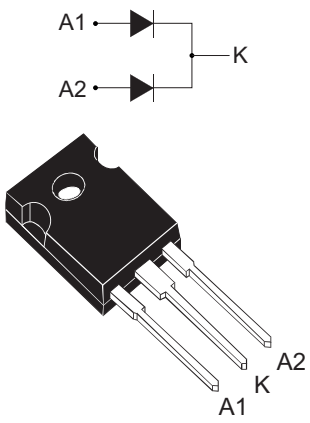
STTH50W03C

Turbo 2 ultrafast high voltage rectifier

Datasheet – production data



TO-247
STTH50W03CW

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:

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

Table 4. Static electrical characteristics per diode

Symbol	Parameter	Test conditions		Min.	Typ	Max.	Unit
I_R (1)	Reverse leakage current	T_j = 25 °C	$V_R = V_{RRM}$			15	µA
		T_j = 125° C			15	150	
V_F (2)	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, δ < 2%
2. Pulse test: t_p = 380 µs, δ < 2%

To evaluate the conduction losses use the following equation:

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

Table 5. Dynamic electrical characteristics per diode

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

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

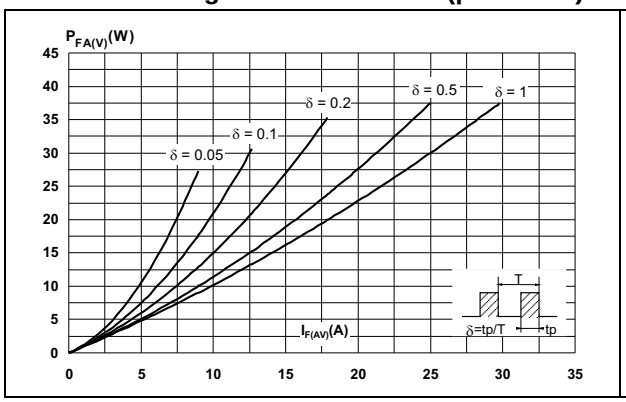


Figure 2. Forward voltage drop versus forward current (typical values, per diode)

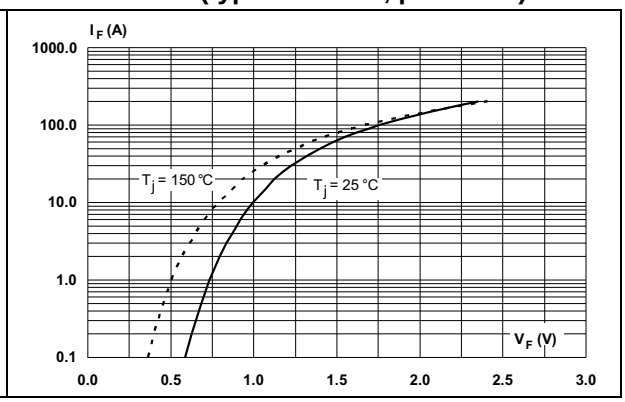


Figure 3. Forward voltage drop versus forward current (maximum values, per diode)

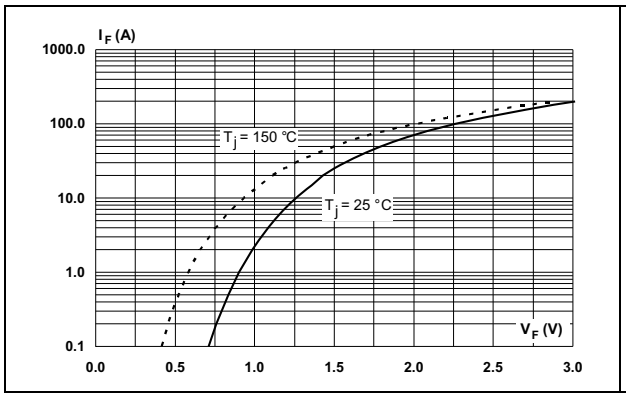


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration

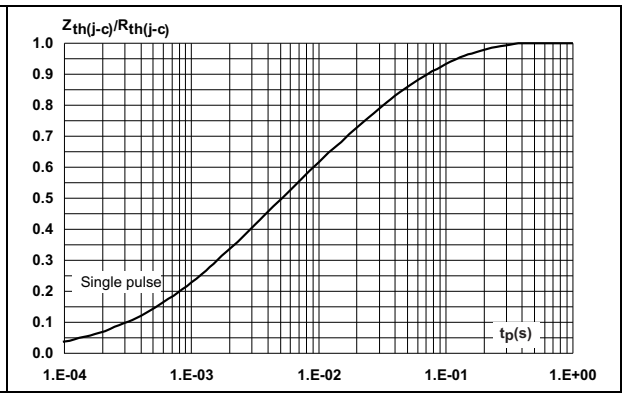


Figure 5. Peak reverse recovery current versus dI_F/dt (typical values, per diode)

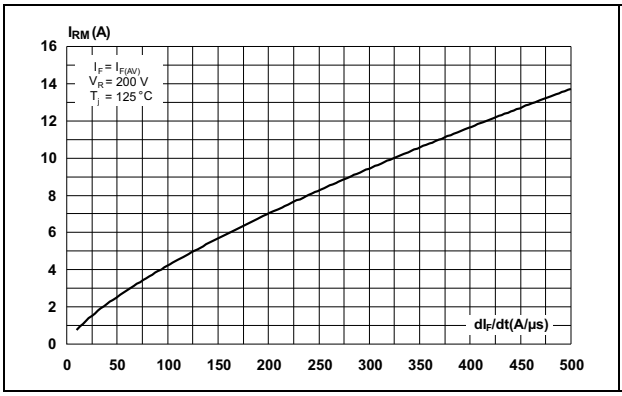


Figure 6. Reverse recovery time versus dI_F/dt (typical values, per diode)

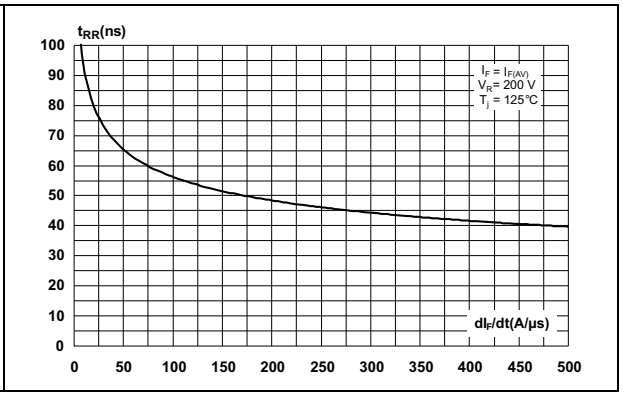


Figure 7. Reverse recovery charges versus dI_F/dt (typical values, per diode)

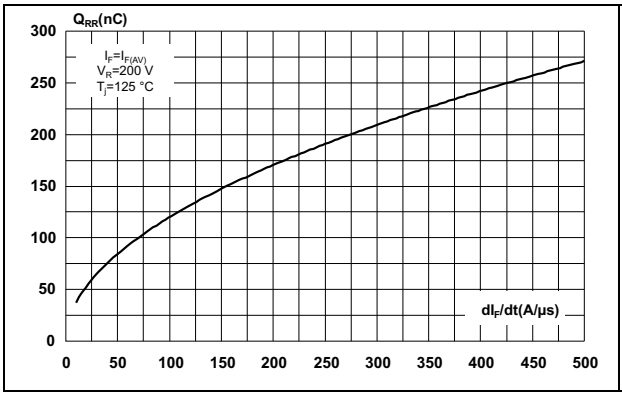


Figure 8. Reverse recovery softness factor versus dI_F/dt (typical values, per diode)

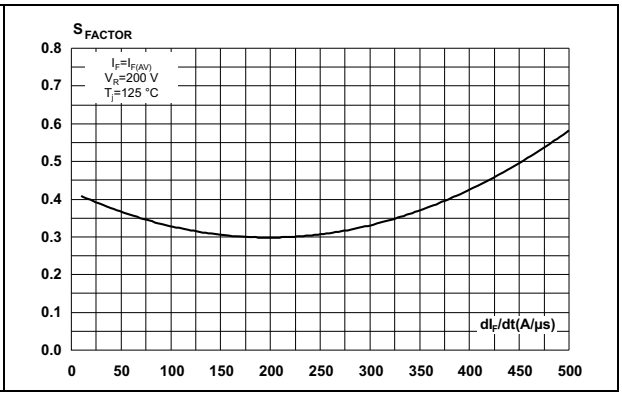


Figure 9. Relative variations of dynamic parameters versus junction temperature

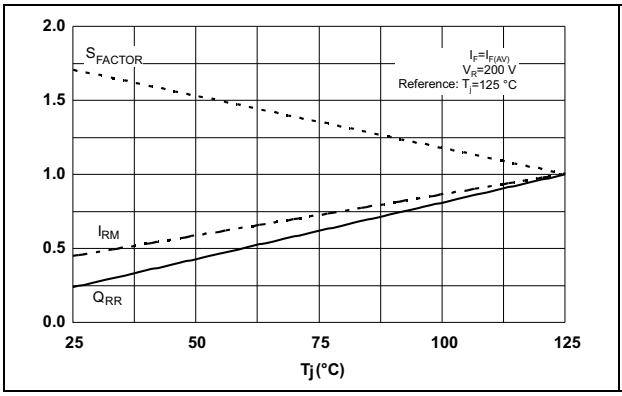


Figure 10. Transient peak forward voltage versus dI_F/dt (typical values, per diode)

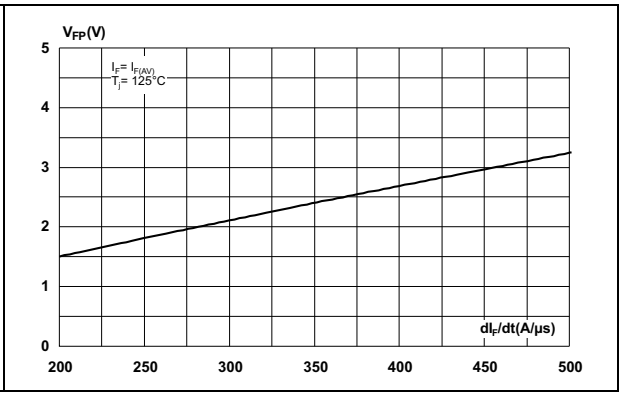


Figure 11. Forward recovery time versus dI_F/dt (typical values, per diode)

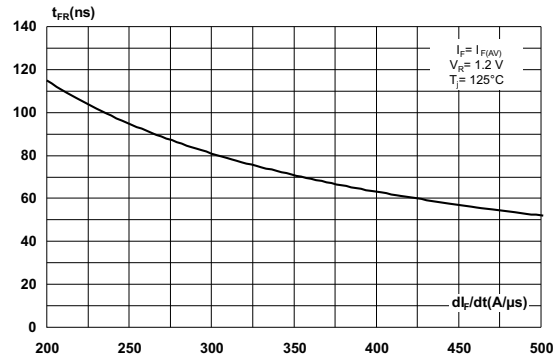
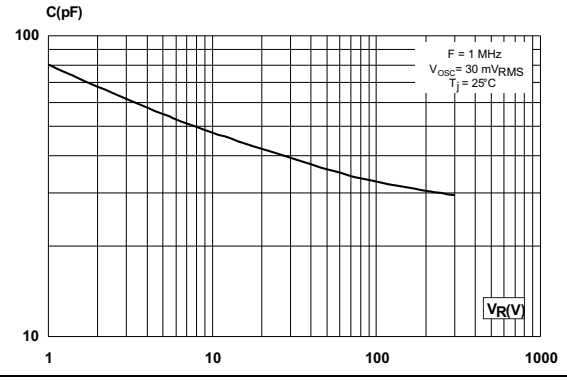


Figure 12. Junction capacitance versus reverse voltage applied (typical values, per diode)



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

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Figure 13. TO-247 dimension definitions

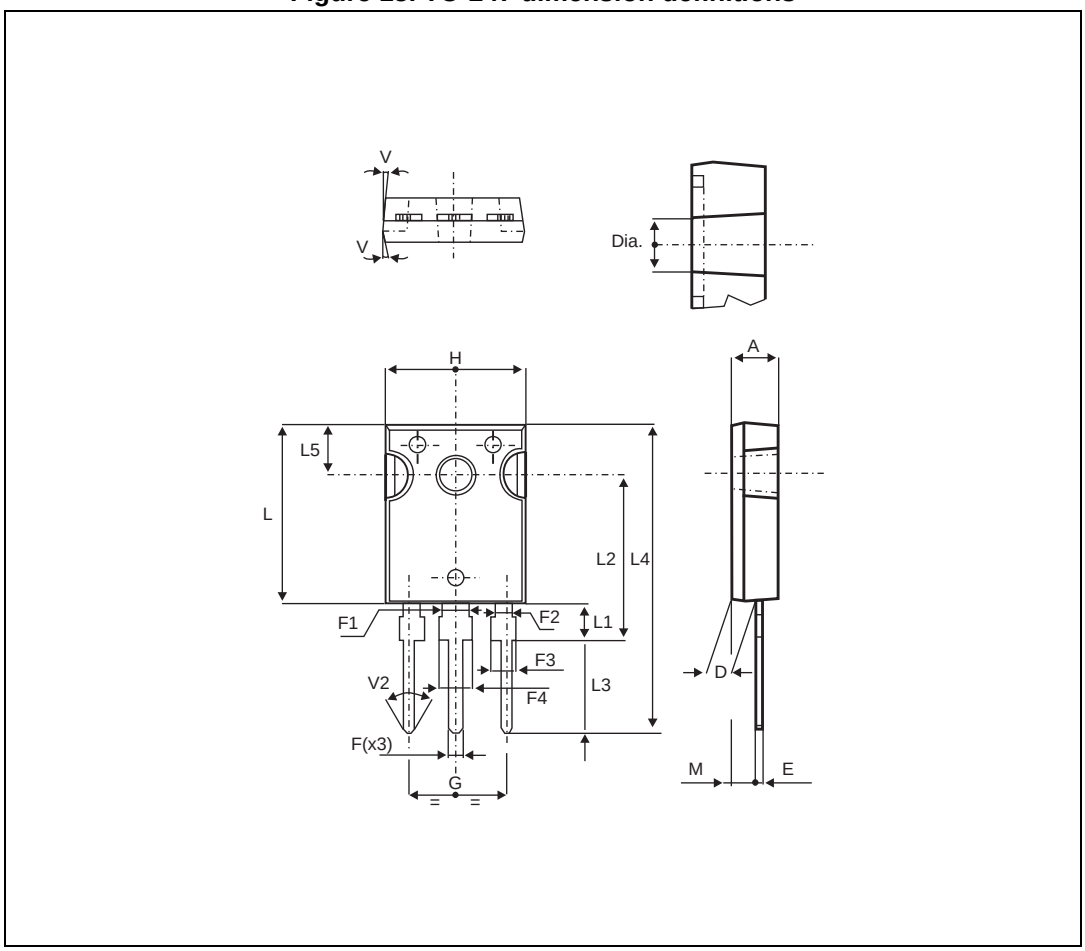

Table 6. TO-247 dimension values

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(1)	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(2)	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
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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