1. General description

Trench Maximum Efficiency General Application (MEGA) Schottky barrier rectifier encapsulated in a CFP2-HP (SOD323HP) power flat lead Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- Low forward voltage
- Low $Q_r$ and low $I_{RM}$
- Low leakage current
- High power capability due to clip-bonding technology
- Power flat lead plastic package with exposed heatsink for optimal thermal connection
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

- High efficiency DC-to-DC conversion
- Switch mode power supply
- Freewheeling applications
- Reverse polarity protection
- OR-ing

4. Quick reference data

Table 1. 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; $T_{sp} \leq 166$ °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>45</td>
<td>V</td>
</tr>
<tr>
<td>$V_F$</td>
<td>forward voltage</td>
<td>$I_F = 2$ A; pulsed; $T_j = 25$ °C</td>
<td>[1]</td>
<td>-</td>
<td>500</td>
<td>600</td>
</tr>
<tr>
<td>$I_R$</td>
<td>reverse current</td>
<td>$V_R = 45$ V; pulsed; $T_j = 25$ °C</td>
<td>[1]</td>
<td>-</td>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_R = 45$ V; pulsed; $T_j = 125$ °C</td>
<td>[1]</td>
<td>-</td>
<td>3</td>
<td>9</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></td>
<td></td>
</tr>
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</table>

6. Ordering information

Table 3. Ordering information

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package</th>
<th>Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMEG45T20EXD-Q</td>
<td>CFP2-HP</td>
<td>SOD323HP: plastic surface-mounted package with solderable lead ends; 2.2 mm x 1.3 mm x 0.68 mm body</td>
<td>SOD323HP</td>
</tr>
</tbody>
</table>

7. Marking

Table 4. Marking codes

<table>
<thead>
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<th>Type number</th>
<th>Marking code</th>
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</thead>
<tbody>
<tr>
<td>PMEG45T20EXD-Q</td>
<td>2J</td>
</tr>
</tbody>
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8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC60134).

<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>45</td>
<td>V</td>
</tr>
<tr>
<td>I_F</td>
<td>forward current</td>
<td>δ = 1; T_sp ≤ 165 °C</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; δ = 0.5; f = 20 kHz; square wave; T_sp ≤ 166 °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 = 8.3 ms; half sine wave; T_j(init) = 25 °C</td>
<td>-</td>
<td>22</td>
<td>A</td>
</tr>
<tr>
<td>P_tot</td>
<td>total power dissipation</td>
<td>T_amb ≤ 25 °C</td>
<td>[1]</td>
<td>0.65</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>
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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>230</td>
<td>K/W</td>
</tr>
<tr>
<td>$R_{th(j-sp)}$</td>
<td>thermal resistance from junction to solder point</td>
<td></td>
<td>[1]</td>
<td>[3]</td>
<td>125</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.

FR4 PCB, standard footprint

Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

FR4 PCB, mounting pad for cathode 1 cm$^2$

Fig. 2. 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; pulsed; T_j = 25 °C</td>
<td>[1] 45</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>V_F</td>
<td>forward voltage</td>
<td>I_F = 0.1 A; pulsed; T_j = 25 °C</td>
<td>[1] -</td>
<td>330</td>
<td>385</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_F = 0.5 A; pulsed; T_j = 25 °C</td>
<td>[1] -</td>
<td>390</td>
<td>445</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_F = 0.7 A; pulsed; T_j = 25 °C</td>
<td>[1] -</td>
<td>410</td>
<td>465</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_F = 1 A; pulsed; T_j = 25 °C</td>
<td>[1] -</td>
<td>430</td>
<td>490</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_F = 2 A; pulsed; T_j = 25 °C</td>
<td>[1] -</td>
<td>500</td>
<td>560</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_F = 2 A; pulsed; T_j = -40 °C</td>
<td>[1] -</td>
<td>540</td>
<td>600</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_F = 2 A; pulsed; T_j = 125 °C</td>
<td>[1] -</td>
<td>440</td>
<td>500</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_F = 2 A; pulsed; T_j = 150 °C</td>
<td>[1] -</td>
<td>430</td>
<td>490</td>
<td>mV</td>
</tr>
<tr>
<td>I_R</td>
<td>reverse current</td>
<td>V_R = 10 V; pulsed; T_j = 25 °C</td>
<td>[1] -</td>
<td>2</td>
<td>10</td>
<td>μA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_R = 45 V; pulsed; T_j = 25 °C</td>
<td>[1] -</td>
<td>4</td>
<td>25</td>
<td>μA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_R = 45 V; pulsed; T_j = 125 °C</td>
<td>[1] -</td>
<td>3</td>
<td>9</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_R = 45 V; pulsed; T_j = 150 °C</td>
<td>[1] -</td>
<td>11</td>
<td>40</td>
<td>mA</td>
</tr>
<tr>
<td>C_d</td>
<td>diode capacitance</td>
<td>V_R = 4 V; f = 1 MHz; T_j = 25 °C</td>
<td>-</td>
<td>160</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_R = 10 V; f = 1 MHz; T_j = 25 °C</td>
<td>-</td>
<td>100</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td>t_{tr}</td>
<td>reverse recovery time</td>
<td>I_F = 0.5 A; I_R = 1 A; I_{R(meas)} = 0.25 A; T_j = 25 °C</td>
<td>-</td>
<td>5</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>step recovery</td>
<td>dI_F/dt = 100 A/μs; I_F = 1 A; V_R = 30 V; T_j = 25 °C</td>
<td>-</td>
<td>9</td>
<td>-</td>
<td>ns</td>
</tr>
<tr>
<td>I_{RM}</td>
<td>peak reverse recovery current</td>
<td>-</td>
<td>0.38</td>
<td>-</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Q_{tr}</td>
<td>reverse recovery charge</td>
<td>-</td>
<td>2.5</td>
<td>-</td>
<td>nC</td>
<td></td>
</tr>
<tr>
<td>V_{FRM}</td>
<td>peak forward recovery voltage</td>
<td>I_F = 0.5 A; dI_F/dt = 20 A/μs; T_j = 25 °C</td>
<td>-</td>
<td>405</td>
<td>-</td>
<td>mV</td>
</tr>
</tbody>
</table>

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

PMEG45T20EXD-Q

45 V, 2 A Trench MEGA Schottky barrier rectifier

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

- Pulsed condition
  1. $T_j = 175 \, ^\circ\text{C}$
  2. $T_j = 150 \, ^\circ\text{C}$
  3. $T_j = 125 \, ^\circ\text{C}$
  4. $T_j = 100 \, ^\circ\text{C}$
  5. $T_j = 85 \, ^\circ\text{C}$
  6. $T_j = 25 \, ^\circ\text{C}$
  7. $T_j = -40 \, ^\circ\text{C}$

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

- Pulsed condition
  1. $T_j = 175 \, ^\circ\text{C}$
  2. $T_j = 150 \, ^\circ\text{C}$
  3. $T_j = 125 \, ^\circ\text{C}$
  4. $T_j = 100 \, ^\circ\text{C}$
  5. $T_j = 85 \, ^\circ\text{C}$
  6. $T_j = 25 \, ^\circ\text{C}$
  7. $T_j = -40 \, ^\circ\text{C}$

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

- $f = 1 \, \text{MHz}; \ T_{\text{amb}} = 25 \, ^\circ\text{C}$

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

- $T_j = 100 \, ^\circ\text{C}$
  1. $\delta = 0.1$
  2. $\delta = 0.2$
  3. $\delta = 0.5$
  4. $\delta = 0.8$
  5. $\delta = 1; \ \text{DC}$
**Fig. 7.** Average reverse power dissipation as a function of reverse voltage; typical values

\[
PR_{(AV)}(W) = 0.0 \times 10^3 V_R(V)
\]

- \(T_j = 100\ °C\)
- (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

\[
IF_{(AV)}(A) = 0 \times 10^3 (T_{amb}\ °C)
\]

- \(T_j = 175\ °C\)
- (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. 9.** Average forward current as a function of ambient temperature; typical values

FR4 PCB, mounting pad for cathode 1 cm²

- \(T_j = 175\ °C\)
- (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 solder point temperature; typical values

FR4 PCB, standard footprint

- \(T_j = 175\ °C\)
- (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. Derated maximum reverse voltage as a function of junction temperature; typical values
FR4 PCB, standard footprint
$R_{th} = 230 \, \text{K/W}$

Fig. 12. Derated maximum reverse voltage as a function of junction temperature; typical values
FR4 PCB, mounting pad for cathode 1 cm$^2$
$R_{th} = 125 \, \text{K/W}$

Fig. 13. Derated maximum reverse voltage as a function of junction temperature; typical values
Soldering point of cathode tab
$R_{th} = 6 \, \text{K/W}$
11. Test information

Fig. 14. Reverse recovery definition; step recovery

Fig. 15. Reverse recovery definition; ramp recovery

Fig. 16. 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

\[ I_{RMS} = I_{F(AV)} \text{ at DC, and } I_{RMS} = I_M \times \sqrt{\delta} \] 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**
13. Soldering

Footprint information for reflow soldering of SOD323HP

---

Fig. 19. Reflow soldering footprint for CFP2-HP (SOD323HP)

Dimensions in mm

1.0 0.5 0.9 0.4 1.7 1.6 0.5 1.5
1.1 1.2 1.0 1.0 1.0
1.8 1.4 1.4 1.2 1.1 1.0
0.78 0.88 0.98 1.18
0.78 0.88 0.98 1.18

recommended stencil thickness: 0.1 mm

occupied area
solder resist
solder land
solder paste

Issue date 21-04-02

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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>PMEG45T20EXD-Q v.1</td>
<td>20210618</td>
<td>Product data sheet</td>
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</tbody>
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15. Legal information

Data sheet status

<table>
<thead>
<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
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<td>Objective [short] data sheet</td>
<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>
<td>This document contains data from the preliminary specification.</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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