



# STGW30N90D

N-channel 900V - 30A - TO-247  
Very fast PowerMESH™ IGBT

Preliminary Data

## Features

Type	V <sub>CEs</sub>	V <sub>CE(sat)</sub> @25°C	I <sub>C</sub> @100°C
STGW30N90D	900V	< 2.75V	30A

- Low on-losses
- Low on-voltage drop (V<sub>cesat</sub>)
- High current capability
- High input impedance (voltage driven)
- Low gate charge
- Ideal for soft switching application

## Description

Using the latest high voltage technology based on its patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, with outstanding performances.

## Application

- Induction heating

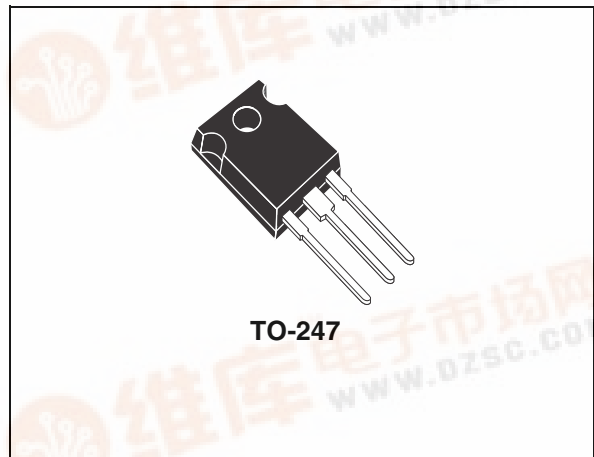


Figure 1. Internal schematic diagram

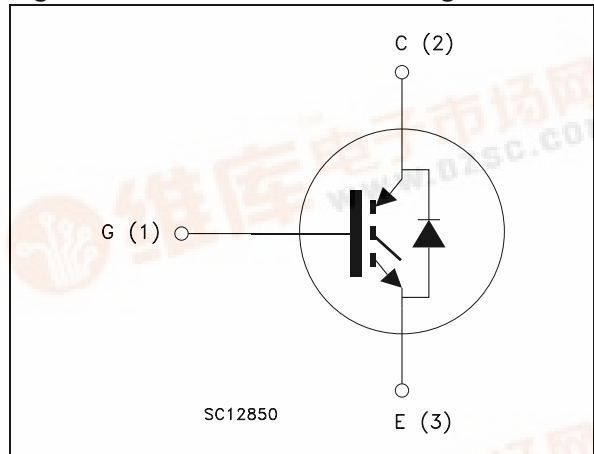


Table 1. Device summary

Order code	Marking	Package	Packaging
STGW30N90D	GW30N90D	TO-247	Tube



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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-emitter voltage ( $V_{GS} = 0$ )	900	V
$I_C^{(1)}$	Collector current (continuous) at 25°C	60	A
$I_C^{(1)}$	Collector current (continuous) at 100°C	30	A
$I_{CL}^{(2)}$	Collector current (pulsed)	135	A
$V_{GE}$	Gate-emitter voltage	±25	V
$P_{TOT}$	Total dissipation at $T_C = 25^\circ\text{C}$	220	W
$I_f$	Diode RMS forward current at $T_C = 25^\circ\text{C}$	30	A
$T_j$	Operating junction temperature	-55 to 150	°C
$T_{stg}$	Storage temperature		

1. Calculated according to the iterative formula:

$$I_C(T_C) = \frac{T_{JMAX} - T_C}{R_{THJ-C} \times V_{CESAT(MAX)}(T_C) \cdot I_C}$$

2.  $V_{clamp}=900\text{V}$ ,  $T_j=125^\circ\text{C}$ ,  $R_G=10\Omega$ ,  $V_{GE}=15\text{V}$

**Table 3. Thermal resistance**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	0.57	°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient (diode)	1.6	°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient (IGBT)	50	°C/W

## 2 Electrical characteristics

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

**Table 4. Static electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{BR(CES)}$	Collector-emitter breakdown voltage	$I_C = 1mA, V_{GE} = 0$	900			V
$V_{CE(SAT)}$	Collector-emitter saturation voltage	$V_{GE} = 15V, I_C = 20A, T_j = 25^{\circ}C$ $V_{GE} = 15V, I_C = 20A, T_j = 125^{\circ}C$		2.2 2.0	2.75	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 ( $V_{CE} = 0$ )	$V_{GE} = \text{Max rating}, T_c = 25^{\circ}C$ $V_{GE} = \text{Max rating}, T_c = 125^{\circ}C$			500 10	$\mu A$ mA
$I_{GES}$	Gate-emitter leakage current ( $V_{CE} = 0$ )	$V_{GE} = \pm 20V, V_{CE} = 0$			$\pm 100$	nA
$g_{fs}$	Forward transconductance	$V_{CE} = 25V, I_C = 20A$		14		S

**Table 5. Dynamic electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{ies}$	Input capacitance	$V_{CE} = 25V, f = 1\text{ MHz}, V_{GE} = 0$		2510		pF
$C_{oes}$	Output capacitance			175		pF
$C_{res}$	Reverse transfer capacitance			30		pF
$Q_g$	Total gate charge	$V_{CE} = 900V,$ $I_C = 20A, V_{GE} = 15V$		110	120	nC
$Q_{ge}$	Gate-emitter charge			16		nC
$Q_{gc}$	Gate-collector charge			49		nC

**Table 6. Switching on/off (inductive load)**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{CC} = 900V, I_C = 20A$		29		ns
$t_r$	Current rise time	$R_G = 10\Omega, V_{GE} = 15V,$		11		ns
$(di/dt)_{on}$	Turn-on current slope	$T_j = 25^\circ C$ (see Figure 2)		1820		A/ $\mu s$
$t_{d(on)}$	Turn-on delay time	$V_{CC} = 900V, I_C = 20A$		27		ns
$t_r$	Current rise time	$R_G = 10\Omega, V_{GE} = 15V,$		14		ns
$(di/dt)_{on}$	Turn-on current slope	$T_j = 125^\circ C$ (see Figure 2)		1580		A/ $\mu s$
$t_r(V_{off})$	Off voltage rise time	$V_{CC} = 900V, I_C = 20A$		90		ns
$t_{d(off)}$	Turn-off delay time	$R_G = 10\Omega, V_{GE} = 15V,$		275		ns
$t_f$	Current fall time	$T_j = 25^\circ C$ (see Figure 2)		312		ns
$t_r(V_{off})$	Off voltage rise time	$V_{CC} = 900V, I_C = 20A$		150		ns
$t_{d(off)}$	Turn-off delay time	$R_G = 10\Omega, V_{GE} = 15V,$		336		ns
$t_f$	Current fall time	$T_j = 125^\circ C$ (see Figure 2)		592		ns

**Table 7. Switching energy (inductive load)**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$E_{on}^{(1)}$	Turn-on switching losses	$V_{CC} = 900V, I_C = 20A$		1660		$\mu J$
$E_{off}^{(2)}$	Turn-off switching losses	$R_G = 10\Omega, V_{GE} = 15V,$		4438		$\mu J$
$E_{ts}$	Total switching losses	$T_j = 25^\circ C$ (see Figure 2)		6096		$\mu J$
$E_{on}^{(1)}$	Turn-on switching losses	$V_{CC} = 900V, I_C = 20A$		3015		$\mu J$
$E_{off}^{(2)}$	Turn-off switching losses	$R_G = 10\Omega, V_{GE} = 15V,$		6900		$\mu J$
$E_{ts}$	Total switching losses	$T_j = 125^\circ C$ (see Figure 2)		9915		$\mu J$

- $E_{on}$  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-pack diode, the co-pack diode is used as external diode. IGBTs & Diode are at the same temperature (25°C and 125°C)
- Turn-off losses include also the tail of the collector current

**Table 8. Collector-emitter diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_f$	Forward on-voltage	$I_f = 20A, T_j = 25^\circ C$ $I_f = 20A, T_j = 125^\circ C$		1.9 1.7	2.5	V V
$t_{rr}$	Reverse recovery time	$I_f = 20A, V_R = 27V,$		152		ns
$Q_{rr}$	Reverse recovery charge	$T_j = 125^\circ C, di/dt = 100A/\mu s$		722		nC
$I_{rrm}$	Reverse recovery current	(see Figure 5)		9		A

### 3 Test circuit

Figure 2. Test circuit for inductive load switching

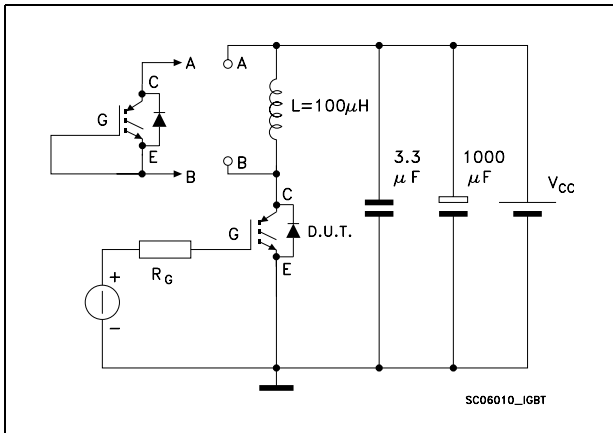


Figure 3. Gate charge test circuit

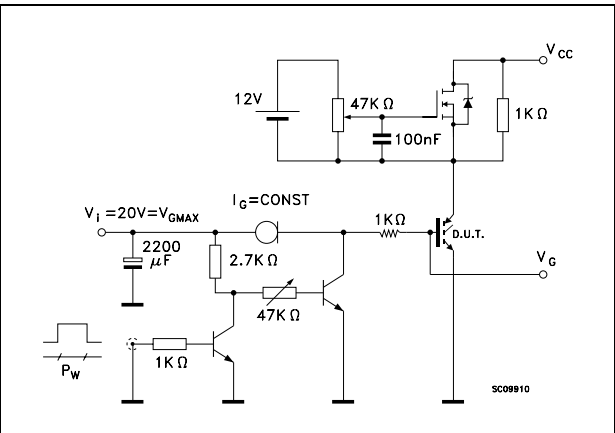


Figure 4. Switching waveform

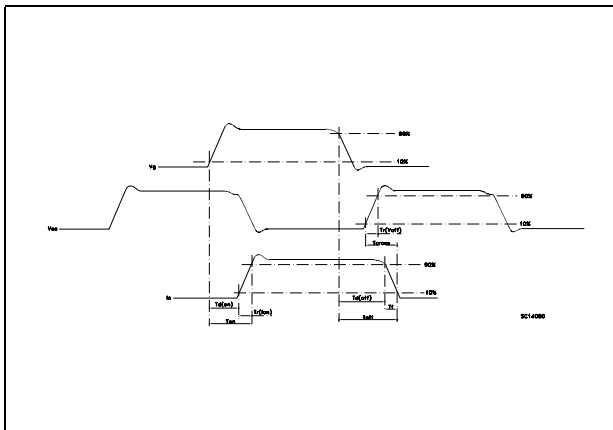
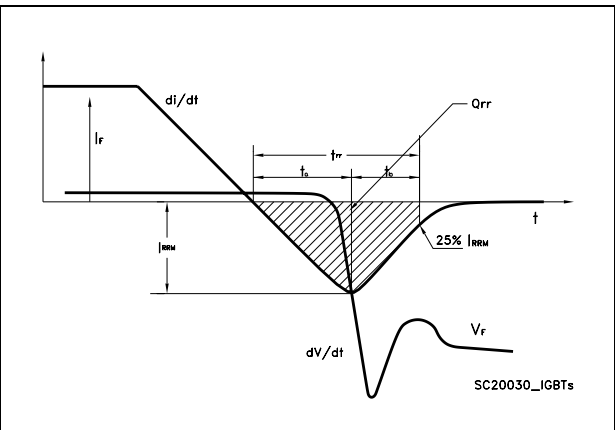


Figure 5. Diode recovery time waveform

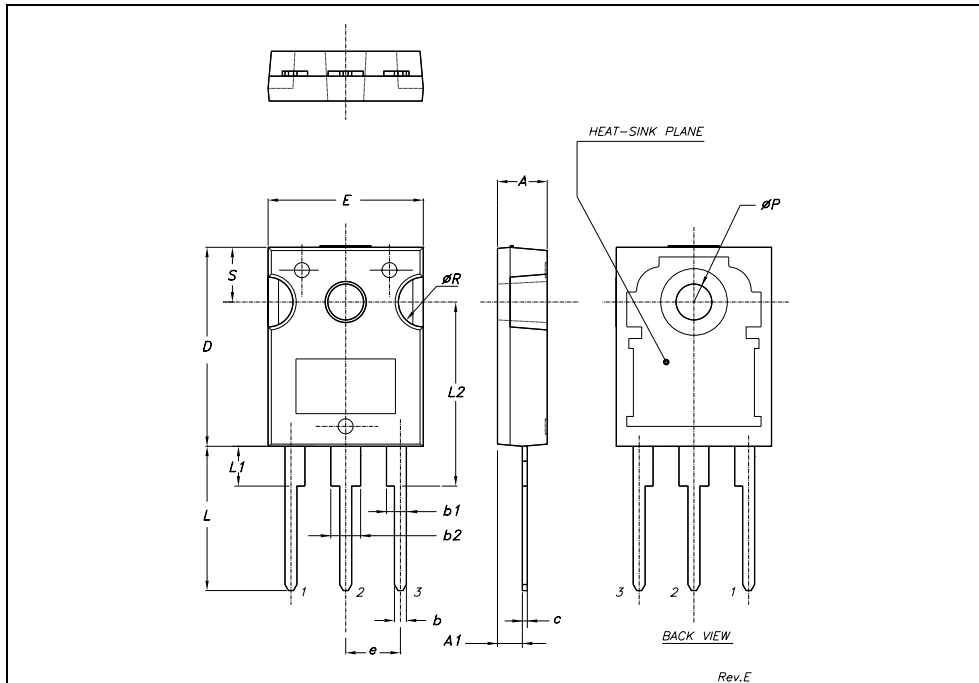


## 4 Package mechanical data

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](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	
øP	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

**Table 9. Revision history**

Date	Revision	Changes
19-Jul-2006	1	First issue.

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