



STGB20NB37LZ

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

TYPE	V _{CES}	V _{CE(sat)}	I _C
STGB20NB37Z	CLAMPED	< 2.0 V	20 A

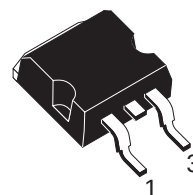
- POLYSILICON GATE VOLTAGE DRIVEN
- LOW THRESHOLD VOLTAGE
- LOW ON-VOLTAGE DROP
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- HIGH VOLTAGE CLAMPING FEATURE
- SURFACE-MOUNTING D²PAK (TO-263)
POWER PACKAGE IN TUBE (NO SUFFIX) OR
IN TAPE & REEL (SUFFIX "T4")

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.

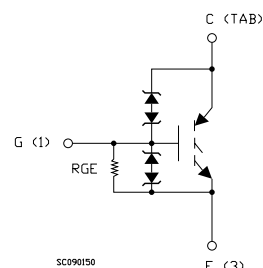
APPLICATIONS

- 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	30	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	150	W
	Derating Factor	1	W/°C
E _{SD}	ESD (Human Body Model)	4	KV
T _{stg}	Storage Temperature	-65 to 150	°C
T _j	Max. Operating Junction Temperature	150	°C

(■) 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
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 mA, V _{GE} = 0, T _C = -40°C	380	405	430	V
		I _C = 2 mA, V _{GE} = 0, T _C = 25°C	375	400	425	V
		I _C = 2 mA, V _{GE} = 0, T _C = 150°C	370	395	420	V
BV _(ECR)	Emitter Collector Break-down Voltage	I _C = 75 mA, T _C = 25°C	20	28		V
BV _{GE}	Gate Emitter Break-down Voltage	I _G = ± 2 mA	12	14	16	V
I _{CES}	Collector cut-off Current (V _{GE} = 0)	V _{CE} = 15 V, V _{GE} = 0, T _C = 150 °C			10	μA
		V _{CE} = 200 V, V _{GE} = 0, T _C = 150°C			100	μA
I _{GES}	Gate-Emitter Leakage Current (V _{CE} = 0)	V _{GE} = ± 10V, V _{CE} = 0	± 300	± 660	± 1000	μA
R _{GE}	Gate Emitter Resistance		10	15	30	KΩ

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GE(th)}	Gate Threshold Voltage	V _{CE} = V _{GE} , I _C = 250μA, T _C = -40°C	1.2			V
		V _{CE} = V _{GE} , I _C = 250μA, T _C = 25°C	1	1.4	2	V
		V _{CE} = V _{GE} , I _C = 250μA, T _C = 150°C	0.6			V
V _{CE(SAT)}	Collector-Emitter Saturation Voltage	V _{CE} = 4.5V, I _C = 10 A, T _C = 25°C		1.1	1.8	V
		V _{CE} = 4.5V, I _C = 10 A, T _C = 150°C		1.0	1.7	V
		V _{CE} = 4.5V, I _C = 20 A, T _C = 25°C		1.35	2.0	V
		V _{CE} = 4.5V, I _C = 20 A, T _C = 150°C		1.25	2.0	V

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs}	Forward Transconductance	V _{CE} = 25 V, I _C = 20 A		35		S
C _{ies}	Input Capacitance	V _{CE} = 25V, f = 1 MHz, V _{GE} = 0		2300		pF
C _{oes}	Output Capacitance			165		pF
C _{res}	Reverse Transfer Capacitance			28		pF
Q _g	Gate Charge	V _{CE} = 280V, I _C = 20 A, V _{GE} = 5V		51		nC

FUNCTIONAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
II	Latching Current	$V_{\text{Clamp}} = 250 \text{ V}$, $T_C = 150^\circ\text{C}$ $R_{\text{GOFF}} = 1\text{K}\Omega$, $V_{\text{GE}} = 4.5 \text{ V}$	80			A
U.I.S.	Functional Test Open Secondary Coil	$R_{\text{GOFF}} = 1\text{K}\Omega$, $L = 3 \text{ mH}$, $T_C = 25^\circ\text{C}$	21.6	26		A
		$R_{\text{GOFF}} = 1\text{K}\Omega$, $L = 3 \text{ mH}$, $T_C = 150^\circ\text{C}$	15	18		A

SWITCHING ON

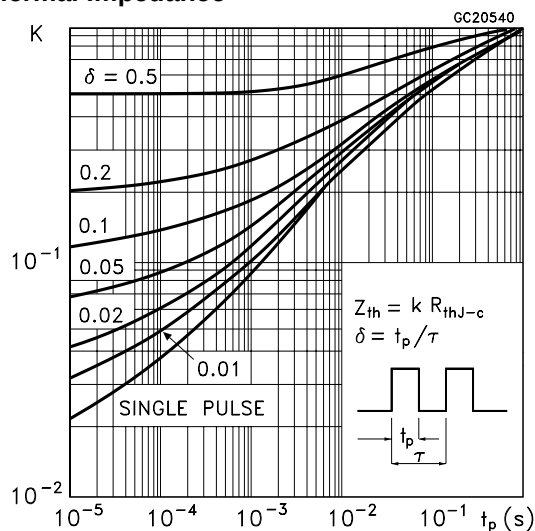
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(\text{on})}$	Turn-on Delay Time	$V_{\text{CC}} = 250 \text{ V}$, $I_C = 20 \text{ A}$		2.3		μs
t_r	Rise Time	$R_G = 1\text{K}\Omega$, $V_{\text{GE}} = 4.5 \text{ V}$		0.6		μs
$(di/dt)_{\text{on}}$	Turn-on Current Slope	$V_{\text{CC}} = 250 \text{ V}$, $I_C = 20 \text{ A}$ $R_G = 1\text{K}\Omega$, $V_{\text{GE}} = 4.5 \text{ V}$		550		A/ μs
Eon	Turn-on Switching Losses	$V_{\text{CC}} = 250 \text{ V}$, $I_C = 20 \text{ A}$, $T_C = 25^\circ\text{C}$		8.8		mJ
		$R_G = 1\text{K}\Omega$, $V_{\text{GE}} = 4.5 \text{ V}$, $T_C = 150^\circ\text{C}$		9.2		mJ

SWITCHING OFF

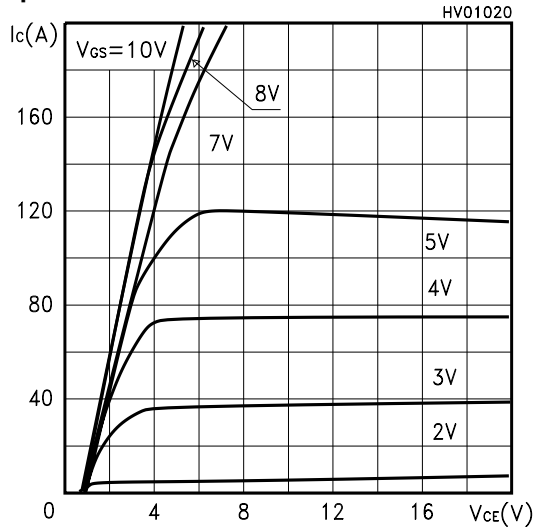
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-over Time	$V_{\text{CC}} = 250 \text{ V}$, $I_C = 20 \text{ A}$, $R_{\text{GE}} = 1\text{K}\Omega$, $V_{\text{GE}} = 4.5 \text{ V}$		4.8		μs
$t_r(V_{\text{off}})$	Off Voltage Rise Time			2.6		μs
$t_{d(\text{off})}$	Delay Time			2.0		μs
t_f	Fall Time			11.5		μs
$E_{\text{off}}(**)$	Turn-off Switching Loss			11.8		mJ
t_c	Cross-over Time	$V_{\text{CC}} = 250 \text{ V}$, $I_C = 20 \text{ A}$, $R_{\text{GE}} = 10 \Omega$, $V_{\text{GE}} = 15 \text{ V}$ $T_J = 125^\circ\text{C}$		7.8		μs
$t_r(V_{\text{off}})$	Off Voltage Rise Time			3.5		μs
$t_{d(\text{off})}$	Delay Time			3.9		μs
t_f	Fall Time			12.0		μs
$E_{\text{off}}(**)$	Turn-off Switching Loss			17.8		mJ

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

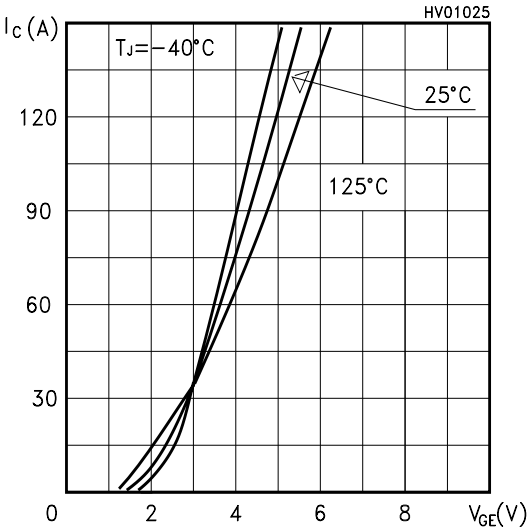
Thermal Impedance



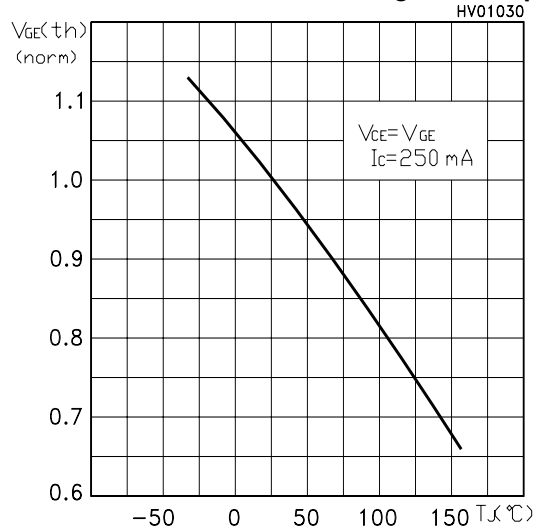
Output Characteristics



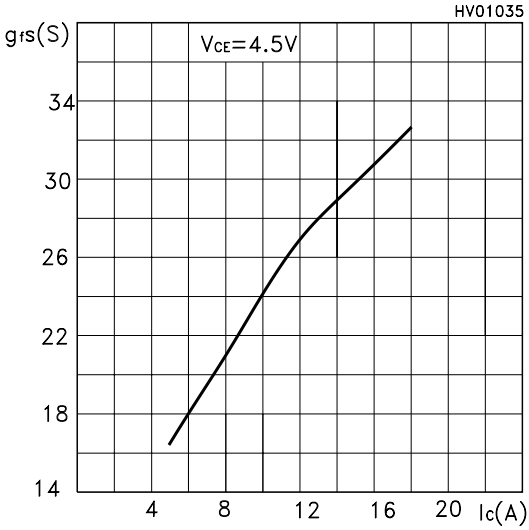
Transfer Characteristics



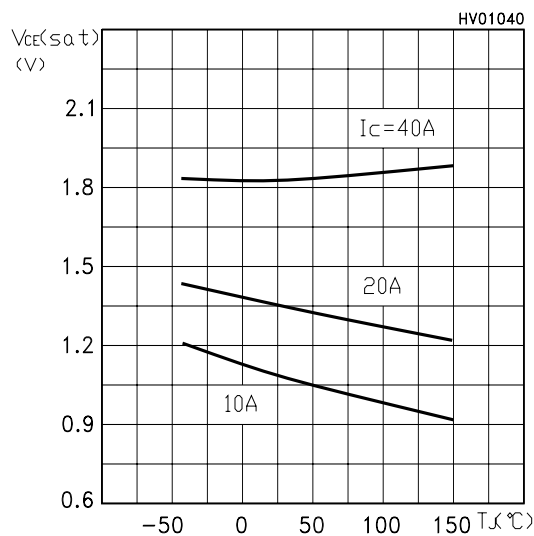
Normalized Gate Threshold Voltage vs Temp.



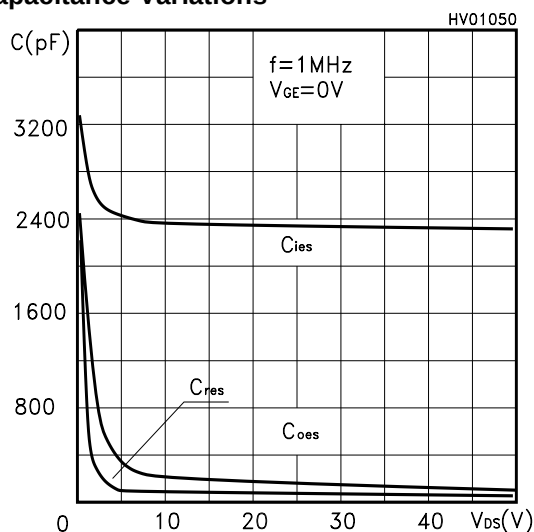
Transconductance



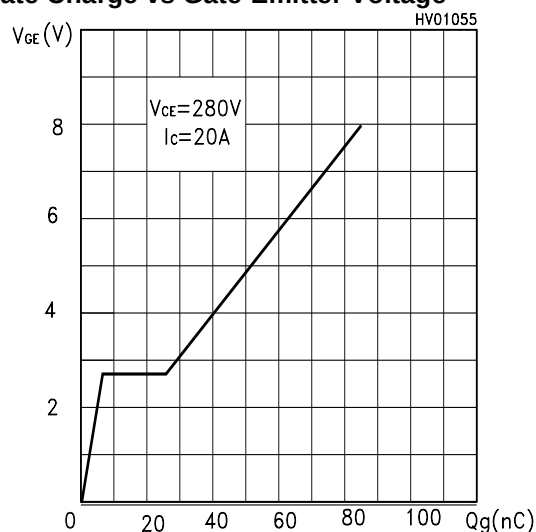
Collector-Emitter On Voltage vs Temperature



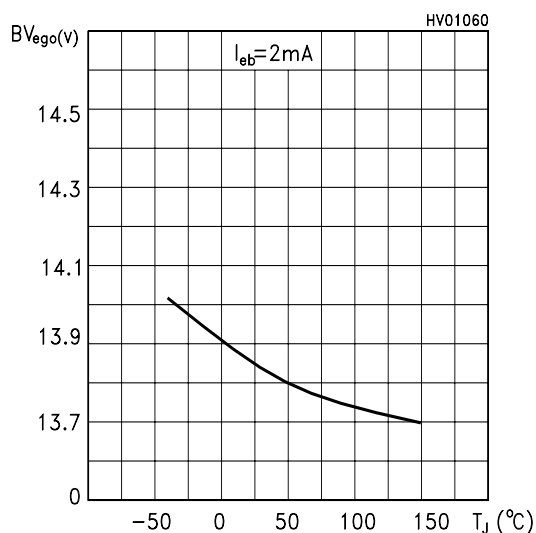
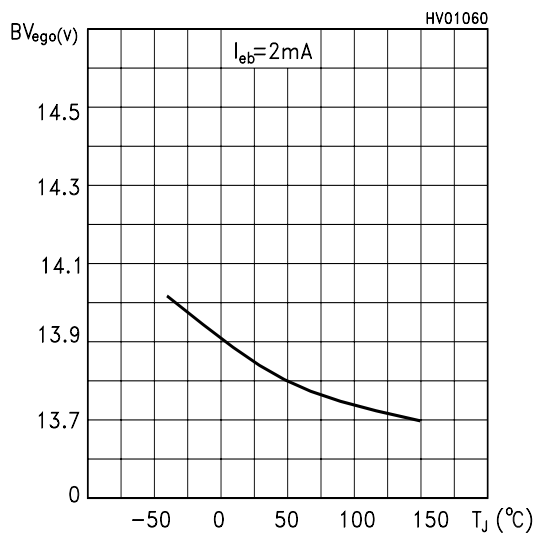
Capacitance Variations



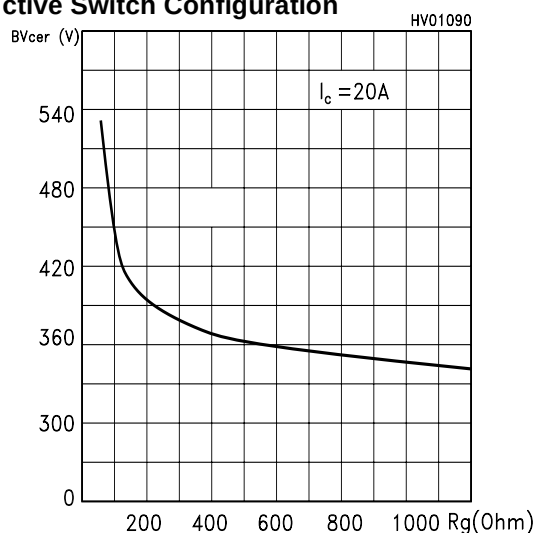
Gate Charge vs Gate-Emitter Voltage



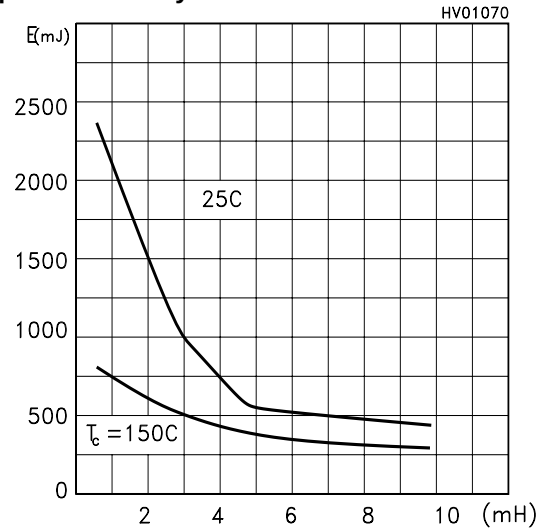
Break-Down Voltage vs Temperature

BV_{GEO} (Zener Gate-Emitter) vs Temperature

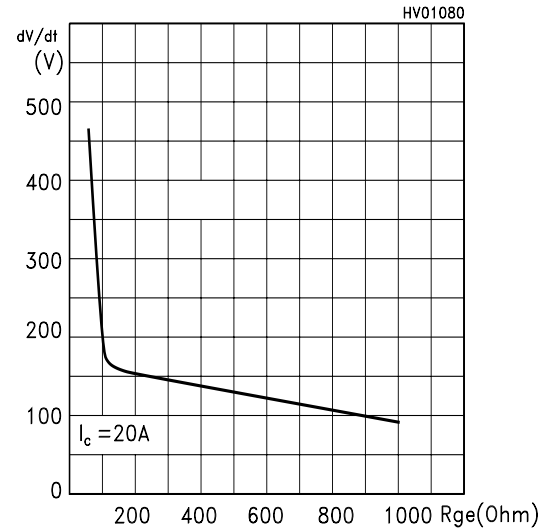
Break-Down Voltage vs Emitter Resistance Inductive Switch Configuration



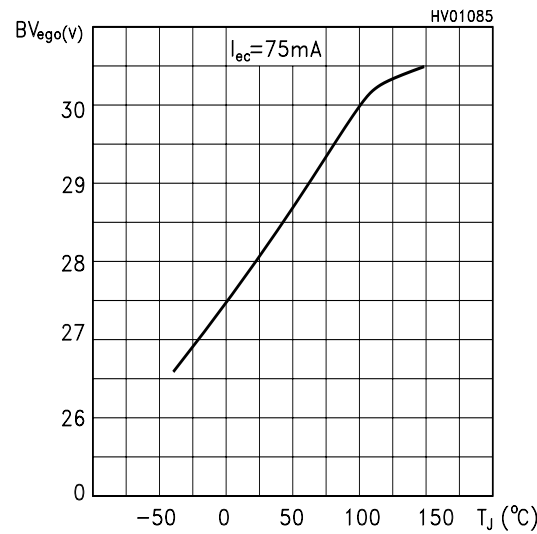
Self Clamped Inductive Switching Energy vs
Open Secondary Coil



dV/dt Gate-Emitter Resistance

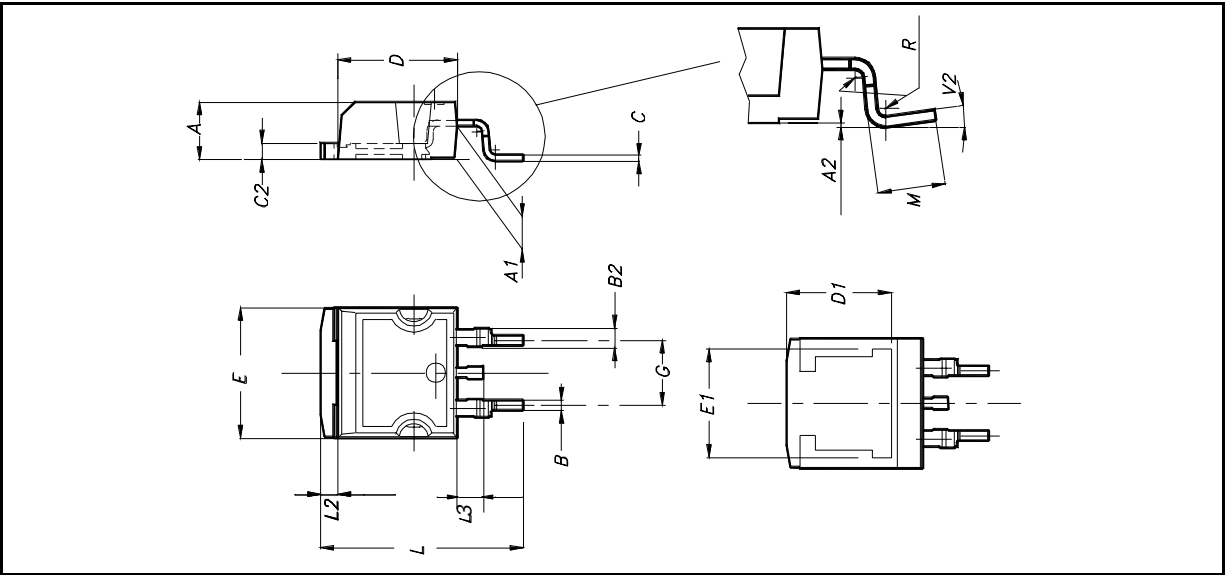


B_{VEC} Reverse Battery Voltage

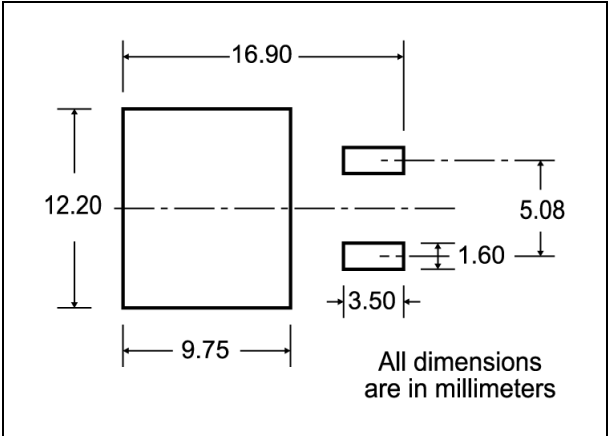


D²PAK MECHANICAL DATA

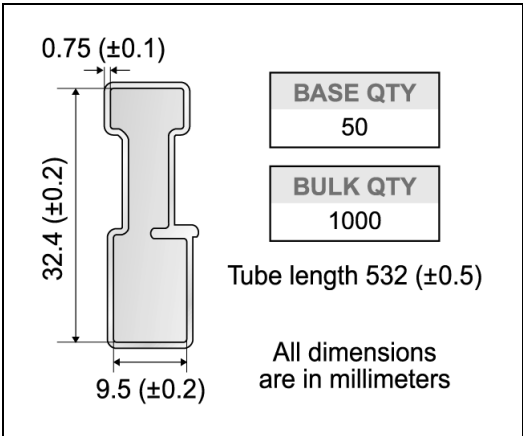
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334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



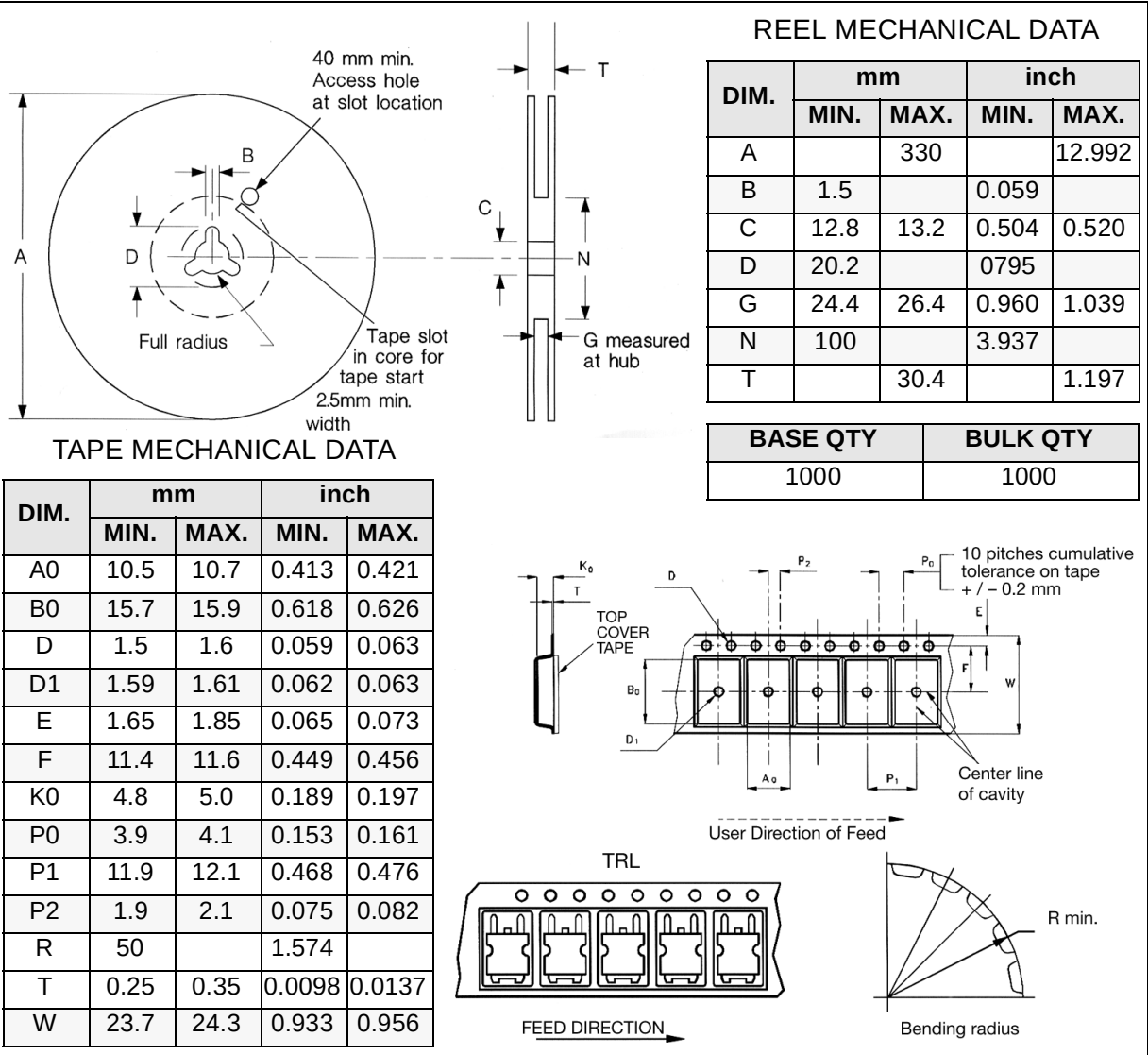
D²PAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



TAPE AND REEL SHIPMENT (suffix "T4")*



* on sales type

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