

## Turbo 2 ultrafast high voltage rectifier

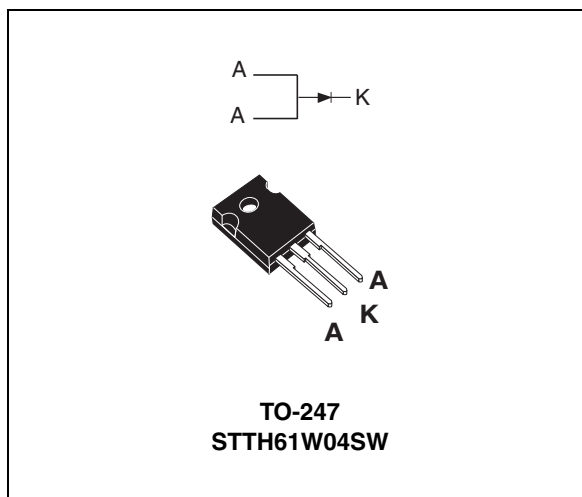
Datasheet – production data

### Features

- Ultrafast switching
- Low reverse recovery current
- Low thermal resistance
- Reduces switching losses
- ECOPACK<sup>®</sup>2 compliant component
- Ribbon bonding for more robustness

### Description

The STTH61W04SW, uses ST Turbo 2, 400 V technology. It is especially suited to be used for DC/DC and DC/AC converters in secondary stage of MIG/MMA/TIG welding machine. Housed in ST's TO-247, this device offers high power integration for all welding machines.



**Table 1. Device summary**

Symbol	Value
$I_{F(AV)}$	60 A
$V_{RRM}$	400 V
$t_{rr}$ (typ)	40 ns
$T_j$ (max)	175 °C
$V_F$ (typ)	0.93 V

# 1 Characteristics

**Table 2. Absolute ratings (limiting values, at 25 °C, unless otherwise specified)**

Symbol	Parameter	Value	Unit	
$V_{RRM}$	Repetitive peak reverse voltage	400	V	
$I_{F(RMS)}$	Forward rms current	90	A	
$I_{F(AV)}$	Average forward current, $\delta = 0.5$	$T_c = 110^\circ\text{C}$ Per diode	60	A
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10$ ms sinusoidal	500	A
$T_{stg}$	Storage temperature range	-65 to + 175	°C	
$T_j$	Maximum operating junction temperature	+ 175	°C	

**Table 3. Thermal resistance**

Symbol	Parameter	Value	Unit	
$R_{th(j-c)}$	Junction to case	Total	0.7	°C / W

**Table 4. Static electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$ $V_R = V_{RRM}$			20	$\mu\text{A}$
$V_F^{(2)}$	Forward voltage drop	$T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$ $I_F = 60$ A			1.35	
				0.93	1.15	

1. Pulse test:  $t_p = 5$  ms,  $\delta < 2\%$

2. Pulse test:  $t_p = 380$   $\mu\text{s}$ ,  $\delta < 2\%$

To evaluate the conduction losses use the following equation:

$$P = 0.85 \times I_{F(AV)} + 0.005 I_{F(RMS)}^2$$

**Table 5. Dynamic electrical characteristics**

Symb ol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{RM}$	Reverse recovery current	$T_j = 125^\circ\text{C}$ $I_F = 60$ A, $V_R = 320$ V $di_F/dt = -200$ A/ $\mu\text{s}$		19	26	A
$Q_{RR}$	Reverse recovery charge			1400		nC
$S_{factor}$	Softness factor			0.3		
$t_{rr}$	Reverse recovery time	$T_j = 25^\circ\text{C}$ $I_F = 1$ A, $V_R = 30$ V $di_F/dt = -100$ A/ $\mu\text{s}$		40	55	ns
$t_{fr}$	Forward recovery time	$T_j = 25^\circ\text{C}$ $I_F = 60$ A,			250	ns
$V_{FP}$	Forward recovery voltage	$T_j = 25^\circ\text{C}$ $V_{FR} = 1.2$ V $di_F/dt = 400$ A/ $\mu\text{s}$		2	3	V

Figure 1. Average forward power dissipation versus average forward current

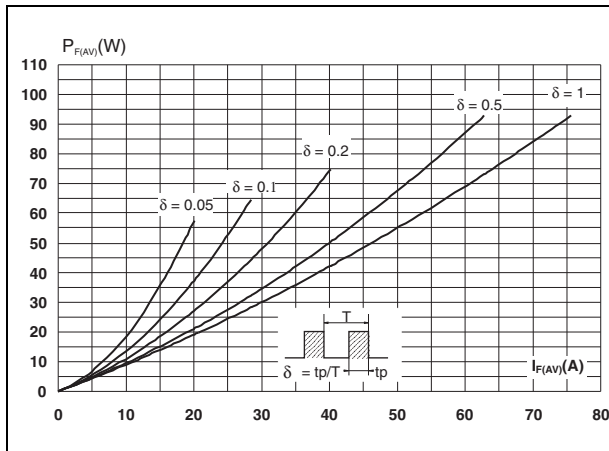


Figure 2. Forward voltage drop versus forward current

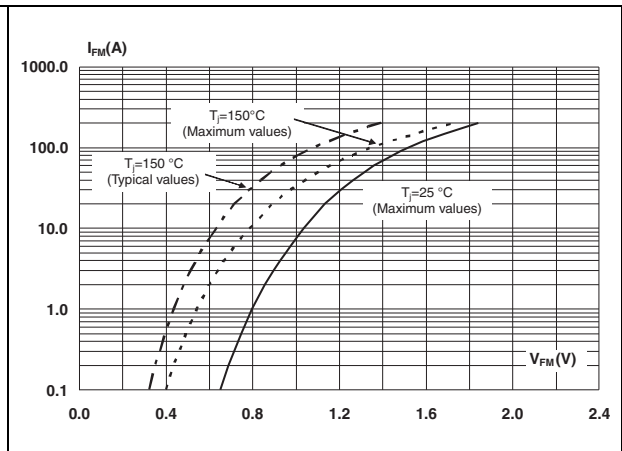


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

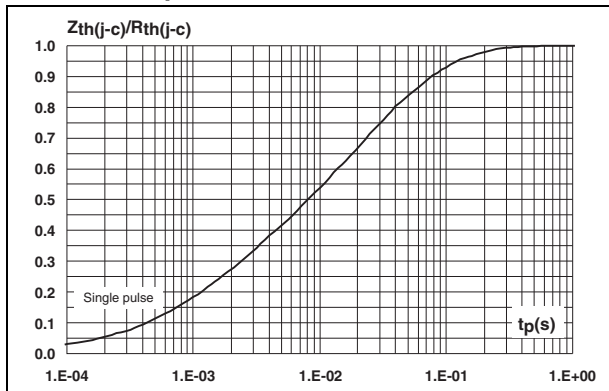


Figure 4. Peak reverse recovery current versus di\_F/dt (typical values)

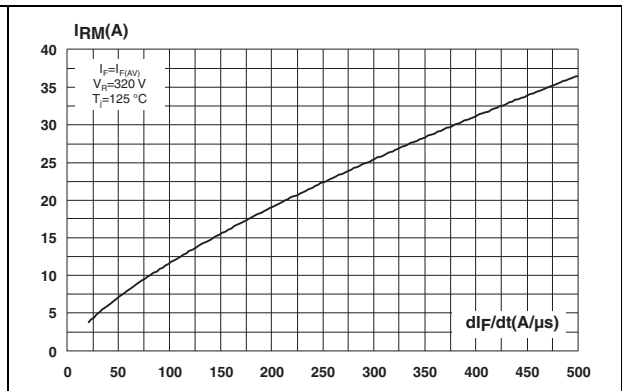


Figure 5. Reverse recovery time versus di\_F/dt (typical values)

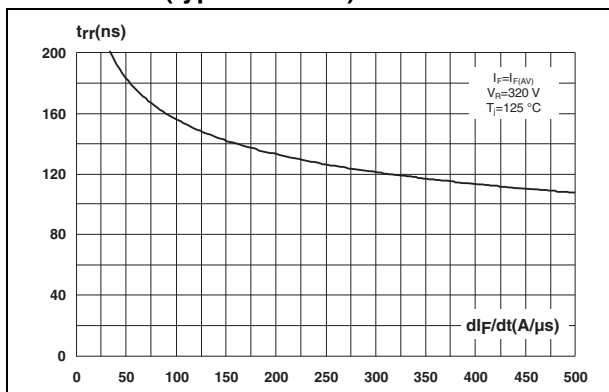


Figure 6. Reverse recovery charges versus di\_F/dt (typical values)

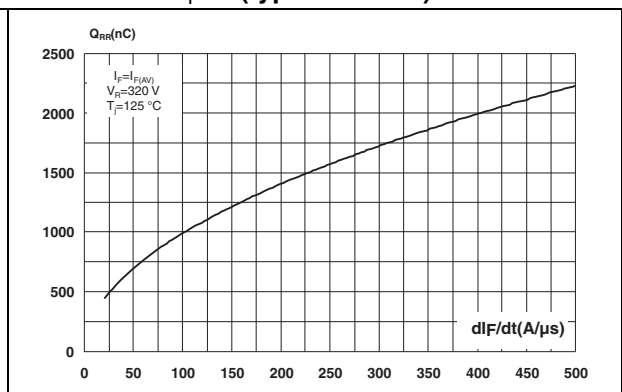


Figure 7. Reverse recovery softness factor versus  $di_F/dt$  (typical values)

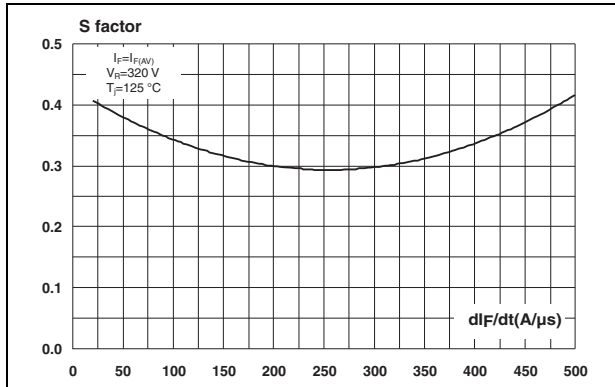


Figure 8. Relative variation of dynamic parameters versus junction temperature

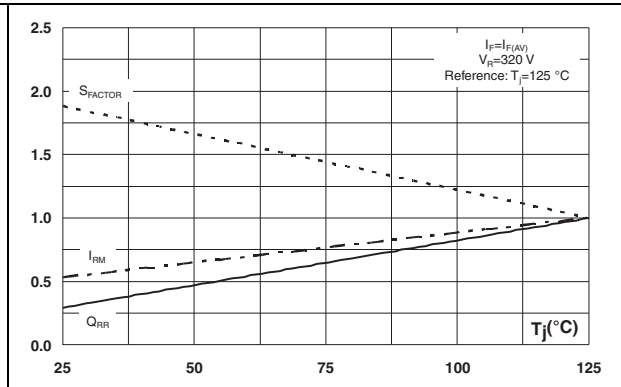


Figure 9. Transient peak forward voltage versus  $di_F/dt$  (typical values)

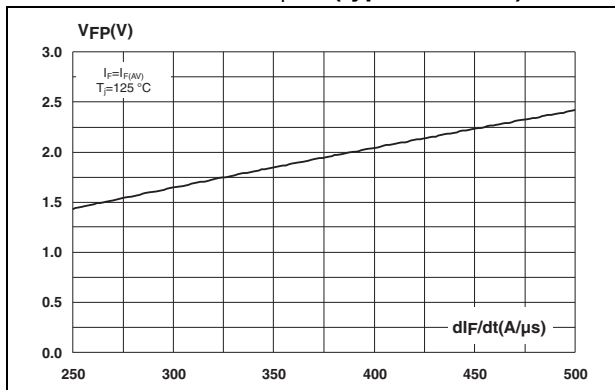


Figure 10. Forward recovery time versus  $di_F/dt$  (typical values)

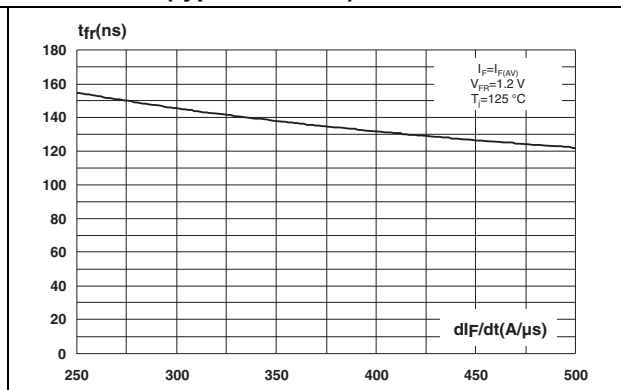
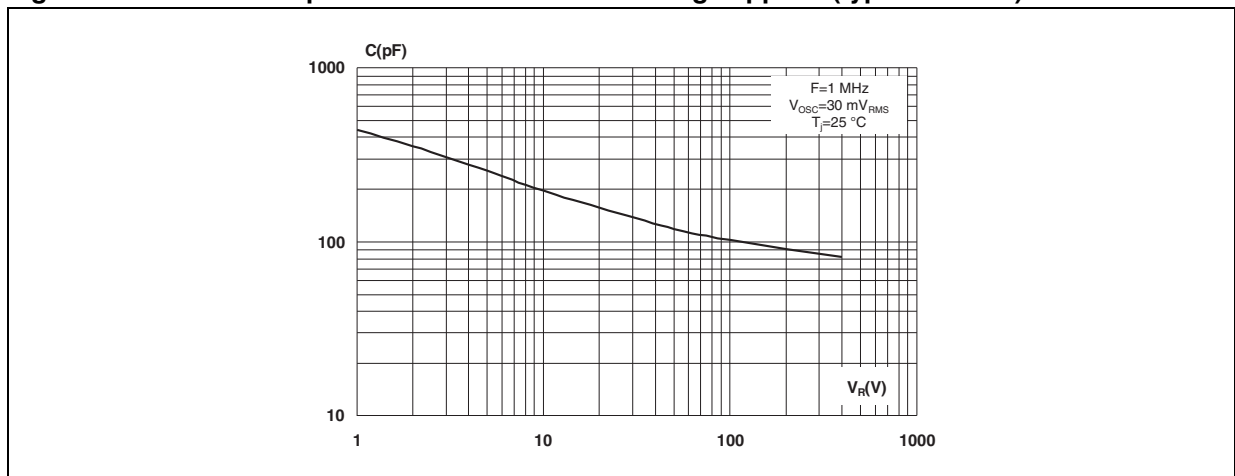


Figure 11. Junction capacitance versus reverse voltage applied (typical values)



## 2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.55 N·m (1.0 N·m maximum)

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**Table 6. TO-247 dimensions**

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.85		5.15	0.191		0.203
A1	2.20		2.60	0.086		0.102
b	1.00		1.40	0.039		0.055
b1	2.00		2.40	0.078		0.094
b2	3.00		3.40	0.118		0.133
c	0.40		0.80	0.015		0.031
D <sup>(1)</sup>	19.85		20.15	0.781		0.793
E	15.45		15.75	0.608		0.620
e	5.30	5.45	5.60	0.209	0.215	0.220
L	14.20		14.80	0.559		0.582
L1	3.70		4.30	0.145		0.169
L2	18.50 typ.			0.728 typ.		
∅P <sup>(2)</sup>	3.55		3.65	0.139		0.143
∅R	4.50		5.50	0.177		0.217
S	5.30	5.50	5.70	0.209	0.216	0.224

1. Dimension D plus gate protrusion does not exceed 20.5 mm
2. Resin thickness around the mounting hole is not less than 0.9 mm

### 3 Ordering information

Table 7. Ordering information

Ordering type	Marking	Package	Weight	Base qty	Delivery mode
STTH61W04SW	STTH61W04SW	TO-247	4.46 g	50	Tube

### 4 Revision history

Table 8. Document revision history

Date	Revision	Changes
05-Oct-2012	1	First issue.

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