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PMEG045T050EPD

45 V, 5 A low VF Trench MEGA Schottky barrier rectifier

8 June 2018

Product data sheet

1. General description

Trench Maximum Efficiency General Application (MEGA) Schottky barrier rectifier encapsulated in a CFP15 (SOT1289) power and flat lead Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- Average forward current: $I_{F(AV)} \leq 5$ A
- Reverse voltage: $V_R \leq 45$ V
- Low forward voltage
- Low leakage current due to Trench MEGA Schottky technology
- High power capability due to clip-bonding technology and heat sink
- Small and thin SMD power plastic package, typical height 0.78 mm
- AEC-Q101 qualified

3. Applications

- Low voltage rectification
- High efficiency DC-to-DC conversion
- Switch mode power supply
- Freewheeling application
- Reverse polarity protection
- Low power consumption application

4. Quick reference data

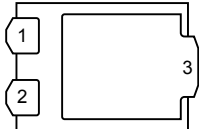
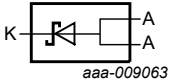
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$I_{F(AV)}$	average forward current	$\delta = 0.5$; $f = 20$ kHz; $T_{sp} \leq 160$ °C; square wave		-	-	5	A
V_R	reverse voltage	$T_j = 25$ °C		-	-	45	V
V_F	forward voltage	$I_F = 5$ A; $t_p \leq 300$ μ s; $\delta \leq 0.02$; $T_j = 25$ °C		-	465	525	mV
I_R	reverse current	$V_R = 10$ V; $T_j = 25$ °C; pulsed	[1]	-	7	24	μ A
		$V_R = 45$ V; $T_j = 25$ °C; pulsed	[1]	-	13	44	μ 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	A	anode	 CFP15 (SOT1289)	 aaa-009063
2	A	anode		
3	K	cathode		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMEG045T050EPD	CFP15	plastic, thermal enhanced ultra thin SMD package; 3 terminals; 5.8 x 4.3 x 0.78 mm body	SOT1289

7. Marking

Table 4. Marking codes

Type number	Marking code
PMEG045T050EPD	045T M05E

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	$T_j = 25\text{ }^{\circ}\text{C}$		-	45	V
I_F	forward current	$\delta = 1; T_{sp} \leq 155\text{ }^{\circ}\text{C}$		-	7	A
$I_{F(AV)}$	average forward current	$\delta = 0.5; f = 20\text{ kHz}; T_{sp} \leq 160\text{ }^{\circ}\text{C}$; square wave		-	5	A
I_{FSM}	non-repetitive peak forward current	$t_p = 8\text{ ms}$; square wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$		-	45	A
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ }^{\circ}\text{C}$	[1]	-	1.66	W
			[2]	-	2.15	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

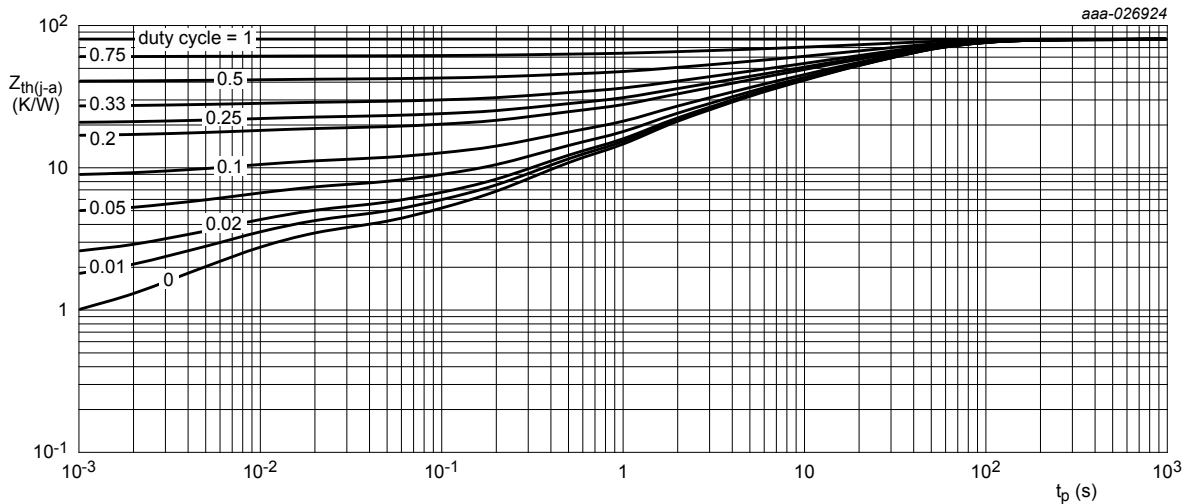
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1] [2]	-	-	90	K/W
			[1] [3]	-	-	70	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[4]	-	-	3	K/W

[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.

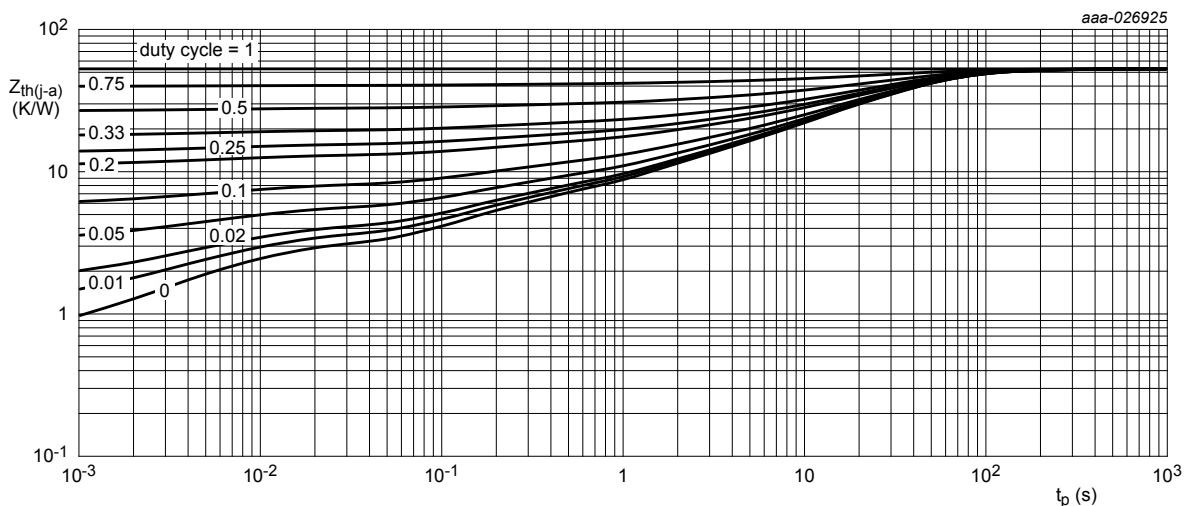
[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm^2 .

[4] 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 cm²

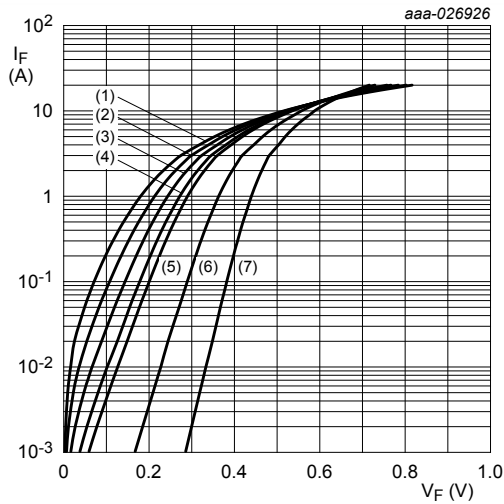
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

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	$I_F = 0.1 \text{ A}$; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25 \text{ }^{\circ}\text{C}$		-	290	-	mV
		$I_F = 1 \text{ A}$; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25 \text{ }^{\circ}\text{C}$		-	365	410	mV
		$I_F = 2 \text{ A}$; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25 \text{ }^{\circ}\text{C}$		-	395	445	mV
		$I_F = 5 \text{ A}$; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25 \text{ }^{\circ}\text{C}$		-	465	525	mV
		$I_F = 5 \text{ A}$; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_j = -40 \text{ }^{\circ}\text{C}$		-	520	-	mV
		$I_F = 5 \text{ A}$; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_j = 125 \text{ }^{\circ}\text{C}$		-	390	-	mV
I_R	reverse current	$V_R = 10 \text{ V}$; $T_j = 25 \text{ }^{\circ}\text{C}$; pulsed	[1]	-	7	24	μA
		$V_R = 30 \text{ V}$; $T_j = 25 \text{ }^{\circ}\text{C}$; pulsed	[1]	-	10	-	μA
		$V_R = 45 \text{ V}$; $T_j = 25 \text{ }^{\circ}\text{C}$; pulsed	[1]	-	13	44	μA
		$V_R = 45 \text{ V}$; $T_j = 125 \text{ }^{\circ}\text{C}$; pulsed	[1]	-	9	-	mA
C_d	diode capacitance	$V_R = 1 \text{ V}$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^{\circ}\text{C}$		-	830	-	pF
		$V_R = 10 \text{ V}$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^{\circ}\text{C}$		-	350	-	pF
t_{rr}	reverse recovery time step recovery	$I_F = 0.5 \text{ A}$; $I_R = 0.5 \text{ A}$; $I_{R(\text{meas})} = 0.1 \text{ A}$; $T_j = 25 \text{ }^{\circ}\text{C}$		-	24	-	ns
	reverse recovery time ramp recovery	$dl_F/dt = 200 \text{ A}/\mu\text{s}$; $I_F = 6 \text{ A}$; $V_R = 26 \text{ V}$; $T_j = 25 \text{ }^{\circ}\text{C}$		-	16	-	ns
V_{FRM}	peak forward recovery voltage	$I_F = 0.5 \text{ A}$; $dl_F/dt = 20 \text{ A}/\mu\text{s}$; $T_j = 25 \text{ }^{\circ}\text{C}$		-	378	-	mV

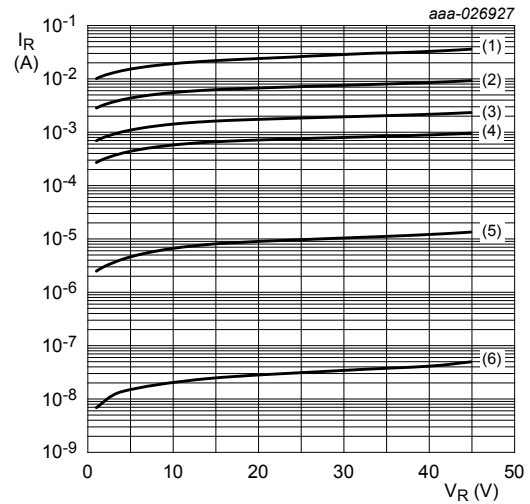
[1] Very short pulse, in order to maintain a stable junction temperature.



pulsed condition

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

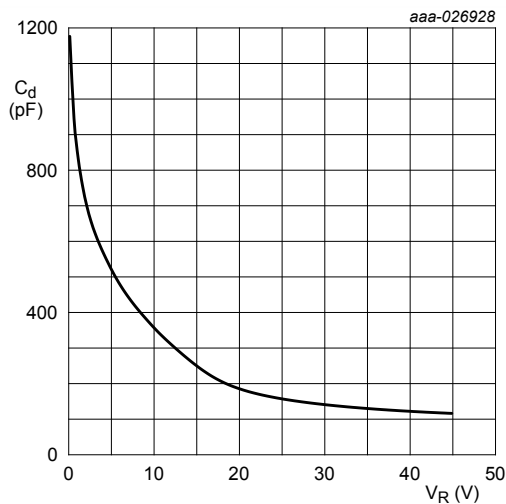
Fig. 3. Forward current as a function of forward voltage; typical values



pulsed condition

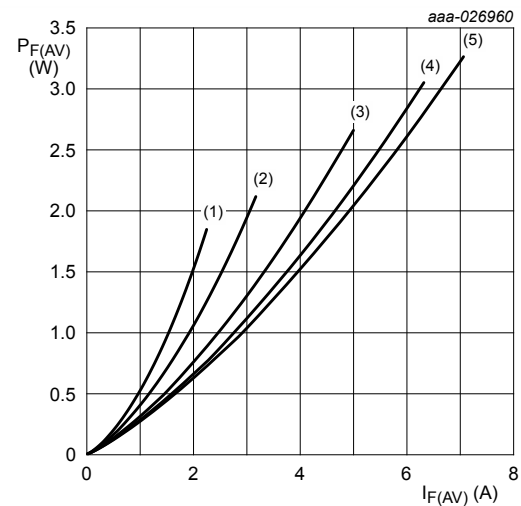
- (1) $T_j = 150\text{ °C}$
- (2) $T_j = 125\text{ °C}$
- (3) $T_j = 100\text{ °C}$
- (4) $T_j = 85\text{ °C}$
- (5) $T_j = 25\text{ °C}$
- (6) $T_j = -40\text{ °C}$

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



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

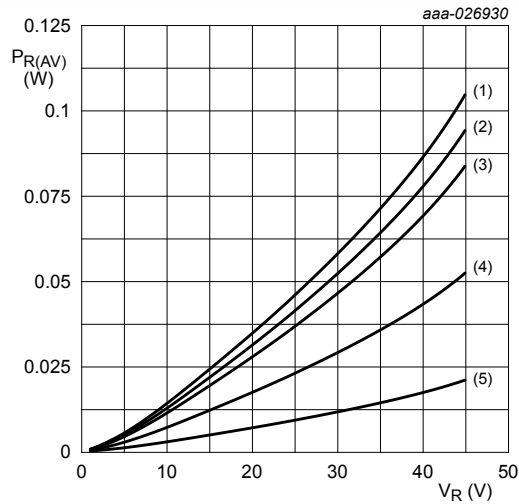
Fig. 5. Diode capacitance as a function of reverse voltage; typical values



$T_j = 100\text{ °C}$

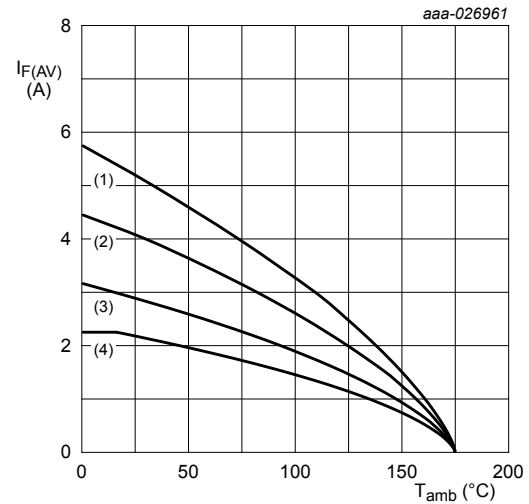
- (1) $\delta = 0.1$
- (2) $\delta = 0.2$
- (3) $\delta = 0.5$
- (4) $\delta = 0.8$
- (5) $\delta = 1$; DC

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



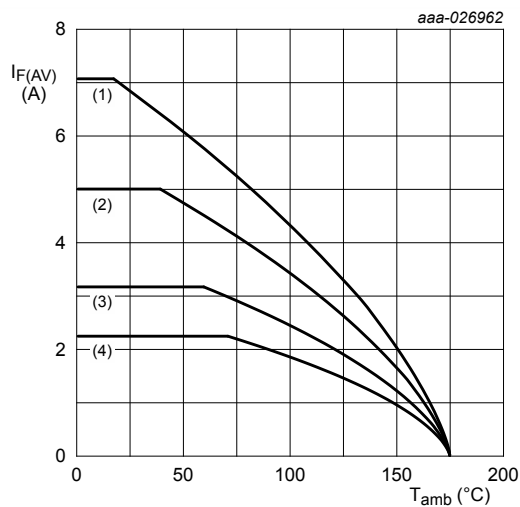
$T_j = 100\text{ °C}$
 (1) $\delta = 1$; DC
 (2) $\delta = 0.9$
 (3) $\delta = 0.8$
 (4) $\delta = 0.5$
 (5) $\delta = 0.2$

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



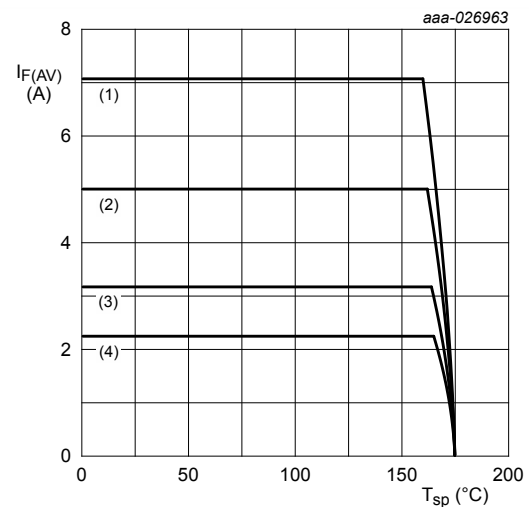
FR4 PCB, standard footprint
 $T_j = 175\text{ °C}$
 (1) $\delta = 1$; DC
 (2) $\delta = 0.5$; $f = 20\text{ kHz}$
 (3) $\delta = 0.2$; $f = 20\text{ kHz}$
 (4) $\delta = 0.1$; $f = 20\text{ kHz}$

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

11. Test information

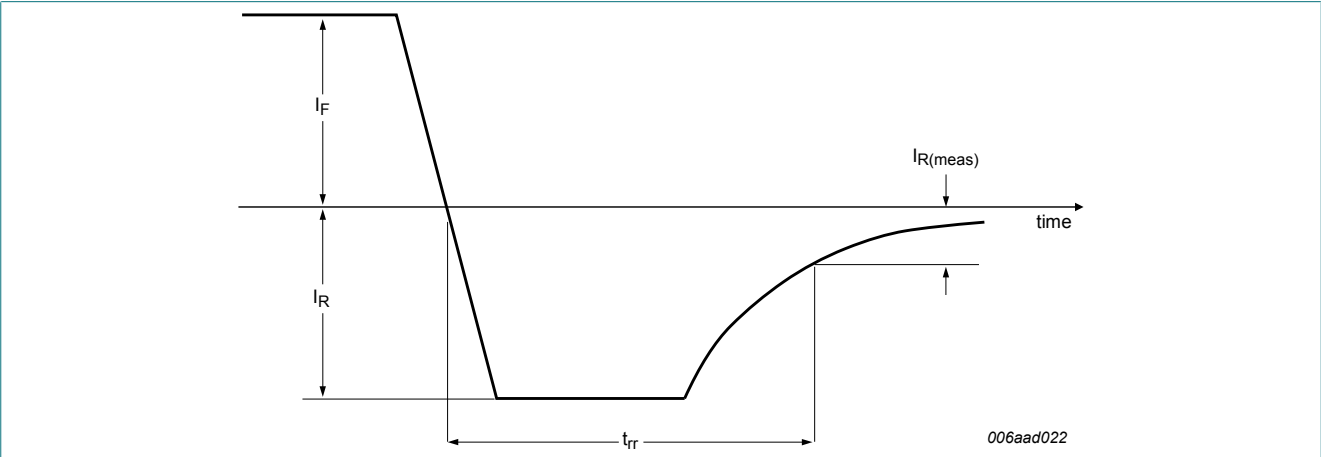


Fig. 11. Reverse recovery definition; step recovery

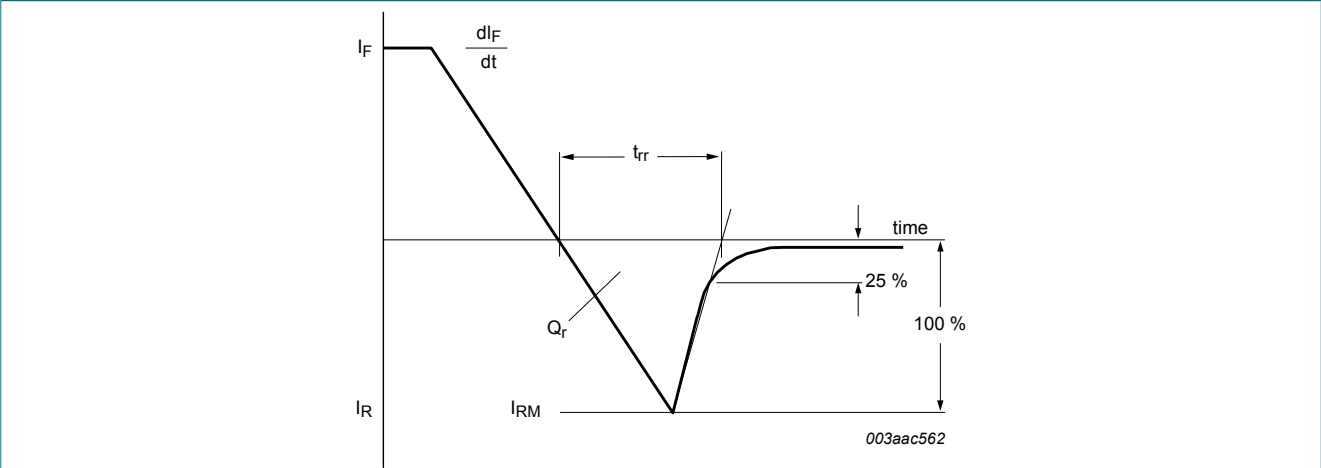


Fig. 12. Reverse recovery definition; ramp recovery

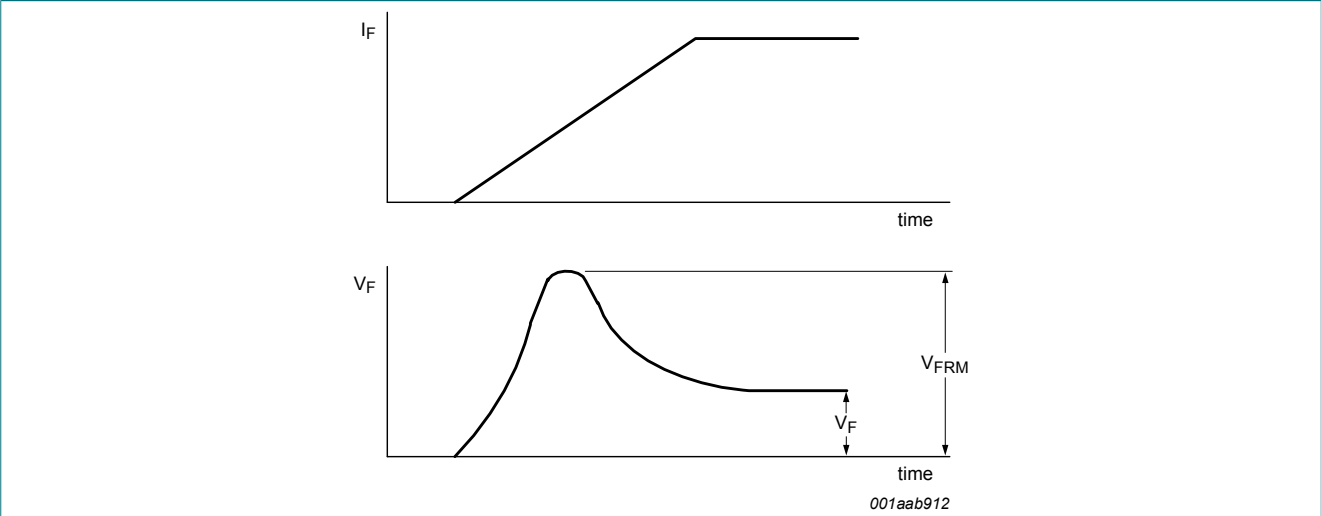


Fig. 13. Forward recovery definition

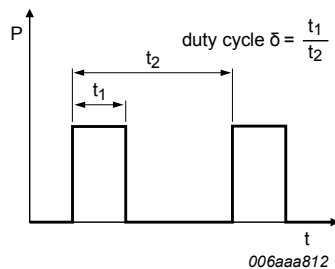


Fig. 14. Duty cycle definition

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

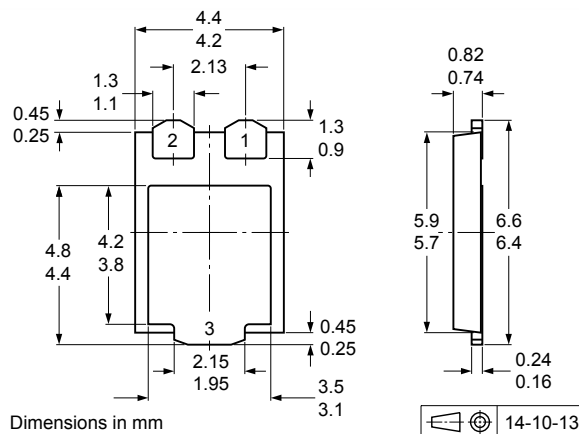


Fig. 15. Package outline CFP15 (SOT1289)

13. Soldering

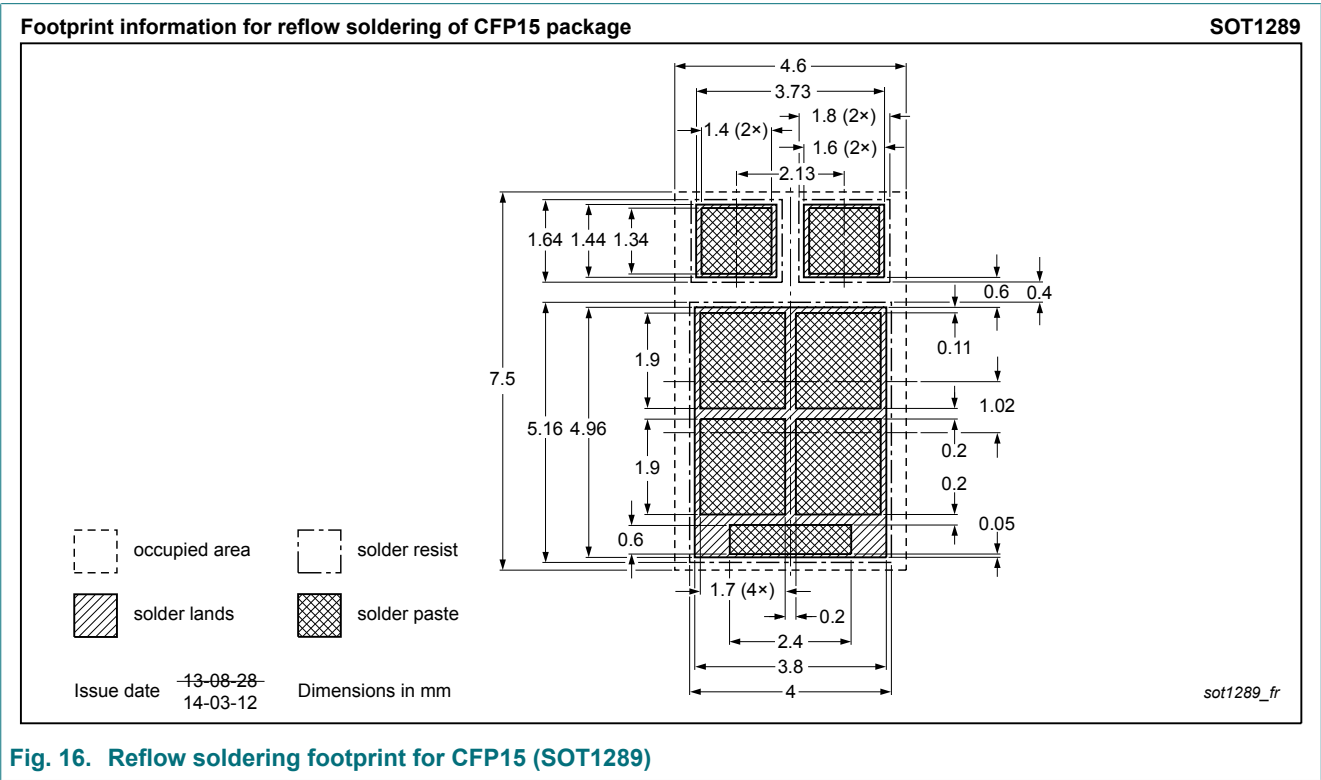


Fig. 16. Reflow soldering footprint for CFP15 (SOT1289)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG045T050EPD v.2	20180608	Product data sheet	-	PMEG045T050EPD v.1
Modifications:	<ul style="list-style-type: none">Figure 3: typo at x-scale corrected			
PMEG045T050EPD v.1	20170728	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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