PMEG045T150EPD

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

2 September 2015 — **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: $V_R \leq 45$ 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

- 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; $T_{sp} \leq 145$ °C; square wave		-	-	15	A
V_R	reverse voltage	$T_j = 25$ °C		-	-	45	V
V_F	forward voltage	$I_F = 15$ A; $t_p \leq 300$ µs; $\delta \leq 0.02$; $T_j = 25$ °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	µA
		$V_R = 45$ V; $t_p \leq 3$ ms; $\delta \leq 0.03$; $T_j = 25$ °C; pulsed		-	30	100	µA

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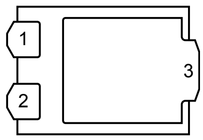
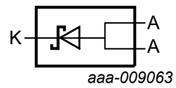
5. Pinning information

Table 2. Pinning information

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

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMEG045T150EPD	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
PMEG045T150EPD	045T 150E

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 °C		-	45	V
I_F	forward current	T_{sp} = 140 °C; δ = 1		-	21	A
$I_{F(AV)}$	average forward current	δ = 0.5; f = 20 kHz; T_{sp} ≤ 145 °C; square wave		-	15	A
I_{FSM}	non-repetitive peak forward current	t_p = 8 ms; $T_{j(init)}$ = 25 °C; square wave		-	210	A
P_{tot}	total power dissipation	T_{amb} ≤ 25 °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

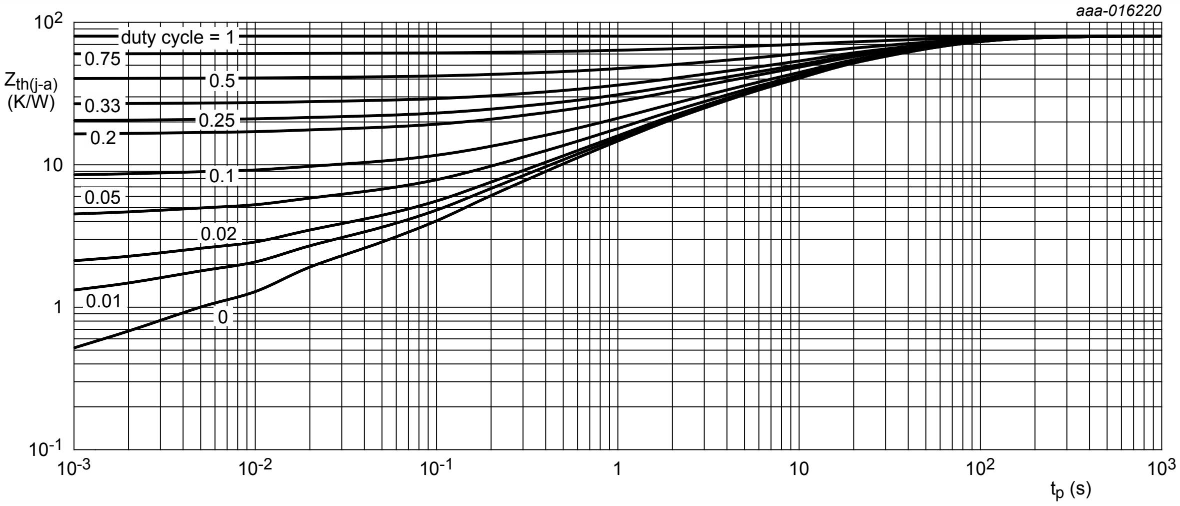
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm^2.
[3] Device mounted on a ceramic Printed-Circuit Board (PCB), Al_2O_3, standard footprint.

9. Thermal characteristics

Table 6. Thermal characteristics

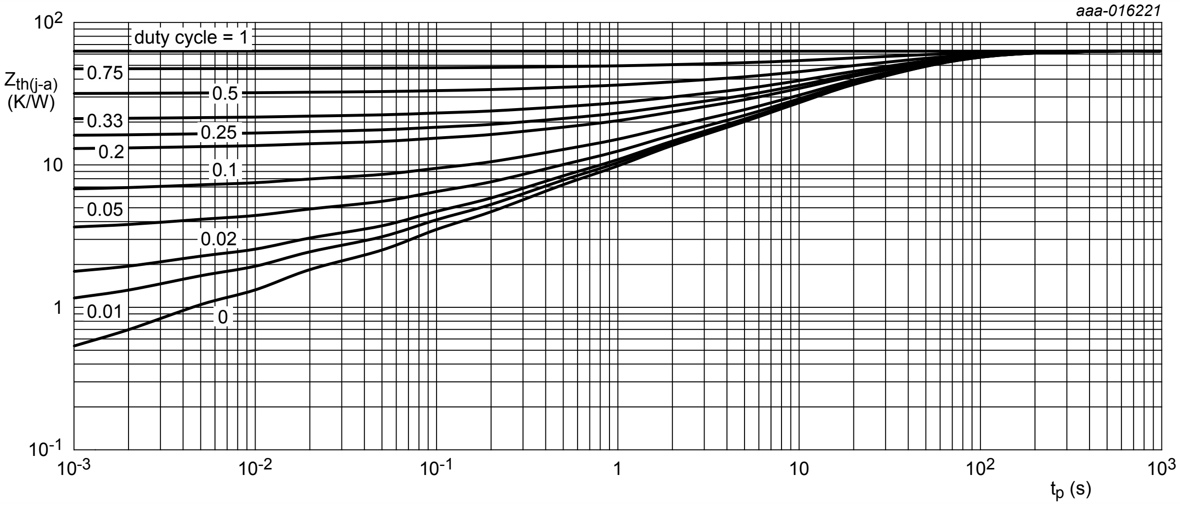
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1][2]	-	-	90	K/W
			[1][3]	-	-	70	K/W
			[1][4]	-	-	42	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[5]	-	-	3	K/W

[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^2.
[4] Device mounted on a ceramic PCB, Al_2O_3, standard footprint.
[5] Soldering point of cathode tab.



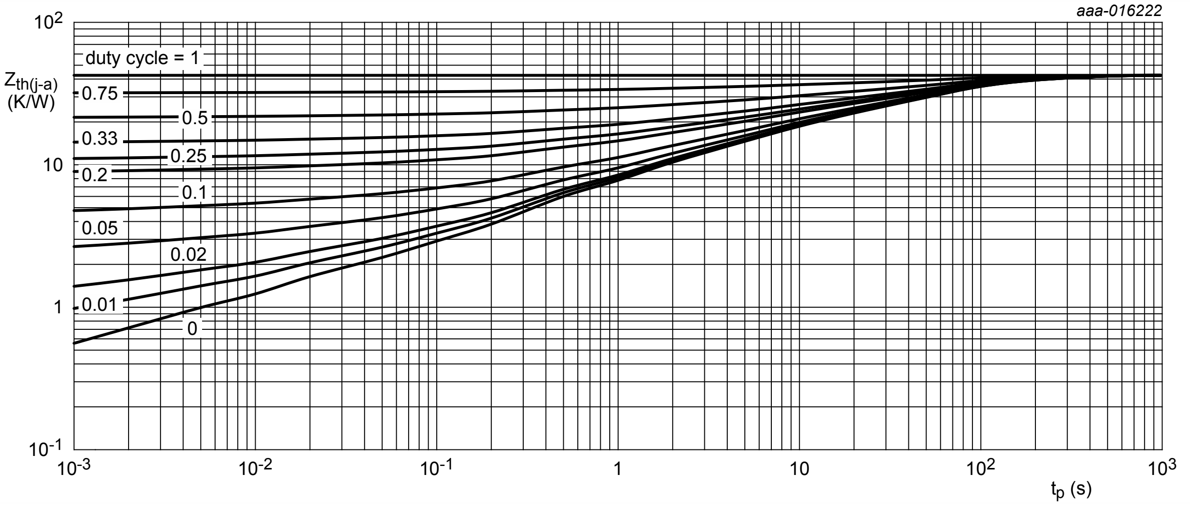
FR4 PCB, standard footprint

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^2

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



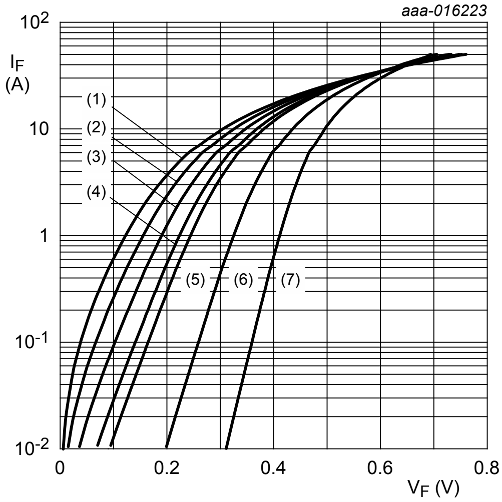
Ceramic PCB, Al_2O_3, standard footprint

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 mA; T_j = 25 °C; t_p ≤ 1.2 ms; δ ≤ 0.12; pulsed		45	-	-	V
V_F	forward voltage	I_F = 1 A; t_p ≤ 300 µs; δ ≤ 0.02; T_j = 25 °C; pulsed		-	320	380	mV
		I_F = 5 A; t_p ≤ 300 µs; δ ≤ 0.02; T_j = 25 °C; pulsed		-	390	460	mV
		I_F = 10 A; t_p ≤ 300 µs; δ ≤ 0.02; T_j = 25 °C; pulsed		-	440	-	mV
		I_F = 15 A; t_p ≤ 300 µs; δ ≤ 0.02; T_j = 25 °C; pulsed		-	480	550	mV
		I_F = 15 A; t_p ≤ 300 µs; δ ≤ 0.02; T_j = 125 °C; pulsed		-	405	-	mV
I_R	reverse current	V_R = 5 V; t_p ≤ 3 ms; δ ≤ 0.03; T_j = 25 °C; pulsed		-	12	-	µA
		V_R = 10 V; t_p ≤ 3 ms; δ ≤ 0.03; T_j = 25 °C; pulsed		-	16	50	µA
		V_R = 45 V; t_p ≤ 3 ms; δ ≤ 0.03; T_j = 25 °C; pulsed		-	30	100	µA
		V_R = 45 V; t_p ≤ 3 ms; δ ≤ 0.03; T_j = 125 °C; pulsed		-	22	-	mA
C_d	diode capacitance	V_R = 1 V; f = 1 MHz; T_j = 25 °C		-	2200	-	pF
		V_R = 10 V; f = 1 MHz; T_j = 25 °C		-	800	-	pF
t_{rr}	reverse recovery time step recovery	I_F = 0.5 A; I_R = 0.5 A; $I_{R(meas)}$ = 0.1 A; T_j = 25 °C		-	60	-	ns
t_{rr}	reverse recovery time ramp recovery	dI_F/dt = 200 A/µs; T_j = 25 °C; I_F = 6 A; V_R = 26 V		-	20	-	ns
V_{FRM}	peak forward recovery voltage	I_F = 0.5 A; dI_F/dt = 20 A/µs; T_j = 25 °C		-	305	-	mV



pulsed condition

(1) T_j = 175 °C

(2) T_j = 150 °C

(3) T_j = 125 °C

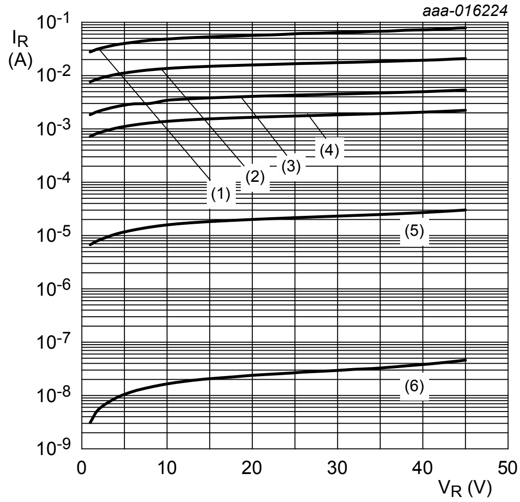
(4) T_j = 100 °C

(5) T_j = 85 °C

(6) T_j = 25 °C

(7) T_j = −40 °C

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



pulsed condition

(1) T_j = 150 °C

(2) T_j = 125 °C

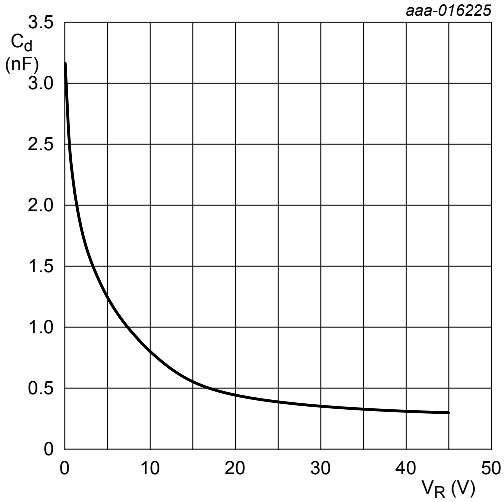
(3) T_j = 100 °C

(4) T_j = 85 °C

(5) T_j = 25 °C

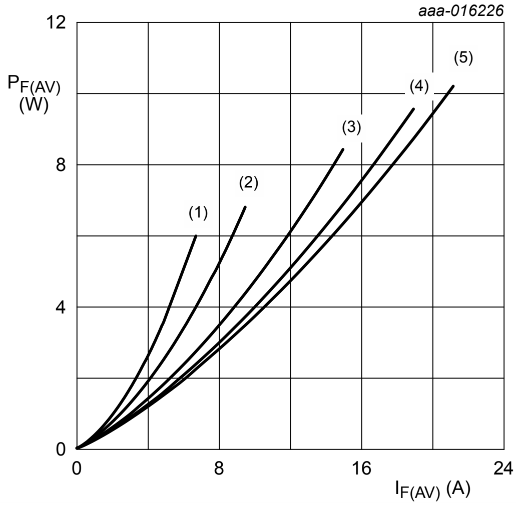
(6) T_j = −40 °C

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



f = 1 MHz; T_{amb} = 25 °C

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



T_j = 100 °C

(1) δ = 0.1

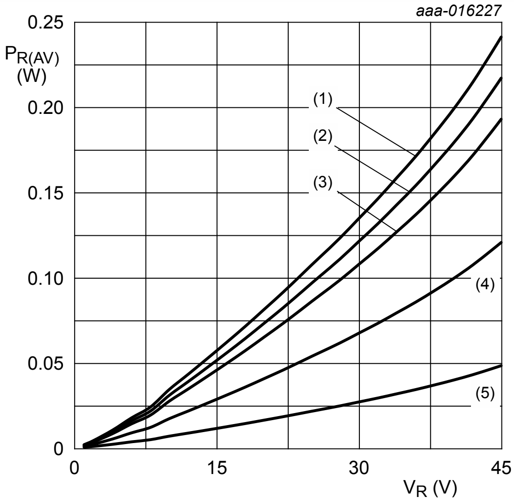
(2) δ = 0.2

(3) δ = 0.5

(4) δ = 0.8

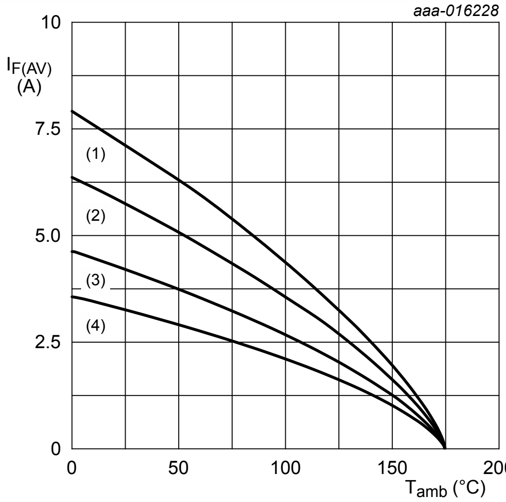
(5) δ = 1

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



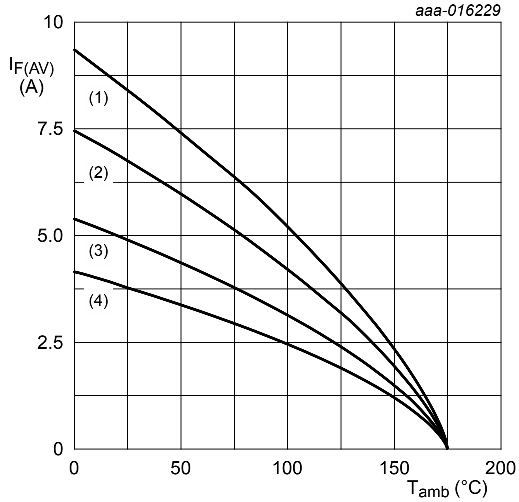
T_j = 100 °C
(1) δ = 1
(2) δ = 0.9
(3) δ = 0.8
(4) δ = 0.5
(5) δ = 0.2

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



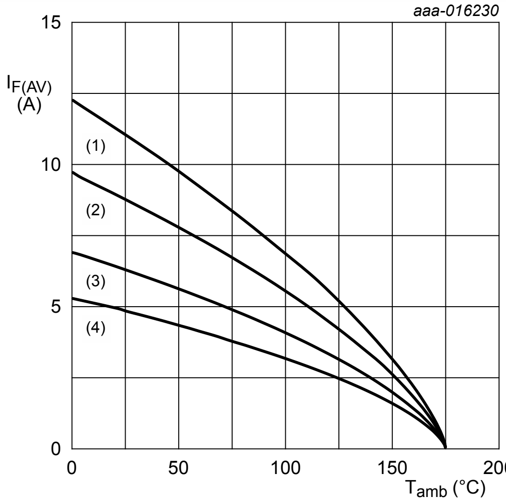
FR4 PCB, standard footprint
T_j = 175 °C
(1) δ = 1; DC
(2) δ = 0.5; f = 20 kHz
(3) δ = 0.2; f = 20 kHz
(4) δ = 0.1; f = 20 kHz

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



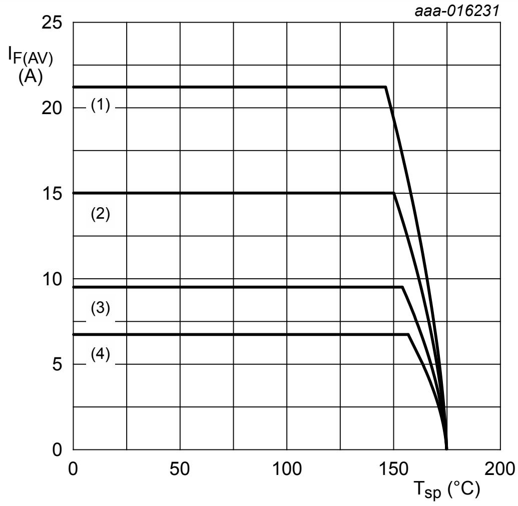
FR4 PCB, mounting pad for cathode 1 cm^2
T_j = 175 °C
(1) δ = 1; DC
(2) δ = 0.5; f = 20 kHz
(3) δ = 0.2; f = 20 kHz
(4) δ = 0.1; f = 20 kHz

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



Ceramic PCB, Al_2O_3, standard footprint
T_j = 175 °C
(1) δ = 1; DC
(2) δ = 0.5; f = 20 kHz
(3) δ = 0.2; f = 20 kHz
(4) δ = 0.1; f = 20 kHz

Fig. 11. Average forward current as a function of ambient temperature; typical values



T_j = 175 °C

(1) δ = 1; DC

(2) δ = 0.5; f = 20 kHz

(3) δ = 0.2; f = 20 kHz

(4) δ = 0.1; f = 20 kHz

Fig. 12. Average forward current as a function of solder point temperature; typical values

11. Test information

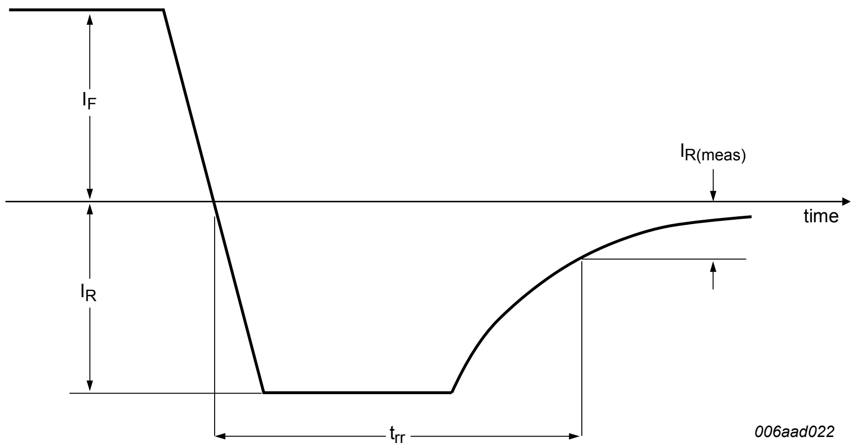


Fig. 13. Reverse recovery definition; step recovery

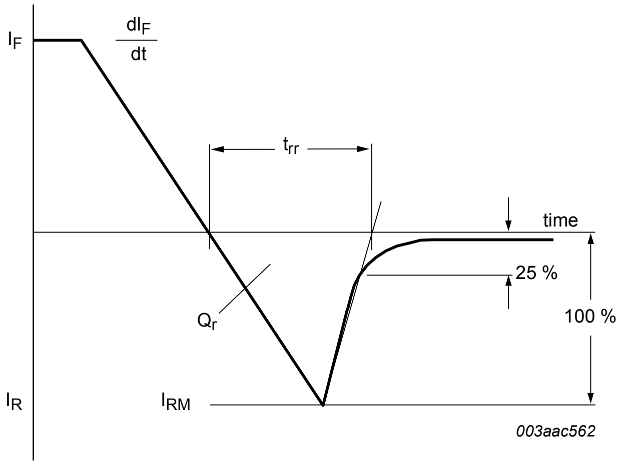


Fig. 14. Reverse recovery definition; ramp recovery

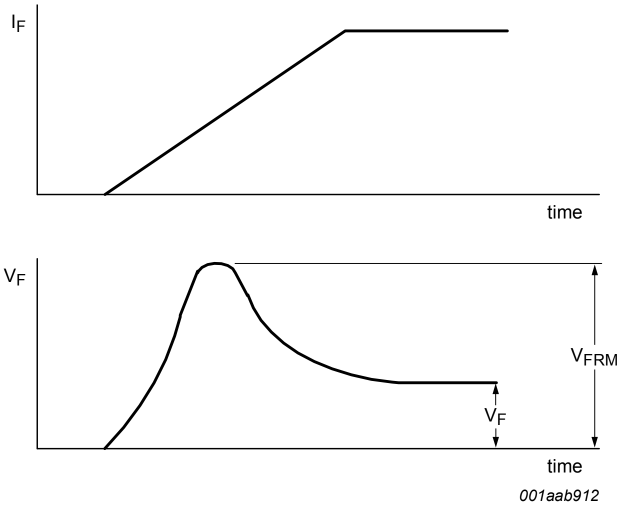


Fig. 15. Forward recovery definition

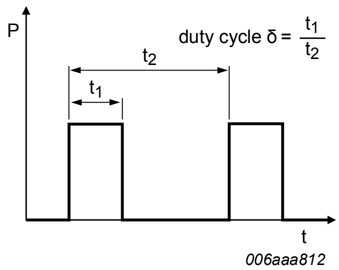


Fig. 16. Duty cycle definition

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.

11.1 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

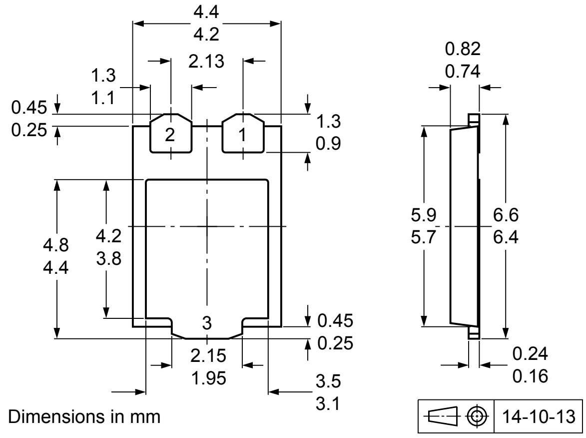


Fig. 17. Package outline CFP15 (SOT1289)

13. Soldering

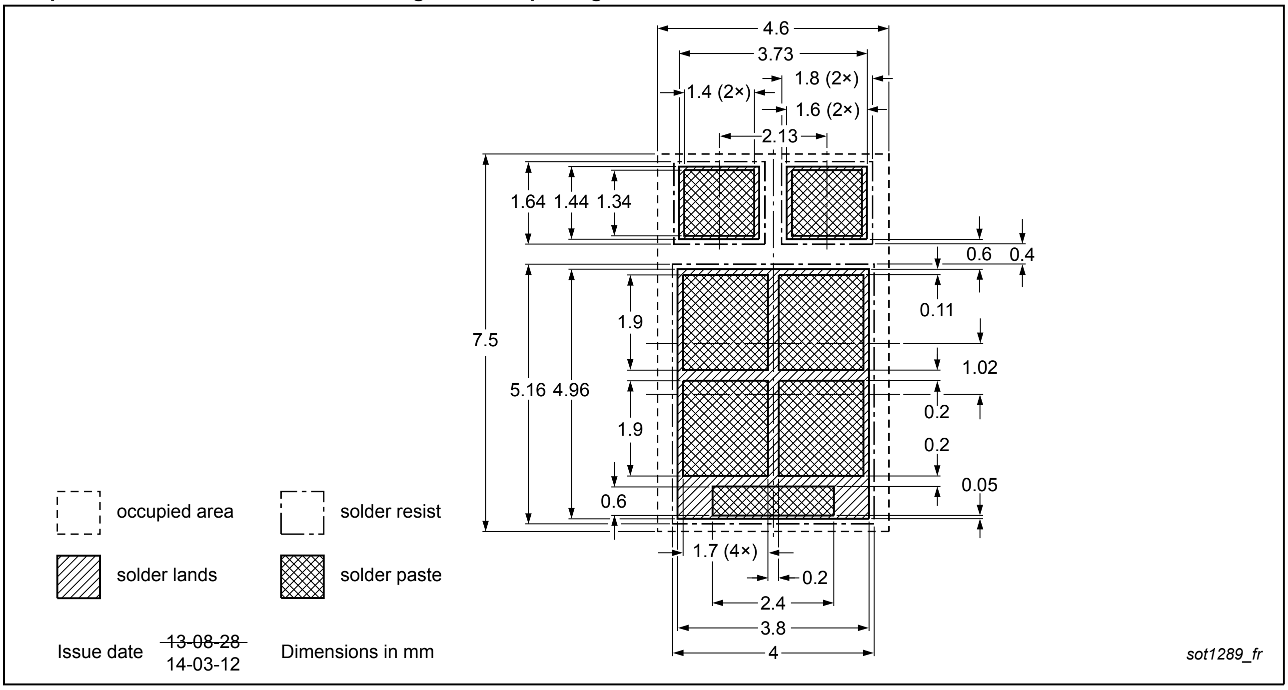


Fig. 18. Reflow soldering footprint for CFP15 (SOT1289)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG045T150EPD v.1	20150902	Product data sheet	-	-

15. Legal information

15.1 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.

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term 'short data sheet' is explained in section "Definitions".
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16. Contents