



STGB10NB37LZ

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

TYPE	V _{CES}	V _{CE(sat)}	I _C
STGB10NB37LZ	CLAMPED	< 1.8 V	20 A

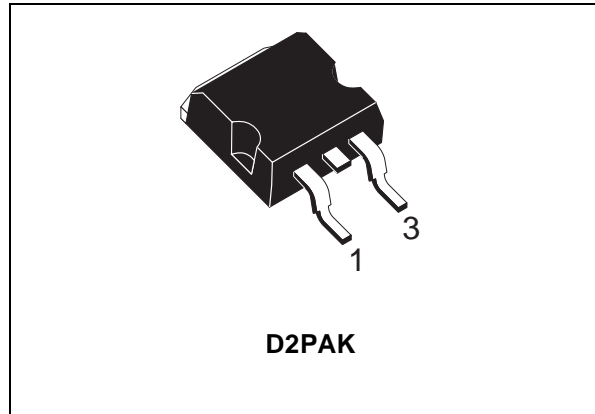
- POLYSILICON GATE VOLTAGE DRIVEN
- LOW THRESHOLD VOLTAGE
- LOW ON-VOLTAGE DROP
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- HIGH VOLTAGE CLAMPING FEATURE

DESCRIPTION

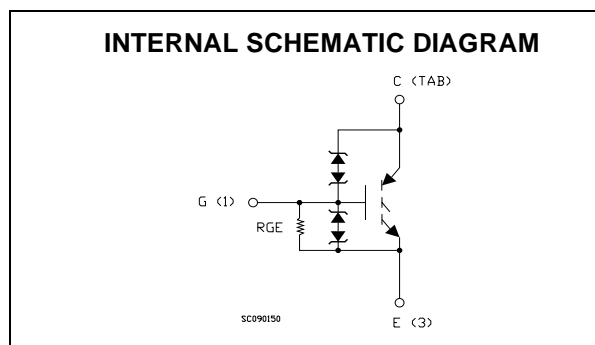
Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH™ IGBTs, with outstanding performances. The built in collector-gate zener exhibits a very precise active clamping while the gate-emitter zener supplies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

APPLICATIONS

- AUTOMOTIVE IGNITION



D2PAK



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CES}	Collector-Emitter Voltage (V _{GS} = 0)	CLAMPED	V
V _{ECR}	Reverse Battery Protection	18	V
V _{GE}	Gate-Emitter Voltage	CLAMPED	V
I _C	Collector Current (continuous) at T _C = 100°C	20	A
I _{CM}	Collector Current (pulse width < 100μs)	60	A
P _{TOT}	Total Dissipation at T _C = 25°C	125	W
	Derating Factor	0.83	W/°C
ESD	ESD (Human Body Model)	4	KV
T _{stg}	Storage Temperature	-65 to 175	°C
T _j	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°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°C	18			V
BV _{GE}	Gate Emitter Break-down Voltage	$I_G = \pm 2 \text{ mA}$ $T_j = -40^\circ\text{C}$ to 150°C	12		16	V
I _{CES}	Collector cut-off Current ($V_{GE} = 0$)	$V_{CE} = 15 \text{ V}$, $V_{GE} = 0$, $T_j = 150^\circ\text{C}$ $V_{CE} = 200 \text{ V}$, $V_{GE} = 0$, $T_C = 150^\circ\text{C}$			10 100	μA μA
I _{GES}	Gate-Emitter Leakage Current ($V_{CE} = 0$)	$V_{GE} = \pm 10 \text{ V}$, $V_{CE} = 0$			± 700	μA
R _{GE}	Gate Emitter Resistance			20		K Ω

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GE(th)}	Gate Threshold Voltage	$V_{CE} = V_{GE}$, $I_C = 250 \mu\text{A}$, $T_j = -40^\circ\text{C}$ to 150°C	0.6		2.4	V
V _{CE(SAT)}	Collector-Emitter Saturation Voltage	$V_{GE} = 4.5 \text{ V}$, $I_C = 10 \text{ A}$, $T_j = 25^\circ\text{C}$ $V_{GE} = 4.5 \text{ V}$, $I_C = 10 \text{ A}$, $T_C = -40^\circ\text{C}$		1.2 1.3	1.8	V V
I _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	$V_{CE} = 15 \text{ V}$, $I_C = 20 \text{ A}$		18		S
C _{ies}	Input Capacitance	$V_{CE} = 25 \text{ V}$, $f = 1 \text{ MHz}$, $V_{GE} = 0$		1250		pF
C _{oes}	Output Capacitance			103		pF
C _{res}	Reverse Transfer Capacitance			18		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 _L	Latching Current	V _{Clamp} = 320 V, T _C = 125 °C R _{G OFF} = 1KΩ, V _{GE} = 5 V L = 300μH	20			A
U.I.S.	Unclamped Inductive Switching Current	R _{G OFF} = 1KΩ, L = 1.6 mH, T _C = 125°C, V _{CC} = 30V	15			A

SWITCHING ON

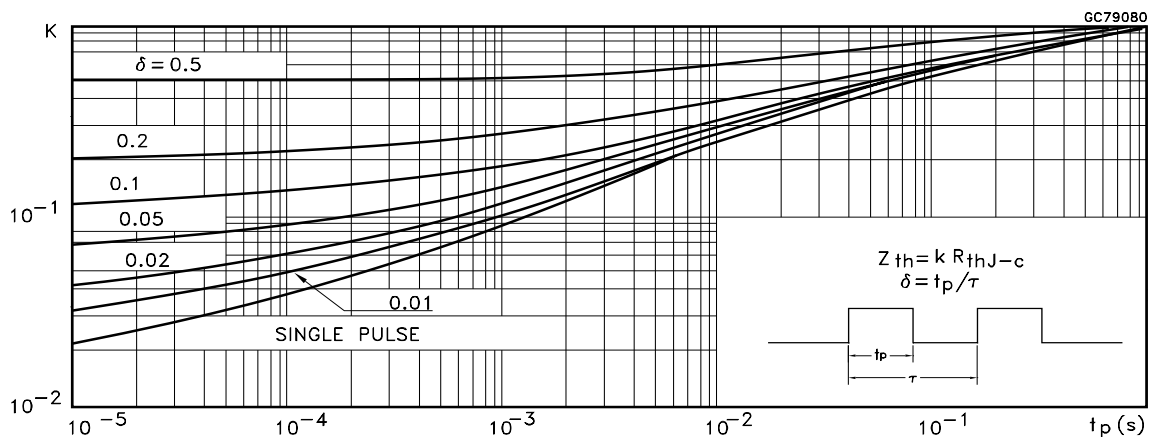
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t _{d(on)}	Turn-on Delay Time	V _{CC} = 320 V, I _C = 10 A		520		ns
t _r	Rise Time	R _G = 1KΩ, V _{GE} = 5 V		340		ns
(di/dt) _{on} E _{on}	Turn-on Current Slope Turn-on Switching Losses	V _{CC} = 320 V, I _C = 10 A R _G = 1KΩ, V _{GE} = 5 V		17 180		A/μs μJ

SWITCHING OFF

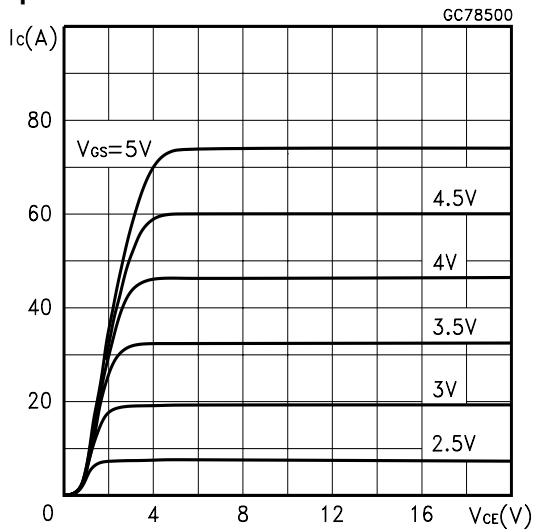
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t _c	Cross-over Time	V _{clamp} = 320 V, I _C = 10 A, R _{GE} = 1KΩ, V _{GE} = 5 V		4		μs
t _{r(Voff)}	Off Voltage Rise Time			2.2		μs
t _{d(off)}	Delay Time			14.8		μs
t _f	Fall Time			1.5		μs
E _{off(**)}	Turn-off Switching Loss			4.0		mJ
t _c	Cross-over Time	V _{clamp} = 320 V, I _C = 10 A, R _{GE} = 1KΩ, V _{GE} = 5 V T _J = 125 °C		5.2		μs
t _{r(Voff)}	Off Voltage Rise Time			2.8		μs
t _{d(off)}	Delay Time			15.8		μs
t _f	Fall Time			2		μs
E _{off(**)}	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

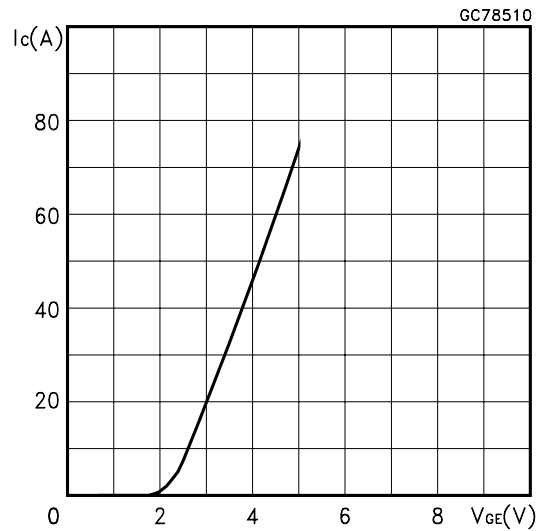
Normalized Transient Thermal Impedance



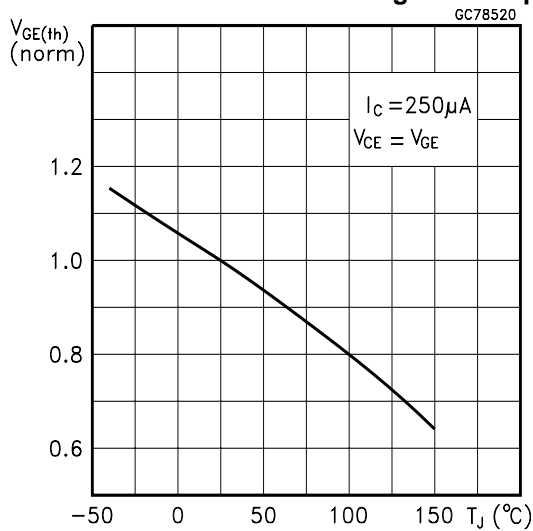
Output Characteristics



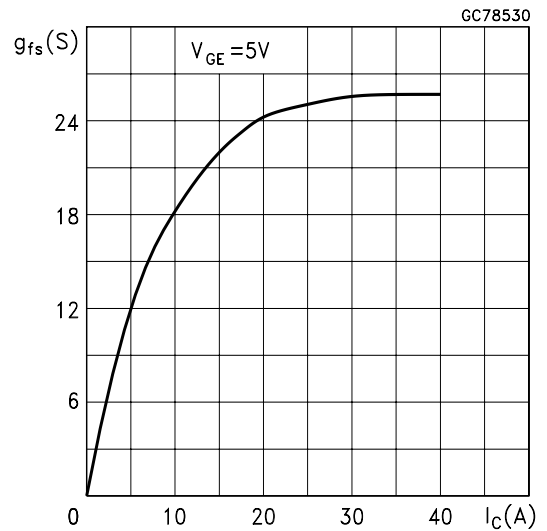
Transfer Characteristics



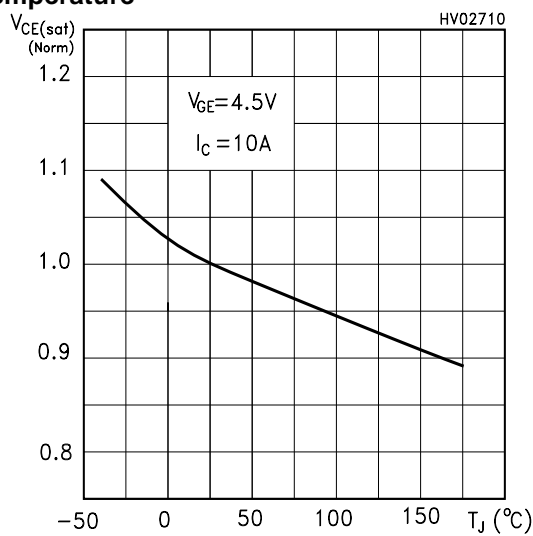
Normalized Gate Threshold Voltage vs Temp.



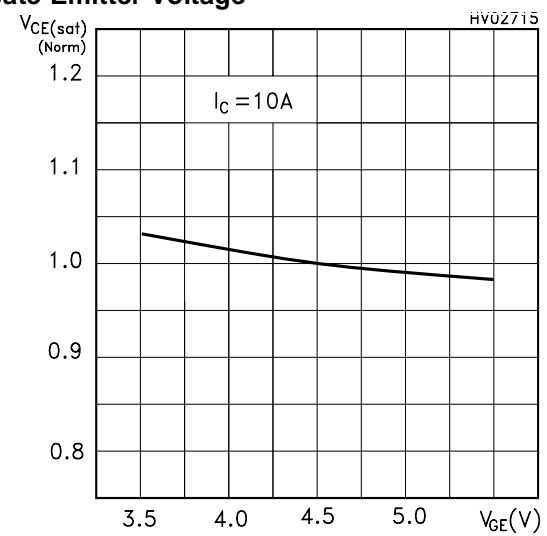
Transconductance



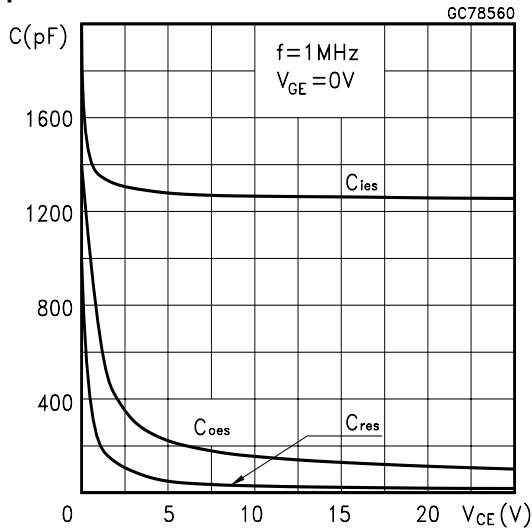
Normalized Collector-Emitter On Voltage vs Temperature



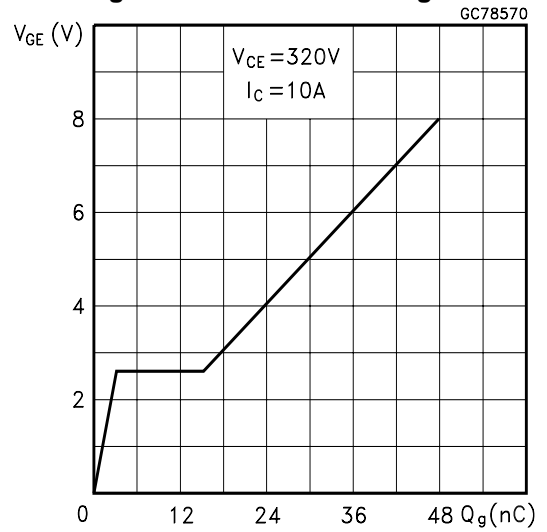
Normalized Collector-Emitter On Voltage vs Gate-Emitter Voltage



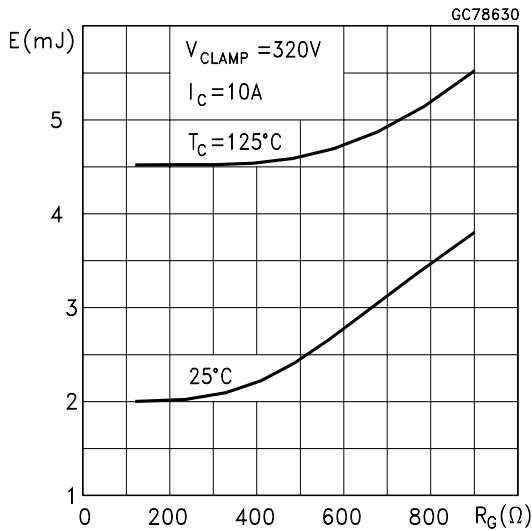
Capacitance Variations



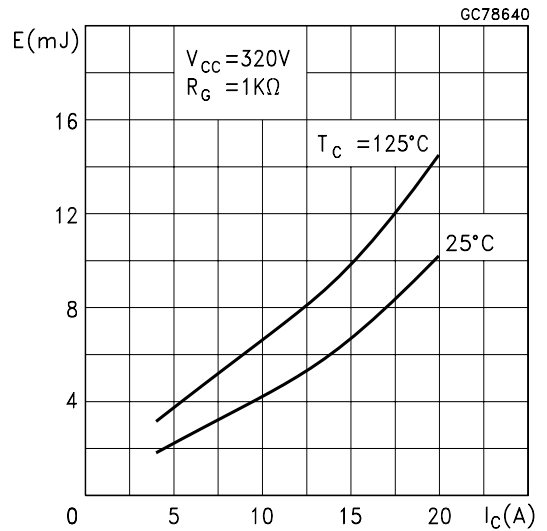
Gate Charge vs Gate-Emitter Voltage



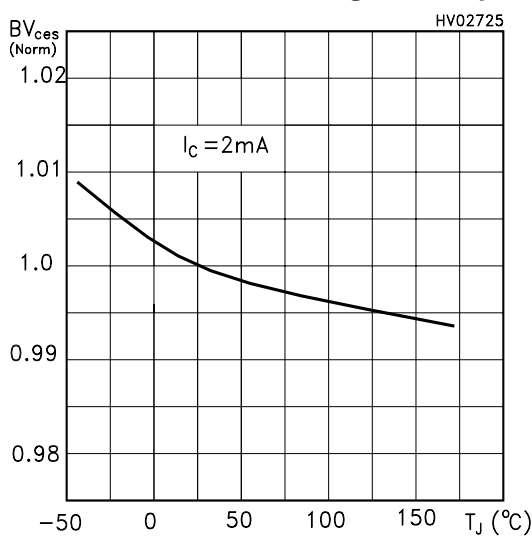
Off Losses vs Gate Resistance



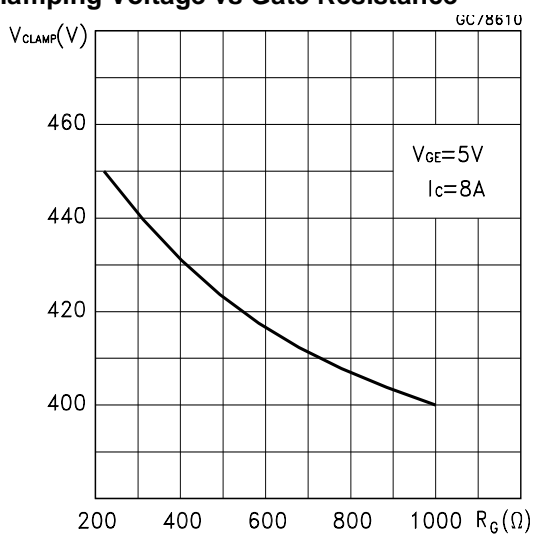
Off Losses vs Collector Current



Normalized Break-down Voltage vs Temp.



Clamping Voltage vs Gate Resistance



Self Clamped Inductive Switching I_{MAX} vs Open Secondary Coil

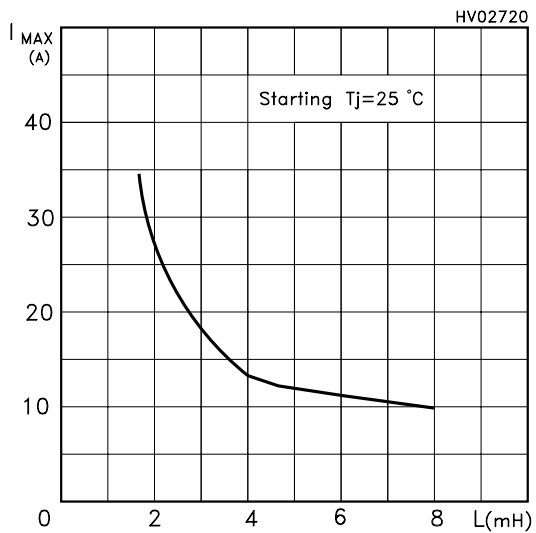


Fig. 1: Unclamped Inductive Load Test Circuit

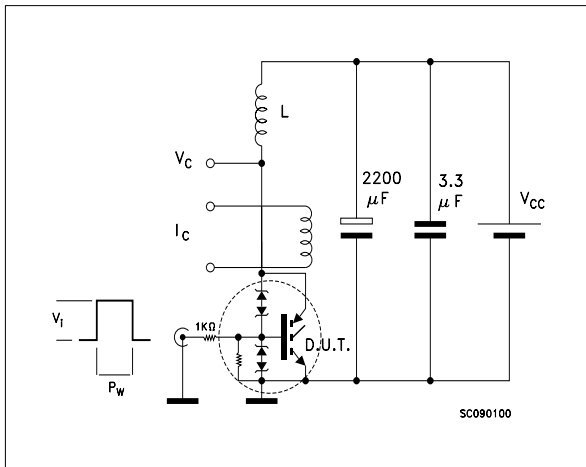


Fig. 2: Unclamped Inductive Waveform

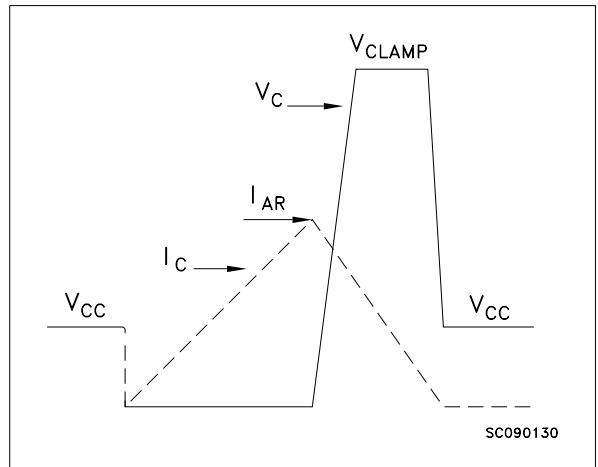


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times

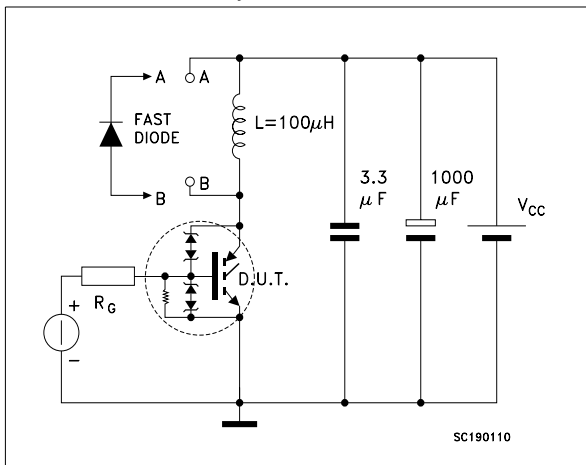
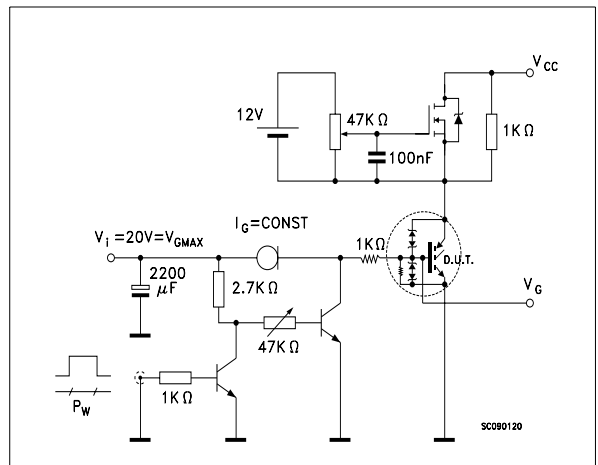
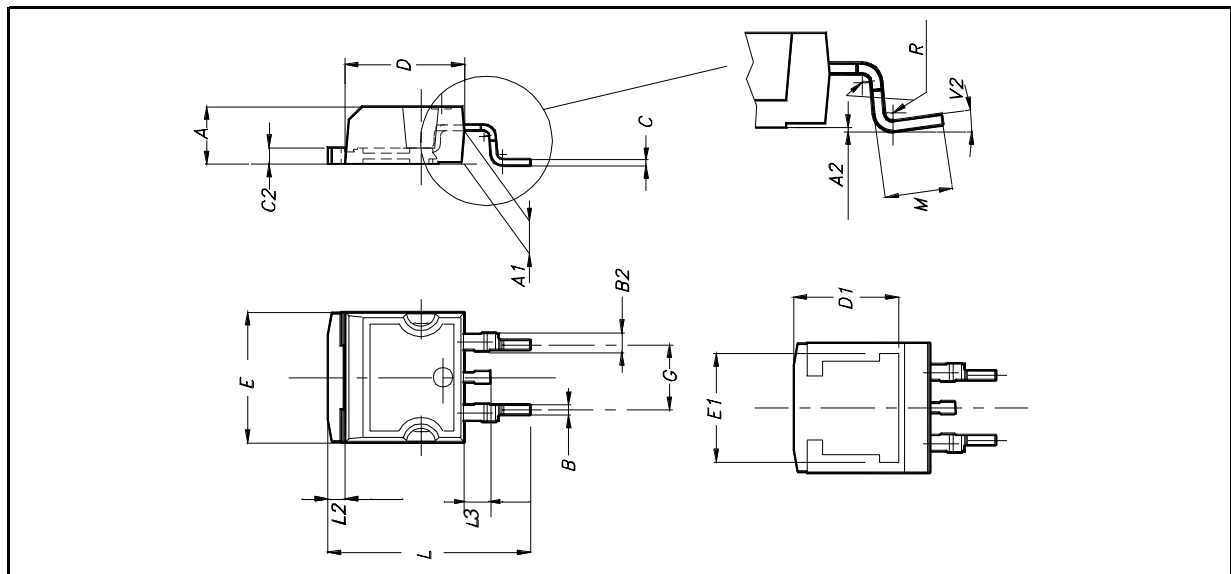


Fig. 4: Gate Charge test Circuit

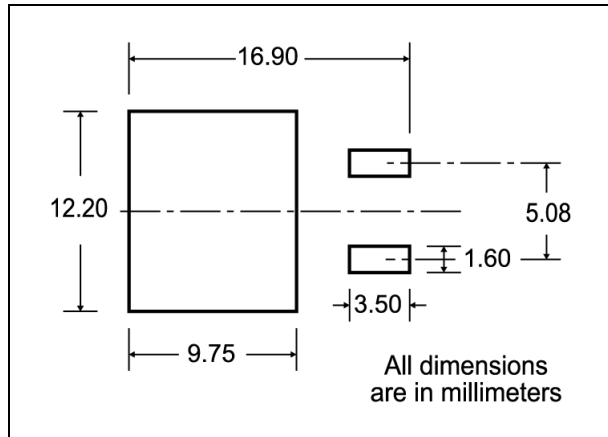


D²PAK MECHANICAL DATA

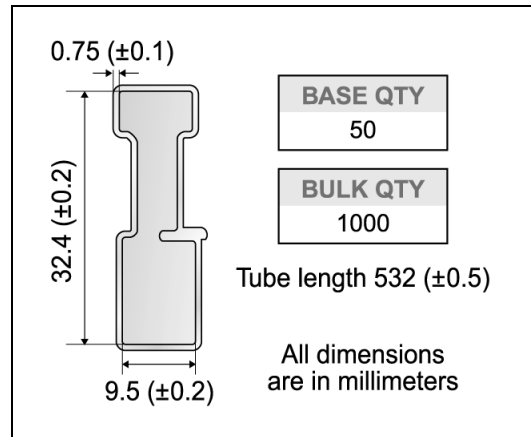
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334	
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°			



D²PAK 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 width of 2.5 mm min. The full radius is also indicated.

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	BULK QTY
1000	1000

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

Diagrams showing the tape and reel shipment details. The top view shows the tape with dimensions D, P₂, P₀, E, F, W, A₀, P₁, and the center line of the cavity. The side view shows the tape with dimensions K₀, T, D, B₀, D₁, and the center line of the cavity. The bottom view shows the reel with dimensions TRL, FEED DIRECTION, and Bending radius R min. A note indicates a 10-pitch cumulative tolerance on the tape of ±0.2 mm.

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