1. General description

Planar Maximum Efficiency General Application (MEGA) Schottky barrier rectifier with an integrated guard ring for stress protection, encapsulated in a leadless ultra small DFN1608D-2 (SOD1608) Surface-Mounted Device (SMD) plastic package with visible and solderable side pads.

2. Features and benefits

- Average forward current: $I_{F(AV)} \leq 2\ A$
- Reverse voltage: $V_R \leq 40\ V$
- Low forward voltage $V_F \leq 660\ \text{mV}$
- Low reverse current
- AEC-Q101 qualified
- Solderable side pads
- Package height typ. 0.37 mm
- Ultra small and leadless SMD plastic package

3. Applications

- Low voltage rectification
- High efficiency DC-to-DC conversion
- Switch mode power supply
- LED backlight for mobile application
- Low power consumption applications
- Ultra high-speed switching
- Reverse polarity protection

4. Quick reference data

<table>
<thead>
<tr>
<th>Table 1. Quick reference data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Symbol</strong></td>
</tr>
<tr>
<td>$I_{F(AV)}$</td>
</tr>
<tr>
<td>$V_R$</td>
</tr>
<tr>
<td>$V_F$</td>
</tr>
</tbody>
</table>
Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(I_R)</td>
<td>reverse current</td>
<td>(V_R = 10, \text{V}; , T_j = 25, ^\circ\text{C})</td>
<td>-</td>
<td>1</td>
<td>5</td>
<td>(\mu\text{A})</td>
</tr>
<tr>
<td>(t_{\text{rr}})</td>
<td>reverse recovery time</td>
<td>(I_R = 0.5, \text{A}; , I_F = 0.5, \text{A}; , I_{R(\text{meas})} = 0.1, \text{A}; , T_j = 25, ^\circ\text{C})</td>
<td>-</td>
<td>4</td>
<td>-</td>
<td>ns</td>
</tr>
</tbody>
</table>

[1] Device mounted on a ceramic Printed-Circuit Board (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></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 Name</th>
<th>Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMEG4020EPK</td>
<td>DFN1608D-2</td>
<td>DFN1608D-2: leadless ultra small plastic package; 2 terminals</td>
<td>SOD1608</td>
</tr>
</tbody>
</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>PMEG4020EPK</td>
<td>0001 0000</td>
</tr>
</tbody>
</table>

Fig. 1. SOD1608 binary marking code description
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>40</td>
<td>V</td>
</tr>
<tr>
<td>I_F</td>
<td>forward current</td>
<td>T_sp ≤ 125 °C</td>
<td></td>
<td>2.83</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 ≤ 130 °C; square wave</td>
<td></td>
<td>2</td>
<td>A</td>
</tr>
<tr>
<td>I_FRM</td>
<td>repetitive peak forward current</td>
<td>T_p ≤ 1 ms; δ ≤ 0.25</td>
<td></td>
<td>4</td>
<td>A</td>
</tr>
<tr>
<td>I_FSM</td>
<td>non-repetitive peak forward current</td>
<td>T_p = 8 ms; T_(jinit) = 25 °C; square wave</td>
<td></td>
<td>5</td>
<td>A</td>
</tr>
<tr>
<td>P_tot</td>
<td>total power dissipation</td>
<td>T_amb ≤ 25 °C</td>
<td>[2]</td>
<td>415</td>
<td>mW</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[3]</td>
<td>895</td>
<td>mW</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[1]</td>
<td>1565</td>
<td>mW</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</td>
<td>in free air</td>
<td>[1][2]</td>
<td>-</td>
<td>300</td>
<td>K/W</td>
</tr>
<tr>
<td></td>
<td>from junction to ambient</td>
<td></td>
<td>[1][3]</td>
<td>-</td>
<td>140</td>
<td>K/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[1][4]</td>
<td>-</td>
<td>80</td>
<td>K/W</td>
</tr>
<tr>
<td>R_Th(j-sp)</td>
<td>thermal resistance</td>
<td></td>
<td>[5]</td>
<td>-</td>
<td>20</td>
<td>K/W</td>
</tr>
<tr>
<td></td>
<td>from junction to solder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>point</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

FR4 PCB, standard footprint

Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

FR4 PCB, mounting pad for cathode 1 cm²
Ceramic PCB, Al₂O₃, standard footprint

Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

### 10. 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>$I_F = 100 , mA$; pulsed; $t_p \leq 300 , \mu s$; $\delta \leq 0.02$; $T_j = 25 , ^{\circ}C$</td>
<td>-</td>
<td>330</td>
<td>380</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 500 , mA$; pulsed; $t_p \leq 300 , \mu s$; $\delta \leq 0.02$; $T_j = 25 , ^{\circ}C$</td>
<td>-</td>
<td>415</td>
<td>480</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 1 , A$; pulsed; $t_p \leq 300 , \mu s$; $\delta \leq 0.02$; $T_j = 25 , ^{\circ}C$</td>
<td>-</td>
<td>490</td>
<td>550</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 2 , A$; pulsed; $t_p \leq 300 , \mu s$; $\delta \leq 0.02$; $T_j = 25 , ^{\circ}C$</td>
<td>-</td>
<td>585</td>
<td>660</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>1</td>
<td>5</td>
<td>µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 40 , V$; $T_j = 25 , ^{\circ}C$</td>
<td>-</td>
<td>8</td>
<td>30</td>
<td>µA</td>
</tr>
<tr>
<td>C_d</td>
<td>diode capacitance</td>
<td>$V_R = 1 , V$; $f = 1 , MHz$; $T_j = 25 , ^{\circ}C$</td>
<td>-</td>
<td>75</td>
<td>90</td>
<td>pF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 10 , V$; $f = 1 , MHz$; $T_j = 25 , ^{\circ}C$</td>
<td>-</td>
<td>30</td>
<td>40</td>
<td>pF</td>
</tr>
<tr>
<td>t_rr</td>
<td>reverse recovery time</td>
<td>$I_F = 0.5 , A$; $I_R = 0.5 , A$; $I_{R(meas)} = 0.1 , A$; $T_j = 25 , ^{\circ}C$</td>
<td>-</td>
<td>4</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>V_FRM</td>
<td>peak forward recovery voltage</td>
<td>$I_F = 0.5 , A$; $dI_F/dt = 20 , A/\mu s$; $T_j = 25 , ^{\circ}C$</td>
<td>-</td>
<td>440</td>
<td>-</td>
<td>mV</td>
</tr>
</tbody>
</table>
PMEG4020EPK

40 V, 2 A low VF MEGA Schottky barrier rectifier

Fig. 5. Forward current as a function of forward voltage; typical values

Fig. 6. Reverse current as a function of reverse voltage; typical values

Fig. 7. Diode capacitance as a function of reverse voltage; typical values

Fig. 8. Average forward power dissipation as a function of average forward current; typical values
**Fig. 9.** Average reverse power dissipation as a function of reverse voltage; typical values

\[
P_{R(\text{AV})} = \begin{cases} \text{(1)}: 1 \\ \text{(2)}: 0.9 \\ \text{(3)}: 0.8 \\ \text{(4)}: 0.5 \end{cases}
\]

- \( T_j = 125 \, ^{\circ}\text{C} \)
- \( \delta = 1 \)
- \( \delta = 0.9 \)
- \( \delta = 0.8 \)
- \( \delta = 0.5 \)

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

\[
I_{F(\text{AV})} = \begin{cases} \text{(1)}: 1 \\ \text{(2)}: 0.5; f = 20 \, \text{kHz} \\ \text{(3)}: 0.2; f = 20 \, \text{kHz} \\ \text{(4)}: 0.1; f = 20 \, \text{kHz} \end{cases}
\]

- \( T_j = 150 \, ^{\circ}\text{C} \)
- \( \delta = 1 \) (DC)
- \( \delta = 0.5; f = 20 \, \text{kHz} \)
- \( \delta = 0.2; f = 20 \, \text{kHz} \)
- \( \delta = 0.1; f = 20 \, \text{kHz} \)

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

\[
I_{F(\text{AV})} = \begin{cases} \text{(1)}: 1 \\ \text{(2)}: 0.5; f = 20 \, \text{kHz} \\ \text{(3)}: 0.2; f = 20 \, \text{kHz} \\ \text{(4)}: 0.1; f = 20 \, \text{kHz} \end{cases}
\]

- \( T_j = 150 \, ^{\circ}\text{C} \)
- \( \delta = 1 \) (DC)
- \( \delta = 0.5; f = 20 \, \text{kHz} \)
- \( \delta = 0.2; f = 20 \, \text{kHz} \)
- \( \delta = 0.1; f = 20 \, \text{kHz} \)

**Fig. 12.** Average forward current as a function of ambient temperature; typical values

\[
I_{F(\text{AV})} = \begin{cases} \text{(1)}: 1 \\ \text{(2)}: 0.5; f = 20 \, \text{kHz} \\ \text{(3)}: 0.2; f = 20 \, \text{kHz} \\ \text{(4)}: 0.1; f = 20 \, \text{kHz} \end{cases}
\]

- \( T_j = 150 \, ^{\circ}\text{C} \)
- \( \delta = 1 \) (DC)
- \( \delta = 0.5; f = 20 \, \text{kHz} \)
- \( \delta = 0.2; f = 20 \, \text{kHz} \)
- \( \delta = 0.1; f = 20 \, \text{kHz} \)
Fig. 13. Average forward current as a function of solder point temperature; typical values

\[ T_J = 150 \, ^\circ\text{C} \]

(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. 14. 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.

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 DFN1608D-2 (SOD1608)](image)

Fig. 17. Package outline DFN1608D-2 (SOD1608)

13. Soldering

![Footprint information for reflow soldering of DFN1608D-2 package](image)

Fig. 18. Reflow soldering footprint for DFN1608D-2 (SOD1608)
### 14. Revision history

<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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<td>20140211</td>
<td>Product data sheet</td>
<td>-</td>
<td>PMEG4020EPK v.1</td>
</tr>
<tr>
<td>Modifications:</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>• Marking code corrected</td>
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<tr>
<td>PMEG4020EPK v.1</td>
<td>20120425</td>
<td>Product data sheet</td>
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15. Legal information

15.1 Data sheet status

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<tbody>
<tr>
<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>
</tr>
</tbody>
</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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