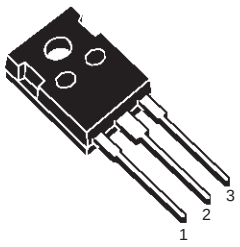
STW6NA80
STH6NA80FI

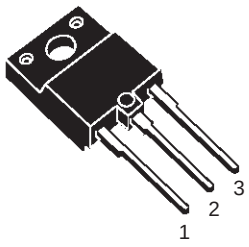
N - CHANNEL 800V - 1.8Ω - 5.4A - TO-247/ISOWATT218
FAST POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STW6NA80	800 V	< 2.2 Ω	5.4 A
STH6NA80FI	800 V	< 2.2 Ω	3.4 A

- TYPICAL $R_{DS(on)}$ = 1.8 Ω
- AVALANCE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- VERY HIGH CURRENT CAPABILITY
- APPLICATION ORIENTED CHARACTERIZATION



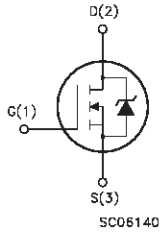
TO-247



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
		STW6NA80	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	5.4	3.4	A
I_D	Drain Current (continuous) at T_c = 100 °C	3.4	2.1	A
I_{DM}(•)	Drain Current (pulsed)	22	22	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-247	ISOWATT218	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	0.83	2.08	°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, $\delta < 1\%$)	5.4	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25\ ^oC$, $I_D = I_{AR}$, $V_{DD} = 50$ V)	150	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	5.8	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100\ ^oC$, pulse width limited by T_j max, $\delta < 1\%$)	3.4	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	$I_D = 250\ \mu A$ $V_{GS} = 0$	800			V
I_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$) Zero Gate Voltage Drain Current ($V_{GS} = 0$)	V_{DS} = Max Rating V_{DS} = Max Rating x 0.8 $T_c = 100\ ^oC$			25 50	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	$V_{DS} = V_{GS}$ $I_D = 250\ \mu A$	2.25	3	3.75	V
$R_{DS(on)}$	Static Drain-source On Resistance Static Drain-source On Resistance	$V_{GS} = 10$ V $I_D = 3$ A $V_{GS} = 10$ V $I_D = 3$ A $T_c = 100^oC$		1.8	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	5.4			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 3$ 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 $V_{GS} = 0$		1250 140 35	1700 190 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} = 400 V I_D = 3 A R_G = 4.7 Ω V_{GS} = 10 V (see test circuit, figure 3)		40 100	55 135	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)		180		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		55 8 24	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} = 640 V I_D = 6 A R_G = 47 Ω V_{GS} = 10 V (see test circuit, figure 5)		75 25 110	100 35 150	ns ns ns

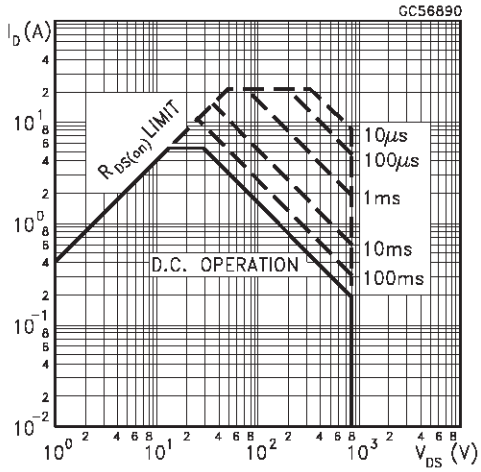
SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}(•)	Source-drain Current Source-drain Current (pulsed)				5.4 22	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 15.2 38		ns µC A

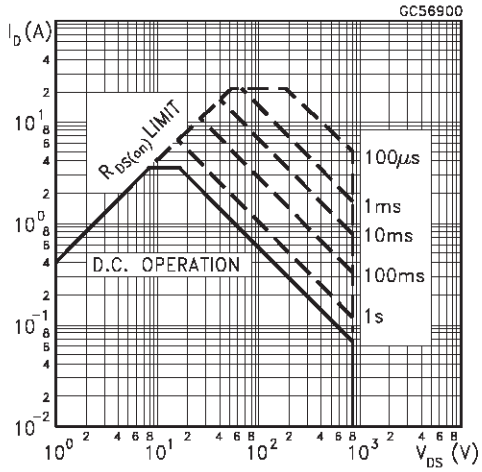
(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %

(•) Pulse width limited by safe operating area

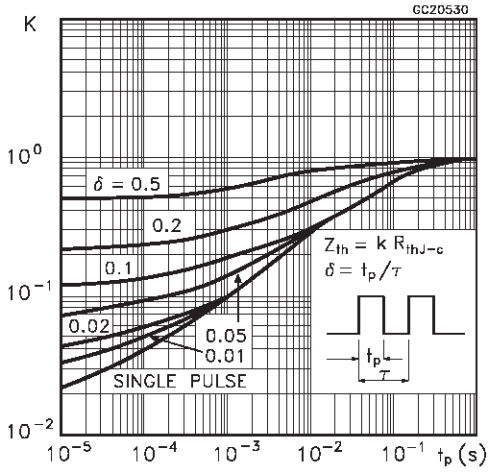
Safe Operating Area for TO-247



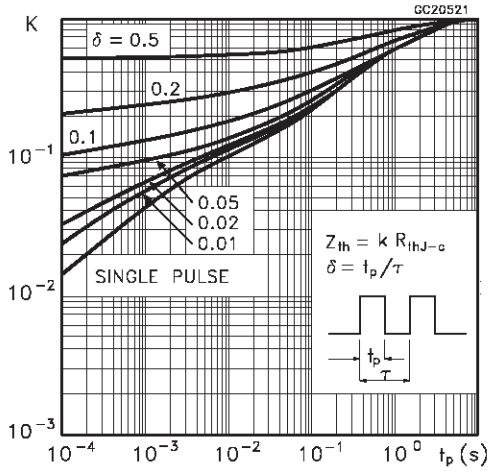
Safe Operating Area for ISOWATT218



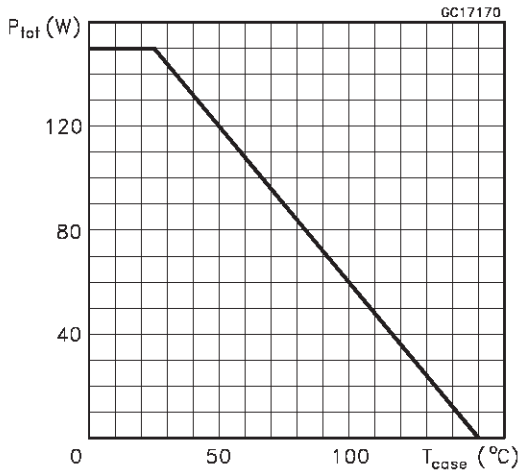
Thermal Impedance for TO-247



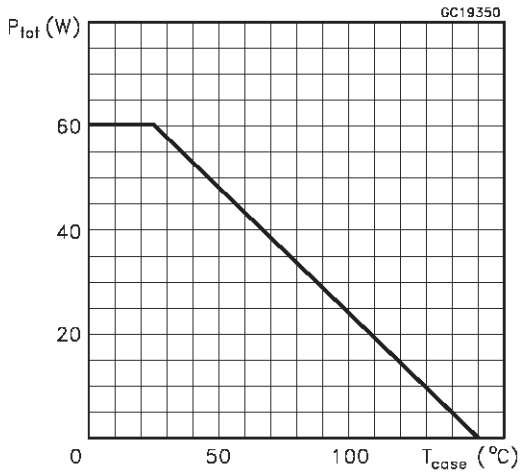
Thermal Impedance for ISOWATT218



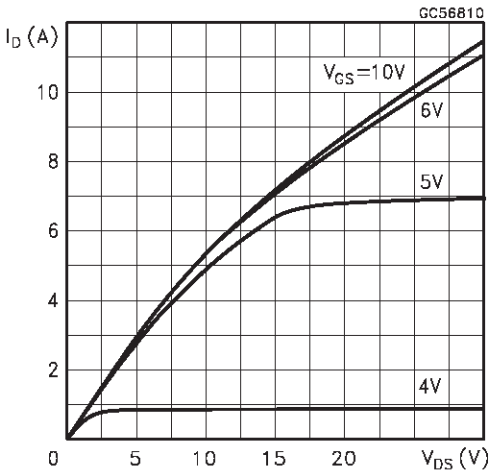
Derating Curve for TO-247



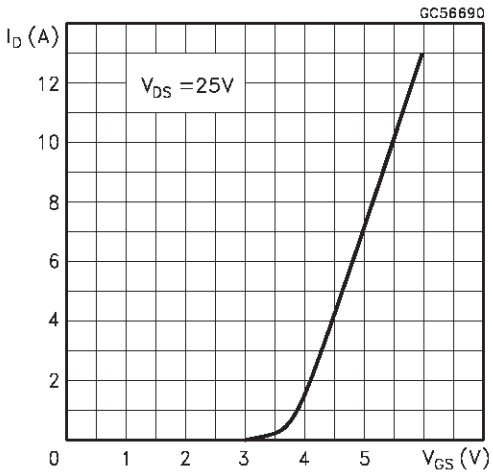
Derating Curve for ISOWATT218



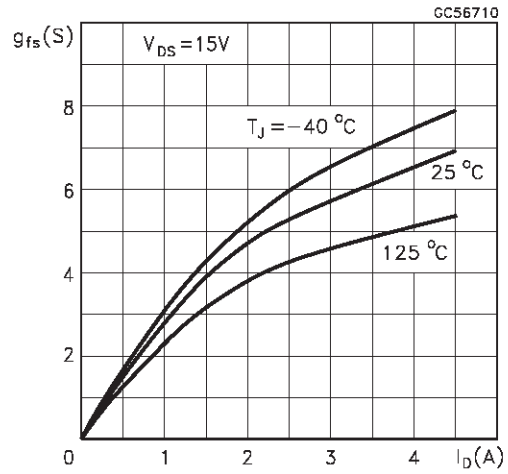
Output Characteristics



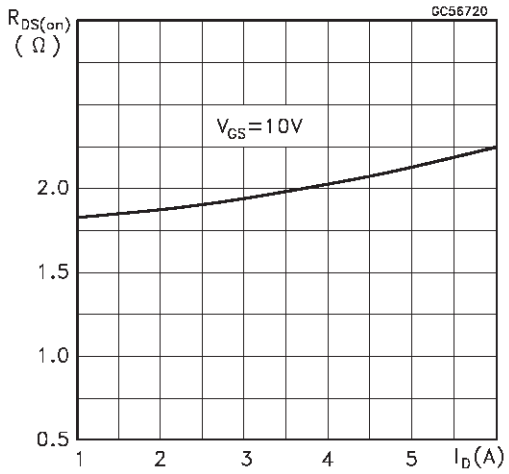
Transfer Characteristics



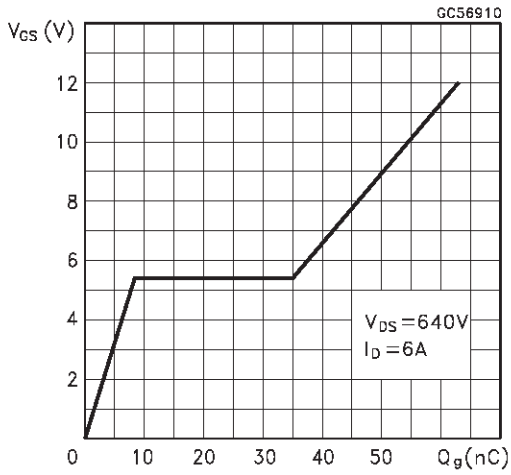
Transconductance



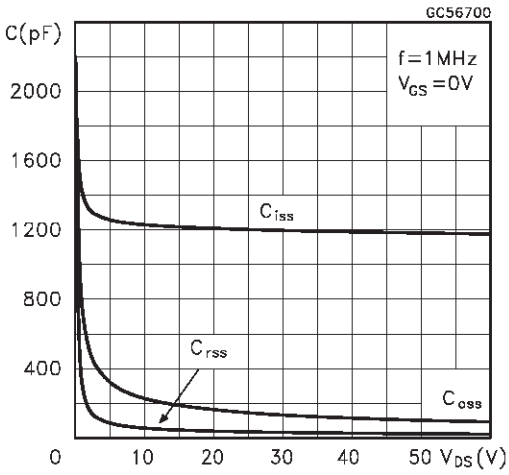
Static Drain-source On Resistance



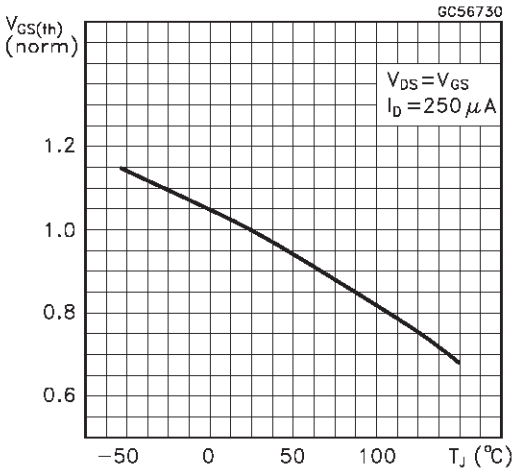
Gate Charge vs Gate-source Voltage



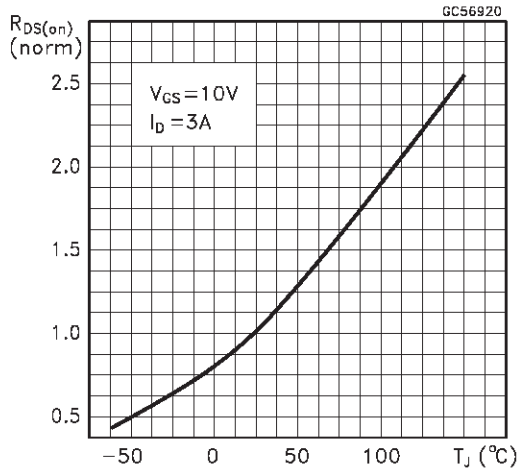
Capacitance Variations



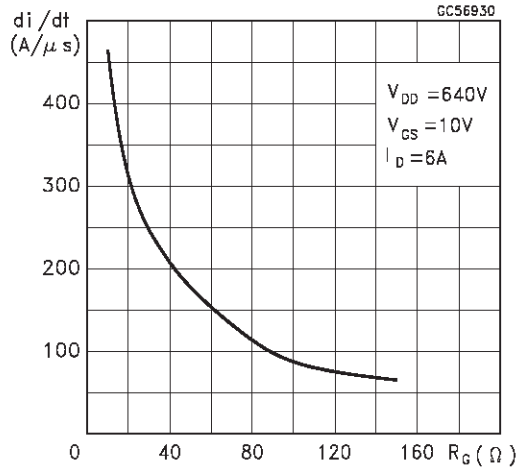
Normalized Gate Threshold Voltage vs Temperature



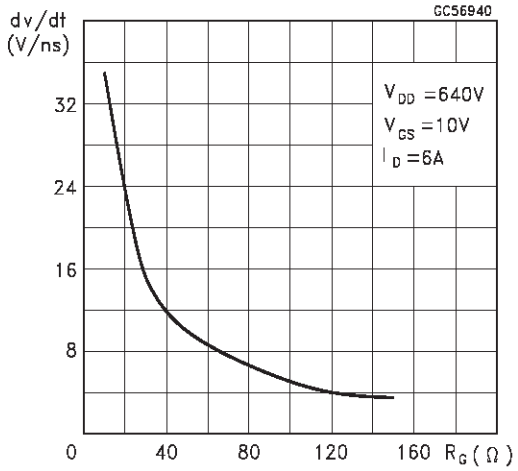
Normalized On Resistance vs Temperature



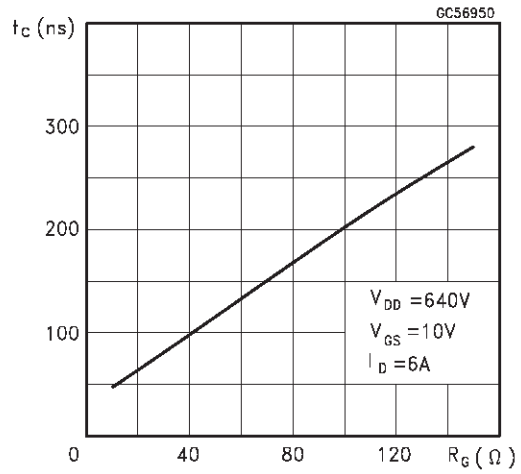
Turn-on Current Slope



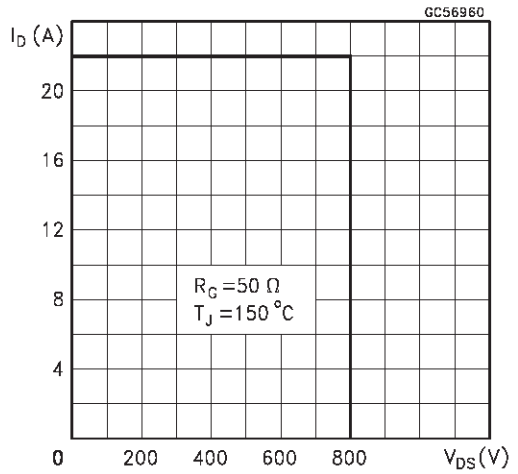
Turn-off Drain-source Voltage Slope



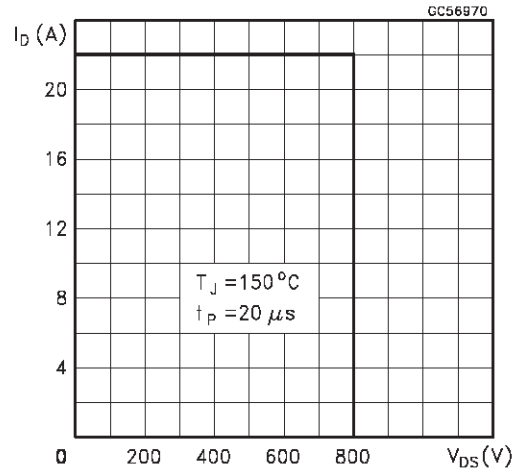
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

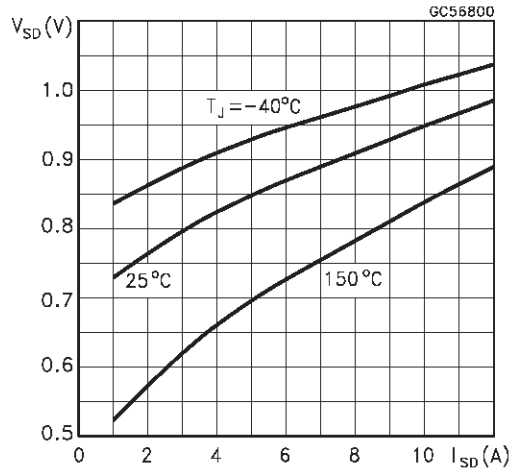


Fig. 1: Unclamped Inductive Load Test Circuit

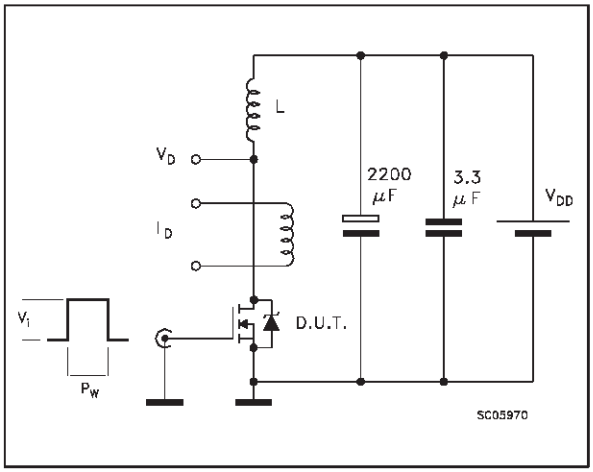


Fig. 2: Unclamped Inductive Waveform

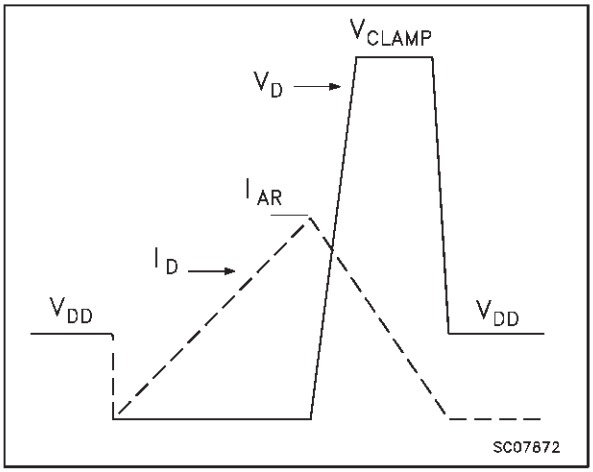


Fig. 3: Switching Times Test Circuits For Resistive Load

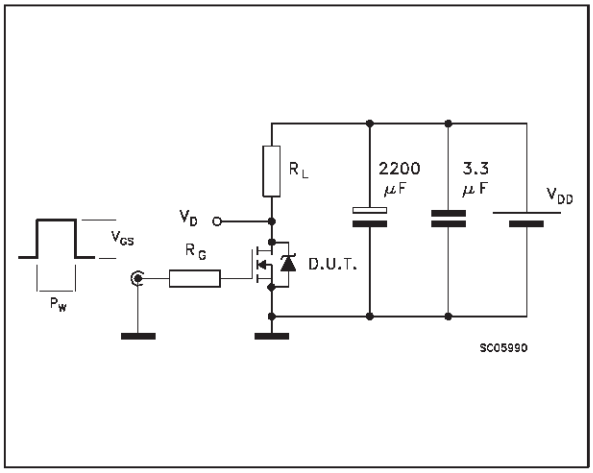


Fig. 4: Gate Charge test Circuit

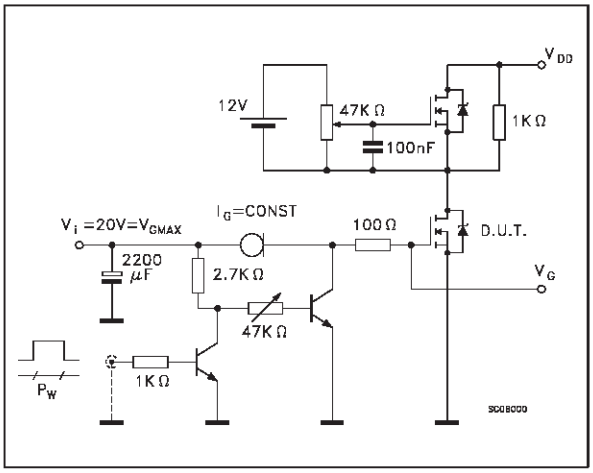
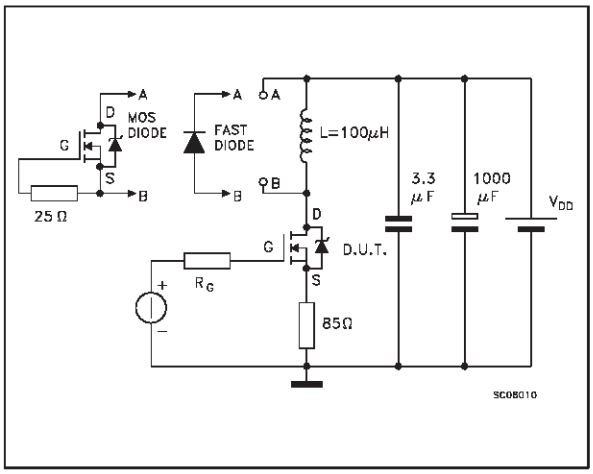
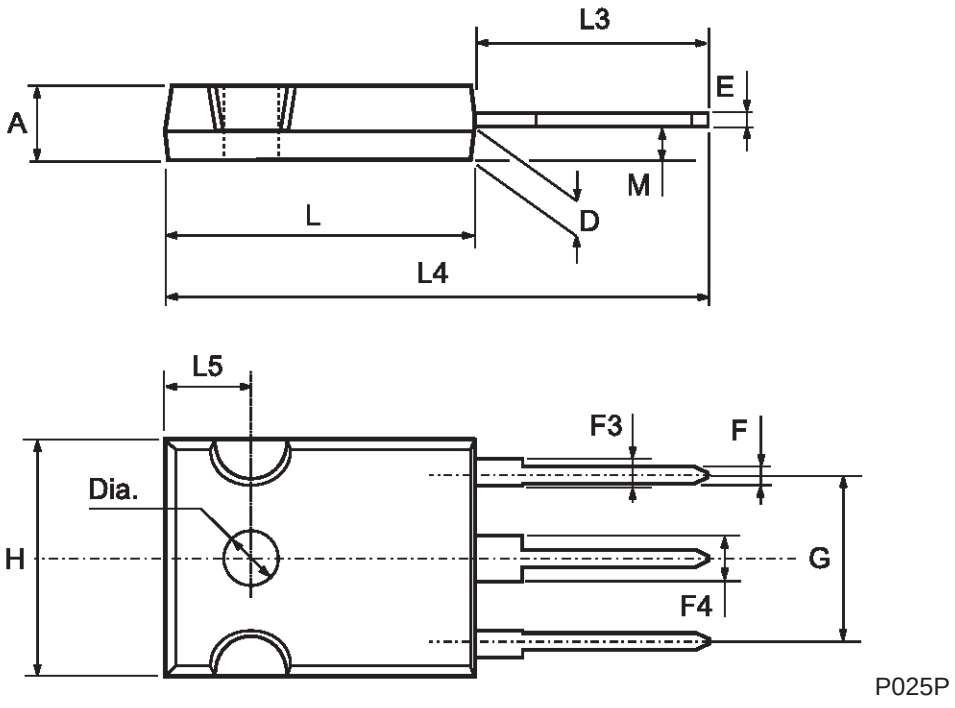


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



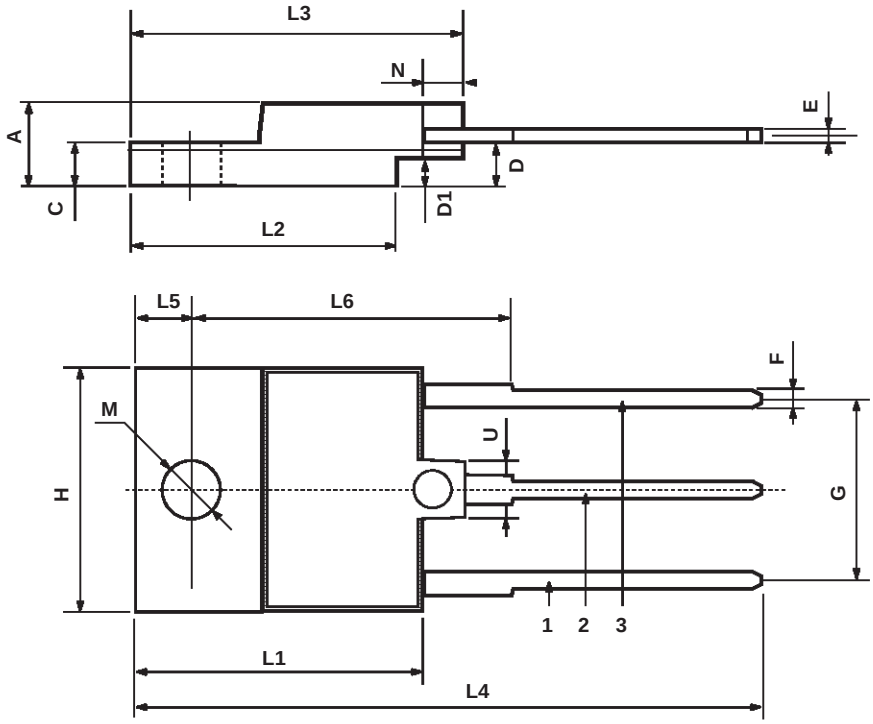
TO-247 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.7		5.3	0.185		0.209
D	2.2		2.6	0.087		0.102
E	0.4		0.8	0.016		0.031
F	1		1.4	0.039		0.055
F3	2		2.4	0.079		0.094
F4	3		3.4	0.118		0.134
G		10.9			0.429	
H	15.3		15.9	0.602		0.626
L	19.7		20.3	0.776		0.779
L3	14.2		14.8	0.559	0.413	0.582
L4		34.6			1.362	
L5		5.5			0.217	
M	2		3	0.079		0.118
Dia	3.55		3.65	0.140		0.144



ISOWATT218 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	0.75		1	0.029		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	



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