

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

Datasheet - production data



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.

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

Figure 1. Device configuration

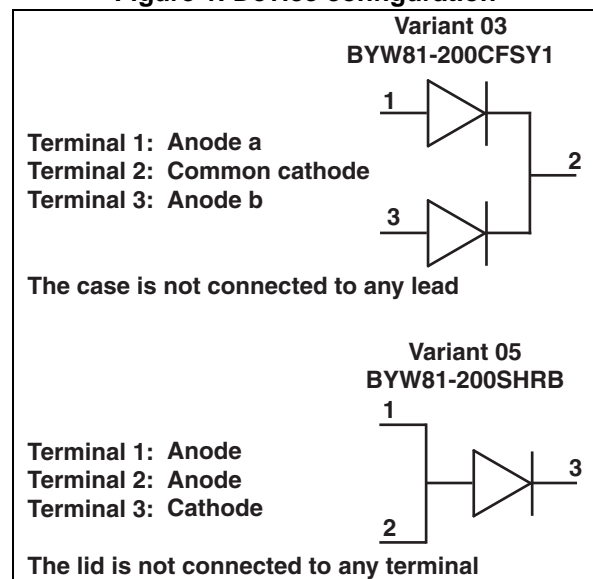


Table 1. Device summary⁽¹⁾

| 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 ⁽¹⁾ ⁽²⁾ | | |
| | Variant 05 | 250 | A |
| | Variant 03 (per diode) | 250 | |
| | Variant 03 (per device) | 500 | |
| V_{RRM} | Repetitive peak reverse voltage ⁽³⁾ | 200 | |
| I_O | Average output rectified current (50% duty cycle) ⁽²⁾ ⁽⁴⁾ | | |
| | Variant 05 | 15 | A |
| | Variant 03 (per diode) | 15 | |
| | Variant 03 (per device) | 30 | |
| $I_{F(RMS)}$ | Forward rms current (per diode) ⁽²⁾ | | |
| | Variant 05 | 30 | A |
| | Variant 03 (per diode) | 30 | |
| | Variant 03 (per device) | 40 | |
| T_{OP} | Operating case temperature range ⁽⁵⁾ | -55 to +150 | |
| T_J | Junction temperature | +150 | °C |
| T_{STG} | Storage temperature range ⁽⁵⁾ | -55 to +150 | °C |
| T_{SOL} | Soldering temperature | | |
| | TO-254 ⁽⁶⁾ | +260 | °C |
| | SMD.5 ⁽⁷⁾ | +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 $T_{case} \geq +110^\circ C$, derate linearly to 0 A at +150°C.
5. For devices with hot solder dip lead finish all testing performed at $T_{amb} > +125^\circ C$ 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 |
|------------------------------|--|-------|------|
| $R_{th(j-c)}$ ⁽¹⁾ | Junction to case | | |
| | All variants (per diode) | 2.3 | °C/W |
| | Variant 03 (per device) ⁽²⁾ | 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 | μA |
| $V_{F1}^{(1)}$ | 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 ΔV_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)

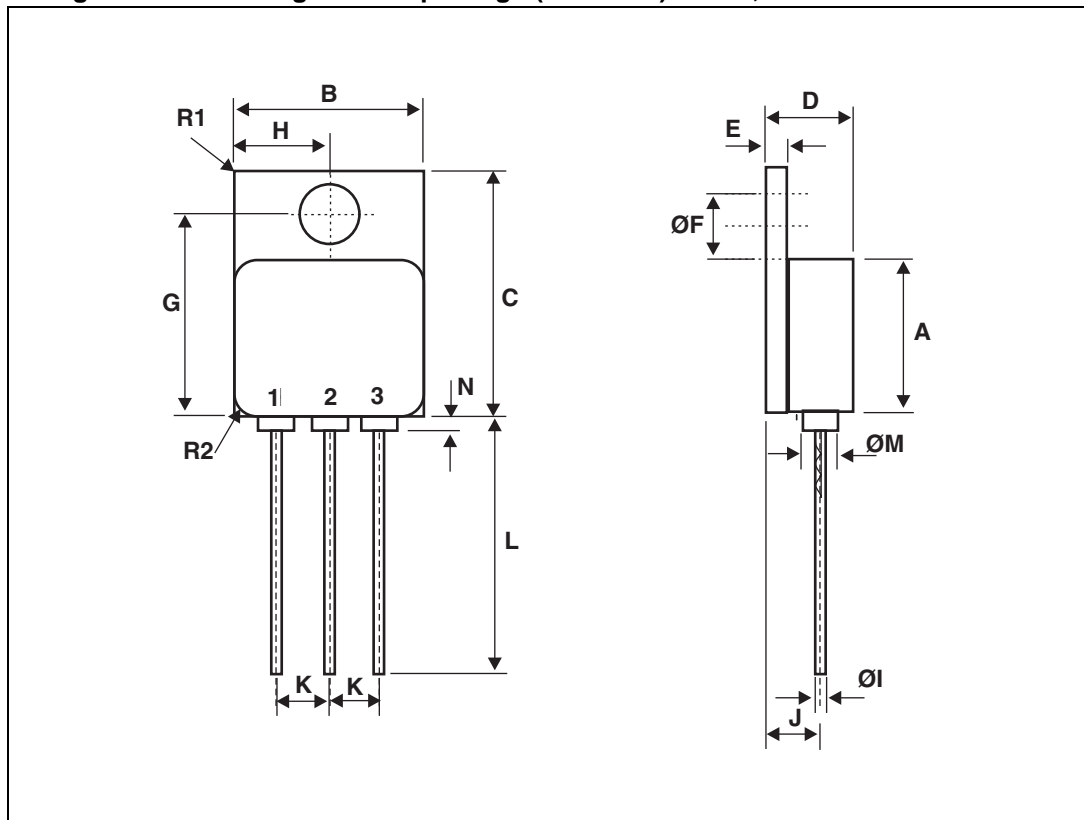
| Symbol | Characteristic | MIL-STD-750 test method | Test conditions ⁽¹⁾ | Limits | | Units |
|----------------|-----------------|-------------------------|---|--------|------|-------|
| | | | | Min. | Max. | |
| I_R | Reverse current | 4016 | $T_{case} = +125 (+0, -5) \text{ }^\circ\text{C}$ DC method, $V_R = 200 \text{ V}$ | - | 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[®] 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.

Figure 2. Metal flange mount package (TO-254^(a)) 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 ⁽¹⁾ | 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 ⁽²⁾ | - | 1 | - | 0.039 |
| R2 ⁽³⁾ | 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

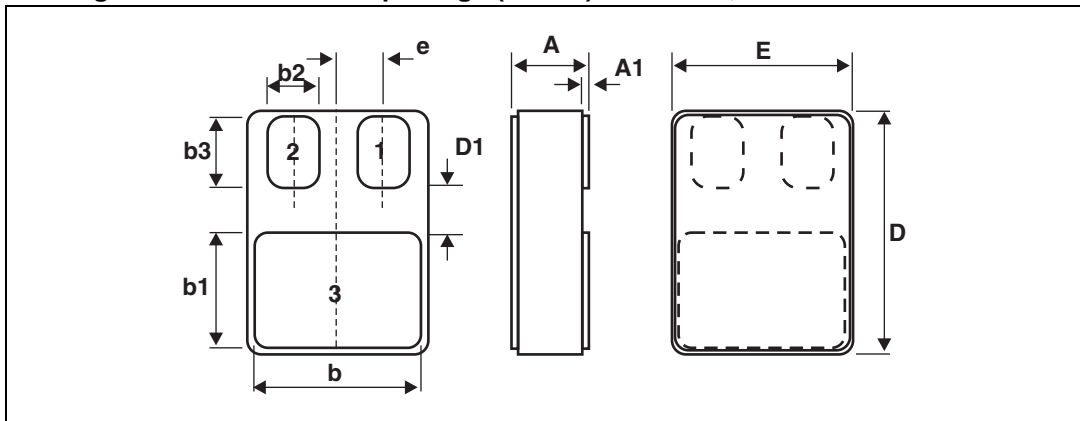


Table 7. Surface mount package (SMD.5) 3-terminal, dimension values

| 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 ⁽¹⁾ | 2.28 | 2.54 | 0.090 | 0.100 |
| b3 ⁽¹⁾ | 2.92 | 3.18 | 0.115 | 0.125 |
| D | 10.03 | 10.28 | 0.395 | 0.405 |
| D1 ⁽¹⁾ | 0.76 | - | 0.030 | - |
| E | 7.39 | 7.64 | 0.291 | 0.301 |
| e ⁽¹⁾ | 1.91 BSC | | 0.075 | |

1. 2 locations

3 Ordering information

Table 8. Ordering information⁽¹⁾

| Order code | ESCC part number | Quality level | Package | Lead finish | Marking ⁽²⁾ | 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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