

**ST(意法)** STPS2045CT **PDF**

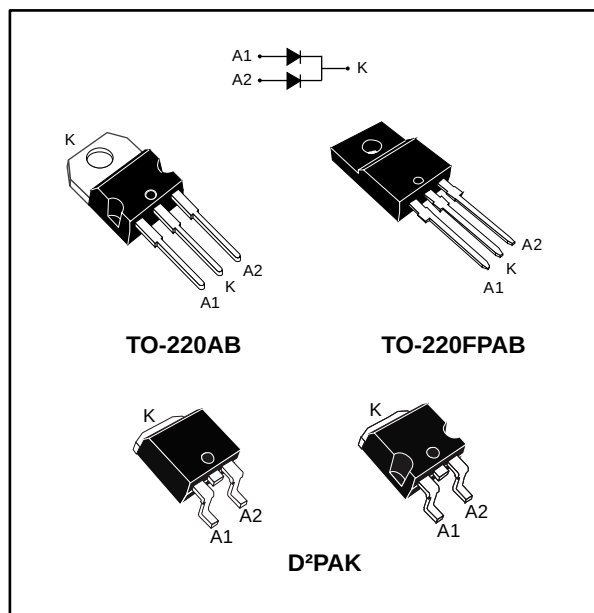


**深圳创唯电子有限公司**

**<http://www.st-ic.com>**

## Power Schottky rectifier

Datasheet - production data



### Description

Dual center tap Schottky rectifier suited for switch mode power supply and high frequency DC to DC converters. Packaged either in TO-220AB, TO-220FPAB, or D<sup>2</sup>PAK, this device is especially intended for use in low voltage, high frequency inverters, free wheeling and polarity protection applications.

Table 1: Device summary

| Symbol       | Value    |
|--------------|----------|
| $I_{F(AV)}$  | 2 x 10 A |
| $V_{RRM}$    | 45 V     |
| $V_F$ (typ.) | 0.5 V    |
| $T_j$ (max.) | 175 °C   |

### Features

- Very small conduction losses
- Negligible switching losses
- Extremely fast switching
- Insulated package: TO-220FPAB
  - Insulating voltage = 2000 V<sub>RMS</sub> sine
- Avalanche rated
- ECOPACK<sup>®</sup>2 compliant component for D<sup>2</sup>PAK on demand

# 1 Characteristics

**Table 2: Absolute ratings (limiting values, per diode, at 25 °C, unless otherwise specified)**

| Symbol                          | Parameter                                             |                               |                         |                                                                          | Value       | Unit |
|---------------------------------|-------------------------------------------------------|-------------------------------|-------------------------|--------------------------------------------------------------------------|-------------|------|
| V <sub>RRM</sub>                | Repetitive peak reverse voltage                       |                               |                         |                                                                          | 45          | V    |
| I <sub>F(RMS)</sub>             | Forward rms current                                   |                               |                         |                                                                          | 30          | A    |
| I <sub>F(AV)</sub>              | Average forward current<br>δ = 0.5, square wave       | TO-220AB / D <sup>2</sup> PAK | T <sub>C</sub> = 155 °C | Per diode                                                                | 10          | A    |
|                                 |                                                       |                               |                         | Per device                                                               | 20          |      |
|                                 |                                                       | TO-220FPAB                    | T <sub>C</sub> = 140 °C | Per diode                                                                | 10          |      |
|                                 |                                                       |                               | T <sub>C</sub> = 125 °C | Per device                                                               | 20          |      |
| I <sub>FSM</sub>                | Surge non repetitive forward current                  |                               |                         | t <sub>p</sub> = 10 ms sinusoidal                                        | 180         | A    |
| P <sub>ARM</sub> <sup>(1)</sup> | Repetitive peak avalanche power                       |                               |                         | t <sub>p</sub> = 10 μs, T <sub>j</sub> = 125 °C                          | 280         | W    |
| V <sub>ARM</sub> <sup>(2)</sup> | Maximum repetitive peak avalanche voltage             |                               |                         | t <sub>p</sub> < 10 μs, T <sub>j</sub> < 125 °C, I <sub>AR</sub> < 7.7 A | 60          | V    |
| V <sub>ASM</sub> <sup>(2)</sup> | Maximum single-pulse peak avalanche voltage           |                               |                         |                                                                          |             |      |
| T <sub>stg</sub>                | Storage temperature range                             |                               |                         |                                                                          | -65 to +175 | °C   |
| T <sub>j</sub>                  | Maximum operating junction temperature <sup>(3)</sup> |                               |                         |                                                                          | 175         |      |

**Notes:**

<sup>(1)</sup>For pulse time duration deratings, please refer to [Figure 3](#). More details regarding the avalanche energy measurements and diode validation in the avalanche are provided in the STMicroelectronics Application notes AN1768, "Admissible avalanche power of Schottky diodes" and AN2025, "Converter improvement using Schottky rectifier avalanche specification".

<sup>(2)</sup>See [Figure 9](#).

<sup>(3)</sup>(dP<sub>tot</sub>/dT<sub>j</sub>) < (1/R<sub>th(j-a)</sub>) condition to avoid thermal runaway for a diode on its own heatsink.

**Table 3: Thermal parameters**

| Symbol               | Parameter        |                               |           | Max. value | Unit |
|----------------------|------------------|-------------------------------|-----------|------------|------|
| R <sub>th(j-c)</sub> | Junction to case | TO-220AB / D <sup>2</sup> PAK | Per diode | 2.2        | °C/W |
|                      |                  |                               | Total     | 1.4        |      |
|                      |                  | TO-220FPAB                    | Per diode | 4.5        |      |
|                      |                  |                               | Total     | 3.5        |      |
| R <sub>th(c)</sub>   | Coupling         | TO-220AB / D <sup>2</sup> PAK |           | 0.4        |      |
|                      |                  | TO-220FPAB                    |           | 2.5        |      |

When the diodes 1 and 2 are used simultaneously:

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

Table 4: Static electrical characteristics (per diode)

| Symbol      | Parameter               | Test conditions       |                     | Min. | Typ. | Max. | Unit          |
|-------------|-------------------------|-----------------------|---------------------|------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_J = 25\text{ °C}$  | $V_R = V_{RRM}$     | -    |      | 100  | $\mu\text{A}$ |
|             |                         | $T_J = 125\text{ °C}$ |                     | -    | 7    | 15   | mA            |
| $V_F^{(1)}$ | Forward voltage drop    | $T_J = 125\text{ °C}$ | $I_F = 10\text{ A}$ | -    | 0.5  | 0.57 | V             |
|             |                         | $T_J = 25\text{ °C}$  | $I_F = 20\text{ A}$ | -    |      | 0.84 |               |
|             |                         | $T_J = 125\text{ °C}$ |                     | -    | 0.65 | 0.72 |               |

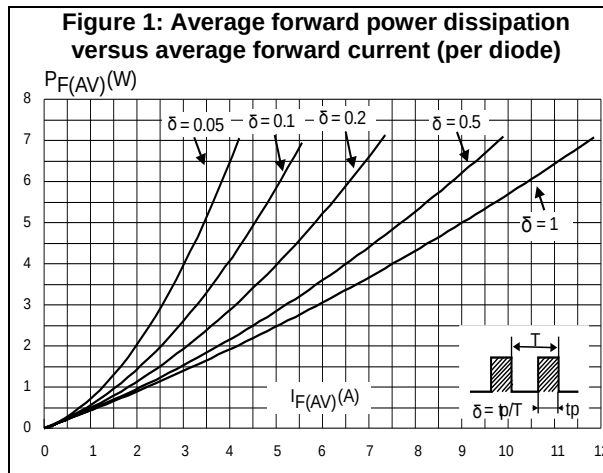
**Notes:**

<sup>(1)</sup>Pulse test:  $t_p = 380\text{ }\mu\text{s}$ ,  $\delta < 2\%$

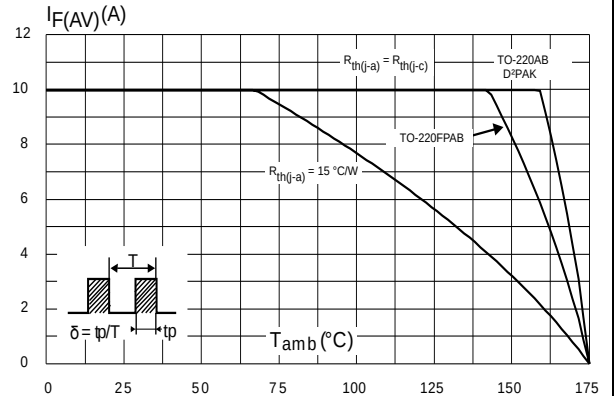
To evaluate the conduction losses, use the following equation:

$$P = 0.42 \times I_{F(AV)} + 0.015 \times I_{F(RMS)}^2$$

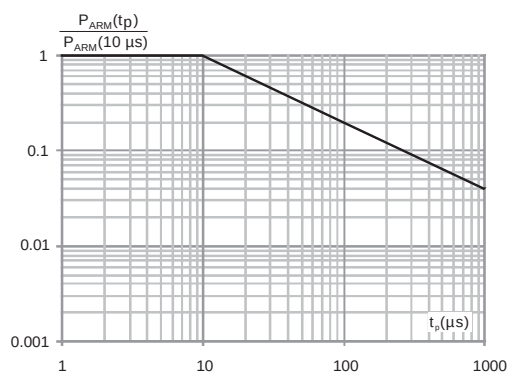
## 1.1 Characteristics (curves)



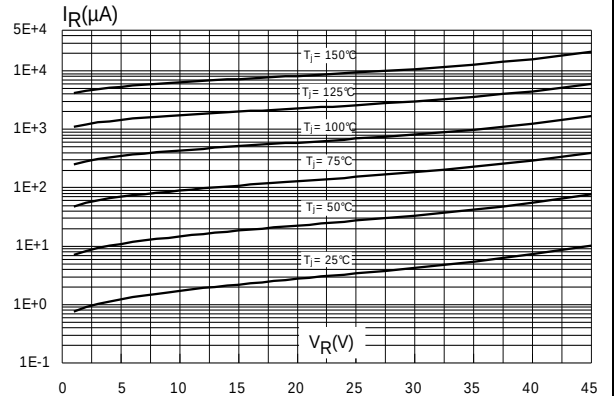
**Figure 2: Average forward current versus ambient temperature ( $\delta = 0.5$ , per diode)**



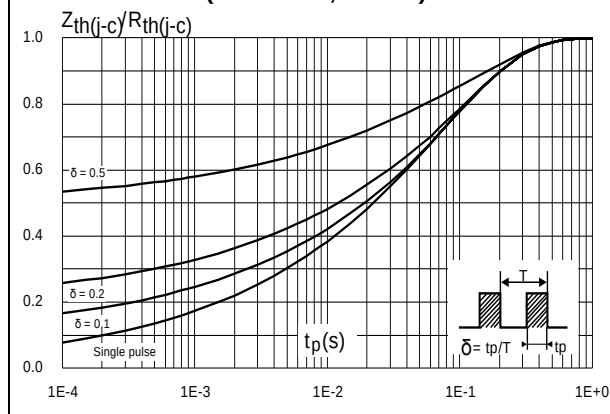
**Figure 3: Normalized avalanche power deratings versus pulse duration ( $T_j = 125^{\circ}C$ )**



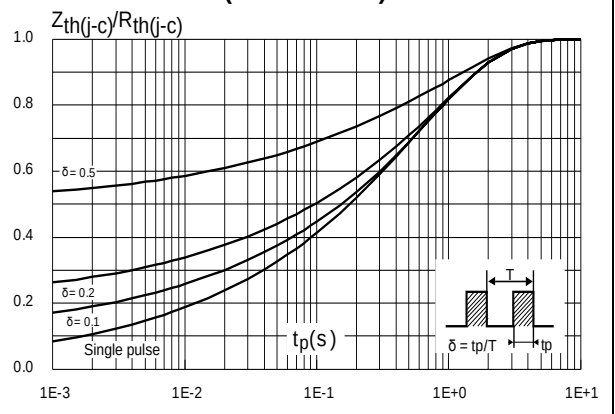
**Figure 4: Reverse leakage current versus reverse voltage applied (typical values, per diode)**



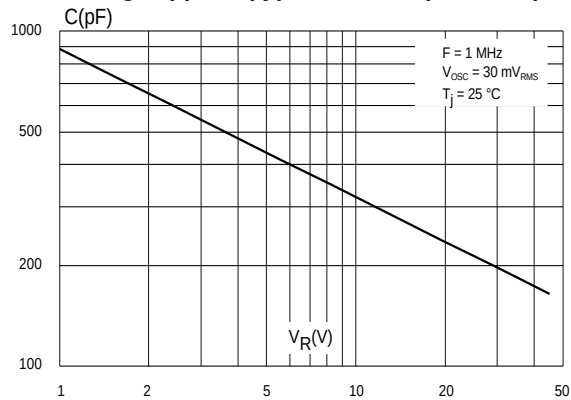
**Figure 5: Relative variation of thermal impedance junction to case versus pulse duration (TO-220AB, D<sup>2</sup>PAK)**



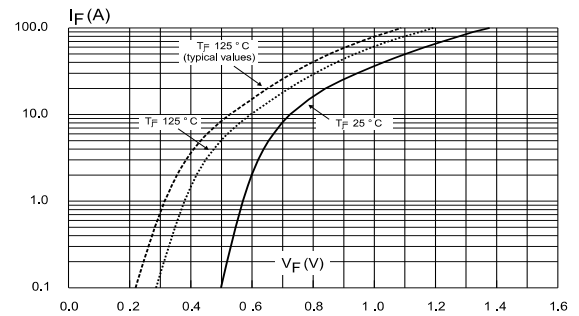
**Figure 6: Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAB)**



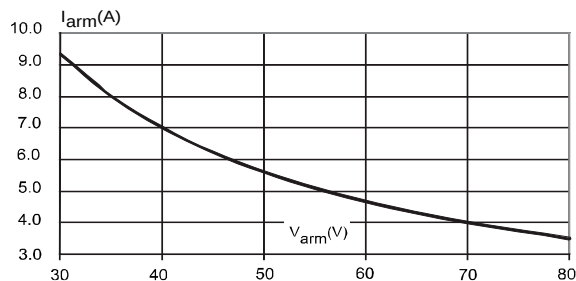
**Figure 7: Junction capacitance versus reverse voltage applied (typical values, per diode)**



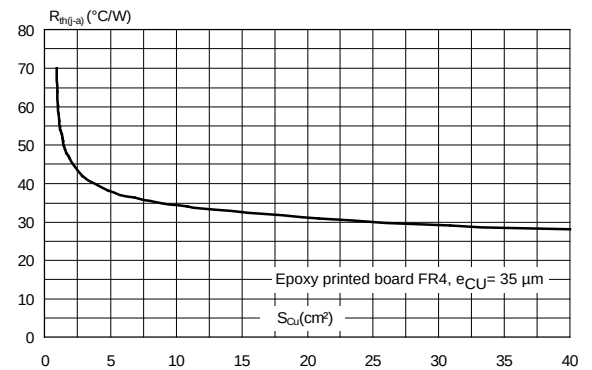
**Figure 8: Forward voltage drop versus forward current (maximum values, per diode)**



**Figure 9: Reverse safe operating area ( $t_p < 10 \text{ } \mu\text{s}$  and  $T_J < 125 \text{ }^\circ\text{C}$ )**



**Figure 10: Thermal resistance junction to ambient versus copper surface under tab for D<sup>2</sup>PAK**



## 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.

- Cooling method: by conduction (C)
- Epoxy meets UL 94,V0
- Recommended torque value: 0.55 N·m (for TO-220AB and TO-220FPAB)
- Maximum torque value: 0.7 N·m (for TO-220AB and TO-220FPAB)

## 2.1 TO-220AB package information

Figure 11: TO-220AB package outline

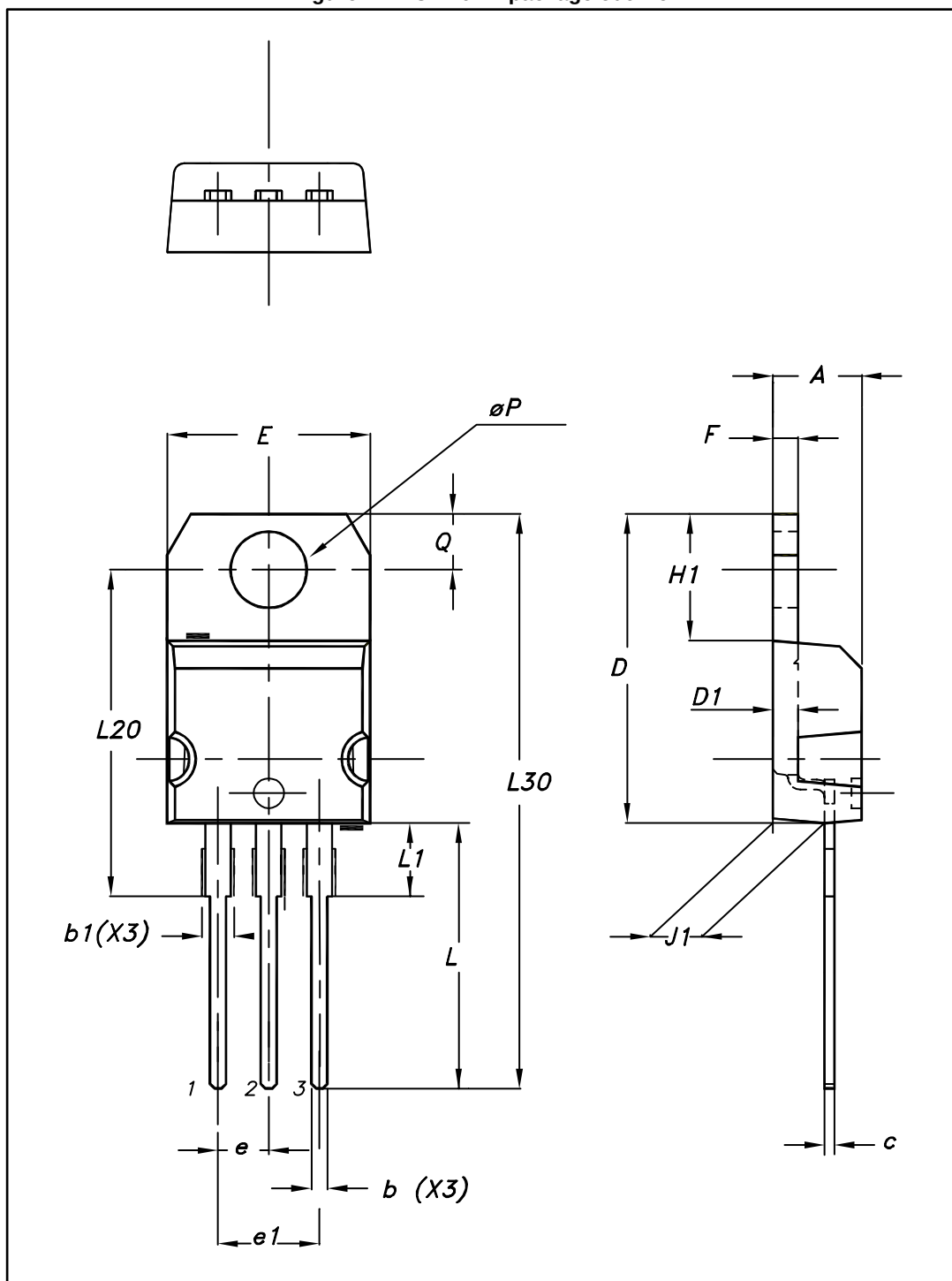




Table 5: TO-220AB package mechanical data

| Ref. | Dimensions  |       |            |       |
|------|-------------|-------|------------|-------|
|      | Millimeters |       | Inches     |       |
|      | Min.        | Max.  | Min.       | Max.  |
| A    | 4.40        | 4.60  | 0.173      | 0.181 |
| b    | 0.61        | 0.88  | 0.240      | 0.035 |
| b1   | 1.14        | 1.70  | 0.045      | 0.067 |
| c    | 0.48        | 0.70  | 0.019      | 0.028 |
| D    | 15.25       | 15.75 | 0.600      | 0.620 |
| D1   | 1.27 typ.   |       | 0.050 typ. |       |
| E    | 10.00       | 10.40 | 0.394      | 0.409 |
| e    | 2.40        | 2.70  | 0.094      | 0.106 |
| e1   | 4.95        | 5.15  | 0.195      | 0.203 |
| F    | 1.23        | 1.32  | 0.048      | 0.052 |
| H1   | 6.20        | 6.60  | 0.244      | 0.260 |
| J1   | 2.40        | 2.72  | 0.094      | 0.107 |
| L    | 13.00       | 14.00 | 0.512      | 0.551 |
| L1   | 3.50        | 3.93  | 0.138      | 0.155 |
| L20  | 16.40 typ.  |       | 0.646 typ. |       |
| L30  | 28.90 typ.  |       | 1.138 typ. |       |
| θP   | 3.75        | 3.85  | 0.148      | 0.152 |
| Q    | 2.65        | 2.95  | 0.104      | 0.116 |

## 2.2 TO-220FPAB package information

Figure 12: TO-220FPAB package outline

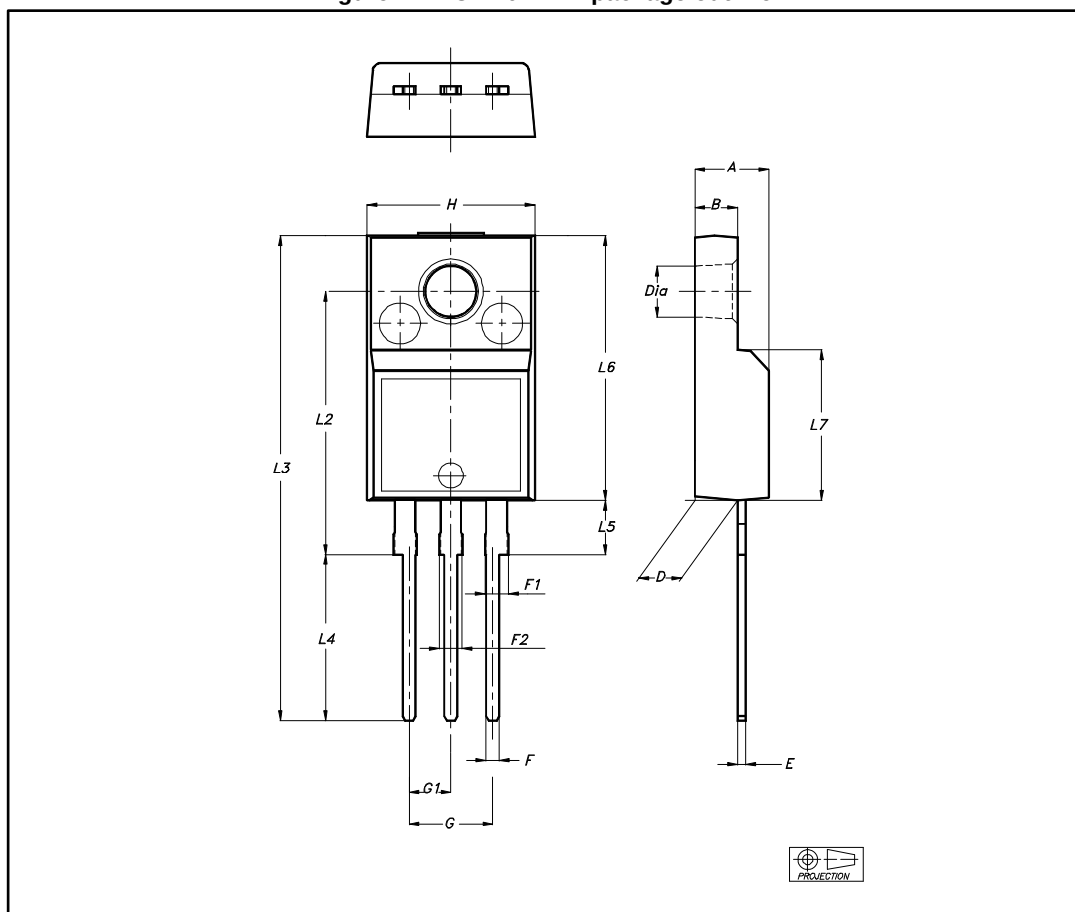
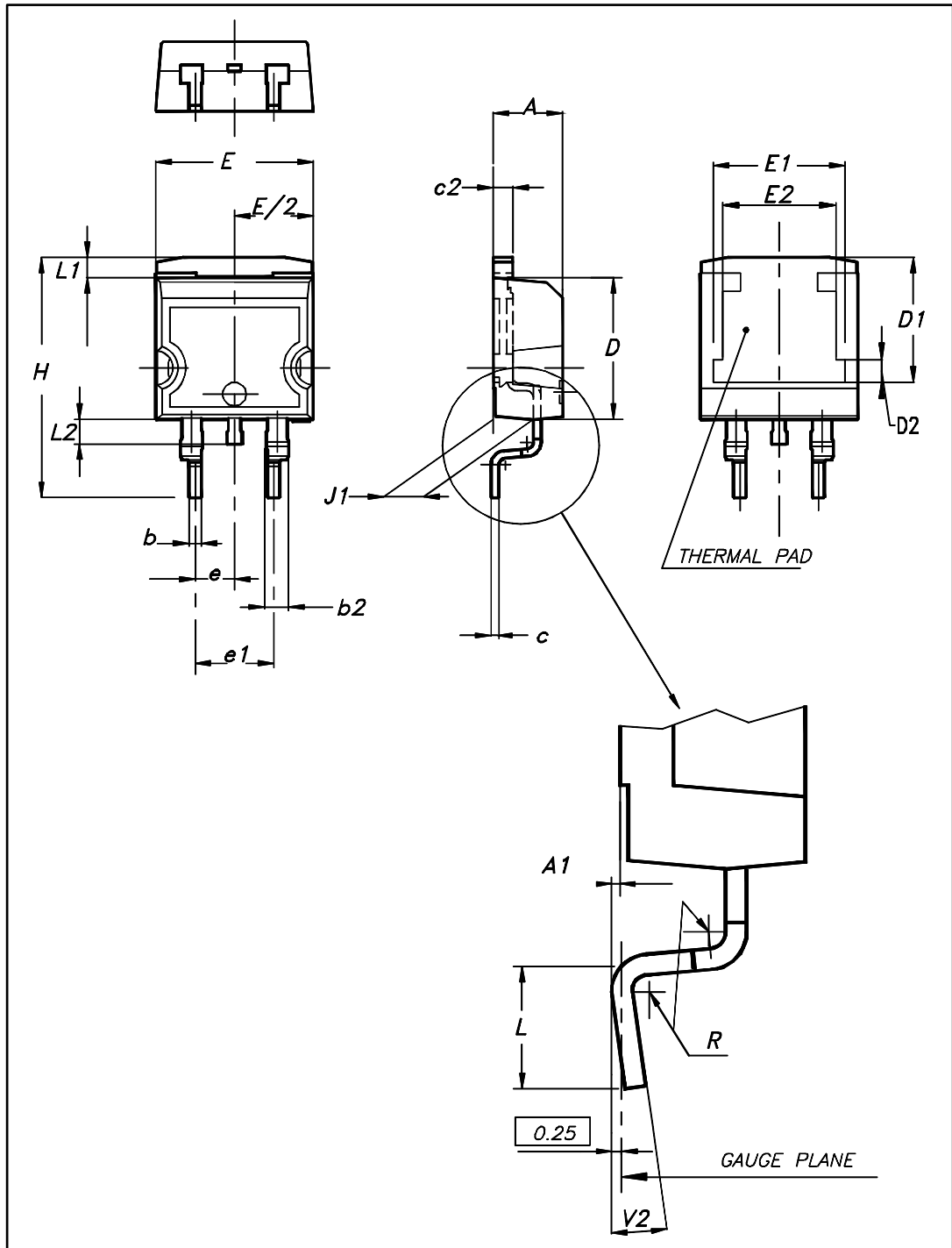


Table 6: TO-220FPAB package mechanical data

| Ref. | Dimensions  |      |           |       |
|------|-------------|------|-----------|-------|
|      | Millimeters |      | Inches    |       |
|      | Min.        | Max. | Min.      | Max.  |
| A    | 4.40        | 4.60 | 0.173     | 0.181 |
| B    | 2.5         | 2.7  | 0.098     | 0.106 |
| D    | 2.5         | 2.75 | 0.098     | 0.108 |
| E    | 0.45        | 0.70 | 0.018     | 0.028 |
| F    | 0.75        | 1    | 0.030     | 0.039 |
| F1   | 1.15        | 1.70 | 0.045     | 0.067 |
| F2   | 1.15        | 1.70 | 0.045     | 0.067 |
| G    | 4.95        | 5.2  | 0.195     | 0.205 |
| G1   | 2.4         | 2.7  | 0.094     | 0.106 |
| H    | 10          | 10.4 | 0.394     | 0.409 |
| L2   | 16 typ.     |      | 0.63 typ. |       |
| L3   | 28.60       | 30.6 | 1.126     | 1.205 |
| L4   | 9.8         | 10.6 | 0.386     | 0.417 |
| L5   | 2.9         | 3.6  | 0.114     | 0.142 |
| L6   | 15.9        | 16.4 | 0.626     | 0.646 |
| L7   | 9           | 9.3  | 0.354     | 0.366 |
| Dia  | 3           | 3.2  | 0.118     | 0.126 |

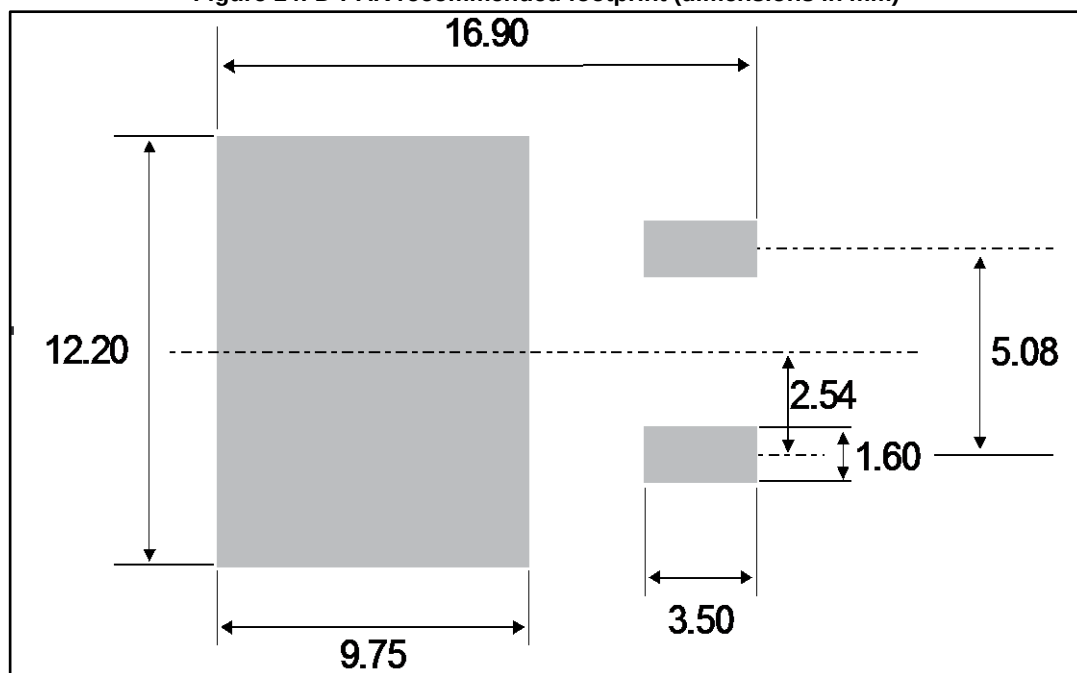
## 2.3 D<sup>2</sup>PAK package information

Figure 13: D<sup>2</sup>PAK package outline

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

Table 7: D<sup>2</sup>PAK package mechanical data

| Ref. | Dimensions  |       |        |       |
|------|-------------|-------|--------|-------|
|      | Millimeters |       | Inches |       |
|      | Min.        | Max.  | Min.   | Max.  |
| A    | 4.36        | 4.60  | 0.172  | 0.181 |
| A1   | 0.00        | 0.25  | 0.000  | 0.010 |
| b    | 0.70        | 0.93  | 0.028  | 0.037 |
| b2   | 1.14        | 1.70  | 0.045  | 0.067 |
| c    | 0.38        | 0.69  | 0.015  | 0.027 |
| c2   | 1.19        | 1.36  | 0.047  | 0.053 |
| D    | 8.60        | 9.35  | 0.339  | 0.368 |
| D1   | 6.90        | 8.00  | 0.272  | 0.311 |
| D2   | 1.10        | 1.50  | 0.043  | 0.060 |
| E    | 10.00       | 10.55 | 0.394  | 0.415 |
| E1   | 8.10        | 8.90  | 0.319  | 0.346 |
| E2   | 6.85        | 7.25  | 0.266  | 0.282 |
| e    | 2.54 typ.   |       | 0.100  |       |
| e1   | 4.88        | 5.28  | 0.190  | 0.205 |
| H    | 15.00       | 15.85 | 0.591  | 0.624 |
| J1   | 2.49        | 2.90  | 0.097  | 0.112 |
| L    | 1.90        | 2.79  | 0.075  | 0.110 |
| L1   | 1.27        | 1.65  | 0.049  | 0.065 |
| L2   | 1.30        | 1.78  | 0.050  | 0.070 |
| R    | 0.4 typ.    |       | 0.015  |       |
| V2   | 0°          | 8°    | 0°     | 8°    |

Figure 14: D<sup>2</sup>PAK recommended footprint (dimensions in mm)

### 3 Ordering information

Table 8: Ordering information

| Order code    | Marking     | Package            | Weight | Base qty. | Delivery mode |
|---------------|-------------|--------------------|--------|-----------|---------------|
| STPS2045CT    | STPS2045CT  | TO-220AB           | 1.95 g | 50        | Tube          |
| STPS2045CFP   | STPS2045CFP | TO-220FPAB         | 1.9 g  | 50        | Tube          |
| STPS2045CG-TR | STPS2045CG  | D <sup>2</sup> PAK | 1.38 g | 1000      | Tape and reel |

### 4 Revision history

Table 9: Document revision history

| Date        | Revision | Changes                                                                                                                                                                                                                                                                                         |
|-------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 05-Oct-2004 | 4F       | Last update.                                                                                                                                                                                                                                                                                    |
| 01-Dec-2004 | 5        | Figure 16 (I <sup>2</sup> PAK Package Mechanical Data): references b1 and b2 changed from 1.17mm to 1.70mm.                                                                                                                                                                                     |
| 05-Feb-2010 | 6        | Updated <i>Table 2</i> (removed voltage). Updated ECOPACK statement. Updated <i>Table 6</i> : <i>TO-220AB package mechanical data</i> .                                                                                                                                                         |
| 05-Mar-2013 | 7        | Updated <i>Table 3</i>                                                                                                                                                                                                                                                                          |
| 21-Oct-2014 | 8        | Updated <i>Features</i> , <i>Table 2</i> , <i>Figure 3</i> and D <sup>2</sup> PAK package information. Added <i>Figure 9</i> . Removed fig 4,5 and 6 of version 7.                                                                                                                              |
| 17-Aug-2015 | 9        | Corrected XML fragment and reformatted to current standard.                                                                                                                                                                                                                                     |
| 14-Oct-2016 | 10       | Remove of I <sup>2</sup> PAK package.<br>Updated cover page, <a href="#">Section 3.1: "Characteristics (curves)"</a> , <a href="#">Section 3: "Characteristics"</a> , <a href="#">Section 4.4: "D<sup>2</sup>PAK package information"</a> and <a href="#">Table 8: "Ordering information"</a> . |

**IMPORTANT NOTICE – PLEASE 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 acknowledgement.

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. 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.

© 2016 STMicroelectronics – All rights reserved