



STGB20NB41LZ

N-CHANNEL CLAMPED 40A - D²PAK INTERNALLY CLAMPED PowerMESH™ IGBT

TYPE	V _{CES}	V _{CE(sat)}	I _C
STGB20NB41LZ	CLAMPED	< 2.0 V	20 A

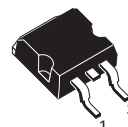
- POLYSILICON GATE VOLTAGE DRIVEN
- LOW THRESHOLD VOLTAGE
- LOW ON-VOLTAGE DROP
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- HIGH VOLTAGE CLAMPING FEATURE
- SURFACE-MOUNTING D²PAK (TO-263)
POWER PACKAGE IN TUBE (NO SUFFIX) OR
IN TAPE & REEL (SUFFIX "T4")

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.

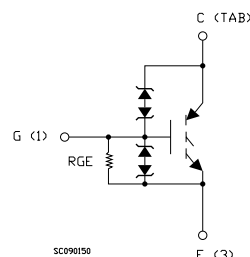
APPLICATIONS

- AUTOMOTIVE IGNITION



D²PAK

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CES}	Collector-Emitter Voltage (V _{GS} = 0)	CLAMPED	V
V _{ECR}	Emitter-Collector Voltage	20	V
V _{GE}	Gate-Emitter Voltage	CLAMPED	V
I _C	Collector Current (continuous) at T _C = 25°C	40	A
I _C	Collector Current (continuous) at T _C = 100°C	20	A
I _{CM} (■)	Collector Current (pulsed)	80	A
E _{as}	Single Pulse Energy T _C = 25°C	700	mJ
P _{TOT}	Total Dissipation at T _C = 25°C	200	W
	Derating Factor	1.33	W/°C
E _{SD}	ESD (Human Body Model)	8	KV
T _{stg}	Storage Temperature	- 55 to 175	°C
T _j	Operating Junction Temperature		

(■)Pulse width limited by safe operating area

STGB20NB41LZ

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	0.75	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	°C/W

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

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
BV(CES)	Clamped Voltage	$I_C = 2 \text{ mA}$, $V_{GE} = 0$, $T_c = -40^\circ\text{C} \div 150^\circ\text{C}$	382	412	442	V
BV(ECR)	Emitter Collector Break-down Voltage	$I_C = 75 \text{ mA}$, $T_c = 25^\circ\text{C}$	20	28		V
BV _{GE}	Gate Emitter Break-down Voltage	$I_G = \pm 2 \text{ mA}$	12	14	16	V
I _{CES}	Collector cut-off Current ($V_{GE} = 0$)	$V_{CE} = 15 \text{ V}$, $V_{GE} = 0$, $T_c = 150^\circ\text{C}$ $V_{CE} = 200 \text{ V}$, $V_{GE} = 0$, $T_c = 150^\circ\text{C}$			10 100	μA μA
I _{GES}	Gate-Emitter Leakage Current ($V_{CE} = 0$)	$V_{GE} = \pm 10 \text{ V}$, $V_{CE} = 0$	± 300	± 660	± 1000	μA
R _{GE}	Gate Emitter Resistance		10	15	30	K Ω

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GE(th)}	Gate Threshold Voltage	$V_{CE} = V_{GE}$, $I_C = 250 \mu\text{A}$, $T_c = 25^\circ\text{C}$	1		2.4	V
V _{CE(SAT)}	Collector-Emitter Saturation Voltage	$V_{GE} = 4.5 \text{ V}$, $I_C = 10 \text{ A}$, $T_c = 25^\circ\text{C}$ $V_{GE} = 4.5 \text{ V}$, $I_C = 20 \text{ A}$, $T_c = 25^\circ\text{C}$		1.1 1.3	1.8 2.0	V V

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs}	Forward Transconductance	$V_{CE} = 25 \text{ V}$, $I_C = 20 \text{ A}$		35		S
C _{ies}	Input Capacitance	$V_{CE} = 25 \text{ V}$, $f = 1 \text{ MHz}$, $V_{GE} = 0$		2300		pF
C _{oes}	Output Capacitance			160		pF
C _{res}	Reverse Transfer Capacitance			25		pF
Q _g	Gate Charge	$V_{CE} = 320 \text{ V}$, $I_C = 20 \text{ A}$, $V_{GE} = 5 \text{ V}$		46		nC

FUNCTIONAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
II	Latching Current	$V_{\text{Clamp}} = 320 \text{ V}$, $T_C = 125^\circ\text{C}$ $R_{\text{GOFF}} = 1\text{K}\Omega$, $V_{\text{GE}} = 10 \text{ V}$		40		A
U.I.S.	Functional Test Open Secondary Coil	$R_{\text{GOFF}} = 1\text{K}\Omega$, $L = 1.6\text{mH}$, $T_C = 125^\circ\text{C}$	20			A

SWITCHING ON

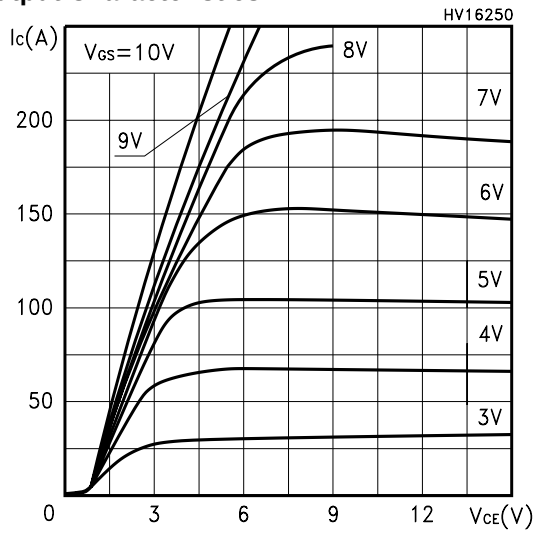
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{\text{d(on)}}$ t_r	Turn-on Delay Time Rise Time	$V_{\text{CC}} = 320 \text{ V}$, $I_C = 20 \text{ A}$ $R_G = 1\text{K}\Omega$, $V_{\text{GE}} = 5 \text{ V}$		1 0.22		μs μs
$(di/dt)_{\text{on}}$	Turn-on Current Slope	$V_{\text{CC}} = 320 \text{ V}$, $I_C = 20 \text{ A}$ $R_G = 1\text{K}\Omega$, $V_{\text{GE}} = 5 \text{ V}$		140		A/ μs
Eon	Turn-on Switching Losses	$V_{\text{CC}} = 320 \text{ V}$, $I_C = 20 \text{ A}$, $T_C = 25^\circ\text{C}$ $R_G = 1\text{K}\Omega$, $V_{\text{GE}} = 5 \text{ V}$, $T_C = 150^\circ\text{C}$		5 5.1		mJ mJ

SWITCHING OFF

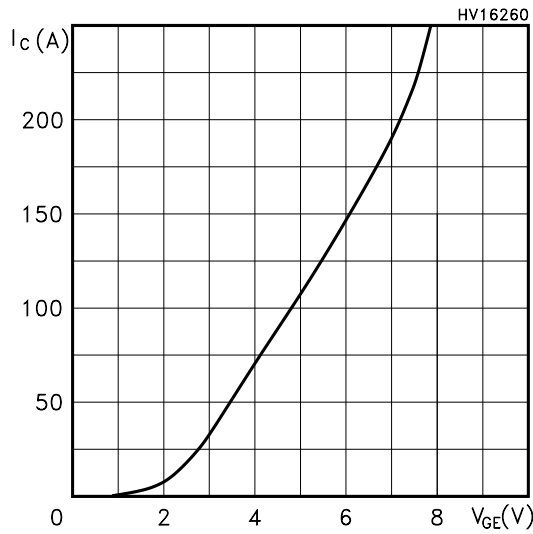
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c $t_r(V_{\text{off}})$ $t_{\text{d(off)}}$ t_f $E_{\text{off}}(**)$	Cross-over Time Off Voltage Rise Time Delay Time Fall Time Turn-off Switching Loss	$V_{\text{CC}} = 320 \text{ V}$, $I_C = 20 \text{ A}$, $R_{\text{GE}} = 1\text{K}\Omega$, $V_{\text{GE}} = 5 \text{ V}$		4.4 2.5 12.1 1.6 12.9		μs μs μs μs mJ
t_c $t_r(V_{\text{off}})$ $t_{\text{d(off)}}$ t_f $E_{\text{off}}(**)$	Cross-over Time Off Voltage Rise Time Delay Time Fall Time Turn-off Switching Loss	$V_{\text{CC}} = 320 \text{ V}$, $I_C = 20 \text{ A}$, $R_{\text{GE}} = 1\text{K}\Omega$, $V_{\text{GE}} = 5 \text{ V}$ $T_J = 125^\circ\text{C}$		6 3.16 13.4 2.7 18.4		μs μs μs μs mJ

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

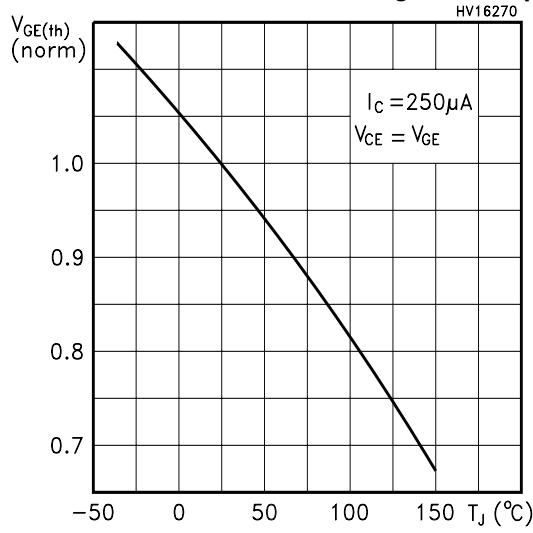
Output Characteristics



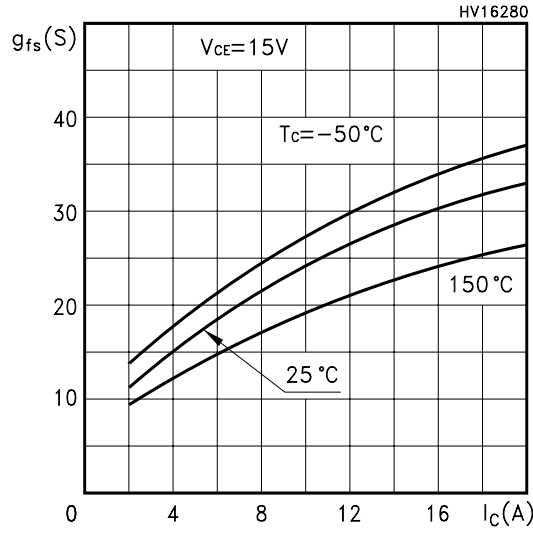
Transfer Characteristics



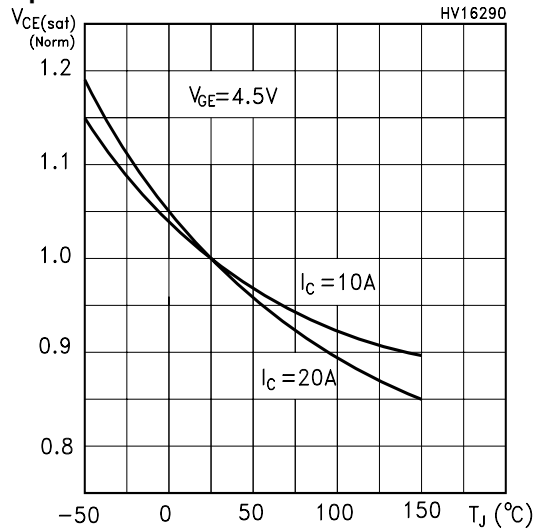
Normalized Gate Threshold Voltage vs Temp.



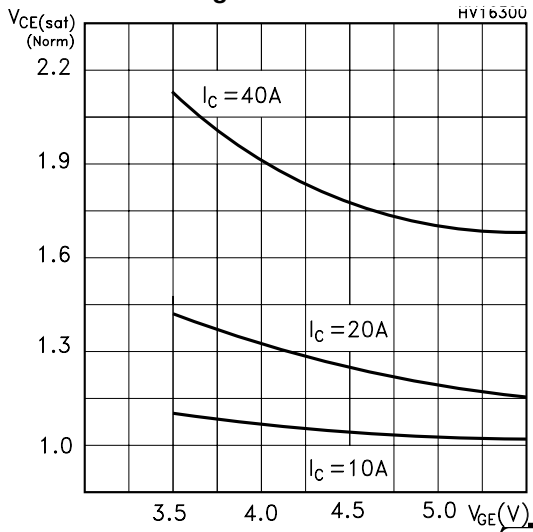
Transconductance



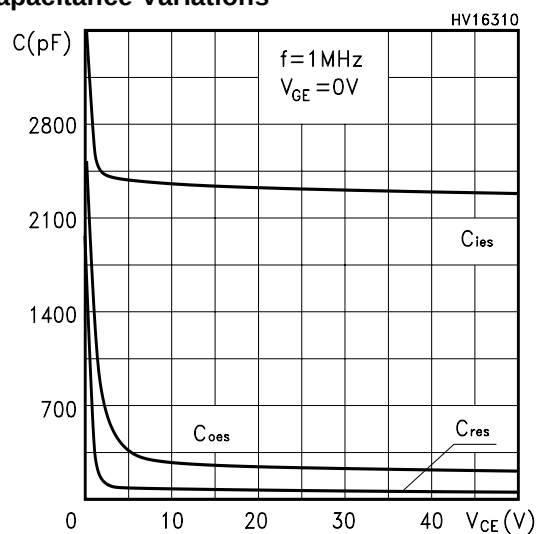
Normalized Collector-Emitter On Voltage vs Temperature



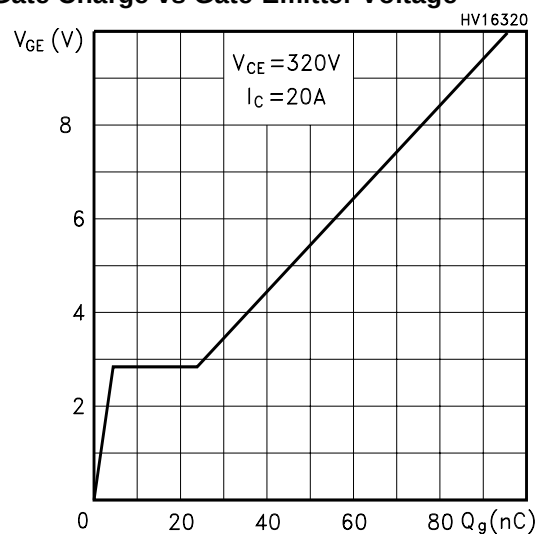
Normalized Collector-Emitter On Voltage vs Gate-Emitter Voltage



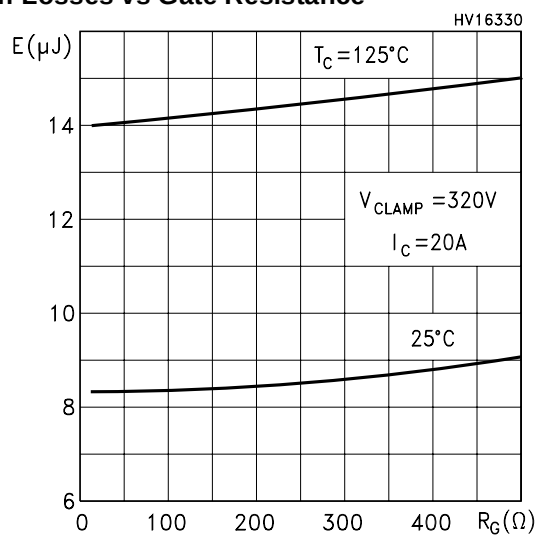
Capacitance Variations



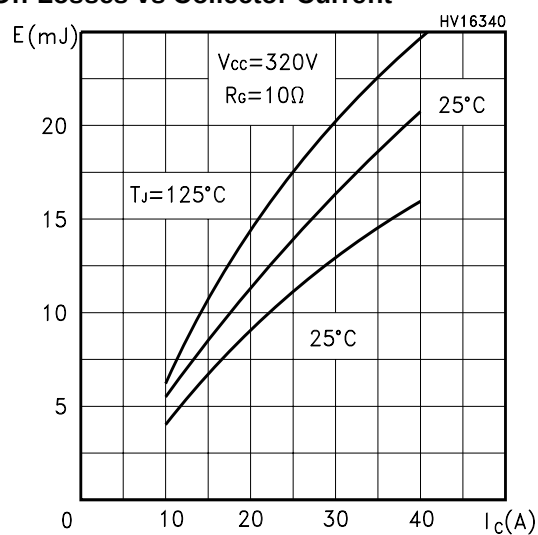
Gate Charge vs Gate-Emitter Voltage



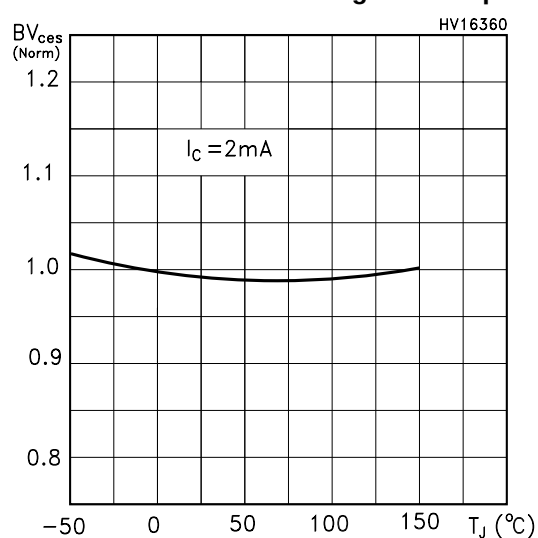
Off Losses vs Gate Resistance



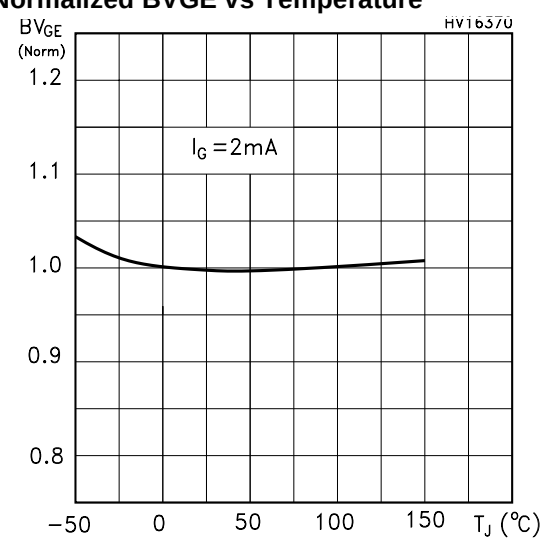
Off Losses vs Collector Current



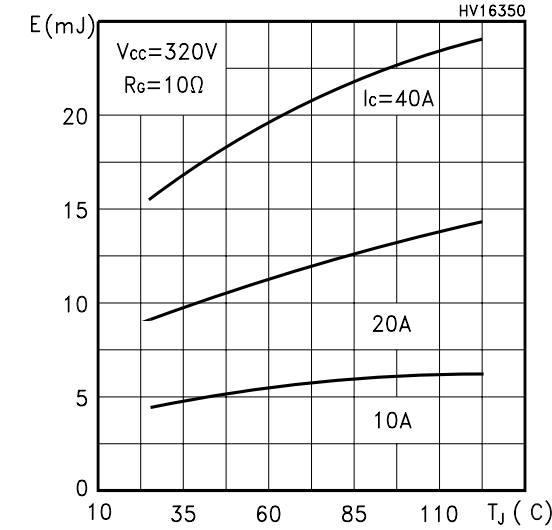
Normalized Break-down Voltage vs Temp.



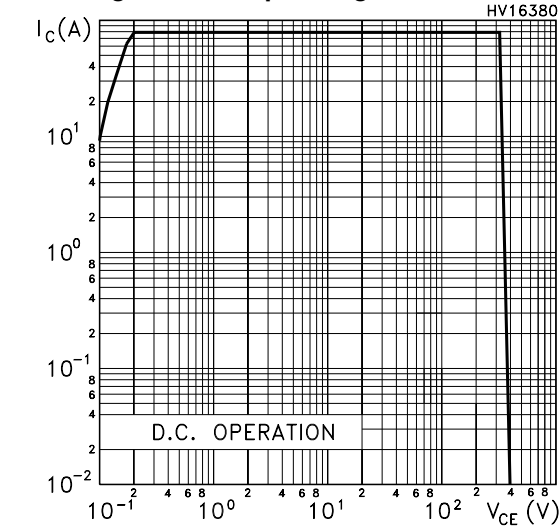
Normalized BVGE vs Temperature



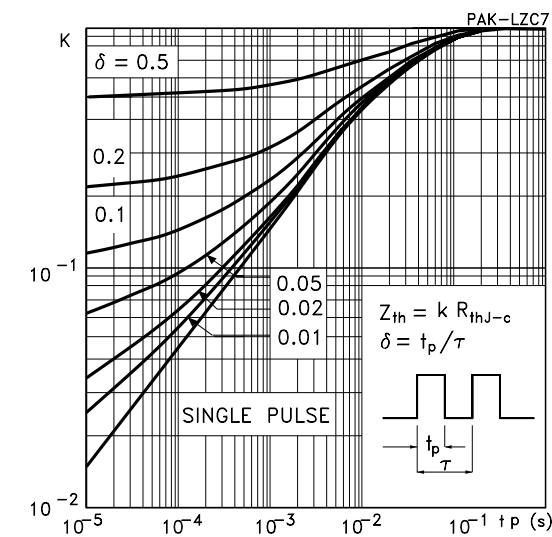
Off Losses vs Temperature



Switching Off Safe Operating Area

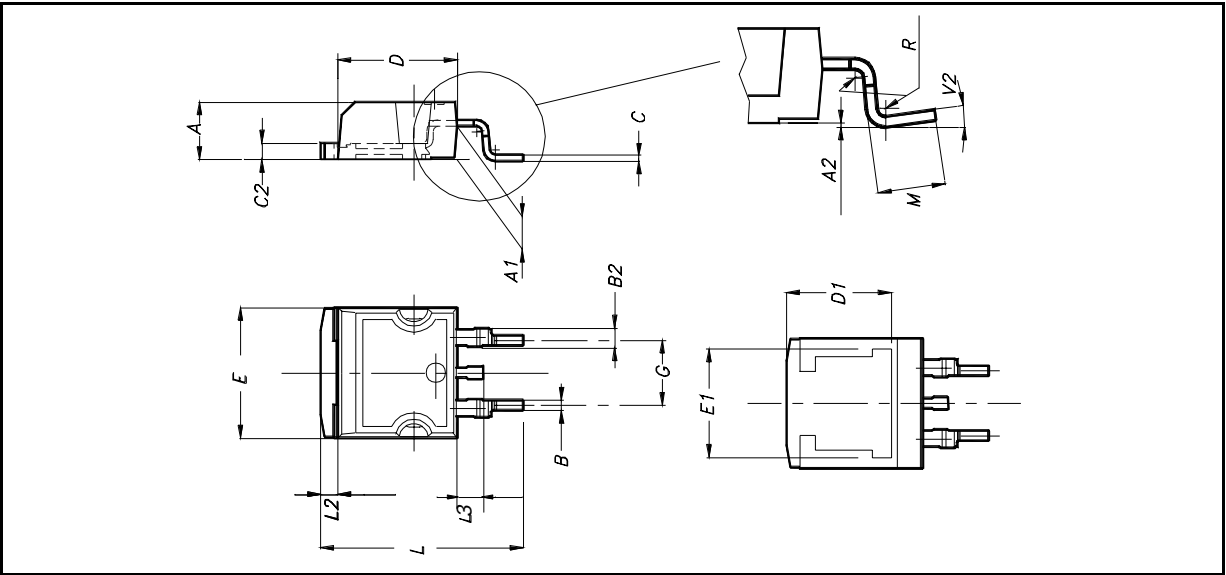


Thermal Impedance

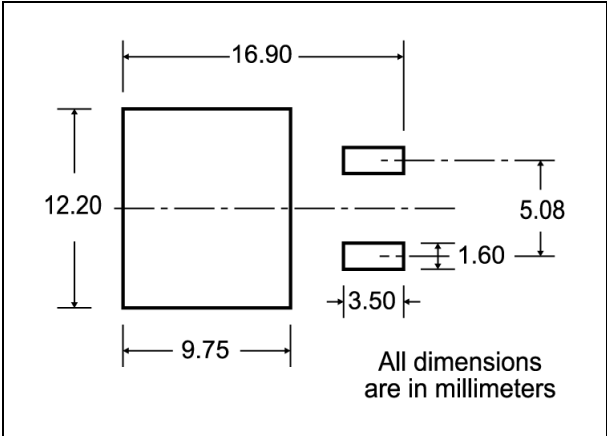


D²PAK MECHANICAL DATA

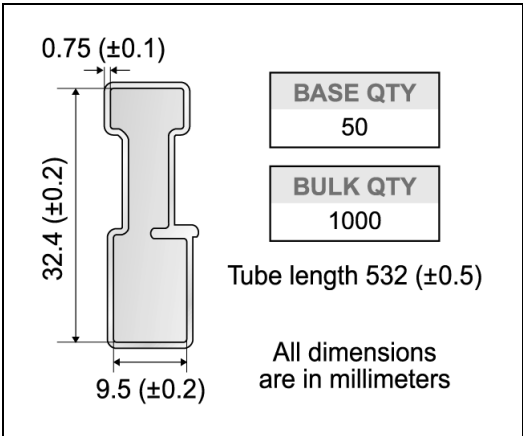
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334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



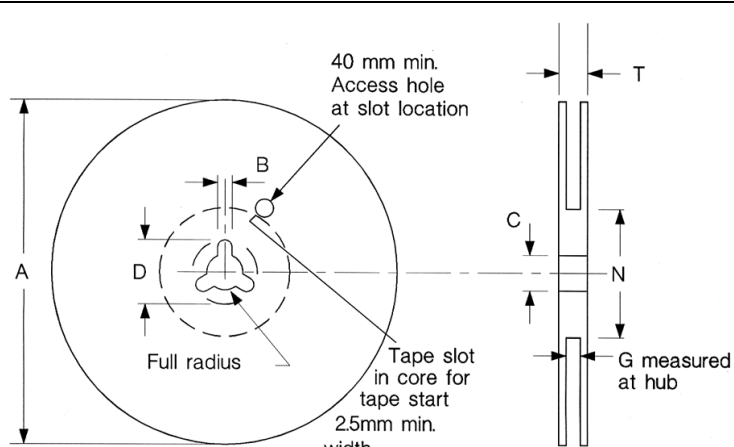
D²PAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



TAPE AND REEL SHIPMENT (suffix "T4")*



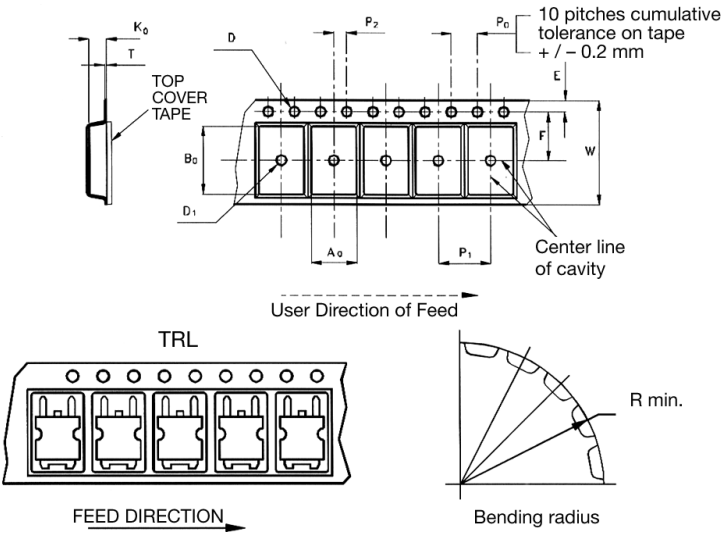
TAPE MECHANICAL DATA

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



* on sales type
8/9

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