1. General description

Trench Maximum Efficiency General Application (MEGA) Schottky barrier rectifier encapsulated in a CFP5 (SOD128) small and flat lead Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- Average forward current: $I_{F(AV)} \leq 2$ A
- Reverse voltage: $V_R \leq 40$ V
- Low forward voltage
- Low leakage current due to Trench MEGA Schottky technology
- High power capability due to clip-bonding technology
- Small and flat lead SMD plastic package
- Suitable for both reflow and wave soldering
- 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
- Freewheeling application
- Reverse polarity protection
- Low power consumption 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; square wave; $T_{sp} \leq 165$ °C</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>A</td>
</tr>
<tr>
<td>$V_R$</td>
<td>reverse voltage</td>
<td>$T_j = 25$ °C</td>
<td>-</td>
<td>-</td>
<td>40</td>
<td>V</td>
</tr>
<tr>
<td>$V_F$</td>
<td>forward voltage</td>
<td>$I_F = 2$ A; $T_j = 25$ °C; pulsed</td>
<td>[1]</td>
<td>445</td>
<td>515</td>
<td>mV</td>
</tr>
<tr>
<td>$I_R$</td>
<td>reverse current</td>
<td>$V_R = 10$ V; $T_j = 25$ °C; pulsed</td>
<td>[1]</td>
<td>3</td>
<td>11.5</td>
<td>µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 40$ V; $T_j = 25$ °C; pulsed</td>
<td>[1]</td>
<td>6</td>
<td>22</td>
<td>µA</td>
</tr>
</tbody>
</table>

[1] Very short pulse, in order to maintain a stable junction temperature.
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</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>anode</td>
<td>1 2</td>
<td>K A</td>
</tr>
</tbody>
</table>

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>
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</thead>
<tbody>
<tr>
<td>PMEG40T20EP-Q</td>
<td>CFP5</td>
<td>plastic, surface mounted package; 2 terminals; 4 mm pitch; 3.8 mm x 2.6 mm x 1 mm body</td>
<td>SOD128</td>
<td></td>
</tr>
</tbody>
</table>

7. Marking

Table 4. Marking codes

<table>
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<th>Type number</th>
<th>Marking code</th>
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<tr>
<td>PMEG40T20EP-Q</td>
<td>DV</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>$T_j = 25 , ^\circ C$</td>
<td></td>
<td>40</td>
<td>V</td>
</tr>
<tr>
<td>$I_F$</td>
<td>forward current</td>
<td>$\delta = 1; T_{sp} \leq 160 , ^\circ C$</td>
<td></td>
<td>2.8</td>
<td>A</td>
</tr>
<tr>
<td>$I_{F(AV)}$</td>
<td>average forward current</td>
<td>$\delta = 0.5; f = 20 , kHz; square wave; T_{sp} \leq 165 , ^\circ C$</td>
<td></td>
<td>2</td>
<td>A</td>
</tr>
<tr>
<td>$I_{FSM}$</td>
<td>non-repetitive peak forward current</td>
<td>$t_p = 8 , ms; square wave; T_{j(init)} = 25 , ^\circ C$</td>
<td></td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td>$P_{tot}$</td>
<td>total power dissipation</td>
<td>$T_{amb} \leq 25 , ^\circ C$</td>
<td>[1]</td>
<td>0.75</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[2]</td>
<td>1.2</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>
<tr>
<td>$T_{stg}$</td>
<td>storage temperature</td>
<td></td>
<td>-65</td>
<td>175</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>[1]</td>
<td>-</td>
<td>-</td>
<td>K/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[2]</td>
<td>200</td>
<td>K/W</td>
<td></td>
</tr>
<tr>
<td>$R_{th(j-sp)}$</td>
<td>thermal resistance from junction to solder point</td>
<td></td>
<td>[3]</td>
<td>-</td>
<td>-</td>
<td>K/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[4]</td>
<td>12</td>
<td>K/W</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. 1. 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>$V_{(BR)R}$</td>
<td>reverse breakdown voltage</td>
<td>$I_R = 1 \ mA; \ T_j = 25 \ ^\circ C$</td>
<td>[1]</td>
<td>40</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>$V_F$</td>
<td>forward voltage</td>
<td>$I_F = 0.1 \ A; \ T_j = 25 \ ^\circ C; \ pulsed$</td>
<td>[1]</td>
<td>-</td>
<td>310</td>
<td>360   mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 0.5 \ A; \ T_j = 25 \ ^\circ C; \ pulsed$</td>
<td>[1]</td>
<td>-</td>
<td>365</td>
<td>420   mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 1 \ A; \ T_j = 25 \ ^\circ C; \ pulsed$</td>
<td>[1]</td>
<td>-</td>
<td>400</td>
<td>460   mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 2 \ A; \ T_j = 25 \ ^\circ C; \ pulsed$</td>
<td>[1]</td>
<td>-</td>
<td>445</td>
<td>515   mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 2 \ A; \ T_j = -40 \ ^\circ C; \ pulsed$</td>
<td>[1]</td>
<td>-</td>
<td>505</td>
<td>-     mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_F = 2 \ A; \ T_j = 125 \ ^\circ C; \ pulsed$</td>
<td>[1]</td>
<td>-</td>
<td>365</td>
<td>-     mV</td>
</tr>
<tr>
<td>$I_R$</td>
<td>reverse current</td>
<td>$V_R = 10 \ V; \ T_j = 25 \ ^\circ C; \ pulsed$</td>
<td>[1]</td>
<td>-</td>
<td>3</td>
<td>11.5  µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 30 \ V; \ T_j = 25 \ ^\circ C; \ pulsed$</td>
<td>[1]</td>
<td>-</td>
<td>5</td>
<td>-     µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 40 \ V; \ T_j = 25 \ ^\circ C; \ pulsed$</td>
<td>[1]</td>
<td>-</td>
<td>6</td>
<td>22    µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 40 \ V; \ T_j = 125 \ ^\circ C; \ pulsed$</td>
<td>[1]</td>
<td>-</td>
<td>4</td>
<td>-     mA</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>355</td>
<td>-</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>150</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td>$t_{rr}$</td>
<td>reverse recovery time recovery</td>
<td>$I_F = 0.5 \ A; \ V_R = 0.5 \ A; \ I_R = 0.1 \ A; \ T_j = 25 \ ^\circ C$</td>
<td>-</td>
<td>11.5</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>reverse recovery time recovery</td>
<td>$dI_F/dt = 200 \ A/\mu s; \ I_F = 6 \ A; \ V_R = 26 \ V; \ T_j = 25 \ ^\circ C$</td>
<td>-</td>
<td>10.5</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>430</td>
<td>-</td>
<td>mV</td>
</tr>
</tbody>
</table>

[1] Very short pulse, in order to maintain a stable junction temperature.
Nexperia

PMEG40T20EP-Q

40 V, 2 A low VF Trench MEGA Schottky barrier rectifier

Fig. 3. Forward current as a function of forward voltage; typical values

- Pulsed condition
  - (1) $T_j = 175$ °C
  - (2) $T_j = 150$ °C
  - (3) $T_j = 125$ °C
  - (4) $T_j = 100$ °C
  - (5) $T_j = 85$ °C
  - (6) $T_j = 25$ °C
  - (7) $T_j = -40$ °C

Fig. 4. Reverse current as a function of reverse voltage; typical values

- Pulsed condition
  - (1) $T_j = 150$ °C
  - (2) $T_j = 125$ °C
  - (3) $T_j = 100$ °C
  - (4) $T_j = 85$ °C
  - (5) $T_j = 25$ °C
  - (6) $T_j = -40$ °C

Fig. 5. Diode capacitance as a function of reverse voltage; typical values

- $f = 1$ MHz; $T_{amb} = 25$ °C

Fig. 6. Average forward power dissipation as a function of average forward current; typical values

- $T_j = 100$ °C
  - (1) $\delta = 0.1$
  - (2) $\delta = 0.2$
  - (3) $\delta = 0.5$
  - (4) $\delta = 0.8$
  - (5) $\delta = 1$; DC
40 V, 2 A low VF Trench MEGA Schottky barrier rectifier

Fig. 7. Average reverse power dissipation as a function of reverse voltage; typical values

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

- \( T_j = 100 \, ^\circ \text{C} \)
- (1) \( \delta = 1; \) DC
- (2) \( \delta = 0.9 \)
- (3) \( \delta = 0.8 \)
- (4) \( \delta = 0.5 \)
- (5) \( \delta = 0.2 \)

Fig. 8. Average forward current as a function of ambient temperature; typical values

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

- \( T_j = 175 \, ^\circ \text{C} \)
- (1) \( \delta = 1; \) DC
- (2) \( \delta = 0.5; f = 20 \, \text{kHz} \)
- (3) \( \delta = 0.2; f = 20 \, \text{kHz} \)
- (4) \( \delta = 0.1; f = 20 \, \text{kHz} \)

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

- FR4 PCB, mounting pad for cathode 1 cm\(^2\)
- \( T_j = 175 \, ^\circ \text{C} \)
- (1) \( \delta = 1; \) DC
- (2) \( \delta = 0.5; f = 20 \, \text{kHz} \)
- (3) \( \delta = 0.2; f = 20 \, \text{kHz} \)
- (4) \( \delta = 0.1; f = 20 \, \text{kHz} \)

Fig. 10. Average forward current as a function of solder point temperature; typical values

- \( T_j = 175 \, ^\circ \text{C} \)
- (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. 11. Reverse recovery definition; step recovery

Fig. 12. Reverse recovery definition; ramp recovery

Fig. 13. Forward recovery definition
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.

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. 15. Package outline CFP5 (SOD128)
13. Soldering

Fig. 16. Reflow soldering footprint for CFP5 (SOD128)
Fig. 17. Wave soldering footprint for CFP5 (SOD128)
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>20211109</td>
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15. Legal information

Data sheet status

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<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
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<td>[1][2]</td>
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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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