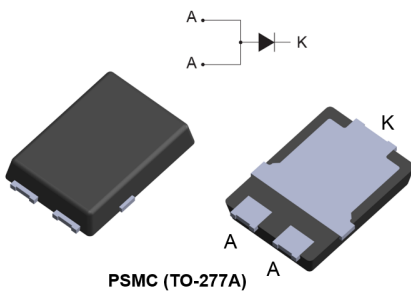



## Automotive 45 V power Schottky rectifier



### 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, δ = 0.5                                     | T <sub>c</sub> = 140 °C                         | A    |
| I <sub>FSM</sub>   | Surge non repetitive forward current                                 | t <sub>p</sub> = 10 ms sinusoidal               | A    |
| P <sub>ARM</sub>   | Repetitive peak avalanche power                                      | t <sub>p</sub> = 10 μs, T <sub>j</sub> = 125 °C | 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   | μA |
|                               |                         | T <sub>j</sub> = 125 °C |                                   | -    | 7    | 23   | 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 | 0.46 |    |
|                               |                         | T <sub>j</sub> = 25 °C  | I <sub>F</sub> = 10 A             | -    |      | 0.62 |    |
|                               |                         | T <sub>j</sub> = 125 °C |                                   | -    | 0.51 | 0.57 |    |

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

2. Pulse test: t<sub>p</sub> = 380 μs, δ < 2%

To evaluate the conduction losses, use the following equation:

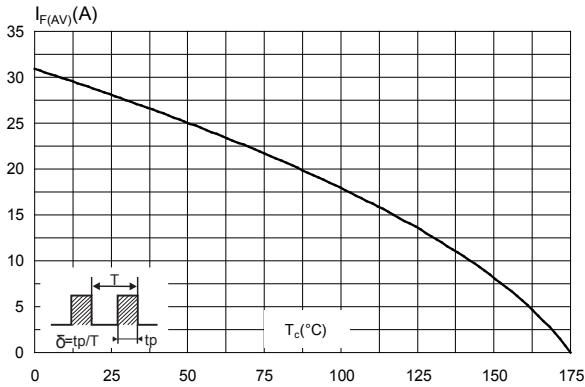
$$P = 0.35 \times I_{F(AV)} + 0.022 \times I_{F(RMS)}^2$$

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

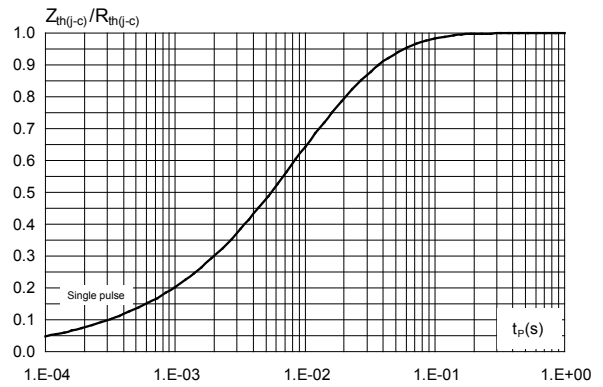
- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses in a power diode

### 1.1 Characteristics (curves)

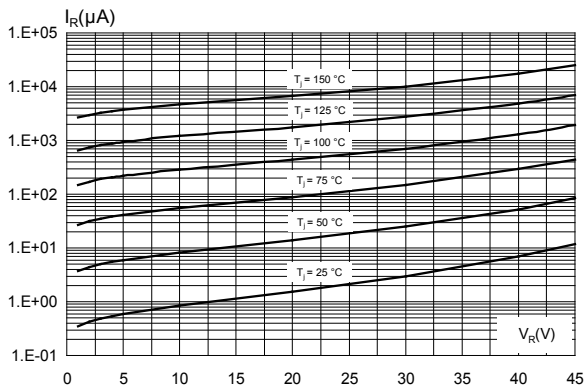
**Figure 1. Average forward current versus case temperature ( $\delta = 0.5$ )**



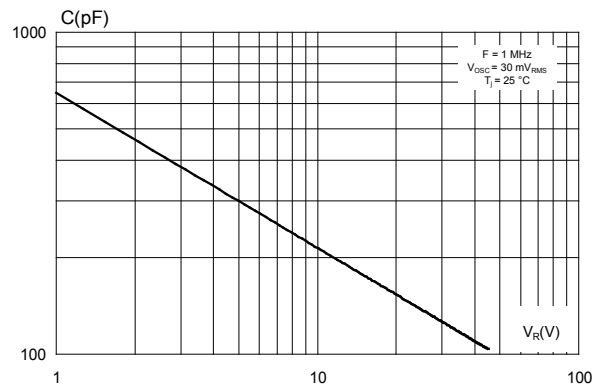
**Figure 2. Relative variation of thermal impedance junction to case versus pulse duration**



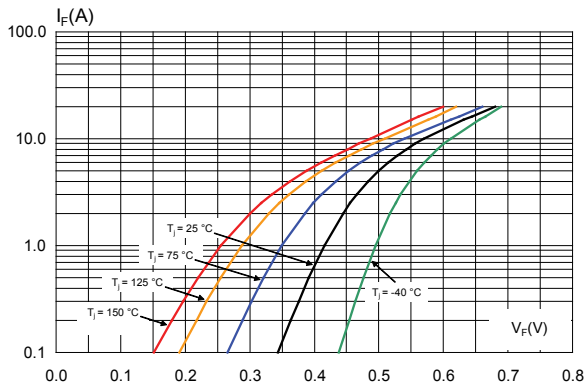
**Figure 3. Reverse leakage current versus reverse voltage applied (typical values)**



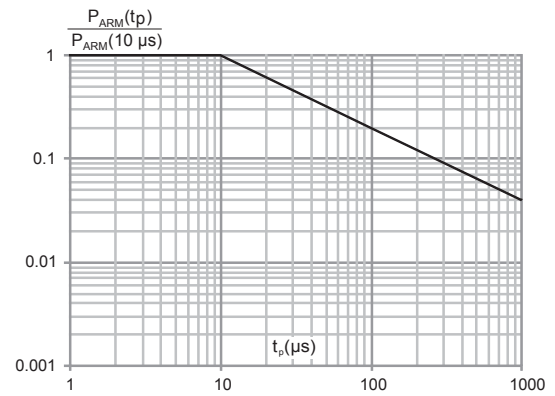
**Figure 4. Junction capacitance versus reverse voltage applied (typical values)**



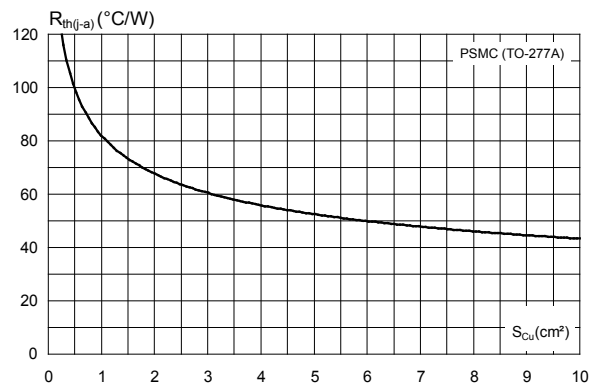
**Figure 5. Forward voltage drop versus forward current (typical values)**



**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,  $e_{Cu} = 35\text{ }\mu\text{m}$ ) (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

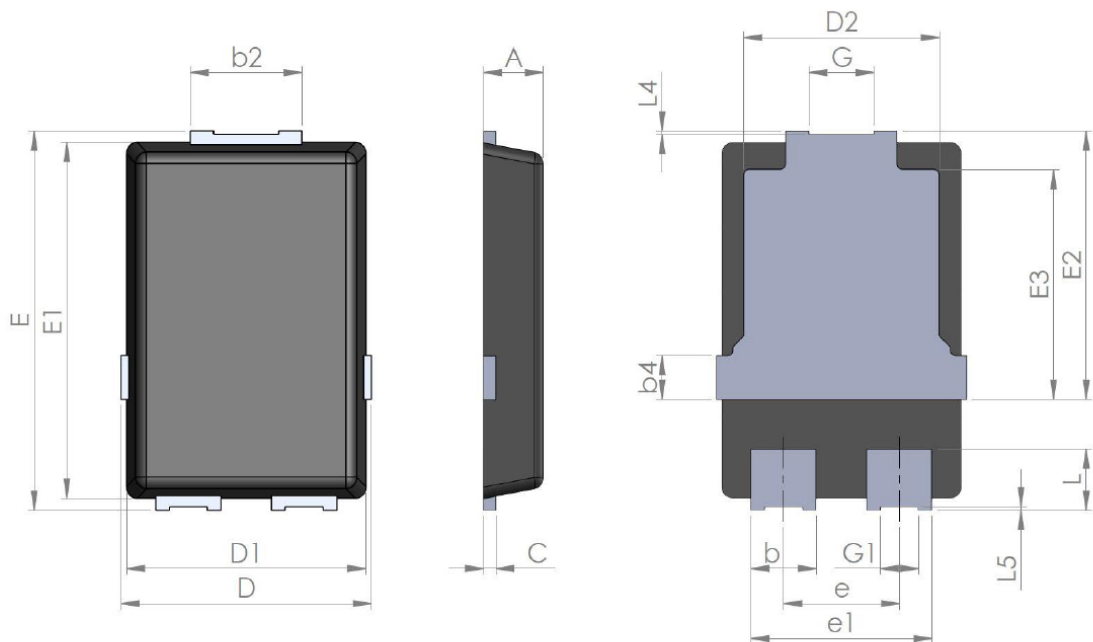


Table 4. PSMC (TO-277A) package mechanical data

| 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)**

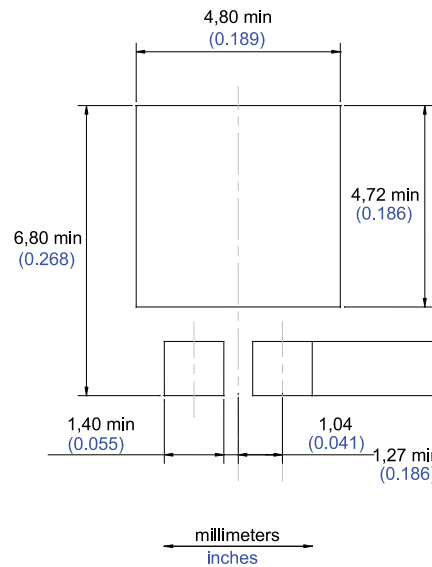
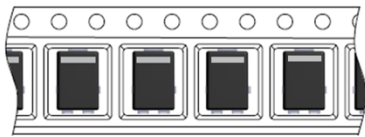


Figure 10. PSMC (TO-277A) marking



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

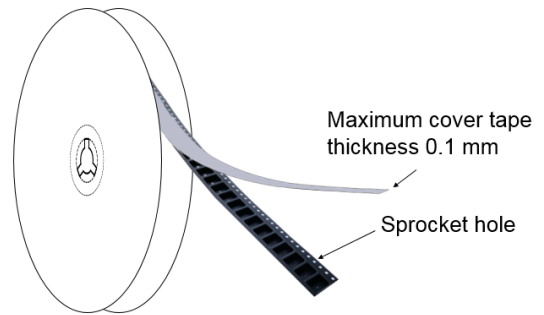


Figure 13. 13" reel dimension values

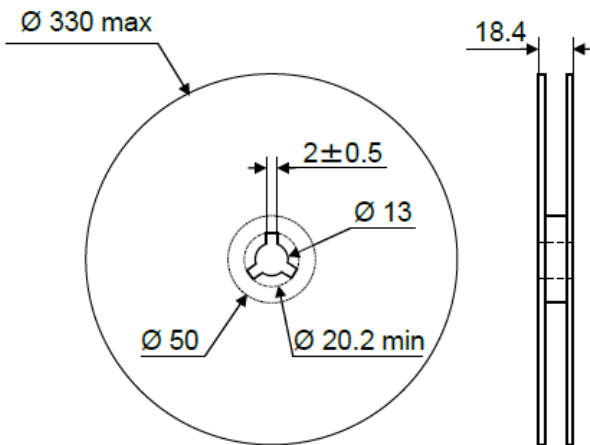


Figure 14. Inner box dimension values

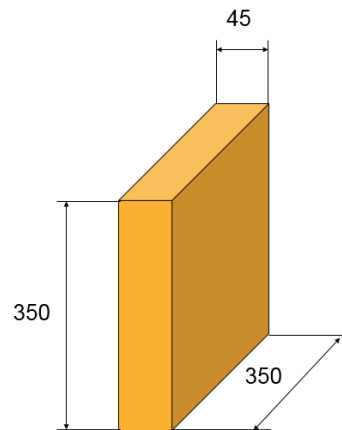


Figure 15. Tape outline



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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