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PMEG45U10EPD

45 V, 10 A extremely low VF MEGA Schottky barrier rectifier

16 December 2014

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 SOT1289 (CFP15) power and flat lead Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- Average forward current: $I_{F(AV)} \leq 10$ A
- Reverse voltage: $V_R \leq 45$ 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

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

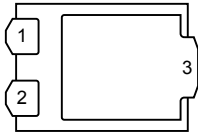
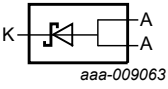
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{F(AV)}$	average forward current	$\delta = 0.5$; $f = 20$ kHz; $T_{sp} \leq 130$ °C; square wave	-	-	10	A
V_R	reverse voltage	$T_j = 25$ °C	-	-	45	V
V_F	forward voltage	$I_F = 10$ A; $t_p \leq 300$ μ s; $\delta \leq 0.02$; $T_j = 25$ °C; pulsed	-	430	490	mV
I_R	reverse current	$V_R = 10$ V; $t_p \leq 3$ ms; $\delta \leq 0.3$; $T_j = 25$ °C; pulsed	-	20	50	μ A
		$V_R = 45$ V; $t_p \leq 3$ ms; $\delta \leq 0.3$; $T_j = 25$ °C; pulsed	-	230	600	μ A



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
PMEG45U10EPD	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
PMEG45U10EPD	4510 UUUU

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	$T_{sp} = 125\text{ }^\circ\text{C}$; $\delta = 1$		-	14	A
$I_{F(AV)}$	average forward current	$\delta = 0.5$; $f = 20\text{ kHz}$; $T_{sp} \leq 130\text{ }^\circ\text{C}$; square wave		-	10	A
I_{FSM}	non-repetitive peak forward current	$t_p = 8\text{ ms}$; $T_{j(init)} = 25\text{ }^\circ\text{C}$; square wave		-	180	A
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ }^\circ\text{C}$	[1]	-	1.4	W
			[2]	-	1.8	W
			[3]	-	3.1	W
T_j	junction temperature			-	150	$^\circ\text{C}$
T_{amb}	ambient temperature			-55	150	$^\circ\text{C}$

Symbol	Parameter	Conditions		Min	Max	Unit
T _{stg}	storage temperature			-65	150	°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 cm².
- [3] Device mounted on a ceramic Printed-Circuit Board (PCB), Al₂O₃, 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]	-	-	40	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 cm².
- [4] Device mounted on a ceramic PCB, Al₂O₃, standard footprint.
- [5] Soldering point of cathode tab.

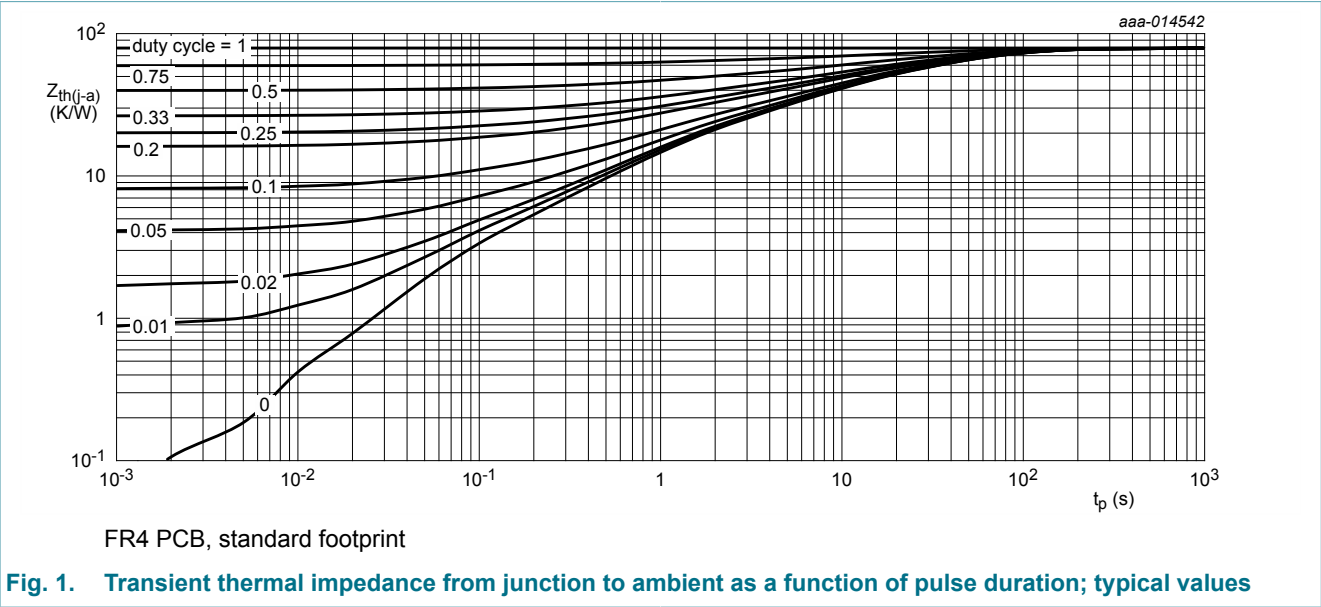
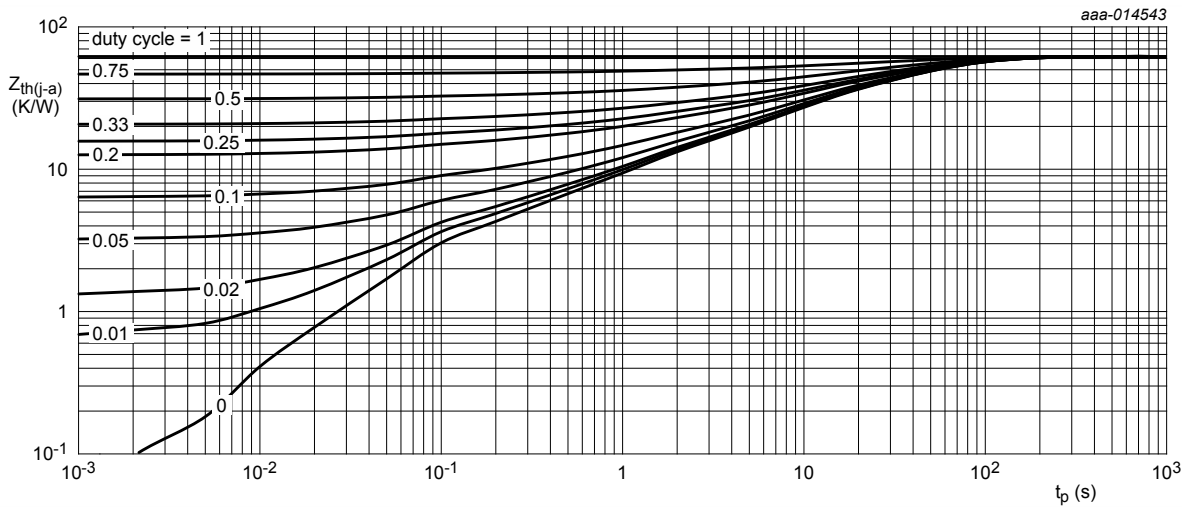
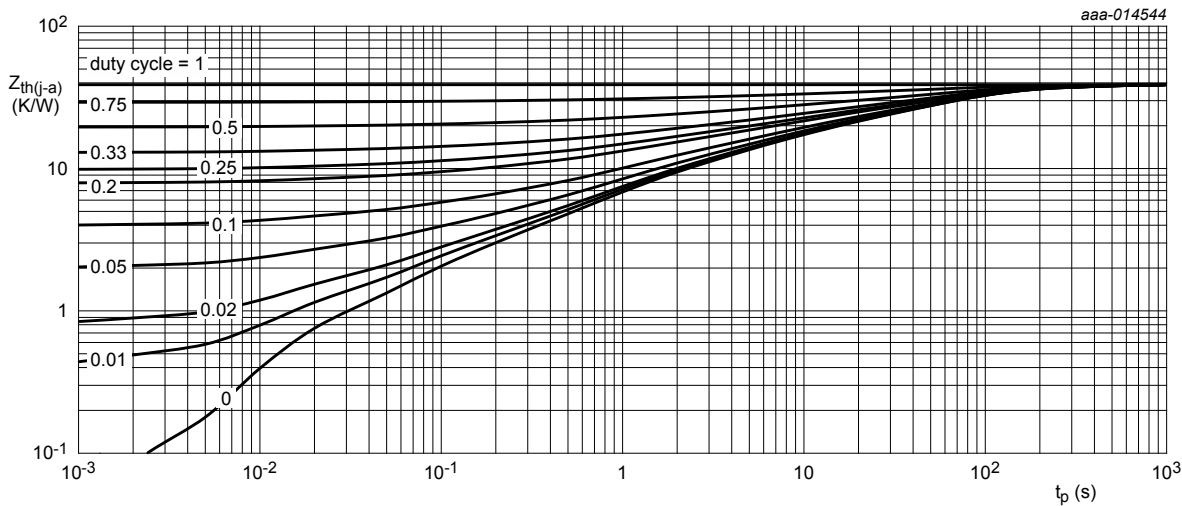


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



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



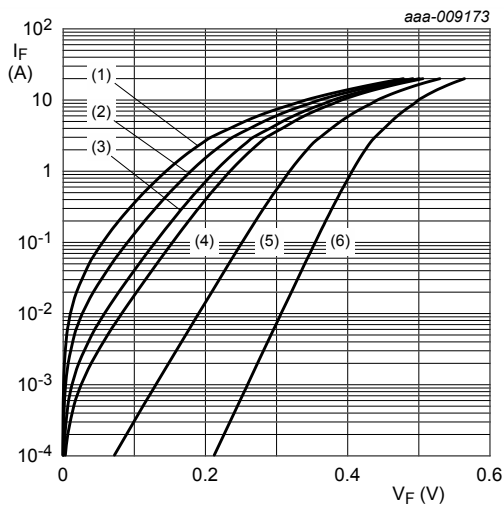
Ceramic PCB, Al₂O₃, standard footprint

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

10. Characteristics

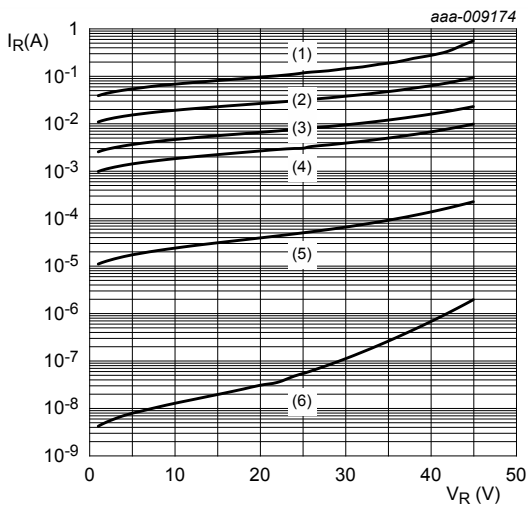
Table 7. Characteristics

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	45	-	-	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	-	314	360	mV
		$I_F = 2 \text{ A}$; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25 \text{ }^\circ\text{C}$; pulsed	-	338	-	mV
		$I_F = 3 \text{ A}$; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25 \text{ }^\circ\text{C}$; pulsed	-	355	-	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	-	380	430	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	-	430	490	mV
I_R	reverse current	$V_R = 5 \text{ V}$; $t_p \leq 3 \text{ ms}$; $\delta \leq 0.3$; $T_j = 25 \text{ }^\circ\text{C}$; pulsed	-	15	-	μA
		$V_R = 10 \text{ V}$; $t_p \leq 3 \text{ ms}$; $\delta \leq 0.3$; $T_j = 25 \text{ }^\circ\text{C}$; pulsed	-	20	50	μA
		$V_R = 30 \text{ V}$; $t_p \leq 3 \text{ ms}$; $\delta \leq 0.3$; $T_j = 25 \text{ }^\circ\text{C}$; pulsed	-	65	-	μA
		$V_R = 45 \text{ V}$; $t_p \leq 3 \text{ ms}$; $\delta \leq 0.3$; $T_j = 25 \text{ }^\circ\text{C}$; pulsed	-	230	600	μA
		$V_R = 10 \text{ V}$; $t_p \leq 3 \text{ ms}$; $\delta \leq 0.3$; $T_j = 125 \text{ }^\circ\text{C}$; pulsed	-	20	-	mA
C_d	diode capacitance	$V_R = 1 \text{ V}$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$	-	1170	-	pF
		$V_R = 10 \text{ V}$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$	-	390	-	pF
t_{rr}	reverse recovery time step recovery	$I_F = 0.5 \text{ A}$; $I_R = 0.5 \text{ A}$; $I_{R(\text{meas})} = 0.1 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$	-	34	-	ns
t_{rr}	reverse recovery time ramp recovery	$dI_F/dt = 200 \text{ A}/\mu\text{s}$; $T_j = 25 \text{ }^\circ\text{C}$; $I_F = 6 \text{ A}$; $V_R = 26 \text{ V}$	-	16	-	ns
V_{FRM}	peak forward recovery voltage	$I_F = 0.5 \text{ A}$; $dI_F/dt = 20 \text{ A}/\mu\text{s}$; $T_j = 25 \text{ }^\circ\text{C}$	-	300	-	mV



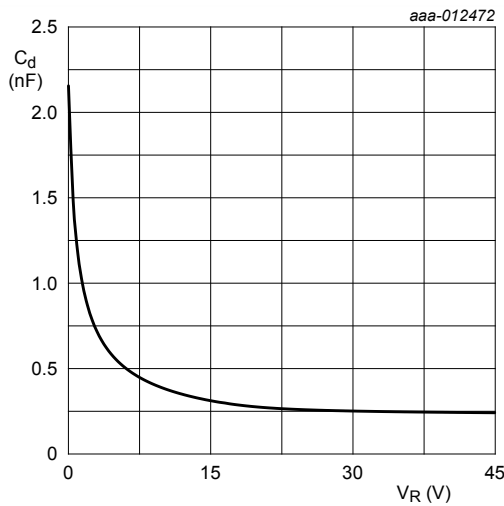
pulsed condition
(1) $T_j = 150^\circ\text{C}$
(2) $T_j = 125^\circ\text{C}$
(3) $T_j = 100^\circ\text{C}$
(4) $T_j = 85^\circ\text{C}$
(5) $T_j = 25^\circ\text{C}$
(6) $T_j = -40^\circ\text{C}$

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



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

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



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

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

11. Test information

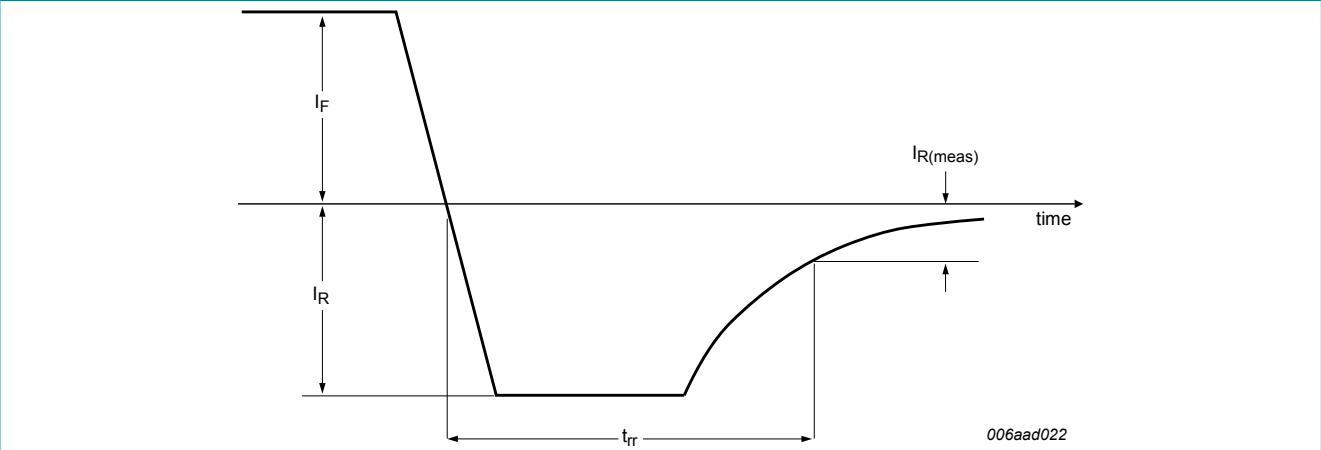


Fig. 7. Reverse recovery definition; step recovery

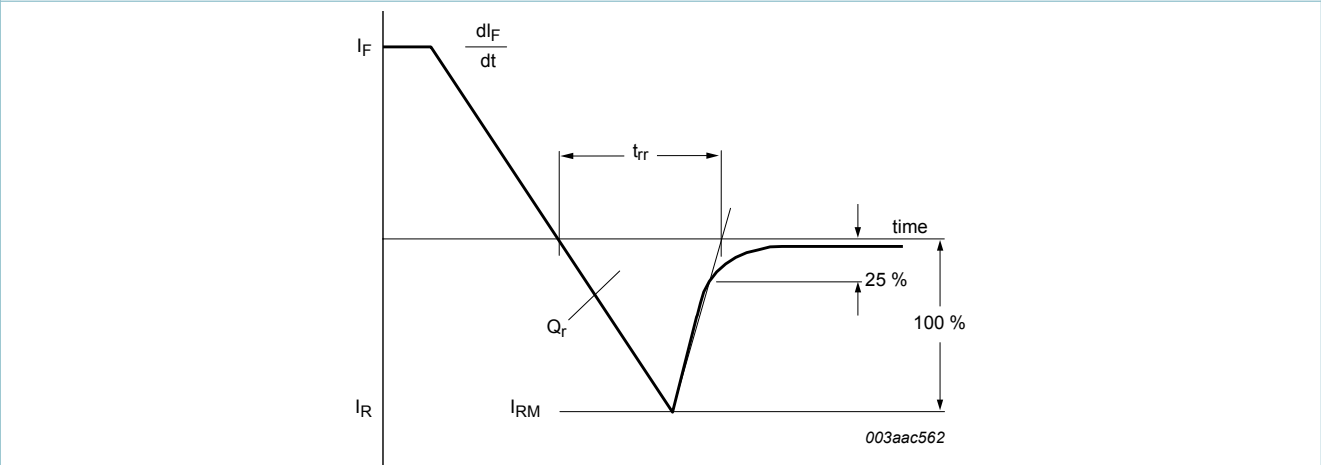


Fig. 8. Reverse recovery definition; ramp recovery

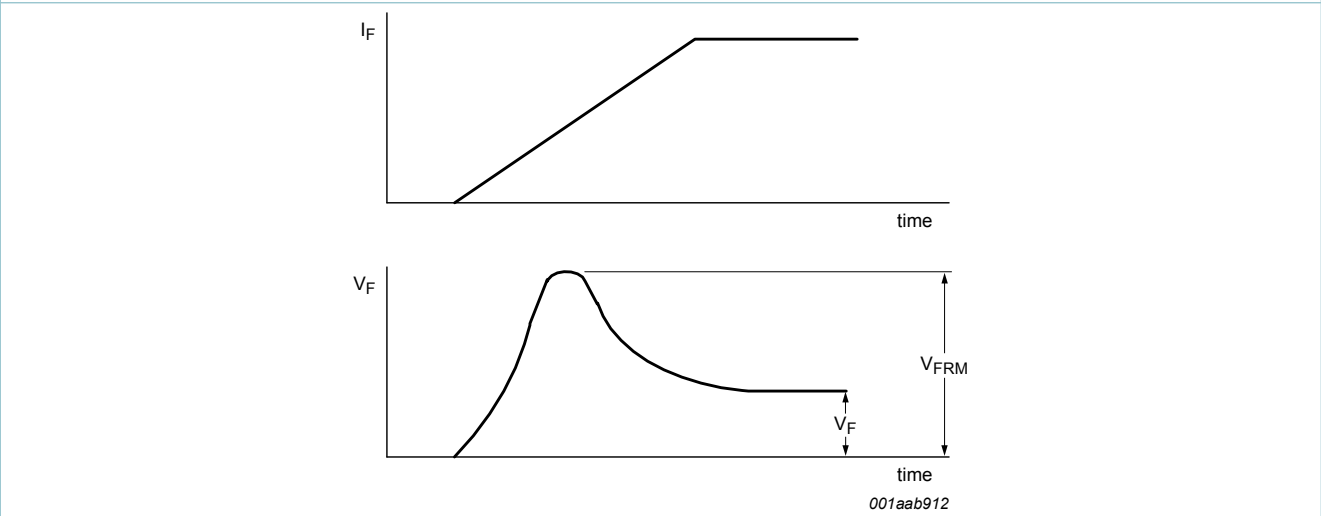


Fig. 9. Forward recovery definition

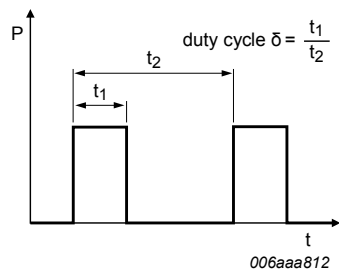


Fig. 10. Duty cycle definition

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

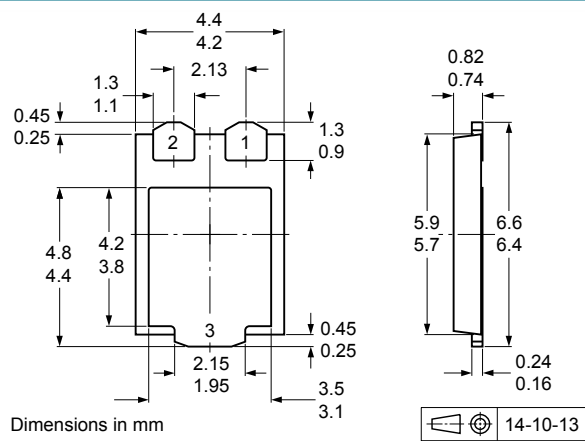


Fig. 11. Package outline CFP15 (SOT1289)

13. Soldering

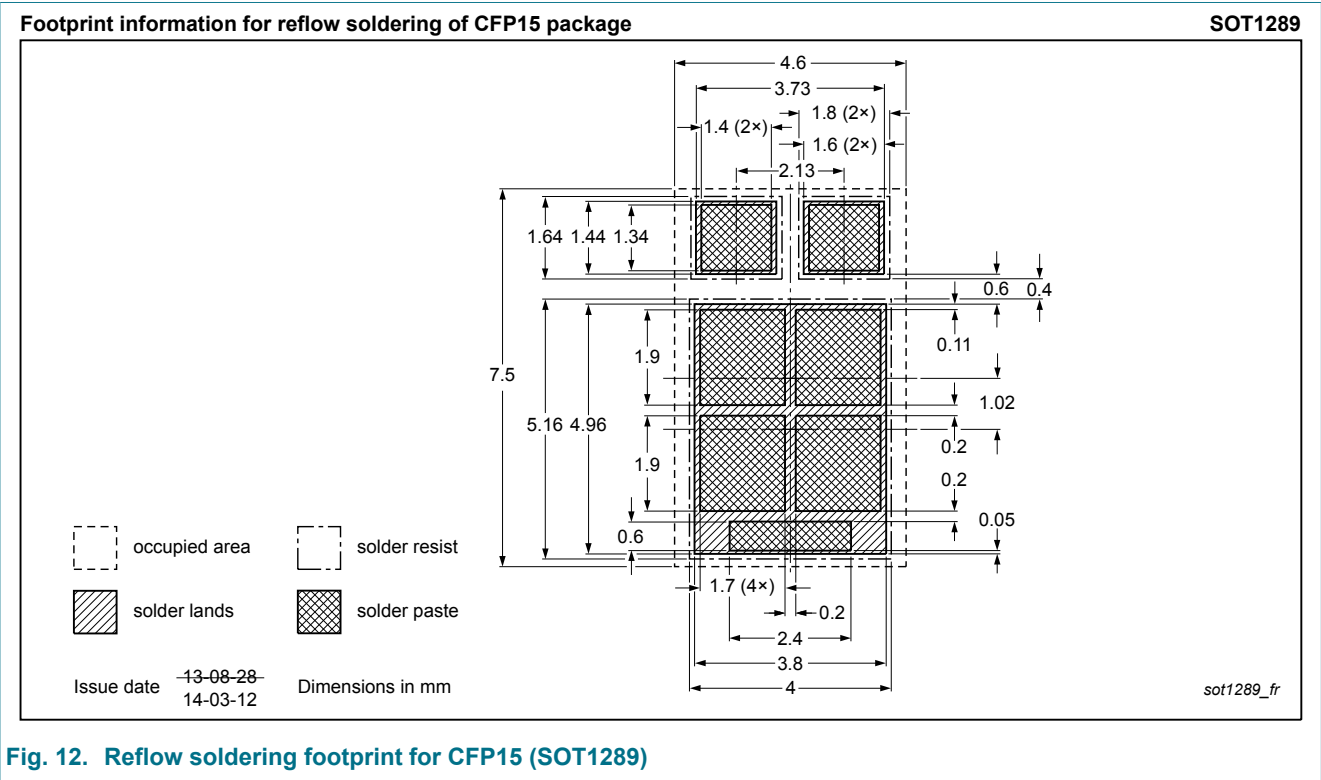


Fig. 12. Reflow soldering footprint for CFP15 (SOT1289)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG45U10EPD v.3	20141216	Product data sheet	-	PMEG45U10EPD v.2
Modifications:	<ul style="list-style-type: none">Package outline drawing updated			
PMEG45U10EPD v.2	20140416	Product data sheet	-	PMEG45U10EPD v.1
PMEG45U10EPD v.1	20140217	Objective data sheet	-	-

15. Legal information

15.1 Data sheet status

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Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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