



PMEG4020EXE-Q

40 V, 2 A 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
- 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

- 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

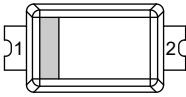
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$I_{F(AV)}$	average forward current	$\delta = 0.5$; $f = 20$ kHz; square wave; $T_{sp} \leq 168$ °C		-	-	2	A
V_R	reverse voltage	$T_j = 25$ °C		-	-	40	V
V_F	forward voltage	$I_F = 2$ A; pulsed; $T_j = 25$ °C	[1]	-	500	570	mV
I_R	reverse current	$V_R = 40$ V; pulsed; $T_j = 25$ °C	[1]	-	10	50	μ A
		$V_R = 40$ V; pulsed; $T_j = 125$ °C	[1]	-	6	25	mA

[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
PMEG4020EXE-Q	CFP3-HP	Power plastic surface mounted package; 2 terminals; 2.80 mm × 1.80 mm × 0.90 mm body	SOD123HP

7. Marking

Table 4. Marking codes

Type number	Marking code
PMEG4020EXE-Q	AE

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	$T_j = 25\text{ }^{\circ}\text{C}$		-	40	V
I_F	forward current	$\delta = 1; T_{sp} \leq 166\text{ }^{\circ}\text{C}$		-	2.8	A
$I_{F(AV)}$	average forward current	$\delta = 0.5; f = 20\text{ kHz}; \text{square wave}; T_{sp} \leq 168\text{ }^{\circ}\text{C}$		-	2	A
I_{FSM}	non-repetitive peak forward current	$t_p = 8.3\text{ ms}; \text{half sine wave}; T_{j(init)} = 25\text{ }^{\circ}\text{C}$		-	50	A
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ }^{\circ}\text{C}$	[1]	-	0.75	W
			[2]	-	1.3	W
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 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 cm².

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 cm².
- [4] Soldering point of cathode tab.

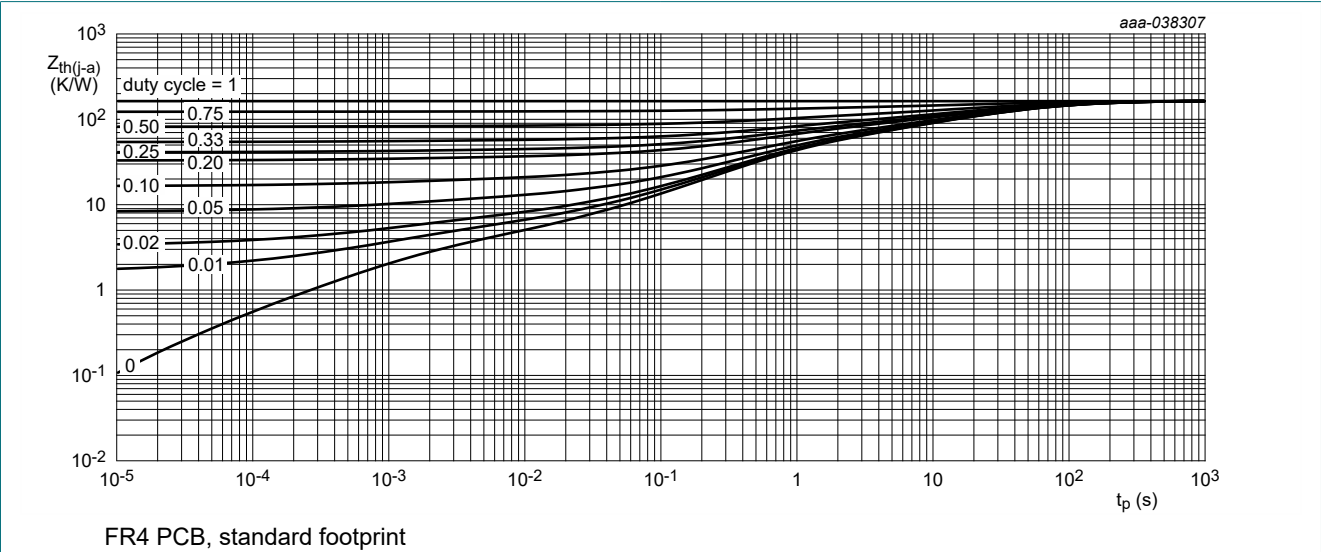


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

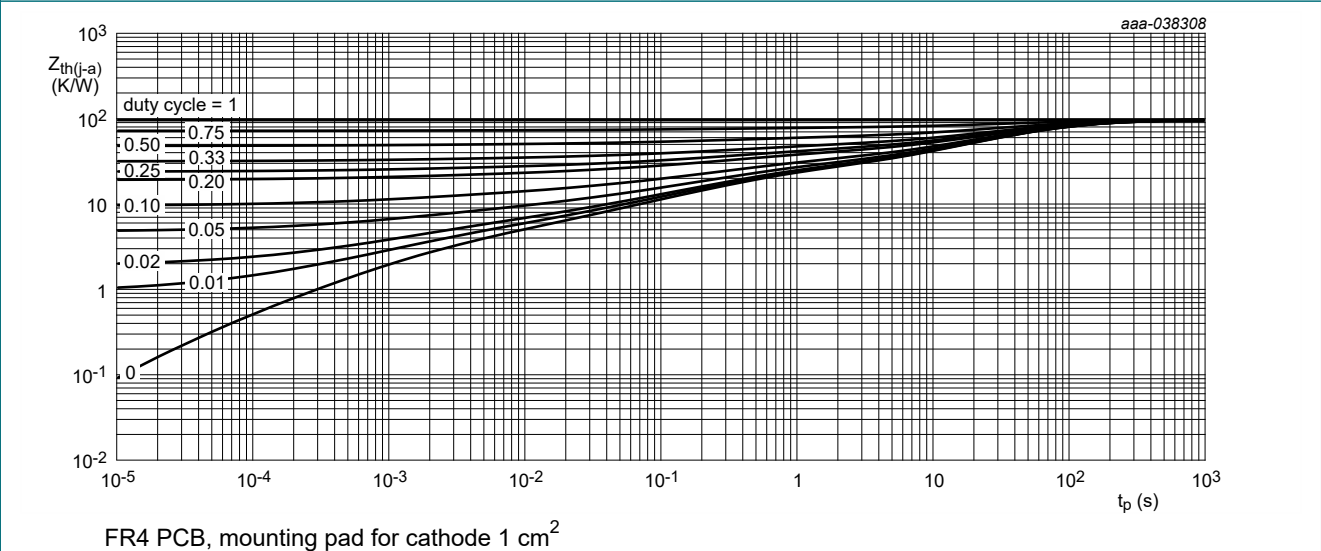


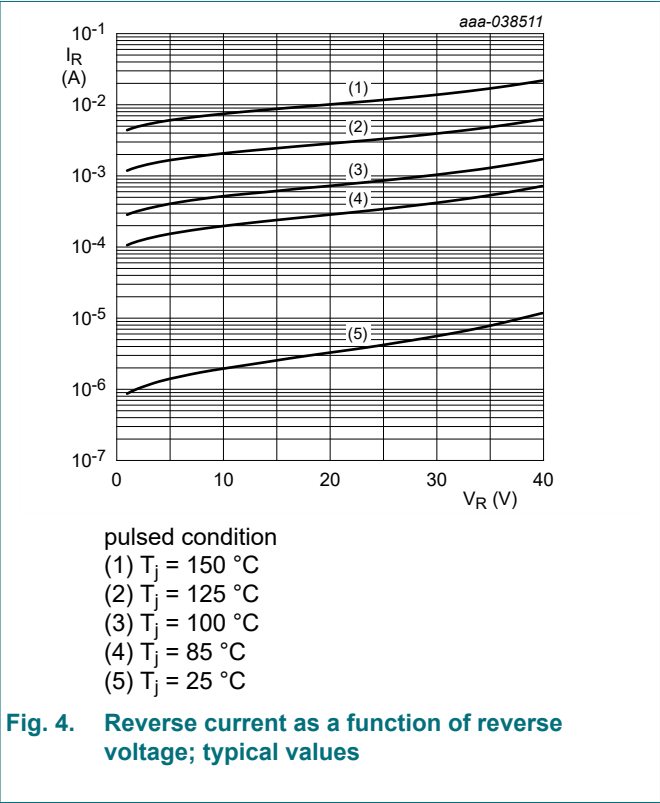
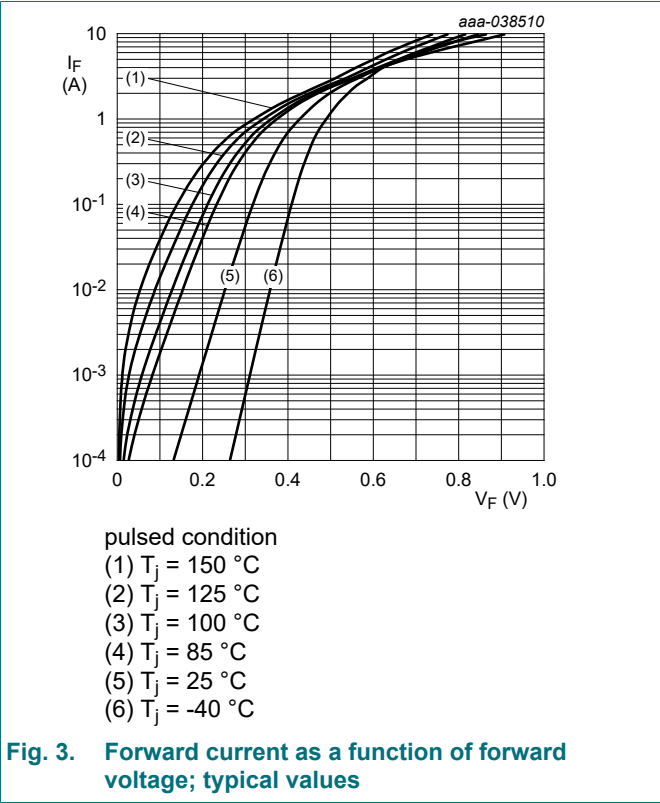
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)R}$	reverse breakdown voltage	$I_R = 3\text{ mA}$; pulsed; $T_j = 25\text{ }^{\circ}\text{C}$	[1]	40	-	-	V
V_F	forward voltage	$I_F = 1\text{ A}$; pulsed; $T_j = 25\text{ }^{\circ}\text{C}$	[1]	-	430	490	mV
		$I_F = 2\text{ A}$; pulsed; $T_j = 25\text{ }^{\circ}\text{C}$	[1]	-	500	570	mV
		$I_F = 2\text{ A}$; pulsed; $T_j = -40\text{ }^{\circ}\text{C}$	[1]	-	540	610	mV
		$I_F = 2\text{ A}$; pulsed; $T_j = 125\text{ }^{\circ}\text{C}$	[1]	-	450	540	mV
I_R	reverse current	$V_R = 40\text{ V}$; pulsed; $T_j = 25\text{ }^{\circ}\text{C}$	[1]	-	10	50	μA
		$V_R = 40\text{ V}$; pulsed; $T_j = 125\text{ }^{\circ}\text{C}$	[1]	-	6	25	mA
C_d	diode capacitance	$V_R = 1\text{ V}$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^{\circ}\text{C}$		-	115	-	pF
		$V_R = 10\text{ V}$; $f = 1\text{ MHz}$; $T_j = 25\text{ }^{\circ}\text{C}$		-	40	-	pF
t_{rr}	reverse recovery time ; step recovery	$I_F = 0.5\text{ A}$; $I_R = 0.5\text{ A}$; $I_{R(meas)} = 0.1\text{ A}$; $T_j = 25\text{ }^{\circ}\text{C}$		-	4	-	ns
	reverse recovery time ; ramp recovery	$dI_F/dt = 200\text{ A}/\mu\text{s}$; $I_F = 6\text{ A}$; $V_R = 26\text{ V}$; $T_j = 25\text{ }^{\circ}\text{C}$		-	6	-	ns
I_{RM}	peak reverse recovery current			-	0.6	-	A
Q_{rr}	reverse recovery charge			-	2.5	-	nC
V_{FRM}	peak forward recovery voltage	$I_F = 0.5\text{ A}$; $dI_F/dt = 20\text{ A}/\mu\text{s}$; $T_j = 25\text{ }^{\circ}\text{C}$		-	390	-	mV

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



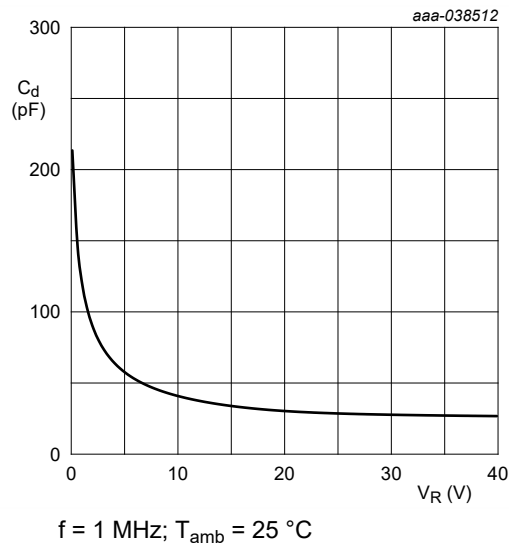


Fig. 5. Diode capacitance as a function of reverse voltage; typical values

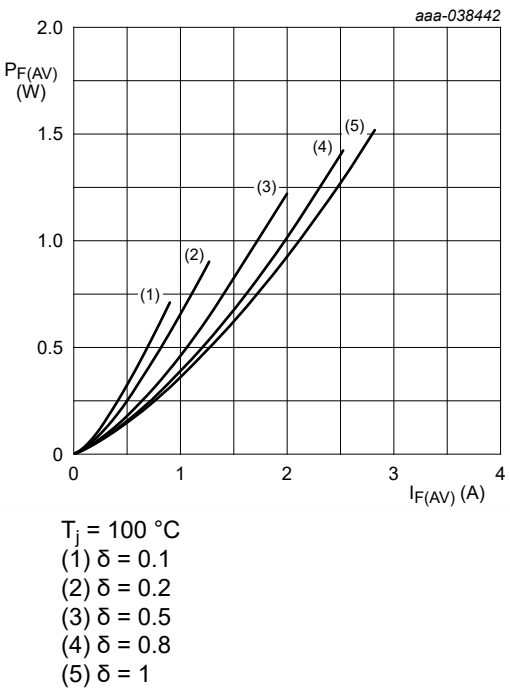


Fig. 6. Average forward power dissipation as a function of average forward current; typical values

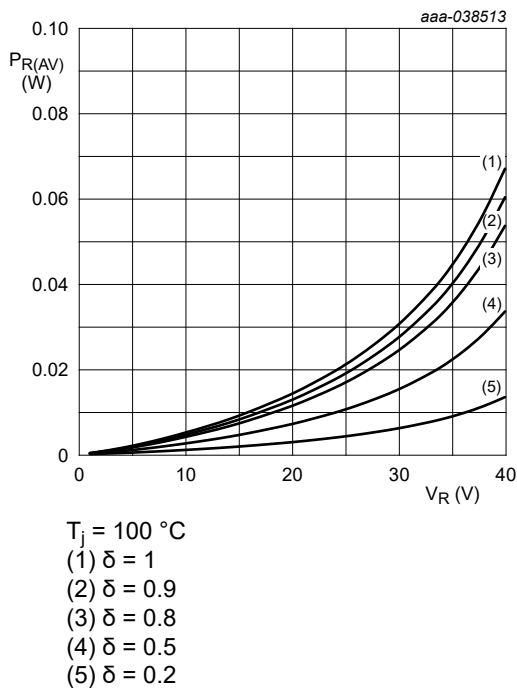


Fig. 7. Average reverse power dissipation as a function of reverse voltage; typical values

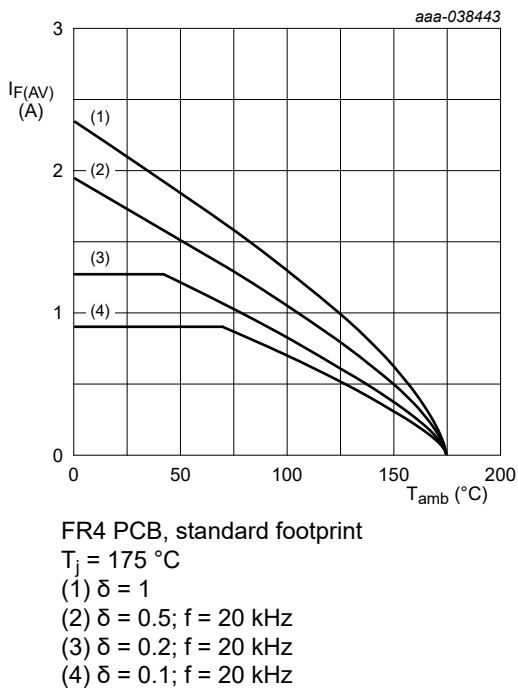
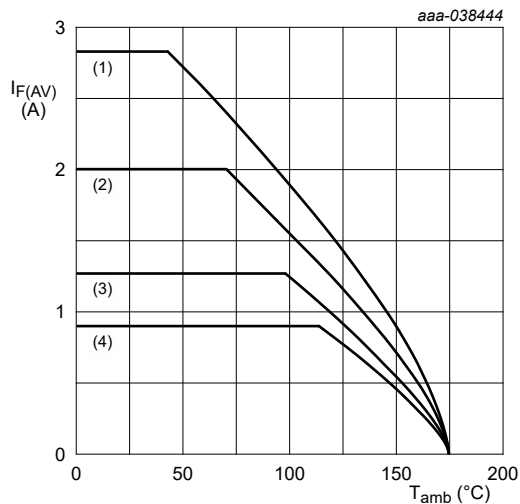
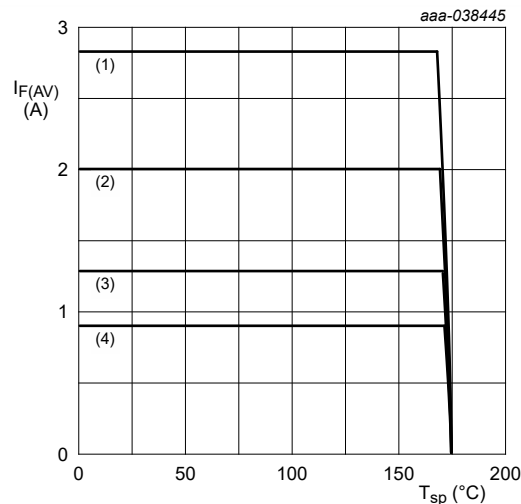


Fig. 8. Average forward current as a function of ambient temperature; typical values



FR4 PCB, mounting pad for cathode 1 cm²
 $T_j = 175$ °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

11. Test information

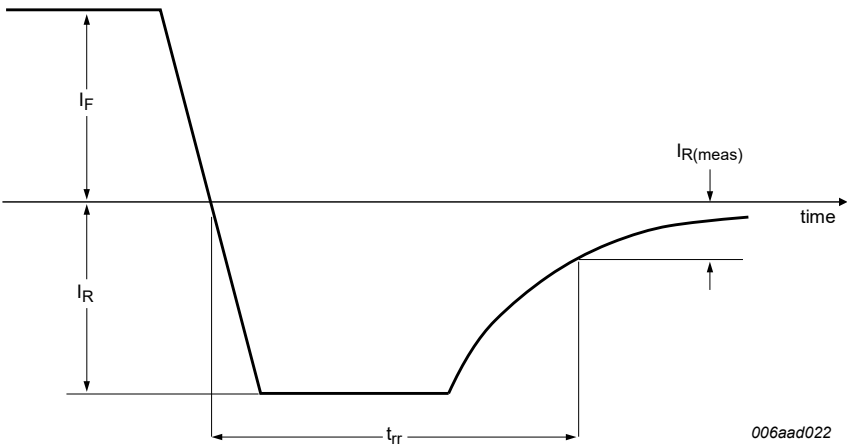


Fig. 11. Reverse recovery definition; step recovery

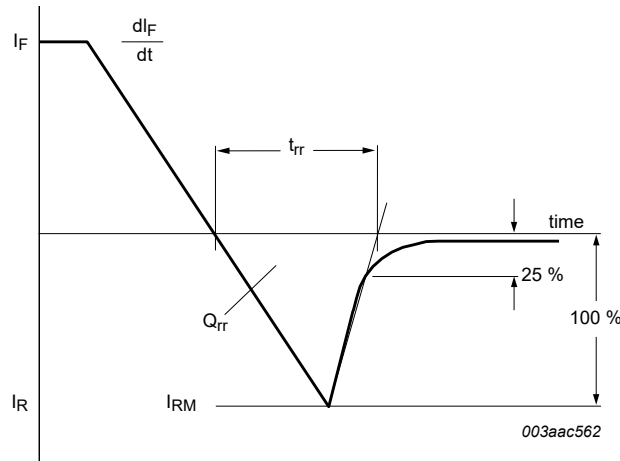


Fig. 12. Reverse recovery definition; ramp recovery

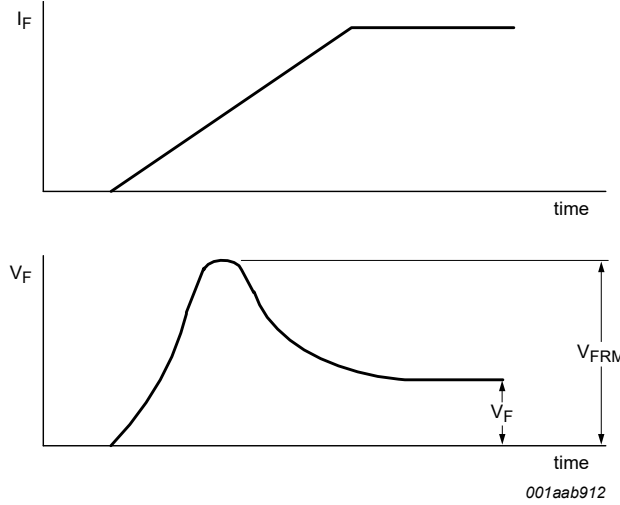


Fig. 13. Forward recovery definition

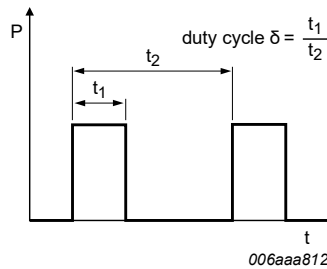


Fig. 14. Duty cycle definition

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

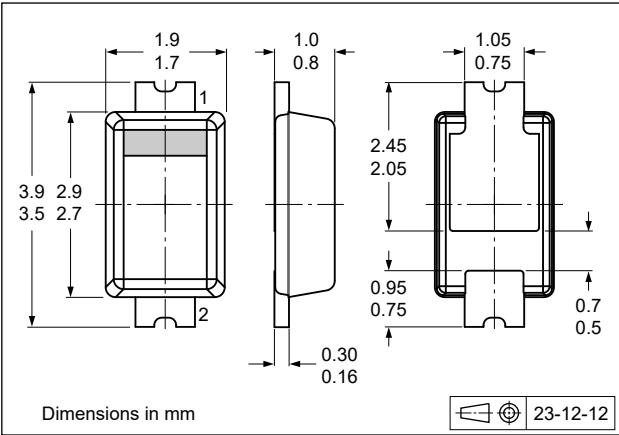


Fig. 15. Package outline CFP3-HP (SOD123HP)

13. Soldering

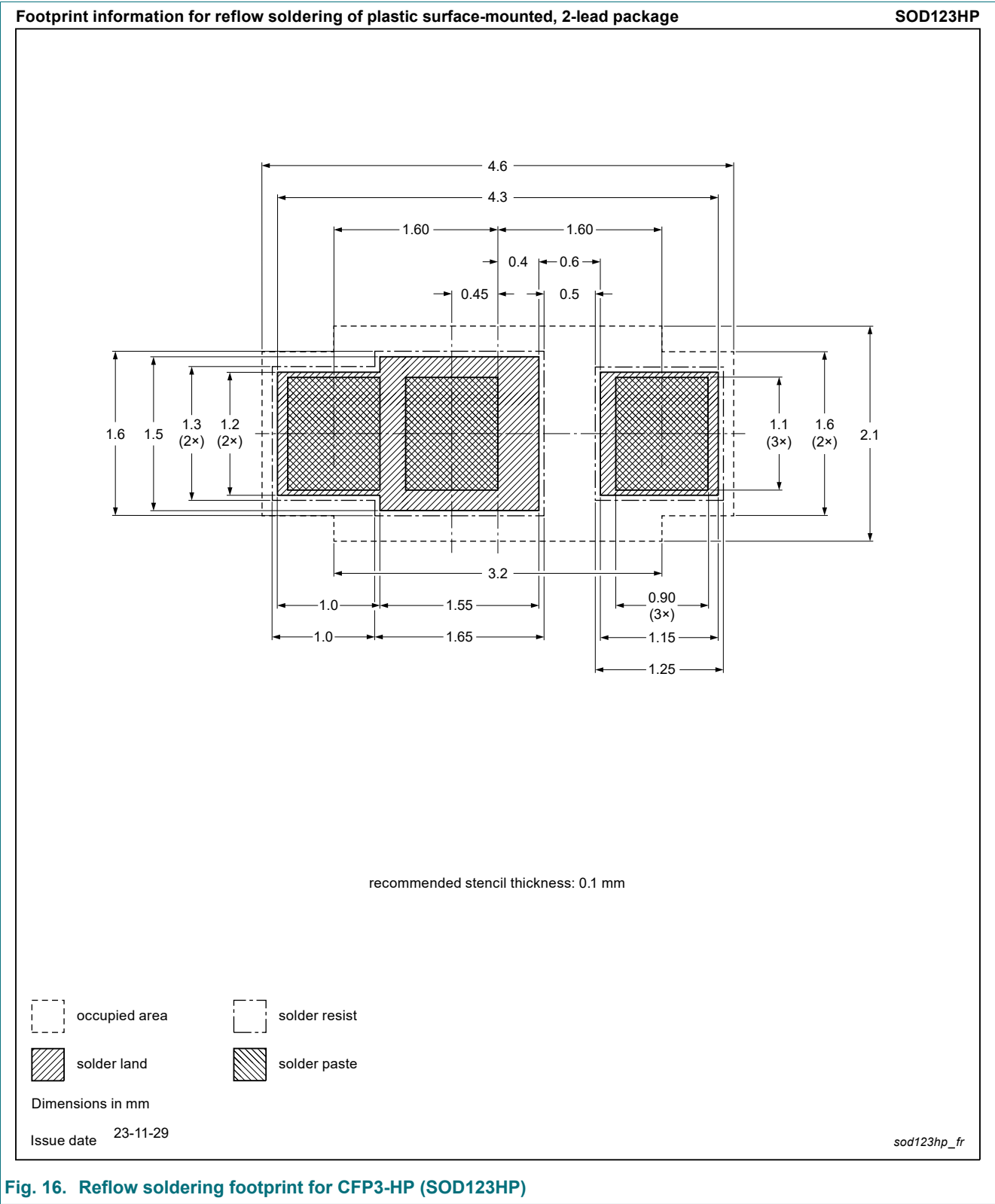


Fig. 16. Reflow soldering footprint for CFP3-HP (SOD123HP)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG4020EXE-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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