



# 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.  $I_R = 1.5$   $\mu$ 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

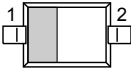
| Symbol      | Parameter               | Conditions                                                                 | Min | Typ | Max | Unit    |
|-------------|-------------------------|----------------------------------------------------------------------------|-----|-----|-----|---------|
| $I_{F(AV)}$ | 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; $t_p \leq 300$ $\mu$ 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   | $\mu$ A |
|             |                         | $V_R = 40$ V; $T_j = 125$ °C; pulsed                                       | [1] | 1   | 8   | mA      |

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

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5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline                                                                          | Graphic symbol                                                                                    |
|-----|--------|-------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| 1   | K      | cathode     | <br>SOD323 | <br><br>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  $1\text{ cm}^2$ .

## 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  $1\text{ cm}^2$ .

[4] Soldering point of cathode tab.

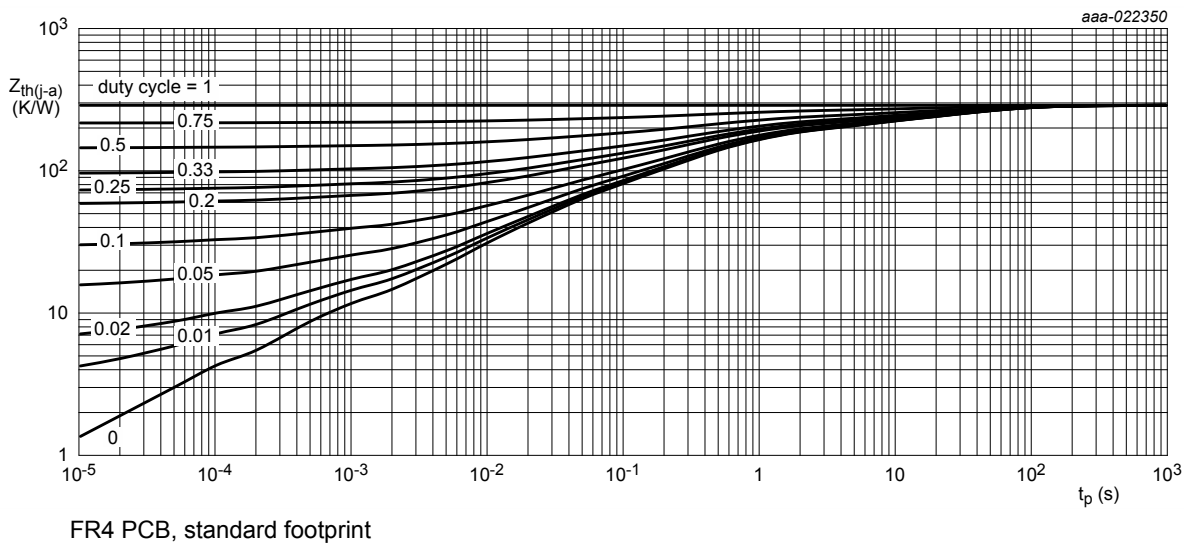


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

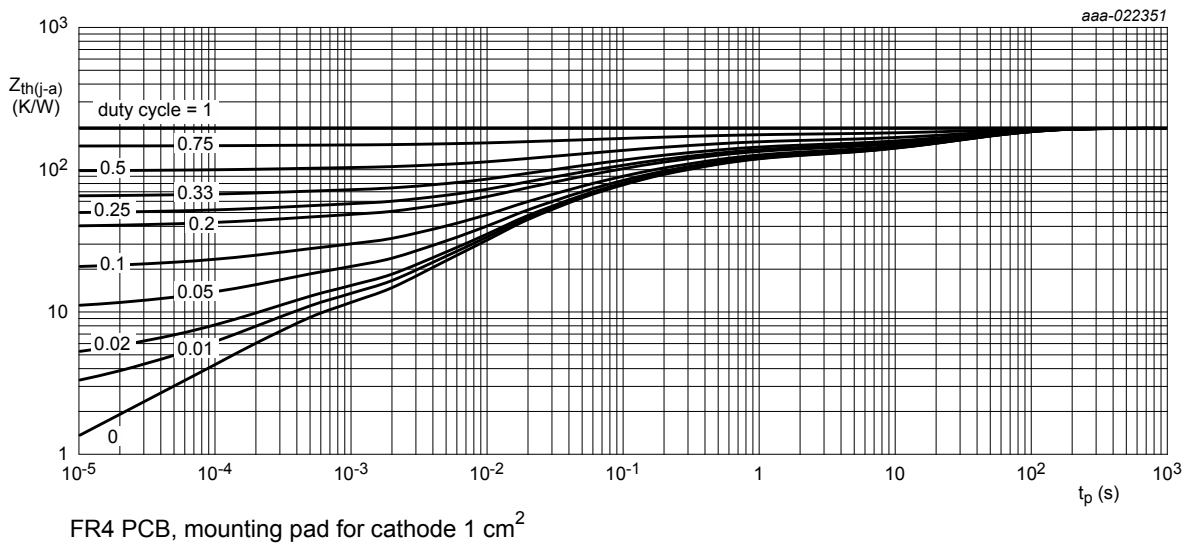


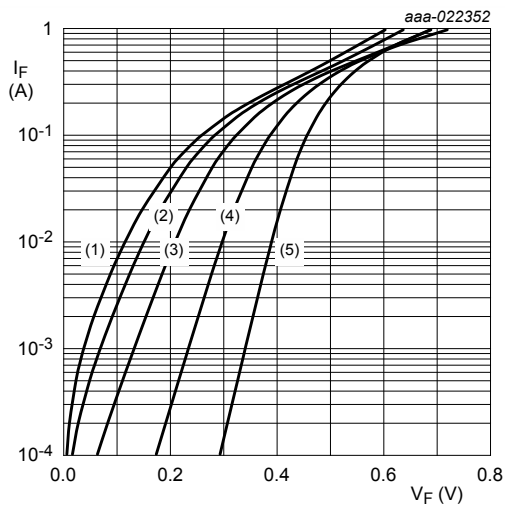
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

Table 7. Characteristics

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

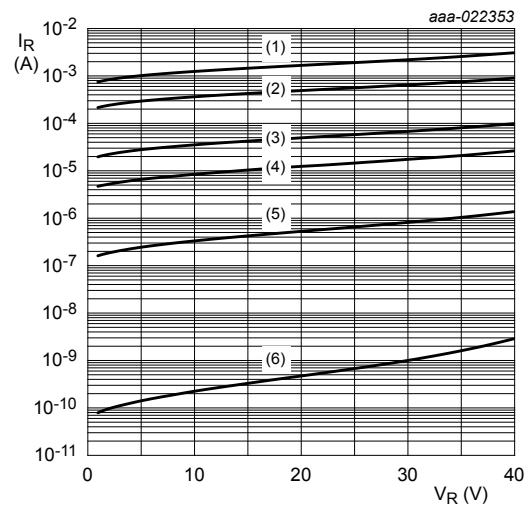
[1] Very short test pulse to keep junction temperature unchanged.



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)  $T_j = -40\text{ °C}$

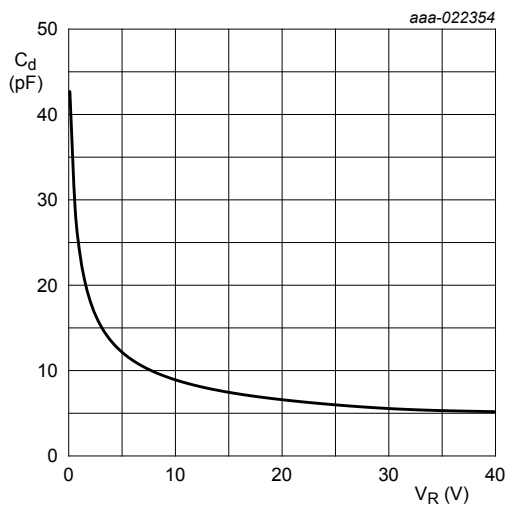
**Fig. 3. Forward current as a function of forward voltage; typical values**



pulsed condition

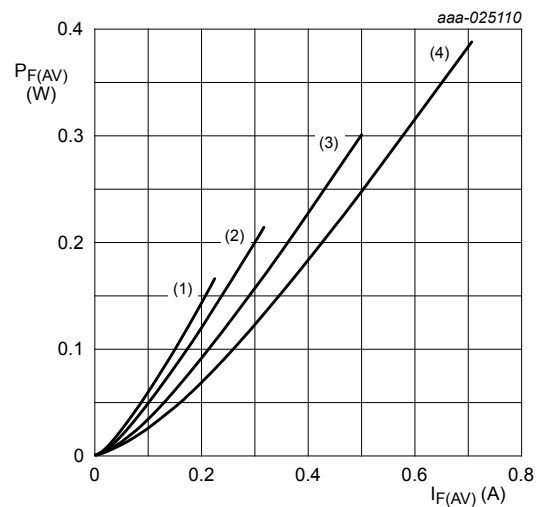
- (1)  $T_j = 150\text{ °C}$
- (2)  $T_j = 125\text{ °C}$
- (3)  $T_j = 85\text{ °C}$
- (4)  $T_j = 65\text{ °C}$
- (5)  $T_j = 25\text{ °C}$
- (6)  $T_j = -40\text{ °C}$

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



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

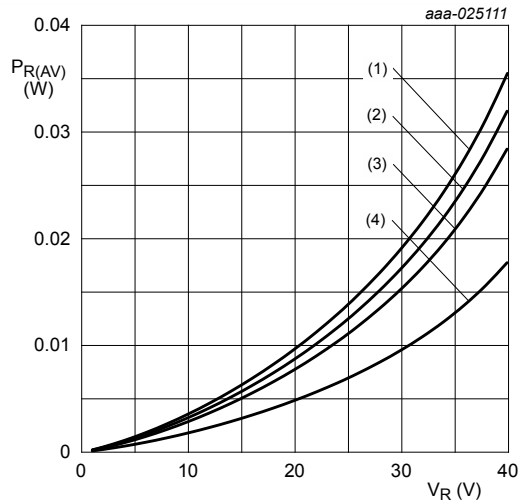
**Fig. 5. Diode capacitance as a function of reverse voltage; typical values**



$T_j = 150\text{ °C}$

- (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**



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

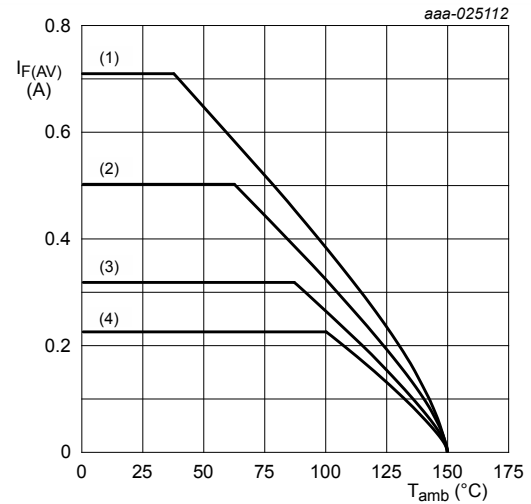
(1)  $\delta = 1$ ; DC

(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

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

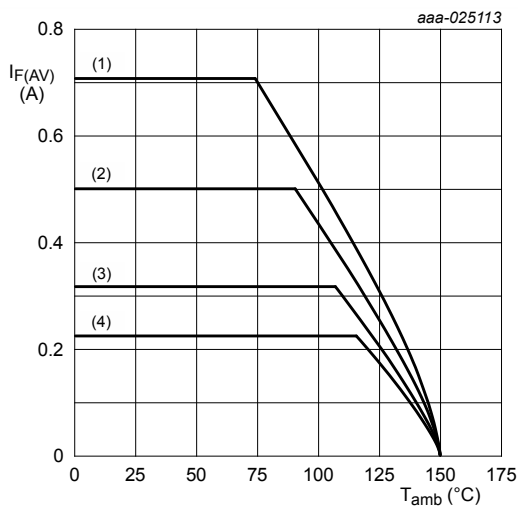
(1)  $\delta = 1$ ; DC

(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  $1\text{ cm}^2$

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

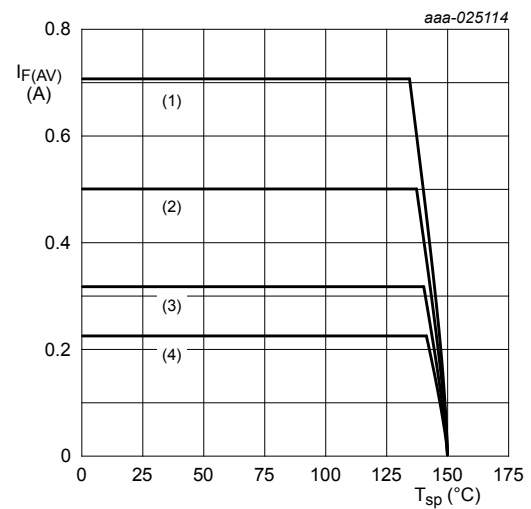
(1)  $\delta = 1$ ; DC

(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

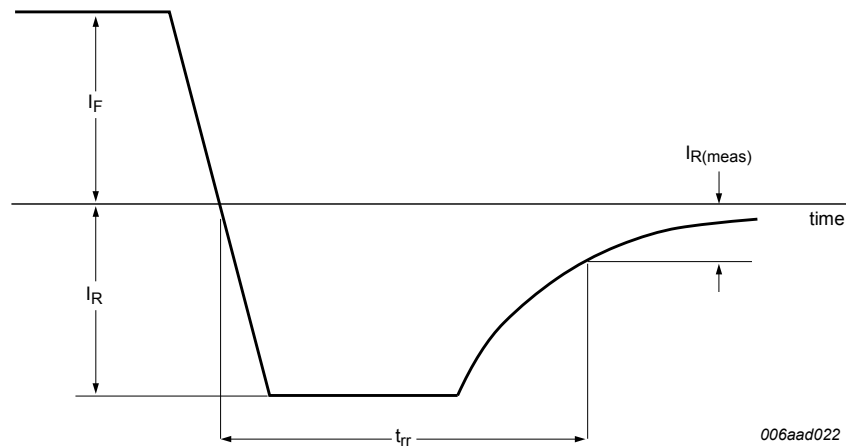


Fig. 11. Reverse recovery definition

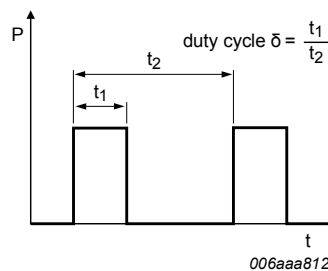


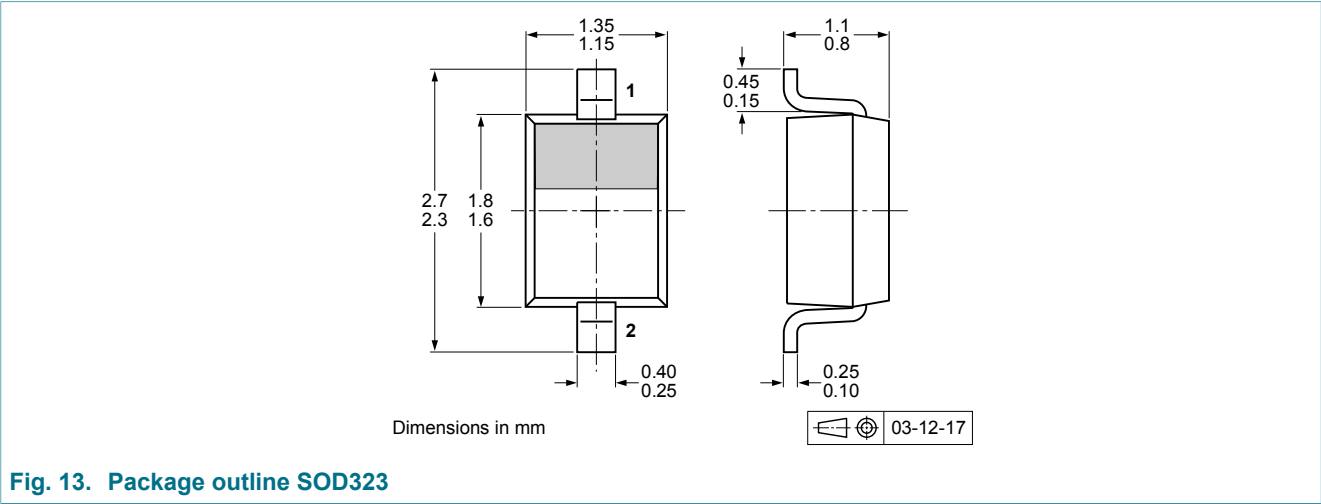
Fig. 12. Duty cycle definition

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.

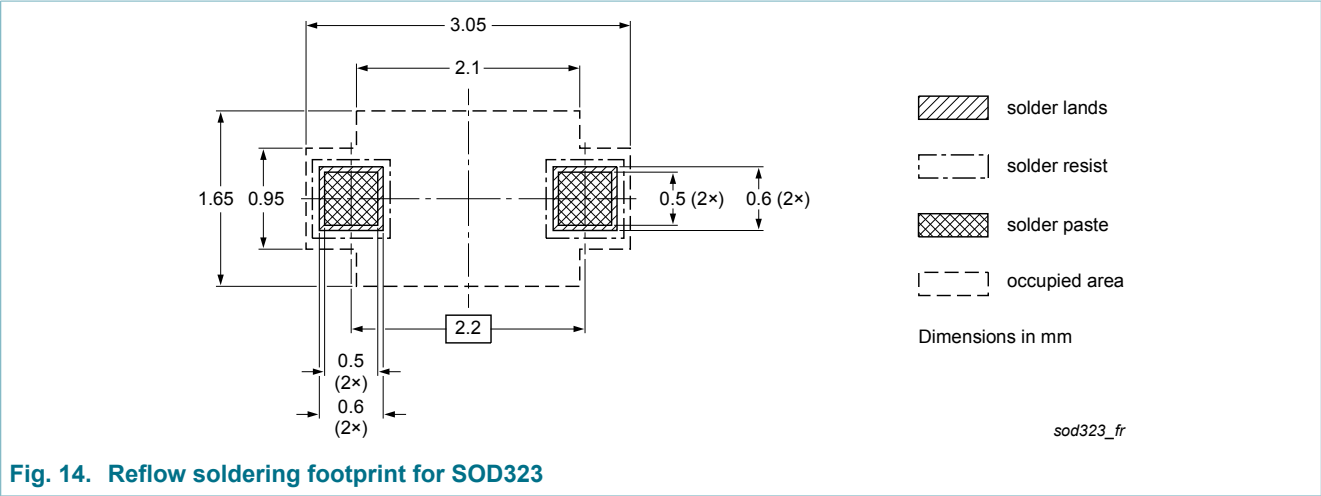
### Quality information

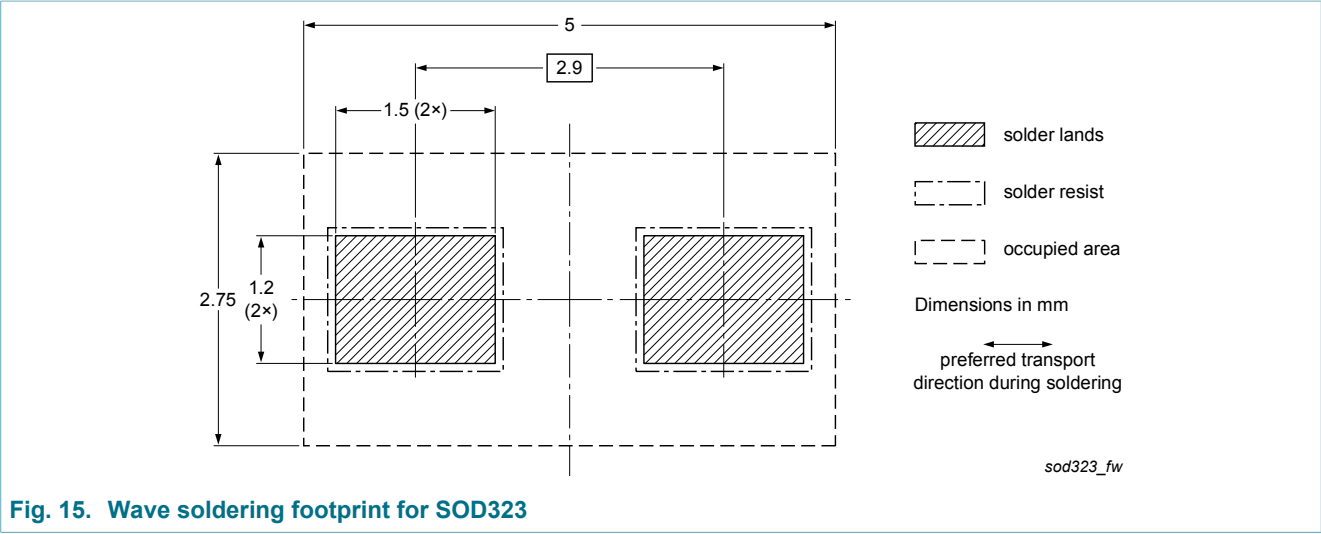
This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.

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 <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.                                     |

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Date of release: 18 November 2016

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