

# PMEG4020EPA

2 A low  $V_F$  MEGA Schottky barrier rectifier

Rev. 01 — 16 December 2009

Product data sheet

## 1. Product profile

### 1.1 General description

Planar Maximum Efficiency General Application (MEGA) Schottky barrier rectifier with an integrated guard ring for stress protection. PMEG4020EPA is encapsulated in an ultra thin SOT1061 leadless small Surface-Mounted Device (SMD) plastic package with medium power capability.

### 1.2 Features

- Average forward current:  $I_{F(AV)} \leq 2$  A
- Reverse voltage:  $V_R \leq 40$  V
- Low forward voltage
- Exposed heat sink (cathode pad) for excellent thermal and electrical conductivity
- Leadless small SMD plastic package with medium power capability
- AEC-Q101 qualified

### 1.3 Applications

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

### 1.4 Quick reference data

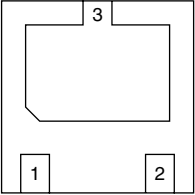

**Table 1. Quick reference data**  
 $T_j = 25$  °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{F(AV)}$	average forward current	square wave; $\delta = 0.5$ ; $f = 20$ kHz				
		$T_{amb} \leq 65$ °C	[1]	-	2	A
		$T_{sp} \leq 140$ °C	-	-	2	A
$V_R$	reverse voltage		-	-	40	V
$V_F$	forward voltage	$I_F = 2$ A	-	470	535	mV
$I_R$	reverse current	$V_R = 40$ V	-	20	100	$\mu$ A

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

## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	anode	 <p>Transparent top view</p>	 <p>006aab624</p>
2	anode		
3	cathode		

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMEG4020EPA	HUSON3	plastic thermal enhanced ultra thin small outline package; no leads; three terminals; body 2 × 2 × 0.65 mm	SOT1061

## 4. Marking

Table 4. Marking codes

Type number	Marking code
PMEG4020EPA	A3

## 5. 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	$T_j = 25\text{ °C}$	-	40	V
$I_{F(AV)}$	average forward current	square wave; $\delta = 0.5$ ; $f = 20\text{ kHz}$			
		$T_{amb} \leq 65\text{ °C}$	[1] -	2	A
		$T_{sp} \leq 140\text{ °C}$	-	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	square wave; $t_p = 8\text{ ms}$	[2][3] -	18	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[4][5] -	520	mW
			[4][6] -	1050	mW
			[4][1] -	1900	mW

**Table 5. Limiting values ...continued**

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

Symbol	Parameter	Conditions	Min	Max	Unit
$T_j$	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,  $Al_2O_3$ , standard footprint.

[2] Both anode pins connected.

[3]  $T_j = 25$  °C prior to surge.

[4] Reflow soldering is the only recommended soldering method.

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

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

## 6. 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]			
			[3]	-	-	240 K/W
			[4]	-	-	120 K/W
			[5]	-	-	65 K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[6]	-	-	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.

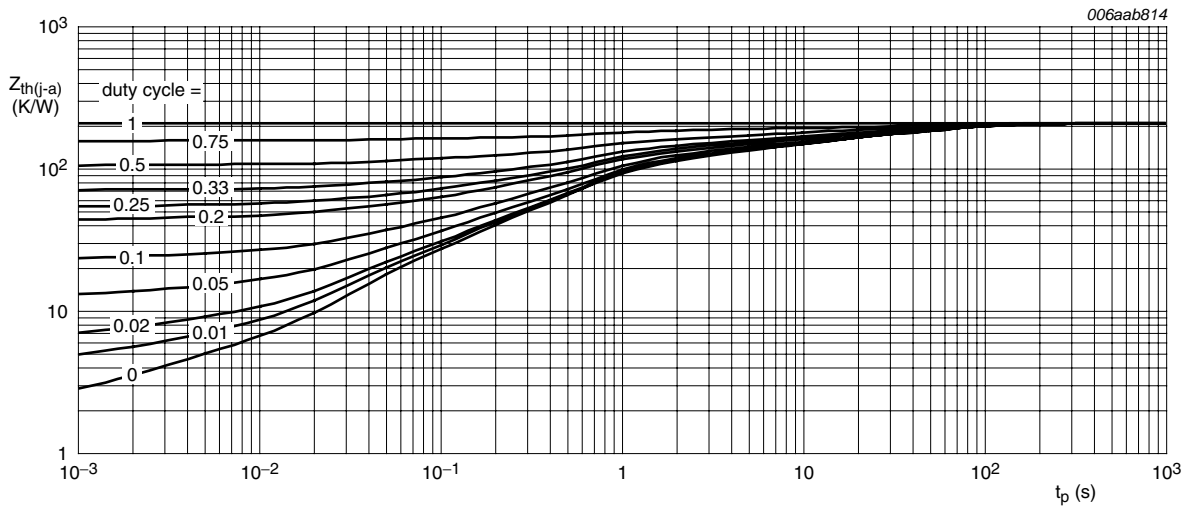
[2] Reflow soldering is the only recommended soldering method.

[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<sup>2</sup>.

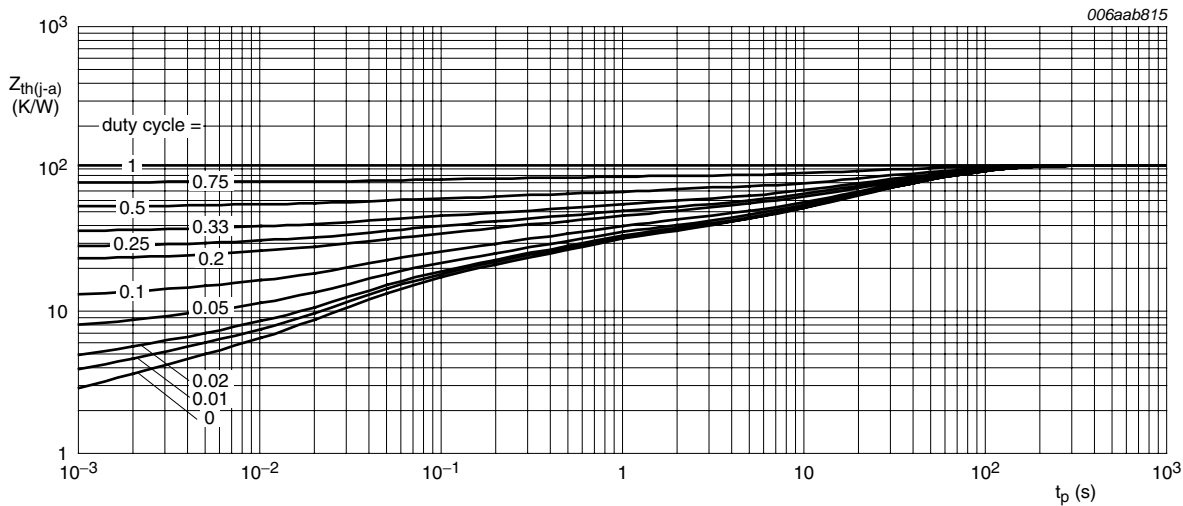
[5] Device mounted on a ceramic PCB,  $Al_2O_3$ , standard footprint.

[6] Soldering point of cathode tab.



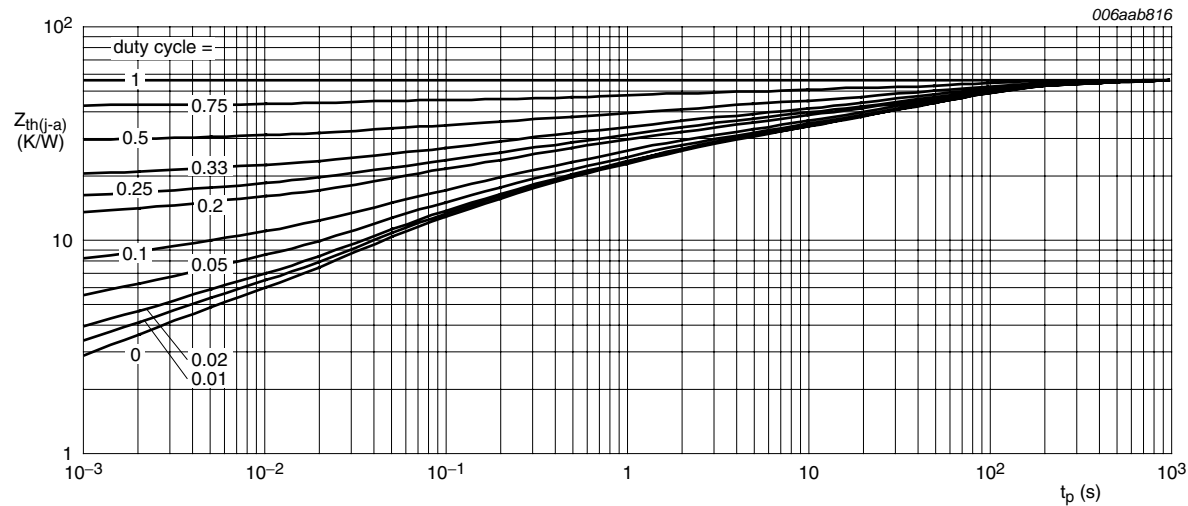
FR4 PCB, standard footprint

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



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,  $Al_2O_3$ , standard footprint

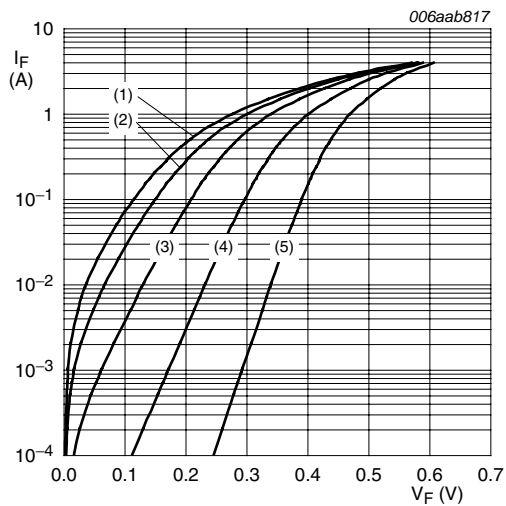
Fig 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7. Characteristics

Table 7. Characteristics  
 $T_j = 25\text{ }^{\circ}C$  unless otherwise specified.

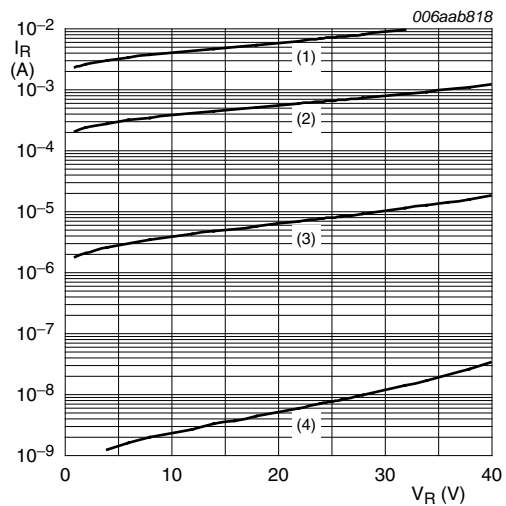
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_F$	forward voltage	$I_F = 0.5\text{ A}$	-	360	-	mV
		$I_F = 1\text{ A}$	-	400	-	mV
		$I_F = 2\text{ A}$	-	470	535	mV
$I_R$	reverse current	$V_R = 10\text{ V}$	-	5	-	$\mu A$
		$V_R = 40\text{ V}$	-	20	100	$\mu A$
$C_d$	diode capacitance	$f = 1\text{ MHz}$				
		$V_R = 1\text{ V}$	-	270	-	pF
		$V_R = 10\text{ V}$	-	100	-	pF
$t_{rr}$	reverse recovery time	[1]	-	85	-	ns

[1] When switched from  $I_F = 10\text{ mA}$  to  $I_R = 10\text{ mA}$ ;  $R_L = 100\text{ }\Omega$ ; measured at  $I_R = 1\text{ mA}$ .



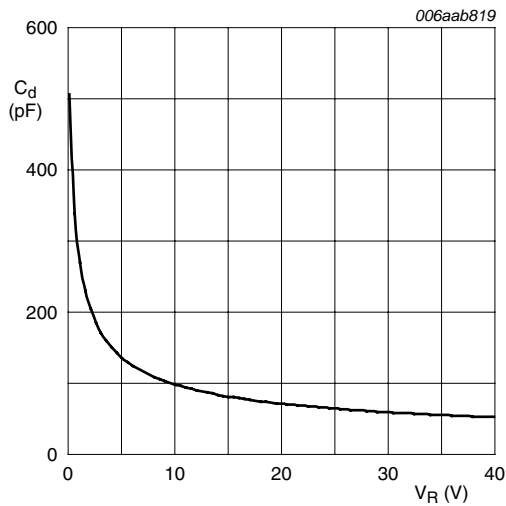
- (1)  $T_j = 150\text{ }^{\circ}\text{C}$
- (2)  $T_j = 125\text{ }^{\circ}\text{C}$
- (3)  $T_j = 85\text{ }^{\circ}\text{C}$
- (4)  $T_j = 25\text{ }^{\circ}\text{C}$
- (5)  $T_j = -40\text{ }^{\circ}\text{C}$

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



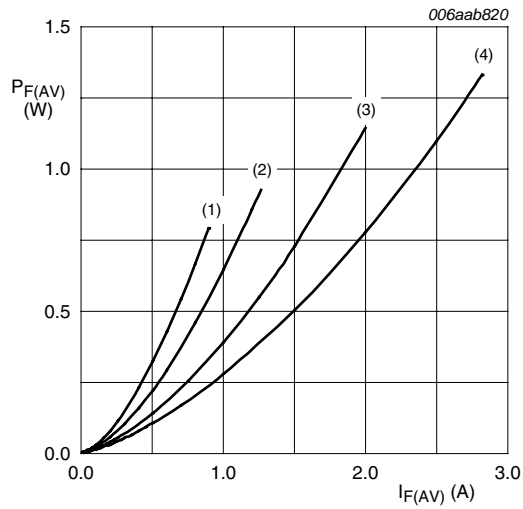
- (1)  $T_j = 125\text{ }^{\circ}\text{C}$
- (2)  $T_j = 85\text{ }^{\circ}\text{C}$
- (3)  $T_j = 25\text{ }^{\circ}\text{C}$
- (4)  $T_j = -40\text{ }^{\circ}\text{C}$

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



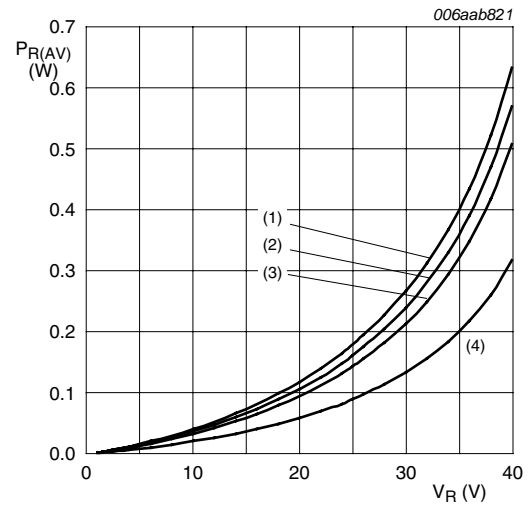
$f = 1\text{ MHz}$ ;  $T_{\text{amb}} = 25\text{ }^{\circ}\text{C}$

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



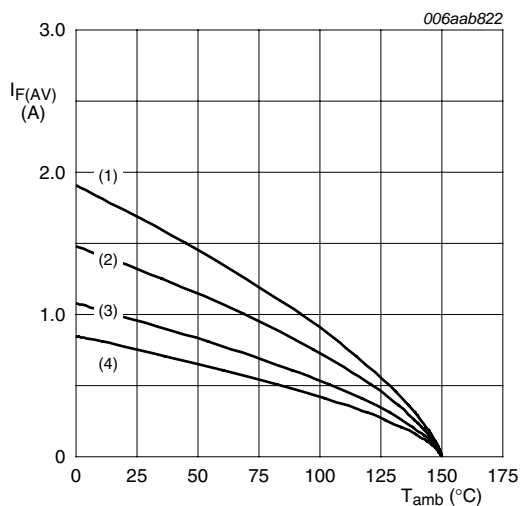
- $T_j = 150\text{ °C}$
- (1)  $\delta = 0.1$
  - (2)  $\delta = 0.2$
  - (3)  $\delta = 0.5$
  - (4)  $\delta = 1$

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



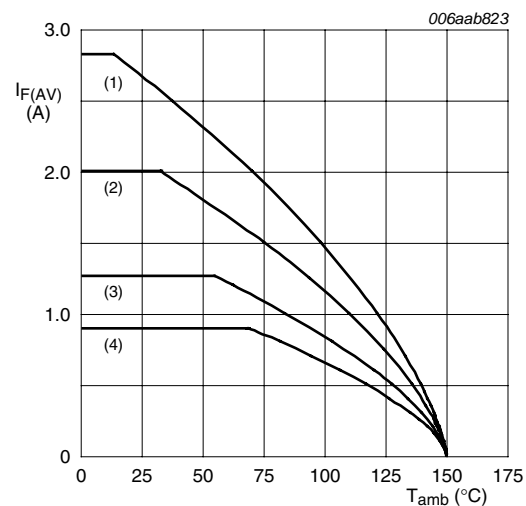
- $T_j = 125\text{ °C}$
- (1)  $\delta = 1$
  - (2)  $\delta = 0.9$
  - (3)  $\delta = 0.8$
  - (4)  $\delta = 0.5$

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



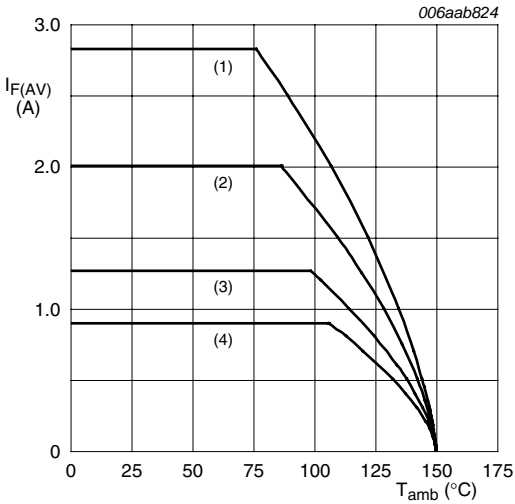
- FR4 PCB, standard footprint  
 $T_j = 150\text{ °C}$
- (1)  $\delta = 1$ ; DC
  - (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$
  - (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$
  - (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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



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

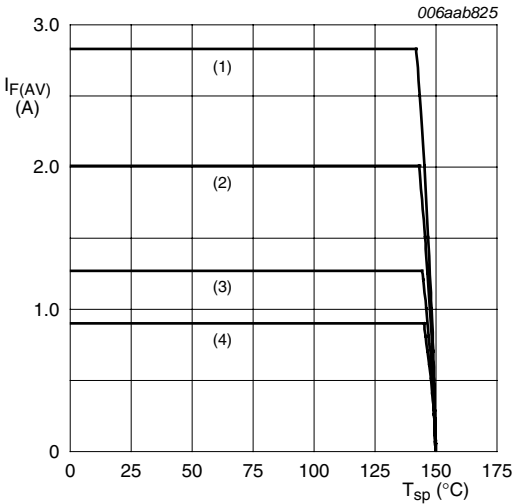


Ceramic PCB,  $Al_2O_3$ , standard footprint

$T_j = 150$  °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 11. Average forward current as a function of ambient temperature; typical values**



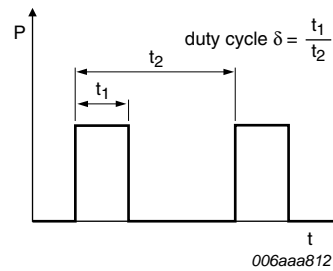
$T_j = 150$  °C

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



## 8. Test information



**Fig 13. Duty cycle definition**

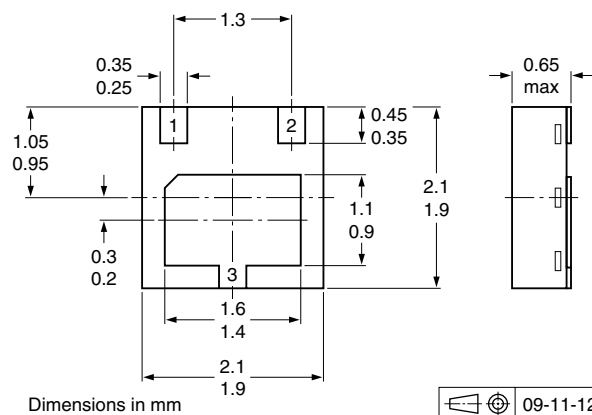
The current ratings for the typical waveforms as shown in [Figure 9](#), [10](#), [11](#) and [12](#) are calculated according to the equations:  $I_{F(AV)} = I_M \times \delta$  with  $I_M$  defined as peak current,

$I_{RMS} = I_{F(AV)}$  at DC, and  $I_{RMS} = I_M \times \sqrt{\delta}$  with  $I_{RMS}$  defined as RMS current.

### 8.1 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.

## 9. Package outline



**Fig 14. Package outline SOT1061**

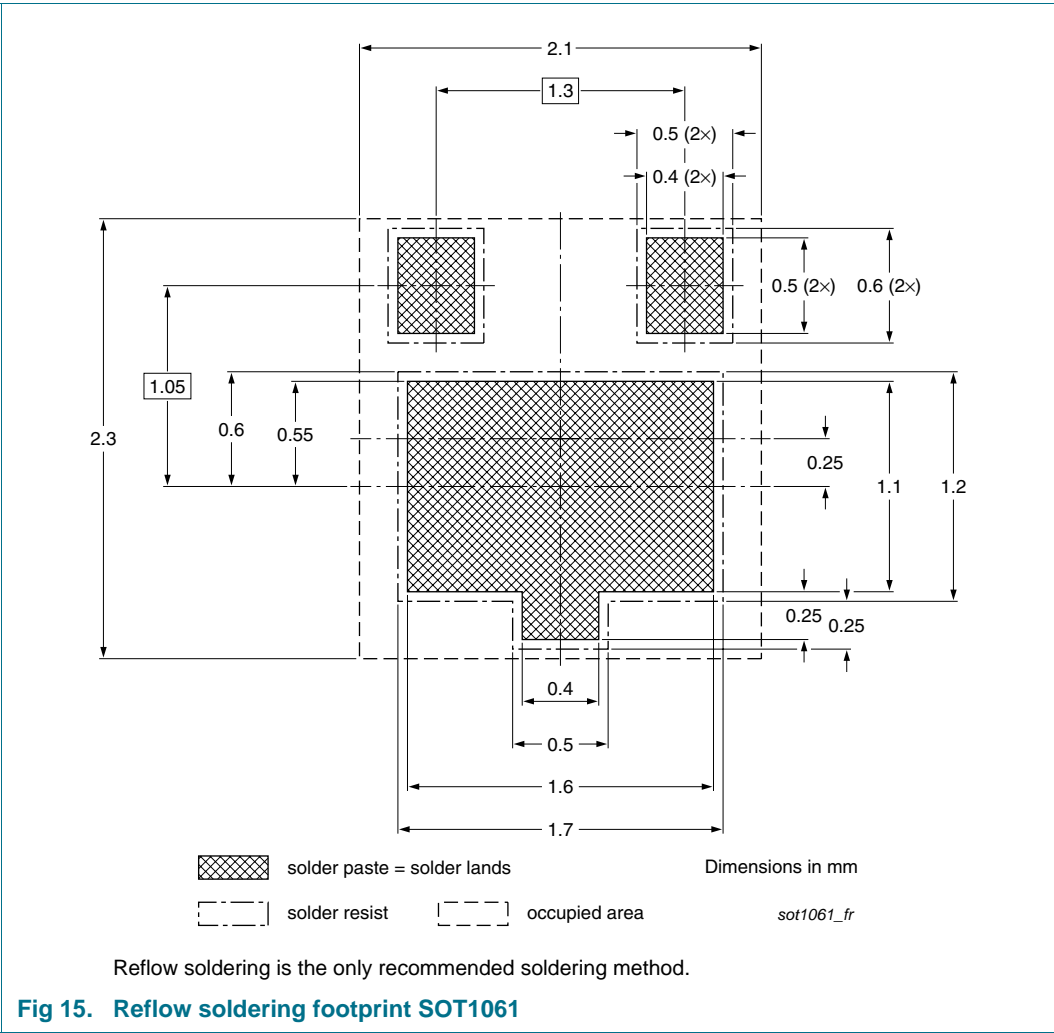
10. Packing information

**Table 8. Packing methods**  
The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

Type number	Package	Description	Packing quantity
			3000
PMEG4020EPA	SOT1061	4 mm pitch, 8 mm tape and reel	-115

[1] For further information and the availability of packing methods, see [Section 14](#).

11. Soldering



## 12. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMEG4020EPA_1	20091216	Product data sheet	-	-

## 13. Legal information

### 13.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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