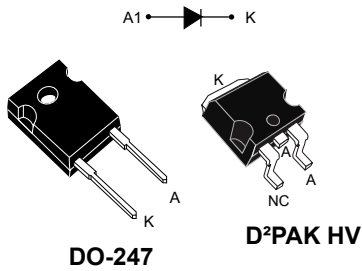


## High voltage rectifier for bridge applications



### Features

- Ultra low conduction losses
- Ultra-low reverse losses
- High junction temperature capability (+175 °C)
- D²PAK HV creepage distance (anode to cathode) = 5.38 mm min. (with top coating)
- ECOPACK®2 compliant (DO-247)

### Applications

- SMPS
- Bridge

### Description

The high quality design of this diode has produced a device with consistently reproducible characteristics and intrinsic ruggedness. These characteristics make it ideal for heavy duty applications that demand long term reliability like automotive applications.

Thanks to its ultra-low conduction losses, the **STBR3012** is especially suitable for use as input bridge diode in battery chargers.

#### Product status link

[STBR3012](#)

#### Product summary

| Symbol       | Value   |
|--------------|---------|
| $I_{F(AV)}$  | 30 A    |
| $V_{RRM}$    | 1200 V  |
| $T_j$        | +175 °C |
| $V_F$ (typ.) | 0.95 V  |

# 1 Characteristics

**Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified)**

| Symbol       | Parameter                            |                                                    | Value       | Unit |
|--------------|--------------------------------------|----------------------------------------------------|-------------|------|
| $V_{RSM}$    | Non-repetitive surge reverse voltage |                                                    | 1500        | V    |
| $V_{RRM}$    | Repetitive peak reverse voltage      |                                                    | 1200        | V    |
| $I_{F(RMS)}$ | Forward rms current                  |                                                    | 45          | A    |
| $I_{F(AV)}$  | Average forward current              | $T_C = 155\text{ °C}$ , $\delta = 0.5$ square wave | 30          | A    |
| $I_{FSM}$    | Surge non repetitive forward current | $t_p = 10\text{ ms}$ sinusoidal                    | 300         | A    |
| $T_{stg}$    | Storage temperature range            |                                                    | -65 to +175 | °C   |
| $T_j$        | Operating junction temperature       |                                                    | +175        | °C   |

**Table 2. Thermal parameters**

| Symbol        | Parameter        | Typ. value | Unit |
|---------------|------------------|------------|------|
| $R_{th(j-c)}$ | Junction to case | 0.45       | °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 | $T_j = 25\text{ °C}$  | $V_R = V_{RRM}$     | -    |      | 2    | $\mu\text{A}$ |
|             |                         | $T_j = 150\text{ °C}$ |                     | -    | 10   | 100  |               |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25\text{ °C}$  | $I_F = 30\text{ A}$ | -    | 1.05 | 1.3  | V             |
|             |                         | $T_j = 150\text{ °C}$ |                     | -    | 0.95 | 1.2  |               |

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:

$$P = 0.96 \times I_{F(AV)} + 0.008 \times I_{F(RMS)}^2$$

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 in a power diode

## 1.1 Characteristics (curves)

**Figure 1. Average forward power dissipation versus average forward current**

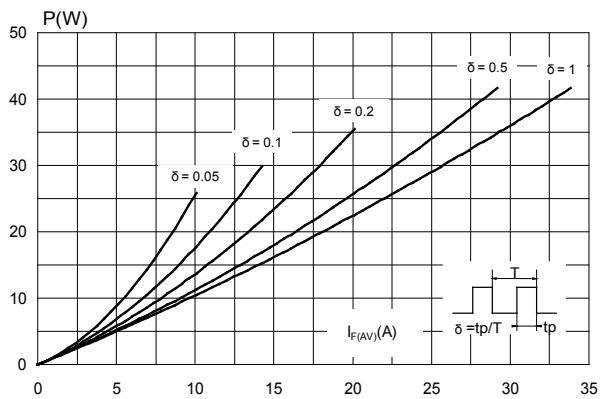


**Figure 2. Forward voltage drop versus forward current (typical values)**

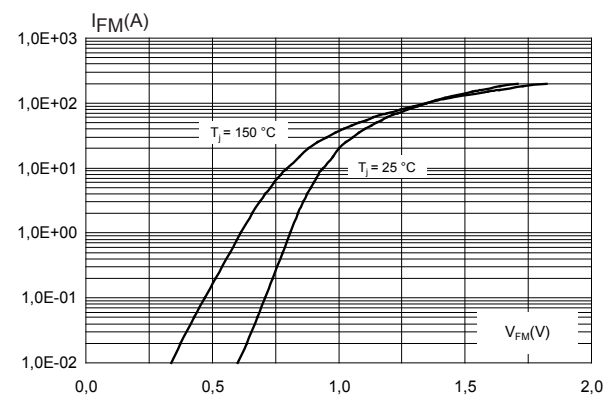


**Figure 3. Forward voltage drop versus forward current (maximum values)**

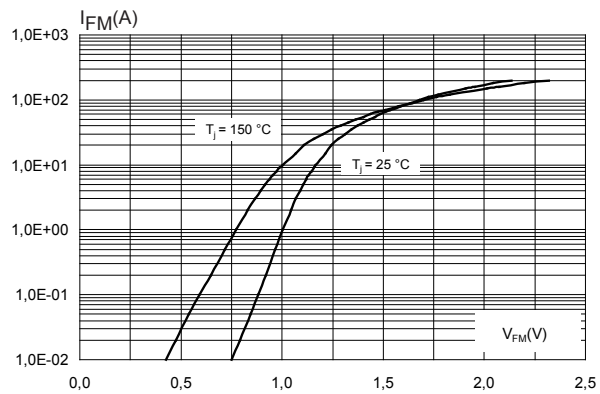


**Figure 4. Relative variation of thermal impedance junction to case versus pulse duration**

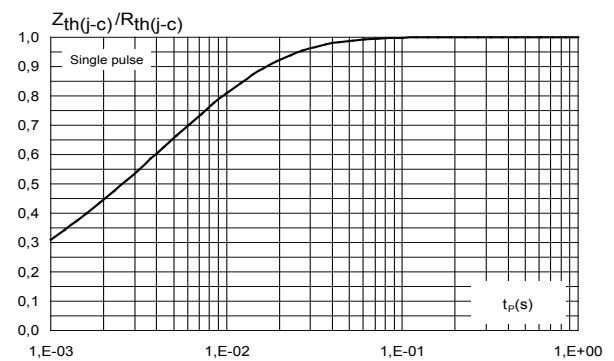
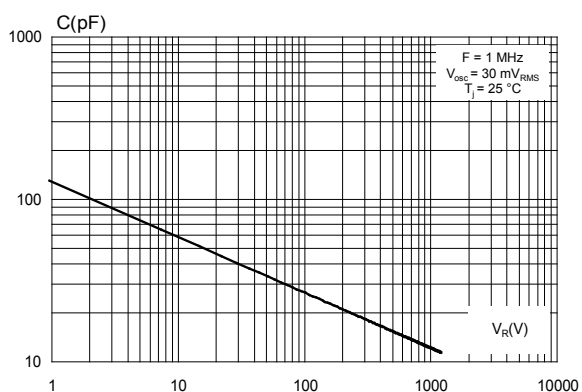
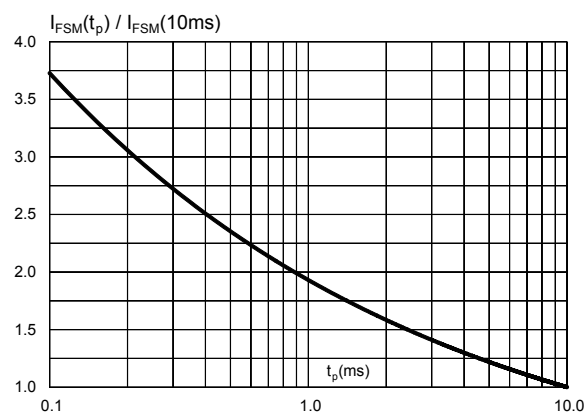
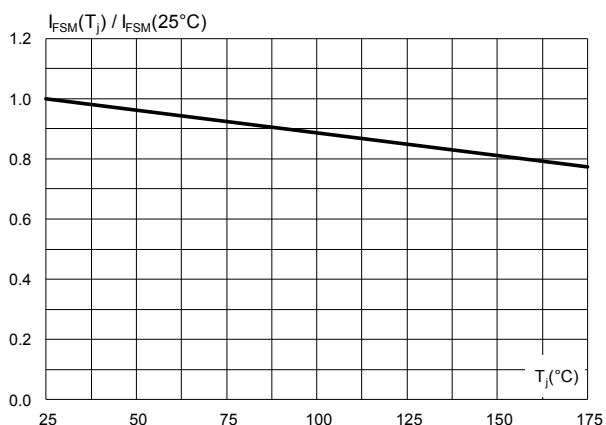
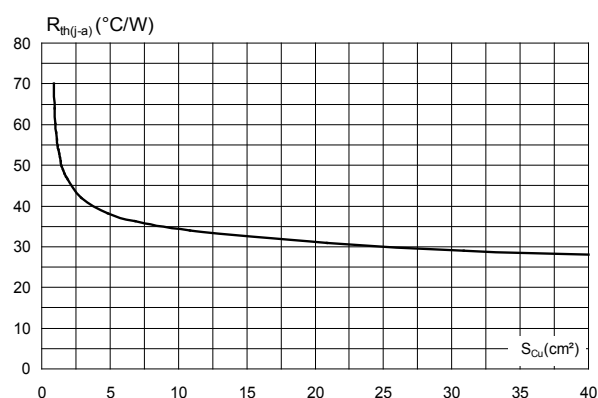


**Figure 5. Junction capacitance versus reverse voltage applied (typical values)**

**Figure 6. Relative variation of non-repetitive peak surge forward current versus pulse duration (sinusoidal waveform)**

**Figure 7. Relative variation of non-repetitive peak surge forward current versus initial junction temperature (sinusoidal waveform)**

**Figure 8. Thermal resistance junction to ambient versus copper surface under tab (typical values, epoxy printed board FR4,  $e_{Cu} = 35\mu\text{m}$ ) (D<sup>2</sup>PAK HV)**


## 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.

### 2.1 DO-247 package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.8 N·m (DO-247)
- Maximum torque value: 1.0 N·m (DO-247)

**Figure 9. DO-247 package outline**

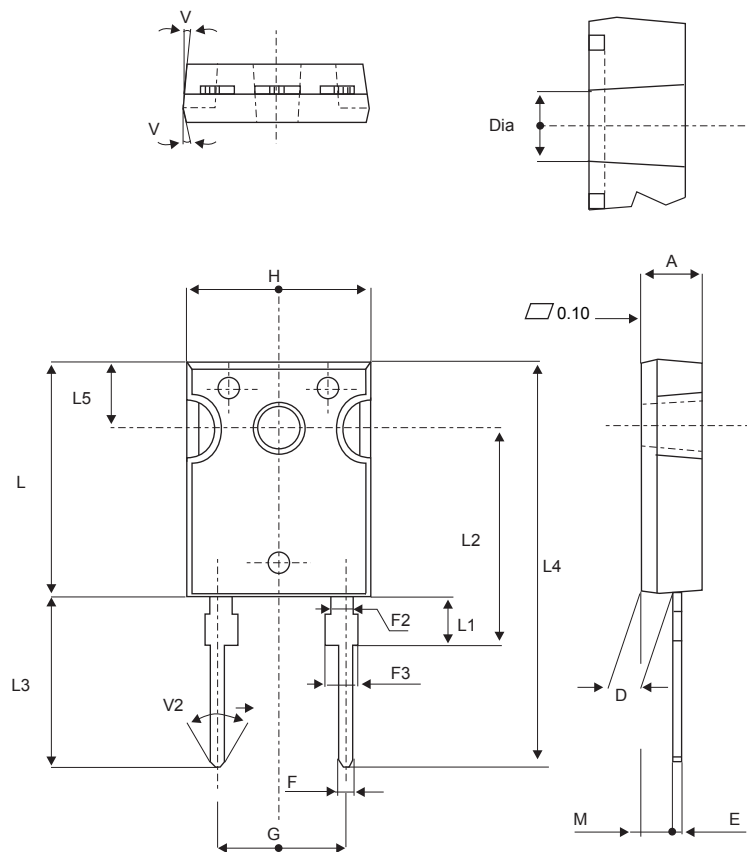


**Table 4. DO-247 package mechanical data**

| Ref. | Dimensions  |       |            |       |
|------|-------------|-------|------------|-------|
|      | Millimeters |       | Inches     |       |
|      | Min.        | Max.  | Min.       | Max.  |
| A    | 4.85        | 5.15  | 0.191      | 0.203 |
| D    | 2.20        | 2.60  | 0.086      | 0.102 |
| E    | 0.40        | 0.80  | 0.015      | 0.031 |
| F    | 1.00        | 1.40  | 0.039      | 0.055 |
| F2   | 2.00 typ.   |       | 0.078 typ. |       |
| F3   | 2.00        | 2.40  | 0.078      | 0.094 |
| G    | 10.90 typ.  |       | 0.429 typ. |       |
| H    | 15.45       | 15.75 | 0.608      | 0.620 |
| L    | 19.85       | 20.15 | 0.781      | 0.793 |
| L1   | 3.70        | 4.30  | 0.145      | 0.169 |
| L2   | 18.50 typ.  |       | 0.728 typ. |       |
| L3   | 14.20       | 14.80 | 0.559      | 0.582 |
| L4   | 34.60 typ.  |       | 1.362 typ. |       |
| L5   | 5.50 typ.   |       | 0.216 typ. |       |
| M    | 2.00        | 3.00  | 0.078      | 0.118 |
| V    | 5°          |       | 5°         |       |
| V2   | 60°         |       | 60°        |       |
| Dia. | 3.55        | 3.65  | 0.139      | 0.143 |

## 2.2 D<sup>2</sup>PAK high voltage package information

**Figure 10. D<sup>2</sup>PAK high voltage package outline**

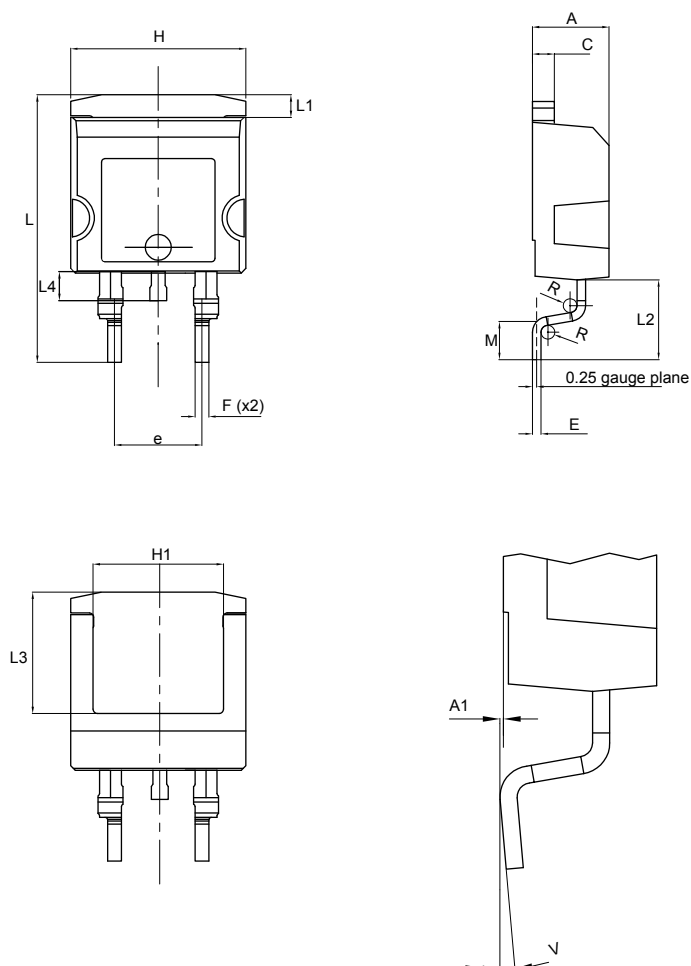
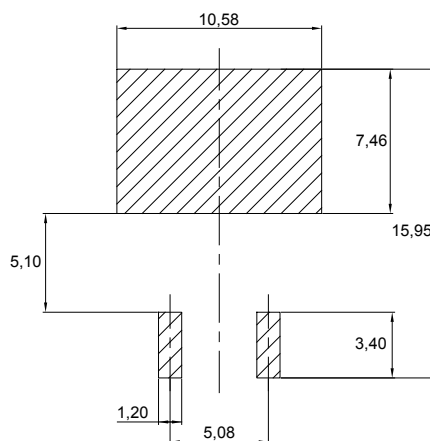


**Table 5. D<sup>2</sup>PAK high voltage package mechanical data**

| Ref. | Dimensions |      |       |
|------|------------|------|-------|
|      | Min.       | Typ. | Max.  |
| A    | 4.30       |      | 4.70  |
| A1   | 0.03       |      | 0.20  |
| C    | 1.17       |      | 1.37  |
| e    | 4.98       |      | 5.18  |
| E    | 0.50       |      | 0.90  |
| F    | 0.78       |      | 0.85  |
| H    | 10.00      |      | 10.40 |
| H1   | 7.40       |      | 7.80  |
| L    | 15.30      |      | 15.80 |
| L1   | 1.27       |      | 1.40  |
| L2   | 4.93       |      | 5.23  |
| L3   | 6.85       |      | 7.25  |
| L4   | 1.5        |      | 1.7   |
| M    | 2.6        |      | 2.9   |
| R    | 0.20       |      | 0.60  |
| V    | 0°         |      | 8°    |

**Figure 11. D<sup>2</sup>PAK High Voltage footprint in mm**


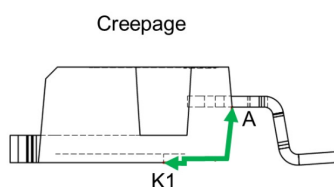
## 2.2.1 Creepage distance between anode and cathode

**Table 6. Creepage distance between anode and cathode**

| Symbol             | Parameter                                                        |                       | Value | Unit |
|--------------------|------------------------------------------------------------------|-----------------------|-------|------|
| Cd <sub>A-K1</sub> | Minimum creepage distance between A and K1 (with top coating)    | D <sup>2</sup> PAK HV | 5.38  | mm   |
| Cd <sub>A-K2</sub> | Minimum creepage distance between A and K2 (without top coating) |                       | 3.48  |      |

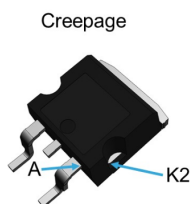
*Note:* D<sup>2</sup>PAK HV creepage distance (anode to cathode) = 5.38 mm min. (refer to IEC 60664-1)

**Figure 12. Creepage with top coating**



Minimum distance between A & K1 = 5.38 mm (with top coating)

**Figure 13. Creepage without top coating**



Minimum distance between A & K2 = 3.48 mm (without top coating)

### 3 Ordering information

**Table 7. Ordering information**

| Order code    | Marking    | Package               | Weight | Base qty. | Delivery mode |
|---------------|------------|-----------------------|--------|-----------|---------------|
| STBR3012W     | STBR3012W  | DO-247                | 4.4 g  | 30        | Tube          |
| STBR3012G2-TR | STBR3012G2 | D <sup>2</sup> PAK HV | 1.48 g | 1000      | Tape and reel |

## Revision history

**Table 8. Document revision history**

| Date        | Revision | Changes                      |
|-------------|----------|------------------------------|
| 02-Nov-2016 | 1        | First issue.                 |
| 19-Nov-2018 | 2        | Added D <sup>2</sup> PAK HV. |

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