



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

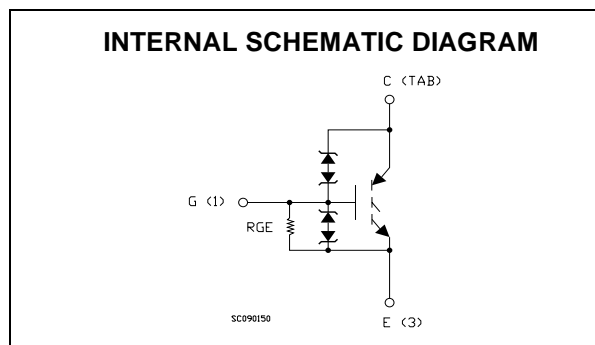
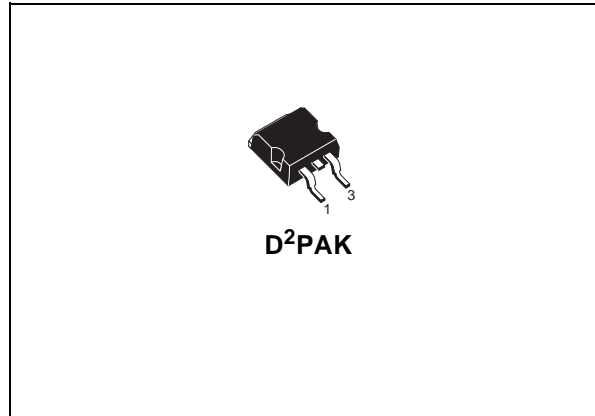
- POLYSILICON GATE VOLTAGE DRIVEN
- LOW THRESHOLD VOLTAGE
- LOW ON-VOLTAGE DROP
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- HIGH VOLTAGE CLAMPING FEATURE

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

Rthj-case	Thermal Resistance Junction-case Max	1	°C/W
Rthj-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 ($V_{GE} = 0$)	$V_{CE} = 15\text{ V}$, $V_{GE} = 0$, $T_j = 150^\circ\text{C}$			10	μA
		$V_{CE} = 200\text{ V}$, $V_{GE} = 0$, $T_j = 150^\circ\text{C}$			100	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	$V_{CE} = V_{GE}$, $I_C = 250\text{ }\mu\text{A}$, $T_C = -40^\circ\text{C}$ to 150°C	0.6		2.2	V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 4.5\text{ V}$, $I_C = 10\text{ A}$, $T_j = 25^\circ\text{C}$		1.2	1.8	V
		$V_{GE} = 4.5\text{ V}$, $I_C = 20\text{ A}$, $T_j = 25^\circ\text{C}$		1.3		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	$V_{Clamp} = 328\text{ V}$, $T_C = 125\text{ °C}$ $R_{GOFF} = 1\text{ K}\Omega$, $V_{GE} = 5\text{ V}$		40		A
U.I.S.	Functional Test Open Secondary Coil	$R_{GOFF} = 1\text{ K}\Omega$, $L = 1\text{ mH}$, $T_C = 125\text{ °C}$	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	$V_{CC} = 328\text{ V}$, $I_C = 10\text{ A}$, $T_C = 25\text{ °C}$ $R_G = 1\text{ K}\Omega$, $V_{GE} = 5\text{ V}$, $T_C = 125\text{ °C}$		2.4 2.6		mJ mJ

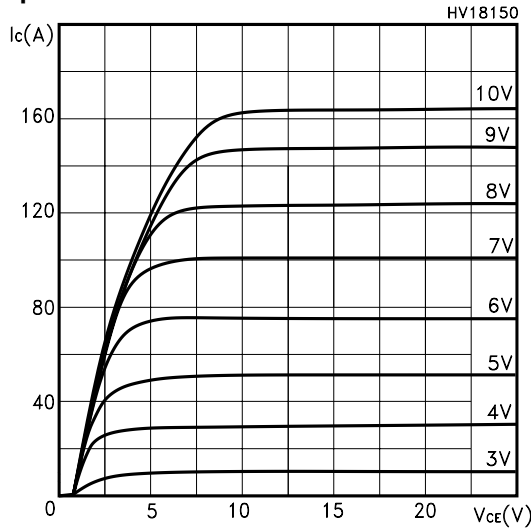
SWITCHING OFF

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	$V_{CC} = 328\text{ V}$, $I_C = 10\text{ A}$, $R_{GE} = 1\text{ K}\Omega$, $V_{GE} = 5\text{ V}$ $T_j = 125\text{ °C}$		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

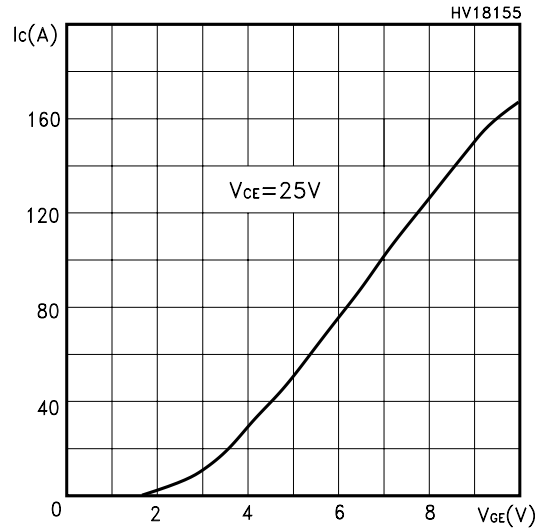
(1) Pulse width limited by max. junction temperature.

(**) Losses Include Also the Tail

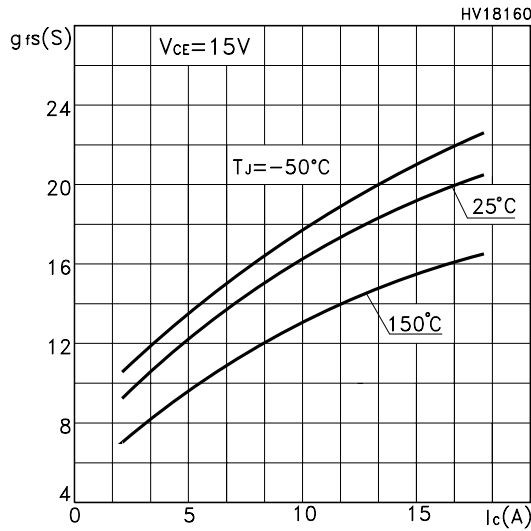
Output Characteristics



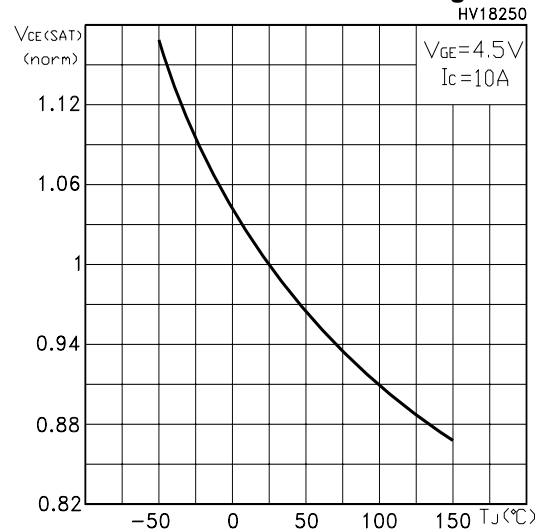
Transfer Characteristics



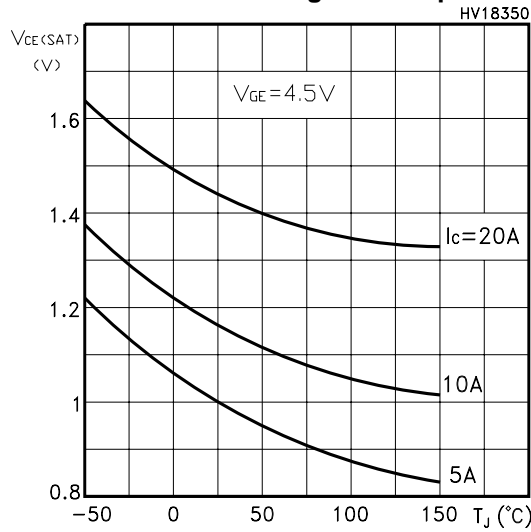
Transconductance



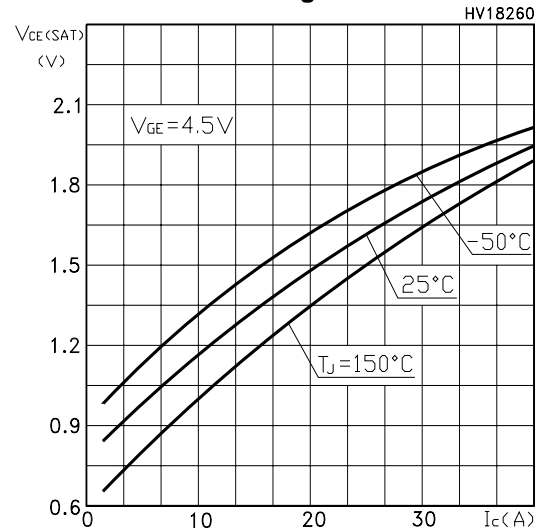
Normalized Collector-Emitter On Voltage vs Temp.



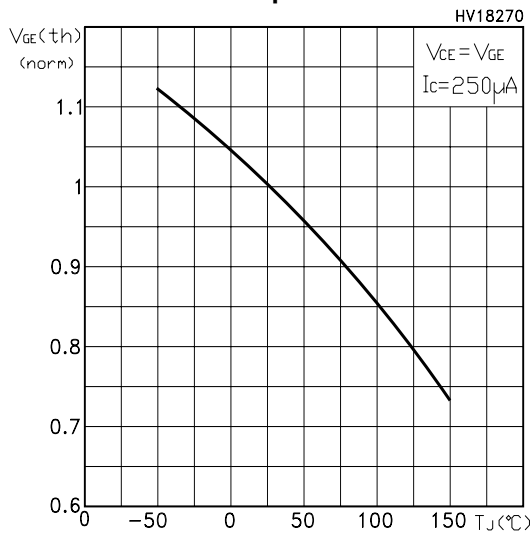
Collector-Emitter On Voltage vs Temperature



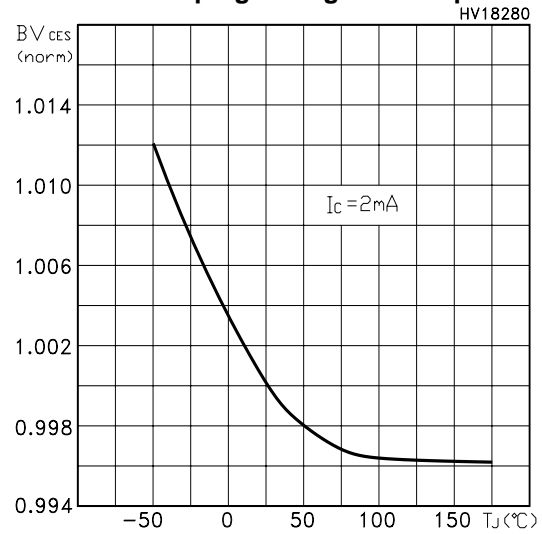
Collector-Emitter On Voltage vs Collector Current



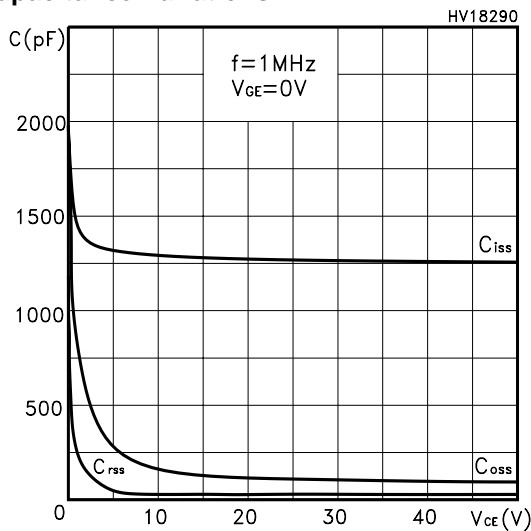
Gate Threshold vs Temperature



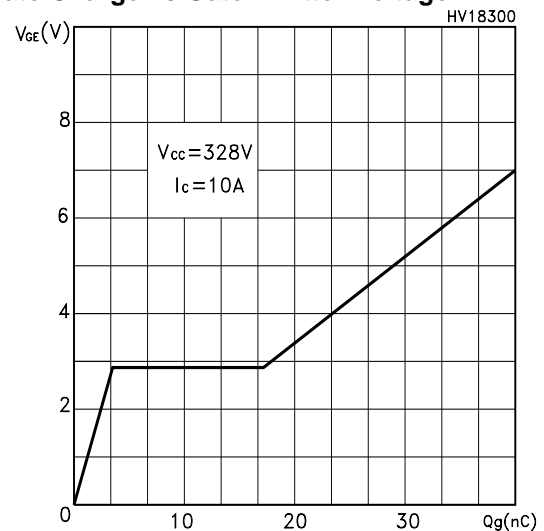
Normalized Clamping Voltage vs Temperature



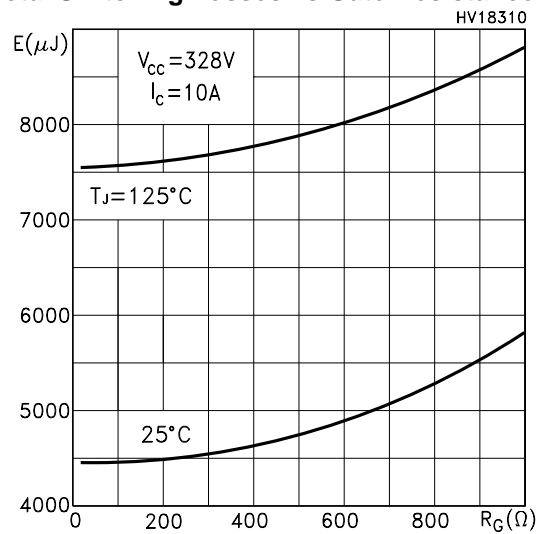
Capacitance Variations



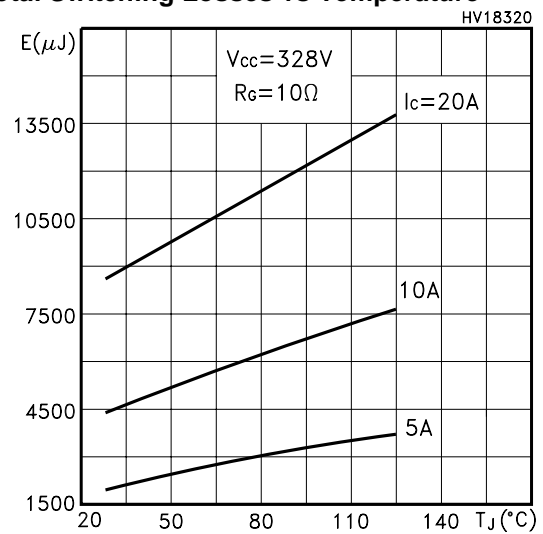
Gate Charge vs Gate-Emitter Voltage



Total Switching Losses vs Gate Resistance

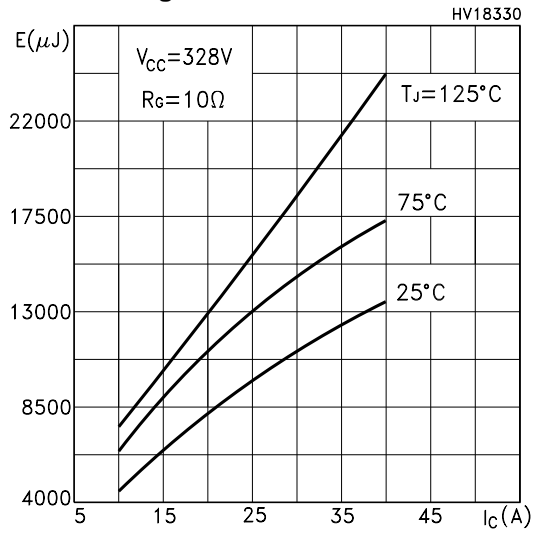


Total Switching Losses vs Temperature

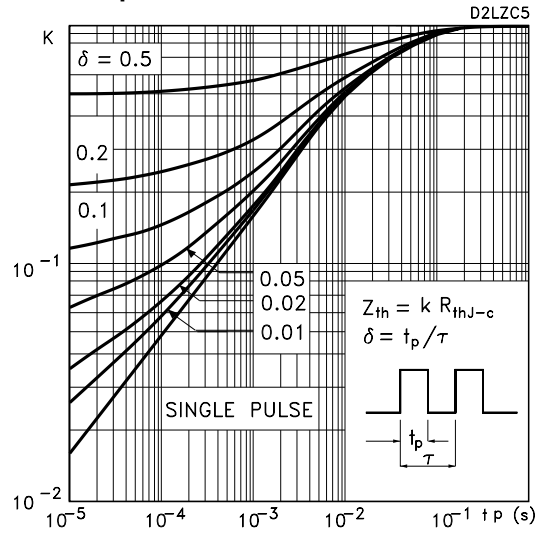


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Total Switching Losses vs Collector Current



Thermal Impedance



Turn-Off SOA

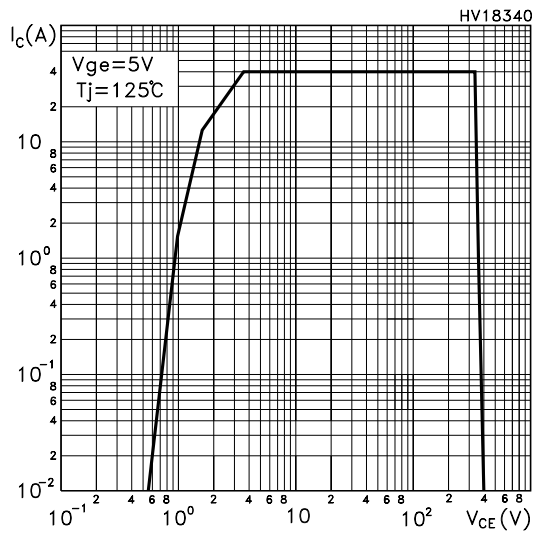


Fig. 1: Unclamped Inductive Load Test Circuit

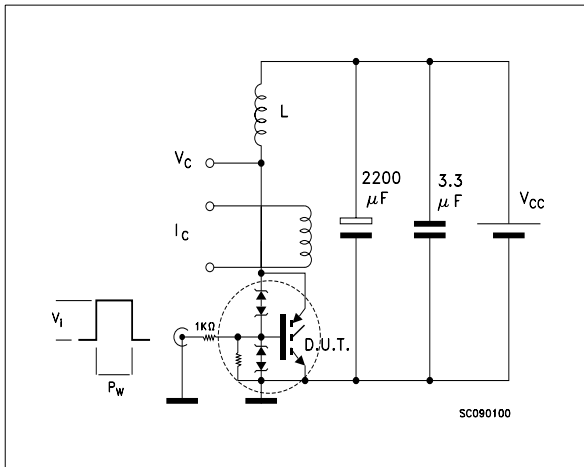


Fig. 2: Unclamped Inductive Waveform

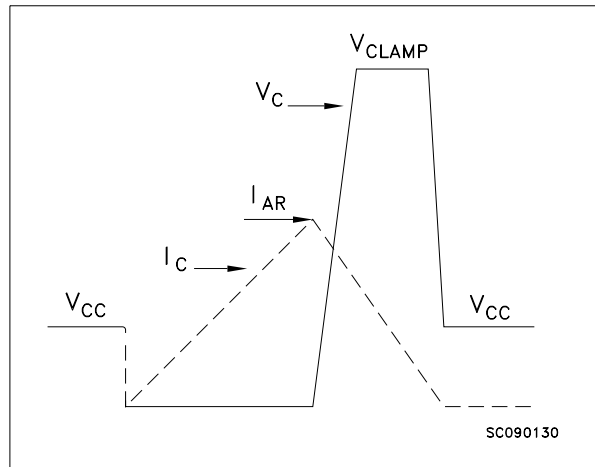


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times

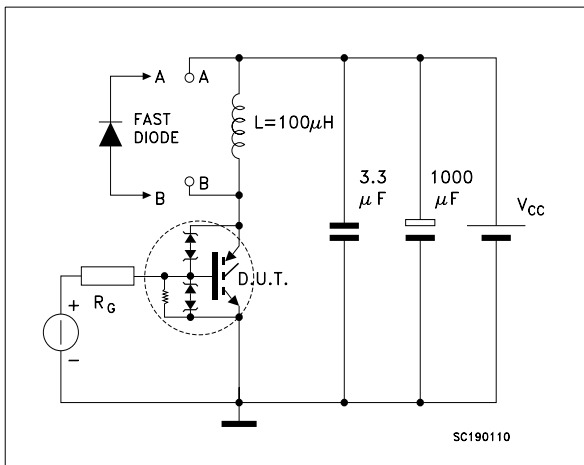
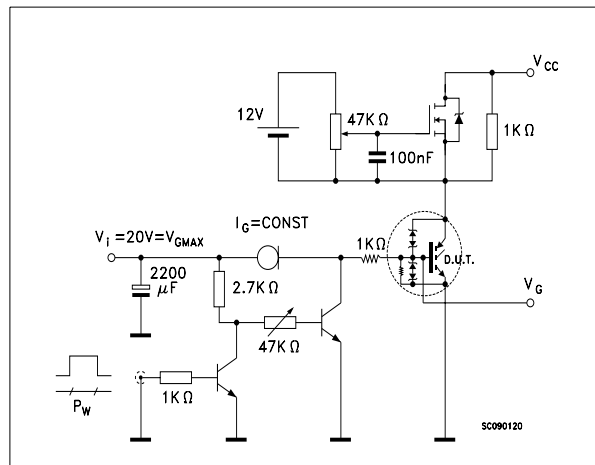
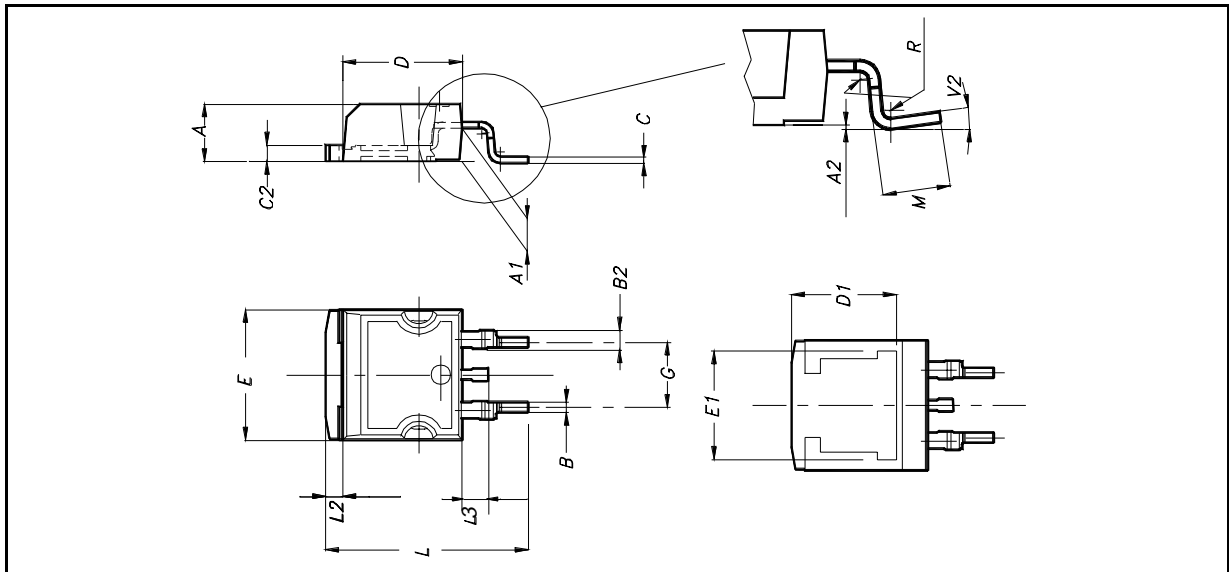


Fig. 4: Gate Charge test Circuit

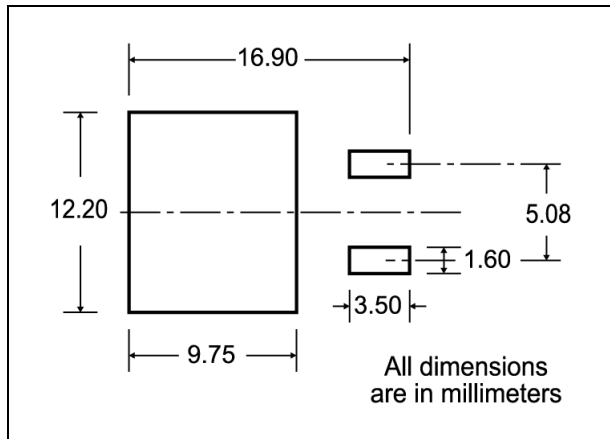


D²PAK MECHANICAL DATA

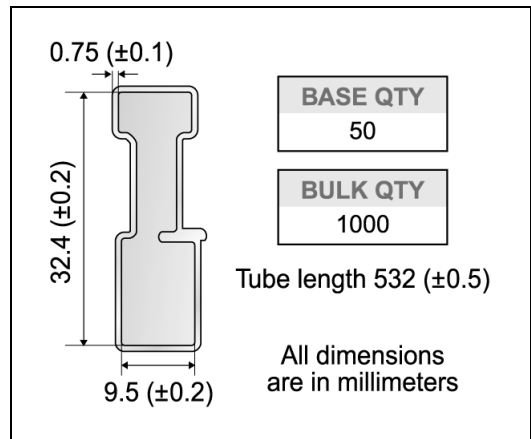
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334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

G measured at hub

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

User Direction of Feed

Center line of cavity

TRL

FEED DIRECTION

Bending radius R min.

* on sales type



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