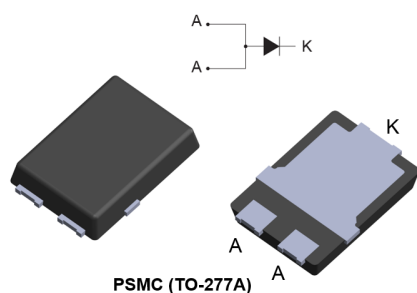


## Automotive 45 V power Schottky rectifier



### Features

- AEC-Q101 qualified 
- Low capacitance
- Negligible switching losses
- Avalanche capability specified
- 175 °C maximum junction temperature
- $V_{RRM}$  guaranteed from -40 °C to 175 °C
- Wettable flanks for automatic visual inspection
- PPAP capable
- ECOPACK<sup>®</sup>2 compliant component

### Application

- DC/DC converters
- Reverse polarity protection
- Freewheeling diodes
- Switching diodes

### Description

The **STPS1045SFY** power Schottky rectifier has been designed for automotive applications.

Packaged in PSMC (TO-277A), this device provides a very low  $V_F$  in a compact package which can withstand high operating junction temperature.

| Product status link         |        |
|-----------------------------|--------|
| <a href="#">STPS1045SFY</a> |        |
| Product summary             |        |
| Symbol                      | Value  |
| $I_{F(AV)}$                 | 10 A   |
| $V_{RRM}$                   | 45 V   |
| $T_j$ (max.)                | 175 °C |
| $V_F$ (typ.)                | 0.51 V |

# 1 Characteristics

**Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified with 2 anode terminals short-circuited)**

| Symbol             | Parameter                                                            | Value                                                       | Unit |
|--------------------|----------------------------------------------------------------------|-------------------------------------------------------------|------|
| V <sub>RRM</sub>   | Repetitive peak reverse voltage (T <sub>j</sub> = -40 °C to +175 °C) | 45                                                          | V    |
| I <sub>F(AV)</sub> | Average forward current, $\delta = 0.5$                              | T <sub>c</sub> = 140 °C<br>10                               | A    |
| I <sub>FSM</sub>   | Surge non repetitive forward current                                 | t <sub>p</sub> = 10 ms sinusoidal<br>210                    | A    |
| P <sub>ARM</sub>   | Repetitive peak avalanche power                                      | t <sub>p</sub> = 10 $\mu$ s, T <sub>j</sub> = 125 °C<br>172 | W    |
| T <sub>stg</sub>   | Storage temperature range                                            | -65 to +175                                                 | °C   |
| T <sub>j</sub>     | Operating junction temperature range <sup>(1)</sup>                  | -40 to +175                                                 | °C   |

1.  $(dP_{tot}/dT_j) < (1/R_{th(j-a)})$  condition to avoid thermal runaway for a diode on its own heatsink.

**Table 2. Thermal resistance parameters**

| Symbol               | Parameter        | Typ. | Unit |
|----------------------|------------------|------|------|
| R <sub>th(j-c)</sub> | Junction to case | 2.5  | °C/W |

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

- AN5088: Rectifiers thermal management, handling and mounting recommendations

**Table 3. Static electrical characteristics (anode terminals short-circuited)**

| 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> = V <sub>RRM</sub> | -    | 50   | $\mu$ A |
|                               |                         | T <sub>j</sub> = 125 °C |                                   | -    | 7    | mA      |
| V <sub>F</sub> <sup>(2)</sup> | Forward voltage drop    | T <sub>j</sub> = 25 °C  | I <sub>F</sub> = 5 A              | -    | 0.54 | V       |
|                               |                         | T <sub>j</sub> = 125 °C |                                   | -    | 0.41 |         |
|                               |                         | T <sub>j</sub> = 25 °C  | I <sub>F</sub> = 10 A             | -    | 0.62 |         |
|                               |                         | T <sub>j</sub> = 125 °C |                                   | -    | 0.51 |         |

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

2. Pulse test: t<sub>p</sub> = 380  $\mu$ s,  $\delta < 2\%$

To evaluate the conduction losses, use the following equation:

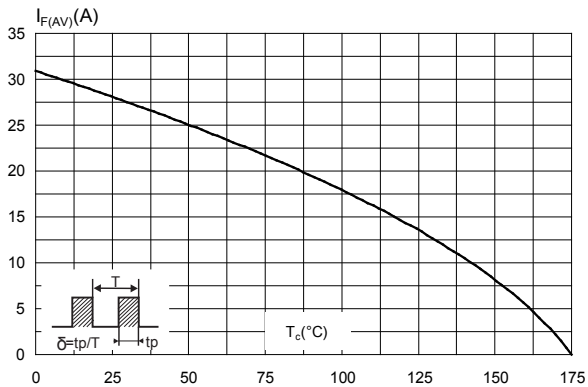
$$P = 0.35 \times I_{F(AV)} + 0.022 \times I_{F(RMS)}^2$$

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

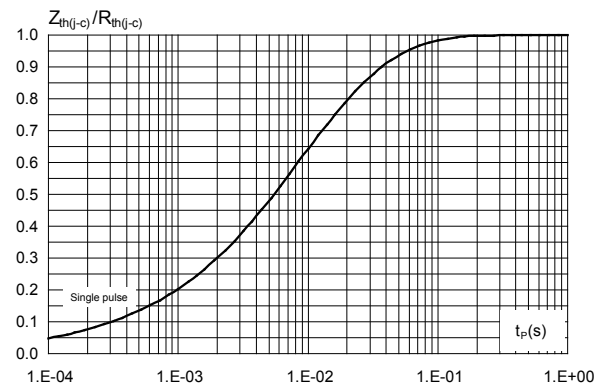
- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses in a power diode

## 1.1 Characteristics (curves)

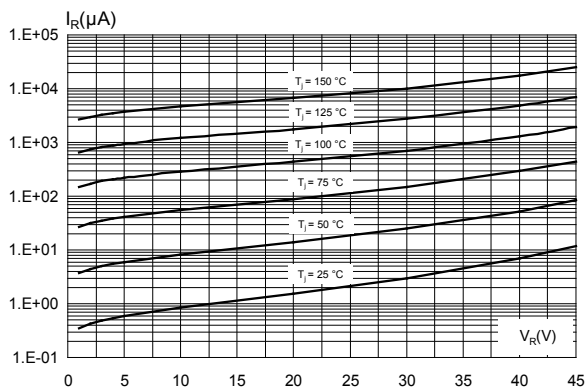
**Figure 1. Average forward current versus case temperature ( $\delta = 0.5$ )**



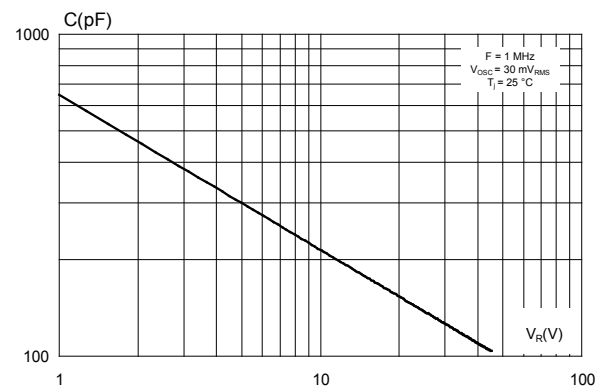
**Figure 2. Relative variation of thermal impedance junction to case versus pulse duration**



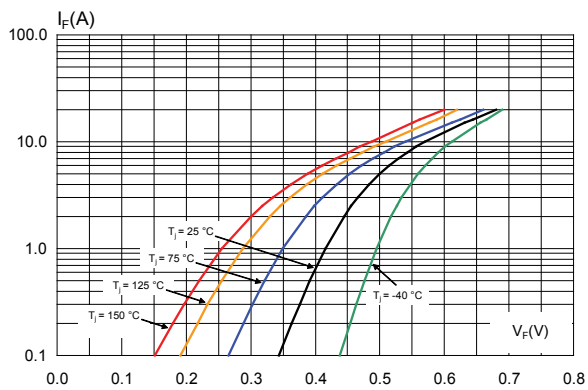
**Figure 3. Reverse leakage current versus reverse voltage applied (typical values)**



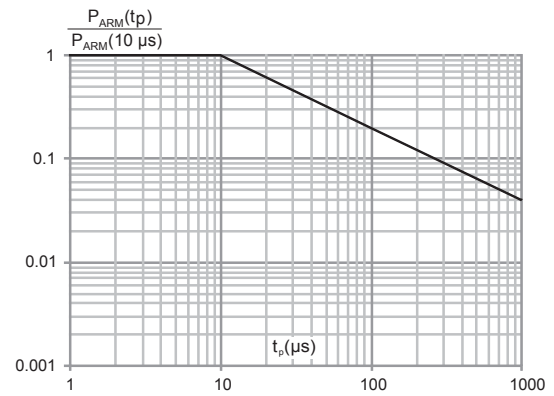
**Figure 4. Junction capacitance versus reverse voltage applied (typical values)**



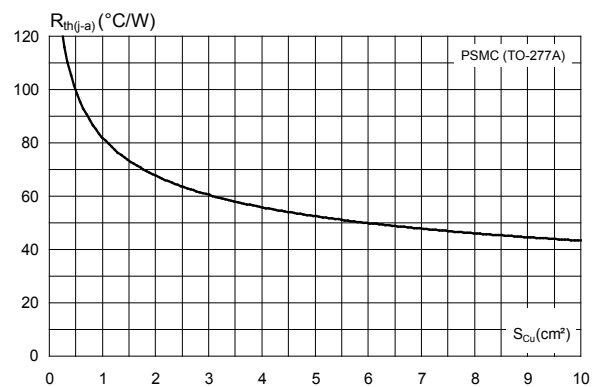
**Figure 5. Forward voltage drop versus forward current (typical values)**



**Figure 6. Normalized avalanche power derating versus pulse duration ( $T_J = 125\text{ °C}$ )**



**Figure 7. Thermal resistance junction to ambient versus copper surface under tab (typical values, epoxy printed board FR4,  $e_{Cu} = 35\text{ μm}$ ) (PSMC (TO-277A))**



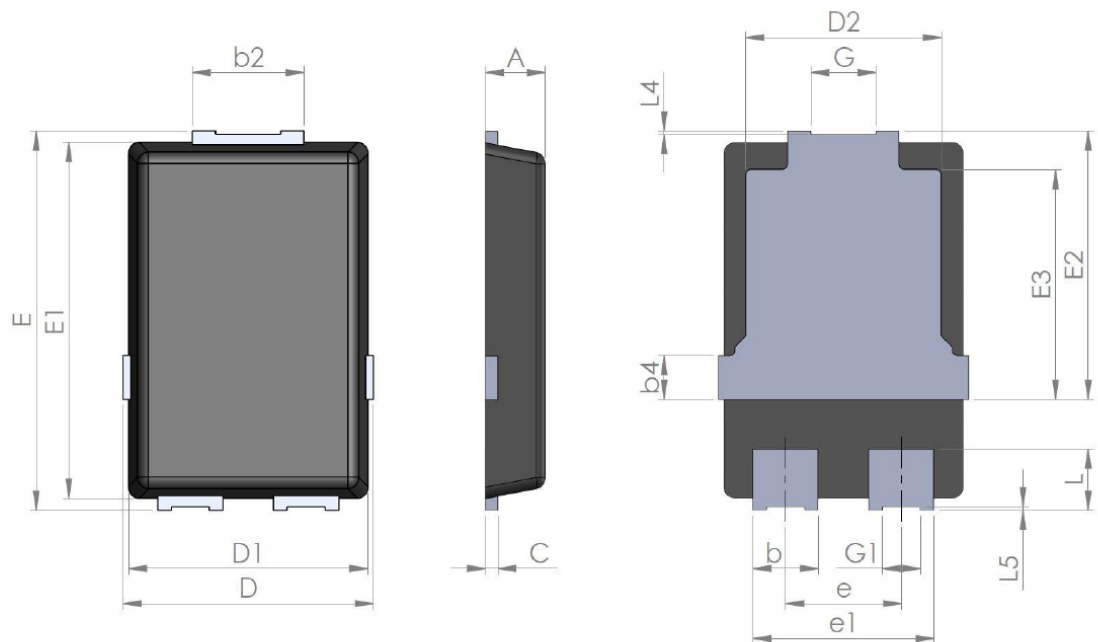
## 2 Package information

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](http://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 8. PSMC (TO-277A) package outline**

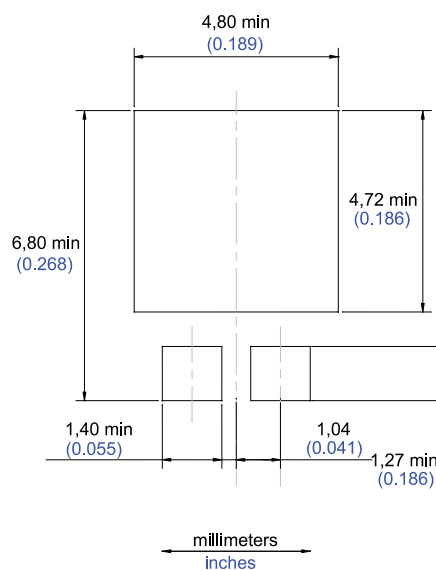


**Table 4. PSMC (TO-277A) package mechanical data**

| 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 |

| Ref. | Dimensions  |      |      |                             |       |       |
|------|-------------|------|------|-----------------------------|-------|-------|
|      | Millimeters |      |      | Inches (for reference only) |       |       |
|      | Min.        | Typ. | Max. | Min.                        | Typ.  | Max.  |
| 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                      |       |       |

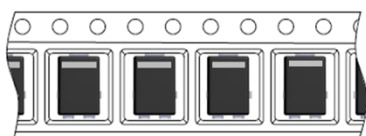
**Figure 9. PSMC (TO-277A) package footprint in mm (in inches)**



**Figure 10. PSMC (TO-277A) marking**

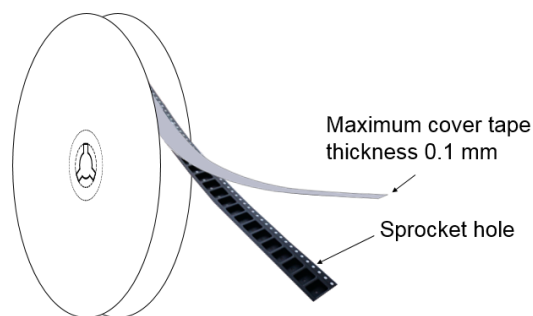


**Figure 11. Package orientation in reel**

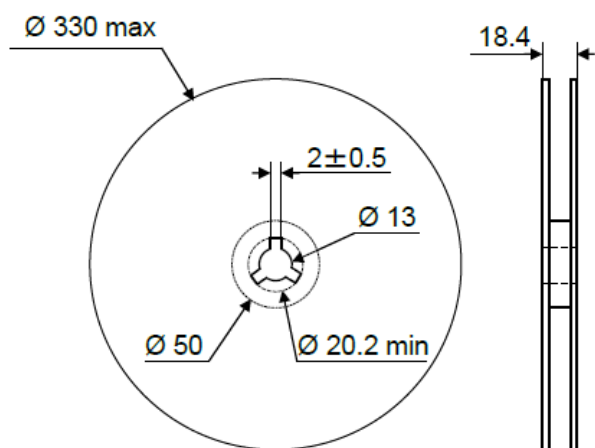


Taped according to EIA-481  
Note: Pocket dimensions are not on scale  
Pocket shape may vary depending on package  
Cathode band only on unidirectional devices

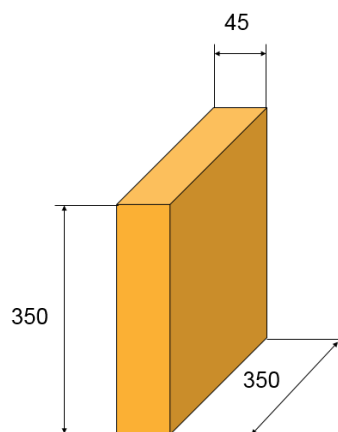
**Figure 12. Tape and reel orientation**



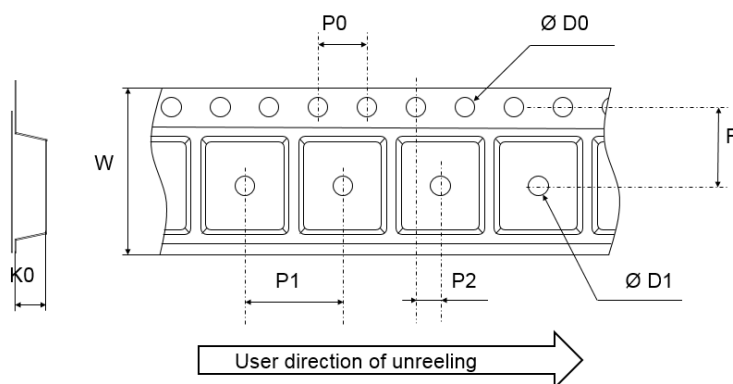
**Figure 13. 13" reel dimension values**



**Figure 14. Inner box dimension values**



**Figure 15. Tape outline**



Note: Pocket dimensions are not on scale  
Pocket shape may vary depending on package

**Table 5. Tape dimension values**

| Ref. | Dimensions  |      |      |
|------|-------------|------|------|
|      | Millimeters |      |      |
|      | Min.        | Typ. | Max. |
| D0   | 1.5         | 1.55 | 1.6  |
| D1   | 1.5         |      |      |
| F    | 5.45        | 5.5  | 5.55 |
| K0   | 1.3         | 1.4  | 1.5  |
| P0   | 3.9         | 4.0  | 4.1  |
| P1   | 7.9         | 8.0  | 8.1  |
| P2   | 1.95        | 2.0  | 2.05 |
| W    | 11.7        | 12   | 12.3 |



### 3 Ordering information

**Table 6. Ordering information**

| Order code  | Marking | Package        | Weight | Base qty. | Delivery mode |
|-------------|---------|----------------|--------|-----------|---------------|
| STPS1045SFY | PS1045Y | PSMC (TO-277A) | 90 mg  | 6000      | Tape and Reel |

## Revision history

**Table 7. Document revision history**

| Date        | Version | Changes          |
|-------------|---------|------------------|
| 06-Aug-2018 | 1       | Initial release. |

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