1. General description

Planar Maximum Efficiency General Application (MEGA) Schottky barrier rectifier with an integrated guard ring for stress protection, encapsulated in a CFP15 (SOT1289) power and flat lead Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- Average forward current: $I_{F(AV)} \leq 15$ A
- Reverse voltage: $V_R \leq 45$ V
- Extremely low forward voltage
- High power capability due to clip-bonding technology and heat sink
- Small and thin SMD power plastic package, typical height 0.78 mm
- AEC-Q101 qualified

3. Applications

- Low voltage rectification
- High efficiency DC-to-DC conversion
- Switch mode power supply
- Freewheeling application
- Reverse polarity protection
- Low power consumption application

4. Quick reference data

<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>$I_{F(AV)}$</td>
<td>average forward current</td>
<td>square wave; $\delta = 0.5$ ; $f = 20$ kHz; $T_{sp} \leq 160 , ^\circ$ C</td>
<td>-</td>
<td>-</td>
<td>15</td>
<td>A</td>
</tr>
<tr>
<td>$V_R$</td>
<td>reverse voltage</td>
<td>$T_j = 25 , ^\circ$ C</td>
<td>-</td>
<td>-</td>
<td>45</td>
<td>V</td>
</tr>
<tr>
<td>$V_F$</td>
<td>forward voltage</td>
<td>$I_F = 15$ A; $t_p \leq 300$ µs; $\delta \leq 0.02$ ; $T_j = 25 , ^\circ$ C, pulsed</td>
<td>-</td>
<td>430</td>
<td>490</td>
<td>mV</td>
</tr>
<tr>
<td>$I_R$</td>
<td>reverse current</td>
<td>$V_R = 10$ V; $t_p \leq 3$ ms; $T_j = 25 , ^\circ$ C; $\delta \leq 0.3$ ; pulsed</td>
<td>-</td>
<td>30</td>
<td>70</td>
<td>µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 45$ V; $t_p \leq 3$ ms; $T_j = 25 , ^\circ$ C; $\delta \leq 0.3$ ; pulsed</td>
<td>-</td>
<td>260</td>
<td>900</td>
<td>µA</td>
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5. Pinning information

Table 2. Pinning information

<table>
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<th>Symbol</th>
<th>Description</th>
<th>Simplified outline</th>
<th>Graphic symbol</th>
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<tr>
<td>1</td>
<td>A</td>
<td>anode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>anode</td>
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<td></td>
</tr>
<tr>
<td>3</td>
<td>K</td>
<td>cathode</td>
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6. Ordering information

Table 3. Ordering information

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<th>Name</th>
<th>Description</th>
<th>Version</th>
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<tr>
<td>PMEG045V150EPD</td>
<td>CFP15</td>
<td>plastic, thermal enhanced</td>
<td>ultra thin SMD package; 3 leads; body: 5.8 x 4.3 x 0.78 mm</td>
<td>SOT1289</td>
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7. Marking

Table 4. Marking codes

<table>
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<td>PMEG045V150EPD</td>
<td>045V 150E</td>
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8. Limiting values

<table>
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<th>Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V&lt;sub&gt;R&lt;/sub&gt;</td>
<td>reverse voltage</td>
<td>T&lt;sub&gt;j&lt;/sub&gt; = 25 °C</td>
<td>-</td>
<td>45</td>
<td>V</td>
</tr>
<tr>
<td>I&lt;sub&gt;F&lt;/sub&gt;</td>
<td>forward current</td>
<td>T&lt;sub&gt;sp&lt;/sub&gt; = 155 °C; δ = 1</td>
<td>-</td>
<td>21</td>
<td>A</td>
</tr>
<tr>
<td>I&lt;sub&gt;F(AV)&lt;/sub&gt;</td>
<td>average forward current</td>
<td>square wave; δ = 0.5 ; f = 20 kHz; T&lt;sub&gt;sp&lt;/sub&gt; ≤ 160 °C</td>
<td>-</td>
<td>15</td>
<td>A</td>
</tr>
<tr>
<td>I&lt;sub&gt;FSM&lt;/sub&gt;</td>
<td>non-repetitive peak forward current</td>
<td>square wave; t&lt;sub&gt;p&lt;/sub&gt; = 8 ms; T&lt;sub&gt;j(init)&lt;/sub&gt; = 25 °C</td>
<td>-</td>
<td>270</td>
<td>A</td>
</tr>
<tr>
<td>P&lt;sub&gt;tot&lt;/sub&gt;</td>
<td>total power dissipation</td>
<td>T&lt;sub&gt;amb&lt;/sub&gt; ≤ 25 °C</td>
<td>[1]</td>
<td>-</td>
<td>1.66 W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[2]</td>
<td>-</td>
<td>2.15 W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[3]</td>
<td>-</td>
<td>3.75 W</td>
</tr>
<tr>
<td>T&lt;sub&gt;j&lt;/sub&gt;</td>
<td>junction temperature</td>
<td></td>
<td>-</td>
<td>175</td>
<td>°C</td>
</tr>
<tr>
<td>T&lt;sub&gt;amb&lt;/sub&gt;</td>
<td>ambient temperature</td>
<td></td>
<td>-55</td>
<td>175</td>
<td>°C</td>
</tr>
<tr>
<td>T&lt;sub&gt;stg&lt;/sub&gt;</td>
<td>storage temperature</td>
<td></td>
<td>-65</td>
<td>175</td>
<td>°C</td>
</tr>
</tbody>
</table>

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm<sup>2</sup>.
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>$R_{th(j-a)}$</td>
<td>thermal resistance from junction to ambient</td>
<td>in free air</td>
<td>[1][2]</td>
<td>-</td>
<td>90</td>
<td>K/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[1][3]</td>
<td>-</td>
<td>70</td>
<td>K/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[1][4]</td>
<td>-</td>
<td>40</td>
<td>K/W</td>
</tr>
<tr>
<td>$R_{th(j-sp)}$</td>
<td>thermal resistance from junction to solder point</td>
<td></td>
<td>[5]</td>
<td>-</td>
<td>3</td>
<td>K/W</td>
</tr>
</tbody>
</table>

[1] For Schottky barrier diodes thermal runaway has to be considered, as in some applications the reverse power losses $P_R$ are a significant part of the total power losses.


FR4 PCB, standard footprint

Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values.
45 V, 15 A low VF MEGA Schottky barrier rectifier

Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

FR4 PCB, mounting pad for cathode 1 cm²

Ceramic PCB, Al₂O₃, standard footprint

Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values
## 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>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{(BR)R}$</td>
<td>reverse breakdown voltage</td>
<td>$I_R = 5 \text{ mA}; T_J = 25 ^\circ C; t_p \leq 1.2 \text{ ms}; \delta \leq 0.12; $ pulsed</td>
<td>45</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>$V_F$</td>
<td>forward voltage</td>
<td>$I_F = 1 \text{ A}; t_p \leq 300 \mu s; \delta \leq 0.02$; $T_J = 25 ^\circ C$; pulsed</td>
<td>-</td>
<td>305</td>
<td>350</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 5 \text{ A}; t_p \leq 300 \mu s; \delta \leq 0.02$; $T_J = 25 ^\circ C$; pulsed</td>
<td>-</td>
<td>360</td>
<td>410</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 10 \text{ A}; t_p \leq 300 \mu s; \delta \leq 0.02$; $T_J = 25 ^\circ C$; pulsed</td>
<td>-</td>
<td>400</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 15 \text{ A}; t_p \leq 300 \mu s; \delta \leq 0.02$; $T_J = 125 ^\circ C$; pulsed</td>
<td>-</td>
<td>430</td>
<td>490</td>
<td>mV</td>
</tr>
<tr>
<td>$I_R$</td>
<td>reverse current</td>
<td>$V_R = 5 \text{ V}; t_p \leq 3 \text{ ms}; T_J = 25 ^\circ C; \delta \leq 0.3$; pulsed</td>
<td>-</td>
<td>20</td>
<td>-</td>
<td>µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 10 \text{ V}; t_p \leq 3 \text{ ms}; T_J = 25 ^\circ C; \delta \leq 0.3$; pulsed</td>
<td>-</td>
<td>30</td>
<td>70</td>
<td>µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 30 \text{ V}; t_p \leq 3 \text{ ms}; T_J = 25 ^\circ C; \delta \leq 0.3$; pulsed</td>
<td>-</td>
<td>90</td>
<td>-</td>
<td>µA</td>
</tr>
<tr>
<td>$C_d$</td>
<td>diode capacitance</td>
<td>$V_R = 45 \text{ V}; t_p \leq 3 \text{ ms}; T_J = 25 ^\circ C; \delta \leq 0.3$; pulsed</td>
<td>-</td>
<td>260</td>
<td>900</td>
<td>µA</td>
</tr>
<tr>
<td>$t_{rr}$</td>
<td>reverse recovery time step recovery</td>
<td>$I_F = 0.5 \text{ A}; I_R = 0.5 \text{ A}; I_{R(\text{meas})} = 0.1 \text{ A}; T_J = 25 ^\circ C$</td>
<td>-</td>
<td>54</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>reverse recovery time ramp recovery</td>
<td>$dI_F/dt = 200 \text{ A/µs}; T_J = 25 ^\circ C; I_F = 6 \text{ A}; V_{FR} = 26 \text{ V}$</td>
<td>-</td>
<td>19</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>$V_{FRM}$</td>
<td>peak forward recovery voltage</td>
<td>$I_F = 0.5 \text{ A}; dI_F/dt = 20 \text{ A/µs}; T_J = 25 ^\circ C$</td>
<td>-</td>
<td>294</td>
<td>-</td>
<td>mV</td>
</tr>
</tbody>
</table>
Fig. 4. Forward current as a function of forward voltage; typical values

- Pulsed condition
  1. $T_J = 175 \, ^\circ C$
  2. $T_J = 150 \, ^\circ C$
  3. $T_J = 125 \, ^\circ C$
  4. $T_J = 100 \, ^\circ C$
  5. $T_J = 85 \, ^\circ C$
  6. $T_J = 25 \, ^\circ C$
  7. $T_J = -40 \, ^\circ C$

Fig. 5. Reverse current as a function of reverse voltage; typical values

- Pulsed condition
  1. $T_J = 150 \, ^\circ C$
  2. $T_J = 125 \, ^\circ C$
  3. $T_J = 100 \, ^\circ C$
  4. $T_J = 85 \, ^\circ C$
  5. $T_J = 25 \, ^\circ C$
  6. $T_J = -40 \, ^\circ C$

Fig. 6. Diode capacitance as a function of reverse voltage; typical values

- $f = 1 \, MHz; \ T_{amb} = 25 \, ^\circ C$

Fig. 7. Average forward power dissipation as a function of average forward current; typical values

- $T_J = 100 \, ^\circ C$
  1. $\delta = 0.1$
  2. $\delta = 0.2$
  3. $\delta = 0.5$
  4. $\delta = 0.8$
  5. $\delta = 1$
**Fig. 8.** Average reverse power dissipation as a function of reverse voltage; typical values

- $T_j = 100 \, ^\circ C$
  - (1) $\delta = 1$
  - (2) $\delta = 0.9$
  - (3) $\delta = 0.8$
  - (4) $\delta = 0.5$
  - (5) $\delta = 0.2$

**Fig. 9.** Average forward current as a function of ambient temperature; typical values

- $T_j = 175 \, ^\circ C$
  - (1) $\delta = 1$; DC
  - (2) $\delta = 0.5$; $f = 20 \, kHz$
  - (3) $\delta = 0.2$; $f = 20 \, kHz$
  - (4) $\delta = 0.1$; $f = 20 \, kHz$

**Fig. 10.** Average forward current as a function of ambient temperature; typical values

- FR4 PCB, mounting pad for cathode $1 \, cm^2$
  - $T_j = 175 \, ^\circ C$
  - (1) $\delta = 1$; DC
  - (2) $\delta = 0.5$; $f = 20 \, kHz$
  - (3) $\delta = 0.2$; $f = 20 \, kHz$
  - (4) $\delta = 0.1$; $f = 20 \, kHz$

**Fig. 11.** Average forward current as a function of ambient temperature; typical values

- Ceramic PCB, $Al_2O_3$, standard footprint
  - $T_j = 175 \, ^\circ C$
  - (1) $\delta = 1$; DC
  - (2) $\delta = 0.5$; $f = 20 \, kHz$
  - (3) $\delta = 0.2$; $f = 20 \, kHz$
  - (4) $\delta = 0.1$; $f = 20 \, kHz$
$T_j = 175 \, ^\circ C$

(1) $\delta = 1; \text{DC}$

(2) $\delta = 0.5; f = 20 \, \text{kHz}$

(3) $\delta = 0.2; f = 20 \, \text{kHz}$

(4) $\delta = 0.1; f = 20 \, \text{kHz}$

Fig. 12. Average forward current as a function of solder point temperature; typical values
11. Test information

Fig. 13. Reverse recovery definition; step recovery

Fig. 14. Reverse recovery definition; ramp recovery

Fig. 15. Forward recovery definition
The current ratings for the typical waveforms are calculated according to the equations: $I_{F(AV)} = I_M \times \delta$ with $I_M$ defined as peak current, $I_{RMS} = I_{F(AV)}$ at DC, and $I_{RMS} = I_M \times \sqrt{\delta}$ with $I_{RMS}$ defined as RMS current.

**Quality information**
This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.

**12. Package outline**

![Package outline CFP15 (SOT1289)](image_url)
13. Soldering

Footprint information for reflow soldering of CFP15 package

Fig. 18. Reflow soldering footprint for CFP15 (SOT1289)
14. Revision history

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<th>Release date</th>
<th>Data sheet status</th>
<th>Change notice</th>
<th>Supersedes</th>
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<td>PMEG045V150EPD v.4</td>
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15. Legal information

Data sheet status

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Objective [short] data sheet
- Development: This document contains data from the objective specification for product development.

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- Qualification: This document contains data from the preliminary specification.

Product [short] data sheet
- Production: This document contains the product specification.

[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".
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