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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

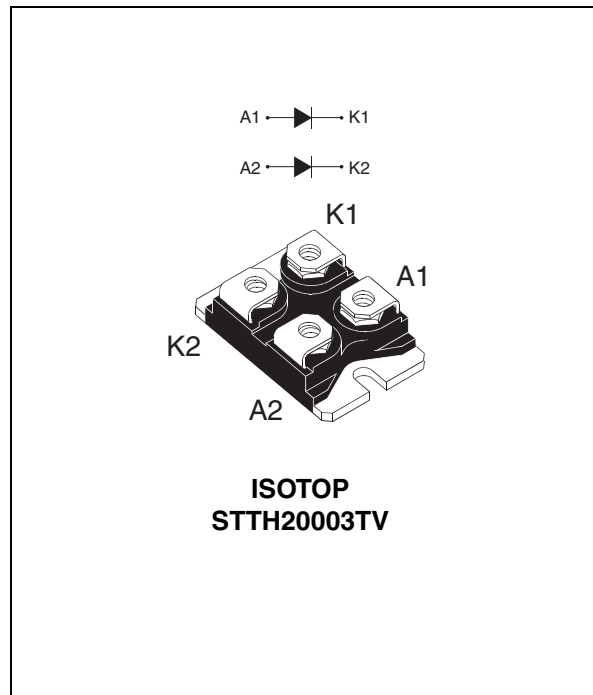
Features and benefits

- 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° 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

TM: ISOTOP is a registered trademark of STMicroelectronics

1 Characteristics

Table 2. Thermal resistance

Symbol	Parameter		Value (max).	Unit
R _{th(j-c)}	Junction to case	Per diode	0.55	°C/W
		Total	0.35	
R _{th(c)}	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 _R ⁽¹⁾	Reverse leakage current	T _j = 25° C	V _R = 300 V			200	µA
		T _j = 125° C			0.2	2	mA
V _F ⁽²⁾	Forward voltage drop	T _j = 25° C	I _F = 100 A			1.20	V
		T _j = 150° C			0.8	0.95	

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:

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

Table 4. Dynamic characteristics (per diode)

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

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

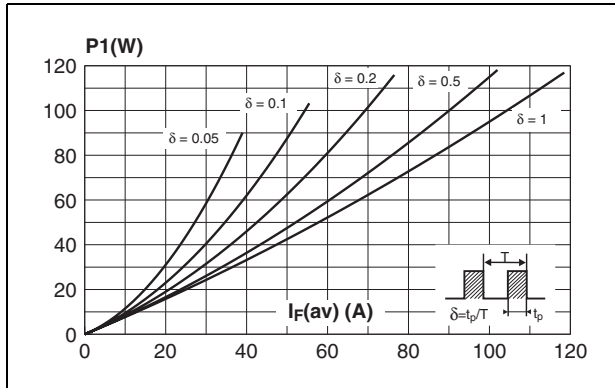


Figure 2. Forward voltage drop versus forward current (per diode)

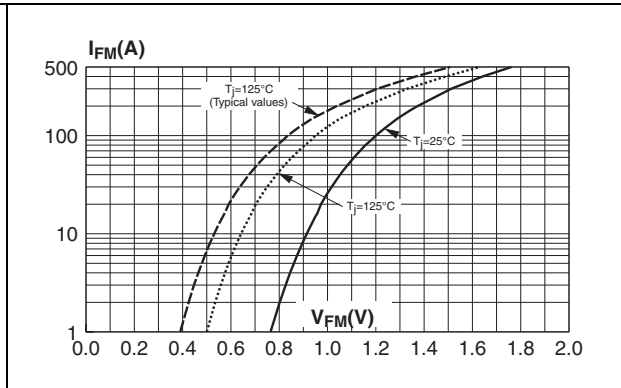


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

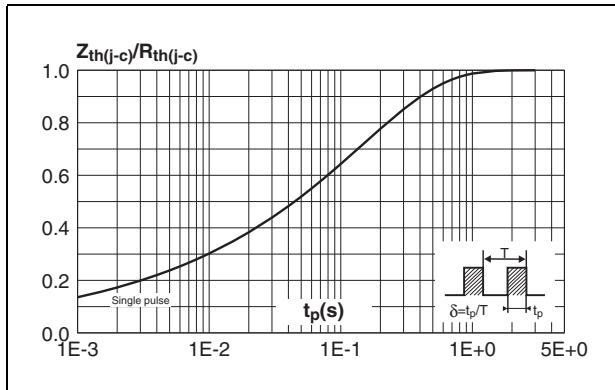


Figure 4. Peak reverse recovery current versus di/dt (90% confidence, per diode)

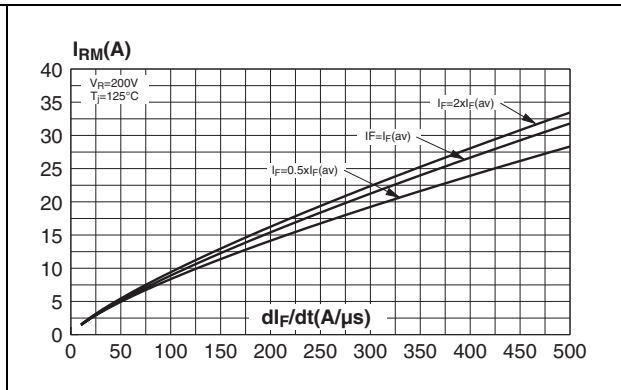


Figure 5. Reverse recovery time versus di/dt (90% confidence, per diode)

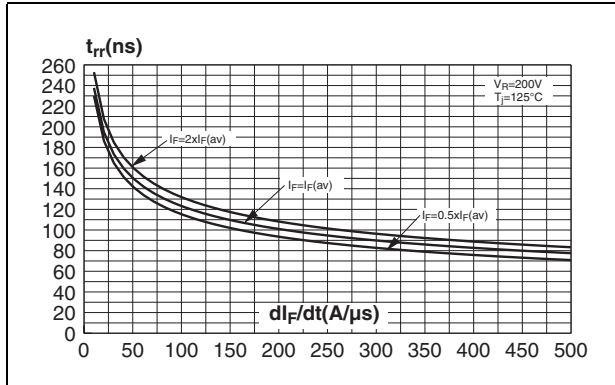


Figure 6. Softness factor (tb/ta) versus di/dt (typical values, per diode)

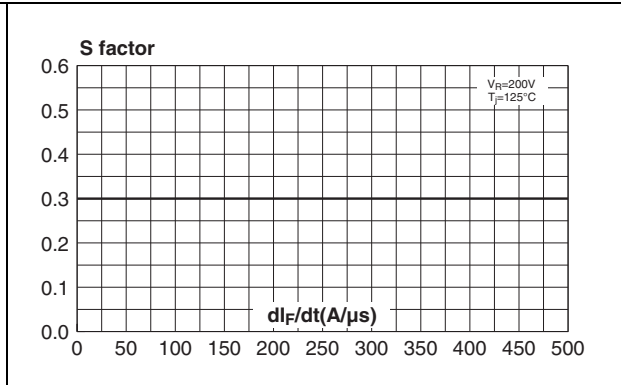


Figure 7. Relative variations of dynamic parameters versus junction temperature (reference: $T_j = 125^\circ\text{C}$)

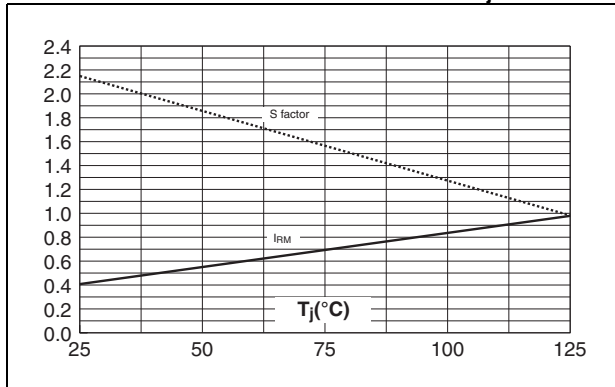


Figure 8. Transient peak forward voltage versus di_F/dt (90% confidence, per diode)

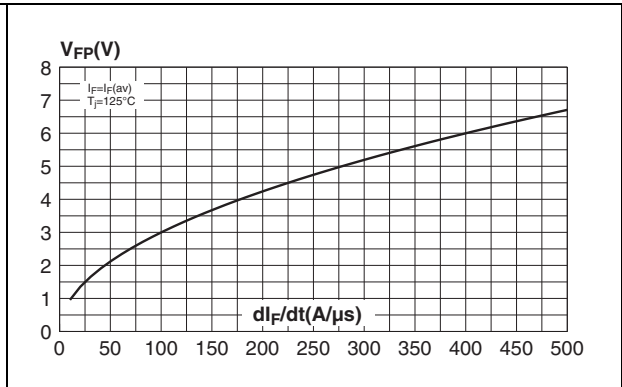
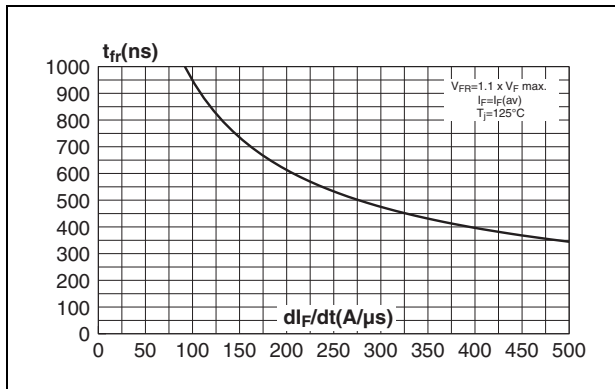


Figure 9. Forward recovery time versus di_F/dt (90% confidence, per diode)



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

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

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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