



STW15NB50 STH15NB50FI

N-CHANNEL 500V - 0.33Ω - 14.6A - T0-247/ISOWATT218 PowerMESH™ MOSFET

TYPE	V _{DSS}	R _{DS(on)}	I _D
STW15NB50	500 V	< 0.36 Ω	14.6 A
STH15NB50FI	500 V	< 0.36 Ω	10.5 A

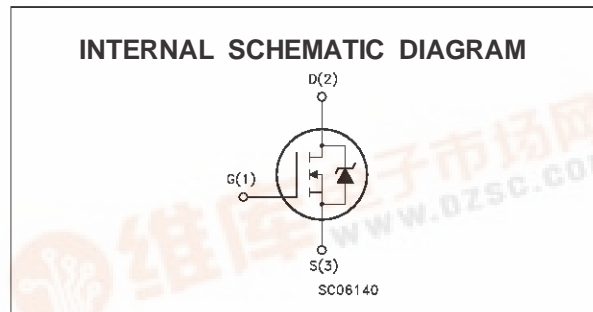
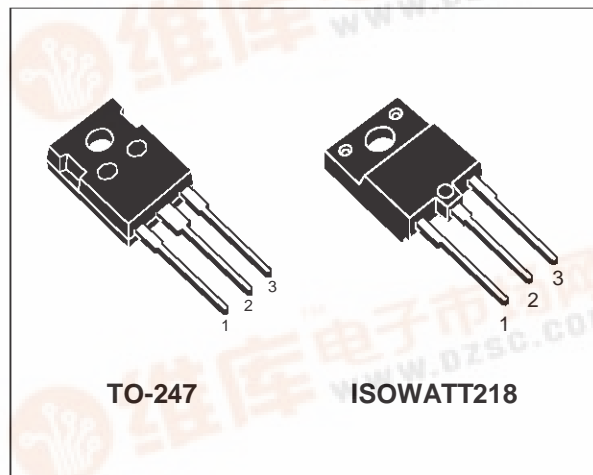
- TYPICAL R_{DS(on)} = 0.33 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- ± 30V GATE TO SOURCE VOLTAGE RATING
- 100% AVALANCHE TESTED
- VERY LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED

DESCRIPTION

Using the latest high voltage MESH OVERLAY™ process, SGS-Thomson has designed an advanced family of power MOSFETs with outstanding performances. The new patent pending strip layout coupled with the Company's proprietary edge termination structure, gives the lowest R_{DS(on)} per area, exceptional avalanche and dv/dt capabilities and unrivalled gate charge and switching characteristics.

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
		STW15NB50	STH15NB50FI	
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	14.6	10.5	A
I _D	Drain Current (continuous) at T _c = 100 °C	9.2	6.6	A
I _{DM(•)}	Drain Current (pulsed)	58.4	58.4	A
P _{tot}	Total Dissipation at T _c = 25 °C	190	80	W
	Derating Factor	0.64	1.52	W/°C
dv/dt(1)	Peak Diode Recovery voltage slope	4		V/ns
V _{ISO}	Insulation Withstand Voltage (DC)	4000		V
T _{stg}	Storage Temperature	-65 to 150		°C
T _j	Max. Operating Junction Temperature	150		°C

STW15NB50 - STH15NB50FI

THERMAL DATA

		TO-247	ISOWATT218	
R _{thj-case}	Thermal Resistance Junction-case Max	0.66	1.56	°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)	14.6	A
E _{AS}	Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V)	850	mJ

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 T _c = 125 °C			1 50	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	3	4	5	V
R _{DS(on)}	Static Drain-source On Resistance	V _{GS} = 10 V I _D = 7.5 A		0.33	0.36	Ω Ω
I _{D(on)}	On State Drain Current	V _{DS} > I _{D(on)} × R _{DS(on)max} V _{GS} = 10 V	14.6			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs} (*)	Forward Transconductance	V _{DS} > I _{D(on)} × R _{DS(on)max} I _D = 7.5 A	8	12		S
C _{iss}	Input Capacitance	V _{DS} = 25 V f = 1 MHz V _{GS} = 0		2600	3400	pF
C _{oss}	Output Capacitance			330	430	pF
C _{rss}	Reverse Transfer Capacitance			40	55	pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	$V_{DD} = 250\text{ V}$ $I_D = 7.5\text{ A}$		24	34	ns
t_r	Rise Time	$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 3)		14	20	ns
Q_g	Total Gate Charge	$V_{DD} = 400\text{ V}$ $I_D = 15\text{ A}$ $V_{GS} = 10\text{ V}$		60	80	nC
Q_{gs}	Gate-Source Charge			15		nC
Q_{gd}	Gate-Drain Charge			27		nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 400\text{ V}$ $I_D = 15\text{ A}$		15	20	ns
t_f	Fall Time	$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$		25	33	ns
t_c	Cross-over Time	(see test circuit, figure 5)		35	47	ns

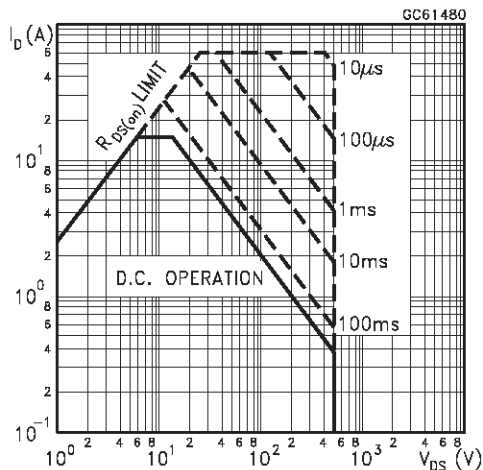
SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				14.6	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				58.4	A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 15\text{ A}$ $V_{GS} = 0$			1.6	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 15\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5)		680		ns
Q_{rr}	Reverse Recovery Charge			9		μC
I_{RRM}	Reverse Recovery Current			26		A

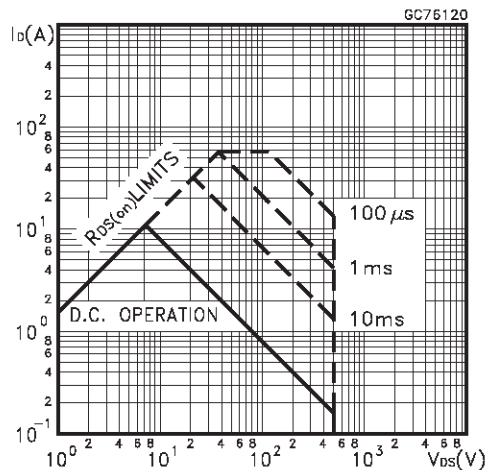
(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

(\bullet) Pulse width limited by safe operating area

Safe Operating Area for TO-247

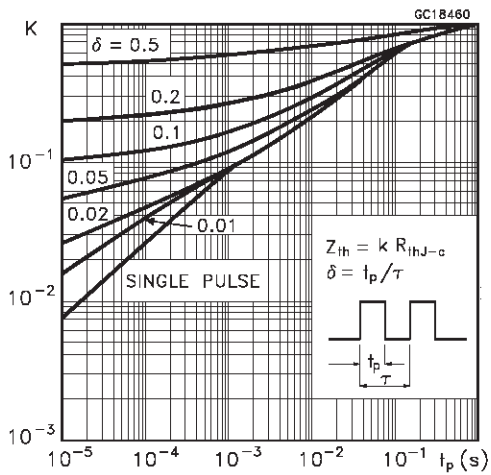


Safe Operating Area for ISOWATT218

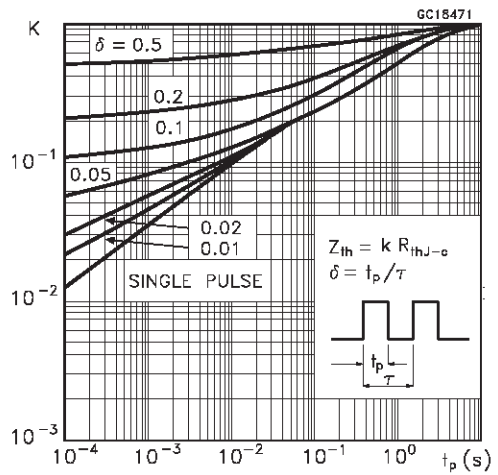


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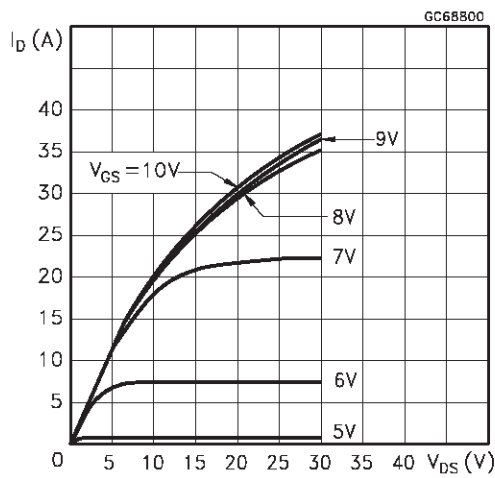
Thermal Impedance for TO-247



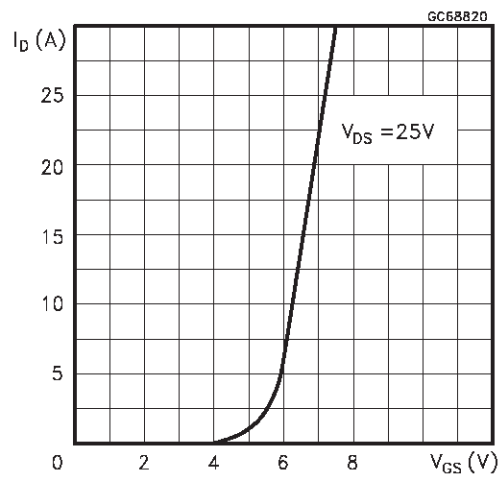
Thermal Impedance for ISOWATT218



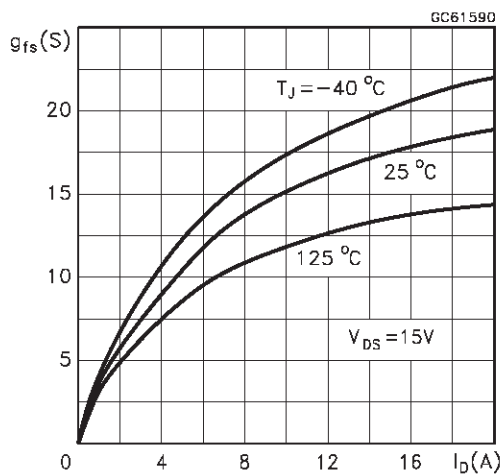
Output Characteristics



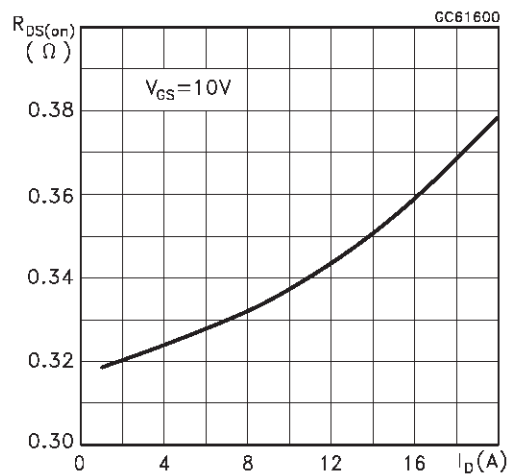
Transfer Characteristics



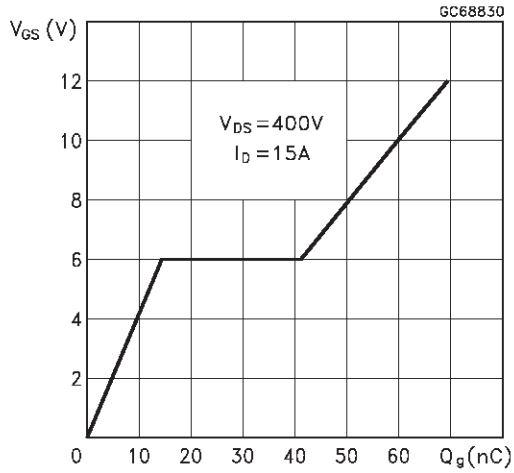
Transconductance



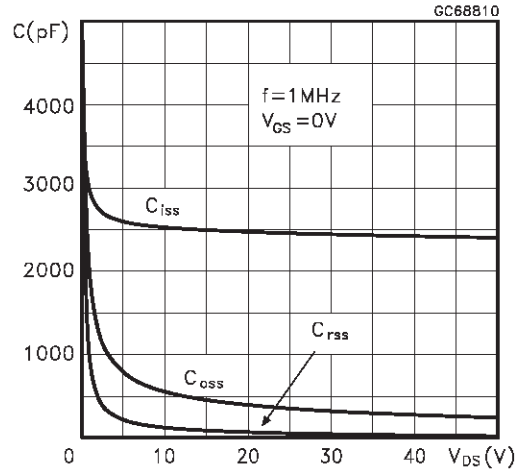
Static Drain-source On Resistance



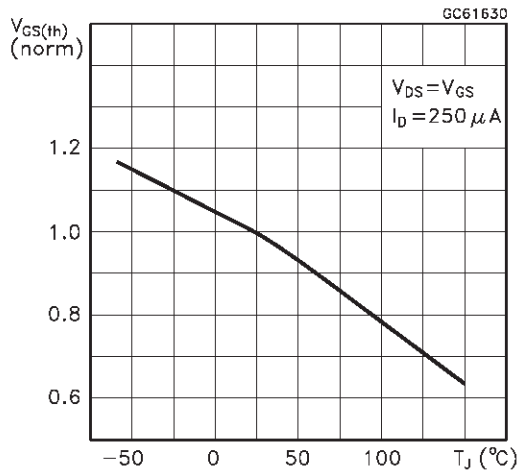
Gate Charge vs Gate-source Voltage



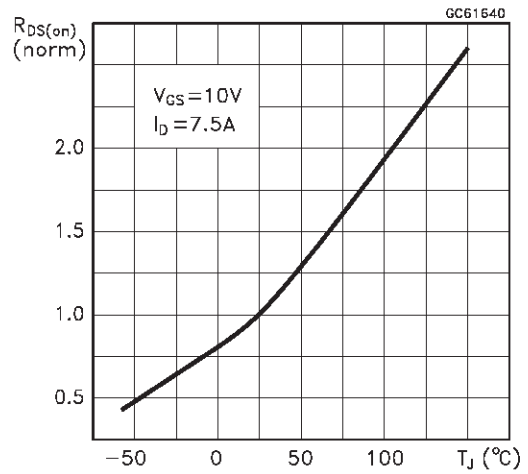
Capacitance Variations



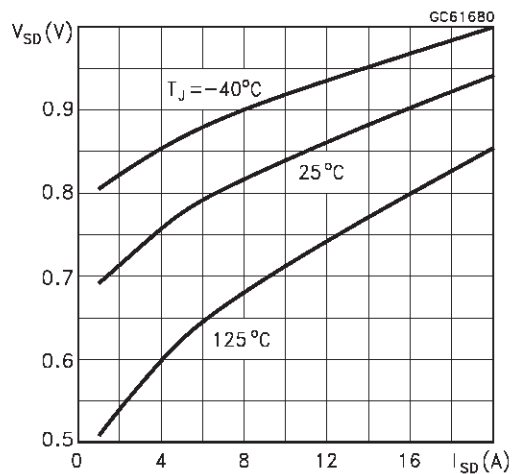
Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics



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Fig. 1: Unclamped Inductive Load Test Circuit

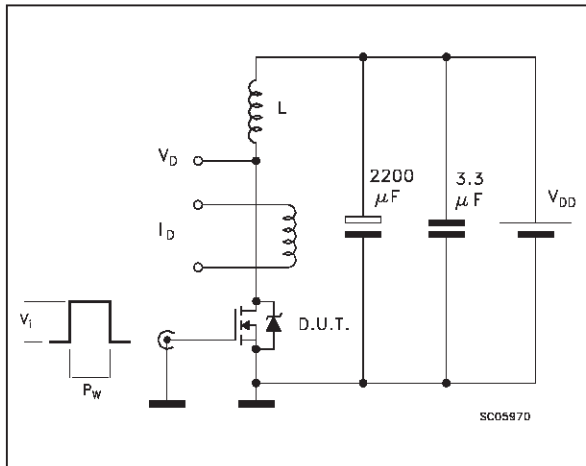


Fig. 2: Unclamped Inductive Waveform

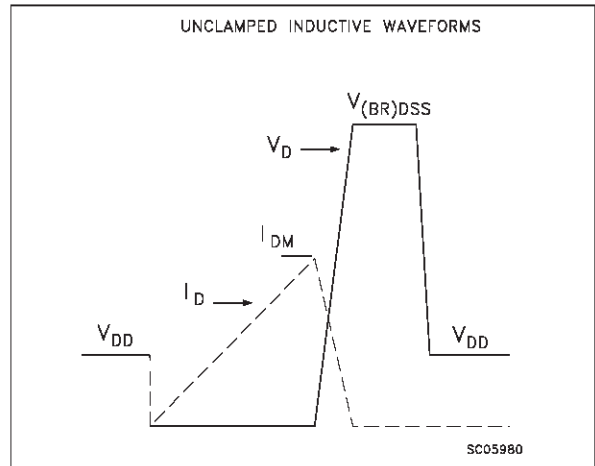


Fig. 3: Switching Times Test Circuits For Resistive Load

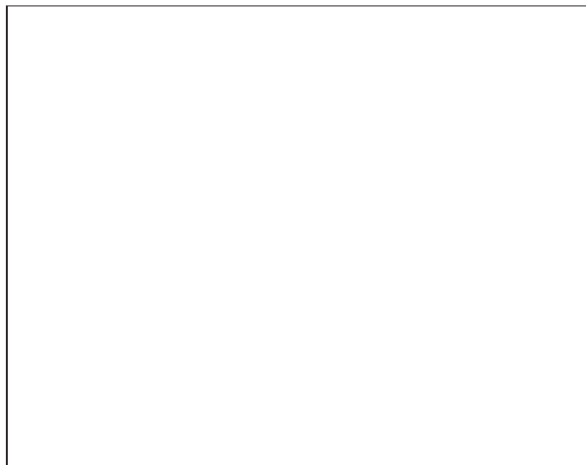


Fig. 4: Gate Charge test Circuit

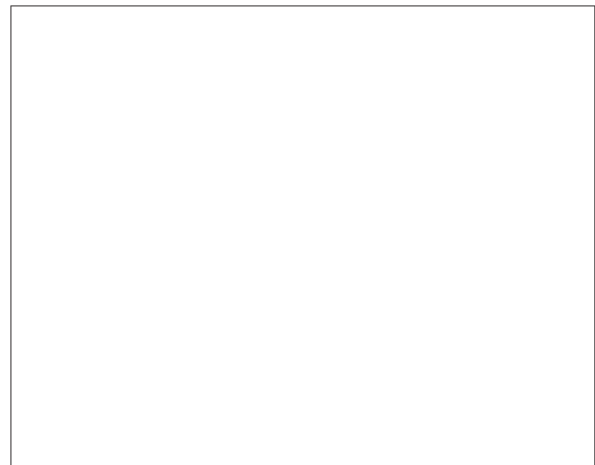
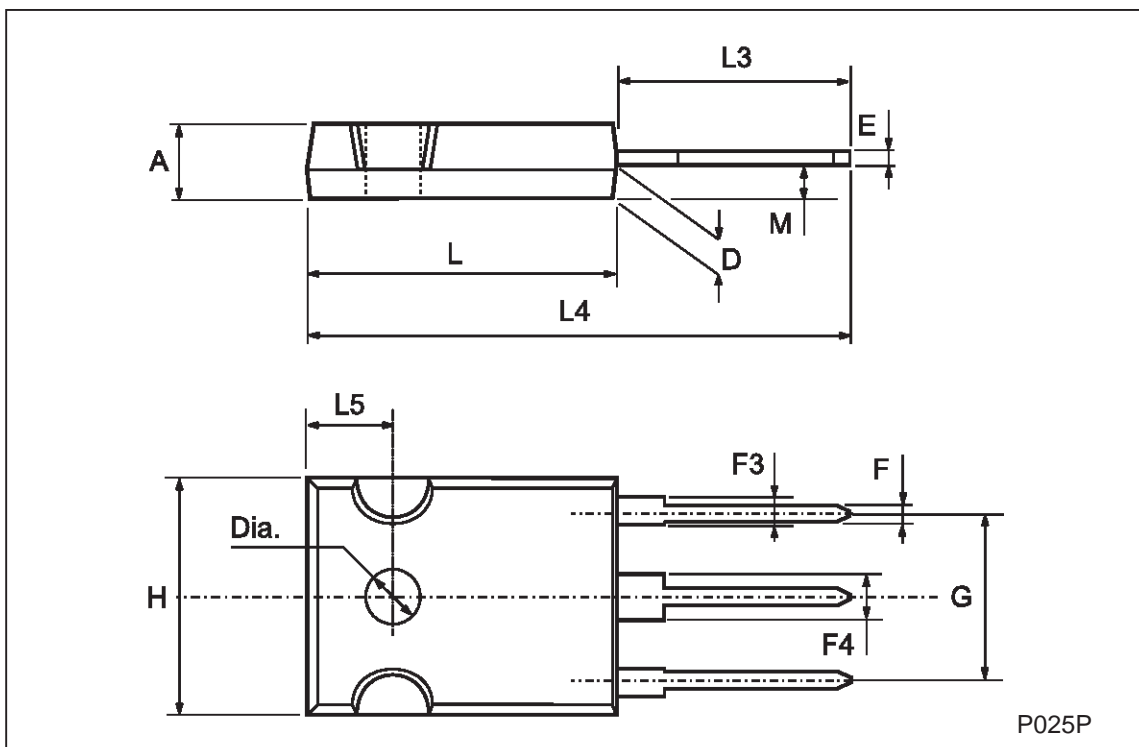


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



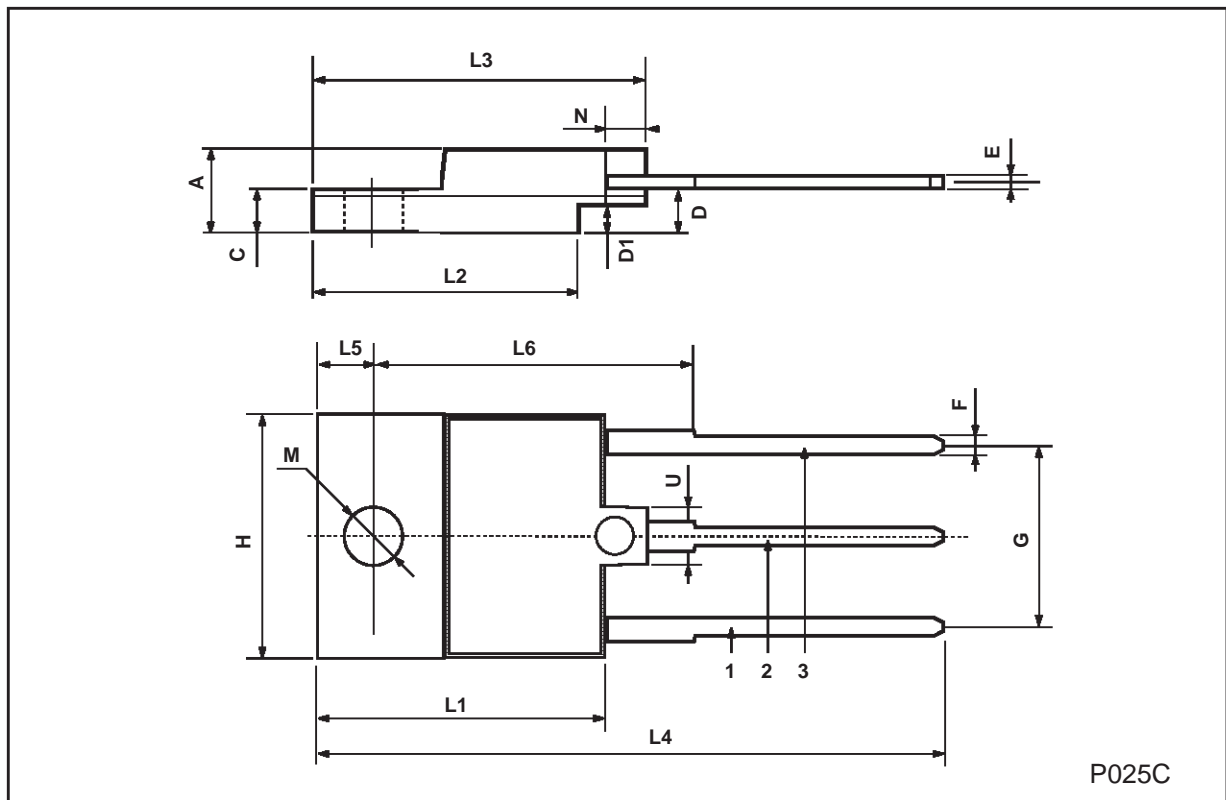
TO-247 MECHANICAL DATA

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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