



# STW15NB50 STH15NB50FI

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

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STW15NB50	500 V	< 0.36 Ω	14.6 A
STH15NB50FI	500 V	< 0.36 Ω	10.5 A

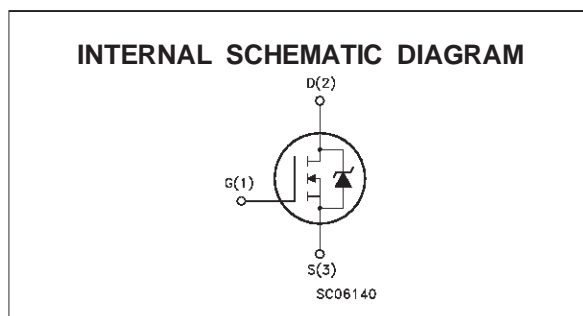
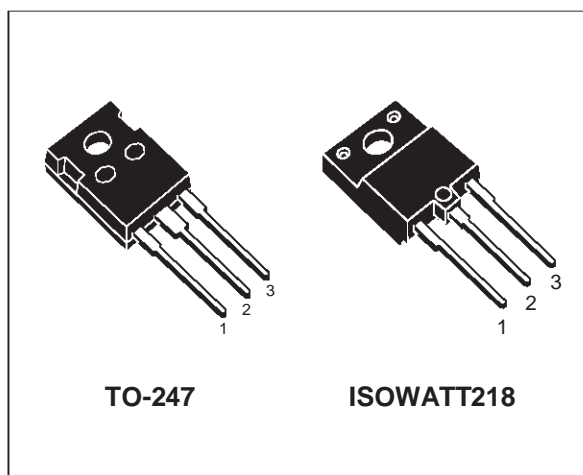
- TYPICAL R<sub>DS(on)</sub> = 0.33 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- ± 30V GATE TO SOURCE VOLTAGE RATING
- 100% AVALANCHE TESTED
- VERY LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED

### 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<sub>DS(on)</sub> 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 <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	500		V
V <sub>DGR</sub>	Drain- gate Voltage (R <sub>GS</sub> = 20 kΩ)	500		V
V <sub>GS</sub>	Gate-source Voltage	± 30		V
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 25 °C	14.6	10.5	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 100 °C	9.2	6.6	A
I <sub>DM</sub> (•)	Drain Current (pulsed)	58.4	58.4	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 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 <sub>ISO</sub>	Insulation Withstand Voltage (DC)	4000		V
T <sub>stg</sub>	Storage Temperature	-65 to 150		°C
T <sub>j</sub>	Max. Operating Junction Temperature	150		°C

## STW15NB50 - STH15NB50FI

### THERMAL DATA

		TO-247	ISOWATT218		
R <sub>thj-case</sub>	Thermal Resistance Junction-case	Max	0.66	1.56	°C/W
R <sub>thj-amb</sub>	Thermal Resistance Junction-ambient	Max	30		°C/W
R <sub>thc-sink</sub>	Thermal Resistance Case-sink	Typ	0.1		°C/W
T <sub>l</sub>	Maximum Lead Temperature For Soldering Purpose		300		°C

### AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I <sub>AR</sub>	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T <sub>j</sub> max)	14.6	A
E <sub>AS</sub>	Single Pulse Avalanche Energy (starting T <sub>j</sub> = 25 °C, I <sub>D</sub> = I <sub>AR</sub> , V <sub>DD</sub> = 50 V)	850	mJ

### ELECTRICAL CHARACTERISTICS (T<sub>case</sub> = 25 °C unless otherwise specified)

#### OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source Breakdown Voltage	I <sub>D</sub> = 250 µA V <sub>GS</sub> = 0	500			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = Max Rating V <sub>DS</sub> = Max Rating T <sub>c</sub> = 125 °C			1 50	µA µA
I <sub>GSS</sub>	Gate-body Leakage Current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ± 30 V			± 100	nA

#### ON (\*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> I <sub>D</sub> = 250 µA	3	4	5	V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10 V I <sub>D</sub> = 7.5 A		0.33	0.36	Ω Ω
I <sub>D(on)</sub>	On State Drain Current	V <sub>DS</sub> > I <sub>D(on)</sub> × R <sub>DS(on)max</sub> V <sub>GS</sub> = 10 V	14.6			A

### DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (*)	Forward Transconductance	V <sub>DS</sub> > I <sub>D(on)</sub> × R <sub>DS(on)max</sub> I <sub>D</sub> = 7.5 A	8	12		S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V f = 1 MHz V <sub>GS</sub> = 0		2600	3400	pF
C <sub>oss</sub>	Output Capacitance			330	430	pF
C <sub>rss</sub>	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
$t_r(V_{off})$	Off-voltage Rise Time	$V_{DD} = 400\text{ V}$ $I_D = 15\text{ A}$		15	20	ns
$t_f$	Fall Time	$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		25	33	ns
$t_c$	Cross-over Time			35	47	ns

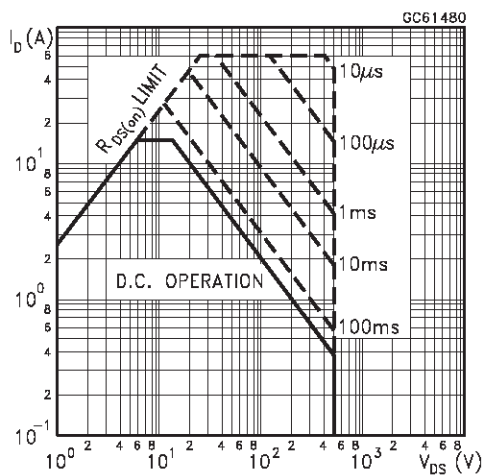
### SOURCE DRAIN DIODE

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		$\mu\text{C}$
$I_{RRM}$	Reverse Recovery Current			26		A

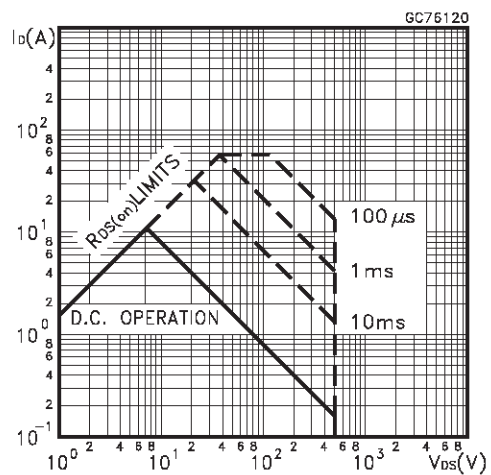
(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

( $\bullet$ ) Pulse width limited by safe operating area

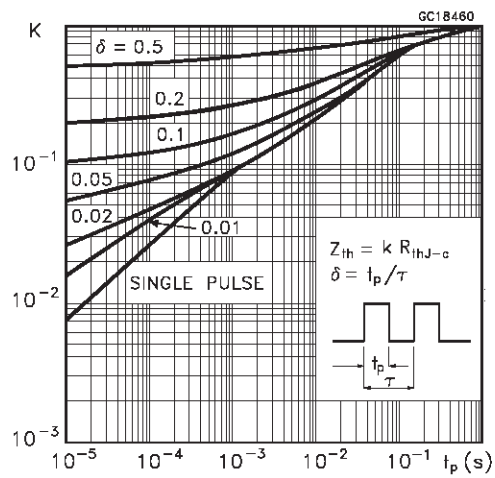
### Safe Operating Area for TO-247



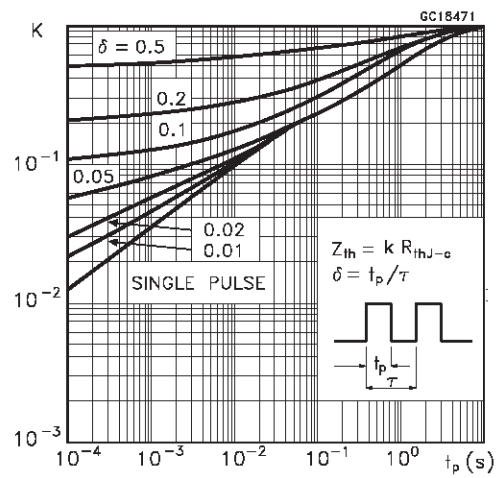
### Safe Operating Area for ISOWATT218



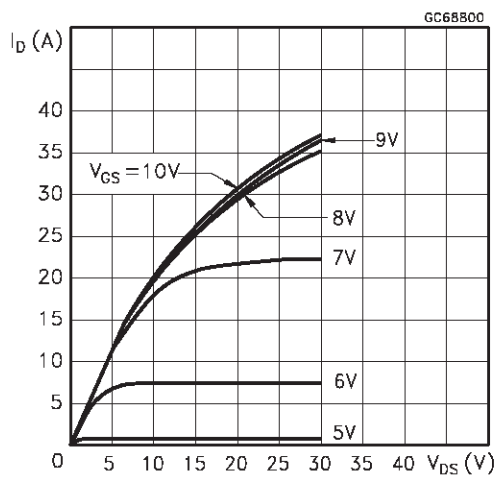
Thermal Impedance for TO-247



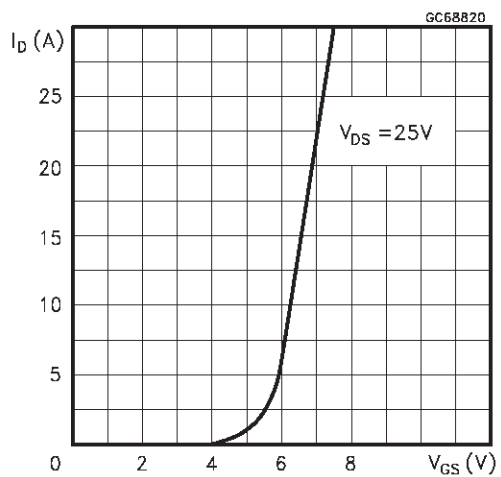
Thermal Impedance for ISOWATT218



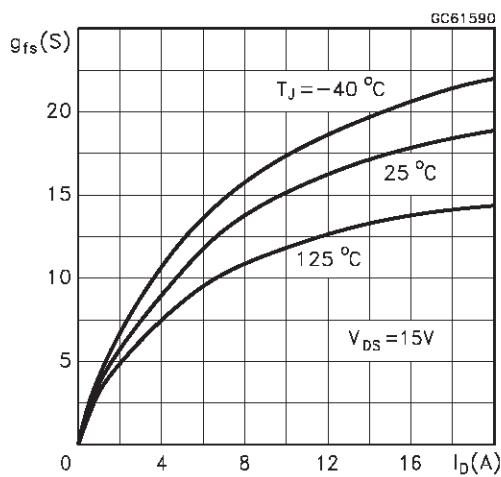
Output Characteristics



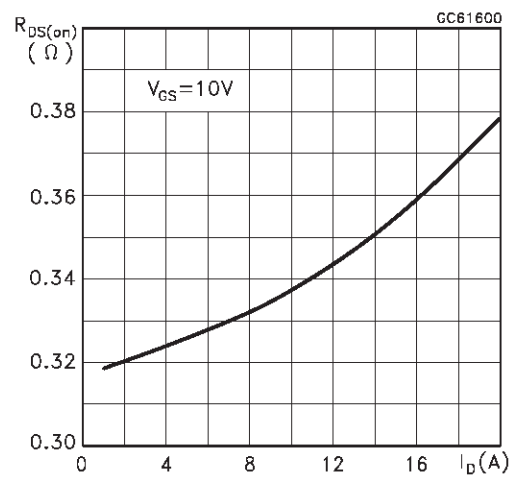
Transfer Characteristics



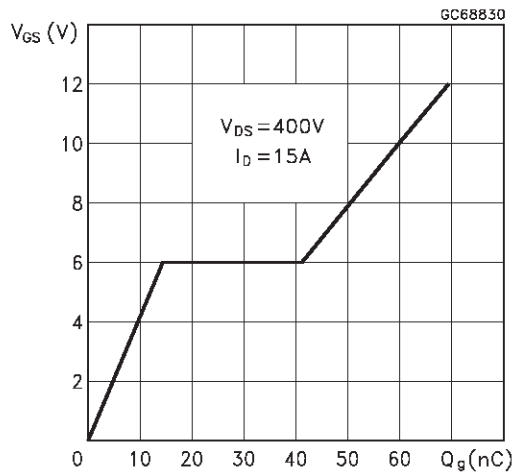
Transconductance



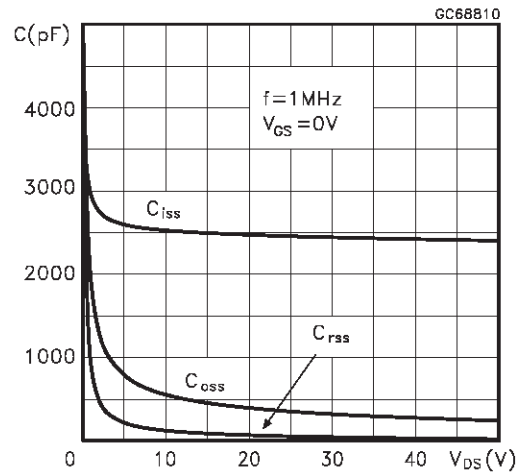
Static Drain-source On Resistance



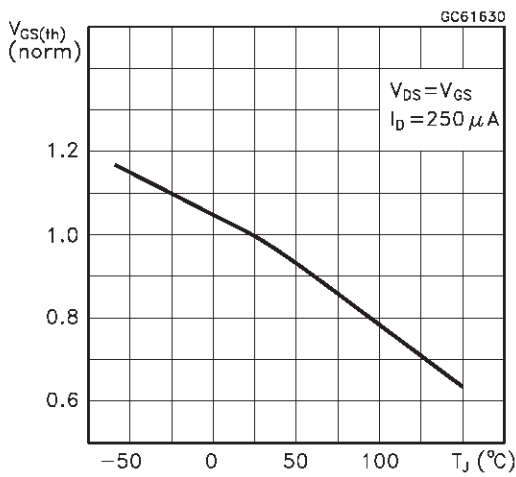
Gate Charge vs Gate-source Voltage



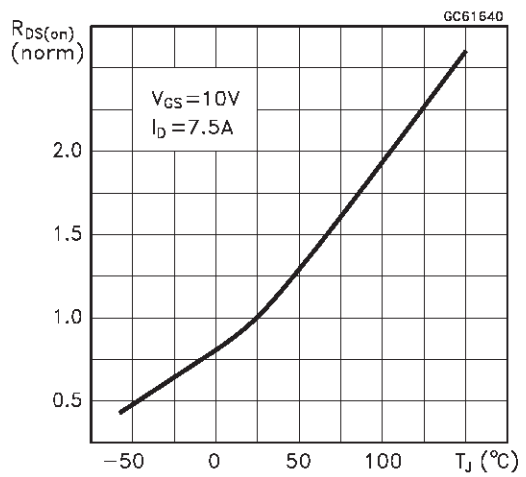
Capacitance Variations



Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

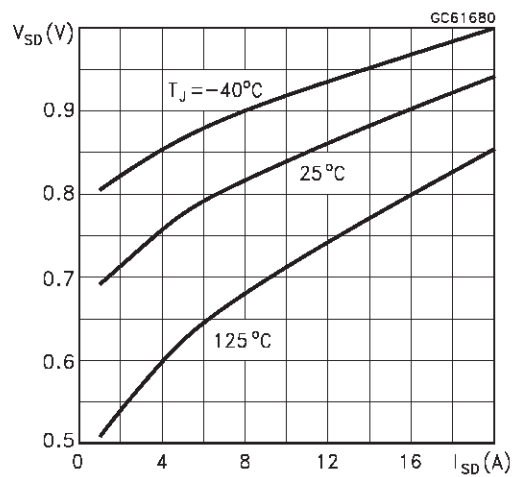


Fig. 1: Unclamped Inductive Load Test Circuit

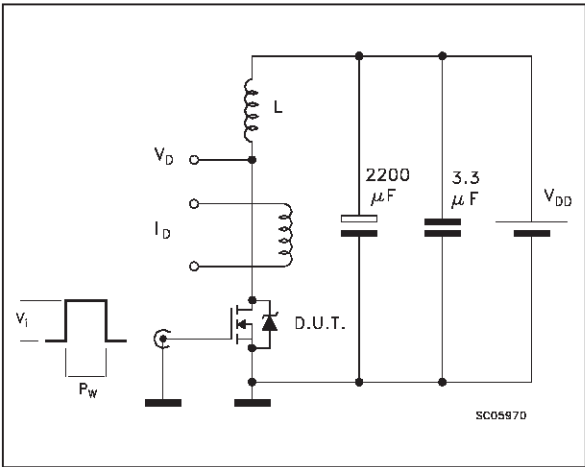


Fig. 2: Unclamped Inductive Waveform

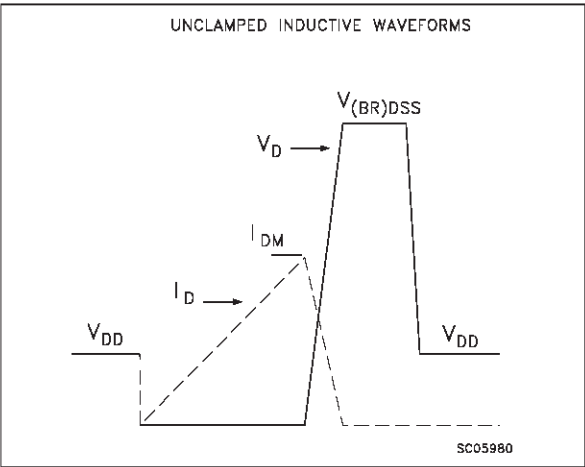


Fig. 3: Switching Times Test Circuits For Resistive Load

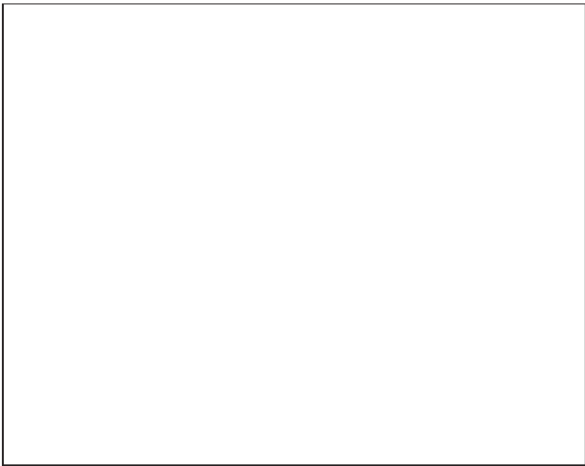
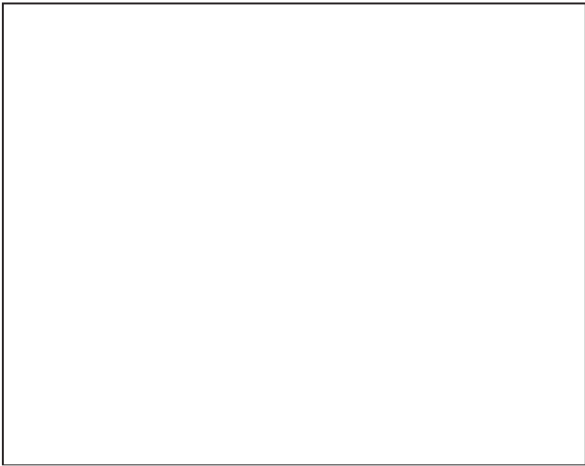


Fig. 4: Gate Charge test Circuit

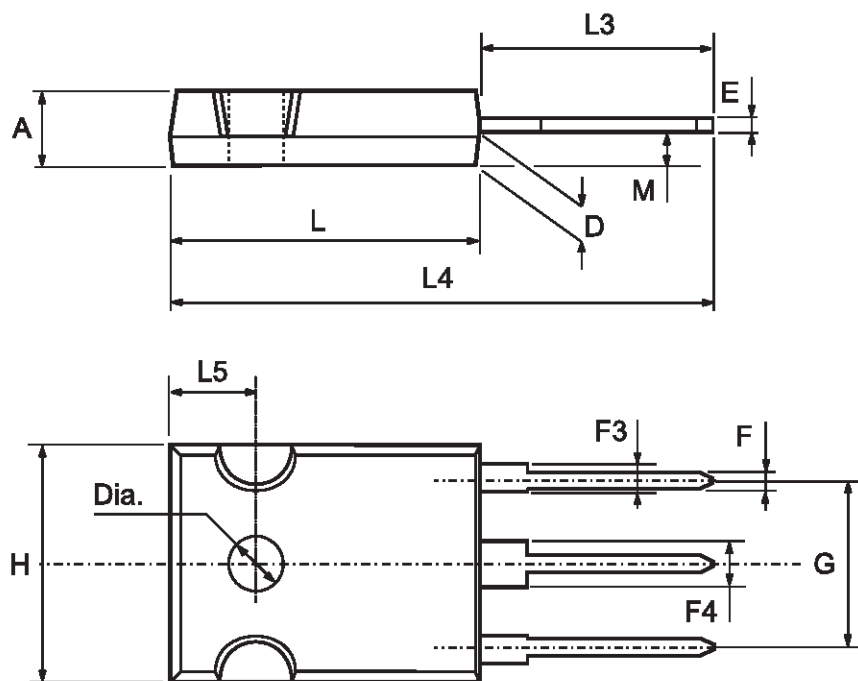


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



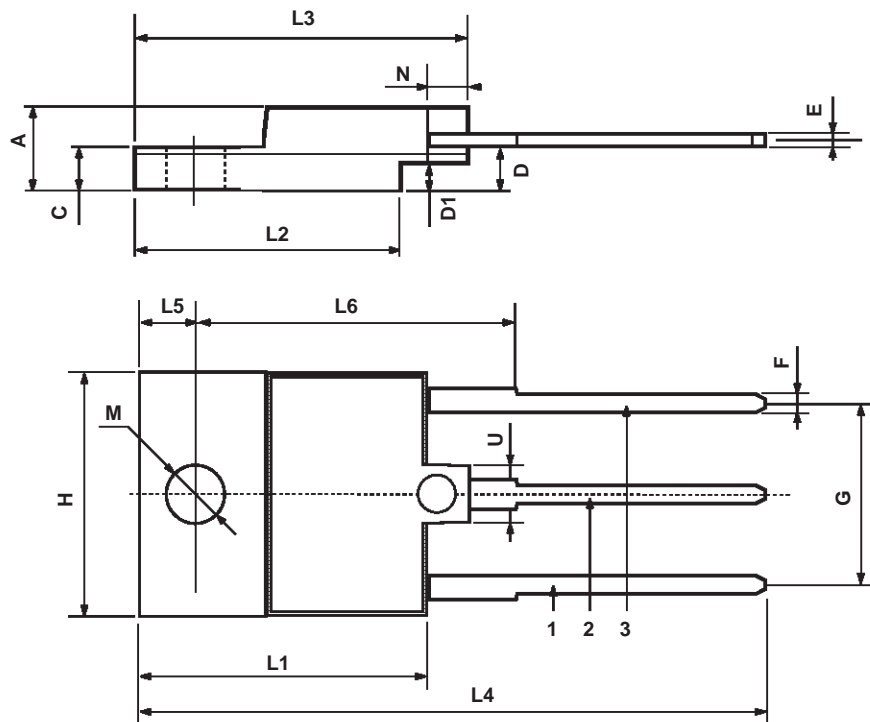
## TO-247 MECHANICAL DATA

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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