



# PMEG3010ESB

30 V, 1 A low VF MEGA Schottky barrier rectifier

8 January 2016

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 leadless ultra small DSN1006-2 (SOD993) Surface-Mounted Device (SMD) package.

## 2. Features and benefits

- Average forward current:  $I_{F(AV)} \leq 1$  A
- Reverse voltage:  $V_R \leq 30$  V
- Low forward voltage, typical:  $V_F = 495$  mV
- Low reverse current, typical:  $I_R = 12$   $\mu$ A
- Package height typ. 270  $\mu$ m

## 3. Applications

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

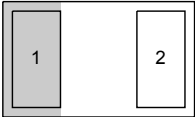
## 4. Quick reference data

Table 1. Quick reference data

| Symbol      | Parameter               | Conditions                                                              | Min | Typ | Max | Unit    |
|-------------|-------------------------|-------------------------------------------------------------------------|-----|-----|-----|---------|
| $I_F$       | forward current         | $T_{sp} \leq 135$ °C; $\delta = 1$                                      | -   | -   | 1.4 | A       |
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$ ; $f = 20$ kHz; $T_{sp} \leq 140$ °C; square wave        | -   | -   | 1   | A       |
| $V_R$       | reverse voltage         | $T_j = 25$ °C                                                           | -   | -   | 30  | V       |
| $V_F$       | forward voltage         | $I_F = 1$ A; $t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$ ; $T_j = 25$ °C | -   | 495 | 565 | mV      |
| $I_R$       | reverse current         | $V_R = 30$ V; $t_p \leq 3$ ms; $\delta \leq 0.3$ ; $T_j = 25$ °C        | -   | 12  | 45  | $\mu$ A |
| $t_{rr}$    | reverse recovery time   | $I_F = 0.5$ A; $I_R = 0.5$ A; $I_{R(meas)} = 0.1$ A; $T_j = 25$ °C      | -   | 3.2 | -   | ns      |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline                                                                                                                     | Graphic symbol                                                                                       |
|-----|--------|-------------|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| 1   | K      | cathode[1]  | <br>Transparent top view<br><b>DSN1006-2 (SOD993)</b> | <br><i>sym001</i> |
| 2   | A      | anode       |                                                                                                                                        |                                                                                                      |

[1] The marking bar indicates the cathode.

6. Ordering information

Table 3. Ordering information

| Type number | Package   |                                                                                |         |
|-------------|-----------|--------------------------------------------------------------------------------|---------|
|             | Name      | Description                                                                    | Version |
| PMEG3010ESB | DSN1006-2 | DSN1006-2, leadless ultra small package; 2 terminals; body 1.0 x 0.6 x 0.27 mm | SOD993  |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PMEG3010ESB | 3E           |

## 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                     | $T_j = 25\text{ }^{\circ}\text{C}$                                                              |     | -   | 30    | V                  |
| $I_F$       | forward current                     | $T_{sp} \leq 135\text{ }^{\circ}\text{C}$ ; $\delta = 1$                                        |     | -   | 1.4   | A                  |
| $I_{F(AV)}$ | average forward current             | $\delta = 0.5$ ; $f = 20\text{ kHz}$ ; $T_{amb} \leq 105\text{ }^{\circ}\text{C}$ ; square wave | [1] | -   | 1     | A                  |
|             |                                     | $\delta = 0.5$ ; $f = 20\text{ kHz}$ ; $T_{sp} \leq 140\text{ }^{\circ}\text{C}$ ; square wave  |     | -   | 1     | 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 | $t_p = 8\text{ ms}$ ; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$ ; square wave                  |     | -   | 10    | A                  |
| $P_{tot}$   | total power dissipation             | $T_{amb} \leq 25\text{ }^{\circ}\text{C}$                                                       | [2] | -   | 0.525 | W                  |
|             |                                     |                                                                                                 | [3] | -   | 1     | W                  |
|             |                                     |                                                                                                 | [1] | -   | 1.78  | W                  |
| $T_j$       | 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 anode and cathode  $1\text{ cm}^2$  each.

## 9. 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] | -   | -   | 240 | K/W  |
|                |                                                  |             | [1][3] | -   | -   | 125 | K/W  |
|                |                                                  |             | [1][4] | -   | -   | 70  | K/W  |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point |             | [5]    | -   | -   | 15  | K/W  |

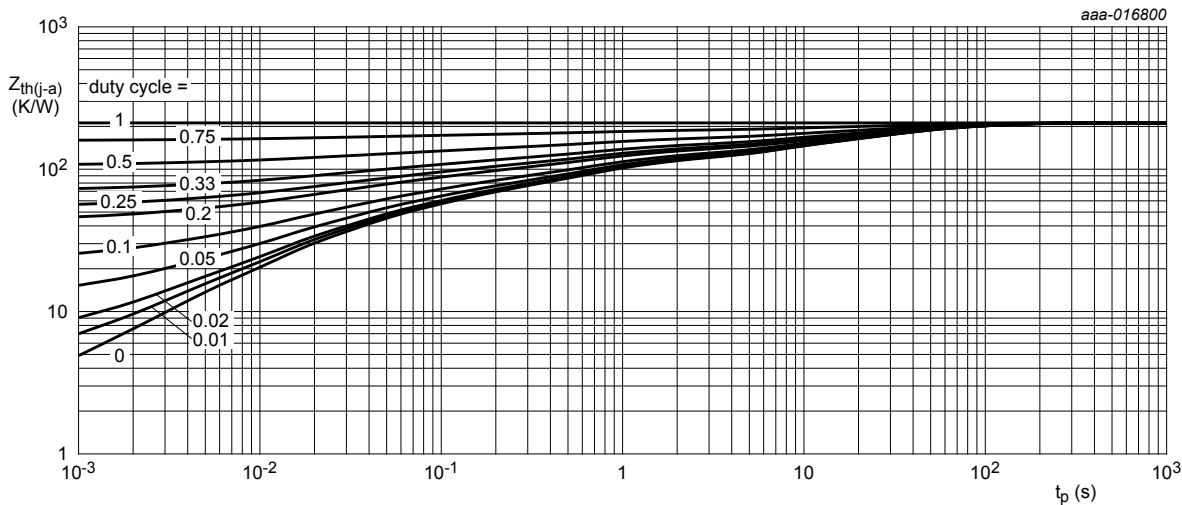
[1] For Schottky barrier diodes thermal runaway has to be considered, as in some applications the reverse power losses  $P_R$  are a significant part of the total power losses.

[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 anode and cathode  $1\text{ cm}^2$  each.

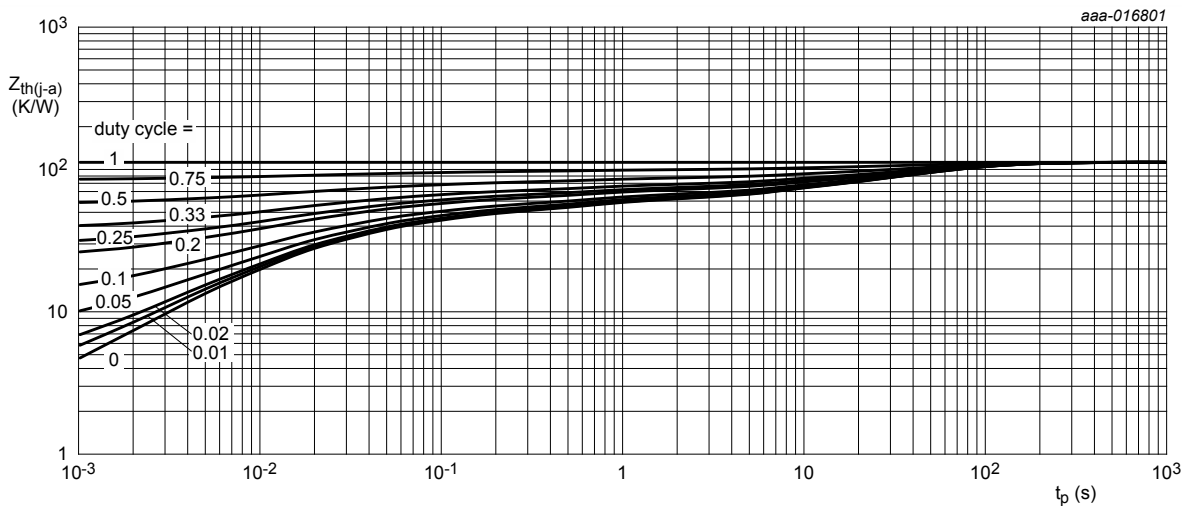
[4] Device mounted on a ceramic PCB,  $\text{Al}_2\text{O}_3$ , standard footprint.

[5] Soldering point of anode tab.



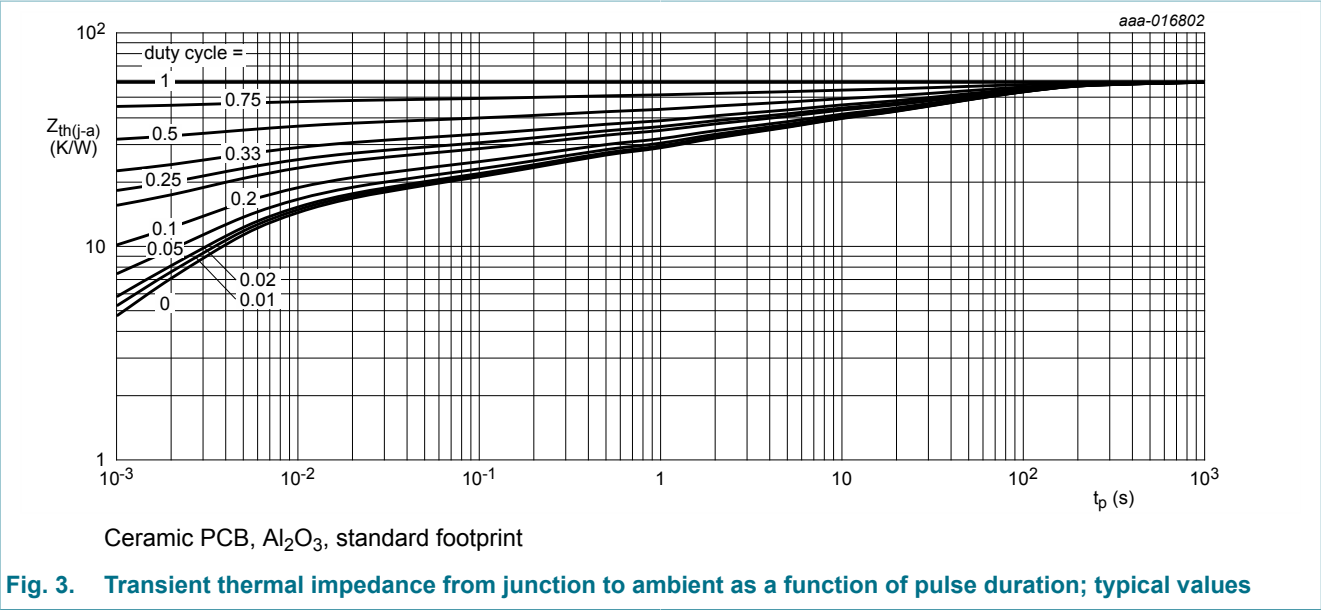
FR4 PCB, standard footprint

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



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

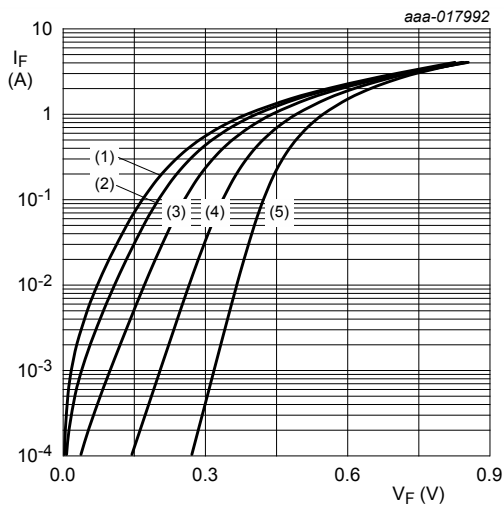
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



## 10. Characteristics

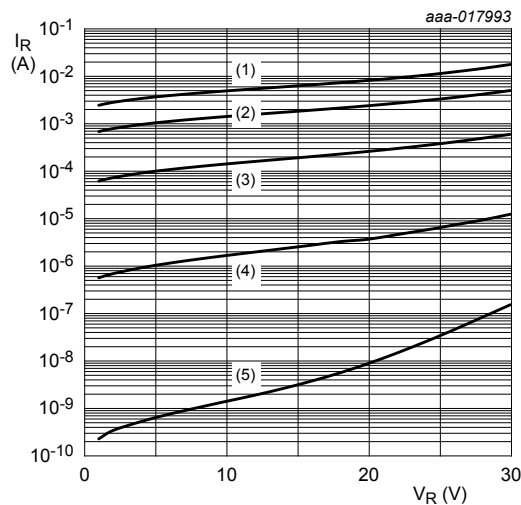
Table 7. Characteristics

| Symbol      | Parameter                 | Conditions                                                                                                                   | Min | Typ | Max | Unit          |
|-------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|---------------|
| $V_{(BR)R}$ | reverse breakdown voltage | $I_R = 1 \text{ mA}$ ; $t_p = 300 \text{ } \mu\text{s}$ ; $\delta = 0.02$ ;<br>$T_J = 25 \text{ } ^\circ\text{C}$            | 30  | -   | -   | V             |
| $V_F$       | forward voltage           | $I_F = 1 \text{ mA}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ;<br>$T_J = 25 \text{ } ^\circ\text{C}$      | -   | 205 | -   | mV            |
|             |                           | $I_F = 10 \text{ mA}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ;<br>$T_J = 25 \text{ } ^\circ\text{C}$     | -   | 265 | -   | mV            |
|             |                           | $I_F = 100 \text{ mA}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ;<br>$T_J = 25 \text{ } ^\circ\text{C}$    | -   | 340 | 375 | mV            |
|             |                           | $I_F = 200 \text{ mA}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ;<br>$T_J = 25 \text{ } ^\circ\text{C}$    | -   | 370 | -   | mV            |
|             |                           | $I_F = 500 \text{ mA}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ;<br>$T_J = 25 \text{ } ^\circ\text{C}$    | -   | 425 | 475 | mV            |
|             |                           | $I_F = 700 \text{ mA}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ;<br>$T_J = 25 \text{ } ^\circ\text{C}$    | -   | 455 | -   | mV            |
|             |                           | $I_F = 1 \text{ A}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ;<br>$T_J = 25 \text{ } ^\circ\text{C}$       | -   | 495 | 565 | mV            |
| $I_R$       | reverse current           | $V_R = 5 \text{ V}$ ; $t_p \leq 3 \text{ ms}$ ; $\delta \leq 0.3$ ; $T_J = 25 \text{ } ^\circ\text{C}$                       | -   | 0.9 | -   | $\mu\text{A}$ |
|             |                           | $V_R = 10 \text{ V}$ ; $t_p \leq 3 \text{ ms}$ ; $\delta \leq 0.3$ ;<br>$T_J = 25 \text{ } ^\circ\text{C}$                   | -   | 1.6 | 5   | $\mu\text{A}$ |
|             |                           | $V_R = 20 \text{ V}$ ; $t_p \leq 3 \text{ ms}$ ; $\delta \leq 0.3$ ;<br>$T_J = 25 \text{ } ^\circ\text{C}$                   | -   | 3.5 | 12  | $\mu\text{A}$ |
|             |                           | $V_R = 30 \text{ V}$ ; $t_p \leq 3 \text{ ms}$ ; $\delta \leq 0.3$ ;<br>$T_J = 25 \text{ } ^\circ\text{C}$                   | -   | 12  | 45  | $\mu\text{A}$ |
| $C_d$       | diode capacitance         | $V_R = 1 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_J = 25 \text{ } ^\circ\text{C}$                                               | -   | 86  | -   | pF            |
|             |                           | $V_R = 10 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_J = 25 \text{ } ^\circ\text{C}$                                              | -   | 32  | -   | 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>$T_J = 25 \text{ } ^\circ\text{C}$ | -   | 3.2 | -   | ns            |



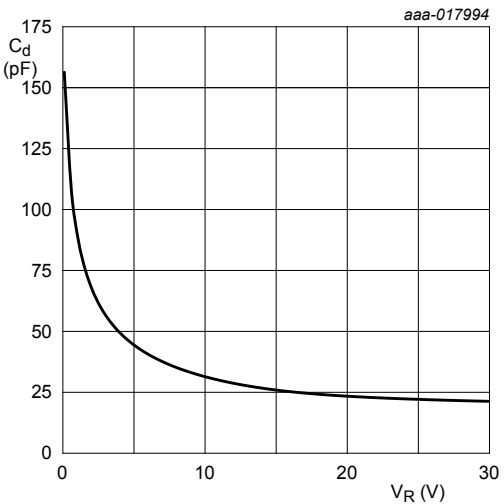
pulsed condition  
(1)  $T_j = 150^\circ\text{C}$   
(2)  $T_j = 125^\circ\text{C}$   
(3)  $T_j = 85^\circ\text{C}$   
(4)  $T_j = 25^\circ\text{C}$   
(5)  $T_j = -40^\circ\text{C}$

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



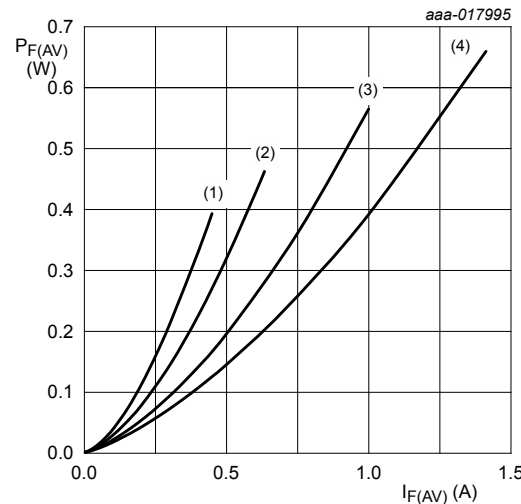
pulsed condition  
(1)  $T_j = 150^\circ\text{C}$   
(2)  $T_j = 125^\circ\text{C}$   
(3)  $T_j = 85^\circ\text{C}$   
(4)  $T_j = 25^\circ\text{C}$   
(5)  $T_j = -40^\circ\text{C}$

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



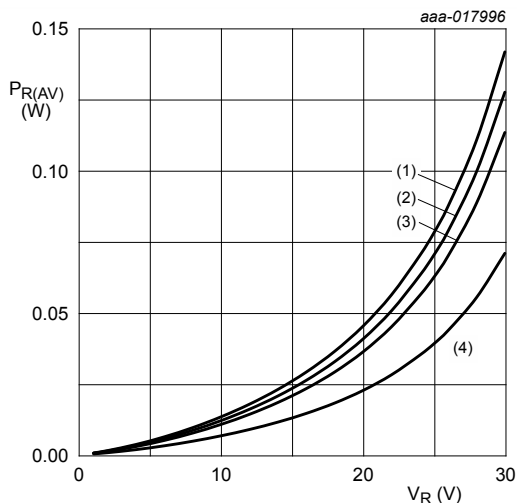
$f = 1\text{ MHz}$ ;  $T_{amb} = 25^\circ\text{C}$

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



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



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

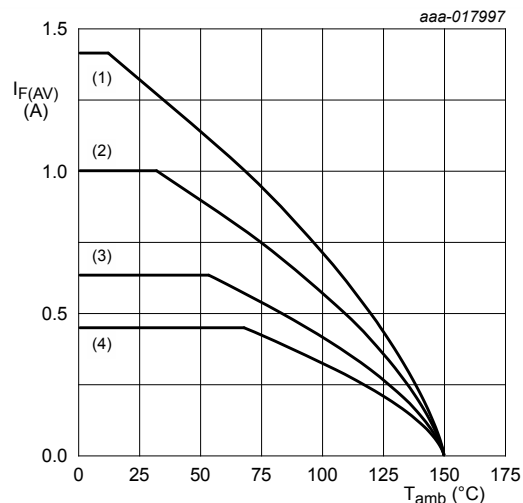
(1)  $\delta = 1$

(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

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

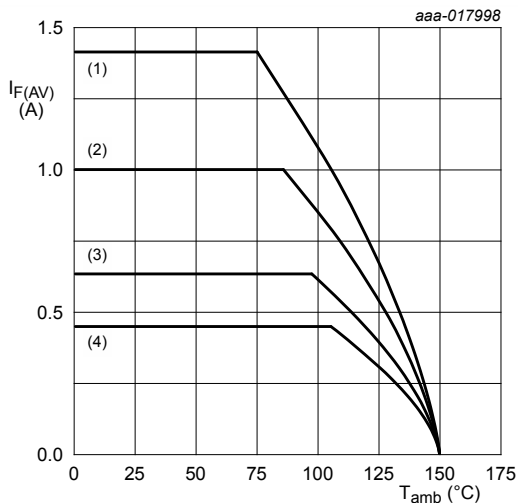
(1)  $\delta = 1$ ; DC

(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  $\text{cm}^2$  each

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

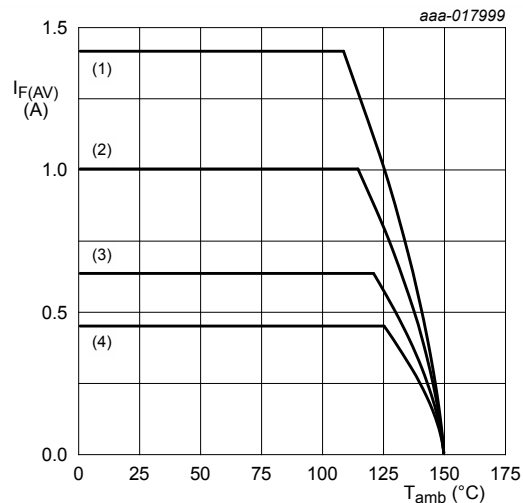
(1)  $\delta = 1$ ; DC

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

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

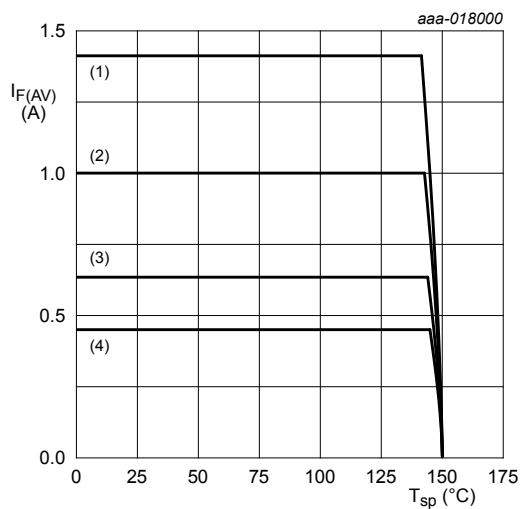
(1)  $\delta = 1$  (DC)

(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. 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

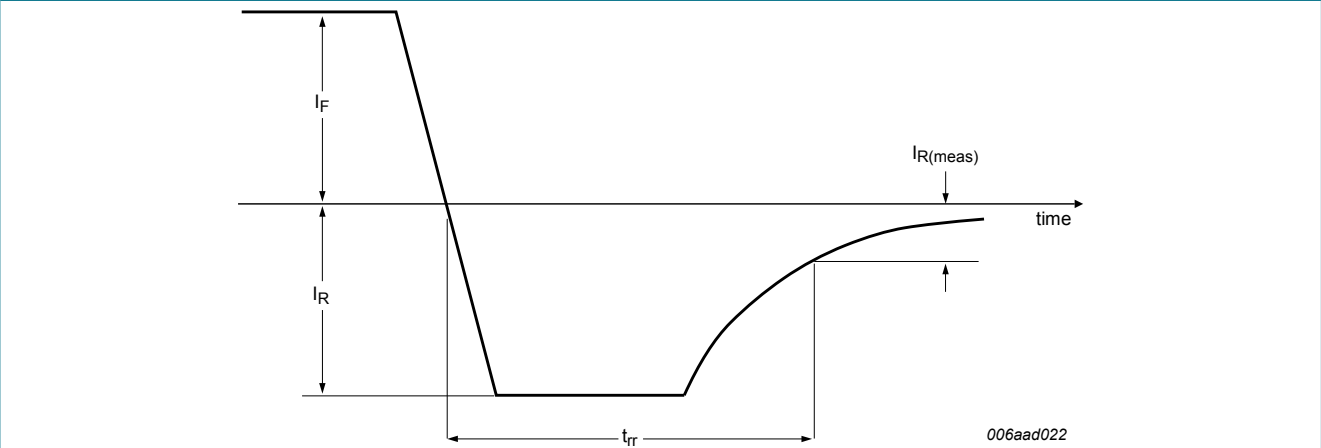


Fig. 13. Reverse recovery definition; step recovery

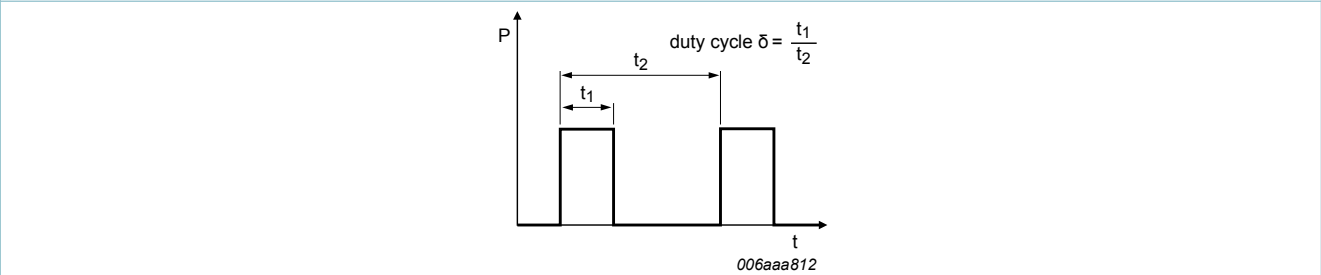


Fig. 14. Duty cycle definition

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

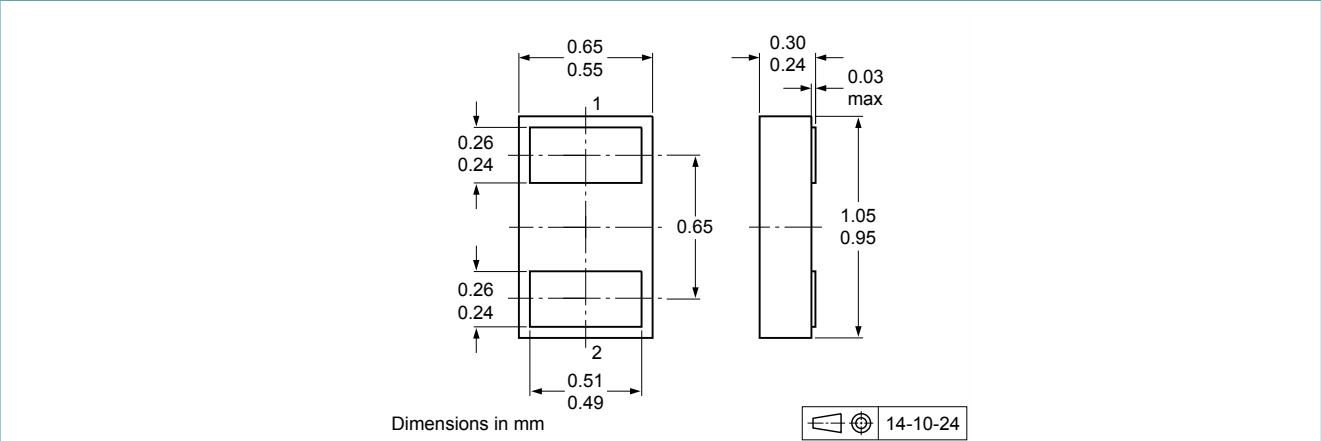


Fig. 15. Package outline DSN1006-2 (SOD993)

13. Soldering

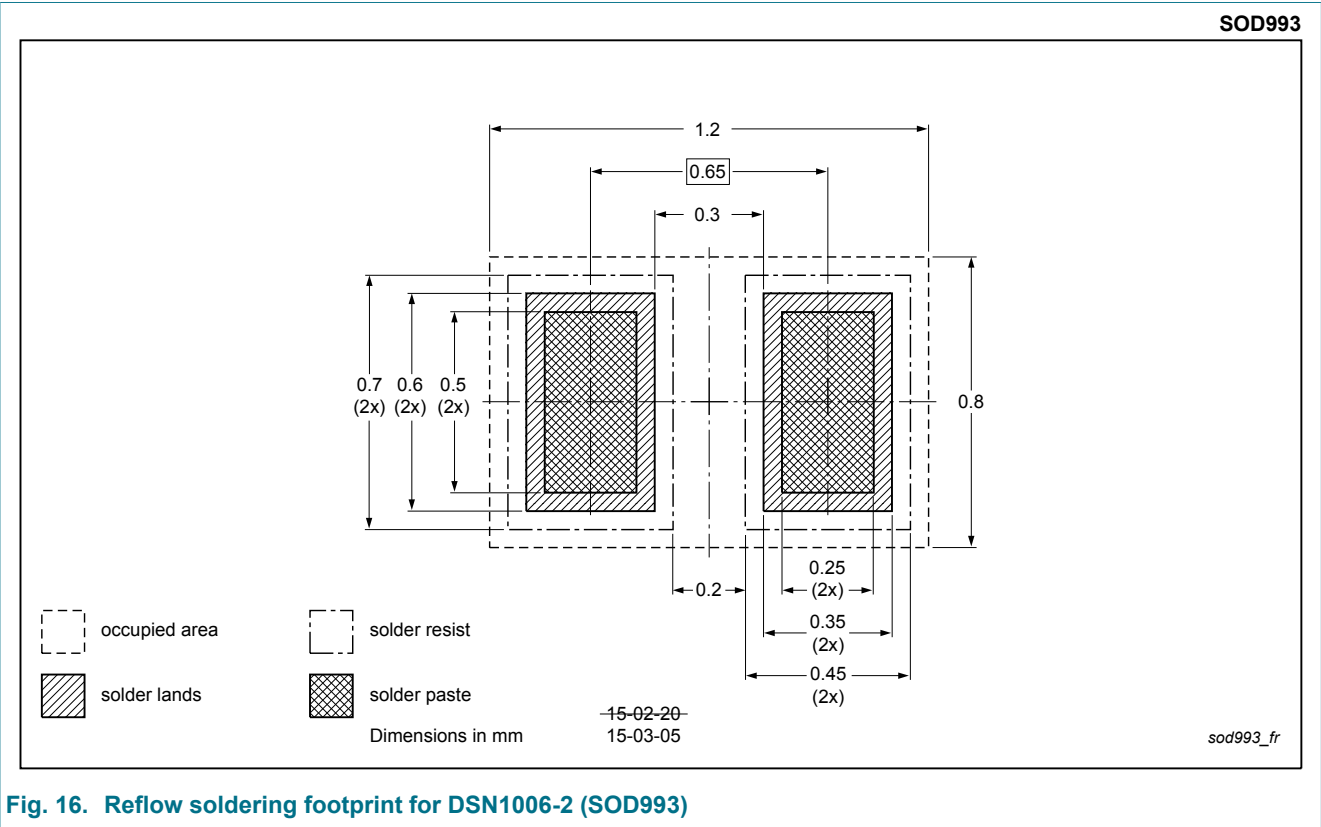


Fig. 16. Reflow soldering footprint for DSN1006-2 (SOD993)

14. Mounting

SOD993 is an ultra small Discretes Silicon No-leads (DSN) package allowing maximized utilization of the package area for active silicon. Due to the special product design, Nexperia investigated the board assembly process parameters. In order to have an optimum soldering quality, Nexperia advises following the assembly recommendations explained in [AN11689](#).

## 15. Revision history

Table 8. Revision history

| Data sheet ID   | Release date                                                                | Data sheet status      | Change notice | Supersedes      |
|-----------------|-----------------------------------------------------------------------------|------------------------|---------------|-----------------|
| PMEG3010ESB v.3 | 20160108                                                                    | Product data sheet     | -             | PMEG3010ESB v.2 |
| Modification:   | <ul style="list-style-type: none"><li>Section added: 14. Mounting</li></ul> |                        |               |                 |
| PMEG3010ESB v.2 | 20150701                                                                    | Product data sheet     | -             | PMEG3010ESB v.1 |
| PMEG3010ESB v.1 | 20150512                                                                    | Preliminary data sheet | -             | -               |

## 16. Legal information

### 16.1 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. |
| 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".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nexperia.com>.

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Date of release: 08 January 2016

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