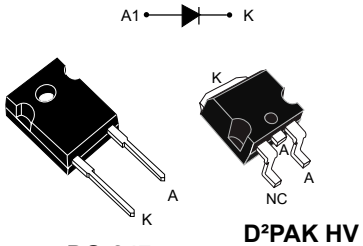
# STBR3012-Y

Datasheet

## Automotive high voltage rectifier for bridge applications




DO-247 D²PAK HV

## Features

- AEC-Q101 qualified
- Ultra low conduction losses
- Ultra-low reverse losses
- High junction temperature capability (+175 °C)
- $V_{RRM}$ guaranteed from -40 to +175 °C
- D²PAK HV creepage distance (anode to cathode) = 5.38 mm min. (with top coating)
- PPAP capable
- ECOPACK®2 compliant (DO-247)

## Applications

- On board charger
- 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-Y is especially suitable for use as input bridge diode in battery chargers.

| Product status link |
|---|
| STBR3012-Y |

| 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 | | 1600 | V |
| $V_{RRM}$ | Repetitive peak reverse voltage | $T_j$ = -40 °C to +175 °C | 1200 | V |
| $I_{F(RMS)}$ | Forward rms current | | 45 | A |
| $I_{F(AV)}$ | Average forward current | $T_C$ = 155 °C, δ = 0.5 square wave | 30 | A |
| $I_{FSM}$ | Surge non repetitive forward current | $t_p$ = 10 ms sinusoidal | 300 | A |
| $T_{stg}$ | Storage temperature range | | -65 to +175 | °C |
| $T_j$ | Operating junction temperature | | -40 to +175 | °C |

**Table 2. Thermal parameters**

| Symbol | Parameter | Typ. value | Unit |
|---|---|---|---|
| $R_{th(j-c)}$ | Junction to case | 0.45 | °C/W |

**Table 3. Static electrical characteristics**

| Symbol | Parameter | Test conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $I_R$ | Reverse leakage current | $T_j$ = 25 °C | $V_R = V_{RRM}$ | - | | 2 | µA |
| | | $T_j$ = 150 °C | | - | 10 | 100 | |
| $V_F$ | Forward voltage drop | $T_j$ = 25 °C | $I_F$ = 30 A | - | 1.05 | 1.3 | V |
| | | $T_j$ = 150 °C | | - | 0.95 | 1.2 | |

1. *Pulse test: $t_p$ = 5 ms, δ < 2%*
2. *Pulse test: $t_p$ = 380 µs, δ < 2%*

To evaluate the conduction losses, use the following equation:

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

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**

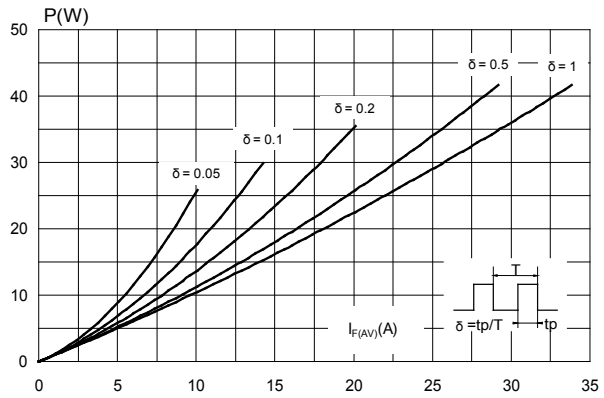



**Figure 2. Forward voltage drop versus forward current (typical values)**

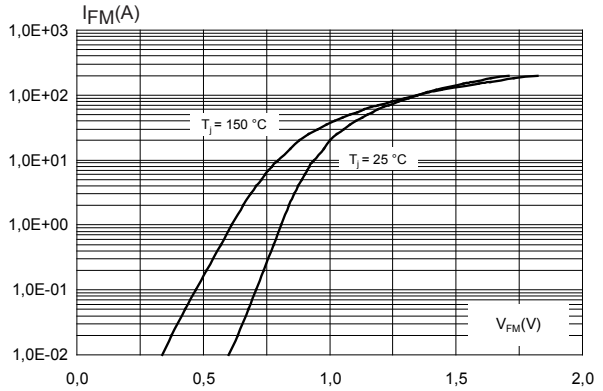



**Figure 3. Forward voltage drop versus forward current (maximum values)**

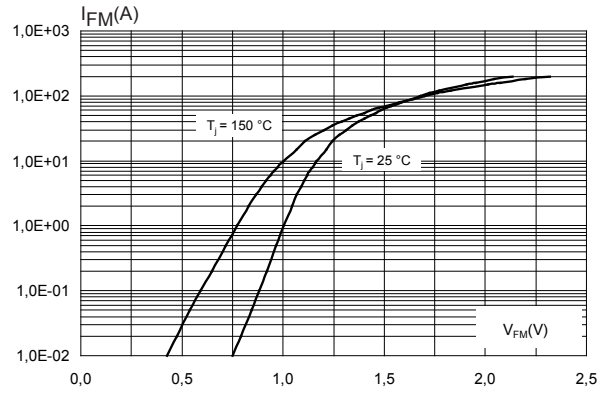



**Figure 4. Relative variation of thermal impedance junction to case versus pulse duration**

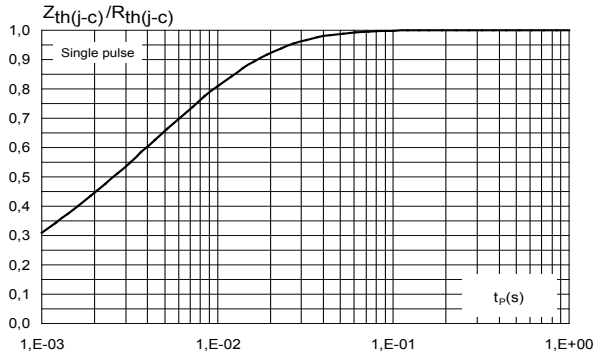


**Figure 5. Junction capacitance versus reverse voltage applied (typical values)**

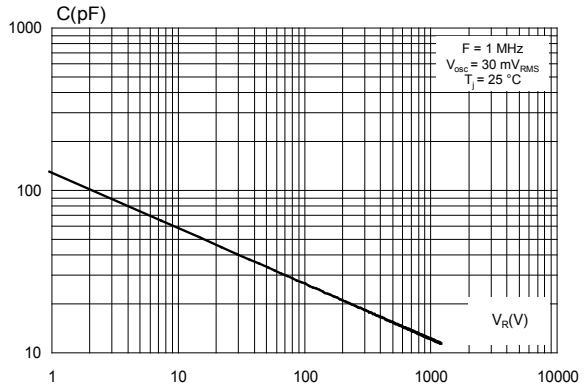



**Figure 6. Relative variation of non-repetitive peak surge forward current versus pulse duration (sinusoidal waveform)**

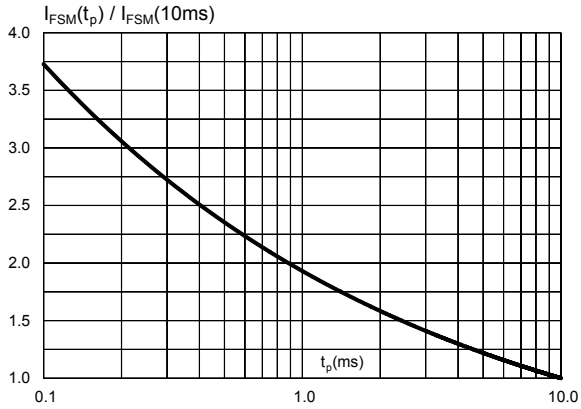



**Figure 7. Relative variation of non-repetitive peak surge forward current versus initial junction temperature (sinusoidal waveform)**

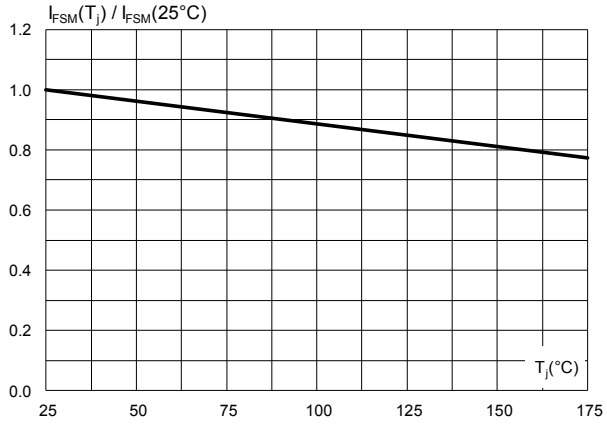
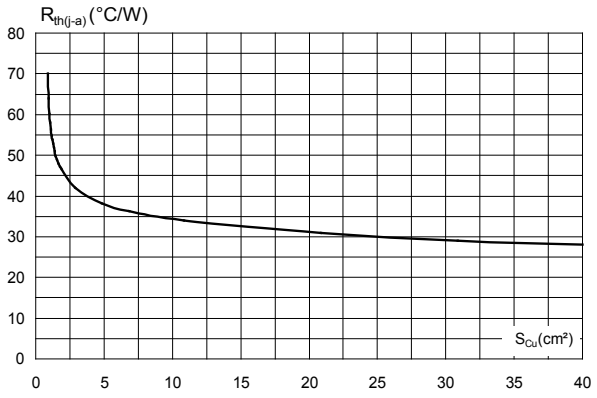



**Figure 8. Thermal resistance junction to ambient versus copper surface under tab (typical values, epoxy printed board FR4, $e_{Cu}$ = 35µm) (D²PAK HV)**



# 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. 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**

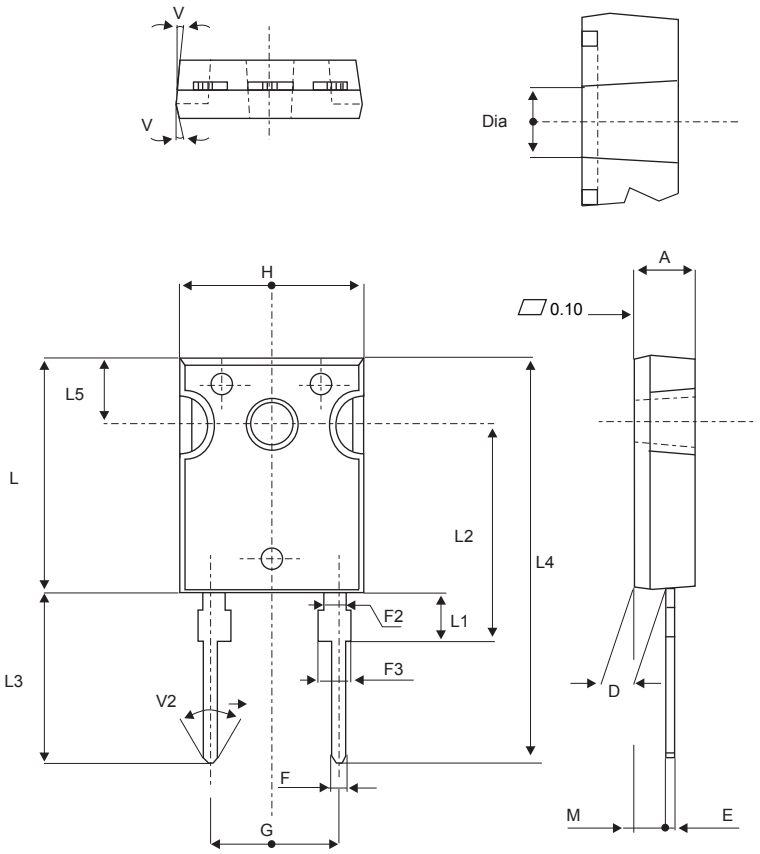


Table 4. **DO-247 package mechanical data**

| 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 D²PAK high voltage package information

Figure 10. D²PAK high voltage package outline

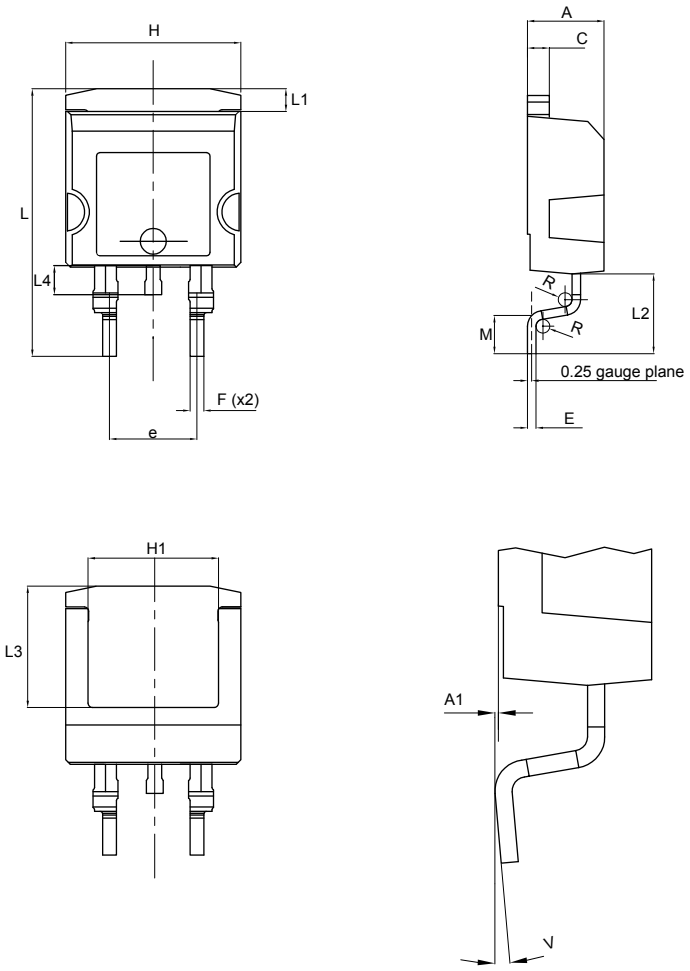
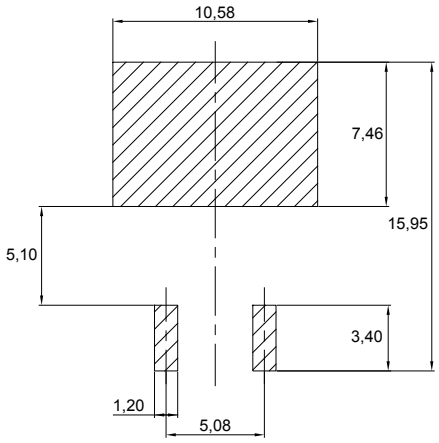


Table 5. D²PAK high voltage package mechanical data

| 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. D²PAK High Voltage footprint in mm



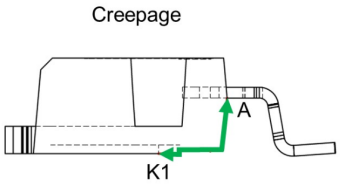
### 2.2.1 Creepage distance between anode and cathode

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

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $Cd_{A-K1}$ | Minimum creepage distance between A and K1 (with top coating) | D²PAK HV | 5.38 | mm |
| $Cd_{A-K2}$ | Minimum creepage distance between A and K2 (without top coating) | | 3.48 | |

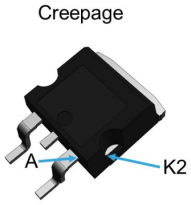
*Note: D²PAK HV creepage distance (anode to cathode) = 5.38 mm min. (refer to IEC 60664-1)*

**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 |
|---|---|---|---|---|---|
| STBR3012WY | STBR3012WY | DO-247 | 4.4 g | 30 | Tube |
| STBR3012G2Y-TR | STBR3012G2Y | D²PAK HV | 1.48 g | 1000 | Tape and reel |

## Revision history

Table 8. **Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 28-Oct-2016 | 1 | First issue. |
| 19-Nov-2018 | 2 | Added D²PAK HV. |