



# PMEG10020AELR-Q

100 V, 2 A low leakage current Schottky barrier rectifier

4 May 2021

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:  $V_R \leq 100$  V
- Low forward voltage:  $V_F = 710$  mV
- High power capability due to clip-bonding technology
- Extremely low leakage current
- High temperature  $T_j \leq 175$  °C
- Small and flat lead SMD plastic package
- Qualified according to AEC-Q101 and recommended for use in automotive applications
- 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

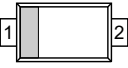

## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; $f = 20$ kHz; square wave; $T_{sp} \leq 160$ °C	-	-	2	A
$V_R$	reverse voltage	$T_j = 25$ °C	-	-	100	V
$V_F$	forward voltage	$I_F = 2$ 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	-	70	300	nA

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode[1]	 CFP3 (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
PMEG10020AELR-Q	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-Q	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	$T_J = 25\text{ }^{\circ}\text{C}$		-	100	V
$I_F$	forward current	$\delta = 1$ ; $T_{sp} = 155\text{ }^{\circ}\text{C}$		-	2.83	A
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; $f = 20\text{ kHz}$ ; square wave; $T_{amb} \leq 90\text{ }^{\circ}\text{C}$	[1]	-	2	A
		$\delta = 0.5$ ; $f = 20\text{ kHz}$ ; square wave; $T_{sp} \leq 160\text{ }^{\circ}\text{C}$		-	2	A
$I_{FRM}$	repetitive peak forward current	$t_p \leq 1\text{ ms}$ ; $\delta \leq 0.25$		-	30	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 8\text{ ms}$ ; square wave; $T_{J(init)} = 25\text{ }^{\circ}\text{C}$		-	50	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ }^{\circ}\text{C}$	[2]	-	680	mW
			[3]	-	1150	mW
			[1]	-	2140	mW
$T_J$	junction temperature			-	175	$^{\circ}\text{C}$
$T_{amb}$	ambient temperature			-55	175	$^{\circ}\text{C}$
$T_{stg}$	storage temperature			-65	175	$^{\circ}\text{C}$

[1] Device mounted on a ceramic Printed-Circuit Board (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
			[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

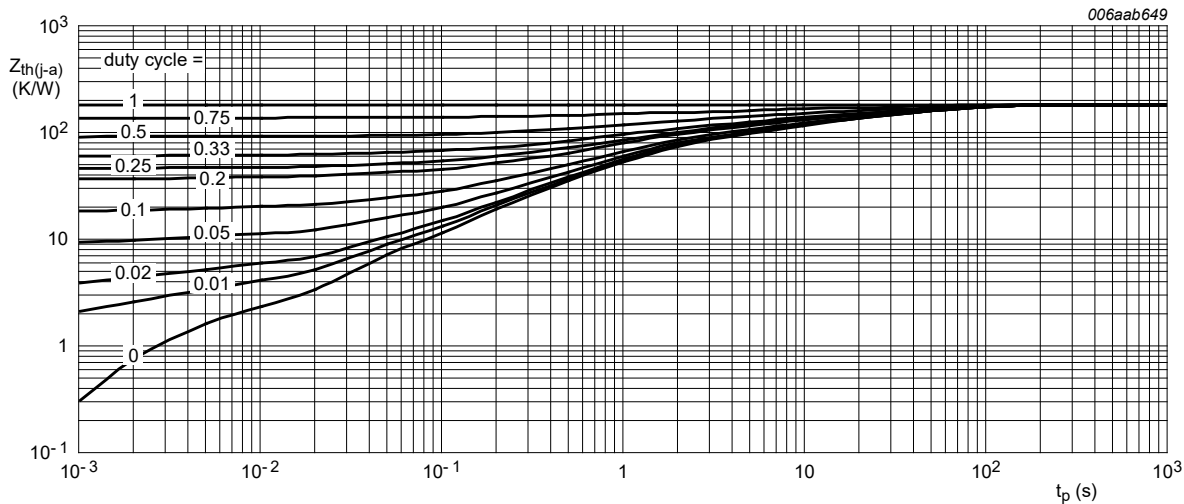
[1] For Schottky barrier diodes thermal runaway has to be considered, as in some applications the reverse power losses  $P_R$  are a significant part of the total power losses.

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

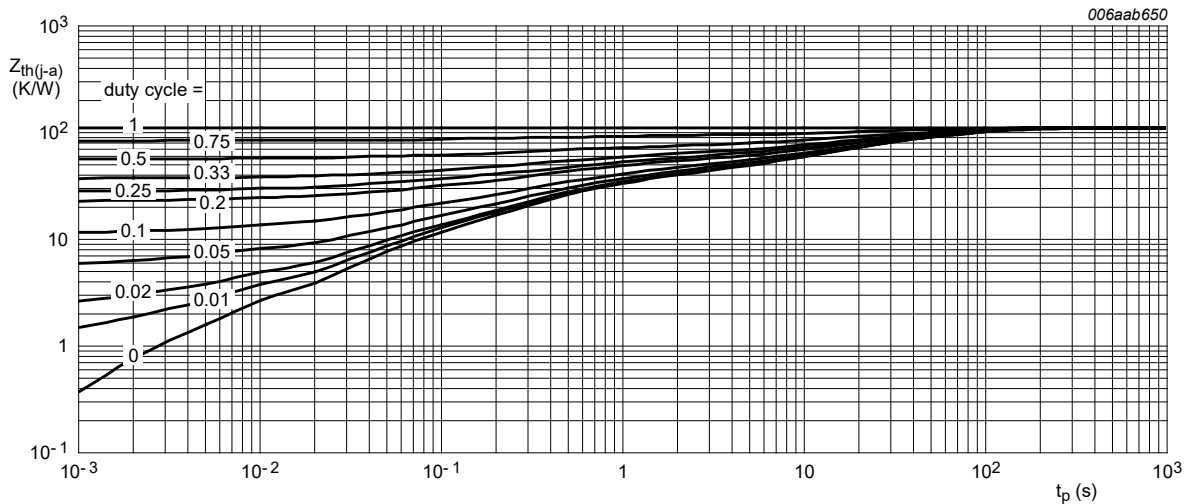
[4] Device mounted on a ceramic PCB,  $\text{Al}_2\text{O}_3$ , standard footprint.

[5] Soldering point of cathode tab.



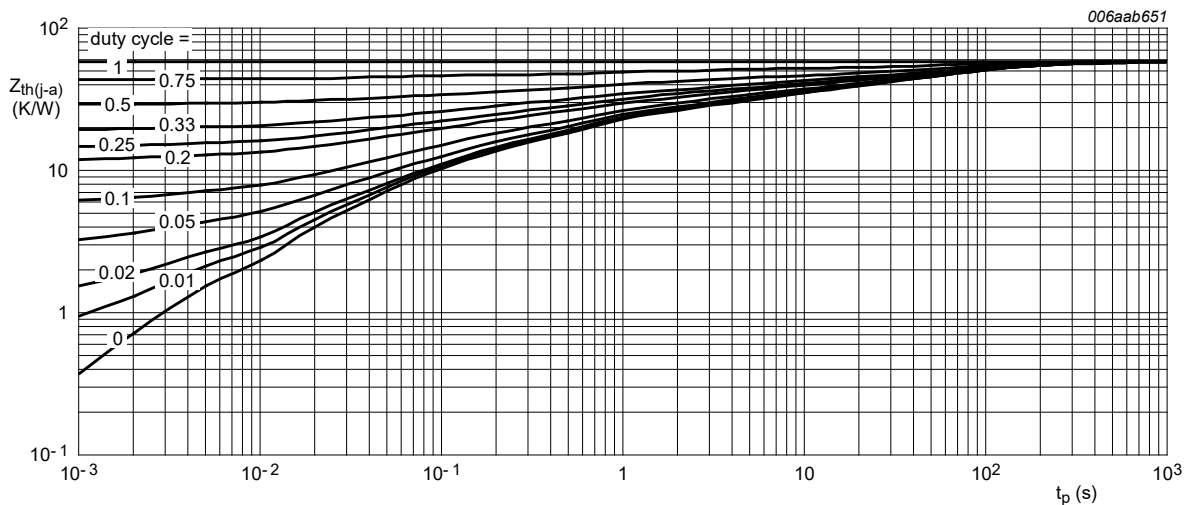
FR4 PCB, standard footprint

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



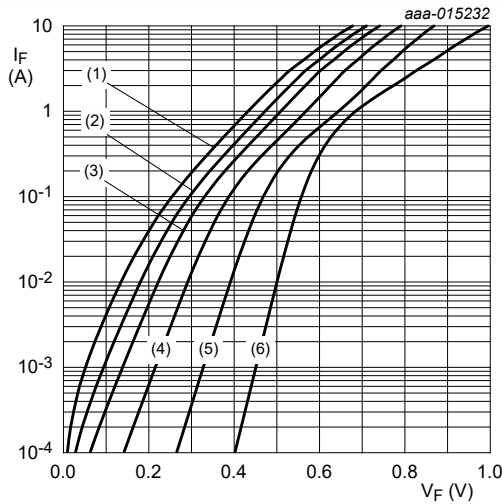
Ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint

Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

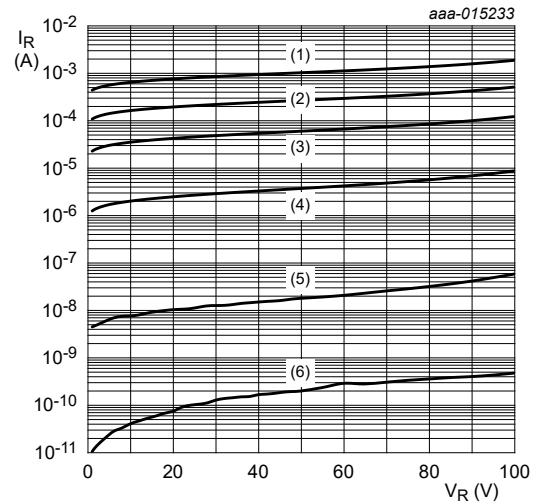
Table 7. Characteristics

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



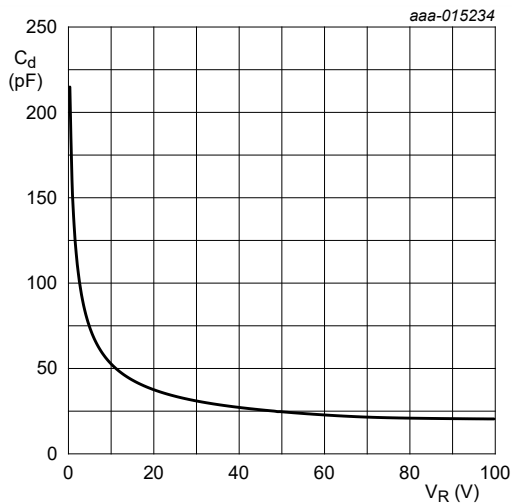
- (1)  $T_j = 175\text{ °C}$
- (2)  $T_j = 150\text{ °C}$
- (3)  $T_j = 125\text{ °C}$
- (4)  $T_j = 85\text{ °C}$
- (5)  $T_j = 25\text{ °C}$
- (6)  $T_j = -40\text{ °C}$

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



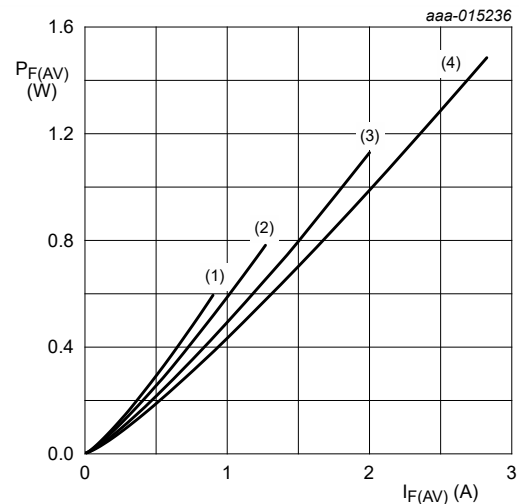
- (1)  $T_j = 175\text{ °C}$
- (2)  $T_j = 150\text{ °C}$
- (3)  $T_j = 125\text{ °C}$
- (4)  $T_j = 85\text{ °C}$
- (5)  $T_j = 25\text{ °C}$
- (6)  $T_j = -40\text{ °C}$

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



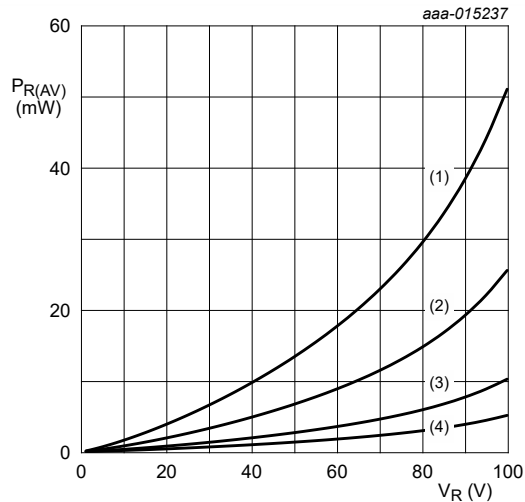
$f = 1\text{ MHz}$ ;  $T_{\text{amb}} = 25\text{ °C}$

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



- $T_j = 175\text{ °C}$
- (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



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

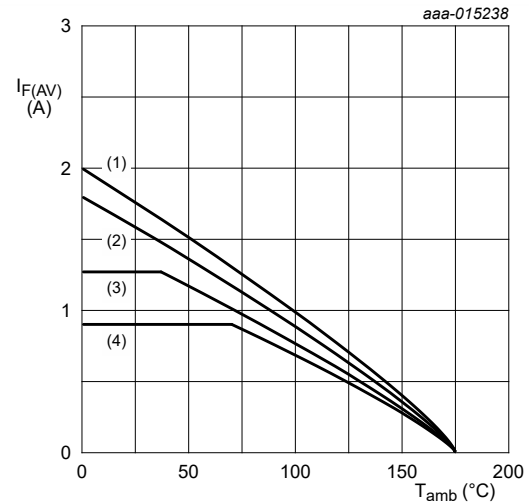
(1)  $\delta = 1$  (DC)

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



FR4 PCB, standard footprint

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

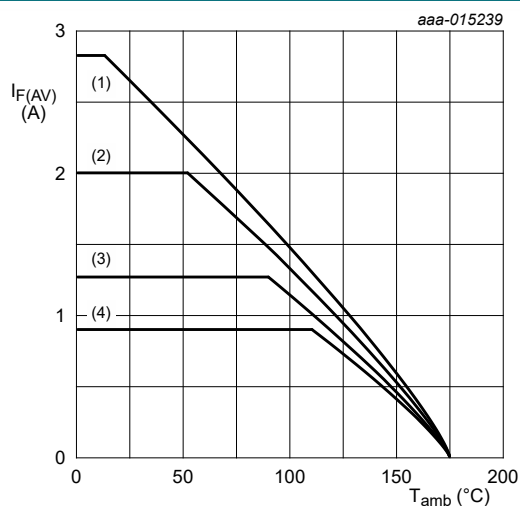
(1)  $\delta = 1$ ; DC

(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  $1\text{ cm}^2$

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

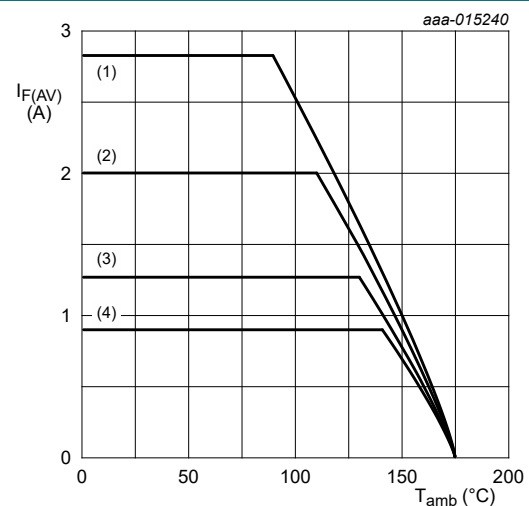
(1)  $\delta = 1$ ; DC

(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

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

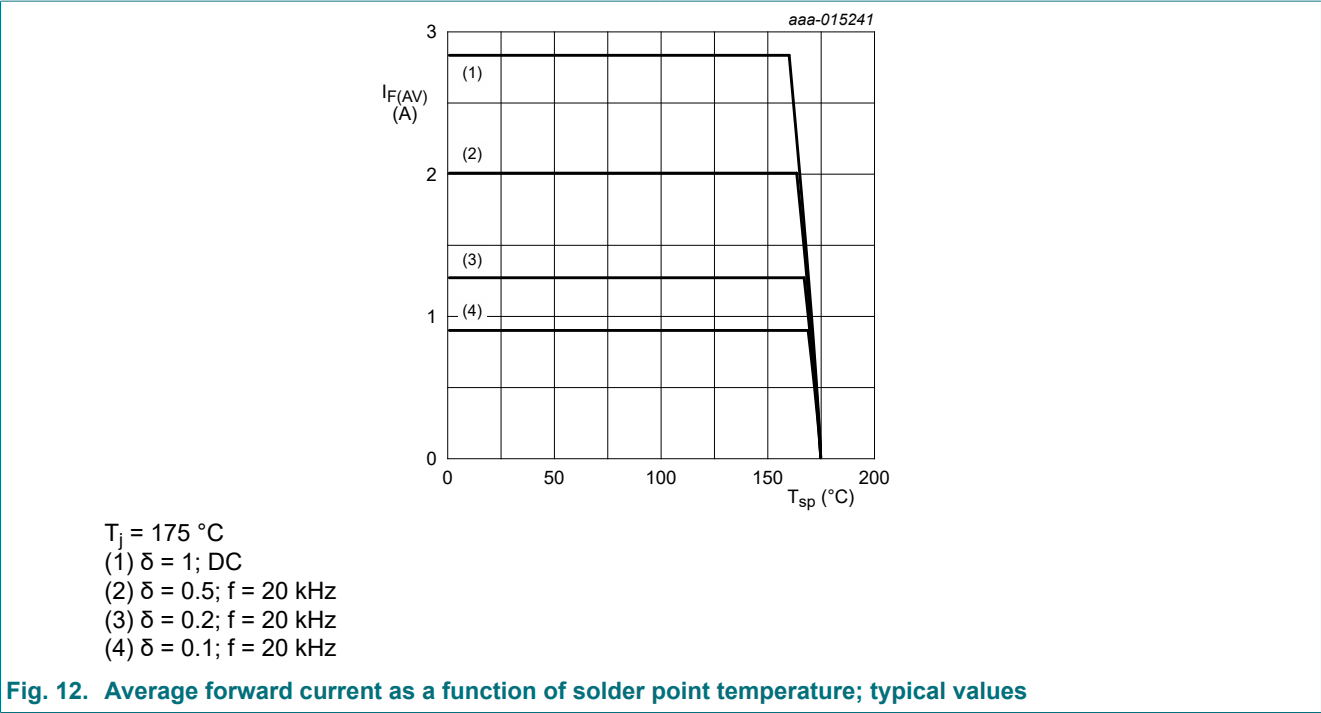
(1)  $\delta = 1$ ; DC

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

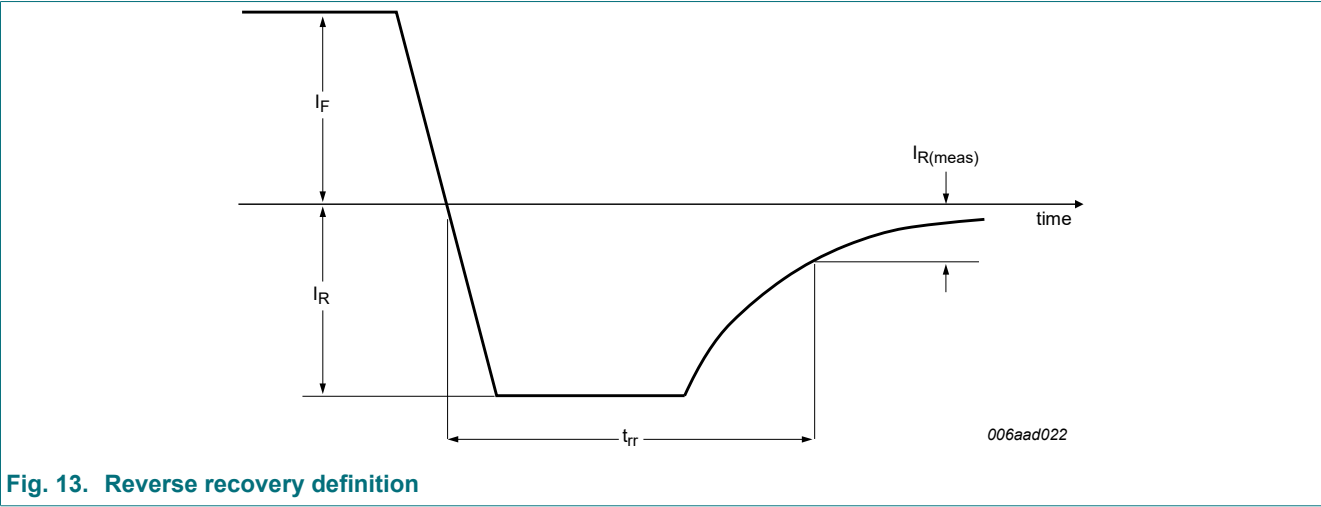
(3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$

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

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



11. Test information





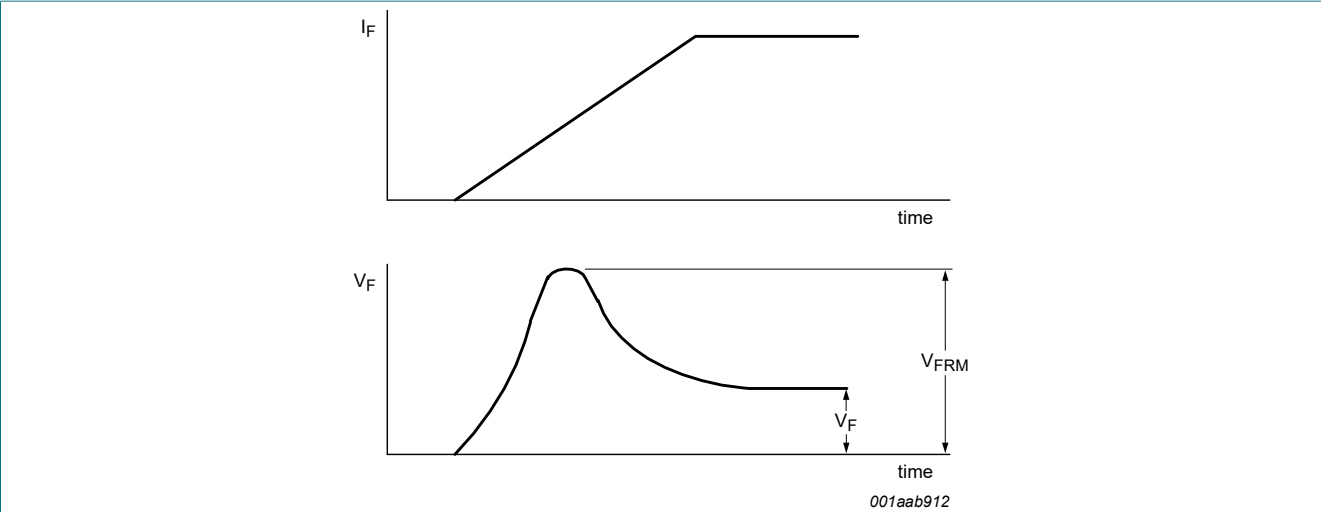


Fig. 14. Forward recovery definition

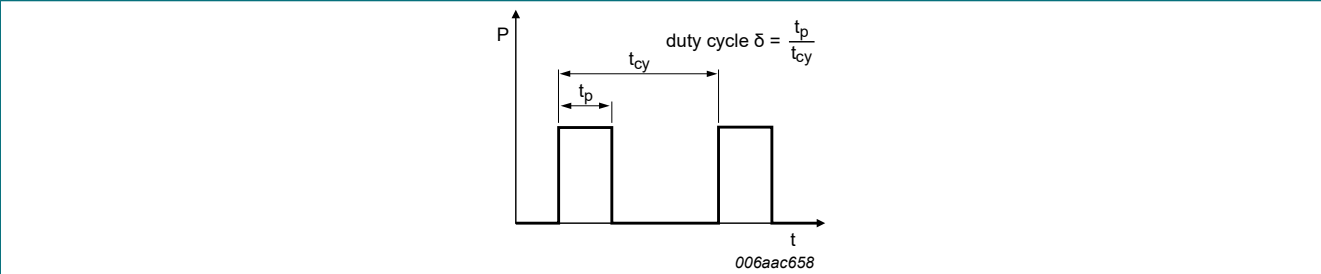


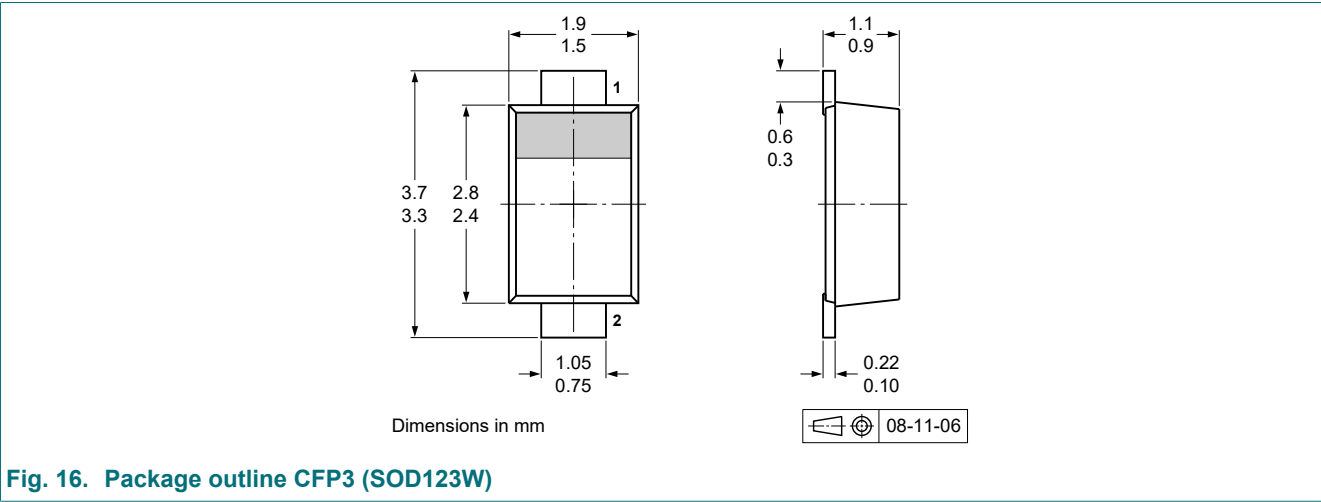
Fig. 15. Duty cycle definition

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



13. Soldering

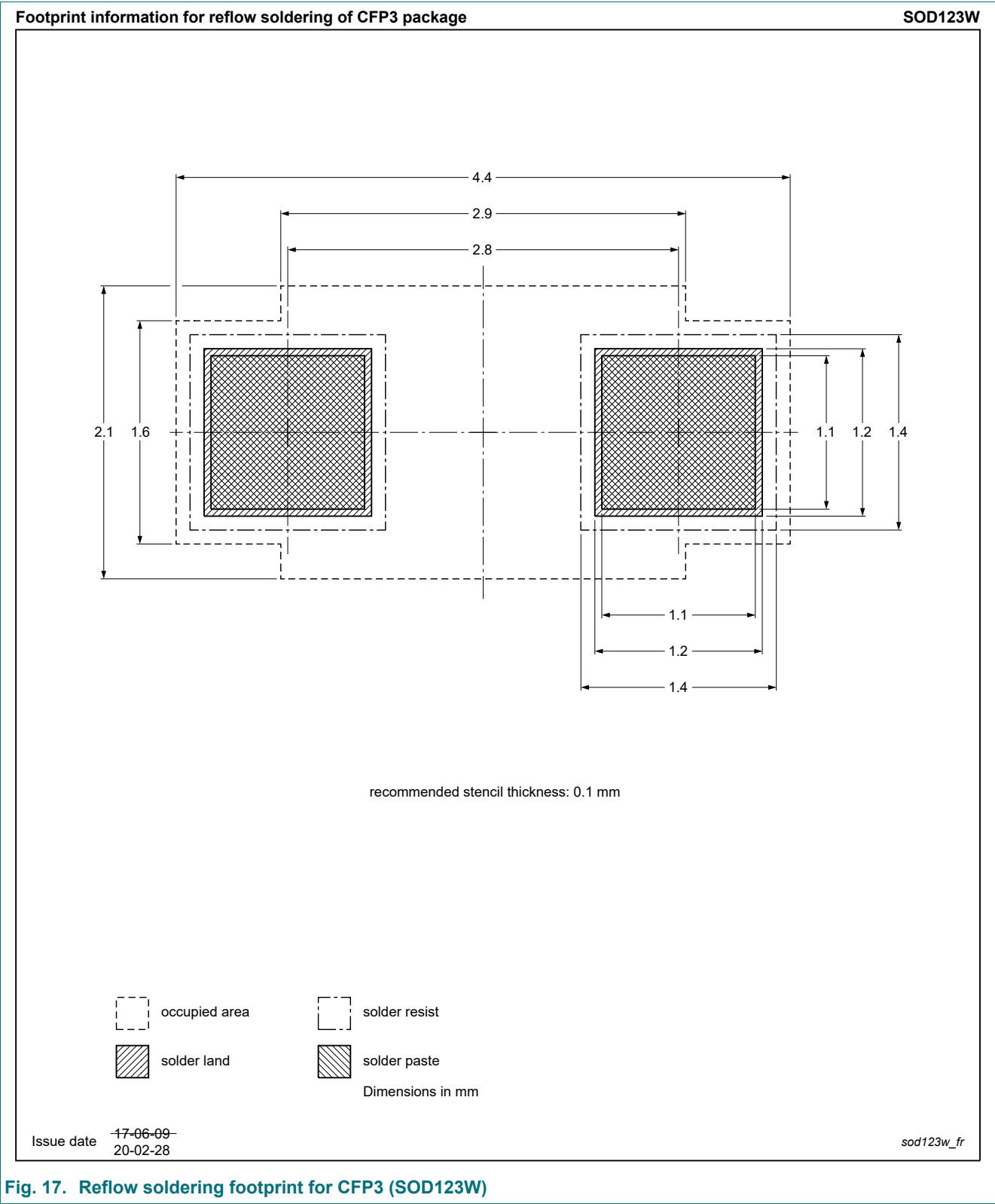


Fig. 17. Reflow soldering footprint for CFP3 (SOD123W)

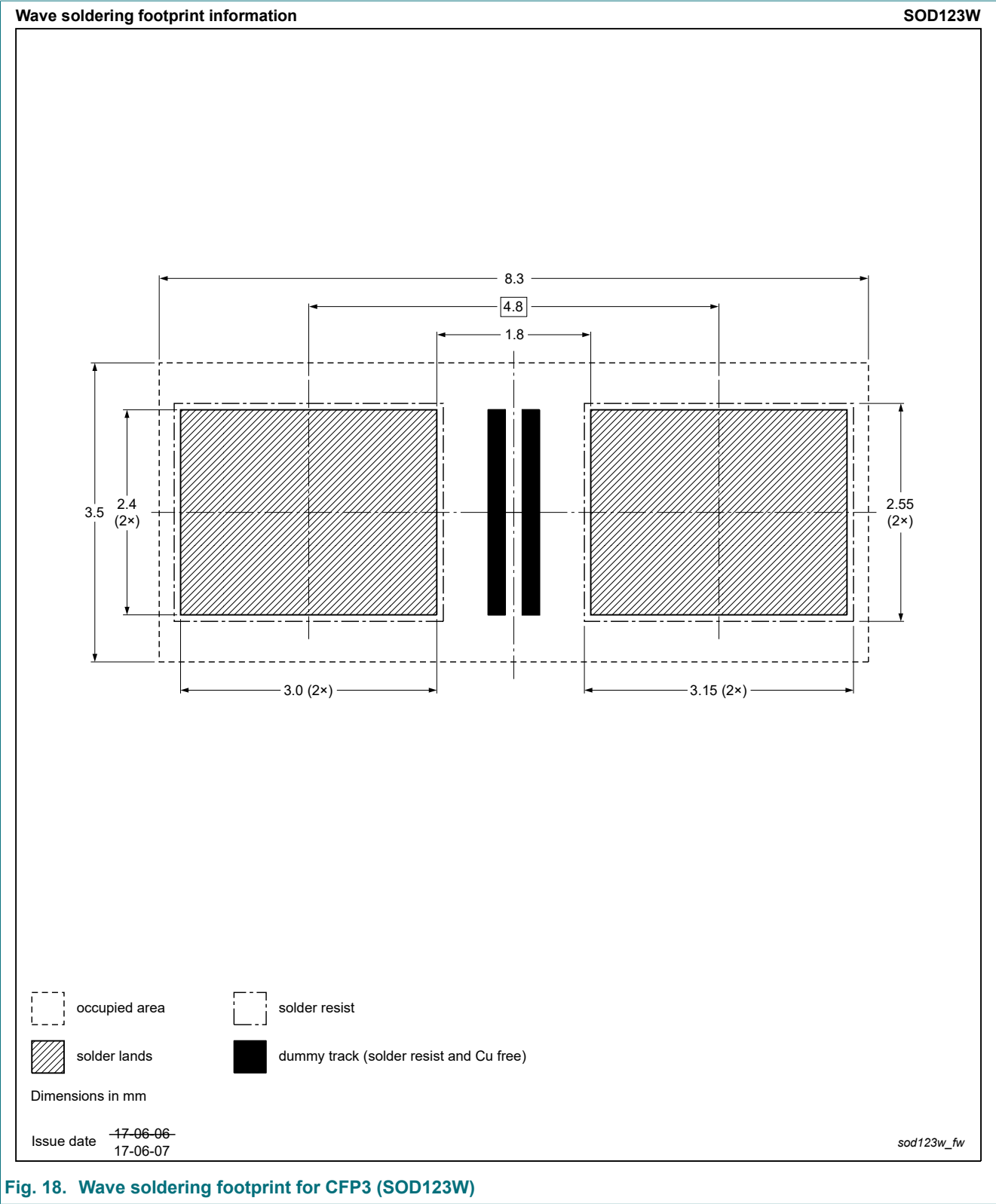


Fig. 18. Wave soldering footprint for CFP3 (SOD123W)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG10020AELR-Q v.1	20210504	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.
- [2] The term 'short data sheet' is explained in section "Definitions".
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