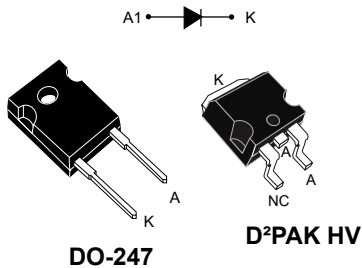



## Automotive high voltage rectifier for bridge applications



### 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
- D<sup>2</sup>PAK HV creepage distance (anode to cathode) = 5.38 mm min. (with top coating)
- PPAP capable
- ECOPACK<sup>®</sup>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	$T_j = -40\text{ °C to }+175\text{ °C}$	V
$I_{F(RMS)}$	Forward rms current	45	A
$I_{F(AV)}$	Average forward current	$T_C = 155\text{ °C}, \delta = 0.5\text{ square wave}$	A
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10\text{ ms sinusoidal}$	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	$T_j = 25\text{ °C}$	-	-	2	$\mu\text{A}$
		$T_j = 150\text{ °C}$			10	
$V_F$	Forward voltage drop	$T_j = 25\text{ °C}$	-	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:

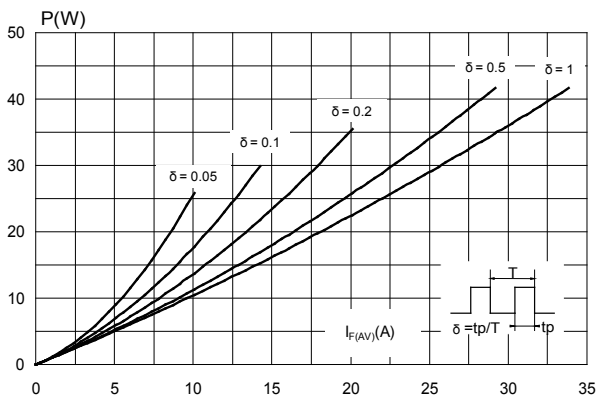
$$P = 0.96 \times I_{F(AV)} + 0.008 \times I_{F(RMS)}^2$$

For more information, please refer to the following application notes related to the power losses:

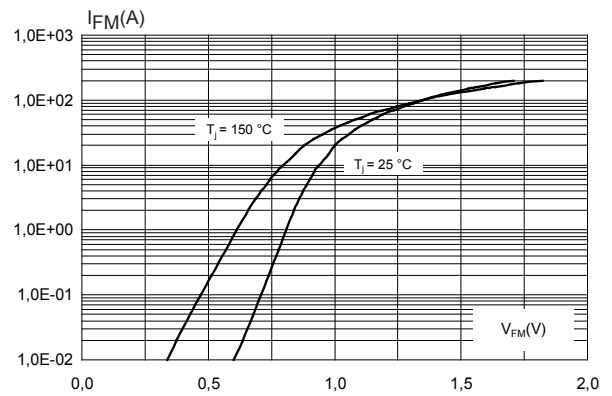
- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses in a power diode

### 1.1 Characteristics (curves)

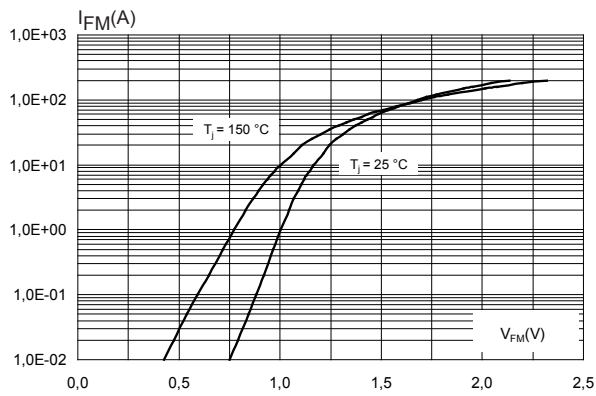
**Figure 1. Average forward power dissipation versus average forward current**



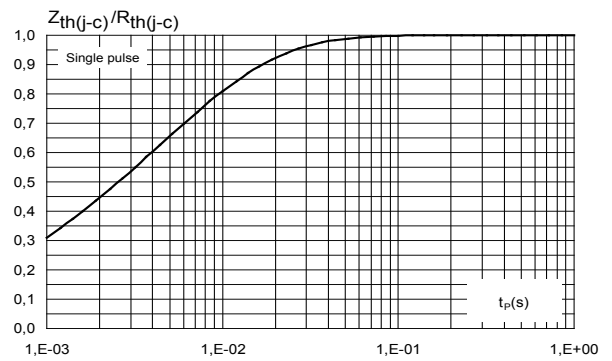
**Figure 2. Forward voltage drop versus forward current (typical values)**



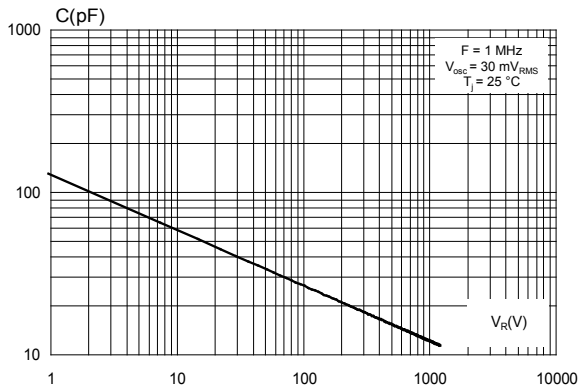
**Figure 3. Forward voltage drop versus forward current (maximum values)**



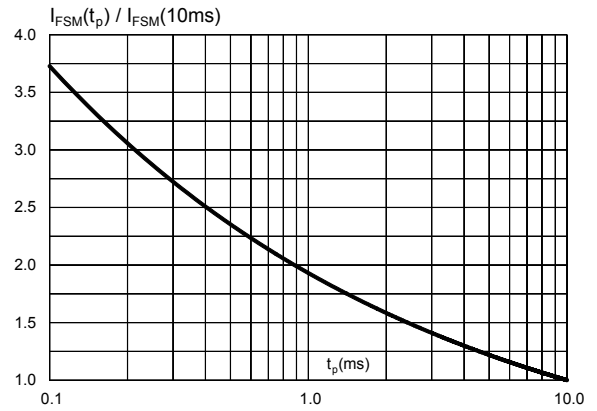
**Figure 4. Relative variation of thermal impedance junction to case versus pulse duration**



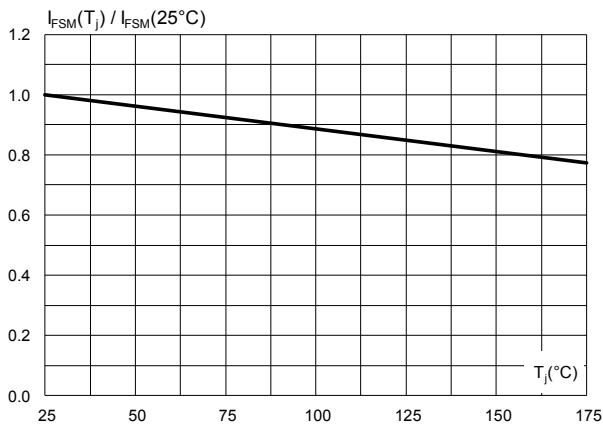
**Figure 5. Junction capacitance versus reverse voltage applied (typical values)**



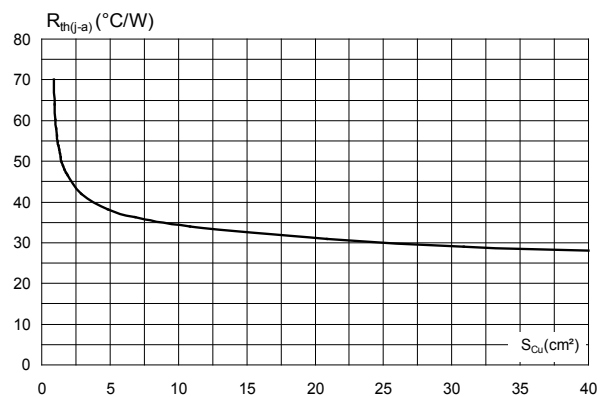
**Figure 6. Relative variation of non-repetitive peak surge forward current versus pulse duration (sinusoidal waveform)**



**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,  $e_{Cu} = 35\mu m$ ) (D<sup>2</sup>PAK HV)**



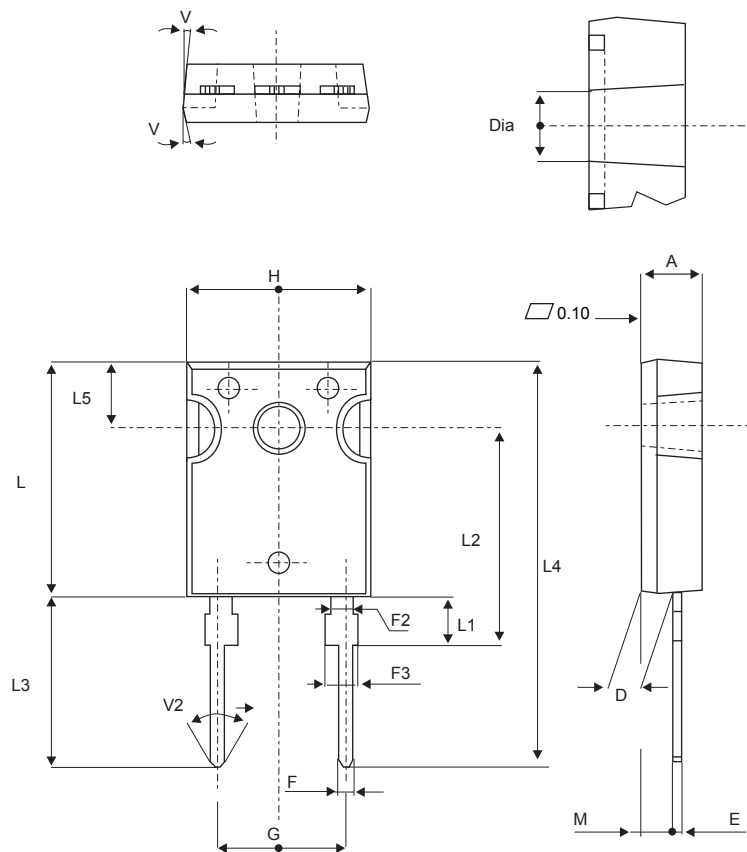
## 2 Package information

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

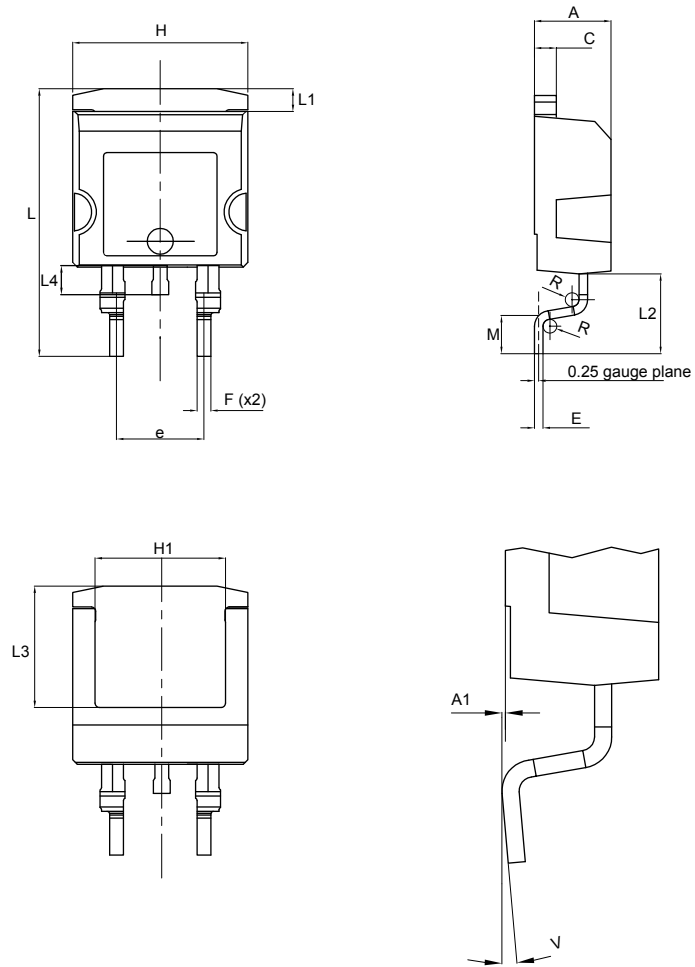


**Table 4. DO-247 package mechanical data**

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

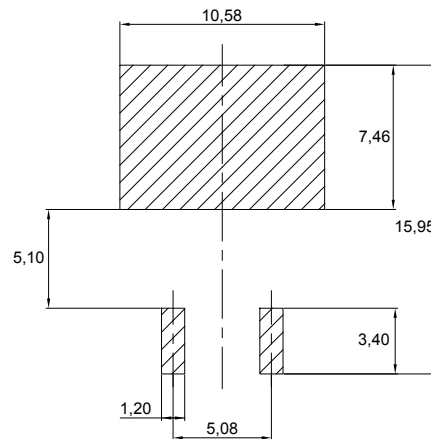
Figure 10. D<sup>2</sup>PAK high voltage package outline



**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**



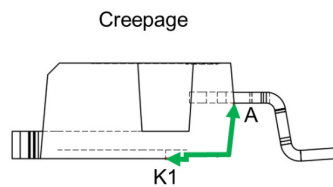
### 2.2.1 Creepage distance between anode and cathode

**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	

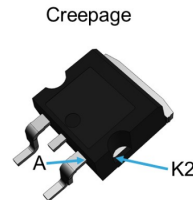
*Note:* D<sup>2</sup>PAK HV creepage distance (anode to cathode) = 5.38 mm min. (refer to IEC 60664-1)

**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
STBR3012WY	STBR3012WY	DO-247	4.4 g	30	Tube
STBR3012G2Y-TR	STBR3012G2Y	D <sup>2</sup> PAK 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 D <sup>2</sup> PAK HV.

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