



# PMEG4010CPAS

40 V, 1 A low VF dual MEGA Schottky barrier rectifier

6 October 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  $I_{F(AV)} \leq 1$  A
- Reverse voltage  $V_R \leq 40$  V
- Low forward voltage  $V_F \leq 500$  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; $T_{amb} \leq 110$ °C; square wave	[1]	-	-	1	A
		$\delta = 0.5$ ; $f = 20$ kHz; $T_{sp} \leq 140$ °C; square wave		-	-	1	A

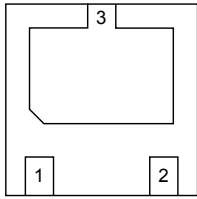
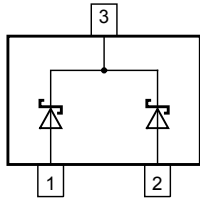
nexperia

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_R$	reverse voltage	$T_j = 25\text{ °C}$	-	-	40	V
<b>Per diode</b>						
$V_F$	forward voltage	$I_F = 1\text{ A}$ ; $t_p \leq 300\text{ }\mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25\text{ °C}$ ; pulsed	-	440	500	mV
$I_R$	reverse current	$V_R = 40\text{ V}$ ; $t_p \leq 300\text{ }\mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25\text{ °C}$ ; pulsed	-	12	55	$\mu\text{A}$

[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
PMEG4010CPAS	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
PMEG4010CPAS	CU

## 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	$T_j = 25\text{ °C}$		-	40	V
$I_F$	forward current	$T_{sp} \leq 130\text{ °C}; \delta = 1$		-	1.4	A
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; $f = 20\text{ kHz}; T_{amb} \leq 110\text{ °C};$ square wave	[1]	-	1	A
		$\delta = 0.5$ ; $f = 20\text{ kHz}; T_{sp} \leq 140\text{ °C};$ square wave		-	1	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.

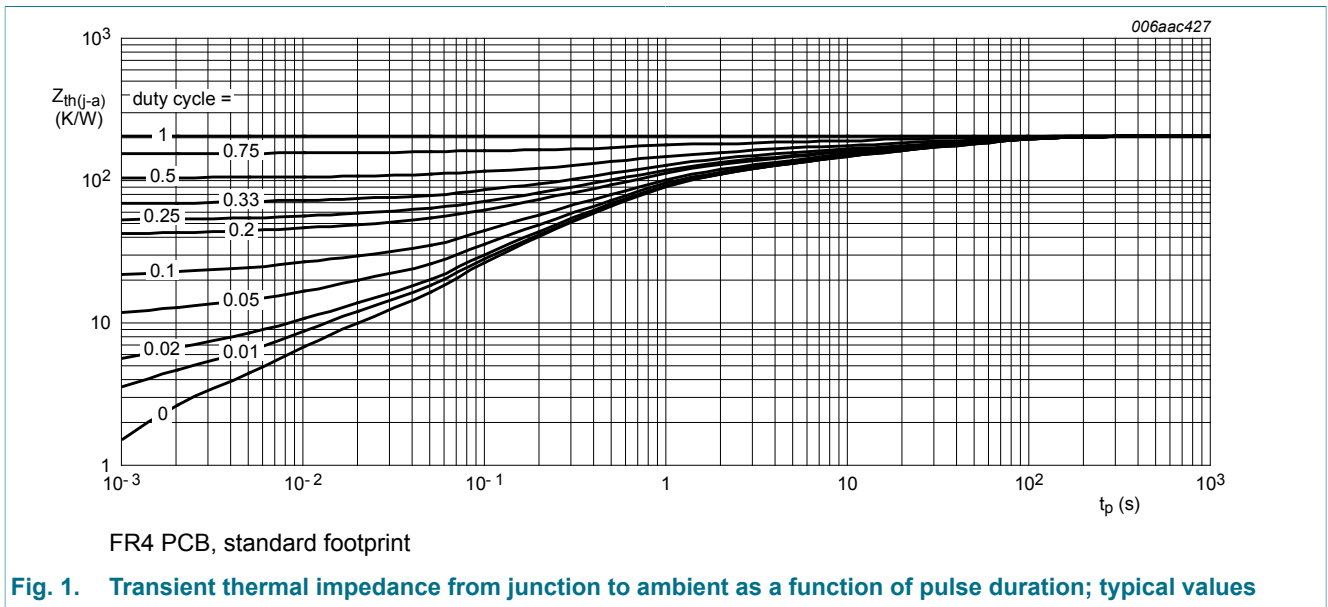
[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm<sup>2</sup>.

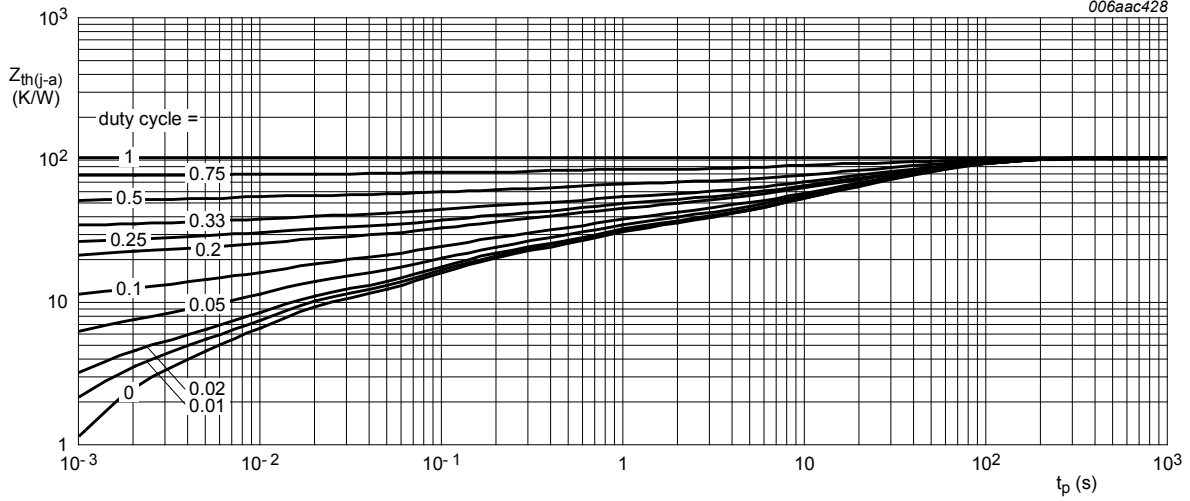
## 9. Thermal characteristics

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

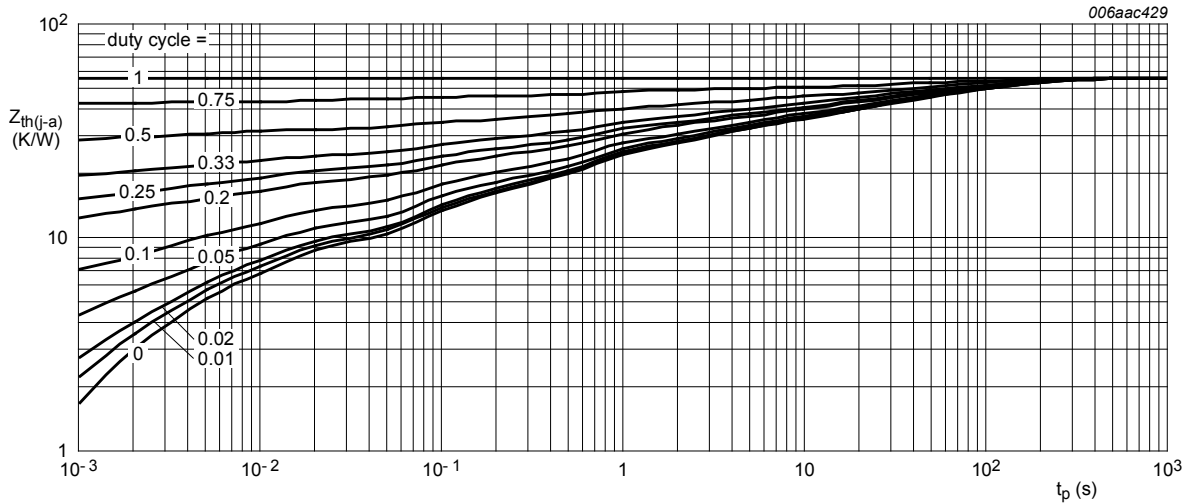
- [1] For Schottky barrier diodes thermal runaway has to be considered, as in some applications the reverse power losses  $P_R$  are a significant part of the total power losses.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [3] Device mounted on an FR4 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



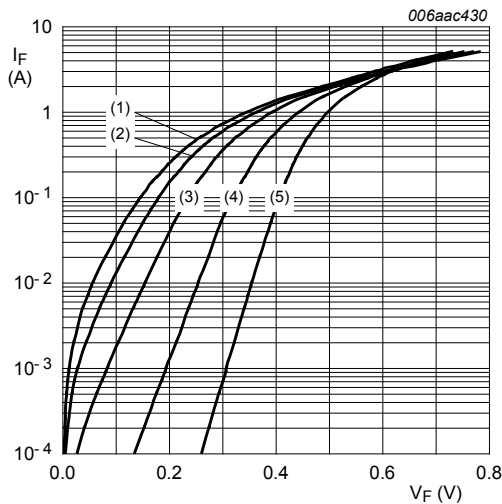
Ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint

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

### 10. Characteristics

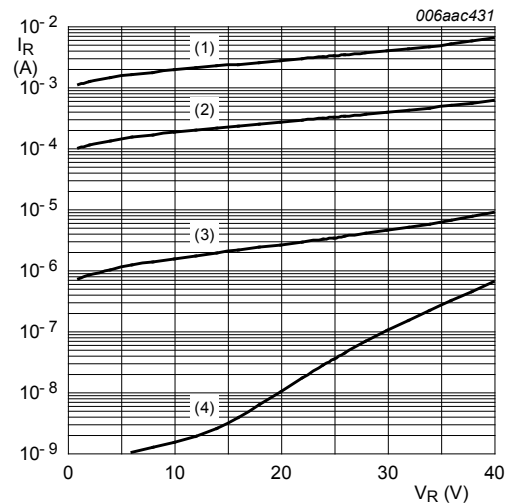
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per diode</b>						
$V_{(BR)R}$	reverse breakdown voltage	$I_R = 1 \text{ mA}$ ; $t_p = 300 \text{ }\mu\text{s}$ ; $\delta = 0.02$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	40	-	-	V
$V_F$	forward voltage	$I_F = 100 \text{ mA}$ ; $t_p \leq 300 \text{ }\mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	-	320	-	mV
		$I_F = 1 \text{ A}$ ; $t_p \leq 300 \text{ }\mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	-	440	500	mV
$I_R$	reverse current	$V_R = 10 \text{ V}$ ; $t_p \leq 300 \text{ }\mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	-	2.5	-	$\mu\text{A}$
		$V_R = 40 \text{ V}$ ; $t_p \leq 300 \text{ }\mu\text{s}$ ; $\delta \leq 0.02$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	-	12	55	$\mu\text{A}$
$C_d$	diode capacitance	$V_R = 1 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	130	-	pF
		$V_R = 10 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	50	-	pF
$t_{rr}$	reverse recovery time	$I_F = 0.5 \text{ A}$ ; $I_R = 1 \text{ A}$ ; $I_{R(\text{meas})} = 0.25 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$	-	3.5	-	ns



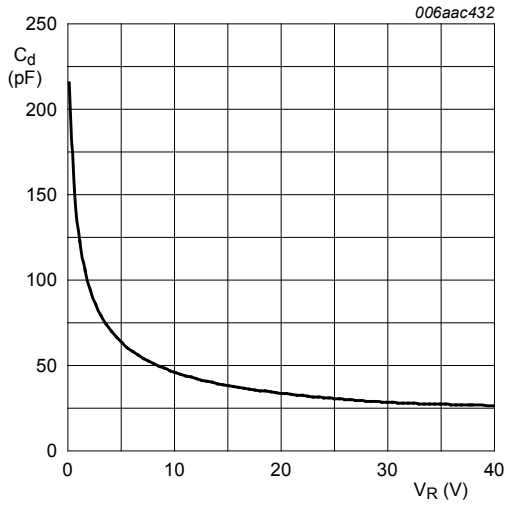
- (1)  $T_j = 150 \text{ }^\circ\text{C}$
- (2)  $T_j = 125 \text{ }^\circ\text{C}$
- (3)  $T_j = 85 \text{ }^\circ\text{C}$
- (4)  $T_j = 25 \text{ }^\circ\text{C}$
- (5)  $T_j = -40 \text{ }^\circ\text{C}$

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



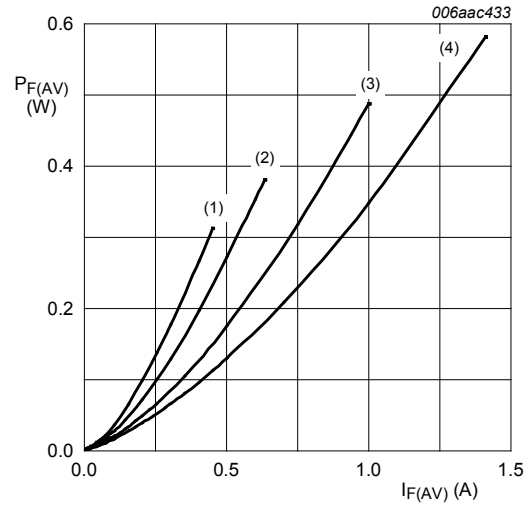
- (1)  $T_j = 125 \text{ }^\circ\text{C}$
- (2)  $T_j = 85 \text{ }^\circ\text{C}$
- (3)  $T_j = 25 \text{ }^\circ\text{C}$
- (4)  $T_j = -40 \text{ }^\circ\text{C}$

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



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

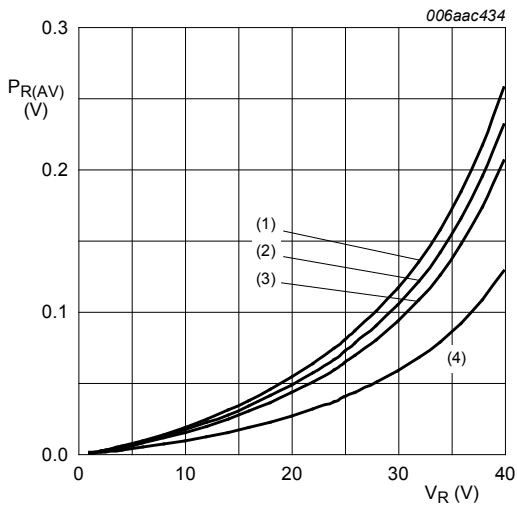
**Fig. 6. Diode capacitance as a function of reverse voltage; typical values**



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

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

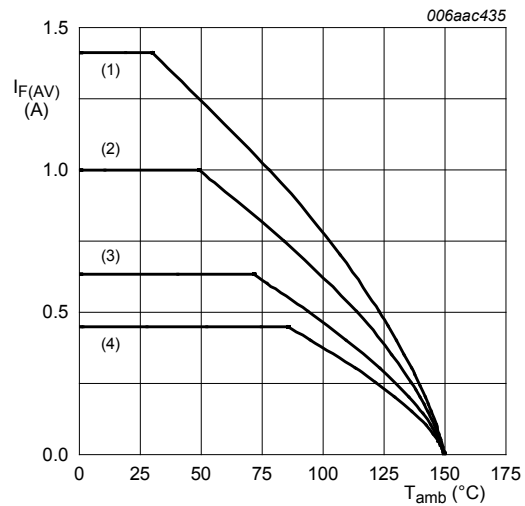
**Fig. 7. Average forward power dissipation as a function of average forward current; typical values**



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

- (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**

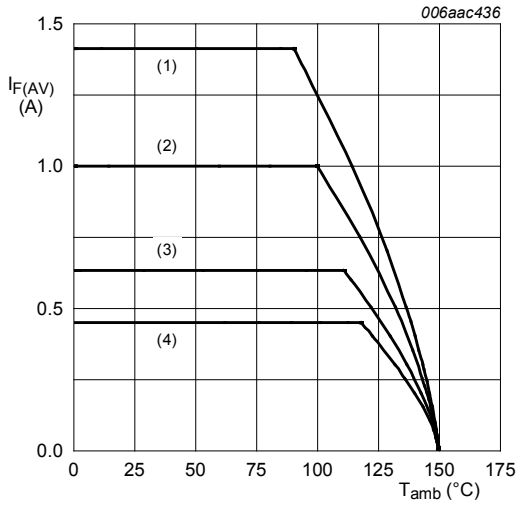


FR4 PCB, standard footprint

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

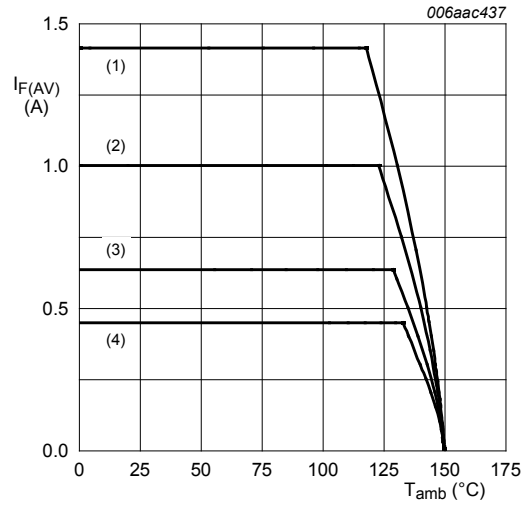
- (1)  $\delta = 1; \text{DC}$
- (2)  $\delta = 0.5; f = 20 \text{ kHz}$
- (3)  $\delta = 0.2; f = 20 \text{ kHz}$
- (4)  $\delta = 0.1; f = 20 \text{ kHz}$

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



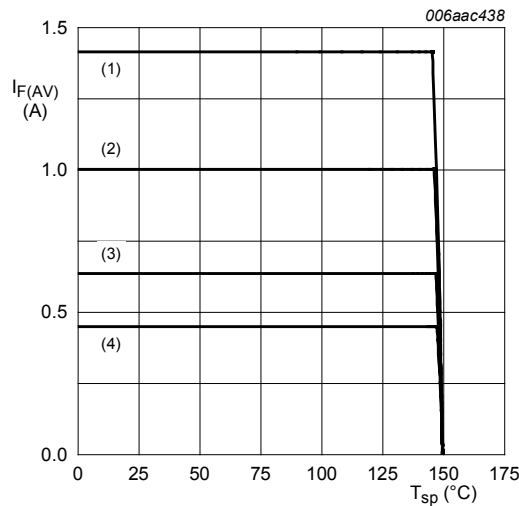
FR4 PCB, mounting pad for cathode 1 cm<sup>2</sup>  
 T<sub>j</sub> = 150 °C  
 (1) δ = 1; DC  
 (2) δ = 0.5; f = 20 kHz  
 (3) δ = 0.2; f = 20 kHz  
 (4) δ = 0.1; f = 20 kHz

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



Ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint  
 T<sub>j</sub> = 150 °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<sub>j</sub> = 150 °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

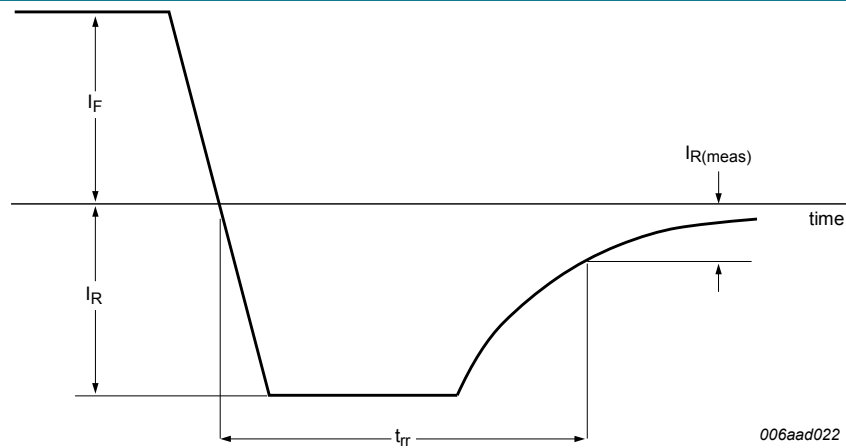


Fig. 13. Reverse recovery definition

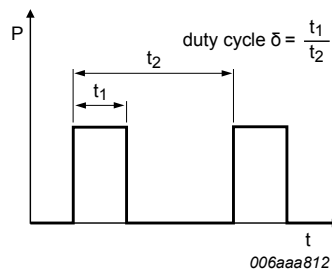


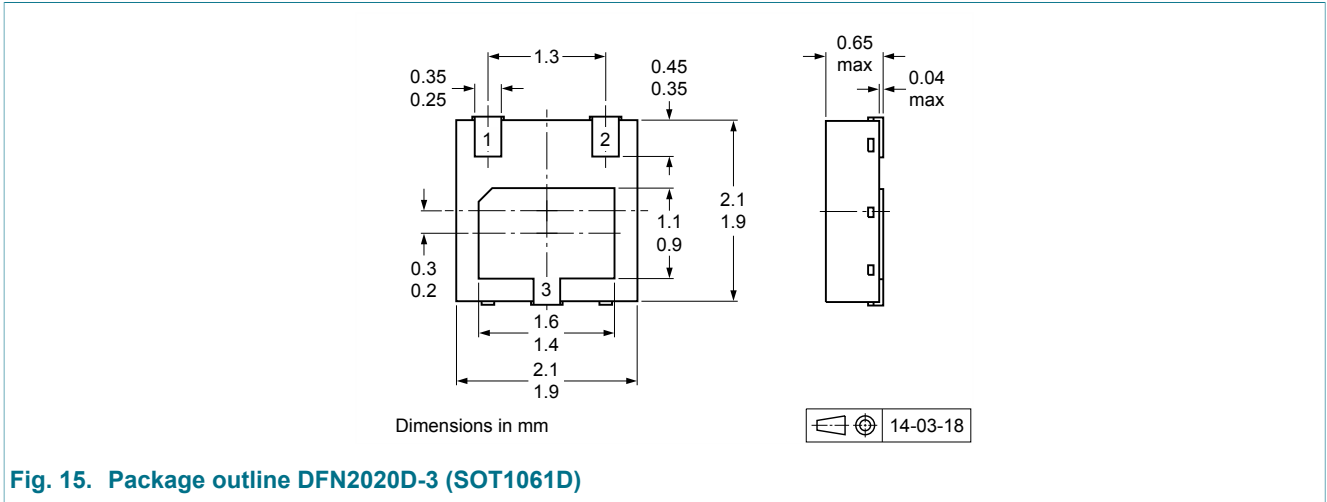
Fig. 14. Duty cycle definition

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,  $I_{RMS} = I_{F(AV)}$  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. 15. Package outline DFN2020D-3 (SOT1061D)**

### 13. Soldering

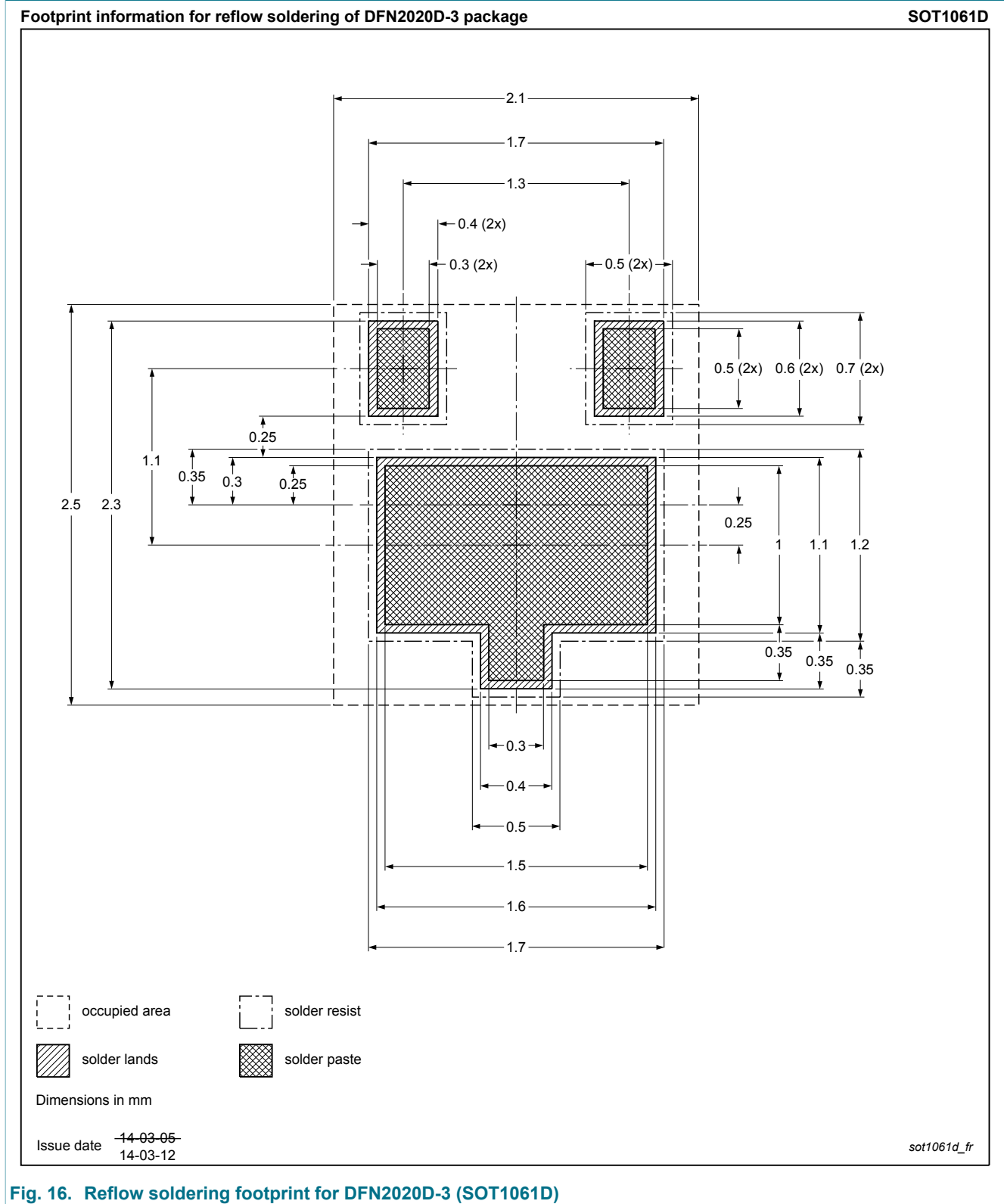


Fig. 16. Reflow soldering footprint for DFN2020D-3 (SOT1061D)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG4010CPAS v.3	20151006	Product data sheet	-	PMEG4010CPAS v.2
Modifications:	• layout correction			
PMEG4010CPAS v.2	20150120	Product data sheet	-	PMEG4010CPAS v.1
PMEG4010CPAS v.1	20141210	Preliminary 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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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## 16. Contents

1	General description .....	1
2	Features and benefits .....	1
3	Applications .....	1
4	Quick reference data .....	1
5	Pinning information .....	2
6	Ordering information .....	2
7	Marking .....	2
8	Limiting values .....	3
9	Thermal characteristics .....	4
10	Characteristics .....	6
11	Test information .....	9
11.1	Quality information .....	9
12	Package outline .....	10
13	Soldering .....	11
14	Revision history .....	12
15	Legal information .....	13
15.1	Data sheet status .....	13
15.2	Definitions .....	13
15.3	Disclaimers .....	13
15.4	Trademarks .....	14

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