



PMEG4020EPAS

40 V, 2 A low VF MEGA Schottky barrier rectifier

19 January 2015

Product data sheet

1. General description

Planar Maximum Efficiency General Application (MEGA) Schottky barrier rectifier 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 $I_{F(AV)} \leq 2 \text{ A}$
- Reverse voltage $V_R \leq 40 \text{ V}$
- Low forward voltage $V_F \leq 535 \text{ mV}$
- 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
$I_{F(AV)}$	average forward current	$\delta = 0.5$; $f = 20 \text{ kHz}$; $T_{\text{amb}} \leq 65 \text{ }^{\circ}\text{C}$; square wave	[1]	-	-	2	A
		$\delta = 0.5$; $f = 20 \text{ kHz}$; $T_{\text{sp}} \leq 140 \text{ }^{\circ}\text{C}$; square wave		-	-	2	A
V_R	reverse voltage	$T_j = 25 \text{ }^{\circ}\text{C}$		-	-	40	V

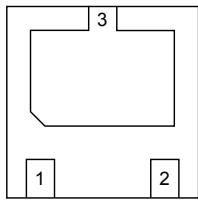
nexperia

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_F	forward voltage	$I_F = 2 \text{ A}$; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25^\circ\text{C}$; pulsed		-	470	535	mV
I_R	reverse current	$V_R = 40 \text{ V}$; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25^\circ\text{C}$; pulsed		-	20	100	µA

[1] Device mounted on a ceramic Printed-Circuit Board (PCB), Al_2O_3 , standard footprint.

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	A	anode		
2	A	anode		
3	K	cathode	 Transparent top view	 006aab624

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMEG4020EPAS	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
PMEG4020EPAS	CS

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	$T_j = 25^\circ\text{C}$		-	40	V
I_F	forward current	$T_{sp} \leq 135^\circ\text{C}$; $\delta = 1$		-	2.8	A
$I_{F(AV)}$	average forward current	$\delta = 0.5$; $f = 20 \text{ kHz}$; $T_{amb} \leq 65^\circ\text{C}$; square wave	[1]	-	2	A
		$\delta = 0.5$; $f = 20 \text{ kHz}$; $T_{sp} \leq 140^\circ\text{C}$; square wave		-	2	A
I_{FRM}	repetitive peak forward current	$t_p \leq 1 \text{ ms}$; $\delta \leq 0.25$	[2]	-	7	A
I_{FSM}	non-repetitive peak forward current	$t_p = 8 \text{ ms}$; $T_{j(\text{init})} = 25^\circ\text{C}$; square wave	[2]	-	18	A
P_{tot}	total power dissipation	$T_{amb} \leq 25^\circ\text{C}$	[3]	-	520	mW
			[4]	-	1050	mW
			[1]	-	1900	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 Printed-Circuit Board (PCB), Al_2O_3 , standard footprint.

[2] Both anode pins connected.

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

[4] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 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]	-	-	240	K/W
			[1][3]	-	-	120	K/W
			[1][4]	-	-	65	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[5]	-	-	10	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^2 .

[4] Device mounted on a ceramic PCB, Al_2O_3 , standard footprint.

[5] Soldering point of cathode tab.

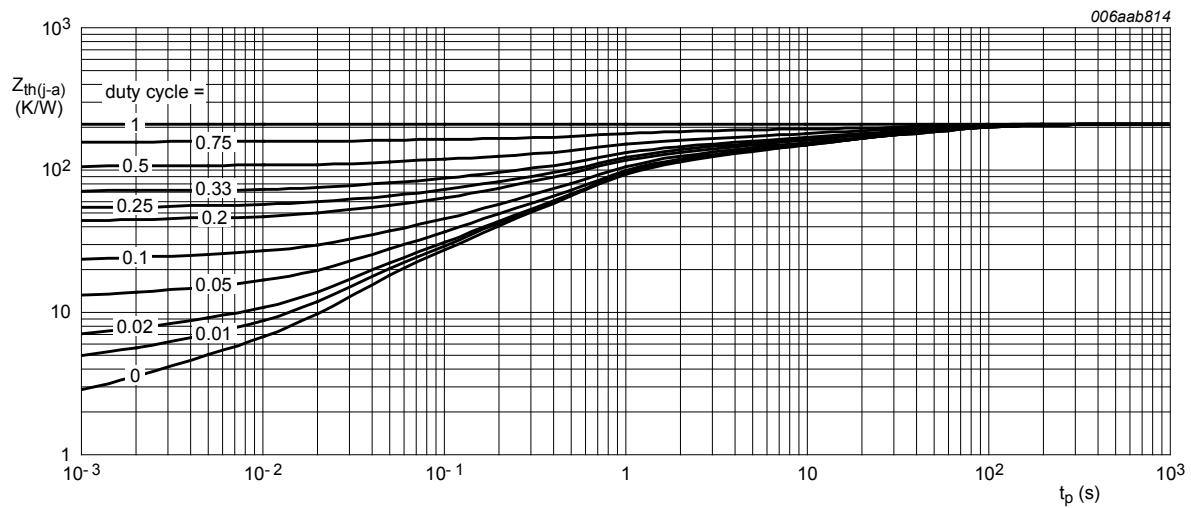


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

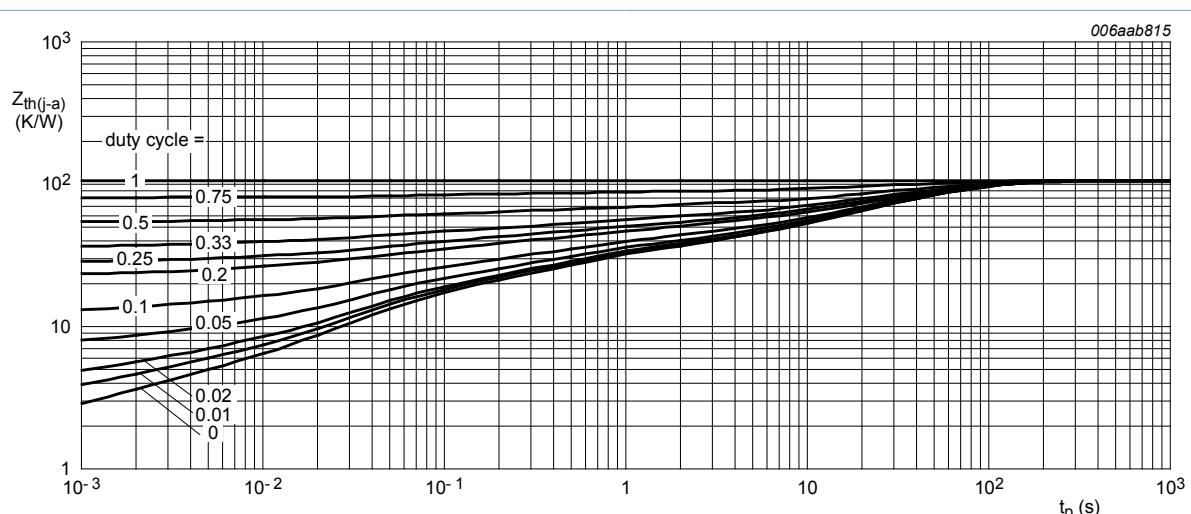
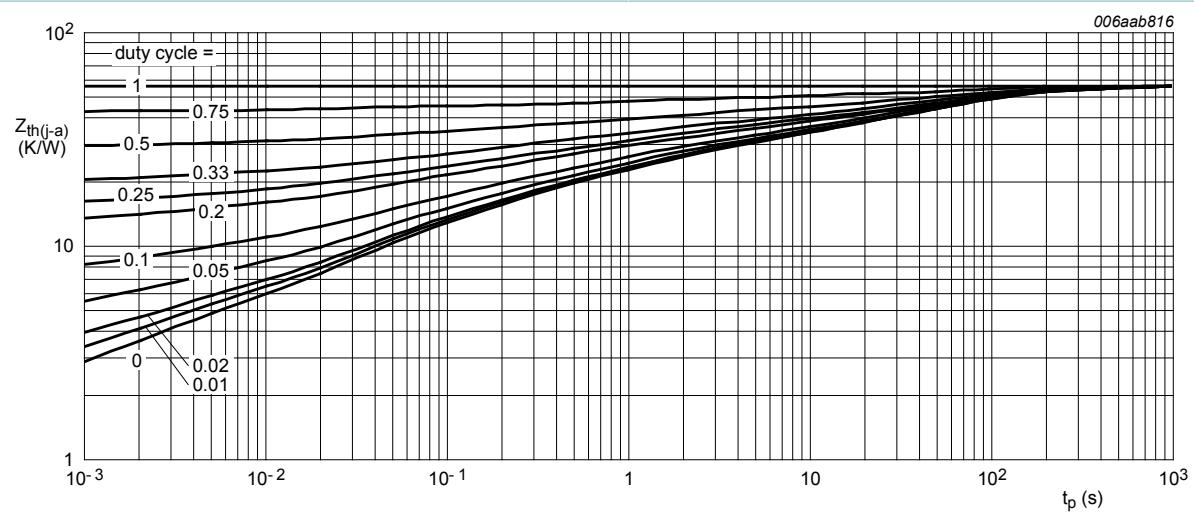


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



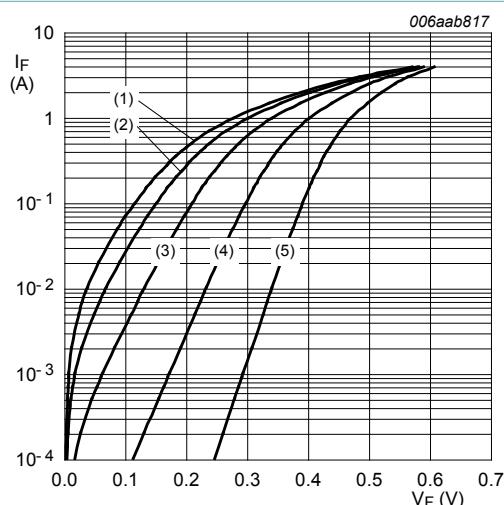
Ceramic PCB, Al_2O_3 , standard footprint

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

10. Characteristics

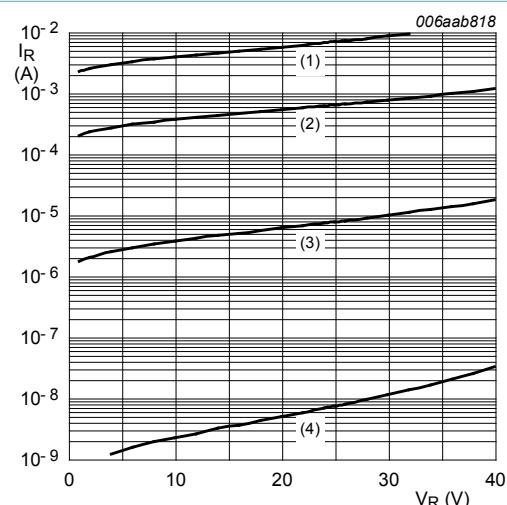
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)R}$	reverse breakdown voltage	$I_R = 1 \text{ mA}$; $t_p = 300 \mu\text{s}$; $\delta = 0.02$; $T_j = 25^\circ\text{C}$; pulsed	40	-	-	V
V_F	forward voltage	$I_F = 0.5 \text{ A}$; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25^\circ\text{C}$; pulsed	-	360	-	mV
		$I_F = 1 \text{ A}$; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25^\circ\text{C}$; pulsed	-	400	-	mV
		$I_F = 2 \text{ A}$; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25^\circ\text{C}$; pulsed	-	470	535	mV
I_R	reverse current	$V_R = 10 \text{ V}$; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25^\circ\text{C}$; pulsed	-	5	-	μA
		$V_R = 40 \text{ V}$; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25^\circ\text{C}$; pulsed	-	20	100	μA
C_d	diode capacitance	$V_R = 1 \text{ V}$; $f = 1 \text{ MHz}$; $T_j = 25^\circ\text{C}$	-	270	-	pF
		$V_R = 10 \text{ V}$; $f = 1 \text{ MHz}$; $T_j = 25^\circ\text{C}$	-	100	-	pF
t_{rr}	reverse recovery time	$I_F = 0.5 \text{ A}$; $I_R = 1 \text{ A}$; $I_{R(\text{meas})} = 0.25 \text{ A}$; $T_j = 25^\circ\text{C}$	-	6	-	ns



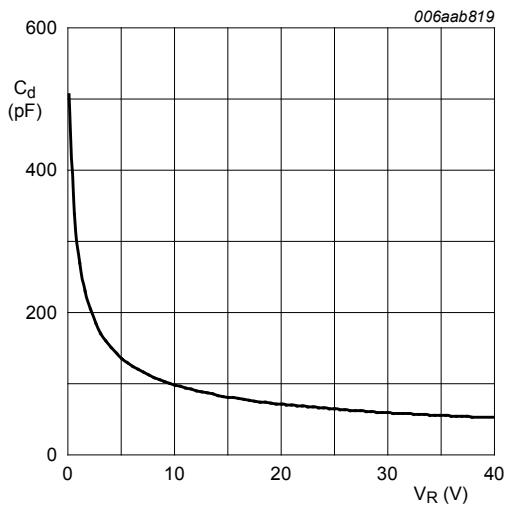
- (1) $T_j = 150^\circ\text{C}$
- (2) $T_j = 125^\circ\text{C}$
- (3) $T_j = 85^\circ\text{C}$
- (4) $T_j = 25^\circ\text{C}$
- (5) $T_j = -40^\circ\text{C}$

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



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

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



$f = 1$ MHz; $T_{amb} = 25$ °C

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

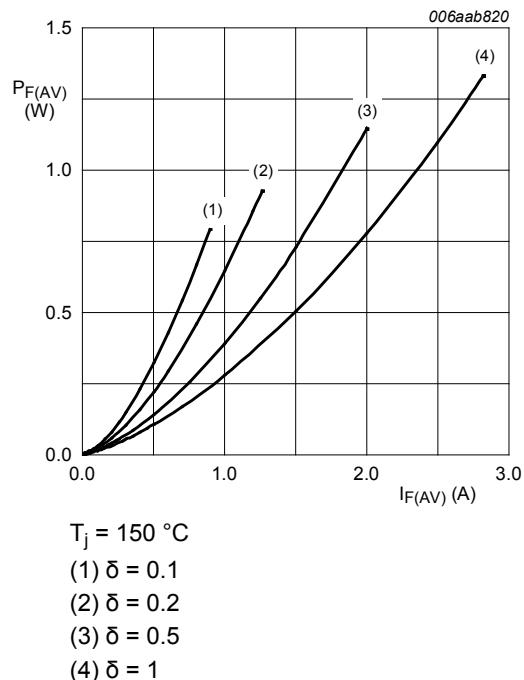
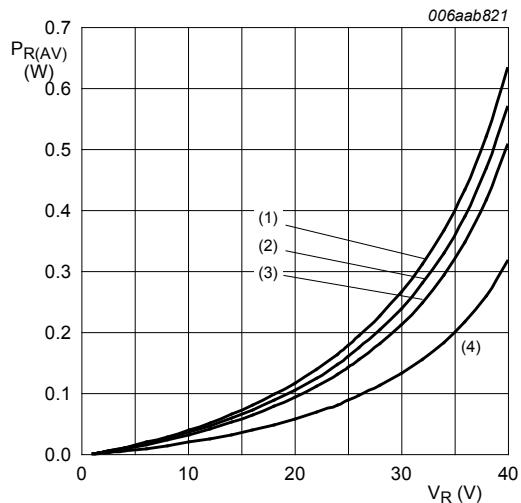


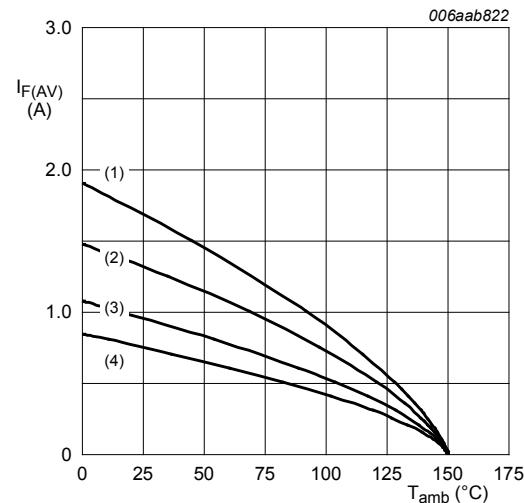
Fig. 7. Average forward power dissipation as a function of average forward current; typical values



$T_j = 125$ °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

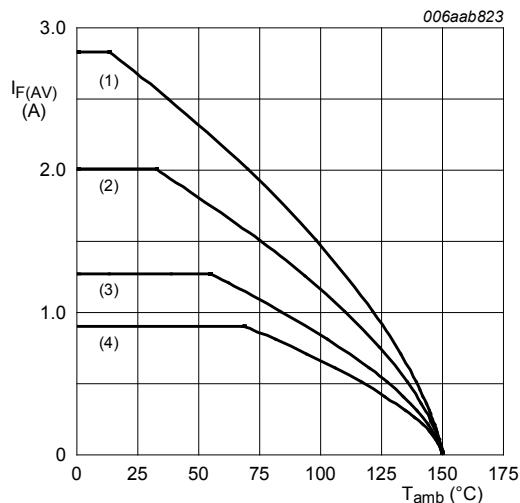


FR4 PCB, standard footprint

$T_j = 150$ °C

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

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



FR4 PCB, mounting pad for cathode 1 cm²

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

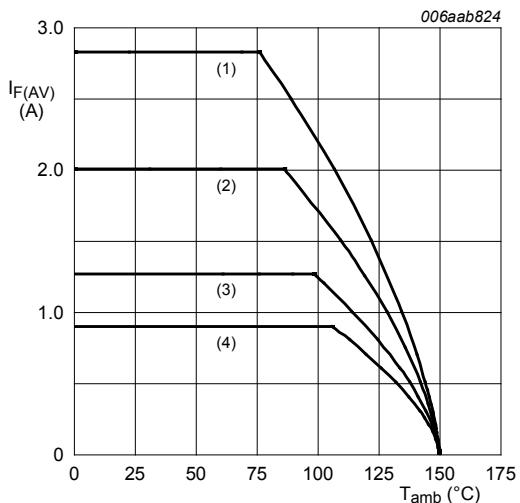
(1) $\delta = 1$; DC

(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 ambient temperature; typical values



Ceramic PCB, Al_2O_3 , standard footprint

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

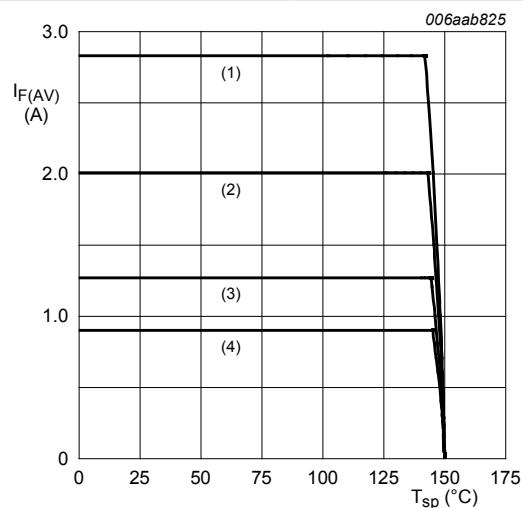
(1) $\delta = 1$; DC

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



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

(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. 12. Average forward current as a function of solder point temperature; typical values

11. Test information

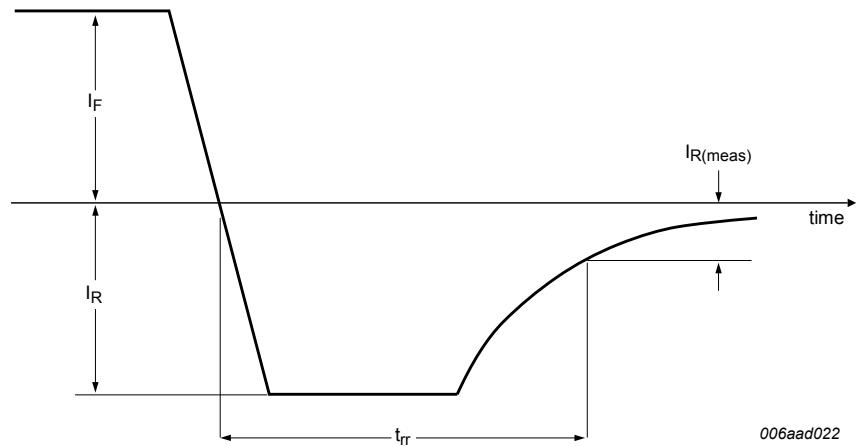


Fig. 13. Reverse recovery definition

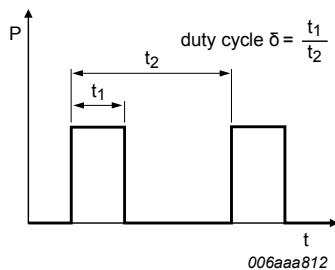


Fig. 14. Duty cycle definition

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

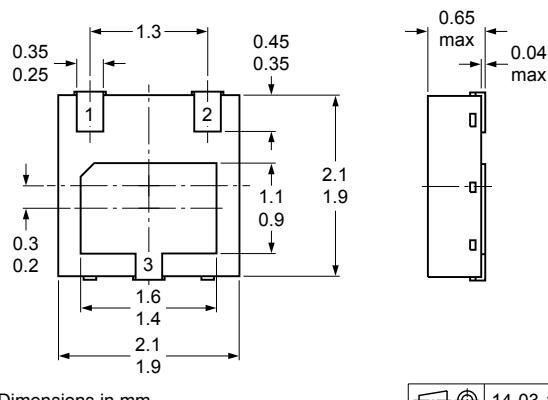
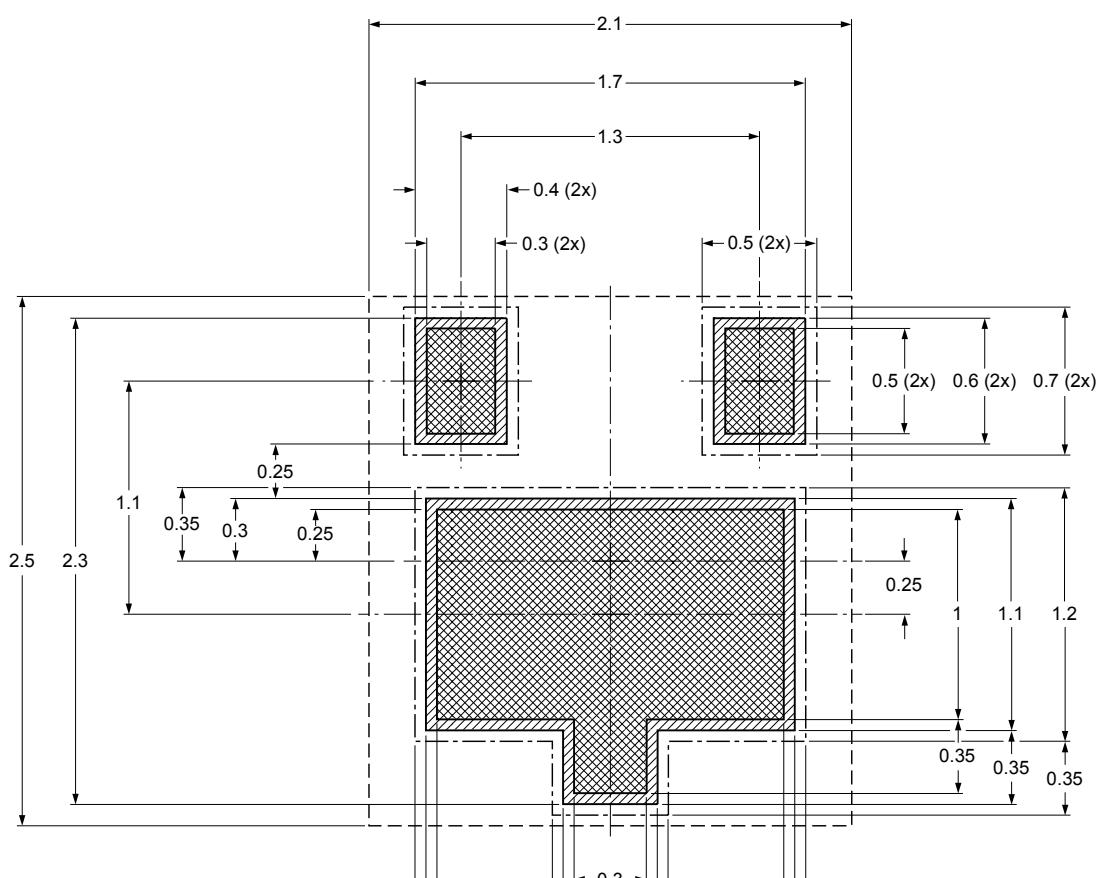


Fig. 15. Package outline DFN2020D-3 (SOT1061D)

13. Soldering

Footprint information for reflow soldering of DFN2020D-3 package

SOT1061D



[] occupied area

[] solder resist

[] solder lands

[] solder paste

Dimensions in mm

Issue date 14-03-05
14-03-12

sot1061d_fr

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
PMEG4020EPAS v.2	20150119	Product data sheet	-	PMEG4020EPAS v.1
Modification:	• Product status changed			
PMEG4020EPAS v.1	20141209	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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Date of release: 19 January 2015



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