### 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<sub>F(AV)</sub> ≤ 2 A
- Reverse voltage: V<sub>R</sub> ≤ 100 V
- Low forward voltage: V<sub>F</sub> = 710 mV
- High power capability due to clip-bonding technology
- · Extremely low leakage current
- High temperature T<sub>i</sub> ≤ 175 °C
- Small and flat lead SMD plastic package
- AEC-Q101 qualified
- · Capable for reflow and wave soldering

## 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	Тур	Max	Unit
I <sub>F(AV)</sub>	average forward current	$\delta$ = 0.5 ; f = 20 kHz; $T_{sp} \le 160$ °C; square wave	-	_	2	Α
V <sub>R</sub>	reverse voltage	T <sub>j</sub> = 25 °C	-	-	100	V
V <sub>F</sub>	forward voltage	$I_F$ = 2 A; $t_p$ ≤ 300 μs; δ ≤ 0.02 ; $T_j$ = 25 °C	-	710	770	mV
I <sub>R</sub>	reverse current	$V_R = 100 \text{ V; } t_p \le 300  \mu\text{s; } \delta \le 0.02 \text{ ; } T_j = 25 \text{ °C}$	-	70	300	nA



# 5. Pinning information

### **Table 2. Pinning information**

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode[1]	1 2	1 🔂 2
2	Α	anode	CFP3 (SOD123W)	sym001

<sup>[1]</sup> The marking bar indicates the cathode.

# 6. Ordering information

#### **Table 3. Ordering information**

Type number	Package					
	Name	Description	Version			
PMEG10020AELR	CFP3	plastic, surface mounted package; 2 terminals; 2.6 mm x 1.7 mm x 1 mm body	SOD123W			

# 7. Marking

#### Table 4. Marking codes

Type number	Marking code
PMEG10020AELR	K9

## 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 <sub>j</sub> = 25 °C		-	100	V
l <sub>F</sub>	forward current	T <sub>sp</sub> = 155 °C; δ = 1		-	2.83	Α
I <sub>F(AV)</sub>	average forward current	$\delta$ = 0.5 ; f = 20 kHz; $T_{amb} \le 90$ °C; square wave	[1]	-	2	Α
		$\delta$ = 0.5 ; f = 20 kHz; $T_{sp} \le 160$ °C; square wave		-	2	Α
I <sub>FRM</sub>	repetitive peak forward current	$t_p \le 1 \text{ ms}; \delta \le 0.25$		-	30	Α
I <sub>FSM</sub>	non-repetitive peak forward current	$t_p$ = 8 ms; $T_{j(init)}$ = 25 °C; square wave		-	50	Α
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C	[2]	-	680	mW
			[3]	-	1150	mW
			[1]	-	2140	mW
T <sub>j</sub>	junction temperature			-	175	°C
T <sub>amb</sub>	ambient temperature			-55	175	°C
T <sub>stg</sub>	storage temperature			-65	175	°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 cathode 1 cm<sup>2</sup>.

### 9. Thermal characteristics

**Table 6. Thermal characteristics** 

Symbol	Parameter	Conditions		Min	Тур	Max	Unit
R <sub>th(j-a)</sub>	thermal resistance		[1] [2]	-	-	220	K/W
	from junction to ambient		[1] [3]	-	-	130	K/W
			[1] [4]	-	-	70	K/W
R <sub>th(j-sp)</sub>	thermal resistance from junction to solder point		[5]	-	-	18	K/W

<sup>[1]</sup> For Schottky barrier diodes thermal runaway has to be considered, as in some applications the reverse power losses P<sub>R</sub> are a significant part of the total power losses.

<sup>[2]</sup> Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

<sup>[3]</sup> Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm<sup>2</sup>.

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

<sup>[5]</sup> Soldering point of cathode tab.

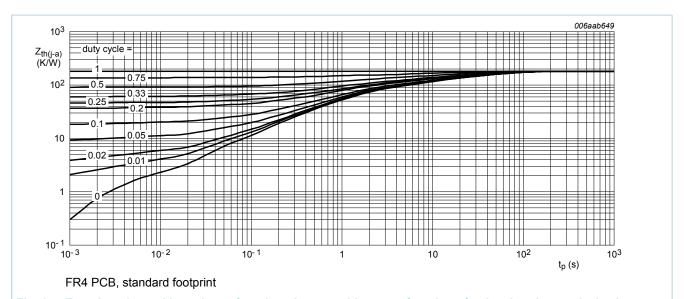


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

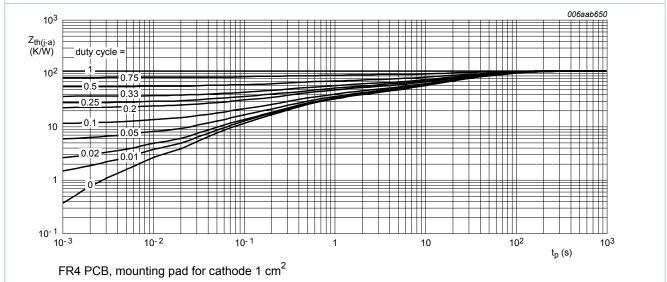
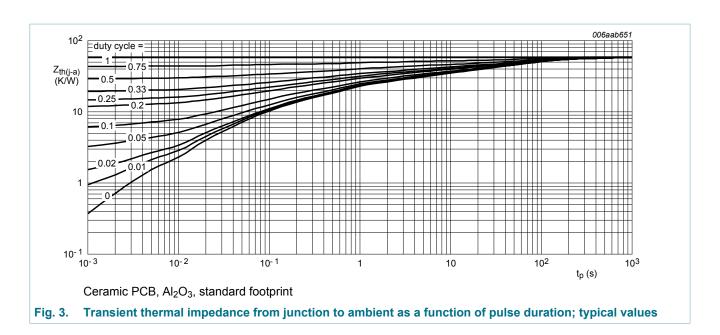


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



### 10. Characteristics

#### **Table 7. Characteristics**

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
$V_{(BR)R}$	reverse breakdown voltage	$I_R$ = 1 mA; $t_p$ = 300 µs; $\delta$ = 0.02 ; $T_j$ = 25 °C	100	-	-	V
V <sub>F</sub>	forward voltage	$I_F = 0.1 \text{ A}; t_p \le 300  \mu\text{s}; \delta \le 0.02 ;$ $T_j = 25 ^{\circ}\text{C}$	-	470	520	mV
		$I_F = 0.5 \text{ A}; t_p \le 300  \mu\text{s}; \delta \le 0.02 ;$ $T_j = 25 ^{\circ}\text{C}$	-	580	630	mV
		$I_F = 0.7 \text{ A}; t_p \le 300  \mu\text{s}; \delta \le 0.02 ;$ $T_j = 25 ^{\circ}\text{C}$	-	610	670	mV
		$I_F$ = 1 A; $t_p \le 300 \mu s$ ; δ ≤ 0.02 ; $T_j$ = 25 °C	-	650	710	mV
		$I_F = 1.6 \text{ A}; t_p \le 300  \mu\text{s}; \delta \le 0.02 ;$ $T_j = 25 ^{\circ}\text{C}$	-	690	750	mV
		$I_F = 2 \text{ A}; t_p \le 300  \mu\text{s}; \delta \le 0.02 ;$ $T_j = 25 ^{\circ}\text{C}$	-	710	770	mV
		$I_F = 2 \text{ A}; t_p \le 300 \text{ μs}; δ \le 0.02 ;$ $T_j = 125 \text{ °C}$	-	575	650	mV
I <sub>R</sub>	reverse current	$V_R = 10 \text{ V}; t_p \le 300  \mu\text{s}; \delta \le 0.02 ;$ $T_j = 25 ^{\circ}\text{C}$	-	10	-	nA
		$V_R = 60 \text{ V}; t_p \le 300  \mu\text{s}; \delta \le 0.02 ;$ $T_j = 25 ^{\circ}\text{C}$	-	25	-	nA
		$V_R = 100 \text{ V}; t_p \le 300  \mu\text{s}; \delta \le 0.02 ;$ $T_j = 25 ^{\circ}\text{C}$	-	70	300	nA
		$V_R = 100 \text{ V}; t_p \le 300  \mu\text{s}; \delta \le 0.02 ;$ $T_j = 125 ^{\circ}\text{C}$	-	120	1000	μA
C <sub>d</sub>	diode capacitance	V <sub>R</sub> = 1 V; f = 1 MHz; T <sub>j</sub> = 25 °C	-	135	-	pF
		V <sub>R</sub> = 4 V; f = 1 MHz; T <sub>j</sub> = 25 °C	-	80	-	pF
		V <sub>R</sub> = 10 V; f = 1 MHz; T <sub>j</sub> = 25 °C	-	50	-	pF
rr	reverse recovery time	$I_F = 0.5 \text{ A}; I_R = 0.5 \text{ A}; I_{R(meas)} = 0.1 \text{ A};$ $T_j = 25 ^{\circ}\text{C}$	-	5	-	ns
$V_{FRM}$	peak forward recovery voltage	$I_F = 0.5 \text{ A}; dI_F/dt = 20 \text{ A/}\mu\text{s}; T_j = 25 °C$	-	630	-	mV

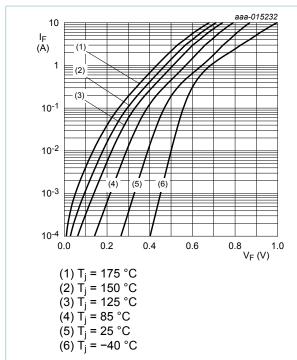


Fig. 4. Forward current as a function of forward voltage; typical values

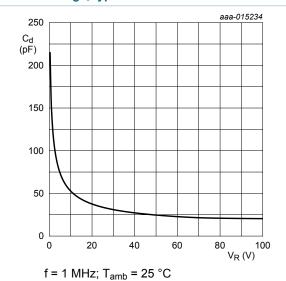


Fig. 6. Diode capacitance as a function of reverse voltage; typical values

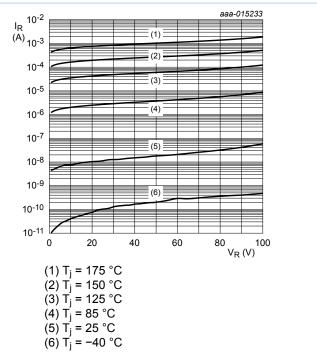
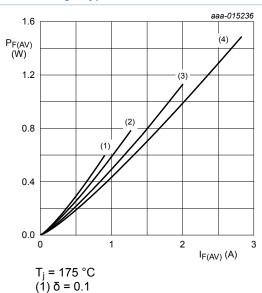


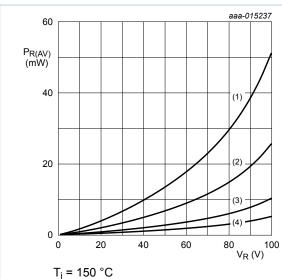
Fig. 5. Reverse current as a function of reverse voltage; typical values



(4)  $\delta$  = 1 Fig. 7. Average forward power dissipation as a function of average forward current; typical values

 $(2) \delta = 0.2$ 

 $(3) \delta = 0.5$ 



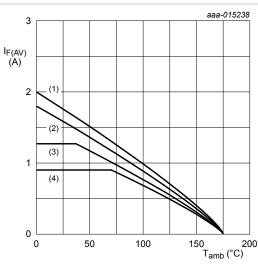
 $(1) \delta = 1 (DC)$ 

(2)  $\delta = 0.5$ ; f = 20 kHz

(3)  $\delta = 0.2$ ; f = 20 kHz

(4)  $\delta$  = 0.1; f = 20 kHz

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



FR4 PCB, standard footprint

 $T_i = 175 \,{}^{\circ}\text{C}$ 

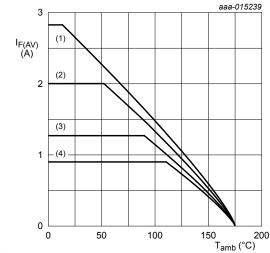
 $(1) \delta = 1; DC$ 

(2)  $\delta$  = 0.5; f = 20 kHz

(3)  $\delta$  = 0.2; f = 20 kHz

(4)  $\delta = 0.1$ ; f = 20 kHz

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



FR4 PCB, mounting pad for cathode 1  $\mathrm{cm}^2$ 

 $T_j = 175 \,{}^{\circ}\text{C}$ 

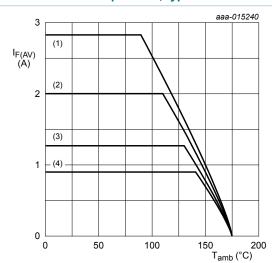
 $(1) \delta = 1; DC$ 

(2)  $\delta$  = 0.5; f = 20 kHz

(3)  $\delta$  = 0.2; f = 20 kHz

(4)  $\delta$  = 0.1; f = 20 kHz

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



Ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint

T<sub>i</sub> = 175 °C

 $(1) \delta = 1; DC$ 

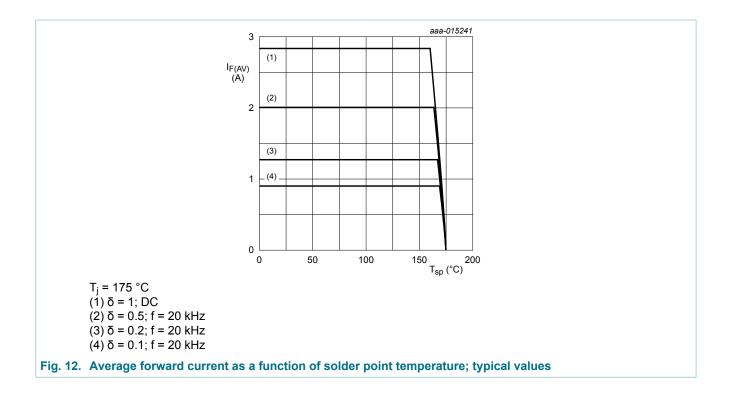
(2)  $\delta = 0.5$ ; f = 20 kHz

(3)  $\delta$  = 0.2; f = 20 kHz

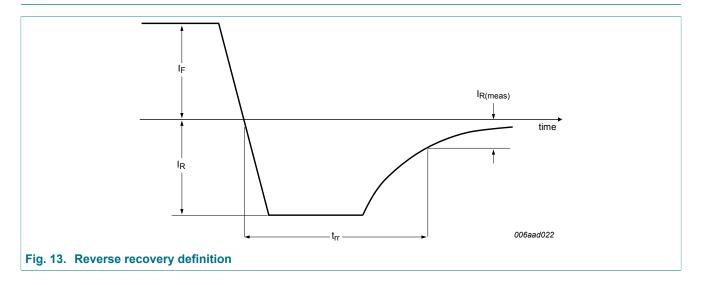
 $(4) \delta = 0.1$ ; f = 20 kHz

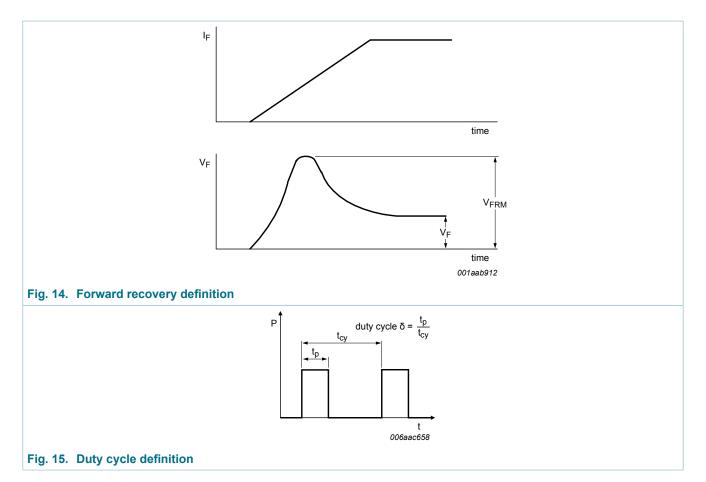
Fig. 11. Average forward current as a function of ambient temperature; typical values

8 / 15



## 11. Test information



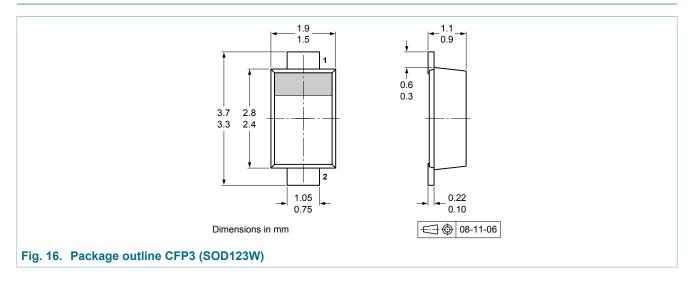


The current ratings for the typical waveforms are calculated according to the equations:  $I_{F(AV)} = I_M \times \delta$  with  $I_M$  defined as peak current,  $I_{RMS} = I_{F(AV)}$  at DC, and  $I_{RMS} = I_M \times \sqrt{\delta}$  with  $I_{RMS}$  defined as RMS current.

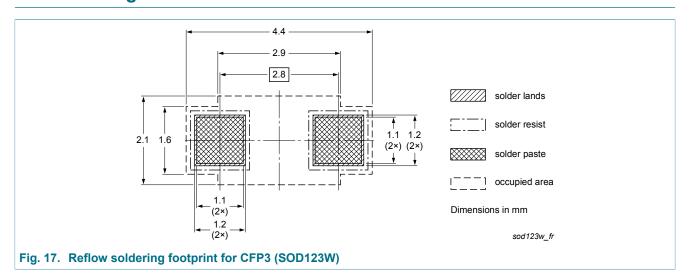
#### **Quality information**

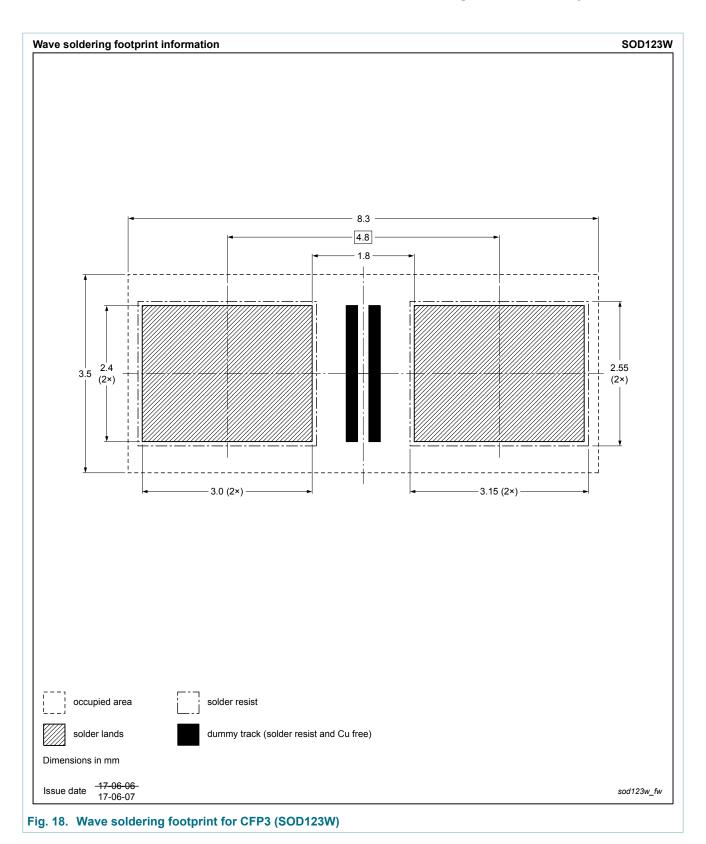
This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.

## 12. Package outline



## 13. Soldering





12 / 15

# 14. Revision history

#### Table 8. Revision history

Table of Nevicion inicio	· y							
Data sheet ID	Release date	Data sheet status	Change notice	Supersedes				
PMEG10020AELR v.4	20171129	Product data sheet	-	PMEG10020AELR v.3				
Modifications:	<ul> <li>Features and benefits: Capable for reflow and wave soldering added</li> <li>Soldering: Wave soldering footprint added</li> </ul>							
PMEG10020AELR v.3	20150507	Product data sheet	-	PMEG10020AELR v.2				
PMEG10020AELR v.2	20150219	Product data sheet	-	PMEG10020AELR v.1				
PMEG10020AELR v.1	20141119	Preliminary 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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PMEG10020AELR

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### 16. Contents

1.	General description	1
2.	Features and benefits	1
3.	Applications	1
4.	Quick reference data	1
5.	Pinning information	2
6.	Ordering information	2
7.	Marking	2
8.	Limiting values	3
9.	Thermal characteristics	3
10.	. Characteristics	6
11.	. Test information	9
12.	. Package outline	11
13.	. Soldering	11
14.	. Revision history	13
15.	. Legal information	14

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