



# PMEG2005EPK

20 V, 0.5 A low VF MEGA Schottky barrier rectifier

Rev. 2 — 14 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:  $I_{F(AV)} \leq 0.5$  A
- Reverse voltage:  $V_R \leq 20$  V
- Low forward voltage  $V_F \leq 410$  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 | square wave; $\delta = 0.5$ ; $f = 20$ kHz; $T_{amb} \leq 130$ °C                  | -   | -   | 0.5 | A       |
|             |                         | square wave; $\delta = 0.5$ ; $f = 20$ kHz; $T_{sp} \leq 140$ °C                   | -   | -   | 0.5 | A       |
| $V_R$       | reverse voltage         | $T_j = 25$ °C                                                                      | -   | -   | 20  | V       |
| $V_F$       | forward voltage         | $I_F = 500$ mA; pulsed; $t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$ ; $T_j = 25$ °C | -   | 360 | 410 | mV      |
| $I_R$       | reverse current         | $V_R = 10$ V; $T_j = 25$ °C                                                        | -   | 30  | 130 | $\mu$ 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                 | -   | 3   | -   | 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

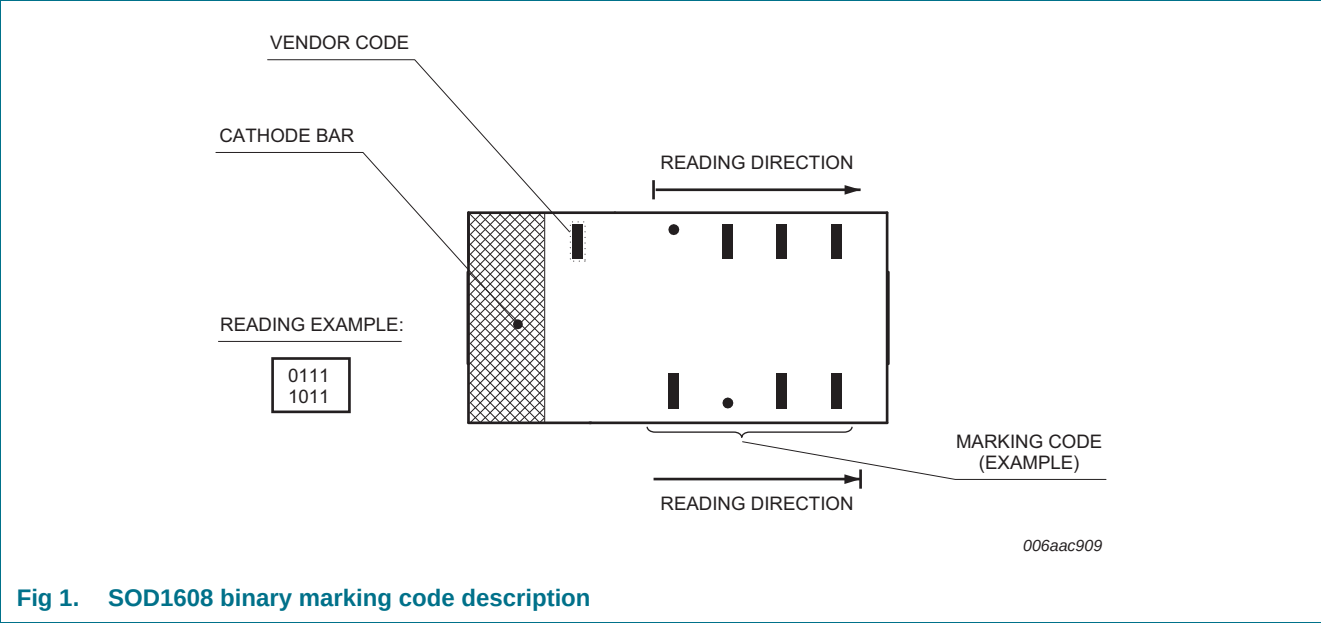
Table 3. Ordering information

| Type number | Package    |                                                   |         |
|-------------|------------|---------------------------------------------------|---------|
|             | Name       | Description                                       | Version |
| PMEG2005EPK | DFN1608D-2 | Leadless ultra small plastic package; 2 terminals | SOD1608 |

4. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PMEG2005EPK | 1000 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                     | $T_j = 25\text{ }^{\circ}\text{C}$                                                                 | -   | 20   | V                  |
| $I_F$       | forward current                     | $T_{sp} \leq 135\text{ }^{\circ}\text{C}$                                                          | -   | 0.7  | A                  |
| $I_{F(AV)}$ | average forward current             | square wave; $\delta = 0.5$ ; $f = 20\text{ kHz}$ ; $T_{amb} \leq 130\text{ }^{\circ}\text{C}$ [1] | -   | 0.5  | A                  |
|             |                                     | square wave; $\delta = 0.5$ ; $f = 20\text{ kHz}$ ; $T_{sp} \leq 140\text{ }^{\circ}\text{C}$      | -   | 0.5  | A                  |
| $I_{FRM}$   | repetitive peak forward current     | $t_p \leq 1\text{ ms}$ ; $\delta \leq 0.5$                                                         | -   | 2    | A                  |
| $I_{FSM}$   | non-repetitive peak forward current | square wave; $t_p = 8\text{ ms}$ ; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$                      | -   | 3    | A                  |
| $P_{tot}$   | total power dissipation             | $T_{amb} \leq 25\text{ }^{\circ}\text{C}$ [2]                                                      | -   | 390  | mW                 |
|             |                                     | [3]                                                                                                | -   | 830  | mW                 |
|             |                                     | [1]                                                                                                | -   | 1470 | mW                 |
| $T_j$       | junction temperature                |                                                                                                    | -   | 150  | $^{\circ}\text{C}$ |
| $T_{amb}$   | ambient temperature                 |                                                                                                    | -55 | 150  | $^{\circ}\text{C}$ |
| $T_{stg}$   | storage temperature                 |                                                                                                    | -65 | 150  | $^{\circ}\text{C}$ |

[1] Device mounted on a ceramic Printed-Circuit Board (PCB),  $\text{Al}_2\text{O}_3$ , standard footprint.

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

[3] 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] | -   | -   | 320 | K/W  |
|                |                                                  | [1][3]             | -   | -   | 150 | K/W  |
|                |                                                  | [1][4]             | -   | -   | 85  | K/W  |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | [5]                | -   | -   | 20  | K/W  |

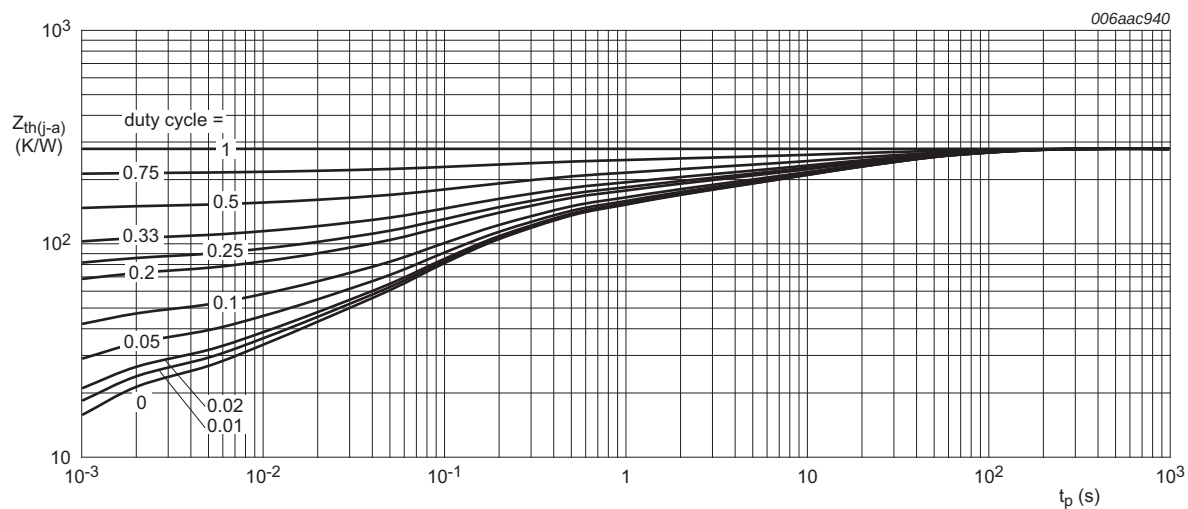
[1] For Schottky barrier diodes thermal runaway has to be considered, as in some applications the reverse power losses  $P_R$  are a significant part of the total power losses.

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

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

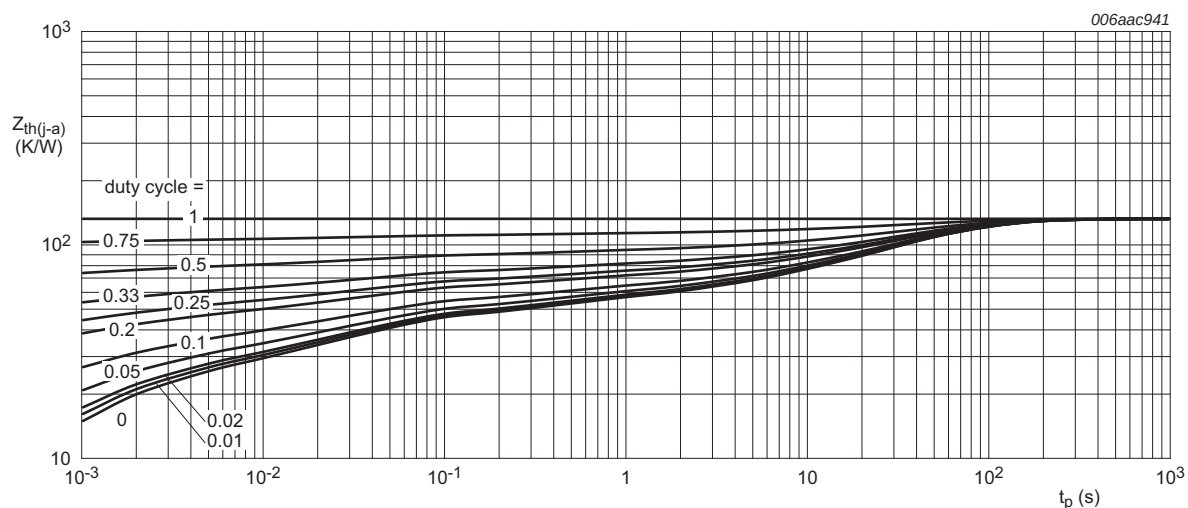
[4] Device mounted on a ceramic PCB,  $\text{Al}_2\text{O}_3$ , standard footprint.

[5] 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**

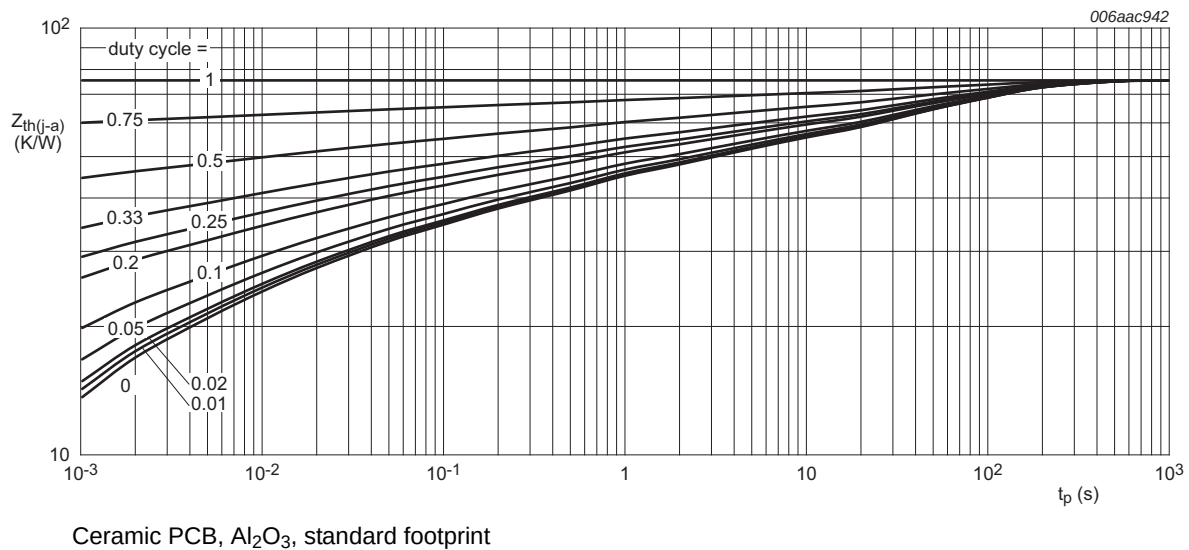


Fig 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 7. Characteristics

Table 7. Characteristics

| Symbol    | Parameter                     | Conditions                                                                                                         | Min | Typ | Max | Unit          |
|-----------|-------------------------------|--------------------------------------------------------------------------------------------------------------------|-----|-----|-----|---------------|
| $V_F$     | forward voltage               | $I_F = 100 \text{ mA}$ ; pulsed; $t_p \leq 300 \mu\text{s}$ ;<br>$\delta \leq 0.02$ ; $T_j = 25^\circ\text{C}$     | -   | 270 | 300 | mV            |
|           |                               | $I_F = 500 \text{ mA}$ ; pulsed; $t_p \leq 300 \mu\text{s}$ ;<br>$\delta \leq 0.02$ ; $T_j = 25^\circ\text{C}$     | -   | 360 | 410 | mV            |
| $I_R$     | reverse current               | $V_R = 10 \text{ V}$ ; $T_j = 25^\circ\text{C}$                                                                    | -   | 30  | 130 | $\mu\text{A}$ |
|           |                               | $V_R = 20 \text{ V}$ ; $T_j = 25^\circ\text{C}$                                                                    | -   | 70  | 300 | $\mu\text{A}$ |
| $C_d$     | diode capacitance             | $V_R = 1 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25^\circ\text{C}$                                               | -   | 35  | -   | pF            |
|           |                               | $V_R = 10 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25^\circ\text{C}$                                              | -   | 13  | -   | pF            |
| $t_{rr}$  | reverse recovery time         | $I_F = 0.5 \text{ A}$ ; $I_R = 0.5 \text{ A}$ ; $I_{R(\text{meas})} = 0.1 \text{ A}$ ;<br>$T_j = 25^\circ\text{C}$ | -   | 3   | -   | ns            |
| $V_{FRM}$ | peak forward recovery voltage | $I_F = 0.5 \text{ A}$ ; $dI_F/dt = 20 \text{ mA}/\mu\text{s}$ ; $T_j = 25^\circ\text{C}$                           | -   | 380 | -   | mV            |

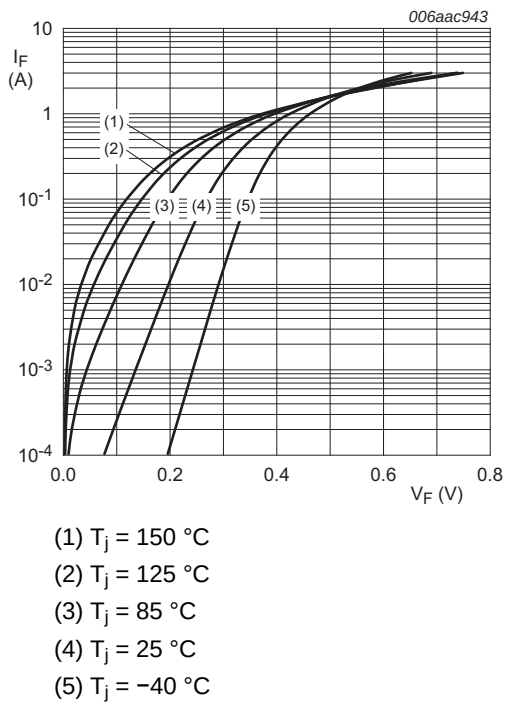


Fig 5. Forward current as a function of forward voltage; typical values

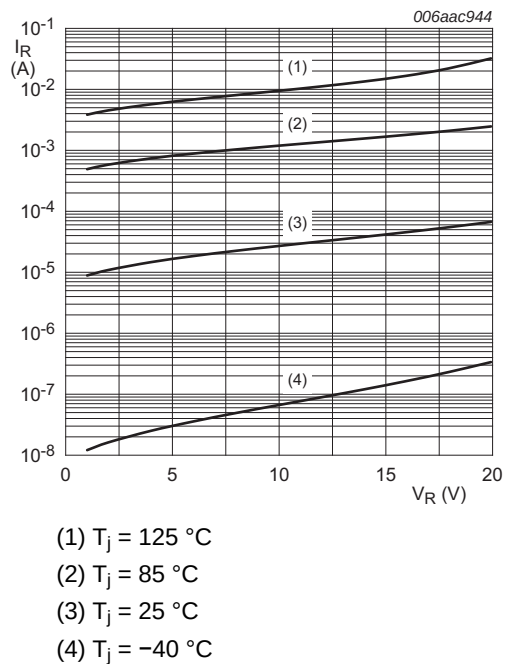


Fig 6. Reverse current as a function of reverse voltage; typical values

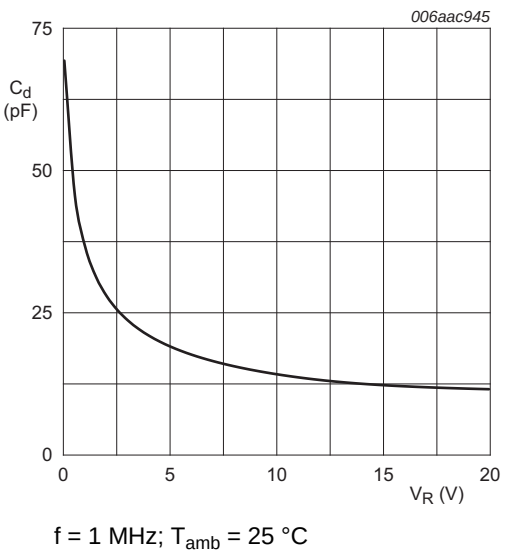


Fig 7. Diode capacitance as a function of reverse voltage; typical values

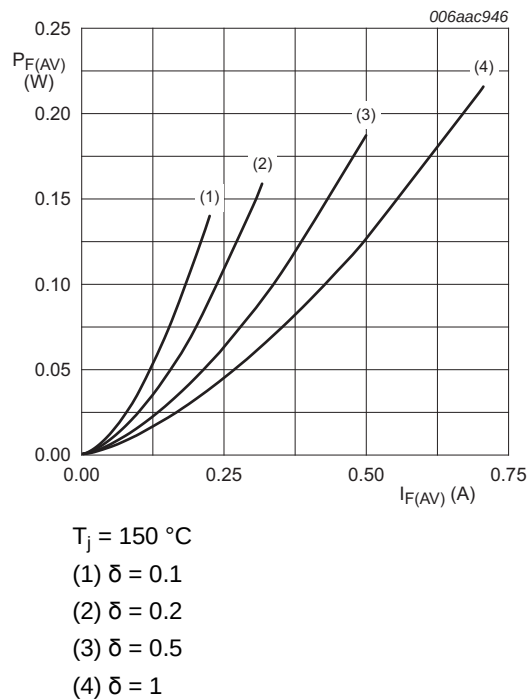
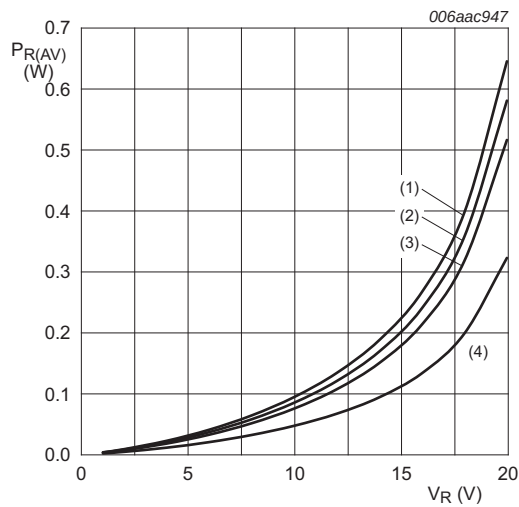


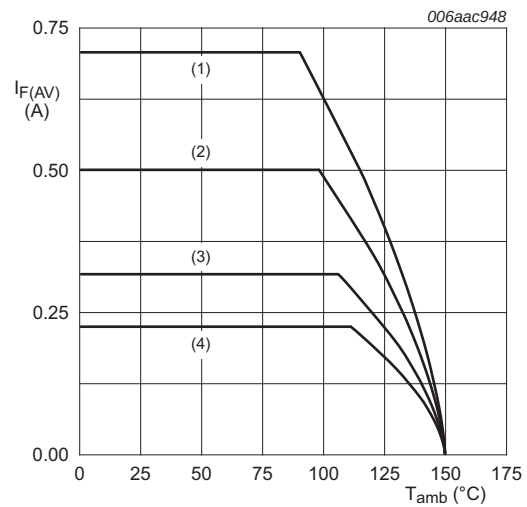
Fig 8. Average forward power dissipation as a function of average forward current; typical values



$T_j = 125\text{ °C}$

- (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

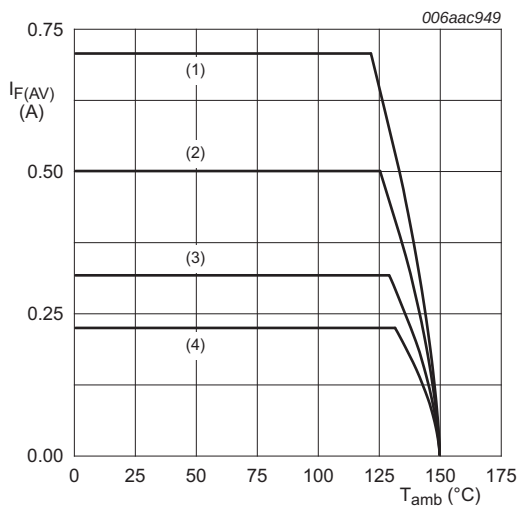


FR4 PCB, standard footprint

$T_j = 150\text{ °C}$

- (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

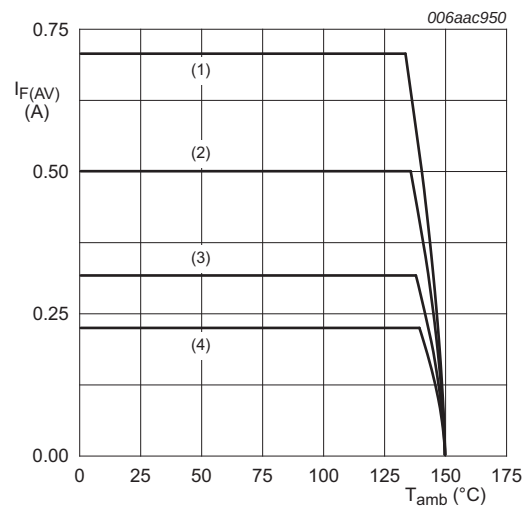


FR4 PCB, mounting pad for cathode  $1\text{ cm}^2$

$T_j = 150\text{ °C}$

- (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

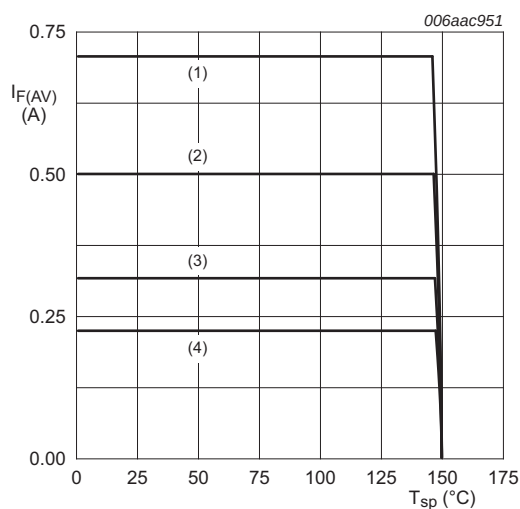


Ceramic PCB,  $\text{Al}_2\text{O}_3$ , standard footprint

$T_j = 150\text{ °C}$

- (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



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

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

## 8. Test information

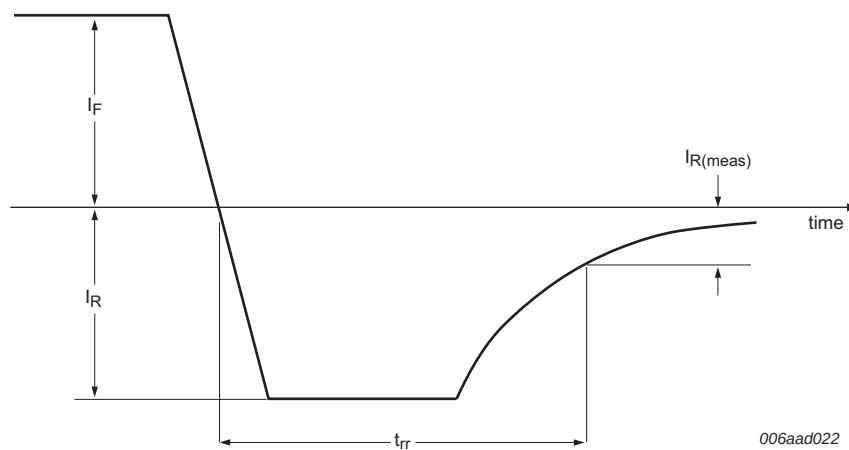


Fig 14. Reverse recovery definition



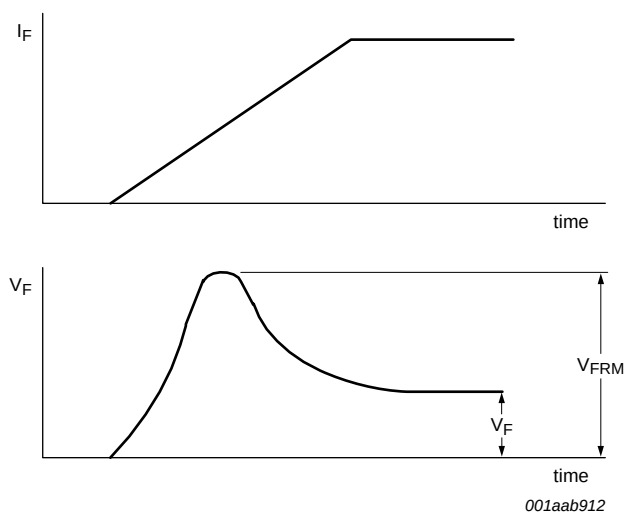


Fig 15. Forward recovery definition

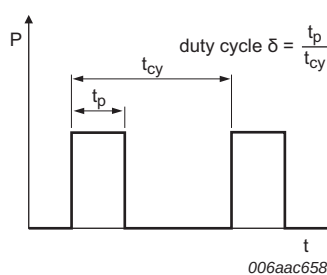


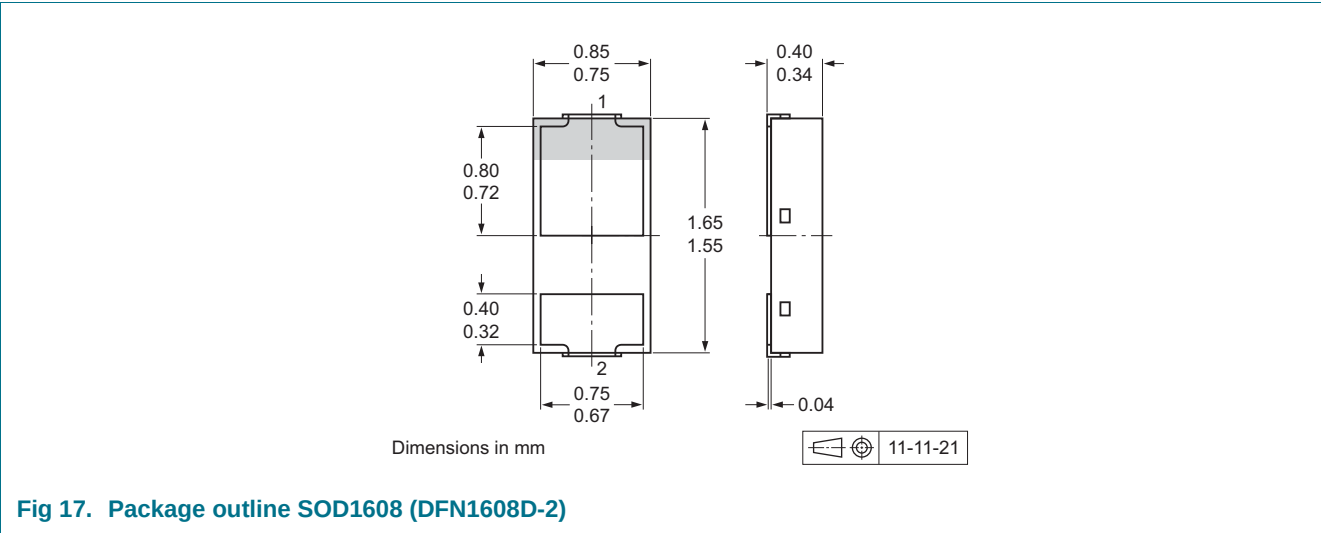
Fig 16. Duty cycle definition

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.

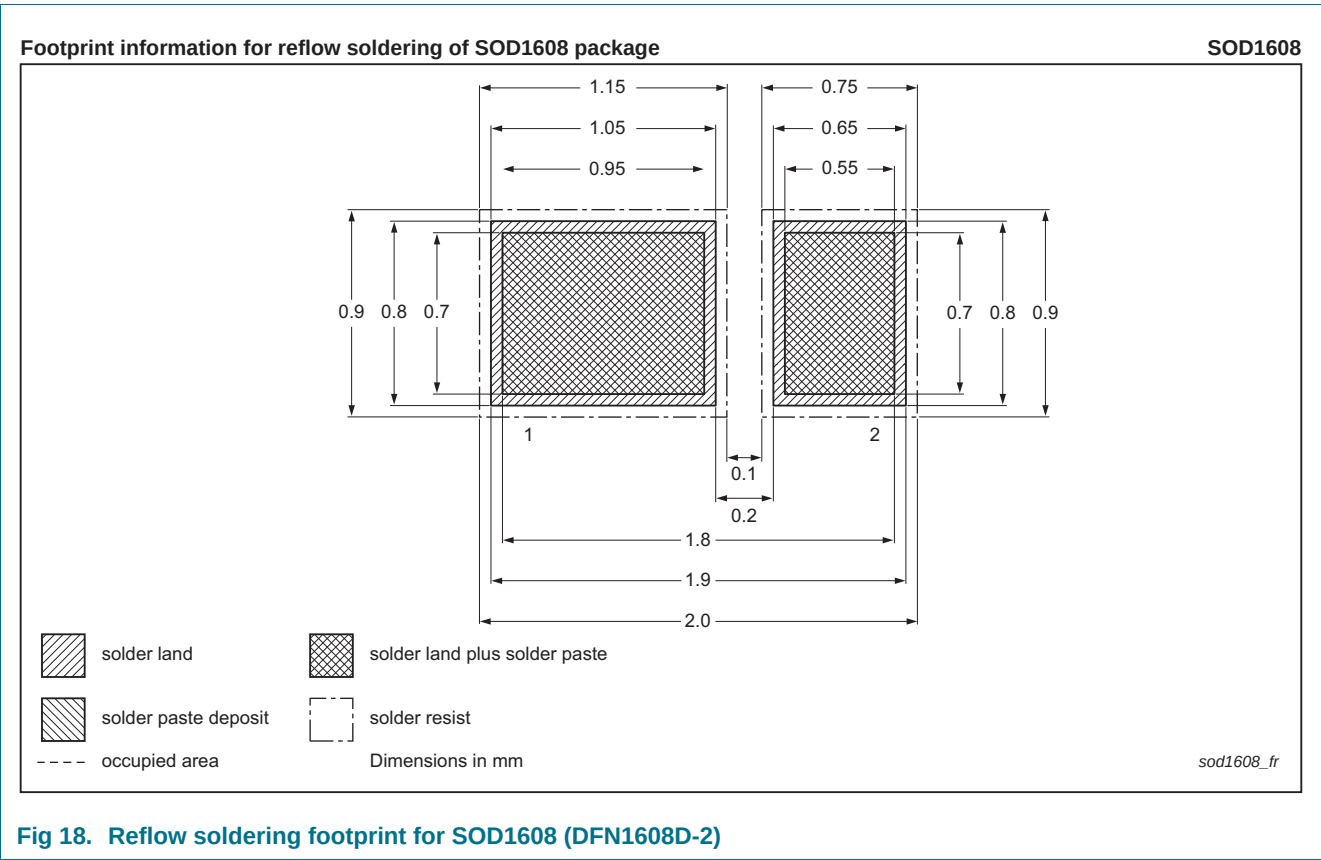
## 8.1 Quality information

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      |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|-----------------|
| PMEG2005EPK v.2 | 20120314                                                                                                                                                                                                                                                                            | Product data sheet | -             | PMEG2005EPK v.1 |
| Modifications:  | <ul style="list-style-type: none"><li>• <a href="#">5 "Limiting values"</a>: <math>I_F</math> corrected</li><li>• <a href="#">7 "Characteristics"</a>: <math>t_{rr}</math> and <math>V_{FRM}</math> added</li><li>• <a href="#">Fig 14.</a> and <a href="#">15</a>: added</li></ul> |                    |               |                 |
| PMEG2005EPK v.1 | 20120112                                                                                                                                                                                                                                                                            | 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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