

# PMEG4020ER

2 A low  $V_F$  MEGA Schottky barrier rectifier

Rev. 01 — 22 October 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 SOD123W small and flat lead Surface-Mounted Device (SMD) plastic package.

### 1.2 Features

- Average forward current:  $I_{F(AV)} \leq 2$  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**  
 $T_j = 25$  °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 |     |     |     |      |
|             |                         | $T_{amb} \leq 85$ °C                             | [1] | -   | 2   | A    |
|             |                         | $T_{sp} \leq 140$ °C                             | -   | -   | 2   | A    |
| $V_R$       | reverse voltage         |  | -   | -   | 40  | V    |
| $V_F$       | forward voltage         | $I_F = 2$ A                                      | -   | 430 | 490 | mV   |
| $I_R$       | reverse current         | $V_R = 40$ V                                     | -   | 25  | 100 | μA   |

[1] Device mounted on a ceramic Printed-Circuit Board (PCB),  $Al_2O_3$ , standard footprint.

## 2. Pinning information

**Table 2. Pinning**

| Pin | Description                 | Simplified outline  | Graphic symbol   |
|-----|-----------------------------|---|--|
| 1   | cathode <a href="#">[1]</a> |  | <br><i>sym001</i> |
| 2   | anode                       |   |  |

[1] The marking bar indicates the cathode.

## 3. Ordering information

**Table 3. Ordering information**

| Type number | Package |  |         |
|-------------|---------|--|---------|
|             | Name    | Description                              | Version |
| PMEG4020ER  | -       | plastic surface-mounted package; 2 leads | SOD123W |

## 4. Marking

**Table 4. Marking codes**

| Type number | Marking code |
|-------------|--------------|
| PMEG4020ER  | BE           |

## 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                     | $T_j = 25\text{ °C}$                                    | -                        | 40   | V    |
| $I_{F(AV)}$ | average forward current             | square wave;<br>$\delta = 0.5$ ;<br>$f = 20\text{ kHz}$ |                          |      |      |
|             |                                     | $T_{amb} \leq 85\text{ °C}$                             | <a href="#">[1]</a> -    | 2    | A    |
|             |                                     | $T_{sp} \leq 140\text{ °C}$                             | -                        | 2    | A    |
| $I_{FSM}$   | non-repetitive peak forward current | square wave;<br>$t_p = 8\text{ ms}$                     | <a href="#">[2]</a> -    | 50   | A    |
| $P_{tot}$   | total power dissipation             | $T_{amb} \leq 25\text{ °C}$                             | <a href="#">[3][4]</a> - | 0.57 | W    |
|             |                                     |   | <a href="#">[3][5]</a> - | 0.95 | W    |
|             |                                     |   | <a href="#">[3][1]</a> - | 1.8  | W    |

**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   |

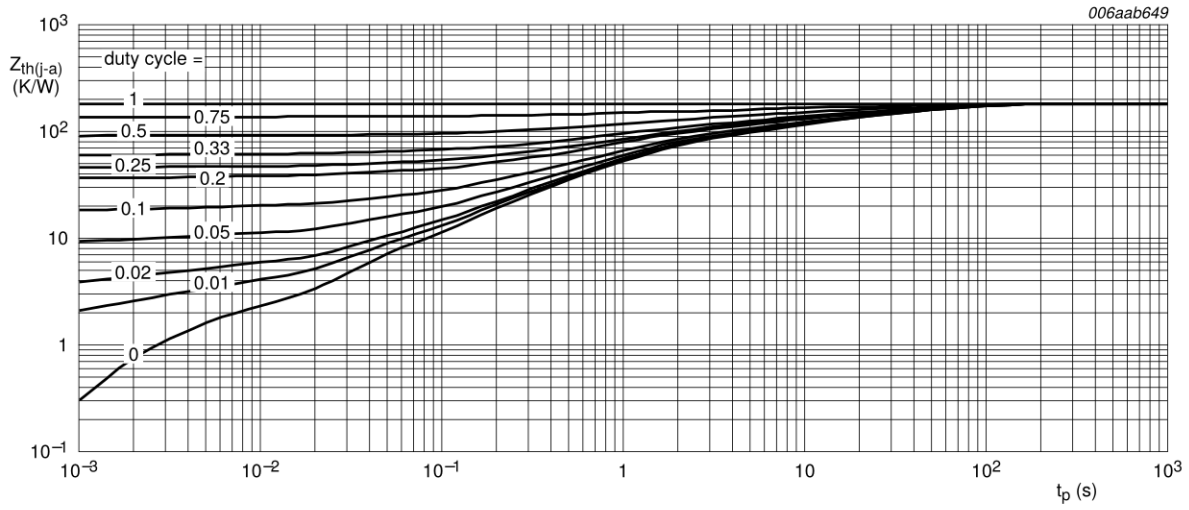
- [1] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.
- [2]  $T_j = 25$  °C prior to surge.
- [3] Reflow soldering is the only recommended soldering method.
- [4] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [5] Device mounted 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**

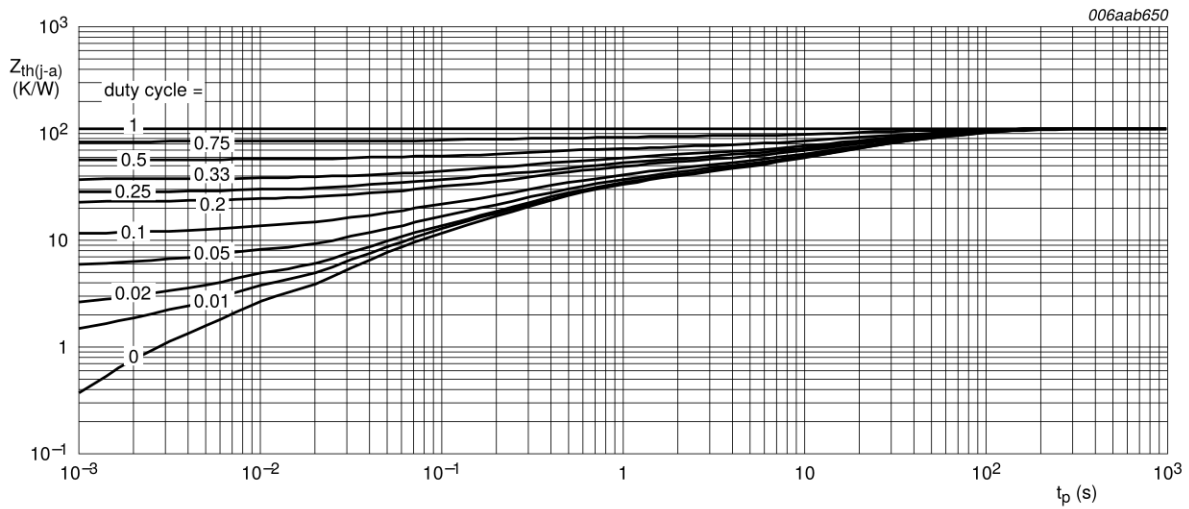
| Symbol         | Parameter  | Conditions  | Min    | Typ | Max | Unit |     |
|----------------|--|-------------|--------|-----|-----|------|-----|
| $R_{th(j-a)}$  | thermal resistance from junction to ambient      | in free air | [1][2] |     |     |      |     |
|                |  |             | [3]    | -   | -   | 220  | K/W |
|                |  |             | [4]    | -   | -   | 130  | K/W |
|                |  |             | [5]    | -   | -   | 70   | K/W |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point |             | [6]    | -   | -   | 18   | 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<sub>2</sub>O<sub>3</sub>, standard footprint.
- [6] Soldering point of cathode tab.



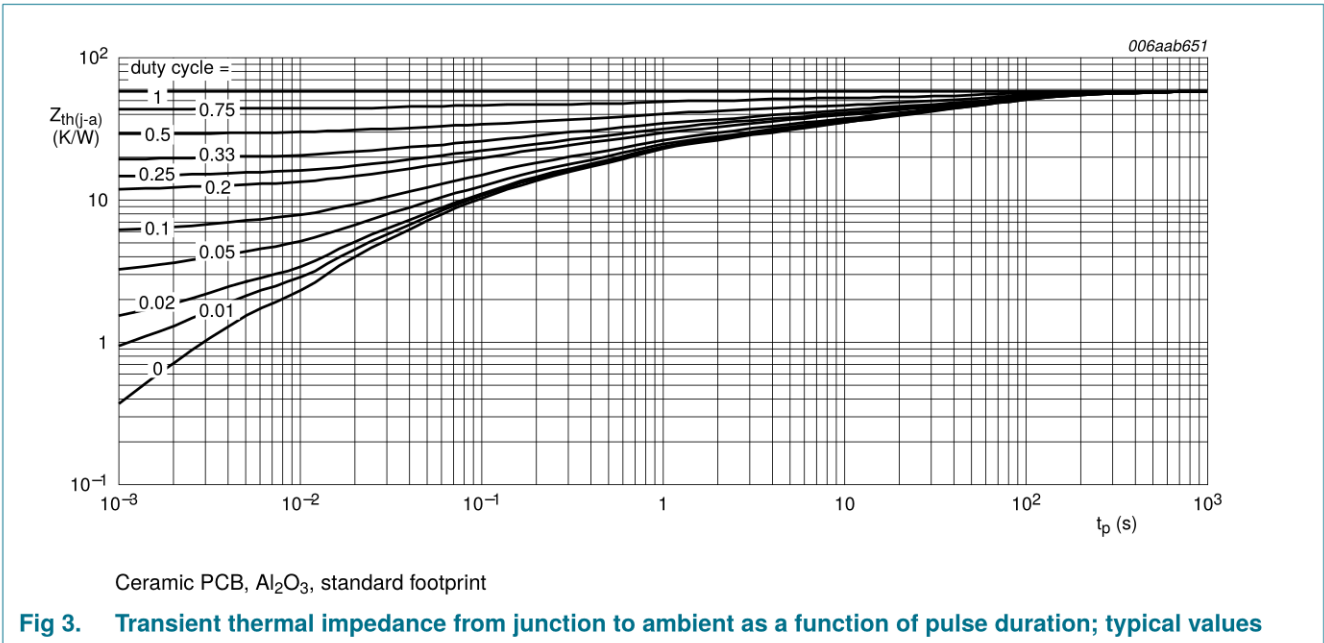
FR4 PCB, standard footprint

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



FR4 PCB, mounting pad for cathode 1 cm<sup>2</sup>

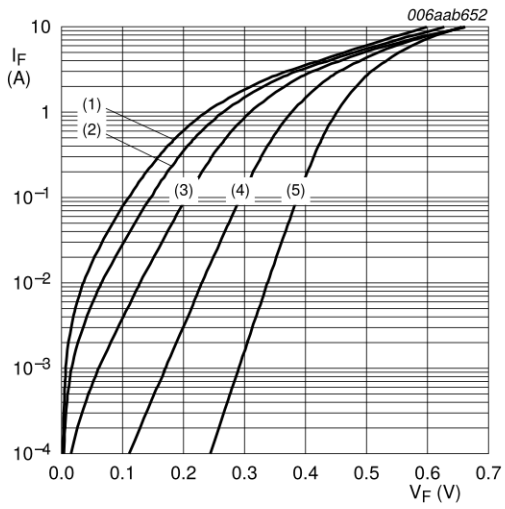
Fig 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



## 7. Characteristics

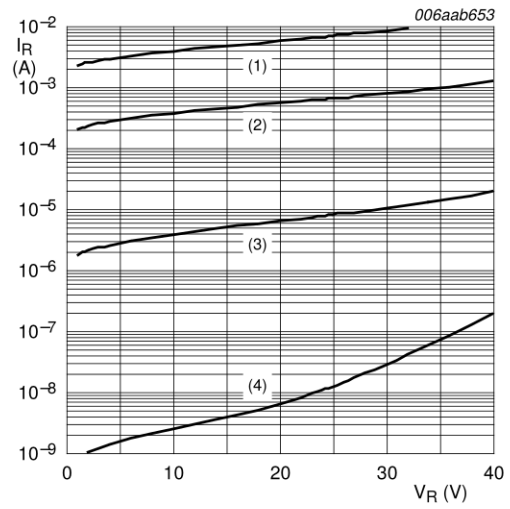
**Table 7. Characteristics**  
 $T_j = 25\text{ }^\circ\text{C}$  unless otherwise specified.

| Symbol | Parameter         | Conditions           | Min | Typ | Max | Unit          |
|--------|-------------------|----------------------|-----|-----|-----|---------------|
| $V_F$  | forward voltage   | $I_F = 0.1\text{ A}$ | -   | 295 | 330 | mV            |
|        |                   | $I_F = 1\text{ A}$   | -   | 380 | 440 | mV            |
|        |                   | $I_F = 2\text{ A}$   | -   | 430 | 490 | mV            |
| $I_R$  | reverse current   | $V_R = 10\text{ V}$  | -   | 5   | -   | $\mu\text{A}$ |
|        |                   | $V_R = 40\text{ V}$  | -   | 25  | 100 | $\mu\text{A}$ |
| $C_d$  | diode capacitance | $f = 1\text{ MHz}$   |     |     |     |               |
|        |                   | $V_R = 1\text{ V}$   | -   | 250 | -   | pF            |
|        |                   | $V_R = 10\text{ V}$  | -   | 95  | -   | pF            |



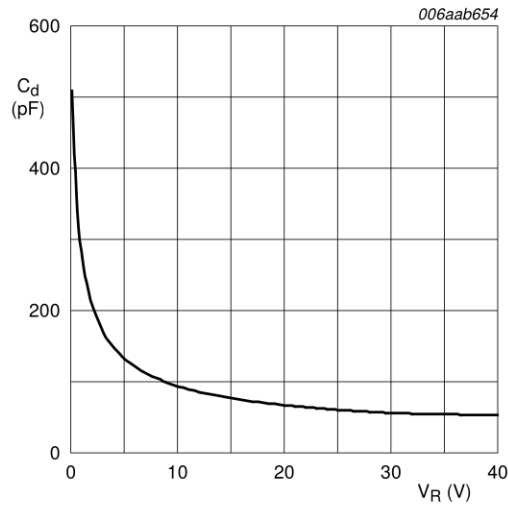
- (1)  $T_j = 150\text{ °C}$
- (2)  $T_j = 125\text{ °C}$
- (3)  $T_j = 85\text{ °C}$
- (4)  $T_j = 25\text{ °C}$
- (5)  $T_j = -40\text{ °C}$

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



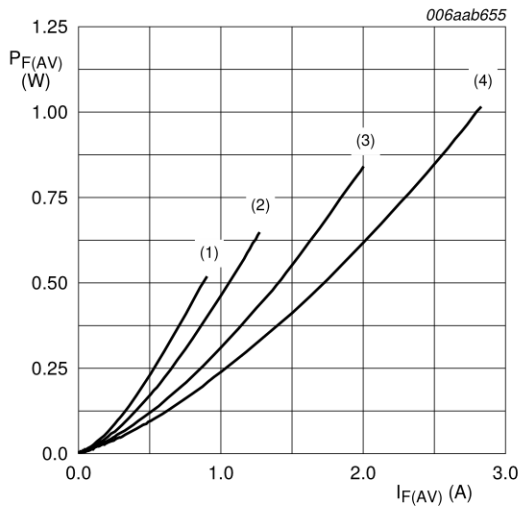
- (1)  $T_j = 125\text{ °C}$
- (2)  $T_j = 85\text{ °C}$
- (3)  $T_j = 25\text{ °C}$
- (4)  $T_j = -40\text{ °C}$

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



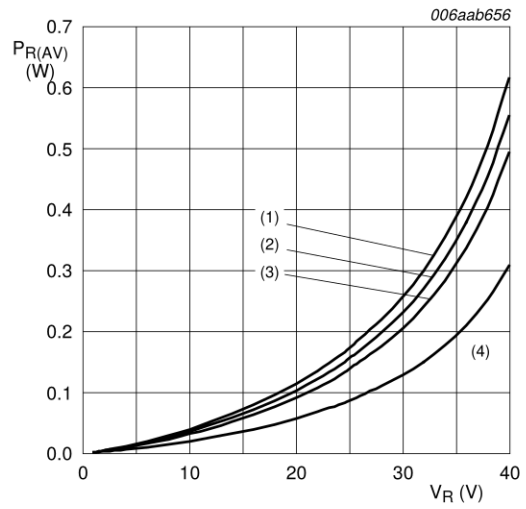
$f = 1\text{ MHz}; T_{amb} = 25\text{ °C}$

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



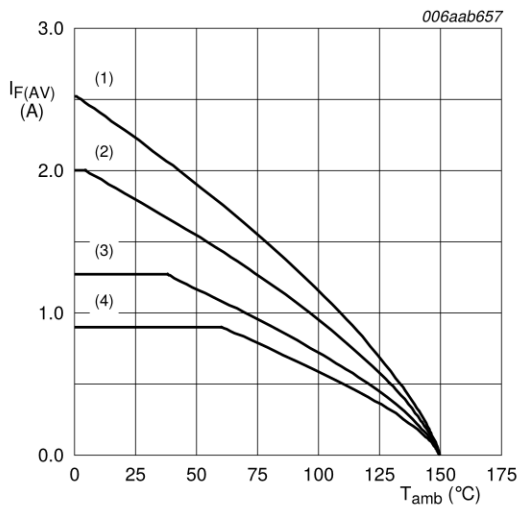
- $T_j = 150\text{ }^\circ\text{C}$
- (1)  $\delta = 0.1$
  - (2)  $\delta = 0.2$
  - (3)  $\delta = 0.5$
  - (4)  $\delta = 1$

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



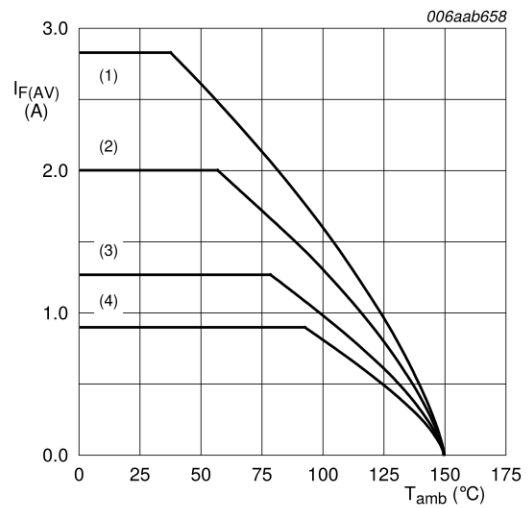
- $T_j = 125\text{ }^\circ\text{C}$
- (1)  $\delta = 1$
  - (2)  $\delta = 0.9$
  - (3)  $\delta = 0.8$
  - (4)  $\delta = 0.5$

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



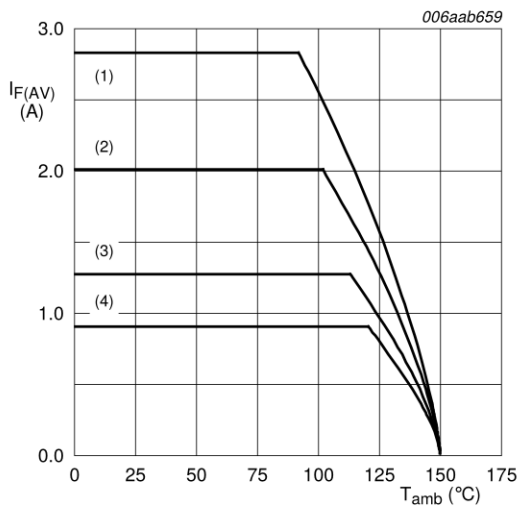
- FR4 PCB, standard footprint  
 $T_j = 150\text{ }^\circ\text{C}$
- (1)  $\delta = 1$ ; DC
  - (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$
  - (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$
  - (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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



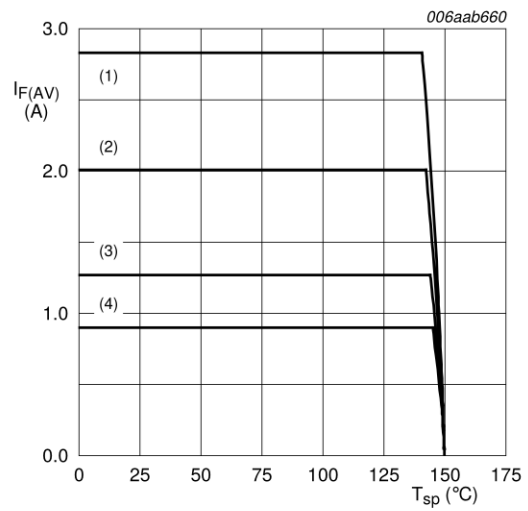
- FR4 PCB, mounting pad for cathode  $1\text{ cm}^2$   
 $T_j = 150\text{ }^\circ\text{C}$
- (1)  $\delta = 1$ ; DC
  - (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$
  - (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$
  - (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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



Ceramic PCB,  $Al_2O_3$ , standard footprint  
 $T_j = 150\text{ °C}$   
 (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 11. Average forward current as a function of ambient temperature; typical values**

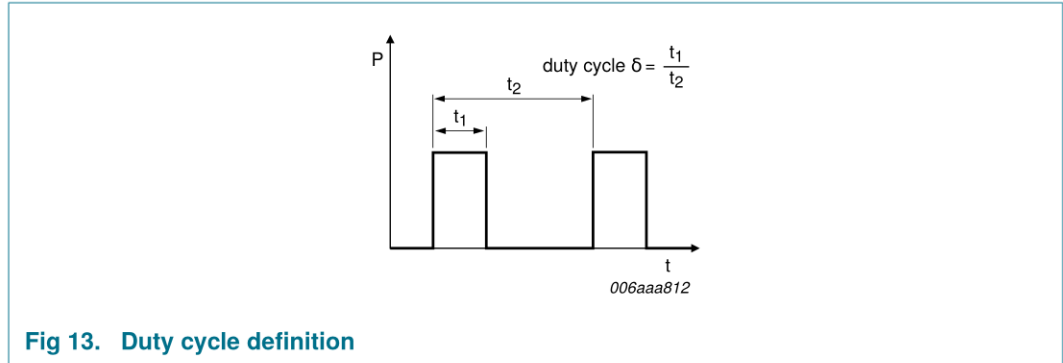


$T_j = 150\text{ °C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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



## 8. Test information



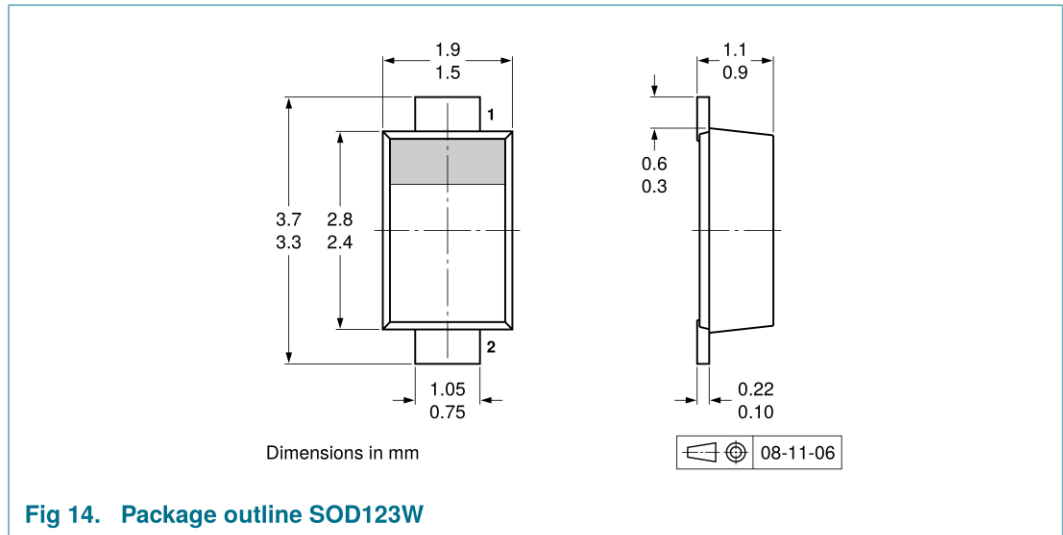
**Fig 13. Duty cycle definition**

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



**Fig 14. Package outline SOD123W**

## 10. Packing information

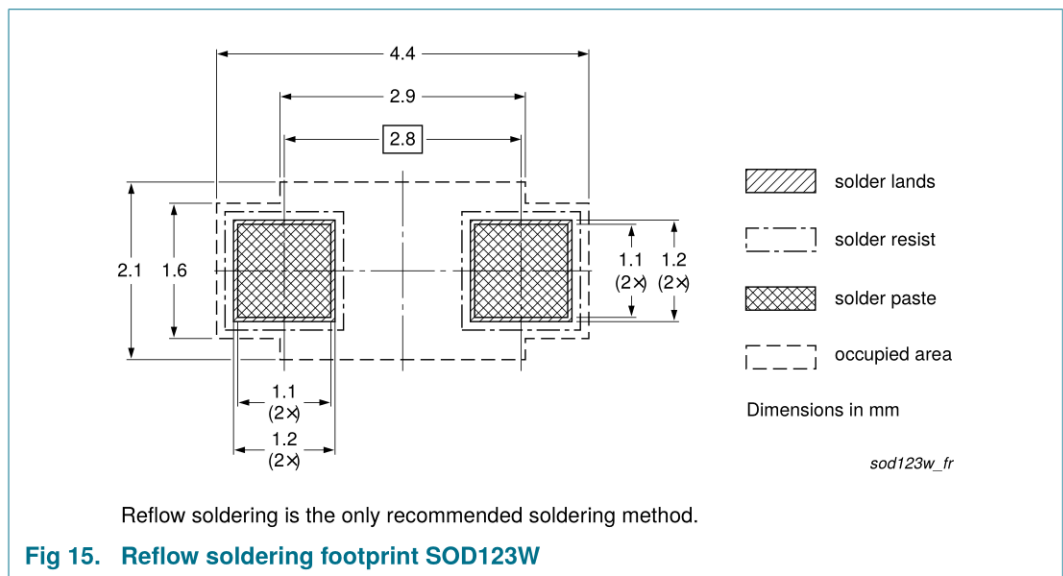
**Table 8. Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

| Type number | Package | Description                    | Packing quantity |
|-------------|---------|--------------------------------|------------------|
|             |         |                                | <b>3000</b>      |
| PMEG4020ER  | SOD123W | 4 mm pitch, 8 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 |
|--------------|--------------|--------------------|---------------|------------|
| PMEG4020ER_1 | 20091022     | 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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Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

