

PMEG45T10EXD-Q

45 V, 1 A Trench MEGA Schottky barrier rectifier

4 January 2022

Product data sheet

1. General description

Trench Maximum Efficiency General Application (MEGA) Schottky barrier rectifier encapsulated in a CFP2-HP (SOD323HP) power flat lead Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- Low forward voltage
- Low Q_{rr} and low I_{RM}
- Low leakage current
- High power capability due to clip-bonding technology
- 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
- Freewheeling applications
- 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; $T_{sp} \leq 172$ °C		-	-	1	A
V_R	reverse voltage	$T_j = 25$ °C		-	-	45	V
V_F	forward voltage	$I_F = 1$ A; pulsed; $T_j = 25$ °C	[1]	-	450	520	mV
I_R	reverse current	$V_R = 45$ V; pulsed; $T_j = 25$ °C	[1]	-	3	20	μ A
		$V_R = 45$ V; pulsed; $T_j = 125$ °C	[1]	-	2.5	8	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	 <p>Transparent top view CFP2-HP (SOD323HP)</p>	 <p>sym001</p>
2	A	anode		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMEG45T10EXD-Q	CFP2-HP	SOD323HP: plastic surface-mounted package with solderable lead ends; 2.2 mm x 1.3 mm x 0.68 mm body	SOD323HP

7. Marking

Table 4. Marking codes

Type number	Marking code
PMEG45T10EXD-Q	2H

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V_R	reverse voltage	$T_j = 25\text{ }^\circ\text{C}$		-	45	V
I_F	forward current	$\delta = 1; T_{sp} \leq 171\text{ }^\circ\text{C}$		-	1.4	A
$I_{F(AV)}$	average forward current	$\delta = 0.5; f = 20\text{ kHz};$ square wave; $T_{sp} \leq 172\text{ }^\circ\text{C}$		-	1	A
I_{FSM}	non-repetitive peak forward current	$t_p = 8.3\text{ ms};$ half sine wave; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$		-	15	A
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ }^\circ\text{C}$	[1]	-	0.65	W
			[2]	-	1.2	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 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]	-	-	230	K/W
			[1] [3]	-	-	125	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[4]	-	-	6	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 cm².
- [4] Soldering point of cathode tab.

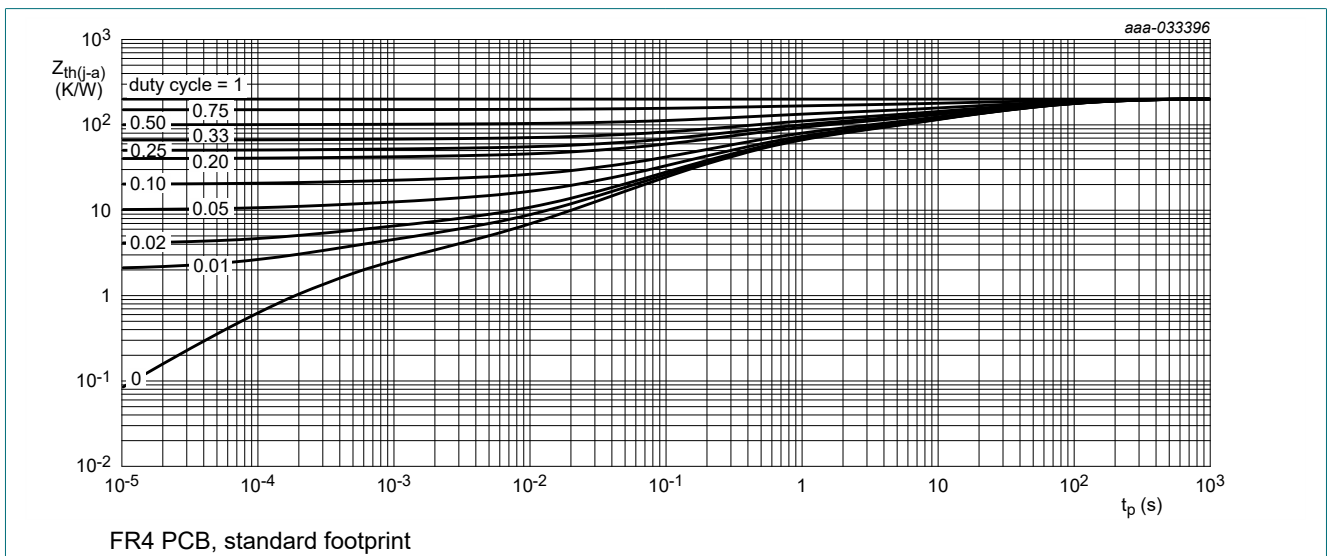


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

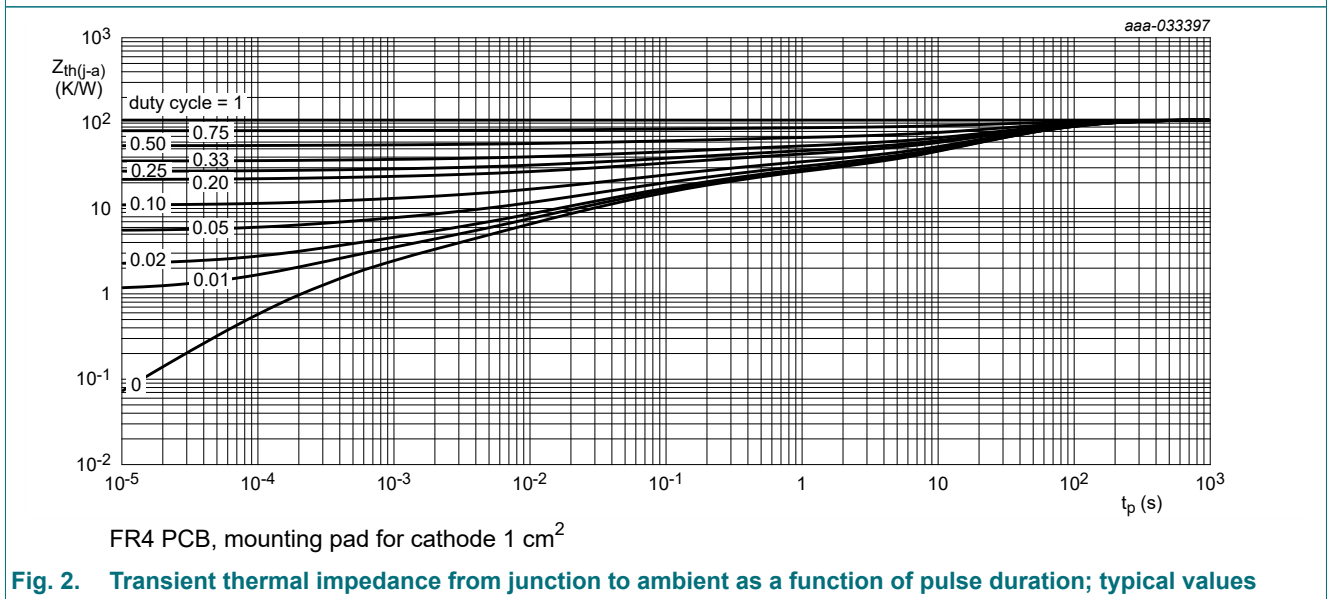


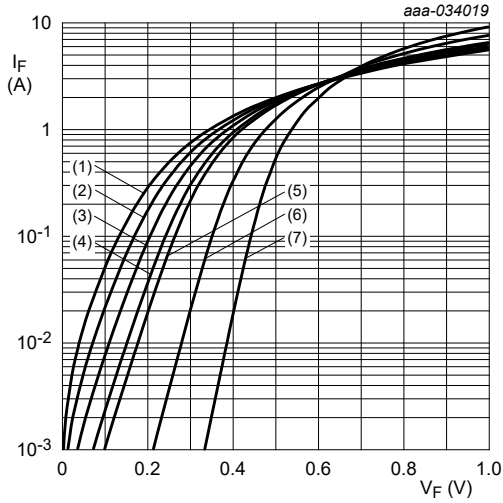
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

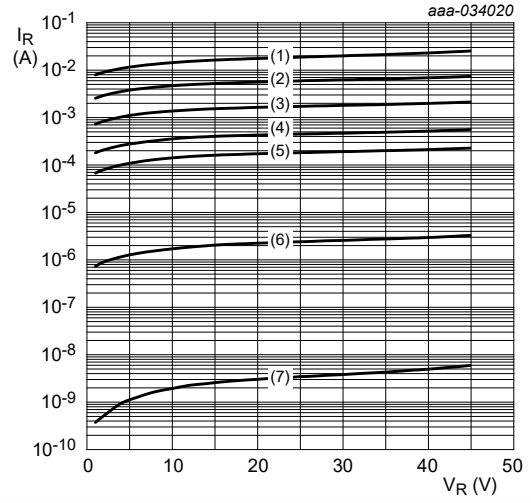
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)R}$	reverse breakdown voltage	$I_R = 1 \text{ mA}$; pulsed; $T_j = 25 \text{ }^\circ\text{C}$	[1]	45	-	-	V
V_F	forward voltage	$I_F = 0.1 \text{ A}$; pulsed; $T_j = 25 \text{ }^\circ\text{C}$	[1]	-	330	380	mV
		$I_F = 0.5 \text{ A}$; pulsed; $T_j = 25 \text{ }^\circ\text{C}$	[1]	-	400	450	mV
		$I_F = 0.7 \text{ A}$; pulsed; $T_j = 25 \text{ }^\circ\text{C}$	[1]	-	420	470	mV
		$I_F = 1 \text{ A}$; pulsed; $T_j = 25 \text{ }^\circ\text{C}$	[1]	-	450	520	mV
		$I_F = 1 \text{ A}$; pulsed; $T_j = -40 \text{ }^\circ\text{C}$	[1]	-	505	575	mV
		$I_F = 1 \text{ A}$; pulsed; $T_j = 125 \text{ }^\circ\text{C}$	[1]	-	360	430	mV
		$I_F = 1 \text{ A}$; pulsed; $T_j = 150 \text{ }^\circ\text{C}$	[1]	-	340	410	mV
I_R	reverse current	$V_R = 10 \text{ V}$; pulsed; $T_j = 25 \text{ }^\circ\text{C}$	[1]	-	1.5	8.8	μA
		$V_R = 45 \text{ V}$; pulsed; $T_j = 25 \text{ }^\circ\text{C}$	[1]	-	3	20	μA
		$V_R = 45 \text{ V}$; pulsed; $T_j = 125 \text{ }^\circ\text{C}$	[1]	-	2.5	8	mA
		$V_R = 45 \text{ V}$; pulsed; $T_j = 150 \text{ }^\circ\text{C}$	[1]	-	10	35	mA
C_d	diode capacitance	$V_R = 4 \text{ V}$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$		-	130	-	pF
		$V_R = 10 \text{ V}$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$		-	80	-	pF
t_{rr}	reverse recovery time step recovery	$I_F = 0.5 \text{ A}$; $I_R = 1 \text{ A}$; $I_{R(\text{meas})} = 0.25 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$		-	4.5	-	ns
	reverse recovery time ramp recovery	$dI_F/dt = 100 \text{ A}/\mu\text{s}$; $I_F = 1 \text{ A}$; $V_R = 30 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$		-	8	-	ns
I_{RM}	peak reverse recovery current			-	0.36	-	A
Q_{rr}	reverse recovery charge			-	2	-	nC
V_{FRM}	peak forward recovery voltage	$I_F = 0.5 \text{ A}$; $dI_F/dt = 20 \text{ A}/\mu\text{s}$; $T_j = 25 \text{ }^\circ\text{C}$		-	405	-	mV

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



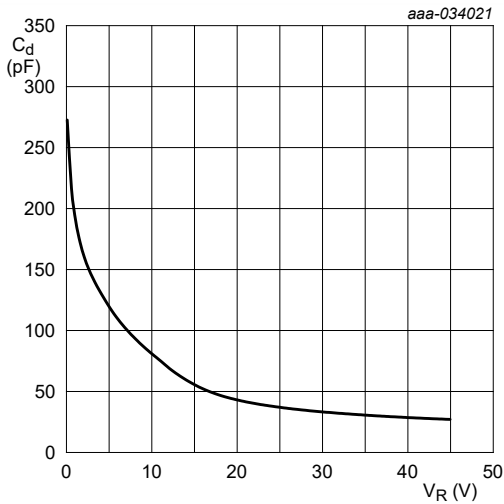
pulsed condition
 (1) $T_j = 175\text{ }^\circ\text{C}$
 (2) $T_j = 150\text{ }^\circ\text{C}$
 (3) $T_j = 125\text{ }^\circ\text{C}$
 (4) $T_j = 100\text{ }^\circ\text{C}$
 (5) $T_j = 85\text{ }^\circ\text{C}$
 (6) $T_j = 25\text{ }^\circ\text{C}$
 (7) $T_j = -40\text{ }^\circ\text{C}$

Fig. 3. Forward current as a function of forward voltage; typical values



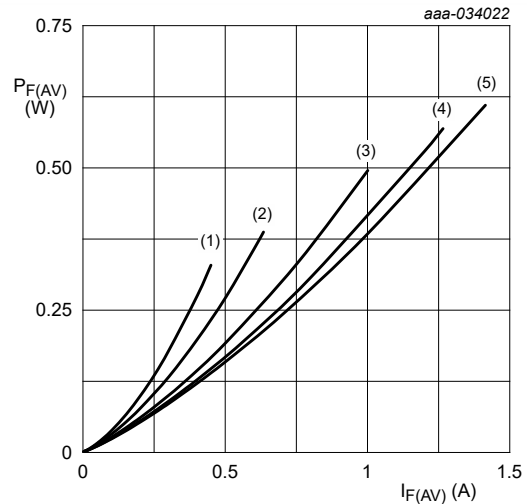
pulsed condition
 (1) $T_j = 175\text{ }^\circ\text{C}$
 (2) $T_j = 150\text{ }^\circ\text{C}$
 (3) $T_j = 125\text{ }^\circ\text{C}$
 (4) $T_j = 100\text{ }^\circ\text{C}$
 (5) $T_j = 85\text{ }^\circ\text{C}$
 (6) $T_j = 25\text{ }^\circ\text{C}$
 (7) $T_j = -40\text{ }^\circ\text{C}$

Fig. 4. Reverse current as a function of reverse voltage; typical values



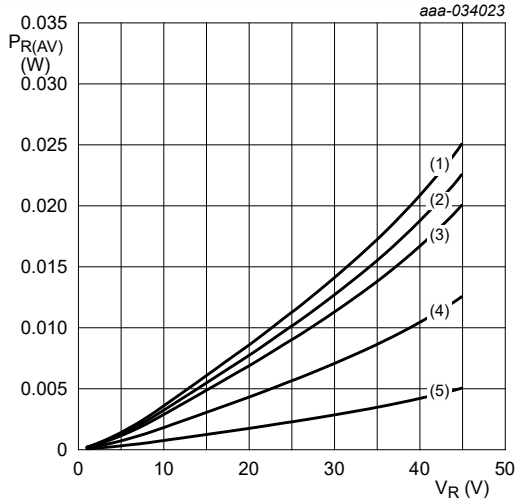
$f = 1\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

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



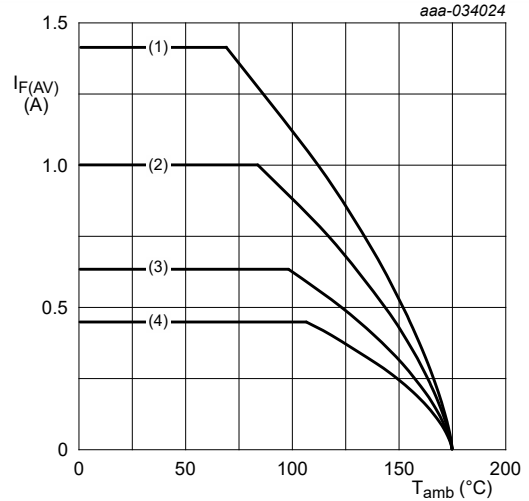
$T_j = 100\text{ }^\circ\text{C}$
 (1) $\delta = 0.1$
 (2) $\delta = 0.2$
 (3) $\delta = 0.5$
 (4) $\delta = 0.8$
 (5) $\delta = 1$; DC

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



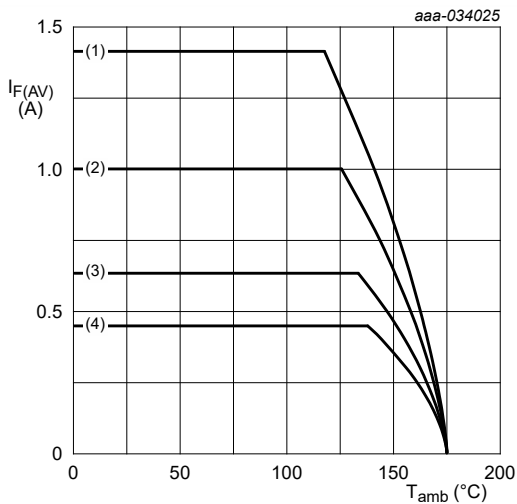
$T_j = 100\text{ °C}$
 (1) $\delta = 1$; DC
 (2) $\delta = 0.9$
 (3) $\delta = 0.8$
 (4) $\delta = 0.5$
 (5) $\delta = 0.2$

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



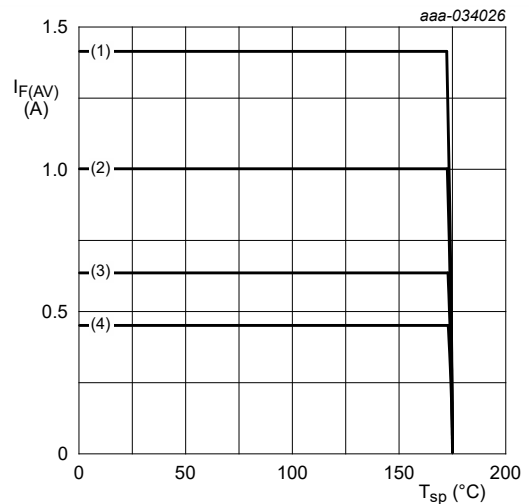
FR4 PCB, standard footprint
 $T_j = 175\text{ °C}$
 (1) $\delta = 1$; DC
 (2) $\delta = 0.5$; $f = 20\text{ kHz}$
 (3) $\delta = 0.2$; $f = 20\text{ kHz}$
 (4) $\delta = 0.1$; $f = 20\text{ kHz}$

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



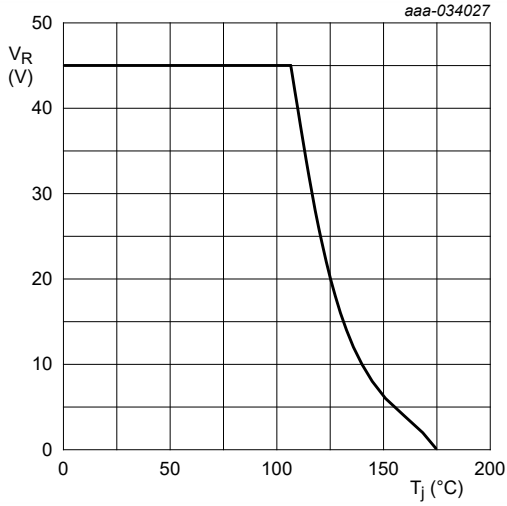
FR4 PCB, mounting pad for cathode 1 cm^2
 $T_j = 175\text{ °C}$
 (1) $\delta = 1$; DC
 (2) $\delta = 0.5$; $f = 20\text{ kHz}$
 (3) $\delta = 0.2$; $f = 20\text{ kHz}$
 (4) $\delta = 0.1$; $f = 20\text{ kHz}$

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



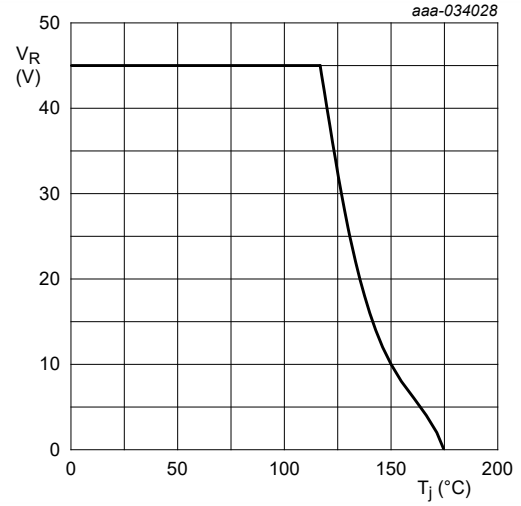
$T_j = 175\text{ °C}$
 (1) $\delta = 1$; DC
 (2) $\delta = 0.5$; $f = 20\text{ kHz}$
 (3) $\delta = 0.2$; $f = 20\text{ kHz}$
 (4) $\delta = 0.1$; $f = 20\text{ kHz}$

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



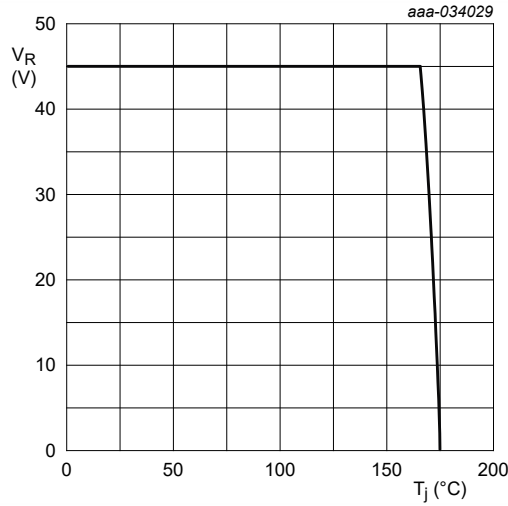
FR4 PCB, standard footprint
R_{th} = 230 K/W

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



FR4 PCB, mounting pad for cathode 1 cm²
R_{th} = 125 K/W

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



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

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

11. Test information

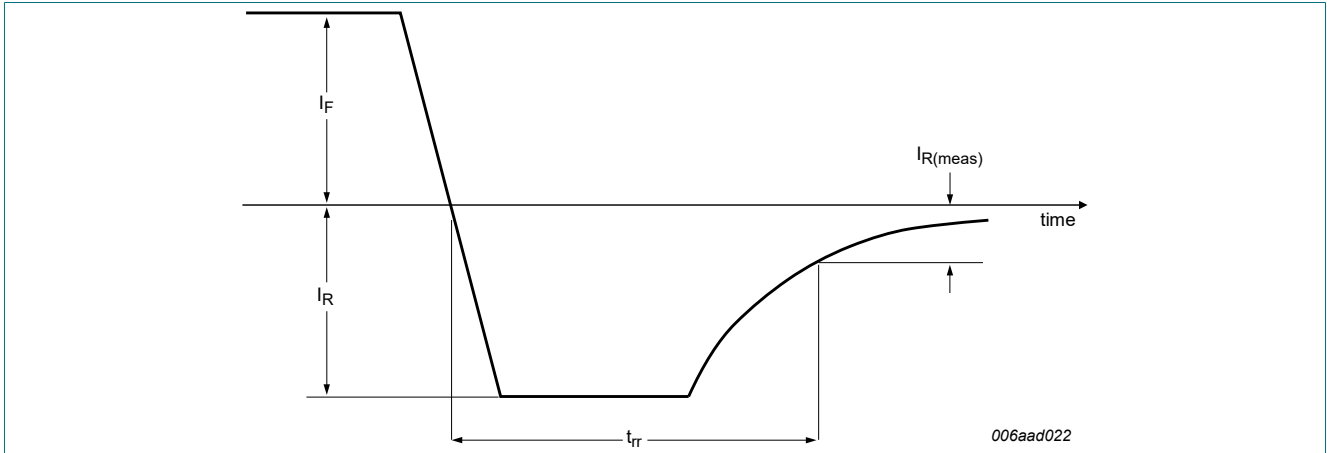


Fig. 14. Reverse recovery definition; step recovery

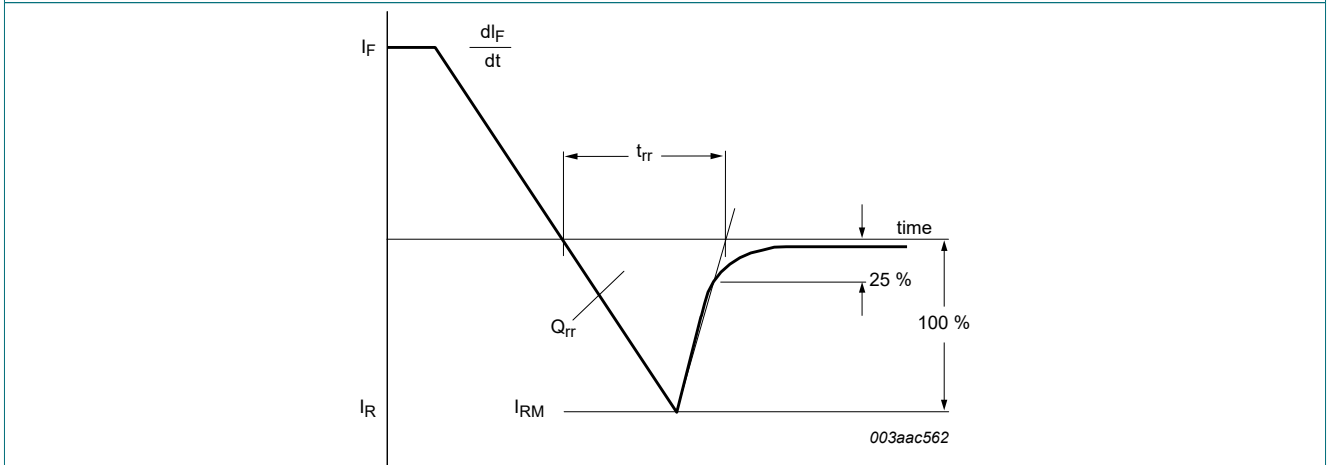


Fig. 15. Reverse recovery definition; ramp recovery

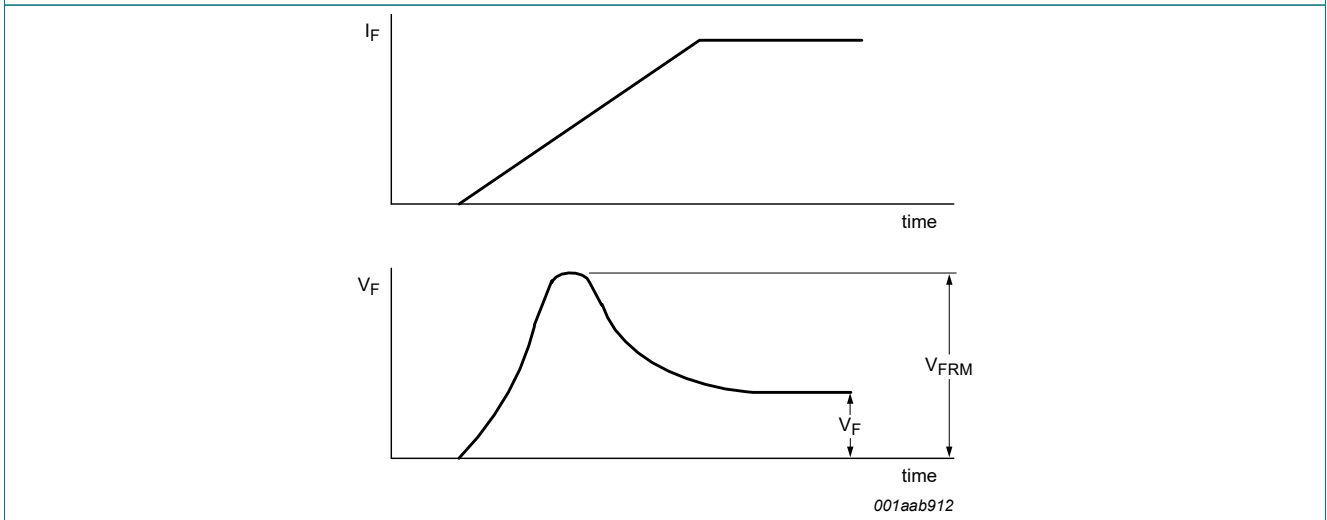


Fig. 16. Forward recovery definition

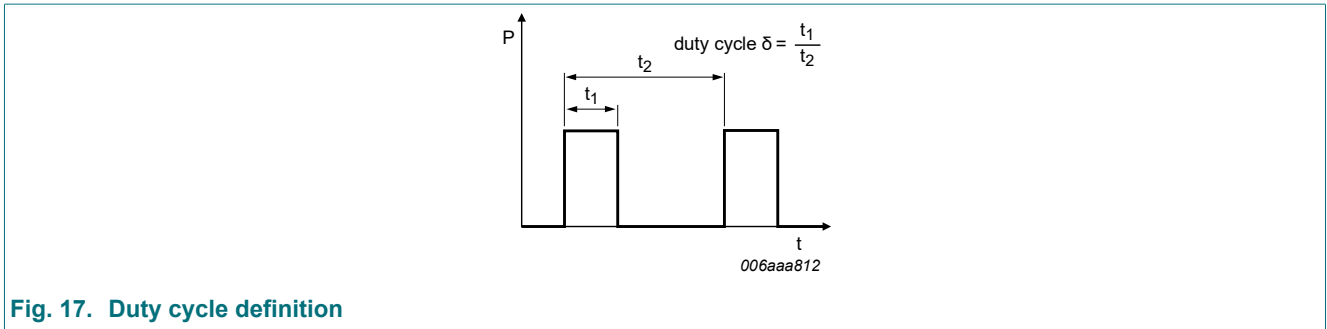


Fig. 17. Duty cycle definition

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

$$I_{F(AV)} = I_M \times \delta$$

with I_M 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

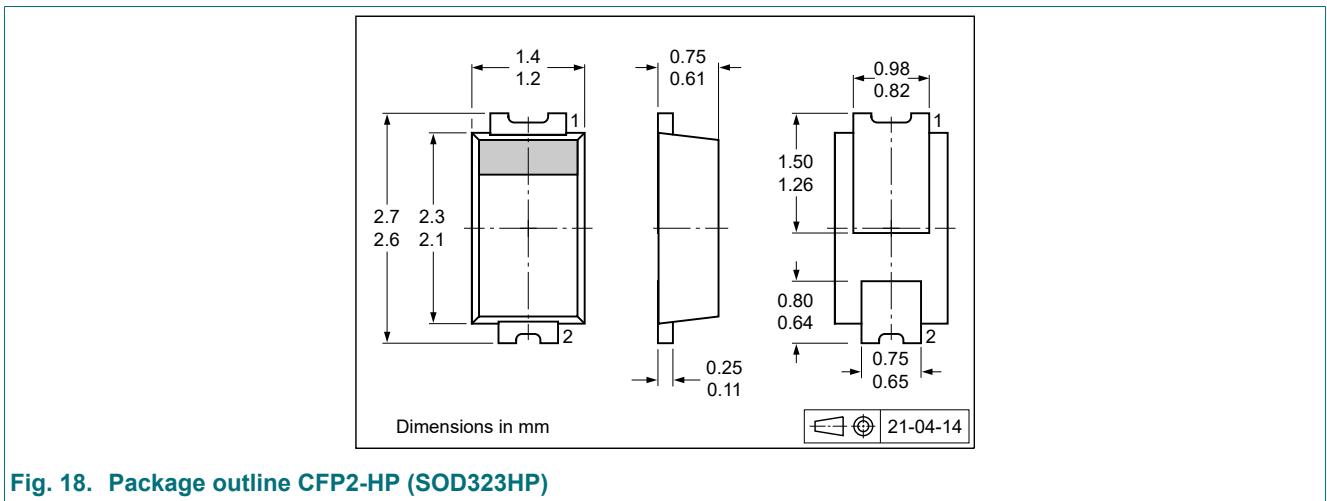


Fig. 18. Package outline CFP2-HP (SOD323HP)

13. Soldering

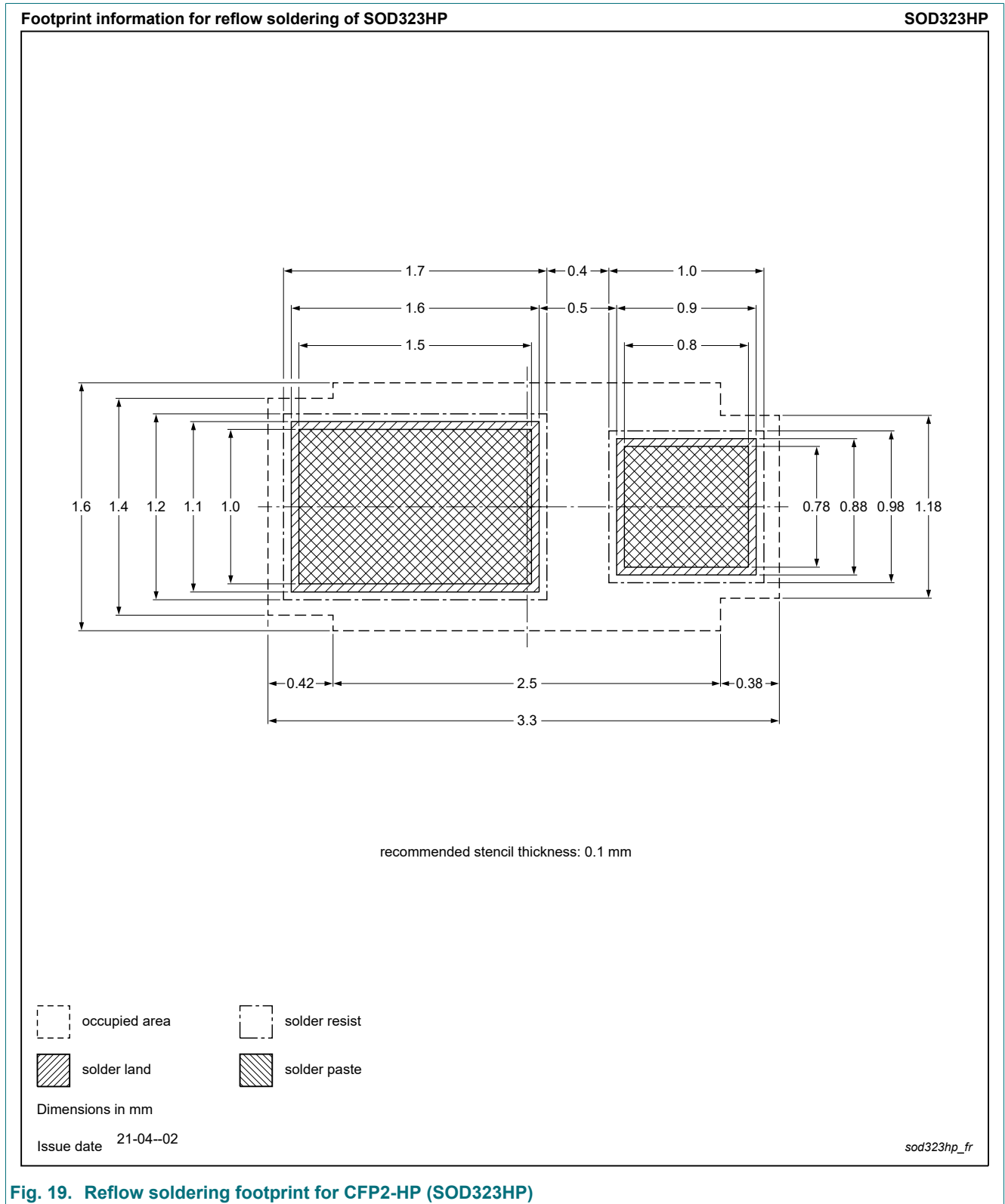


Fig. 19. Reflow soldering footprint for CFP2-HP (SOD323HP)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG45T10EXD-Q v.1	20220104	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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