



# PMEG050T150EIPD

50 V, 15 A low VF Trench MEGA Schottky barrier rectifier

27 November 2019

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:  $I_{F(AV)} \leq 15$  A
- Reverse voltage:  $V_R \leq 50$  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 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

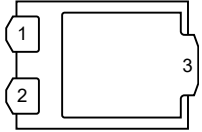
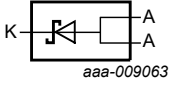
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_R$	reverse voltage	$T_j = 25$ °C		-	-	50	V
$V_F$	forward voltage	$I_F = 15$ A; $T_j = 25$ °C; pulsed	[1]	-	510	570	mV
$I_R$	reverse current	$V_R = 10$ V; $T_j = 25$ °C; pulsed	[1]	-	14	51	$\mu$ A
		$V_R = 50$ V; $T_j = 25$ °C; pulsed	[1]	-	35	200	$\mu$ 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	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
PMEG050T150EIPD	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
PMEG050T150EIPD	050T M15E

## 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	$T_j = 25\text{ °C}$		-	50	V
$I_F$	forward current	$\delta = 1; T_{sp} \leq 118\text{ °C}$		-	21	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 8\text{ ms}$ ; square wave; $T_{j(\text{init})} = 25\text{ °C}$		-	130	A
$P_{\text{tot}}$	total power dissipation	$T_{\text{amb}} \leq 25\text{ °C}$	[1]	-	1.66	W
			[2]	-	2.15	W
$T_j$	junction temperature			-	175	°C
$T_{\text{amb}}$	ambient temperature			-55	175	°C
$T_{\text{stg}}$	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 cm<sup>2</sup>.

## 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<sup>2</sup>.
- [4] Soldering point of cathode tab.

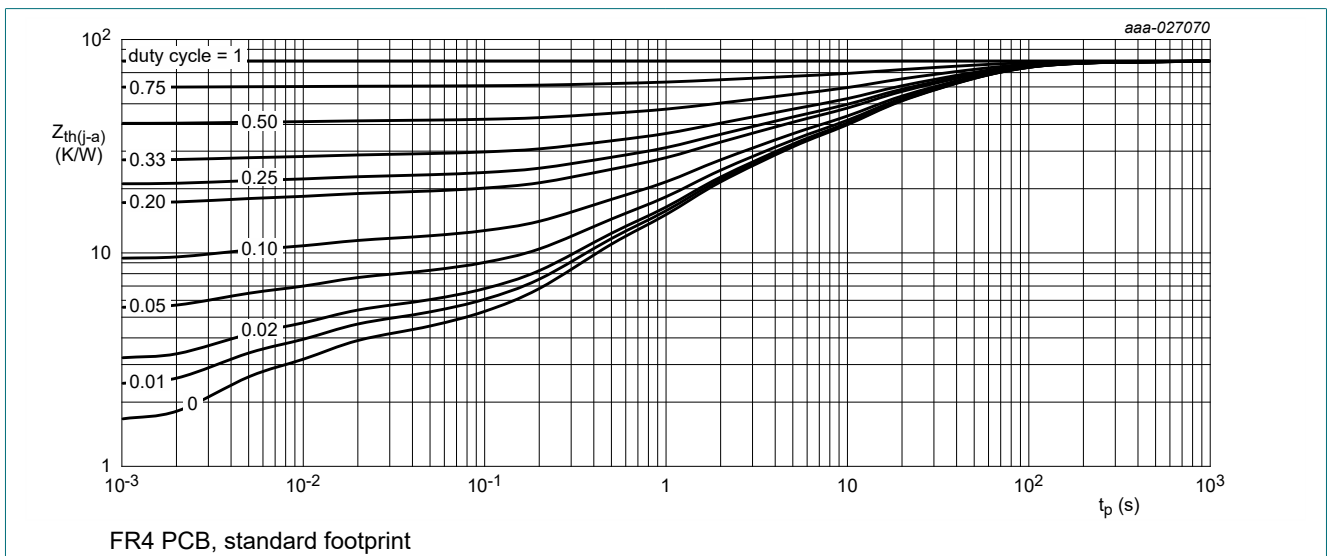


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

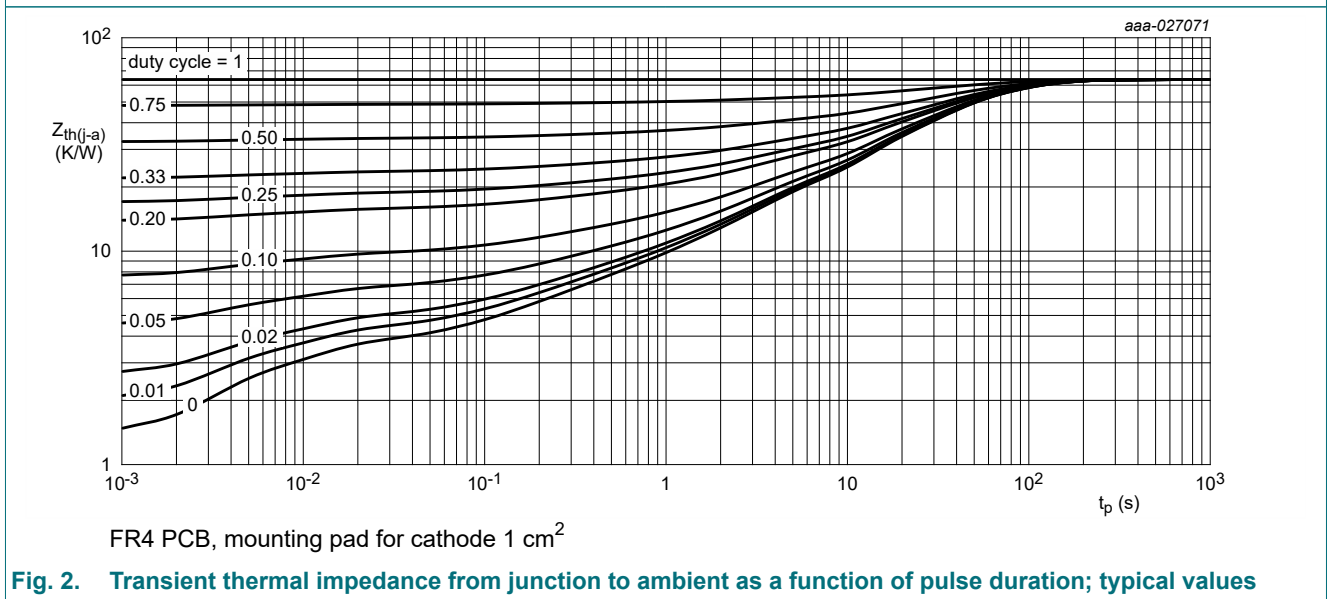


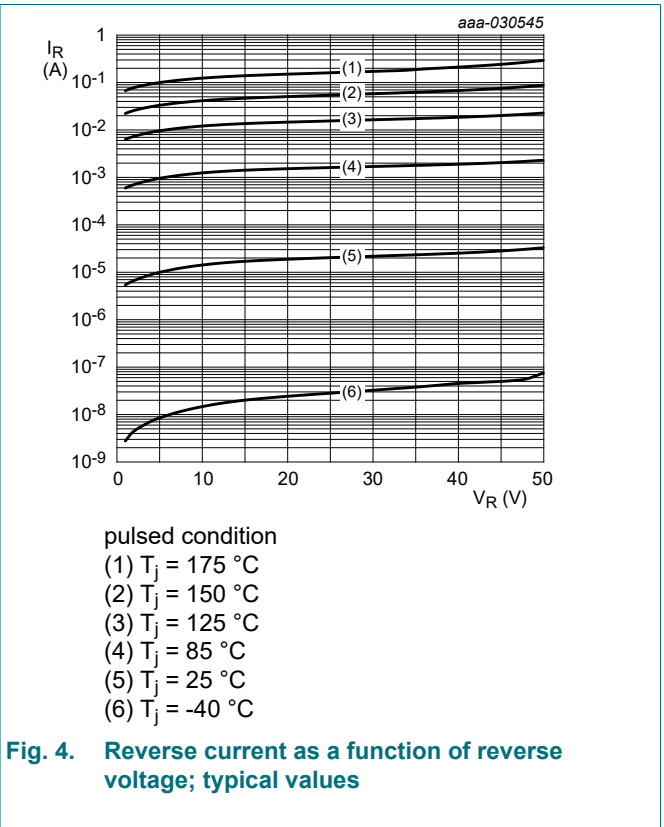
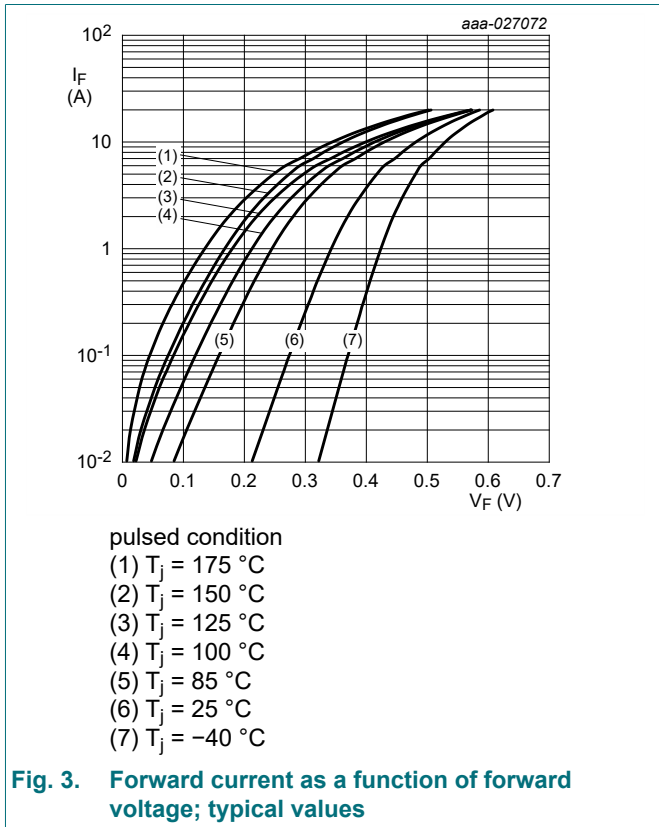
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

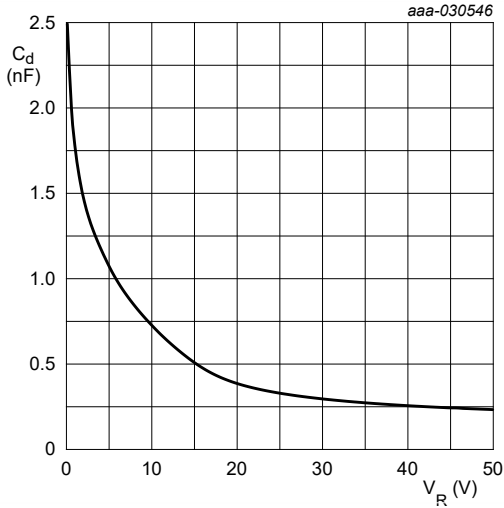
### 10. Characteristics

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]	50	-	V	
$V_F$	forward voltage	$I_F = 1 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	335	375	mV
		$I_F = 5 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	410	460	mV
		$I_F = 10 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	465	520	mV
		$I_F = 15 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	510	570	mV
		$I_F = 15 \text{ A}$ ; $T_j = -40 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	550	-	mV
		$I_F = 15 \text{ A}$ ; $T_j = 125 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	465	-	mV
$I_R$	reverse current	$V_R = 10 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	14	51	$\mu\text{A}$
		$V_R = 30 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	23	-	$\mu\text{A}$
		$V_R = 50 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	35	200	$\mu\text{A}$
		$V_R = 50 \text{ V}$ ; $T_j = 125 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	25	-	mA
$C_d$	diode capacitance	$V_R = 1 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	1.7	-	nF
		$V_R = 10 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	0.72	-	nF
$t_{rr}$	reverse recovery time step recovery	$I_F = 0.5 \text{ A}$ ; $I_R = 0.5 \text{ A}$ ; $I_{R(\text{meas})} = 0.1 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	49	-	ns
	reverse recovery time ramp recovery	$dI_F/dt = 200 \text{ A}/\mu\text{s}$ ; $I_F = 6 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	21	-	ns

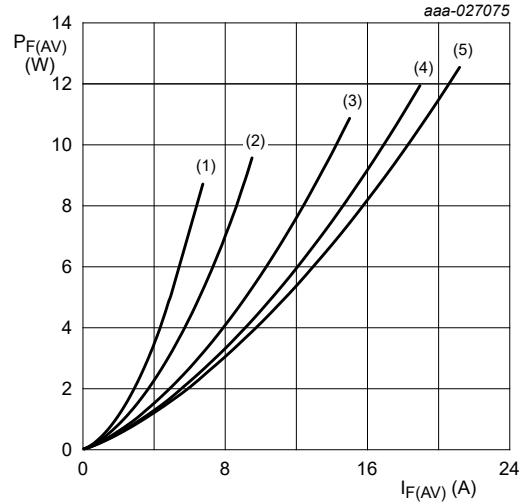
[1] Very short pulse, in order to maintain a stable junction temperature.





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

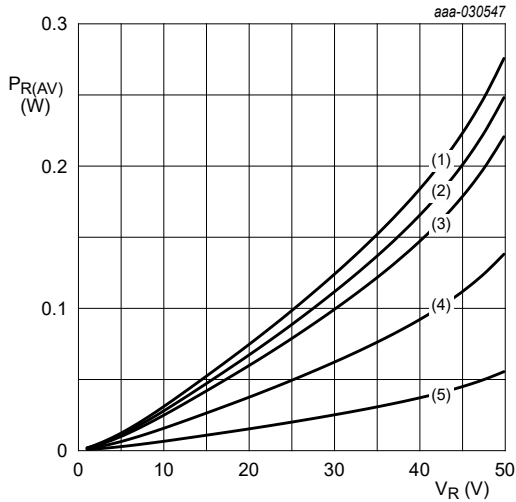
**Fig. 5. Diode capacitance as a function of reverse voltage; typical values**



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

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

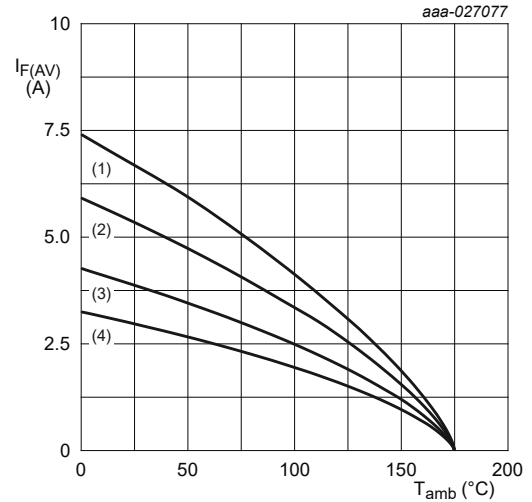
**Fig. 6. Average forward power dissipation as a function of average forward current; typical values**



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

- (1)  $\delta = 1; \text{DC}$
- (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**

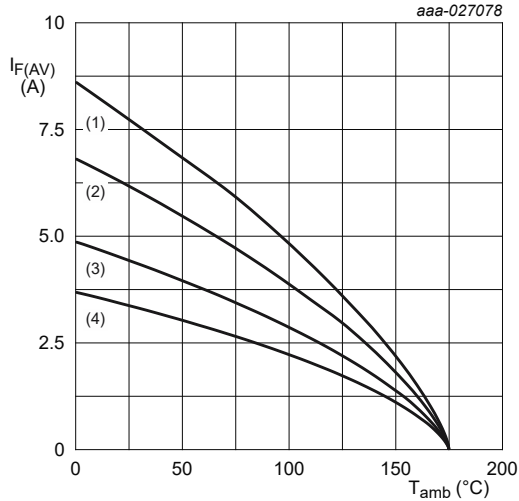


FR4 PCB, standard footprint

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

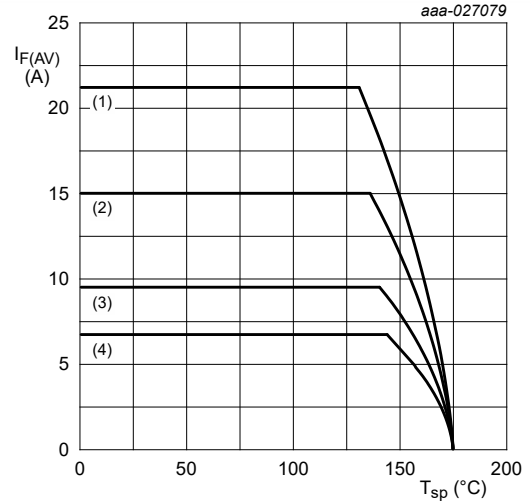
- (1)  $\delta = 1; \text{DC}$
- (2)  $\delta = 0.5; f = 20 \text{ kHz}$
- (3)  $\delta = 0.2; f = 20 \text{ kHz}$
- (4)  $\delta = 0.1; f = 20 \text{ kHz}$

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



FR4 PCB, mounting pad for cathode 1 cm<sup>2</sup>  
 $T_j = 175$  °C  
 (1)  $\delta = 1$ ; DC  
 (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)  $\delta = 1$ ; DC  
 (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

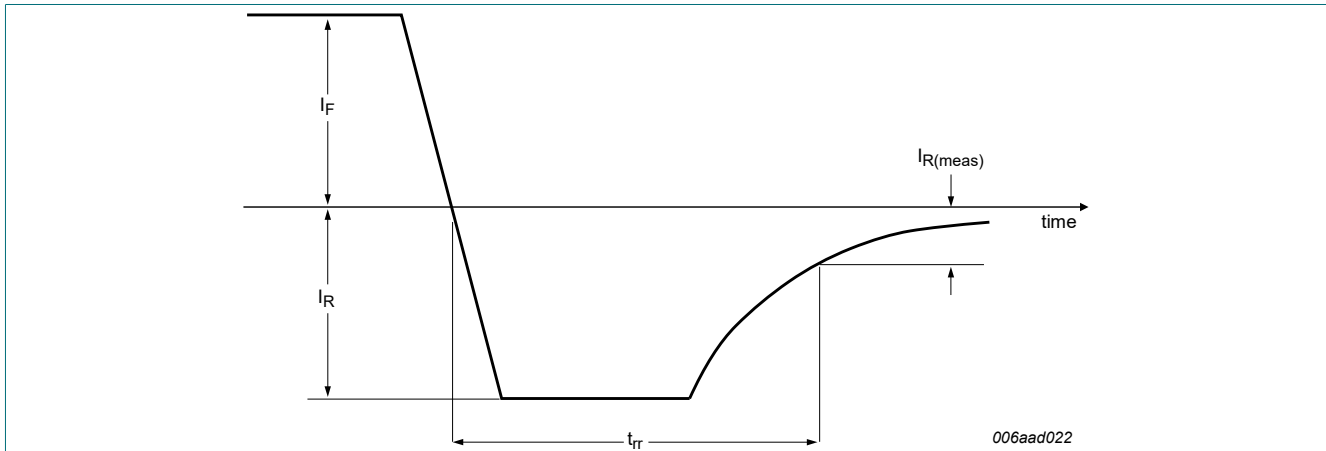


Fig. 11. Reverse recovery definition; step recovery

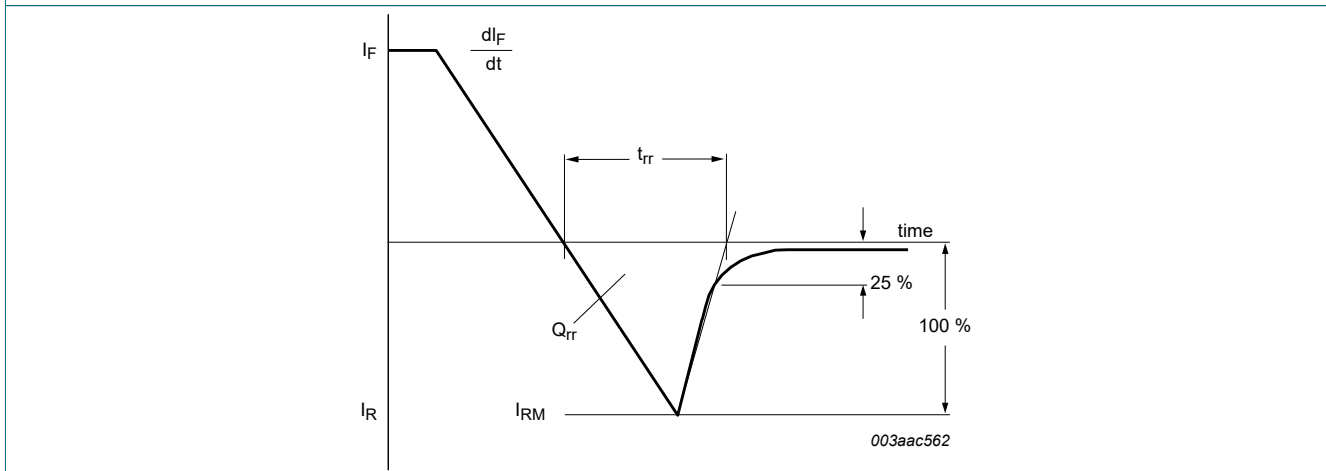


Fig. 12. Reverse recovery definition; ramp recovery

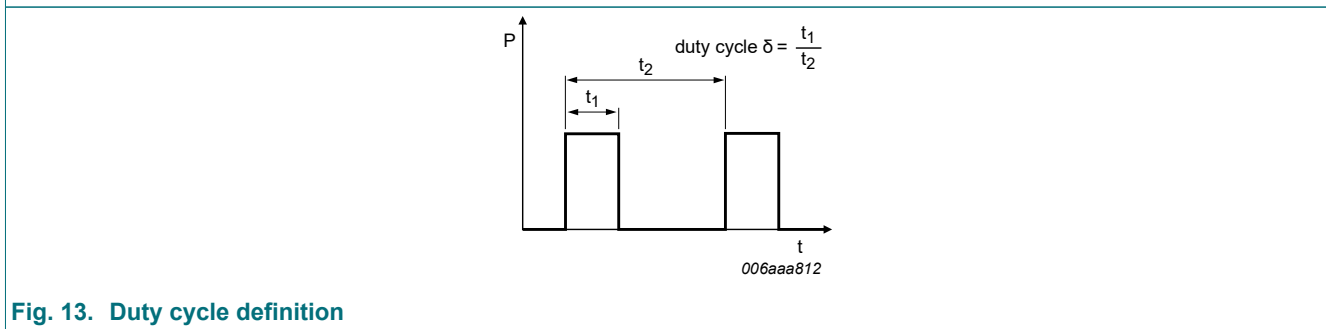


Fig. 13. Duty cycle definition

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

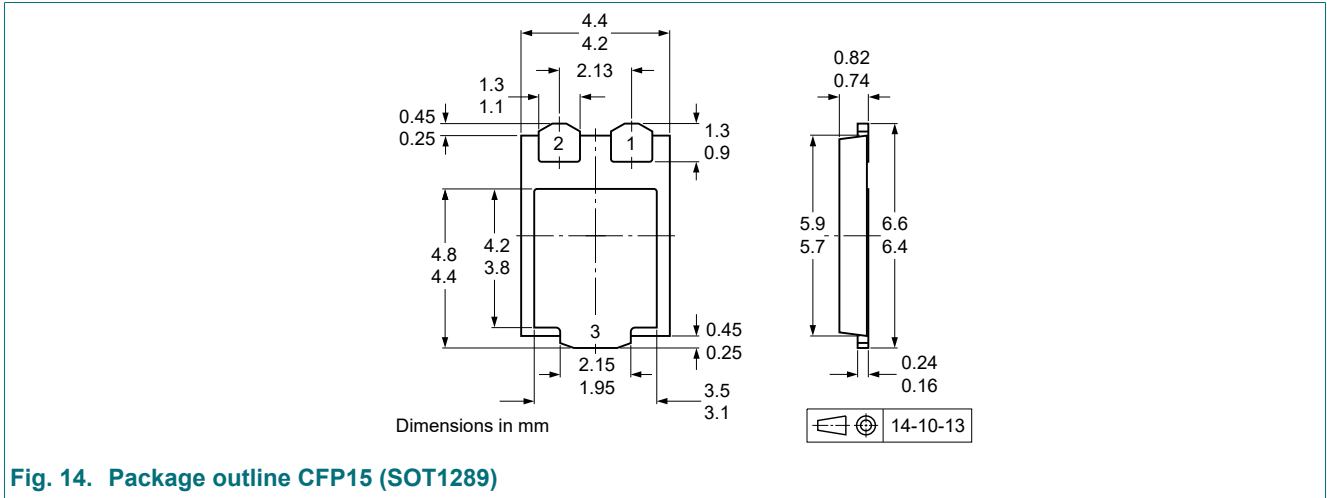


Fig. 14. Package outline CFP15 (SOT1289)

## 13. Soldering

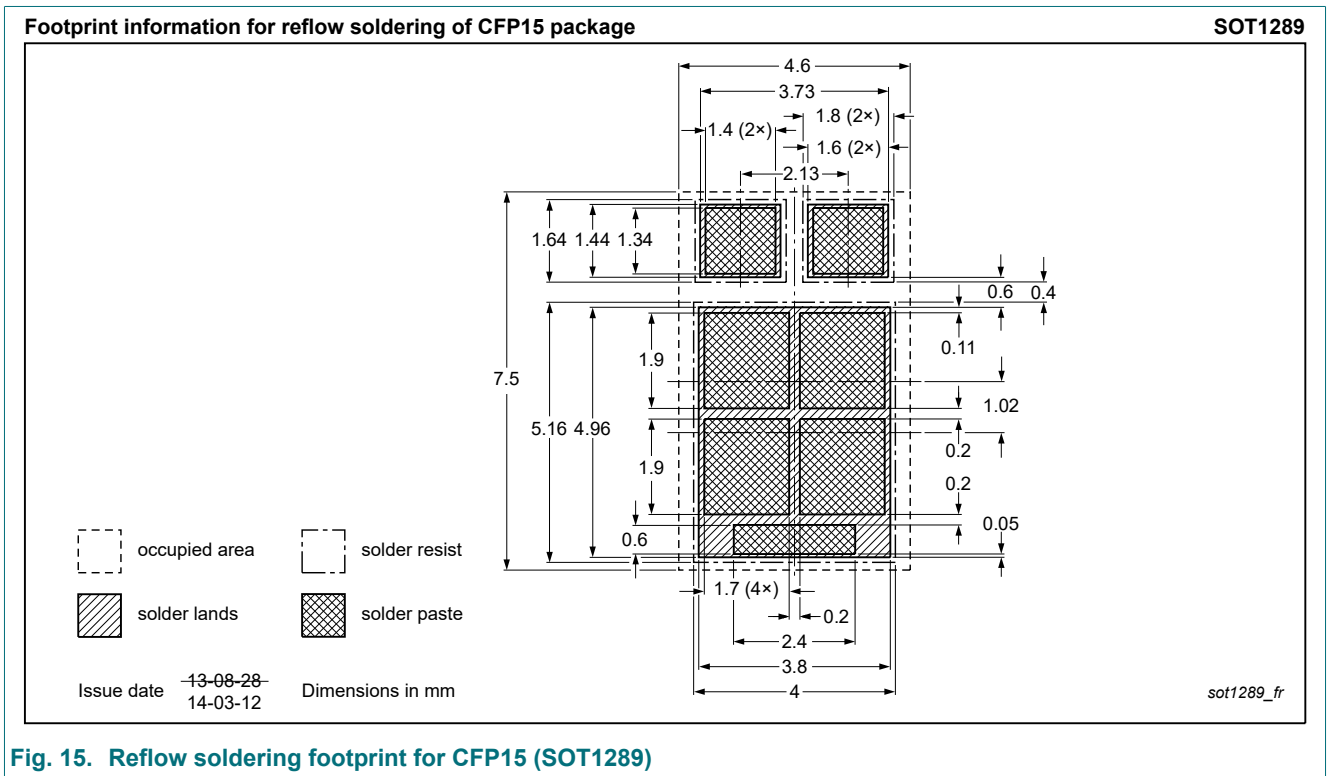


Fig. 15. Reflow soldering footprint for CFP15 (SOT1289)



## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG050T150EIPD v.2	20191127	Product data sheet	-	PMEG050T150EIPD v.1
Modifications:	• Product status changed			
PMEG050T150EIPD v.1	20190830	Objective 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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