



STGB7NB40LZ

N-CHANNEL CLAMPED 14A - D²PAK INTERNALLY CLAMPED PowerMESH™ IGBT

TYPE	V _{CES}	V _{CE(sat)}	I _C
STGB7NB40LZ	CLAMPED	< 1.50 V	14 A

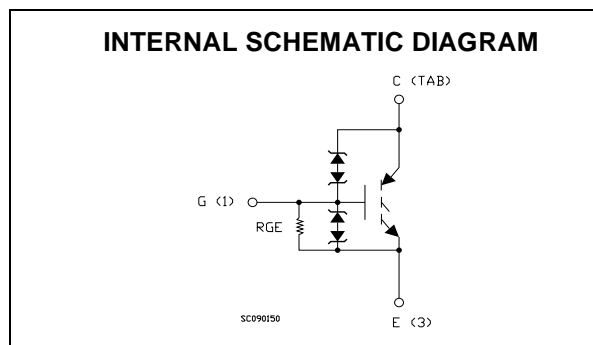
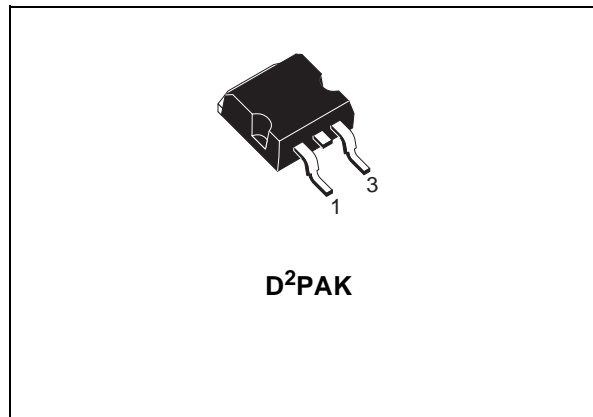
- POLYSILICON GATE VOLTAGE DRIVEN
- LOW THRESHOLD VOLTAGE
- LOW ON-VOLTAGE DROP
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- HIGH VOLTAGE CLAMPING FEATURE

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



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CES}	Collector-Emitter Voltage (V _{GS} = 0)	CLAMPED	V
V _{ECR}	Reverse Battery Protection	20	V
V _{GE}	Gate-Emitter Voltage	CLAMPED	V
I _C	Collector Current (continuous) at 100°C	14	A
R _G	Minimum External Gate Resistor	500	Ω
P _{TOT}	Total Dissipation at T _C = 25°C	100	W
	Derating Factor	0.66	W/°C
E _{CL}	Single Pulse Collector to Emitter Avalanche Energy I _C = 13 A ; T _j = 150°C (see fig.1-2)	130	mJ
E _{ECAV}	Reverse Avalanche Energy I _C = 7 A ; f = 100 Hz ; T _C = 25°C	10	mJ
T _{stg}	Storage Temperature	-55 to 175	°C
T _j	Operating Junction Temperature		

STGB7NB40LZ

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	1.5	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max (free air)	62.5	°C/W

ELECTRICAL CHARACTERISTICS (T_{CASE} = 25°C UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
BV _(CES)	Collector-Emitter Clamped Voltage	I _C = 10 mA, V _{GE} = 0, T _C = -40°C to 150°C; R _G = 1 KΩ	370	400	430	V
BV _(ECS)	Emitter Collector Break-down Voltage	I _{EC} = 75 mA, V _{GE} = 0,	20	27		V
BV _{GE}	Gate Emitter Break-down Voltage	I _G = ± 2 mA	12		16	V
I _{CES}	Collector-Emitter Leakage Current	V _{GE} = 200 V, V _{CE} = 0, R _G = 1 KΩ T _C = 25°C T _C = 150°C			25 250	μA μA
I _{GES}	Gate-Emitter Leakage Current (V _{CE} = 0)	V _{GE} = ± 10 V, V _{CE} = 0			1000	μA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GE(th)}	Gate Threshold Voltage	V _{CE} = V _{GE} , I _C = 1 mA, T _C = 25°C V _{CE} = V _{GE} , I _C = 1 mA, T _C = 150°C	1.2 0.75		2.2 1.8	V V
V _{CE(SAT)}	Collector-Emitter Saturation Voltage	V _{GE} = 4.5 V, I _C = 7 A, T _j = 25°C V _{GE} = 5.0 V, I _C = 14 A, T _C = 25°C		1.3	1.50 1.9	V V
R _{GE}	Gate Emitter Resistance		10	20	30	KΩ

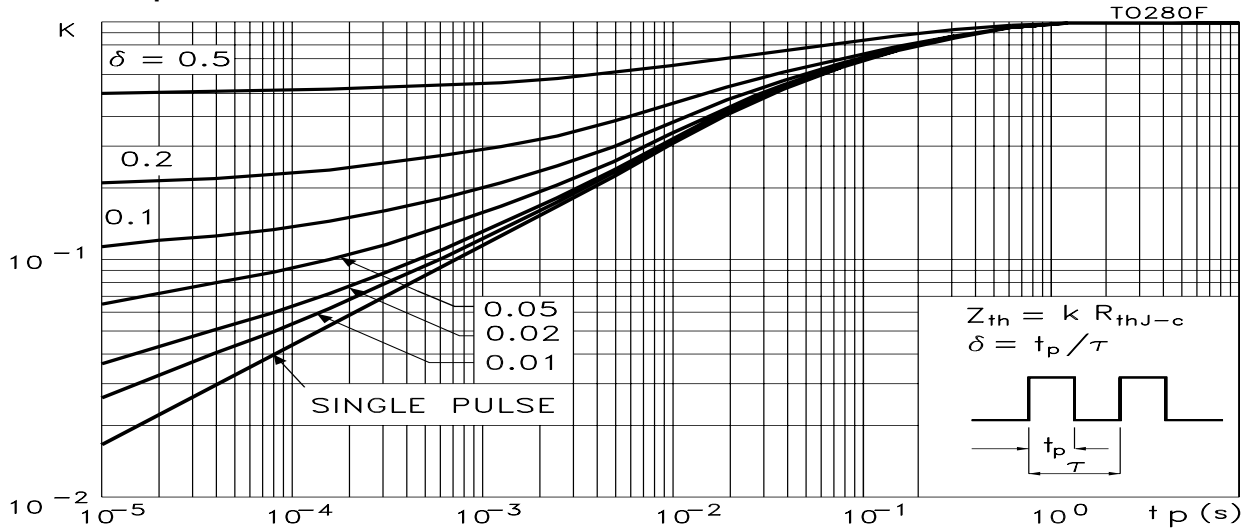
DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
C _{ies}	Input Capacitance	V _{CE} = 25 V, f = 1 MHz, V _{GE} = 0		910		pF
C _{oes}	Output Capacitance			80		pF
C _{res}	Reverse Transfer Capacitance			15		pF
Q _g	Gate Charge	V _{CE} = 40 V, I _C = 7 A, V _{GE} = 5 V		22		nC

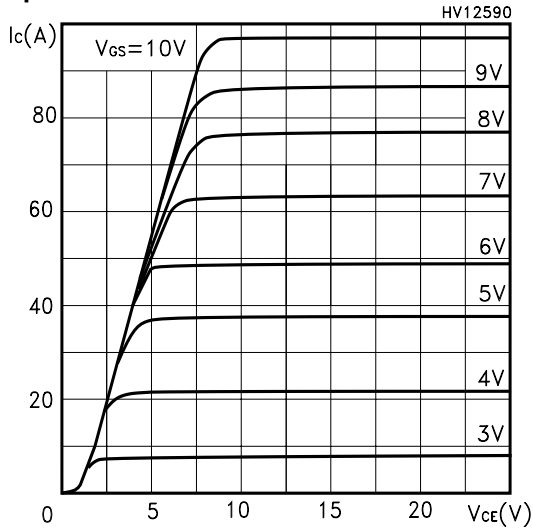
SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t _{d(on)}	Delay Time	V _{CE} = 14 V, R _G = 1KΩ,		0.9		μs
t _r	Current Rise Time	R _L = 1Ω, V _{GE} = 5 V		4.5		μs
t _{d(off)}	Delay Time	V _{CE} = 300 V, R _G = 1KΩ,		4.4		μs
t _f	Current Fall Time	R _L = 46Ω, V _{GE} = 5 V		3.6		μs

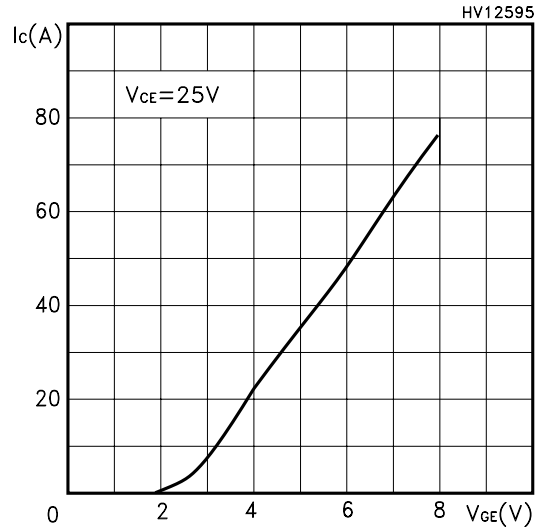
Thermal Impedance



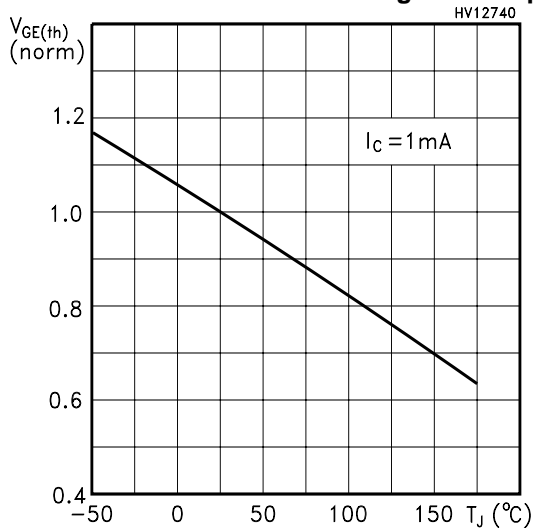
Output Characteristics



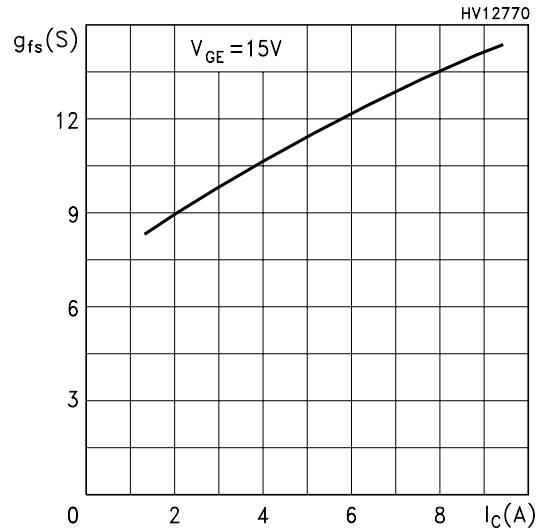
Transfer Characteristics



Normalized Gate Threshold Voltage vs Temp.

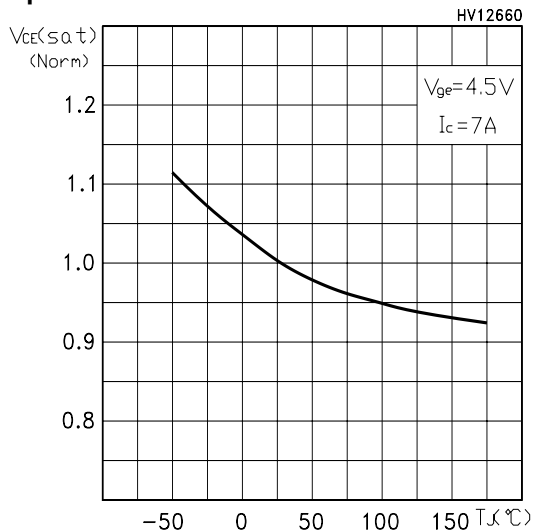


Transconductance

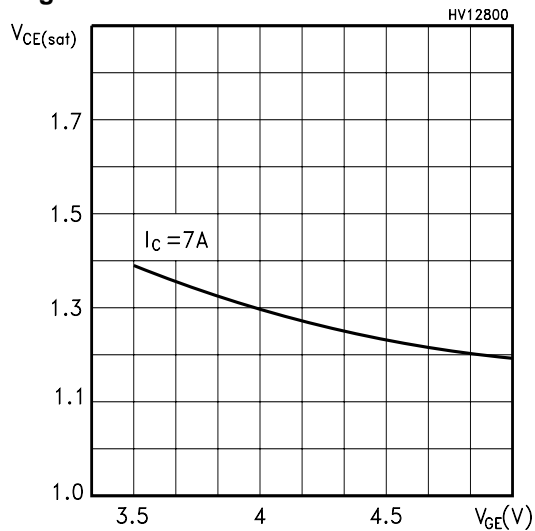


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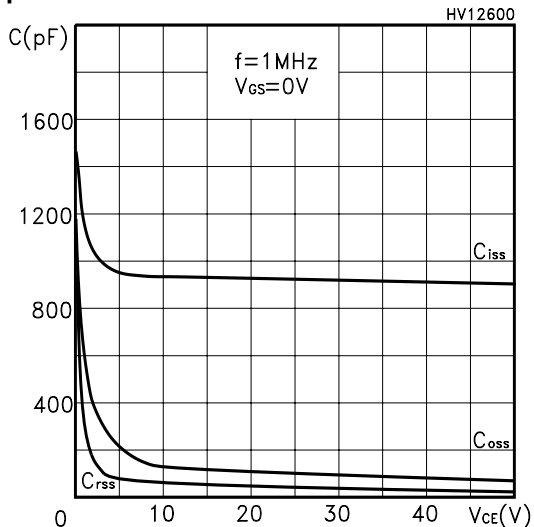
Normalized Collector-Emitter On Voltage vs Temperature



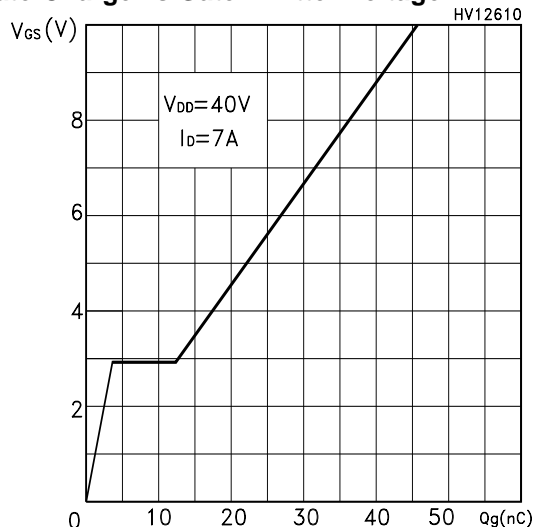
Collector-Emitter On Voltage vs Gate-Emitter Voltage



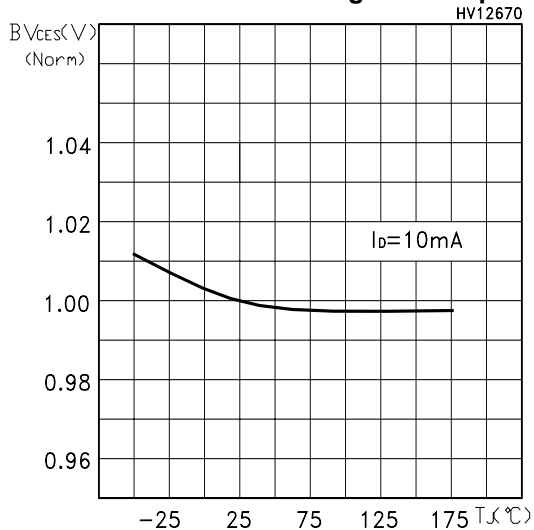
Capacitance Variations



Gate-Charge vs Gate-Emitter Voltage



Normalized Break-down Voltage vs Temp.



Clamping Voltage vs Gate Resistance

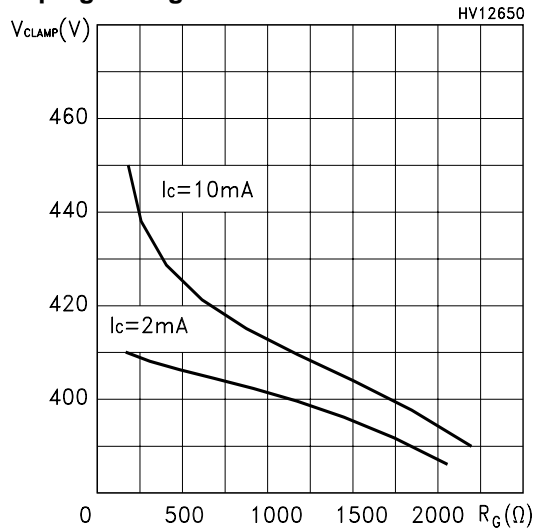


Fig. 1: Unclamped Inductive Load Test Circuit

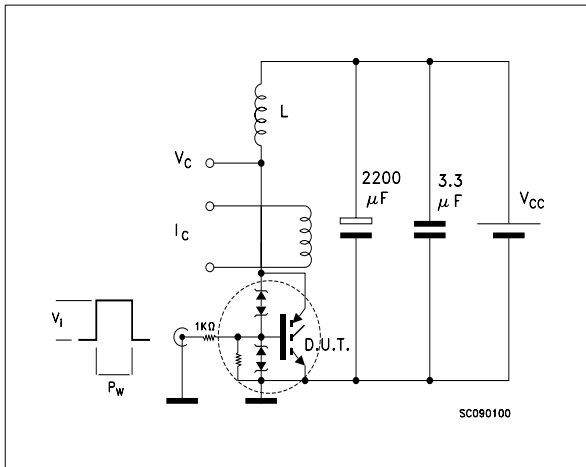


Fig. 2: Unclamped Inductive Waveform

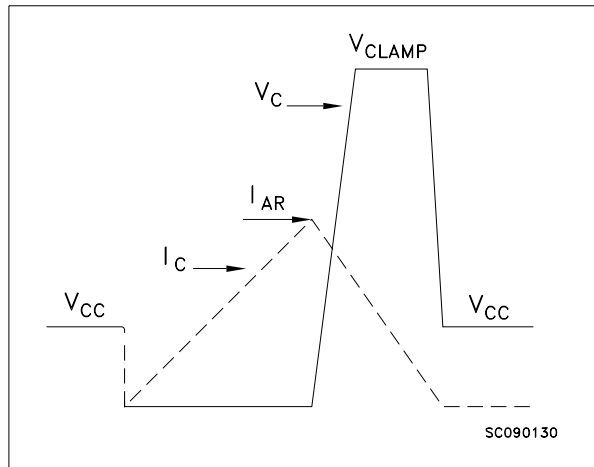


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times

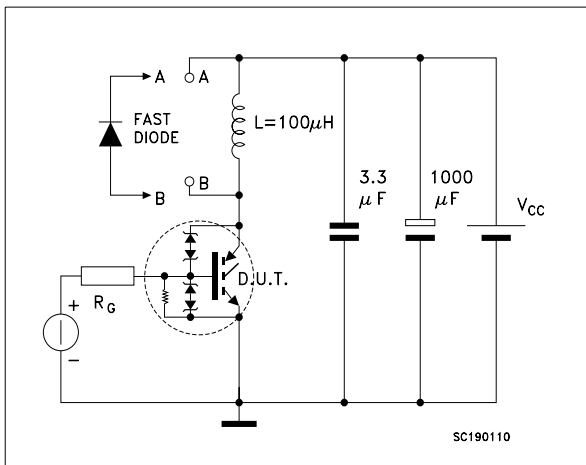
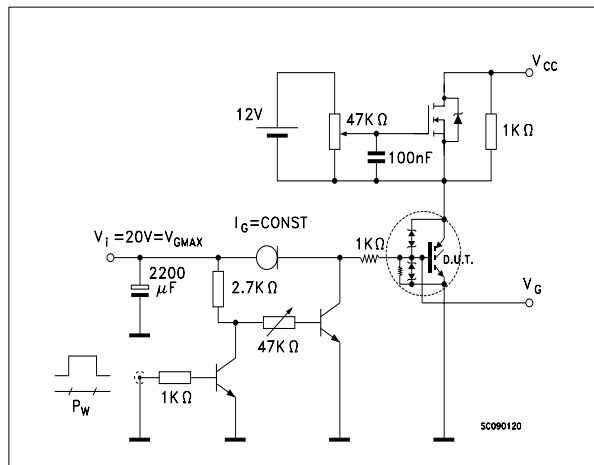
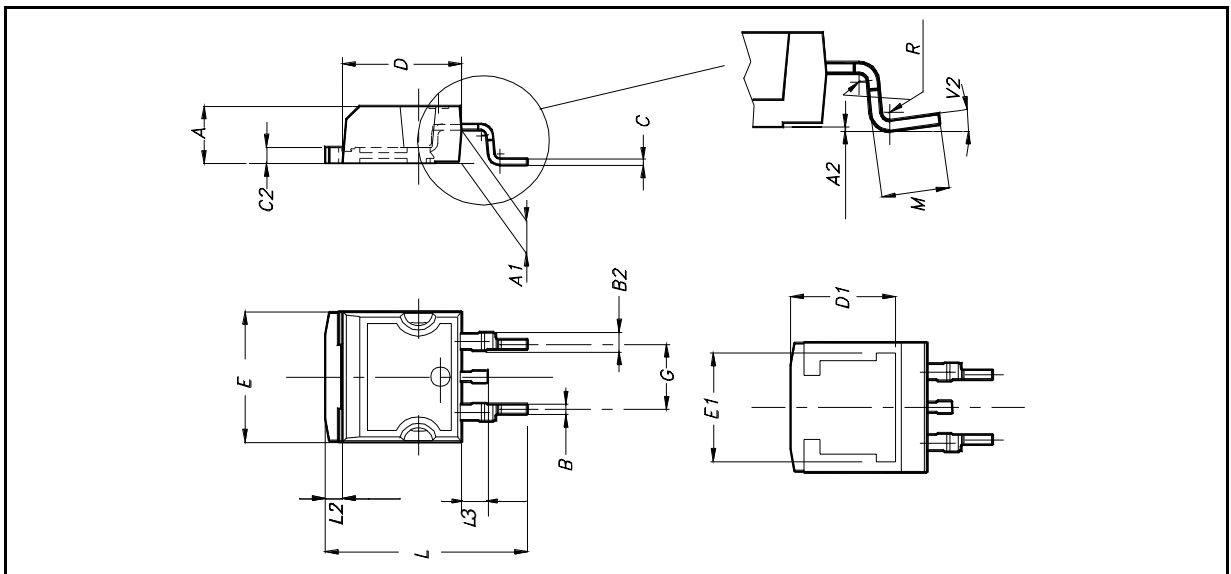


Fig. 4: Gate Charge test Circuit

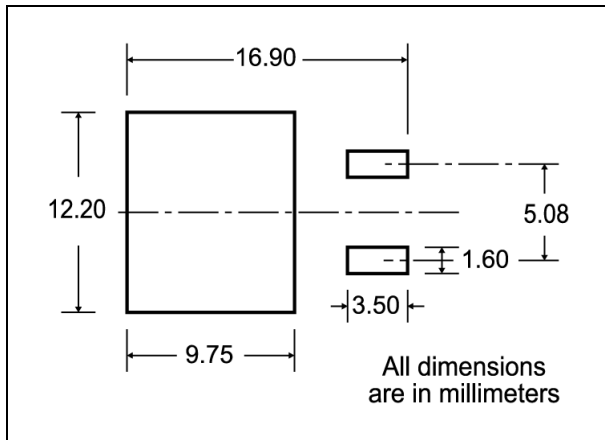


D²PAK MECHANICAL DATA

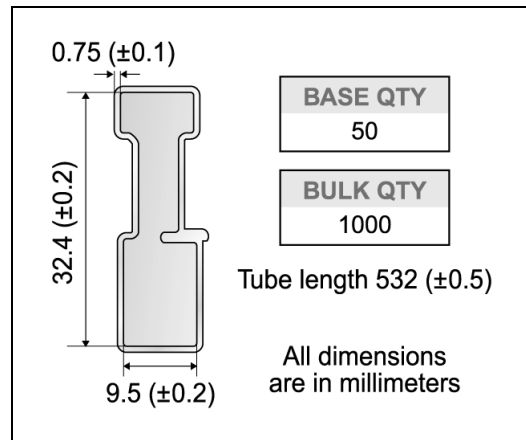
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8			0.315	
E	10		10.4	0.393		
E1		8.5			0.334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

Diagram showing the tape mechanical data. It includes a top view of the tape with dimensions A, B, C, D, and G. A note indicates a 40 mm min. access hole at the slot location. Another note indicates a 2.5 mm min. width for the tape slot in the core for tape start. The full radius is also indicated. A side view shows dimensions T, C, N, and G measured at the hub.

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

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

Diagrams showing the tape and reel shipment details. The top diagram shows a top view of the tape with dimensions K₀, D, P₂, P₀, E, F, W, B₀, D₁, A₀, P₁, and the center line of the cavity. A note indicates a 10-pitch cumulative tolerance on the tape of ±0.2 mm. The bottom diagram shows a side view of the tape with dimensions TRL and FEED DIRECTION. The bending radius is labeled as R min.

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