



# STGE50NB60HD

## N-CHANNEL 50A - 600V ISOTOP PowerMESH™ IGBT

### PRELIMINARY DATA

TYPE	V <sub>CES</sub>	V <sub>CE(sat)</sub>	I <sub>C</sub>
STGE50NB60HD	600 V	< 2.8 V	50 A

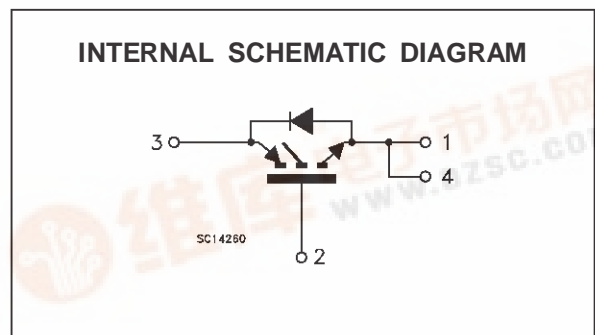
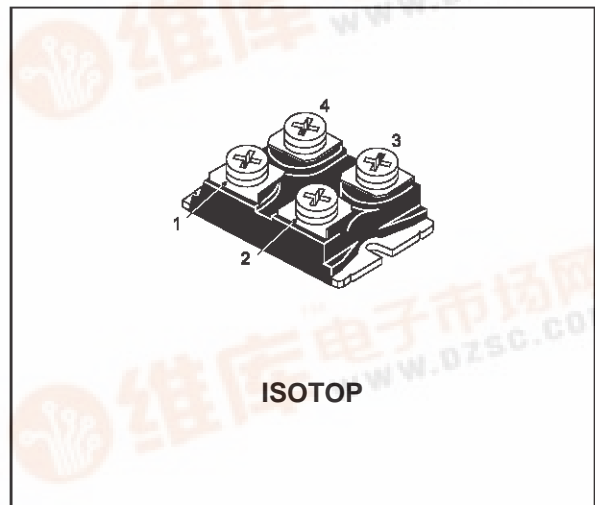
- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- LOW ON-VOLTAGE DROP (V<sub>CESAT</sub>)
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- VERY HIGH FREQUENCY OPERATION
- OFF LOSSES INCLUDE TAIL CURRENT
- CO-PACKAGED WITH TURBOSWITCH™ ANTIPARALLEL DIODE

### 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 to achieve very low switching times for high frequency applications (<120kHz).

### APPLICATIONS

- HIGH FREQUENCY MOTOR CONTROLS
- WELDING EQUIPMENTS
- SMPS AND PFC IN BOTH HARD SWITCH AND RESONANT TOPOLOGIES



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>CES</sub>	Collector-Emitter Voltage (V <sub>GS</sub> = 0)	600	V
V <sub>GE</sub>	Gate-Emitter Voltage	± 20	V
I <sub>C</sub>	Collector Current (continuous) at T <sub>c</sub> = 25 °C	100	A
I <sub>C</sub>	Collector Current (continuous) at T <sub>c</sub> = 100 °C	50	A
I <sub>CM</sub> (•)	Collector Current (pulsed)	400	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	300	W
	Derating Factor	2.4	W/°C
T <sub>stg</sub>	Storage Temperature	-65 to 150	°C
T <sub>j</sub>	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

## STGE50NB60HD

### THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.416	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	30	$^{\circ}C/W$
$R_{thc-h}$	Thermal Resistance Case-heatsink	Typ	0.1	$^{\circ}C/W$

### ELECTRICAL CHARACTERISTICS ( $T_j = 25^{\circ}C$ unless otherwise specified)

#### OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{BR(CES)}$	Collector-Emitter Breakdown Voltage	$I_C = 250 \mu A$ $V_{GE} = 0$	600			V
$I_{CES}$	Collector cut-off ( $V_{GE} = 0$ )	$V_{CE} = \text{Max Rating}$ $T_j = 25^{\circ}C$ $V_{CE} = \text{Max Rating}$ $T_j = 125^{\circ}C$			100 1000	$\mu A$ $\mu A$
$I_{GES}$	Gate-Emitter Leakage Current ( $V_{CE} = 0$ )	$V_{GE} = \pm 20 V$ $V_{CE} = 0$			$\pm 100$	nA

#### ON (\*)

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	$V_{GE} = 15 V$ $I_C = 50 A$ $V_{GE} = 15 V$ $I_C = 50 A$ $T_j = 125^{\circ}C$		2.3 1.9	2.8	V V

### DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs}$	Forward Transconductance	$V_{CE} = 25 V$ $I_C = 50 A$		22		S
$C_{ies}$ $C_{oes}$ $C_{res}$	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{CE} = 25 V$ $f = 1 MHz$ $V_{GE} = 0$		4500 450 90		pF pF pF
$Q_G$ $Q_{GE}$ $Q_{GC}$	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	$V_{CE} = 480 V$ $I_C = 50 A$ $V_{GE} = 15 V$		260 28 15		nC nC nC
$I_{CL}$	Latching Current	$V_{clamp} = 480 V$ $R_G = 10 \Omega$ $T_j = 150^{\circ}C$	200			A

### SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Delay Time Rise Time	$V_{CC} = 480 V$ $I_C = 50 A$ $V_{GE} = 15 V$ $R_G = 10 \Omega$		20 70		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{CC} = 480 V$ $I_C = 50 A$ $R_G = 10 \Omega$ $V_{GE} = 15 V$		350		A/ $\mu s$
$E_{on(\odot)}$	Turn-on Switching Losses	$T_j = 125^{\circ}C$		950		$\mu J$

**ELECTRICAL CHARACTERISTICS** (continued)**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_c$	Cross-Over Time	$V_{CC} = 480\text{ V}$ $I_C = 50\text{ A}$		166		ns
$t_r(V_{off})$	Off Voltage Rise Time	$R_{GE} = 10\ \Omega$ $V_{GE} = 15\text{ V}$		48		ns
$t_{d(off)}$	Delay Time			326		ns
$t_f$	Fall Time			90		ns
$E_{off(**)}$	Turn-off Switching Loss			2.1		mJ
$E_{ts(\odot)}$	Total Switching Loss			3		mJ
$t_c$	Cross-Over Time	$V_{CC} = 480\text{ V}$ $I_C = 50\text{ A}$		270		ns
$t_r(V_{off})$	Off Voltage Rise Time	$R_{GE} = 10\ \Omega$ $V_{GE} = 15\text{ V}$		75		ns
$t_{d(off)}$	Delay Time	$T_j = 125\text{ }^\circ\text{C}$		340		ns
$t_f$	Fall Time			200		ns
$E_{off(**)}$	Turn-off Switching Loss			2.9		mJ
$E_{ts(\odot)}$	Total Switching Loss			3.85		mJ

**COLLECTOR-EMITTER DIODE**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_f$	Forward Current				50	A
$I_{fm}$	Forward Current pulsed				400	A
$V_f$	Forward On-Voltage	$I_f = 50\text{ A}$				V
		$I_f = 50\text{ A}$ $T_j = 125\text{ }^\circ\text{C}$		2		V
$t_{rr}$	Reverse Recovery Time	$I_f = 50\text{ A}$ $V_R = 200\text{ V}$		200		nS
$Q_{rr}$	Reverse Recovery Charge	$dI/dt = 100\text{ A}/\mu\text{S}$ $T_j = 125\text{ }^\circ\text{C}$				nC
$I_{rrm}$	Reverse Recovery Current					A

- (●) Pulse width limited by max. junction temperature  
 (⊙) Include recovery losses on the STTA2006 freewheeling diode  
 (\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %  
 (\*\*) Losses Include Also The Tail (Jedec Standardization)

Fig. 1: Gate Charge test Circuit

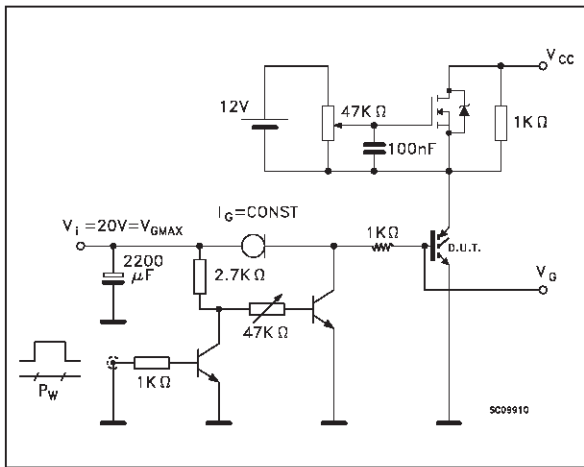


Fig. 2: Test Circuit For Inductive Load Switching

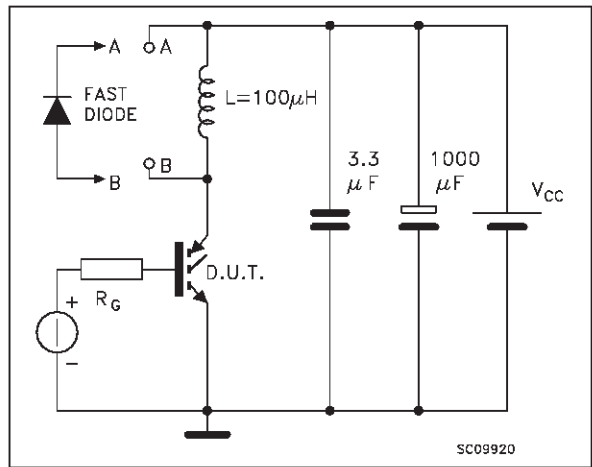
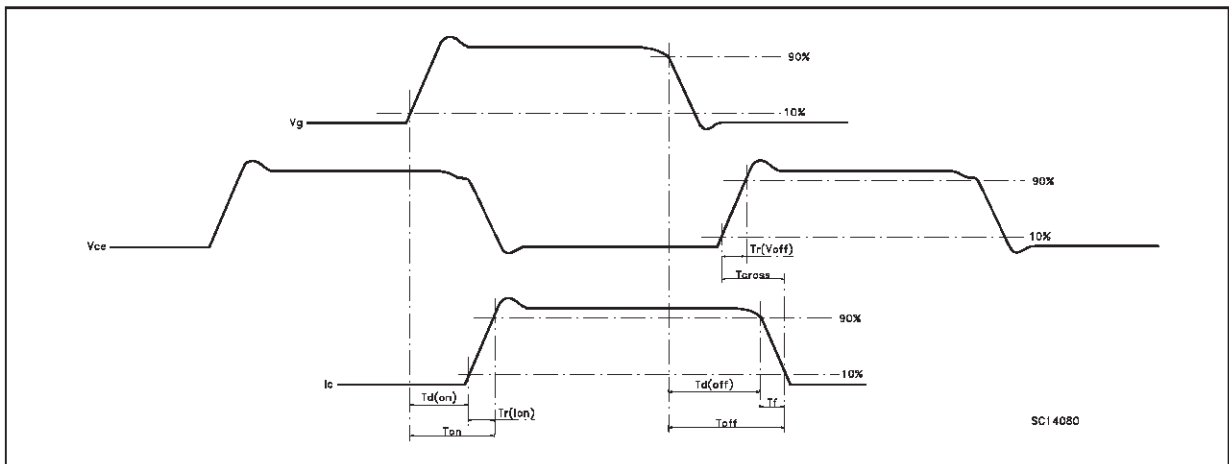
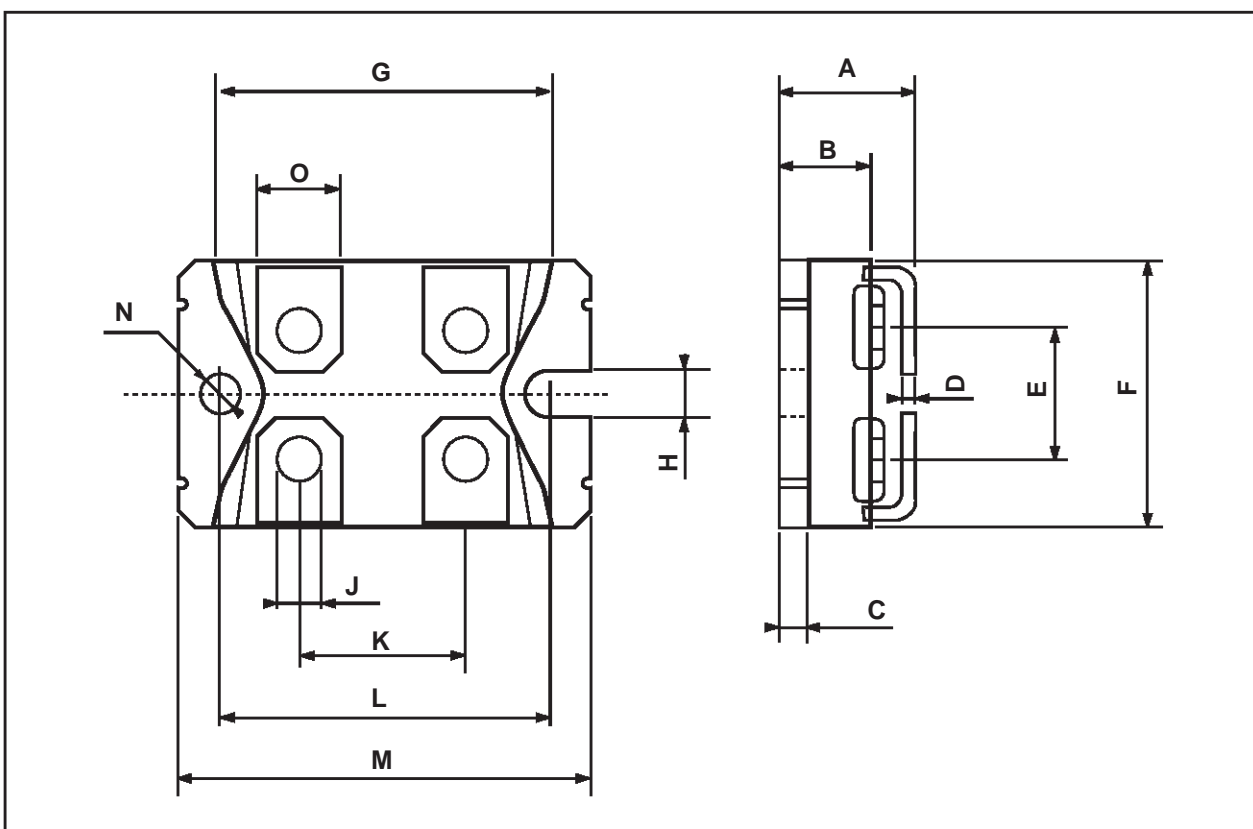


Fig. 3: Switching Waveforms



## ISOTOP MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	11.8		12.2	0.466		0.480
B	8.9		9.1	0.350		0.358
C	1.95		2.05	0.076		0.080
D	0.75		0.85	0.029		0.033
E	12.6		12.8	0.496		0.503
F	25.15		25.5	0.990		1.003
G	31.5		31.7	1.240		1.248
H	4			0.157		
J	4.1		4.3	0.161		0.169
K	14.9		15.1	0.586		0.594
L	30.1		30.3	1.185		1.193
M	37.8		38.2	1.488		1.503
N	4			0.157		
O	7.8		8.2	0.307		0.322



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