

## Turbo 2 ultrafast high voltage rectifier

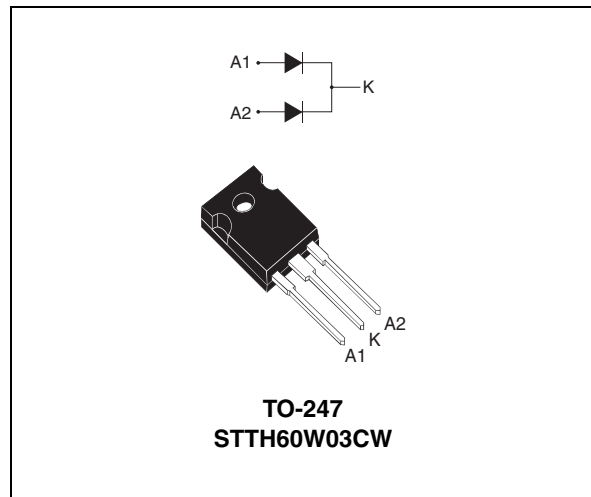
Datasheet – production data

### Features

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

### Description

The STTH60W03C uses ST Turbo 2 300 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 30 A
$V_{RRM}$	300 V
$t_{rr}$ (typ)	25 ns
$T_j$	175 °C
$V_F$ (typ)	0.94 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		300	V	
$I_{F(RMS)}$	RMS forward current		50	A	
$I_{F(AV)}$	Average forward current, $\delta = 0.5$	$T_c = 110\text{ °C}$	Per diode	30	A
		$T_c = 95\text{ °C}$	Per device	60	
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10\text{ ms sinusoidal}$	280	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	1.5	°C / W
		Total	0.9	°C / W
$R_{th(c)}$	Coupling		0.3	°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**

Symbol	Parameter	Test conditions		Min.	Typ	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ °C}$	$V_R = V_{RRM}$			20	$\mu\text{A}$
		$T_j = 125\text{ °C}$			20	200	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ °C}$	$I_F = 30\text{ A}$			1.45	V
		$T_j = 150\text{ °C}$			0.94	1.15	
		$T_j = 25\text{ °C}$	$I_F = 60\text{ A}$			1.7	
		$T_j = 150\text{ °C}$			1.18	1.45	

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

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

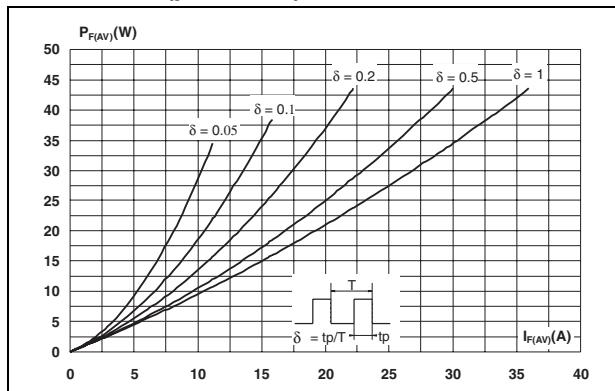
To evaluate the conduction losses use the following equation:

$$P = 0.85 \times I_{F(AV)} + 0.01 I_{F(RMS)}^2$$

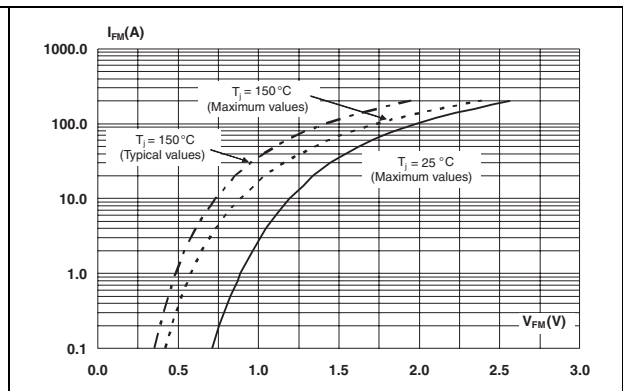
**Table 5. Dynamic electrical characteristics**

Symbol	Parameter	Test conditions		Min.	Typ	Max.	Unit
$I_{RM}$	Reverse recovery current	$T_j = 125\text{ }^\circ\text{C}$	$I_F = 30\text{ A}, V_R = 200\text{ V}$ $di_F/dt = -200\text{ A}/\mu\text{s}$		7	9	A
$Q_{RR}$	Reverse recovery charge				180		nC
$S_{factor}$	Softness factor				0.3		
$t_{rr}$	Reverse recovery time	$T_j = 25\text{ }^\circ\text{C}$	$I_F = 1\text{ A}, V_R = 30\text{ V}$ $di_F/dt = -100\text{ A}/\mu\text{s}$		25	35	ns
$t_{fr}$	Forward recovery time	$T_j = 25\text{ }^\circ\text{C}$	$I_F = 30\text{ A}, V_{FR} = 1.5\text{ V}$ $di_F/dt = 200\text{ A}/\mu\text{s}$			180	ns
$V_{FP}$	Forward recovery voltage				2.0	3.0	V

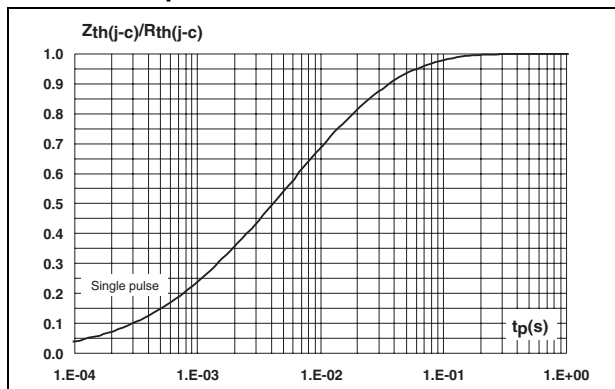
**Figure 1. Average forward power dissipation versus average forward current (per diode)**



**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/dt (typical values, per diode)**

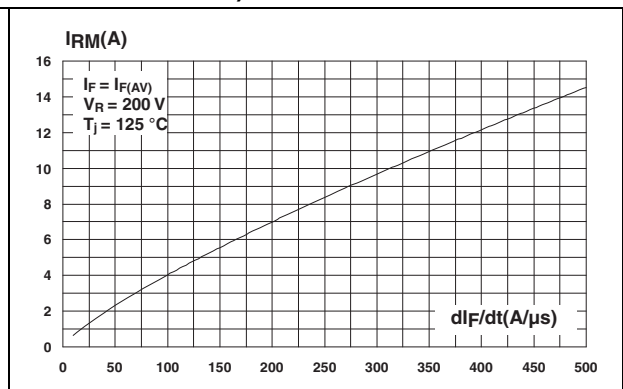


Figure 5. Reverse recovery time versus  $di_F/dt$  (typical values, per diode)

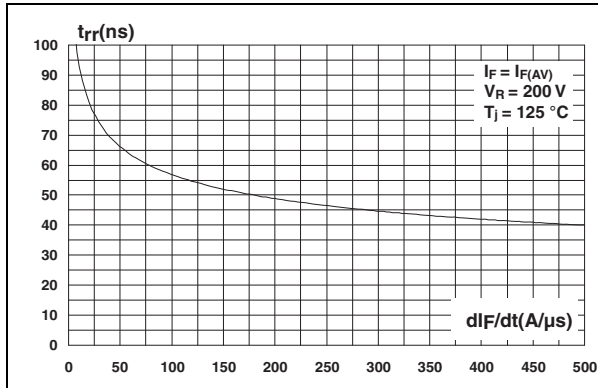


Figure 6. Reverse recovery charges versus  $di_F/dt$  (typical values, per diode)

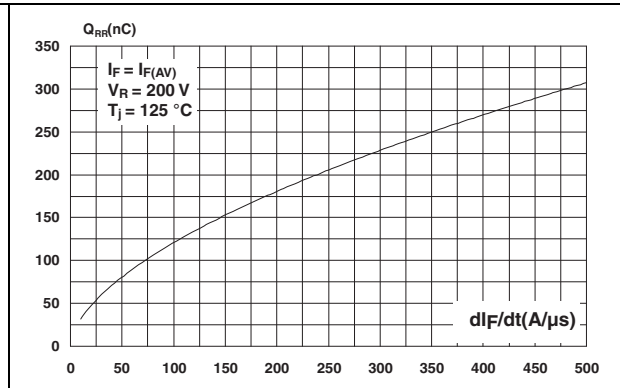


Figure 7. Relative variations of dynamic parameters versus junction temperature

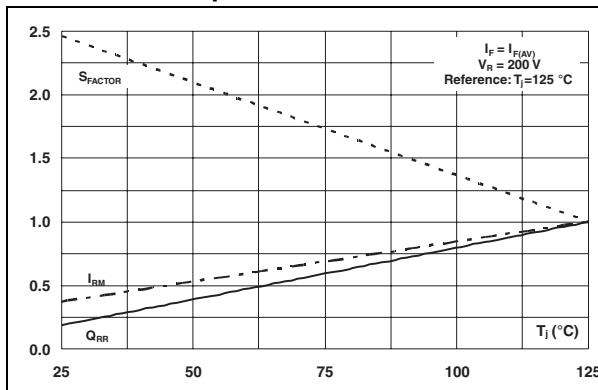


Figure 8. Reverse recovery softness factor versus  $di_F/dt$  (typical values, per diode)

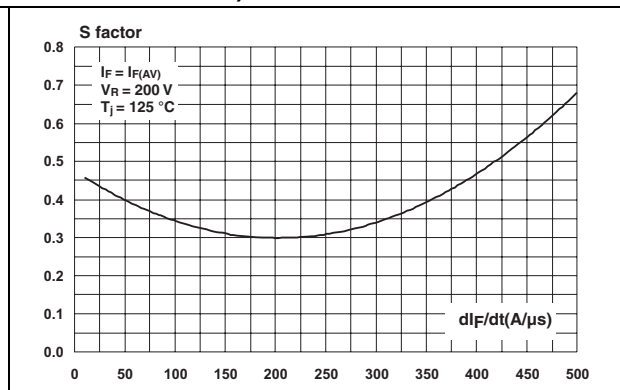


Figure 9. Forward recovery time versus  $di_F/dt$  (typical values, per diode)

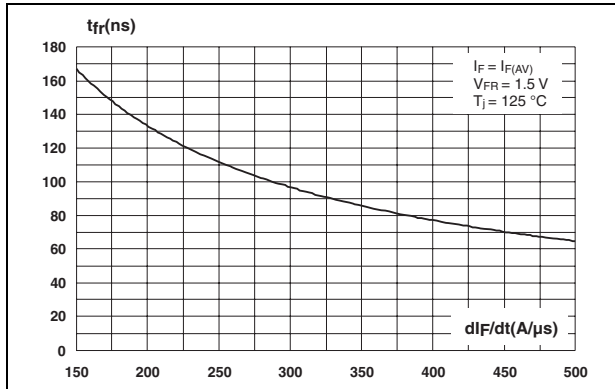


Figure 10. Transient peak forward voltage versus  $di_F/dt$  (typical values, per diode)

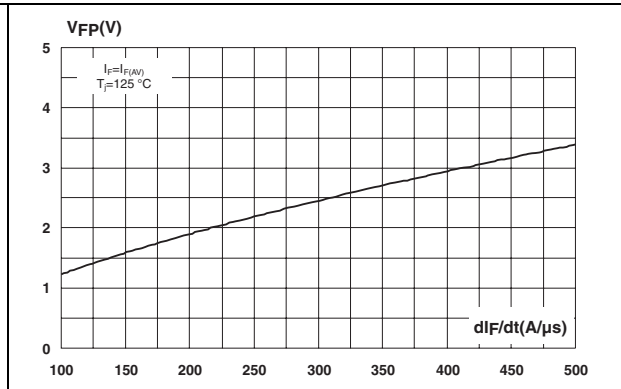
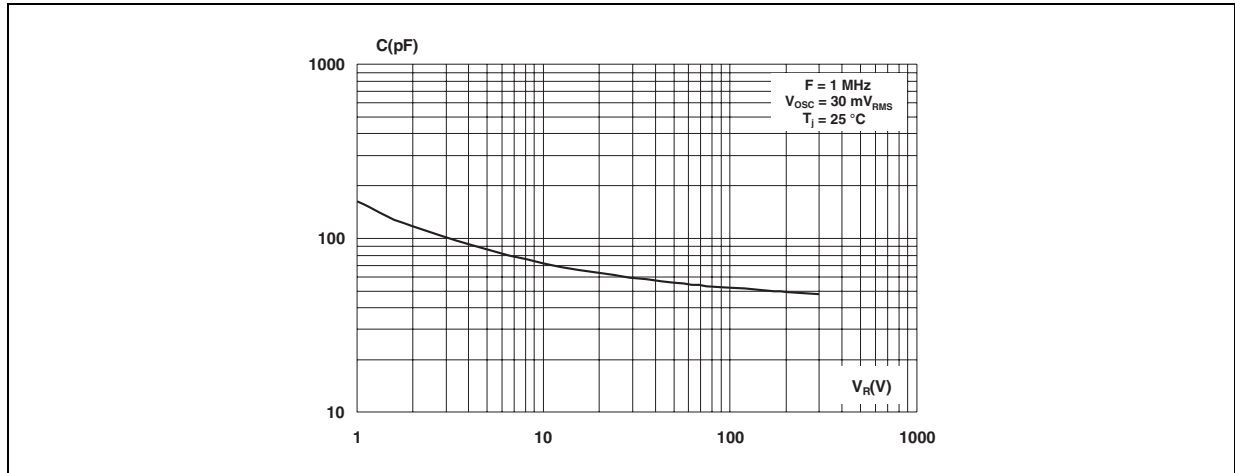


Figure 11. Junction capacitance versus reverse voltage applied (typical values, per diode)



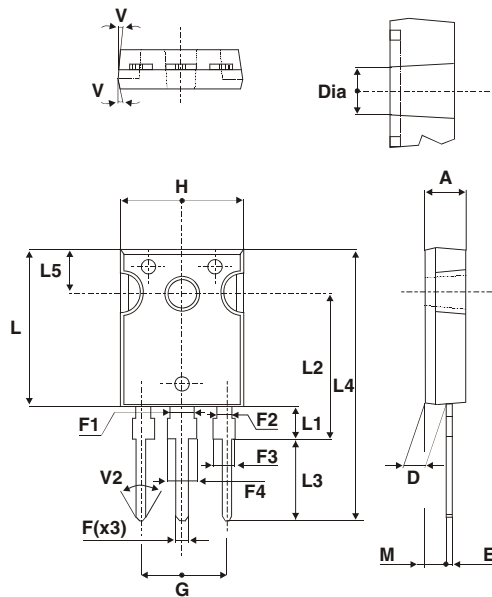
## 2 Package information

- 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.	Max.	Min.	Max.
A	4.85	5.15	0.191	0.203
D	2.20	2.60	0.086	0.102
E	0.40	0.80	0.015	0.031
F	1.00	1.40	0.039	0.055
F1	3.00 typ.		0.118 typ.	
F2	2.00 typ.		0.078 typ.	
F3	2.00	2.40	0.078	0.094
F4	3.00	3.40	0.118	0.133
G	10.90 typ.		0.429 typ.	
H	15.45	15.75	0.608	0.620
L	19.85	20.15	0.781	0.793
L1	3.70	4.30	0.145	0.169
L2	18.50 typ.		0.728 typ.	
L3	14.20	14.80	0.559	0.582
L4	34.60 typ.		1.362 typ.	
L5	5.50 typ.		0.216 typ.	
M	2.00	3.00	0.078	0.118
V	5° typ.		5° typ.	
V2	60° typ.		60° typ.	
Dia.	3.55	3.65	0.139	0.143



### 3 Ordering information

Table 7. Ordering information

Ordering type	Marking	Package	Weight	Base qty	Delivery mode
STTH60W03CW	STTH60W03CW	TO-247	4.46 g	50	Tube

### 4 Revision history

Table 8. Document revision history

Date	Revision	Changes
07-June-2012	1	First issue.

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