



PMEG4002ESF

40 V, 0.2 A low VF MEGA Schottky barrier rectifier

6 February 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 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. $V_F = 315$ mV
- Low reverse current typ. $I_R = 0.24$ μ 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

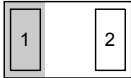

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{F(AV)}$	average forward current	$\delta = 0.5$; $f = 20$ kHz; $T_{sp} \leq 147$ °C; square wave	-	-	0.2	A
		$\delta = 0.5$; $f = 20$ kHz; $T_{amb} \leq 140$ °C; square wave	[1]	-	0.2	A
V_R	reverse voltage	$T_j = 25$ °C	-	-	40	V
V_F	forward voltage	$I_F = 10$ mA; $t_p \leq 300$ μ s; $\delta \leq 0.02$; $T_j = 25$ °C	-	315	390	mV
I_R	reverse current	$V_R = 10$ V; $T_j = 25$ °C; pulsed	-	0.24	2.5	μ A
t_{rr}	reverse recovery time	$I_F = 500$ mA; $I_R = 500$ mA; $I_{R(meas)} = 100$ mA; $T_j = 25$ °C	-	1.28	-	ns

[1] Device mounted on a ceramic Printed-Circuit Board (PCB), Al_2O_3 , standard footprint.



5. Pinning information

Table 2. Pinning information

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

[1] The marking bar indicates the cathode.

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMEG4002ESF	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
PMEG4002ESF	M

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	$\delta = 0.5; f = 20\text{ kHz}; T_{sp} \leq 147\text{ °C};$ square wave		-	0.2	A
		$\delta = 0.5; f = 20\text{ kHz}; T_{amb} \leq 140\text{ °C};$ square wave	[1]	-	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
			[1]	-	1200	mW
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), Al₂O₃, 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 cm² 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]	-	-	310	K/W
			[1][3]	-	-	190	K/W
			[1][4]	-	-	105	K/W
$R_{th(j-sp)}$	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_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 cm² each.
- [4] Device mounted on a ceramic PCB, Al₂O₃, standard footprint.
- [5] Soldering point of anode tab.

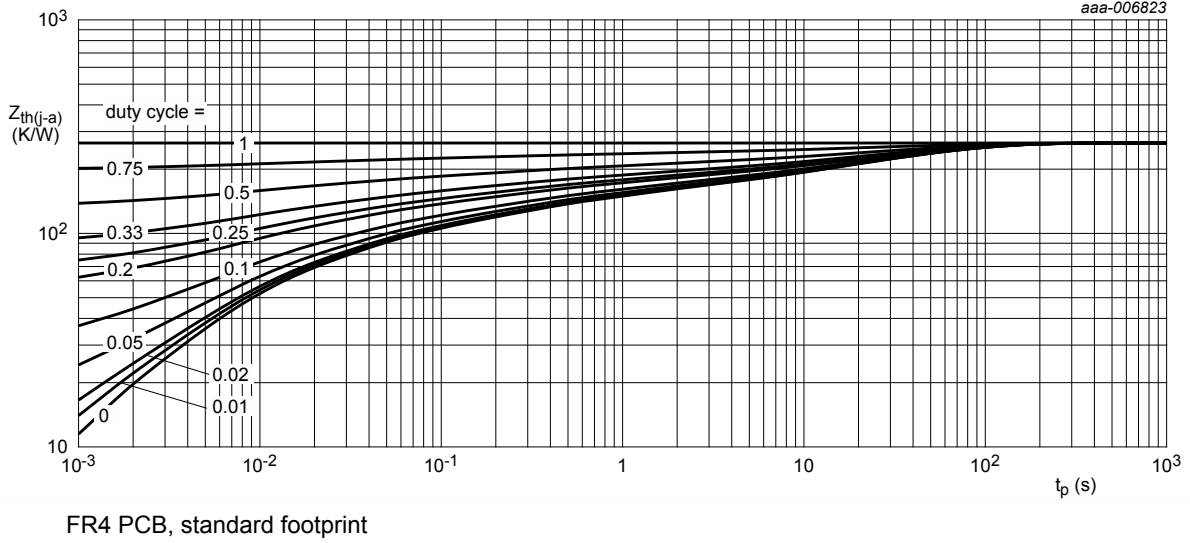


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

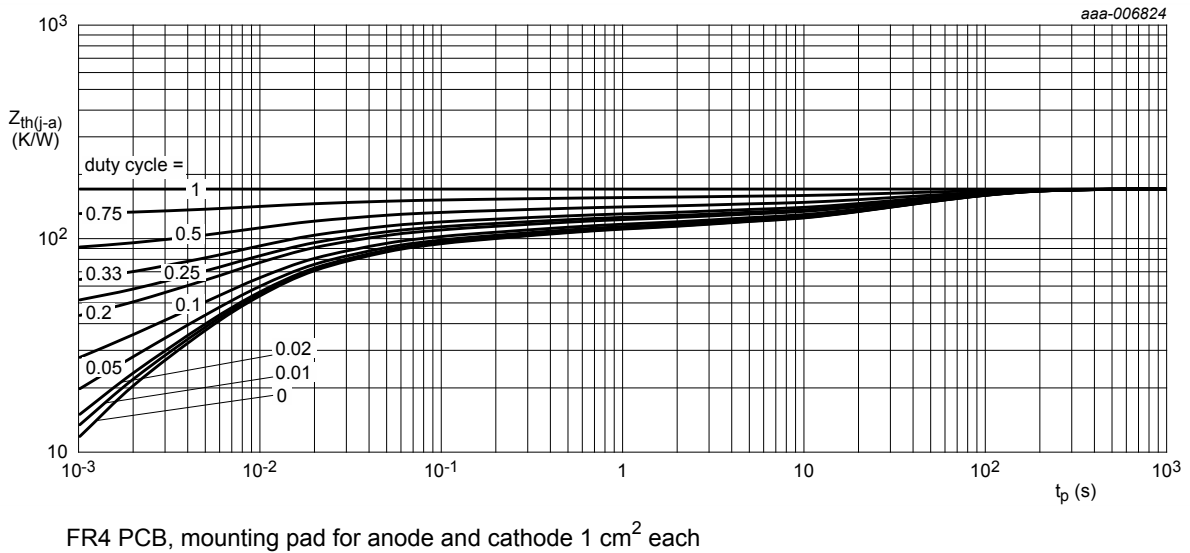
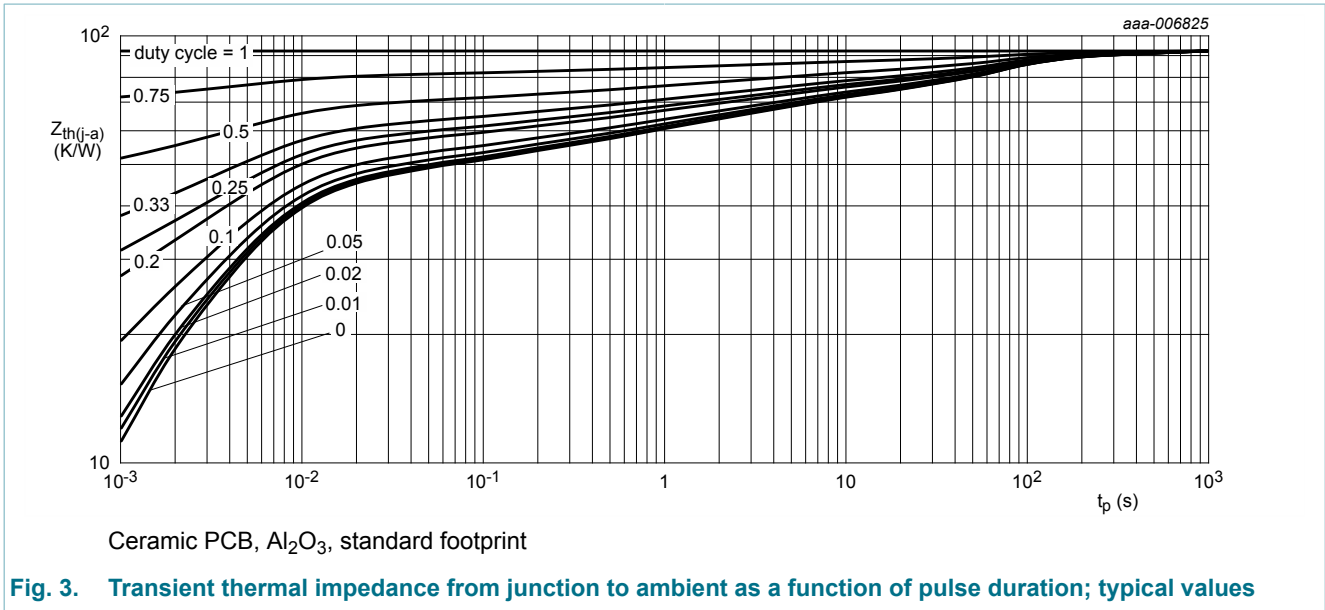


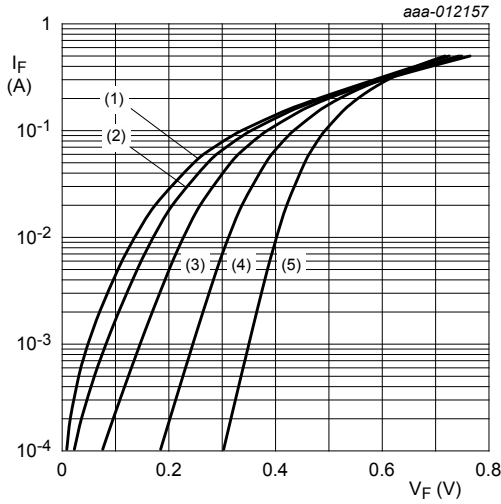
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



10. Characteristics

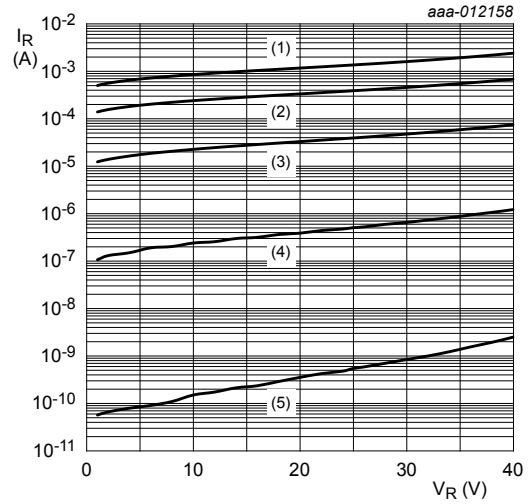
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)R}$	reverse breakdown voltage	$I_R = 100 \mu\text{A}$; $t_p = 300 \mu\text{s}$; $\delta = 0.02$; $T_j = 25 \text{ }^\circ\text{C}$	40	-	-	V
V_F	forward voltage	$I_F = 0.1 \text{ mA}$; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25 \text{ }^\circ\text{C}$	-	185	255	mV
		$I_F = 1 \text{ mA}$; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25 \text{ }^\circ\text{C}$	-	250	320	mV
		$I_F = 10 \text{ mA}$; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25 \text{ }^\circ\text{C}$	-	315	390	mV
		$I_F = 100 \text{ mA}$; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25 \text{ }^\circ\text{C}$	-	440	510	mV
		$I_F = 200 \text{ mA}$; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25 \text{ }^\circ\text{C}$	-	525	600	mV
I_R	reverse current	$V_R = 10 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; pulsed	-	0.24	2.5	μA
		$V_R = 40 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; pulsed	-	1.2	6.5	μA
C_d	diode capacitance	$V_R = 1 \text{ V}$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$	-	17	-	pF
		$V_R = 10 \text{ V}$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$	-	7	-	pF
t_{rr}	reverse recovery time	$I_F = 500 \text{ mA}$; $I_R = 500 \text{ mA}$; $I_{R(\text{meas})} = 100 \text{ mA}$; $T_j = 25 \text{ }^\circ\text{C}$	-	1.28	-	ns



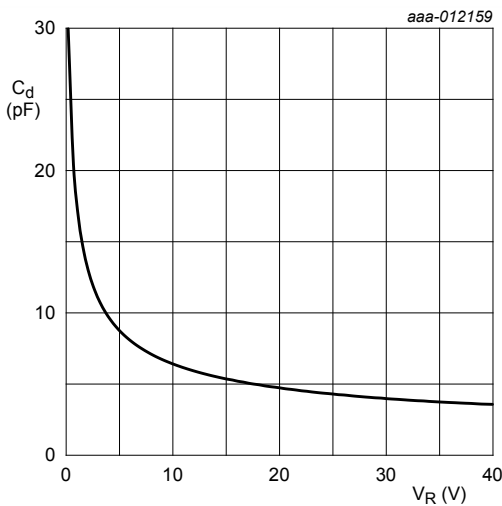
pulsed condition
 (1) $T_j = 150^\circ\text{C}$
 (2) $T_j = 125^\circ\text{C}$
 (3) $T_j = 85^\circ\text{C}$
 (4) $T_j = 25^\circ\text{C}$
 (5) $T_j = -40^\circ\text{C}$

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



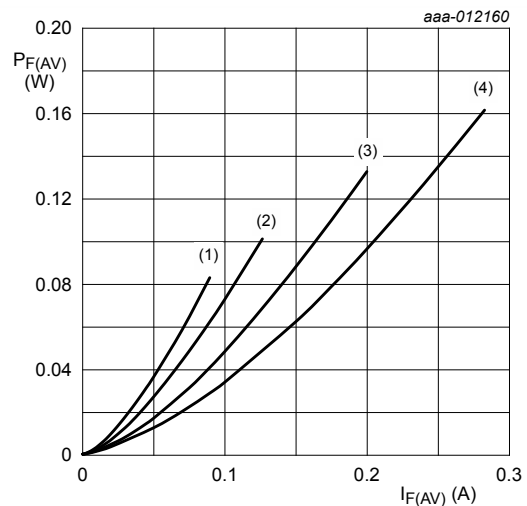
pulsed condition
 (1) $T_j = 150^\circ\text{C}$
 (2) $T_j = 125^\circ\text{C}$
 (3) $T_j = 85^\circ\text{C}$
 (4) $T_j = 25^\circ\text{C}$
 (5) $T_j = -40^\circ\text{C}$

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



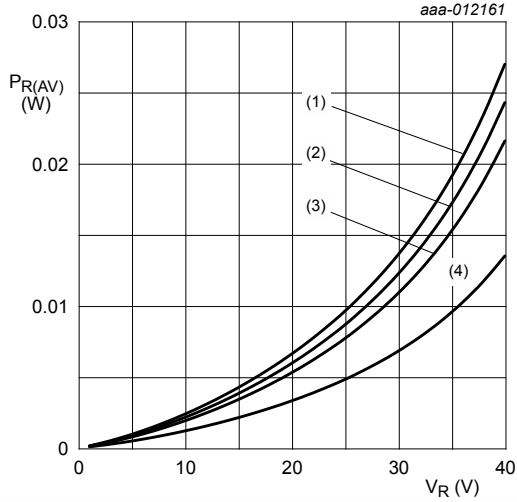
$f = 1\text{ MHz}; T_{\text{amb}} = 25^\circ\text{C}$

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



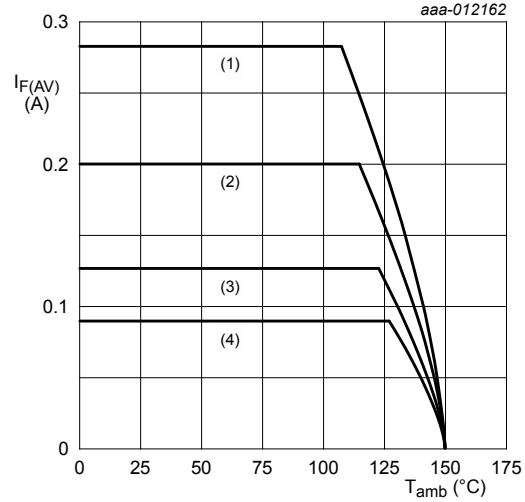
$T_j = 150^\circ\text{C}$
 (1) $\delta = 0.1$
 (2) $\delta = 0.2$
 (3) $\delta = 0.5$
 (4) $\delta = 1$

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



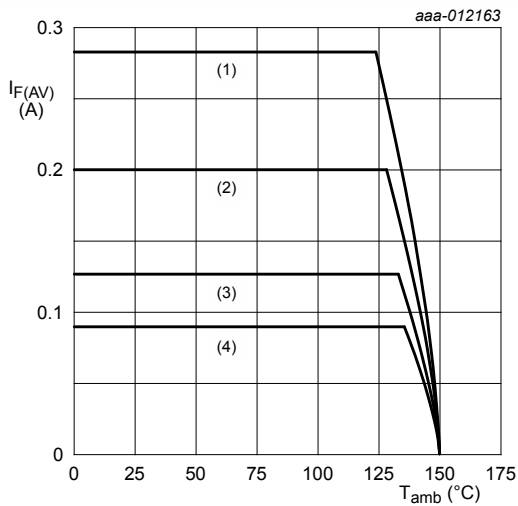
$T_j = 125\text{ °C}$
 (1) $\delta = 1$
 (2) $\delta = 0.9$
 (3) $\delta = 0.8$
 (4) $\delta = 0.5$

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



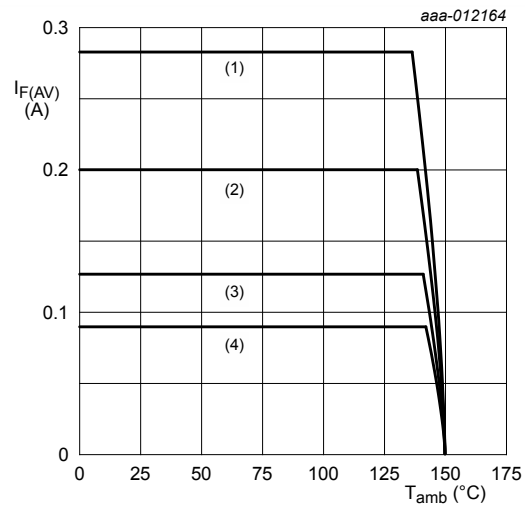
FR4 PCB, standard footprint
 $T_j = 150\text{ °C}$
 (1) $\delta = 1$; DC
 (2) $\delta = 0.5$; $f = 20\text{ kHz}$
 (3) $\delta = 0.2$; $f = 20\text{ kHz}$
 (4) $\delta = 0.1$; $f = 20\text{ kHz}$

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



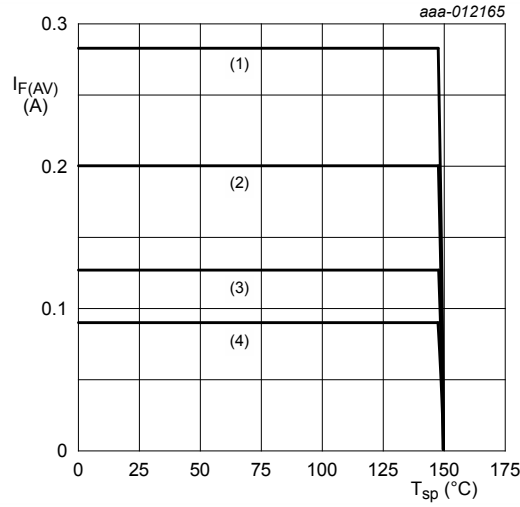
FR4 PCB, mounting pad for anode and cathode
 1 cm^2 each
 $T_j = 150\text{ °C}$
 (1) $\delta = 1$; DC
 (2) $\delta = 0.5$; $f = 20\text{ kHz}$
 (3) $\delta = 0.2$; $f = 20\text{ kHz}$
 (4) $\delta = 0.1$; $f = 20\text{ kHz}$

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



Ceramic PCB, Al_2O_3 , standard footprint
 $T_j = 150\text{ °C}$
 (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



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

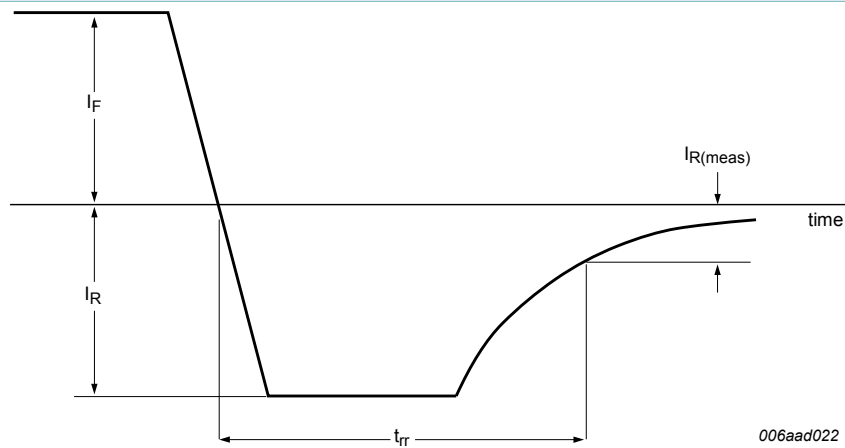


Fig. 13. Reverse recovery definition

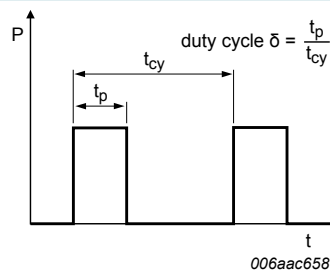


Fig. 14. Duty cycle definition

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

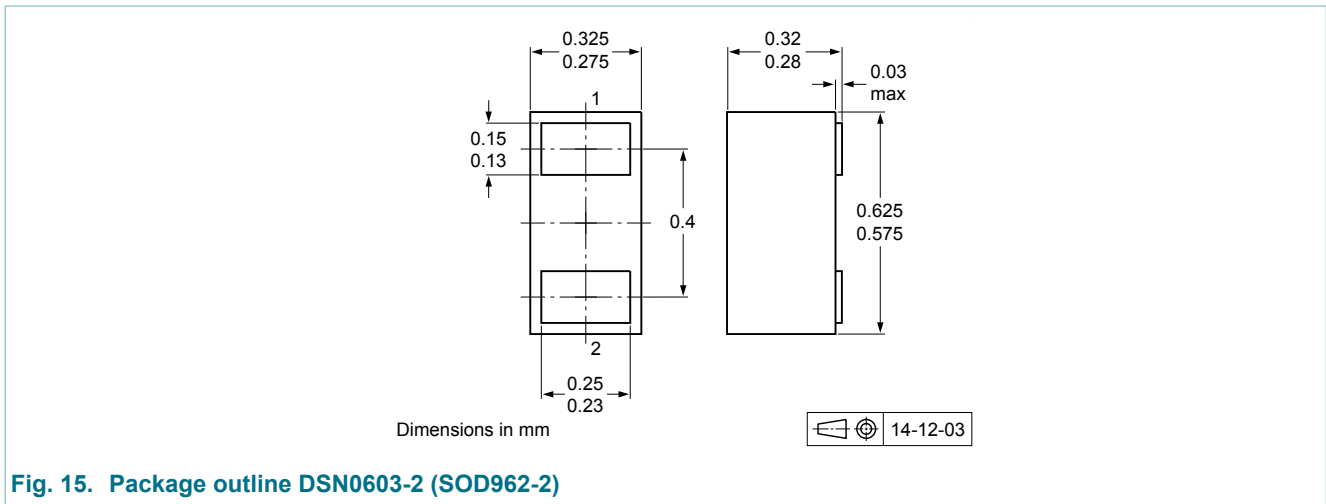


Fig. 15. Package outline DSN0603-2 (SOD962-2)

13. Soldering

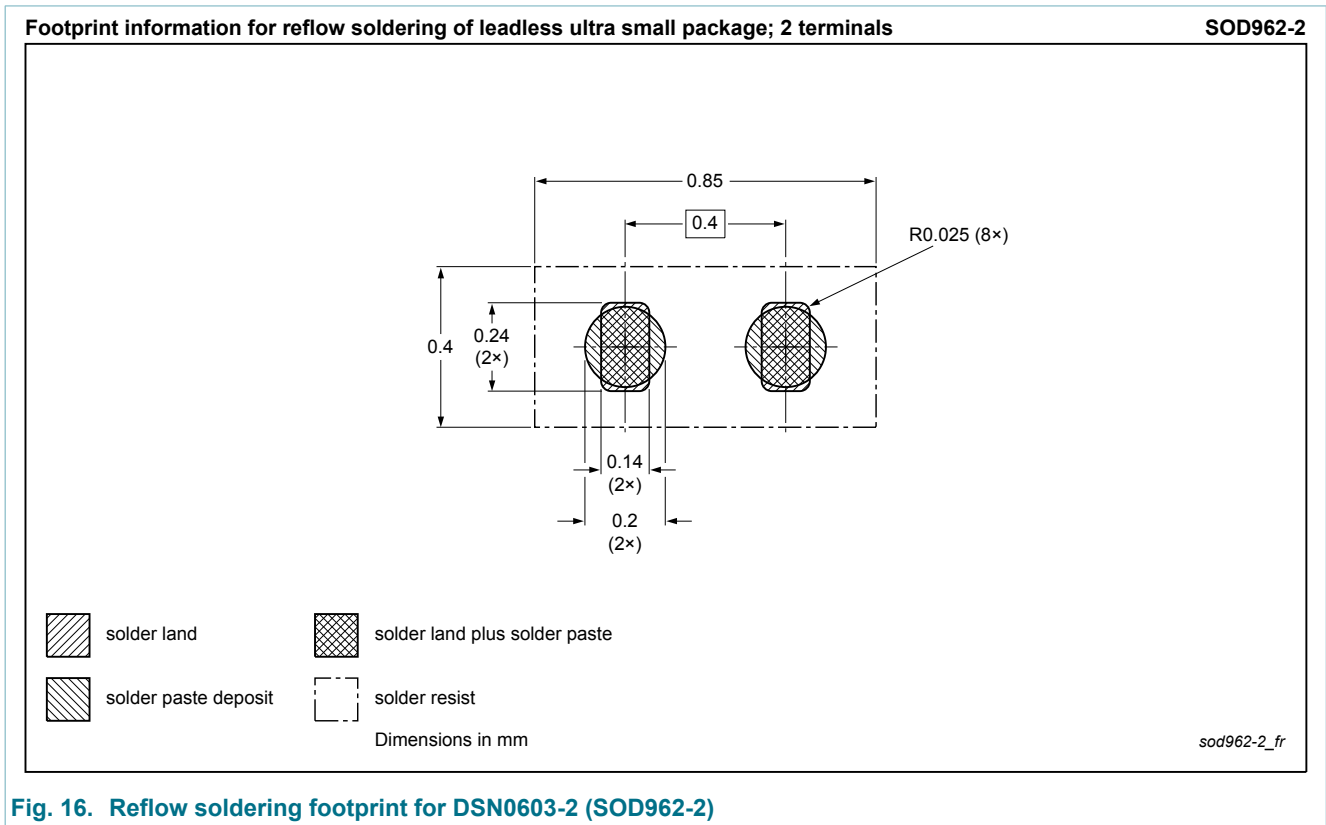


Fig. 16. Reflow soldering footprint for DSN0603-2 (SOD962-2)

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG4002ESF v.2	20150206	Product data sheet	-	PMEG4002ESF v.1
Modifications:	<ul style="list-style-type: none">Product status changed			
PMEG4002ESF v.1	20140408	Preliminary data sheet	-	-

14. Legal information

14.1 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.

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