1. General description

Ultrafast power diode in a SOD113 (2-lead TO-220F) plastic package.

2. Features and benefits

- Fast switching
- Isolated plastic package
- Low leakage current
- Low forward voltage drop
- Low thermal resistance
- Soft recovery characteristic
- Enhanced avalanche energy capability

3. Applications

- High frequency switched-mode power supplies
- Discontinuous Current Mode (DCM) Power Factor Correction (PFC)

4. Quick reference data

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Values</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{RMM}$</td>
<td>repetitive peak reverse voltage</td>
<td></td>
<td>600</td>
<td>V</td>
</tr>
<tr>
<td>$I_{F(AV)}$</td>
<td>average forward current</td>
<td>$\delta = 0.5$ ; square-wave pulse; $T_j \leq 71 ^\circ C$;</td>
<td>10</td>
<td>A</td>
</tr>
<tr>
<td>$I_{FRM}$</td>
<td>repetitive peak forward current</td>
<td>$\delta = 0.5$ ; $t_p = 25$ μs; $T_j \leq 71 ^\circ C$; square-wave pulse</td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td>$I_{FSM}$</td>
<td>non-repetitive peak forward current</td>
<td>$t_r = 10$ ms; $T_{j(init)} = 25 ^\circ C$; sine-wave pulse;</td>
<td>75</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$t_r = 8.3$ ms; $T_{j(init)} = 25 ^\circ C$; sine-wave pulse;</td>
<td>83</td>
<td>A</td>
</tr>
</tbody>
</table>

**Static characteristics**

- $V_F$ forward voltage
  - $I_F = 10$ A; $T_j = 25 ^\circ C$; $V_R = 30$ V; \(dI/dt = 50 \text{ A/μs}; T_j = 25 ^\circ C; \text{Fig. 7}\)
  - $I_F = 10$ A; $T_j = 150 ^\circ C$; $V_R = 30$ V; \(dI/dt = 200 \text{ A/μs}; T_j = 25 ^\circ C; \text{Fig. 7}\)

**Dynamic characteristics**

- $t_r$ reverse recovery time
  - $I_F = 1$ A; $V_R = 30$ V; $dI/dt = 50 \text{ A/μs}; T_j = 25 ^\circ C; \text{Fig. 7}$
  - $I_F = 10$ A; $V_R = 200$ V; $dI/dt = 200 \text{ A/μs}; T_j = 25 ^\circ C; \text{Fig. 7}$
  - $I_F = 10$ A; $V_R = 200$ V; $dI/dt = 200 \text{ A/μs}; T_j = 125 ^\circ C; \text{Fig. 7}$
  - $I_F = 10$ A; $V_R = 400$ V; $dI/dt = 500 \text{ A/μs}; T_j = 25 ^\circ C; \text{Fig. 7}$
5. Pinning information

Table 2. Pinning information

<table>
<thead>
<tr>
<th>Pin</th>
<th>Symbol</th>
<th>Description</th>
<th>Simplified outline</th>
<th>Graphic symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>K</td>
<td>cathode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>anode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mb</td>
<td>n.c.</td>
<td>mounting base; isolated</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. Ordering information

Table 3. Ordering information

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>BYV10EX-600P</td>
<td>TO-220F</td>
</tr>
</tbody>
</table>

7. Marking

Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking codes</th>
</tr>
</thead>
</table>
8. Limiting values

Table 5. Limiting values
In accordance with the Absolute Maximum Rating System (IEC 60134).

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Values</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{RRM}</td>
<td>repetitive peak reverse voltage</td>
<td></td>
<td>600</td>
<td>V</td>
</tr>
<tr>
<td>V_{RWM}</td>
<td>crest working reverse voltage</td>
<td></td>
<td>600</td>
<td>V</td>
</tr>
<tr>
<td>V_{R}</td>
<td>reverse voltage</td>
<td>DC</td>
<td>600</td>
<td>V</td>
</tr>
<tr>
<td>I_{F(AV)}</td>
<td>average forward current</td>
<td>δ = 0.5 ; square-wave pulse; T_{j} ≤ 71 °C; Fig. 1; Fig. 2; Fig. 3</td>
<td>10</td>
<td>A</td>
</tr>
<tr>
<td>I_{FRM}</td>
<td>repetitive peak forward current</td>
<td>δ = 0.5 ; t_{p} = 25 μs; T_{j} ≤ 71 °C; square-wave pulse</td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td>I_{FSM}</td>
<td>non-repetitive peak forward current</td>
<td>t_{p} = 10 ms; T_{j(init)} = 25 °C; sine-wave pulse; Fig. 4</td>
<td>75</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>t_{p} = 8.3 ms; T_{j(init)} = 25 °C; sine-wave pulse</td>
<td>83</td>
<td>A</td>
</tr>
<tr>
<td>T_{stg}</td>
<td>storage temperature</td>
<td></td>
<td>-65 to 175</td>
<td>°C</td>
</tr>
<tr>
<td>T_{j}</td>
<td>junction temperature</td>
<td></td>
<td>175</td>
<td>°C</td>
</tr>
</tbody>
</table>

Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values

\[
I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}
\]
\[
V_o = 1.268 \, V; R_s = 0.031 \, \Omega
\]

Fig. 2. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values

\[
a = \text{form factor} = \frac{I_{F(RMS)}}{I_{F(AV)}}
\]
\[
V_o = 1.268 \, V; R_s = 0.031 \, \Omega
\]
Fig. 3. Forward current as a function of heatsink temperature; maximum values

Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values
9. Thermal characteristics

Table 6. Thermal characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{th(j-h)}$</td>
<td>thermal resistance from junction to heatsink</td>
<td>With heatsink compound; Fig. 5</td>
<td>-</td>
<td>-</td>
<td>5.5</td>
<td>K/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Without heatsink compound</td>
<td>-</td>
<td>-</td>
<td>7.2</td>
<td>K/W</td>
</tr>
<tr>
<td>$R_{th(j-a)}$</td>
<td>thermal resistance from junction to ambient free air</td>
<td>in free air</td>
<td>-</td>
<td>55</td>
<td>-</td>
<td>K/W</td>
</tr>
</tbody>
</table>

Fig. 5. Transient thermal impedance from junction to heatsink as a function of pulse duration

10. Isolation characteristics

Table 6. Isolation characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{isol(RMS)}$</td>
<td>RMS isolation voltage</td>
<td>50 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; from all pins to external heatsink; sinusoidal waveform; clean and dust free</td>
<td>-</td>
<td>-</td>
<td>2500</td>
<td>V</td>
</tr>
<tr>
<td>$C_{isol}$</td>
<td>isolation capacitance</td>
<td>from cathode to external heatsink</td>
<td>-</td>
<td>10</td>
<td>-</td>
<td>PF</td>
</tr>
</tbody>
</table>
11. Characteristics

Table 7. Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_F$</td>
<td>forward current</td>
<td>$I_F = 10 A; T_j = 25 °C$; $I_F = 10 A; T_j = 150 °C$; <strong>Fig. 6</strong></td>
<td>-</td>
<td>1.55</td>
<td>2</td>
<td>V</td>
</tr>
<tr>
<td>$I_R$</td>
<td>reverse current</td>
<td>$V_R = 600 V; T_j = 25 °C$</td>
<td>-</td>
<td>-</td>
<td>10</td>
<td>μA</td>
</tr>
<tr>
<td>$V_R$</td>
<td>reverse current</td>
<td>$V_R = 600 V; T_j = 150 °C$</td>
<td>-</td>
<td>-</td>
<td>250</td>
<td>μA</td>
</tr>
</tbody>
</table>

Static characteristics

Dynamic characteristics

$Q_r$ reverse charge

$t_r$ reverse recovery time

$I_{RM}$ peak reverse recovery current

$E_{as}$ non-repetitive avalanche energy

Fig. 6. Forward current as a function of forward voltage

Fig. 7. Reverse recovery definitions; ramp recovery

$V_o = 1.268 V; R_s = 0.031 \, \Omega$

(1) $T_j = 150 °C$; typical values
(2) $T_j = 150 °C$; maximum values
(3) $T_j = 25 °C$; maximum values
12. Package outline

Plastic single-ended package; isolated heatsink mounted;
1 mounting hole; 2-lead TO-220 'full pack'  

Fig. 8. Package outline SOD113 (TO-220F)
WeEn Semiconductors

BYV10EX-600P
Ultrafast power diode

13. Legal information

Data sheet status

<table>
<thead>
<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective [short] data sheet</td>
<td>Development</td>
<td>This document contains data from the objective specification for product development.</td>
</tr>
<tr>
<td>Preliminary [short] data sheet</td>
<td>Qualification</td>
<td>This document contains data from the preliminary specification.</td>
</tr>
<tr>
<td>Product [short] data sheet</td>
<td>Production</td>
<td>This document contains the product specification.</td>
</tr>
</tbody>
</table>

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