



# PMEG6020AELR

60 V, 2 A low leakage current Schottky barrier rectifier

8 September 2016

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

- Extremely low leakage current  $I_R = 235 \text{ nA}$
- Average forward current:  $I_{F(AV)} \leq 2 \text{ A}$
- Reverse voltage:  $V_R \leq 60 \text{ V}$
- Low forward voltage  $V_F = 600 \text{ mV}$
- High power capability due to clip-bonding technology
- High temperature  $T_j \leq 175 \text{ }^\circ\text{C}$
- Small and flat lead SMD plastic package
- 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	square wave; $\delta = 0.5$ ; $f = 20 \text{ kHz}$ ; $T_{sp} \leq 165 \text{ }^\circ\text{C}$	-	-	2	A
$V_R$	reverse voltage	$T_j = 25 \text{ }^\circ\text{C}$	-	-	60	V
$V_F$	forward voltage	$I_F = 2 \text{ A}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	600	670	mV
$I_R$	reverse current	$V_R = 60 \text{ V}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; $\delta \leq 0.02$	-	235	700	nA

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode[1]	 SOD123W	 sym001
2	A	anode		

[1] The marking bar indicates the cathode.

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMEG6020AELR	SOD123W	plastic surface mounted package; 2 leads	SOD123W

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PMEG6020AELR	KE

## 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	$T_j = 25\text{ °C}$		-	60	V
$I_F$	forward current	$T_{sp} = 160\text{ °C}; \delta = 1$		-	2.83	A
$I_{F(AV)}$	average forward current	square wave; $\delta = 0.5$ ; $f = 20\text{ kHz}; T_{amb} \leq 95\text{ °C}$	[1]	-	2	A
		square wave; $\delta = 0.5$ ; $f = 20\text{ kHz}; T_{sp} \leq 165\text{ °C}$		-	2	A
$I_{FSM}$	non-repetitive peak forward current	square wave; $t_p = 8\text{ ms}; T_{j(init)} = 25\text{ °C}$		-	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.

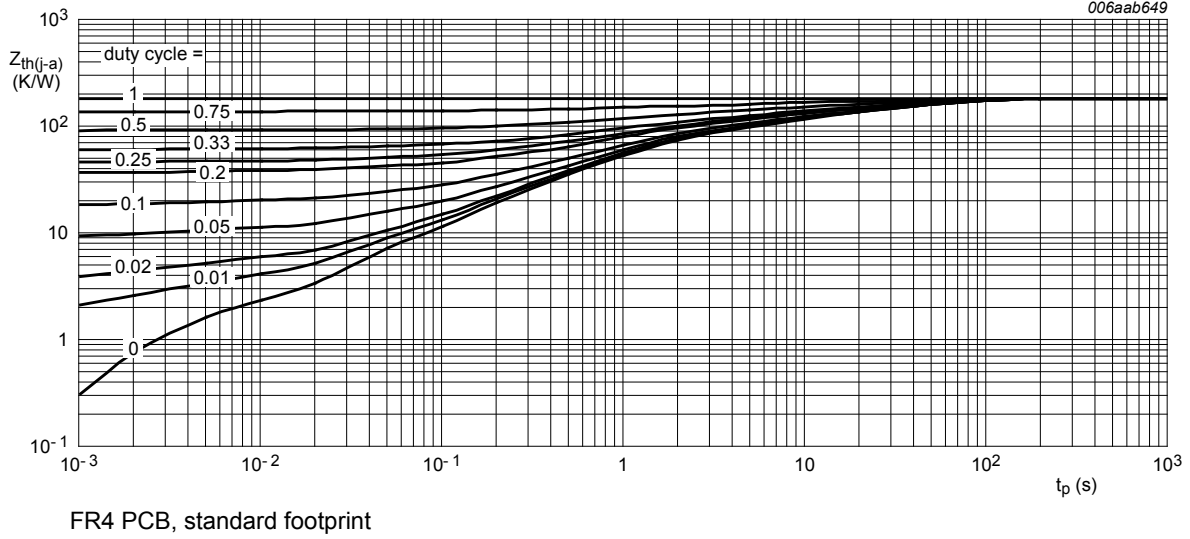


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

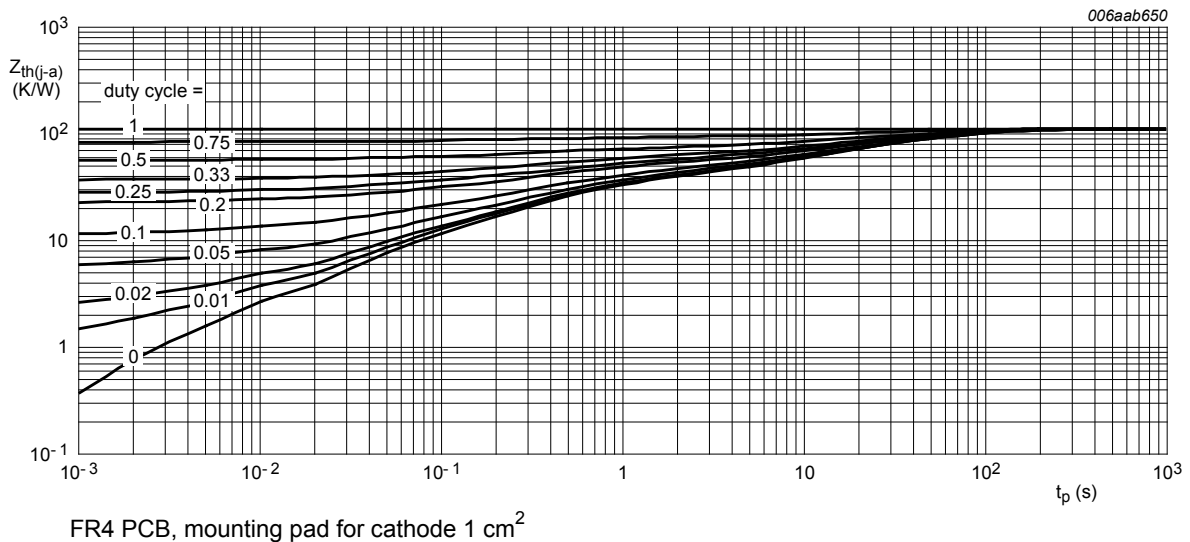
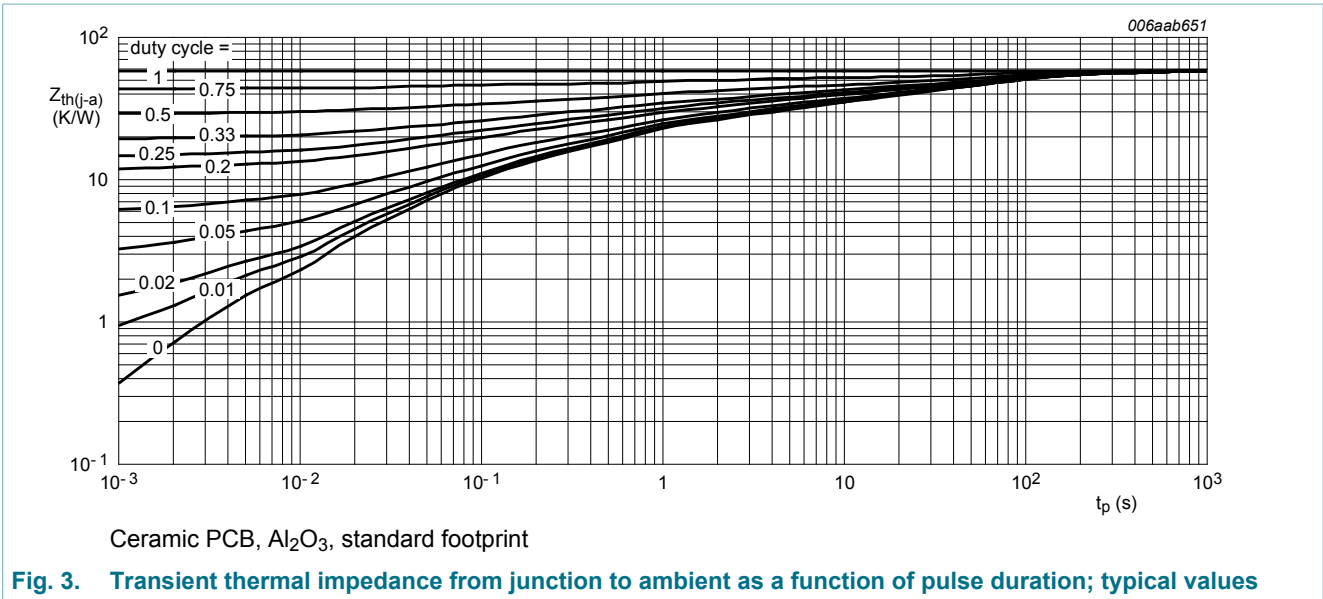


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)R}$	reverse breakdown voltage	$I_R = 1 \text{ mA}$ ; $t_p = 300 \text{ } \mu\text{s}$ ; $\delta = 0.02$ ; $T_j = 25 \text{ } ^\circ\text{C}$	60	-	-	V
$V_F$	forward voltage	$I_F = 0.1 \text{ A}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ } ^\circ\text{C}$	-	450	510	mV
		$I_F = 0.5 \text{ A}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ } ^\circ\text{C}$	-	510	570	mV
		$I_F = 0.7 \text{ A}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ } ^\circ\text{C}$	-	525	590	mV
		$I_F = 1 \text{ A}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ } ^\circ\text{C}$	-	545	610	mV
		$I_F = 1.6 \text{ A}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ } ^\circ\text{C}$	-	580	650	mV
		$I_F = 2 \text{ A}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ } ^\circ\text{C}$	-	600	670	mV
		$I_F = 2 \text{ A}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 125 \text{ } ^\circ\text{C}$	-	510	630	mV
$I_R$	reverse current	$V_R = 10 \text{ V}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $T_j = 25 \text{ } ^\circ\text{C}$ ; $\delta \leq 0.02$	-	15	-	nA
		$V_R = 40 \text{ V}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $T_j = 25 \text{ } ^\circ\text{C}$ ; $\delta \leq 0.02$	-	50	-	nA
		$V_R = 60 \text{ V}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $T_j = 25 \text{ } ^\circ\text{C}$ ; $\delta \leq 0.02$	-	235	700	nA
		$V_R = 60 \text{ V}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $T_j = 125 \text{ } ^\circ\text{C}$ ; $\delta \leq 0.02$	-	285	1400	$\mu\text{A}$
$C_d$	diode capacitance	$V_R = 1 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ } ^\circ\text{C}$	-	220	-	pF
		$V_R = 4 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ } ^\circ\text{C}$	-	135	-	pF
		$V_R = 10 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ } ^\circ\text{C}$	-	88	-	pF
$t_{rr}$	reverse recovery time	$I_F = 0.5 \text{ A}$ ; $I_R = 0.5 \text{ A}$ ; $I_{R(\text{meas})} = 0.1 \text{ A}$ ; $T_j = 25 \text{ } ^\circ\text{C}$	-	9	-	ns
$V_{FRM}$	peak forward recovery voltage	$I_F = 0.5 \text{ A}$ ; $di_F/dt = 20 \text{ A}/\mu\text{s}$ ; $T_j = 25 \text{ } ^\circ\text{C}$	-	580	-	mV

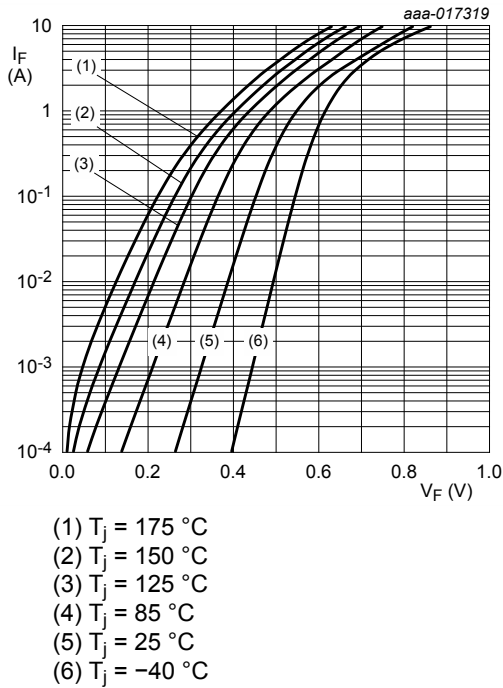


Fig. 4. Forward current as a function of forward voltage; typical values

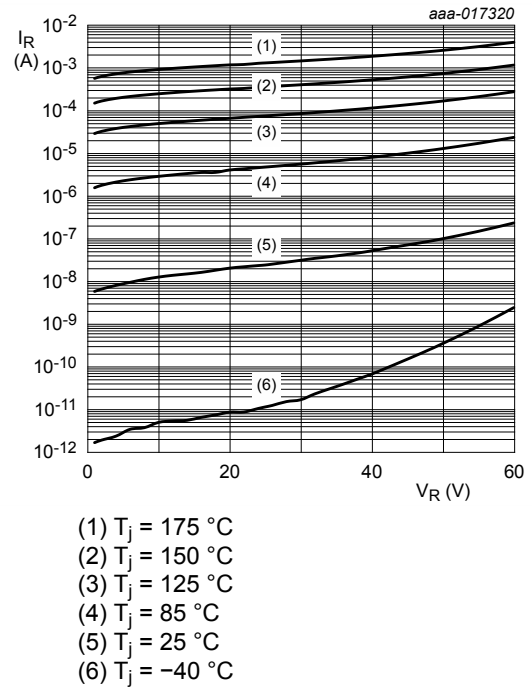


Fig. 5. Reverse current as a function of reverse voltage; typical values

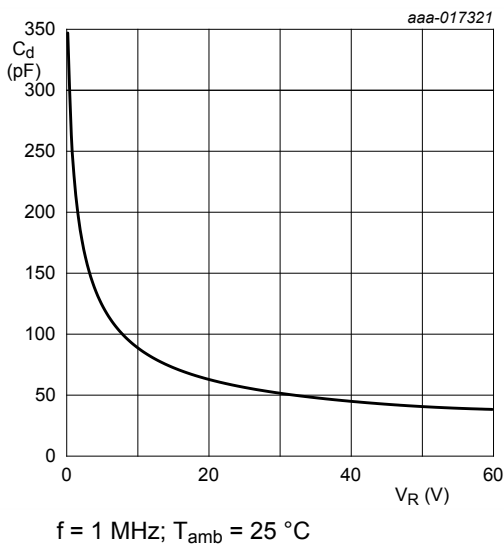


Fig. 6. Diode capacitance as a function of reverse voltage; typical values

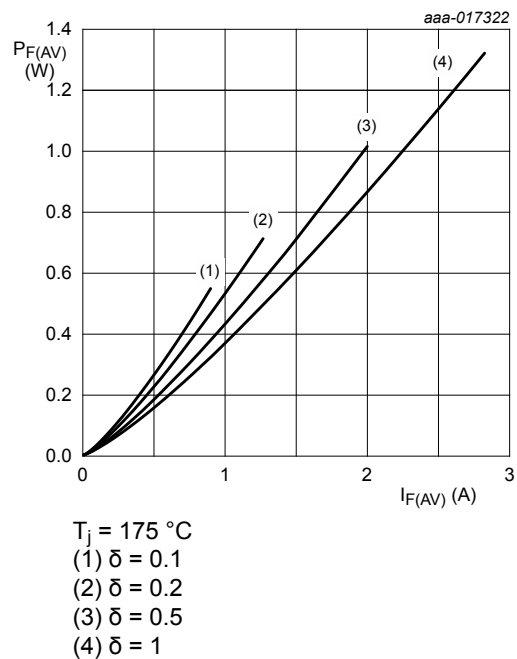
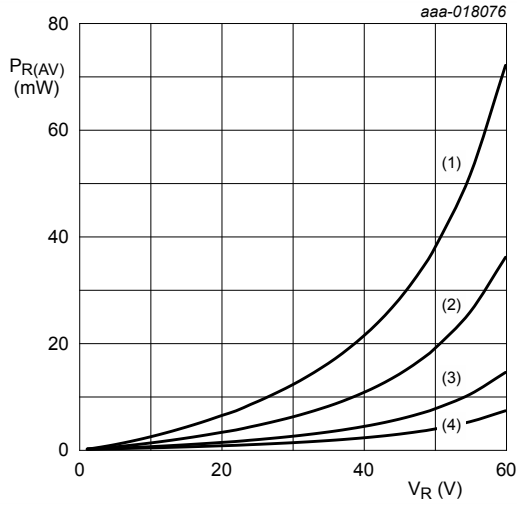
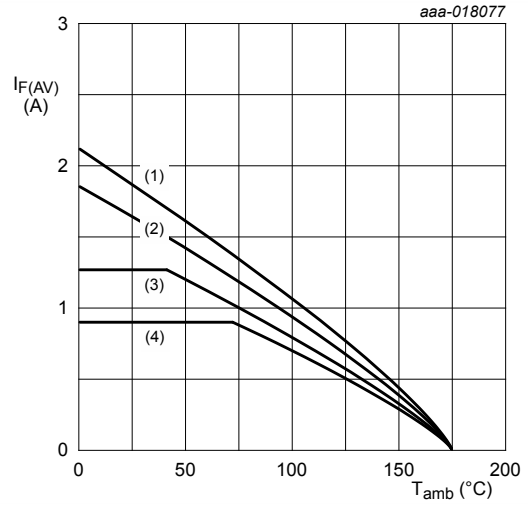


Fig. 7. Average forward power dissipation as a function of average forward current; typical values



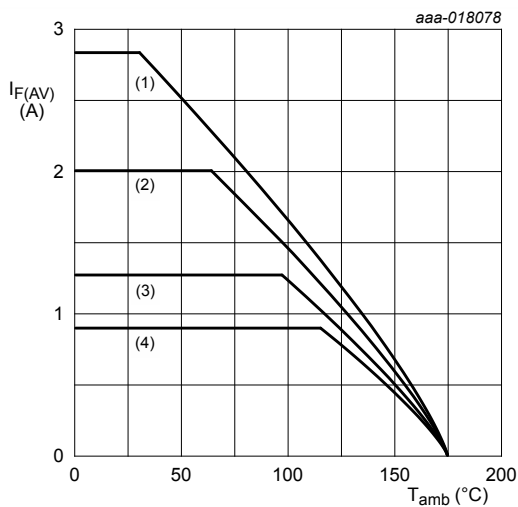
$T_j = 150\text{ °C}$   
 (1)  $\delta = 1$  (DC)  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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



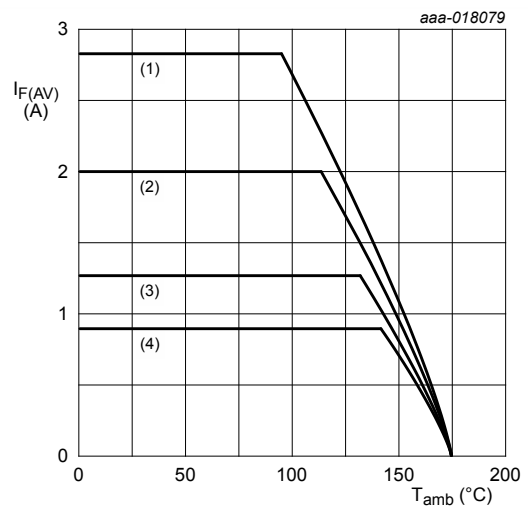
FR4 PCB, standard footprint  
 $T_j = 175\text{ °C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

**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)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

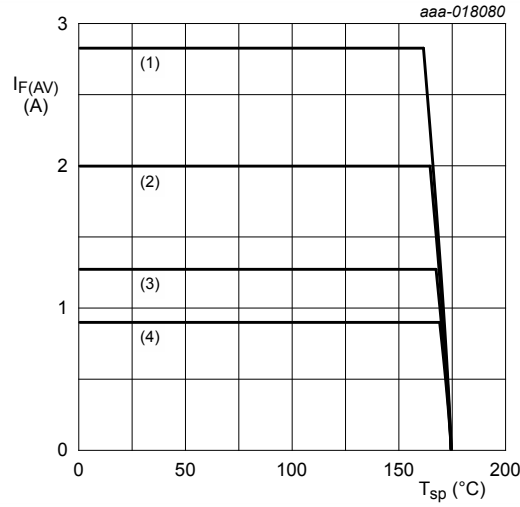
**Fig. 10. Average forward current as a function of ambient temperature; typical values**



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

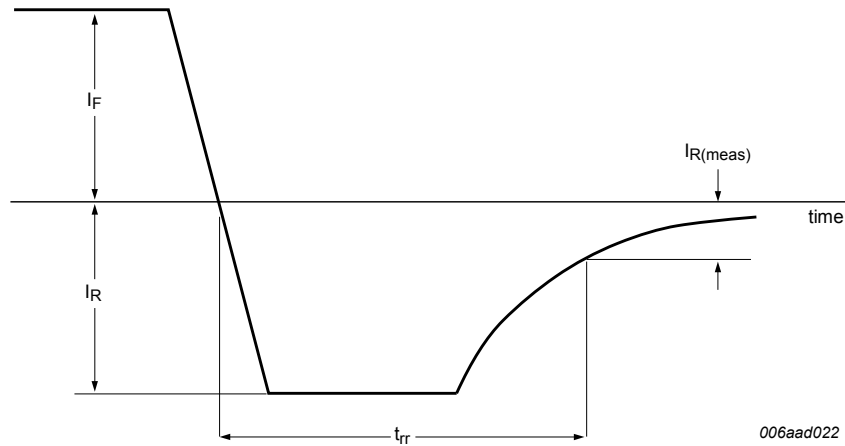


Fig. 13. Reverse recovery definition

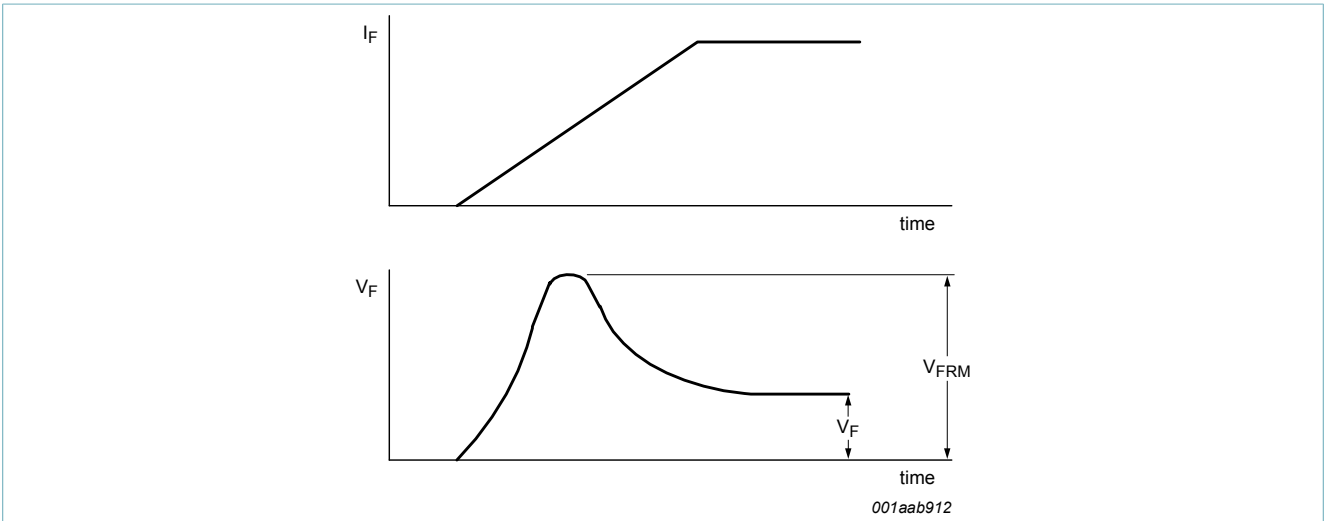


Fig. 14. Forward recovery definition

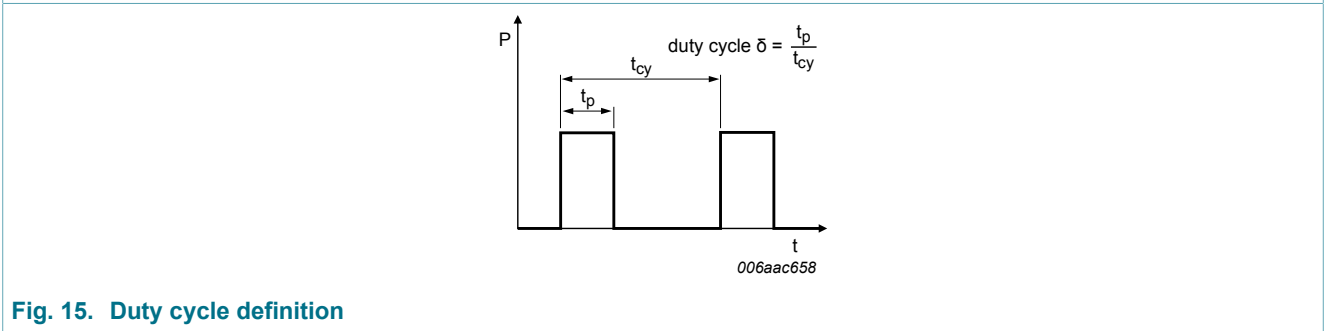


Fig. 15. Duty cycle definition

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.

**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

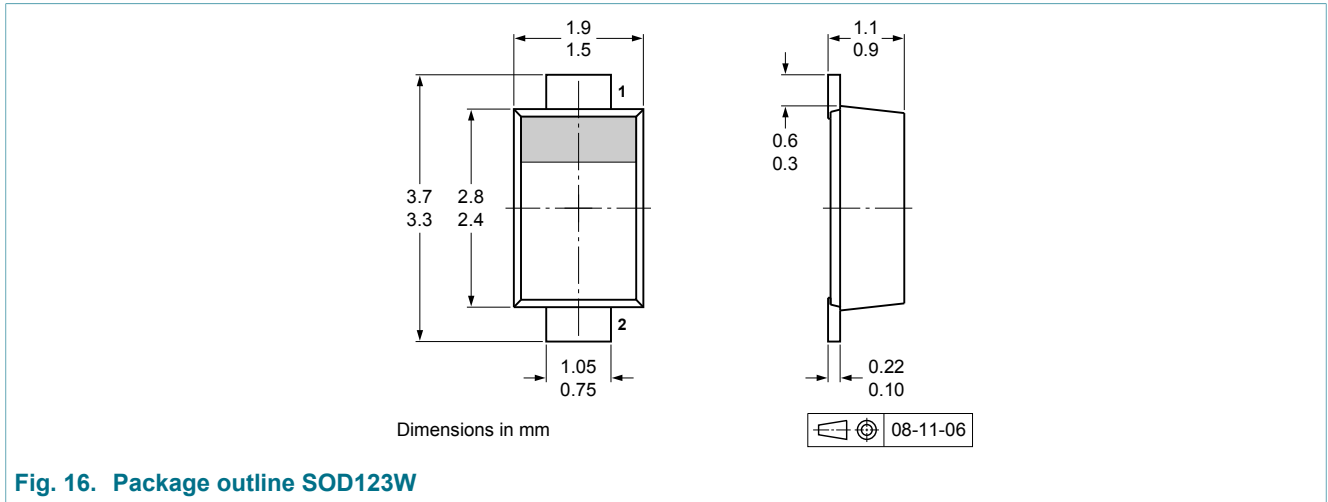


Fig. 16. Package outline SOD123W

## 13. Soldering

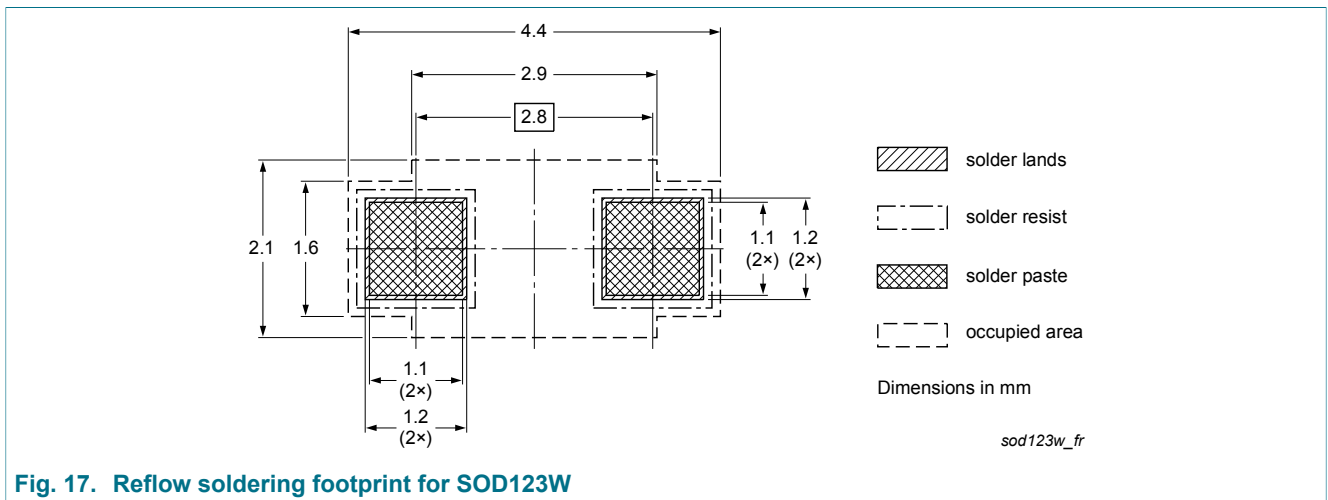


Fig. 17. Reflow soldering footprint for SOD123W

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG6020AELR v.3	20160908	Product data sheet	-	PMEG6020AELR v.2
Modification:	<ul style="list-style-type: none"><li>Figure 12: editorial change</li></ul>			
PMEG6020AELR v.2	20150619	Product data sheet	-	PMEG6020AELR v.1
PMEG6020AELR v.1	20150507	Product data sheet	-	-

## 15. Legal information

### 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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- [2] The term 'short data sheet' is explained in section "Definitions".
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