



# PMEG4002AESF

40 V, 0.2 A low VF MEGA Schottky barrier rectifier

10 March 2017

Product data sheet

## 1. General description

Planar Maximum Efficiency General Application (MEGA) Schottky barrier rectifier with an integrated guard ring for stress protection in a DSN0603-2 (SOD962-2) leadless ultra small Chip-Scale Package (CSP).

## 2. Features and benefits

- Average forward current  $I_{F(AV)} \leq 0.2$  A
- Reverse voltage  $V_R \leq 40$  V
- Low forward voltage typ.  $V_F = 250$  mV
- Low reverse current typ.  $I_R = 3$   $\mu$ A
- Package height typ. 0.3 mm

## 3. Applications

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

## 4. Quick reference data

Table 1. Quick reference data

| Symbol | Parameter       | Conditions                                                                    | Min | Typ | Max  | Unit    |
|--------|-----------------|-------------------------------------------------------------------------------|-----|-----|------|---------|
| $I_F$  | forward current | $T_{sp} \leq 145$ °C; $\delta = 1$                                            | -   | -   | 0.28 | A       |
| $V_R$  | reverse voltage | $T_j = 25$ °C                                                                 | -   | -   | 40   | V       |
| $V_F$  | forward voltage | $I_F = 200$ mA; $t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$ ;<br>$T_j = 25$ °C | -   | 450 | 525  | mV      |
| $I_R$  | reverse current | $V_R = 40$ V; $T_j = 25$ °C; pulsed                                           | -   | 13  | 80   | $\mu$ A |

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline                                                                                                                                   | Graphic symbol                                                                                    |
|-----|--------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| 1   | K      | cathode[1]  |  <p>Transparent<br/>top view</p> <p><b>DSN0603-2 (SOD962-2)</b></p> |  <p>sym001</p> |
| 2   | A      | anode       |                                                                                                                                                      |                                                                                                   |

[1] The marking bar indicates the cathode.

## 6. Ordering information

Table 3. Ordering information

| Type number  | Package   |                                                                    |          |
|--------------|-----------|--------------------------------------------------------------------|----------|
|              | Name      | Description                                                        | Version  |
| PMEG4002AESF | DSN0603-2 | Leadless ultra small package; 2 terminals; body 0.6 x 0.3 x 0.3 mm | SOD962-2 |

## 7. Marking

Table 4. Marking codes

| Type number  | Marking code |
|--------------|--------------|
| PMEG4002AESF | N            |

## 8. 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                     | $T_{sp} \leq 145\text{ °C}$ ; $\delta = 1$                                        |     | -   | 0.28 | A    |
| $I_{F(AV)}$ | average forward current             | $\delta = 0.5$ ; $f = 20\text{ kHz}$ ; $T_{amb} \leq 140\text{ °C}$ ; square wave | [1] | -   | 0.2  | A    |
|             |                                     | $\delta = 0.5$ ; $f = 20\text{ kHz}$ ; $T_{sp} \leq 147\text{ °C}$ ; square wave  |     | -   | 0.2  | A    |
| $I_{FRM}$   | repetitive peak forward current     | $t_p \leq 1\text{ ms}$ ; $\delta \leq 0.25$                                       |     | -   | 1.2  | A    |
| $I_{FSM}$   | non-repetitive peak forward current | $t_p = 8\text{ ms}$ ; $T_{j(init)} = 25\text{ °C}$ ; square wave                  |     | -   | 3.5  | A    |
| $P_{tot}$   | total power dissipation             | $T_{amb} \leq 25\text{ °C}$                                                       | [2] | -   | 405  | mW   |
|             |                                     |                                                                                   | [3] | -   | 660  | mW   |

| Symbol           | Parameter            | Conditions |     | Min | Max  | Unit |
|------------------|----------------------|------------|-----|-----|------|------|
|                  |                      |            | [1] | -   | 1200 | mW   |
| T <sub>j</sub>   | junction temperature |            |     | -   | 150  | °C   |
| T <sub>amb</sub> | ambient temperature  |            |     | -55 | 150  | °C   |
| T <sub>stg</sub> | storage temperature  |            |     | -65 | 150  | °C   |

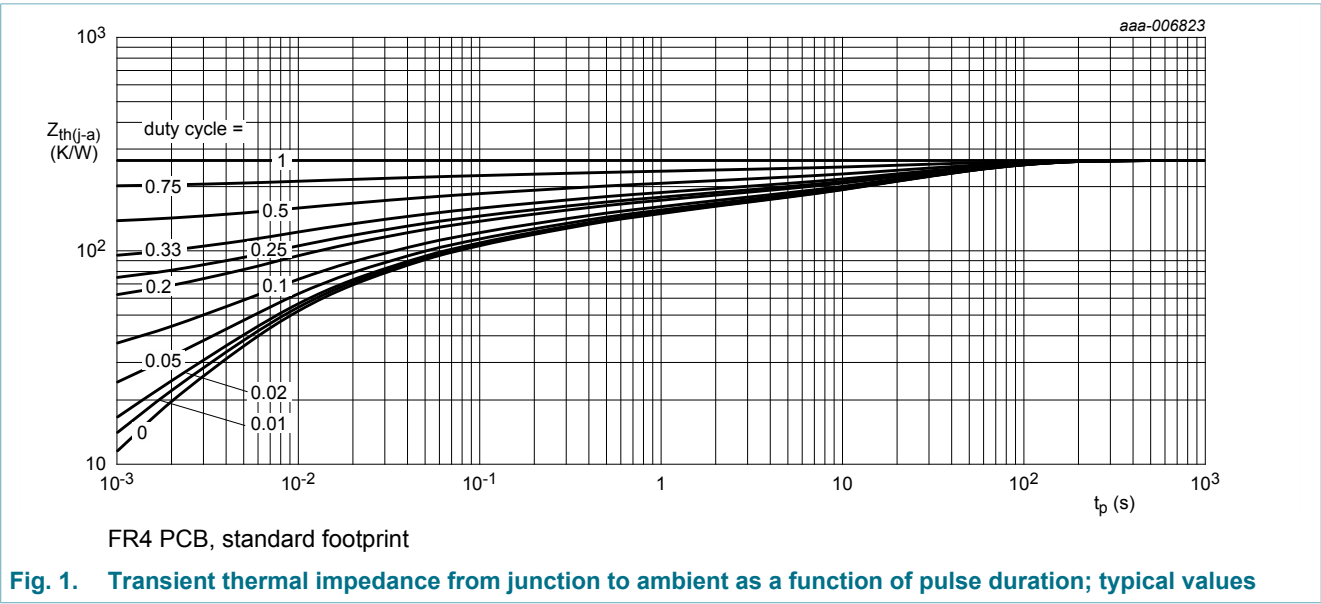
- [1] Device mounted on a ceramic Printed-Circuit Board (PCB), Al<sub>2</sub>O<sub>3</sub>, standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for anode and cathode 1 cm<sup>2</sup> each.

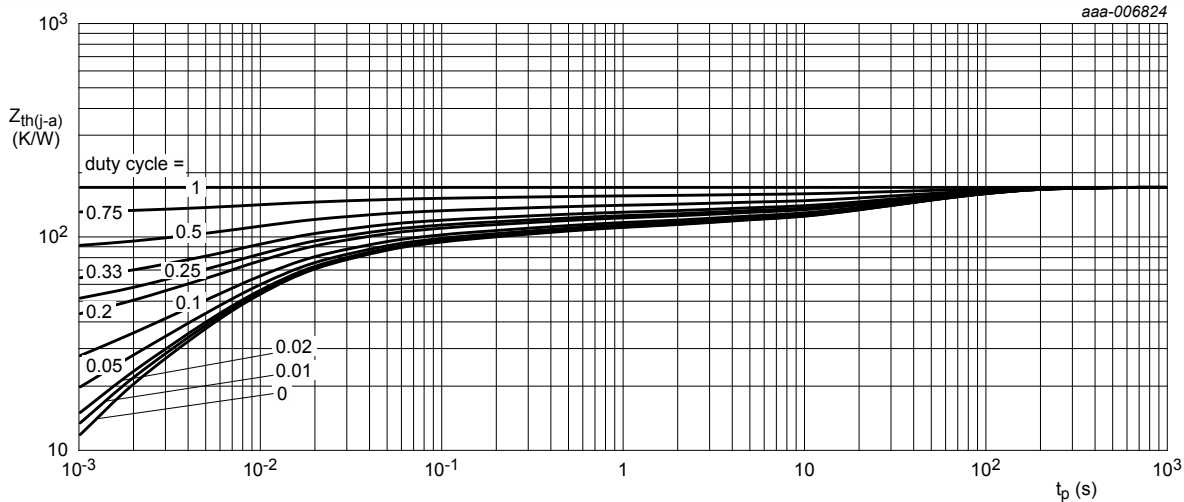
9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol                | Parameter                                        | Conditions  |         | Min | Typ | Max | Unit |
|-----------------------|--------------------------------------------------|-------------|---------|-----|-----|-----|------|
| R <sub>th(j-a)</sub>  | thermal resistance from junction to ambient      | in free air | [1] [2] | -   | -   | 310 | K/W  |
|                       |                                                  |             | [1] [3] | -   | -   | 190 | K/W  |
|                       |                                                  |             | [1] [4] | -   | -   | 105 | K/W  |
| R <sub>th(j-sp)</sub> | thermal resistance from junction to solder point |             | [5]     | -   | -   | 40  | K/W  |

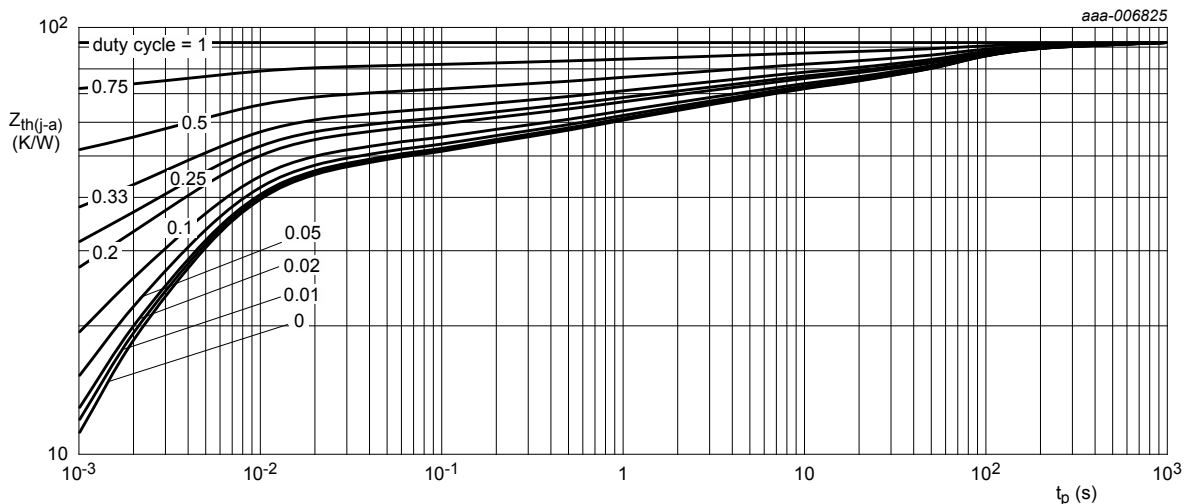
- [1] For Schottky barrier diodes thermal runaway has to be considered, as in some applications the reverse power losses P<sub>R</sub> are a significant part of the total power losses.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for anode and cathode 1 cm<sup>2</sup> each.
- [4] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.
- [5] Soldering point of anode tab.





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

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



Ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint

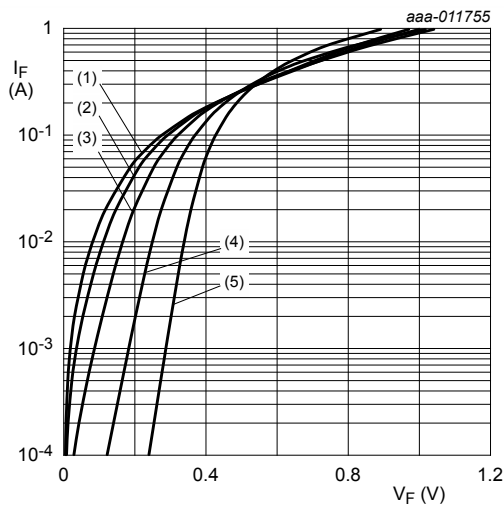
Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

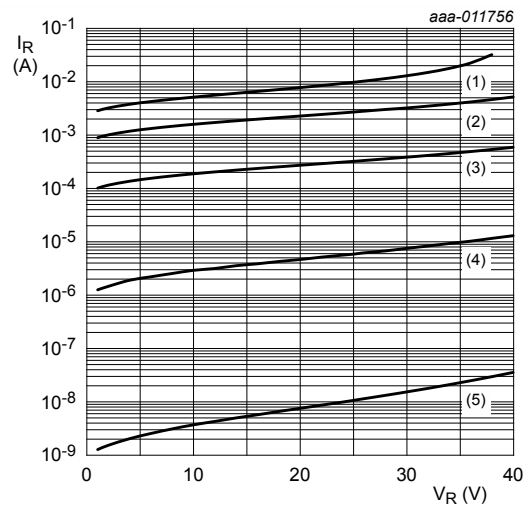
| Symbol      | Parameter                         | Conditions                                                                                                                 | Min | Typ | Max | Unit |
|-------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|------|
| $V_{(BR)R}$ | reverse reverse breakdown voltage | $I_R = 100\text{ }\mu\text{A}$ ; $t_p = 300\text{ }\mu\text{s}$ ; $\delta = 0.02$ ;<br>$T_{sp} = 25\text{ }^\circ\text{C}$ | 40  | -   | -   | V    |
| $V_F$       | forward voltage                   | $I_F = 0.1\text{ mA}$ ; $t_p \leq 300\text{ }\mu\text{s}$ ; $\delta \leq 0.02$ ;<br>$T_J = 25\text{ }^\circ\text{C}$       | -   | 120 | 185 | mV   |
|             |                                   | $I_F = 1\text{ mA}$ ; $t_p \leq 300\text{ }\mu\text{s}$ ; $\delta \leq 0.02$ ;<br>$T_J = 25\text{ }^\circ\text{C}$         | -   | 180 | 245 | mV   |
|             |                                   | $I_F = 10\text{ mA}$ ; $t_p \leq 300\text{ }\mu\text{s}$ ; $\delta \leq 0.02$ ;<br>$T_J = 25\text{ }^\circ\text{C}$        | -   | 250 | 320 | mV   |

| Symbol   | Parameter             | Conditions                                                                                                            |  | Min | Typ  | Max | Unit          |
|----------|-----------------------|-----------------------------------------------------------------------------------------------------------------------|--|-----|------|-----|---------------|
|          |                       | $I_F = 100\text{ mA}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02\text{ };$<br>$T_j = 25\text{ }^\circ\text{C}$ |  | -   | 370  | 440 | mV            |
|          |                       | $I_F = 200\text{ mA}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02\text{ };$<br>$T_j = 25\text{ }^\circ\text{C}$ |  | -   | 450  | 525 | mV            |
| $I_R$    | reverse current       | $V_R = 10\text{ V}; T_j = 25\text{ }^\circ\text{C}; \text{pulsed}$                                                    |  | -   | 3    | 20  | $\mu\text{A}$ |
|          |                       | $V_R = 40\text{ V}; T_j = 25\text{ }^\circ\text{C}; \text{pulsed}$                                                    |  | -   | 13   | 80  | $\mu\text{A}$ |
| $C_d$    | diode capacitance     | $V_R = 1\text{ V}; f = 1\text{ MHz}; T_j = 25\text{ }^\circ\text{C}$                                                  |  | -   | 18   | -   | pF            |
|          |                       | $V_R = 10\text{ V}; f = 1\text{ MHz}; T_j = 25\text{ }^\circ\text{C}$                                                 |  | -   | 7    | -   | pF            |
| $t_{rr}$ | reverse recovery time | $I_F = 500\text{ mA}; I_R = 500\text{ mA};$<br>$I_{R(\text{meas})} = 100\text{ mA}; T_j = 25\text{ }^\circ\text{C}$   |  | -   | 1.25 | -   | ns            |



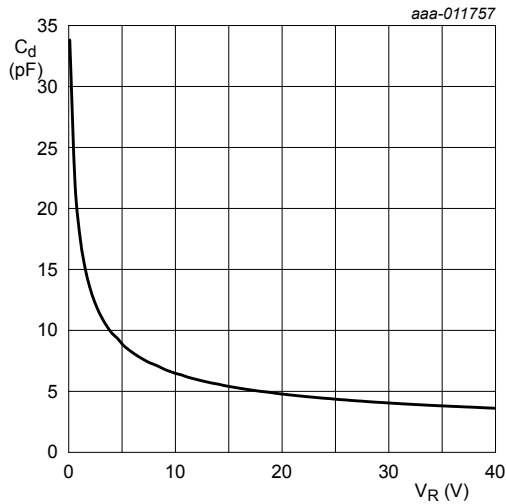
pulsed condition  
(1)  $T_j = 150\text{ }^\circ\text{C}$   
(2)  $T_j = 125\text{ }^\circ\text{C}$   
(3)  $T_j = 85\text{ }^\circ\text{C}$   
(4)  $T_j = 25\text{ }^\circ\text{C}$   
(5)  $T_j = -40\text{ }^\circ\text{C}$

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



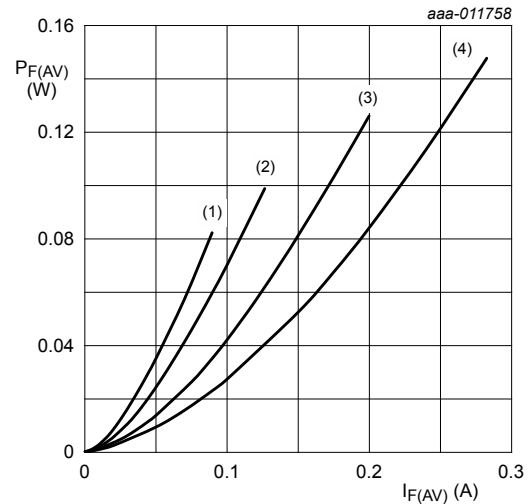
pulsed condition  
(1)  $T_j = 150\text{ }^\circ\text{C}$   
(2)  $T_j = 125\text{ }^\circ\text{C}$   
(3)  $T_j = 85\text{ }^\circ\text{C}$   
(4)  $T_j = 25\text{ }^\circ\text{C}$   
(5)  $T_j = -40\text{ }^\circ\text{C}$

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



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

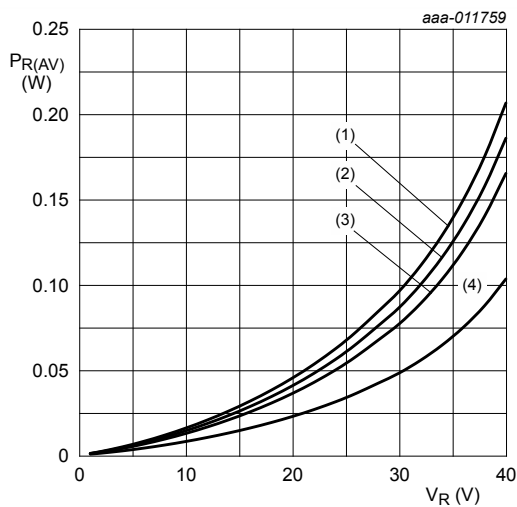
**Fig. 6.** Diode capacitance as a function of reverse voltage; typical values



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

- (1)  $\delta = 0.1$
- (2)  $\delta = 0.2$
- (3)  $\delta = 0.5$
- (4)  $\delta = 1$

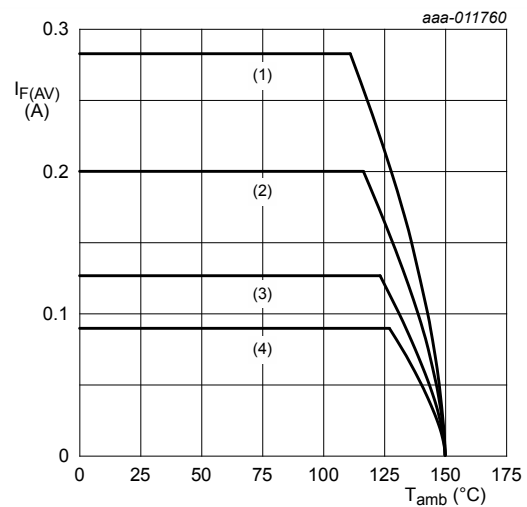
**Fig. 7.** Average forward power dissipation as a function of average forward current; typical values



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

- (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

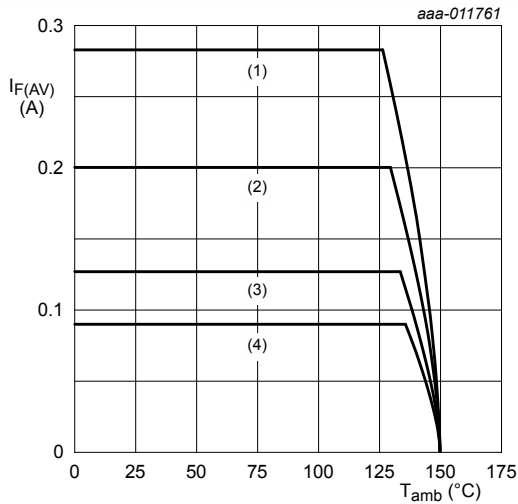


FR4 PCB, standard footprint

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

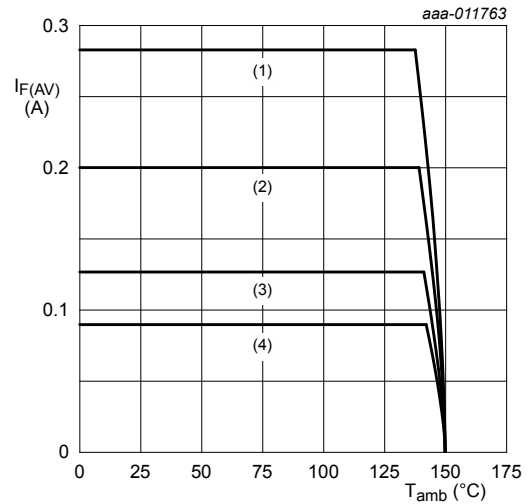
- (1)  $\delta = 1$ ; DC
- (2)  $\delta = 0.5$ ;  $f = 20 \text{ kHz}$
- (3)  $\delta = 0.2$ ;  $f = 20 \text{ kHz}$
- (4)  $\delta = 0.1$ ;  $f = 20 \text{ kHz}$

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



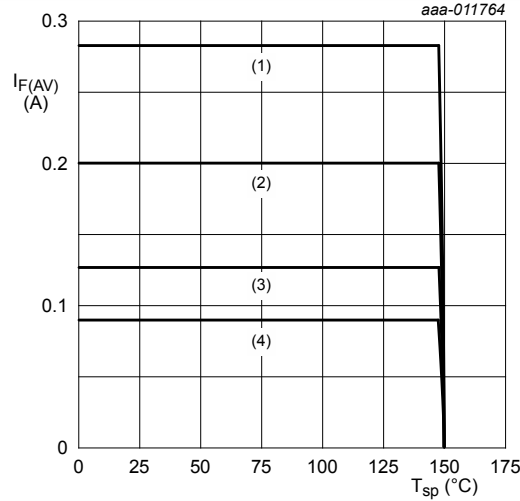
FR4 PCB, mounting pad for anode and cathode  
1 cm<sup>2</sup> each  
 $T_j = 150$  °C  
(1)  $\delta = 1$ ; DC  
(2)  $\delta = 0.5$ ;  $f = 20$  kHz  
(3)  $\delta = 0.2$ ;  $f = 20$  kHz  
(4)  $\delta = 0.1$ ;  $f = 20$  kHz

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



Ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, 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

## 11. Test information

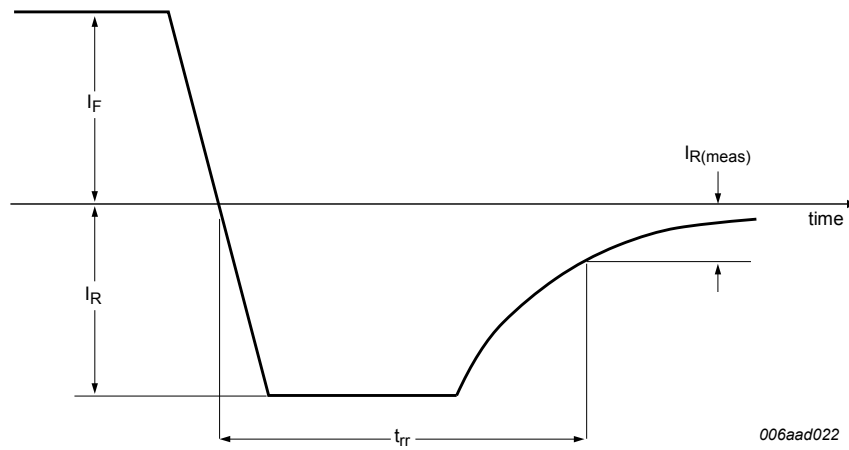


Fig. 13. Reverse recovery definition

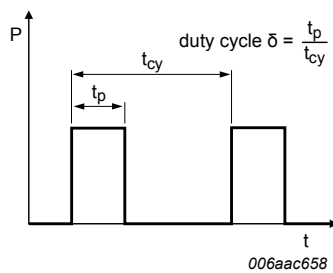


Fig. 14. Duty cycle definition

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.

12. Package outline

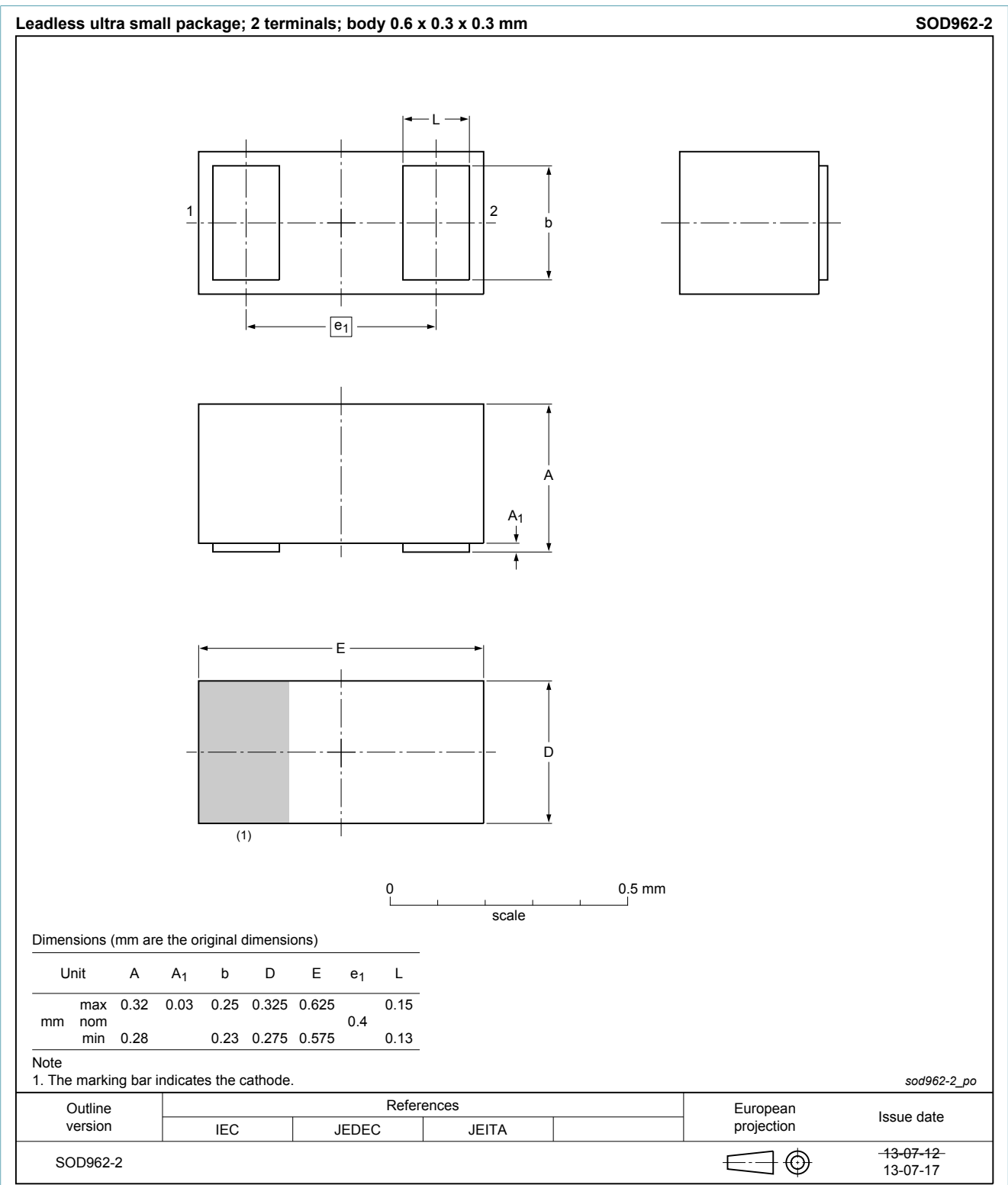


Fig. 15. Package outline DSN0603-2 (SOD962-2)

13. Soldering

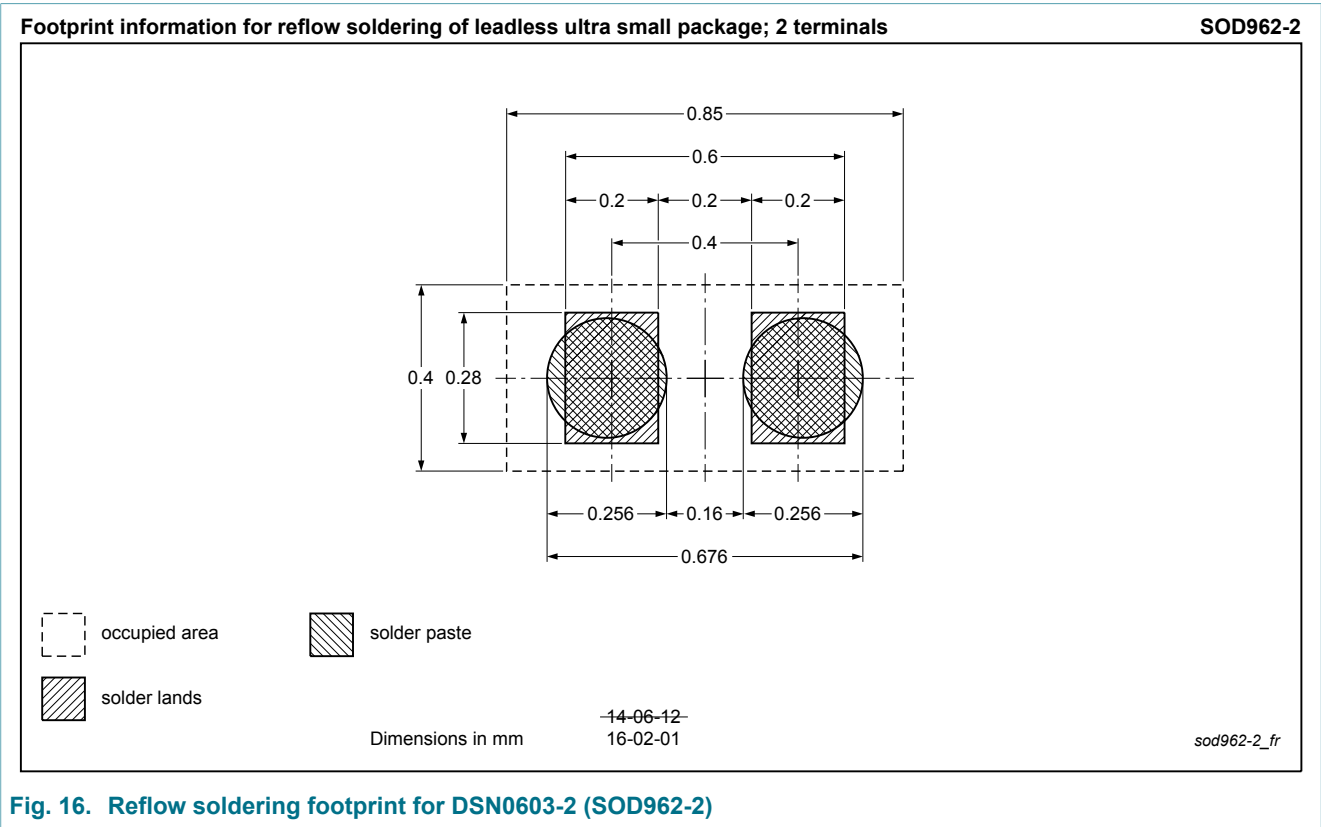


Fig. 16. Reflow soldering footprint for DSN0603-2 (SOD962-2)

14. Revision history

Table 8. Revision history

| Data sheet ID         | Release date | Data sheet status  | Change notice | Supersedes |
|-----------------------|--------------|--------------------|---------------|------------|
| PMEG4002AESF_S500 v.1 | 20150505     | Product data sheet | -             | -          |

## 15. Legal information

### Data sheet status

| Document status [1][2]         | Product status [3] | Definition                                                                            |
|--------------------------------|--------------------|---------------------------------------------------------------------------------------|
| Objective [short] data sheet   | Development        | This document contains data from the objective specification for product development. |
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