



# PMEG060T050ELPE

60 V, 5 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:  $I_{F(AV)} \leq 5$  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

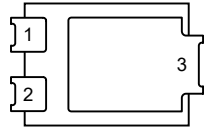
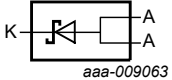
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; square wave; $f = 20$ kHz; $T_{sp} \leq 159$ °C		-	-	5	A
$V_R$	reverse voltage	$T_j = 25$ °C		-	-	60	V
$V_F$	forward voltage	$I_F = 5$ A; pulsed; $T_j = 25$ °C	[1]	-	620	690	mV
$I_R$	reverse current	$V_R = 10$ V; pulsed; $T_j = 25$ °C	[1]	-	0.14	0.9	$\mu$ A
		$V_R = 60$ V; pulsed; $T_j = 25$ °C	[1]	-	0.3	1.8	$\mu$ A

[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
PMEG060T050ELPE	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
PMEG060T050ELPE	060T M05E

## 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	$T_j = 25\text{ °C}$		-	60	V
$I_F$	forward current	$\delta = 1; T_{sp} \leq 154\text{ °C}$		-	7	A
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; square wave; $f = 20\text{ kHz}$ ; $T_{sp} \leq 159\text{ °C}$		-	5	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 8\text{ ms}$ ; square wave; $T_{j(\text{init})} = 25\text{ °C}$		-	60	A
		$t_p = 8\text{ ms}$ ; half sine wave; $T_{j(\text{init})} = 25\text{ °C}$		-	80	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 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.

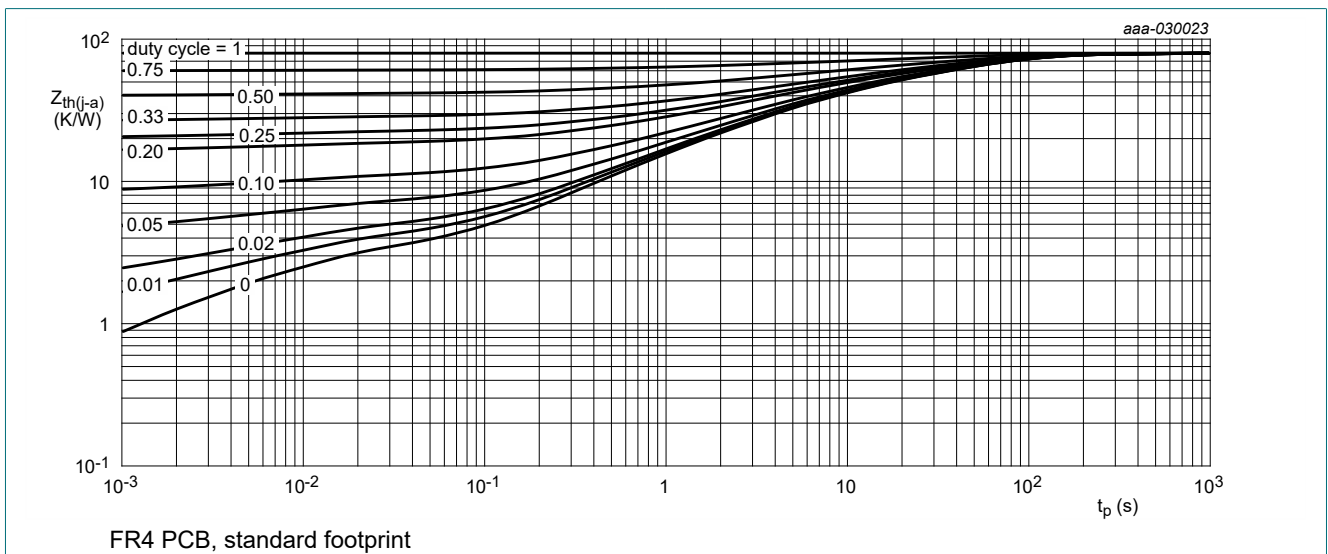


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

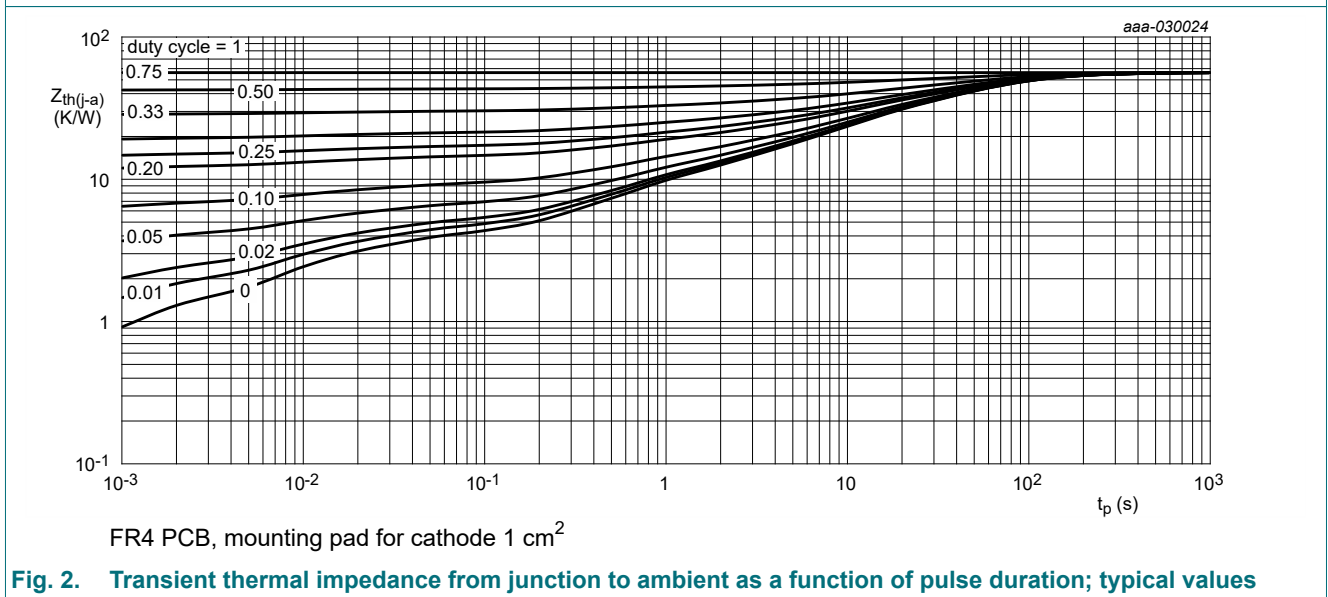


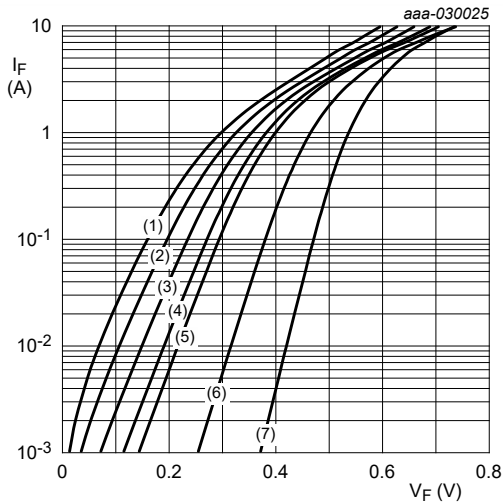
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

Table 7. Characteristics

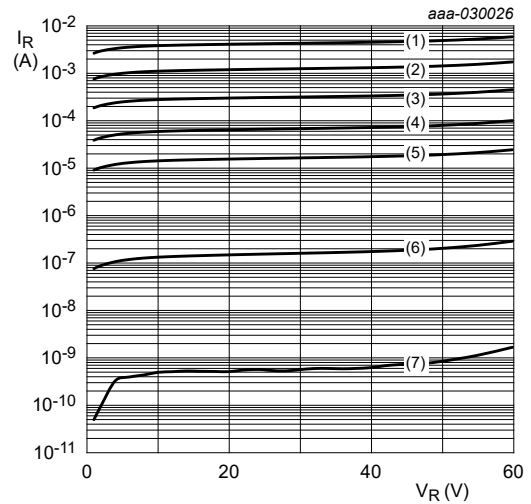
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)R}$	reverse breakdown voltage	$I_R = 1 \text{ mA}$ ; pulsed; $T_j = 25 \text{ }^\circ\text{C}$	[1]	60	-	-	V
$V_F$	forward voltage	$I_F = 0.1 \text{ A}$ ; pulsed; $T_j = 25 \text{ }^\circ\text{C}$	[1]	-	380	450	mV
		$I_F = 0.5 \text{ A}$ ; pulsed; $T_j = 25 \text{ }^\circ\text{C}$	[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
		$I_F = 5 \text{ A}$ ; pulsed; $T_j = 25 \text{ }^\circ\text{C}$	[1]	-	620	690	mV
		$I_F = 5 \text{ A}$ ; pulsed; $T_j = -40 \text{ }^\circ\text{C}$	[1]	-	650	720	mV
		$I_F = 5 \text{ A}$ ; pulsed; $T_j = 125 \text{ }^\circ\text{C}$	[1]	-	560	630	mV
		$I_F = 5 \text{ A}$ ; pulsed; $T_j = 150 \text{ }^\circ\text{C}$	[1]	-	530	600	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	$dl_F/dt = 200 \text{ A}/\mu\text{s}$ ; $I_F = 6 \text{ A}$ ; $V_R = 26 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	12	-	ns
$V_{FRM}$	peak forward recovery voltage	$I_F = 0.5 \text{ A}$ ; $dl_F/dt = 20 \text{ A}/\mu\text{s}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	460	-	mV

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



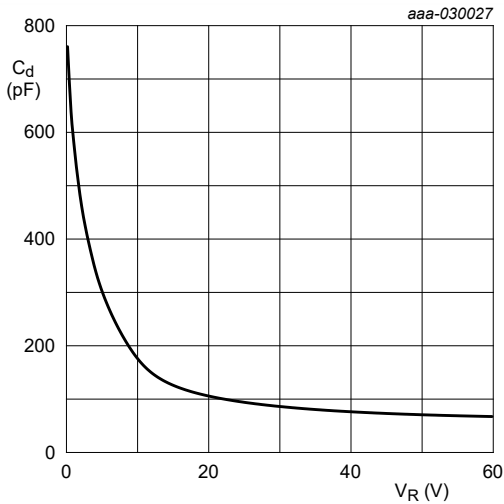
pulsed condition  
 (1)  $T_j = 175\text{ }^\circ\text{C}$   
 (2)  $T_j = 150\text{ }^\circ\text{C}$   
 (3)  $T_j = 125\text{ }^\circ\text{C}$   
 (4)  $T_j = 100\text{ }^\circ\text{C}$   
 (5)  $T_j = 85\text{ }^\circ\text{C}$   
 (6)  $T_j = 25\text{ }^\circ\text{C}$   
 (7)  $T_j = -40\text{ }^\circ\text{C}$

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



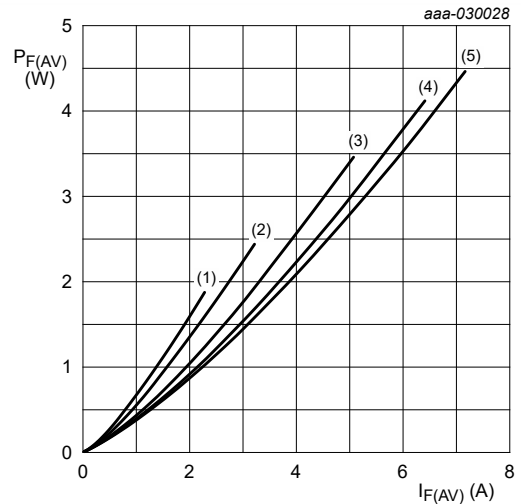
pulsed condition  
 (1)  $T_j = 175\text{ }^\circ\text{C}$   
 (2)  $T_j = 150\text{ }^\circ\text{C}$   
 (3)  $T_j = 125\text{ }^\circ\text{C}$   
 (4)  $T_j = 100\text{ }^\circ\text{C}$   
 (5)  $T_j = 85\text{ }^\circ\text{C}$   
 (6)  $T_j = 25\text{ }^\circ\text{C}$   
 (7)  $T_j = -40\text{ }^\circ\text{C}$

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



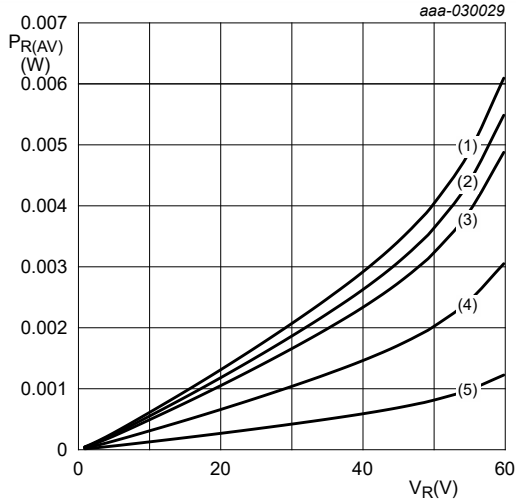
$f = 1\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

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



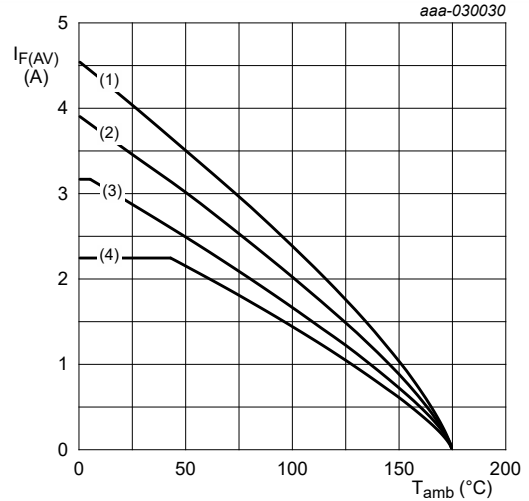
$T_j = 100\text{ }^\circ\text{C}$   
 (1)  $\delta = 0.1$   
 (2)  $\delta = 0.2$   
 (3)  $\delta = 0.5$   
 (4)  $\delta = 0.8$   
 (5)  $\delta = 1$ ; DC

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



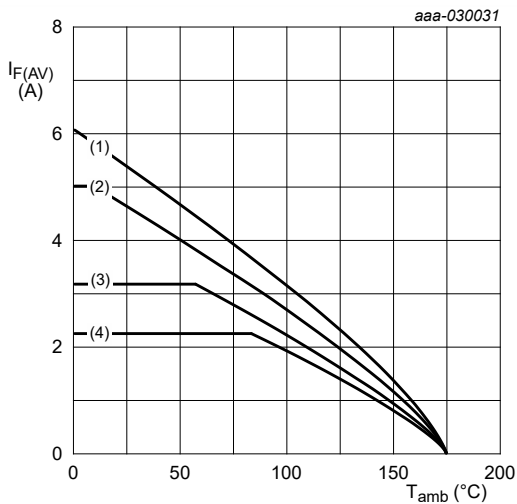
$T_j = 100\text{ }^\circ\text{C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.9$   
 (3)  $\delta = 0.8$   
 (4)  $\delta = 0.5$   
 (5)  $\delta = 0.2$

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



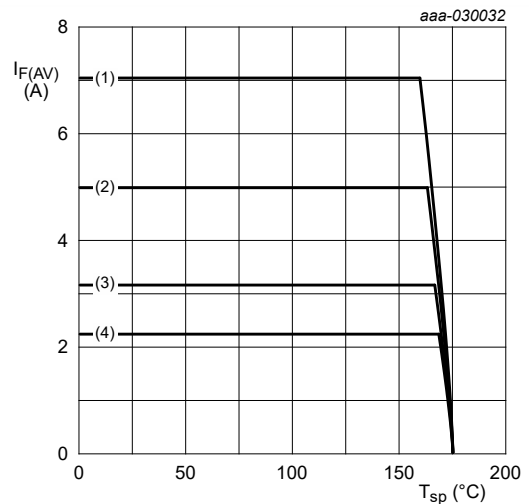
FR4 PCB, standard footprint  
 $T_j = 175\text{ }^\circ\text{C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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

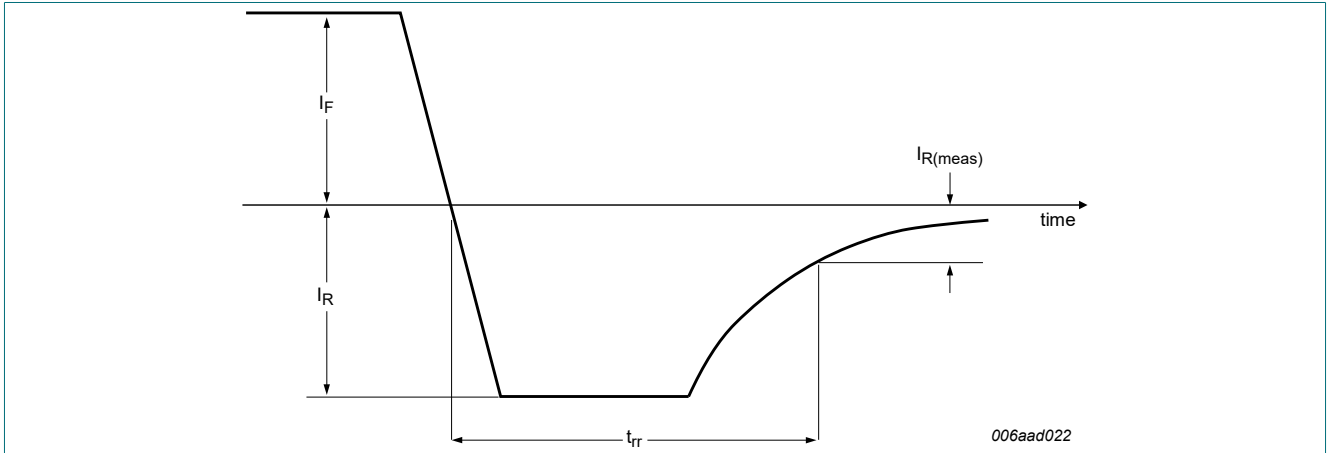


Fig. 11. Reverse recovery definition; step recovery

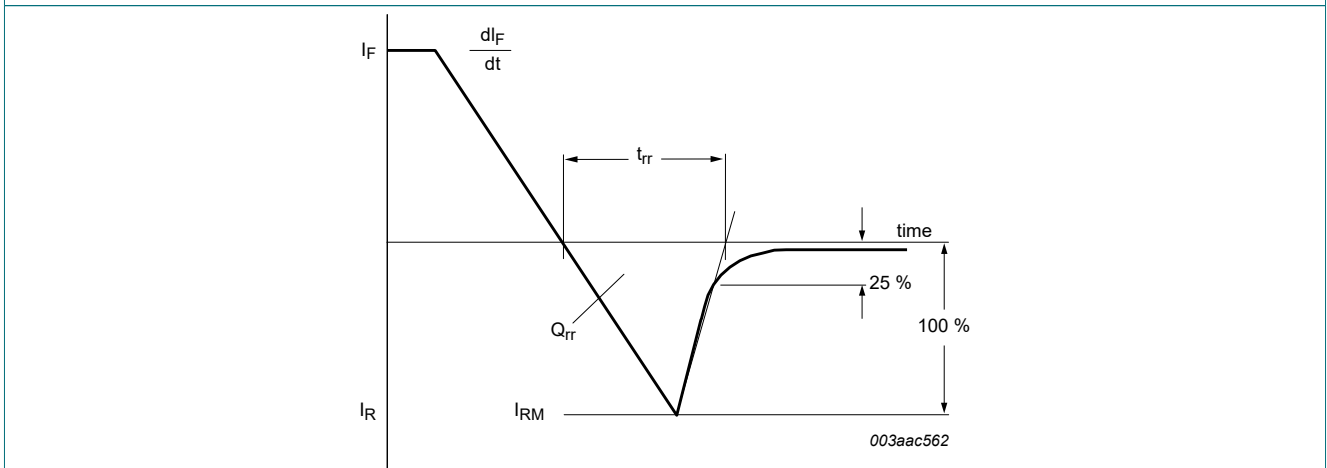


Fig. 12. Reverse recovery definition; ramp recovery

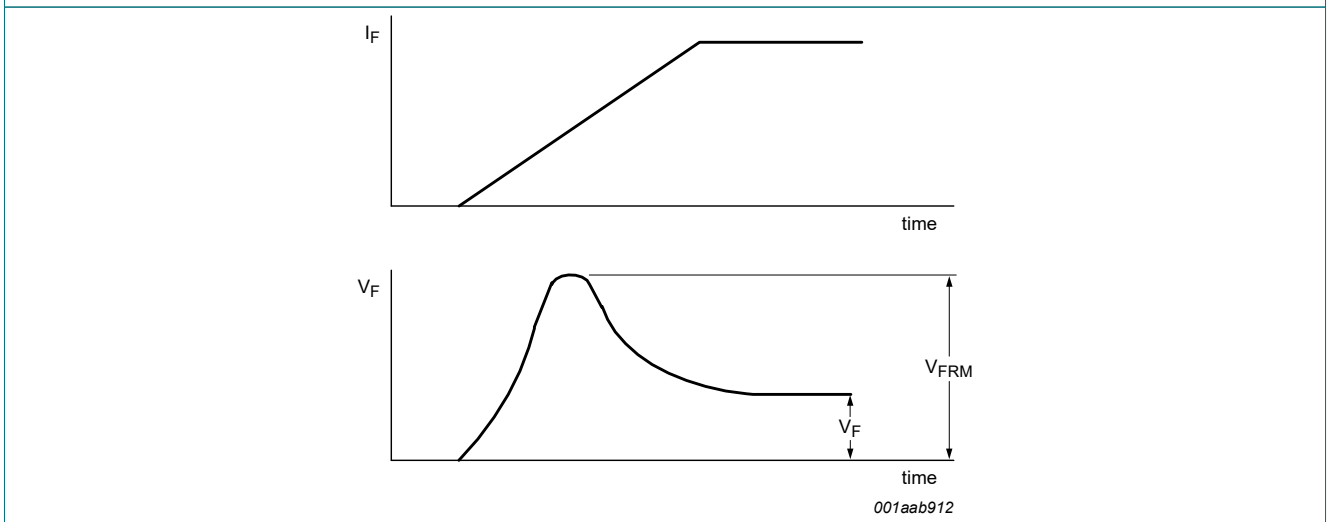


Fig. 13. Forward recovery definition

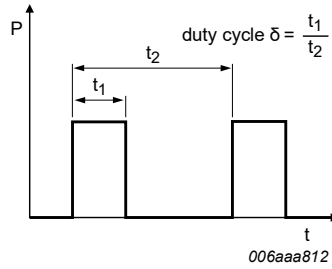


Fig. 14. Duty cycle definition

The current ratings for the typical waveforms are calculated according to the equations:

$$I_{F(AV)} = I_M \times \delta$$

with  $I_M$  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**

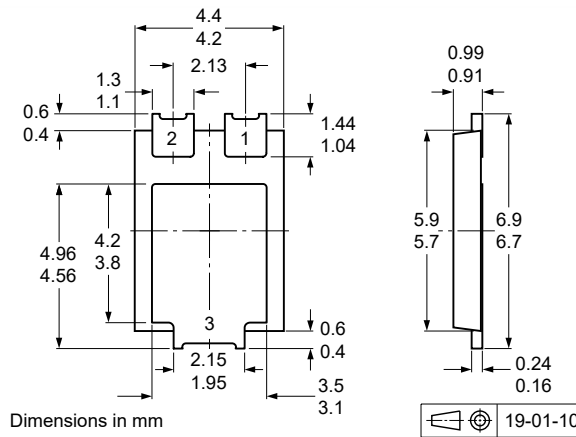
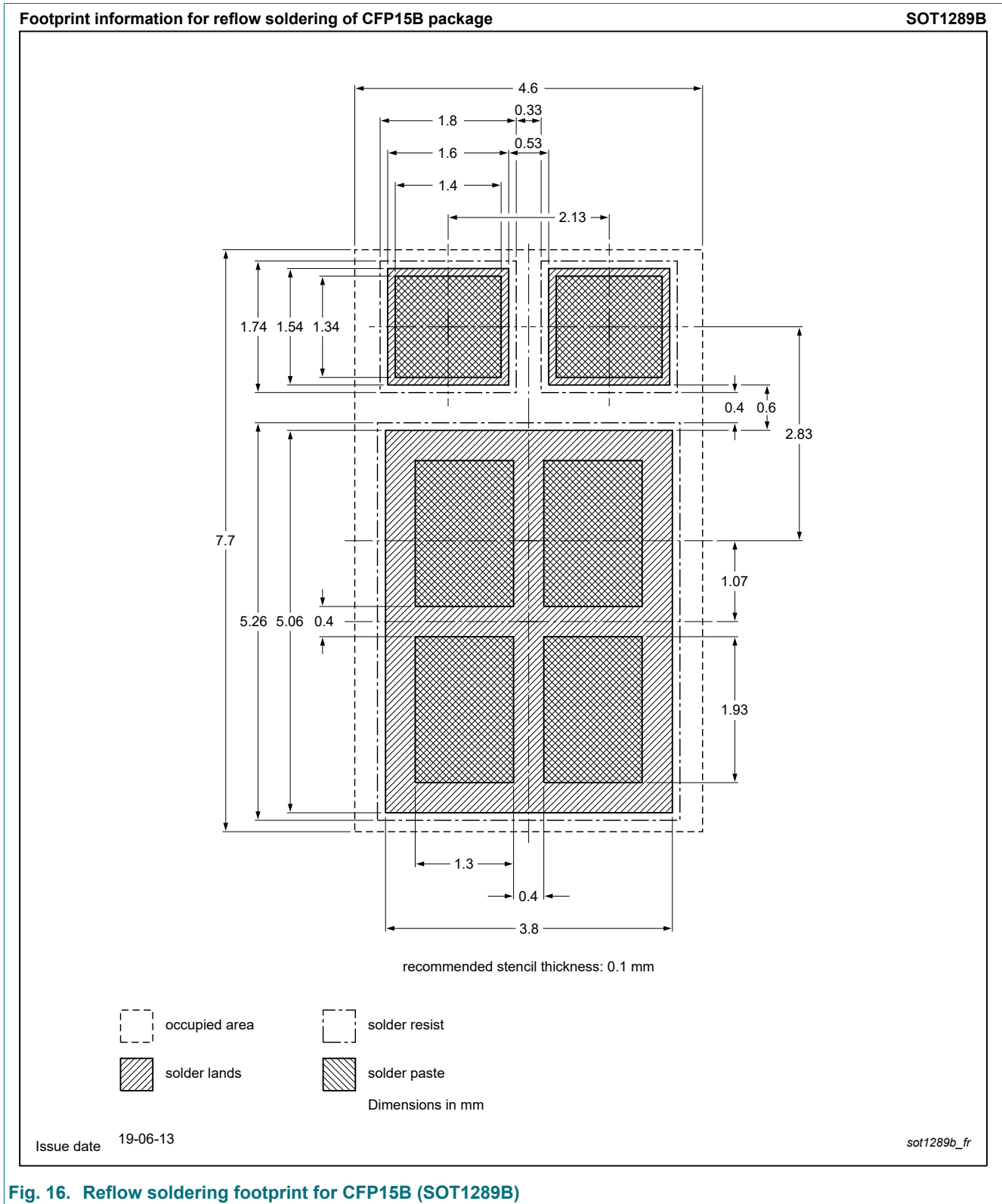


Fig. 15. Package outline CFP15B (SOT1289B)

### 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
PMEG060T050ELPE 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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