

## Ultrafast high voltage rectifier

### Main product characteristics

$I_{F(AV)}$	up to 2 x 100 A
$V_{RRM}$	300 V
$T_j$ (max)	150° C
$V_F$ (typ)	0.95 V
$t_{rr}$ (max)	90 ns

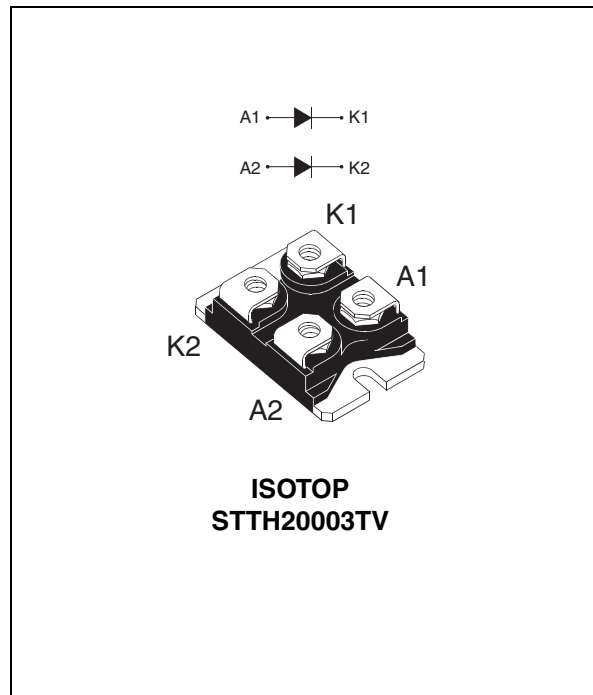
### Features and benefits

- Combines highest recovery and reverse voltage performance
- Ultrafast, soft and noise-free recovery
- Package insulation voltage 2500  $V_{rms}$
- low inductance and low capacitance allow simpler layout

### Description

Dual rectifiers suited for Switch Mode Power Supply and high frequency DC to DC converters.

Packaged in ISOTOP™, this device is intended for use in low voltage, high frequency inverters, free wheeling operation, welding equipment and telecom power supplies.



### Order codes

Part number	Marking
STTH20003TV	STTH20003TV

**Table 1. Absolute ratings (limiting values, per diode,  $T_c = 25^\circ\text{C}$  unless otherwise stated)**

Symbol	Parameter		Value	Unit
$V_{RRM}$	Repetitive peak reverse voltage		300	V
$I_{F(RMS)}$	RMS forward current		180	A
$I_{F(AV)}$	Average forward current	$T_c = 85^\circ\text{C}$ $\delta = 0.5$	Per diode 100	A
			Per device 200	
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10\text{ ms}$ sinusoidal	100	A
$T_{stg}$	Storage temperature range		-55 to + 150	° C
$T_j$	Maximum operating junction temperature		150	° C

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# 1 Characteristics

**Table 2. Thermal resistance**

Symbol	Parameter		Value (max).	Unit
R <sub>th(j-c)</sub>	Junction to case	Per diode	0.55	°C/W
		Total	0.35	
R <sub>th(c)</sub>	Coupling		0.1	

When diodes 1 and 2 are used simultaneously:

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

**Table 3. Static electrical characteristics (per diode)**

Symbol	Parameter	Test conditions		Min.	Typ	Max.	Unit
I <sub>R</sub> <sup>(1)</sup>	Reverse leakage current	T <sub>j</sub> = 25° C	V <sub>R</sub> = 300 V			200	μA
		T <sub>j</sub> = 125° C			0.2	2	mA
V <sub>F</sub> <sup>(2)</sup>	Forward voltage drop	T <sub>j</sub> = 25° C	I <sub>F</sub> = 100 A			1.20	V
		T <sub>j</sub> = 150° C			0.8	0.95	

1. Pulse test: t<sub>p</sub> = 5 ms, δ < 2%

2. Pulse test: t<sub>p</sub> = 380 μs, δ < 2%

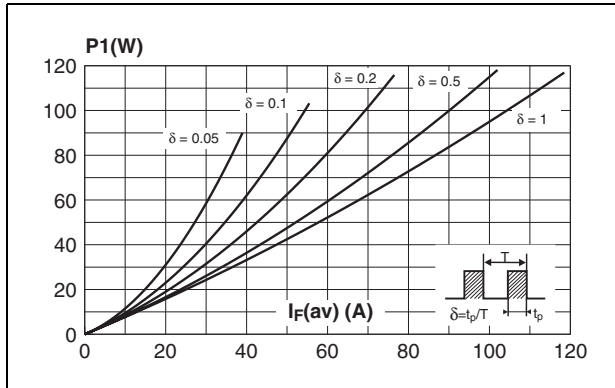
To evaluate the conduction losses use the following equation:

$$P = 0.75 \times I_{F(AV)} + 0.0020 I_{F(RMS)}^2$$

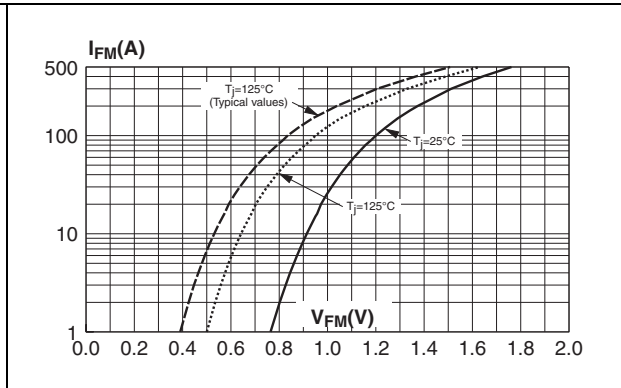
**Table 4. Dynamic characteristics (per diode)**

Symbol	Parameter	Test conditions			Min	Typ	Max	Unit
t <sub>rr</sub>	Reverse recovery time	T <sub>j</sub> = 25° C	I <sub>F</sub> = 0.5 A I <sub>rr</sub> = 0.25 A I <sub>R</sub> = 1 A			55		ns
			I <sub>F</sub> = 1 A dI <sub>F</sub> /dt = -50 A/μs V <sub>R</sub> = 30 V				90	
I <sub>RM</sub>	Reverse recovery current	T <sub>j</sub> = 125° C	I <sub>F</sub> = 100 A V <sub>R</sub> = 200 V dI <sub>F</sub> /dt = -200 A/μs				18	A
S <sub>factor</sub>	Softness factor	T <sub>j</sub> = 125° C	I <sub>F</sub> = 100 A V <sub>R</sub> = 200 V dI <sub>F</sub> /dt = -200 A/μs			0.3		
t <sub>fr</sub>	Forward recovery time	T <sub>j</sub> = 25° C	I <sub>F</sub> = 100 A dI <sub>F</sub> /dt = 200 A/μs V <sub>FR</sub> = 1.1 x V <sub>Fmax</sub>				1400	ns
V <sub>FP</sub>	Forward recovery voltage	T <sub>j</sub> = 25° C	I <sub>F</sub> = 100 A dI <sub>F</sub> /dt = 200 A/μs V <sub>FR</sub> = 1.1 x V <sub>Fmax</sub>				5	V

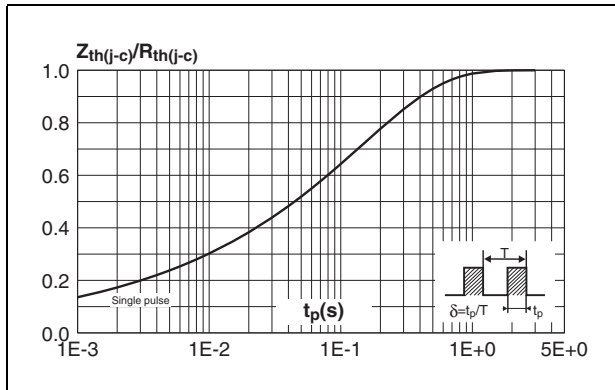
**Figure 1. Conduction losses versus average forward current (per diode)**



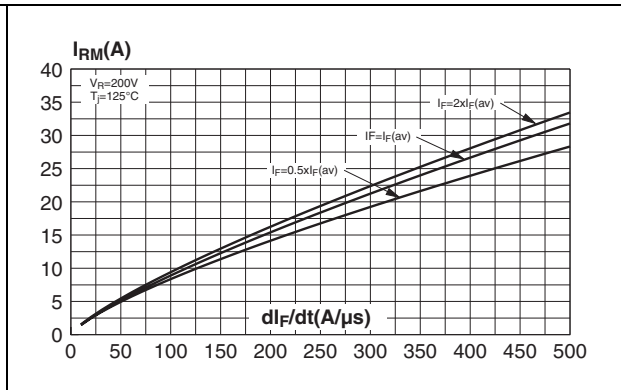
**Figure 2. Forward voltage drop versus forward current (per diode)**



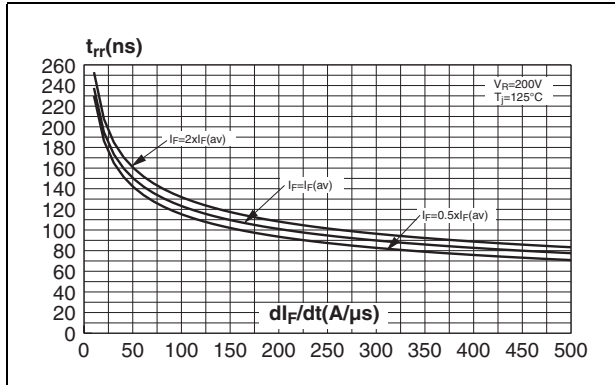
**Figure 3. Relative variation of thermal impedance junction to case versus pulse duration**



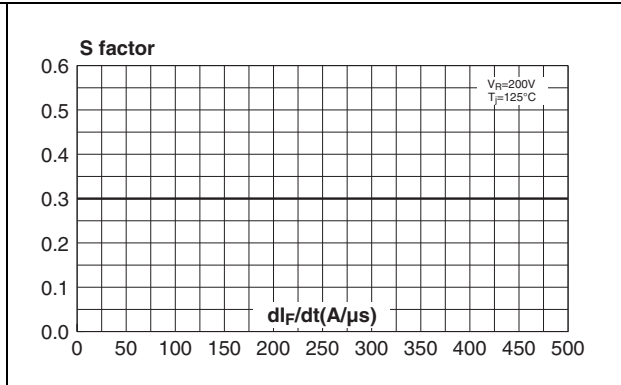
**Figure 4. Peak reverse recovery current versus di/dt (90% confidence, per diode)**



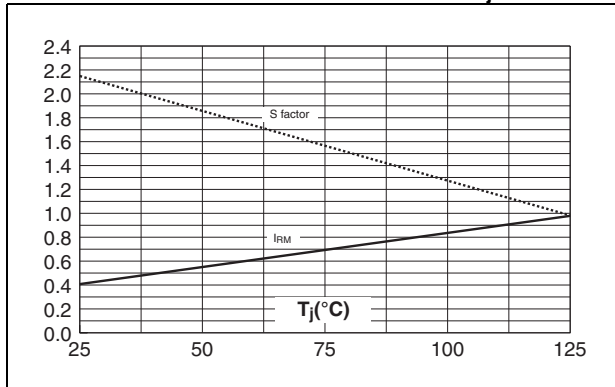
**Figure 5. Reverse recovery time versus di/dt (90% confidence, per diode)**



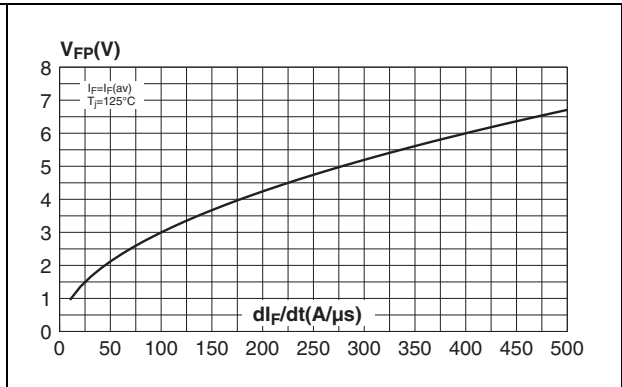
**Figure 6. Softness factor (tb/ta) versus di/dt (typical values, per diode)**



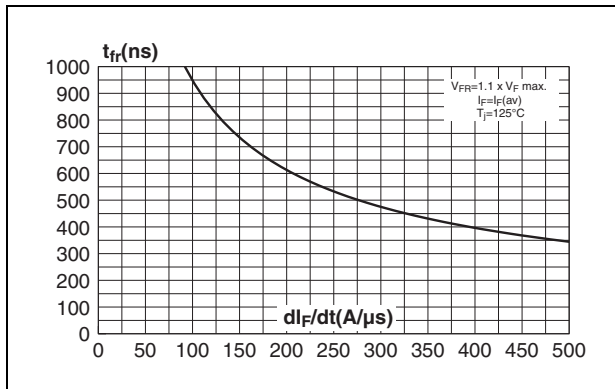
**Figure 7. Relative variations of dynamic parameters versus junction temperature (reference:  $T_j = 125^\circ\text{C}$ )**



**Figure 8. Transient peak forward voltage versus  $di_F/dt$  (90% confidence, per diode)**



**Figure 9. Forward recovery time versus  $di_F/dt$  (90% confidence, per diode)**



## 2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 1.3 Nm
- Maximum torque value: 1.5 Nm

Table 5. ISOTOP Dimensions

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	11.80	12.20	0.465	0.480
A1	8.90	9.10	0.350	0.358
B	7.8	8.20	0.307	0.323
C	0.75	0.85	0.030	0.033
C2	1.95	2.05	0.077	0.081
D	37.80	38.20	1.488	1.504
D1	31.50	31.70	1.240	1.248
E	25.15	25.50	0.990	1.004
E1	23.85	24.15	0.939	0.951
E2	24.80 typ.		0.976 typ.	
G	14.90	15.10	0.587	0.594
G1	12.60	12.80	0.496	0.504
G2	3.50	4.30	0.138	0.169
F	4.10	4.30	0.161	0.169
F1	4.60	5.00	0.181	0.197
P	4.00	4.30	0.157	0.69
P1	4.00	4.40	0.157	0.173
S	30.10	30.30	1.185	1.193

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### 3 Ordering information

Ordering type	Marking	Package	Weight	Base qty	Delivery mode
STTH20003TV	STTH20003TV	ISOTOP	27 g (without screws)	10 (with screws)	Tube

### 4 Revision history

Date	Revision	Description of Changes
1999	2C	First issue
5-Sep-2006	2	Reformatted to current standards. Thermal resistance updated in Table 2.

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