



# PMEG10010ELR

100 V, 1 A low leakage current Schottky barrier rectifier

7 May 2015

Product data sheet

## 1. General description

Planar Maximum Efficiency General Application (MEGA) Schottky barrier rectifier with an integrated guard ring for stress protection, encapsulated in a SOD123W small and flat lead Surface-Mounted Device (SMD) plastic package.

## 2. Features and benefits

- Average forward current:  $I_{F(AV)} \leq 1$  A
- Reverse voltage:  $V_R \leq 100$  V
- Low forward voltage:  $V_F = 710$  mV
- High power capability due to clip-bonding technology
- Extremely low leakage current  $I_R = 40$  nA
- High temperature  $T_j \leq 175$  °C
- AEC-Q101 qualified

## 3. Applications

- Low voltage rectification
- High efficiency DC-to-DC conversion
- Switch mode power supply
- Reverse polarity protection
- Low power consumption applications

## 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; $T_{sp} \leq 170$ °C; square wave	-	-	1	A
$V_R$	reverse voltage	$T_j = 25$ °C	-	-	100	V
$V_F$	forward voltage	$I_F = 1$ A; $t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$ ; $T_j = 25$ °C	-	710	770	mV
$I_R$	reverse current	$V_R = 100$ V; $t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$ ; $T_j = 25$ °C	-	40	150	nA



## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode[1]	 <p><b>SOD123W</b></p>	
2	A	anode		<p><i>sym001</i></p>

[1] The marking bar indicates the cathode.

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMEG10010ELR	SOD123W	plastic surface mounted package; 2 leads	SOD123W

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PMEG10010ELR	K7

## 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	$T_j = 25\text{ °C}$		-	100	V
$I_F$	forward current	$T_{sp} = 165\text{ °C}; \delta = 1$		-	1.4	A
$I_{F(AV)}$	average forward current	$\delta = 0.5; f = 20\text{ kHz}; T_{amb} \leq 135\text{ °C};$ square wave	[1]	-	1	A
		$\delta = 0.5; f = 20\text{ kHz}; T_{sp} \leq 170\text{ °C};$ square wave		-	1	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 8\text{ ms}; T_{j(init)} = 25\text{ °C};$ square wave		-	50	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[2]	-	680	mW
			[3]	-	1150	mW
			[1]	-	2140	mW
$T_j$	junction temperature			-	175	°C
$T_{amb}$	ambient temperature			-55	175	°C
$T_{stg}$	storage temperature			-65	175	°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 cathode  $1\text{ cm}^2$ .

## 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]	-	-	220	K/W
			[1][3]	-	-	130	K/W
			[1][4]	-	-	70	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[5]	-	-	18	K/W

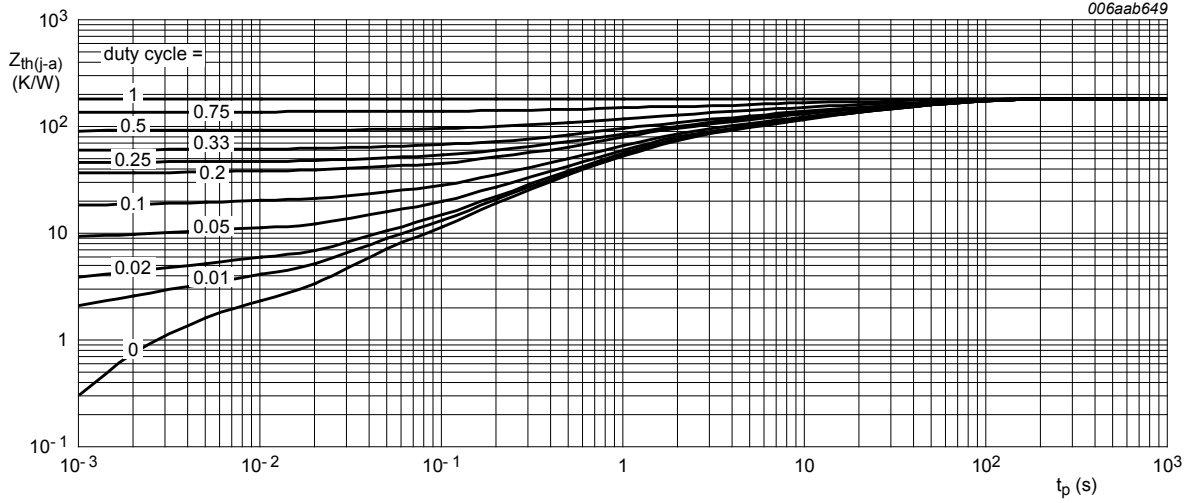
[1] For Schottky barrier diodes thermal runaway has to be considered, as in some applications the reverse power losses  $P_R$  are a significant part of the total power losses.

[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 cathode  $1\text{ cm}^2$ .

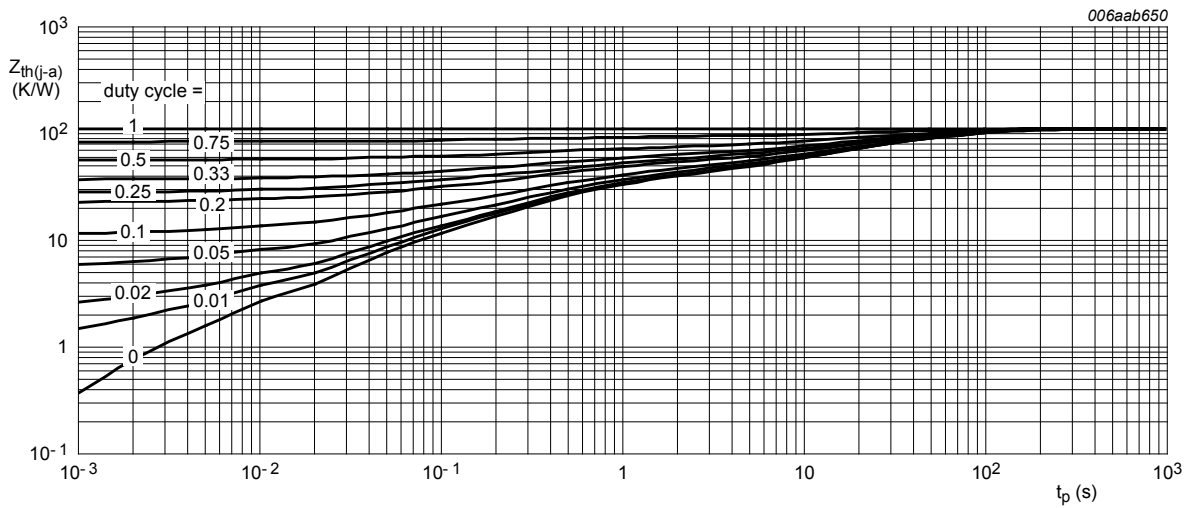
[4] Device mounted on a ceramic PCB,  $Al_2O_3$ , standard footprint.

[5] Soldering point of cathode tab.



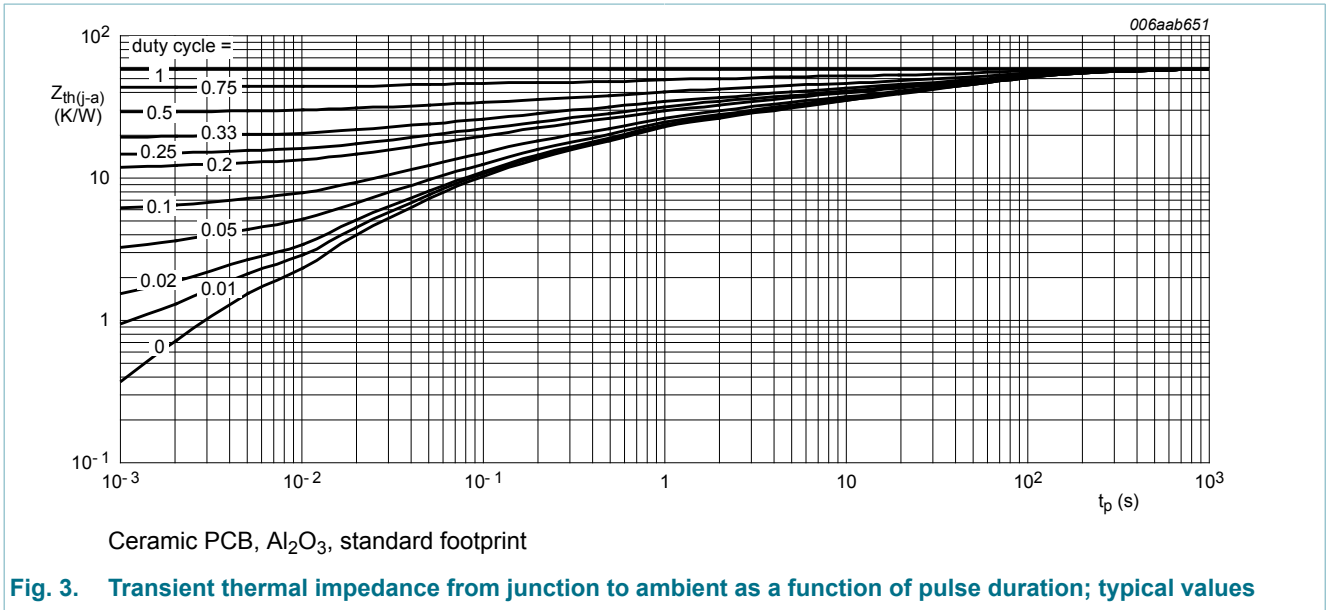
FR4 PCB, standard footprint

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



FR4 PCB, mounting pad for cathode 1 cm<sup>2</sup>

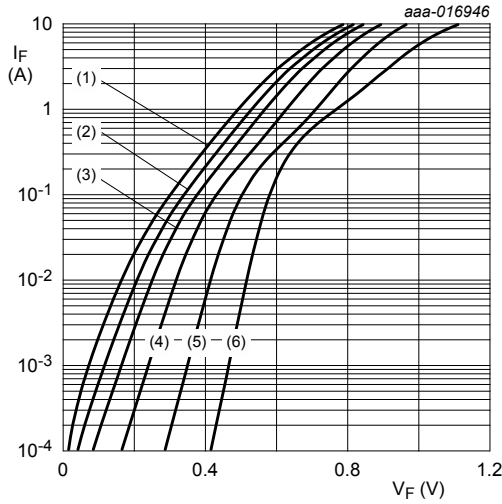
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



## 10. Characteristics

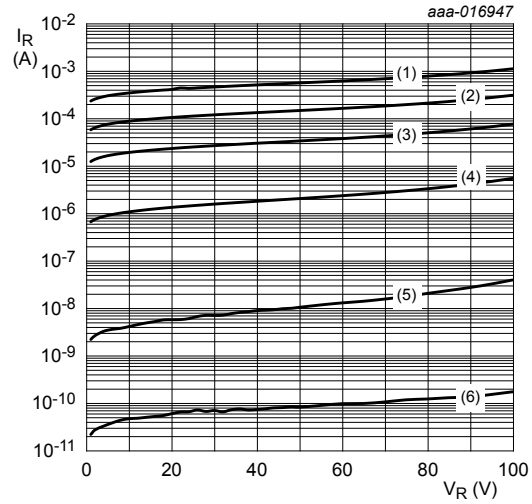
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)R}$	reverse breakdown voltage	$I_R = 1 \text{ mA}; T_j = 25 \text{ }^\circ\text{C}; t_p = 300 \text{ } \mu\text{s}; \delta = 0.02$	100	-	-	V
$V_F$	forward voltage	$I_F = 0.1 \text{ A}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_j = 25 \text{ }^\circ\text{C}$	-	505	565	mV
		$I_F = 0.5 \text{ A}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_j = 25 \text{ }^\circ\text{C}$	-	640	710	mV
		$I_F = 0.7 \text{ A}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_j = 25 \text{ }^\circ\text{C}$	-	675	740	mV
		$I_F = 1 \text{ A}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_j = 25 \text{ }^\circ\text{C}$	-	710	770	mV
		$I_F = 1 \text{ A}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_j = 125 \text{ }^\circ\text{C}$	-	575	680	mV
$I_R$	reverse current	$V_R = 10 \text{ V}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_j = 25 \text{ }^\circ\text{C}$	-	4	-	nA
		$V_R = 60 \text{ V}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_j = 25 \text{ }^\circ\text{C}$	-	12	-	nA
		$V_R = 100 \text{ V}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_j = 25 \text{ }^\circ\text{C}$	-	40	150	nA
		$V_R = 100 \text{ V}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_j = 125 \text{ }^\circ\text{C}$	-	70	500	$\mu\text{A}$
$C_d$	diode capacitance	$V_R = 1 \text{ V}; f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ\text{C}$	-	70	-	pF
		$V_R = 4 \text{ V}; f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ\text{C}$	-	42	-	pF
		$V_R = 10 \text{ V}; f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ\text{C}$	-	28	-	pF
$t_{rr}$	reverse recovery time	$I_F = 0.5 \text{ A}; I_R = 1 \text{ A}; I_{R(\text{meas})} = 0.25 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$	-	3.7	-	ns
$V_{FRM}$	peak forward recovery voltage	$I_F = 0.5 \text{ A}; dI_F/dt = 20 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}$	-	690	-	V



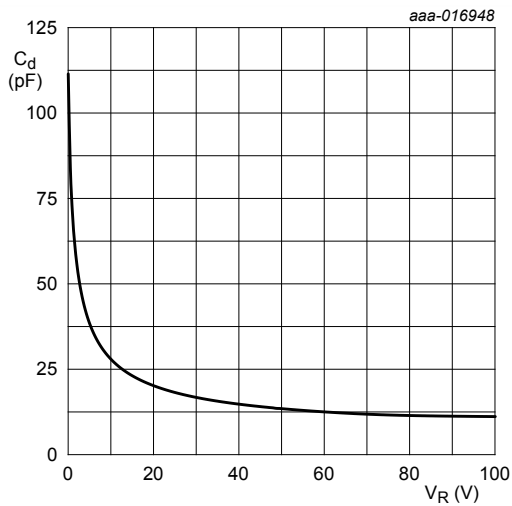
- (1)  $T_j = 175\text{ }^\circ\text{C}$
- (2)  $T_j = 150\text{ }^\circ\text{C}$
- (3)  $T_j = 125\text{ }^\circ\text{C}$
- (4)  $T_j = 85\text{ }^\circ\text{C}$
- (5)  $T_j = 25\text{ }^\circ\text{C}$
- (6)  $T_j = -40\text{ }^\circ\text{C}$

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



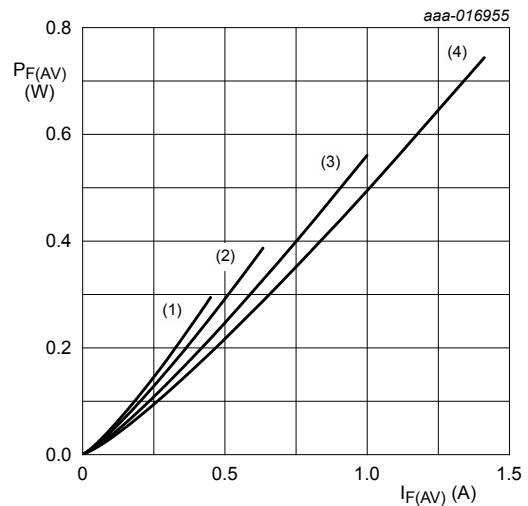
- (1)  $T_j = 175\text{ }^\circ\text{C}$
- (2)  $T_j = 150\text{ }^\circ\text{C}$
- (3)  $T_j = 125\text{ }^\circ\text{C}$
- (4)  $T_j = 85\text{ }^\circ\text{C}$
- (5)  $T_j = 25\text{ }^\circ\text{C}$
- (6)  $T_j = -40\text{ }^\circ\text{C}$

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



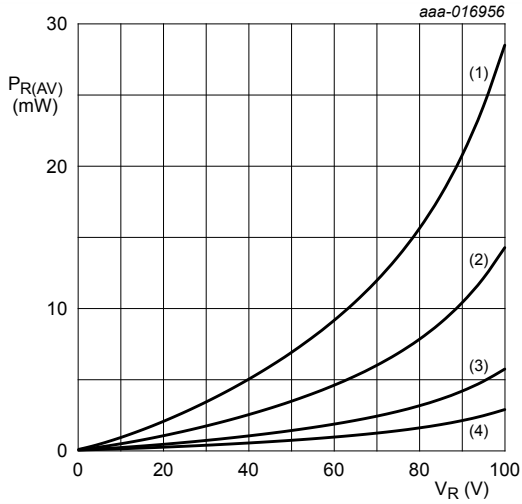
$f = 1\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

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



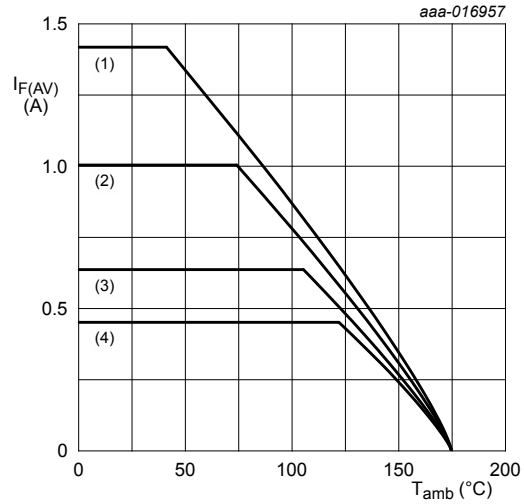
- $T_j = 175\text{ }^\circ\text{C}$
- (1)  $\delta = 0.1$
- (2)  $\delta = 0.2$
- (3)  $\delta = 0.5$
- (4)  $\delta = 1$

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



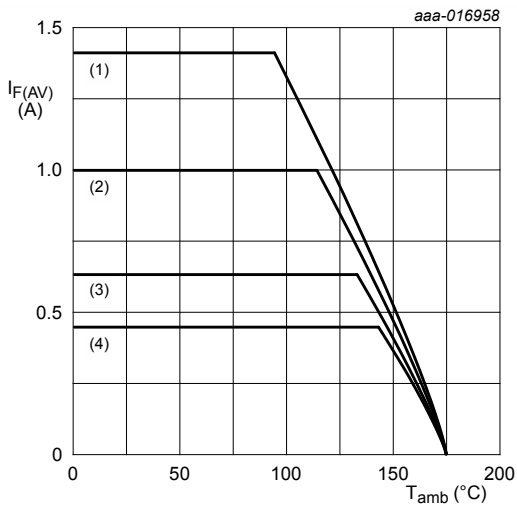
$T_j = 150\text{ °C}$   
 (1)  $\delta = 1$  (DC)  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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



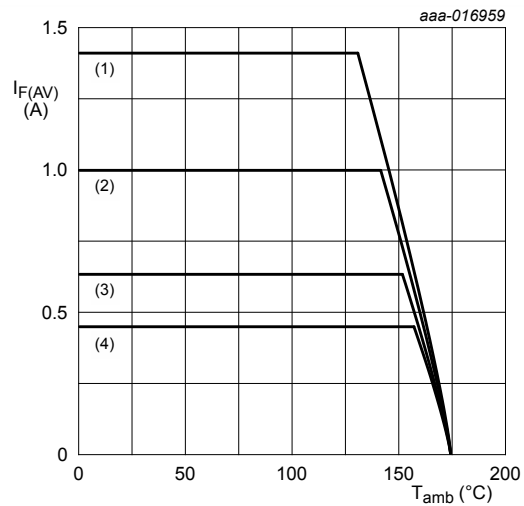
FR4 PCB, standard footprint  
 $T_j = 175\text{ °C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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



FR4 PCB, mounting pad for cathode  $1\text{ cm}^2$   
 $T_j = 175\text{ °C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

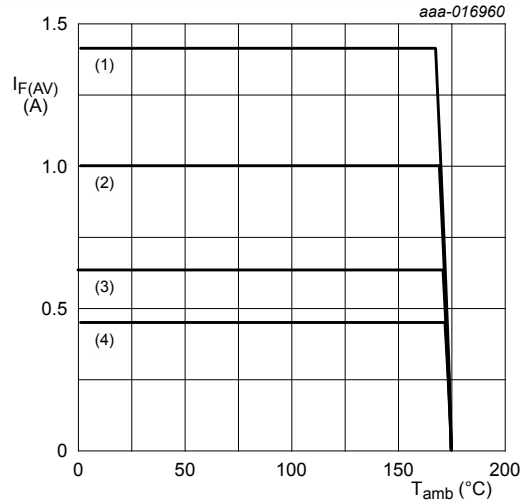
**Fig. 10. Average forward current as a function of ambient temperature; typical values**



Ceramic PCB,  $\text{Al}_2\text{O}_3$ , standard footprint  
 $T_j = 175\text{ °C}$   
 (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**





$T_j = 175\text{ °C}$

(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

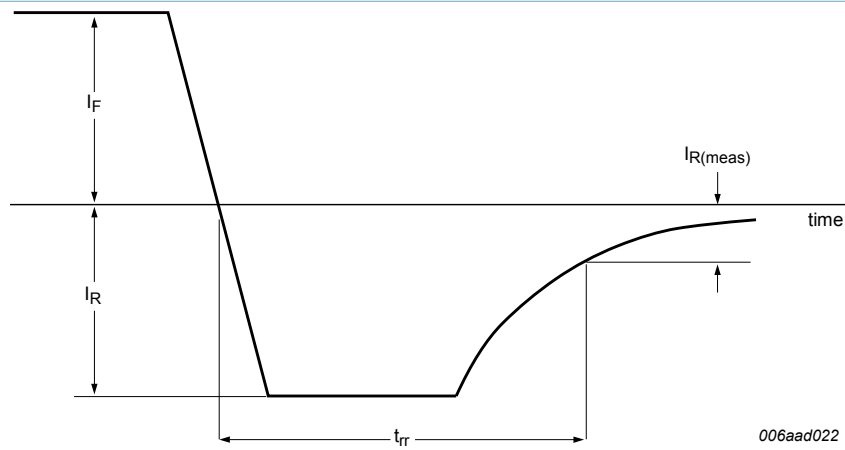


Fig. 13. Reverse recovery definition

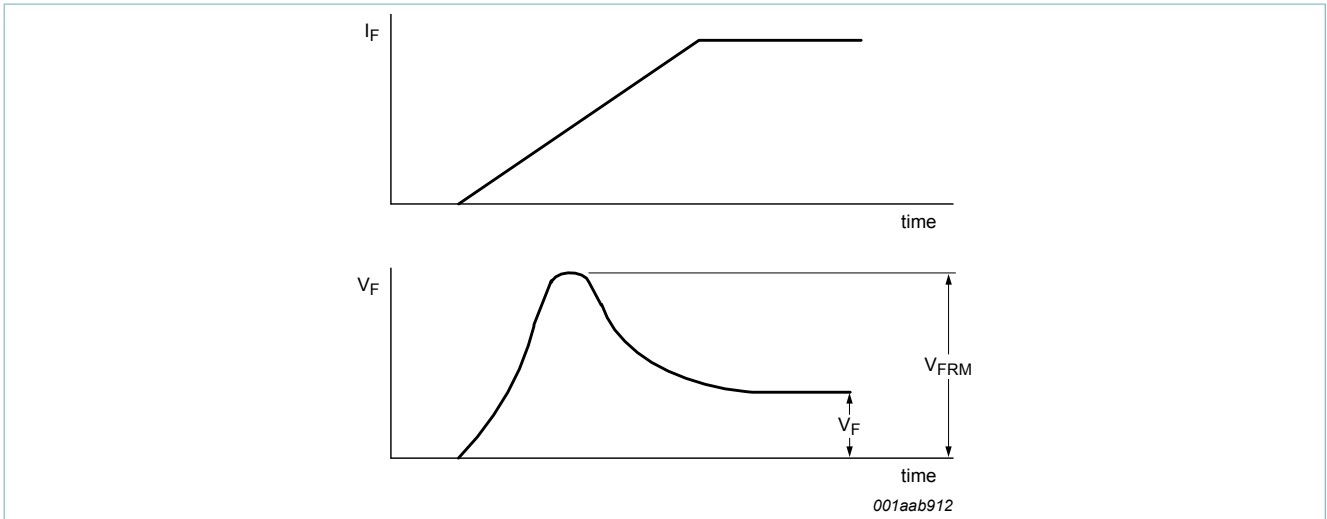


Fig. 14. Forward recovery definition

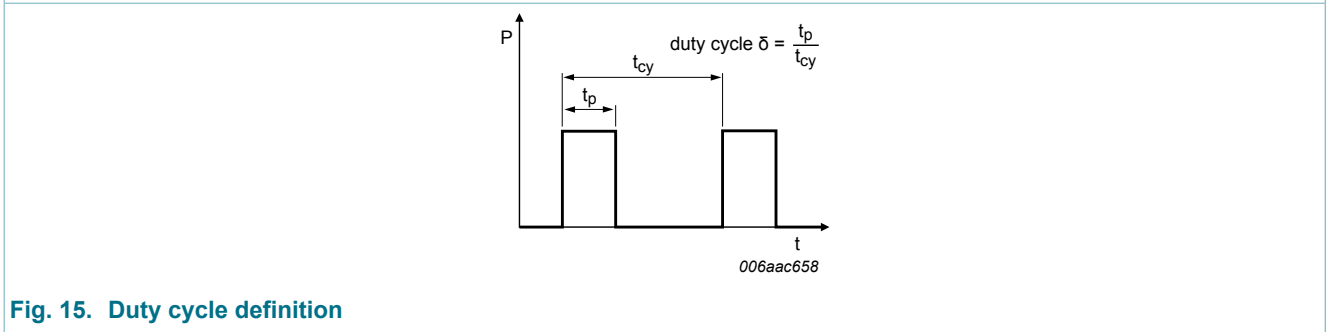


Fig. 15. Duty cycle definition

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.

### 11.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.

## 12. Package outline

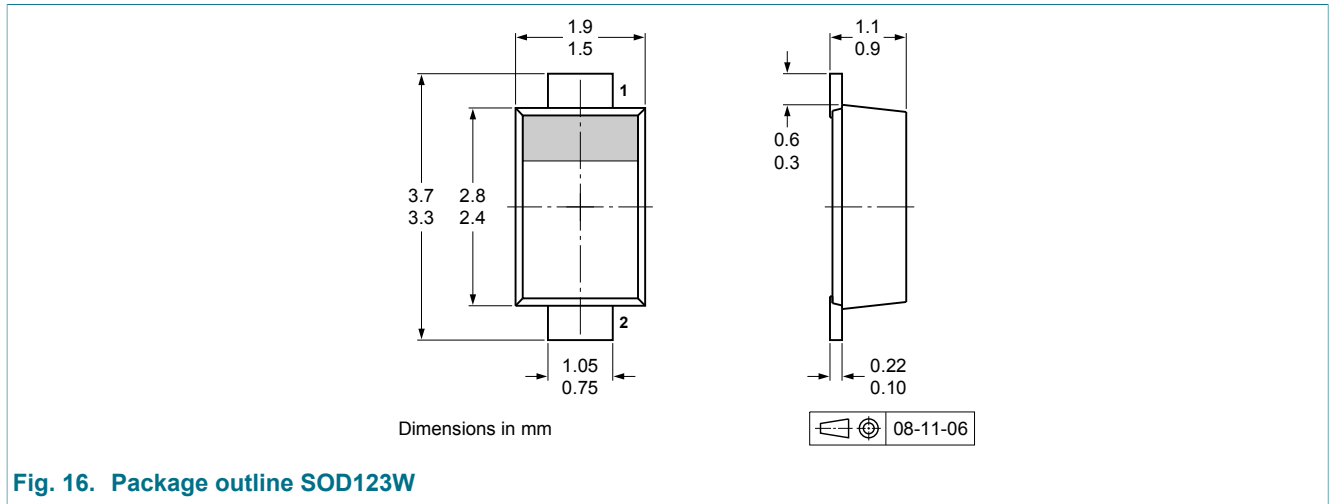


Fig. 16. Package outline SOD123W

## 13. Soldering

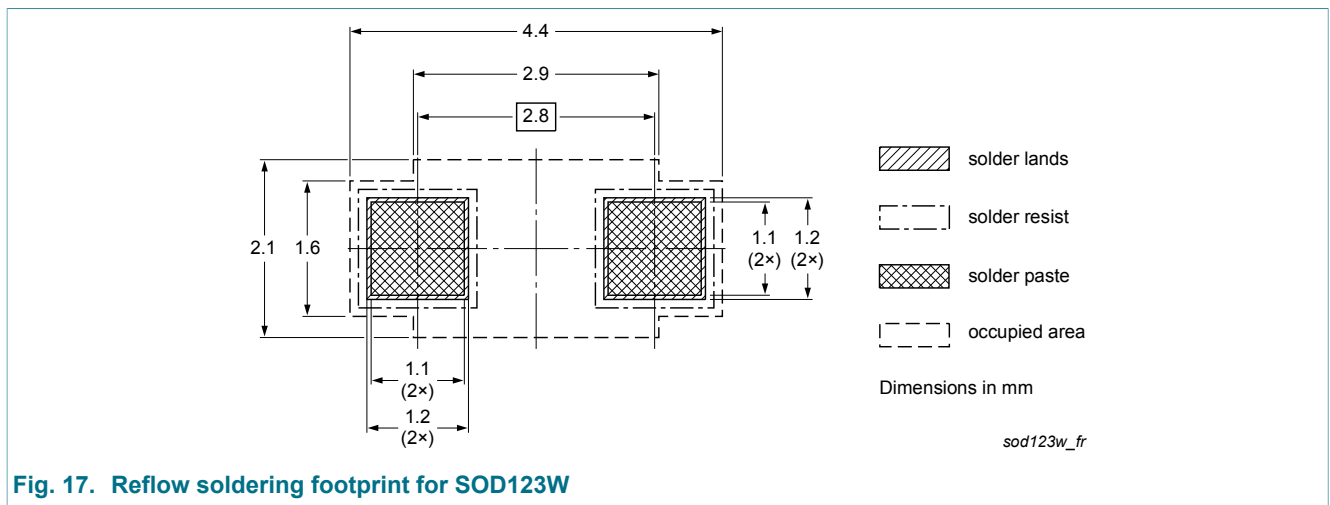


Fig. 17. Reflow soldering footprint for SOD123W

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG10010ELR v.2	20150507	Product data sheet	-	PMEG10010ELR v.1
Modifications:	<ul style="list-style-type: none"><li>Product status changed</li></ul>			
PMEG10010ELR v.1	20150220	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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