

## STGW30NC60W

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

**Target Specification** 

#### **General features**

Туре	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

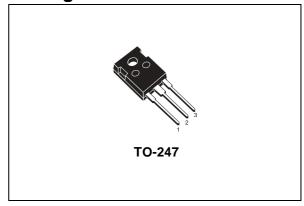
### **Description**

Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH<sup>™</sup> IGBTs, with outstanding performances. The suffix "W" identifies a family optimized for very high frequency application.

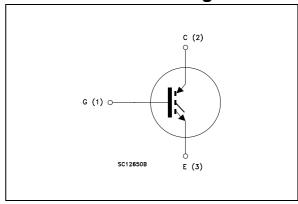
### **Applications**

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

### **Package**



### Internal schematic diagram



### **Order codes**

Sales Type	s Type Marking Package		Packaging	
STGW30NC60W	STGW30NC60W W30NC60W		TUBE	

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1 Electrical ratings STGW30NC60W

# 1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit		
V <sub>CES</sub>	Collector-Emitter Voltage (V <sub>GS</sub> = 0)	600	V		
I <sub>C</sub>	Collector Current (continuous) at 25°C (#)	60	Α		
I <sub>C</sub>	Collector Current (continuous) at 100°C (#)	30	Α		
V <sub>ECR</sub>	Reverse Battery Protection	20	V		
V <sub>GE</sub>	Gate-Emitter Voltage	± 20	V		
I <sub>CM</sub> Note 1	Collector Current (pulsed)	100	Α		
P <sub>TOT</sub>	Total Dissipation at T <sub>C</sub> = 25°C	200	W		
	Derating Factor	1.6	W/°C		
T <sub>stg</sub>	Storage Temperature		လူ		
T <sub>j</sub>	Operating Junction Temperature	- 55 to 150			

Table 2. Thermal Data

		Min.	Тур.	Max.	Unit
Rthj-case	Thermal Resistance Junction-case			0.625	°C/W
Rthj-amb	Thermal Resistance Junction-ambient			62.5	°C/W
TL	Maximum Lead Temperature for Soldering Purpose (1.6 mm from case, for 10 sec.)		300		°C

**STGW30NC60W** 2 Electrical characteristics

# 2 Electrical characteristics

 $(T_{CASE} = 25 \, ^{\circ}C \text{ unless otherwise specified})$ 

Table 3. Static

Symbol	Parameter	Test Conditions		Тур.	Max.	Unit
V <sub>BR(CES)</sub>	Collectro-Emitter Breakdown Voltage	I <sub>C</sub> = 1 mA, V <sub>GE</sub> = 0	600			V
V <sub>CE(SAT)</sub>	Collector-Emitter Saturation Voltage	V <sub>GE</sub> = 15 V, I <sub>C</sub> = 20A, Tj= 25°C V <sub>GE</sub> = 15 V, I <sub>C</sub> = 20A, Tj= 125°C		1.9 1.8	2.5	V V
V <sub>GE(th)</sub>	Gate Threshold Voltage	$V_{CE} = V_{GE}$ , $I_{C} = 250 \mu A$	3.75		5.75	V
I <sub>CES</sub>	Collector-Emitter Leakage Current (V <sub>CE</sub> = 0)	V <sub>GE</sub> = Max Rating,Tc=25°C V <sub>GE</sub> = Max Rating, Tc=125°C			10 1	μA mA
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
g <sub>fs</sub> Note 1	Forward Transconductance	$V_{CE} = 15 V_{,} I_{C} = 20 A$		15		S

Table 4. Dynamic

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
C <sub>ies</sub> C <sub>oes</sub> C <sub>res</sub>	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V <sub>CE</sub> = 25V, f = 1 MHz, V <sub>GE</sub> = 0		2200 225 50		pF pF pF
Q <sub>g</sub> Q <sub>ge</sub> Q <sub>gc</sub>	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	$V_{CE} = 390 \text{ V}, I_{C} = 20 \text{ A},$ $V_{GE} = 15 \text{ V},$ (see Figure 2)		100 16 45	140	nC nC nC
I <sub>CL</sub>	Turn-Off SOA Minimum Current	$V_{clamp} = 480 \text{ V}, Tj = 150^{\circ}\text{C}$ $R_G = 10 \Omega, V_{GE} = 15 \text{V}$	100			А

2 Electrical characteristics STGW30NC60W

Table 5. Switching On/Off

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
t <sub>d(on)</sub> t <sub>r</sub> (di/dt) <sub>on</sub>	Turn-on Delay Time Current Rise Time Turn-on Current Slope	$V_{CC}$ = 390 V, $I_{C}$ = 20 A $R_{G}$ = 10 $\Omega$ , $V_{GE}$ = 15V, Tj= 25°C (see Figure 3)		31 11 1600		ns ns A/µs
t <sub>d(on)</sub> t <sub>r</sub> (di/dt) <sub>on</sub>	Turn-on Delay Time Current Rise Time Turn-on Current Slope	$V_{CC} = 390 \text{ V, } I_{C} = 20 \text{ A}$ $R_{G} = 10 \Omega, V_{GE} = 15 \text{V, Tj} = 125 ^{\circ}\text{C}$ (see Figure 3)		31 11.5 1500		ns ns A/µs
$t_r(V_{off})$ $t_d(_{off})$ $t_f$	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 <sub>r</sub> (V <sub>off</sub> ) t <sub>d</sub> ( <sub>off</sub> ) t <sub>f</sub>	Off Voltage Rise Time Turn-off Delay Time Current Fall Time	$V_{cc}$ = 390 V, $I_{C}$ = 5 A, $R_{GE}$ =10 $\Omega$ , $V_{GE}$ =15 V, Tj=125 °C (see Figure 3)		34 152 48		ns ns ns

Table 6. Switching energy

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Eon Note 3 E <sub>off</sub> Note 4 E <sub>ts</sub>	Turn-on Switching Losses Turn-off Switching Losses Total Switching Losses	$V_{CC} = 390 \text{ V, } I_{C} = 75 \text{ A}$ $R_{G} = 10 \Omega, V_{GE} = 15 \text{V, Tj} = 25 ^{\circ}\text{C}$ (see Figure 3)		200 205 405		μJ μJ μJ
Eon Note 3  E <sub>off</sub> Note 4  E <sub>ts</sub>	Turn-on Switching Losses Turn-off Switching Losses Total Switching Losses	$V_{CC}$ = 390 V, $I_{C}$ = 5 A $R_{G}$ = 10 $\Omega$ , $V_{GE}$ = 15V, $T_{j}$ = 125°C (see Figure 3)		400 365 765		µJ µJ µJ

<sup>(1)</sup>Pulse width limited by max. junction temperature

<sup>(2)</sup> Eon is the tun-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-pack diode is used as external diode. IGBTs & Diode are at the same temperature (25°C and 125°C)

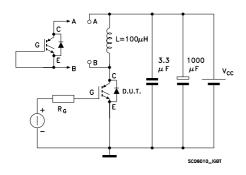
<sup>(3)</sup> Turn-off losses include also the tail of the collector current

STGW30NC60W 3 Test Circuits

## 3 Test Circuits

Figure 1. Test Circuit for Inductive Load Switching

Figure 2. Gate Charge Test Circuit



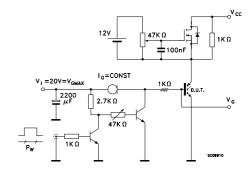
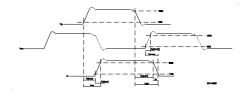


Figure 3. Switching Waveform

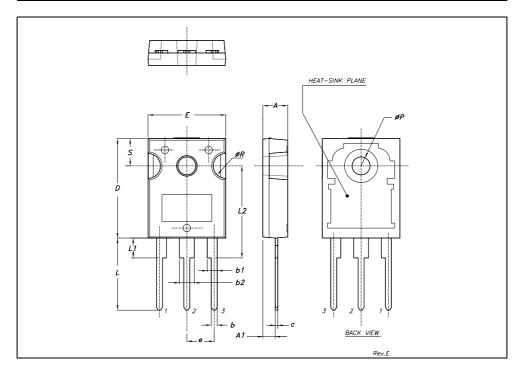


# 4 Package mechanical data

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: <a href="https://www.st.com">www.st.com</a>

#### **TO-247 MECHANICAL DATA**

DIM.		mm.			inch	
DIIVI.	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
Α	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
С	0.40		0.80	0.015		0.03
D	19.85		20.15	0.781		0.793
Е	15.45		15.75	0.608		0.620
е		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	
øΡ	3.55		3.65	0.140		0.143
øR	4.50		5.50	0.177		0.216
S		5.50			0.216	



5 Revision History STGW30NC60W

# 5 Revision History

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

**STGW30NC60W** 5 Revision History

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