1. General description

Trench Maximum Efficiency General Application (MEGA) Schottky barrier rectifier encapsulated in a CFP3 (SOD123W) small and flat lead Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- Average forward current: $I_{F(AV)} \leq 2$ A
- Reverse voltage: $V_R \leq 40$ V
- Low forward voltage
- Low leakage current due to Trench MEGA Schottky technology
- High power capability due to clip-bonding technology
- Small and flat lead SMD plastic package
- Suitable for both reflow and wave soldering
- 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>$I_{F(AV)}$</td>
<td>average forward current</td>
<td>$\delta = 0.5; f = 20$ kHz; square wave; $T_{sp} \leq 160$ °C</td>
<td>-</td>
<td>-</td>
<td>2</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>40</td>
<td>V</td>
</tr>
<tr>
<td>$V_F$</td>
<td>forward voltage</td>
<td>$I_F = 2$ A; $T_J = 25$ °C; pulsed</td>
<td>450</td>
<td>515</td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>$I_R$</td>
<td>reverse current</td>
<td>$V_R = 10$ V; $T_J = 25$ °C; pulsed</td>
<td>[1]</td>
<td>-</td>
<td>11.5</td>
<td>µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 40$ V; $T_J = 25$ °C; pulsed</td>
<td>[1]</td>
<td>-</td>
<td>22</td>
<td>µA</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>K</td>
<td>cathode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>anode</td>
<td>CFP3 (SOD123W)</td>
<td>K A</td>
</tr>
</tbody>
</table>

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>PMEG40T20ER-Q</td>
<td>CFP3</td>
<td>plastic, surface mounted package; 2 terminals; 2.6 mm x 1.7 mm x 1 mm body</td>
<td>SOD123W</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>PMEG40T20ER-Q</td>
<td>L4</td>
</tr>
</tbody>
</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 , ^\circ C )</td>
<td>-</td>
<td>40</td>
<td>V</td>
</tr>
<tr>
<td>( I_F )</td>
<td>forward current</td>
<td>( \delta = 1; , T_{sp} \leq 155 , ^\circ C )</td>
<td>-</td>
<td>2.8</td>
<td>A</td>
</tr>
<tr>
<td>( I_{F(AV)} )</td>
<td>average forward current</td>
<td>( \delta = 0.5; , f = 20 , kHz; , \text{square wave}; , T_{sp} \leq 160 , ^\circ C )</td>
<td>-</td>
<td>2</td>
<td>A</td>
</tr>
<tr>
<td>( I_{FSM} )</td>
<td>non-repetitive peak forward current</td>
<td>( t_p = 8 , \text{ms}; , \text{square wave}; , T_{j(init)} = 25 , ^\circ C )</td>
<td>-</td>
<td>20</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>0.68</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[2]</td>
<td>1.15</td>
<td>W</td>
</tr>
<tr>
<td>( T_j )</td>
<td>junction temperature</td>
<td></td>
<td>-</td>
<td>175</td>
<td>(^\circ C)</td>
</tr>
<tr>
<td>( T_{amb} )</td>
<td>ambient temperature</td>
<td></td>
<td>-55</td>
<td>175</td>
<td>(^\circ C)</td>
</tr>
<tr>
<td>( T_{stg} )</td>
<td>storage temperature</td>
<td></td>
<td>-65</td>
<td>175</td>
<td>(^\circ 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>220</td>
<td>K/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[1]</td>
<td>[3]</td>
<td>130</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>[4]</td>
<td>-</td>
<td>18</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.

![Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values](image-url)
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 mA; pulsed; T_J = 25 °C</td>
<td>40</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>V_F</td>
<td>forward voltage</td>
<td>I_F = 0.1 A; T_J = 25 °C; pulsed</td>
<td>-</td>
<td>310</td>
<td>360</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_F = 0.5 A; T_J = 25 °C; pulsed</td>
<td>-</td>
<td>365</td>
<td>420</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_F = 1 A; T_J = 25 °C; pulsed</td>
<td>-</td>
<td>400</td>
<td>460</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_F = 2 A; T_J = 25 °C; pulsed</td>
<td>-</td>
<td>450</td>
<td>515</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_F = 2 A; T_J = -40 °C; pulsed</td>
<td>-</td>
<td>505</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_F = 2 A; T_J = 125 °C; pulsed</td>
<td>-</td>
<td>365</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td>I_R</td>
<td>reverse current</td>
<td>V_R = 10 V; T_J = 25 °C; pulsed</td>
<td>-</td>
<td>3</td>
<td>11.5</td>
<td>μA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_R = 30 V; T_J = 25 °C; pulsed</td>
<td>-</td>
<td>5</td>
<td>-</td>
<td>μA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_R = 40 V; T_J = 25 °C; pulsed</td>
<td>-</td>
<td>6</td>
<td>22</td>
<td>μA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_R = 40 V; T_J = 125 °C; pulsed</td>
<td>-</td>
<td>4</td>
<td>-</td>
<td>mA</td>
</tr>
<tr>
<td>C_d</td>
<td>diode capacitance</td>
<td>V_R = 1 V; f = 1 MHz; T_J = 25 °C</td>
<td>-</td>
<td>350</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_R = 10 V; f = 1 MHz; T_J = 25 °C</td>
<td>-</td>
<td>145</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td>t_rr</td>
<td>reverse recovery time step recovery</td>
<td>I_F = 0.5 A; I_R = 0.5 A; I_R(meas) = 0.1 A; T_J = 25 °C</td>
<td>-</td>
<td>11.5</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>reverse recovery time ramp recovery</td>
<td>dI_F/dt = 200 A/μs; I_F = 6 A; V_R = 26 V; T_J = 25 °C</td>
<td>-</td>
<td>11</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>V_FRM</td>
<td>peak forward recovery voltage</td>
<td>I_F = 0.5 A; dI_F/dt = 20 A/μs; T_J = 25 °C</td>
<td>-</td>
<td>430</td>
<td>-</td>
<td>mV</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

- 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. $T_j = -40 \, ^\circ C$

$pulsed \ condition$

Fig. 4. 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. 5. Diode capacitance as a function of reverse voltage; typical values

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

Fig. 6. 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. $\delta = 1; \ DC$
**Fig. 7.** Average reverse power dissipation as a function of reverse voltage; typical values

\[ T_j = 100 \, ^\circ\text{C} \]

1. \( \delta = 1; \) 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

FR4 PCB, standard footprint

\[ T_j = 175 \, ^\circ\text{C} \]

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

FR4 PCB, mounting pad for cathode 1 cm\(^2\)

\[ T_j = 175 \, ^\circ\text{C} \]

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

\[ T_j = 175 \, ^\circ\text{C} \]

1. \( \delta = 1; \) DC
2. \( \delta = 0.5; f = 20 \text{ kHz} \)
3. \( \delta = 0.2; f = 20 \text{ kHz} \)
4. \( \delta = 0.1; f = 20 \text{ kHz} \)
11. Test information

Fig. 11. Reverse recovery definition; step recovery

Fig. 12. Reverse recovery definition; ramp recovery

Fig. 13. 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

\[ I_{RMS} = I_{F(AV)} \text{ at } DC, \text{ and } I_{RMS} = I_M \times \sqrt{\delta} \]
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 CFP3 (SOD123W)](image)
13. Soldering

Footprint information for reflow soldering of CFP3 package

---

**Fig. 16. Reflow soldering footprint for CFP3 (SOD123W)**

---

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Fig. 17. Wave soldering footprint for CFP3 (SOD123W)
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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<tbody>
<tr>
<td>PMEG40T20ER-Q v.1</td>
<td>20211108</td>
<td>Product data sheet</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
### 15. Legal information

#### Data sheet status

<table>
<thead>
<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
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</thead>
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<td>[1][2]</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>
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</tbody>
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Nexperia

PMEG40T20ER-Q

40 V, 2 A low VF Trench MEGA Schottky barrier rectifier

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