



# 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")

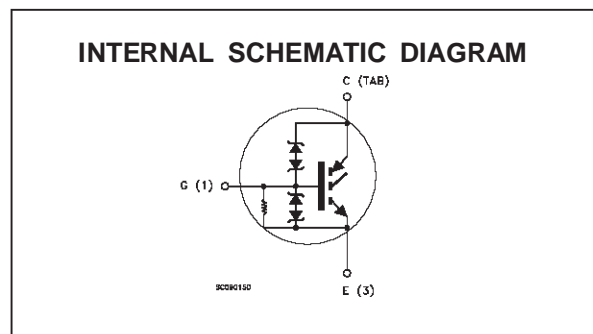
### DESCRIPTION

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

$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.2	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	$^{\circ}C/W$
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.2	$^{\circ}C/W$

### ELECTRICAL CHARACTERISTICS ( $T_j = 25^{\circ}C$ unless otherwise specified)

#### OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$BV_{(CES)}$	Clamped Voltage	$I_C = 2\text{ mA}$ $T_j = -40\text{ to }150^{\circ}C$ $V_{GE} = 0$	375	400	425	V
$BV_{(ECR)}$	Emitter Collector Break-down Voltage	$I_C = 75\text{ mA}$ $T_j = -40\text{ to }150^{\circ}C$ $V_{GE} = 0$	18			V
$BV_{GE}$	Gate Emitter Break-down Voltage	$I_C = \pm 2\text{ mA}$ $T_j = -40\text{ to }150^{\circ}C$	12		16	V
$I_{CES}$	Collector cut-off Current ( $V_{GE} = 0$ )	$V_{CE} = 15\text{ V}$ $V_{GE} = 0$ $T_j = 150^{\circ}C$ $V_{CE} = 200\text{ V}$ $V_{GE} = 0$ $T_j = 150^{\circ}C$			10 100	$\mu A$ $\mu A$
$I_{GES}$	Gate-Emitter Leakage Current ( $V_{CE} = 0$ )	$V_{GE} = \pm 10\text{ V}$ $V_{CE} = 0$			$\pm 0.7$	mA
$R_{GE}$	Gate Emitter Resistance			20		$K\Omega$

#### ON (\*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Threshold Voltage	$V_{CE} = V_{GE}$ $I_C = 250\ \mu A$ $T_j = -40\text{ to }150^{\circ}C$	0.6		2.4	V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 4.5\text{ V}$ $I_C = 10\text{ A}$ $T_j = 25^{\circ}C$ $V_{GE} = 4.5\text{ V}$ $I_C = 10\text{ A}$ $T_j = -40^{\circ}C$		1.2 1.3	1.8	V V
$I_C$	Collector Current	$V_{GE} = 4.5\text{ V}$ $V_{CE} = 9\text{ V}$	20			A

#### DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs}$	Forward Transconductance	$V_{CE} = 25\text{ V}$ $I_C = 10\text{ A}$	10	18		S
$C_{ies}$ $C_{oes}$ $C_{res}$	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{CE} = 25\text{ V}$ $f = 1\text{ MHz}$ $V_{GE} = 0$		1250 103 18	1700 140 25	pF pF pF
$Q_G$	Gate Charge	$V_{CE} = 320\text{ V}$ $I_C = 10\text{ A}$ $V_{GE} = 5\text{ V}$		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<sub>OFF</sub></sub> = 1 KΩ T <sub>C</sub> = 125 °C	20			A
U.I.S.	Unclamped Inductive Switching Current Functional Test	R <sub>G<sub>OFF</sub></sub> = 1 KΩ L = 200 μH T <sub>j</sub> = 125 °C R <sub>G<sub>OFF</sub></sub> = 1 KΩ L = 3 mH T <sub>start</sub> = 55 °C	15 12			A 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**

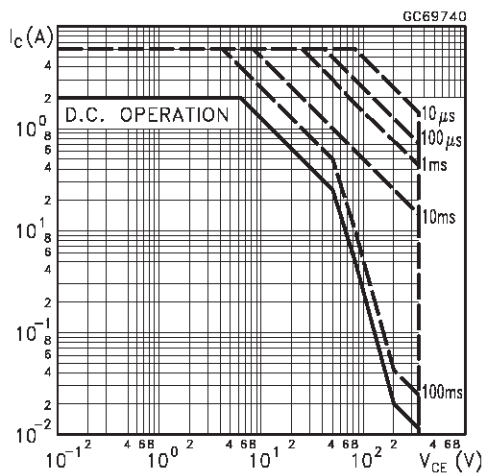
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t <sub>d(on)</sub> t <sub>r</sub>	Delay Time Rise Time	V <sub>CC</sub> = 320 V I <sub>C</sub> = 10 A V <sub>GE</sub> = 5 V R <sub>G</sub> = 1 KΩ		520 340		ns ns
(di/dt) <sub>on</sub> E <sub>on</sub>	Turn-on Current Slope Turn-on Switching Losses	V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

**SWITCHING OFF**

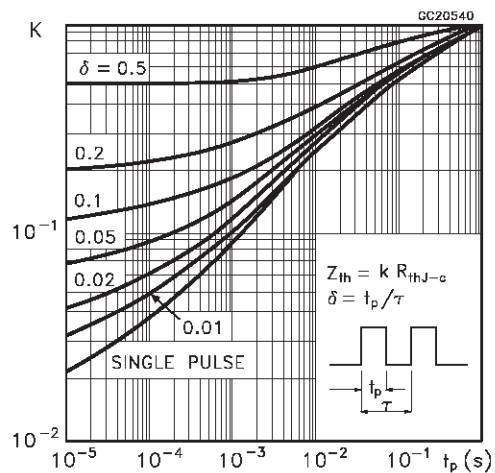
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t <sub>c</sub> t <sub>r</sub> (V <sub>off</sub> ) t <sub>f</sub> t <sub>d</sub> (off) E <sub>off</sub> (**)	Cross-Over Time Off Voltage Rise Time Fall Time Off Voltage Delay Time Turn-off Switching Loss	V <sub>CLAMP</sub> = 320 V I <sub>C</sub> = 10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

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

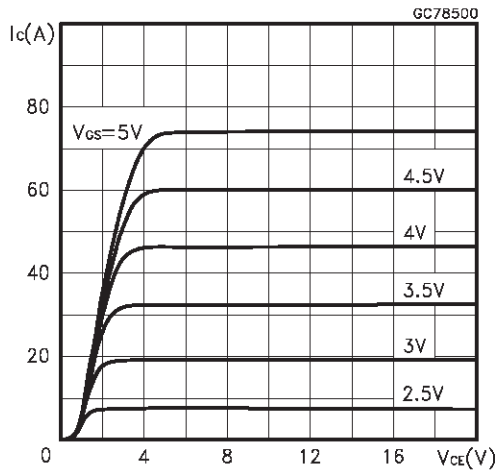
**Safe Operating Area**



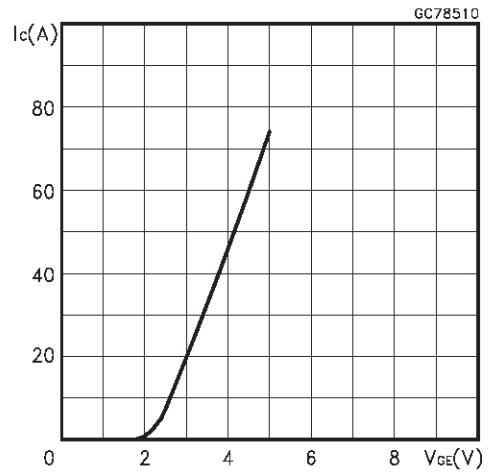
**Thermal Impedance**



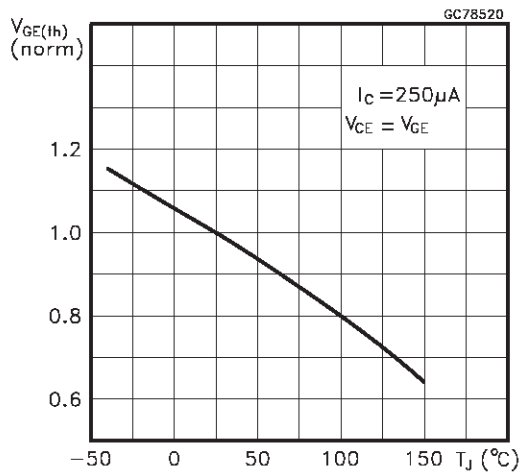
Output Characteristics



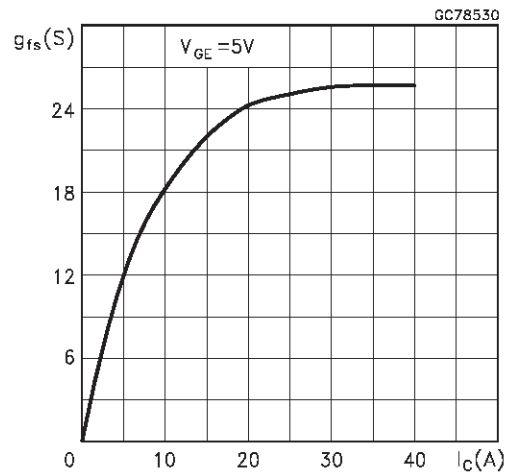
Transfer Characteristics



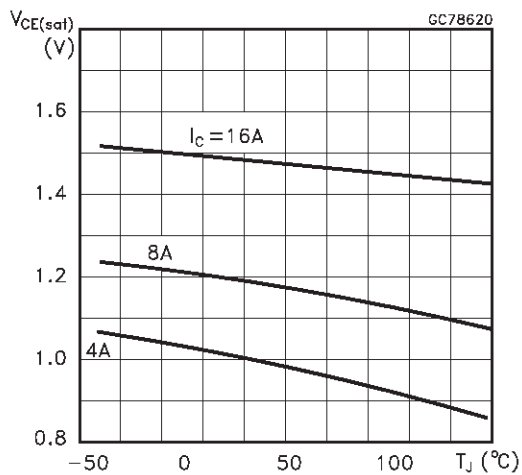
Normalized Gate Threshold Voltage vs Temperature



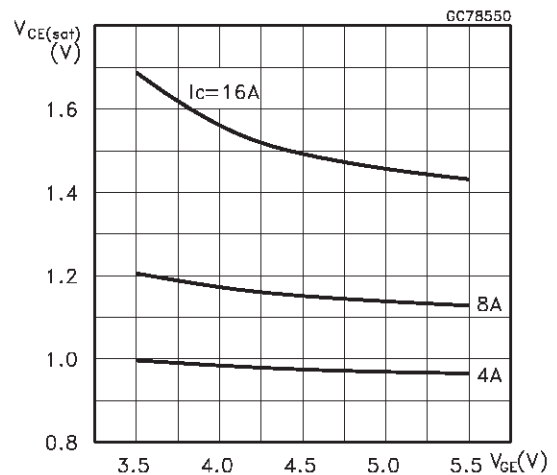
Transconductance



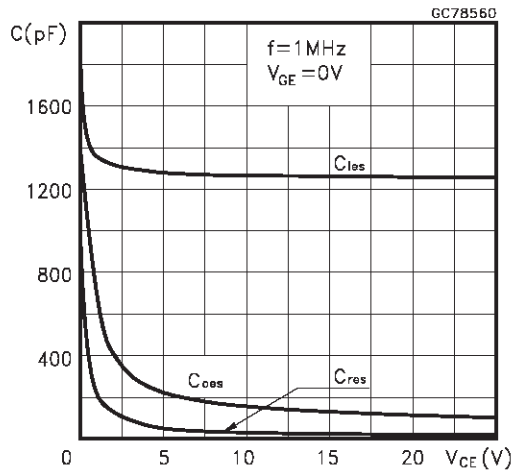
Collector-Emitter On Voltage vs Temperature



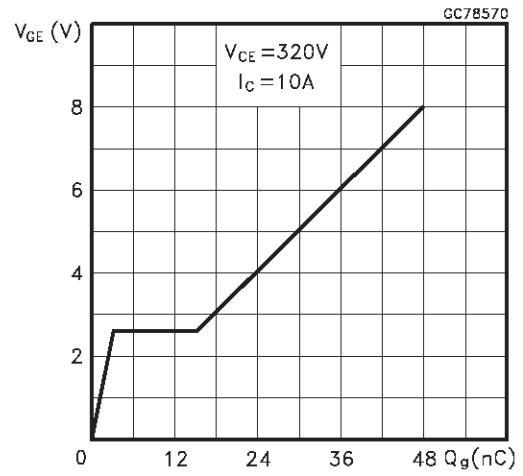
Collector-Emitter On Voltage vs Gate-Emitter Voltage



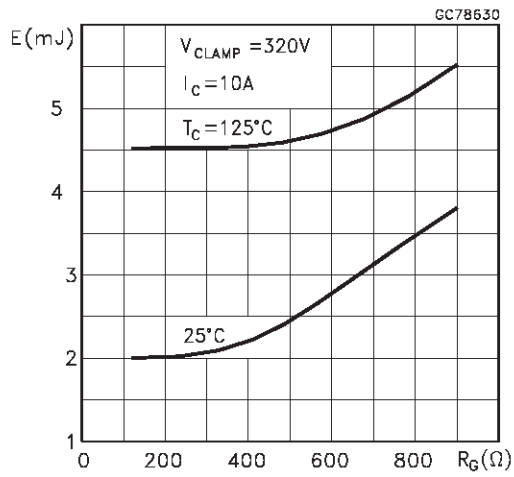
Capacitance Variations



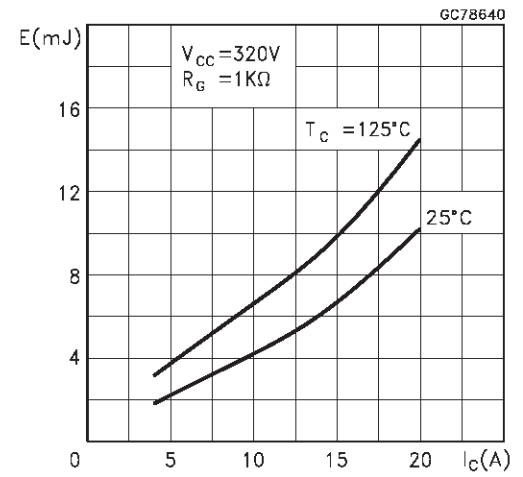
Gate Charge vs Gate-Emitter Voltage



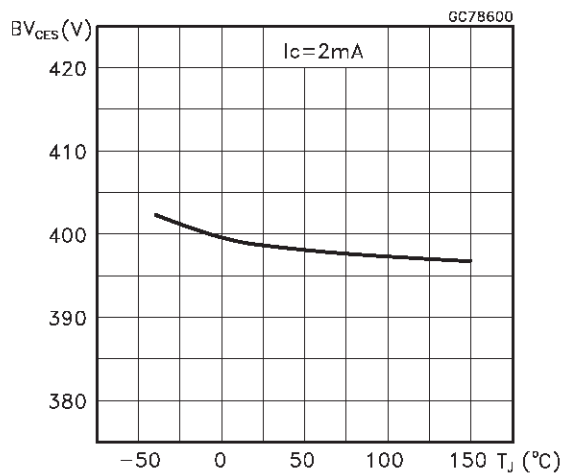
Off Losses vs Gate Resistance



Off Losses vs Collector Current



Break-down Voltage vs Temperature



Clamping Voltage vs Gate Resistance

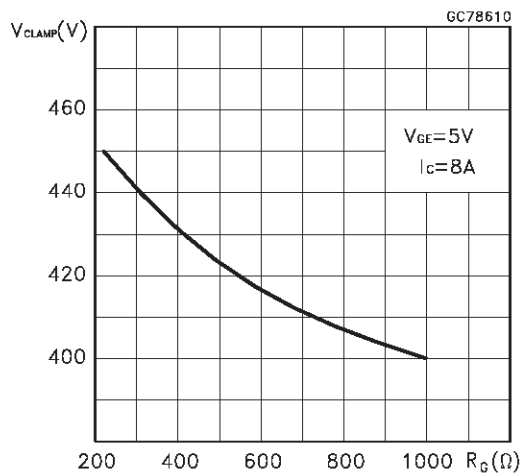


Fig. 1: Unclamped Inductive Load Test Circuit

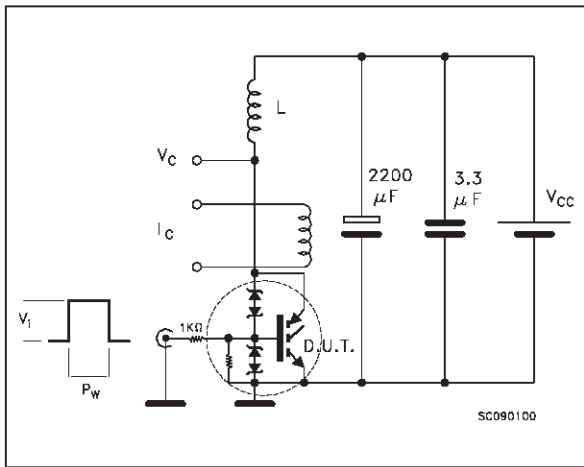


Fig. 2: Unclamped Inductive Waveform

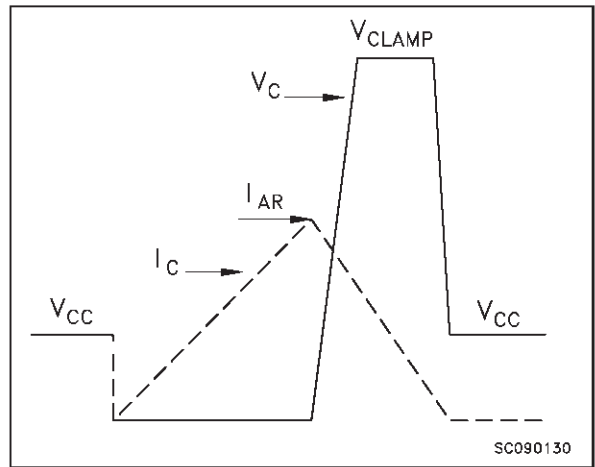


Fig. 3: Switching Times Test Circuits For Resistive Load

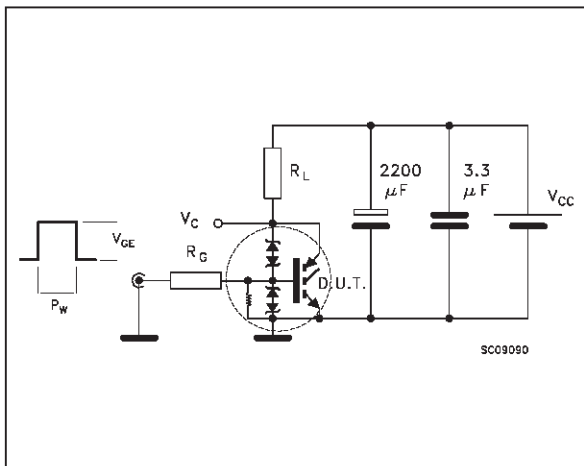


Fig. 4: Gate Charge test Circuit

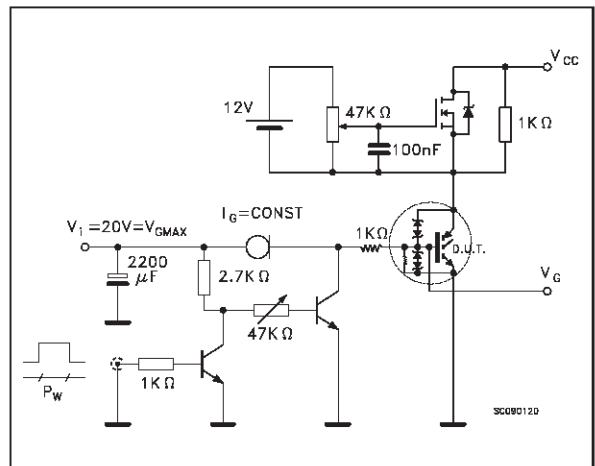
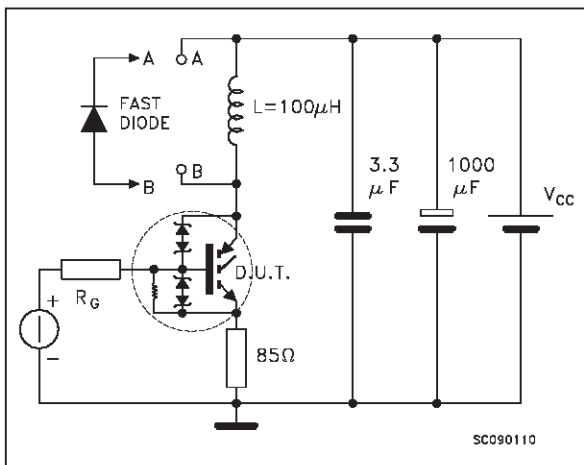
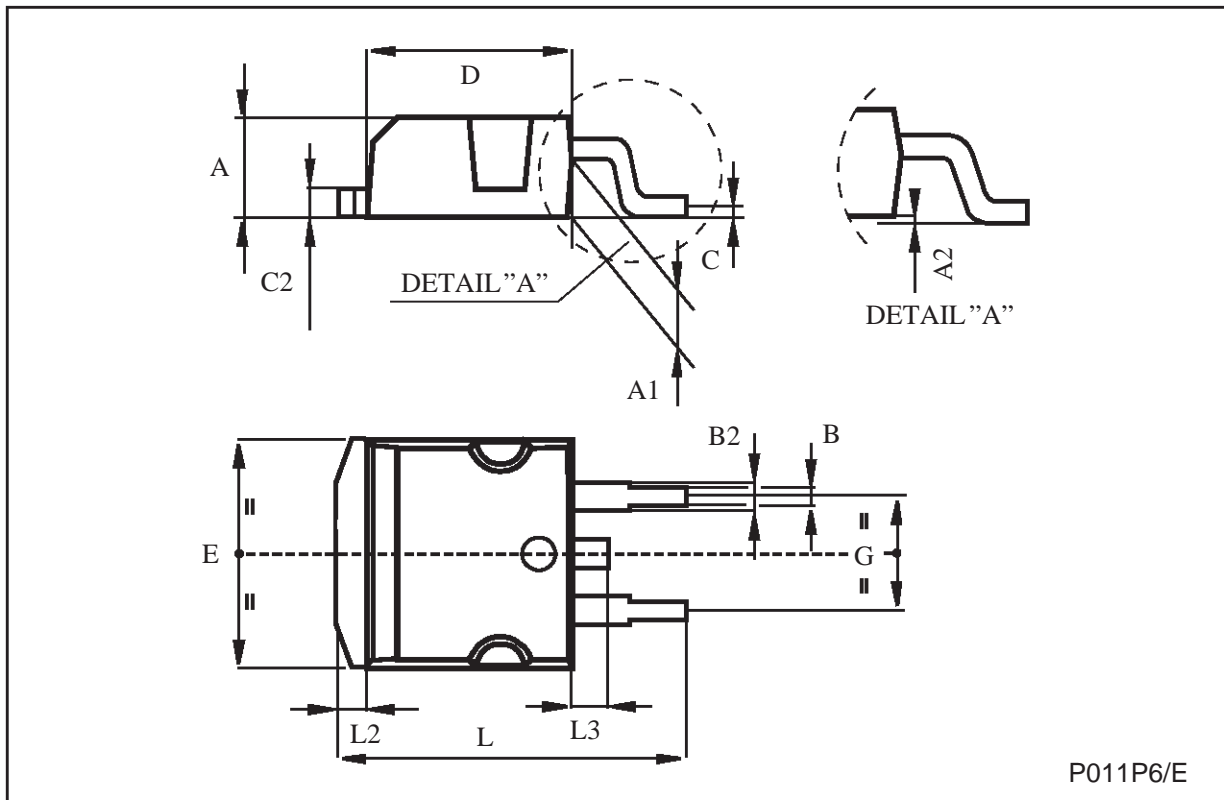


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



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



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