



# PMEG050T150EPD

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

27 June 2016

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 power plastic package, typical height 0.78 mm
- AEC-Q101 qualified

## 3. Applications

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

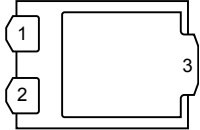
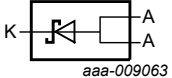
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{F(AV)}$	average forward current	square wave; $\delta = 0.5$ ; $f = 20$ kHz; $T_{sp} \leq 145$ °C	-	-	15	A
$V_R$	reverse voltage	$T_j = 25$ °C	-	-	50	V
$V_F$	forward voltage	$I_F = 15$ A; $t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$ ; $T_j = 25$ °C; pulsed	-	480	550	mV
$I_R$	reverse current	$V_R = 10$ V; $t_p \leq 3$ ms; $\delta \leq 0.03$ ; $T_j = 25$ °C; pulsed	-	16	50	$\mu$ A
		$V_R = 50$ V; $t_p \leq 3$ ms; $\delta \leq 0.03$ ; $T_j = 25$ °C; pulsed	-	34	100	$\mu$ A

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	A	anode	 <p>CFP15 (SOT1289)</p>	
2	A	anode		
3	K	cathode		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMEG050T150EPD	CFP15	plastic, thermal enhanced ultra thin SMD package; 3 leads; body: 5.8 x 4.3 x 0.78 mm	SOT1289

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PMEG050T150EPD	050T U15E

## 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	$T_{sp} = 140\text{ °C}; \delta = 1$		-	21	A
$I_{F(AV)}$	average forward current	square wave; $\delta = 0.5$ ; $f = 20\text{ kHz}; T_{sp} \leq 145\text{ °C}$		-	15	A
$I_{FSM}$	non-repetitive peak forward current	square wave; $t_p = 8\text{ ms}; T_{j(\text{init})} = 25\text{ °C}$		-	210	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1]	-	1.66	W
			[2]	-	2.15	W
			[3]	-	3.5	W
$T_j$	junction temperature			-	175	°C
$T_{amb}$	ambient temperature			-55	175	°C
$T_{stg}$	storage temperature			-65	175	°C

[1] Device mounted on an FR4 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>.

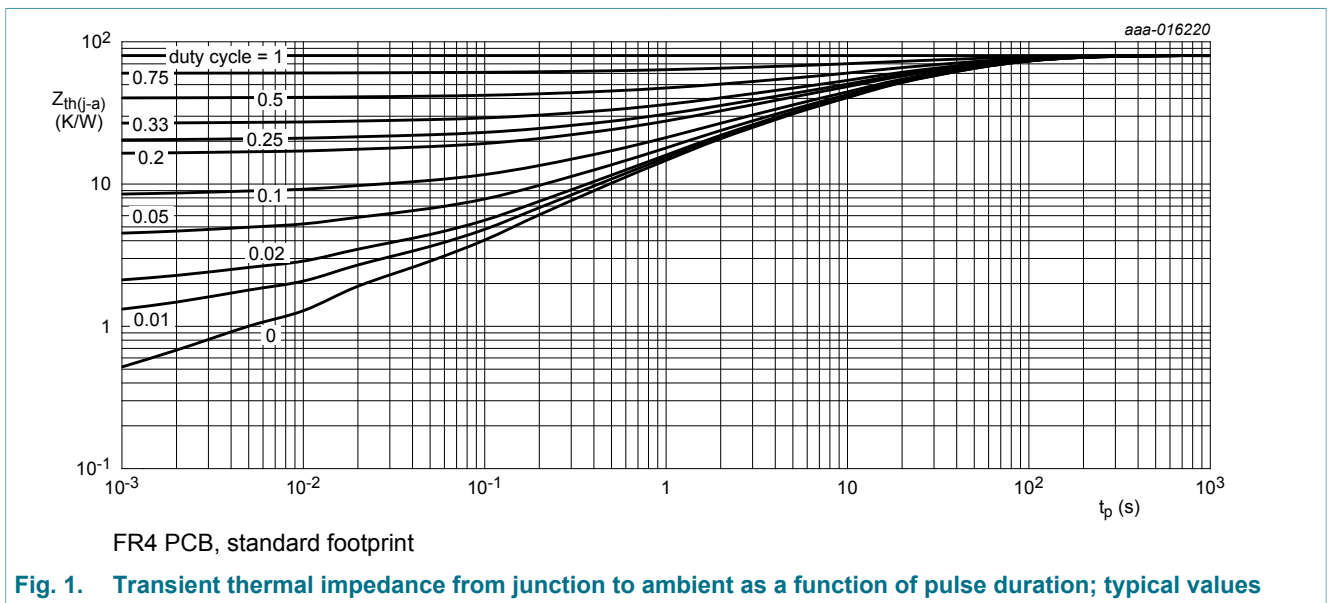
[3] Device mounted on a ceramic Printed-Circuit Board (PCB), Al<sub>2</sub>O<sub>3</sub>, standard footprint.

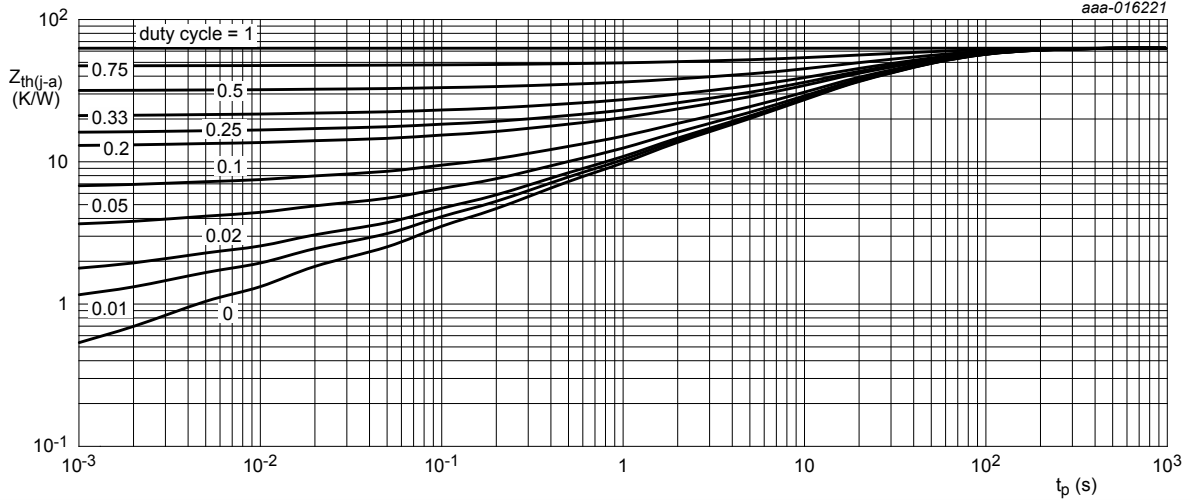
## 9. Thermal characteristics

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
			[1][4]	-	-	42	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[5]	-	-	3	K/W

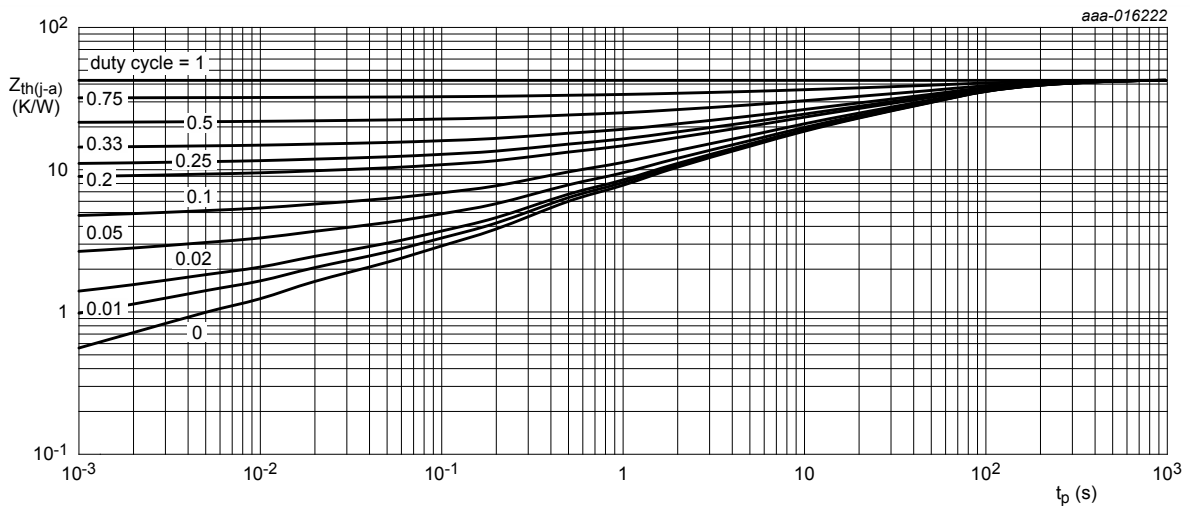
- [1] For Schottky barrier diodes thermal runaway has to be considered, as in some applications the reverse power losses  $P_R$  are a significant part of the total power losses.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm<sup>2</sup>.
- [4] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.
- [5] Soldering point of cathode tab.





FR4 PCB, mounting pad for cathode  $1\text{ cm}^2$

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



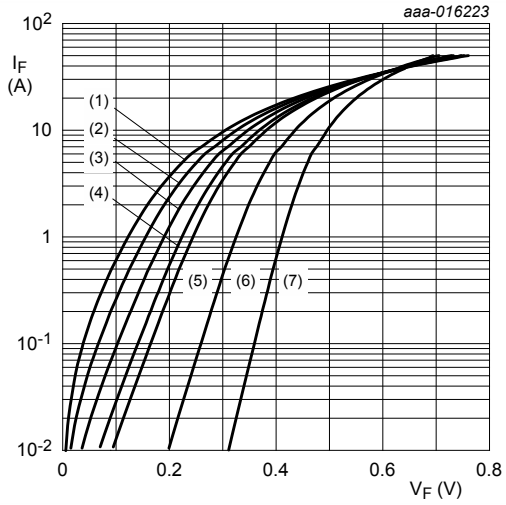
Ceramic PCB,  $\text{Al}_2\text{O}_3$ , standard footprint

**Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**

## 10. Characteristics

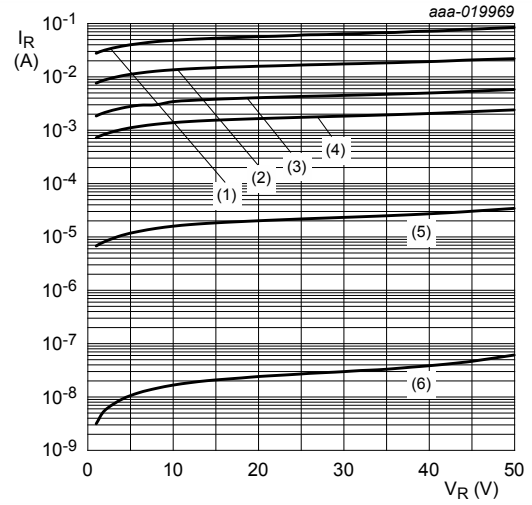
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)R}$	reverse breakdown voltage	$I_R = 5 \text{ mA}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; $t_p \leq 1.2 \text{ ms}$ ; $\delta \leq 0.12$ ; pulsed	50	-	-	V
$V_F$	forward voltage	$I_F = 1 \text{ A}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	-	320	380	mV
		$I_F = 5 \text{ A}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	-	390	460	mV
		$I_F = 10 \text{ A}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	-	440	-	mV
		$I_F = 15 \text{ A}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	-	480	550	mV
		$I_F = 15 \text{ A}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 125 \text{ }^\circ\text{C}$ ; pulsed	-	405	-	mV
$I_R$	reverse current	$V_R = 5 \text{ V}$ ; $t_p \leq 3 \text{ ms}$ ; $\delta \leq 0.03$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	-	12	-	$\mu\text{A}$
		$V_R = 10 \text{ V}$ ; $t_p \leq 3 \text{ ms}$ ; $\delta \leq 0.03$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	-	16	50	$\mu\text{A}$
		$V_R = 50 \text{ V}$ ; $t_p \leq 3 \text{ ms}$ ; $\delta \leq 0.03$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	-	34	100	$\mu\text{A}$
		$V_R = 50 \text{ V}$ ; $t_p \leq 3 \text{ ms}$ ; $\delta \leq 0.03$ ; $T_j = 125 \text{ }^\circ\text{C}$ ; pulsed	-	22	-	mA
$C_d$	diode capacitance	$V_R = 1 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	2200	-	pF
		$V_R = 10 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	800	-	pF
$t_{rr}$	reverse recovery time step recovery	$I_F = 0.5 \text{ A}$ ; $I_R = 1 \text{ A}$ ; $I_{R(\text{meas})} = 0.25 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	60	-	ns
$V_{FRM}$	peak forward recovery voltage	$I_F = 0.5 \text{ A}$ ; $dI_F/dt = 20 \text{ A}/\mu\text{s}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	305	-	mV



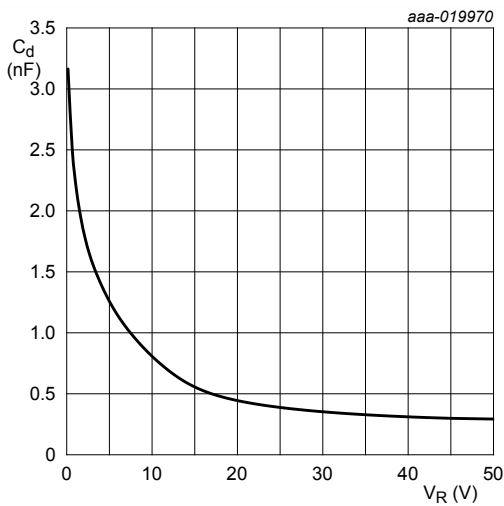
- pulsed condition
- (1)  $T_j = 175\text{ }^\circ\text{C}$
  - (2)  $T_j = 150\text{ }^\circ\text{C}$
  - (3)  $T_j = 125\text{ }^\circ\text{C}$
  - (4)  $T_j = 100\text{ }^\circ\text{C}$
  - (5)  $T_j = 85\text{ }^\circ\text{C}$
  - (6)  $T_j = 25\text{ }^\circ\text{C}$
  - (7)  $T_j = -40\text{ }^\circ\text{C}$

Fig. 4. Forward current as a function of forward voltage; typical values



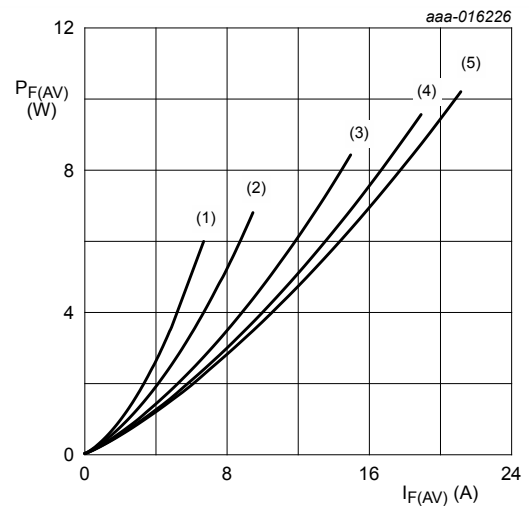
- pulsed condition
- (1)  $T_j = 150\text{ }^\circ\text{C}$
  - (2)  $T_j = 125\text{ }^\circ\text{C}$
  - (3)  $T_j = 100\text{ }^\circ\text{C}$
  - (4)  $T_j = 85\text{ }^\circ\text{C}$
  - (5)  $T_j = 25\text{ }^\circ\text{C}$
  - (6)  $T_j = -40\text{ }^\circ\text{C}$

Fig. 5. Reverse current as a function of reverse voltage; typical values



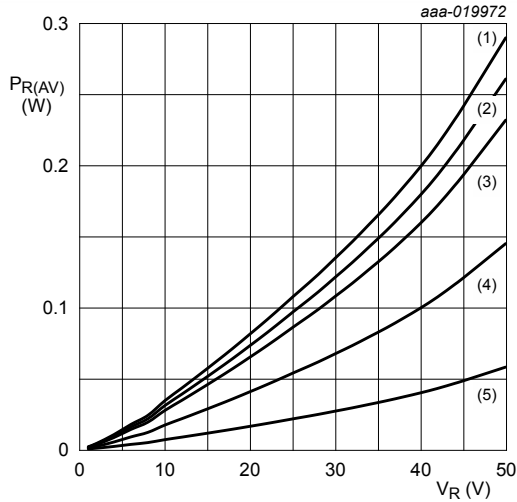
$f = 1\text{ MHz}; T_{\text{amb}} = 25\text{ }^\circ\text{C}$

Fig. 6. Diode capacitance as a function of reverse voltage; typical values



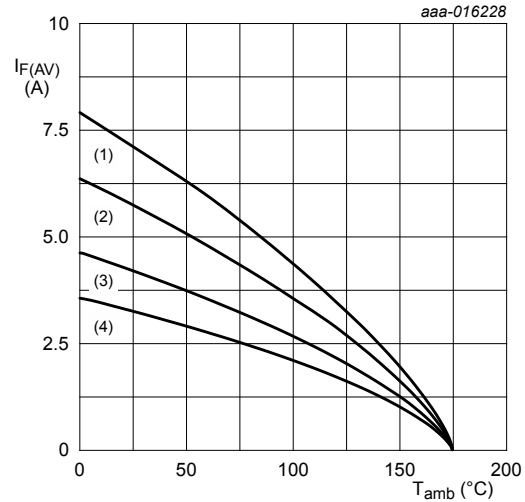
- $T_j = 100\text{ }^\circ\text{C}$
- (1)  $\delta = 0.1$
  - (2)  $\delta = 0.2$
  - (3)  $\delta = 0.5$
  - (4)  $\delta = 0.8$
  - (5)  $\delta = 1$

Fig. 7. Average forward power dissipation as a function of average forward current; typical values



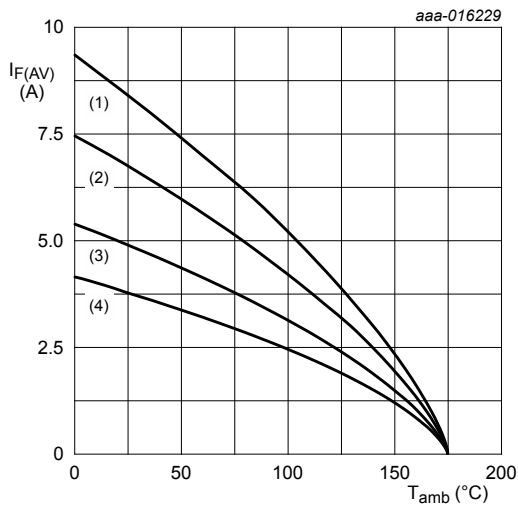
$T_j = 100\text{ °C}$   
 (1)  $\delta = 1$   
 (2)  $\delta = 0.9$   
 (3)  $\delta = 0.8$   
 (4)  $\delta = 0.5$   
 (5)  $\delta = 0.2$

**Fig. 8.** Average reverse power dissipation as a function of reverse voltage; typical values



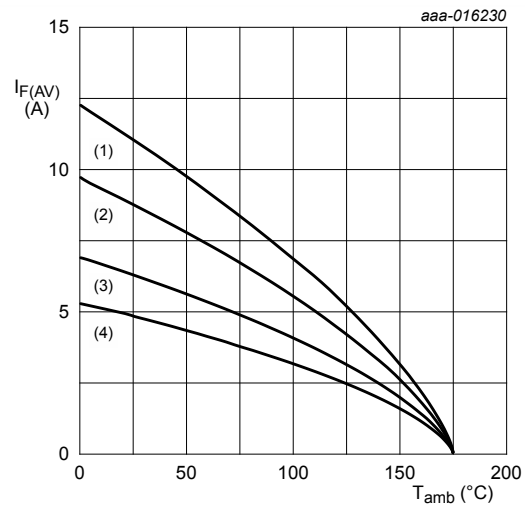
FR4 PCB, standard footprint  
 $T_j = 175\text{ °C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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



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

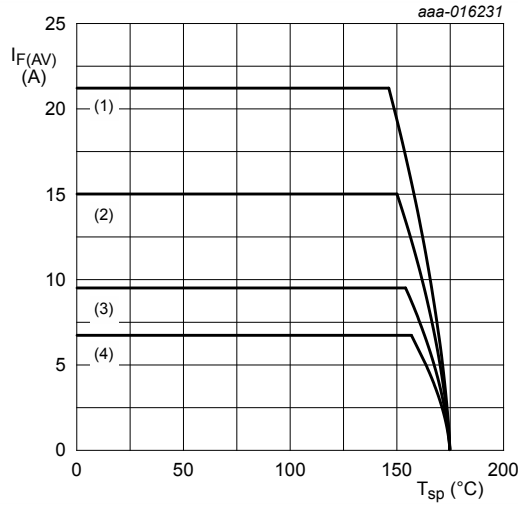
**Fig. 10.** Average forward current as a function of ambient temperature; typical values



Ceramic PCB,  $\text{Al}_2\text{O}_3$ , 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. 11.** 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. 12. Average forward current as a function of solder point temperature; typical values

### 11. Test information

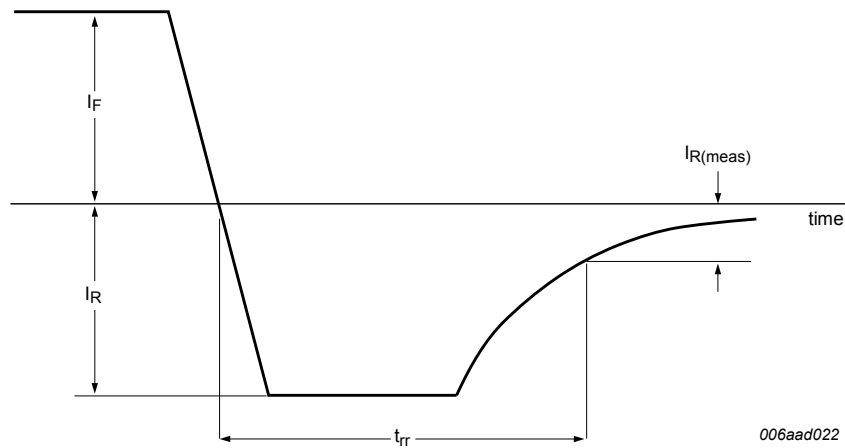


Fig. 13. Reverse recovery definition; step recovery

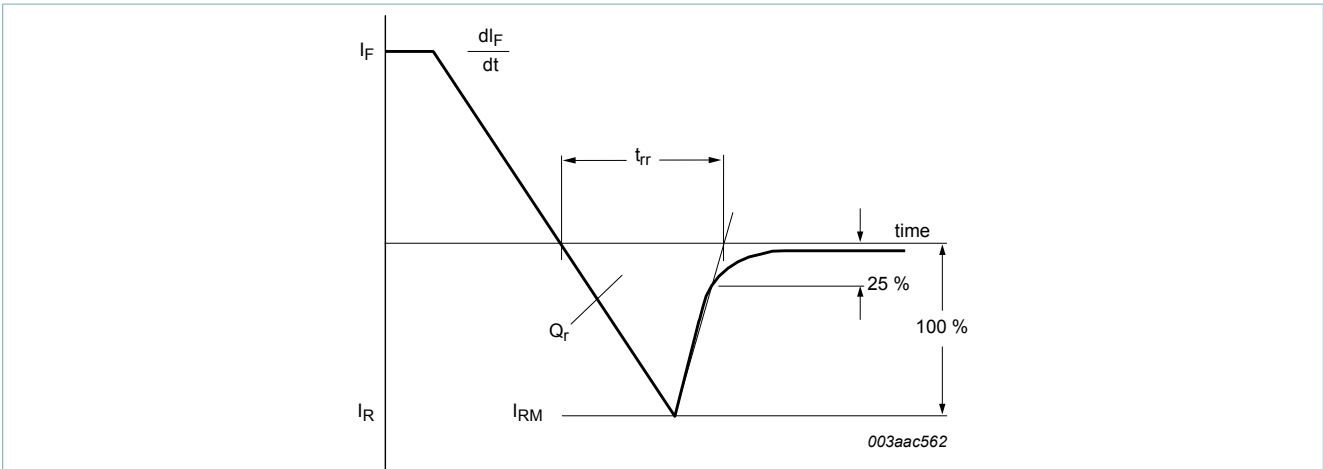


Fig. 14. Reverse recovery definition; ramp recovery

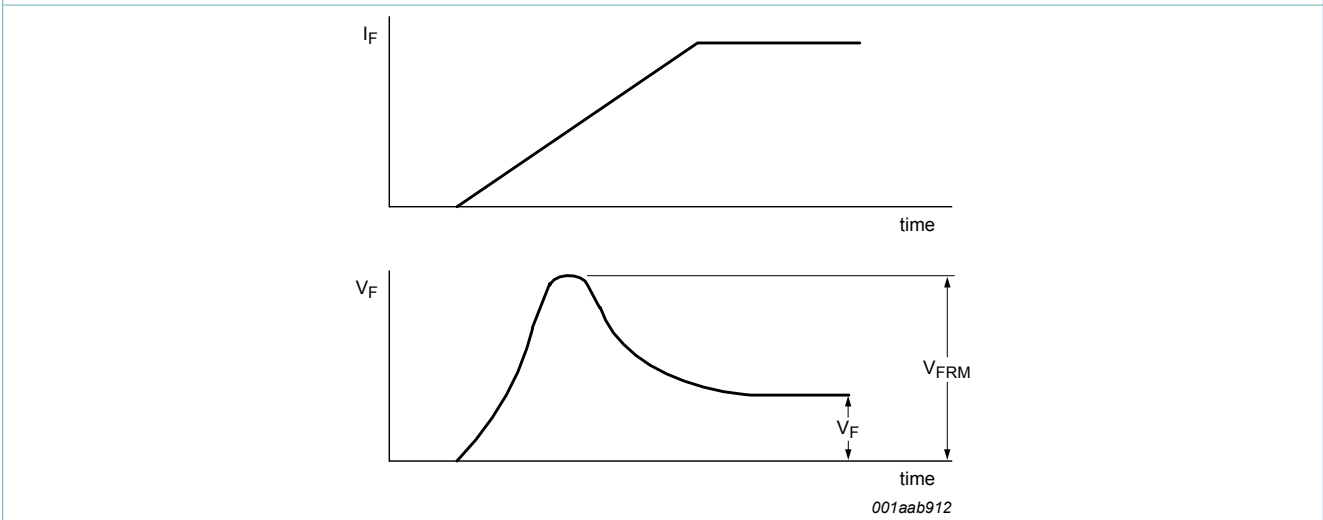


Fig. 15. Forward recovery definition

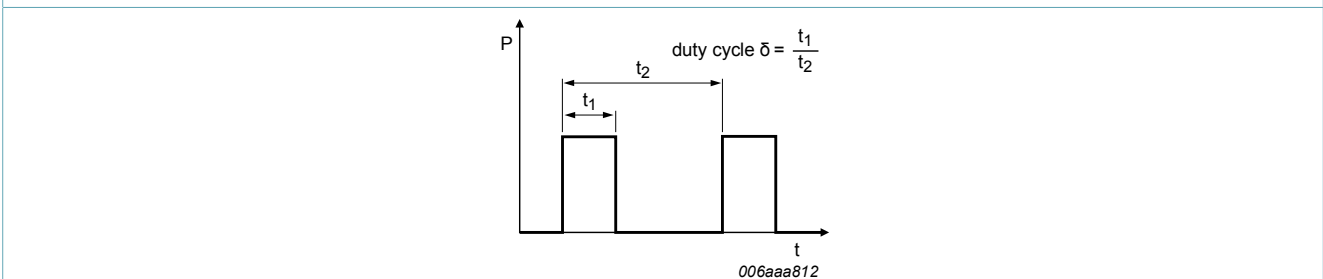


Fig. 16. Duty cycle definition

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.

**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

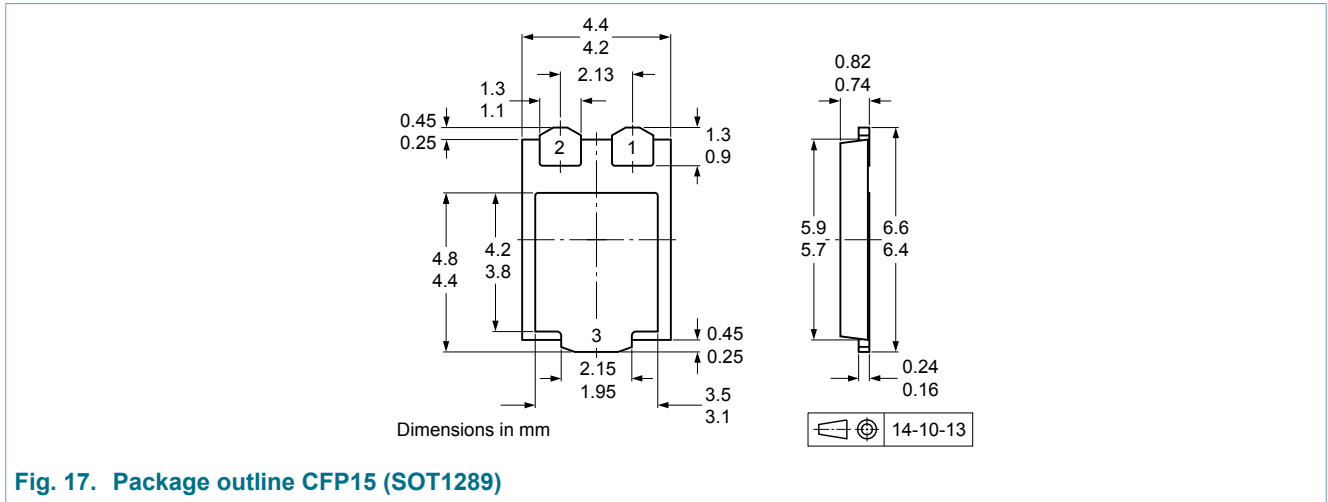


Fig. 17. Package outline CFP15 (SOT1289)

## 13. Soldering

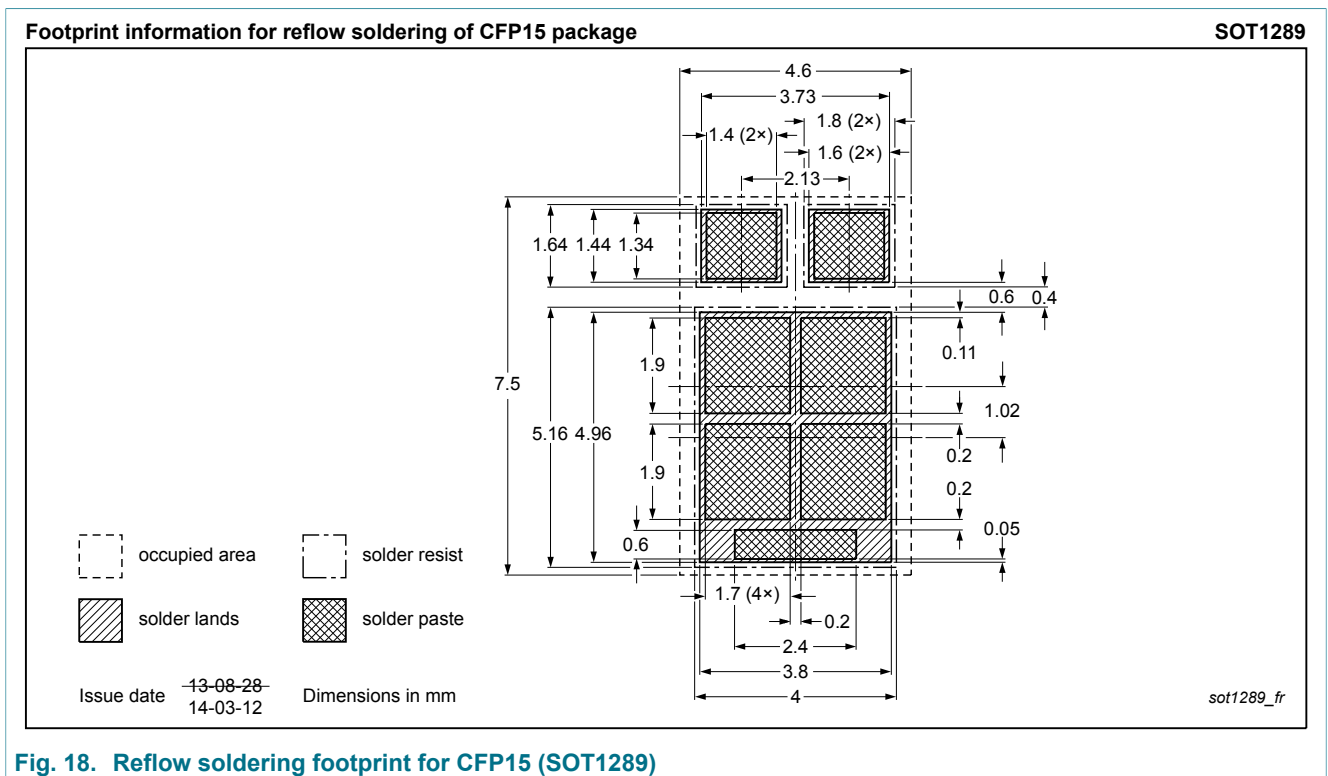


Fig. 18. Reflow soldering footprint for CFP15 (SOT1289)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG050T150EPD v.3	20160627	Product data sheet	-	PMEG050T150EPD v.2
Modification:	• Section 7: Marking code corrected			
PMEG050T150EPD v.2	20151218	Product data sheet	-	PMEG050T150EPD v.1
PMEG050T150EPD v.1	20150930	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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 27 June 2016

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