



PMEG4010ESB

40 V, 1 A low VF MEGA Schottky barrier rectifier

27 November 2015

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: $V_R \leq 40$ V
- Low forward voltage, typical: $V_F = 510$ mV
- Low reverse current, typical: $I_R = 13$ μ A
- Package height typ. 270 μ 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

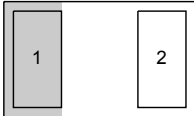

4. Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------|-------------------------|---|-----|-----|-----|---------|
| $I_{F(AV)}$ | 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 | - | - | 40 | V |
| V_F | forward voltage | $I_F = 1$ A; $t_p \leq 300$ μ s; $\delta \leq 0.02$; $T_j = 25$ °C | - | 510 | 610 | mV |
| I_R | reverse current | $V_R = 20$ V; $t_p \leq 3$ ms; $\delta \leq 0.3$; $T_j = 25$ °C | - | 2.1 | 6 | μ A |
| | | $V_R = 40$ V; $t_p \leq 3$ ms; $\delta \leq 0.3$; $T_j = 25$ °C | - | 13 | 40 | μ A |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|------------------------|---|---|
| 1 | K | cathode ^[1] |  <p>Transparent top view DSN1006-2 (SOD993)</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 |
| PMEG4010ESB | 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 |
|-------------|--------------|
| PMEG4010ESB | 4E |

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 | $T_{sp} \leq 135\text{ °C}; \delta = 1$ | | - | 1.4 | A |
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$; $f = 20\text{ kHz}; T_{amb} \leq 105\text{ °C};$ square wave | [1] | - | 1 | A |
| | | $\delta = 0.5$; $f = 20\text{ kHz}; T_{sp} \leq 140\text{ °C};$ 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 | $t_p = 8\text{ ms}; T_{j(init)} = 25\text{ °C};$ square wave | | - | 10 | A |
| P_{tot} | total power dissipation | $T_{amb} \leq 25\text{ °C}$ | [2] | - | 0.525 | W |
| | | | [3] | - | 1 | W |
| | | | [1] | - | 1.78 | W |
| 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] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for anode and cathode 1 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 cm^2 each.

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

[5] Soldering point of anode tab.

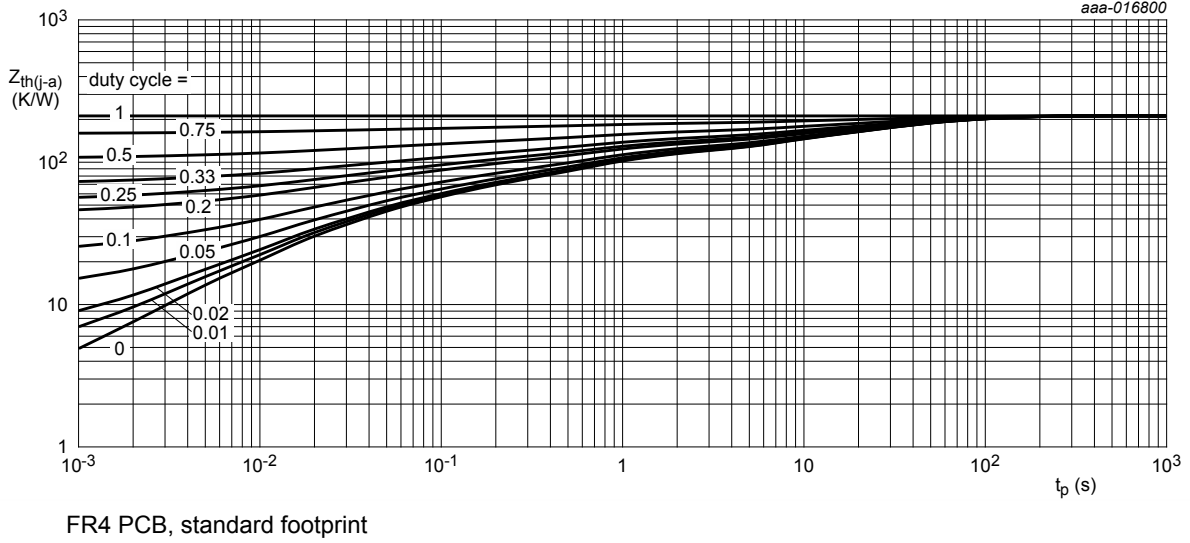


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

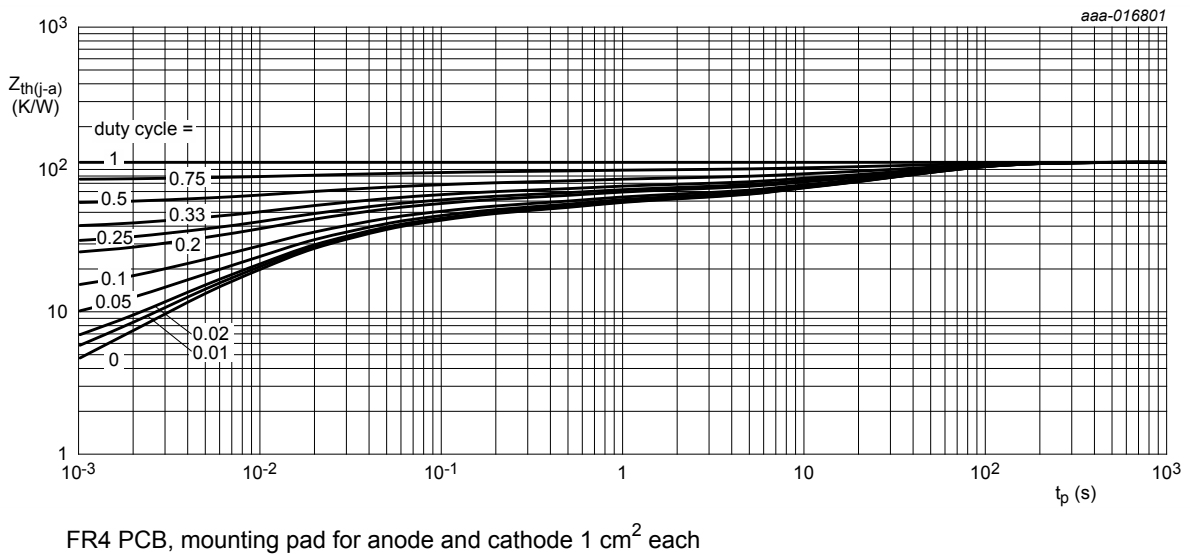


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

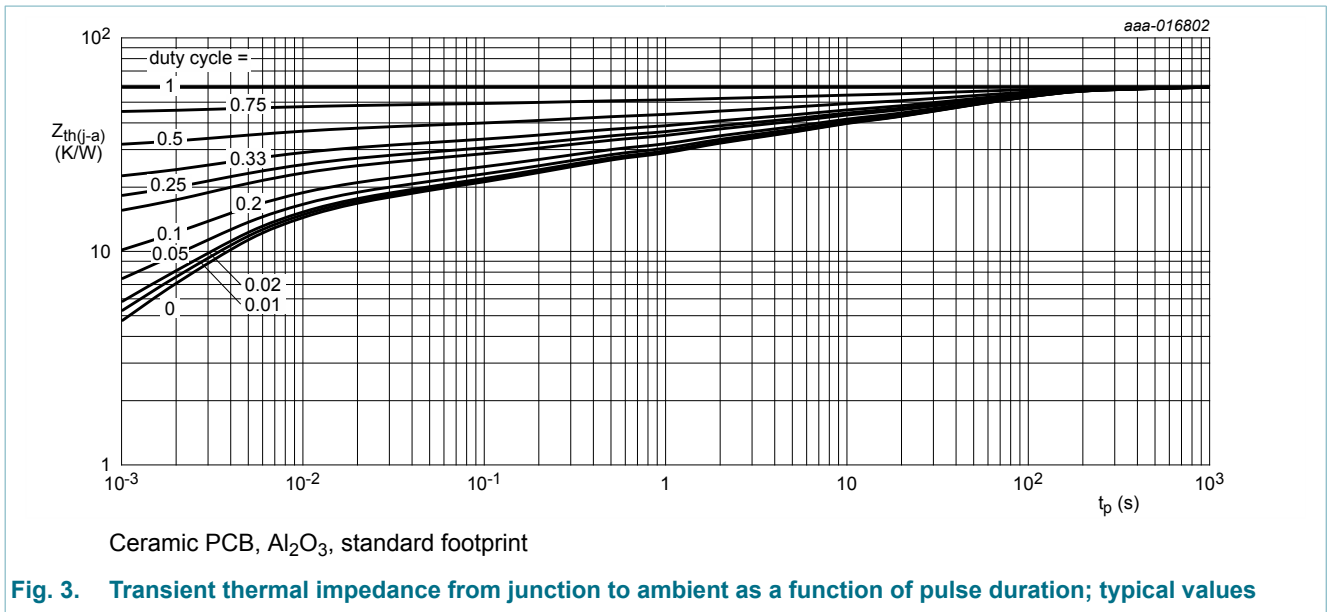


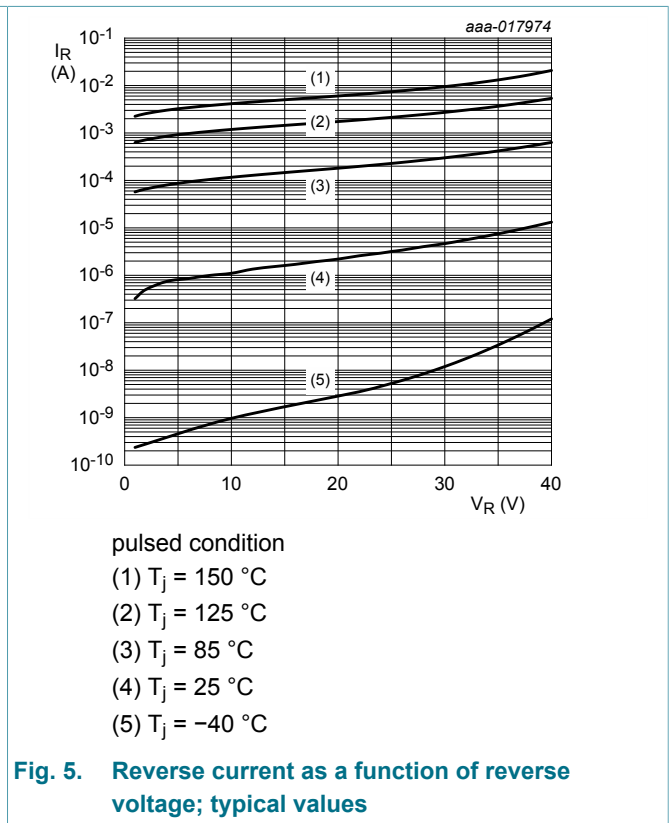
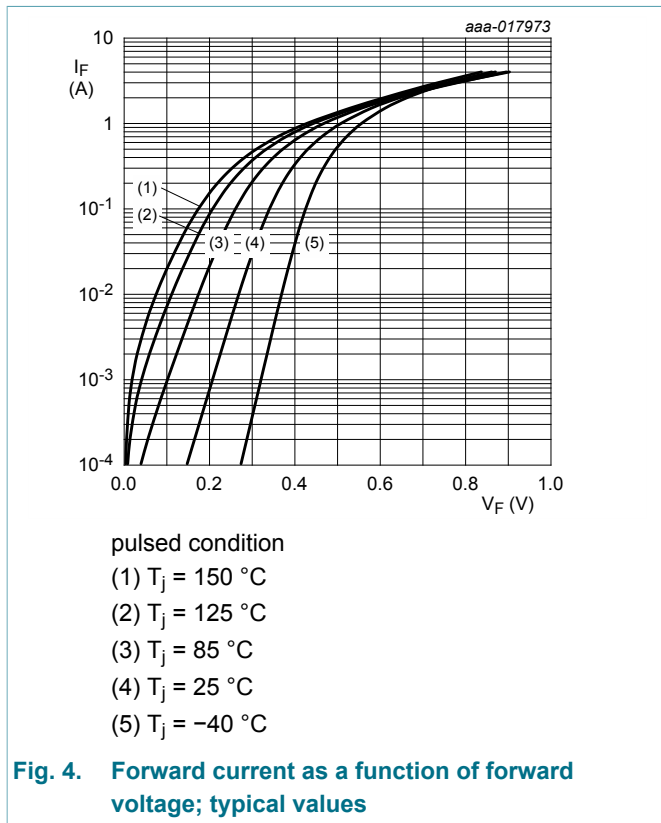
Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

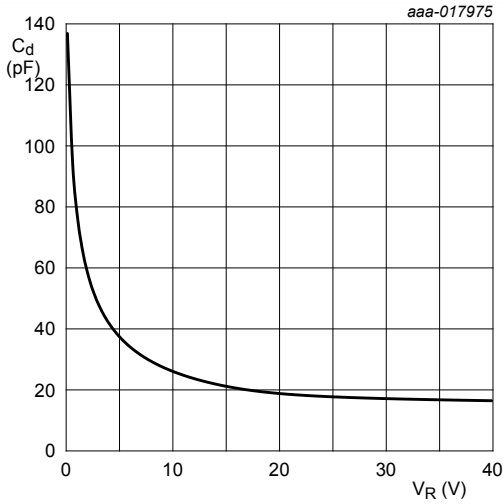
10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------|---------------------------|--|-----|-----|-----|---------------|
| $V_{(BR)R}$ | reverse breakdown voltage | $I_R = 1 \text{ mA}; t_p = 300 \mu\text{s}; \delta = 0.02 ; T_j = 25 \text{ }^\circ\text{C}$ | 40 | - | - | V |
| V_F | forward voltage | $I_F = 1 \text{ mA}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02 ; T_j = 25 \text{ }^\circ\text{C}$ | - | 205 | - | mV |
| | | $I_F = 10 \text{ mA}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02 ; T_j = 25 \text{ }^\circ\text{C}$ | - | 270 | - | mV |
| | | $I_F = 100 \text{ mA}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02 ; T_j = 25 \text{ }^\circ\text{C}$ | - | 340 | 385 | mV |
| | | $I_F = 200 \text{ mA}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02 ; T_j = 25 \text{ }^\circ\text{C}$ | - | 370 | - | mV |
| | | $I_F = 500 \text{ mA}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02 ; T_j = 25 \text{ }^\circ\text{C}$ | - | 430 | 495 | mV |
| | | $I_F = 700 \text{ mA}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02 ; T_j = 25 \text{ }^\circ\text{C}$ | - | 465 | - | mV |
| | | $I_F = 1 \text{ A}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02 ; T_j = 25 \text{ }^\circ\text{C}$ | - | 510 | 610 | mV |
| I_R | reverse current | $V_R = 5 \text{ V}; t_p \leq 3 \text{ ms}; \delta \leq 0.3 ; T_j = 25 \text{ }^\circ\text{C}$ | - | 0.8 | - | μA |
| | | $V_R = 10 \text{ V}; t_p \leq 3 \text{ ms}; \delta \leq 0.3 ; T_j = 25 \text{ }^\circ\text{C}$ | - | 1 | 4 | μA |
| | | $V_R = 20 \text{ V}; t_p \leq 3 \text{ ms}; \delta \leq 0.3 ; T_j = 25 \text{ }^\circ\text{C}$ | - | 2.1 | 6 | μA |

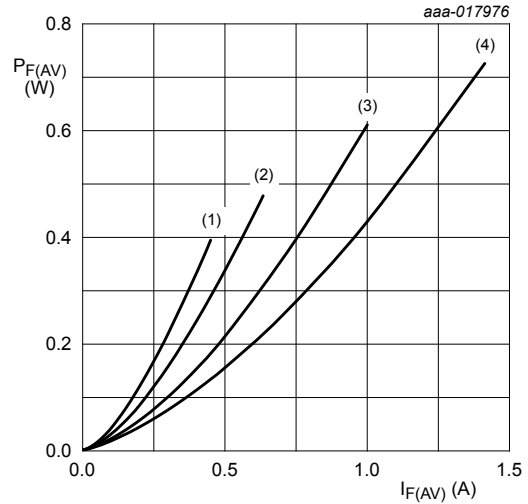
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------|-----------------------|--|-----|-----|-----|---------------|
| | | $V_R = 40\text{ V}; t_p \leq 3\text{ ms}; \delta \leq 0.3$; $T_j = 25\text{ }^\circ\text{C}$ | - | 13 | 40 | μA |
| C_d | diode capacitance | $V_R = 1\text{ V}; f = 1\text{ MHz}; T_j = 25\text{ }^\circ\text{C}$ | - | 75 | - | pF |
| | | $V_R = 10\text{ V}; f = 1\text{ MHz}; T_j = 25\text{ }^\circ\text{C}$ | - | 22 | - | pF |
| t_{rr} | reverse recovery time | $I_F = 0.5\text{ A}; I_R = 0.5\text{ A}; I_{R(\text{meas})} = 0.1\text{ A};$ $T_j = 25\text{ }^\circ\text{C}$ | - | 2.9 | - | ns |





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

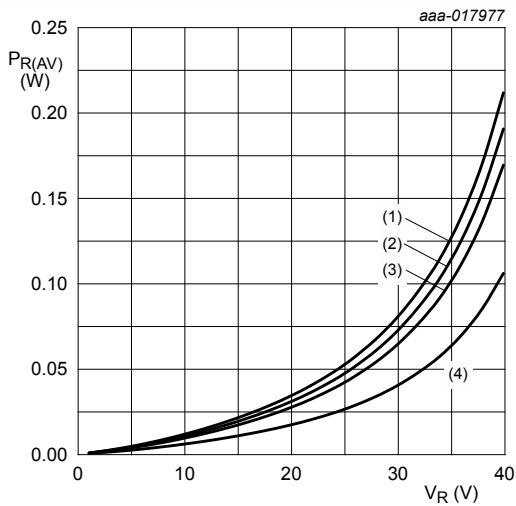
Fig. 6. Diode capacitance as a function of reverse voltage; typical values



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

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

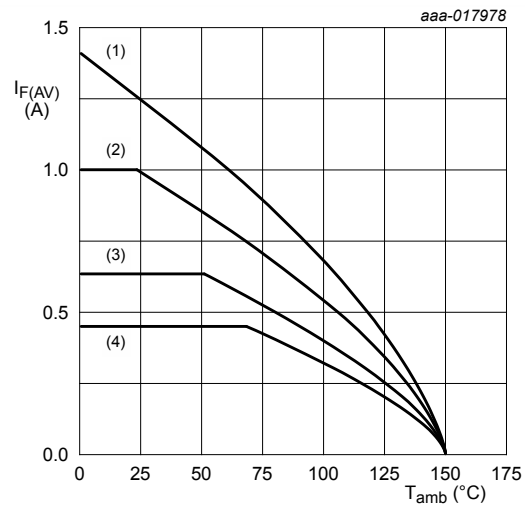
Fig. 7. Average forward power dissipation as a function of average forward current; typical values



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

- (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

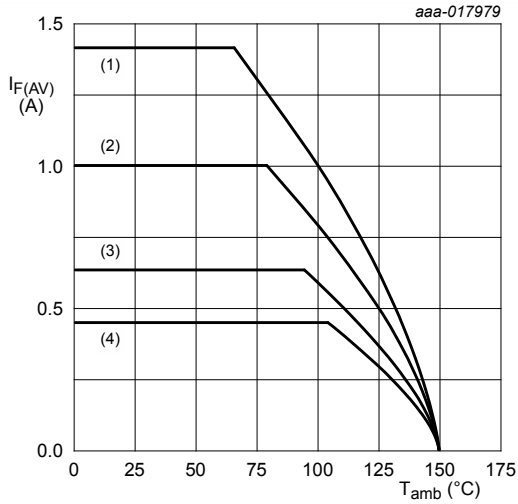


FR4 PCB, standard footprint

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

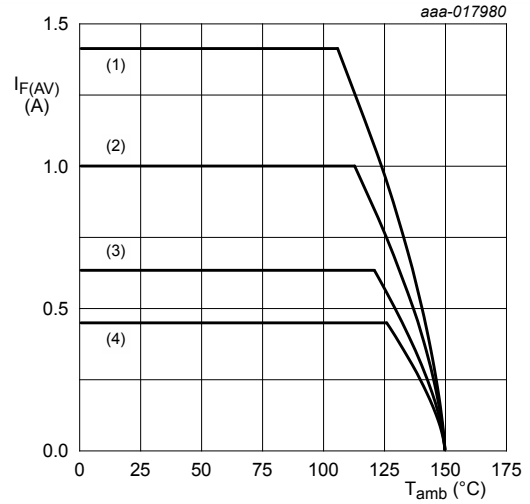
- (1) $\delta = 1$; DC
- (2) $\delta = 0.5$; $f = 20 \text{ kHz}$
- (3) $\delta = 0.2$; $f = 20 \text{ kHz}$
- (4) $\delta = 0.1$; $f = 20 \text{ kHz}$

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



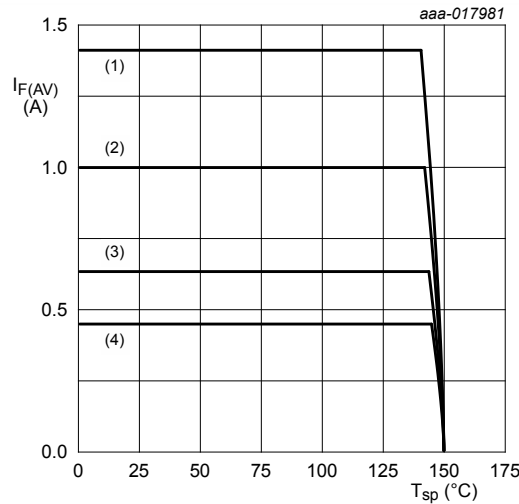
FR4 PCB, mounting pad for anode and cathode 1 cm² each
 T_j = 150 °C
 (1) δ = 1; DC
 (2) δ = 0.5; f = 20 kHz
 (3) δ = 0.2; f = 20 kHz
 (4) δ = 0.1; f = 20 kHz

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



Ceramic PCB, Al₂O₃, standard footprint
 T_j = 150 °C
 (1) δ = 1 (DC)
 (2) δ = 0.5; f = 20 kHz
 (3) δ = 0.2; f = 20 kHz
 (4) δ = 0.1; f = 20 kHz

Fig. 11. Average forward current as a function of ambient temperature; typical values



T_j = 150 °C
 (1) δ = 1 (DC)
 (2) δ = 0.5; f = 20 kHz
 (3) δ = 0.2; f = 20 kHz
 (4) δ = 0.1; f = 20 kHz

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

11. Test information

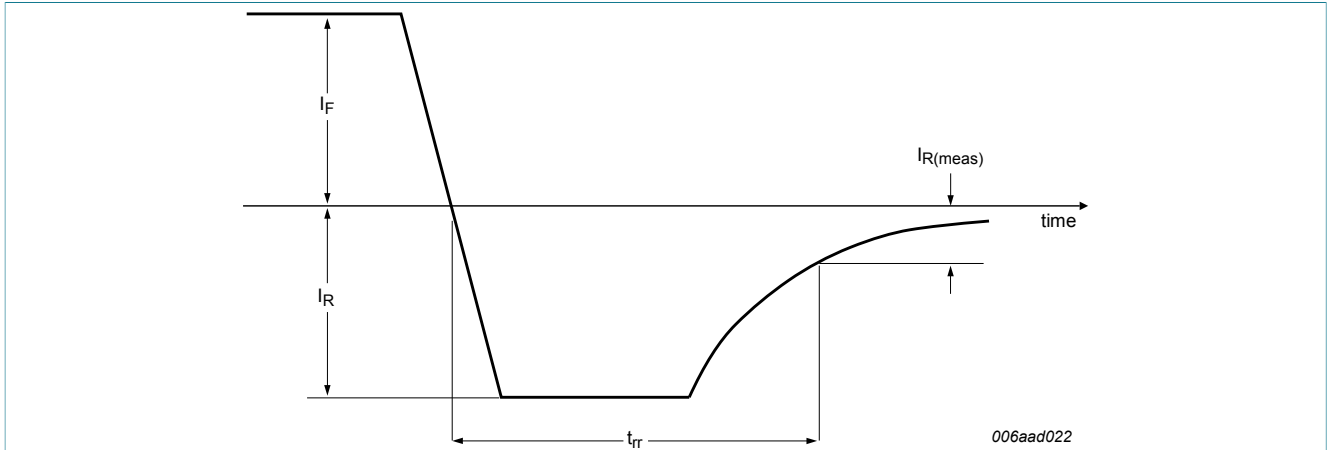


Fig. 13. Reverse recovery definition; step recovery

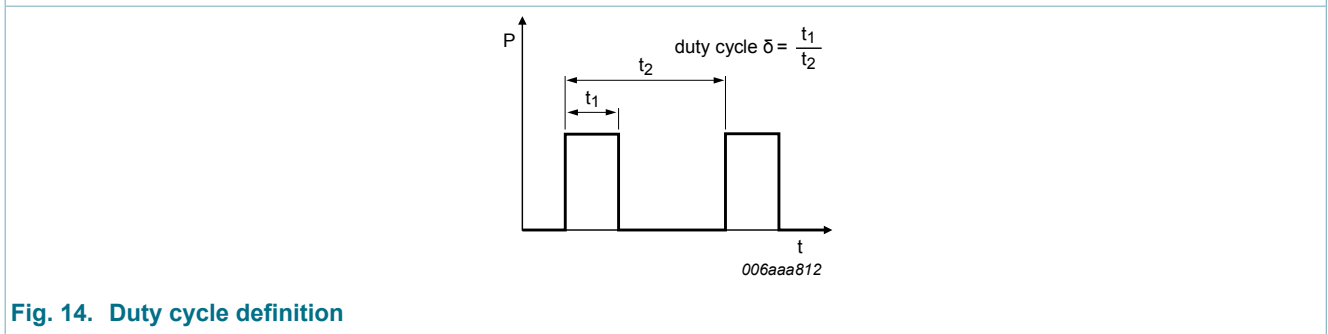


Fig. 14. Duty cycle definition

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

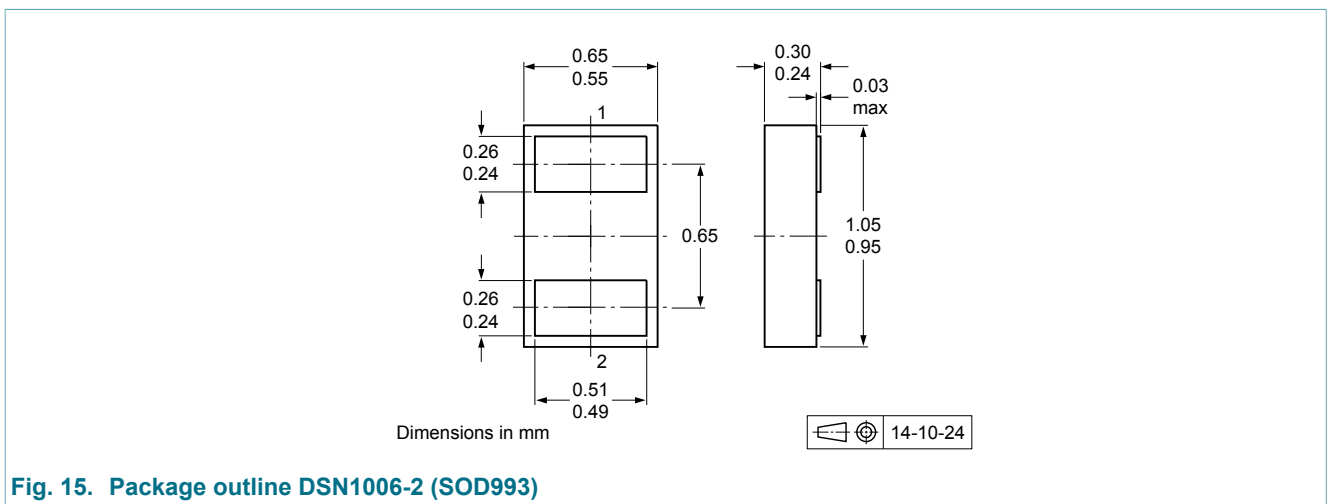


Fig. 15. Package outline DSN1006-2 (SOD993)

13. Soldering

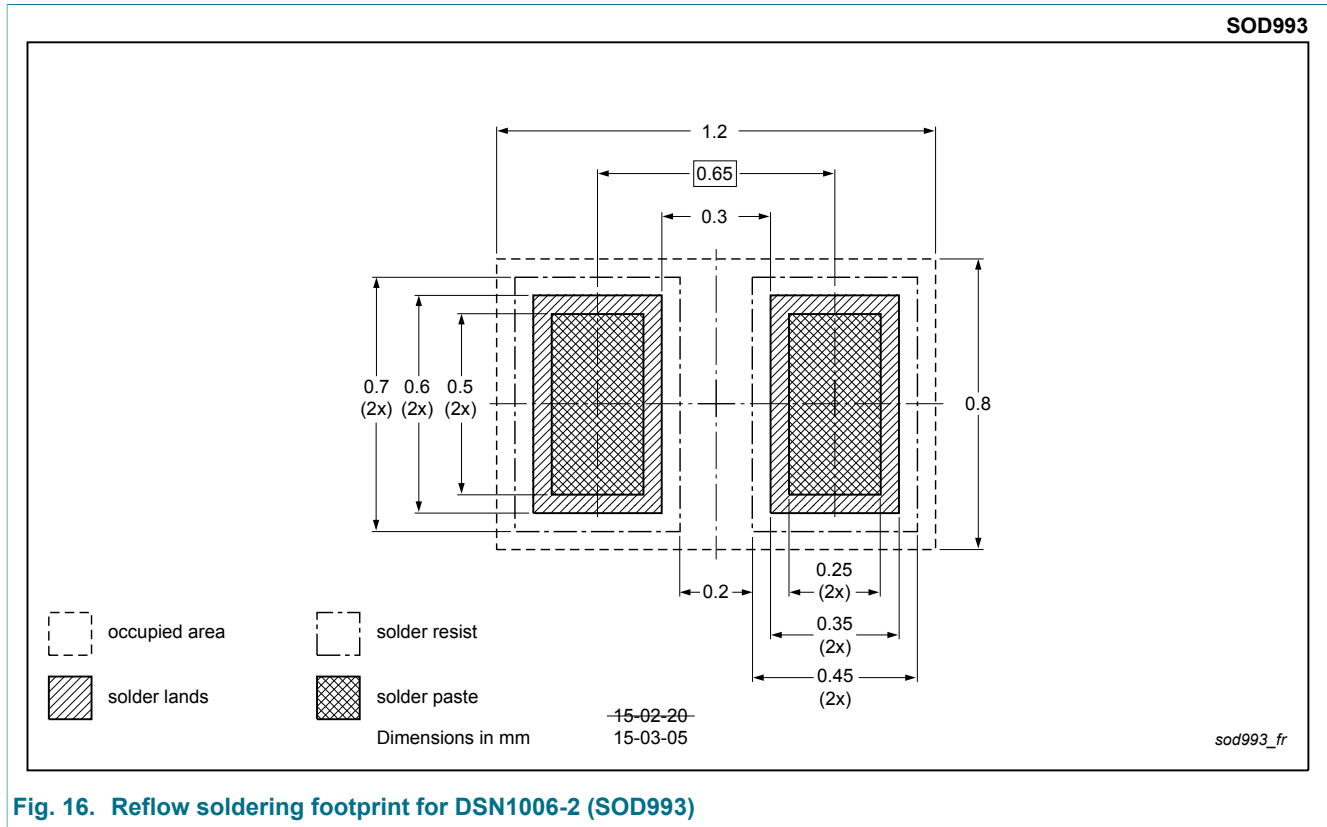


Fig. 16. Reflow soldering footprint for DSN1006-2 (SOD993)

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 |
|-----------------|--|------------------------|---------------|-----------------|
| PMEG4010ESB v.3 | 20151127 | Product data sheet | - | PMEG4010ESB v.2 |
| Modifications: | <ul style="list-style-type: none">Added section "Mounting" | | | |
| PMEG4010ESB v.2 | 20150624 | Product data sheet | - | PMEG4010ESB v.1 |
| PMEG4010ESB 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".
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