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
- Capable for reflow and wave soldering
- 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; $T_{sp} \leq 160$ °C; square wave</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>[1]</td>
<td>-</td>
<td>450</td>
<td>515  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>3</td>
<td>11.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 40$ V; $T_J = 25$ °C; pulsed</td>
<td>[1]</td>
<td>-</td>
<td>6</td>
<td>22</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>
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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>
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</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>
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</thead>
<tbody>
<tr>
<td>PMEG40T20ER</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>
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</table>

7. Marking

Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code</th>
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</thead>
<tbody>
<tr>
<td>PMEG40T20ER</td>
<td>L4</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>$T_j = 25 , ^\circ C$</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>$\delta = 0.5 , ; , f = 20 , \text{kHz}; , T_{sp} \leq 160 , ^\circ C; , \text{square wave}$</td>
<td>-</td>
<td>2</td>
<td>A</td>
</tr>
<tr>
<td>$I_{F(SM)}$</td>
<td>non-repetitive peak forward current</td>
<td>$t_p = 8 , \text{ms}; , \text{square wave}; , T_{j(\text{init})} = 25 , ^\circ C$</td>
<td>-</td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td>$P_{\text{tot}}$</td>
<td>total power dissipation</td>
<td>$T_{\text{amb}} \leq 25 , ^\circ C$</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>°C</td>
</tr>
<tr>
<td>$T_{\text{amb}}$</td>
<td>ambient temperature</td>
<td></td>
<td>-55</td>
<td>175</td>
<td>°C</td>
</tr>
<tr>
<td>$T_{\text{stg}}$</td>
<td>storage temperature</td>
<td></td>
<td>-65</td>
<td>175</td>
<td>°C</td>
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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>$R_{\text{th}(j-a)}$</td>
<td>thermal resistance</td>
<td>from junction to ambient</td>
<td>in free air</td>
<td>[1] [2]</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R_{\text{th}(j-sp)}$</td>
<td>thermal resistance</td>
<td>from junction to solder point</td>
<td>[4]</td>
<td>-</td>
<td>-</td>
<td>18</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

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} $</td>
<td>40</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>$V_F$</td>
<td>forward voltage</td>
<td>$I_F = 0.1 \text{ A} \ ; \ T_j = 25 \degree \text{C} $</td>
<td>-</td>
<td>310</td>
<td>360</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 0.5 \text{ A} \ ; \ T_j = 25 \degree \text{C} $</td>
<td>-</td>
<td>365</td>
<td>420</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 1 \text{ A} \ ; \ T_j = 25 \degree \text{C} $</td>
<td>-</td>
<td>400</td>
<td>460</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 2 \text{ A} \ ; \ T_j = 25 \degree \text{C} $</td>
<td>-</td>
<td>450</td>
<td>515</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 2 \text{ A} \ ; \ T_j = -40 \degree \text{C}$</td>
<td>-</td>
<td>505</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td>$I_R$</td>
<td>reverse current</td>
<td>$V_R = 10 \text{ V} \ ; \ T_j = 25 \degree \text{C} $</td>
<td>-</td>
<td>3</td>
<td>11.5</td>
<td>µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 30 \text{ V} \ ; \ T_j = 25 \degree \text{C} $</td>
<td>-</td>
<td>5</td>
<td>-</td>
<td>µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 40 \text{ V} \ ; \ T_j = 25 \degree \text{C} $</td>
<td>-</td>
<td>6</td>
<td>22</td>
<td>µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 40 \text{ V} \ ; \ T_j = 125 \degree \text{C} $</td>
<td>-</td>
<td>4</td>
<td>-</td>
<td>mA</td>
</tr>
<tr>
<td>$C_d$</td>
<td>diode capacitance</td>
<td>$V_R = 1 \text{ V} \ ; \ f = 1 \text{ MHz} \ ; \ T_j = 25 \degree \text{C}$</td>
<td>-</td>
<td>350</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 10 \text{ V} \ ; \ f = 1 \text{ MHz} \ ; \ T_j = 25 \degree \text{C}$</td>
<td>-</td>
<td>145</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td>$t_{rr}$</td>
<td>reverse recovery time step recovery</td>
<td>$I_F = 0.5 \text{ A}; \ I_R = 0.5 \text{ A}; \ I_{R(meas)} = 0.1 \text{ A} ; \ T_j = 25 \degree \text{C}$</td>
<td>-</td>
<td>11.5</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>reverse recovery time ramp recovery</td>
<td>$dI_F/dt = 200 \text{ A/µs} ; \ I_F = 6 \text{ A} \ ; \ V_R = 26 \text{ V} ; \ T_j = 25 \degree \text{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 \text{ A}; \ dI_F/dt = 20 \text{ A/µs} ; \ T_j = 25 \degree \text{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) $T_J = -40 \, ^\circ C$

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) $\delta = 1; \, DC$
**40 V, 2 A low VF Trench MEGA Schottky barrier rectifier**

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

- $T_j = 100 \degree C$
  - $(1) \delta = 1$; DC
  - $(2) \delta = 0.9$
  - $(3) \delta = 0.8$
  - $(4) \delta = 0.5$
  - $(5) \delta = 0.2$

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

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

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

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

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

**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

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,

\[ I_{RMS} = I_{F(AV)} \text{ at DC}, \] 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

**Fig. 15. Package outline CFP3 (SOD123W)**
13. Soldering

![Soldering Diagram](sod123w_fr)

Fig. 16. Reflow soldering footprint for CFP3 (SOD123W)
Fig. 17. Wave soldering footprint for CFP3 (SOD123W)
14. Revision history

Table 8. Revision history

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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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<td>20180306</td>
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<td>PMEG40T20ER v.1</td>
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<td>Modifications:</td>
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<td>• Graphic symbol changed</td>
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Nexperia

PMEG40T20ER

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

15. Legal information

Data sheet status

<table>
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<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
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<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>
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</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.nexperia.com.

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