STGB6NB60HD

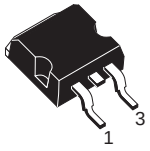
N-CHANNEL 6A - 600V - D²PAK
Low Drop PowerMESH™ IGBT

PRELIMINARY DATA

General features

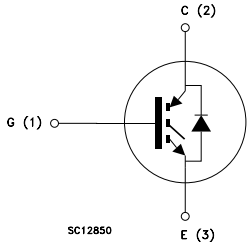
Type	V_{CES}	$V_{CE(sat)}$ (Max)@ 25°C	I_C @100°C
STGB6NB60HD	600V	< 2.7V	6A

- 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



D²PAK

Internal schematic diagram



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	D²PAK	TAPE & REEL

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} *Note* 1	Collector Current (pulsed)	48	A
V_{GE}	Gate-Emitter Voltage	± 20	V
P_{TOT}	Total Dissipation at T_C = 25°C	80	W
T_j	Operating Junction Temperature	– 65 to 150	°C
T_{stg}	Storage Temperature		

Table 2. Thermal resistance

		Min.	Typ.	Max.	Unit
Rthj-case	Thermal Resistance Junction-case			1.56	°C/W
Rthj-amb	Thermal Resistance Junction-ambient			62.5	°C/W
Rthc-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, Tj= 25°C V_{GE}= 15V, I_C= 6A, Tj= 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,Tc=25°C V_{CE} = Max Rating, Tc=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} C_{oes} C_{res}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{CE} = 25V, f = 1MHz, V_{GE} = 0	390 45 10	560 68 15	730 90 20	pF pF pF
Q_g Q_{ge} Q_{gc}	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	V_{CE} = 480V, I_C = 6A, V_{GE} = 15V, (see Figure 2)		42 7.9 17.6	55	nC nC nC
I_{CL}	Turn-Off SOA Minimum Current	V_{clamp} = 480V , Tj = 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
$t_{d(on)}$ t_r $(di/dt)_{on}$	Turn-on Delay Time Current Rise Time Turn-on Current Slope	V_{CC} = 480V, I_C = 6A R_G= 10Ω, V_{GE}= 15V, Tj= 125°C (see Figure 3)		15 48 160		ns ns A/µs
t_c $t_r(V_{off})$ $t_{d(off)}$ t_f	Cross-over Time Off Voltage Rise Time Turn-off Delay Time Current Fall Time	V_{cc} =480V, I_C = 6A, R_{GE}=10Ω , V_{GE} =15V, Tj=25°C (see Figure 3)		85 20 75 70		ns ns ns
t_c $t_r(V_{off})$ $t_{d(off)}$ t_f	Cross-over Time Off Voltage Rise Time Turn-off Delay Time Current Fall Time	V_{cc} =480V, I_C = 6A, R_{GE}=10Ω , V_{GE} =15V, Tj=125°C (see Figure 3)		150 50 110 110		ns ns ns

Table 6. Switching energy (inductive load)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Eon *Note* 2 E_{off} *Note* 3 E_{ts}	Turn-on Switching Losses Turn-off Switching Losses Total Switching Losses	V_{cc} =480V, I_C = 6A, R_{GE}=10Ω , V_{GE} =15V, Tj=25°C (see Figure 3)		150 85 235		µJ µJ µJ
Eon *Note* 2 E_{off} *Note* 3 E_{ts}	Turn-on Switching Losses Turn-off Switching Losses Total Switching Losses	V_{cc} =480V, I_C = 6A, R_{GE}=10Ω , V_{GE} =15V, Tj=125°C (see Figure 3)		185 220 405		µJ µJ µJ

Table 7. Collector-emitter diode

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

(1)Pulse width limited by max. junction temperature

(2) Eon is the tun-on losses when a typical diode is used in the test circuit in figure 2 Eon include diode recovery energy. If the IGBT is offered in a package with a co-pak diode, the co-pack 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

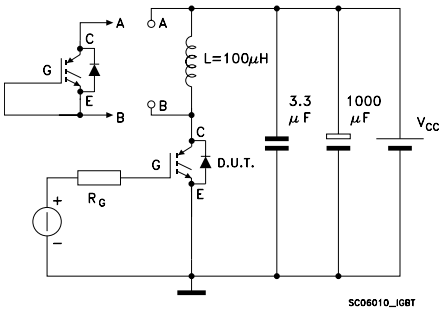


Figure 2. Gate Charge Test Circuit

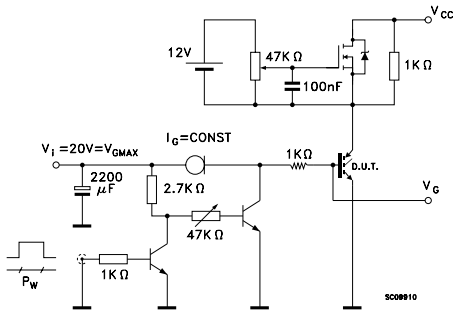


Figure 3. Switching Waveform

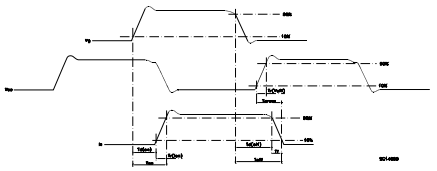
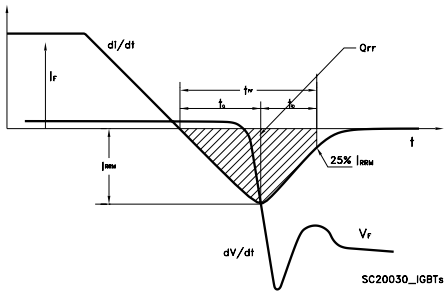


Figure 4. Diode Recovery Time Waveform

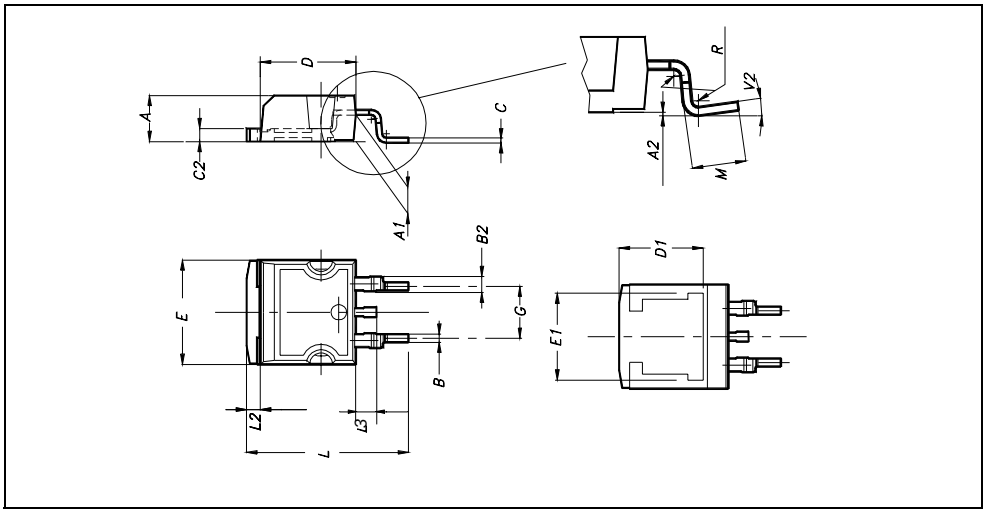


4 Package mechanical data

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

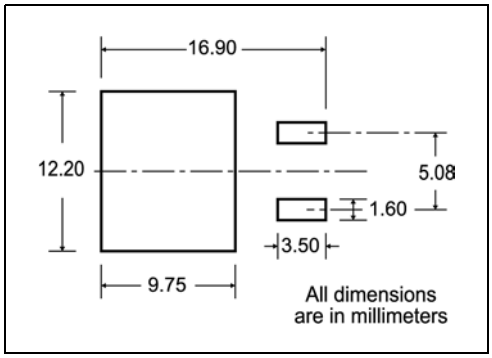
D^2PAK MECHANICAL DATA

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	0º		4º			

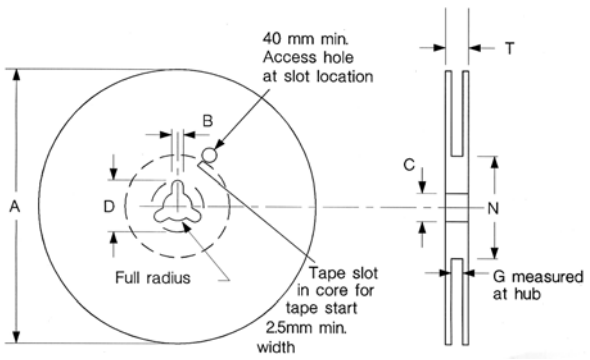


5 Packaging mechanical data

D²PAK FOOTPRINT



TAPE AND REEL SHIPMENT



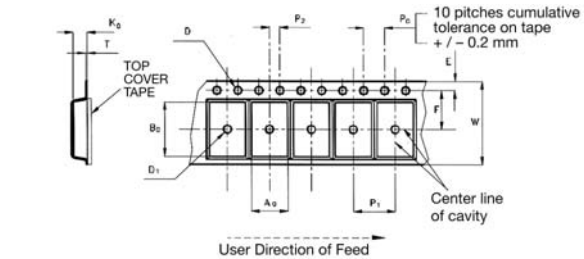
REEL MECHANICAL DATA

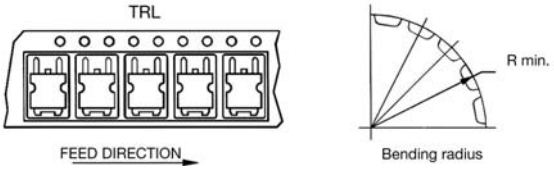
DIM.	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A		330		12.992
B	1.5		0.059	
C	12.8	13.2	0.504	0.520
D	20.2		0795	
G	24.4	26.4	0.960	1.039
N	100		3.937	
T		30.4		1.197

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





* on sales type

6 Revision History

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