



# THE DATASHEET OF PMEG040V050EPDZ





# PMEG040V050EPD

40 V, 5 A low VF MEGA Schottky barrier rectifier

26 July 2016

Product data sheet

## 1. General description

Planar Maximum Efficiency General Application (MEGA) Schottky barrier rectifier with an integrated guard ring for stress protection, 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:  $V_R \leq 40$  V
- Extremely low forward voltage
- 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

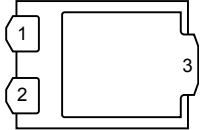
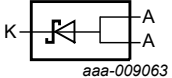
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{F(AV)}$	average forward current	square wave; $\delta = 0.5$ ; $f = 20$ kHz; $T_{sp} \leq 158$ °C	-	-	5	A
$V_R$	reverse voltage	$T_j = 25$ °C	-	-	40	V
$V_F$	forward voltage	$I_F = 5$ A; $t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$ ; $T_j = 25$ °C	-	475	520	mV
$I_R$	reverse current	$V_R = 10$ V; $T_j = 25$ °C; pulsed	[1]	6	52	$\mu$ A
		$V_R = 40$ V; $T_j = 25$ °C; pulsed	[1]	32	120	$\mu$ A

[1] Very short test pulse to prevent junction self heating

## 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
PMEG040V050EPD	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
PMEG040V050EPD	040V U05E

## 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	$T_j = 25\text{ °C}$		-	40	V
$I_F$	forward current	$T_{sp} \leq 154\text{ °C}; \delta = 1$		-	7	A
$I_{F(AV)}$	average forward current	square wave; $\delta = 0.5$ ; $f = 20\text{ kHz}; T_{sp} \leq 158\text{ °C}$		-	5	A
$I_{FSM}$	non-repetitive peak forward current	square wave; $t_p = 8\text{ ms}; T_{j(\text{init})} = 25\text{ °C}$		-	120	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1]	-	1.66	W
			[2]	-	2.15	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  $1\text{ cm}^2$ .

## 9. Thermal characteristics

**Table 6. Thermal characteristics**

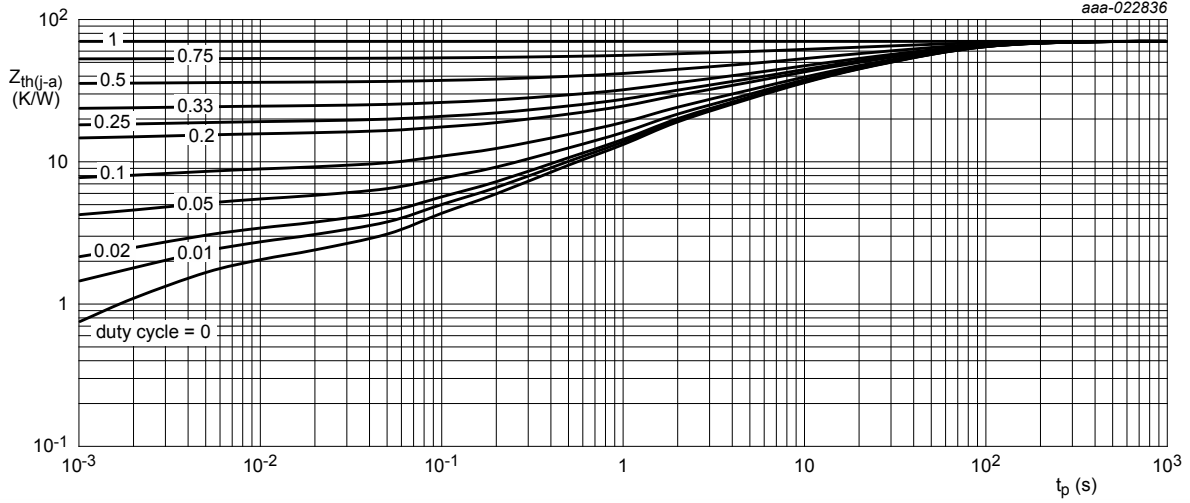
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1][2]	-	-	90	K/W
			[1][3]	-	-	70	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[4]	-	-	3	K/W

[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.

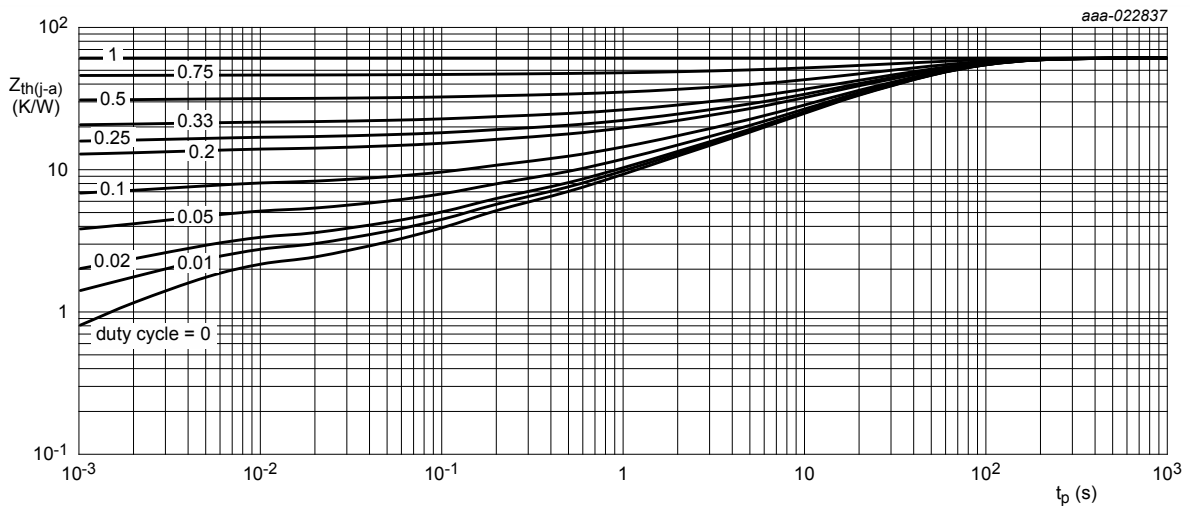
[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode  $1\text{ cm}^2$ .

[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 cm<sup>2</sup>

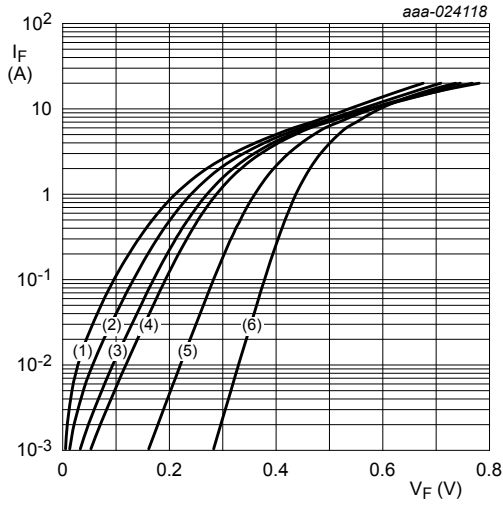
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)R}$	reverse breakdown voltage	$I_R = 3 \text{ mA}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	40	-	-	V
$V_F$	forward voltage	$I_F = 0.1 \text{ A}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	285	320	mV
		$I_F = 1 \text{ A}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	360	420	mV
		$I_F = 1.5 \text{ A}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	380	435	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	-	mV
		$I_F = 3 \text{ A}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	425	490	mV
		$I_F = 5 \text{ A}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	475	520	mV
		$I_F = 5 \text{ A}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = -40 \text{ }^\circ\text{C}$		-	515	-	mV
		$I_F = 5 \text{ A}$ ; $t_p \leq 300 \text{ } \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 125 \text{ }^\circ\text{C}$		-	415	-	mV
$I_R$	reverse current	$V_R = 10 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	6	52	$\mu\text{A}$
		$V_R = 30 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	17	-	$\mu\text{A}$
		$V_R = 40 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	32	120	$\mu\text{A}$
		$V_R = 40 \text{ V}$ ; $T_j = 125 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	18	-	$\text{mA}$
$C_d$	diode capacitance	$V_R = 1 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	395	-	$\text{pF}$
		$V_R = 4 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	210	-	$\text{pF}$
		$V_R = 10 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	130	-	$\text{pF}$
$t_{rr}$	reverse recovery time step recovery	$I_F = 0.5 \text{ A}$ ; $I_R = 0.5 \text{ A}$ ; $I_{R(\text{meas})} = 0.1 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	13	-	ns
	reverse recovery time ramp recovery	$dI_F/dt = 200 \text{ A}/\mu\text{s}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; $I_F = 6 \text{ A}$ ; $V_R = 26 \text{ V}$		-	11	-	ns

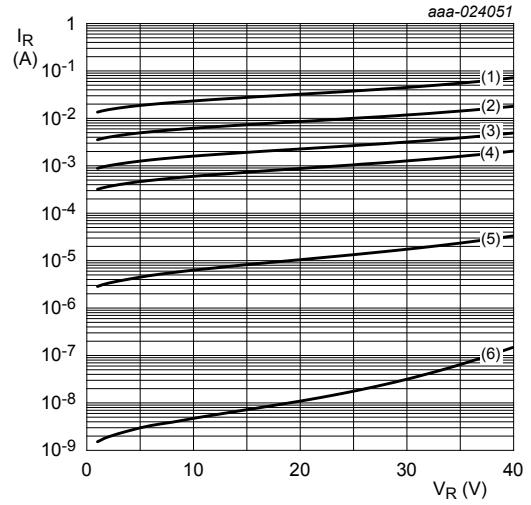
[1] Very short test pulse to prevent junction self heating



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)  $T_j = -40\text{ °C}$

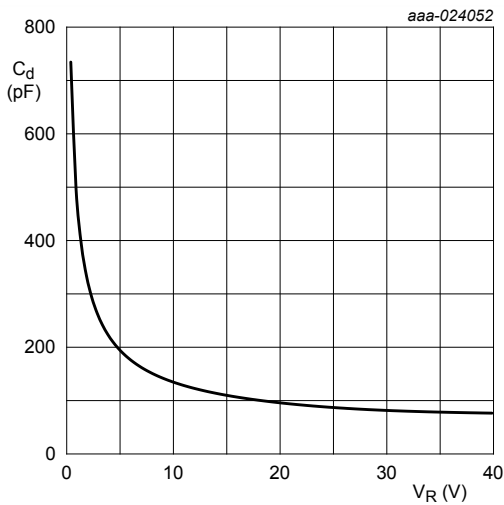
**Fig. 3. Forward current as a function of forward voltage; typical values**



pulsed condition

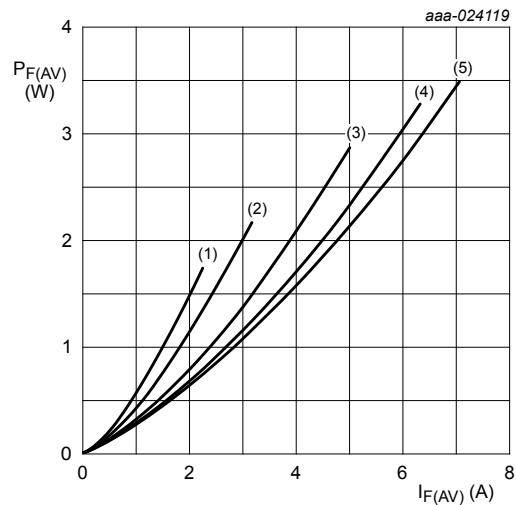
- (1)  $T_j = 150\text{ °C}$
- (2)  $T_j = 125\text{ °C}$
- (3)  $T_j = 100\text{ °C}$
- (4)  $T_j = 85\text{ °C}$
- (5)  $T_j = 25\text{ °C}$
- (6)  $T_j = -40\text{ °C}$

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



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

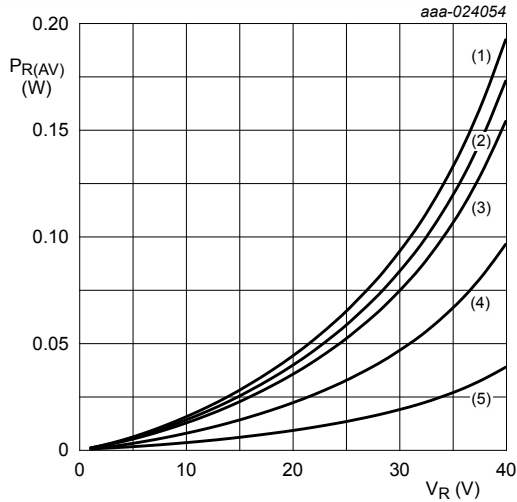
**Fig. 5. Diode capacitance as a function of reverse voltage; typical values**



$T_j = 100\text{ °C}$

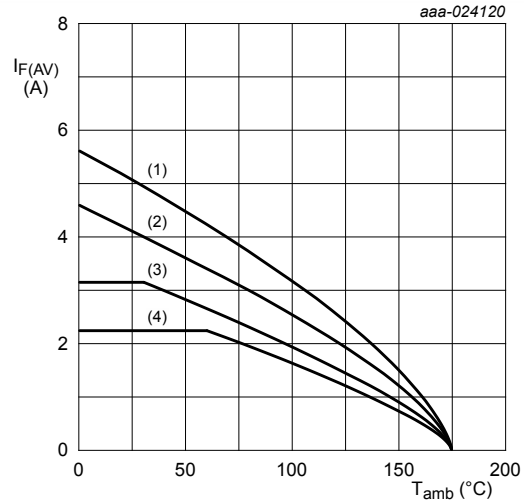
- (1)  $\delta = 0.1$
- (2)  $\delta = 0.2$
- (3)  $\delta = 0.5$
- (4)  $\delta = 0.8$
- (5)  $\delta = 1$

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



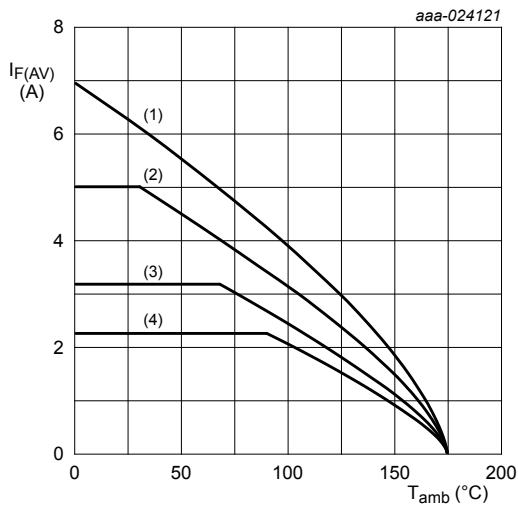
$T_j = 100\text{ }^\circ\text{C}$   
 (1)  $\delta = 1$   
 (2)  $\delta = 0.9$   
 (3)  $\delta = 0.8$   
 (4)  $\delta = 0.5$   
 (5)  $\delta = 0.2$

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



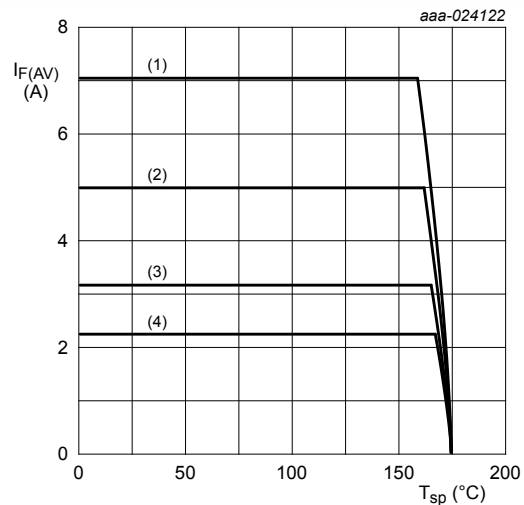
FR4 PCB, standard footprint  
 $T_j = 175\text{ }^\circ\text{C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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



FR4 PCB, mounting pad for cathode  $1\text{ cm}^2$   
 $T_j = 175\text{ }^\circ\text{C}$   
 (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**



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

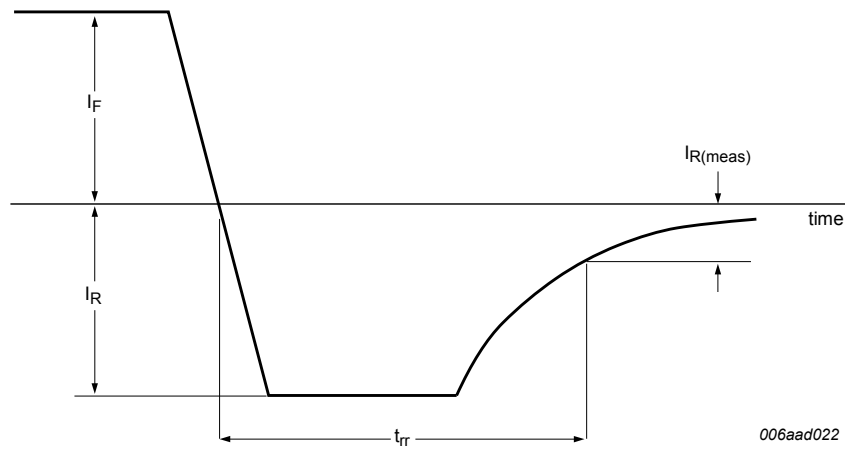


Fig. 11. Reverse recovery definition; step recovery

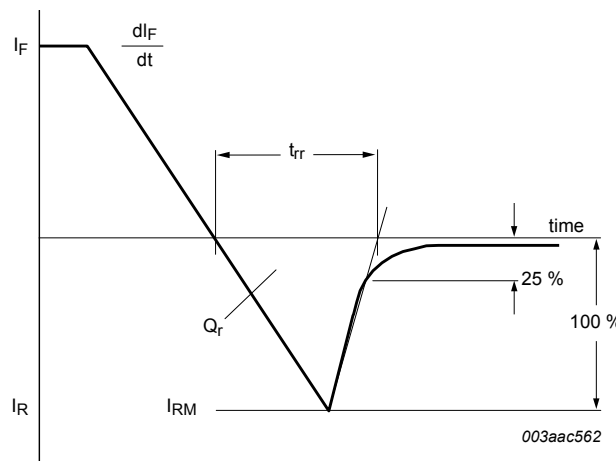


Fig. 12. Reverse recovery definition; ramp recovery

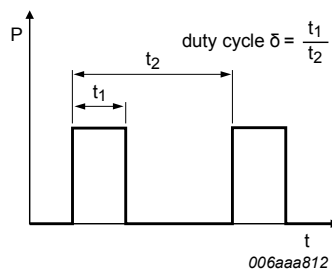


Fig. 13. Duty cycle definition

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**

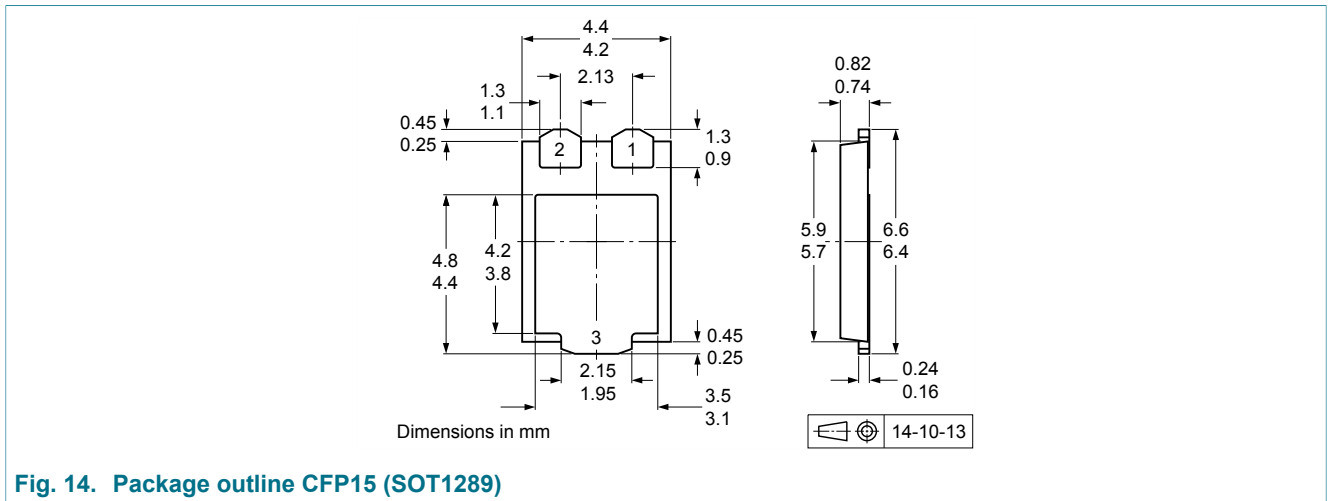


Fig. 14. Package outline CFP15 (SOT1289)

**13. Soldering**

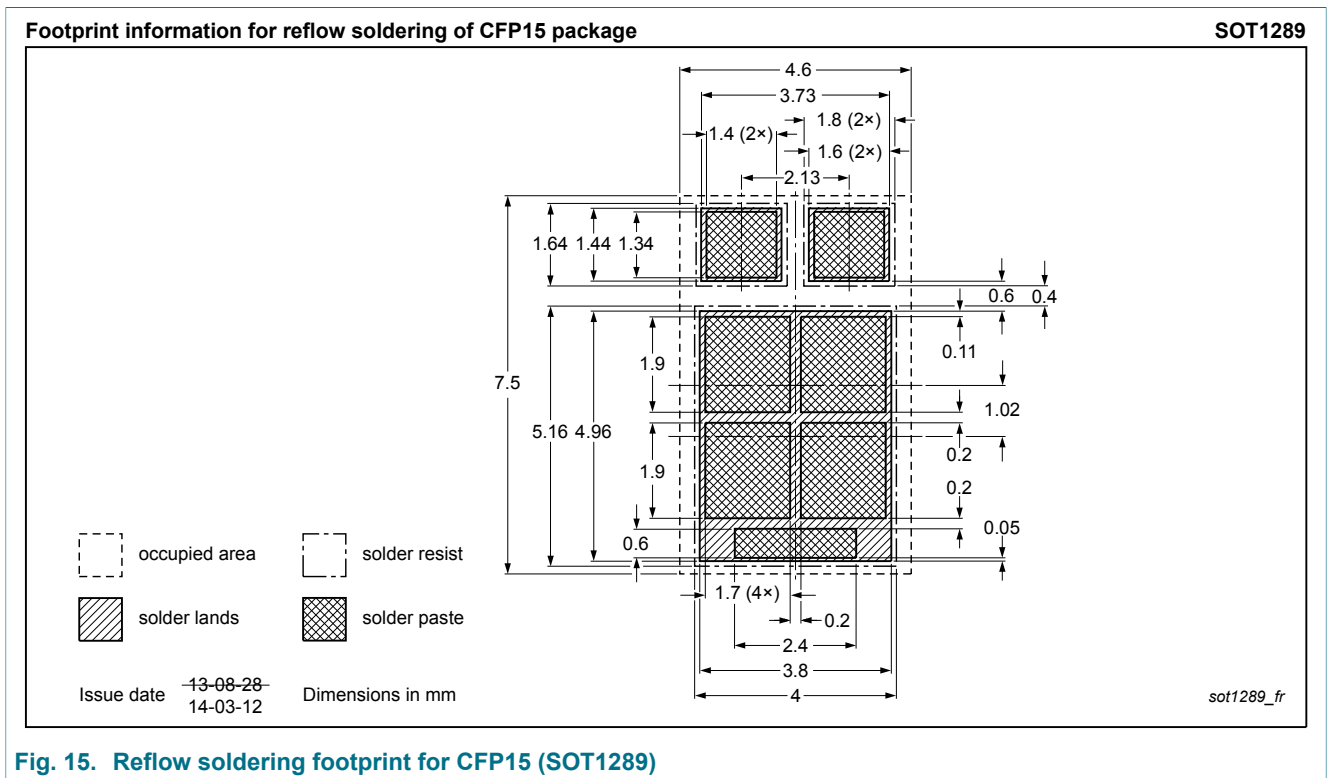


Fig. 15. Reflow soldering footprint for CFP15 (SOT1289)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG040V050EPD v.1	20160726	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.
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Date of release: 26 July 2016

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