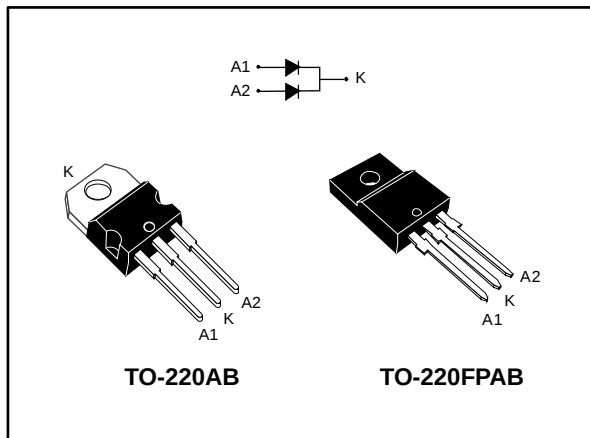


## Power Schottky rectifier

Datasheet - production data



### Features

- High junction temperature capability
- Optimized trade-off between leakage current and forward voltage drop
- Low leakage current
- Avalanche capability specified
- Insulated package TO-220FPAB
  - Insulated voltage: 2000  $V_{RMS}$  sine

### Description

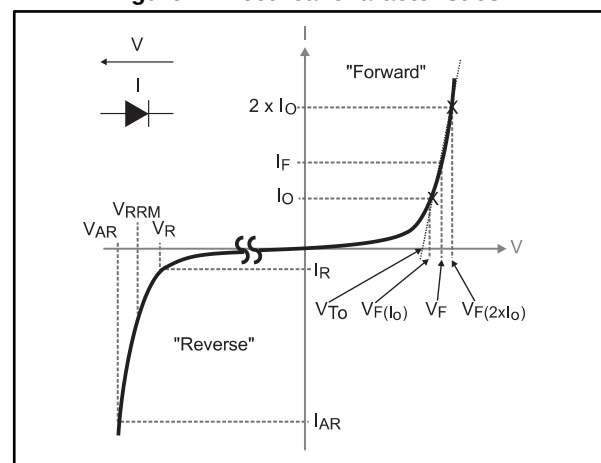
This dual diode Schottky rectifier is suited for high frequency switch mode power supply.

Packaged in TO-220AB and TO-220FPAB, this device is particularly suited for use in notebook, game station, LCD TV and desktop adapters, providing these applications with a good efficiency at both low and high load.

Table 1: Device summary

| Symbol      | Value           |
|-------------|-----------------|
| $I_{F(AV)}$ | $2 \times 10$ A |
| $V_{RRM}$   | 80 V            |
| $T_J(max.)$ | 175 °C          |
| $V_F(typ.)$ | 515 mV          |

Figure 1: Electrical characteristics



$V_{ARM}$  and  $I_{ARM}$  must respect the reverse safe operating area defined in Figure 10.  $V_{AR}$  and  $I_{AR}$  are pulse measurements ( $t_p < 1 \mu s$ ).  $V_R$ ,  $I_R$ ,  $V_{RRM}$  and  $V_F$ , are static characteristics.

# 1 Characteristics

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

| Symbol                          | Parameter                                             |            |                                                                                |            | Value       | Unit |
|---------------------------------|-------------------------------------------------------|------------|--------------------------------------------------------------------------------|------------|-------------|------|
| V <sub>RRM</sub>                | Repetitive peak reverse voltage                       |            |                                                                                |            | 80          | V    |
| I <sub>F(RMS)</sub>             | Forward rms current                                   |            |                                                                                |            | 30          | A    |
| I <sub>F(AV)</sub>              | Average forward current $\delta = 0.5$ , square wave  | TO-220AB   | T <sub>C</sub> = 155 °C                                                        | Per diode  | 10          | A    |
|                                 |                                                       |            | T <sub>C</sub> = 150 °C                                                        | Per device | 20          |      |
|                                 |                                                       | TO-220FPAB | T <sub>C</sub> = 130 °C                                                        | Per diode  | 10          |      |
|                                 |                                                       |            | T <sub>C</sub> = 100 °C                                                        | Per device | 20          |      |
| I <sub>FSM</sub>                | Surge non repetitive forward current                  |            | t <sub>p</sub> = 10 ms sinusoidal                                              |            | 220         | A    |
| P <sub>ARM</sub> <sup>(1)</sup> | Repetitive peak avalanche power                       |            | t <sub>p</sub> = 10 μs, T <sub>j</sub> = 125 °C                                |            | 385         | W    |
| V <sub>ARM</sub> <sup>(2)</sup> | Maximum repetitive peak avalanche voltage             |            | t <sub>p</sub> < 1 μs,<br>T <sub>j</sub> < 150 °C,<br>I <sub>AR</sub> < 16.2 A |            | 100         | V    |
| V <sub>ASM</sub> <sup>(2)</sup> | Maximum single pulse peak avalanche voltage           |            | t <sub>p</sub> < 1 μs,<br>T <sub>j</sub> < 150 °C,<br>I <sub>AR</sub> < 16.2 A |            | 100         | V    |
| T <sub>stg</sub>                | Storage temperature range                             |            |                                                                                |            | -65 to +175 | °C   |
| T <sub>j</sub>                  | Maximum operating junction temperature <sup>(3)</sup> |            |                                                                                |            | 175         | °C   |

**Notes:**

<sup>(1)</sup>For pulse time duration deratings, please refer to figure 4. More details regarding the avalanche energy measurements and diode validation in the avalanche are provided in the application notes AN1768 and AN2025.

<sup>(2)</sup>See Figure 10

<sup>(3)</sup>(dP<sub>tot</sub>/dT<sub>j</sub>) < (1/R<sub>th(j-a)</sub>) condition to avoid thermal runaway for a diode on its own heatsink.

**Table 3: Thermal parameters**

| Symbol               | Parameter        |            |           | Max. value | Unit |
|----------------------|------------------|------------|-----------|------------|------|
| R <sub>th(j-c)</sub> | Junction to case | TO-220AB   | Per diode | 2.30       | °C/W |
|                      |                  |            | Total     | 1.55       |      |
|                      |                  | TO-220FPAB | Per diode | 5.80       |      |
|                      |                  |            | Total     | 4.65       |      |
| R <sub>th(c)</sub>   | Coupling         | TO-220AB   |           | 0.80       | °C/W |
|                      |                  | TO-220FPAB |           | 3.50       |      |

When the diodes 1 and 2 are used simultaneously:

$$\Delta T_j (\text{diode1}) = P_{(\text{diode1})} \times R_{th(j-c)} (\text{per diode}) + P_{(\text{diode2})} \times R_{th(c)}$$

Table 4: Static electrical characteristics (per diode)

| Symbol      | Parameter               | Test conditions       |                     | Min. | Typ.  | Max.  | Unit          |
|-------------|-------------------------|-----------------------|---------------------|------|-------|-------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ °C}$  | $V_R = V_{RRM}$     | -    | 5.8   | 25    | $\mu\text{A}$ |
|             |                         | $T_j = 125\text{ °C}$ |                     | -    | 5     | 15    | mA            |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25\text{ °C}$  | $I_F = 5\text{ A}$  | -    | 0.590 | 0.640 | V             |
|             |                         | $T_j = 125\text{ °C}$ |                     | -    | 0.515 | 0.550 |               |
|             |                         | $T_j = 25\text{ °C}$  | $I_F = 10\text{ A}$ | -    | 0.710 | 0.780 |               |
|             |                         | $T_j = 125\text{ °C}$ |                     | -    | 0.595 | 0.650 |               |
|             |                         | $T_j = 25\text{ °C}$  | $I_F = 20\text{ A}$ | -    | 0.850 | 0.945 |               |
|             |                         | $T_j = 125\text{ °C}$ |                     | -    | 0.690 | 0.780 |               |

**Notes:**

<sup>(1)</sup>Pulse test:  $t_p = 5\text{ ms}$ ,  $\delta < 2\%$

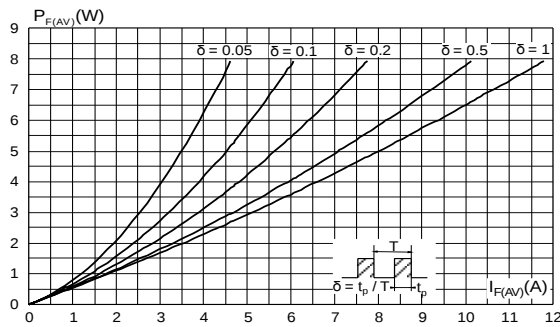
<sup>(2)</sup>Pulse test:  $t_p = 380\text{ }\mu\text{s}$ ,  $\delta < 2\%$

To evaluate the conduction losses, use the following equation:

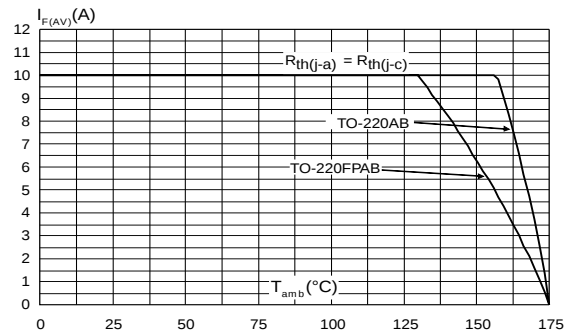
$$P = 0.52 \times I_{F(AV)} + 0.013 \times I_{F(RMS)}^2$$

## 1.1 Characteristics (curves)

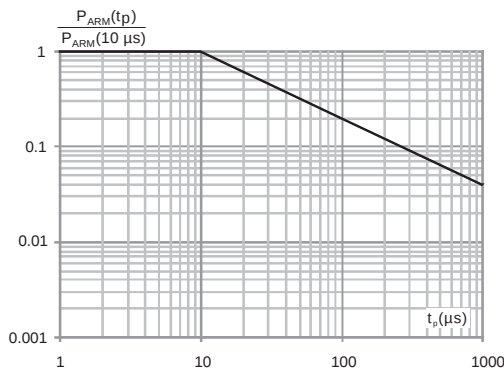
**Figure 2: Average forward power dissipation versus average forward current (per diode)**



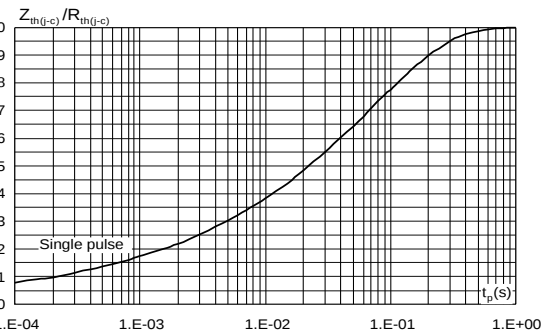
**Figure 3: Average forward current versus ambient temperature ( $\delta = 0.5$ , per diode)**



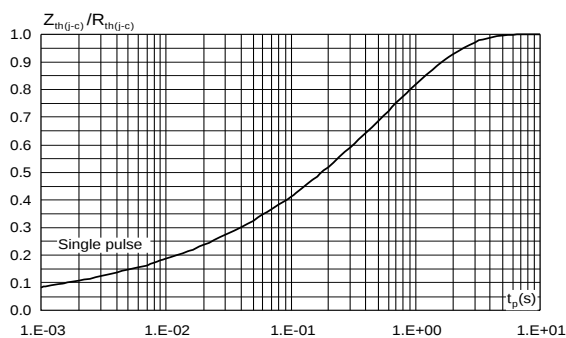
**Figure 4: Normalized avalanche power derating versus pulse duration ( $T_j = 125^\circ\text{C}$ )**



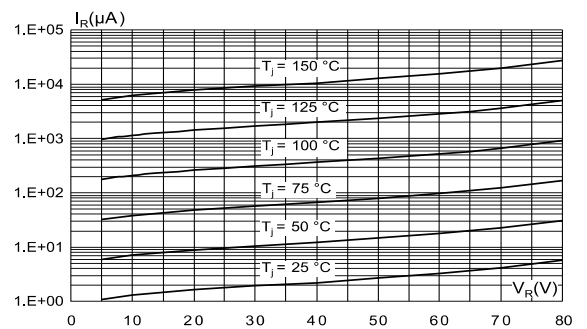
**Figure 5: Relative thermal impedance junction to case versus pulse duration (TO-220AB)**

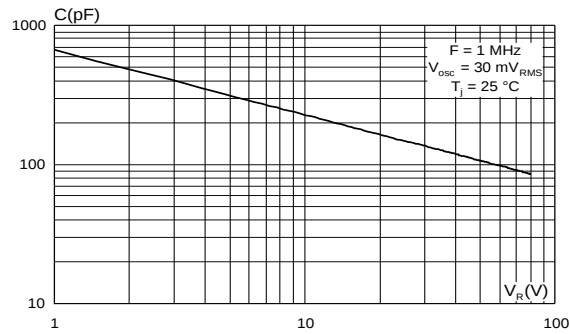
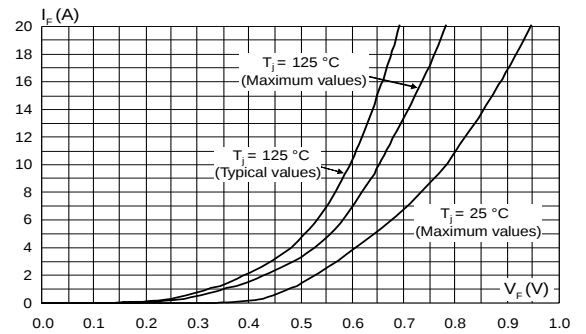
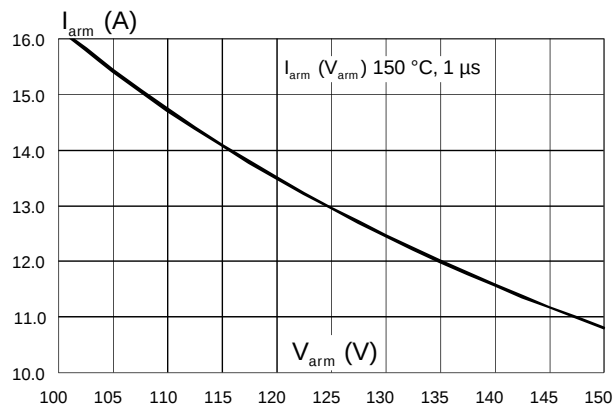


**Figure 6: Relative thermal impedance junction to case versus pulse duration (TO-220FPAB)**



**Figure 7: Reverse leakage current versus reverse voltage applied (typical values, per diode)**



**Figure 8: Junction capacitance versus reverse voltage applied (typical values, per diode)****Figure 9: Forward voltage drop versus forward current (per diode)****Figure 10: Reverse safe operating area ( $t_p < 1 \mu\text{s}$  and  $T_j < 150^\circ\text{C}$ )**

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

- Cooling method: by conduction (C)
- Epoxy meets UL 94,V0
- Recommended torque value: 0.55 N·m (for TO-220AB and TO-220FPAB)
- Maximum torque value: 0.7 N·m (for TO-220AB and TO-220FPAB)

### 2.1 TO-220AB package information

Figure 11: TO-220AB package outline

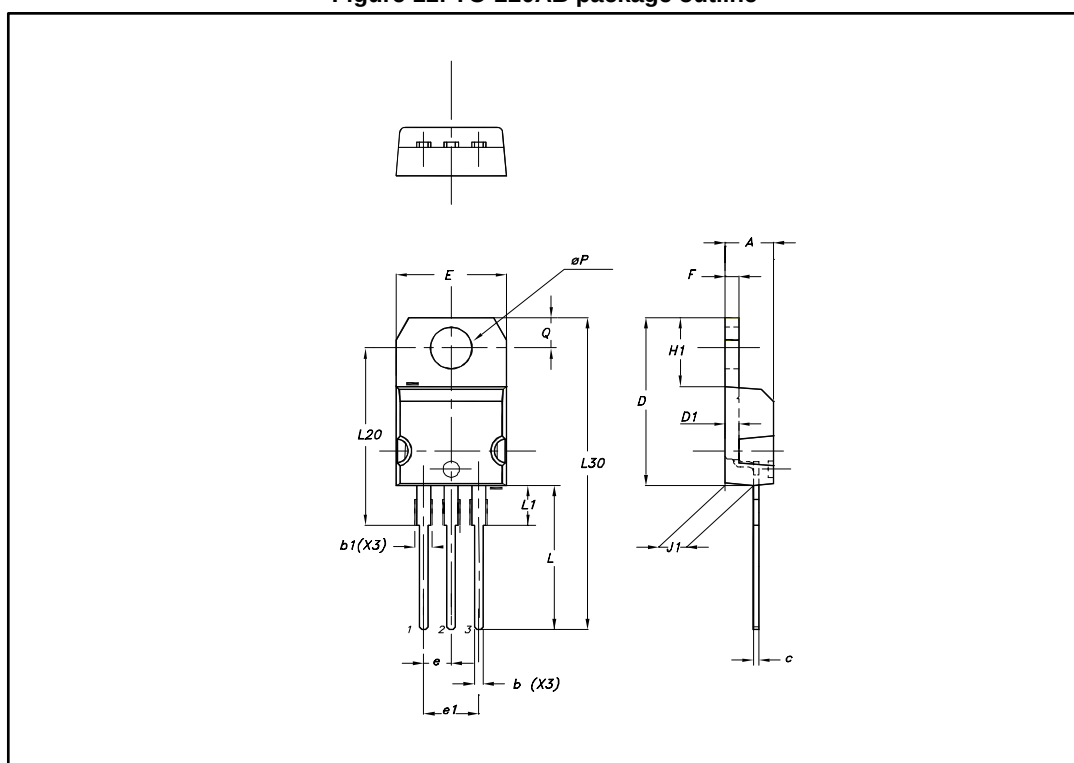


Table 5: TO-220AB package mechanical data

| Ref. | Dimensions  |       |            |       |
|------|-------------|-------|------------|-------|
|      | Millimeters |       | Inches     |       |
|      | Min.        | Max.  | Min.       | Max.  |
| A    | 4.40        | 4.60  | 0.173      | 0.181 |
| b    | 0.61        | 0.88  | 0.240      | 0.035 |
| b1   | 1.14        | 1.70  | 0.045      | 0.067 |
| c    | 0.48        | 0.70  | 0.019      | 0.028 |
| D    | 15.25       | 15.75 | 0.600      | 0.620 |
| D1   | 1.27 typ.   |       | 0.050 typ. |       |
| E    | 10.00       | 10.40 | 0.394      | 0.409 |
| e    | 2.40        | 2.70  | 0.094      | 0.106 |
| e1   | 4.95        | 5.15  | 0.195      | 0.203 |
| F    | 1.23        | 1.32  | 0.048      | 0.052 |
| H1   | 6.20        | 6.60  | 0.244      | 0.260 |
| J1   | 2.40        | 2.72  | 0.094      | 0.107 |
| L    | 13.00       | 14.00 | 0.512      | 0.551 |
| L1   | 3.50        | 3.93  | 0.138      | 0.155 |
| L20  | 16.40 typ.  |       | 0.646 typ. |       |
| L30  | 28.90 typ.  |       | 1.138 typ. |       |
| θP   | 3.75        | 3.85  | 0.148      | 0.152 |
| Q    | 2.65        | 2.95  | 0.104      | 0.116 |

## 2.2 TO-220FPAB package information

Figure 12: TO-220FPAB package outline

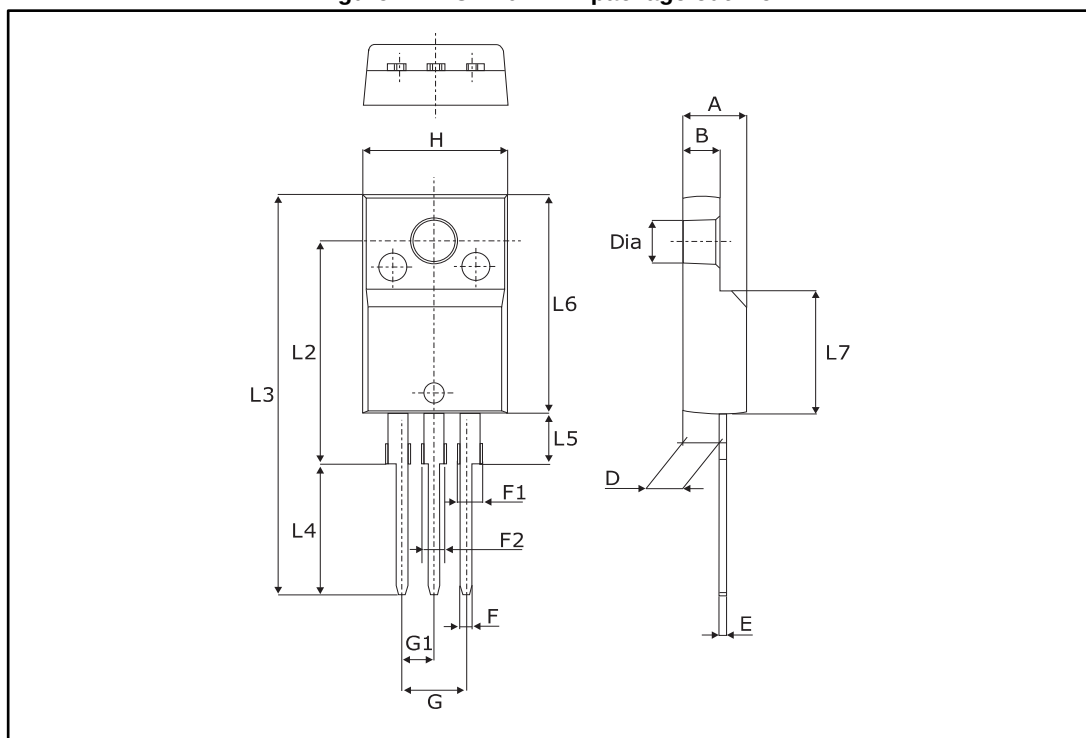


Table 6: TO-220FPAB package mechanical data

| Ref. | Dimensions  |       |           |       |
|------|-------------|-------|-----------|-------|
|      | Millimeters |       | Inches    |       |
|      | Min.        | Max.  | Min.      | Max.  |
| A    | 4.40        | 4.60  | 0.173     | 0.181 |
| B    | 2.5         | 2.7   | 0.098     | 0.106 |
| D    | 2.50        | 2.75  | 0.098     | 0.108 |
| E    | 0.45        | 0.70  | 0.018     | 0.027 |
| F    | 0.75        | 1.0   | 0.03      | 0.039 |
| F1   | 1.15        | 1.70  | 0.045     | 0.067 |
| F2   | 1.15        | 1.70  | 0.045     | 0.067 |
| G    | 4.95        | 5.20  | 0.195     | 0.205 |
| G1   | 2.40        | 2.70  | 0.094     | 0.106 |
| H    | 10.00       | 10.40 | 0.393     | 0.409 |
| L2   | 16.00 typ.  |       | 0.63 typ. |       |
| L3   | 28.60       | 30.60 | 1.126     | 1.205 |
| L4   | 9.80        | 10.6  | 0.386     | 0.417 |
| L5   | 2.90        | 3.60  | 0.114     | 0.142 |
| L6   | 15.90       | 16.40 | 0.626     | 0.646 |
| L7   | 9.00        | 9.30  | 0.354     | 0.366 |
| Dia  | 3.0         | 3.20  | 0.118     | 0.126 |

### 3 Ordering information

Table 7: Ordering information

| Order code    | Marking     | Package    | Weight | Base qty. | Delivery mode |
|---------------|-------------|------------|--------|-----------|---------------|
| STPS20SM80CT  | PS20SM80CT  | TO-220AB   | 1.9 g  | 50        | Tube          |
| STPS20SM80CFP | PS20SM80CFP | TO-220FPAB | 1.9 g  | 50        | Tube          |

### 4 Revision history

Table 8: Document revision history

| Date        | Revision | Changes                                       |
|-------------|----------|-----------------------------------------------|
| 11-Apr-2011 | 1        | First issue.                                  |
| 12-May-2017 | 2        | Removed D <sup>2</sup> PAK and DPAK packages. |

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