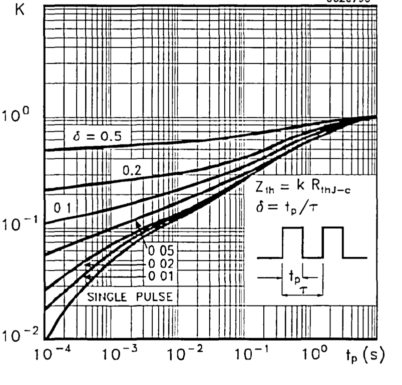
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				2 8	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 2 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 3.8 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		500 4.3 17		ns µC A

(*) Pulsed Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

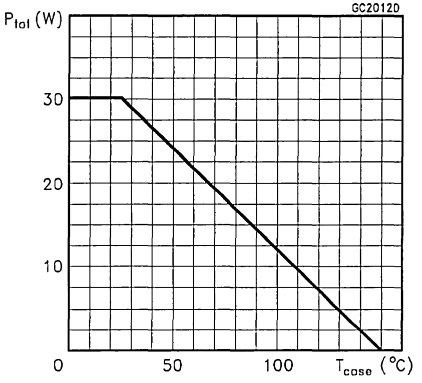
Safe Operating Area



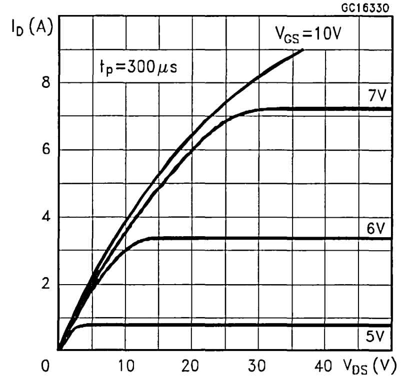
Thermal Impedance



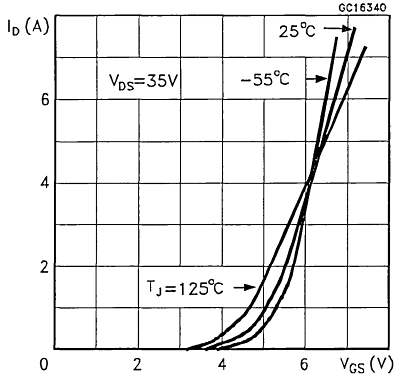
Derating Curve



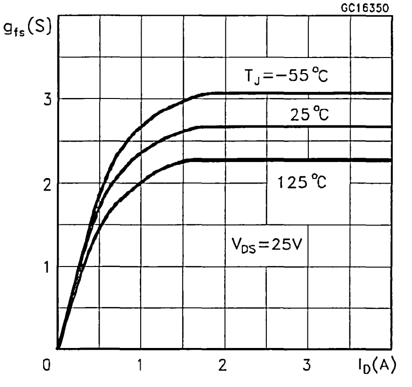
Output Characteristics



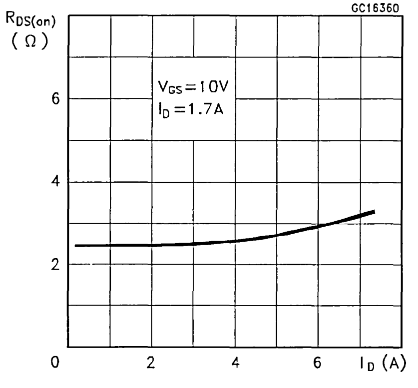
Transfer Characteristics



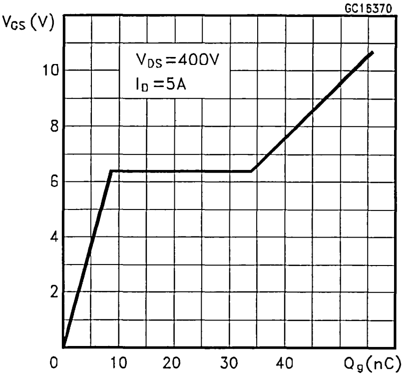
Transconductance



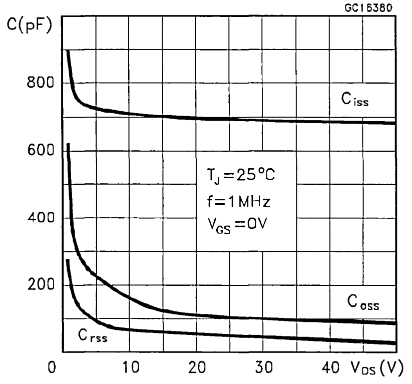
Static Drain-source On Resistance



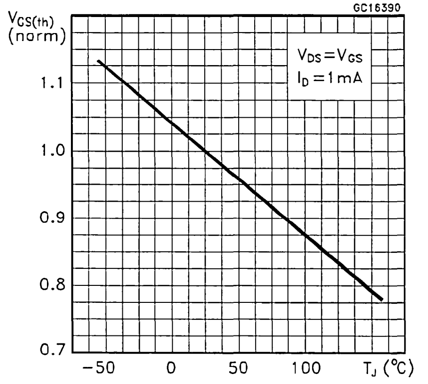
Gate Charge vs Gate-source Voltage



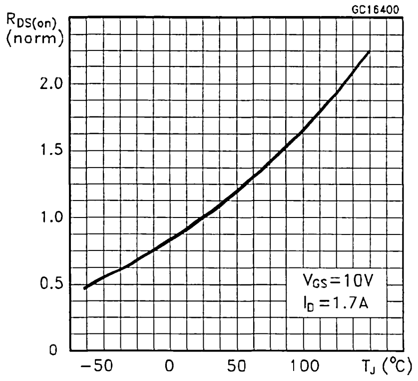
Capacitance Variations



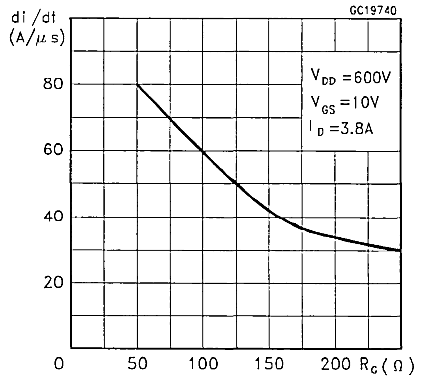
Normalized Gate Threshold Voltage vs Temperature



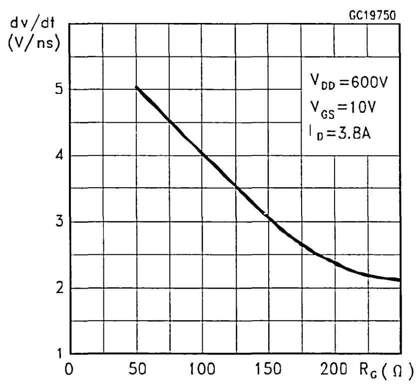
Normalized On Resistance vs Temperature



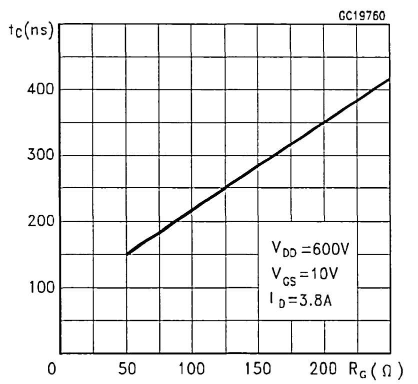
Turn-on Current Slope



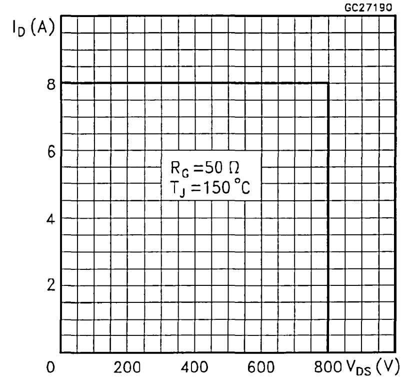
Turn-off Drain-source Voltage Slope



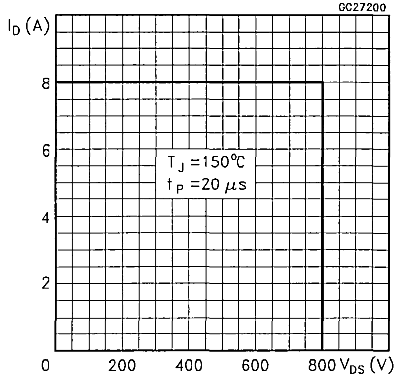
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

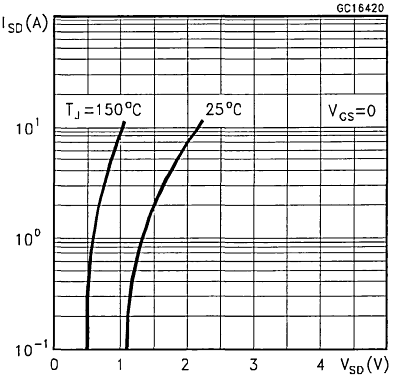


Fig. 1: Unclamped Inductive Load Test Circuits

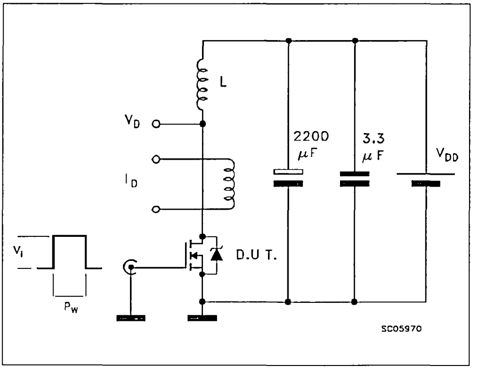


Fig. 2: Unclamped Inductive Waveforms

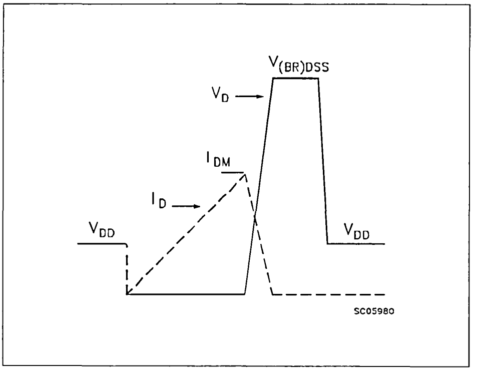


Fig. 3: Switching Times Test Circuits For Resistive Load

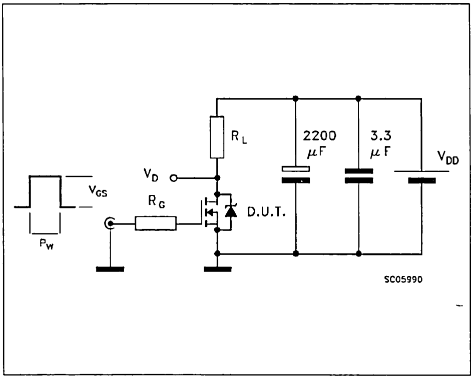


Fig. 4: Gate Charge Test Circuit

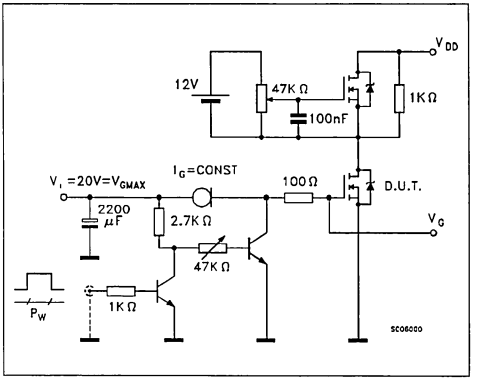
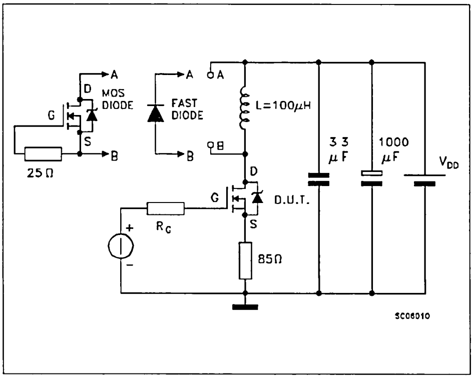


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON MICROELECTRONICS

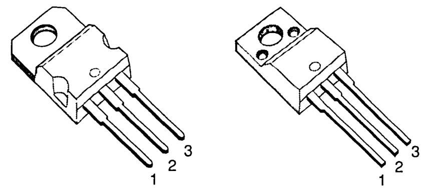
STP4N90
STP4N90FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP4N90	900 V	< 3.5 Ω	3.6 A
STP4N90FI	900 V	< 3.5 Ω	2.3 A

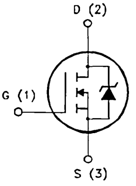
- TYPICAL $R_{DS(on)}$ = 2.9 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)



TO-220 ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP4N90	STP4N90FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	900		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	900		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	3.6	2.3	A
I_D	Drain Current (continuous) at T_c = 100 °C	2.2	1.3	A
I_{DM}(•)	Drain Current (pulsed)	15	15	A
P_{tot}	Total Dissipation at T_c = 25 °C	100	40	W
	Derating Factor	0.8	0.32	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1.25	3.12	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current (repetitive or not-repetitive, T_j = 25 °C)	3.6	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	190	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	8	mJ
I_{AR}	Avalanche Current (repetitive or not-repetitive, T_j = 100 °C)	2.2	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	900			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 1.7 A V_{GS} = 10V I_D = 1.7 A T_c = 100°C		2.9	3.5 7	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	3.6			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 1.7 A	1			S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0			1100 150 55	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 2.3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		65 150	90 200	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 600 V I_D = 3.8 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		80	110	A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 5 A V_{GS} = 10 V		55 8 26	70	nC nC nC

SWITCHING OFF

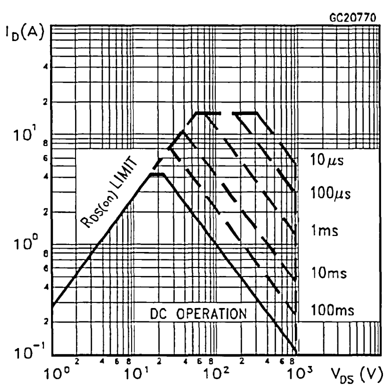
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 600 V I_D = 3.8 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		110 140 150	145 190 200	ns ns ns

SOURCE DRAIN DIODE

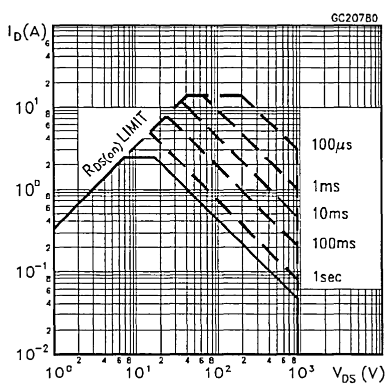
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				3.6 16	A A
V_{SD}	Forward On Voltage	I_{SD} = 3.6 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 3.6 A di/dt = 100 A/µs V_R = 100 V (see test circuit, figure 5)		500 4.3 17		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

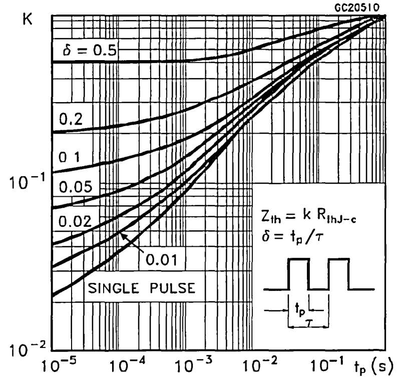
Safe Operating Areas For TO-220



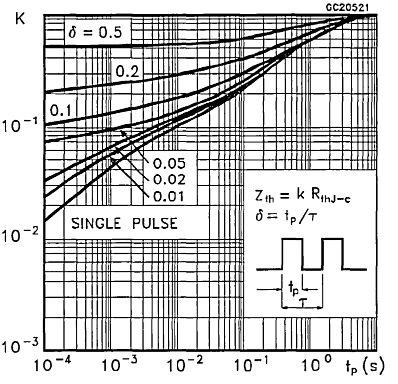
Safe Operating Areas For ISOWATT220



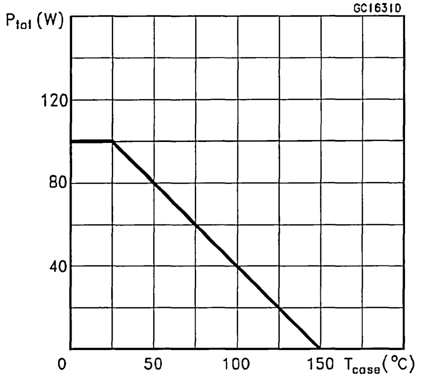
Thermal Impedeance For TO-220



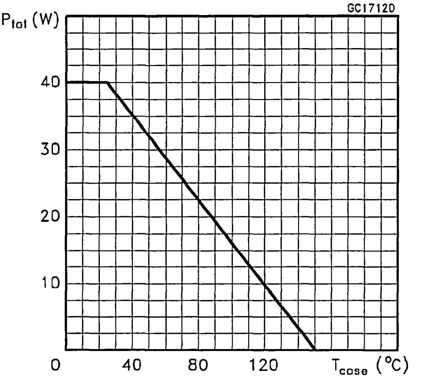
Thermal Impedance For ISOWATT220



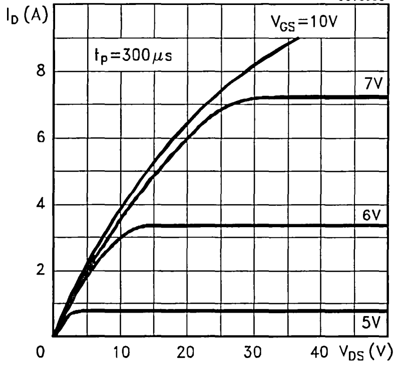
Derating Curve For TO-220



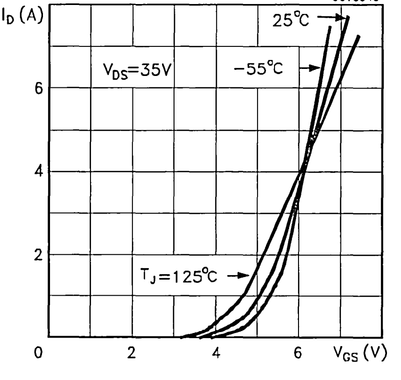
Derating Curve For ISOWATT220



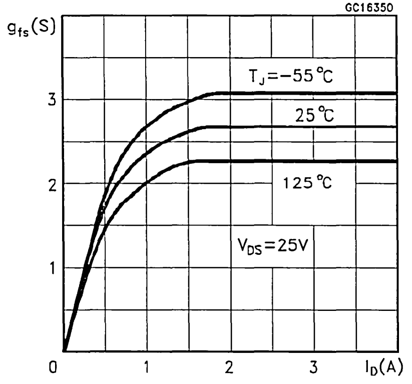
Output Characteristics



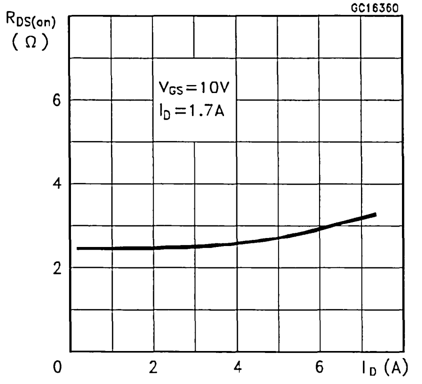
Transfer Characteristics



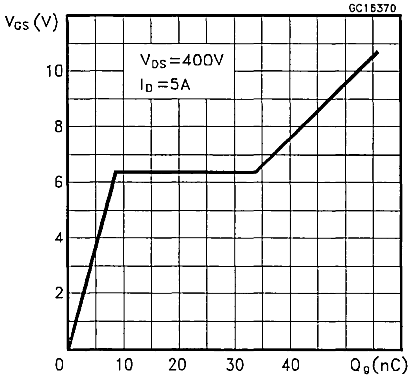
Transconductance



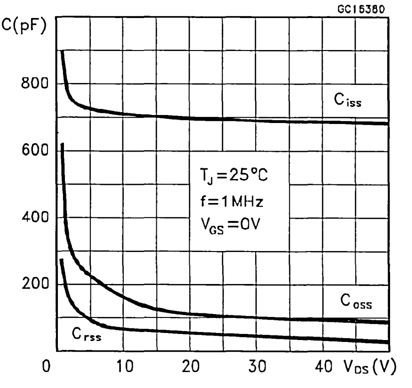
Static Drain-source On Resistance



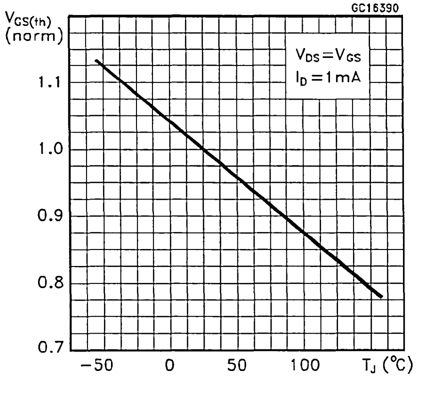
Gate Charge vs Gate-source Voltage



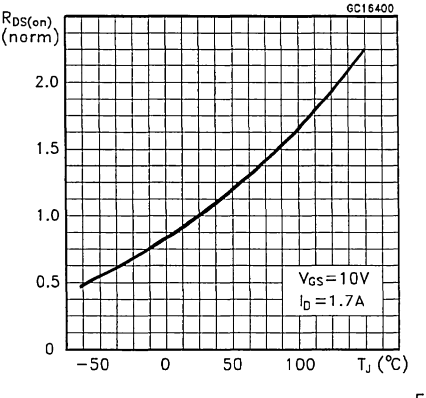
Capacitance Variations



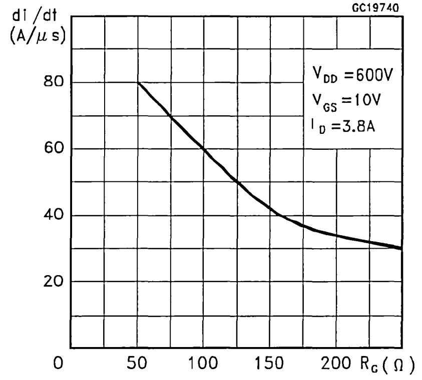
Normalized Gate Threshold Voltage vs Temperature



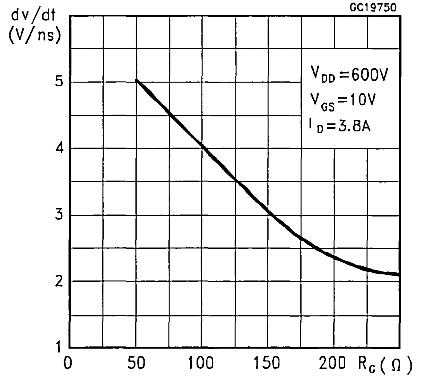
Normalized On Resistance vs Temperature



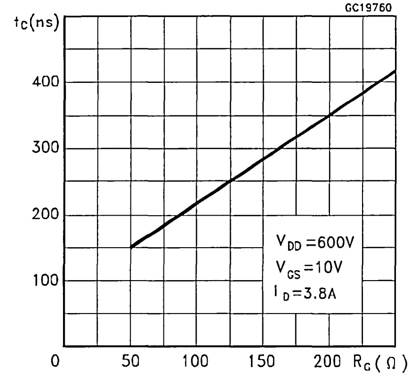
Turn-on Current Slope



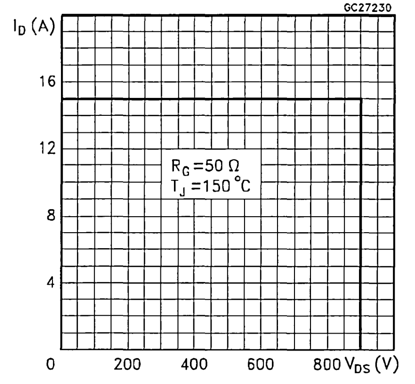
Turn-off Drain-source Voltage Slope



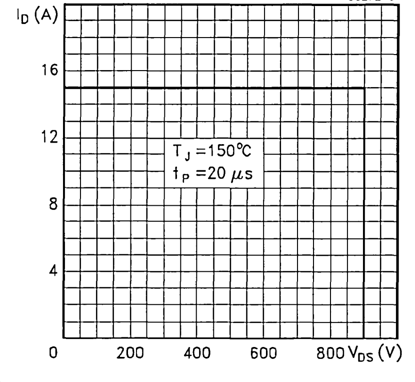
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

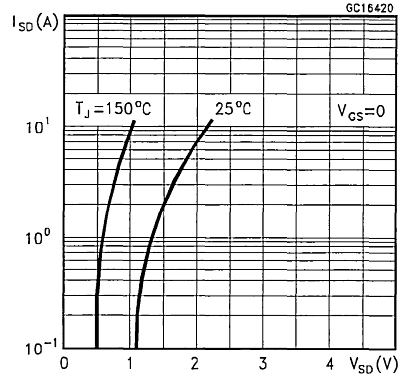


Fig. 1: Unclamped Inductive Load Test Circuits

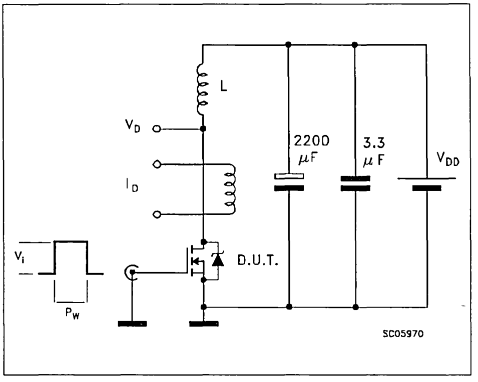


Fig. 2: Unclamped Inductive Waveforms

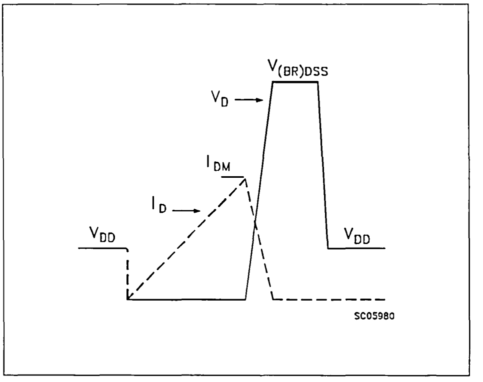


Fig. 3: Switching Times Test Circuits For Resistive Load

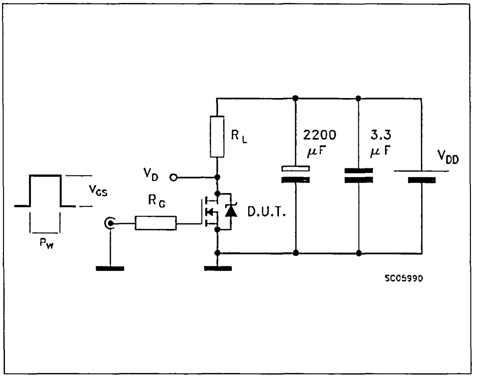


Fig. 4: Gate Charge Test Circuit

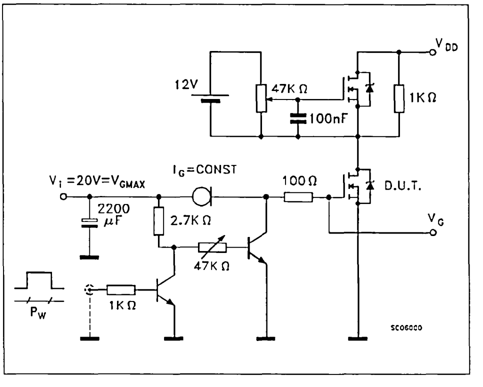
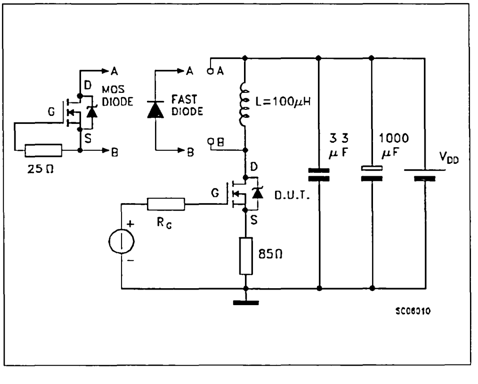


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



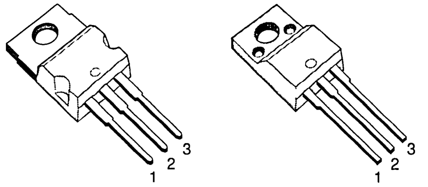
SGS-THOMSON
MICROELECTRONICS

STP4N100
STP4N100FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP4N100	1000 V	< 3.5 Ω	4 A
STP4N100FI	1000 V	< 3.5 Ω	2.2 A

- TYPICAL $R_{DS(on)}$ = 3.1 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

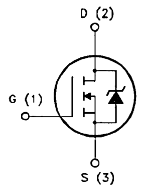


TO-220 **ISOWATT220**

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP4N100	STP4N100FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	1000		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	1000		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	4	2.2	A
I_D	Drain Current (continuous) at T_c = 100 °C	2.5	1.4	A
I_{DM}(•)	Drain Current (pulsed)	16	16	A
P_{tot}	Total Dissipation at T_c = 25 °C	125	40	W
	Derating Factor	1	0.32	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case Max	1	3.12	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	4	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	160	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	8.3	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	2.5	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	1000			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 2 A V_{GS} = 10V I_D = 2 A T_c = 100°C		3.1	3.5 7	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	4			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 2 A	2	4		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1230 165 70	1500 200 85	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 800 V I_D = 2 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		36 30	45 165	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 800 V I_D = 4 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		180		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 800 V I_D = 4 A V_{GS} = 10 V		80 8 40	100	nC nC nC

SWITCHING OFF

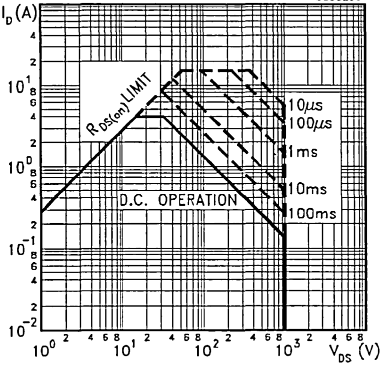
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 800 V I_D = 4 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		100 25 155	125 32 190	ns ns ns

SOURCE DRAIN DIODE

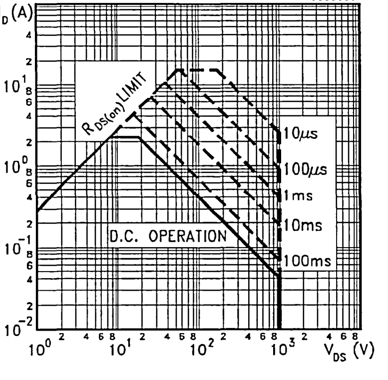
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				4 16	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 4A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 4 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		1200 30 50		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

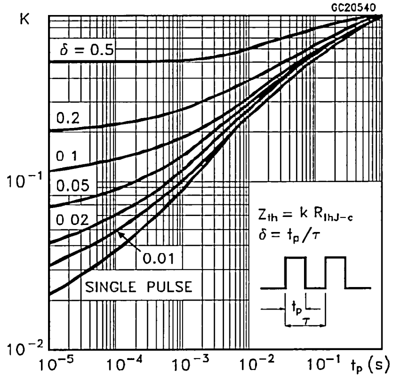
Safe Operating Areas For TO-220



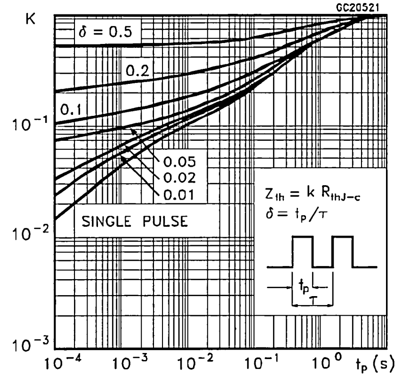
Safe Operating Areas For ISOWATT220



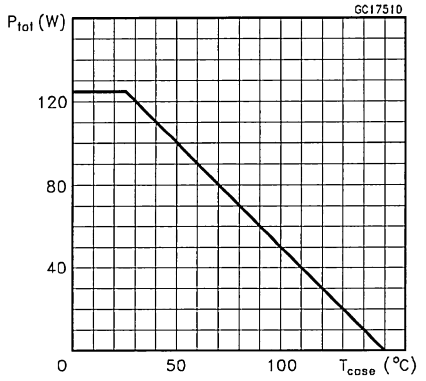
Thermal Impedeance For TO-220



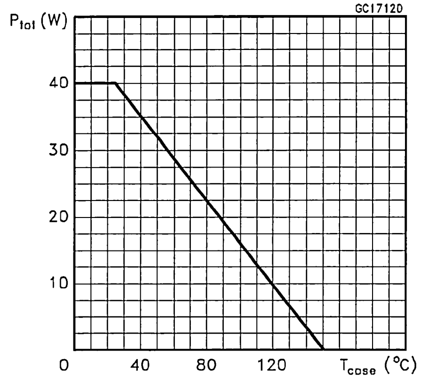
Thermal Impedance For ISOWATT220



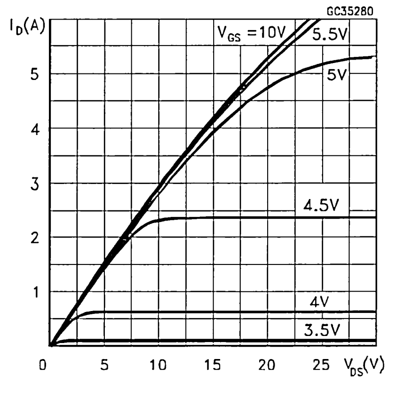
Derating Curve For TO-220



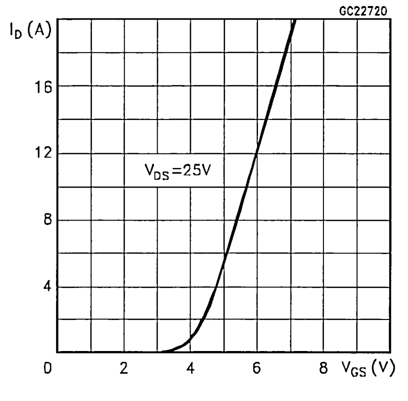
Derating Curve For ISOWATT220



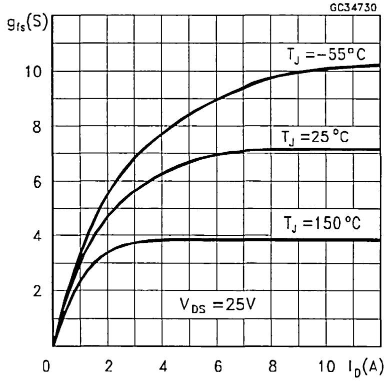
Output Characteristics



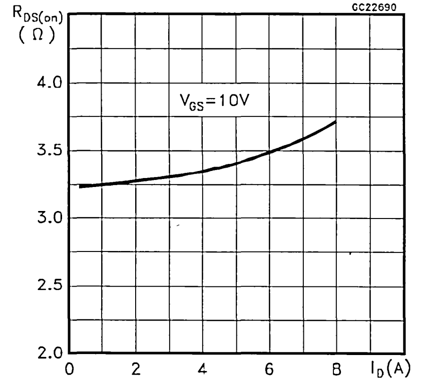
Transfer Characteristics



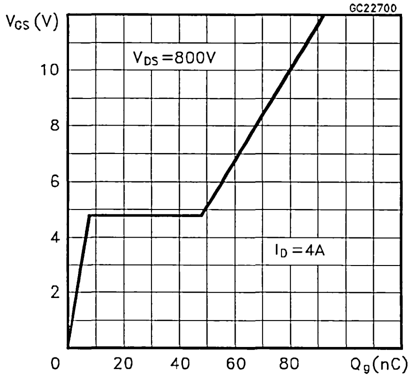
Transconductance



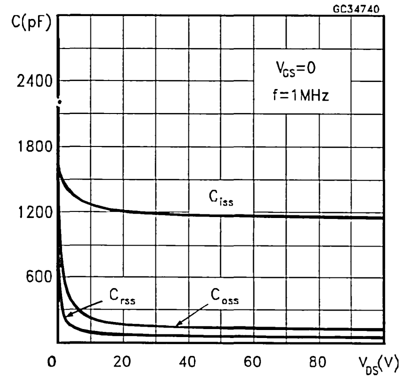
Static Drain-source On Resistance



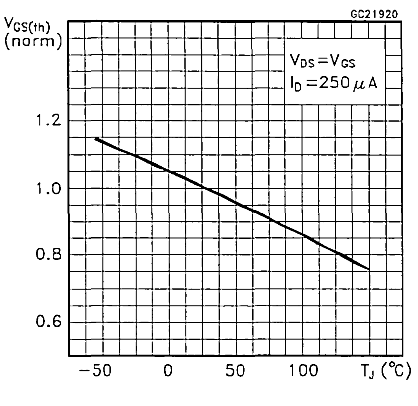
Gate Charge vs Gate-source Voltage



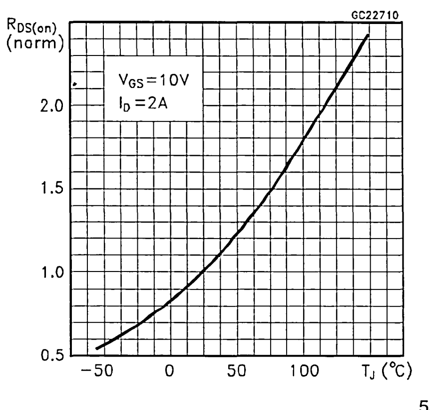
Capacitance Variations



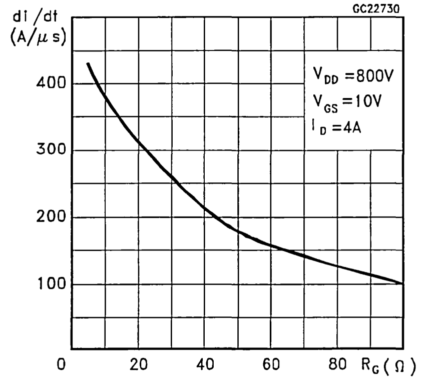
Normalized Gate Threshold Voltage vs Temperature



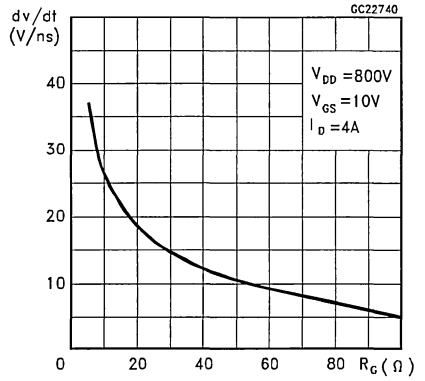
Normalized On Resistance vs Temperature



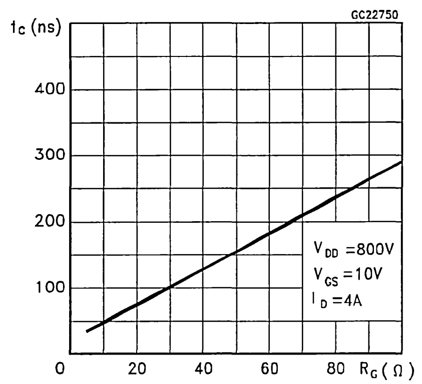
Turn-on Current Slope



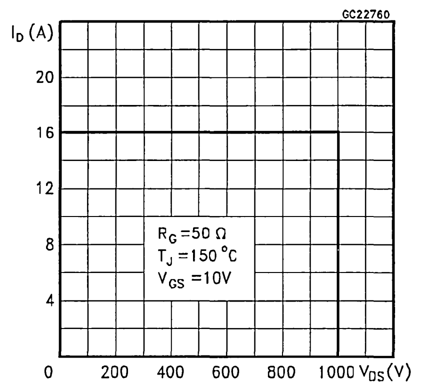
Turn-off Drain-source Voltage Slope



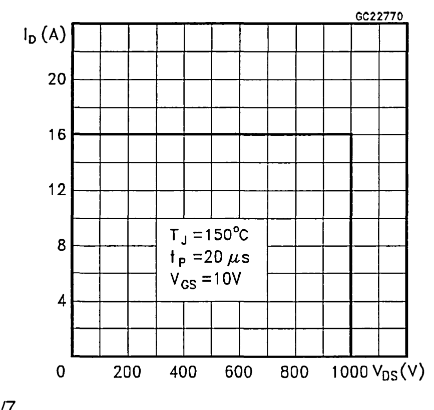
Cross-over Time



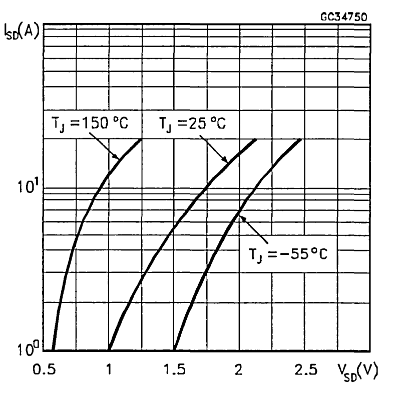
Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics



SGS-THOMSON MICROELECTRONICS

Fig. 1: Unclamped Inductive Load Test Circuits

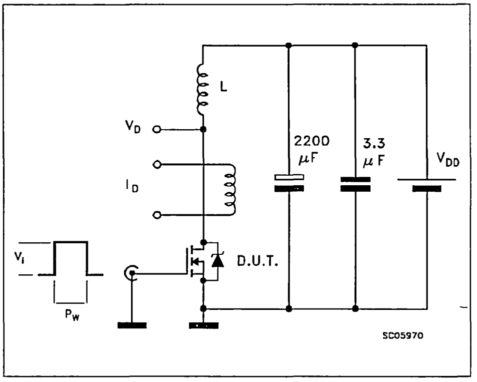


Fig. 2: Unclamped Inductive Waveforms

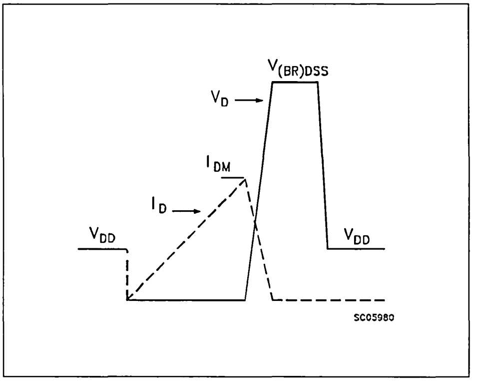


Fig. 3: Switching Times Test Circuits For Resistive Load

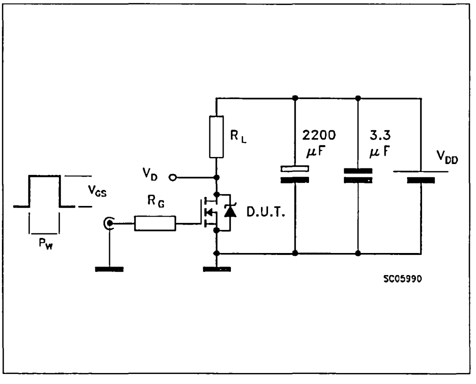


Fig. 4: Gate Charge Test Circuit

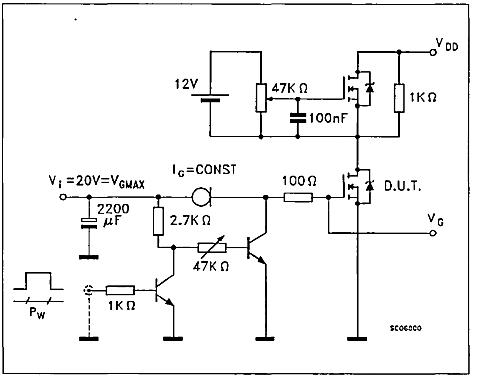
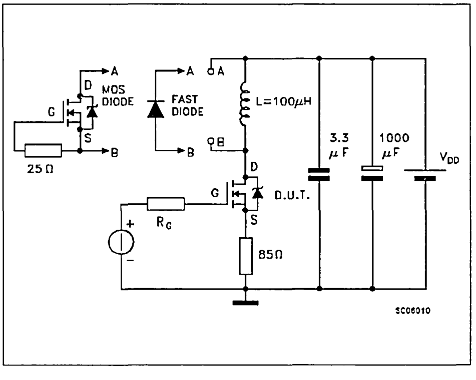


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON
MICROELECTRONICS

STP4N100XI

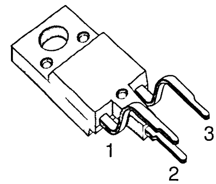
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP4N100XI	1000 V	< 4 Ω	2 A

- TYPICAL $R_{DS(on)}$ = 3.1 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

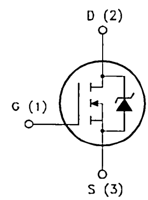
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)



ISOWATT221

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	1000	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	1000	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	2	A
I_D	Drain Current (continuous) at T_c = 100 °C	1.3	A
$I_{DM}(\bullet)$	Drain Current (pulsed)	8	A
P_{tot}	Total Dissipation at T_c = 25 °C	35	W
	Derating Factor	0.28	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	4000	V
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	3.57	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	60	°C/W
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.5	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	4	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	160	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	8.3	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	2.5	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	1000			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 2 A V_{GS} = 10V I_D = 2 A T_c = 100°C		3.1	4 8	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	2			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 2 A	2	4		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1230 165 70	1500 200 85	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 800 V I_D = 2 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		36 130	45 165	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 800 V I_D = 4 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 5)		180		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 800 V I_D = 4 A V_{GS} = 10 V		80 8 40	100	nC nC nC

SWITCHING OFF

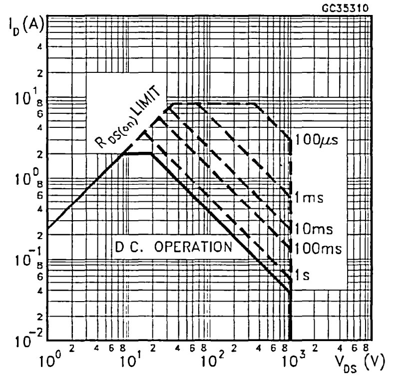
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 800 V I_D = 4 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		100 25 155	125 32 190	ns ns ns

SOURCE DRAIN DIODE

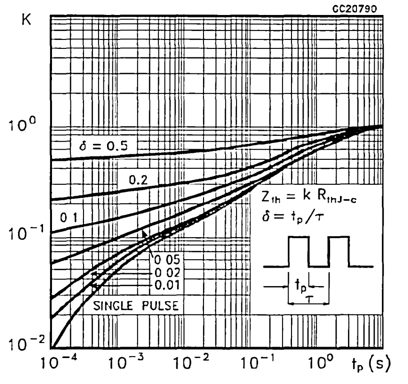
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				2 8	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 2 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 4 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		1200 30 50		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

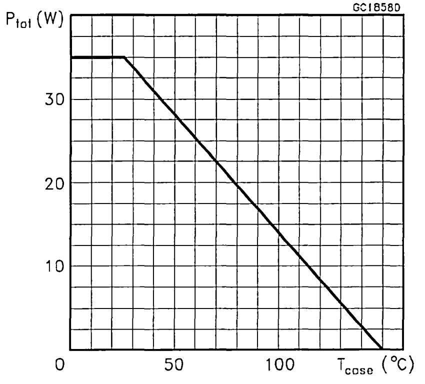
Safe Operating Area



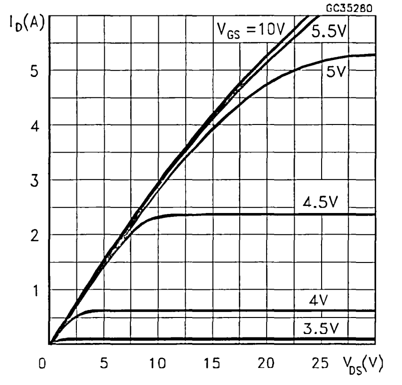
Thermal Impedance



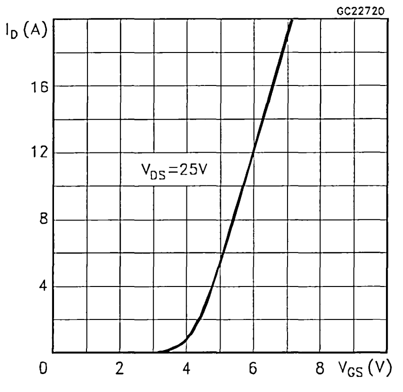
Derating Curve



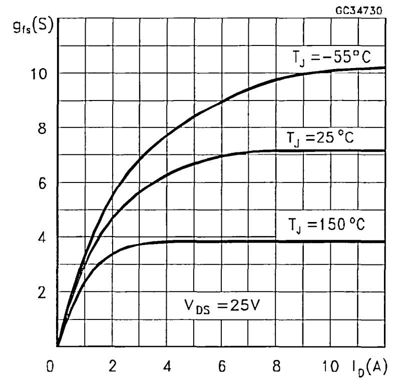
Output Characteristics



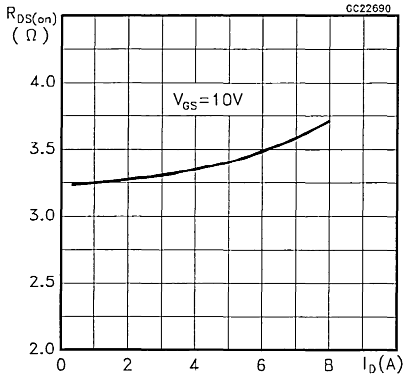
Transfer Characteristics



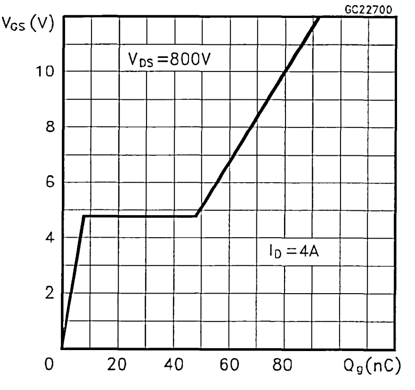
Transconductance



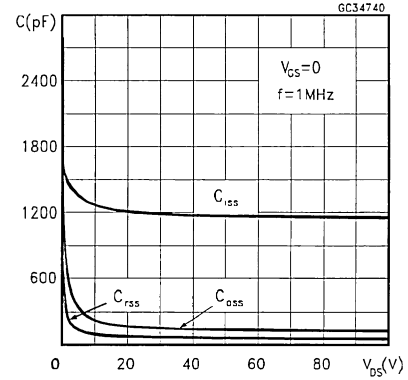
Static Drain-source On Resistance



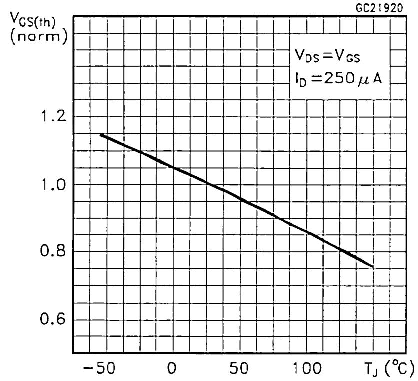
Gate Charge vs Gate-source Voltage



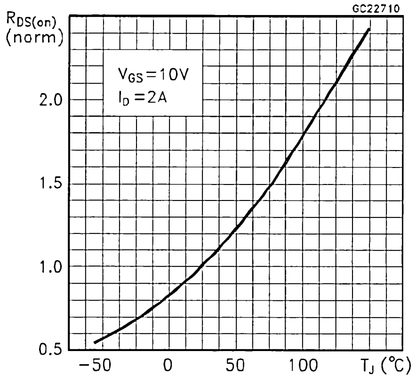
Capacitance Variations



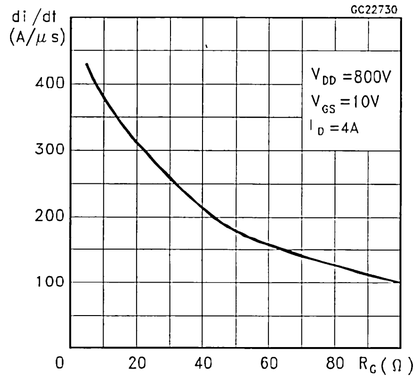
Normalized Gate Threshold Voltage vs Temperature



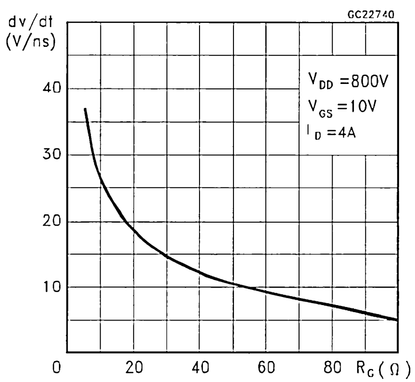
Normalized On Resistance vs Temperature



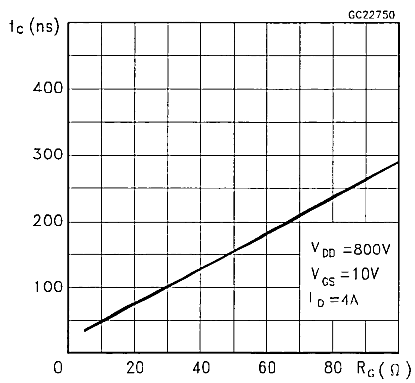
Turn-on Current Slope



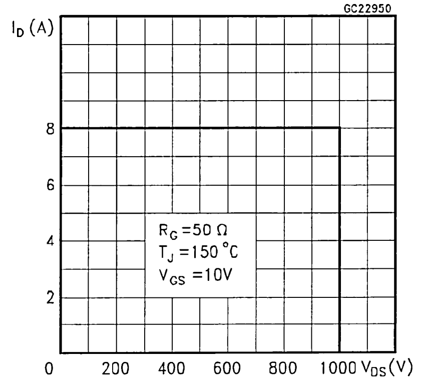
Turn-off Drain-source Voltage Slope



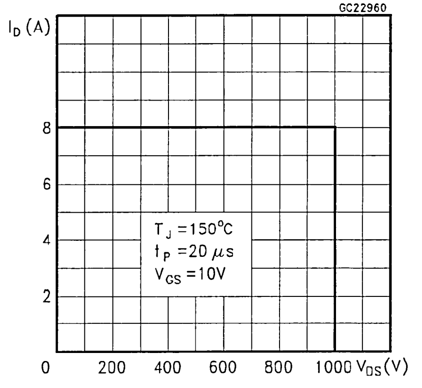
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

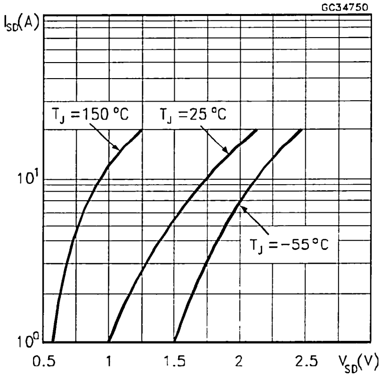


Fig. 1: Unclamped Inductive Load Test Circuits

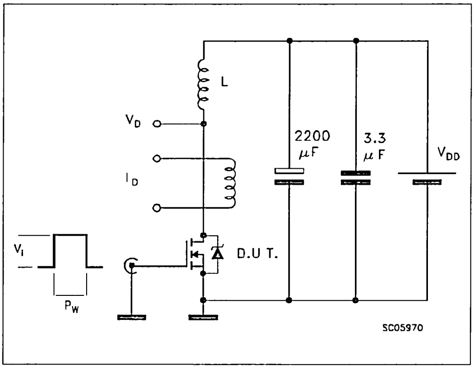


Fig. 2: Unclamped Inductive Waveforms

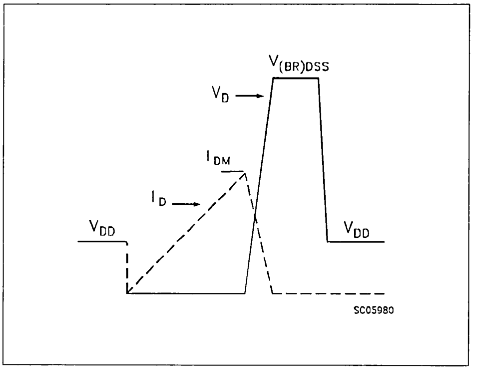


Fig. 3: Switching Times Test Circuits For Resistive Load

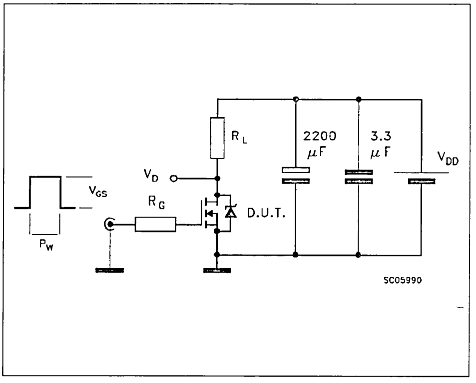


Fig. 4: Gate Charge Test Circuit

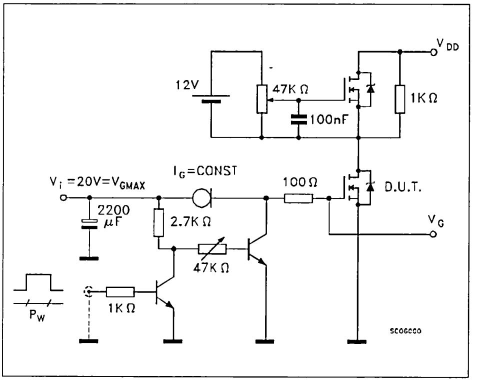
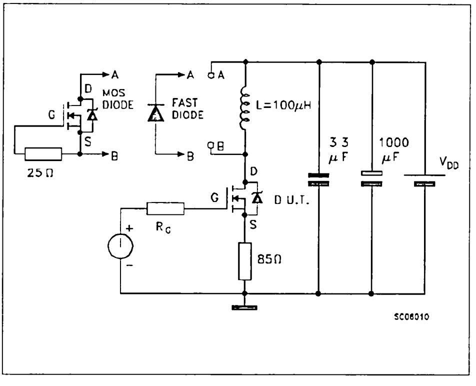


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



SGS-THOMSON
MICROELECTRONICS

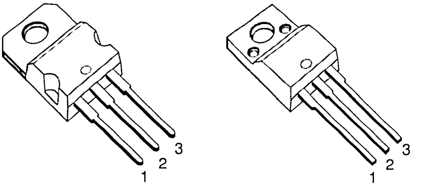
STP5N30
STP5N30FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP5N30 STP5N30FI	300 V 300 V	< 1.4 Ω < 1.4 Ω	5 A 3.5 A

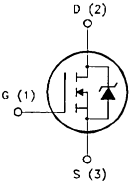
- TYPICAL $R_{DS(on)}$ = 1.2 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS
- HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT
- PARTICULARLY SUITABLE FOR ELECTRONIC FLUORESCENT LAMP BALLASTS



TO-220 ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP5N30	STP5N30FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	300		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	300		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	5	3.5	A
I_D	Drain Current (continuous) at T_c = 100 °C	3.2	2.2	A
I_{DM}(•)	Drain Current (pulsed)	20	20	A
P_{tot}	Total Dissipation at T_c = 25 °C	75	35	W
	Derating Factor	0.6	0.28	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.67	3.57	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Thermal Resistance Case-sink Maximum Lead Temperature For Soldering Purpose	Max Typ 	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	5	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	50	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	1.5	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	3.2	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	300			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 2.5 A V_{GS} = 10V I_D = 2.5 A T_c = 100°C		1.2	1.4 2.8	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	5			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 2.5 A	2	3.1		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		500 80 16	700 110 25	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 150 V I_D = 2.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		45 30	60 40	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 240 V I_D = 5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		330		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 240 V I_D = 5 A V_{GS} = 10 V		20 6 8	30	nC nC nC

SWITCHING OFF

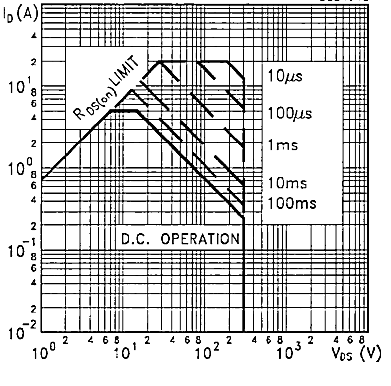
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 240 V I_D = 5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		35 20 60	50 30 80	ns ns ns

SOURCE DRAIN DIODE

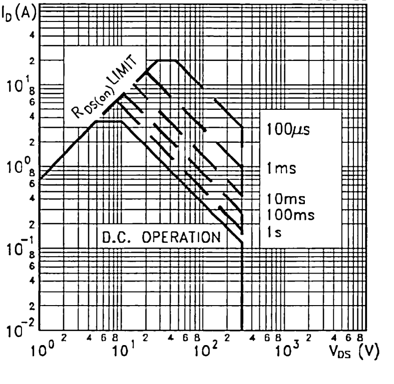
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				5 20	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 5 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 5 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		300 1.7 13		ns µC A

(*) Pulsed Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

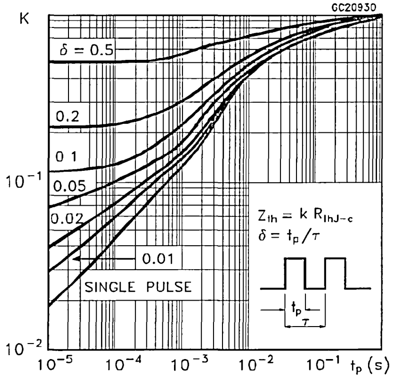
Safe Operating Areas For TO-220



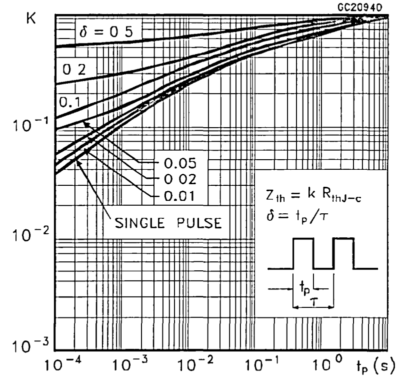
Safe Operating Areas For ISOWATT220



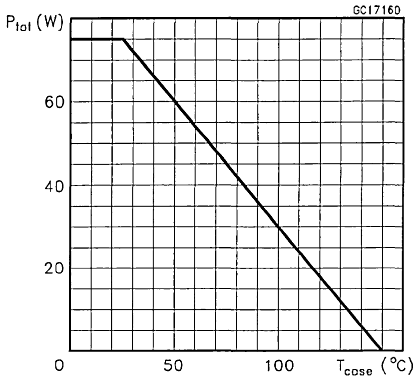
Thermal Impedeance For TO-220



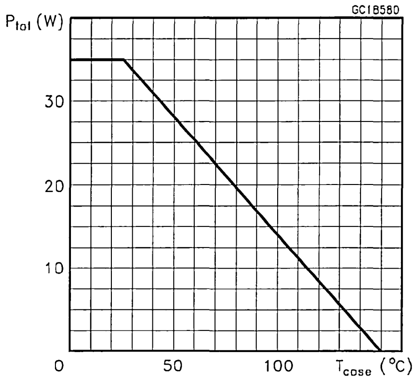
Thermal Impedance For ISOWATT220



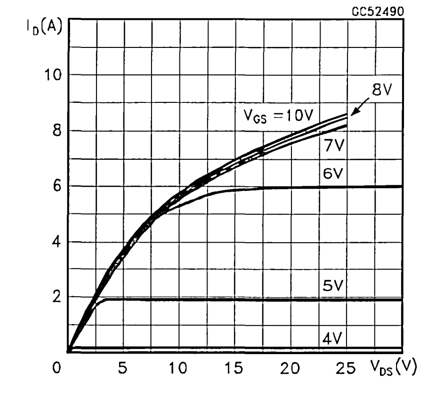
Derating Curve For TO-220



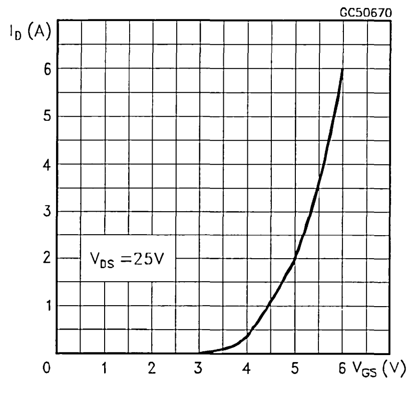
Derating Curve For ISOWATT220



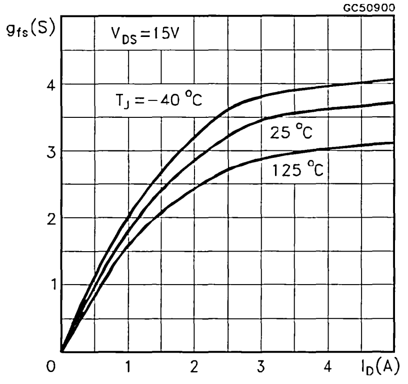
Output Characteristics



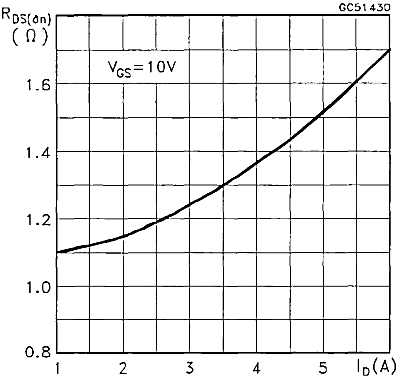
Transfer Characteristics



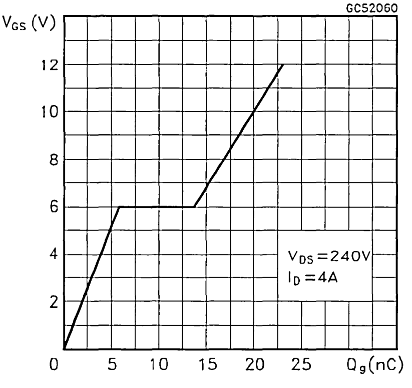
Transconductance



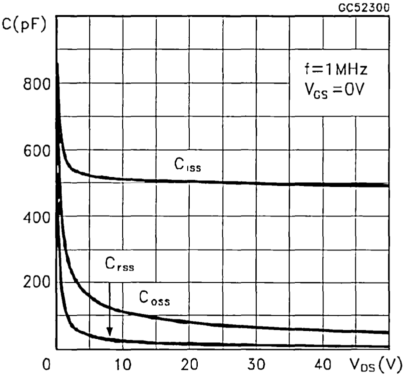
Static Drain-source On Resistance



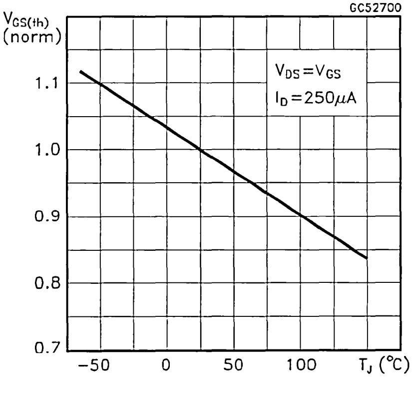
Gate Charge vs Gate-source Voltage



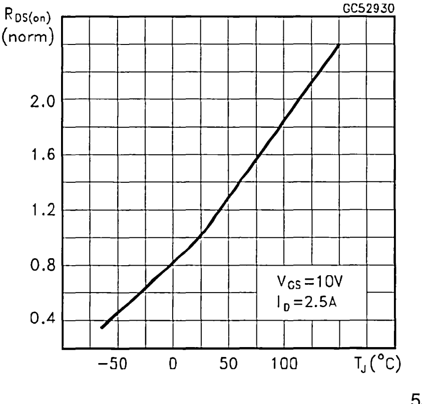
Capacitance Variations



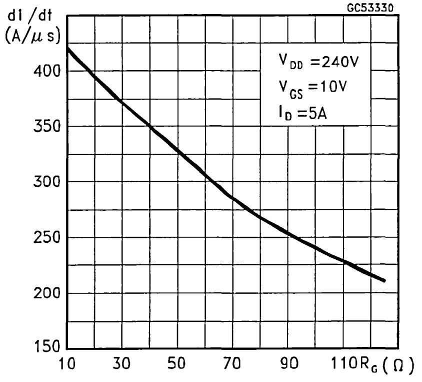
Normalized Gate Threshold Voltage vs Temperature



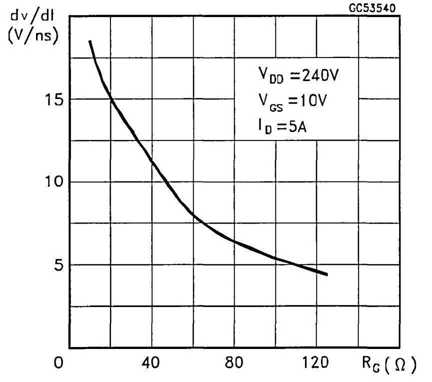
Normalized On Resistance vs Temperature



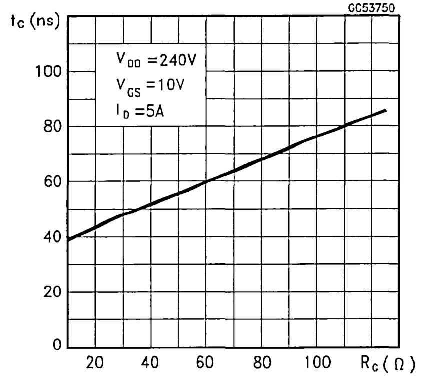
Turn-on Current Slope



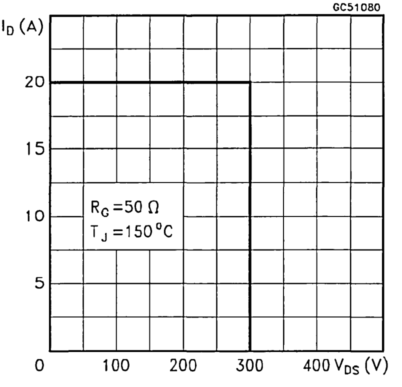
Turn-off Drain-source Voltage Slope



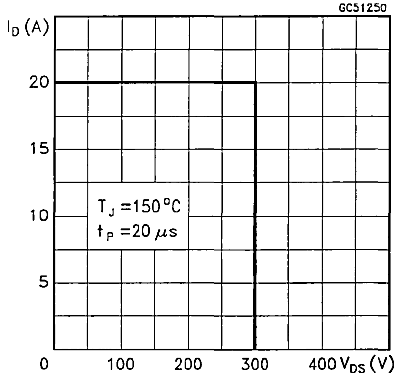
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

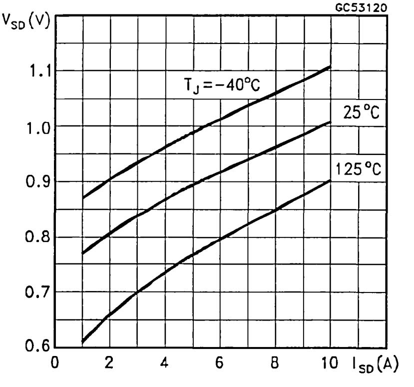


Fig. 1: Unclamped Inductive Load Test Circuits

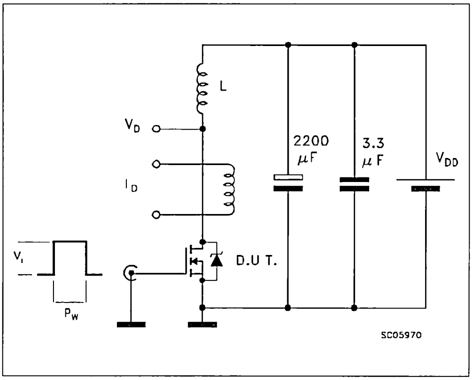


Fig. 2: Unclamped Inductive Waveforms

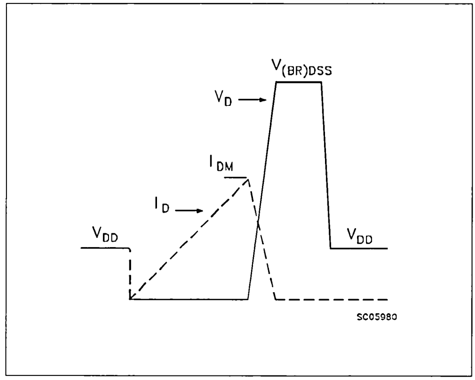


Fig. 3: Switching Times Test Circuits For Resistive Load

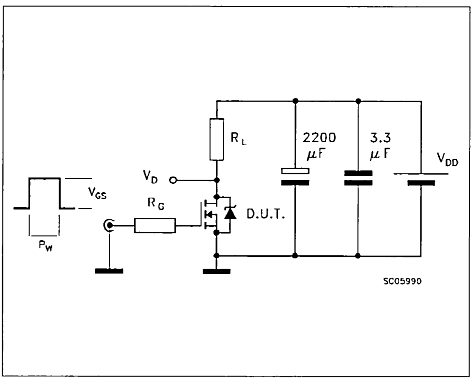


Fig. 4: Gate Charge Test Circuit

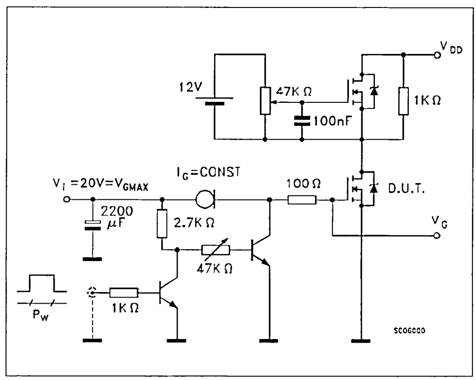
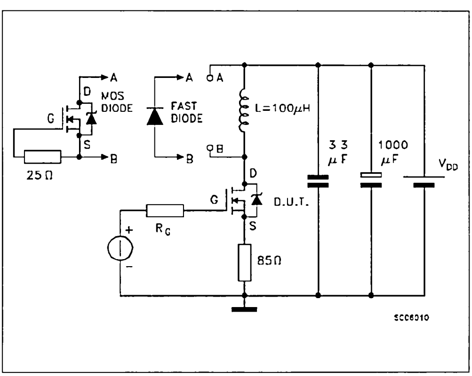


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON
MICROELECTRONICS

STP5N30L
STP5N30LFI

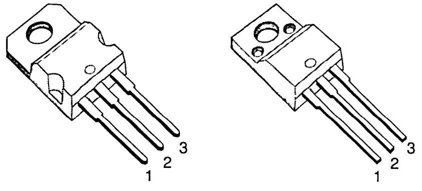
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP5N30L	300 V	< 1.4 Ω	5 A
STP5N30LFI	300 V	< 1.4 Ω	3.5 A

- TYPICAL $R_{DS(on)}$ = 1.25 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

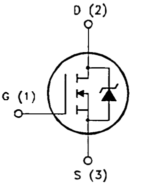
APPLICATIONS

- HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT
- PARTICULARLY SUITABLE FOR ELECTRONIC FLUORESCENT LAMP BALLASTS



TO-220 ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP5N30L	STP5N30LFI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	300		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	300		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	5	3.5	A
I_D	Drain Current (continuous) at T_c = 100 °C	3.2	2.2	A
I_{DM}(•)	Drain Current (pulsed)	20	20	A
P_{tot}	Total Dissipation at T_c = 25 °C	75	35	W
	Derating Factor	0.6	0.28	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.67	3.57	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Thermal Resistance Case-sink Maximum Lead Temperature For Soldering Purpose	Max Typ 	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	5	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	50	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	1.5	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	3.2	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	300			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	1	1.6	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 5 V I_D = 2.5 A V_{GS} = 5 V I_D = 2.5 A T_c = 100°C		1.25	1.4 2.8	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	5			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 2.5 A	2	5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		580 75 14	780 110 25	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 150 V I_D = 2.5 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 3)		70 165	90 215	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 240 V I_D = 5 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		115		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 240 V I_D = 5 A V_{GS} = 5 V		16 5 7	22	nC nC nC

SWITCHING OFF

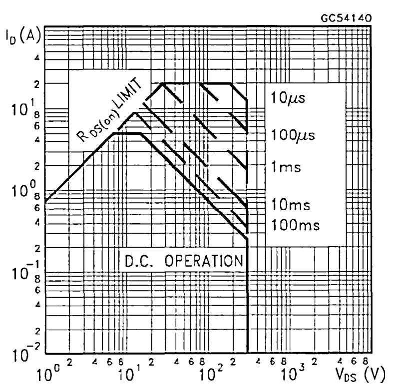
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 240 V I_D = 5 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		60 50 120	80 65 160	ns ns ns

SOURCE DRAIN DIODE

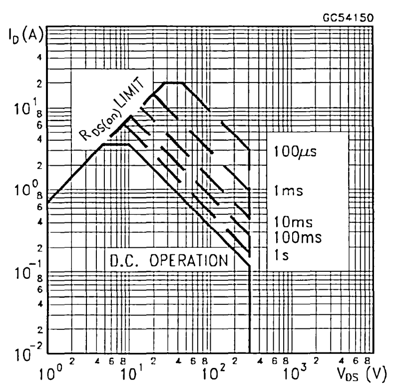
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				5 20	A A
V_{SD} (·)	Forward On Voltage	I_{SD} = 5 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 5 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		360 2.4 13		ns µC A

(·) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

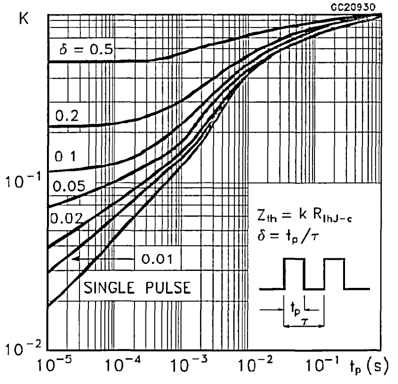
Safe Operating Areas For TO-220



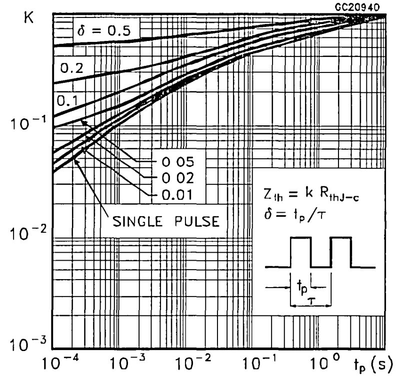
Safe Operating Areas For ISOWATT220



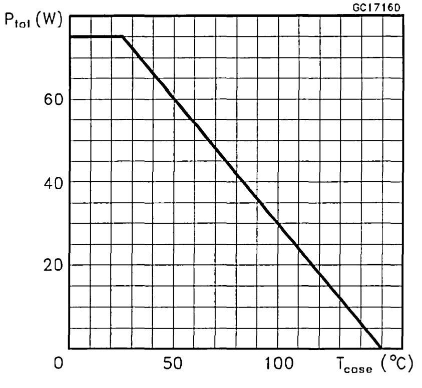
Thermal Impedeance For TO-220



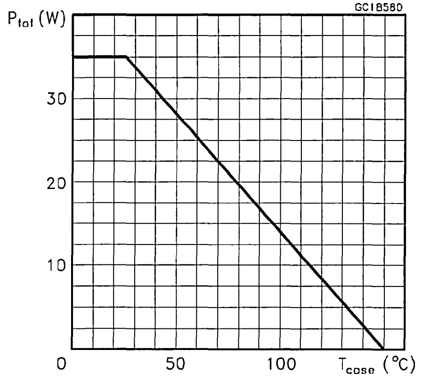
Thermal Impedance For ISOWATT220



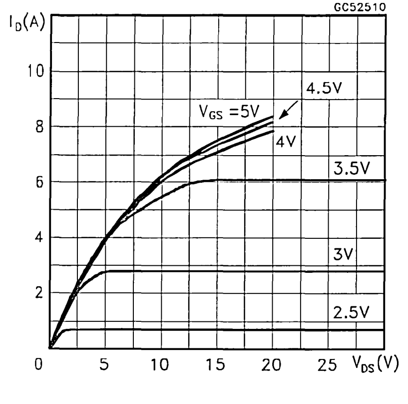
Derating Curve For TO-220



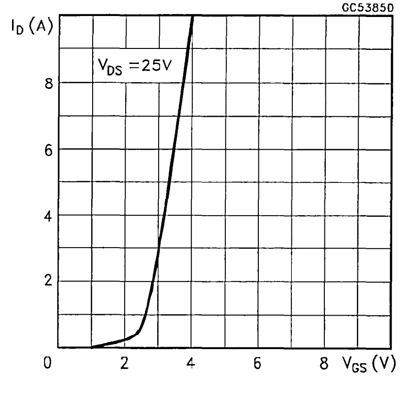
Derating Curve For ISOWATT220



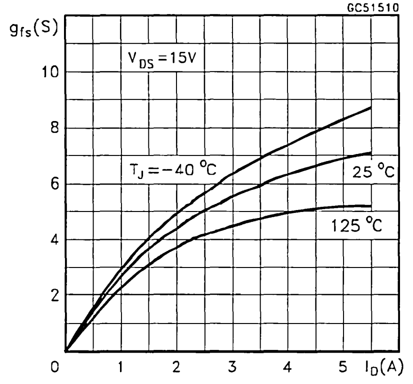
Output Characteristics



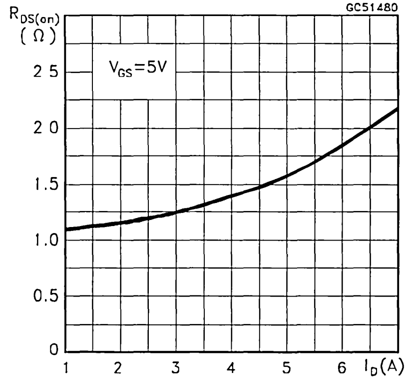
Transfer Characteristics



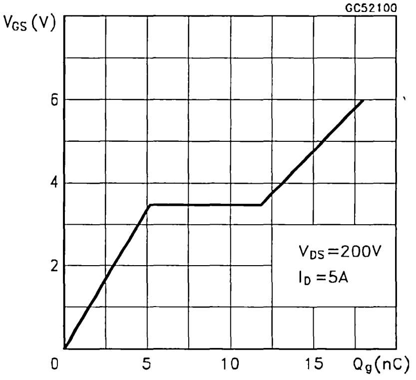
Transconductance



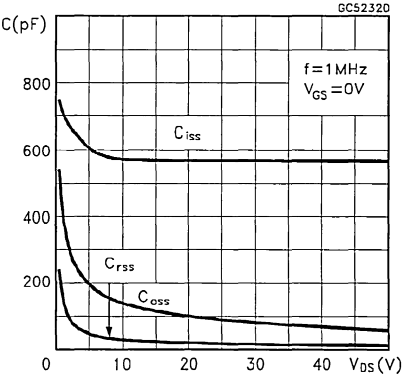
Static Drain-source On Resistance



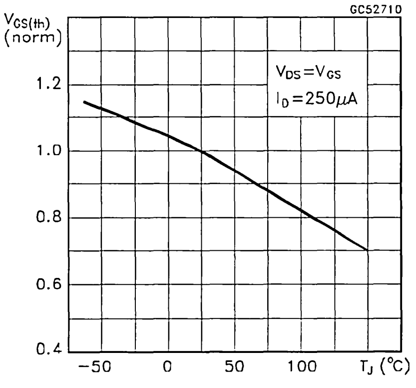
Gate Charge vs Gate-source Voltage



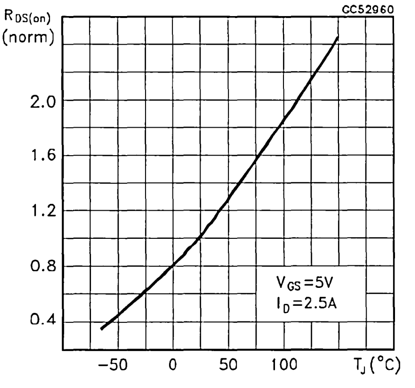
Capacitance Variations



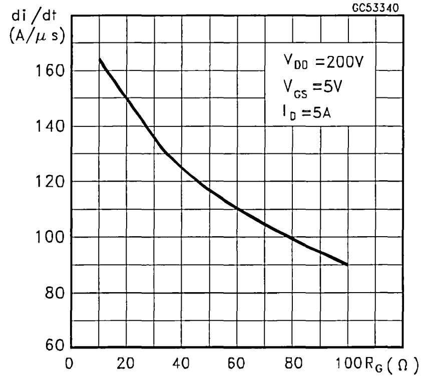
Normalized Gate Threshold Voltage vs Temperature



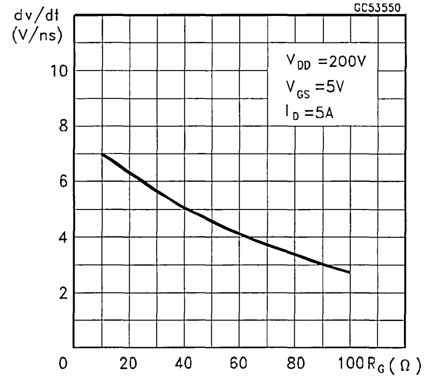
Normalized On Resistance vs Temperature



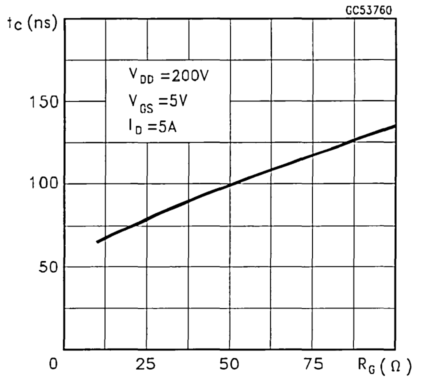
Turn-on Current Slope



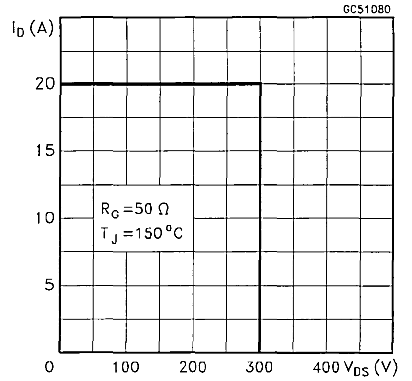
Turn-off Drain-source Voltage Slope



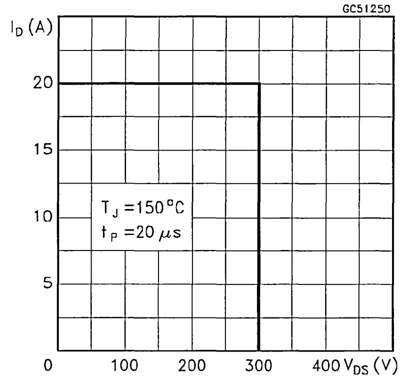
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

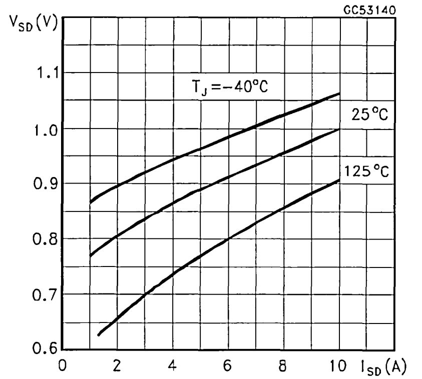


Fig. 1: Unclamped Inductive Load Test Circuits

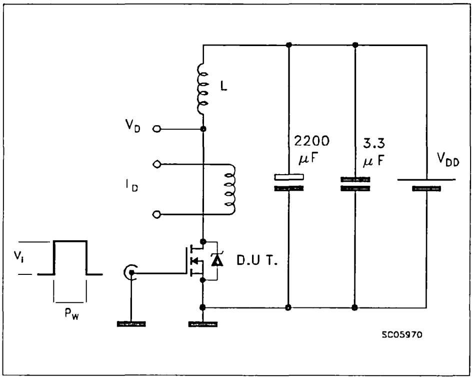


Fig. 2: Unclamped Inductive Waveforms

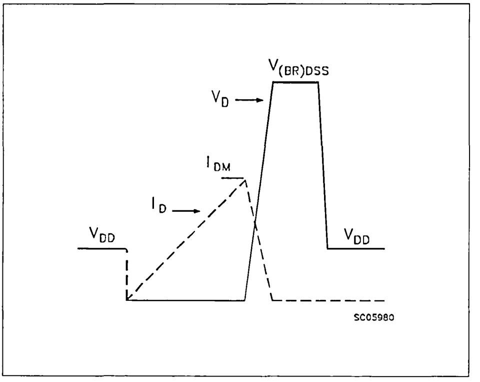


Fig. 3: Switching Times Test Circuits For Resistive Load

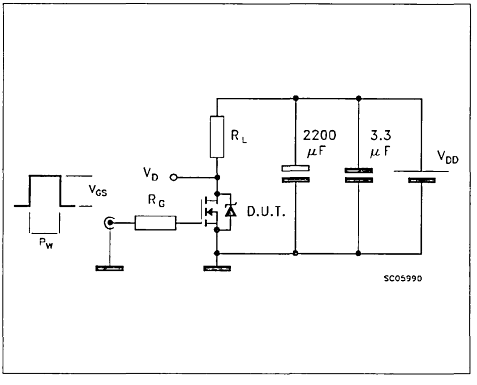


Fig. 4: Gate Charge Test Circuit

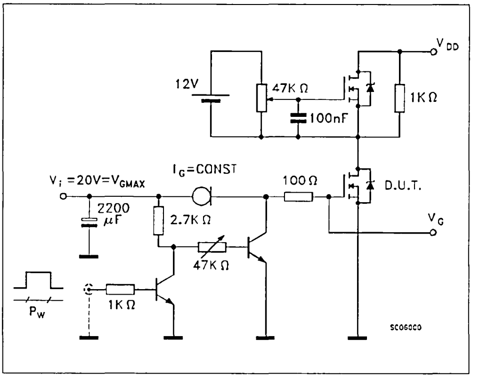
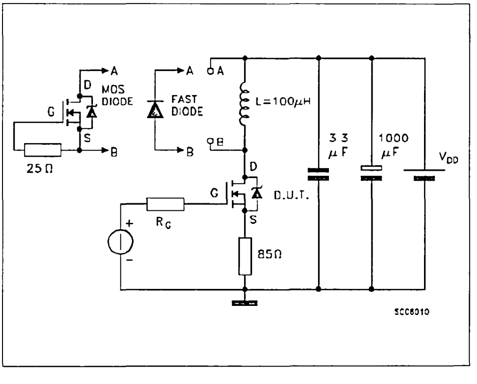


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON MICROELECTRONICS

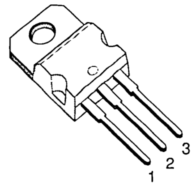
STP5N50
STP5N50FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

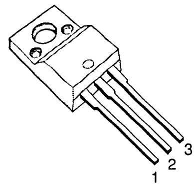
TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP5N50	500 V	< 1.6 Ω	4.5 A
STP5N50FI	500 V	< 1.6 Ω	3 A

- TYPICAL $R_{DS(on)}$ = 1.4 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT

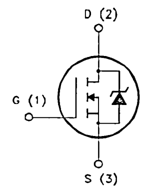


TO-220



ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP5N50	STP5N50FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	500		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	500		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	4.5	3	A
I_D	Drain Current (continuous) at T_c = 100 °C	3	1.8	A
I_{DM}(•)	Drain Current (pulsed)	15	15	A
P_{tot}	Total Dissipation at T_c = 25 °C	100	35	W
	Derating Factor	0.8	0.28	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-200	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case Max	1.25	3.57	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	4.5	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25\ ^oC$, $I_D = I_{AR}$, $V_{DD} = 50$ V)	280	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	7.4	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100\ ^oC$, pulse width limited by T_j max, $\delta < 1\%$)	2.5	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25\ ^oC$ unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250\ \mu A$ $V_{GS} = 0$	500			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125\ ^oC$			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250\ \mu A$	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 2.5$ A $V_{GS} = 10V$ $I_D = 2.5$ A $T_c = 100^oC$		1.4	1.6 3.2	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	4.5			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 2.5$ A	2.7	3.4		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		600 100 40	800 130 55	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 225 V I_D = 2.5 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 3)		45 34	60 42	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 400 V I_D = 4.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		170		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 4.5 A V_{GS} = 10 V		42 6 20	52	nC nC nC

SWITCHING OFF

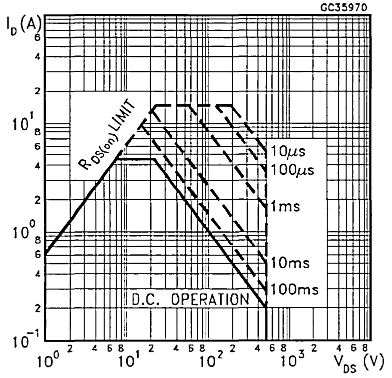
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 400 V I_D = 4.5 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 5)		35 45 60	45 55 75	ns ns ns

SOURCE DRAIN DIODE

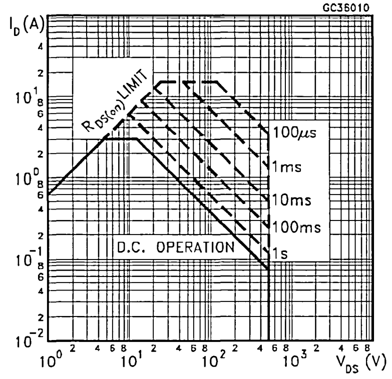
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				4.5 15	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 4.5 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 4.5 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		430 3.8 17.5		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

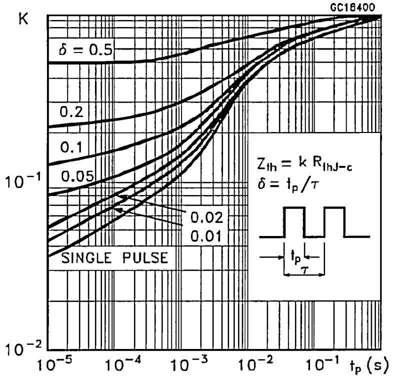
Safe Operating Areas For TO-220



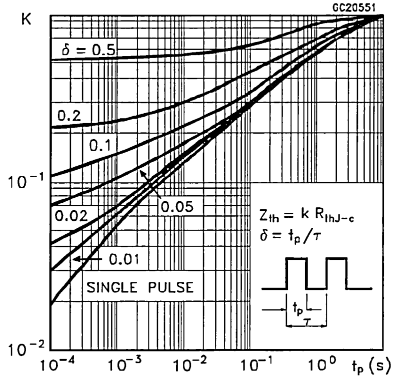
Safe Operating Areas For ISOWATT220



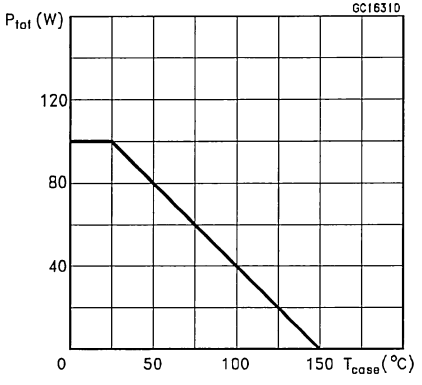
Thermal Impedeance For TO-220



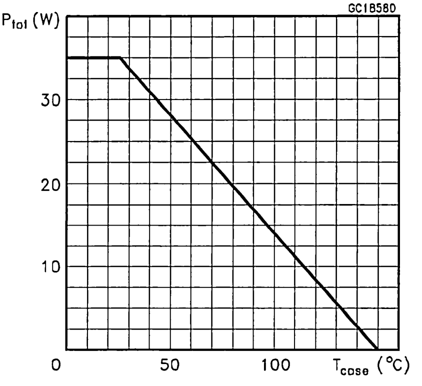
Thermal Impedance For ISOWATT220



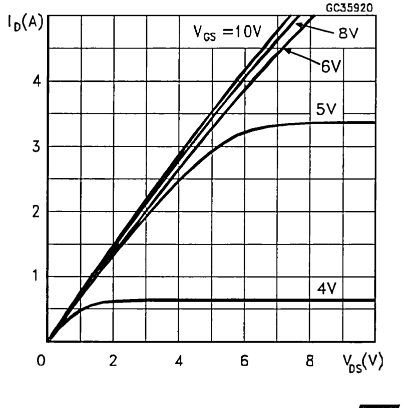
Derating Curve For TO-220



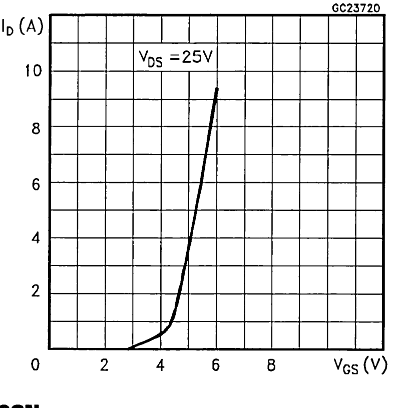
Derating Curve For ISOWATT220



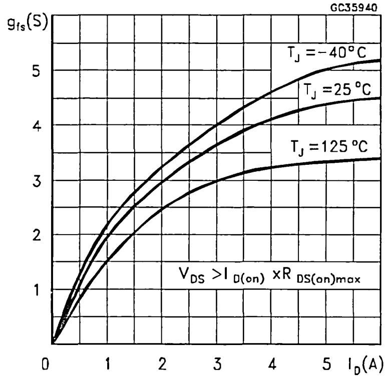
Output Characteristics



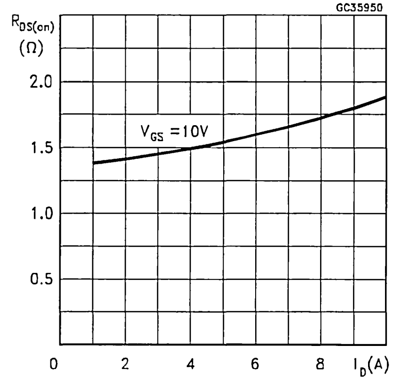
Transfer Characteristics



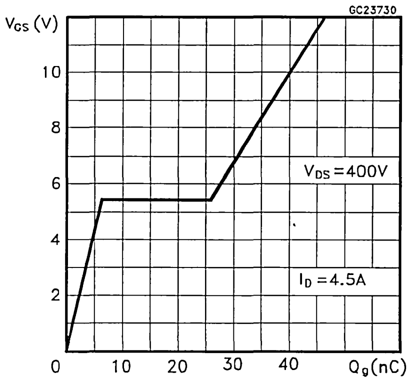
Transconductance



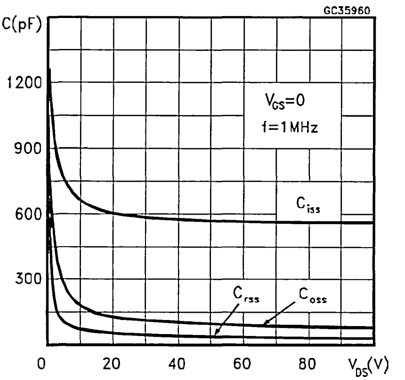
Static Drain-source On Resistance



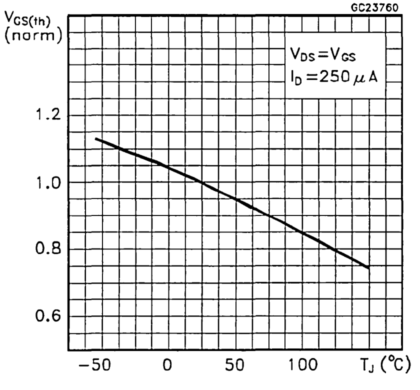
Gate Charge vs Gate-source Voltage



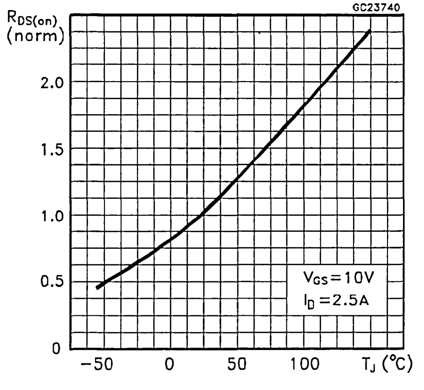
Capacitance Variations



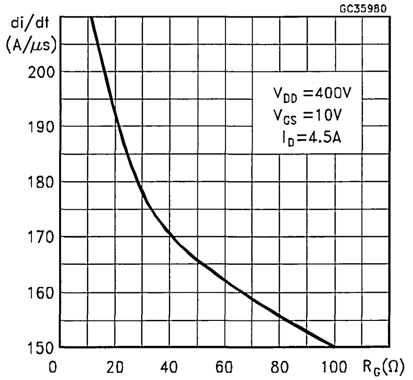
Normalized Gate Threshold Voltage vs Temperature



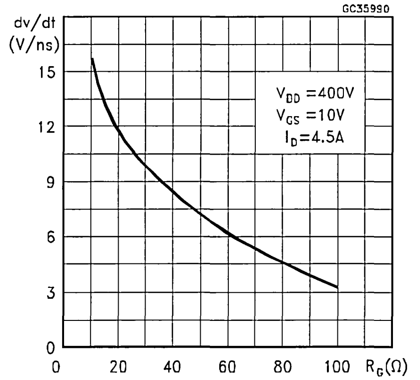
Normalized On Resistance vs Temperature



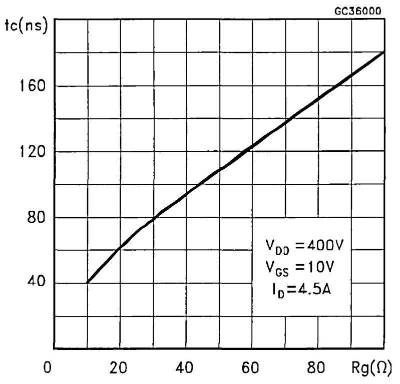
Turn-on Current Slope



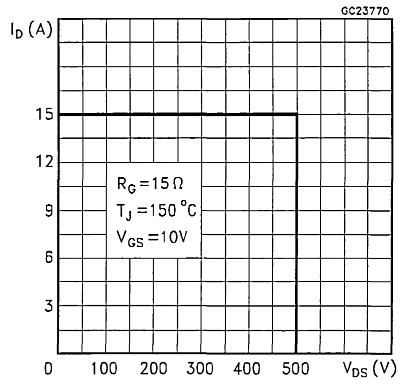
Turn-off Drain-source Voltage Slope



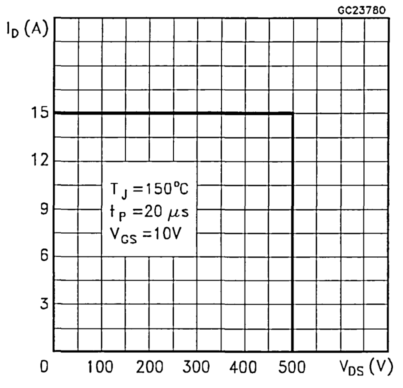
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

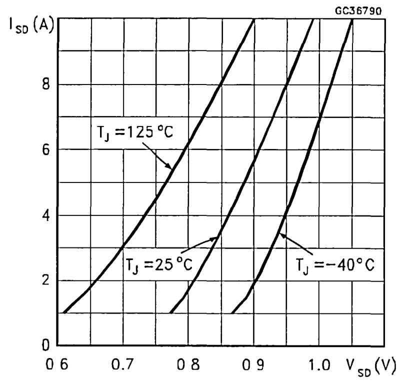


Fig. 1: Unclamped Inductive Load Test Circuits

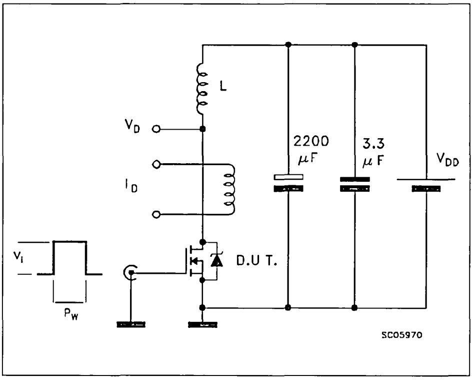


Fig. 2: Unclamped Inductive Waveforms

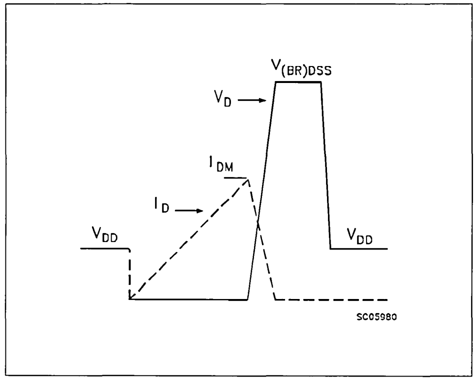


Fig. 3: Switching Times Test Circuits For Resistive Load

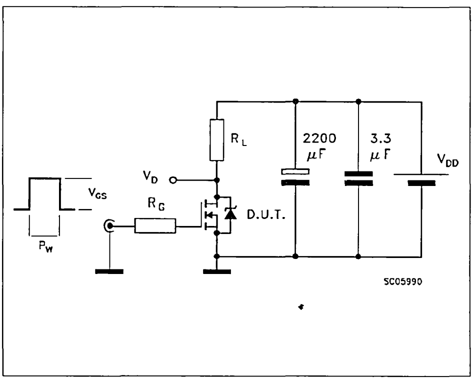


Fig. 4: Gate Charge Test Circuit

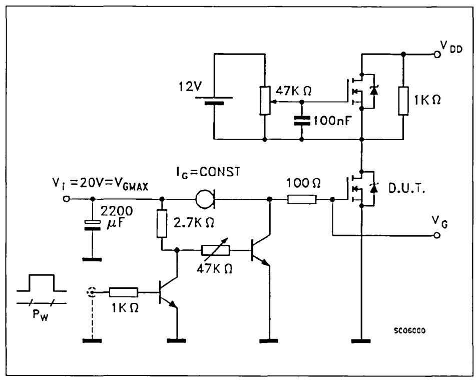
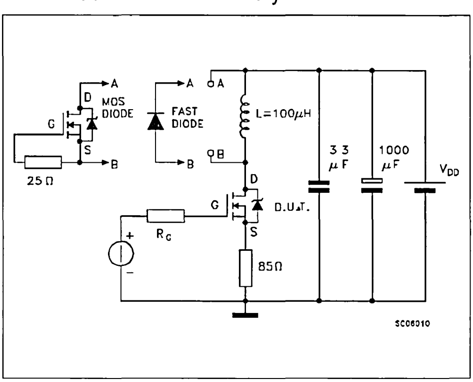


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



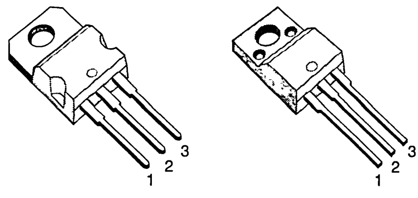
STP5NA50
STP5NA50FI

N - CHANNEL ENHANCEMENT MODE
FAST POWER MOS TRANSISTOR

ADVANCE DATA

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP5NA50	500 V	< 1.6 Ω	5 A
STP5NA50FI	500 V	< 1.6 Ω	3.1 A

- TYPICAL $R_{DS(on)}$ = 1.2 Ω
- ± 30V GATE TO SOURCE VOLTAGE RATING
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INTRINSIC CAPACITANCES
- GATE GHARGE MINIMIZED
- REDUCED THRESHOLD VOLTAGE SPREAD



TO-220 ISOWATT220

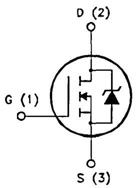
DESCRIPTION

This series of POWER MOSFETS represents the most advanced high voltage technology. The optimized cell layout coupled with a new proprietary edge termination concur to give the device low $R_{DS(on)}$ and gate charge, unequalled ruggedness and superior switching performance.

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- DC-AC CONVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLIES AND MOTOR DRIVE

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP5NA50	STP5NA50FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	500		V
V_{DGR}	Drain-gate Voltage (R_{GS} = 20 kΩ)	500		V
V_{GS}	Gate-source Voltage	± 30		V
I_D	Drain Current (continuous) at T_c = 25 °C	5	3.1	A
I_D	Drain Current (continuous) at T_c = 100 °C	3.3	2.1	A
I_{DM}(•)	Drain Current (pulsed)	20	20	A
P_{tot}	Total Dissipation at T_c = 25 °C	100	35	W
	Derating Factor	0.8	0.28	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case Max	1.25	3.57	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient Max	62.5		°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	5	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	140	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	4.2	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	2.1	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	400			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 30 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2.25	3	3.75	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 2.5 A V_{GS} = 10V I_D = 2.5 A T_c = 100°C		1.2	1.6 3.2	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	5			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 2.5 A	2.7	4		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		700 115 30		pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 250 V I_D = 2.5 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 3)		15 45		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 250 V I_D = 5 A R_G = 47 Ω V_{GS} = 10 V (see test circuit, figure 5)		400		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 5 A V_{GS} = 10 V		32 6 14		nC nC nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 400 V I_D = 5 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 5)		15 12 30		ns ns ns

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				5 20	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 5 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 5 A di/dt = 100 A/µs V_{DD} = 50 V T_j = 150 °C (see test circuit, figure 5)		380 3.4 18		ns µC A

(*) Pulsed Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

SGS-THOMSON MICROELECTRONICS

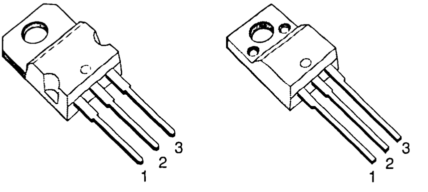
STP5N60
STP5N60FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP5N60	600 V	< 1.6 Ω	5.6 A
STP5N60FI	600 V	< 1.6 Ω	3.2 A

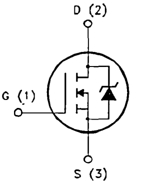
- TYPICAL $R_{DS(on)}$ = 1.33 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



TO-220 ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP5N60	STP5N60FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	600		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	600		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	5.6	3.2	A
I_D	Drain Current (continuous) at T_c = 100 °C	3.5	2	A
I_{DM}(•)	Drain Current (pulsed)	20	20	A
P_{tot}	Total Dissipation at T_c = 25 °C	100	40	W
	Derating Factor	1	0.32	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1	3.12	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	5.6	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25\ ^oC$, $I_D = I_{AR}$, $V_{DD} = 50$ V)	350	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	15	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100\ ^oC$, pulse width limited by T_j max, $\delta < 1\%$)	3.5	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25\ ^oC$ unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250\ \mu A$ $V_{GS} = 0$	600			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125\ ^oC$			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250\ \mu A$	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 2.5$ A $V_{GS} = 10V$ $I_D = 2.5$ A $T_c = 100^oC$		1.33	1.5 3	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	5.6			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 2.5$ A	1.5	3.4		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		720 120 50	1000 170 70	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 300 V I_D = 2.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		55 150	75 200	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 480 V I_D = 5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		115		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 480 V I_D = 5 A V_{GS} = 10 V		46 8 25	65	nC nC nC

SWITCHING OFF

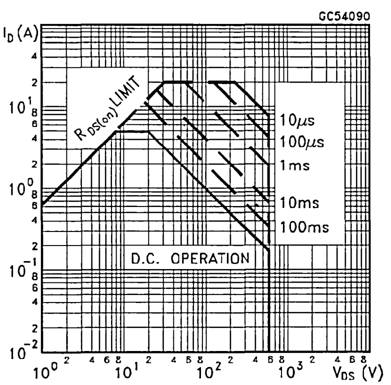
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 480 V I_D = 5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		80 25 120	105 35 160	ns ns ns

SOURCE DRAIN DIODE

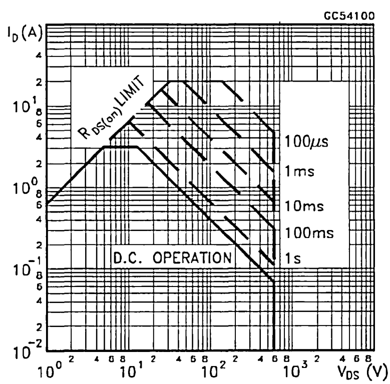
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				5.6 20	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 5.9 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 6 A di/dt = 100 A/μs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		525 5.8 22		ns μC A

(*) Pulsed. Pulse duration = 300 μs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

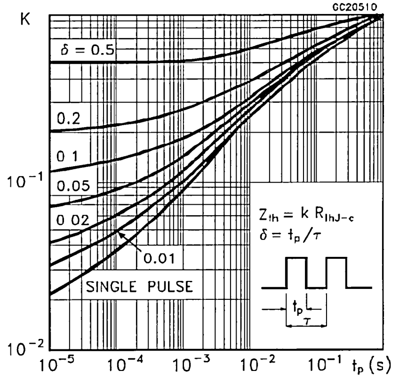
Safe Operating Areas For TO-220



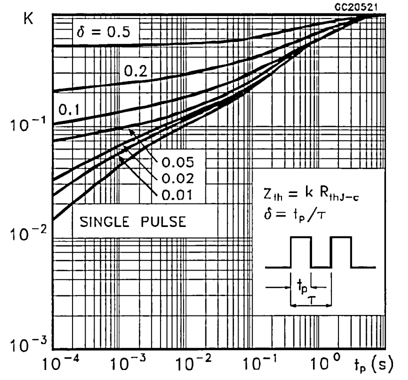
Safe Operating Areas For ISOWATT220



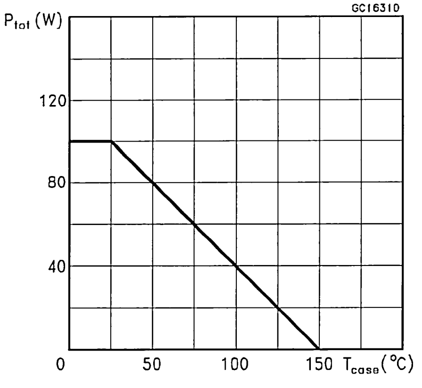
Thermal Impedeance For TO-220



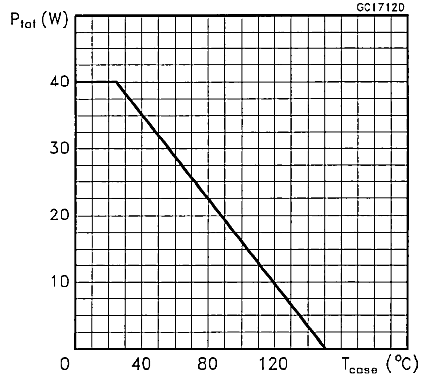
Thermal Impedance For ISOWATT220



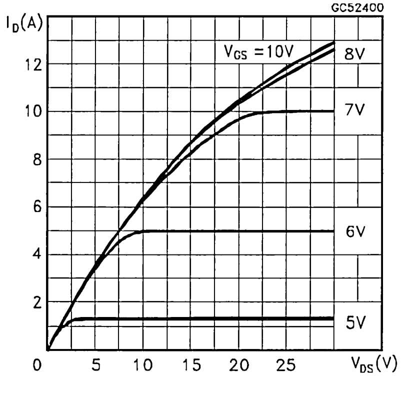
Derating Curve For TO-220



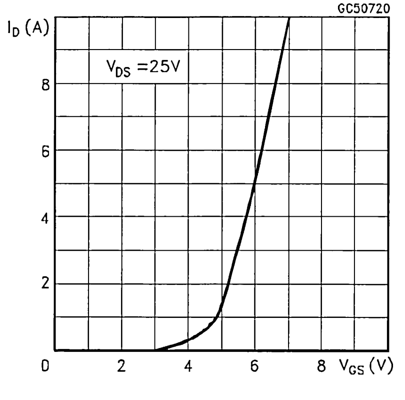
Derating Curve For ISOWATT220



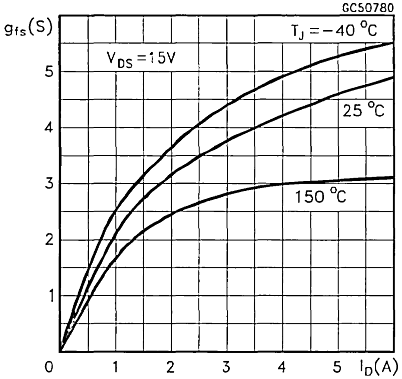
Output Characteristics



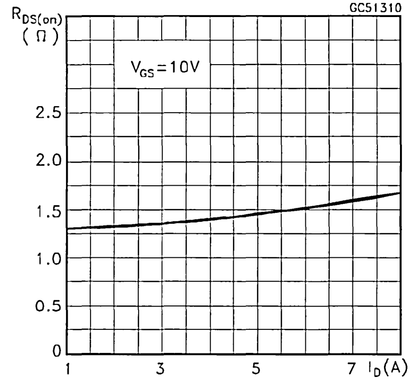
Transfer Characteristics



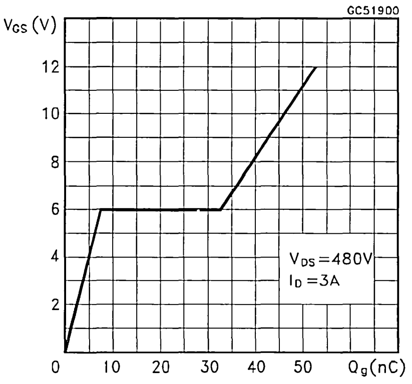
Transconductance



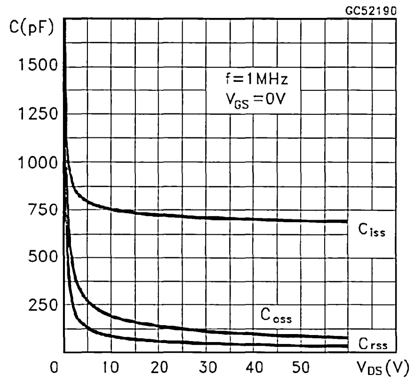
Static Drain-source On Resistance



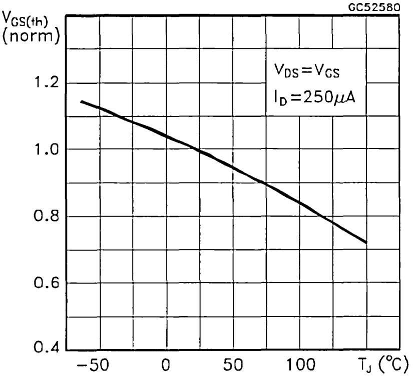
Gate Charge vs Gate-source Voltage



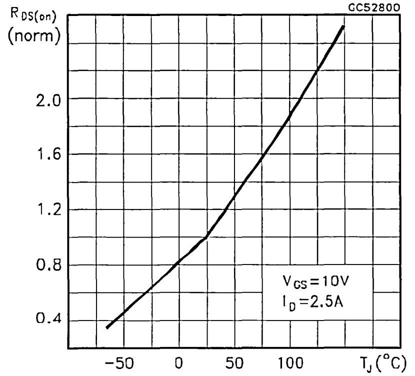
Capacitance Variations



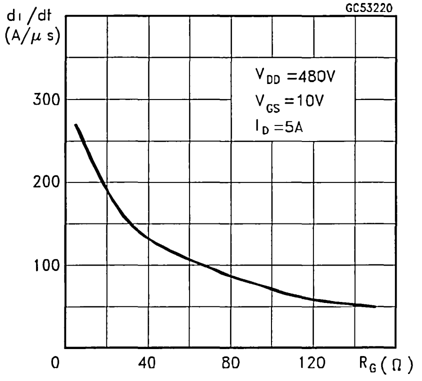
Normalized Gate Threshold Voltage vs Temperature



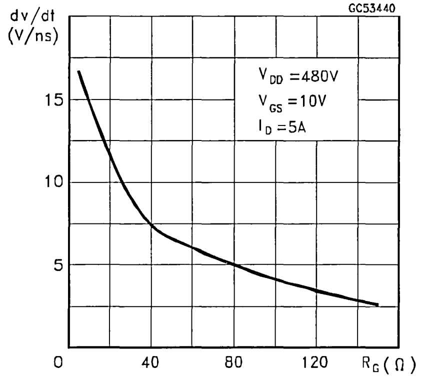
Normalized On Resistance vs Temperature



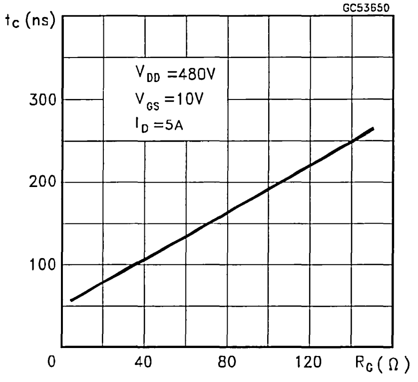
Turn-on Current Slope



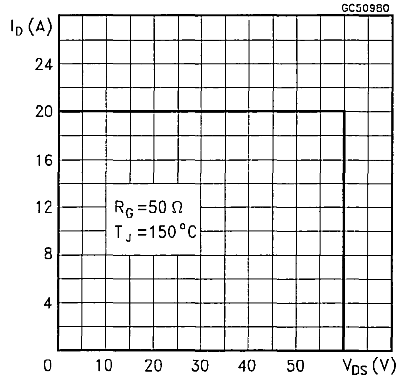
Turn-off Drain-source Voltage Slope



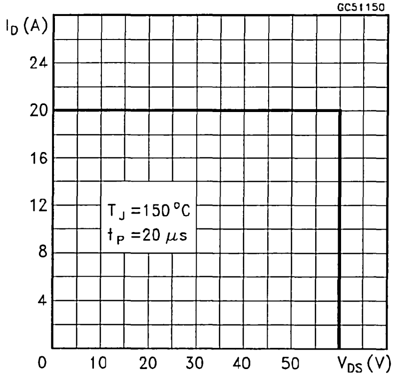
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

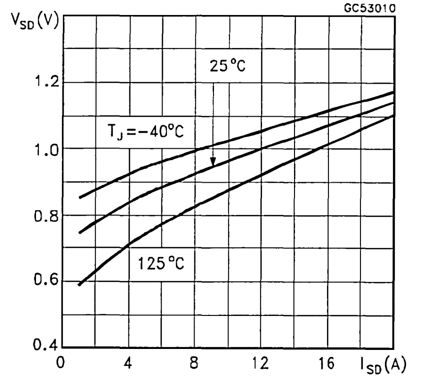


Fig. 1: Unclamped Inductive Load Test Circuits

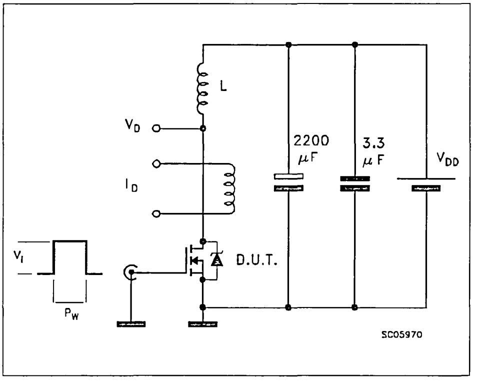


Fig. 2: Unclamped Inductive Waveforms

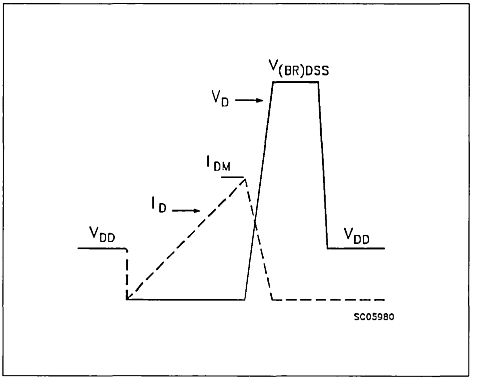


Fig. 3: Switching Times Test Circuits For Resistive Load

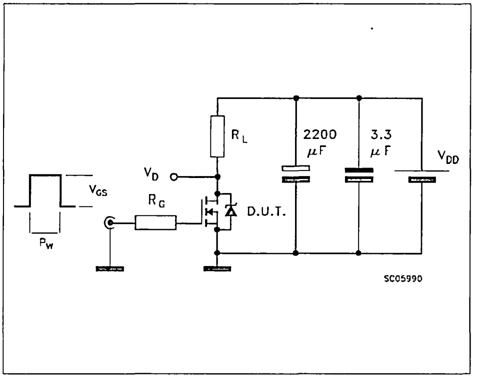


Fig. 4: Gate Charge Test Circuit

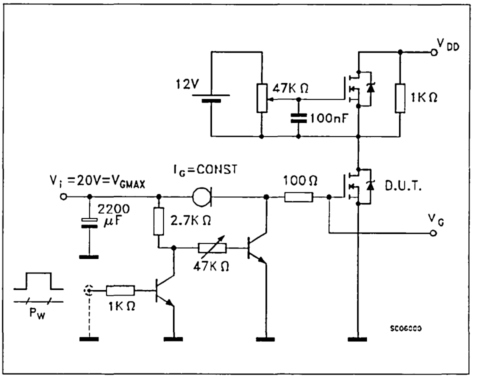
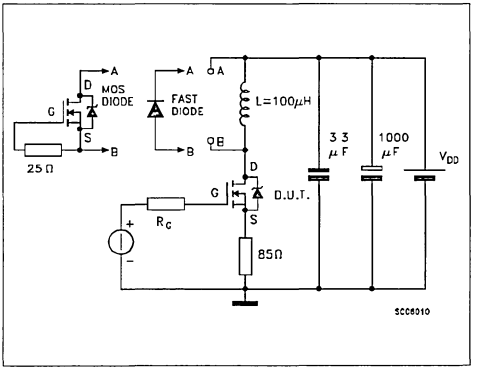


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



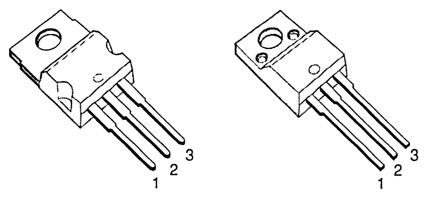
STP5N80
STP5N80FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP5N80	800 V	< 2 Ω	5.5 A
STP5N80FI	800 V	< 2 Ω	3.1 A

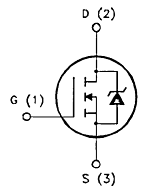
- TYPICAL $R_{DS(on)}$ = 1.65 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)



TO-220 ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP5N80	STP5N80FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	800		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	800		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	5.5	3.1	A
I_D	Drain Current (continuous) at T_c = 100 °C	3.4	2	A
$I_{DM}(\bullet)$	Drain Current (pulsed)	20	20	A
P_{tot}	Total Dissipation at T_c = 25 °C	125	40	W
	Derating Factor	1	0.32	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	3.12	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	5.5	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	320	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	16	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	3.2	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	800			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 2.5 A V_{GS} = 10V I_D = 2.5 A T_c = 100°C		1.65	2 4	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	5			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 2.5 A	2	4		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1190 165 70	1450 200 85	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 400 V I_D = 2.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		50 85	65 105	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 640 V I_D = 5.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		200		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 500 V I_D = 6 A V_{GS} = 10 V		75 9 33	95	nC nC nC

SWITCHING OFF

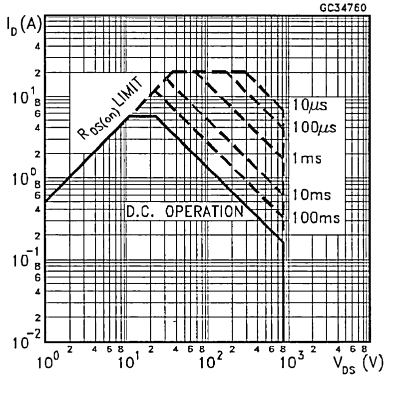
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 640 V I_D = 5.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		120 30 160	150 40 200	ns ns ns

SOURCE DRAIN DIODE

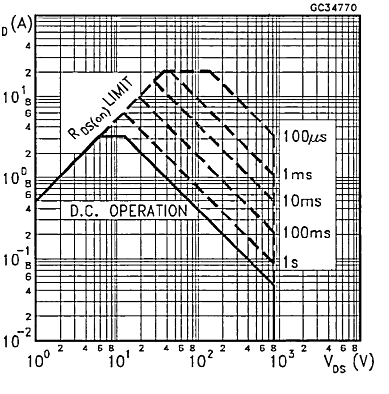
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				5.5 20	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 5.5 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 5.5 A di/dt = 100 A/μs V_{DD} = 80 V T_j = 150 °C (see test circuit, figure 5)		700 7.7 22		ns μC A

(*) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

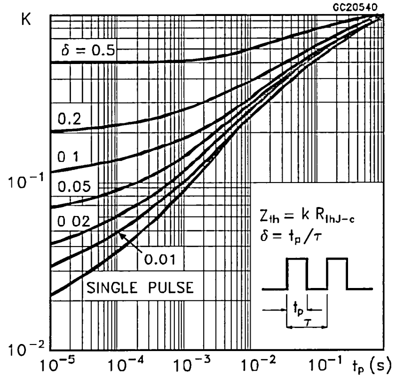
Safe Operating Areas For TO-220



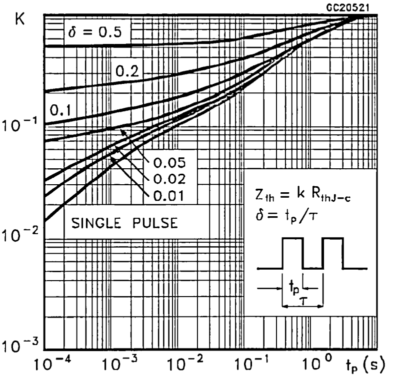
Safe Operating Areas For ISOWATT220



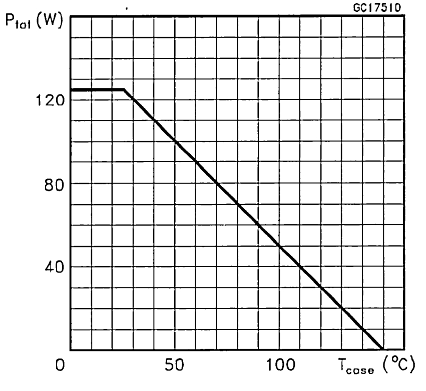
Thermal Impedeance For TO-220



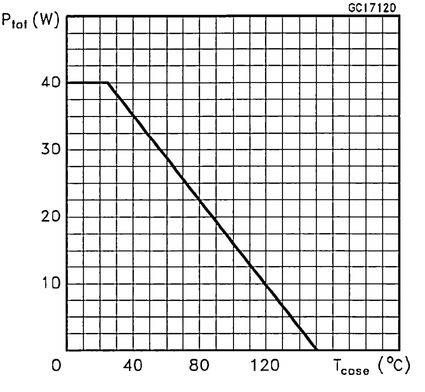
Thermal Impedance For ISOWATT220



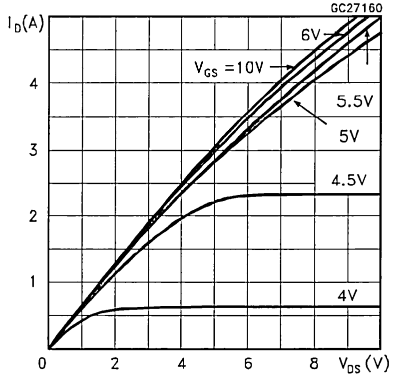
Derating Curve For TO-220



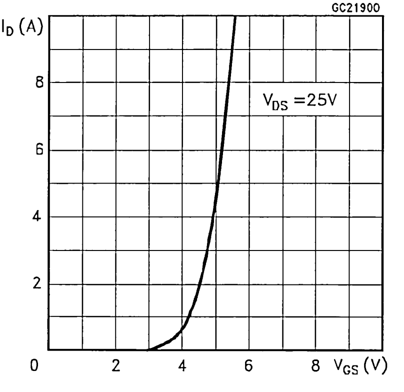
Derating Curve For ISOWATT220



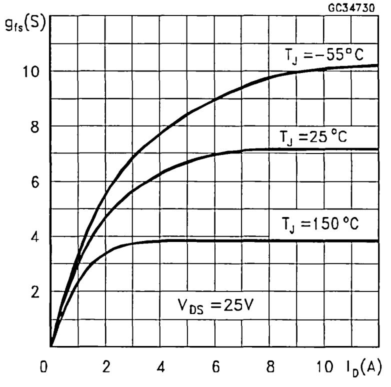
Output Characteristics



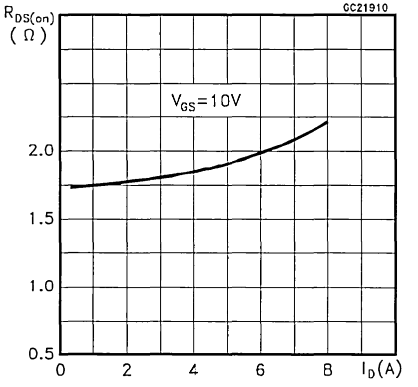
Transfer Characteristics



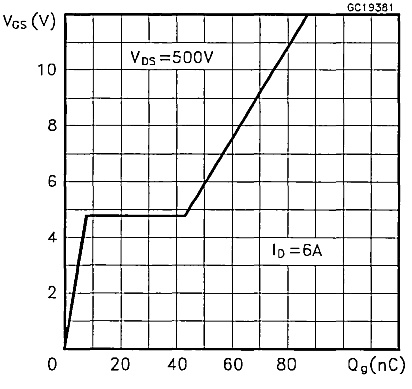
Transconductance



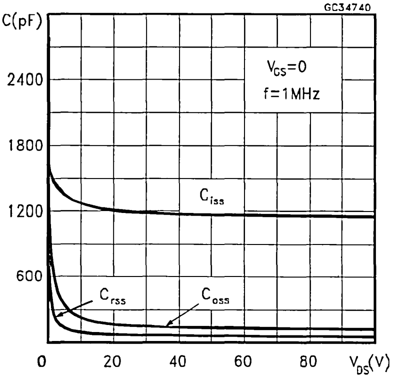
Static Drain-source On Resistance



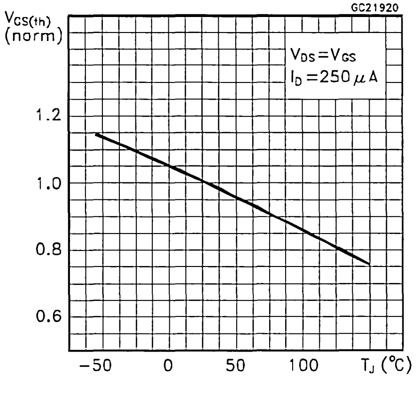
Gate Charge vs Gate-source Voltage



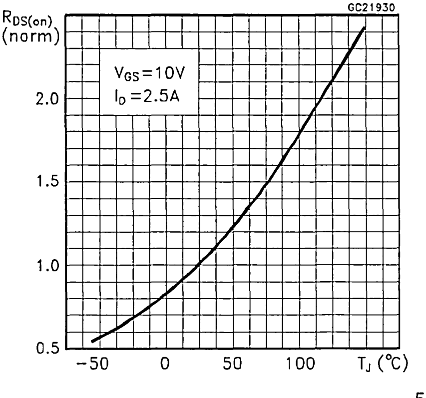
Capacitance Variations



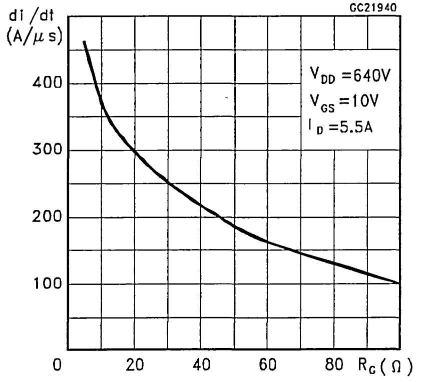
Normalized Gate Threshold Voltage vs Temperature



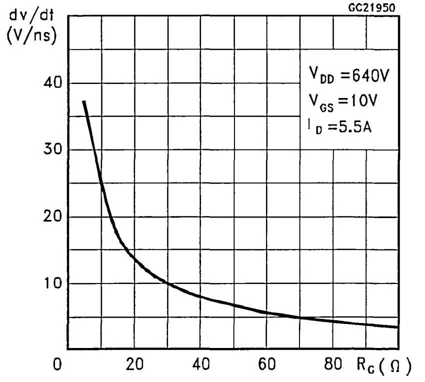
Normalized On Resistance vs Temperature



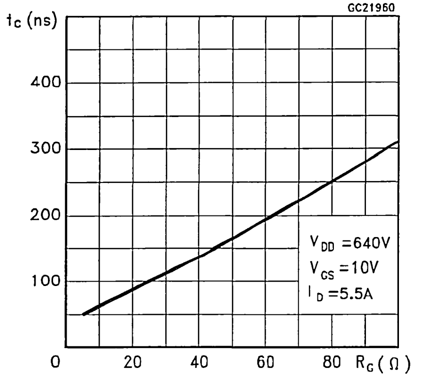
Turn-on Current Slope



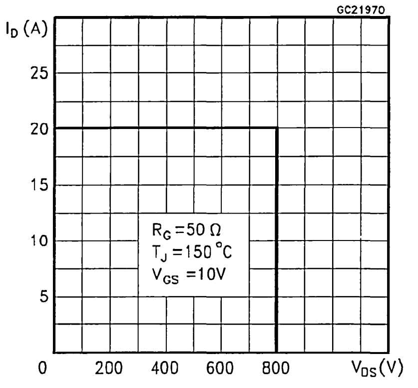
Turn-off Drain-source Voltage Slope



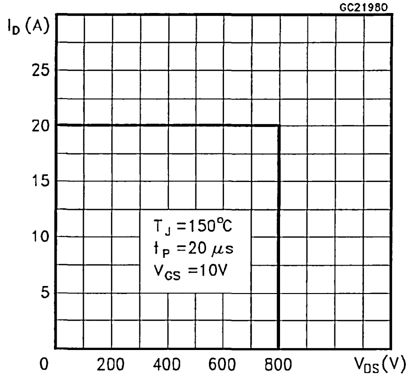
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

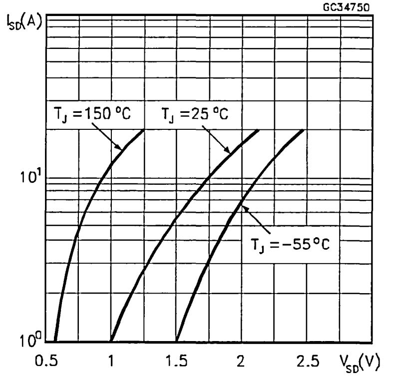


Fig. 1: Unclamped Inductive Load Test Circuits

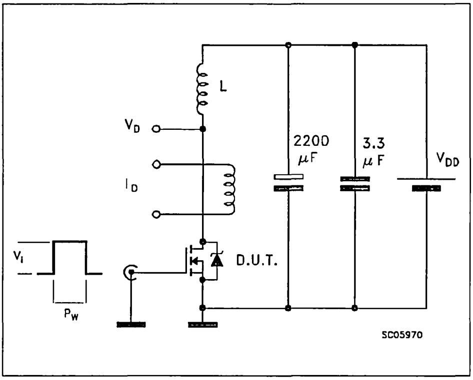


Fig. 2: Unclamped Inductive Waveforms

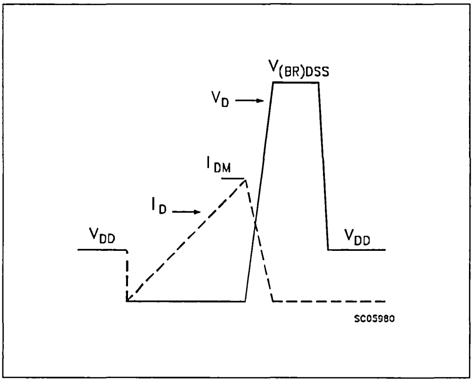


Fig. 3: Switching Times Test Circuits For Resistive Load

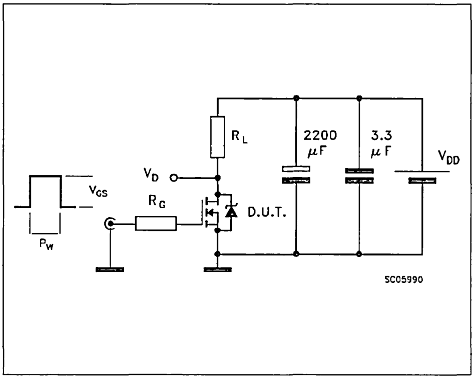


Fig. 4: Gate Charge Test Circuit

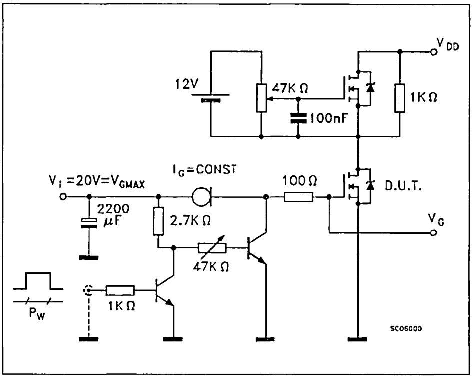
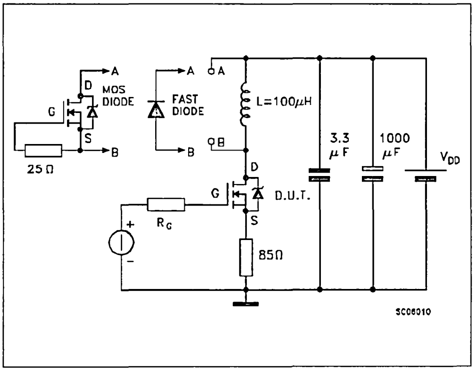


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON MICROELECTRONICS

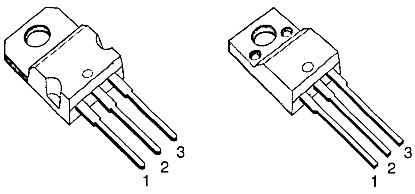
STP5NA80
STP5NA80FI

N - CHANNEL ENHANCEMENT MODE FAST POWER MOS TRANSISTOR

ADVANCE DATA

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP5NA80 STP5NA80FI	800 V 800 V	< 2.4 Ω < 2.4 Ω	4.8 A 2.7 A

- TYPICAL $R_{DS(on)}$ = 2 Ω
- ± 30V GATE TO SOURCE VOLTAGE RATING
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INTRINSIC CAPACITANCES
- GATE GHARGE MINIMIZED
- REDUCED THRESHOLD VOLTAGE SPREAD



TO-220 ISOWATT220

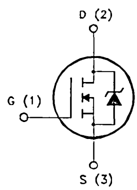
DESCRIPTION

This series of POWER MOSFETS represents the most advanced high voltage technology. The optimized cell layout coupled with a new proprietary edge termination concur to give the device low $R_{DS(on)}$ and gate charge, unequalled ruggedness and superior switching performance.

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- DC-AC CONVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLIES AND MOTOR DRIVE

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP5NA80	STP5NA80FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	800		V
V_{DGR}	Drain-gate Voltage (R_{GS} = 20 kΩ)	800		V
V_{GS}	Gate-source Voltage	± 30		V
I_D	Drain Current (continuous) at T_c = 25 °C	4.8	2.7	A
I_D	Drain Current (continuous) at T_c = 100 °C	3.2	1.8	A
I_{DM}(•)	Drain Current (pulsed)	19	19	A
P_{tot}	Total Dissipation at T_c = 25 °C	125	40	W
	Derating Factor	1	0.32	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	3.12	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Thermal Resistance Case-sink Maximum Lead Temperature For Soldering Purpose	Max Typ 	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	4.8	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	125	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	3.7	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	3.2	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	800			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 30 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2.25	3	3.75	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 2.5 A V_{GS} = 10V I_D = 2.5 A T_c = 100°C		2	2.4 4.8	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	4.8			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 2.5 A	2.7	5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1215 145 35		pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 400 V I_D = 2.5 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		15 25		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 640 V I_D = 5 A R_G = 47 Ω V_{GS} = 10 V (see test circuit, figure 5)		200		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 640 V I_D = 5 A V_{GS} = 10 V		53 7 25		nC nC nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 640 V I_D = 5 A R_G = 47 Ω V_{GS} = 10 V (see test circuit, figure 5)		70 25 110		ns ns ns

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				4.8 19	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 5 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 5 A di/dt = 100 A/μs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		800 16 40		ns μC A

(*) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

STP5N80XI

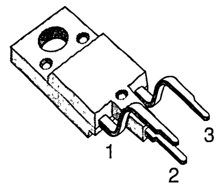
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP5N80XI	800 V	< 2.4 Ω	2.6 A

- TYPICAL $R_{DS(on)}$ = 1.9 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

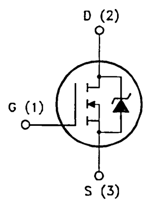
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)



ISOWATT221

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	800	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	800	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	2.6	A
I_D	Drain Current (continuous) at T_c = 100 °C	1.7	A
$I_{DM}(\bullet)$	Drain Current (pulsed)	11	A
P_{tot}	Total Dissipation at T_c = 25 °C	35	W
	Derating Factor	0.28	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	4000	V
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	3.57	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	60	°C/W
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.5	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	5	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	270	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	13	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	3	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	800			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 2.5 A V_{GS} = 10V I_D = 2.5 A T_c = 100°C		1.9	2.4 4.8	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	2.6			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 2.5 A	2	4		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1190 165 70	1450 200 85	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 400 V I_D = 2.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		50 85	65 105	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 640 V I_D = 5.5 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 5)		200		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 500 V I_D = 6 A V_{GS} = 10 V		75 9 33	95	nC nC nC

SWITCHING OFF

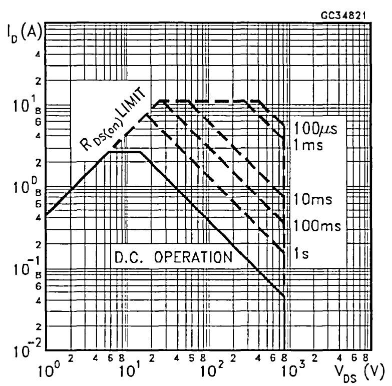
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 640 V I_D = 5.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		120 30 160	150 40 200	ns ns ns

SOURCE DRAIN DIODE

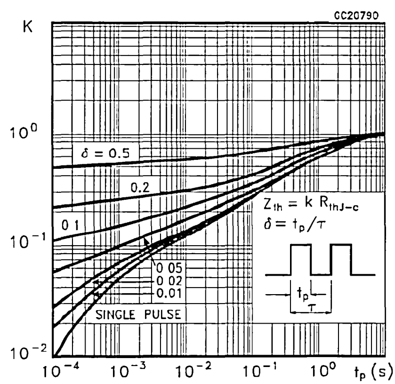
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				2.6 11	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 2.6 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 2 6A di/dt = 100 A/µs V_{DD} = 80 V T_j = 150 °C (see test circuit, figure 5)		700 7.7 22		ns µC A

(*) Pulsed Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

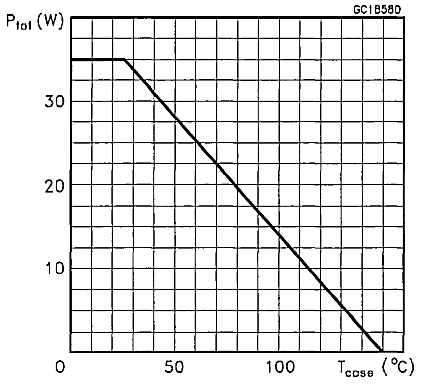
Safe Operating Area



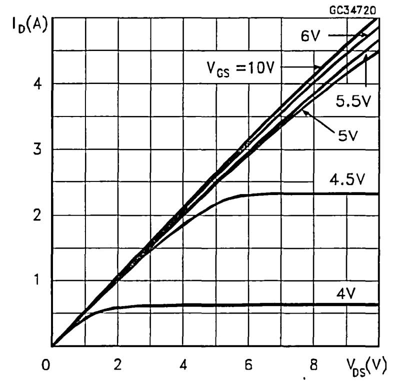
Thermal Impedance



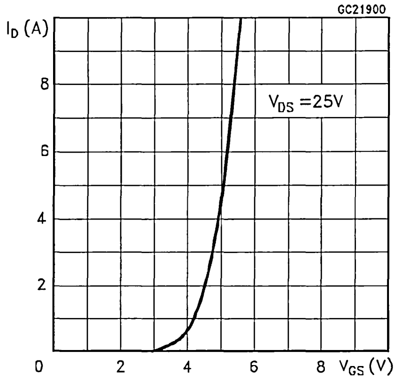
Derating Curve



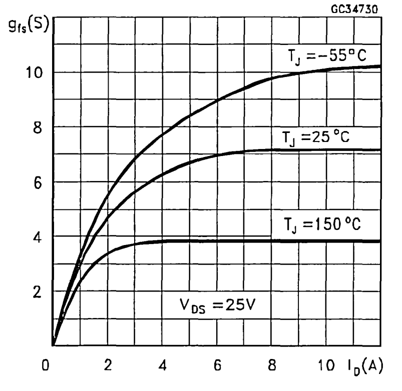
Output Characteristics



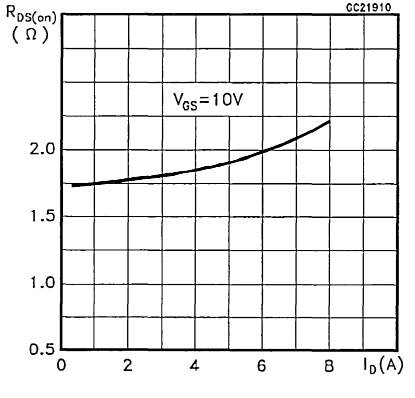
Transfer Characteristics



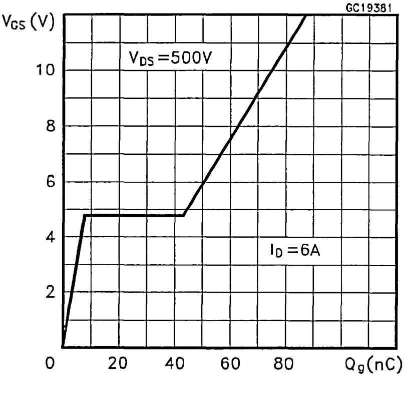
Transconductance



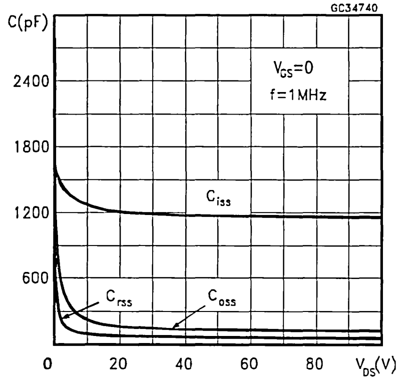
Static Drain-source On Resistance



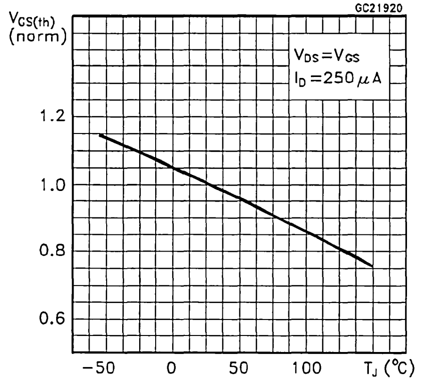
Gate Charge vs Gate-source Voltage



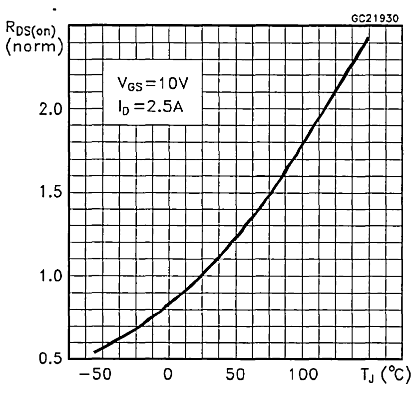
Capacitance Variations



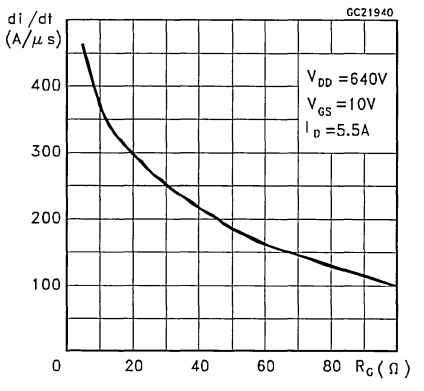
Normalized Gate Threshold Voltage vs Temperature



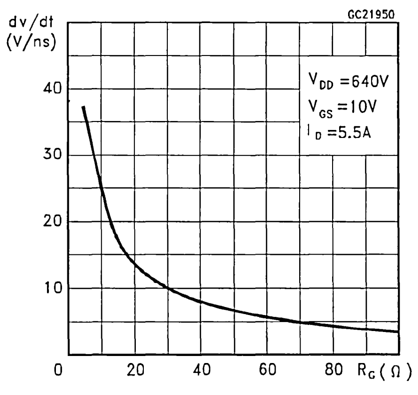
Normalized On Resistance vs Temperature



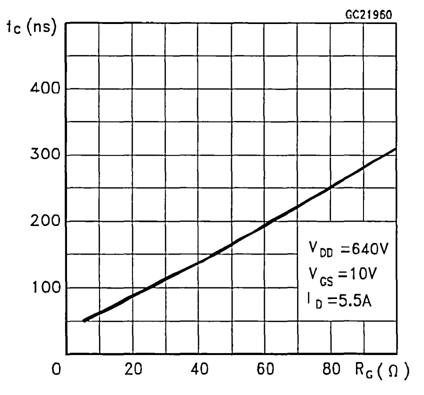
Turn-on Current Slope



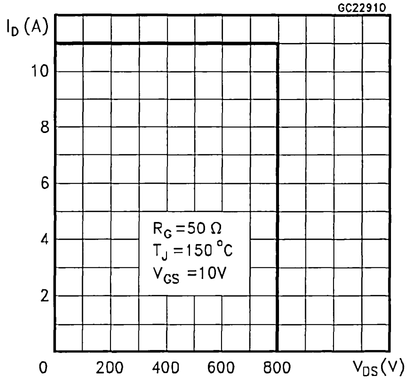
Turn-off Drain-source Voltage Slope



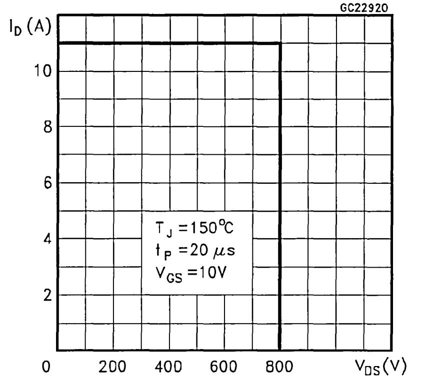
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

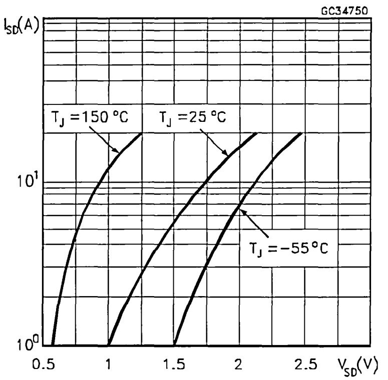


Fig. 1: Unclamped Inductive Load Test Circuits

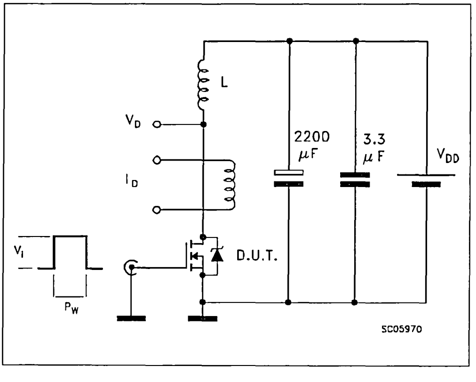


Fig. 2: Unclamped Inductive Waveforms

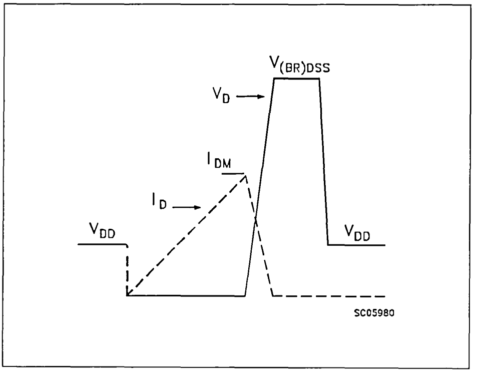


Fig. 3: Switching Times Test Circuits For Resistive Load

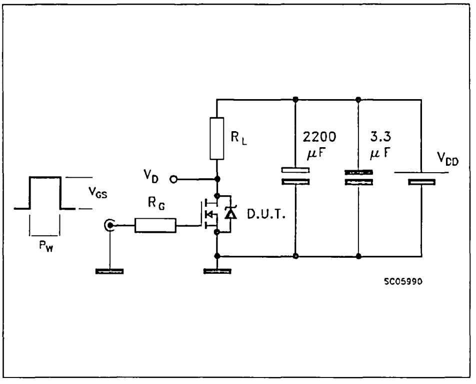


Fig. 4: Gate Charge Test Circuit

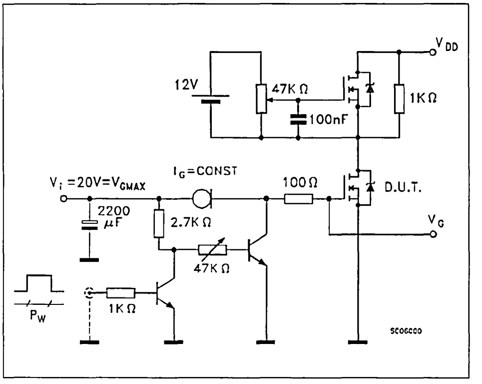
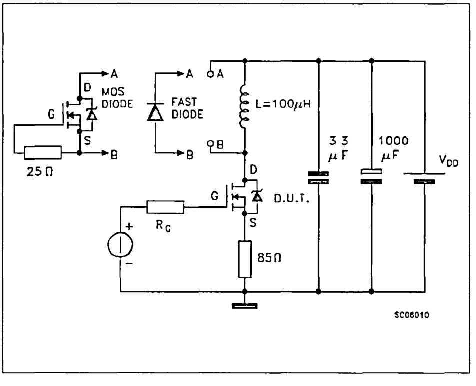


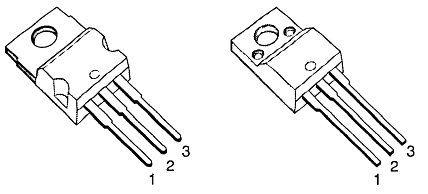
Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP5N90	900 V	< 2.4 Ω	5 A
STP5N90FI	900 V	< 2.4 Ω	2.8 A

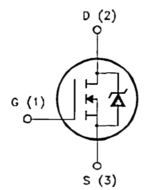
- TYPICAL $R_{DS(on)}$ = 1.9 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION



TO-220 ISOWATT220

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING
- DC-AC INVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLY (UPS)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP5N90	STP5N90FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	900		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	900		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	5	2.8	A
I_D	Drain Current (continuous) at T_c = 100 °C	3	1.7	A
I_{DM}(•)	Drain Current (pulsed)	20	20	A
P_{tot}	Total Dissipation at T_c = 25 °C	125	40	W
	Derating Factor	1	0.32	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case Max	1	3.12	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, δ < 1%)	5	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	270	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, δ < 1%)	13	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, δ < 1%)	3	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	900			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 2.5 A V_{GS} = 10V I_D = 2.5 A T_c = 100°C		1.9	2.4 4.8	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	5			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 2.5 A	2	4		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1190 165 70	1450 200 85	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 400 V I_D = 2.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		50 85	65 105	ns ns
$(dI/dt)_{on}$	Turn-on Current Slope	V_{DD} = 640 V I_D = 5.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		200		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 500 V I_D = 6 A V_{GS} = 10 V		75 9 33	95	nC nC nC

SWITCHING OFF

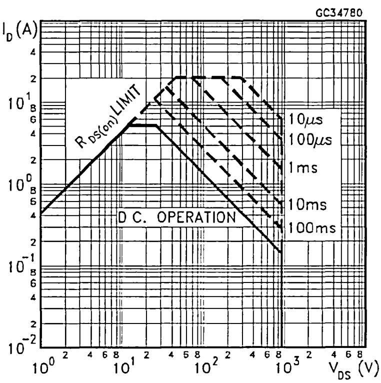
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 640 V I_D = 5.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		120 30 160	150 40 200	ns ns ns

SOURCE DRAIN DIODE

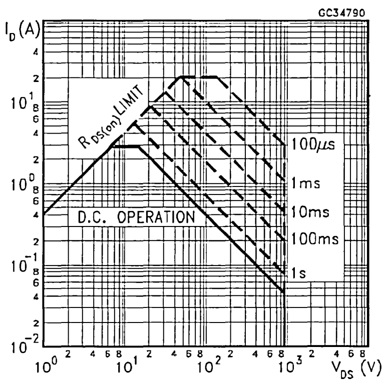
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				5 20	A A
V_{SD}	Forward On Voltage	I_{SD} = 5 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 5 A di/dt = 100 A/µs V_{DD} = 80 V T_j = 150 °C (see test circuit, figure 5)		700 7.7 22		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

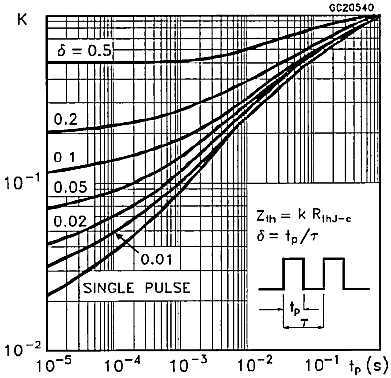
Safe Operating Areas For TO-220



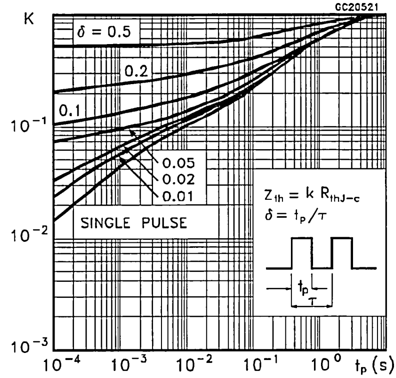
Safe Operating Areas For ISOWATT220



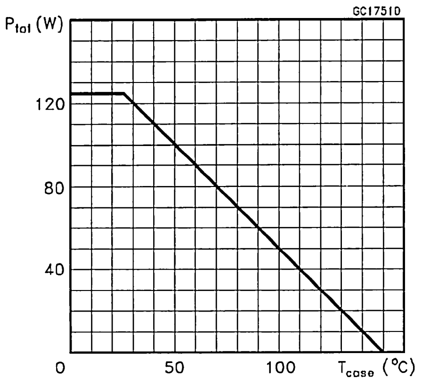
Thermal Impedeance For TO-220



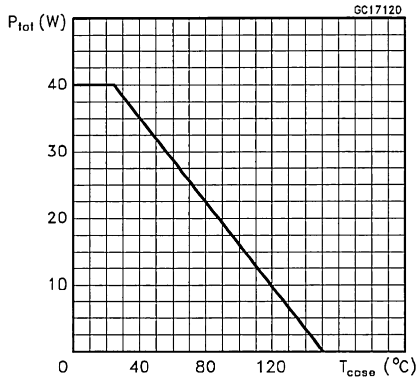
Thermal Impedance For ISOWATT220



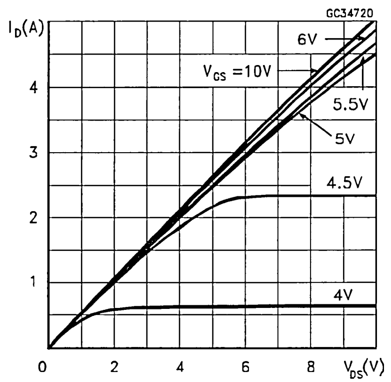
Derating Curve For TO-220



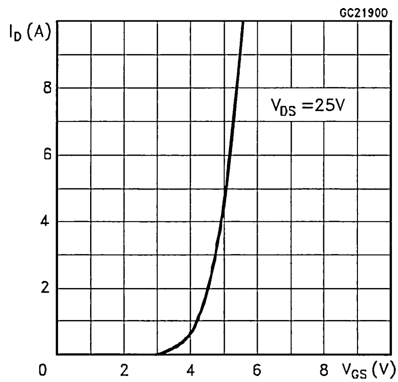
Derating Curve For ISOWATT220



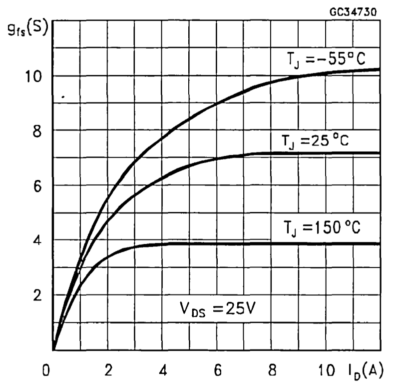
Output Characteristics



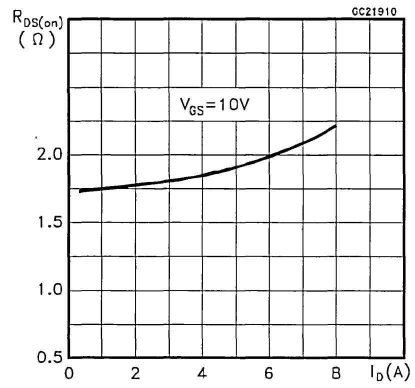
Transfer Characteristics



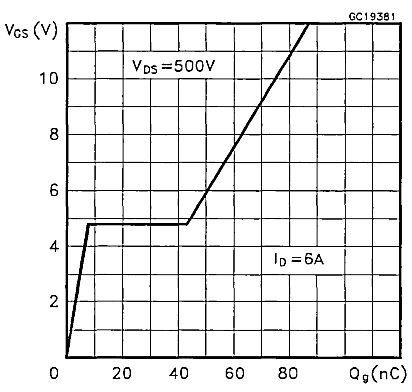
Transconductance



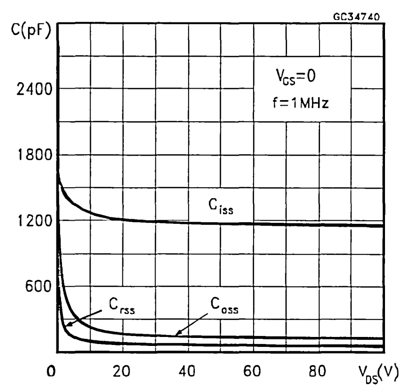
Static Drain-source On Resistance



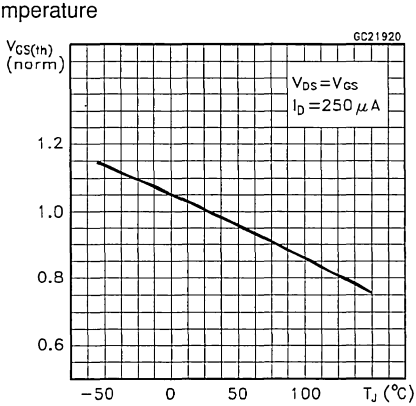
Gate Charge vs Gate-source Voltage



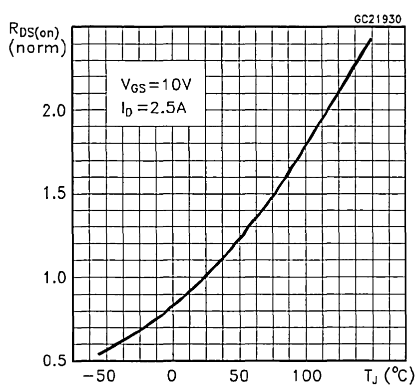
Capacitance Variations



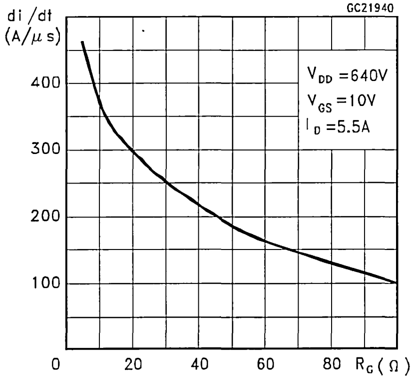
Normalized Gate Threshold Voltage vs Temperature



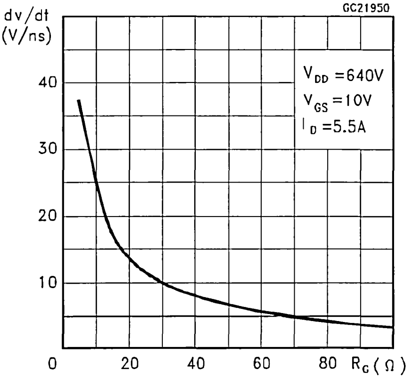
Normalized On Resistance vs Temperature



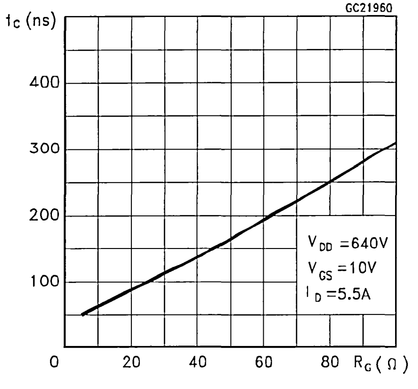
Turn-on Current Slope



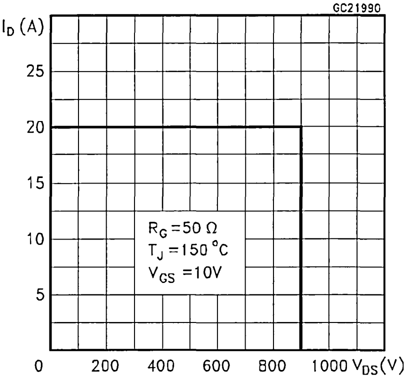
Turn-off Drain-source Voltage Slope



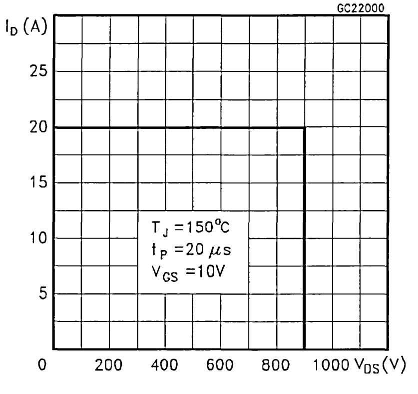
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

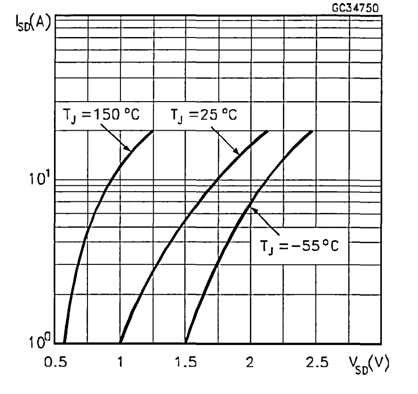


Fig. 1: Unclamped Inductive Load Test Circuits

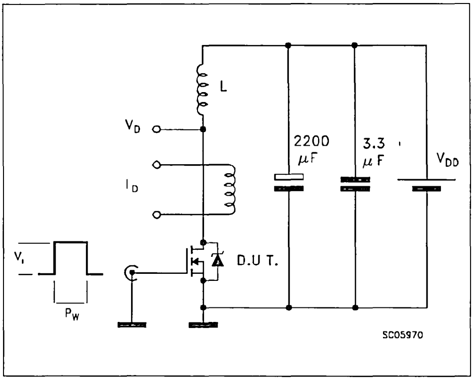


Fig. 2: Unclamped Inductive Waveforms

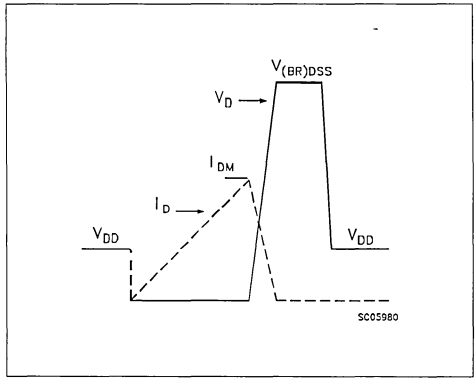


Fig. 3: Switching Times Test Circuits For Resistive Load

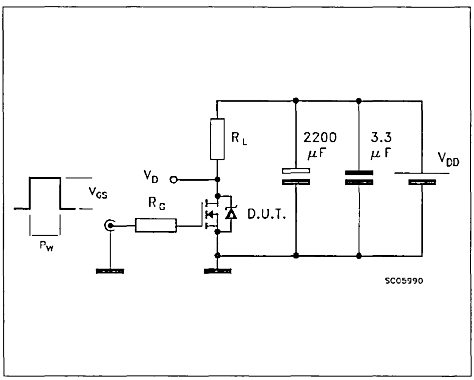


Fig. 4: Gate Charge Test Circuit

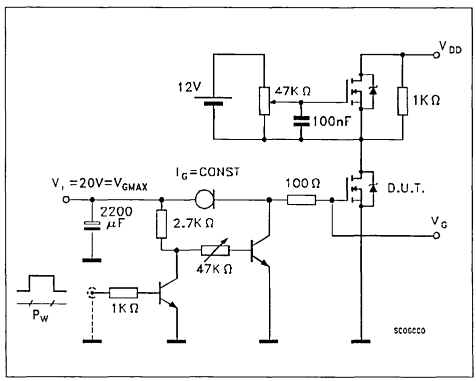
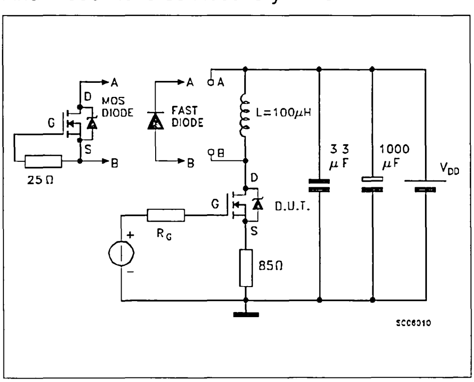


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON MICROELECTRONICS

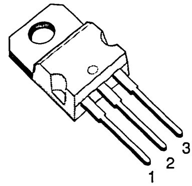
STP6N25
STP6N25FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

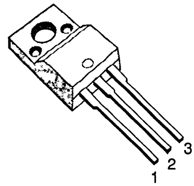
PRELIMINARY DATA

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP6N25	250 V	< 1 Ω	6 A
STP6N25FI	250 V	< 1 Ω	4 A

- TYPICAL $R_{DS(on)}$ = 0.7 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION



TO-220

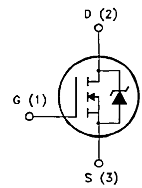


ISOWATT220

APPLICATIONS

- HIGH SPEED SWITCHING
- UNINTERRUPTIBLE POWER SUPPLY (UPS)
- MOTOR CONTROL, AUDIO AMPLIFIERS
- INDUSTRIAL ACTUATORS
- DC-DC & DC-AC CONVERTERS FOR TELECOM, INDUSTRIAL AND CONSUMER ENVIRONMENT
- PARTICULARLY SUITABLE FOR ELECTRONIC FLUORESCENT LAMP BALLASTS

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP6N25	STP6N25FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	250		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	250		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	6	4	A
I_D	Drain Current (continuous) at T_c = 100 °C	4	2.6	A
I_{DM}(•)	Drain Current (pulsed)	24	24	A
P_{tot}	Total Dissipation at T_c = 25 °C	70	35	W
	Derating Factor	0.56	0.28	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case Max	1.79	3.57	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	6	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD}= 50 V)	40	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	10	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	4	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	250			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 3 A V_{GS} = 10V I_D = 3 A T_c = 100°C		0.7	1 2	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	6			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 3 A	1.5	3.5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		500 85 15	700 120 30	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 125 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		35 70	50 100	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 200 V I_D = 6 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		220		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 200 V I_D = 6 A V_{GS} = 10 V		20 6 7	30	nC nC nC

SWITCHING OFF

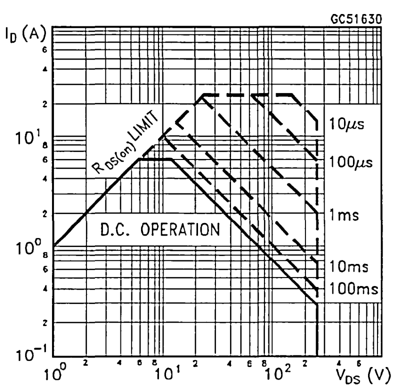
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 200 V I_D = 6 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		40 25 70	60 35 100	ns ns ns

SOURCE DRAIN DIODE

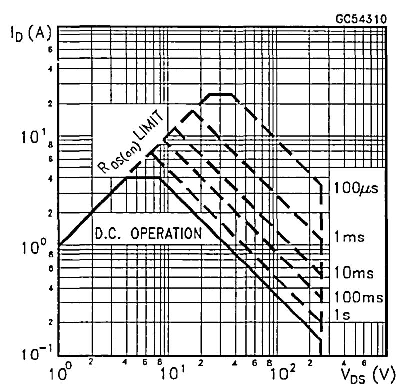
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				6 24	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 6 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 6 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		180 1.1 12		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

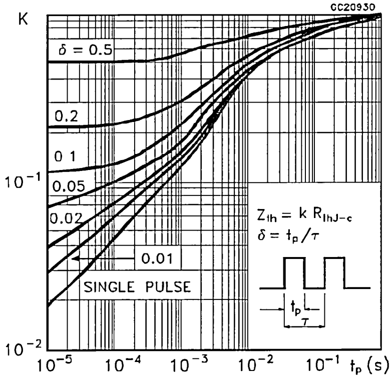
Safe Operating Areas For TO-220



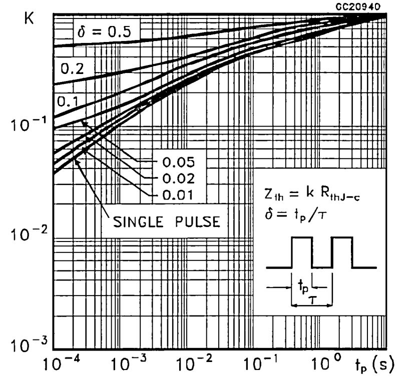
Safe Operating Areas For ISOWATT220



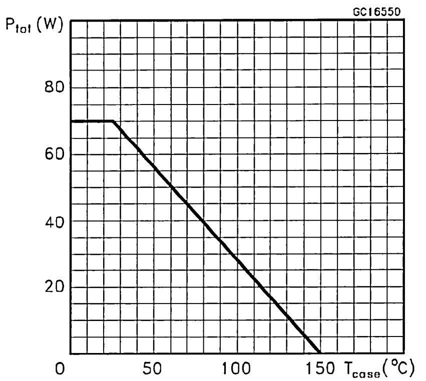
Thermal Impedeance For TO-220



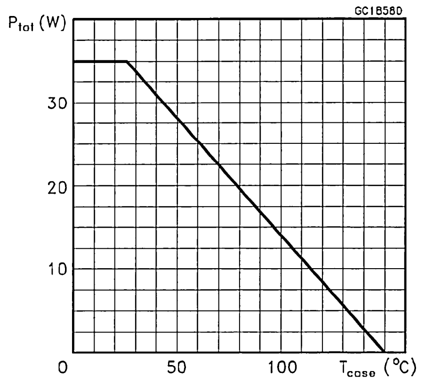
Thermal Impedance For ISOWATT220



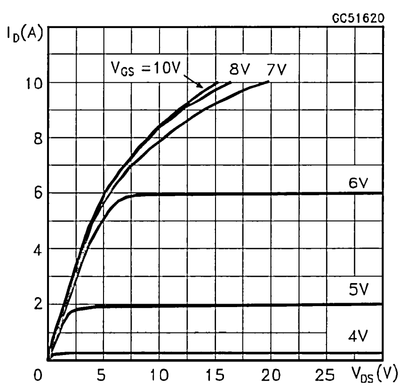
Derating Curve For TO-220



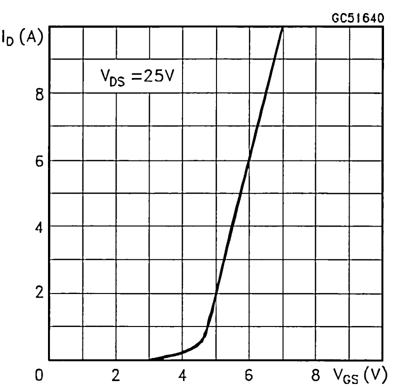
Derating Curve For ISOWATT220



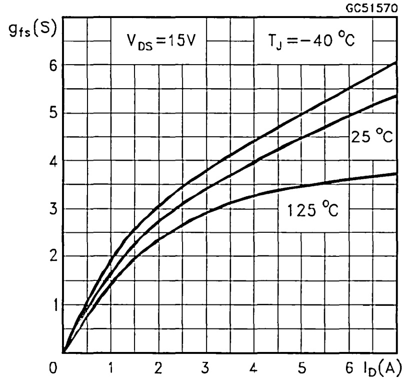
Output Characteristics



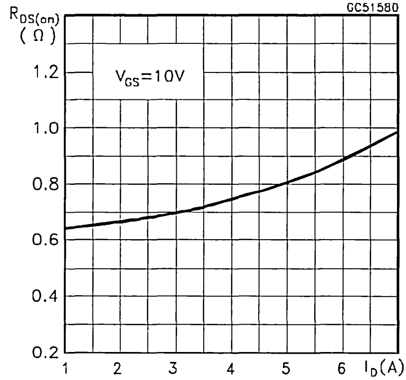
Transfer Characteristics



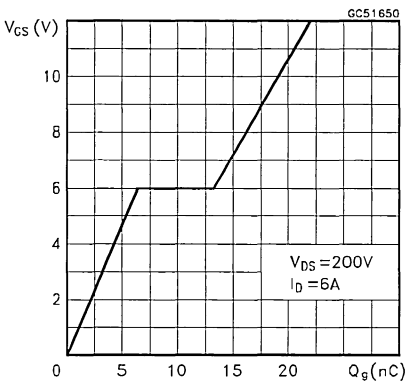
Transconductance



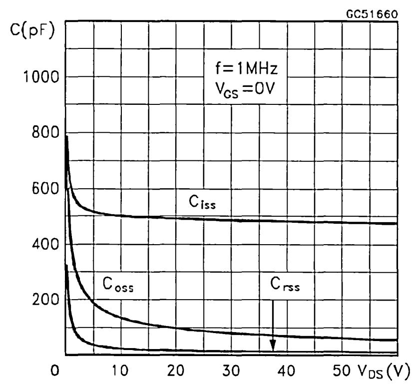
Static Drain-source On Resistance



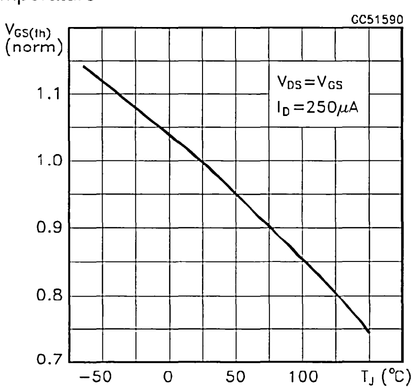
Gate Charge vs Gate-source Voltage



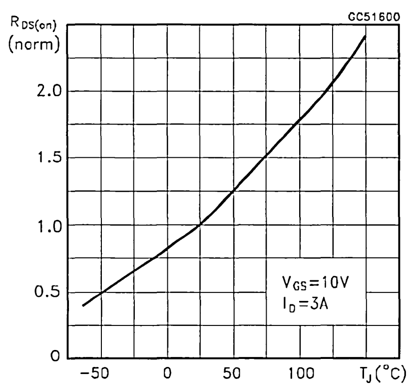
Capacitance Variations



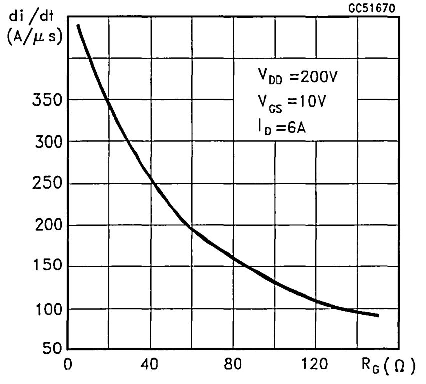
Normalized Gate Threshold Voltage vs Temperature



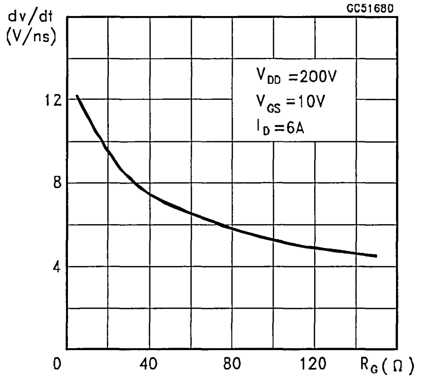
Normalized On Resistance vs Temperature



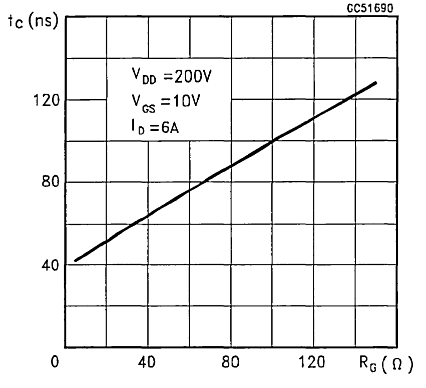
Turn-on Current Slope



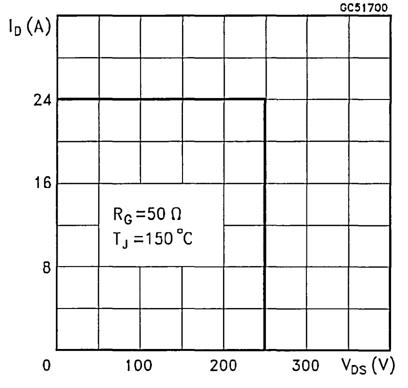
Turn-off Drain-source Voltage Slope



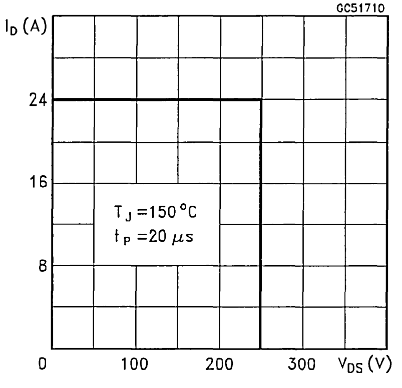
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

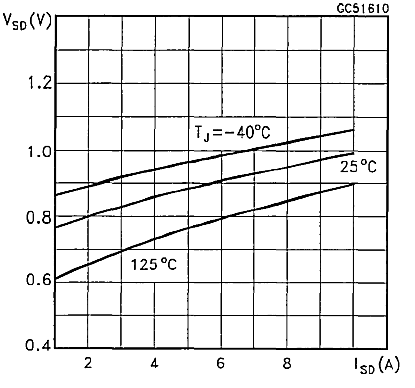


Fig. 1: Unclamped Inductive Load Test Circuits

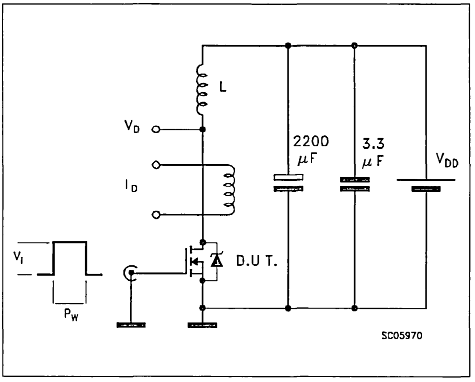


Fig. 2: Unclamped Inductive Waveforms

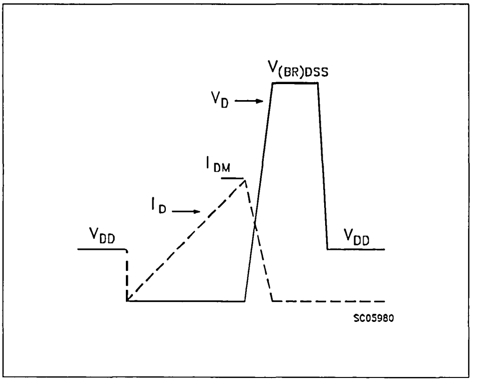


Fig. 3: Switching Times Test Circuits For Resistive Load

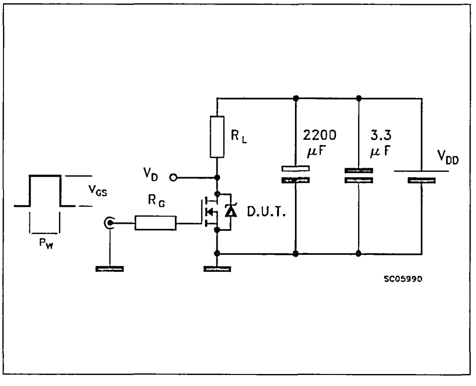


Fig. 4: Gate Charge Test Circuit

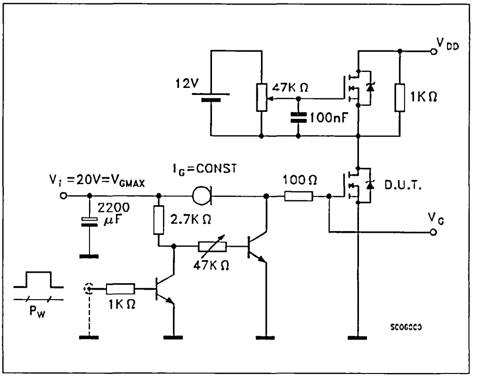
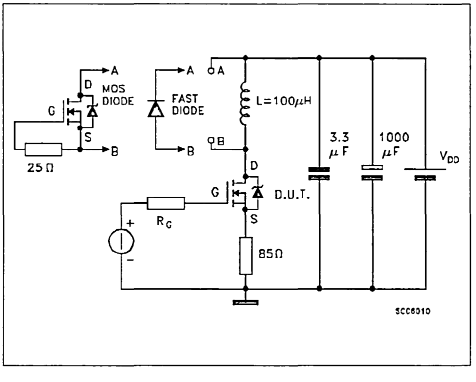


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON MICROELECTRONICS

STP6N50
STP6N50FI

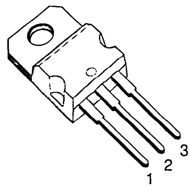
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP6N50	500 V	< 1.1 Ω	6 A
STP6N50FI	500 V	< 1.1 Ω	3.8 A

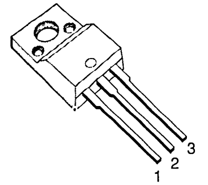
- TYPICAL $R_{DS(on)}$ = 0.93 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT

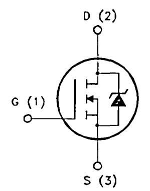


TO-220



ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP6N50	STP6N50FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	500		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	500		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	6	3.8	A
I_D	Drain Current (continuous) at T_c = 100 °C	3.8	2.4	A
I_{DM}(•)	Drain Current (pulsed)	24	24	A
P_{tot}	Total Dissipation at T_c = 25 °C	100	40	W
	Derating Factor	0.8	0.32	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-200	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1.25	3.12	°C/W
$R_{thj\text{-}amb}$ $R_{thc\text{-}sink}$ T_l	Thermal Resistance Junction-ambient Thermal Resistance Case-sink Maximum Lead Temperature For Soldering Purpose	Max Typ 	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	6	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	300	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	7	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	3.8	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	500			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (∗)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 3 A V_{GS} = 10V I_D = 3 A T_c = 100°C		0.93	1.1 2.2	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	6			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (∗)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 3 A	2.5	4.5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		800 140 60	1100 190 80	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 250 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		40 110	55 150	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 400 V I_D = 6 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		85		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 6 A V_{GS} = 10 V		55 9 26	75	nC nC nC

SWITCHING OFF

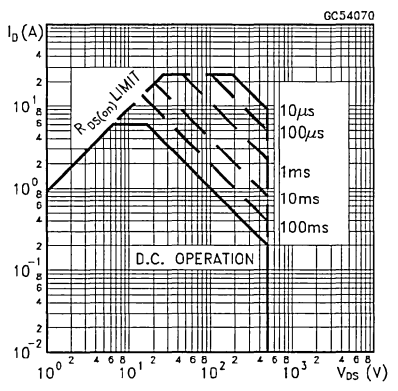
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 400 V I_D = 6 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		115 35 165	160 50 220	ns ns ns

SOURCE DRAIN DIODE

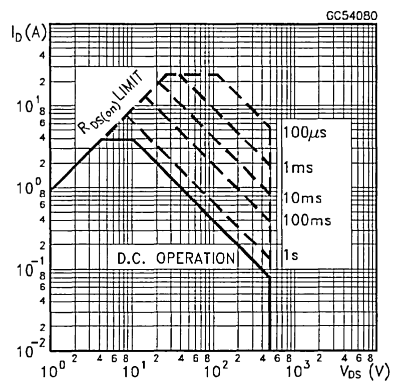
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				6 24	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 6 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 6 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		550 6.9 25		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

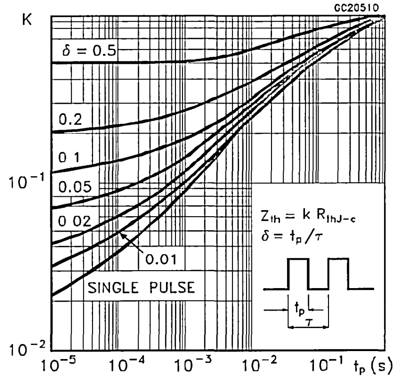
Safe Operating Areas For TO-220



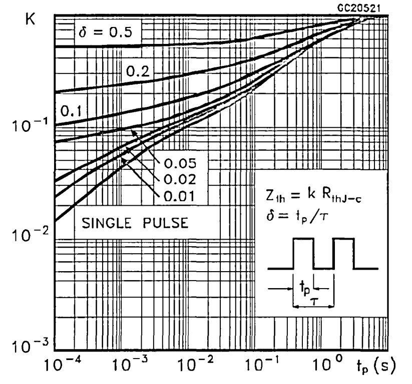
Safe Operating Areas For ISOWATT220



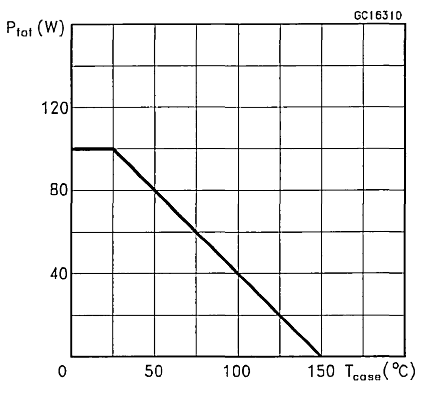
Thermal Impedeance For TO-220



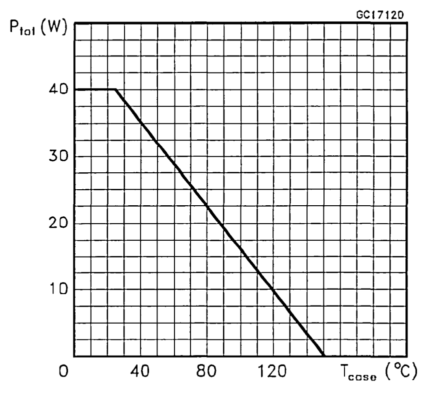
Thermal Impedance For ISOWATT220



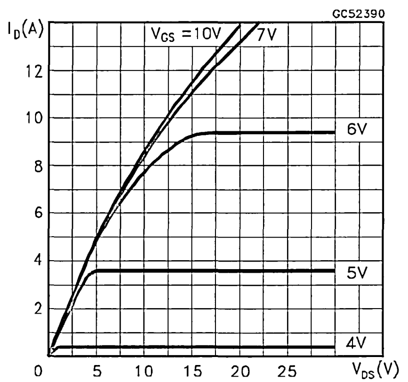
Derating Curve For TO-220



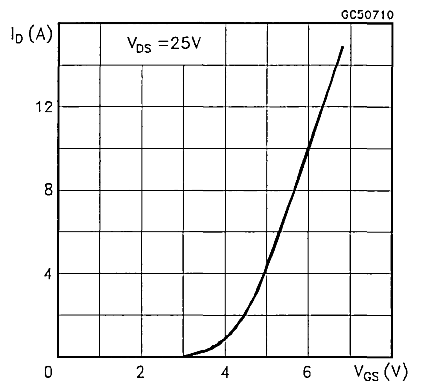
Derating Curve For ISOWATT220



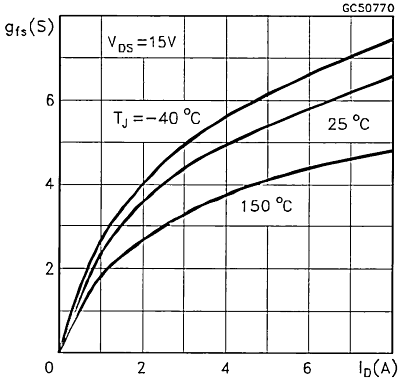
Output Characteristics



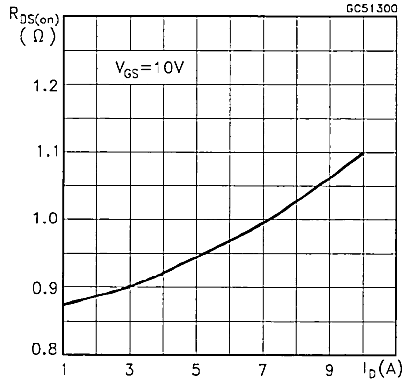
Transfer Characteristics



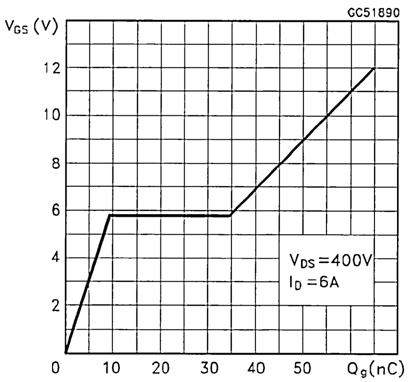
Transconductance



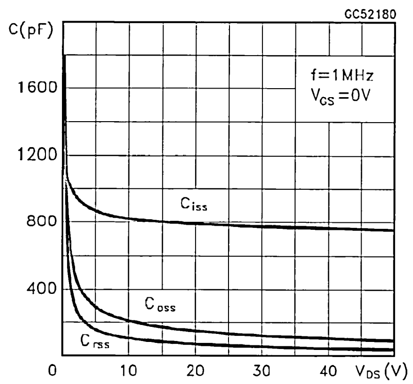
Static Drain-source On Resistance



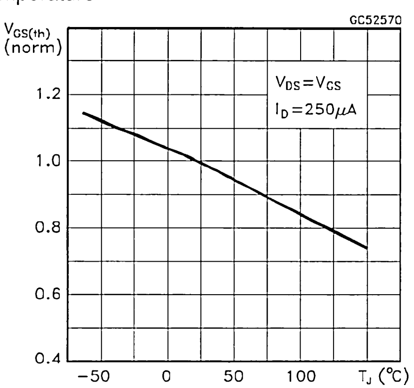
Gate Charge vs Gate-source Voltage



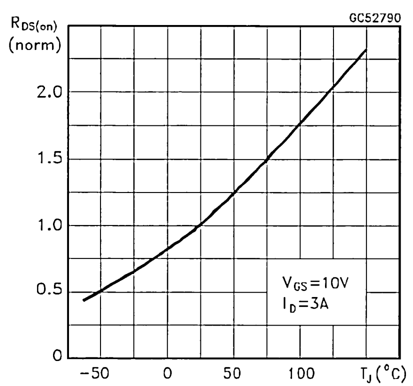
Capacitance Variations



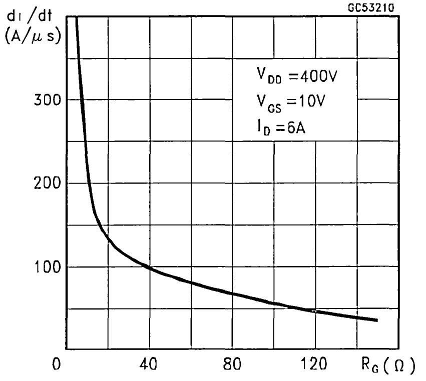
Normalized Gate Threshold Voltage vs Temperature



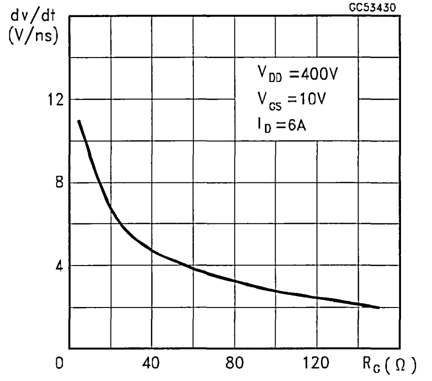
Normalized On Resistance vs Temperature



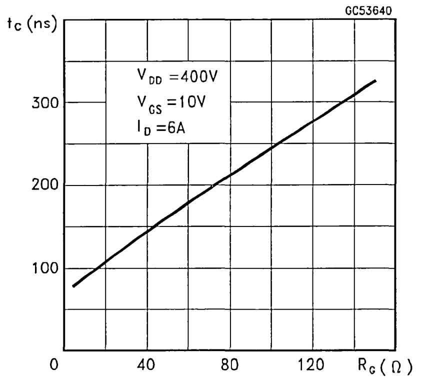
Turn-on Current Slope



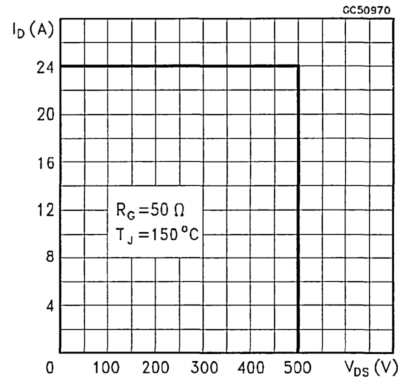
Turn-off Drain-source Voltage Slope



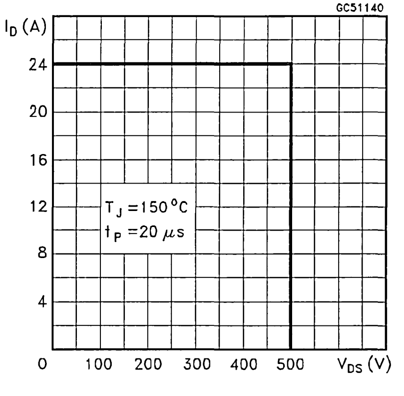
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

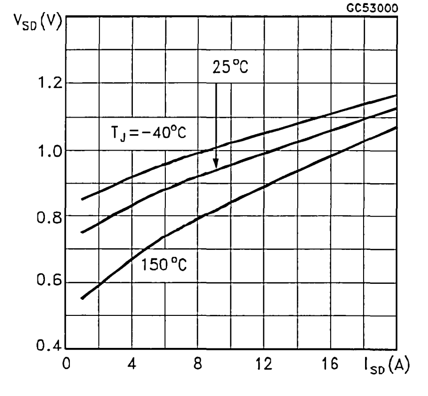


Fig. 1: Unclamped Inductive Load Test Circuits

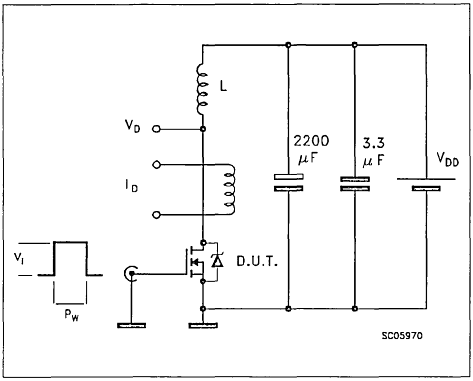


Fig. 2: Unclamped Inductive Waveforms

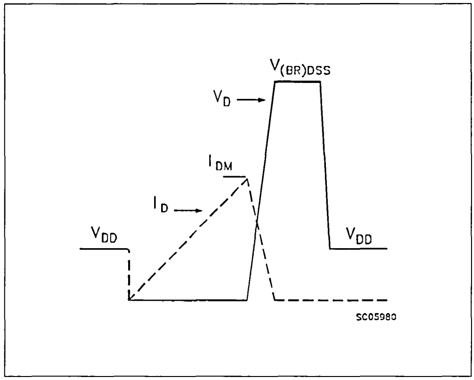


Fig. 3: Switching Times Test Circuits For Resistive Load

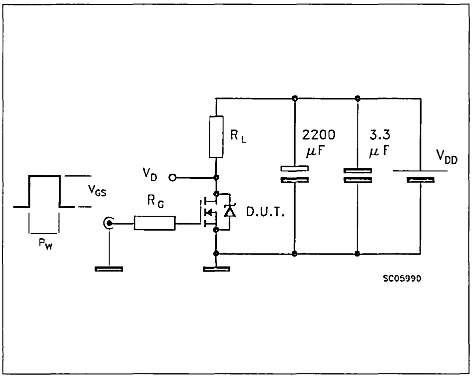


Fig. 4: Gate Charge Test Circuit

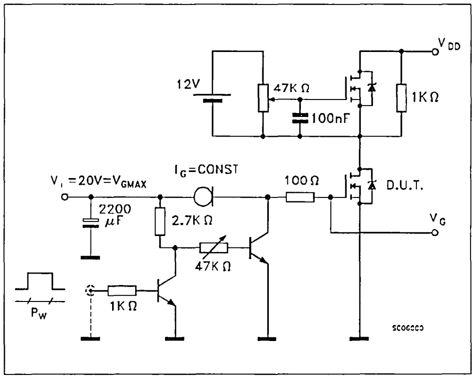
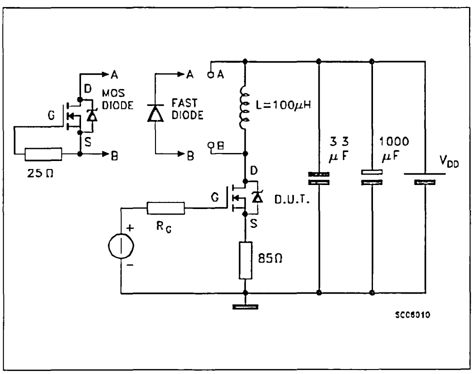


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



STP6N60FI

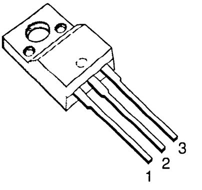
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP6N60FI	600 V	< 1.2 Ω	3.8 A

- TYPICAL $R_{DS(on)}$ = 1 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

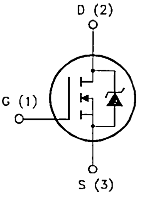
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	600	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	600	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	3.8	A
I_D	Drain Current (continuous) at T_c = 100 °C	2.4	A
I_{DM}(•)	Drain Current (pulsed)	24	A
P_{tot}	Total Dissipation at T_c = 25 °C	40	W
	Derating Factor	0.32	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	2000	V
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	3.12	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	°C/W
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.5	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	6	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	370	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	17	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	3.7	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	600			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 3 A V_{GS} = 10V I_D = 3 A T_c = 100°C		1	1.2 2.4	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	6			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 3 A	2	4.8		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1150 160 75	1500 240 110	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 300 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		50 140	65 175	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 480 V I_D = 6 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		240		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 480 V I_D = 6 A V_{GS} = 10 V		78 8 41	98	nC nC nC

SWITCHING OFF

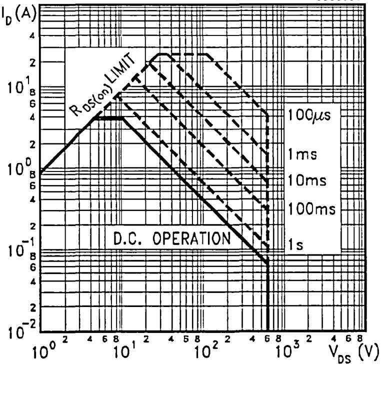
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 480 V I_D = 6 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		100 27 145	125 34 180	ns ns ns

SOURCE DRAIN DIODE

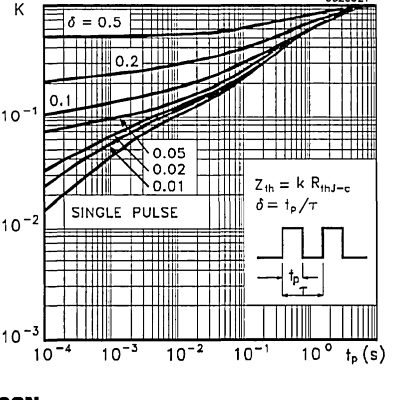
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				3.8 24	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 6 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 6 A di/dt = 100 A/μs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		750 13.5 38		ns μC A

(*) Pulsed. Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

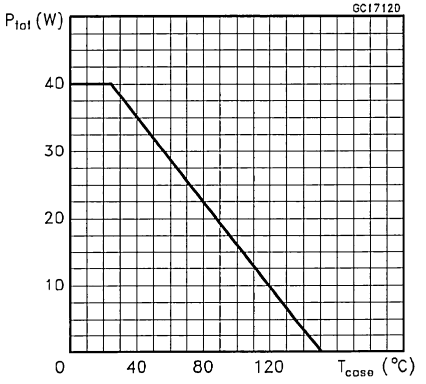
Safe Operating Area



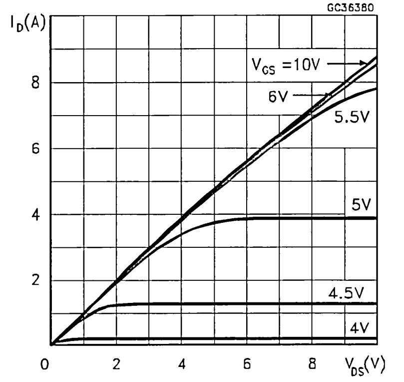
Thermal Impedance



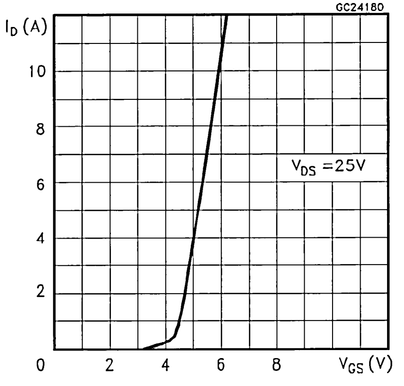
Derating Curve



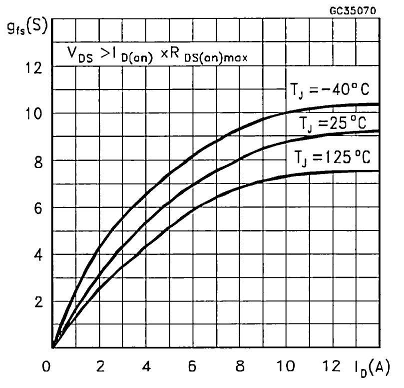
Output Characteristics



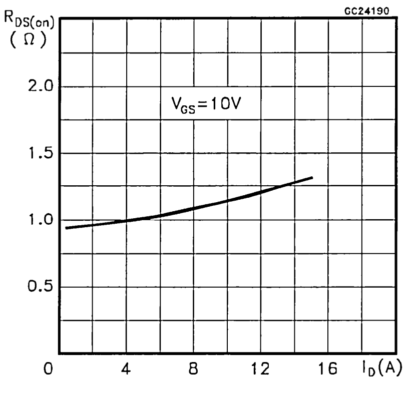
Transfer Characteristics



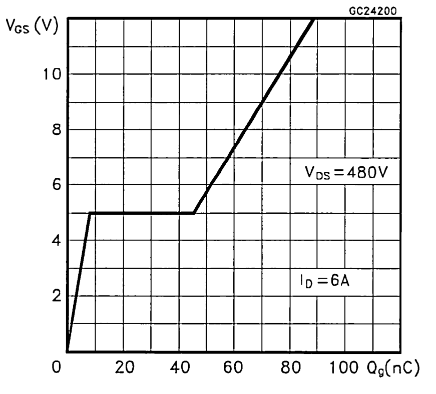
Transconductance



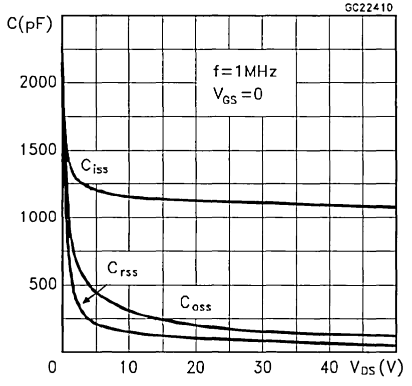
Static Drain-source On Resistance



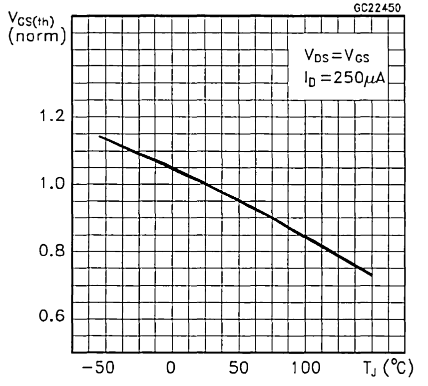
Gate Charge vs Gate-source Voltage



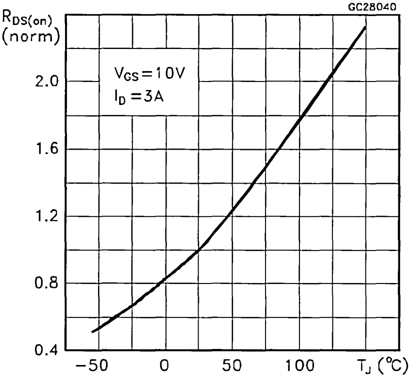
Capacitance Variations



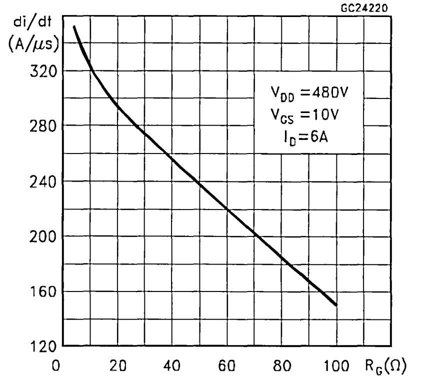
Normalized Gate Threshold Voltage vs Temperature



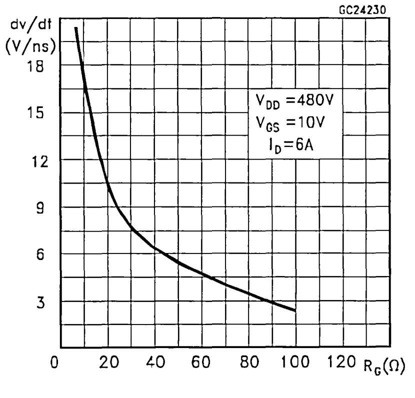
Normalized On Resistance vs Temperature



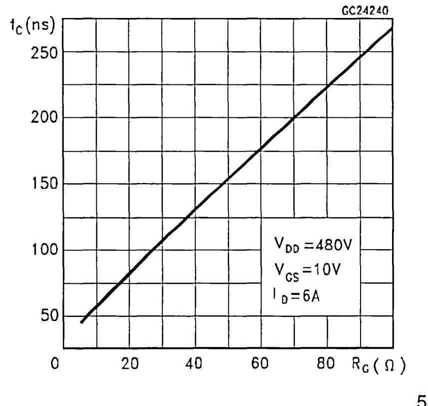
Turn-on Current Slope



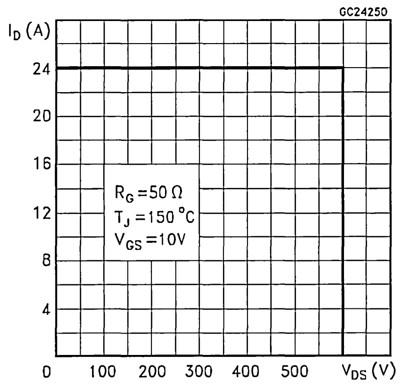
Turn-off Drain-source Voltage Slope



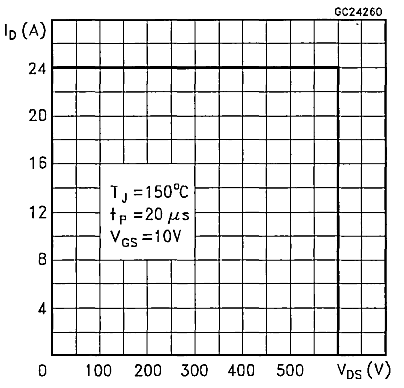
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

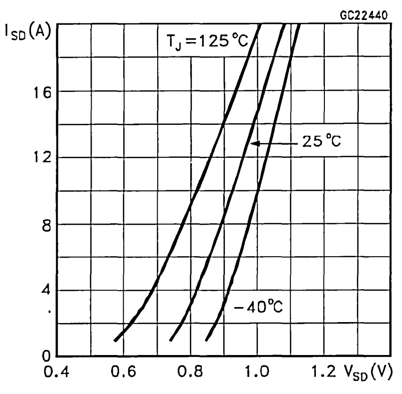


Fig. 1: Unclamped Inductive Load Test Circuits

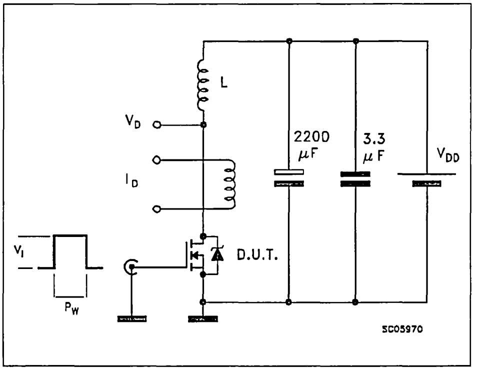


Fig. 2: Unclamped Inductive Waveforms

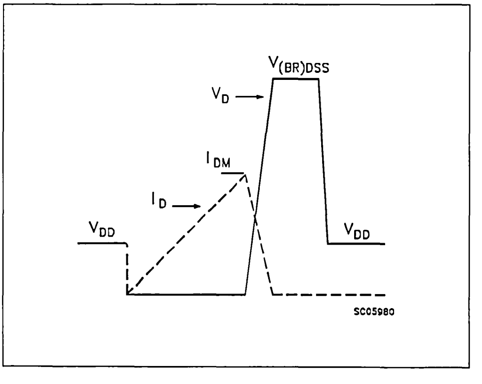


Fig. 3: Switching Times Test Circuits For Resistive Load

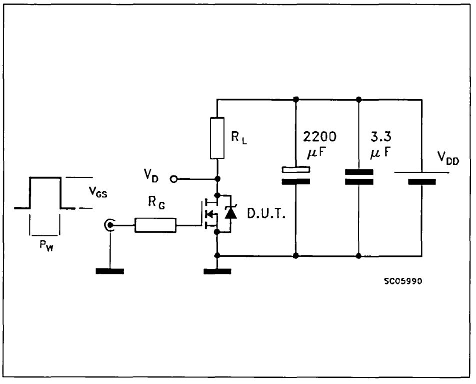


Fig. 4: Gate Charge Test Circuit

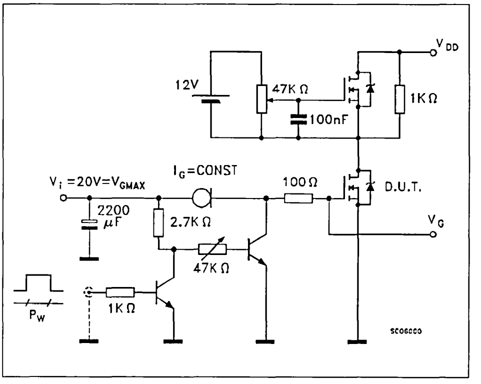
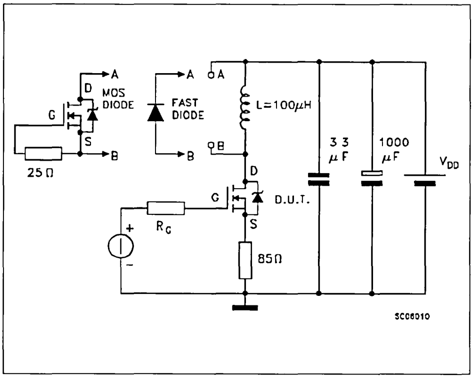


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



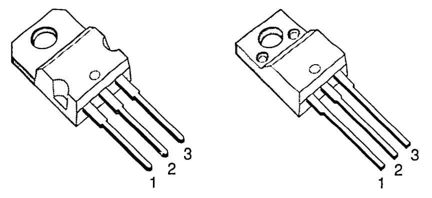
STP7N20
STP7N20FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP7N20 STP7N20FI	200 V 200 V	< 0.65 Ω < 0.65 Ω	7 A 4 A

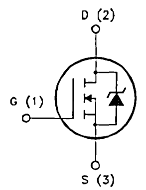
- TYPICAL $R_{DS(on)}$ = 0.55 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



TO-220 **ISOWATT220**

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP7N20	STP7N20FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	200		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	200		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	7	4	A
I_D	Drain Current (continuous) at T_c = 100 °C	4	2	A
I_{DM}(•)	Drain Current (pulsed)	28	28	A
P_{tot}	Total Dissipation at T_c = 25 °C	70	30	W
	Derating Factor	0.56	0.24	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case Max	1.79	4.17	°C/W
$R_{thj-amb}$ R_{thc-s} T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	7	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 50$ V)	30	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	7	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	4	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	200			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 3.5$ A $V_{GS} = 10V$ $I_D = 3.5$ A $T_c = 100$°C		0.55	065 1.3	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	7			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 3.5$ A	1.8	3.8		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		460 90 20	600 120 30	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 100 V I_D = 3.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		30 70	45 100	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 160 V I_D = 7 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		155		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 160 V I_D = 7 A V_{GS} = 10 V		20 6 8	30	nC nC nC

SWITCHING OFF

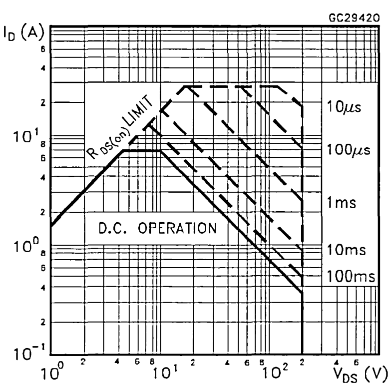
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 160 V I_D = 7 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		40 30 70	60 45 105	ns ns ns

SOURCE DRAIN DIODE

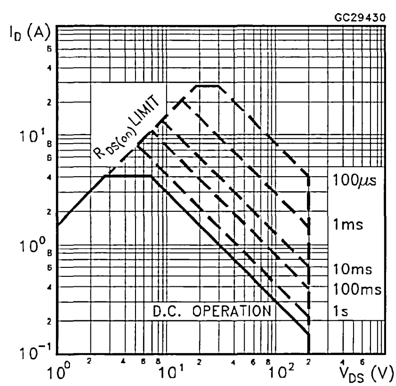
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				7 28	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 7 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 7 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		170 1 12		ns µC A

(*) Pulsed Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

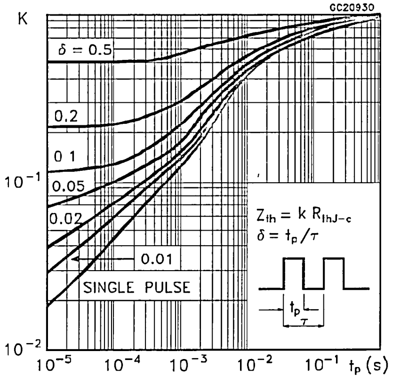
Safe Operating Areas For TO-220



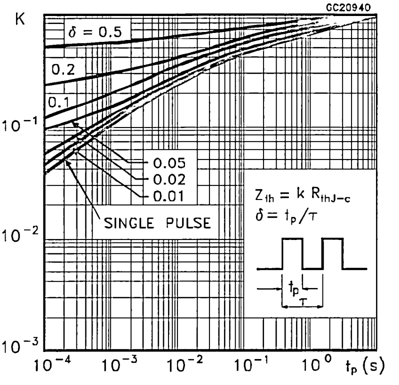
Safe Operating Areas For ISOWATT220



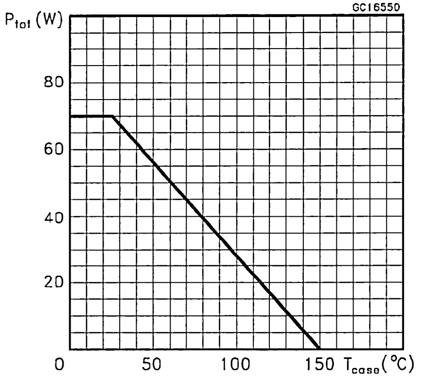
Thermal Impedeance For TO-220



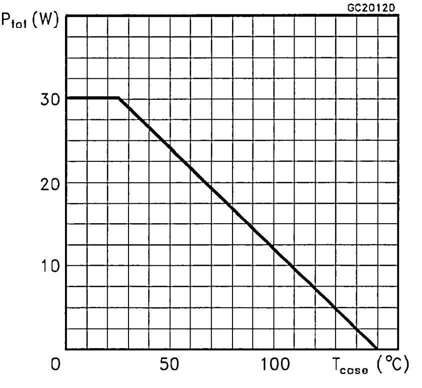
Thermal Impedance For ISOWATT220



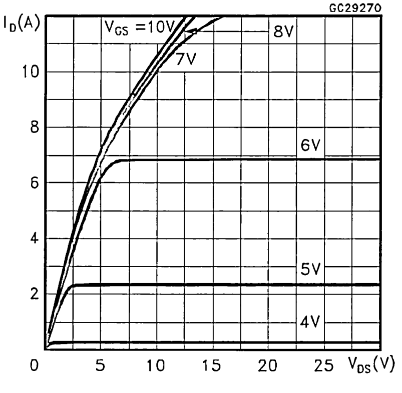
Derating Curve For TO-220



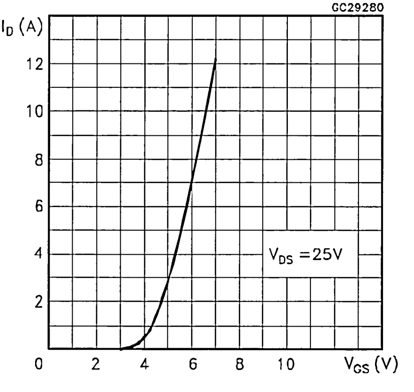
Derating Curve For ISOWATT220



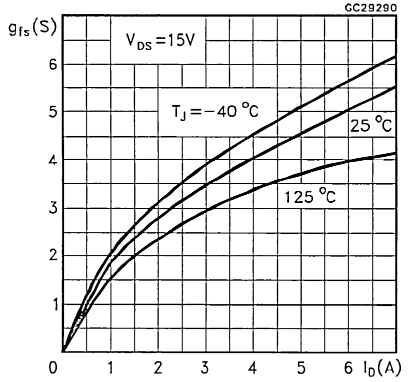
Output Characteristics



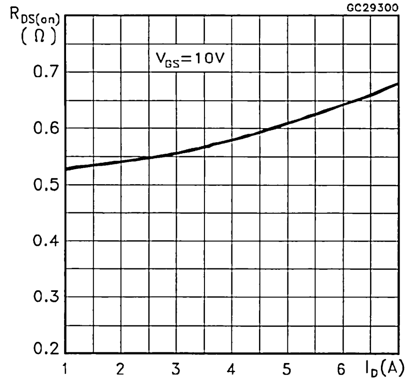
Transfer Characteristics



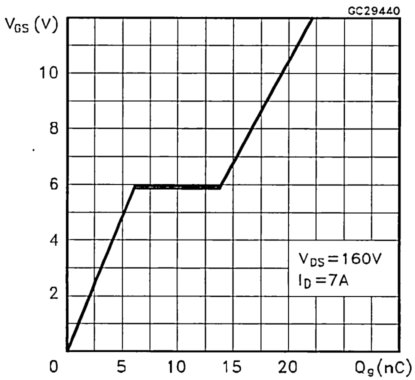
Transconductance



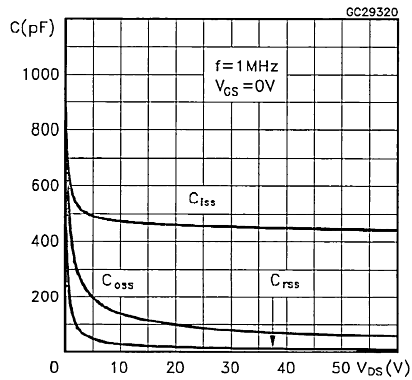
Static Drain-source On Resistance



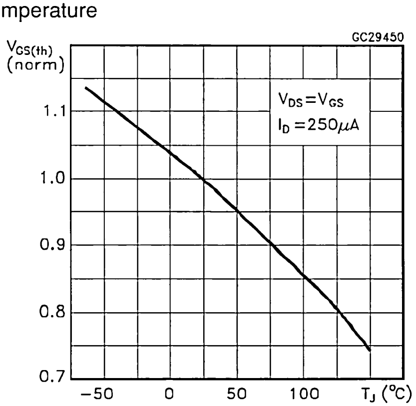
Gate Charge vs Gate-source Voltage



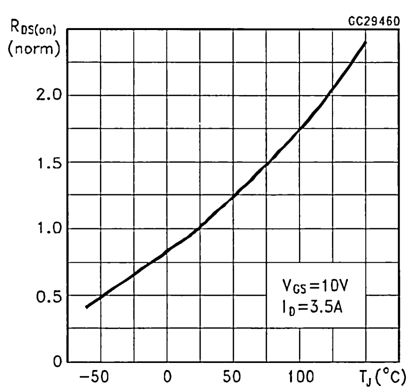
Capacitance Variations



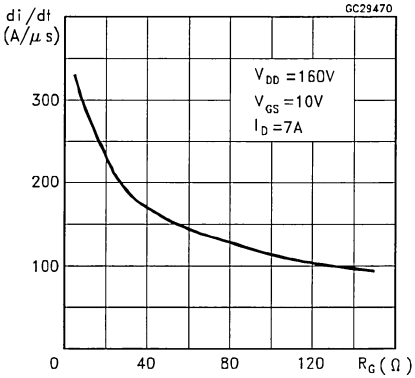
Normalized Gate Threshold Voltage vs Temperature



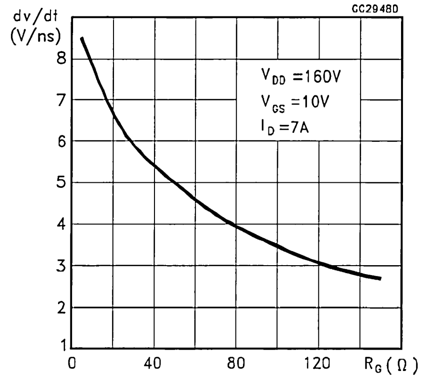
Normalized On Resistance vs Temperature



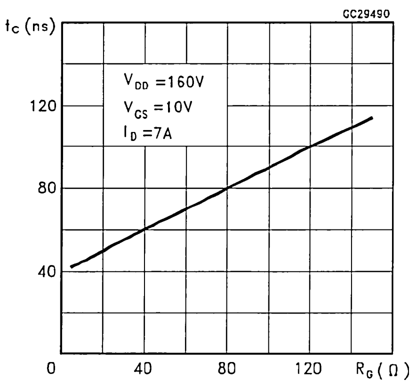
Turn-on Current Slope



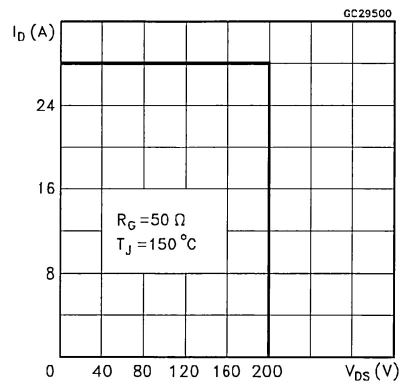
Turn-off Drain-source Voltage Slope



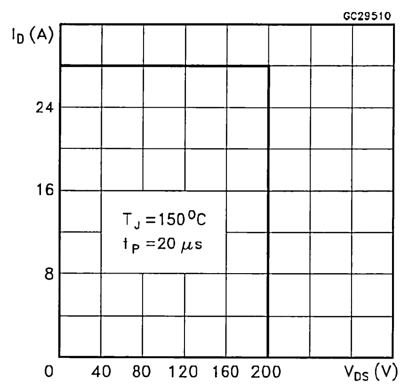
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

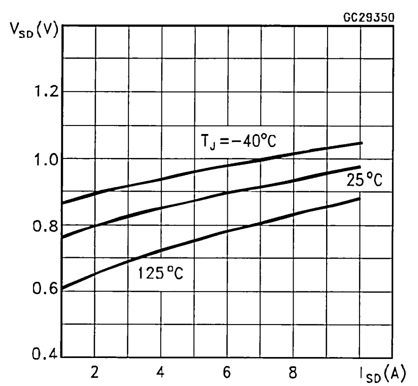


Fig. 1: Unclamped Inductive Load Test Circuits

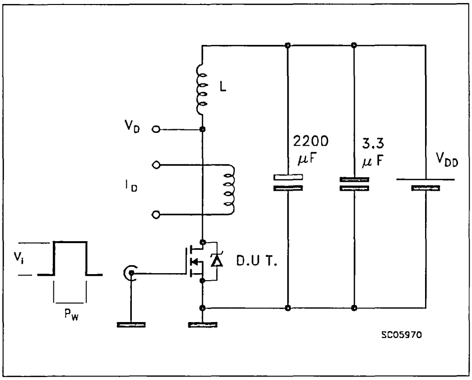


Fig. 2: Unclamped Inductive Waveforms

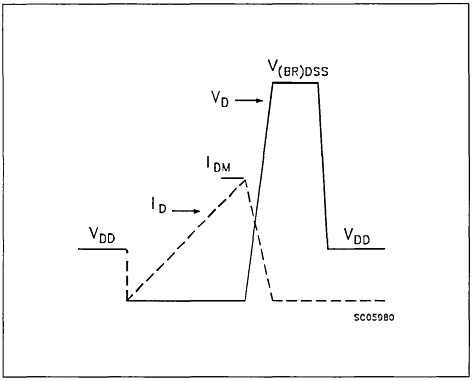


Fig. 3: Switching Times Test Circuits For Resistive Load

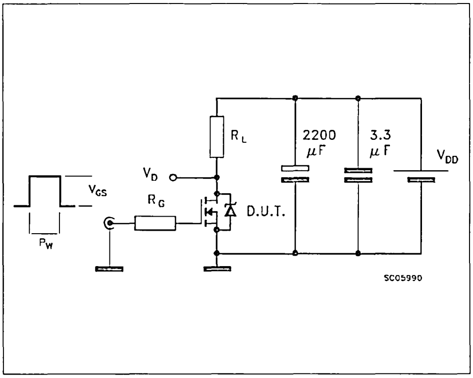


Fig. 4: Gate Charge Test Circuit

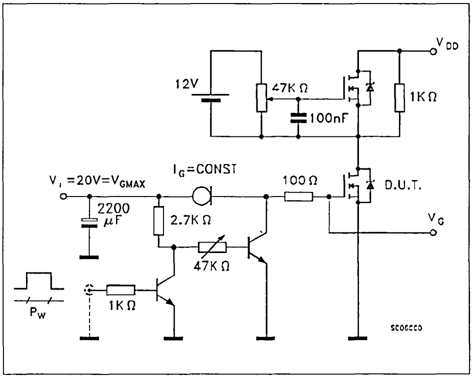
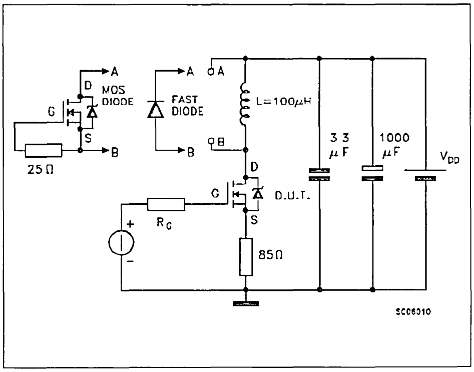


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



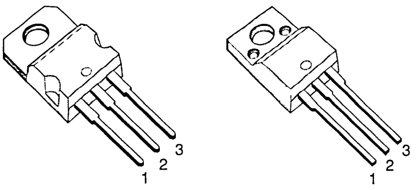
STP8NA50
STP8NA50FI

N - CHANNEL ENHANCEMENT MODE FAST POWER MOS TRANSISTOR

ADVANCE DATA

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP8NA50	500 V	< 0.85 Ω	8 A
STP8NA50FI	500 V	< 0.85 Ω	4.5 A

- TYPICAL $R_{DS(on)}$ = 0.68 Ω
- ± 30V GATE TO SOURCE VOLTAGE RATING
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INTRINSIC CAPACITANCES
- GATE GHARGE MINIMIZED
- REDUCED THRESHOLD VOLTAGE SPREAD

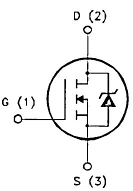


TO-220 ISOWATT220

DESCRIPTION

This series of POWER MOSFETS represents the most advanced high voltage technology. The optimized cell layout coupled with a new proprietary edge termination concur to give the device low $R_{DS(on)}$ and gate charge, unequalled ruggedness and superior switching performance.

INTERNAL SCHEMATIC DIAGRAM



APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- DC-AC CONVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLIES AND MOTOR DRIVE

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP8NA50	STP8NA50FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	500		V
V_{DGR}	Drain-gate Voltage (R_{GS} = 20 kΩ)	500		V
V_{GS}	Gate-source Voltage	± 30		V
I_D	Drain Current (continuous) at T_c = 25 °C	8	4.5	A
I_D	Drain Current (continuous) at T_c = 100 °C	5.3	3	A
I_{DM}(•)	Drain Current (pulsed)	32	32	A
P_{tot}	Total Dissipation at T_c = 25 °C	125	40	W
	Derating Factor	1	0.32	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	3.12	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	8	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	350	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	11	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	5.3	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	500			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 30 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2.25	3	3.75	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 4 A V_{GS} = 10V I_D = 4 A T_c = 100°C		0.68	0.85 1.7	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	8			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 4 A	4.5	6.8		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1200 190 55		pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 250 V I_D = 4 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		18 26		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 400 V I_D = 8 A R_G = 47 Ω V_{GS} = 10 V (see test circuit, figure 5)		240		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 8 A V_{GS} = 10 V		53 8 25		nC nC nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 400 V I_D = 8 A R_G = 47 Ω V_{GS} = 10 V (see test circuit, figure 5)		75 25 115		ns ns ns

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				8 32	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 8 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 8 A di/dt = 100 A/µs V_{DD} = 50 V T_j = 150 °C (see test circuit, figure 5)		440 5.5 25		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

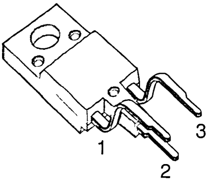
SGS-THOMSON MICROELECTRONICS

STP8N50XI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP8N50XI	500 V	< 0.85 Ω	4.5 A

- TYPICAL $R_{DS(on)}$ = 0.74 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

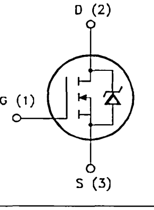


ISOWATT221

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	500	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	500	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	4.5	A
I_D	Drain Current (continuous) at T_c = 100 °C	3	A
I_{DM}(•)	Drain Current (pulsed)	18	A
P_{tot}	Total Dissipation at T_c = 25 °C	35	W
	Derating Factor	0.28	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	4000	V
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	3.57	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	60	°C/W
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.5	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	4.5	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	160	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	6	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	3	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	500			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 4 A V_{GS} = 10V I_D = 4 A T_c = 100°C		0.74	0.85 1.7	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	4.5			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 4 A	4	6		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1100 190 80	1500 240 110	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 200 V I_D = 4 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		40 35	50 43	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 400 V I_D = 8 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		240		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 400 V I_D = 8 A V_{GS} = 10 V		75 9 39	95	nC nC nC

SWITCHING OFF

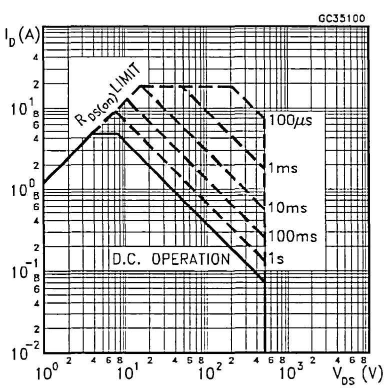
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 400 V I_D = 8 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		25 25 40	32 32 50	ns ns ns

50SOURCE DRAIN DIODE

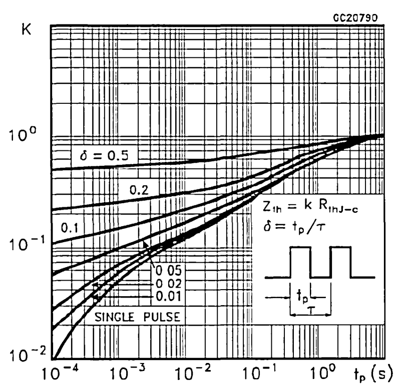
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				4.5 18	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 4.5 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 8 A di/dt = 100 A/μs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		700 12 35		ns μC A

(*) Pulsed. Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

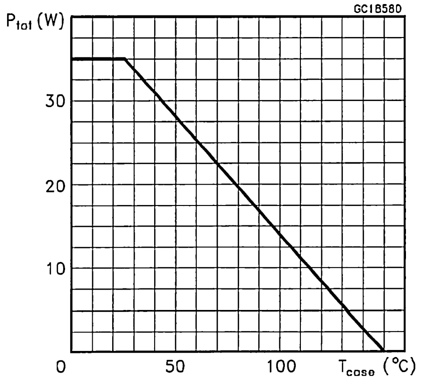
Safe Operating Area



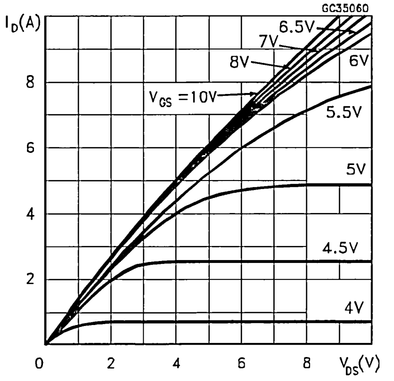
Thermal Impedance



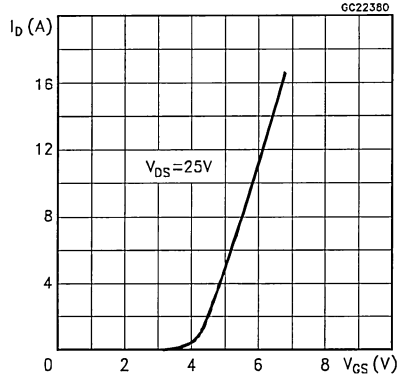
Derating Curve



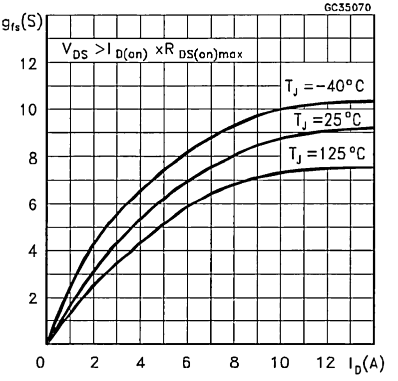
Output Characteristics



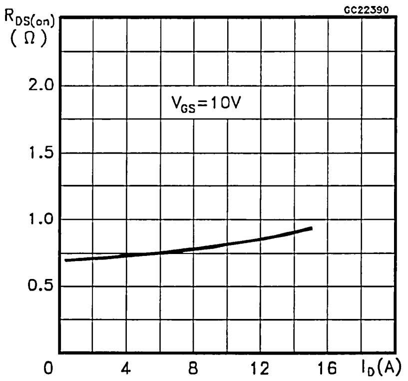
Transfer Characteristics



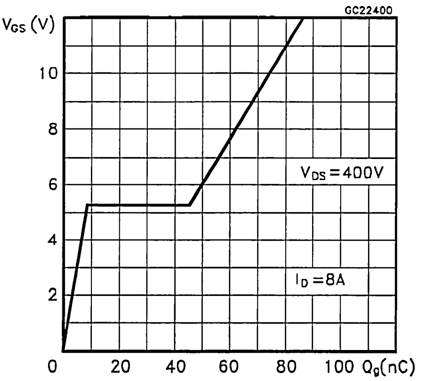
Transconductance



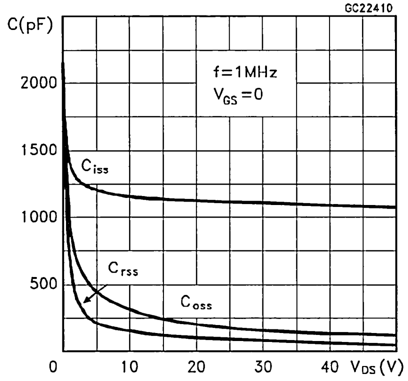
Static Drain-source On Resistance



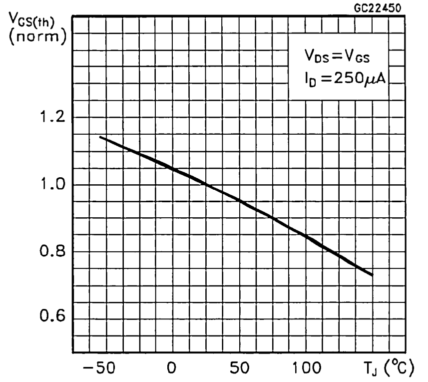
Gate Charge vs Gate-source Voltage



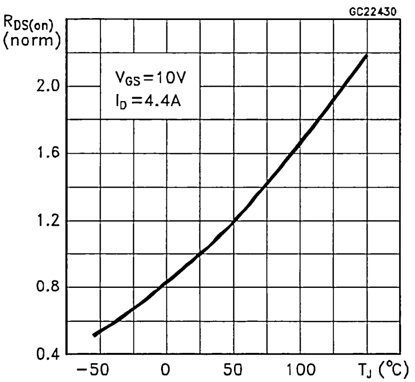
Capacitance Variations



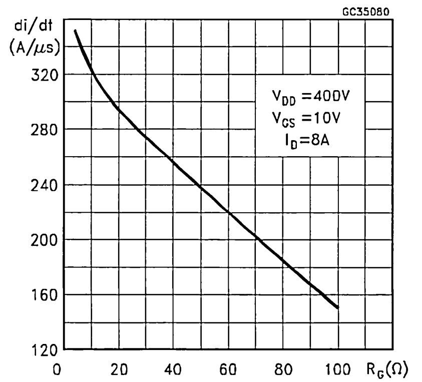
Normalized Gate Threshold Voltage vs Temperature



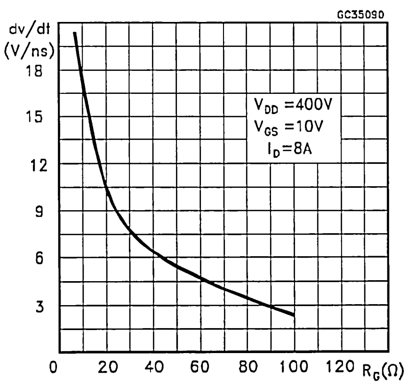
Normalized On Resistance vs Temperature



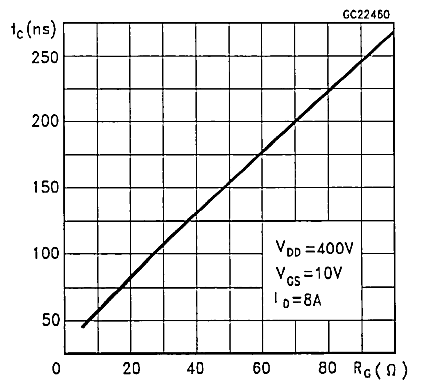
Turn-on Current Slope



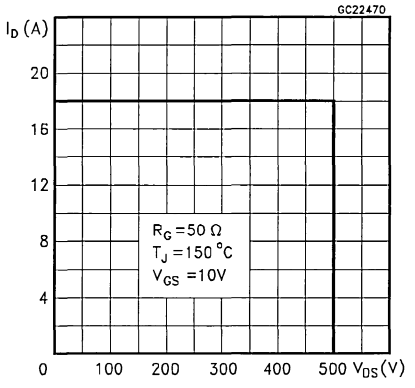
Turn-off Drain-source Voltage Slope



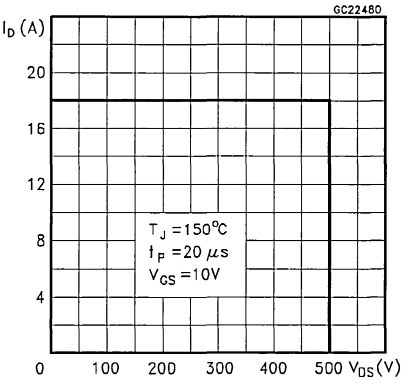
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

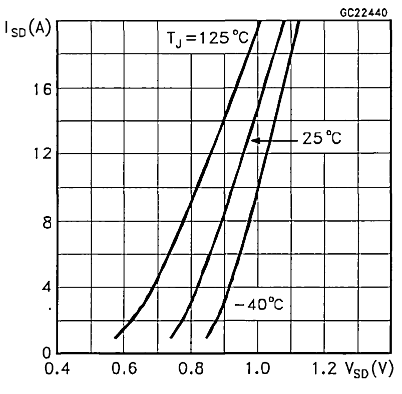


Fig. 1: Unclamped Inductive Load Test Circuits

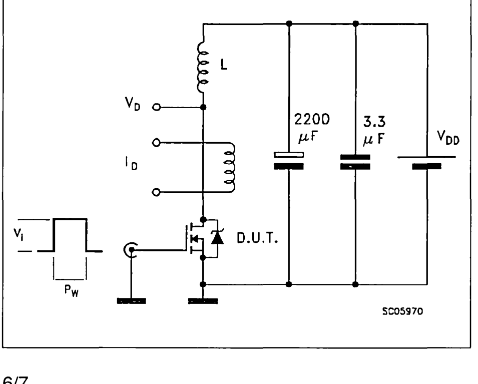


Fig. 2: Unclamped Inductive Waveforms

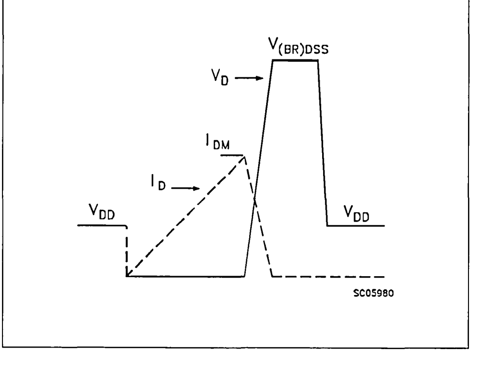


Fig. 3: Switching Times Test Circuits For Resistive Load

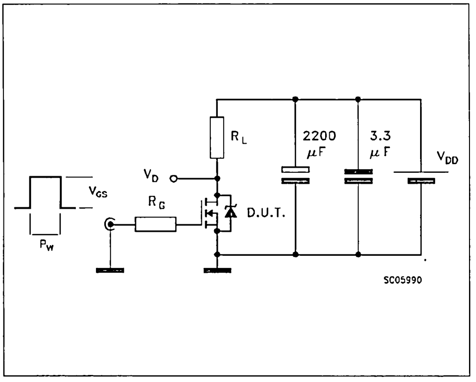


Fig. 4: Gate Charge Test Circuit

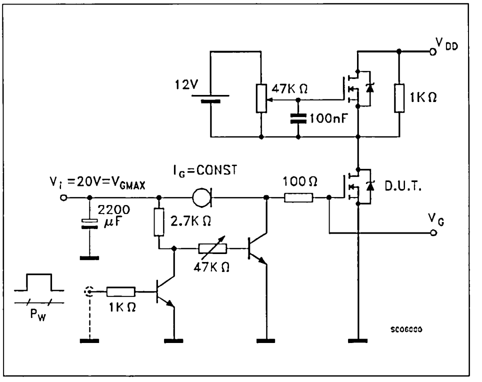
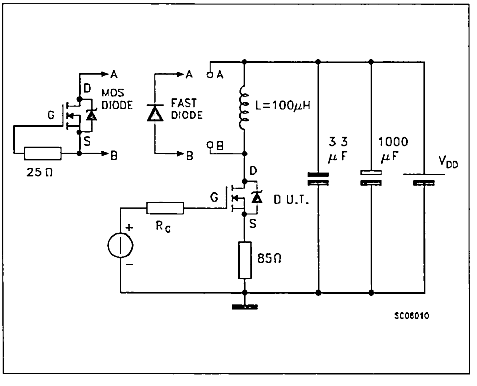


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



STP15N05L
STP15N05LFI

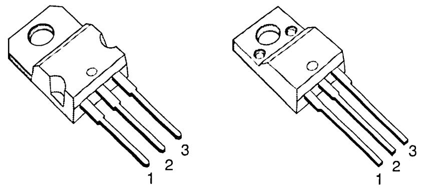
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP15N05L	50 V	< 0.15 Ω	15 A
STP15N05LFI	50 V	< 0.15 Ω	10 A

- TYPICAL $R_{DS(on)}$ = 0.115 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- LOGIC LEVEL COMPATIBLE INPUT
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

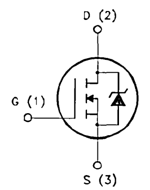
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



TO-220 ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP15N05L	STP15N05LFI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50		V
V_{GS}	Gate-source Voltage	± 15		V
I_D	Drain Current (continuous) at T_c = 25 °C	15	10	A
I_D	Drain Current (continuous) at T_c = 100 °C	10	7	A
I_{DM}(•)	Drain Current (pulsed)	60	60	A
P_{tot}	Total Dissipation at T_c = 25 °C	70	35	W
	Derating Factor	0.47	0.23	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	2.14	4.29	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	15	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	45	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	10	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	10	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	50			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 15 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	1	1.6	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 5 V I_D = 7.5 A V_{GS} = 5 V I_D = 7.5 A T_c = 100°C		0.115	0.15 0.3	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	15			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 7.5 A	5	9		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		350 150 50	500 200 80	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 7.5 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 3)		60 190	90 270	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 15 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		120		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 15 A V_{GS} = 5 V		12 7 4	18	nC nC nC

SWITCHING OFF

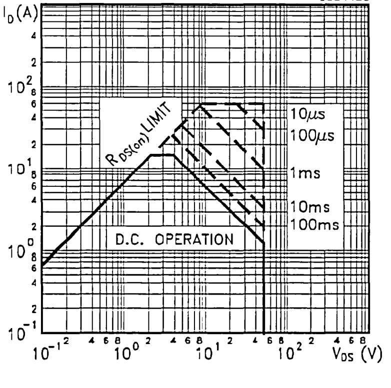
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 15 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		40 60 110	60 90 160	ns ns ns

SOURCE DRAIN DIODE

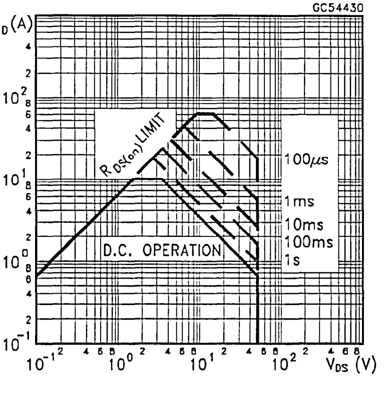
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				15 60	A A
V_{SD} (~)	Forward On Voltage	I_{SD} = 15 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 15 A di/dt = 100 A/µs V_{DD} = 25 V T_j = 150 °C (see test circuit, figure 5)		80 0.18 4.5		ns µC A

(~) Pulsed Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

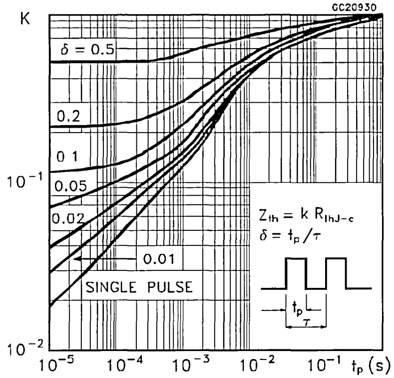
Safe Operating Areas For TO-220



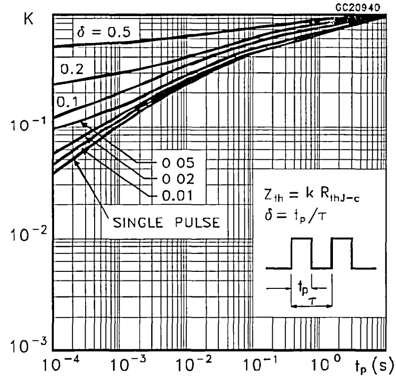
Safe Operating Areas For ISOWATT220



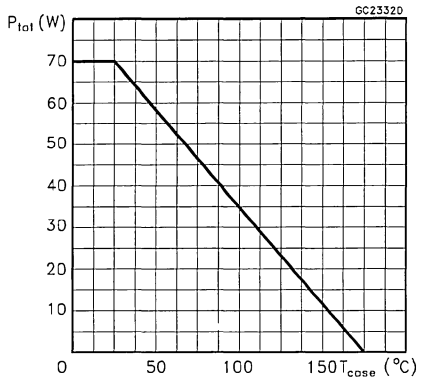
Thermal Impedance For TO-220



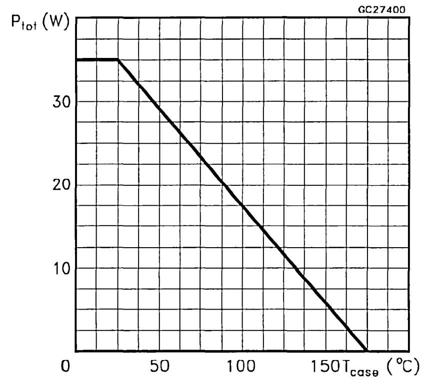
Thermal Impedance For ISOWATT220



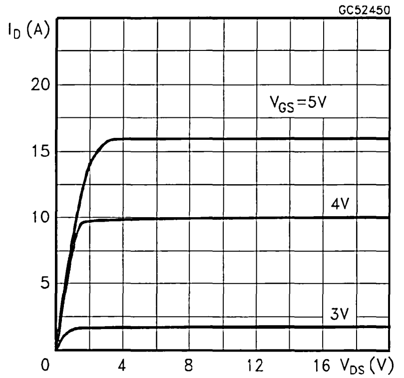
Derating Curve For TO-220



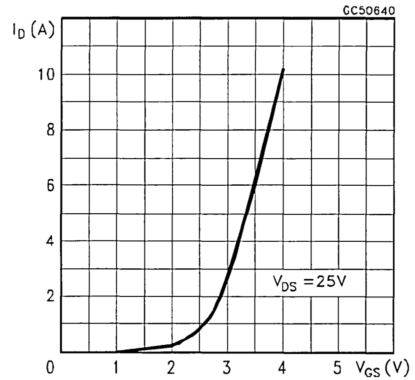
Derating Curve For ISOWATT220



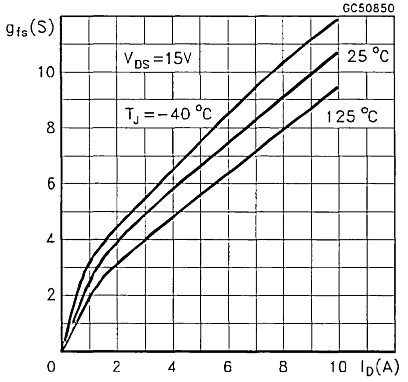
Output Characteristics



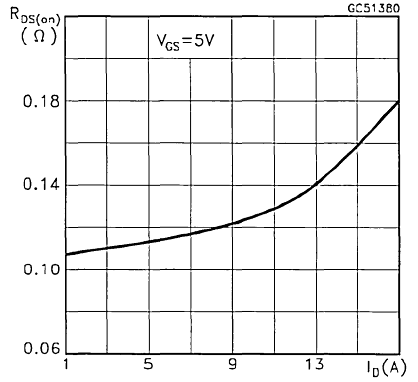
Transfer Characteristics



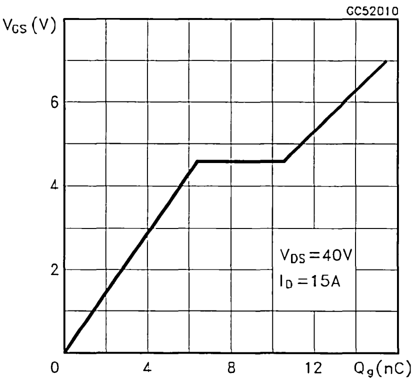
Transconductance



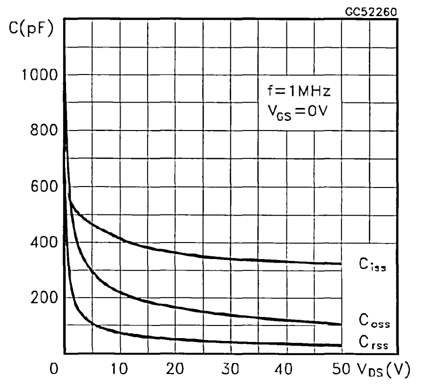
Static Drain-source On Resistance



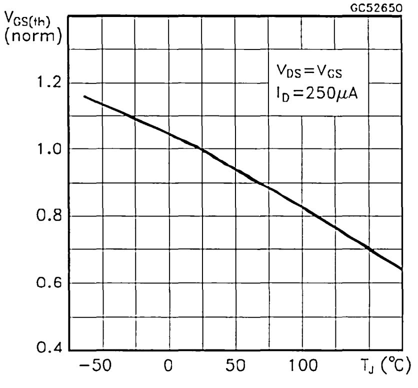
Gate Charge vs Gate-source Voltage



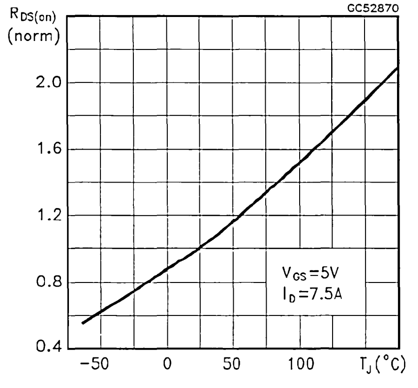
Capacitance Variations



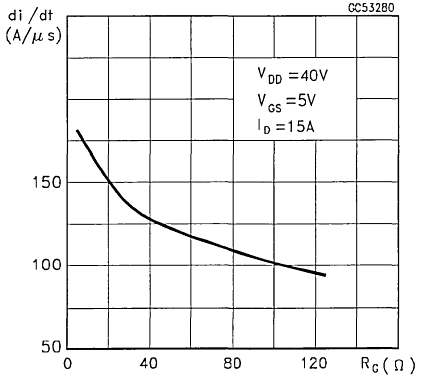
Normalized Gate Threshold Voltage vs Temperature



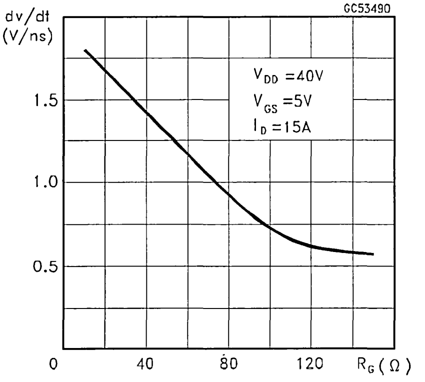
Normalized On Resistance vs Temperature



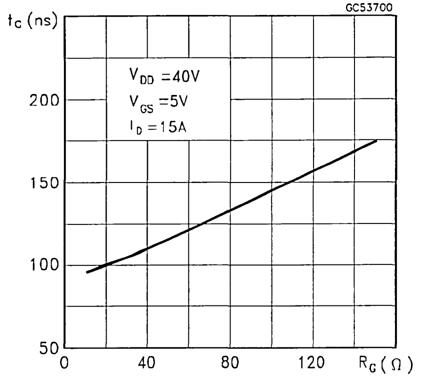
Turn-on Current Slope



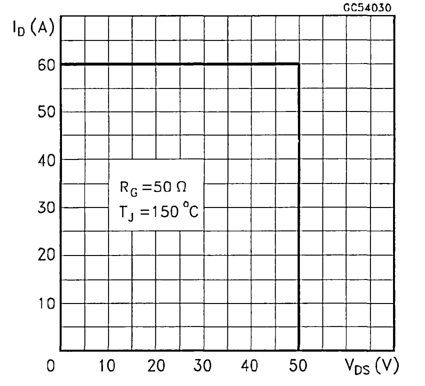
Turn-off Drain-source Voltage Slope



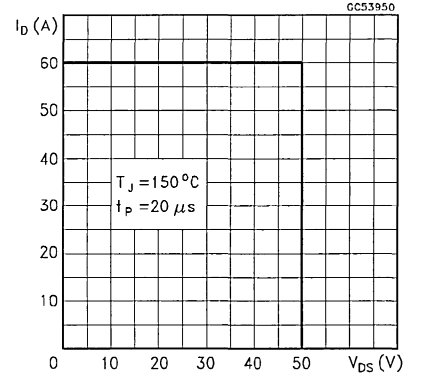
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

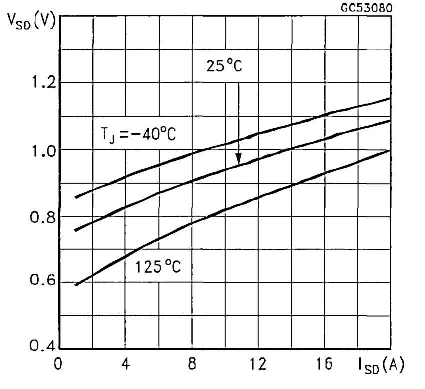


Fig. 1: Unclamped Inductive Load Test Circuits

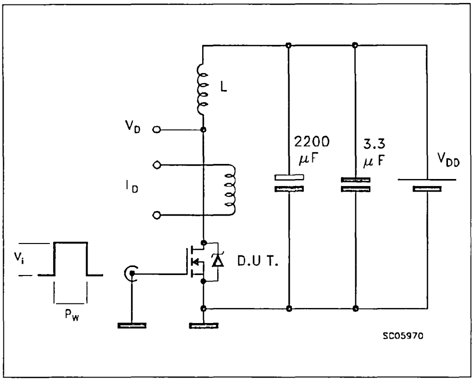


Fig. 2: Unclamped Inductive Waveforms

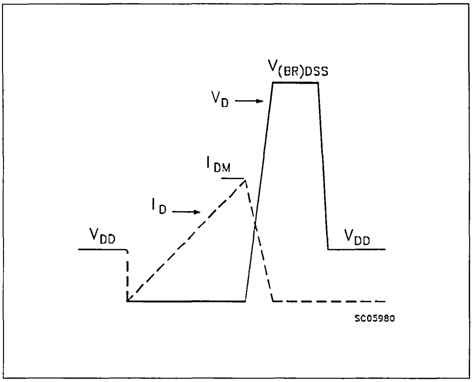


Fig. 3: Switching Times Test Circuits For Resistive Load

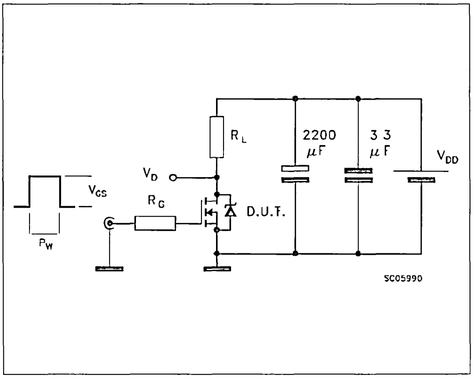


Fig. 4: Gate Charge Test Circuit

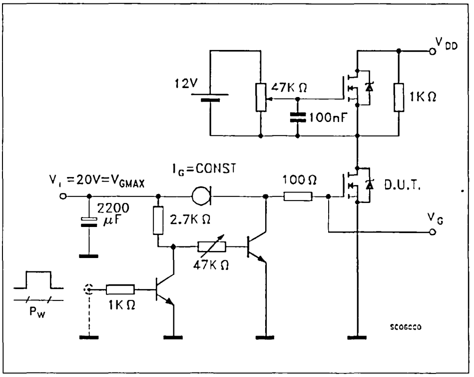
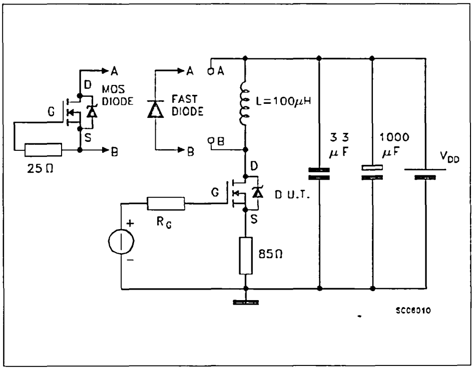


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON MICROELECTRONICS

STP15N06L
STP15N06LFI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP15N06L	60 V	< 0.15 Ω	15 A
STP15N06LFI	60 V	< 0.15 Ω	10 A

- TYPICAL $R_{DS(on)}$ = 0.115 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- LOGIC LEVEL COMPATIBLE INPUT
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
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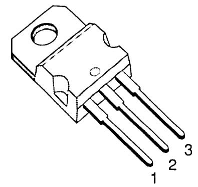
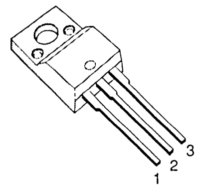
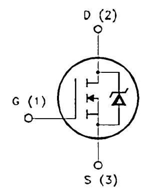


TO-220



ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP15N06L	STP15N06LFI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	60		V
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V_{GS}	Gate-source Voltage	± 15		V
I_D	Drain Current (continuous) at T_c = 25 °C	15	10	A
I_D	Drain Current (continuous) at T_c = 100 °C	10	7	A
I_{DM}(•)	Drain Current (pulsed)	60	60	A
P_{tot}	Total Dissipation at T_c = 25 °C	70	35	W
	Derating Factor	0.47	0.23	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case Max	2.14	4.29	°C/W
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$R_{thc-sink}$	Thermal Resistance Case-sink Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	15	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	40	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	10	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	10	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	60			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 15$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	1	1.6	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 5$ V $I_D = 7.5$ A $V_{GS} = 5$ V $I_D = 7.5$ A $T_c = 100$°C		0.115	0.15 0.3	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	15			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 7.5$ A	5	9		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		350 150 50	500 200 80	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 7.5 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 3)		60 190	90 270	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 15 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		120		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 15 A V_{GS} = 5 V		12 7 4	18	nC nC nC

SWITCHING OFF

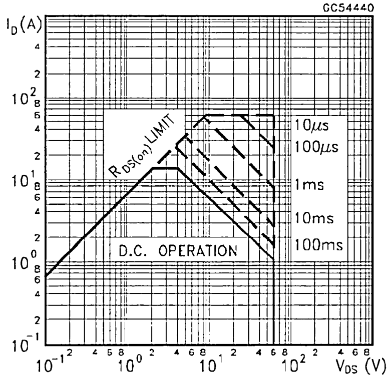
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 15 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		40 60 110	60 90 160	ns ns ns

SOURCE DRAIN DIODE

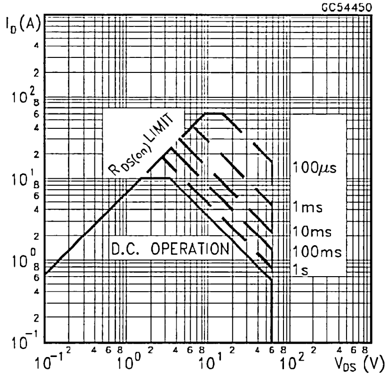
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				15 60	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 15 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 15 A di/dt = 100 A/μs V_{DD} = 25 V T_j = 150 °C (see test circuit, figure 5)		80 0.18 4.5		ns μC A

(*) Pulsed. Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

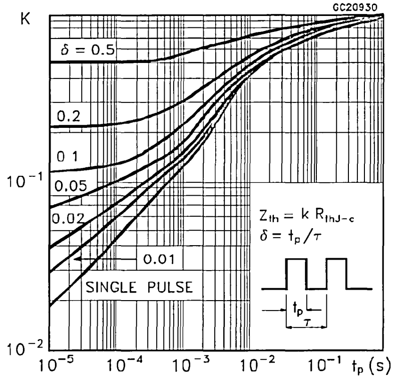
Safe Operating Areas For TO-220



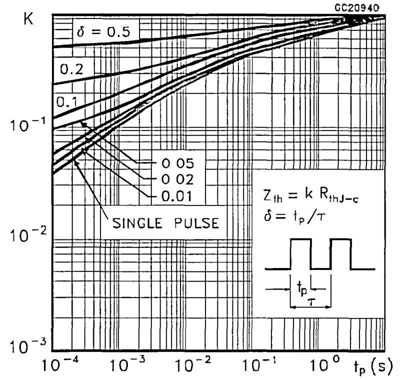
Safe Operating Areas For ISOWATT220



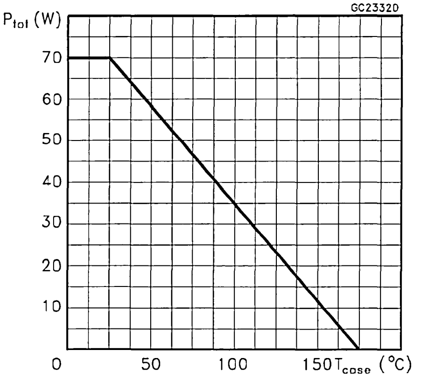
Thermal Impedance For TO-220



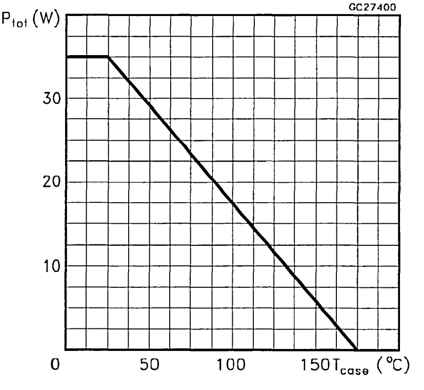
Thermal Impedance For ISOWATT220



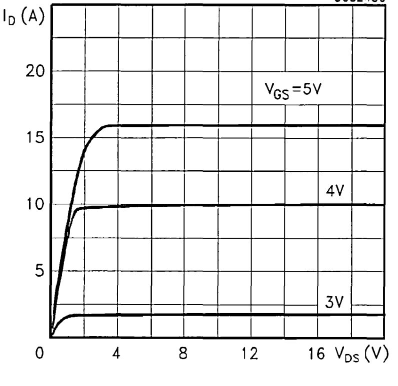
Derating Curve For TO-220



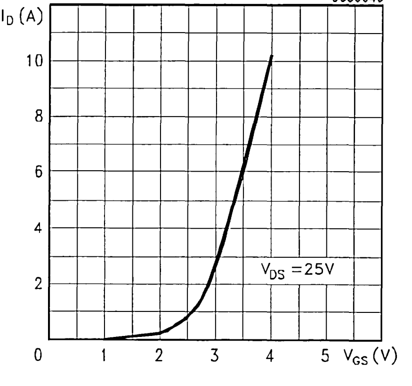
Derating Curve For ISOWATT220



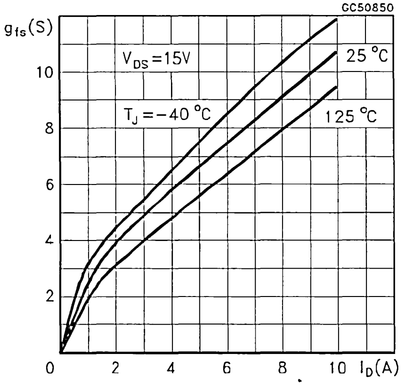
Output Characteristics



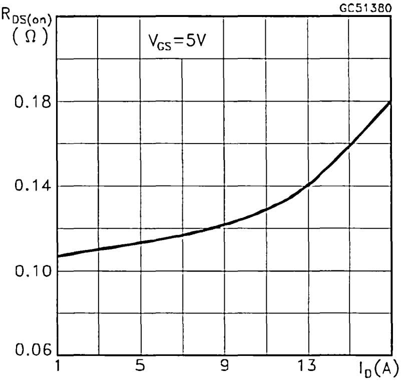
Transfer Characteristics



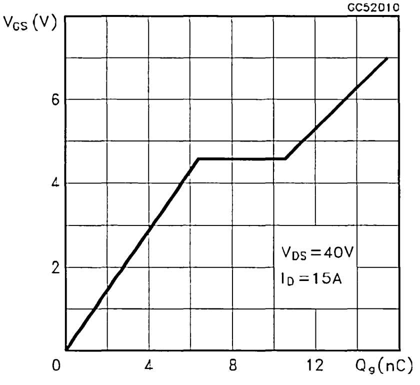
Transconductance



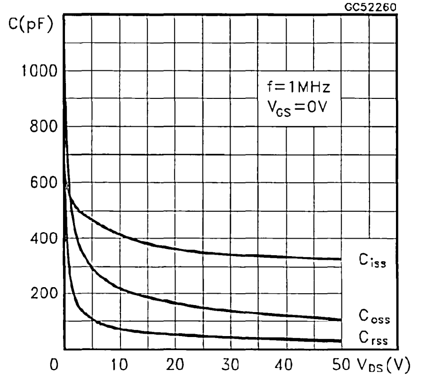
Static Drain-source On Resistance



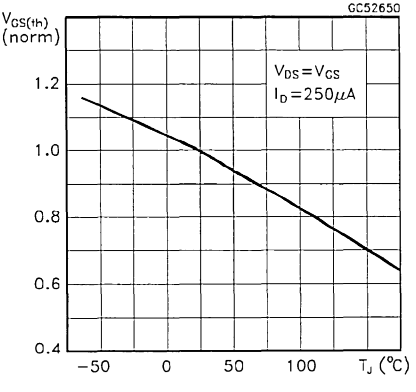
Gate Charge vs Gate-source Voltage



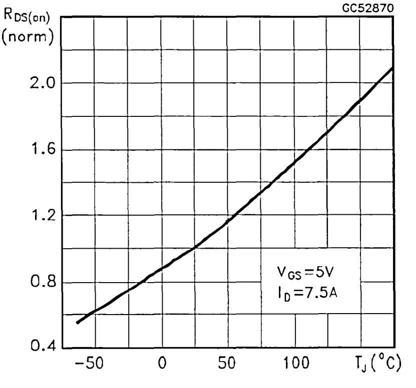
Capacitance Variations



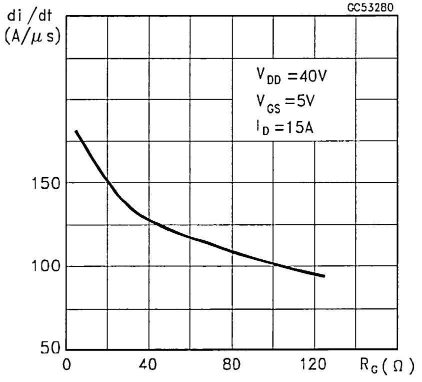
Normalized Gate Threshold Voltage vs Temperature



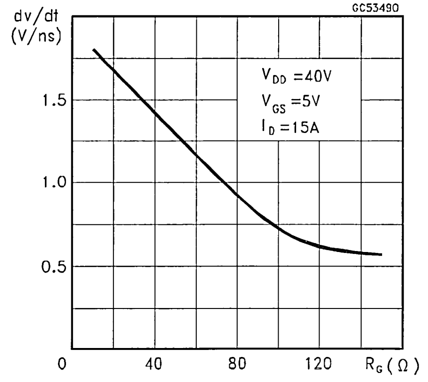
Normalized On Resistance vs Temperature



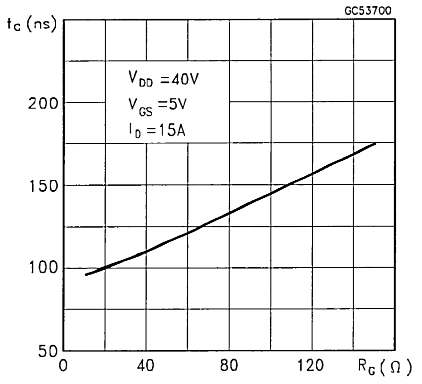
Turn-on Current Slope



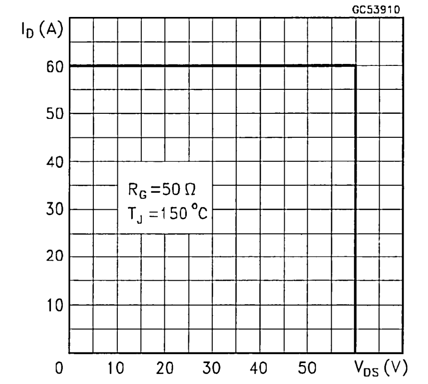
Turn-off Drain-source Voltage Slope



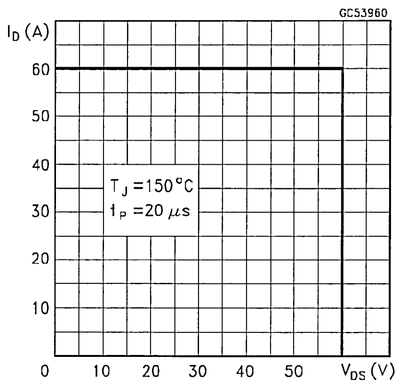
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

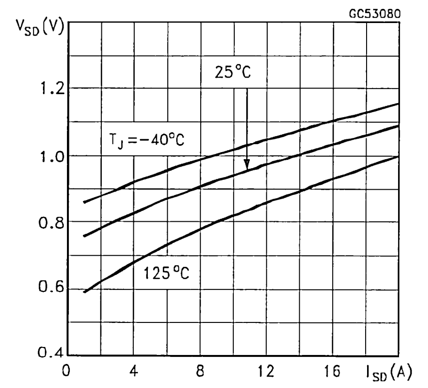


Fig. 1: Unclamped Inductive Load Test Circuits

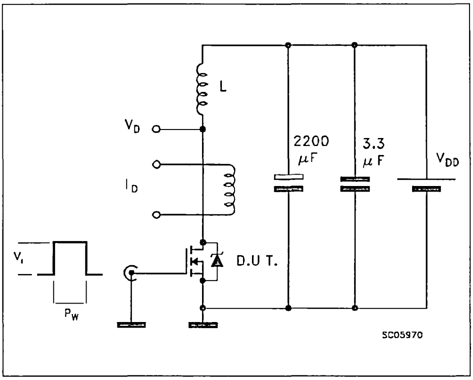


Fig. 2: Unclamped Inductive Waveforms

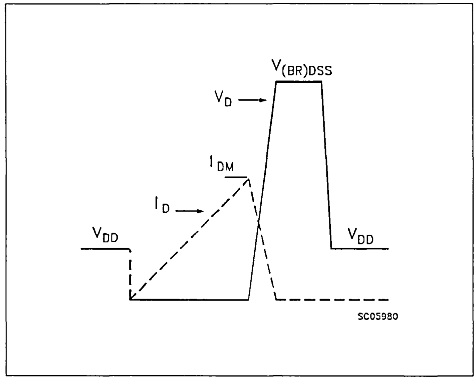


Fig. 3: Switching Times Test Circuits For Resistive Load

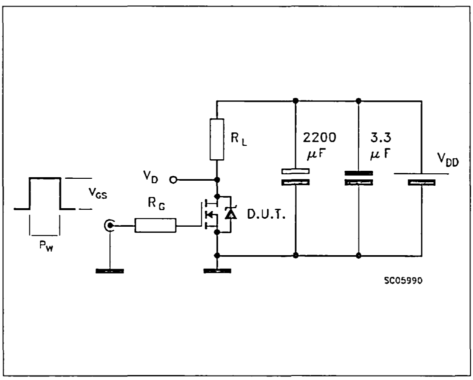


Fig. 4: Gate Charge Test Circuit

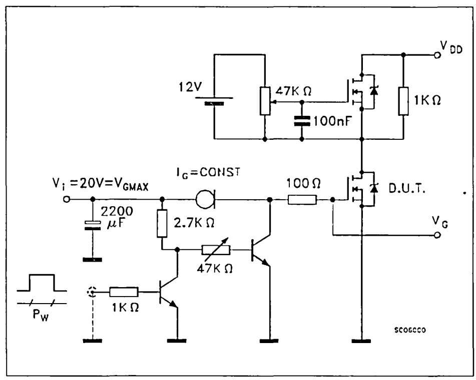
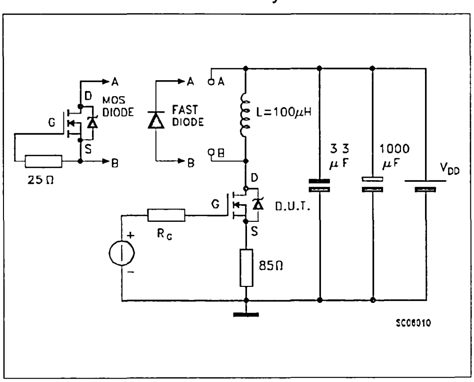


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON MICROELECTRONICS

STP18N10
STP18N10FI

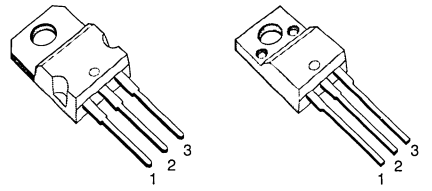
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP18N10	100 V	< 0.14 Ω	18 A
STP18N10FI	100 V	< 0.14 Ω	11 A

- TYPICAL $R_{DS(on)}$ = 0.095 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

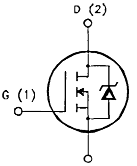
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



TO-220 ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP18N10	STP18N10FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	100		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	100		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	18	11	A
I_D	Drain Current (continuous) at T_c = 100 °C	12	7	A
I_{DM}(•)	Drain Current (pulsed)	72	72	A
P_{tot}	Total Dissipation at T_c = 25 °C	90	40	W
	Derating Factor	0.6	0.27	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.67	3.75	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Thermal Resistance Case-sink Maximum Lead Temperature For Soldering Purpose	Max Typ 	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	18	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	80	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	20	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	12	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	100			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 9 A V_{GS} = 10V I_D = 9 A T_c = 100°C		0.095	0.14 0.28	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	18			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 9 A	5	9		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		650 180 40	900 250 60	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 36 V I_D = 9 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 3)		20 130	30 185	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 80 V I_D = 18 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 5)		180		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 80 V I_D = 18 A V_{GS} = 10 V		27 9 11	40	nC nC nC

SWITCHING OFF

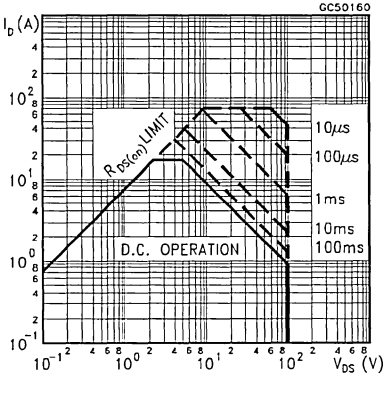
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 80 V I_D = 18 A R_G = 15 Ω V_{GS} = 10 V (see test circuit, figure 5)		55 45 100	80 65 145	ns ns ns

SOURCE DRAIN DIODE

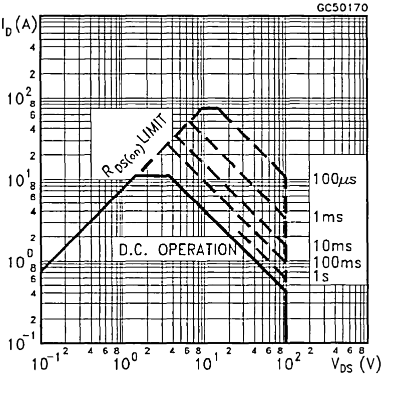
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				18 72	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 18 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 18 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		100 0.4 8		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

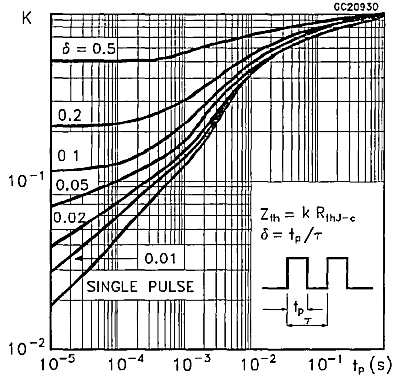
Safe Operating Areas For TO-220



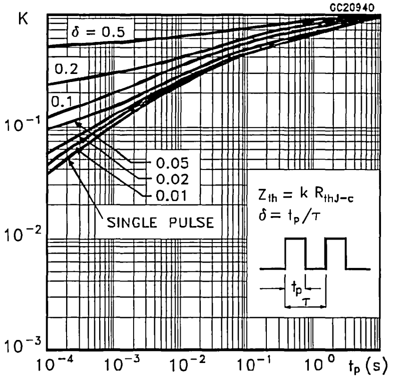
Safe Operating Areas For ISOWATT220



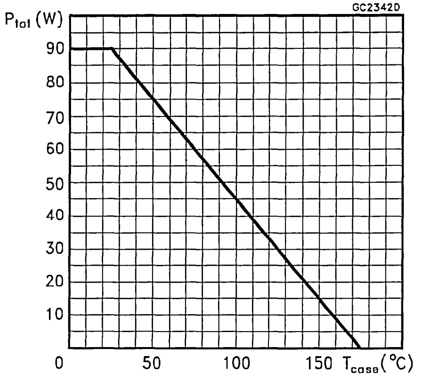
Thermal Impedeance For TO-220



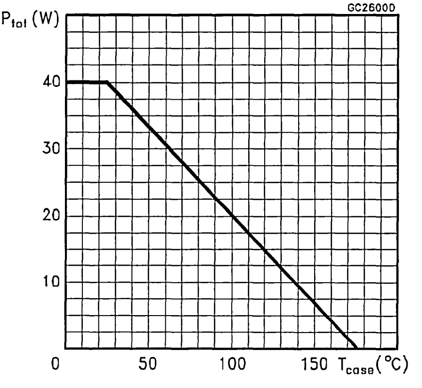
Thermal Impedance For ISOWATT220



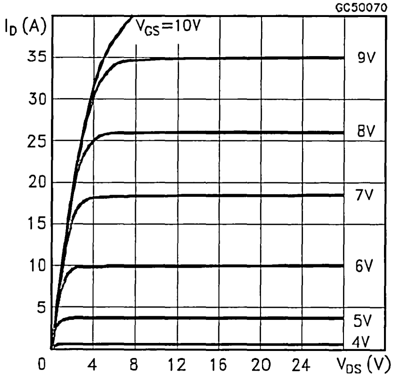
Derating Curve For TO-220



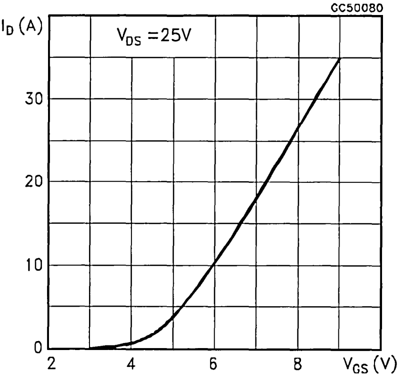
Derating Curve For ISOWATT220



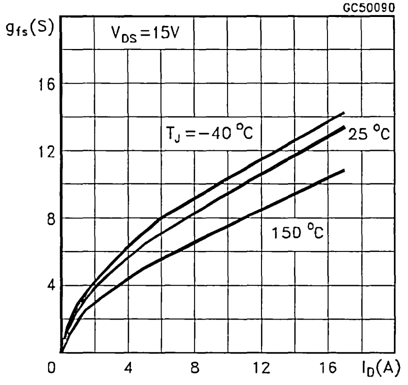
Output Characteristics



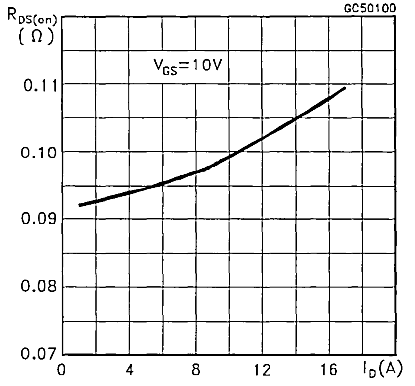
Transfer Characteristics



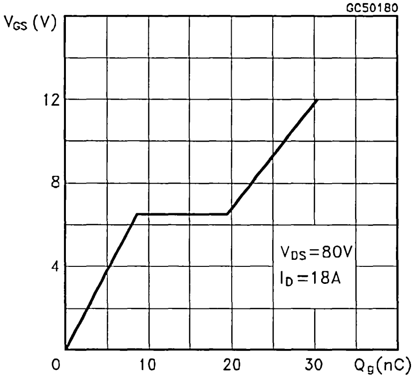
Transconductance



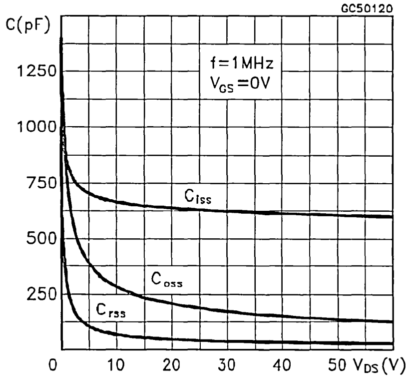
Static Drain-source On Resistance



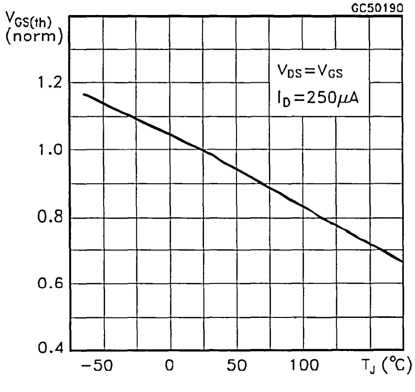
Gate Charge vs Gate-source Voltage



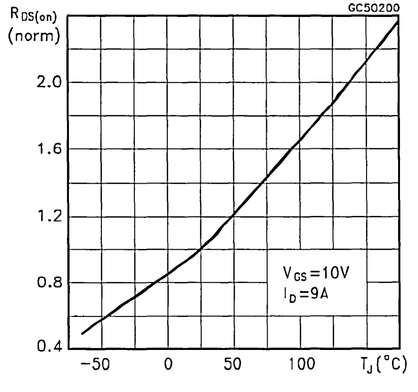
Capacitance Variations



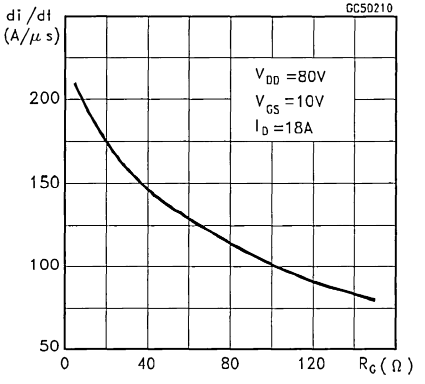
Normalized Gate Threshold Voltage vs Temperature



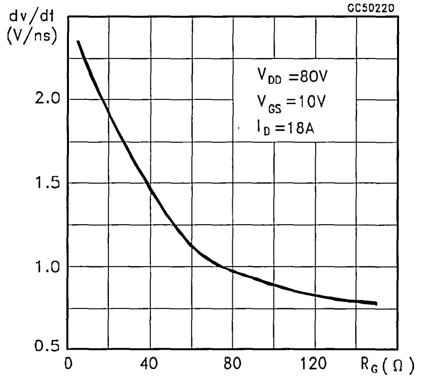
Normalized On Resistance vs Temperature



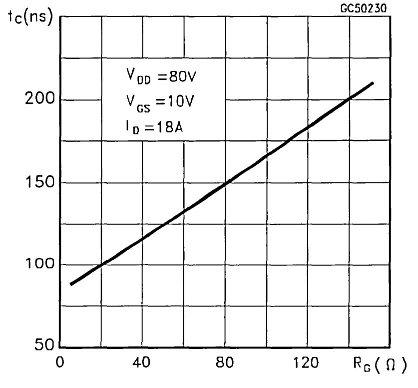
Turn-on Current Slope



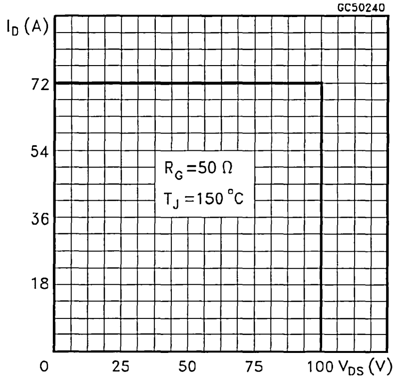
Turn-off Drain-source Voltage Slope



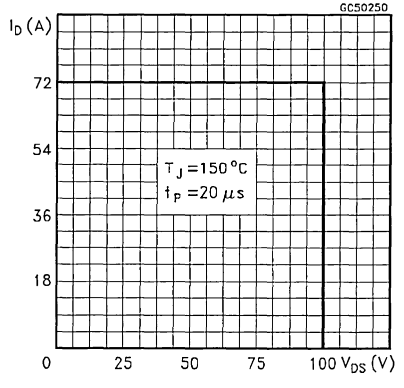
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

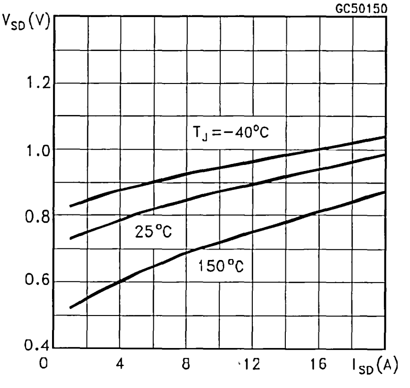


Fig. 1: Unclamped Inductive Load Test Circuits

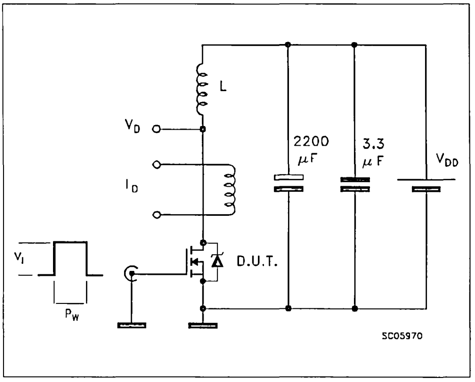


Fig. 2: Unclamped Inductive Waveforms

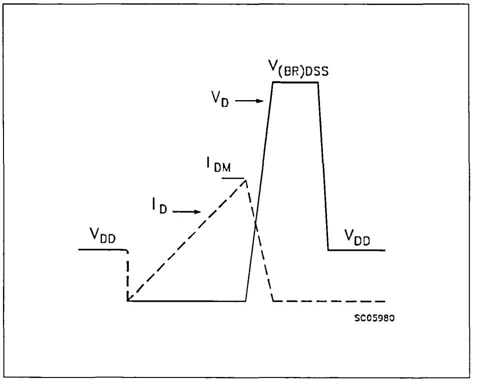


Fig. 3: Switching Times Test Circuits For Resistive Load

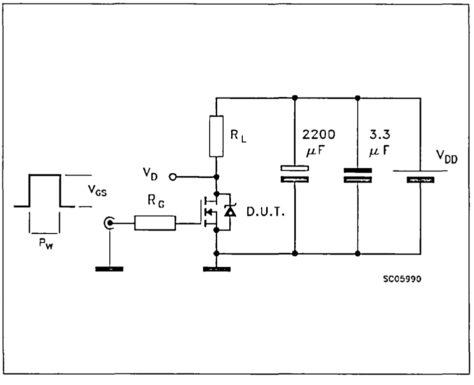


Fig. 4: Gate Charge Test Circuit

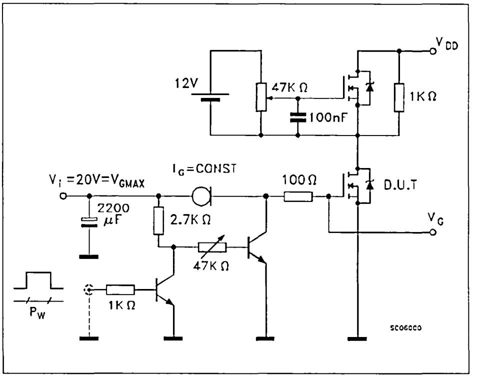
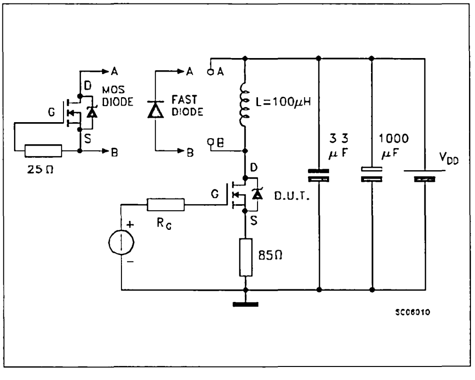


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



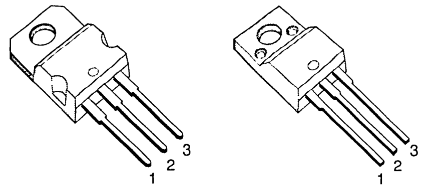
SGS-THOMSON
MICROELECTRONICS

STP20N06
STP20N06FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP20N06	60 V	< 0.085 Ω	20 A
STP20N06FI	60 V	< 0.085 Ω	13 A

- TYPICAL $R_{DS(on)}$ = 0.06 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

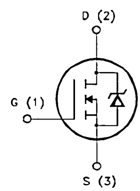


TO-220 ISOWATT220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP20N06	STP20N06FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	60		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	60		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	20	13	A
I_D	Drain Current (continuous) at T_c = 100 °C	14	9	A
I_{DM}(•)	Drain Current (pulsed)	80	80	A
P_{tot}	Total Dissipation at T_c = 25 °C	80	35	W
	Derating Factor	0.53	0.23	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case Max	1.88	4.29	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	20	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	80	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	20	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	14	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	60			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 10 A V_{GS} = 10V I_D = 10 A T_c = 100°C		0.06	0.085 0.17	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	20			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 10 A	6	9		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		520 250 80	700 350 120	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		45 65	65 95	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 20 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		240		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 20 A V_{GS} = 10 V		22 11 7	30	nC nC nC

SWITCHING OFF

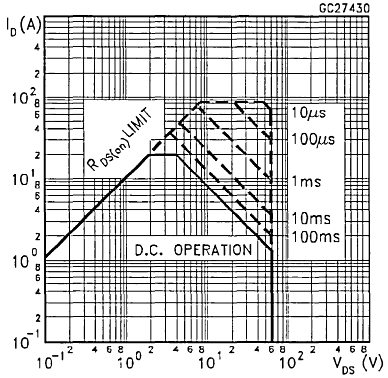
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 20 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		80 60 140	120 90 210	ns ns ns

SOURCE DRAIN DIODE

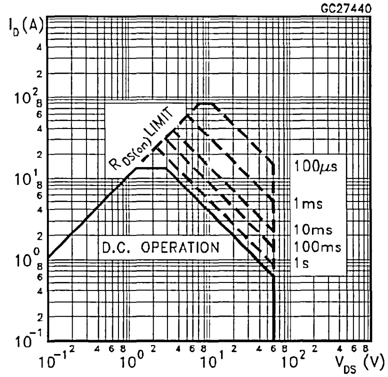
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				20 80	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 20 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 20 A di/dt = 100 A/μs V_{DD} = 15 V T_j = 150 °C (see test circuit, figure 5)		85 0.13 3		ns μC A

(*) Pulsed Pulse duration = 300 μs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

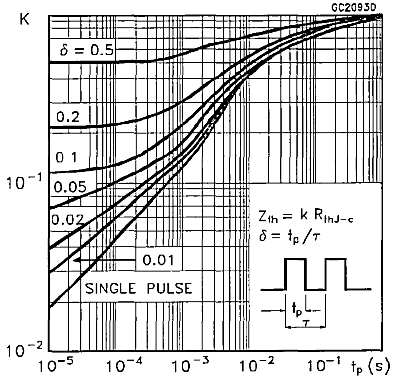
Safe Operating Areas For TO-220



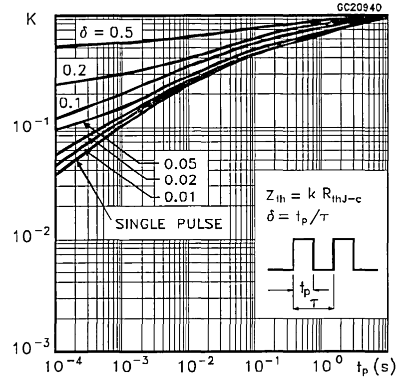
Safe Operating Areas For ISOWATT220



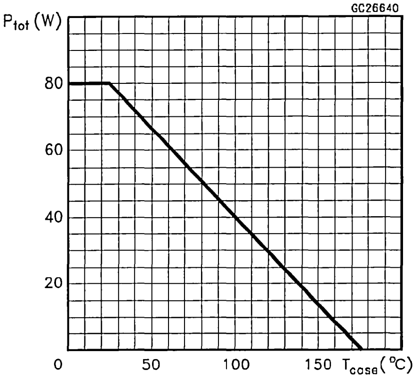
Thermal Impedeance For TO-220



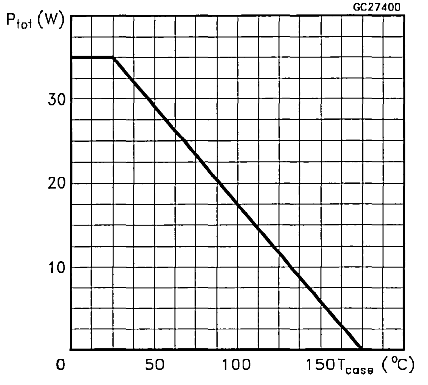
Thermal Impedance For ISOWATT220



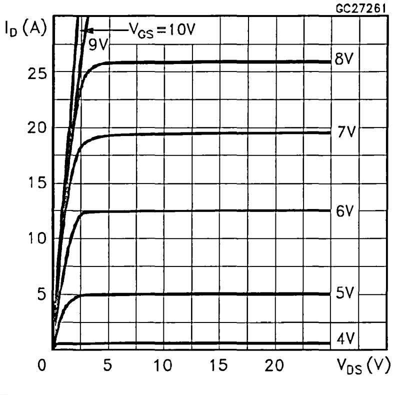
Derating Curve For TO-220



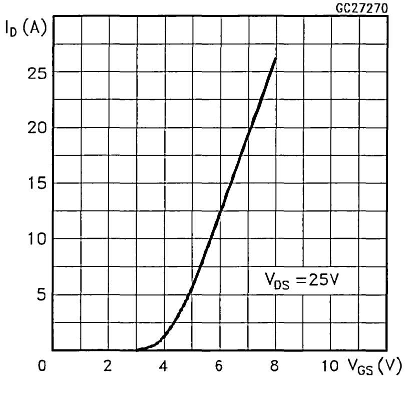
Derating Curve For ISOWATT220



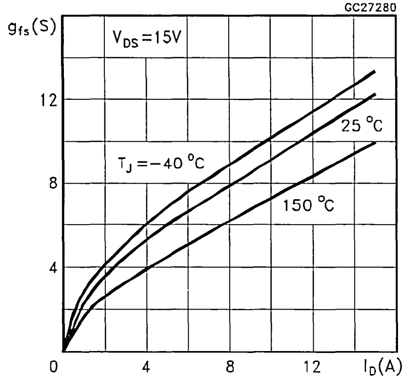
Output Characteristics



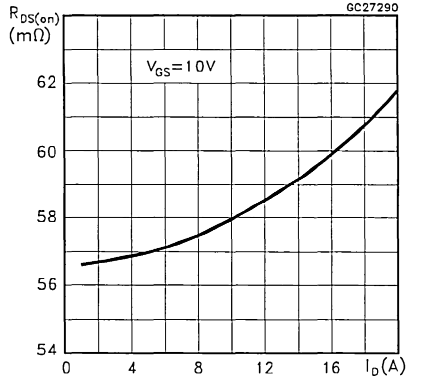
Transfer Characteristics



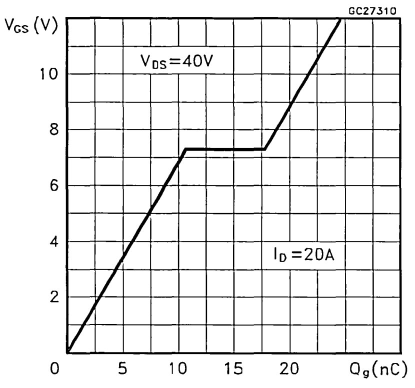
Transconductance



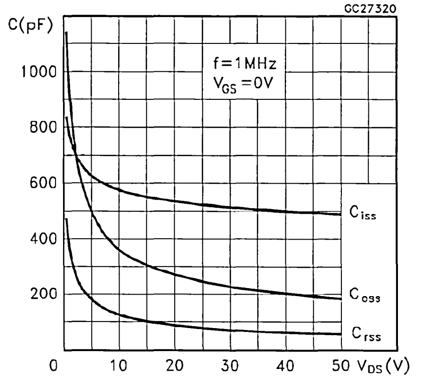
Static Drain-source On Resistance



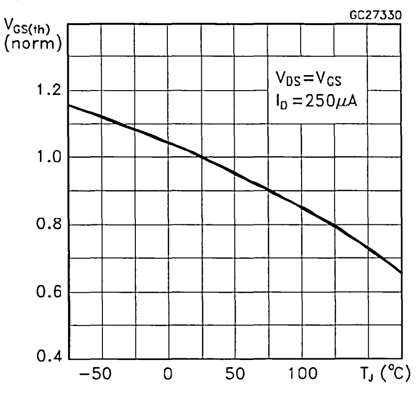
Gate Charge vs Gate-source Voltage



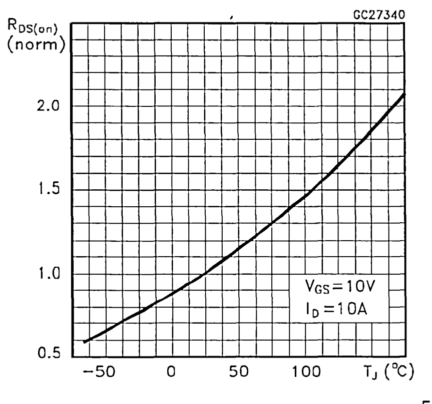
Capacitance Variations



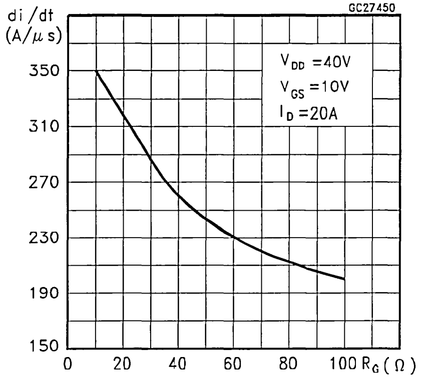
Normalized Gate Threshold Voltage vs Temperature



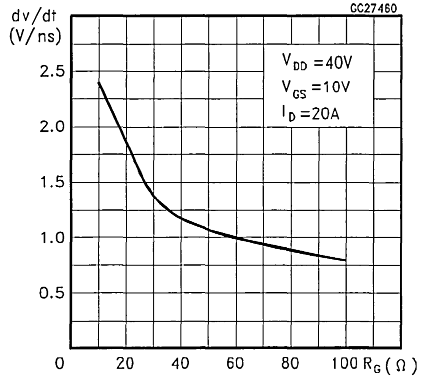
Normalized On Resistance vs Temperature



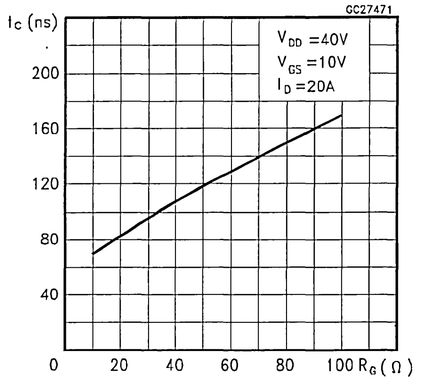
Turn-on Current Slope



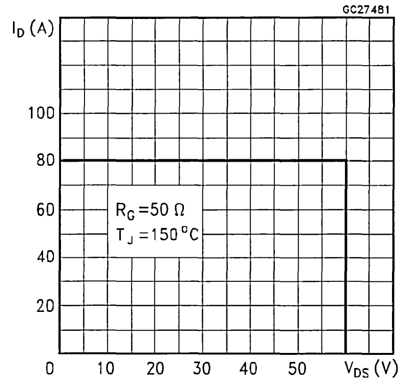
Turn-off Drain-source Voltage Slope



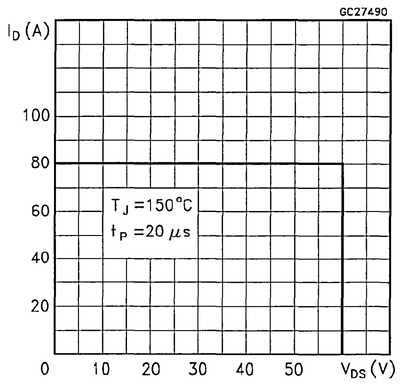
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

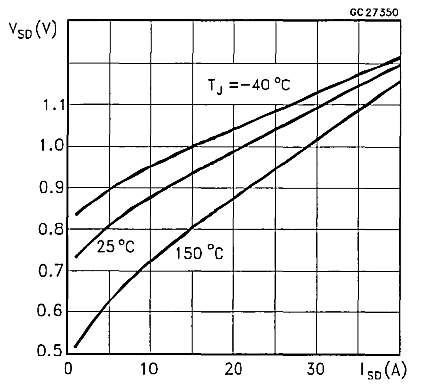


Fig. 1: Unclamped Inductive Load Test Circuits

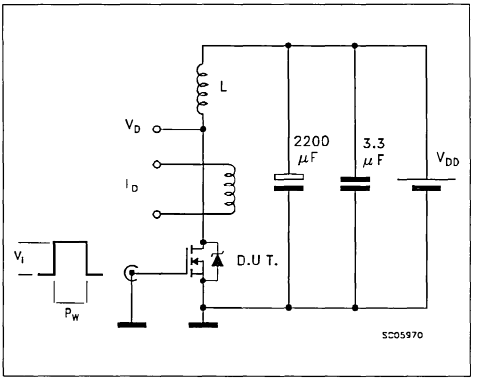


Fig. 2: Unclamped Inductive Waveforms

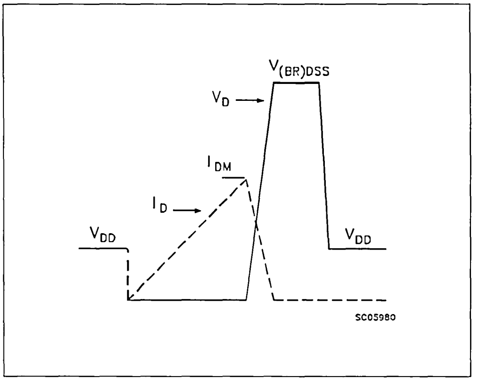


Fig. 3: Switching Times Test Circuits For Resistive Load

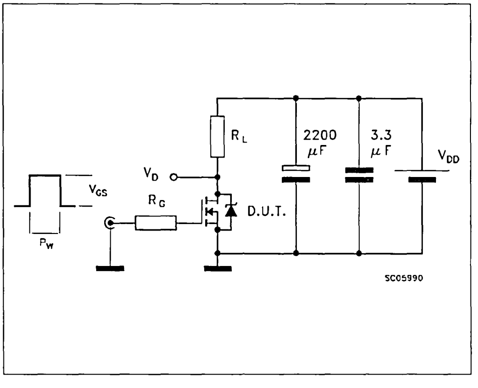


Fig. 4: Gate Charge Test Circuit

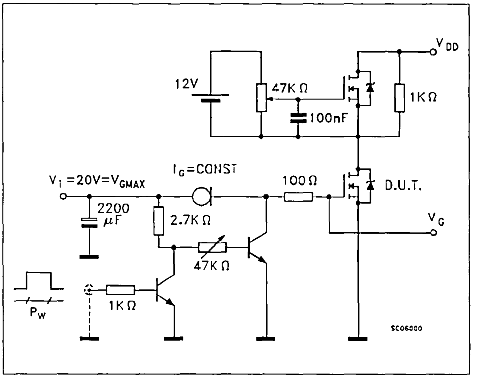
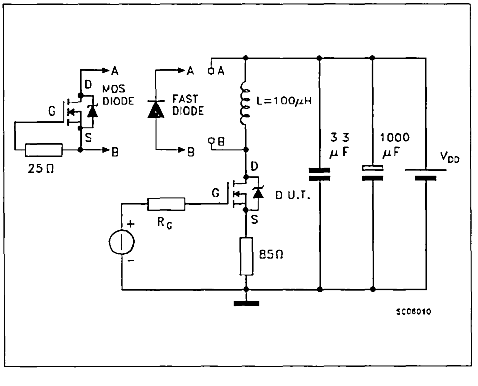


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



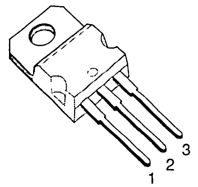
SGS-THOMSON MICROELECTRONICS

STP20N10

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP20N10	100 V	< 0.12 Ω	20 A

- TYPICAL $R_{DS(on)}$ = 0.09 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

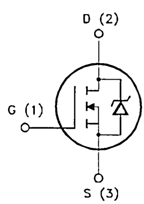


TO-220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	100	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	100	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	20	A
I_D	Drain Current (continuous) at T_c = 100 °C	14	A
I_{DM}(•)	Drain Current (pulsed)	80	A
P_{tot}	Total Dissipation at T_c = 25 °C	105	W
	Derating Factor	0.7	W/°C
T_{stg}	Storage Temperature	-65 to 175	°C
T_j	Max. Operating Junction Temperature	175	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.43	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	°C/W
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.5	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	20	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	60	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	15	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	14	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	100			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 10$ A $V_{GS} = 10V$ $I_D = 10$ A $T_c = 100$°C		0.09	0.12 0.24	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	20			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 10$ A	7	12		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		800 200 40	1100 300 60	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		25 75	35 110	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 80 V I_D = 20 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		300		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 80 V I_D = 20 A V_{GS} = 10 V		30 9 11	45	nC nC nC

SWITCHING OFF

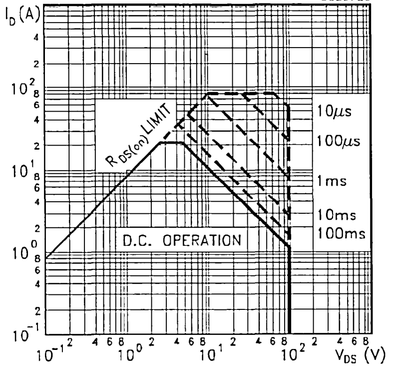
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 80 V I_D = 20 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		70 55 130	100 80 185	ns ns ns

SOURCE DRAIN DIODE

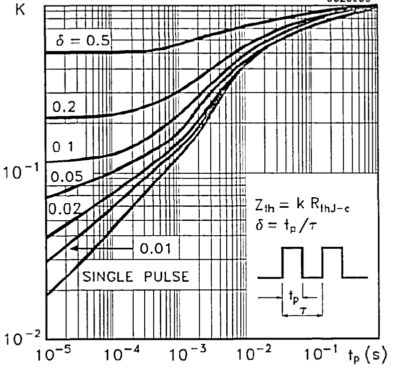
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				20 80	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 20 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 20 A di/dt = 100 A/µs V_{DD} = 20 V T_j = 150 °C (see test circuit, figure 5)		125 0.44 7		ns µC A

(*) Pulsed Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

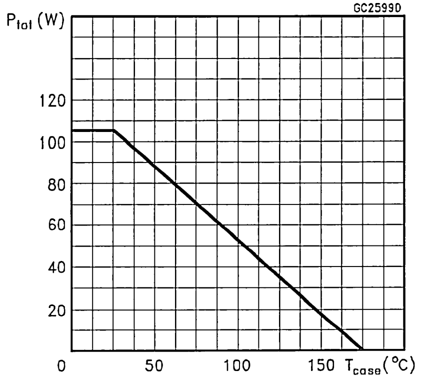
Safe Operating Areas



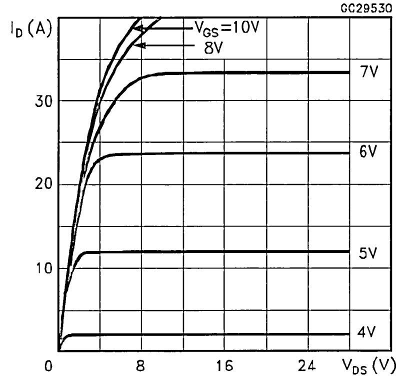
Thermal Impedance



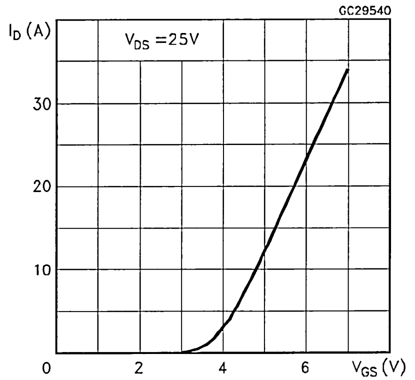
Derating Curve



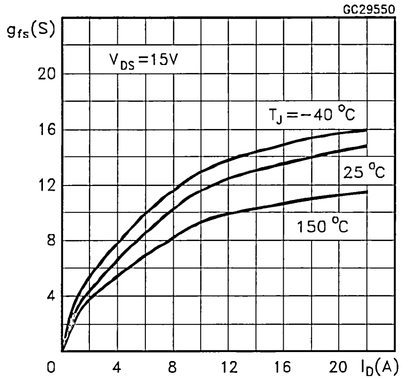
Output Characteristics



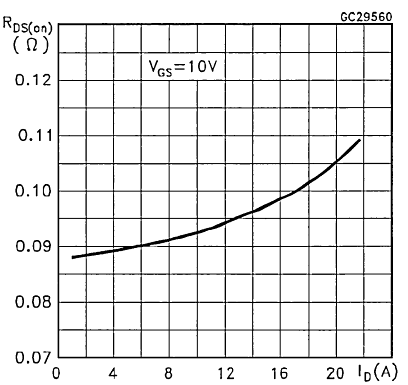
Transfer Characteristics



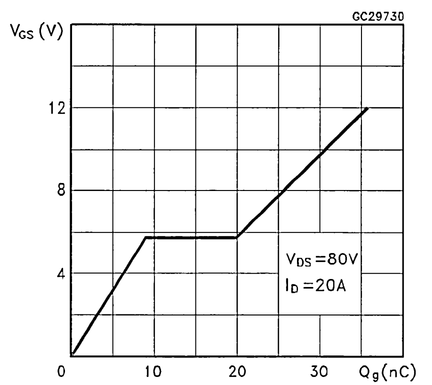
Transconductance



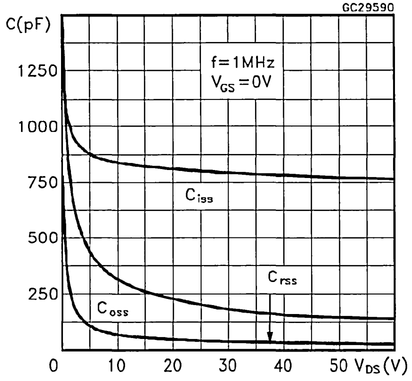
Static Drain-source On Resistance



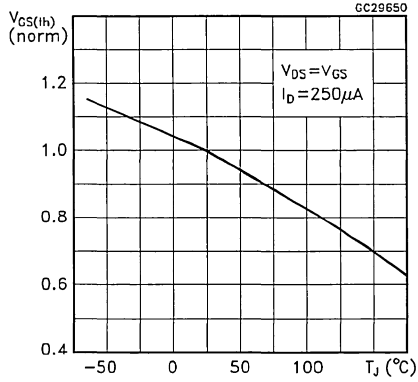
Gate Charge vs Gate-source Voltage



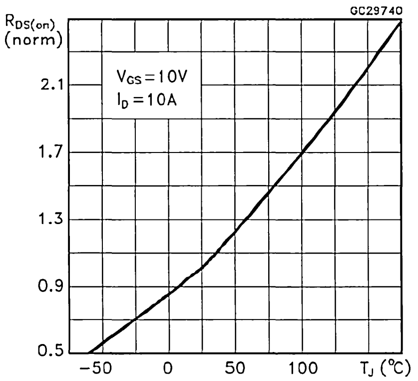
Capacitance Variations



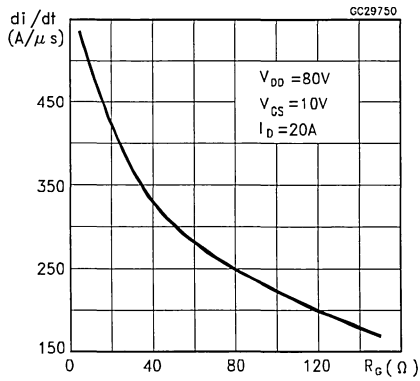
Normalized Gate Threshold Voltage vs Temperature



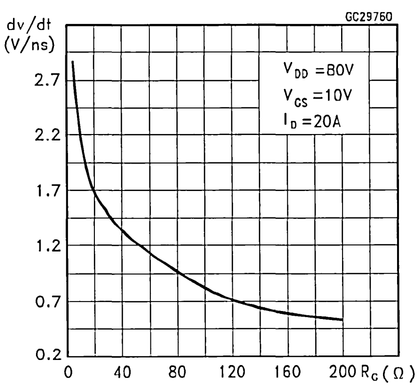
Normalized On Resistance vs Temperature



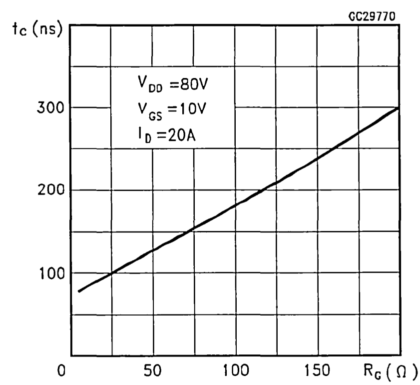
Turn-on Current Slope



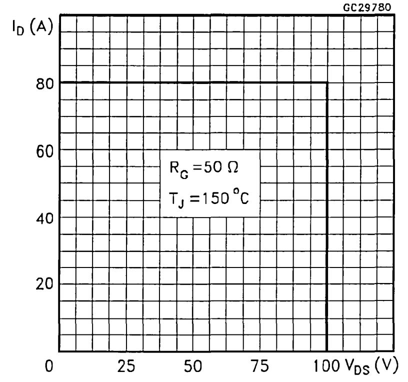
Turn-off Drain-source Voltage Slope



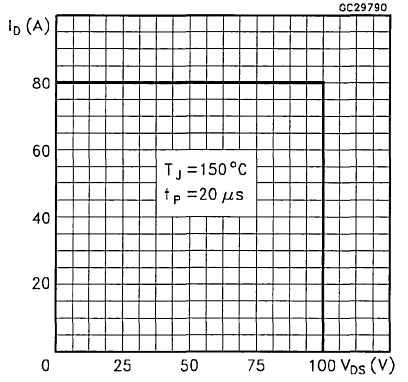
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

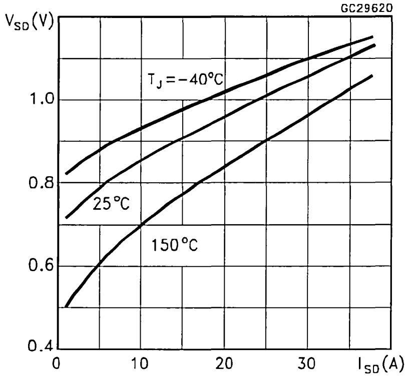


Fig. 1: Unclamped Inductive Load Test Circuits

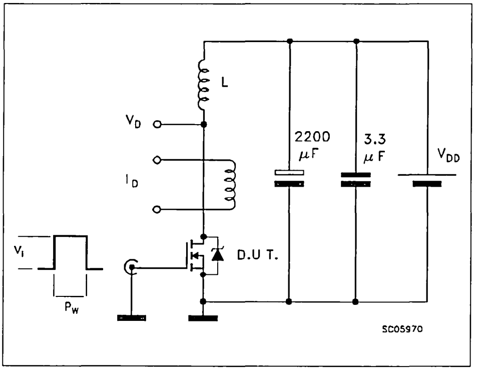


Fig. 2: Unclamped Inductive Waveforms

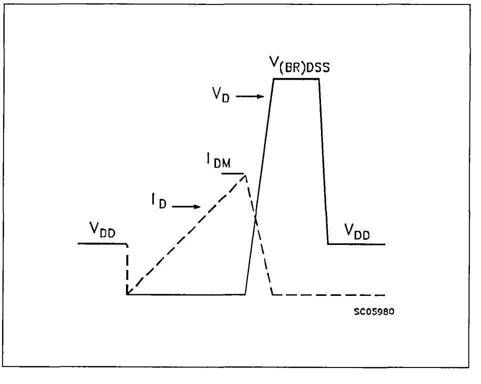


Fig. 3: Switching Times Test Circuits For Resistive Load

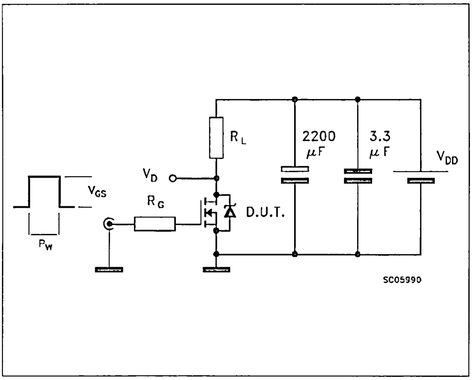


Fig. 4: Gate Charge Test Circuit

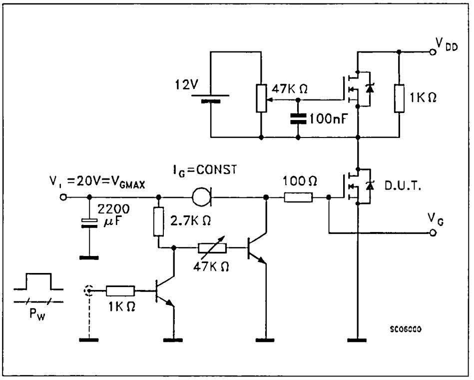
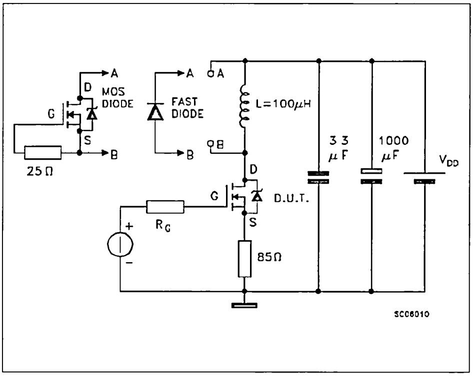


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



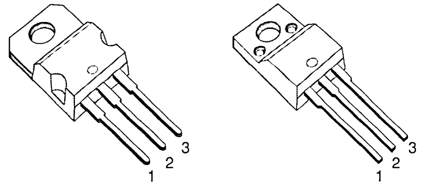
SGS-THOMSON MICROELECTRONICS

STP20N10L
STP20N10LFI

N - CHANNEL ENHANCEMENT MODE LOW THRESHOLD POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP20N10L	100 V	< 0.12 Ω	20 A
STP20N10LFI	100 V	< 0.12 Ω	12 A

- TYPICAL $R_{DS(on)}$ = 0.09 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- LOGIC LEVEL COMPATIBLE INPUT
- APPLICATION ORIENTED CHARACTERIZATION

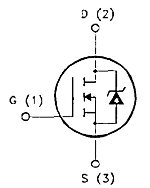


TO-220 ISOWATT220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP20N10L	STP20N10LFI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	100		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	100		V
V_{GS}	Gate-source Voltage	± 15		V
I_D	Drain Current (continuous) at T_c = 25 °C	20	12	A
I_D	Drain Current (continuous) at T_c = 100 °C	14	8	A
I_{DM}(•)	Drain Current (pulsed)	80	80	A
P_{tot}	Total Dissipation at T_c = 25 °C	105	40	W
	Derating Factor	0.7	0.27	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.43	3.75	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	20	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	120	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	30	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	14	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ μA $V_{GS} = 0$	100			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 15$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ μA	1	1.6	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 5$ V $I_D = 10$ A $V_{GS} = 5$ V $I_D = 10$ A $T_c = 100$°C		0.09	0.12 0.24	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	20			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 10$ A	10	16		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		1200 250 60	1500 350 90	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 10 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 3)		50 140	70 200	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 80 V I_D = 20 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		140		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 80 V I_D = 20 A V_{GS} = 5 V		22 6 12	30	nC nC nC

SWITCHING OFF

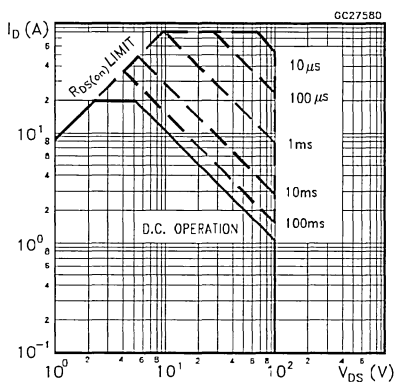
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 80 V I_D = 20 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		80 80 160	110 110 220	ns ns ns

SOURCE DRAIN DIODE

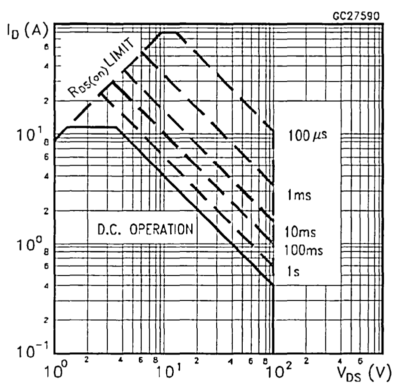
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				20 80	A A
V_{SD} ( )	Forward On Voltage	I_{SD} = 20 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 20 A di/dt = 100 A/µs V_{DD} = 50 V T_j = 150 °C (see test circuit, figure 5)		130 0.4 6		ns µC A

( ) Pulsed. Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

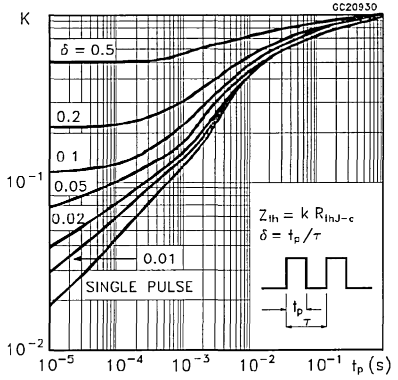
Safe Operating Areas For TO-220



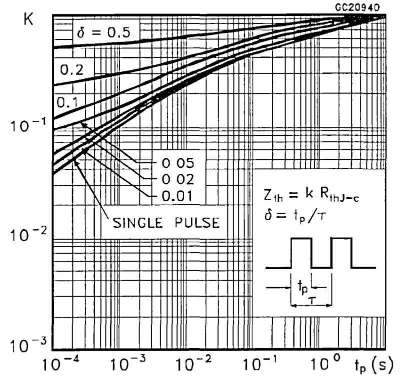
Safe Operating Areas For ISOWATT220



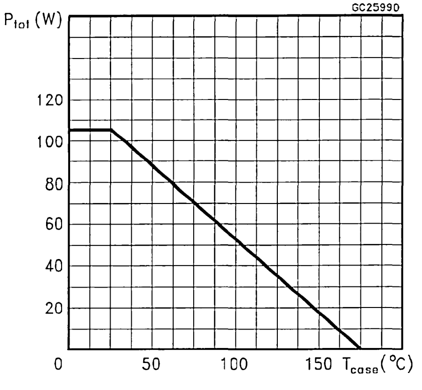
Thermal Impedeance For TO-220



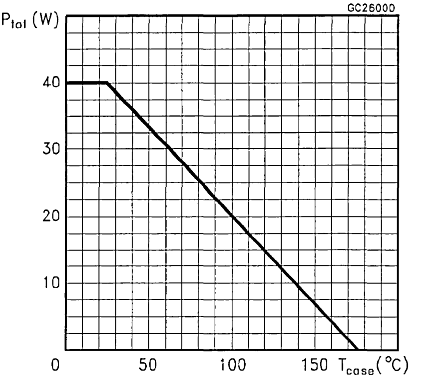
Thermal Impedance For ISOWATT220



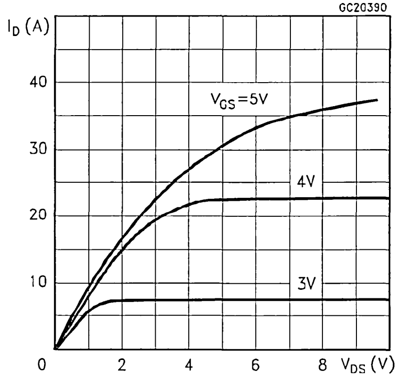
Derating Curve For TO-220



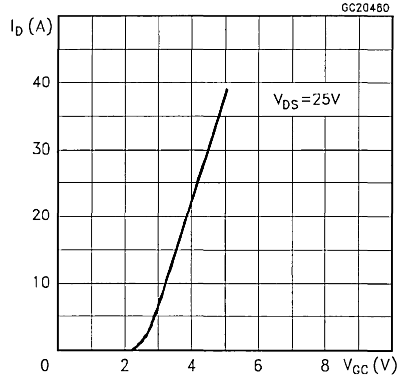
Derating Curve For ISOWATT220



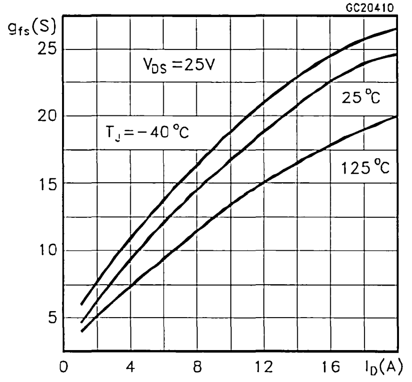
Output Characteristics



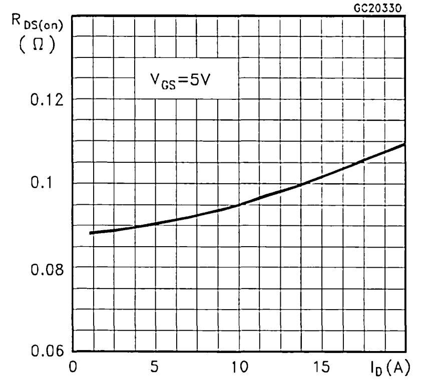
Transfer Characteristics



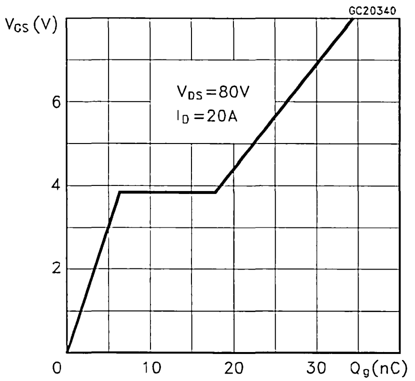
Transconductance



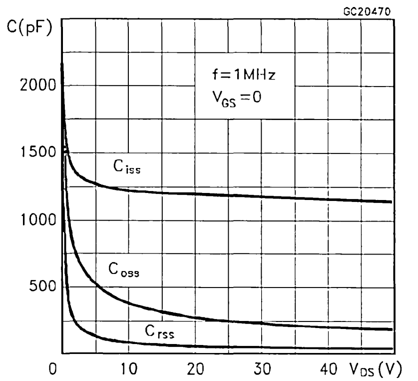
Static Drain-source On Resistance



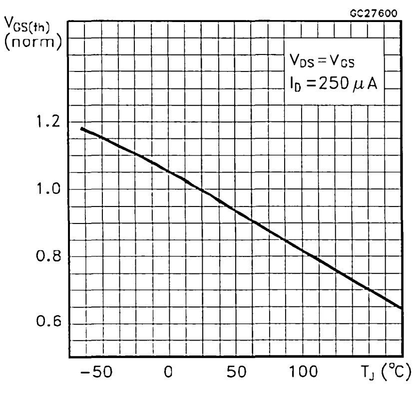
Gate Charge vs Gate-source Voltage



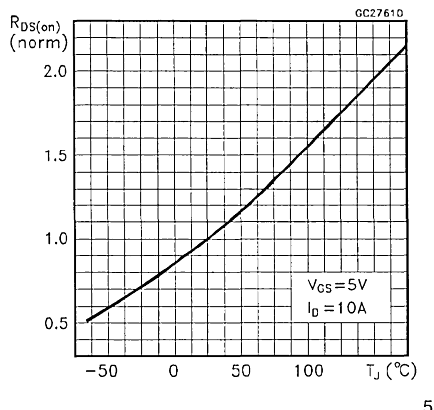
Capacitance Variations



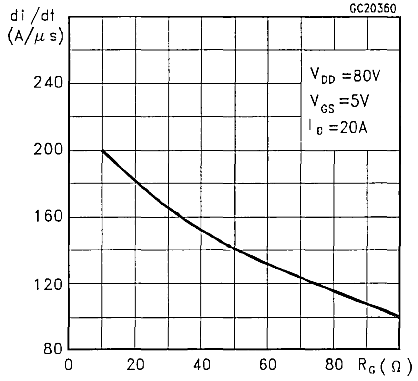
Normalized Gate Threshold Voltage vs Temperature



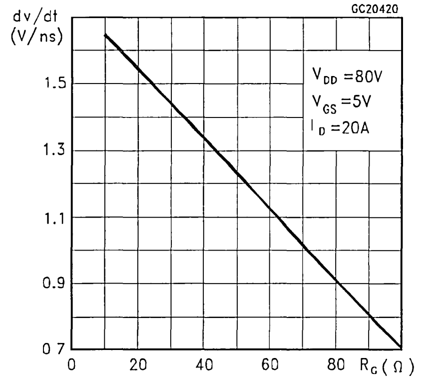
Normalized On Resistance vs Temperature



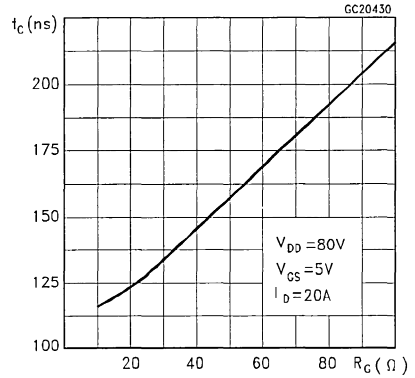
Turn-on Current Slope



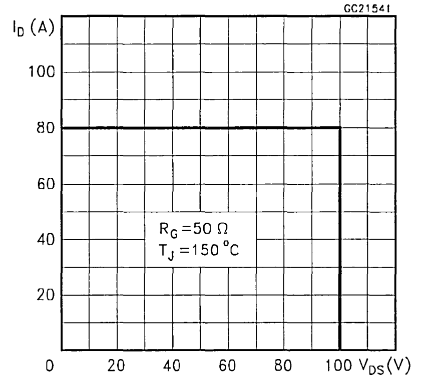
Turn-off Drain-source Voltage Slope



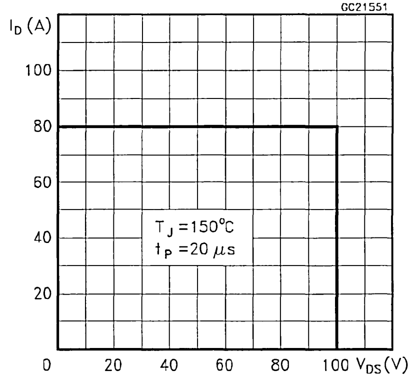
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

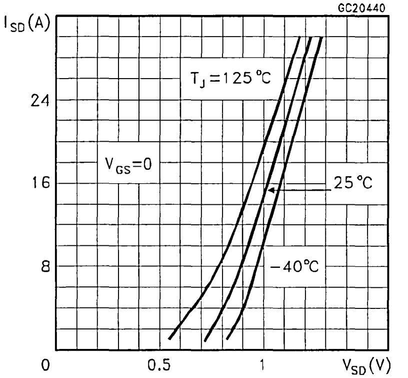


Fig. 1: Unclamped Inductive Load Test Circuits

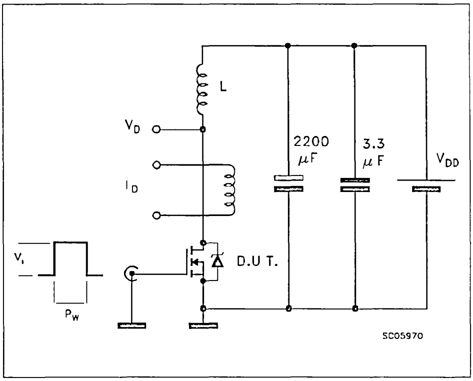


Fig. 2: Unclamped Inductive Waveforms

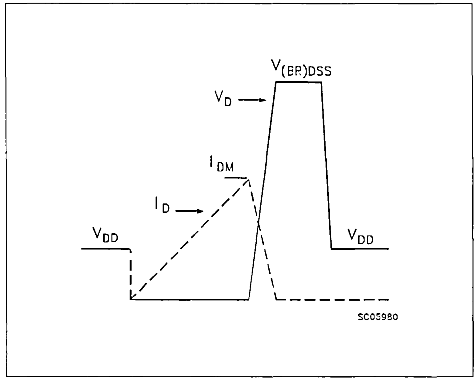


Fig. 3: Switching Times Test Circuits For Resistive Load

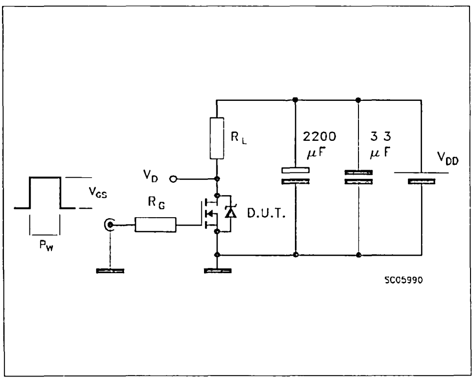


Fig. 4: Gate Charge Test Circuit

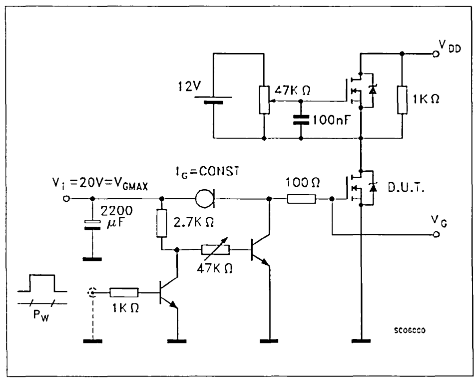
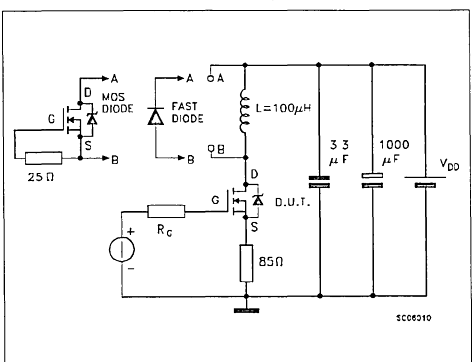


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time

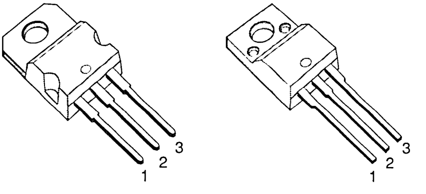


STP21N05L
STP21N05LFI

N - CHANNEL ENHANCEMENT MODE LOW THRESHOLD POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP21N05L	50 V	< 0.085 Ω	21 A
STP21N05LFI	50 V	< 0.085 Ω	14 A

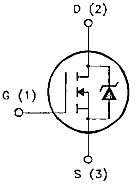
- TYPICAL $R_{DS(on)}$ = 0.065 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- LOGIC LEVEL COMPATIBLE INPUT
- 175 °C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION



TO-220 ISOWATT220

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP21N05L	STP21N05LFI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50		V
V_{GS}	Gate-source Voltage	± 15		V
I_D	Drain Current (continuous) at T_c = 25 °C	21	14	A
I_D	Drain Current (continuous) at T_c = 100 °C	14	9	A
I_{DM}(•)	Drain Current (pulsed)	84	84	A
P_{tot}	Total Dissipation at T_c = 25 °C	80	35	W
	Derating Factor	0.53	0.23	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.88	4.29	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	21	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	80	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	20	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	14	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	50			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 15 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	1	1.6	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 5 V I_D = 10.5 A V_{GS} = 5 V I_D = 10.5 A T_c = 100°C		0.065	0.085 0.17	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	21			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 10.5 A	6	15		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		700 250 70	1000 350 100	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 10.5 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 3)		65 370	95 530	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 21 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		130		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 21 A V_{GS} = 5 V		18 6 10	26	nC nC nC

SWITCHING OFF

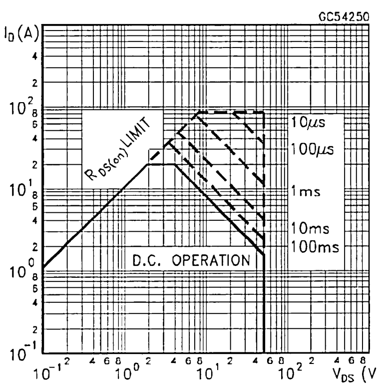
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 21 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		70 100 180	100 150 260	ns ns ns

SOURCE DRAIN DIODE

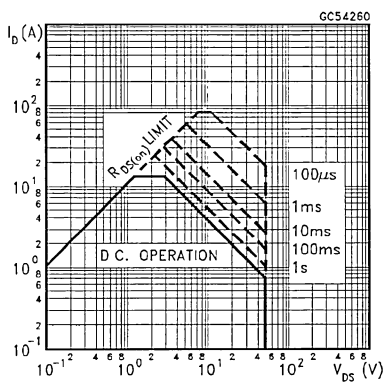
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				21 84	A A
V_{SD} (·)	Forward On Voltage	I_{SD} = 21 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 21 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		65 0.13 4		ns µC A

(·) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

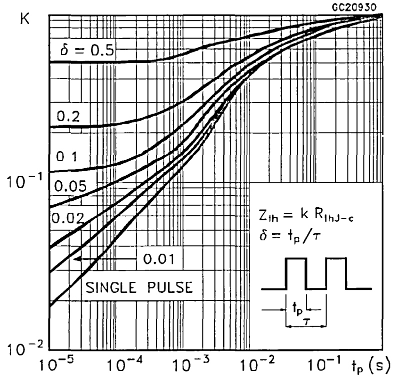
Safe Operating Areas



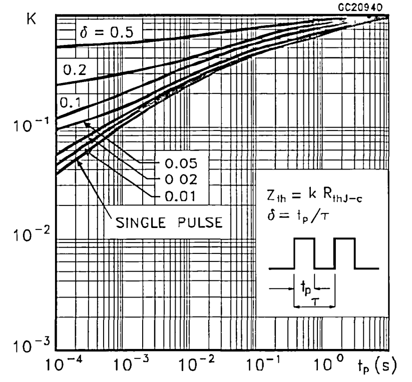
Safe Operating Areas



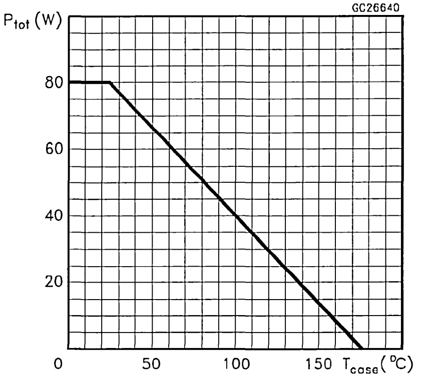
Thermal Impedeance For TO-220



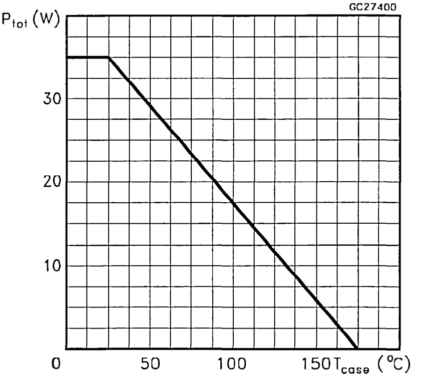
Thermal Impedance For ISOWATT220



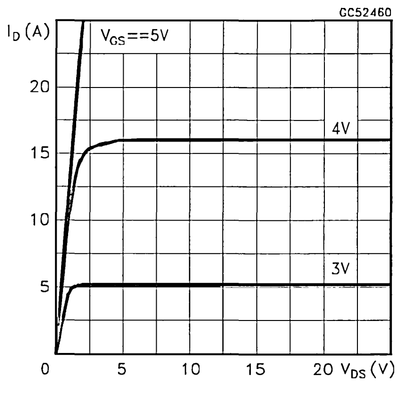
Derating Curve For TO-220



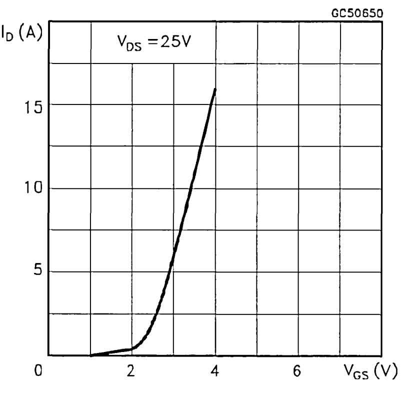
Derating Curve For ISOWATT220



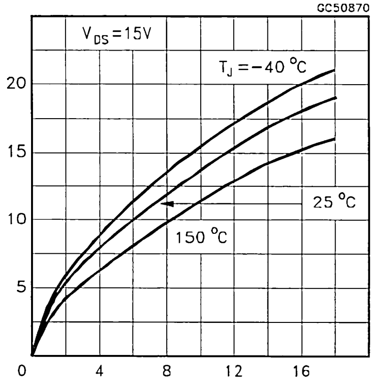
Output Characteristics



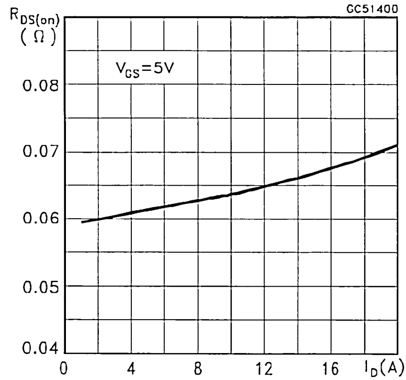
Transfer Characteristics



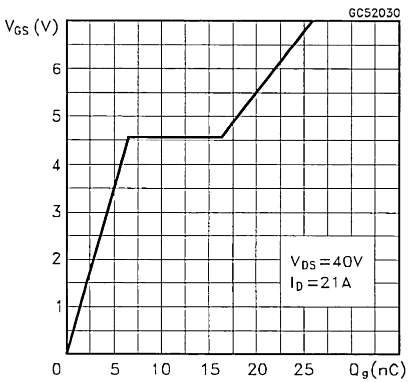
Transconductance



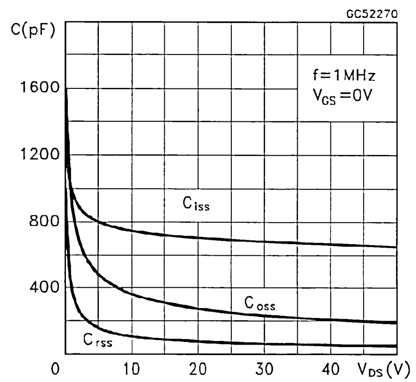
Static Drain-source On Resistance



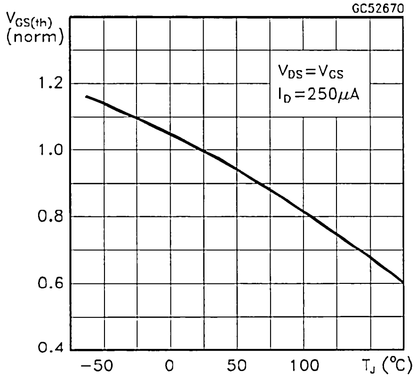
Gate Charge vs Gate-source Voltage



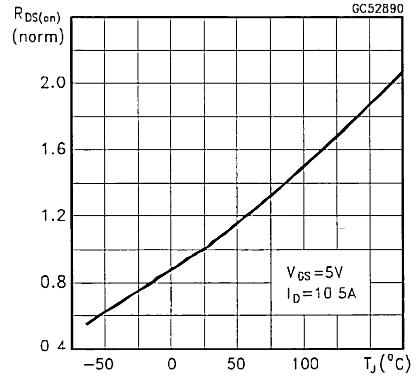
Capacitance Variations



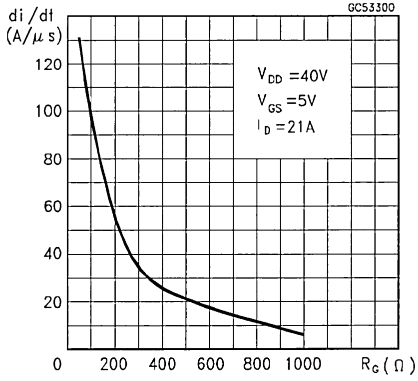
Normalized Gate Threshold Voltage vs Temperature



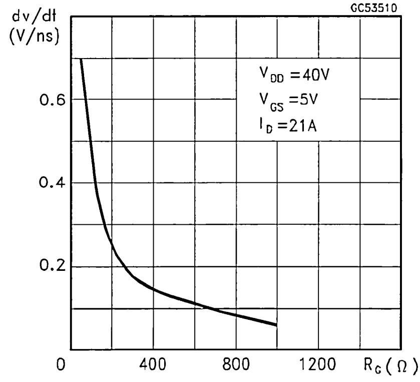
Normalized On Resistance vs Temperature



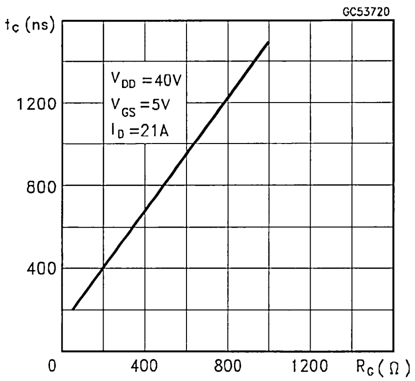
Turn-on Current Slope



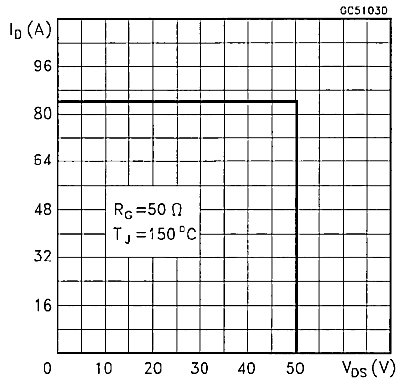
Turn-off Drain-source Voltage Slope



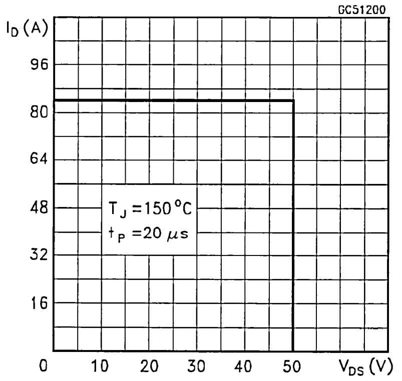
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

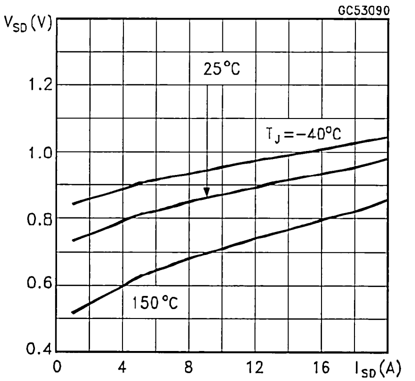


Fig. 1: Unclamped Inductive Load Test Circuits

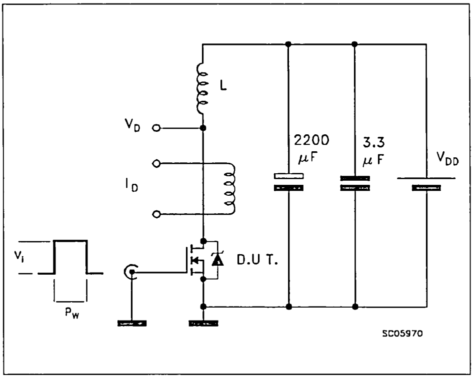


Fig. 2: Unclamped Inductive Waveforms

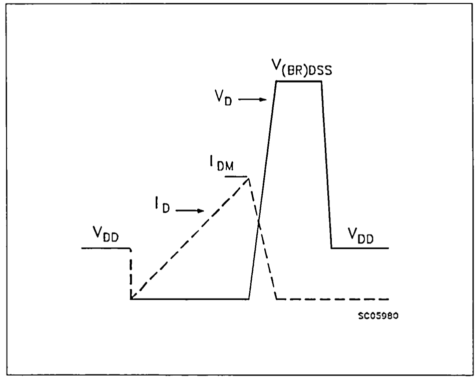


Fig. 3: Switching Times Test Circuits For Resistive Load

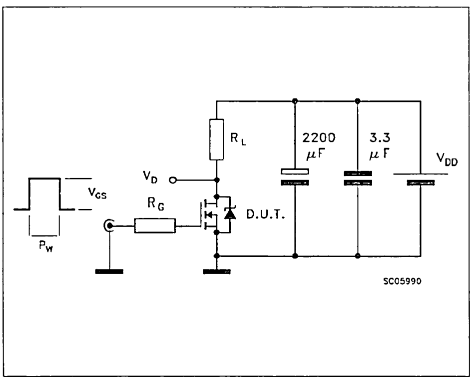


Fig. 4: Gate Charge Test Circuit

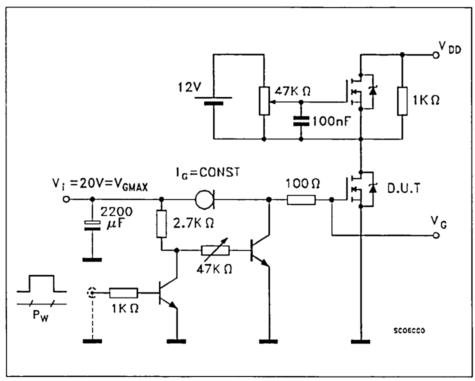
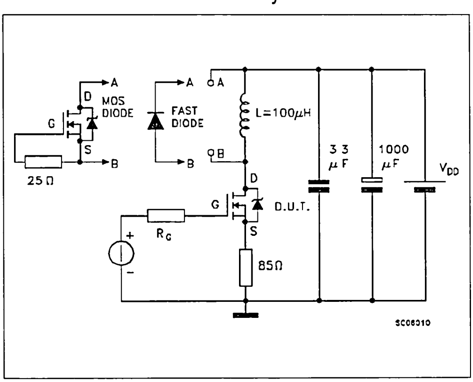


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON
MICROELECTRONICS

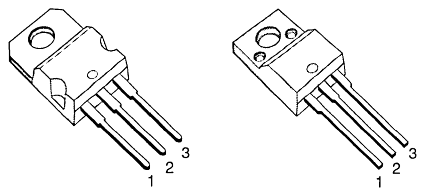
STP21N06L
STP21N06LFI

N - CHANNEL ENHANCEMENT MODE LOW THRESHOLD POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP21N06L	60 V	< 0.085 Ω	21 A
STP21N06LFI	60 V	< 0.085 Ω	14 A

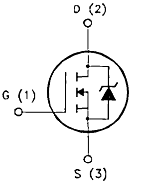
- TYPICAL $R_{DS(on)}$ = 0.065 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- LOGIC LEVEL COMPATIBLE INPUT
- 175 °C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



TO-220 **ISOWATT220**

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP21N06L	STP21N06LFI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	60		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	60		V
V_{GS}	Gate-source Voltage	± 15		V
I_D	Drain Current (continuous) at T_c = 25 °C	21	14	A
I_D	Drain Current (continuous) at T_c = 100 °C	14	9	A
I_{DM}(•)	Drain Current (pulsed)	84	84	A
P_{tot}	Total Dissipation at T_c = 25 °C	80	35	W
	Derating Factor	0.53	0.23	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.88	4.29	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	21	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	80	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	20	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	14	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	60			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 15$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	1	1.6	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 5$ V $I_D = 10.5$ A $V_{GS} = 5$ V $I_D = 10.5$ A $T_c = 100$°C		0.065	0.085 0.17	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	21			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 10.5$ A	6	15		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		700 250 70	1000 350 100	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 10.5 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 3)		65 370	95 530	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 21 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		130		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 21 A V_{GS} = 5 V		18 6 10	26	nC nC nC

SWITCHING OFF

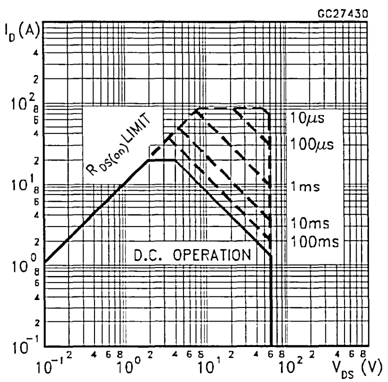
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 21 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		70 100 180	100 150 260	ns ns ns

SOURCE DRAIN DIODE

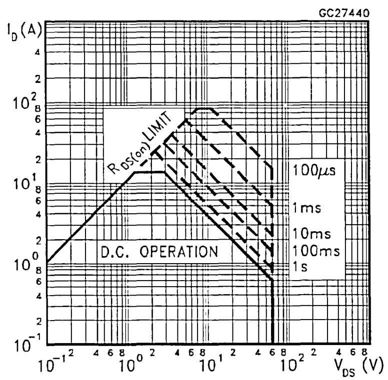
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				21 84	A A
V_{SD} (∗)	Forward On Voltage	I_{SD} = 21 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 21 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		65 0.13 4		ns µC A

(∗) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

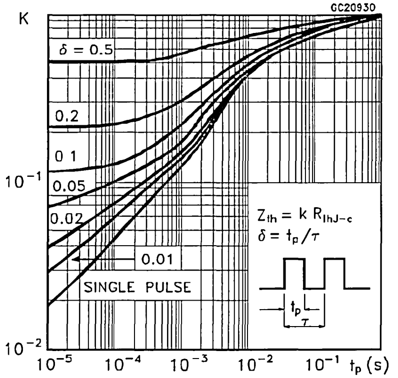
Safe Operating Areas



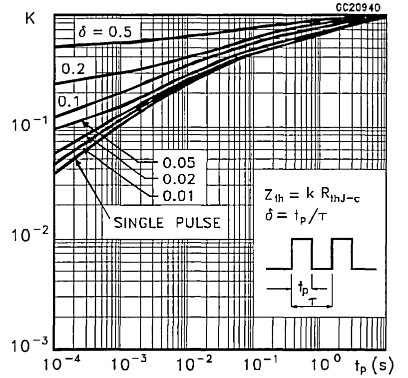
Safe Operating Areas



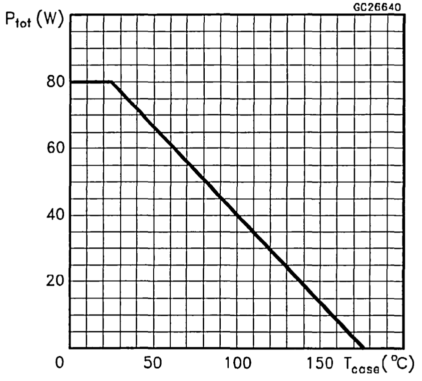
Thermal Impedeance For TO-220



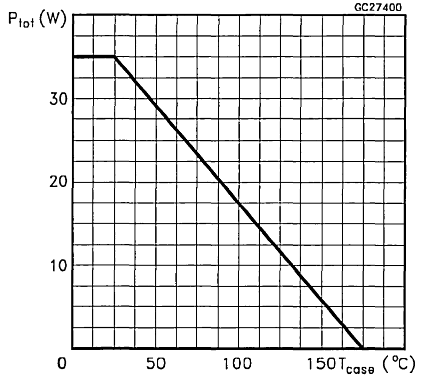
Thermal Impedance For ISOWATT220



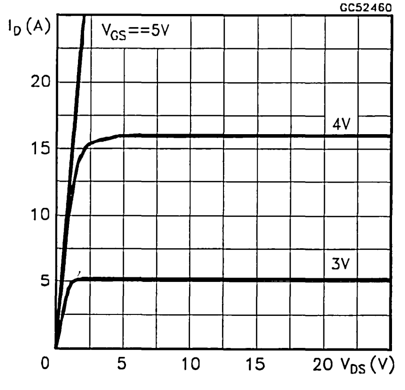
Derating Curve For TO-220



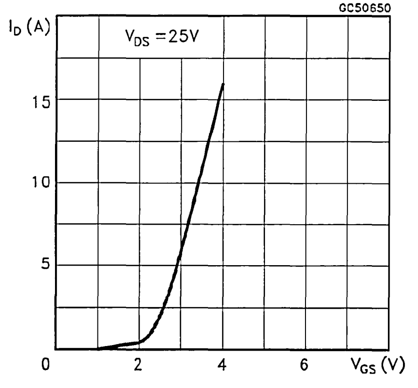
Derating Curve For ISOWATT220



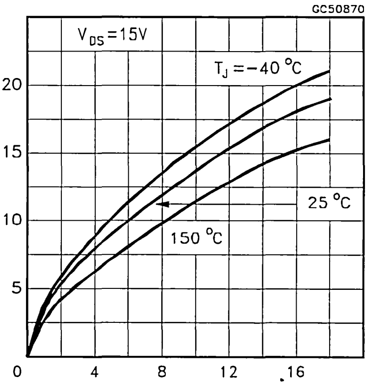
Output Characteristics



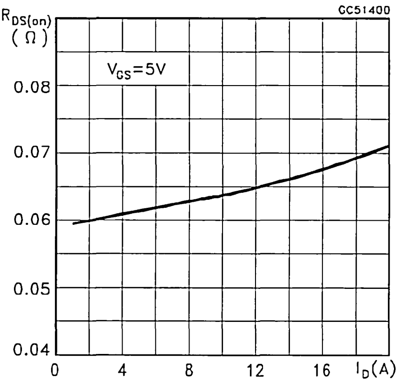
Transfer Characteristics



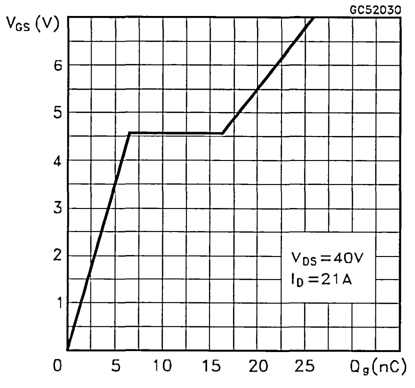
Transconductance



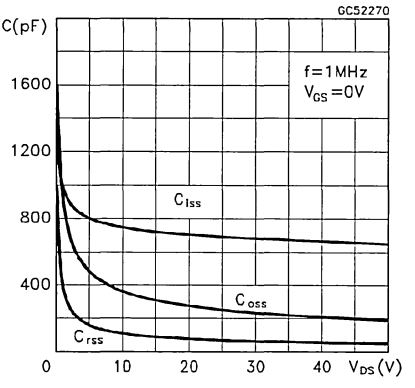
Static Drain-source On Resistance



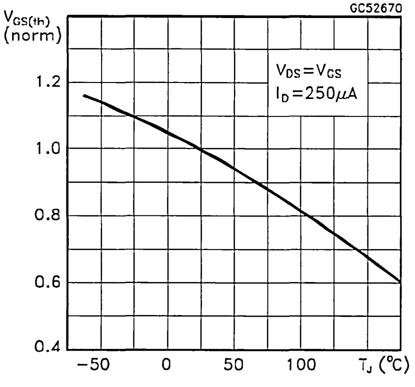
Gate Charge vs Gate-source Voltage



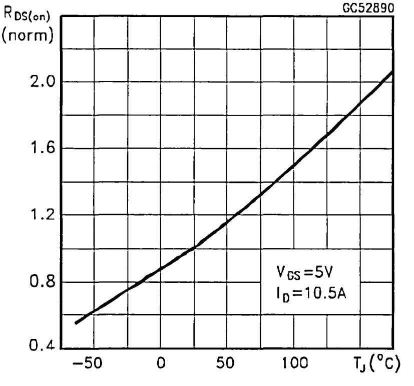
Capacitance Variations



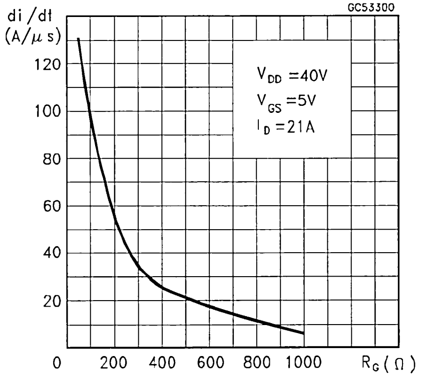
Normalized Gate Threshold Voltage vs Temperature



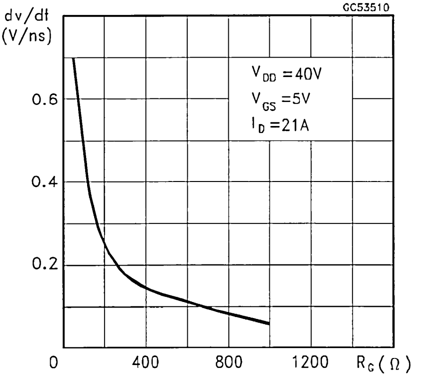
Normalized On Resistance vs Temperature



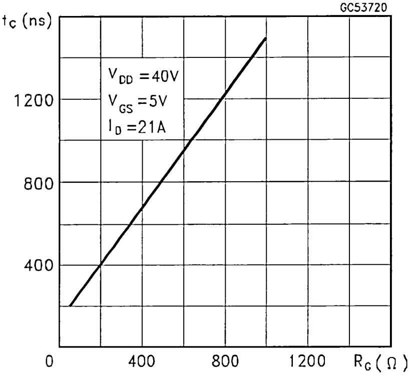
Turn-on Current Slope



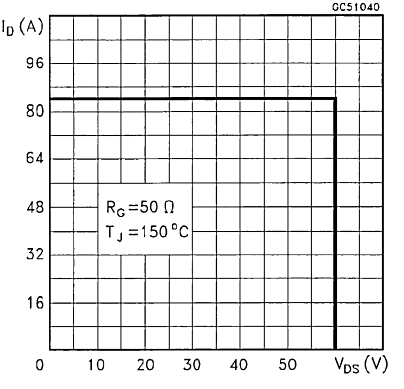
Turn-off Drain-source Voltage Slope



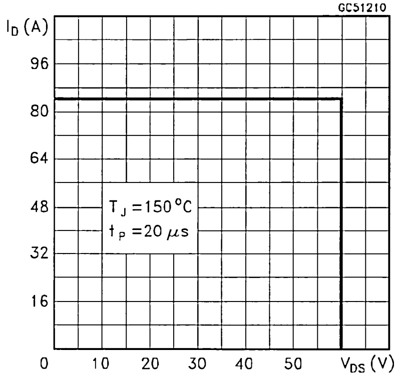
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

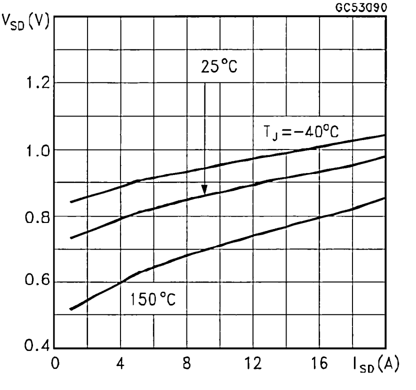


Fig. 1: Unclamped Inductive Load Test Circuits

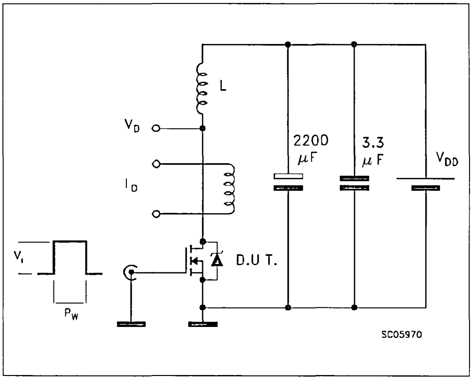


Fig. 2: Unclamped Inductive Waveforms

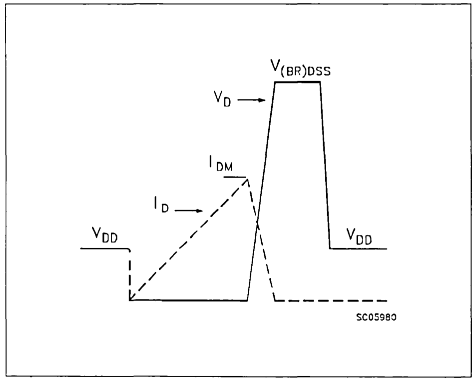


Fig. 3: Switching Times Test Circuits For Resistive Load

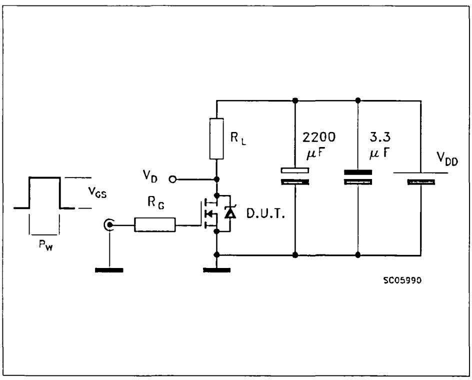


Fig. 4: Gate Charge Test Circuit

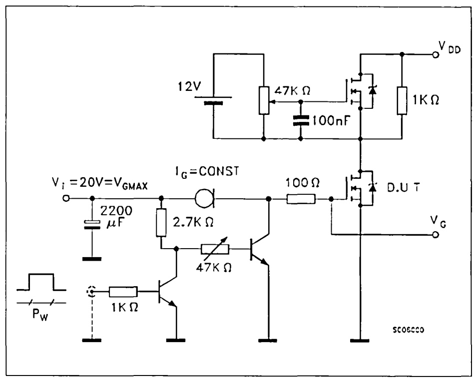
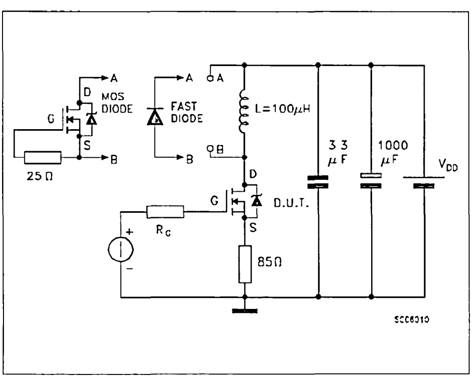


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



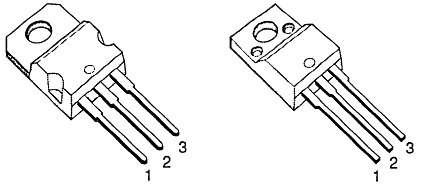
SGS-THOMSON MICROELECTRONICS

STP25N05
STP25N05FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP25N05 STP25N05FI	50 V 50 V	< 0.065 Ω < 0.065 Ω	25 A 16 A

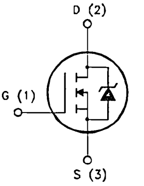
- TYPICAL $R_{DS(on)}$ = 0.048 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION



TO-220 ISOWATT220

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP25N05	STP25N05FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	25	16	A
I_D	Drain Current (continuous) at T_c = 100 °C	17	11	A
I_{DM}(•)	Drain Current (pulsed)	100	100	A
P_{tot}	Total Dissipation at T_c = 25 °C	90	40	W
	Derating Factor	0.6	0.27	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case Max	1.67	3.75	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	25	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	120	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	30	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	17	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	50			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 12.5$ A $V_{GS} = 10V$ $I_D = 12.5$ A $T_c = 100$°C		0.048	0.065 0.13	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	25			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 12.5$ A	7	11		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		700 320 90	900 450 150	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		30 90	45 130	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 25 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		230		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 25 A V_{GS} = 10 V		26 8 9	40	nC nC nC

SWITCHING OFF

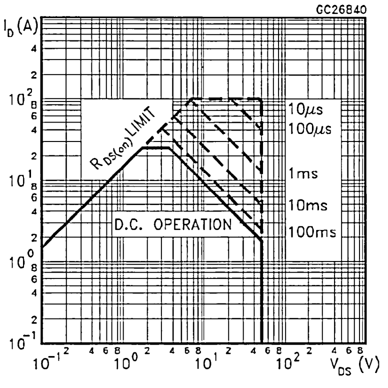
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 25 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		80 80 170	120 120 250	ns ns ns

SOURCE DRAIN DIODE

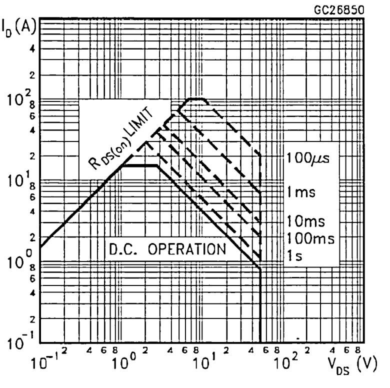
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				25 100	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 25 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 25 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		80 0.22 5.5		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

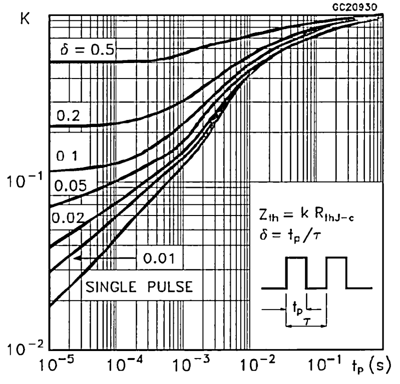
Safe Operating Areas For TO-220



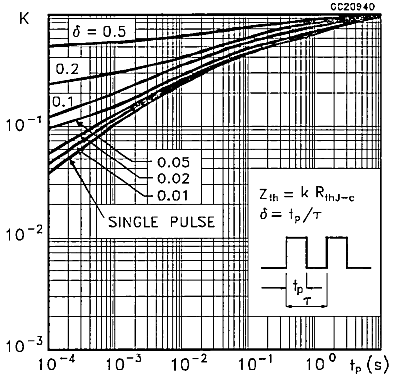
Safe Operating Areas For ISOWATT220



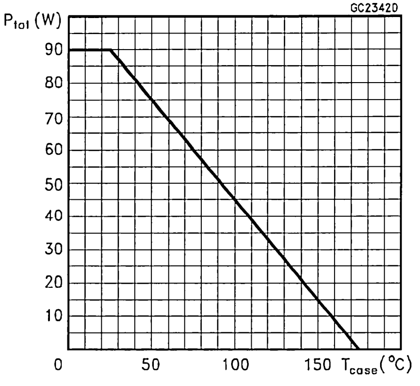
Thermal Impedeance For TO-220



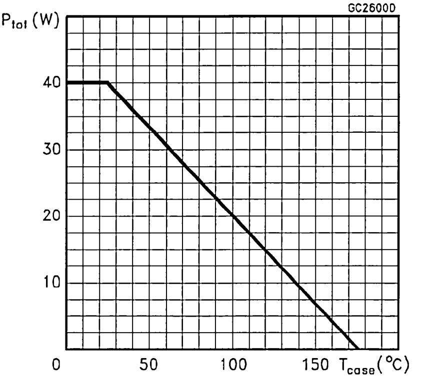
Thermal Impedance For ISOWATT220



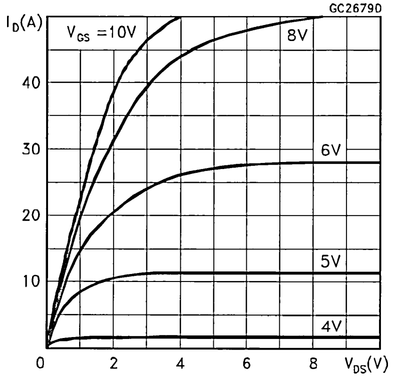
Derating Curve For TO-220



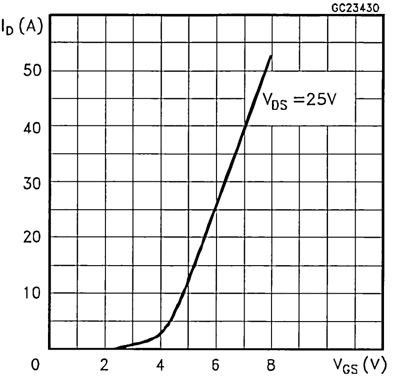
Derating Curve For ISOWATT220



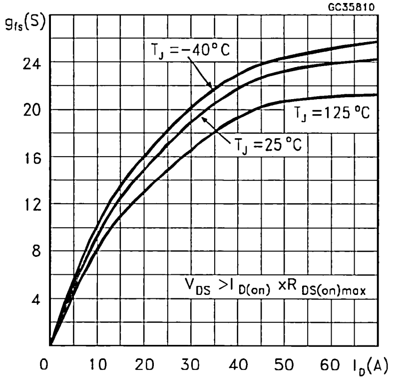
Output Characteristics



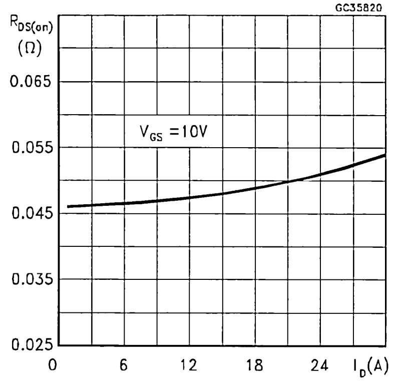
Transfer Characteristics



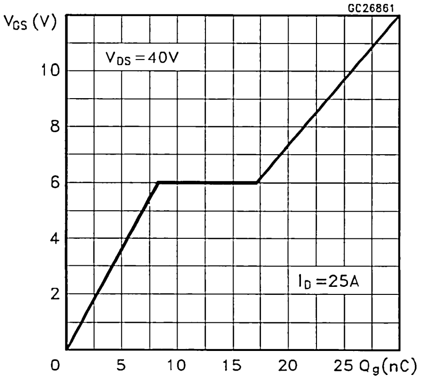
Transconductance



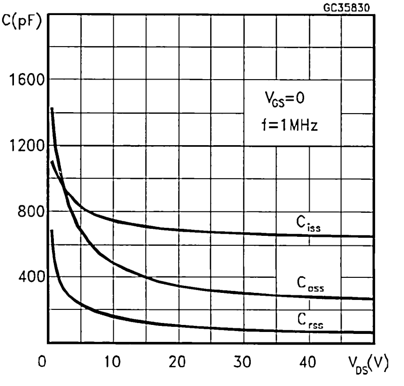
Static Drain-source On Resistance



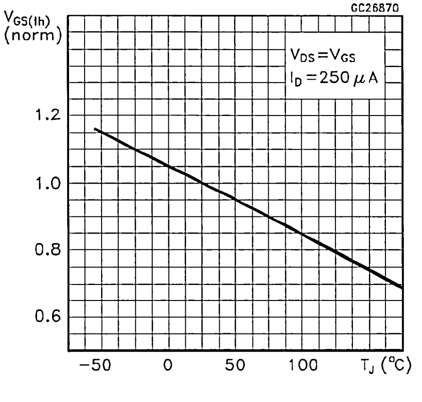
Gate Charge vs Gate-source Voltage



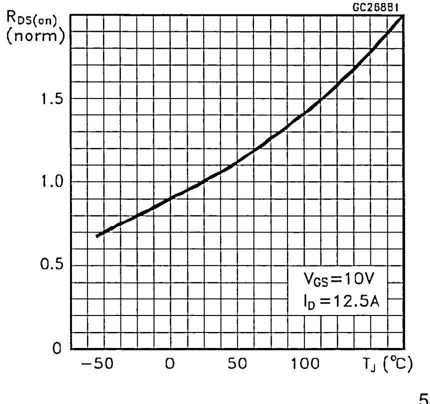
Capacitance Variations



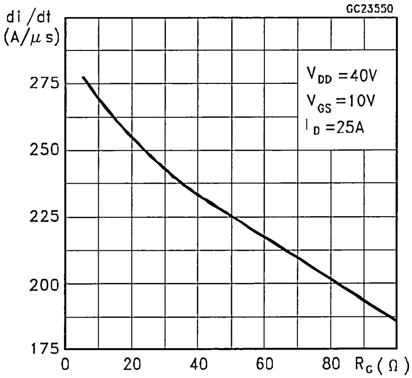
Normalized Gate Threshold Voltage vs Temperature



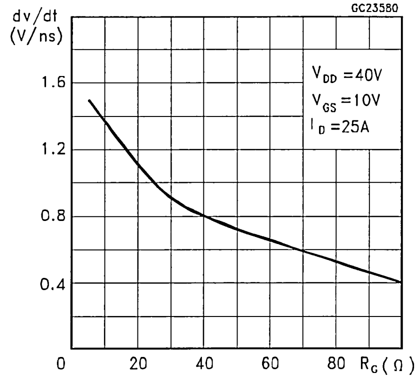
Normalized On Resistance vs Temperature



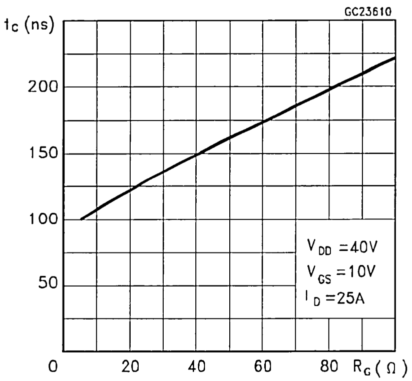
Turn-on Current Slope



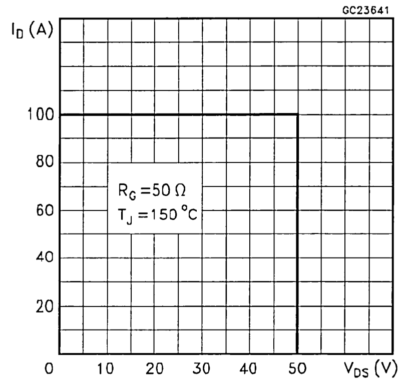
Turn-off Drain-source Voltage Slope



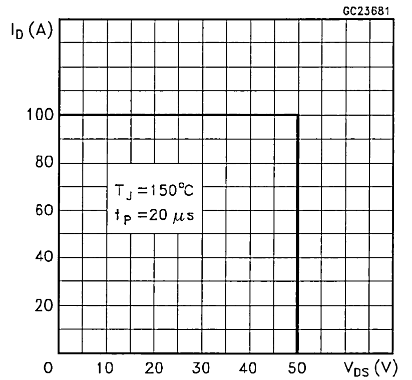
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

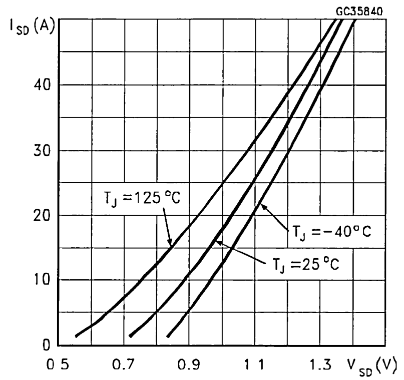


Fig. 1: Unclamped Inductive Load Test Circuits

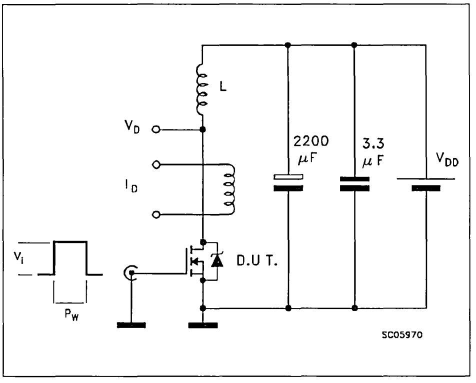


Fig. 2: Unclamped Inductive Waveforms

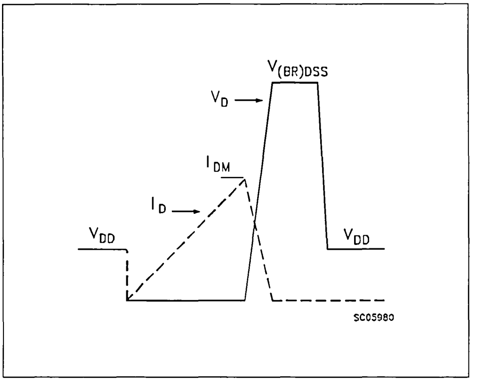


Fig. 3: Switching Times Test Circuits For Resistive Load

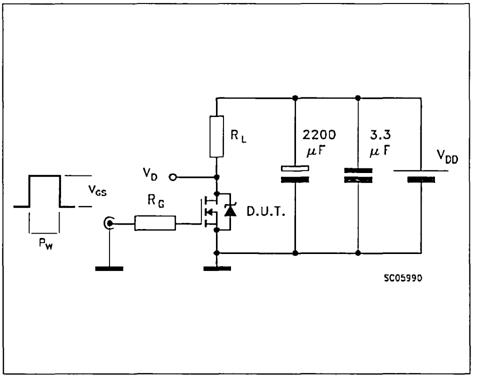


Fig. 4: Gate Charge Test Circuit

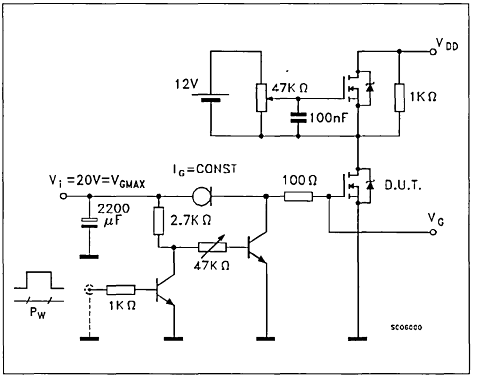
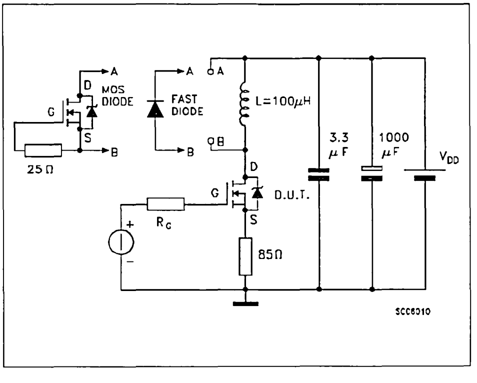


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time

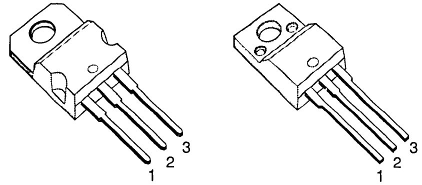


STP25N06
STP25N06FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP25N06	60 V	< 0.065 Ω	25 A
STP25N06FI	60 V	< 0.065 Ω	16 A

- TYPICAL $R_{DS(on)}$ = 0.048 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

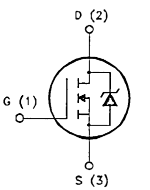


TO-220 ISOWATT220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP25N06	STP25N06FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	60		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	60		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	25	16	A
I_D	Drain Current (continuous) at T_c = 100 °C	17	11	A
I_{DM}(•)	Drain Current (pulsed)	100	100	A
P_{tot}	Total Dissipation at T_c = 25 °C	90	40	W
	Derating Factor	0.6	0.27	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1.57	3.75	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	25	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	100	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	25	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	17	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	60			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 12.5 A V_{GS} = 10V I_D = 12.5 A T_c = 100°C		0.048	0.065 0.13	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	25			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 12.5 A	7	11		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		700 320 90	900 450 150	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 3 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		30 90	45 130	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 25 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		230		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 25 A V_{GS} = 10 V		26 8 9	40	nC nC nC

SWITCHING OFF

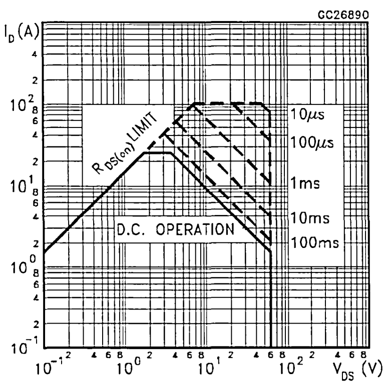
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 25 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		80 80 170	120 120 250	ns ns ns

SOURCE DRAIN DIODE

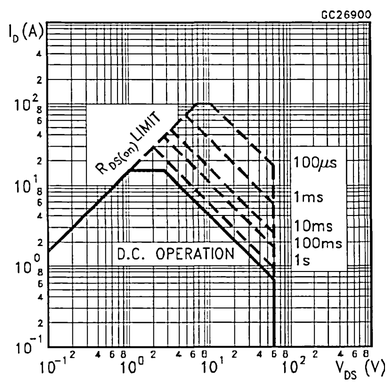
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				25 100	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 25 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 25 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		80 0.22 5.5		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

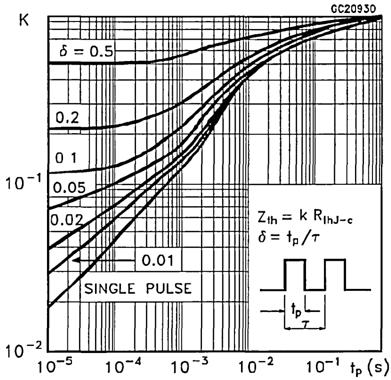
Safe Operating Areas For TO-220



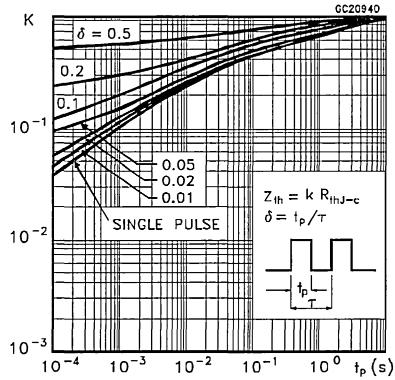
Safe Operating Areas For ISOWATT220



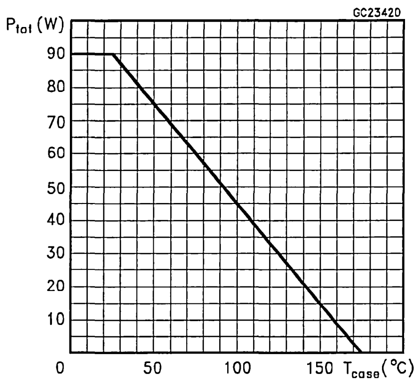
Thermal Impedeance For TO-220



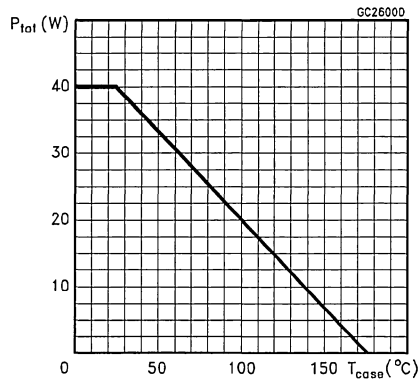
Thermal Impedance For ISOWATT220



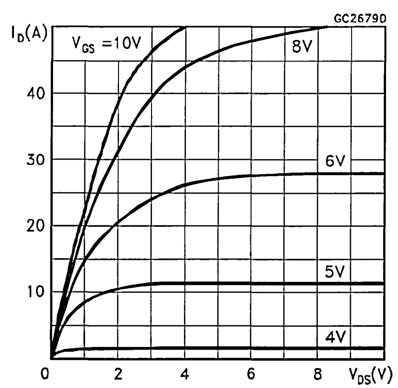
Derating Curve For TO-220



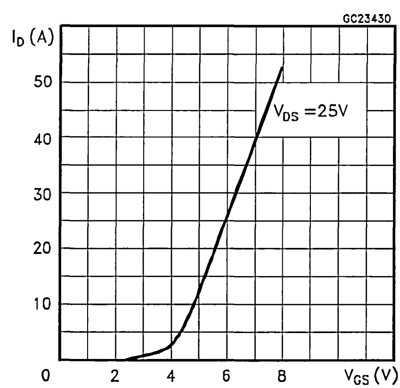
Derating Curve For ISOWATT220



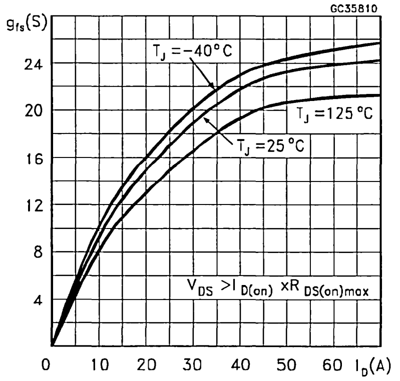
Output Characteristics



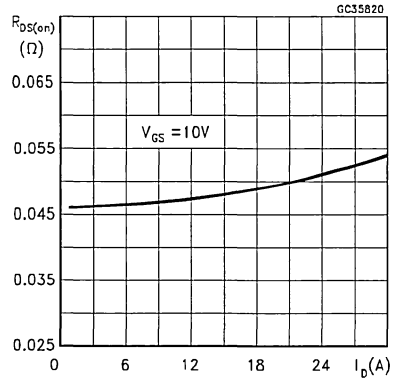
Transfer Characteristics



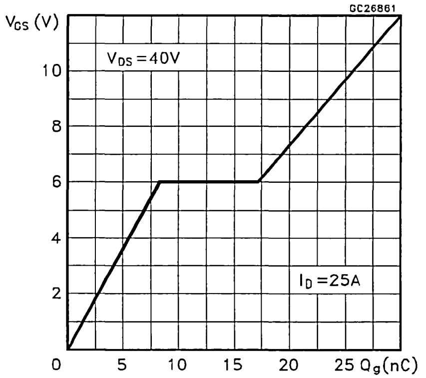
Transconductance



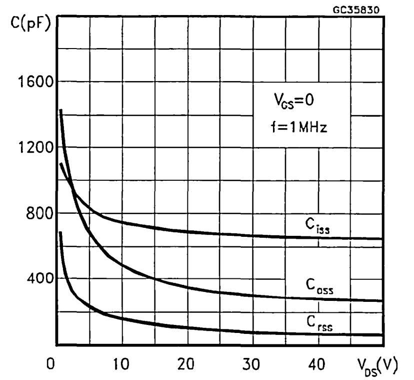
Static Drain-source On Resistance



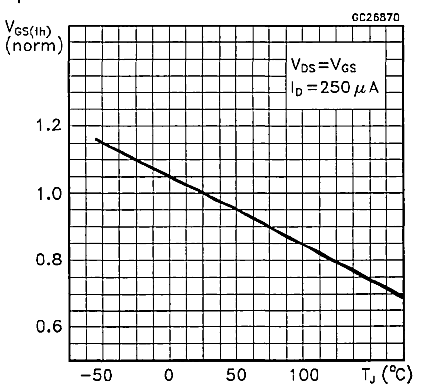
Gate Charge vs Gate-source Voltage



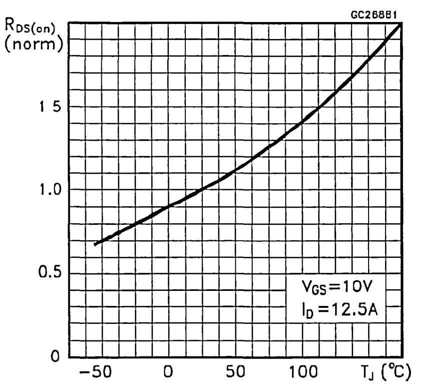
Capacitance Variations



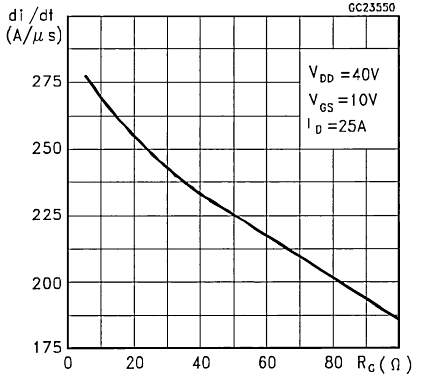
Normalized Gate Threshold Voltage vs Temperature



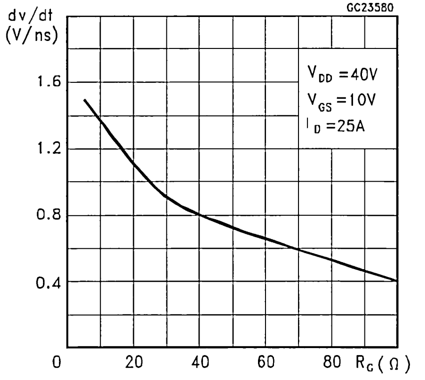
Normalized On Resistance vs Temperature



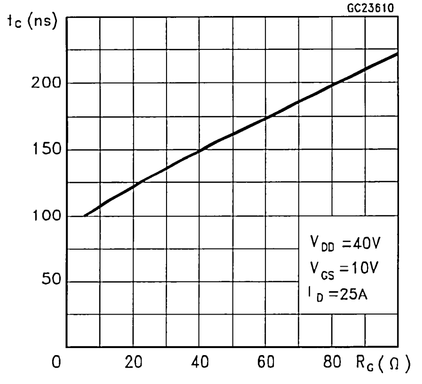
Turn-on Current Slope



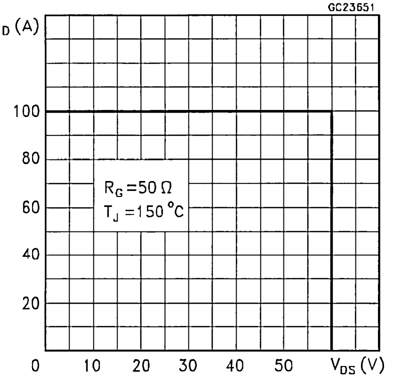
Turn-off Drain-source Voltage Slope



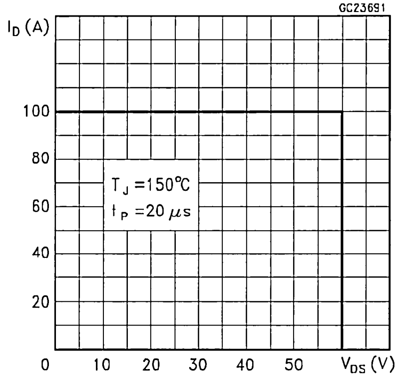
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

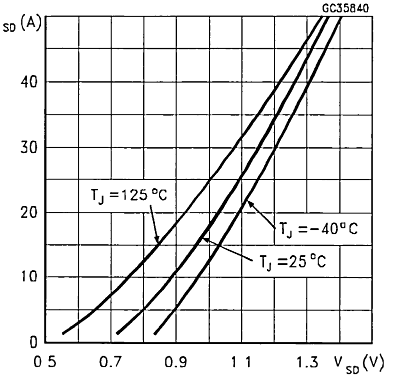


Fig. 1: Unclamped Inductive Load Test Circuits

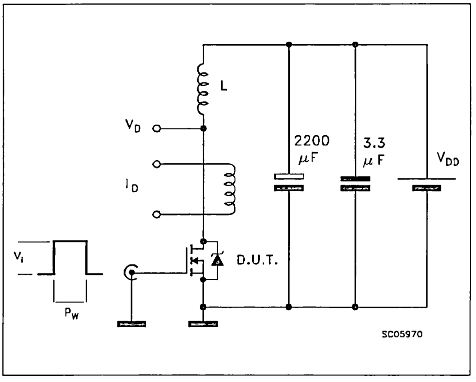


Fig. 2: Unclamped Inductive Waveforms

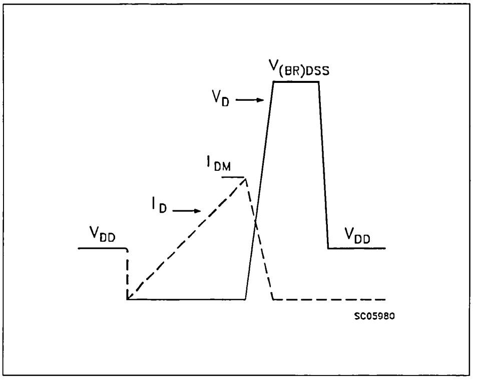


Fig. 3: Switching Times Test Circuits For Resistive Load

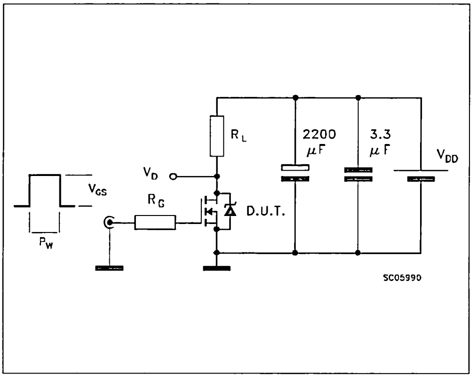


Fig. 4: Gate Charge Test Circuit

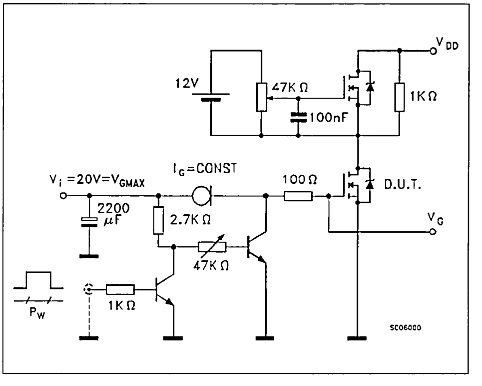
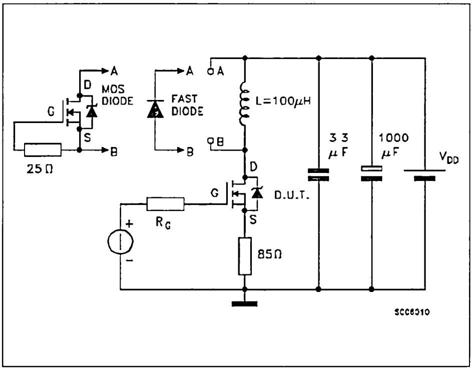


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON MICROELECTRONICS

STP30N05
STP30N05FI

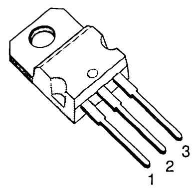
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP30N05 STP30N05FI	50 V 50 V	< 0.05 Ω < 0.05 Ω	30 A 19 A

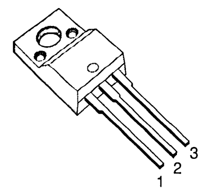
- TYPICAL $R_{DS(on)}$ = 0.045 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

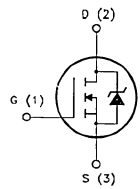


TO-220



ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP30N05	STP30N05FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	30	19	A
I_D	Drain Current (continuous) at T_c = 100 °C	21	13	A
I_{DM}(•)	Drain Current (pulsed)	120	120	A
P_{tot}	Total Dissipation at T_c = 25 °C	105	40	W
	Derating Factor	0.7	0.27	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case Max	1.43	3.75	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	30	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	180	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	45	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	21	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	50			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 15 A V_{GS} = 10V I_D = 15 A T_c = 100°C		0.045	0.05 0.1	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	30			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 15 A	8	12		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		950 420 110	1250 600 200	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 30 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		50 190	70 270	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 30 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		190		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 30 A V_{GS} = 10 V		30 11 14	45	nC nC nC

SWITCHING OFF

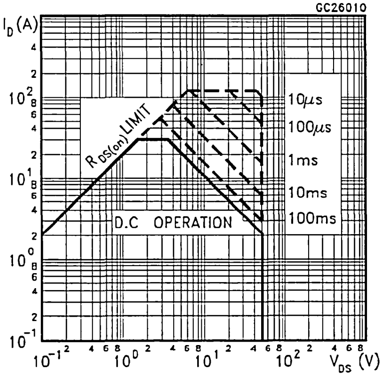
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 30 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		120 75 180	170 100 250	ns ns ns

SOURCE DRAIN DIODE

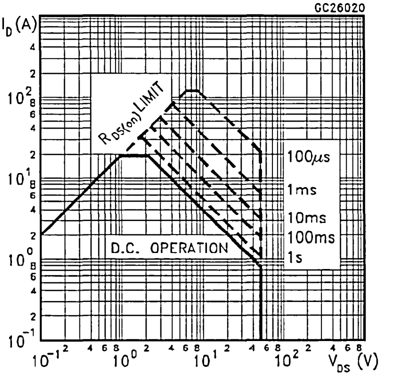
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				30 120	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 30 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 30 A di/dt = 100 A/μs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		85 0.25 6		ns μC A

(*) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

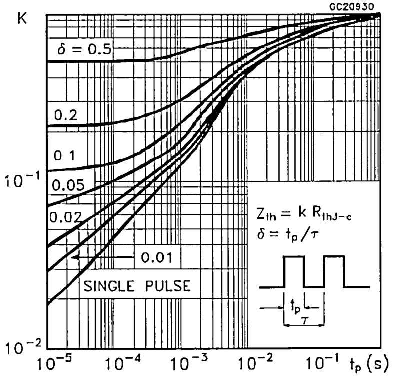
Safe Operating Areas For TO-220



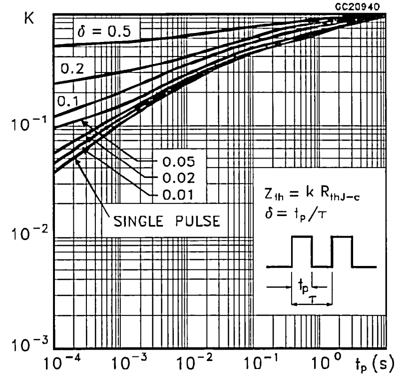
Safe Operating Areas For ISOWATT220



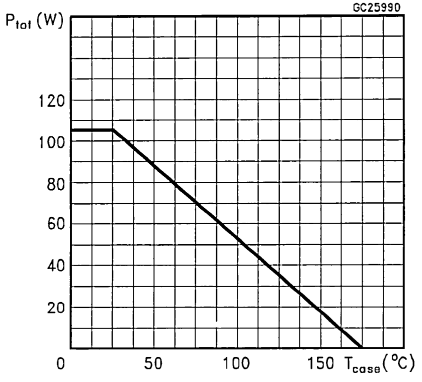
Thermal Impedeance For TO-220



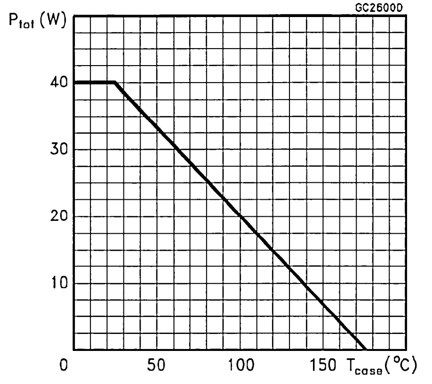
Thermal Impedance For ISOWATT220



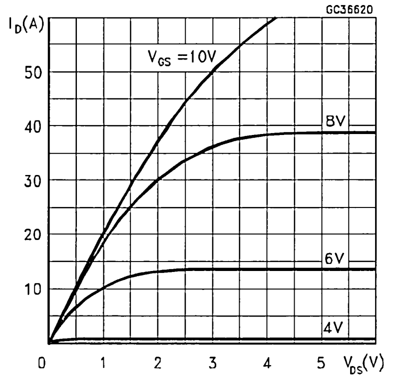
Derating Curve For TO-220



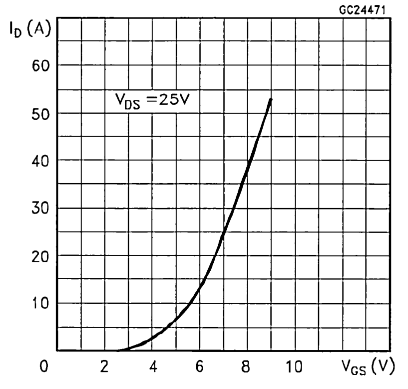
Derating Curve For ISOWATT220



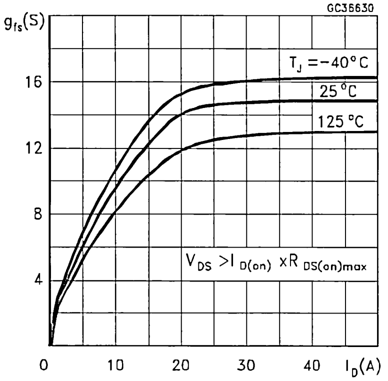
Output Characteristics



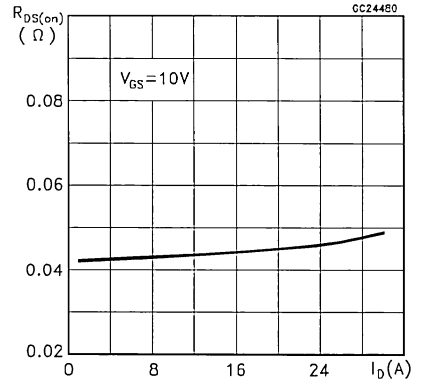
Transfer Characteristics



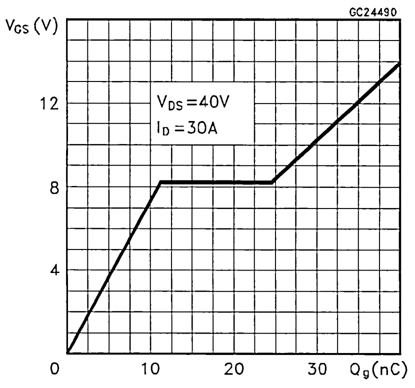
Transconductance



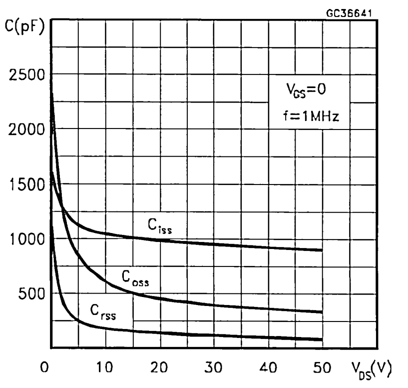
Static Drain-source On Resistance



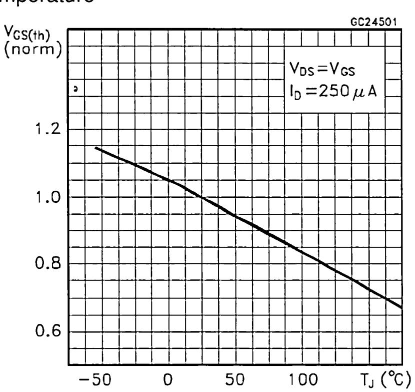
Gate Charge vs Gate-source Voltage



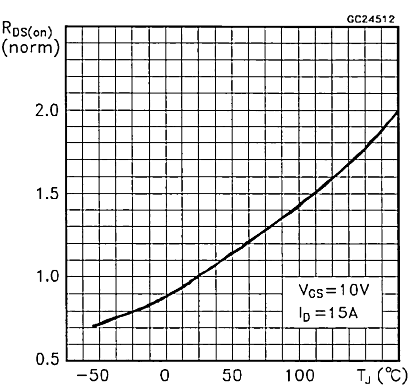
Capacitance Variations



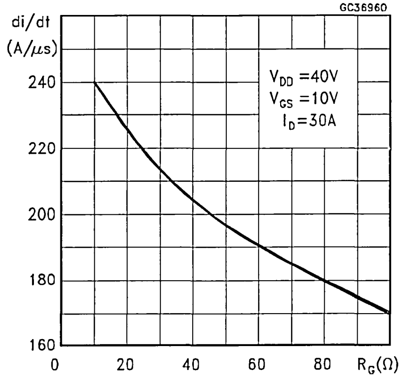
Normalized Gate Threshold Voltage vs Temperature



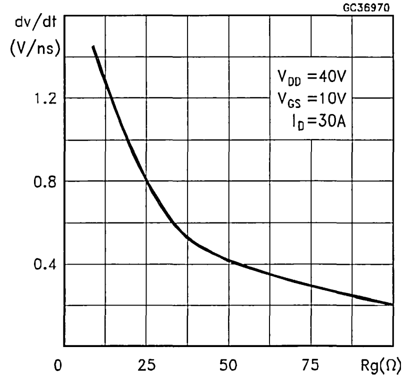
Normalized On Resistance vs Temperature



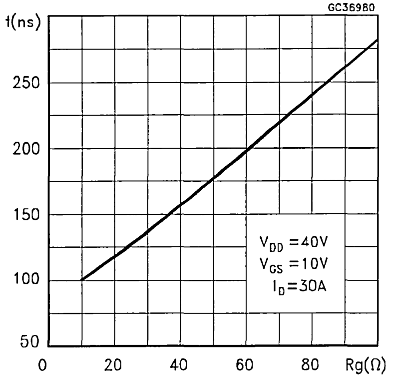
Turn-on Current Slope



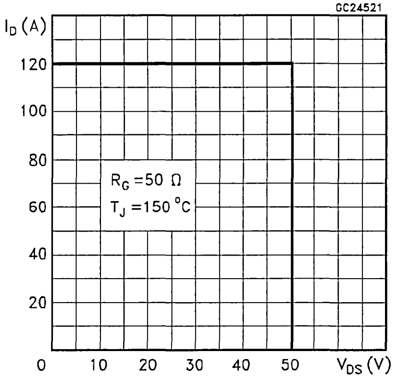
Turn-off Drain-source Voltage Slope



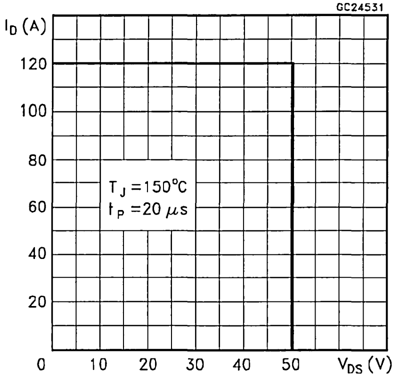
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

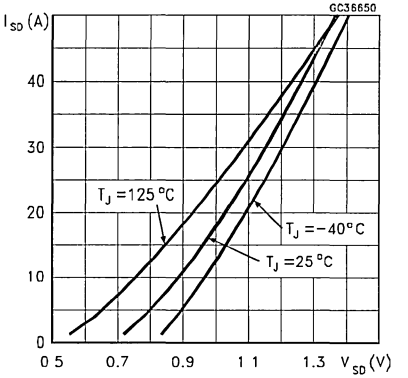


Fig. 1: Unclamped Inductive Load Test Circuits

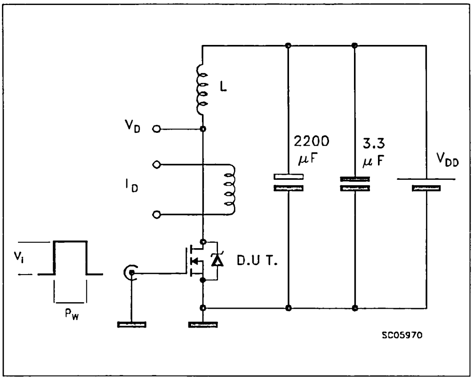


Fig. 2: Unclamped Inductive Waveforms

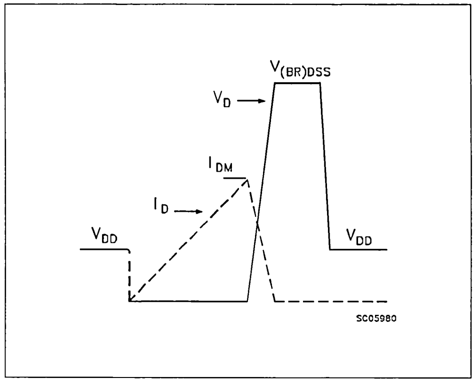


Fig. 3: Switching Times Test Circuits For Resistive Load

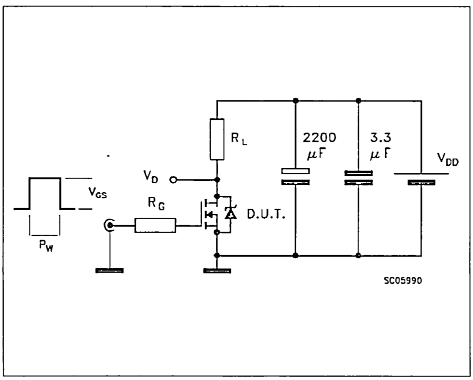


Fig. 4: Gate Charge Test Circuit

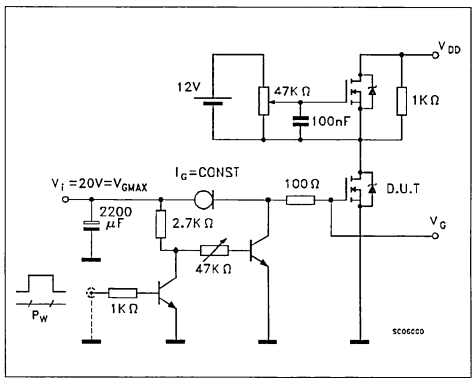
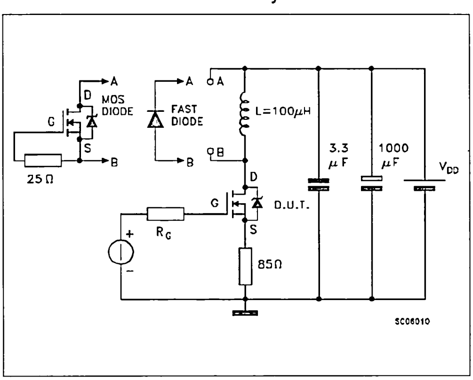


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



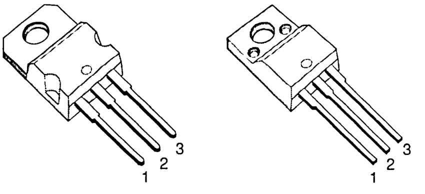
SGS-THOMSON MICROELECTRONICS

STP30N06 STP30N06FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP30N06	60 V	< 0.05 Ω	30 A
STP30N06FI	60 V	< 0.05 Ω	19 A

- TYPICAL $R_{DS(on)}$ = 0.045 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

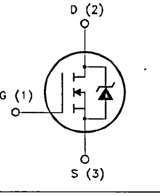


TO-220 ISOWATT220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP30N06	STP30N06FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	60		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	60		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	30	19	A
I_D	Drain Current (continuous) at T_c = 100 °C	21	13	A
I_{DM}(•)	Drain Current (pulsed)	120	120	A
P_{tot}	Total Dissipation at T_c = 25 °C	105	40	W
	Derating Factor	0.7	0.27	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.43	3.57	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	30	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	160	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	40	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	21	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	60			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10$V $I_D = 15$ A $V_{GS} = 10$V $I_D = 15$ A $T_c = 100$°C		0.045	0.05 0.1	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	30			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 15$ A	8	12		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		950 420 110	1250 600 200	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 30 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		50 190	70 270	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 30 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		190		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 30 A V_{GS} = 10 V		30 11 14	45	nC nC nC

SWITCHING OFF

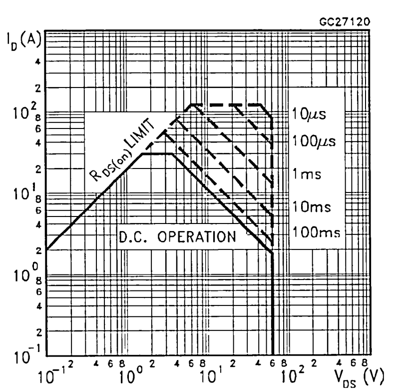
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 30 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		120 75 180	170 100 250	ns ns ns

SOURCE DRAIN DIODE

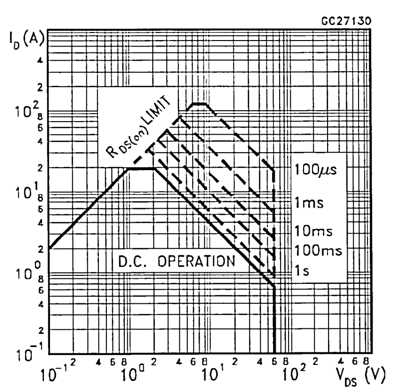
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				30 120	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 30 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 30 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		85 0.25 6		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

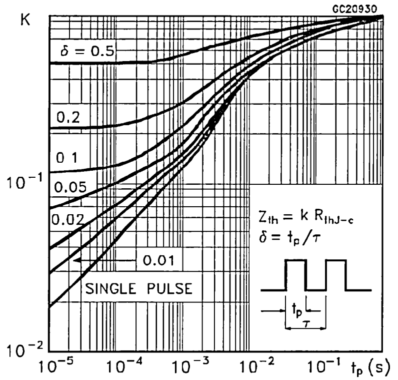
Safe Operating Areas For TO-220



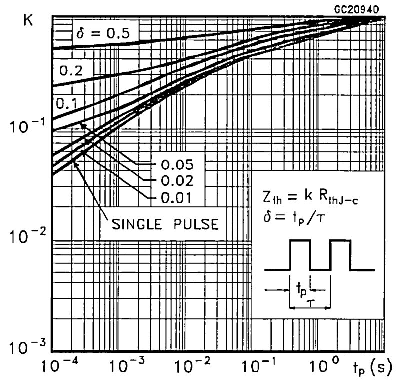
Safe Operating Areas For ISOWATT220



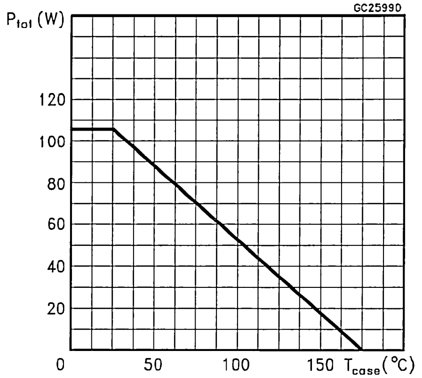
Thermal Impedeance For TO-220



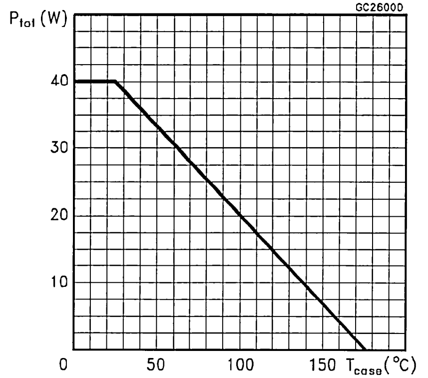
Thermal Impedance For ISOWATT220



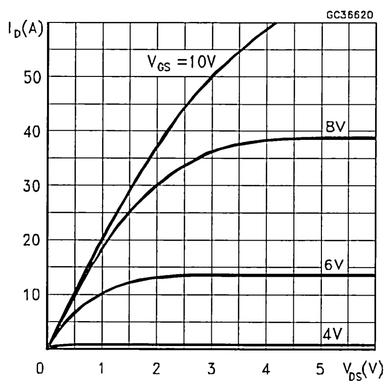
Derating Curve For TO-220



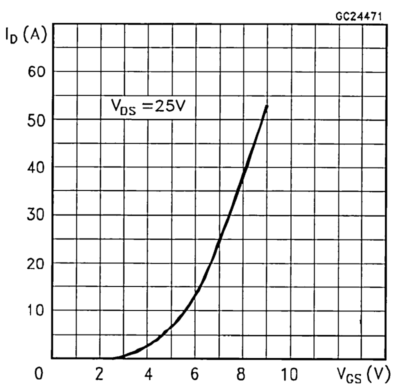
Derating Curve For ISOWATT220



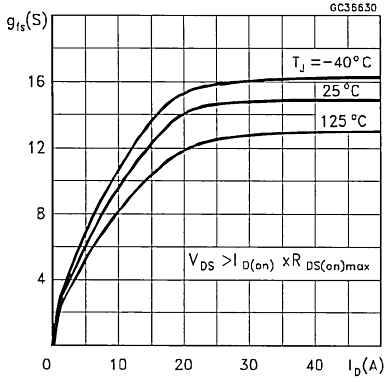
Output Characteristics



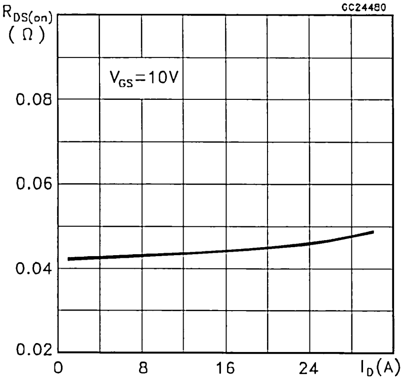
Transfer Characteristics



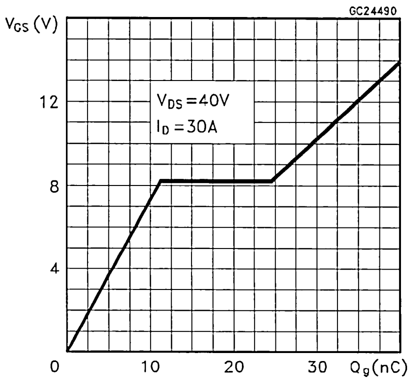
Transconductance



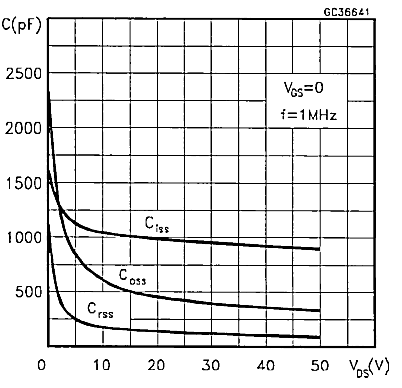
Static Drain-source On Resistance



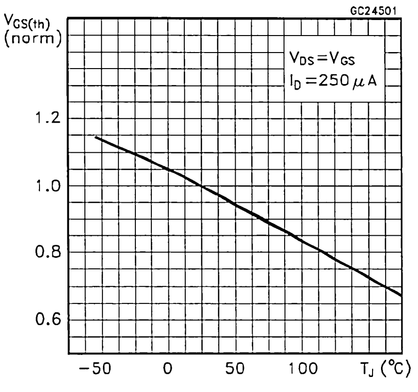
Gate Charge vs Gate-source Voltage



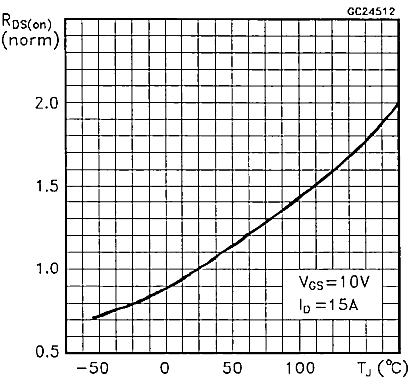
Capacitance Variations



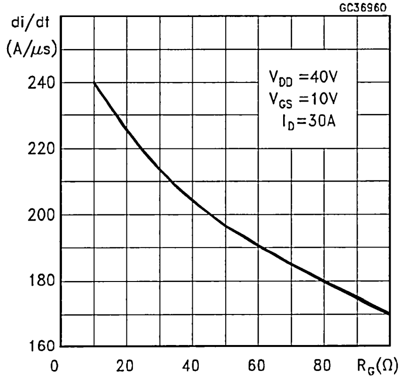
Normalized Gate Threshold Voltage vs Temperature



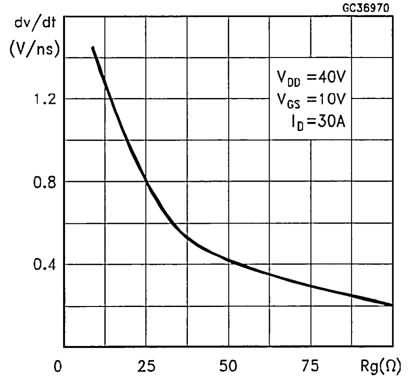
Normalized On Resistance vs Temperature



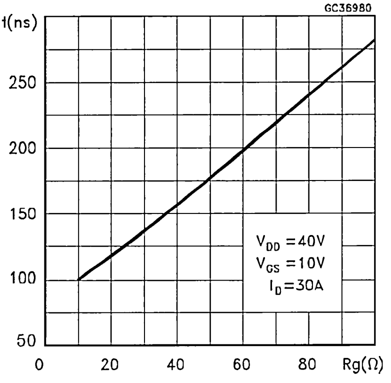
Turn-on Current Slope



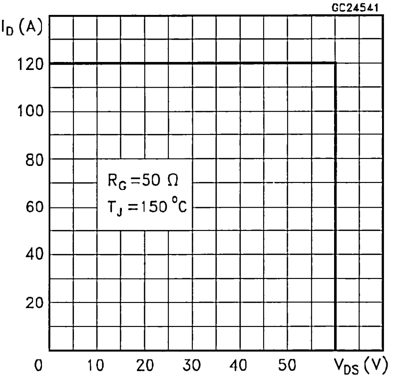
Turn-off Drain-source Voltage Slope



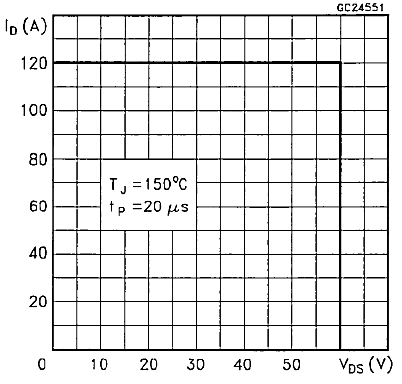
Cross-over Time



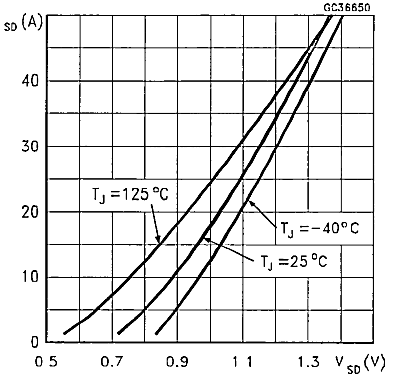
Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics



SGS-THOMSON MICROELECTRONICS

Fig. 1: Unclamped Inductive Load Test Circuits

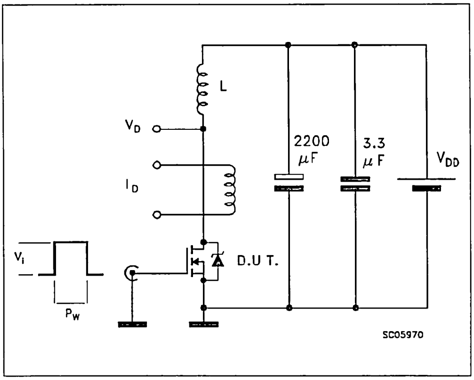


Fig. 2: Unclamped Inductive Waveforms

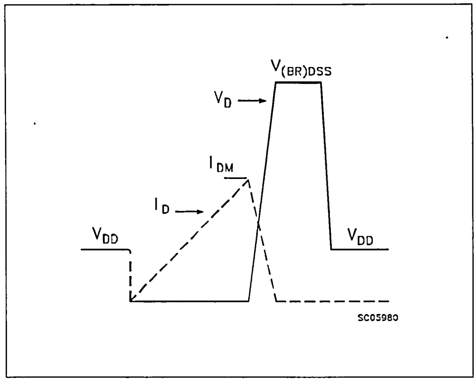


Fig. 3: Switching Times Test Circuits For Resistive Load

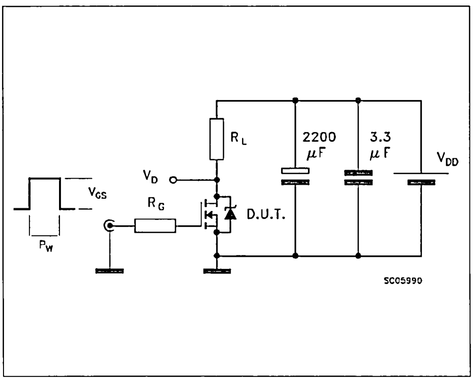


Fig. 4: Gate Charge Test Circuit

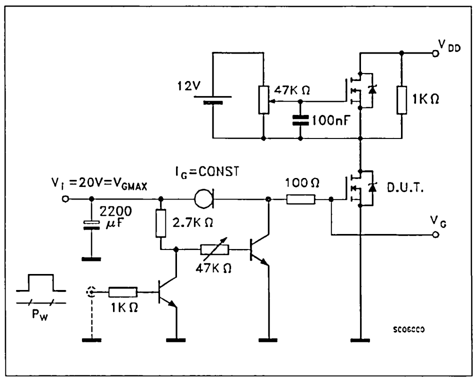
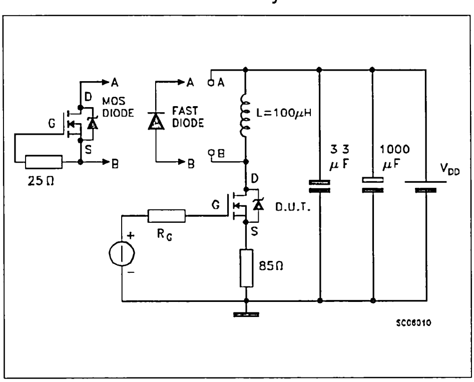


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



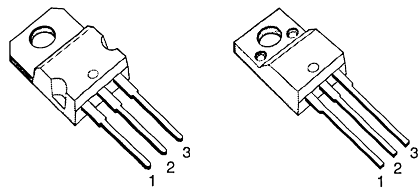
SGS-THOMSON MICROELECTRONICS

STP32N05L
STP32N05LFI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP32N05L STP32N05LFI	50 V 50 V	< 0.055 Ω < 0.055 Ω	32 A 19 A

- TYPICAL $R_{DS(on)}$ = 0.045 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- LOGIC LEVEL COMPATIBLE INPUT
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

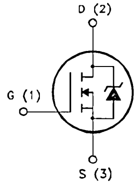


TO-220 ISOWATT220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP32N05L	STP32N05LFI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50		V
V_{GS}	Gate-source Voltage	± 15		V
I_D	Drain Current (continuous) at T_c = 25 °C	32	19	A
I_D	Drain Current (continuous) at T_c = 100 °C	22	13	A
I_{DM}(•)	Drain Current (pulsed)	128	128	A
P_{tot}	Total Dissipation at T_c = 25 °C	105	40	W
	Derating Factor	0.7	0.27	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.43	3.75	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	32	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	200	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	50	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	22	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	50			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 15 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	1	1.6	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 5 V I_D = 16 A V_{GS} = 5 V I_D = 16 A T_c = 100°C		0.045	0.055 0.11	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	32			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 16 A	10	22		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		980 320 80	1300 450 110	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 16 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 3)		60 430	90 630	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 32 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		130		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 32 A V_{GS} = 5 V		25 9 12	35	nC nC nC

SWITCHING OFF

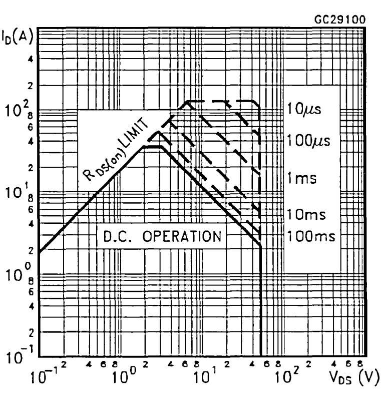
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 32 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		90 140 250	130 200 350	ns ns ns

SOURCE DRAIN DIODE

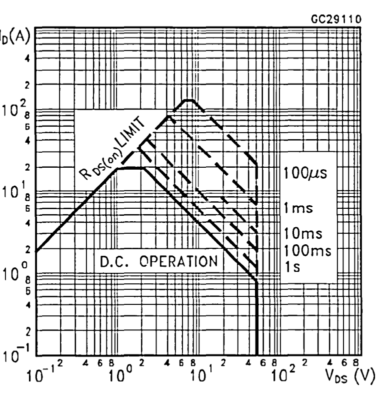
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				32 128	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 32 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 32 A di/dt = 100 A/µs V_{DD} = 25 V T_j = 150 °C (see test circuit, figure 5)		100 0.2 4		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

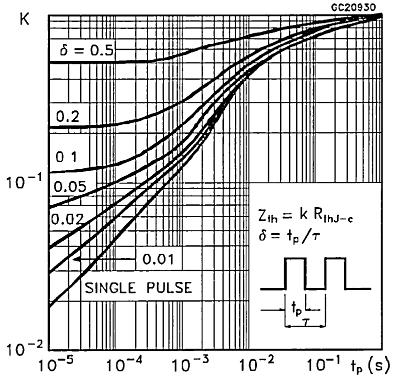
Safe Operating Areas For TO-220



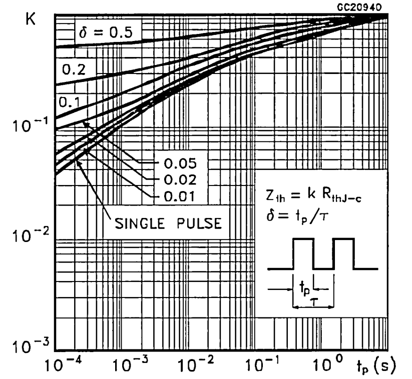
Safe Operating Areas For ISOWATT220



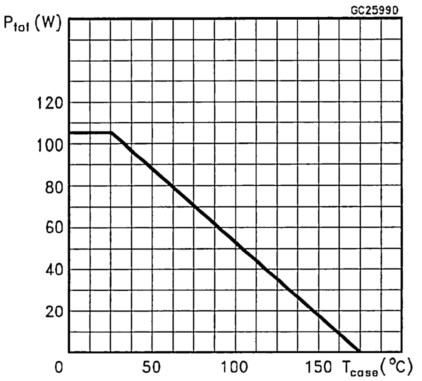
Thermal Impedance For TO-220



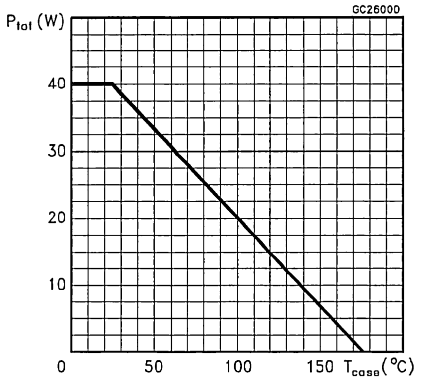
Thermal Impedance For ISOWATT220



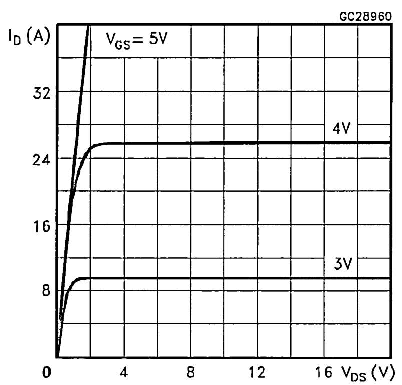
Derating Curve For TO-220



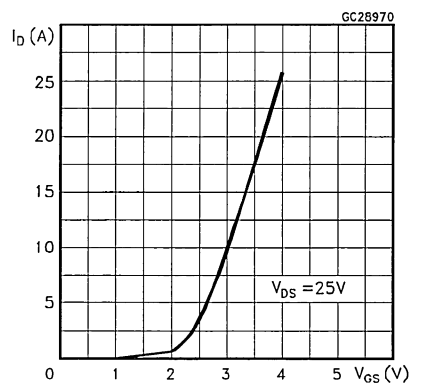
Derating Curve For ISOWATT220



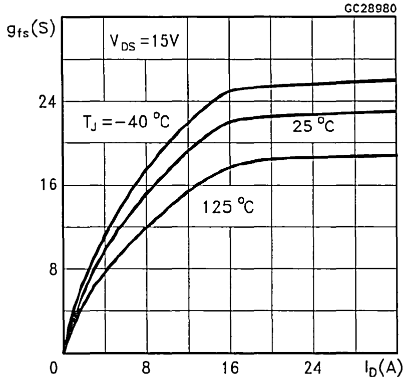
Output Characteristics



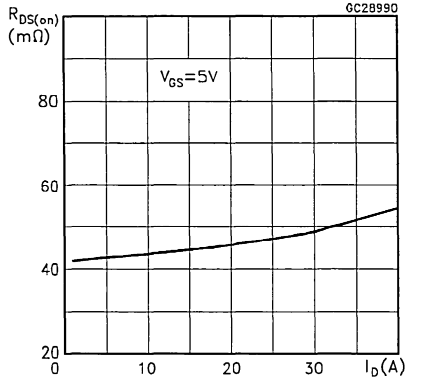
Transfer Characteristics



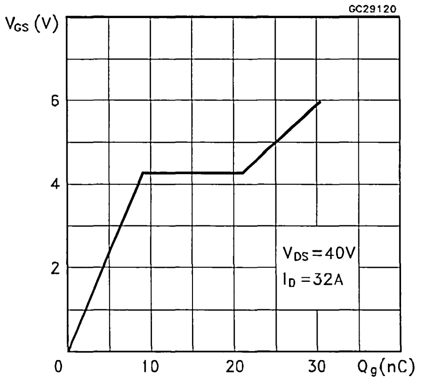
Transconductance



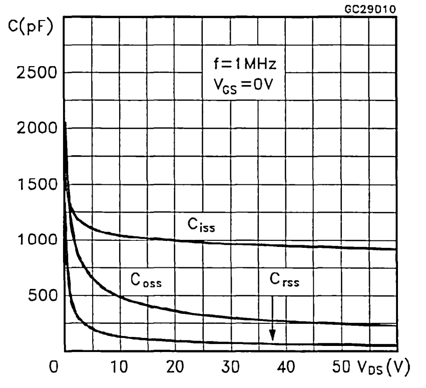
Static Drain-source On Resistance



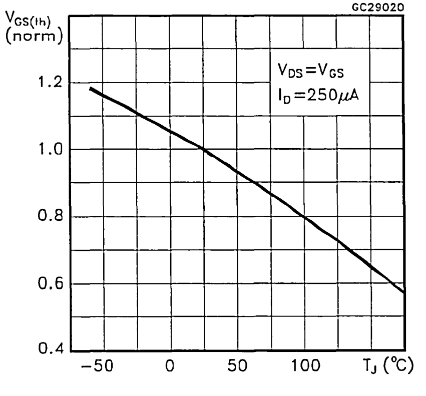
Gate Charge vs Gate-source Voltage



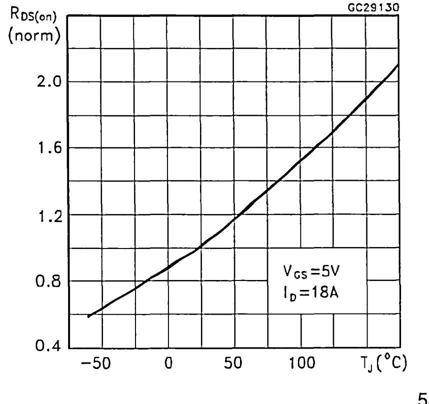
Capacitance Variations



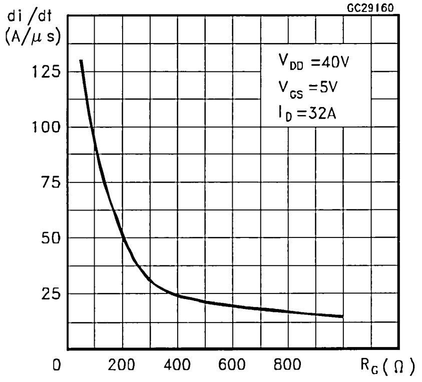
Normalized Gate Threshold Voltage vs Temperature



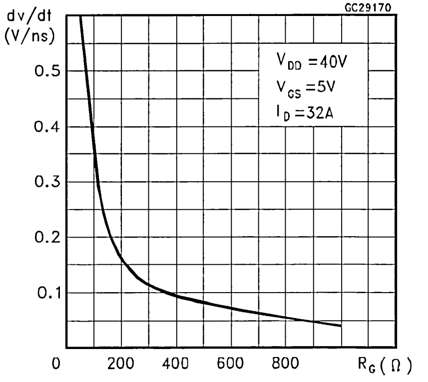
Normalized On Resistance vs Temperature



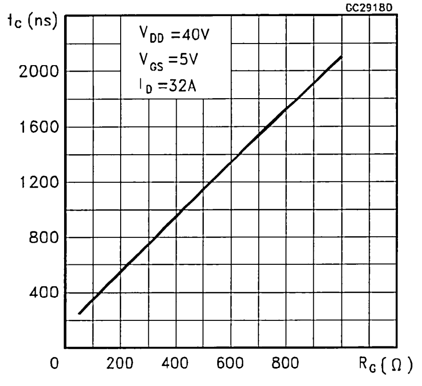
Turn-on Current Slope



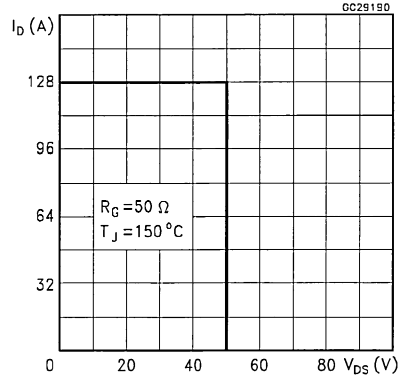
Turn-off Drain-source Voltage Slope



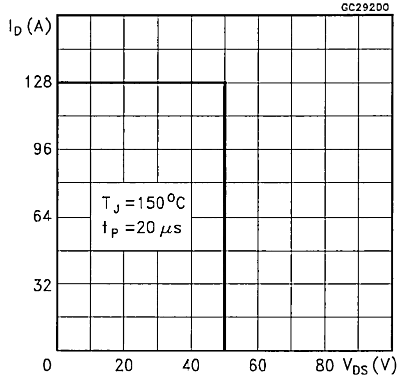
Cross-over Time



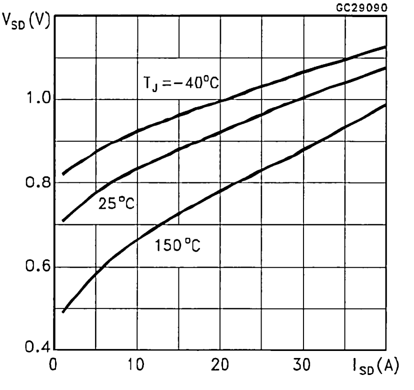
Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics



SGS-THOMSON MICROELECTRONICS

Fig. 1: Unclamped Inductive Load Test Circuits

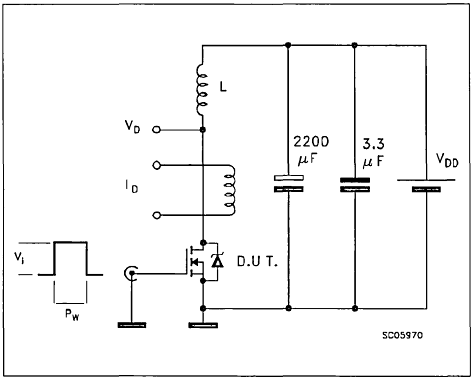


Fig. 2: Unclamped Inductive Waveforms

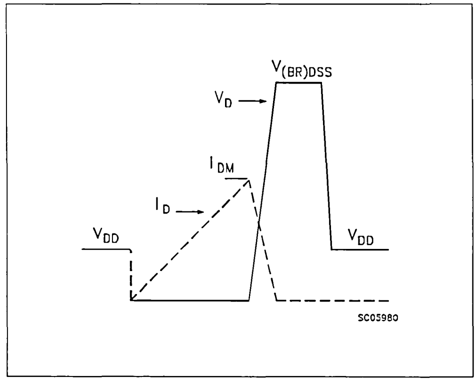


Fig. 3: Switching Times Test Circuits For Resistive Load

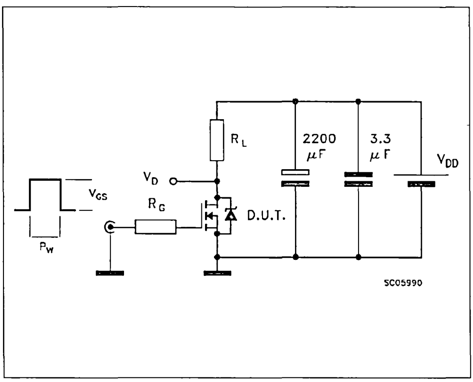


Fig. 4: Gate Charge Test Circuit

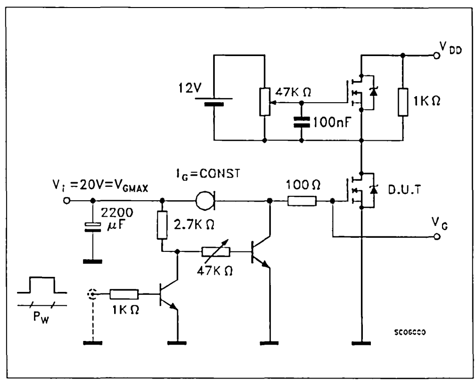
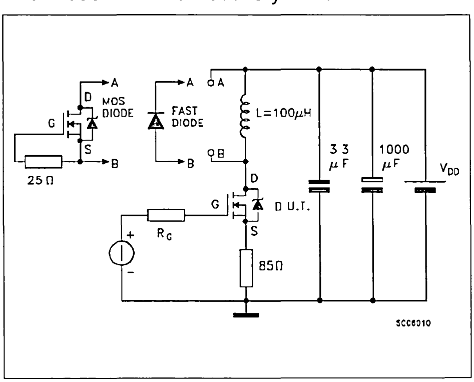


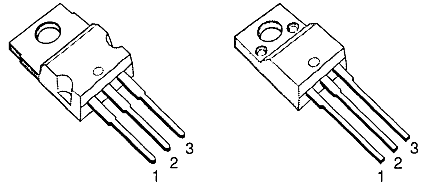
Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP32N06L	60 V	< 0.055 Ω	32 A
STP32N06LFI	60 V	< 0.055 Ω	19 A

- TYPICAL $R_{DS(on)}$ = 0.045 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- LOGIC LEVEL COMPATIBLE INPUT
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

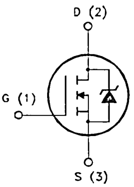


TO-220 ISOWATT220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP32N06L	STP32N06LFI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	60		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	60		V
V_{GS}	Gate-source Voltage	± 15		V
I_D	Drain Current (continuous) at T_c = 25 °C	32	19	A
I_D	Drain Current (continuous) at T_c = 100 °C	22	13	A
I_{DM}(•)	Drain Current (pulsed)	128	128	A
P_{tot}	Total Dissipation at T_c = 25 °C	105	40	W
	Derating Factor	0.7	0.27	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case Max	1.43	3.75	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	32	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	180	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	45	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	22	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	60			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 15 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	1	1.6	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 5 V I_D = 16 A V_{GS} = 5 V I_D = 16 A T_c = 100°C		0.045	0.055 0.11	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	32			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 16 A	10	22		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		980 320 80	1300 450 110	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 16 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 3)		60 430	90 630	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 32 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		130		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 32 A V_{GS} = 5 V		25 9 12	35	nC nC nC

SWITCHING OFF

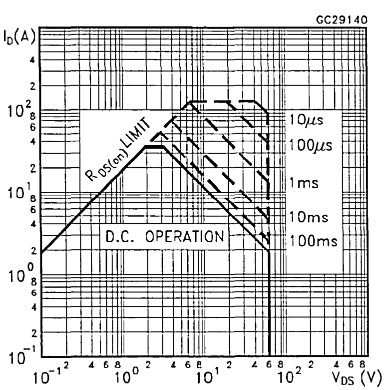
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 32 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		90 140 250	130 200 350	ns ns ns

SOURCE DRAIN DIODE

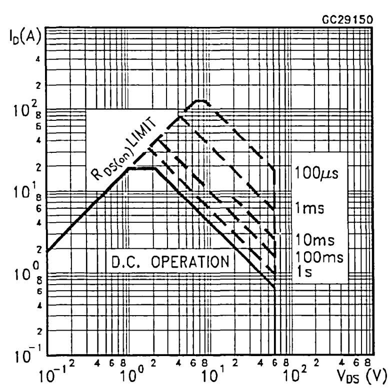
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				32 128	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 32 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 32 A di/dt = 100 A/µs V_{DD} = 25 V T_j = 150 °C (see test circuit, figure 5)		100 0.2 4		ns µC A

(*) Pulsed. Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

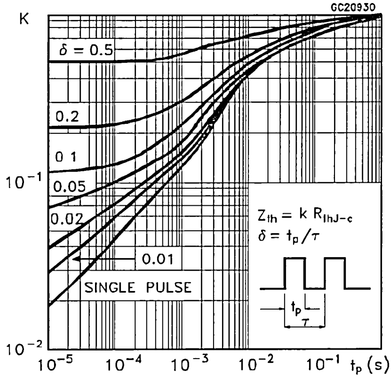
Safe Operating Areas For TO-220



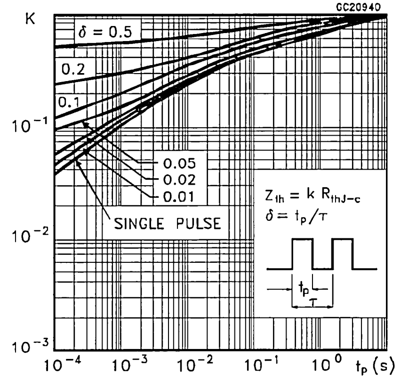
Safe Operating Areas For ISOWATT220



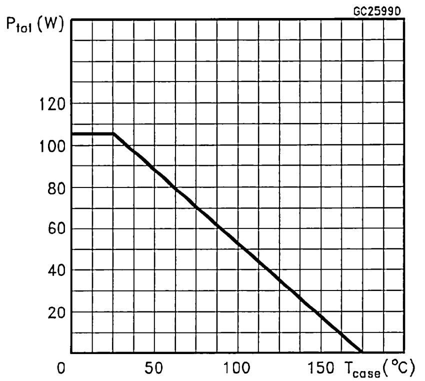
Thermal Impedance For TO-220



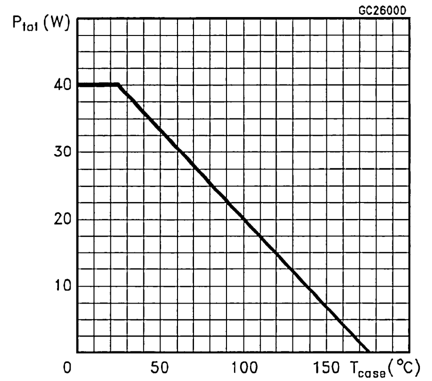
Thermal Impedance For ISOWATT220



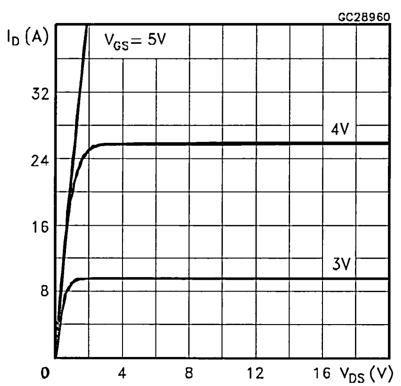
Derating Curve For TO-220



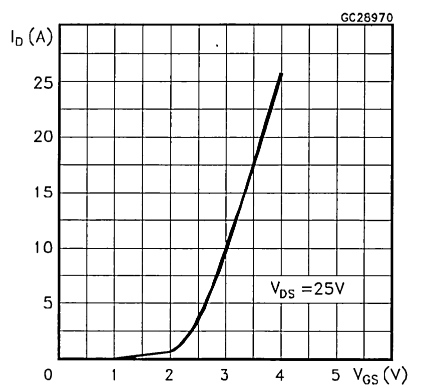
Derating Curve For ISOWATT220



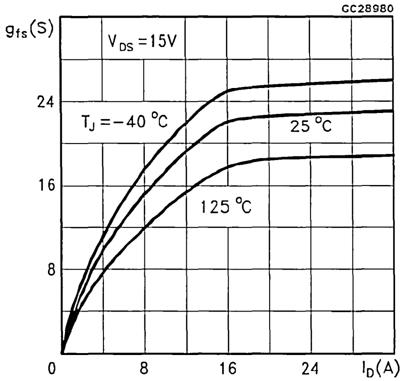
Output Characteristics



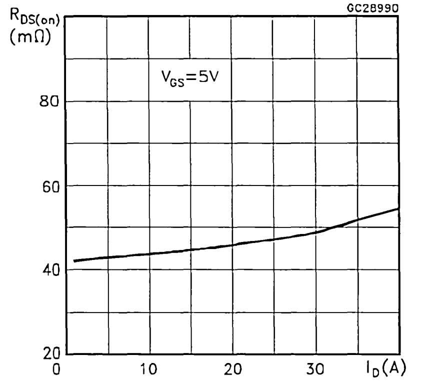
Transfer Characteristics



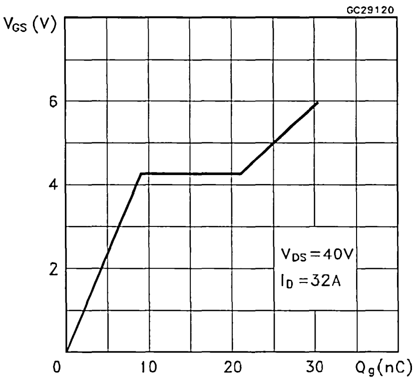
Transconductance



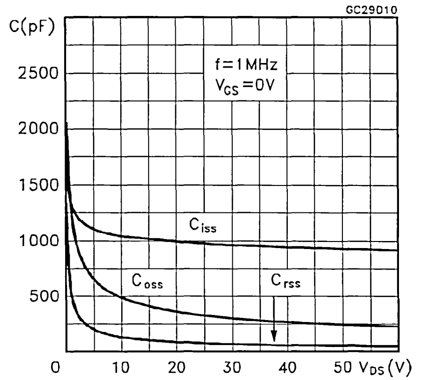
Static Drain-source On Resistance



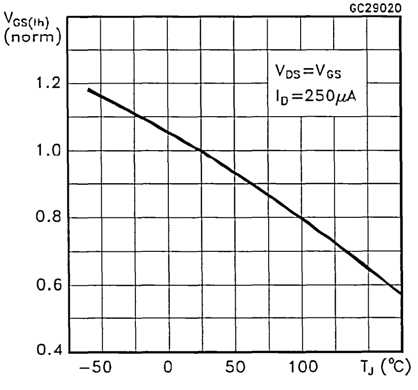
Gate Charge vs Gate-source Voltage



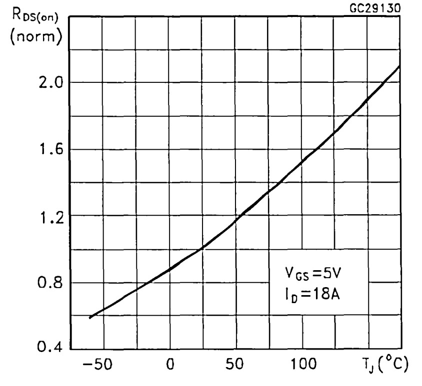
Capacitance Variations



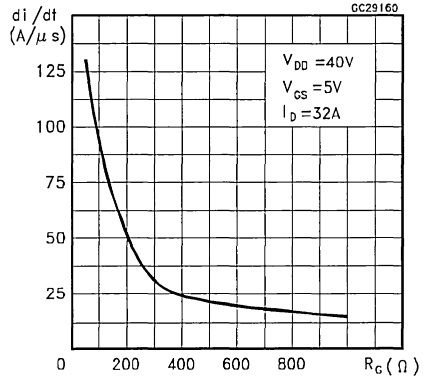
Normalized Gate Threshold Voltage vs Temperature



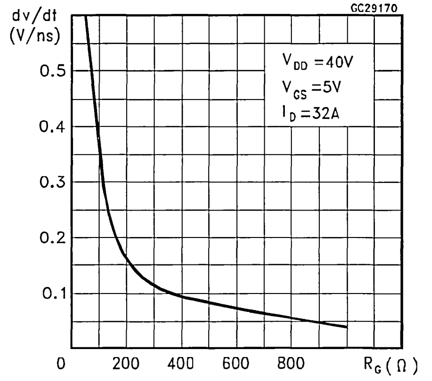
Normalized On Resistance vs Temperature



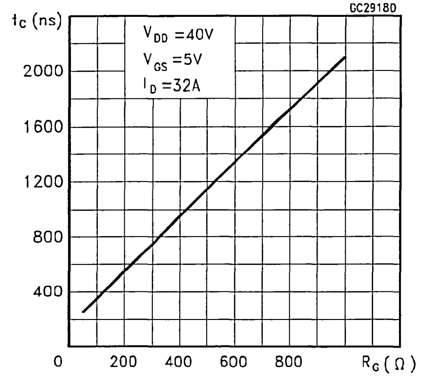
Turn-on Current Slope



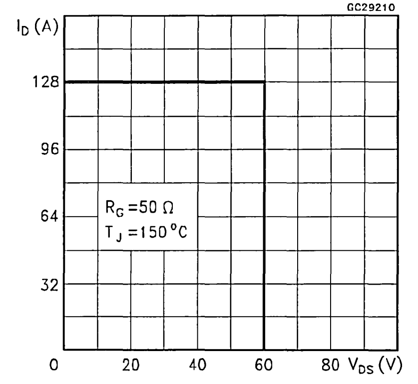
Turn-off Drain-source Voltage Slope



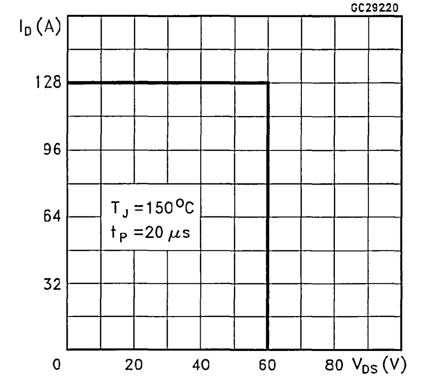
Cross-over Time



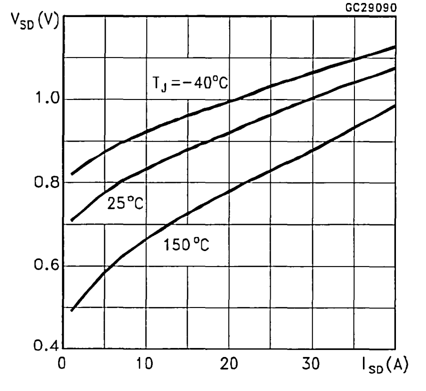
Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics



SGS-THOMSON MICROELECTRONICS

Fig. 1: Unclamped Inductive Load Test Circuits

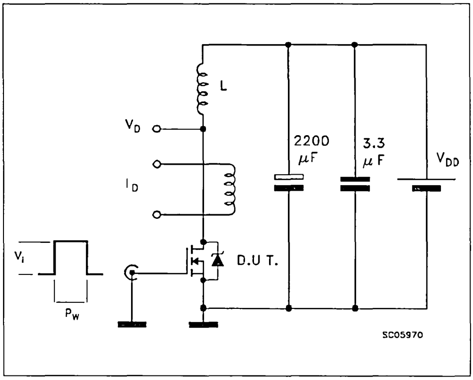


Fig. 2: Unclamped Inductive Waveforms

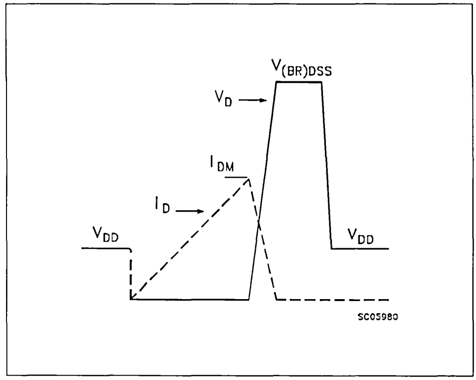


Fig. 3: Switching Times Test Circuits For Resistive Load

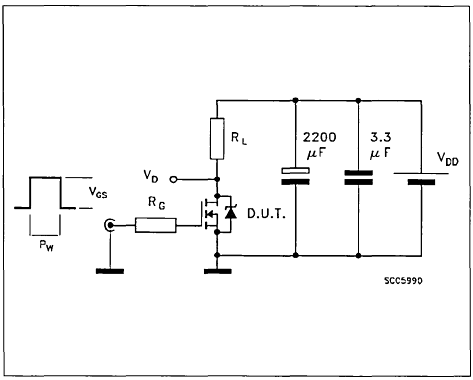


Fig. 4: Gate Charge Test Circuit

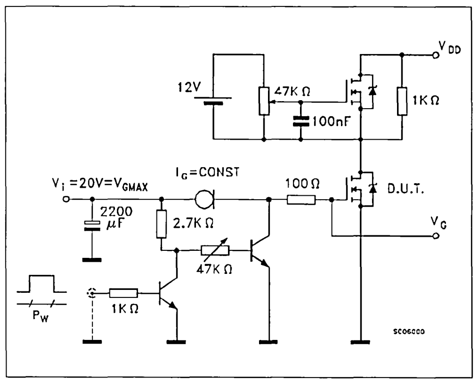
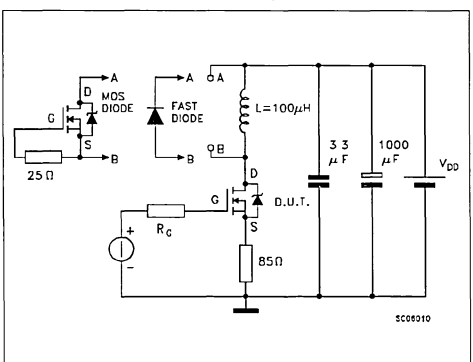


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time

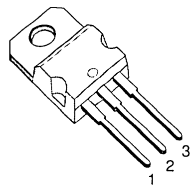


STP33N10
STP33N10FI

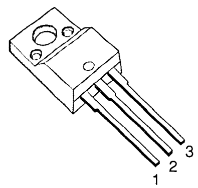
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP33N10 STP33N10FI	100 V 100 V	< 0.06 Ω < 0.06 Ω	33 A 18 A

- TYPICAL $R_{DS(on)}$ = 0.045 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION



TO-220

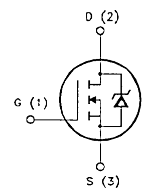


ISOWATT220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP33N10	STP33N10FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	100		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	100		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	33	18	A
I_D	Drain Current (continuous) at T_c = 100 °C	23	12	A
I_{DM}(•)	Drain Current (pulsed)	132	132	A
P_{tot}	Total Dissipation at T_c = 25 °C	150	45	W
	Derating Factor	1	0.3	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	3.33	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Thermal Resistance Case-sink Maximum Lead Temperature For Soldering Purpose	Max Typ	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	33	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25\ ^{\circ}C$, $I_D = I_{AR}$, $V_{DD} = 25$ V)	240	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	60	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100\ ^{\circ}C$, pulse width limited by T_j max, $\delta < 1\%$)	23	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25\ ^{\circ}C$ unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250\ \mu A$ $V_{GS} = 0$	100			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125\ ^{\circ}C$			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250\ \mu A$	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 17$ A $V_{GS} = 10V$ $I_D = 17$ A $T_c = 100^{\circ}C$		0.045	0.06 0.12	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	33			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 17$ A	10	18		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		1600 460 140	2100 600 200	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 50 V I_D = 5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		55 110	80 160	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 80 V I_D = 33 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		300		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 80 V I_D = 33 A V_{GS} = 10 V		55 11 26	80	nC nC nC

SWITCHING OFF

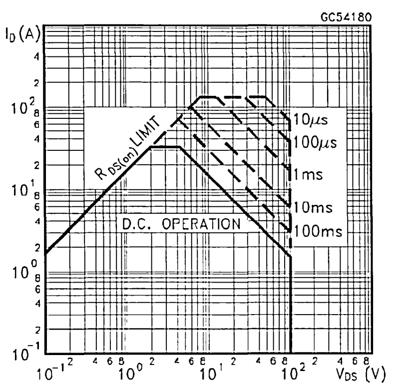
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 80 V I_D = 33 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		110 85 200	160 120 290	ns ns ns

SOURCE DRAIN DIODE

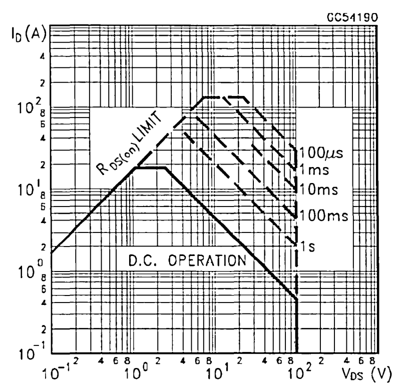
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				33 132	A A
V_{SD} (˙)	Forward On Voltage	I_{SD} = 33 A V_{GS} = 0			1 6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 33 A di/dt = 100 A/µs V_{DD} = 50 V T_j = 150 °C (see test circuit, figure 5)		140 0.7 10		ns µC A

(˙) Pulsed: Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

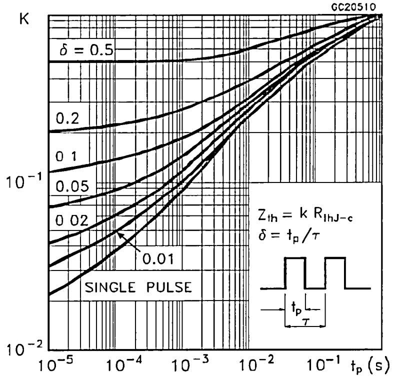
Safe Operating Areas For TO-220



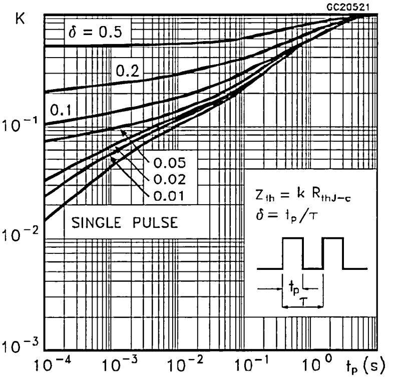
Safe Operating Areas For ISOWATT220



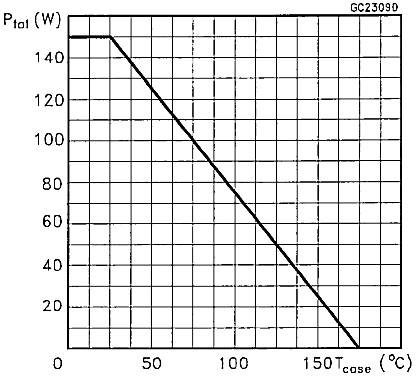
Thermal Impedeance For TO-220



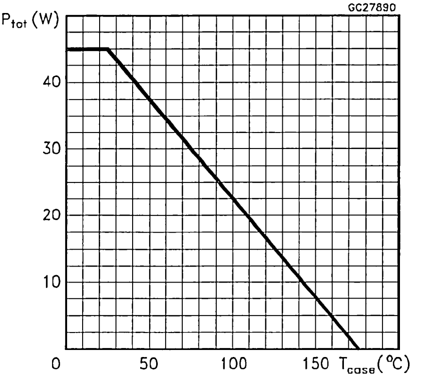
Thermal Impedance For ISOWATT220



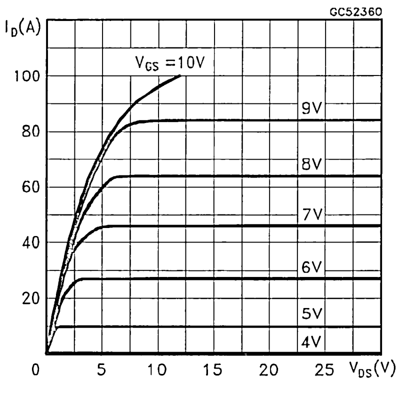
Derating Curve For TO-220



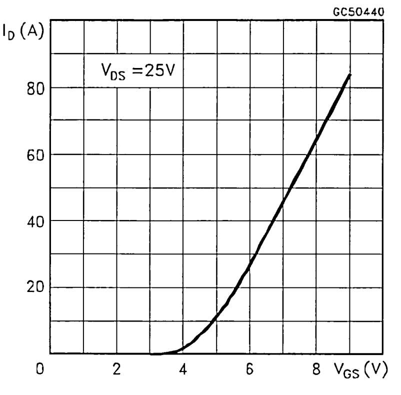
Derating Curve For ISOWATT220



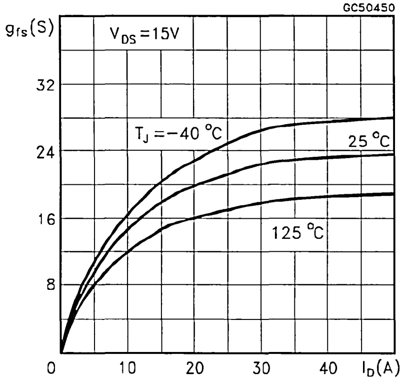
Output Characteristics



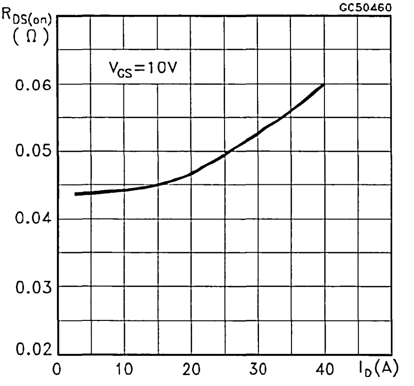
Transfer Characteristics



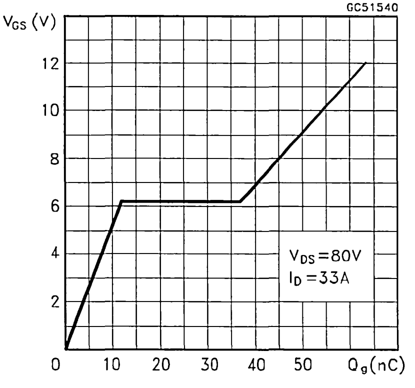
Transconductance



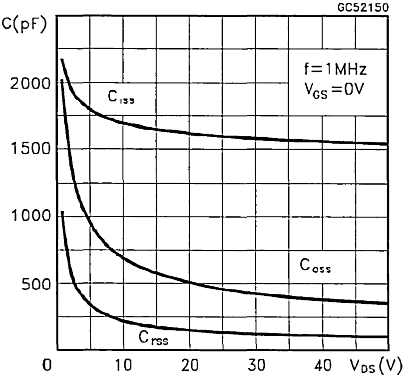
Static Drain-source On Resistance



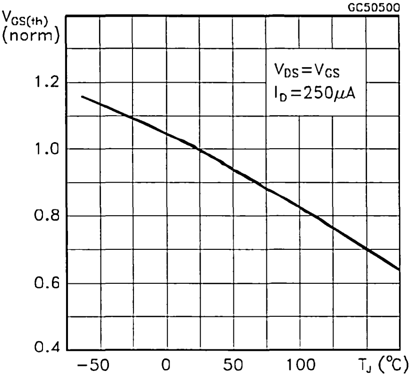
Gate Charge vs Gate-source Voltage



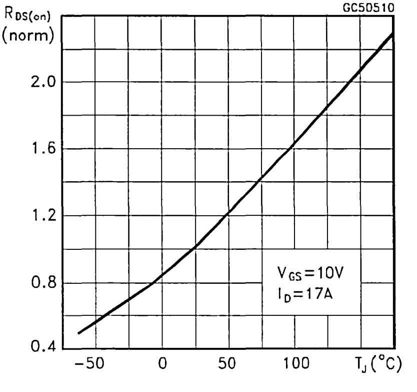
Capacitance Variations



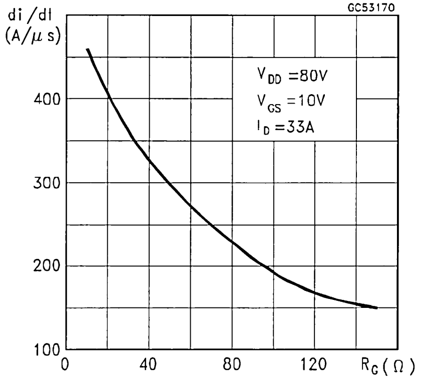
Normalized Gate Threshold Voltage vs Temperature



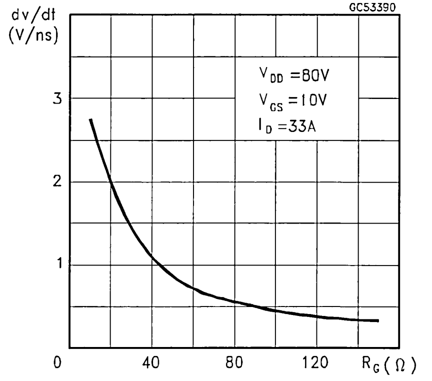
Normalized On Resistance vs Temperature



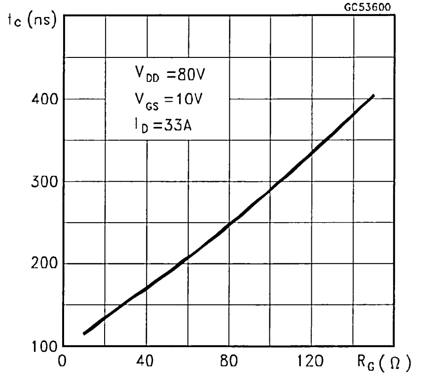
Turn-on Current Slope



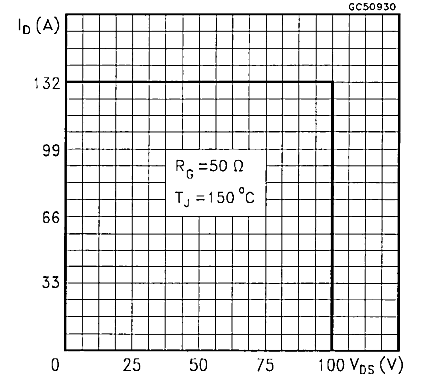
Turn-off Drain-source Voltage Slope



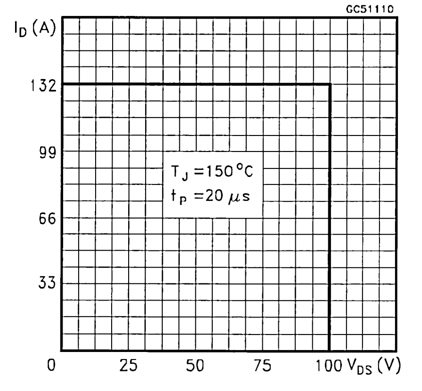
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

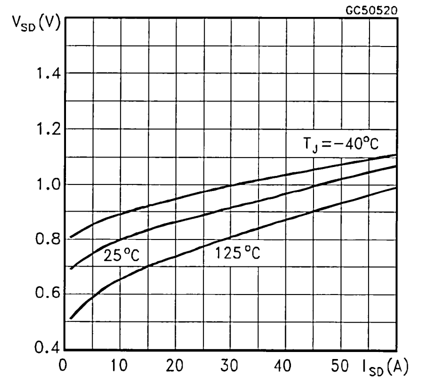


Fig. 1: Unclamped Inductive Load Test Circuits

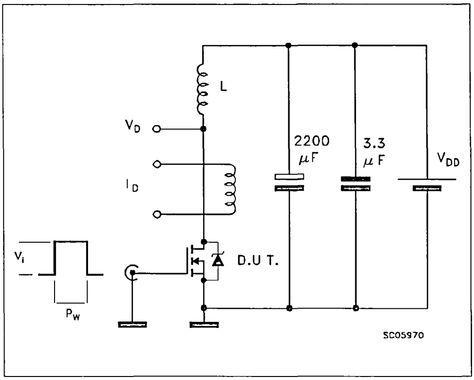


Fig. 2: Unclamped Inductive Waveforms

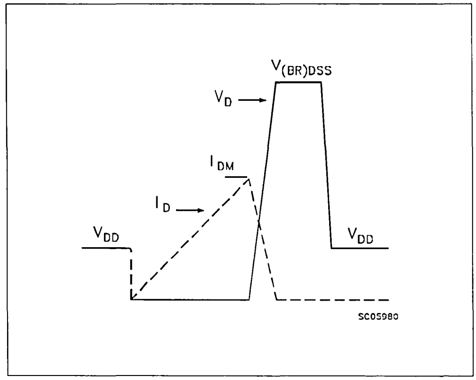


Fig. 3: Switching Times Test Circuits For Resistive Load

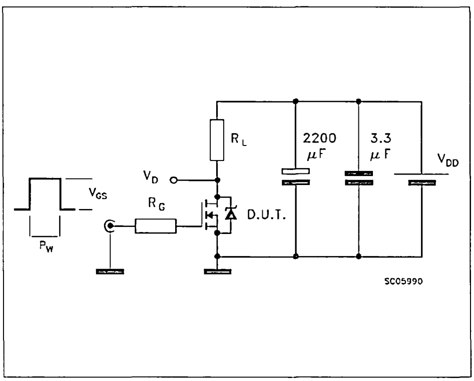


Fig. 4: Gate Charge Test Circuit

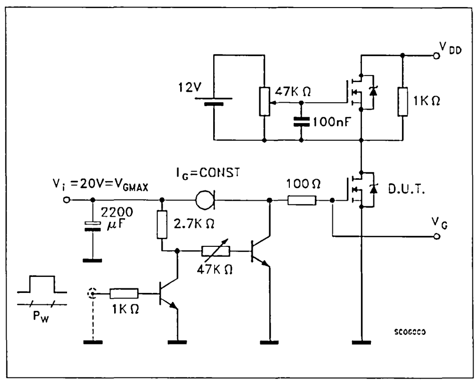
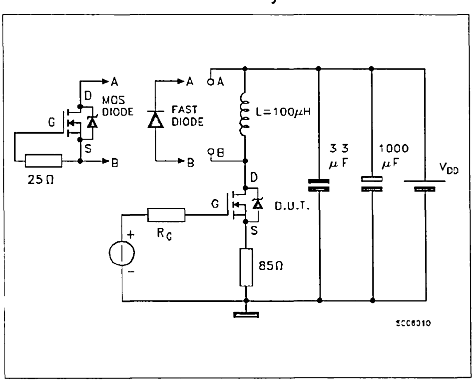


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time

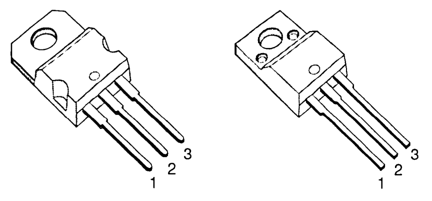


STP36N05L
STP36N05LFI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP36N05L	50 V	< 0.04 Ω	36 A
STP36N05LFI	50 V	< 0.04 Ω	21 A

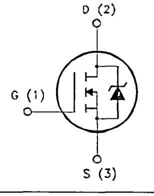
- TYPICAL $R_{DS(on)}$ = 0.033 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- LOGIC LEVEL COMPATIBLE INPUT
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION



TO-220 ISOWATT220

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP36N05L	STP36N05LFI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50		V
V_{GS}	Gate-source Voltage	± 15		V
I_D	Drain Current (continuous) at T_c = 25 °C	36	21	A
I_D	Drain Current (continuous) at T_c = 100 °C	25	14	A
I_{DM}(•)	Drain Current (pulsed)	144	144	A
P_{tot}	Total Dissipation at T_c = 25 °C	120	40	W
	Derating Factor	0.8	0.27	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case Max	1.25	3.75	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient Max	62.5		°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	36	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	240	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	60	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	25	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	50			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 15 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	1	1.6	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 5 V I_D = 18 A V_{GS} = 5 V I_D = 18 A T_c = 100°C		0.033	0.04 0.08	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	36			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 18 A	12	24		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1350 450 130	1800 600 200	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 18 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 3)		90 550	130 800	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 36 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		85		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 36 A V_{GS} = 5 V		35 11 19	50	nC nC nC

SWITCHING OFF

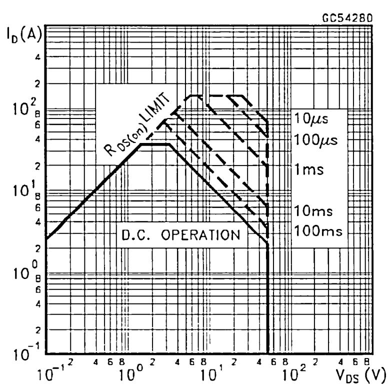
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 36 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		110 180 310	160 260 450	ns ns ns

SOURCE DRAIN DIODE

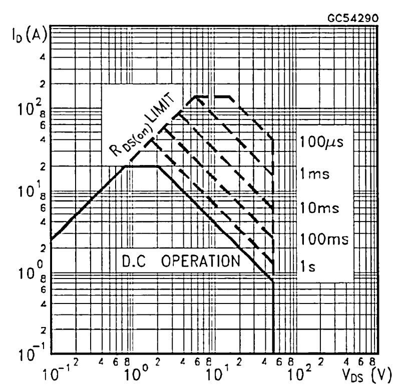
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				36 144	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 36 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 36 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		100 0.27 5.5		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

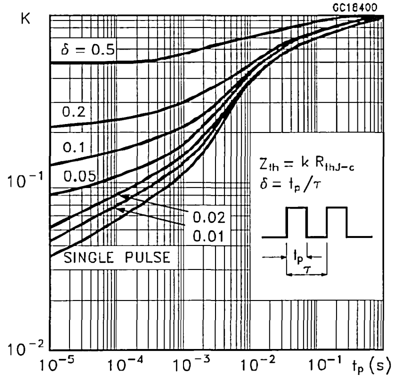
Safe Operating Areas For TO-220



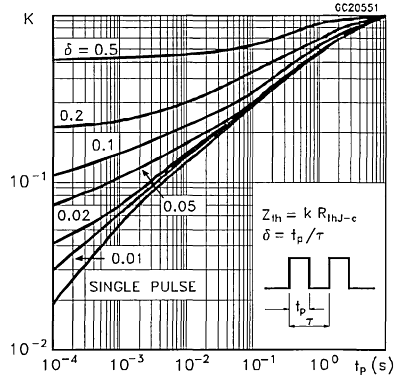
Safe Operating Areas For ISOWATT220



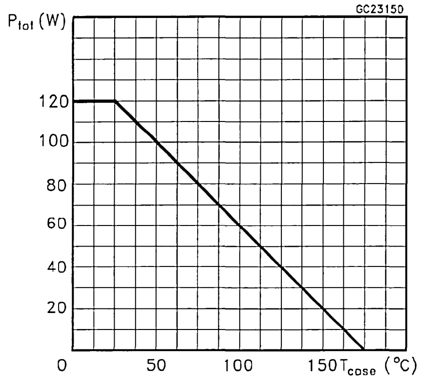
Thermal Impedance For TO-220



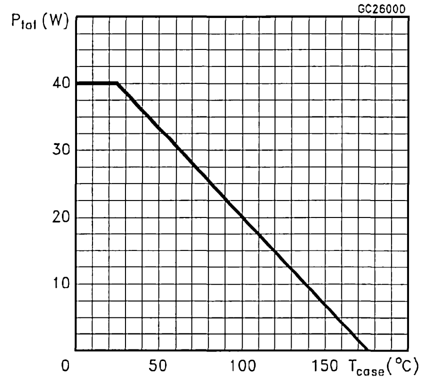
Thermal Impedance For ISOWATT220



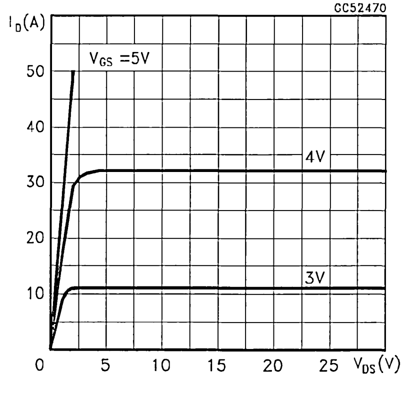
Derating Curve For TO-220



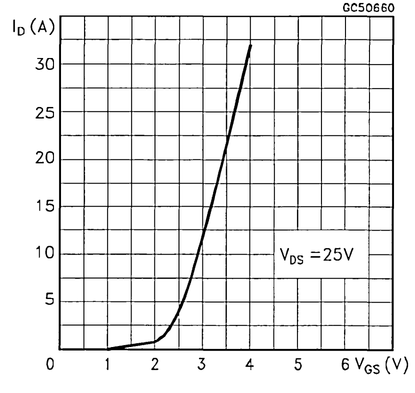
Derating Curve For ISOWATT220



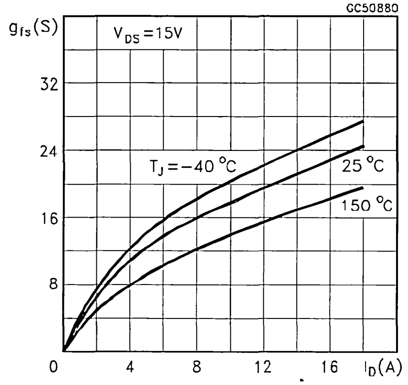
Output Characteristics



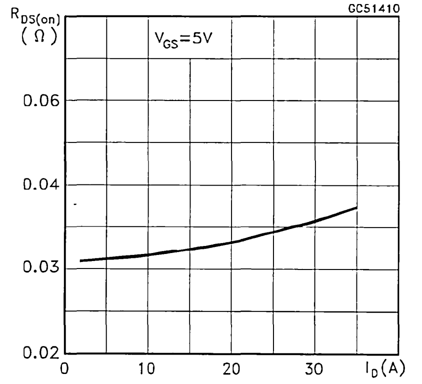
Transfer Characteristics



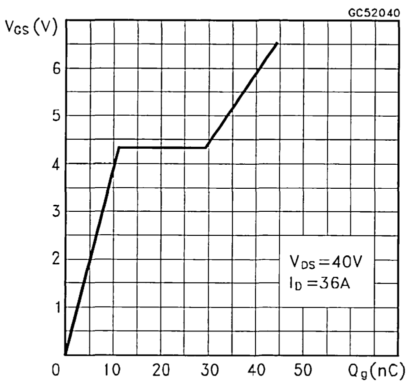
Transconductance



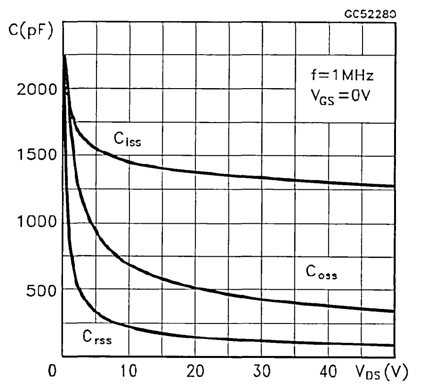
Static Drain-source On Resistance



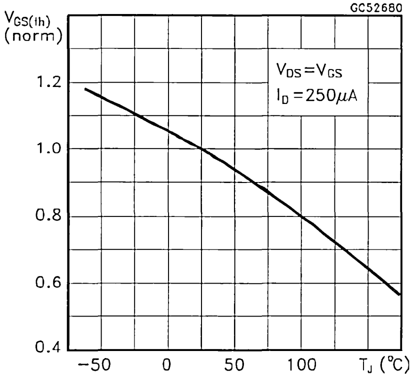
Gate Charge vs Gate-source Voltage



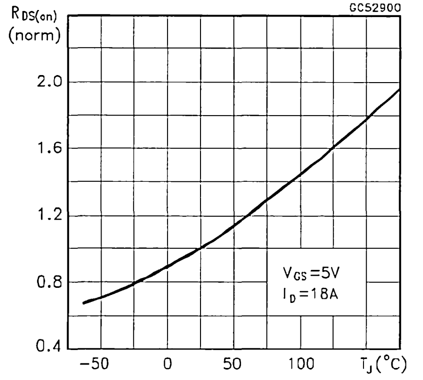
Capacitance Variations



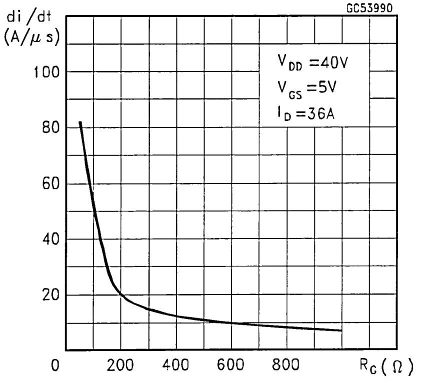
Normalized Gate Threshold Voltage vs Temperature



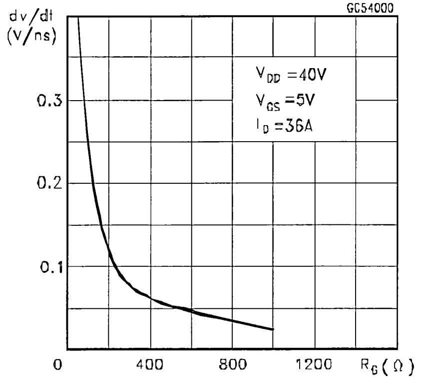
Normalized On Resistance vs Temperature



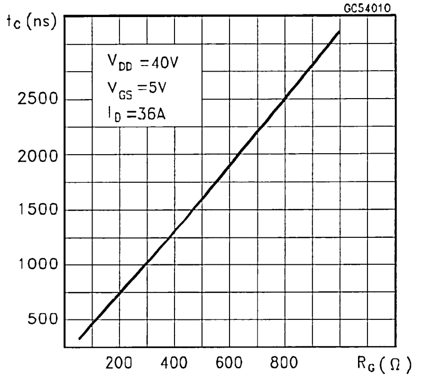
Turn-on Current Slope



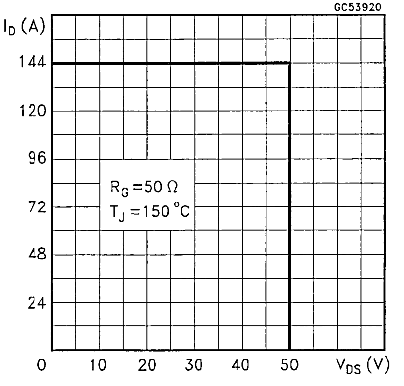
Turn-off Drain-source Voltage Slope



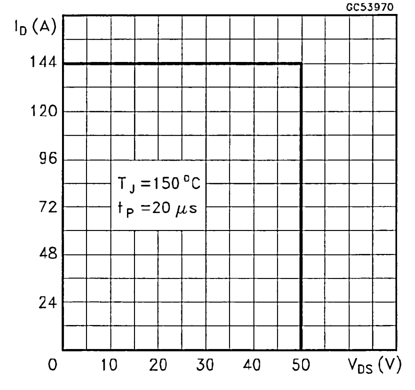
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

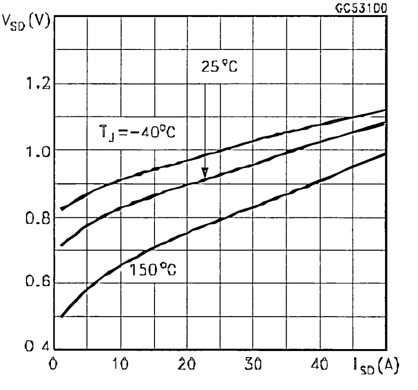


Fig. 1: Unclamped Inductive Load Test Circuits

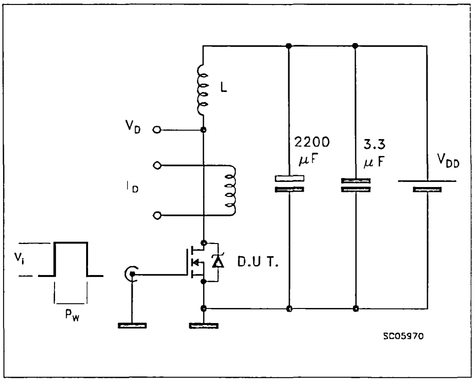


Fig. 2: Unclamped Inductive Waveforms

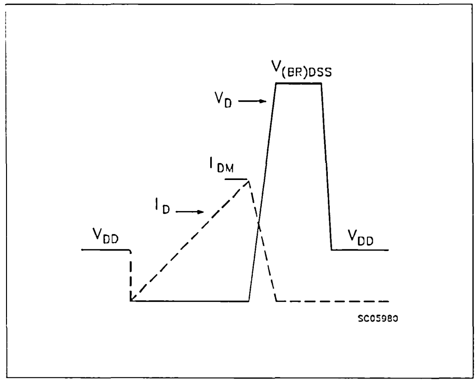


Fig. 3: Switching Times Test Circuits For Resistive Load

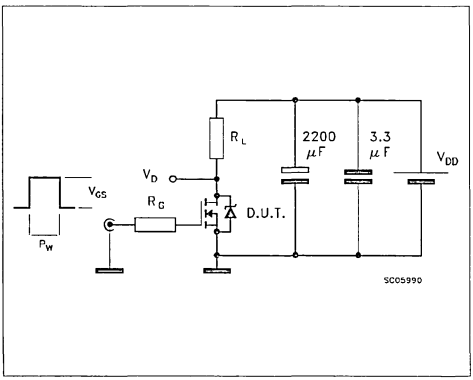


Fig. 4: Gate Charge Test Circuit

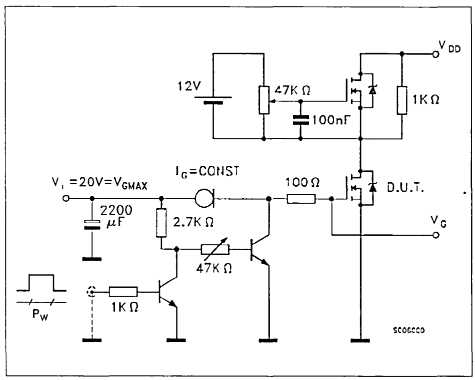
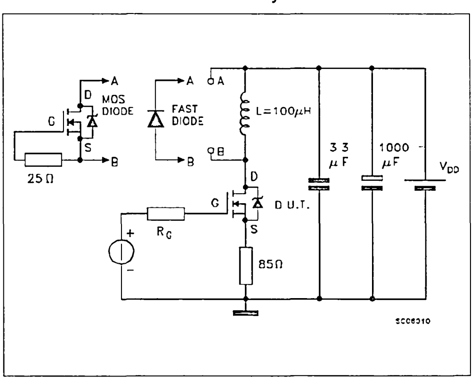


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



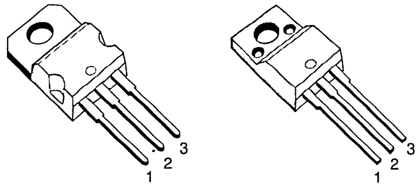
SGS-THOMSON
MICROELECTRONICS

STP36N06
STP36N06FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP36N06	60 V	< 0.04 Ω	36 A
STP36N06FI	60 V	< 0.04 Ω	21 A

- TYPICAL $R_{DS(on)}$ = 0.03 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

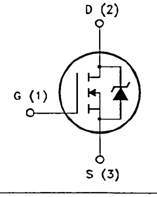


TO-220 ISOWATT220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP36N06	STP36N06FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	60		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	60		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	36	21	A
I_D	Drain Current (continuous) at T_c = 100 °C	25	14	A
I_{DM}(•)	Drain Current (pulsed)	144	144	A
P_{tot}	Total Dissipation at T_c = 25 °C	120	40	W
	Derating Factor	0.8	0.27	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case Max	1.25	3.75	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient Max	62.5		°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	36	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	240	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	60	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	25	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	60			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 18 A V_{GS} = 10V I_D = 18 A T_c = 100°C		0.03	0.04 0.08	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	36			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 18 A	12	16		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1130 480 140	1500 650 200	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 18 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		45 280	65 400	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 36 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		200		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 36 A V_{GS} = 10 V		42 11 21	60	nC nC nC

SWITCHING OFF

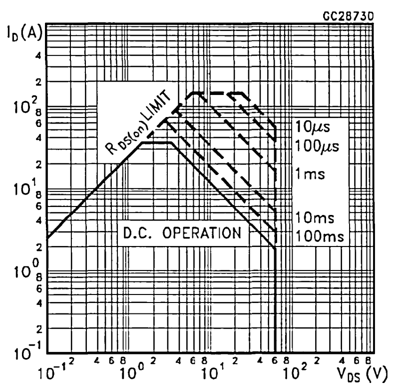
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 36 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		110 105 220	160 150 310	ns ns ns

SOURCE DRAIN DIODE

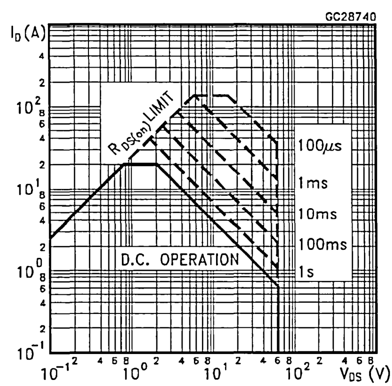
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				36 144	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 36 A V_{GS} = 0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 36 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		90 0.2 4.5		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

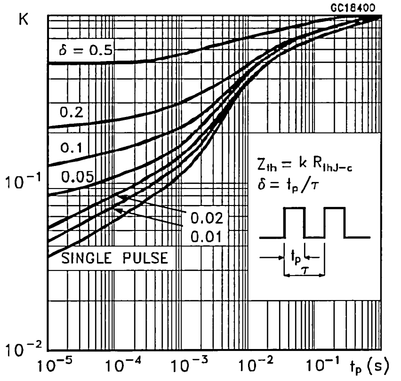
Safe Operating Areas For TO-220



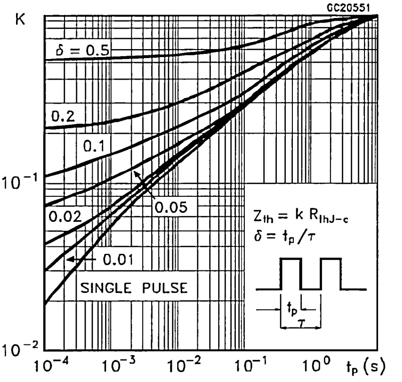
Safe Operating Areas For ISOWATT220



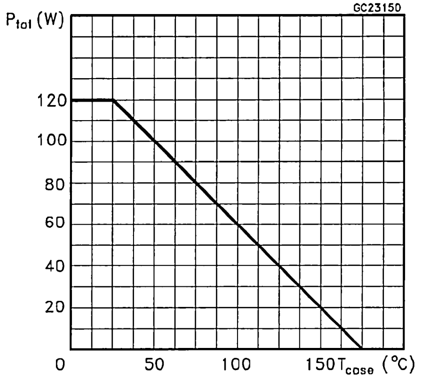
Thermal Impedance For TO-220



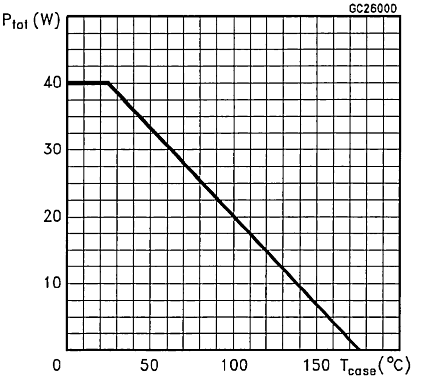
Thermal Impedance For ISOWATT220



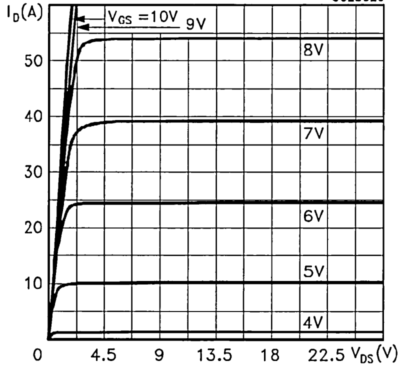
Derating Curve For TO-220



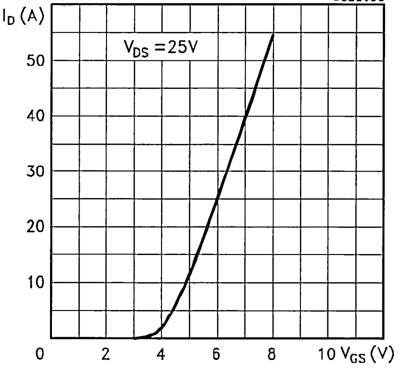
Derating Curve For ISOWATT220



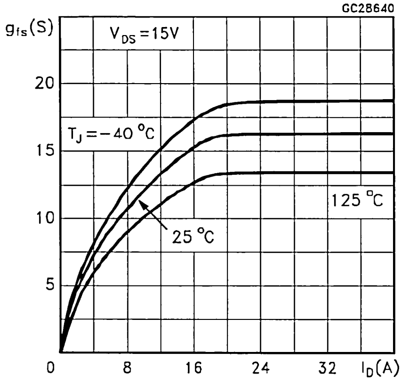
Output Characteristics



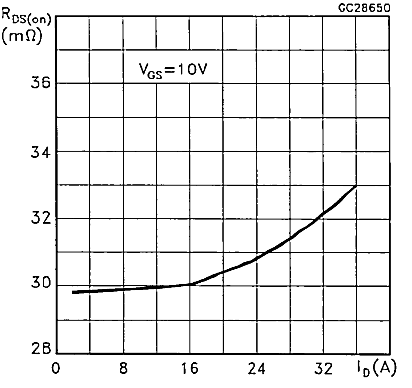
Transfer Characteristics



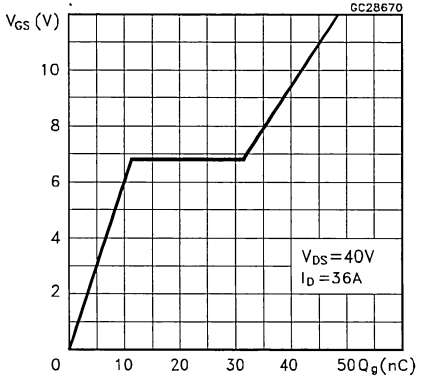
Transconductance



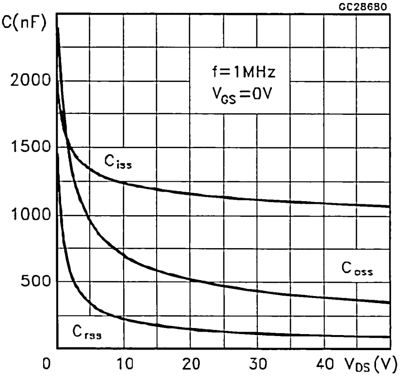
Static Drain-source On Resistance



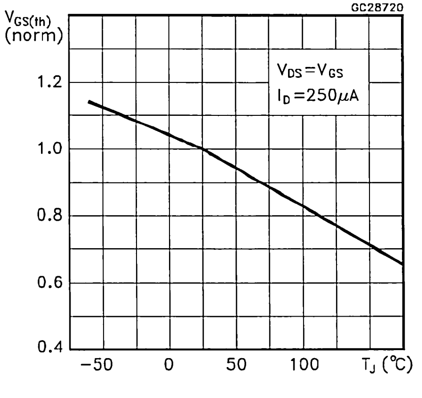
Gate Charge vs Gate-source Voltage



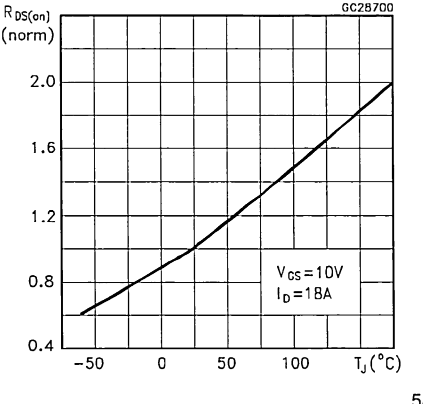
Capacitance Variations



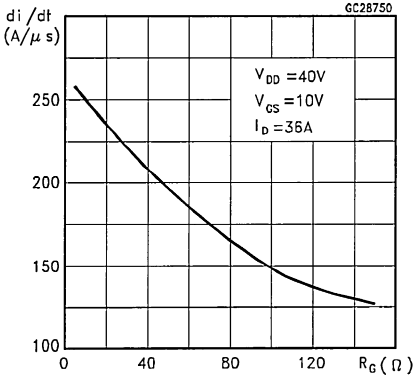
Normalized Gate Threshold Voltage vs Temperature



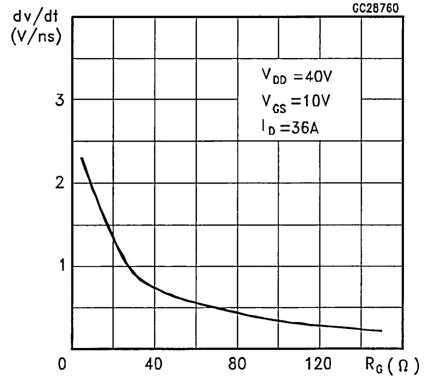
Normalized On Resistance vs Temperature



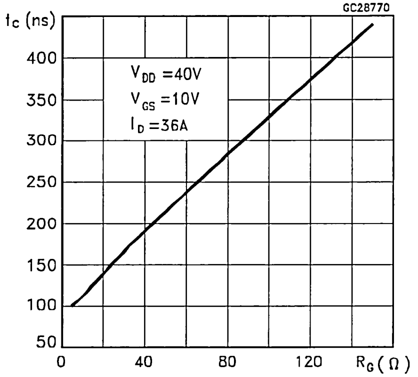
Turn-on Current Slope



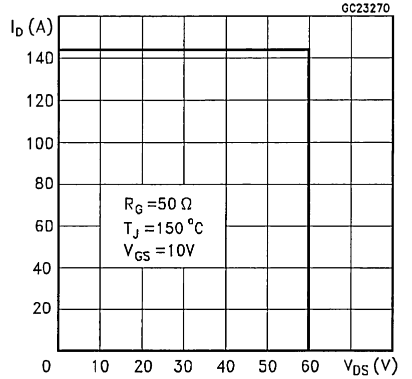
Turn-off Drain-source Voltage Slope



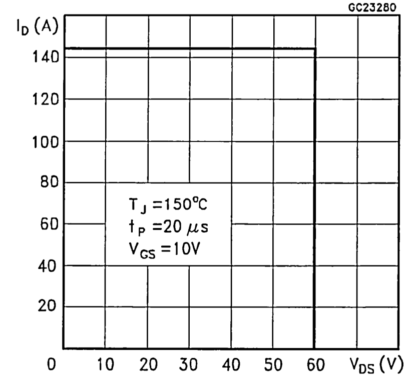
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

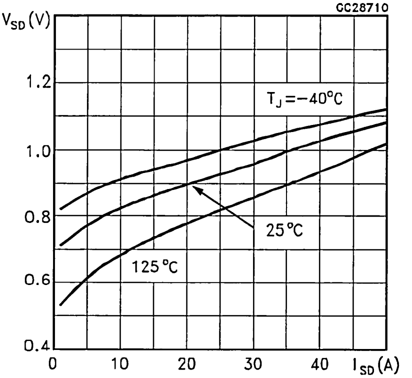


Fig. 1: Unclamped Inductive Load Test Circuits

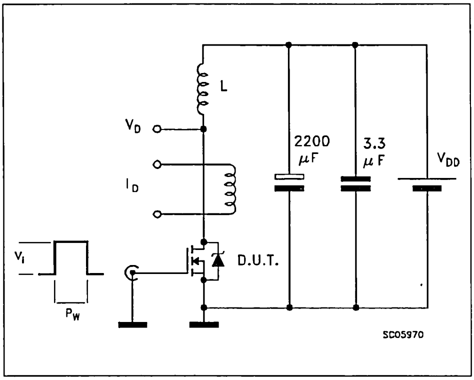


Fig. 2: Unclamped Inductive Waveforms

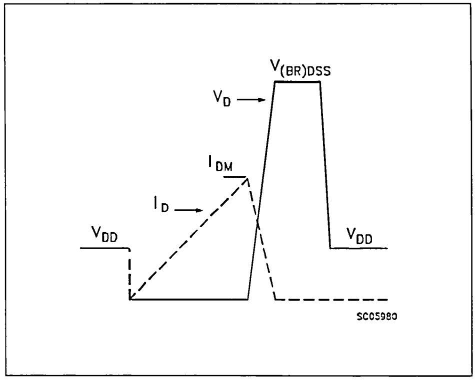


Fig. 3: Switching Times Test Circuits For Resistive Load

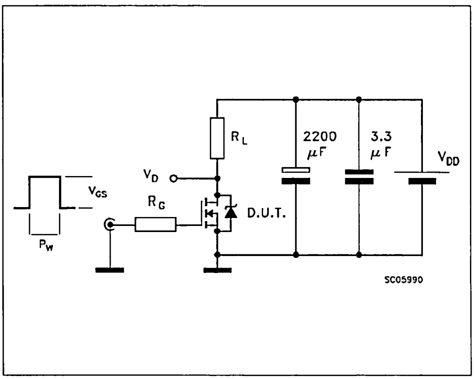


Fig. 4: Gate Charge Test Circuit

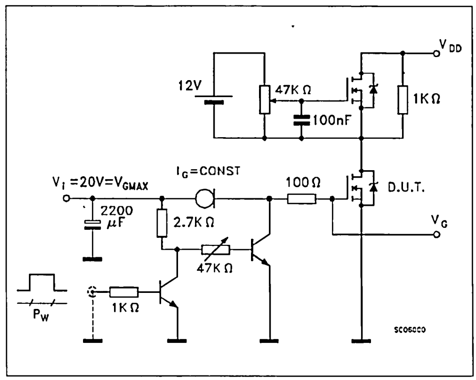
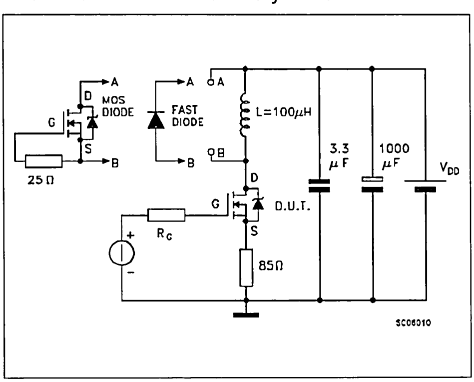


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time

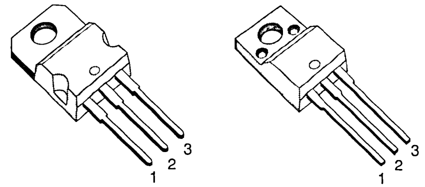


STP36N06L
STP36N06LFI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP36N05L	60 V	< 0.04 Ω	36 A
STP36N05LFI	60 V	< 0.04 Ω	21 A

- TYPICAL $R_{DS(on)}$ = 0.033 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- LOGIC LEVEL COMPATIBLE INPUT
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION



TO-220 ISOWATT220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
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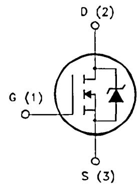
INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP36N06L	STP36N06LFI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	60		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	60		V
V_{GS}	Gate-source Voltage	± 15		V
I_D	Drain Current (continuous) at T_c = 25 °C	36	21	A
I_D	Drain Current (continuous) at T_c = 100 °C	25	14	A
I_{DM}(•)	Drain Current (pulsed)	144	144	A
P_{tot}	Total Dissipation at T_c = 25 °C	120	40	W
	Derating Factor	0.8	0.27	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case Max	1.25	3.75	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max	62.5		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	36	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	240	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	60	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	25	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	60			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 15$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	1	1.6	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 5$ V $I_D = 18$ A $V_{GS} = 5$ V $I_D = 18$ A $T_c = 100$°C		0.033	0.04 0.08	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	36			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 18$ A	12	24		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		1350 450 130	1800 600 200	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 18 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 3)		90 550	130 800	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 36 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		85		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 36 A V_{GS} = 5 V		35 11 19	50	nC nC nC

SWITCHING OFF

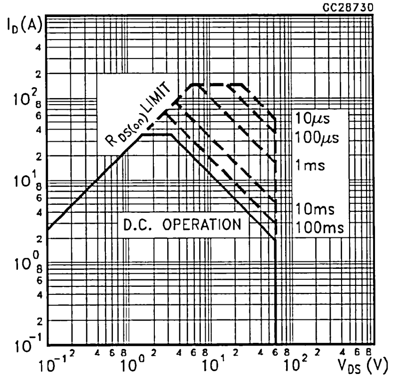
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 36 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		110 180 310	160 260 450	ns ns ns

SOURCE DRAIN DIODE

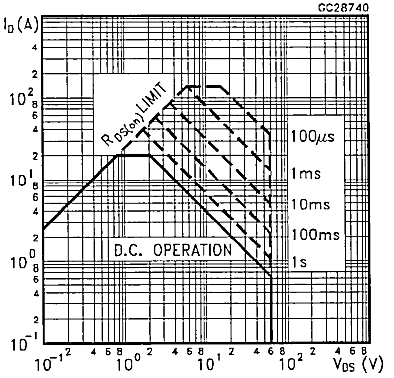
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				36 144	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 36 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 36 A di/dt = 100 A/μs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		100 0.27 5.5		ns μC A

(*) Pulsed. Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

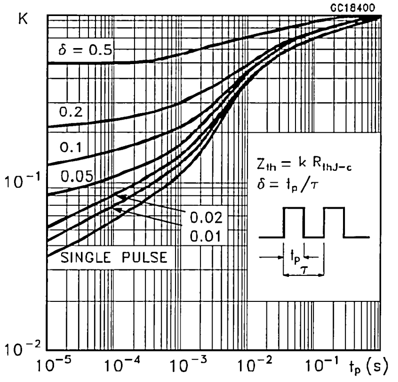
Safe Operating Areas For TO-220



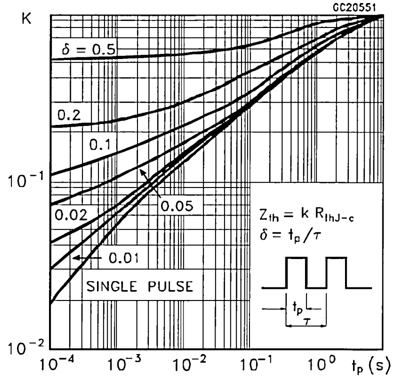
Safe Operating Areas For ISOWATT220



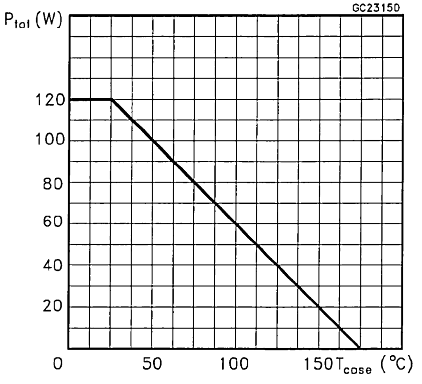
Thermal Impedance For TO-220



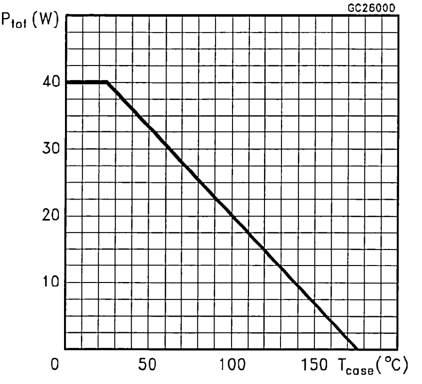
Thermal Impedance For ISOWATT220



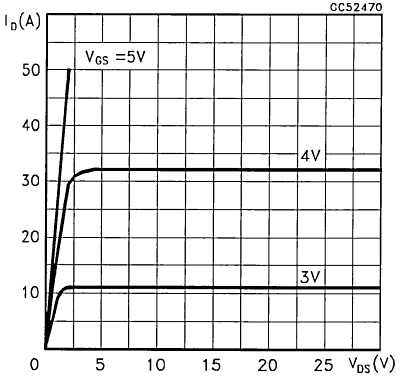
Derating Curve For TO-220



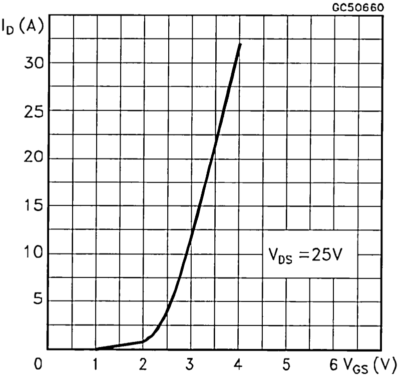
Derating Curve For ISOWATT220



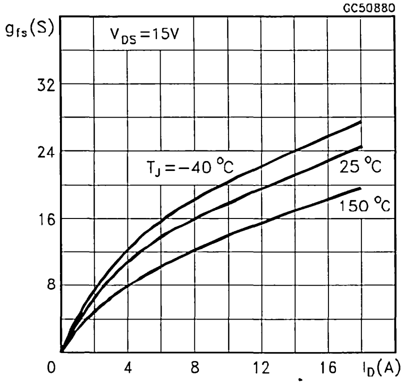
Output Characteristics



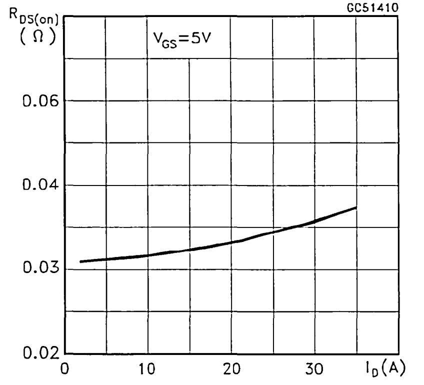
Transfer Characteristics



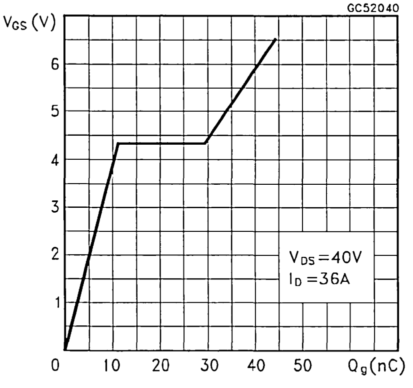
Transconductance



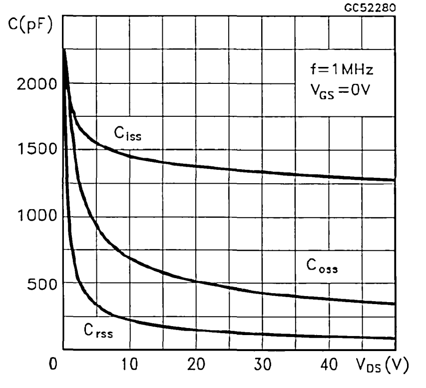
Static Drain-source On Resistance



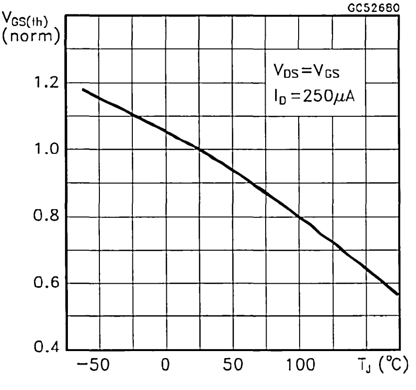
Gate Charge vs Gate-source Voltage



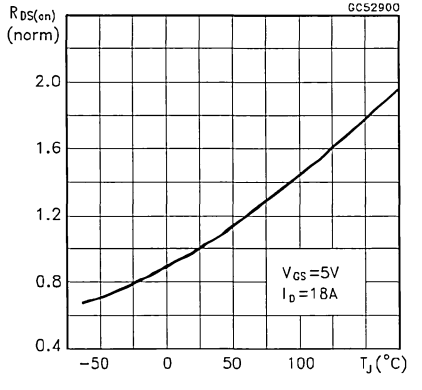
Capacitance Variations



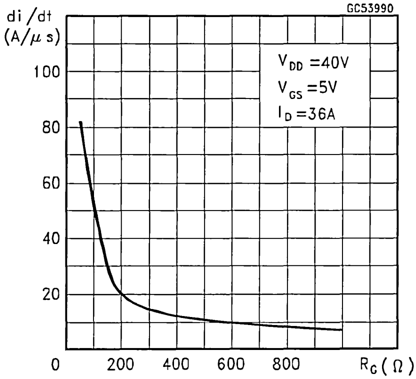
Normalized Gate Threshold Voltage vs Temperature



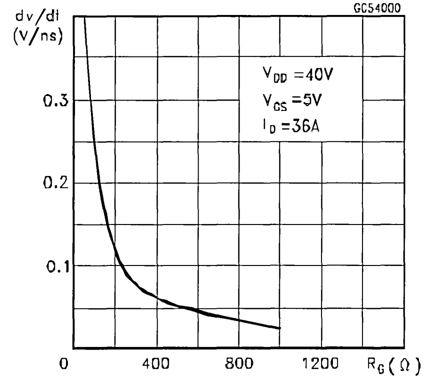
Normalized On Resistance vs Temperature



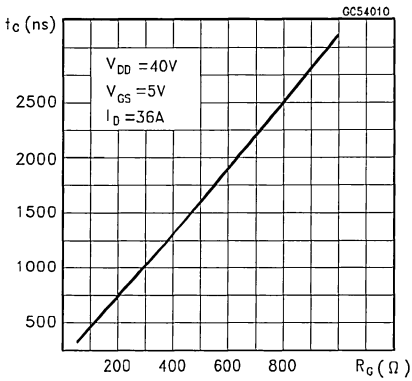
Turn-on Current Slope



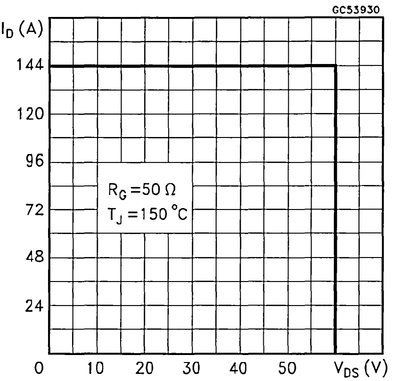
Turn-off Drain-source Voltage Slope



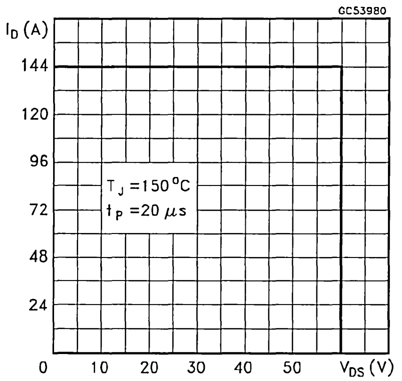
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

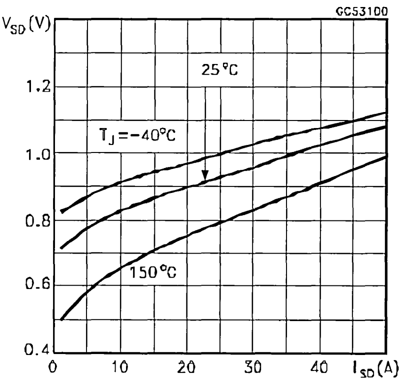


Fig. 1: Unclamped Inductive Load Test Circuits

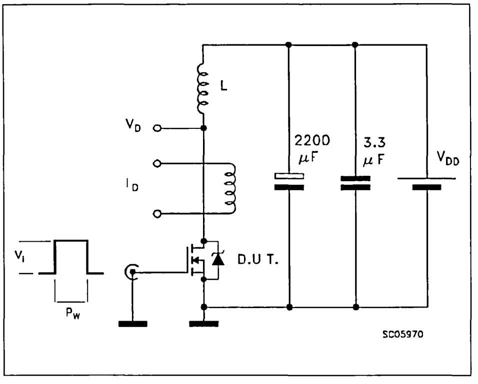


Fig. 2: Unclamped Inductive Waveforms

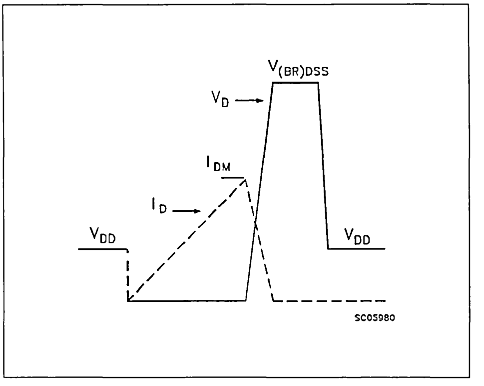


Fig. 3: Switching Times Test Circuits For Resistive Load

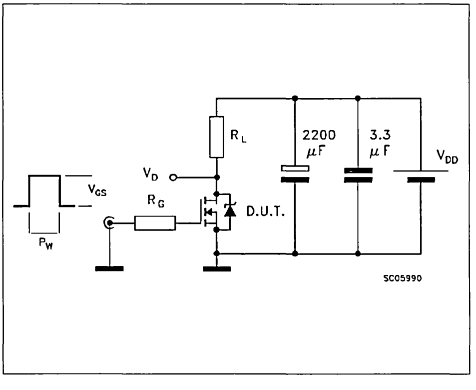


Fig. 4: Gate Charge Test Circuit

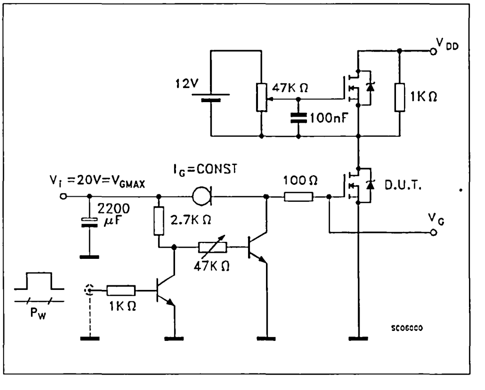
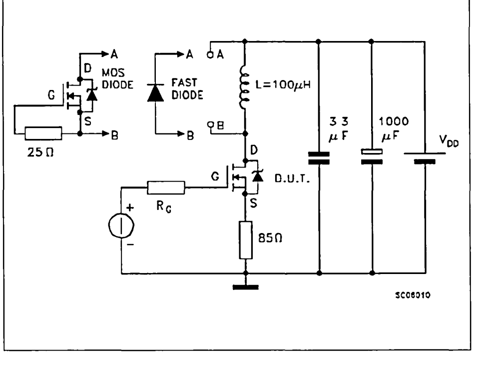


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



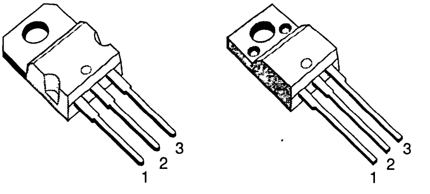
SGS-THOMSON
MICROELECTRONICS

STP40N05
STP40N05FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP40N05	50 V	< 0.035 Ω	40 A
STP40N05FI	50 V	< 0.035 Ω	23 A

- TYPICAL $R_{DS(on)}$ = 0.03 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

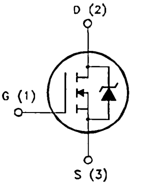


TO-220 ISOWATT220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP40N05	STP40N05FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	40	23	A
I_D	Drain Current (continuous) at T_c = 100 °C	28	16	A
I_{DM}(•)	Drain Current (pulsed)	160	160	A
P_{tot}	Total Dissipation at T_c = 25 °C	120	40	W
	Derating Factor	0.8	0.27	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1.25	3.75	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	40	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	300	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	75	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	28	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	50			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 20 A V_{GS} = 10V I_D = 20 A T_c = 100°C		0.03	0.035 0.07	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	40			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 20 A	13	16		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1130 480 140	1500 650 200	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 20 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		50 290	70 410	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 40 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		200		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 40 A V_{GS} = 10 V		42 11 21	60	nC nC nC

SWITCHING OFF

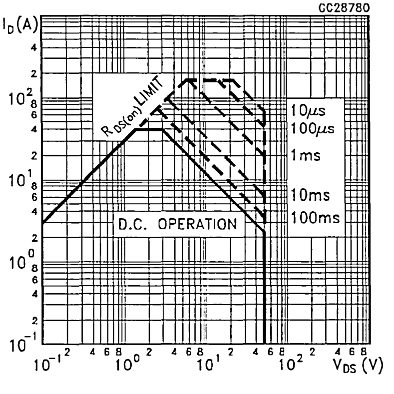
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 40 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		110 110 230	160 160 330	ns ns ns

SOURCE DRAIN DIODE

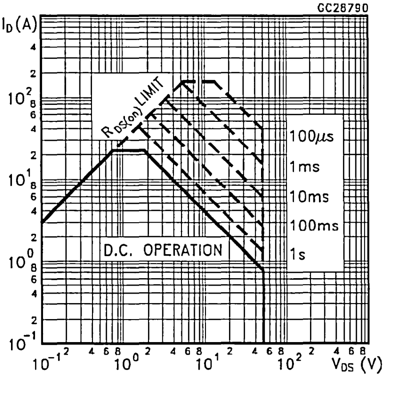
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				40 160	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 40 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 40 A di/dt = 100 A/μs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		90 0.2 4.5		ns μC A

(*) Pulsed· Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

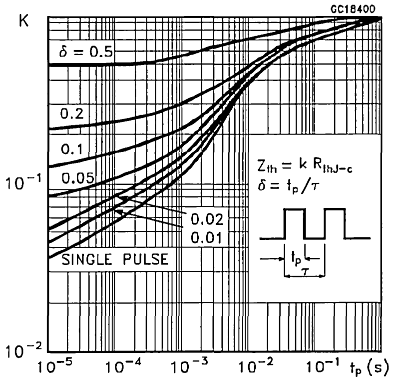
Safe Operating Areas For TO-220



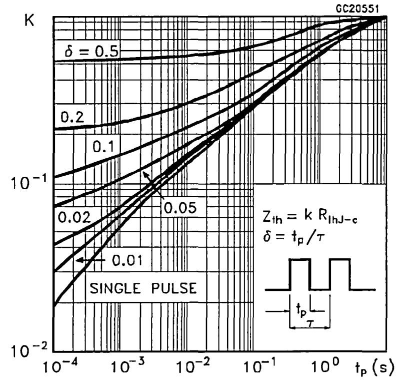
Safe Operating Areas For ISOWATT220



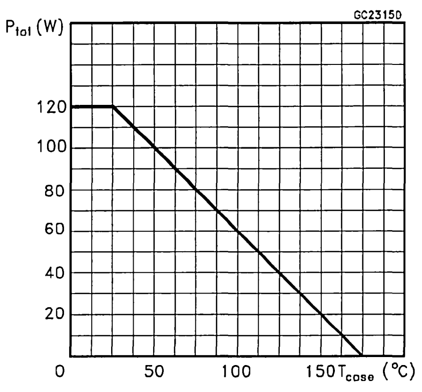
Thermal Impedance For TO-220



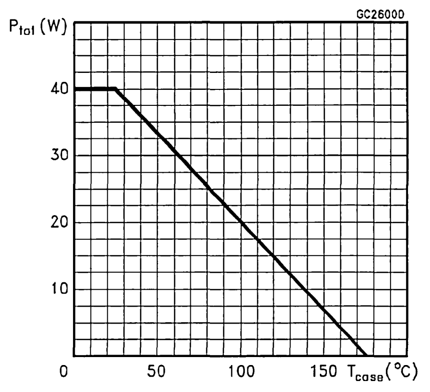
Thermal Impedance For ISOWATT220



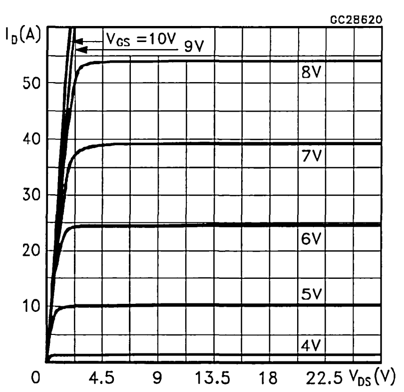
Derating Curve For TO-220



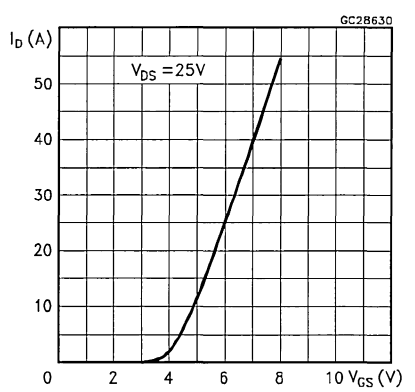
Derating Curve For ISOWATT220



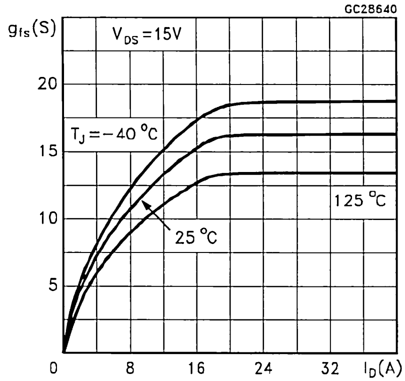
Output Characteristics



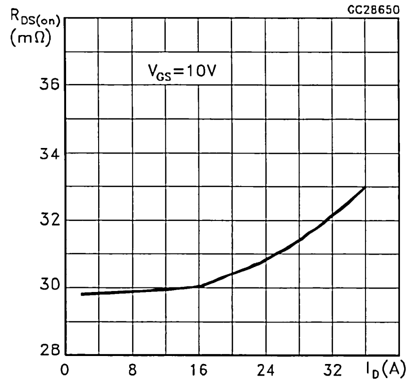
Transfer Characteristics



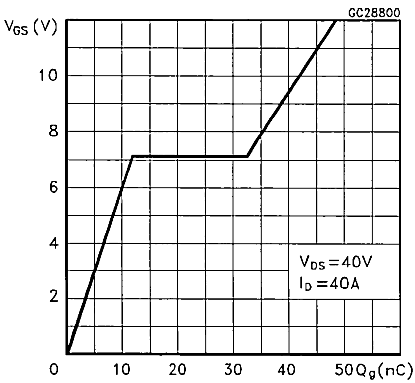
Transconductance



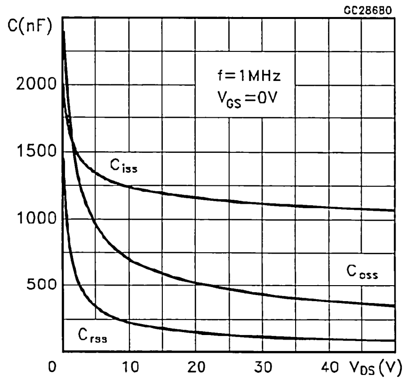
Static Drain-source On Resistance



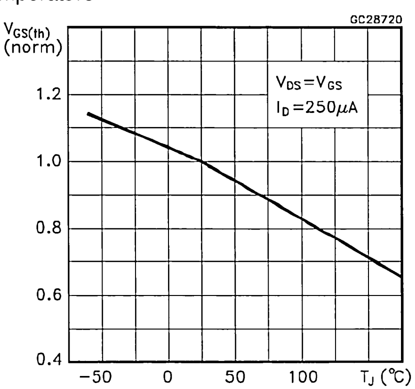
Gate Charge vs Gate-source Voltage



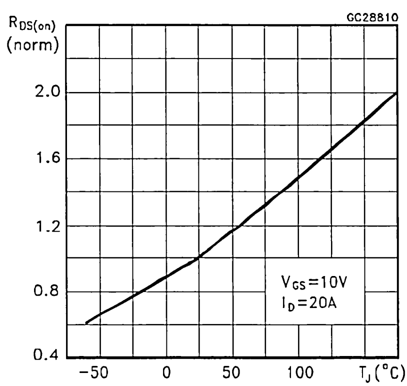
Capacitance Variations



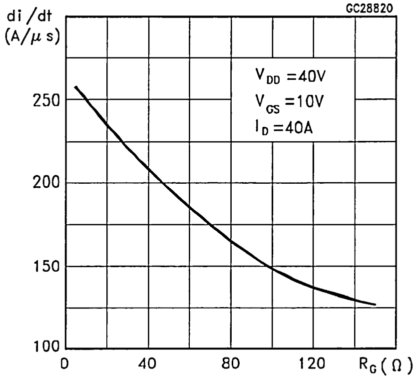
Normalized Gate Threshold Voltage vs Temperature



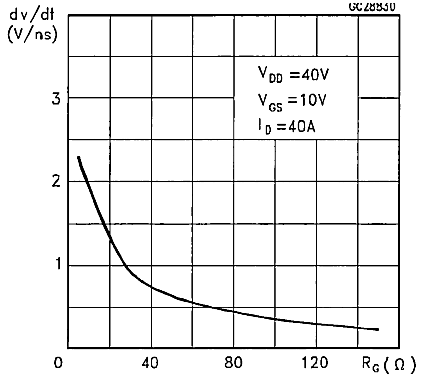
Normalized On Resistance vs Temperature



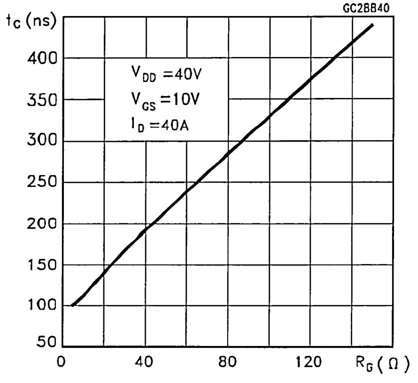
Turn-on Current Slope



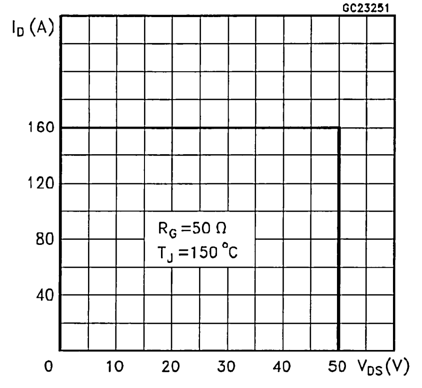
Turn-off Drain-source Voltage Slope



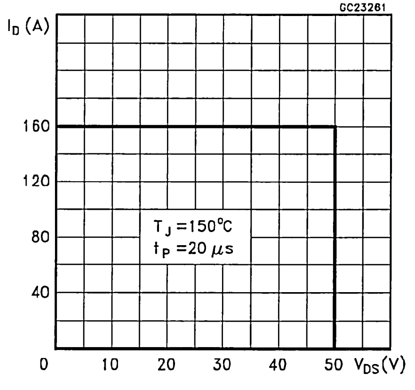
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

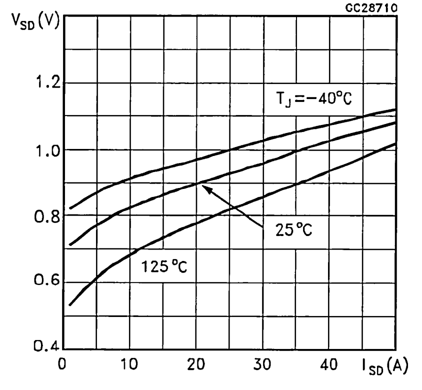


Fig. 1: Unclamped Inductive Load Test Circuits

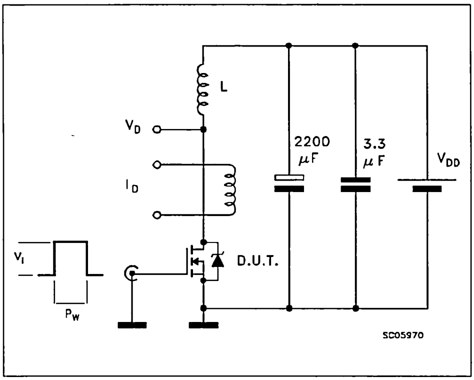


Fig. 2: Unclamped Inductive Waveforms

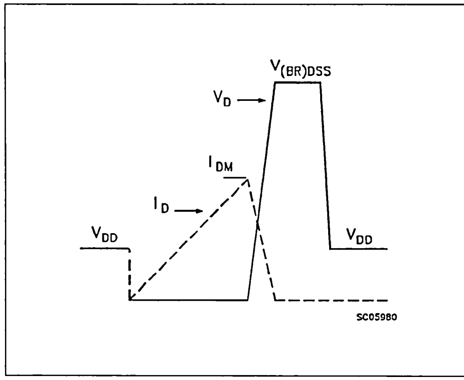


Fig. 3: Switching Times Test Circuits For Resistive Load

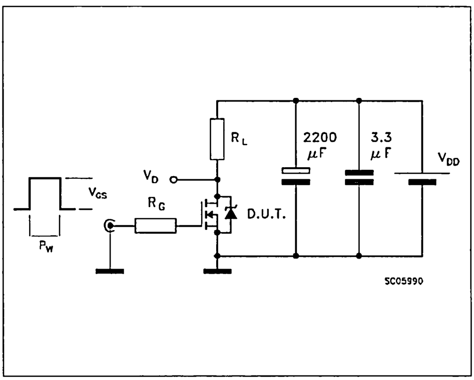


Fig. 4: Gate Charge Test Circuit

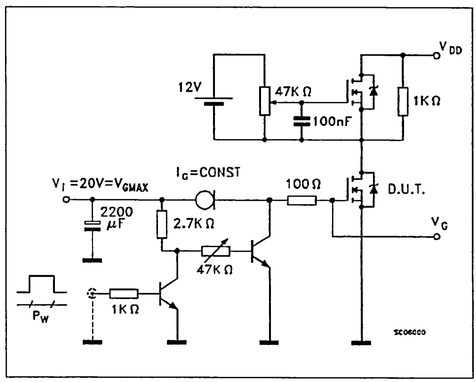
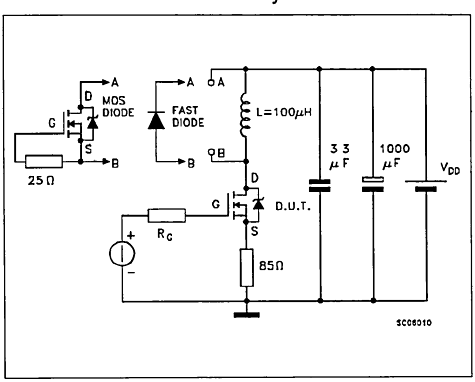


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time

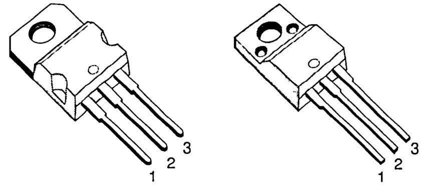


STP40N06 STP40N06FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP40N06	60 V	< 0.035 Ω	40 A
STP40N06FI	60 V	< 0.035 Ω	23 A

- TYPICAL $R_{DS(on)}$ = 0.03 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

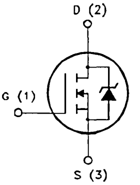


TO-220 ISOWATT220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP40N06	STP40N06FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	60		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	60		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	40	23	A
I_D	Drain Current (continuous) at T_c = 100 °C	28	16	A
I_{DM}(•)	Drain Current (pulsed)	160	160	A
P_{tot}	Total Dissipation at T_c = 25 °C	120	40	W
	Derating Factor	0.8	0.27	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case Max	1.25	3.75	°C/W
$R_{thj\text{-}amb}$ $R_{thc\text{-}sink}$ T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	40	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	300	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	75	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	28	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	60			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10$V $I_D = 20$ A $V_{GS} = 10$V $I_D = 20$ A $T_c = 100$°C		0.03	0.035 0.07	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	40			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 20$ A	13	16		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		1130 480 140	1500 650 200	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 20 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		50 290	70 410	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 40 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		200		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 40 A V_{GS} = 10 V		42 11 21	60	nC nC nC

SWITCHING OFF

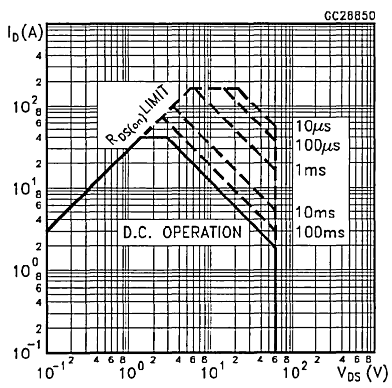
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 40 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		110 110 230	160 160 330	ns ns ns

SOURCE DRAIN DIODE

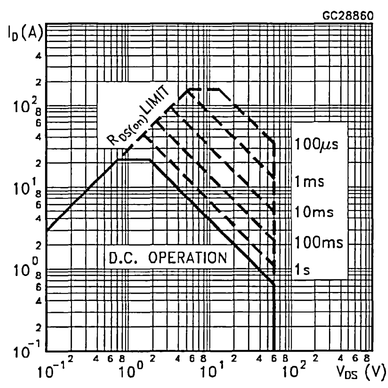
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				40 160	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 40 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 40 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		90 0.2 4.5		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

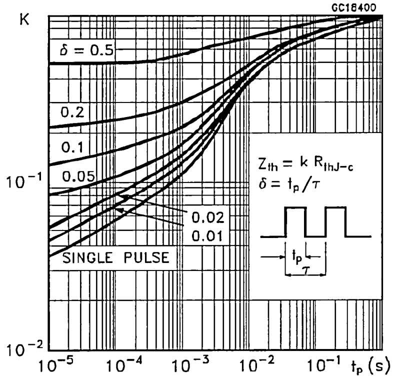
Safe Operating Areas For TO-220



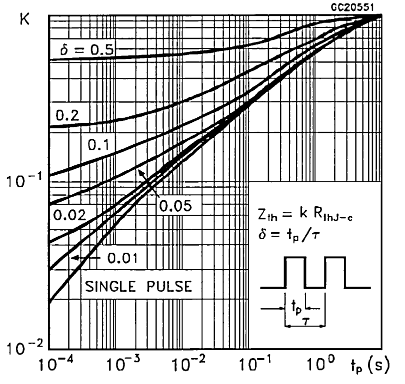
Safe Operating Areas For ISOWATT220



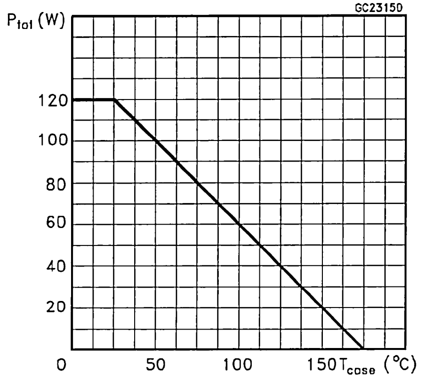
Thermal Impedance For TO-220



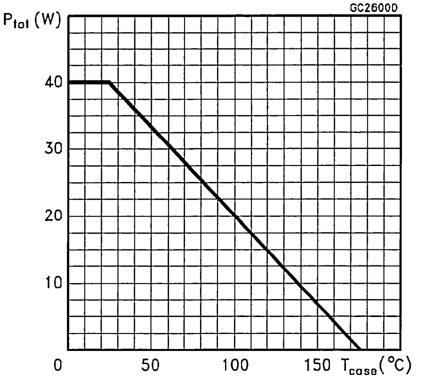
Thermal Impedance For ISOWATT220



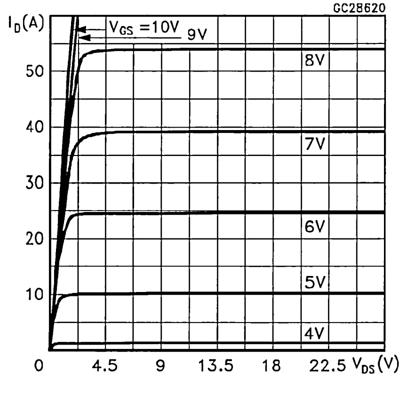
Derating Curve For TO-220



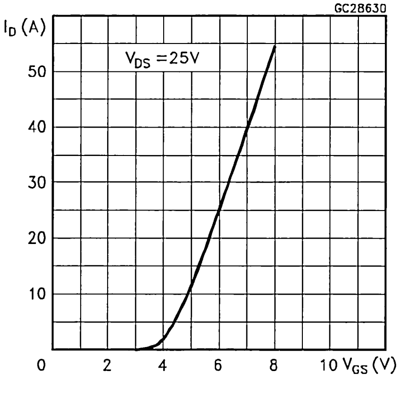
Derating Curve For ISOWATT220



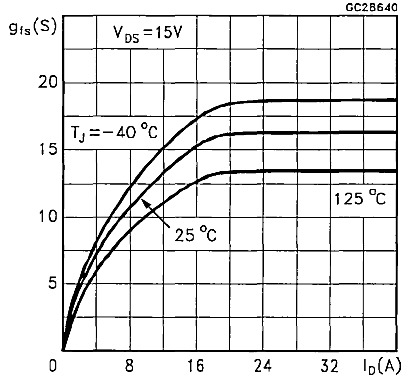
Output Characteristics



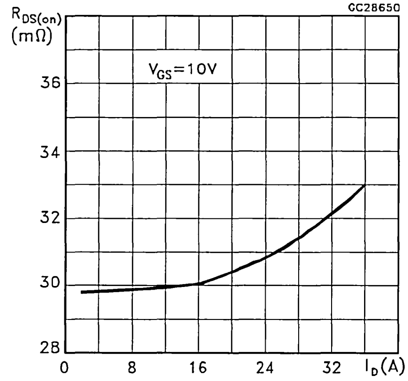
Transfer Characteristics



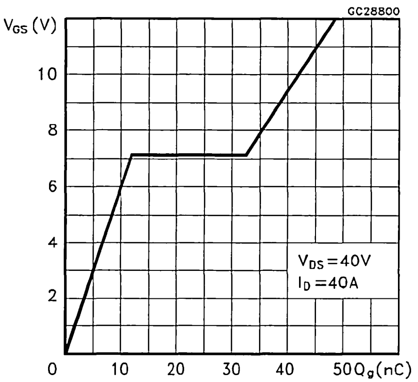
Transconductance



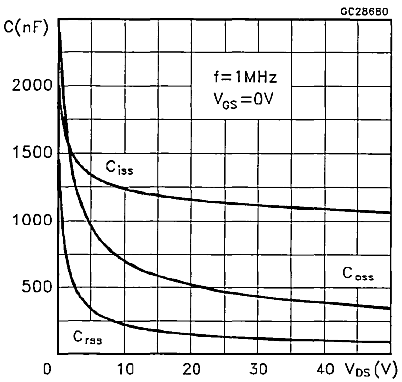
Static Drain-source On Resistance



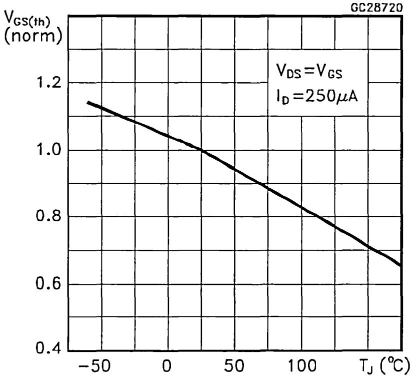
Gate Charge vs Gate-source Voltage



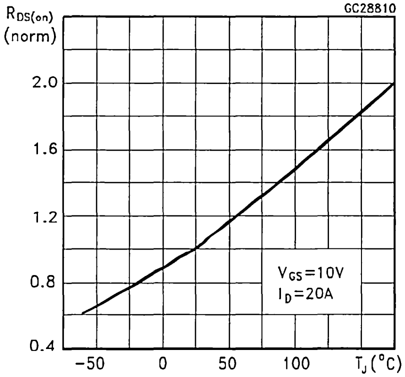
Capacitance Variations



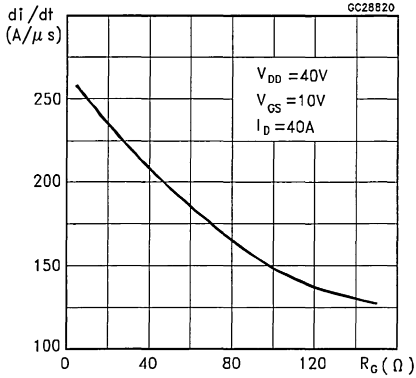
Normalized Gate Threshold Voltage vs Temperature



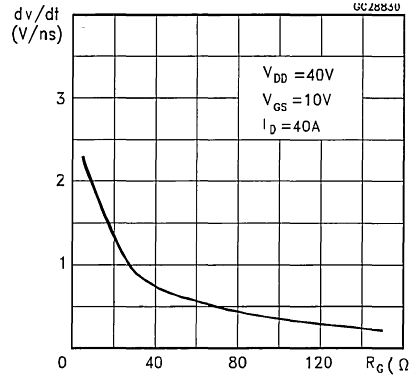
Normalized On Resistance vs Temperature



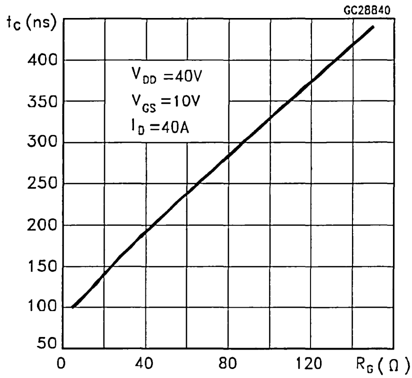
Turn-on Current Slope



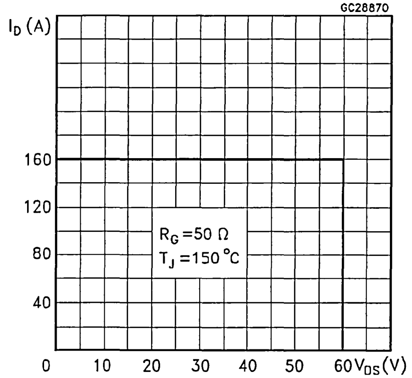
Turn-off Drain-source Voltage Slope



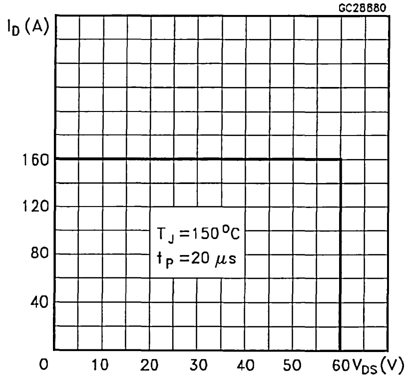
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

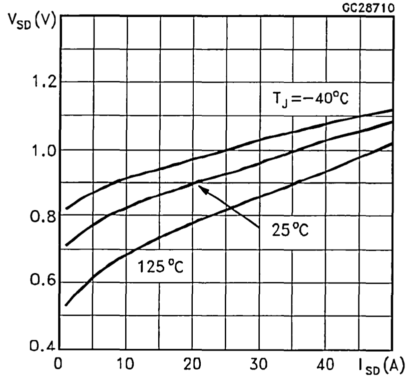


Fig. 1: Unclamped Inductive Load Test Circuits

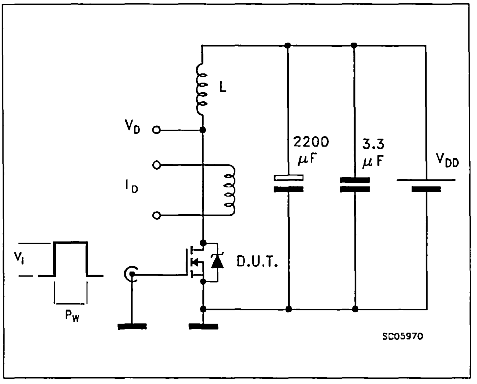


Fig. 2: Unclamped Inductive Waveforms

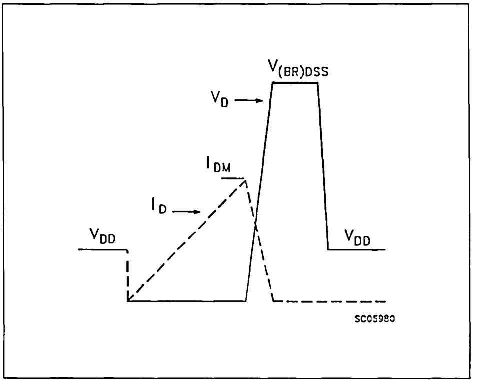


Fig. 3: Switching Times Test Circuits For Resistive Load

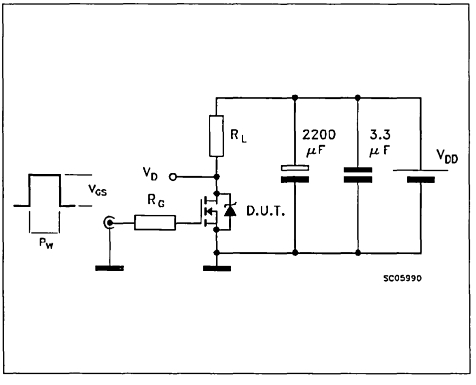


Fig. 4: Gate Charge Test Circuit

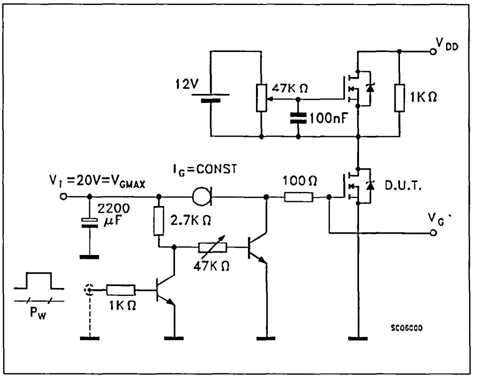
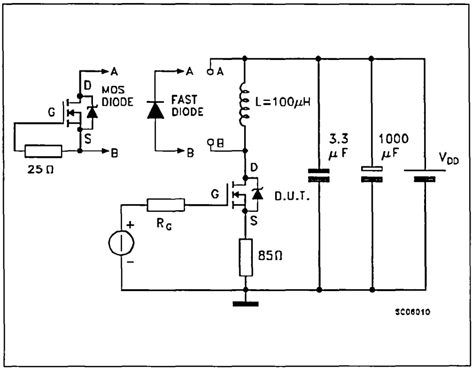


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time

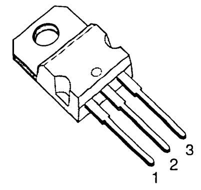


STP40N10
STP40N10FI

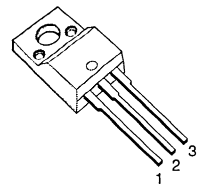
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP40N10	100 V	< 0.04 Ω	40 A
STP40N10FI	100 V	< 0.04 Ω	22 A

- TYPICAL $R_{DS(on)}$ = 0.035 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION



TO-220

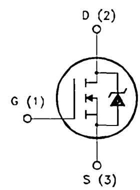


ISOWATT220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP40N10	STP40N10FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	100		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	100		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	40	22	A
I_D	Drain Current (continuous) at T_c = 100 °C	28	15	A
I_{DM}(•)	Drain Current (pulsed)	160	160	A
P_{tot}	Total Dissipation at T_c = 25 °C	150	45	W
	Derating Factor	1	0.3	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case Max	1	3.33	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	40	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	210	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	50	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	28	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	100			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 20 A V_{GS} = 10V I_D = 20 A T_c = 100°C		0.035	0.04 0.08	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	40			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 20 A	14	25		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		2150 600 150	2800 800 200	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 80 V I_D = 20 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		20 130	30 190	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 80 V I_D = 40 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		500		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 80 V I_D = 40 A V_{GS} = 10 V		70 12 30	100	nC nC nC

SWITCHING OFF

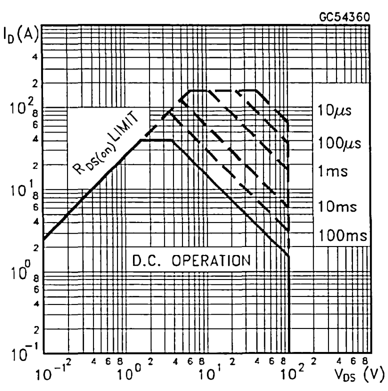
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 80 V I_D = 40 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		50 70 140	70 100 200	ns ns ns

SOURCE DRAIN DIODE

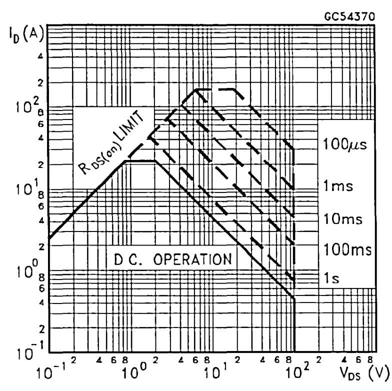
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				40 160	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 40 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 40 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		130 0.65 10		ns µC A

( ) Pulsed Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

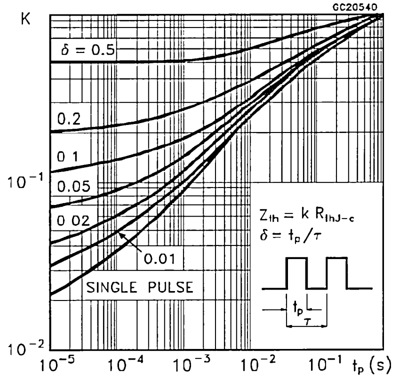
Safe Operating Areas For TO-220



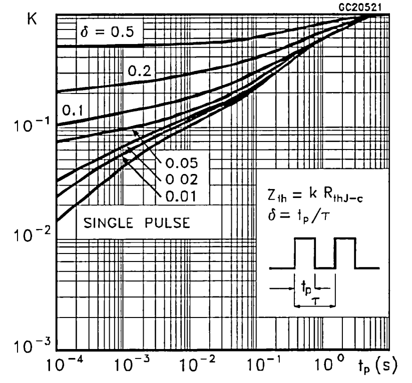
Safe Operating Areas For ISOWATT220



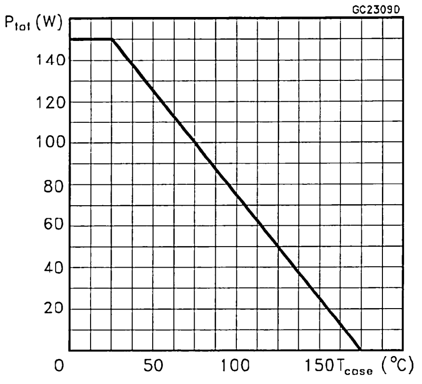
Thermal Impedeance For TO-220



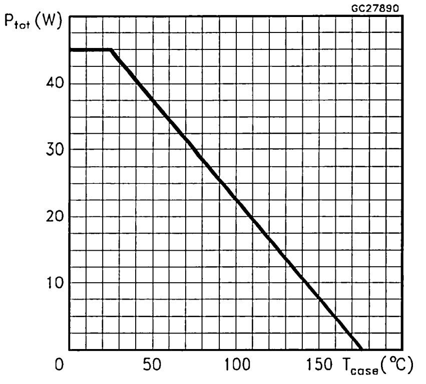
Thermal Impedance For ISOWATT220



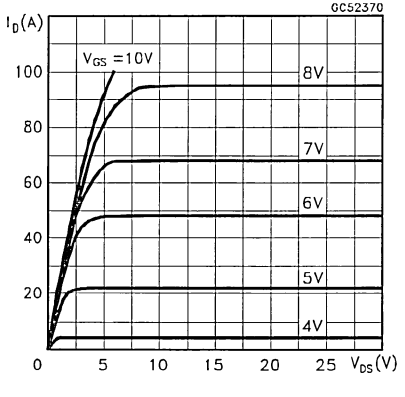
Derating Curve For TO-220



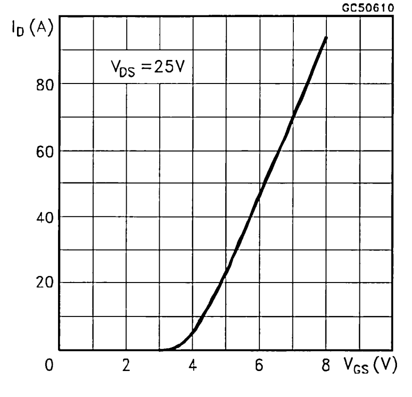
Derating Curve For ISOWATT220



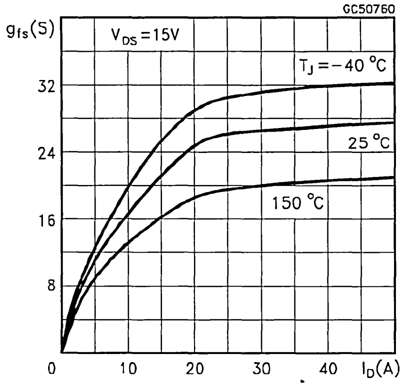
Output Characteristics



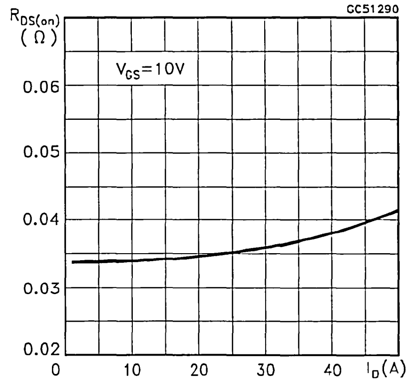
Transfer Characteristics



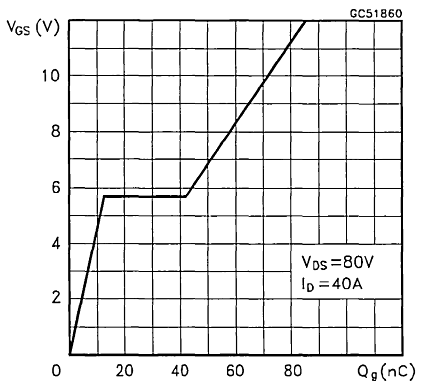
Transconductance



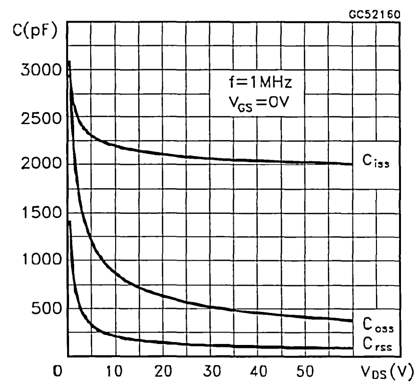
Static Drain-source On Resistance



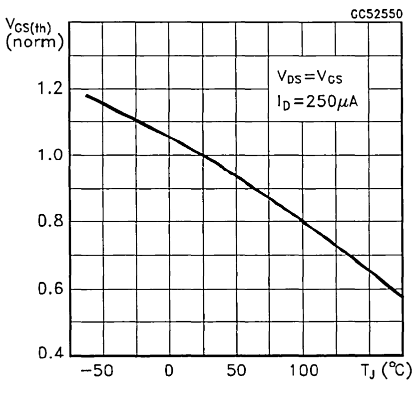
Gate Charge vs Gate-source Voltage



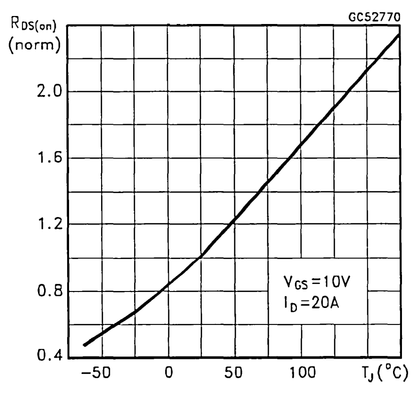
Capacitance Variations



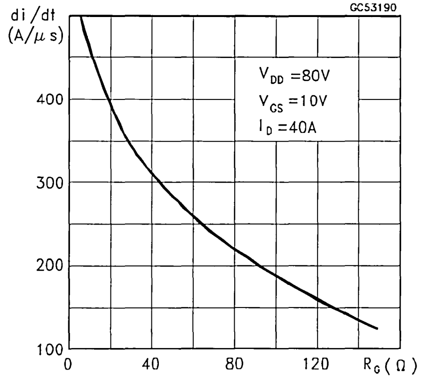
Normalized Gate Threshold Voltage vs Temperature



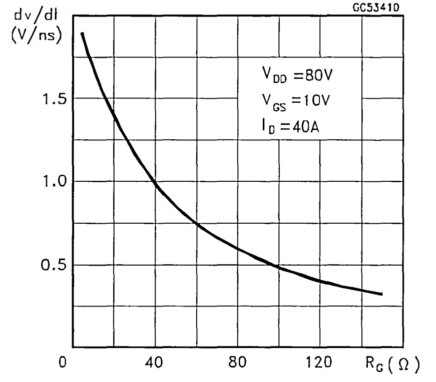
Normalized On Resistance vs Temperature



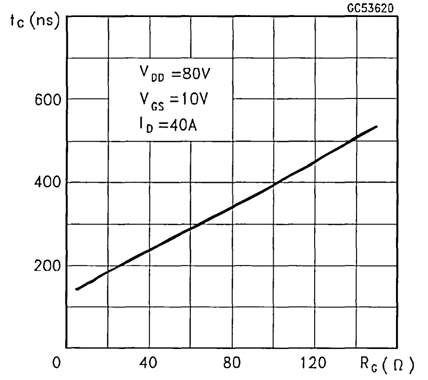
Turn-on Current Slope



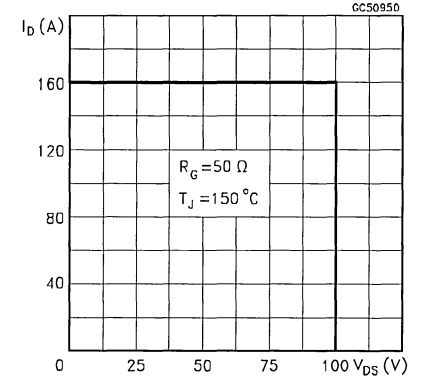
Turn-off Drain-source Voltage Slope



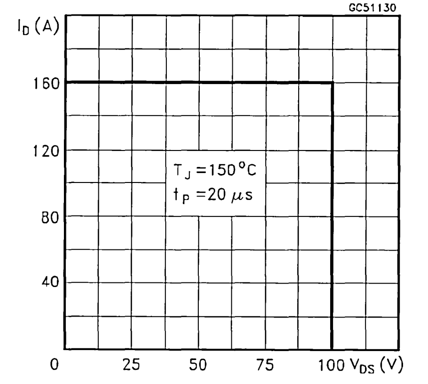
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

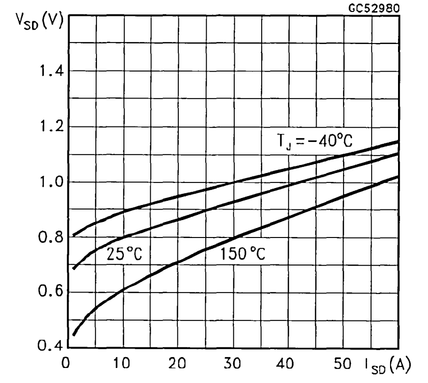


Fig. 1: Unclamped Inductive Load Test Circuits

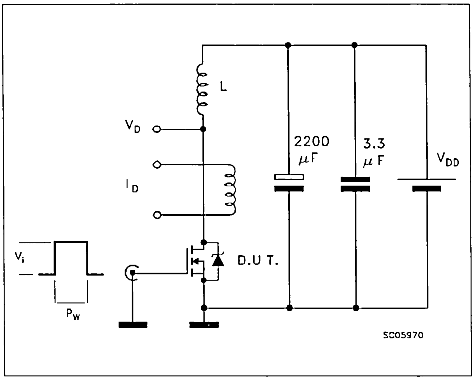


Fig. 2: Unclamped Inductive Waveforms

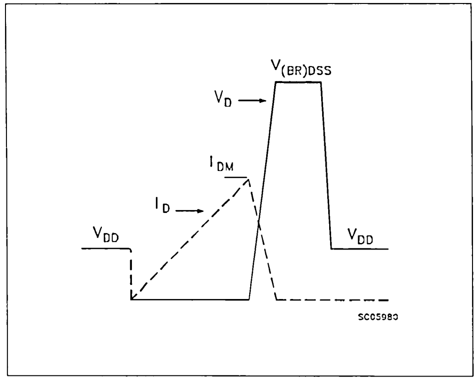


Fig. 3: Switching Times Test Circuits For Resistive Load

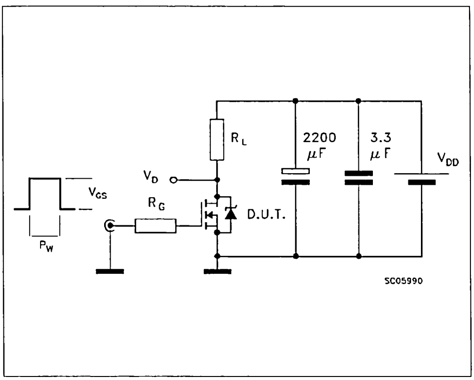


Fig. 4: Gate Charge Test Circuit

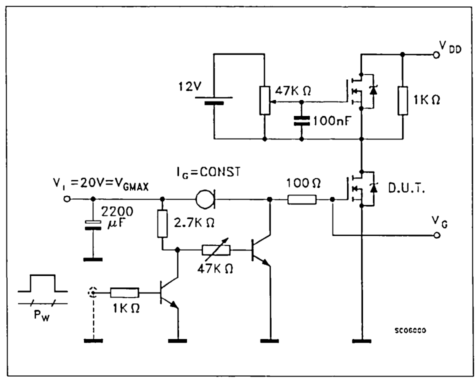
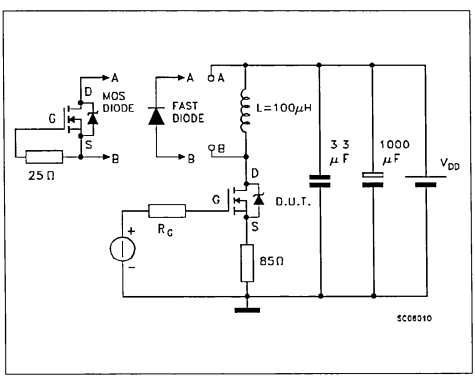


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



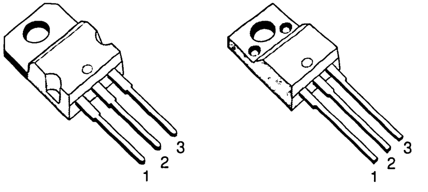
SGS-THOMSON
MICROELECTRONICS

STP50N05L
STP50N05LFI

N - CHANNEL ENHANCEMENT MODE LOW THRESHOLD POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP50N05L	50 V	< 0.028 Ω	50 A
STP50N05LFI	50 V	< 0.028 Ω	27 A

- TYPICAL $R_{DS(on)}$ = 0.024 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- LOGIC LEVEL COMPATIBLE INPUT
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

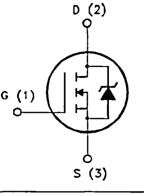


TO-220 ISOWATT220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP50N05L	STP50N05LFI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50		V
V_{GS}	Gate-source Voltage	± 15		V
I_D	Drain Current (continuous) at T_c = 25 °C	50	27	A
I_D	Drain Current (continuous) at T_c = 100 °C	35	19	A
I_{DM}(•)	Drain Current (pulsed)	200	200	A
P_{tot}	Total Dissipation at T_c = 25 °C	150	45	W
	Derating Factor	1	0.3	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	3.33	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	50	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	400	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	100	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	35	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	50			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 15 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	1	1.6	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 5 V I_D = 25 A V_{GS} = 5 V I_D = 25 A T_c = 100°C		0.024	0.028 0.056	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	50			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 25 A	17	31		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		2000 660 160	2600 900 220	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 25 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 3)		95 550	140 800	ns ns
$(dI/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 50 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		100		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 80 V I_D = 50 A V_{GS} = 5 V		42 11 25	60	nC nC nC

SWITCHING OFF

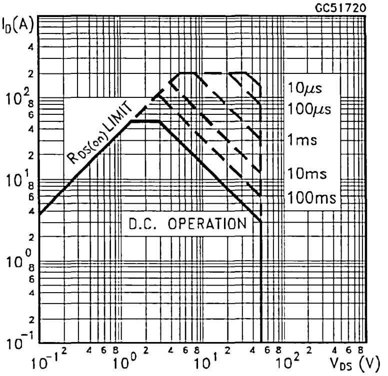
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 50 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		145 215 380	210 310 550	ns ns ns

SOURCE DRAIN DIODE

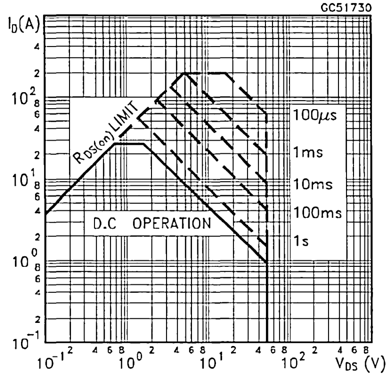
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				50 200	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 50 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 50 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		110 0.27 5		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

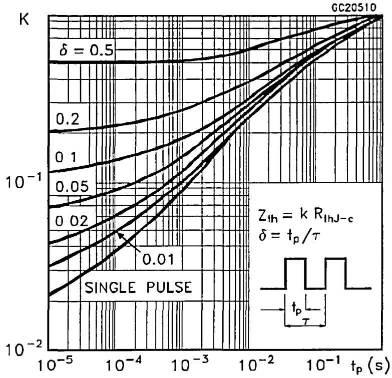
Safe Operating Areas For TO-220



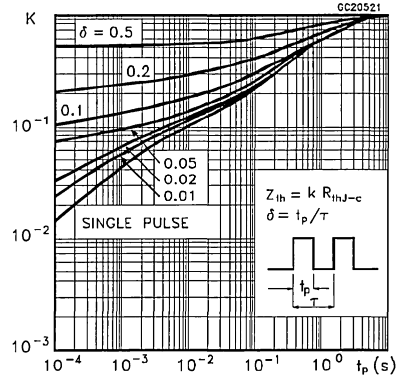
Safe Operating Areas For ISOWATT220



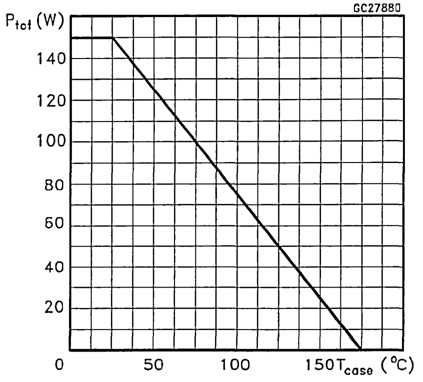
Thermal Impedeance For TO-220



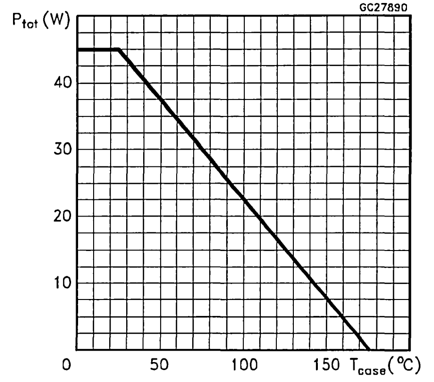
Thermal Impedance For ISOWATT220



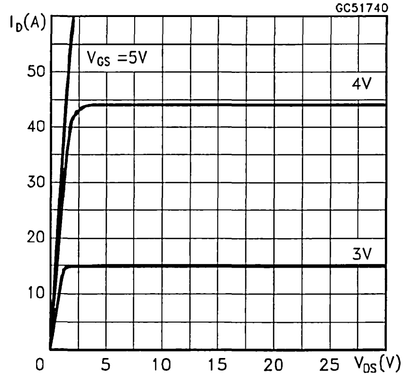
Derating Curve For TO-220



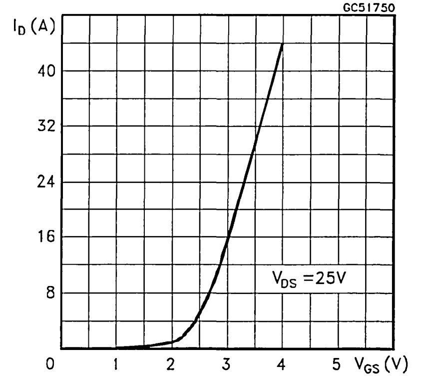
Derating Curve For ISOWATT220



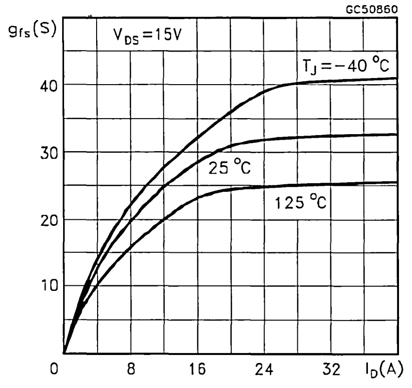
Output Characteristics



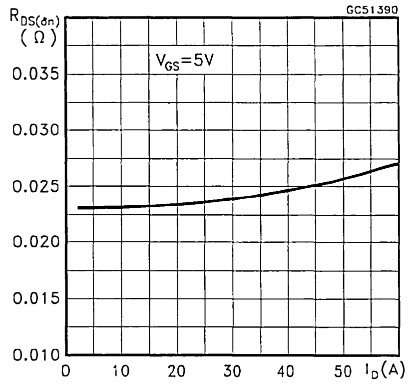
Transfer Characteristics



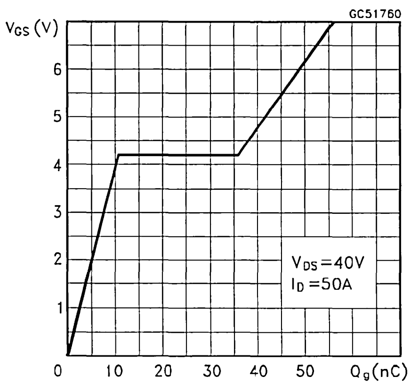
Transconductance



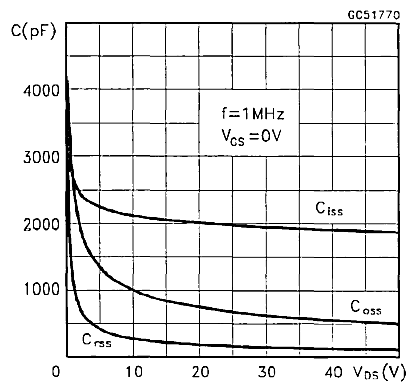
Static Drain-source On Resistance



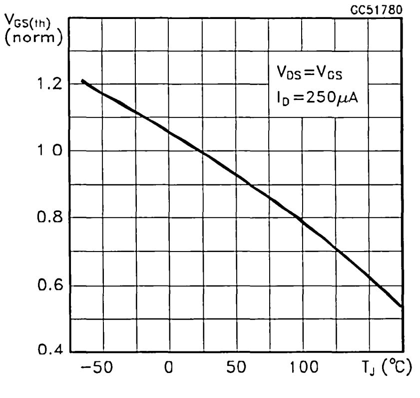
Gate Charge vs Gate-source Voltage



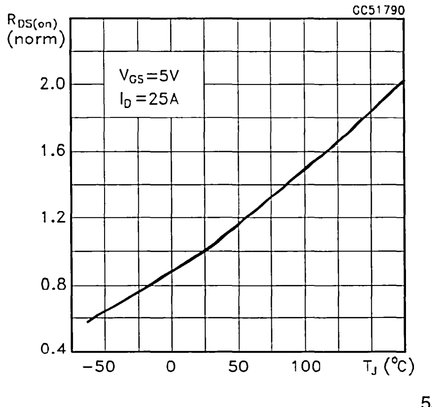
Capacitance Variations



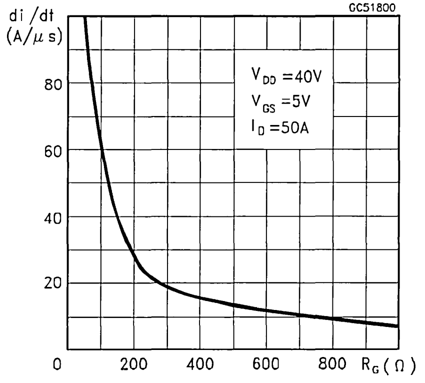
Normalized Gate Threshold Voltage vs Temperature



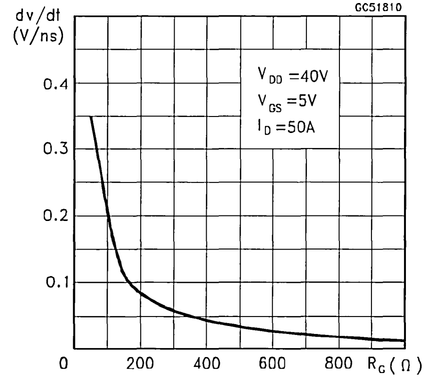
Normalized On Resistance vs Temperature



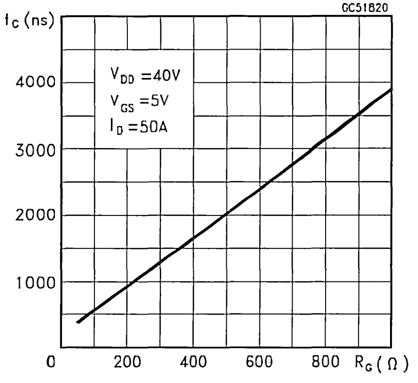
Turn-on Current Slope



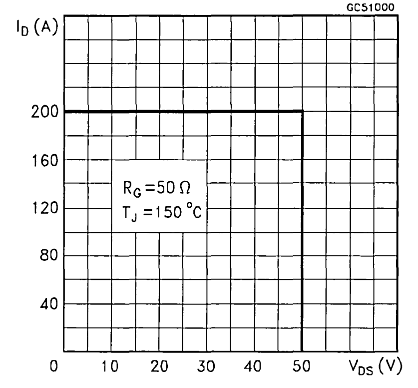
Turn-off Drain-source Voltage Slope



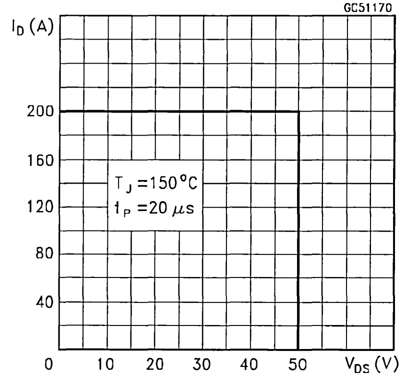
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

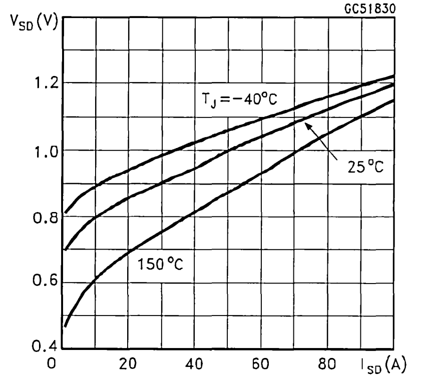


Fig. 1: Unclamped Inductive Load Test Circuits

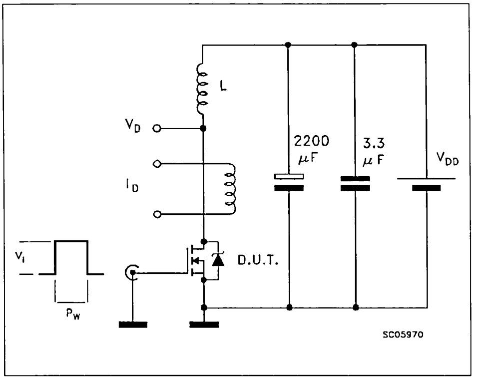


Fig. 2: Unclamped Inductive Waveforms

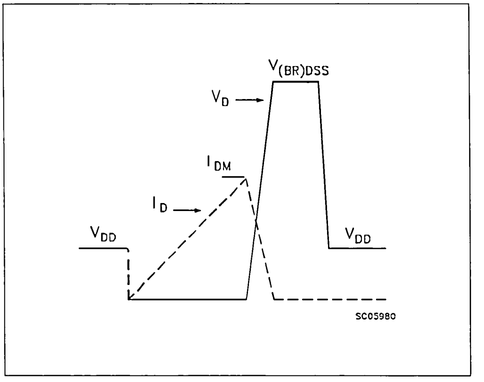


Fig. 3: Switching Times Test Circuits For Resistive Load

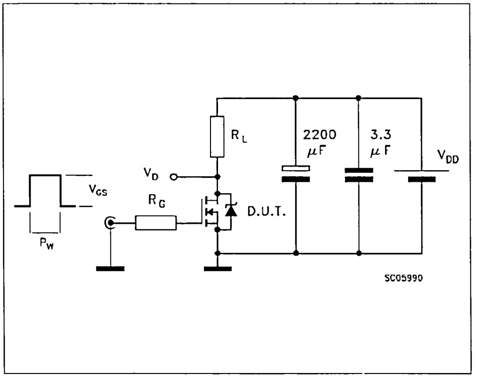


Fig. 4: Gate Charge Test Circuit

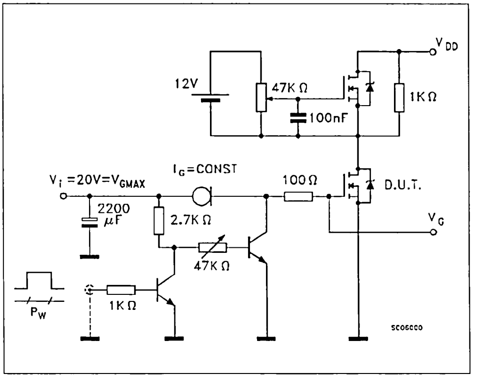
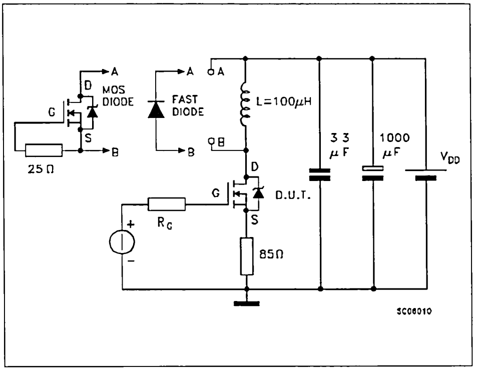


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



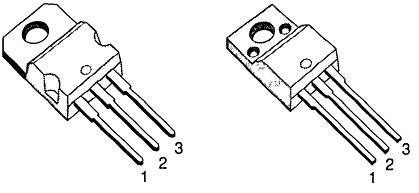
SGS-THOMSON MICROELECTRONICS

STP50N06
STP50N06FI

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP50N06	60 V	< 0.028 Ω	50 A
STP50N06FI	60 V	< 0.028 Ω	27 A

- TYPICAL $R_{DS(on)}$ = 0.022 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

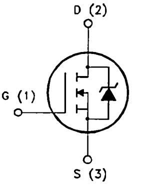


TO-220 ISOWATT220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP50N06	STP50N06FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	60		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	60		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	50	27	A
I_D	Drain Current (continuous) at T_c = 100 °C	35	19	A
I_{DM}(•)	Drain Current (pulsed)	200	200	A
P_{tot}	Total Dissipation at T_c = 25 °C	150	45	W
	Derating Factor	1	0.3	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	3.33	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Thermal Resistance Case-sink Maximum Lead Temperature For Soldering Purpose	Max Typ	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	50	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	400	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	100	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	35	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	60			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10 V I_D = 25 A V_{GS} = 10 V I_D = 25 A T_c = 100°C		0.022	0.028 0.056	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	50			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 25 A	17	22		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1700 630 200	2200 850 260	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 25 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		50 110	70 160	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 50 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		460		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 50 A V_{GS} = 10 V		50 14 25	70	nC nC nC

SWITCHING OFF

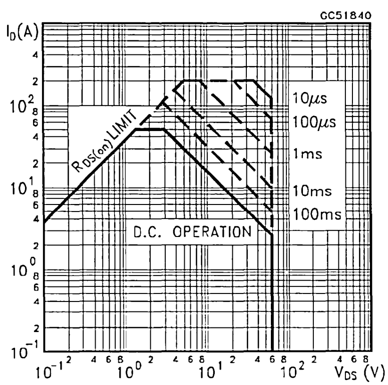
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 50 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		55 50 110	80 70 160	ns ns ns

SOURCE DRAIN DIODE

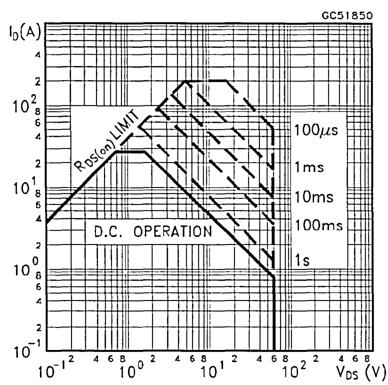
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				50 200	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 50 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 50 A di/dt = 100 A/μs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		150 0.45 6		ns μC A

(*) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

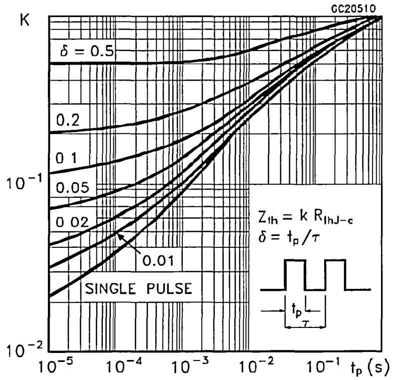
Safe Operating Areas For TO-220



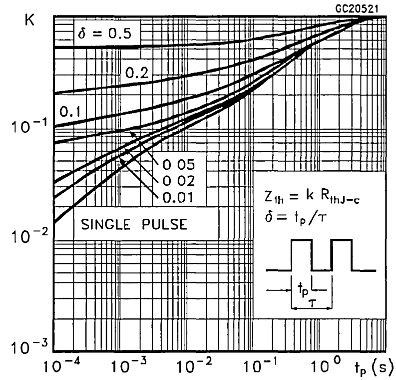
Safe Operating Areas For ISOWATT220



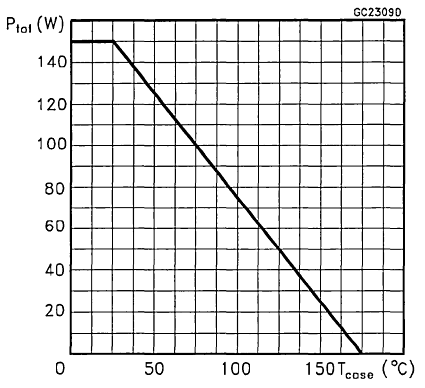
Thermal Impedeance For TO-220



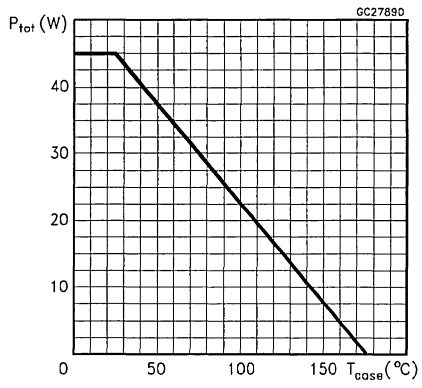
Thermal Impedance For ISOWATT220



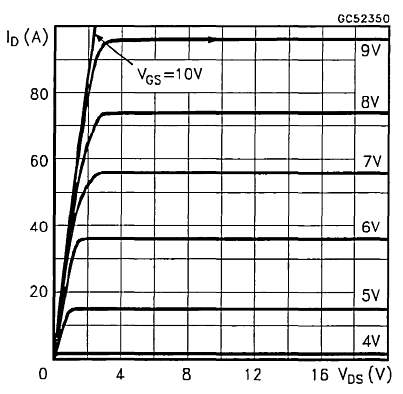
Derating Curve For TO-220



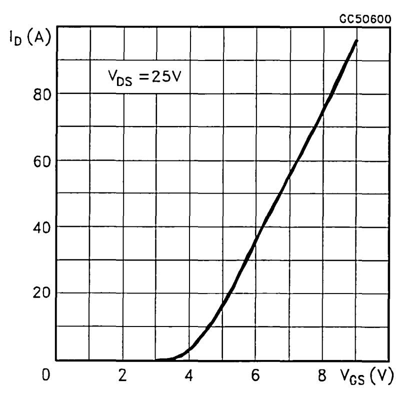
Derating Curve For ISOWATT220



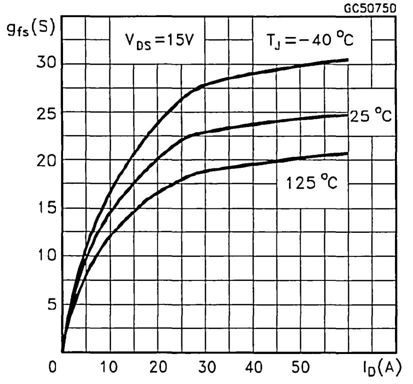
Output Characteristics



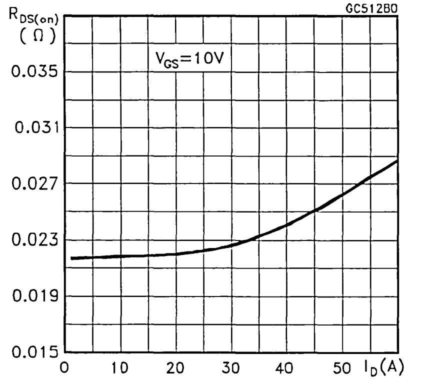
Transfer Characteristics



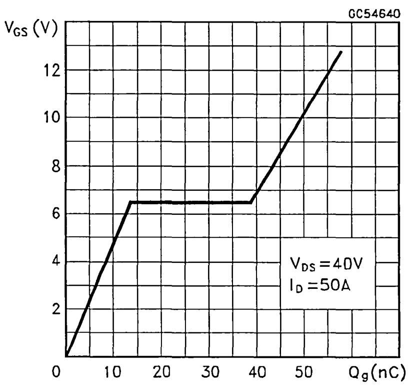
Transconductance



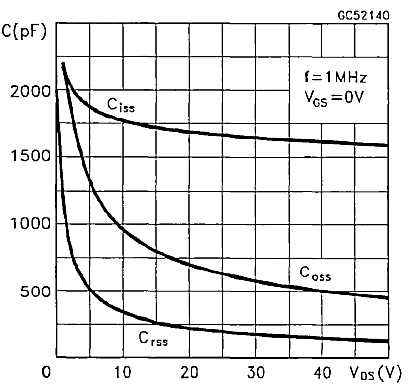
Static Drain-source On Resistance



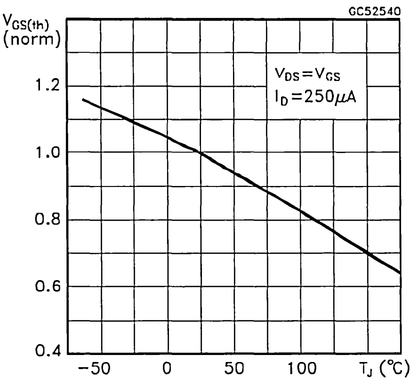
Gate Charge vs Gate-source Voltage



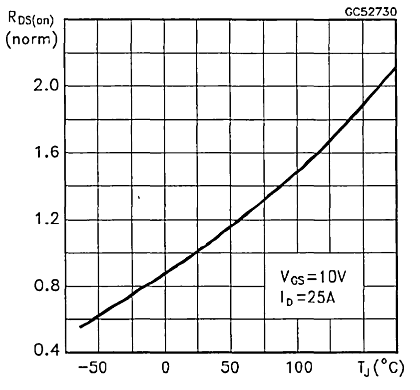
Capacitance Variations



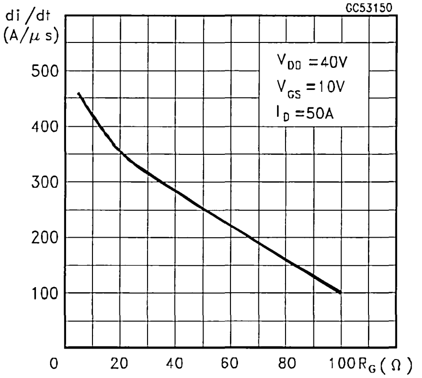
Normalized Gate Threshold Voltage vs Temperature



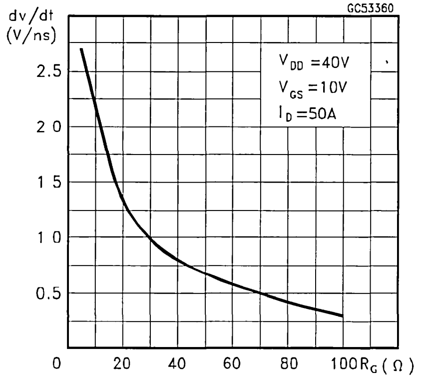
Normalized On Resistance vs Temperature



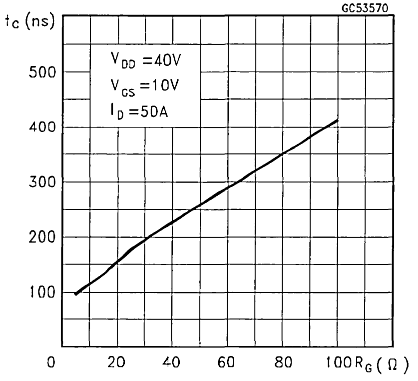
Turn-on Current Slope



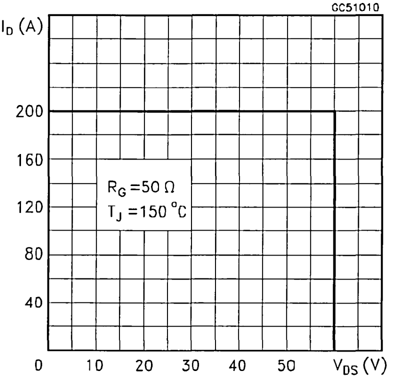
Turn-off Drain-source Voltage Slope



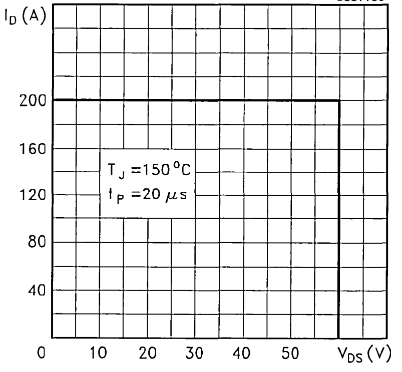
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

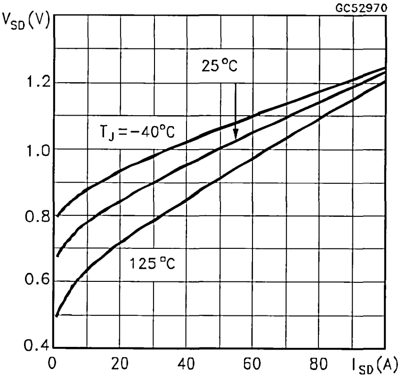


Fig. 1: Unclamped Inductive Load Test Circuits

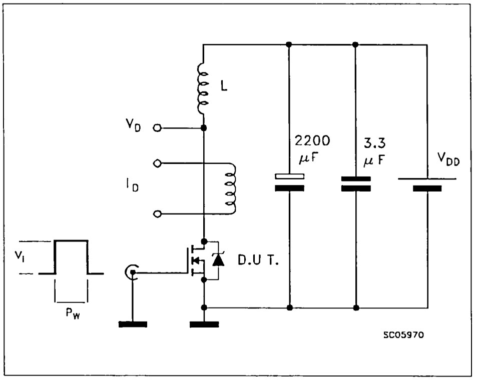


Fig. 2: Unclamped Inductive Waveforms

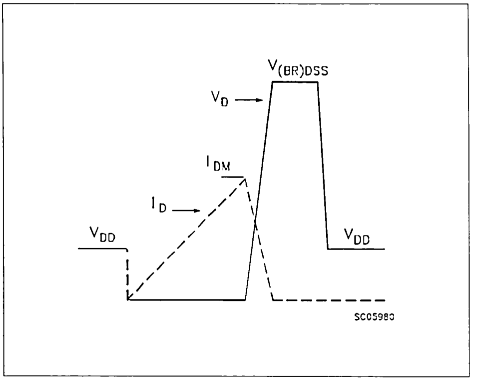


Fig. 3: Switching Times Test Circuits For Resistive Load

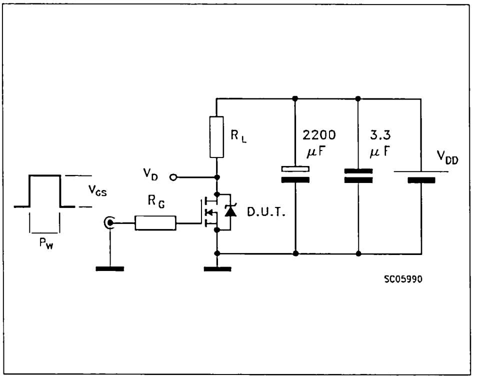


Fig. 4: Gate Charge Test Circuit

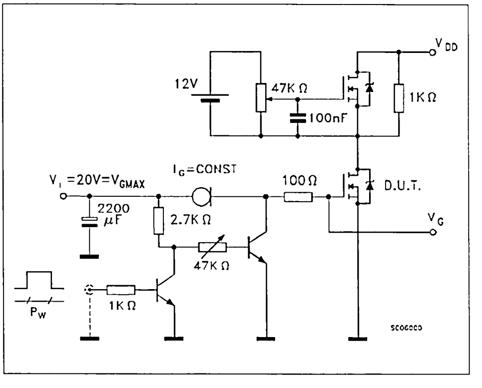
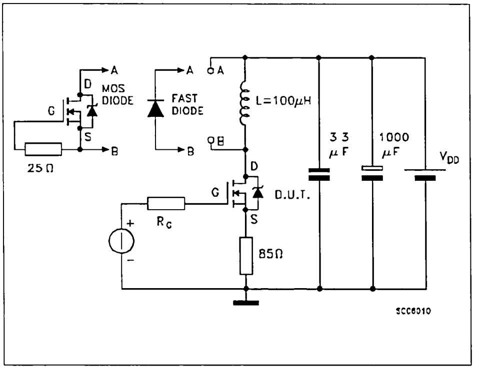


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time

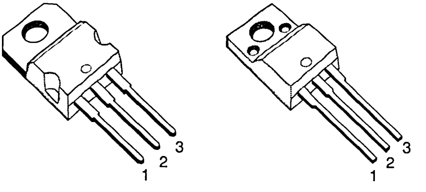


STP50N06L
STP50N06LFI

N - CHANNEL ENHANCEMENT MODE LOW THRESHOLD POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP50N06L	60 V	< 0.028 Ω	50 A
STP50N06LFI	60 V	< 0.028 Ω	27 A

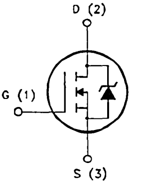
- TYPICAL $R_{DS(on)}$ = 0.024 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- LOGIC LEVEL COMPATIBLE INPUT
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION



TO-220 ISOWATT220

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP50N06L	STP50N06LFI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	60		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	60		V
V_{GS}	Gate-source Voltage	± 15		V
I_D	Drain Current (continuous) at T_c = 25 °C	50	27	A
I_D	Drain Current (continuous) at T_c = 100 °C	35	19	A
$I_{DM}(\bullet)$	Drain Current (pulsed)	200	200	A
P_{tot}	Total Dissipation at T_c = 25 °C	150	45	W
	Derating Factor	1	0.3	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	3.33	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	50	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	400	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	100	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	35	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	60			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 15 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	1	1.6	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 5 V I_D = 25 A V_{GS} = 5 V I_D = 25 A T_c = 100°C		0.024	0.028 0.056	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	50			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 25 A	17	31		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		2000 660 160	2600 900 220	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 25 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 3)		95 550	140 800	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 50 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		100		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 80 V I_D = 50 A V_{GS} = 5 V		42 11 25	60	nC nC nC

SWITCHING OFF

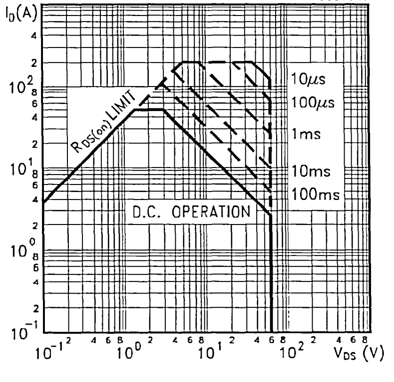
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 50 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		145 215 380	210 310 550	ns ns ns

SOURCE DRAIN DIODE

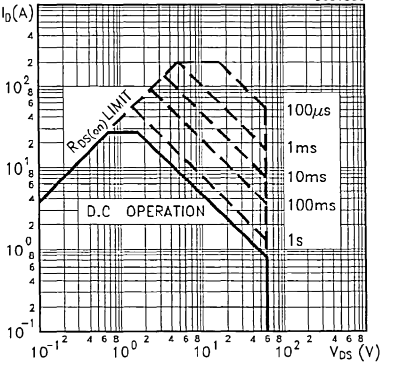
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				50 200	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 50 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 50 A di/dt = 100 A/μs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		110 0.27 5		ns μC A

(*) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

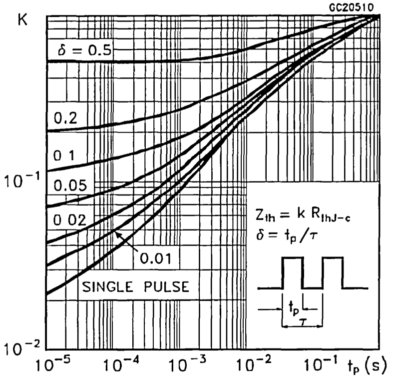
Safe Operating Areas For TO-220



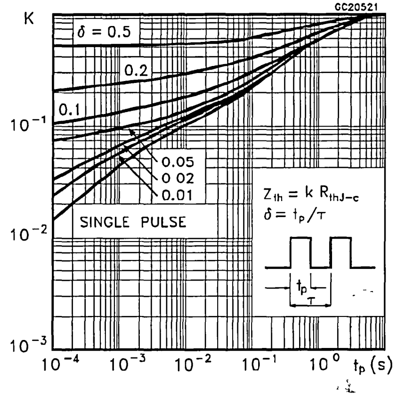
Safe Operating Areas For ISOWATT220



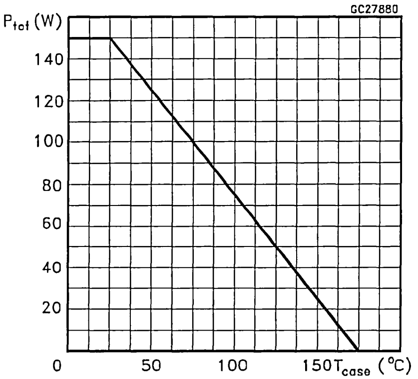
Thermal Impedeance For TO-220



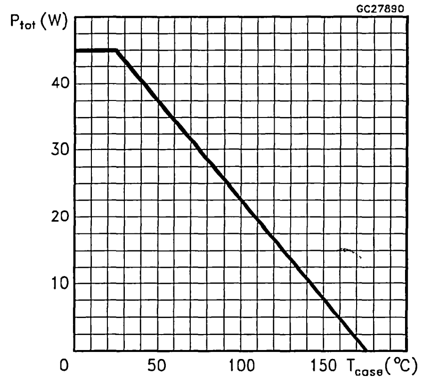
Thermal Impedance For ISOWATT220



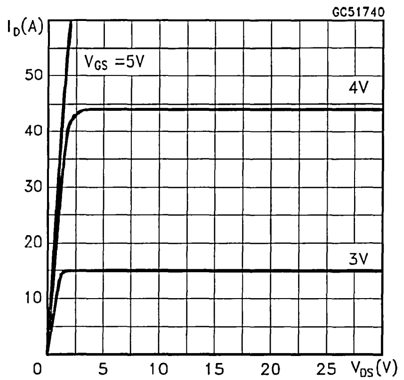
Derating Curve For TO-220



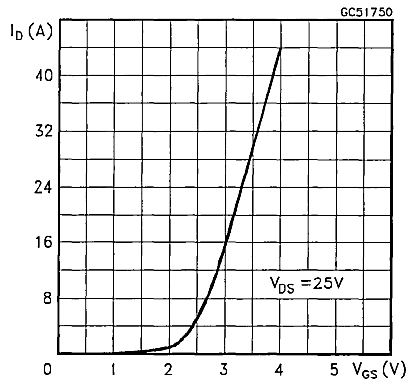
Derating Curve For ISOWATT220



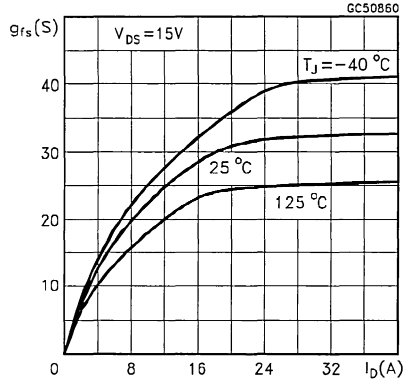
Output Characteristics



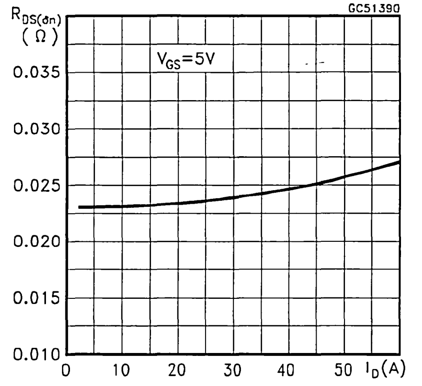
Transfer Characteristics



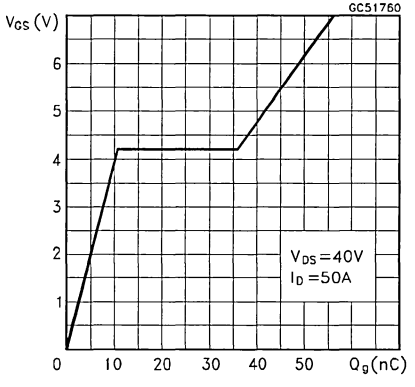
Transconductance



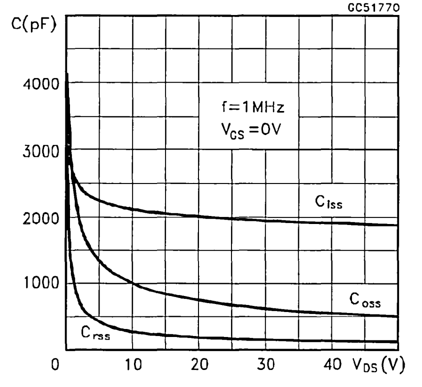
Static Drain-source On Resistance



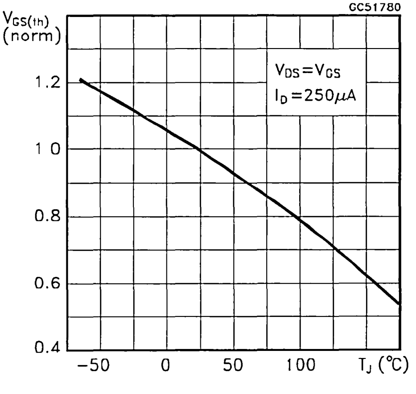
Gate Charge vs Gate-source Voltage



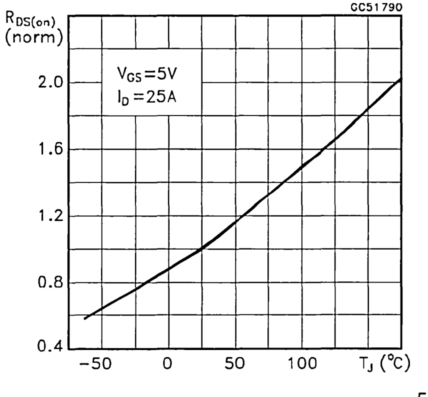
Capacitance Variations



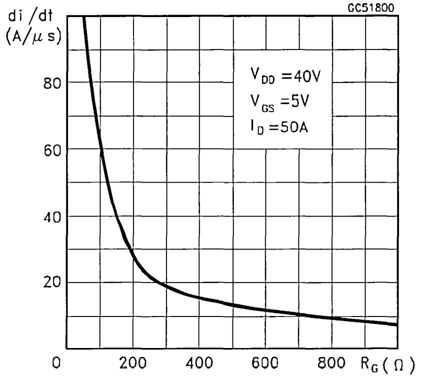
Normalized Gate Threshold Voltage vs Temperature



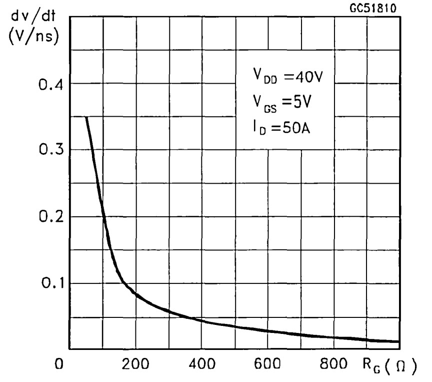
Normalized On Resistance vs Temperature



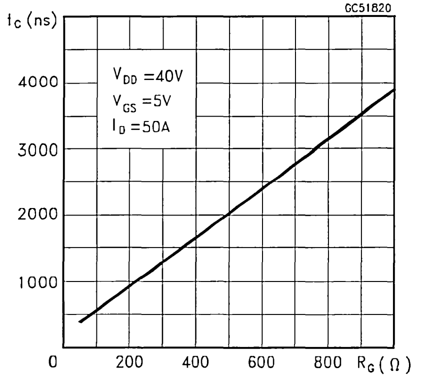
Turn-on Current Slope



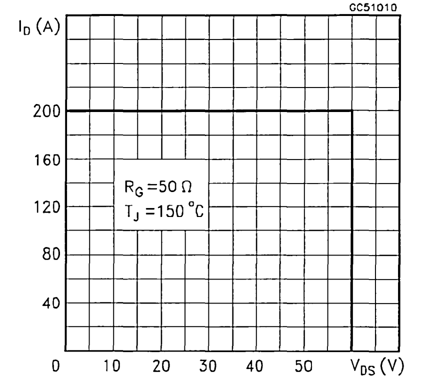
Turn-off Drain-source Voltage Slope



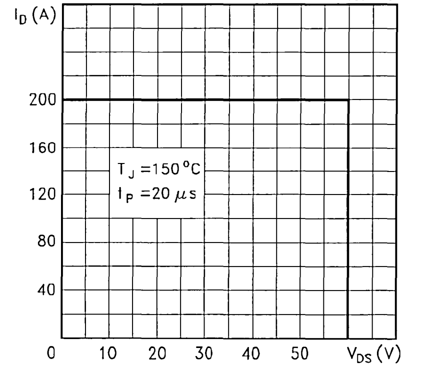
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

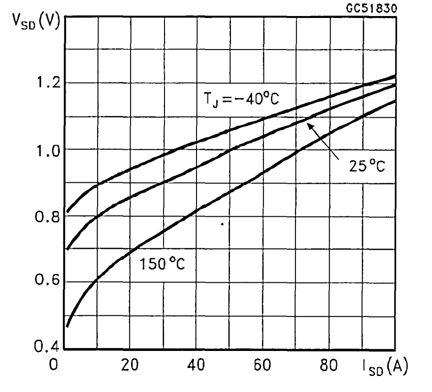


Fig. 1: Unclamped Inductive Load Test Circuits

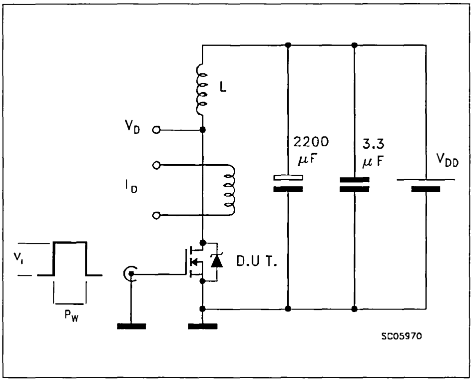


Fig. 2: Unclamped Inductive Waveforms

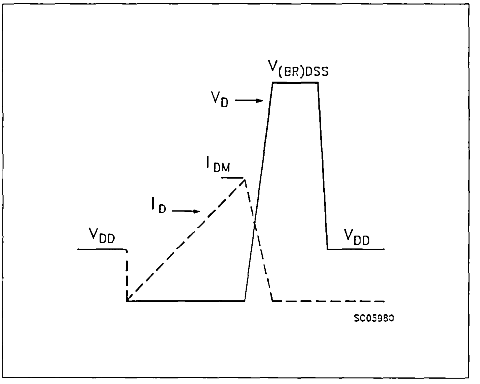


Fig. 3: Switching Times Test Circuits For Resistive Load

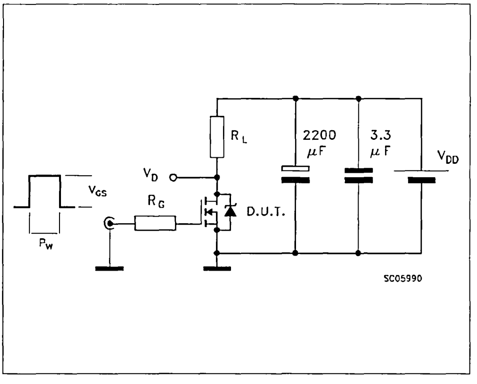


Fig. 4: Gate Charge Test Circuit

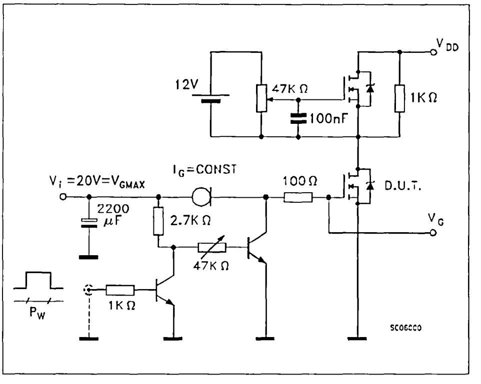
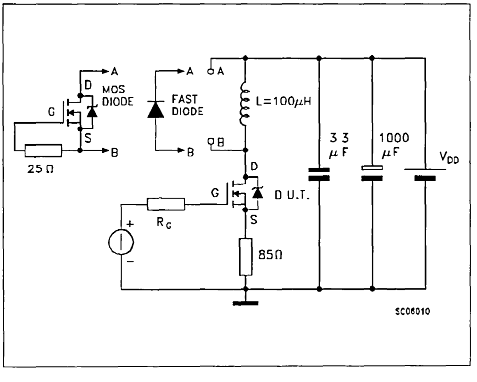


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



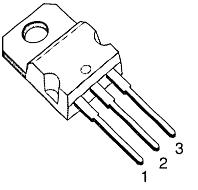
SGS-THOMSON
MICROELECTRONICS

STP53N05

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP53N05	50 V	< 0.025 Ω	53 A

- TYPICAL $R_{DS(on)}$ = 0.022 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

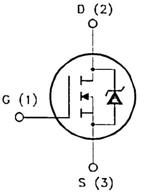


TO-220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	53	A
I_D	Drain Current (continuous) at T_c = 100 °C	37	A
I_{DM}(•)	Drain Current (pulsed)	212	A
P_{tot}	Total Dissipation at T_c = 25 °C	150	W
	Derating Factor	1	W/°C
T_{stg}	Storage Temperature	-65 to 175	°C
T_j	Max. Operating Junction Temperature	175	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	°C/W
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.5	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	53	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	450	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	110	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	37	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	50			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 26 5 A V_{GS} = 10V I_D = 26.5 A T_c = 100°C		0.022	0.025 0.05	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	53			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 26.5 A	17	22		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		1700 630 200	2200 850 260	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 26.5 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		50 110	70 160	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 53 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		460		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 53 A V_{GS} = 10 V		50 14 25	70	nC nC nC

SWITCHING OFF

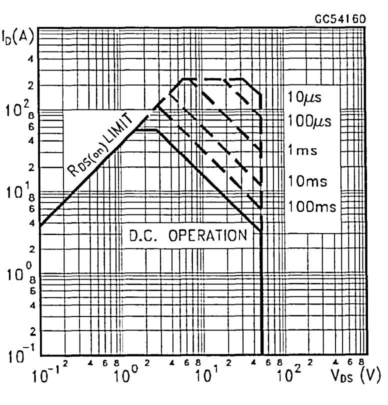
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 53 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		55 50 110	80 70 160	ns ns ns

SOURCE DRAIN DIODE

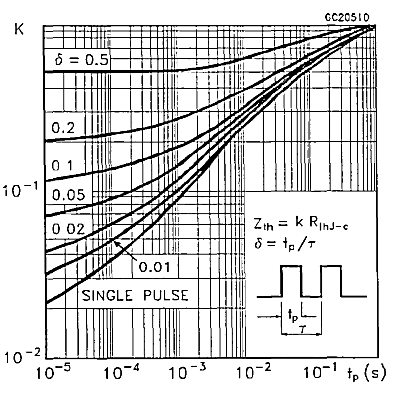
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				53 212	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 53 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 53 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		150 0 45 6		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

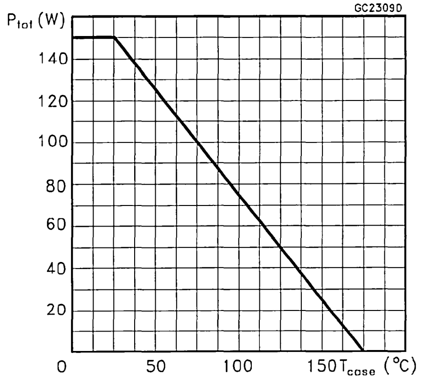
Safe Operating Areas



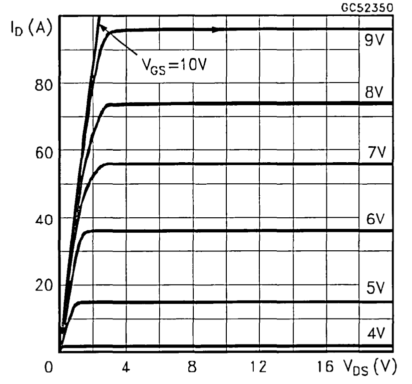
Thermal Impedance



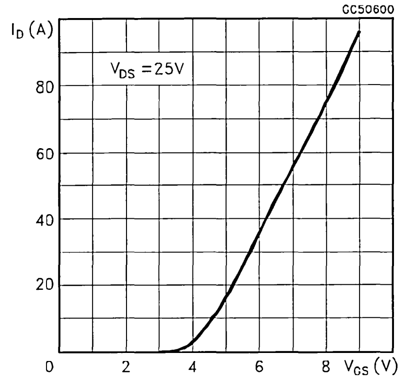
Derating Curve



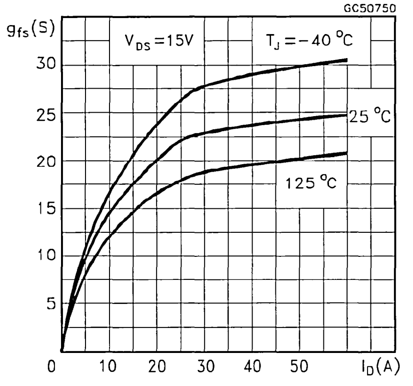
Output Characteristics



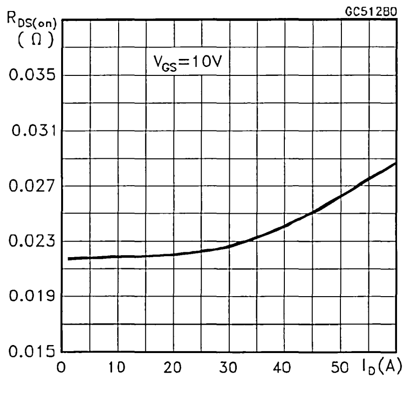
Transfer Characteristics



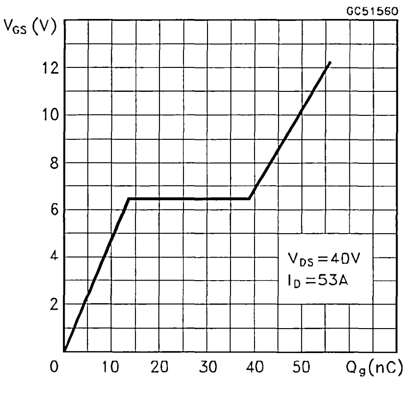
Transconductance



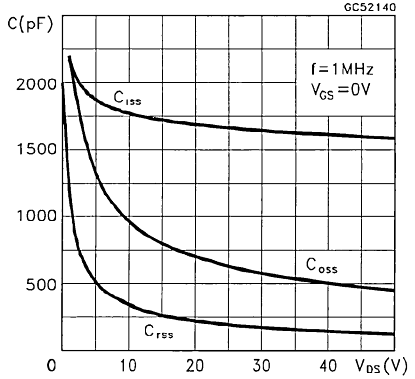
Static Drain-source On Resistance



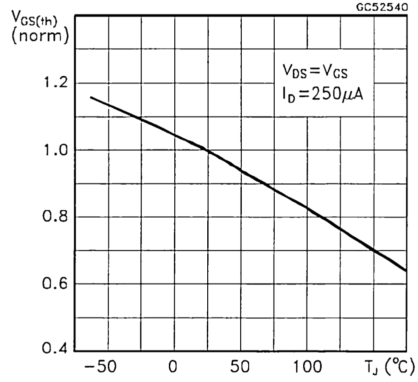
Gate Charge vs Gate-source Voltage



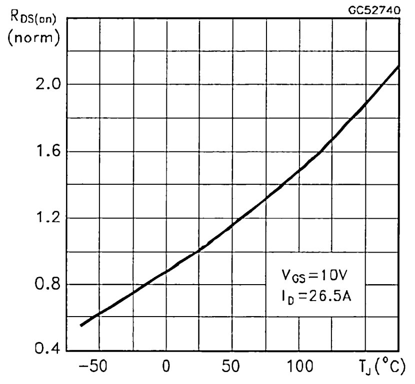
Capacitance Variations



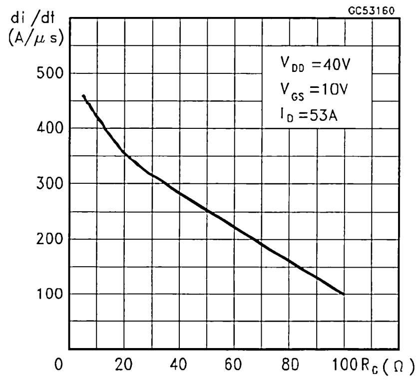
Normalized Gate Threshold Voltage vs Temperature



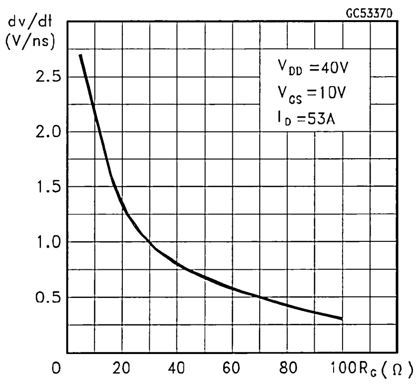
Normalized On Resistance vs Temperature



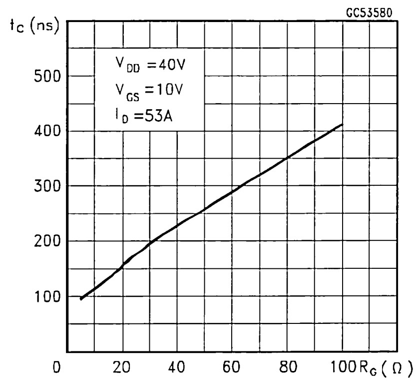
Turn-on Current Slope



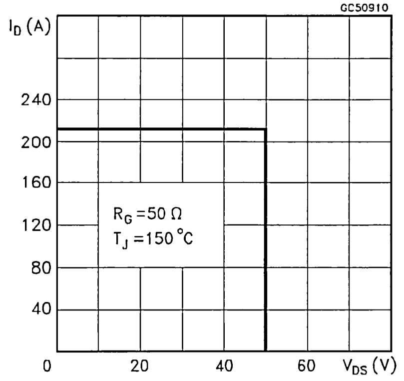
Turn-off Drain-source Voltage Slope



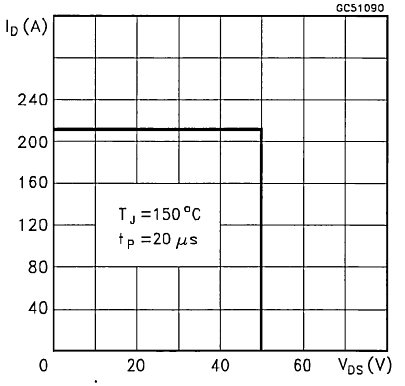
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

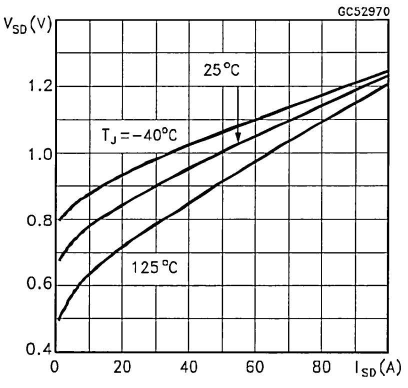


Fig. 1: Unclamped Inductive Load Test Circuits

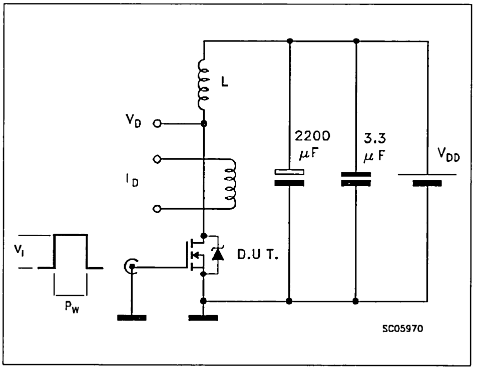


Fig. 2: Unclamped Inductive Waveforms

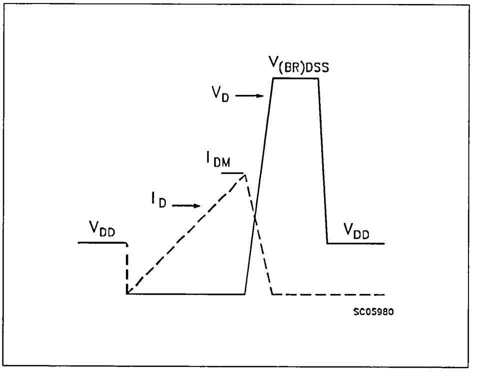


Fig. 3: Switching Times Test Circuits For Resistive Load

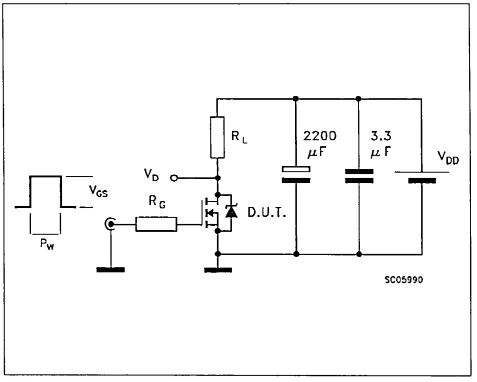


Fig. 4: Gate Charge Test Circuit

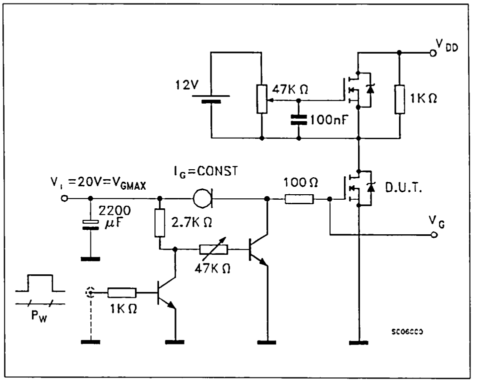
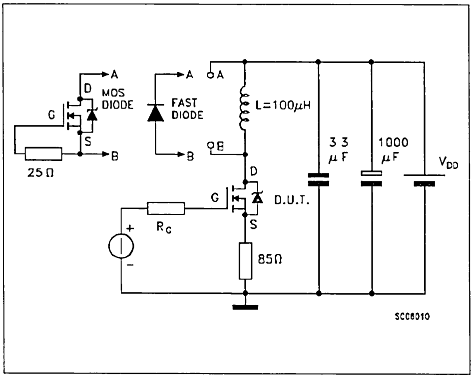


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



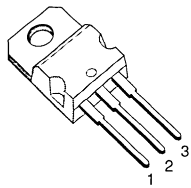
SGS-THOMSON
MICROELECTRONICS

STP53N06

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP53N06	60 V	< 0.025 Ω	53 A

- TYPICAL $R_{DS(on)}$ = 0.022 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

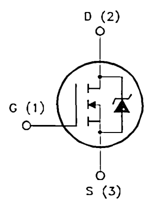


TO-220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	60	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	60	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	53	A
I_D	Drain Current (continuous) at T_c = 100 °C	37	A
I_{DM}(•)	Drain Current (pulsed)	212	A
P_{tot}	Total Dissipation at T_c = 25 °C	150	W
	Derating Factor	1	W/°C
T_{stg}	Storage Temperature	-65 to 175	°C
T_j	Max. Operating Junction Temperature	175	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	°C/W
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.5	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	53	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	450	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	110	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	37	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	60			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10$V $I_D = 26.5$ A $V_{GS} = 10$V $I_D = 26.5$ A $T_c = 100$°C		0.022	0.025 0.05	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	53			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 26.5$ A	17	22		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		1700 630 200	2200 850 260	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 26.5 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		50 110	70 160	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 53 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		460		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 53 A V_{GS} = 10 V		50 14 25	70	nC nC nC

SWITCHING OFF

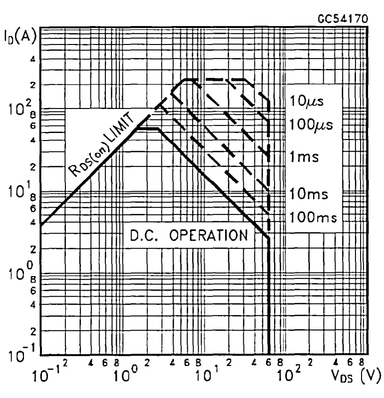
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 53 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		55 50 110	80 70 160	ns ns ns

SOURCE DRAIN DIODE

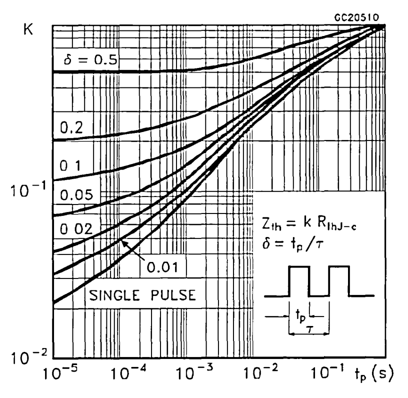
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				53 212	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 53 A V_{GS} = 0			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 53 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		150 0.45 6		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

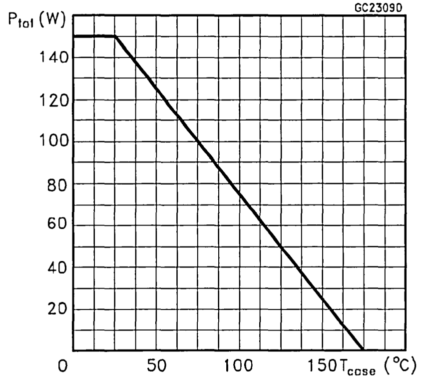
Safe Operating Areas



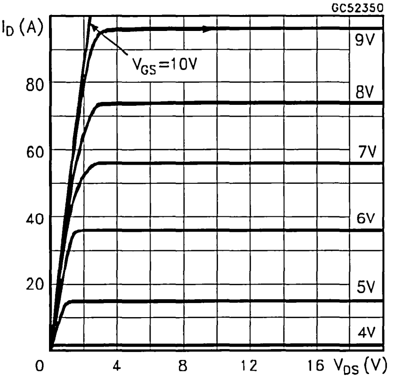
Thermal Impedance



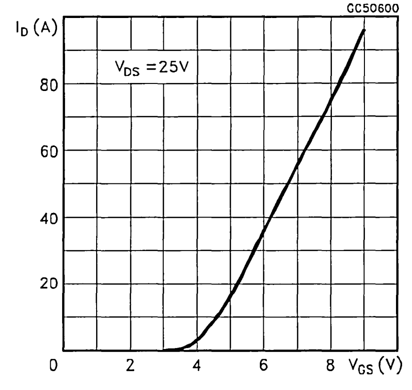
Derating Curve



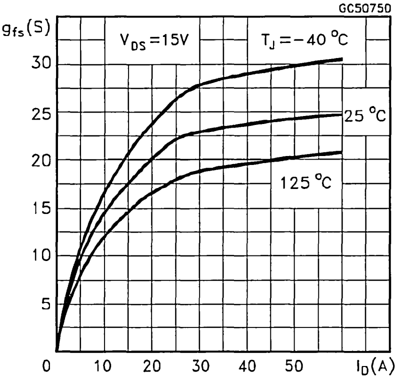
Output Characteristics



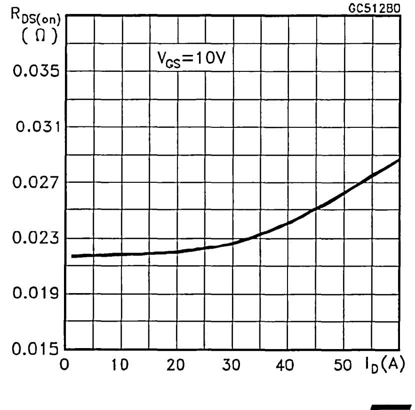
Transfer Characteristics



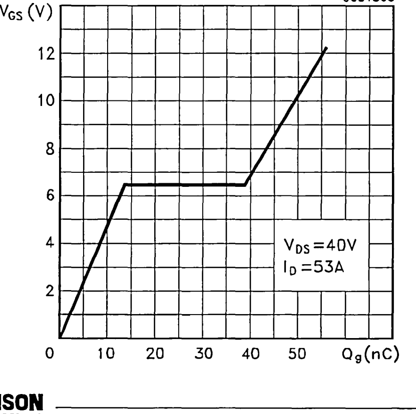
Transconductance



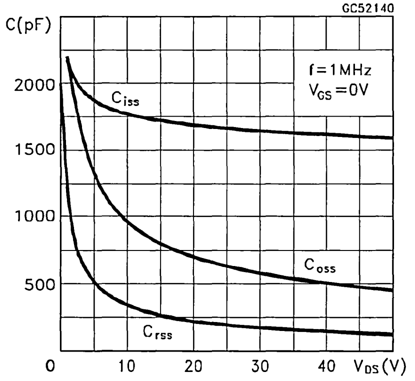
Static Drain-source On Resistance



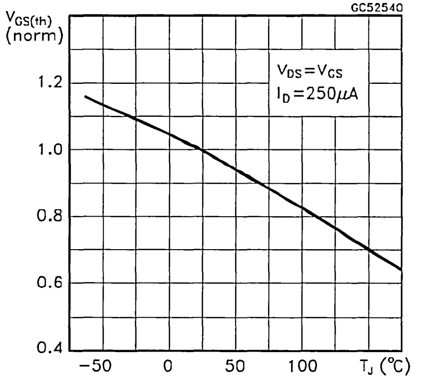
Gate Charge vs Gate-source Voltage



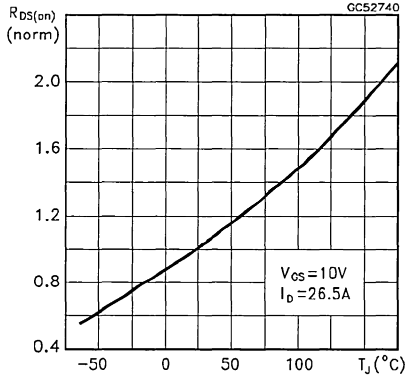
Capacitance Variations



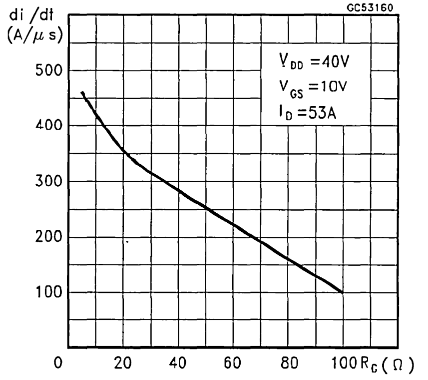
Normalized Gate Threshold Voltage vs Temperature



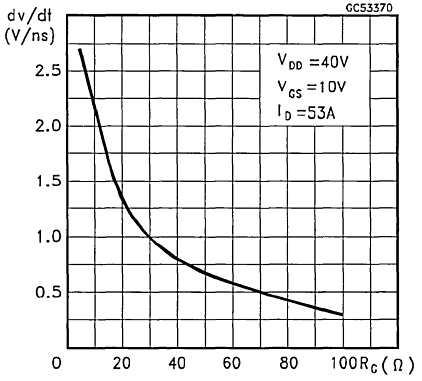
Normalized On Resistance vs Temperature



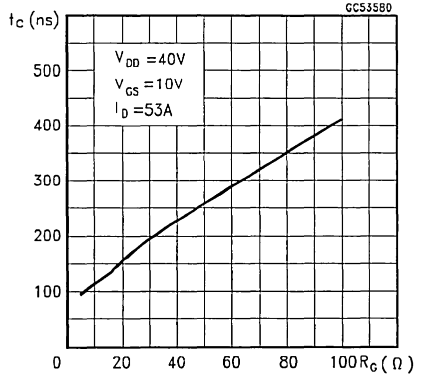
Turn-on Current Slope



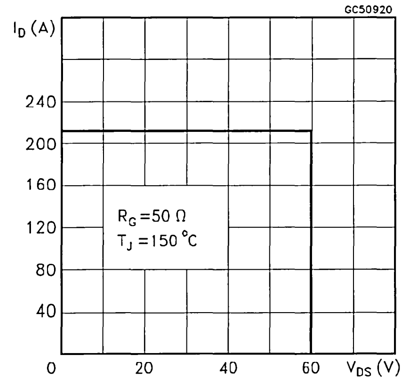
Turn-off Drain-source Voltage Slope



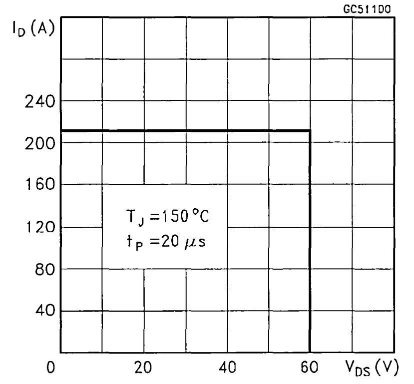
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

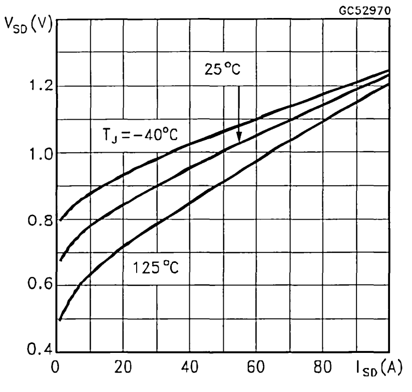


Fig. 1: Unclamped Inductive Load Test Circuits

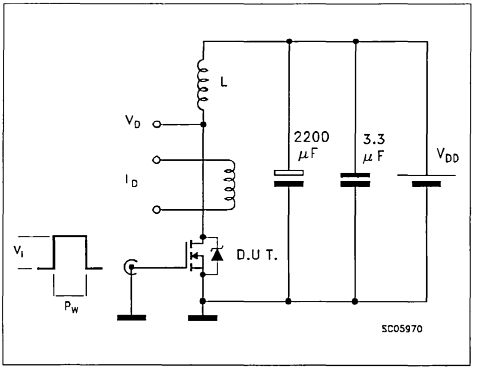


Fig. 2: Unclamped Inductive Waveforms

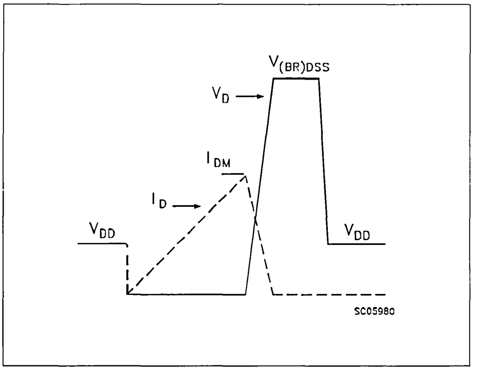


Fig. 3: Switching Times Test Circuits For Resistive Load

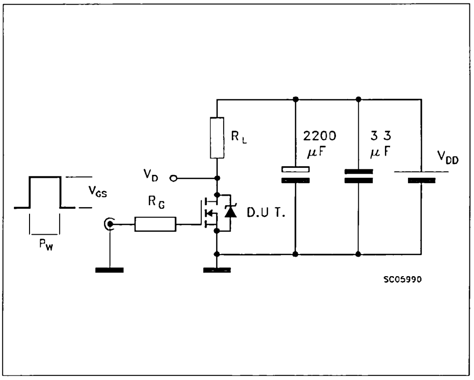


Fig. 4: Gate Charge Test Circuit

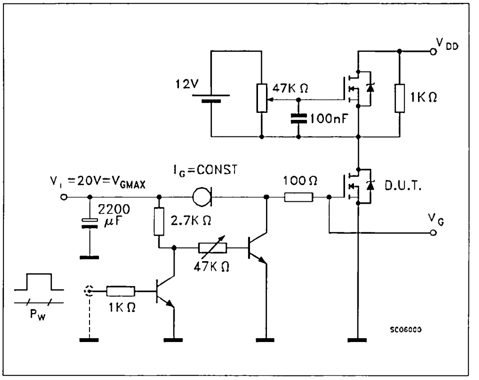
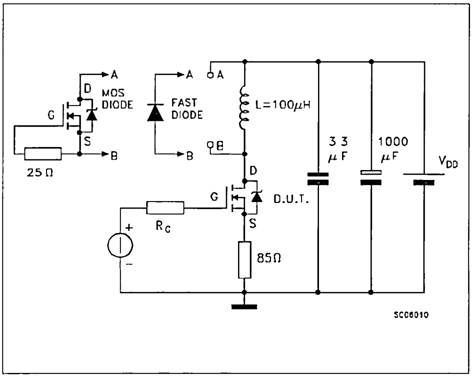


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



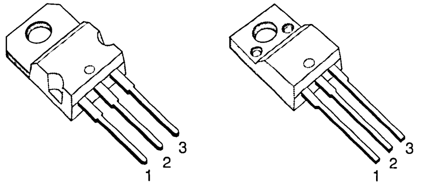
SGS-THOMSON
MICROELECTRONICS

STP55N05L
STP55N05LFI

N - CHANNEL ENHANCEMENT MODE LOW THRESHOLD POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP55N05L	50 V	< 0.023 Ω	55 A
STP55N05LFI	50 V	< 0.023 Ω	30 A

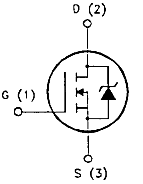
- TYPICAL $R_{DS(on)}$ = 0.02 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- LOGIC LEVEL COMPATIBLE INPUT
- 175°C OPERATING TEMPERATURE FOR STANDARD PACKAGE
- APPLICATION ORIENTED CHARACTERIZATION



TO-220 ISOWATT220

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP55N05L	STP55N05LFI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50		V
V_{GS}	Gate-source Voltage	± 15		V
I_D	Drain Current (continuous) at T_c = 25 °C	55	30	A
I_D	Drain Current (continuous) at T_c = 100 °C	38	21	A
I_{DM}(•)	Drain Current (pulsed)	220	220	A
P_{tot}	Total Dissipation at T_c = 25 °C	150	45	W
	Derating Factor	1	0.3	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

		TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case Max	1	3.33	°C/W
$R_{thj-amb}$ $R_{thc-sink}$ T_l	Thermal Resistance Junction-ambient Max Thermal Resistance Case-sink Typ Maximum Lead Temperature For Soldering Purpose	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	55	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	500	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	120	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	38	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	50			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 15$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	1	1.6	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 5$ V $I_D = 27.5$ A $V_{GS} = 5$ V $I_D = 27.5$ A $T_c = 100$°C		0.02	0.023 0.046	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	55			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 27.5$ A	20	39		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		2700 850 180	3600 1200 250	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 27.5 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 3)		150 950	220 1400	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 55 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		110		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 55 A V_{GS} = 5 V		55 12 28	80	nC nC nC

SWITCHING OFF

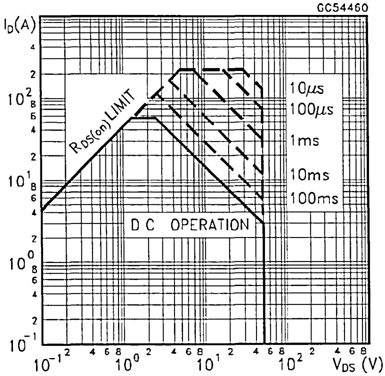
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 55 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		185 250 500	270 350 700	ns ns ns

SOURCE DRAIN DIODE

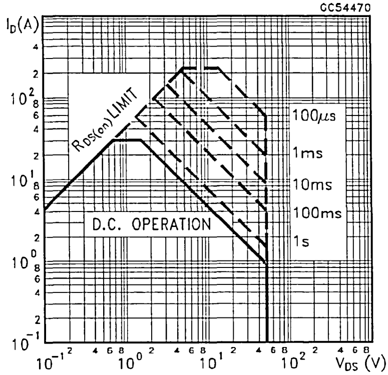
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				55 220	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 55 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 55 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		120 0.3 5		ns µC A

(*) Pulsed. Pulse duration = 300 µs, duty cycle 1 5 %
(•) Pulse width limited by safe operating area

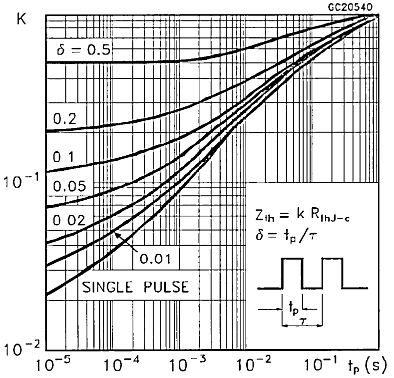
Safe Operating Areas For TO-220



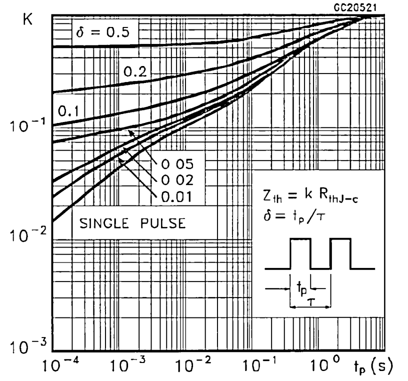
Safe Operating Areas For ISOWATT220



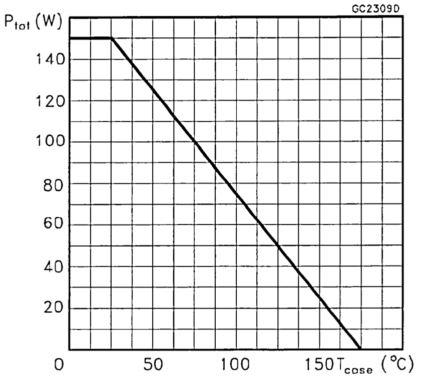
Thermal Impedeance For TO-220



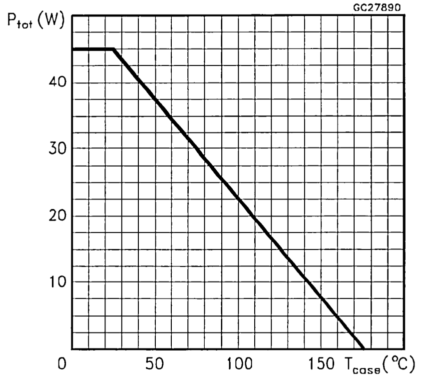
Thermal Impedance For ISOWATT220



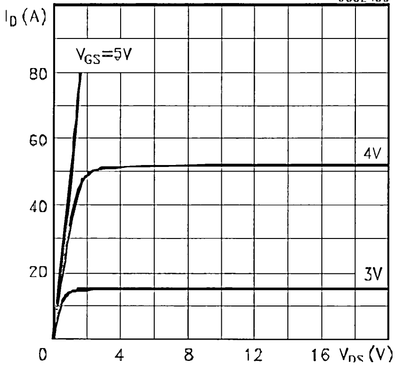
Derating Curve For TO-220



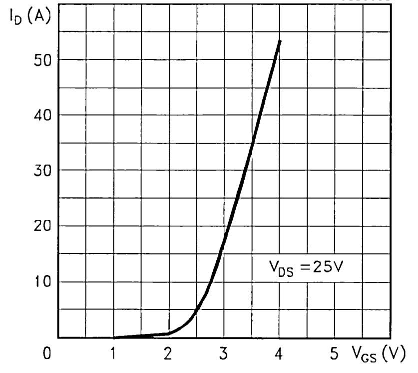
Derating Curve For ISOWATT220



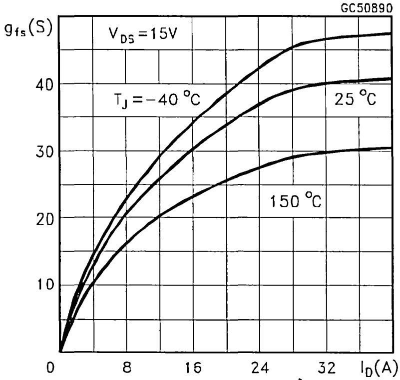
Output Characteristics



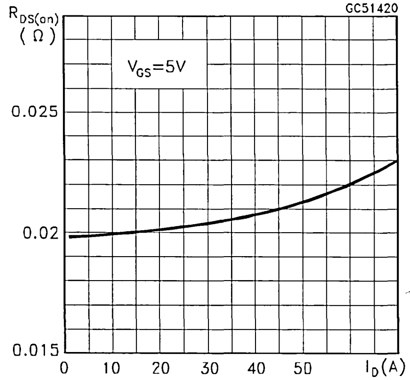
Transfer Characteristics



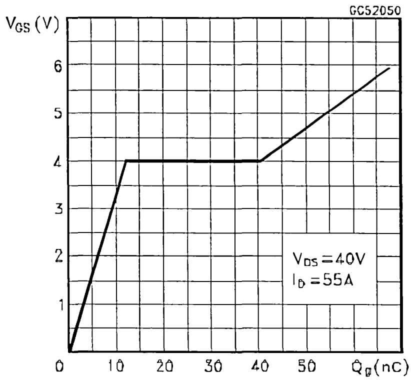
Transconductance



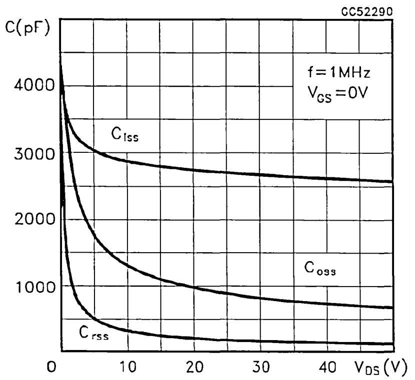
Static Drain-source On Resistance



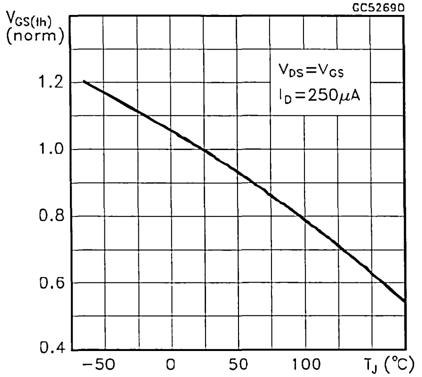
Gate Charge vs Gate-source Voltage



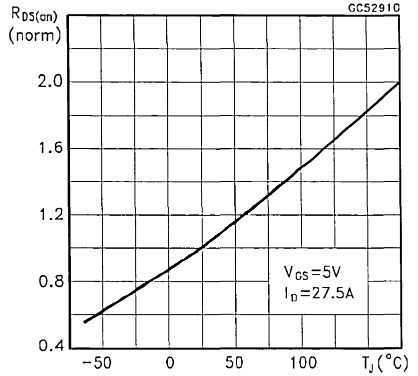
Capacitance Variations



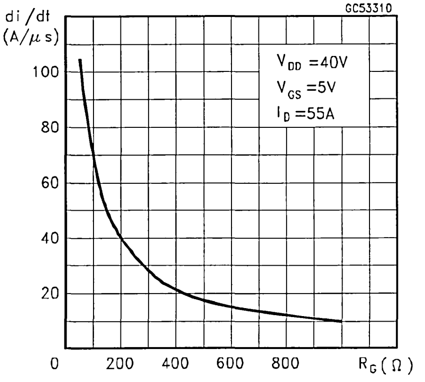
Normalized Gate Threshold Voltage vs Temperature



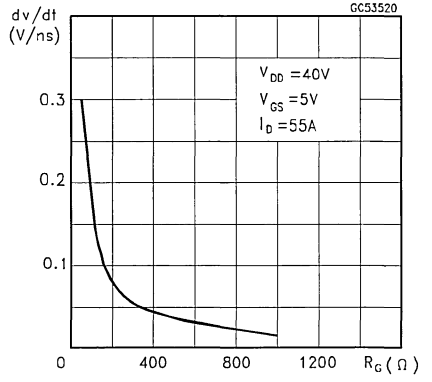
Normalized On Resistance vs Temperature



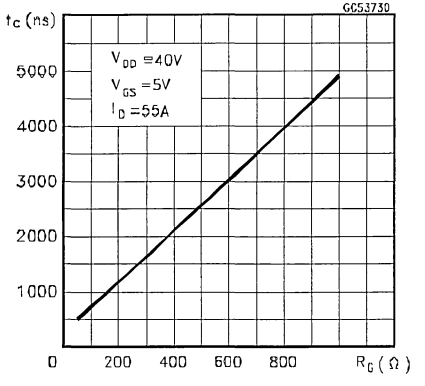
Turn-on Current Slope



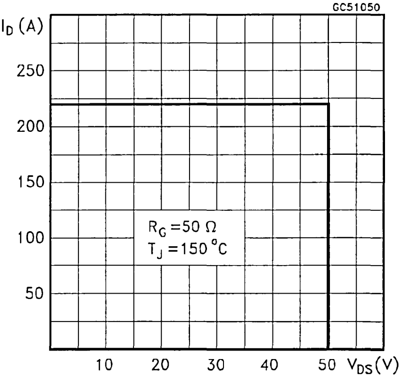
Turn-off Drain-source Voltage Slope



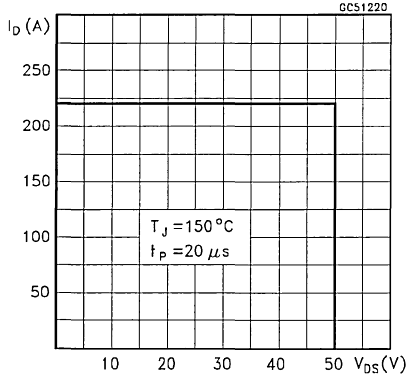
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

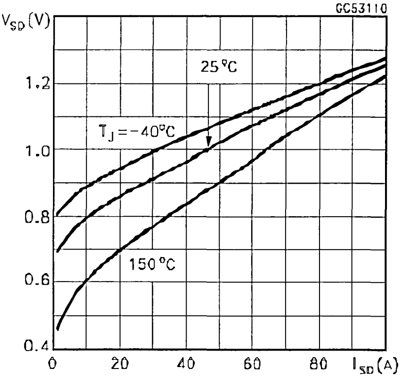


Fig. 1: Unclamped Inductive Load Test Circuits

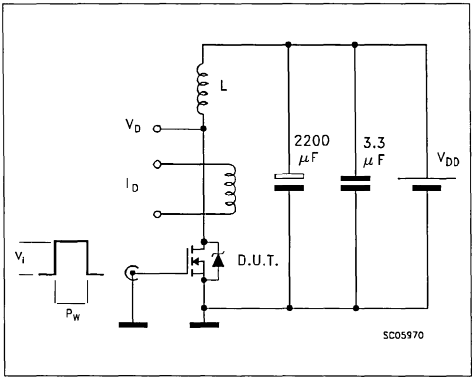


Fig. 2: Unclamped Inductive Waveforms

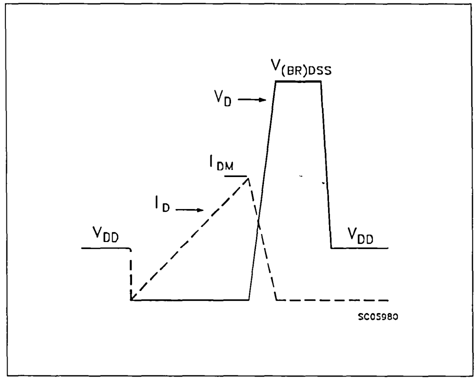


Fig. 3: Switching Times Test Circuits For Resistive Load

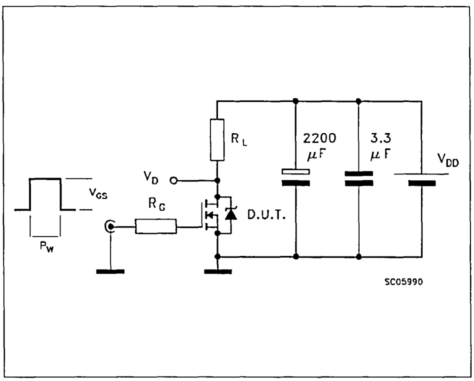


Fig. 4: Gate Charge Test Circuit

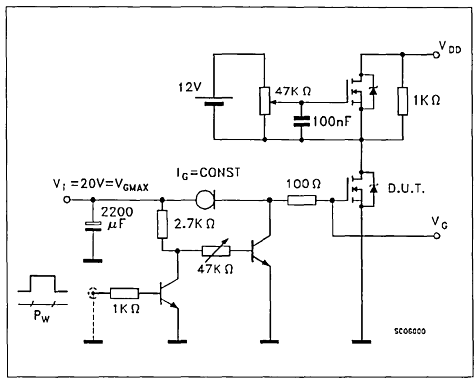
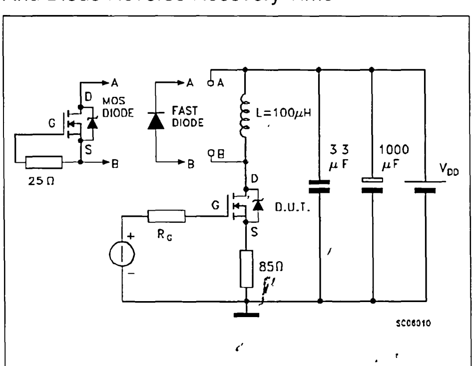


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time

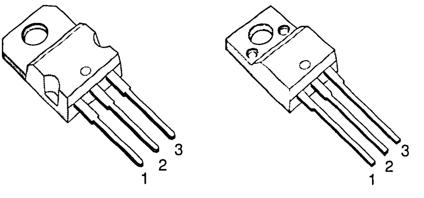


STP55N06L
STP55N06LFI

N - CHANNEL ENHANCEMENT MODE LOW THRESHOLD POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP55N06L	60 V	< 0.023 Ω	55 A
STP55N06LFI	60 V	< 0.023 Ω	30 A

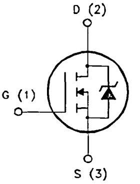
- TYPICAL $R_{DS(on)}$ = 0.02 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- LOGIC LEVEL COMPATIBLE INPUT
- 175°C OPERATING TEMPERATURE FOR STANDARD PACKAGE
- APPLICATION ORIENTED CHARACTERIZATION



TO-220 ISOWATT220

APPLICATIONS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP55N06L	STP55N06LFI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	60		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	60		V
V_{GS}	Gate-source Voltage	± 15		V
I_D	Drain Current (continuous) at T_c = 25 °C	55	30	A
I_D	Drain Current (continuous) at T_c = 100 °C	38	21	A
I_{DM}(•)	Drain Current (pulsed)	220	220	A
P_{tot}	Total Dissipation at T_c = 25 °C	150	45	W
	Derating Factor	1	0.3	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1	3.33	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc\text{-}sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	55	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	500	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	120	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	38	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 μA V_{GS} = 0	60			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 15 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 μA	1	1.6	2.5	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 5 V I_D = 27.5 A V_{GS} = 5 V I_D = 27.5 A T_c = 100°C		0.02	0.023 0.046	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	55			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 27.5 A	20	39		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		2700 850 180	3600 1200 250	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 25 V I_D = 27.5 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 3)		150 950	220 1400	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 55 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		110		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 55 A V_{GS} = 5 V		55 12 28	80	nC nC nC

SWITCHING OFF

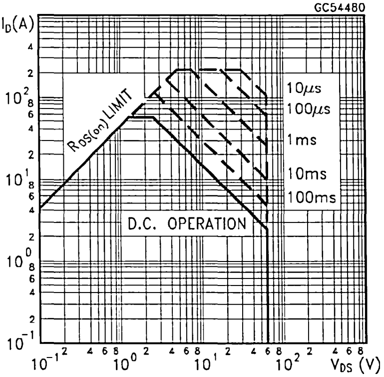
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 55 A R_G = 50 Ω V_{GS} = 5 V (see test circuit, figure 5)		185 250 500	270 350 700	ns ns ns

SOURCE DRAIN DIODE

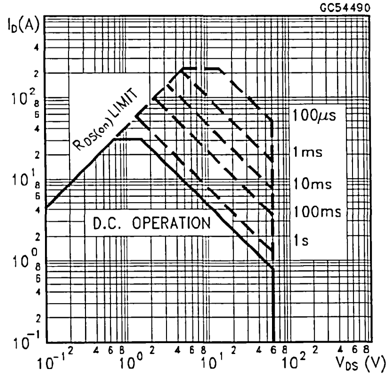
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				55 220	A A
V_{SD} (·)	Forward On Voltage	I_{SD} = 55 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 55 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		120 0.3 5		ns µC A

(·) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

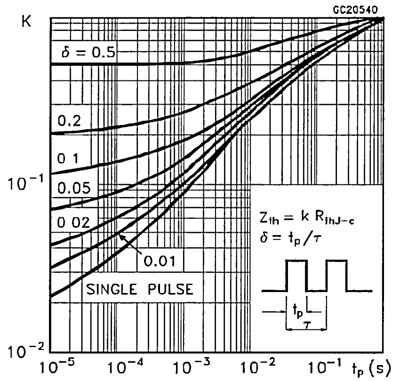
Safe Operating Areas For TO-220



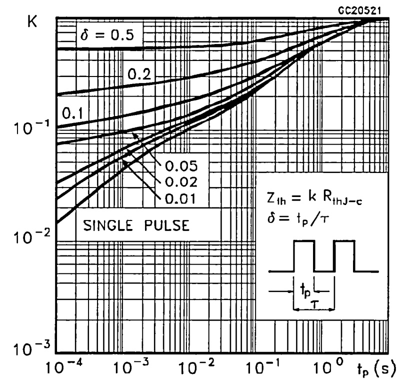
Safe Operating Areas For ISOWATT220



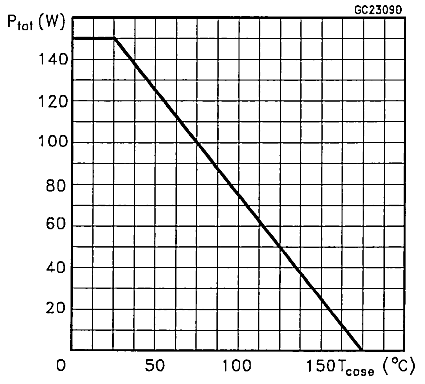
Thermal Impedeance For TO-220



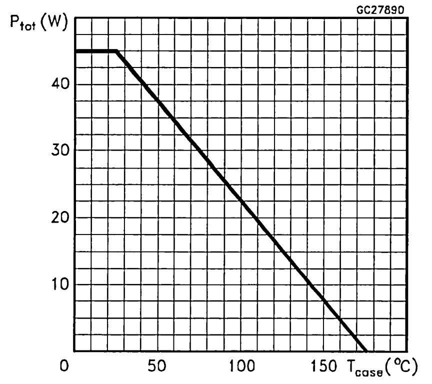
Thermal Impedance For ISOWATT220



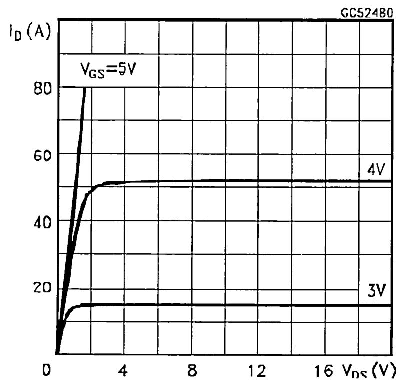
Derating Curve For TO-220



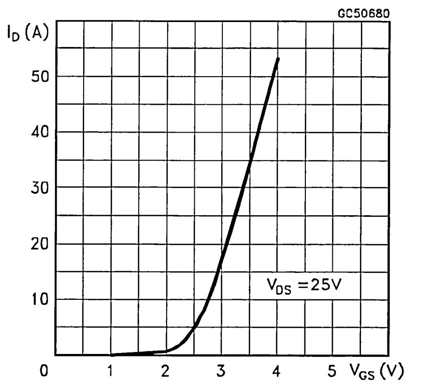
Derating Curve For ISOWATT220



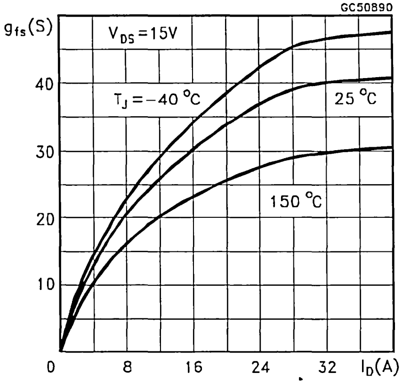
Output Characteristics



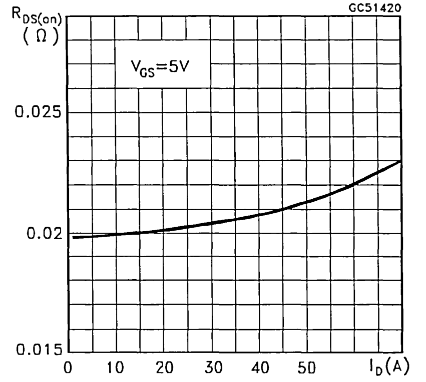
Transfer Characteristics



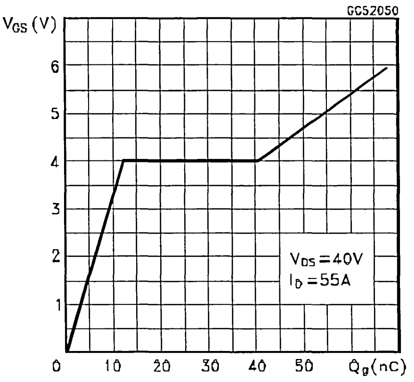
Transconductance



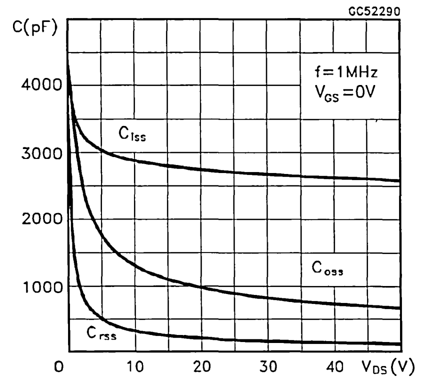
Static Drain-source On Resistance



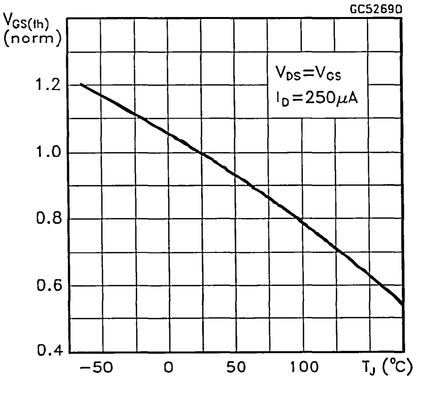
Gate Charge vs Gate-source Voltage



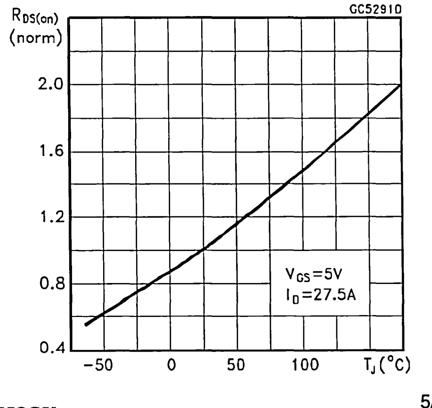
Capacitance Variations



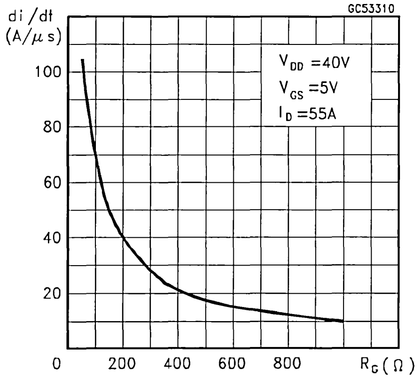
Normalized Gate Threshold Voltage vs Temperature



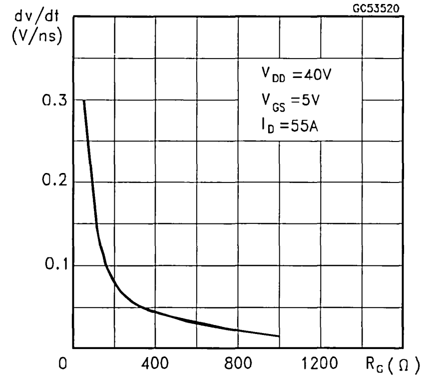
Normalized On Resistance vs Temperature



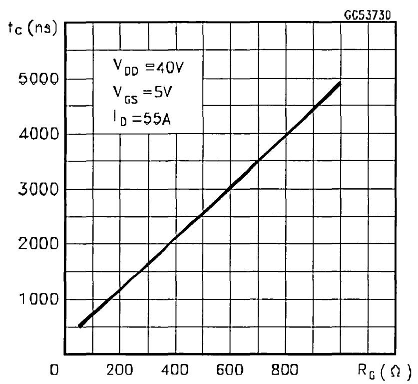
Turn-on Current Slope



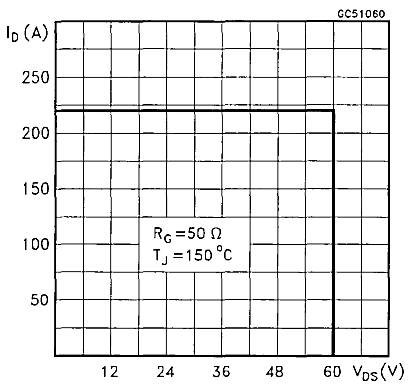
Turn-off Drain-source Voltage Slope



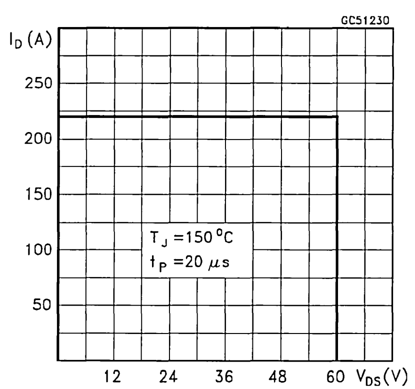
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

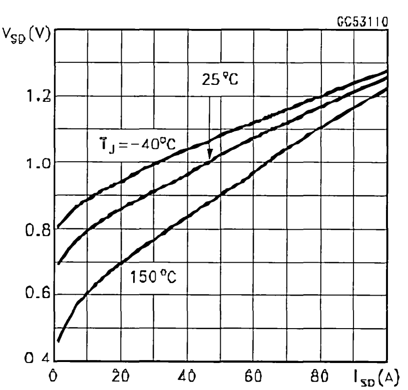


Fig. 1: Unclamped Inductive Load Test Circuits

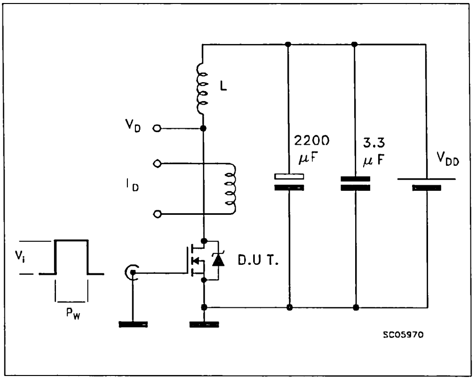


Fig. 2: Unclamped Inductive Waveforms

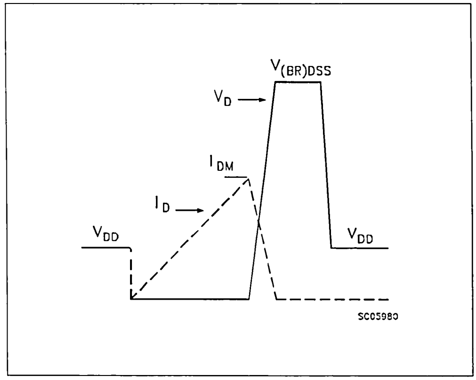


Fig. 3: Switching Times Test Circuits For Resistive Load

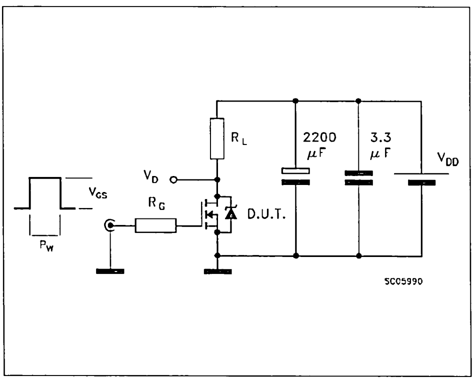


Fig. 4: Gate Charge Test Circuit

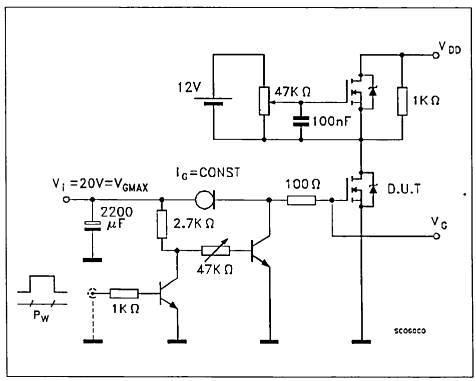
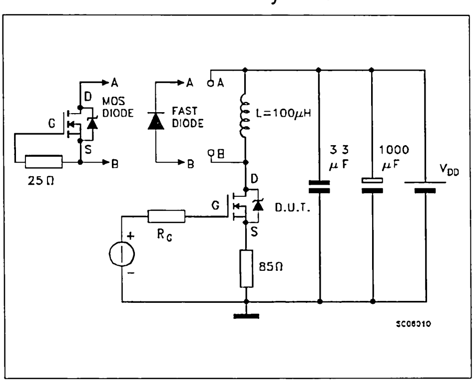


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



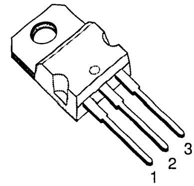
SGS-THOMSON
MICROELECTRONICS

STP60N05
STP60N05FI

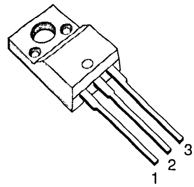
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP60N05	50 V	< 0.02 Ω	60 A
STP60N05FI	50 V	< 0.02 Ω	32 A

- TYPICAL $R_{DS(on)}$ = 0.017 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- VERY LOW $R_{DS(on)}$
- APPLICATION ORIENTED CHARACTERIZATION



TO-220

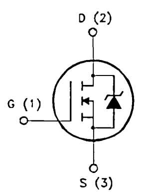


ISOWATT220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP60N05	STP60N05FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	60	32	A
I_D	Drain Current (continuous) at T_c = 100 °C	42	22	A
I_{DM}(•)	Drain Current (pulsed)	240	240	A
P_{tot}	Total Dissipation at T_c = 25 °C	150	45	W
	Derating Factor	1	0.3	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	3.33	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	60	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 25$ V)	700	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	170	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	42	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	50			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10$ V $I_D = 30$ A $V_{GS} = 10$ V $I_D = 30$ A $T_c = 100$°C		0.017	0.02 0.04	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	60			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 30$ A	16	29		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V $f = 1$ MHz $V_{GS} = 0$		2200 950 250	2900 1300 350	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 40 V I_D = 60 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		65 500	90 700	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 60 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		185		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 60 A V_{GS} = 10 V		68 15 27	95	nC nC nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 60 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		160 190 370	220 270 520	ns ns ns

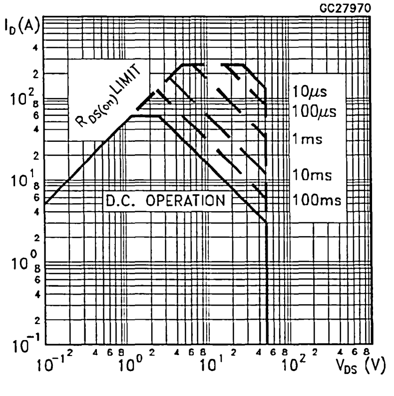
SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				60 240	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 60 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 60 A di/dt = 100 A/µs V_{DD} = 25 V T_j = 150 °C (see test circuit, figure 5)		120 0.27 4.5		ns µC A

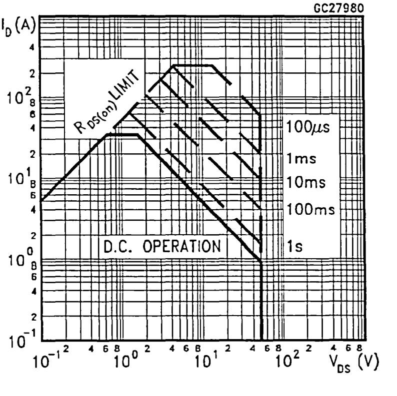
(*) Pulsed Pulse duration = 300 µs, duty cycle 1.5 %

(•) Pulse width limited by safe operating area

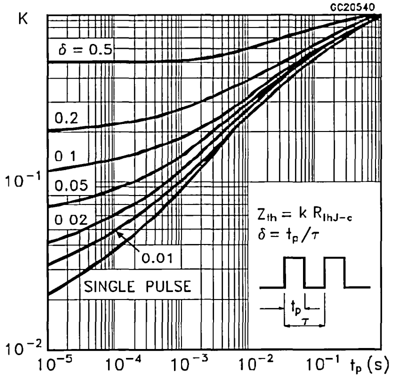
Safe Operating Areas for TO-220



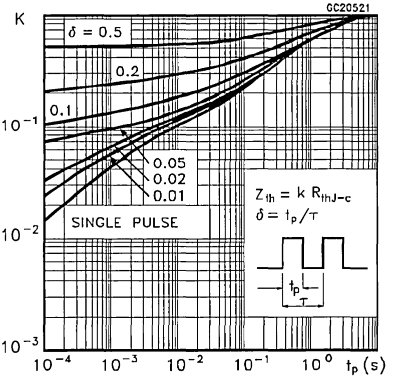
Safe Operating Areas for ISOWATT220



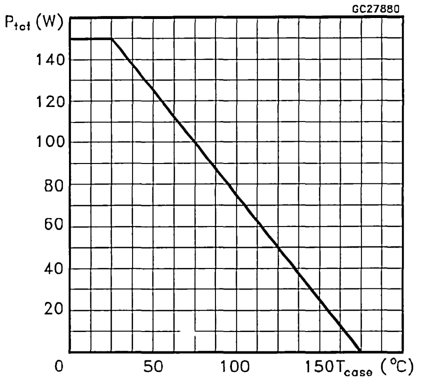
Thermal Impedance For TO-220



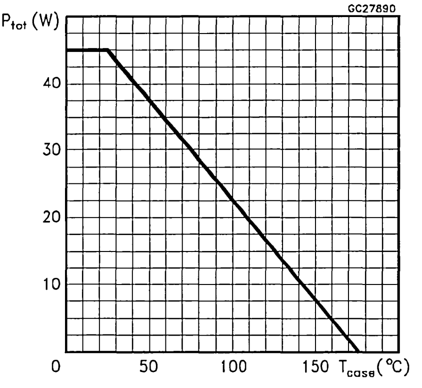
Thermal Impedance For ISOWATT220



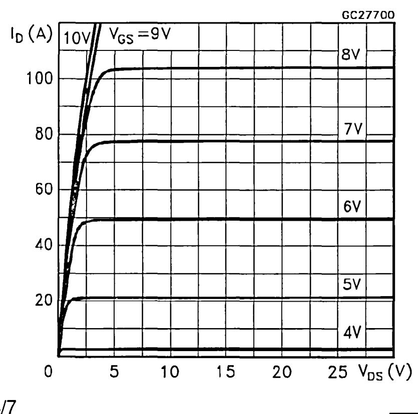
Derating Curve For TO-220



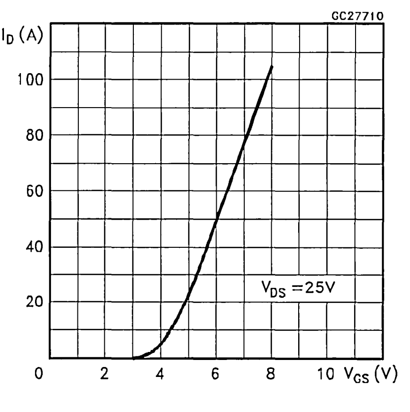
Derating Curve For ISOWATT220



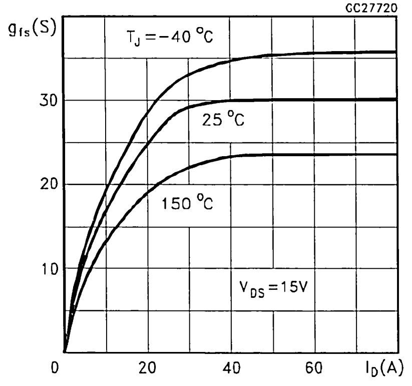
Output Characteristics



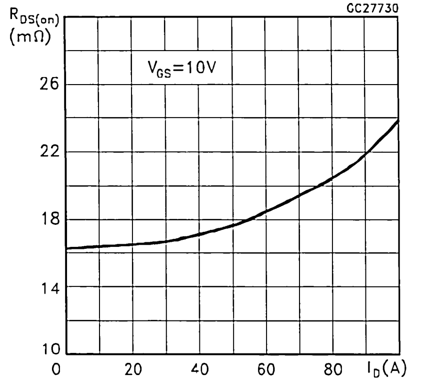
Transfer Characteristics



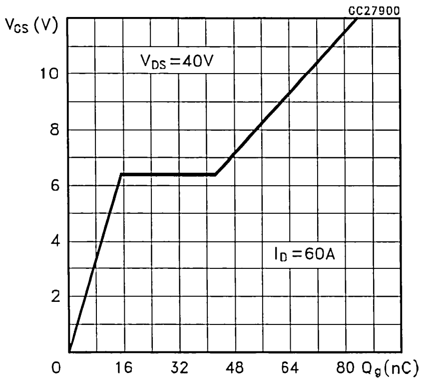
Transconductance



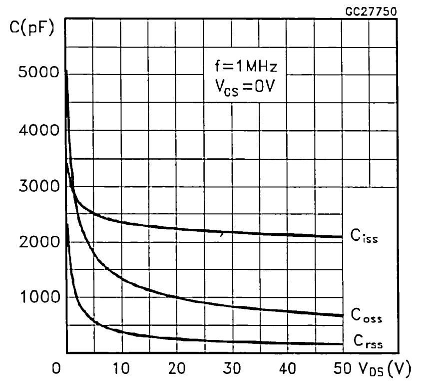
Static Drain-source On Resistance



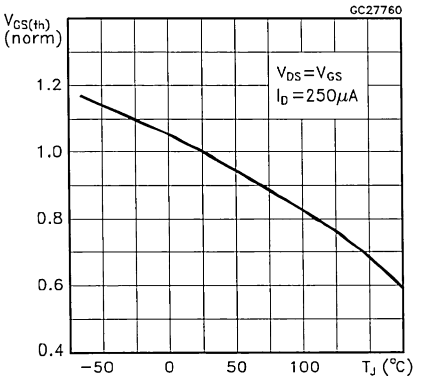
Gate Charge vs Gate-source Voltage



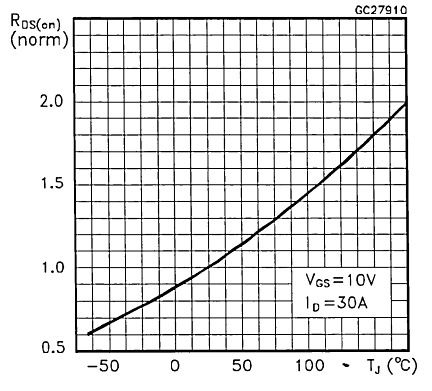
Capacitance Variations



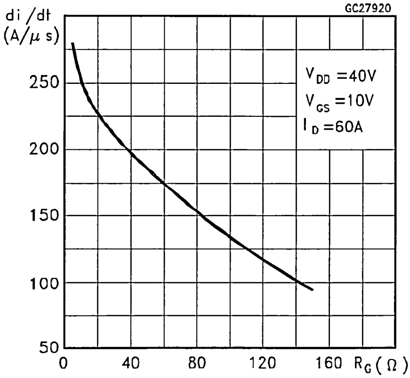
Normalized Gate Threshold Voltage vs Temperature



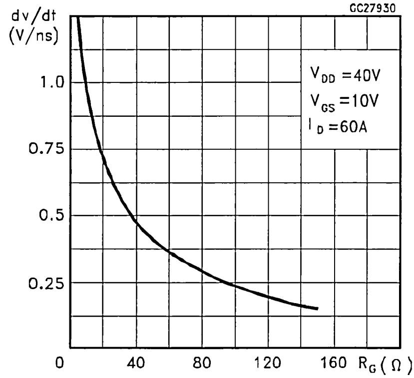
Normalized On Resistance vs Temperature



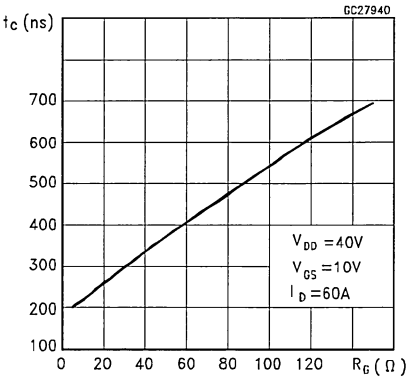
Turn-on Current Slope



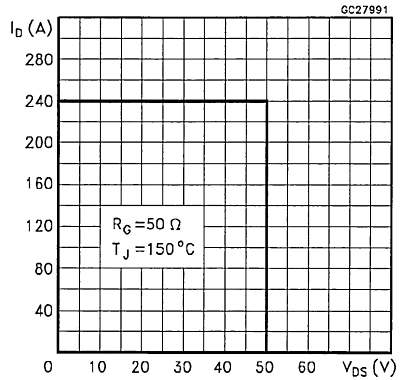
Turn-off Drain-source Voltage Slope



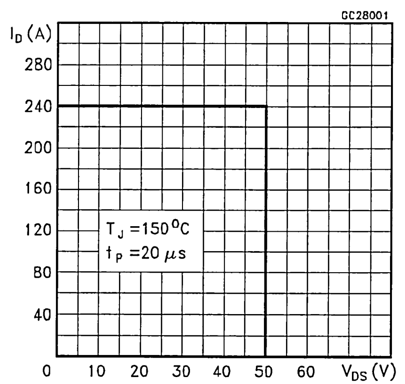
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

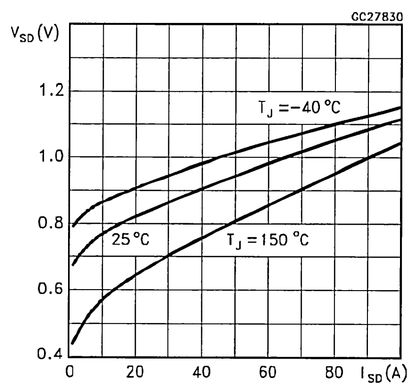


Fig. 1: Unclamped Inductive Load Test Circuits

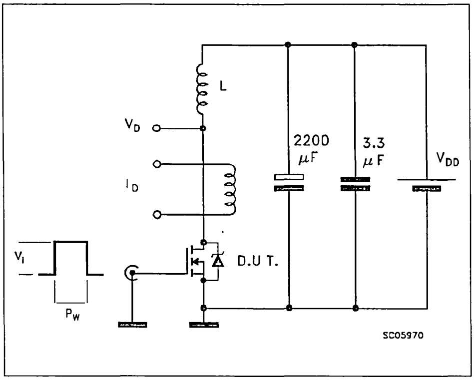


Fig. 2: Unclamped Inductive Waveforms

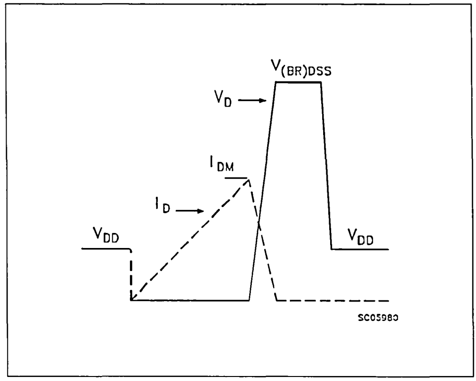


Fig. 3: Switching Times Test Circuits For Resistive Load

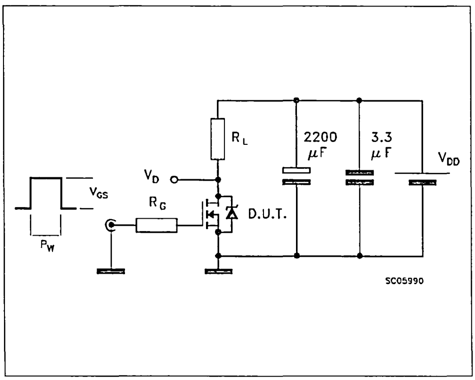


Fig. 4: Gate Charge Test Circuit

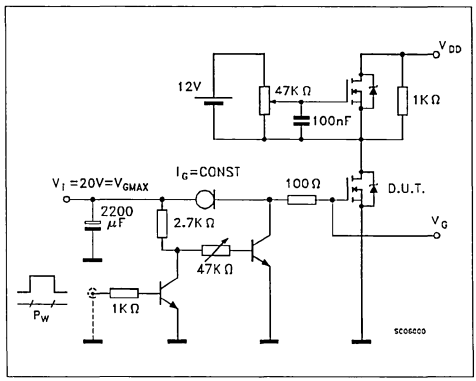
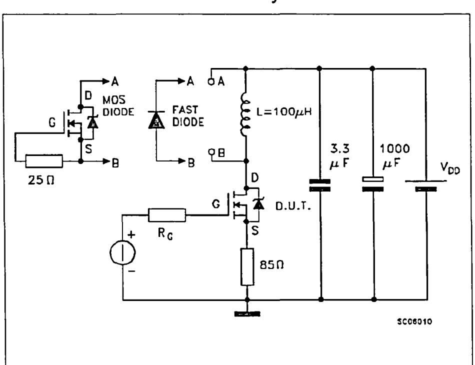


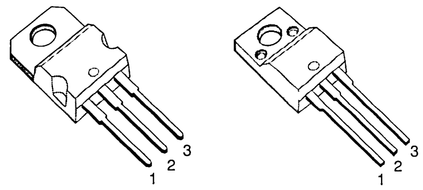
Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP60N06	60 V	< 0.02 Ω	60 A
STP60N06FI	60 V	< 0.02 Ω	32 A

- TYPICAL $R_{DS(on)}$ = 0.017 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- VERY LOW $R_{DS(on)}$
- APPLICATION ORIENTED CHARACTERIZATION

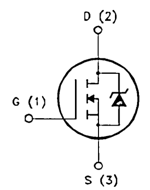


TO-220 ISOWATT220

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP60N06	STP60N06FI	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	60		V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	60		V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	60	32	A
I_D	Drain Current (continuous) at T_c = 100 °C	42	22	A
I_{DM}(•)	Drain Current (pulsed)	240	240	A
P_{tot}	Total Dissipation at T_c = 25 °C	150	45	W
	Derating Factor	1	0.3	W/°C
V_{ISO}	Insulation Withstand Voltage (DC)	—	2000	V
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

			TO-220	ISOWATT220	
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	3.33	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5		°C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	60	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	600	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	150	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	42	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0	60			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10 V I_D = 30 A V_{GS} = 10 V I_D = 30 A T_c = 100°C		0.017	0.02 0.04	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	60			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 30 A	16	29		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		2200 950 250	2900 1300 350	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 40 V I_D = 60 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		65 500	90 700	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 60 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		185		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 60 A V_{GS} = 10 V		68 15 27	95	nC nC nC

SWITCHING OFF

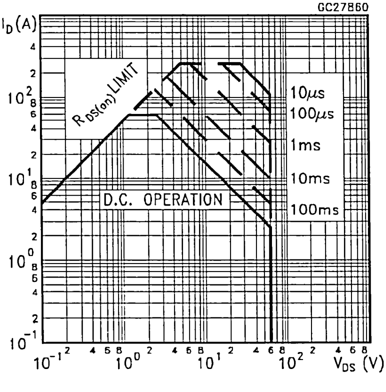
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 60 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		160 190 370	220 270 520	ns ns ns

SOURCE DRAIN DIODE

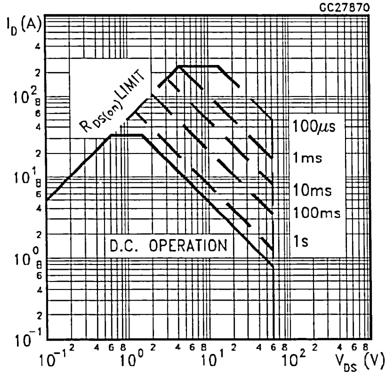
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				60 240	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 60 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 60 A di/dt = 100 A/µs V_{DD} = 25 V T_j = 150 °C (see test circuit, figure 5)		120 0.27 4.5		ns µC A

(*) Pulsed. Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

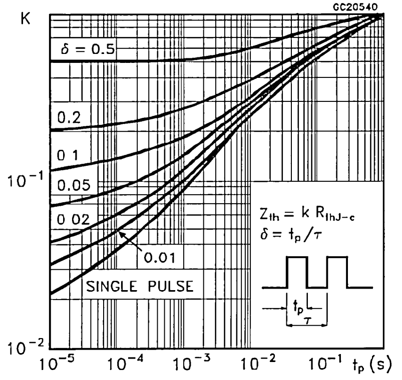
Safe Operating Areas For TO-220



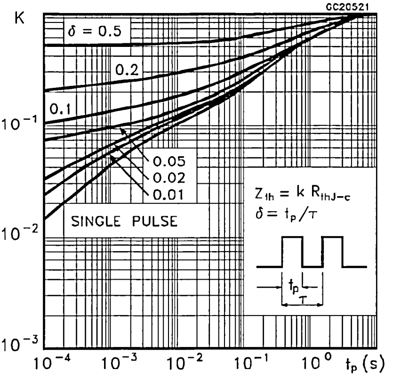
Safe Operating Areas For ISOWATT220



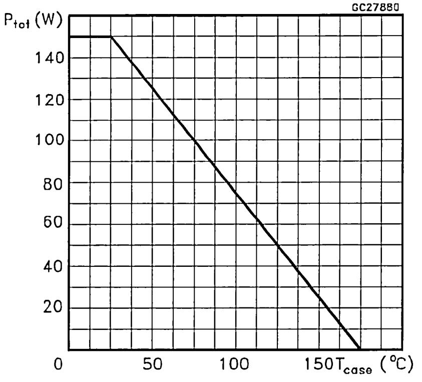
Thermal Impedance For TO-220



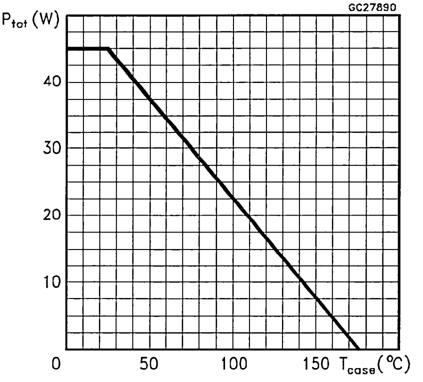
Thermal Impedance For ISOWATT220



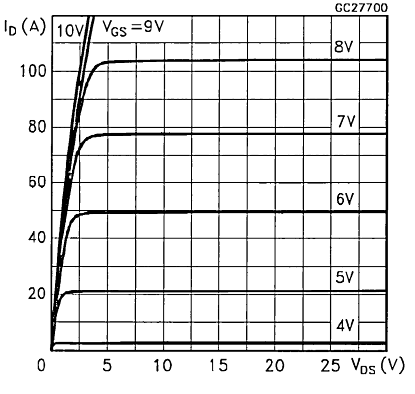
Derating Curve For TO-220



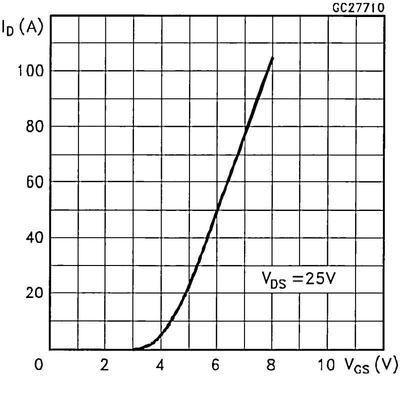
Derating Curve For ISOWATT220



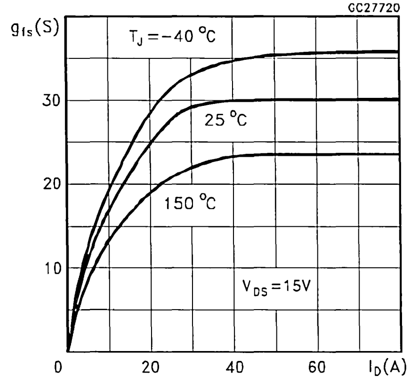
Output Characteristics



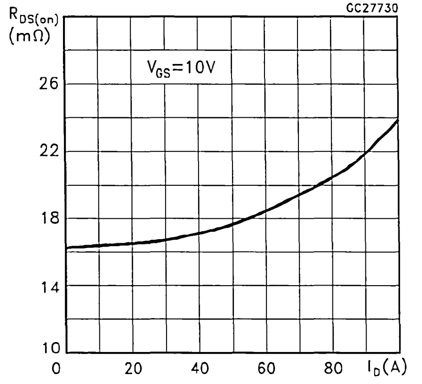
Transfer Characteristics



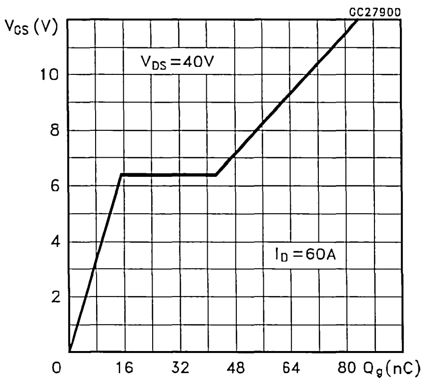
Transconductance



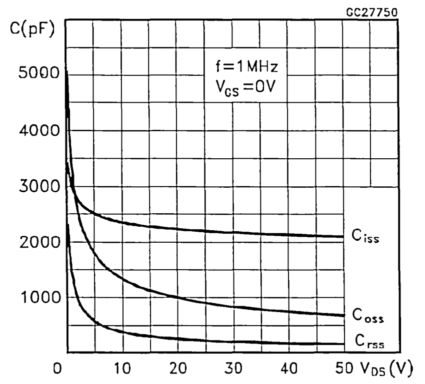
Static Drain-source On Resistance



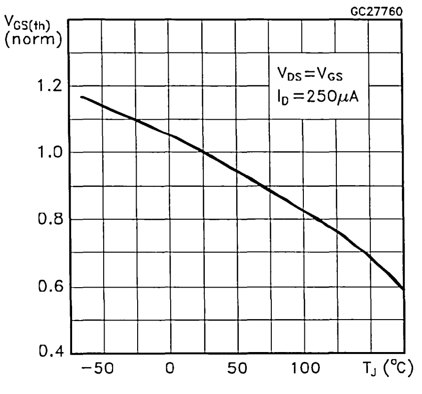
Gate Charge vs Gate-source Voltage



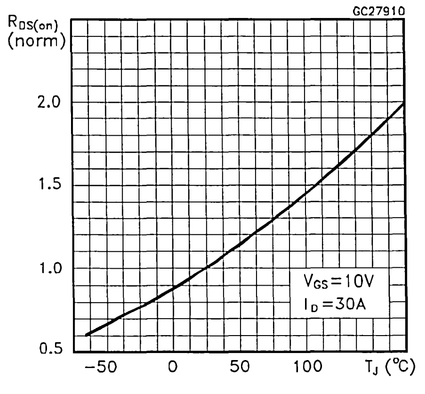
Capacitance Variations



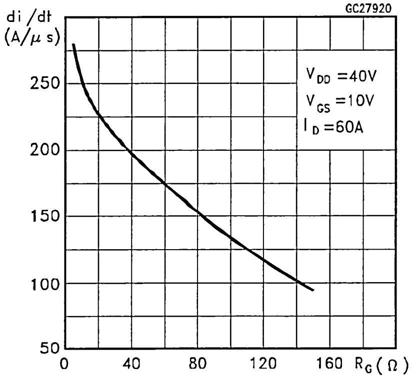
Normalized Gate Threshold Voltage vs Temperature



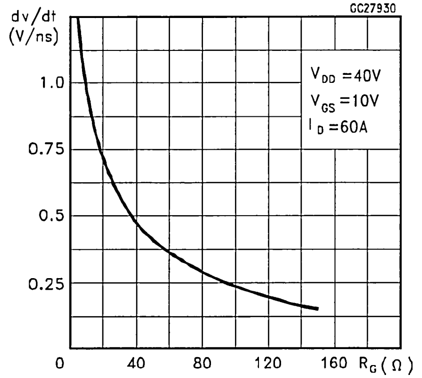
Normalized On Resistance vs Temperature



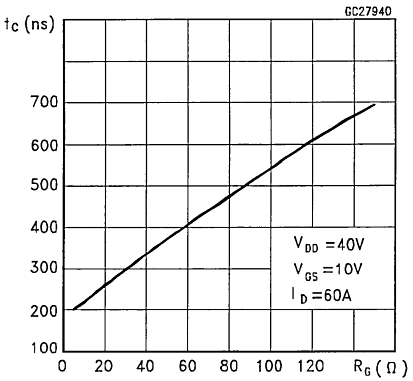
Turn-on Current Slope



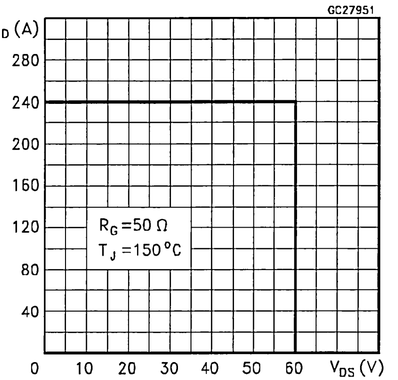
Turn-off Drain-source Voltage Slope



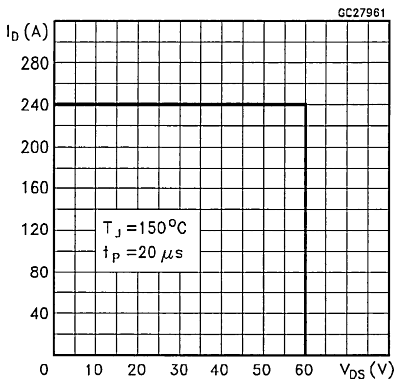
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

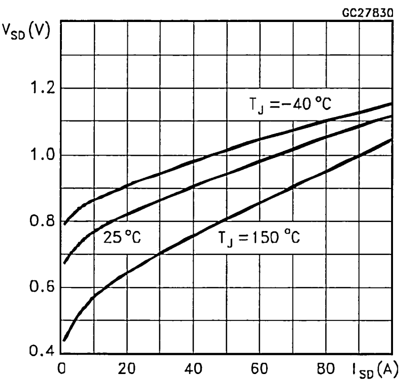


Fig. 1: Unclamped Inductive Load Test Circuits

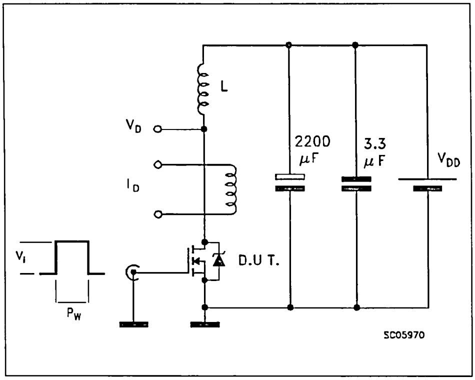


Fig. 2: Unclamped Inductive Waveforms

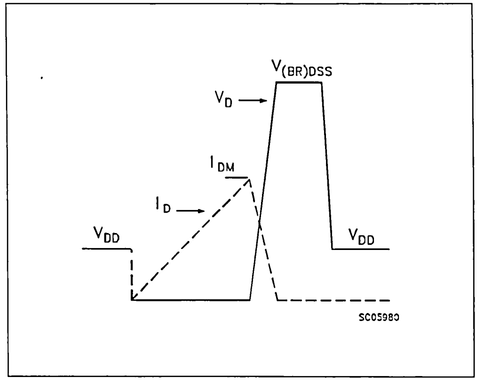


Fig. 3: Switching Times Test Circuits For Resistive Load

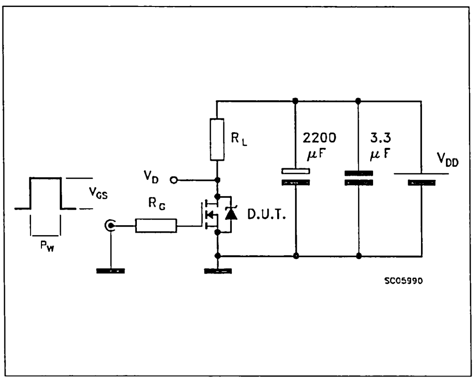


Fig. 4: Gate Charge Test Circuit

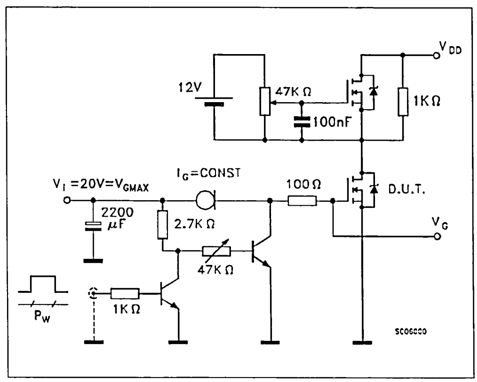
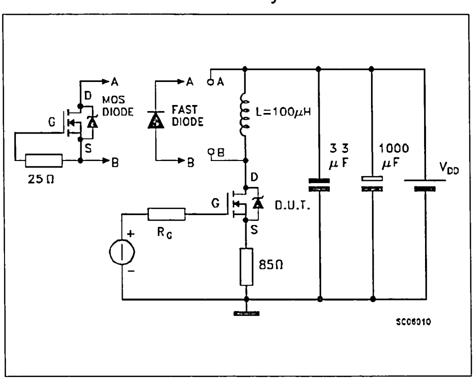


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON
MICROELECTRONICS

STP60N05-16
STP60N06-16

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP60N05-16	50 V	< 0.016 Ω	60 A
STP60N06-16	60 V	< 0.016 Ω	60 A

- TYPICAL $R_{DS(on)}$ = 0.013 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- VERY HIGH CURRENT CAPABILITY
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS
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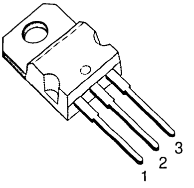
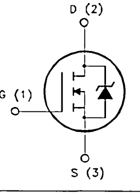
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



TO-220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP60N05-16	STP60N06-16	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	50	60	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	50	60	V
V_{GS}	Gate-source Voltage	± 20		V
I_D	Drain Current (continuous) at T_c = 25 °C	60		A
I_D	Drain Current (continuous) at T_c = 100 °C	42		A
I_{DM}(•)	Drain Current (pulsed)	240		A
P_{tot}	Total Dissipation at T_c = 25 °C	150		W
	Derating Factor	1		W/°C
T_{stg}	Storage Temperature	-65 to 175		°C
T_j	Max. Operating Junction Temperature	175		°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	°C/W
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.5	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	60	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	600	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	150	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 °C, pulse width limited by T_j max, $\delta < 1\%$)	42	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA V_{GS} = 0 for **STP60N05-16** for **STP60N06-16**	 50 60			 V V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 T_c = 125 °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ± 20 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ I_D = 250 µA	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10 V I_D = 30 A V_{GS} = 10 V I_D = 30 A T_c = 100°C		0.013	0.016 0.032	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	60			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ I_D = 30 A	20	40		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		2900 900 230	3800 1200 300	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 30 V I_D = 30 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)		75 370	105 520	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 40 V I_D = 60 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		190		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 40 V I_D = 60 A V_{GS} = 10 V		105 18 44	150	nC nC nC

SWITCHING OFF

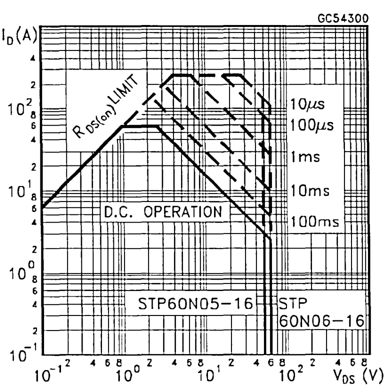
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 40 V I_D = 60 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		185 250 480	260 350 680	ns ns ns

SOURCE DRAIN DIODE

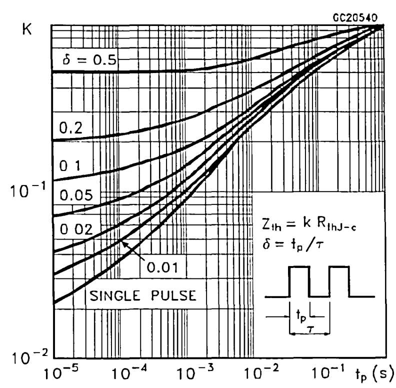
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				60 240	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 60 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 60 A di/dt = 100 A/µs V_{DD} = 30 V T_j = 150 °C (see test circuit, figure 5)		120 0.36 6		ns µC A

(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

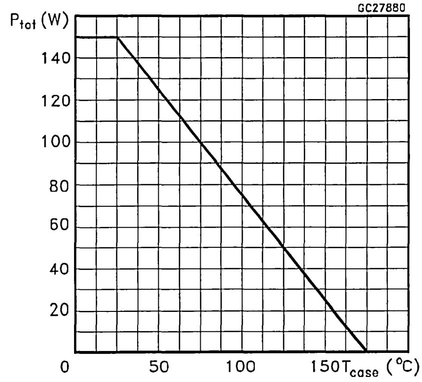
Safe Operating Areas



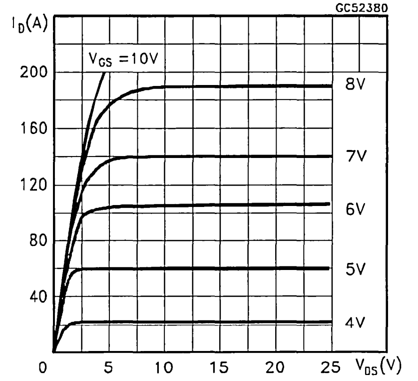
Thermal Impedance



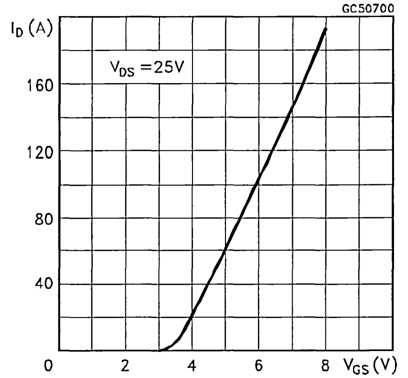
Derating Curve



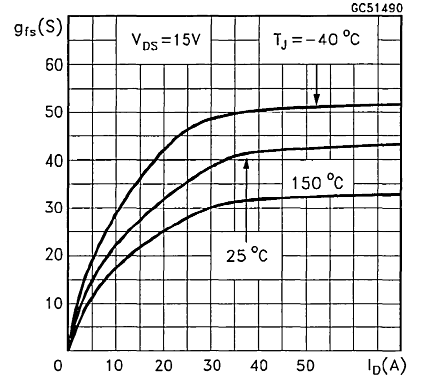
Output Characteristics



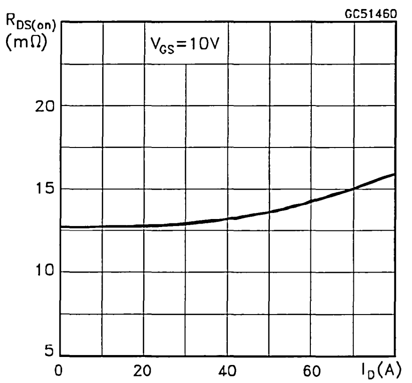
Transfer Characteristics



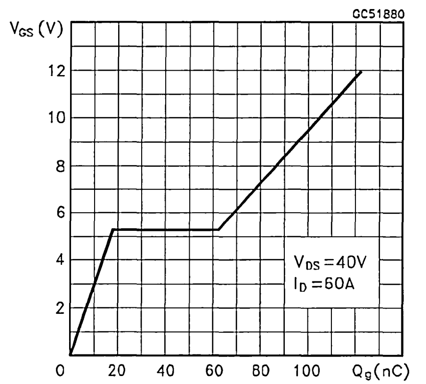
Transconductance



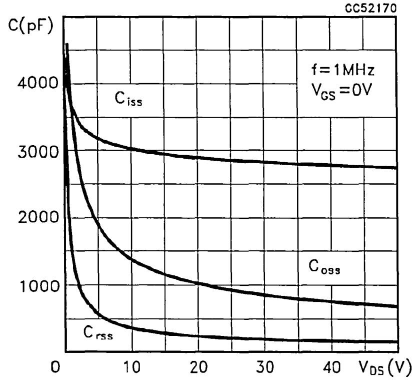
Static Drain-source On Resistance



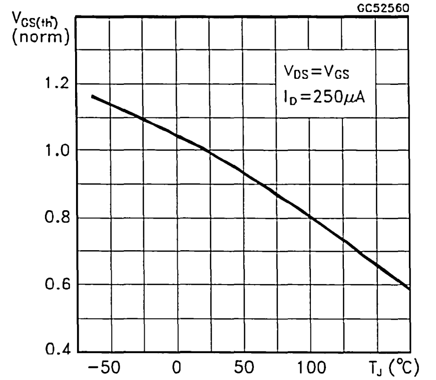
Gate Charge vs Gate-source Voltage



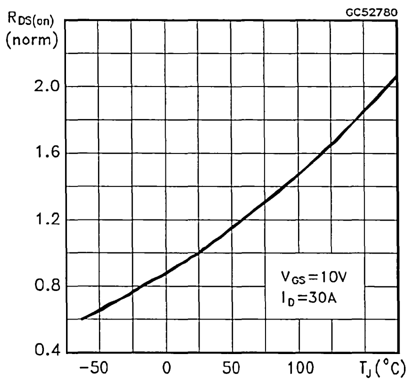
Capacitance Variations



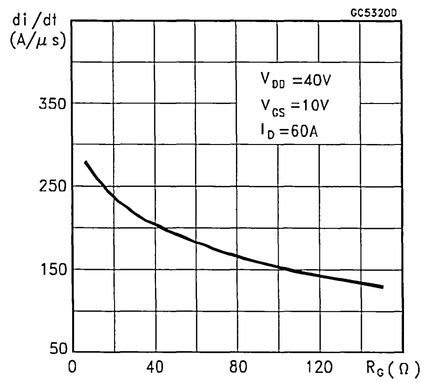
Normalized Gate Threshold Voltage vs Temperature



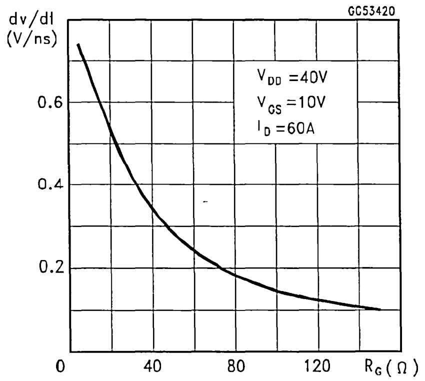
Normalized On Resistance vs Temperature



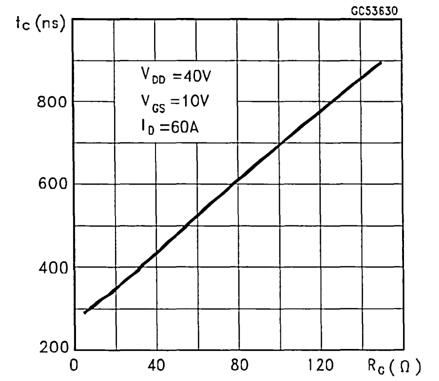
Turn-on Current Slope



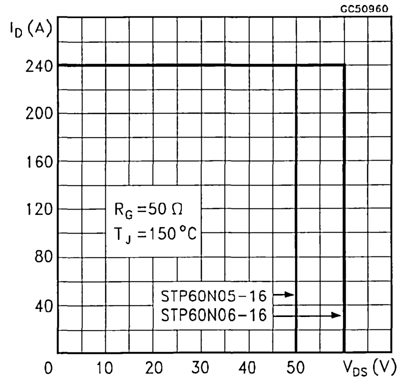
Turn-off Drain-source Voltage Slope



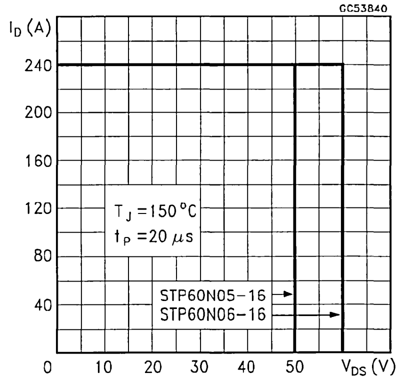
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

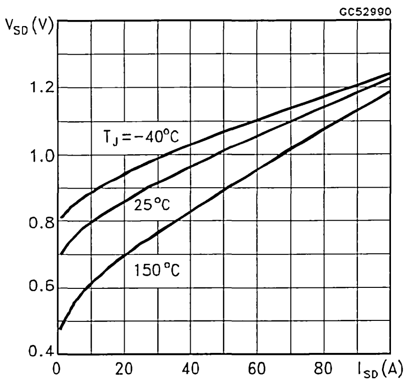


Fig. 1: Unclamped Inductive Load Test Circuits

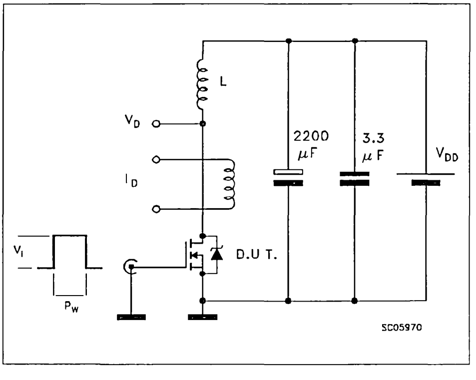


Fig. 2: Unclamped Inductive Waveforms

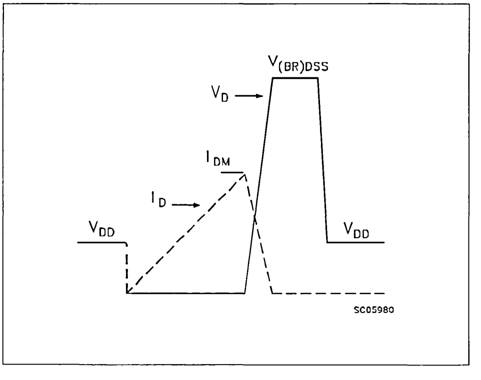


Fig. 3: Switching Times Test Circuits For Resistive Load

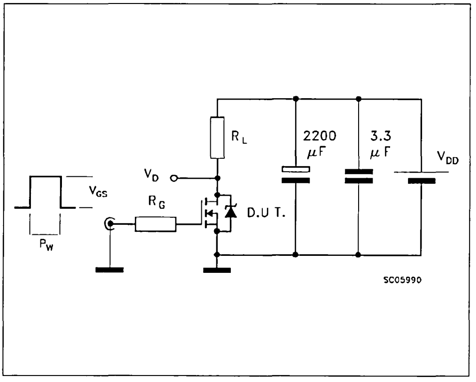


Fig. 4: Gate Charge Test Circuit

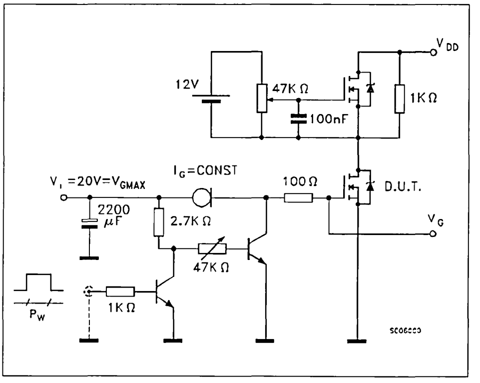
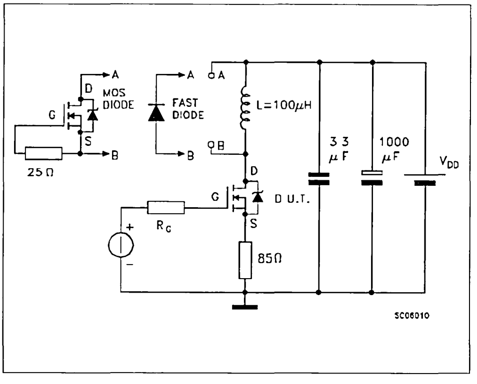


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time



SGS-THOMSON
MICROELECTRONICS

STW16N40

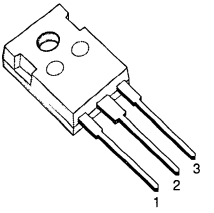
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STW16N40	400 V	< 0.3 Ω	16 A

- TYPICAL $R_{DS(on)}$ = 0.21 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

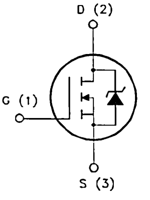
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



TO-247

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	400	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	400	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	16	A
I_D	Drain Current (continuous) at T_c = 100 °C	10	A
I_{DM}(•)	Drain Current (pulsed)	64	A
P_{tot}	Total Dissipation at T_c = 25 °C	180	W
	Derating Factor	1.44	W/°C
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.69	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	30	°C/W
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.1	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	16	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25$ °C, $I_D = I_{AR}$, $V_{DD} = 50$ V)	435	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	23	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100$ °C, pulse width limited by T_j max, $\delta < 1\%$)	10	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25$ °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250$ µA $V_{GS} = 0$	400			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 125$ °C			250 1000	µA µA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20$ V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250$ µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10$V $I_D = 8$ A $V_{GS} = 10$V $I_D = 8$ A $T_c = 100$°C		0.21	0.3 0 6	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10$ V	16			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 8$ A	6	12		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25$ V f = 1 MHz $V_{GS} = 0$		2200 400 205	2900 550 270	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	V_{DD} = 200 V I_D = 8 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		25 85	35 115	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 320 V I_D = 16 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		350		A/μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 320 V I_D = 16 A V_{GS} = 10 V		145 15 80	190	nC nC nC

SWITCHING OFF

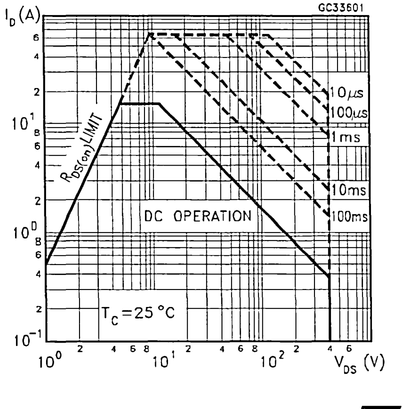
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	V_{DD} = 320 V I_D = 16 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 5)		105 35 150	140 50 200	ns ns ns

SOURCE DRAIN DIODE

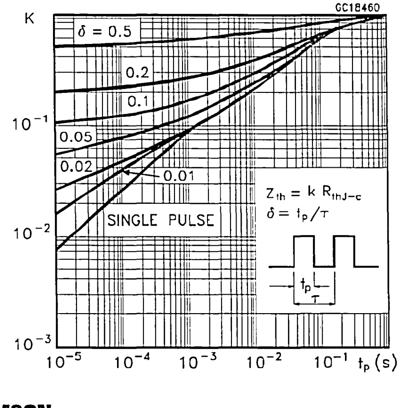
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				16 64	A A
V_{SD} (*)	Forward On Voltage	I_{SD} = 16 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 16 A di/dt = 100 A/μs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		620 10.9 35		ns μC A

(*) Pulsed. Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

Safe Operating Areas

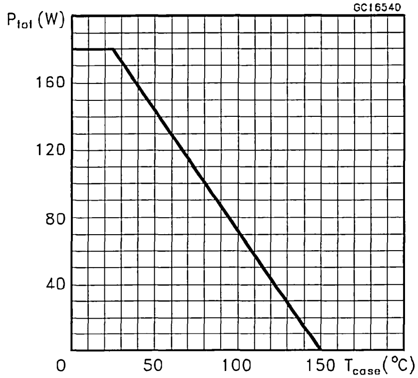


Thermal Impedance

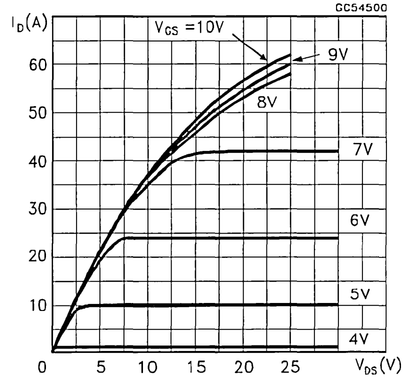


SGS-THOMSON MICROELECTRONICS

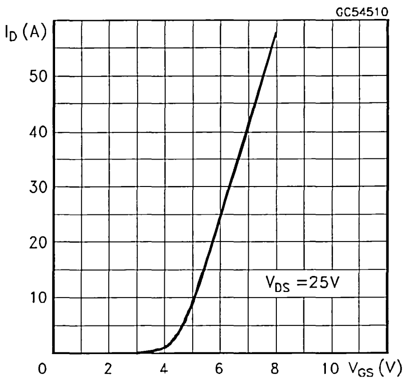
Derating Curve



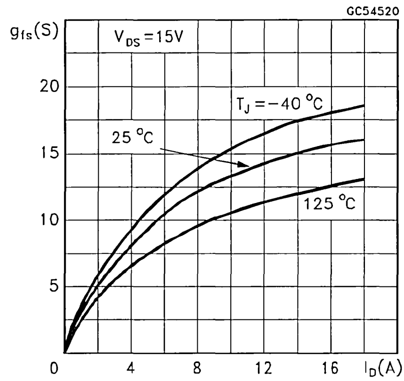
Output Characteristics



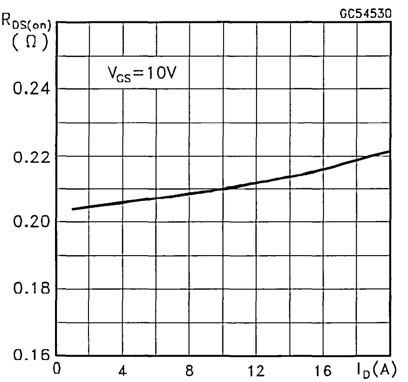
Transfer Characteristics



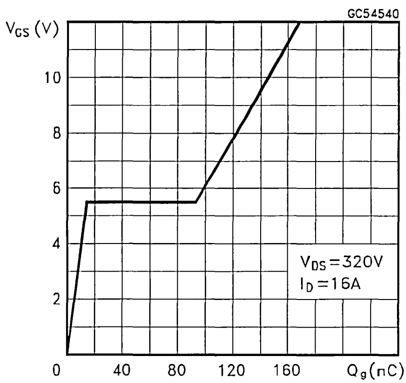
Transconductance



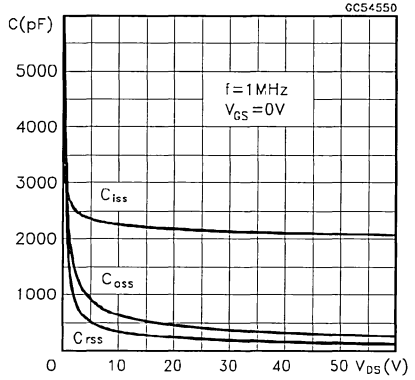
Static Drain-source On Resistance



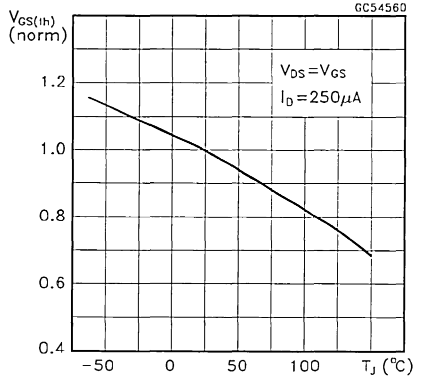
Gate Charge vs Gate-source Voltage



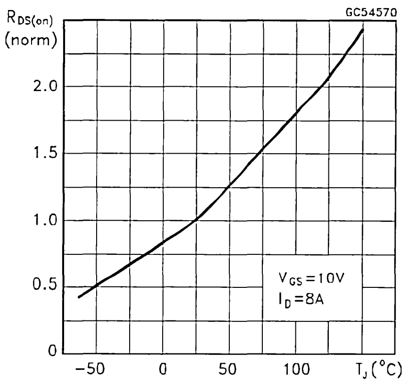
Capacitance Variations



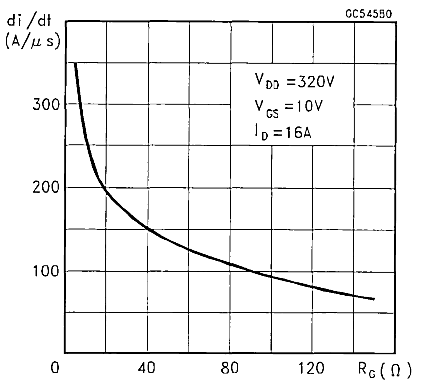
Normalized Gate Threshold Voltage vs Temperature



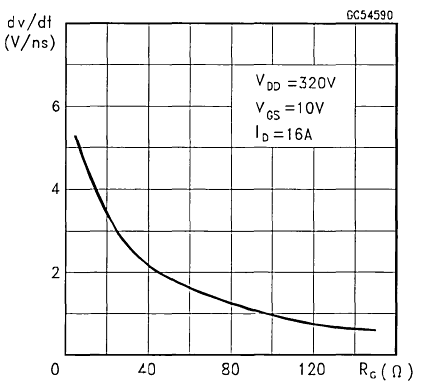
Normalized On Resistance vs Temperature



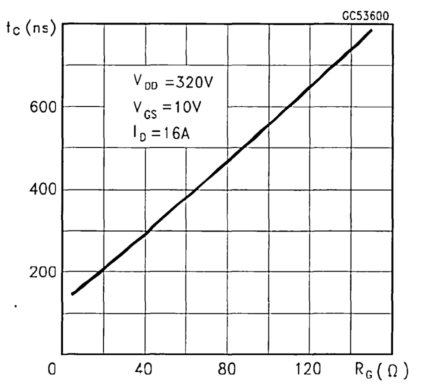
Turn-on Current Slope



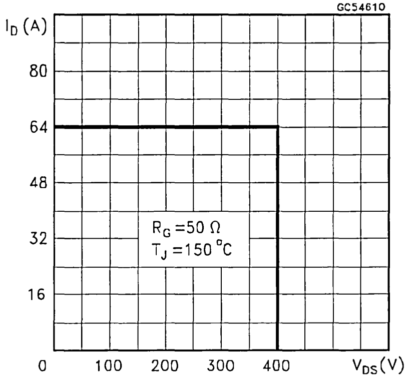
Turn-off Drain-source Voltage Slope



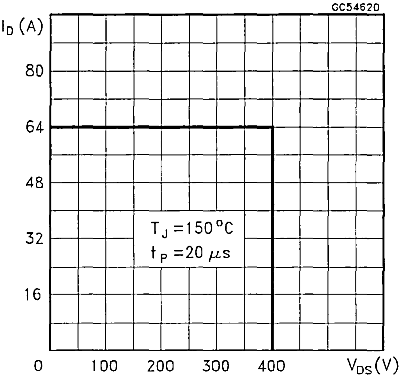
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

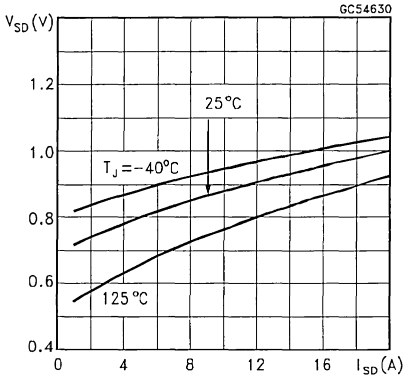


Fig. 1: Unclamped Inductive Load Test Circuits

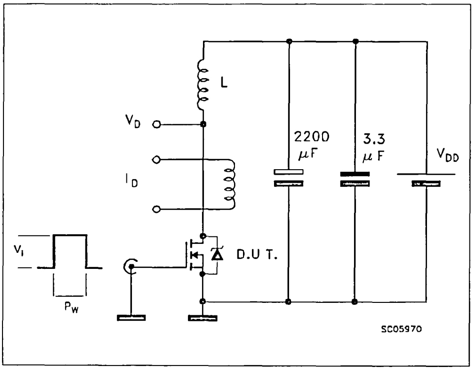


Fig. 2: Unclamped Inductive Waveforms

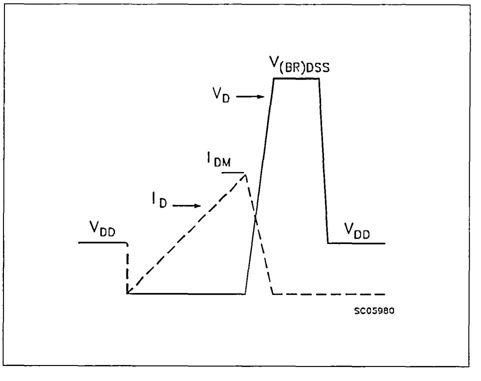


Fig. 3: Switching Times Test Circuits For Resistive Load

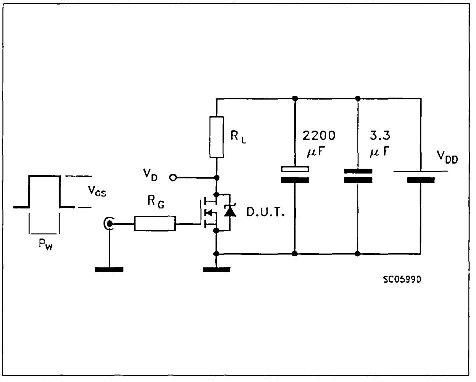


Fig. 4: Gate Charge Test Circuit

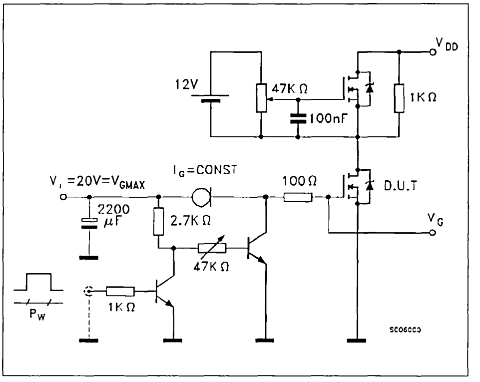
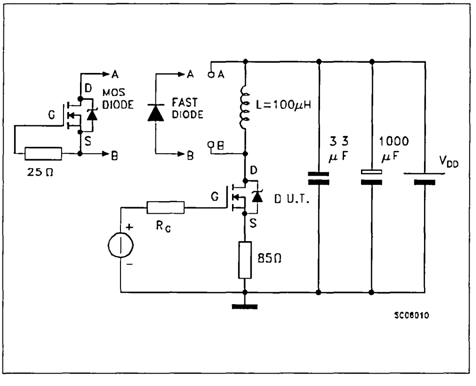


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times

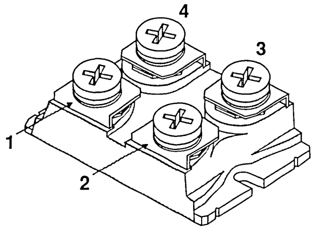


PACKAGES

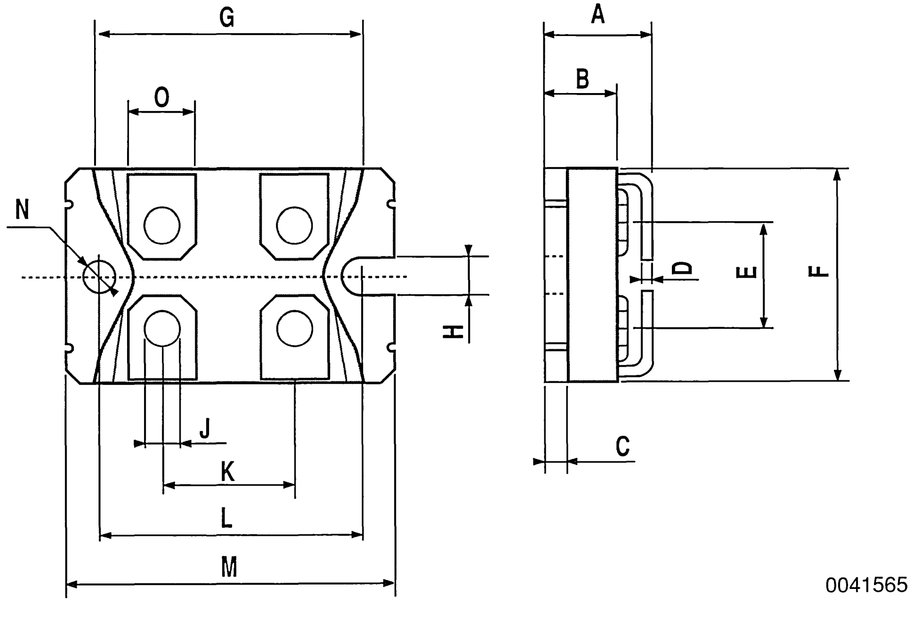
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	11.8		12.2	0.466		0.480
B	8.9		9.1	0.350		0.358
C	1.95		2.05	0.076		0.080
D	0.75		0.85	0.029		0.033
E	12.6		12.8	0.496		0.503
F	25.15		25.5	0.990		1.003
G	31.5		31.7	1.240		1.248
H	4			0.157		
J	4.1		4.3	0.161		0.169
K	14.9		15.1	0.586		0.594
L	30.1		30.3	1.185		1.193
M	37.8		38.2	1.488		1.503
N	4			0.157		
O	7.8		8.2	0.307		0.322
P	5.5			0.216		

SGS-THOMSON
MICROELECTRONICS

OUTLINE AND MECHANICAL DATA



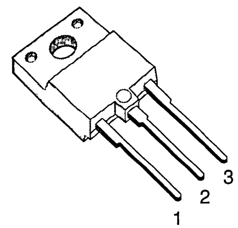
ISOTOP



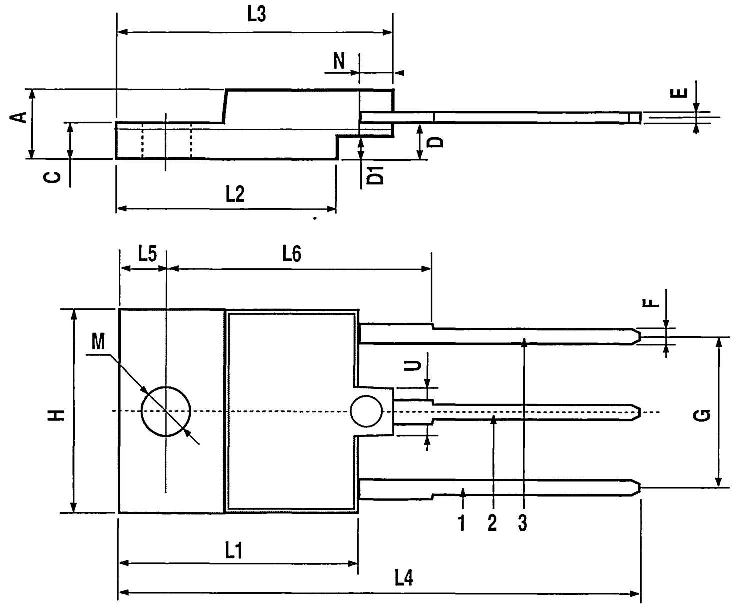
SGS-THOMSON
MICROELECTRONICS

OUTLINE AND MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	5.35		5.65	0.210		0.222
C	3.3		3.8	0.130		0.149
D	2.9		3.1	0.114		0.122
D1	1.88		2.08	0.074		0.081
E	0.45		1	0.017		0.039
F	1.05		1.25	0.041		0.049
G	10.8		11.2	0.425		0.441
H	15.8		16.2	0.622		0.637
L1	20.8		21.2	0.818		0.834
L2	19.1		19.9	0.752		0.783
L3	22.8		23.6	0.897		0.929
L4	40.5		42.5	1.594		1.673
L5	4.85		5.25	0.190		0.206
L6	20.25		20.75	0.797		0.817
M	3.5		3.7	0.137		0.145
N	2.1		2.3	0.082		0.090
U		4.6			0.181	



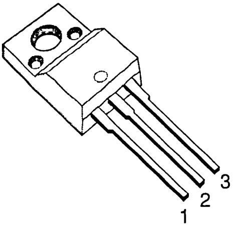
ISOWATT218



DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.4		0.7	0.015		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		3.66
Ø	3		3.2	0.118		0.126

SGS-THOMSON MICROELECTRONICS

OUTLINE AND MECHANICAL DATA



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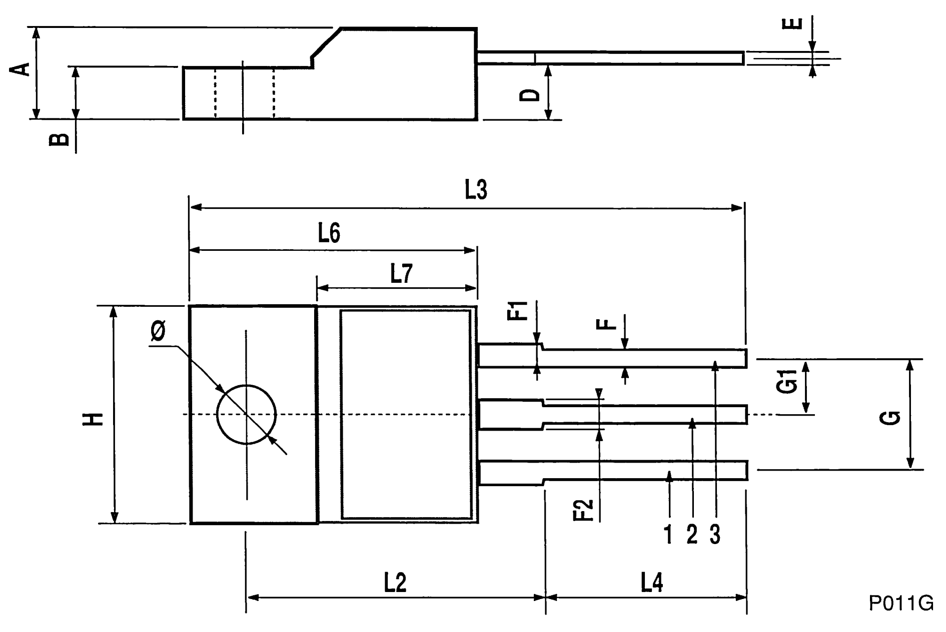
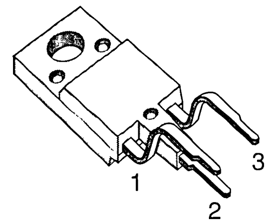


DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	5.13		5.33	0.202		0.210
B	2.63		2.83	0.103		0.111
D	3.05		3.35	0.120		0.132
D1	1.90		2.10	0.074		0.082
E	0.50		0.70	0.019		0.027
F	0.70		1.00	0.027		0.039
F1	1.25		1.50	0.049		0.059
F2	1.25		1.50	0.049		0.059
G	5.00		5.20	0.196		0.204
G1	2.50		2.60	0.098		0.102
H	10.00		10.40	0.393		0.409
L	6.80		7.10	0.267		0.279
L1	14.70		15.10	0.578		0.594
L2		20.20			0.795	
L3	26.60		28.60	1.047		1.126
L5	3.30		3.40	0.130		0.134
L6	15.90		16.30	0.626		0.641
L7	23.20		25.20	0.913		0.992
L8		19.80			0.779	
N2		6.00			0.236	
DIA.	3.00		3.20	0.118		0.126
S	4.88		5.28	0.192		0.207

SGS-THOMSON
MICROELECTRONICS

OUTLINE AND MECHANICAL DATA



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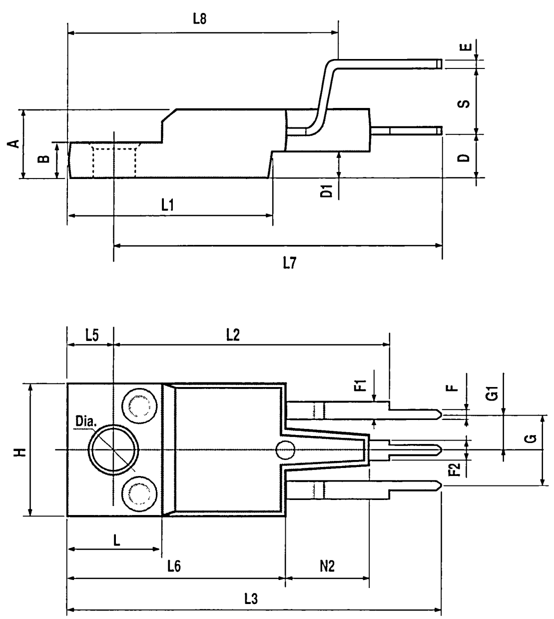
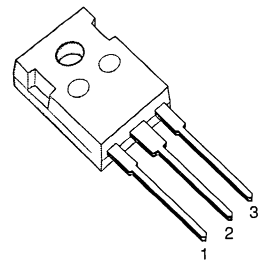


P011O

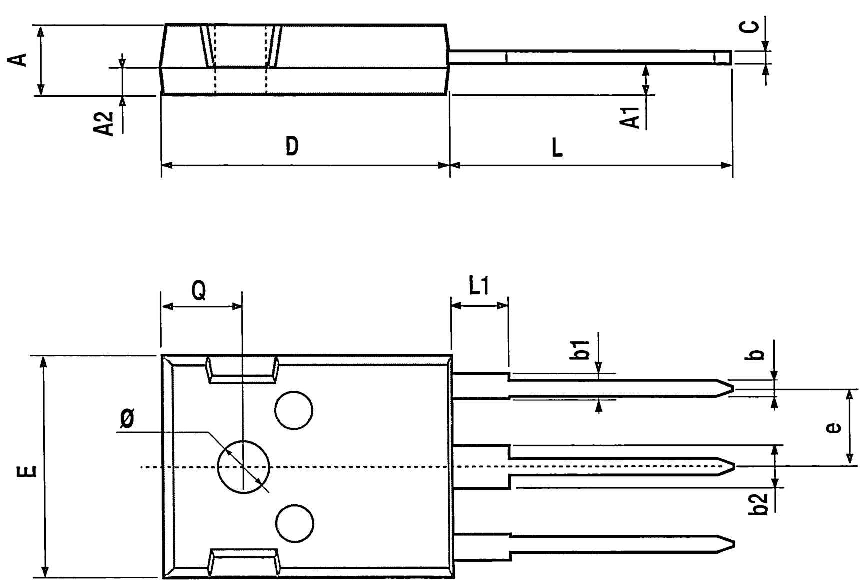
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.7		5.3	0.185		0.208
A1			2.87			0.113
A2	1.5		2.5	0.059		0.098
b	1		1.4	0.039		0.055
b1			2.25			0.088
b2	3.05		3.43	0.120		0.135
C	0.4		0.8	0.015		0.031
D	20.4		21.18	0.803		0.833
e	5.43		5.47	0.213		0.215
E	15.3		15.95	0.602		0.628
L	15.57			0.613		
L1	3.7		4.3	0.145		0.169
Q	5.3		5.84	0.208		0.230
ØP	3.5		3.71	0.137		0.146

SGS-THOMSON
MICROELECTRONICS

OUTLINE AND MECHANICAL DATA



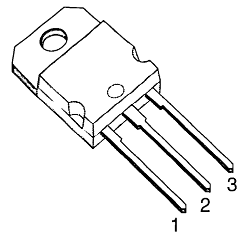
TO-247



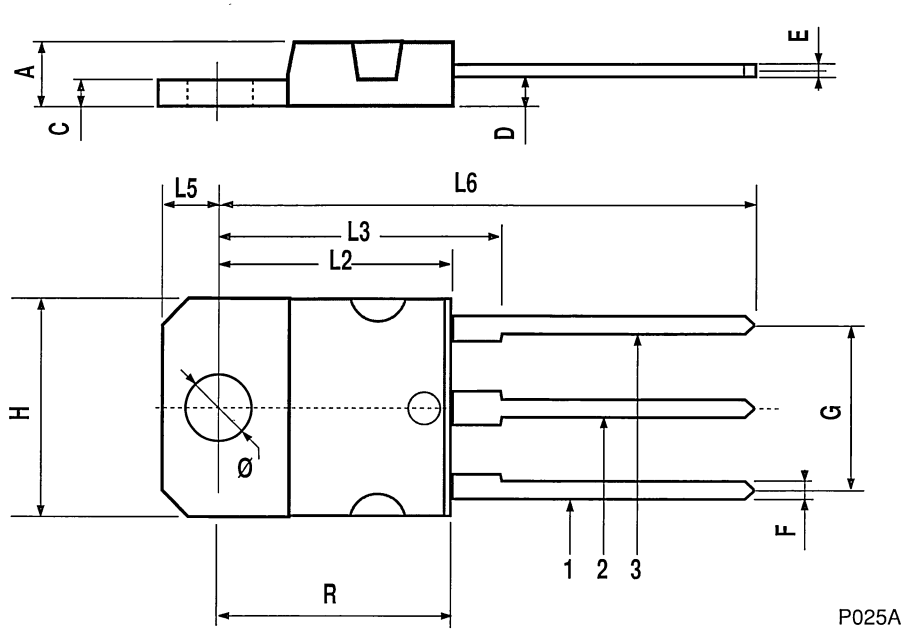
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.7		4.9	0.185		0.193
C	1.9		2.1	0.075		0.082
D		2.5			0.098	
E	0.5		0.78	0.019		0.030
F	1.1		1.3	0.043		0.051
G	10.8		11.1	0.425		0.437
H	14.7		15.2	0.578		0.598
L2	–		16.2	–		0.637
L3		18			0.708	
L5	3.95		4.15	0.155		0.163
L6		31			1.220	
R	–		12.2	–		0.480
Ø	4		4.1	0.157		0.161

SGS-THOMSON
MICROELECTRONICS

OUTLINE AND MECHANICAL DATA



TO-218 (SOT-93)

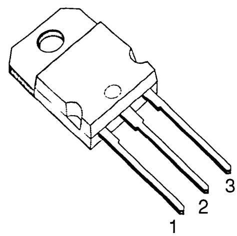


Phasing out during 1993 (see next page)

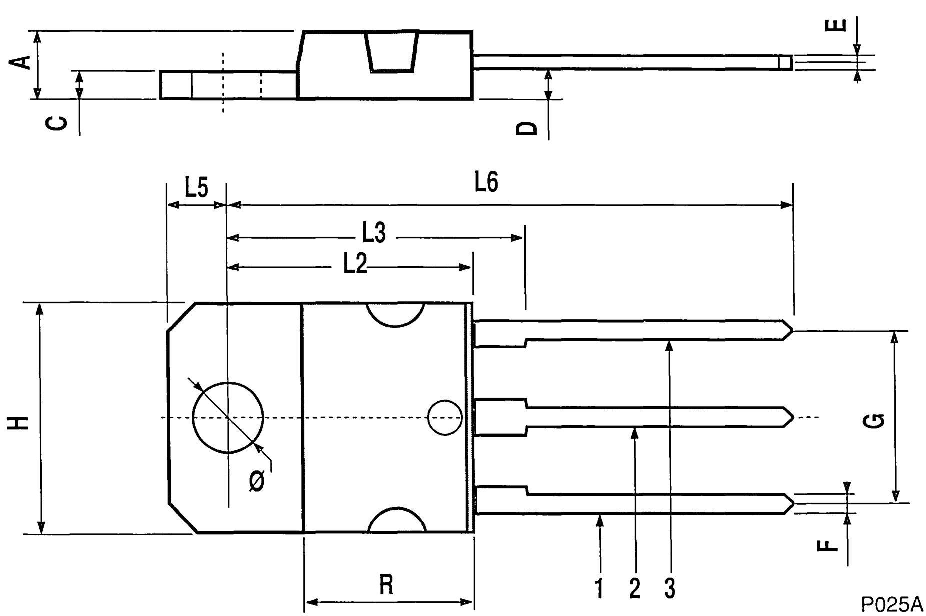
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.7		4.9	0.185		0.193
C	1.17		1.37	0.046		0.054
D		2.5			0.098	
E	0.5		0.78	0.019		0.030
F	1.1		1.3	0.043		0.051
G	10.8		11.1	0.425		0.437
H	14.7		15.2	0.578		0.598
L2	–		16.2	–		0.637
L3		18			0.708	
L5	3.95		4.15	0.155		0.163
L6		31			1.220	
R	–		12.2	–		0.480
Ø	4		4.1	0.157		0.161

SGS-THOMSON
MICROELECTRONICS

OUTLINE AND MECHANICAL DATA



TO-218 (SOT-93) (new version)

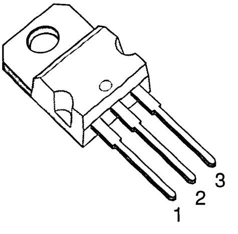


Introduction starting Q3 1993

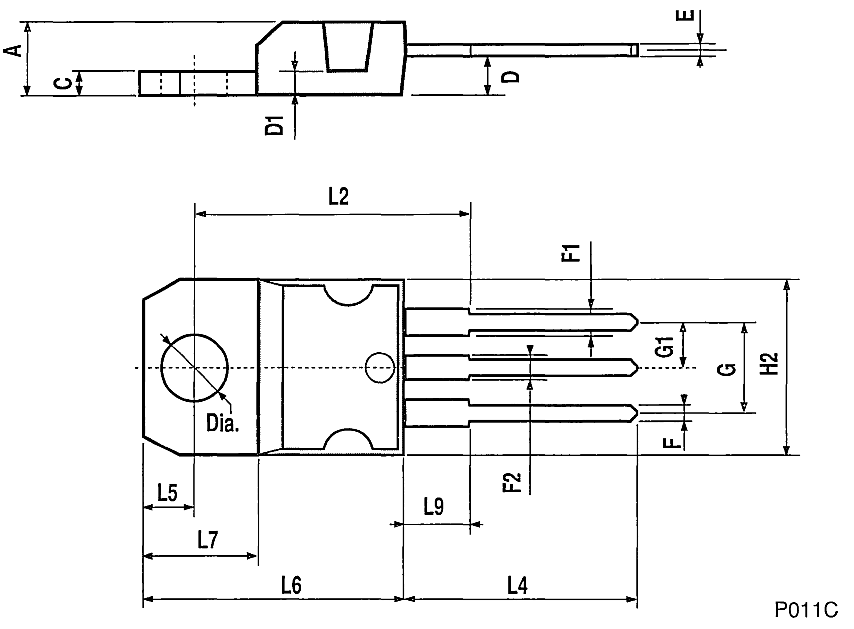
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.2		15.9	0.598		0.625
L7	6.2		6.6	0.244		0.260
L9	3.5		4.2	0.137		0.165
DIA.	3.75		3.85	0.147		0.151

SGS-THOMSON
MICROELECTRONICS

OUTLINE AND MECHANICAL DATA



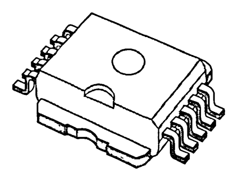
TO-220 (DSG)



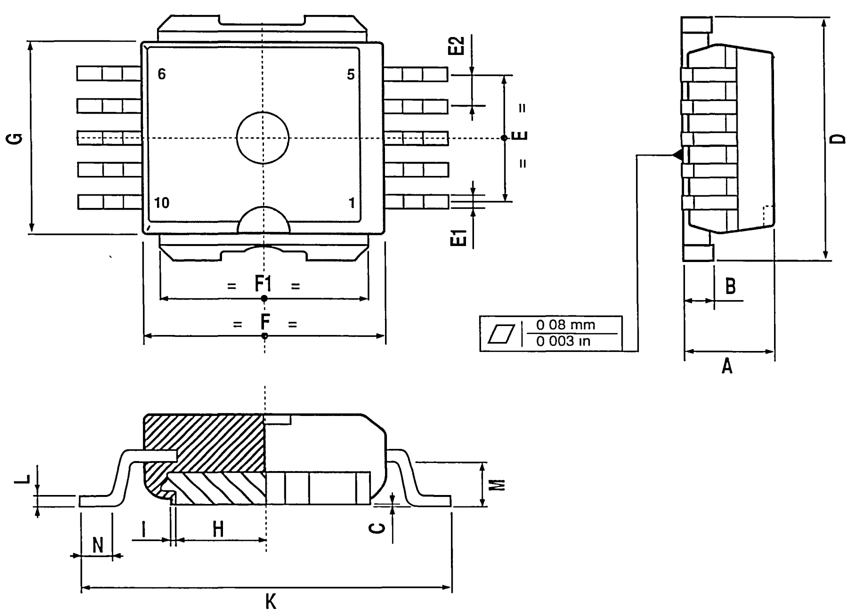
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	3.45	3.5	3.55	0.135	0.137	0.140
B		1.28	1.30		0.050	0.051
C			0.15			0.006
D	9.40	9.50	9.60	0.370	0.374	0.378
E	4.98	5.08	5.48	0.196	0.200	0.216
E1	0.40	0.45	0.60	0.016	0.018	0.024
E2	1.17	1.27	1.37	0.046	0.050	0.054
F	9.30	9.40	9.50	0.366	0.370	0.374
F1	7.95	8.00	8.15	0.313	0.315	0.321
G	7.40	7.50	7.60	0.291	0.295	0.299
H	6.80	6.90	7.00	0.267	0.417	0.421
I		0.10			0.004	
K	13.80	14.10	14.40	0.543	0.555	0.567
L		0.40	0.50		0.016	0.020
M	1.60	1.67	1.80	0.063	0.066	0.071
N	0.60	0.08	1.00	0.024	0.031	0.039

SGS-THOMSON
MICROELECTRONICS

OUTLINE AND MECHANICAL DATA



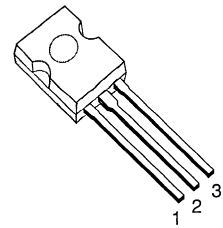
PowerSO-10



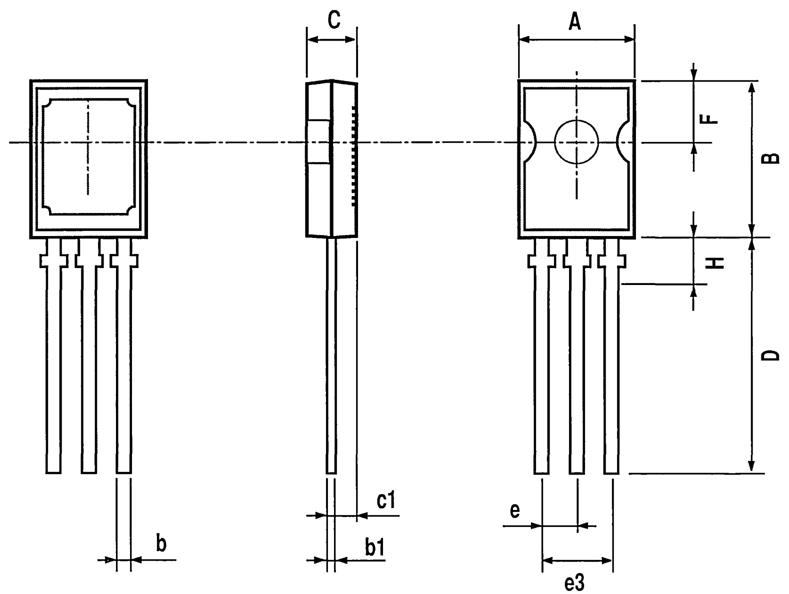
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	7.4		7.8	0.291		0.307
B	10.5		11.3	0.413		0.445
b	0.7		0.9	0.028		0.035
b1	0.49		0.75	0.019		0.030
C	2.4		2.7	0.04		0.106
c1		1.2			0.047	
D		15.7			0.618	
e		2.2			0.087	
e3		4.4			0.173	
F		3.8			0.150	
H			2.54		0.100	

SGS-THOMSON
MICROELECTRONICS

OUTLINE AND MECHANICAL DATA



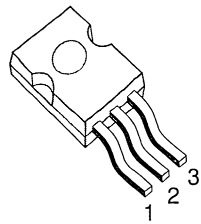
SOT-82



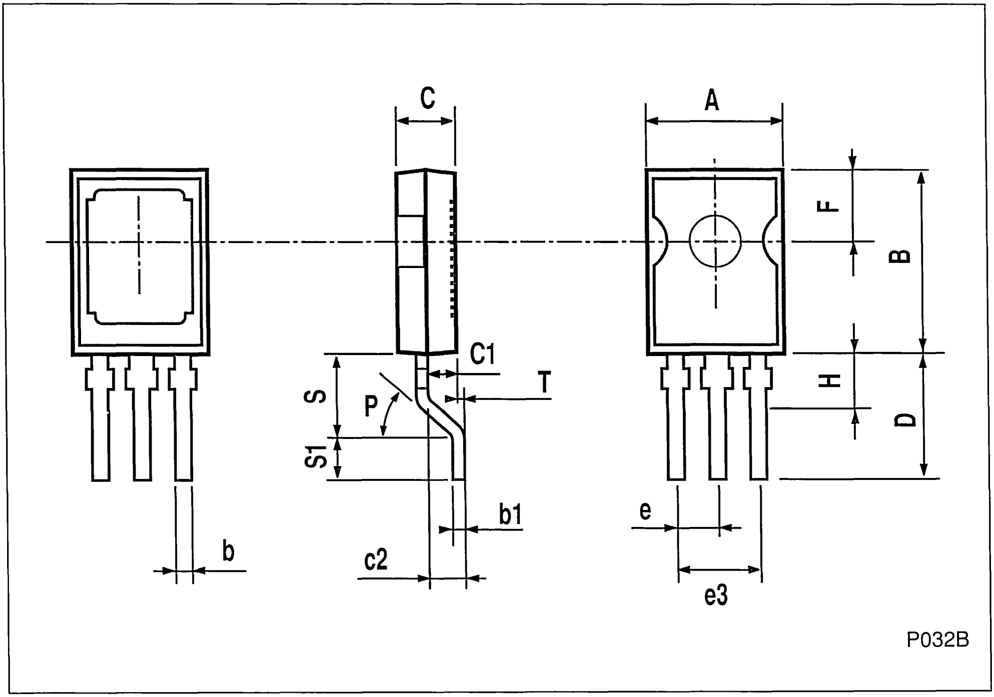
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	7.4		7.8	0.291		0.307
B	10.5		11.3	0.413		0.445
b	0.7		0.9	0.028		0.035
b1	0.49		0.75	0.019		0.030
C	2.4		2.7	0.094		0.106
c1		1.2			0.047	
c2		1.3			0.051	
D		6			0.236	
e		2.2			0.087	
e3		4.4			0.173	
F		3.8			0.150	
H			2.54			0.100
P	45° (typ.)					
S		4			0.157	
S1		2			0.079	
T		0.1			0.004	

SGS-THOMSON
MICROELECTRONICS

OUTLINE AND MECHANICAL DATA



SOT-194



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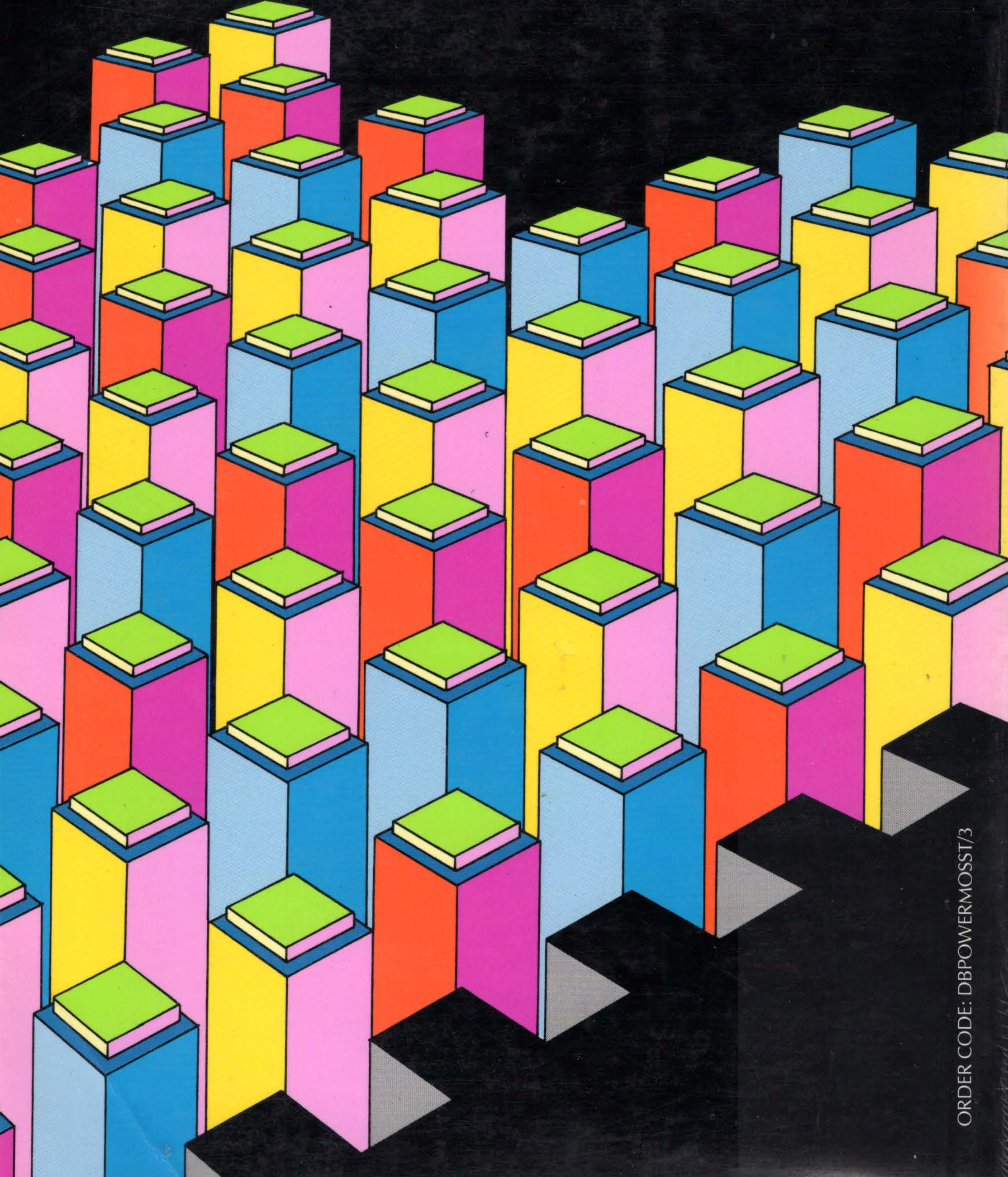

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