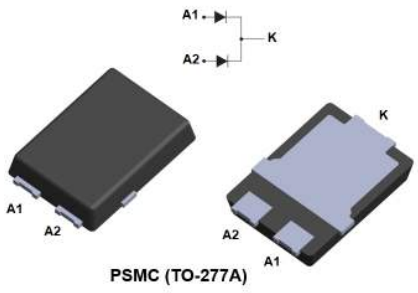
STTH1002CSF

Datasheet

200 V, dual 5 A ultrafast rectifier



PSMC (TO-277A)

Features

- 175 °C maximum operation junction temperature
- High surge current capability
- ECOPACK2 compliant component

Application

- DC/DC converters
- Freewheeling diodes
- LED Lighting

Description

The STTH1002CSF has been developed for applications requiring an optimized VF and reverse recovery characteristics.

These characteristics make it ideal for use in secondary rectification functions, such as DC/DC converters or lighting applications.

Product status link
STTH1002CSF

Product summary	
Symbol	**Value**
$I_{F(AV)}$	2 X 5 A
V_{RRM}	200 V
t_{rr}(max)	27 ns
T_j (max.)	175 °C
V_F (typ.)	0.79 V

1 Characteristics

Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified, per diode)

Symbol	Parameter			Value	Unit
V_{RRM}	Repetitive peak reverse voltage			200	V
$I_{F(AV)}$	Average forward current, δ = 0.5	Per diode	T_c = 160 °C	5	A
		Per device	T_c = 160 °C	10	
I_{FSM}	Surge non repetitive forward current		t_p = 10 ms sinusoidal	85	A
T_{stg}	Storage temperature range			-65 to +175	°C
T_j	Maximum operating junction temperature range			+175	°C

Table 2. Thermal resistance parameters

Symbol	Parameter		Typ.	Unit
$R_{th(j-c)}$	Junction to case	Per diode	2.45	°C/W
		Per device	1.66	
Rth(c)	Coupling		0.87	°C/W

For more information, please refer to the following application note:

- AN5088: Rectifiers thermal management, handling and mounting recommendations

When the diodes 1 and 2 are used simultaneously:

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

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	$V_R = V_{RRM}$	-		4	µA
		T_j = 125 °C		-	4	40	
V_F(2)	Forward voltage drop	T_j = 25 °C	I_F = 5 A	-	0.91	1.05	V
		T_j = 125 °C		-	0.79	0.91	
		T_j = 25 °C	I_F = 10 A	-	1.02	1.17	
		T_j = 125 °C		-	0.90	1.04	

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:

$P = 0.78 \times I_{F(AV)} + 0.026 \times I_F{}^2{}_{(RMS)}$

For more information, please refer to the following application notes related to the power losses:

- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses in a power diode

Table 4. Dynamic characteristics per diode at T_j = 25°C, unless otherwise specified

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
t_{rr}	Reverse recovery time	T_j = 25 °C	I_F = 1 A, dI_F/dt = -50 A/µs, V_R = 30 V	-	28	35	ns
			I_F = 1 A, dI_F/dt = -100 A/µs, V_R = 30 V	-	21	27	
I_{RM}	Reverse recovery current	T_j = 125 °C	I_F = 5 A, dI_F/dt = -200 A/µs, V_R = 160 V	-	6.3		A

1.1 Characteristics (curves)

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

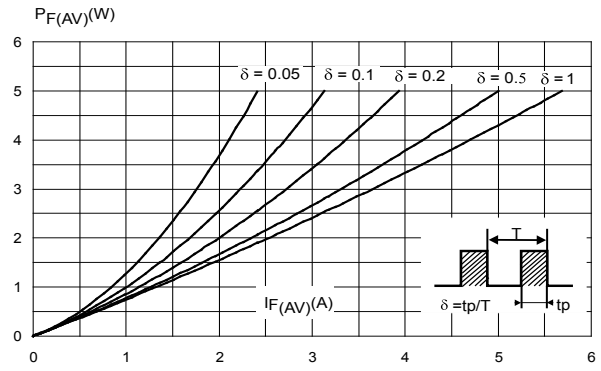


Figure 2. Forward voltage drop versus forward current (typical values, per diode)

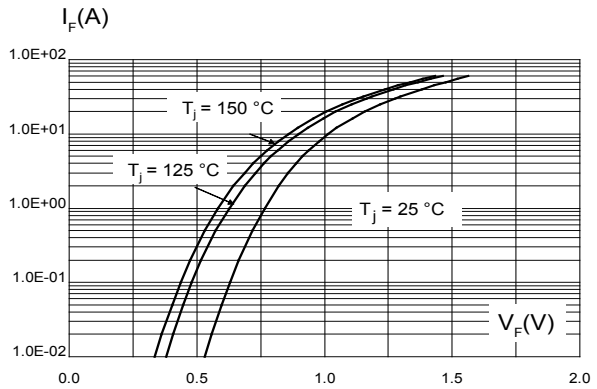


Figure 3. Forward voltage drop versus forward current (maximum values, per diode)

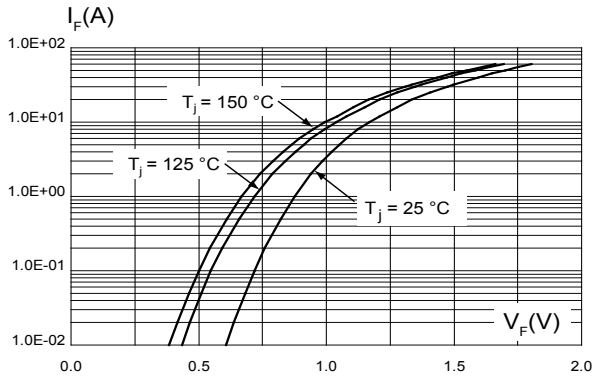


Figure 4. Relative variation of thermal impedance junction to case total versus pulse duration

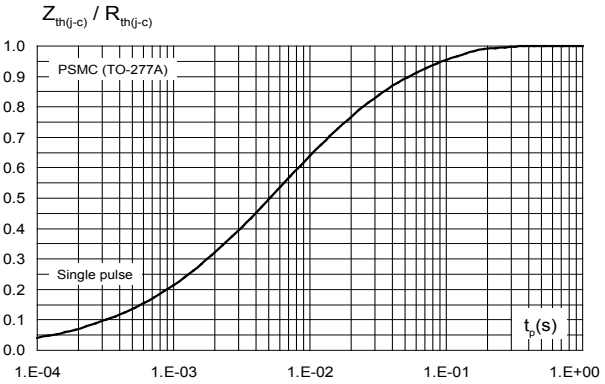


Figure 5. Peak reverse recovery current versus dIF/dt (typical values, per diode)

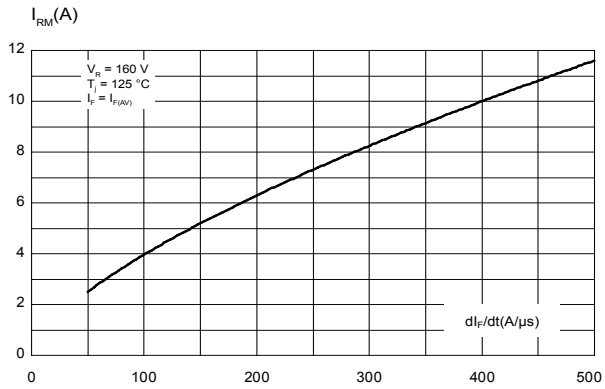


Figure 6. Reverse recovery time versus dIF/dt (typical values, per diode)

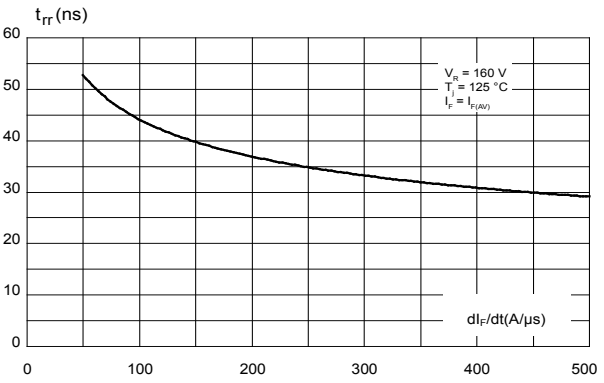


Figure 7. Reverse recovery charges versus dIF/dt (typical values, per diode)

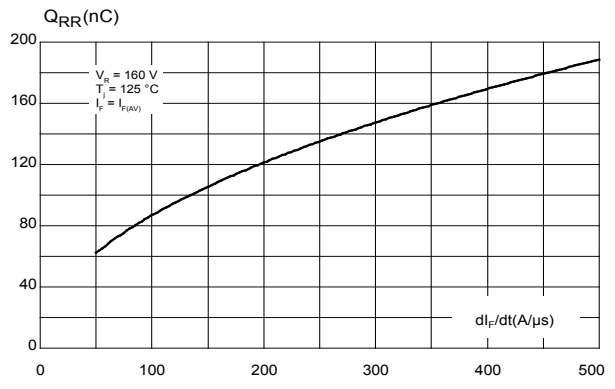


Figure 8. Reverse recovery softness versus dIF/dt (typical values, per diode)

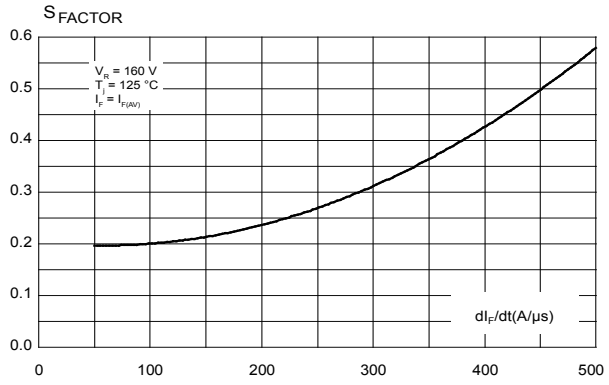


Figure 9. Relative variations of dynamic parameters versus junction temperature

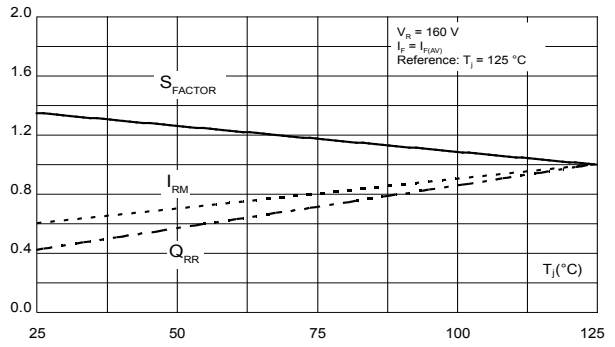


Figure 10. Junction capacitance versus reverse voltage applied (typical values, per diode)

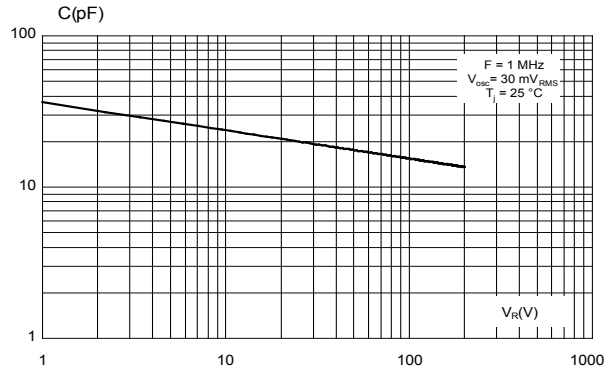
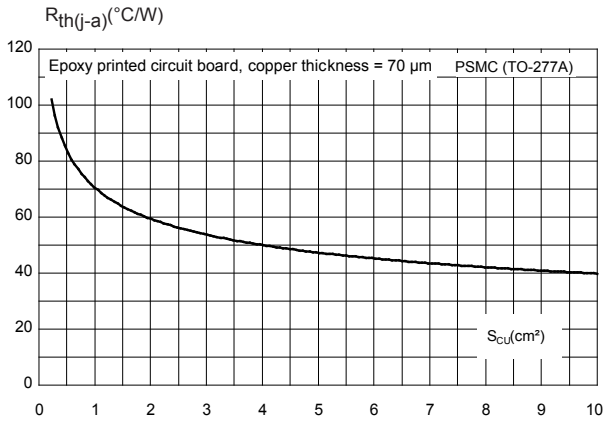


Figure 11. Thermal resistance junction to ambient versus copper surface under tab (typical values, epoxy printed board FR4, e_{Cu} = 70 µm) (PSMC (TO-277A))



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.

2.1 PSMC (TO-277A) package information

- Epoxy meets UL94,V0
- Cooling method : by conduction (C)

Figure 12. PSMC (TO-277A) package outline

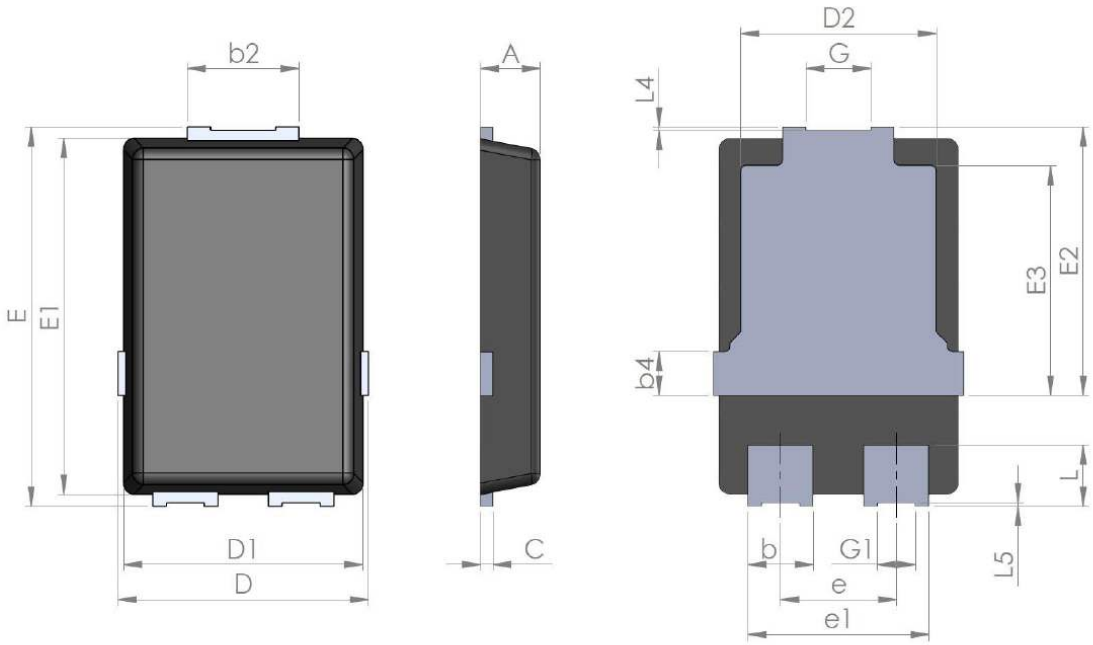
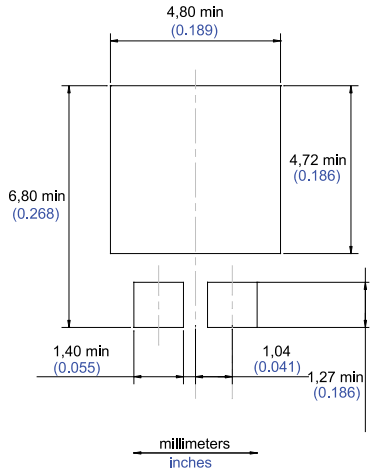


Table 5. PSMC (TO-277A) package mechanical data

Ref.	Dimensions					
	Millimeters			Inches (for reference only)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	1.00	1.10	1.20	0.039	0.043	0.047
b	1.05	1.20	1.35	0.041	0.047	0.053
b2	1.90	2.05	2.20	0.075	0.081	0.087
b4		0.75			0.029	
C	0.15	0.23	0.40	0.006	0.009	0.016
D	4.45	4.60	4.75	0.175	0.181	0.187
D1	4.25	4.40	4.45	0.167	0.173	0.175
D2	3.40	3.60	3.70	0.134	0.142	0.146
E	6.35	6.50	6.65	0.250	0.256	0.262
E1	6.05	6.10	6.15	0.238	0.240	0.242
E2	4.50	4.60	4.70	0.177	0.181	0.185
E3		3.94			1.55	
e		2.13			0.084	
e1		3.33			0.131	
G		1.20			0.047	
G1		0.70			0.027	
L	0.90	1.05	1.24	0.035	0.041	0.049
L4	0.02			0.0008		
L5	0.02			0.0008		

Figure 13. PSMC (TO-277A) package footprint in mm (in inches)



Note: For package and tape orientation, reel and inner box dimensions and tape outline please check TN1173

3 Ordering information

Table 6. **Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STTH1002CSF	TH1002C	PSMC (TO-277A)	90 mg	6000	Tape and Reel

Revision history

Table 7. **Document revision history**

Date	Version	Changes
29-Oct-2020	1	Initial release.