

STGW30NC60WD

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

General features

Туре	V _{CES}	V _{CE(sat)} (Max)@ 25°C	I _C @100°C
STGW30NC60WD	600V	< 2.5V	30A

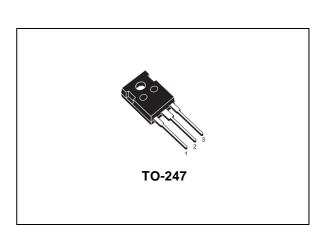
- LOWER C_{RES} / C_{IES} RATIO (NO CROSS CONDUCTION SUSCEPTIBILITY)
- **■** HIGH FREQUENCY OPERATION
- VERY SOFT ULTRA FAST RECOVERY ANTI PARALLEL DIODE



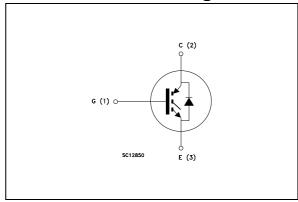
Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH $^{\text{TM}}$ IGBTs, with outstanding performances. The suffix "W" identifies a family optimized for very high frequency application.

Applications

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



Internal schematic diagram



Order codes

Sales Type	Marking	Package	Packaging
STGW30NC60WD	STGW30NC60WD W30NC60WD		TUBE

1 Electrical ratings STGW30NC60WD

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	Α	
I _C	Collector Current (continuous) at 100°C	30	Α	
I _{CM} Note 1	Collector Current (pulsed)	200	Α	
V _{GE}	Gate-Emitter Voltage	± 20	V	
P _{TOT}	Total Dissipation at T _C = 25°C	200	W	
T _j	Operating Junction Temperature	FF to 1F0		
T _{stg}	Storage Temperature	55 to 150		
TL	Maximum Lead Temperature for Soldering Purpose (1.6 mm from case, for 10 sec.)	300	°C	

Table 2. Thermal resistance

		Min.	Тур.	Max.	Unit
Rthj-case	Thermal Resistance Junction-case			0.625	°C/W
Rthj-amb	Thermal Resistance Junction-ambient			62.5	°C/W

STGW30NC60WD 2 Electrical characteristics

2 Electrical characteristics

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

Table 3. Static

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
V _{BR(CES)}	Collectro-Emitter Breakdown Voltage	$I_C = 1$ mA, $V_{GE} = 0$	600			V
V _{CE(SAT)}	Collector-Emitter Saturation Voltage	V _{GE} = 15V, I _C = 20A, Tj= 25°C V _{GE} = 15V, I _C = 20A, Tj= 125°C		2.1 1.8	2.5	V V
V _{GE(th)}	Gate Threshold Voltage	$V_{CE} = V_{GE}, I_{C} = 250 \mu A$	3.75		5.75	V
I _{CES}	Collector-Emitter Leakage Current (V _{GE} = 0)	V _{CE} = Max Rating,Tc=25°C V _{CE} = Max Rating, Tc=125°C			10 1	μA mA
I _{GES}	Gate-Emitter Leakage Current (V _{CE} = 0)	V _{GE} = ± 20V , V _{CE} = 0			± 100	nA
9 _{fs}	Forward Transconductance	$V_{CE} = 15V_{,} I_{C} = 20A$		15		S

Table 4. Dynamic

	,					
Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
C _{ies} C _{oes} C _{res}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{CE} = 25V, f = 1MHz, V_{GE} = 0$		2080 175 52		pF pF pF
Q _g Q _{ge} Q _{gc}	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	V_{CE} = 390V, I_{C} = 20A, V_{GE} = 15V, (see Figure 17)		102 17.5 47	140	nC nC nC
I _{CL}	Turn-Off SOA Minimum Current	$V_{clamp} = 480V$, $Tj = 150$ °C $R_G = 10\Omega$, $V_{GE} = 15V$	200			А

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Table 5. Switching on/off (inductive load)

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
t _{d(on)} t _r (di/dt) _{on}	Turn-on Delay Time Current Rise Time Turn-on Current Slope	V_{CC} = 390V, I_{C} = 20A R_{G} = 10 Ω , V_{GE} = 15V, T_{J} = 25°C (see Figure 3)		29.5 12 1640		ns ns A/µs
t _{d(on)} t _r (di/dt) _{on}	Turn-on Delay Time Current Rise Time Turn-on Current Slope	V_{CC} = 390V, I_{C} = 20A R_{G} = 10 Ω , V_{GE} = 15V, T_{J} = 125°C (see Figure 3)		29 13.5 1600		ns ns A/µs
$t_{\rm r}({ m V}_{ m off}) \ t_{ m d}({ m off}) \ t_{ m f}$	Off Voltage Rise Time Turn-off Delay Time Current Fall Time	V_{cc} = 390V, I_{C} = 20A, R_{GE} = 10 Ω , V_{GE} = 15V, T_{J} =25°C (see Figure 18)		19.5 118 27		ns ns ns
$\begin{array}{c} t_{\rm r}({\rm V}_{\rm off}) \\ t_{\rm d}(_{\rm off}) \\ t_{\rm f} \end{array}$	Off Voltage Rise Time Turn-off Delay Time Current Fall Time	$V_{cc} = 390 \text{V}, I_{C} = 20 \text{A},$ $R_{GE} = 10 \Omega, V_{GE} = 15 \text{V}, Tj = 125 ^{\circ}\text{C}$ (see Figure 18)		46 151 38		ns ns ns

Table 6. Switching energy (inductive load)

Table of Officering onergy (made to read)						
Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
Eon Note 2 E _{off} Note 3 E _{ts}	Turn-on Switching Losses Turn-off Switching Losses Total Switching Losses	$V_{CC} = 390V, I_{C} = 20A$ $R_{G} = 10\Omega, V_{GE} = 15V, Tj = 25^{\circ}C$ (see Figure 18)		116 181 297		μJ μJ μJ
Eon Note 2 E _{off} Note 3 E _{ts}	Turn-on Switching Losses Turn-off Switching Losses Total Switching Losses	$V_{CC} = 390V, I_{C} = 20A$ $R_{G} = 10\Omega, V_{GE} = 15V, Tj = 125^{\circ}C$ (see Figure 18)		239 355 594		μJ μJ μJ

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Table 7. Collector-emitter diode

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
V _f	Forward On-Voltage	If = 10A If = 10A, Tj = 125°C		1.5 1.1	2	V V
t _{rr} Q _{rr} I _{rrm} S	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current Softness factor of the diode	If = 20A, $V_R = 50V$, $T_j = 25$ °C, di/dt = 100A/ μ s (see Figure 19)		44 66 3 0.375		ns ns nC A
t _{rr} Q _{rr} I _{rrm} S	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current Softness factor of the diode	If = 20A, $V_R = 50V$, $T_j = 125$ °C, $di/dt = 100A/\mu s$ (see Figure 19)		88 237 5.4 0.57		ns ns nC A

⁽¹⁾Pulse width limited by max. junction temperature

⁽²⁾ Eon is the tun-on losses when a typical diode is used in the test circuit in figure 2 Eon include diode recovery energy. 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)

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

2 Electrical characteristics STGW30NC60WD

2.1 Electrical characteristics (curves)

Figure 1. Output Characteristics

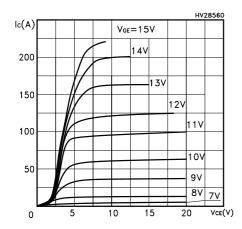


Figure 2. Transfer Characteristics

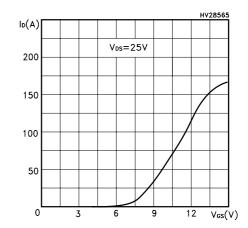


Figure 3. Transconductance

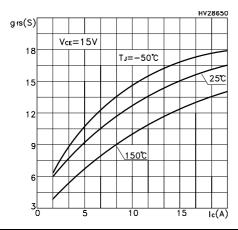


Figure 4. Collector-Emitter on Voltage vs Temperature

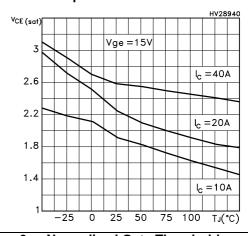


Figure 5. Collector-Emitter on Voltage vs Collector Current

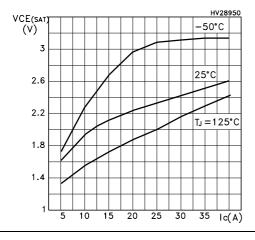
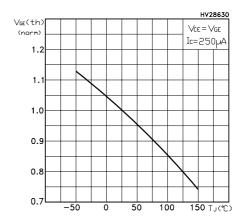


Figure 6. Normalized Gate Threshold vs Temperature



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Figure 7. Normalized Breakdown Voltage vs Temperature

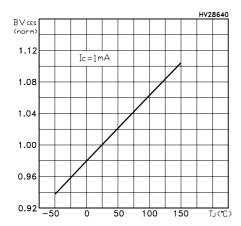


Figure 8. Gate Charge vs Gate-Emitter Voltage

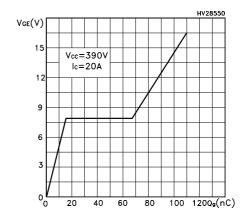
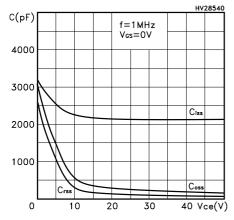


Figure 9. Capacitance Variations

Figure 10. Switching Losses vs Temperature



 $E(\mu J) \qquad V_{CC} = 390V \qquad \qquad I_{CC} = 15V \qquad \qquad I_{CC} = 15$

Figure 11. Switching Losses vs Gate Resistance

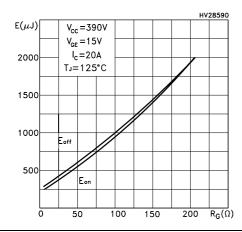
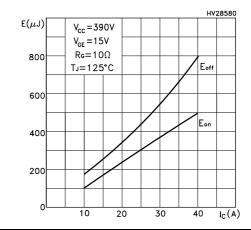
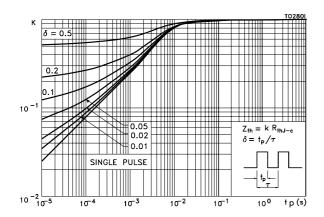


Figure 12. Switching Losses vs Collector Current



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Figure 13. Thermal Impedance Figure 14. Turn-Off SOA



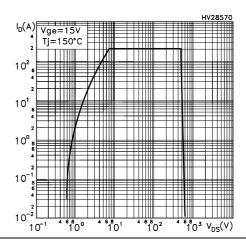
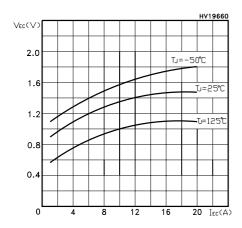


Figure 15. Emitter-Collector Diode Characteristics



STGW30NC60WD 3 Test Circuits

3 Test Circuits

Figure 16. Test Circuit for Inductive Load Switching

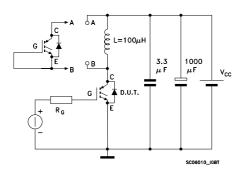


Figure 17. Gate Charge Test Circuit

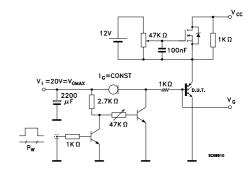
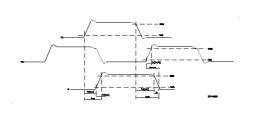
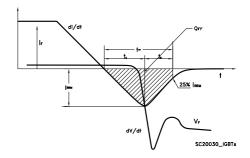


Figure 18. Switching Waveform

Figure 19. Diode Recovery Time Waveform



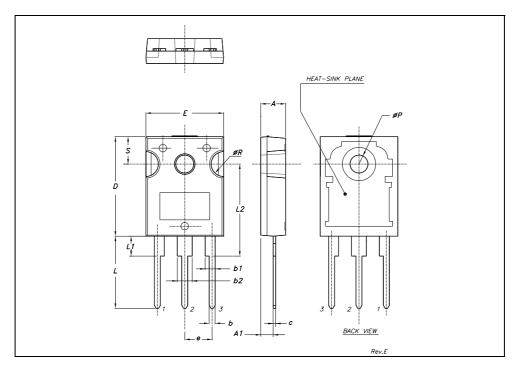


4 Package mechanical data

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

TO-247 MECHANICAL DATA

DIM		mm.			inch	
DIM.	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 STGW30NC60WD

5 Revision History

Date	Revision	Changes	
21-Nov-2005	1	Initial release.	
29-Nov-2005	2	Modified Figure 4 and Figure 5	

STGW30NC60WD 5 Revision History

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