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PMEG4005CEA

40 V, 0.5 A low VF MEGA Schottky barrier rectifier

18 November 2016

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 a very small SOD323 (SC-76) Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- Average forward current: $I_{F(AV)} \leq 0.5$ A
- Reverse voltage: $V_R \leq 40$ V
- Low forward voltage typ. $V_F = 550$ mV
- Low reverse current typ. $I_R = 1.5$ μ A
- Very small SMD plastic package
- AEC-Q101 qualified

3. Applications

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

4. Quick reference data

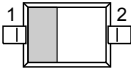
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{F(AV)}$	average forward current	$\delta = 0.5$; $f = 20$ kHz; $T_{sp} \leq 135$ °C; square wave	-	-	0.5	A
V_R	reverse voltage	$T_j = 25$ °C	-	-	40	V
V_F	forward voltage	$I_F = 500$ mA; $t_p \leq 300$ μ s; $\delta \leq 0.02$; $T_j = 25$ °C	-	550	640	mV
I_R	reverse current	$V_R = 40$ V; $T_j = 25$ °C; pulsed	[1]	1.5	8	μ A
		$V_R = 40$ V; $T_j = 125$ °C; pulsed	[1]	1	8	mA

[1] Very short test pulse to keep junction temperature unchanged.

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 SOD323	 sym001
2	A	anode		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMEG4005CEA	SOD323	plastic surface-mounted package; 2 leads	SOD323

7. Marking

Table 4. Marking codes

Type number	Marking code
PMEG4005CEA	EC

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	$T_j = 25\text{ °C}$		-	40	V
I_F	forward current	$T_{sp} \leq 130\text{ °C}$; $\delta = 1$		-	0.5	A
$I_{F(AV)}$	average forward current	$\delta = 0.5$; $f = 20\text{ kHz}$; $T_{sp} \leq 135\text{ °C}$; square wave		-	0.5	A
I_{FRM}	repetitive peak forward current	$t_p \leq 1\text{ ms}$; $\delta \leq 0.25$		-	2	A
I_{FSM}	non-repetitive peak forward current	$t_p = 8\text{ ms}$; $T_{j(init)} = 25\text{ °C}$; square wave		-	8	A
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1]	-	380	mW
			[2]	-	555	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 an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] 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

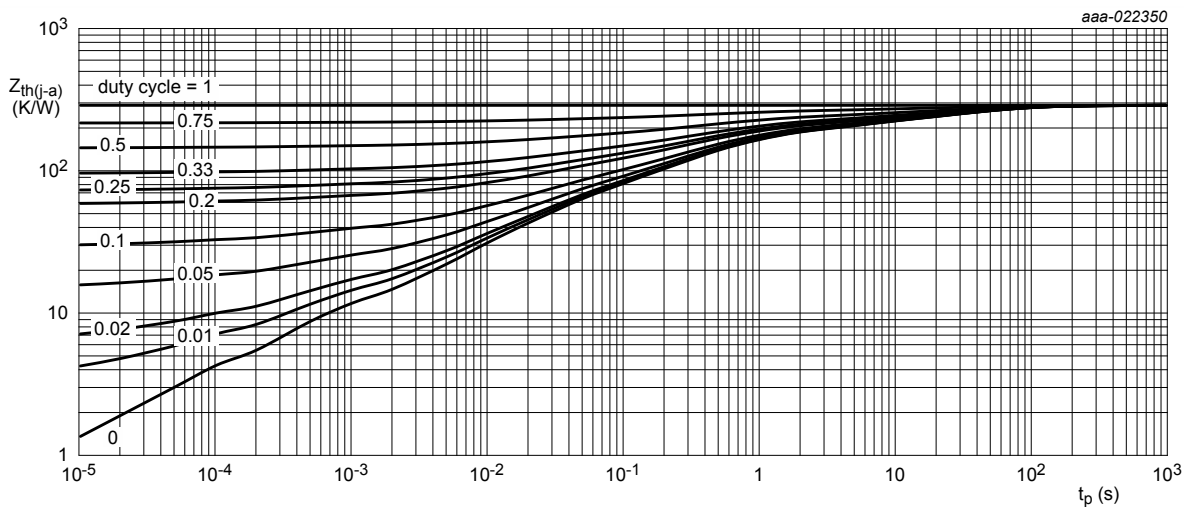
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1] [2]	-	-	330	K/W
			[1] [3]	-	-	225	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[4]	-	-	45	K/W

[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.

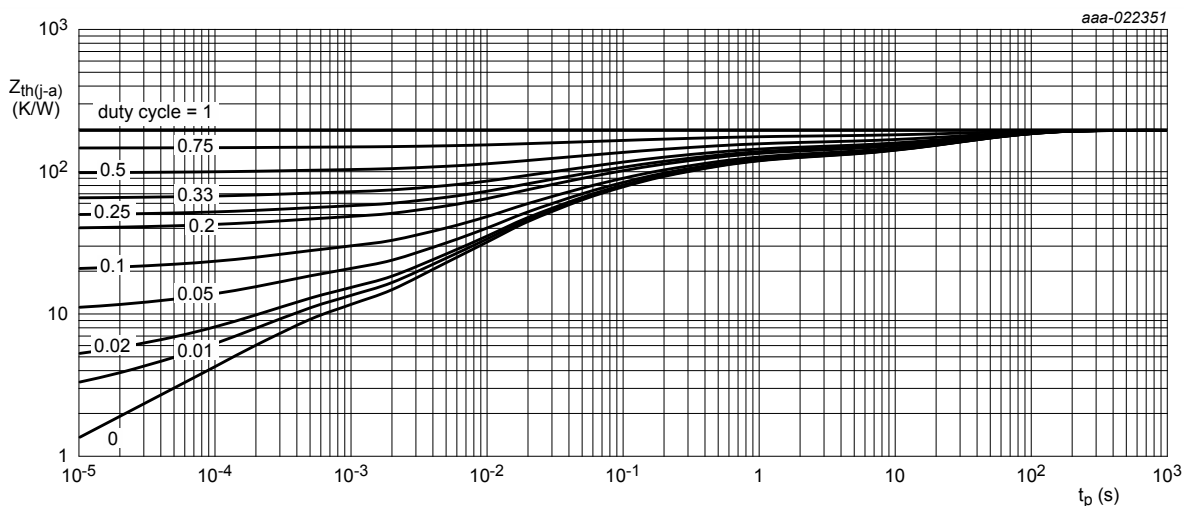
[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm^2 .

[4] 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^2

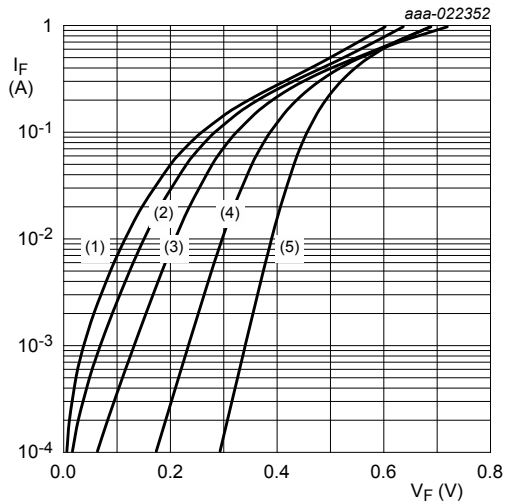
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)R}$	reverse breakdown voltage	$I_R = 1 \text{ mA}$; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25 \text{ } ^\circ\text{C}$		40	-	-	V
V_F	forward voltage	$I_F = 10 \text{ mA}$; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25 \text{ } ^\circ\text{C}$		-	300	380	mV
		$I_F = 100 \text{ mA}$; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25 \text{ } ^\circ\text{C}$		-	390	470	mV
		$I_F = 200 \text{ mA}$; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25 \text{ } ^\circ\text{C}$		-	435	510	mV
		$I_F = 300 \text{ mA}$; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25 \text{ } ^\circ\text{C}$		-	515	600	mV
		$I_F = 400 \text{ mA}$; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25 \text{ } ^\circ\text{C}$		-	515	600	mV
		$I_F = 500 \text{ mA}$; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_j = 25 \text{ } ^\circ\text{C}$		-	550	640	mV
		$I_F = 500 \text{ mA}$; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_j = -40 \text{ } ^\circ\text{C}$		-	570	670	mV
		$I_F = 500 \text{ mA}$; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_j = 125 \text{ } ^\circ\text{C}$		-	520	610	mV
I_R	reverse current	$V_R = 30 \text{ V}$; $T_j = 25 \text{ } ^\circ\text{C}$; pulsed	[1]	-	1	5	μA
		$V_R = 40 \text{ V}$; $T_j = 25 \text{ } ^\circ\text{C}$; pulsed	[1]	-	1.5	8	μA
		$V_R = 40 \text{ V}$; $T_j = 125 \text{ } ^\circ\text{C}$; pulsed	[1]	-	1	8	mA
C_d	diode capacitance	$V_R = 1 \text{ V}$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ } ^\circ\text{C}$		-	24	-	pF
		$V_R = 4 \text{ V}$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ } ^\circ\text{C}$		-	13.5	-	pF
		$V_R = 10 \text{ V}$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ } ^\circ\text{C}$		-	9	-	pF
t_{rr}	reverse recovery time	$I_F = 0.5 \text{ A}$; $I_R = 0.5 \text{ A}$; $I_{R(\text{meas})} = 0.1 \text{ A}$; $T_j = 25 \text{ } ^\circ\text{C}$		-	1.8	-	ns

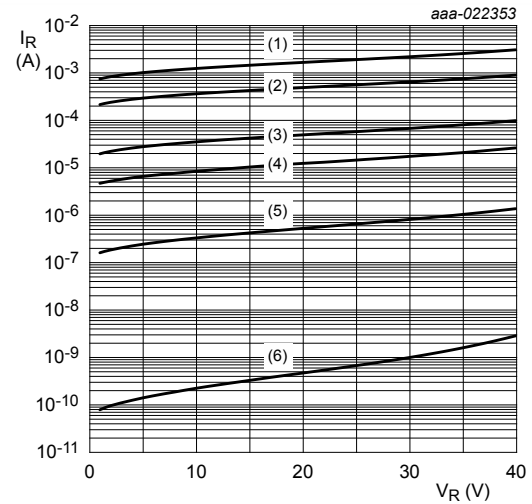
[1] Very short test pulse to keep junction temperature unchanged.



pulsed condition

- (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) $T_j = -40\text{ °C}$

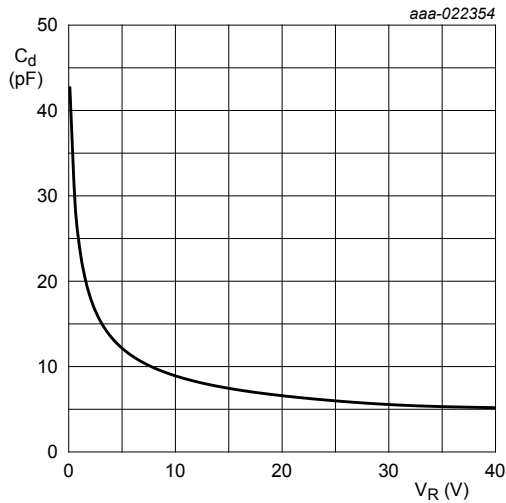
Fig. 3. Forward current as a function of forward voltage; typical values



pulsed condition

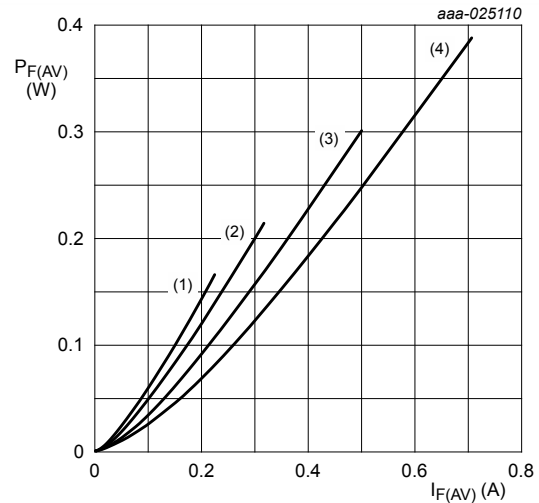
- (1) $T_j = 150\text{ °C}$
- (2) $T_j = 125\text{ °C}$
- (3) $T_j = 85\text{ °C}$
- (4) $T_j = 65\text{ °C}$
- (5) $T_j = 25\text{ °C}$
- (6) $T_j = -40\text{ °C}$

Fig. 4. Reverse current as a function of reverse voltage; typical values



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

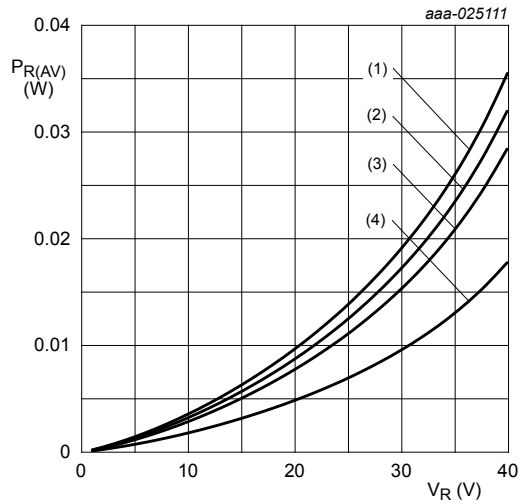
Fig. 5. Diode capacitance as a function of reverse voltage; typical values



$T_j = 150\text{ °C}$

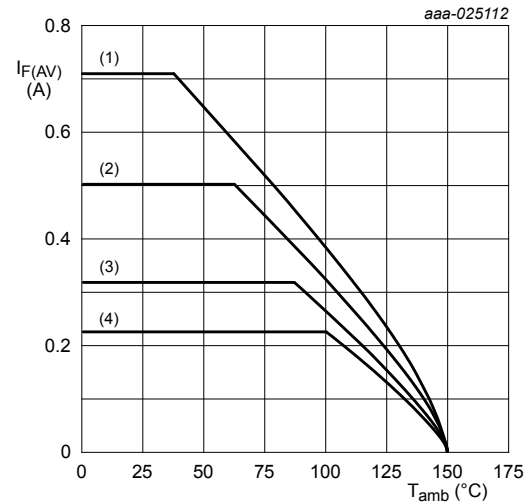
- (1) $\delta = 0.1$
- (2) $\delta = 0.2$
- (3) $\delta = 0.5$
- (4) $\delta = 1\text{ (DC)}$

Fig. 6. Average forward power dissipation as a function of average forward current; typical values



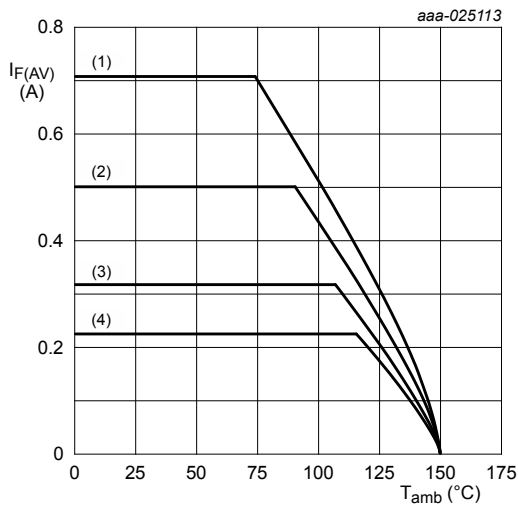
$T_j = 125\text{ }^{\circ}\text{C}$
 (1) $\delta = 1$; DC
 (2) $\delta = 0.9$; $f = 20\text{ kHz}$
 (3) $\delta = 0.8$; $f = 20\text{ kHz}$
 (4) $\delta = 0.5$; $f = 20\text{ kHz}$

Fig. 7. Average reverse power dissipation as a function of reverse voltage; typical values



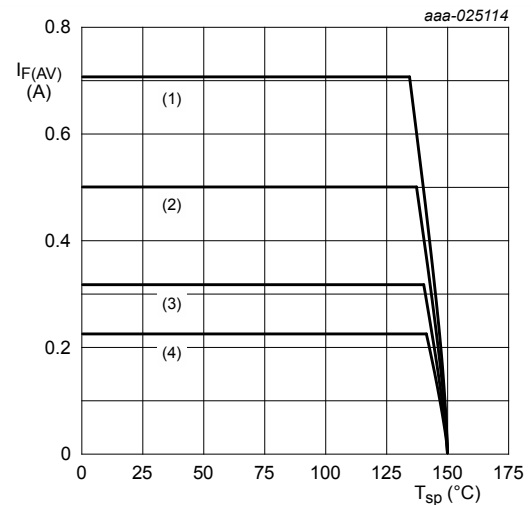
FR4 PCB, standard footprint
 $T_j = 150\text{ }^{\circ}\text{C}$
 (1) $\delta = 1$; DC
 (2) $\delta = 0.5$; $f = 20\text{ kHz}$
 (3) $\delta = 0.2$; $f = 20\text{ kHz}$
 (4) $\delta = 0.1$; $f = 20\text{ kHz}$

Fig. 8. Average forward current as a function of ambient temperature; typical values



FR4 PCB, mounting pad for cathode 1 cm^2
 $T_j = 150\text{ }^{\circ}\text{C}$
 (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. 9. 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. 10. Average forward current as a function of solder point temperature; typical values

11. Test information

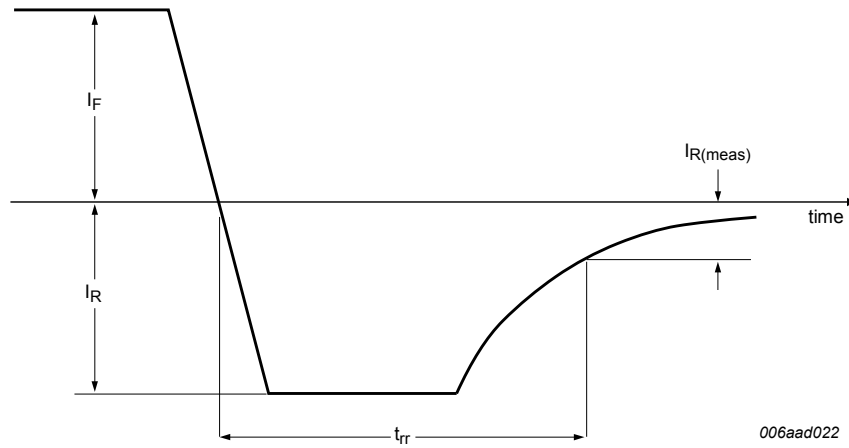


Fig. 11. Reverse recovery definition

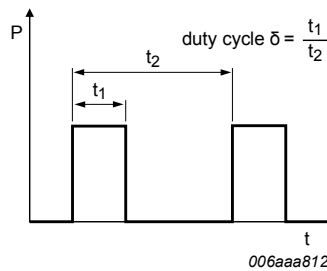


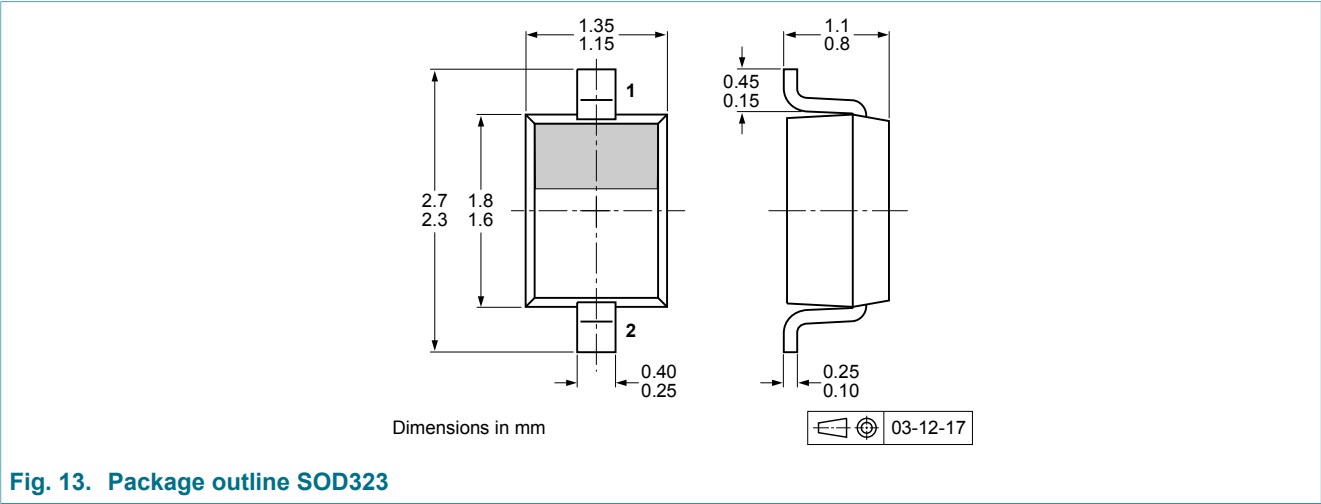
Fig. 12. Duty cycle definition

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.

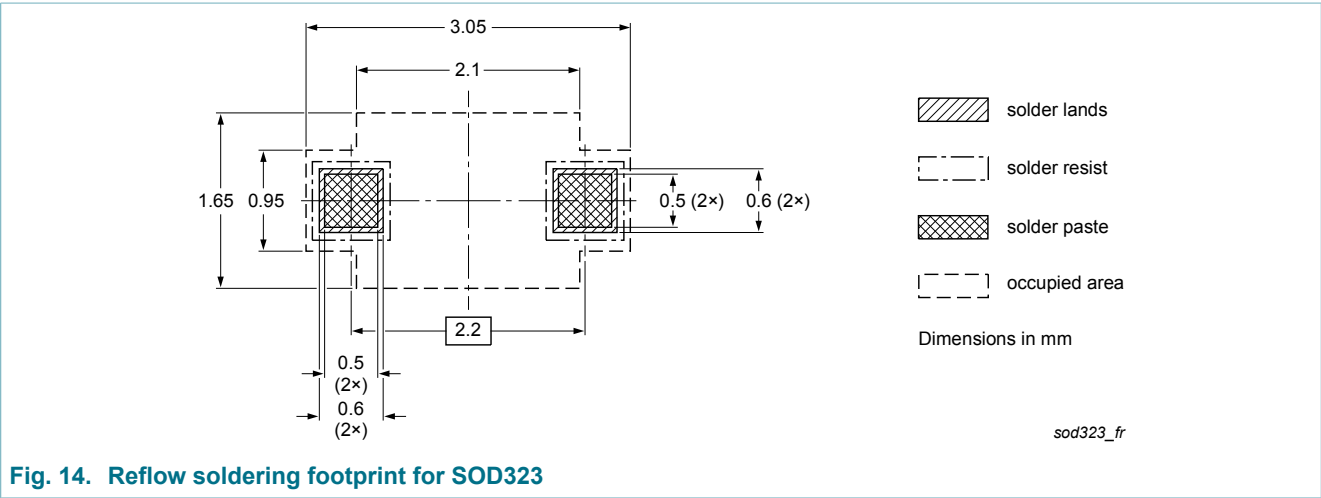
Quality information

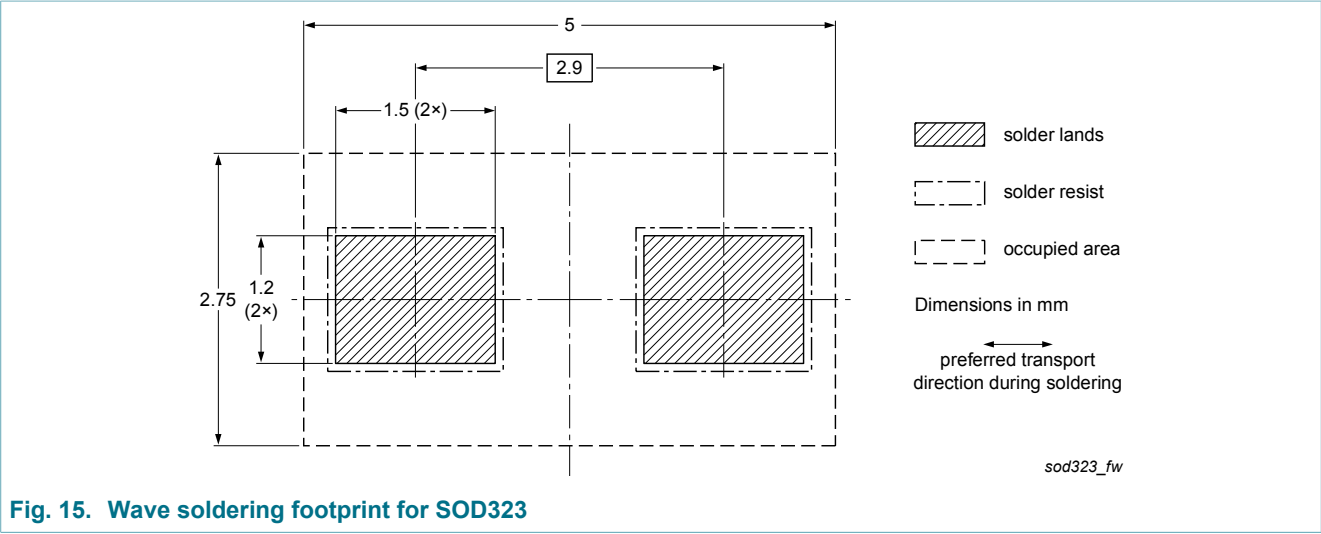
This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.

12. Package outline



13. Soldering





14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMEG4005CEA v.1	20161118	Product data sheet	-	-

15. Legal information

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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- [2] The term 'short data sheet' is explained in section "Definitions".
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