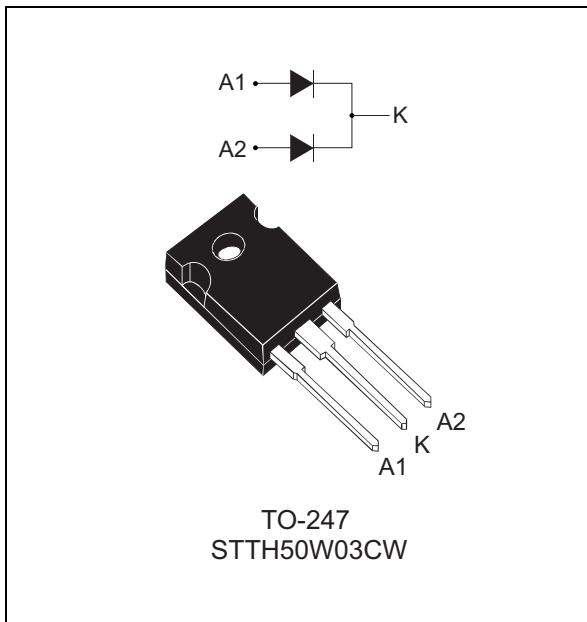


## Turbo 2 ultrafast high voltage rectifier

Datasheet – production data



### Description

The STTH50W03C uses ST Turbo 2 300 V technology. It is especially suited to be used for DC/DC and DC/AC converters in the secondary stage of MIG/MMA/TIG welding machines. 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 25 A
$V_{RRM}$	300 V
$t_{rr}$ (typ)	20 ns
$T_j$	175 °C
$V_F$ (typ)	1 V

### Features

- Ultrafast switching
- Low reverse recovery current
- Low thermal resistance
- Reduces switching losses
- ECOPACK®2 compliant component

# 1 Characteristics

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

Symbol	Parameter			Value	Unit
$V_{RRM}$	Repetitive peak reverse voltage			300	V
$I_{F(RMS)}$	Forward rms current			40	A
$I_{F(AV)}$	Average forward current, $\delta = 0.5$	$T_c = 105$ °C	Per diode	25	A
		$T_c = 100$ °C	Per device	50	
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10$ ms sinusoidal		200	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	1.8	°C / W
		Total	1	
$R_{th(c)}$	Coupling		0.2	

When diodes 1 and 2 are used simultaneously:

$$T_{j(diode\ 1)} = P_{(diode\ 1)} \times R_{th(j-c)}(\text{Per diode}) + P_{(diode\ 2)} \times R_{th(c)}$$

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

Symbol	Parameter	Test conditions		Min.	Typ	Max.	Unit
$I_R$ <sup>(1)</sup>	Reverse leakage current	$T_j = 25$ °C	$V_R = V_{RRM}$			15	μA
		$T_j = 125$ °C			15	150	
$V_F$ <sup>(2)</sup>	Forward voltage drop	$T_j = 25$ °C	$I_F = 25$ A			1.5	V
		$T_j = 150$ °C			1.0	1.2	
		$T_j = 25$ °C	$I_F = 50$ A			1.8	
		$T_j = 150$ °C			1.25	1.5	

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

2. Pulse test:  $t_p = 380$  μs,  $\delta < 2\%$

To evaluate the conduction losses use the following equation:

$$P = 0.9 \times I_{F(AV)} + 0.012 I_{F(RMS)}^2$$

Table 5. Dynamic electrical characteristics per diode

Symbol	Parameter	Test conditions		Min.	Typ	Max.	Unit
$I_{RM}$	Reverse recovery current	$T_j = 125^\circ\text{C}$	$I_F = 25\text{ A}, V_R = 200\text{ V}$ $dI_F/dt = -200\text{ A}/\mu\text{s}$		7	9	A
$Q_{RR}$	Reverse recovery charge				170		nC
$S_{\text{factor}}$	Softness factor				0.3		
$t_{rr}$	Reverse recovery time	$T_j = 25^\circ\text{C}$	$I_F = 1\text{ A}, V_R = 30\text{ V}$ $dI_F/dt = -100\text{ A}/\mu\text{s}$		20	27	ns
$t_{fr}$	Forward recovery time	$T_j = 25^\circ\text{C}$	$I_F = 25\text{ A}, V_{FR} = 1.2\text{ V}$ $dI_F/dt = 400\text{ A}/\mu\text{s}$			120	ns
$V_{FP}$	Forward recovery voltage				2.5	3.6	V

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

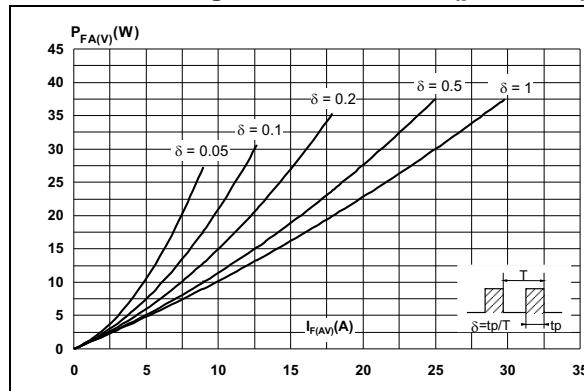


Figure 2. Forward voltage drop versus forward current (typical values, per diode)

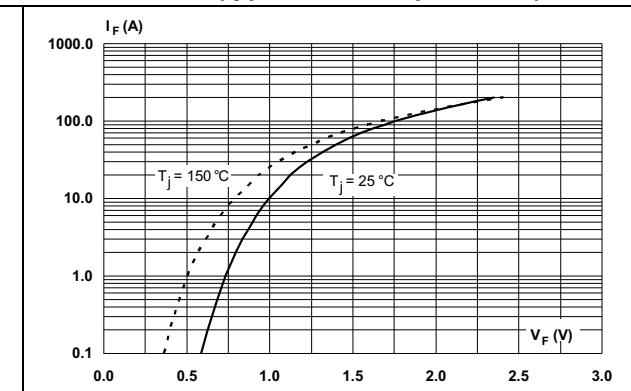


Figure 3. Forward voltage drop versus forward current (maximum values, per diode)

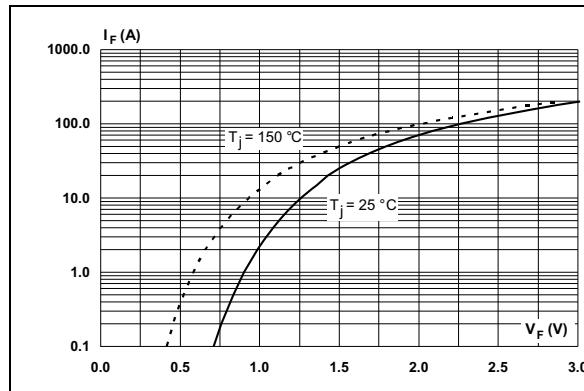
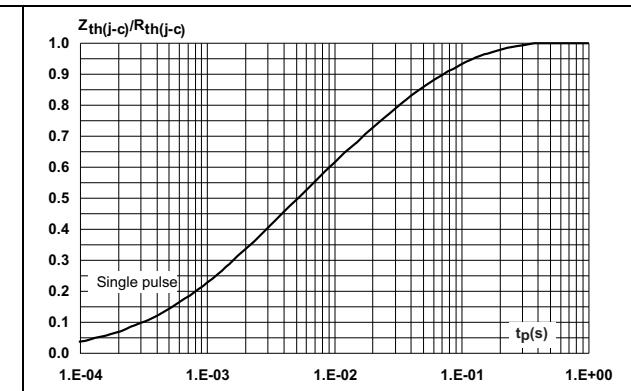
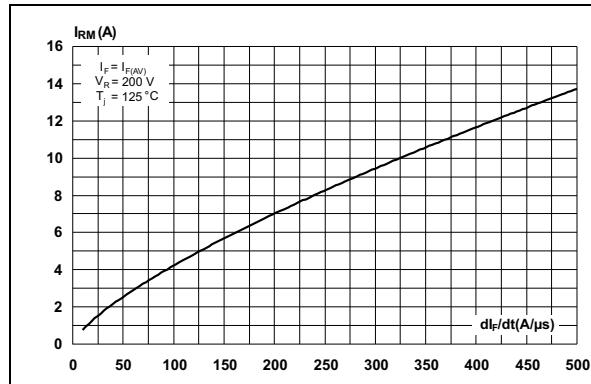


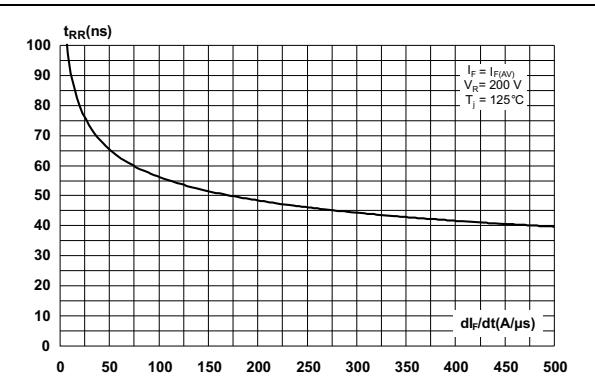
Figure 4. Relative variation of thermal impedance junction to case versus pulse duration



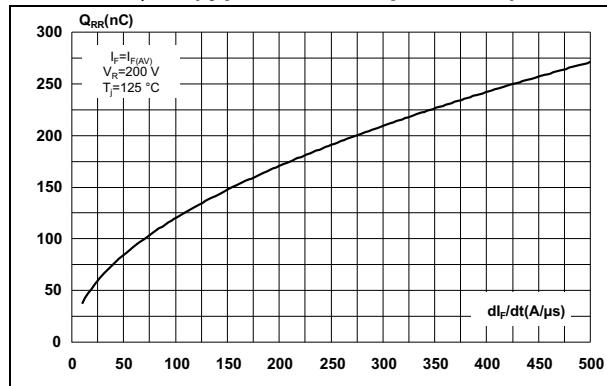
**Figure 5. Peak reverse recovery current versus  $di_F/dt$  (typical values, per diode)**



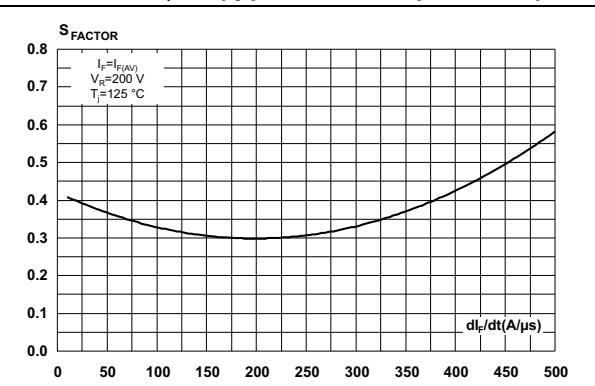
**Figure 6. Reverse recovery time versus  $di_F/dt$  (typical values, per diode)**



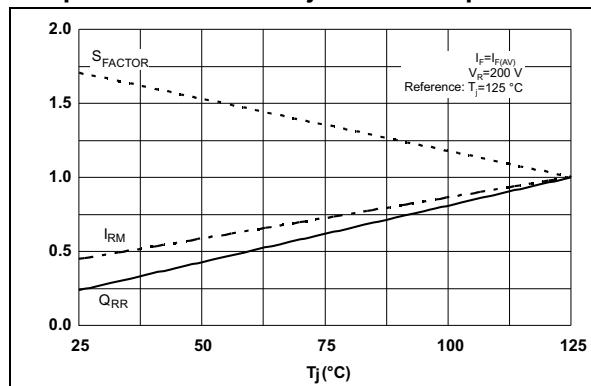
**Figure 7. Reverse recovery charges versus  $di_F/dt$  (typical values, per diode)**



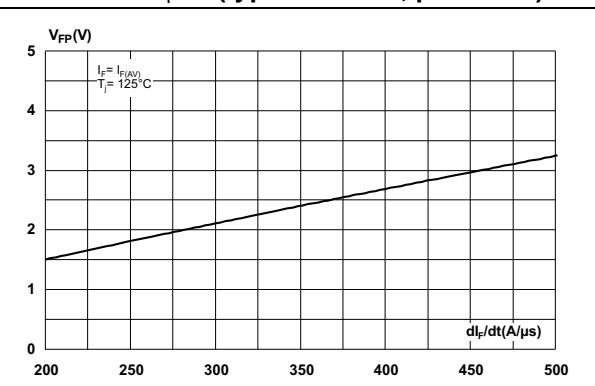
**Figure 8. Reverse recovery softness factor versus  $di_F/dt$  (typical values, per diode)**



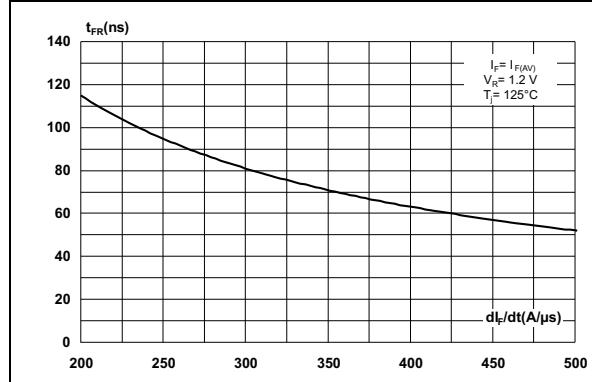
**Figure 9. Relative variations of dynamic parameters versus junction temperature**



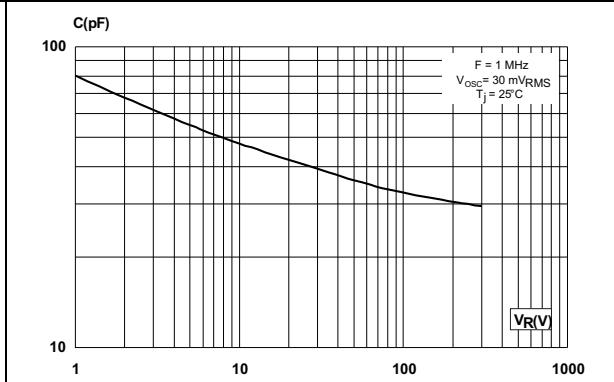
**Figure 10. Transient peak forward voltage versus  $di_F/dt$  (typical values, per diode)**



**Figure 11. Forward recovery time versus  $di_F/dt$  (typical values, per diode)**



**Figure 12. 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: 0.5 N·m
- Maximum torque value: 1.0 N·m

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com).  
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Figure 13. TO-247 dimension definitions

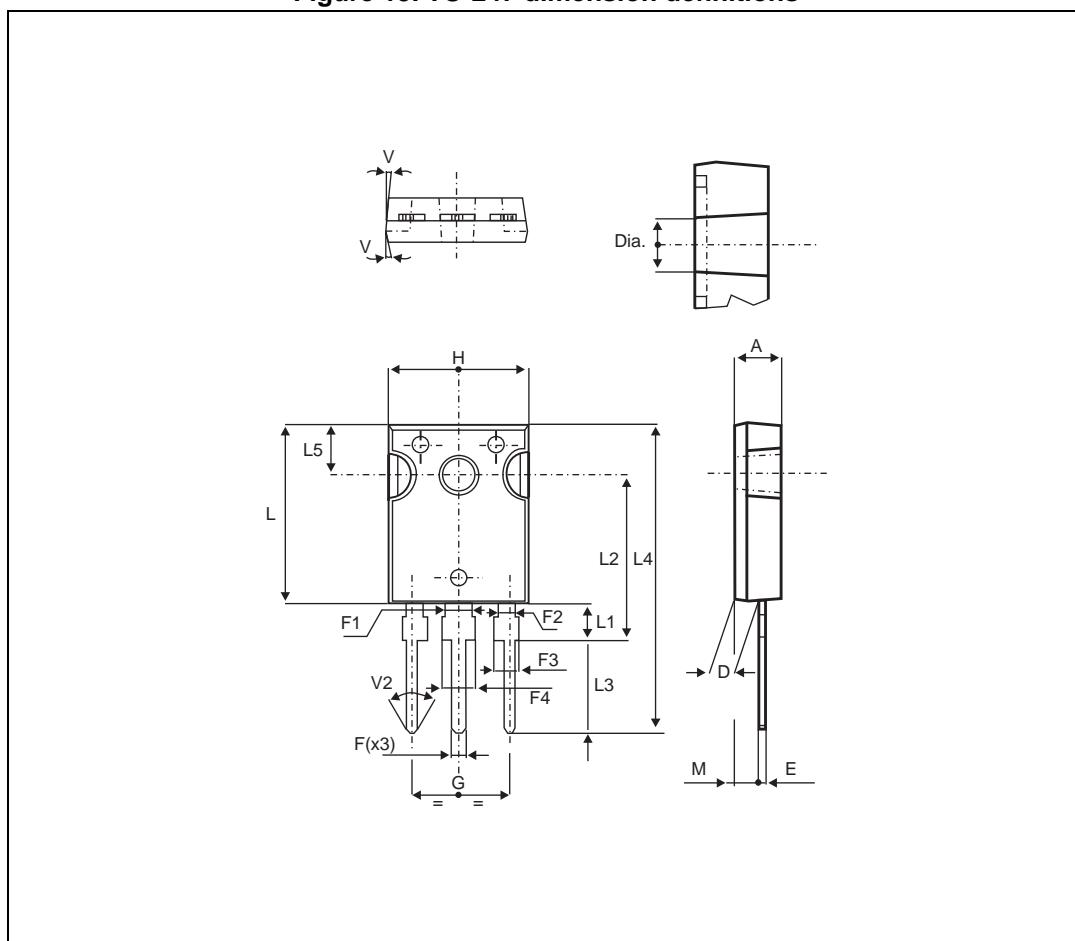


Table 6. TO-247 dimension values

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.		
ØP <sup>(2)</sup>	3.55		3.65	0.139		0.143
ØR	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
STTH50W03CW	STTH50W03CW	TO-247	4.46 g	50	Tube

### 4 Revision history

**Table 8. Document revision history**

Date	Revision	Changes
09-Aug-2013	1	First issue.

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