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: $I_{F(AV)} \leq 5$ 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>
</tr>
</thead>
<tbody>
<tr>
<td>$I_{F(AV)}$</td>
<td>average forward current</td>
<td>$\delta = 0.5; f = 20$ kHz; $T_{sp} \leq 170$ °C; square wave</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>A</td>
</tr>
<tr>
<td>$V_R$</td>
<td>reverse voltage</td>
<td>$T_J = 25$ °C</td>
<td>-</td>
<td>-</td>
<td>45</td>
<td>V</td>
</tr>
<tr>
<td>$V_F$</td>
<td>forward voltage</td>
<td>$I_F$ = 5 A; $t_p \leq 300$ µs; $\delta \leq 0.02$; $T_J$ = 25 °C; pulsed</td>
<td>-</td>
<td>425</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; $\delta \leq 0.3$; $T_J$ = 25 °C; pulsed</td>
<td>-</td>
<td>10</td>
<td>30</td>
<td>µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 45$ V; $t_p \leq 3$ ms; $\delta \leq 0.3$; $T_J$ = 25 °C; pulsed</td>
<td>-</td>
<td>120</td>
<td>300</td>
<td>µA</td>
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5. Pinning information

Table 2. Pinning information

<table>
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<th>Pin</th>
<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>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>K</td>
<td>cathode</td>
<td>CF1P5 (SOT1289)</td>
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6. Ordering information

Table 3. Ordering information

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<thead>
<tr>
<th>Type number</th>
<th>Package</th>
<th>Name</th>
<th>Description</th>
<th>Version</th>
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</thead>
<tbody>
<tr>
<td>PMEG045V050EPD</td>
<td>CFP15</td>
<td>plastic, thermal enhanced ultra thin SMD package; 3 leads; body: 5.8 x 4.3 x 0.78 mm</td>
<td>SOT1289</td>
<td></td>
</tr>
</tbody>
</table>

7. Marking

Table 4. Marking codes

<table>
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<th>Marking code</th>
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<tr>
<td>PMEG045V050EPD</td>
<td>045V 050E</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>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_R</td>
<td>reverse voltage</td>
<td>T_j = 25 °C</td>
<td>-</td>
<td>45</td>
<td>V</td>
</tr>
<tr>
<td>I_F</td>
<td>forward current</td>
<td>T_sp = 165 °C; δ = 1</td>
<td>-</td>
<td>7</td>
<td>A</td>
</tr>
<tr>
<td>I_F(AV)</td>
<td>average forward current</td>
<td>δ = 0.5; f = 20 kHz; T_sp ≤ 170 °C; square wave</td>
<td>-</td>
<td>5</td>
<td>A</td>
</tr>
<tr>
<td>I_FSM</td>
<td>non-repetitive peak forward current</td>
<td>t_p = 8 ms; T_j(init) = 25 °C; square wave</td>
<td>-</td>
<td>160</td>
<td>A</td>
</tr>
<tr>
<td>P_tot</td>
<td>total power dissipation</td>
<td>T_amb ≤ 25 °C</td>
<td>[1]</td>
<td>1.66</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[2]</td>
<td>2.15</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[3]</td>
<td>3.75</td>
<td>W</td>
</tr>
<tr>
<td>T_j</td>
<td>junction temperature</td>
<td></td>
<td>-</td>
<td>175</td>
<td>°C</td>
</tr>
<tr>
<td>T_amb</td>
<td>ambient temperature</td>
<td></td>
<td>-55</td>
<td>175</td>
<td>°C</td>
</tr>
<tr>
<td>T_stg</td>
<td>storage temperature</td>
<td></td>
<td>-65</td>
<td>175</td>
<td>°C</td>
</tr>
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</table>

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>-</td>
<td>90 K/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[1][3]</td>
<td>-</td>
<td>-</td>
<td>70 K/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[1][4]</td>
<td>-</td>
<td>-</td>
<td>40 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>-</td>
<td>3 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.

![Graph](aaa-014460)

**Fig. 1.** Transient thermal impedance from junction to ambient as a function of pulse duration; typical values
FR4 PCB, mounting pad for cathode 1 cm²

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

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>$I_R = 5 \text{ mA}; T_J = 25 \degree \text{C}; t_p \leq 1.2 \text{ ms}; \delta \leq 0.12 ; ; \text{pulsed}$</td>
<td>45</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>V_F</td>
<td>forward voltage</td>
<td>$I_F = 1 \text{ A}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_J = 25 \degree \text{C}; \text{pulsed}$</td>
<td>-</td>
<td>340</td>
<td>390</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 2 \text{ A}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_J = 25 \degree \text{C}; \text{pulsed}$</td>
<td>-</td>
<td>370</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 5 \text{ A}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_J = 25 \degree \text{C}; \text{pulsed}$</td>
<td>-</td>
<td>425</td>
<td>490</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 5 \text{ A}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_J = 125 \degree \text{C}; \text{pulsed}$</td>
<td>-</td>
<td>340</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td>I_R</td>
<td>reverse current</td>
<td>$V_R = 5 \text{ V}; t_p \leq 3 \text{ ms}; \delta \leq 0.3; T_J = 25 \degree \text{C}; \text{pulsed}$</td>
<td>-</td>
<td>7</td>
<td>-</td>
<td>\mu\text{A}</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 10 \text{ V}; t_p \leq 3 \text{ ms}; \delta \leq 0.3; T_J = 25 \degree \text{C}; \text{pulsed}$</td>
<td>-</td>
<td>10</td>
<td>30</td>
<td>\mu\text{A}</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 30 \text{ V}; t_p \leq 3 \text{ ms}; \delta \leq 0.3; T_J = 25 \degree \text{C}; \text{pulsed}$</td>
<td>-</td>
<td>30</td>
<td>-</td>
<td>\mu\text{A}</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 45 \text{ V}; t_p \leq 3 \text{ ms}; \delta \leq 0.3; T_J = 25 \degree \text{C}; \text{pulsed}$</td>
<td>-</td>
<td>120</td>
<td>300</td>
<td>\mu\text{A}</td>
</tr>
<tr>
<td>C_d</td>
<td>diode capacitance</td>
<td>$V_R = 1 \text{ V}; f = 1 \text{ MHz}; T_J = 25 \degree \text{C}$</td>
<td>-</td>
<td>580</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 10 \text{ V}; f = 1 \text{ MHz}; T_J = 25 \degree \text{C}$</td>
<td>-</td>
<td>190</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td>t_{rr}</td>
<td>reverse recovery time step recovery</td>
<td>$I_F = 0.5 \text{ A}; I_R = 0.5 \text{ A}; I_{R\text{meas}} = 0.1 \text{ A}; T_J = 25 \degree \text{C}$</td>
<td>-</td>
<td>19</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>t_{rr}</td>
<td>reverse recovery time ramp recovery</td>
<td>$dI_F/dt = 200 \text{ A}/\mu\text{s}; T_J = 25 \degree \text{C}; I_F = 6 \text{ A}; V_R = 26 \text{ V}$</td>
<td>-</td>
<td>12</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>V_{FRM}</td>
<td>peak forward recovery voltage</td>
<td>$I_F = 0.5 \text{ A}; dI_F/dt = 20 \text{ A}/\mu\text{s}; T_J = 25 \degree \text{C}$</td>
<td>-</td>
<td>331</td>
<td>-</td>
<td>mV</td>
</tr>
</tbody>
</table>
45 V, 5 A low VF MEGA Schottky barrier rectifier

**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

- **FR4 PCB, standard footprint**
  - $T_j = 175 \, ^\circ C$
  - (1) $\delta = 1; \text{ DC}$
  - (2) $\delta = 0.5; f = 20 \text{ kHz}$
  - (3) $\delta = 0.2; f = 20 \text{ kHz}$
  - (4) $\delta = 0.1; f = 20 \text{ kHz}$

- **Ceramic PCB, Al$_2$O$_3$, standard footprint**
  - $T_j = 175 \, ^\circ C$
  - (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. 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) $\delta = 1; \text{ DC}$
  - (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. 11.** Average forward current as a function of ambient temperature; typical values

- **Ceramic PCB, Al$_2$O$_3$, standard footprint**
  - $T_j = 175 \, ^\circ C$
  - (1) $\delta = 1; \text{ DC}$
  - (2) $\delta = 0.5; f = 20 \text{ kHz}$
  - (3) $\delta = 0.2; f = 20 \text{ kHz}$
  - (4) $\delta = 0.1; f = 20 \text{ kHz}$
11. Test information

Fig. 12. Average forward current as a function of solder point 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. 13. Reverse recovery definition; step recovery
The current ratings for the typical waveforms are calculated according to the equations:
\[ I_{F(\text{AV})} = I_M \times \delta \] with \( I_M \) defined as peak current, \( I_{RMS} = I_{F(\text{AV})} \) at DC, and \( I_{RMS} = I_M \times \sqrt{\delta} \) with \( I_{RMS} \) defined as RMS current.
11.1 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)

Fig. 17. Package outline CFP15 (SOT1289)

13. Soldering

![Reflow soldering footprint for CFP15 (SOT1289)](image)

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

Table 8. Revision history

<table>
<thead>
<tr>
<th>Data sheet ID</th>
<th>Release date</th>
<th>Data sheet status</th>
<th>Change notice</th>
<th>Supersedes</th>
</tr>
</thead>
<tbody>
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<td>PMEG045V050EPD v.2</td>
<td>20150126</td>
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<td>-</td>
<td>PMEG045V050EPD v.1</td>
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Modifications:
- Table limiting values: enhanced with the latest measurements
- Table thermal characteristics: updated table with the latest measurements
- Table characteristics: enhanced table with the latest measurements
- Figures 1 to 12: added
- Section test information: updated
- Package outline replaced by minimized package outline

<table>
<thead>
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<th>Data sheet ID</th>
<th>Release date</th>
<th>Data sheet status</th>
<th>Change notice</th>
<th>Supersedes</th>
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</thead>
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<td>20140703</td>
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15. Legal information

15.1 Data sheet status

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<tr>
<td>Objective [short] data sheet</td>
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<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>
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[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.nexperia.com.

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