



# STGP10N60L

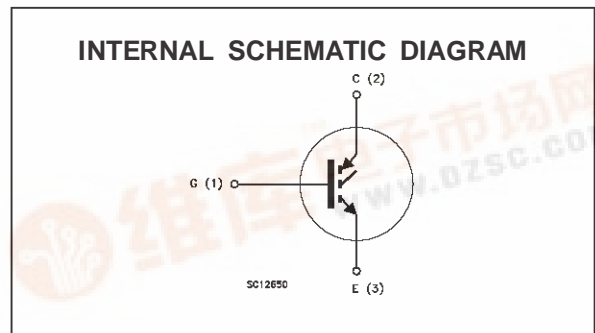
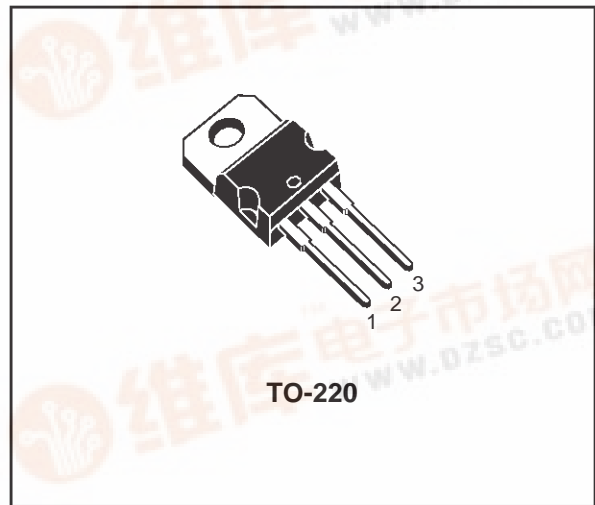
## N-CHANNEL 10A - 600V TO-220 LOGIC LEVEL IGBT

TYPE	V <sub>CEs</sub>	V <sub>CE(sat)</sub>	I <sub>C</sub>
STGP10N60L	600 V	< 1.95 V	10 A

- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- VERY LOW ON-VOLTAGE DROP (V<sub>cesat</sub>)
- LOW THRESHOLD VOLTAGE (LOGIC LEVEL INPUT)
- HIGH CURRENT CAPABILITY
- OFF LOSSES INCLUDE TAIL CURRENT

### APPLICATIONS

- ELECTRONIC IGNITION
- LIGHT DIMMER
- STATIC RELAYS



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>CEs</sub>	Collector-Emitter Voltage (V <sub>GS</sub> = 0)	600	V
V <sub>ECR</sub>	Reverse Battery Protection	25	V
V <sub>GE</sub>	Gate-Emitter Voltage	± 15	V
I <sub>C</sub>	Collector Current (continuous) at T <sub>c</sub> = 25 °C	25	A
I <sub>C</sub>	Collector Current (continuous) at T <sub>c</sub> = 100 °C	20	A
I <sub>CM(•)</sub>	Collector Current (pulsed)	100	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	125	W
	Derating Factor	0.83	W/°C
T <sub>stg</sub>	Storage Temperature	-65 to 175	°C
T <sub>j</sub>	Max. Operating Junction Temperature	175	°C

(•) Pulse width limited by safe operating area

## STGP10N60L

### THERMAL DATA

R <sub>thj-case</sub>	Thermal Resistance Junction-case	Max	1.2	°C/W
R <sub>thj-amb</sub>	Thermal Resistance Junction-ambient	Max	62.5	°C/W
R <sub>thc-sink</sub>	Thermal Resistance Case-sink	Typ	0.1	°C/W

### ELECTRICAL CHARACTERISTICS (T<sub>j</sub> = - 40 to 150 °C unless otherwise specified)

#### OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>BR(ces)</sub>	Collector-Emitter Breakdown Voltage	I <sub>C</sub> = 250 μA V <sub>GE</sub> = 0	600			V
I <sub>CES</sub>	Collector cut-off (V <sub>GE</sub> = 0)	V <sub>CE</sub> = Max Rating T <sub>j</sub> = 25 °C V <sub>CE</sub> = Max Rating T <sub>j</sub> = 125 °C			25 100	μA μA
I <sub>GES</sub>	Gate-Emitter Leakage Current (V <sub>CE</sub> = 0)	V <sub>GE</sub> = ± 15 V V <sub>CE</sub> = 0			± 100	nA

#### ON (\*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>GE(th)</sub>	Gate Threshold Voltage	V <sub>CE</sub> = V <sub>GE</sub> I <sub>C</sub> = 250 μA V <sub>CE</sub> = V <sub>GE</sub> I <sub>C</sub> = 250 μA T <sub>j</sub> = 25 °C	0.6 1.0		2.4 2.0	V V
V <sub>CE(SAT)</sub>	Collector-Emitter Saturation Voltage	V <sub>GE</sub> = 4.5 V I <sub>C</sub> = 8 A T <sub>j</sub> = - 40 °C V <sub>GE</sub> = 4.5 V I <sub>C</sub> = 9.5 A T <sub>j</sub> = 25 °C V <sub>GE</sub> = 4.5 V I <sub>C</sub> = 8 A T <sub>j</sub> = 150 °C		1.5 1.4 1.25	2.0	V V V
I <sub>C</sub>	Collector Current	V <sub>GE</sub> = 4.5 V V <sub>CE</sub> = 7 V	15	45		A

### DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub>	Forward Transconductance	V <sub>CE</sub> = 25 V I <sub>C</sub> = 8 A T <sub>j</sub> = 25 °C	7	12		S
C <sub>ies</sub> C <sub>oes</sub> C <sub>res</sub>	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V <sub>CE</sub> = 25 V f = 1 MHz V <sub>GE</sub> = 0		1800 120 19	2600 165 26	pF pF pF
Q <sub>G</sub>	Gate Charge	V <sub>CE</sub> = 400 V I <sub>C</sub> = 8 A V <sub>GE</sub> = 5 V		30		nC

### FUNCTIONAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I <sub>CL</sub>	Latching Current	V <sub>clamp</sub> = 480 V dV/dt = 200 V/μs T <sub>j</sub> = 125 °C	20			A
E <sub>CF</sub>	Forward Clamping Energy	T <sub>start</sub> = 55 °C V <sub>clamp</sub> = 480 V I <sub>C</sub> = 10 A L = 4.2 mH - Single Pulse	210			mJ
E <sub>AR</sub>	Reverse Avalanche Energy		10			mJ

**ELECTRICAL CHARACTERISTICS** (continued)

**SWITCHING ON**

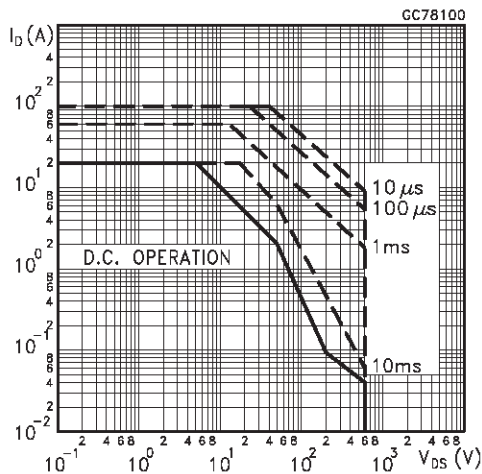
Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
$t_{d(on)}$	Delay Time	$V_{CC} = 480\text{ V}$	$I_C = 8\text{ A}$		0.7		$\mu\text{s}$
$t_r$	Rise Time	$V_{GE} = 5\text{ V}$	$R_G = 1\text{ K}\Omega$		1.9		$\mu\text{s}$
$(di/dt)_{on}$	Turn-on Current Slope	$V_{CC} = 480\text{ V}$	$I_C = 8\text{ A}$		5		A/ $\mu\text{s}$
$E_{on}$	Turn-on Switching Losses	$R_G = 1\text{ K}\Omega$	$V_{GE} = 5\text{ V}$		2.5		mJ
		$T_j = 125\text{ }^\circ\text{C}$					

**SWITCHING OFF**

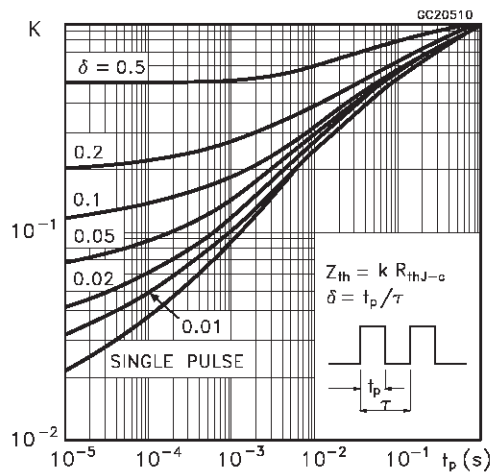
Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
$t_c$	Cross-Over Time	$V_{CC} = 480\text{ V}$	$I_C = 8\text{ A}$		4		$\mu\text{s}$
$t_r(V_{off})$	Off Voltage Rise Time	$R_{GE} = 1\text{ K}\Omega$	$V_{GE} = 5\text{ V}$		2.5		$\mu\text{s}$
$t_f$	Fall Time	$T_j = 25\text{ }^\circ\text{C}$			1.5		$\mu\text{s}$
$E_{off(**)}$	Turn-off Switching Loss				9.0		mJ
$t_c$	Cross-Over Time	$V_{CC} = 480\text{ V}$	$I_C = 8\text{ A}$		6		$\mu\text{s}$
$t_r(V_{off})$	Off Voltage Rise Time	$R_{GE} = 1\text{ K}\Omega$	$V_{GE} = 5\text{ V}$		3.3		$\mu\text{s}$
$t_f$	Fall Time	$T_j = 125\text{ }^\circ\text{C}$			2.5		$\mu\text{s}$
$E_{off(**)}$	Turn-off Switching Loss				10.8		mJ

(\*) Pulse width limited by safe operating area  
 (\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %  
 (\*\*) Losses Include Also The Tail (Jedec Standardization)

**Safe Operating Area**

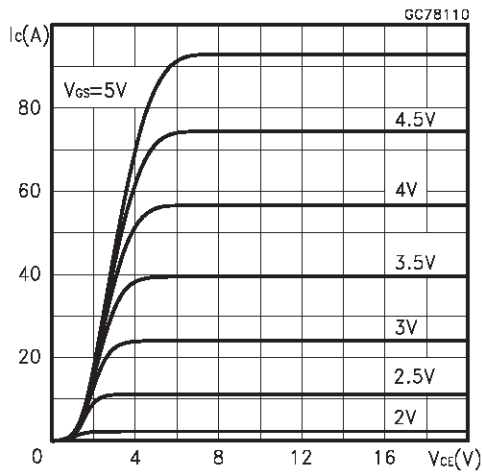


**Thermal Impedance**

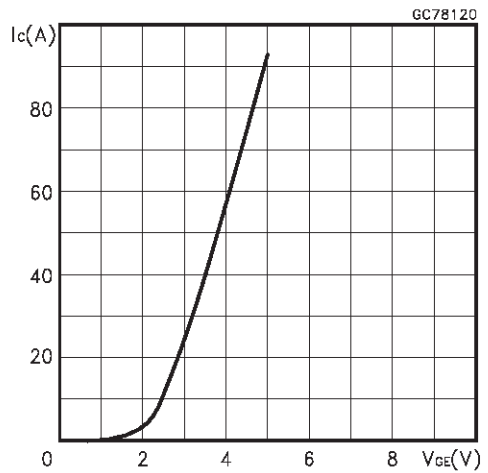


# STGP10N60L

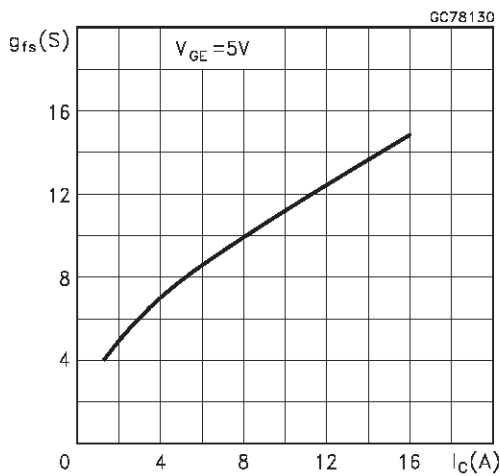
Output Characteristics



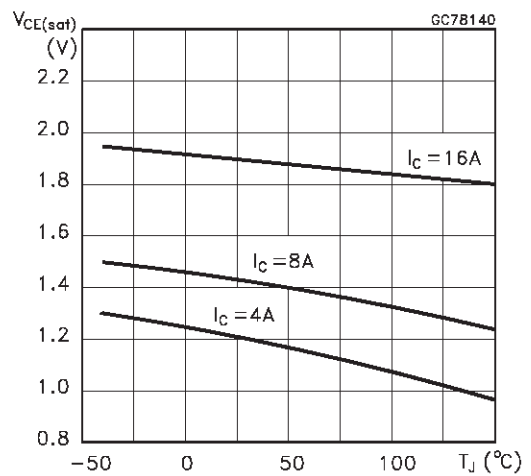
Transfer Characteristics



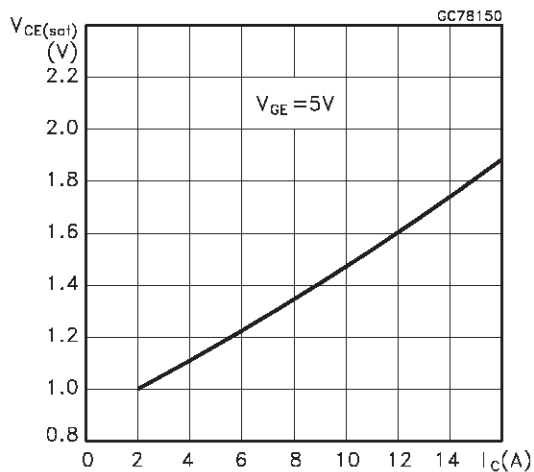
Transconductance



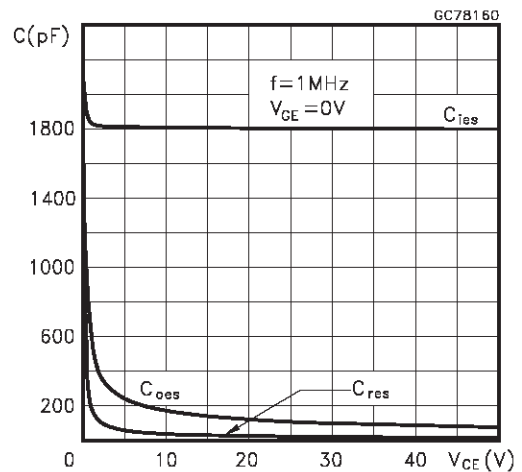
Collector-Emitter On Voltage vs Temperature



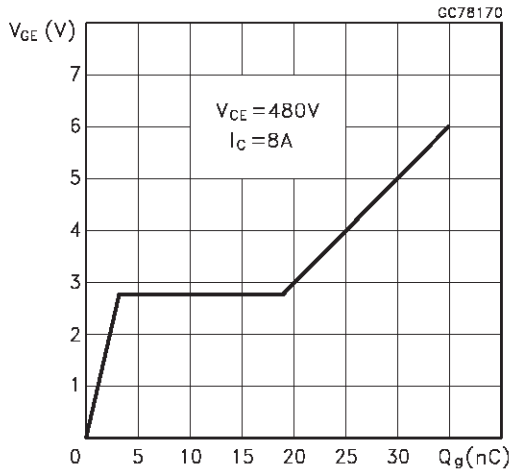
Collector-Emitter On Voltage vs Collector Current



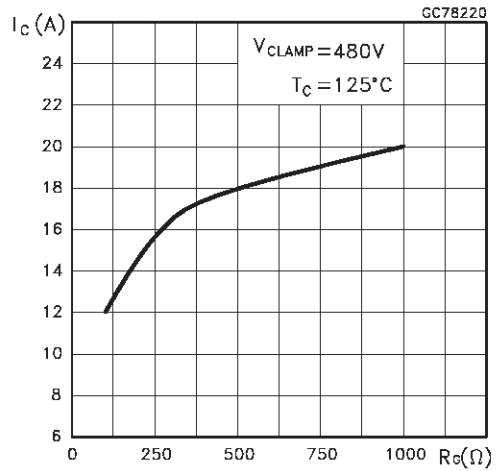
Capacitance Variations



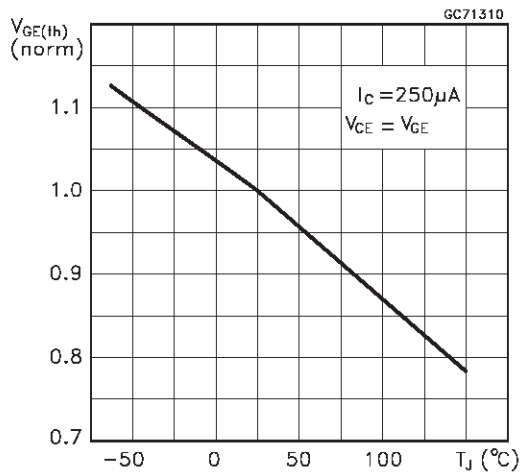
Gate Charge vs Gate-Emitter Voltage



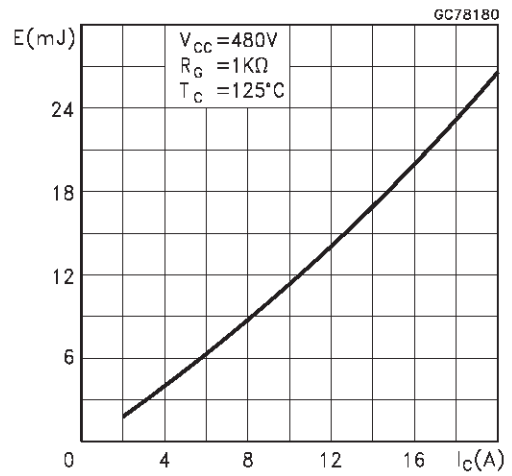
Latching Current vs Rg



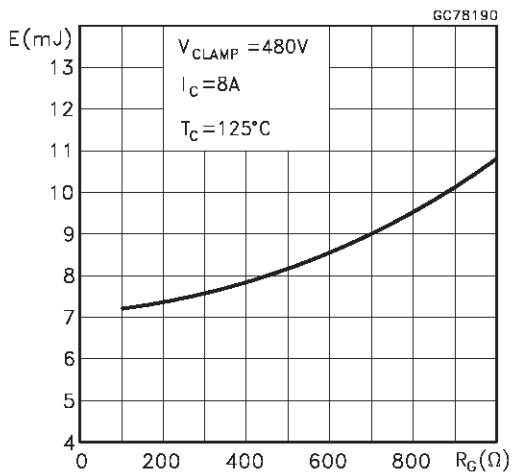
Gate Threshold vs Temperature



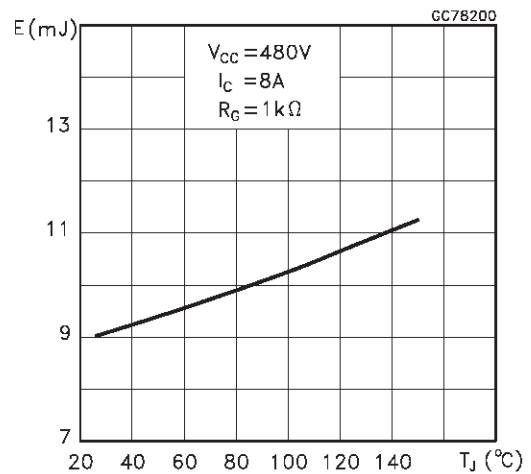
Off Losses vs Collector Current



Off Losses vs Gate Resistance



Off Losses vs Temperature



# STGP10N60L

## Switching Off Safe Operatin Area

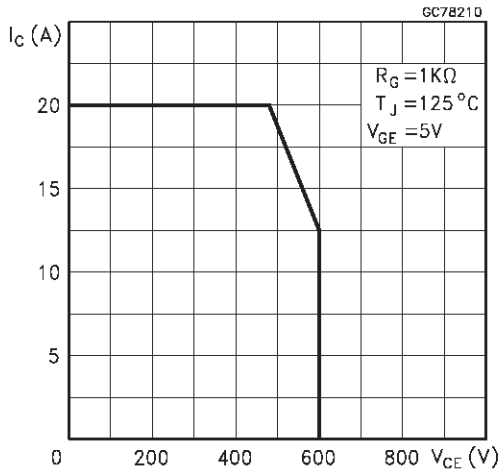


Fig. 1: Gate Charge test Circuit

Fig. 2: Switching Times Test Circuit For Resistive Load

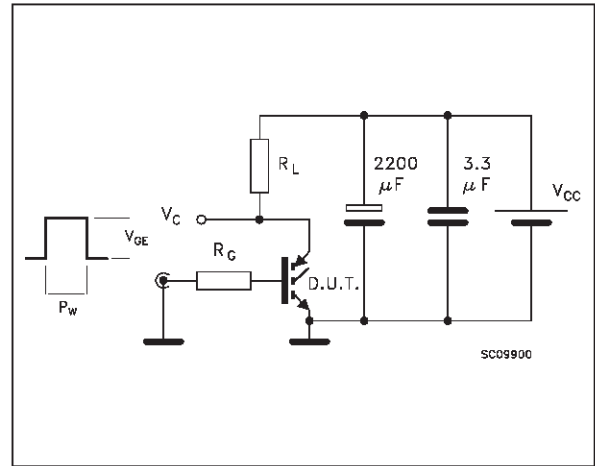
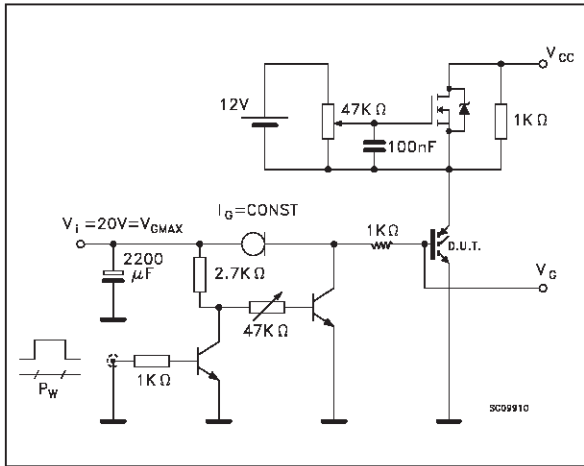
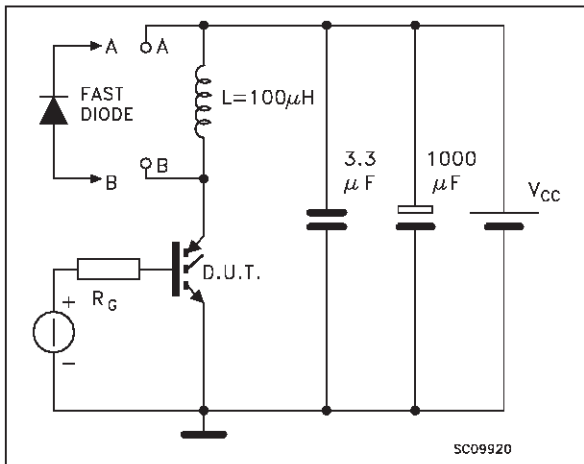
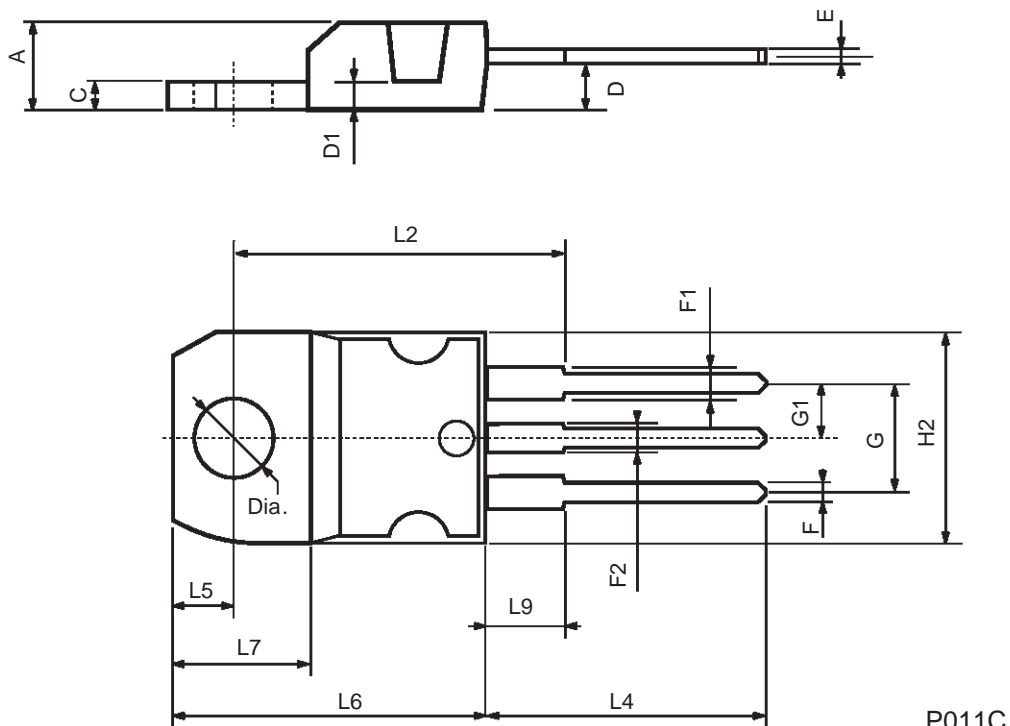


Fig. 3: Test Circuit For Inductive Load Switching



## 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



Information furnished is believed to be accurate and reliable. However, STMicroelectronics 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 STMicroelectronics. Specification mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a trademark of STMicroelectronics

© 1999 STMicroelectronics – Printed in Italy – All Rights Reserved  
STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - China - Finland - France - Germany - Hong Kong - India - Italy - Japan - Malaysia - Malta - Morocco -  
Singapore - Spain - Sweden - Switzerland - United Kingdom - U.S.A.