



# PMEG40T20ER

40 V, 2 A low VF Trench MEGA Schottky barrier rectifier

1 April 2023

Product data sheet

## 1. General description

Trench Maximum Efficiency General Application (MEGA) Schottky barrier rectifier encapsulated in a CFP3 (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:  $V_R \leq 40$  V
- Low forward voltage
- Low leakage current due to Trench MEGA Schottky technology
- High power capability due to clip-bonding technology
- 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
- Freewheeling application
- Reverse polarity protection
- Low power consumption application

## 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; $T_{sp} \leq 160$ °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; pulsed                               | [1] | -   | 450 | 515  | mV      |
| $I_R$       | reverse current         | $V_R = 10$ V; $T_j = 25$ °C; pulsed                              | [1] | -   | 3   | 11.5 | $\mu$ A |
|             |                         | $V_R = 40$ V; $T_j = 25$ °C; pulsed                              | [1] | -   | 6   | 22   | $\mu$ A |

[1] Very short pulse, in order to maintain a stable junction temperature.

5. Pinning information

Table 2. Pinning information

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

6. Ordering information

Table 3. Ordering information

| Type number                 | Package |                                                                            |                         |
|-----------------------------|---------|----------------------------------------------------------------------------|-------------------------|
|                             | Name    | Description                                                                | Version                 |
| <a href="#">PMEG40T20ER</a> | CFP3    | plastic, surface mounted package; 2 terminals; 2.6 mm x 1.7 mm x 1 mm body | <a href="#">SOD123W</a> |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PMEG40T20ER | L4           |

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                  |
| $I_F$       | forward current                     | $\delta = 1; T_{sp} \leq 155\text{ }^{\circ}\text{C}$                                      |     | -   | 2.8  | A                  |
| $I_{F(AV)}$ | average forward current             | $\delta = 0.5; f = 20\text{ kHz}$ ; square wave; $T_{sp} \leq 160\text{ }^{\circ}\text{C}$ |     | -   | 2    | A                  |
| $I_{FSM}$   | non-repetitive peak forward current | $t_p = 8\text{ ms}$ ; square wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$       |     | -   | 20   | A                  |
| $P_{tot}$   | total power dissipation             | $T_{amb} \leq 25\text{ }^{\circ}\text{C}$                                                  | [1] | -   | 0.68 | W                  |
|             |                                     |                                                                                            | [2] | -   | 1.15 | 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 an FR4 Printed-Circuit Board (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<sup>2</sup>.

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  |
|                |                                                  |             | [1] [3] | -   | -   | 130 | K/W  |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point |             | [4]     | -   | -   | 18  | 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] Soldering point of cathode tab.

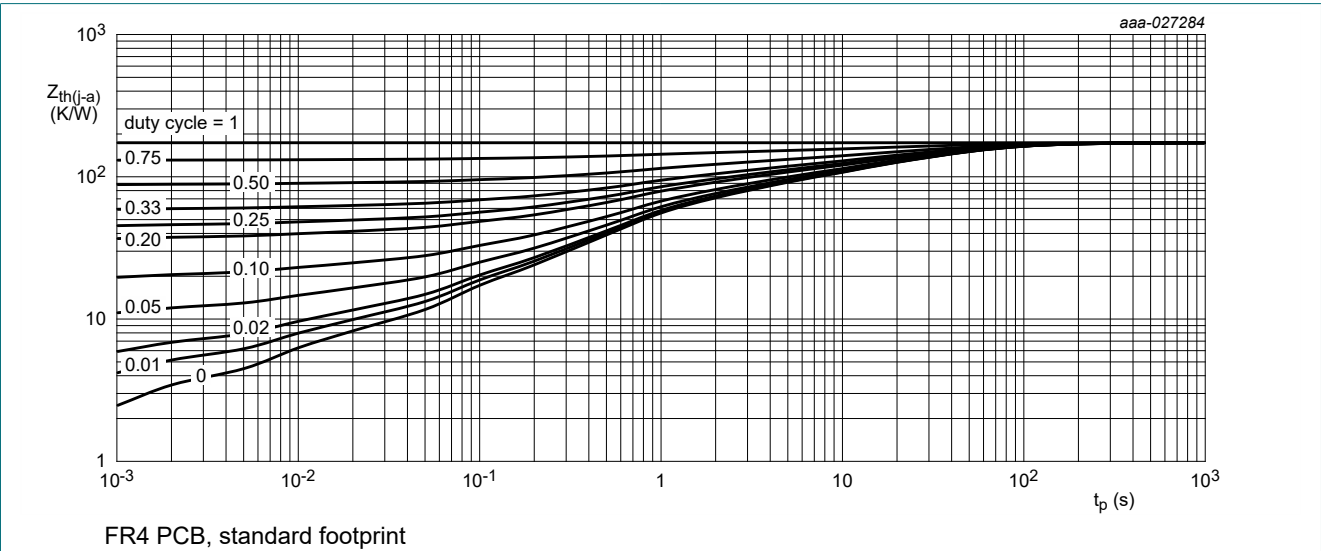


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

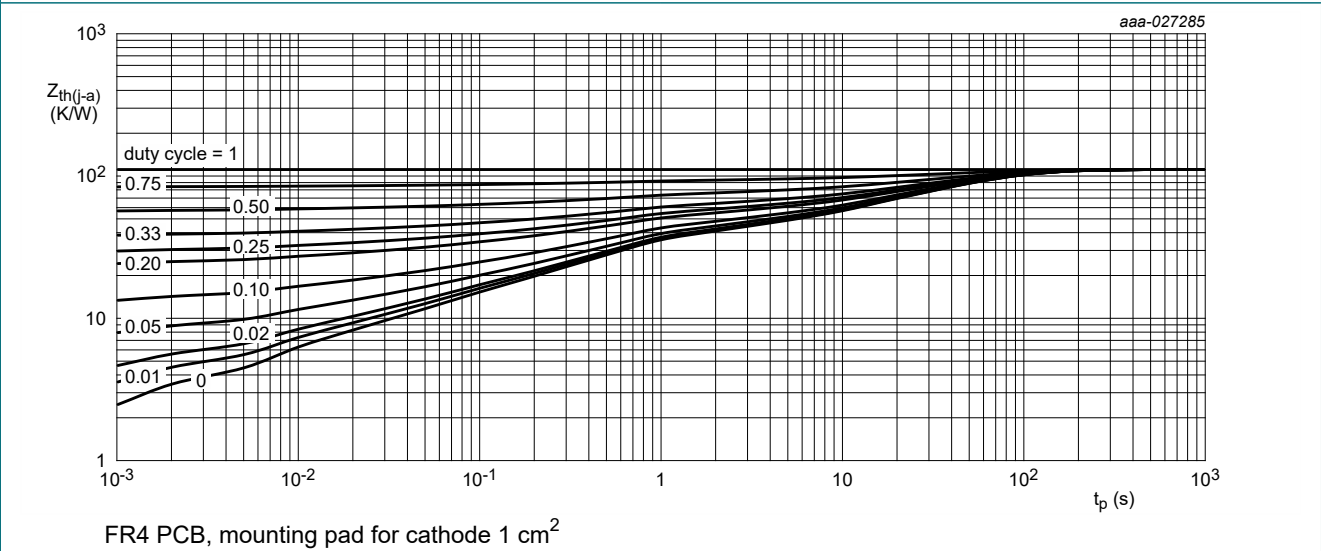


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

| Symbol      | Parameter                           | Conditions                                                                                        |     | Min | Typ  | Max  | Unit |
|-------------|-------------------------------------|---------------------------------------------------------------------------------------------------|-----|-----|------|------|------|
| $V_{(BR)R}$ | reverse breakdown voltage           | $I_R = 1\text{ mA}$ ; pulsed; $T_j = 25\text{ °C}$                                                | [1] | 40  | -    | -    | V    |
| $V_F$       | forward voltage                     | $I_F = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ; pulsed                                              | [1] | -   | 310  | 360  | mV   |
|             |                                     | $I_F = 0.5\text{ A}$ ; $T_j = 25\text{ °C}$ ; pulsed                                              | [1] | -   | 365  | 420  | mV   |
|             |                                     | $I_F = 1\text{ A}$ ; $T_j = 25\text{ °C}$ ; pulsed                                                | [1] | -   | 400  | 460  | mV   |
|             |                                     | $I_F = 2\text{ A}$ ; $T_j = 25\text{ °C}$ ; pulsed                                                | [1] | -   | 450  | 515  | mV   |
|             |                                     | $I_F = 2\text{ A}$ ; $T_j = -40\text{ °C}$ ; pulsed                                               | [1] | -   | 505  | -    | mV   |
|             |                                     | $I_F = 2\text{ A}$ ; $T_j = 125\text{ °C}$ ; pulsed                                               | [1] | -   | 365  | -    | mV   |
| $I_R$       | reverse current                     | $V_R = 10\text{ V}$ ; $T_j = 25\text{ °C}$ ; pulsed                                               | [1] | -   | 3    | 11.5 | μA   |
|             |                                     | $V_R = 30\text{ V}$ ; $T_j = 25\text{ °C}$ ; pulsed                                               | [1] | -   | 5    | -    | μA   |
|             |                                     | $V_R = 40\text{ V}$ ; $T_j = 25\text{ °C}$ ; pulsed                                               | [1] | -   | 6    | 22   | μA   |
|             |                                     | $V_R = 40\text{ V}$ ; $T_j = 125\text{ °C}$ ; pulsed                                              | [1] | -   | 4    | -    | mA   |
| $C_d$       | diode capacitance                   | $V_R = 1\text{ V}$ ; $f = 1\text{ MHz}$ ; $T_j = 25\text{ °C}$                                    |     | -   | 350  | -    | pF   |
|             |                                     | $V_R = 10\text{ V}$ ; $f = 1\text{ MHz}$ ; $T_j = 25\text{ °C}$                                   |     | -   | 145  | -    | pF   |
| $t_{rr}$    | reverse recovery time step recovery | $I_F = 0.5\text{ A}$ ; $I_R = 0.5\text{ A}$ ; $I_{R(meas)} = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ |     | -   | 11.5 | -    | ns   |
|             | reverse recovery time ramp recovery | $dI_F/dt = 200\text{ A/μs}$ ; $I_F = 6\text{ A}$ ; $V_R = 26\text{ V}$ ; $T_j = 25\text{ °C}$     |     | -   | 11   | -    | ns   |
| $V_{FRM}$   | peak forward recovery voltage       | $I_F = 0.5\text{ A}$ ; $dI_F/dt = 20\text{ A/μs}$ ; $T_j = 25\text{ °C}$                          |     | -   | 430  | -    | mV   |

[1] Very short pulse, in order to maintain a stable junction temperature.

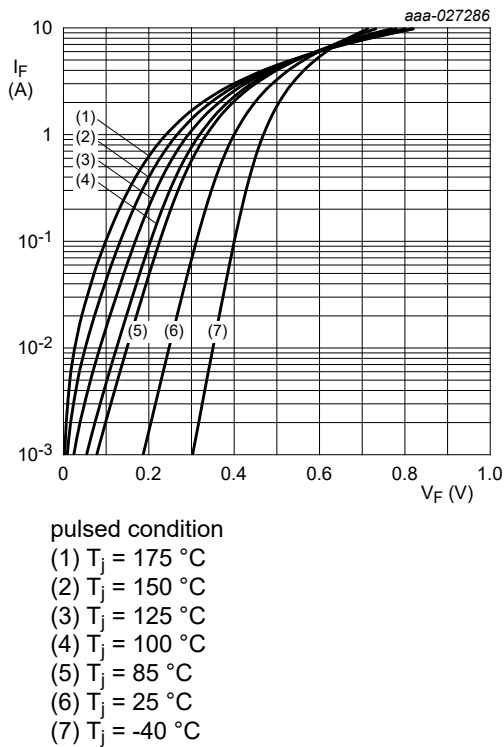


Fig. 3. Forward current as a function of forward voltage; typical values

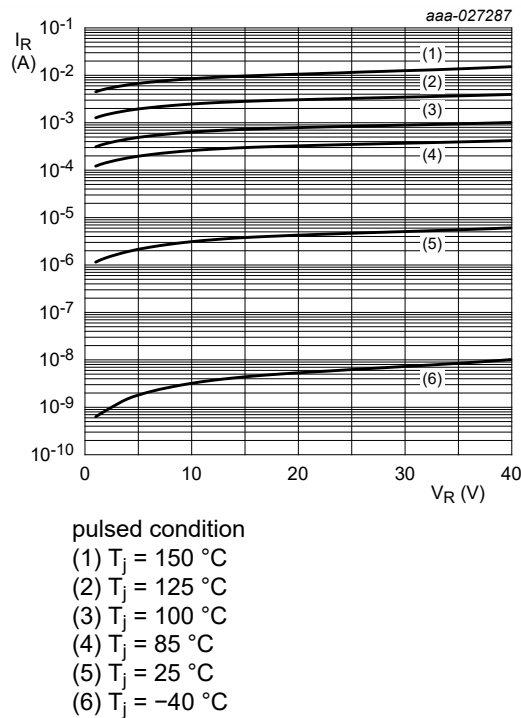


Fig. 4. Reverse current as a function of reverse voltage; typical values

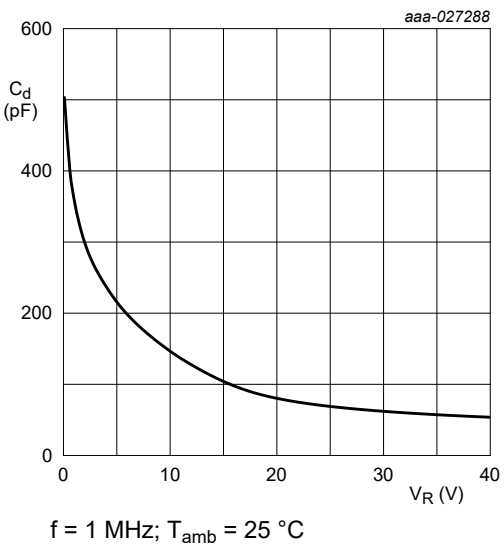


Fig. 5. Diode capacitance as a function of reverse voltage; typical values

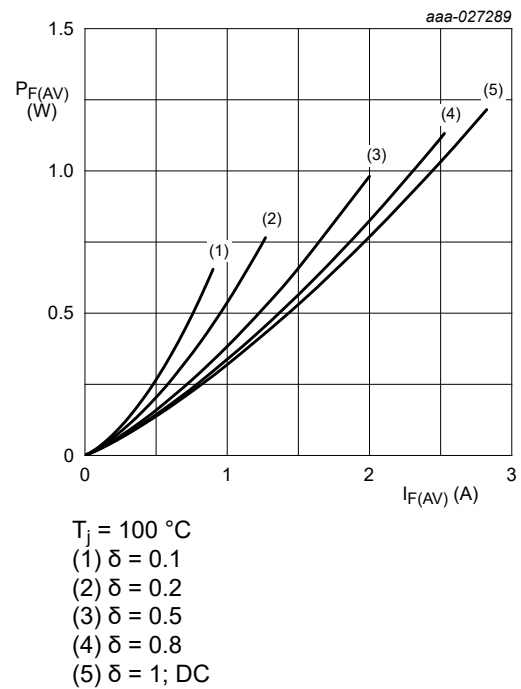
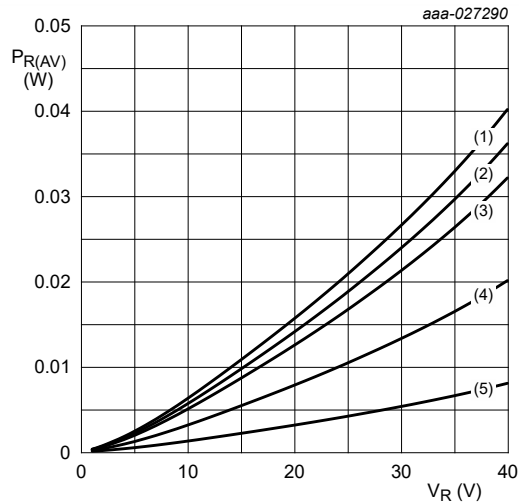
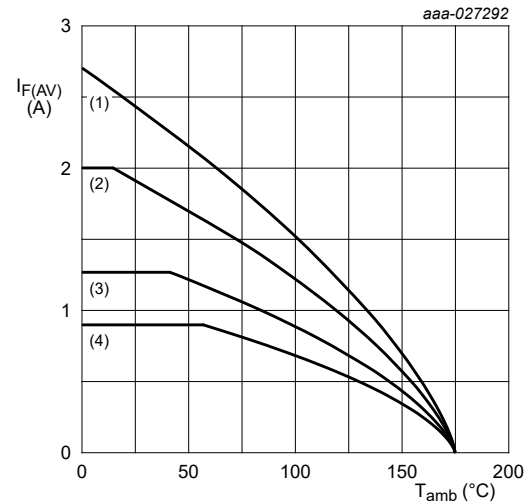


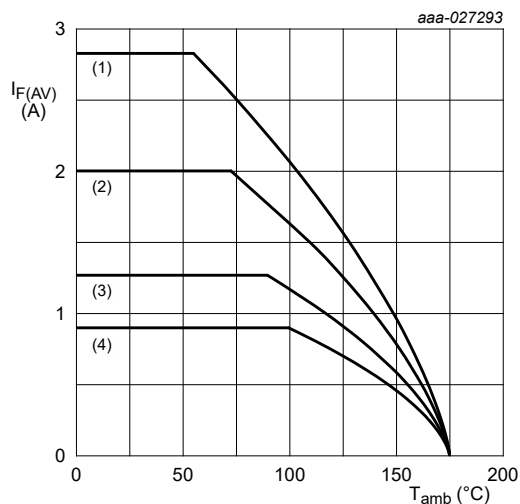
Fig. 6. Average forward power dissipation as a function of average forward current; typical values



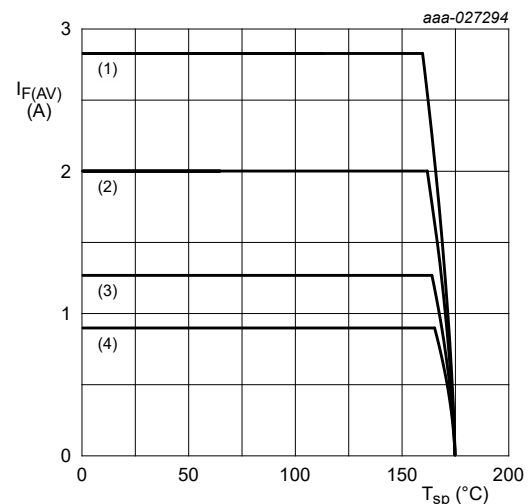
**Fig. 7.** Average reverse power dissipation as a function of reverse voltage; typical values



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



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



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

11. Test information

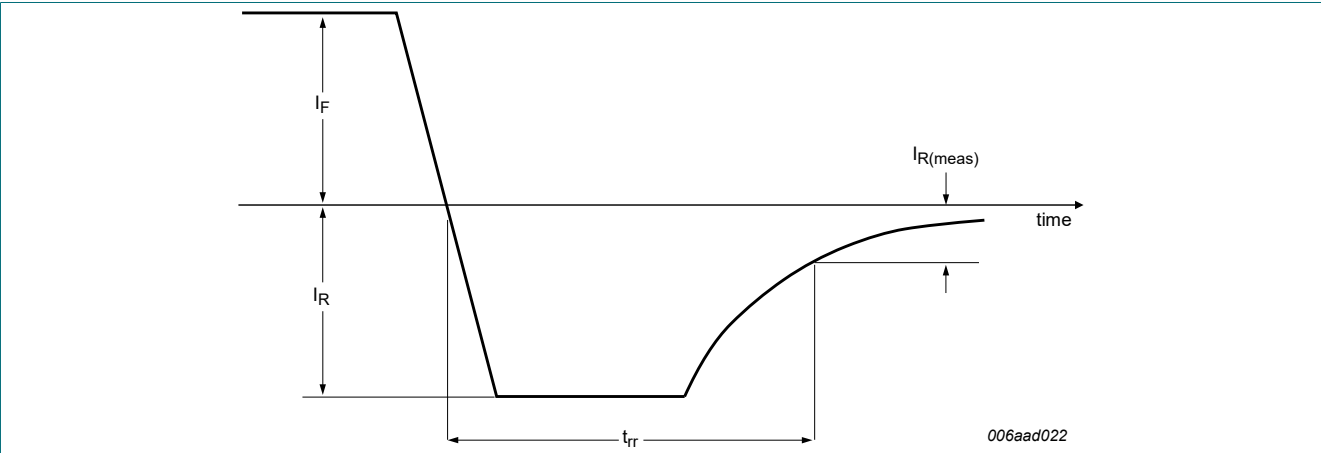


Fig. 11. Reverse recovery definition; step recovery

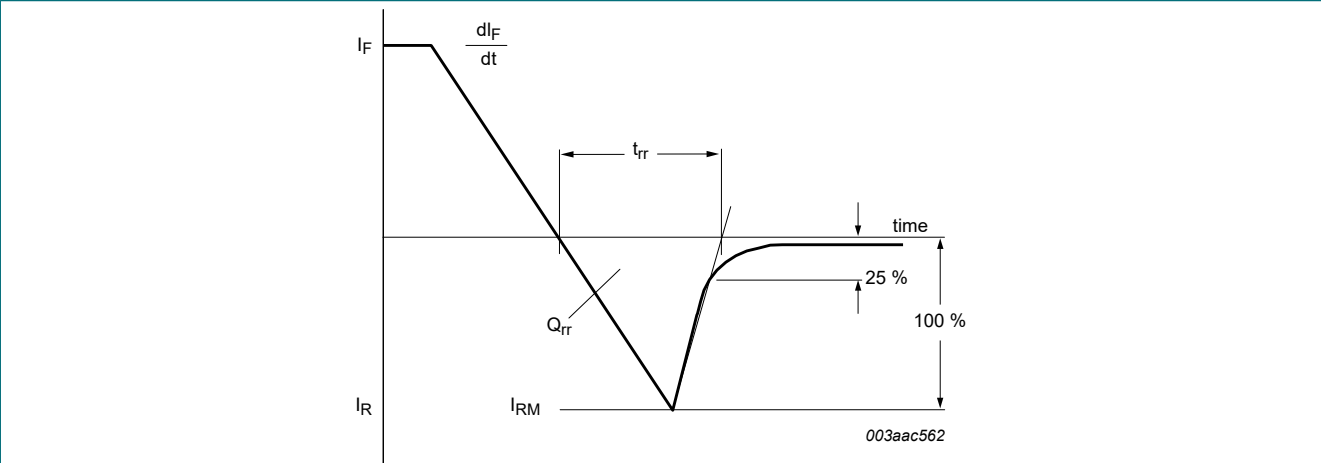


Fig. 12. Reverse recovery definition; ramp recovery

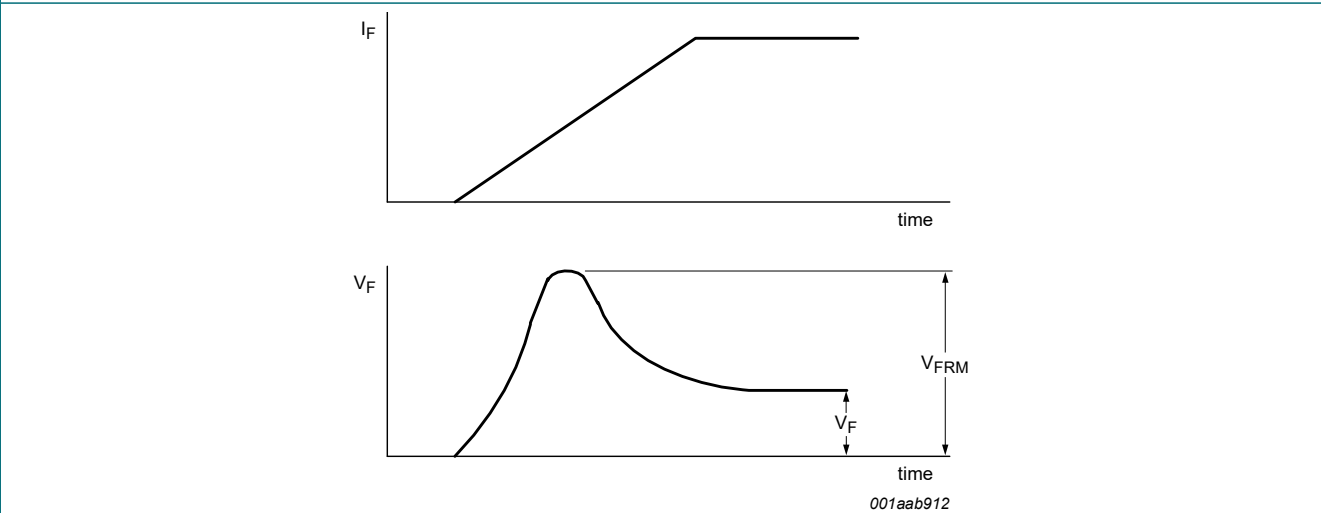


Fig. 13. Forward recovery definition

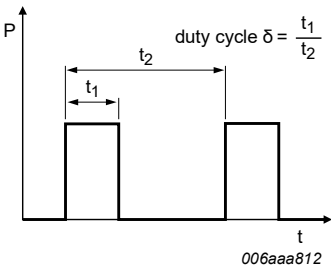


Fig. 14. Duty cycle definition

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.

12. Package outline

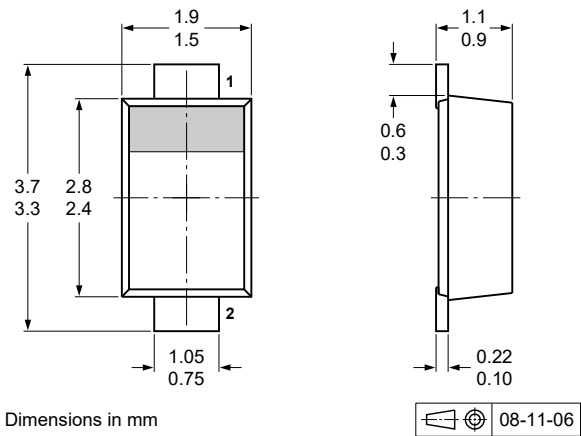


Fig. 15. Package outline CFP3 (SOD123W)



13. Soldering

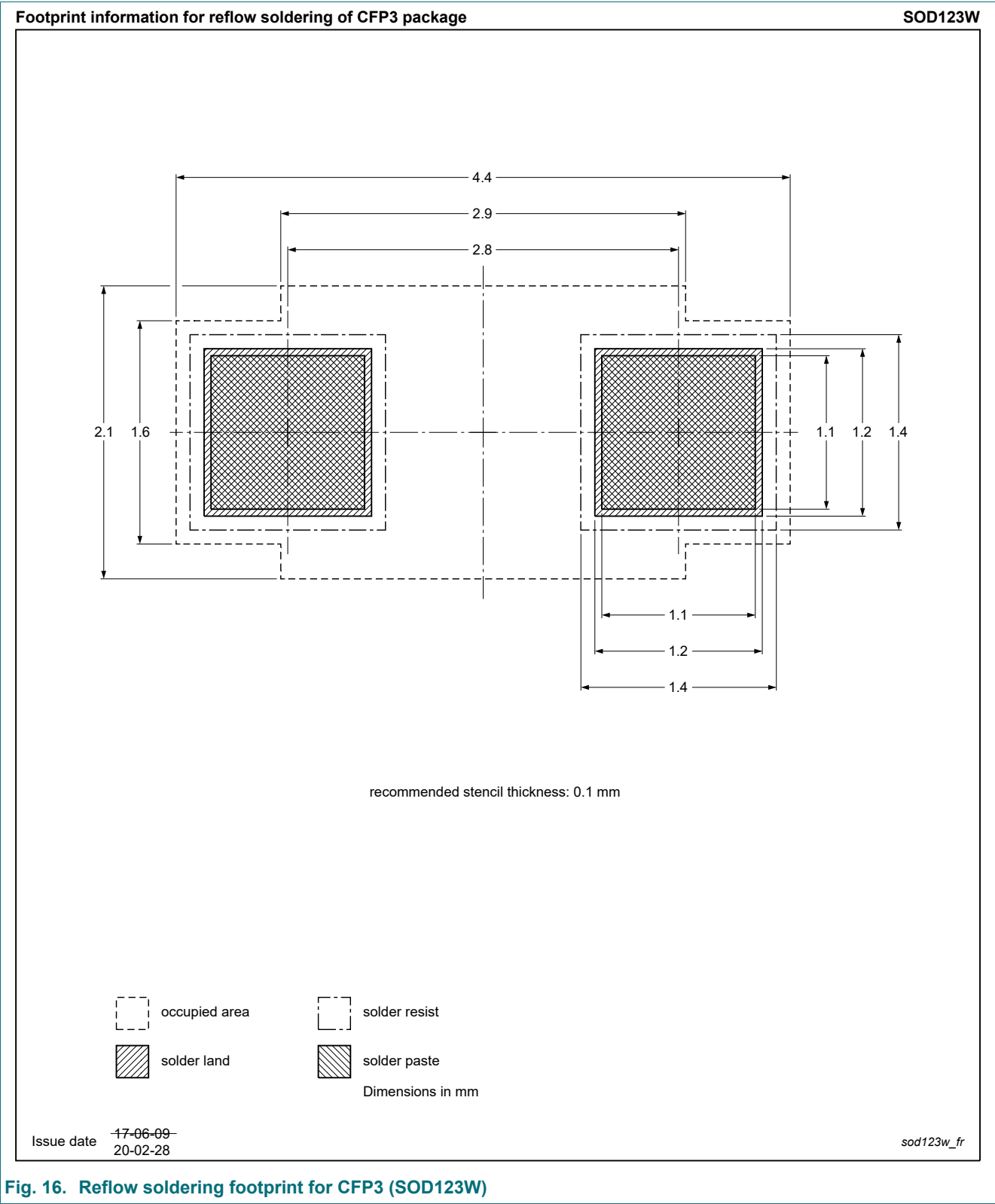


Fig. 16. Reflow soldering footprint for CFP3 (SOD123W)

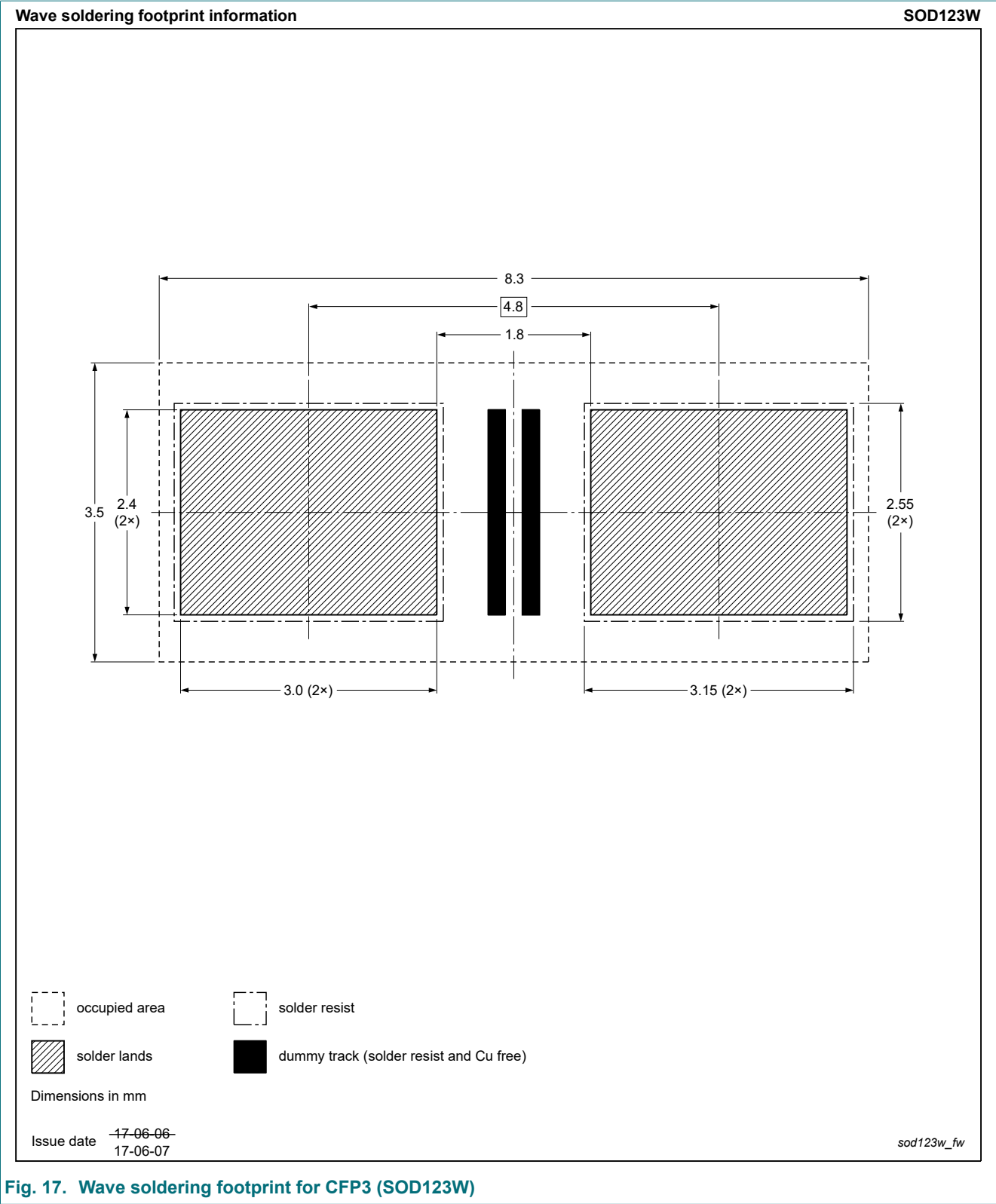


Fig. 17. Wave soldering footprint for CFP3 (SOD123W)

14. Revision history

Table 8. Revision history

| Data sheet ID   | Release date                                                                                                                                                             | Data sheet status  | Change notice | Supersedes      |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|-----------------|
| PMEG40T20ER v.3 | 20230401                                                                                                                                                                 | Product data sheet | -             | PMEG40T20ER v.2 |
| Modifications:  | <ul style="list-style-type: none"><li>Product changed to non-automotive qualification. Please refer to nexperia.com for automotive(-Q) product alternative(s).</li></ul> |                    |               |                 |
| PMEG40T20ER v.2 | 20180306                                                                                                                                                                 | Product data sheet | -             | PMEG40T20ER v.1 |
| PMEG40T20ER v.1 | 20170928                                                                                                                                                                 | 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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