

## Aerospace 1 x 15 A and 2 x 15 A - 200 V fast recovery rectifier

Datasheet - production data



### Features

- Very small conduction losses
- Negligible switching losses
- High surge current capability
- High avalanche energy capability
- Hermetic packages
- Target radiation qualification:
  - 150 krad (Si) low dose rate
  - 1 Mrad high dose rate
- ESCC qualified

### Description

Packaged in hermetic TO-254 or SMD.5, this device is intended for use in medium voltage, high frequency switching mode power supplies, high frequency DC to DC converters, and other aerospace applications.

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

Figure 1. Device configuration

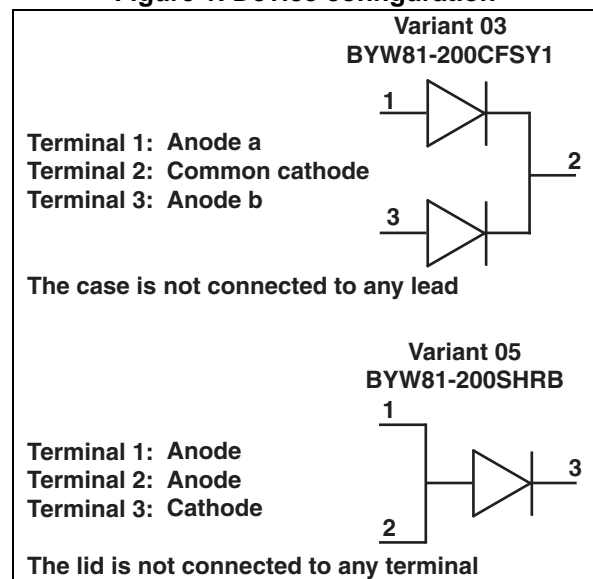


Table 1. Device summary<sup>(1)</sup>

Order code	ESCC part number	Quality level	EPPL	Package	$I_{F(AV)}$	$V_{RRM}$	$V_F (max)$	$T_{j(max)}$
BYW81-200CFSY1	-	Engineering model	-	TO-254	2 x 15 A	200 V	1.15 V	150 °C
BYW81-200CFSYHRB	5103/029/03	ESCC flight	-	TO-254	2 x 15 A			
BYW81-200SHRB	5103/029/05	ESCC flight	Y	SMD.5	15 A			

1. Contact ST sales office for information about the specific conditions for products in die form.

# 1 Characteristics

**Table 2. Absolute maximum ratings**

Symbol	Characteristic	Value	Unit
$I_{FSM}$	Forward surge current <sup>(1)</sup> <sup>(2)</sup>		
	Variant 05	250	A
	Variant 03 (per diode)	250	
	Variant 03 (per device)	500	
$V_{RRM}$	Repetitive peak reverse voltage <sup>(3)</sup>	200	
$I_O$	Average output rectified current (50% duty cycle) <sup>(2)</sup> <sup>(4)</sup>		
	Variant 05	15	A
	Variant 03 (per diode)	15	
	Variant 03 (per device)	30	
$I_{F(RMS)}$	Forward rms current (per diode) <sup>(2)</sup>		
	Variant 05	30	A
	Variant 03 (per diode)	30	
	Variant 03 (per device)	40	
$T_{OP}$	Operating case temperature range <sup>(5)</sup>	-55 to +150	
$T_J$	Junction temperature	+150	°C
$T_{STG}$	Storage temperature range <sup>(5)</sup>	-55 to +150	°C
$T_{SOL}$	Soldering temperature		
	TO-254 <sup>(6)</sup>	+260	°C
	SMD.5 <sup>(7)</sup>	+245	

1. Sinusoidal pulse of 10 ms duration
2. For variant 03 the “per device” ratings apply only when both cathode terminals are tied together.
3. Pulsed, duration 5 ms, F = 50 Hz
4. For  $T_{case} \geq +110^\circ\text{C}$ , derate linearly to 0 A at +150°C.
5. For devices with hot solder dip lead finish all testing performed at  $T_{amb} > +125^\circ\text{C}$  are carried out in a 100% inert atmosphere.
6. Duration 10 seconds maximum at a distance of not less than 1.5 mm from the device body and the same lead shall not be re-soldered until 3 minutes have elapsed.
7. Duration 5 seconds maximum the same package shall not be re-soldered until 3 minutes have elapsed.

**Table 3. Thermal resistance**

Symbol	Parameter	Value	Unit
$R_{th(j-c)}$ <sup>(1)</sup>	Junction to case		
	All variants (per diode)	2.3	°C/W
	Variant 03 (per device) <sup>(2)</sup>	1.4	

1. Package mounted on infinite heatsink.
2. For variant 03 the “per device” ratings apply only when both cathode terminals are tied together.

**Table 4. Electrical measurements at ambient temperature (per diode),  $T_{amb} = 22 \pm 3 \text{ }^\circ\text{C}$**

Symbol	Characteristic	MIL-STD-750 test method	Test conditions	Limits		Units
				Min.	Max.	
$I_R$	Reverse current	4016	DC method, $V_R = 200 \text{ V}$	-	20	$\mu\text{A}$
$V_{F1}^{(1)}$	Forward voltage	4011	Pulse method, $I_F = 10 \text{ A}$	-	1.0	V
$V_{F2}^{(1)}$			Pulse method, $I_F = 20 \text{ A}$	-	1.2	V
$V_{BR}$	Breakdown voltage	4021	$I_R = 100 \mu\text{A}$	200	-	V
C	Capacitance	4001	$V_R = 10 \text{ V}$ , $F = 1 \text{ MHz}$	-	220	pF
$t_{rr}$	Reverse recovery time	4031	$I_F = 1 \text{ A}$ , $V_R = 30 \text{ V}$ , $di_F/dt = -50 \text{ A}/\mu\text{s}$	-	40	ns
$Z_{th(j-c)}^{(2)}$	Relative thermal impedance, junction to case	3101	$I_H = 15 \text{ to } 40 \text{ A}$ , $t_H = 50 \text{ ms}$ $I_M = 50 \text{ mA}$ , $t_{md} = 100 \mu\text{s}$	Calculate $\Delta V_F^{(3)}$		$^\circ\text{C}/\text{W}$

1. Pulse width  $\leq 680\mu\text{s}$ , duty cycle  $\leq 2\%$
2. Performed only during screening tests parameter drift values (initial measurements), go-no-go.
3. The limits for  $\Delta V_F$  shall be defined by the manufacturer on every lot in accordance with MIL-STD-750 Method 3101 and shall guarantee the  $R_{th(j-c)}$  limits specified in maximum ratings.

**Table 5. Electrical measurements at high and low temperatures (per diode)**

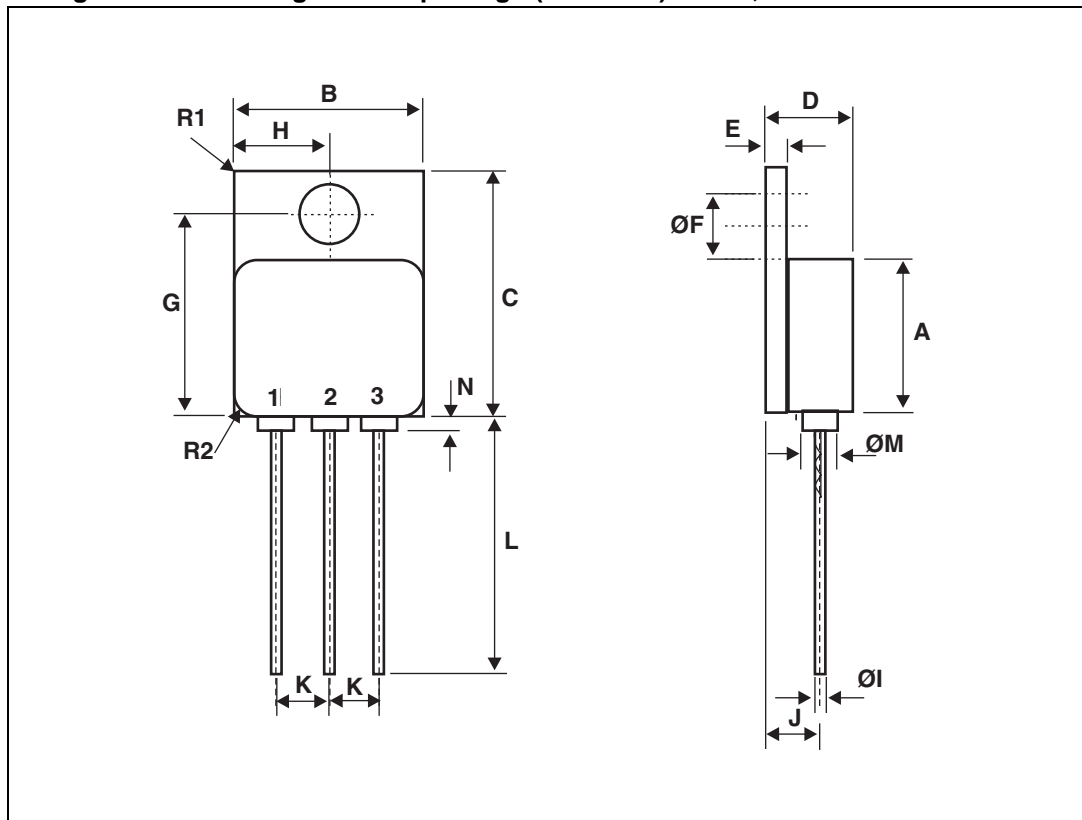
Symbol	Characteristic	MIL-STD-750 test method	Test conditions <sup>(1)</sup>	Limits		Units
				Min.	Max.	
$I_R$	Reverse current	4016	$T_{case} = +125 (+0, -5) \text{ }^\circ\text{C}$ DC method, $V_R = 200 \text{ V}$	-	10	mA
$V_{F1}^{(2)}$	Forward voltage	4011	$T_{case} = +125 (+0, -5) \text{ }^\circ\text{C}$ pulse method, $I_F = 10 \text{ A}$	-	0.85	V
			$T_{case} = +55 (+0, -5) \text{ }^\circ\text{C}$ pulse method, $I_F = 10 \text{ A}$	-	1.15	V

1. Read and record measurements shall be performed on a sample of 5 components with 0 failures allowed. Alternatively a 100% inspection may be performed.
2. Pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$

## 2 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

Figure 2. Metal flange mount package (TO-254<sup>(a)</sup>) 3 lead, dimension definitions



a. The terminal identification is specified by the device configuration. See [Figure](#) for terminal connections

Table 6. Metal flange mount package (TO-254) 3-lead, dimension values

Reference	Dimension in millimeters		Dimension in inches	
	Min.	Max.	Min.	Max.
A	13.59	13.84	0.535	0.545
B	13.59	13.84	0.535	0.545
C	20.07	20.32	0.790	0.800
D	6.3	6.7	0.248	0.264
E	1	1.35	0.039	0.053
ØF	3.5	3.9	0.138	0.154
G	16.89	17.4	0.665	0.685
H	6.86 BSC		0.270 BSC	
ØI <sup>(1)</sup>	0.89	1.14	0.035	0.045
J	3.81 BSC		0.150 BSC	
K	3.81 BSC		0.150 BSC	
L	12.95	14.5	0.510	0.571
ØM	3.05 Typ.		0.120 Typ.	
N	-	0.71	-	0.028
R1 <sup>(2)</sup>	-	1	-	0.039
R2 <sup>(3)</sup>	1.65 Typ.		0.065	

1. 3 locations
2. Radius of heatsink flange corner - 4 locations
3. Radius of body corner - 4 locations

Figure 3. Surface mount package (SMD.5) 3-terminal, dimension definitions

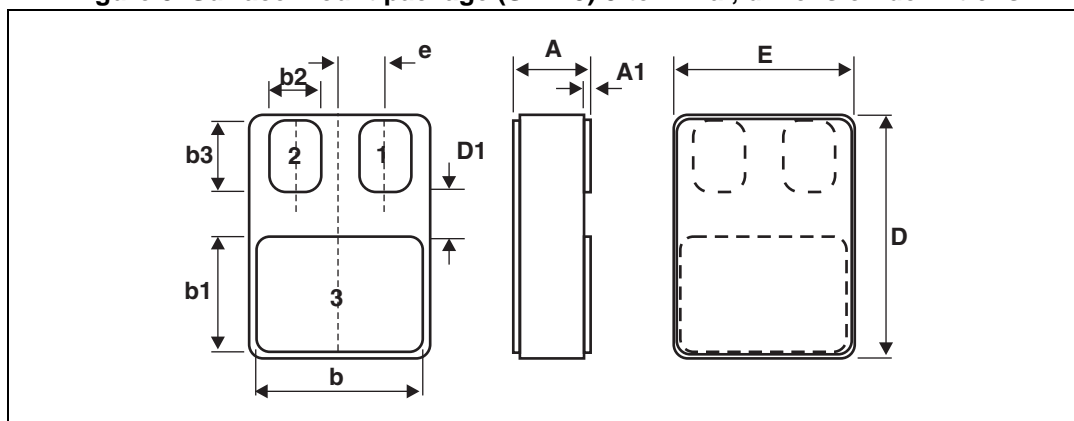


Table 7. Surface mount package (SMD.5) 3-terminal, dimension values

Reference	Dimension in millimeters		Dimension in inches	
	Min.	Max.	Min.	Max.
A	2.84	3.15	0.112	0.124
A1	0.25	0.51	0.010	0.20
b	7.13	7.39	0.281	0.291
b1	5.58	5.84	0.220	0.230
b2 <sup>(1)</sup>	2.28	2.54	0.090	0.100
b3 <sup>(1)</sup>	2.92	3.18	0.115	0.125
D	10.03	10.28	0.395	0.405
D1 <sup>(1)</sup>	0.76	-	0.030	-
E	7.39	7.64	0.291	0.301
e <sup>(1)</sup>	1.91 BSC		0.075	

1. 2 locations

### 3 Ordering information

Table 8. Ordering information<sup>(1)</sup>

Order code	ESCC part number	Quality level	Package	Lead finish	Marking <sup>(2)</sup>	Mass	Packing
BYW81-200CFSY1	-	Engineering model	TO-254	Gold	BYW81200CFSY1 + BeO	10 g	Strip pack
BYW81-200FSYHRB	5103/029/03	ESCC flight	TO-254	Solder dip	510302901 + BeO		
BYW81-200SHRB	5103/029/05	ESCC flight	SMD.5	Gold	510302905	2.0 g	

1. Contact ST sales office for information about the specific conditions for products in die form.

2. 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), ESA logo, serial number of the part within the assembly lot.

## 4 Other information

### 4.1 Date code

Date code is structured as describe below:

- EM xyywwz
- ESCC flight yywwz

Where:

- x (EM only): 3, assembly location Rennes (France)
- yy: last two digits year
- ww: week digits
- z: lot index in the week

### 4.2 Documentation

In [Table 9](#) is a summary of the documentation provided with each type of products.

Table 9. Documentation provided with each type of products

Quality level	Documentation
Engineering model	
ESCC flight	Certificate of conformance

## 5 Revision history

Table 10. Document revision history

Date	Revision	Changes
3-Nov-2010	1	First issue.
8-Nov-2013	2	Inserted <i>Other information</i>



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