



# STGW50NB60H

## N-CHANNEL 50A - 600V TO-247 PowerMESH™ IGBT

PRELIMINARY DATA

TYPE	V <sub>CES</sub>	V <sub>CE(sat)</sub>	I <sub>C</sub>
STGW50NB60H	600 V	< 2.8 V	50 A

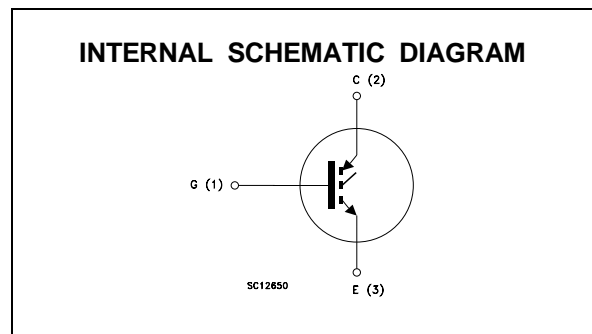
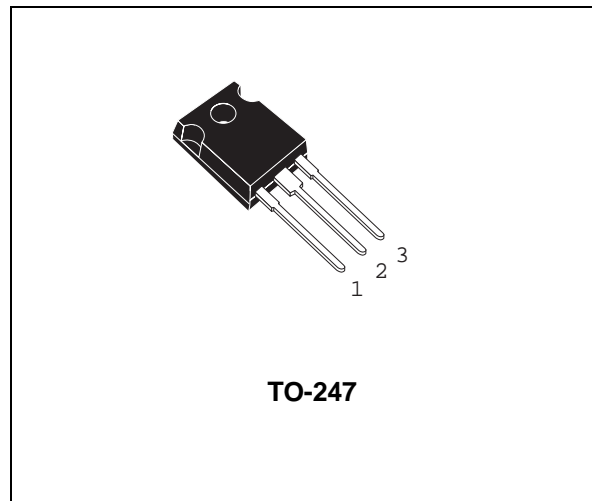
- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- LOW ON-VOLTAGE DROP (V<sub>CESAT</sub>)
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- VERY HIGH FREQUENCY OPERATION
- OFF LOSSES INCLUDE TAIL CURRENT

### 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>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	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	250	W
	Derating Factor	2	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

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### THERMAL DATA

R <sub>thj-case</sub>	Thermal Resistance Junction-case	Max	0.5	°C/W
R <sub>thj-amb</sub>	Thermal Resistance Junction-ambient	Max	30	°C/W
R <sub>thc-h</sub>	Thermal Resistance Case-heatsink	Typ	0.1	°C/W

### ELECTRICAL CHARACTERISTICS (T<sub>j</sub> = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>BR(CES)</sub>	Collector-Emitter Breakdown Voltage	I <sub>C</sub> = 250 μA V <sub>GE</sub> = 0	600			V
I <sub>CES</sub>	Collector cut-off (V <sub>GE</sub> = 0)	V <sub>CE</sub> = Max Rating T <sub>j</sub> = 25 °C V <sub>CE</sub> = Max Rating T <sub>j</sub> = 125 °C			10 100	μA μA
I <sub>GES</sub>	Gate-Emitter Leakage Current (V <sub>CE</sub> = 0)	V <sub>GE</sub> = ± 20 V V <sub>CE</sub> = 0			± 100	nA

ON (\*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>GE(th)</sub>	Gate Threshold Voltage	V <sub>CE</sub> = V <sub>GE</sub> I <sub>C</sub> = 250 μA	3		5	V
V <sub>CE(SAT)</sub>	Collector-Emitter Saturation Voltage	V <sub>GE</sub> = 15 V I <sub>C</sub> = 50 A V <sub>GE</sub> = 15 V I <sub>C</sub> = 50 A T <sub>j</sub> = 125 °C		2.3 1.9	2.8	V V

### DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub>	Forward Transconductance	V <sub>CE</sub> = 25 V I <sub>C</sub> = 50 A		22		S
C <sub>ies</sub> C <sub>oes</sub> C <sub>res</sub>	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V <sub>CE</sub> = 25 V f = 1 MHz V <sub>GE</sub> = 0		4500 450 90		pF pF pF
Q <sub>G</sub> Q <sub>GE</sub> Q <sub>GC</sub>	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	V <sub>CE</sub> = 480 V I <sub>C</sub> = 50 A V <sub>GE</sub> = 15 V		260 28 115		nC nC nC
I <sub>CL</sub>	Latching Current	V <sub>clamp</sub> = 480 V R <sub>G</sub> = 10 Ω V <sub>GE</sub> = 15 V T <sub>j</sub> = 150 °C	200			A

### SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t <sub>d(on)</sub> t <sub>r</sub>	Delay Time Rise Time	V <sub>CC</sub> = 480 V I <sub>C</sub> = 50 A V <sub>GE</sub> = 15 V R <sub>G</sub> = 10 Ω		30 90		ns ns
(di/dt) <sub>on</sub>	Turn-on Current Slope	V <sub>CC</sub> = 480 V I <sub>C</sub> = 50 A R <sub>G</sub> = 10 Ω V <sub>GE</sub> = 15 V		350		A/μs
E <sub>on</sub>	Turn-on Switching Losses	T <sub>j</sub> = 125 °C		600		μJ

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_c$	Cross-Over Time	$V_{CC} = 480\text{ V}$		166		ns
$t_r(V_{off})$	Off Voltage Rise Time	$I_C = 50\text{ A}$ $R_{GE} = 10\ \Omega$		48		ns
$t_{d(off)}$	Delay Time	$V_{GE} = 15\text{ V}$		326		ns
$t_f$	Fall Time			90		ns
$E_{off(**)}$	Turn-off Switching Loss			2.1		mJ
$E_{ts}$	Total Switching Loss			2.7		mJ
$t_c$	Cross-Over Time	$V_{CC} = 480\text{ V}$		270		ns
$t_r(V_{off})$	Off Voltage Rise Time	$I_C = 50\text{ A}$ $R_{GE} = 10\ \Omega$		75		ns
$t_{d(off)}$	Delay Time	$V_{GE} = 15\text{ V}$ $T_j = 125\text{ }^\circ\text{C}$		340		ns
$t_f$	Fall Time			200		ns
$E_{off(**)}$	Turn-off Switching Loss			2.9		mJ
$E_{ts}$	Total Switching Loss			3.5		mJ

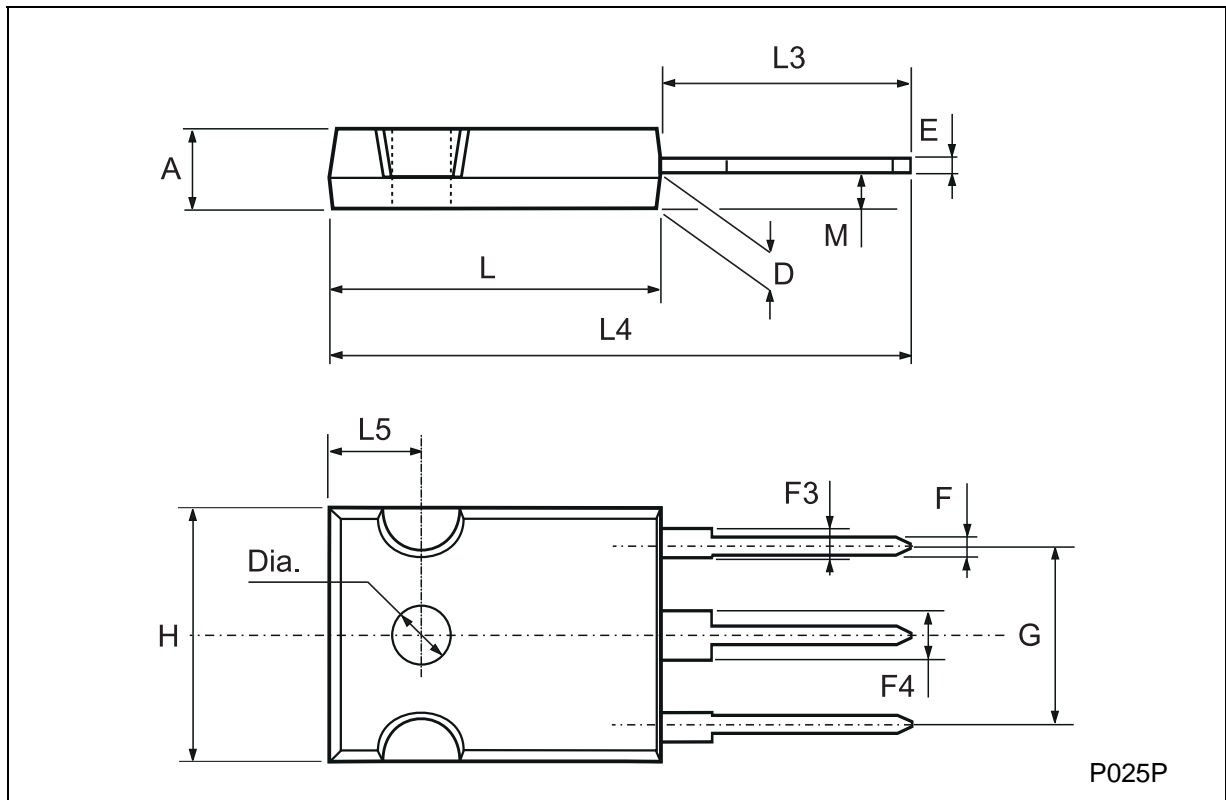
(●) Pulse width limited by max. junction temperature

(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

(\*\*) Losses Include Also The Tail (Jedec Standardization)

**TO-247 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.7		5.3	0.185		0.209
D	2.2		2.6	0.087		0.102
E	0.4		0.8	0.016		0.031
F	1		1.4	0.039		0.055
F3	2		2.4	0.079		0.094
F4	3		3.4	0.118		0.134
G		10.9			0.429	
H	15.3		15.9	0.602		0.626
L	19.7		20.3	0.776		0.779
L3	14.2		14.8	0.559		0.582
L4		34.6			1.362	
L5		5.5			0.217	
M	2		3	0.079		0.118



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