

PMEG45T20EXD

45 V, 2 A Trench MEGA Schottky barrier rectifier

18 June 2021

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

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; $T_{sp} \leq 166$ °C	-	-	2	A
V_R	reverse voltage	$T_j = 25$ °C	-	-	45	V
V_F	forward voltage	$I_F = 2$ A; pulsed; $T_j = 25$ °C	[1]	500	560	mV
I_R	reverse current	$V_R = 45$ V; pulsed; $T_j = 25$ °C	[1]	4	25	μ A
		$V_R = 45$ V; pulsed; $T_j = 125$ °C	[1]	3	9	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	 Transparent top view CFP2-HP (SOD323HP)	 sym001
2	A	anode		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMEG45T20EXD	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
PMEG45T20EXD	2J

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	$\delta = 1; T_{sp} \leq 165\text{ }^{\circ}\text{C}$		-	2.8	A
$I_{F(AV)}$	average forward current	$\delta = 0.5; f = 20\text{ kHz; square wave; } T_{sp} \leq 166\text{ }^{\circ}\text{C}$		-	2	A
I_{FSM}	non-repetitive peak forward current	$t_p = 8.3\text{ ms; half sine wave; } T_{j(init)} = 25\text{ }^{\circ}\text{C}$		-	22	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.

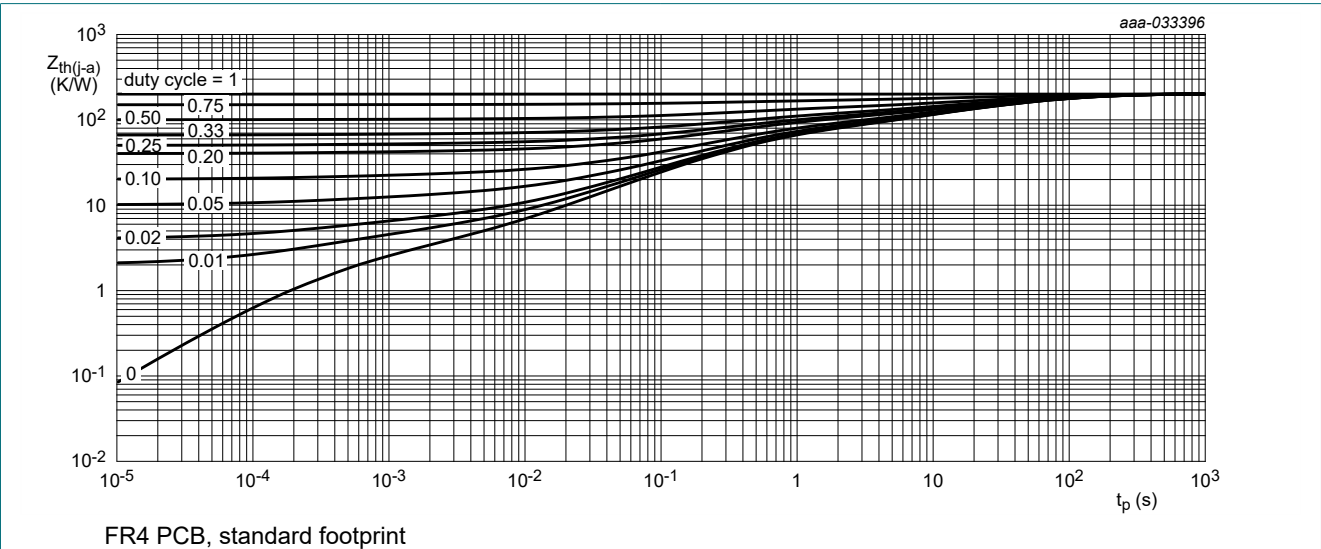


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

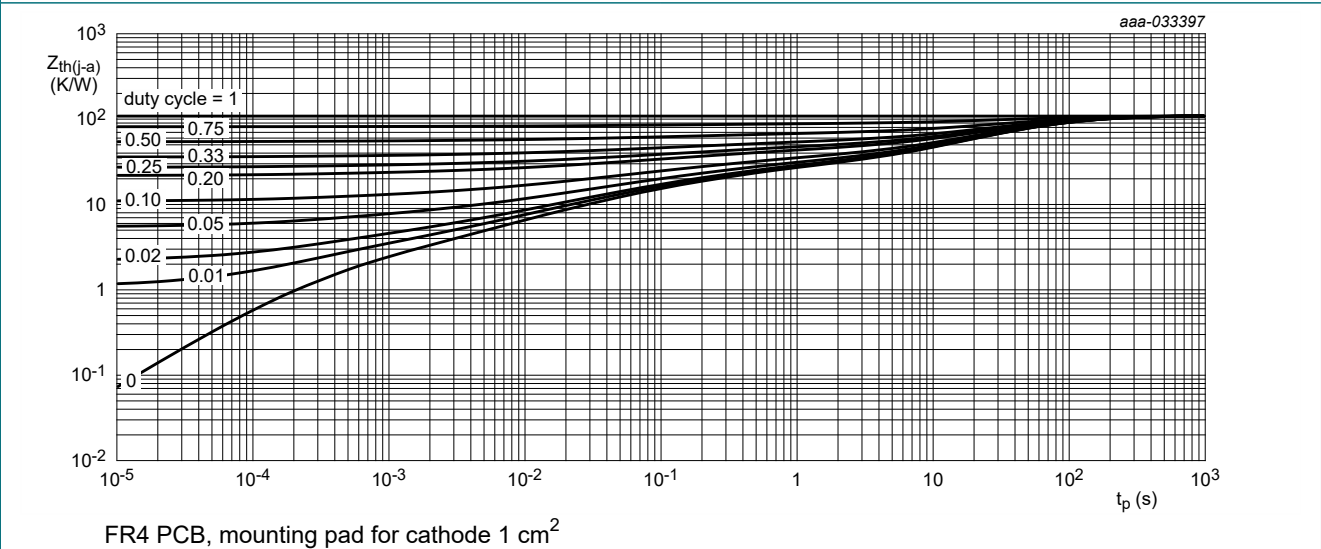


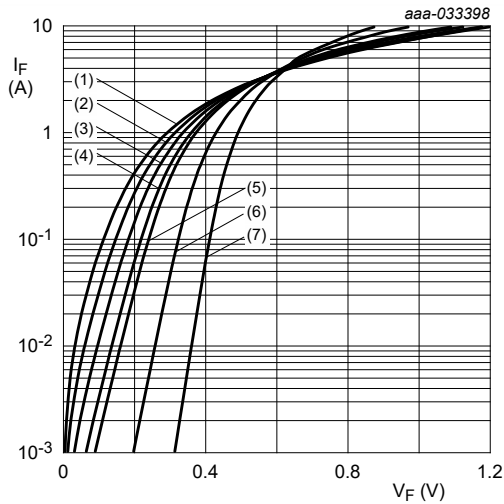
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

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	385	mV
		$I_F = 0.5 \text{ A}$; pulsed; $T_j = 25 \text{ }^{\circ}\text{C}$	[1]	-	390	445	mV
		$I_F = 0.7 \text{ A}$; pulsed; $T_j = 25 \text{ }^{\circ}\text{C}$	[1]	-	410	465	mV
		$I_F = 1 \text{ A}$; 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	560	mV
		$I_F = 2 \text{ A}$; pulsed; $T_j = -40 \text{ }^{\circ}\text{C}$	[1]	-	540	600	mV
		$I_F = 2 \text{ A}$; pulsed; $T_j = 125 \text{ }^{\circ}\text{C}$	[1]	-	440	500	mV
		$I_F = 2 \text{ A}$; pulsed; $T_j = 150 \text{ }^{\circ}\text{C}$	[1]	-	430	490	mV
I_R	reverse current	$V_R = 10 \text{ V}$; pulsed; $T_j = 25 \text{ }^{\circ}\text{C}$	[1]	-	2	10	μA
		$V_R = 45 \text{ V}$; pulsed; $T_j = 25 \text{ }^{\circ}\text{C}$	[1]	-	4	25	μA
		$V_R = 45 \text{ V}$; pulsed; $T_j = 125 \text{ }^{\circ}\text{C}$	[1]	-	3	9	mA
		$V_R = 45 \text{ V}$; pulsed; $T_j = 150 \text{ }^{\circ}\text{C}$	[1]	-	11	40	mA
C_d	diode capacitance	$V_R = 4 \text{ V}$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^{\circ}\text{C}$		-	160	-	pF
		$V_R = 10 \text{ V}$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^{\circ}\text{C}$		-	100	-	pF
t_{rr}	reverse recovery time step recovery	$I_F = 0.5 \text{ A}$; $I_R = 1 \text{ A}$; $I_{R(\text{meas})} = 0.25 \text{ A}$; $T_j = 25 \text{ }^{\circ}\text{C}$		-	5	-	ns
	reverse recovery time ramp recovery	$dI_F/dt = 100 \text{ A}/\mu\text{s}$; $I_F = 1 \text{ A}$; $V_R = 30 \text{ V}$; $T_j = 25 \text{ }^{\circ}\text{C}$		-	9	-	ns
I_{RM}	peak reverse recovery current			-	0.38	-	A
Q_{rr}	reverse recovery charge			-	2.5	-	nC
V_{FRM}	peak forward recovery voltage	$I_F = 0.5 \text{ A}$; $dI_F/dt = 20 \text{ A}/\mu\text{s}$; $T_j = 25 \text{ }^{\circ}\text{C}$		-	405	-	mV

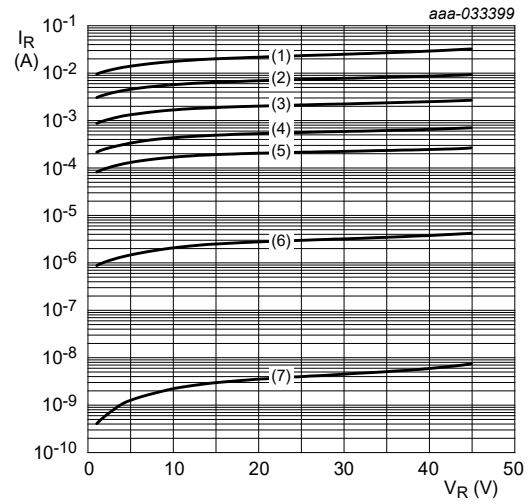
[1] Very short pulse, in order to maintain a stable junction temperature.



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) $T_j = -40\text{ }^{\circ}\text{C}$

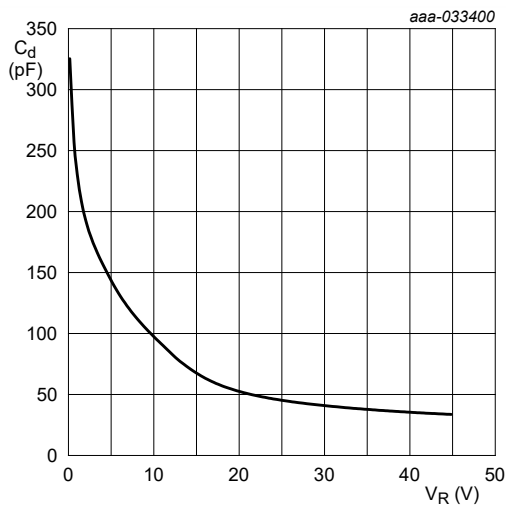
Fig. 3. Forward current as a function of forward voltage; typical values



pulsed condition

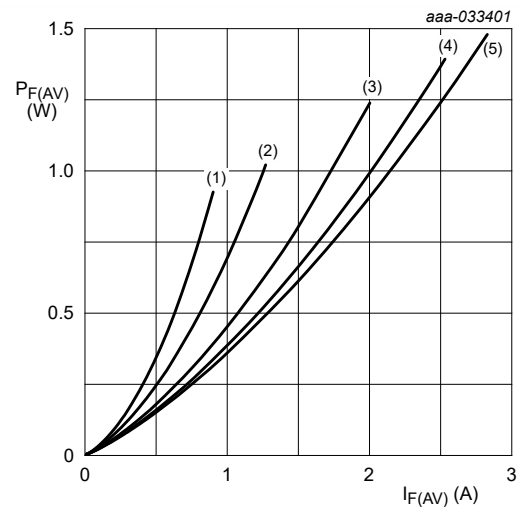
- (1) $T_j = 175\text{ }^{\circ}\text{C}$
- (2) $T_j = 150\text{ }^{\circ}\text{C}$
- (3) $T_j = 125\text{ }^{\circ}\text{C}$
- (4) $T_j = 100\text{ }^{\circ}\text{C}$
- (5) $T_j = 85\text{ }^{\circ}\text{C}$
- (6) $T_j = 25\text{ }^{\circ}\text{C}$
- (7) $T_j = -40\text{ }^{\circ}\text{C}$

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



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

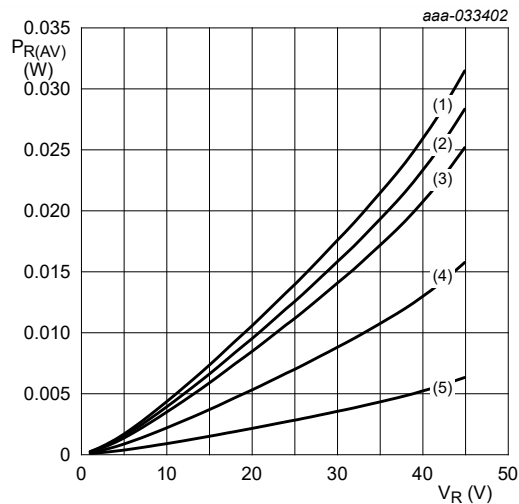
Fig. 5. Diode capacitance as a function of reverse voltage; typical values



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

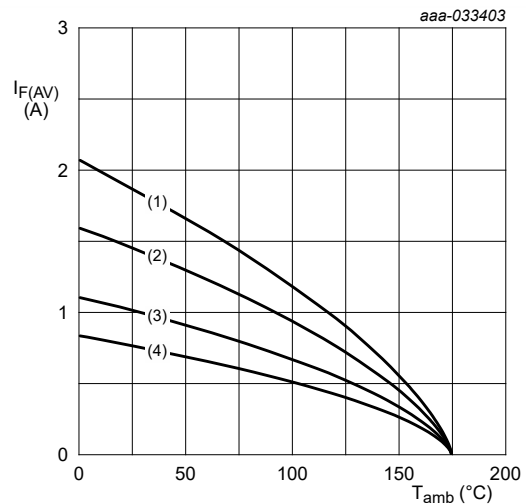
- (1) $\delta = 0.1$
- (2) $\delta = 0.2$
- (3) $\delta = 0.5$
- (4) $\delta = 0.8$
- (5) $\delta = 1$; DC

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



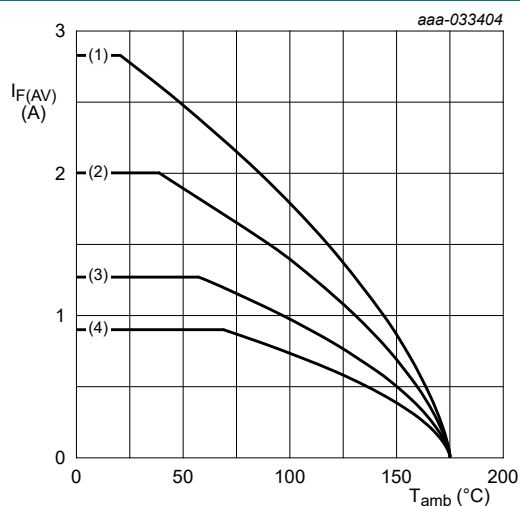
$T_j = 100\text{ °C}$
 (1) $\delta = 1$; DC
 (2) $\delta = 0.9$
 (3) $\delta = 0.8$
 (4) $\delta = 0.5$
 (5) $\delta = 0.2$

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



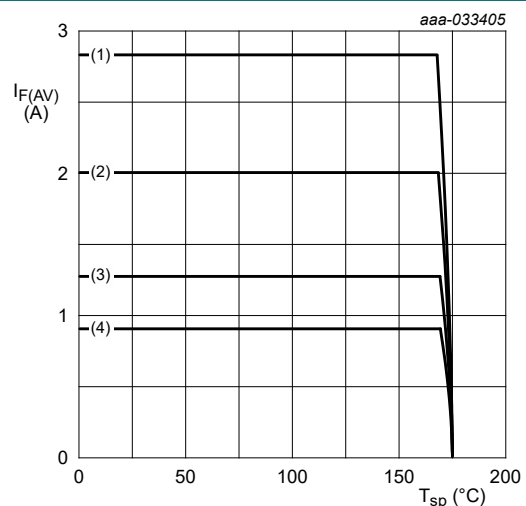
FR4 PCB, standard footprint
 $T_j = 175\text{ °C}$
 (1) $\delta = 1$; DC
 (2) $\delta = 0.5$; $f = 20\text{ kHz}$
 (3) $\delta = 0.2$; $f = 20\text{ kHz}$
 (4) $\delta = 0.1$; $f = 20\text{ kHz}$

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

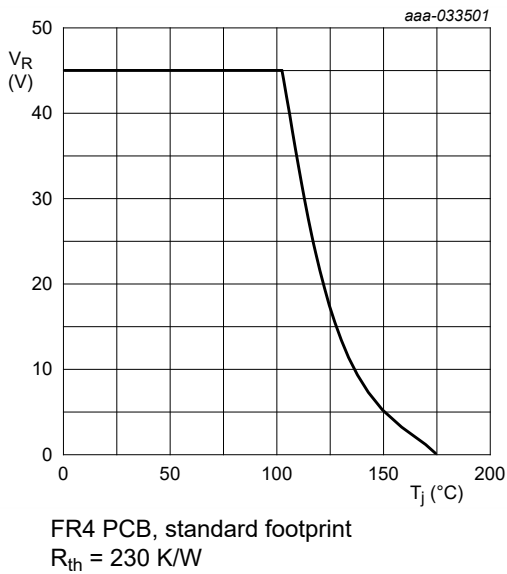


Fig. 11. Derated maximum reverse voltage as a function of junction temperature; typical values

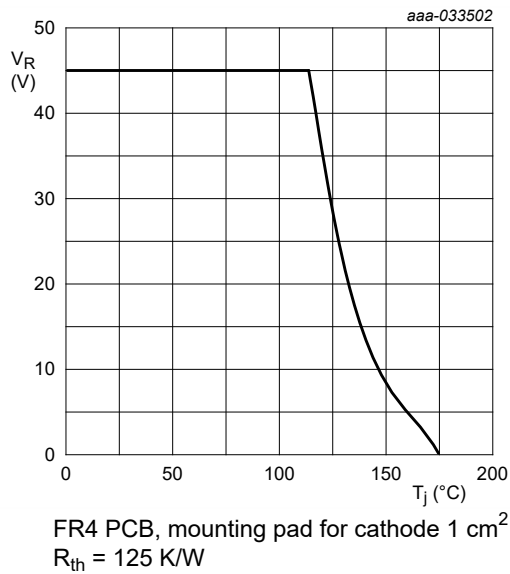


Fig. 12. Derated maximum reverse voltage as a function of junction temperature; typical values

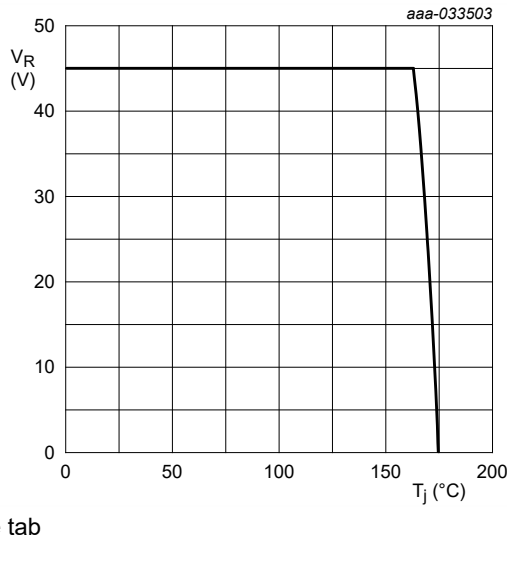


Fig. 13. Derated maximum reverse voltage as a function of junction temperature; typical values

11. Test information

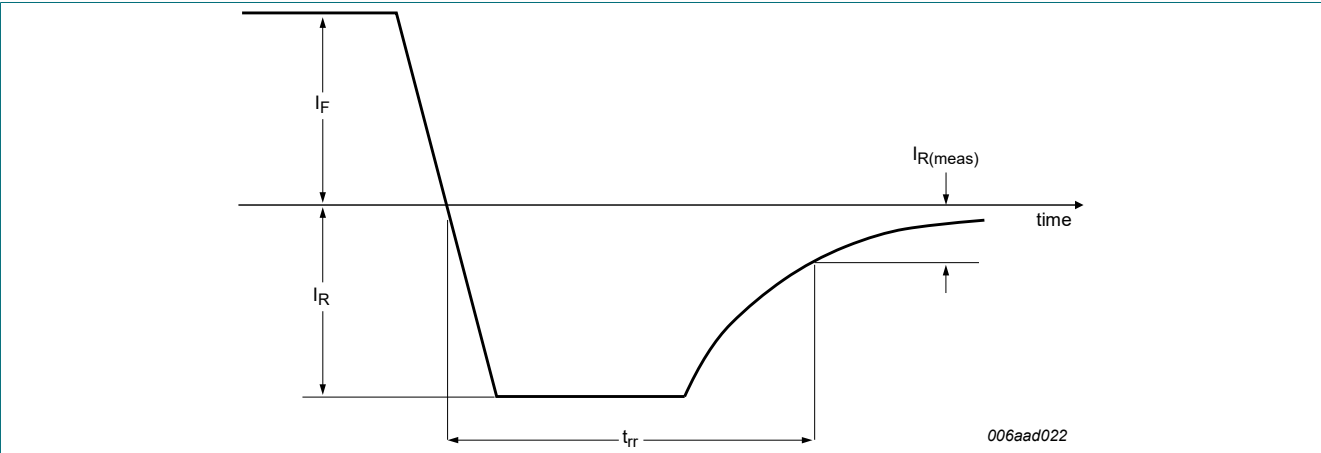


Fig. 14. Reverse recovery definition; step recovery

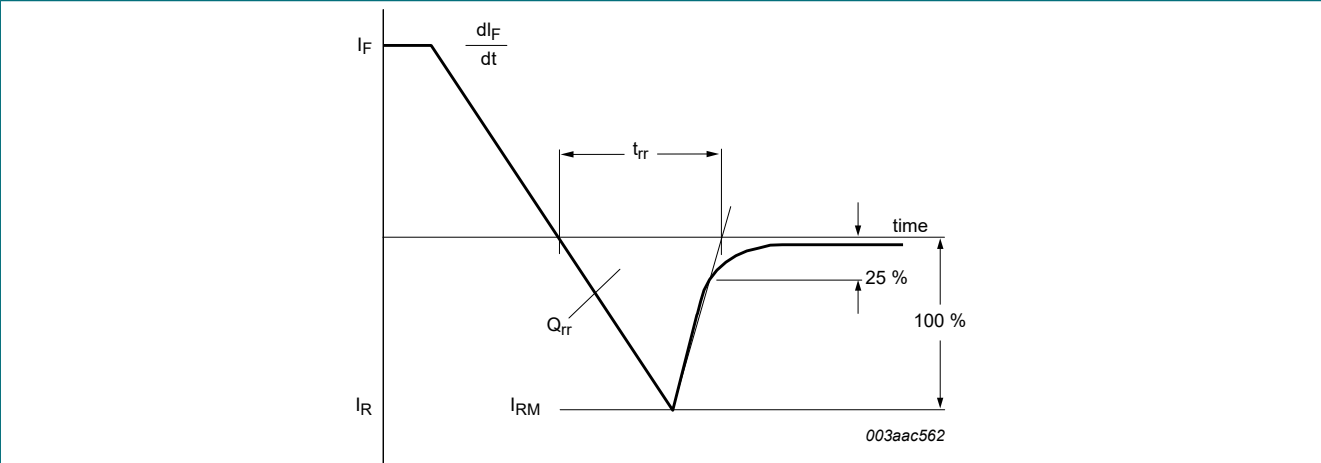


Fig. 15. Reverse recovery definition; ramp recovery

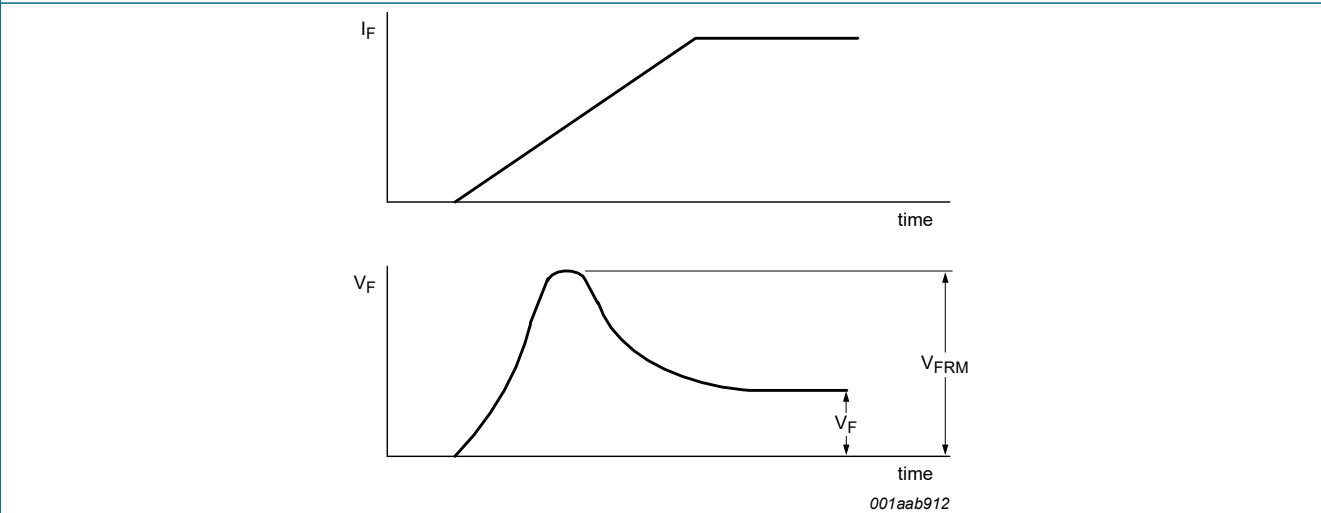


Fig. 16. Forward recovery definition

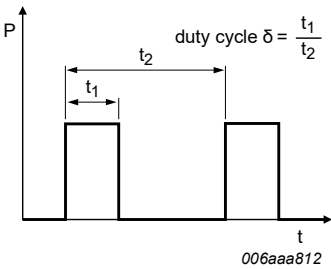


Fig. 17. Duty cycle definition

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, $I_{RMS} = I_{F(AV)}$ at DC, and $I_{RMS} = I_M \times \sqrt{\delta}$ with I_{RMS} defined as RMS current.

12. Package outline

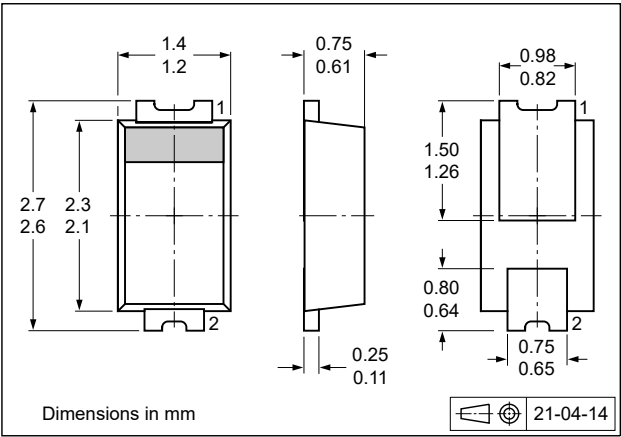


Fig. 18. Package outline CFP2-HP (SOD323HP)

13. Soldering

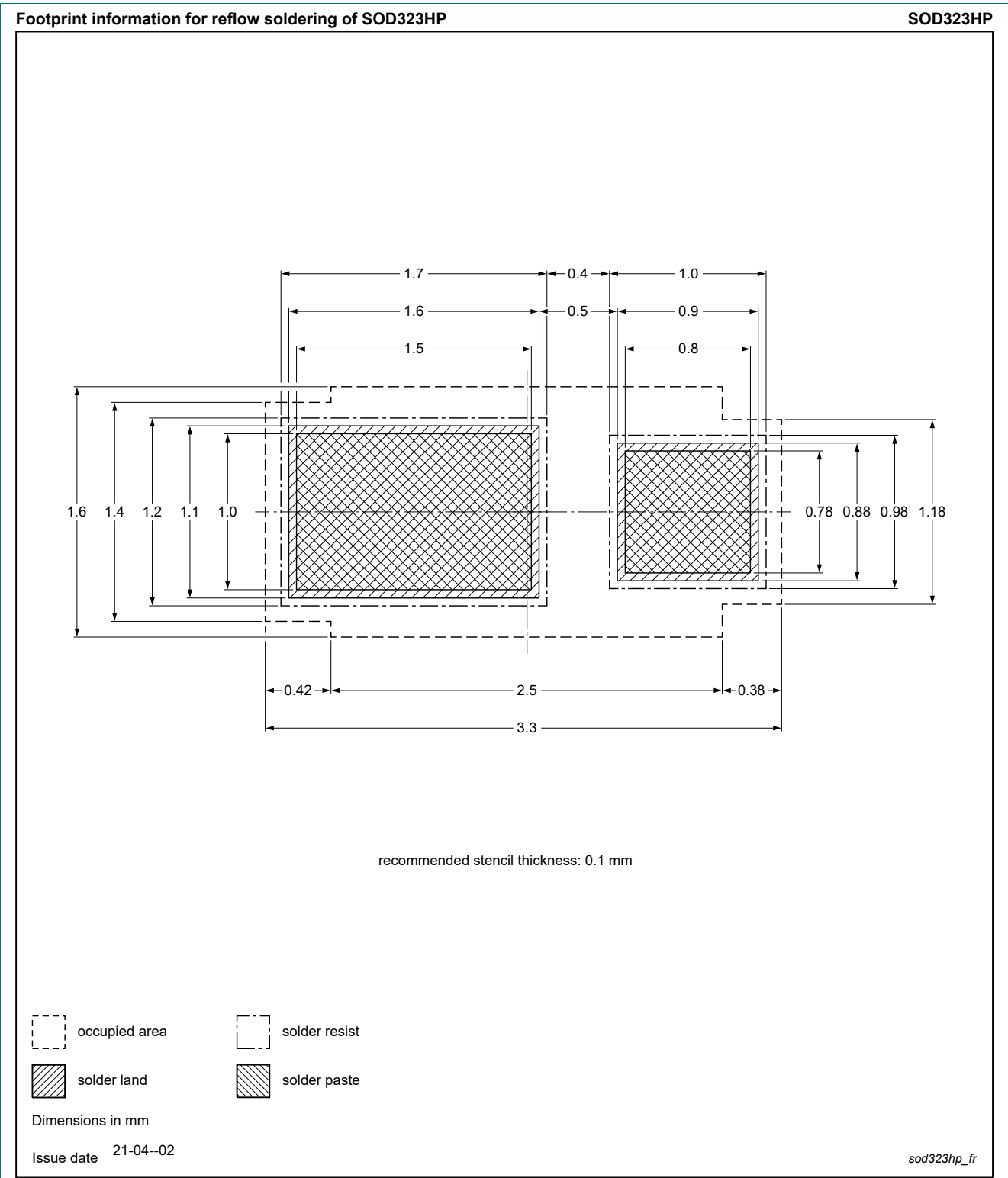


Fig. 19. Reflow soldering footprint for CFP2-HP (SOD323HP)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG45T20EXD v.2	20210618	Product data sheet	-	PMEG45T20EXD v.1
Modifications:	Product status changed			
PMEG45T20EXD v.1	20210429	Preliminary 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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