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: $I_R = 13$ 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	δ = 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; $t_p \leq 300$ µs; δ ≤ 0.02 ; $T_j = 25$ °C		-	510	610	mV
I_R	reverse current	$V_R = 20$ V; $t_p \leq 3$ ms; δ ≤ 0.3 ; $T_j = 25$ °C		-	2.1	6	µA
		$V_R = 40$ V; $t_p \leq 3$ ms; δ ≤ 0.3 ; $T_j = 25$ °C		-	13	40	µA

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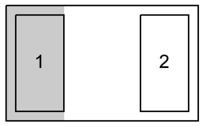
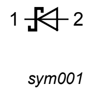
5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode[1]	 Transparent top view **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
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 °C		-	40	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} ≤ 105 °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

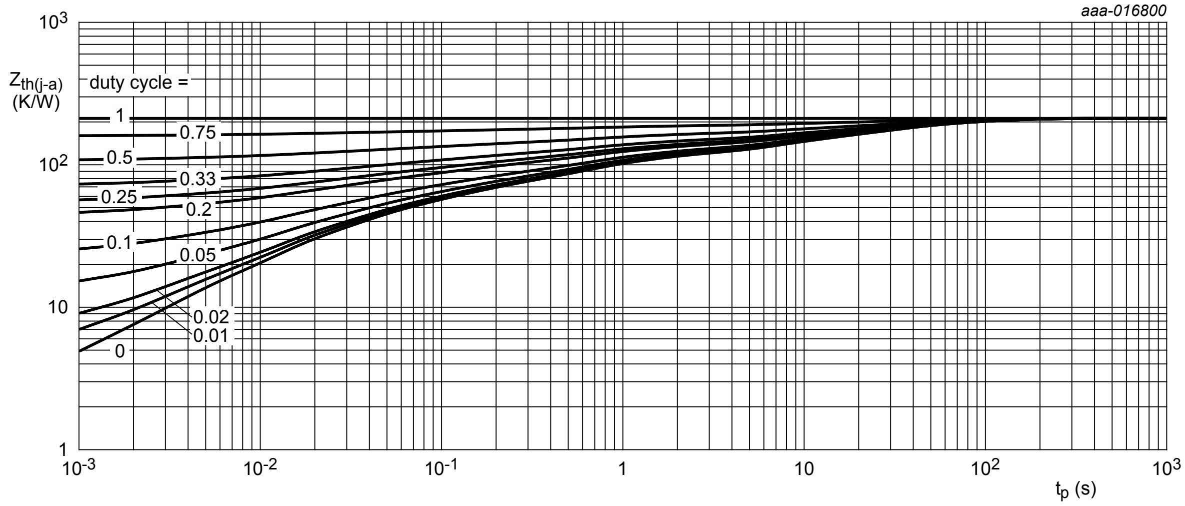
[1] Device mounted on a ceramic Printed-Circuit Board (PCB), Al_2O_3, standard footprint.
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for anode and cathode 1 cm^2 each.

9. Thermal characteristics

Table 6. Thermal characteristics

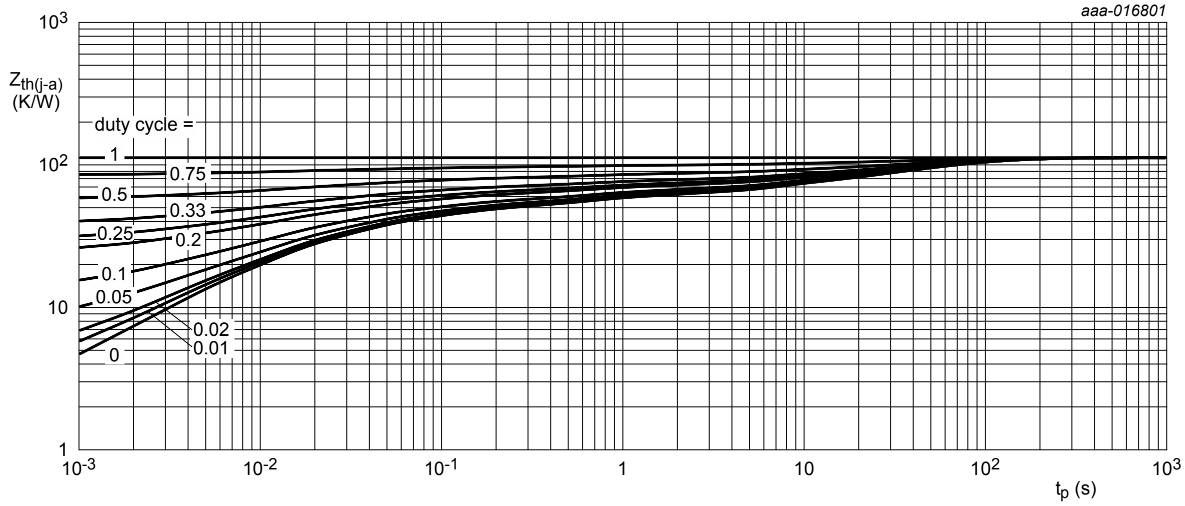
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1][2]	-	-	240	K/W
			[1][3]	-	-	125	K/W
			[1][4]	-	-	70	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[5]	-	-	15	K/W

[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.



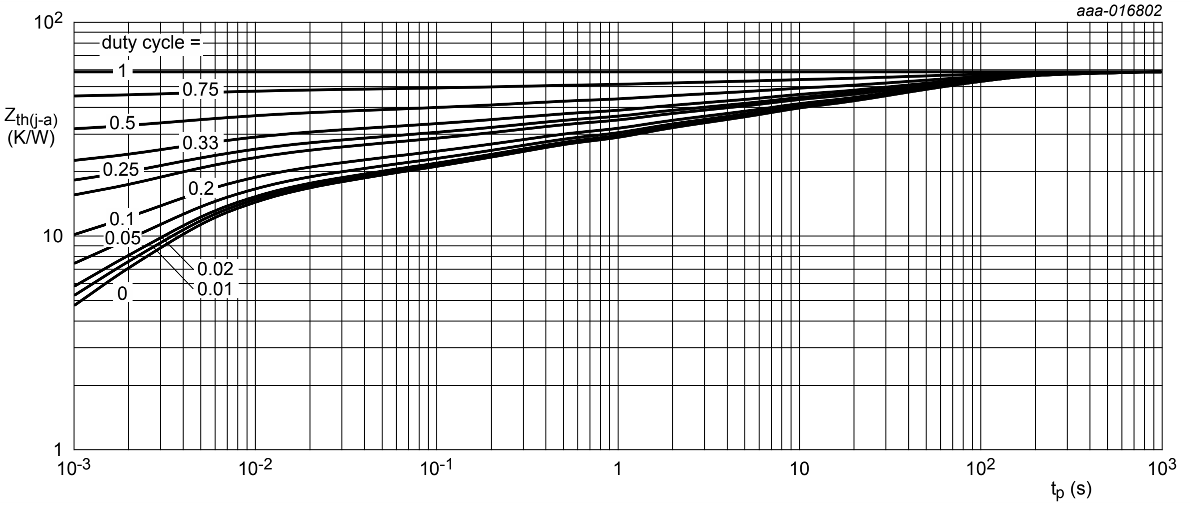
FR4 PCB, standard footprint

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

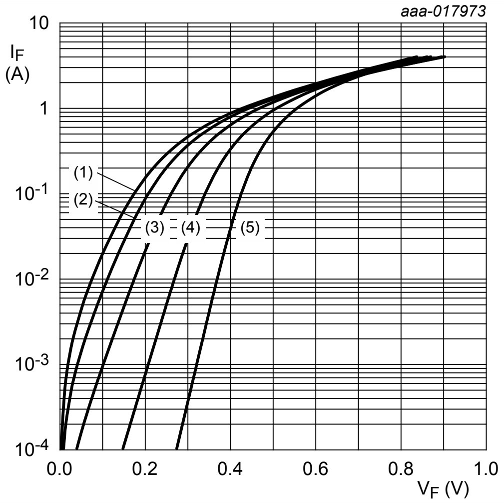
Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

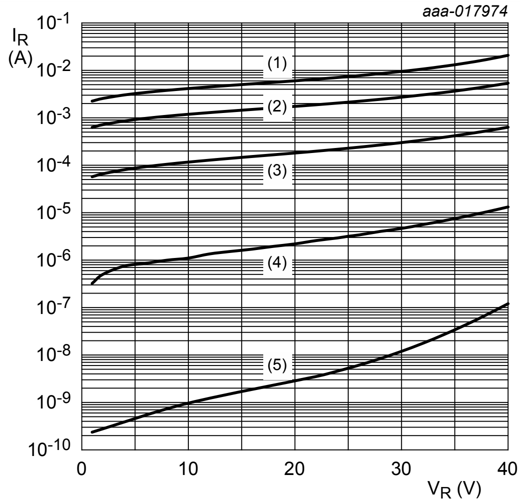
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)R}$	reverse breakdown voltage	I_R = 1 mA; t_p = 300 µs; δ = 0.02 ; T_j = 25 °C		40	-	-	V
V_F	forward voltage	I_F = 1 mA; t_p ≤ 300 µs; δ ≤ 0.02 ; T_j = 25 °C		-	205	-	mV
		I_F = 10 mA; t_p ≤ 300 µs; δ ≤ 0.02 ; T_j = 25 °C		-	270	-	mV
		I_F = 100 mA;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

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
		V_R = 40 V; t_p ≤ 3 ms; δ ≤ 0.3 ; T_j = 25 °C		-	13	40	µA
C_d	diode capacitance	V_R = 1 V; f = 1 MHz; T_j = 25 °C		-	75	-	pF
		V_R = 10 V; f = 1 MHz; T_j = 25 °C		-	22	-	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		-	2.9	-	ns



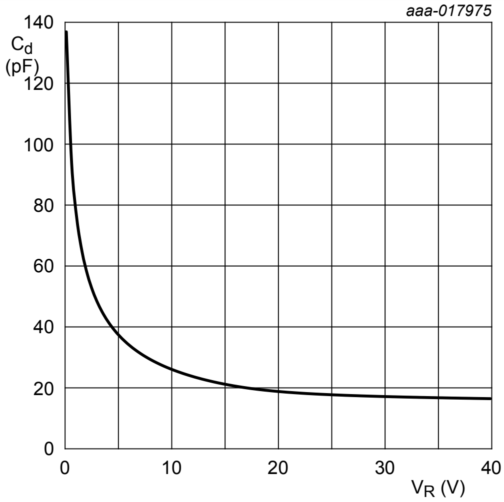
pulsed condition
(1) T_j = 150 °C
(2) T_j = 125 °C
(3) T_j = 85 °C
(4) T_j = 25 °C
(5) T_j = −40 °C

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



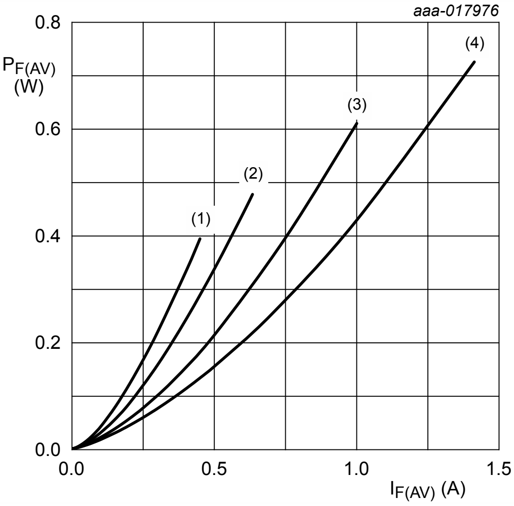
pulsed condition
(1) T_j = 150 °C
(2) T_j = 125 °C
(3) T_j = 85 °C
(4) T_j = 25 °C
(5) T_j = −40 °C

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



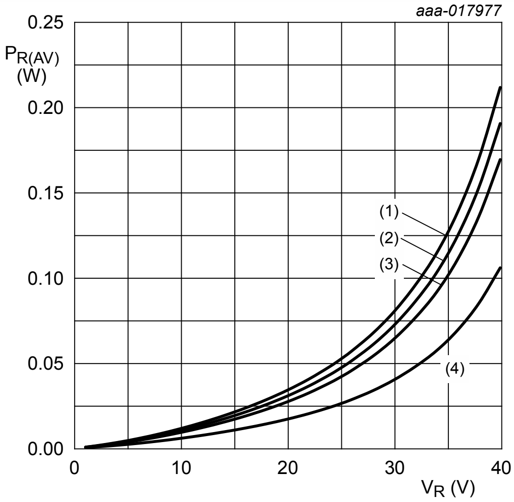
f = 1 MHz; T_{amb} = 25 °C

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



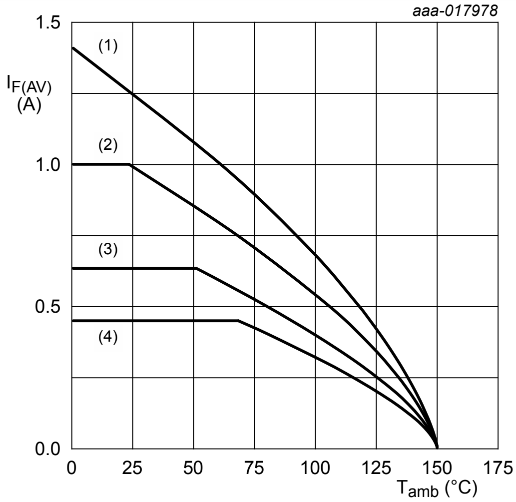
T_j = 150 °C
(1) δ = 0.1
(2) δ = 0.2
(3) δ = 0.5
(4) δ = 1

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



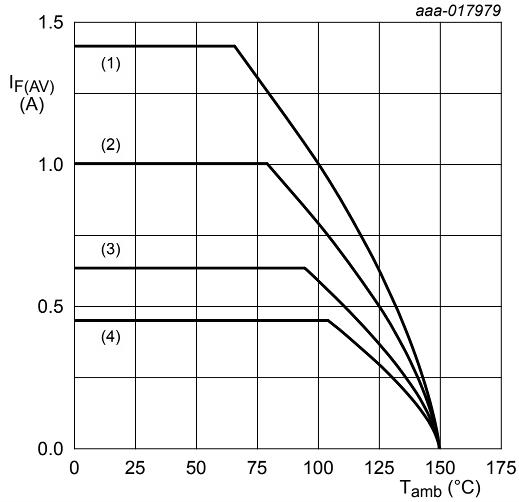
T_j = 125 °C
(1) δ = 1
(2) δ = 0.9
(3) δ = 0.8
(4) δ = 0.5

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

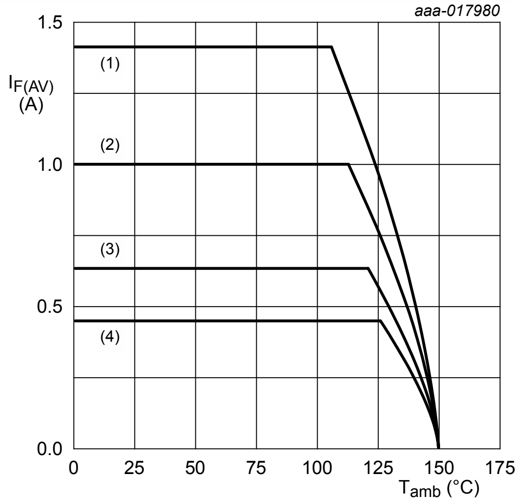
(1) δ = 1; DC

(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

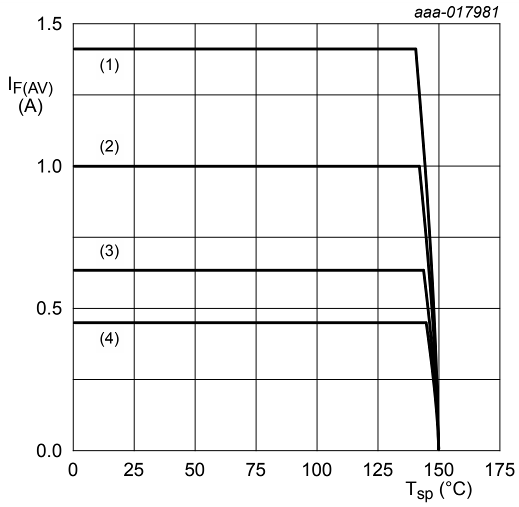
(1) δ = 1 (DC)

(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

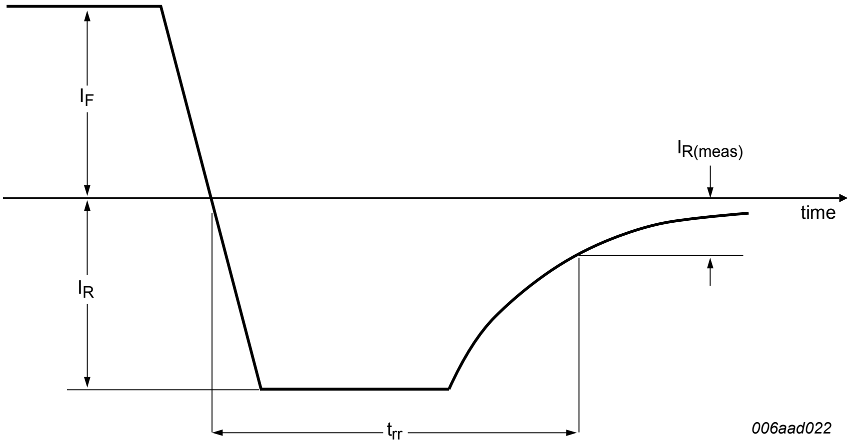


Fig. 13. Reverse recovery definition; step recovery

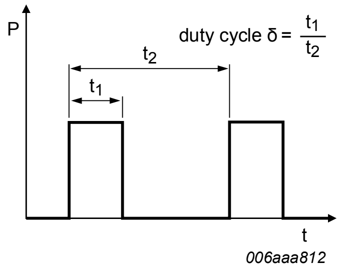


Fig. 14. Duty cycle definition

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

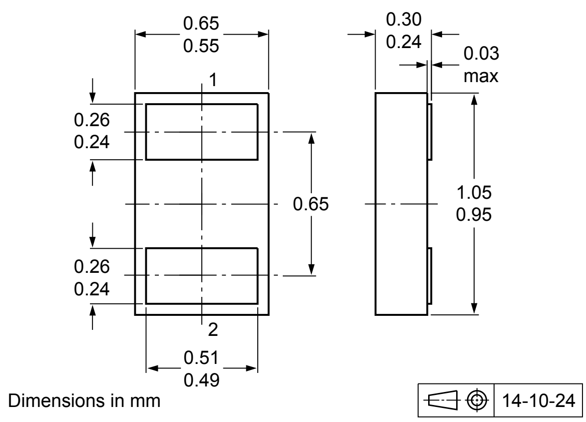


Fig. 15. Package outline DSN1006-2 (SOD993)

13. Soldering

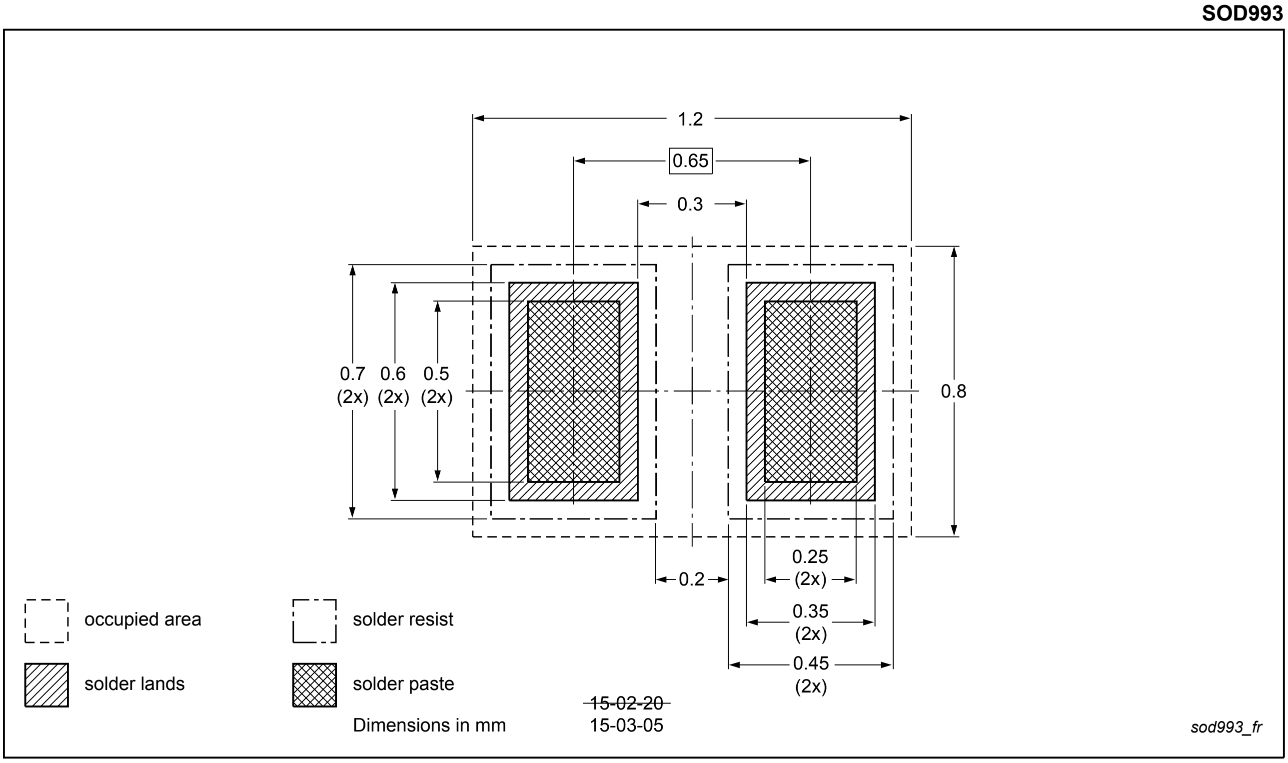


Fig. 16. Reflow soldering footprint for DSN1006-2 (SOD993)

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 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:	• 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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17. Contents

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Date of release: 27 November 2015