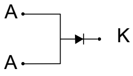
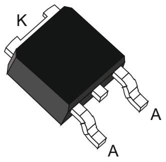
# STPST10H100SB-Y

Datasheet

## Automotive 100 V - 10 A DPAK power Schottky trench rectifier





DPAK

## Features

- AEC-Q101 qualified
- PPAP capable
- Low forward voltage drop
- Low recovery charges
- Reduces conduction, reverse and switching losses
- 100% Avalanche tested in production
- Operating $T_j$ from -40 °C to +175 °C
- ECOPACK2 compliant

## Applications

- Automotive LED lighting
- Flyback topology
- On-board DC/DC converter
- ECU power supply

## Description

This 10 A, 100 V rectifier is based on ST trench technology that achieves the best-inclass $V_F/I_R$ trade-off for a given silicon surface.

Integrated in a DPAK package, this STPST10H100SB-Y trench, and automotive-graded device is intended to be used in high frequency miniature switched mode power supplies such as in automotive, DC/DC converters or ECU power supply. It is also adapted to freewheeling applications, OR-ring, or reverse polarity protection.

| Product label |
|---|
| SUSTAINABLE TECHNOLOGY |

| Product status link |
|---|
| STPST10H100SB-Y |

| Product summary | |
|---|---|
| **$I_{F(AV)}$** | 10 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 |
|---|---|---|---|---|
| $V_{RRM}$ | Repetitive peak reverse voltage ($T_j$ = -40°C to + 175°C) | | 100 | V |
| $I_{F(RMS)}$ | Forward rms current | | 45 | A |
| $I_{F(AV)}$ | Average forward current, δ = 0.5 square wave | $T_c$ = 165 °C | 10 | A |
| $I_{FSM}$ | Surge non repetitive forward current | $t_p$ = 10 ms sinusoidal | 210 | A |
| $I_{AS}$ | Single pulse avalanche current(1) | $T_j$ = 25°C, L = 300 µH,<br>$V_{DD}$ = 15 V | 14 | A |
| $T_{stg}$ | Storage temperature range | | -65 to +175 | °C |
| $T_j$ | Maximum operating junction temperature range(2) | | -40 to +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 |
|---|---|---|---|
| $R_{th(j-c)}$ | Junction to case | 0.7 | °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 |
|---|---|---|---|---|---|---|---|
| $I_R$(1) | Reverse leakage current | $T_j$ = 125 °C | $V_R$ = 70 V | - | 2.0 | 6.4 | mA |
| | | $T_j$ = 25 °C | $V_R$ = 100 V | - | | 26 | µA |
| | | $T_j$ = 125 °C | | - | 4.0 | 13.5 | mA |
| $V_F$(2) | Forward voltage drop | $T_j$ = 25 °C | $I_F$ = 5 A | - | 0.545 | 0.605 | V |
| | | $T_j$ = 125 °C | | - | 0.470 | 0.530 | |
| | | $T_j$ = 25 °C | $I_F$ = 10 A | - | 0.645 | 0.715 | |
| | | $T_j$ = 125 °C | | - | 0.570 | 0.625 | |

1. *Pulse test: $t_p$ = 5 ms, δ < 2%*
2. *Pulse test: $t_p$ = 380 µs, δ < 2%*

To evaluate the conduction losses, use the following equation:

$P = 0.435 \times I_{F(AV)} + 0.019 \times I_F{}^2{}_{(RMS)}$

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)

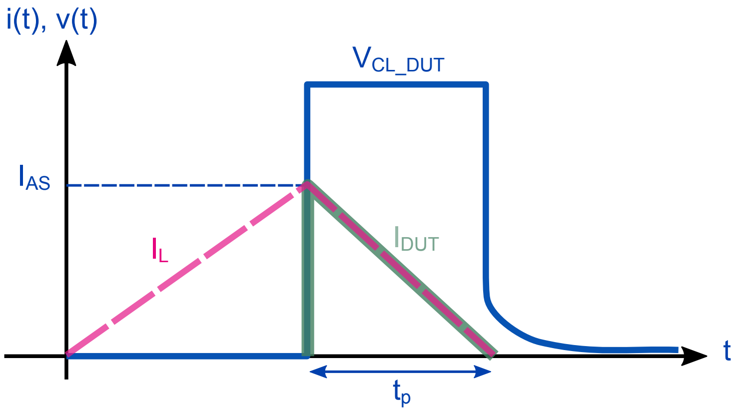
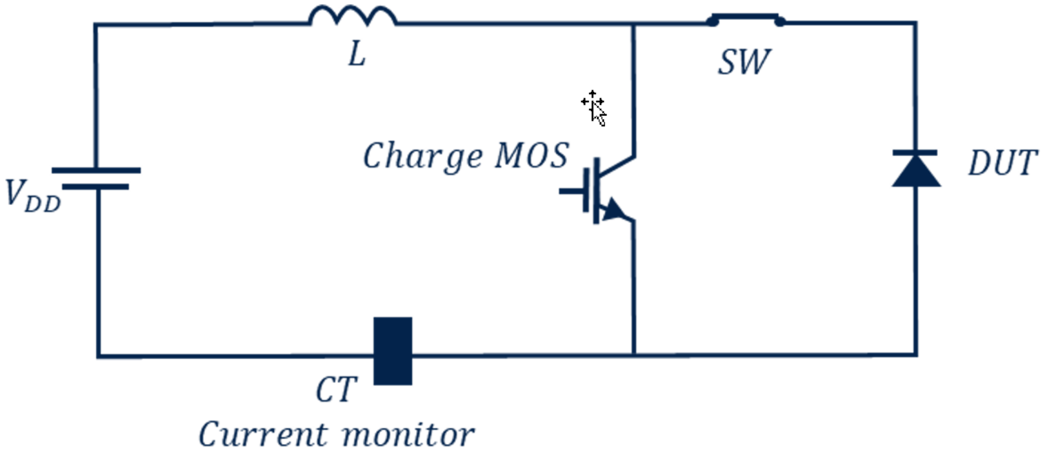


**Figure 2.** Unclamped Inductive Switching Test circuit



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

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

## 1.1 Characteristics (curves)

**Figure 3.** Average forward current versus case temperature (δ = 0.5)

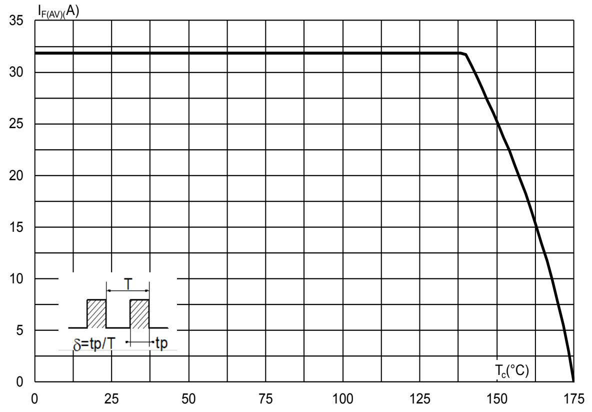


**Figure 4.** Relative variation of thermal impedance junction to case versus pulse duration

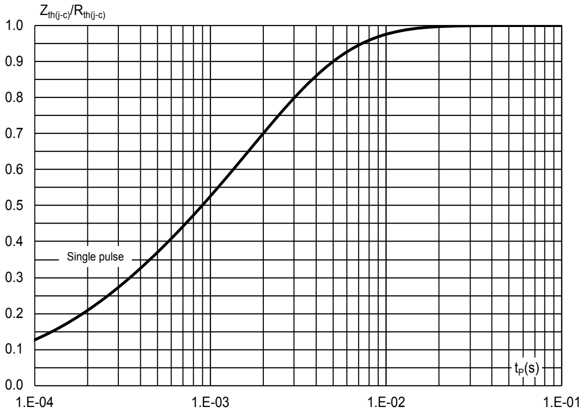


**Figure 5.** Reverse leakage current versus reverse voltage applied (typical values)

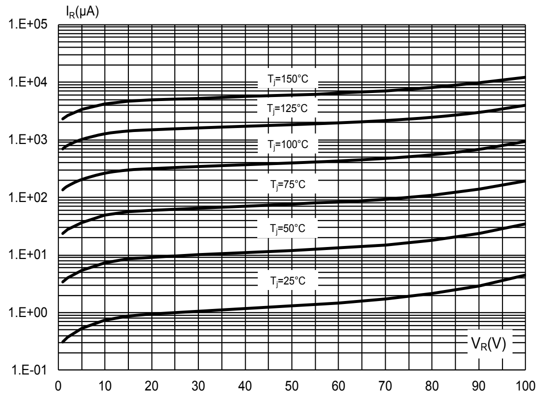


**Figure 6.** Junction capacitance versus reverse voltage applied (typical values)

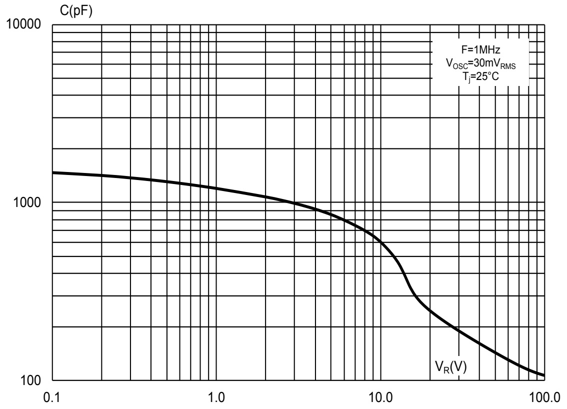


**Figure 7.** Forward voltage drop versus forward current (typical values)

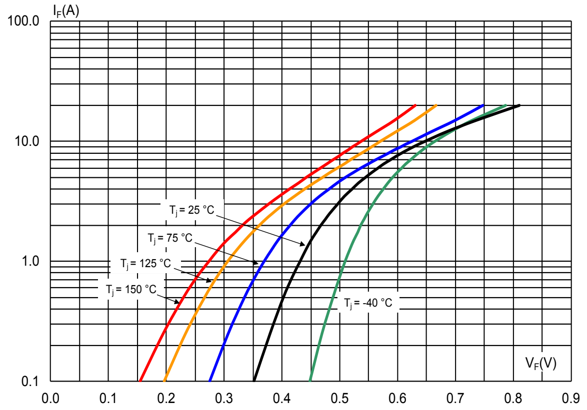
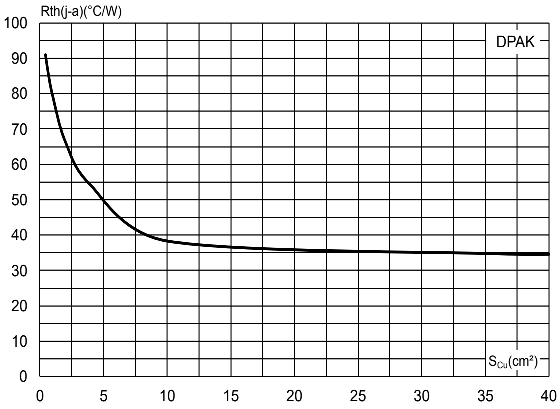


**Figure 8.** Thermal resistance junction to ambient versus copper surface under tab (typical values, epoxy printed board FR4, $e_{Cu}$= 70 µm)



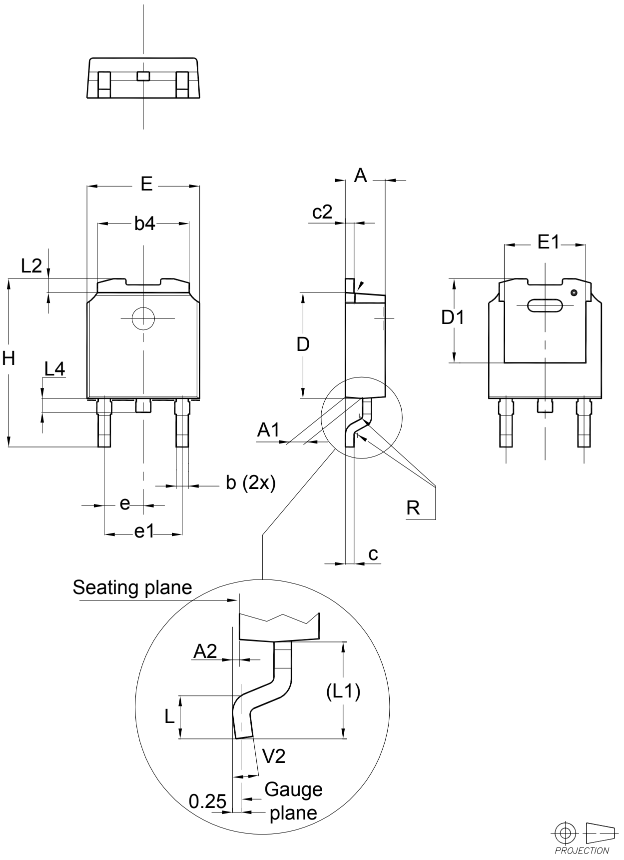
# 2 Package information

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. ECOPACK is an ST trademark.

## 2.1 DPAK package information

- Epoxy meets UL94, V0

**Figure 9. DPAK package outline**



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

### Table 4. DPAK mechanical data

| Dim. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches(1) | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 2.20 | | 2.40 | 0.087 | | 0.094 |
| A1 | 0.90 | | 1.10 | 0.035 | | 0.043 |
| A2 | 0.03 | | 0.23 | 0.001 | | 0.009 |
| b | 0.64 | | 0.90 | 0.025 | | 0.035 |
| b4 | 5.20 | | 5.40 | 0.205 | | 0.213 |
| c | 0.45 | | 0.60 | 0.018 | | 0.024 |
| c2 | 0.48 | | 0.60 | 0.019 | | 0.024 |
| D | 6.00 | | 6.20 | 0.236 | | 0.244 |
| D1 | 4.95 | 5.10 | 5.25 | 0.195 | 0.201 | 0.207 |
| E | 6.40 | | 6.60 | 0.252 | | 0.260 |
| E1 | 4.60 | 4.70 | 4.80 | 0.181 | 0.185 | 0.189 |
| e | 2.159 | 2.286 | 2.413 | 0.085 | 0.090 | 0.095 |
| e1 | 4.445 | 4.572 | 4.699 | 0.175 | 0.180 | 0.185 |
| H | 9.35 | | 10.10 | 0.368 | | 0.398 |
| L | 1.00 | | 1.50 | 0.039 | | 0.059 |
| (L1) | 2.60 | 2.80 | 3.00 | 0.102 | 0.110 | 0.118 |
| L2 | 0.65 | 0.80 | 0.95 | 0.026 | 0.031 | 0.037 |
| L4 | 0.60 | | 1.00 | 0.024 | | 0.039 |
| R | | 0.20 | | | 0.008 | |
| V2 | 0° | | 8° | 0° | | 8° |

1. *Inches dimensions given for reference only*

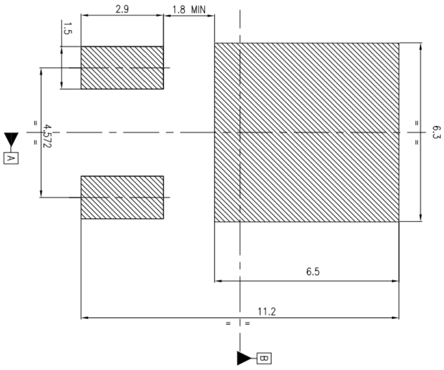


Figure 10. **DPAK recommended footprint (dimensions are in mm)**

*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 |
|---|---|---|---|---|---|
| STPST10H100SBYTR | STPST 10H1Y | DPAK | 0.32 g | 2500 | Tape and reel |

## Revision history

Table 6. **Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 16-Dec-2022 | 1 | Initial release. |
| 21-Jul-2023 | 2 | Updated *Features*. |

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