

STGP10NB60SD

N-CHANNEL 10A - 600V - TO-220 Low Drop PowerMESH™ IGBT

General features

Туре	V _{CES}	V _{CE(sat)} (Max)@ 25°C	I _C @100°C
STGP10NB60SD	600V	< 1.7V	10A

- HIGH CURRENT CAPABILITY
- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)

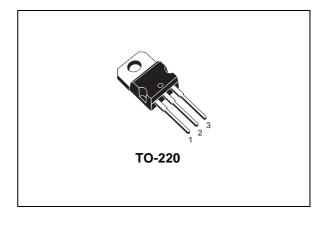
Description

Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH $^{\text{TM}}$ IGBTs, with outstanding performances. The suffix "S" identifies a family optimized achieve minimum on-voltage drop for low frequency application (<1kHz).

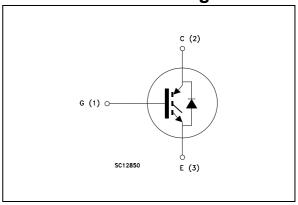
Applications

- LIGHT DIMMER
- STATIC RELAYS
- MOTOR CONTROL

Order codes



Internal schematic diagram



Sales Type	Marking	Package	Packaging
STGP10NB60SD	GP10NB60SD	TO-220	TUBE

1 Electrical ratings STGP10NB60SD

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V _{CES}	Collector-Emitter Voltage (V _{GS} = 0)	600	V
I _C Note 5	Collector Current (continuous) at T _C = 25°C	20	Α
I _C Note 5	Collector Current (continuous) at T _C = 100°C	10	Α
I _{CM} Note 1	Collector Current (pulsed)	80	W
V _{GE}	Gate-Emitter Voltage	±20	Α
P _{TOT}	Total Dissipation at T _C = 25°C	31.5	W
T _{stg}	Storage Temperature		°C
T _j	Operating Junction Temperature	- 65 to 150	

Table 2. Thermal resistance

Rthj-case	Thermal Resistance Junction-case Max	4.7	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	°C/W
Rthc-sink	Thermal resistance Case-sink Typ	0.5	

STGP10NB60SD 2 Electrical characteristics

2 Electrical characteristics

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

Table 3. Static

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
V _{BR(CES)}	Collector-Emitter Breakdown Voltage	I _C = 250μA, V _{GE} = 0	600			V
V _{BR(CES)}	Collector-Emitter Breakdown Voltage I _C = 1mA, V _{GE} = 0		20			V
V _{CE(sat)}	Collector-Emitter Saturation Voltage	V_{GE} = 15V, I_{C} = 5A V_{GE} = 15V, I_{C} = 10A V_{GE} =15V, I_{C} = 10A, Tc= 125°C		1.15 1.35 1.25	1.7	V V V
V _{GE(th)}	Gate Threshold Voltage	$V_{CE} = V_{GE}$, $I_{C} = 250\mu A$	2.5		5	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			10 100	μA μA
I _{GES}	Gate-Emitter Leakage Current (V _{CE} = 0)	V _{GE} = ±20V , V _{CE} = 0			±100	nA
9 _{fs}	Forward Transconductance	$V_{CE} = 25V_{,} I_{C} = 10A$	5			S

Table 4. Dynamic

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
C _{ies} C _{oes} C _{res}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{CE} = 25V, f = 1MHz, V_{GE} = 0$		610 65 12		pF pF pF
Qg	Total Gate Charge	$V_{CE} = 400 \text{V}, I_{C} = 5 \text{A},$ $V_{GE} = 15 \text{V}, \text{ (see Figure 17)}$		33		nC
I _{CL}	Latching Current	V_{clamp} =480V, RG=1k Ω Tj=125°C	20			А

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Table 5. Switching On/Off (inductive load)

Symbol	Parameter	Test Conditions	Min.	Тур.	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} = 10A R_{G} = 1k Ω , V_{GE} = 15V, Tj= 25°C (see Figure 18)		0.7 0.46 8		ns ns A/µs
t_{c} $t_{r}(V_{off})$ t_{f}	Cross-over Time Off Voltage Rise Time Current Fall Time	V_{CC} = 480V, I_{C} = 10A R_{G} = 1k Ω , V_{GE} = 15V,Tj= 25°C (see Figure 18)		2.2 1.2 1.2		hs hs
t_{c} $t_{r}(V_{off})$ t_{f}	Cross-over Time Off Voltage Rise Time Current Fall Time	V_{CC} = 480V, I_{C} = 10A R_{G} = 1k Ω , V_{GE} = 15V, Tj=125°C (see Figure 18)		3.8 1.2 1.9		µs µs µs

Table 6. Switching energy (inductive load)

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Eon Note 3	Turn-on Switching Losses	$V_{CC} = 480V, I_{C} = 10A$		0.6		mJ
E _{off} Note 4	Turn-off Switching Losses	$R_G = 1k\Omega$, $V_{GE} = 15V$, $Tj = 25$ °C		5.0		mJ
E _{ts}	Total Switching Losses	(see Figure 18)		5.6		mJ

Table 7. Collector-emitter diode

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
I _F	Forward Current Forward Current pulsed				7 56	A A
V _f	Forward On-Voltage	I _f = 3.5A I _f = 3.5A, Tj = 125°C		1.4 1.15	1.9	V V
t _{rr} Q _{rr} I _{rrm}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current			50 70 2.7		ns nC A

⁽¹⁾Pulse width limited by max. junction temperature

$$I_{C}(T_{C}) = \frac{T_{JMAX}^{-T}C}{R_{THJ-C}^{\times V}CESAT(MAX)^{(T_{C}, I_{C})}}$$

⁽²⁾ Pulsed: Pulse duration = $300 \mu s$, duty cycle 1.5%

⁽³⁾Eon is the tun-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-pack diode is used as external diode. IGBTs & Diode are at the same temperature (25°C and 125°C)

⁽⁴⁾ Turn-off losses include also the tail of the collector current

⁽⁵⁾ Calculated according to the iterative formula:

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2.1 Electrical characteristics (curves)

Figure 1. Safe Operating Area

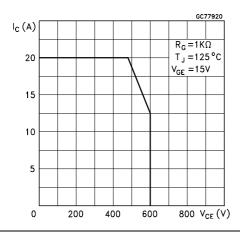


Figure 2. Thermal Impedance

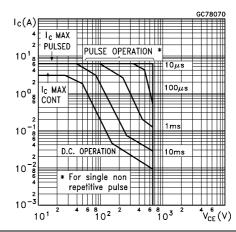


Figure 3. Output Characteristics

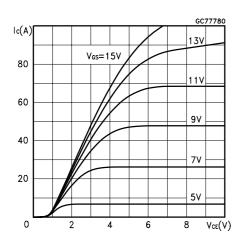


Figure 4. Transfer Characteristics

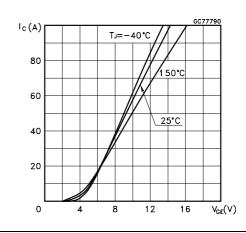


Figure 5. Transconductance

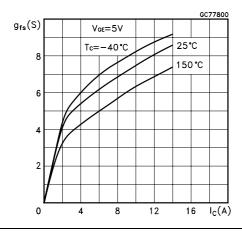
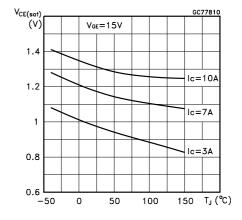


Figure 6. Collector-Emitter on Voltage vs Temperature



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Figure 7. Collector-Emitter on Voltage vs Collector Current

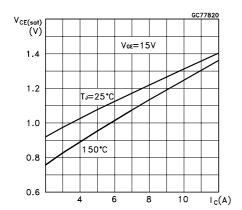


Figure 8. Gate Threshold Voltage vs Temperature

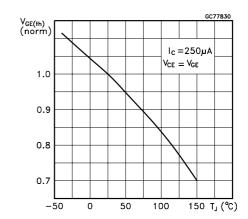


Figure 9. Capacitance Variations

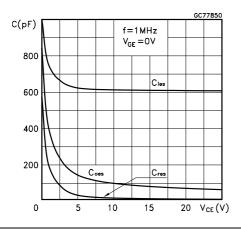


Figure 10. Gate Charge vs Gate-Emitter Voltage

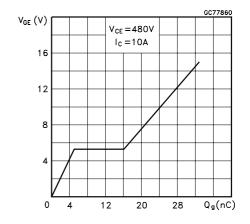


Figure 11. Switching Losses vs Gate Resistance

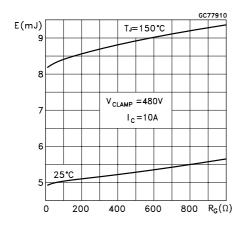
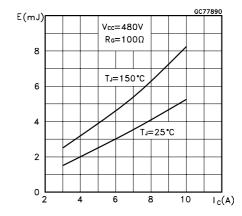


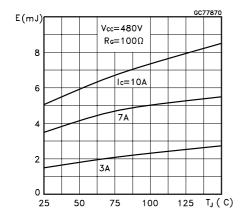
Figure 12. Switching Losses vs Collector Current



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Figure 13. Switching Losses vs Temperature Figure 14. Nor

Figure 14. Normalized Breakdown Voltage vs
Temperature



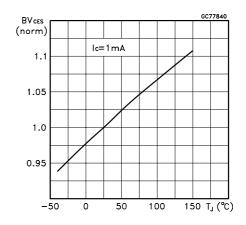
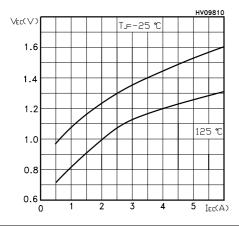


Figure 15. Emitter-Collector Diode Characteristics



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3 Test Circuits STGP10NB60SD

3 Test Circuits

Figure 16. Test Circuit for Inductive Load Switching

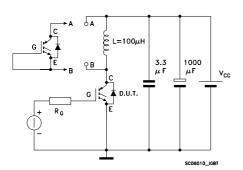


Figure 17. Gate Charge Test Circuit

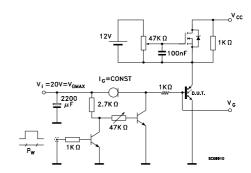
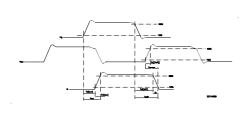
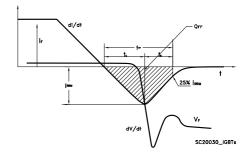


Figure 18. Switching Waveform

Figure 19. Diode Recovery Time Waveform

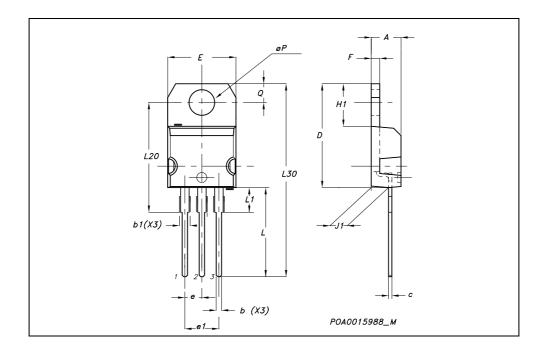




4 Package mechanical data

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

DIM		mm.			inch	
DIM.	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
Α	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
С	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
Е	10		10.40	0.393		0.409
е	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	
øΡ	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



STGP10NB60SD 5 Revision History

5 Revision History

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

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5 Revision History STGP10NB60SD

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