1. General description

Planar Maximum Efficiency General Application (MEGA) Schottky barrier rectifier with an integrated guard ring for stress protection, encapsulated in an ultra thin DFN2020D-3 (SOT1061D) leadless small 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 $V_F \leq 535$ mV
- Low reverse current
- Reduced Printed-Circuit-Board (PCB) area requirements
- Exposed heat sink (cathode pad) for excellent thermal and electrical conductivity
- Leadless small SMD plastic package with visible and solderable side pads
- Suitable for Automatic Optical Inspection (AOI) of solder joints
- AEC-Q101 qualified

3. Applications

- Low voltage rectification
- High efficiency DC-to-DC conversion
- Switch Mode Power Supply (SMPS)
- Free-wheeling application
- Reverse polarity protection
- Low power consumption application
- Battery chargers for mobile equipment
- LED backlight for mobile 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; $T_{amb} \leq 65$ °C; square wave</td>
<td>[1]</td>
<td>-</td>
<td>-</td>
<td>2 A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$\delta = 0.5; f = 20$ kHz; $T_{sp} \leq 140$ °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>
</tbody>
</table>
Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
---|---|---|---|---|---|---|
V_F | forward voltage | I_F = 2 A; t_p ≤ 300 µs; δ ≤ 0.02; T_J = 25 °C; pulsed | - | 470 | 535 | mV |
I_R | reverse current | V_R = 40 V; t_p ≤ 300 µs; δ ≤ 0.02; T_J = 25 °C; pulsed | - | 20 | 100 | µA |


5. 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>A</td>
<td>anode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>anode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>K</td>
<td>cathode</td>
<td></td>
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6. Ordering information

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package Name</th>
<th>Description</th>
<th>Version</th>
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</thead>
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<tr>
<td>PMEG4020EPAS</td>
<td>DFN2020D-3</td>
<td>DFN2020D-3: plastic thermal enhanced ultra thin small outline package; no leads; 3 terminals; body 2 x 2 x 0.65 mm</td>
<td>SOT1061D</td>
</tr>
</tbody>
</table>

7. Marking

<table>
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<tr>
<th>Type number</th>
<th>Marking code</th>
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<tr>
<td>PMEG4020EPAS</td>
<td>CS</td>
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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 °C</td>
<td>-</td>
<td>40</td>
<td>V</td>
</tr>
<tr>
<td>I_F</td>
<td>forward current</td>
<td>T_sp ≤ 135 °C; δ = 1</td>
<td>-</td>
<td>2.8</td>
<td>A</td>
</tr>
<tr>
<td>I_F(AV)</td>
<td>average forward current</td>
<td>δ = 0.5; f = 20 kHz; T_amb ≤ 65 °C; square wave</td>
<td>[1]</td>
<td>2</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>δ = 0.5; f = 20 kHz; T_sp ≤ 140 °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>[2]</td>
<td>-</td>
<td>7</td>
</tr>
<tr>
<td>I_FSM</td>
<td>non-repetitive peak forward current</td>
<td>T_p = 8 ms; T_j(init) = 25 °C; square wave</td>
<td>[2]</td>
<td>-</td>
<td>18</td>
</tr>
<tr>
<td>P_tot</td>
<td>total power dissipation</td>
<td>T_amb ≤ 25 °C</td>
<td>[3]</td>
<td>-</td>
<td>520</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[4]</td>
<td>-</td>
<td>1050</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>[1]</td>
<td>-</td>
<td>1900</td>
</tr>
<tr>
<td>T_j</td>
<td>junction temperature</td>
<td></td>
<td></td>
<td>-</td>
<td>150</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>
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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_θh(j-a)</td>
<td>thermal resistance from junction to ambient</td>
<td>in free air</td>
<td>[1][2]</td>
<td>-</td>
<td>240</td>
<td>K/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[1][3]</td>
<td>-</td>
<td>120</td>
<td>K/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[1][4]</td>
<td>-</td>
<td>65</td>
<td>K/W</td>
</tr>
<tr>
<td>R_θh(j-sp)</td>
<td>thermal resistance from junction to solder point</td>
<td>[5]</td>
<td>-</td>
<td>-</td>
<td>10</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

Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values
Ceramic PCB, Al₂O₃, standard footprint

**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>$V_{BR}$</td>
<td>reverse breakdown voltage</td>
<td>$I_R = 1 \text{ mA}; t_p = 300 \mu s; \delta = 0.02; T_j = 25 °C; pulsed</td>
<td>40</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>$V_F$</td>
<td>forward voltage</td>
<td>$I_F = 0.5 \text{ A}; t_p \leq 300 \mu s; \delta \leq 0.02; T_j = 25 °C; pulsed</td>
<td>-</td>
<td>360</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 1 \text{ A}; t_p \leq 300 \mu s; \delta \leq 0.02; T_j = 25 °C; pulsed</td>
<td>-</td>
<td>400</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 2 \text{ A}; t_p \leq 300 \mu s; \delta \leq 0.02; T_j = 25 °C; pulsed</td>
<td>-</td>
<td>470</td>
<td>535</td>
<td>mV</td>
</tr>
<tr>
<td>$I_R$</td>
<td>reverse current</td>
<td>$V_R = 10 \text{ V}; t_p \leq 300 \mu s; \delta \leq 0.02; T_j = 25 °C; pulsed</td>
<td>-</td>
<td>5</td>
<td>-</td>
<td>µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 40 \text{ V}; t_p \leq 300 \mu s; \delta \leq 0.02; T_j = 25 °C; pulsed</td>
<td>-</td>
<td>20</td>
<td>100</td>
<td>µA</td>
</tr>
<tr>
<td>$C_d$</td>
<td>diode capacitance</td>
<td>$V_R = 1 \text{ V}; f = 1 \text{ MHz}; T_j = 25 °C</td>
<td>-</td>
<td>270</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 10 \text{ V}; f = 1 \text{ MHz}; T_j = 25 °C</td>
<td>-</td>
<td>100</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 = 1 \text{ A}; I_R(\text{meas}) = 0.25 \text{ A}; T_j = 25 °C</td>
<td>-</td>
<td>6</td>
<td>-</td>
<td>ns</td>
</tr>
</tbody>
</table>

### Fig. 4. Forward current as a function of forward voltage; typical values

### Fig. 5. Reverse current as a function of reverse voltage; typical values
Fig. 6. Diode capacitance as a function of reverse voltage; typical values

\[ C_d (\text{pF}) \]

\[ V_R (\text{V}) \]

\( f = 1 \text{ MHz}; T_{\text{amb}} = 25 \degree \text{C} \)

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

\[ P_{\text{F(AV)}} (\text{W}) \]

\[ I_{\text{F(AV)}} (\text{A}) \]

\( T_j = 150 \degree \text{C} \)

(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

\[ P_{\text{R(AV)}} (\text{W}) \]

\[ V_R (\text{V}) \]

\( T_j = 125 \degree \text{C} \)

(1) \( \delta = 1 \)
(2) \( \delta = 0.9 \)
(3) \( \delta = 0.8 \)
(4) \( \delta = 0.5 \)

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

\[ I_{\text{F(AV)}} (\text{A}) \]

\[ T_{\text{amb}} (\degree \text{C}) \]

FR4 PCB, standard footprint

\( T_j = 150 \degree \text{C} \)

(1) \( \delta = 1; \text{DC} \)
(2) \( \delta = 0.5; f = 20 \text{ kHz} \)
(3) \( \delta = 0.2; f = 20 \text{ kHz} \)
(4) \( \delta = 0.1; f = 20 \text{ kHz} \)
FR4 PCB, mounting pad for cathode 1 cm²

$T_j = 150 \, ^\circ\text{C}$

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

Ceramic PCB, Al₂O₃, standard footprint

$T_j = 150 \, ^\circ\text{C}$

(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

$T_j = 150 \, ^\circ\text{C}$

(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 solder point temperature; typical values
11. Test information

![Reverse recovery definition](image1)

**Fig. 13. Reverse recovery definition**

![Duty cycle definition](image2)

**Fig. 14. Duty cycle 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 diagram](imageURL)

Fig. 15. Package outline DFN2020D-3 (SOT1061D)
13. Soldering

Footprint information for reflow soldering of DFN2020D-3 package

Fig. 16. Reflow soldering footprint for DFN2020D-3 (SOT1061D)
## 14. 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>20150119</td>
<td>Product data sheet</td>
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<td>PMEG4020EPAS v.1</td>
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<td>Modification:</td>
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<td>• Product status changed</td>
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<tr>
<td>PMEG4020EPAS v.1</td>
<td>20141209</td>
<td>Preliminary data sheet</td>
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15. Legal information

15.1 Data sheet status

<table>
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<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
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<td>Development</td>
<td>This document contains data from the objective specification for product development.</td>
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<tr>
<td>Preliminary [short] data sheet</td>
<td>Qualification</td>
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<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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