

739-029

**N - CHANNEL ENHANCEMENT MODE
FAST POWER MOS TRANSISTOR**

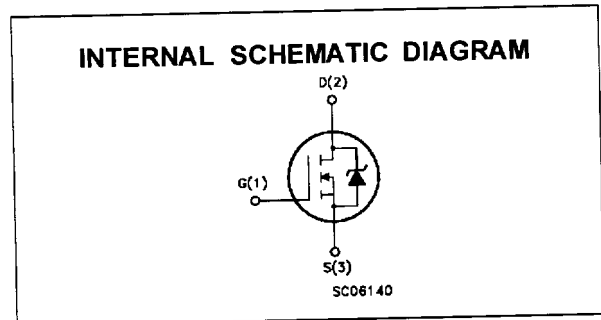
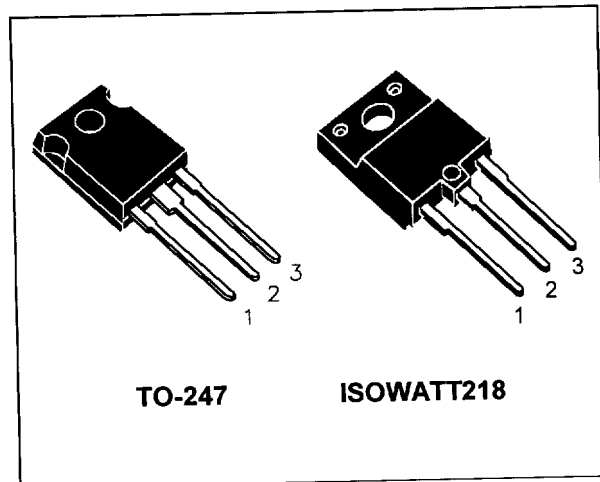
PRELIMINARY DATA

TYPE	V _{DSS}	R _{DS(on)}	I _D
STW7NA80	800 V	< 1.9 Ω	6.5 A
STH7NA80FI	800 V	< 1.9 Ω	4 A

- TYPICAL R_{DS(on)} = 1.68 Ω
- ± 30V GATE TO SOURCE VOLTAGE RATING
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED
- REDUCED THRESHOLD VOLTAGE SPREAD

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
		STW7NA80	STH7NA80FI	
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	6.5	4	A
I _D	Drain Current (continuous) at T _c = 100 °C	4	2.5	A
I _{DM} (*)	Drain Current (pulsed)	26	26	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

STW7NA80-STH7NA80FI

THERMAL DATA

		TO-247	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, $\delta < 1\%$)	6.3	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25\text{ °C}$, $I_D = I_{AR}$, $V_{DD} = 50\text{ V}$)	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 ($T_c = 100\text{ °C}$, pulse width limited by T_j max, $\delta < 1\%$)	4	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	$I_D = 250\text{ }\mu\text{A}$ $V_{GS} = 0$	800			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 ($V_{DS} = 0$)	$V_{GS} = \pm 30\text{ V}$			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250\text{ }\mu\text{A}$	2.25	3	3.75	
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10\text{ V}$ $I_D = 3.5\text{ A}$ $V_{GS} = 10\text{ V}$ $I_D = 3.5\text{ A}$ $T_c = 100\text{ °C}$		1.68	1.9 3.8	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10\text{ V}$	7			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs} (*)$	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 3.5\text{ A}$	4.5	6.3		S
C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}$ $f = 1\text{ MHz}$ $V_{GS} = 0$		1330	1750	pF
C_{oss}	Output Capacitance			160	210	pF
C_{rss}	Reverse Transfer Capacitance			40	55	pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	$V_{DD} = 400\text{ V}$ $I_D = 3.5\text{ A}$ $R_G = 47\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 3)		3.5 9.5	45 125	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 640\text{ V}$ $I_D = 7\text{ A}$ $R_G = 47\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		170		A/ μ s
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 640\text{ V}$ $I_D = 7\text{ A}$ $V_{GS} = 10\text{ V}$		58 8 27	78	nC nC nC

SWITCHING OFF

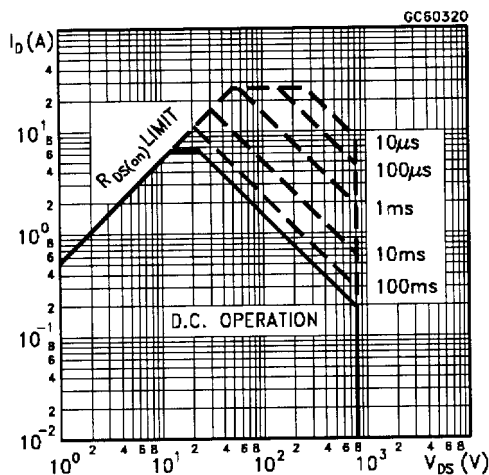
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_r(V_{off})$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	$V_{DD} = 640\text{ V}$ $I_D = 6\text{ A}$ $R_G = 47\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		90 25 125	120 35 165	ns ns ns

SOURCE DRAIN DIODE

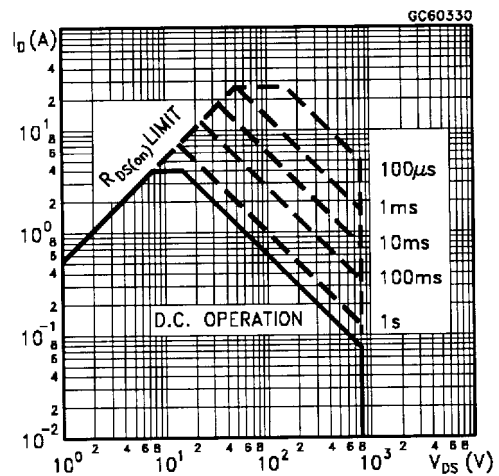
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM}(\bullet)$	Source-drain Current Source-drain Current (pulsed)				6.5 26	A A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 7\text{ A}$ $V_{GS} = 0$			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 7\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5)		850 15 35		ns μ C A

(*) Pulsed Pulse duration = 300 μ s, duty cycle 1.5 %
(\bullet) Pulse width limited by safe operating area

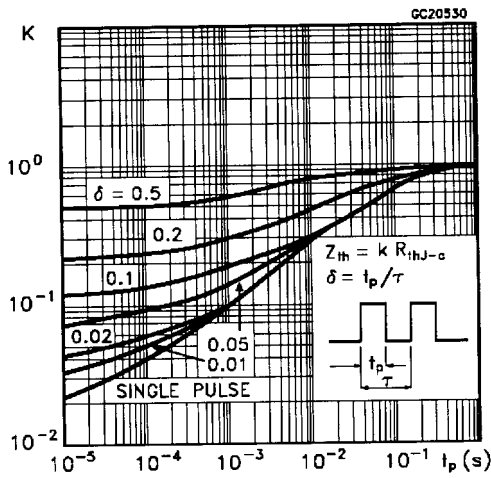
Safe Operating Area for TO-247



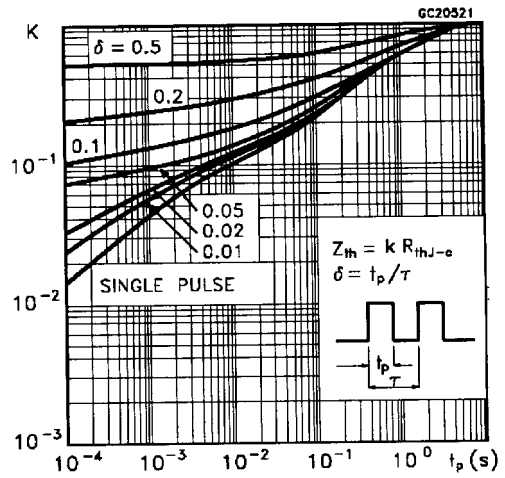
Safe Operating Area for ISOWATT218



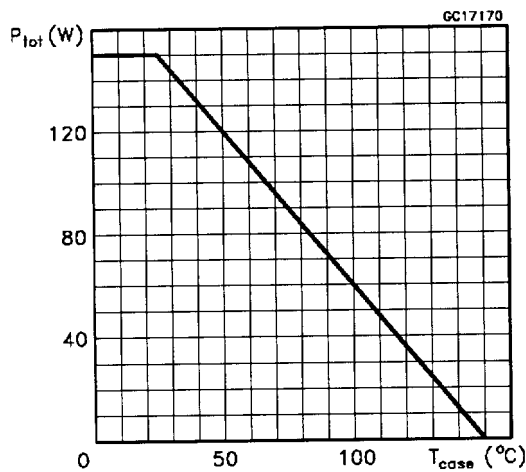
Thermal Impedance for TO-247



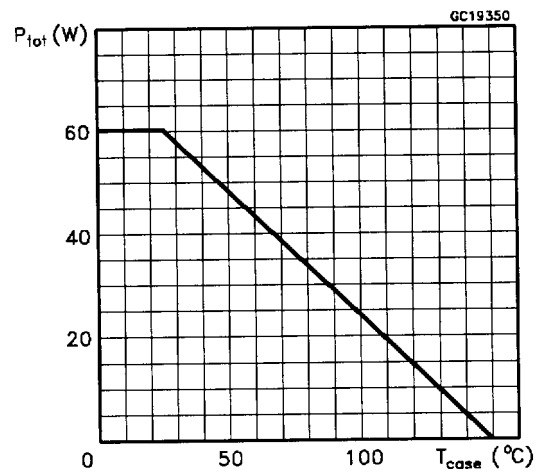
Thermal Impedance for ISOWATT218



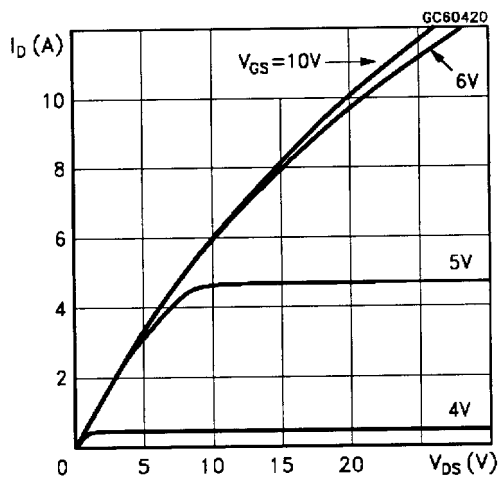
Derating Curve for TO-247



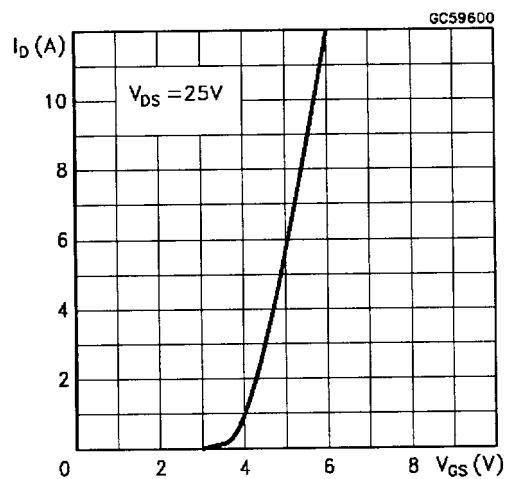
Derating Curve for ISOWATT218



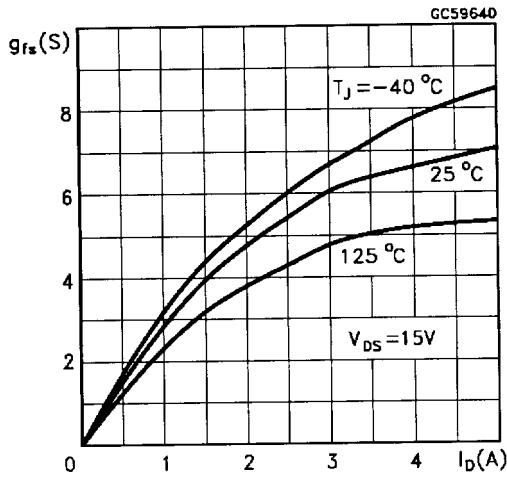
Output Characteristics



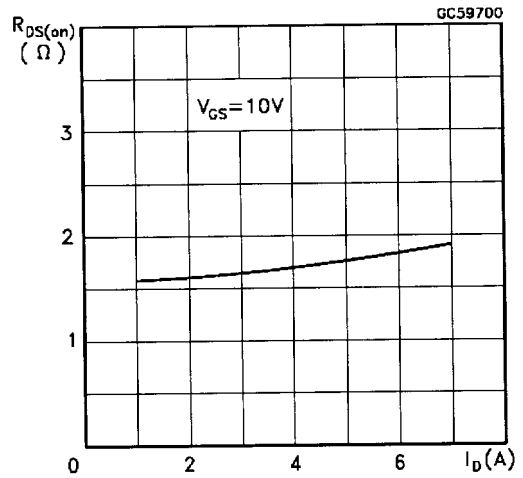
Transfer Characteristics



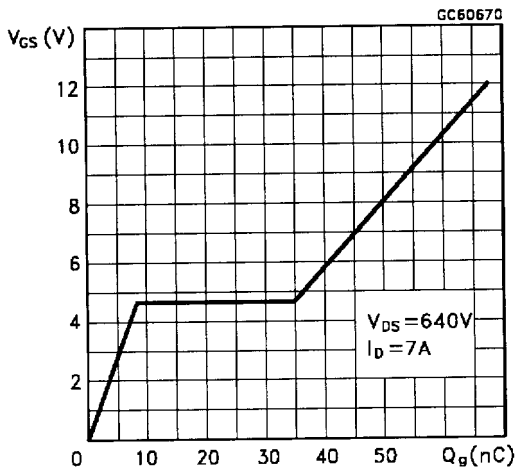
Transconductance



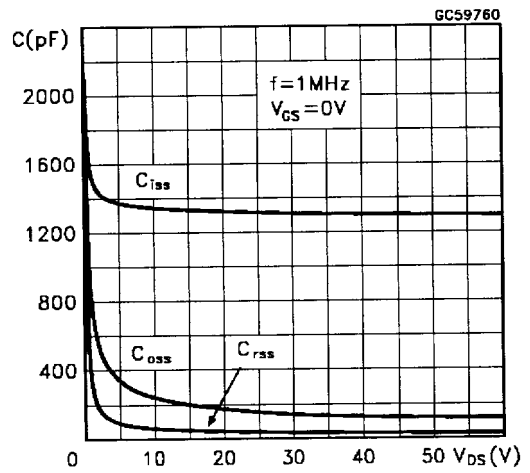
Static Drain-source On Resistance



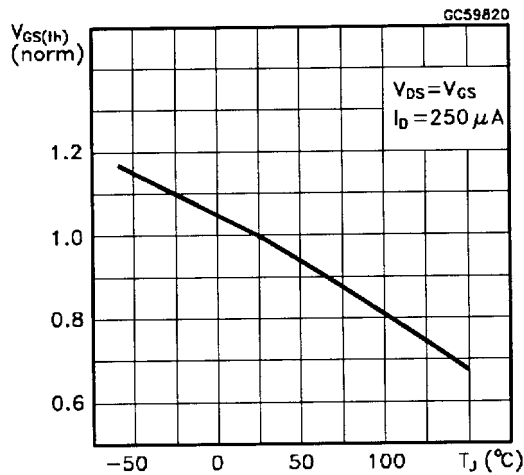
Gate Charge vs Gate-source Voltage



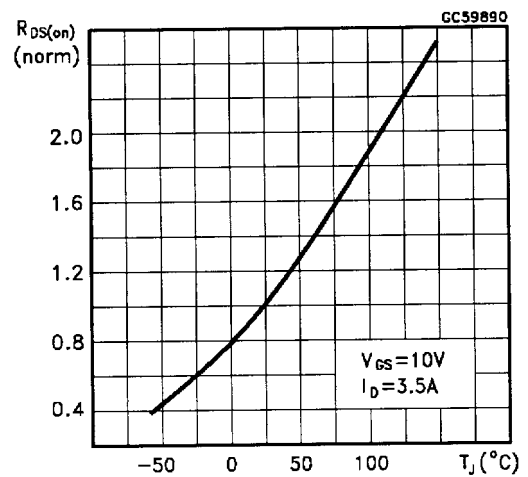
Capacitance Variations



Normalized Gate Threshold Voltage vs Temperature

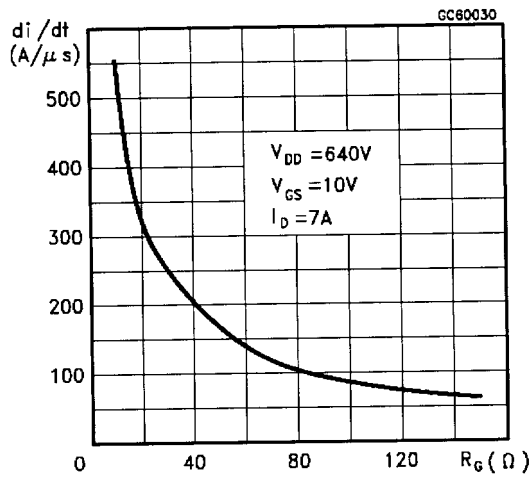


Normalized On Resistance vs Temperature

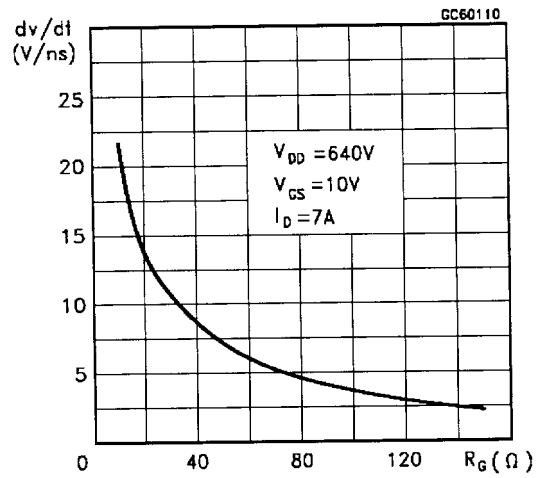


STW7NA80-STH7NA80FI

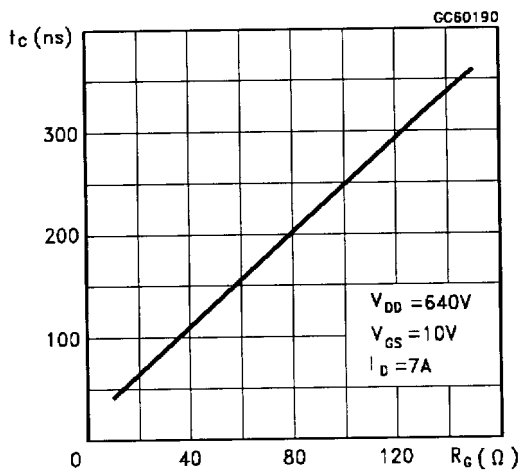
Turn-on Current Slope



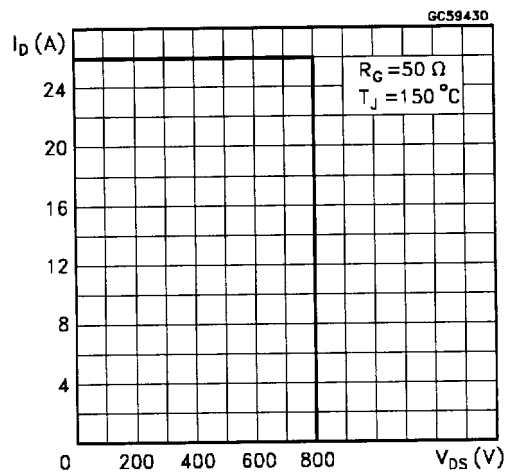
Turn-off Drain-source Voltage Slope



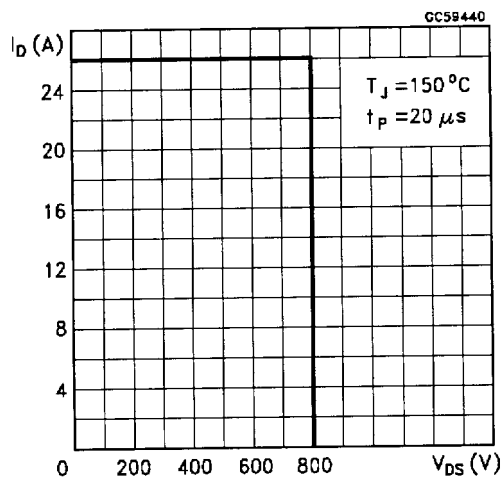
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

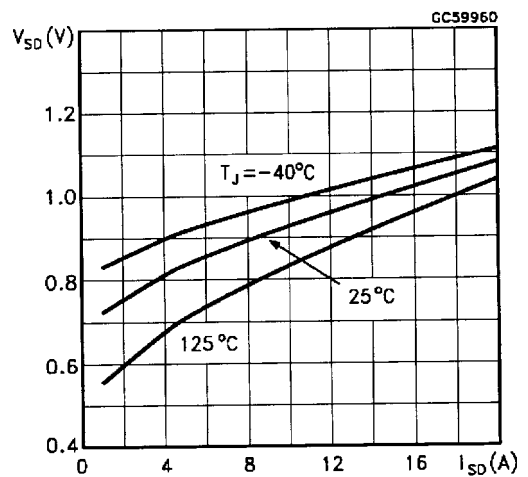


Fig. 1: Unclamped Inductive Load Test Circuit

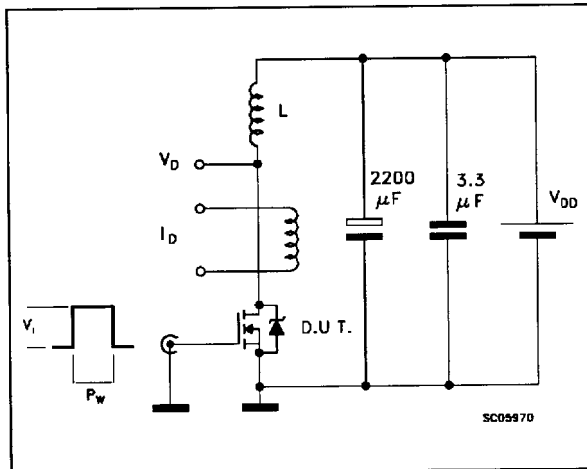


Fig. 2: Unclamped Inductive Waveform

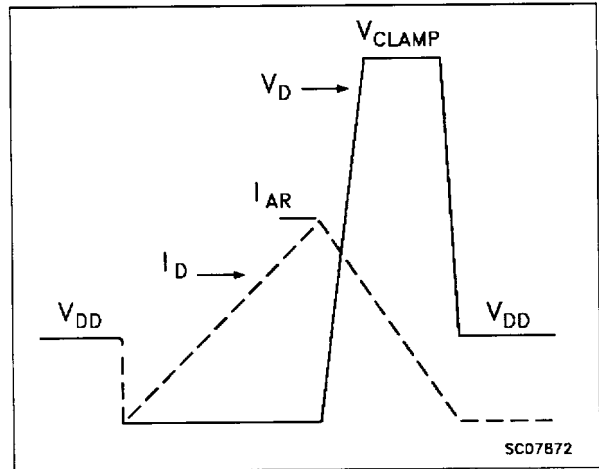


Fig. 3: Switching Times Test Circuits For Resistive Load

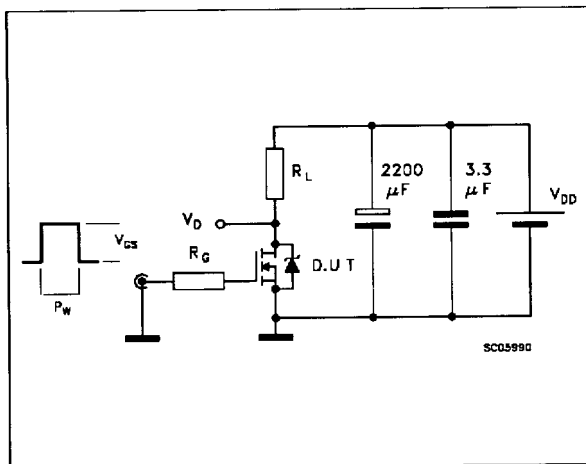


Fig. 4: Gate Charge test Circuit

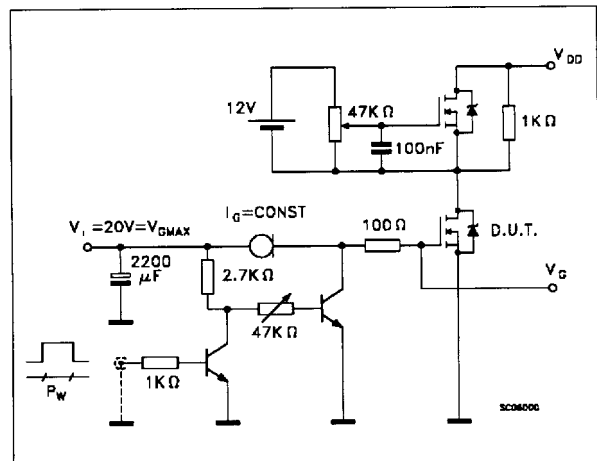
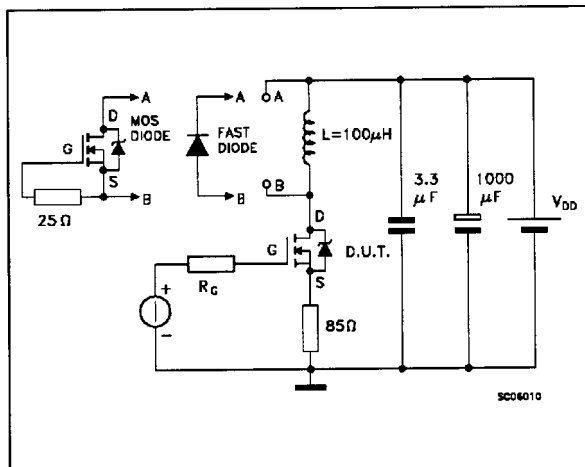
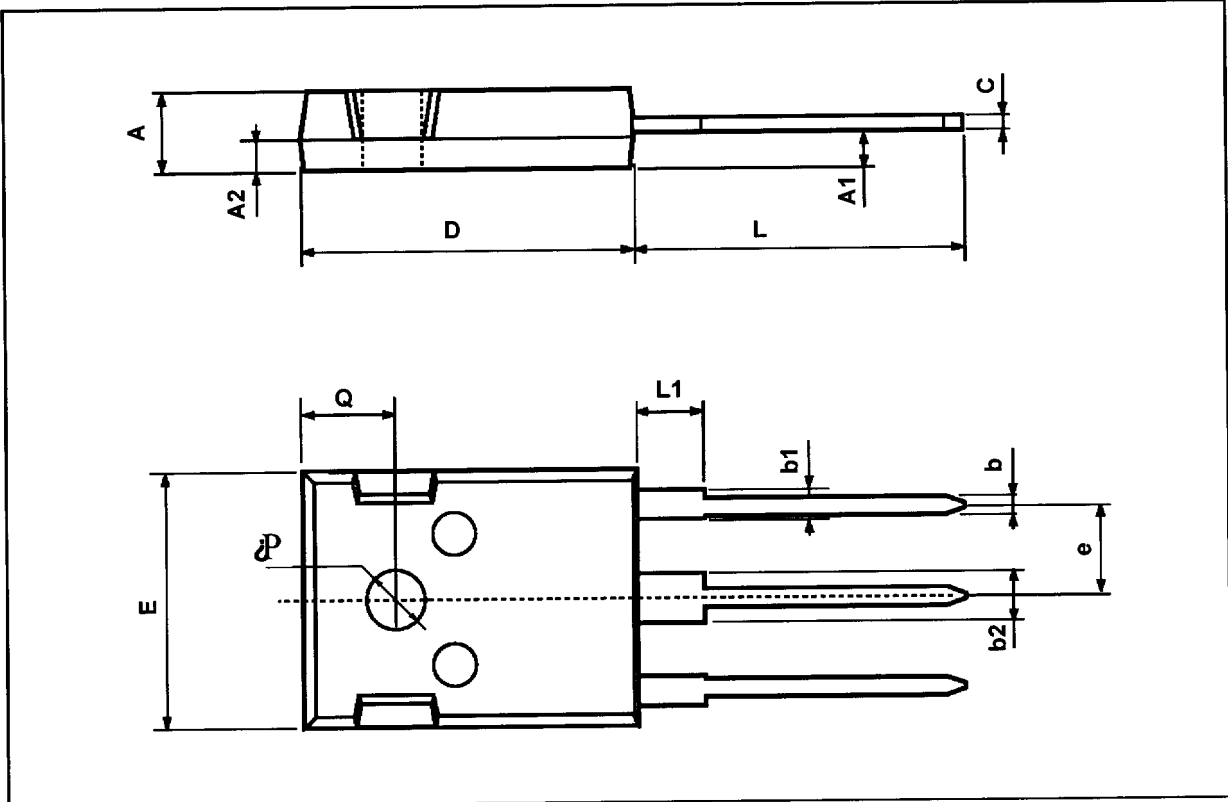


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



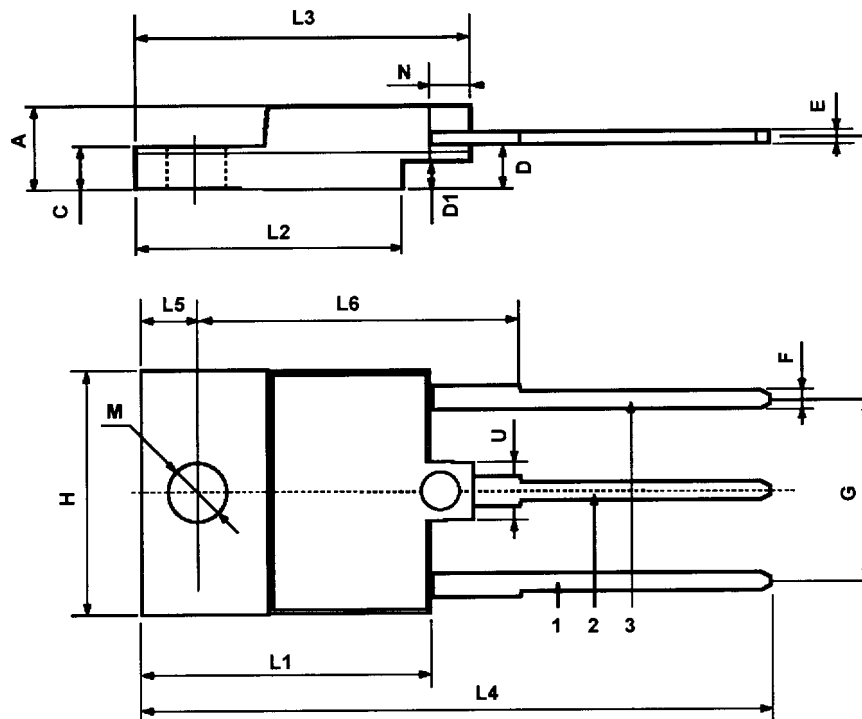
TO-247 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.7		5.3	0.185		0.208
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
P	3.5		3.71	0.137		0.146



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	0.45		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	



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