100 V, 20 A power Schottky rectifier

Features
- Negligible switching losses
- High junction temperature capability
- Low leakage current
- Good trade off between leakage current and forward voltage drop
- Avalanche rated
- Insulated package: TO-220FPAB
  - Insulating voltage = 2000 V_{RMS} sine
- ECOPACK®2 compliant component for D²PAK on demand

Applications
- Switching diode
- SMPS
- DC/DC converter
- LED lighting
- Adapter for notebook and game station

Description
Dual center tap Schottky rectifier designed for high frequency miniature switch mode power supplies such as adaptors and on-board DC-DC converters.

Product summary

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>I_{F(AV)}</td>
<td>2 x 10 A</td>
</tr>
<tr>
<td>V_{RRM}</td>
<td>100 V</td>
</tr>
<tr>
<td>T_j (max)</td>
<td>175 °C</td>
</tr>
<tr>
<td>V_f (typ)</td>
<td>0.59 V</td>
</tr>
</tbody>
</table>
## Characteristics

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

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{RRM}$</td>
<td>Repetitive peak reverse voltage</td>
<td>100</td>
<td>V</td>
</tr>
<tr>
<td>$I_{F(RMS)}$</td>
<td>Forward rms current</td>
<td>30</td>
<td>A</td>
</tr>
<tr>
<td>$I_{F(AV)}$</td>
<td>Average forward current $\delta = 0.5$, square wave</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TO-220AB, D²PAK, I²PAK $T_C = 160 ^\circ C$</td>
<td>10</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>Per diode</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TO-220FPAB $T_C = 145 ^\circ C$</td>
<td>10</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>Per device</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TO-220FPAB $T_C = 125 ^\circ C$</td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>Per device</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_{FSM}$</td>
<td>Surge non repetitive forward current $t_p = 10 \text{ ms}$ sinusoidal</td>
<td>250</td>
<td>A</td>
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<tr>
<td>$P_{ARM}$</td>
<td>Repetitive peak avalanche power $t_p = 10 \mu s$, $T_J = 125 ^\circ C$</td>
<td>775</td>
<td>W</td>
</tr>
<tr>
<td>$T_{stg}$</td>
<td>Storage temperature range</td>
<td>-65 to +175 °C</td>
<td></td>
</tr>
<tr>
<td>$T_J$</td>
<td>Maximum operating junction temperature (1)</td>
<td>+175 °C</td>
<td></td>
</tr>
</tbody>
</table>

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 parameter

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{th(j-c)}$</td>
<td>Junction to case</td>
<td></td>
<td>°C/W</td>
</tr>
<tr>
<td></td>
<td>TO-220AB, D²PAK, I²PAK $T_C = 160 ^\circ C$</td>
<td>1.6</td>
<td>°C/W</td>
</tr>
<tr>
<td></td>
<td>Per diode</td>
<td>4</td>
<td>°C/W</td>
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<tr>
<td></td>
<td>TO-220FPAB $T_C = 145 ^\circ C$</td>
<td>0.9</td>
<td>°C/W</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>3.2</td>
<td>°C/W</td>
</tr>
<tr>
<td>$R_{th(c)}$</td>
<td>Coupling</td>
<td></td>
<td>°C/W</td>
</tr>
<tr>
<td></td>
<td>TO-220AB, D²PAK, I²PAK $T_C = 160 ^\circ C$</td>
<td>0.15</td>
<td>°C/W</td>
</tr>
<tr>
<td></td>
<td>TO-220FPAB</td>
<td>2.5</td>
<td>°C/W</td>
</tr>
</tbody>
</table>

When the diodes 1 and 2 are used simultaneously:

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

For more information, please refer to the following application note:
- AN5088: Rectifiers thermal management, handling and mounting recommendations

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

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
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<tbody>
<tr>
<td>$I_{R(1)}$</td>
<td>Reverse leakage current $T_J = 25 ^\circ C$</td>
<td>$V_R = V_{RRM}$</td>
<td>-</td>
<td>4.5</td>
<td>-</td>
<td>μA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_J = 125 ^\circ C$</td>
<td>-</td>
<td>2</td>
<td>6</td>
<td>mA</td>
</tr>
<tr>
<td>$V_{F(2)}$</td>
<td>Forward voltage drop $T_J = 25 ^\circ C$</td>
<td>$I_F = 10 \text{ A}$</td>
<td>-</td>
<td>0.77</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 20 \text{ A}$</td>
<td>-</td>
<td>0.88</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_J = 125 ^\circ C$</td>
<td>$I_F = 10 \text{ A}$</td>
<td>-</td>
<td>0.59</td>
<td>0.64</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 20 \text{ A}$</td>
<td>-</td>
<td>0.67</td>
<td>0.73</td>
<td>V</td>
</tr>
</tbody>
</table>
1. Pulse test: $t_p = 5\, \text{ms}, \delta < 2\%$

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

To evaluate the conduction losses use the following equation:

$$P = 0.55 \times I_{F\text{(AV)}} + 0.009 \times I_{F\text{2(RMS)}}$$

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 ($T_j = 125 \, ^\circ C$)

**Figure 4.** Relative variation of thermal impedance junction to case versus pulse duration

**Figure 5.** Relative variation of thermal impedance junction to case versus pulse duration

**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 (maximum values, per diode)

Figure 9. Thermal resistance junction to ambient versus copper surface under tab (epoxy printed board FR4, $e_{Cu} = 35 \mu m$) (D²PAK)
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.
2.1 D²PAK package information

- Cooling method: by conduction (C)
- Epoxy meets UL 94,V0

*Figure 10. D²PAK package outline*
### Table 4. D²PAK package mechanical data

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Dimensions</th>
<th>Millimeters</th>
<th>Inches</th>
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<tr>
<td></td>
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<td>Min.</td>
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</tr>
<tr>
<td>A</td>
<td></td>
<td>4.36</td>
<td>4.60</td>
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<td>A1</td>
<td></td>
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<td>0.25</td>
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<tr>
<td>b</td>
<td></td>
<td>0.70</td>
<td>0.93</td>
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<tr>
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<td>8.00</td>
</tr>
<tr>
<td>D2</td>
<td></td>
<td>1.10</td>
<td>1.50</td>
</tr>
<tr>
<td>E</td>
<td></td>
<td>10.00</td>
<td>10.55</td>
</tr>
<tr>
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</tr>
<tr>
<td>e1</td>
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<td>5.28</td>
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<tr>
<td>H</td>
<td></td>
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<td>15.85</td>
</tr>
<tr>
<td>J1</td>
<td></td>
<td>2.49</td>
<td>2.90</td>
</tr>
<tr>
<td>L</td>
<td></td>
<td>1.90</td>
<td>2.79</td>
</tr>
<tr>
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<td>1.27</td>
<td>1.65</td>
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<td>L2</td>
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<td>1.78</td>
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<td></td>
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<td>0.015</td>
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<tr>
<td>V2</td>
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<td>0°</td>
<td>8°</td>
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Figure 11. D²PAK Recommended footprint
2.2  I²PAK package information

- Epoxy meets UL 94,V0
- Cooling method: by conduction (C)

*Figure 12. I²PAK package outline*
<table>
<thead>
<tr>
<th>Ref.</th>
<th>Dimensions</th>
<th>Millimeters</th>
<th>Inches (for reference only)</th>
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<td>Min.</td>
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<tr>
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<td>4.40</td>
<td>4.60</td>
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<td>9.35</td>
<td>0.352</td>
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</table>
2.3 TO-220AB package information

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

Figure 13. TO-220AB package outline
<table>
<thead>
<tr>
<th>Ref.</th>
<th>Dimensions</th>
<th>Millimeters</th>
<th>Inches</th>
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<tr>
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2.4 TO-220FPAB 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 14. TO-220FPAB package outline
Table 7. TO-220FPAB package mechanical data

<table>
<thead>
<tr>
<th></th>
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<td>16.40</td>
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<td>0.6482</td>
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<td>0.3557</td>
<td>0.3676</td>
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<tr>
<td>Dia</td>
<td></td>
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<td>3.20</td>
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Table 8. Ordering information

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<th>Base qty</th>
<th>Delivery mode</th>
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<td>STPS20H100CT</td>
<td>TO-220AB</td>
<td>1.95 g</td>
<td>50</td>
<td>Tube</td>
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<tr>
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<td>STPS20H100CFP</td>
<td>TO-220FPAB</td>
<td>1.90 g</td>
<td>50</td>
<td>Tube</td>
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<tr>
<td>STPS20H100CR</td>
<td>STPS20H100CR</td>
<td>i2PAK</td>
<td>1.50 g</td>
<td>50</td>
<td>Tube</td>
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<td>Tube</td>
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<td>STPS20H100CG</td>
<td>D2PAK</td>
<td>1.48 g</td>
<td>1000</td>
<td>Tape and reel</td>
</tr>
</tbody>
</table>
Revision history

Table 9. Document revision history

<table>
<thead>
<tr>
<th>Date</th>
<th>Revision</th>
<th>Changes</th>
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<tbody>
<tr>
<td>Jul-2003</td>
<td>4G</td>
<td>Previous release</td>
</tr>
<tr>
<td>21-Mar-2007</td>
<td>5</td>
<td>Removed ISOWATT package</td>
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<tr>
<td>10-Sep-2007</td>
<td>6</td>
<td>Reformatted cover page to current standards - no technical changes. Updated dimensions A1, b, b1, c, c2, L, and L1 in Table 8.</td>
</tr>
<tr>
<td>22-Sep-2011</td>
<td>7</td>
<td>Updated Table 8.</td>
</tr>
<tr>
<td>21-May-2015</td>
<td>8</td>
<td>Updated features, and packages silhouette in cover page. Updated Section 1: &quot;Characteristics&quot; and Section 1.1: &quot;Characteristics (curves)&quot;. Updated Section 2.2: &quot;D²PAK package information&quot;.</td>
</tr>
<tr>
<td>16-Apr-2018</td>
<td>9</td>
<td>Updated I²PAK package mechanical data.</td>
</tr>
<tr>
<td>20-Jan-2020</td>
<td>10</td>
<td>Updated Section 1 Characteristics and Table 8. Ordering information. Added Section Applications.</td>
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