



# PMEG4015EPK

40 V, 1.5 A low VF MEGA Schottky barrier rectifier

Rev. 2 — 6 March 2012

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 leadless ultra small SOD1608 (DFN1608D-2) Surface-Mounted Device (SMD) plastic package with visible and solderable side pads.

### 1.2 Features and benefits

- Average forward current:  $I_{F(AV)} \leq 1.5$  A
- Reverse voltage:  $V_R \leq 40$  V
- Low forward voltage  $V_F \leq 610$  mV
- Low reverse current
- AEC-Q101 qualified
- Solderable side pads
- Package height typ. 0.37 mm
- Ultra small and leadless SMD plastic package

### 1.3 Applications

- Low voltage rectification
- High efficiency DC-to-DC conversion
- Switch mode power supply
- LED backlight for mobile application
- Low power consumption applications
- Ultra high-speed switching
- Reverse polarity protection

### 1.4 Quick reference data

Table 1. Quick reference data

| Symbol      | Parameter               | Conditions                                                                        | Min | Typ | Max | Unit    |
|-------------|-------------------------|-----------------------------------------------------------------------------------|-----|-----|-----|---------|
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$ ; $f = 20$ kHz; $T_{amb} \leq 65$ °C; square wave                  | -   | -   | 1.5 | A       |
|             |                         | $\delta = 0.5$ ; $f = 20$ kHz; $T_{sp} \leq 135$ °C; square wave                  | -   | -   | 1.5 | A       |
| $V_R$       | reverse voltage         | $T_j = 25$ °C                                                                     | -   | -   | 40  | V       |
| $V_F$       | forward voltage         | $I_F = 1.5$ A; pulsed; $t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$ ; $T_j = 25$ °C | -   | 540 | 610 | mV      |
| $I_R$       | reverse current         | $V_R = 10$ V; $T_j = 25$ °C                                                       | -   | 1   | 5   | $\mu$ A |
| $t_{rr}$    | reverse recovery time   | $I_R = 0.5$ A; $I_F = 0.5$ A; $I_{R(meas)} = 0.1$ A; $T_j = 25$ °C                | -   | 4   | -   | ns      |

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



2. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description            | Simplified outline                                                                                                                        | Graphic symbol                                                                                    |
|-----|--------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| 1   | K      | cathode <sup>[1]</sup> |  <p>Transparent top view</p> <p>SOD1608 (DFN1608D-2)</p> |  <p>sym001</p> |
| 2   | A      | anode                  |                                                                                                                                           |                                                                                                   |

[1] The marking bar indicates the cathode.

3. Ordering information

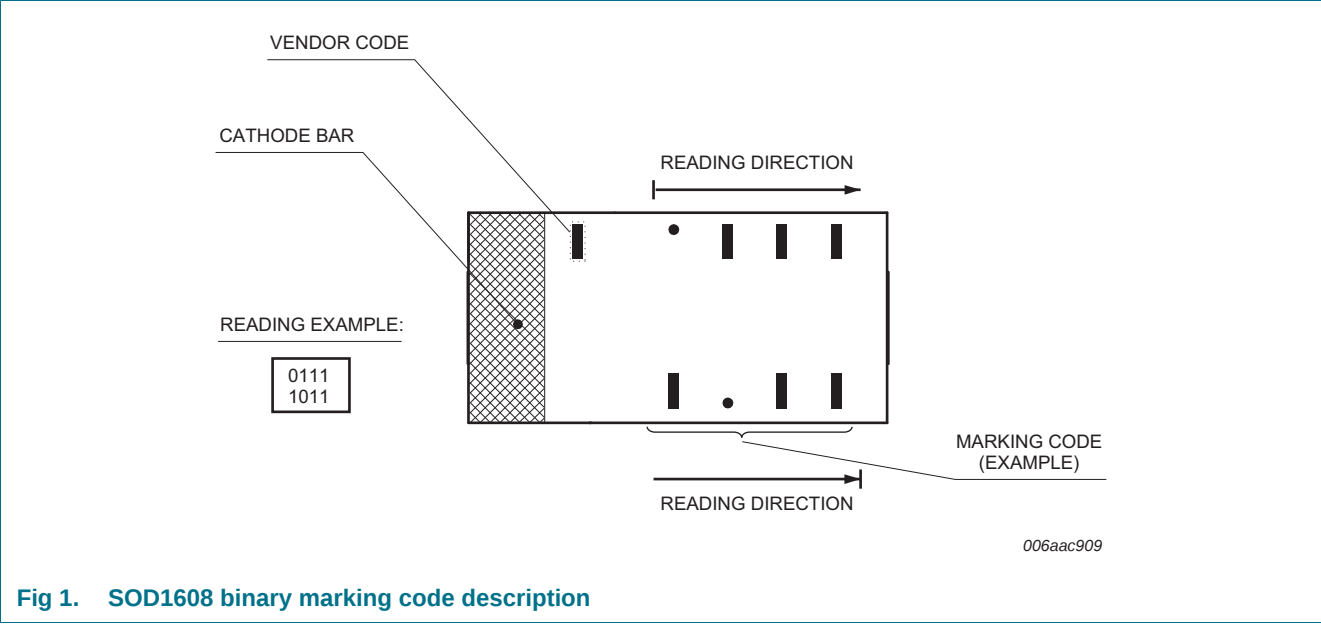
Table 3. Ordering information

| Type number | Package    |                                                   |         |
|-------------|------------|---------------------------------------------------|---------|
|             | Name       | Description                                       | Version |
| PMEG4015EPK | DFN1608D-2 | Leadless ultra small plastic package; 2 terminals | SOD1608 |

4. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PMEG4015EPK | 0110 0000    |



## 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    |
| $I_F$       | forward current                     | $T_{sp} \leq 130\text{ °C}$                                                     | -      | 2.1  | A    |
| $I_{F(AV)}$ | average forward current             | $\delta = 0.5$ ; $f = 20\text{ kHz}$ ; square wave; $T_{amb} \leq 65\text{ °C}$ | [1]    | 1.5  | A    |
|             |                                     | $\delta = 0.5$ ; $f = 20\text{ kHz}$ ; square wave; $T_{sp} \leq 135\text{ °C}$ | -      | 1.5  | A    |
| $I_{FRM}$   | repetitive peak forward current     | $t_p \leq 1\text{ ms}$ ; $\delta \leq 0.25$                                     | -      | 4    | A    |
| $I_{FSM}$   | non-repetitive peak forward current | $t_p = 8\text{ ms}$ ; $T_{j(init)} = 25\text{ °C}$ ; square wave                | -      | 5    | A    |
| $P_{tot}$   | total power dissipation             | $T_{amb} \leq 25\text{ °C}$                                                     | [2][3] | 415  | mW   |
|             |                                     |                                                                                 | [4][3] | 895  | mW   |
|             |                                     |                                                                                 | [1][3] | 1565 | mW   |
| $T_j$       | junction temperature                |                                                                                 | -      | 150  | °C   |
| $T_{amb}$   | ambient temperature                 |                                                                                 | -55    | 150  | °C   |
| $T_{stg}$   | storage temperature                 |                                                                                 | -65    | 150  | °C   |

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

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

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

[4] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode  $1\text{ cm}^2$ .

## 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] | -   | 300 | K/W  |
|                |                                                  |             | [1][4][3] | -   | 140 | K/W  |
|                |                                                  |             | [1][5][3] | -   | 80  | K/W  |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point |             | [6]       | -   | 20  | 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.

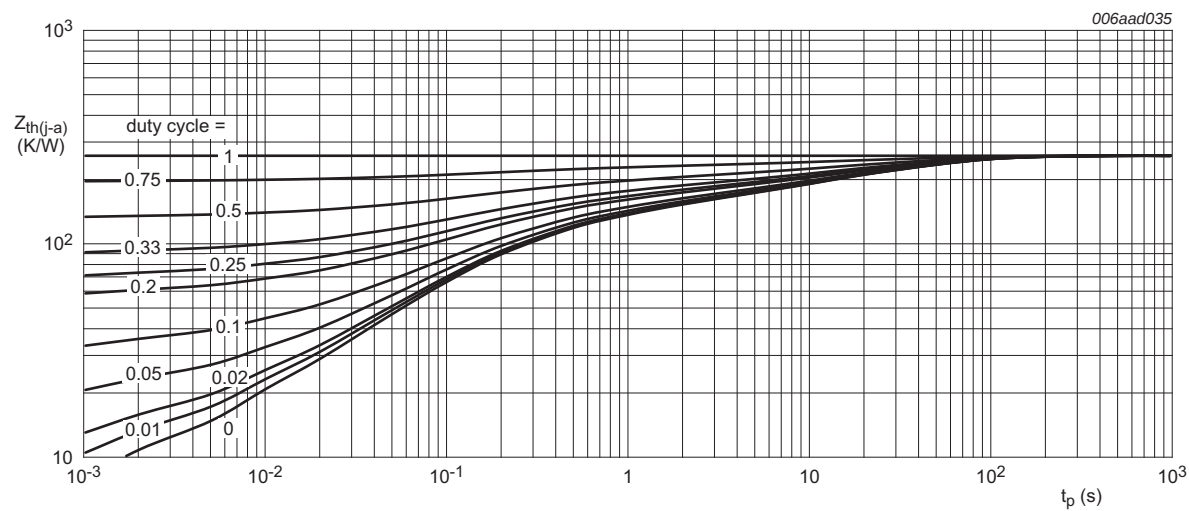
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

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

[4] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode  $1\text{ cm}^2$ .

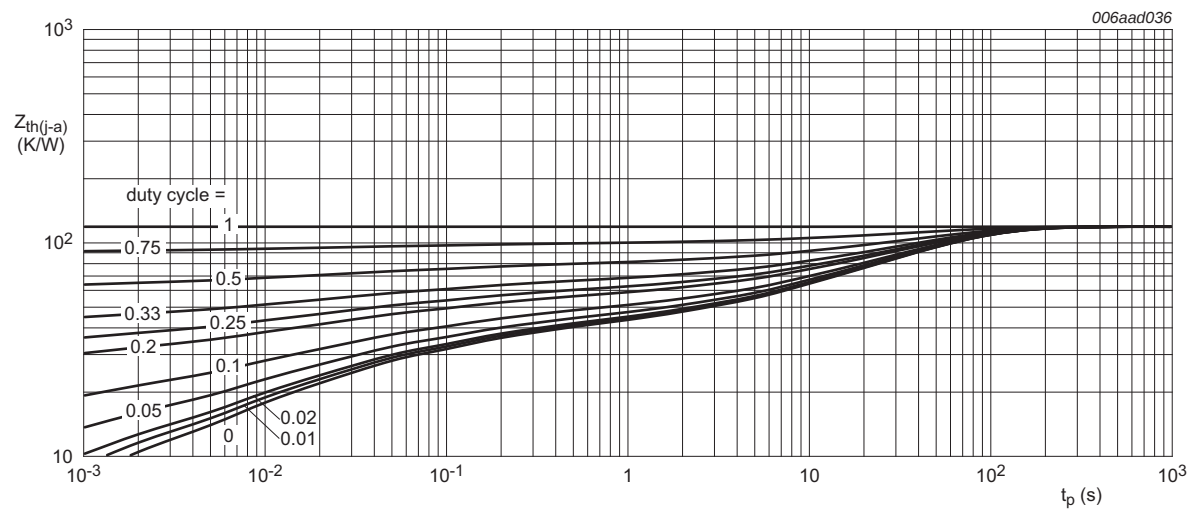
[5] Device mounted on a ceramic PCB,  $Al_2O_3$ , standard footprint.

[6] Soldering point of cathode tab.



FR4 PCB, standard footprint

Fig 2. 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 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

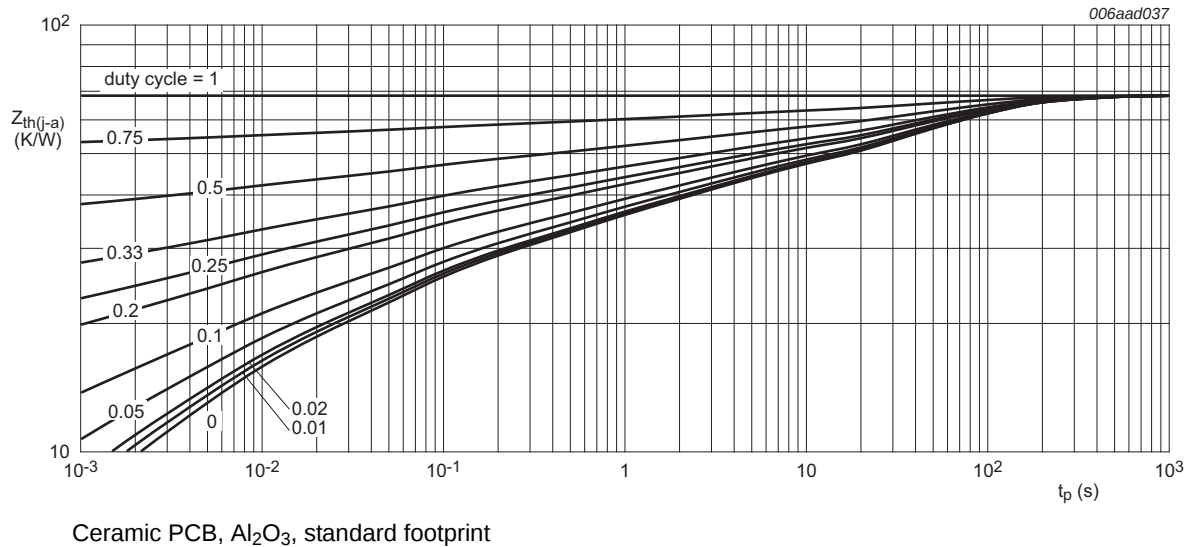


Fig 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 7. Characteristics

Table 7. Characteristics

| Symbol    | Parameter                     | Conditions                                                                                                      | Min | Typ | Max | Unit          |
|-----------|-------------------------------|-----------------------------------------------------------------------------------------------------------------|-----|-----|-----|---------------|
| $V_F$     | forward voltage               | $I_F = 100 \text{ mA}$ ; pulsed; $t_p \leq 300 \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25^\circ\text{C}$     | -   | 330 | 380 | mV            |
|           |                               | $I_F = 500 \text{ mA}$ ; pulsed; $t_p \leq 300 \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25^\circ\text{C}$     | -   | 415 | 480 | mV            |
|           |                               | $I_F = 1 \text{ A}$ ; pulsed; $t_p \leq 300 \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25^\circ\text{C}$        | -   | 490 | 550 | mV            |
|           |                               | $I_F = 1.5 \text{ A}$ ; pulsed; $t_p \leq 300 \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25^\circ\text{C}$      | -   | 540 | 610 | mV            |
| $I_R$     | reverse current               | $V_R = 10 \text{ V}$ ; $T_j = 25^\circ\text{C}$                                                                 | -   | 1   | 5   | $\mu\text{A}$ |
|           |                               | $V_R = 40 \text{ V}$ ; $T_j = 25^\circ\text{C}$                                                                 | -   | 8   | 30  | $\mu\text{A}$ |
| $C_d$     | diode capacitance             | $V_R = 1 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25^\circ\text{C}$                                            | -   | 75  | 90  | pF            |
|           |                               | $V_R = 10 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25^\circ\text{C}$                                           | -   | 30  | 40  | pF            |
| $t_{rr}$  | reverse recovery time         | $I_F = 0.5 \text{ A}$ ; $I_R = 0.5 \text{ A}$ ; $I_{R(\text{meas})} = 0.1 \text{ A}$ ; $T_j = 25^\circ\text{C}$ | -   | 4   | -   | ns            |
| $V_{FRM}$ | peak forward recovery voltage | $I_F = 0.5 \text{ A}$ ; $dI_F/dt = 20 \text{ A}/\mu\text{s}$ ; $T_j = 25^\circ\text{C}$                         | -   | 440 | -   | mV            |

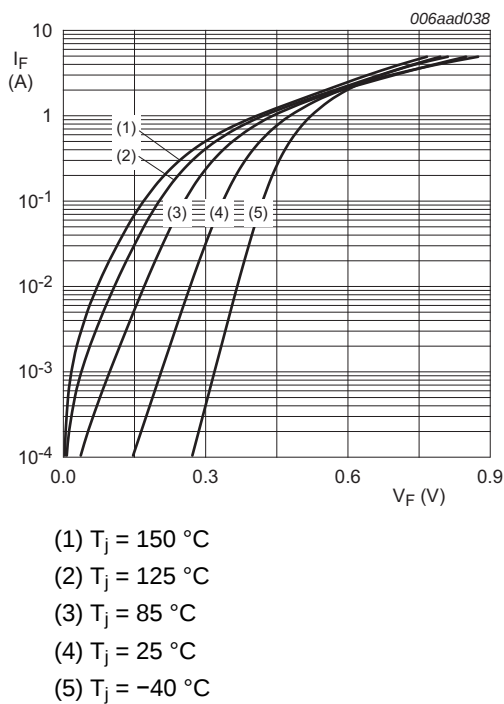


Fig 5. Forward current as a function of forward voltage; typical values

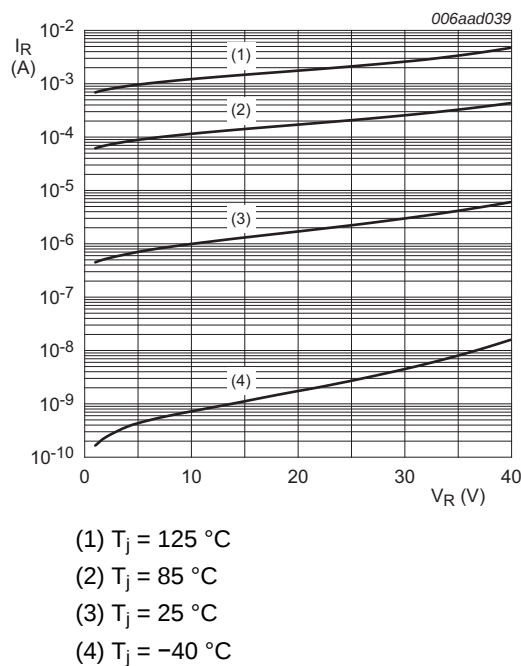


Fig 6. Reverse current as a function of reverse voltage; typical values

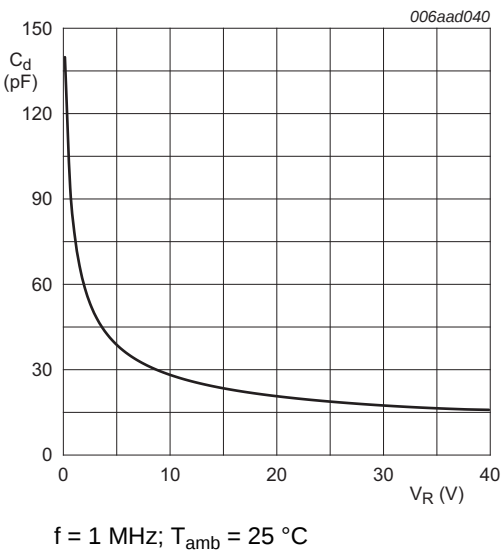


Fig 7. Diode capacitance as a function of reverse voltage; typical values

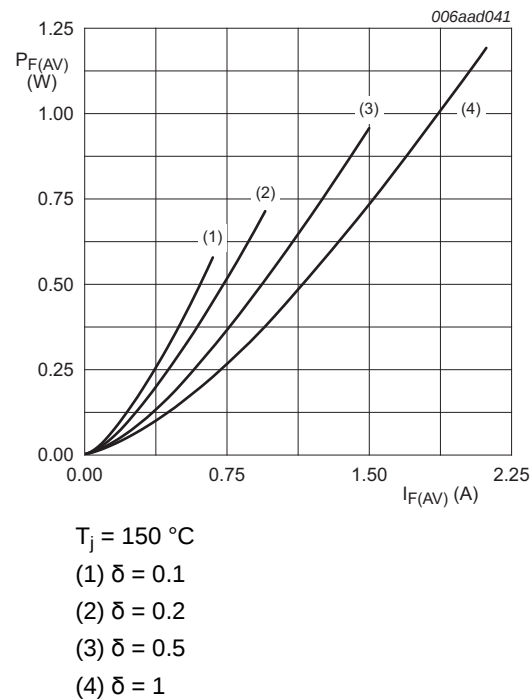
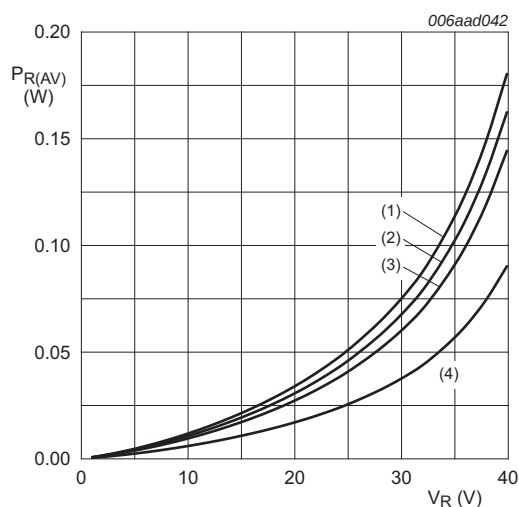


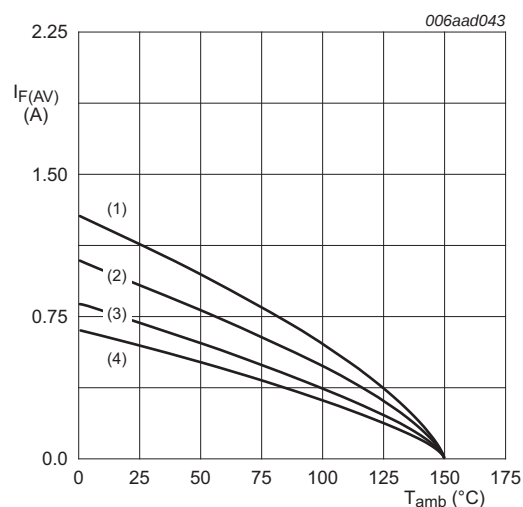
Fig 8. Average forward power dissipation as a function of average forward current; typical values



$T_j = 125\text{ }^{\circ}\text{C}$

- (1)  $\delta = 1$
- (2)  $\delta = 0.9$
- (3)  $\delta = 0.8$
- (4)  $\delta = 0.5$

**Fig 9.** Average reverse power dissipation as a function of reverse voltage; typical values

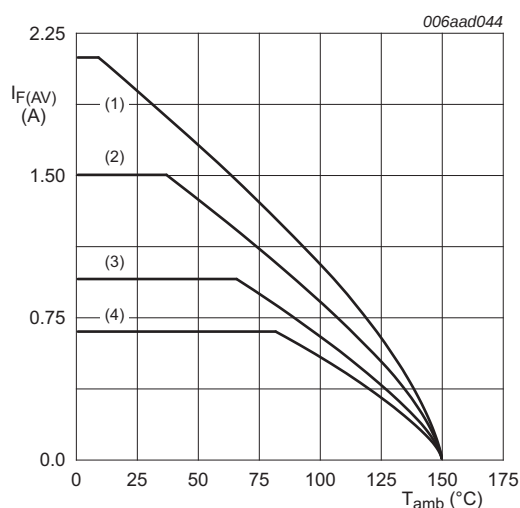


FR4 PCB, standard footprint

$T_j = 150\text{ }^{\circ}\text{C}$

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

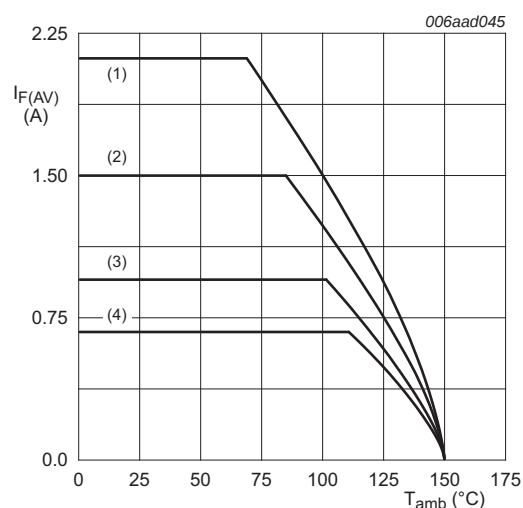


FR4 PCB, mounting pad for cathode  $1\text{ cm}^2$

$T_j = 150\text{ }^{\circ}\text{C}$

- (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 11.** Average forward current as a function of ambient temperature; typical values

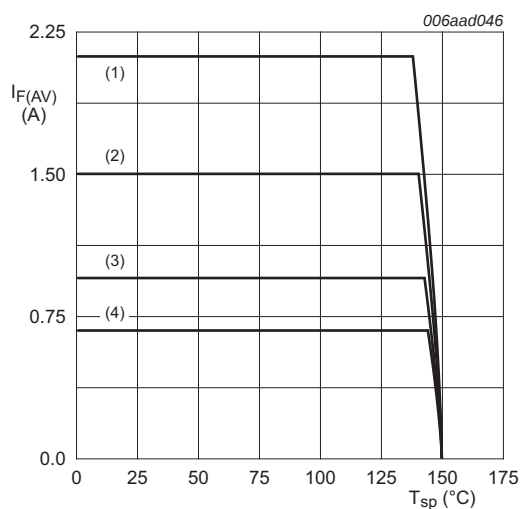


Ceramic PCB,  $\text{Al}_2\text{O}_3$ , standard footprint

$T_j = 150\text{ }^{\circ}\text{C}$

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

## 8. Test information

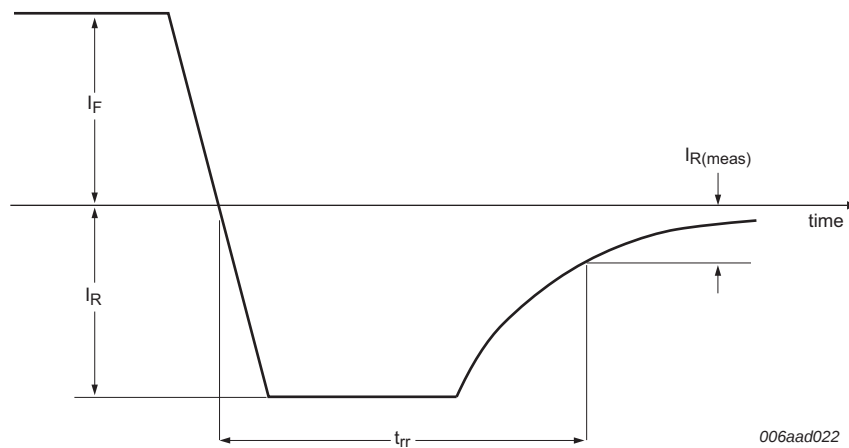


Fig 14. Reverse recovery definition

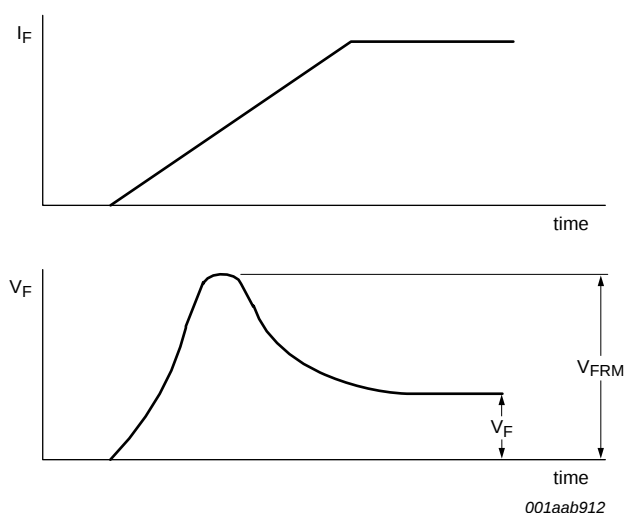


Fig 15. Forward recovery definition

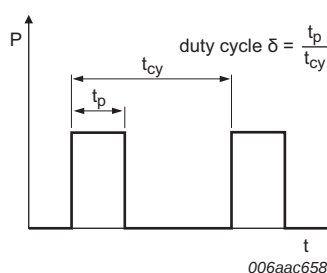


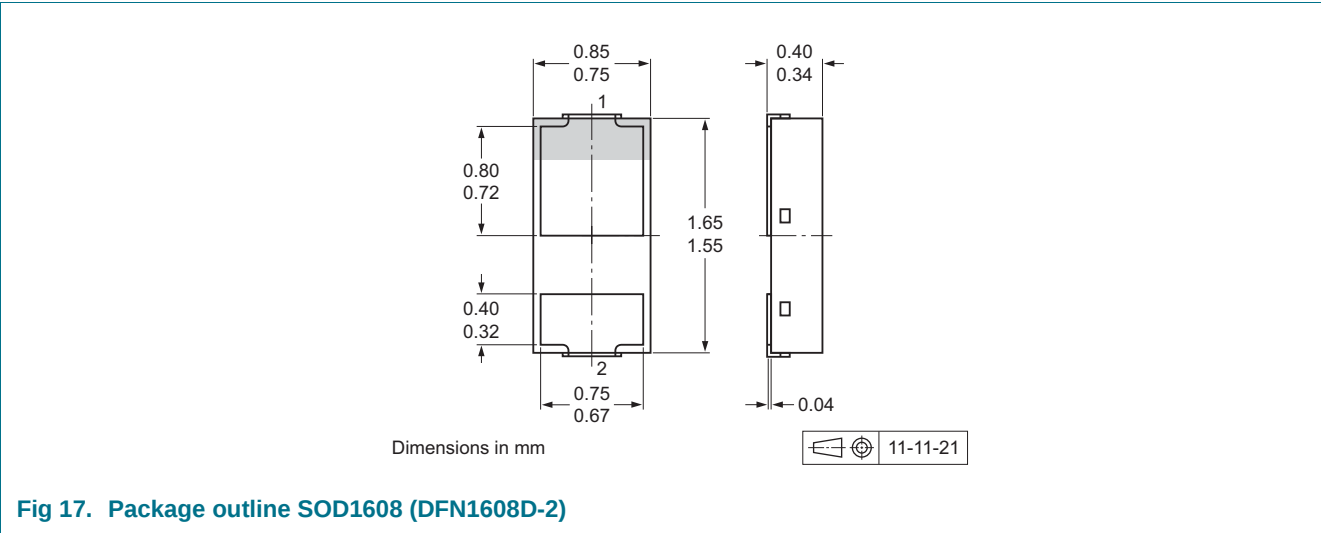
Fig 16. Duty cycle definition

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.

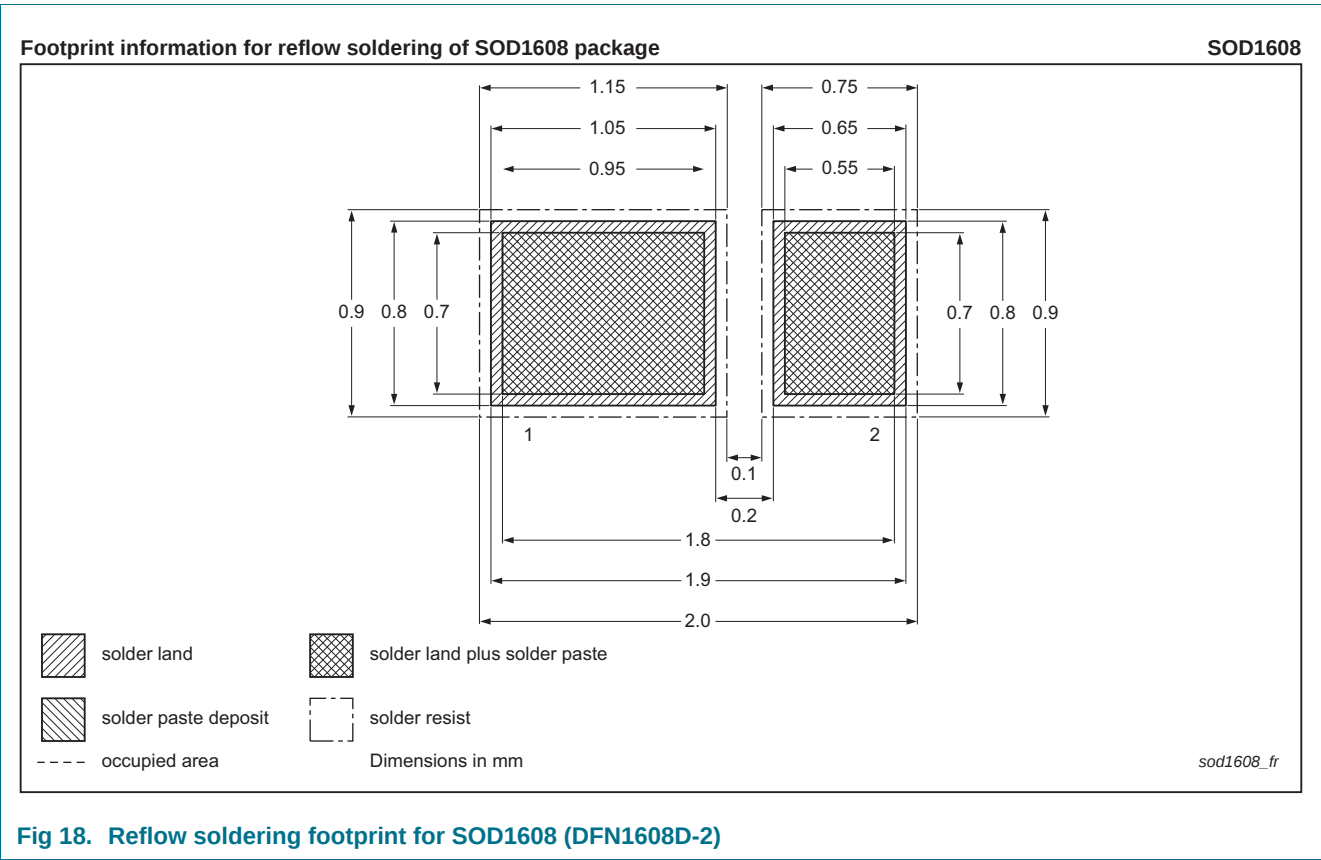
## 8.1 Quality information

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. Soldering



## 11. Revision history

Table 8. Revision history

| Document ID     | Release date                                                       | Data sheet status  | Change notice | Supersedes      |
|-----------------|--------------------------------------------------------------------|--------------------|---------------|-----------------|
| PMEG4015EPK v.2 | 20120306                                                           | Product data sheet | -             | PMEG4015EPK v.1 |
| Modifications:  | • <a href="#">Fig 14.</a> and <a href="#">15</a> : corrected title |                    |               |                 |
| PMEG4015EPK v.1 | 20120302                                                           | Product data sheet | -             | -               |

## 12. Legal information

### 12.1 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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## 14. Contents

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|           |                                          |           |
|-----------|------------------------------------------|-----------|
| <b>1</b>  | <b>Product profile</b> . . . . .         | <b>1</b>  |
| 1.1       | General description . . . . .            | 1         |
| 1.2       | Features and benefits . . . . .          | 1         |
| 1.3       | Applications . . . . .                   | 1         |
| 1.4       | Quick reference data . . . . .           | 1         |
| <b>2</b>  | <b>Pinning information</b> . . . . .     | <b>2</b>  |
| <b>3</b>  | <b>Ordering information</b> . . . . .    | <b>2</b>  |
| <b>4</b>  | <b>Marking</b> . . . . .                 | <b>2</b>  |
| <b>5</b>  | <b>Limiting values</b> . . . . .         | <b>3</b>  |
| <b>6</b>  | <b>Thermal characteristics</b> . . . . . | <b>3</b>  |
| <b>7</b>  | <b>Characteristics</b> . . . . .         | <b>5</b>  |
| <b>8</b>  | <b>Test information</b> . . . . .        | <b>8</b>  |
| 8.1       | Quality information . . . . .            | 9         |
| <b>9</b>  | <b>Package outline</b> . . . . .         | <b>10</b> |
| <b>10</b> | <b>Soldering</b> . . . . .               | <b>10</b> |
| <b>11</b> | <b>Revision history</b> . . . . .        | <b>11</b> |
| <b>12</b> | <b>Legal information</b> . . . . .       | <b>12</b> |
| 12.1      | Data sheet status . . . . .              | 12        |
| 12.2      | Definitions . . . . .                    | 12        |
| 12.3      | Disclaimers . . . . .                    | 12        |
| 12.4      | Trademarks . . . . .                     | 13        |
| <b>13</b> | <b>Contact information</b> . . . . .     | <b>13</b> |

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For sales office addresses, please send an email to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

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