



# PMEG3020BER-Q

2 A low VF MEGA Schottky barrier rectifier

8 June 2021

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 SOD123W small and flat lead Surface-Mounted Device (SMD) plastic package.

## 2. Features and benefits

- Average forward current:  $I_{F(AV)} \leq 2$  A
- Reverse voltage:  $V_R \leq 30$  V
- Low forward voltage
- High power capability due to clip-bond technology
- Qualified according to AEC-Q101 and recommended for use in automotive applications
- Small and flat lead SMD plastic package
- Suitable for both reflow and wave soldering

## 3. Applications

- Low voltage rectification
- High efficiency DC-to-DC conversion
- Switch Mode Power Supply (SMPS)
- Reverse polarity protection
- Low power consumption 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; square wave; $T_{amb} \leq 75$ °C | [1] | -   | -   | 2   | A       |
|             |                         | $\delta = 0.5$ ; $f = 20$ kHz; square wave; $T_{sp} \leq 135$ °C |     | -   | -   | 2   | A       |
| $V_R$       | reverse voltage         | $T_j = 25$ °C                                                    |     | -   | -   | 30  | V       |
| $V_F$       | forward voltage         | $I_F = 2$ A; $T_j = 25$ °C                                       |     | -   | 460 | 520 | mV      |
| $I_R$       | reverse current         | $V_R = 30$ V; $T_j = 25$ °C                                      |     | -   | 15  | 50  | $\mu$ A |

[1] Device mounted on a ceramic PCB,  $Al_2O_3$ , standard footprint.

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline                                                                                  | Graphic symbol                                                                                |
|-----|--------|-------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| 1   | K      | cathode[1]  | <br>CFP3 (SOD123W) | <br>sym001 |
| 2   | A      | anode       |                                                                                                     |                                                                                               |

[1] The marking bar indicates the cathode.

6. Ordering information

Table 3. Ordering information

| Type number   | Package |                                                                            |         |
|---------------|---------|----------------------------------------------------------------------------|---------|
|               | Name    | Description                                                                | Version |
| PMEG3020BER-Q | CFP3    | plastic, surface mounted package; 2 terminals; 2.6 mm x 1.7 mm x 1 mm body | SOD123W |

7. Marking

Table 4. Marking codes

| Type number   | Marking code |
|---------------|--------------|
| PMEG3020BER-Q | BA           |

## 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                     | $T_j = 25\text{ }^{\circ}\text{C}$                                                            |     | -   | 30   | V                  |
| $I_{F(AV)}$ | average forward current             | $\delta = 0.5$ ; $f = 20\text{ kHz}$ ; square wave; $T_{amb} \leq 75\text{ }^{\circ}\text{C}$ | [1] | -   | 2    | A                  |
|             |                                     | $\delta = 0.5$ ; $f = 20\text{ kHz}$ ; square wave; $T_{sp} \leq 135\text{ }^{\circ}\text{C}$ |     | -   | 2    | A                  |
| $I_{FSM}$   | non-repetitive peak forward current | $t_p = 8\text{ ms}$ ; square wave; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$                 |     | -   | 50   | A                  |
| $P_{tot}$   | total power dissipation             | $T_{amb} \leq 25\text{ }^{\circ}\text{C}$                                                     | [2] | -   | 0.57 | W                  |
|             |                                     |                                                                                               | [3] | -   | 0.95 | W                  |
|             |                                     |                                                                                               | [1] | -   | 1.8  | W                  |
| $T_j$       | junction temperature                |                                                                                               |     | -   | 150  | $^{\circ}\text{C}$ |
| $T_{amb}$   | ambient temperature                 |                                                                                               |     | -55 | 150  | $^{\circ}\text{C}$ |
| $T_{stg}$   | storage temperature                 |                                                                                               |     | -65 | 150  | $^{\circ}\text{C}$ |

[1] Device mounted on a ceramic PCB,  $\text{Al}_2\text{O}_3$ , 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  $1\text{ cm}^2$ .

## 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] | -   | -   | 220 | K/W  |
|                |                                                  |             | [3] [2] | -   | -   | 130 | K/W  |
|                |                                                  |             | [4] [2] | -   | -   | 70  | K/W  |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point |             | [5]     | -   | -   | 18  | K/W  |

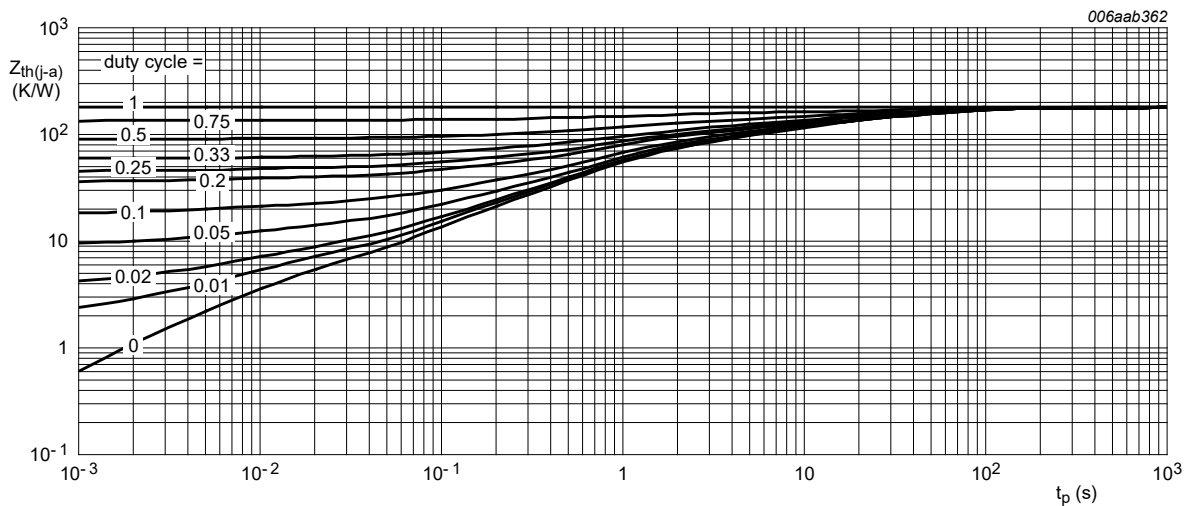
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] 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.

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

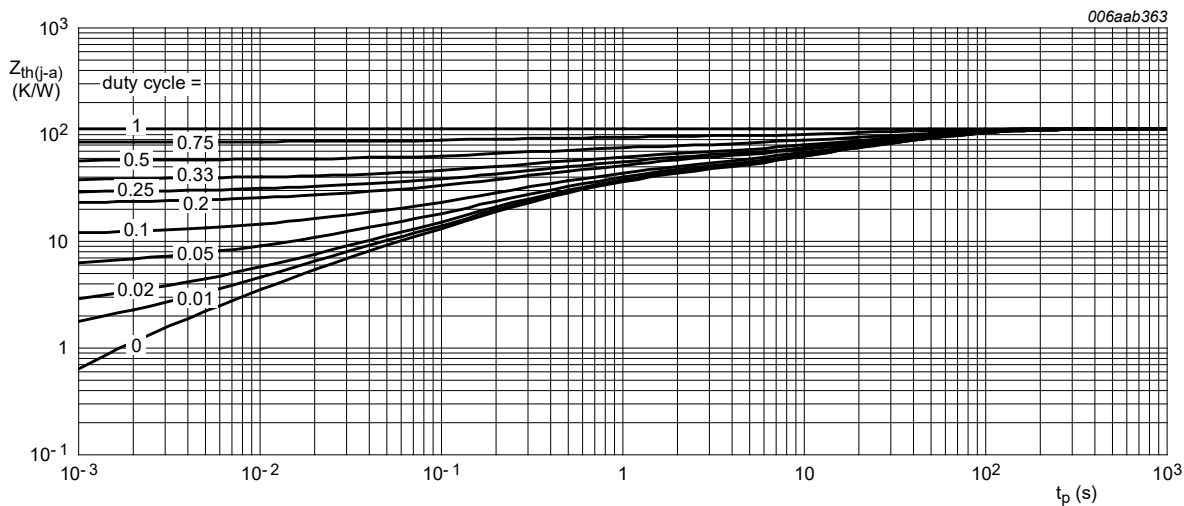
[4] Device mounted on a ceramic PCB,  $\text{Al}_2\text{O}_3$ , standard footprint.

[5] Soldering point of cathode tab.



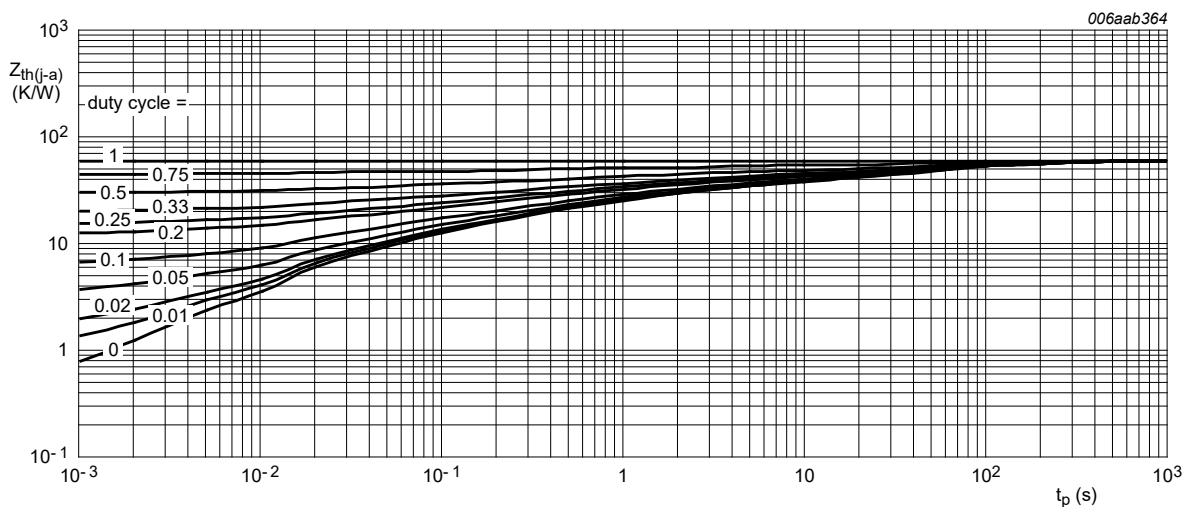
FR4 PCB, standard footprint

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



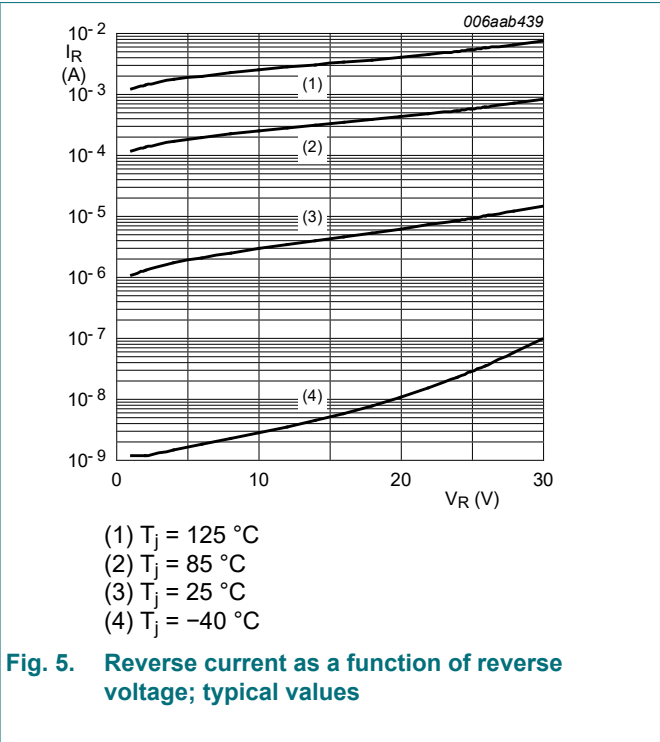
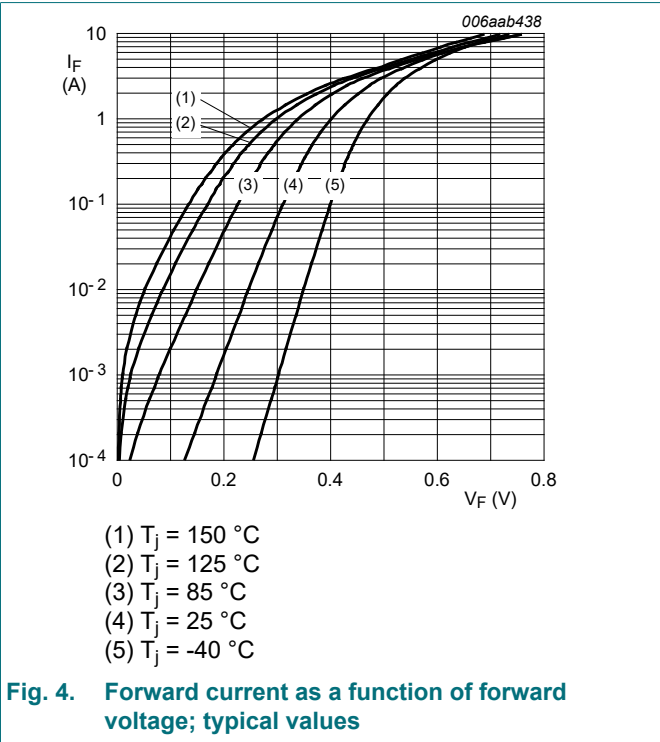
Ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint

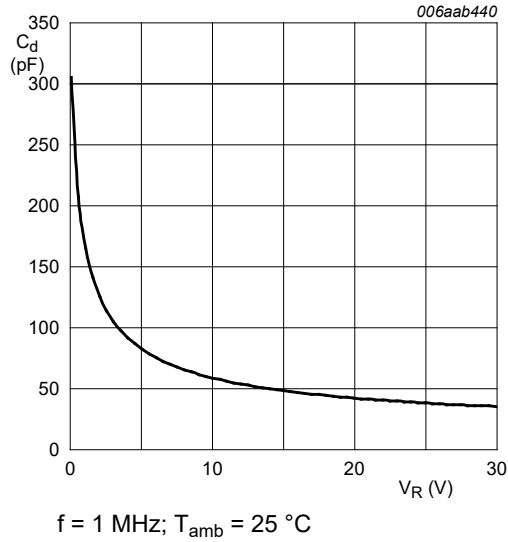
Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

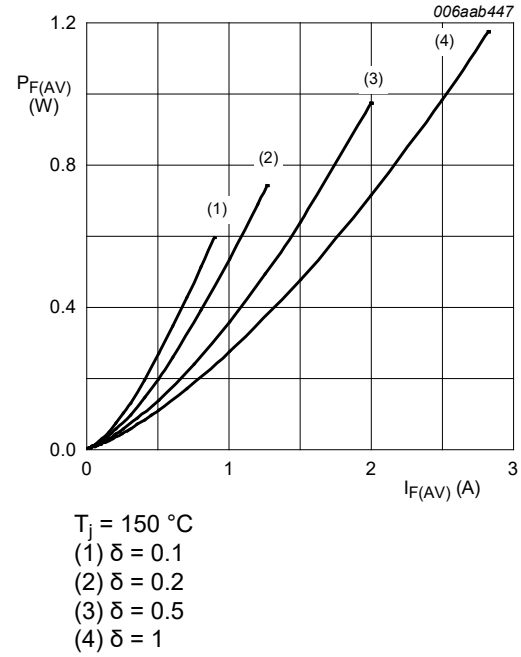
Table 7. Characteristics

| 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           | -   | 315 | 360 | mV   |
|                |                   | I <sub>F</sub> = 0.7 A; T <sub>j</sub> = 25 °C           | -   | 390 | 430 | mV   |
|                |                   | I <sub>F</sub> = 1 A; T <sub>j</sub> = 25 °C             | -   | 405 | 450 | mV   |
|                |                   | I <sub>F</sub> = 1.5 A; T <sub>j</sub> = 25 °C           | -   | 430 | 480 | mV   |
|                |                   | I <sub>F</sub> = 2 A; T <sub>j</sub> = 25 °C             | -   | 460 | 520 | mV   |
| I <sub>R</sub> | reverse current   | V <sub>R</sub> = 5 V; T <sub>j</sub> = 25 °C             | -   | 2   | -   | μA   |
|                |                   | V <sub>R</sub> = 10 V; T <sub>j</sub> = 25 °C            | -   | 3   | -   | μA   |
|                |                   | V <sub>R</sub> = 30 V; T <sub>j</sub> = 25 °C            | -   | 15  | 50  | μA   |
| C <sub>d</sub> | diode capacitance | V <sub>R</sub> = 1 V; f = 1 MHz; T <sub>j</sub> = 25 °C  | -   | 170 | -   | pF   |
|                |                   | V <sub>R</sub> = 10 V; f = 1 MHz; T <sub>j</sub> = 25 °C | -   | 60  | -   | pF   |

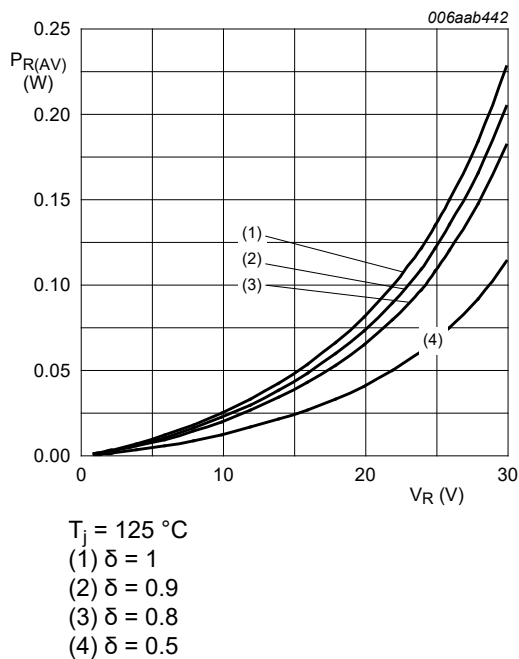




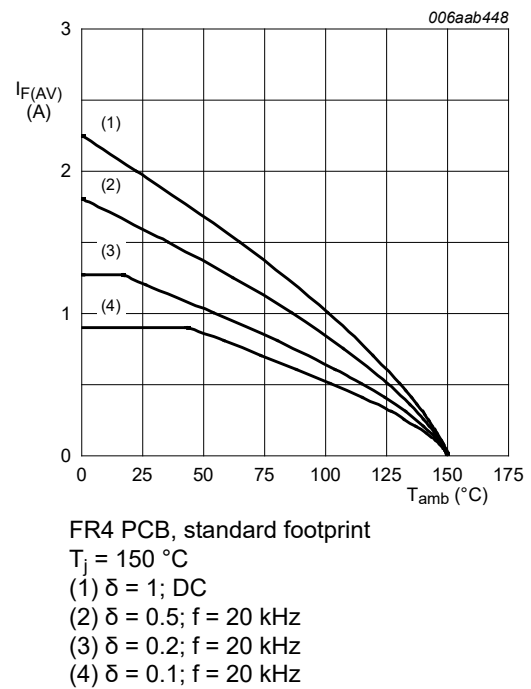
**Fig. 6.** Diode capacitance as a function of reverse voltage; typical values



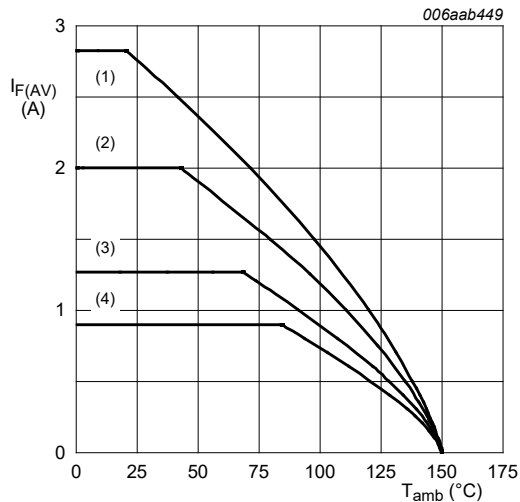
**Fig. 7.** Average forward power dissipation as a function of average forward current; typical values



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



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



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

$T_j = 150$  °C

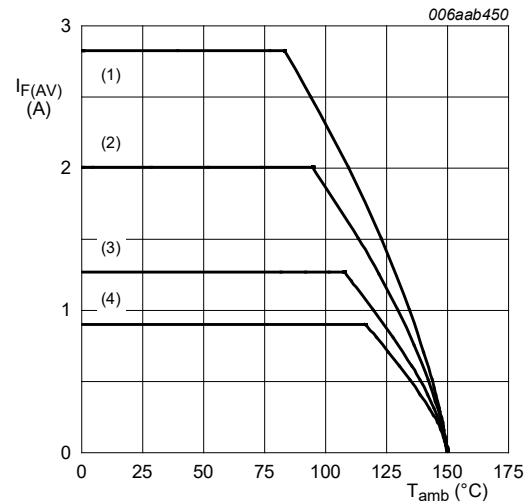
(1)  $\delta = 1$ ; DC

(2)  $\delta = 0.5$ ;  $f = 20$  kHz

(3)  $\delta = 0.2$ ;  $f = 20$  kHz

(4)  $\delta = 0.1$ ;  $f = 20$  kHz

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



Ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint

$T_j = 150$  °C

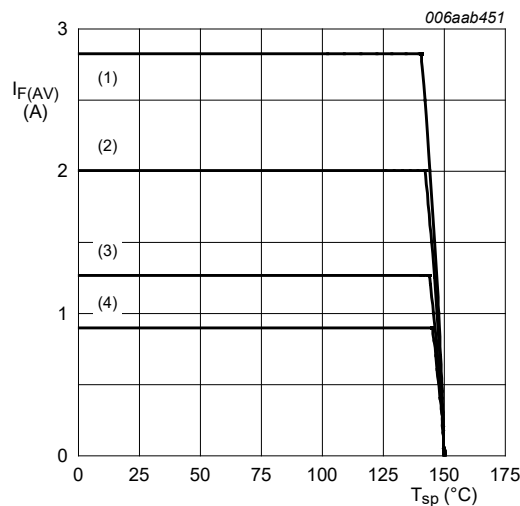
(1)  $\delta = 1$ ; DC

(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

## 11. Test information

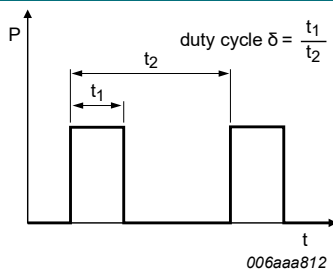


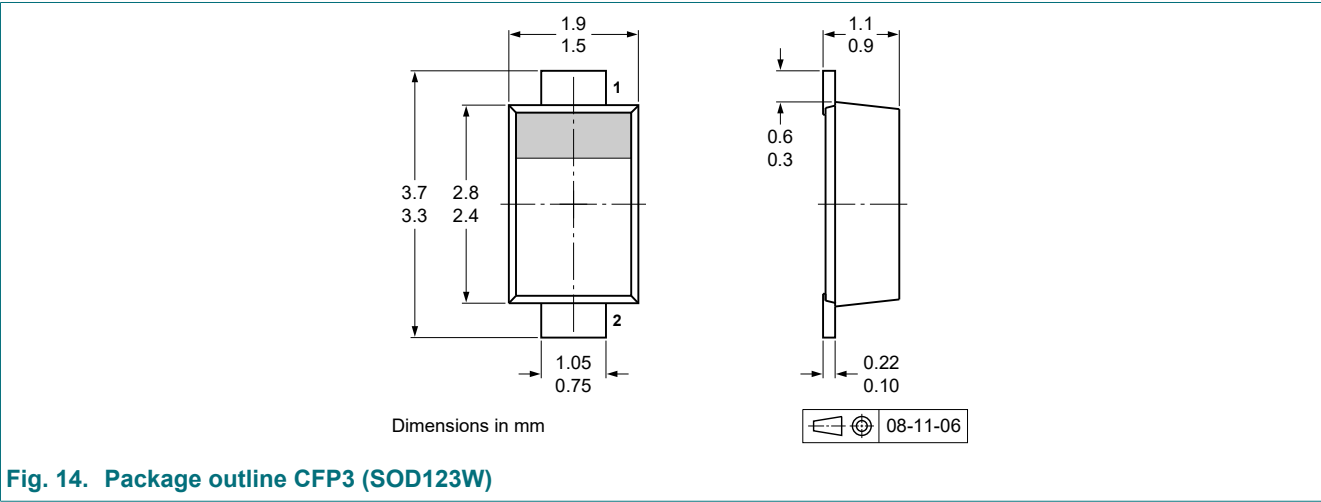
Fig. 13. Duty cycle definition

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

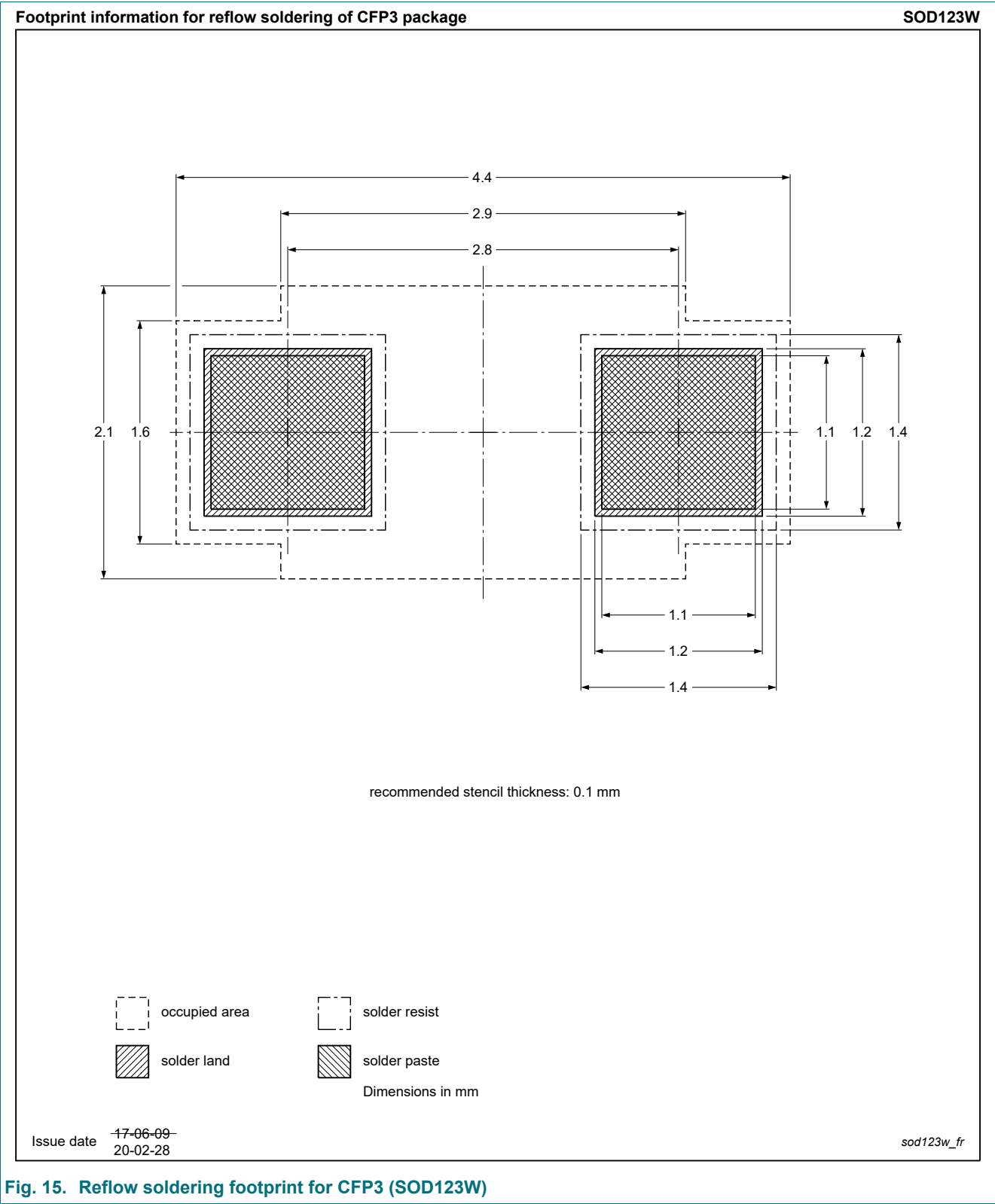


Fig. 15. Reflow soldering footprint for CFP3 (SOD123W)

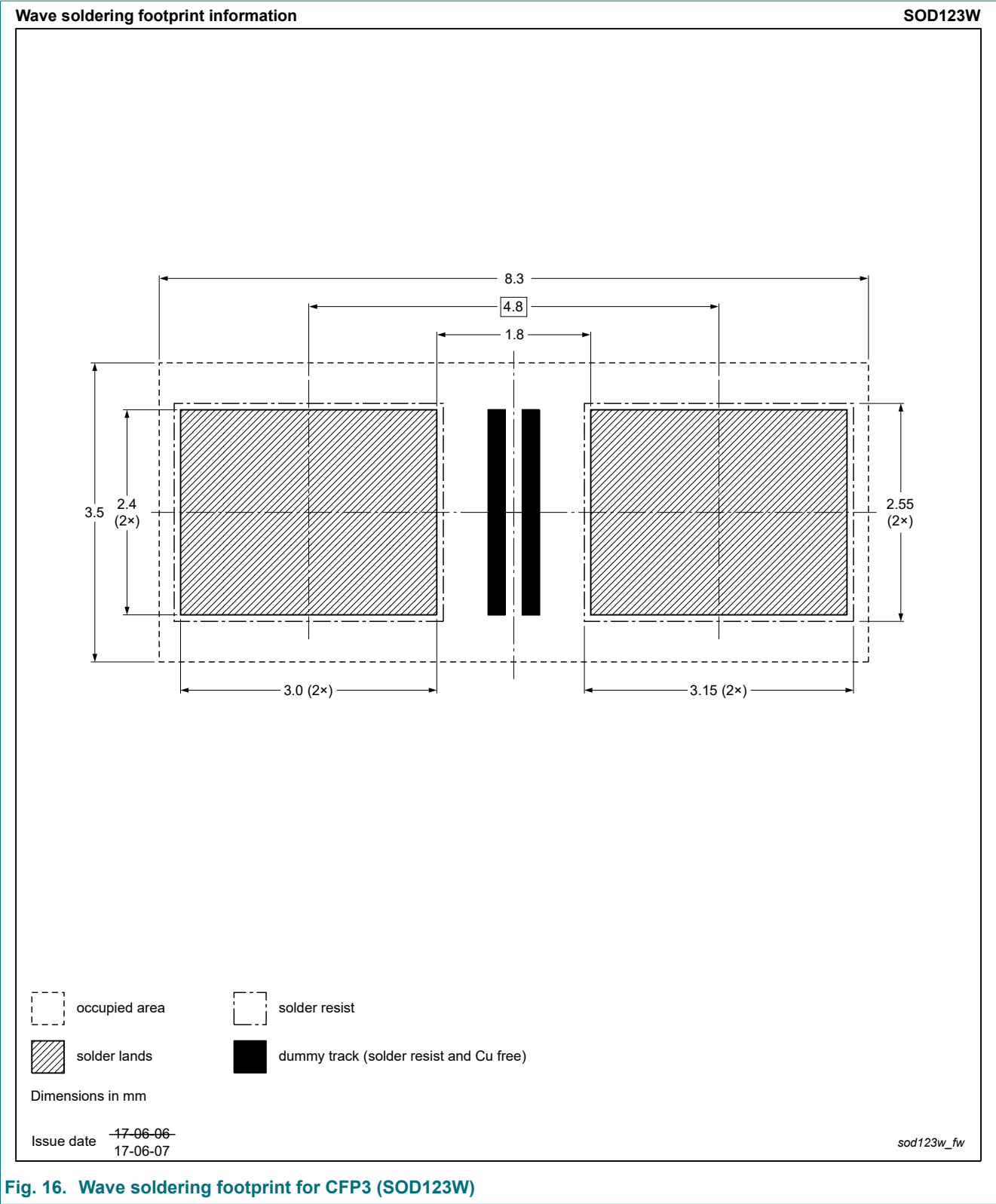


Fig. 16. Wave soldering footprint for CFP3 (SOD123W)

14. Revision history

Table 8. Revision history

| Data sheet ID     | Release date | Data sheet status  | Change notice | Supersedes |
|-------------------|--------------|--------------------|---------------|------------|
| PMEG3020BER-Q v.1 | 20210608     | Product data sheet | -             | -          |

## 15. Legal information

### Data sheet status

| Document status<br>[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".
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