



# PMEG4020ETP

High temperature 40 V, 2 A low VF Schottky barrier rectifier

20 February 2023

Product data sheet

## 1. General description

Planar Schottky barrier rectifier with an integrated guard ring for stress protection, encapsulated in a SOD128 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:  $V_R \leq 40$  V
- Low forward voltage
- High power capability due to clip-bonding technology
- Small and flat lead SMD plastic package
- High temperature  $T_j \leq 175$  °C
- Suitable for both reflow and wave soldering

## 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

## 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; $T_{sp} \leq 165$ °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 |

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol                  |
|-----|--------|-------------|--------------------|---------------------------------|
| 1   | K      | cathode[1]  | <br>CFP5 (SOD128)  | <br>$K \rightarrow A$<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                |
| <a href="#">PMEG4020ETP</a> | CFP5    | plastic, surface mounted package; 2 terminals; 4 mm pitch; 3.8 mm x 2.6 mm x 1 mm body | <a href="#">SOD128</a> |

## 7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PMEG4020ETP | C2           |

## 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    |
| $I_{F(AV)}$ | average forward current             | $\delta = 0.5$ ; $f = 20\text{ kHz}$ ; square wave; $T_{amb} \leq 110\text{ °C}$ | [1] | -   | 2    | A    |
|             |                                     | $\delta = 0.5$ ; $f = 20\text{ kHz}$ ; square wave; $T_{sp} \leq 165\text{ °C}$  |     | -   | 2    | A    |
| $I_{FSM}$   | non-repetitive peak forward current | $t_p = 8.3\text{ ms}$ ; half sine wave; $T_{j(init)} = 25\text{ °C}$             |     | -   | 50   | A    |
| $P_{tot}$   | total power dissipation             | $T_{amb} \leq 25\text{ °C}$                                                      | [2] | -   | 750  | mW   |
|             |                                     |                                                                                  | [3] | -   | 1.25 | W    |
|             |                                     |                                                                                  | [1] | -   | 2.5  | W    |
| $T_j$       | junction temperature                |                                                                                  |     | -   | 175  | °C   |
| $T_{amb}$   | ambient temperature                 |                                                                                  |     | -55 | 175  | °C   |
| $T_{stg}$   | storage temperature                 |                                                                                  |     | -65 | 175  | °C   |

[1] Device mounted on a ceramic PCB,  $Al_2O_3$ , 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] | -   | -   | 200 | K/W  |
|                |                                                  |             | [1] [3] | -   | -   | 120 | K/W  |
|                |                                                  |             | [1] [4] | -   | -   | 60  | K/W  |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point |             | [5]     | -   | -   | 12  | 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<sup>2</sup>.
- [4] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.
- [5] Soldering point of cathode tab.

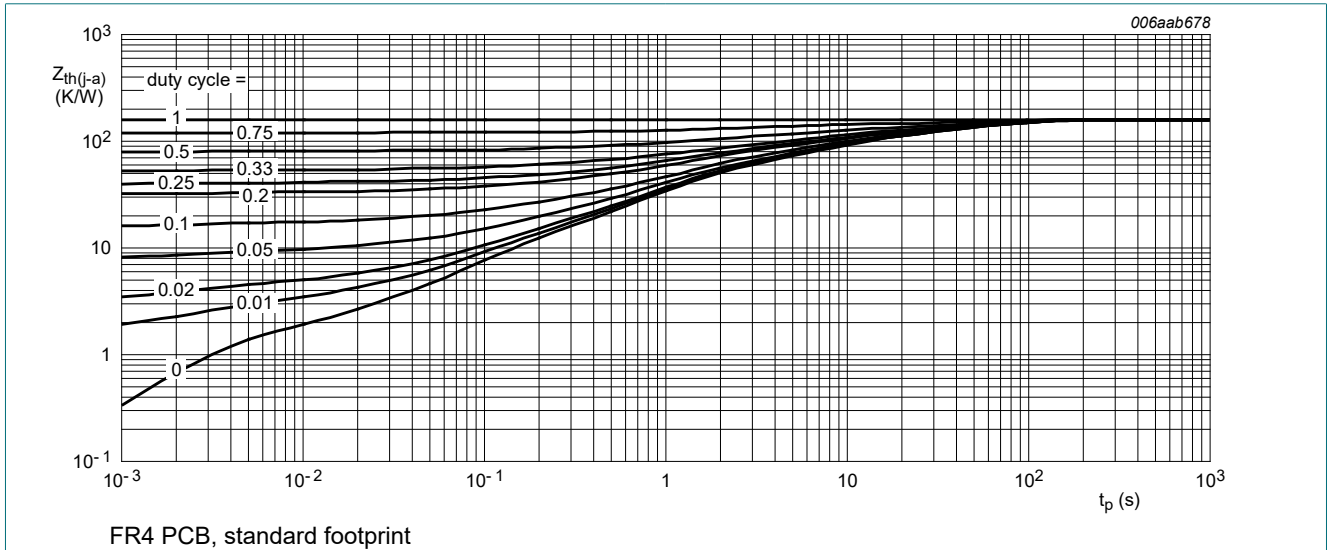


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

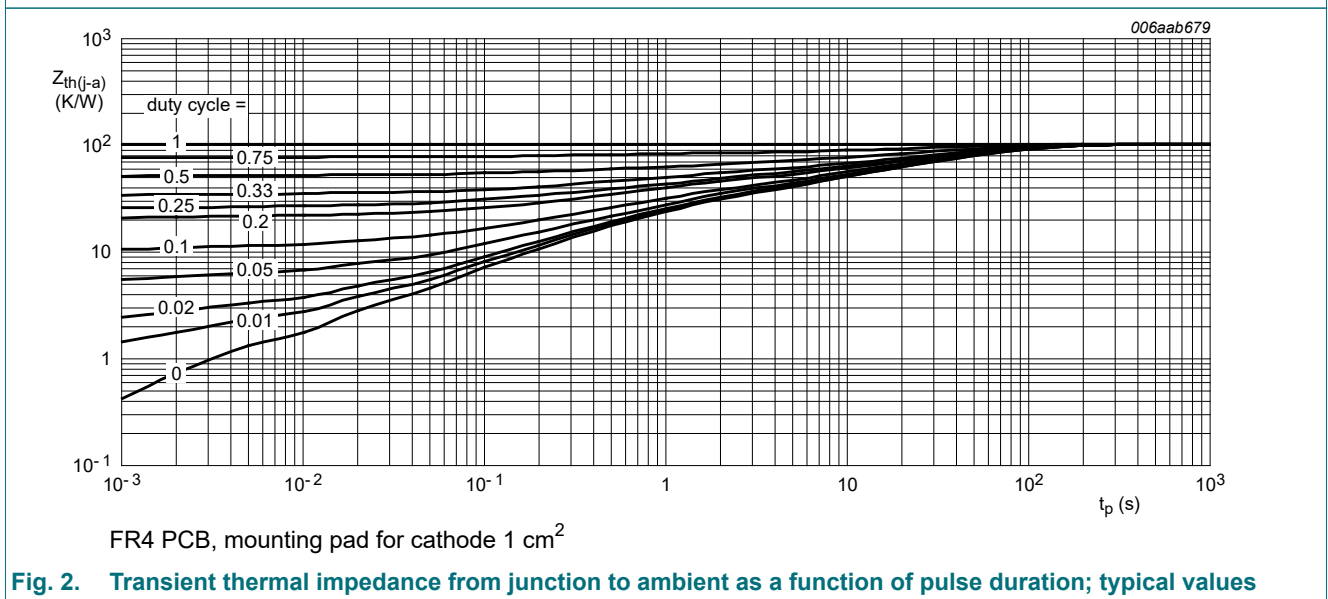
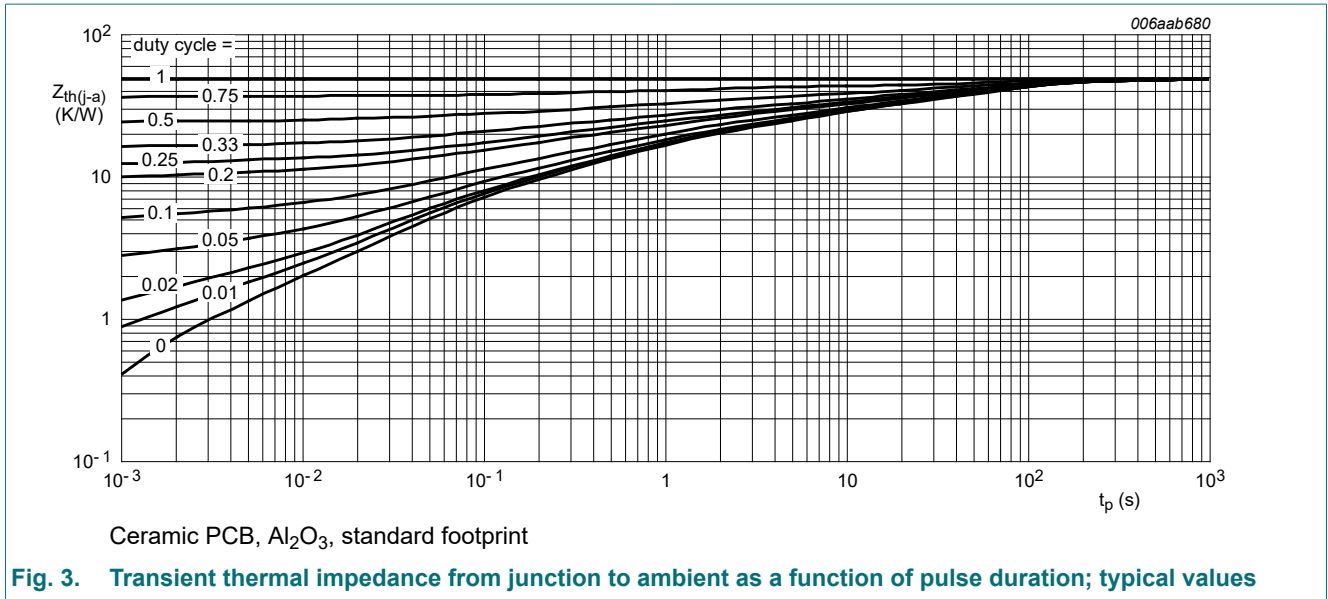


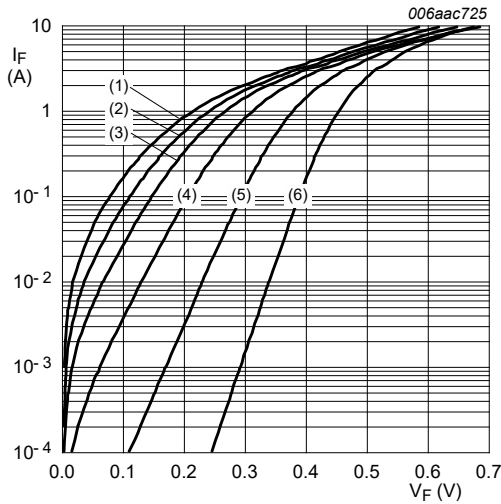
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



## 10. Characteristics

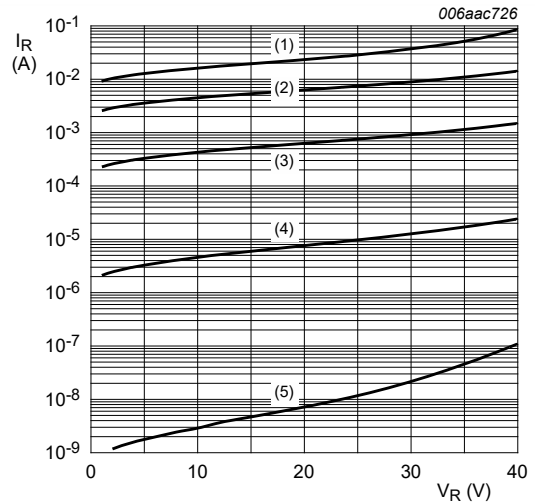
Table 7. Characteristics

| Symbol         | Parameter         | Conditions                                               | Min | Typ | Max | Unit |
|----------------|-------------------|----------------------------------------------------------|-----|-----|-----|------|
| V <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   |



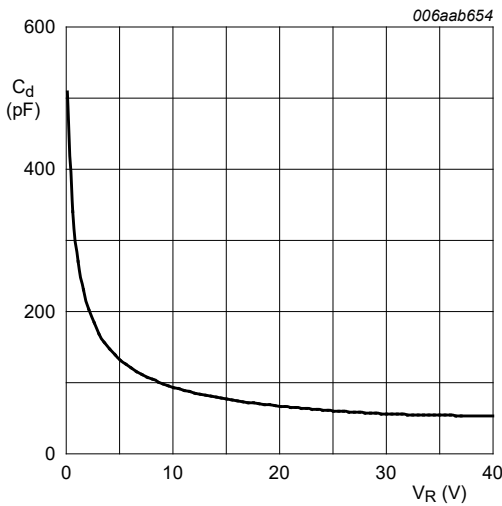
- (1)  $T_j = 175^\circ\text{C}$
- (2)  $T_j = 150^\circ\text{C}$
- (3)  $T_j = 125^\circ\text{C}$
- (4)  $T_j = 85^\circ\text{C}$
- (5)  $T_j = 25^\circ\text{C}$
- (6)  $T_j = -40^\circ\text{C}$

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



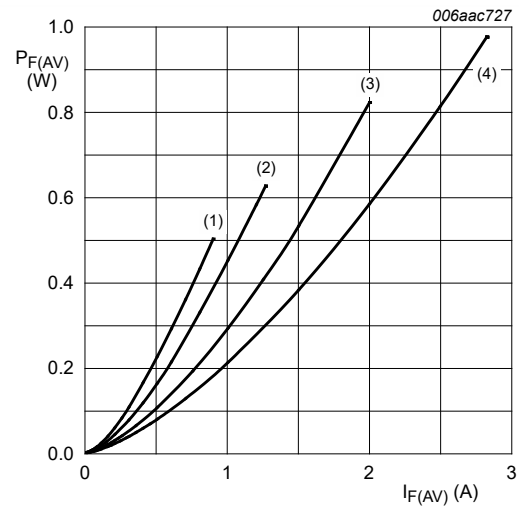
- (1)  $T_j = 150^\circ\text{C}$
- (2)  $T_j = 125^\circ\text{C}$
- (3)  $T_j = 85^\circ\text{C}$
- (4)  $T_j = 25^\circ\text{C}$
- (5)  $T_j = -40^\circ\text{C}$

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



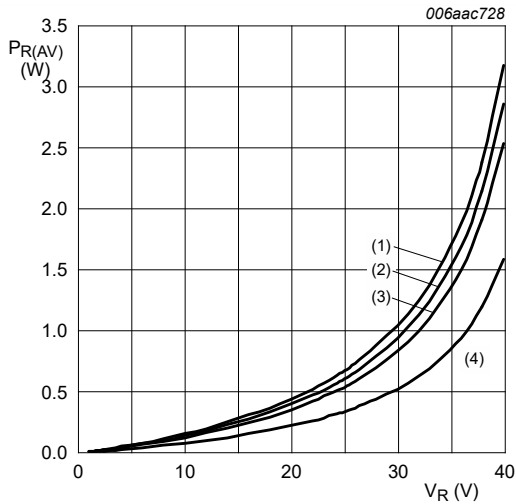
$f = 1\text{ MHz}; T_{\text{amb}} = 25^\circ\text{C}$

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



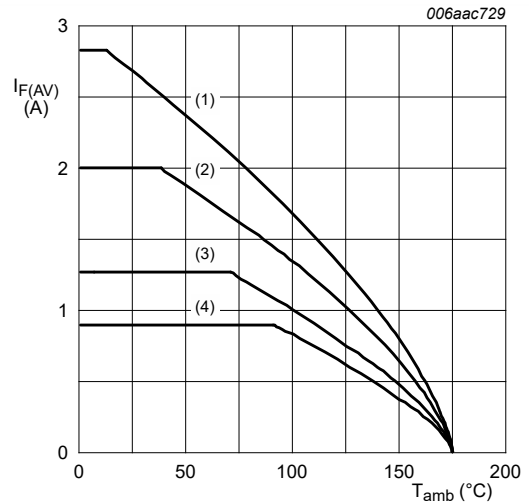
- $T_j = 175^\circ\text{C}$
- (1)  $\delta = 0.1$
- (2)  $\delta = 0.2$
- (3)  $\delta = 0.5$
- (4)  $\delta = 1.0$

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



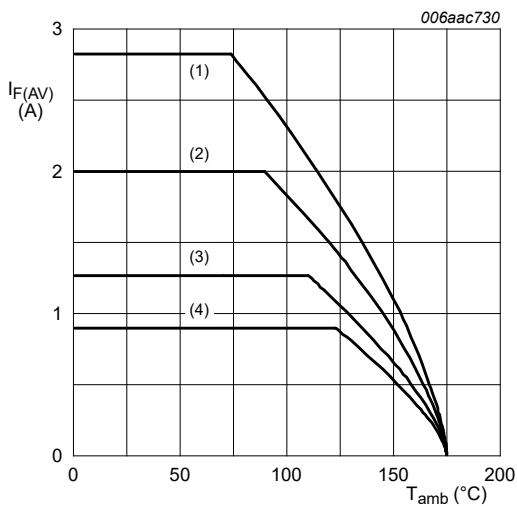
$T_j = 150\text{ }^\circ\text{C}$   
 (1)  $\delta = 1.0$   
 (2)  $\delta = 0.9$   
 (3)  $\delta = 0.8$   
 (4)  $\delta = 0.5$

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



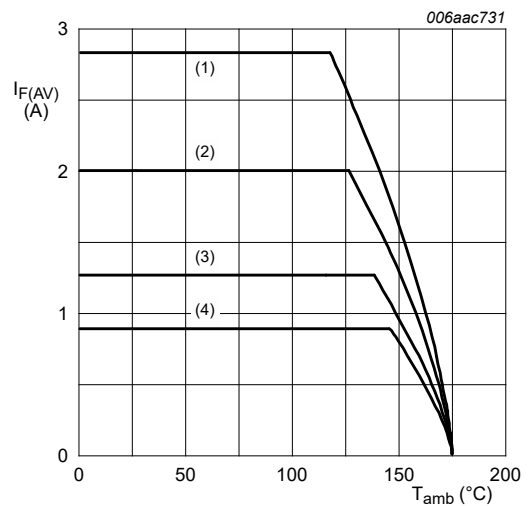
FR4 PCB, standard footprint  
 $T_j = 175\text{ }^\circ\text{C}$   
 (1)  $\delta = 1.0$  (DC)  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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



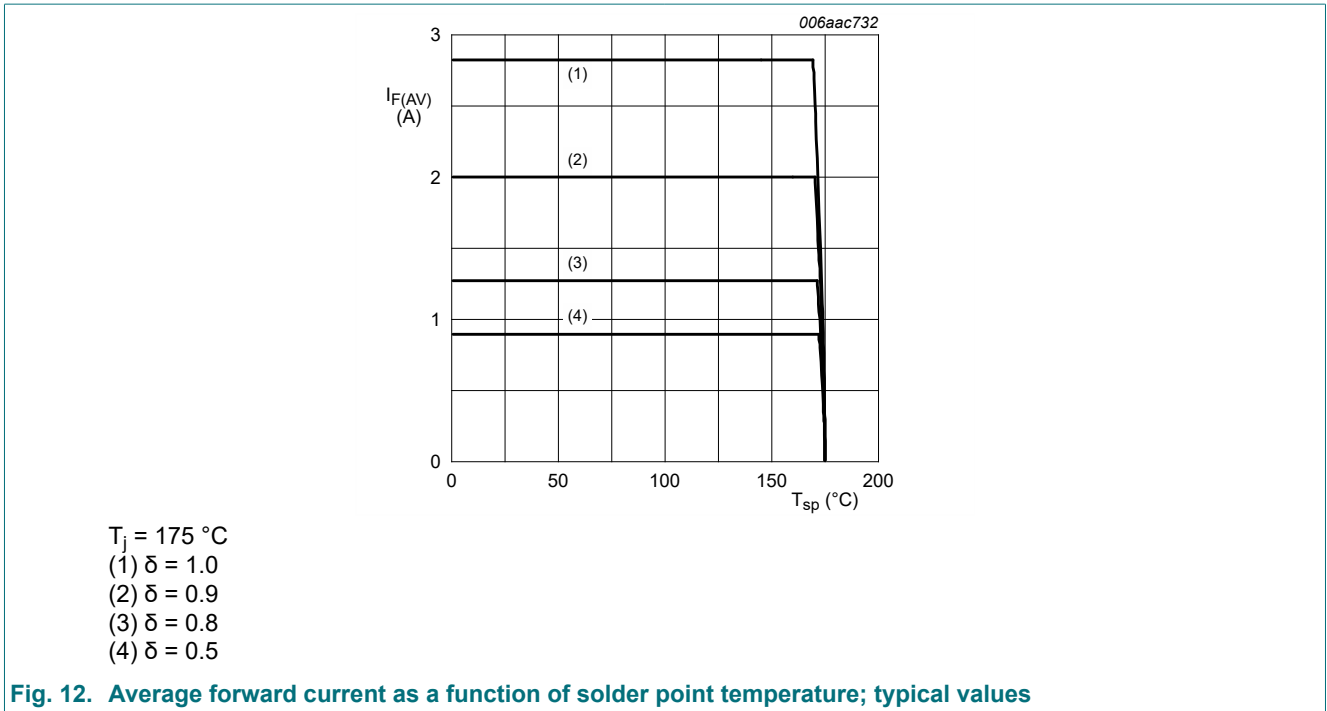
FR4 PCB, mounting pad for cathode  $1\text{ cm}^2$   
 $T_j = 175\text{ }^\circ\text{C}$   
 (1)  $\delta = 1.0$   
 (2)  $\delta = 0.9$   
 (3)  $\delta = 0.8$   
 (4)  $\delta = 0.5$

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

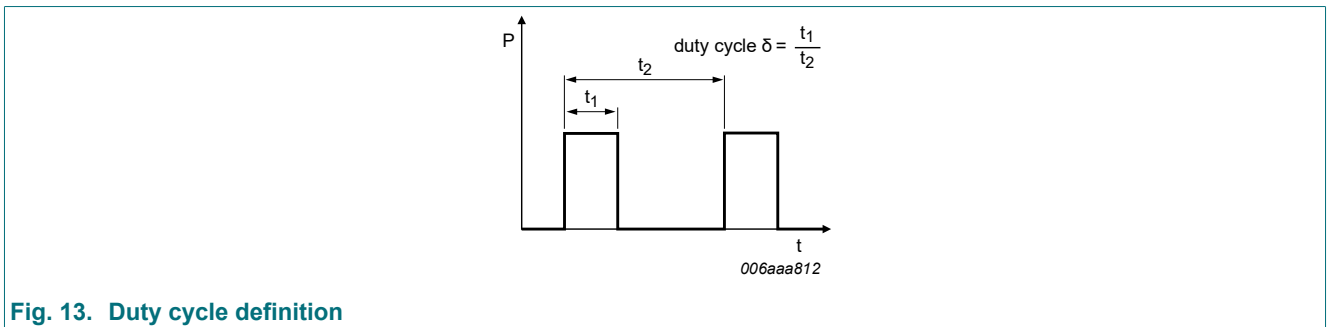


Ceramic PCB,  $\text{Al}_2\text{O}_3$ , standard footprint  
 $T_j = 175\text{ }^\circ\text{C}$   
 (1)  $\delta = 1.0$  (DC)  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

**Fig. 11.** Average forward current as a function of ambient temperature; typical values



## 11. Test information



The current ratings for the typical waveforms are calculated according to the equations:

$$I_{F(AV)} = I_M \times \delta \text{ with } I_M \text{ defined as peak current}$$

$$I_{RMS} = I_{F(AV)} \text{ at DC}$$

$$I_{RMS} = I_M \times \sqrt{\delta} \text{ with } I_{RMS} \text{ defined as RMS current}$$

## 12. Package outline

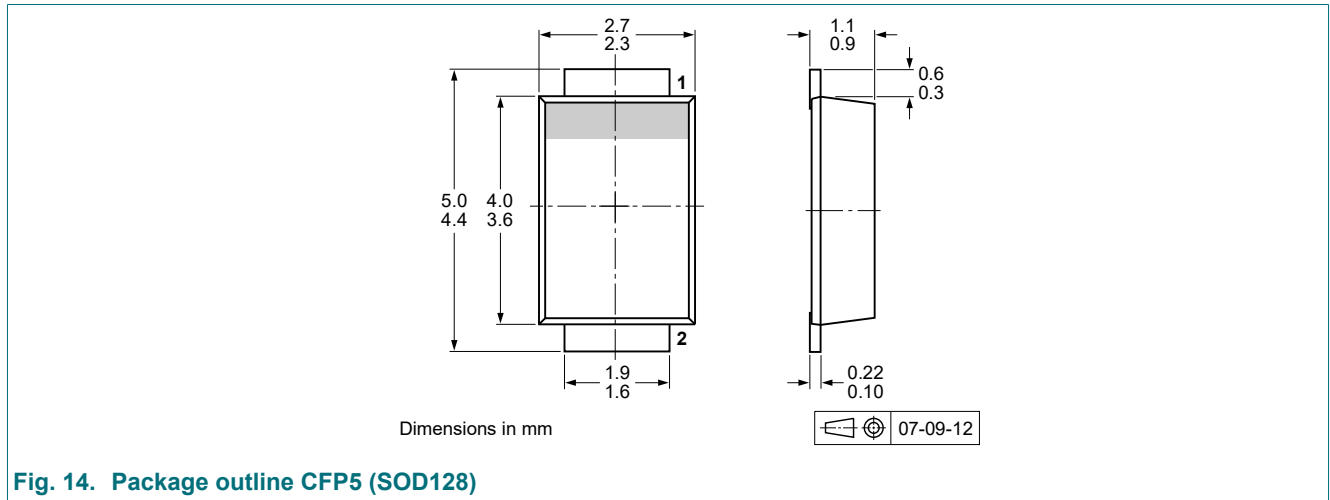


Fig. 14. Package outline CFP5 (SOD128)

## 13. Soldering

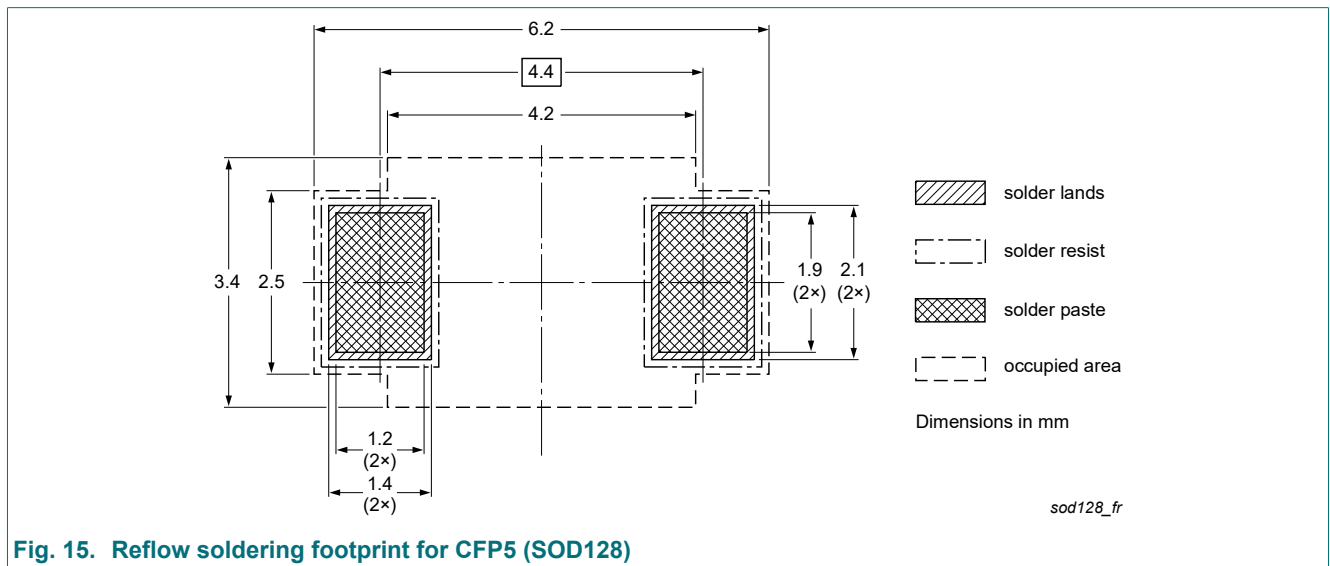
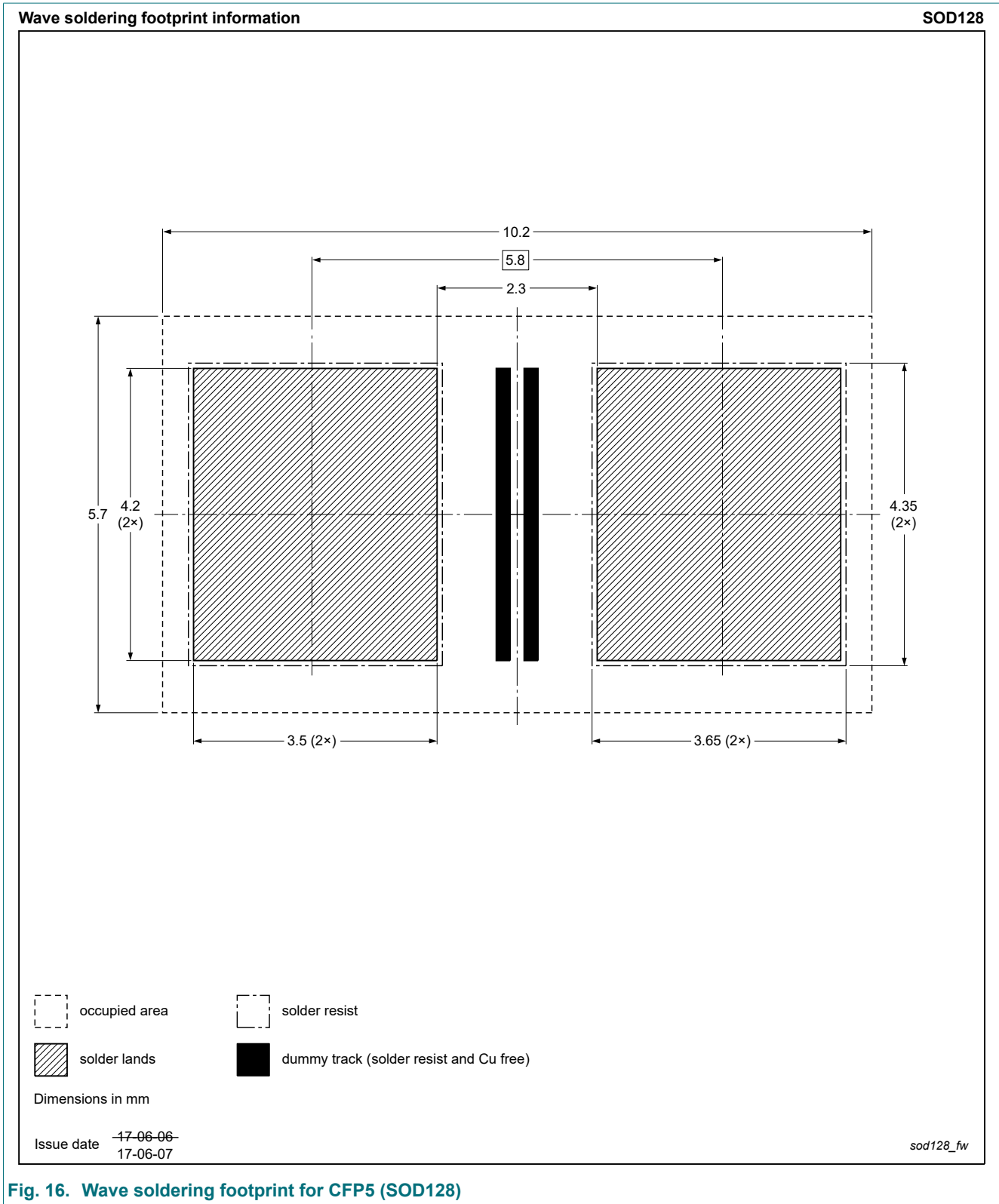


Fig. 15. Reflow soldering footprint for CFP5 (SOD128)





**Fig. 16. Wave soldering footprint for CFP5 (SOD128)**

## 14. Revision history

Table 8. Revision history

| Data sheet ID   | Release date                                                                                                                                                 | Data sheet status  | Change notice | Supersedes      |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|-----------------|
| PMEG4020ETP v.4 | 20230220                                                                                                                                                     | Product data sheet | -             | PMEG4020ETP v.3 |
| Modifications:  | <ul style="list-style-type: none"><li>Limiting values: Measurement conditions for <math>I_{FSM}</math> changed from square wave to half-sine wave.</li></ul> |                    |               |                 |
| PMEG4020ETP v.3 | 20230101                                                                                                                                                     | Product data sheet | -             | PMEG4020ETP v.2 |
| PMEG4020ETP v.2 | 20180307                                                                                                                                                     | Product data sheet | -             | PMEG4020ETP v.1 |
| PMEG4020ETP v.1 | 20111005                                                                                                                                                     | 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.                                     |

- [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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## Contents

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|                                 |    |
|---------------------------------|----|
| 1. General description.....     | 1  |
| 2. Features and benefits.....   | 1  |
| 3. Applications.....            | 1  |
| 4. Quick reference data.....    | 1  |
| 5. Pinning information.....     | 1  |
| 6. Ordering information.....    | 2  |
| 7. Marking.....                 | 2  |
| 8. Limiting values.....         | 2  |
| 9. Thermal characteristics..... | 3  |
| 10. Characteristics.....        | 4  |
| 11. Test information.....       | 7  |
| 12. Package outline.....        | 8  |
| 13. Soldering.....              | 8  |
| 14. Revision history.....       | 10 |
| 15. Legal information.....      | 11 |

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