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# PMEG6020ETP

## High-temperature 60 V, 2 A Schottky barrier rectifier

11 October 2012

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, encapsulated in a SOD128 small and flat lead Surface-Mounted Device (SMD) plastic package.

### 1.2 Features and benefits

- Average forward current:  $I_{F(AV)} \leq 2$  A
- Reverse voltage:  $V_R \leq 60$  V
- Low forward voltage
- High power capability due to clip-bonding technology
- Small and flat lead SMD plastic package
- AEC-Q101 qualified
- High temperature  $T_j \leq 175$  °C

### 1.3 Applications

- Low voltage rectification
- High efficiency DC-to-DC conversion
- Switch mode power supply
- Reverse polarity protection

### 1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$I_F$	forward current	$T_{sp} = 165$ °C	-	-	2.8	A	
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; $f = 20$ kHz; $T_{amb} \leq 120$ °C; square wave	[1]	-	-	2	A
		$\delta = 0.5$ ; $f = 20$ kHz; $T_{sp} \leq 170$ °C; square wave		-	-	2	A
$V_R$	reverse voltage	$T_j = 25$ °C	-	-	60	V	
$V_F$	forward voltage	$I_F = 2$ A; $T_j = 25$ °C	-	460	530	mV	
$I_R$	reverse current	$T_j = 25$ °C; $V_R = 60$ V; $t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$ ; pulsed	-	60	150	$\mu$ A	



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## PMEG6020ETP



### High-temperature 60 V, 2 A Schottky barrier rectifier

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$t_{rr}$	reverse recovery time	$I_R = 0.5 \text{ A}$ ; $I_F = 0.5 \text{ A}$ ; $I_{R(\text{meas})} = 0.1 \text{ A}$ ; $T_J = 25 \text{ }^\circ\text{C}$	-	8.6	-	ns

[1] Device mounted on a ceramic Printed-Circuit Board (PCB),  $\text{Al}_2\text{O}_3$ , standard footprint.

## 2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode[1]	 SOD128	 sym001
2	A	anode		

[1] The marking bar indicates the cathode.

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMEG6020ETP	SOD128	plastic surface-mounted package; 2 leads	SOD128

## 4. Marking

Table 4. Marking codes

Type number	Marking code
PMEG6020ETP	D9

## 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	$T_J = 25 \text{ }^\circ\text{C}$	-	60	V
$I_F$	forward current	$T_{sp} = 165 \text{ }^\circ\text{C}$	-	2.8	A
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; $f = 20 \text{ kHz}$ ; $T_{amb} \leq 120 \text{ }^\circ\text{C}$ ; square wave	[1]	2	A
		$\delta = 0.5$ ; $f = 20 \text{ kHz}$ ; $T_{sp} \leq 170 \text{ }^\circ\text{C}$ ; square wave	-	2	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 8 \text{ ms}$ ; $T_{j(\text{init})} = 25 \text{ }^\circ\text{C}$ ; square wave	-	50	A

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**PMEG6020ETP**

**High-temperature 60 V, 2 A Schottky barrier rectifier**

Symbol	Parameter	Conditions		Min	Max	Unit
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C	[2]	-	750	mW
			[3]	-	1250	mW
			[1]	-	2500	mW
T <sub>j</sub>	junction temperature			-	175	°C
T <sub>amb</sub>	ambient temperature			-55	175	°C
T <sub>stg</sub>	storage temperature			-65	175	°C

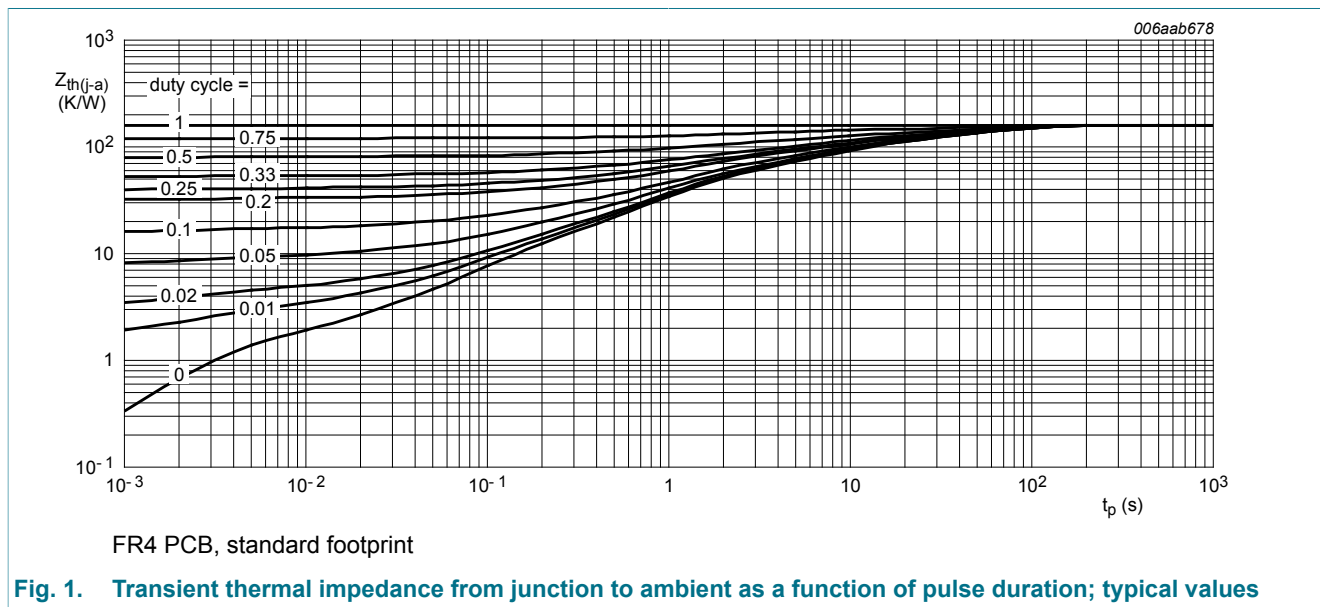
- [1] Device mounted on a ceramic Printed-Circuit Board (PCB), Al<sub>2</sub>O<sub>3</sub>, standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm<sup>2</sup>.

**6. Thermal characteristics**

**Table 6. Thermal characteristics**

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	in free air	[1][2]	-	-	200	K/W
			[1][3]	-	-	120	K/W
			[1][4]	-	-	60	K/W
R <sub>th(j-sp)</sub>	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<sub>R</sub> 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.

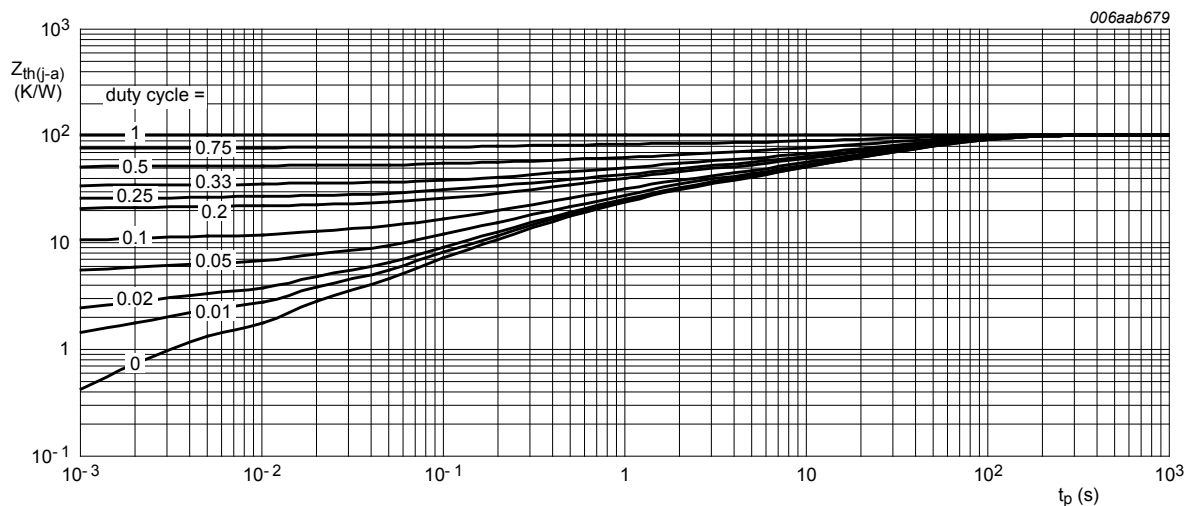


**Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**

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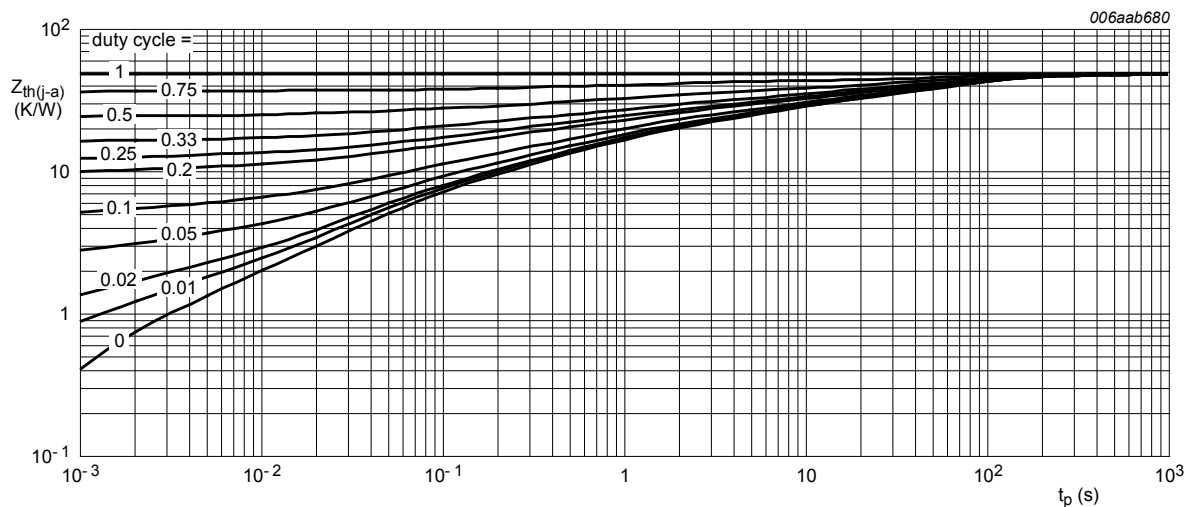
**PMEG6020ETP**

High-temperature 60 V, 2 A Schottky barrier rectifier



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**

**7. Characteristics**

**Table 7. Characteristics**

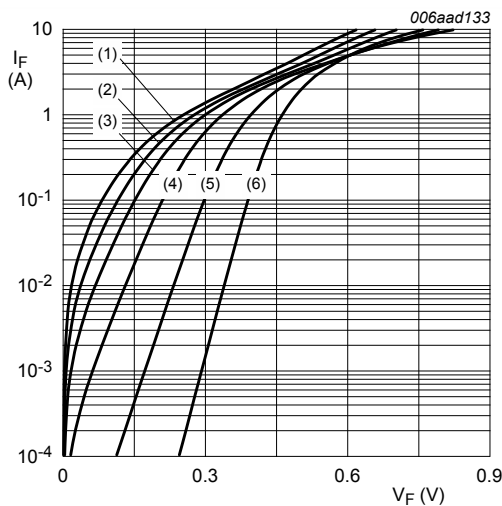
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>F</sub>	forward voltage	I <sub>F</sub> = 0.1 A; T <sub>j</sub> = 25 °C	-	300	340	mV
		I <sub>F</sub> = 0.5 A; T <sub>j</sub> = 25 °C	-	360	420	mV
		I <sub>F</sub> = 1 A; T <sub>j</sub> = 25 °C	-	400	460	mV
		I <sub>F</sub> = 1.5 A; T <sub>j</sub> = 25 °C	-	430	500	mV
		I <sub>F</sub> = 2 A; T <sub>j</sub> = 25 °C	-	460	530	mV
		I <sub>F</sub> = 2 A; T <sub>j</sub> = -40 °C	-	500	590	mV

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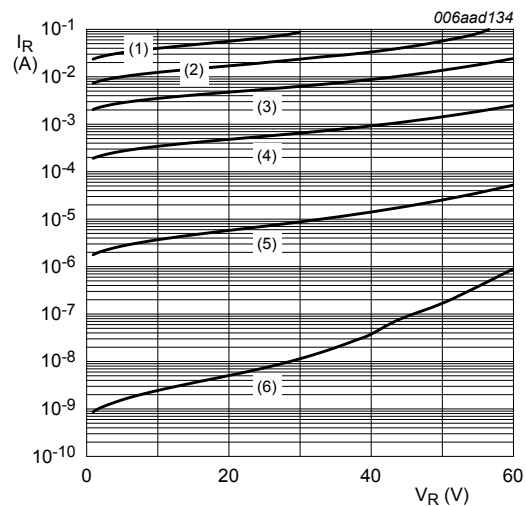
**High-temperature 60 V, 2 A Schottky barrier rectifier**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
		$I_F = 2\text{ A}; T_j = 125\text{ }^\circ\text{C}$	-	395	480	mV
		$I_F = 2\text{ A}; T_j = 150\text{ }^\circ\text{C}$	-	380	460	mV
		$I_F = 2\text{ A}; T_j = 175\text{ }^\circ\text{C}$	-	360	450	mV
$I_R$	reverse current	$V_R = 5\text{ V}; T_j = 25\text{ }^\circ\text{C}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02$ ; pulsed	-	2.5	-	$\mu\text{A}$
		$V_R = 10\text{ V}; T_j = 25\text{ }^\circ\text{C}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02$ ; pulsed	-	3.5	-	$\mu\text{A}$
		$V_R = 60\text{ V}; T_j = 25\text{ }^\circ\text{C}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02$ ; pulsed	-	60	150	$\mu\text{A}$
		$V_R = 60\text{ V}; T_j = -40\text{ }^\circ\text{C}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02$ ; pulsed	-	0.9	15	$\mu\text{A}$
		$V_R = 60\text{ V}; T_j = 125\text{ }^\circ\text{C}; t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02$ ; pulsed	-	27	100	mA
$C_d$	diode capacitance	$V_R = 1\text{ V}; f = 1\text{ MHz}; T_j = 25\text{ }^\circ\text{C}$	-	240	-	pF
		$V_R = 10\text{ V}; f = 1\text{ MHz}; T_j = 25\text{ }^\circ\text{C}$	-	80	-	pF
$t_{rr}$	reverse recovery time	$I_F = 0.5\text{ A}; I_R = 0.5\text{ A}; I_{R(\text{meas})} = 0.1\text{ A}; T_j = 25\text{ }^\circ\text{C}$	-	8.6	-	ns
$V_{FRM}$	peak forward recovery voltage	$I_F = 1\text{ A}; dI_F/dt = 40\text{ A}/\mu\text{s}; T_j = 25\text{ }^\circ\text{C}$	-	401	-	mV



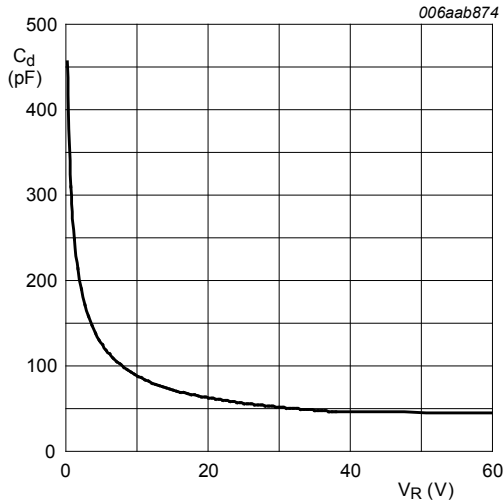
- (1)  $T_j = 175\text{ }^\circ\text{C}$
- (2)  $T_j = 150\text{ }^\circ\text{C}$
- (3)  $T_j = 125\text{ }^\circ\text{C}$
- (4)  $T_j = 85\text{ }^\circ\text{C}$
- (5)  $T_j = 25\text{ }^\circ\text{C}$
- (6)  $T_j = -40\text{ }^\circ\text{C}$

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



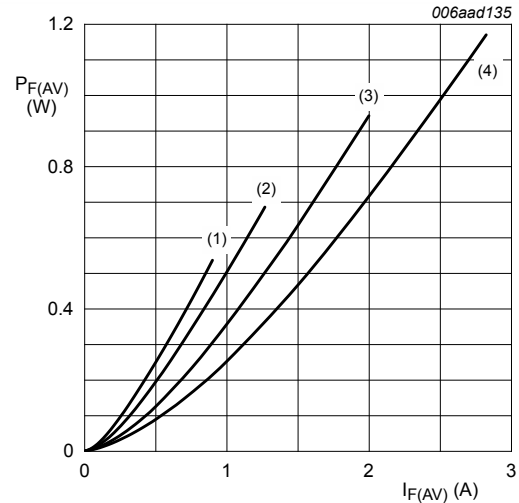
- (1)  $T_j = 175\text{ }^\circ\text{C}$
- (2)  $T_j = 150\text{ }^\circ\text{C}$
- (3)  $T_j = 125\text{ }^\circ\text{C}$
- (4)  $T_j = 85\text{ }^\circ\text{C}$
- (5)  $T_j = 25\text{ }^\circ\text{C}$
- (6)  $T_j = -40\text{ }^\circ\text{C}$

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



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

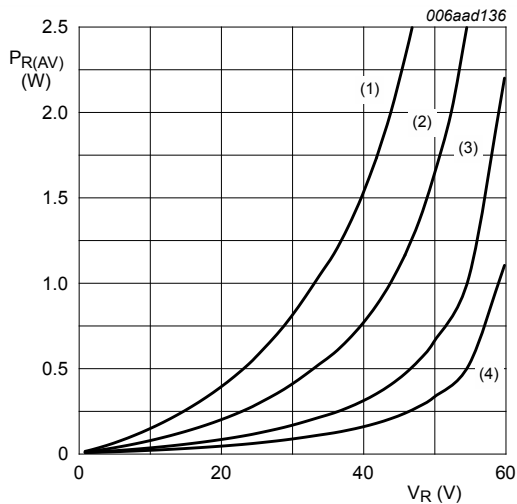
**Fig. 6. Diode capacitance as a function of reverse voltage; typical values**



$T_j = 175 \text{ }^\circ\text{C}$

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

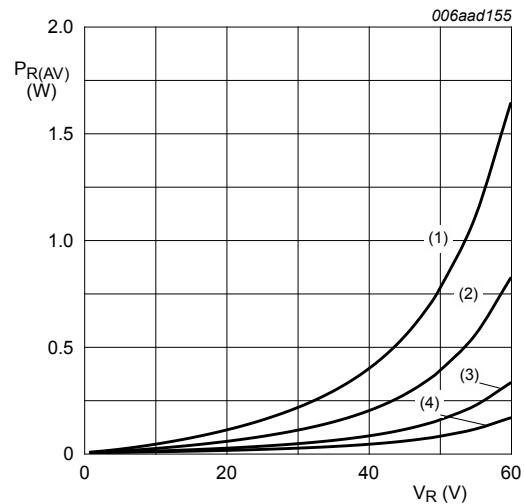
**Fig. 7. Average forward power dissipation as a function of average forward current; typical values**



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

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

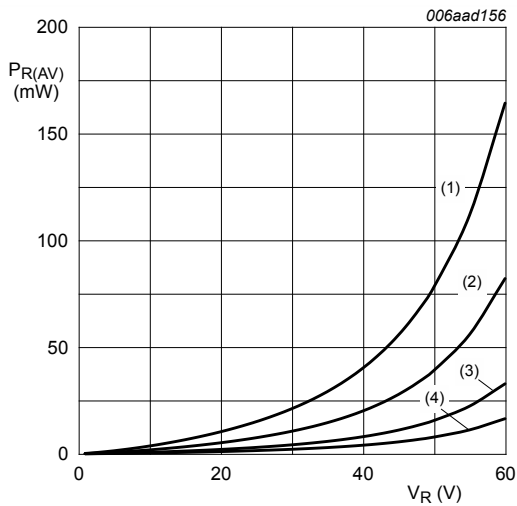
**Fig. 8. Average reverse power dissipation as a function of reverse voltage; typical values**



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

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

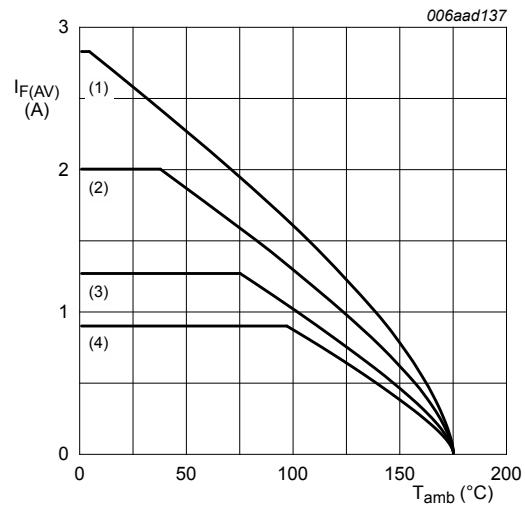
**Fig. 9. Average reverse power dissipation as a function of reverse voltage; typical values**



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

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

**Fig. 10. Average reverse power dissipation as a function of reverse voltage; typical values**

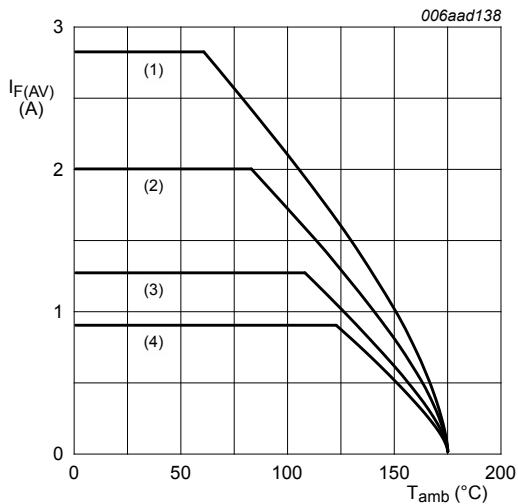


FR4 PCB, standard footprint

$T_j = 175\text{ }^\circ\text{C}$

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

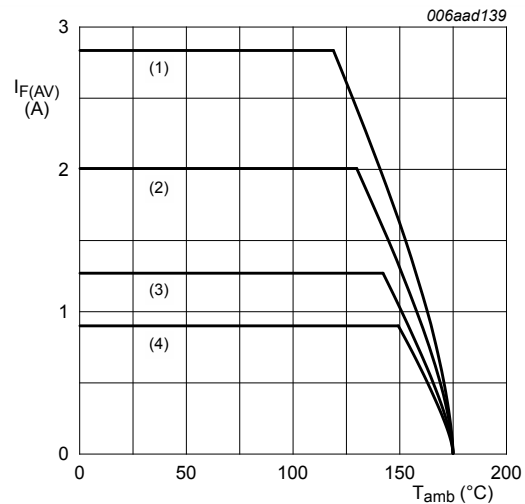


FR4 PCB, mounting pad for cathode 1 cm<sup>2</sup>

$T_j = 175\text{ }^\circ\text{C}$

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



Ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, 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)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

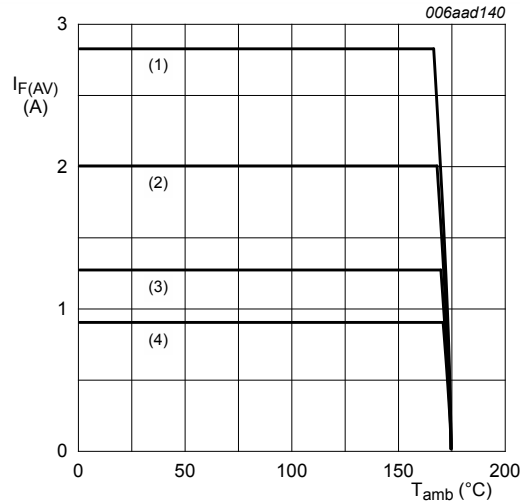
**Fig. 13. Average forward current as a function of ambient temperature; typical values**



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**PMEG6020ETP**

High-temperature 60 V, 2 A Schottky barrier rectifier



$T_j = 175\text{ °C}$

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

8. Test information

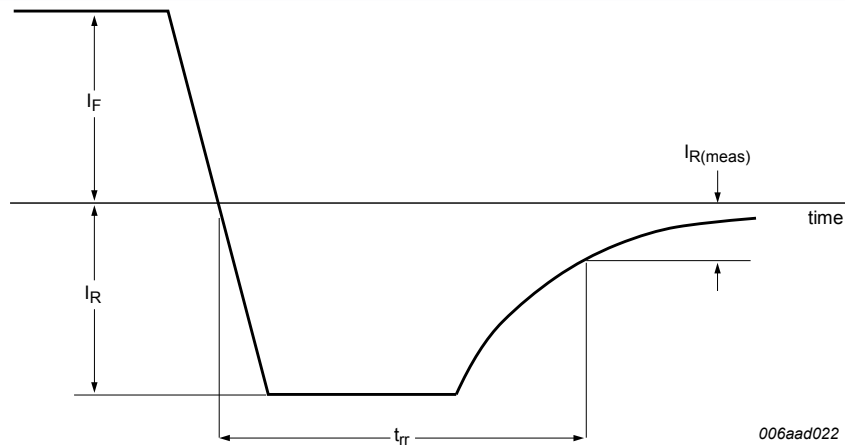
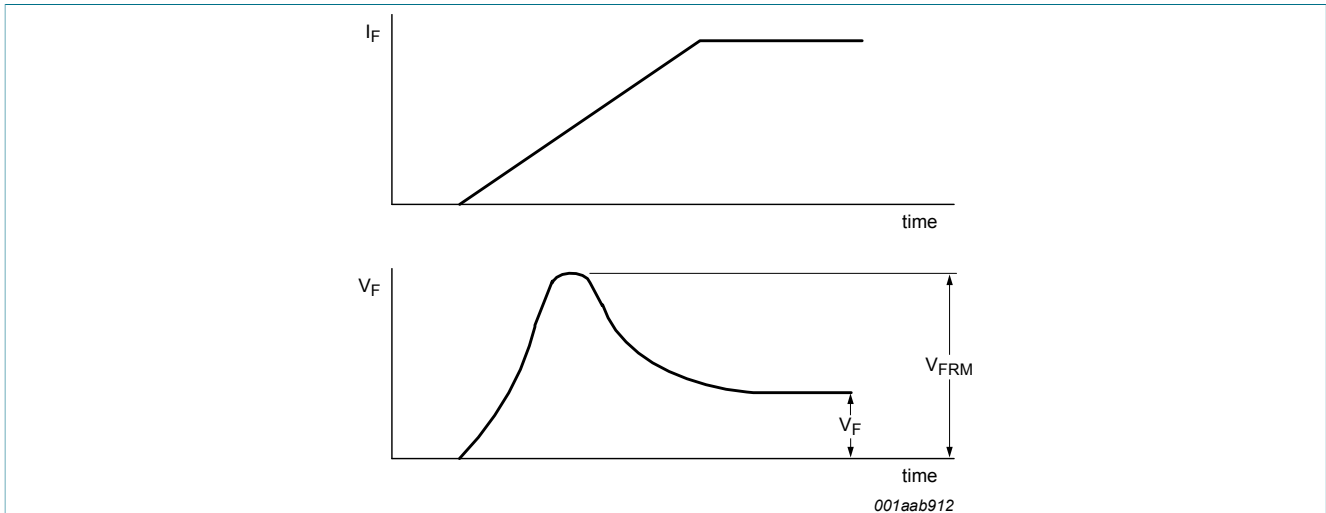
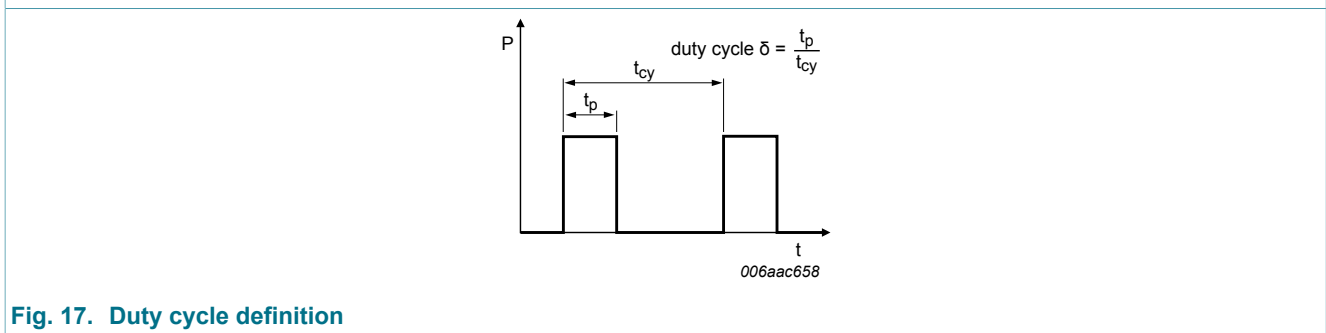


Fig. 15. Reverse recovery definition



**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.

## 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

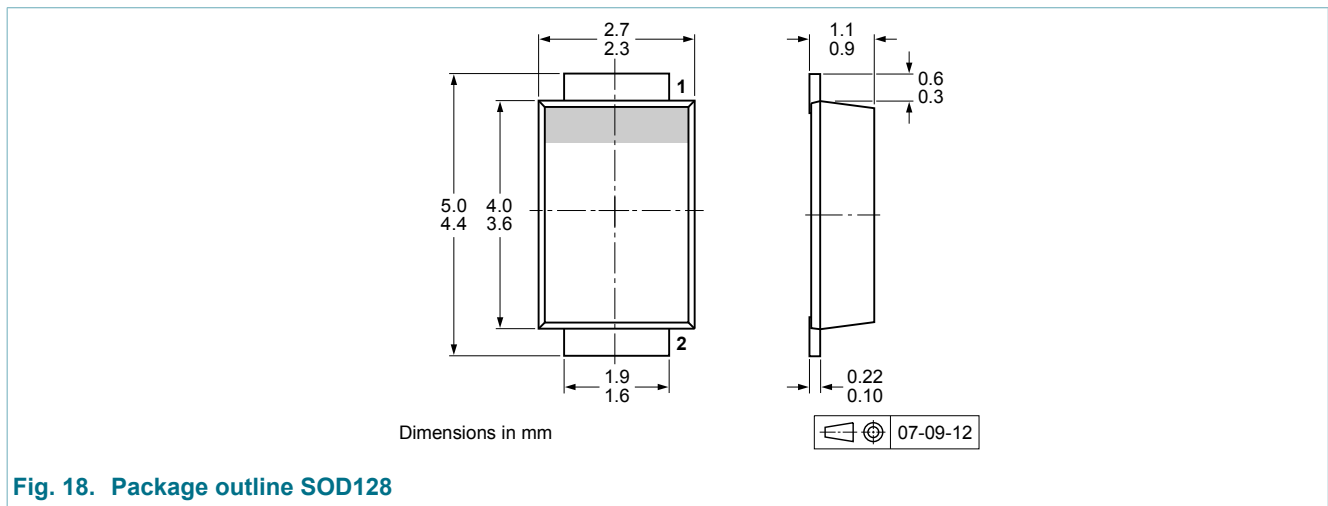


Fig. 18. Package outline SOD128

## 10. Soldering

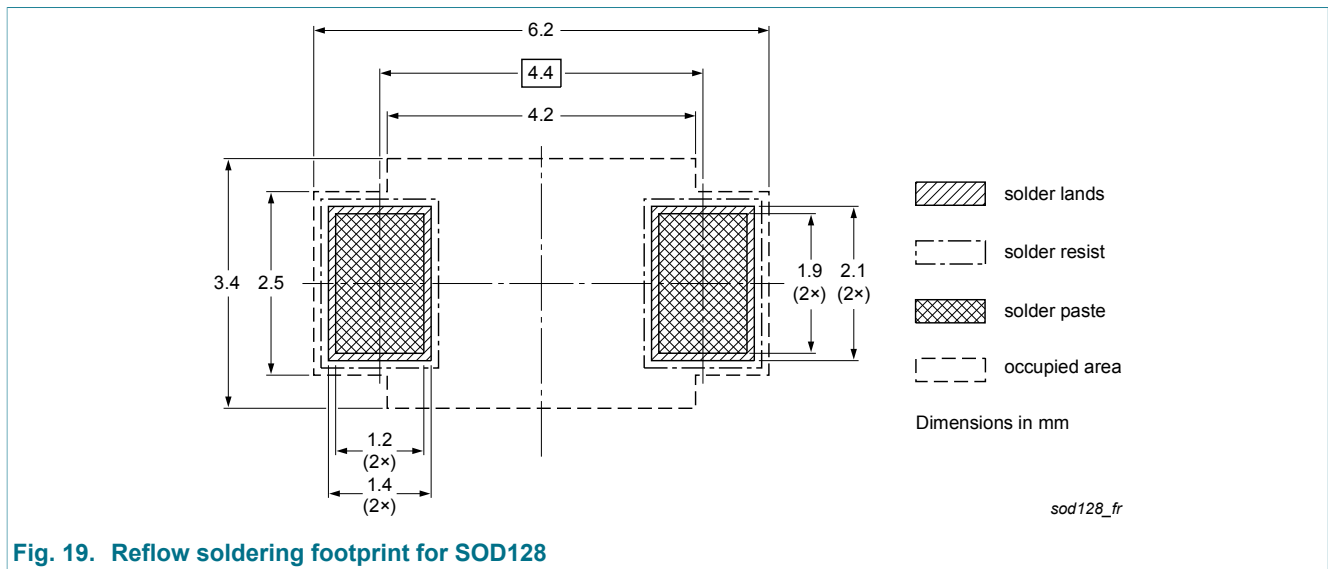


Fig. 19. Reflow soldering footprint for SOD128

## 11. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG6020ETP v.1	20121011	Product data sheet	-	-

## 12. Legal information

### 12.1 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.

- [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".  
 [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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## 13. Contents

<b>1</b>	<b>Product profile</b> .....	<b>1</b>
1.1	General description .....	1
1.2	Features and benefits .....	1
1.3	Applications .....	1
1.4	Quick reference data .....	1
<b>2</b>	<b>Pinning information</b> .....	<b>2</b>
<b>3</b>	<b>Ordering information</b> .....	<b>2</b>
<b>4</b>	<b>Marking</b> .....	<b>2</b>
<b>5</b>	<b>Limiting values</b> .....	<b>2</b>
<b>6</b>	<b>Thermal characteristics</b> .....	<b>3</b>
<b>7</b>	<b>Characteristics</b> .....	<b>4</b>
<b>8</b>	<b>Test information</b> .....	<b>8</b>
8.1	Quality information .....	
<b>9</b>	<b>Package outline</b> .....	<b>10</b>
<b>10</b>	<b>Soldering</b> .....	<b>10</b>
<b>11</b>	<b>Revision history</b> .....	<b>10</b>
<b>12</b>	<b>Legal information</b> .....	<b>11</b>
12.1	Data sheet status .....	11
12.2	Definitions .....	11
12.3	Disclaimers .....	11
12.4	Trademarks .....	12

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Date of release: 11 October 2012