



# STGB10NB37LZ

## N-CHANNEL CLAMPED 10A D<sup>2</sup>PAK INTERNALLY CLAMPED PowerMESH™ IGBT

TYPE	V <sub>CES</sub>	V <sub>CE(sat)</sub>	I <sub>C</sub>
STGB10NB37LZ	CLAMPED	< 1.8 V	10 A

- POLYSILICON GATE VOLTAGE DRIVEN
- LOW THRESHOLD VOLTAGE
- LOW ON-VOLTAGE DROP
- HIGH CURRENT CAPABILITY
- HIGH VOLTAGE CLAMPING FEATURE
- SURFACE-MOUNTING D<sup>2</sup>PAK (TO-263) POWER PACKAGE IN TUBE (NO SUFFIX) OR IN TAPE & REEL (SUFFIX "T4")

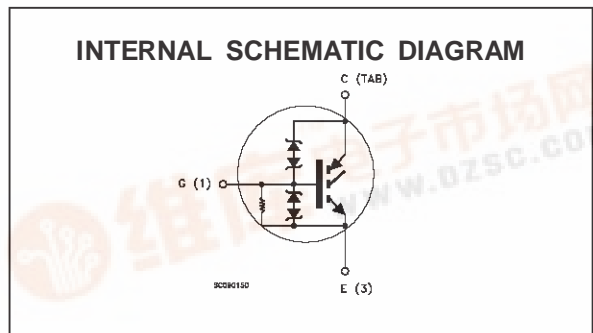
### DESCRIPTION

Using the latest high voltage technology based on patented strip layout, SGS-Thomson has designed an advanced family of IGBTs with outstanding performances.

The built in collector-gate zener exhibits a very precise active clamping while the gate-emitter zener supplies an ESD protection.

### APPLICATIONS

- AUTOMOTIVE IGNITION



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>CES</sub>	Collector-Emitter Voltage (V <sub>GS</sub> = 0)	CLAMPED	V
V <sub>ECR</sub>	Reverse Battery Protection	18	V
V <sub>GE</sub>	Gate-Emitter Voltage	CLAMPED	V
I <sub>C</sub>	Collector Current (continuous) at T <sub>c</sub> = 25 °C	20	A
I <sub>C</sub>	Collector Current (continuous) at T <sub>c</sub> = 100 °C	20	A
I <sub>CM</sub> (•)	Collector Current (pulsed)	60	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	125	W
	Derating Factor	0.83	W/°C
E <sub>SD</sub>	ESD (Human Body Model)	4	KV
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



## STGB10NB37LZ

### 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	0.2	°C/W

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

#### OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
BV <sub>(CES)</sub>	Clamped Voltage	I <sub>C</sub> = 2 mA V <sub>GE</sub> = 0 T <sub>j</sub> = - 40 to 150 °C	375	400	425	V
BV <sub>(ECR)</sub>	Emitter Collector Break-down Voltage	I <sub>C</sub> = 75 mA V <sub>GE</sub> = 0 T <sub>j</sub> = - 40 to 150 °C	18			V
BV <sub>GE</sub>	Gate Emitter Break-down Voltage	I <sub>C</sub> = ± 2 mA T <sub>j</sub> = - 40 to 150 °C	12		16	V
I <sub>CES</sub>	Collector cut-off Current (V <sub>GE</sub> = 0)	V <sub>CE</sub> = 15 V V <sub>GE</sub> = 0 T <sub>j</sub> = 150 °C V <sub>CE</sub> = 200 V V <sub>GE</sub> = 0 T <sub>j</sub> = 150 °C			10 100	μA μA
I <sub>GES</sub>	Gate-Emitter Leakage Current (V <sub>CE</sub> = 0)	V <sub>GE</sub> = ± 10 V V <sub>CE</sub> = 0			± 0.7	mA
R <sub>GE</sub>	Gate Emitter Resistance			20		KΩ

#### 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 T <sub>j</sub> = - 40 to 150 °C	0.6		2.4	V
V <sub>CE(SAT)</sub>	Collector-Emitter Saturation Voltage	V <sub>GE</sub> = 4.5 V I <sub>C</sub> = 10 A T <sub>j</sub> = 25 °C V <sub>GE</sub> = 4.5 V I <sub>C</sub> = 10 A T <sub>j</sub> = - 40 °C		1.2 1.3	1.8	V V
I <sub>C</sub>	Collector Current	V <sub>GE</sub> = 4.5 V V <sub>CE</sub> = 9 V	20			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> = 10 A	10	18		S
C <sub>ies</sub>	Input Capacitance	V <sub>CE</sub> = 25 V f = 1 MHz V <sub>GE</sub> = 0		1250	1700	pF
C <sub>oes</sub>	Output Capacitance			103	140	pF
C <sub>res</sub>	Reverse Transfer Capacitance			18	25	pF
Q <sub>G</sub>	Gate Charge	V <sub>CE</sub> = 320 V I <sub>C</sub> = 10 A V <sub>GE</sub> = 5 V		28		nC

**FUNCTIONAL CHARACTERISTICS**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I <sub>L</sub>	Latching Current	V <sub>CLAMP</sub> = 320 V V <sub>GE</sub> = 5 V R <sub>G OFF</sub> = 1 KΩ T <sub>C</sub> = 125 °C	20			A
U.I.S.	Unclamped Inductive Switching Current Functional Test	R <sub>G OFF</sub> =1 KΩ L =200 μH T <sub>j</sub> = 125 °C	15			A
		R <sub>G OFF</sub> =1 KΩ L =3 mH T <sub>start</sub> = 55 °C	12			A
E <sub>AS</sub>	Single Pulse Avalanche Energy	T <sub>start</sub> = 55 °C T <sub>start</sub> = 150 °C			215 150	mJ mJ
E <sub>AR</sub>	Reverse Avalanche Energy	T <sub>C</sub> = 125 °C duty cycle < 1% pulse width limited by t <sub>jmax</sub>			10	mJ

**ELECTRICAL CHARACTERISTICS (continued)**

**SWITCHING ON**

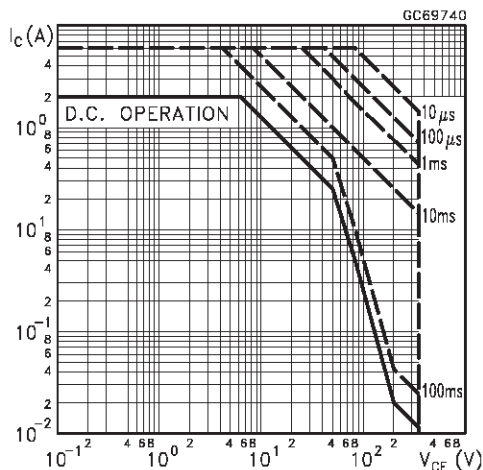
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t <sub>d(on)</sub>	Delay Time	V <sub>CC</sub> = 320 V I <sub>C</sub> = 10 A		520		ns
t <sub>r</sub>	Rise Time	V <sub>GE</sub> = 5 V R <sub>G</sub> = 1 KΩ		340		ns
(di/dt) <sub>on</sub>	Turn-on Current Slope	V <sub>CC</sub> = 320 V I <sub>C</sub> = 10 A		17		A/μs
E <sub>on</sub>	Turn-on Switching Losses	R <sub>G</sub> = 1 KΩ V <sub>GE</sub> = 5 V		180		μJ

**SWITCHING OFF**

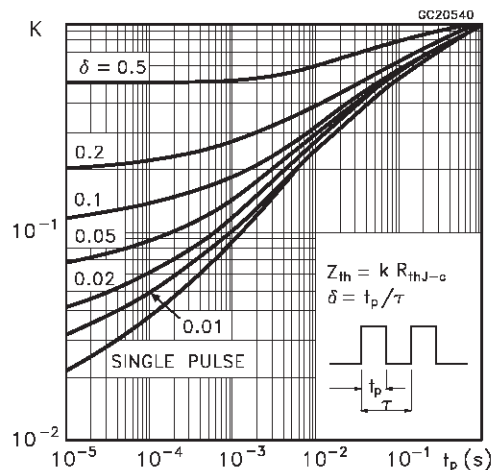
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t <sub>c</sub>	Cross-Over Time	V <sub>CLAMP</sub> = 320 V I <sub>C</sub> = 10 A		4		μs
t <sub>r(Voff)</sub>	Off Voltage Rise Time	R <sub>GE</sub> = 1 KΩ V <sub>GE</sub> = 5 V		2.2		μs
t <sub>f</sub>	Fall Time			1.5		μs
t <sub>d(off)</sub>	Off Voltage Delay Time			14.8		μs
E <sub>off(**)</sub>	Turn-off Switching Loss			4.0		mJ
t <sub>c</sub>	Cross-Over Time	V <sub>CLAMP</sub> = 320 V I <sub>C</sub> = 10 A		5.2		μs
t <sub>r(Voff)</sub>	Off Voltage Rise Time	R <sub>GE</sub> = 1 KΩ V <sub>GE</sub> = 5 V		2.8		μs
t <sub>f</sub>	Fall Time			2		μs
t <sub>d(off)</sub>	Off Voltage Delay Time	T <sub>j</sub> = 125 °C		15.8		μs
E <sub>off(**)</sub>	Turn-off Switching Loss			6.5		mJ

(\*) Pulse width limited by safe operating area (\*\*) Pulsed: Pulse duration = 300 ms, duty cycle 1.5 % (\*\*\*) Losses Include Also The Tail (jedec Standardization)

**Safe Operating Area**

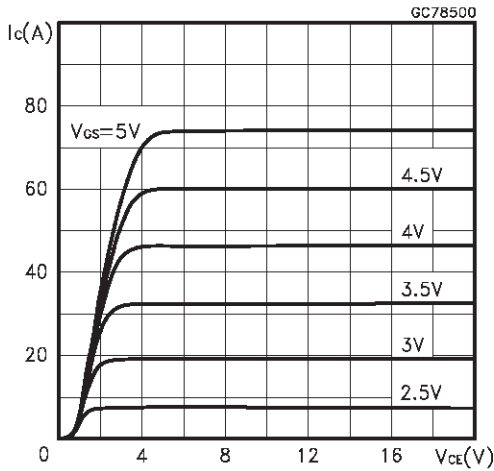


**Thermal Impedance**

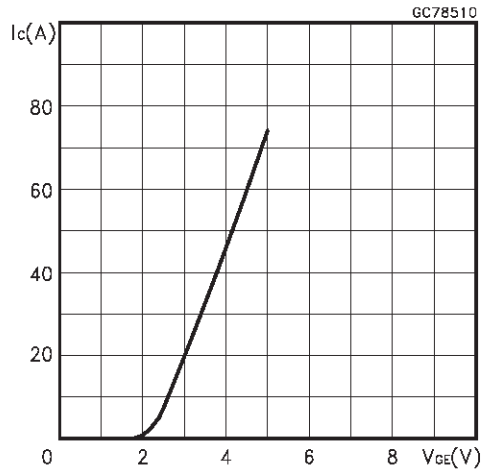


# STGB10NB37LZ

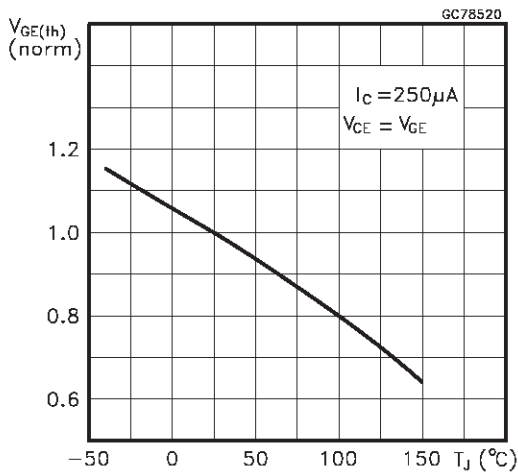
Output Characteristics



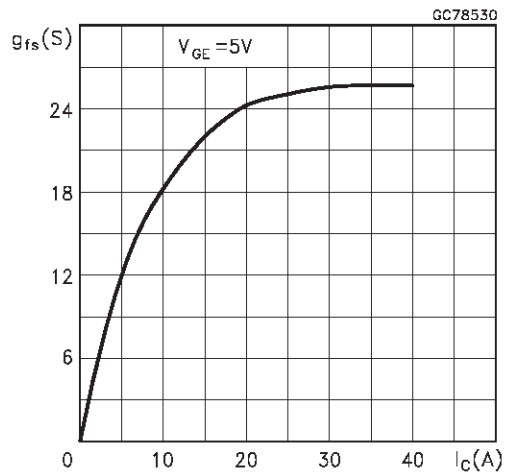
Transfer Characteristics



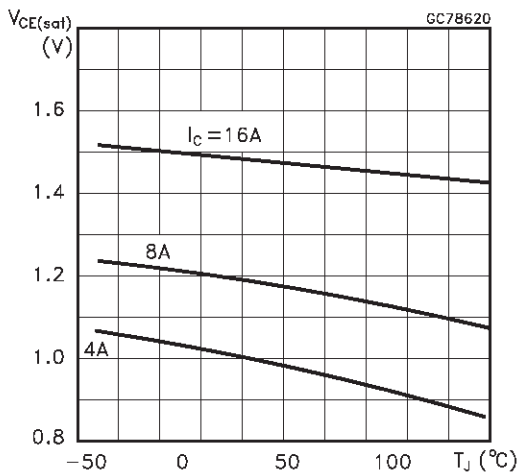
Normalized Gate Threshold Voltage vs Temperature



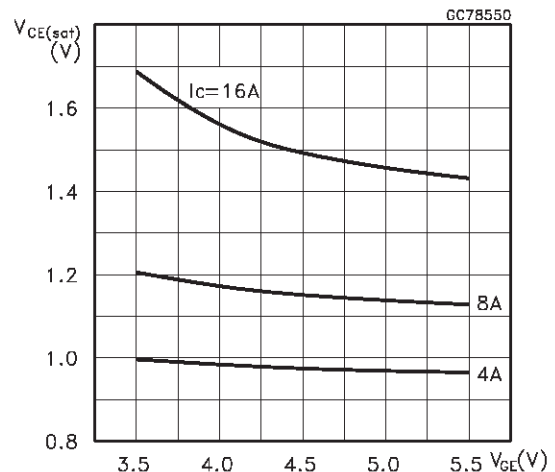
Transconductance



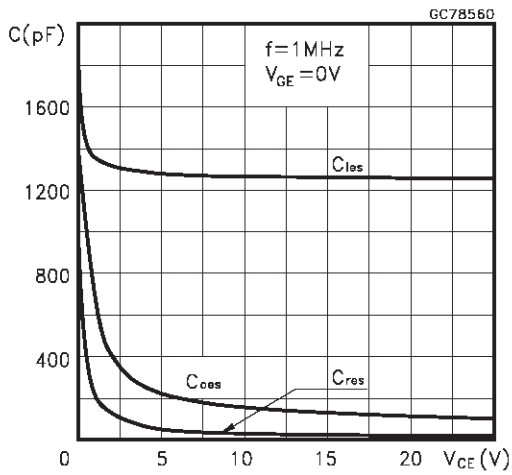
Collector-Emitter On Voltage vs Temperature



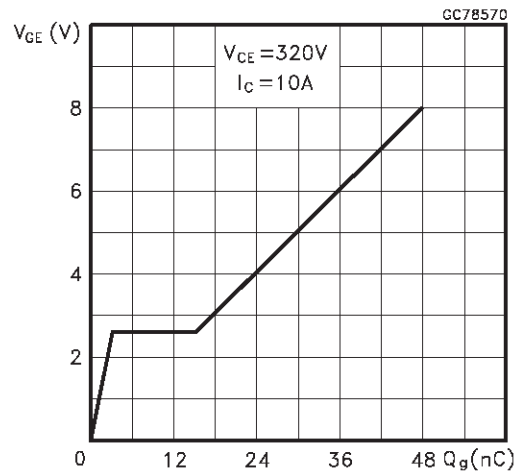
Collector-Emitter On Voltage vs Gate-Emitter Voltage



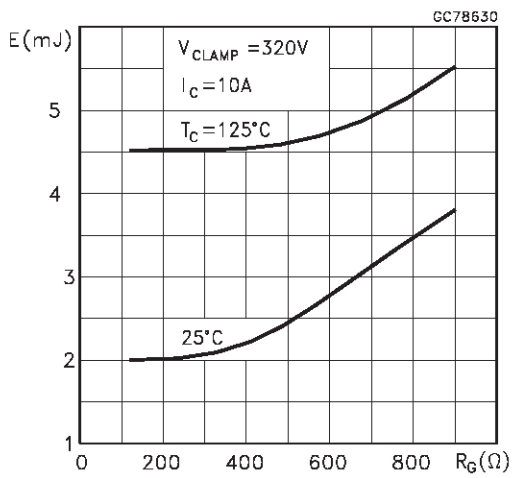
Capacitance Variations



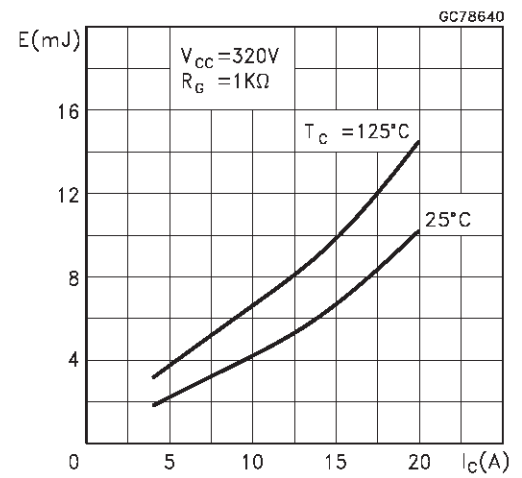
Gate Charge vs Gate-Emitter Voltage



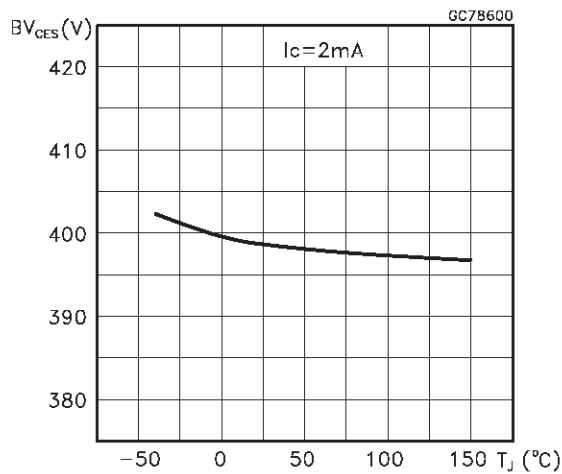
Off Losses vs Gate Resistance



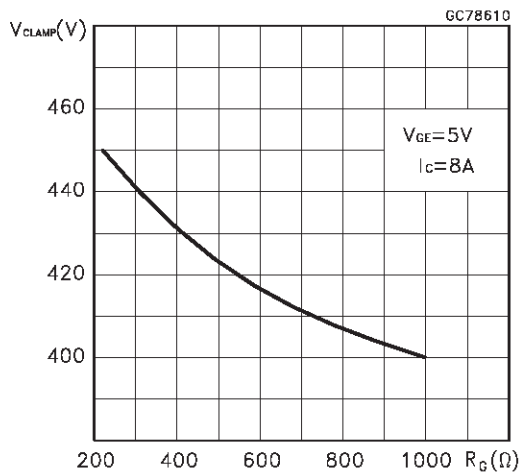
Off Losses vs Collector Current



Break-down Voltage vs Temperature

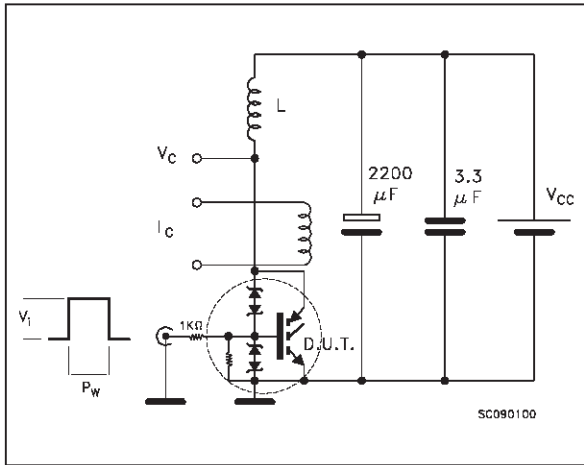


Clamping Voltage vs Gate Resistance

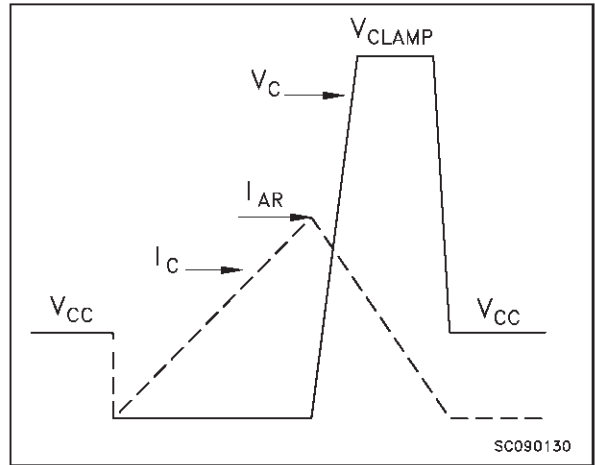


# STGB10NB37LZ

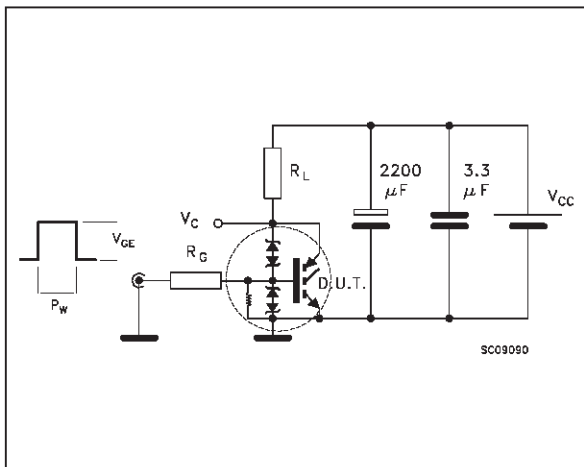
**Fig. 1: Unclamped Inductive Load Test Circuit**



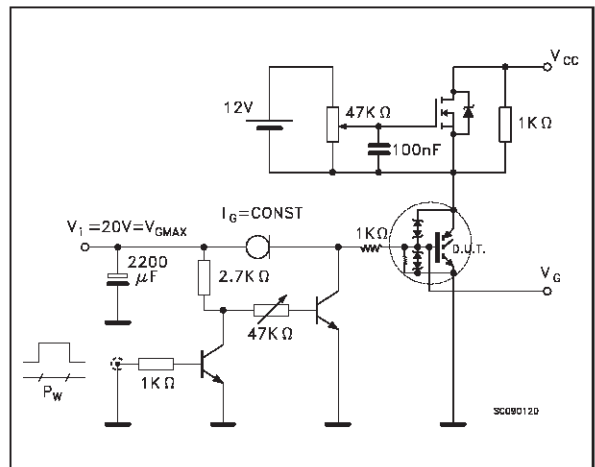
**Fig. 2: Unclamped Inductive Waveform**



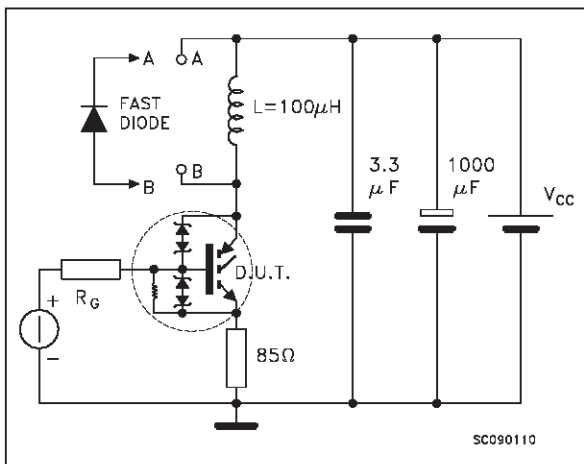
**Fig. 3: Switching Times Test Circuits For Resistive Load**



**Fig. 4: Gate Charge test Circuit**

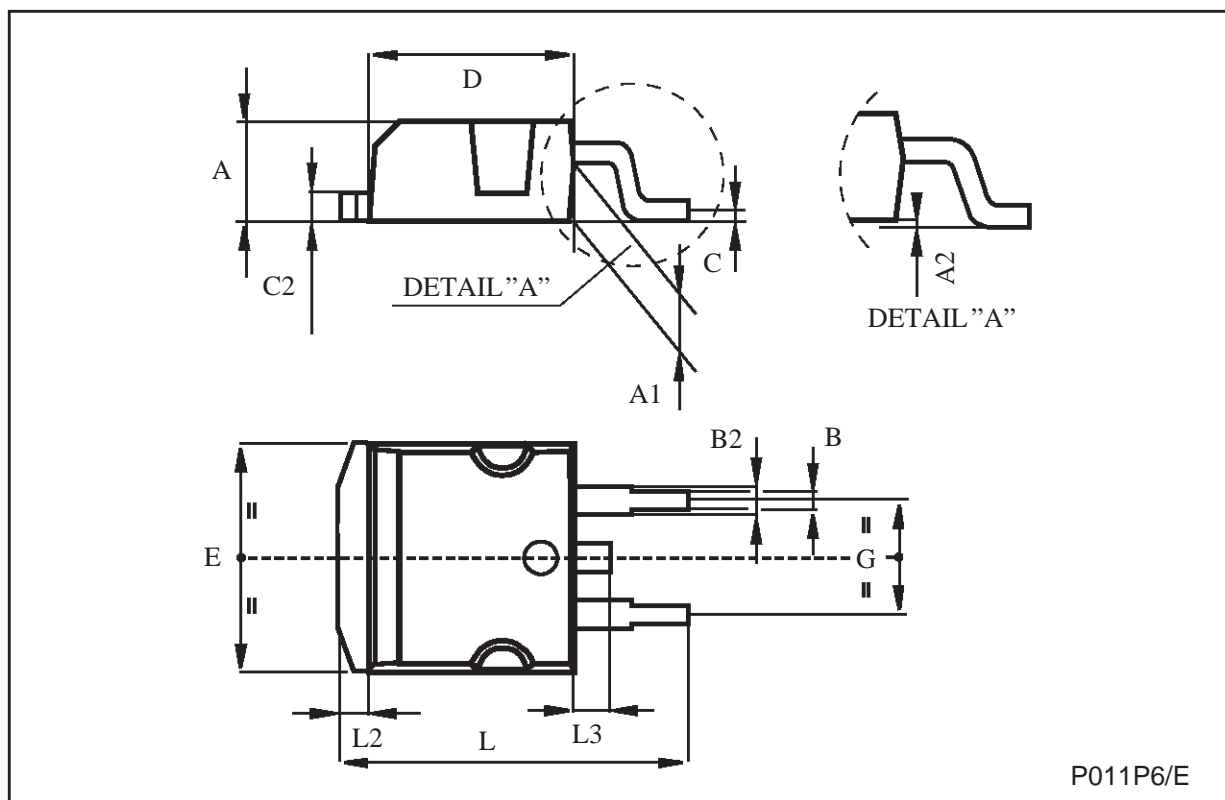


**Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times**



TO-263 (D<sup>2</sup>PAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.21		1.36	0.047		0.053
D	8.95		9.35	0.352		0.368
E	10		10.4	0.393		0.409
G	4.88		5.28	0.192		0.208
L	15		15.85	0.590		0.624
L2	1.27		1.4	0.050		0.055
L3	1.4		1.75	0.055		0.068



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.