



# PMEG10020ELXE-Q

100 V, 2 A low leakage current Schottky barrier rectifier

5 January 2024

Product data sheet

## 1. General description

Planar Schottky barrier rectifier encapsulated in a CFP3-HP (SOD123HP) power flat lead Surface-Mounted Device (SMD) plastic package.

## 2. Features and benefits

- Low forward voltage
- Extremely low leakage current
- High surge current robustness
- High power capability due to clip bond package
- Power flat lead plastic package with exposed heatsink for optimal thermal connection
- Qualified according to AEC-Q101 and recommended for use in automotive applications

## 3. Applications

- High efficiency DC-to-DC conversion
- Switch Mode Power Supply (SMPS)
- Freewheeling application
- Reverse polarity protection
- OR-ing

## 4. Quick reference data

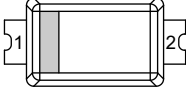

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; $f = 20$ kHz; square wave; $T_{sp} \leq 165$ °C	-	-	2	A
$V_R$	reverse voltage	$T_j = 25$ °C	-	-	100	V
$V_F$	forward voltage	$I_F = 2$ A; pulsed; $T_j = 25$ °C	[1]	780	840	mV
$I_R$	reverse current	$V_R = 100$ V; pulsed; $T_j = 25$ °C	[1]	30	150	nA
		$V_R = 100$ V; pulsed; $T_j = 125$ °C	[1]	60	500	$\mu$ A

[1] Very short pulse, in order to maintain a stable junction temperature.

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode[1]	 CFP3-HP (SOD123HP)	 sym001
2	A	anode		

[1] The marking bar indicates the cathode.

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
<a href="#">PMEG10020ELXE-Q</a>	CFP3-HP	Power plastic surface mounted package; 2 terminals; 2.80 mm × 1.80 mm × 0.90 mm body	<a href="#">SOD123HP</a>

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PMEG10020ELXE-Q	AN

## 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	$\delta = 1; T_{sp} \leq 162\text{ °C}$		-	2.8	A
$I_{F(AV)}$	average forward current	$\delta = 0.5; f = 20\text{ kHz};$ square wave; $T_{sp} \leq 165\text{ °C}$		-	2	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 8.3\text{ ms};$ half sine wave; $T_{j(init)} = 25\text{ °C}$		-	50	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1]	-	0.75	W
			[2]	-	1.3	W
$T_j$	junction temperature			-	175	°C
$T_{amb}$	ambient temperature			-55	175	°C
$T_{stg}$	storage temperature			-65	175	°C

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

[2] 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]	-	-	200	K/W
			[3] [2]	-	-	115	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[4]	-	-	6	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 cm<sup>2</sup>.
- [4] Soldering point of cathode tab.

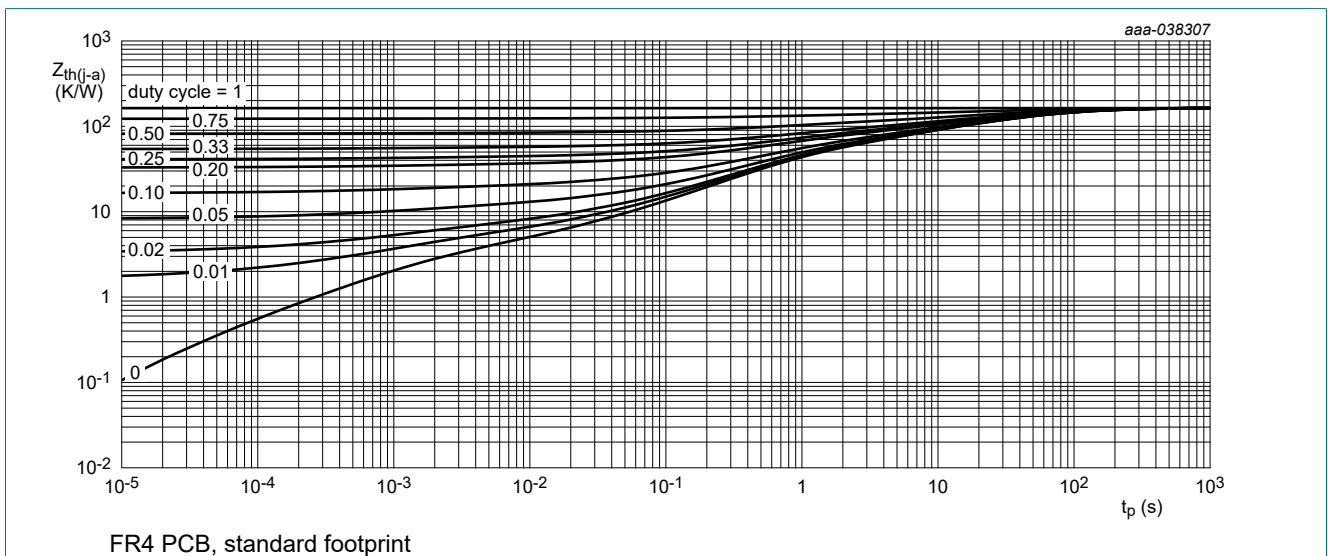


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

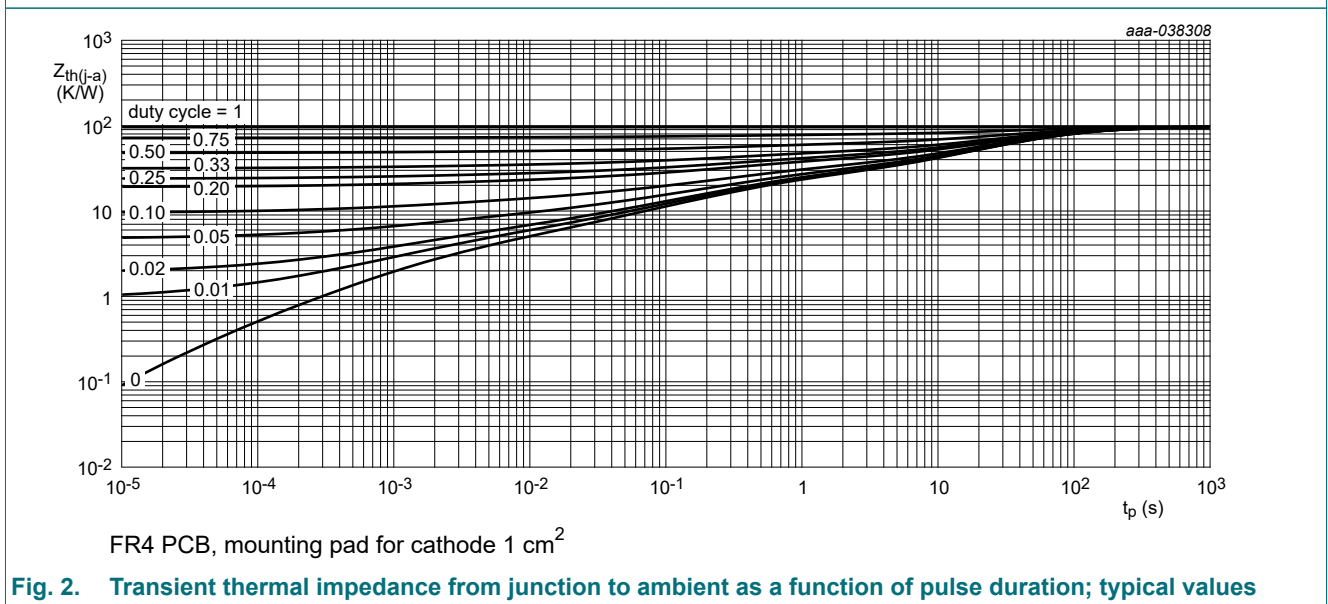


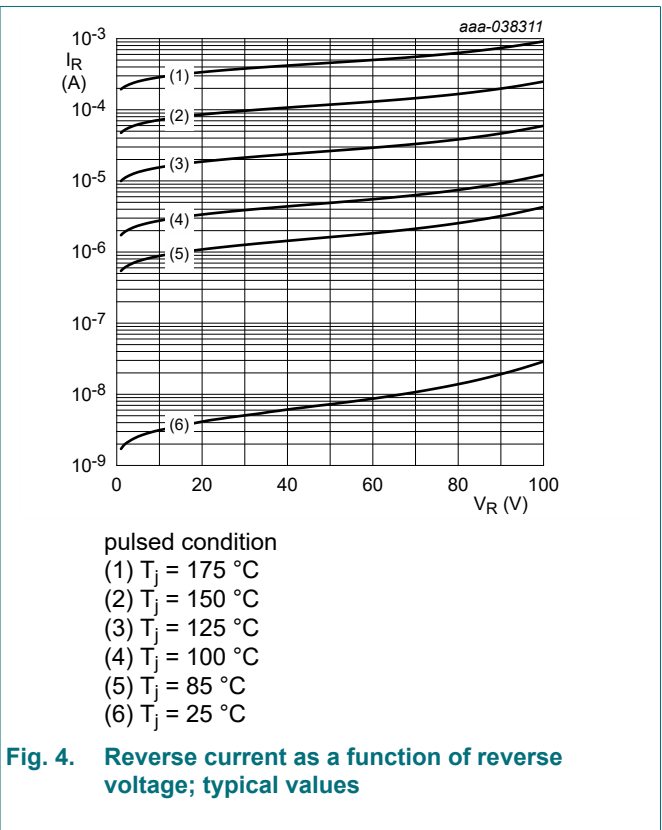
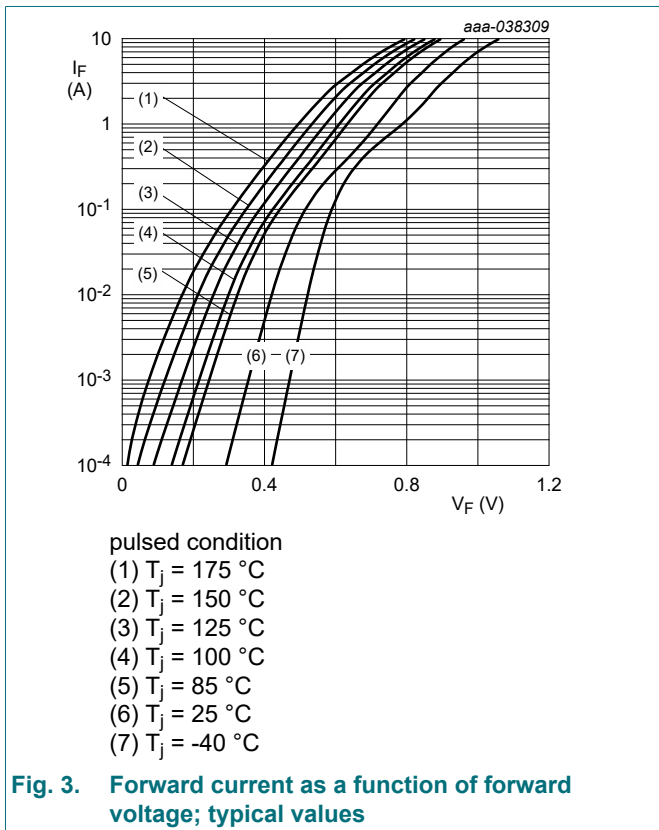
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

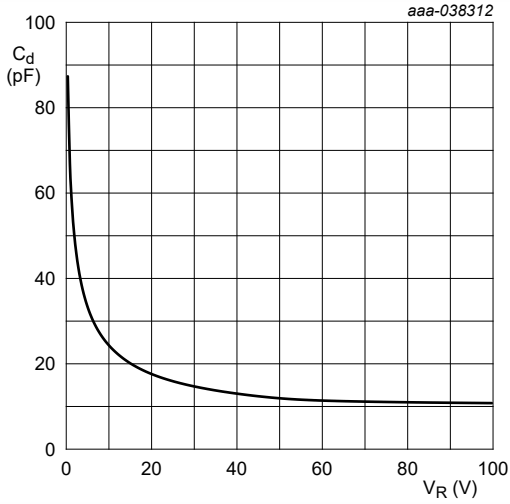
## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{(BR)R}$	reverse breakdown voltage	$I_R = 1 \text{ mA}$ ; pulsed; $T_j = 25 \text{ }^\circ\text{C}$	[1]	100	-	V	
$V_F$	forward voltage	$I_F = 1 \text{ A}$ ; pulsed; $T_j = 25 \text{ }^\circ\text{C}$	[1]	-	720	780	mV
		$I_F = 2 \text{ A}$ ; pulsed; $T_j = 25 \text{ }^\circ\text{C}$	[1]	-	780	840	mV
		$I_F = 2 \text{ A}$ ; pulsed; $T_j = -40 \text{ }^\circ\text{C}$	[1]	-	865	935	mV
		$I_F = 2 \text{ A}$ ; pulsed; $T_j = 125 \text{ }^\circ\text{C}$	[1]	-	635	740	mV
$I_R$	reverse current	$V_R = 100 \text{ V}$ ; pulsed; $T_j = 25 \text{ }^\circ\text{C}$	[1]	-	30	150	nA
		$V_R = 100 \text{ V}$ ; pulsed; $T_j = 125 \text{ }^\circ\text{C}$	[1]	-	60	500	$\mu\text{A}$
$C_d$	diode capacitance	$V_R = 1 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	55	-	pF
		$V_R = 10 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	25	-	pF
$t_{rr}$	reverse recovery time ; step recovery	$I_F = 0.5 \text{ A}$ ; $I_R = 0.5 \text{ A}$ ; $I_{R(\text{meas})} = 0.1 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	4	-	ns
	reverse recovery time ; ramp recovery	$dI_F/dt = 200 \text{ A}/\mu\text{s}$ ; $I_F = 6 \text{ A}$ ; $V_R = 26 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	14	-	ns
$I_{RM}$	peak reverse recovery current			-	1.6	A	
$Q_{rr}$	reverse recovery charge			-	13	nC	
$V_{FRM}$	peak forward recovery voltage	$I_F = 0.5 \text{ A}$ ; $dI_F/dt = 20 \text{ A}/\mu\text{s}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	680	mV	

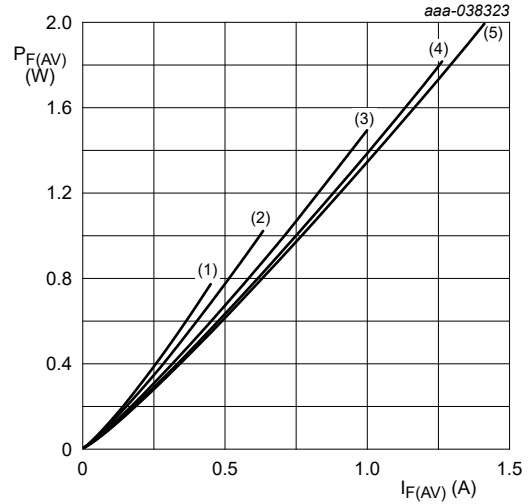
[1] Very short pulse, in order to maintain a stable junction temperature.





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

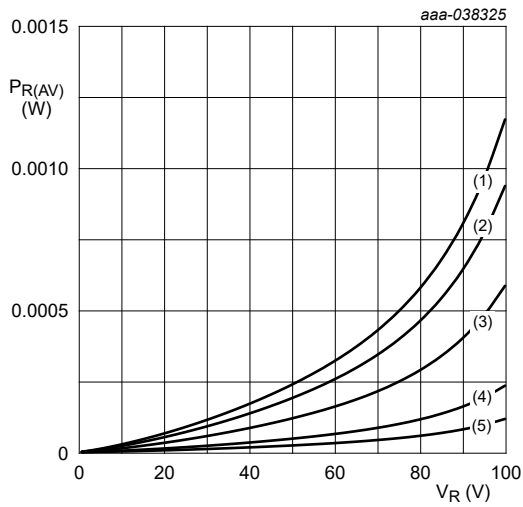
**Fig. 5. Diode capacitance as a function of reverse voltage; typical values**



$T_j = 100 \text{ }^\circ\text{C}$

- (1)  $\delta = 0.1$
- (2)  $\delta = 0.2$
- (3)  $\delta = 0.5$
- (4)  $\delta = 0.8$
- (5)  $\delta = 1$

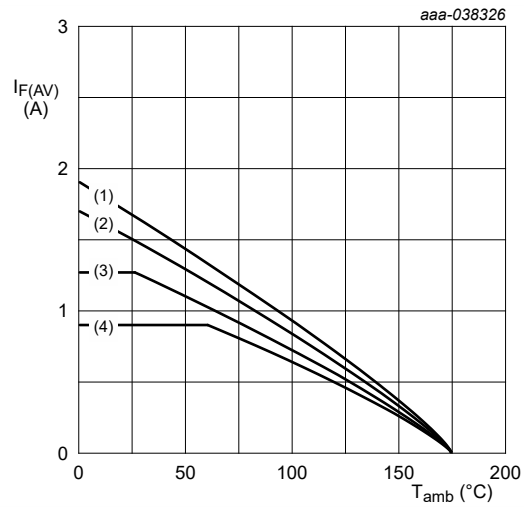
**Fig. 6. Average forward power dissipation as a function of average forward current; typical values**



$T_j = 100 \text{ }^\circ\text{C}$

- (1)  $\delta = 1$
- (2)  $\delta = 0.8$
- (3)  $\delta = 0.5$
- (4)  $\delta = 0.2$
- (5)  $\delta = 0.1$

**Fig. 7. Average reverse power dissipation as a function of reverse voltage; typical values**

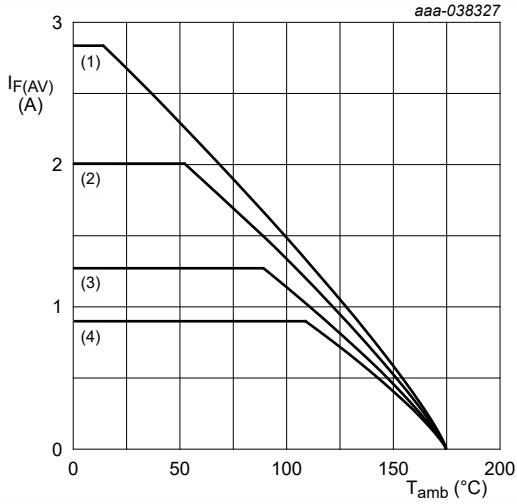


FR4 PCB, standard footprint

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

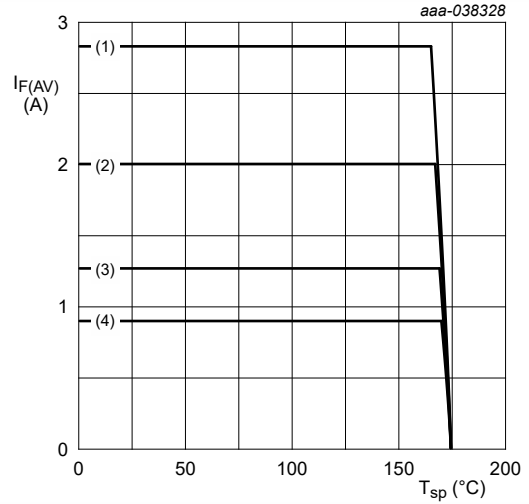
- (1)  $\delta = 1$
- (2)  $\delta = 0.5; f = 20 \text{ kHz}$
- (3)  $\delta = 0.2; f = 20 \text{ kHz}$
- (4)  $\delta = 0.1; f = 20 \text{ kHz}$

**Fig. 8. Average forward current as a function of ambient temperature; typical values**



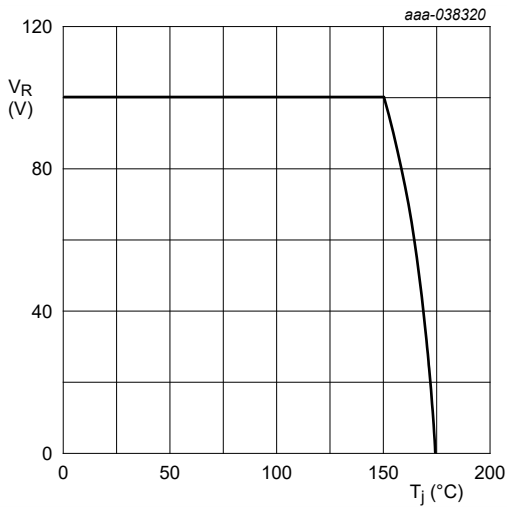
FR4 PCB, mounting pad for cathode 1 cm<sup>2</sup>  
 $T_j = 175$  °C  
 (1)  $\delta = 1$   
 (2)  $\delta = 0.5$ ;  $f = 20$  kHz  
 (3)  $\delta = 0.2$ ;  $f = 20$  kHz  
 (4)  $\delta = 0.1$ ;  $f = 20$  kHz

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



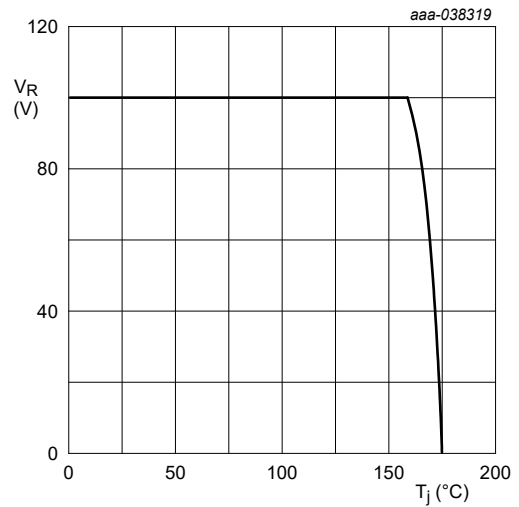
$T_j = 175$  °C  
 (1)  $\delta = 1$   
 (2)  $\delta = 0.5$ ;  $f = 20$  kHz  
 (3)  $\delta = 0.2$ ;  $f = 20$  kHz  
 (4)  $\delta = 0.1$ ;  $f = 20$  kHz

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



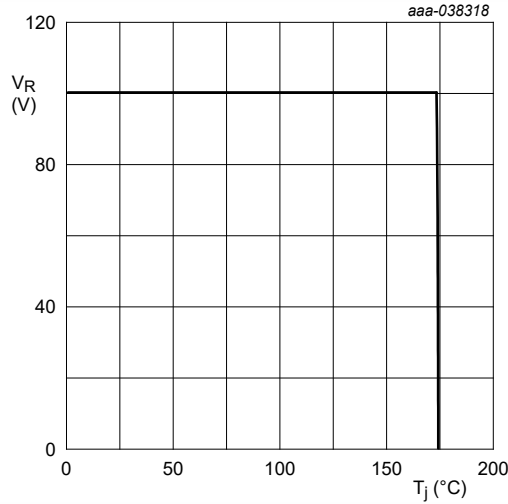
FR4 PCB, standard footprint  
 $R_{th} = 200$  K/W

Fig. 11. Derated maximum reverse voltage as a function of junction temperature; typical values



FR4 PCB, mounting pad for cathode 1 cm<sup>2</sup>  
 $R_{th} = 115$  K/W

Fig. 12. Derated maximum reverse voltage as a function of junction temperature; typical values



Soldering point of cathode tab  
 $R_{th} = 6 \text{ K/W}$

Fig. 13. Derated maximum reverse voltage as a function of junction temperature; typical values

### 11. Test information

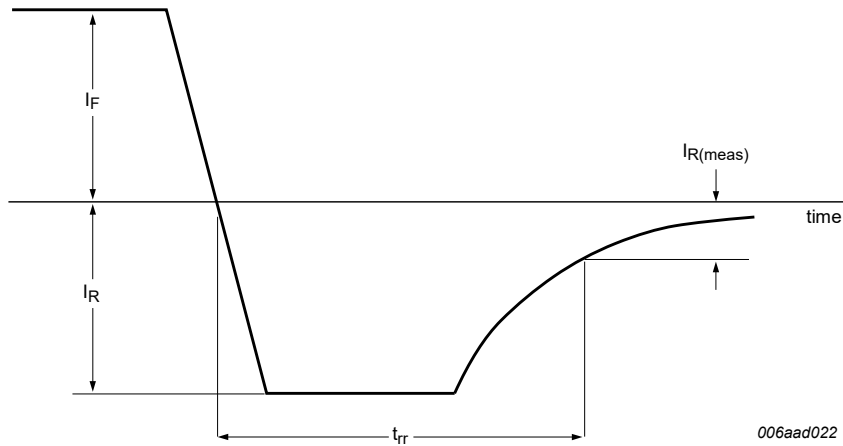


Fig. 14. Reverse recovery definition; step recovery

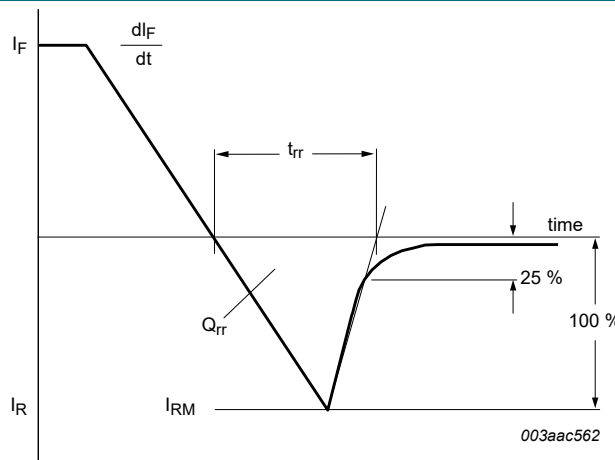


Fig. 15. Reverse recovery definition; ramp recovery

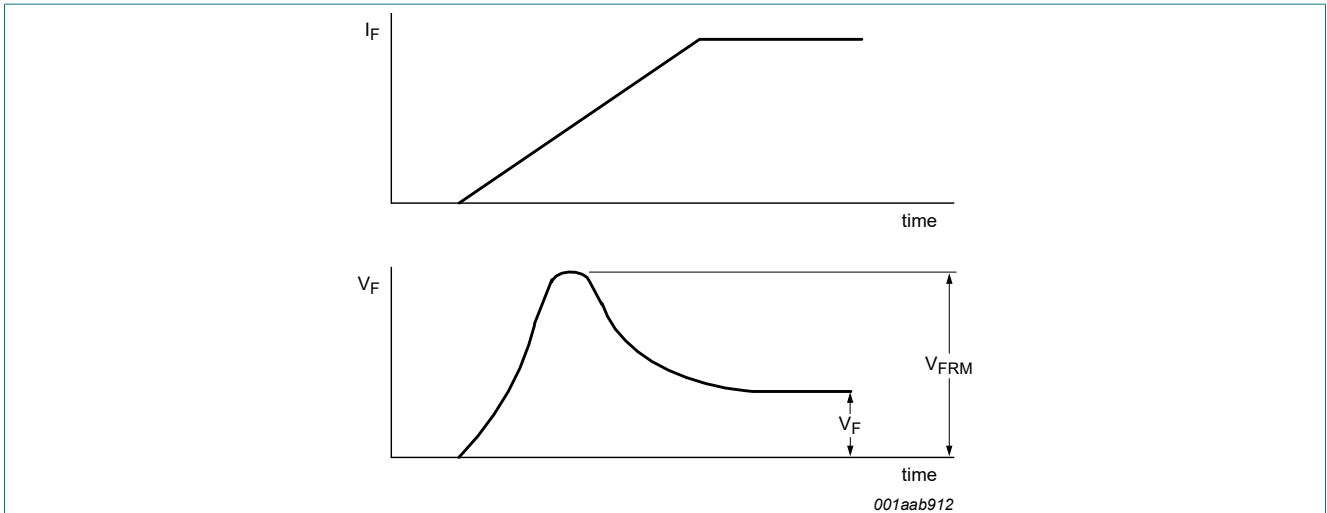


Fig. 16. Forward recovery definition

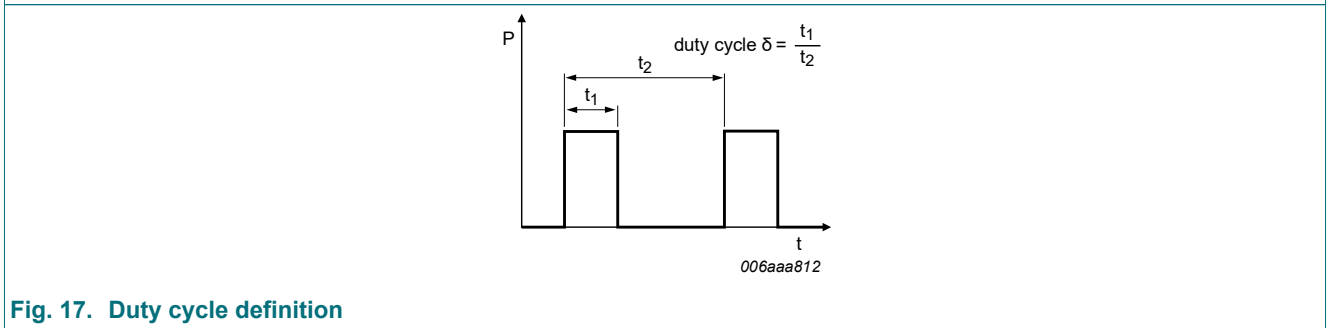


Fig. 17. Duty cycle definition

The current ratings for the typical waveforms are calculated according to the equations:

$$I_{F(AV)} = I_M \times \delta \text{ with } I_M \text{ defined as peak current}$$

$$I_{RMS} = I_{F(AV)} \text{ at DC, and } I_{RMS} = I_M \times \sqrt{\delta}$$

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

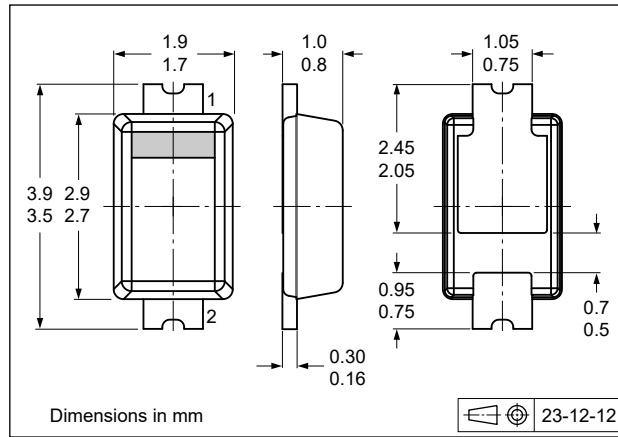


Fig. 18. Package outline CFP3-HP (SOD123HP)

### 13. Soldering

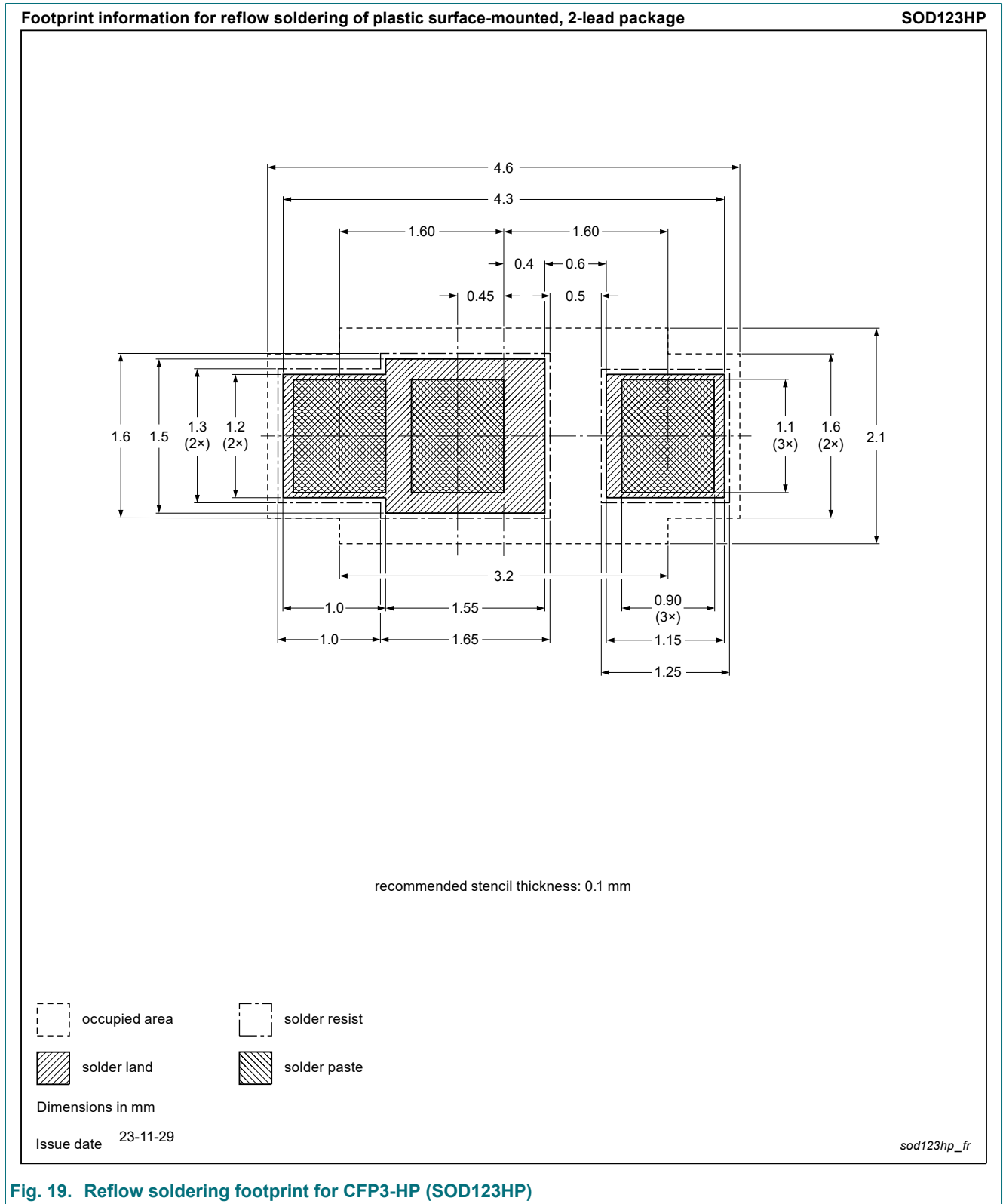


Fig. 19. Reflow soldering footprint for CFP3-HP (SOD123HP)

### 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG10020ELXE-Q v.1	20240105	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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