



# STGB10NB37LZ

## N-CHANNEL CLAMPED 20A - D2PAK INTERNALLY CLAMPED PowerMesh™ IGBT

TYPE	V <sub>CES</sub>	V <sub>CE(sat)</sub>	I <sub>C</sub>
STGB10NB37LZ	CLAMPED	< 1.8 V	20 A

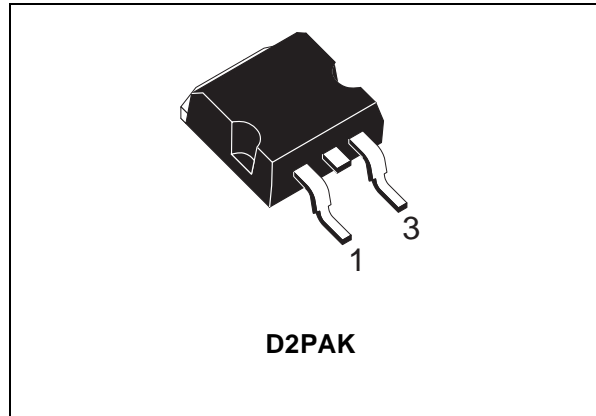
- POLYSILICON GATE VOLTAGE DRIVEN
- LOW THRESHOLD VOLTAGE
- LOW ON-VOLTAGE DROP
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- HIGH VOLTAGE CLAMPING FEATURE

### DESCRIPTION

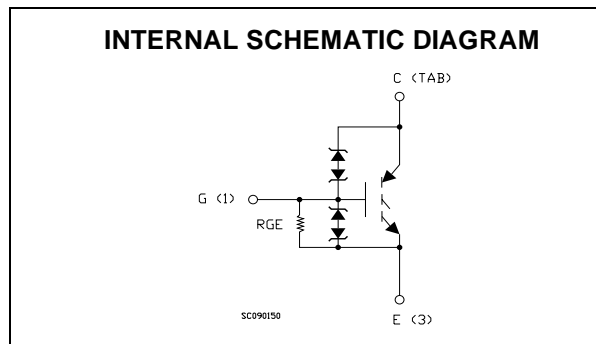
Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH™ IGBTs, with outstanding performances. The built in collector-gate zener exhibits a very precise active clamping while the gate-emitter zener supplies an ESD protection.

### APPLICATIONS

- AUTOMOTIVE IGNITION



D2PAK



### 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> = 100°C	20	A
I <sub>CM</sub>	Collector Current (pulse width < 100μs)	60	A
P <sub>TOT</sub>	Total Dissipation at T <sub>C</sub> = 25°C	125	W
	Derating Factor	0.83	W/°C
ESD	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

## STGB10NB37LZ

### THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	1.2	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	°C/W
Rthc-sink	Thermal Resistance Case-sink Typ	0.2	°C/W

### ELECTRICAL CHARACTERISTICS (TCASE = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
BV(CES)	Clamped Voltage	$I_C = 2 \text{ mA}$ , $V_{GE} = 0$ , $T_j = -40^\circ\text{C}$ to $150^\circ\text{C}$	375	400	425	V
BV(ECR)	Emitter Collector Break-down Voltage	$I_{EC} = 75 \text{ mA}$ , $V_{GE} = 0$ , $T_j = -40^\circ\text{C}$ to $150^\circ\text{C}$	18			V
BV <sub>GE</sub>	Gate Emitter Break-down Voltage	$I_G = \pm 2 \text{ mA}$ $T_j = -40^\circ\text{C}$ to $150^\circ\text{C}$	12		16	V
I <sub>CES</sub>	Collector cut-off Current ( $V_{GE} = 0$ )	$V_{CE} = 15 \text{ V}$ , $V_{GE} = 0$ , $T_j = 150^\circ\text{C}$ $V_{CE} = 200 \text{ V}$ , $V_{GE} = 0$ , $T_C = 150^\circ\text{C}$			10 100	$\mu\text{A}$ $\mu\text{A}$
I <sub>GES</sub>	Gate-Emitter Leakage Current ( $V_{CE} = 0$ )	$V_{GE} = \pm 10 \text{ V}$ , $V_{CE} = 0$			$\pm 700$	$\mu\text{A}$
R <sub>GE</sub>	Gate Emitter Resistance			20		K $\Omega$

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>GE(th)</sub>	Gate Threshold Voltage	$V_{CE} = V_{GE}$ , $I_C = 250 \mu\text{A}$ , $T_j = -40^\circ\text{C}$ to $150^\circ\text{C}$	0.6		2.4	V
V <sub>CE(SAT)</sub>	Collector-Emitter Saturation Voltage	$V_{GE} = 4.5 \text{ V}$ , $I_C = 10 \text{ A}$ , $T_j = 25^\circ\text{C}$ $V_{GE} = 4.5 \text{ V}$ , $I_C = 10 \text{ A}$ , $T_C = -40^\circ\text{C}$		1.2 1.3	1.8	V V
I <sub>C</sub>	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 <sub>fs</sub>	Forward Transconductance	$V_{CE} = 15 \text{ V}$ , $I_C = 20 \text{ A}$		18		S
C <sub>ies</sub>	Input Capacitance	$V_{CE} = 25 \text{ V}$ , $f = 1 \text{ MHz}$ , $V_{GE} = 0$		1250		pF
C <sub>oes</sub>	Output Capacitance			103		pF
C <sub>res</sub>	Reverse Transfer Capacitance			18		pF
Q <sub>g</sub>	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, T <sub>C</sub> = 125 °C R <sub>G OFF</sub> = 1KΩ, V <sub>GE</sub> = 5 V L = 300μH	20			A
U.I.S.	Unclamped Inductive Switching Current	R <sub>G OFF</sub> = 1KΩ, L = 1.6 mH, T <sub>C</sub> = 125°C, V <sub>CC</sub> = 30V	15			A

SWITCHING ON

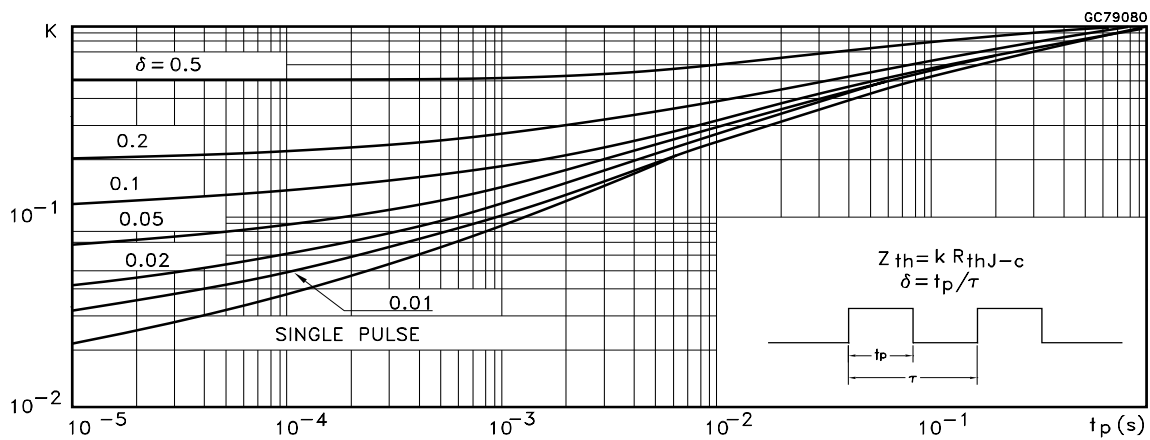
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>CC</sub> = 320 V, I <sub>C</sub> = 10 A		520		ns
t <sub>r</sub>	Rise Time	R <sub>G</sub> = 1KΩ, V <sub>GE</sub> = 5 V		340		ns
(di/dt) <sub>on</sub> E <sub>on</sub>	Turn-on Current Slope Turn-on Switching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

SWITCHING OFF

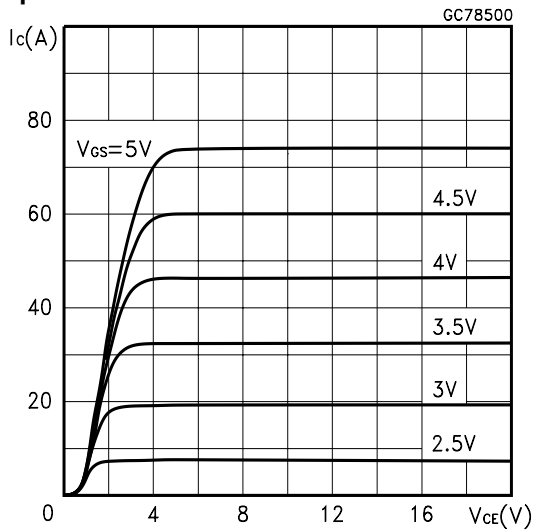
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t <sub>c</sub>	Cross-over Time	V <sub>clamp</sub> = 320 V, I <sub>C</sub> = 10 A, R <sub>GE</sub> = 1KΩ, V <sub>GE</sub> = 5 V		4		μs
t <sub>r(Voff)</sub>	Off Voltage Rise Time			2.2		μs
t <sub>d(off)</sub>	Delay Time			14.8		μs
t <sub>f</sub>	Fall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

(●) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %. (1) Pulse width limited by max. junction temperature. (\*\*) Losses Include Also the Tail

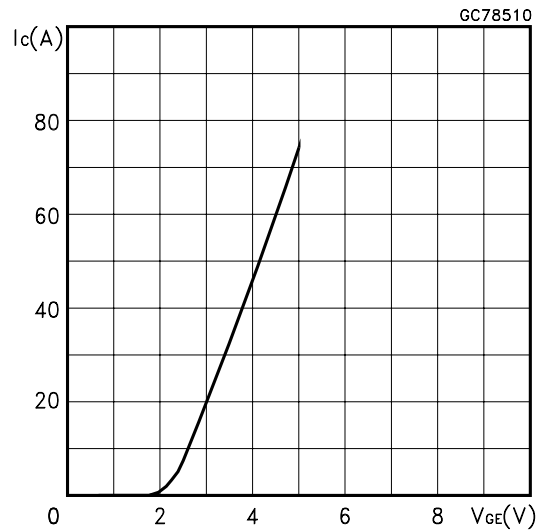
Normalized Transient Thermal Impedance



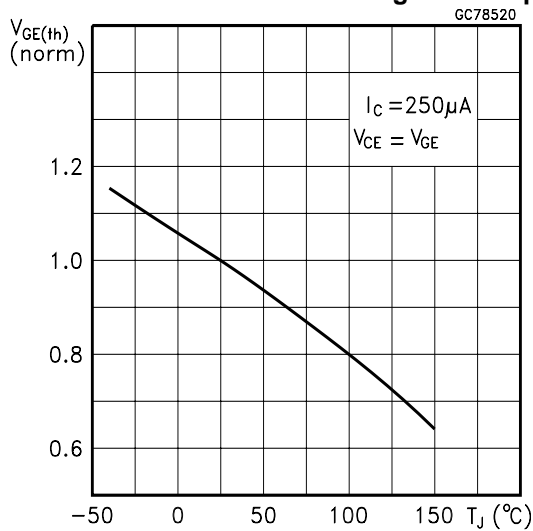
Output Characteristics



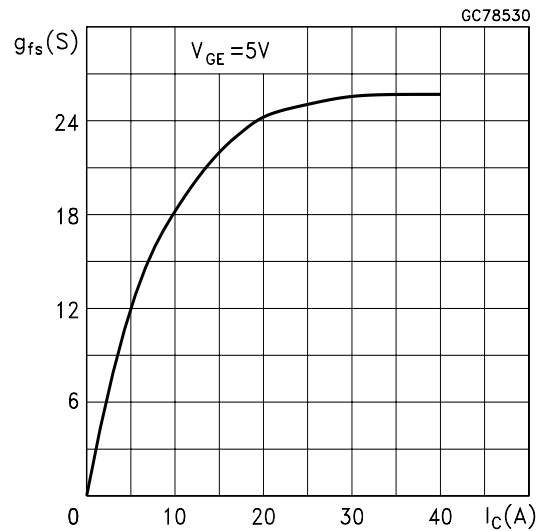
Transfer Characteristics



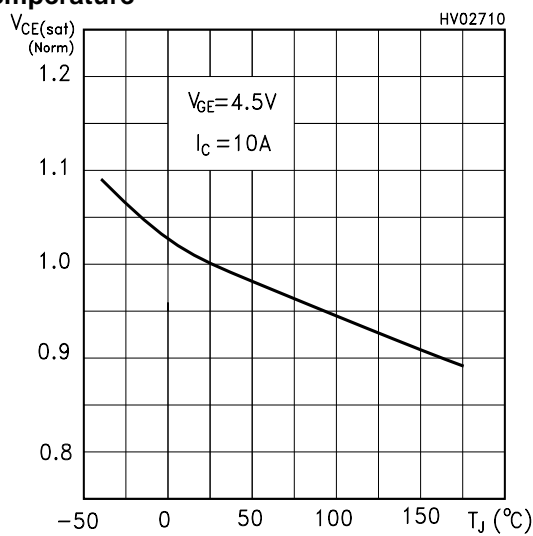
Normalized Gate Threshold Voltage vs Temp.



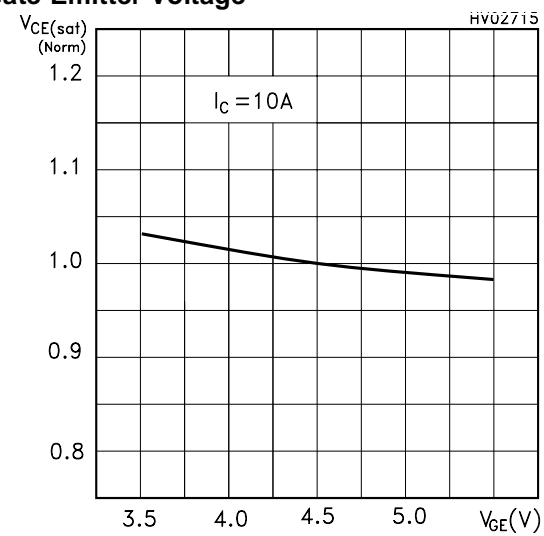
Transconductance



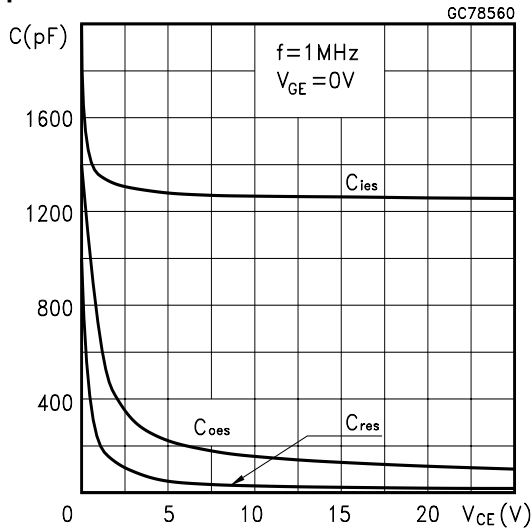
Normalized Collector-Emitter On Voltage vs Temperature



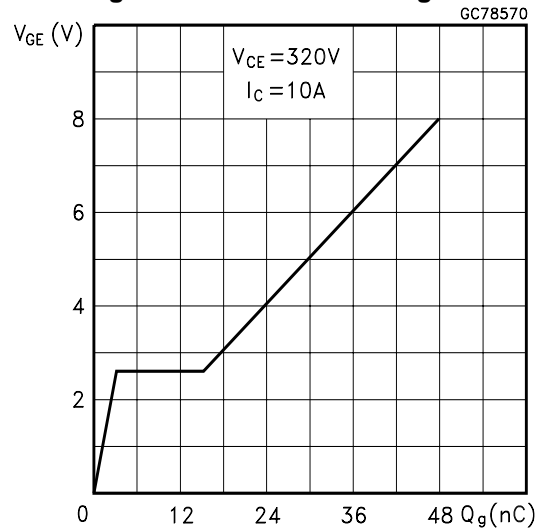
Normalized Collector-Emitter On Voltage vs Gate-Emitter Voltage



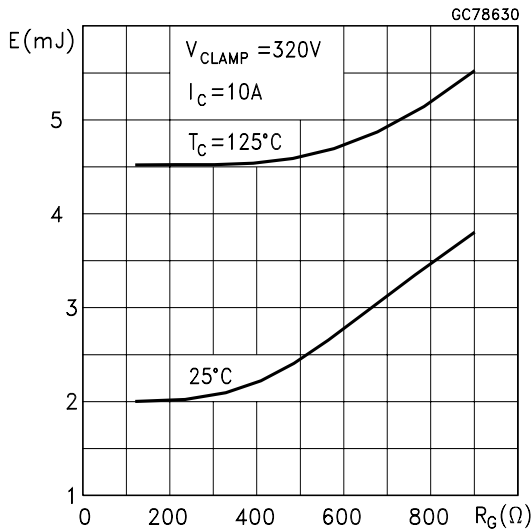
Capacitance Variations



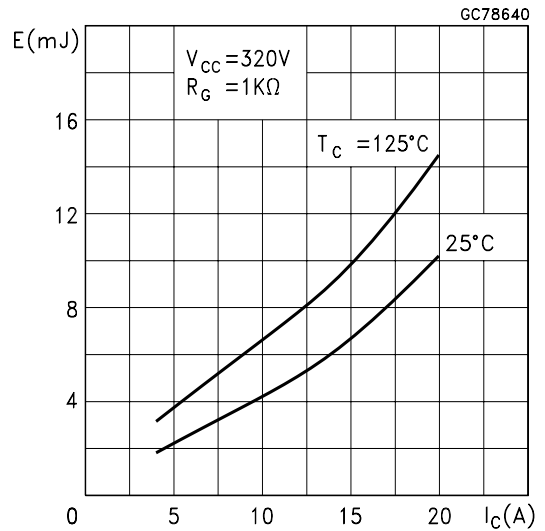
Gate Charge vs Gate-Emitter Voltage



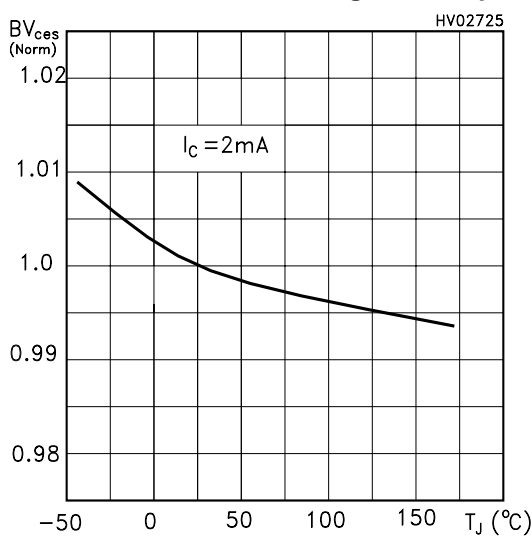
Off Losses vs Gate Resistance



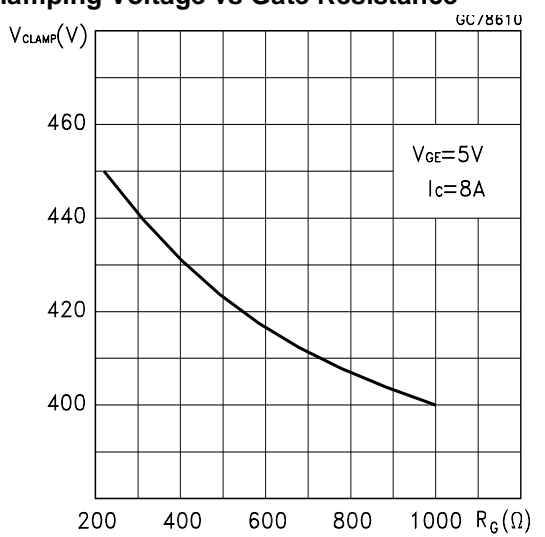
Off Losses vs Collector Current



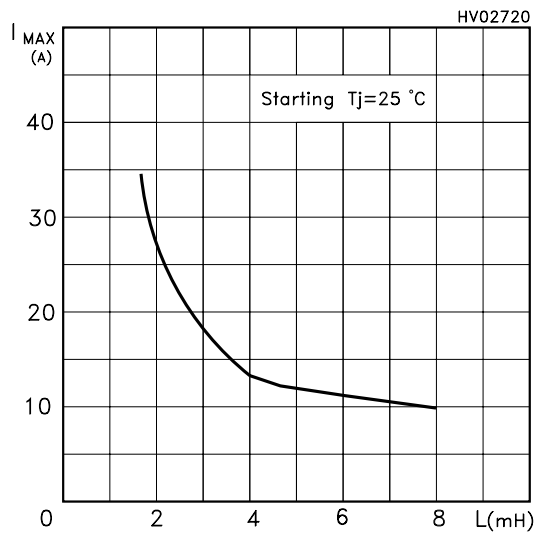
Normalized Break-down Voltage vs Temp.



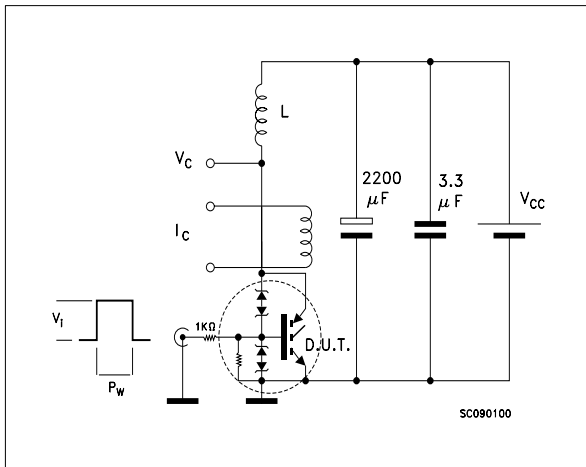
Clamping Voltage vs Gate Resistance



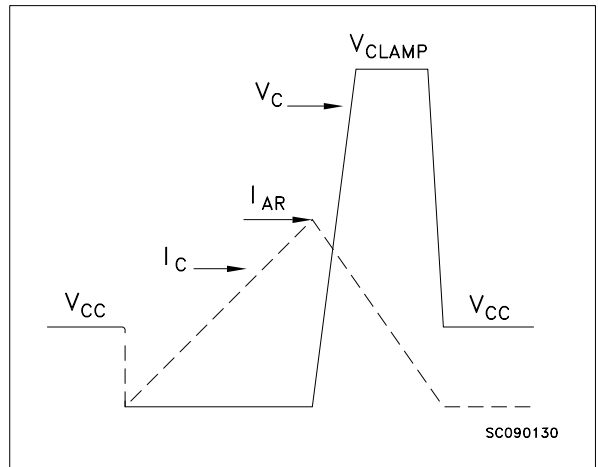
Self Clamped Inductive Switching I<sub>MAX</sub> vs  
Open Secondary Coil



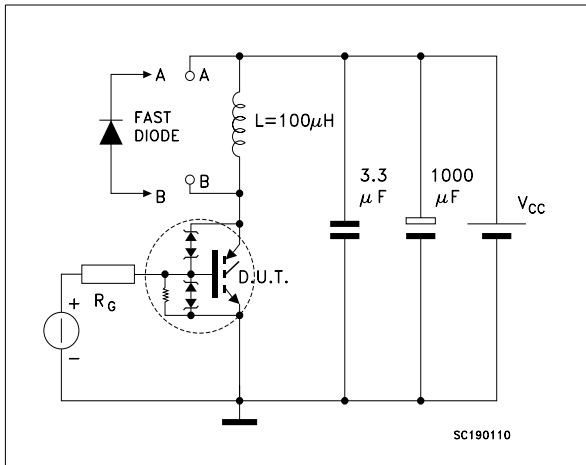
**Fig. 1: Unclamped Inductive Load Test Circuit**



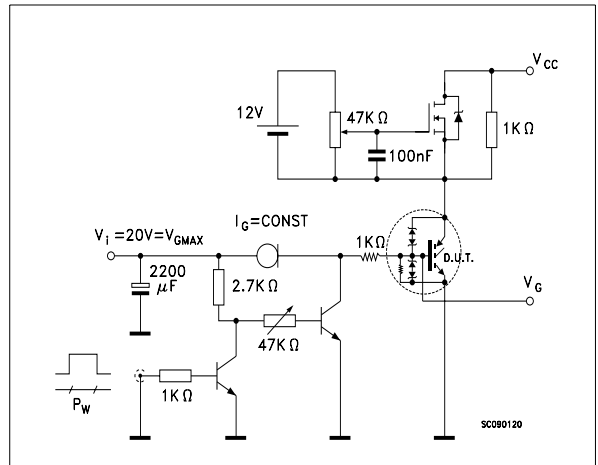
**Fig. 2: Unclamped Inductive Waveform**



**Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times**

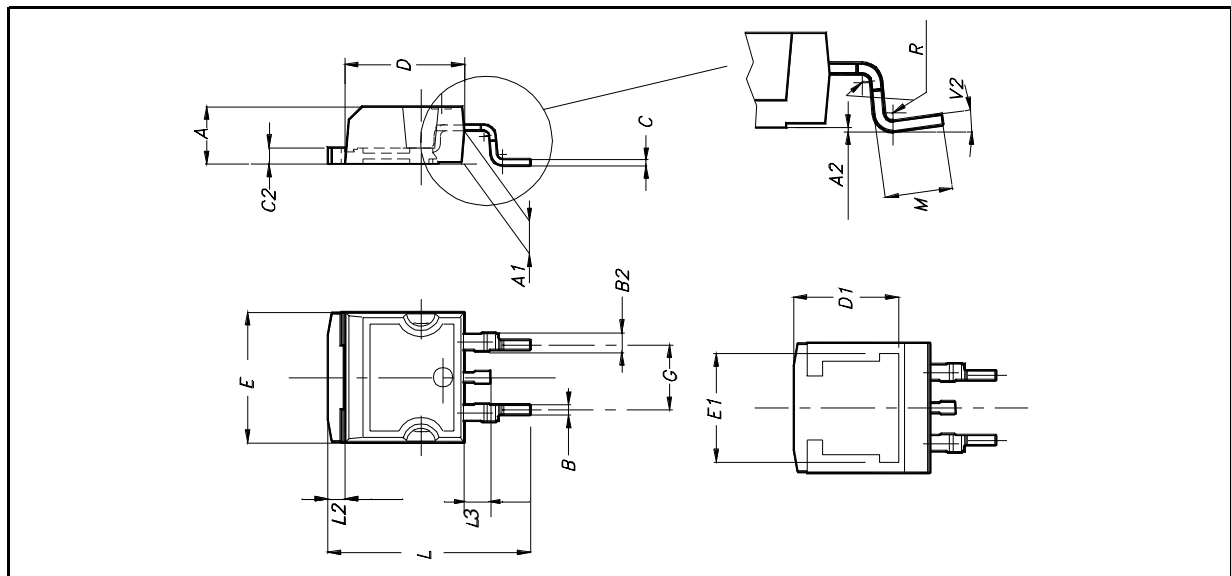


**Fig. 4: Gate Charge test Circuit**



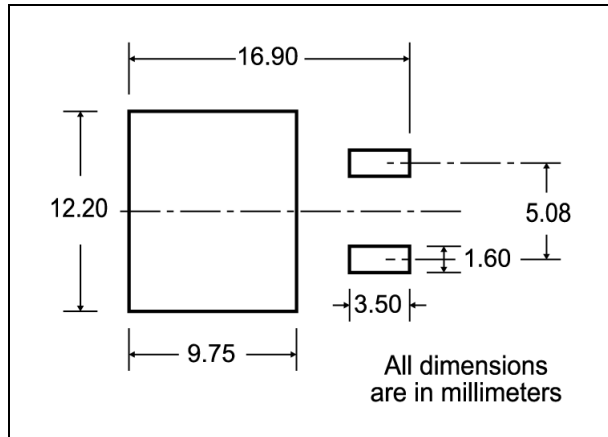
**D<sup>2</sup>PAK MECHANICAL DATA**

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
A2	0.03		0.23	0.001		0.009
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	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334	
G	4.88		5.28	0.192		0.208
L	15		15.85	0.590		0.625
L2	1.27		1.4	0.050		0.055
L3	1.4		1.75	0.055		0.068
M	2.4		3.2	0.094		0.126
R		0.4			0.015	
V2	0°		8°			

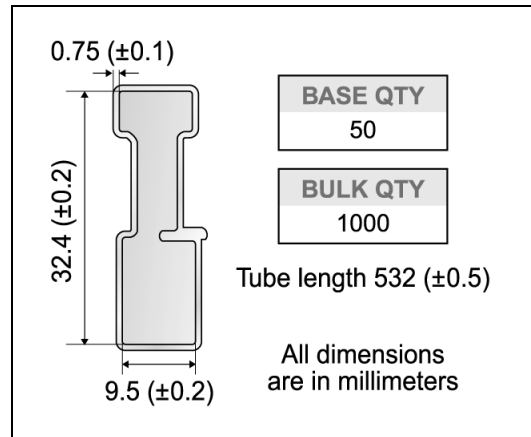




**D<sup>2</sup>PAK FOOTPRINT**



**TUBE SHIPMENT (no suffix)\***



**TAPE AND REEL SHIPMENT (suffix "T4")\***

Diagram showing the tape mechanical data. It includes a top view of the tape with dimensions A, B, C, D, and a side view with dimensions T, N, G. A 40 mm min. access hole is shown at the slot location. The tape slot in the core has a 2.5 mm min. width. The full radius is also indicated.

**TAPE MECHANICAL DATA**

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	10.5	10.7	0.413	0.421
B0	15.7	15.9	0.618	0.626
D	1.5	1.6	0.059	0.063
D1	1.59	1.61	0.062	0.063
E	1.65	1.85	0.065	0.073
F	11.4	11.6	0.449	0.456
K0	4.8	5.0	0.189	0.197
P0	3.9	4.1	0.153	0.161
P1	11.9	12.1	0.468	0.476
P2	1.9	2.1	0.075	0.082
R	50		1.574	
T	0.25	0.35	0.0098	0.0137
W	23.7	24.3	0.933	0.956

**REEL MECHANICAL DATA**

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0.795	
G	24.4	26.4	0.960	1.039
N	100		3.937	
T		30.4		1.197

**BASE QTY** 1000      **BULK QTY** 1000

Diagram showing the tape and reel shipment details. It includes a top view of the tape with dimensions A<sub>0</sub>, B<sub>0</sub>, D<sub>1</sub>, F, W, P<sub>1</sub>, P<sub>2</sub>, P<sub>0</sub>, E, and a side view with dimensions K<sub>0</sub>, T, D, B<sub>0</sub>, D<sub>1</sub>, A<sub>0</sub>, P<sub>1</sub>. A 10-pitch cumulative tolerance on the tape is indicated as ±0.2 mm. The center line of the cavity is also shown. The bending radius is labeled as R min. The user direction of feed and feed direction are also indicated.

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