

## Turbo 2 ultrafast high voltage rectifier

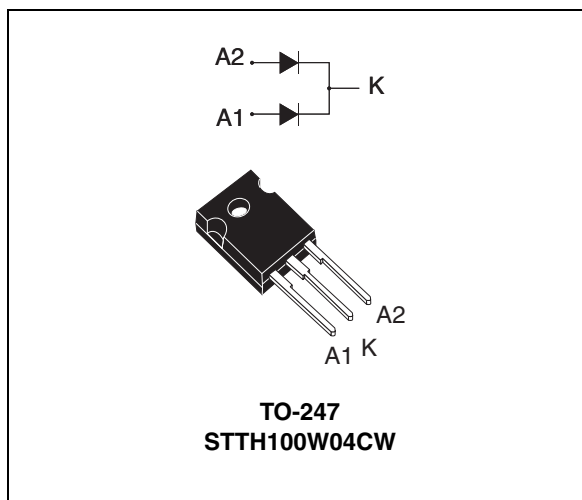
Datasheet – production data

### 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 STTH100W04CW, 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 and industrial applications.



**Table 1. Device summary**

Symbol	Value
$I_{F(AV)}$	2 x 50 A
$V_{RRM}$	400 V
$t_{rr}$ (typ)	35 ns
$T_j$ (max)	175 °C
$V_F$ (typ)	0.98 V

# 1 Characteristics

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

Symbol	Parameter		Value	Unit	
$V_{RRM}$	Repetitive peak reverse voltage		400	V	
$I_{F(RMS)}$	Forward rms current		75	A	
$I_{F(AV)}$	Average forward current, $\delta = 0.5$	$T_c = 120\text{ °C}$	Per diode	50	A
		$T_c = 110\text{ °C}$	Per device	100	
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10\text{ ms sinusoidal}$	350	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	Per diode	0.7	°C / W
		Total	0.4	
$R_{th(c)}$	Coupling		0.1	°C / W

When diodes 1 and 2 are used simultaneously:

$$T_j(\text{diode 1}) = P(\text{diode 1}) \times R_{th(j-c)}(\text{per diode}) + P(\text{diode 2}) \times R_{th(c)}$$

**Table 4. Static electrical characteristics (per diode)**

Symbol	Parameter	Test conditions		Min.	Typ	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ °C}$	$V_R = V_{RRM}$			25	$\mu\text{A}$
		$T_j = 125\text{ °C}$			25	250	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ °C}$	$I_F = 50\text{ A}$			1.45	V
		$T_j = 150\text{ °C}$			0.98	1.20	
		$T_j = 25\text{ °C}$	$I_F = 100\text{ A}$			1.75	
		$T_j = 150\text{ °C}$			1.25	1.55	

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

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

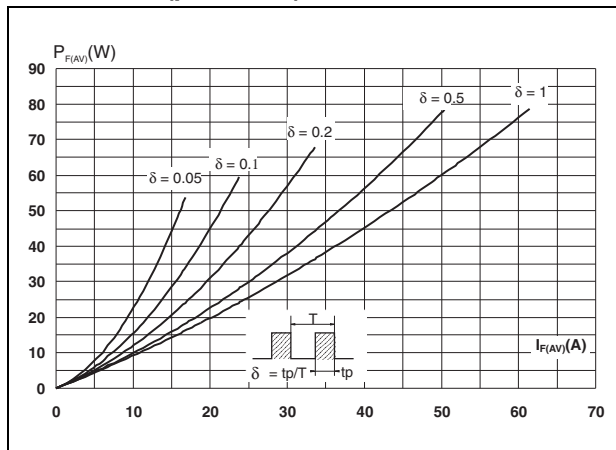
To evaluate the conduction losses use the following equation:

$$P = 0.85 \times I_{F(AV)} + 0.007 I_{F(RMS)}^2$$

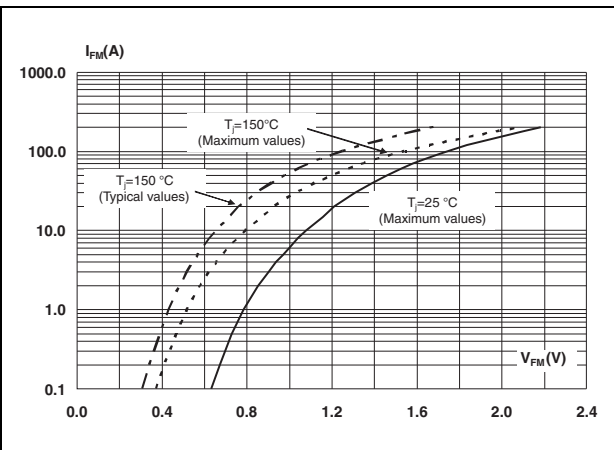
**Table 5. Dynamic electrical characteristics (per diode)**

Symbol	Parameter	Test conditions		Min.	Typ	Max.	Unit
$I_{RM}$	Reverse recovery current	$T_j = 125\text{ }^\circ\text{C}$	$I_F = 50\text{ A}, V_R = 320\text{ V}$ $di_F/dt = -200\text{ A}/\mu\text{s}$		15	20	A
$Q_{RR}$	Reverse recovery charge				850		nC
$S_{factor}$	Softness factor				0.3		
$t_{rr}$	Reverse recovery time	$T_j = 25\text{ }^\circ\text{C}$	$I_F = 1\text{ A}, V_R = 30\text{ V}$ $di_F/dt = -100\text{ A}/\mu\text{s}$		35	50	ns
$t_{fr}$	Forward recovery time	$T_j = 25\text{ }^\circ\text{C}$	$I_F = 50\text{ A}, V_{FR} = 1.4\text{ V}$ $di_F/dt = 200\text{ A}/\mu\text{s}$			500	ns
$V_{FP}$	Forward recovery voltage	$T_j = 25\text{ }^\circ\text{C}$			2	3	V

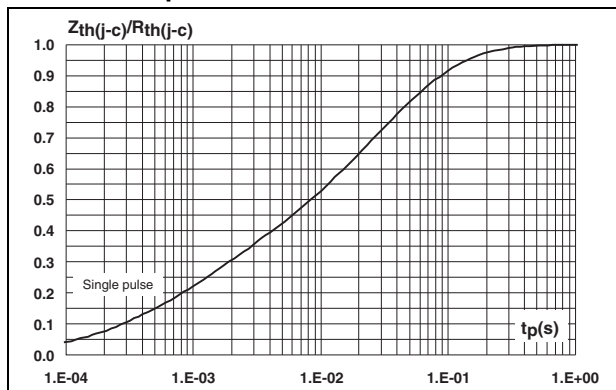
**Figure 1. Average forward power dissipation versus average forward current (per diode)**



**Figure 2. Forward voltage drop versus forward current (per diode)**



**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, per diode)**

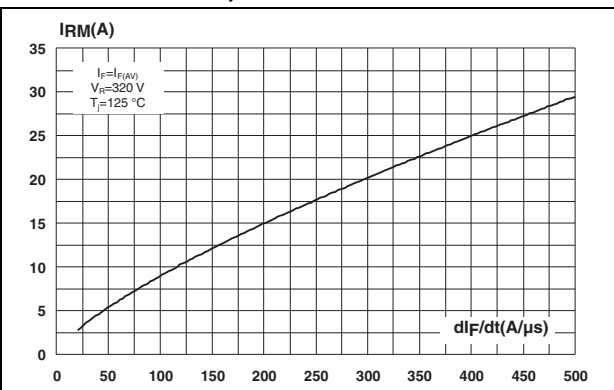


Figure 5. Reverse recovery time versus  $di_F/dt$  (typical values, per diode)

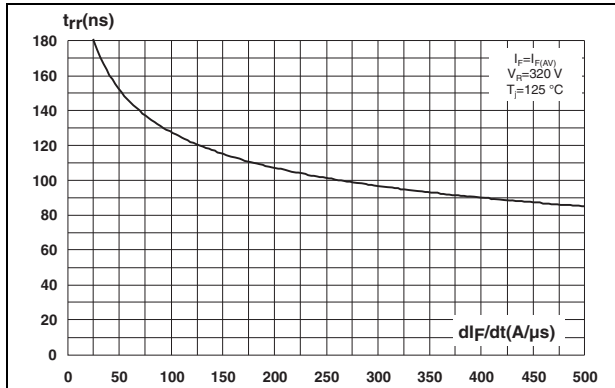


Figure 6. Reverse recovery charges versus  $di_F/dt$  (typical values, per diode)

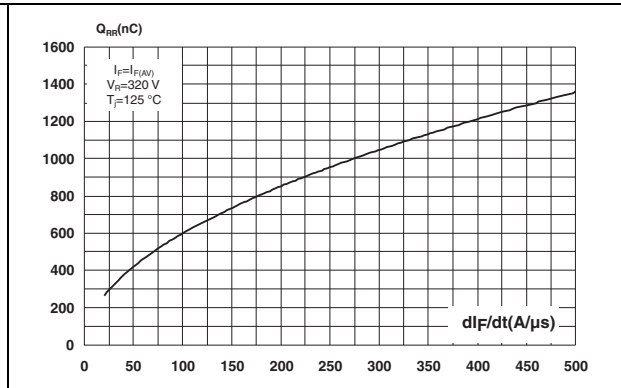


Figure 7. Reverse recovery softness factor versus  $di_F/dt$  (typical values, per diode)

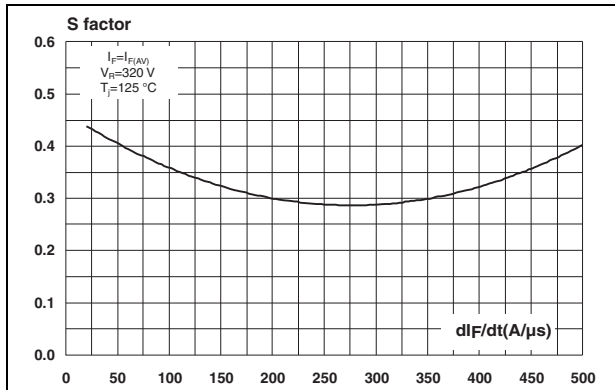


Figure 8. Relative variation of dynamic parameters versus junction temperature

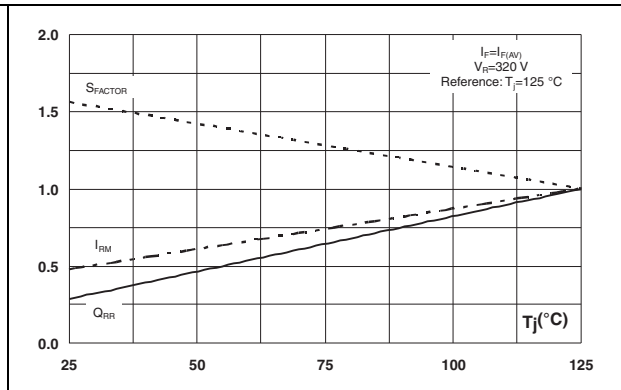


Figure 9. Transient peak forward voltage versus  $di_F/dt$  (typical values, per diode)

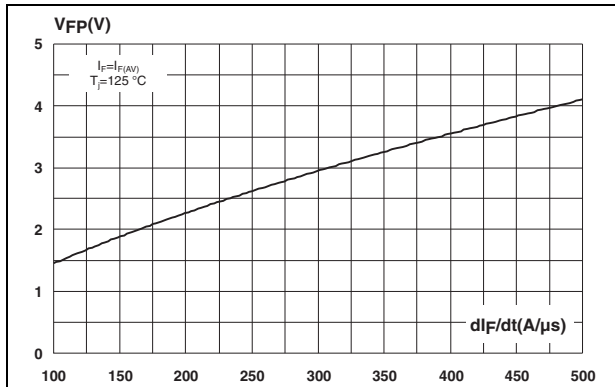


Figure 10. Forward recovery time versus  $di_F/dt$  (typical values, per diode)

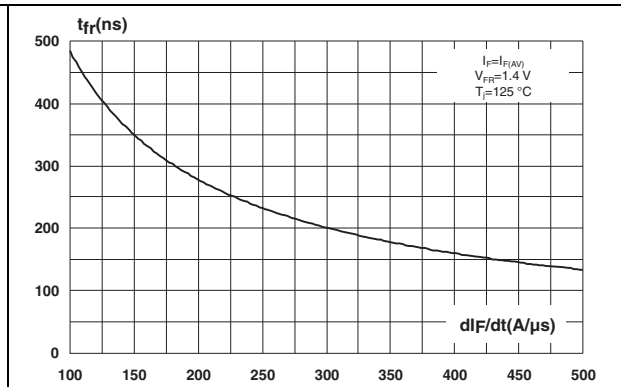
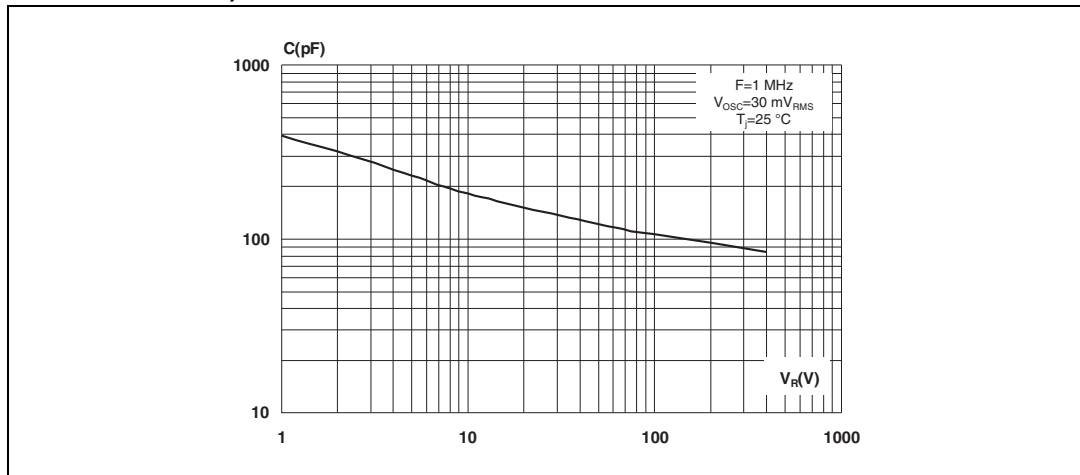


Figure 11. Junction capacitance versus reverse voltage applied (typical values, per diode)



## 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
STTH100W04CW	STTH100W04CW	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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