



STGD3NB60HD

N-CHANNEL 6A - 600V - DPAK

PowerMESH™ IGBT

TYPE	V _{CES}	V _{CE(sat)} (Max) @ 25°C	I _C @ 100°C
STGD3NB60HD	600 V	< 2.8 V	6 A

- HIGH INPUT IMPEDANCE
- OFF LOSSES INCLUDE TAIL CURRENT
- LOW GATE CHARGE
- HIGH FREQUENCY OPERATION
- TYPICAL SHORT CIRCUIT WITHSTAND TIME
5micro S-family, 4 micro H family
- CO-PACKAGED WITH TURBOSWITCH™
ANTIPARALLEL DIODE

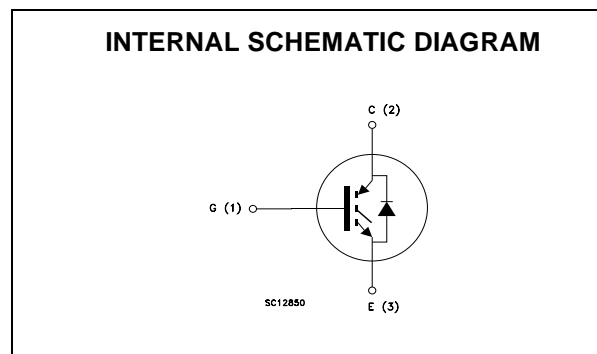
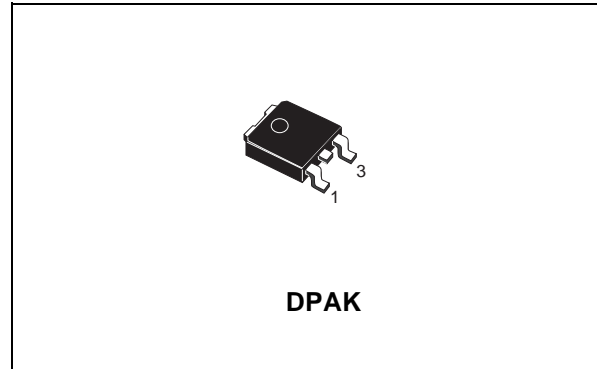
DESCRIPTION

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 suffix "H" identifies a family optimized for high frequency applications (up to 50kHz) in order to achieve very high switching performances (reduced t_{fall}) maintaining a low voltage drop.

APPLICATIONS

- HIGH FREQUENCY MOTOR CONTROLS
- SMPS and PFC IN BOTH HARD SWITCH AND
RESONANT TOPOLOGIES



ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STGD3NB60HDT4	GD3NB60HD	DPAK	TAPE & REEL

STGD3NB60HD

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CES}	Collector-Emitter Voltage ($V_{GS} = 0$)	600	V
V_{ECR}	Emitter-Collector Voltage	20	V
V_{GE}	Gate-Emitter Voltage	± 20	V
I_C	Collector Current (continuous) at $T_C = 25^\circ\text{C}$	10	A
I_C	Collector Current (continuous) at $T_C = 100^\circ\text{C}$	6	A
I_{CM} (■)	Collector Current (pulsed)	24	A
P_{TOT}	Total Dissipation at $T_C = 25^\circ\text{C}$	50	W
	Derating Factor	0.4	W/ $^\circ\text{C}$
T_{stg}	Storage Temperature	-55 to 150	$^\circ\text{C}$
T_j	Operating Junction Temperature		

(■) Pulse width limited by safe operating area

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	2.5	$^\circ\text{C}/\text{W}$
Rthj-amb	Thermal Resistance Junction-ambient Max	100	$^\circ\text{C}/\text{W}$

ELECTRICAL CHARACTERISTICS ($T_{CASE} = 25^\circ\text{C}$ UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{BR(CES)}$	Collector-Emitter Breakdown Voltage	$I_C = 250\ \mu\text{A}$, $V_{GE} = 0$	600			V
I_{CES}	Collector cut-off ($V_{GE} = 0$)	$V_{CE} = \text{Max Rating}$, $T_C = 25^\circ\text{C}$ $V_{CE} = \text{Max Rating}$, $T_C = 125^\circ\text{C}$			50 100	μA μA
I_{GES}	Gate-Emitter Leakage Current ($V_{CE} = 0$)	$V_{GE} = \pm 20\text{V}$, $V_{CE} = 0$			± 100	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Threshold Voltage	$V_{CE} = V_{GE}$, $I_C = 250\ \mu\text{A}$	3		5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 15\text{V}$, $I_C = 3\ \text{A}$ $V_{GE} = 15\text{V}$, $I_C = 3\ \text{A}$, $T_j = 125^\circ\text{C}$		2.4 1.9	2.8	V V

ELECTRICAL CHARACTERISTICS (CONTINUED)

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	$V_{CE} = 25 \text{ V}, I_C = 3 \text{ A}$		2.4		S
C_{ies} C_{oes} C_{res}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{CE} = 25 \text{ V}, f = 1 \text{ MHz}, V_{GE} = 0$		235 33 6.6		pF pF pF
Q_g Q_{ge} Q_{gc}	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	$V_{CE} = 480 \text{ V}, I_C = 3 \text{ A},$ $V_{GE} = 15 \text{ V}$		21 6 7.6	27	nC nC nC
I_{CL}	Latching Current	$V_{clamp} = 480 \text{ V}, T_j = 125^\circ\text{C}$ $R_G = 10 \Omega$	12			A

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Delay Time Rise Time	$V_{CC} = 480 \text{ V}, I_C = 3 \text{ A}$ $R_G = 10 \Omega, V_{GE} = 15 \text{ V}$		5 11		ns ns
$(di/dt)_{on}$ E_{on}	Turn-on Current Slope Turn-on Switching Losses	$V_{CC} = 480 \text{ V}, I_C = 3 \text{ A}, R_G = 10 \Omega$ $V_{GE} = 15 \text{ V}, T_j = 125^\circ\text{C}$		400 77		A/ μs μJ

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c $t_r(V_{off})$ $t_{d(off)}$ t_f $E_{off(**)}$ E_{ts}	Cross-over Time Off Voltage Rise Time Delay Time Fall Time Turn-off Switching Loss Total Switching Loss	$V_{CC} = 480 \text{ V}, I_C = 3 \text{ A},$ $R_{GE} = 10 \Omega, V_{GE} = 15 \text{ V}$		76 36 53 77 33 100		ns ns ns ns μJ μJ
t_c $t_r(V_{off})$ $t_{d(off)}$ t_f $E_{off(**)}$ E_{ts}	Cross-over Time Off Voltage Rise Time Delay Time Fall Time Turn-off Switching Loss Total Switching Loss	$V_{CC} = 480 \text{ V}, I_C = 3 \text{ A},$ $R_{GE} = 10 \Omega, V_{GE} = 15 \text{ V}$ $T_j = 125^\circ\text{C}$		180 82 58 110 88 165		ns ns ns ns μJ μJ

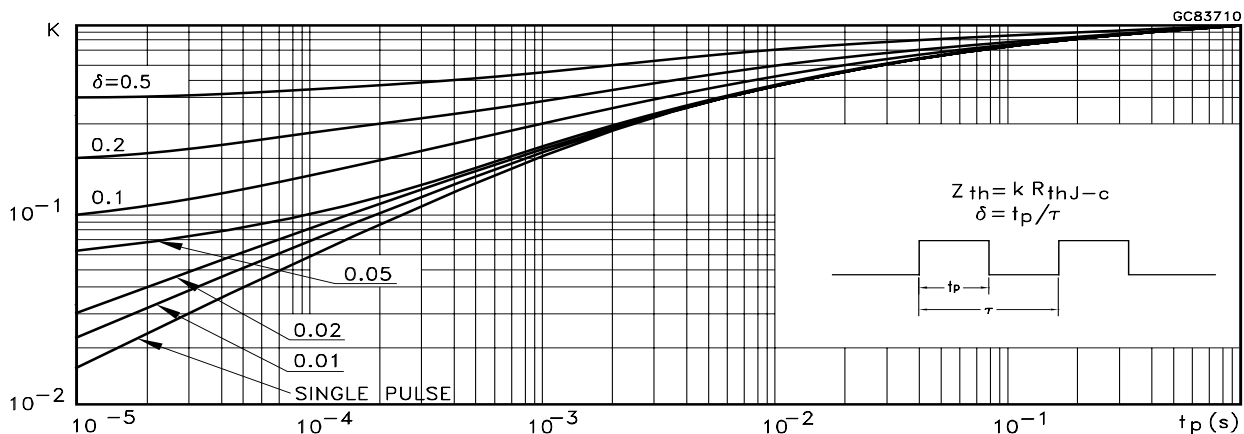
Note: 1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.
2. Pulse width limited by max. junction temperature.
(**)Losses include Also the Tail (Jedec Standardization)

COLLECTOR-EMITTER DIODE

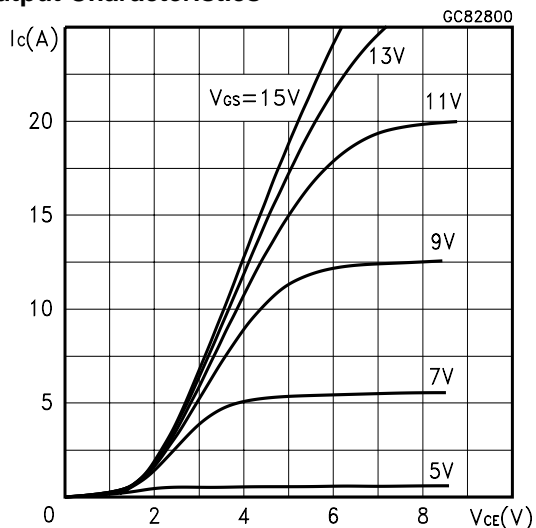
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_f I_{fm}	Forward Current Forward Current pulsed				1.5 12	A A
V_f	Forward On-Voltage	$I_f = 1.5 \text{ A}$ $I_f = 1.5 \text{ A}, T_j = 125^\circ\text{C}$		1.6 1.3	2.1	V V
t_{rr} Q_{rr} I_{rrm}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_f = 1.5 \text{ A}, V_R = 400 \text{ V},$ $T_j = 125^\circ\text{C}, di/dt = 100 \text{ A}/\mu\text{s}$		95 110 2.7		ns nC A

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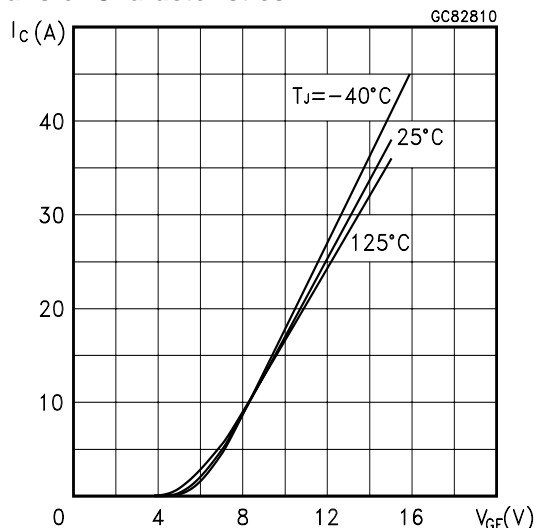
Thermal Impedance



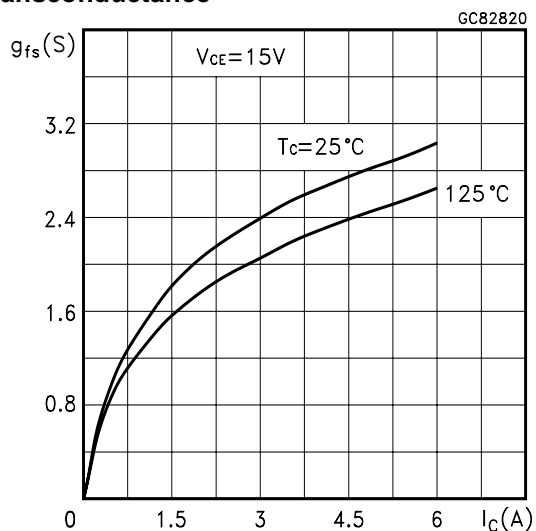
Output Characteristics



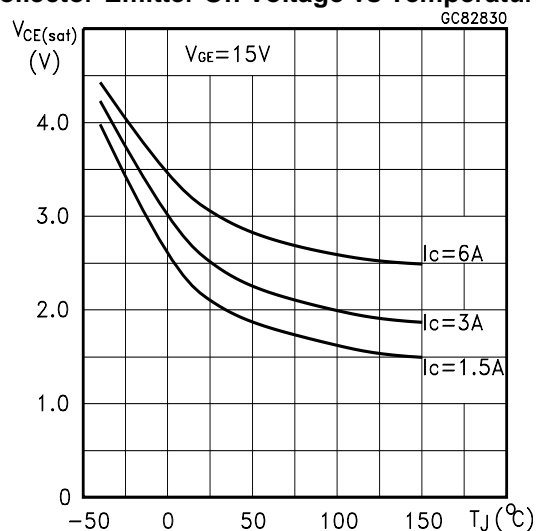
Transfer Characteristics



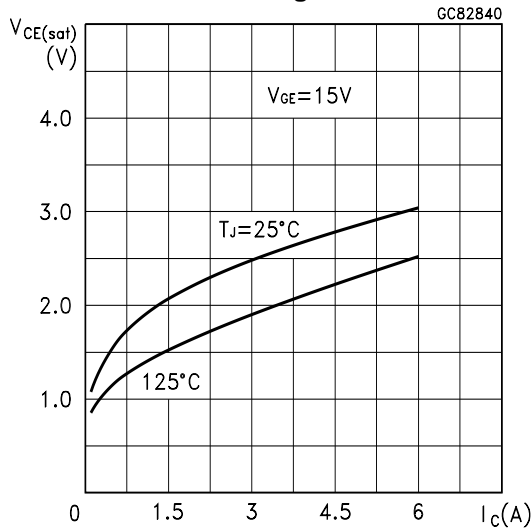
Transconductance



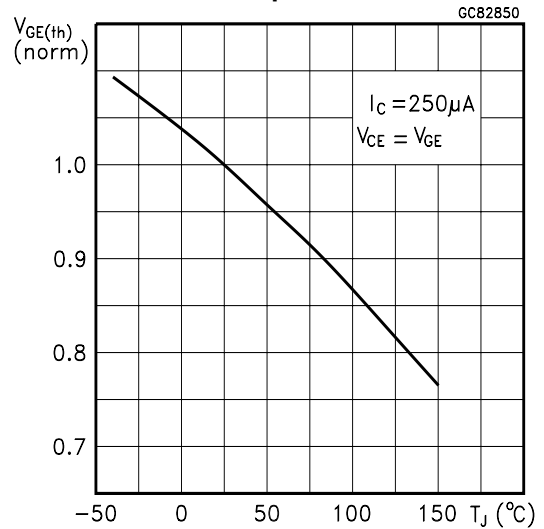
Collector-Emitter On Voltage vs Temperature



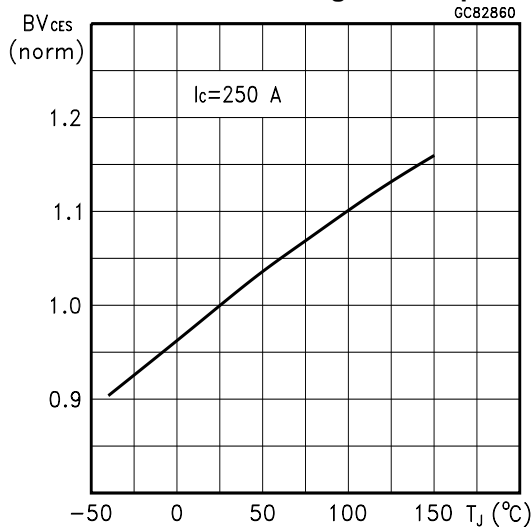
Collector-Emitter On Voltage vs Collector Current



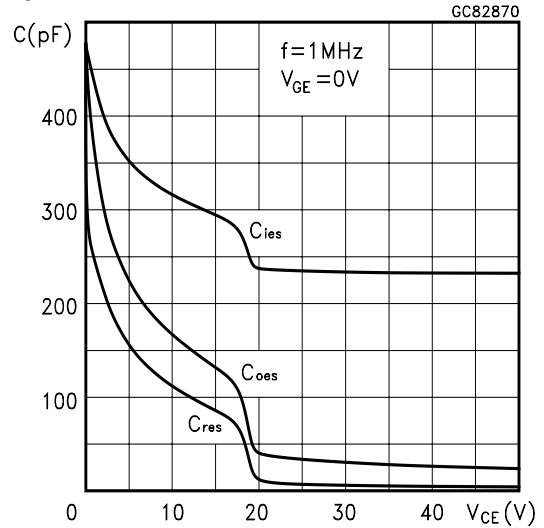
Gate Threshold vs Temperature



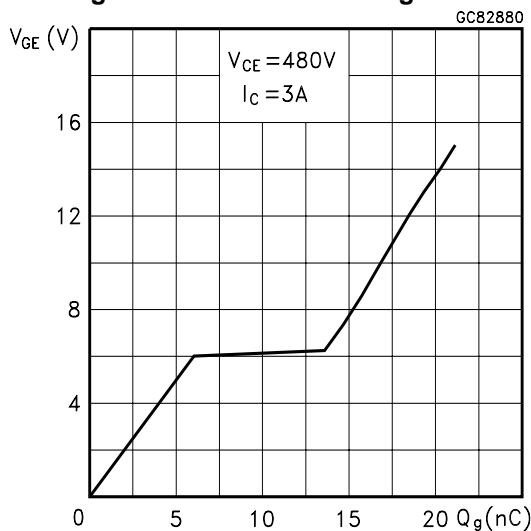
Normalized Breakdown Voltage vs Temperature



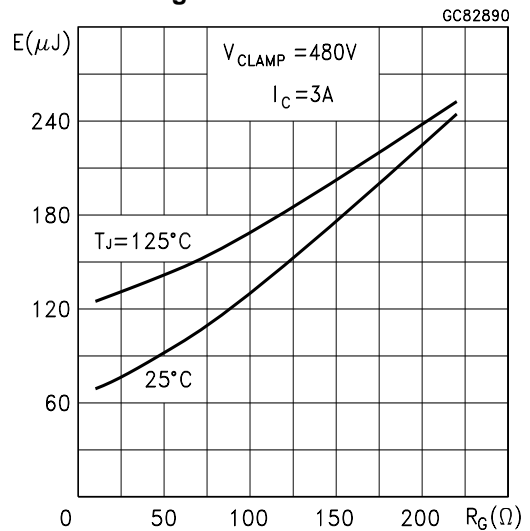
Capacitance Variations



Gate Charge vs Gate-Emitter Voltage

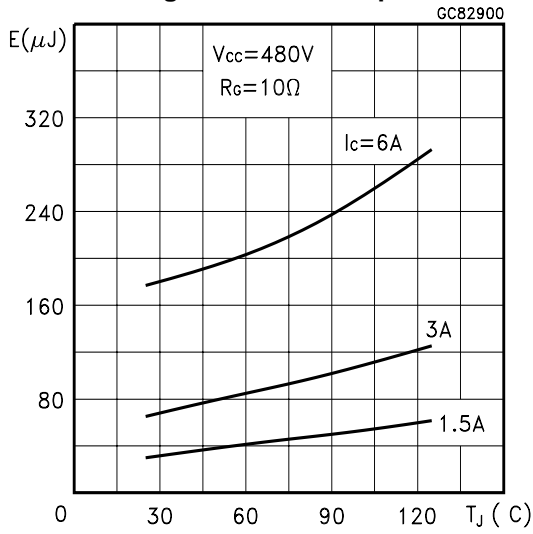


Total Switching Losses vs Gate Resistance

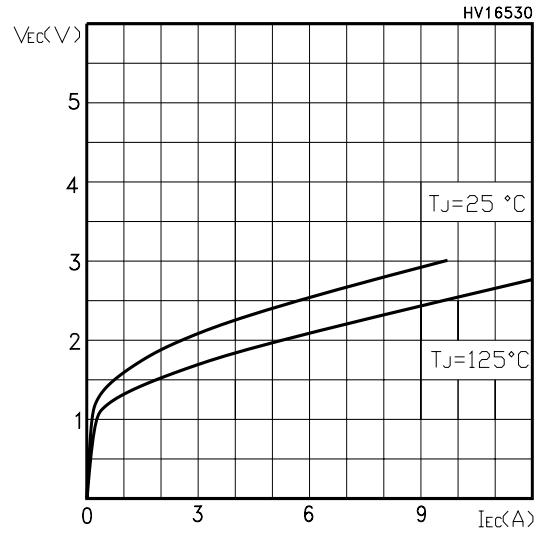


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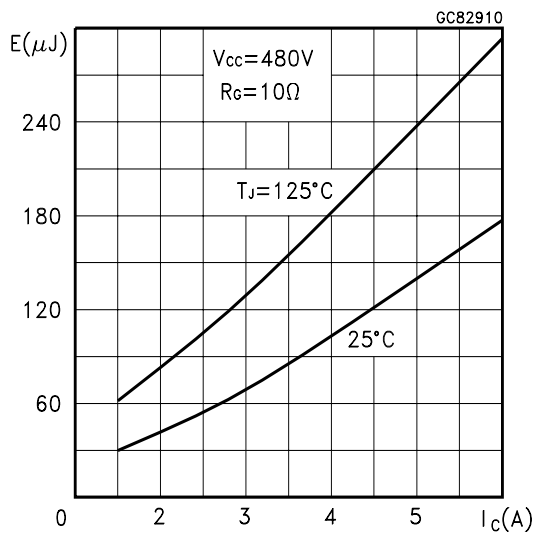
Total Switching Losses vs Temperature



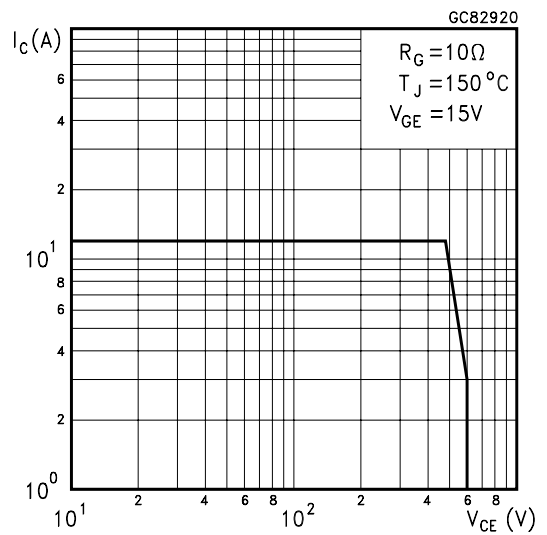
Emitter-collector Diode Characteristics



Total Switching Losses vs Collector Current

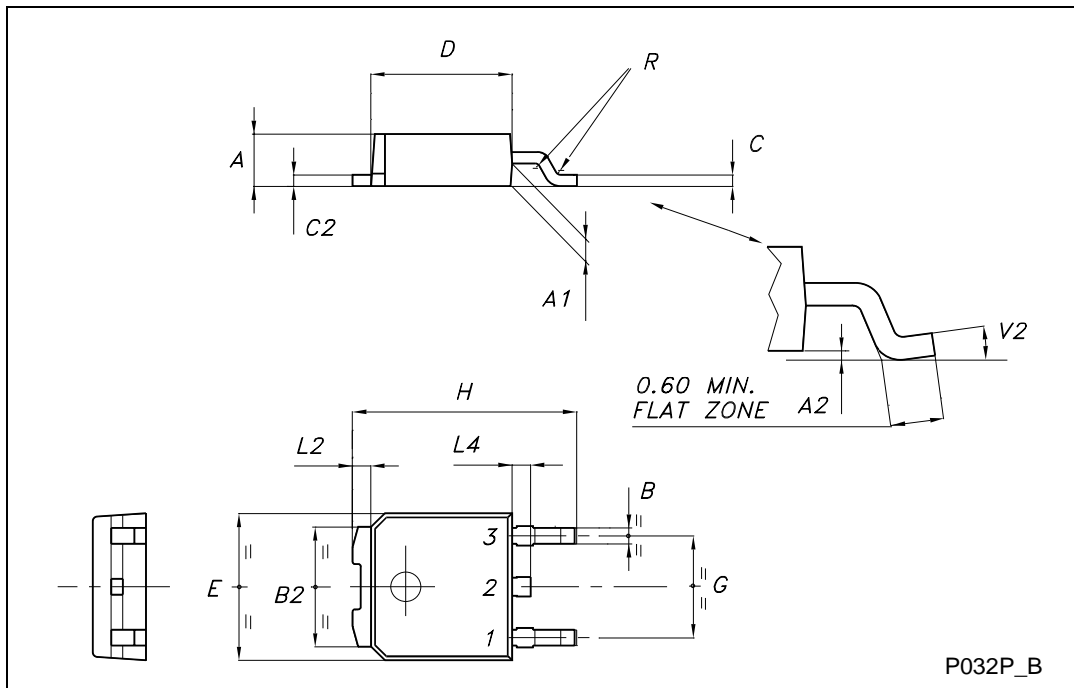


Switching Off Safe Operating Area



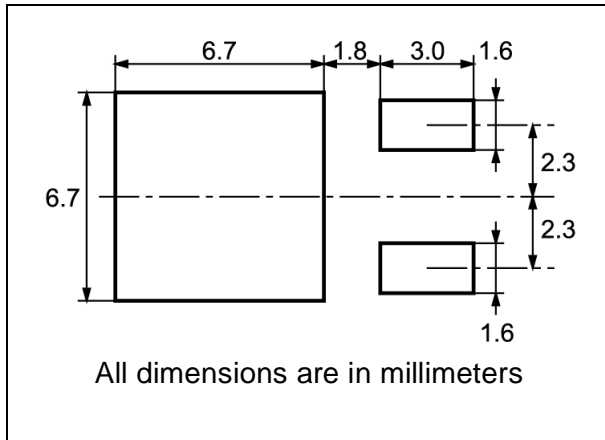
TO-252 (DPAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.20		2.40	0.087		0.094
A1	0.90		1.10	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.90	0.025		0.035
B2	5.20		5.40	0.204		0.213
C	0.45		0.60	0.018		0.024
C2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.236		0.244
E	6.40		6.60	0.252		0.260
G	4.40		4.60	0.173		0.181
H	9.35		10.10	0.368		0.398
L2		0.8			0.031	
L4	0.60		1.00	0.024		0.039
V2	0°		8°	0°		0°

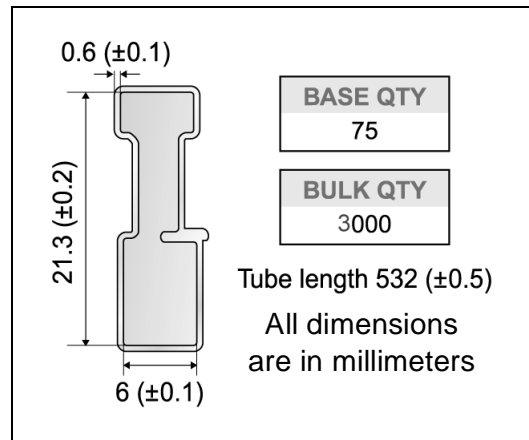


P032P_B

DPAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



TAPE AND REEL SHIPMENT (suffix "T4")*

40 mm min. Access hole at slot location

Tape slot in core for tape start 2.5mm min. width

Full radius

G measured at 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	16.4	18.4	0.645	0.724
N	50		1.968	
T		22.4		0.881

BASE QTY	BULK QTY
2500	2500

TAPE MECHANICAL DATA

DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A0	6.8	7	0.267	0.275
B0	10.4	10.6	0.409	0.417
B1		12.1		0.476
D	1.5	1.6	0.059	0.063
D1	1.5		0.059	
E	1.65	1.85	0.065	0.073
F	7.4	7.6	0.291	0.299
K0	2.55	2.75	0.100	0.108
P0	3.9	4.1	0.153	0.161
P1	7.9	8.1	0.311	0.319
P2	1.9	2.1	0.075	0.082
R	40		1.574	
W	15.7	16.3	0.618	0.641

TOP COVER TAPE

10 pitches cumulative tolerance on tape +/- 0.2 mm

Center line of cavity

User Direction of Feed

FEED DIRECTION

Bending radius R min.

For machine ref. only including draft and radii concentric around B0

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