

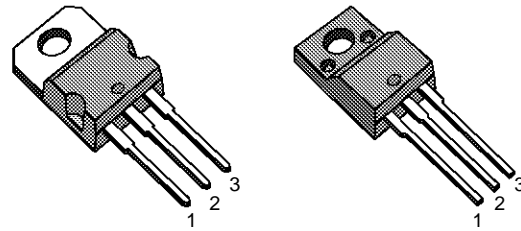
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTORS

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

APPLICATIONS

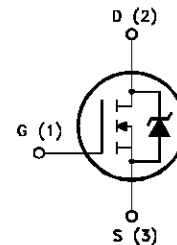
- HIGH CURRENT, HIGH SPEED SWITCHING
- UNINTERRUPTIBLE POWER SUPPLY (UPS)
- MOTOR CONTROL, AUDIO AMPLIFIERS
- INDUSTRIAL ACTUATORS
- DC-DC & DC-AC CONVERTERS FOR TELECOM, INDUSTRIAL AND CONSUMER ENVIRONMENT



TO-220

ISOWATT220

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		IRF640	IRF640FI	
V _{DS}	Drain-source Voltage (V _{GS} = 0)	200		V
V _{DGR}	Drain- gate Voltage (R _{GS} = 20 k Ω)	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 $T_j = 25\text{ °C}$, $I_D = I_{AR}$, $V_{DD} = 25\text{ V}$)	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 ($T_c = 100\text{ °C}$, pulse width limited by T_j max, $\delta < 1\%$)	11	A

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

OFF

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

ON (*)

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

DYNAMIC

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

ELECTRICAL CHARACTERISTICS (continued)**SWITCHING RESISTIVE LOAD**

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

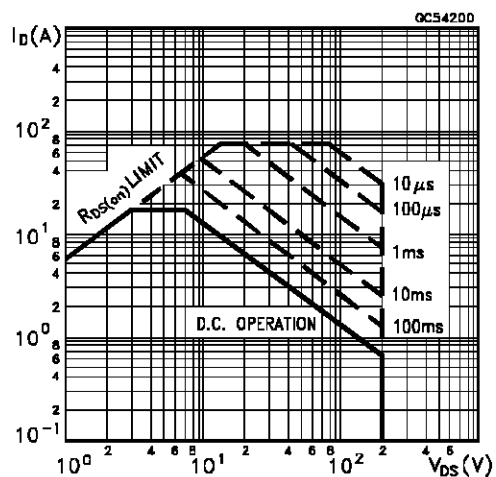
SOURCE DRAIN DIODE

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

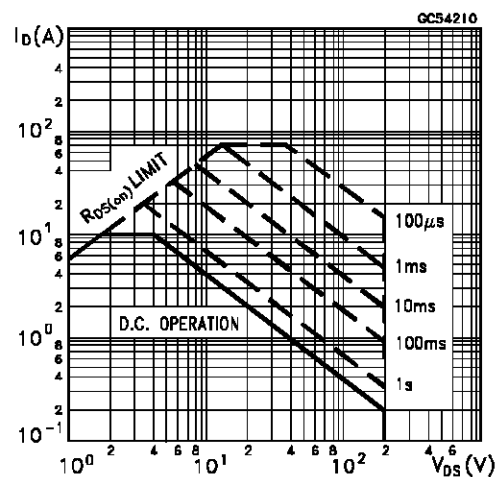
(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

(•) Pulse width limited by safe operating area

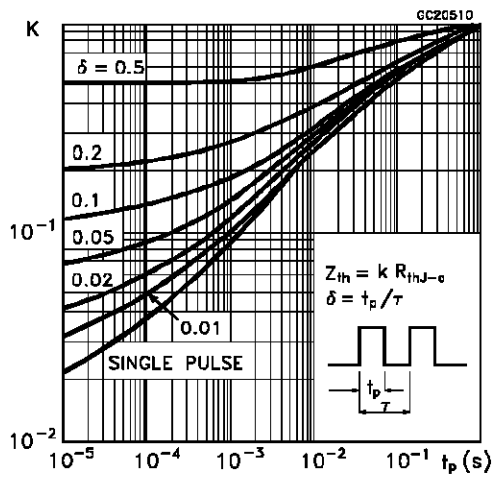
Safe Operating Area for TO-220



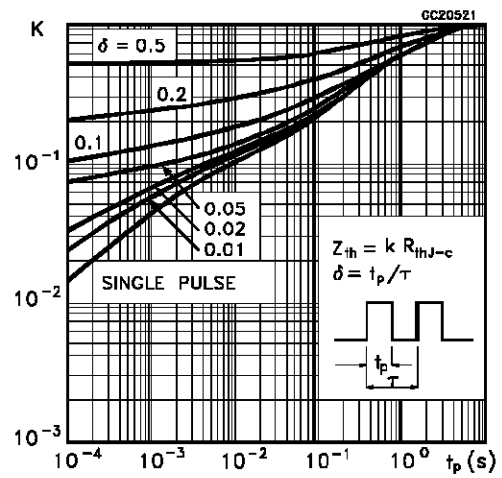
Safe Operating Area for ISOWATT220



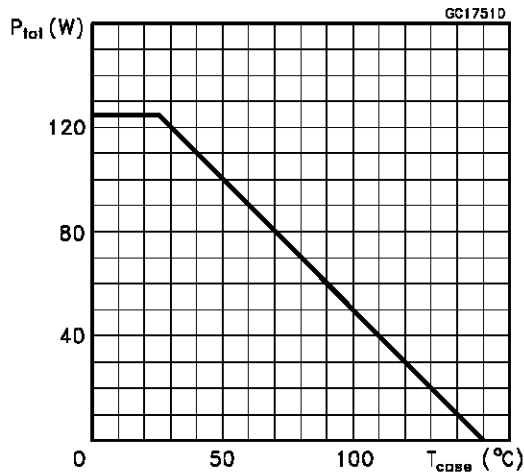
Thermal Impedance for TO-220



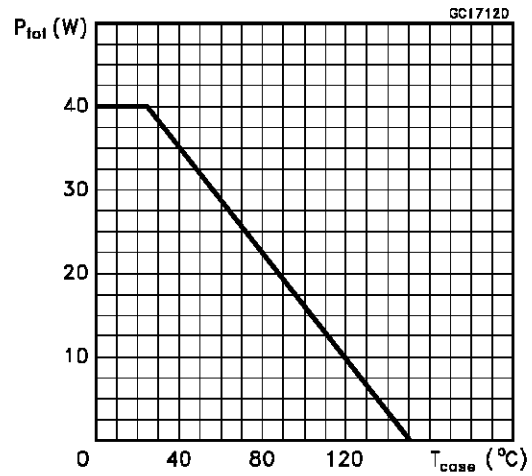
Thermal Impedance for ISOWATT220



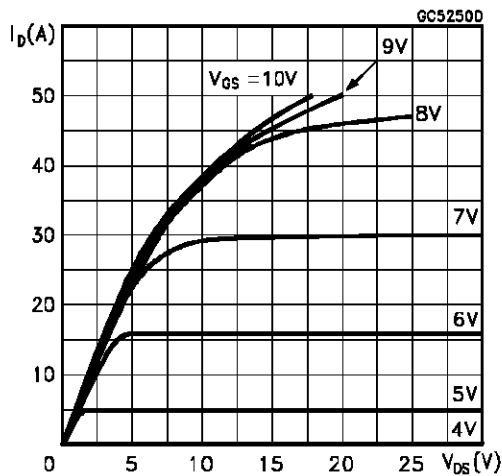
Derating Curve for TO-220



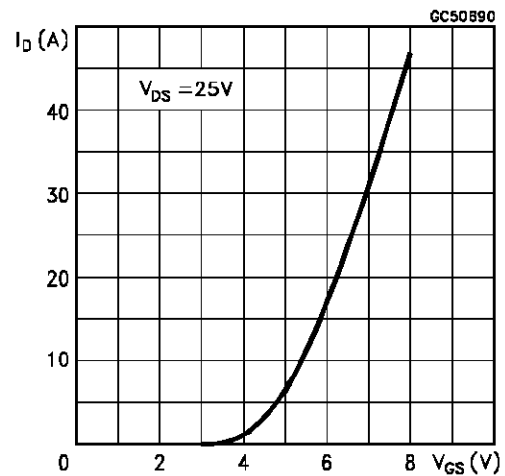
Derating Curve for ISOWATT220



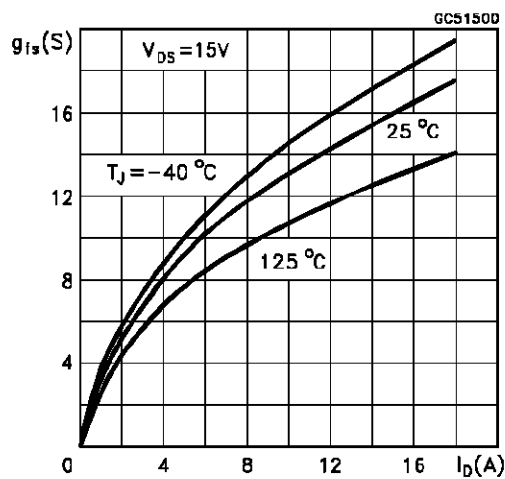
Output Characteristics



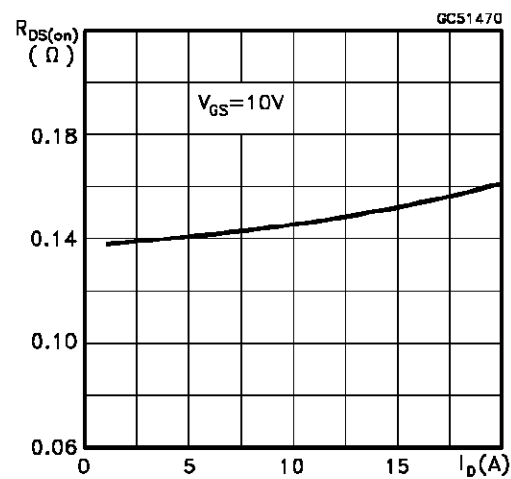
Transfer Characteristics



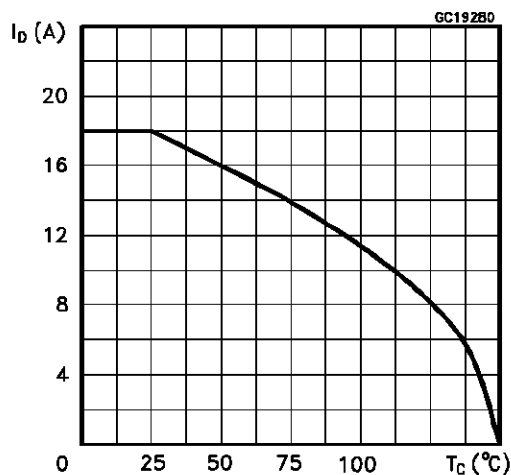
Transconductance



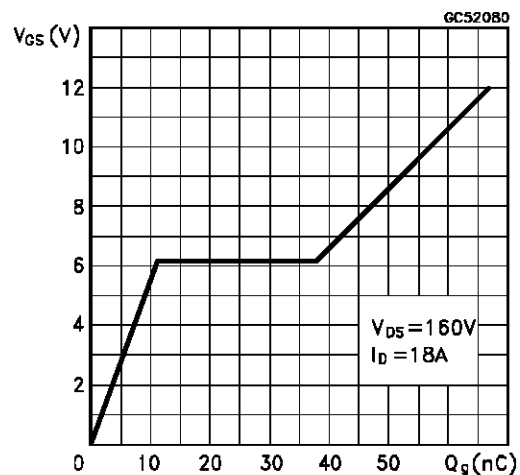
Static Drain-source On Resistance



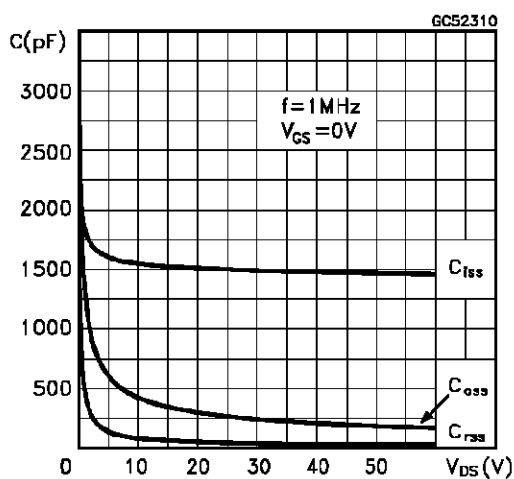
Maximum Drain Current vs Temperature



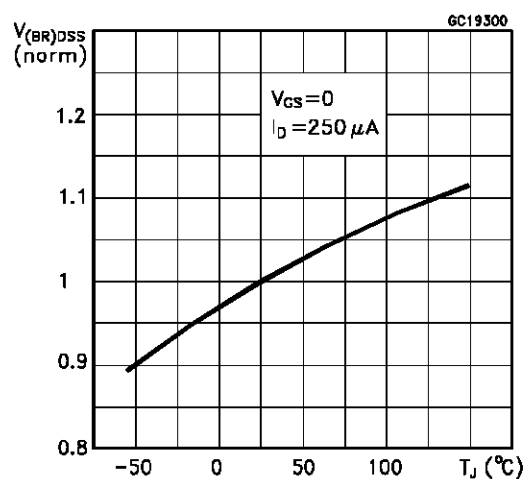
Gate Charge vs Gate-source Voltage



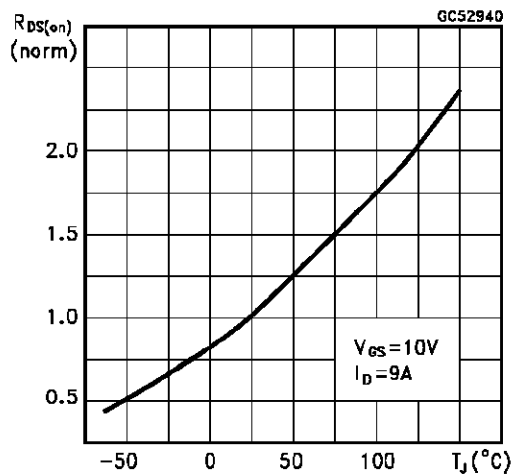
Capacitance Variations



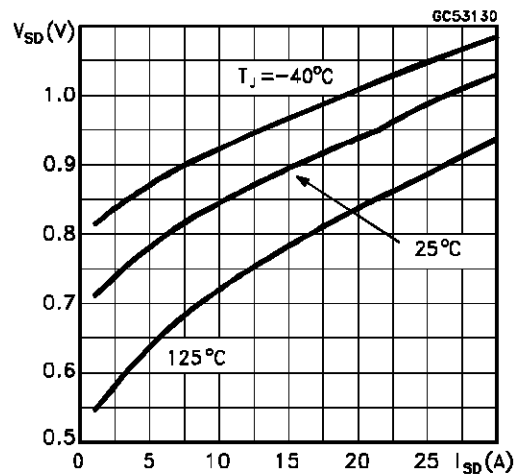
Normalized Breakdown Voltage vs Temperature



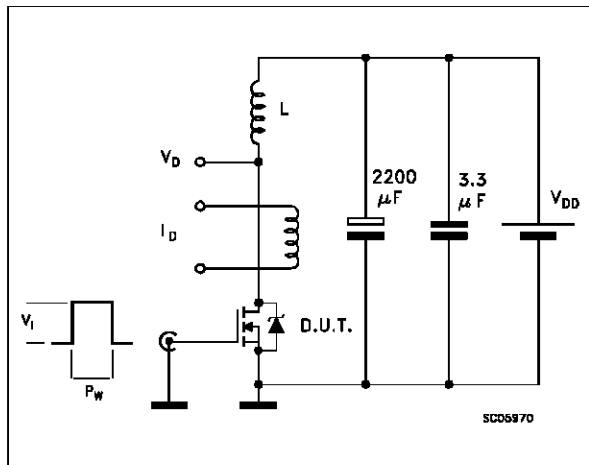
Normalized On Resistance vs Temperature



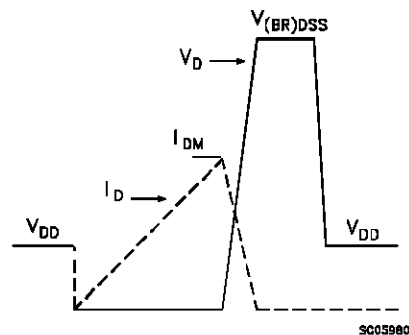
Source-drain Diode Forward Characteristics



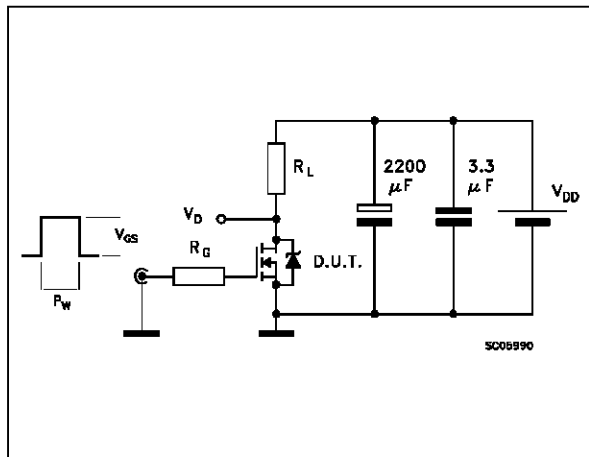
Unclamped Inductive Load Test Circuit



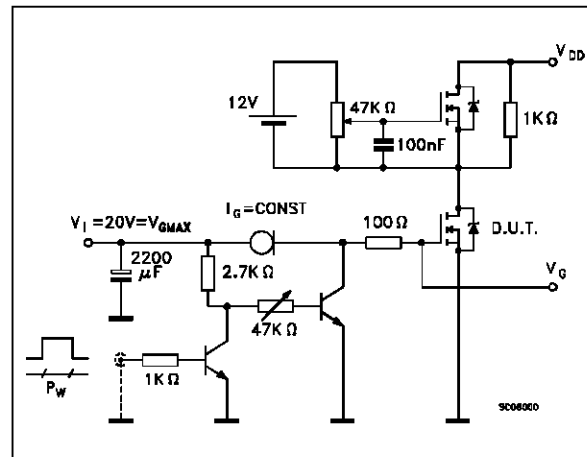
Unclamped Inductive Waveforms



Switching Time Test Circuit

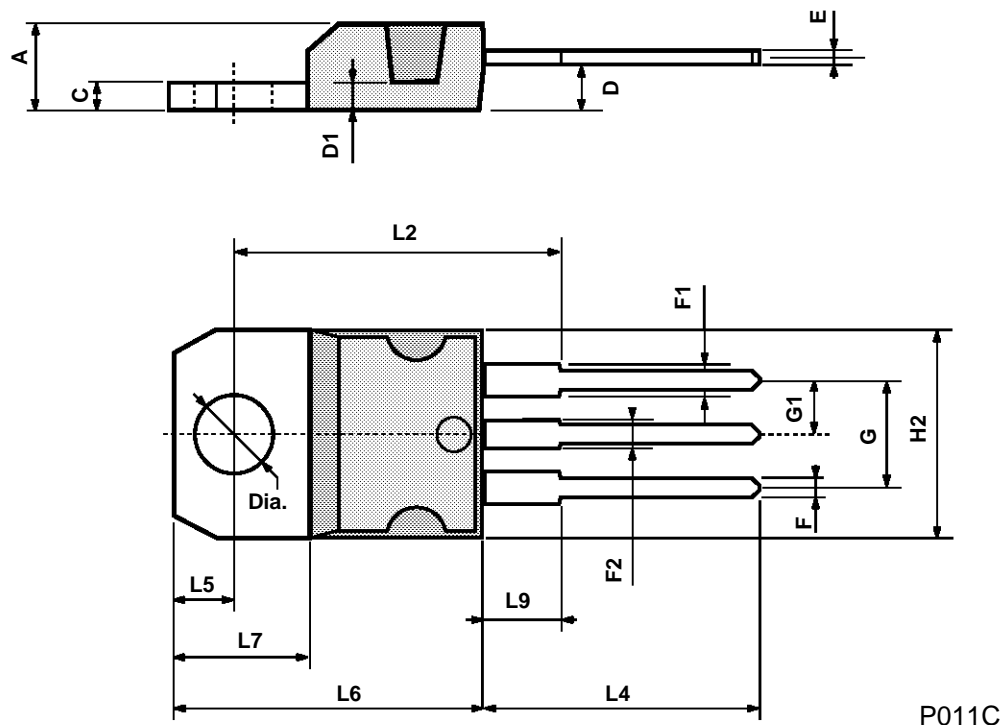


Gate Charge Test Circuit



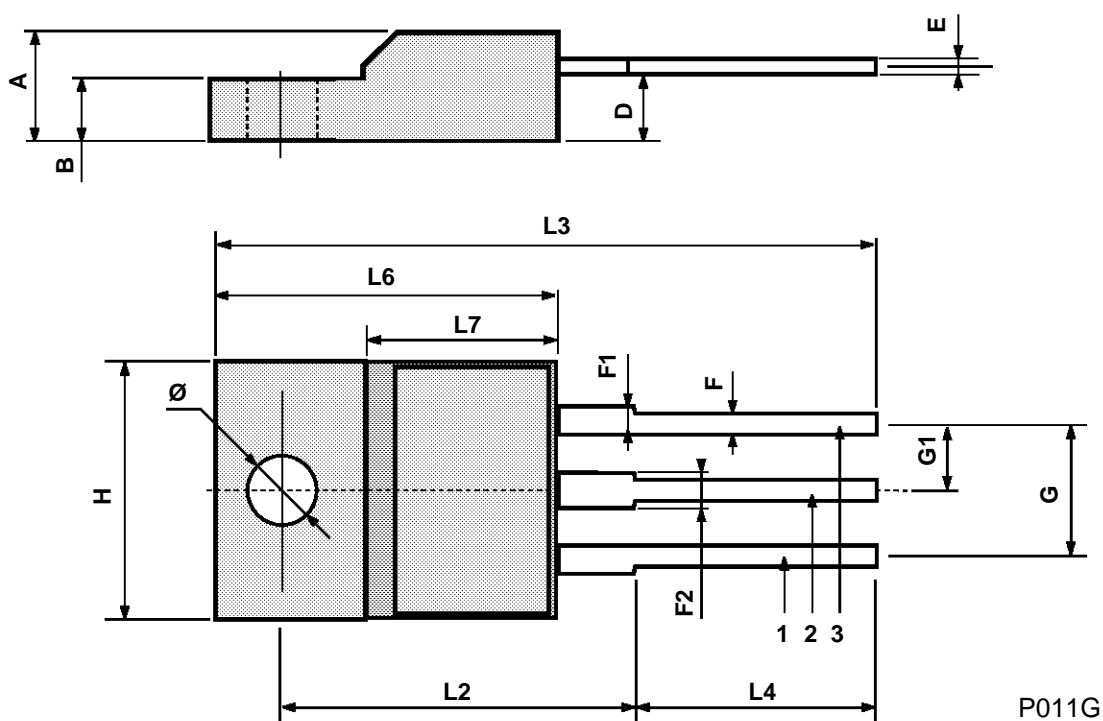
TO-220 MECHANICAL DATA

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	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



ISOWATT220 MECHANICAL DATA

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
L4	9.8		10.6	0.385		0.417
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
Ø	3		3.2	0.118		0.126



Information furnished is believed to be accurate and reliable. However, SGS-THOMSON Microelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of SGS-THOMSON Microelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. SGS-THOMSON Microelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of SGS-THOMSON Microelectronics.

© 1994 SGS-THOMSON Microelectronics - All Rights Reserved

SGS-THOMSON Microelectronics GROUP OF COMPANIES

Australia - Brazil - France - Germany - Hong Kong - Italy - Japan - Korea - Malaysia - Malta - Morocco - The Netherlands -
Singapore - Spain - Sweden - Switzerland - Taiwan - Thailand - United Kingdom - U.S.A