



STGP3NB60F - STGD3NB60F

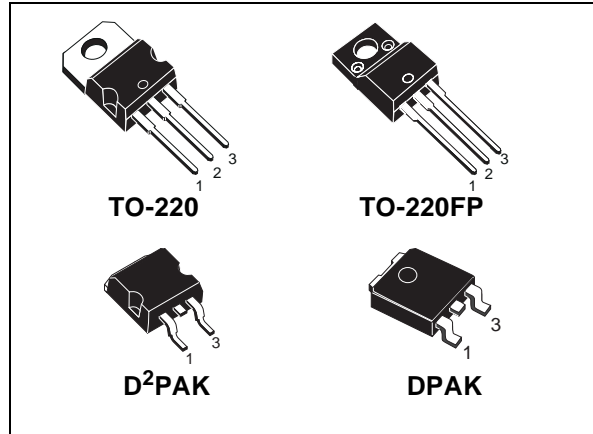
STGP3NB60FD-STGF3NB60FD-STGB3NB60FD

N-CHANNEL 3A - 600V - TO-220/TO-220FP/DPAK/D²PAK

PowerMESH™ IGBT

TYPE	V _{CES}	V _{CE(sat)} (Typ) @ 125°C	I _C @ 125°C
STGP3NB60F	600 V	< 2.4 V	3 A
STGD3NB60F	600 V	< 2.4 V	3 A
STGP3NB60FD	600 V	< 2.4 V	3 A
STGF3NB60FD	600 V	< 2.4 V	3 A
STGB3NB60FD	600 V	< 2.4 V	3 A

- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- LOW ON-VOLTAGE DROP (V_{cesat})
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- OFF LOSSES INCLUDE TAIL CURRENT
- HIGH FREQUENCY OPERATION
- SHORT CIRCUIT RATED



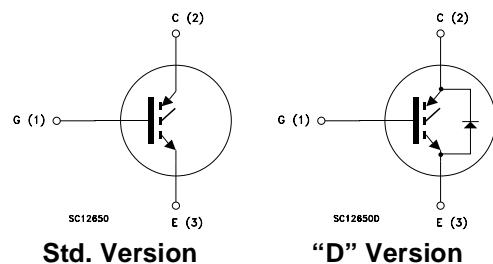
DESCRIPTION

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 "F" identifies a family optimized to achieve very low switching times for frequency applications (<40 KHz)

APPLICATIONS

- MOTOR CONTROLS
- SMPS AND PFC IN BOTH HARD SWITCHING AND RESONANT TOPOLOGIES

INTERNAL SCHEMATIC DIAGRAM



ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STGP3NB60F	GP3NB60F	TO-220	TUBE
STGD3NB60FT4	GD3NB60F	DPAK	TAPE & REEL
STGP3NB60FD	GP3NB60FD	TO-220	TUBE
STGF3NB60FD	GF3NB60FD	TO-220FP	TUBE
STGB3NB60FDT4	GB3NB60FD	D ² PAK	TAPE & REEL

STGP3NB60F/STGD3NB60F/STGP3NB60FD/STGF3NB60FD/STGB3NB60FD**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value			Unit
		TO-220/D ² PAK	TO-220FP	DPAK	
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°C	6			A
I _C	Collector Current (continuous) at T _C = 100°C	3			A
I _{CM} (■)	Collector Current (pulsed)	24			A
I _f (1)	Forward Current	3			A
I _{fm} (1)	Forward Current Pulsed	24			A
P _{TOT}	Total Dissipation at T _C = 25°C	68	25	60	W
	Derating Factor	0.55	0.2	0.47	W/°C
V _{ISO}	Insulation Withstand Voltage A.C.	--	2500	--	V
T _{stg}	Storage Temperature	– 55 to 150			°C
T _j	Max. Operating Junction Temperature	150			°C

(■) Pulse width limited by safe operating area

(1) For "D" version only

THERMAL DATA

		TO-220/D ² PAK	TO-220FP	DPAK	
R _{thj-case}	Thermal Resistance Junction-case Max	1.8	5	2.1	°C/W
R _{thj-amb}	Thermal Resistance Junction-ambient Max	62.5		100	°C/W
R _{thc-h}	Thermal Resistance Case-heatsink Typ	0.5			°C/W

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{BR(CES)}	Collector-Emitter Breakdown Voltage	I _C = 250 μA, V _{GE} = 0	600			V
I _{CES}	Collector cut-off (V _{GE} = 0)	V _{CE} = Max Rating, T _C = 25°C V _{CE} = Max Rating, T _C = 125°C			50 100	μA μA
I _{GES}	Gate-Emitter Leakage Current (V _{CE} = 0)	V _{GE} = ±20V, V _{CE} = 0			±100	nA
V _{GE(th)}	Gate Threshold Voltage	V _{CE} = V _{GE} , I _C = 250 μA	3		5	V
V _{CE(sat)}	Collector-Emitter Saturation Voltage	V _{GE} = 15 V, I _C = 3 A V _{GE} = 15 V, I _C = 3 A, T _j = 125°C		1.9 1.6	2.4	V V

STGP3NB60F/STGD3NB60F/STGP3NB60FD/STGF3NB60FD/STGB3NB60FD**SWITCHING PARAMETERS**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	$V_{CE} = 25\text{ V}$, $I_C = 3\text{ A}$		2		S
C_{ies} C_{oes} C_{res}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{CE} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GE} = 0$		230 33 6		pF pF pF
Q_g Q_{ge} Q_{gc}	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	$V_{CE} = 480\text{ V}$, $I_C = 3\text{ A}$, $V_{GE} = 15\text{ V}$		16 1.5 8	20	nC nC nC
$t_{d(on)}$ t_r	Turn-on Delay Time Rise Time	$V_{CC} = 480\text{ V}$, $I_C = 3\text{ A}$ $R_G = 10\Omega$, $V_{GE} = 15\text{ V}$		12.5 4		ns ns
$(di/dt)_{on}$ E_{on}	Turn-on Current Slope Turn-on Switching Losses	$V_{CC} = 480\text{ V}$, $I_C = 3\text{ A}$, $R_G = 10\Omega$ $V_{GE} = 15\text{ V}$, $T_J = 125^\circ\text{C}$		840 31		A/ μs 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	$V_{CC} = 480\text{ V}$, $I_C = 3\text{ A}$, $R_{GE} = 10\Omega$, $V_{GE} = 15\text{ V}$ $T_J = 25^\circ\text{C}$		220 60 105 150 125 149		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	$V_{CC} = 480\text{ V}$, $I_C = 3\text{ A}$, $R_{GE} = 10\Omega$, $V_{GE} = 15\text{ V}$ $T_J = 125^\circ\text{C}$		490 174 230 305 295 326		ns ns ns ns μJ μJ

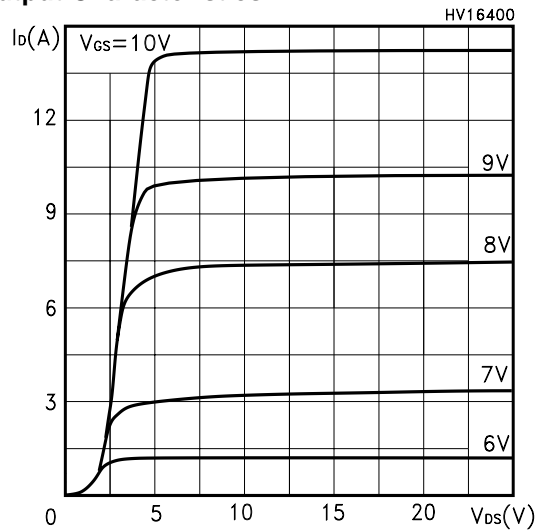
COLLECTOR-EMITTER DIODE ("D" VERSION)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_f	Forward On-Voltage	$I_f = 1.5\text{ A}$ $I_f = 1.5\text{ A}$, $T_J = 125^\circ\text{C}$		1.31 0.95	1.8	V V
t_{rr} Q_{rr} I_{rrm}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_f = 3\text{ A}$, $V_R = 35\text{ V}$, $T_J = 125^\circ\text{C}$, $di/dt = 100\text{ A}/\mu\text{s}$		45 70 2.7		ns nC A

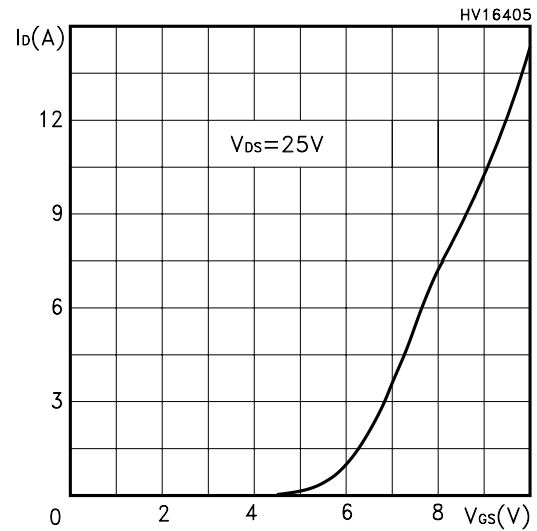
Note: 1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.
 2. Pulse width limited by max. junction temperature.
 (**) Losses include Also the Tail (Jedec Standardization)

STGP3NB60F/STGD3NB60F/STGP3NB60FD/STGF3NB60FD/STGB3NB60FD

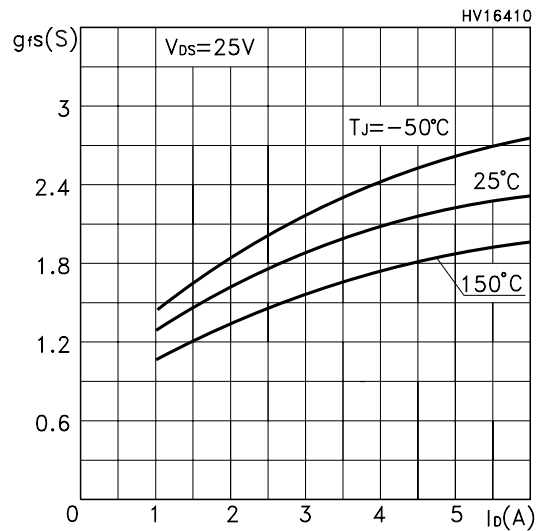
Output Characteristics



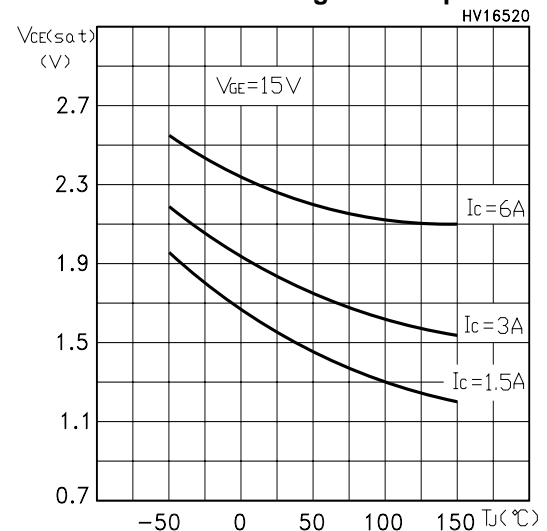
Transfer Characteristics



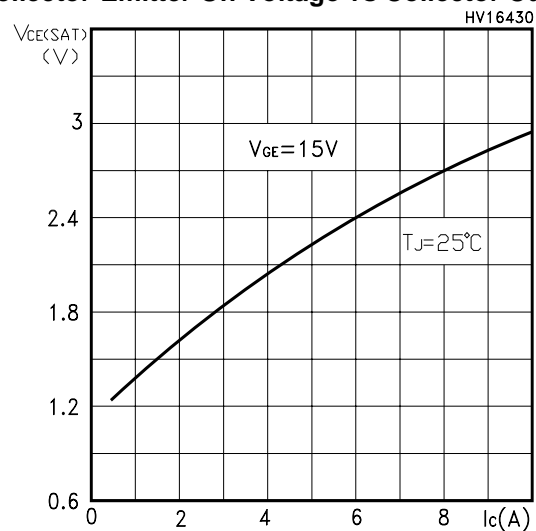
Transconductance



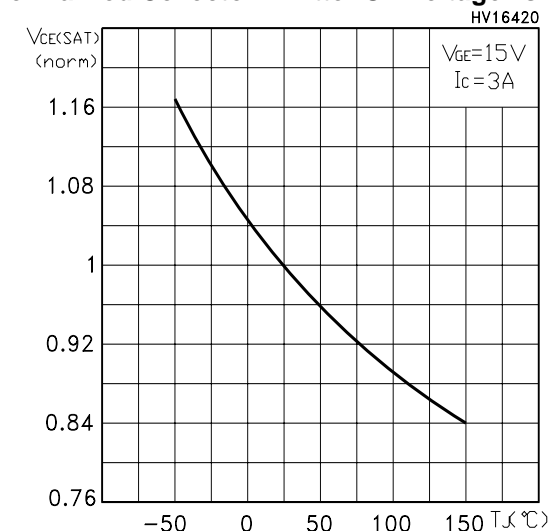
Collector-Emitter On Voltage vs Temperature



Collector-Emitter On Voltage vs Collector Current

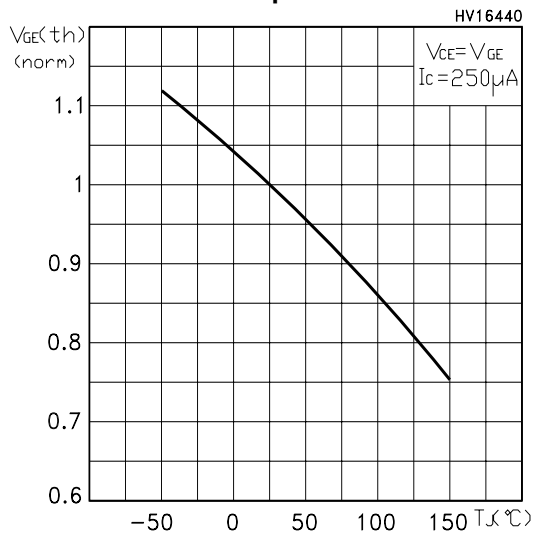


Normalized Collector-Emitter On Voltage vs Temp.

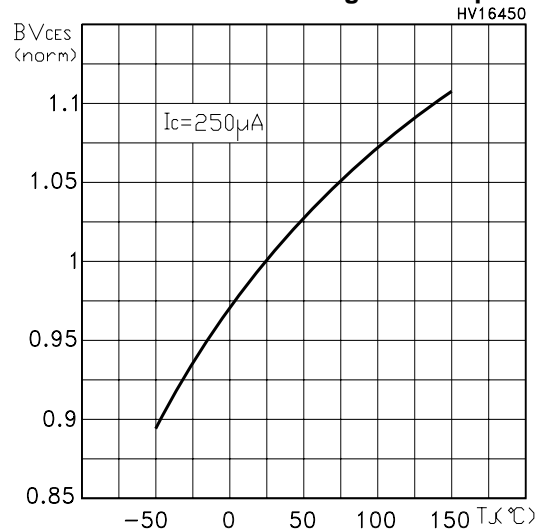


STGP3NB60F/STGD3NB60F/STGP3NB60FD/STGF3NB60FD/STGB3NB60FD

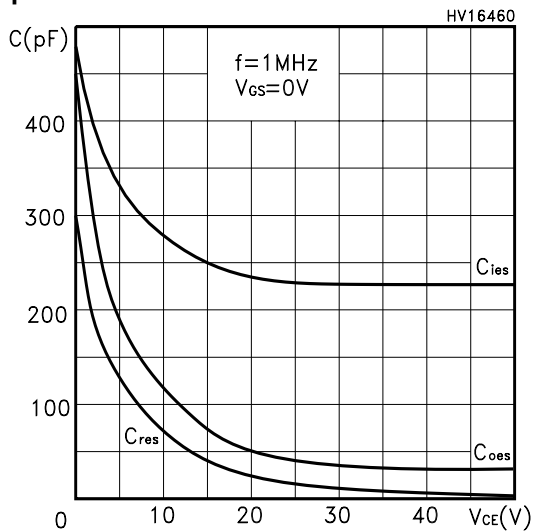
Gate Threshold vs Temperature



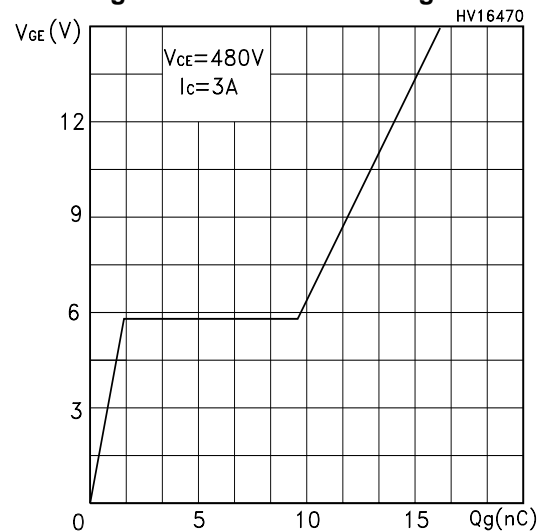
Normalized Breakdown Voltage vs Temperature



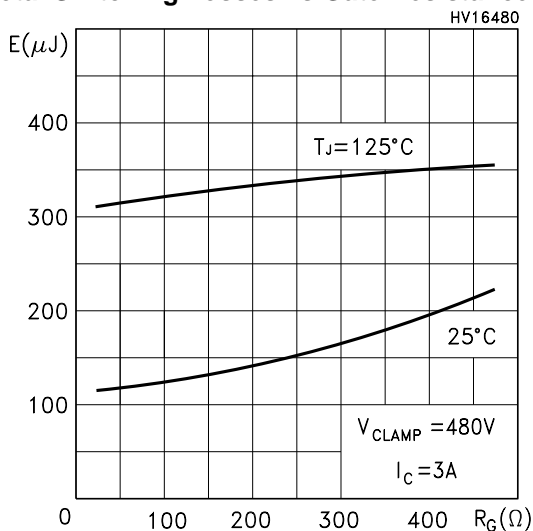
Capacitance Variations



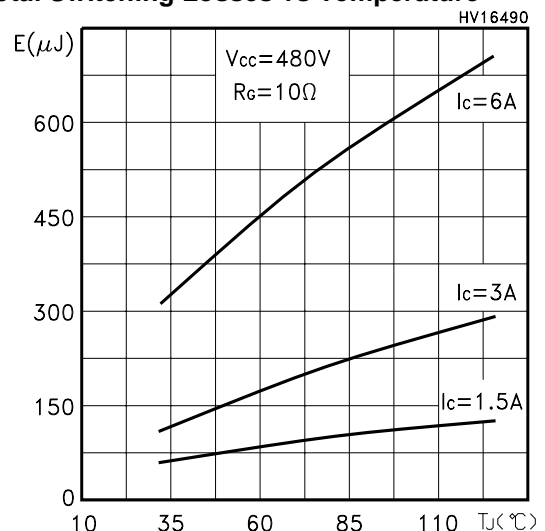
Gate Charge vs Gate-Emmitter Voltage



Total Switching Losses vs Gate Resistance

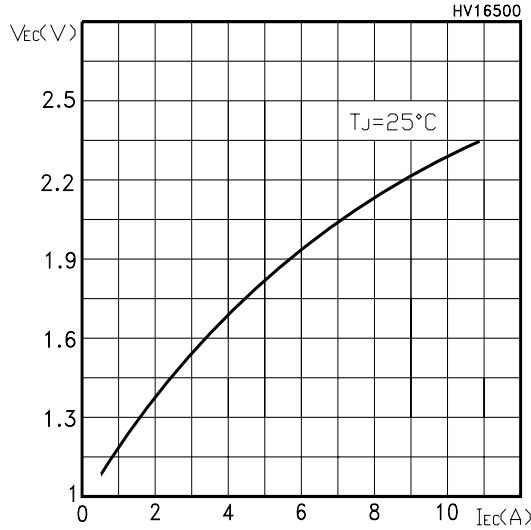


Total Switching Losses vs Temperature

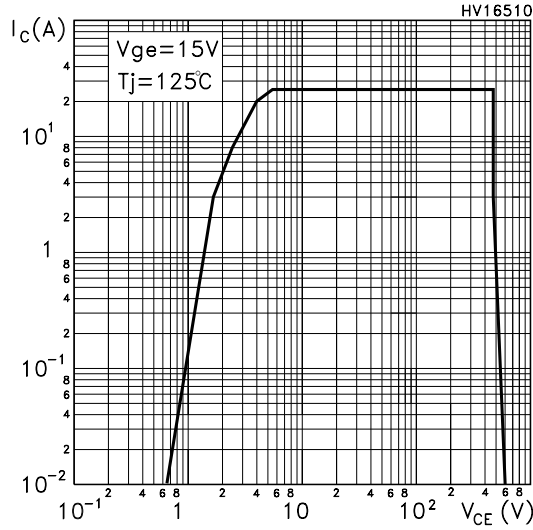


STGP3NB60F/STGD3NB60F/STGP3NB60FD/STGF3NB60FD/STGB3NB60FD

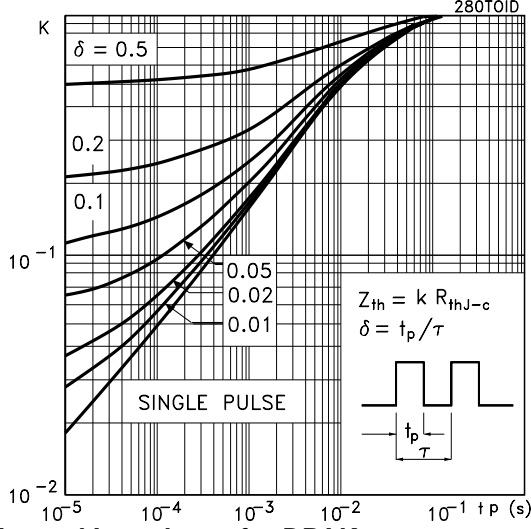
Emitter-collector Diode Characteristics



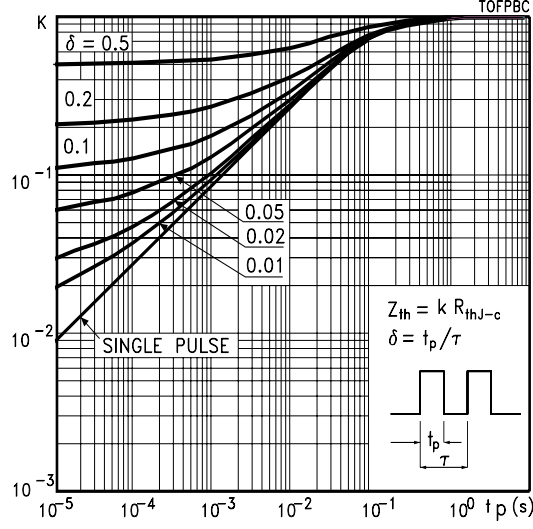
Turn-Off SOA



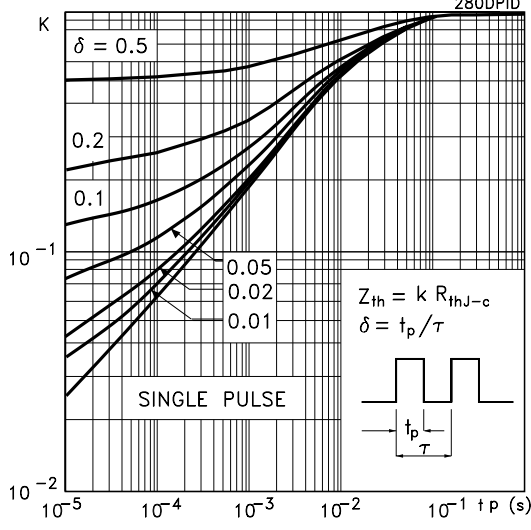
Thermal Impedance for TO-220 / D2PAK



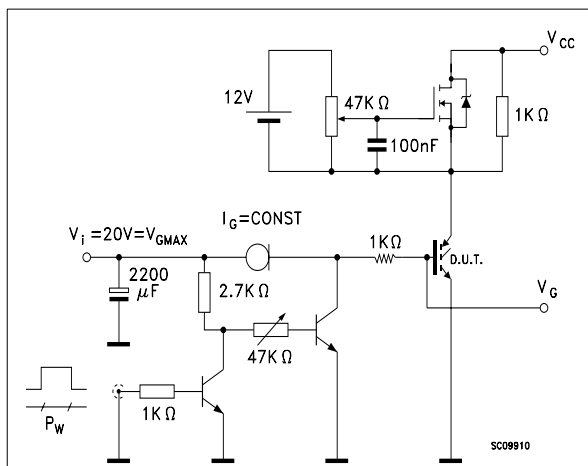
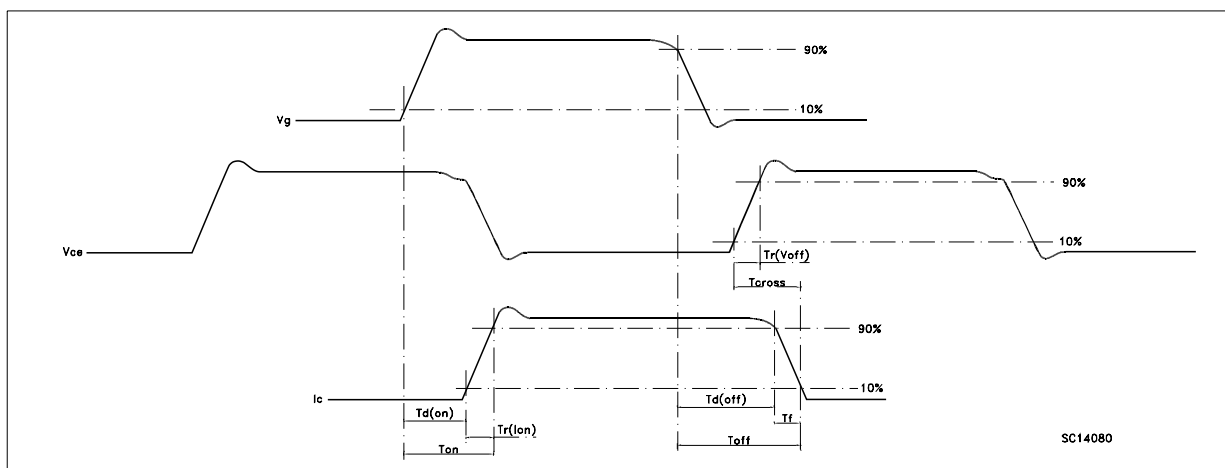
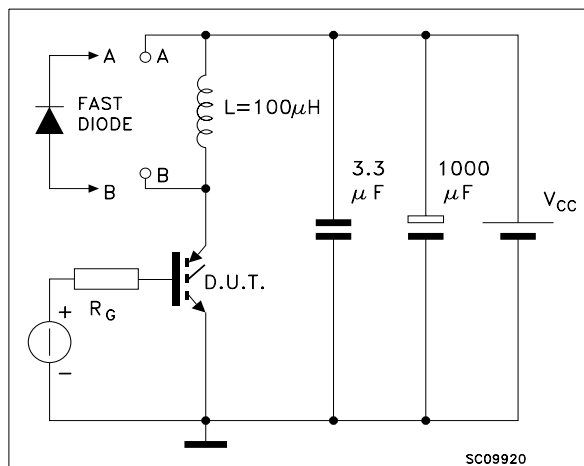
Thermal Impedance for TO-220FP



Thermal Impedance for DPAK

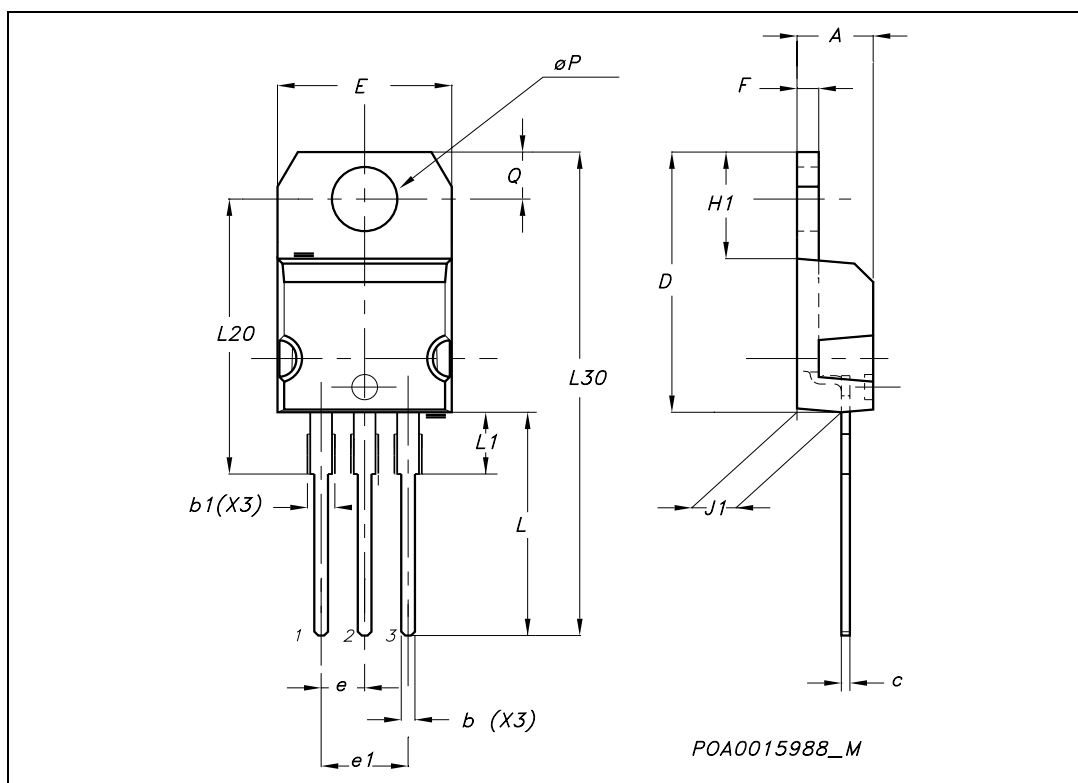


STGP3NB60F/STGD3NB60F/STGP3NB60FD/STGF3NB60FD/STGB3NB60FD

Fig. 1: Gate Charge test Circuit

Fig. 2: Test Circuit For Inductive Load Switching


STGP3NB60F/STGD3NB60F/STGP3NB60FD/STGF3NB60FD/STGB3NB60FD**TO-220 MECHANICAL DATA**

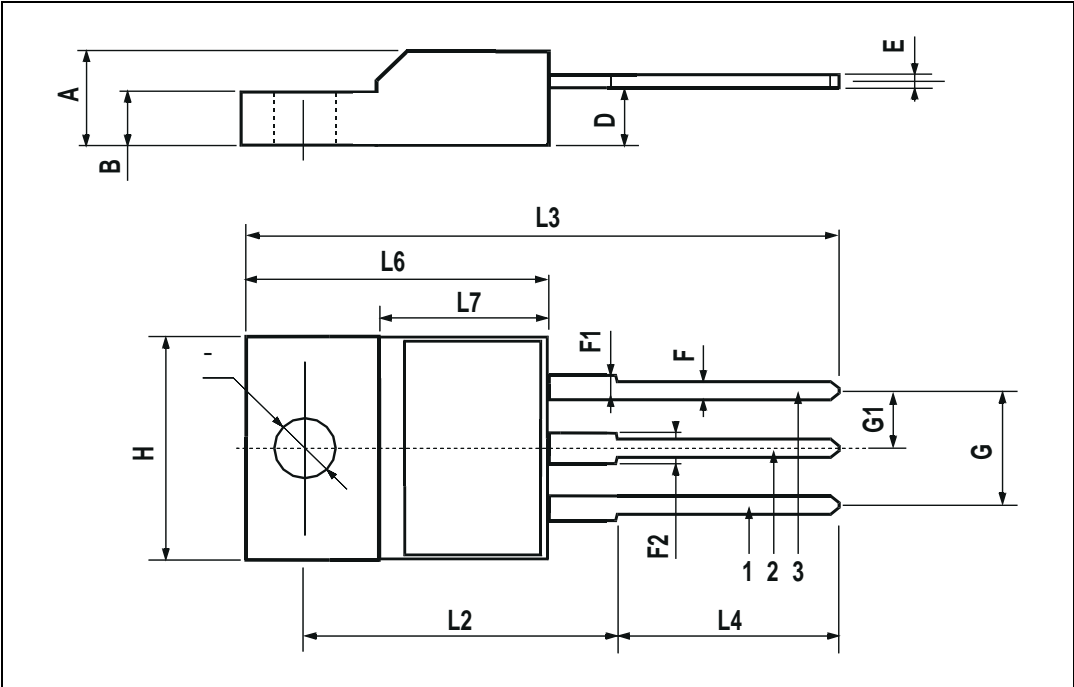
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.15		1.70	0.045		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.052
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
øP	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



STGP3NB60F/STGD3NB60F/STGP3NB60FD/STGF3NB60FD/STGB3NB60FD

TO-220FP MECHANICAL DATA

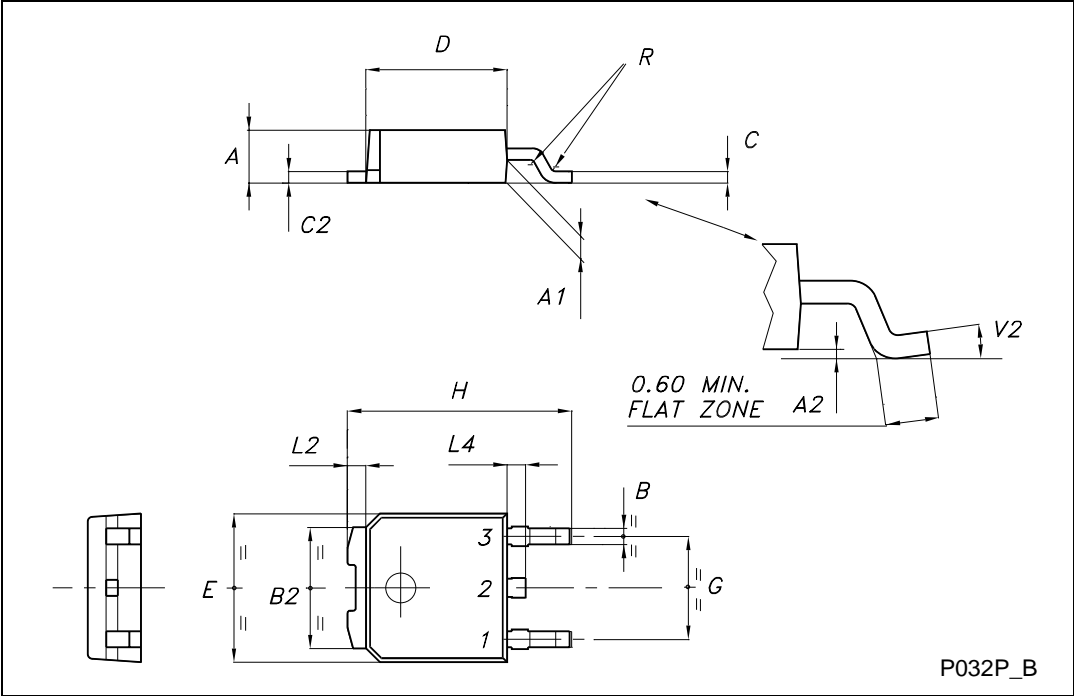
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.7	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	0.385		0.417
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
Ø	3		3.2	0.118		0.126



STGP3NB60F/STGD3NB60F/STGP3NB60FD/STGF3NB60FD/STGB3NB60FD

TO-252 (DPAK) MECHANICAL DATA

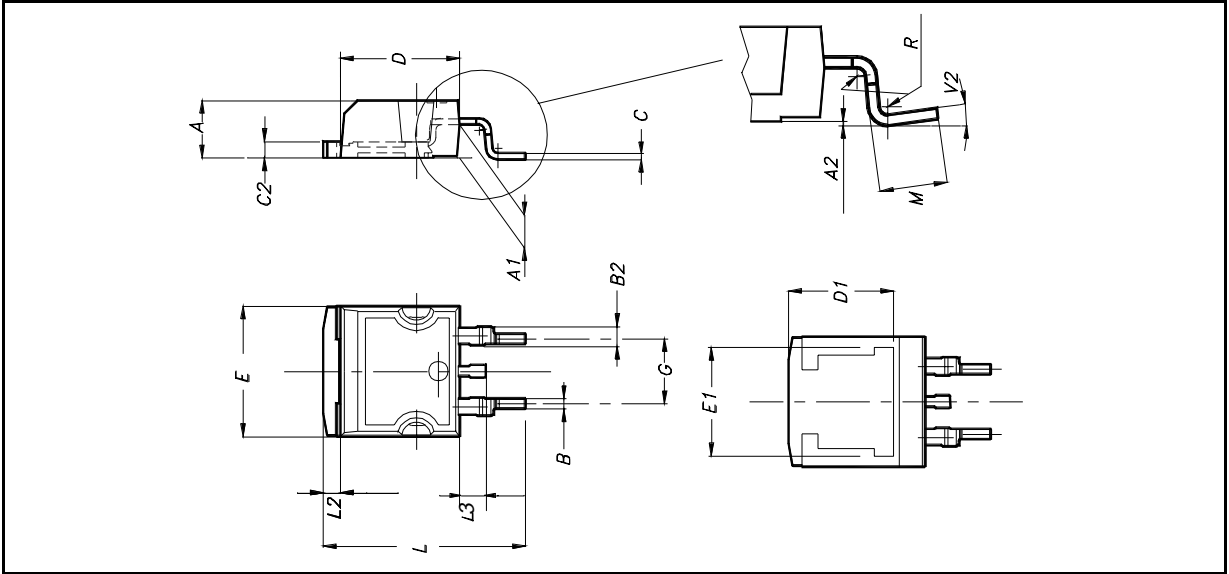
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.20		2.40	0.087		0.094
A1	0.90		1.10	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.90	0.025		0.035
B2	5.20		5.40	0.204		0.213
C	0.45		0.60	0.018		0.024
C2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.236		0.244
E	6.40		6.60	0.252		0.260
G	4.40		4.60	0.173		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°

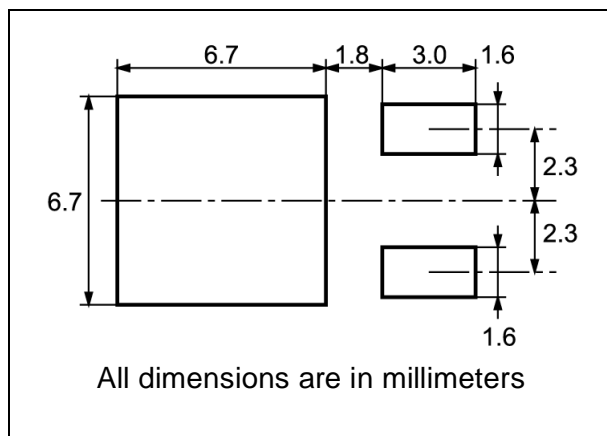
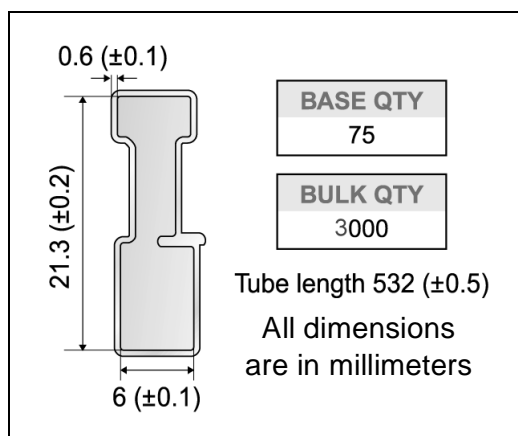
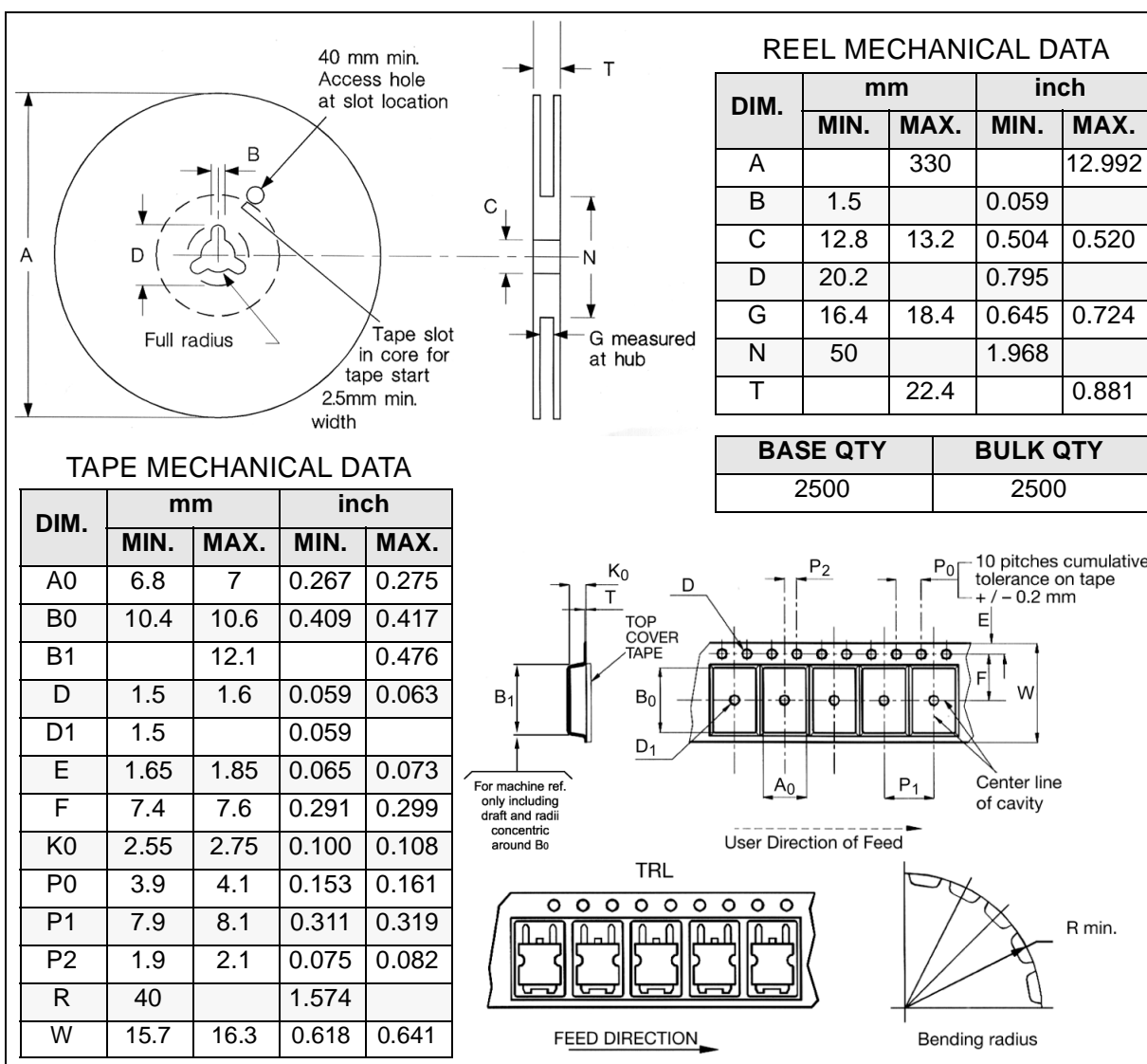


STGP3NB60F/STGD3NB60F/STGP3NB60FD/STGF3NB60FD/STGB3NB60FD

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°			

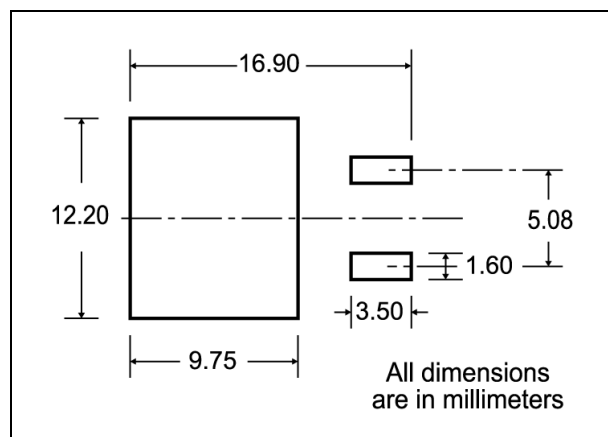


STGP3NB60F/STGD3NB60F/STGP3NB60FD/STGF3NB60FD/STGB3NB60FD**DPAK FOOTPRINT****TUBE SHIPMENT (no suffix)*****TAPE AND REEL SHIPMENT (suffix "T4")***

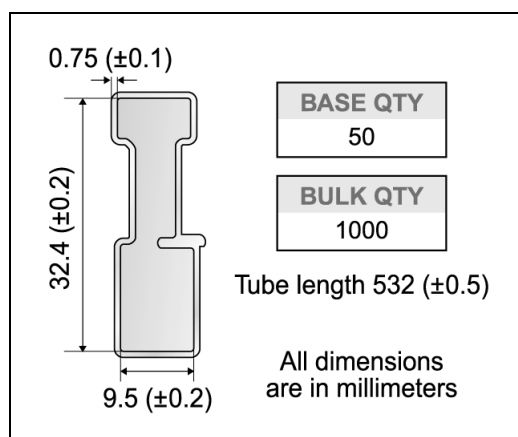
* on sales type

STGP3NB60F/STGD3NB60F/STGP3NB60FD/STGF3NB60FD/STGB3NB60FD

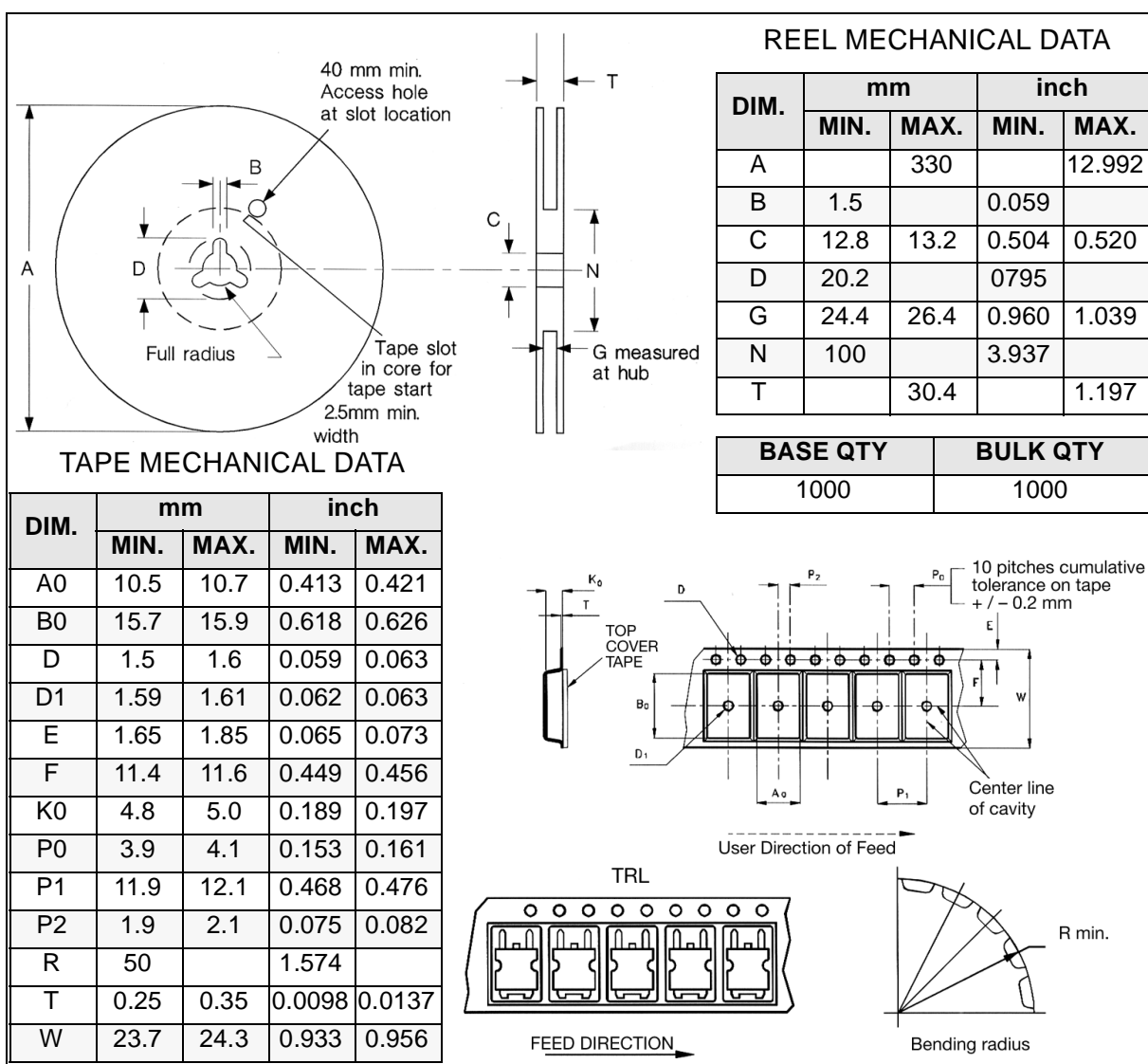
D²PAK FOOTPRINT



TUBE SHIPMENT (no suffix)*



TAPE AND REEL SHIPMENT (suffix "T4")*



* on sales



STGP3NB60F/STGD3NB60F/STGP3NB60FD/STGF3NB60FD/STGB3NB60FD

Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

© The ST logo is a registered trademark of STMicroelectronics

© 2003 STMicroelectronics - Printed in Italy - All Rights Reserved
STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - Canada - China - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco
Singapore - Spain - Sweden - Switzerland - United Kingdom - United States.

© <http://www.st.com>