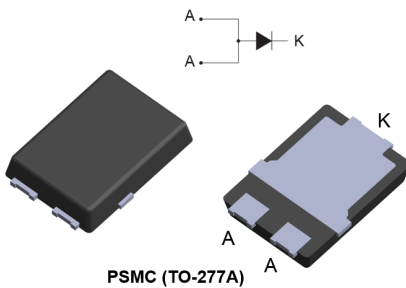


## 100 V - 12 A power Schottky trench rectifier



## Features

- ST trench patented process
- High junction temperature capability
- Low forward voltage drop
- Low recovery charges
- Reduces conduction, reverse and switching losses
- Avalanche tested
- Flat packages
- ECOPACK2 compliant

## Applications

- DC/DC converter
- LED lighting
- Flyback topology
- Auxiliary power supply
- Switch mode power supply (SMPS)



## Description

This 12 A, 100 V rectifier is based on ST trench technology that achieves the best-in-class  $V_F/I_R$  trade-off for a given silicon surface.

Integrated in flat and space-saving packages, this STPST12H100 trench rectifier is intended to be used in high frequency miniature switched mode power supplies. It is also an ideal candidate for auxiliary power supply in telecom, server, or smart metering. ST trench rectifiers are adapted to freewheeling, OR-ring or reverse polarity protection applications, and can be the perfect companion device to our transistors, drivers, or ST VIPer products.

## Product label



## Product status link

[STPST12H100](#)

## Product summary

|              |         |
|--------------|---------|
| $I_{F(AV)}$  | 12 A    |
| $V_{RRM}$    | 100 V   |
| $T_j$ (max.) | 175 °C  |
| $V_F$ (typ.) | 0.570 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                       |   | 100         | V    |
| I <sub>F(AV)</sub> | Average forward current, $\delta = 0.5$ , square wave | T <sub>c</sub> = 155 °C   | 12          | A    |
| I <sub>FSM</sub>   | Surge non repetitive forward current                  | t <sub>p</sub> = 10 ms<br>sinusoidal                            | 230         | A    |
| I <sub>AS</sub>    | Single pulse avalanche current <sup>(1)</sup>         | T <sub>j</sub> = 25 °C, L = 300 $\mu$ H, V <sub>DD</sub> = 15 V | 16          | A    |
| T <sub>stg</sub>   | Storage temperature range                             |   | -65 to +175 | °C   |
| T <sub>j</sub>     | Maximum operating junction temperature <sup>(2)</sup> |   | +175        | °C   |

1. Please refer to [Figure 1](#) and [Figure 2](#) for the unclamped inductive switching test circuit, and waveform.
2.  $(dP_{tot}/dT_j) < (1/R_{th(j-a)})$  condition to avoid thermal runaway for a diode on its own heatsink.

**Table 2. Thermal resistance parameter**

| Symbol               | Parameter        | Typ. value | Unit |
|----------------------|------------------|------------|------|
| R <sub>th(j-c)</sub> | Junction to case | 1.0        | °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**

| Symbol                        | Parameter               | Test conditions         |                        | Min. | Typ.  | Max.  | Unit    |
|-------------------------------|-------------------------|-------------------------|------------------------|------|-------|-------|---------|
| I <sub>R</sub> <sup>(1)</sup> | Reverse leakage current | T <sub>j</sub> = 125 °C | V <sub>R</sub> = 70 V  | -    | 2.3   | 6.8   | mA      |
|                               |                         | T <sub>j</sub> = 25 °C  | V <sub>R</sub> = 100 V | -    |       | 24    | $\mu$ A |
|                               |                         | T <sub>j</sub> = 125 °C |                        | -    | 4.2   | 14    | mA      |
| V <sub>F</sub> <sup>(2)</sup> | Forward voltage drop    | T <sub>j</sub> = 25 °C  | I <sub>F</sub> = 6 A   | -    | 0.535 | 0.595 | V       |
|                               |                         | T <sub>j</sub> = 125 °C |                        | -    | 0.470 | 0.525 |         |
|                               |                         | T <sub>j</sub> = 25 °C  | I <sub>F</sub> = 12 A  | -    | 0.640 | 0.710 |         |
|                               |                         | T <sub>j</sub> = 125 °C |                        | -    | 0.570 | 0.625 |         |

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:

$$P = 0.425 \times I_{F(AV)} + 0.0167 \times I_F^2(RMS)$$

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 on a power diode

Figure 1. Current and voltage waveforms for avalanche energy test across D.U.T (device under test)

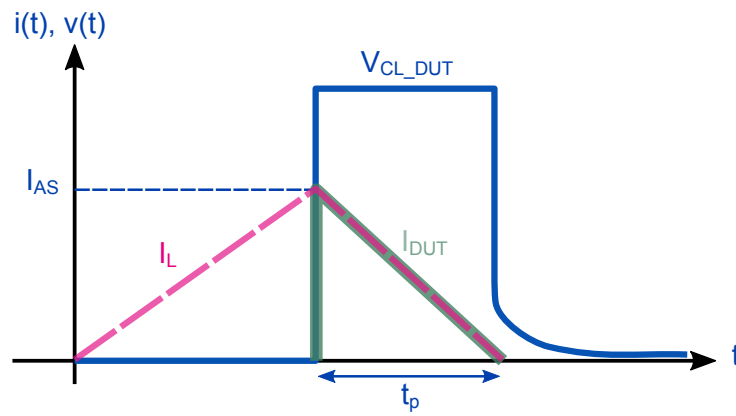
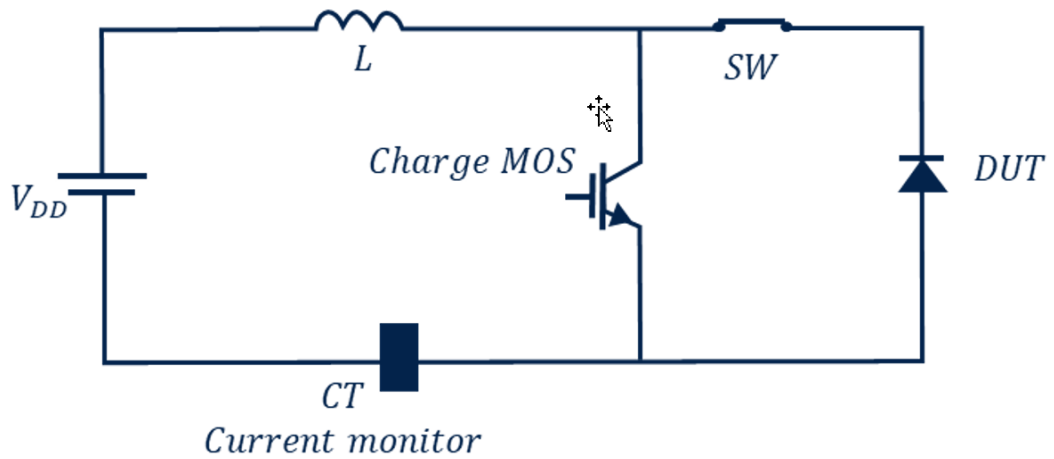


Figure 2. Unclamped Inductive Switching Test circuit

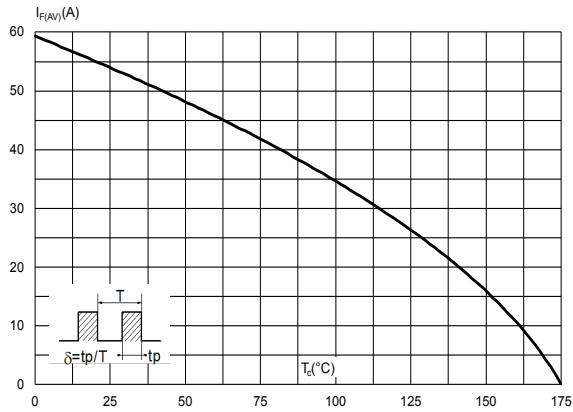


$$E_{AS} = \frac{1}{2} \times L \times I_{AS}^2 \times \left( \frac{V_{CLDUT}}{V_{CLDUT} - V_{DD}} \right) \cong \frac{1}{2} \times L \times I_{AS}^2$$

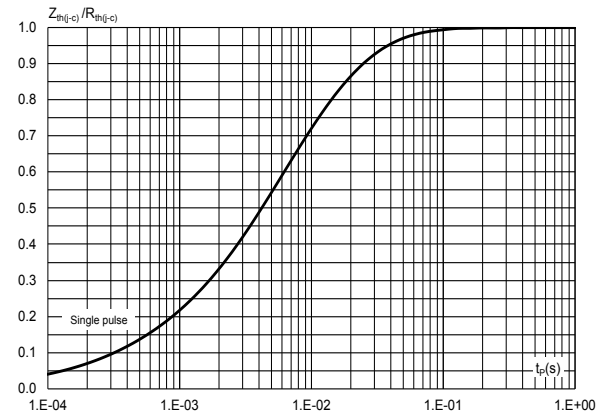
$$t_p = \left( \frac{L \times I_{AS}}{V_{CLDUT} - V_{DD}} \right)$$

## 1.1 Characteristics (curves)

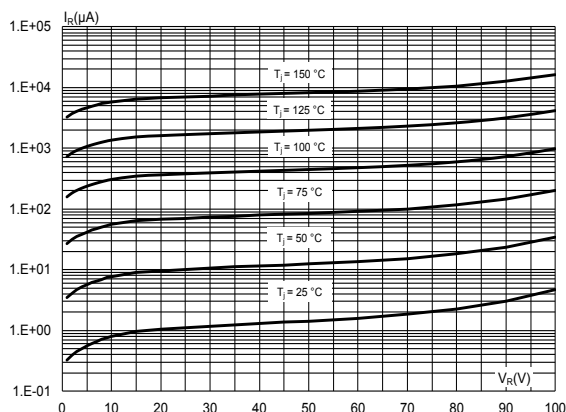
**Figure 3. Average forward current versus case temperature ( $\delta = 0.5$ )**



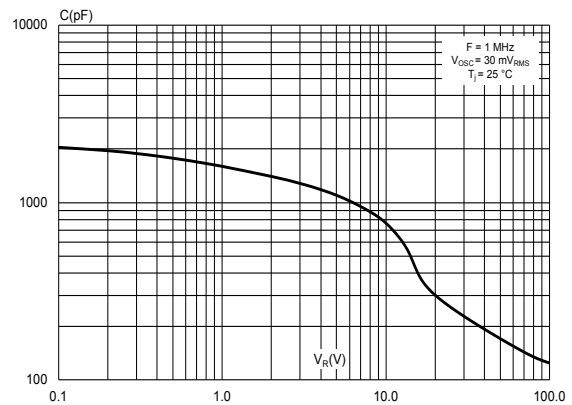
**Figure 4. Relative variation of thermal impedance junction to case versus pulse duration**



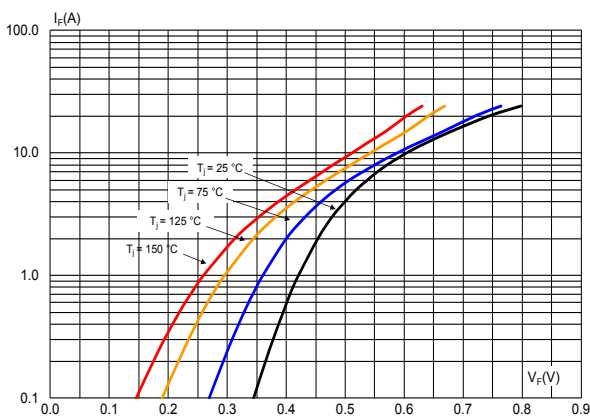
**Figure 5. Reverse leakage current versus reverse voltage applied (typical values)**



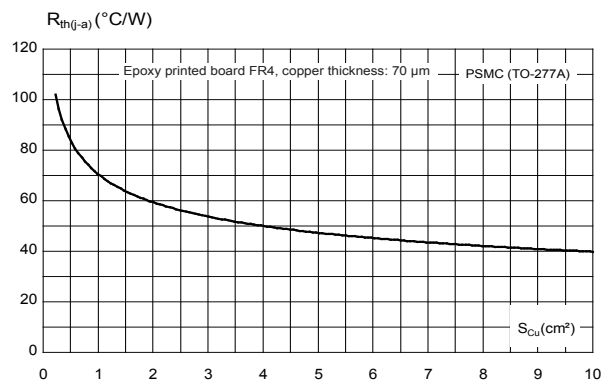
**Figure 6. Junction capacitance versus reverse voltage applied (typical values)**



**Figure 7. Forward voltage drop versus forward current (typical values)**



**Figure 8. Thermal resistance junction to ambient versus copper surface under tab (typical values, epoxy printed board FR4,  $e_{Cu} = 70 \mu\text{m}$ )**



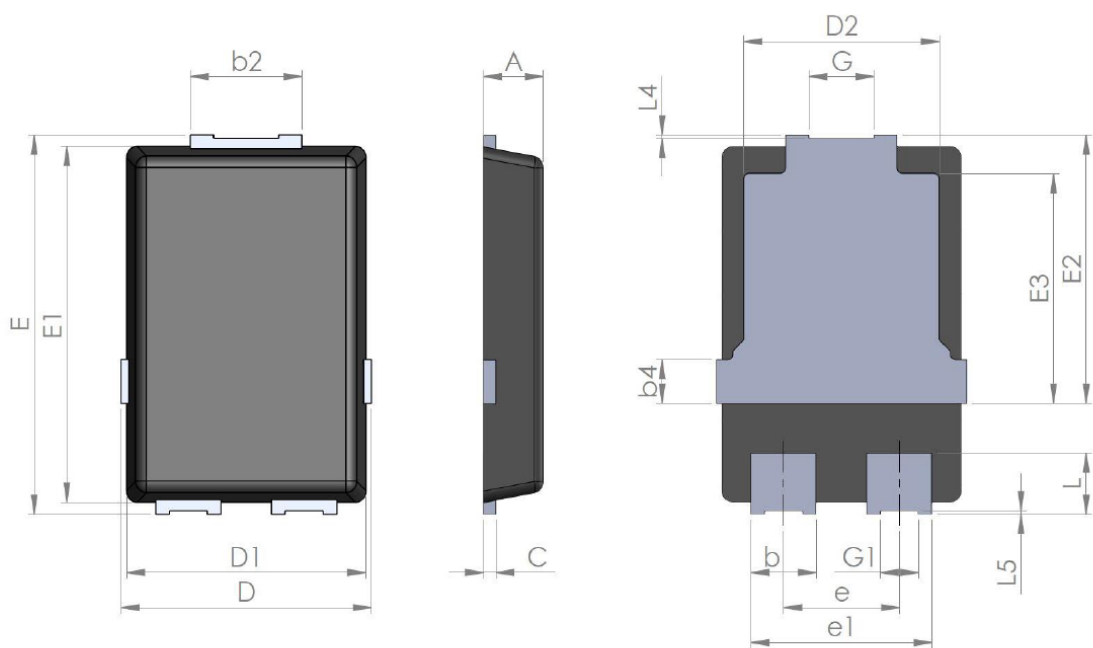
## 2 Package information

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 9. PSMC (TO-277A) package outline**

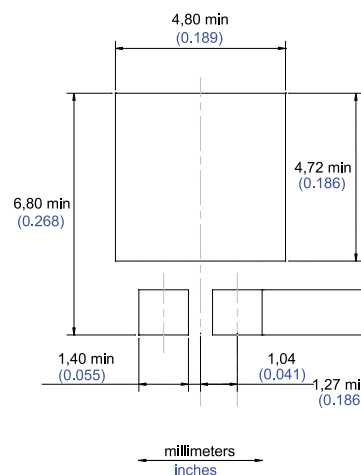


**Note:** *This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.*

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 10. 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 |
|---------------|---------|----------------|---------|-----------|---------------|
| STPST12H100SF | T12H1   | PSMC (TO-277A) | 90.0 mg | 6000      | Tape and reel |

## Revision history

**Table 6. Document revision history**

| Date        | Revision | Changes          |
|-------------|----------|------------------|
| 02-Jan-2023 | 1        | Initial release. |



**IMPORTANT NOTICE – READ CAREFULLY**

STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST’s terms and conditions of sale in place at the time of order acknowledgment.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of purchasers’ products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, refer to [www.st.com/trademarks](http://www.st.com/trademarks). All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2023 STMicroelectronics – All rights reserved