1. General description

Planar Maximum Efficiency General Application (MEGA) 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: $I_{F(AV)} \leq 1$ A
- Reverse voltage: $V_R \leq 60$ V
- Extremely low leakage current
- Low forward voltage
- High power capability due to clip-bonding technology
- Small and flat lead SMD plastic package
- AEC-Q101 qualified
- High temperature $T_J \leq 175$ °C
- Capable for reflow and wave soldering

3. Applications

- Low voltage rectification
- High efficiency DC-to-DC conversion
- Switch mode power supply
- Reverse polarity protection

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; $T_{sp} \leq 170$ °C; square wave</td>
<td>-</td>
<td>-</td>
<td>1 A</td>
<td></td>
</tr>
<tr>
<td>$V_R$</td>
<td>reverse voltage</td>
<td>$T_J = 25$ °C</td>
<td>-</td>
<td>-</td>
<td>60 V</td>
<td></td>
</tr>
<tr>
<td>$V_F$</td>
<td>forward voltage</td>
<td>$I_F = 1$ A; $T_J = 25$ °C</td>
<td>-</td>
<td>605</td>
<td>660 mV</td>
<td></td>
</tr>
<tr>
<td>$I_R$</td>
<td>reverse current</td>
<td>$V_R = 60$ V; $t_p \leq 300 \mu$s; $\delta \leq 0.02$; $T_J = 25$ °C; pulsed</td>
<td>-</td>
<td>90</td>
<td>300 nA</td>
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 nexperia
5. Pinning information

Table 2: Pinning information

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<th>Pin</th>
<th>Symbol</th>
<th>Description</th>
<th>Simplified outline</th>
<th>Graphic symbol</th>
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<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>
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[1] The marking bar indicates the cathode.

6. Ordering information

Table 3: Ordering information

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<th>Package</th>
<th>Name</th>
<th>Description</th>
<th>Version</th>
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<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>
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7. Marking

Table 4: Marking codes

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<td>PMEG6010ELR</td>
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8. Limiting values

Table 5: Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

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<th>Symbol</th>
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<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>60</td>
<td>V</td>
</tr>
<tr>
<td>$I_F$</td>
<td>forward current</td>
<td>$\delta = 1; \ T_{sp} = 165 , ^\circ C$</td>
<td>-</td>
<td>1.41</td>
<td>A</td>
</tr>
<tr>
<td>$I_{F(AV)}$</td>
<td>average forward current</td>
<td>$\delta = 0.5; f = 20 , kHz; \ T_{sp} \leq 170 , ^\circ C$; square wave</td>
<td>-</td>
<td>1</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$\delta = 0.5; f = 20 , kHz; \ T_{amb} \leq 140 , ^\circ C$; square wave</td>
<td>[1]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_{FSM}$</td>
<td>non-repetitive peak forward current</td>
<td>$t_p = 8 , ms; \ square \ wave; \ T_{j(init)} = 25 , ^\circ C$</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></td>
<td>mW</td>
</tr>
<tr>
<td>$P_{tot}$</td>
<td>total power dissipation</td>
<td>$T_{amb} \leq 25 , ^\circ C$</td>
<td>[3]</td>
<td></td>
<td>W</td>
</tr>
<tr>
<td>$P_{tot}$</td>
<td>total power dissipation</td>
<td>$T_{amb} \leq 25 , ^\circ C$</td>
<td>[1]</td>
<td></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>$T_{amb}$</td>
<td>ambient temperature</td>
<td></td>
<td>-55</td>
<td>175</td>
<td>°C</td>
</tr>
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</table>
60 V, 1 A low leakage current Schottky barrier rectifier

<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>T_{stg}</td>
<td>storage temperature</td>
<td></td>
<td>-65</td>
<td>175</td>
<td>°C</td>
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</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>[1]</td>
<td>[2]</td>
<td>-</td>
<td>220</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[1]</td>
<td>[3]</td>
<td>-</td>
<td>130</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[1]</td>
<td>[4]</td>
<td>-</td>
<td>70</td>
</tr>
<tr>
<td>R_{th(j-sp)}</td>
<td>thermal resistance from junction to solder point</td>
<td></td>
<td>[5]</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
FR4 PCB, mounting pad for cathode 1 cm²

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></td>
<td></td>
<td>$V_{BR,R}$ reverse breakdown voltage</td>
<td>$I_R = 1 \text{ mA}; T_J = 25 \degree C$</td>
<td>60</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$V_F$</td>
<td>forward voltage</td>
<td>$I_F = 0.1 \text{ A}; T_J = 25 \degree C$</td>
<td>-</td>
<td>475</td>
<td>540</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 0.5 \text{ A}; T_J = 25 \degree C$</td>
<td>-</td>
<td>550</td>
<td>605</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 0.7 \text{ A}; T_J = 25 \degree C$</td>
<td>-</td>
<td>575</td>
<td>625</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 1 \text{ A}; T_J = 25 \degree C$</td>
<td>-</td>
<td>605</td>
<td>660</td>
<td>mV</td>
</tr>
<tr>
<td>$I_R$</td>
<td>reverse current</td>
<td>$V_R = 5 \text{ V}; t_p \leq 300 \mu s; \delta \leq 0.02; T_J = 25 \degree C$</td>
<td>-</td>
<td>5</td>
<td>-</td>
<td>nA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 10 \text{ V}; t_p \leq 300 \mu s; \delta \leq 0.02; T_J = 25 \degree C$</td>
<td>-</td>
<td>6</td>
<td>-</td>
<td>nA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 40 \text{ V}; t_p \leq 300 \mu s; \delta \leq 0.02; T_J = 25 \degree C$</td>
<td>-</td>
<td>25</td>
<td>50</td>
<td>nA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 60 \text{ V}; t_p \leq 300 \mu s; \delta \leq 0.02; T_J = 25 \degree C$</td>
<td>-</td>
<td>90</td>
<td>300</td>
<td>nA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 10 \text{ V}; t_p \leq 300 \mu s; \delta \leq 0.02; T_J = 125 \degree C$</td>
<td>-</td>
<td>25</td>
<td>-</td>
<td>\mu A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 60 \text{ V}; t_p \leq 300 \mu s; \delta \leq 0.02; T_J = 125 \degree C$</td>
<td>-</td>
<td>120</td>
<td>-</td>
<td>\mu A</td>
</tr>
<tr>
<td>$C_d$</td>
<td>diode capacitance</td>
<td>$V_R = 1 \text{ V}; f = 1 \text{ MHz}; T_J = 25 \degree C$</td>
<td>-</td>
<td>110</td>
<td>-</td>
<td>\text{pF}</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 4 \text{ V}; f = 1 \text{ MHz}; T_J = 25 \degree C$</td>
<td>-</td>
<td>65</td>
<td>-</td>
<td>\text{pF}</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 10 \text{ V}; f = 1 \text{ MHz}; T_J = 25 \degree C$</td>
<td>-</td>
<td>45</td>
<td>-</td>
<td>\text{pF}</td>
</tr>
<tr>
<td>$t_{rr}$</td>
<td>reverse recovery time</td>
<td>$I_F = 0.5 \text{ A}; I_R = 0.5 \text{ A}; \dot{I}_R(\text{meas}) = 0.1 \text{ A}; T_J = 25 \degree C$</td>
<td>-</td>
<td>4.5</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>$V_{FRM}$</td>
<td>peak forward recovery voltage</td>
<td>$I_F = 0.5 \text{ A}; \frac{dI_F}{dt} = 20 \text{ A/\mu s}; T_J = 25 \degree C$</td>
<td>-</td>
<td>580</td>
<td>-</td>
<td>mV</td>
</tr>
</tbody>
</table>
**Fig. 4.** Forward current as a function of forward voltage; typical values

(1) $T_J = 175 \, ^\circ\text{C}$  
(2) $T_J = 150 \, ^\circ\text{C}$  
(3) $T_J = 125 \, ^\circ\text{C}$  
(4) $T_J = 85 \, ^\circ\text{C}$  
(5) $T_J = 25 \, ^\circ\text{C}$  
(6) $T_J = -40 \, ^\circ\text{C}$

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

(1) $T_J = 175 \, ^\circ\text{C}$  
(2) $T_J = 150 \, ^\circ\text{C}$  
(3) $T_J = 125 \, ^\circ\text{C}$  
(4) $T_J = 85 \, ^\circ\text{C}$  
(5) $T_J = 25 \, ^\circ\text{C}$  
(6) $T_J = -40 \, ^\circ\text{C}$

**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

$T_J = 175 \, ^\circ\text{C}$  
(1) $\delta = 0.1$  
(2) $\delta = 0.2$  
(3) $\delta = 0.5$  
(4) $\delta = 1$
60 V, 1 A low leakage current Schottky barrier rectifier

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

- **T<sub>j</sub> = 150 °C**
  - (1) δ = 1
  - (2) δ = 0.5
  - (3) δ = 0.2
  - (4) δ = 0.1

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

- **FR4 PCB, standard footprint**
  - **T<sub>j</sub> = 175 °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

- **FR4 PCB, mounting pad for cathode 1 cm<sup>2**
  - **T<sub>j</sub> = 175 °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. 11.** Average forward current as a function of ambient temperature; typical values

- **Ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint**
  - **T<sub>j</sub> = 175 °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
11. Test information

Fig. 12. Average forward current as a function of solder point temperature; typical values

Fig. 13. Reverse recovery definition

$T_j = 175 \, ^\circ C$

(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. 14. 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, 

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

\[ I_{RMS} = I_M \times \sqrt{\delta} \] with \( I_{RMS} \) defined as RMS current.

Fig. 15. Duty cycle definition

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. 16. Package outline CFP3 (SOD123W)

13. Soldering

Fig. 17. Reflow soldering footprint for CFP3 (SOD123W)
Wave soldering footprint information

Fig. 18. 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>Product data sheet</td>
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<td>PMEG6010ELR v.3</td>
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<td>Modifications:</td>
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<tr>
<td></td>
<td></td>
<td>• Features and benefits: Capable for reflow and wave soldering added</td>
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<td></td>
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<td>• Soldering: Wave soldering footprint added</td>
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15. Legal information

Data sheet status

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<th>Definition</th>
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<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>
<td>This document contains data from the preliminary specification.</td>
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<tr>
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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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16. Contents

1. General description ................................................................. 1
2. Features and benefits ............................................................ 1
3. Applications ........................................................................ 1
4. Quick reference data ............................................................. 1
5. Pinning information ............................................................... 2
6. Ordering information ............................................................ 2
7. Marking ............................................................................. 2
8. Limiting values .................................................................... 2
9. Thermal characteristics ....................................................... 3
10. Characteristics ...................................................................... 5
11. Test information ................................................................. 8
12. Package outline ................................................................. 10
13. Soldering ............................................................................ 10
14. Revision history ................................................................. 12
15. Legal information .............................................................. 13

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