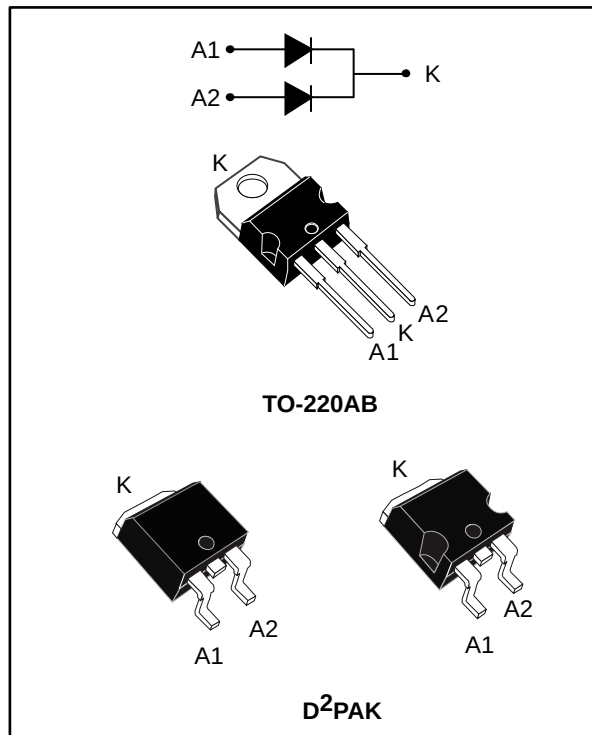


## High frequency secondary rectifier

Datasheet - production data



### Description

Dual center tap fast recovery epitaxial diodes suited for switch mode power supply and high frequency DC to DC converters.

Packaged either in TO-220AB and D<sup>2</sup>PAK, this device is particularly intended for secondary rectification inside SMPS with high space and power density.

Table 1: Device summary

| Symbol          | Value          |
|-----------------|----------------|
| $I_{F(AV)}$     | 2 x 10 A       |
| $V_{RRM}$       | 300 V          |
| $T_j$           | -40 to +175 °C |
| $V_F$ (typ.)    | 0.8 V          |
| $t_{rr}$ (typ.) | 26 ns          |

### Features

- Ultrafast, soft and noise-free recovery
- Low forward voltage drop meaning very small conduction losses
- 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                 |                                   |            | 300         | 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 | T <sub>C</sub> = 155 °C           | Per diode  | 10          | A    |
|                     |                                                 | T <sub>C</sub> = 150 °C           | Per device | 20          |      |
| I <sub>FSM</sub>    | Surge non repetitive forward current            | t <sub>p</sub> = 10 ms sinusoidal |            | 150         | A    |
| T <sub>stg</sub>    | Storage temperature range                       |                                   |            | -65 to +175 | °C   |
| T <sub>j</sub>      | Maximum operating junction temperature range    |                                   |            | -40 to +175 | °C   |

**Table 3: Thermal parameters**

| Symbol        | Parameter        |           | Max. value | Unit |
|---------------|------------------|-----------|------------|------|
| $R_{th(j-c)}$ | Junction to case | Per diode | 1.5        | °C/W |
|               |                  | Total     | 1.0        |      |
| $R_{th(c)}$   | Coupling         |           | 0.5        | °C/W |

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 | $T_j = 25\text{ °C}$  | $V_R = V_{RRM}$     | -    |      | 10   | $\mu\text{A}$ |
|             |                         | $T_j = 125\text{ °C}$ |                     | -    | 10   | 100  |               |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25\text{ °C}$  | $I_F = 10\text{ A}$ | -    | 0.95 | 1.2  | V             |
|             |                         | $T_j = 125\text{ °C}$ |                     | -    | 0.8  | 0.95 |               |

**Notes:**

(1) Pulse test:  $t_p = 5\text{ ms}$ ,  $\delta < 2\%$

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

To evaluate the conduction losses, use the following equation:

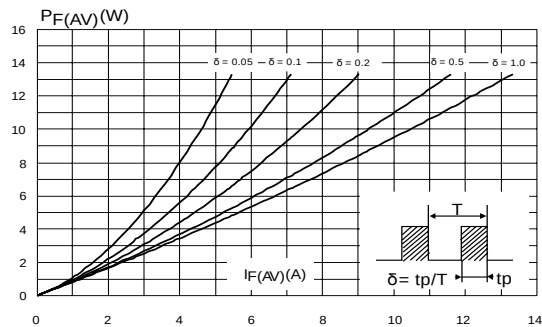
$$P = 0.8 \times I_{F(AV)} + 0.015 \times I_{F(RMS)}^2$$

Table 5: Dynamic electrical characteristics (per diode)

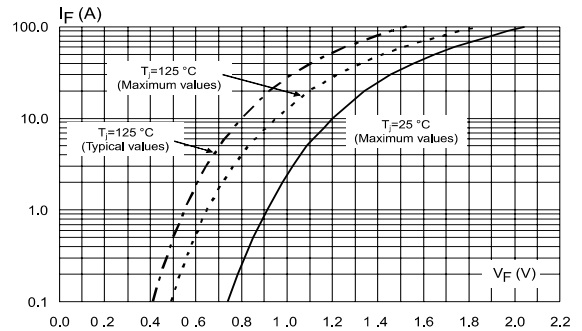
| Symbol       | Parameter                | Test conditions                     |                                                                                             | Min. | Typ. | Max. | Unit |
|--------------|--------------------------|-------------------------------------|---------------------------------------------------------------------------------------------|------|------|------|------|
| $t_{rr}$     | Reverse recovery time    | $T_j = 25\text{ }^{\circ}\text{C}$  | $I_F = 1\text{ A}$ ,<br>$V_R = 30\text{ V}$ ,<br>$di_F/dt = -100\text{ A}/\mu\text{s}$      | -    | 26   | 35   | ns   |
|              |                          |                                     | $I_F = 10\text{ A}$ ,<br>$V_R = 200\text{ V}$ ,<br>$di_F/dt = -200\text{ A}/\mu\text{s}$    | -    | 55   | 72   |      |
| $I_{RM}$     | Reverse recovery current | $T_j = 125\text{ }^{\circ}\text{C}$ | $I_F = 10\text{ A}$ ,<br>$V_R = 200\text{ V}$ ,<br>$di_F/dt = -200\text{ A}/\mu\text{s}$    | -    | 9    | 12   | A    |
| $S_{factor}$ | Softness factor          |                                     |                                                                                             | -    | 0.3  |      |      |
| $Q_{RR}$     | Reverse recovery charges |                                     |                                                                                             | -    | 250  | 375  | nC   |
| $t_{fr}$     | Forward recovery time    | $T_j = 25\text{ }^{\circ}\text{C}$  | $I_F = 10\text{ A}$ ,<br>$V_{FR} = 1.05\text{ V}$ ,<br>$di_F/dt = 100\text{ A}/\mu\text{s}$ | -    |      | 200  | ns   |
| $V_{FP}$     | Forward recovery voltage |                                     |                                                                                             | -    | 2.5  | 3.5  | V    |

## 1.1 Characteristics (curves)

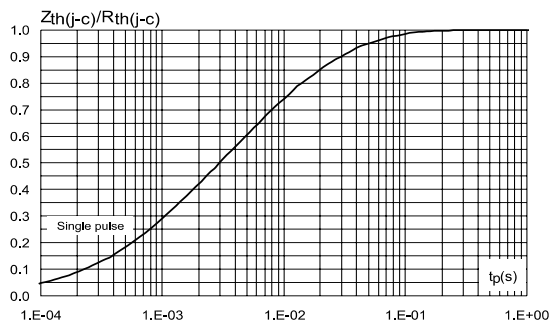
**Figure 1: Conduction losses versus average forward current (per diode)**



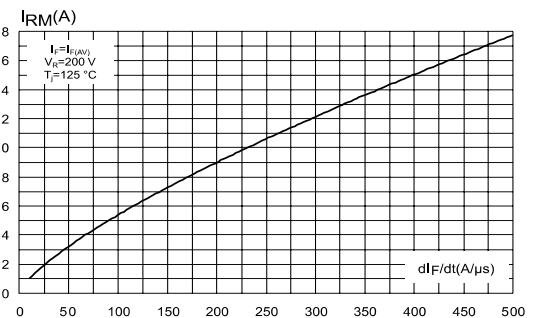
**Figure 2: Forward voltage drop versus forward current (per diode)**



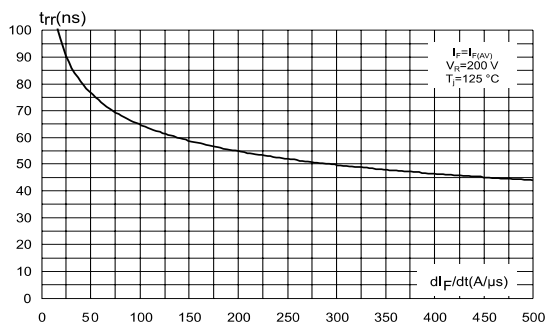
**Figure 3: Relative variation of thermal impedance junction to case versus pulse duration**



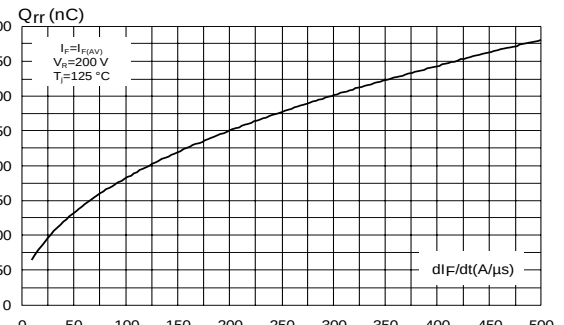
**Figure 4: Peak reverse recovery current versus  $di_F/dt$  (typical values, per diode)**



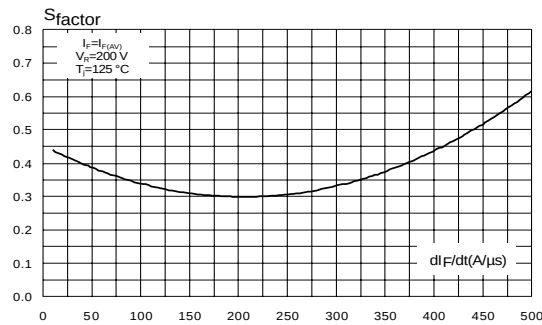
**Figure 5: Reverse recovery time versus  $di_F/dt$  (typical values, per diode)**



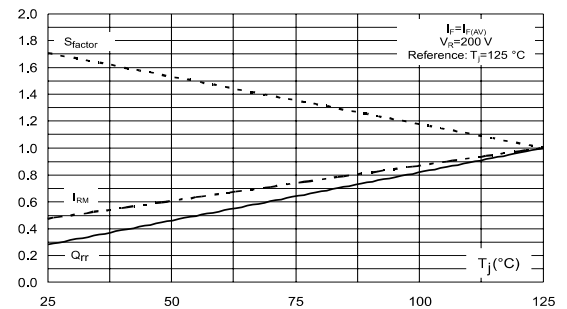
**Figure 6: Reverse recovery charges versus  $di_F/dt$  (typical values, per diode)**



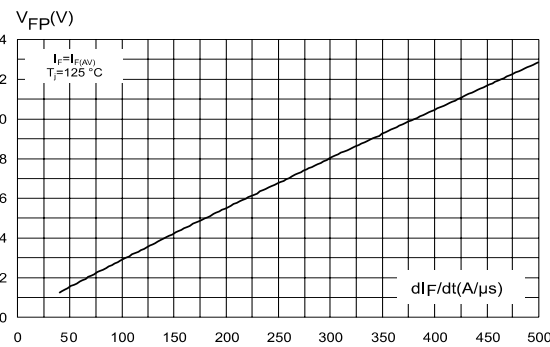
**Figure 7: Reverse recovery softness factor versus  $di_F/dt$  (typical values, per diode)**



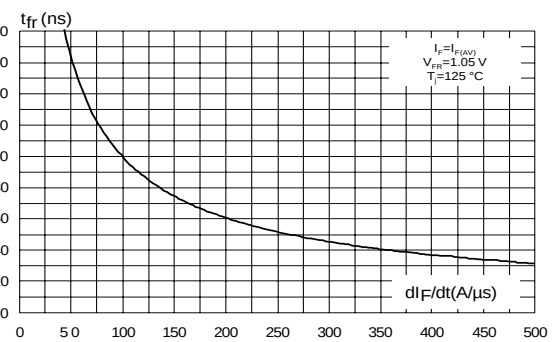
**Figure 8: Relative variation of dynamic parameters versus junction temperature**



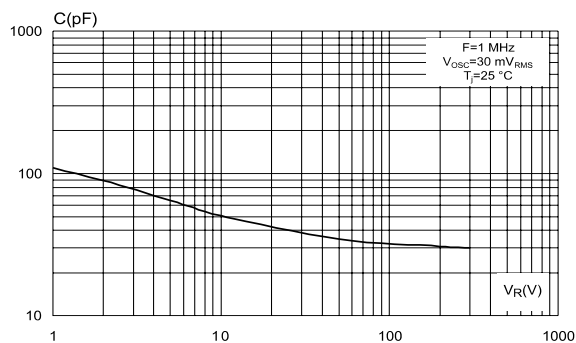
**Figure 9: Transient peak forward voltage versus  $di_F/dt$  (typical values, per diode)**



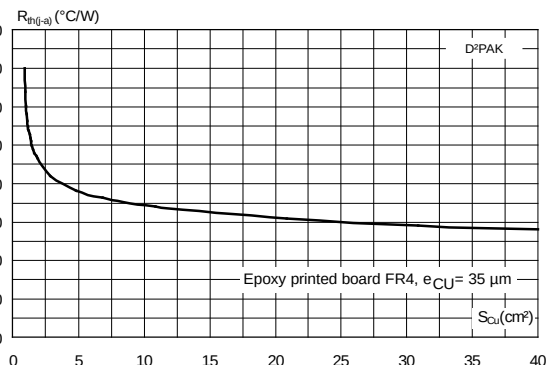
**Figure 10: Forward recovery time versus  $di_F/dt$  (typical values, per diode)**



**Figure 11: Junction capacitance versus reverse voltage applied (typical values, per diode)**



**Figure 12: Thermal resistance, junction to ambient, versus copper surface under tab**

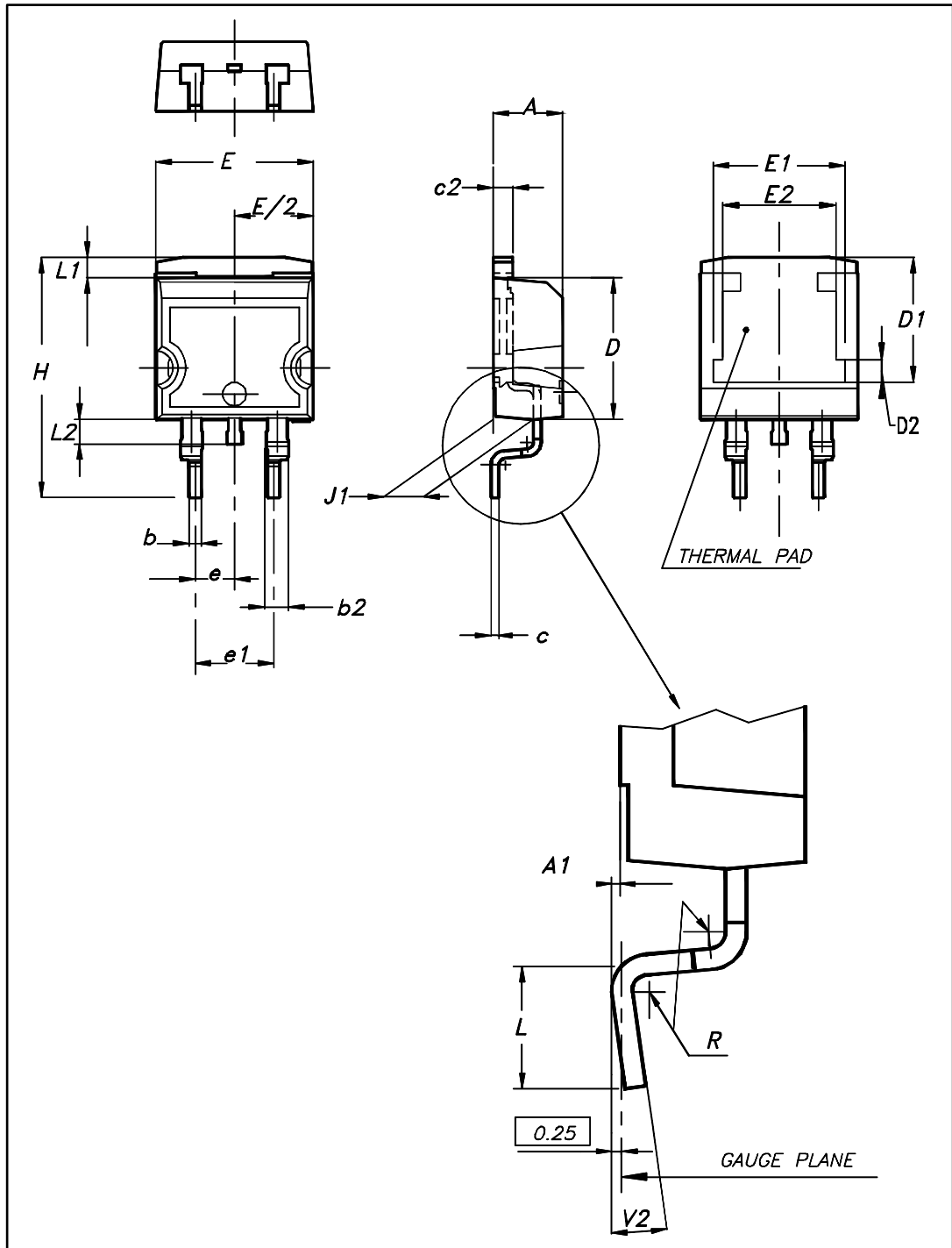


## 2 Package information

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)
- Maximum torque value: 0.7 N·m (for TO-220AB)

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

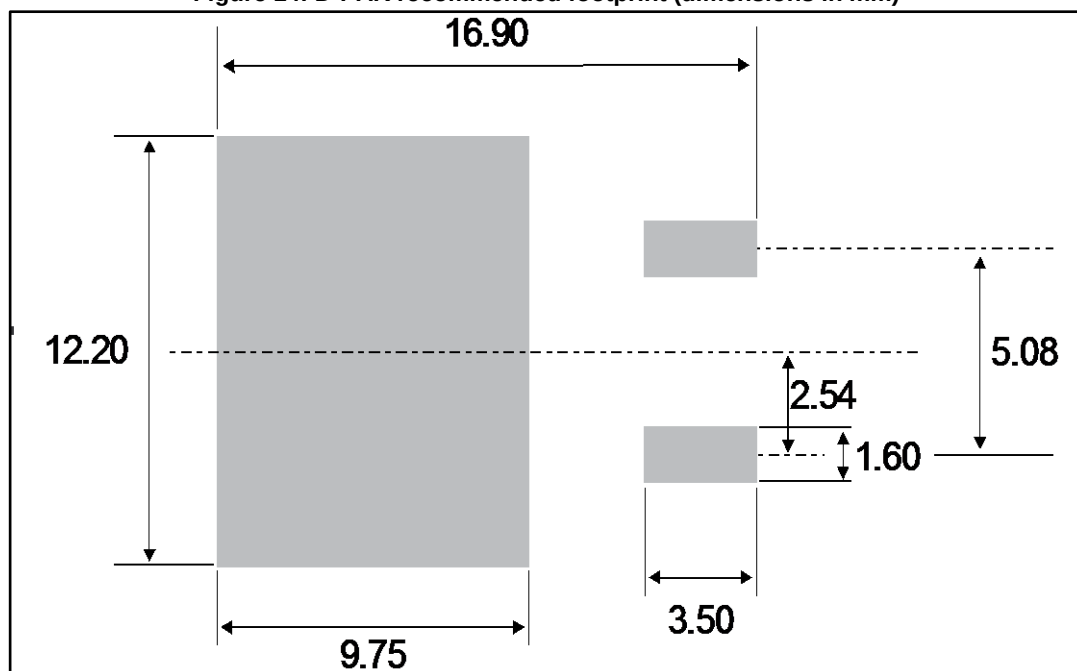
Figure 13: D<sup>2</sup>PAK package outline

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

Table 6: 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)

## 2.2 TO-220AB package information

Figure 15: TO-220AB package outline

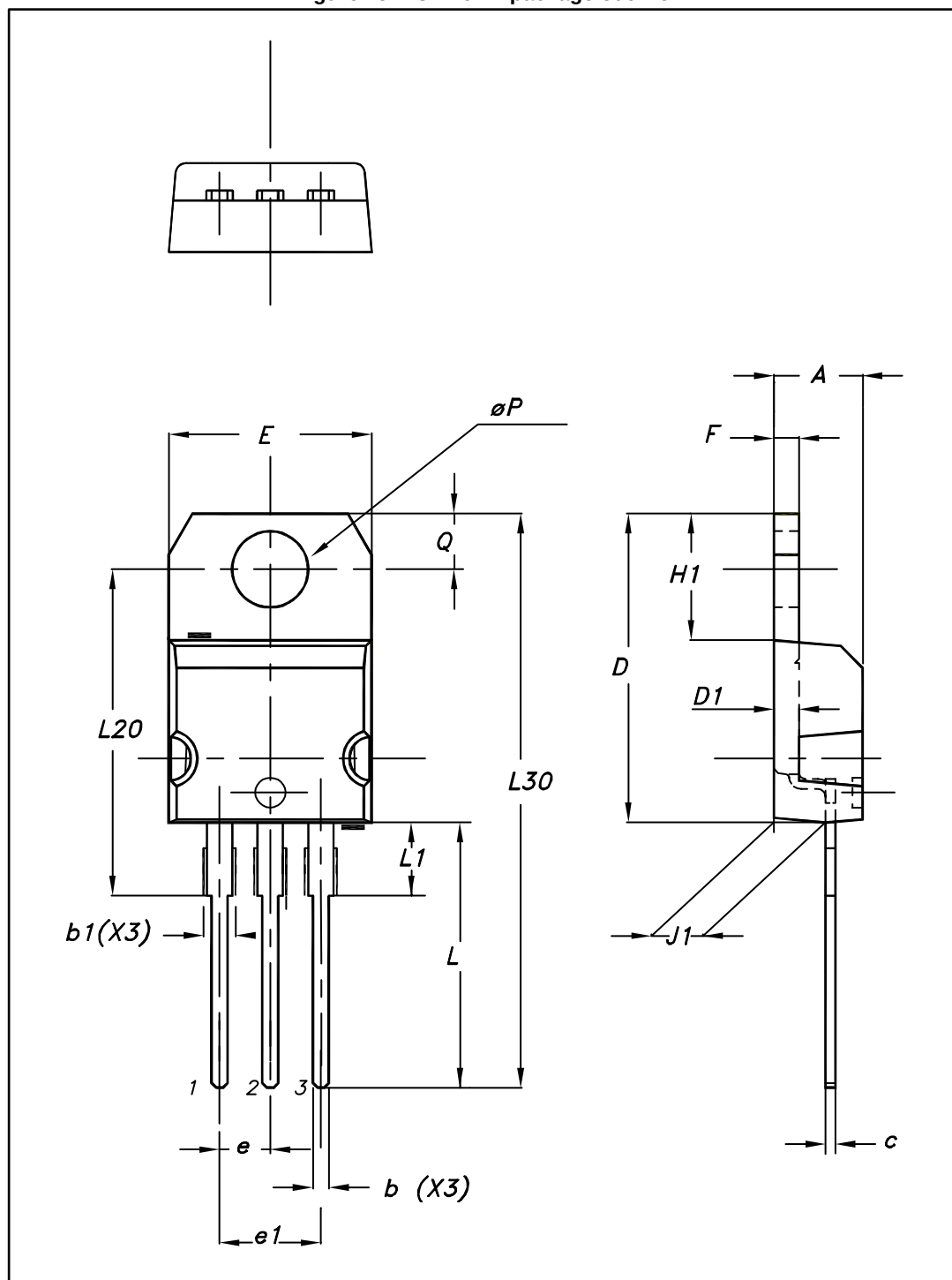


Table 7: TO-220AB package mechanical data

| 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 |

### 3 Ordering information

Table 8: Ordering information

| Order code     | Marking     | Package            | Weight | Base qty. | Delivery mode |
|----------------|-------------|--------------------|--------|-----------|---------------|
| STTH20L03CT    | STTH20L03CT | TO-220AB           | 1.9 g  | 50        | Tube          |
| STTH20L03CG-TR | STTH20L03CG | D <sup>2</sup> PAK | 1.38 g | 1000      | Tape and reel |

### 4 Revision history

Table 9: Document revision history

| Date        | Revision | Changes                                                                                                                                                   |
|-------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 22-Jun-2012 | 1        | Initial release.                                                                                                                                          |
| 07-Oct-2016 | 2        | Updated cover page and <a href="#">Table 8: "Ordering information"</a> .<br>Updated <a href="#">Section 2.1: "D<sup>2</sup>PAK package information"</a> . |

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