



STGB6NB60HD

N-CHANNEL 6A - 600V - D²PAK
Low Drop PowerMESH™ IGBT

PRELIMINARY DATA

General features

Type	V _{CES}	V _{CE(sat)} (Max) @ 25°C	I _C @ 100°C
STGB6NB60HD	600V	< 2.7V	6A

- LOWER C_{RES} / C_{IES} RATIO (NO CROSS CONDUCTION SUSCEPTIBILITY)
- HIGH FREQUENCY OPERATION
- VERY SOFT ULTRA FAST RECOVERY ANTI PARALLEL DIODE
- TYPICAL SHORT CIRCUIT WITHSTAND TIME 5MICROS S-family, 4micro H-family
- CO-PACKAGE WITH TURBOSWITCH™ ANTIPARALLEL DIODE

Description

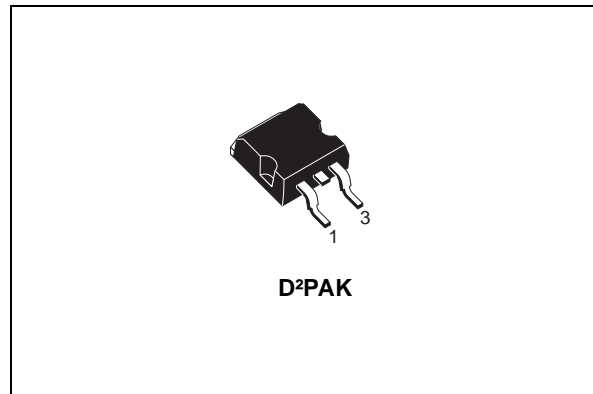
Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH™ IGBTs, with outstanding performances. The suffix "H" identifies a family optimized for high frequency application.

Applications

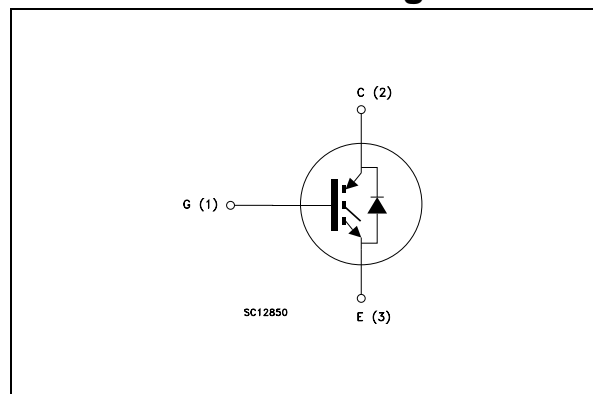
- HIGH FREQUENCY MOTOR CONTROL
- SMPS and PFC IN BOTH HARD SWITCH AND RESONANT TOPOLOGIES

Order codes

Sales Type	Marking	Package	Packaging
STGB6NB60HD	GB6NB60HD	D ² PAK	TAPE & REEL



Internal schematic diagram



1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-Emitter Voltage ($V_{GS} = 0$)	600	V
I_C	Collector Current (continuous) at 25°C	12	A
I_C	Collector Current (continuous) at 100°C	6	A
I_{CM} <i>Note 1</i>	Collector Current (pulsed)	48	A
V_{GE}	Gate-Emitter Voltage	± 20	V
P_{TOT}	Total Dissipation at $T_C = 25^\circ\text{C}$	80	W
T_j	Operating Junction Temperature	– 65 to 150	°C
T_{stg}	Storage Temperature		

Table 2. Thermal resistance

		Min.	Typ.	Max.	Unit
$R_{thj-case}$	Thermal Resistance Junction-case			1.56	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient			62.5	°C/W
R_{thc-h}	Thermal Resistance case-hetsink		0.5		°C/W

2 Electrical characteristics

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

Table 3. Static

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{BR(CES)}	Collectro-Emitter Breakdown Voltage	I _C = 250μA, V _{GE} = 0	600			V
V _{CE(SAT)}	Collector-Emitter Saturation Voltage	V _{GE} = 15V, I _C = 6A, T _j = 25°C V _{GE} = 15V, I _C = 6A, T _j = 125°C		2.1 1.6	2.7	V V
V _{GE(th)}	Gate Threshold Voltage	V _{CE} = V _{GE} , I _C = 250μA	3		5	V
I _{CES}	Collector-Emitter Leakage 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} = 25V, I _C = 6A	3	4.5		S

Table 4. Dynamic

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
C _{ies}	Input Capacitance	V _{CE} = 25V, f = 1MHz, V _{GE} = 0	390	560	730	pF
C _{oes}	Output Capacitance		45	68	90	pF
C _{res}	Reverse Transfer Capacitance		10	15	20	pF
Q _g	Total Gate Charge	V _{CE} = 480V, I _C = 6A, V _{GE} = 15V, (see Figure 2)		42	55	nC
Q _{ge}	Gate-Emitter Charge			7.9		nC
Q _{gc}	Gate-Collector Charge			17.6		nC
I _{CL}	Turn-Off SOA Minimum Current	V _{clamp} = 480V , T _j = 150°C R _G = 10Ω, V _{GE} = 15V	52			A

Table 5. Switching on/off (inductive load)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 480V, I_C = 6A$		15		ns
t_r	Current Rise Time	$R_G = 10\Omega, V_{GE} = 15V, T_j = 125^\circ C$		48		ns
$(di/dt)_{on}$	Turn-on Current Slope	(see Figure 3)		160		A/ μs
t_c	Cross-over Time	$V_{CC} = 480V, I_C = 6A,$		85		ns
$t_r(V_{off})$	Off Voltage Rise Time	$R_{GE} = 10\Omega, V_{GE} = 15V, T_j = 25^\circ C$		20		ns
$t_{d(off)}$	Turn-off Delay Time	(see Figure 3)		75		ns
t_f	Current Fall Time			70		ns
t_c	Cross-over Time	$V_{CC} = 480V, I_C = 6A,$		150		ns
$t_r(V_{off})$	Off Voltage Rise Time	$R_{GE} = 10\Omega, V_{GE} = 15V, T_j = 125^\circ C$		50		ns
$t_{d(off)}$	Turn-off Delay Time	(see Figure 3)		110		ns
t_f	Current Fall Time			110		ns

Table 6. Switching energy (inductive load)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
E_{on} Note 2	Turn-on Switching Losses	$V_{CC} = 480V, I_C = 6A,$		150		μJ
E_{off} Note 3	Turn-off Switching Losses	$R_{GE} = 10\Omega, V_{GE} = 15V, T_j = 25^\circ C$		85		μJ
E_{ts}	Total Switching Losses	(see Figure 3)		235		μJ
E_{on} Note 2	Turn-on Switching Losses	$V_{CC} = 480V, I_C = 6A,$		185		μJ
E_{off} Note 3	Turn-off Switching Losses	$R_{GE} = 10\Omega, V_{GE} = 15V, T_j = 125^\circ C$		220		μJ
E_{ts}	Total Switching Losses	(see Figure 3)		405		μJ

Table 7. Collector-emitter diode

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_f	Forward On-Voltage	$I_f = 6A$ $I_f = 6A, T_j = 125^\circ C$		1.8 1.4	2.2	V V
I_f	Forward Current				6	A
I_{fm}	Forward Current pulsed				48	A
t_{rr}	Reverse Recovery Time	$I_f = 6A, V_R = 200V,$		100		ns
Q_{rr}	Reverse Recovery Charge	$T_j = 125^\circ C, di/dt = 100A/\mu s$		135		ns
I_{rrm}	Reverse Recovery Current	(see Figure 4)		2.7		nC

(1) Pulse width limited by max. junction temperature

(2) E_{on} is the turn-on losses when a typical diode is used in the test circuit in figure 2 E_{on} include diode recovery energy. 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)

(3) Turn-off losses include also the tail of the collector current

3 Test Circuits

Figure 1. Test Circuit for Inductive Load Switching

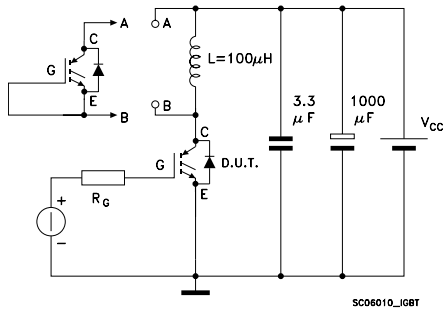


Figure 2. Gate Charge Test Circuit

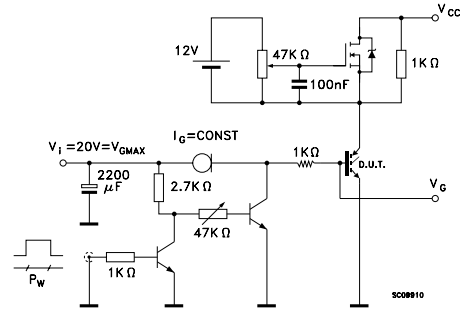


Figure 3. Switching Waveform

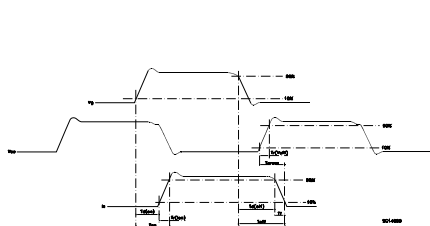
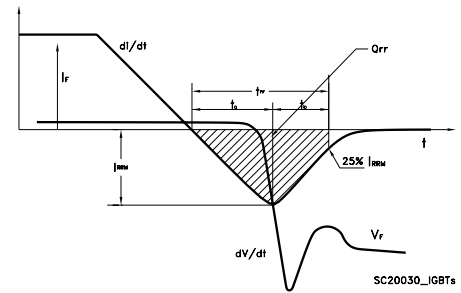


Figure 4. Diode Recovery Time Waveform

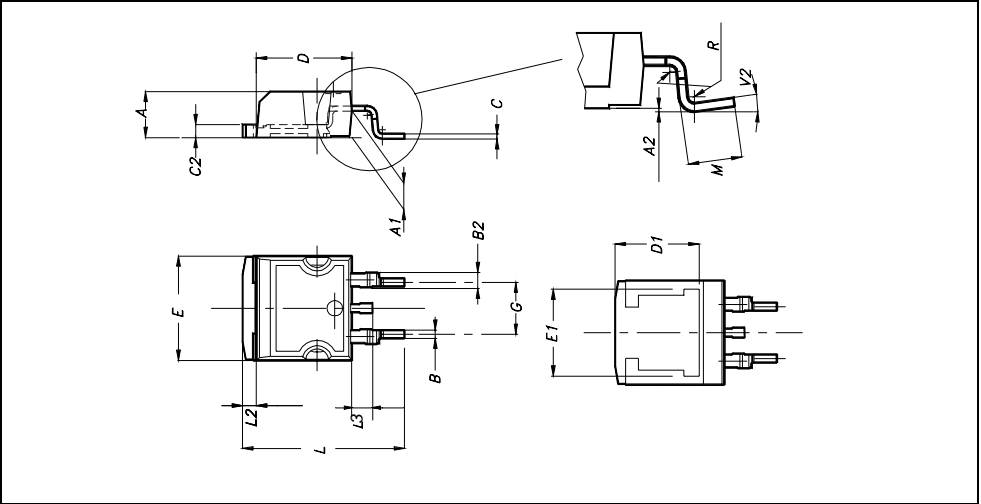


4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

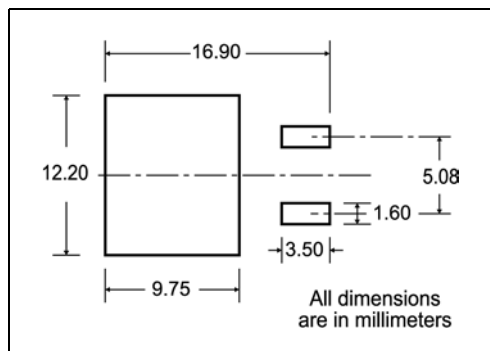
D²PAK MECHANICAL DATA

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°		4°			

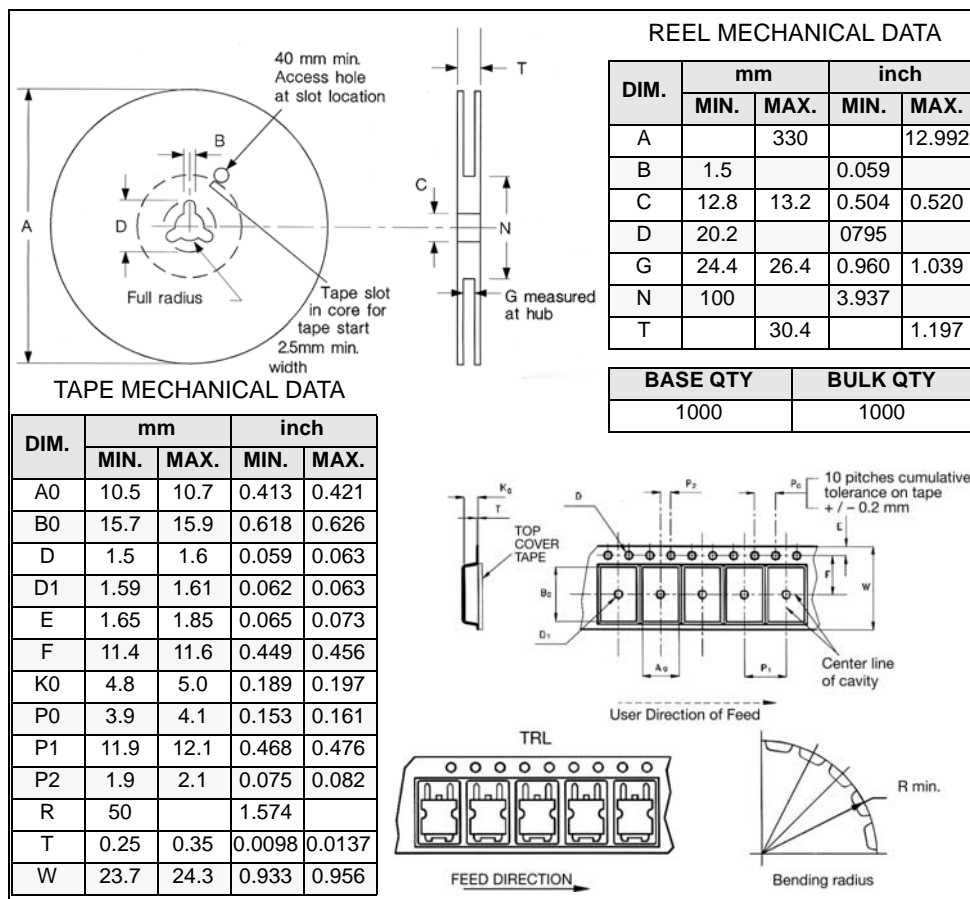


5 Packaging mechanical data

D²PAK FOOTPRINT



TAPE AND REEL SHIPMENT



* on sales type

6 Revision History

Date	Revision	Changes
18-Nov-2005	1	Initial release.

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