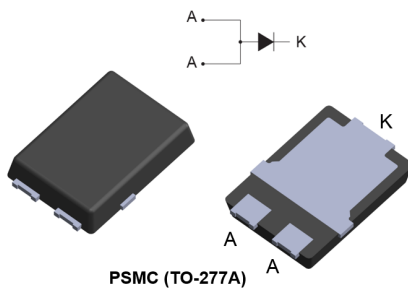



## Automotive 100 V, 5 A low $I_r$ power Schottky rectifier



### Features

- AEC-Q101 qualified 
- PPAP capable
- $V_{RRM}$  guaranteed from  $-40\text{ }^{\circ}\text{C}$  to  $175\text{ }^{\circ}\text{C}$
- Low leakage current
- Avalanche capability specified
- Very low conduction losses
- High junction temperature capability
- Low profile design - 1.1 mm package typical height
- Wettable flanks for automatic visual inspection
- ECOPACK2 compliant component

### Applications

- DC / DC converter
- Auxiliary Power supply
- Freewheeling function
- Reverse battery protection

### Description

The 5 A, 100 V power Schottky rectifier has been designed for automotive applications.

Packaged in PSMC (TO-277A), the STPS5S100SFY provides a high level of performance in a compact and flat package which can withstand high operating junction temperature.

| Product status link |                        |
|---------------------|------------------------|
| STPS5S100SFY        |                        |
| Product summary     |                        |
| Symbol              | Value                  |
| $I_{F(AV)}$         | 5 A                    |
| $V_{RRM}$           | 100 V                  |
| $T_j$ (max.)        | 175 $^{\circ}\text{C}$ |
| $V_F$ (typ.)        | 0.590 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) | 100   | V    |
| I <sub>F(AV)</sub> | Average forward current, δ = 0.5                                     | T <sub>c</sub> = 160 °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 | 1.46 | °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  | -    |       | 2.5   | μA   |
|                               |                         | T <sub>j</sub> = 125 °C | -    | 0.85  | 2.0   | mA   |
| V <sub>F</sub> <sup>(2)</sup> | Forward voltage drop    | T <sub>j</sub> = 25 °C  | -    |       | 0.720 | V    |
|                               |                         | T <sub>j</sub> = 125 °C | -    | 0.525 | 0.595 |      |
|                               |                         | T <sub>j</sub> = 25 °C  | -    |       | 0.820 |      |
|                               |                         | T <sub>j</sub> = 125 °C | -    | 0.590 | 0.670 |      |

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:

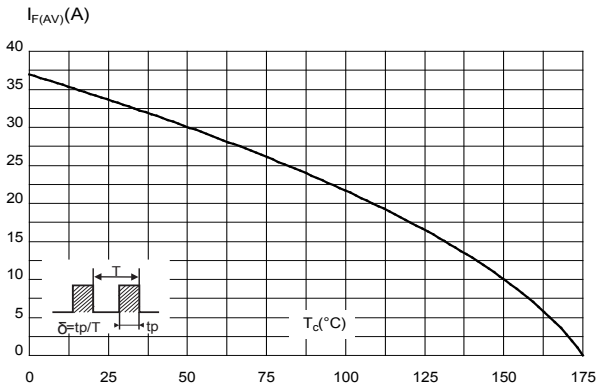
$$P = 0.520 \times I_{F(AV)} + 0.030 \times I_{F(RMS)}^2$$

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

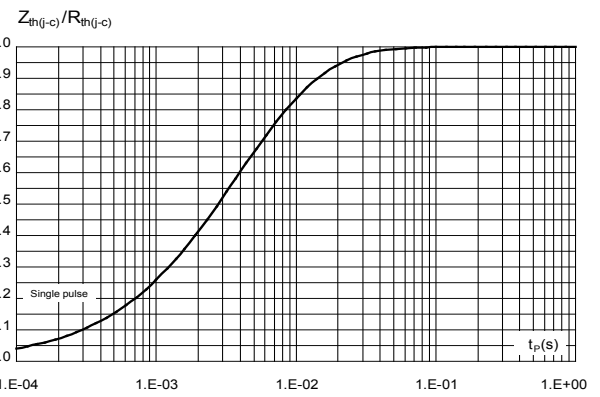
- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses in a power diode

## 1.1 Characteristics (curves)

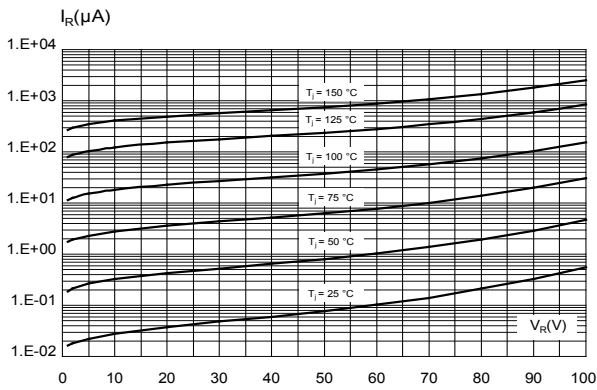
**Figure 1. Average forward current versus case temperature ( $\delta = 0.5$ )**



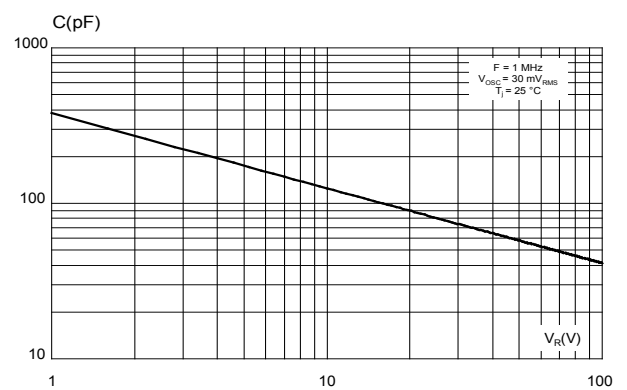
**Figure 2. Relative variation of thermal impedance junction to case versus pulse duration**



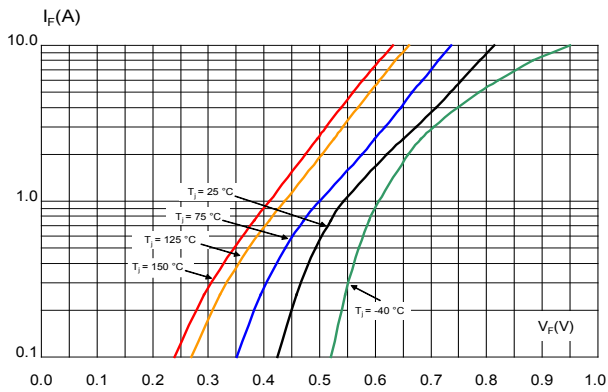
**Figure 3. Reverse leakage current versus reverse voltage applied (typical values)**



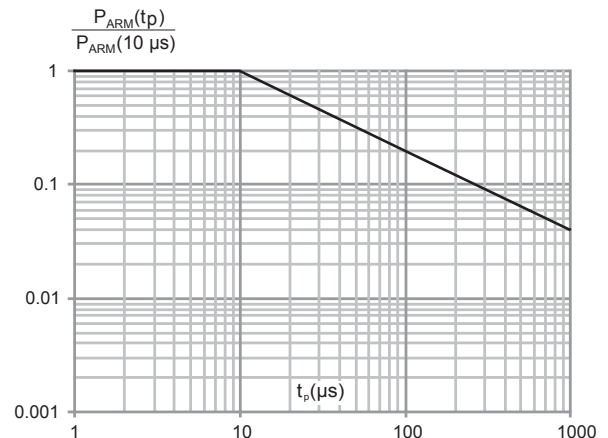
**Figure 4. Junction capacitance versus reverse voltage applied (typical values)**



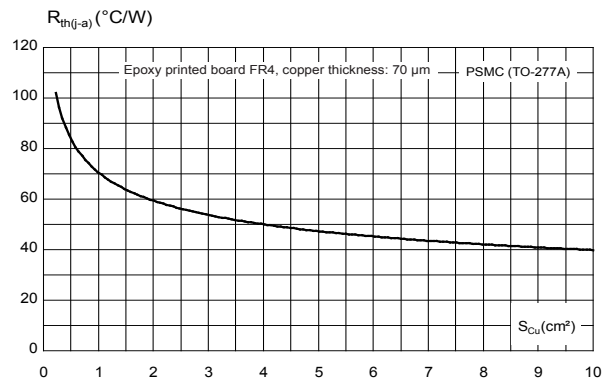
**Figure 5. Forward voltage drop versus forward current (typical values)**



**Figure 6. Normalized avalanche power derating versus pulse duration ( $T_j = 125$  °C)**



**Figure 7. Thermal resistance junction to ambient versus copper surface under tab (typical values, epoxy printed board FR4,  $e_{Cu} = 70 \mu m$ ) (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**

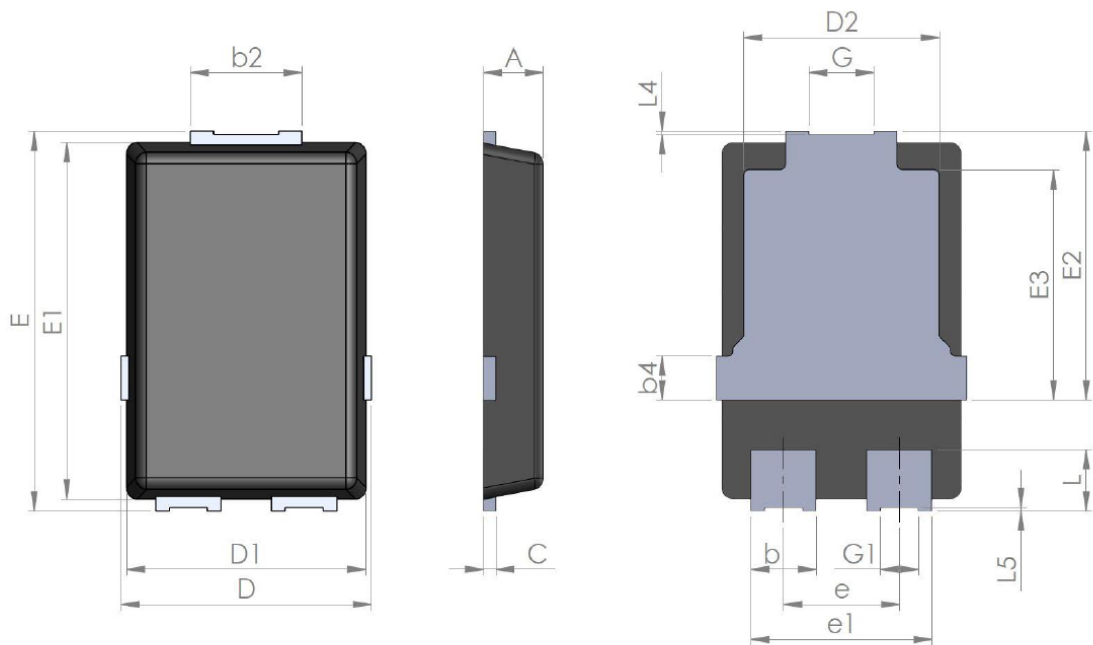
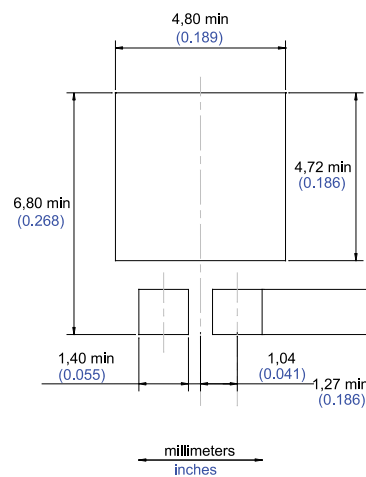


Table 4. PSMC (TO-277A) package mechanical data

| 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 |
| 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)



Note: For package and tape orientation, reel and inner box dimensions and tape outline please check [TN1173](#)

### 3 Ordering information

**Table 5. Ordering information**

| Order code   | Marking | Package        | Weight | Base qty. | Delivery mode |
|--------------|---------|----------------|--------|-----------|---------------|
| STPS5S100SFY | Y5S100  | PSMC (TO-277A) | 90 mg  | 6000      | Tape and Reel |

## Revision history

**Table 6. Document revision history**

| Date        | Version | Changes          |
|-------------|---------|------------------|
| 01-Dec-2020 | 1       | Initial release. |



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