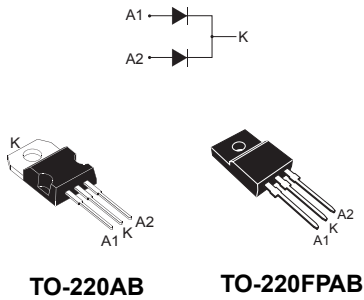


## 100 V power Schottky rectifier



### Features

- High junction temperature capability for converters located in confined environment
- Low leakage current at high temperature
- Low static and dynamic losses as a result of the Schottky barrier
- Avalanche specification
- ECOPACK®2 compliant

### Applications

- Switching diode
- SMPS
- DC/DC converter
- LED lighting
- Desktop power supply

### Description

Schottky barrier rectifier designed for high frequency miniature switched mode power supplies such as adaptors and on board DC/DC converters.

The **STPS20S100C** is housed in TO-220AB and TO-220FPAB packages.

| Product status link         |          |
|-----------------------------|----------|
| <a href="#">STPS20S100C</a> |          |
| Product summary             |          |
| Symbol                      | Value    |
| $I_{F(AV)}$                 | 2 x 10 A |
| $V_{RRM}$                   | 100 V    |
| $T_j$                       | 175 °C   |
| $V_F$ (typ.)                | 0.66 V   |

# 1 Characteristics

**Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified, per diode)**

| Symbol              | Parameter                                             |            |                                                 |            | Value       | Unit |
|---------------------|-------------------------------------------------------|------------|-------------------------------------------------|------------|-------------|------|
| V <sub>RRM</sub>    | Repetitive peak reverse voltage                       |            |                                                 |            | 100         | V    |
| I <sub>F(RMS)</sub> | Forward rms current                                   |            |                                                 |            | 30          | A    |
| I <sub>F(AV)</sub>  | Average forward current                               | TO-220AB   | T <sub>C</sub> = 155 °C, δ = 0.5                | Per diode  | 10          | A    |
|                     |                                                       |            | T <sub>C</sub> = 150 °C, δ = 0.5                | Per device | 20          |      |
|                     |                                                       | TO-220FPAB | T <sub>C</sub> = 135 °C, δ = 0.5                | Per diode  | 10          |      |
|                     |                                                       |            | T <sub>C</sub> = 115 °C, δ = 0.5                | Per device | 20          |      |
| I <sub>FSM</sub>    | Surge non repetitive forward current                  |            | t <sub>p</sub> = 10 ms sinusoidal               |            | 180         | A    |
| P <sub>ARM</sub>    | Repetitive peak avalanche power                       |            | t <sub>p</sub> = 10 μs, T <sub>j</sub> = 125 °C |            | 518         | W    |
| T <sub>stg</sub>    | Storage temperature range                             |            |                                                 |            | -65 to +175 | °C   |
| T <sub>j</sub>      | Maximum operating junction temperature <sup>(1)</sup> |            |                                                 |            | 175         | °C   |

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

**Table 2. Thermal resistance parameters**

| Symbol        | Parameter        |            |           | Max. value | Unit |
|---------------|------------------|------------|-----------|------------|------|
| $R_{th(j-c)}$ | Junction to case | TO-220AB   | Per diode | 2.2        | °C/W |
|               |                  |            | Total     | 1.3        |      |
|               |                  | TO-220FPAB | Per diode | 4.5        |      |
|               |                  |            | Total     | 3.5        |      |
| $R_{th(c)}$   | Coupling         | TO-220AB   |           | 0.3        |      |
|               |                  | TO-220FPAB |           | 2.5        |      |

When the diodes 1 and 2 are used simultaneously :

$$\Delta T_j(\text{diode } 1) = P(\text{diode } 1) \times R_{th(j-c)}(\text{per diode}) + P(\text{diode } 2) \times R_{th(c)}$$

**Table 3. Static electrical characteristics (per diode)**

| Symbol      | Parameter               | Test conditions       |                 | Min. | Typ. | Max. | Unit          |
|-------------|-------------------------|-----------------------|-----------------|------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ °C}$  | $V_R = V_{RRM}$ | -    |      | 3.5  | $\mu\text{A}$ |
|             |                         | $T_j = 125\text{ °C}$ |                 | -    | 1.3  | 4.5  | mA            |

| Symbol      | Parameter            | Test conditions       |                     | Min. | Typ. | Max. | Unit |
|-------------|----------------------|-----------------------|---------------------|------|------|------|------|
| $V_F^{(2)}$ | Forward voltage drop | $T_j = 25\text{ °C}$  | $I_F = 5\text{ A}$  | -    |      | 0.73 | V    |
|             |                      | $T_j = 125\text{ °C}$ |                     | -    | 0.57 | 0.61 |      |
|             |                      | $T_j = 25\text{ °C}$  | $I_F = 10\text{ A}$ | -    |      | 0.85 |      |
|             |                      | $T_j = 125\text{ °C}$ |                     | -    | 0.66 | 0.71 |      |
|             |                      | $T_j = 25\text{ °C}$  | $I_F = 20\text{ A}$ | -    |      | 0.94 |      |
|             |                      | $T_j = 125\text{ °C}$ |                     | -    | 0.74 | 0.80 |      |

1. Pulse test:  $t_p = 5\text{ ms}$ ,  $\delta < 2\%$

2. Pulse test:  $t_p = 380\text{ }\mu\text{s}$ ,  $\delta < 2\%$

To evaluate the conduction losses, use the following equation:

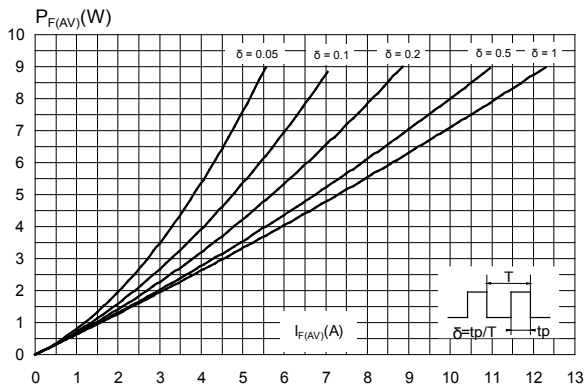
$$P = 0.62 \times I_{F(AV)} + 0.009 \times I_{F(RMS)}^2$$

For more information, please refer to the following application notes related to the power losses :

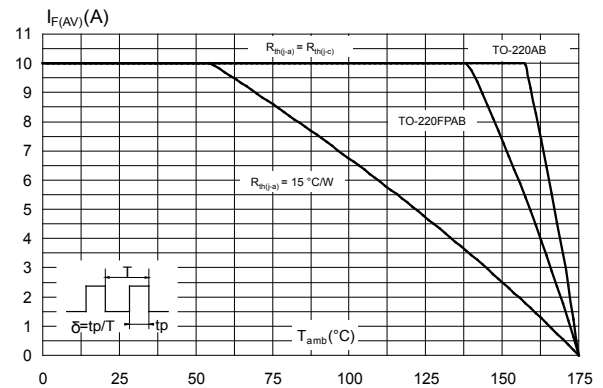
- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses on a power diode

## 1.1 Characteristics (curves)

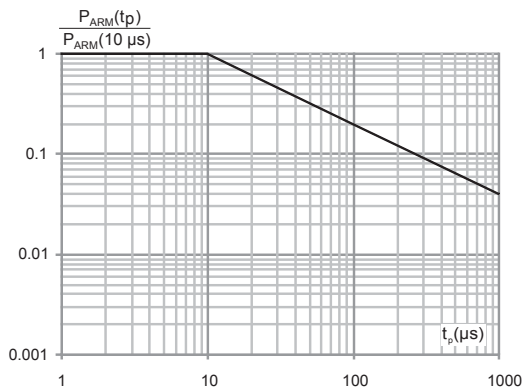
**Figure 1. Average forward power dissipation versus average forward current (per diode)**



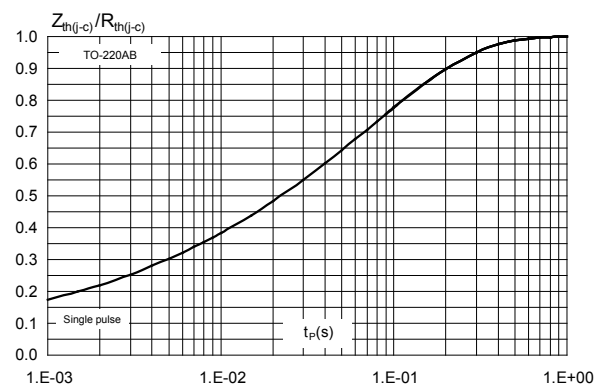
**Figure 2. Average forward current versus ambient temperature ( $\delta = 0.5$ , per diode)**



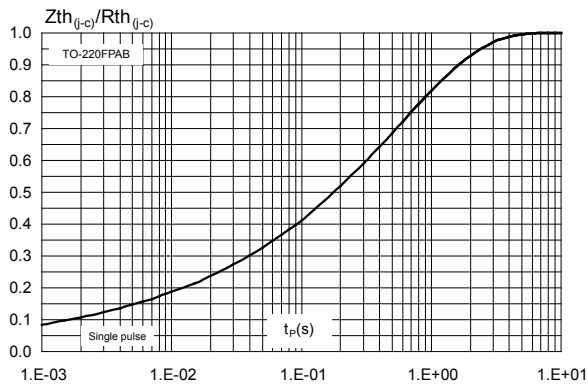
**Figure 3. Normalized avalanche power derating versus pulse duration ( $T_j = 125\text{ °C}$ )**



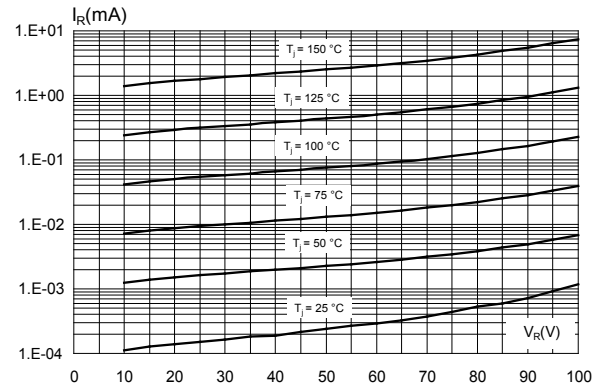
**Figure 4. Relative variation of thermal impedance junction to case versus pulse duration (TO-220AB)**



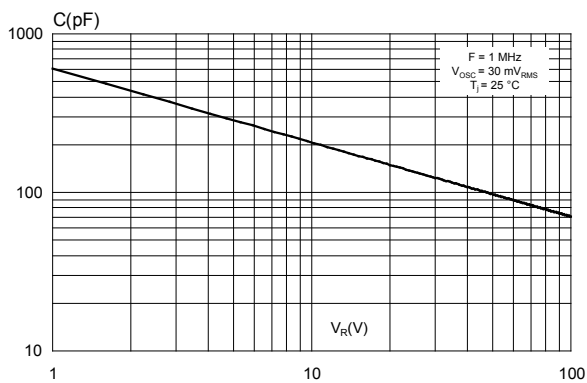
**Figure 5. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAB)**



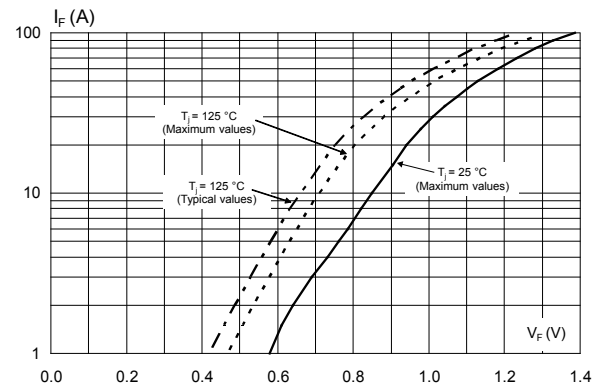
**Figure 6. Reverse leakage current versus reverse voltage applied (typical values, per diode)**



**Figure 7. Junction capacitance versus reverse voltage applied (typical values, per diode)**



**Figure 8. Forward voltage drop versus forward current (per diode)**



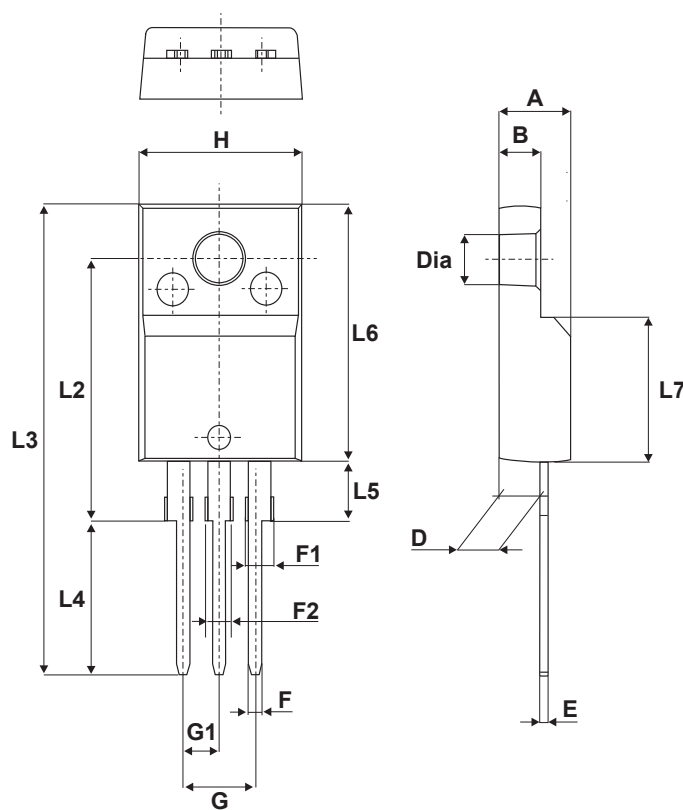
## 2 Package information

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.

### 2.1 TO-220FPAB package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.55 N·m
- Maximum torque value: 0.70 N·m

**Figure 9. TO-220FPAB package outline**



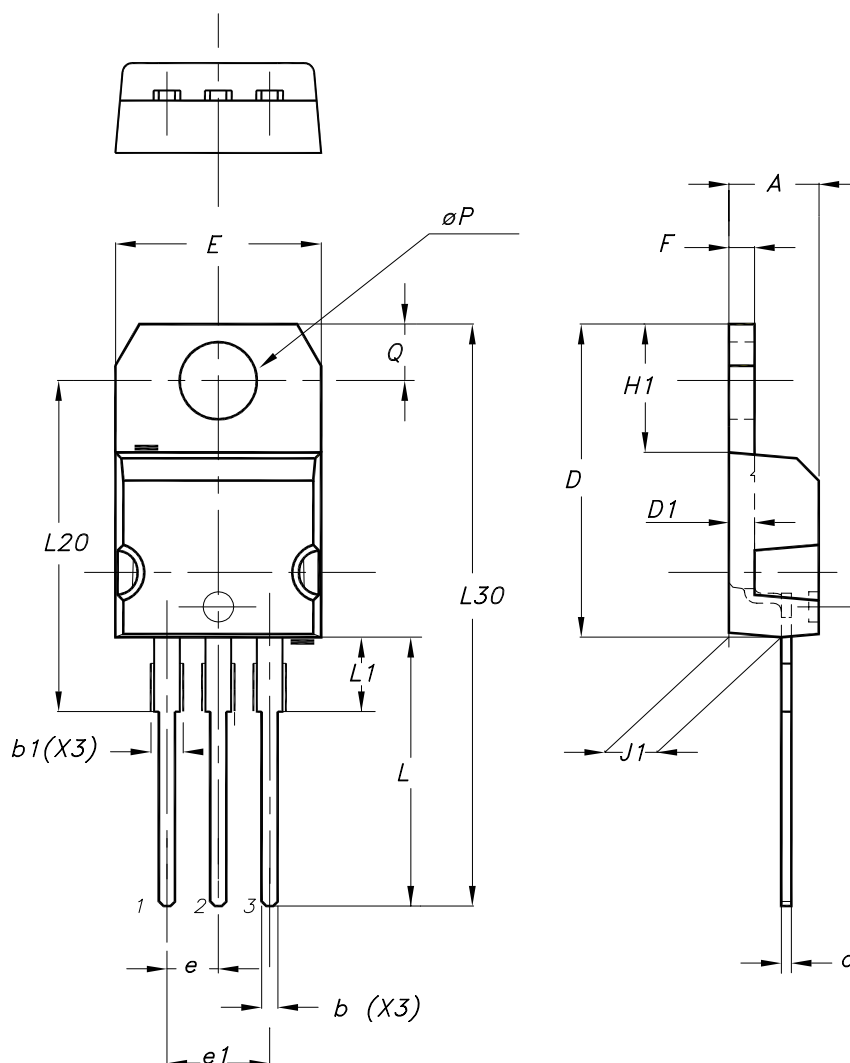
**Table 4. TO-220FPAB package mechanical data**

| Ref. | Dimensions  |       |           |       |
|------|-------------|-------|-----------|-------|
|      | Millimeters |       | Inches    |       |
|      | Min.        | Max.  | Min.      | Max.  |
| A    | 4.40        | 4.60  | 0.173     | 0.181 |
| B    | 2.50        | 2.70  | 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        | 1.00  | 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        | 10.60 | 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  | 3.00        | 3.20  | 0.118     | 0.126 |

## 2.2 TO-220AB package information

- Epoxy meets UL 94,V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.55 N·m
- Maximum torque value: 0.70 N·m

**Figure 10. 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        | 1.55 | 0.045  | 0.061 |



| Ref. | Dimensions  |       |            |       |
|------|-------------|-------|------------|-------|
|      | Millimeters |       | Inches     |       |
|      | Min.        | Max.  | Min.       | Max.  |
| 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 |

### 3 Ordering information

**Table 6. Ordering information**

| Order code    | Marking       | Package    | Weight | Base qty. | Delivery mode |
|---------------|---------------|------------|--------|-----------|---------------|
| STPS20S100CT  | STPS20S100CT  | TO-220AB   | 1.95 g | 50        | Tube          |
| STPS20S100CFP | STPS20S100CFP | TO-220FPAB | 1.90 g |           |               |

## Revision history

**Table 7. Document revision history**

| Date        | Version | Changes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 16-Mar-2005 | 1       | First issue.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 03-Feb-2010 | 2       | Added cathode indicator K to illustration of TO-220AB on cover page.<br>Changed parameter in Table 2 from " RMS forward voltage " to " Forward rms current ".                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 11-May-2018 | 3       | Removed figure 4, figure 5 and figure 6.<br>Updated Figure 3. Normalized avalanche power derating versus pulse duration ( $T_j = 125\text{ }^{\circ}\text{C}$ ), Table 1. Absolute ratings (limiting values at $25\text{ }^{\circ}\text{C}$ , unless otherwise specified, per diode), Figure 4. Relative variation of thermal impedance junction to case versus pulse duration (TO-220AB) and Figure 5. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAB).<br>Updated Section 3 Ordering information.<br>Removed I <sup>2</sup> PAK package.<br>Minor text changes to improve readability. |

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