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Team Nexperia
1. Product profile

1.1 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 SOD1608 (DFN1608D-2) Surface-Mounted Device (SMD) plastic package with visible and solderable side pads.

1.2 Features and benefits

- Average forward current: $I_{F(AV)} \leq 0.5\; \text{A}$
- Reverse voltage: $V_R \leq 20\; \text{V}$
- Low forward voltage $V_F \leq 410\; \text{mV}$
- Low reverse current
- AEC-Q101 qualified
- Solderable side pads
- Package height typ. 0.37 mm
- Ultra small and leadless SMD plastic package

1.3 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

1.4 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>square wave; $\delta = 0.5; f = 20; \text{kHz}; T_{\text{amb}} \leq 130; ^\circ; \text{C}$</td>
<td>[1]</td>
<td>-</td>
<td>0.5</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>square wave; $\delta = 0.5; f = 20; \text{kHz}; T_{\text{sp}} \leq 140; ^\circ; \text{C}$</td>
<td></td>
<td>-</td>
<td>0.5</td>
<td>A</td>
</tr>
<tr>
<td>$V_R$</td>
<td>reverse voltage</td>
<td>$T_J = 25; ^\circ; \text{C}$</td>
<td>-</td>
<td>-</td>
<td>20</td>
<td>V</td>
</tr>
<tr>
<td>$V_F$</td>
<td>forward voltage</td>
<td>$I_F = 500; \text{mA};$ pulsed; $t_p \leq 300; \mu; \text{s};$ $\delta \leq 0.02; T_J = 25; ^\circ; \text{C}$</td>
<td>-</td>
<td>360</td>
<td>410</td>
<td>mV</td>
</tr>
<tr>
<td>$I_R$</td>
<td>reverse current</td>
<td>$V_R = 10; \text{V}; T_J = 25; ^\circ; \text{C}$</td>
<td>-</td>
<td>30</td>
<td>130</td>
<td>$\mu\text{A}$</td>
</tr>
<tr>
<td>$t_{fr}$</td>
<td>reverse recovery time</td>
<td>$I_{R} = 0.5; \text{A}; I_F = 0.5; \text{A}; I_{R(meas)} = 0.1; \text{A}; T_J = 25; ^\circ; \text{C}$</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>ns</td>
</tr>
</tbody>
</table>

2. 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><img src="sym001.png" alt="Simplified outline" /></td>
<td><img src="sym001.png" alt="Graphic symbol" /></td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>anode</td>
<td><img src="sym001.png" alt="Transparent top view" /></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) The marking bar indicates the cathode.

3. 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>PMEG2005EPK</td>
<td>DFN1608D-2</td>
<td>Leadless ultra small plastic package; 2 terminals</td>
<td>SOD1608</td>
</tr>
</tbody>
</table>

4. Marking

Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMEG2005EPK</td>
<td>1000 0000</td>
</tr>
</tbody>
</table>

Fig 1. SOD1608 binary marking code description
5. 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>20</td>
<td>V</td>
</tr>
<tr>
<td>$I_F$</td>
<td>forward current</td>
<td>$T_{SP} \leq 135 , ^\circ C$</td>
<td>-</td>
<td>0.7</td>
<td>A</td>
</tr>
<tr>
<td>$I_{F(AV)}$</td>
<td>average forward current</td>
<td>square wave; $\delta = 0.5; f = 20 , kHz; $ $T_{AMB} \leq 130 , ^\circ C$</td>
<td>[1]</td>
<td>-</td>
<td>0.5 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>square wave; $\delta = 0.5; f = 20 , kHz; $ $T_{SP} \leq 140 , ^\circ C$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_{FRM}$</td>
<td>repetitive peak forward current</td>
<td>$t_p \leq 1 , ms; \delta \leq 0.5$</td>
<td>-</td>
<td>2</td>
<td>A</td>
</tr>
<tr>
<td>$I_{FSM}$</td>
<td>non-repetitive peak forward current</td>
<td>square wave; $t_p = 8 , ms; T_{j(init)} = 25 , ^\circ C$</td>
<td>-</td>
<td>3</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>-</td>
<td>390 mW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_{AMB} \leq 130 , ^\circ C$</td>
<td>[3]</td>
<td>-</td>
<td>830 mW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$T_{AMB} \leq 140 , ^\circ C$</td>
<td>[1]</td>
<td>-</td>
<td>1470 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>-</td>
<td>-55</td>
<td>150 °C</td>
</tr>
<tr>
<td>$T_{STG}$</td>
<td>storage temperature</td>
<td></td>
<td>-</td>
<td>-65</td>
<td>150 °C</td>
</tr>
</tbody>
</table>


6. 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][2]</td>
<td>-</td>
<td>-</td>
<td>320 K/W</td>
</tr>
<tr>
<td>$R_{th(j-sp)}$</td>
<td>thermal resistance from junction to solder point</td>
<td></td>
<td>[3][4]</td>
<td>-</td>
<td>-</td>
<td>85 K/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[5]</td>
<td>-</td>
<td>-</td>
<td>20 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 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
7. 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>$I_F = 100 \text{ mA}; \text{pulsed}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_j = 25 ^\circ\text{C}$</td>
<td>-</td>
<td>270</td>
<td>300</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 500 \text{ mA}; \text{pulsed}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_j = 25 ^\circ\text{C}$</td>
<td>-</td>
<td>360</td>
<td>410</td>
<td>mV</td>
</tr>
<tr>
<td>$I_R$</td>
<td>reverse current</td>
<td>$V_R = 10 \text{ V}; T_j = 25 ^\circ\text{C}$</td>
<td>-</td>
<td>30</td>
<td>130</td>
<td>\mu A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 20 \text{ V}; T_j = 25 ^\circ\text{C}$</td>
<td>-</td>
<td>70</td>
<td>300</td>
<td>\mu A</td>
</tr>
<tr>
<td>$C_d$</td>
<td>diode capacitance</td>
<td>$V_R = 1 \text{ V}; f = 1 \text{ MHz}; T_j = 25 ^\circ\text{C}$</td>
<td>-</td>
<td>35</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 10 \text{ V}; f = 1 \text{ MHz}; T_j = 25 ^\circ\text{C}$</td>
<td>-</td>
<td>13</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td>$t_{rr}$</td>
<td>reverse recovery time</td>
<td>$I_F = 0.5 \text{ A}; I_R = 0.5 \text{ A}; I_{R(meas)} = 0.1 \text{ A}; T_j = 25 ^\circ\text{C}$</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>$V_{FRM}$</td>
<td>peak forward recovery voltage</td>
<td>$I_F = 0.5 \text{ A}; \frac{dI_F}{dt} = 20 \text{ mA/\mu s}; T_j = 25 ^\circ\text{C}$</td>
<td>-</td>
<td>380</td>
<td>-</td>
<td>mV</td>
</tr>
</tbody>
</table>
20 V, 0.5 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
20 V, 0.5 A low VF MEGA Schottky barrier rectifier

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

- $T_j = 125 \, ^\circ C$
  - (1) $\delta = 1$
  - (2) $\delta = 0.9$
  - (3) $\delta = 0.8$
  - (4) $\delta = 0.5$

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

- FR4 PCB, standard footprint
  - $T_j = 150 \, ^\circ C$
  - (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 cm²
  - $T_j = 150 \, ^\circ C$
  - (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 11.** Average forward current as a function of ambient temperature; typical values

- Ceramic PCB, Al₂O₃, standard footprint
  - $T_j = 150 \, ^\circ C$
  - (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 12.** Average forward current as a function of ambient temperature; typical values

- Ceramic PCB, Al₂O₃, standard footprint
  - $T_j = 150 \, ^\circ C$
  - (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
8. Test information

**Fig 13.** Average forward current as a function of solder point temperature; typical values

<table>
<thead>
<tr>
<th>Tsp (°C)</th>
<th>IF(AV) (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>50</td>
<td>0.25</td>
</tr>
<tr>
<td>100</td>
<td>0.50</td>
</tr>
<tr>
<td>150</td>
<td>0.75</td>
</tr>
<tr>
<td>175</td>
<td>1.00</td>
</tr>
</tbody>
</table>

- 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 14.** Reverse recovery definition

- I<sub>F</sub> (forward current)
- I<sub>R</sub> (reverse current)
- t<sub>r</sub> (recovery time)
- t<sub>tr</sub> (rise time)
- t<sub>rr</sub> (reverse recovery time)
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.

8.1 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.
9. Package outline

Fig 17. Package outline SOD1608 (DFN1608D-2)

10. Soldering

Footprint information for reflow soldering of SOD1608 package

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

<table>
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<tr>
<th>Document ID</th>
<th>Release date</th>
<th>Data sheet status</th>
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<th>Supersedes</th>
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<td>Product data sheet</td>
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<td>PMEG2005EPK v.1</td>
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<td>• 5 &quot;Limiting values&quot;: $I_F$ corrected</td>
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<tr>
<td>• 7 &quot;Characteristics&quot;: $t_{rr}$ and $V_{FRM}$ added</td>
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<td>• Fig 14. and 15: added</td>
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12. Legal information

12.1 Data sheet status

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<th></th>
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<tbody>
<tr>
<td>Objective [short] data sheet Development</td>
<td>This document contains data from the objective specification for product development.</td>
<td></td>
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<tr>
<td>Preliminary [short] data sheet Qualification</td>
<td>This document contains data from the preliminary specification.</td>
<td></td>
</tr>
<tr>
<td>Product [short] data sheet Production</td>
<td>This document contains the product specification.</td>
<td></td>
</tr>
</tbody>
</table>

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[2] The term "short data sheet" is explained in section "Definitions".
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