
# PMEG6010ESB

## 60 V, 1 A low VF MEGA Schottky barrier rectifier

24 August 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: $V_R \leq 60$ V
- Low forward voltage, typical: $V_F = 625$ mV
- Low reverse current, typical: $I_R = 9$ µA
- Package height typ. 270 µm

## 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

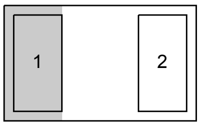
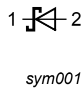
## 4. Quick reference data

**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 | | - | - | 60 | V |
| $V_F$ | forward voltage | $I_F = 1$ A; $t_p \leq 300$ µs; $\delta \leq 0.02$ ; $T_j = 25$ °C | | - | 625 | 730 | mV |
| $I_R$ | reverse current | $V_R = 30$ V; $t_p \leq 3$ ms; $\delta \leq 0.3$ ; $T_j = 25$ °C | | - | 1.8 | 6 | µA |
| | | $V_R = 60$ V; $t_p \leq 3$ ms; $\delta \leq 0.3$ ; $T_j = 25$ °C | | - | 9 | 30 | µA |

## 5. Pinning information

**Table 2. Pinning information**

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

[1] The marking bar indicates the cathode.

## 6. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| PMEG6010ESB | 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 |
|---|---|
| PMEG6010ESB | 6E |

## 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 °C | | - | 60 | V |
| $I_F$ | forward current | $T_{sp}$ ≤ 135 °C; δ = 1 | | - | 1.4 | A |
| $I_{F(AV)}$ | average forward current | δ = 0.5 ; f = 20 kHz; $T_{amb}$ ≤ 95 °C; square wave | [1] | - | 1 | A |
| | | δ = 0.5 ; f = 20 kHz; $T_{sp}$ ≤ 140 °C; square wave | | - | 1 | A |
| $I_{FRM}$ | repetitive peak forward current | $t_p$ ≤ 1 ms; δ ≤ 0.25 | | - | 4 | A |
| $I_{FSM}$ | non-repetitive peak forward current | $t_p$ = 8 ms; $T_{j(init)}$ = 25 °C; square wave | | - | 10 | A |
| $P_{tot}$ | total power dissipation | $T_{amb}$ ≤ 25 °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.

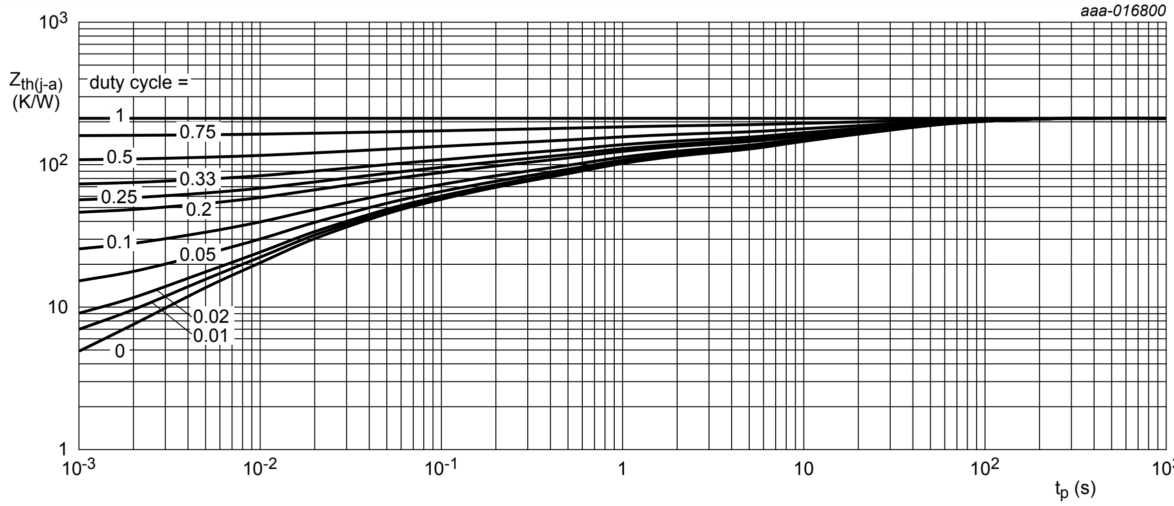
[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for anode and cathode 1 $cm^2$ each.

# 9. Thermal characteristics

**Table 6. Thermal characteristics**

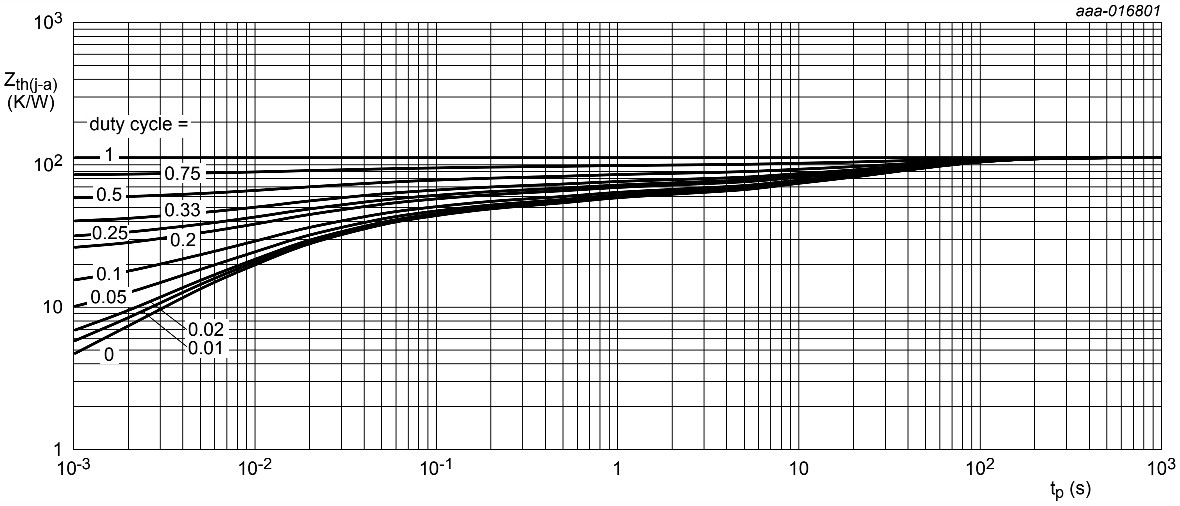
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1][2] | - | - | 240 | K/W |
| | | | [1][3] | - | - | 125 | K/W |
| | | | [1][4] | - | - | 70 | K/W |
| $R_{th(j-sp)}$ | thermal 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.



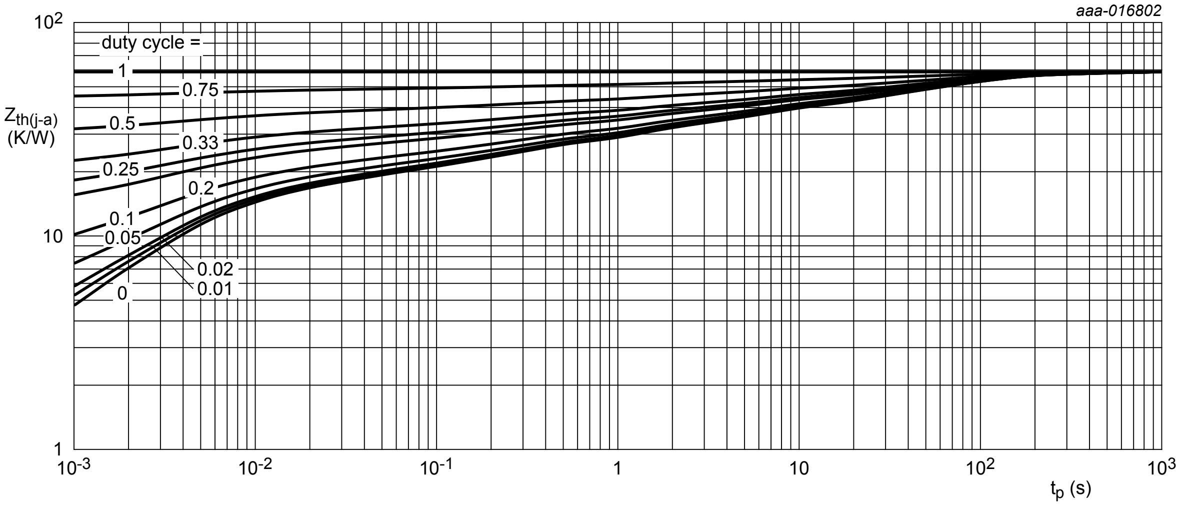

FR4 PCB, standard footprint

**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 $cm^2$ each

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



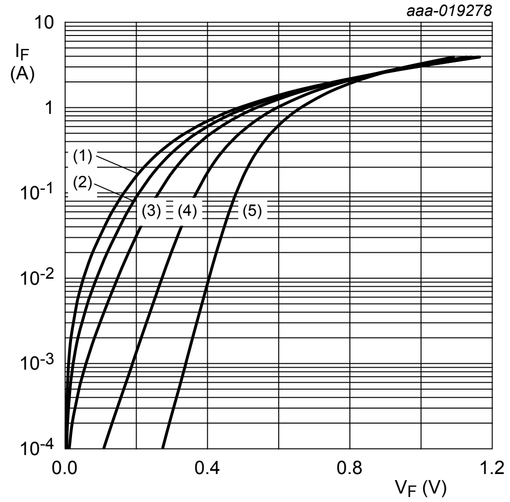

Ceramic PCB, $Al_2O_3$, standard footprint

**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 breakdown voltage | $I_R$ = 1 mA; $t_p$ = 300 µs; δ = 0.02 ; $T_j$ = 25 °C | | 60 | - | - | V |
| $V_F$ | forward voltage | $I_F$ = 1 mA; $t_p$ ≤ 300 µs; δ ≤ 0.02 ; $T_j$ = 25 °C | | - | 210 | - | mV |
| | | $I_F$ = 10 mA; $t_p$ ≤ 300 µs; δ ≤ 0.02 ; $T_j$ = 25 °C | | - | 275 | - | mV |
| | | $I_F$ = 100 mA; $t_p$ ≤ 300 µs; δ ≤ 0.02 ; $T_j$ = 25 °C | | - | 355 | 400 | mV |
| | | $I_F$ = 200 mA; $t_p$ ≤ 300 µs; δ ≤ 0.02 ; $T_j$ = 25 °C | | - | 400 | - | mV |
| | | $I_F$ = 500 mA; $t_p$ ≤ 300 µs; δ ≤ 0.02 ; $T_j$ = 25 °C | | - | 490 | 555 | mV |
| | | $I_F$ = 700 mA; $t_p$ ≤ 300 µs; δ ≤ 0.02 ; $T_j$ = 25 °C | | - | 545 | - | mV |
| | | $I_F$ = 1 A; $t_p$ ≤ 300 µs; δ ≤ 0.02 ; $T_j$ = 25 °C | | - | 625 | 730 | mV |
| $I_R$ | reverse current | $V_R$ = 5 V; $t_p$ ≤ 3 ms; δ ≤ 0.3 ; $T_j$ = 25 °C | | - | 0.6 | - | µA |
| | | $V_R$ = 10 V; $t_p$ ≤ 3 ms; δ ≤ 0.3 ; $T_j$ = 25 °C | | - | 0.8 | 2.5 | µA |
| | | $V_R$ = 30 V; $t_p$ ≤ 3 ms; δ ≤ 0.3 ; $T_j$ = 25 °C | | - | 1.8 | 6 | µA |
| | | $V_R$ = 60 V; $t_p$ ≤ 3 ms; δ ≤ 0.3 ; $T_j$ = 25 °C | | - | 9 | 30 | µA |
| $C_d$ | diode capacitance | $V_R$ = 1 V; f = 1 MHz; $T_j$ = 25 °C | | - | 55 | - | pF |
| | | $V_R$ = 10 V; f = 1 MHz; $T_j$ = 25 °C | | - | 20 | - | pF |
| $t_{rr}$ | reverse recovery time | $I_F$ = 0.5 A; $I_R$ = 0.5 A; $I_{R(meas)}$ = 0.1 A; $T_j$ = 25 °C | | - | 2.4 | - | ns |




pulsed condition

(1) $T_j$ = 150 °C

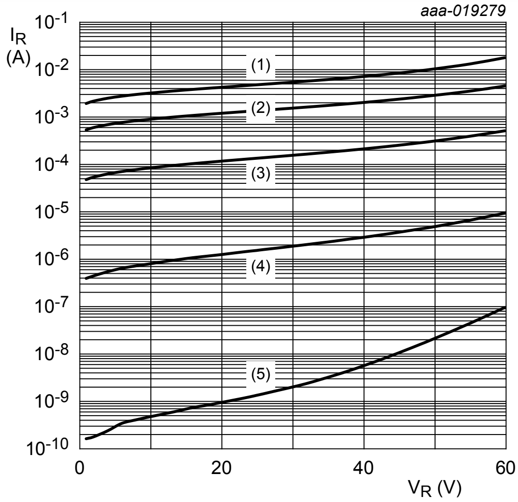
(2) $T_j$ = 125 °C

(3) $T_j$ = 85 °C

(4) $T_j$ = 25 °C

(5) $T_j$ = −40 °C

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




pulsed condition

(1) $T_j$ = 150 °C

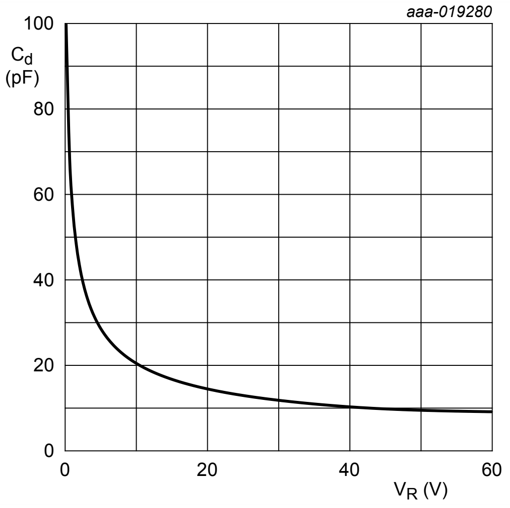
(2) $T_j$ = 125 °C

(3) $T_j$ = 85 °C

(4) $T_j$ = 25 °C

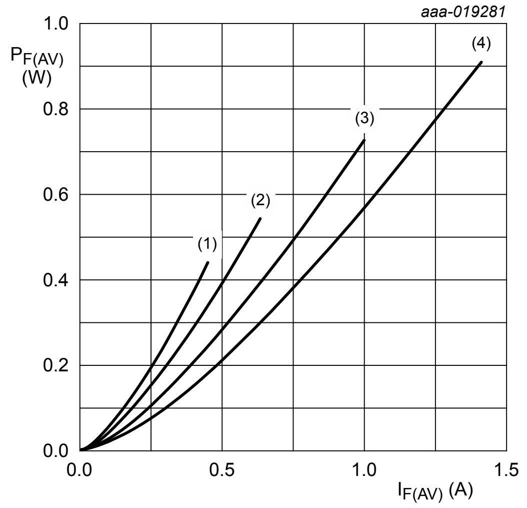
(5) $T_j$ = −40 °C

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




f = 1 MHz; $T_{amb}$ = 25 °C

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




$T_j$ = 150 °C

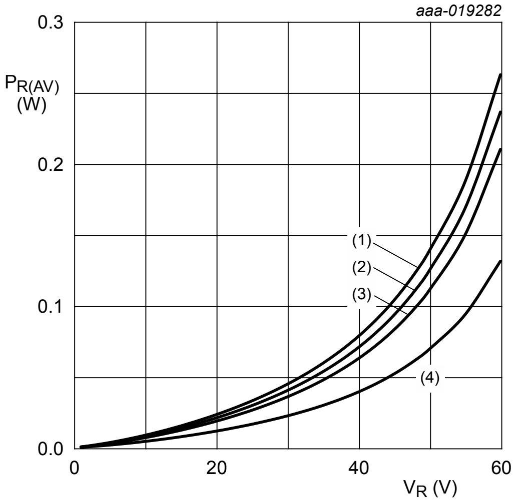
(1) δ = 0.1

(2) δ = 0.2

(3) δ = 0.5

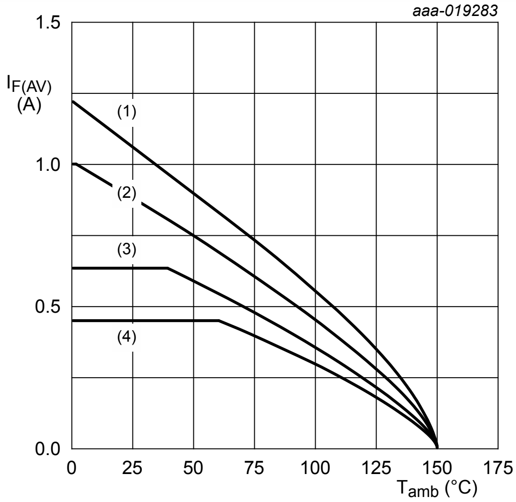
(4) δ = 1

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



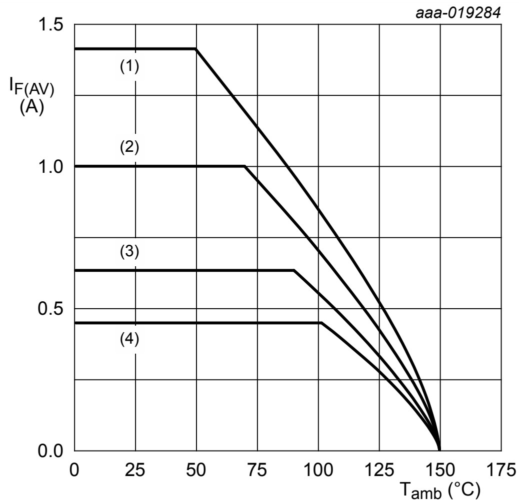

$T_j$ = 150 °C
(1) δ = 1
(2) δ = 0.9
(3) δ = 0.8
(4) δ = 0.5

**Fig. 8. Average reverse power dissipation as a function of reverse voltage; typical values**



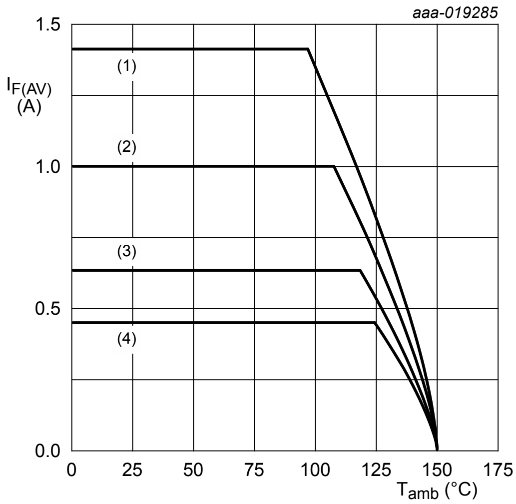

FR4 PCB, standard footprint
$T_j$ = 150 °C
(1) δ = 1; DC
(2) δ = 0.5; f = 20 kHz
(3) δ = 0.2; f = 20 kHz
(4) δ = 0.1; f = 20 kHz

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



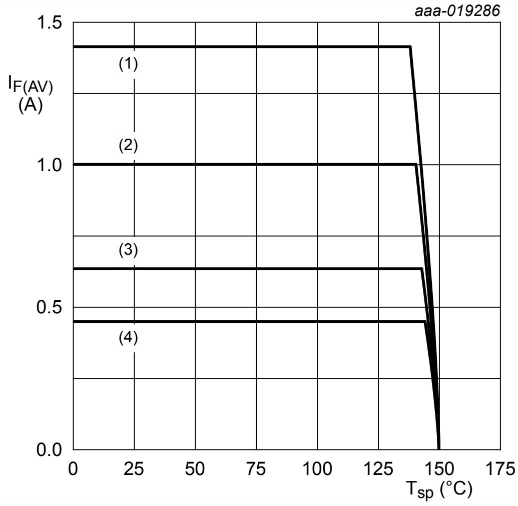

FR4 PCB, mounting pad for anode and cathode 1 $cm^2$ each
$T_j$ = 150 °C
(1) δ = 1; DC
(2) δ = 0.5; f = 20 kHz
(3) δ = 0.2; f = 20 kHz
(4) δ = 0.1; f = 20 kHz

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




Ceramic PCB, $Al_2O_3$, 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

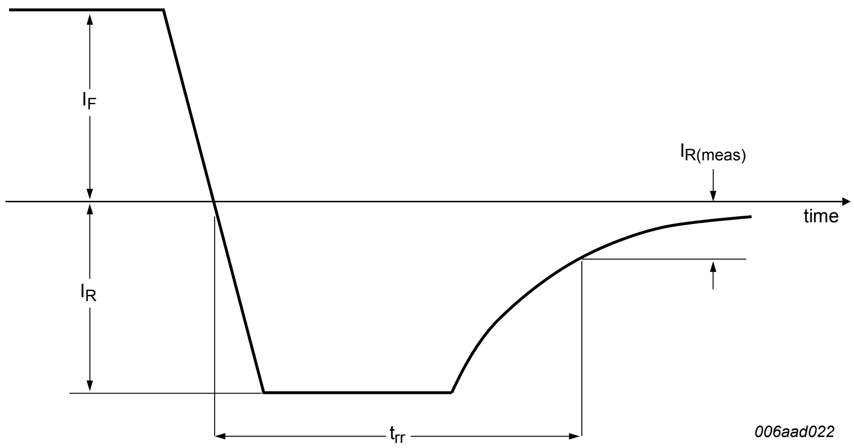



**Fig. 13. Reverse recovery definition; step recovery**

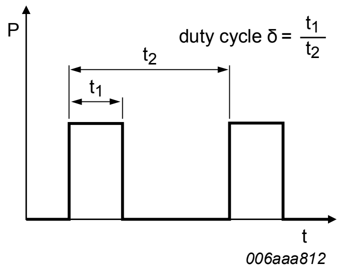



**Fig. 14. Duty cycle definition**

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

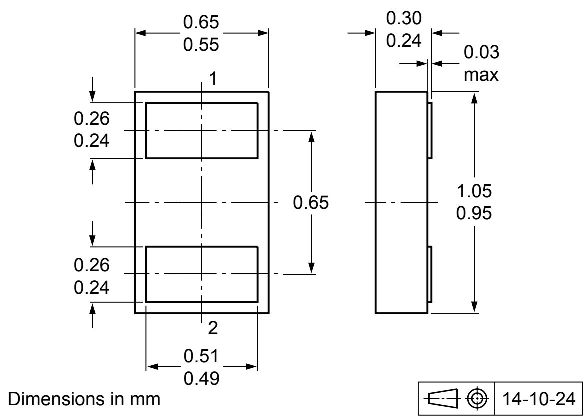



**Fig. 15. Package outline DSN1006-2 (SOD993)**

## 13. Soldering

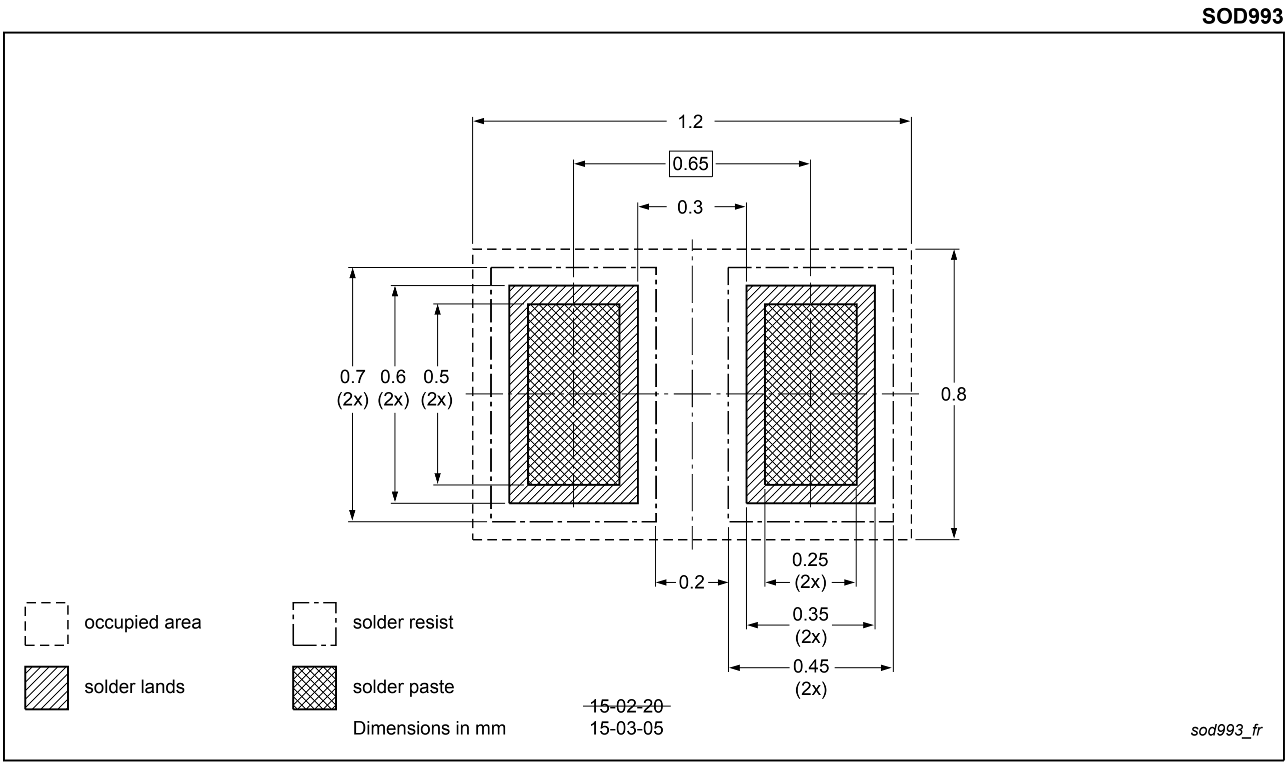



**Fig. 16. Reflow soldering footprint for DSN1006-2 (SOD993)**

## 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 advices to follow the assembly recommendations explained in AN11689.

## 15. Revision history

**Table 8. Revision history**

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| PMEG6010ESB v.1 | 20150824 | Product data sheet | - | - |

# 16. Legal information

## 16.1 Data sheet status

| Document status [1][2] | Product status [3] | Definition |
|---|---|---|
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**Date of release: 24 August 2015**