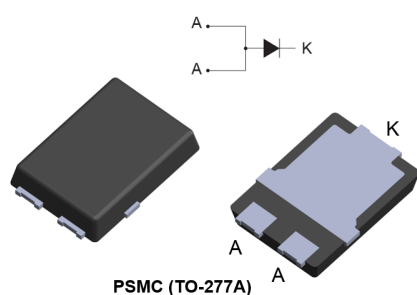


## 45 V power Schottky rectifier



### Features

- Low profile design – package height of 1.1 mm typ.
- Wettable flanks for automatic visual inspection
- High junction temperature capability
- Low Leakage current
- Avalanche capability
- ECOPACK®2 compliant

### Applications

- Set-top box
- Battery charger
- DC / DC converter

### Description

This 45 V Schottky barrier rectifier has been optimized for use in high frequency miniature DC/DC converters, reverse battery protection, battery chargers and adaptors.

Packaged in PSMC (TO-277A), the [STPS1045SF](#) provides a high level of performance in a compact and flat package which can withstand very high operating junction temperature.

| Product status link        |        |
|----------------------------|--------|
| <a href="#">STPS1045SF</a> |        |
| Product summary            |        |
| Symbol                     | Value  |
| $I_{F(AV)}$                | 10 A   |
| $V_{RRM}$                  | 45 V   |
| $T_j \text{ (max.)}$       | 175 °C |
| $V_F \text{ (typ.)}$       | 0.51 V |

# 1 Characteristics

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

| Symbol      | Parameter                                             |                                                       | Value       | Unit |
|-------------|-------------------------------------------------------|-------------------------------------------------------|-------------|------|
| $V_{RRM}$   | Repetitive peak reverse voltage                       |                                                       | 45          | V    |
| $I_{F(AV)}$ | Average forward current, $\delta = 0.5$ square wave   | $T_c = 140\text{ °C}$                                 | 10          | A    |
| $I_{FSM}$   | Surge non repetitive forward current                  | $t_p = 10\text{ ms}$ sinusoidal                       | 210         | A    |
| $P_{ARM}$   | Repetitive peak avalanche power                       | $t_p = 10\text{ }\mu\text{s}$ , $T_j = 125\text{ °C}$ | 172         | W    |
| $T_{stg}$   | Storage temperature range                             |                                                       | -65 to +175 | °C   |
| $T_j$       | Maximum operating junction temperature <sup>(1)</sup> |                                                       | +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. value | Unit |
|---------------|------------------|------------|------|
| $R_{th(j-c)}$ | 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          |
|-------------|-------------------------|-----------------------|---------------------|------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ °C}$  | $V_R = V_{RRM}$     | -    |      | 50   | $\mu\text{A}$ |
|             |                         | $T_j = 125\text{ °C}$ |                     | -    | 7    | 23   | mA            |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25\text{ °C}$  | $I_F = 5\text{ A}$  | -    |      | 0.54 | V             |
|             |                         | $T_j = 125\text{ °C}$ |                     | -    | 0.41 | 0.46 |               |
|             |                         | $T_j = 25\text{ °C}$  | $I_F = 10\text{ A}$ | -    |      | 0.62 |               |
|             |                         | $T_j = 125\text{ °C}$ |                     | -    | 0.51 | 0.57 |               |

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 conduction losses, use the following equation:

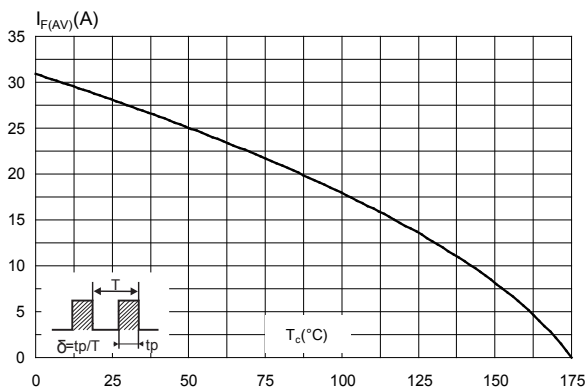
$$P = 0.35 \times I_{F(AV)} + 0.022 \times I_F^2(RMS)$$

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

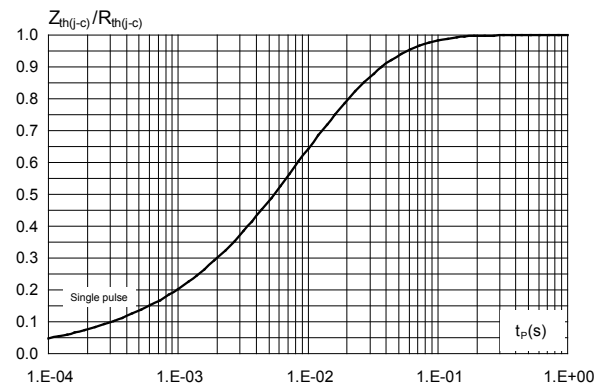
- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses in a power diode

## 1.1 Characteristics (curves)

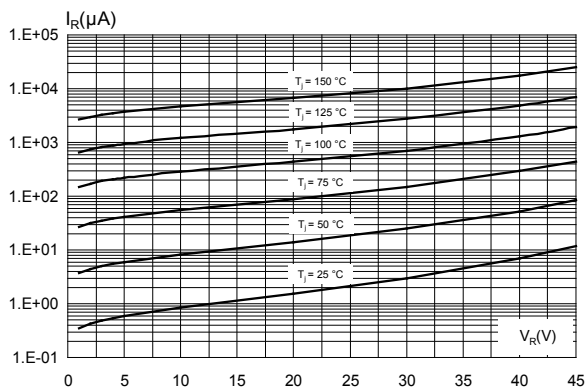
**Figure 1. Average forward current versus case temperature ( $\delta = 0.5$ )**



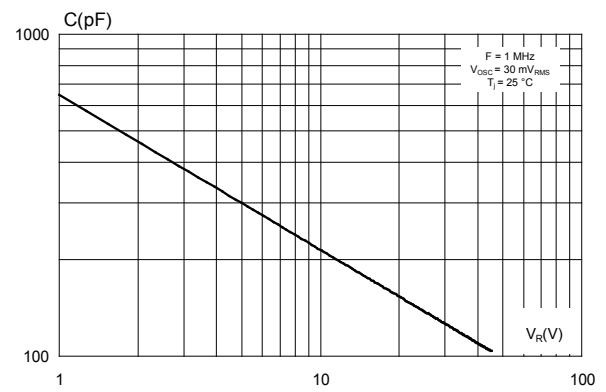
**Figure 2. Relative variation of thermal impedance junction to case versus pulse duration**



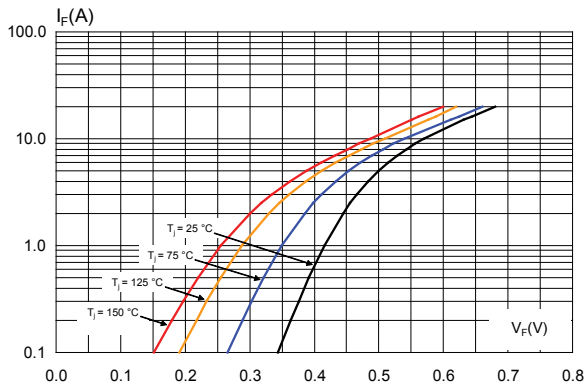
**Figure 3. Reverse leakage current versus reverse voltage applied (typical values)**



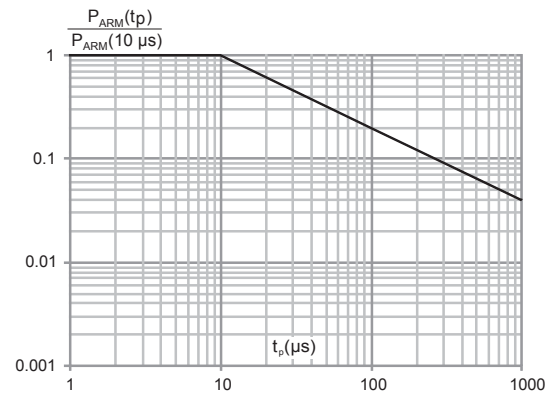
**Figure 4. Junction capacitance versus reverse voltage applied (typical values)**



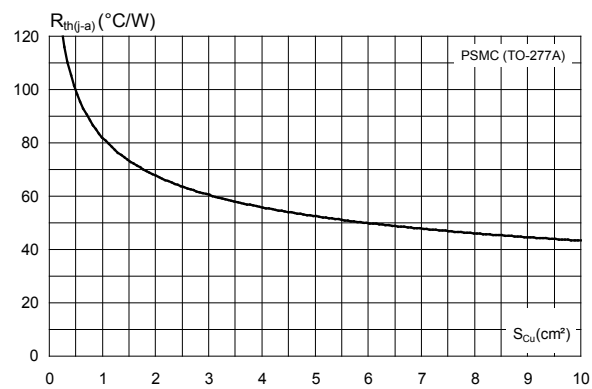
**Figure 5. Forward voltage drop versus forward current (typical values)**



**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))**



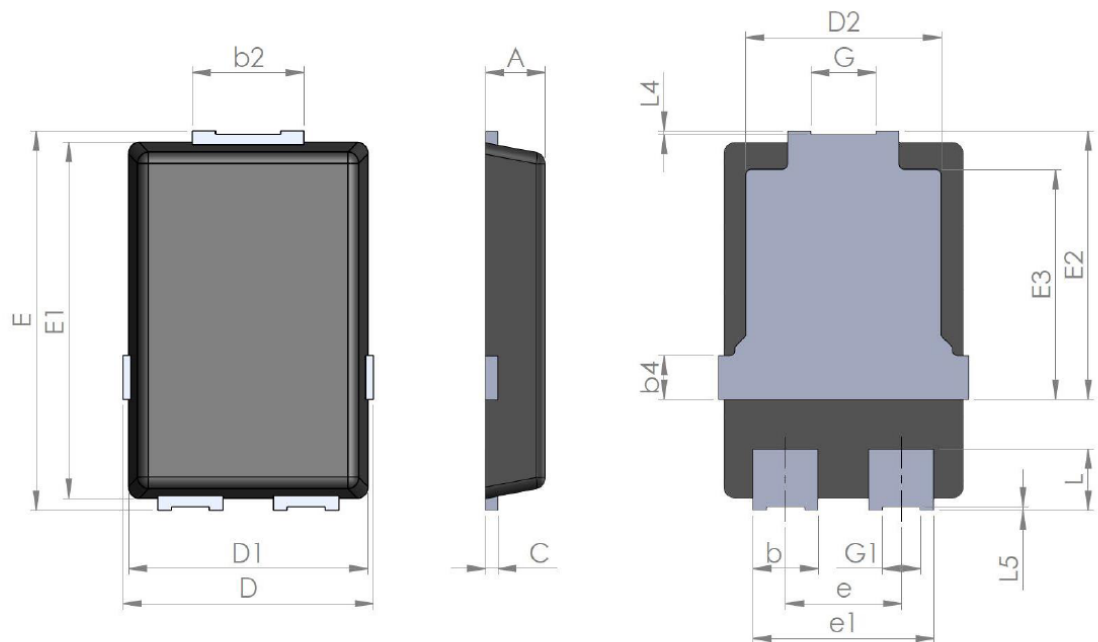
## 2 Package information

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**

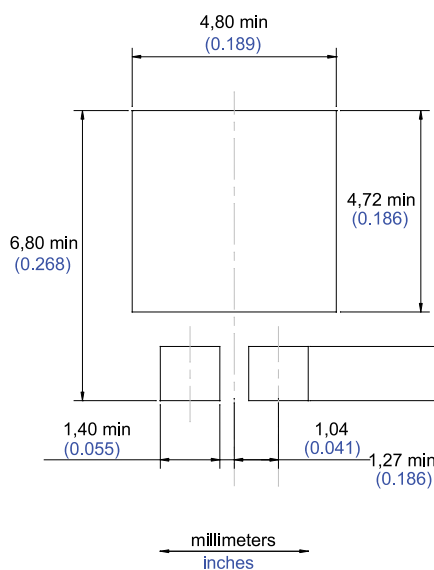


**Table 4. PSMC (TO-277A) package mechanical data**

| 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)**



### 3 Ordering information

**Table 5. Ordering information**

| Order code | Marking | Package        | Weight | Base qty. | Delivery mode |
|------------|---------|----------------|--------|-----------|---------------|
| STPS1045SF | PS1045  | PSMC (TO-277A) | 90 mg  | 6000      | Tape and Reel |

## Revision history

**Table 6. Document revision history**

| Date        | Version | Changes          |
|-------------|---------|------------------|
| 27-Jul-2018 | 1       | Initial release. |



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