1. General description

Ultrafast power diode in a SOD142 (2-lead TO247) plastic package.

2. Features and benefits

- Fast switching and soft reverse recovery characteristics
- Low forward voltage drop
- Low leakage current
- Low reverse recovery current
- Reduces switching losses in associated MOSFET or IGBT
- High operating temperature capability ($T_{j\,(\text{max})} = 175°C$)

3. Applications

- UPS
- EV Charger
- Welding Machine
- Air Conditioner

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>$V_{\text{RRM}}$</td>
<td>repetitive peak reverse voltage</td>
<td></td>
<td>600</td>
<td>V</td>
</tr>
<tr>
<td>$I_{\text{F(AV)}}$</td>
<td>average forward current</td>
<td>$\delta = 0.5$; square-wave pulse; $T_{\text{amb}} \leq 129°C$; Fig. 1; Fig. 2; Fig. 3</td>
<td>60</td>
<td>A</td>
</tr>
<tr>
<td>$I_{\text{FRM}}$</td>
<td>repetitive peak forward current</td>
<td>$\delta = 0.5$; $t_p = 25,\mu s$; $T_{\text{amb}} \leq 129°C$; square-wave pulse</td>
<td>120</td>
<td>A</td>
</tr>
<tr>
<td>$I_{\text{FSM}}$</td>
<td>non-repetitive peak forward current</td>
<td>$t_p = 10,\text{ms}$; $T_{j,(\text{init})} = 25°C$; sine-wave pulse; Fig. 4</td>
<td>600</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$t_p = 8.3,\text{ms}$; $T_{j,(\text{init})} = 25°C$; sine-wave pulse;</td>
<td>660</td>
<td>A</td>
</tr>
</tbody>
</table>

<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 voltage</td>
<td>$I_F = 60,A$; $T_j = 25°C$; Fig. 6</td>
<td>-</td>
<td>1.55</td>
<td>2</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 60,A$; $T_j = 150°C$; Fig. 6</td>
<td>-</td>
<td>1.2</td>
<td>1.6</td>
<td>V</td>
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</table>

Dynamic 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>$t_r$</td>
<td>reverse recovery time</td>
<td>$I_F = 1,A$; $V_R = 30,V$; $dI_F/dt = 50,A/\mu s$; $T_j = 25°C$; Fig. 7</td>
<td>-</td>
<td>-</td>
<td>55</td>
<td>ns</td>
</tr>
</tbody>
</table>
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>
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</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>mb</td>
<td>mounting base; connected to cathode</td>
<td>TO-247 (SOD142)</td>
<td></td>
</tr>
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</table>

6. Ordering information

Table 3. Ordering information

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package name</th>
<th>Orderable part number</th>
<th>Packing method</th>
<th>Small packing quantity</th>
<th>Package version</th>
<th>Package issue date</th>
</tr>
</thead>
<tbody>
<tr>
<td>BYV60W-600P</td>
<td>TO247</td>
<td>BYV60W-600PQ</td>
<td>Tube</td>
<td>30</td>
<td>SOD142</td>
<td>27-Nov-2012</td>
</tr>
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</table>

7. Marking

Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BYV60W-600P</td>
<td>BYV60W-600P</td>
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</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>repeative 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>$\delta = 0.5$ ; square-wave pulse; $T_{mb} \leq 129 , ^{\circ}C$; Fig. 1; Fig. 2; Fig. 3</td>
<td>60</td>
<td>A</td>
</tr>
<tr>
<td>$I_{RRM}$</td>
<td>repeative peak forward current</td>
<td>$\delta = 0.5$ ; $t_p = 25 , \mu s$; $T_{mb} \leq 129 , ^{\circ}C$; square-wave pulse</td>
<td>120</td>
<td>A</td>
</tr>
<tr>
<td>$I_{FSM}$</td>
<td>non-repetative peak forward current</td>
<td>$t_p = 10 , ms$; $T_{j(init)} = 25 , ^{\circ}C$; sine-wave pulse; Fig. 4</td>
<td>600</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$t_p = 8.3 , ms$; $T_{j(init)} = 25 , ^{\circ}C$; sine-wave pulse; Fig. 4</td>
<td>660</td>
<td>A</td>
</tr>
<tr>
<td>$I^2t$</td>
<td>limiting Joule-integral</td>
<td>SIN; $t_p = 10 , ms$</td>
<td>1800</td>
<td>A^2s</td>
</tr>
<tr>
<td>$T_{stg}$</td>
<td>storage temperature</td>
<td></td>
<td>-55 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

$P_{tot} = I_{f(AV)} \times \sqrt{\delta}$

$V_r = 1.6 \, V$; $R_s = 0.0013 \, \Omega$

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

$a = \frac{I_{f(RMS)}}{I_{f(AV)}}$

$V_o = 1.6 \, V$; $R_s = 0.0013 \, \Omega$
Fig. 3. Forward current as a function of mounting base 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>$R_{th(j-mb)}$</td>
<td>thermal resistance from junction to mounting base</td>
<td>Fig. 5</td>
<td>-</td>
<td>-</td>
<td>0.44</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>45</td>
<td>-</td>
<td>K/W</td>
</tr>
</tbody>
</table>

Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration
## 10. 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>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Static characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_F$</td>
<td>forward current</td>
<td>$I_F = 60 , A; , T_j = 25 , ^\circ C; , \text{Fig. 6}$</td>
<td>-</td>
<td>1.55</td>
<td>2</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 60 , A; , T_j = 150 , ^\circ C; , \text{Fig. 6}$</td>
<td>-</td>
<td>1.2</td>
<td>1.6</td>
<td>V</td>
</tr>
<tr>
<td>$I_R$</td>
<td>reverse current</td>
<td>$V_R = 600 , V; , T_j = 25 , ^\circ C$</td>
<td>-</td>
<td>-</td>
<td>10</td>
<td>μA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 600 , V; , T_j = 125 , ^\circ C$</td>
<td>-</td>
<td>-</td>
<td>500</td>
<td>μA</td>
</tr>
<tr>
<td><strong>Dynamic characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$Q_r$</td>
<td>reverse charge</td>
<td>$I_F = 60 , A; , V_R = 400 , V; , dI_F/dt = 200 , A/\mu s; , T_j = 25 , ^\circ C; , \text{Fig. 7}$</td>
<td>-</td>
<td>143</td>
<td>-</td>
<td>nC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 60 , A; , V_R = 400 , V; , dI_F/dt = 200 , A/\mu s; , T_j = 125 , ^\circ C; , \text{Fig. 7}$</td>
<td>-</td>
<td>876</td>
<td>-</td>
<td>nC</td>
</tr>
<tr>
<td>$t_{rr}$</td>
<td>reverse recovery time</td>
<td>$I_F = 1 , A; , V_R = 30 , V; , dI_R/dt = 50 , A/\mu s; , T_j = 25 , ^\circ C; , \text{Fig. 7}$</td>
<td>-</td>
<td>-</td>
<td>55</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 60 , A; , V_R = 400 , V; , dI_F/dt = 200 , A/\mu s; , T_j = 25 , ^\circ C; , \text{Fig. 7}$</td>
<td>-</td>
<td>53</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 60 , A; , V_R = 400 , V; , dI_F/dt = 200 , A/\mu s; , T_j = 125 , ^\circ C; , \text{Fig. 7}$</td>
<td>-</td>
<td>120</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>$I_{RM}$</td>
<td>peak reverse recovery current</td>
<td>$I_F = 60 , A; , V_R = 400 , V; , dI_F/dt = 200 , A/\mu s; , T_j = 25 , ^\circ C; , \text{Fig. 7}$</td>
<td>-</td>
<td>5.4</td>
<td>-</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 60 , A; , V_R = 400 , V; , dI_F/dt = 200 , A/\mu s; , T_j = 125 , ^\circ C; , \text{Fig. 7}$</td>
<td>-</td>
<td>14.5</td>
<td>-</td>
<td>A</td>
</tr>
<tr>
<td>$E_{as}$</td>
<td>non-repetitive avalanche energy</td>
<td>$I_R = 2.2 , A; , T_{(inj)} = 25 , ^\circ C; , L = 40 , mH$</td>
<td>-</td>
<td>97</td>
<td>-</td>
<td>mJ</td>
</tr>
</tbody>
</table>
$V_o = 1.6 \text{ V}; R_s = 0.0013 \text{ Ω}$
(1) $T_j = 150 \degree \text{ C};$ typical values
(2) $T_j = 150 \degree \text{ C};$ maximum values
(3) $T_j = 25 \degree \text{ C};$ maximum values

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

Fig. 7. Reverse recovery definitions; ramp recovery
11. Package outline

Plastic Single-ended through-hole package; Heatsink mounted; 1 mounting hole; 2-lead TO-247

Dimensions (mm are the original dimensions)

<table>
<thead>
<tr>
<th>Unit</th>
<th>A</th>
<th>A₁</th>
<th>b</th>
<th>b₁</th>
<th>b₂</th>
<th>c</th>
<th>D</th>
<th>D₁</th>
<th>D₂</th>
<th>e</th>
<th>E</th>
<th>E₁</th>
<th>E₂</th>
<th>E₃</th>
<th>L</th>
<th>L₁</th>
<th>p</th>
<th>p₁</th>
<th>p₂</th>
<th>q</th>
<th>Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>max</td>
<td>5.2</td>
<td>2.1</td>
<td>1.4</td>
<td>2.2</td>
<td>3.2</td>
<td>0.7</td>
<td>20.6</td>
<td>17.68</td>
<td>1.2</td>
<td>15.75</td>
<td>14.22</td>
<td>5.2</td>
<td>1.8</td>
<td>20.9</td>
<td>4.75</td>
<td>3.7</td>
<td>7.3</td>
<td>3.6</td>
<td>6.18</td>
<td>2.6</td>
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<tr>
<td>nom</td>
<td>4.7</td>
<td>1.9</td>
<td>1.0</td>
<td>1.8</td>
<td>2.8</td>
<td>0.5</td>
<td>20.3</td>
<td>17.28</td>
<td>0.8</td>
<td>15.45</td>
<td>13.82</td>
<td>4.8</td>
<td>1.4</td>
<td>20.4</td>
<td>4.25</td>
<td>3.5</td>
<td>7.1</td>
<td>3.4</td>
<td>5.78</td>
<td>2.2</td>
<td></td>
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Outline

| SOD142 | TO247 |

References

- IEC
- JEDEC
- JEITA

European projection

- IEC
- JEDEC
- JEITA

Issue date

- 12-11-13
- 12-11-27
12. Legal information

Data sheet status

<table>
<thead>
<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
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<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>

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL: http://www.ween-semi.com.

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