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Kind regards,

Team Nexperia



# PMEG2020CPAS

20 V, 2 A low VF dual MEGA Schottky barrier rectifier

20 January 2015

Product data sheet

## 1. General description

Planar Maximum Efficiency General Application (MEGA) Schottky barrier rectifier in common cathode configuration with an integrated guard ring for stress protection, encapsulated in an ultra thin DFN2020D-3 (SOT1061D) leadless small Surface-Mounted Device (SMD) plastic package with visible and solderable side pads.

## 2. Features and benefits

- Average forward current  $I_{F(AV)} \leq 2$  A
- Reverse voltage  $V_R \leq 20$  V
- Low forward voltage  $V_F \leq 420$  mV
- Low reverse current
- Reduced Printed-Circuit-Board (PCB) area requirements
- Exposed heat sink (cathode pad) for excellent thermal and electrical conductivity
- Leadless small SMD plastic package with visible and solderable side pads
- Suitable for Automatic Optical Inspection (AOI) of solder joints
- AEC-Q101 qualified

## 3. Applications

- Low voltage rectification
- High efficiency DC-to-DC conversion
- Switch Mode Power Supply (SMPS)
- Free-wheeling application
- Reverse polarity protection
- Low power consumption application
- Battery chargers for mobile equipment
- LED backlight for mobile application

## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
<b>Per diode</b>							
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; $f = 20$ kHz; $T_{amb} \leq 80$ °C; square wave	[1]	-	-	2	A
		$\delta = 0.5$ ; $f = 20$ kHz; $T_{sp} \leq 140$ °C; square wave		-	-	2	A

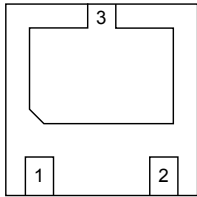
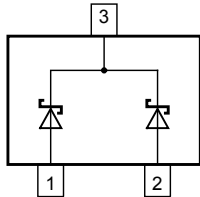


Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_R$	reverse voltage	$T_j = 25\text{ }^\circ\text{C}$	-	-	20	V
<b>Per diode</b>						
$V_F$	forward voltage	$I_F = 2\text{ A}$ ; $t_p \leq 300\text{ }\mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25\text{ }^\circ\text{C}$ ; pulsed	-	385	420	mV
$I_R$	reverse current	$V_R = 20\text{ V}$ ; $t_p \leq 300\text{ }\mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25\text{ }^\circ\text{C}$ ; pulsed	-	380	1000	$\mu\text{A}$

[1] Device mounted on a ceramic PCB,  $\text{Al}_2\text{O}_3$ , standard footprint.

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	anode diode 1	A1	 <p>Transparent top view <b>DFN2020D-3 (SOT1061D)</b></p>	 <p>006aaa438</p>
2	anode diode 2	A2		
3	common cathode	K		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMEG2020CPAS	DFN2020D-3	DFN2020D-3: plastic thermal enhanced ultra thin small outline package; no leads; 3 terminals; body 2 x 2 x 0.65 mm	SOT1061D

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PMEG2020CPAS	CW

## 8. Limiting values

**Table 5. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
<b>Per diode</b>						
$V_R$	reverse voltage	$T_j = 25\text{ °C}$		-	20	V
$I_F$	forward current	$T_{sp} \leq 135\text{ °C}; \delta = 1$		-	2.8	A
$I_{F(AV)}$	average forward current	$\delta = 0.5; f = 20\text{ kHz}; T_{amb} \leq 80\text{ °C};$ square wave	[1]	-	2	A
		$\delta = 0.5; f = 20\text{ kHz}; T_{sp} \leq 140\text{ °C};$ square wave		-	2	A
$I_{FRM}$	repetitive peak forward current	$t_p \leq 1\text{ ms}; \delta \leq 0.25$		-	7	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 8\text{ ms}; T_{j(init)} = 25\text{ °C};$ square wave		-	9	A
<b>Per device; one diode loaded</b>						
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[2]	-	500	mW
			[3]	-	960	mW
			[1]	-	1800	mW
$T_j$	junction temperature			-	150	°C
$T_{amb}$	ambient temperature			-55	150	°C
$T_{stg}$	storage temperature			-65	150	°C

[1] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

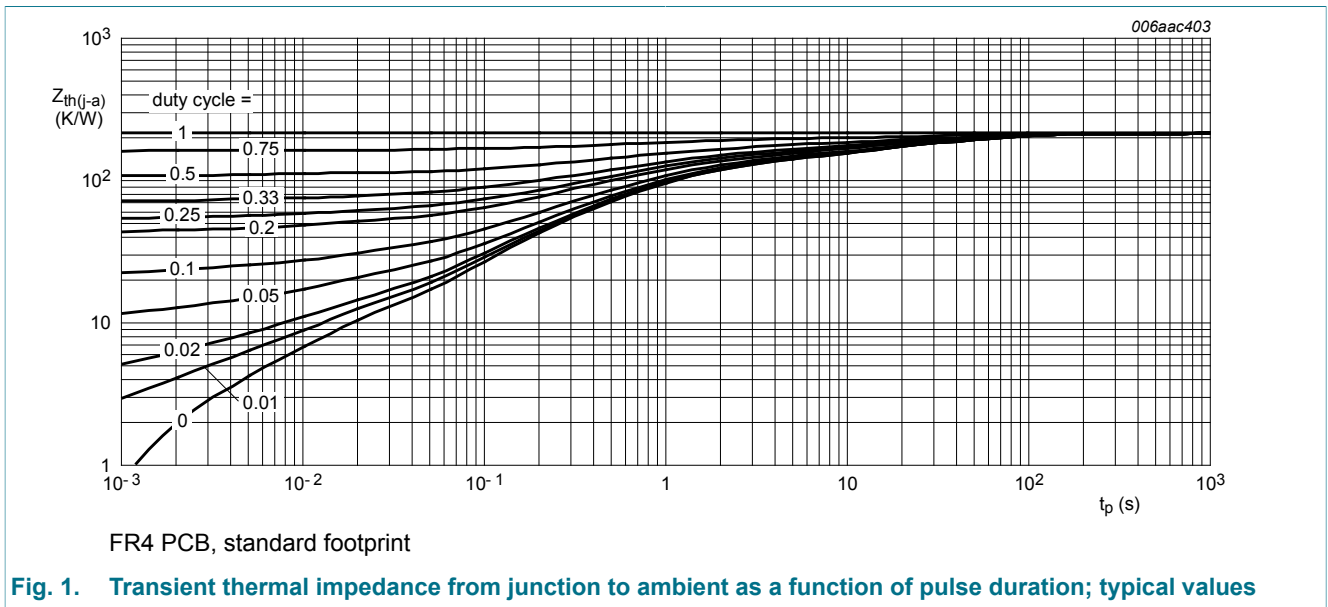
[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm<sup>2</sup>.

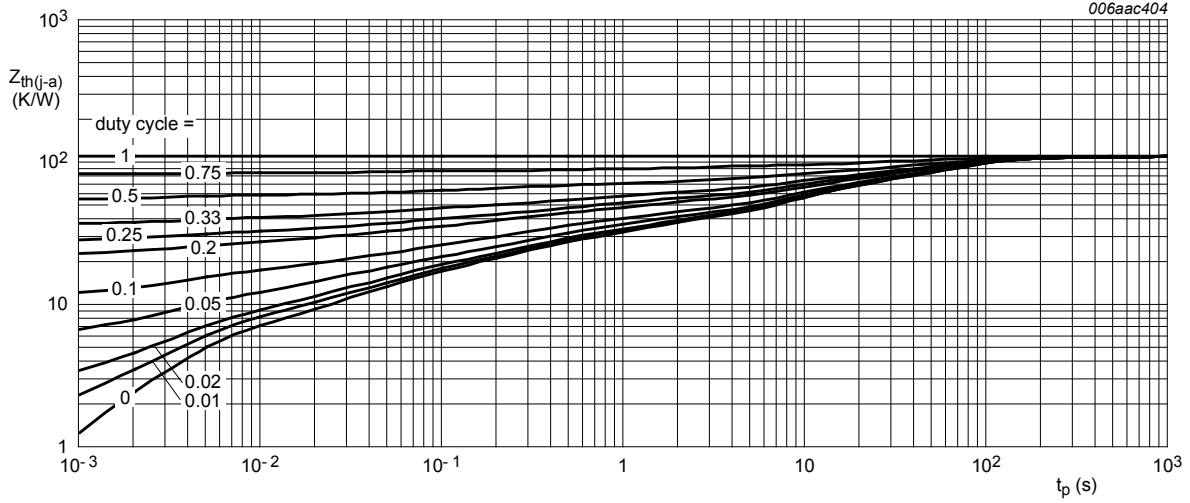
### 9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
<b>Per device; one diode loaded</b>							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1][2]	-	-	250	K/W
			[1][3]	-	-	130	K/W
			[1][4]	-	-	70	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[5]	-	-	12	K/W

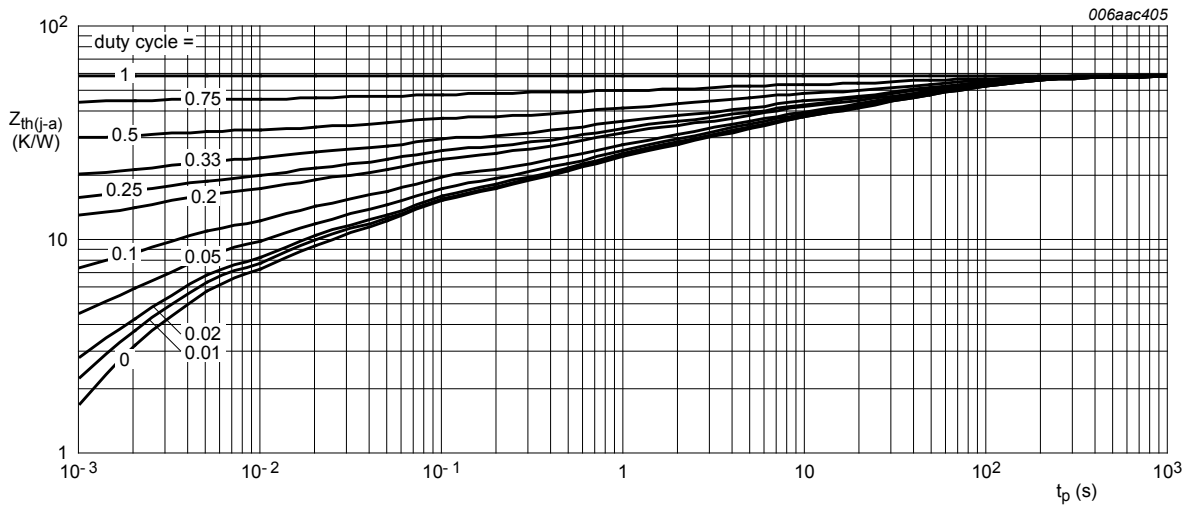
- [1] For Schottky barrier diodes thermal runaway has to be considered, as in some applications the reverse power losses  $P_R$  are a significant part of the total power losses.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm<sup>2</sup>.
- [4] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.
- [5] Soldering point of cathode tab.





FR4 PCB, mounting pad for cathode 1 cm<sup>2</sup>

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



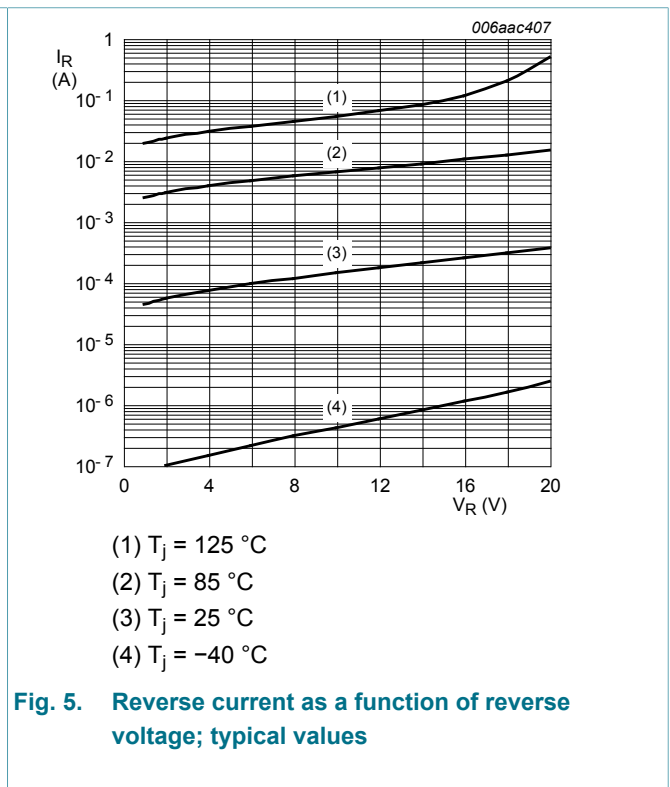
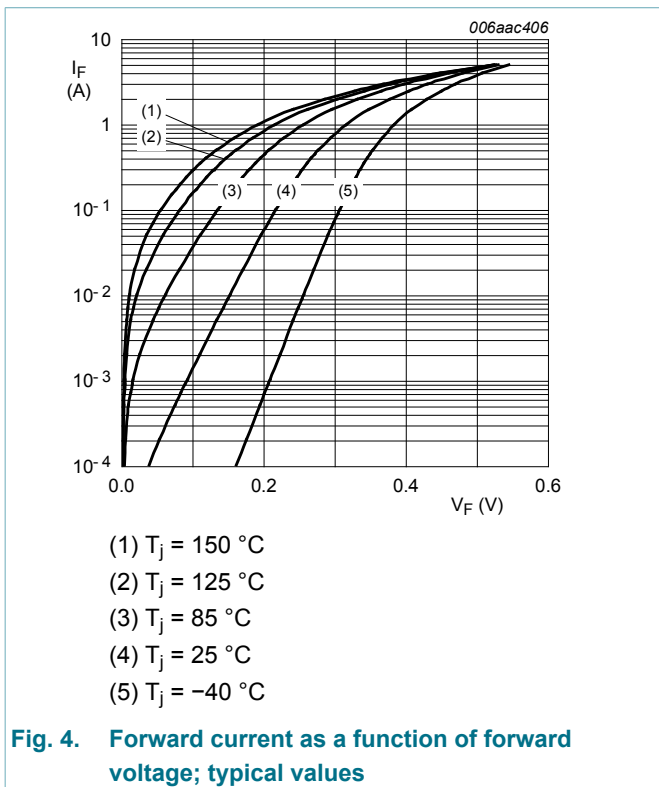
Ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint

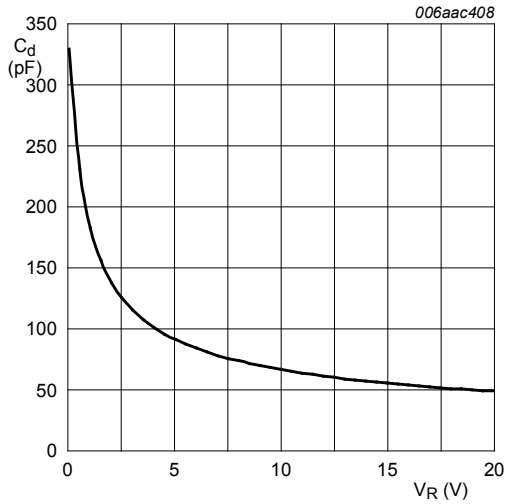
Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

### 10. Characteristics

Table 7. Characteristics

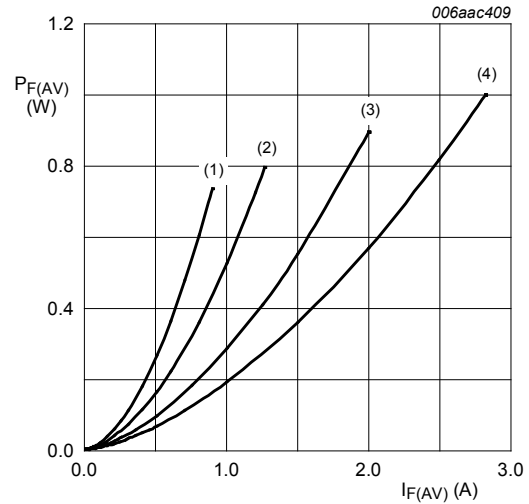
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per diode</b>						
$V_{(BR)R}$	reverse breakdown voltage	$I_R = 5 \text{ mA}; T_j = 25 \text{ }^\circ\text{C}; t_p = 300 \text{ } \mu\text{s}; \delta = 0.02; \text{ pulsed}$	20	-	-	V
$V_F$	forward voltage	$I_F = 100 \text{ mA}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_j = 25 \text{ }^\circ\text{C}; \text{ pulsed}$	-	220	-	mV
		$I_F = 1 \text{ A}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_j = 25 \text{ }^\circ\text{C}; \text{ pulsed}$	-	320	360	mV
		$I_F = 2 \text{ A}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_j = 25 \text{ }^\circ\text{C}; \text{ pulsed}$	-	385	420	mV
$I_R$	reverse current	$V_R = 10 \text{ V}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_j = 25 \text{ }^\circ\text{C}; \text{ pulsed}$	-	160	-	$\mu\text{A}$
		$V_R = 20 \text{ V}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_j = 25 \text{ }^\circ\text{C}; \text{ pulsed}$	-	380	1000	$\mu\text{A}$
$C_d$	diode capacitance	$V_R = 1 \text{ V}; f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ\text{C}$	-	175	-	pF
		$V_R = 10 \text{ V}; f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ\text{C}$	-	65	-	pF
$t_{rr}$	reverse recovery time	$I_F = 10 \text{ mA}; I_R = 10 \text{ mA}; R_L = 100 \text{ } \Omega; I_{R(\text{meas})} = 1 \text{ mA}; T_j = 25 \text{ }^\circ\text{C}$	-	55	-	ns





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

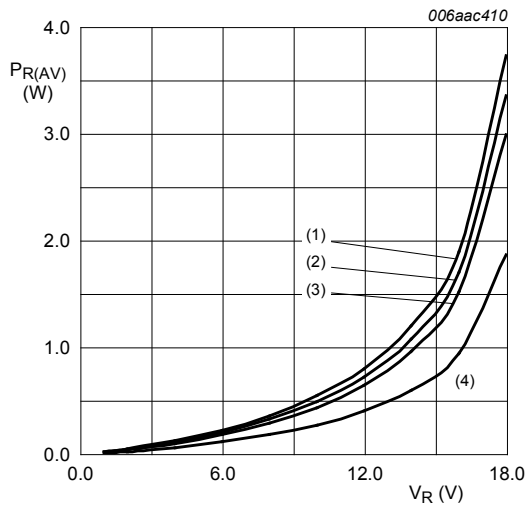
**Fig. 6. Diode capacitance as a function of reverse voltage; typical values**



$T_j = 150 \text{ }^\circ\text{C}$

- (1)  $\delta = 0.1$
- (2)  $\delta = 0.2$
- (3)  $\delta = 0.5$
- (4)  $\delta = 1$

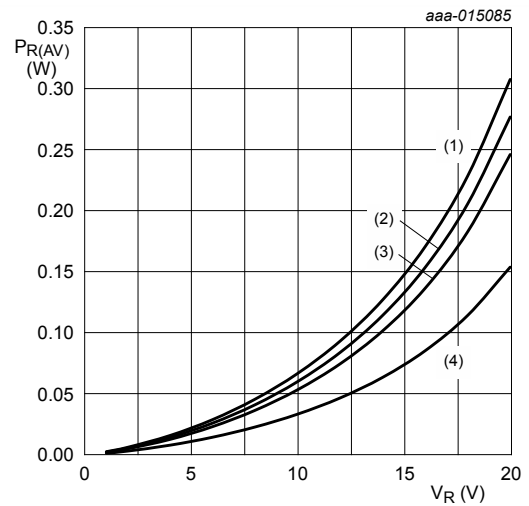
**Fig. 7. Average forward power dissipation as a function of average forward current; typical values**



$T_j = 125 \text{ }^\circ\text{C}$

- (1)  $\delta = 1$
- (2)  $\delta = 0.9$
- (3)  $\delta = 0.8$
- (4)  $\delta = 0.5$

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

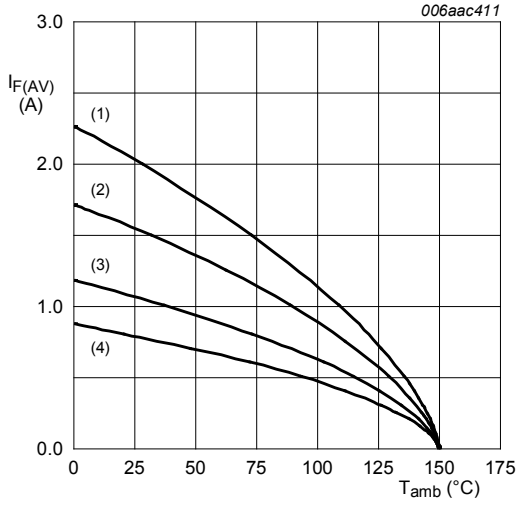


$T_j = 85 \text{ }^\circ\text{C}$

- (1)  $\delta = 1$
- (2)  $\delta = 0.9$
- (3)  $\delta = 0.8$
- (4)  $\delta = 0.5$

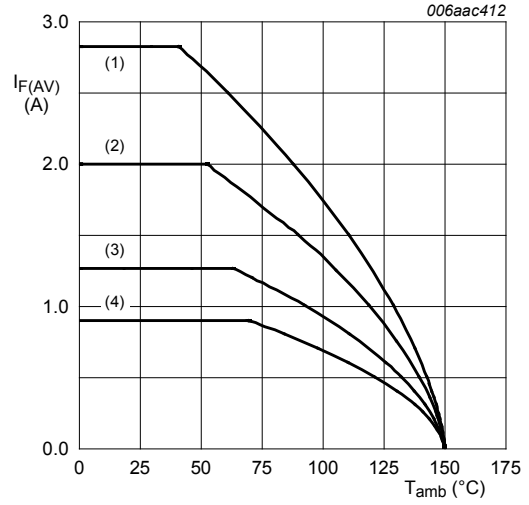
**Fig. 9. Average reverse power dissipation as a function of reverse voltage; typical values**





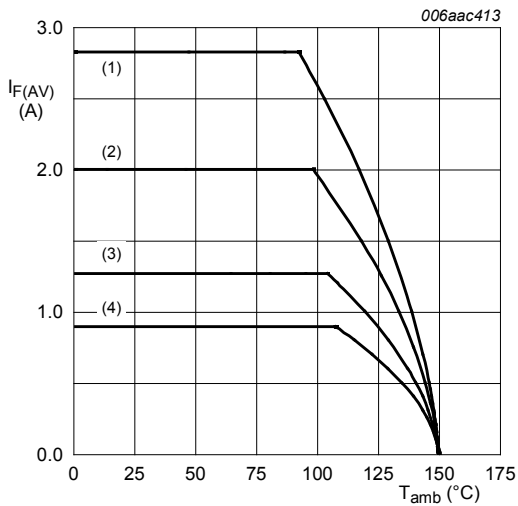
FR4 PCB, standard footprint  
 $T_j = 150\text{ °C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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



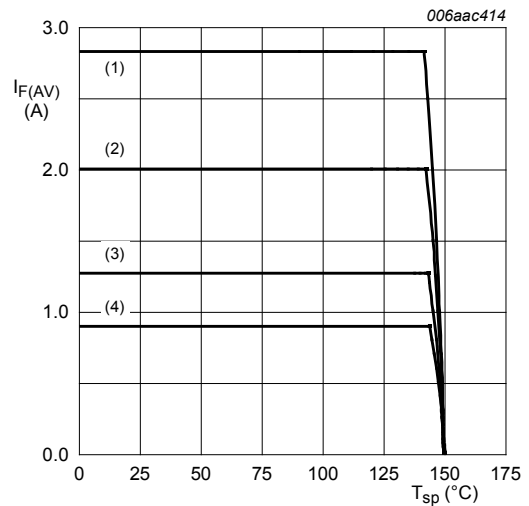
FR4 PCB, mounting pad for cathode  $1\text{ cm}^2$   
 $T_j = 150\text{ °C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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



Ceramic PCB,  $\text{Al}_2\text{O}_3$ , standard footprint  
 $T_j = 150\text{ °C}$   
 (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. 12. Average forward current as a function of ambient temperature; typical values**



$T_j = 150\text{ °C}$   
 (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. 13. Average forward current as a function of solder point temperature; typical values**

### 11. Test information

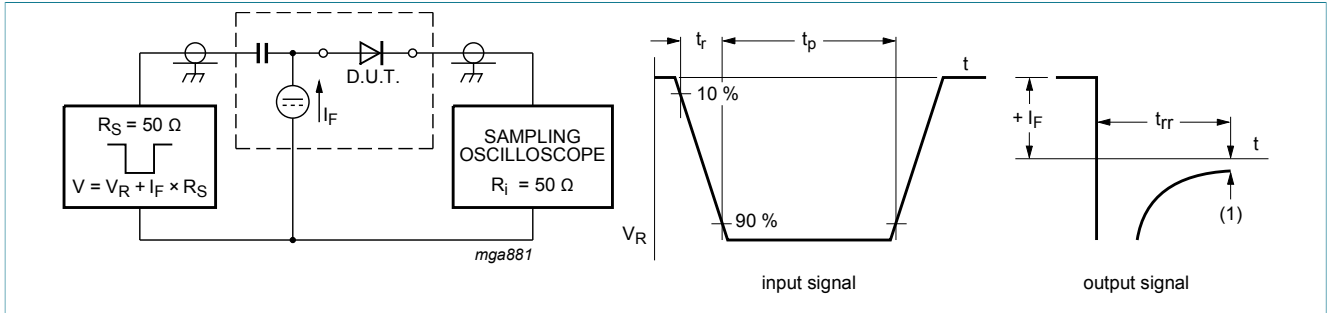


Fig. 14. Reverse recovery time: test circuit and waveforms

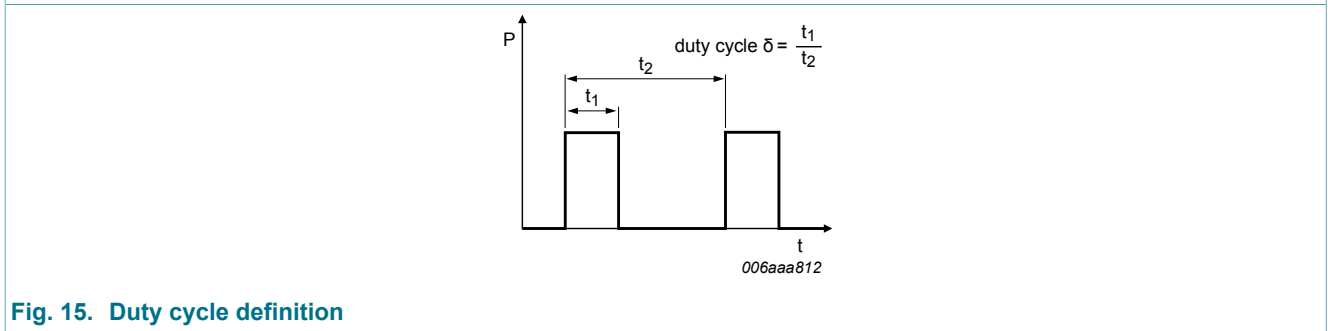


Fig. 15. Duty cycle definition

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

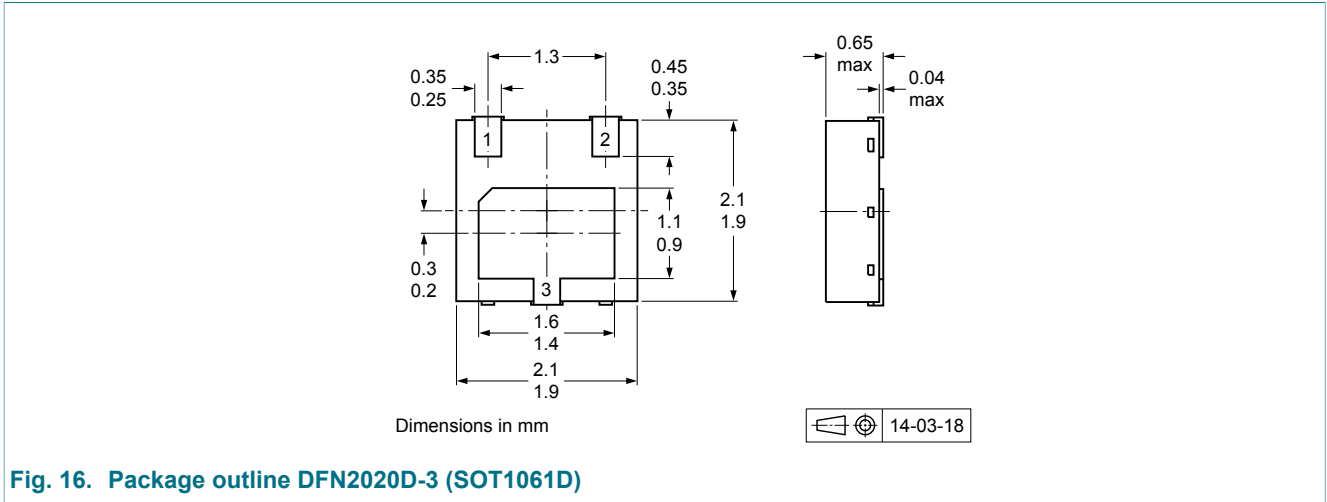
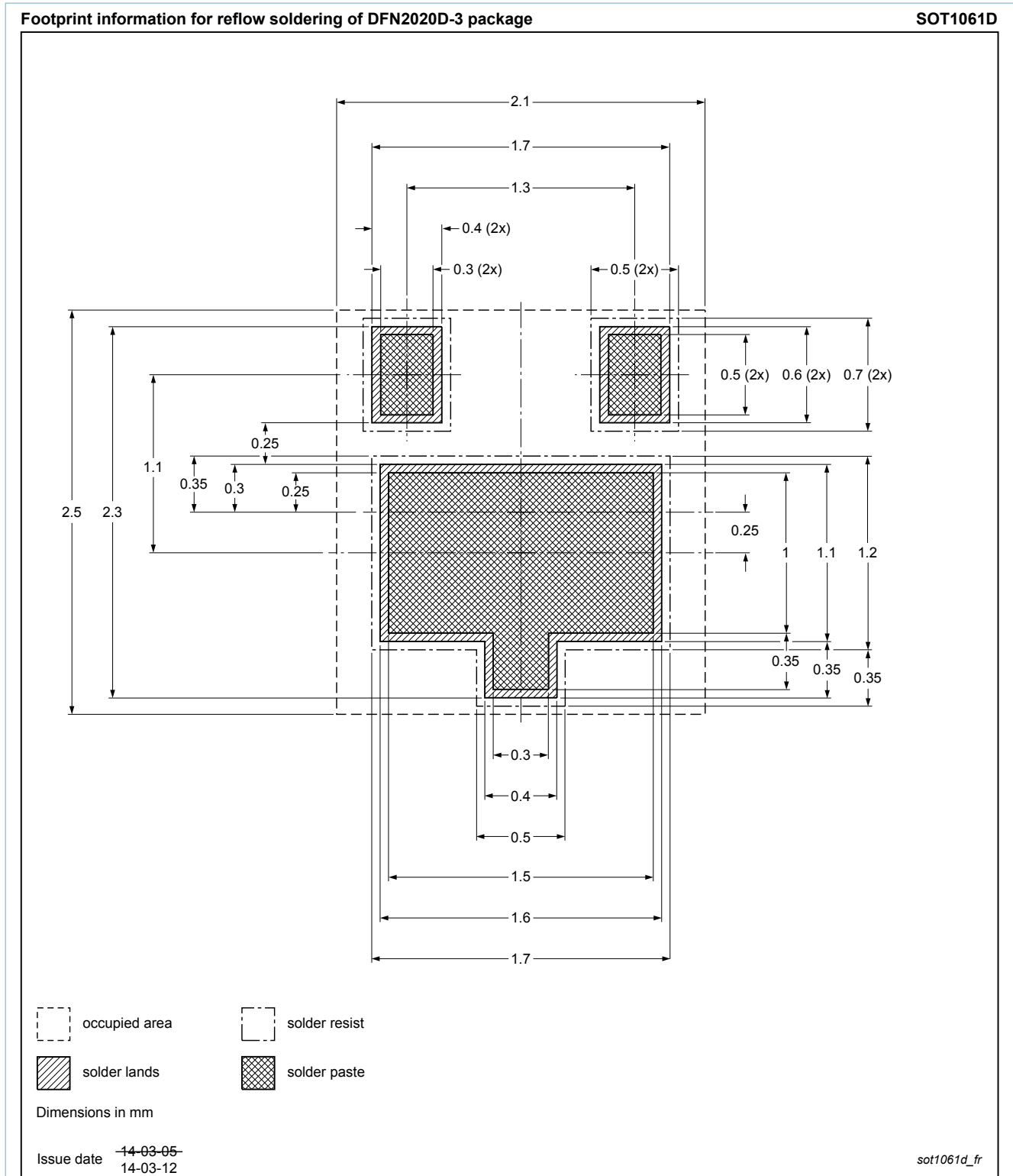


Fig. 16. Package outline DFN2020D-3 (SOT1061D)



**Fig. 17. Reflow soldering footprint for DFN2020D-3 (SOT1061D)**

## 13. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG2020CPAS v.2	20150120	Product data sheet	-	PMEG2020CPAS v.1
Modifications:	<ul style="list-style-type: none"><li>changed data sheet status</li></ul>			
PMEG2020CPAS v.1	20141210	Preliminary data sheet	-	-

## 14. Legal information

### 14.1 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.
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