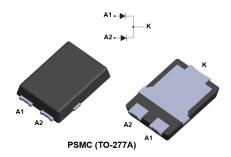


### Automotive 200 V, dual 5 A ultrafast rectifier



#### **Features**



- PPAP capable
- 175 °C maximum operation junction temperature
- V<sub>RRM</sub> guaranteed from -40 °C to 175 °C
- · High surge current capability
- ECOPACK2 compliant component

### **Application**

- · Reverse polarity protection in E.C.U
- DC/DC converters
- · Freewheeling diodes
- LED Lighting

### **Description**

The STTH1002CSFY 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
STTH1002CSFY

Product summary				
Symbol	Value			
I <sub>F(AV)</sub>	2 X 5 A			
V <sub>RRM</sub>	200 V			
t <sub>rr</sub> (max)	27 ns			
T <sub>j</sub> (max.)	175 °C			
V <sub>F</sub> (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 ( $T_j$ = -40 °C to +175 C)			200	V	
I	Average forward ourrent 5 = 0.5	Per diode	T <sub>c</sub> = 160 °C	5		
I <sub>F(AV)</sub>	Average forward current, δ = 0.5	Per device	T <sub>c</sub> = 160 °C	10	Α	
I <sub>FSM</sub>	Surge non repetitive forward current	85	Α			
T <sub>stg</sub>	Storage temperature range	-65 to +175	°C			
Tj	Operating junction temperature range			-40 to +175	°C	

Table 2. Thermal resistance parameters

Symbol	Parameter	Тур.	Unit	
Para s	lunction to coop	Per diode	2.45	°C/W
R <sub>th(j-c)</sub> Junction to case	Junction to case	Per device	1.66	C/VV
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:

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

Table 3. Static electrical characteristics (per diode)

Symbol	Parameter	Test conditions		Min.	Тур.	Max.	Unit
L (1)		T <sub>j</sub> = 25 °C	V <sub>R</sub> = V <sub>RRM</sub>	-		4	μA
I <sub>R</sub> <sup>(1)</sup>	Reverse leakage current	T <sub>j</sub> = 125 °C		-	4	40	
		T <sub>j</sub> = 25 °C	I <sub>F</sub> = 5 A	-	0.91	1.05	V
V <sub>F</sub> <sup>(2)</sup>	Forward voltage drap	T <sub>j</sub> = 125 °C		-	0.79	0.91	
VF(=)	Forward voltage drop	T <sub>j</sub> = 25 °C		-	1.02	1.17	V
		T <sub>j</sub> = 125 °C	1F - 10 A	-	0.90	1.04	

- 1. Pulse test:  $t_p = 5$  ms,  $\delta < 2\%$
- 2. Pulse test:  $t_p$  = 380  $\mu$ s,  $\delta$  < 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

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

Symbol	Parameter	Test conditions			Тур.	Max.	Unit
	Doverne receivery time	T <sub>i</sub> = 25 °C	$I_F = 1 \text{ A, } dI_F / dt = -50 \text{ A/} \mu \text{s, } V_R = 30 \text{ V}$	-	28	35	
чr	Reverse recovery time		I <sub>F</sub> = 1 A, dI <sub>F</sub> /dt = -100 A/µs, V <sub>R</sub> = 30 V	-	21	27	ns
I <sub>RM</sub>	Reverse recovery current	T <sub>j</sub> = 125 °C	$I_F = 5 \text{ A}, dI_F/dt = -200 \text{ A/}\mu\text{s}, V_R = 160 \text{ V}$	-	6.3		Α

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#### 1.1 Characteristics (curves)

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

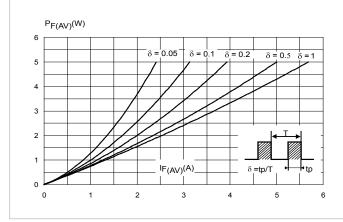


Figure 2. Forward voltage drop versus forward current (typical values, per diode)

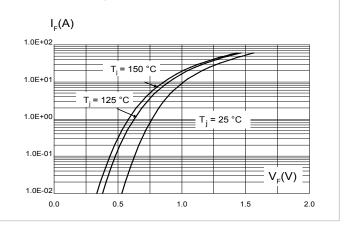


Figure 3. Forward voltage drop versus forward current (maximum values, per diode)

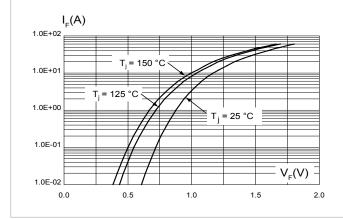


Figure 4. Relative variation of thermal impedance junction to case total versus pulse duration

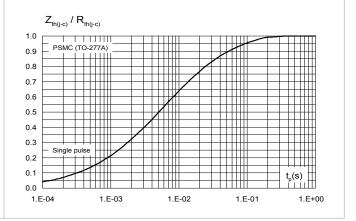


Figure 5. Peak reverse recovery current versus dIF/dt (typical values, per diode)

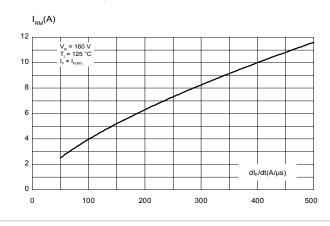
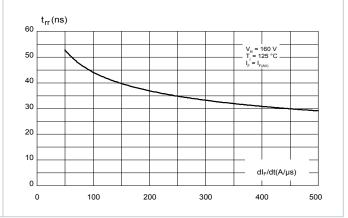


Figure 6. Reverse recovery time versus dIF/dt (typical values, per diode)



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values, per diode)  $Q_{RR}(nC)$ 

Figure 7. Reverse recovery charges versus dIF/dt (typical

160 120 80 40  $dI_F/dt(A/\mu s)$ 100 200 500 0 300 400

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

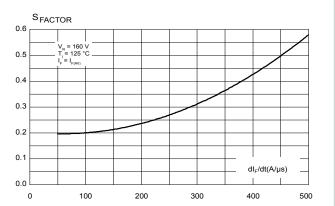


Figure 9. Relative variations of dynamic parameters versus junction temperature

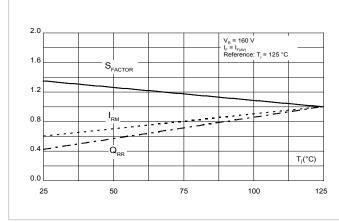


Figure 10. Junction capacitance versus reverse voltage applied (typical values, per diode)

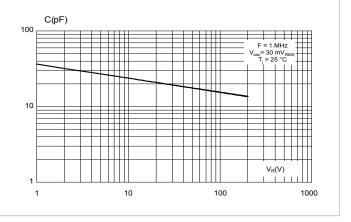
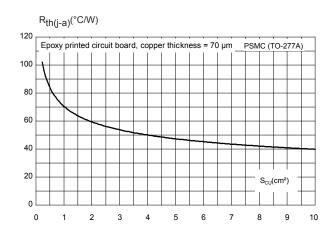


Figure 11. Thermal resistance junction to ambient versus copper surface under tab (typical values, epoxy printed board FR4,  $e_{Cu}$  = 70  $\mu$ m) (PSMC (TO-277A))



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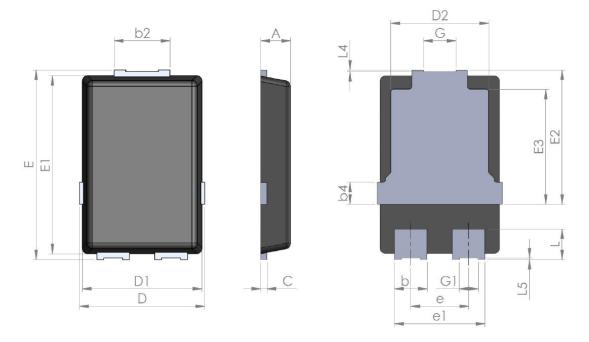
# 2 Package information

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



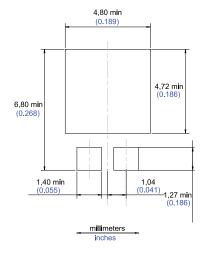
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Table 5. PSMC (TO-277A) package mechanical data

	Dimensions							
Ref.		Millimeters			Inches (for reference only)			
	Min.	Тур.	Max.	Min.	Тур.	Max.		
А	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			
С	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			
е		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

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# **3** Ordering information

**Table 6. Ordering information** 

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STTH1002CSFY	T1002CY	PSMC (TO-277A)	90 mg	6000	Tape and Reel

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# **Revision history**

**Table 7. Document revision history** 

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

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