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Kind regards,

Team Nexperia



# PMEG4050EP

5 A low  $V_F$  MEGA Schottky barrier rectifier

Rev. 01 — 14 September 2009

Product data sheet

## 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 SOD128 small and flat lead Surface-Mounted Device (SMD) plastic package.

### 1.2 Features

- Average forward current:  $I_{F(AV)} \leq 5$  A
- Reverse voltage:  $V_R \leq 40$  V
- Low forward voltage
- High power capability due to clip-bond technology
- AEC-Q101 qualified
- Small and flat lead SMD plastic package

### 1.3 Applications

- Low voltage rectification
- High efficiency DC-to-DC conversion
- Switch Mode Power Supply (SMPS)
- Reverse polarity protection
- Low power consumption applications

### 1.4 Quick reference data

**Table 1. Quick reference data**  
 *$T_j = 25^\circ\text{C}$  unless otherwise specified.*

| Symbol      | Parameter               | Conditions                                                                           | Min | Typ | Max | Unit          |
|-------------|-------------------------|--------------------------------------------------------------------------------------|-----|-----|-----|---------------|
| $I_{F(AV)}$ | average forward current | square wave;<br>$\delta = 0.5$ ;<br>$f = 20$ kHz;<br>$T_{sp} \leq 130^\circ\text{C}$ | -   | -   | 5   | A             |
| $V_R$       | reverse voltage         |                                                                                      | -   | -   | 40  | V             |
| $V_F$       | forward voltage         | $I_F = 5$ A                                                                          | -   | 430 | 490 | mV            |
| $I_R$       | reverse current         | $V_R = 40$ V                                                                         | -   | 60  | 300 | $\mu\text{A}$ |

## 2. Pinning information

Table 2. Pinning

| Pin | Description            | Simplified outline                                                                  | Graphic symbol                                                                      |
|-----|------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1   | cathode <sup>[1]</sup> |  |  |
| 2   | anode                  |                                                                                     |                                                                                     |

sym001

[1] The marking bar indicates the cathode.

## 3. Ordering information

Table 3. Ordering information

| Type number | Package |                                          |         |
|-------------|---------|------------------------------------------|---------|
|             | Name    | Description                              | Version |
| PMEG4050EP  | -       | plastic surface-mounted package; 2 leads | SOD128  |

## 4. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PMEG4050EP  | AF           |

## 5. Limiting values

Table 5. Limiting values

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

| Symbol      | Parameter                           | Conditions                                              | Min                 | Max  | Unit |
|-------------|-------------------------------------|---------------------------------------------------------|---------------------|------|------|
| $V_R$       | reverse voltage                     | $T_j = 25\text{ }^\circ\text{C}$                        | -                   | 40   | V    |
| $I_{F(AV)}$ | average forward current             | square wave;<br>$\delta = 0.5$ ;<br>$f = 20\text{ kHz}$ |                     |      |      |
|             |                                     | $T_{amb} \leq 0\text{ }^\circ\text{C}$ <sup>[1]</sup>   | -                   | 5    | A    |
|             |                                     | $T_{sp} \leq 130\text{ }^\circ\text{C}$                 | -                   | 5    | A    |
| $I_{FSM}$   | non-repetitive peak forward current | square wave;<br>$t_p = 8\text{ ms}$                     | <sup>[2]</sup> -    | 70   | A    |
| $P_{tot}$   | total power dissipation             | $T_{amb} \leq 25\text{ }^\circ\text{C}$                 | <sup>[3][4]</sup> - | 625  | mW   |
|             |                                     |                                                         | <sup>[3][5]</sup> - | 1050 | mW   |
|             |                                     |                                                         | <sup>[3][1]</sup> - | 2100 | mW   |

**Table 5.** Limiting values ...continued

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

| Symbol    | Parameter            | Conditions | Min | Max  | Unit |
|-----------|----------------------|------------|-----|------|------|
| $T_j$     | junction temperature |            | -   | 150  | °C   |
| $T_{amb}$ | ambient temperature  |            | -55 | +150 | °C   |
| $T_{stg}$ | storage temperature  |            | -65 | +150 | °C   |

[1] Device mounted on a ceramic PCB,  $Al_2O_3$ , standard footprint.[2]  $T_j = 25$  °C prior to surge.

[3] Reflow soldering is the only recommended soldering method.

[4] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[5] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm<sup>2</sup>.

## 6. Thermal characteristics

**Table 6.** Thermal characteristics

| Symbol         | Parameter                                        | Conditions  | Min    | Typ | Max | Unit    |
|----------------|--------------------------------------------------|-------------|--------|-----|-----|---------|
| $R_{th(j-a)}$  | thermal resistance from junction to ambient      | in free air | [1][2] |     |     |         |
|                |                                                  |             | [3]    | -   | -   | 200 K/W |
|                |                                                  |             | [4]    | -   | -   | 120 K/W |
|                |                                                  |             | [5]    | -   | -   | 60 K/W  |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point |             | [6]    | -   | -   | 12 K/W  |

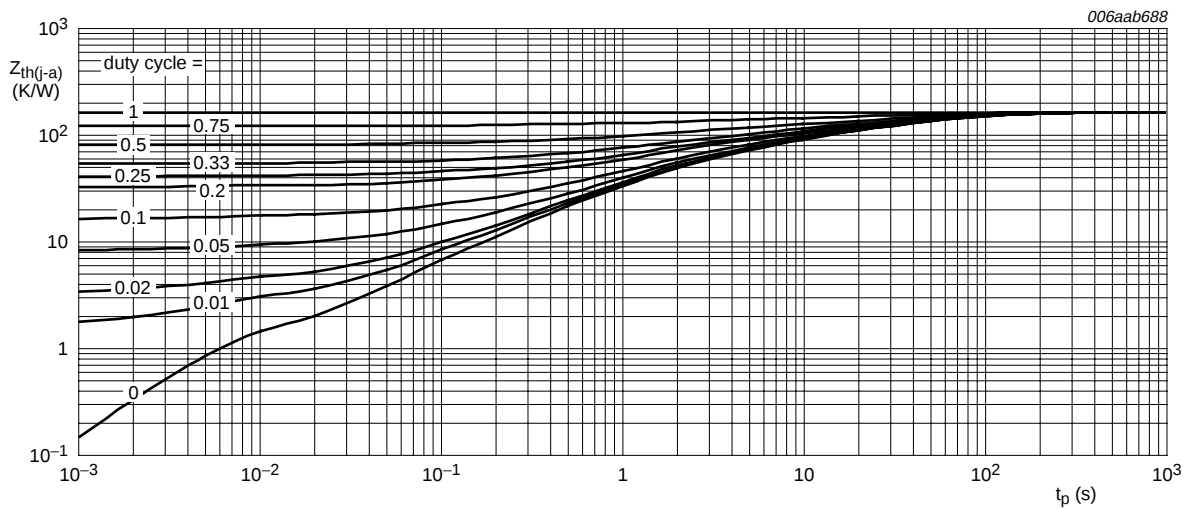
[1] For Schottky barrier diodes thermal runaway has to be considered, as in some applications the reverse power losses  $P_R$  are a significant part of the total power losses.

[2] Reflow soldering is the only recommended soldering method.

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

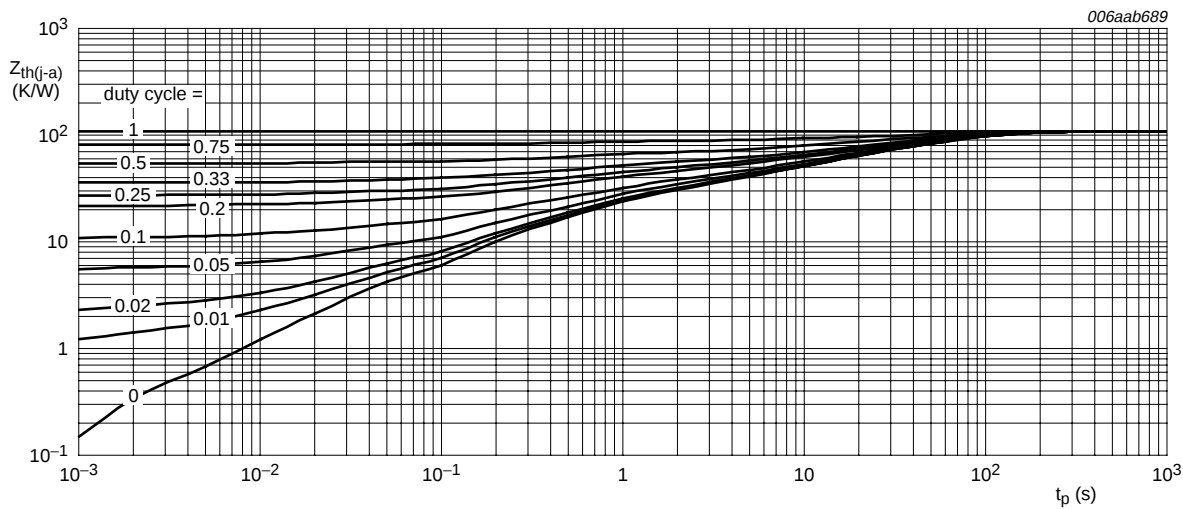
[4] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm<sup>2</sup>.[5] Device mounted on a ceramic PCB,  $Al_2O_3$ , standard footprint.

[6] Soldering point of cathode tab.



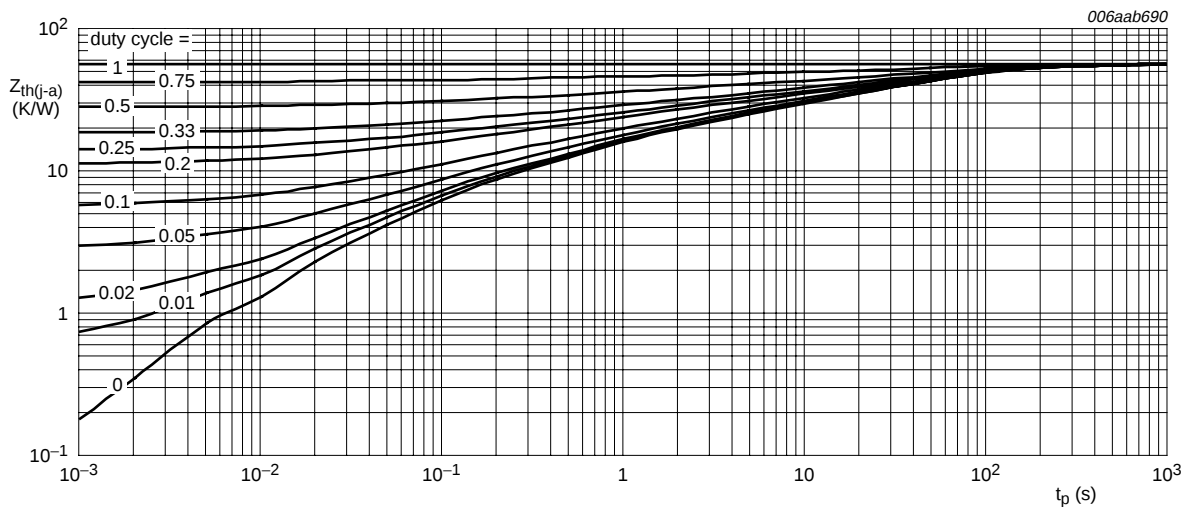
FR4 PCB, standard footprint

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



FR4 PCB, mounting pad for cathode  $1\text{ cm}^2$

Fig 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



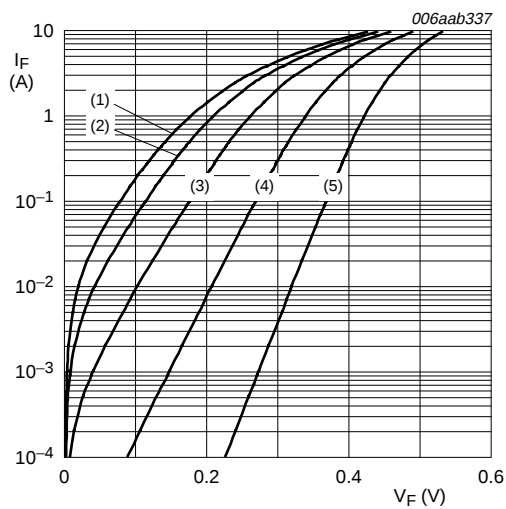
Ceramic PCB,  $Al_2O_3$ , standard footprint

Fig 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7. Characteristics

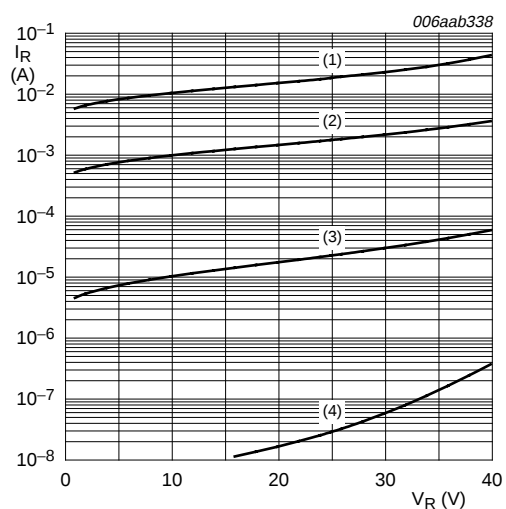
Table 7. Characteristics  
 $T_j = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

| Symbol | Parameter         | Conditions           | Min | Typ | Max | Unit          |
|--------|-------------------|----------------------|-----|-----|-----|---------------|
| $V_F$  | forward voltage   | $I_F = 0.1\text{ A}$ | -   | 270 | 310 | mV            |
|        |                   | $I_F = 1\text{ A}$   | -   | 340 | 390 | mV            |
|        |                   | $I_F = 5\text{ A}$   | -   | 430 | 490 | mV            |
| $I_R$  | reverse current   | $V_R = 10\text{ V}$  | -   | 10  | -   | $\mu\text{A}$ |
|        |                   | $V_R = 40\text{ V}$  | -   | 60  | 300 | $\mu\text{A}$ |
| $C_d$  | diode capacitance | $f = 1\text{ MHz}$   |     |     |     |               |
|        |                   | $V_R = 1\text{ V}$   | -   | 600 | -   | pF            |
|        |                   | $V_R = 10\text{ V}$  | -   | 220 | -   | pF            |



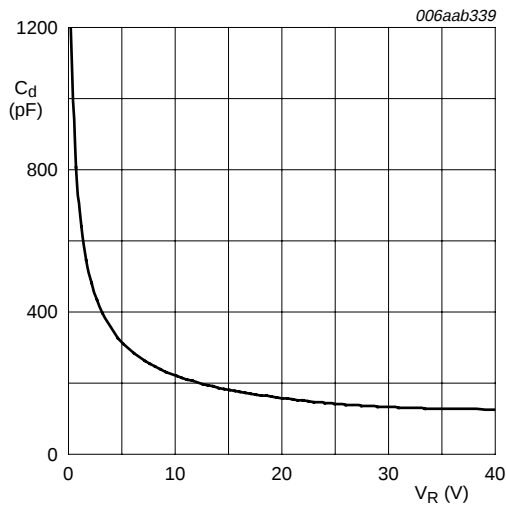
- (1)  $T_j = 150^\circ\text{C}$
- (2)  $T_j = 125^\circ\text{C}$
- (3)  $T_j = 85^\circ\text{C}$
- (4)  $T_j = 25^\circ\text{C}$
- (5)  $T_j = -40^\circ\text{C}$

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



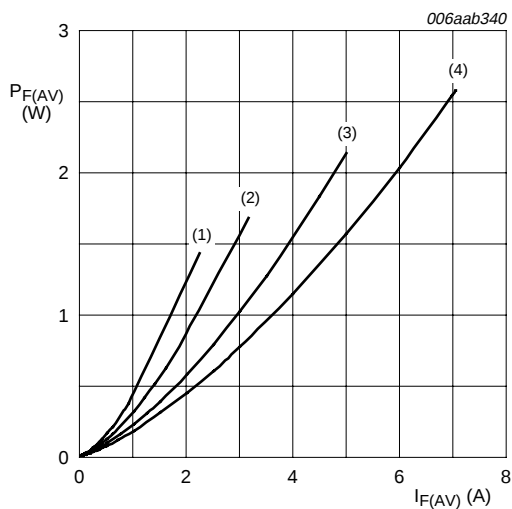
- (1)  $T_j = 125^\circ\text{C}$
- (2)  $T_j = 85^\circ\text{C}$
- (3)  $T_j = 25^\circ\text{C}$
- (4)  $T_j = -40^\circ\text{C}$

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



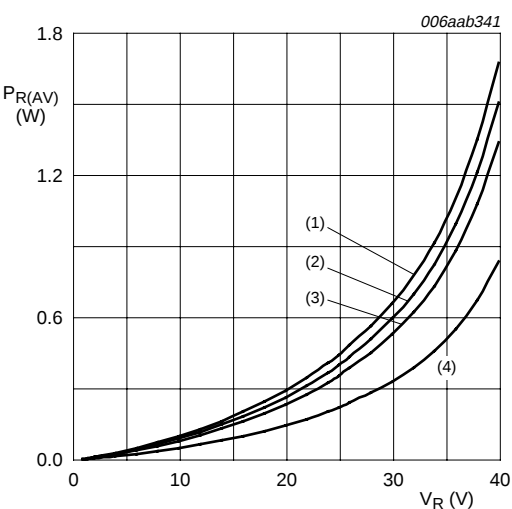
$f = 1\text{ MHz}$ ;  $T_{\text{amb}} = 25^\circ\text{C}$

Fig 6. Diode capacitance as a function of reverse voltage; typical values



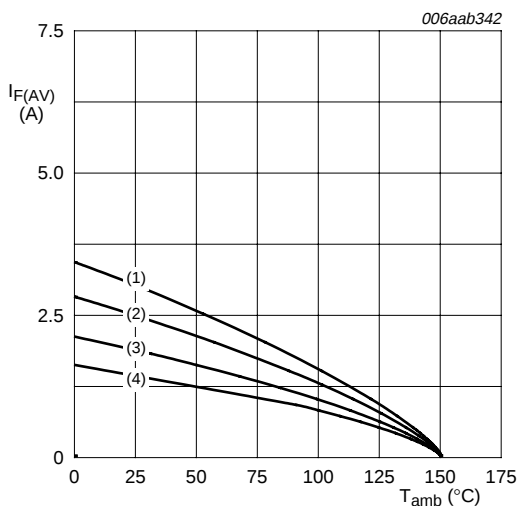
- $T_j = 150\text{ }^{\circ}\text{C}$
- (1)  $\delta = 0.1$
  - (2)  $\delta = 0.2$
  - (3)  $\delta = 0.5$
  - (4)  $\delta = 1$

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



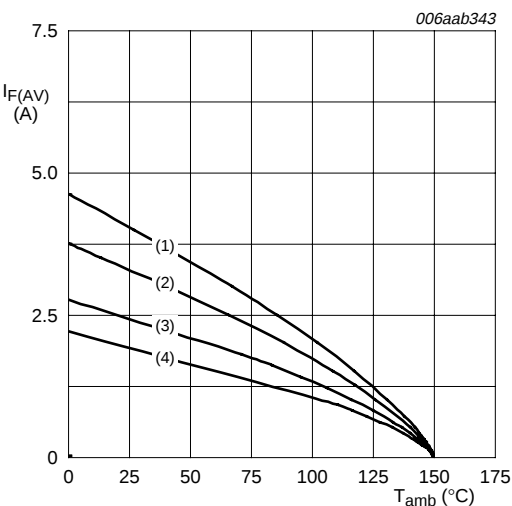
- $T_j = 125\text{ }^{\circ}\text{C}$
- (1)  $\delta = 1$
  - (2)  $\delta = 0.9$
  - (3)  $\delta = 0.8$
  - (4)  $\delta = 0.5$

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



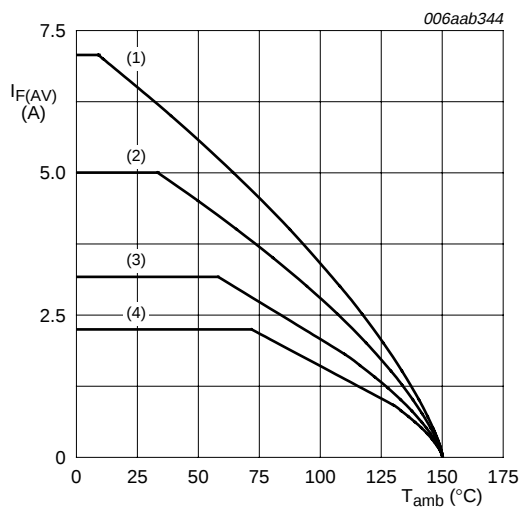
- FR4 PCB, standard footprint  
 $T_j = 150\text{ }^{\circ}\text{C}$
- (1)  $\delta = 1$ ; DC
  - (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$
  - (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$
  - (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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



- FR4 PCB, mounting pad for cathode  $1\text{ cm}^2$   
 $T_j = 150\text{ }^{\circ}\text{C}$
- (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 ambient temperature; typical values

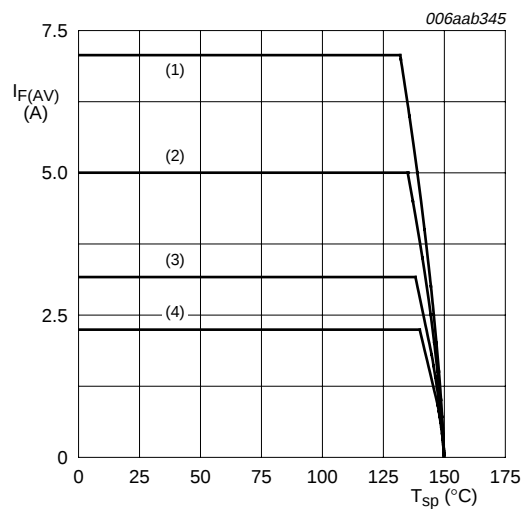


Ceramic PCB,  $Al_2O_3$ , standard footprint

$T_j = 150$  °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

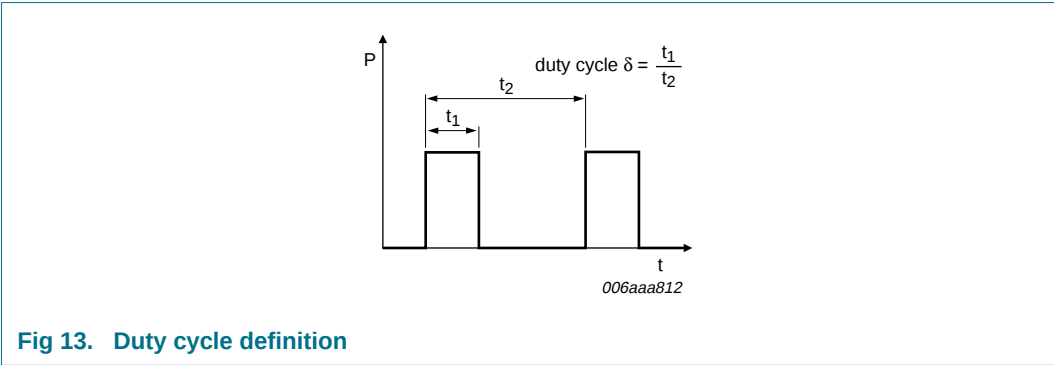


$T_j = 150$  °C

- (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

8. Test information

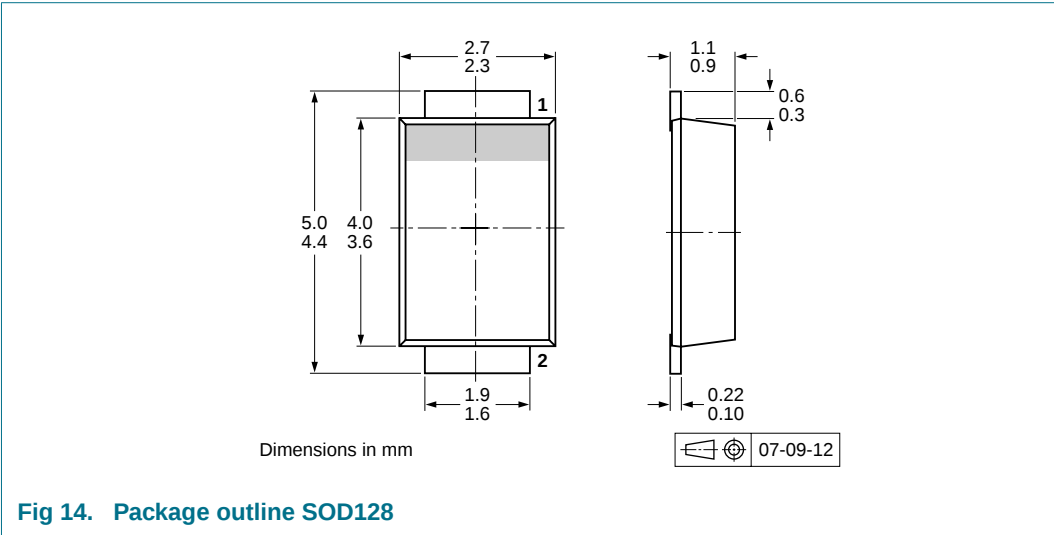


The current ratings for the typical waveforms as shown in [Figure 9](#), [10](#), [11](#) and [12](#) are calculated according to the equations:  $I_{F(AV)} = I_M \times \delta$  with  $I_M$  defined as peak current,  $I_{RMS} = I_{F(AV)}$  at DC, and  $I_{RMS} = I_M \times \sqrt{\delta}$  with  $I_{RMS}$  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



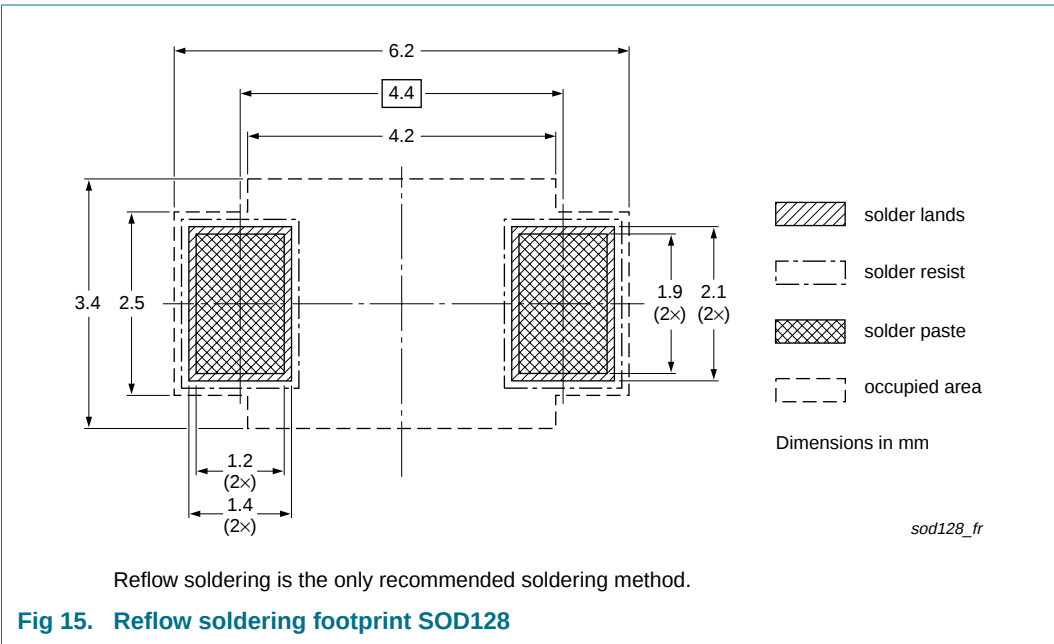
10. Packing information

**Table 8. Packing methods**  
*The indicated -xxx are the last three digits of the 12NC ordering code.*[\[1\]](#)

| Type number | Package | Description                     | Packing quantity |
|-------------|---------|---------------------------------|------------------|
|             |         |                                 | <b>3000</b>      |
| PMEG4050EP  | SOD128  | 4 mm pitch, 12 mm tape and reel | -115             |

[1] For further information and the availability of packing methods, see [Section 14](#).

11. Soldering



12. Revision history

Table 9. Revision history

| Document ID  | Release date | Data sheet status  | Change notice | Supersedes |
|--------------|--------------|--------------------|---------------|------------|
| PMEG4050EP_1 | 20090914     | Product data sheet | -             | -          |

## 13. Legal information

### 13.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | Definition                                                                            |
|-----------------------------------|-------------------------------|---------------------------------------------------------------------------------------|
| 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.                                     |

[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".

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