

Aerospace 2 x 30 A - 150 V Schottky rectifier

Datasheet - preliminary data



Description

This power Schottky rectifier is packaged and screened to comply with the ESCC5000 specification for aerospace products. It is a dual monolithic Schottky rectifier assembled in an SMD.5 hermetic package and characterized in total dose at high dose rate and in single event effect to be used in aerospace applications. It is intended to get ESCC qualified.

The complete ESCC specification for this device is available from the European Space Agency web site. ST guarantees full compliance of qualified parts with the ESCC detailed specification.

Features

- Forward current: 2 x 30 A
- Repetitive peak voltage: 150 V
- Low forward voltage drop
- Monolithic dual die - common cathode
- Hermetic package
- SEE and TID characterized
- Package mass: 2 g
- ESCC qualification in progress

Functional diagram

Figure 1: Functional diagram

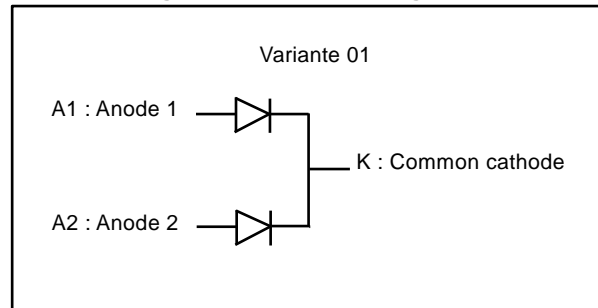


Table 1: Device configuration

Order code	ESCC detailed specification	Quality	lead finish	IF(AV)	V _{rrm}	T _j (max)	V _F (max)
STPS60A150CS1 ⁽¹⁾	-	Engineering model	Gold	2 x 30 A	150	175	TBD
STPS60A150CSG	TBD	Flight model	Gold				

Notes:

⁽¹⁾In development

1 Characteristics

Table 2: Absolute maximum ratings, limiting values at 25 °C, per diode, unless otherwise specified

Symbol	Parameter	Value	Unit
$I_{FSM}^{(1)(2)}$	Non-repetitive forward surge current $t_P = 10$ ms sinusoidal	190	A
V_{RRM}	Repetitive peak reverse voltage	150	V
$I_O^{(3)}$	Average output rectified current	30	A
$T_J^{(4)}$	Maximum junction temperature	+175	°C
$T_{sol}^{(5)}$	Soldering temperature	+245	°C

Notes:

(1) Sinusoidal pulse of 10 ms duration.

(2) At $T_{amb} \leq +25^\circ\text{C}$

(3) At $T_{case} \geq +110^\circ\text{C}$, derate linearly to 0 A at $+175^\circ\text{C}$.

(4) $(dP_{tot}/dT_J) < (1/R_{th(j-a)})$ condition to avoid thermal runaway for a diode on its own heatsink.

(5) Duration 5 seconds maximum. The same package must not be resoldered until 3 minutes have elapsed.

Table 3: Thermal parameter

Symbol	Parameter	Maximum value	Unit
$R_{th(j-c)}$	Thermal resistance, junction to case (per diode) ⁽¹⁾	3.4	°C/W
$R_{th(j-c)}$	Thermal resistance, junction to case (per package) ⁽¹⁾	2.2	°C/W

Notes:

(1) Package mounted on infinite heatsink.

Table 4: Static electrical characteristics per diode

Symbol	Parameter	MIL-STD-750 test method	Test conditions ⁽¹⁾		Limits			Unit	
					Min.	Typ.	Max.		
I _R	Reverse leakage current	4016	DC method, V _R = 150 V	T _j = 25 °C	-		TBD	μA	
				T _j = 125 °C	-	2.0	6.5	mA	
V _{F1} ⁽²⁾	Forward voltage	4011	Pulse method I _F = 5 A	T _j = -55 °C	-	0.77	0.84	V	
				T _j = 25 °C	-	0.70	0.78		
				T _j = 125 °C	-	0.56	0.62		
				Pulse method, I _F = 10 A	T _j = -55 °C	-	0.92		1.03
					T _j = 25 °C	-	0.77		0.85
					T _j = 125 °C	-	0.62		0.69
			Pulse method, I _F = 20 A	T _j = -55 °C	-	1.27	1.44	V	
				T _j = 25 °C	-	0.85	0.93		
				T _j = 125 °C	-	0.70	0.78		
				Pulse method, I _F = 30 A	T _j = -55 °C	-	1.65		1.87
					T _j = 25 °C	-	0.90		0.99
					T _j = 125 °C	-	0.76		0.83
C ⁽³⁾	Junction capacitance	4001	V _R = 10 V, f = 1 MHz	T _{case} = 25 °C	-	168	220	pF	

Notes:

⁽¹⁾Values are guaranteed by sampling as per STMicroelectronics wafer lot acceptance procedure and at 100% only in case this sampling test doesn't successfully pass the acceptance criteria.

⁽²⁾Pulse width ≤ 680 μs, duty cycle ≤ 2%

⁽³⁾C are guaranteed by sampling as per STMicroelectronics wafer lot acceptance procedure and at 100% only in case this sampling test doesn't successfully pass the acceptance criteria.

1.1 Characteristic curves

TO BE DEFINED

2 Radiation

The technology of the STMicroelectronics Rad-Hard Schottky rectifiers is intrinsically highly resistant to radiative environments.

The product radiation hardness assurance is supported by a Total Ionisation Dose (TID) test at high dose rate on each diffusion lot and a Single Effect Event (SEE) characterization.

2.1 Total dose radiation (TID) testing

Each diffusion lot is tested in total ionizing dose at high dose rate on 10 parts housed in SMD.5, 5 biased and 5 unbiased.

The irradiation is done according to the ESCC 22900 specification, standard window.

Both pre-irradiation and post-irradiation performances are tested using the same circuitry and test conditions for a direct comparison can be done ($T_{amb} = 22 \pm 3 \text{ }^\circ\text{C}$ unless otherwise specified).

The following parameters are measured :

- Before irradiation
- After irradiation (target 1 Mrad (Si))
- After 24 hrs at room temperature
- after 168 hrs at 100 °C anneal

2.2 Single event effect

The Single Event Effect (SEE) relevant to power rectifiers are characterized, i.e. the Single Event Burnout (SEB).

The tests are performed as per ESCC 25100, each one on 3 pieces from 1 wafer at room temperature.

The accept/reject criteria are :

- SEB (Destructive mode):
The diode is reverse biased during irradiation. The test is stopped as soon as a SEB occurs or when the reverse leakage current is above the specification or when the overall fluence on the component reaches $1\text{E}7 \text{ cm}^2$.
- PIST (Post-Irradiation STress) test:
After the irradiation, a stress is applied to the diode in order to reveal any latent damage on the irradiated devices.
The reverse voltage value is increased from 0 V to 100% of V_{Rmax} . and then decreased from 100% of the V_{Rmax} . to 0 V. At each step, the reverse leakage current value is measured.

Table 5: Radiation hardness assurance summary

Type	Conditions	Result
Total ionisation dose	High dose rate 5 biased + 5 unbiased each wafer lot	Immune up to 1 Mrad(Si)
Single effect burnout	LET = TBD V_{cc} : TBD	No burnout

3 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.

3.1 SMD.5 package information

Figure 2: Surface mount SMD.5 package outline (3-terminal)

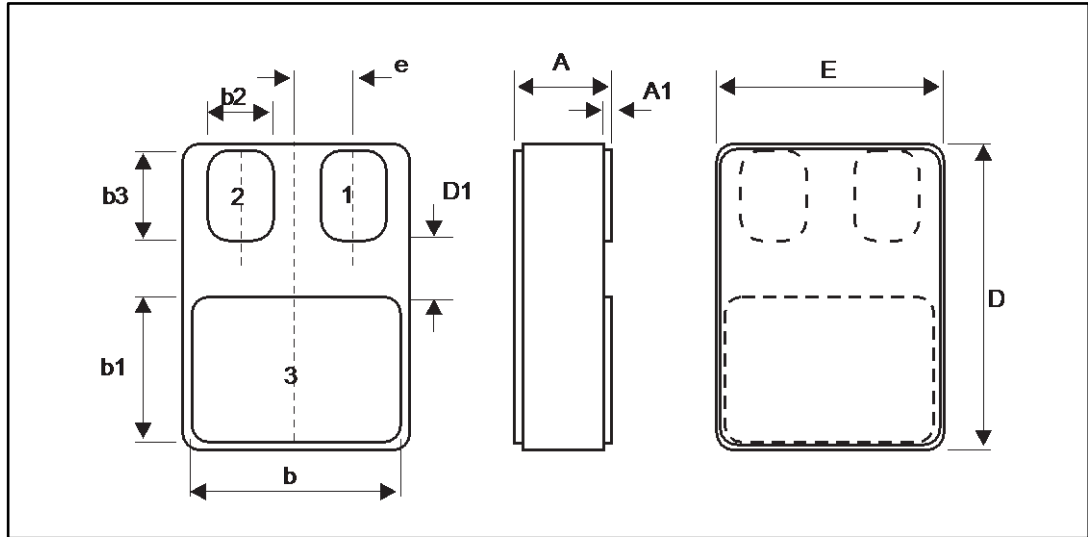


Table 6: SMD.5 package mechanical data

Symbols	Dimansions (mm)			Dimansions (inches)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.84		3.15	0.112		0.124
A1	0.25		0.51	0.010		0.200
b	7.13		7.39	0.281		0.291
b1	5.58		5.84	0.220		0.230
b2 ⁽¹⁾	2.28		2.54	0.090		0.100
b3	2.92		3.18	0.115		0.125
D	10.03		10.28	0.395		0.405
D1	0.76			0.030		
E	7.39		7.64	0.291		0.301
e		1.91 BSC			0.075	

Notes:

⁽¹⁾2 locations

4 Ordering information

Table 7: Ordering information

Order code	ESCC detailed specification	Package	Lead finishing	Marking ⁽¹⁾	Weight	Packing
STPS60A150CS1 ⁽²⁾	-	SMD.5	Gold	STPS60A150CS1	2 g	Strip pack
STPS60A150CSG	TBD			TBD		

Notes:

⁽¹⁾Specific marking only. The full marking includes in addition:

- for the engineering models : ST logo, date code, country of origin (FR)
- for ESCC flight parts : ST logo, date code, country of origin (FR), manufacturer code (CSTM), serial number of the part within the assembly lot

⁽²⁾in development

5 Other information

5.1 Traceability information

Date code information is structured as described in

Table 8: Date codes

Model	Date code ⁽¹⁾
EM	3yywwN
ESCC	yywwN

Notes:

⁽¹⁾yy = year, ww = week number, N = lot index in the week.

5.2 Documentation

The table below provides the default documentation packed together with the parts depending on their quality level.

Table 9: Default documentation provided with the parts

Quality level	Documentation
Engineering Model	Certificate of Conformance
ESCC Flight	Certificate of Conformance includes the reference of the ESCC qualification maintenance test lot.

6 Revision history

Table 10: Document revision history

Date	Revision	Changes
02-Oct-2017	1	First issue.

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.

© 2017 STMicroelectronics – All rights reserved