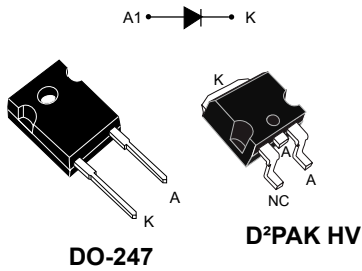


High voltage rectifier for bridge applications



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	μA
		$T_j = 150\text{ °C}$		-	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

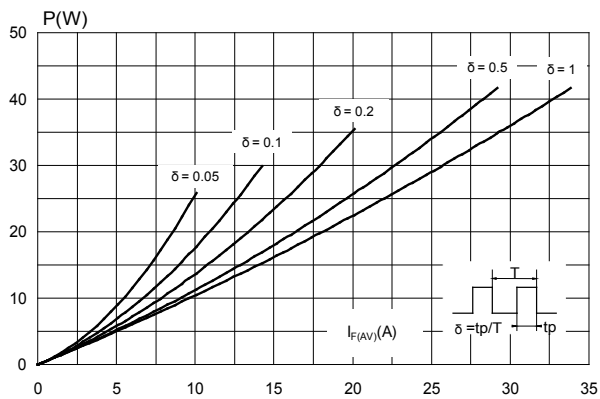


Figure 2. Forward voltage drop versus forward current (typical values)

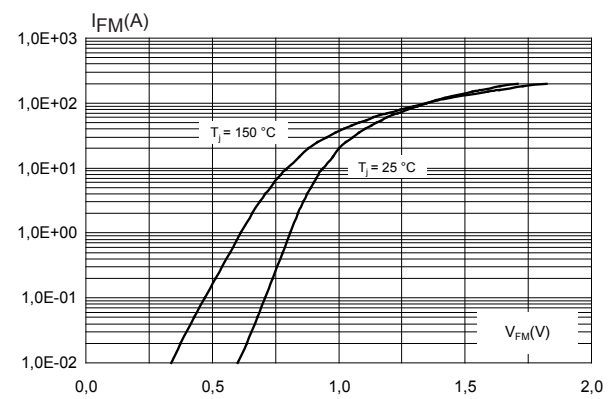


Figure 3. Forward voltage drop versus forward current (maximum values)

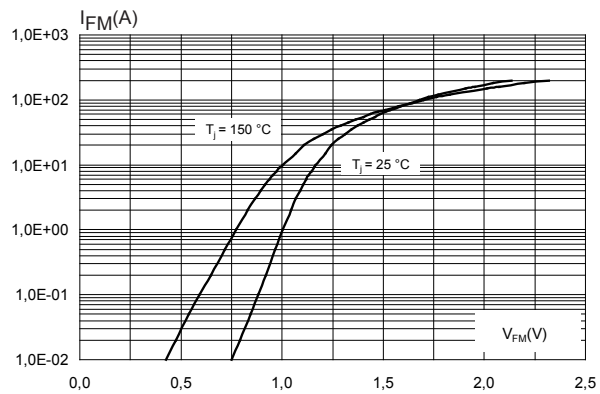


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration

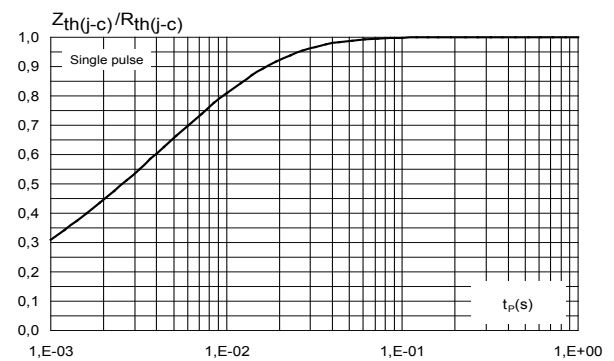
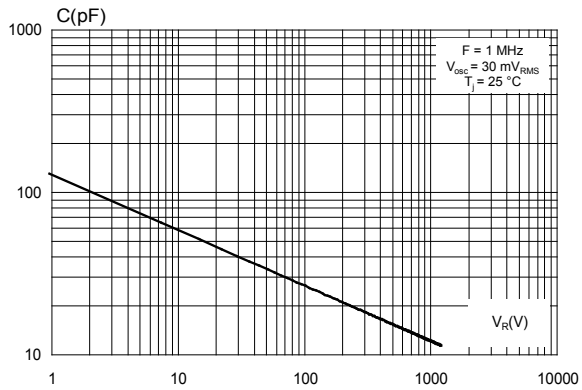
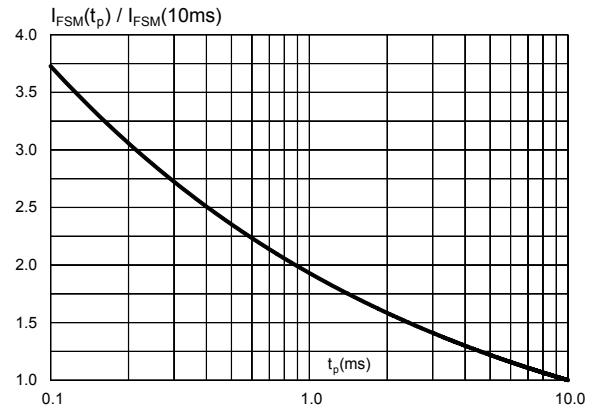
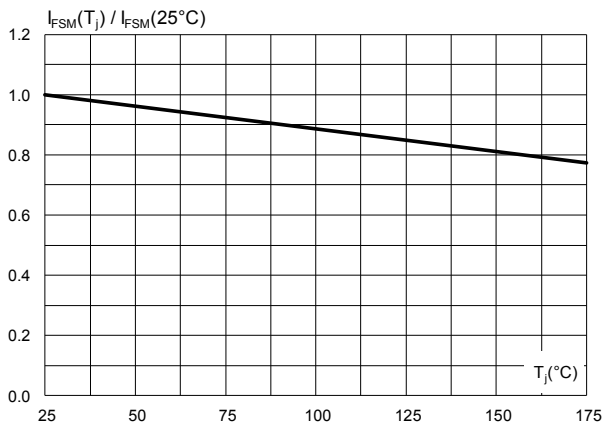
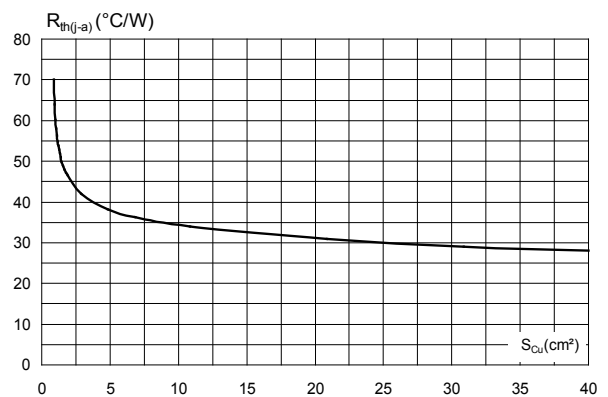


Figure 5. Junction capacitance versus reverse voltage applied (typical values)

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, $e_{Cu} = 35\mu\text{m}$) (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

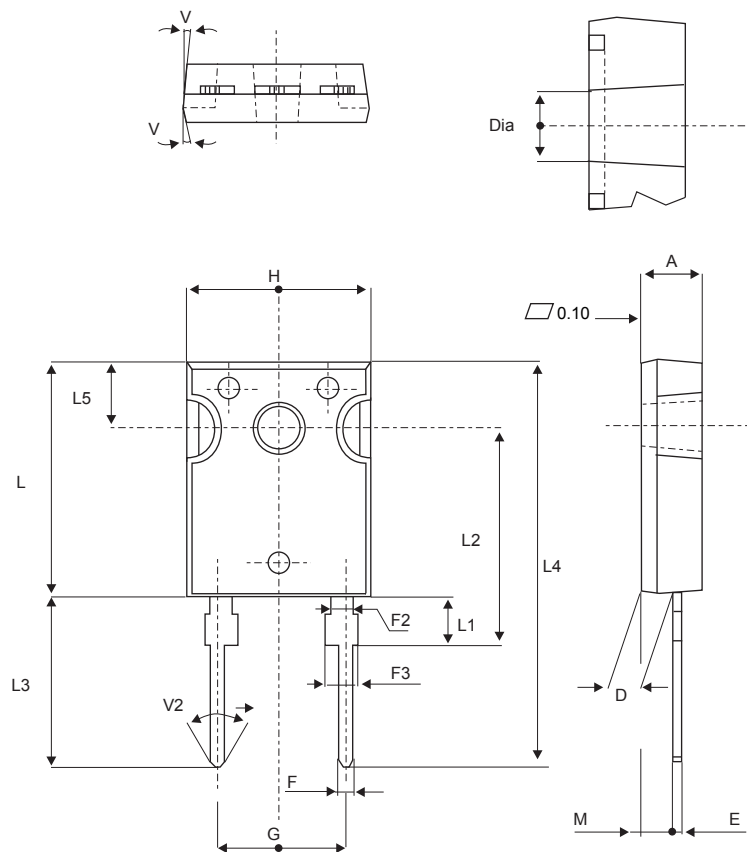


Table 4. DO-247 package mechanical data

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

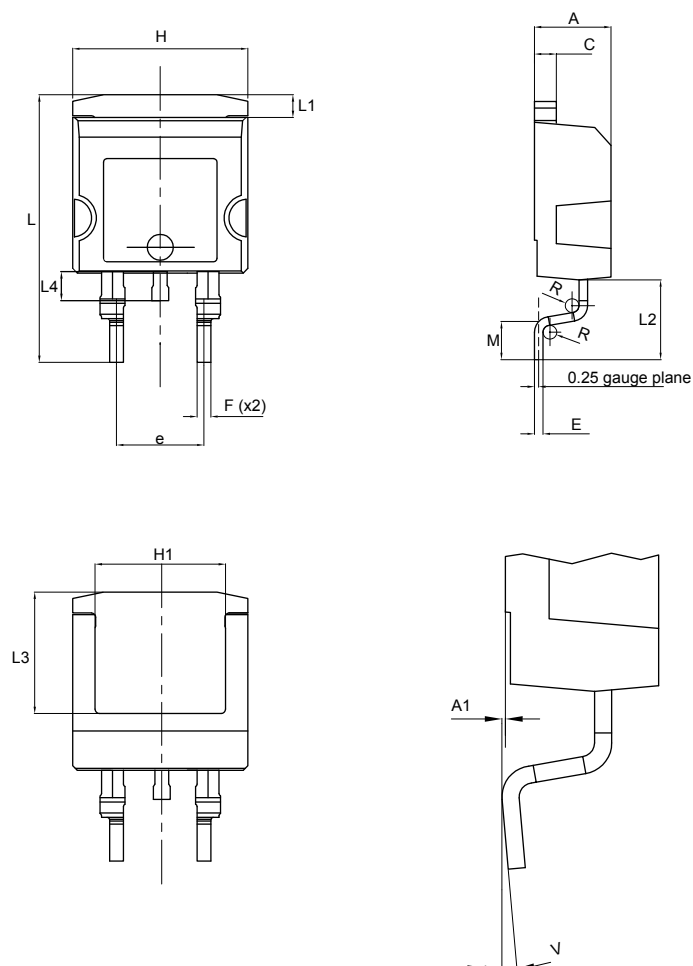
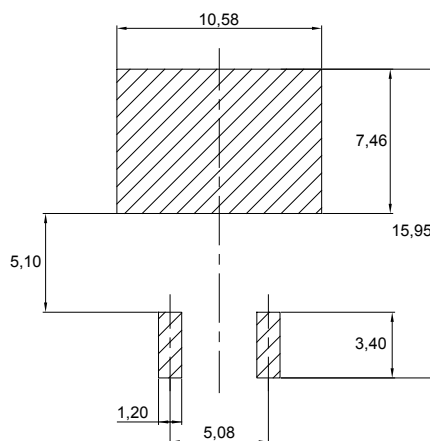


Table 5. D²PAK high voltage package mechanical data

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


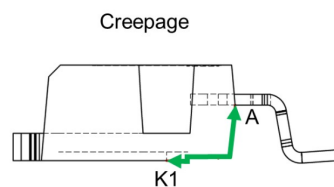
2.2.1 Creepage distance between anode and cathode

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)	D ² PAK HV	5.38	mm
Cd _{A-K2}	Minimum creepage distance between A and K2 (without top coating)		3.48	

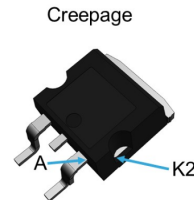
Note: D²PAK HV creepage distance (anode to cathode) = 5.38 mm min. (refer to IEC 60664-1)

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
STBR3012W	STBR3012W	DO-247	4.4 g	30	Tube
STBR3012G2-TR	STBR3012G2	D ² 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 ² PAK HV.

IMPORTANT NOTICE – PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2018 STMicroelectronics – All rights reserved