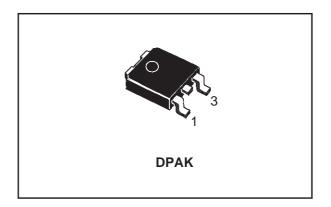


# STGD7NB60H

# N-CHANNEL 7A - 600V - DPAK PowerMESH™ IGBT

TYPE	V <sub>CES</sub>	V <sub>CE(sat)</sub>	Ic
STD7NB60H	600 V	< 2.8 V	7 A

- HIGH INPUT IMPEDANCE
- LOW ON-VOLTAGE DROP (Vcesat)
- OFF LOSSES INCLUDE TAIL CURRENT
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- VERY HIGH FREQUENCY OPERATION
- CO-PACKAGED WITH TURBOSWITCHT
- TYPICAL SHORT CIRCUIT WITHSTAND TIME 5MICROS S-family, 4 micro H family
- ANTIPARALLEL DIODE



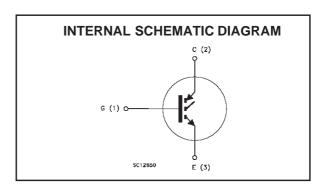
#### **DESCRIPTION**

Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the Power-MESH<sup>TM</sup> IGBTs, with outstanding perfomances.

The suffix "H" identifies a family optimized for high frequency applications (up to 50kHz)in order to achieve very high switching performances (reduced tfall) mantaining a low voltage drop.

#### **APPLICATIONS**

- HIGH FREQUENCY MOTOR CONTROLS
- 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
Ic	Collector Current (continuos) at T <sub>C</sub> = 25°C	14	А
Ic	Collector Current (continuos) at T <sub>C</sub> = 100°C	7	А
I <sub>CM</sub> (■)	Collector Current (pulsed)	56	А
Ртот	Total Dissipation at T <sub>C</sub> = 25°C	55	W
	Derating Factor	0.44	W/°C
T <sub>stg</sub>	Storage Temperature	-65 to 150	°C
Tj	Max. Operating Junction Temperature	150	°C

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### THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	2.27	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	100	°C/W
Rthc-sink	Thermal Resistance Case-sink Typ	1.5	°C/W

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

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
V <sub>BR(CES)</sub>	Collectro-Emitter Breakdown Voltage	$I_C = 250 \mu A, V_{GE} = 0$	600			V
I <sub>CES</sub>	Collector cut-off	V <sub>CE</sub> = Max Rating, T <sub>C</sub> = 25 °C			10	μΑ
	$(V_{GE} = 0)$	V <sub>CE</sub> = Max Rating, T <sub>C</sub> = 125 °C			100	μΑ
I <sub>GES</sub>	Gate-Emitter Leakage Current (V <sub>CE</sub> = 0)	$V_{GE} = \pm 20V$ , $V_{CE} = 0$			±100	nA

# ON (1)

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
V <sub>GE(th)</sub>	Gate Threshold Voltage	$V_{CE} = V_{GE}$ , $I_C = 250\mu A$	3		5	V
V <sub>CE(sat)</sub>	Collector-Emitter Saturation	V <sub>GE</sub> = 15V, I <sub>C</sub> = 7 A		2.3	2.8	V
	Voltage	V <sub>GE</sub> = 15V, I <sub>C</sub> = 7 A, Tj =125°C		1.9		V

#### **DYNAMIC**

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
9fs	Forward Transconductance	V <sub>CE</sub> = 25 V , I <sub>C</sub> =3 A	3.5	5		S
C <sub>ies</sub>	Input Capacitance	$V_{CE} = 25V, f = 1 \text{ MHz}, V_{GE} = 0$		560		pF
C <sub>oes</sub>	Output Capacitance			68		pF
C <sub>res</sub>	Reverse Transfer Capacitance			15		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> = 480V, I <sub>C</sub> = 7 A, V <sub>GE</sub> = 15V		42 7.9 17.6	55	nC nC nC
I <sub>CL</sub>	Latching Current	$V_{clamp} = 480 \text{ V}$ , $Tj = 150^{\circ}\text{C}$ $R_G = 10 \Omega$	28			А

## SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
t <sub>d(on)</sub> t <sub>r</sub>	Turn-on Delay Time Rise Time	$V_{CC} = 480 \text{ V}, I_{C} = 7 \text{ A}$ RG = 10\Omega, VGE = 15 V		15 48		ns ns
(di/dt) <sub>on</sub> Eon	Turn-on Current Slope Turn-on Switching Losses	$V_{CC}$ = 480 V, $I_{C}$ = 7 A R <sub>G</sub> =10 $\Omega$ V <sub>GE</sub> = 15 V,Tj = 125°C		160 70		A/μs μJ

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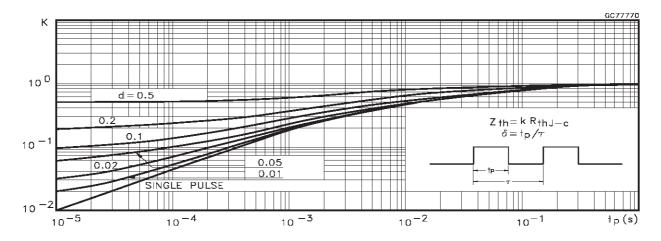
## **ELECTRICAL CHARACTERISTICS** (CONTINUED)

### **SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
tc	Cross-over Time	$V_{CC} = 480 \text{ V, I}_{C} = 7 \text{ A,}$		85		ns
$t_r(V_{Off})$	Off Voltage Rise Time	$R_{GE} = 10 \Omega$ , $V_{GE} = 15 V$		20		ns
t <sub>d</sub> (off)	Delay Time			75		ns
tf	Fall Time			70		ns
E <sub>off</sub> (**)	Turn-off Switching Loss			85		μЈ
E <sub>ts</sub>	Total Switching Loss			130		μЈ
t <sub>c</sub>	Cross-over Time	$V_{CC} = 480 \text{ V}, I_{C} = 3 \text{ A},$		150		ns
$t_r(V_{off})$	Off Voltage Rise Time	$R_{GE}$ = 10 $\Omega$ , $V_{GE}$ = 15 $V$ Ti = 125 °C		50		ns
t <sub>d</sub> (off)	Delay Time	1) = 120 0		110		ns
t <sub>f</sub>	Fall Time			110		ns
E <sub>off</sub> (**)	Turn-off Switching Loss			220		μЈ
E <sub>ts</sub>	Total Switching Loss			290		μЈ

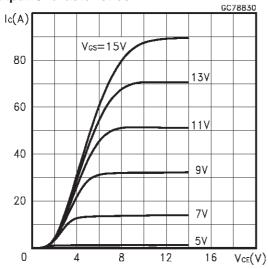
Note: 1. Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %.
2. Pulse width limited by max. junction temperature.

### **Thermal Impedance**

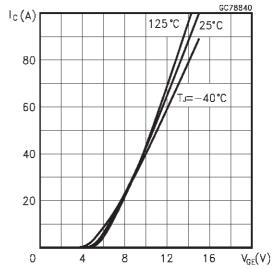


<sup>(\*\*)</sup>Losses include Also the Tail (Jedec Standardization)

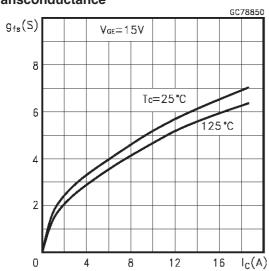
### **Output Characteristics**



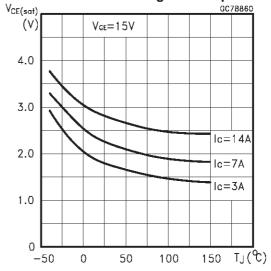
#### **Transfer Characteristics**



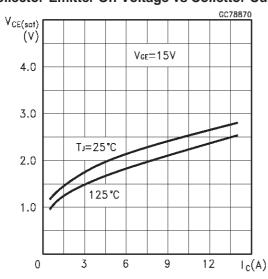
#### **Transconductance**



## Collector-Emitter On Voltage vs Temperature

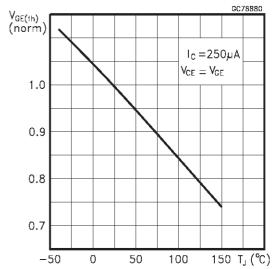


# Collector-Emitter On Voltage vs Collettor Current



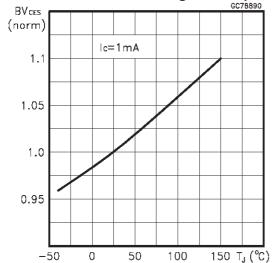
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### **Gate Threshold vs Temperature**

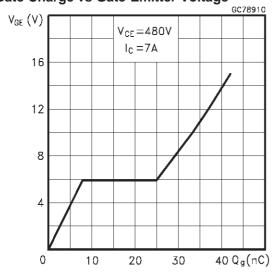


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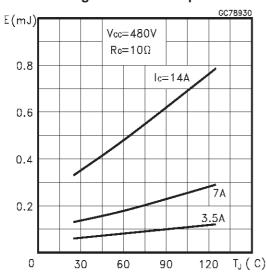
# Normalized Breakdown Voltage vs Temperature



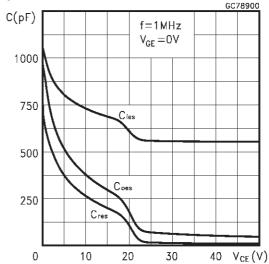
# Gate Charge vs Gate-Emitter Voltage



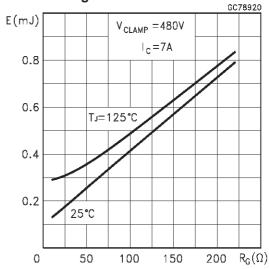
#### **Total Switching Losses vs Temperature**



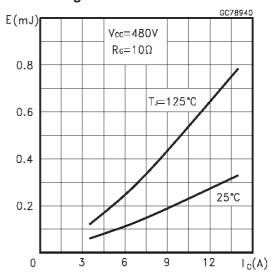
### **Capacitance Variations**



# Total Switching Losses vs Gate Resistance

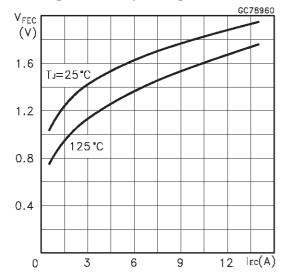


#### **Total Switching Losses vs Collector Current**



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# **Switching Off Safe Operating Area**



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Fig. 1: Gate Charge test Circuit

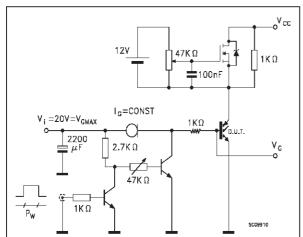
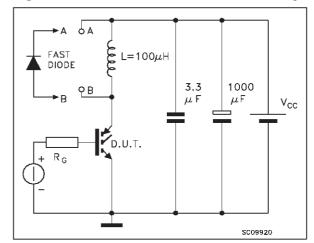
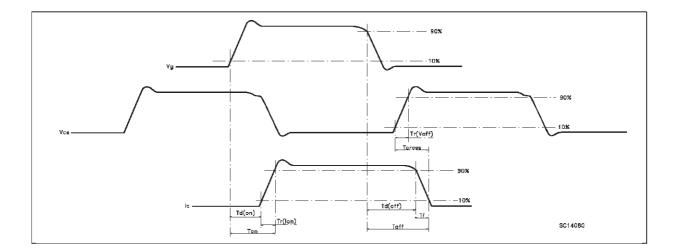


Fig. 2: Test Circuit For Inductive Load Switching

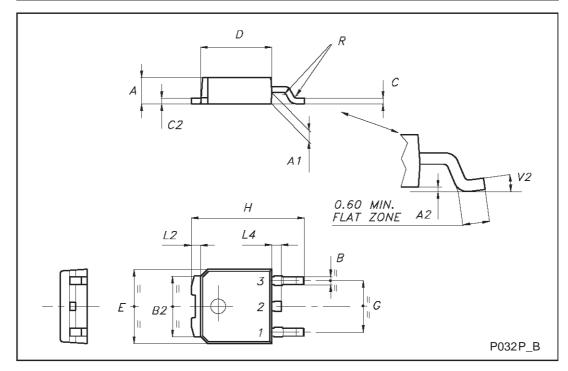




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# **TO-252 (DPAK) MECHANICAL DATA**

DIM.		mm			inch	
DIIVI.	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
А	2.20		2.40	0.087		0.094
A1	0.90		1.10	0.035		0.043
A2	0.03		0.23	0.001		0.009
В	0.64		0.90	0.025		0.035
B2	5.20		5.40	0.204		0.213
С	0.45		0.60	0.018		0.024
C2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.236		0.244
E	6.40		6.60	0.252		0.260
G	4.40		4.60	0.173		0.181
Н	9.35		10.10	0.368		0.398
L2		0.8			0.031	
L4	0.60		1.00	0.024		0.039
V2	0°		8°	0°		0°



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