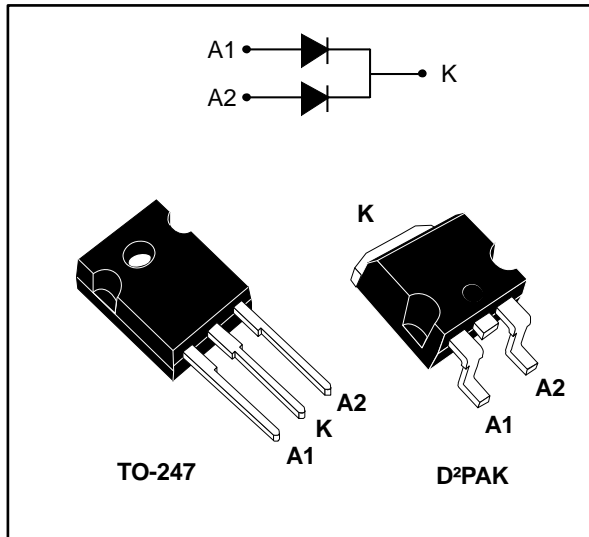


## Turbo 2 ultratfast high voltage rectifier

Datasheet - production data



### Description

This device uses ST Turbo 2 600 V technology, and is particularly suited as boost diode in discontinuous or critical mode power factor corrections.

It is also intended for use as a freewheeling diode in power supplies and other power switching applications.

Table 1: Device summary

| Symbol          | Value          |
|-----------------|----------------|
| $I_{F(AV)}$     | up to 2 x 20 A |
| $V_{RRM}$       | 600 V          |
| $V_F$ (typ.)    | 0.95 V         |
| $t_{rr}$ (max.) | 55 ns          |

### Features

- Ultrafast switching
- Low reverse current
- Low thermal resistance
- Reduce switching and 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              |                                   | 600         | V    |   |
| I <sub>F(RMS)</sub> | Forward rms current                          |                                   | 30          | A    |   |
| I <sub>F(AV)</sub>  | Average forward current δ = 0.5, square wave | T <sub>C</sub> = 140 °C           | Per diode   | 15   | A |
|                     |  | T <sub>C</sub> = 125 °C           | Per device  | 30   |   |
|                     |  | T <sub>C</sub> = 120 °C           | Per diode   | 20   |   |
|                     |  | T <sub>C</sub> = 110 °C           | Per device  | 40   |   |
| I <sub>FSM</sub>    | Surge non repetitive forward current         | t <sub>p</sub> = 10 ms sinusoidal | 130         | A    |   |
| T <sub>stg</sub>    | Storage temperature range                    |                                   | -65 to +175 | °C   |   |
| T <sub>j</sub>      | Maximum operating junction temperature       |                                   | +175        | °C   |   |

**Table 3: Thermal parameters**

| Symbol               | Parameter        |           | Max. value | Unit |
|----------------------|------------------|-----------|------------|------|
| R <sub>th(j-c)</sub> | Junction to case | Per diode | 1.7        | °C/W |
|                      |                  | Total     | 1.15       |      |
| R <sub>th(c)</sub>   | Coupling         |           | 0.6        | °C/W |

When the diodes 1 and 2 are used simultaneously:

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

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

| Symbol                        | Parameter               | Test conditions         |                                   | Min. | Typ. | Max. | Unit |
|-------------------------------|-------------------------|-------------------------|-----------------------------------|------|------|------|------|
| I <sub>R</sub> <sup>(1)</sup> | Reverse leakage current | T <sub>j</sub> = 25 °C  | V <sub>R</sub> = V <sub>RRM</sub> | -    |      | 15   | µA   |
|                               |                         | T <sub>j</sub> = 150 °C |                                   | -    | 40   | 400  |      |
| V <sub>F</sub> <sup>(2)</sup> | Forward voltage drop    | T <sub>j</sub> = 25 °C  | I <sub>F</sub> = 15 A             | -    |      | 1.55 | V    |
|                               |                         | T <sub>j</sub> = 150 °C |                                   | -    | 0.95 | 1.2  |      |
|                               |                         | T <sub>j</sub> = 25 °C  | I <sub>F</sub> = 30 A             |      |      | 1.76 |      |
|                               |                         | T <sub>j</sub> = 150 °C |                                   | 1.15 | 1.45 |      |      |

**Notes:**

<sup>(1)</sup>Pulse test: t<sub>p</sub> = 5 ms, δ < 2%

<sup>(2)</sup>Pulse test: t<sub>p</sub> = 380 µs, δ < 2%

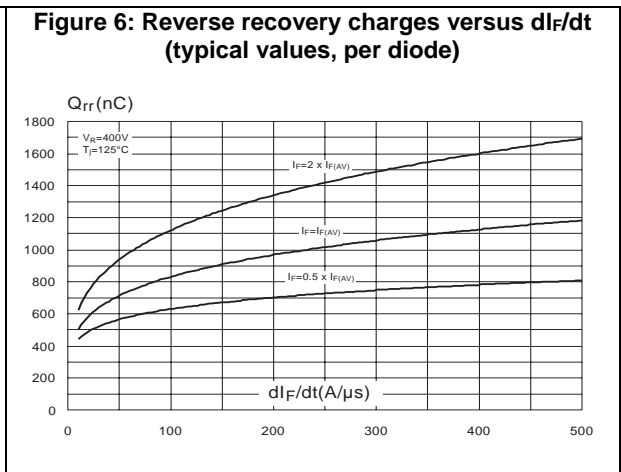
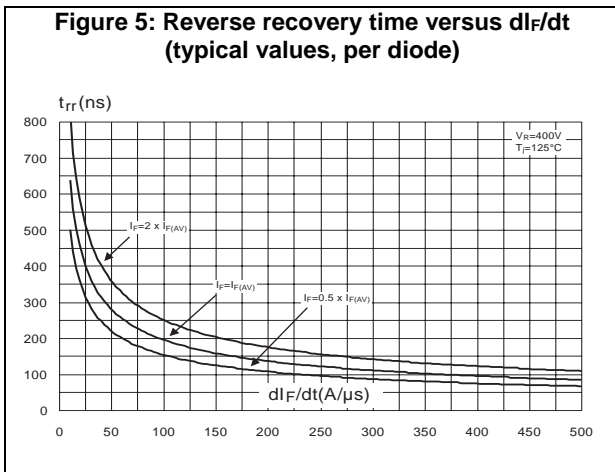
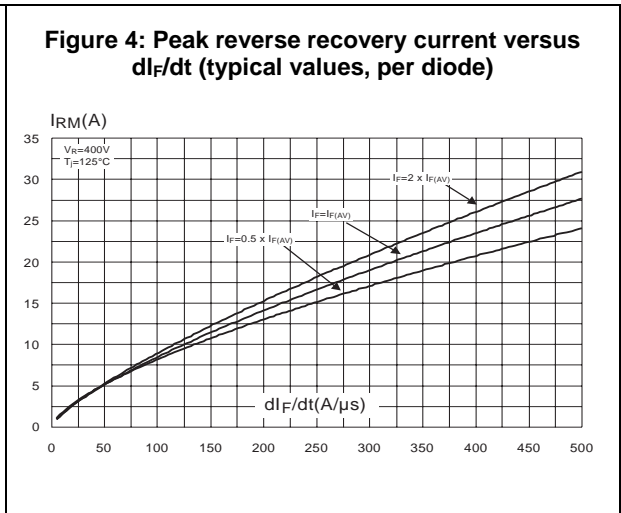
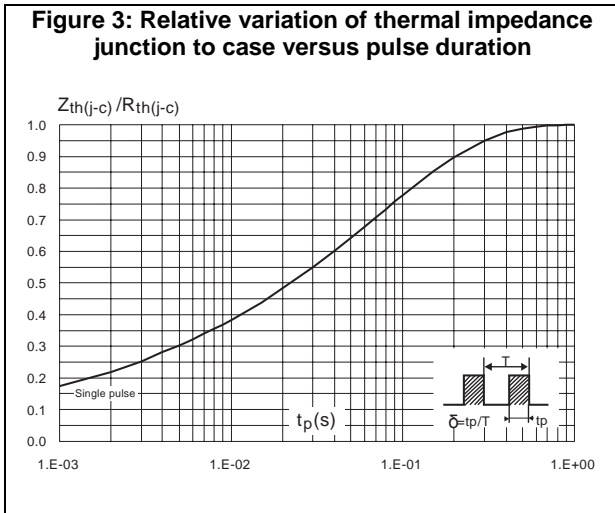
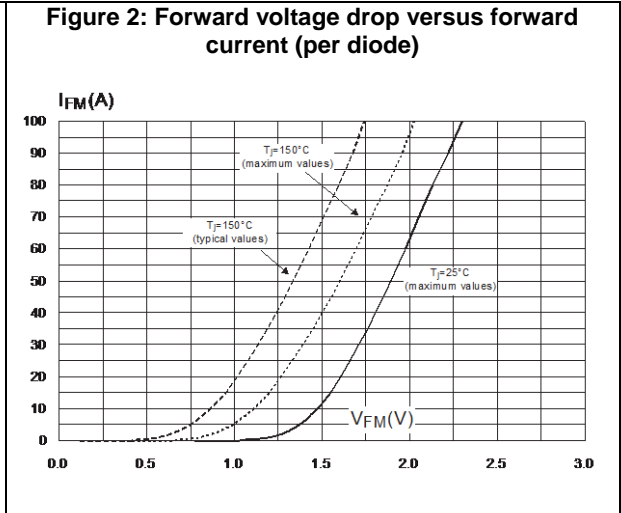
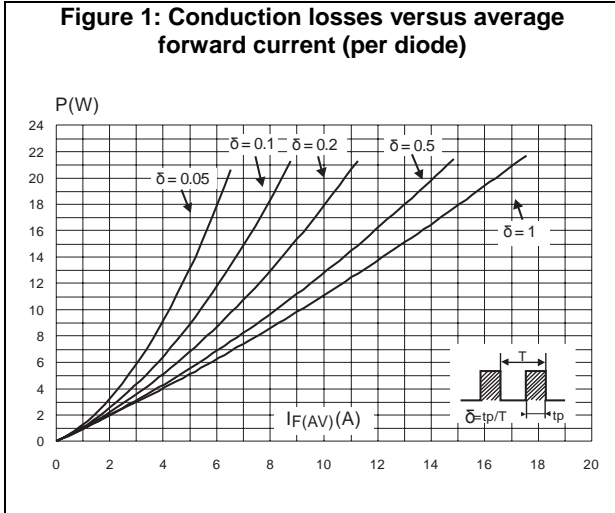
To evaluate the conduction losses, use the following equation:

$$P = 0.94 \times I_{F(AV)} + 0.017 \times I_{F(RMS)}^2$$

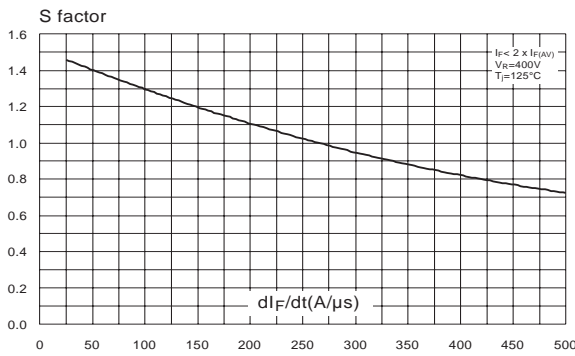
Table 5: Dynamic electrical characteristics (per diode)

| Symbol   | Parameter                | Test conditions       |  | Min. | Typ. | Max. | Unit |
|----------|--------------------------|-----------------------|--|------|------|------|------|
| $t_{rr}$ | Reverse recovery time    | $T_j = 25\text{ °C}$  | $I_F = 0.5\text{ A}$<br>$I_R = 1\text{ A}$<br>$I_{rr} = 0.25\text{ A}$                         | -    |      | 55   | ns   |
|          |                          |                       | $I_F = 1\text{ A}$<br>$V_R = 30\text{ V}$<br>$di_F/dt = 50\text{ A}/\mu\text{s}$               | -    | 60   | 85   |      |
| $I_{RM}$ | Reverse recovery current | $T_j = 125\text{ °C}$ | $I_F = 15\text{ A}$<br>$V_R = 400\text{ V}$<br>$di_F/dt = 100\text{ A}/\mu\text{s}$            | -    | 8.5  | 12   | A    |
| $t_{fr}$ | Forward recovery time    | $T_j = 25\text{ °C}$  | $I_F = 15\text{ A}$<br>$V_{FR} = 1.1 \times V_{Fmax.}$<br>$di_F/dt = 100\text{ A}/\mu\text{s}$ | -    |      | 300  | ns   |
| $V_{FP}$ | Forward recovery voltage |                       |  | -    | 3.0  |      | V    |

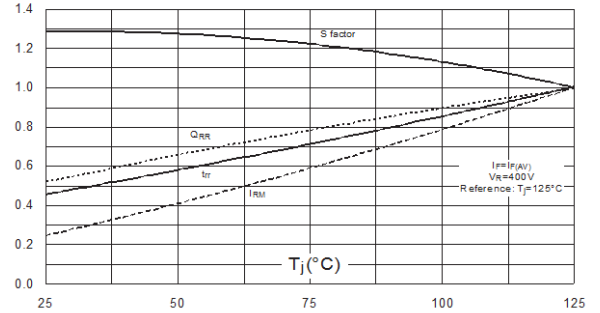
### 1.1 Characteristics (curves)



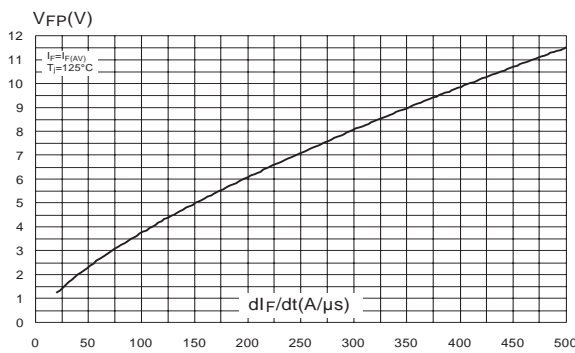
**Figure 7: Reverse recovery softness factor versus  $di_F/dt$  (typical values, per diode)**



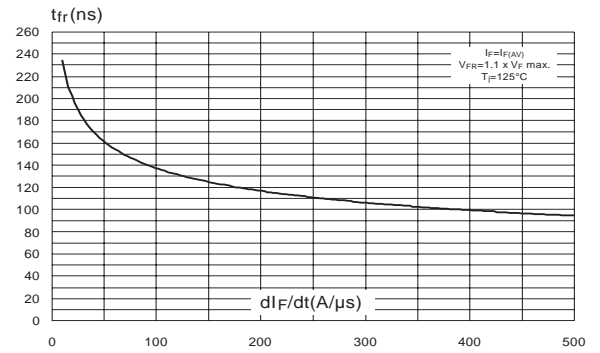
**Figure 8: Relative variation of dynamic parameters versus junction temperature**



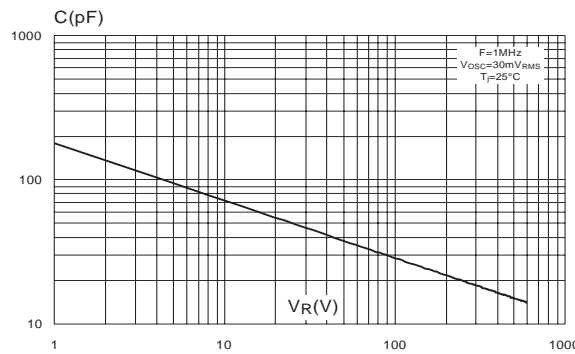
**Figure 9: Transient peak forward voltage versus  $di_F/dt$  (typical values, per diode)**



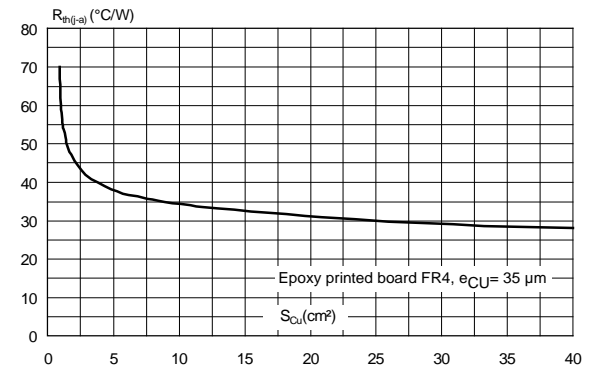
**Figure 10: Forward recovery time versus  $di_F/dt$  (typical values, per diode)**



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



**Figure 12: Thermal resistance, junction to ambient, versus copper surface under tab (D<sup>2</sup>PAK)**



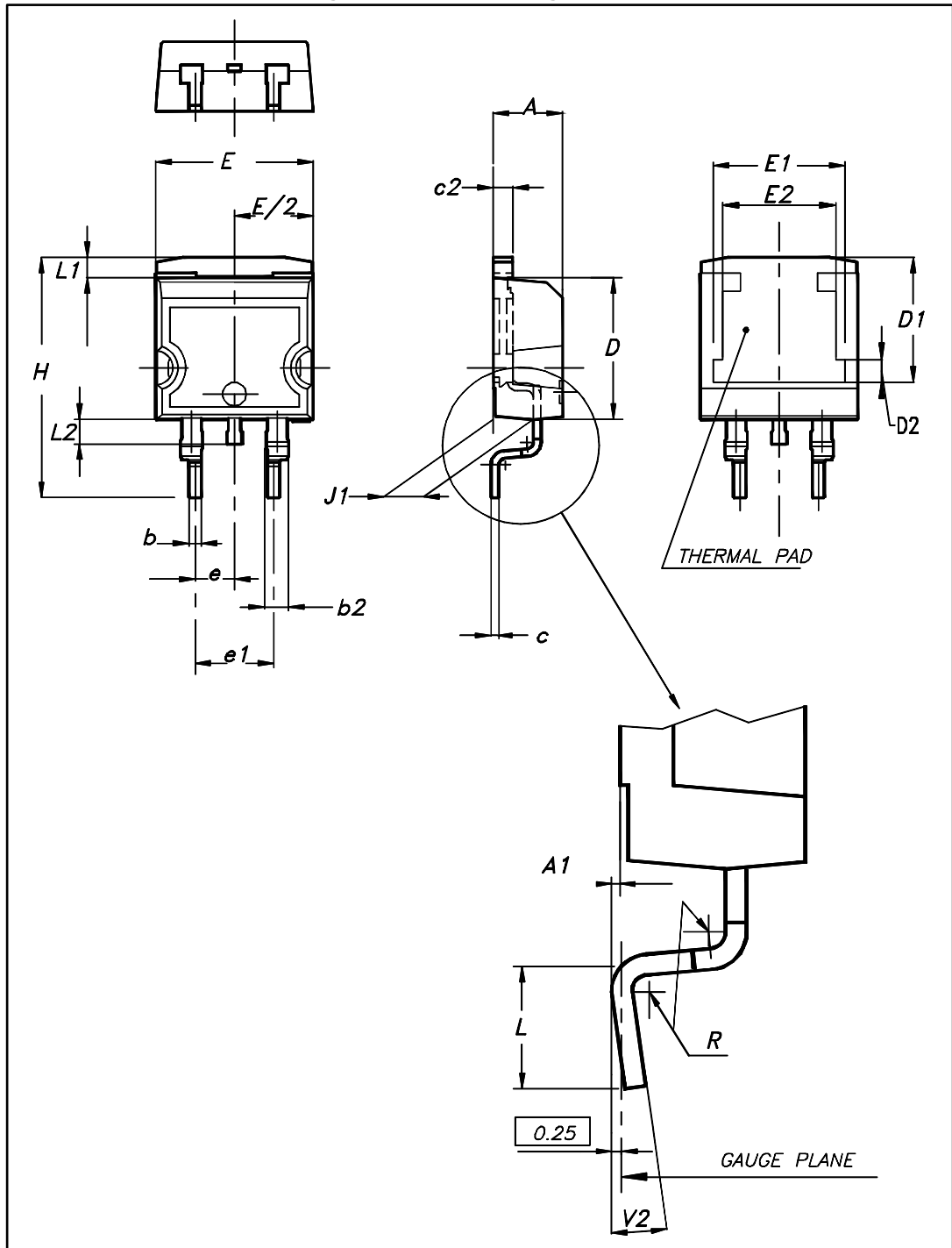
## 2 Package information

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: 0.8 N·m
- Maximum torque value: 1.0 N·m

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

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

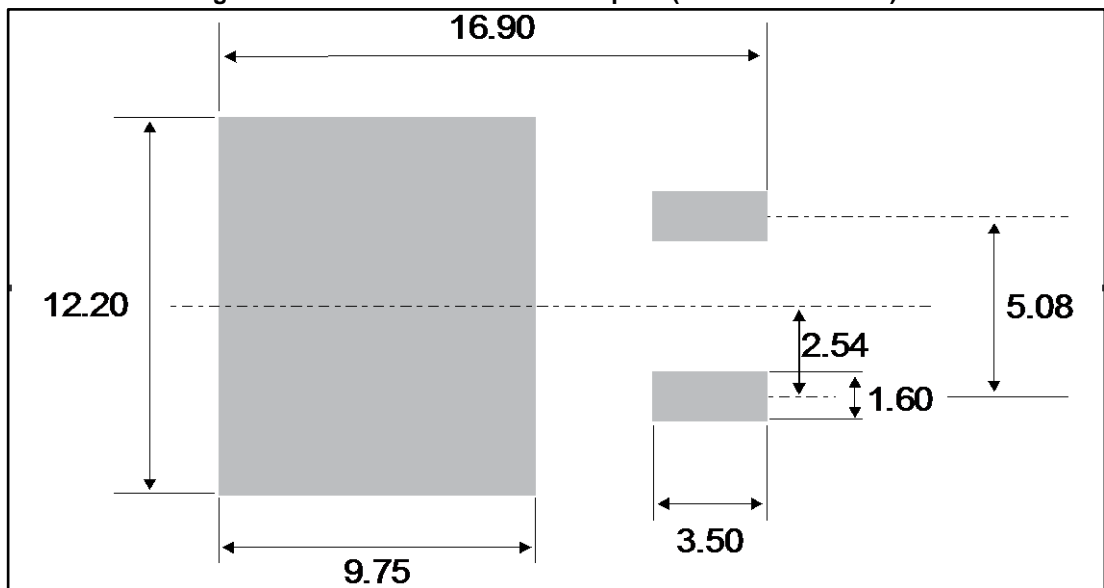


This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

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-247 package information

Figure 15: TO-247 package outline

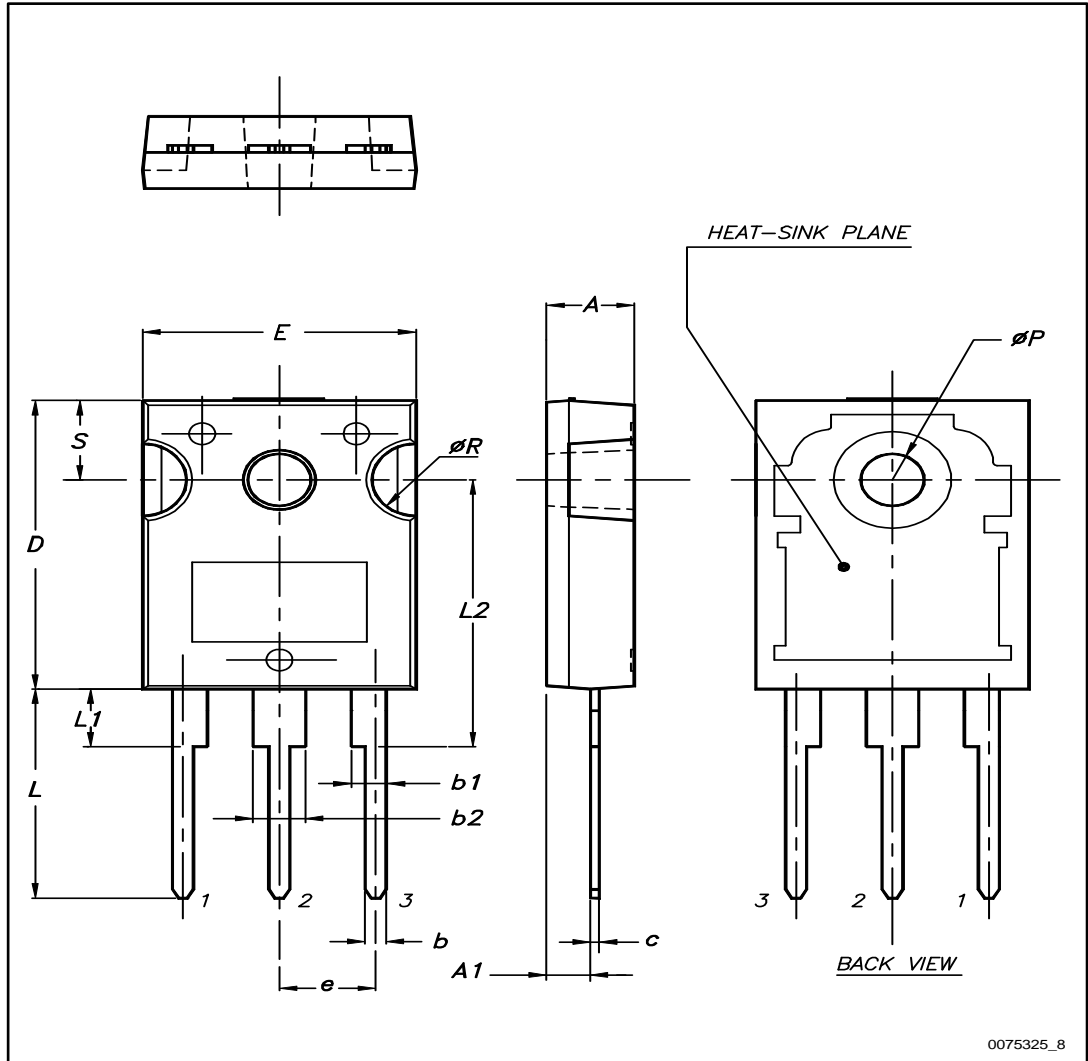


Table 7: TO-247 package mechanical data

| Ref.              | Dimensions  |       |       |        |       |       |
|-------------------|-------------|-------|-------|--------|-------|-------|
|                   | Millimeters |       |       | Inches |       |       |
|                   | Min.        | Typ.  | Max.  | Min.   | Typ.  | Max.  |
| A                 | 4.85        |       | 5.15  | 0.191  |       | 0.203 |
| A1                | 2.20        |       | 2.60  | 0.086  |       | 0.102 |
| b                 | 1.00        |       | 1.40  | 0.039  |       | 0.055 |
| b1                | 2.00        |       | 2.40  | 0.078  |       | 0.094 |
| b2                | 3.00        |       | 3.40  | 0.118  |       | 0.133 |
| c                 | 0.40        |       | 0.80  | 0.015  |       | 0.031 |
| D <sup>(1)</sup>  | 19.85       |       | 20.15 | 0.781  |       | 0.793 |
| E                 | 15.45       |       | 15.75 | 0.608  |       | 0.620 |
| e                 | 5.30        | 5.45  | 5.60  | 0.209  | 0.215 | 0.220 |
| L                 | 14.20       |       | 14.80 | 0.559  |       | 0.582 |
| L1                | 3.70        |       | 4.30  | 0.145  |       | 0.169 |
| L2                |             | 18.50 |       |        | 0.728 |       |
| ØP <sup>(2)</sup> | 3.55        |       | 3.65  | 0.139  |       | 0.143 |
| ØR                | 4.50        |       | 5.50  | 0.177  |       | 0.217 |
| S                 | 5.30        | 5.50  | 5.70  | 0.209  | 0.216 | 0.224 |

**Notes:**

<sup>(1)</sup>Dimension D plus gate protusion does not exceed 20.5 mm

<sup>(2)</sup>Resin thickness around the mounting hole is not less than 0.9 mm.

### 3 Ordering information

Table 8: Ordering information

| Order code     | Marking     | Package            | Weight | Base qty. | Delivery mode |
|----------------|-------------|--------------------|--------|-----------|---------------|
| STTH30L06CG-TR | STTH30L06CG | D <sup>2</sup> PAK | 1.48 g | 1000      | Tape and reel |
| STTH30L06CW    | STTH30L06CW | TO-247             | 4.46 g | 50        | Tube          |

### 4 Revision history

Table 9: Document revision history

| Date        | Revision | Changes                               |
|-------------|----------|---------------------------------------|
| 07-Sep-2004 | 1        | Initial release.                      |
| 14-Dec-2016 | 2        | Removed TO-220AB package information. |

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