



# STGP12NB60HD

N-CHANNEL 12A - 600V – TO-220

PowerMESH™ IGBT

TARGET DATA

TYPE	V <sub>CES</sub>	V <sub>CE(sat)</sub>	I <sub>C</sub>
STGP12NB60HD	600 V	< 2.8 V	12 A

- HIGH INPUT IMPEDANCE
- LOW ON-VOLTAGE DROP (V<sub>cesat</sub>)
- OFF LOSSES INCLUDE TAIL CURRENT
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- VERY HIGH FREQUENCY OPERATION
- CO-PACKAGED WITH TURBOSWITCH™
- ANTIPARALLEL DIODE

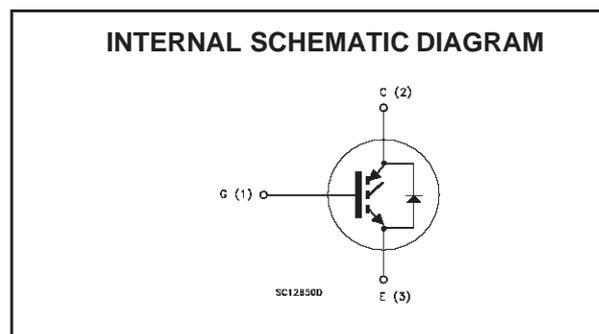
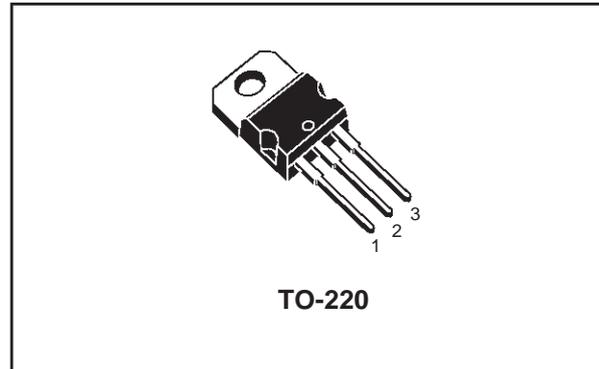
## DESCRIPTION

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 applications (up to 50kHz) in order to achieve very high switching performances (reduced t<sub>fall</sub>) maintaining a low voltage drop.

## APPLICATIONS

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



## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>CES</sub>	Collector-Emitter Voltage (V <sub>GS</sub> = 0)	600	V
V <sub>ECR</sub>	Emitter-Collector Voltage	20	V
V <sub>GE</sub>	Gate-Emitter Voltage	± 20	V
I <sub>C</sub>	Collector Current (continuous) at T <sub>C</sub> = 25°C	24	A
I <sub>C</sub>	Collector Current (continuous) at T <sub>C</sub> = 100°C	12	A
I <sub>CM (n)</sub>	Collector Current (pulsed)	96	A
P <sub>TOT</sub>	Total Dissipation at T <sub>C</sub> = 25°C	100	W
	Derating Factor	0.8	W/°C
T <sub>stg</sub>	Storage Temperature	-65 to 150	°C
T <sub>j</sub>	Max. Operating Junction Temperature	150	°C

## STGP12NB60HD

### THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	1.25	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	°C/W
Rthc-sink	Thermal Resistance Case-sink Typ	0.5	°C/W

### ELECTRICAL CHARACTERISTICS (TCASE = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{BR(CE)}$	Collectro-Emitter Breakdown Voltage	$I_C = 250 \mu A, V_{GE} = 0$	600			V
$I_{CES}$	Collector cut-off ( $V_{GE} = 0$ )	$V_{CE} = \text{Max Rating}, T_C = 25 \text{ }^\circ\text{C}$ $V_{CE} = \text{Max Rating}, T_C = 125 \text{ }^\circ\text{C}$			10 100	$\mu A$ $\mu A$
$I_{GES}$	Gate-Emitter Leakage Current ( $V_{CE} = 0$ )	$V_{GE} = \pm 20V, V_{CE} = 0$			$\pm 100$	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Threshold Voltage	$V_{CE} = V_{GE}, I_C = 250\mu A$	3		5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 15V, I_C = 12 A$ $V_{GE} = 15V, I_C = 12 A, T_J = 125^\circ C$		2.0 1.7	2.8	V V

### DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs}$	Forward Transconductance	$V_{CE} = 25 V, I_C = 12 A$		TBD		S
$C_{ies}$	Input Capacitance	$V_{CE} = 25V, f = 1 \text{ MHz}, V_{GE} = 0$		TBD		pF
$C_{oes}$	Output Capacitance			TBD		pF
$C_{res}$	Reverse Transfer Capacitance			TBD		pF
$Q_g$ $Q_{ge}$ $Q_{gc}$	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	$V_{CE} = 480V, I_C = 12 A,$ $V_{GE} = 15V$		TBD TBD TBD		nC nC nC
$I_{CL}$	Latching Current	$V_{clamp} = 480 V, T_J = 150^\circ C$ $R_G = 10 \Omega$	48			A

### SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on Delay Time Rise Time	$V_{CC} = 480 V, I_C = 12 A$ $R_G = 10\Omega, V_{GE} = 15 V$		5 46		ns ns
$(di/dt)_{on}$ $E_{on}$	Turn-on Current Slope Turn-on Switching Losses	$V_{CC} = 480 V, I_C = 12 A$ $R_G = 10\Omega, V_{GE} = 15 V,$ $T_J = 125^\circ C$		1000 290		A/ $\mu s$ $\mu J$

DIODE INSIDE: STTH506

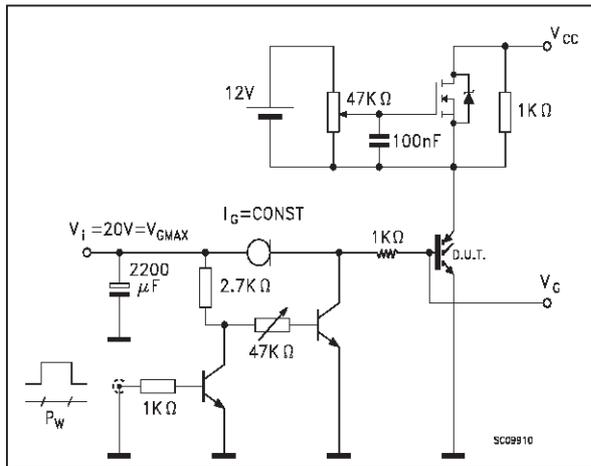
## ELECTRICAL CHARACTERISTICS (CONTINUED)

## SWITCHING OFF

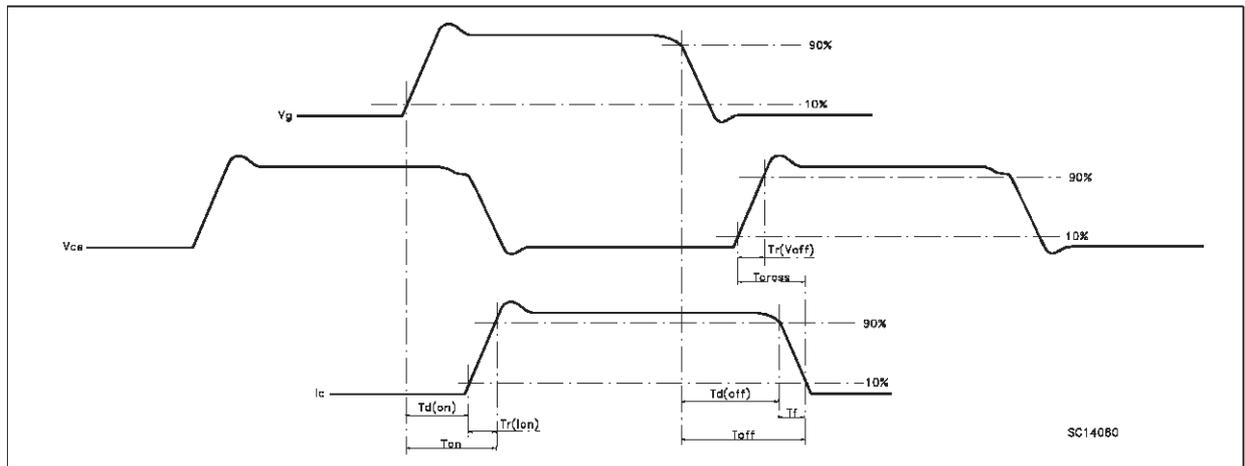
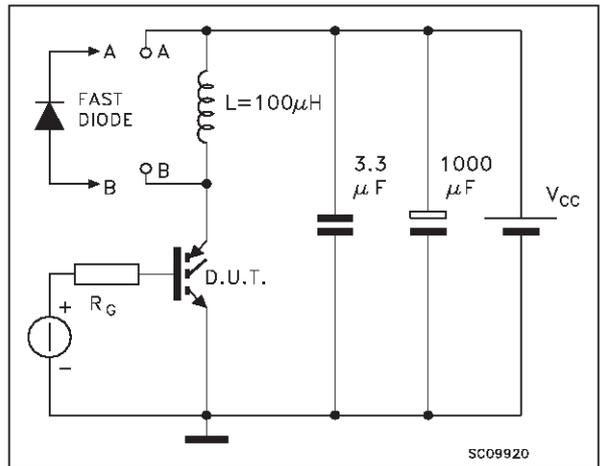
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_c$	Cross-over Time	$V_{CC} = 480\text{ V}$ , $I_C = 12\text{ A}$ , $R_{GE} = 10\ \Omega$ , $V_{GE} = 15\text{ V}$		150		ns
$t_r(V_{off})$	Off Voltage Rise Time			27		ns
$t_{d(off)}$	Delay Time			76		ns
$t_f$	Fall Time			92		ns
$E_{off(**)}$	Turn-off Switching Loss			0.21		mJ
$E_{ts}$	Total Switching Loss			0.49		mJ
$t_c$	Cross-over Time	$V_{CC} = 480\text{ V}$ , $I_C = 12\text{ A}$ , $R_{GE} = 10\ \Omega$ , $V_{GE} = 15\text{ V}$ $T_j = 125\text{ }^\circ\text{C}$		230		ns
$t_r(V_{off})$	Off Voltage Rise Time			76		ns
$t_{d(off)}$	Delay Time			95		ns
$t_f$	Fall Time			200		ns
$E_{off(**)}$	Turn-off Switching Loss			0.45		mJ
$E_{ts}$	Total Switching Loss			0.74		mJ

Note: 1. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.  
 2. Pulse width limited by max. junction temperature.  
 (\*\*). Losses include Also the Tail (Jedec Standardization)

**Fig. 1: Gate Charge test Circuit**

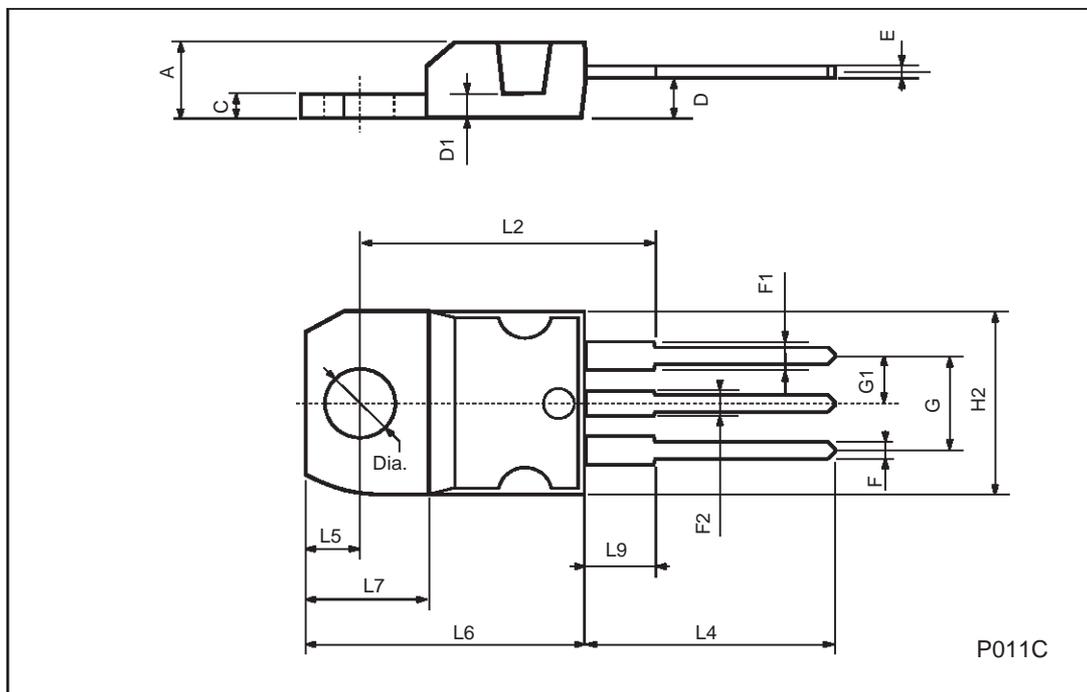


**Fig. 2: Test Circuit For Inductive Load Switching**



## TO-220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



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