



# PMEG3020ER

## 2 A low VF MEGA Schottky barrier rectifier

10 November 2017

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:  $I_{F(AV)} \leq 2$  A
- Reverse voltage:  $V_R \leq 30$  V
- Low forward voltage
- High power capability due to clip-bond technology
- AEC-Q101 qualified
- Small and flat lead SMD plastic package
- Capable for reflow and wave soldering

### 3. Applications

- Low voltage rectification
- High efficiency DC-to-DC conversion
- Switch Mode Power Supply (SMPS)
- 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; $T_{amb} \leq 90$ °C; square wave	[1]	-	-	2	A
		$\delta = 0.5$ ; $f = 20$ kHz; $T_{sp} \leq 140$ °C; square wave		-	-	2	A
$V_R$	reverse voltage	$T_j = 25$ °C		-	-	30	V
$V_F$	forward voltage	$I_F = 2$ A; $T_j = 25$ °C		-	365	420	mV
$I_R$	reverse current	$V_R = 30$ V; $T_j = 25$ °C		-	0.6	1.5	mA

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

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode[1]	 CFP3 (SOD123W)	 <i>sym001</i>
2	A	anode		

[1] The marking bar indicates the cathode.

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMEG3020ER	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
PMEG3020ER	B9

## 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	$T_j = 25\text{ }^{\circ}\text{C}$		-	30	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; $f = 20\text{ kHz}$ ; $T_{amb} \leq 90\text{ }^{\circ}\text{C}$ ; square wave	[1]	-	2	A
		$\delta = 0.5$ ; $f = 20\text{ kHz}$ ; $T_{sp} \leq 140\text{ }^{\circ}\text{C}$ ; square wave		-	2	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 8\text{ ms}$ ; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$ ; square wave		-	50	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ }^{\circ}\text{C}$	[2]	-	0.57	W
			[3]	-	0.95	W
			[1]	-	1.8	W
$T_j$	junction temperature			-	150	$^{\circ}\text{C}$
$T_{amb}$	ambient temperature			-55	150	$^{\circ}\text{C}$
$T_{stg}$	storage temperature			-65	150	$^{\circ}\text{C}$

[1] Device mounted on a ceramic PCB,  $\text{Al}_2\text{O}_3$ , 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
			[3] [2]	-	-	130	K/W
			[4] [2]	-	-	70	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[5]	-	-	18	K/W

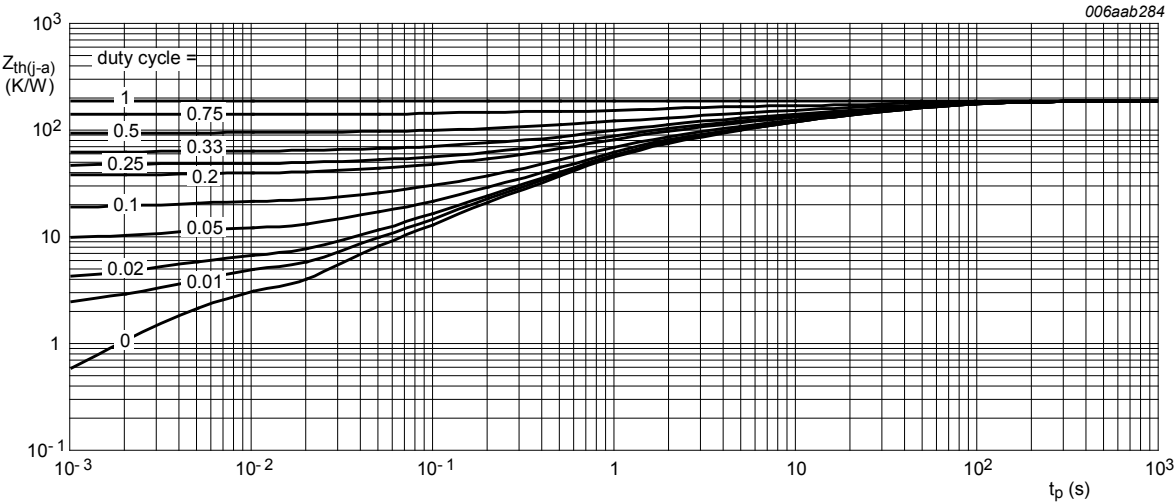
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] 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.

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode  $1\text{ cm}^2$ .

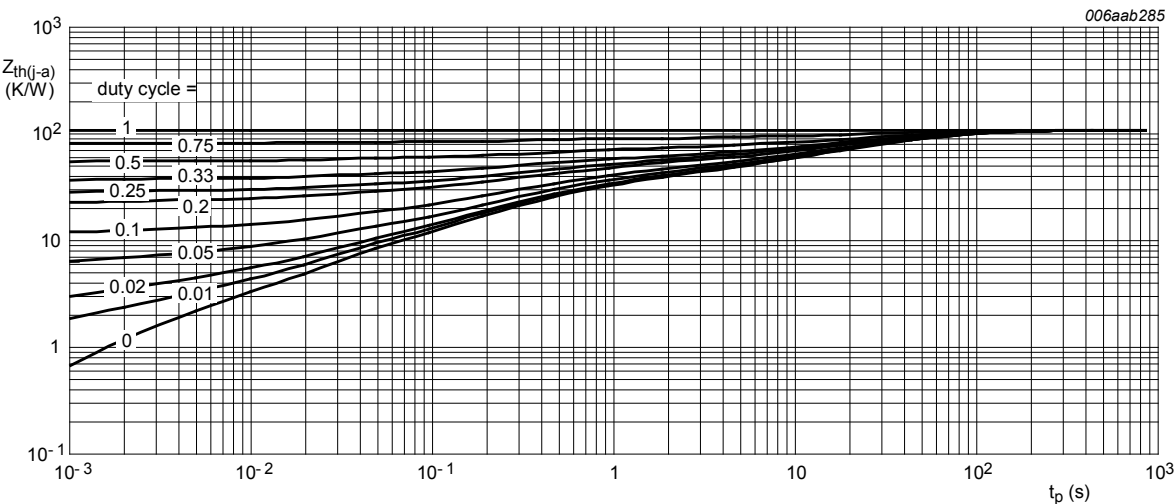
[4] Device mounted on a ceramic PCB,  $\text{Al}_2\text{O}_3$ , standard footprint.

[5] Soldering point of cathode tab.



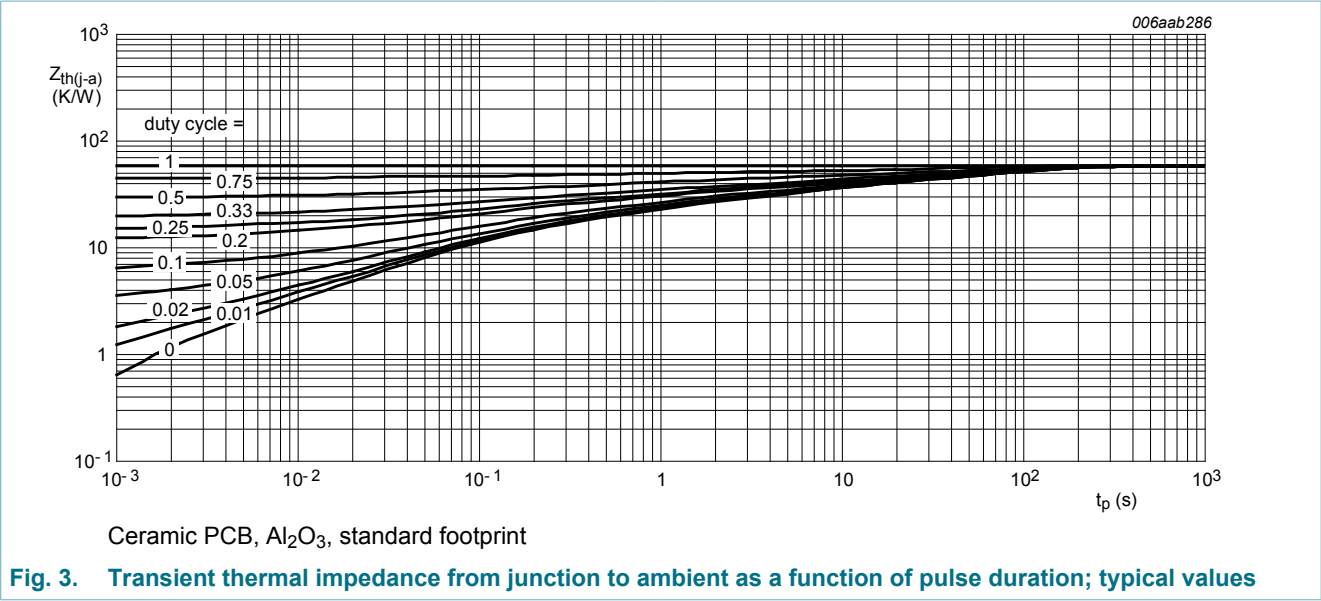
FR4 PCB, standard footprint

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
$V_F$	forward voltage	$I_F = 0.1\text{ A}; T_j = 25\text{ }^{\circ}\text{C}$	-	230	260	mV
		$I_F = 1\text{ A}; T_j = 25\text{ }^{\circ}\text{C}$	-	320	360	mV
		$I_F = 1.5\text{ A}; T_j = 25\text{ }^{\circ}\text{C}$	-	340	380	mV
		$I_F = 2\text{ A}; T_j = 25\text{ }^{\circ}\text{C}$	-	365	420	mV
$I_R$	reverse current	$V_R = 5\text{ V}; T_j = 25\text{ }^{\circ}\text{C}$	-	55	-	$\mu\text{A}$
		$V_R = 30\text{ V}; T_j = 25\text{ }^{\circ}\text{C}$	-	0.6	1.5	mA
$C_d$	diode capacitance	$V_R = 1\text{ V}; f = 1\text{ MHz}; T_j = 25\text{ }^{\circ}\text{C}$	-	170	-	pF
		$V_R = 10\text{ V}; f = 1\text{ MHz}; T_j = 25\text{ }^{\circ}\text{C}$	-	60	-	pF

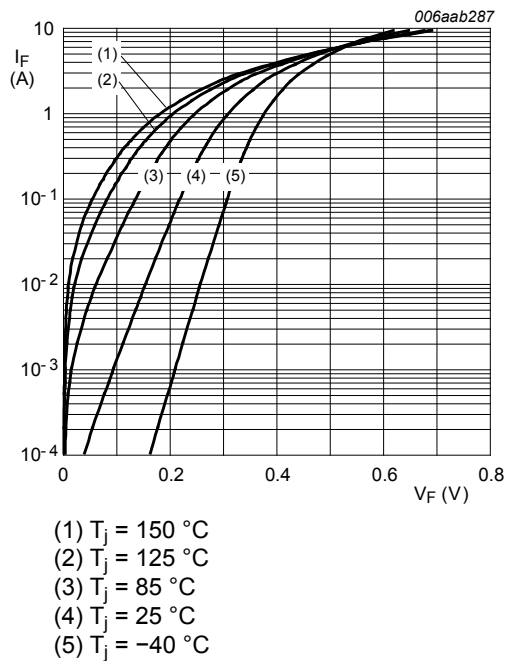


Fig. 4. Forward current as a function of forward voltage; typical values

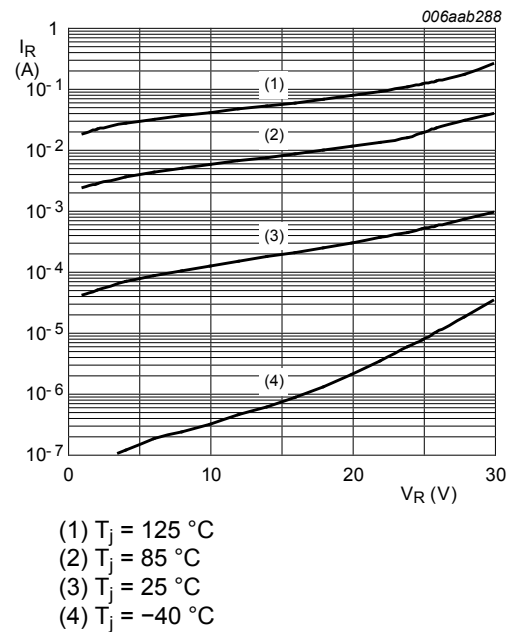
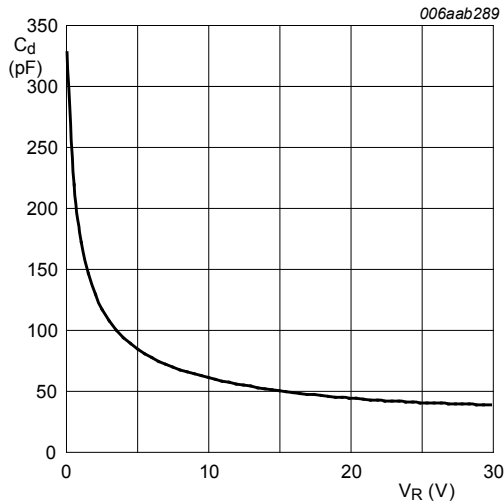
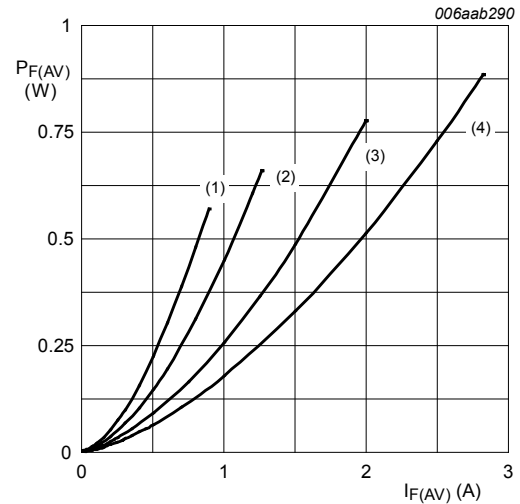


Fig. 5. Reverse current as a function of reverse voltage; typical values



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

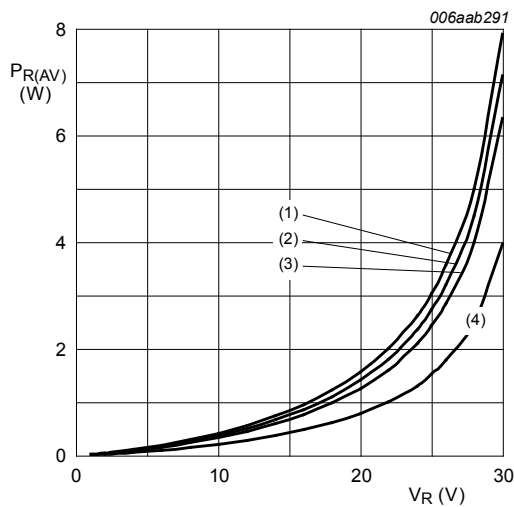
**Fig. 6.** Diode capacitance as a function of reverse voltage; typical values



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

- (1)  $\delta = 0.1$
- (2)  $\delta = 0.2$
- (3)  $\delta = 0.5$
- (4)  $\delta = 1$

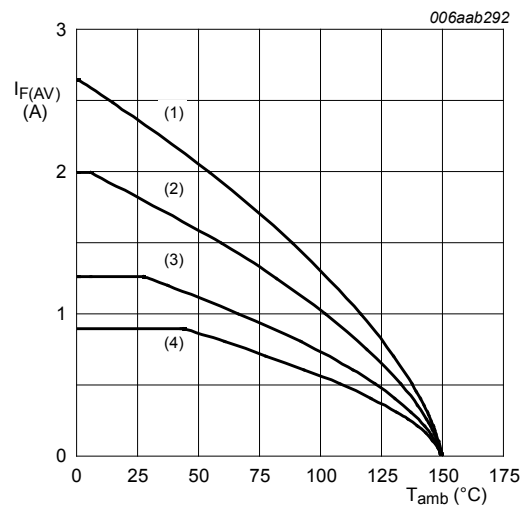
**Fig. 7.** Average forward power dissipation as a function of average forward current; typical values



$T_j = 125 \text{ }^{\circ}\text{C}$

- (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

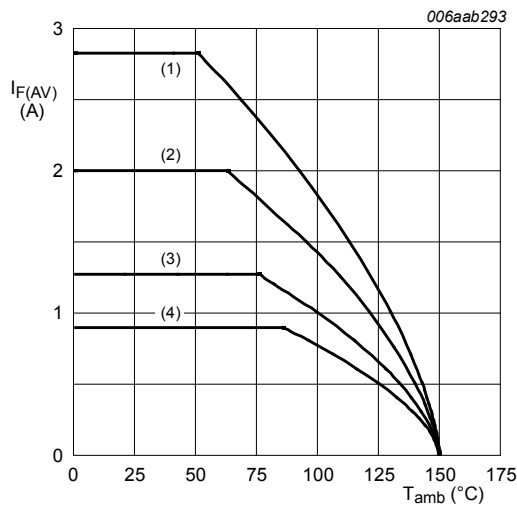


FR4 PCB, standard footprint

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

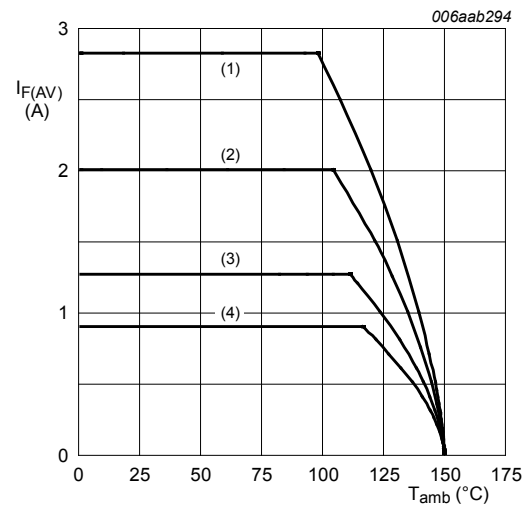
- (1)  $\delta = 1$ ; DC
- (2)  $\delta = 0.5$ ;  $f = 20 \text{ kHz}$
- (3)  $\delta = 0.2$ ;  $f = 20 \text{ kHz}$
- (4)  $\delta = 0.1$ ;  $f = 20 \text{ kHz}$

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



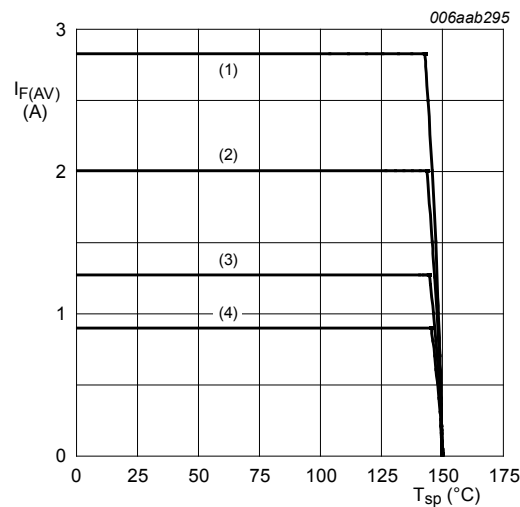
FR4 PCB, mounting pad for cathode 1 cm<sup>2</sup>  
 $T_j = 150$  °C  
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.5$ ;  $f = 20$  kHz  
 (3)  $\delta = 0.2$ ;  $f = 20$  kHz  
 (4)  $\delta = 0.1$ ;  $f = 20$  kHz

**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  
 $T_j = 150$  °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**



$T_j = 150$  °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

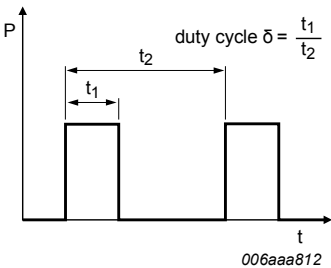


Fig. 13. Duty cycle definition

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

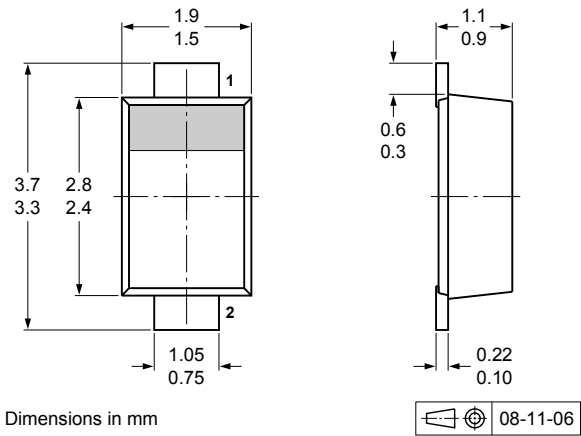
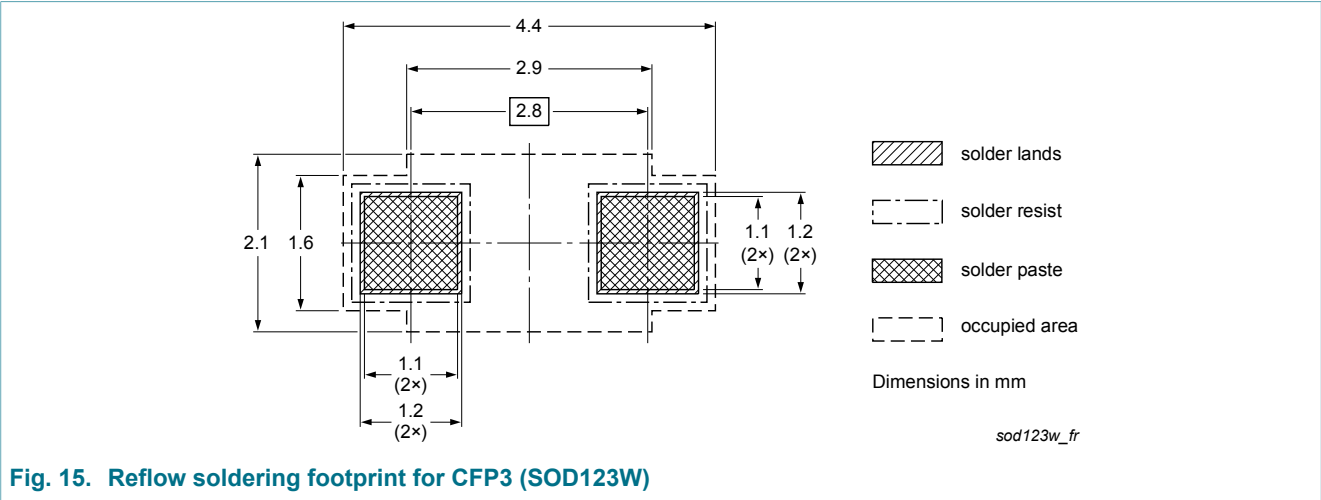


Fig. 14. Package outline CFP3 (SOD123W)

13. Soldering



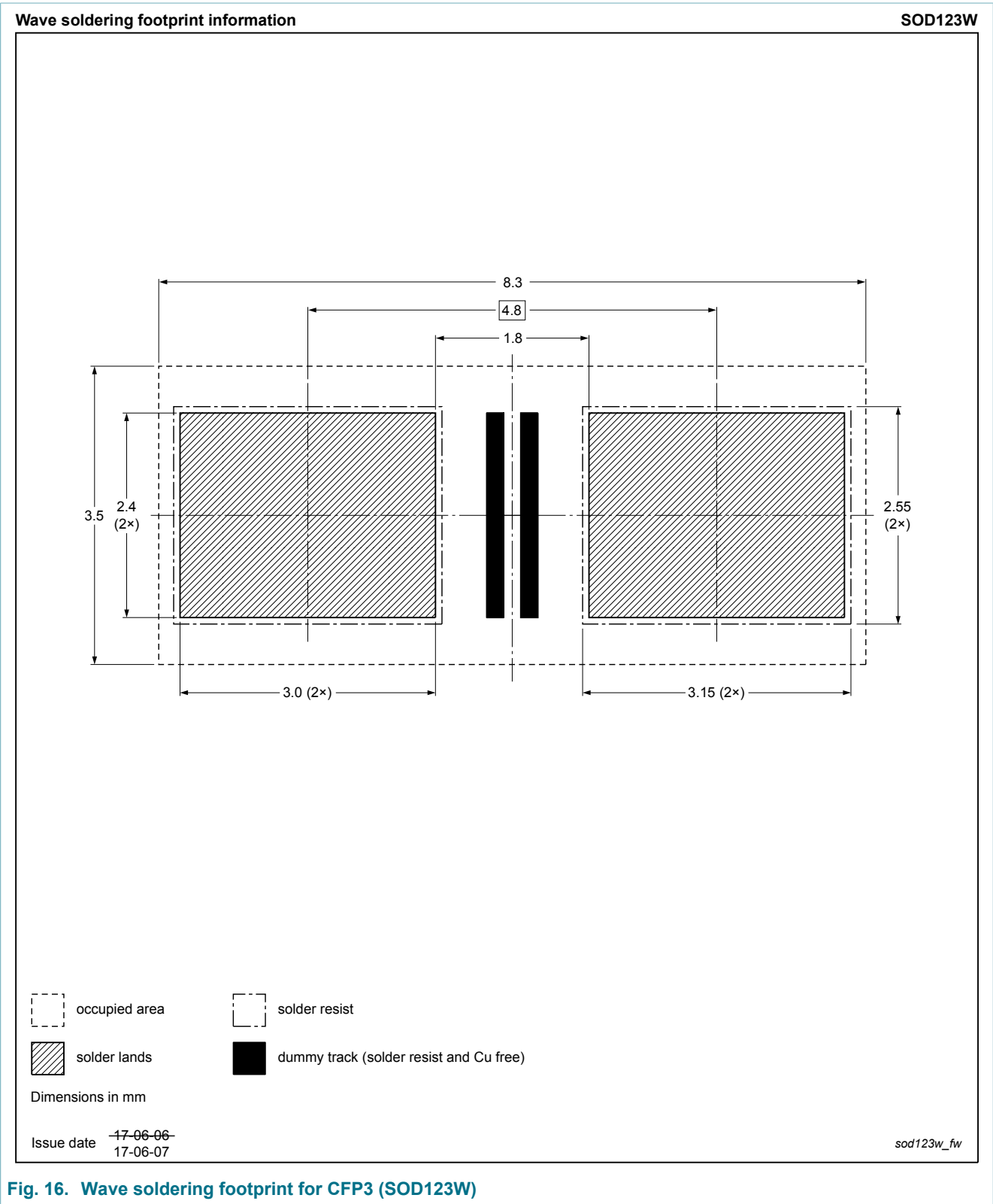


Fig. 16. Wave soldering footprint for CFP3 (SOD123W)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG3020ER v.2	20171110	Product data sheet	-	PMEG3020ER_1
Modifications:	<ul style="list-style-type: none"><li>Features and benefits: Capable for reflow and wave soldering added</li><li>Soldering: Wave soldering footprint added</li></ul>			
PMEG3020ER_1	20081229	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.

- [1] Please consult the most recently issued document before initiating or completing a design.
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