



# PMEG4005ESF

40 V, 0.5 A low VF MEGA Schottky barrier rectifier

13 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  $I_{F(AV)} \leq 0.5$  A
- Reverse voltage  $V_R \leq 40$  V
- Low forward voltage typ.  $V_F = 315$  mV
- Low reverse current typ.  $I_R = 0.24$   $\mu$ 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

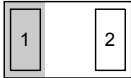

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; $f = 20$ kHz; $T_{amb} \leq 95$ °C; square wave	[1]	-	-	0.5	A
		$\delta = 0.5$ ; $f = 20$ kHz; $T_{sp} \leq 140$ °C; square wave		-	-	0.5	A
$V_R$	reverse voltage	$T_j = 25$ °C		-	-	40	V
$V_F$	forward voltage	$I_F = 10$ mA; $t_p \leq 300$ $\mu$ 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	$\mu$ 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</p> <p><b>DSN0603-2 (SOD962-2)</b></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
PMEG4005ESF	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
PMEG4005ESF	Y

## 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	$T_{sp} \leq 135\text{ °C}; \delta = 1$		-	0.71	A
$I_{F(AV)}$	average forward current	$\delta = 0.5; f = 20\text{ kHz}; T_{amb} \leq 95\text{ °C};$ square wave	[1]	-	0.5	A
		$\delta = 0.5; f = 20\text{ kHz}; T_{sp} \leq 140\text{ °C};$ square wave		-	0.5	A
$I_{FRM}$	repetitive peak forward current	$t_p = 1\text{ ms}; \delta \leq 0.25$		-	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), Al<sub>2</sub>O<sub>3</sub>, 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<sup>2</sup> 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 cm<sup>2</sup> each.

[4] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.

[5] Soldering point of anode tab.

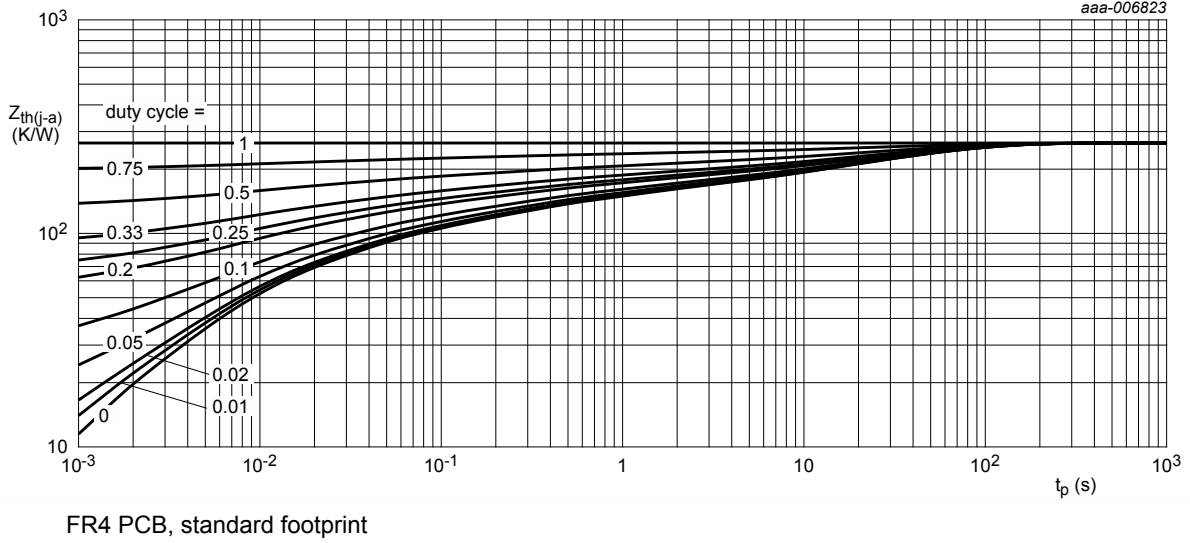


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

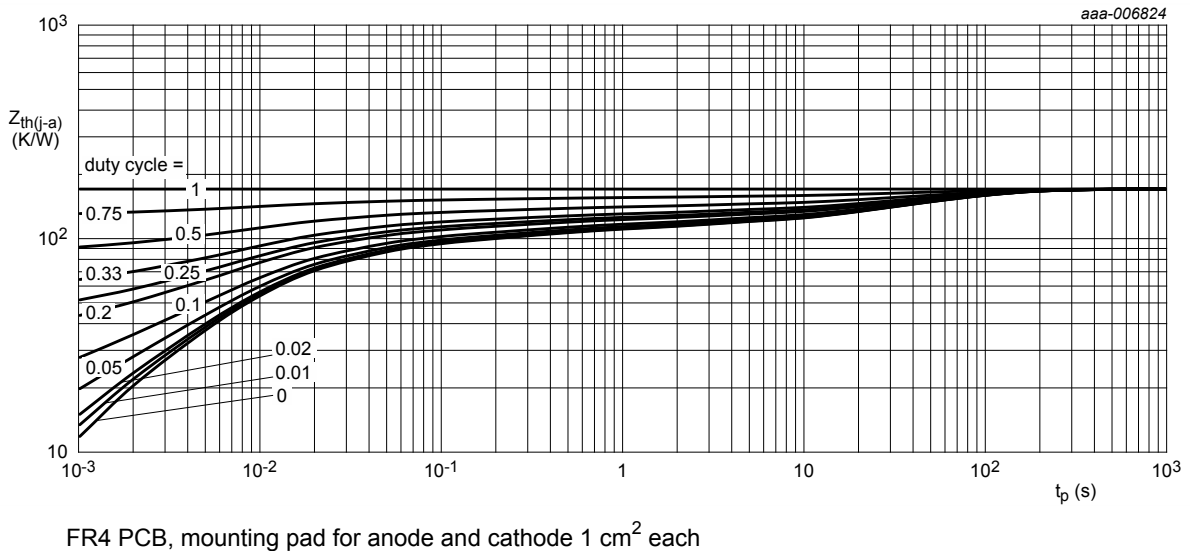
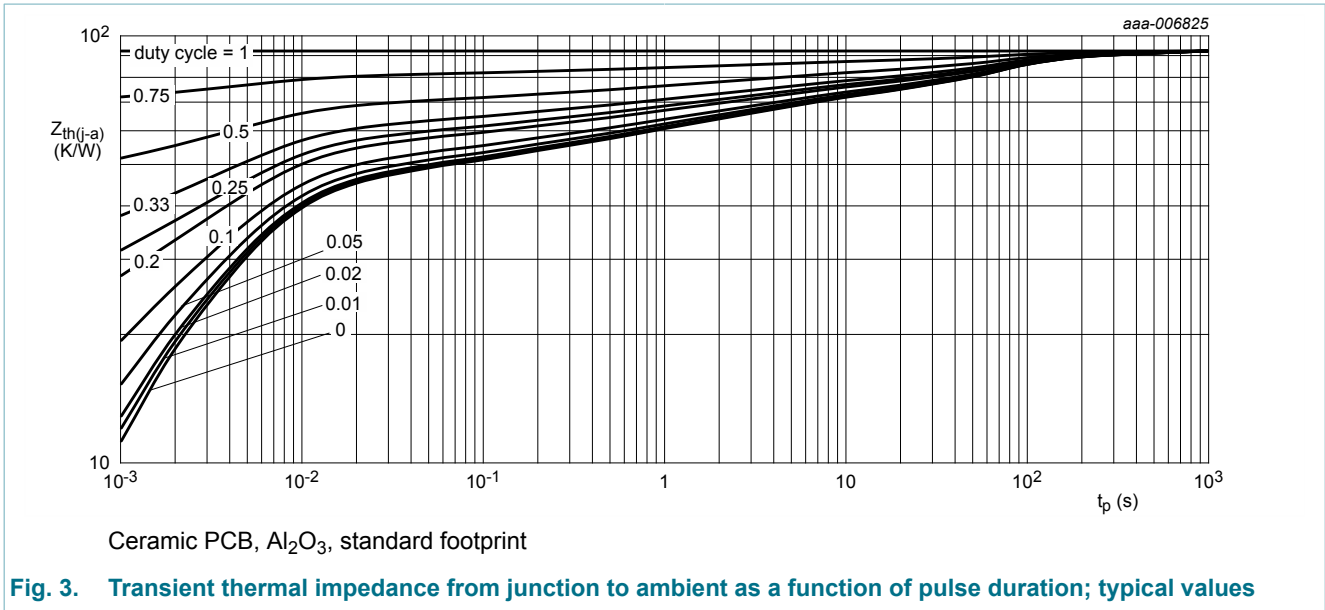


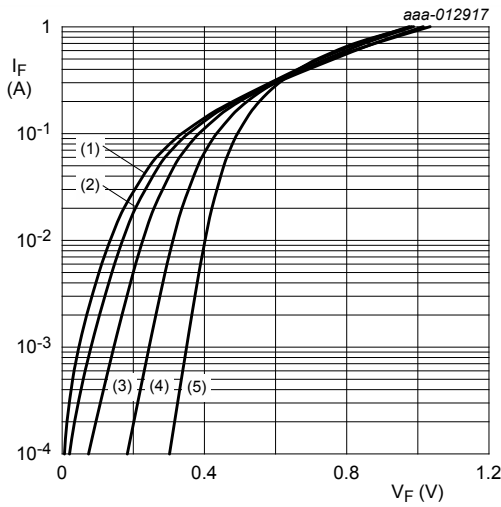
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



## 10. Characteristics

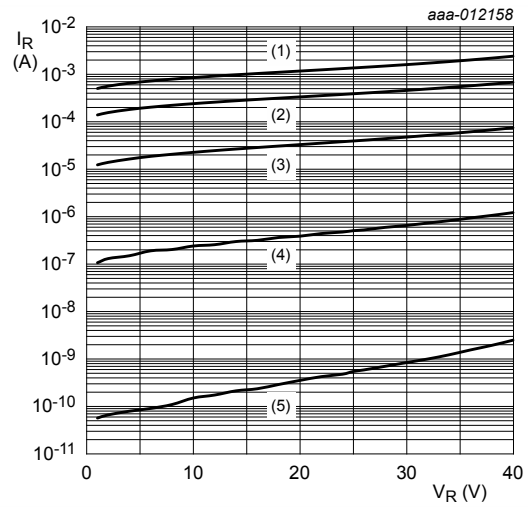
Table 7. Characteristics

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
		$I_F = 400 \text{ mA}$ ; $t_p \leq 300 \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	680	790	mV
		$I_F = 500 \text{ mA}$ ; $t_p \leq 300 \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	750	880	mV
$I_R$	reverse current	$V_R = 10 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	-	0.24	2.5	$\mu\text{A}$
		$V_R = 40 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	-	1.2	6.5	$\mu\text{A}$
$C_d$	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



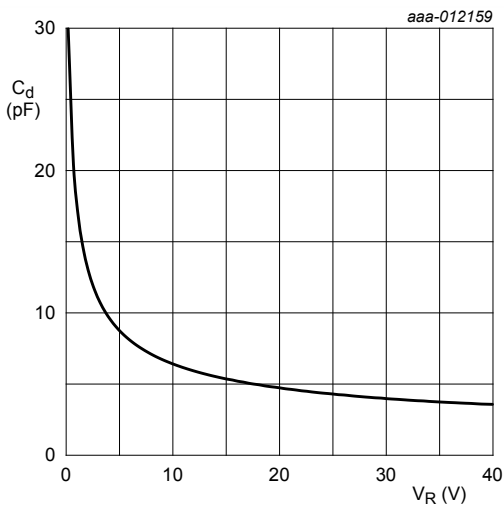
pulsed condition  
 (1)  $T_j = 150\text{ }^\circ\text{C}$   
 (2)  $T_j = 125\text{ }^\circ\text{C}$   
 (3)  $T_j = 85\text{ }^\circ\text{C}$   
 (4)  $T_j = 25\text{ }^\circ\text{C}$   
 (5)  $T_j = -40\text{ }^\circ\text{C}$

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



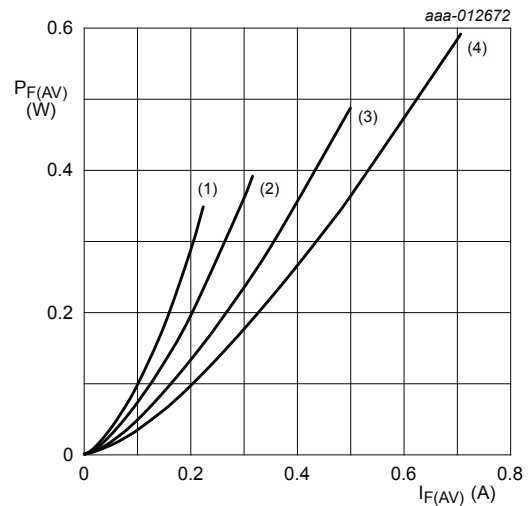
pulsed condition  
 (1)  $T_j = 150\text{ }^\circ\text{C}$   
 (2)  $T_j = 125\text{ }^\circ\text{C}$   
 (3)  $T_j = 85\text{ }^\circ\text{C}$   
 (4)  $T_j = 25\text{ }^\circ\text{C}$   
 (5)  $T_j = -40\text{ }^\circ\text{C}$

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



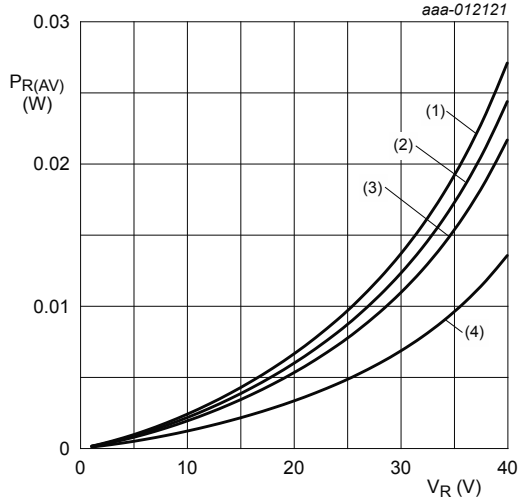
$f = 1\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

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



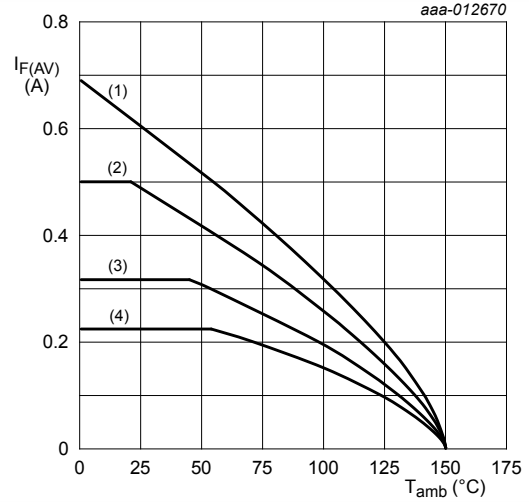
$T_j = 150\text{ }^\circ\text{C}$   
 (1)  $\delta = 0.1$   
 (2)  $\delta = 0.2$   
 (3)  $\delta = 0.5$   
 (4)  $\delta = 1$

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



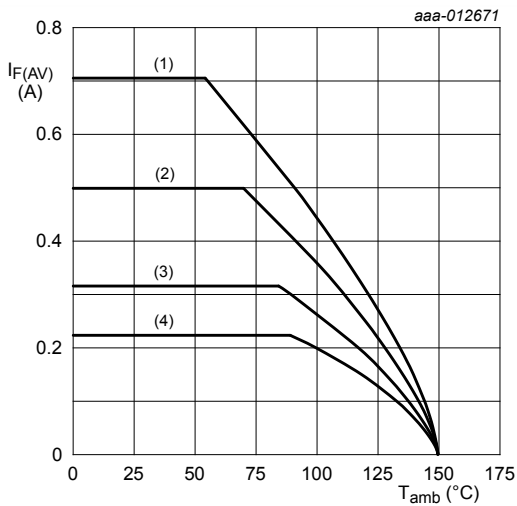
$T_j = 125\text{ }^\circ\text{C}$   
 (1)  $\delta = 1$   
 (2)  $\delta = 0.9$   
 (3)  $\delta = 0.8$   
 (4)  $\delta = 0.5$

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



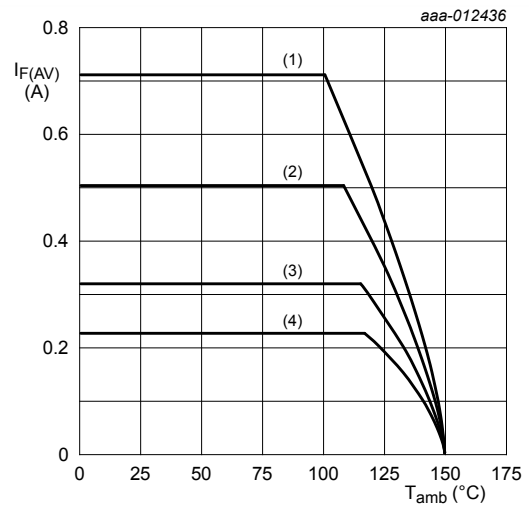
FR4 PCB, standard footprint  
 $T_j = 150\text{ }^\circ\text{C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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



FR4 PCB, mounting pad for anode and cathode  
 $1\text{ cm}^2$  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)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

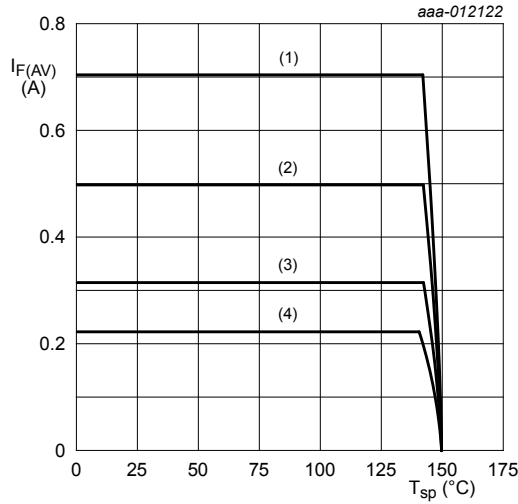
**Fig. 10. Average forward current as a function of ambient temperature; typical values**



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**





$T_j = 150\text{ °C}$   
 (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. 12. Average forward current as a function of solder point temperature; typical values

### 11. Test information

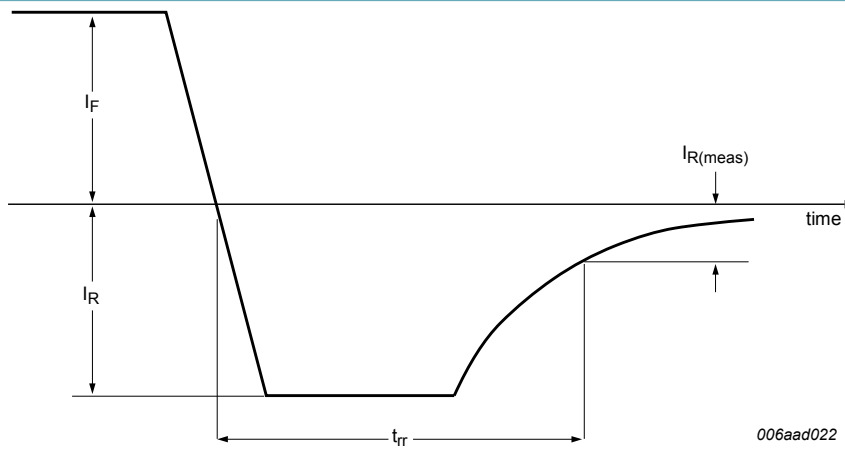


Fig. 13. Reverse recovery definition

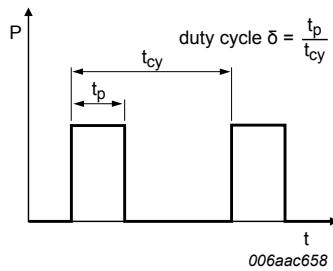


Fig. 14. Duty cycle definition

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

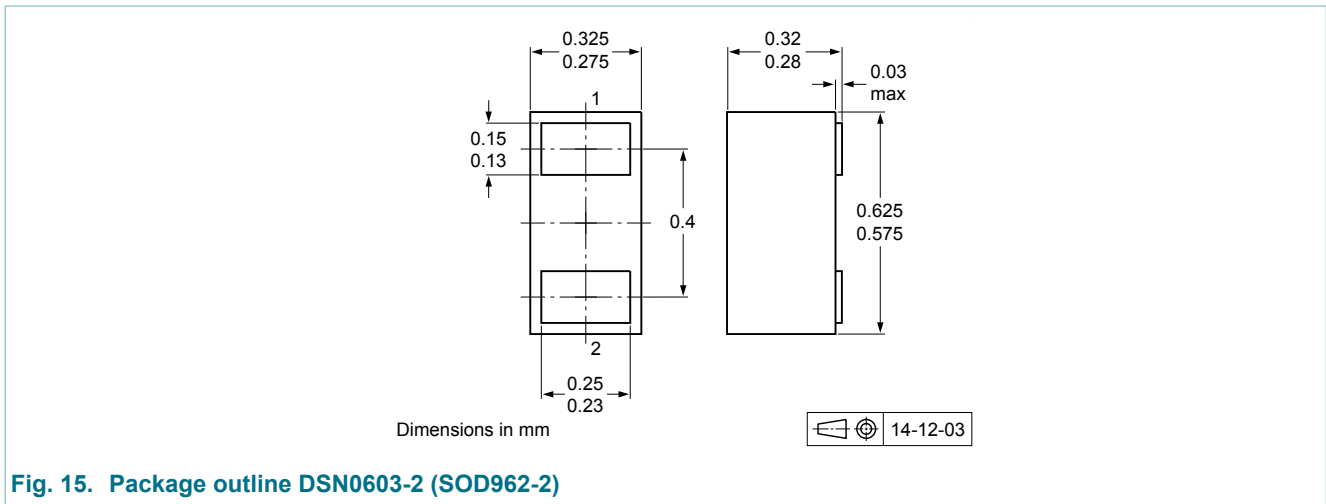


Fig. 15. Package outline DSN0603-2 (SOD962-2)

## 13. Soldering

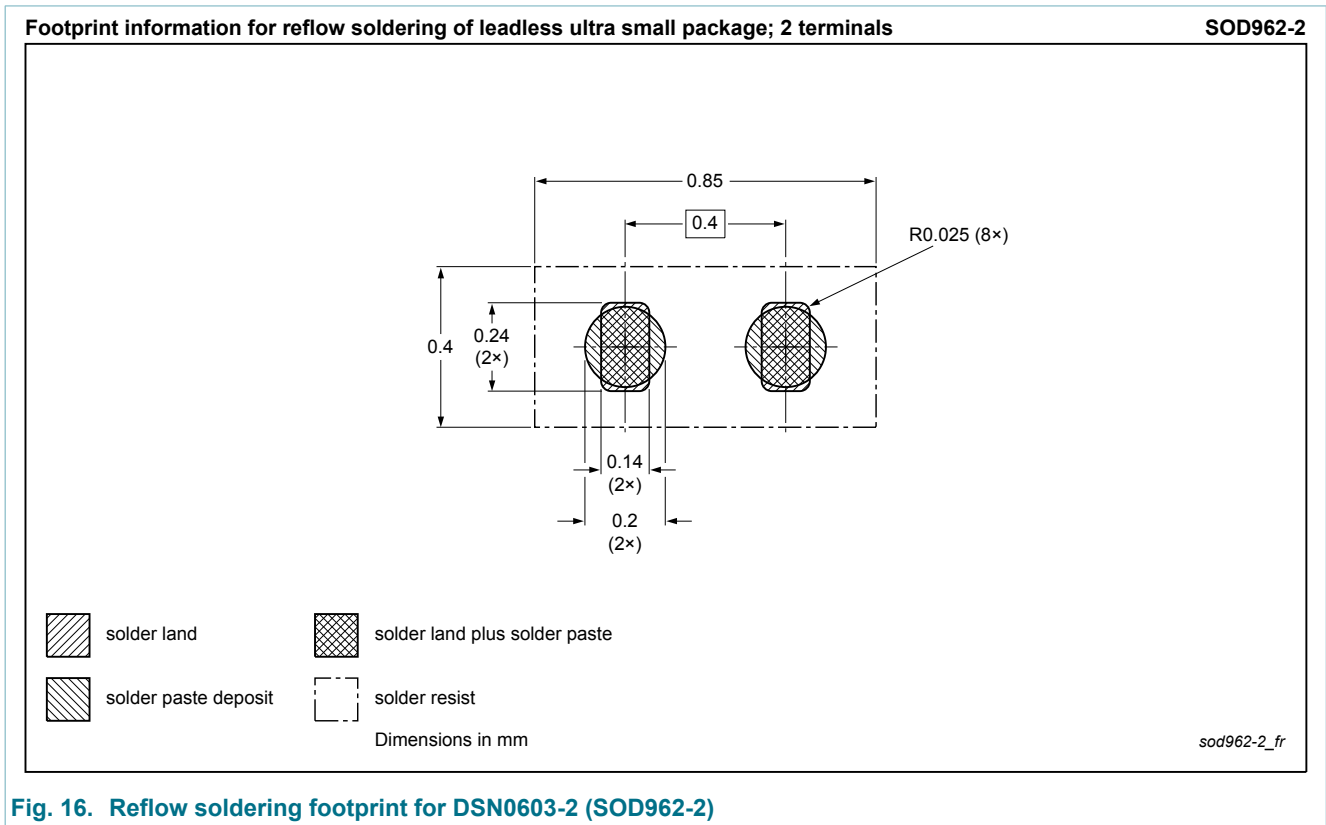


Fig. 16. Reflow soldering footprint for DSN0603-2 (SOD962-2)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG4005ESF v.2	20150213	Product data sheet	-	PMEG4005ESF v.1
Modifications:	<ul style="list-style-type: none"><li>Product status changed</li></ul>			
PMEG4005ESF v.1	20140512	Preliminary data sheet	-	-

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### 15.1 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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