



# STGW30NC60W

N-CHANNEL 30A - 600V - TO-247  
Ultra FAST Switching PowerMESH™ IGBT

Target Specification

## General features

Type	V <sub>CES</sub>	V <sub>CE(sat)</sub> (Max)@ 25°C	I <sub>C</sub> @100°C
STGW30NC60W	600 V	< 2.5 V	30 A

- VERY LOW OFF LOSSES INCLUDING TAIL CURRENT
- LOWER C<sub>RES</sub> / C<sub>IES</sub> RATIO
- LOSSES INCLUDE DIODE RECOVERY ENERGY
- HIGH FREQUENCY OPERATION
- VERY SOFT ULTRA FAST RECOVERY ANTI PARALLEL 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 "W" identifies a family optimized for very high frequency application.

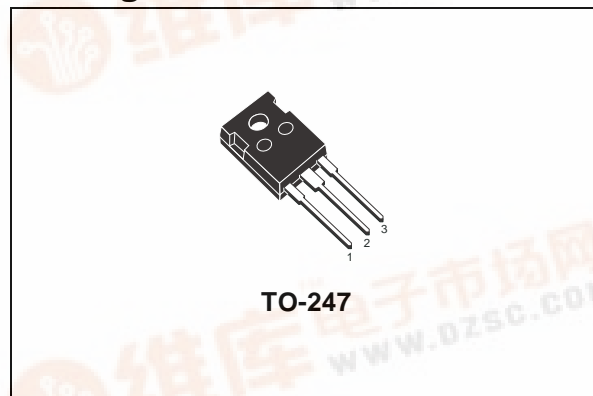
## Applications

- HIGH FREQUENCY INVERTERS, UPS, MOTOR DRIVERS
- HF, SMPS and PFC IN BOTH HARD SWITCH AND RESONANT TOPOLOGIES

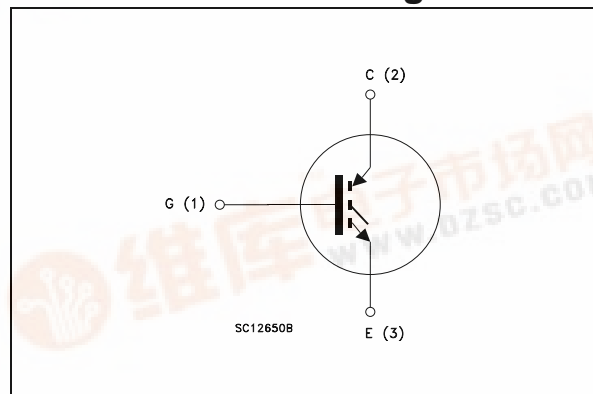
## Order codes

Sales Type	Marking	Package	Packaging
STGW30NC60W	W30NC60W	TO-247	TUBE

## Package



## Internal schematic diagram



# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-Emitter Voltage ( $V_{GS} = 0$ )	600	V
$I_C$	Collector Current (continuous) at 25°C (#)	60	A
$I_C$	Collector Current (continuous) at 100°C (#)	30	A
$V_{ECR}$	Reverse Battery Protection	20	V
$V_{GE}$	Gate-Emitter Voltage	± 20	V
$I_{CM}$ <i>Note 1</i>	Collector Current (pulsed)	100	A
$P_{TOT}$	Total Dissipation at $T_C = 25^\circ\text{C}$	200	W
	Derating Factor	1.6	W/°C
$T_{stg}$	Storage Temperature	– 55 to 150	°C
$T_j$	Operating Junction Temperature		

**Table 2. Thermal Data**

		Min.	Typ.	Max.	Unit
$R_{thj-case}$	Thermal Resistance Junction-case			0.625	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient			62.5	°C/W
$T_L$	Maximum Lead Temperature for Soldering Purpose (1.6 mm from case, for 10 sec.)		300		°C

## 2 Electrical characteristics

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

**Table 3. Static**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{BR(CES)}$	Collectro-Emitter Breakdown Voltage	$I_C = 1\text{ mA}$ , $V_{GE} = 0$	600			V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 15\text{ V}$ , $I_C = 20\text{ A}$ , $T_j = 25\text{ °C}$ $V_{GE} = 15\text{ V}$ , $I_C = 20\text{ A}$ , $T_j = 125\text{ °C}$		1.9 1.8	2.5	V V
$V_{GE(th)}$	Gate Threshold Voltage	$V_{CE} = V_{GE}$ , $I_C = 250\text{ }\mu\text{A}$	3.75		5.75	V
$I_{CES}$	Collector-Emitter Leakage Current ( $V_{CE} = 0$ )	$V_{GE} = \text{Max Rating}$ , $T_c = 25\text{ °C}$ $V_{GE} = \text{Max Rating}$ , $T_c = 125\text{ °C}$			10 1	$\mu\text{A}$ mA
$I_{GES}$	Gate-Emitter Leakage Current ( $V_{CE} = 0$ )	$V_{GE} = \pm 20\text{ V}$ , $V_{CE} = 0$			$\pm 100$	nA
$g_{fs}$ <i>Note 1</i>	Forward Transconductance	$V_{CE} = 15\text{ V}$ , $I_C = 20\text{ A}$		15		S

**Table 4. Dynamic**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$C_{ies}$ $C_{oes}$ $C_{res}$	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{CE} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GE} = 0$		2200 225 50		pF pF pF
$Q_g$ $Q_{ge}$ $Q_{gc}$	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	$V_{CE} = 390\text{ V}$ , $I_C = 20\text{ A}$ , $V_{GE} = 15\text{ V}$ , (see Figure 2)		100 16 45	140	nC nC nC
$I_{CL}$	Turn-Off SOA Minimum Current	$V_{clamp} = 480\text{ V}$ , $T_j = 150\text{ °C}$ $R_G = 10\text{ }\Omega$ , $V_{GE} = 15\text{ V}$	100			A

**Table 5. Switching On/Off**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$ $(di/dt)_{on}$	Turn-on Delay Time Current Rise Time Turn-on Current Slope	$V_{CC} = 390\text{ V}$ , $I_C = 20\text{ A}$ $R_G = 10\ \Omega$ , $V_{GE} = 15\text{ V}$ , $T_j = 25^\circ\text{C}$ (see Figure 3)		31 11 1600		ns ns $\text{A}/\mu\text{s}$
$t_{d(on)}$ $t_r$ $(di/dt)_{on}$	Turn-on Delay Time Current Rise Time Turn-on Current Slope	$V_{CC} = 390\text{ V}$ , $I_C = 20\text{ A}$ $R_G = 10\ \Omega$ , $V_{GE} = 15\text{ V}$ , $T_j = 125^\circ\text{C}$ (see Figure 3)		31 11.5 1500		ns ns $\text{A}/\mu\text{s}$
$t_r(V_{off})$ $t_{d(off)}$ $t_f$	Off Voltage Rise Time Turn-off Delay Time Current Fall Time	$V_{CC} = 390\text{ V}$ , $I_C = 5\text{ A}$ , $R_{GE} = 10\ \Omega$ , $V_{GE} = 15\text{ V}$ , $T_j = 25^\circ\text{C}$ (see Figure 3)		16.5 115 38		ns ns ns
$t_r(V_{off})$ $t_{d(off)}$ $t_f$	Off Voltage Rise Time Turn-off Delay Time Current Fall Time	$V_{CC} = 390\text{ V}$ , $I_C = 5\text{ A}$ , $R_{GE} = 10\ \Omega$ , $V_{GE} = 15\text{ V}$ , $T_j = 125^\circ\text{C}$ (see Figure 3)		34 152 48		ns ns ns

**Table 6. Switching energy**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$E_{on}$ <i>Note 3</i> $E_{off}$ <i>Note 4</i> $E_{ts}$	Turn-on Switching Losses Turn-off Switching Losses Total Switching Losses	$V_{CC} = 390\text{ V}$ , $I_C = 75\text{ A}$ $R_G = 10\ \Omega$ , $V_{GE} = 15\text{ V}$ , $T_j = 25^\circ\text{C}$ (see Figure 3)		200 205 405		$\mu\text{J}$ $\mu\text{J}$ $\mu\text{J}$
$E_{on}$ <i>Note 3</i> $E_{off}$ <i>Note 4</i> $E_{ts}$	Turn-on Switching Losses Turn-off Switching Losses Total Switching Losses	$V_{CC} = 390\text{ V}$ , $I_C = 5\text{ A}$ $R_G = 10\ \Omega$ , $V_{GE} = 15\text{ V}$ , $T_j = 125^\circ\text{C}$ (see Figure 3)		400 365 765		$\mu\text{J}$ $\mu\text{J}$ $\mu\text{J}$

(1) Pulse width limited by max. junction temperature

(2)  $E_{on}$  is the turn-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-pak diode is used as external diode. IGBTs & Diode are at the same temperature ( $25^\circ\text{C}$  and  $125^\circ\text{C}$ )

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

### 3 Test Circuits

Figure 1. Test Circuit for Inductive Load Switching

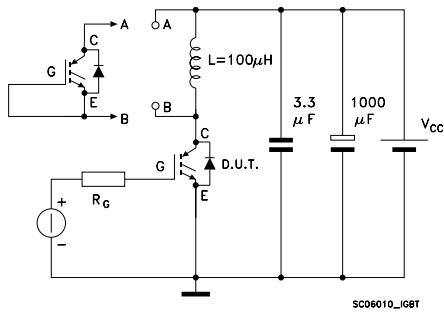


Figure 2. Gate Charge Test Circuit

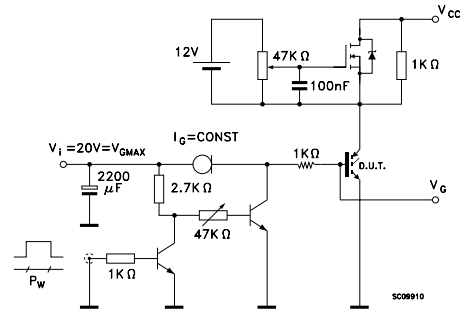
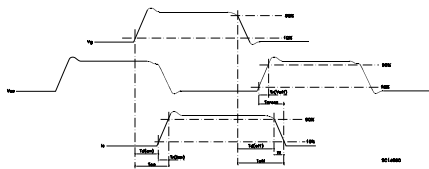


Figure 3. Switching Waveform

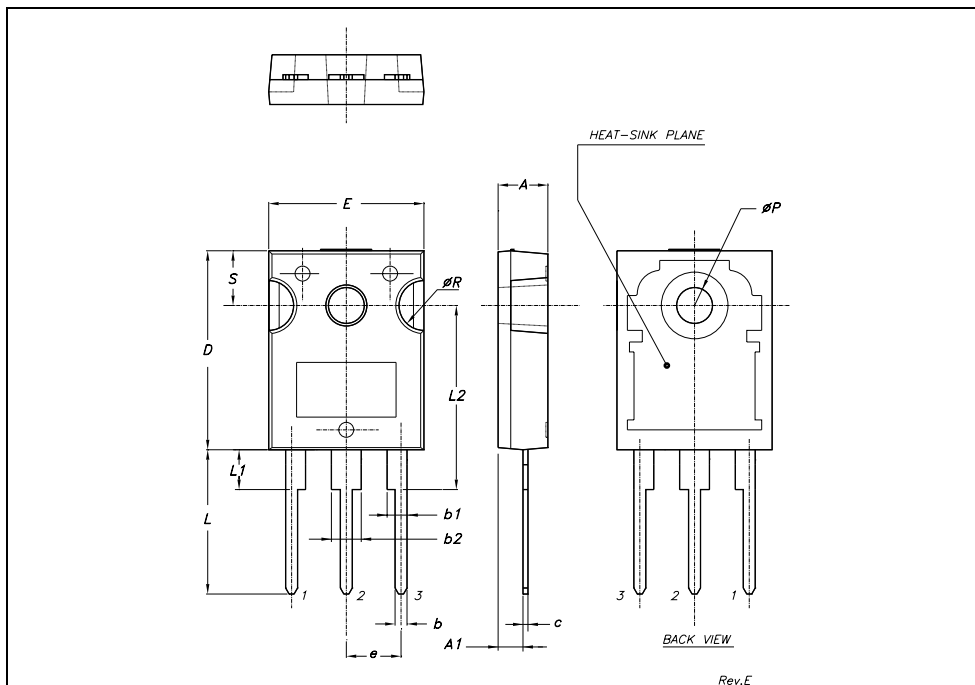


## 4 Package mechanical data

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](http://www.st.com)

**TO-247 MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.85		5.15	0.19		0.20
A1	2.20		2.60	0.086		0.102
b	1.0		1.40	0.039		0.055
b1	2.0		2.40	0.079		0.094
b2	3.0		3.40	0.118		0.134
c	0.40		0.80	0.015		0.03
D	19.85		20.15	0.781		0.793
E	15.45		15.75	0.608		0.620
e		5.45			0.214	
L	14.20		14.80	0.560		0.582
L1	3.70		4.30	0.14		0.17
L2		18.50			0.728	
∅P	3.55		3.65	0.140		0.143
∅R	4.50		5.50	0.177		0.216
S		5.50			0.216	



## 5 Revision History

Date	Revision	Changes
15-Sep-2005	1	Initial release.



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