



# PMEG060T030ELPE

60 V, 3 A low leakage current Trench MEGA Schottky barrier rectifier

16 December 2019

Product data sheet

## 1. General description

Trench Maximum Efficiency General Application (MEGA) Schottky barrier rectifier encapsulated in a CFP15B (SOT1289B) power and flat lead Surface-Mounted Device (SMD) plastic package.

## 2. Features and benefits

- Average forward current:  $I_{F(AV)} \leq 3$  A
- Reverse voltage:  $V_R \leq 60$  V
- Low forward voltage
- Low leakage current due to Trench MEGA Schottky technology
- High power capability due to clip-bonding technology
- Small and flat lead SMD power plastic package
- 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
- Low voltage, high frequency inverters

## 4. Quick reference data

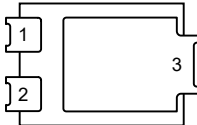
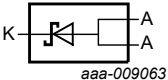
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; square wave; $f = 20$ kHz; $T_{sp} \leq 167$ °C		-	-	3	A
$V_R$	reverse voltage	$T_j = 25$ °C		-	-	60	V
$V_F$	forward voltage	$I_F = 3$ A; pulsed; $T_j = 25$ °C	[1]	-	550	620	mV
$I_R$	reverse current	$V_R = 10$ V; pulsed; $T_j = 25$ °C	[1]	-	0.14	0.9	µA
		$V_R = 60$ V; pulsed; $T_j = 25$ °C	[1]	-	0.3	1.8	µA

[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	 CFP15B (SOT1289B)	 aaa-009063
2	A	anode		
3	K	cathode		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMEG060T030ELPE	CFP15B	plastic, thermal enhanced ultra thin SMD package; 3 leads; 2.13 mm pitch; 5.8 x 4.3 x 0.95 mm body	SOT1289B

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PMEG060T030ELPE	060T M03E

## 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	$T_j = 25\text{ }^{\circ}\text{C}$		-	60	V
$I_F$	forward current	$\delta = 1$ ; $T_{sp} \leq 165\text{ }^{\circ}\text{C}$		-	4.2	A
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; square wave; $f = 20\text{ kHz}$ ; $T_{sp} \leq 167\text{ }^{\circ}\text{C}$		-	3	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 8\text{ ms}$ ; square wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$		-	60	A
		$t_p = 8\text{ ms}$ ; half sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$		-	80	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ }^{\circ}\text{C}$	[1]	-	1.66	W
			[2]	-	2.15	W
$T_j$	junction temperature			-	175	$^{\circ}\text{C}$
$T_{amb}$	ambient temperature			-55	175	$^{\circ}\text{C}$
$T_{stg}$	storage temperature			-65	175	$^{\circ}\text{C}$

[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  $1\text{ cm}^2$ .

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

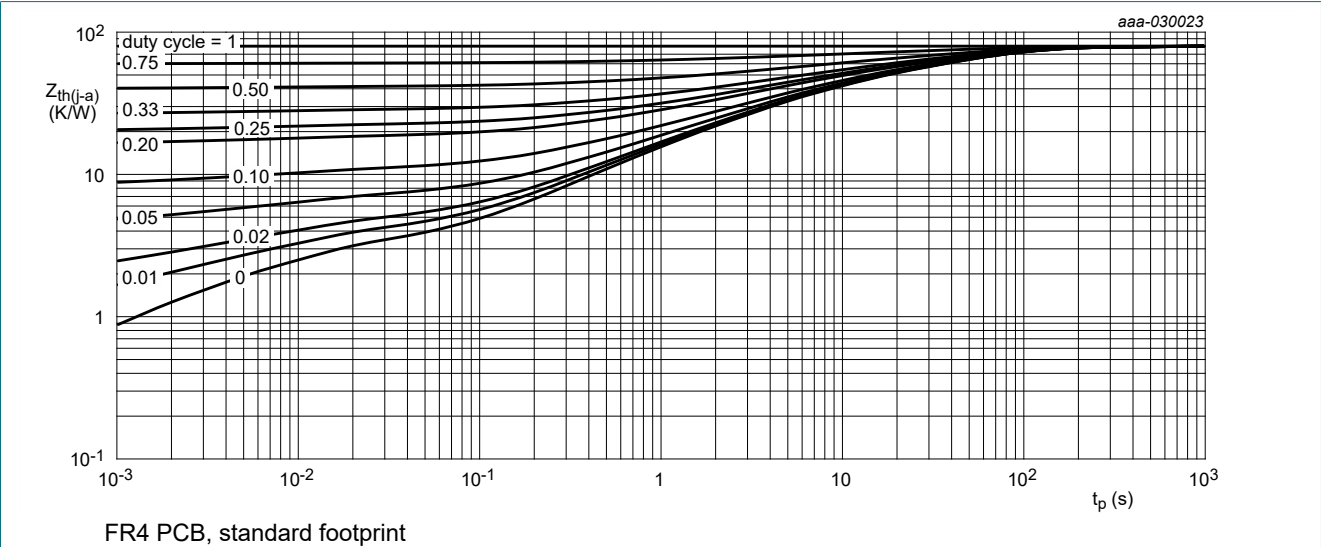


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

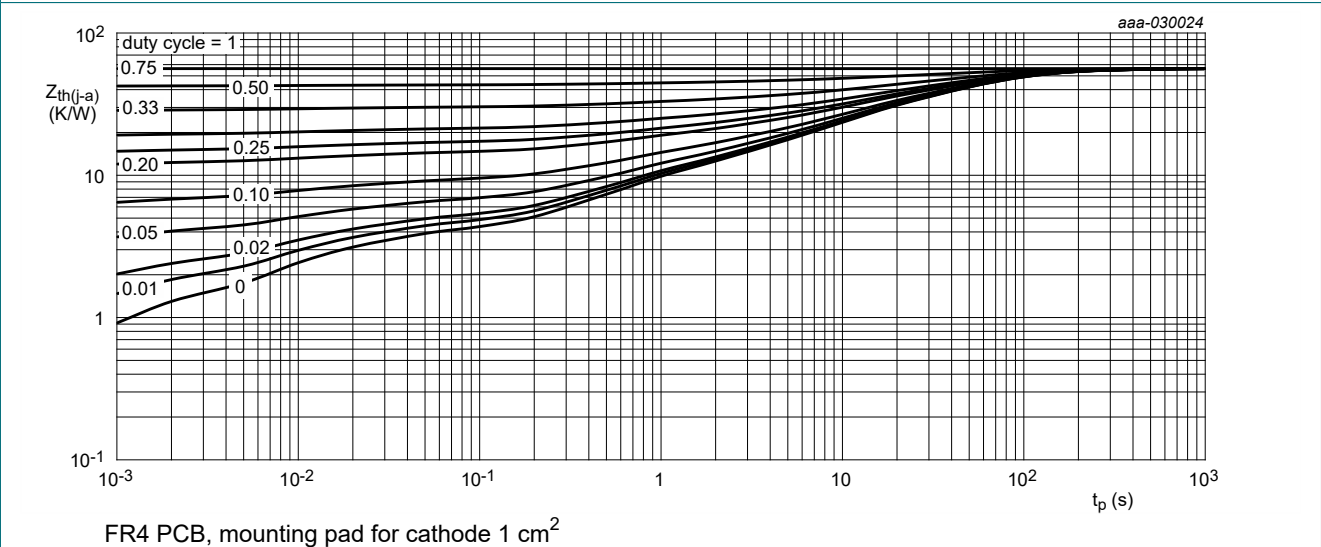


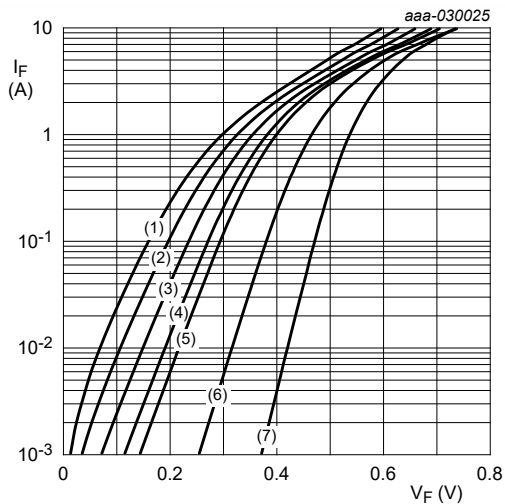
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

Table 7. Characteristics

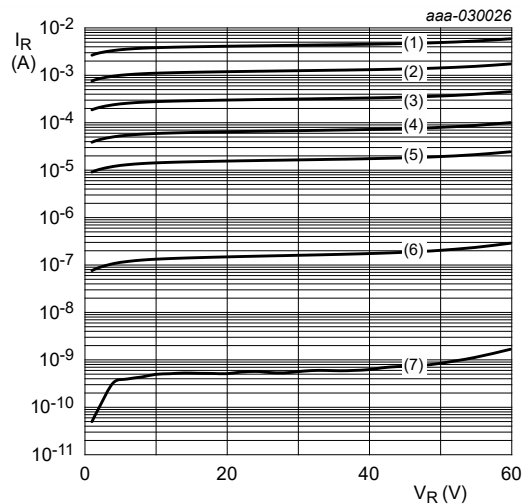
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)R}$	reverse breakdown voltage	$I_R = 1 \text{ mA}$ ; pulsed; $T_j = 25 \text{ }^{\circ}\text{C}$	[1]	60	-	-	V
$V_F$	forward voltage	$I_F = 0.1 \text{ A}$ ; pulsed; $T_j = 25 \text{ }^{\circ}\text{C}$	[1]	-	380	450	mV
		$I_F = 0.5 \text{ A}$ ; pulsed; $T_j = 25 \text{ }^{\circ}\text{C}$	[1]	-	440	510	mV
		$I_F = 1 \text{ A}$ ; pulsed; $T_j = 25 \text{ }^{\circ}\text{C}$	[1]	-	470	540	mV
		$I_F = 2 \text{ A}$ ; pulsed; $T_j = 25 \text{ }^{\circ}\text{C}$	[1]	-	515	590	mV
		$I_F = 3 \text{ A}$ ; pulsed; $T_j = 25 \text{ }^{\circ}\text{C}$	[1]	-	550	620	mV
		$I_F = 3 \text{ A}$ ; pulsed; $T_j = -40 \text{ }^{\circ}\text{C}$	[1]	-	600	680	mV
		$I_F = 3 \text{ A}$ ; pulsed; $T_j = 125 \text{ }^{\circ}\text{C}$	[1]	-	470	570	mV
		$I_F = 3 \text{ A}$ ; pulsed; $T_j = 150 \text{ }^{\circ}\text{C}$	[1]	-	450	550	mV
$I_R$	reverse current	$V_R = 10 \text{ V}$ ; pulsed; $T_j = 25 \text{ }^{\circ}\text{C}$	[1]	-	0.14	0.9	$\mu\text{A}$
		$V_R = 40 \text{ V}$ ; pulsed; $T_j = 25 \text{ }^{\circ}\text{C}$	[1]	-	0.18	-	$\mu\text{A}$
		$V_R = 60 \text{ V}$ ; pulsed; $T_j = 25 \text{ }^{\circ}\text{C}$	[1]	-	0.3	1.8	$\mu\text{A}$
		$V_R = 60 \text{ V}$ ; pulsed; $T_j = 125 \text{ }^{\circ}\text{C}$	[1]	-	0.5	3	mA
		$V_R = 60 \text{ V}$ ; pulsed; $T_j = 150 \text{ }^{\circ}\text{C}$	[1]	-	1.8	9	mA
$C_d$	diode capacitance	$V_R = 1 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^{\circ}\text{C}$		-	560	-	pF
		$V_R = 10 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^{\circ}\text{C}$		-	170	-	pF
$t_{rr}$	reverse recovery time step recovery	$I_F = 0.5 \text{ A}$ ; $I_R = 0.5 \text{ A}$ ; $I_{R(\text{meas})} = 0.1 \text{ A}$ ; $T_j = 25 \text{ }^{\circ}\text{C}$		-	16	-	ns
	reverse recovery time ramp recovery	$dI_F/dt = 200 \text{ A}/\mu\text{s}$ ; $I_F = 6 \text{ A}$ ; $V_R = 26 \text{ V}$ ; $T_j = 25 \text{ }^{\circ}\text{C}$		-	12	-	ns
$V_{FRM}$	peak forward recovery voltage	$I_F = 0.5 \text{ A}$ ; $dI_F/dt = 20 \text{ A}/\mu\text{s}$ ; $T_j = 25 \text{ }^{\circ}\text{C}$		-	460	-	mV

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



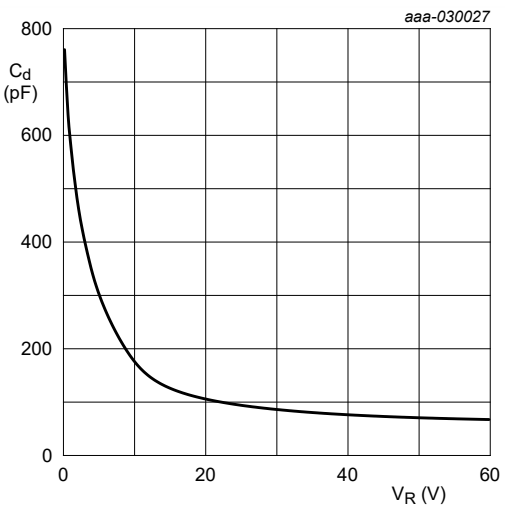
pulsed condition  
(1)  $T_j = 175\text{ }^{\circ}\text{C}$   
(2)  $T_j = 150\text{ }^{\circ}\text{C}$   
(3)  $T_j = 125\text{ }^{\circ}\text{C}$   
(4)  $T_j = 100\text{ }^{\circ}\text{C}$   
(5)  $T_j = 85\text{ }^{\circ}\text{C}$   
(6)  $T_j = 25\text{ }^{\circ}\text{C}$   
(7)  $T_j = -40\text{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

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



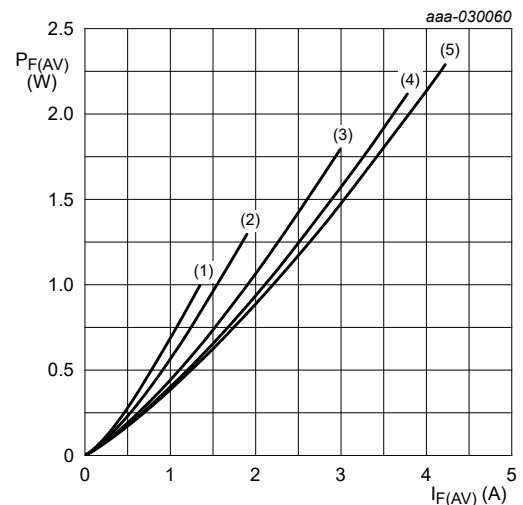
pulsed condition  
(1)  $T_j = 175\text{ }^{\circ}\text{C}$   
(2)  $T_j = 150\text{ }^{\circ}\text{C}$   
(3)  $T_j = 125\text{ }^{\circ}\text{C}$   
(4)  $T_j = 100\text{ }^{\circ}\text{C}$   
(5)  $T_j = 85\text{ }^{\circ}\text{C}$   
(6)  $T_j = 25\text{ }^{\circ}\text{C}$   
(7)  $T_j = -40\text{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

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



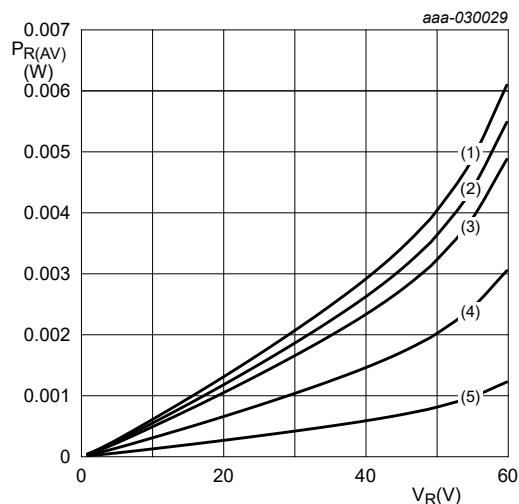
$f = 1\text{ MHz}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$

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



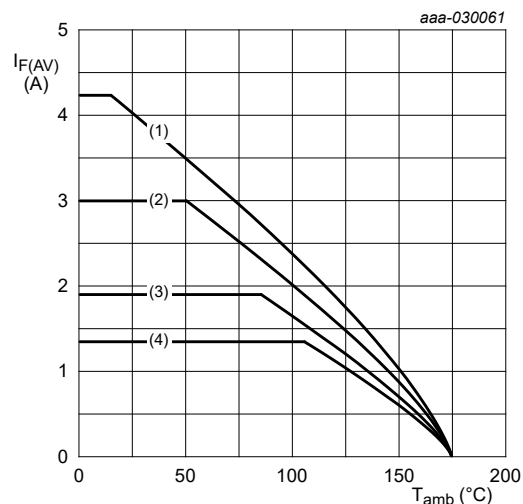
$T_j = 100\text{ }^{\circ}\text{C}$   
(1)  $\delta = 0.1$   
(2)  $\delta = 0.2$   
(3)  $\delta = 0.5$   
(4)  $\delta = 0.8$   
(5)  $\delta = 1$ ; DC

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



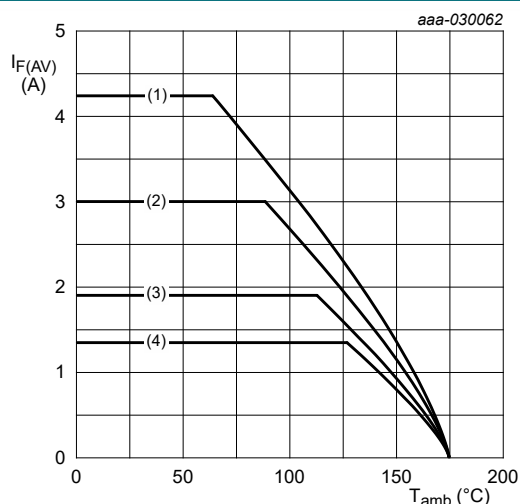
$T_j = 100\text{ }^{\circ}\text{C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.9$   
 (3)  $\delta = 0.8$   
 (4)  $\delta = 0.5$   
 (5)  $\delta = 0.2$

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



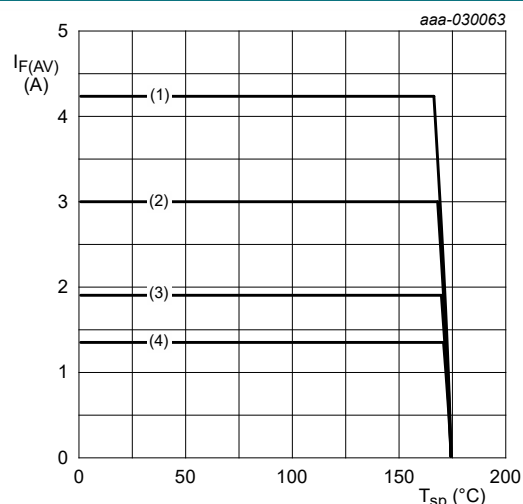
FR4 PCB, standard footprint  
 $T_j = 175\text{ }^{\circ}\text{C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

**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

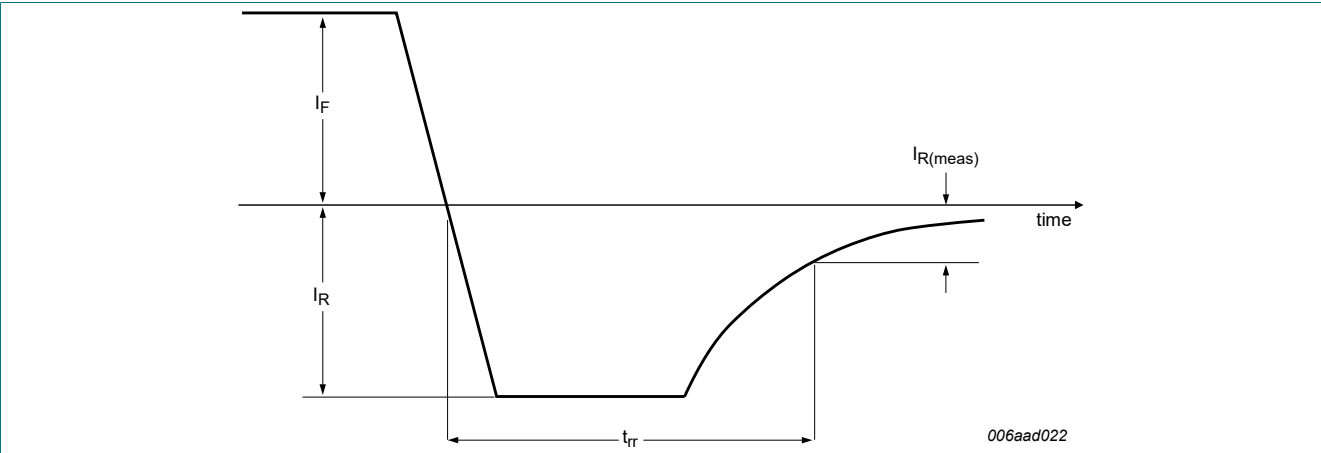


Fig. 11. Reverse recovery definition; step recovery

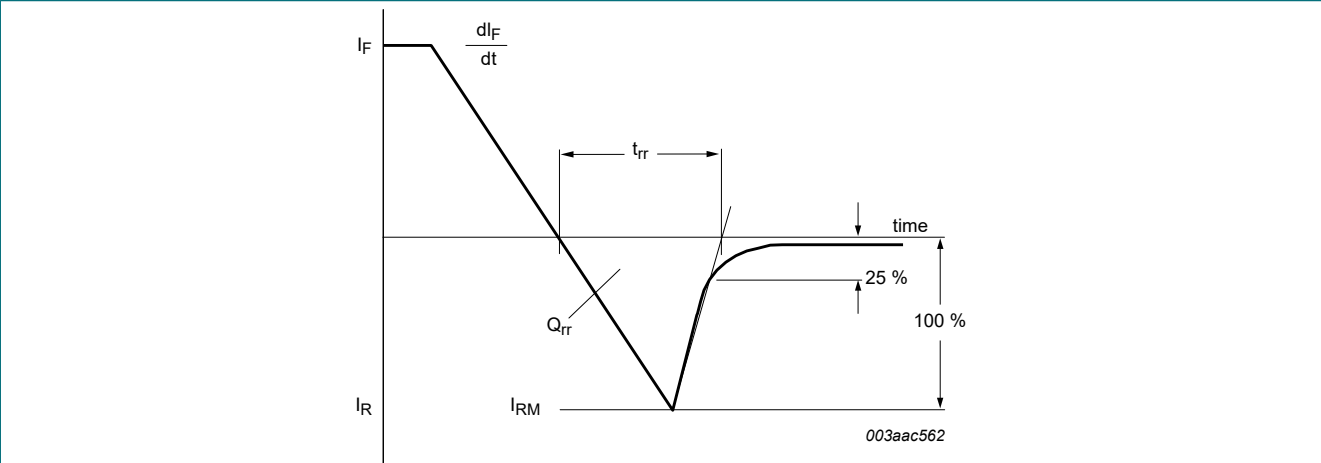


Fig. 12. Reverse recovery definition; ramp recovery

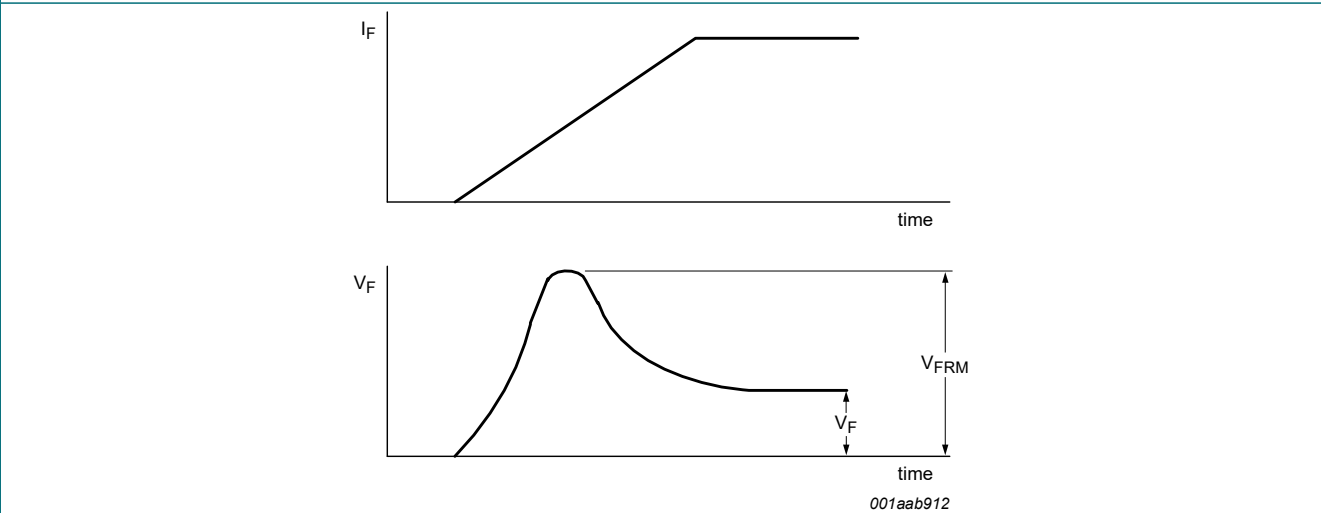


Fig. 13. Forward recovery definition

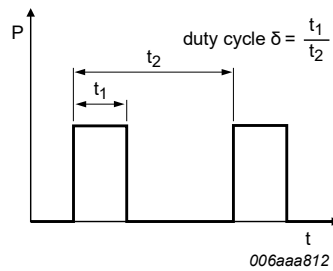


Fig. 14. Duty cycle definition

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

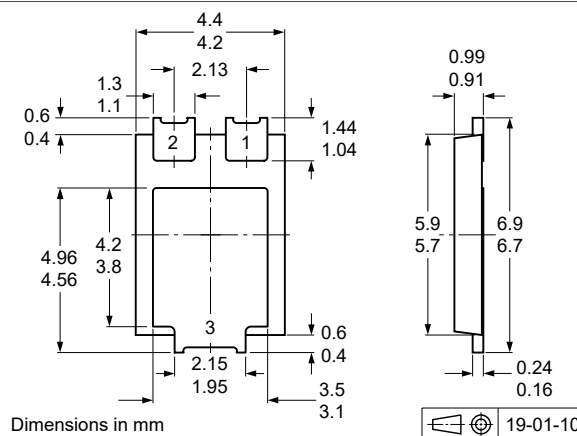


Fig. 15. Package outline CFP15B (SOT1289B)

13. Soldering

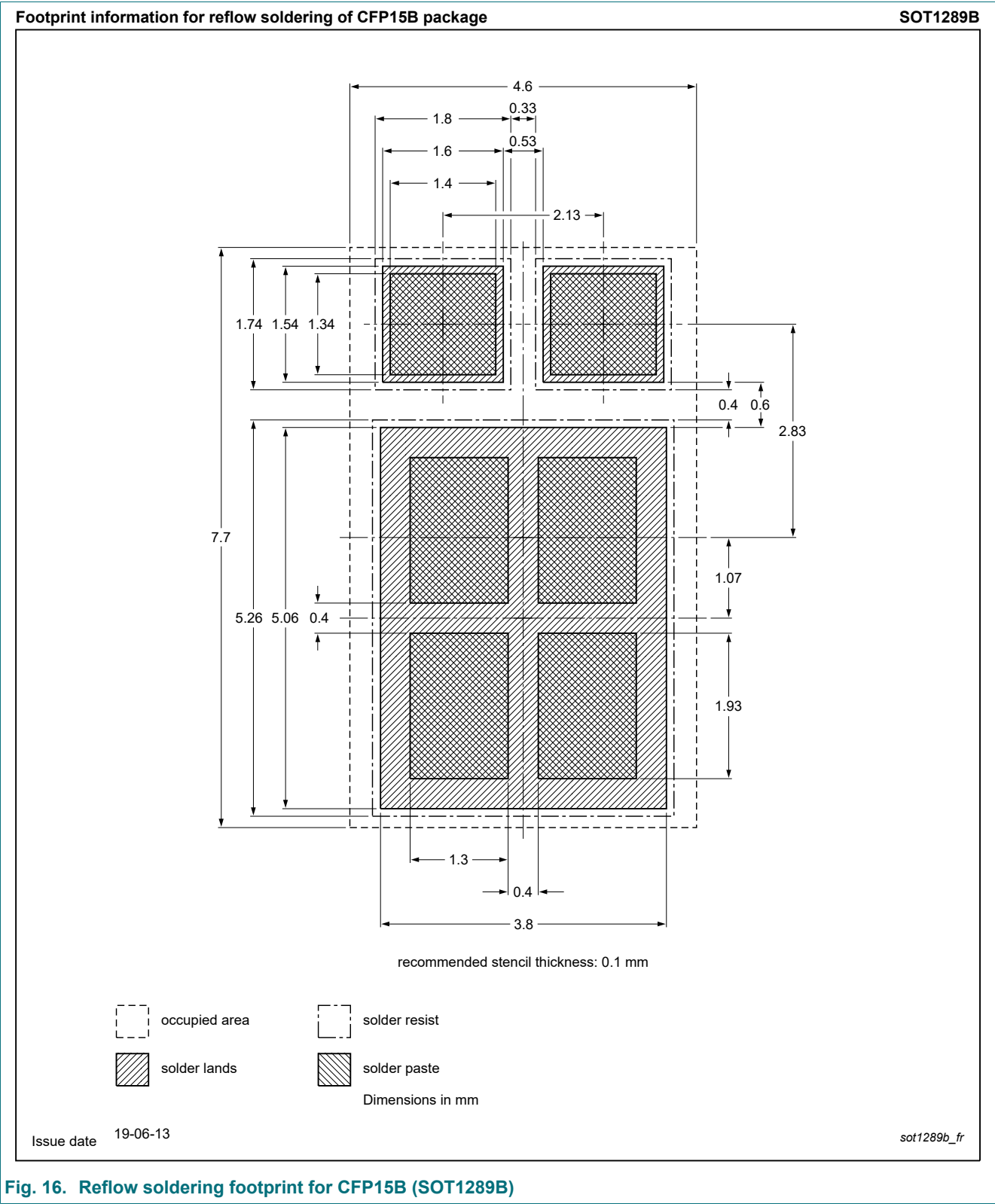


Fig. 16. Reflow soldering footprint for CFP15B (SOT1289B)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG060T030ELPE v.1	20191216	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.
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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