



# PMEG4050ETP

40 V, 5 A low VF MEGA Schottky barrier rectifier

25 April 2018

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 SOD128 small and flat lead Surface-Mounted Device (SMD) plastic package.

## 2. Features and benefits

- Average forward current:  $I_{F(AV)} \leq 5$  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
- AEC-Q101 qualified
- High temperature  $T_j \leq 175$  °C
- Capable for 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; $T_{sp} \leq 155$ °C; square wave | -   | -   | 5   | A    |
| $V_R$       | reverse voltage         | $T_j = 25$ °C                                                    | -   | -   | 40  | V    |
| $V_F$       | forward voltage         | $I_F = 5$ A; $T_j = 25$ °C                                       | -   | 430 | 490 | mV   |
| $I_R$       | reverse current         | $V_R = 40$ V; $T_j = 25$ °C                                      | -   | 60  | 300 | µA   |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline                                                                                 | Graphic symbol                                                                                |
|-----|--------|-------------|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| 1   | K      | cathode[1]  | <br>CFP5 (SOD128) | <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 |
| PMEG4050ETP | CFP5    | plastic, surface mounted package; 2 terminals; 4 mm pitch; 3.8 mm x 2.6 mm x 1 mm body | SOD128  |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PMEG4050ETP | C4           |

## 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                     | $T_j = 25\text{ }^{\circ}\text{C}$                                                             |     | -   | 40   | V                  |
| $I_{F(AV)}$ | average forward current             | $\delta = 0.5$ ; $f = 20\text{ kHz}$ ; $T_{amb} \leq 15\text{ }^{\circ}\text{C}$ ; square wave | [1] | -   | 5    | A                  |
|             |                                     | $\delta = 0.5$ ; $f = 20\text{ kHz}$ ; $T_{sp} \leq 155\text{ }^{\circ}\text{C}$ ; square wave |     | -   | 5    | A                  |
| $I_{FSM}$   | non-repetitive peak forward current | $t_p = 8\text{ ms}$ ; square wave; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$                  |     | -   | 70   | A                  |
| $P_{tot}$   | total power dissipation             | $T_{amb} \leq 25\text{ }^{\circ}\text{C}$                                                      | [2] | -   | 750  | mW                 |
|             |                                     |                                                                                                | [3] | -   | 1.25 | W                  |
|             |                                     |                                                                                                | [1] | -   | 2.5  | W                  |
| $T_j$       | junction temperature                |                                                                                                |     | -   | 175  | $^{\circ}\text{C}$ |
| $T_{amb}$   | ambient temperature                 |                                                                                                |     | -55 | 175  | $^{\circ}\text{C}$ |
| $T_{stg}$   | storage temperature                 |                                                                                                |     | -65 | 175  | $^{\circ}\text{C}$ |

[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] | -   | -   | 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  $1\text{ cm}^2$ .

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

[5] Soldering point of cathode tab.

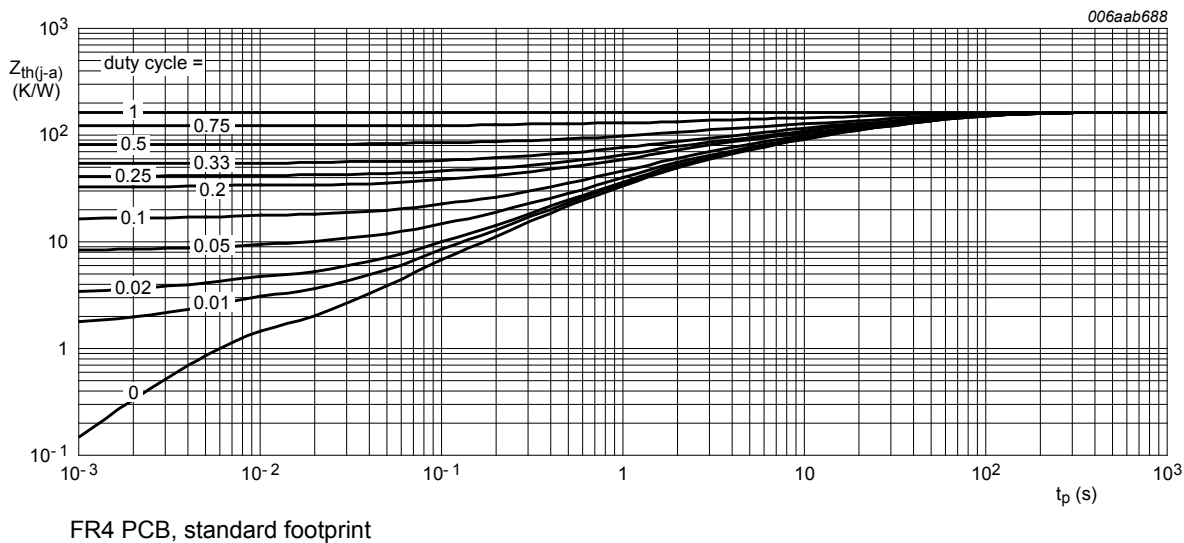


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

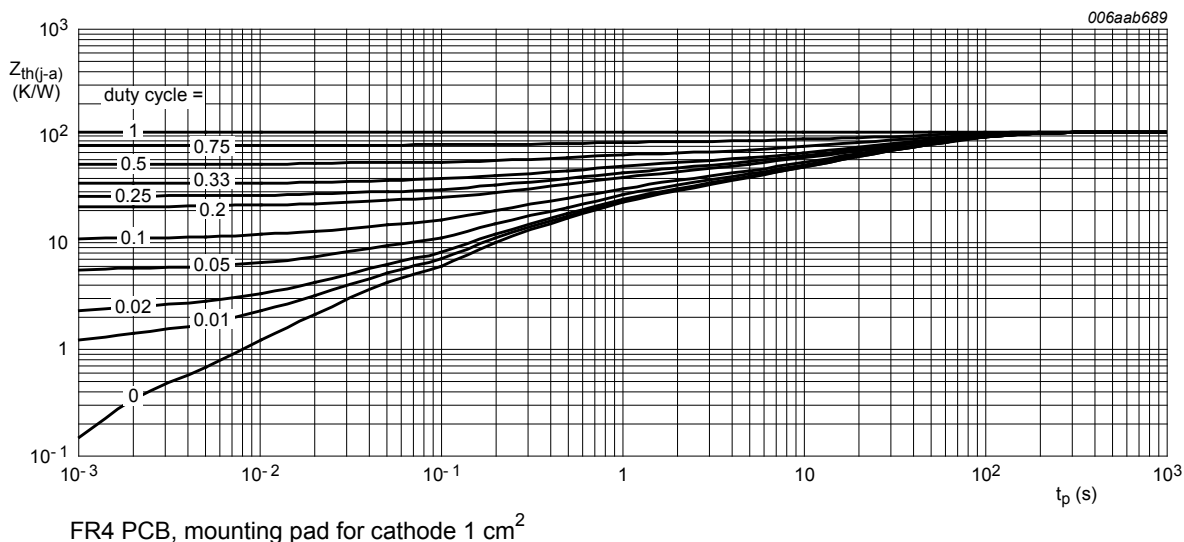
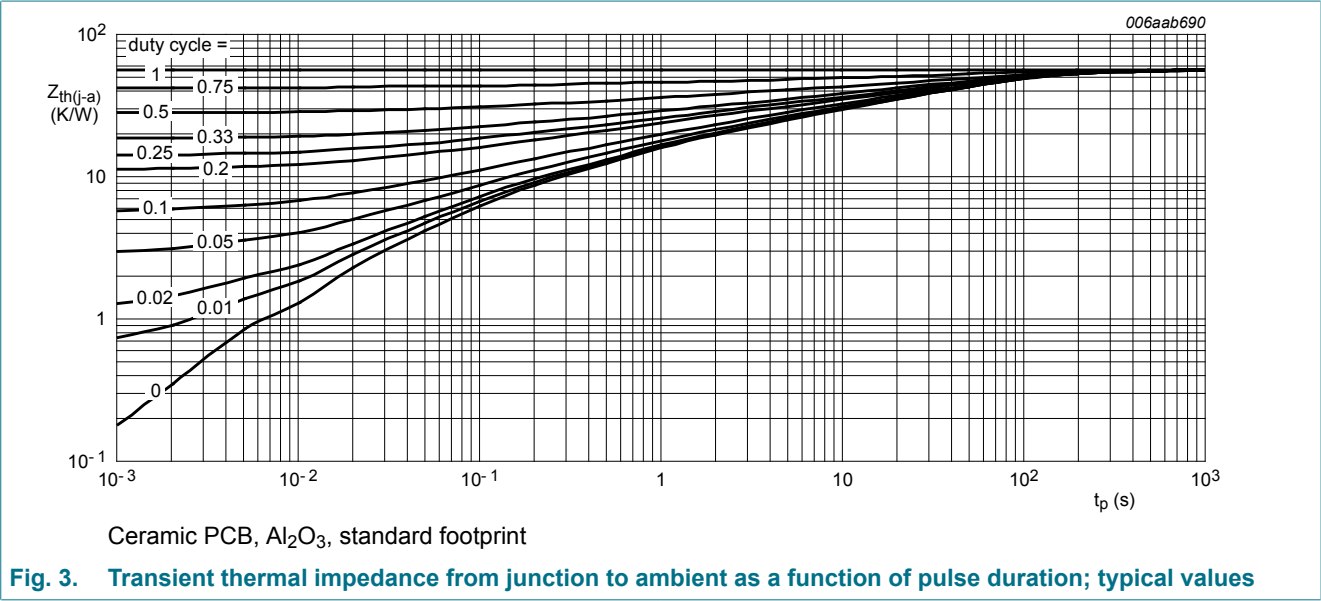


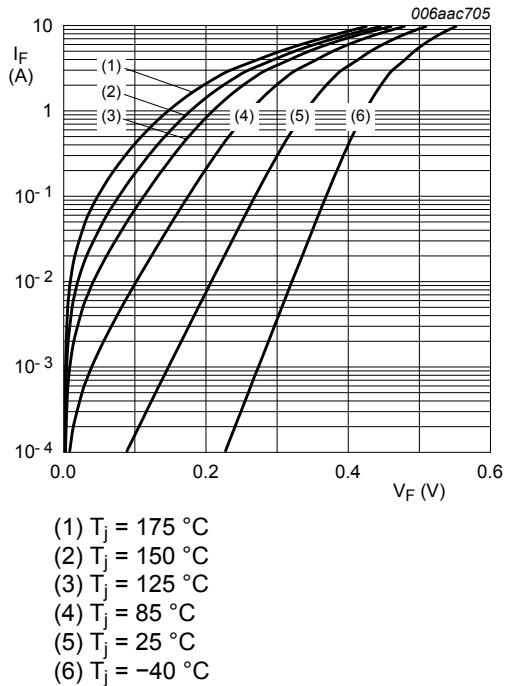
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



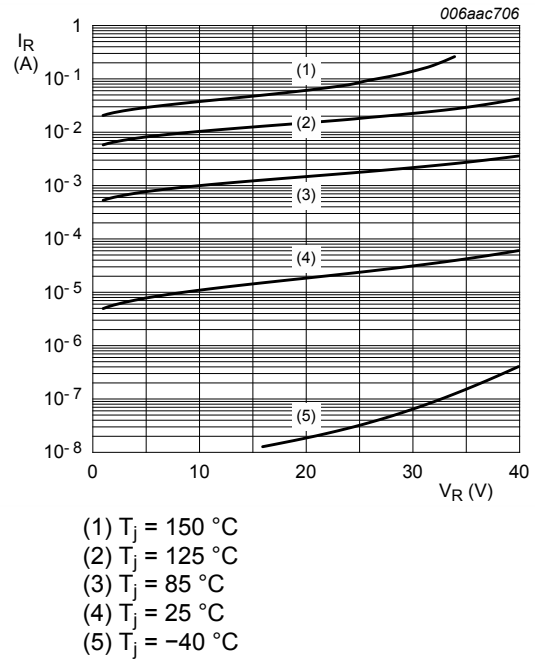
10. Characteristics

Table 7. Characteristics

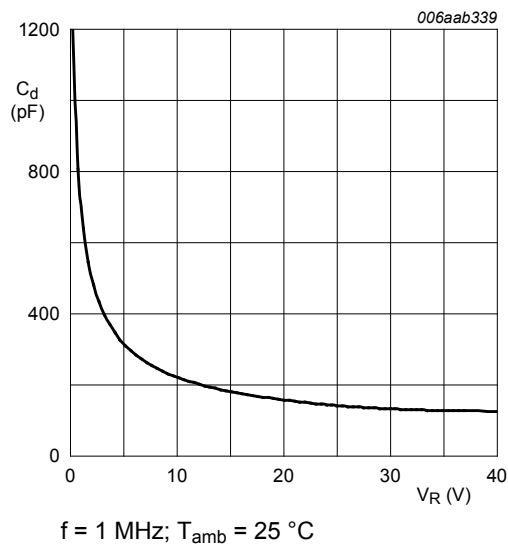
| Symbol         | Parameter         | Conditions                                               | Min | Typ | Max | Unit |
|----------------|-------------------|----------------------------------------------------------|-----|-----|-----|------|
| V <sub>F</sub> | forward voltage   | I <sub>F</sub> = 0.1 A; T <sub>j</sub> = 25 °C           | -   | 270 | 310 | mV   |
|                |                   | I <sub>F</sub> = 1 A; T <sub>j</sub> = 25 °C             | -   | 340 | 390 | mV   |
|                |                   | I <sub>F</sub> = 5 A; T <sub>j</sub> = 25 °C             | -   | 430 | 490 | mV   |
|                |                   | I <sub>F</sub> = 5 A; T <sub>j</sub> = 125 °C            | -   | 340 | 390 | mV   |
| I <sub>R</sub> | reverse current   | V <sub>R</sub> = 10 V; T <sub>j</sub> = 25 °C            | -   | 10  | -   | μA   |
|                |                   | V <sub>R</sub> = 40 V; T <sub>j</sub> = 25 °C            | -   | 60  | 300 | μA   |
|                |                   | V <sub>R</sub> = 10 V; T <sub>j</sub> = 125 °C           | -   | 10  | -   | mA   |
|                |                   | V <sub>R</sub> = 40 V; T <sub>j</sub> = 125 °C           | -   | 42  | -   | mA   |
| C <sub>d</sub> | diode capacitance | V <sub>R</sub> = 1 V; f = 1 MHz; T <sub>j</sub> = 25 °C  | -   | 600 | -   | pF   |
|                |                   | V <sub>R</sub> = 10 V; f = 1 MHz; T <sub>j</sub> = 25 °C | -   | 220 | -   | pF   |



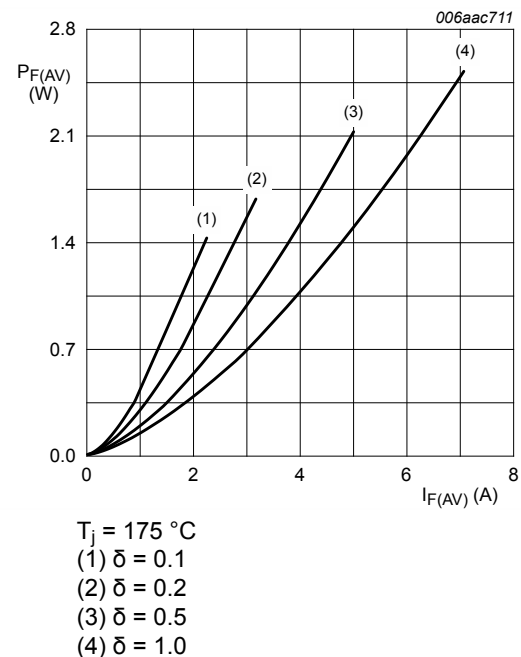
**Fig. 4. Forward current as a function of forward voltage; typical values**



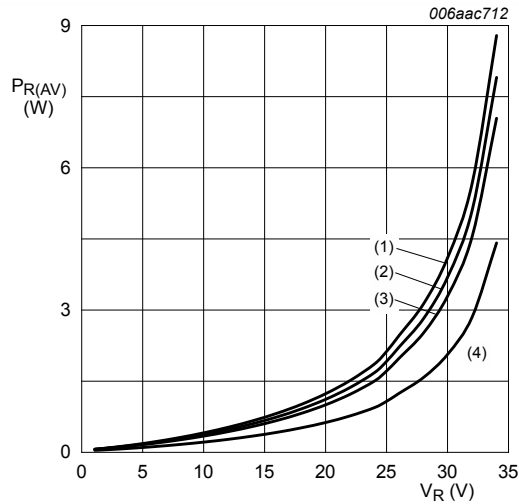
**Fig. 5. Reverse current as a function of reverse voltage; typical values**



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



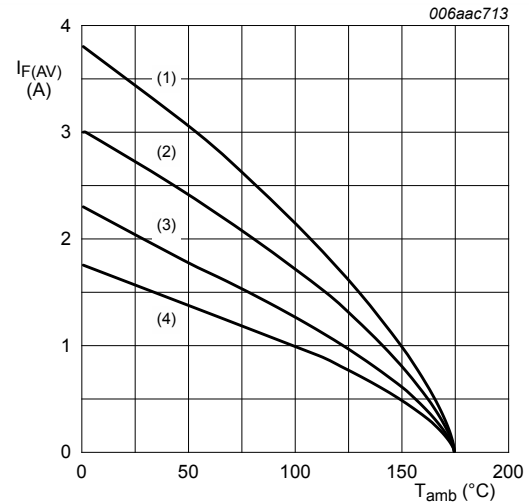
**Fig. 7. Average forward power dissipation as a function of average forward current; typical values**



$T_j = 150\text{ °C}$

- (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

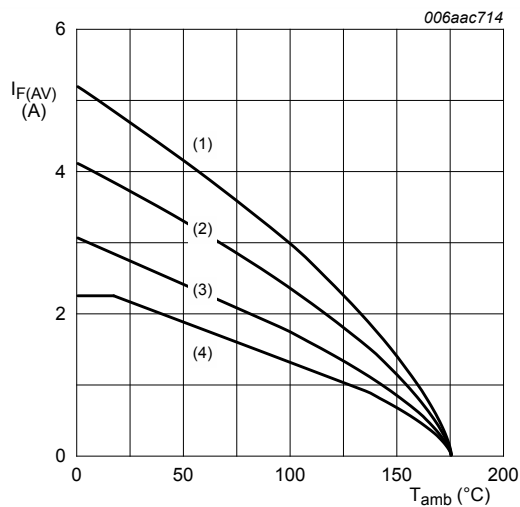


FR4 PCB, standard footprint

$T_j = 175\text{ °C}$

- (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

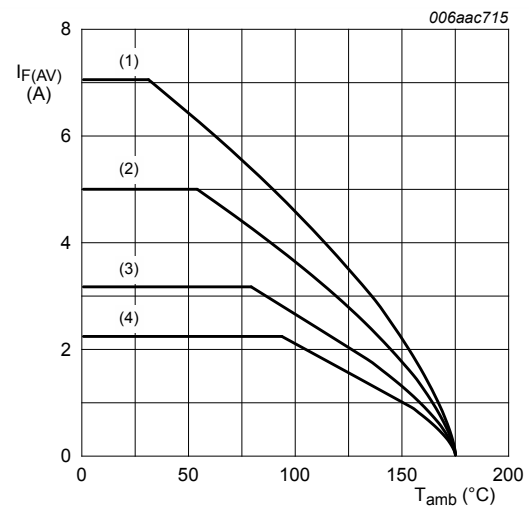


FR4 PCB, mounting pad for cathode  $1\text{ cm}^2$

$T_j = 175\text{ °C}$

- (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

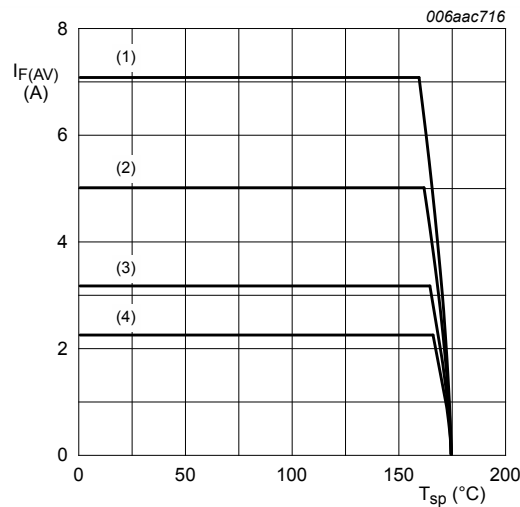


Ceramic PCB,  $\text{Al}_2\text{O}_3$ , standard footprint

$T_j = 175\text{ °C}$

- (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



$T_j = 175\text{ °C}$

(1)  $\delta = 1.0$

(2)  $\delta = 0.9$

(3)  $\delta = 0.8$

(4)  $\delta = 0.5$

Fig. 12. Average forward current as a function of solder point temperature; typical values

## 11. Test information

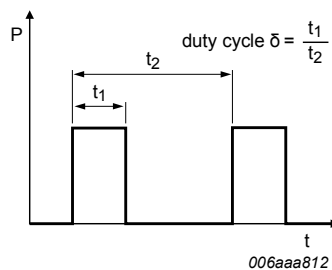


Fig. 13. Duty cycle definition

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

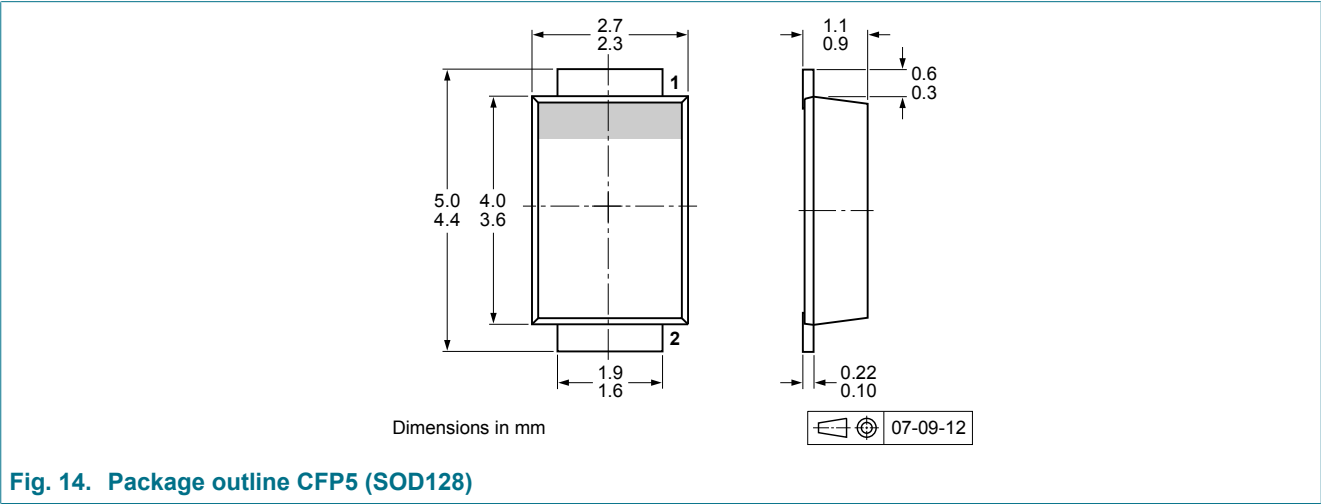
$I_{F(AV)} = I_M \times \delta$  with  $I_M$  defined as peak current,  $I_{RMS} = I_{F(AV)}$  at DC, and  $I_{RMS} = I_M \times \sqrt{\delta}$  with  $I_{RMS}$  defined as RMS current.

### Quality information

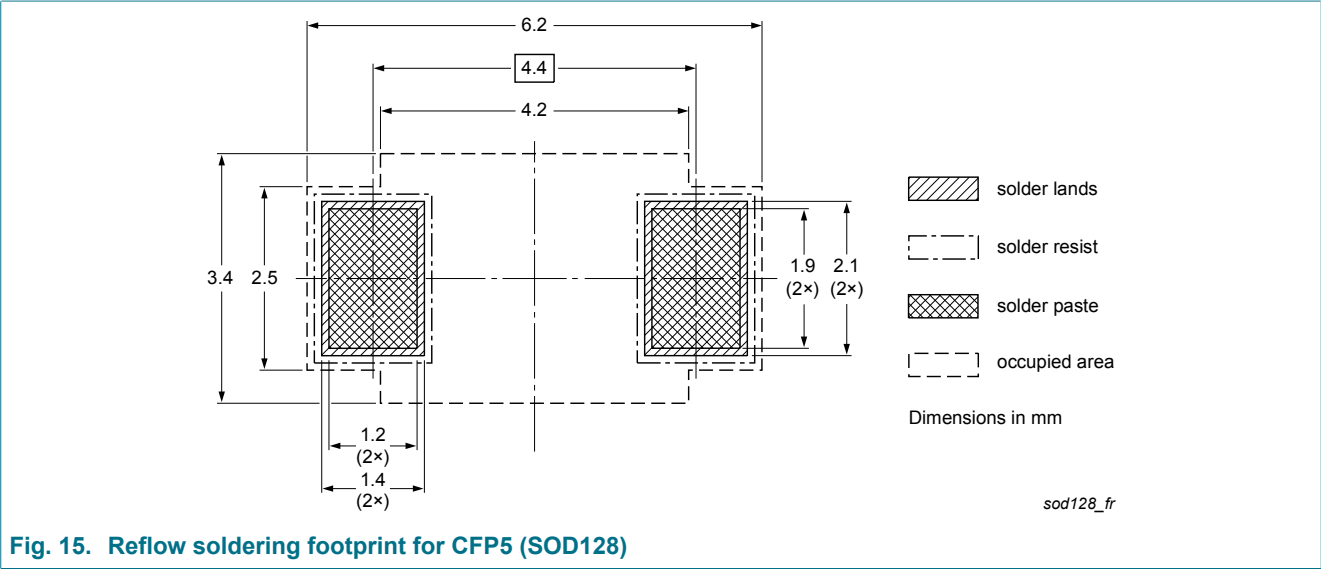
This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - *Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.



12. Package outline



13. Soldering



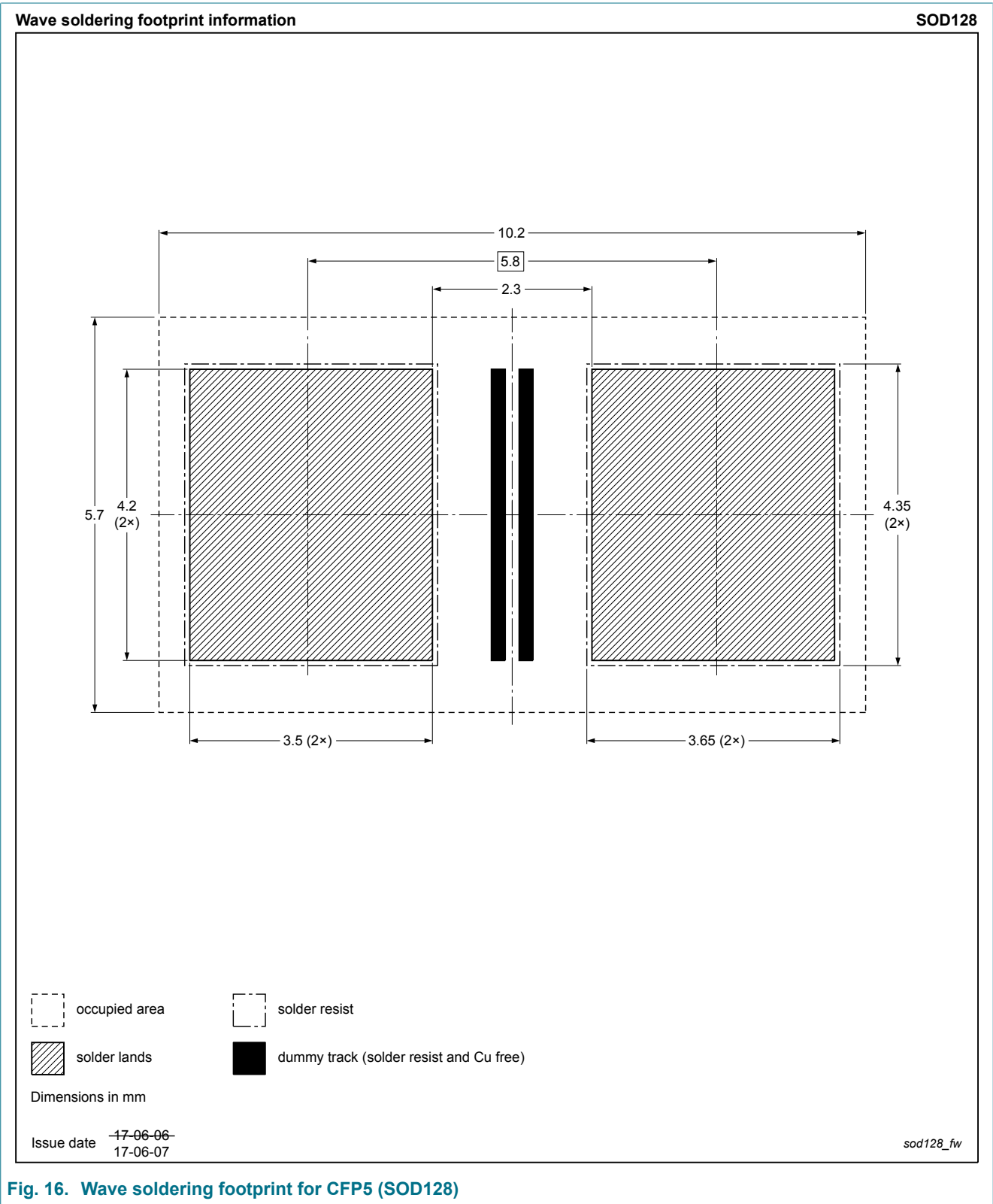


Fig. 16. Wave soldering footprint for CFP5 (SOD128)

14. Revision history

Table 8. Revision history

| Data sheet ID   | Release date                                                                                                                                                         | Data sheet status  | Change notice | Supersedes      |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|-----------------|
| PMEG4050ETP v.2 | 20180425                                                                                                                                                             | Product data sheet | -             | PMEG4050ETP v.1 |
| Modifications:  | <ul style="list-style-type: none"><li>Features and benefits: Capable for reflow and wave soldering added</li><li>Soldering: Wave soldering footprint added</li></ul> |                    |               |                 |
| PMEG4050ETP v.1 | 20111010                                                                                                                                                             | 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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Date of release: 25 April 2018