

# PMEG4002EJ

200 mA low  $V_F$  MEGA Schottky barrier rectifier

Rev. 01 — 15 May 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, encapsulated in a SOD323F (SC-90) small and flat lead Surface-Mounted Device (SMD) plastic package.

### 1.2 Features

- Average forward current:  $I_{F(AV)} \leq 0.2$  A
- Reverse voltage:  $V_R \leq 40$  V
- Low forward voltage
- AEC-Q101 qualified
- Small and flat lead SMD plastic package

### 1.3 Applications

- Low voltage rectification
- High efficiency DC-to-DC conversion
- Switch Mode Power Supply (SMPS)
- Reverse polarity protection
- Ultra high-speed switching
- Low power consumption applications

### 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				
		$T_{amb} \leq 130$ °C	[1]	-	0.2	A
		$T_{sp} \leq 145$ °C	-	-	0.2	A
$V_R$	reverse voltage		-	-	40	V
$V_F$	forward voltage	$I_F = 0.2$ A	-	520	600	mV
$I_R$	reverse current	$V_R = 40$ V	-	0.7	10	$\mu$ 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	cathode <a href="#">[1]</a>		 <i>sym001</i>
2	anode		

[1] The marking bar indicates the cathode.

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
PMEG4002EJ	SC-90	plastic surface-mounted package; 2 leads	SOD323F

## 4. Marking

**Table 4. Marking codes**

Type number	Marking code
PMEG4002EJ	1N

## 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; $\delta = 0.5$ ; $f = 20\text{ kHz}$				
		$T_{amb} \leq 130\text{ °C}$	<a href="#">[1]</a>	-	0.2	A
		$T_{sp} \leq 145\text{ °C}$	-	-	0.2	A
$I_{FRM}$	repetitive peak forward current	$t_p \leq 1\text{ ms}$ ; $\delta \leq 0.25$	-	2.6	A	
$I_{FSM}$	non-repetitive peak forward current	square wave; $t_p = 8\text{ ms}$	<a href="#">[2]</a>	-	2.75	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	<a href="#">[3][4]</a>	-	385	mW
			<a href="#">[3][5]</a>	-	695	mW
			<a href="#">[3][1]</a>	-	1045	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

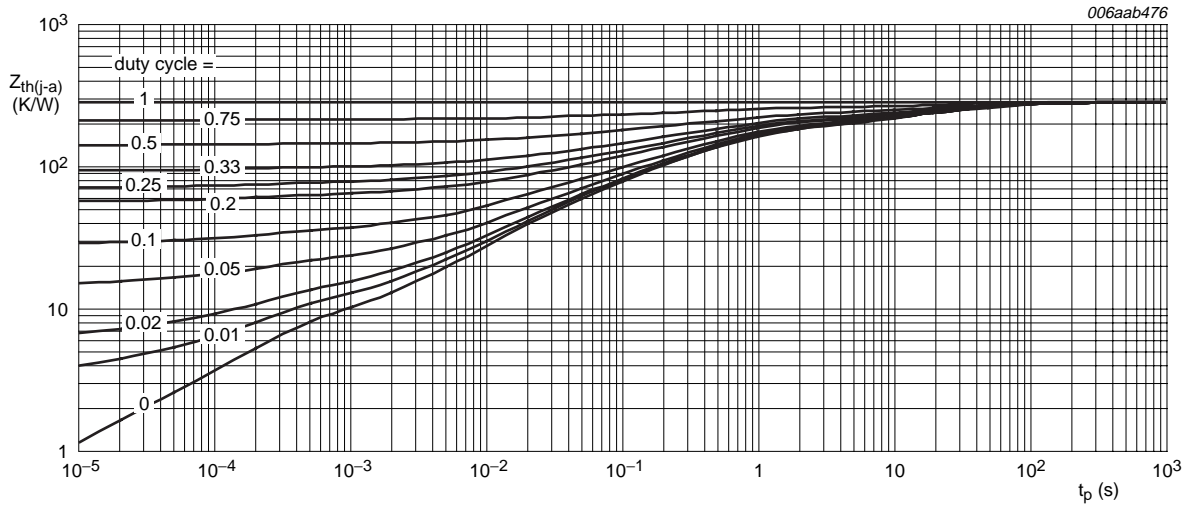
- [1] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.
- [2]  $T_j = 25$  °C prior to surge.
- [3] Reflow soldering is the only recommended soldering method.
- [4] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [5] Device mounted 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**

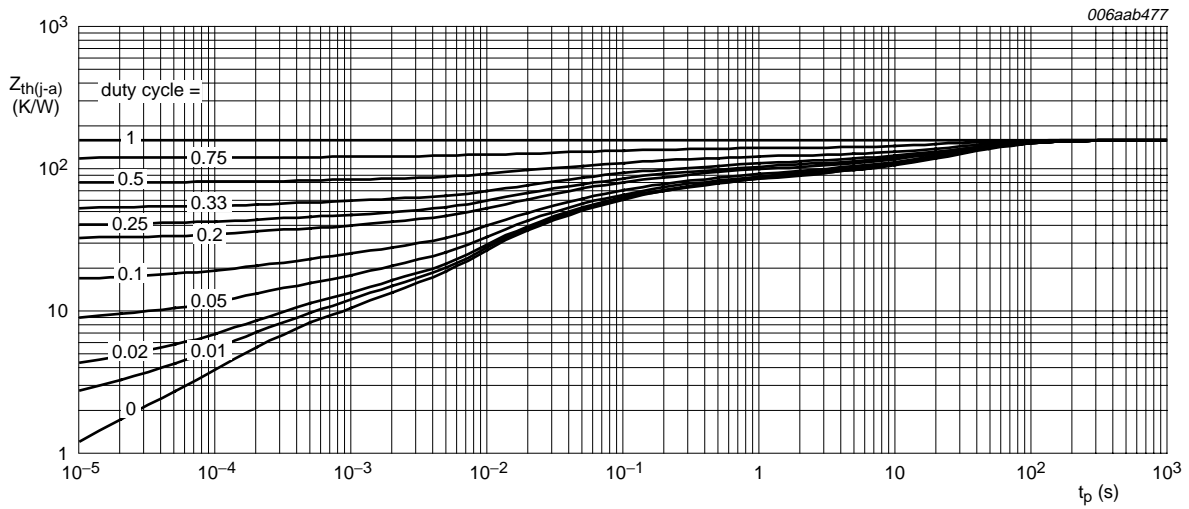
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1][2]				
			[3]	-	-	325	K/W
			[4]	-	-	180	K/W
			[5]	-	-	120	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[6]	-	25	K/W	

- [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<sub>2</sub>O<sub>3</sub>, standard footprint.
- [6] Soldering point of cathode tab.



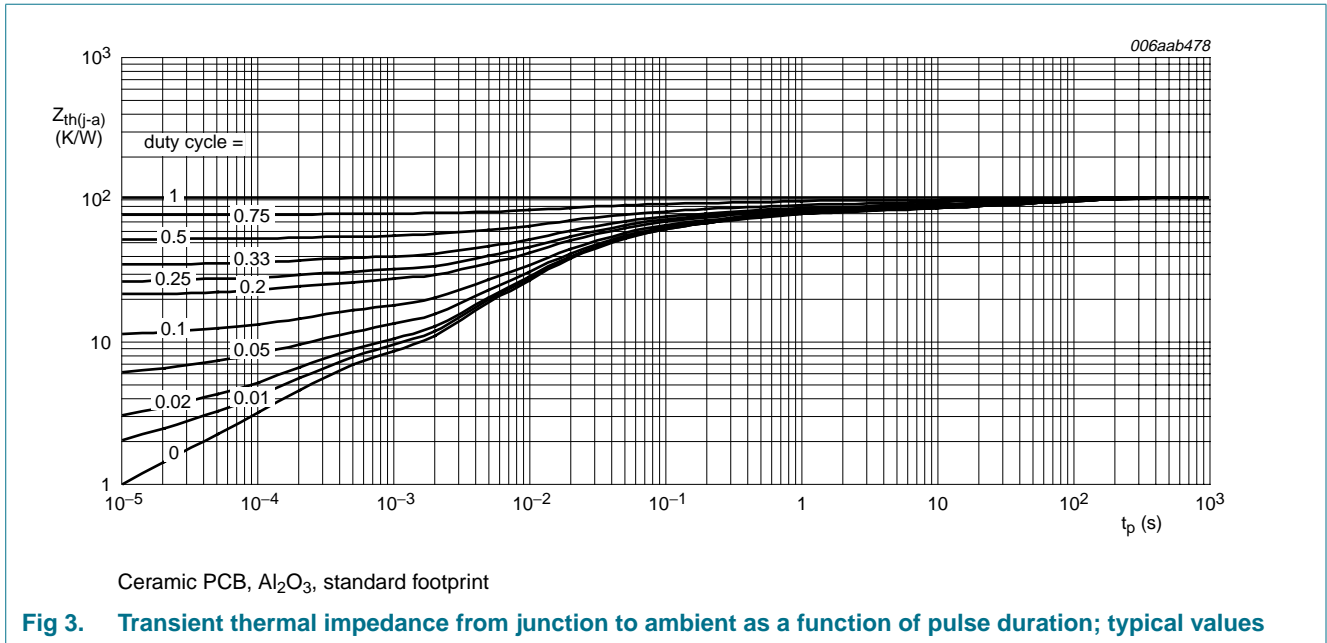
FR4 PCB, standard footprint

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



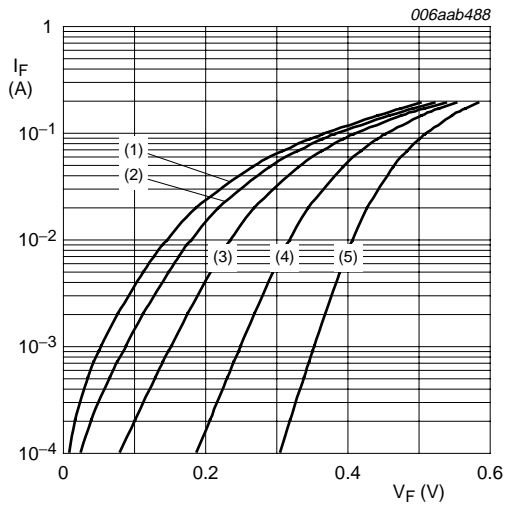
## 7. Characteristics

**Table 7. Characteristics**

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

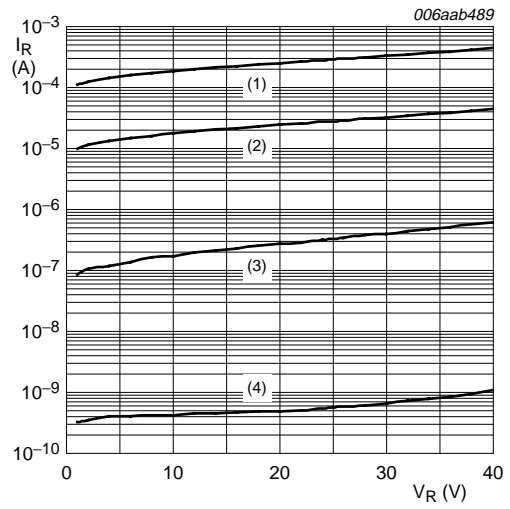
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_F$	forward voltage	$I_F = 0.1\text{ mA}$	-	190	220	mV
		$I_F = 1\text{ mA}$	-	250	290	mV
		$I_F = 10\text{ mA}$	-	320	360	mV
		$I_F = 100\text{ mA}$	-	440	500	mV
		$I_F = 200\text{ mA}$	-	520	600	mV
$I_R$	reverse current	$V_R = 10\text{ V}$	-	0.2	0.3	$\mu\text{A}$
		$V_R = 25\text{ V}$	-	0.3	0.5	$\mu\text{A}$
		$V_R = 40\text{ V}$	-	0.7	10	$\mu\text{A}$
$C_d$	diode capacitance	$f = 1\text{ MHz}$				
		$V_R = 1\text{ V}$	-	14	-	pF
		$V_R = 10\text{ V}$	-	6	-	pF
$t_{rr}$	reverse recovery time	[1]	-	5	-	ns

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



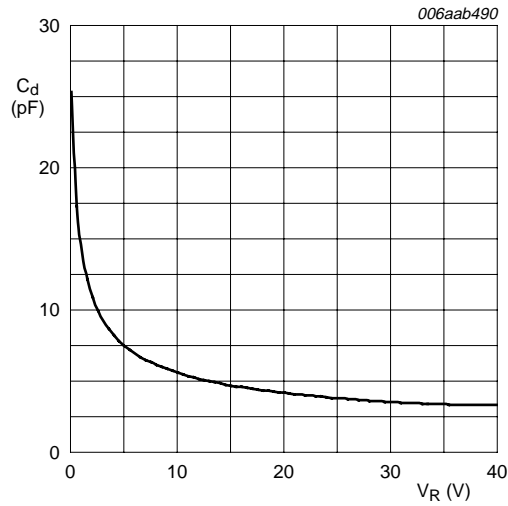
- (1)  $T_j = 150\text{ °C}$
- (2)  $T_j = 125\text{ °C}$
- (3)  $T_j = 85\text{ °C}$
- (4)  $T_j = 25\text{ °C}$
- (5)  $T_j = -40\text{ °C}$

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



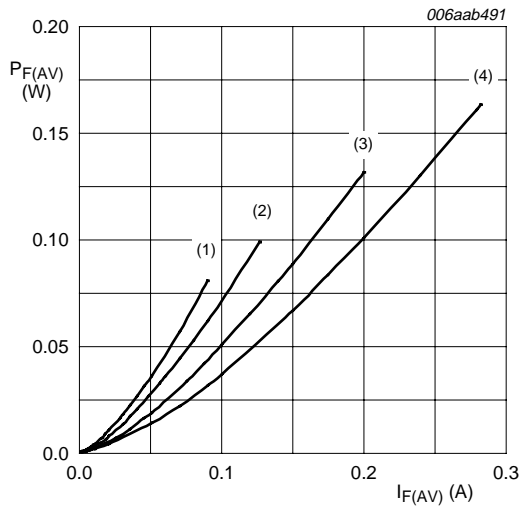
- (1)  $T_j = 125\text{ °C}$
- (2)  $T_j = 85\text{ °C}$
- (3)  $T_j = 25\text{ °C}$
- (4)  $T_j = -40\text{ °C}$

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



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

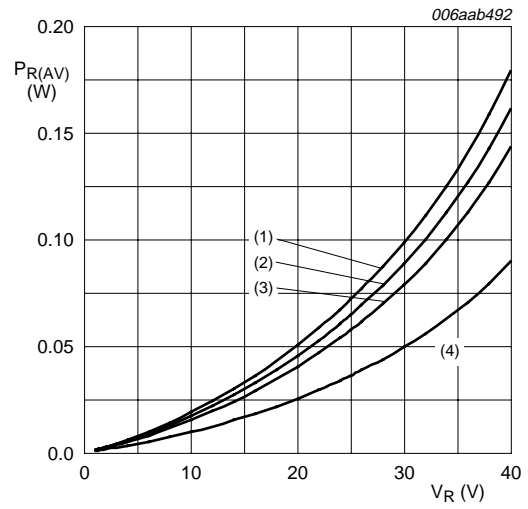
**Fig 6. Diode capacitance as a function of reverse voltage; typical values**



$T_j = 150\text{ °C}$

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

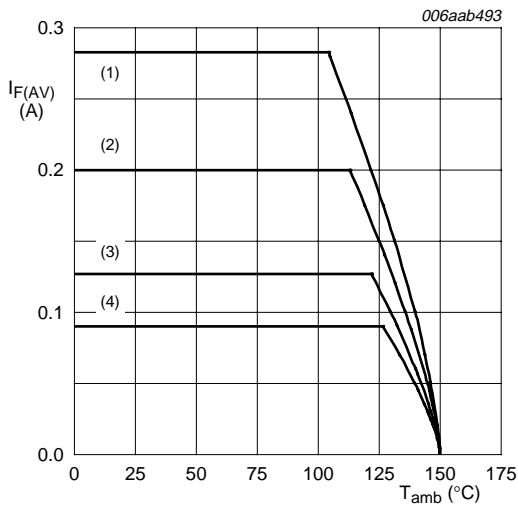
**Fig 7. Average forward power dissipation as a function of average forward current; typical values**



$T_j = 125\text{ °C}$

- (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**

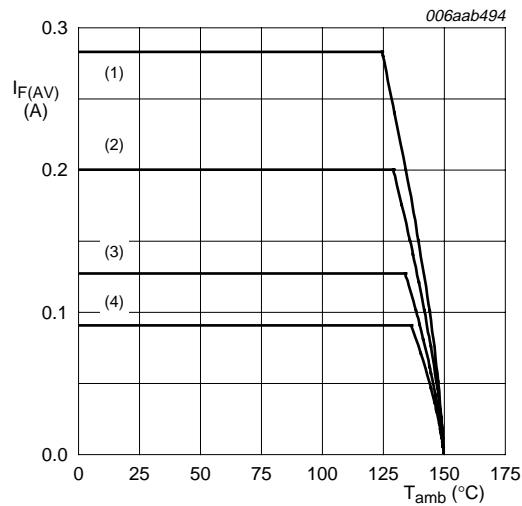


FR4 PCB, standard footprint

$T_j = 150\text{ °C}$

- (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**

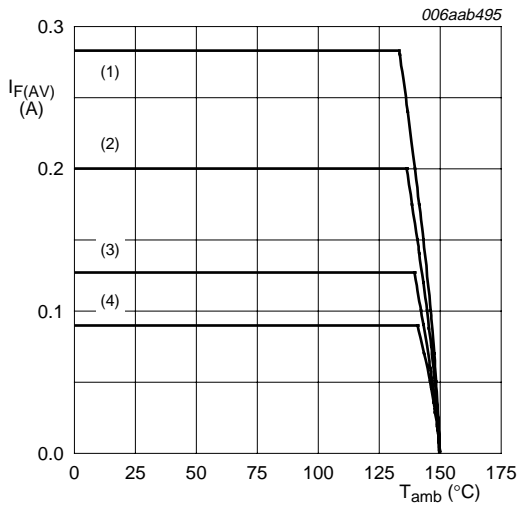


FR4 PCB, mounting pad for cathode 1 cm<sup>2</sup>

$T_j = 150\text{ °C}$

- (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**

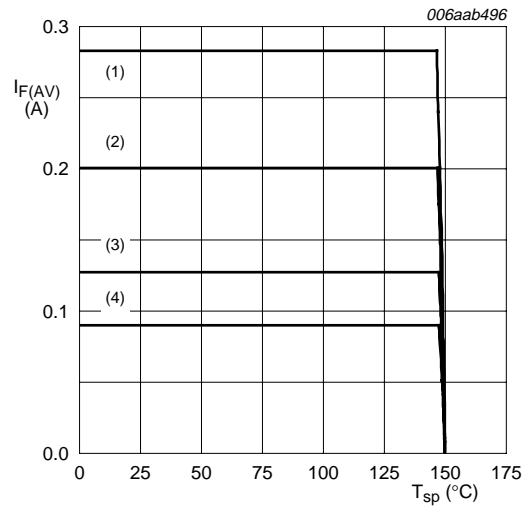


Ceramic PCB,  $Al_2O_3$ , standard footprint

$T_j = 150$  °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

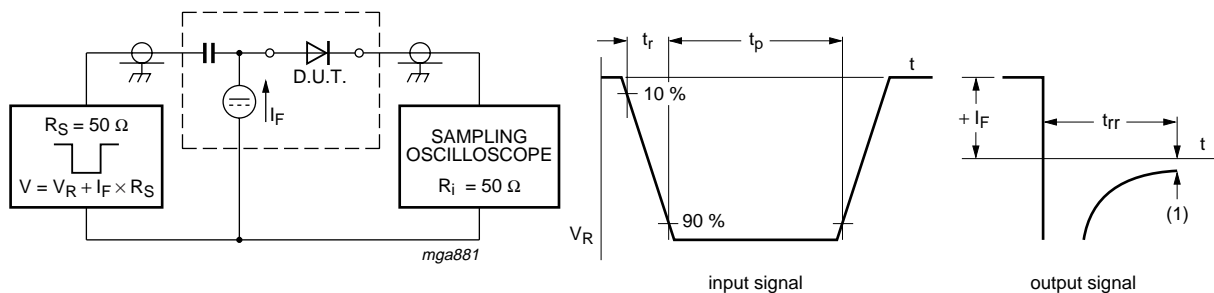


$T_j = 150$  °C

- (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



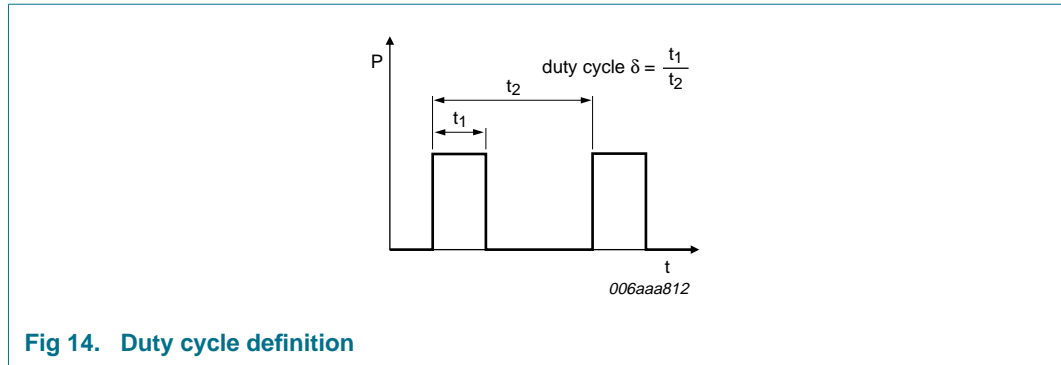
(1)  $I_R = 1$  mA

Input signal: reverse pulse rise time  $t_r = 0.6$  ns; reverse voltage pulse duration  $t_p = 100$  ns; duty cycle  $\delta = 0.05$

Oscilloscope: rise time  $t_r = 0.35$  ns

Fig 13. Reverse recovery time test circuit and waveforms



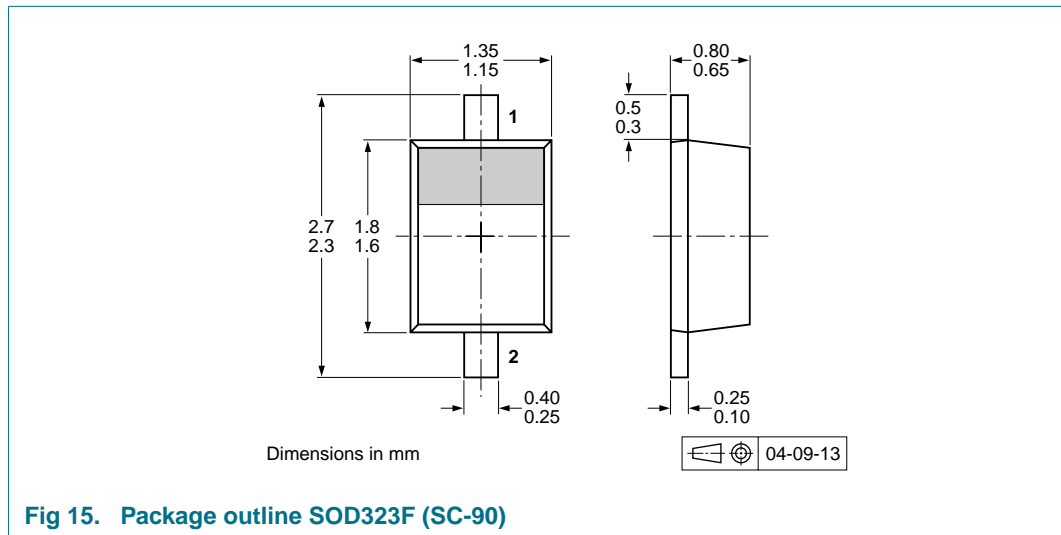


The current ratings for the typical waveforms as shown in [Figure 9](#), [10](#), [11](#) and [12](#) are calculated according to the equations:  $I_{F(AV)} = I_M \times \delta$  with  $I_M$  defined as peak current,  $I_{RMS} = I_{F(AV)}$  at DC, and  $I_{RMS} = I_M \times \sqrt{\delta}$  with  $I_{RMS}$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



## 10. Packing information

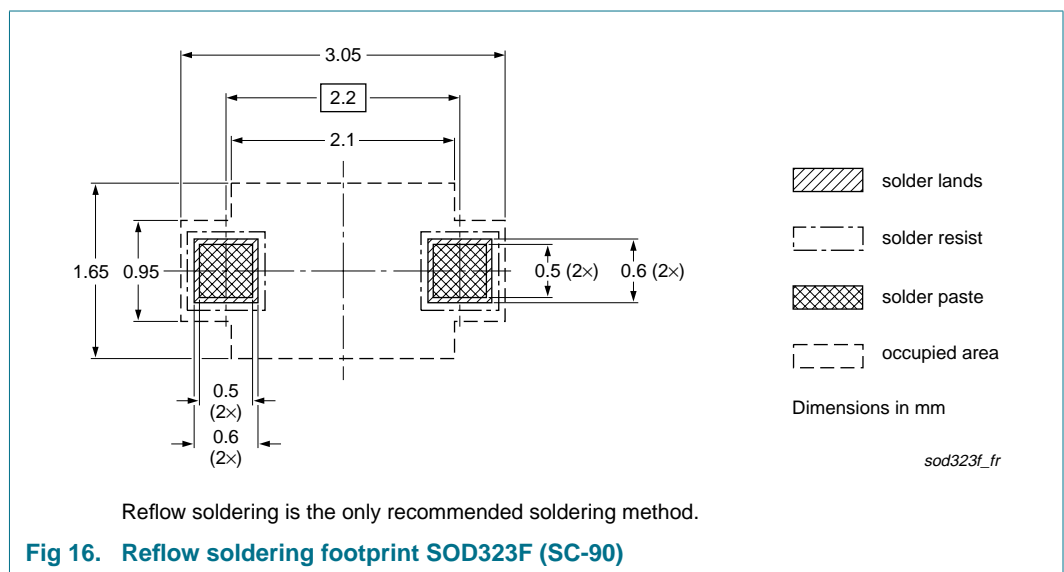
**Table 8. Packing methods**

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

Type number	Package	Description	Packing quantity	
			3000	10000
PMEG4002EJ	SOD323F	4 mm pitch, 8 mm tape and reel	-115	-135

[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
PMEG4002EJ_1	20090515	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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