



STGB10NB40LZ

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

TYPE	V _{CES}	V _{CE(sat)}	I _C
STGB10NB40LZ	CLAMPED	< 1.8 V	20 A

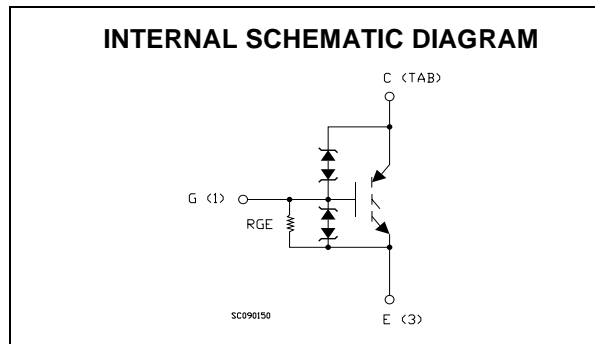
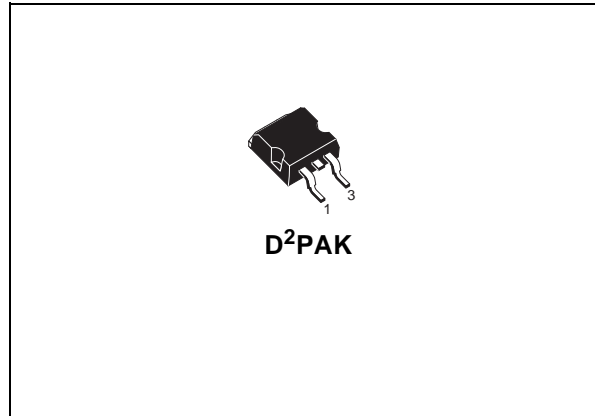
- POLYSILICON GATE VOLTAGE DRIVEN
- LOW THRESHOLD VOLTAGE
- LOW ON-VOLTAGE DROP
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- HIGH VOLTAGE CLAMPING FEATURE

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



ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STGB10NB40LZT4	GB10NB40LZ	D ² PAK	TAPE & REEL

STGB10NB40LZ

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CES}	Collector-Emitter Voltage ($V_{GS} = 0$)	CLAMPED	V
V_{ECR}	Emitter-Collector Voltage	18	V
V_{GE}	Gate-Emitter Voltage	CLAMPED	V
I_C	Collector Current (continuous) at $T_C = 25^\circ\text{C}$	20	A
I_C	Collector Current (continuous) at $T_C = 100^\circ\text{C}$	10	A
I_{CM} (■)	Collector Current (pulsed)	40	A
E_{as}	Single Pulse Energy $T_c = 25^\circ\text{C}$	300	mJ
P_{TOT}	Total Dissipation at $T_C = 25^\circ\text{C}$	150	W
	Derating Factor	1	W/°C
E_{SD}	ESD (Human Body Model)	4	KV
T_{stg}	Storage Temperature	- 55 to 175	°C
T_j	Operating Junction Temperature		

(■) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case Max	1	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient Max	62.5	°C/W

ELECTRICAL CHARACTERISTICS ($T_{CASE} = 25^\circ\text{C}$ 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	380	410	440	V
$BV_{(ECR)}$	Emitter Collector Break-down Voltage	$I_C = 75\text{ mA}$, $T_j = 25^\circ\text{C}$	18			V
BV_{GE}	Gate Emitter Break-down Voltage	$I_G = \pm 2\text{ mA}$	12		16	V
I_{CES}	Collector cut-off Current ($V_{GE} = 0$)	$V_{CE} = 15\text{ V}$, $V_{GE} = 0$, $T_j = 150^\circ\text{C}$ $V_{CE} = 200\text{ V}$, $V_{GE} = 0$, $T_j = 150^\circ\text{C}$			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	$V_{CE} = V_{GE}$, $I_C = 250\ \mu\text{A}$, $T_C = -40^\circ\text{C}$ to 150°C	0.6		2.2	V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 4.5\text{ V}$, $I_C = 10\text{ A}$, $T_j = 25^\circ\text{C}$ $V_{GE} = 4.5\text{ V}$, $I_C = 20\text{ A}$, $T_j = 25^\circ\text{C}$		1.2 1.3	1.8	V V

ELECTRICAL CHARACTERISTICS (CONTINUED)
DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	$V_{CE} = 15 \text{ V}$, $I_C = 10 \text{ A}$		18		S
C_{ies}	Input Capacitance	$V_{CE} = 25 \text{ V}$, $f = 1 \text{ MHz}$, $V_{GE} = 0$		1300		pF
C_{oes}	Output Capacitance			105		pF
C_{res}	Reverse Transfer Capacitance			12		pF
Q_g	Gate Charge	$V_{CE} = 328 \text{ V}$, $I_C = 10 \text{ A}$, $V_{GE} = 5 \text{ V}$		28		nC

FUNCTIONAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
II	Latching Current	$V_{Clamp} = 328 \text{ V}$, $T_C = 125 \text{ }^\circ\text{C}$ $R_{GOFF} = 1 \text{ K}\Omega$, $V_{GE} = 5 \text{ V}$		40		A
U.I.S.	Functional Test Open Secondary Coil	$R_{GOFF} = 1 \text{ K}\Omega$, $L = 1 \text{ mH}$, $T_C = 125 \text{ }^\circ\text{C}$	13			A

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 328 \text{ V}$, $I_C = 10 \text{ A}$ $R_G = 1 \text{ K}\Omega$, $V_{GE} = 5 \text{ V}$		1300		ns
t_r	Rise Time			270		ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{CC} = 328 \text{ V}$, $I_C = 10 \text{ A}$ $R_G = 1 \text{ K}\Omega$, $V_{GE} = 5 \text{ V}$		60		A/ μs
E_{on}	Turn-on Switching Losses	$V_{CC} = 328 \text{ V}$, $I_C = 10 \text{ A}$, $T_C = 25 \text{ }^\circ\text{C}$ $R_G = 1 \text{ K}\Omega$, $V_{GE} = 5 \text{ V}$, $T_C = 125 \text{ }^\circ\text{C}$		2.4 2.6		mJ mJ

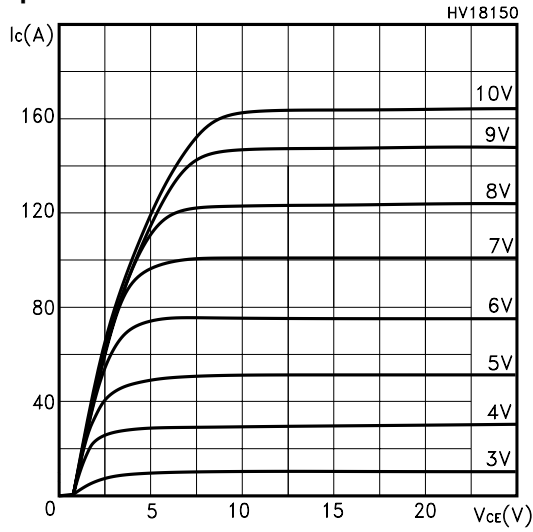
SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-over Time	$V_{CC} = 328 \text{ V}$, $I_C = 10 \text{ A}$, $R_{GE} = 1 \text{ K}\Omega$, $V_{GE} = 5 \text{ V}$		3.6		μs
$t_r(V_{off})$	Off Voltage Rise Time			2		μs
$t_{d(off)}$	Delay Time			8		μs
t_f	Fall Time			1.4		μs
$E_{off(**)}$	Turn-off Switching Loss			5		mJ
t_c	Cross-over Time	$V_{CC} = 328 \text{ V}$, $I_C = 10 \text{ A}$, $R_{GE} = 1 \text{ K}\Omega$, $V_{GE} = 5 \text{ V}$ $T_j = 125 \text{ }^\circ\text{C}$		5.7		μs
$t_r(V_{off})$	Off Voltage Rise Time			2.7		μs
$t_{d(off)}$	Delay Time			9.2		μs
t_f	Fall Time			2.8		μs
$E_{off(**)}$	Turn-off Switching Loss			8.7		mJ

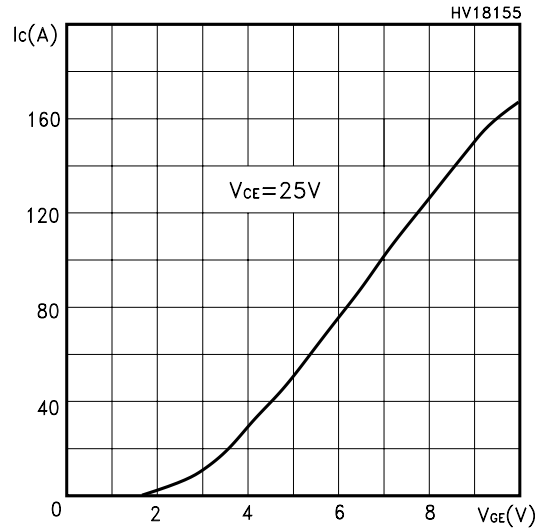
(1) Pulse width limited by max. junction temperature.

(**) Losses Include Also the Tail

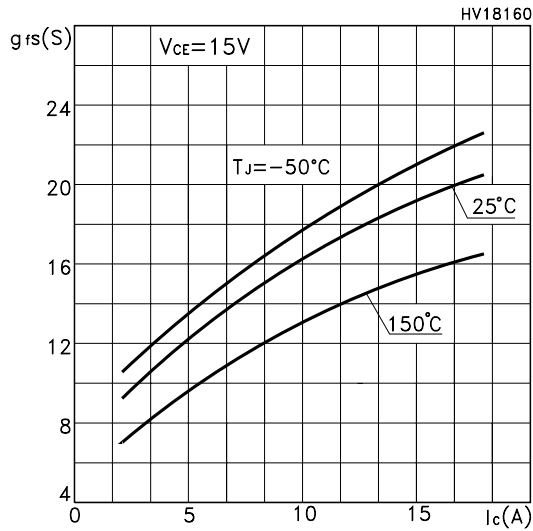
Output Characteristics



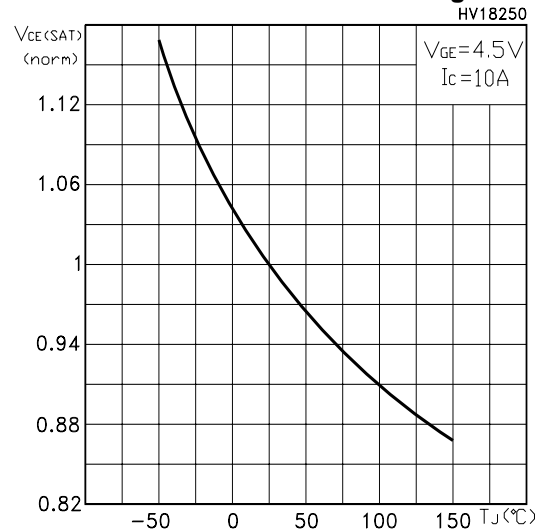
Transfer Characteristics



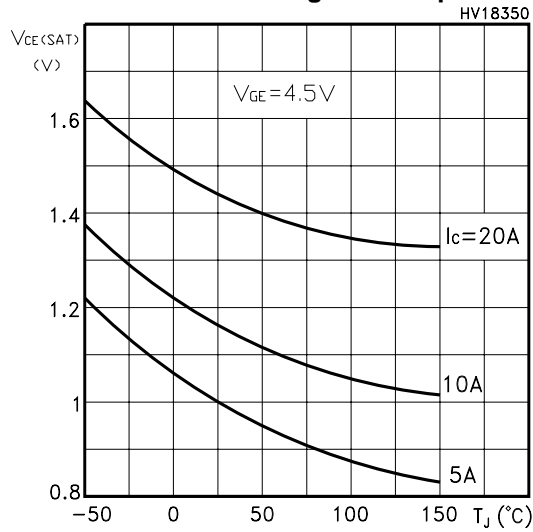
Transconductance



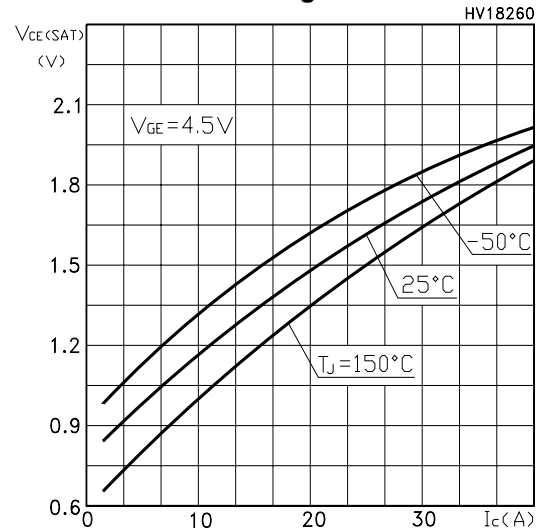
Normalized Collector-Emitter On Voltage vs Temp.



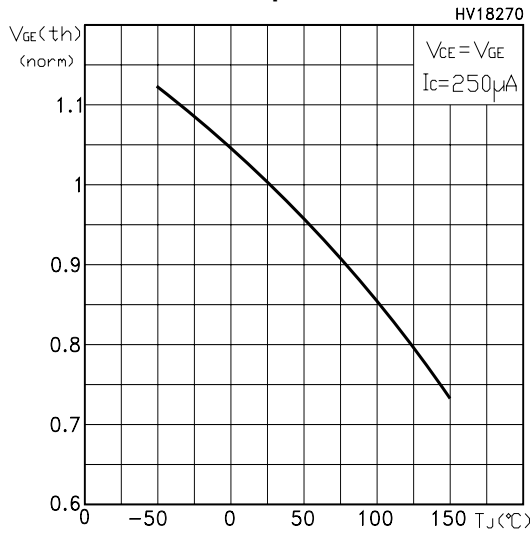
Collector-Emitter On Voltage vs Temperature



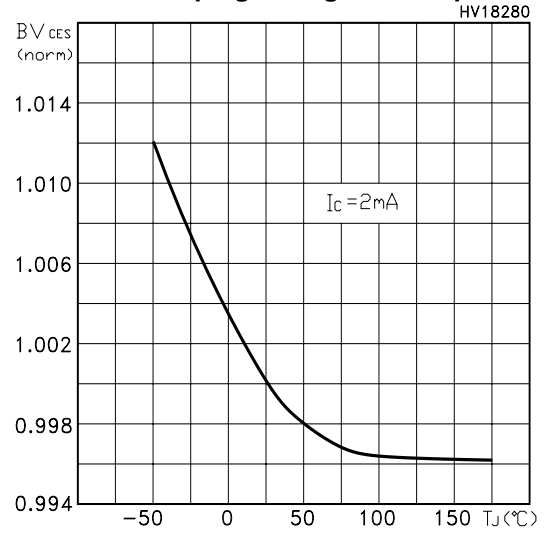
Collector-Emitter On Voltage vs Collector Current



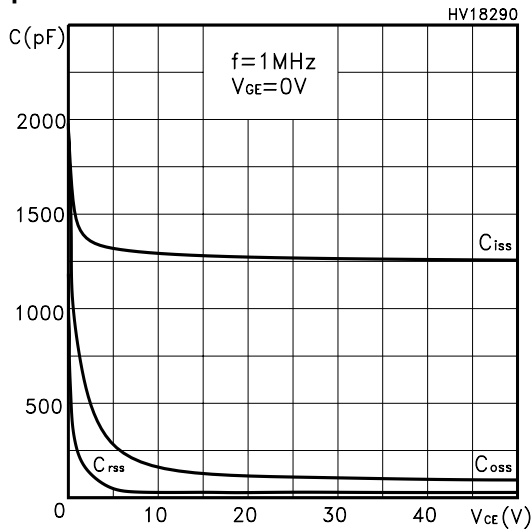
Gate Threshold vs Temperature



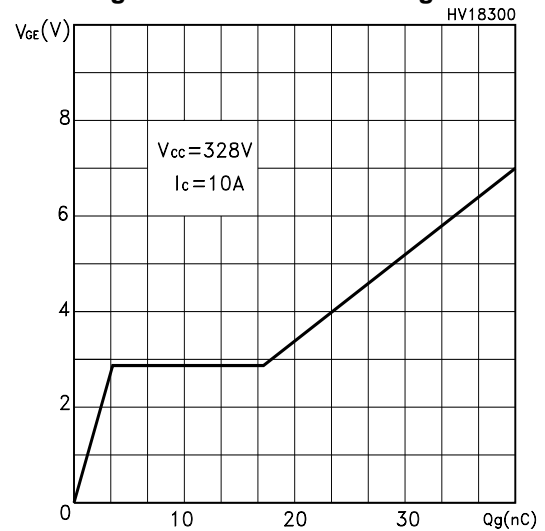
Normalized Clamping Voltage vs Temperature



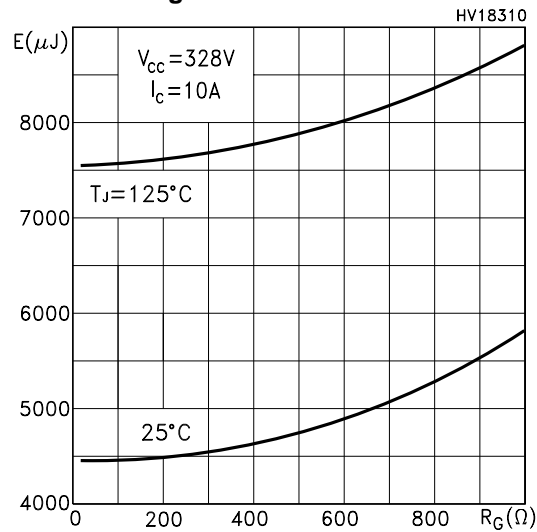
Capacitance Variations



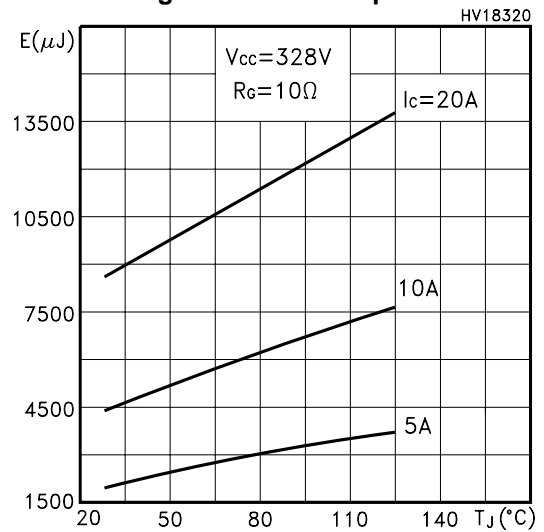
Gate Charge vs Gate-Emitter Voltage



Total Switching Losses vs Gate Resistance

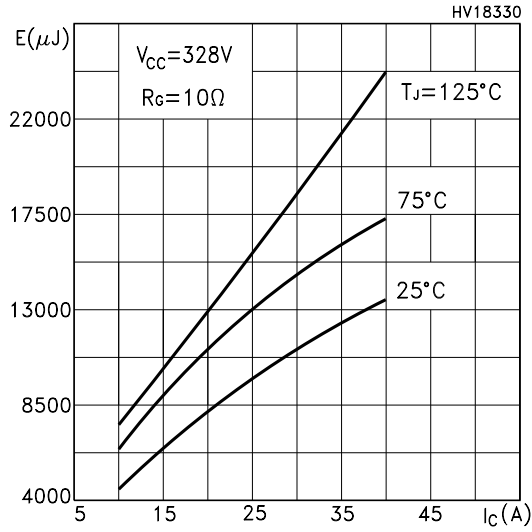


Total Switching Losses vs Temperature

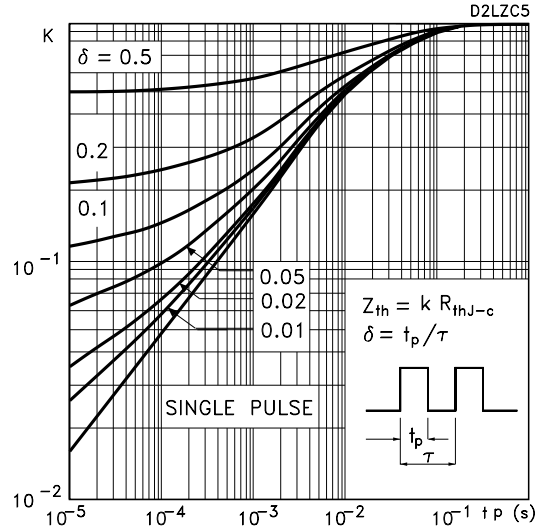


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Total Switching Losses vs Collector Current



Thermal Impedance



Turn-Off SOA

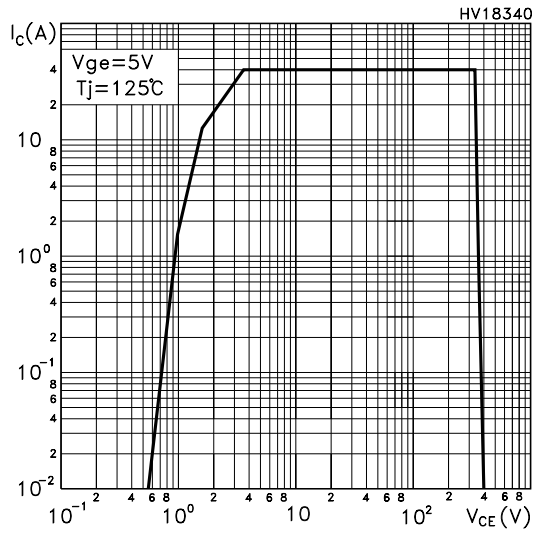


Fig. 1: Unclamped Inductive Load Test Circuit

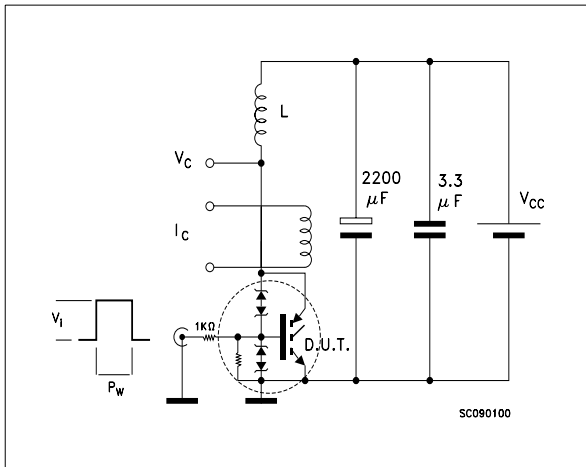


Fig. 2: Unclamped Inductive Waveform

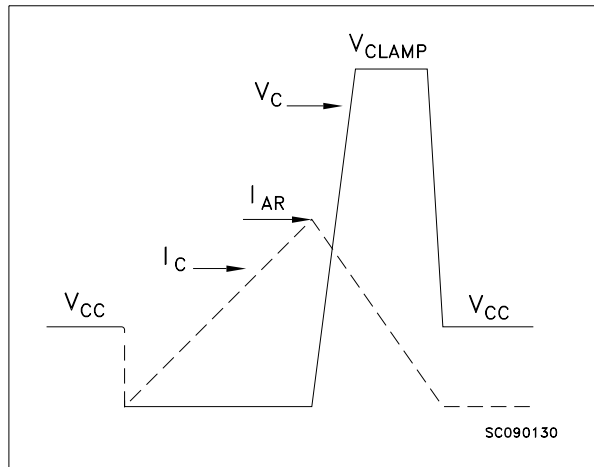


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times

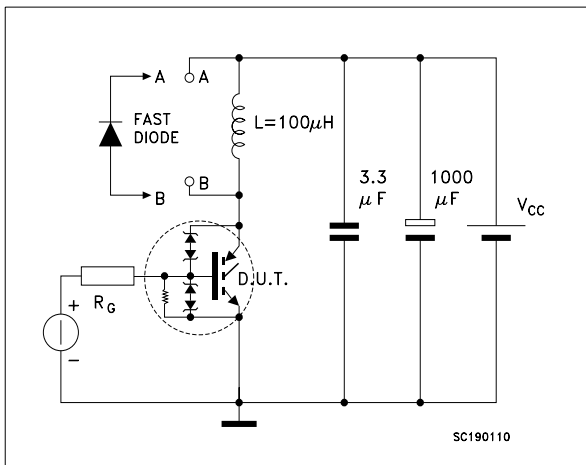
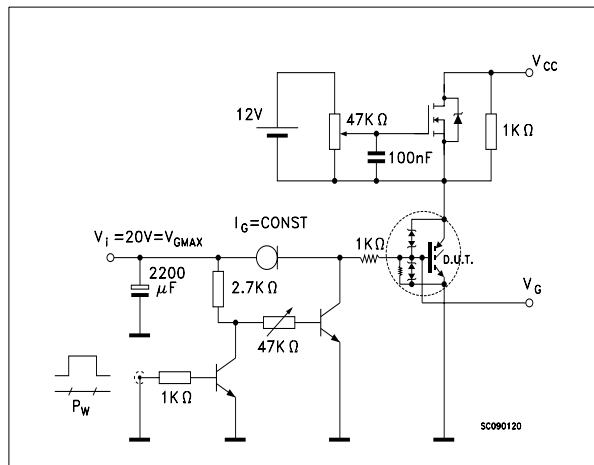
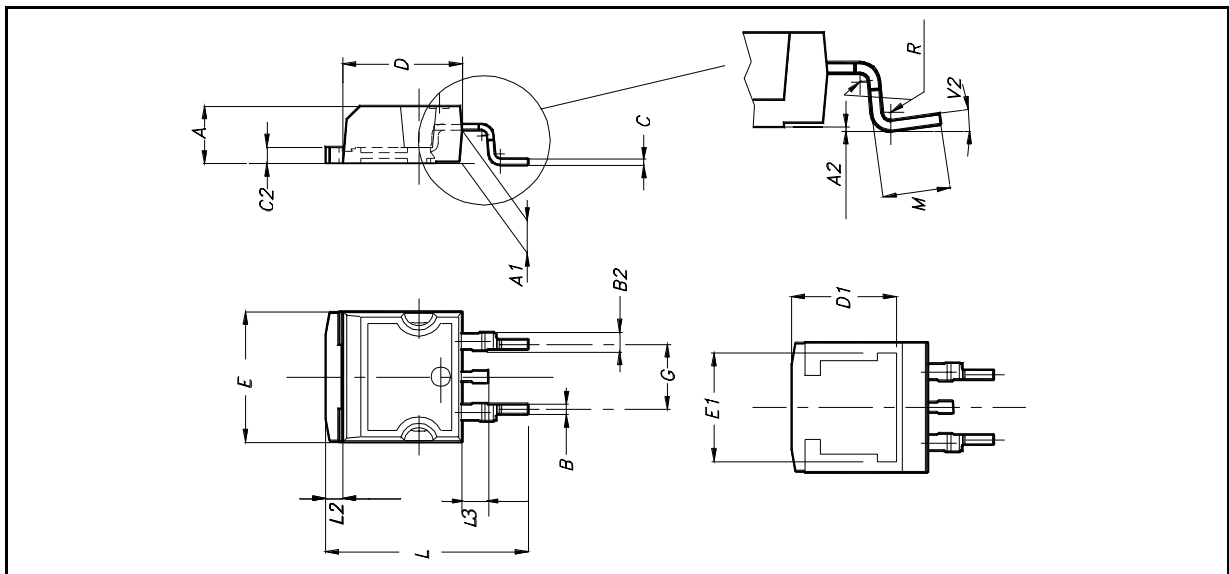


Fig. 4: Gate Charge test Circuit

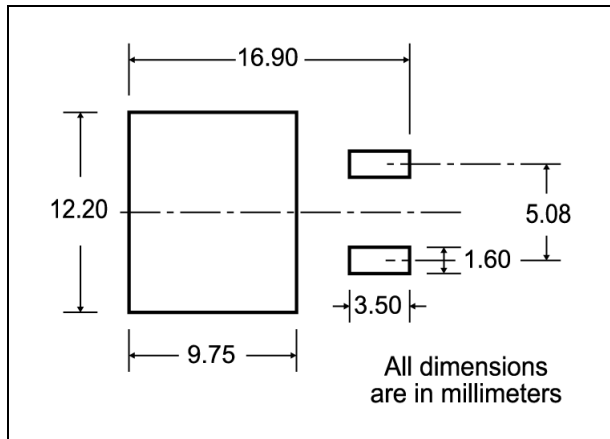


D²PAK MECHANICAL DATA

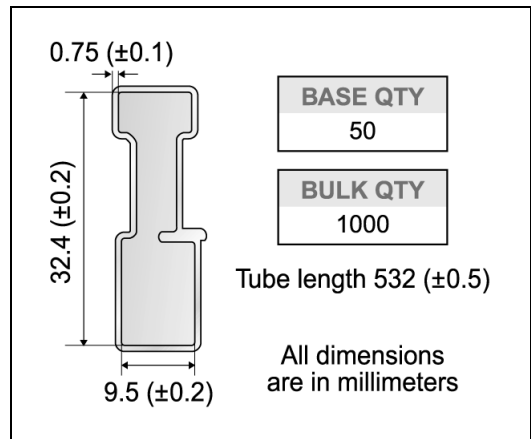
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334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

40 mm min. Access hole at slot location

Full radius

Tape slot in core for tape start 2.5mm min. width

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	BULK QTY
1000	1000

10 pitches cumulative tolerance on tape +/- 0.2 mm

Center line of cavity

User Direction of Feed

FEED DIRECTION

Bending radius R min.

* on sales type



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