1. General description

Planar Schottky barrier rectifier with an integrated guard ring for stress protection, encapsulated in a SOD123W small and flat lead Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- Average forward current: \( I_{F(AV)} \leq 2 \, \text{A} \)
- Reverse voltage: \( V_R \leq 40 \, \text{V} \)
- Low forward voltage
- High power capability due to clip-bond technology
- Small and flat lead SMD plastic package
- 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 (SMPS)
- Reverse polarity protection
- Low power consumption applications

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 , \text{kHz}; ) square wave; ( T_{\text{amb}} \leq 85 , \text{\degree C} )</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( \delta = 0.5; f = 20 , \text{kHz}; ) square wave; ( T_{sp} \leq 140 , \text{\degree 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 , \text{\degree 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 , \text{A}; T_J = 25 , \text{\degree C} )</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 = 40 , \text{V}; T_J = 25 , \text{\degree C} )</td>
<td>-</td>
<td>25</td>
<td>100</td>
<td>\mu A</td>
</tr>
</tbody>
</table>

[1] Device mounted on a ceramic PCB, \( \text{Al}_2\text{O}_3 \), standard footprint.
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[1]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>anode</td>
<td>CFP3 (SOD123W)</td>
<td></td>
</tr>
</tbody>
</table>

[1] The marking bar indicates the cathode.

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>PMEG4020ER-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>PMEG4020ER-Q</td>
<td>BE</td>
</tr>
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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>$I_{F(AV)}$</td>
<td>average forward current</td>
<td>$\delta = 0.5; f = 20 , kHz; square wave; T_{amb} \leq 85 , ^\circ C$</td>
<td>-</td>
<td>2</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$\delta = 0.5; f = 20 , kHz; square wave; T_{sp} \leq 140 , ^\circ C$</td>
<td>-</td>
<td>2</td>
<td>A</td>
</tr>
<tr>
<td>$I_{FSM}$</td>
<td>non-repetitive peak forward current</td>
<td>$t_p = 8.3 , ms; half sine wave; T_{J(init)} = 25 , ^\circ C$</td>
<td>-</td>
<td>50</td>
<td>A</td>
</tr>
<tr>
<td>$P_{tot}$</td>
<td>total power dissipation</td>
<td>$T_{amb} \leq 25 , ^\circ C$</td>
<td>[2]</td>
<td>0.57</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[3]</td>
<td>0.95</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[1]</td>
<td>1.8</td>
<td>W</td>
</tr>
<tr>
<td>$T_J$</td>
<td>junction temperature</td>
<td></td>
<td>-</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>$T_{amb}$</td>
<td>ambient temperature</td>
<td></td>
<td>-55</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>$T_{stg}$</td>
<td>storage temperature</td>
<td></td>
<td>-65</td>
<td>150</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>-</td>
<td>-</td>
<td>220</td>
<td>K/W</td>
</tr>
<tr>
<td>$R_{th(j-a)}$</td>
<td></td>
<td>[1] [2]</td>
<td>-</td>
<td>-</td>
<td>130</td>
<td>K/W</td>
</tr>
<tr>
<td>$R_{th(j-a)}$</td>
<td></td>
<td>[1] [3]</td>
<td>-</td>
<td>-</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>[5]</td>
<td>-</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.

![Image](image1.png)

**Fig. 1.** Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

![Image](image2.png)

**Fig. 2.** Transient thermal impedance from junction to ambient as a function of pulse duration; typical values
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>$V_F$</td>
<td>forward voltage</td>
<td>$I_F = 0.1 , A; , T_J = 25 , ^\circ, C$</td>
<td>-</td>
<td>295</td>
<td>330</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 1 , A; , T_J = 25 , ^\circ, C$</td>
<td>-</td>
<td>380</td>
<td>440</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 2 , A; , T_J = 25 , ^\circ, C$</td>
<td>-</td>
<td>430</td>
<td>490</td>
<td>mV</td>
</tr>
<tr>
<td>$I_R$</td>
<td>reverse current</td>
<td>$V_R = 10 , V; , T_J = 25 , ^\circ, C$</td>
<td>-</td>
<td>5</td>
<td>-</td>
<td>µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 40 , V; , T_J = 25 , ^\circ, C$</td>
<td>-</td>
<td>25</td>
<td>100</td>
<td>µA</td>
</tr>
<tr>
<td>$C_d$</td>
<td>diode capacitance</td>
<td>$V_R = 1 , V; , f = 1 , \text{MHz}; , T_J = 25 , ^\circ, C$</td>
<td>-</td>
<td>250</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 10 , V; , f = 1 , \text{MHz}; , T_J = 25 , ^\circ, C$</td>
<td>-</td>
<td>95</td>
<td>-</td>
<td>pF</td>
</tr>
</tbody>
</table>
Fig. 4. Forward current as a function of forward voltage; typical values

(1) $T_J = 150 \, ^\circ\text{C}$
(2) $T_J = 125 \, ^\circ\text{C}$
(3) $T_J = 85 \, ^\circ\text{C}$
(4) $T_J = 25 \, ^\circ\text{C}$
(5) $T_J = -40 \, ^\circ\text{C}$

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

(1) $T_J = 125 \, ^\circ\text{C}$
(2) $T_J = 85 \, ^\circ\text{C}$
(3) $T_J = 25 \, ^\circ\text{C}$
(4) $T_J = -40 \, ^\circ\text{C}$

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

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

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

$T_J = 150 \, ^\circ\text{C}$
(1) $\delta = 0.1$
(2) $\delta = 0.2$
(3) $\delta = 0.5$
(4) $\delta = 1$
**Fig. 8.** Average reverse power dissipation as a function of reverse voltage; typical values

- **Tj = 125 °C**
  - (1) δ = 1
  - (2) δ = 0.9
  - (3) δ = 0.8
  - (4) δ = 0.5

**FR4 PCB, standard footprint**

- **Tj = 150 °C**
  - (1) δ = 1; DC
  - (2) δ = 0.5; f = 20 kHz
  - (3) δ = 0.2; f = 20 kHz
  - (4) δ = 0.1; f = 20 kHz

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

- **FR4 PCB, mounting pad for cathode 1 cm²**
  - **Tj = 150 °C**
    - (1) δ = 1; DC
    - (2) δ = 0.5; f = 20 kHz
    - (3) δ = 0.2; f = 20 kHz
    - (4) δ = 0.1; f = 20 kHz

- **Ceramic PCB, Al₂O₃, standard footprint**
  - **Tj = 150 °C**
    - (1) δ = 1; DC
    - (2) δ = 0.5; f = 20 kHz
    - (3) δ = 0.2; f = 20 kHz
    - (4) δ = 0.1; f = 20 kHz

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

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


11. Test information

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
- \( I_{\text{RMS}} = I_{F(\text{AV})} \) at DC
- \( I_{\text{RMS}} = I_M \times \sqrt{\delta} \) with \( I_{\text{RMS}} \) 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. 14. Package outline CFP3 (SOD123W)
13. Soldering

Footprint information for reflow soldering of CFP3 package

---

Fig. 15. Reflow soldering footprint for CFP3 (SOD123W)

recommended stencil thickness: 0.1 mm
Fig. 16. 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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<td>20221116</td>
<td>Product data sheet</td>
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<td>PMEG4020ER-Q v.1</td>
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<td>Modifications:</td>
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<td>• Limiting values:</td>
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<tr>
<td>Measurement conditions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>for $I_{FSM}$ changed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>from square wave to</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>half-sine wave.</td>
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<td>PMEG4020ER-Q v.1</td>
<td>20210611</td>
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15. Legal information

Data sheet status

<table>
<thead>
<tr>
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<th>Product status</th>
<th>Definition</th>
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</tbody>
</table>

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

Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |

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

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[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 https://www.nexperia.com.

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