1. General description

Trench Maximum Efficiency General Application (MEGA) Schottky barrier rectifier encapsulated in a CFP15B (SOT1289B) power and flat lead Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- Average forward current: $I_{F(AV)} \leq 10 \, \text{A}$
- Reverse voltage: $V_R \leq 45 \, \text{V}$
- Extremely low forward voltage
- High power capability due to clip-bonding technology and heat sink
- Small and thin SMD power plastic package, typical height 0.95 mm
- Qualified according to AEC-Q101 and recommended for use in automotive applications

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>$V_R$</td>
<td>reverse voltage</td>
<td>$T_j = 25 , ^\circ\text{C}$</td>
<td>-</td>
<td>-</td>
<td>45</td>
<td>V</td>
</tr>
<tr>
<td>$I_{F(AV)}$</td>
<td>average forward current</td>
<td>$\delta = 0.5; , f = 20 , \text{kHz}; , T_{sp} \leq 142 , ^\circ\text{C}$</td>
<td>-</td>
<td>-</td>
<td>10</td>
<td>A</td>
</tr>
<tr>
<td>$V_F$</td>
<td>forward voltage</td>
<td>$I_F = 10 , \text{A}; , T_j = 25 , ^\circ\text{C}; , \text{pulsed}$</td>
<td>[1]</td>
<td>480</td>
<td>545</td>
<td>mV</td>
</tr>
<tr>
<td>$I_R$</td>
<td>reverse current</td>
<td>$V_R = 10 , \text{V}; , T_j = 25 , ^\circ\text{C}; , \text{pulsed}$</td>
<td>[1]</td>
<td>11</td>
<td>41</td>
<td>$\mu\text{A}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 45 , \text{V}; , T_j = 25 , ^\circ\text{C}; , \text{pulsed}$</td>
<td>[1]</td>
<td>22</td>
<td>80</td>
<td>$\mu\text{A}$</td>
</tr>
</tbody>
</table>

[1] Very short pulse, in order to maintain a stable junction temperature.
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>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></td>
<td></td>
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6. Ordering information

Table 3. Ordering information

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package</th>
<th>Name</th>
<th>Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMEG045T100EPE-Q</td>
<td>CFP15B</td>
<td>plastic, thermal enhanced ultra thin SMD package; 3 leads; 2.13 mm pitch; 5.8 x 4.3 x 0.95 mm body</td>
<td>SOT1289B</td>
<td></td>
</tr>
</tbody>
</table>

7. Marking

Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMEG045T100EPE-Q</td>
<td>045T M10E</td>
</tr>
</tbody>
</table>

8. 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>$T_j = 25 , ^\circ C$</td>
<td>-</td>
<td>45</td>
<td>V</td>
</tr>
<tr>
<td>$I_F$</td>
<td>forward current</td>
<td>$\delta = 1; \ T_{sp} \leq 137 , ^\circ C$</td>
<td>-</td>
<td>14</td>
<td>A</td>
</tr>
<tr>
<td>$I_{F(AV)}$</td>
<td>average forward current</td>
<td>$\delta = 0.5; f = 20 , kHz; \ T_{sp} \leq 142 , ^\circ C$</td>
<td>-</td>
<td>10</td>
<td>A</td>
</tr>
<tr>
<td>$I_{F(SM)}$</td>
<td>non-repetitive peak forward current</td>
<td>$t_p = 8 , ms; \ square \ wave; \ T_{j(init)} = 25 , ^\circ C$</td>
<td>-</td>
<td>130</td>
<td>A</td>
</tr>
<tr>
<td>$P_{tot}$</td>
<td>total power dissipation</td>
<td>$T_{amb} \leq 25 , ^\circ C$</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>$T_j$</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>
</tbody>
</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]</td>
<td>[2]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$R_{th(j-sp)}$</td>
<td>thermal resistance from junction to solder point</td>
<td>[4]</td>
<td>-</td>
<td>-</td>
<td>90</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

FR4 PCB, mounting pad for cathode $1 \text{ cm}^2$

**Fig. 2.** 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>$I_R = 1 \text{ mA}; T_j = 25 \degree \text{C}$</td>
<td>45</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>$V_F$</td>
<td>forward voltage</td>
<td>$I_F = 0.1 \text{ A}; T_j = 25 \degree \text{C};$ pulsed</td>
<td>[1]</td>
<td>-</td>
<td>275</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 1 \text{ A}; T_j = 25 \degree \text{C};$ pulsed</td>
<td>[1]</td>
<td>-</td>
<td>340</td>
<td>385 mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 5 \text{ A}; T_j = 25 \degree \text{C};$ pulsed</td>
<td>[1]</td>
<td>-</td>
<td>415</td>
<td>475 mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 10 \text{ A}; T_j = 25 \degree \text{C};$ pulsed</td>
<td>[1]</td>
<td>-</td>
<td>480</td>
<td>545 mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 10 \text{ A}; T_j = -40 \degree \text{C};$ pulsed</td>
<td>[1]</td>
<td>-</td>
<td>530</td>
<td>- mV</td>
</tr>
<tr>
<td>$I_R$</td>
<td>reverse current</td>
<td>$V_R = 10 \text{ V}; T_j = 25 \degree \text{C};$ pulsed</td>
<td>[1]</td>
<td>-</td>
<td>11</td>
<td>41  µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 30 \text{ V}; T_j = 25 \degree \text{C};$ pulsed</td>
<td>[1]</td>
<td>-</td>
<td>17</td>
<td>- µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 45 \text{ V}; T_j = 25 \degree \text{C};$ pulsed</td>
<td>[1]</td>
<td>-</td>
<td>22</td>
<td>80  µA</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>1.4</td>
<td>-</td>
<td>nF</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>0.6</td>
<td>-</td>
<td>nF</td>
</tr>
<tr>
<td>$t_{rr}$</td>
<td>reverse recovery time</td>
<td>$I_F = 0.5 \text{ A}; I_R = 0.5 \text{ A}; I_{R(meas)} = 0.1 \text{ A}; T_j = 25 \degree \text{C}$</td>
<td>-</td>
<td>40</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>step recovery</td>
<td>$dl_F/dt = 200 \text{ A/µs}; I_F = 6 \text{ A}; T_j = 25 \degree \text{C}$</td>
<td>-</td>
<td>20</td>
<td>-</td>
<td>ns</td>
</tr>
</tbody>
</table>

[1] Very short pulse, in order to maintain a stable junction temperature.

**Fig. 3.** Forward current as a function of forward voltage; typical values

**Fig. 4.** Reverse current as a function of reverse voltage; typical values
45 V, 10 A low VF Trench MEGA Schottky barrier rectifier

**Fig. 5.** Diode capacitance as a function of reverse voltage; typical values

\[ C_d (\text{nF}) \]

- \( f = 1 \text{ MHz}; T_{\text{amb}} = 25 ^\circ \text{C} \)

**Fig. 6.** Average forward power dissipation as a function of average forward current; typical values

\[ P_{F(\text{AV})} (\text{W}) \]

- \( T_J = 100 ^\circ \text{C} \)
  - (1) \( \delta = 0.1 \)
  - (2) \( \delta = 0.2 \)
  - (3) \( \delta = 0.5 \)
  - (4) \( \delta = 0.8 \)
  - (5) \( \delta = 1; \text{DC} \)

**Fig. 7.** Average reverse power dissipation as a function of reverse voltage; typical values

\[ P_{R(\text{AV})} (\text{W}) \]

- \( T_J = 100 ^\circ \text{C} \)
  - (1) \( \delta = 1; \text{DC} \)
  - (2) \( \delta = 0.9 \)
  - (3) \( \delta = 0.8 \)
  - (4) \( \delta = 0.5 \)
  - (5) \( \delta = 0.2 \)

**Fig. 8.** Average forward current as a function of ambient temperature; typical values

\[ I_{F(\text{AV})} (\text{A}) \]

- FR4 PCB, standard footprint
  - \( T_J = 175 ^\circ \text{C} \)
  - (1) \( \delta = 1; \text{DC} \)
  - (2) \( \delta = 0.5; f = 20 \text{ kHz} \)
  - (3) \( \delta = 0.2; f = 20 \text{ kHz} \)
  - (4) \( \delta = 0.1; f = 20 \text{ kHz} \)
FR4 PCB, mounting pad for cathode 1 cm²

\( T_j = 175 \, ^\circ C \)

(1) \( \delta = 1; \) 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. 9. Average forward current as a function of ambient temperature; typical values

\( T_j = 175 \, ^\circ C \)

(1) \( \delta = 1; \) DC
(2) \( \delta = 0.5; f = 20 \, \text{kHz} \)
(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 solder point temperature; typical values

11. Test information

Fig. 11. Reverse recovery definition; step recovery
Fig. 12. Reverse recovery definition; ramp recovery

![Diagram of reverse 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.

Fig. 13. Duty cycle definition

![Diagram of duty cycle 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 diagram]

Fig. 14. Package outline CFP15B (SOT1289B)
13. Soldering

Footprint information for reflow soldering of CFP15B package

Fig. 15. Reflow soldering footprint for CFP15B (SOT1289B)
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>
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</thead>
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<td>PMEG045T100EPE-Q v.2</td>
<td>20210507</td>
<td>Product data sheet</td>
<td>-</td>
<td>PMEG045T100EPE-Q v.1</td>
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<tr>
<td>Modifications:</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>• Features and benefits: added recommendation for automotive applications</td>
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<tr>
<td>PMEG045T100EPE-Q v.1</td>
<td>20210303</td>
<td>Product data sheet</td>
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15. Legal information

Data sheet status

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

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