

## Aerospace 1 x 20 and 2 x 20 A - 100 V Schottky rectifier

### Features

- Forward current: 1 x 20 and 2 x 20 A
- Repetitive peak voltage: 100 V
- Low forward voltage drop: 0.8 V
- Maximum junction temperature: 175 °C
- Negligible switching losses
- Low capacitance
- High reverse avalanche surge capability
- Hermetic packages
- Target radiation qualification:
  - 150 krad (Si) low dose rate
  - 1 Mrad high dose rate
- ESCC qualified



### Description

This power Schottky rectifier is designed and packaged to comply with the ESCC5000 specification for aerospace products. Housed in hermetically sealed packages both surface mount and through hole, it is ideal for use in applications for aerospace and other harsh environments.

The STPS20100HR is intended for use in medium voltage application and particularly, in high frequency circuits where low switching losses and low noise are required.

**Table 1. Device summary**

| Order code       | ESCC detailed specification | Quality level     | Configuration              | Package | Mass   | EPPL |
|------------------|-----------------------------|-------------------|----------------------------|---------|--------|------|
| STPS20100S1      | -                           | Engineering model | Single die                 | SMD.5   | 2.0 g  | -    |
| STPS20100SHRB    | 5106/016/05                 | ESCC flight       |                            |         |        | -    |
| STPS20100FSYHRB  | 5106/016/01                 | ESCC flight       | Single die                 | TO-254  | 10.0 g | -    |
| STPS20100AFSY1   | -                           | Engineering model | Double die, common anode   |         |        | -    |
| STPS20100AFSYHRB | 5106/016/02                 | ESCC flight       |                            |         |        | Y    |
| STPS20100CFSY1   | -                           | Engineering model | Double die, common cathode |         |        | -    |
| STPS20100CFSYHRB | 5106/016/03                 | ESCC flight       |                            |         |        | Y    |
| STPS20100SFSYHRB | 5106/016/04                 | ESCC flight       | Double die, serial         |         |        | Y    |

# 1 Characteristics

**Table 2. Absolute maximum ratings**

| Symbol       | Characteristic   | Value        | Unit |
|--------------|--|--------------|------|
| $I_{FSM}$    | Forward surge current (per diode) <sup>(1)</sup>   | 250          | A    |
| $V_{RRM}$    | Repetitive peak reverse voltage <sup>(2)</sup>   | 100          | V    |
| $I_{RRM}$    | Repetitive peak reverse current <sup>(3)</sup>   | 1            | A    |
| $I_O$        | Average output rectified current (50% duty cycle): <sup>(4), (5)</sup><br>All variants (per diode)<br>Variants 02, and 03 (per device) | 20<br>40     | A    |
| $I_{F(RMS)}$ | Forward rms current (per diode)  | 30           | A    |
| $T_{OP}$     | Operating temperature range <sup>(6)</sup><br>(case temperature)   | -65 to +175  | °C   |
| $T_J$        | Junction temperature   | +175         | °C   |
| $T_{STG}$    | Storage temperature range <sup>(6)</sup>   | -65 to +175  | °C   |
| $T_{SOL}$    | Soldering temperature:<br>For TO-254 <sup>(7)</sup><br>For SMD.5 <sup>(8)</sup>  | +260<br>+245 | °C   |
| dV/dt        | Critical rate of rise of reverse voltage   | 10000        | V/μs |

1. Sinusoidal pulse of 10 ms duration
2. Pulsed, duration 5 ms, F = 50 Hz
3. Pulsed, duration 2 μs, F = 1 kHz
4. For  $T_{case} > +140$  °C, derate linearly to 0 A at +175 °C.
5. The "per Device" ratings apply only as follows:  
Variant 02: when both cathode terminals are tied together  
Variant 03: when both anode terminals are tied together.
6. For variants with hot solder dip lead finish all testing performed at  $T_{amb} > +125$  °C are carried out in a 100% inert atmosphere.
7. 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 resoldered until 3 minutes have elapsed.
8. Duration 5 seconds maximum and the same package shall not be resoldered until 3 minutes have elapsed.

**Table 3. Thermal resistance**

| Symbol              | Characteristic   | Value                | Unit |
|---------------------|--|----------------------|------|
| $R_{th(j-c)}^{(1)}$ | Thermal resistance, junction to case<br>Variants 01, and 05<br>Variants 02, 03 and 04 (per diode)<br>Variants 02, and 03 (per device) <sup>(2)</sup> | 1.65<br>1.65<br>0.85 | °C/W |

1. Package mounted on infinite heatsink
2. The per device ratings apply for variant 02 when both cathode terminals are tied together and for variant 03 when when both anode 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   | Values                 |      | Units                |
|----------------|--|-------------------------|---|------------------------|------|----------------------|
|                |  |                         |   | Min.                   | Max. |                      |
| $I_R$          | Reverse Current                              | 4016                    | DC method, $V_R = 100 \text{ V}$  | -                      | 30   | $\mu\text{A}$        |
| $V_{F1}^{(1)}$ | Forward Voltage                              | 4011                    | Pulse method, $I_F = 10 \text{ A}$  | -                      | 780  | mV                   |
| $V_{F2}^{(1)}$ |  |                         | Pulse method, $I_F = 20 \text{ A}$  | -                      | 1    | V                    |
| C              | Capacitance                                  | 4001                    | $V_R = 10 \text{ V}$ , $F = 1 \text{ MHz}$  | -                      | 700  | pF                   |
| $Z_{th(j-c)}$  | Relative thermal impedance, junction to case | 3101                    | $I_H = 15 \text{ to } 40 \text{ A}$ , $t_H = 50 \text{ ms}$<br>$I_M = 50 \text{ mA}$ , $t_{md} = 100 \text{ }\mu\text{s}$ | Calculate $\Delta V_F$ |      | $^{\circ}\text{C/W}$ |

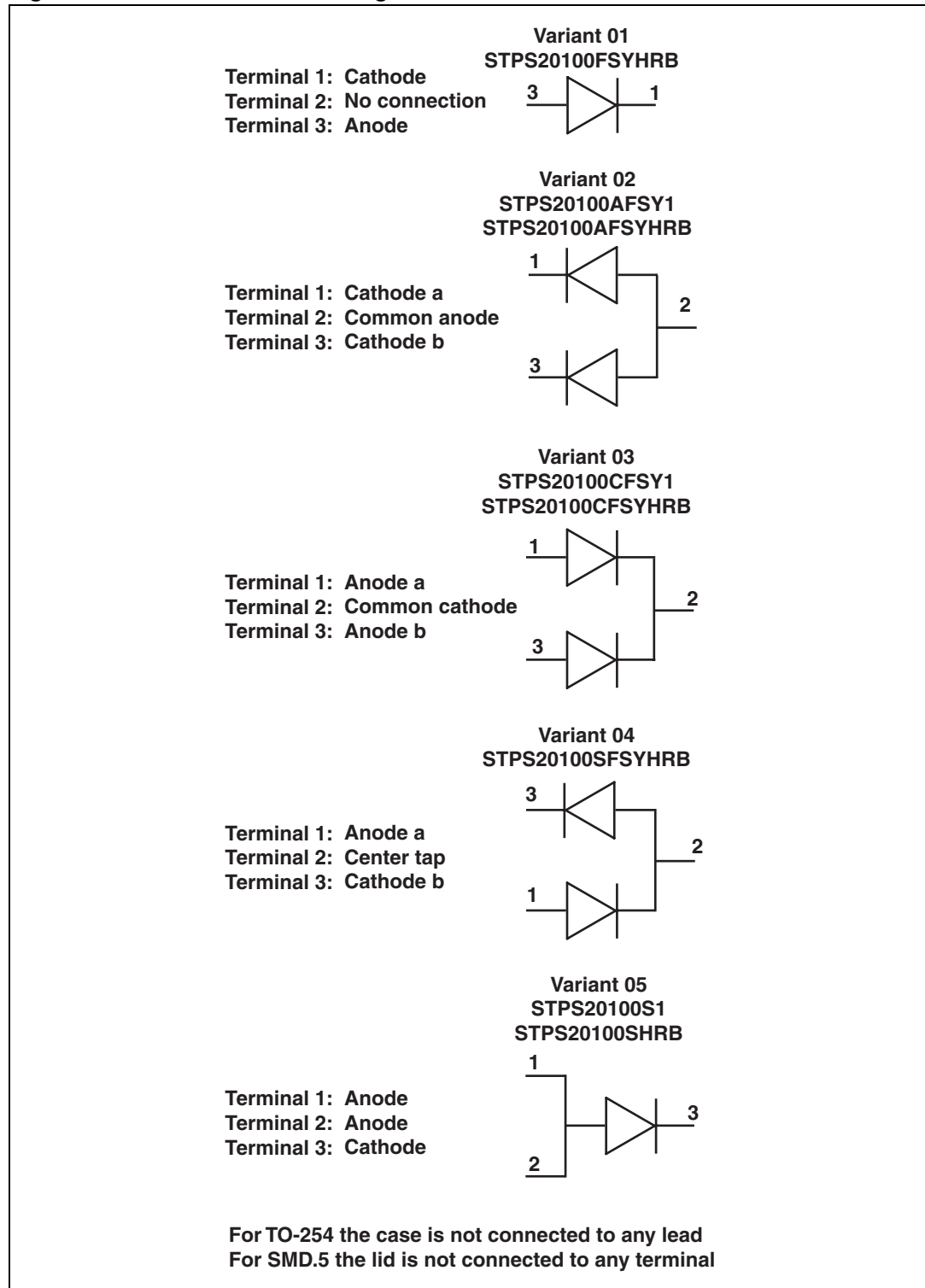
1. Pulse width  $\leq 680\mu\text{s}$ , Duty Cycle  $\leq 2\%$ **Table 5. Electrical measurements at high and low temperatures (per diode)**

| Symbol         | Characteristic  | MIL-STD-750 test method | Test conditions   | Values |      | Units |
|----------------|-----------------|-------------------------|---|--------|------|-------|
|                |                 |                         |   | Min.   | Max. |       |
| $I_R$          | Reverse Current | 4016                    | $T_{case} = +125 (+0, -5) \text{ }^{\circ}\text{C}$<br>DC method, $V_R = 100 \text{ V}$   | -      | 20   | mA    |
| $V_{F2}^{(1)}$ | Forward Voltage | 4011                    | $T_{case} = +125 (+0, -5) \text{ }^{\circ}\text{C}$<br>pulse method, $I_F = 20 \text{ A}$ | -      | 900  | mV    |
|                |                 |                         | $T_{case} = -55 (+5, -0) \text{ }^{\circ}\text{C}$<br>pulse method, $I_F = 20 \text{ A}$  | -      | 1.1  | V     |

1. Pulse width  $\leq 680\mu\text{s}$ , Duty Cycle  $\leq 2\%$

## 2 Configurations

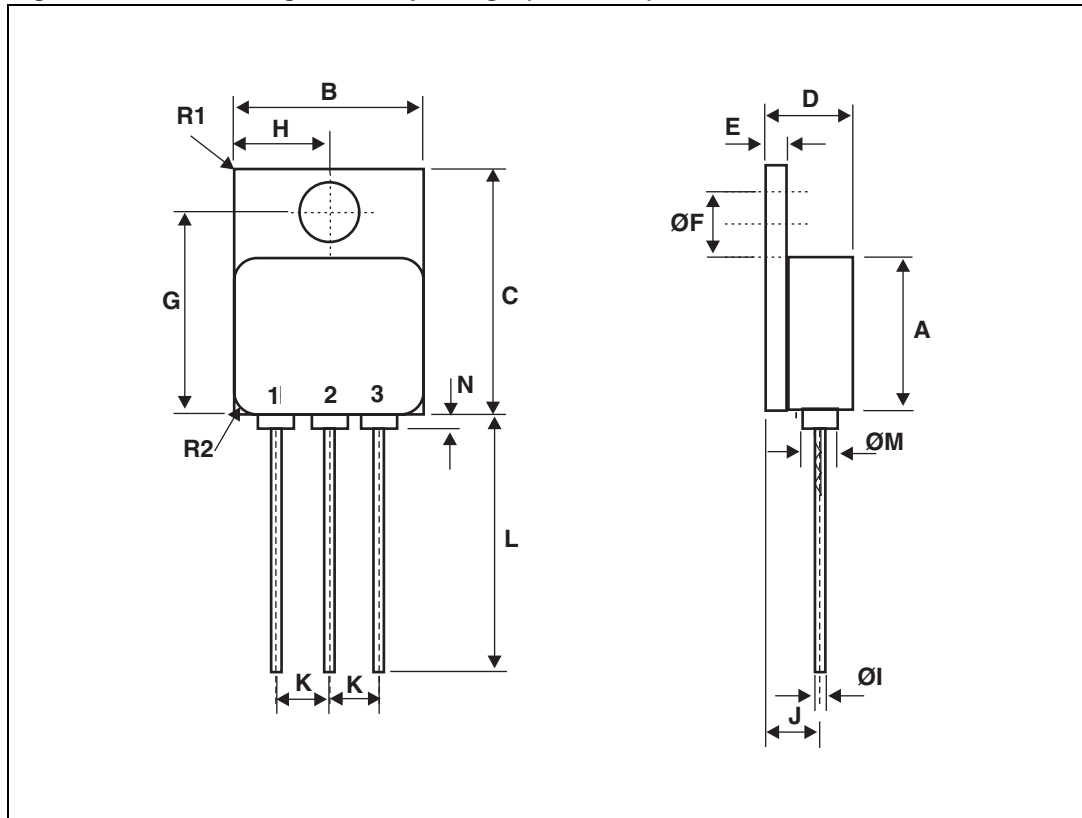
Figure 1. Available device configurations



### 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](http://www.st.com). ECOPACK® is an ST trademark.

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

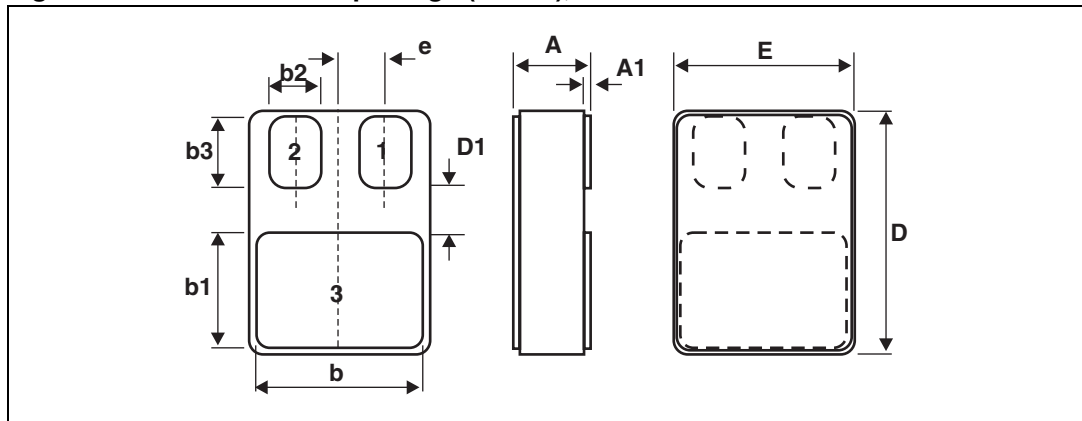


a. The terminal identification is specified by the device configuration. See [Figure 1](#) for terminal connections

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

| Reference         | Dimension in millimetres |       | Dimlension 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                        | 3.9   | 0.039                | 0.154 |
| 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 millimetres |       | Dimlension 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

## 4 Ordering Information

**Table 8. Ordering information**

| Order code       | ESCC detailed specification | Package | Lead finish | Marking              | EPPL | Mass (g) | Packing     |
|------------------|-----------------------------|---------|-------------|----------------------|------|----------|-------------|
| STPS20100S1      | -                           | SMD.5   | Gold        | STPS20100S1          | -    | 2.0      | Waffle pack |
| STPS20100SHRB    | 5106/016/05                 |         | Gold        | 510601605            | -    |          |             |
| STPS20100FSYHRB  | 5106/016/01                 | TO-254  | Solder dip  | 510601601 + BeO      | -    | 10.0     |             |
| STPS20100AFSY1   | -                           |         | Gold        | STPS20100AFSY1 + BeO | -    |          |             |
| STPS20100AFSYHRB | 5106/016/02                 |         | Solder dip  | 510601602 + BeO      | Y    |          |             |
| STPS20100CFSY1   | -                           |         | Gold        | STPS20100CFSY1 + BeO | -    |          |             |
| STPS20100CFSYHRB | 5106/016/03                 |         | Solder dip  | 510601603 + BeO      | Y    |          |             |
| STPS20100SFSYHRB | 5106/016/04                 |         | Solder dip  | 510601604 + BeO      | Y    |          |             |



## 5 Revision history

**Table 9. Document revision history**

| Date        | Revision | Changes          |
|-------------|----------|------------------|
| 25-Mar-2010 | 1        | Initial release. |

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