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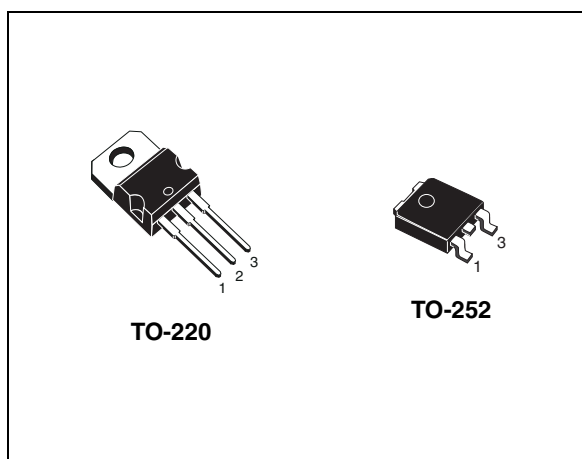
STGD7NB60K STGP7NB60K

N-channel 600V - 7A - TO-220 / DPAK
Short circuit rated PowerMESH™ IGBT

General features

Type	V _{CES}	V _{CE(sat)} Max @25°C	I _C @100°C
STGD7NB60K	600V	< 2.8V	7A
STGP7NB60K	600V	< 2.8V	7A

- High input impedance (voltage driven)
- Low on-voltage drop (Vcesat)
- Low gate charge
- High current capability
- High frequency operation
- Short circuit rated



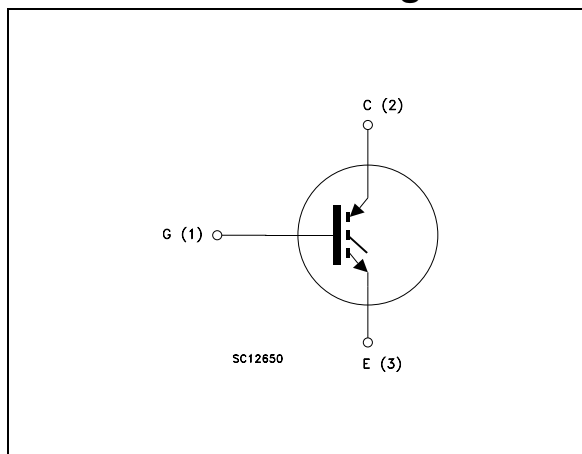
Description

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 "K" identifies a family optimized for high frequency motor control applications with short circuit withstand capability.

Applications

- High frequency motor controls
- SMPS and PFC in both hard switching and resonant topologies

Internal schematic diagram



Order codes

Part number	Marking	Package	Packaging
STGD7NB60KT4	GD7NB60K	DPAK	Tape & reel
STGP7NB60K	GP7NB60K	TO-220	Tube

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Electrical ratings

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		TO-220	DPAK	
V _{CES}	Collector-emitter voltage (V _{GS} = 0)	600		V
I _C ⁽¹⁾	Collector current (continuous) at T _C = 25°C	14		A
I _C ⁽¹⁾	Collector current (continuous) at T _C = 100°C	7		A
I _{CM} ⁽²⁾	Collector current (pulsed)	56		A
V _{GE}	Gate-emitter voltage	±20		V
P _{TOT}	Total dissipation at T _C = 25°C	80	70	W
T _{SC}	Short circuit withstand	0.64	0.56	μs
T _{stg}	Storage temperature	– 65 to 150		°C
T _j	Operating junction temperature	150		

1. Calculated according to the iterative formula::

$$I_C(T_C) = \frac{T_{JMAX} - T_C}{R_{THJ-C} \times V_{CESAT(MAX)}(T_C, I_C)}$$

2. Pulse width limited by max junction temperature

Table 2. Thermal resistance

Symbol	Parameter	TO-220	DPAK	Unit
$R_{thj-case}$	Thermal resistance junction-case Max	1.56	1.4	$^\circ\text{C/W}$
$R_{thj-amb}$	Thermal resistance junction-ambient Max	62.5	100	$^\circ\text{C/W}$

Electrical characteristics

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2 Electrical characteristics

(T_{CASE}=25°C unless otherwise specified)

Table 3. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V _{BR(CES)}	Collector-emitter breakdown voltage	I _C = 1mA, V _{GE} = 0	600			V
V _{CE(sat)}	Collector-emitter saturation voltage	V _{GE} = 15V, I _C = 7A V _{GE} = 15V, I _C = 7A, T _C = 125°C		2.3 1.9	2.8	V V
V _{GE(th)}	Gate threshold voltage	V _{CE} = V _{GE} , I _C = 250 μA	5		7	V
I _{CES}	Collector cut-off current (V _{GE} = 0)	V _{CE} = Max rating, T _C = 25°C V _{CE} = Max rating, T _C = 125°C			50 500	μA μA
I _{GES}	Gate-emitter leakage current (V _{CE} = 0)	V _{GE} = ±20V, V _{CE} = 0			±100	nA
g _{fs}	Forward transconductance	V _{CE} = 15V, I _C = 7A		3.7		S

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C _{ies} C _{oes} C _{res}	Input capacitance Output capacitance Reverse transfer capacitance	V _{CE} = 25V, f = 1MHz, V _{GE} = 0		495 77 13		pF pF pF
Q _g Q _{ge} Q _{gc}	Total gate charge Gate-emitter charge Gate-collector charge	V _{CE} = 480V, I _C = 7A, V _{GE} = 15V, (see Figure 17)		32.7 5.9 18.3	45	nC nC nC
tscw	Short circuit withstand time	V _{CE} = 0.5V V _{BR(CES)} , R _G = 10Ω V _{GE} = 15V, T _j = 125°C	10			μs

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Electrical characteristics

Table 5. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on delay time Current rise time	$V_{CC} = 480V, I_C = 7A$ $R_G = 10\Omega, V_{GE} = 15V,$ $T_J = 25^\circ C$ (see Figure 18)		15 6		ns ns
$(di/dt)_{on}$ $E_{on}^{(1)}$	Turn-on delay time Turn-on switching losses	$V_{CC} = 480V, I_C = 7A$ $R_G = 10\Omega, V_{GE} = 15V,$ $T_J = 125^\circ C$ (see Figure 18)		980 95		A/ μs μJ
t_c $t_r(V_{off})$ $t_{d(off)}$ t_f $E_{off}^{(2)}$ E_{ts}	Cross-over time Off voltage rise time Turn-off delay time Current fall time Turn-off switching losses Total switching losses	$V_{CC} = 480V, I_C = 7A,$ $R_{GE} = 10\Omega, V_{GE} = 15V,$ $T_J = 25^\circ C$ (see Figure 18)		105 30 50 100 140 200		ns ns ns ns μJ μJ
t_c $t_r(V_{off})$ $t_{d(off)}$ t_f $E_{off}^{(1)}$ E_{ts}	Cross-over time Off voltage rise time Turn-off delay time Current fall time Turn-off switching losses Total switching losses	$V_{CC} = 480V, I_C = 7A,$ $R_{GE} = 10\Omega, V_{GE} = 15V,$ $T_J = 125^\circ C$ (see Figure 18)		227 68 52 150 300 395		ns ns ns ns μJ μJ

1. E_{on} is the turn-on losses when a typical diode is used in the test circuit in figure 2. If the IGBT is offered in a package with a co-pak diode, the co-pak diode is used as external diode. IGBTs & Diode are at the same temperature (25°C and 125°C)
2. Turn-off losses include also the tail of the collector current

Electrical characteristics

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2.1 Electrical characteristics (curves)

Figure 1. Output characteristics

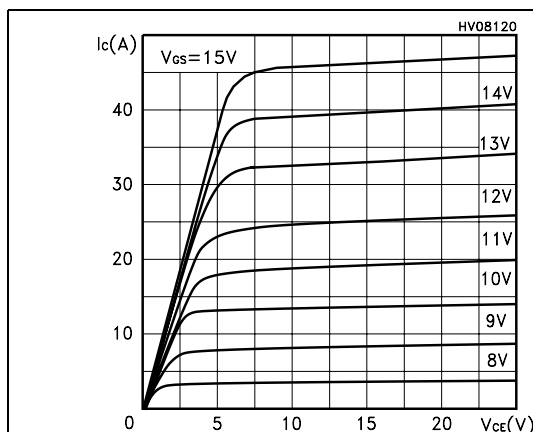


Figure 2. Transfer characteristics

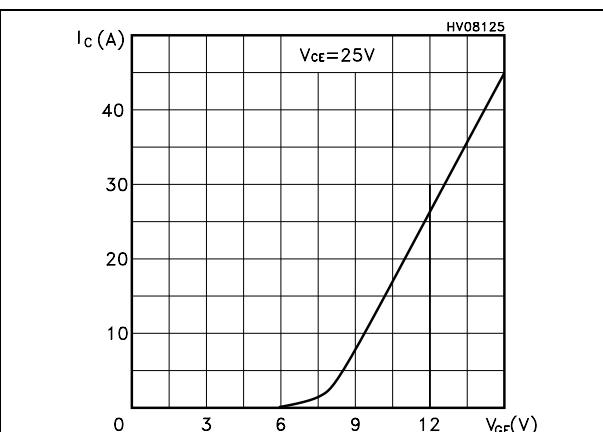


Figure 3. Transconductance

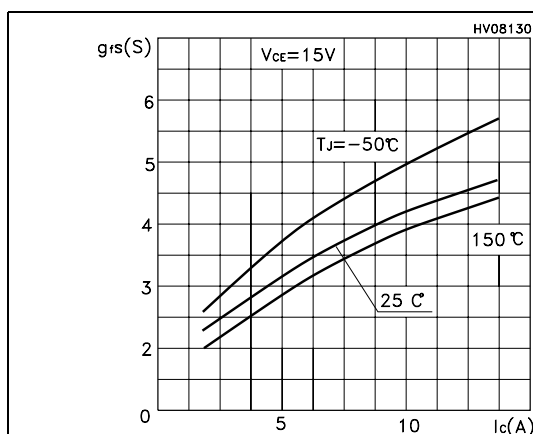


Figure 4. Normalized collector-emitter on voltage

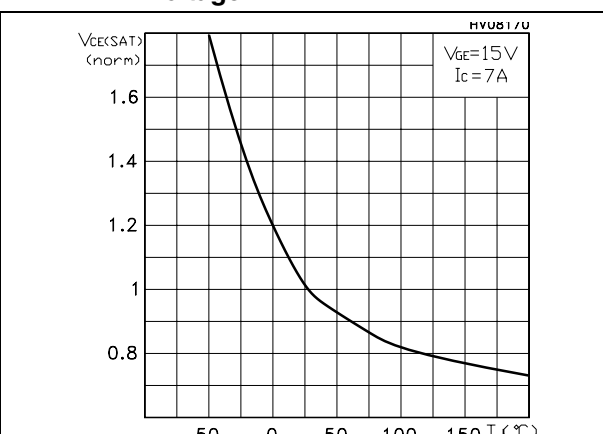


Figure 5. Gate charge vs gate-source voltage

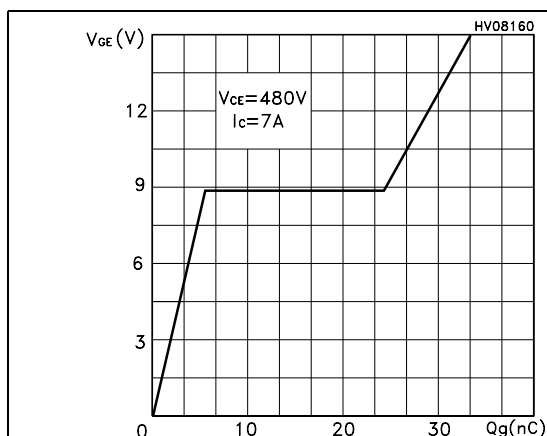
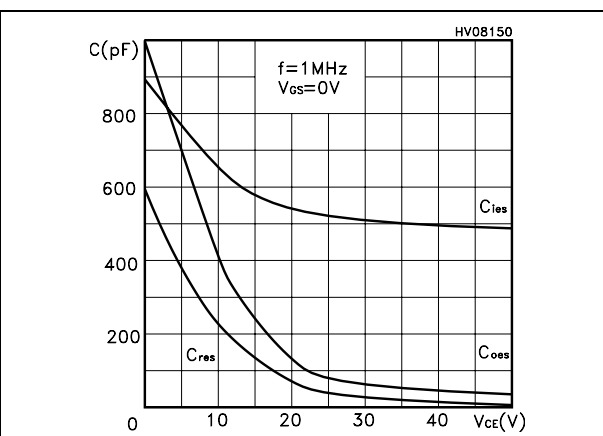


Figure 6. Capacitance variations



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Electrical characteristics

Figure 7. Normalized gate threshold voltage vs temperature

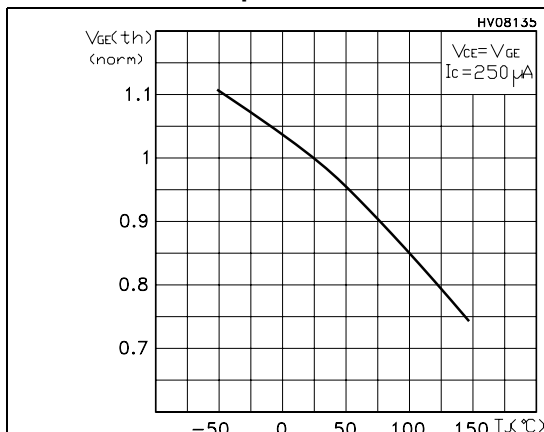


Figure 8. Collector-emitter on voltage vs collector current

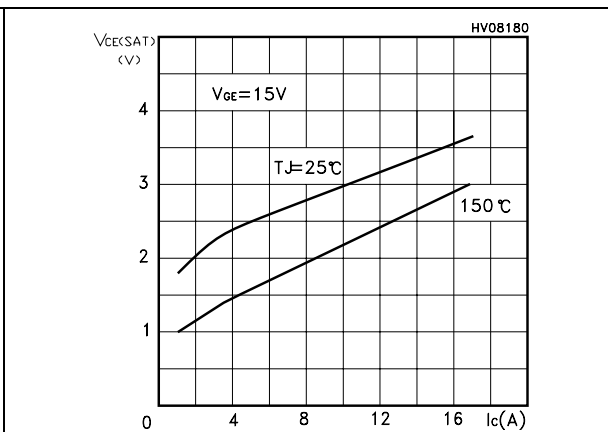


Figure 9. Normalized breakdown voltage vs temperature

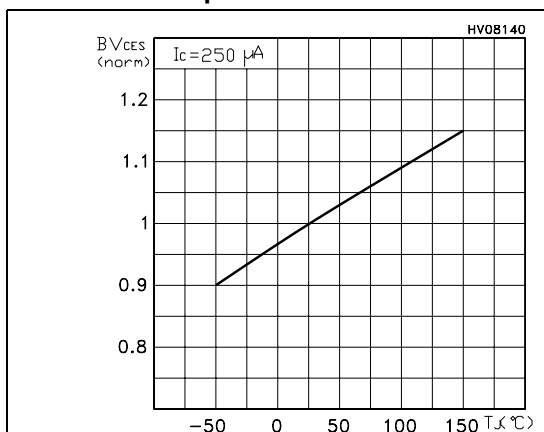


Figure 10. Switching losses vs temperature

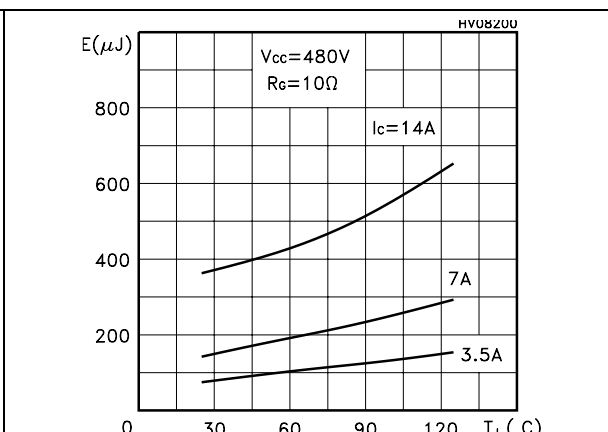
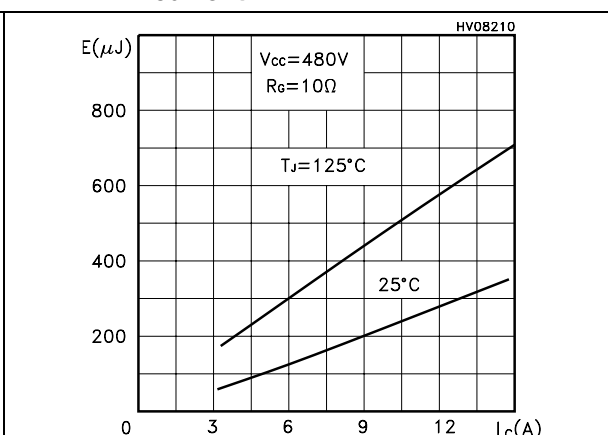
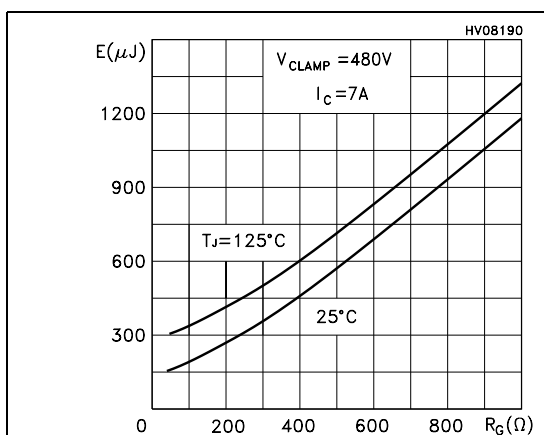


Figure 11. Switching losses vs gate resistance **Figure 12. Switching losses vs collector current**



Electrical characteristics

STGD7NB60K - STGP7NB60K

Figure 13. Thermal Impedance for DPAK

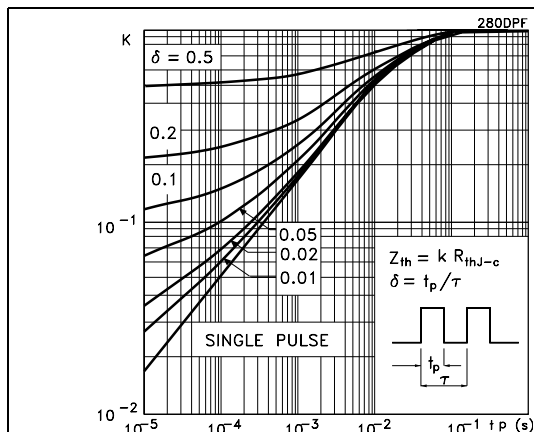


Figure 14. Thermal Impedance

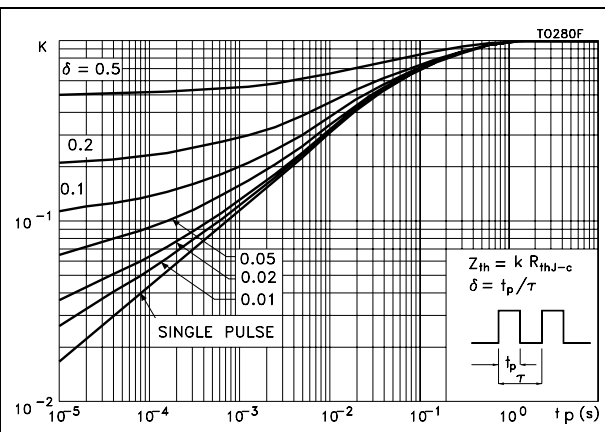
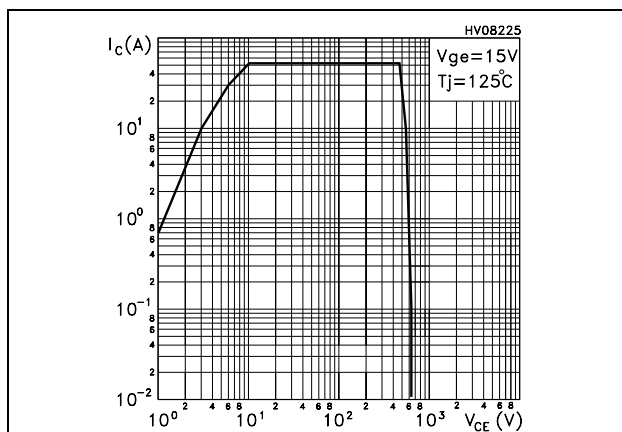


Figure 15. Turn-off SOA



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Test circuit

3 Test circuit

Figure 16. Test circuit for inductive load switching

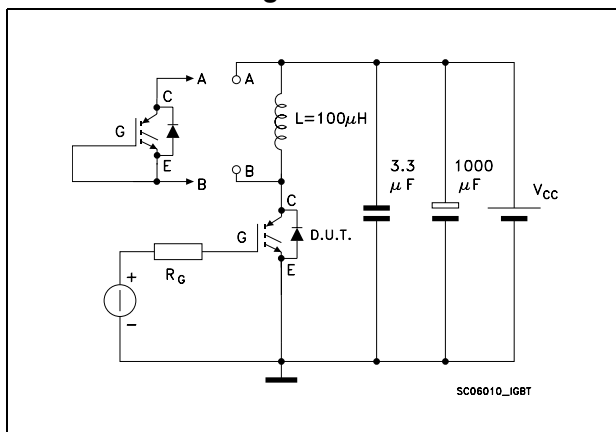


Figure 17. Gate charge test circuit

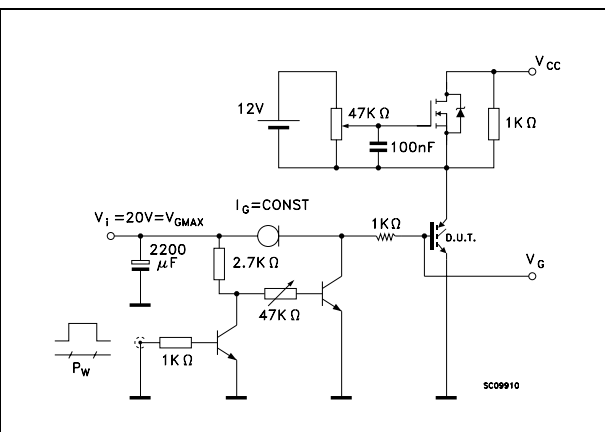


Figure 18. Switching waveform

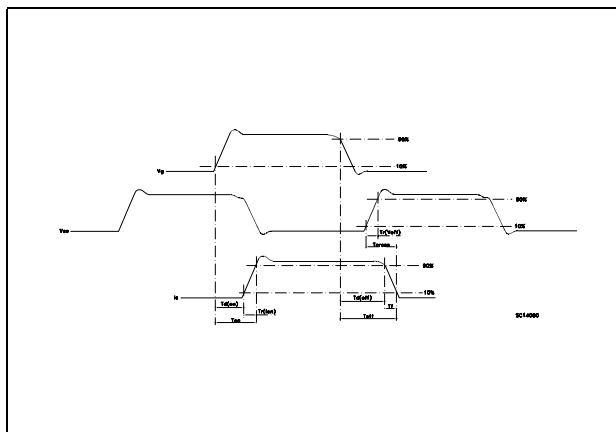
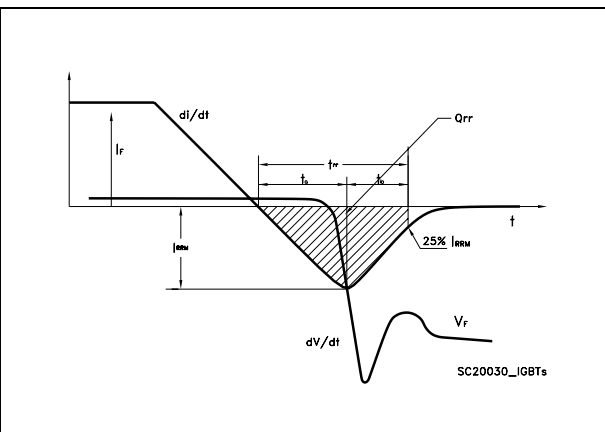


Figure 19. Diode recovery time waveform



4 Package mechanical data

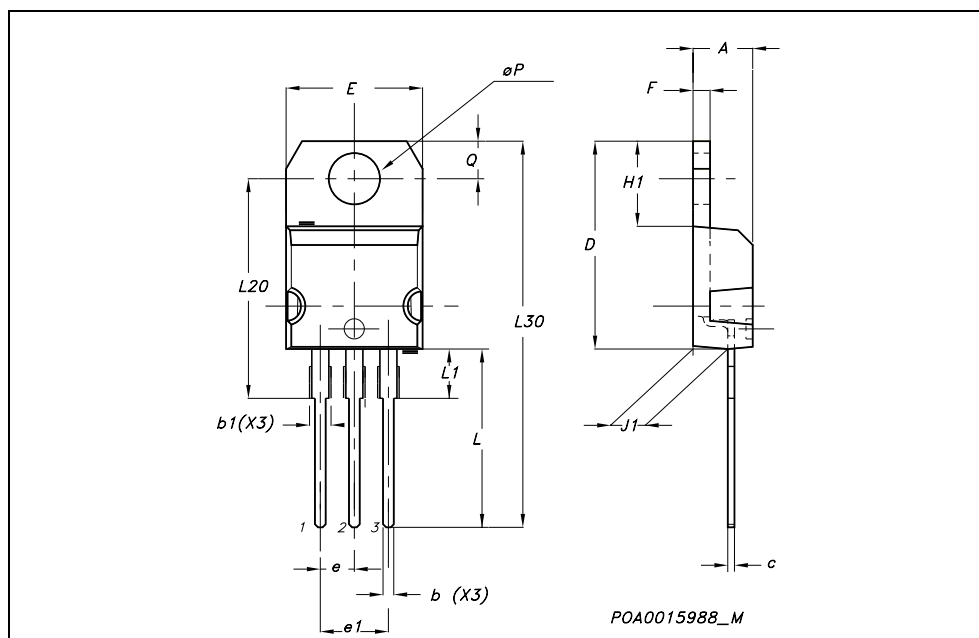
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Package mechanical data

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

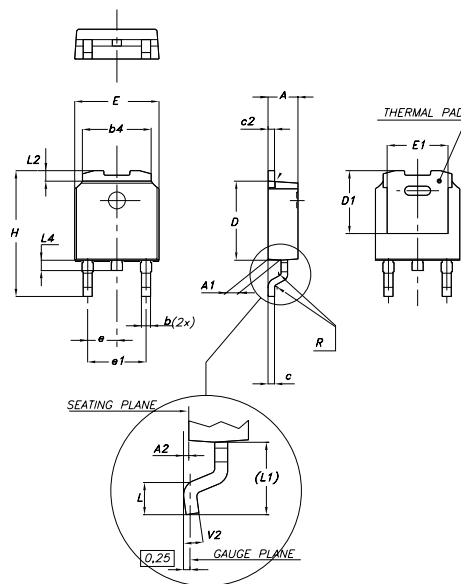


Package mechanical data

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DPAK MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.9	0.025		0.035
b4	5.2		5.4	0.204		0.212
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
D1		5.1			0.200	
E	6.4		6.6	0.252		0.260
E1		4.7			0.185	
e		2.28			0.090	
e1	4.4		4.6	0.173		0.181
H	9.35		10.1	0.368		0.397
L	1			0.039		
(L1)		2.8			0.110	
L2		0.8			0.031	
L4	0.6		1	0.023		0.039
R		0.2			0.008	
V2	0°		8°	0°		8°



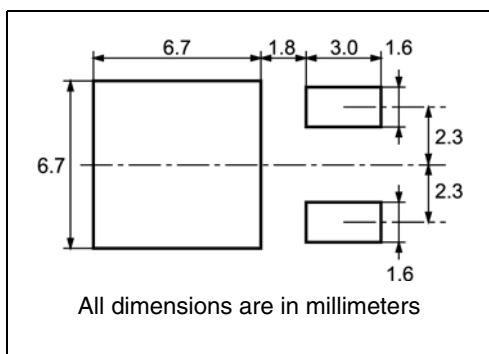
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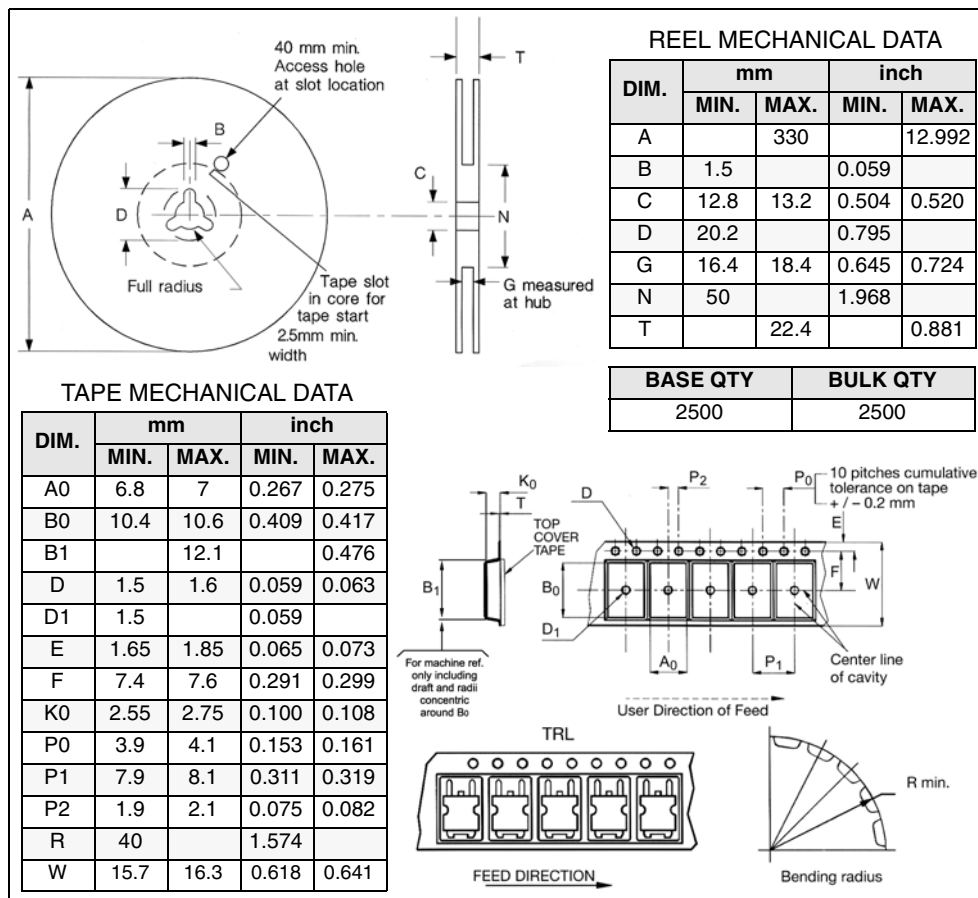
Packaging mechanical data

5 Packaging mechanical data

DPAK FOOTPRINT



TAPE AND REEL SHIPMENT



Revision history

STGD7NB60K - STGP7NB60K

6 Revision history

Table 6. Revision history

Date	Revision	Changes
21-Mar-2005	1	First release
23-Jun-2006	2	The document has been reformatted
26-Jan-2007	3	Typing error

STGD7NB60K - STGP7NB60K

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