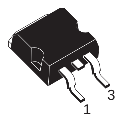
STGB10NB40LZ

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

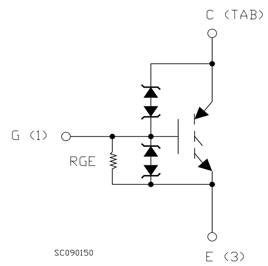


D^2PAK

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.

INTERNAL SCHEMATIC DIAGRAM



APPLICATIONS

- AUTOMOTIVE IGNITION

ORDERING INFORMATION

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

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 (continuos) at T_C = 25°C	20	A
I_C	Collector Current (continuos) at T_C = 100°C	10	A
I_{CM} (▪)	Collector Current (pulsed)	40	A
Eas	Single Pulse Energy Tc = 25°C	300	mJ
P_{TOT}	Total Dissipation at T_C = 25°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 °C UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$BV_{(CES)}$	Clamped Voltage	I_C = 2 mA, V_{GE} = 0, Tj= - 40°C to 150°C	380	410	440	V
$BV_{(ECR)}$	Emitter Collector Break-down Voltage	I_C = 75 mA, Tj= 25°C	18			V
BV_{GE}	Gate Emitter Break-down Voltage	I_G = ± 2 mA	12		16	V
I_{CES}	Collector cut-off Current (V_{GE} = 0)	V_{CE} = 15 V, V_{GE}= 0 ,T_j= 150 °C V_{CE}= 200 V, V_{GE}= 0 ,T_j= 150°C			10 100	μA μA
I_{GES}	Gate-Emitter Leakage Current (V_{CE} = 0)	V_{GE} = ± 10V , V_{CE} = 0			± 700	μA
R_{GE}	Gate Emitter Resistance			20		KΩ

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Threshold Voltage	V_{CE} = V_{GE}, I_C = 250 μA, T_C= - 40°C to 150°C	0.6		2.2	V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	V_{GE} =4.5V, I_C = 10 A, Tj= 25°C V_{GE} =4.5V, I_C = 20 A, Tj= 25°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 V , I_C= 10 A		18		S
C_{ies}	Input Capacitance	V_{CE} = 25V, f = 1 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} = 328V, I_C = 10 A, V_{GE} = 5V		28		nC

FUNCTIONAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Il	Latching Current	V_{Clamp} = 328 V, T_C = 125 °C R_{GOFF} = 1KΩ , V_{GE} = 5 V		40		A
U.I.S.	Functional Test Open Secondary Coil	R_{GOFF} = 1KΩ , L = 1 mH , Tc= 125°C	13			A

SWITCHING ON

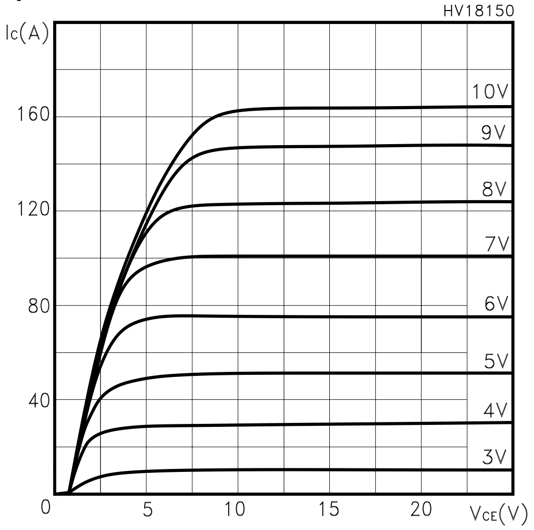
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	V_{CC} = 328 V, I_C = 10 A R_G = 1KΩ , V_{GE} = 5 V		1300		ns
t_r	Rise Time			270		ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{CC}= 328 V, I_C = 10 A R_G=1KΩ, V_{GE} = 5 V		60		A/µs
Eon	Turn-on Switching Losses	V_{CC}=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

SWITCHING OFF

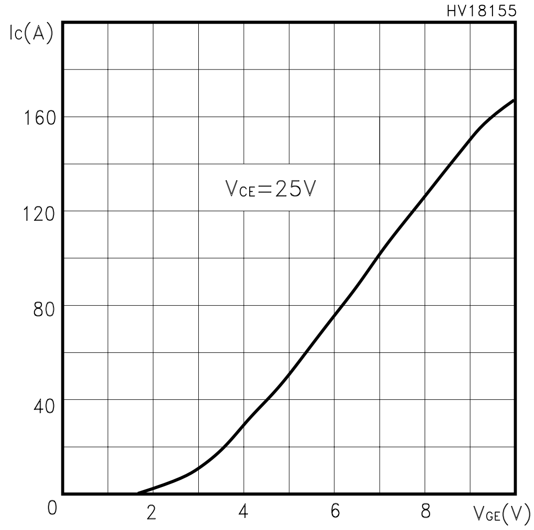
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-over Time	V_{cc} = 328 V, I_C = 10 A, R_{GE} = 1K Ω , V_{GE} = 5 V		3.6		µs
$t_r(V_{off})$	Off Voltage Rise Time			2		µs
$t_d(_{off})$	Delay Time			8		µs
t_f	Fall Time			1.4		µs
E_{off}(**)	Turn-off Switching Loss			5		mJ
t_c	Cross-over Time	V_{cc} = 328 V, I_C = 10 A, R_{GE} = 1KΩ , V_{GE} = 5 V Tj = 125 °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

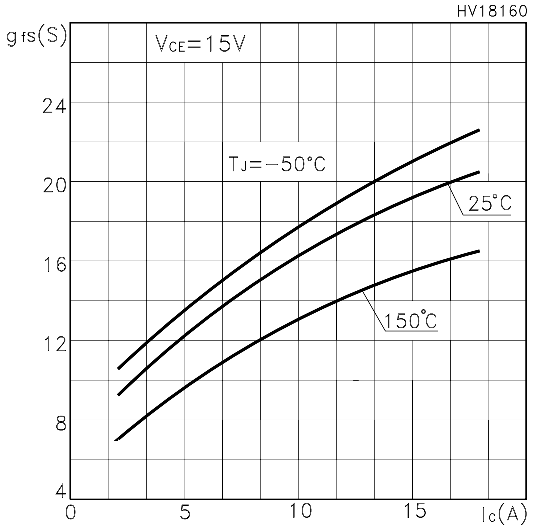
Output Characteristics



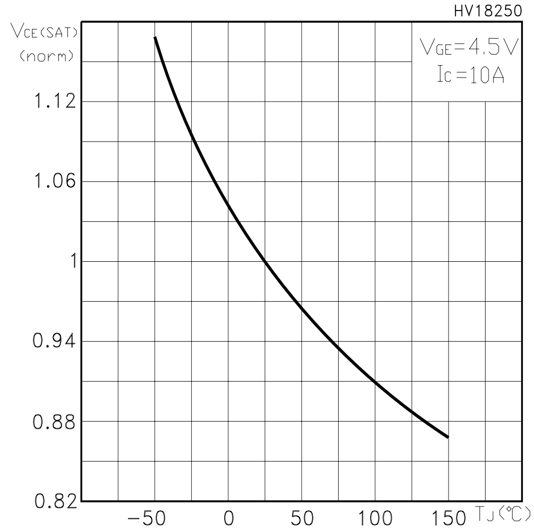
Transfer Characteristics



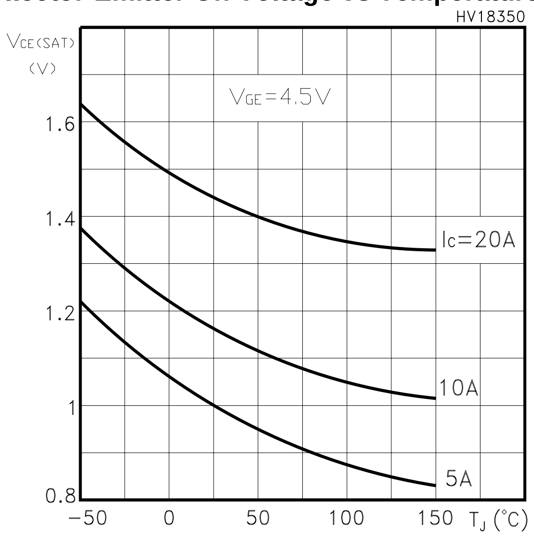
Transconductance



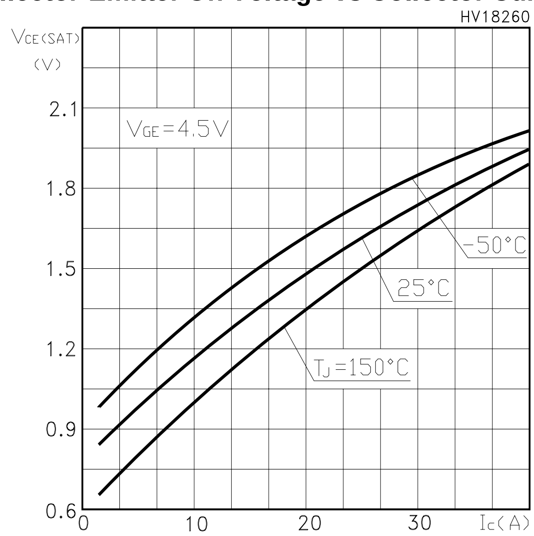
Normalized Collector-Emitter On Voltage vs Temp.



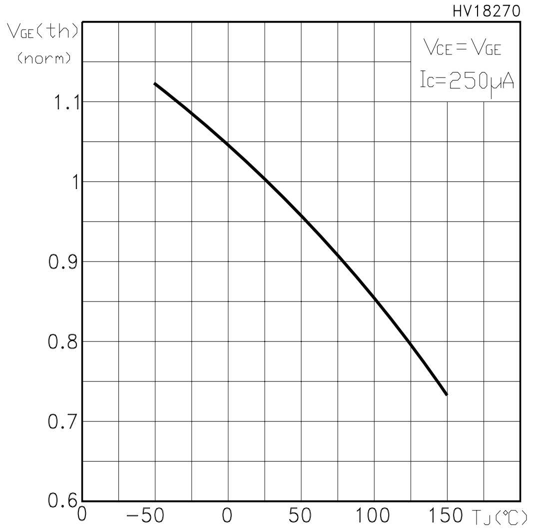
Collector-Emitter On Voltage vs Temperature



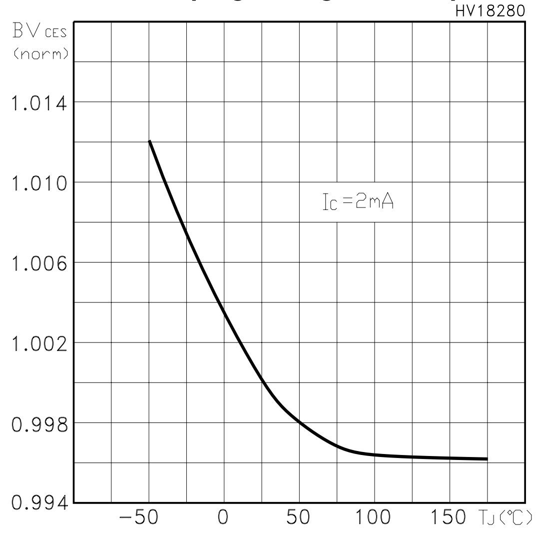
Collector-Emitter On Voltage vs Collector Current



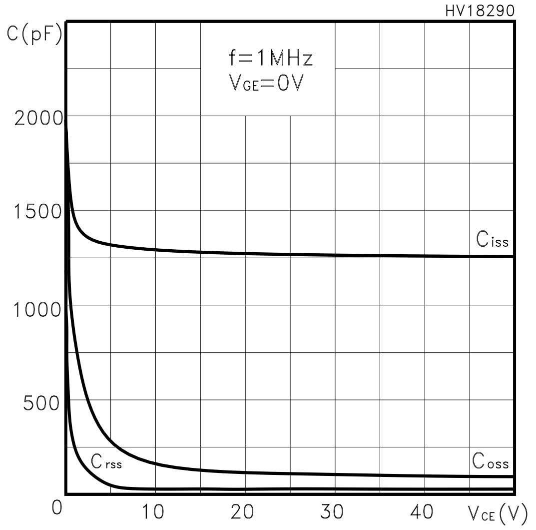
Gate Threshold vs Temperature



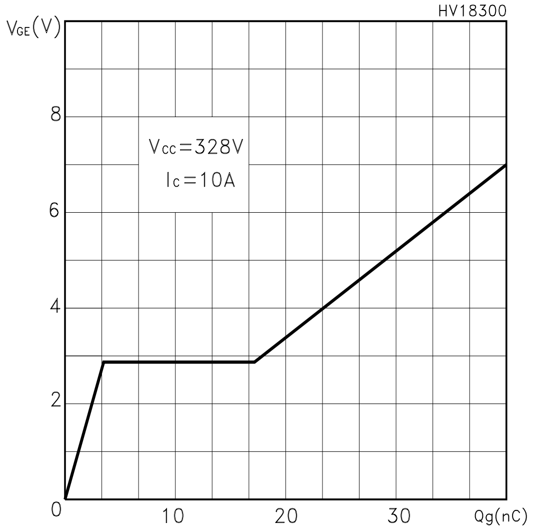
Normalized Clamping Voltage vs Temperature



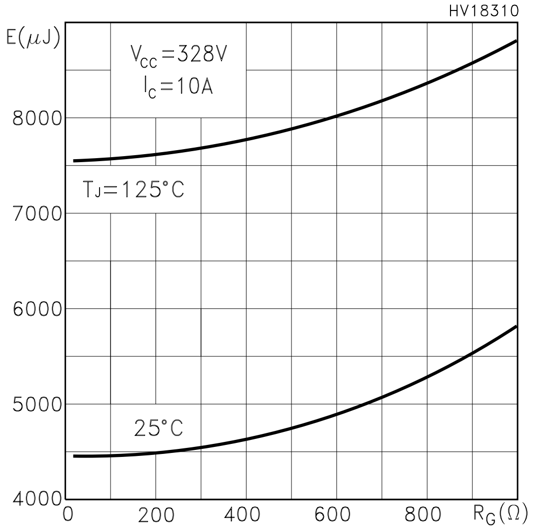
Capacitance Variations



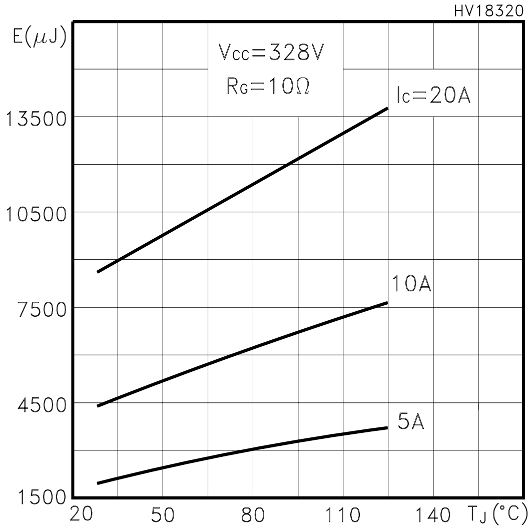
Gate Charge vs Gate-Emitter Voltage



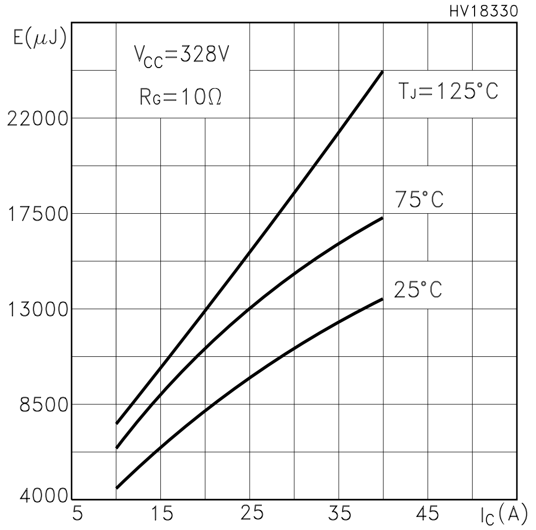
Total Switching Losses vs Gate Resistance



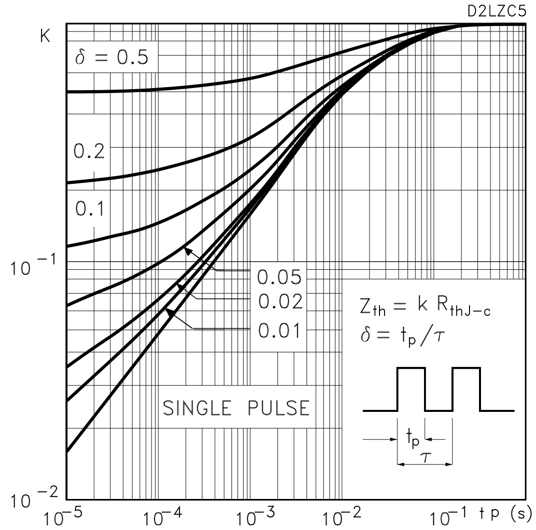
Total Switching Losses vs Temperature



Total Switching Losses vs Collector Current



Thermal Impedance



Turn-Off SOA

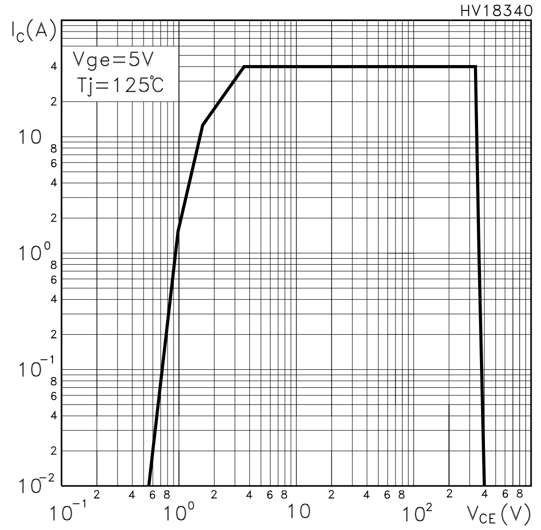


Fig. 1: Unclamped Inductive Load Test Circuit

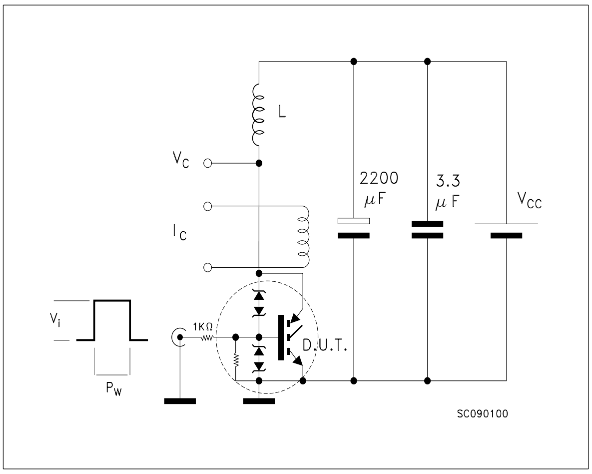


Fig. 2: Unclamped Inductive Waveform

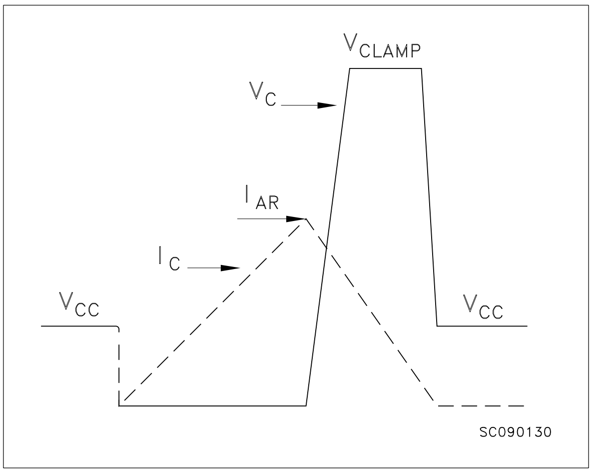


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times

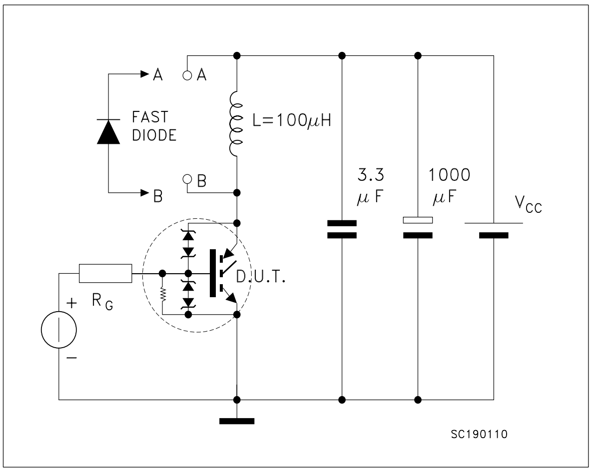
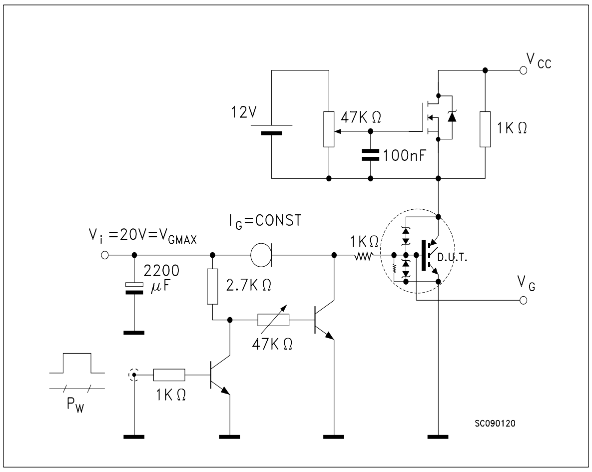
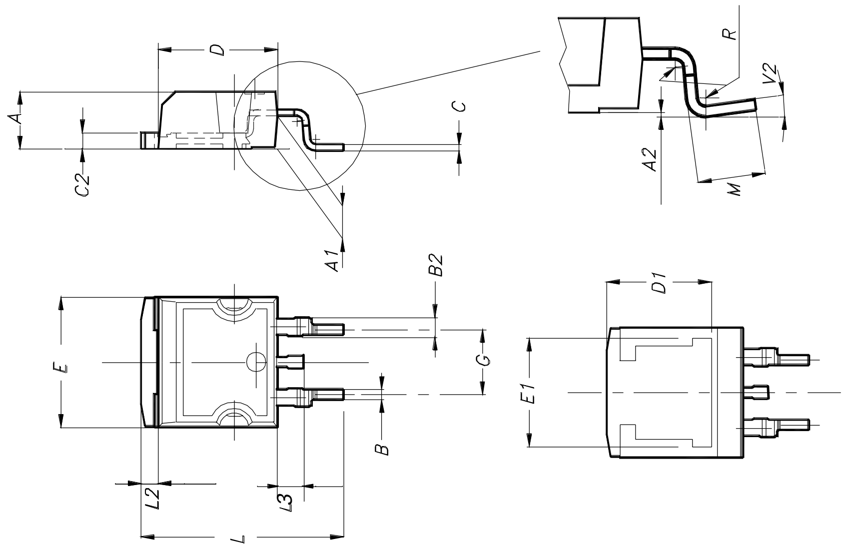


Fig. 4: Gate Charge test Circuit

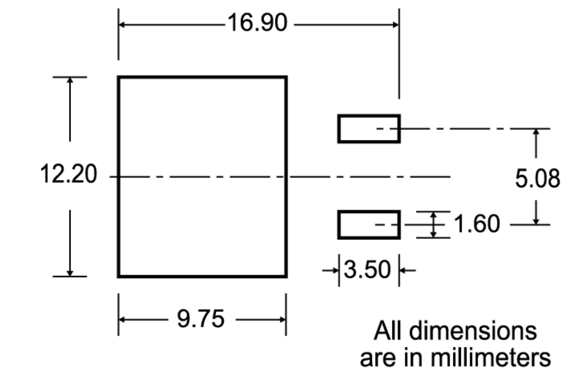


D^2PAK MECHANICAL DATA

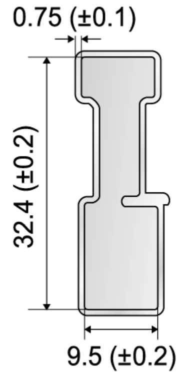
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334	
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	0º		8º			



D2PAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



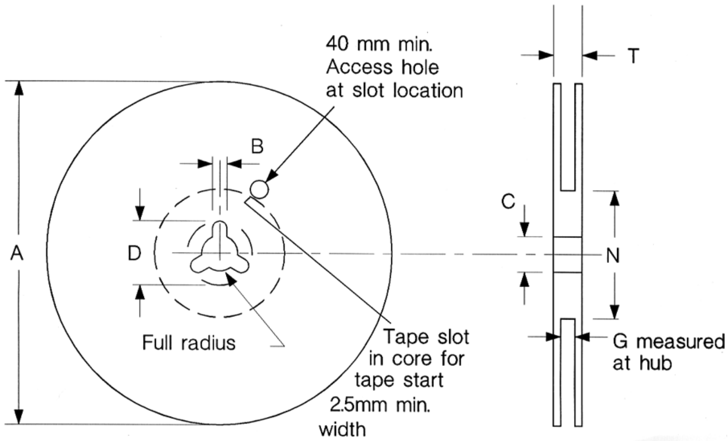
BASE QTY
50

BULK QTY
1000

Tube length 532 (±0.5)

All dimensions are in millimeters

TAPE AND REEL SHIPMENT (suffix "T4")*



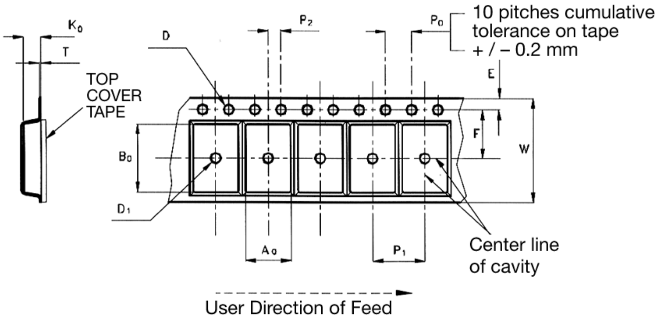
REEL MECHANICAL DATA

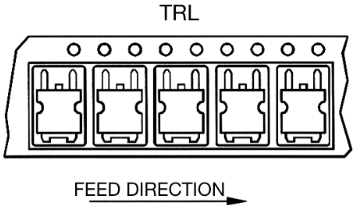
DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0795	
G	24.4	26.4	0.960	1.039
N	100		3.937	
T		30.4		1.197

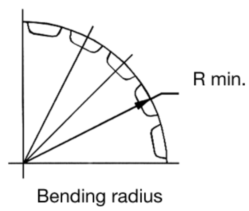
BASE QTY	BULK QTY
1000	1000

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







* on sales type