



PMEG120G10ELR

120 V, 1 A Silicon Germanium (SiGe) rectifier

28 February 2020

Product data sheet

1. General description

Silicon Germanium (SiGe) rectifier encapsulated in a CFP3 (SOD123W) small and flat lead Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

| Features | Benefits |
|--|---|
| <ul style="list-style-type: none">• Low forward voltage and low Q_{rr}• Extremely low leakage current• Thermal stability up to 175 °C junction temperature• Fast and smooth switching• Low parasitic capacitance• AEC-Q101 qualified | <ul style="list-style-type: none">• Excellent efficiency• Extraordinary safe operating area• Minimal impact on Electro-Magnetic Compatibility (EMC) allowing simplified certification |

3. Applications

- High-efficiency power conversion
 - Automotive LED lighting
 - Engine control unit
 - Server power supply
 - Base station power supply
- Reverse polarity protection
- OR-ing

4. Quick reference data


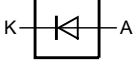
Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------|-------------------------|--|-----|-----|-----|------|
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$; square wave; $f = 20$ kHz; $T_{sp} \leq 167$ °C | - | - | 1 | A |
| V_R | reverse voltage | $T_j = 25$ °C | - | - | 120 | V |
| V_F | forward voltage | $I_F = 1$ A; $T_j = 25$ °C; pulsed | [1] | 770 | 840 | mV |
| I_R | reverse current | $V_R = 120$ V; $T_j = 25$ °C; pulsed | [1] | 0.2 | 30 | nA |
| | | $V_R = 120$ V; $T_j = 150$ °C; pulsed | [1] | 10 | 100 | μA |

[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 |  CFP3 (SOD123W) |  006aab040 |
| 2 | A | anode | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|---------------|---------|--|---------|
| | Name | Description | Version |
| PMEG120G10ELR | 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 |
|---------------|--------------|
| PMEG120G10ELR | LE |

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Attention: Stress above one of these maximum values may cause irreversible damage to the device.

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|-------------|-------------------------------------|---|-----|-----|------|------|
| V_R | reverse voltage | $T_j = 25\text{ °C}$ | | - | 120 | V |
| I_F | forward current | $\delta = 1; T_{sp} \leq 165\text{ °C}$ | | - | 1.4 | A |
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$; square wave; $f = 20\text{ kHz}$; $T_{sp} \leq 167\text{ °C}$ | | - | 1 | 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 | $T_{amb} \leq 25\text{ °C}$ | [1] | - | 0.68 | W |
| | | | [2] | - | 1.15 | 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 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^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] | - | - | 220 | K/W |
| | | | [2] | - | - | 130 | K/W |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | [3] | - | - | 18 | K/W |

- [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 cm².
- [3] Soldering point of cathode tab.

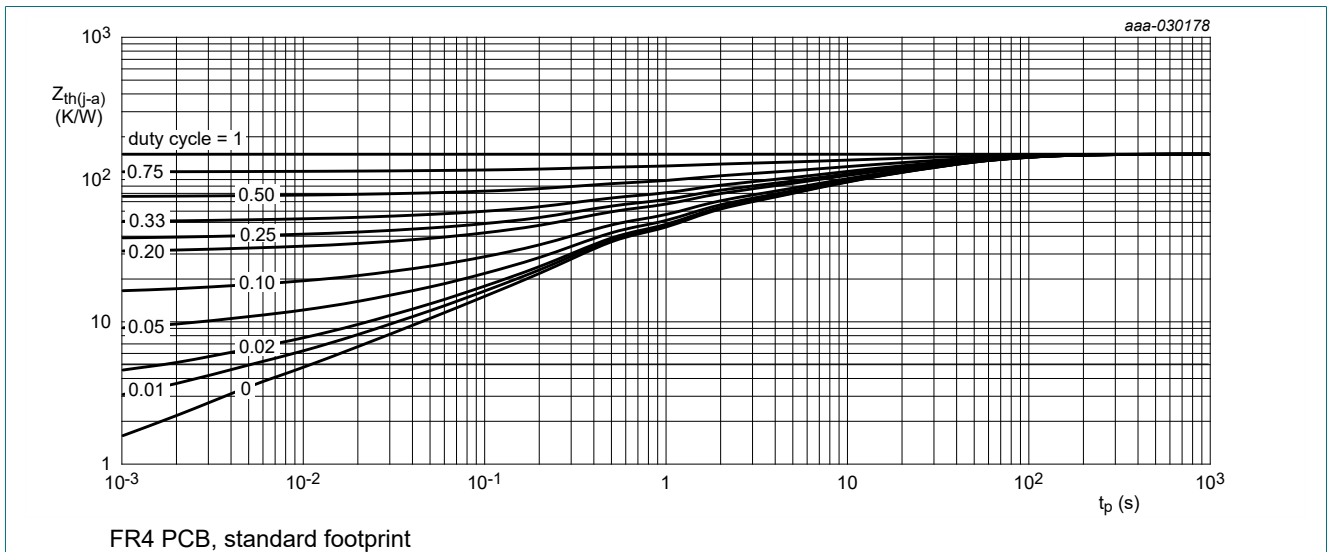


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

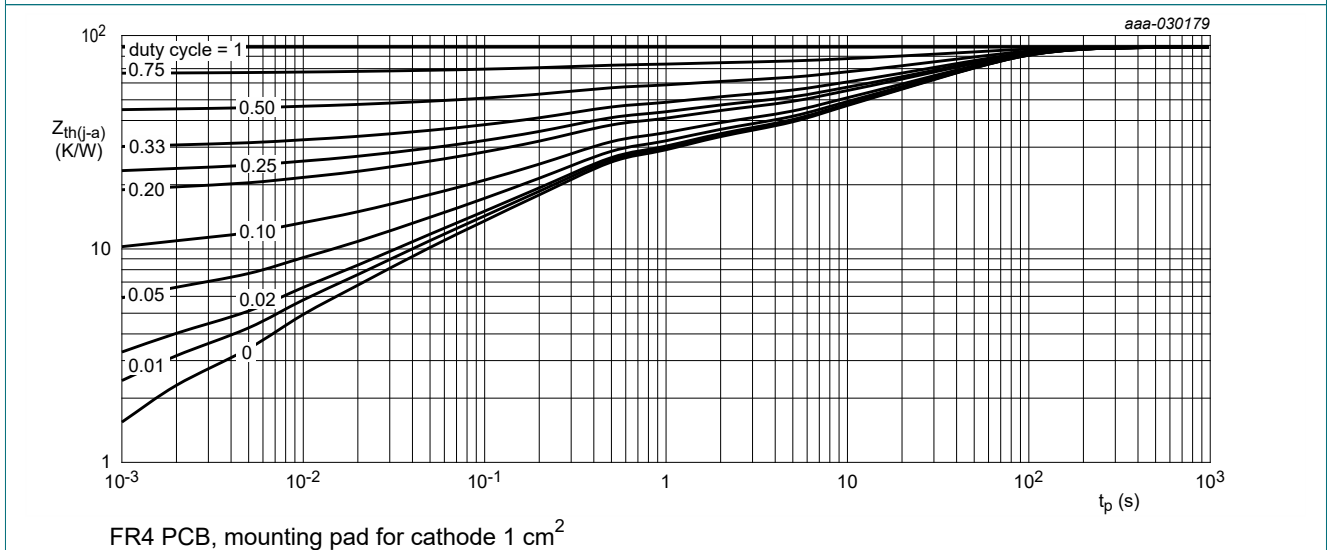


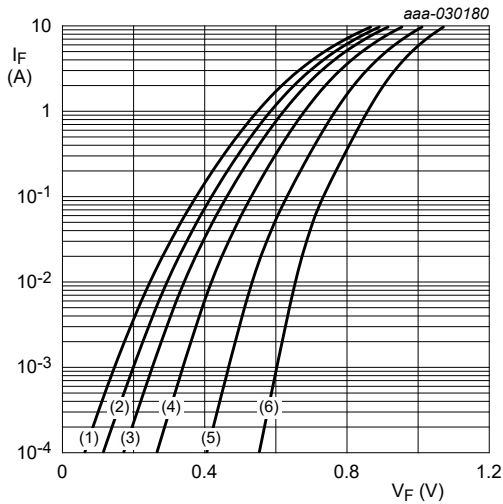
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

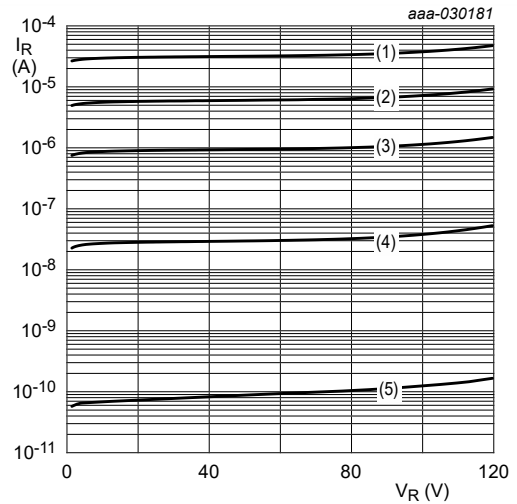
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|-------------|-------------------------------------|---|-----|-----|-----|-----|---------------|
| $V_{(BR)R}$ | reverse breakdown voltage | $I_R = 1 \text{ mA}$; pulsed; $T_j = 25 \text{ }^\circ\text{C}$ | [1] | 120 | - | - | V |
| V_F | forward voltage | $I_F = 0.1 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$; pulsed | [1] | - | 635 | 710 | mV |
| | | $I_F = 0.5 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$; pulsed | [1] | - | 725 | 800 | mV |
| | | $I_F = 0.7 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$; pulsed | [1] | - | 745 | 820 | mV |
| | | $I_F = 1 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$; pulsed | [1] | - | 770 | 840 | mV |
| | | $I_F = 1 \text{ A}$; $T_j = -40 \text{ }^\circ\text{C}$; pulsed | [1] | - | 860 | 950 | mV |
| | | $I_F = 1 \text{ A}$; $T_j = 125 \text{ }^\circ\text{C}$; pulsed | [1] | - | 620 | 720 | mV |
| I_R | reverse current | $V_R = 120 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; pulsed | [1] | - | 0.2 | 30 | nA |
| | | $V_R = 120 \text{ V}$; $T_j = 125 \text{ }^\circ\text{C}$; pulsed | [1] | - | 2 | 20 | μA |
| | | $V_R = 120 \text{ V}$; $T_j = 150 \text{ }^\circ\text{C}$; pulsed | [1] | - | 10 | 100 | μA |
| C_d | diode capacitance | $V_R = 1 \text{ V}$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$ | | - | 36 | - | pF |
| | | $V_R = 10 \text{ V}$; $f = 1 \text{ MHz}$; $T_j = 25 \text{ }^\circ\text{C}$ | | - | 15 | - | pF |
| t_{rr} | reverse recovery time step recovery | $I_F = 0.5 \text{ A}$; $I_R = 1 \text{ A}$; $I_{R(\text{meas})} = 0.25 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$ | | - | 6 | - | ns |
| | reverse recovery time ramp recovery | $di_F/dt = 100 \text{ A}/\mu\text{s}$; $I_F = 1 \text{ A}$; $V_R = 30 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$ | | - | 12 | - | ns |
| I_{RM} | peak reverse recovery current | | | - | 0.7 | - | A |
| Q_{rr} | reverse recovery charge | | | - | 5 | - | nC |
| V_{FRM} | peak forward recovery voltage | $I_F = 0.5 \text{ A}$; $di_F/dt = 20 \text{ A}/\mu\text{s}$; $T_j = 25 \text{ }^\circ\text{C}$ | | - | 745 | - | mV |

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



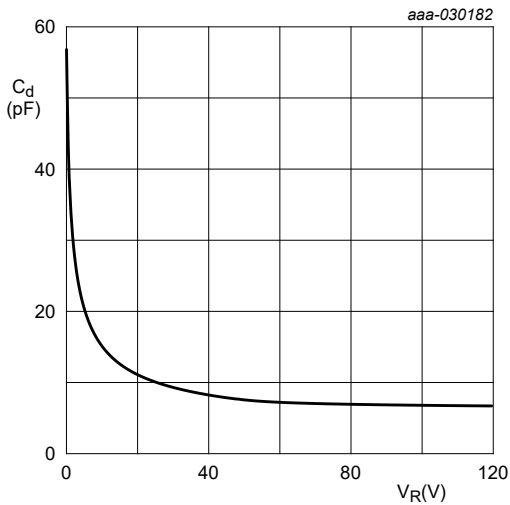
pulsed condition
 (1) $T_j = 175\text{ °C}$
 (2) $T_j = 150\text{ °C}$
 (3) $T_j = 125\text{ °C}$
 (4) $T_j = 85\text{ °C}$
 (5) $T_j = 25\text{ °C}$
 (6) $T_j = -40\text{ °C}$

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



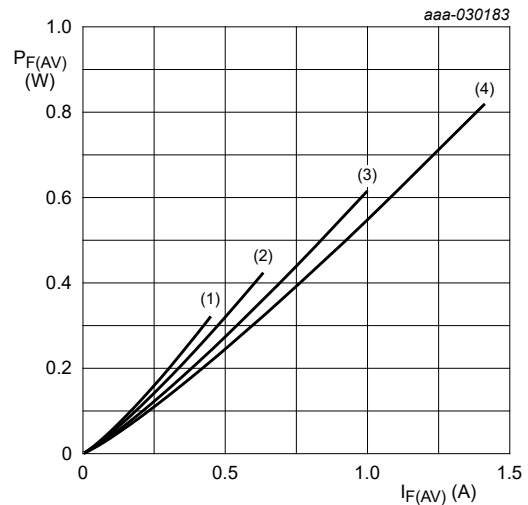
pulsed condition
 (1) $T_j = 175\text{ °C}$
 (2) $T_j = 150\text{ °C}$
 (3) $T_j = 125\text{ °C}$
 (4) $T_j = 85\text{ °C}$
 (5) $T_j = 25\text{ °C}$

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



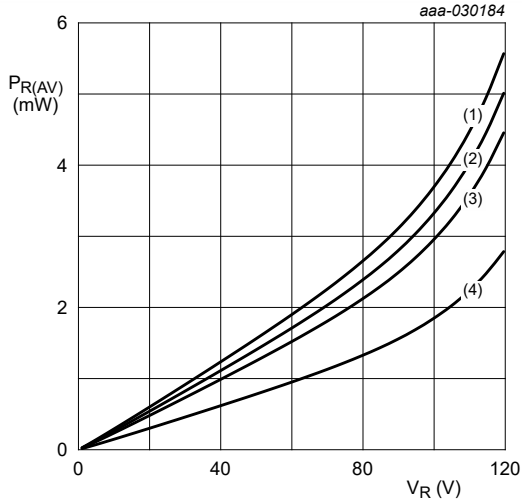
$f = 1\text{ MHz}$; $T_{amb} = 25\text{ °C}$

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



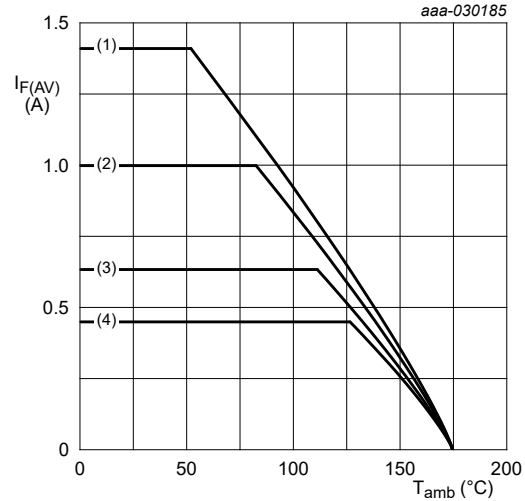
$T_j = 175\text{ °C}$
 (1) $\delta = 0.1$
 (2) $\delta = 0.2$
 (3) $\delta = 0.5$
 (4) $\delta = 1$; DC

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



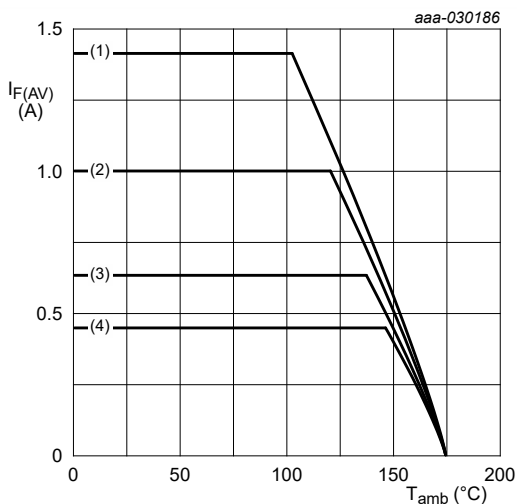
$T_j = 175\text{ }^\circ\text{C}$
 (1) $\delta = 1$; DC
 (2) $\delta = 0.9$
 (3) $\delta = 0.8$
 (4) $\delta = 0.5$

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



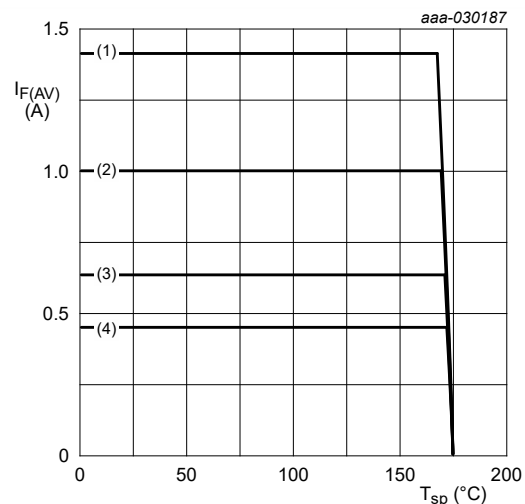
FR4 PCB, standard footprint
 $T_j = 175\text{ }^\circ\text{C}$
 (1) $\delta = 1$; DC
 (2) $\delta = 0.5$; $f = 20\text{ kHz}$
 (3) $\delta = 0.2$; $f = 20\text{ kHz}$
 (4) $\delta = 0.1$; $f = 20\text{ kHz}$

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



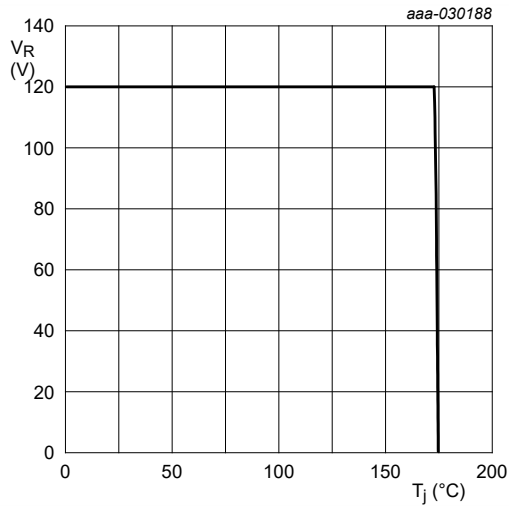
FR4 PCB, mounting pad for cathode 1 cm^2
 $T_j = 175\text{ }^\circ\text{C}$
 (1) $\delta = 1$; DC
 (2) $\delta = 0.5$; $f = 20\text{ kHz}$
 (3) $\delta = 0.2$; $f = 20\text{ kHz}$
 (4) $\delta = 0.1$; $f = 20\text{ kHz}$

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



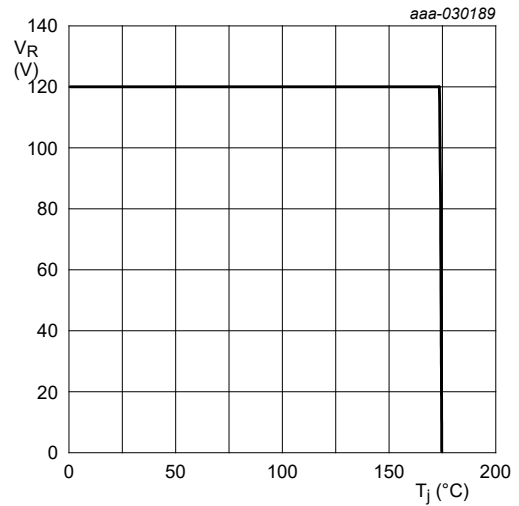
$T_j = 175\text{ }^\circ\text{C}$
 (1) $\delta = 1$; DC
 (2) $\delta = 0.5$; $f = 20\text{ kHz}$
 (3) $\delta = 0.2$; $f = 20\text{ kHz}$
 (4) $\delta = 0.1$; $f = 20\text{ kHz}$

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



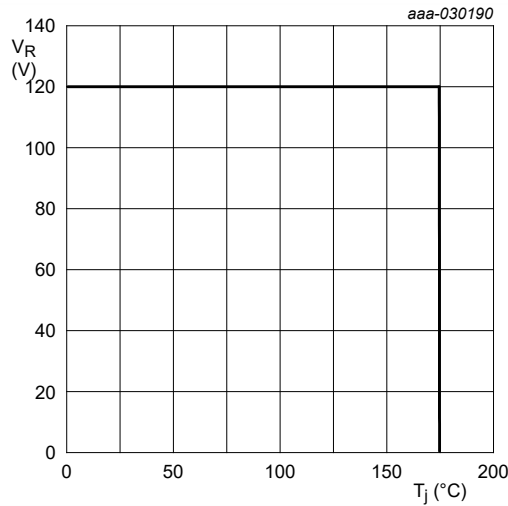
FR4 PCB, standard footprint
 $R_{th} = 220 \text{ K/W}$

Fig. 11. Derated maximum reverse voltage as a function of junction temperature; typical values



FR4 PCB, mounting pad for cathode 1 cm^2
 $R_{th} = 130 \text{ K/W}$

Fig. 12. Derated maximum reverse voltage as a function of junction temperature; typical values



Soldering point of cathode tab
 $R_{th} = 18 \text{ K/W}$

Fig. 13. Derated maximum reverse voltage as a function of junction temperature; typical values

11. Test information

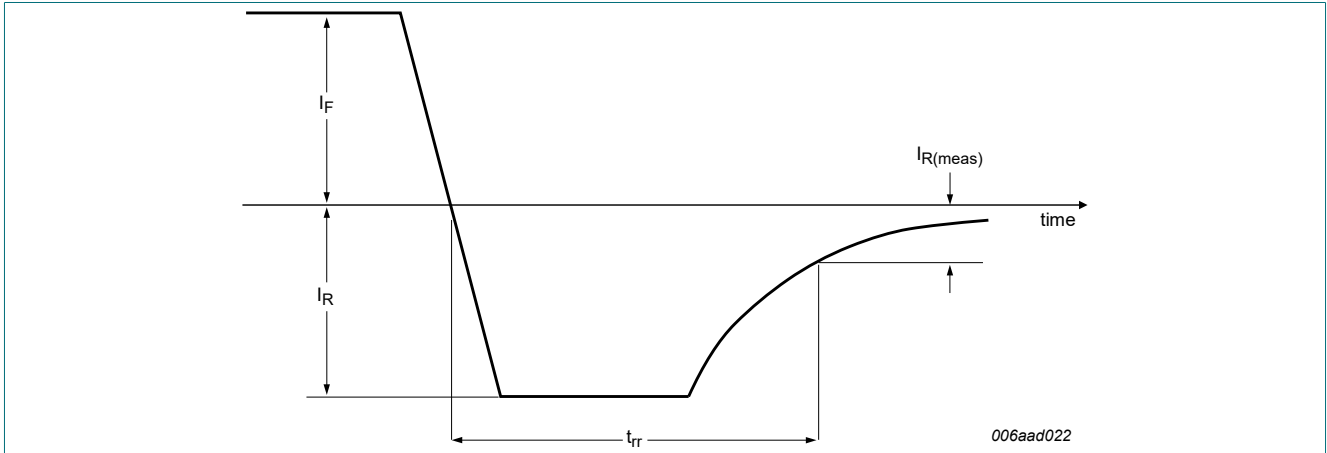


Fig. 14. Reverse recovery definition; step recovery

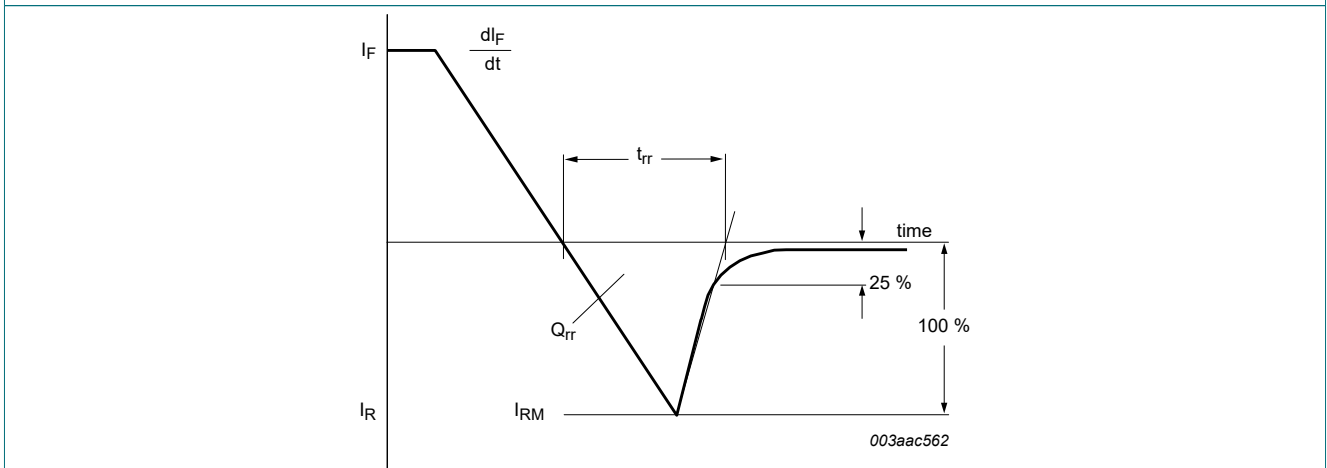


Fig. 15. Reverse recovery definition; ramp recovery

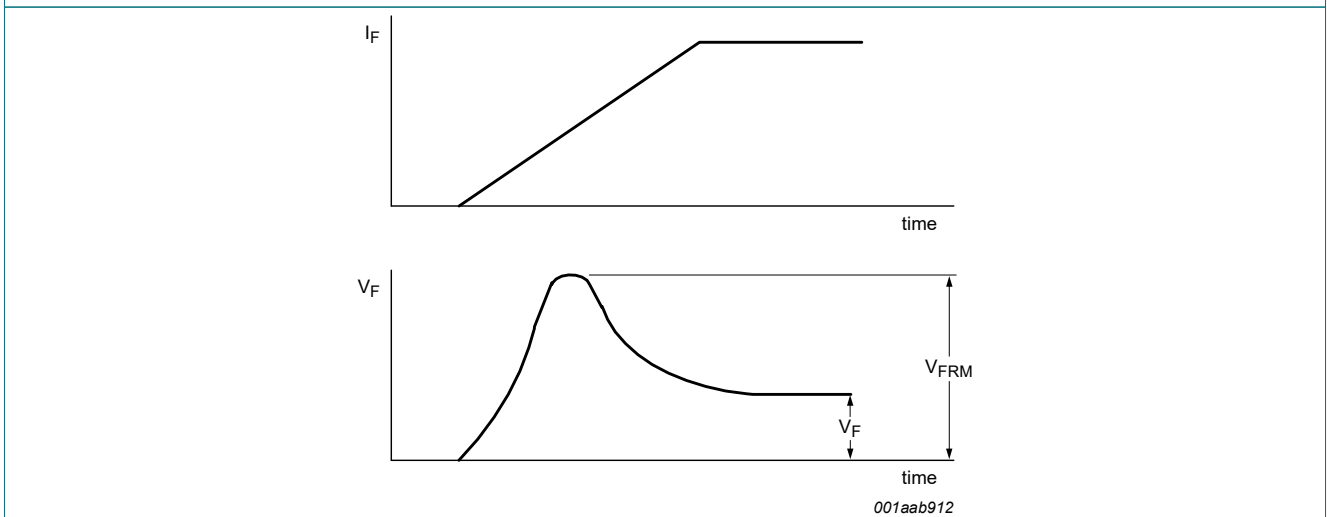


Fig. 16. Forward recovery definition

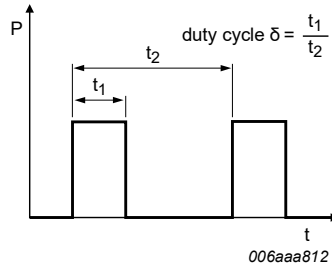


Fig. 17. Duty cycle definition

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

$$I_{RMS} = I_{F(AV)} \text{ at DC, and } I_{RMS} = I_M \times \sqrt{\delta}$$

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

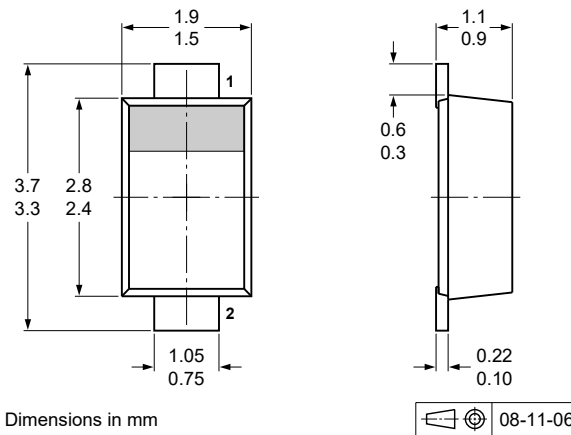


Fig. 18. Package outline CFP3 (SOD123W)

13. Soldering

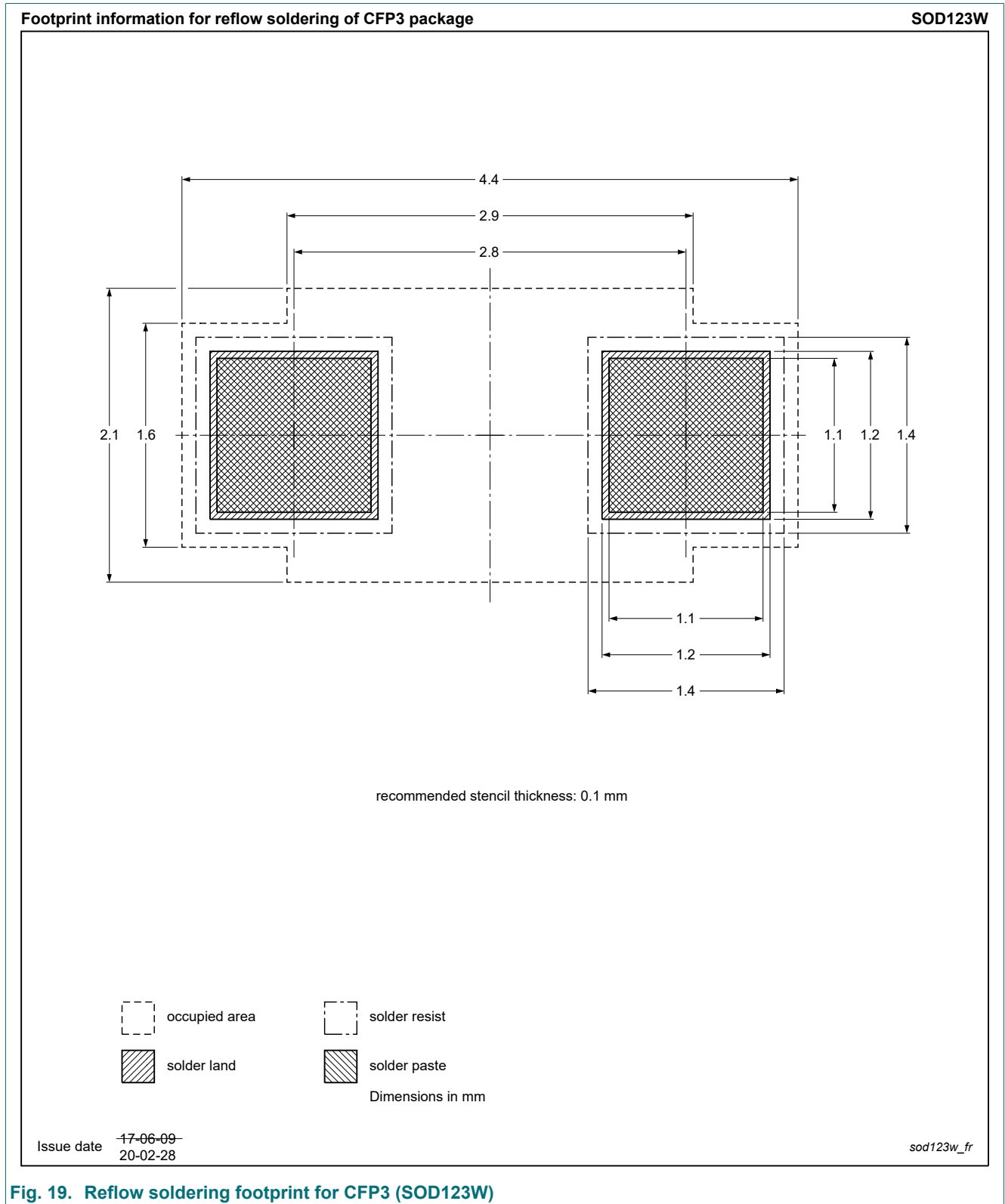


Fig. 19. Reflow soldering footprint for CFP3 (SOD123W)

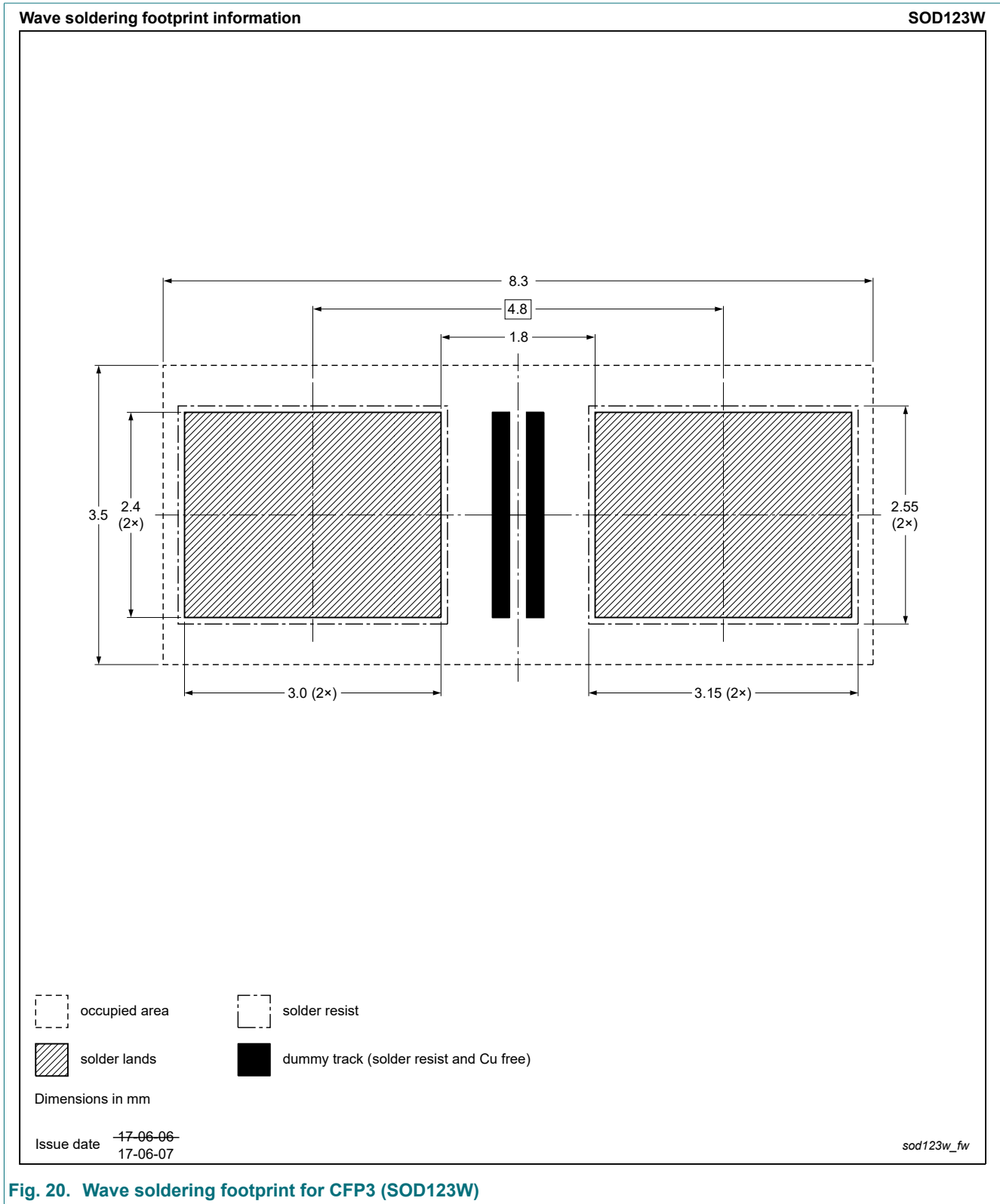


Fig. 20. Wave soldering footprint for CFP3 (SOD123W)

14. Mounting

This device is sensitive to Electro Static Discharge (ESD). Observe precautions for handling electrostatic sensitive devices. Such precautions are described in the ANSI/ESD S20.20, IEC/ST 61340-5, JESD625-A or equivalent standards.

15. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|-------------------|--------------------------|----------------------|---------------|------------|
| PMEG120G10ELR v.2 | 20200211 | Product data sheet | - | - |
| Modifications: | • Product status changed | | | |
| PMEG120G10ELR v.1 | 20180905 | Objective data sheet | | - |

16. 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".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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