

## Power Schottky rectifier

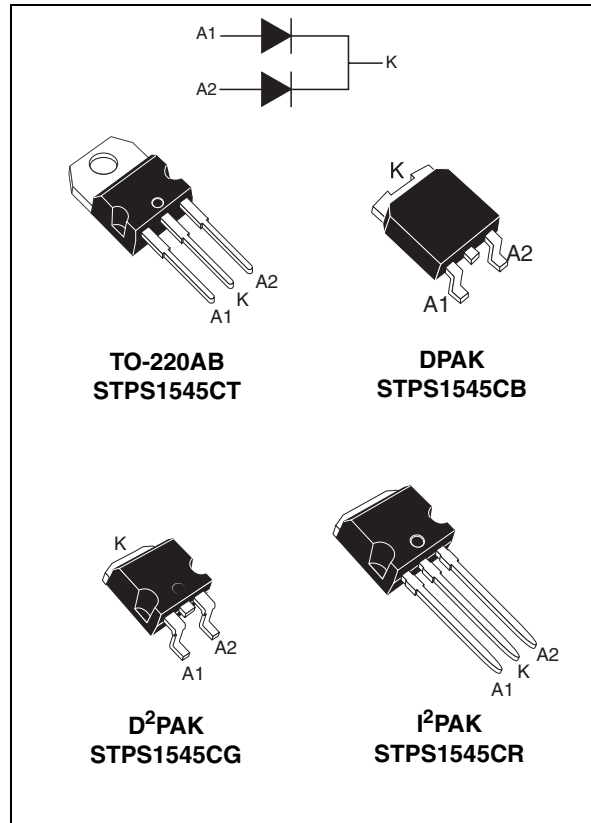
### Features

- very small conduction losses
- negligible switching losses
- extremely fast switching
- avalanche capability specified

### Description

Dual center tap Schottky rectifier suited for switch mode power supply and high frequency DC to DC converters.

Packaged either in TO-220AB, D<sup>2</sup>PAK, I<sup>2</sup>PAK, or DPAK, this device is especially intended for use in low voltage, high frequency inverters, free wheeling and polarity protection applications.



**Table 1. Device summary**

|             |           |
|-------------|-----------|
| $I_{F(AV)}$ | 2 x 7.5 A |
| $V_{RRM}$   | 45 V      |
| $T_j$ (max) | 175 °C    |
| $V_F$ (max) | 0.57 V    |

# 1 Characteristics

**Table 2. Absolute ratings (limiting values)**

| Symbol              | Parameter                                             |                                              |           | Value        | Unit |
|---------------------|-------------------------------------------------------|----------------------------------------------|-----------|--------------|------|
| V <sub>RRM</sub>    | Repetitive peak reverse voltage                       |                                              |           | 45           | V    |
| I <sub>F(RMS)</sub> | Forward rms current                                   |                                              |           | 20           | A    |
| I <sub>F(AV)</sub>  | Average forward current δ = 0.5                       | T <sub>c</sub> = 157 °C                      | Per diode | 7.5          | A    |
| I <sub>FSM</sub>    | Surge non repetitive forward current                  | t <sub>p</sub> = 10 ms sinusoidal            |           | 150          | A    |
| I <sub>RRM</sub>    | Peak repetitive reverse current                       | t <sub>p</sub> = 2 μs square<br>F = 1 kHz    |           | 1            | A    |
| I <sub>RSM</sub>    | Non repetitive peak reverse current                   | t <sub>p</sub> = 100 μs square               |           | 2            | A    |
| P <sub>ARM</sub>    | Repetitive peak avalanche power                       | t <sub>p</sub> = 1 μs T <sub>j</sub> = 25 °C |           | 2700         | W    |
| T <sub>stg</sub>    | Storage temperature range                             |                                              |           | -65 to + 175 | °C   |
| T <sub>j</sub>      | Maximum operating junction temperature <sup>(1)</sup> |                                              |           | 175          | °C   |
| dV/dt               | Critical rate of rise of reverse voltage              |                                              |           | 10000        | V/μs |

1.  $\frac{dP_{tot}}{dT_j} < \frac{1}{R_{th(j-a)}}$  condition to avoid thermal runaway for a diode on its own heatsink

**Table 3. Thermal resistances**

| Symbol        | Parameter        |                    | Value      | Unit                 |
|---------------|------------------|--------------------|------------|----------------------|
| $R_{th(j-c)}$ | Junction to case | Per diode<br>Total | 3.0<br>1.7 | $^{\circ}\text{C/W}$ |
| $R_{th(c)}$   | Coupling         |                    | 0.35       |                      |

When the diodes 1 and 2 are used simultaneously:

$$\Delta T_j(\text{diode 1}) = P(\text{diode1}) \times R_{th(j-c)}(\text{Per diode}) + P(\text{diode2}) \times R_{th(c)}$$

**Table 4. Static electrical characteristics (per diode)**

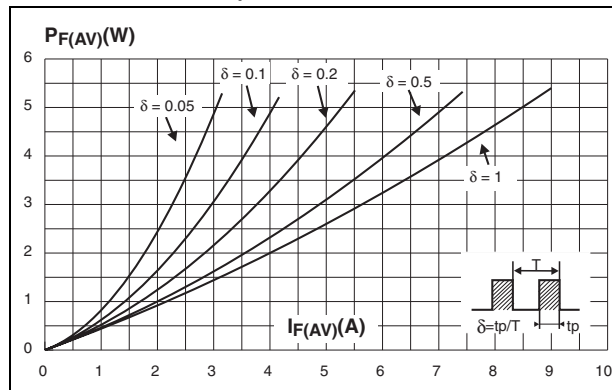
| Symbol      | Parameter               | Test conditions                     |                      | Min. | Typ. | Max. | Unit          |
|-------------|-------------------------|-------------------------------------|----------------------|------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ }^{\circ}\text{C}$  | $V_R = V_{RRM}$      | -    | -    | 100  | $\mu\text{A}$ |
|             |                         | $T_j = 125\text{ }^{\circ}\text{C}$ |                      | -    | 5    | 15   | mA            |
| $V_F^{(1)}$ | Forward voltage drop    | $T_j = 125\text{ }^{\circ}\text{C}$ | $I_F = 7.5\text{ A}$ | -    | 0.5  | 0.57 | V             |
|             |                         | $T_j = 25\text{ }^{\circ}\text{C}$  | $I_F = 15\text{ A}$  | -    | -    | 0.84 |               |
|             |                         | $T_j = 125\text{ }^{\circ}\text{C}$ | $I_F = 15\text{ A}$  | -    | 0.65 | 0.72 |               |

1. Pulse test:  $t_p = 380\text{ }\mu\text{s}$ ,  $\delta < 2\%$

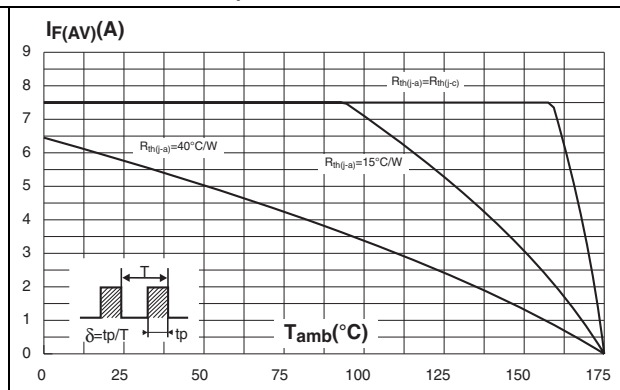
To evaluate the conduction losses use the following equation:

$$P = 0.42 \times I_{F(AV)} + 0.020 I_{F(RMS)}^2$$

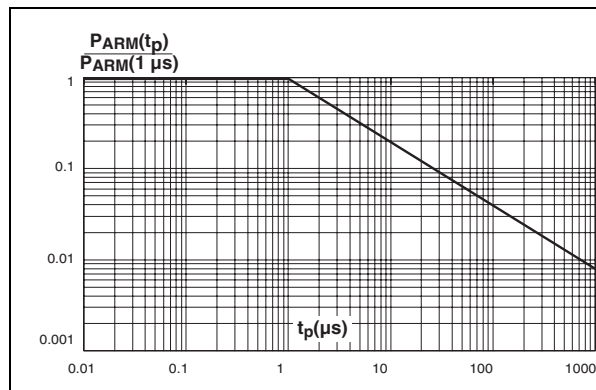
**Figure 1. Average forward power dissipation versus average forward current (per diode)**



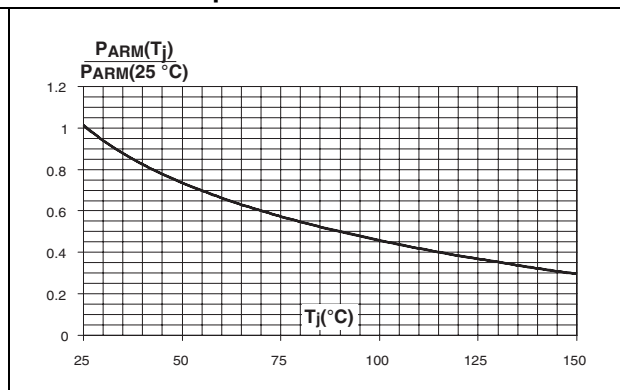
**Figure 2. Average forward current versus ambient temperature ( $\delta = 0.5$ , per diode)**



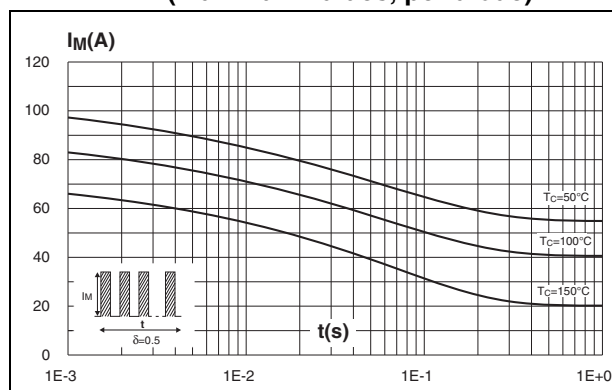
**Figure 3. Normalized avalanche power derating versus pulse duration**



**Figure 4. Normalized avalanche power derating versus junction temperature**



**Figure 5. Non repetitive surge peak forward current versus overload duration (maximum values, per diode)**



**Figure 6. Relative variation of thermal impedance junction to case versus pulse duration**

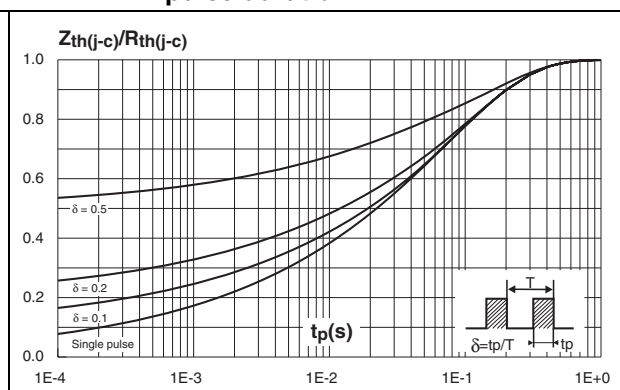


Figure 7. Reverse leakage current versus reverse voltage applied (typical values, per diode)

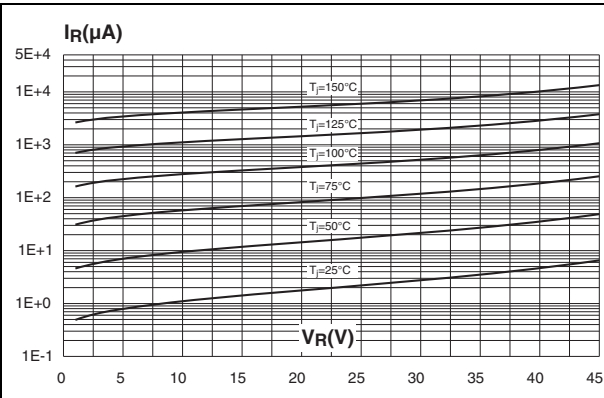


Figure 8. Junction capacitance versus reverse voltage applied (typical values, per diode)

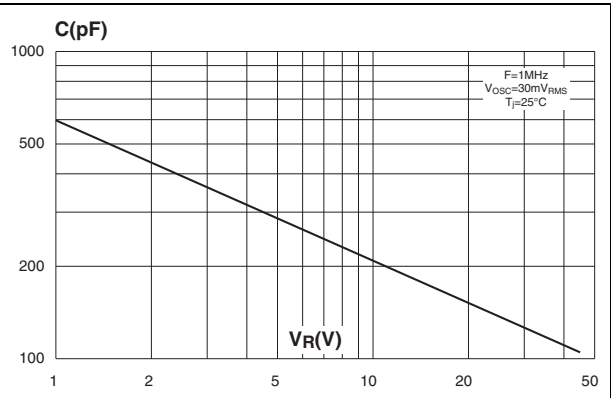


Figure 9. Forward voltage drop versus forward current (high values, per diode)

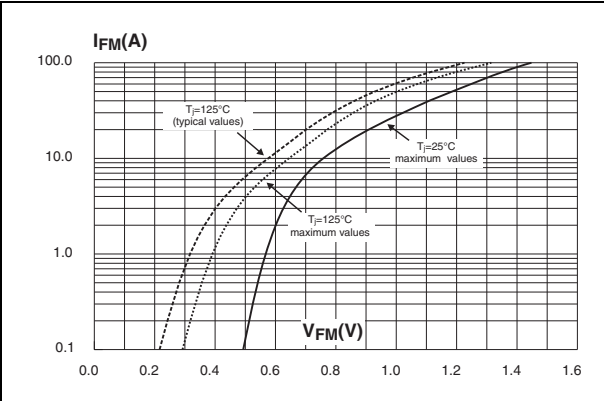


Figure 10. Thermal resistance junction to ambient versus copper surface under tab (D<sup>2</sup>PAK)

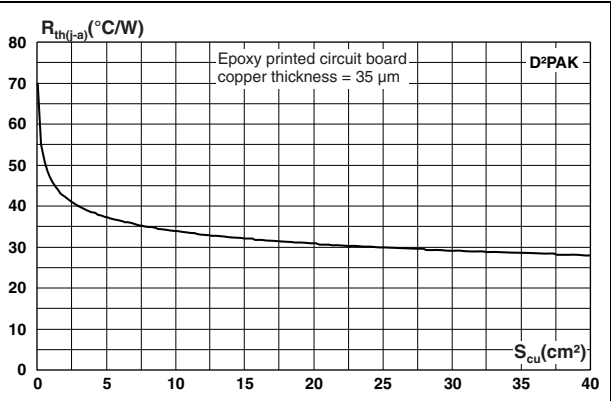
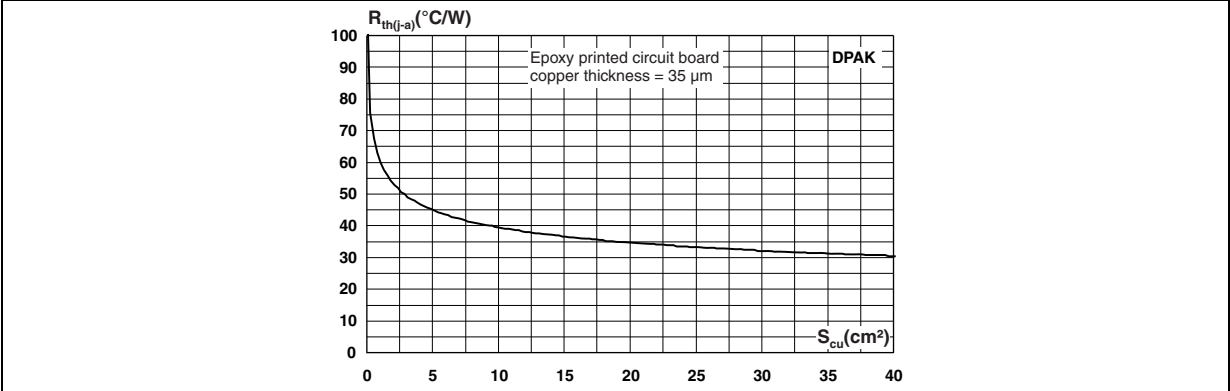


Figure 11. Thermal resistance junction to ambient versus copper surface under tab (DPAK)



## 2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.4 to 0.6 N·m

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

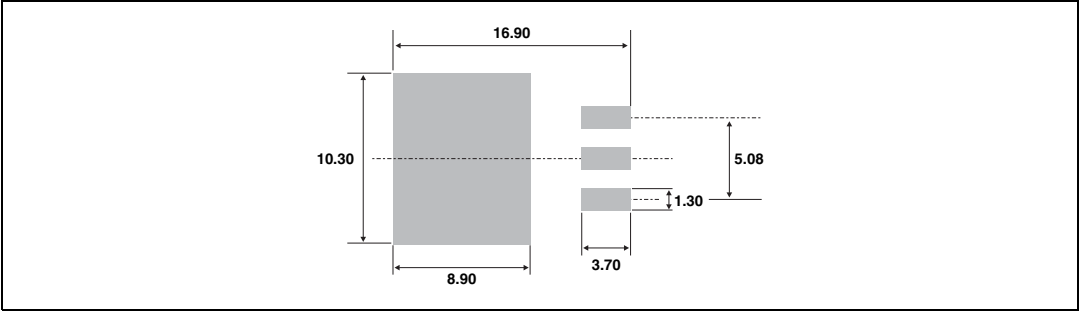
**Figure 12. TO-220AB dimensions**

| Ref  | Dimensions  |       |            |       |
|------|-------------|-------|------------|-------|
|      | Millimeters |       | Inches     |       |
|      | Min.        | Max.  | Min.       | Max.  |
| A    | 4.40        | 4.60  | 0.173      | 0.181 |
| C    | 1.23        | 1.32  | 0.048      | 0.051 |
| D    | 2.40        | 2.72  | 0.094      | 0.107 |
| E    | 0.49        | 0.70  | 0.019      | 0.027 |
| F    | 0.61        | 0.88  | 0.024      | 0.034 |
| F1   | 1.14        | 1.70  | 0.044      | 0.066 |
| F2   | 1.14        | 1.70  | 0.044      | 0.066 |
| G    | 4.95        | 5.15  | 0.194      | 0.202 |
| G1   | 2.40        | 2.70  | 0.094      | 0.106 |
| H2   | 10          | 10.40 | 0.393      | 0.409 |
| L2   | 16.4 typ.   |       | 0.645 typ. |       |
| L4   | 13          | 14    | 0.511      | 0.551 |
| L5   | 2.65        | 2.95  | 0.104      | 0.116 |
| L6   | 15.25       | 15.75 | 0.600      | 0.620 |
| L7   | 6.20        | 6.60  | 0.244      | 0.259 |
| L9   | 3.50        | 3.93  | 0.137      | 0.154 |
| M    | 2.6 typ.    |       | 0.102 typ. |       |
| Dia. | 3.75        | 3.85  | 0.147      | 0.151 |

Table 5. D<sup>2</sup>PAK dimensions

| Ref. | Dimensions  |       |            |       |
|------|-------------|-------|------------|-------|
|      | Millimeters |       | Inches     |       |
|      | Min.        | Max.  | Min.       | Max.  |
| A    | 4.40        | 4.60  | 0.173      | 0.181 |
| A1   | 2.49        | 2.69  | 0.098      | 0.106 |
| A2   | 0.03        | 0.23  | 0.001      | 0.009 |
| B    | 0.70        | 0.93  | 0.027      | 0.037 |
| B2   | 1.14        | 1.70  | 0.045      | 0.067 |
| C    | 0.45        | 0.60  | 0.017      | 0.024 |
| C2   | 1.23        | 1.36  | 0.048      | 0.054 |
| D    | 8.95        | 9.35  | 0.352      | 0.368 |
| E    | 10.00       | 10.40 | 0.393      | 0.409 |
| G    | 4.88        | 5.28  | 0.192      | 0.208 |
| L    | 15.00       | 15.85 | 0.590      | 0.624 |
| L2   | 1.27        | 1.40  | 0.050      | 0.055 |
| L3   | 1.40        | 1.75  | 0.055      | 0.069 |
| M    | 2.40        | 3.20  | 0.094      | 0.126 |
| R    | 0.40 typ.   |       | 0.016 typ. |       |
| V2   | 0°          | 8°    | 0°         | 8°    |

Figure 13. Footprint (dimensions in millimeters)



Mounting (soldering) the I<sup>2</sup>PAK metal slug (heatsink) with alloy, like a surface mount device, IS NOT PERMITTED. A standard through-hole mounting is mandatory.

Figure 14. I<sup>2</sup>PAK dimensions

| Ref | Dimensions  |      |       |        |      |      |
|-----|-------------|------|-------|--------|------|------|
|     | Millimeters |      |       | Inches |      |      |
|     | Min.        | Typ. | Max.  | Min.   | Typ. | Max. |
| A   | 4.40        | 4.60 | 0.173 | 0.181  | A    | 4.40 |
| A1  | 2.49        | 2.69 | 0.098 | 0.106  | A1   | 2.49 |
| b   | 0.70        | 0.93 | 0.028 | 0.037  | b    | 0.70 |
| b1  | 1.14        | 1.17 | 0.044 | 0.046  | b1   | 1.14 |
| b2  | 1.14        | 1.17 | 0.044 | 0.046  | b2   | 1.14 |
| c   | 0.45        | 0.60 | 0.018 | 0.024  | c    | 0.45 |
| c2  | 1.23        | 1.36 | 0.048 | 0.054  | c2   | 1.23 |
| D   | 8.95        | 9.35 | 0.352 | 0.368  | D    | 8.95 |
| e   | 2.40        | 2.70 | 0.094 | 0.106  | e    | 2.40 |
| E   | 10.0        | 10.4 | 0.394 | 0.409  | E    | 10.0 |
| L   | 13.1        | 13.6 | 0.516 | 0.535  | L    | 13.1 |
| L1  | 3.48        | 3.78 | 0.137 | 0.149  | L1   | 3.48 |
| L2  | 1.27        | 1.40 | 0.050 | 0.055  | L2   | 1.27 |

**Table 6. DPAK dimensions**

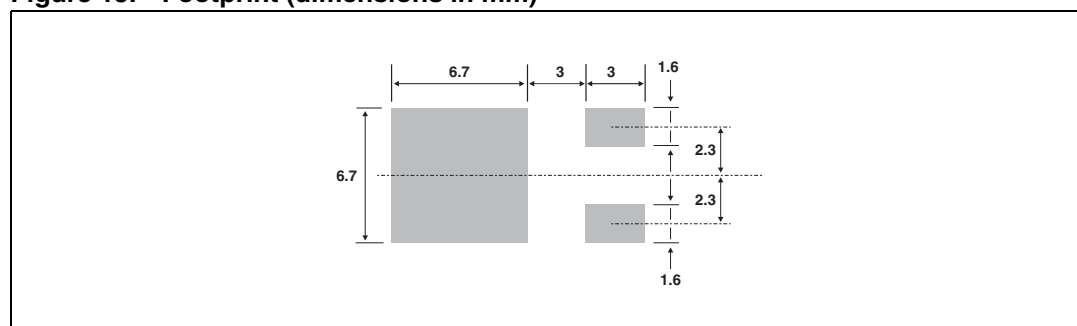
Technical drawing of a 1/2" x 1/2" x 1/2" angle bracket. The drawing includes a top view, a side view, and a detail view of the corner. Dimensions are labeled as follows:

- A**: Thickness of the main body.
- A1**: Thickness of the flange.
- A2**: Thickness of the corner reinforcement.
- B**: Width of the main body.
- B2**: Width of the flange.
- C**: Thickness of the corner reinforcement.
- C2**: Thickness of the corner reinforcement.
- D**: Height of the main body.
- E**: Total height of the main body.
- G**: Distance from the bottom edge to the center of the corner reinforcement.
- H**: Total height of the main body.
- L2**: Distance from the top edge to the center of the corner reinforcement.
- L4**: Distance from the side edge to the center of the corner reinforcement.
- V2**: Angle of the corner reinforcement.

0.60 MIN.

| Ref. | Dimensions  |       |            |       |
|------|-------------|-------|------------|-------|
|      | Millimeters |       | Inches     |       |
|      | Min.        | Max.  | Min.       | Max.  |
| A    | 2.20        | 2.40  | 0.086      | 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 |
| B2   | 5.20        | 5.40  | 0.204      | 0.212 |
| C    | 0.45        | 0.60  | 0.017      | 0.023 |
| C2   | 0.48        | 0.60  | 0.018      | 0.023 |
| D    | 6.00        | 6.20  | 0.236      | 0.244 |
| E    | 6.40        | 6.60  | 0.251      | 0.259 |
| G    | 4.40        | 4.60  | 0.173      | 0.181 |
| H    | 9.35        | 10.10 | 0.368      | 0.397 |
| L2   | 0.80 typ.   |       | 0.031 typ. |       |
| L4   | 0.60        | 1.00  | 0.023      | 0.039 |
| V2   | 0°          | 8°    | 0°         | 8°    |

**Figure 15. Footprint (dimensions in mm)**



### 3 Ordering information

**Table 7. Ordering information**

| Order code    | Marking    | Package            | Weight | Base qty | Delivery mode |
|---------------|------------|--------------------|--------|----------|---------------|
| STPS1545CT    | STPS1545CT | TO-220AB           | 2.23 g | 50       | Tube          |
| STPS1545CG    | STPS1545CG | D <sup>2</sup> PAK | 1.48 g | 50       | Tube          |
| STPS1545CG-TR | STPS1545CG | D <sup>2</sup> PAK | 1.48 g | 1000     | Tape and reel |
| STPS1545CR    | STPS1545CR | I <sup>2</sup> PAK | 1.49 g | 50       | Tube          |
| STPS1545CB-TR | STPS1545CB | DPAK               | 0.3 g  | 2500     | Tape and reel |

For the latest information on available order codes see the product pages on [www.st.com](http://www.st.com).

### 4 Revision history

**Table 8. Document revision history**

| Date        | Revision | Changes                                  |
|-------------|----------|------------------------------------------|
| Jul-2003    | 5F       | Last release.                            |
| 21-Mar-2007 | 6        | Removed ISOWATT and TO-220FPAB packages. |
| 03-Nov-2010 | 7        | Added DPAK package.                      |

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