

Ultrafast high voltage rectifier

Features

- Ultrafast switching
- Low reverse current
- Low thermal resistance
- Reduces switching and conduction losses
- Insulated package:
 - Electrical insulation = 2500 V rms
 - Capacitance = 189 pF

Description

The STTH20004TV1 uses ST new 400 V technology and is specially suited for use in switching power supplies, welding equipment, and industrial applications, as an output rectification diode.

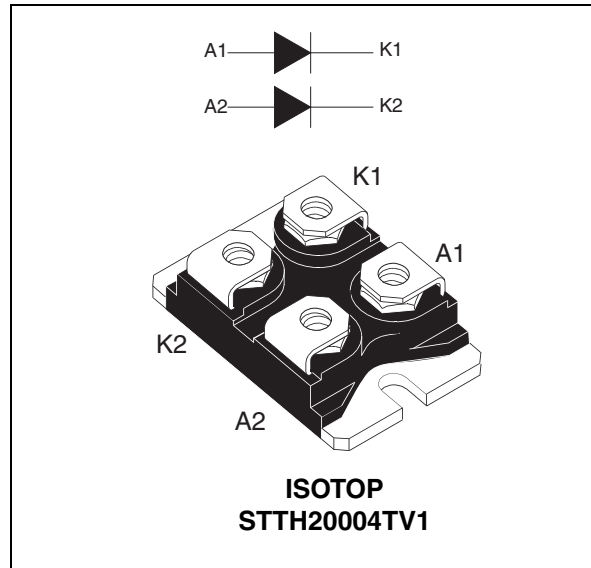


Table 1. Device summary

Symbol	Value
$I_{F(AV)}$	Up to 2 x 120 A
V_{RRM}	400 V
$T_j(max)$	150 °C
$V_F (typ)$	0.83 V
$t_{rr} (typ)$	60 ns

1 Characteristics

Table 2. Absolute ratings (limiting values, per diode)

Symbol	Parameter			Value	Unit
V _{RRM}	Repetitive peak reverse voltage			400	V
I _{F(RMS)}	Forward rms current			200	A
I _{F(AV)}	Average forward current, δ = 0.5	T _c = 90 °C	Per diode	100	A
		T _c = 73 °C	Per diode	120	
I _{FSM}	Surge non repetitive forward current	t _p = 10 ms Sinusoidal		900	A
T _{stg}	Storage temperature range			-55 to + 150	°C
T _j	Maximum operating junction temperature			150	°C

Table 3. Thermal parameter

Symbol	Parameter		Maximum	Unit
$R_{th(j-c)}$	Junction to case	Per diode	0.50	$^{\circ}\text{C/W}$
		Total	0.30	
$R_{th(c)}$	Coupling		0.10	

When the diodes 1 and 2 are used simultaneously:

$$\Delta T_j (\text{diode1}) = P_{(\text{diode1})} \times R_{th(j-c)} (\text{per diode}) + P_{(\text{diode2})} \times R_{th(c)}$$

Table 4. Static electrical characteristics (per diode)

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ }^{\circ}\text{C}$	$V_R = V_{RRM}$			100	μA
		$T_j = 125\text{ }^{\circ}\text{C}$			100	1000	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ }^{\circ}\text{C}$	$I_F = 100\text{ A}$			1.2	V
		$T_j = 150\text{ }^{\circ}\text{C}$			0.83	1.0	

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 maximum conduction losses use the following equation:

$$P = 0.8 \times I_{F(AV)} + 0.002 I_{F(RMS)}^2$$

Table 5. Dynamic characteristics

Symbol	Parameter		Test conditions	Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	$T_j = 25\text{ °C}$	$I_F = 1\text{ A}$, $di_F/dt = 50\text{ A/}\mu\text{s}$, $V_R = 30\text{ V}$		75	100	ns
			$I_F = 1\text{ A}$, $di_F/dt = 200\text{ A/}\mu\text{s}$, $V_R = 30\text{ V}$		45	60	
t_{fr}	Forward recovery time	$T_j = 25\text{ °C}$	$I_F = 100\text{ A}$, $di_F/dt = 200\text{ A/}\mu\text{s}$ $V_{FR} = 1.1 \times V_{Fmax}$			800	ns
V_{FP}	Forward recovery voltage				2.6		V
I_{RM}	Reverse recovery current	$T_j = 125\text{ °C}$	$I_F = 100\text{ A}$, $di_F/dt = 100\text{ A/}\mu\text{s}$, $V_R = 200\text{ V}$			18	A
S_{factor}					0.4		-

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

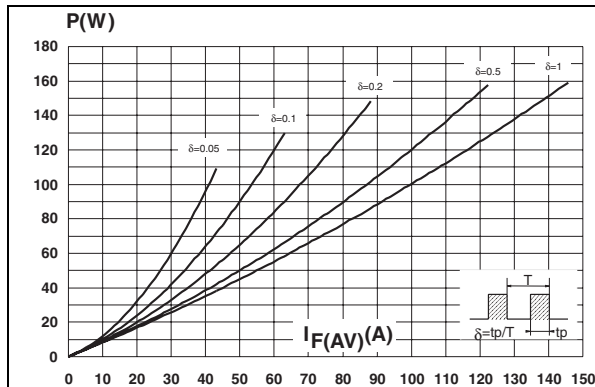


Figure 2. Forward voltage drop versus forward current (per diode)

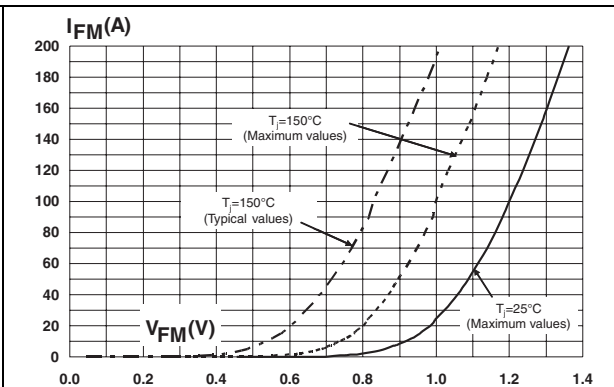


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

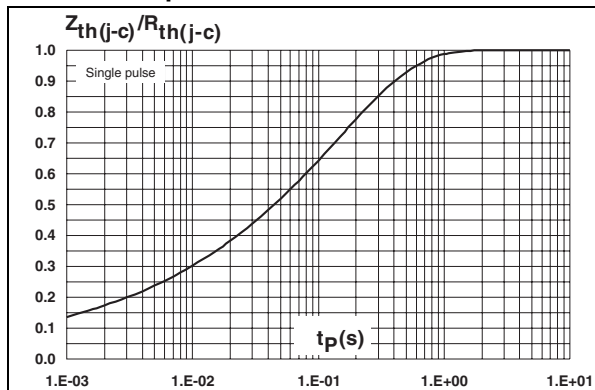


Figure 4. Peak reverse recovery current versus di_F/dt (typical values, per diode)

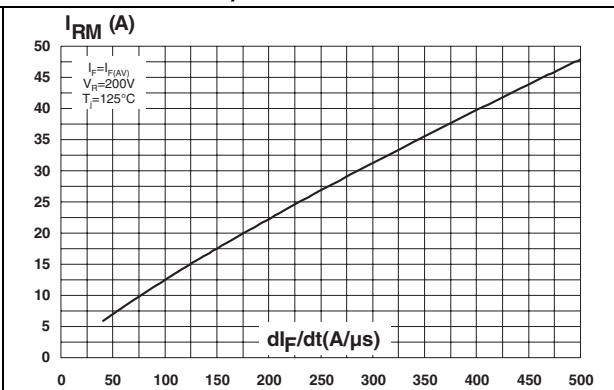


Figure 5. Reverse recovery time versus di_F/dt (typical values, per diode)

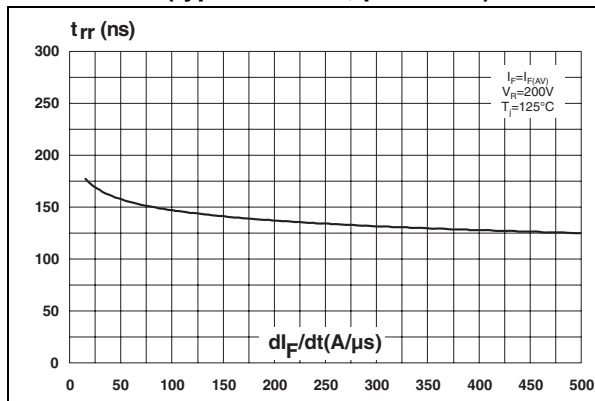


Figure 6. Reverse recovery charges versus di_F/dt (typical values, per diode)

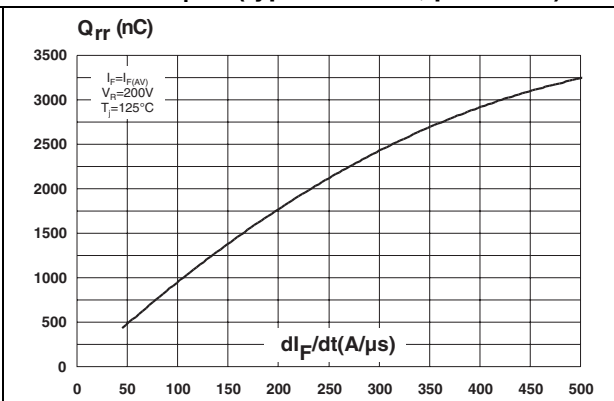


Figure 7. Reverse recovery time versus dl_F/dt (typical values, per diode)

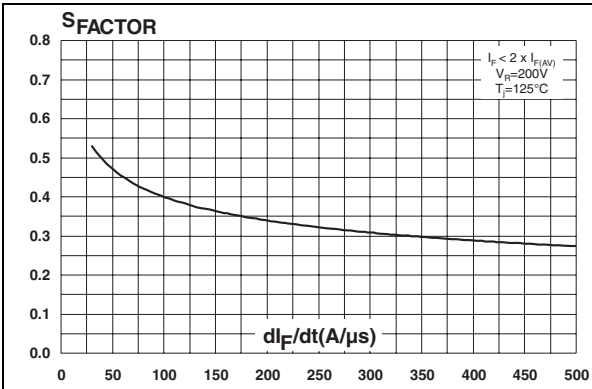


Figure 8. Relative variations of dynamic parameters versus junction temperature

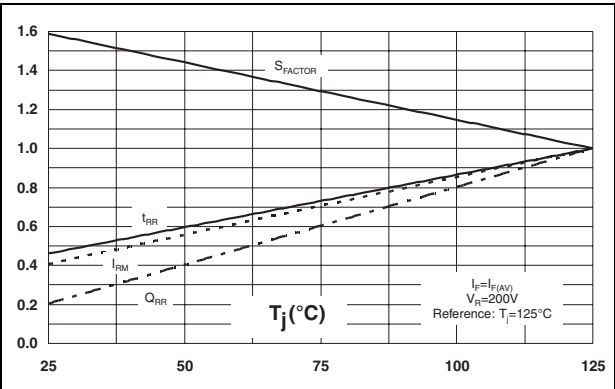


Figure 9. Transient peak forward voltage versus dl_F/dt (typical values, per diode)

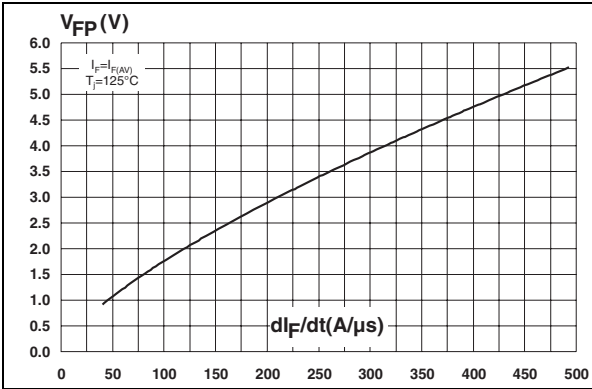


Figure 10. Forward recovery time versus dl_F/dt (typical values, per diode)

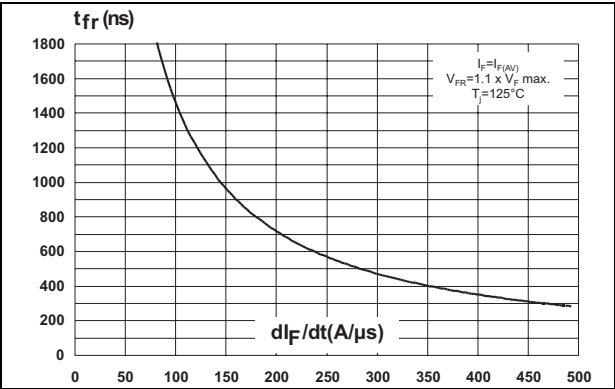
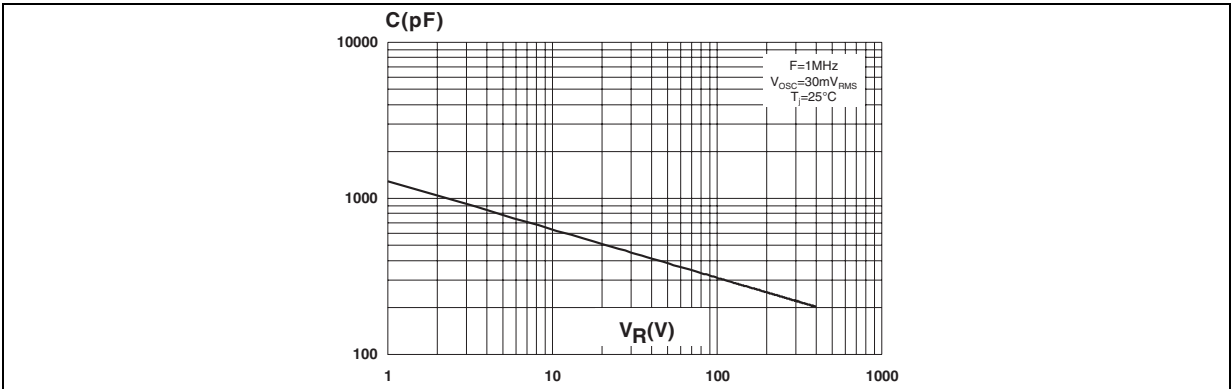


Figure 11. Reverse recovery time versus dl_F/dt (typical values, per diode)

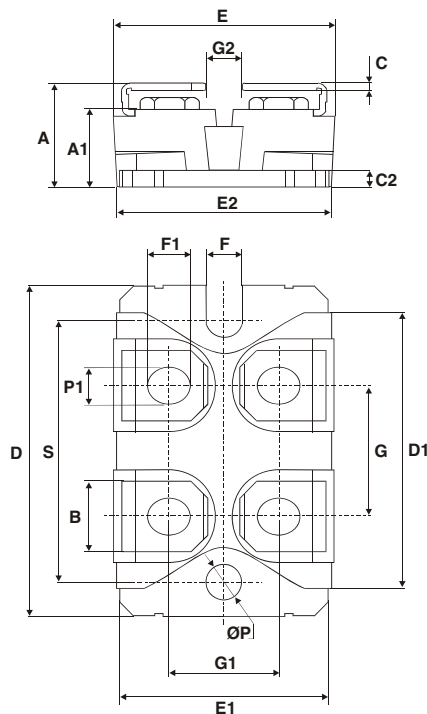


2 Package information

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. ECOPACK® is an ST trademark.

Table 6. 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



3 Ordering information

Table 7. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH20004TV1	STTH20004TV1	ISOTOP	27 g (without screws)	10 (with screws)	Tube

4 Revision history

Table 8. Document revision history

Date	Revision	Changes
18-Oct-2005	1	First issue.
15-Sep-2011	2	Added insulated package information in Features .

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