



# PMEG4020ETR

40 V, 2 A low VF MEGA Schottky barrier rectifier

Rev. 1 — 5 October 2011

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 SOD123W 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:  $V_R \leq 40$  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
- Low power consumption applications
- High temperature applications

### 1.4 Quick reference data

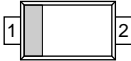

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{F(AV)}$	average forward current	square wave; $\delta = 0.5$ ; $f = 20$ kHz; $T_{amb} \leq 110$ °C	-	-	2	A
		square wave; $\delta = 0.5$ ; $f = 20$ kHz; $T_{sp} \leq 165$ °C	-	-	2	A
$V_R$	reverse voltage	$T_j = 25$ °C	-	-	40	V
$V_F$	forward voltage	$I_F = 2$ A; $T_j = 25$ °C	-	430	490	mV
$I_R$	reverse current	$V_R = 40$ V; $T_j = 25$ °C	-	25	100	$\mu$ A

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

## 2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode <sup>[1]</sup>	 SOD123W	 sym001
2	A	anode		

[1] The marking bar indicates the cathode.

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMEG4020ETR	-	plastic surface-mounted package; 2 leads	SOD123W

## 4. Marking

Table 4. Marking codes

Type number	Marking code
PMEG4020ETR	C1

## 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; $\delta = 0.5$ ; $f = 20\text{ kHz}$ ; $T_{amb} \leq 110\text{ °C}$	[1]	-	2	A
		square wave; $\delta = 0.5$ ; $f = 20\text{ kHz}$ ; $T_{sp} \leq 165\text{ °C}$		-	2	A
$I_{FSM}$	non-repetitive peak forward current	square wave; $t_p = 8\text{ ms}$ ; $T_{j(init)} = 25\text{ °C}$	-	50	A	
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[2][3]	-	680	mW
			[4][3]	-	1150	mW
			[1][3]	-	2140	mW
$T_j$	junction temperature		-	175	°C	
$T_{amb}$	ambient temperature		-55	175	°C	
$T_{stg}$	storage temperature		-65	175	°C	

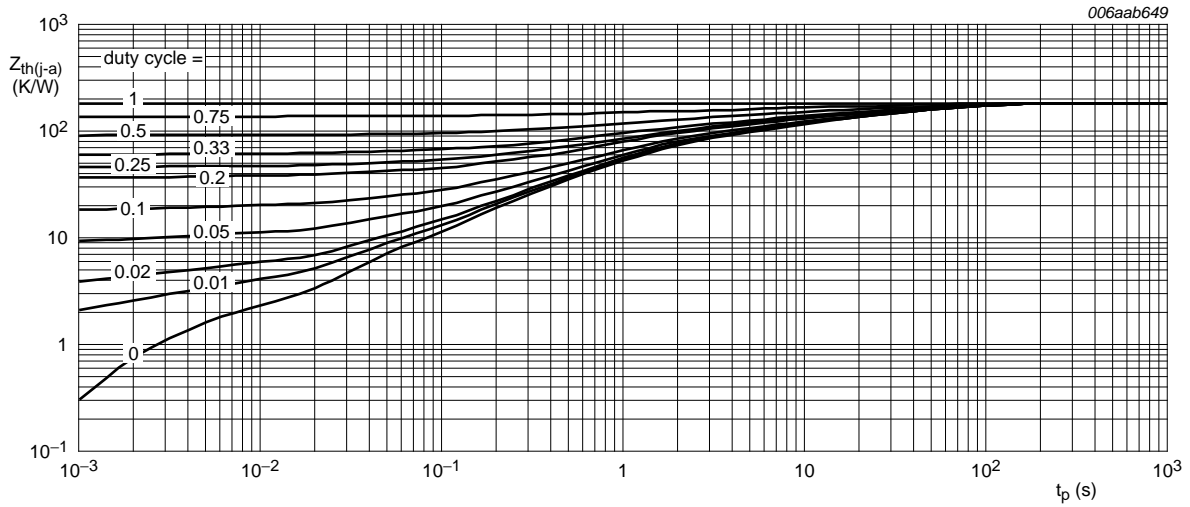
- [1] Device mounted on a ceramic Printed-Circuit Board (PCB),  $Al_2O_3$ , standard footprint.  
 [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.  
 [3] Reflow soldering is the only recommended soldering method.  
 [4] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode  $1\text{ cm}^2$ .

## 6. Thermal characteristics

**Table 6. Thermal characteristics**

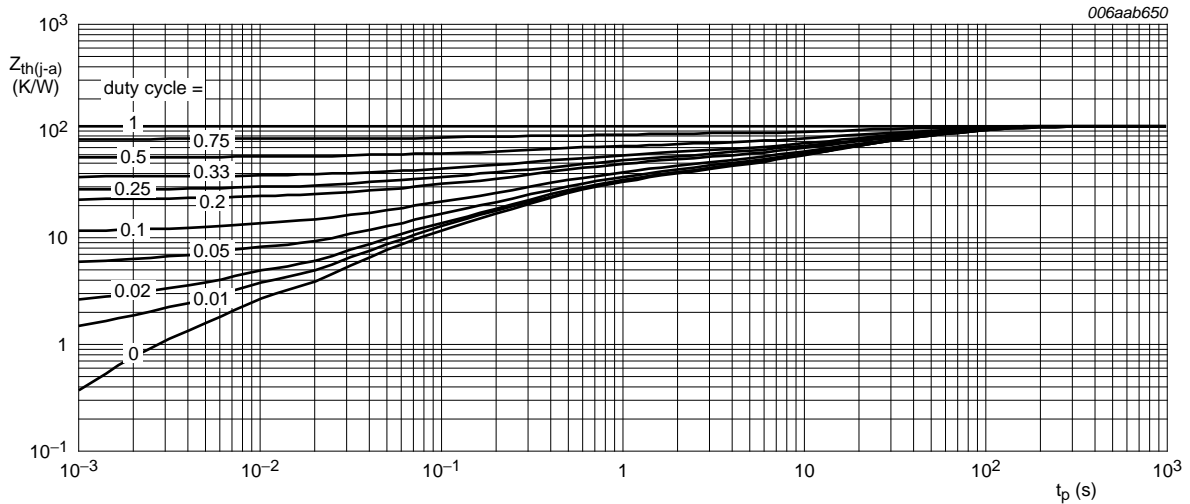
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1][2][3]	-	-	220	K/W
			[1][4][3]	-	-	130	K/W
			[1][5][3]	-	-	70	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[6]	-	-	18	K/W

- [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] Reflow soldering is the only recommended soldering method.  
 [4] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode  $1\text{ cm}^2$ .  
 [5] Device mounted on a ceramic PCB,  $Al_2O_3$ , standard footprint.  
 [6] Soldering point of cathode tab.



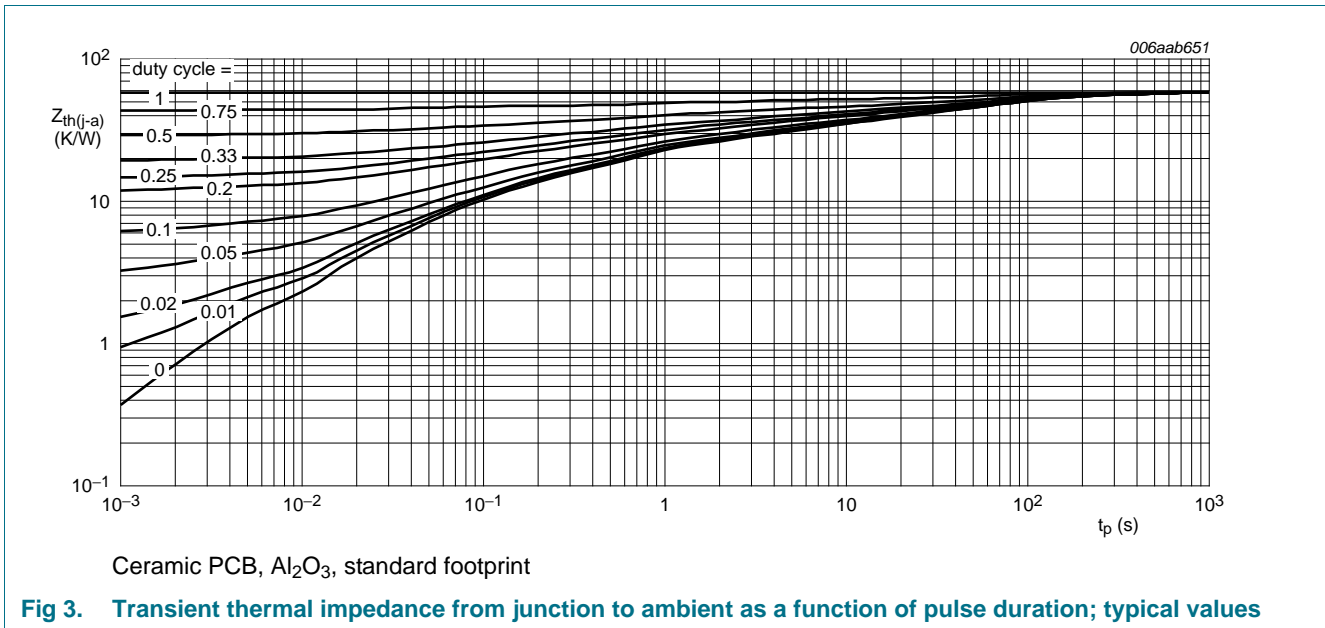
FR4 PCB, standard footprint

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>

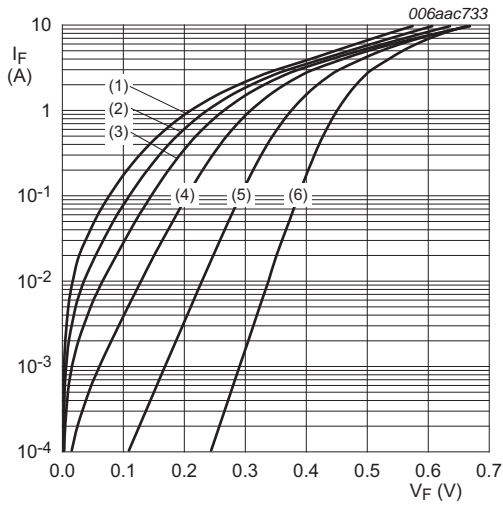
Fig 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



## 7. Characteristics

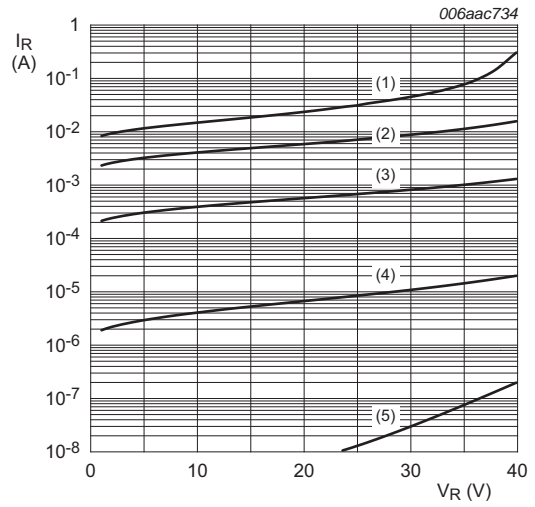
**Table 7. Characteristics**

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	-	295	330	mV
		I <sub>F</sub> = 1 A; T <sub>j</sub> = 25 °C	-	380	440	mV
		I <sub>F</sub> = 2 A; T <sub>j</sub> = 25 °C	-	430	490	mV
		I <sub>F</sub> = 2 A; T <sub>j</sub> = 125 °C	-	330	380	mV
I <sub>R</sub>	reverse current	V <sub>R</sub> = 10 V; T <sub>j</sub> = 25 °C	-	5	-	µA
		V <sub>R</sub> = 40 V; T <sub>j</sub> = 25 °C	-	25	100	µA
		V <sub>R</sub> = 10 V; T <sub>j</sub> = 125 °C	-	4	-	mA
		V <sub>R</sub> = 40 V; T <sub>j</sub> = 125 °C	-	15	-	mA
C <sub>d</sub>	diode capacitance	V <sub>R</sub> = 1 V; f = 1 MHz; T <sub>j</sub> = 25 °C	-	250	-	pF
		V <sub>R</sub> = 10 V; f = 1 MHz; T <sub>j</sub> = 25 °C	-	95	-	pF



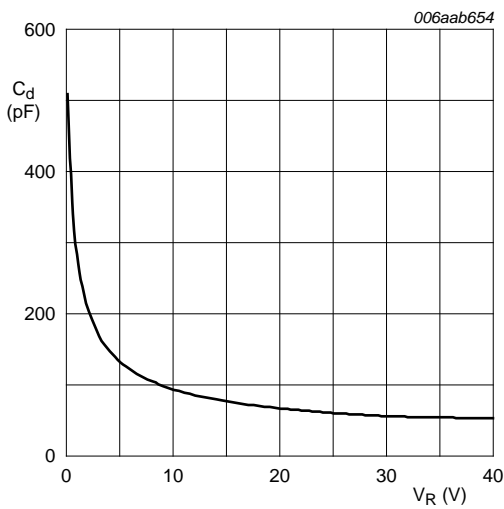
- (1)  $T_j = 175\text{ °C}$
- (2)  $T_j = 150\text{ °C}$
- (3)  $T_j = 125\text{ °C}$
- (4)  $T_j = 85\text{ °C}$
- (5)  $T_j = 25\text{ °C}$
- (6)  $T_j = -40\text{ °C}$

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



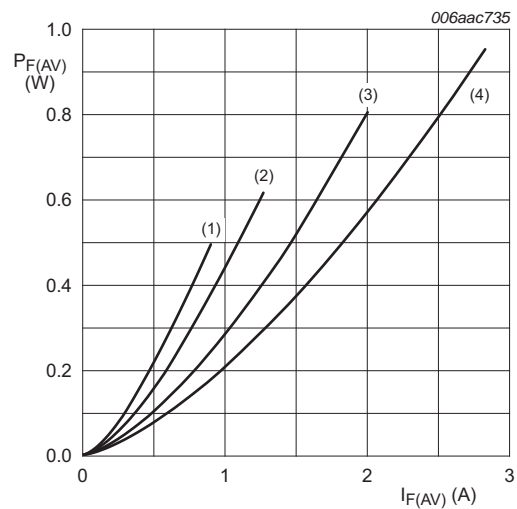
- (1)  $T_j = 150\text{ °C}$
- (2)  $T_j = 125\text{ °C}$
- (3)  $T_j = 85\text{ °C}$
- (4)  $T_j = 25\text{ °C}$
- (5)  $T_j = -40\text{ °C}$

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



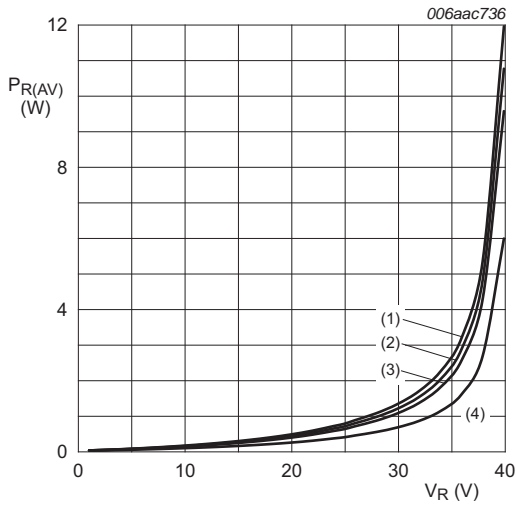
$f = 1\text{ MHz}; T_{amb} = 25\text{ °C}$

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



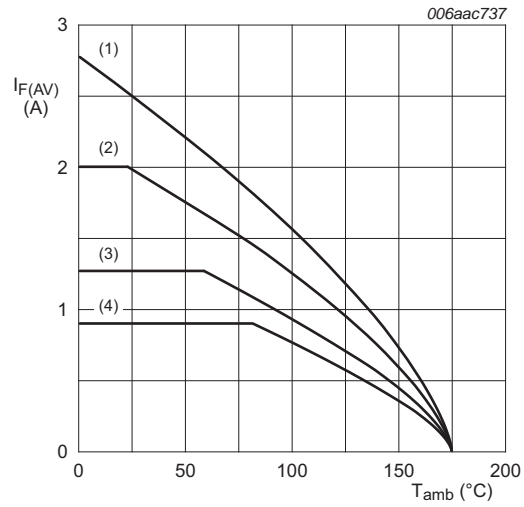
- $T_j = 175\text{ °C}$
- (1)  $\delta = 0.1$
- (2)  $\delta = 0.2$
- (3)  $\delta = 0.5$
- (4)  $\delta = 1.0$

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



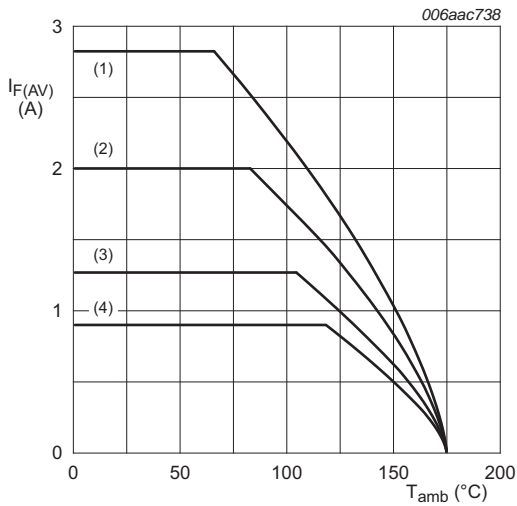
$T_j = 150\text{ °C}$   
 (1)  $\delta = 1.0$   
 (2)  $\delta = 0.9$   
 (3)  $\delta = 0.8$   
 (4)  $\delta = 0.5$

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



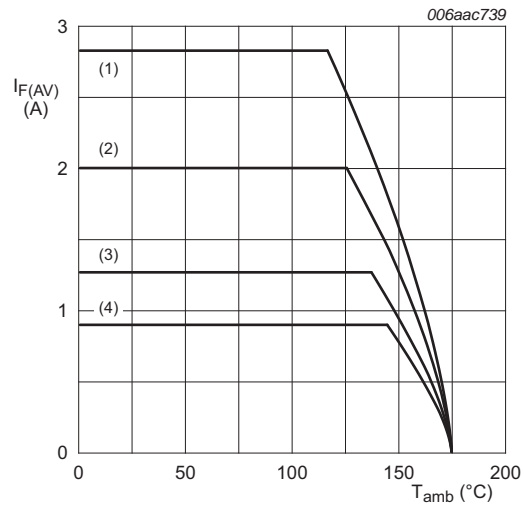
FR4 PCB, standard footprint  
 $T_j = 175\text{ °C}$   
 (1)  $\delta = 1.0$  (DC)  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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



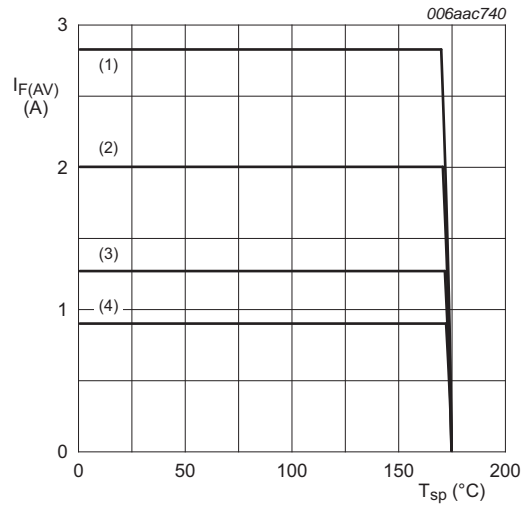
FR4 PCB, mounting pad for cathode  $1\text{ cm}^2$   
 $T_j = 175\text{ °C}$   
 (1)  $\delta = 1.0$   
 (2)  $\delta = 0.9$   
 (3)  $\delta = 0.8$   
 (4)  $\delta = 0.5$

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



Ceramic PCB,  $\text{Al}_2\text{O}_3$ , standard footprint  
 $T_j = 175\text{ °C}$   
 (1)  $\delta = 1.0$  (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



$T_j = 175\text{ °C}$

(1)  $\delta = 1.0$

(2)  $\delta = 0.9$

(3)  $\delta = 0.8$

(4)  $\delta = 0.5$

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



## 8. Test information

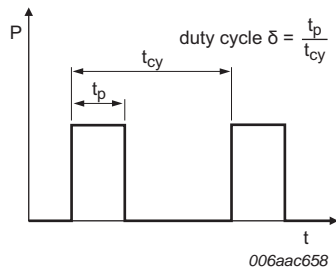


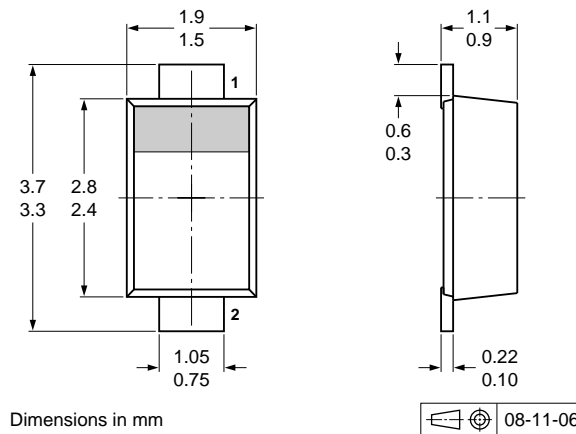
Fig 13. Duty cycle definition

The current ratings for the typical waveforms as shown in figures [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



Dimensions in mm

Fig 14. Package outline SOD123W

## 10. Packing information

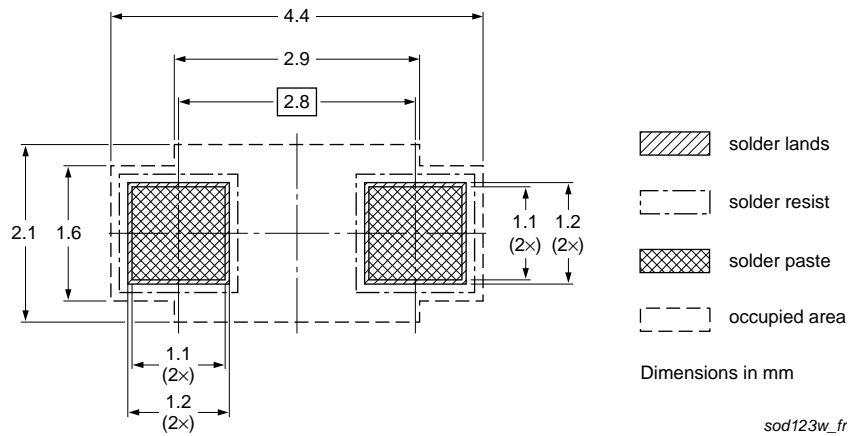
**Table 8. Ordering information**

The indicated -xxx are the last three digits of the 12NC ordering code. [1]

Type number	Package	Description	Packing quantity
			<b>3000</b>
PMEG4020ETR	SOD123W	4 mm pitch, 8 mm tape and reel	-115

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

## 11. Soldering



Reflow soldering is the only recommended soldering method.

**Fig 15. Reflow soldering footprint for SOD123W**

## 12. Revision history

**Table 9.** Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMEG4020ETR v.1	20111005	Product data sheet	-	-

## 13. Legal information

### 13.1 Data sheet status

Document status <a href="#">[1]</a> <a href="#">[2]</a>	Product status <a href="#">[3]</a>	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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For sales office addresses, please send an email to: [salesaddresses@nexperia.com](mailto:salesaddresses@nexperia.com)

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