



# PMEG100T050ELPE

100 V, 5 A low leakage current Trench MEGA Schottky barrier rectifier

3 December 2020

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

- Low forward voltage
- Low  $Q_{rr}$  and low  $I_{RM}$
- Low leakage current
- High power capability due to clip-bonding technology
- Small and flat lead SMD power plastic package
- AEC-Q101 qualified

## 3. Applications

- High efficiency DC-to-DC conversion
- Automotive LED lighting
- Switch mode power supply
- Freewheeling application
- Reverse polarity protection
- OR-ing

## 4. Quick reference data

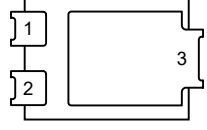
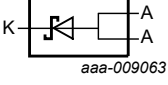
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; square wave; $f = 20$ kHz; $T_{sp} \leq 163$ °C		-	-	5	A
$V_R$	reverse voltage	$T_j = 25$ °C		-	-	100	V
$V_F$	forward voltage	$I_F = 5$ A; pulsed; $T_j = 25$ °C	[1]	-	750	810	mV
$I_R$	reverse current	$V_R = 100$ V; pulsed; $T_j = 25$ °C	[1]	-	0.4	2.5	$\mu$ A
		$V_R = 100$ V; pulsed; $T_j = 125$ °C	[1]	-	0.6	3	mA

[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
PMEG100T050ELPE	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
PMEG100T050ELPE	100T L05E

## 8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC60134).

Symbol	Parameter	Conditions		Min	Max	Unit
$V_R$	reverse voltage	$T_j = 25\text{ °C}$		-	100	V
$I_F$	forward current	$\delta = 1; T_{sp} \leq 159\text{ °C}$		-	7	A
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; square wave; $f = 20\text{ kHz}$ ; $T_{sp} \leq 163\text{ °C}$		-	5	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 8.3\text{ ms}$ ; half sine wave; $T_{j(init)} = 25\text{ °C}$		-	100	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 cm<sup>2</sup>.

## 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]	-	-	7	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.

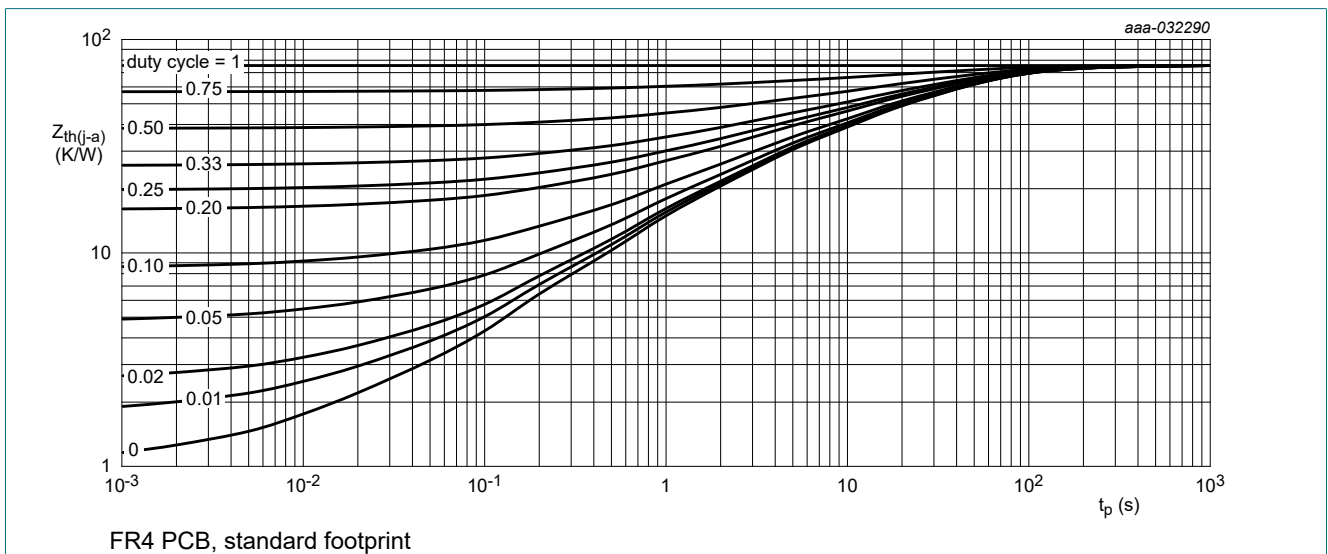


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

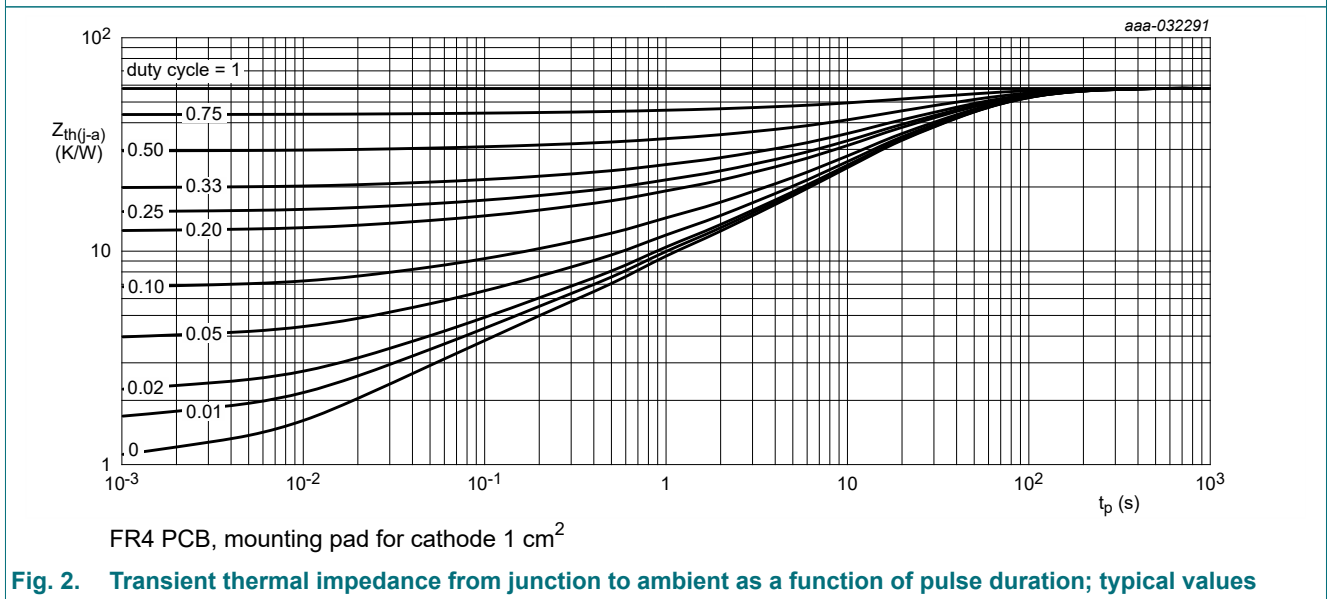


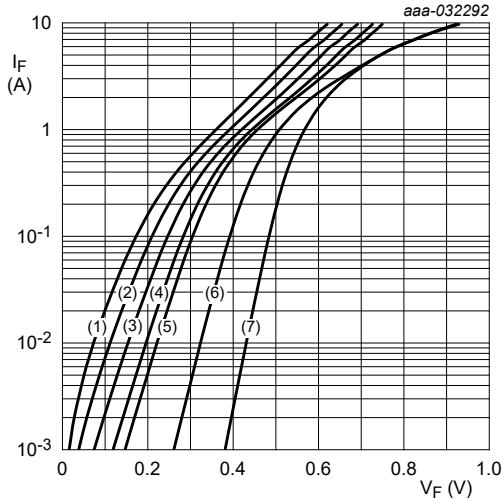
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

Table 7. Characteristics

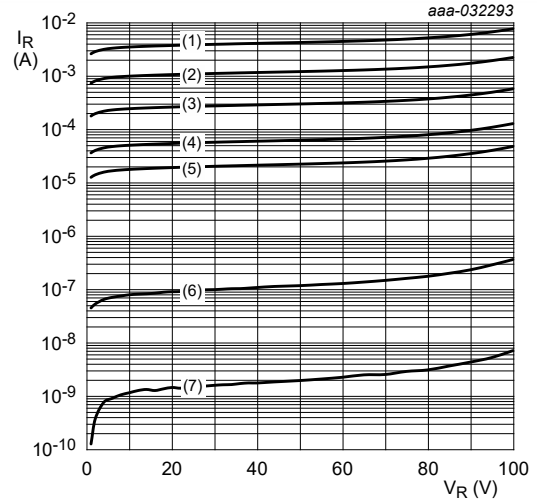
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)R}$	reverse breakdown voltage	$I_R = 1 \text{ mA}; T_j = 25 \text{ }^\circ\text{C}$	[1]	100	-	-	V
$V_F$	forward voltage	$I_F = 0.5 \text{ A}; \text{ pulsed}; T_j = 25 \text{ }^\circ\text{C}$	[1]	-	460	560	mV
		$I_F = 1 \text{ A}; \text{ pulsed}; T_j = 25 \text{ }^\circ\text{C}$	[1]	-	510	580	mV
		$I_F = 2 \text{ A}; \text{ pulsed}; T_j = 25 \text{ }^\circ\text{C}$	[1]	-	580	650	mV
		$I_F = 3 \text{ A}; \text{ pulsed}; T_j = 25 \text{ }^\circ\text{C}$	[1]	-	650	710	mV
		$I_F = 5 \text{ A}; \text{ pulsed}; T_j = 25 \text{ }^\circ\text{C}$	[1]	-	750	810	mV
		$I_F = 5 \text{ A}; \text{ pulsed}; T_j = -40 \text{ }^\circ\text{C}$	[1]	-	755	820	mV
		$I_F = 5 \text{ A}; \text{ pulsed}; T_j = 125 \text{ }^\circ\text{C}$	[1]	-	620	690	mV
		$I_F = 5 \text{ A}; \text{ pulsed}; T_j = 150 \text{ }^\circ\text{C}$	[1]	-	580	660	mV
$I_R$	reverse current	$V_R = 60 \text{ V}; \text{ pulsed}; T_j = 25 \text{ }^\circ\text{C}$	[1]	-	0.15	0.63	$\mu\text{A}$
		$V_R = 100 \text{ V}; \text{ pulsed}; T_j = 25 \text{ }^\circ\text{C}$	[1]	-	0.4	2.5	$\mu\text{A}$
		$V_R = 100 \text{ V}; \text{ pulsed}; T_j = 125 \text{ }^\circ\text{C}$	[1]	-	0.6	3	mA
		$V_R = 100 \text{ V}; \text{ pulsed}; T_j = 150 \text{ }^\circ\text{C}$	[1]	-	2.3	12	mA
$C_d$	diode capacitance	$V_R = 1 \text{ V}; f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ\text{C}$		-	410	-	pF
		$V_R = 10 \text{ V}; f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ\text{C}$		-	120	-	pF
$t_{rr}$	reverse recovery time step recovery	$I_F = 0.5 \text{ A}; I_R = 0.5 \text{ A}; I_{R(\text{meas})} = 0.1 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$		-	12	-	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
$I_{RM}$	peak reverse recovery current	$dI_F/dt = 200 \text{ A}/\text{s}; I_F = 6 \text{ A}; V_R = 26 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$		-	1.3	-	A
$Q_{rr}$	reverse recovery charge			-	9.5	-	nC
$V_{FRM}$	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.



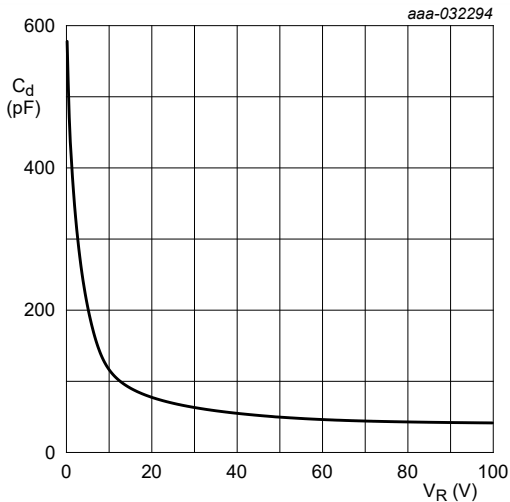
pulsed condition  
 (1)  $T_j = 175\text{ }^\circ\text{C}$   
 (2)  $T_j = 150\text{ }^\circ\text{C}$   
 (3)  $T_j = 125\text{ }^\circ\text{C}$   
 (4)  $T_j = 100\text{ }^\circ\text{C}$   
 (5)  $T_j = 85\text{ }^\circ\text{C}$   
 (6)  $T_j = 25\text{ }^\circ\text{C}$   
 (7)  $T_j = -40\text{ }^\circ\text{C}$

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



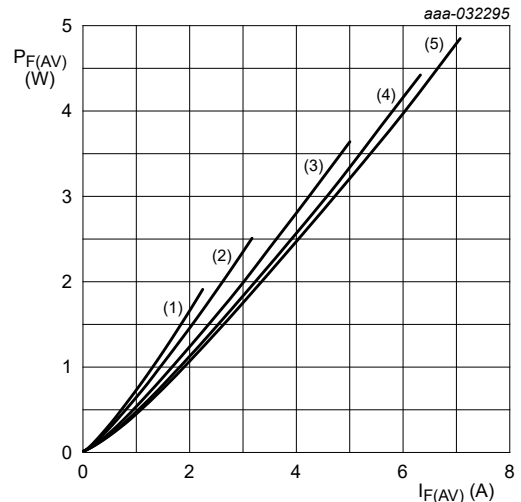
pulsed condition  
 (1)  $T_j = 175\text{ }^\circ\text{C}$   
 (2)  $T_j = 150\text{ }^\circ\text{C}$   
 (3)  $T_j = 125\text{ }^\circ\text{C}$   
 (4)  $T_j = 100\text{ }^\circ\text{C}$   
 (5)  $T_j = 85\text{ }^\circ\text{C}$   
 (6)  $T_j = 25\text{ }^\circ\text{C}$   
 (7)  $T_j = -40\text{ }^\circ\text{C}$

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



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

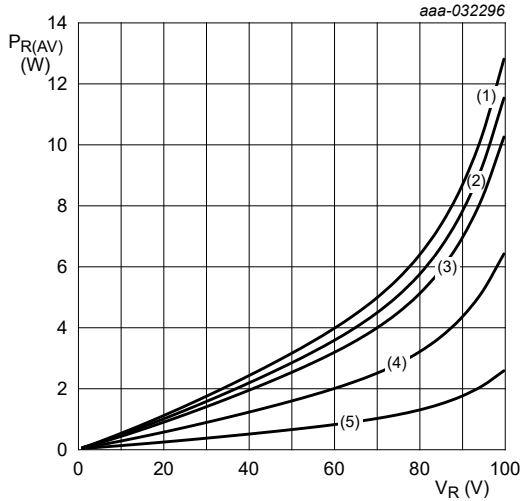
Fig. 5. Diode capacitance as a function of reverse voltage; typical values



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

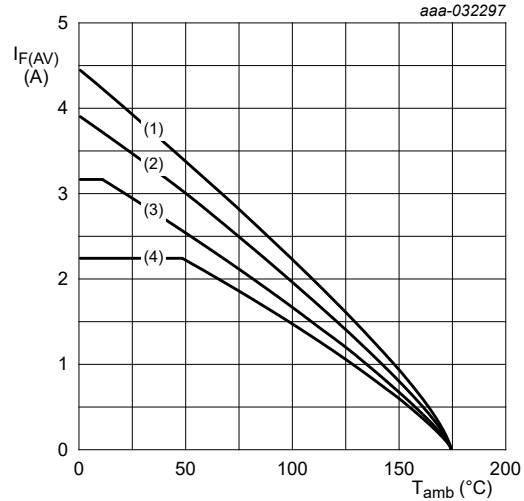
Fig. 6. Average forward power dissipation as a function of average forward current; typical values

100 V, 5 A low leakage current Trench MEGA Schottky barrier rectifier



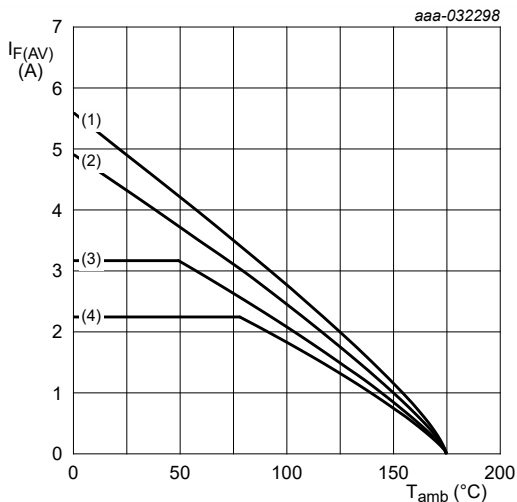
$T_j = 100\text{ }^\circ\text{C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.9$   
 (3)  $\delta = 0.8$   
 (4)  $\delta = 0.5$   
 (5)  $\delta = 0.2$

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



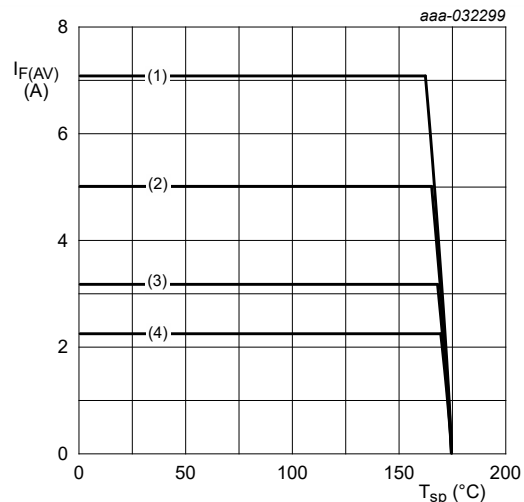
FR4 PCB, standard footprint  
 $T_j = 175\text{ }^\circ\text{C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

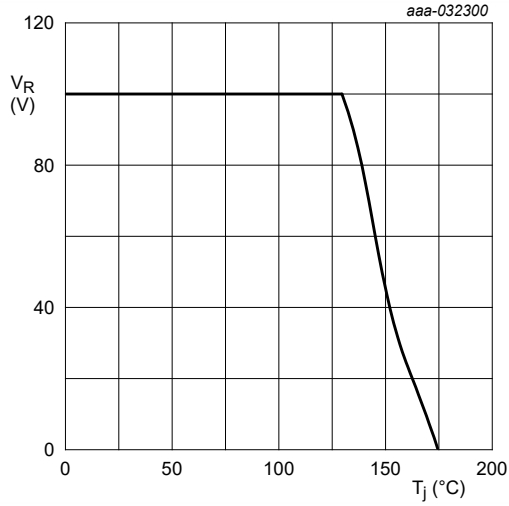
Fig. 9. Average forward current as a function of ambient temperature; typical values



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

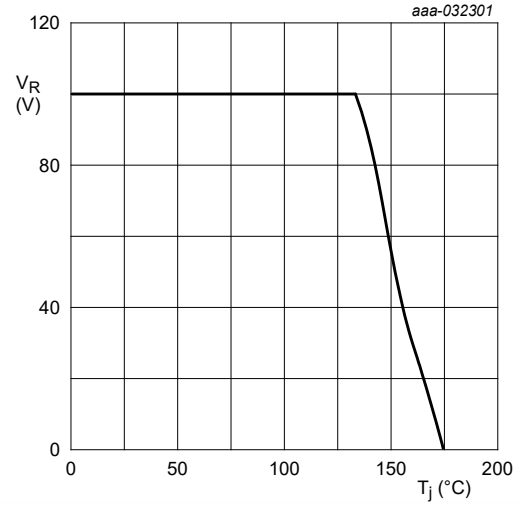
Fig. 10. Average forward current as a function of solder point temperature; typical values

100 V, 5 A low leakage current Trench MEGA Schottky barrier rectifier



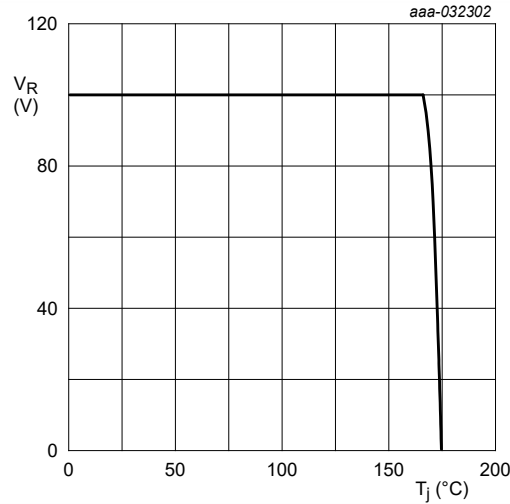
FR4 PCB, standard footprint  
R<sub>th</sub> = 90 K/W

Fig. 11. Derated maximum reverse voltage as a function of junction temperature; typical values



FR4 PCB, mounting pad for cathode 1 cm<sup>2</sup>  
R<sub>th</sub> = 70 K/W

Fig. 12. Derated maximum reverse voltage as a function of junction temperature; typical values



Soldering point of cathode tab  
R<sub>th</sub> = 7 K/W

Fig. 13. Derated maximum reverse voltage as a function of junction temperature; typical values

11. Test information

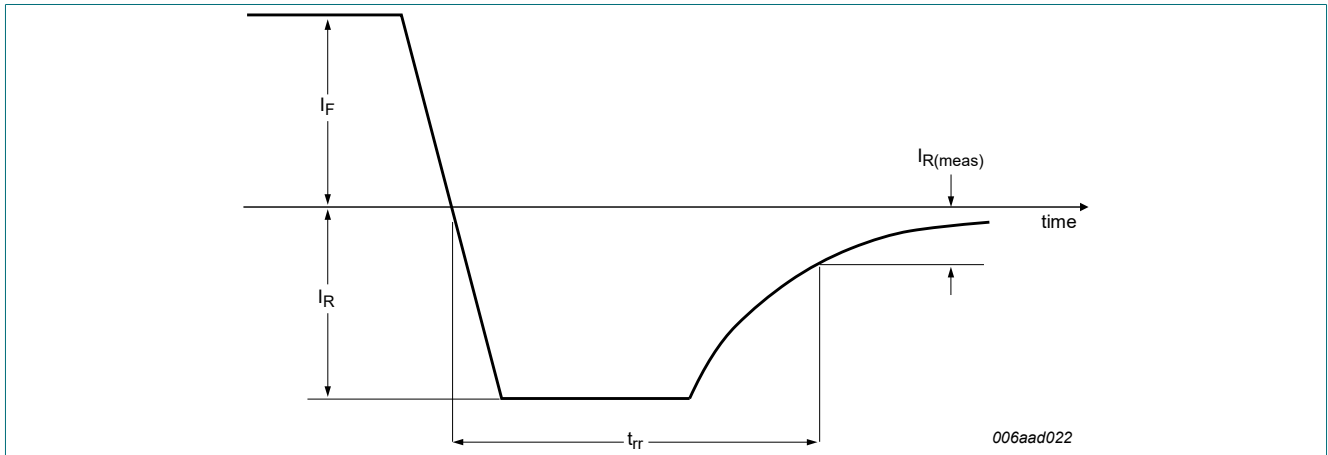


Fig. 14. Reverse recovery definition; step recovery



Fig. 15. Reverse recovery definition; ramp recovery



Fig. 16. Forward recovery definition



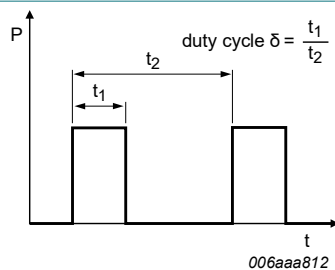


Fig. 17. Duty cycle definition

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

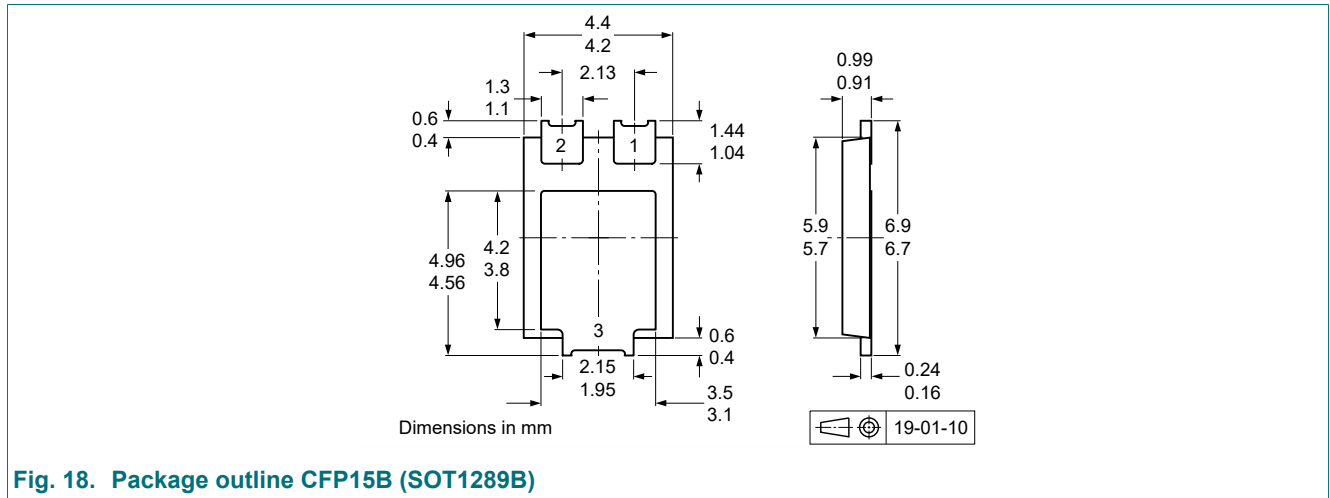


Fig. 18. Package outline CFP15B (SOT1289B)

## 13. Soldering

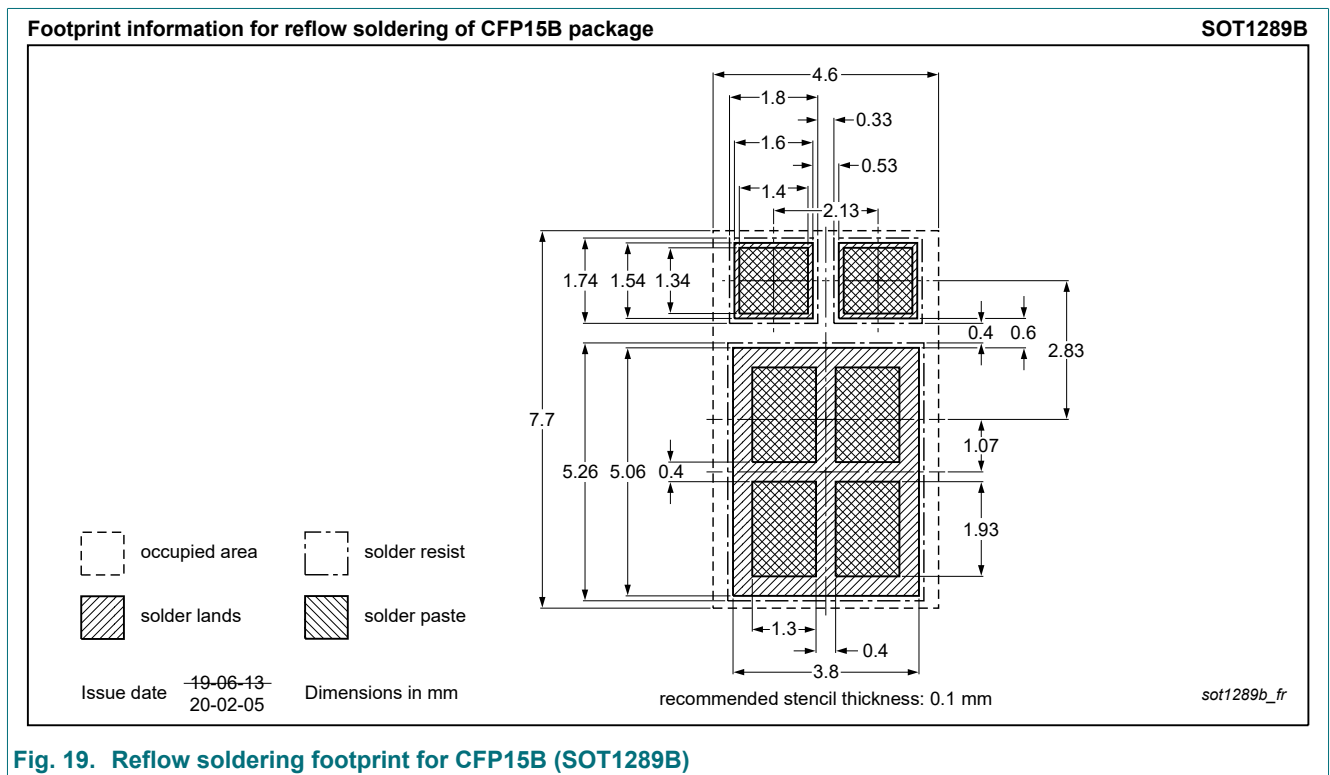


Fig. 19. Reflow soldering footprint for CFP15B (SOT1289B)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG100T050ELPE v.2	20201203	Product data sheet	-	PMEG100T050ELPE v.1
Modifications:	• Product status changed			
PMEG100T050ELPE v.1	20201019	Preliminary 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.

- [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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Date of release: 3 December 2020

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