



# PMEG150G20ELR-Q

150 V, 2 A Silicon Germanium (SiGe) rectifier

14 May 2021

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"><li>Low forward voltage and low <math>Q_{rr}</math></li><li>Extremely low leakage current</li><li>Thermal stability up to 175 °C junction temperature</li><li>Fast and smooth switching</li><li>Low parasitic capacitance</li><li>Qualified according to AEC-Q101 and recommended for use in automotive applications</li></ul> | <ul style="list-style-type: none"><li>Excellent efficiency</li><li>Extraordinary safe operating area</li><li>Minimal impact on Electro-Magnetic Compatibility (EMC) allowing simplified certification</li></ul> |

## 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

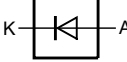
Table 1. Quick reference data

| Symbol      | Parameter               | Conditions                                                       |     | Min | Typ | Max | Unit |
|-------------|-------------------------|------------------------------------------------------------------|-----|-----|-----|-----|------|
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$ ; $f = 20$ kHz; square wave; $T_{sp} \leq 160$ °C |     | -   | -   | 2   | A    |
| $V_R$       | reverse voltage         | $T_j = 25$ °C                                                    |     | -   | -   | 150 | V    |
| $V_F$       | forward voltage         | $I_F = 2$ A; $T_j = 25$ °C; pulsed                               | [1] | -   | 780 | 850 | mV   |
| $I_R$       | reverse current         | $V_R = 150$ V; $T_j = 25$ °C; pulsed                             | [1] | -   | 0.4 | 30  | nA   |
|             |                         | $V_R = 150$ V; $T_j = 150$ °C; pulsed                            | [1] | -   | 30  | 300 | 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     | <br>CFP3 (SOD123W) | <br>006aab040 |
| 2   | A      | anode       |                                                                                                     |                                                                                                  |

## 6. Ordering information

Table 3. Ordering information

| Type number     | Package |                                                                            |         |
|-----------------|---------|----------------------------------------------------------------------------|---------|
|                 | Name    | Description                                                                | Version |
| PMEG150G20ELR-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 |
|-----------------|--------------|
| PMEG150G20ELR-Q | LH           |

## 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                     | $T_j = 25\text{ }^{\circ}\text{C}$                                                            |     | -   | 150  | 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 | $t_p = 8.3\text{ ms}$ ; half sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$     |     | -   | 70   | 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  $1\text{ cm}^2$ .

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] | -   | -   | 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 cm<sup>2</sup>.  
[3] Soldering point of cathode tab.

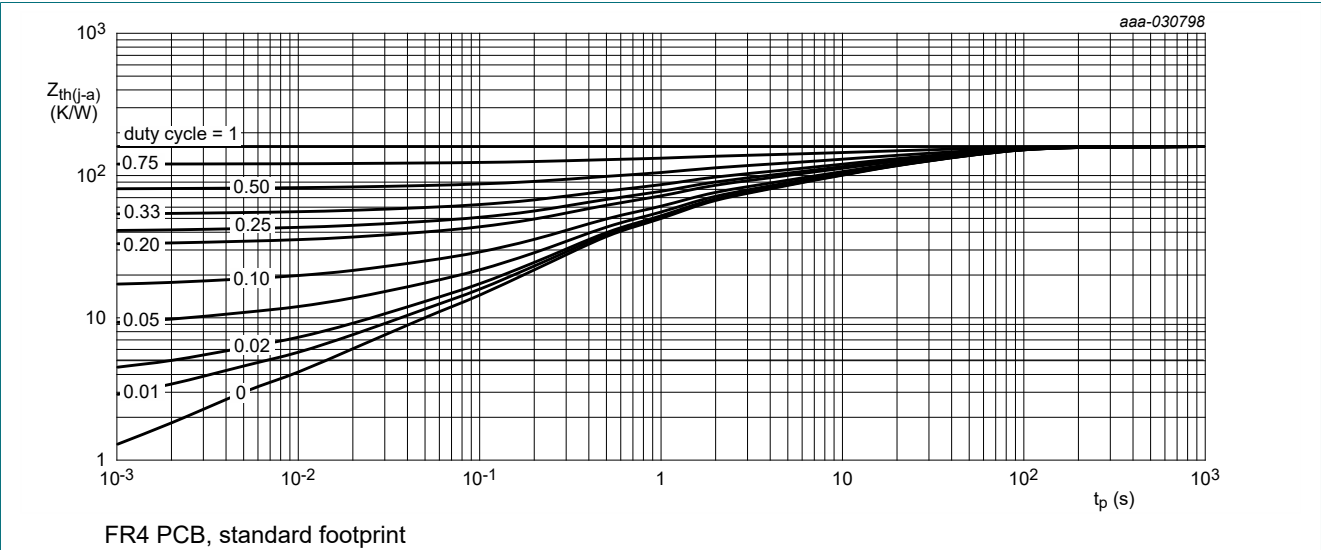


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

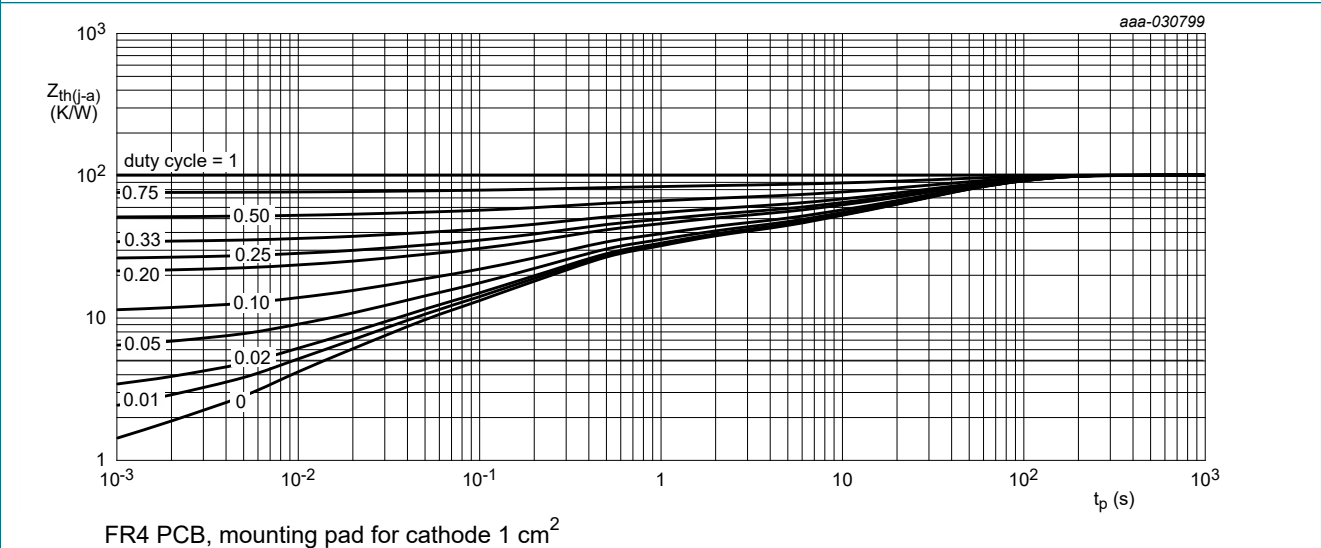


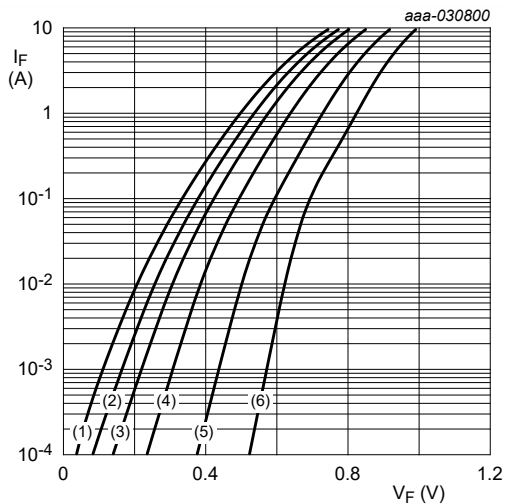
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

Table 7. Characteristics

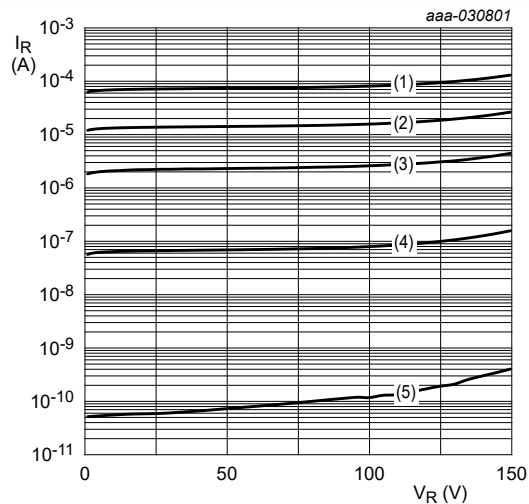
| Symbol      | Parameter                           | Conditions                                                                                                              |     | Min | Typ | Max | Unit          |
|-------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|-----|---------------|
| $V_{(BR)R}$ | reverse breakdown voltage           | $I_R = 1 \text{ mA}$ ; pulsed; $T_j = 25 \text{ }^\circ\text{C}$                                                        | [1] | 150 | -   | -   | V             |
| $V_F$       | forward voltage                     | $I_F = 0.1 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed                                                      | [1] | -   | 600 | 680 | mV            |
|             |                                     | $I_F = 0.5 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed                                                      | [1] | -   | 690 | 770 | mV            |
|             |                                     | $I_F = 1 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed                                                        | [1] | -   | 730 | 800 | mV            |
|             |                                     | $I_F = 2 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed                                                        | [1] | -   | 780 | 850 | mV            |
|             |                                     | $I_F = 2 \text{ A}$ ; $T_j = -40 \text{ }^\circ\text{C}$ ; pulsed                                                       | [1] | -   | 870 | 960 | mV            |
|             |                                     | $I_F = 2 \text{ A}$ ; $T_j = 125 \text{ }^\circ\text{C}$ ; pulsed                                                       | [1] | -   | 640 | 740 | mV            |
| $I_R$       | reverse current                     | $V_R = 150 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed                                                      | [1] | -   | 0.4 | 30  | nA            |
|             |                                     | $V_R = 150 \text{ V}$ ; $T_j = 125 \text{ }^\circ\text{C}$ ; pulsed                                                     | [1] | -   | 5   | 50  | $\mu\text{A}$ |
|             |                                     | $V_R = 150 \text{ V}$ ; $T_j = 150 \text{ }^\circ\text{C}$ ; pulsed                                                     | [1] | -   | 30  | 300 | $\mu\text{A}$ |
| $C_d$       | diode capacitance                   | $V_R = 1 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ\text{C}$                                           |     | -   | 70  | -   | pF            |
|             |                                     | $V_R = 10 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ\text{C}$                                          |     | -   | 28  | -   | pF            |
| $t_{rr}$    | reverse recovery time step recovery | $I_F = 0.5 \text{ A}$ ; $I_R = 1 \text{ A}$ ; $I_{R(\text{meas})} = 0.25 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ |     | -   | 8   | -   | ns            |
|             | reverse recovery time ramp recovery | $di_F/dt = 100 \text{ A}/\mu\text{s}$ ; $I_F = 1 \text{ A}$ ; $V_R = 30 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$  |     | -   | 14  | -   | ns            |
| $I_{RM}$    | peak reverse recovery current       |                                                                                                                         |     | -   | 0.7 | -   | A             |
| $Q_{rr}$    | reverse recovery charge             |                                                                                                                         |     | -   | 7   | -   | nC            |
| $V_{FRM}$   | peak forward recovery voltage       | $I_F = 0.5 \text{ A}$ ; $di_F/dt = 20 \text{ A}/\mu\text{s}$ ; $T_j = 25 \text{ }^\circ\text{C}$                        |     | -   | 715 | -   | mV            |

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



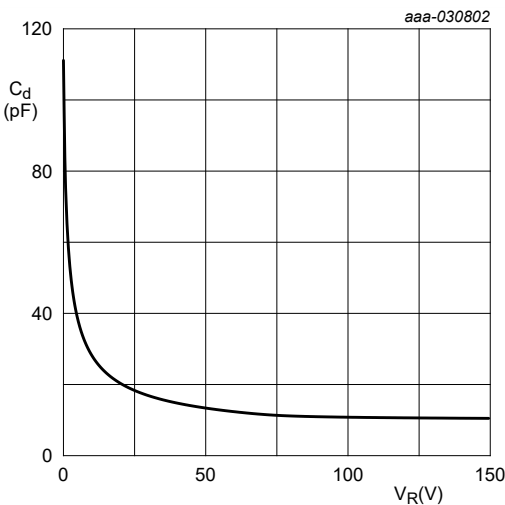
pulsed condition  
(1)  $T_j = 175^\circ\text{C}$   
(2)  $T_j = 150^\circ\text{C}$   
(3)  $T_j = 125^\circ\text{C}$   
(4)  $T_j = 85^\circ\text{C}$   
(5)  $T_j = 25^\circ\text{C}$   
(6)  $T_j = -40^\circ\text{C}$

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



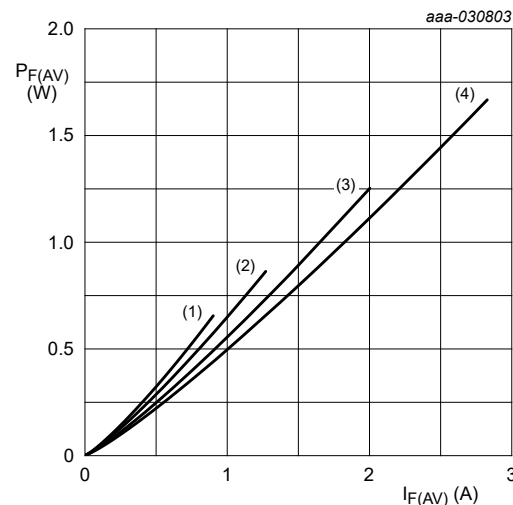
pulsed condition  
(1)  $T_j = 175^\circ\text{C}$   
(2)  $T_j = 150^\circ\text{C}$   
(3)  $T_j = 125^\circ\text{C}$   
(4)  $T_j = 85^\circ\text{C}$   
(5)  $T_j = 25^\circ\text{C}$

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



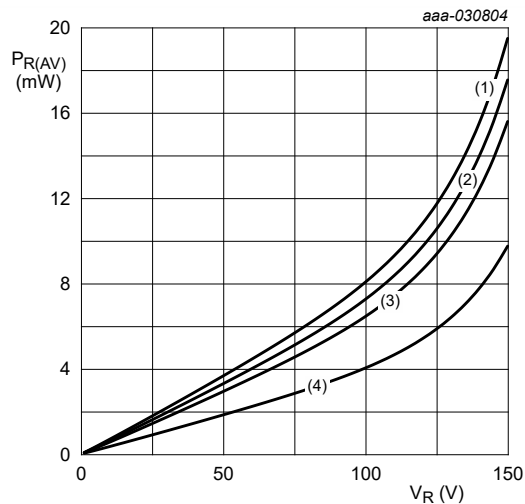
$f = 1\text{ MHz}$ ;  $T_{\text{amb}} = 25^\circ\text{C}$

Fig. 5. 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)  $\delta = 1$ ; DC

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



$T_j = 175\text{ °C}$

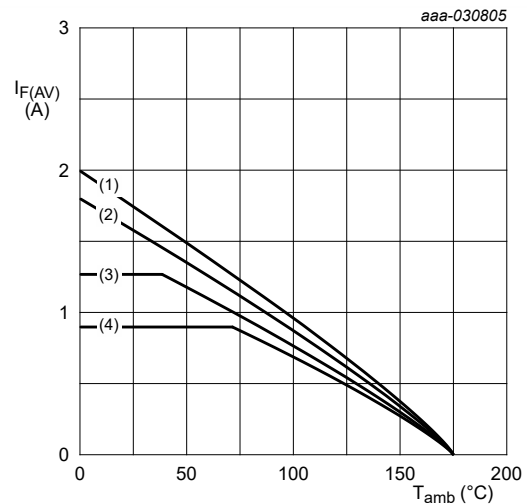
(1)  $\delta = 1$ ; DC

(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

$T_j = 175\text{ °C}$

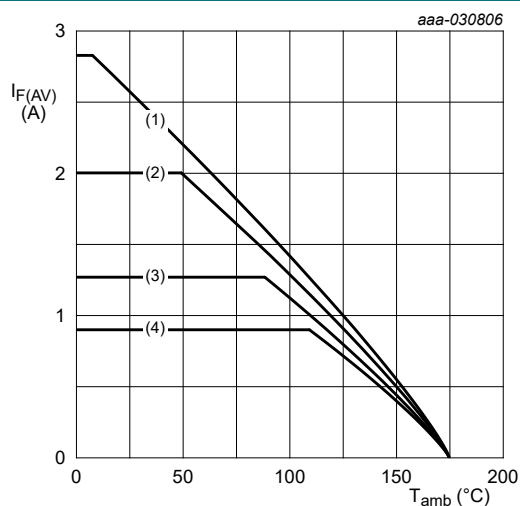
(1)  $\delta = 1$ ; DC

(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  $1\text{ cm}^2$

$T_j = 175\text{ °C}$

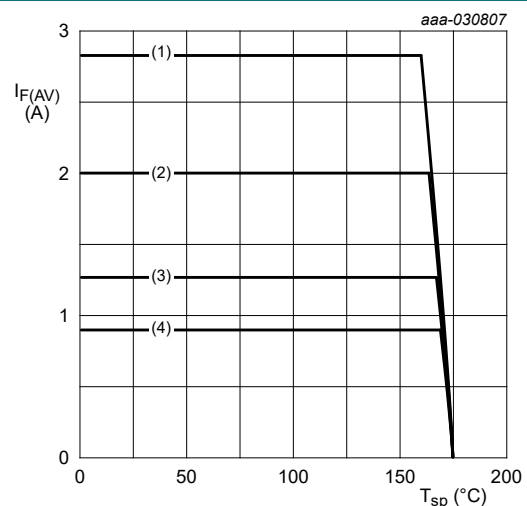
(1)  $\delta = 1$ ; DC

(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



$T_j = 175\text{ °C}$

(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

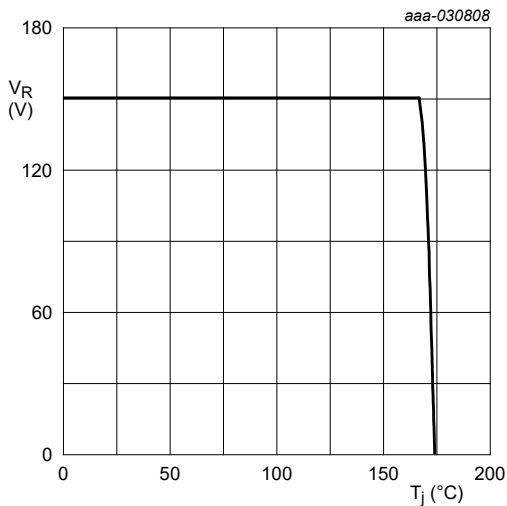


Fig. 11. Derated maximum reverse voltage as a function of junction temperature; typical values

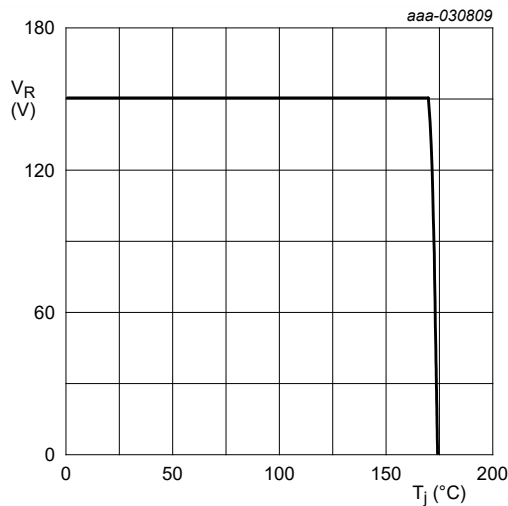


Fig. 12. Derated maximum reverse voltage as a function of junction temperature; typical values

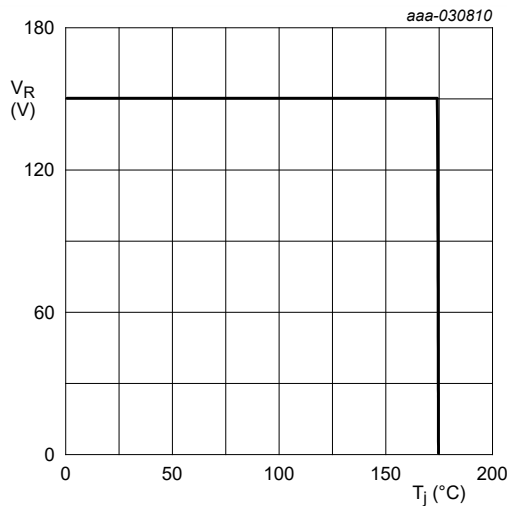


Fig. 13. Derated maximum reverse voltage as a function of junction temperature; typical values

11. Test information

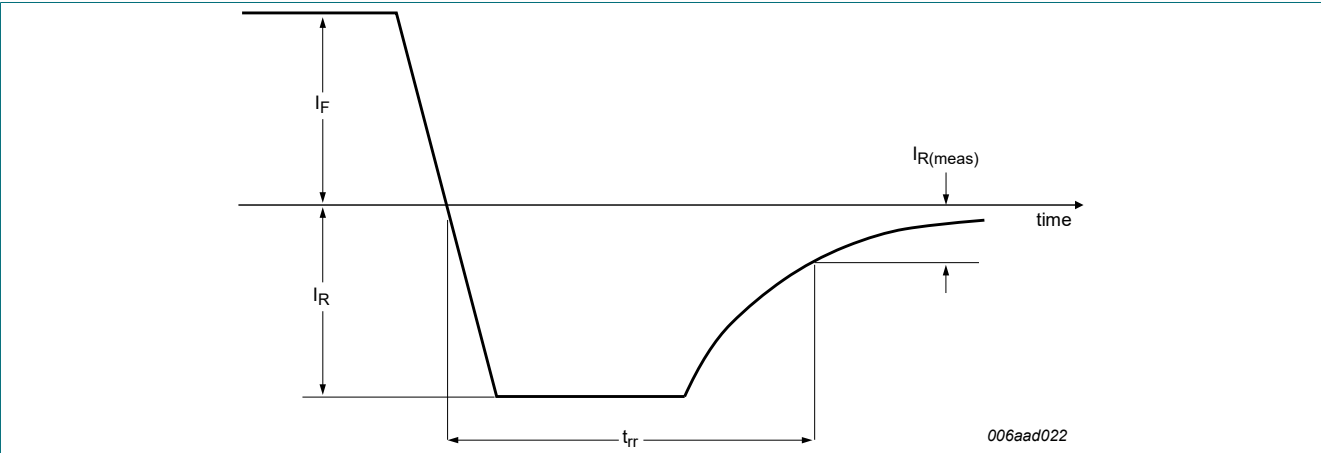


Fig. 14. Reverse recovery definition; step recovery

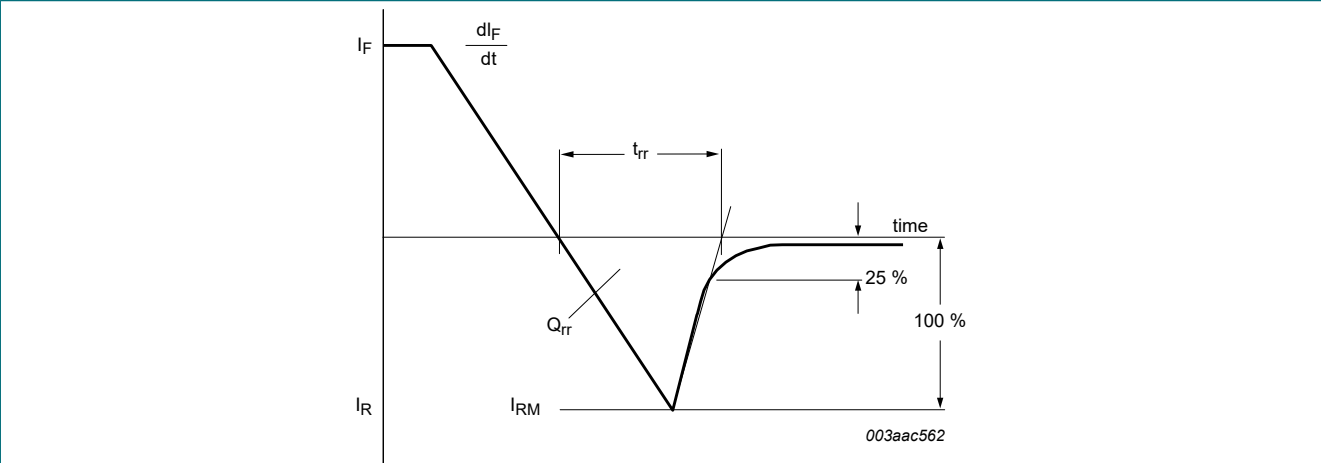


Fig. 15. Reverse recovery definition; ramp recovery

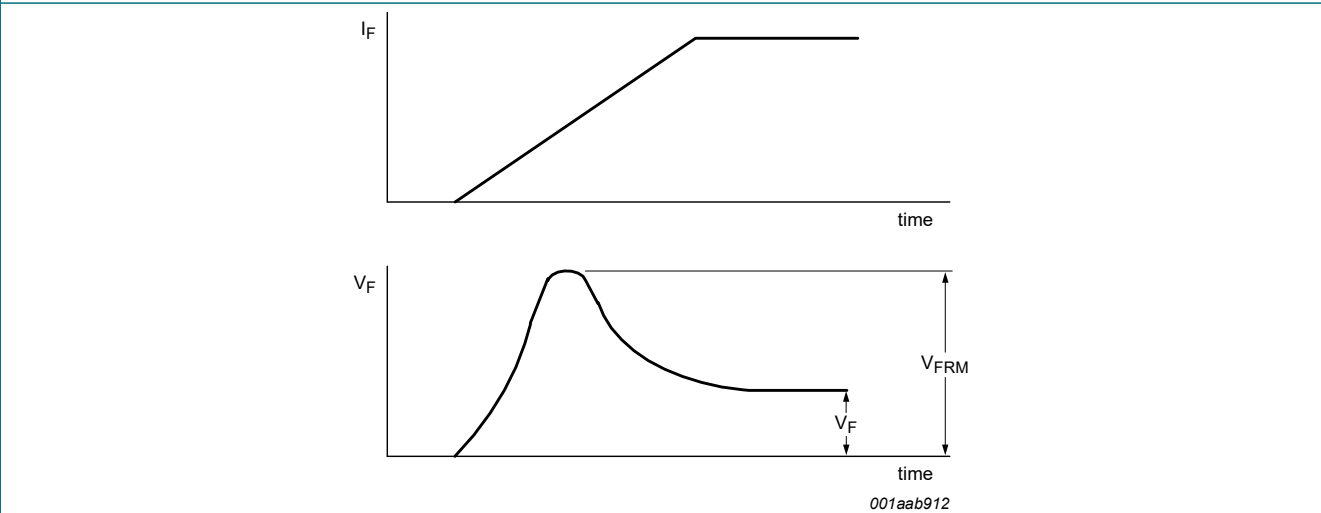
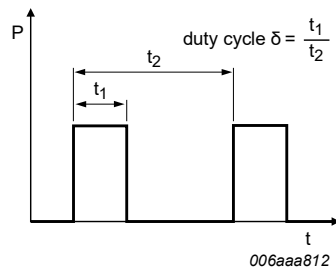


Fig. 16. Forward recovery definition





**Fig. 17. Duty cycle definition**

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

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

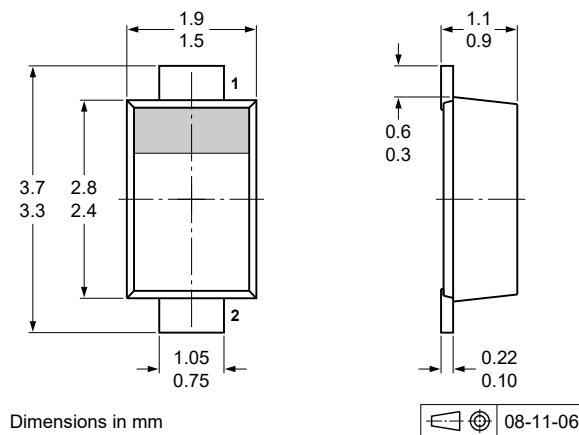
$$I_{RMS} = I_{F(AV)} \text{ at DC, and } I_{RMS} = I_M \times \sqrt{\delta}$$

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

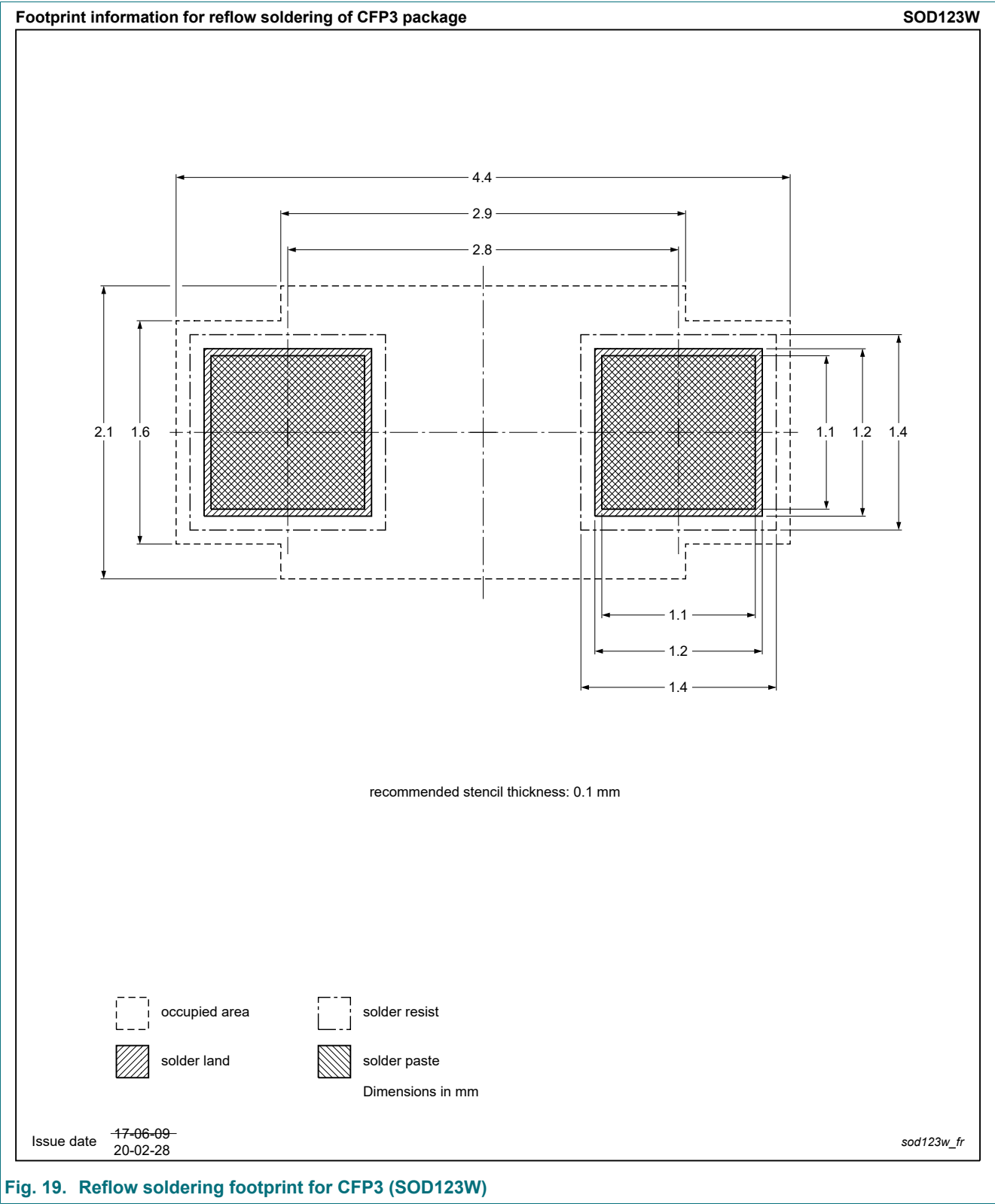


Fig. 19. Reflow soldering footprint for CFP3 (SOD123W)

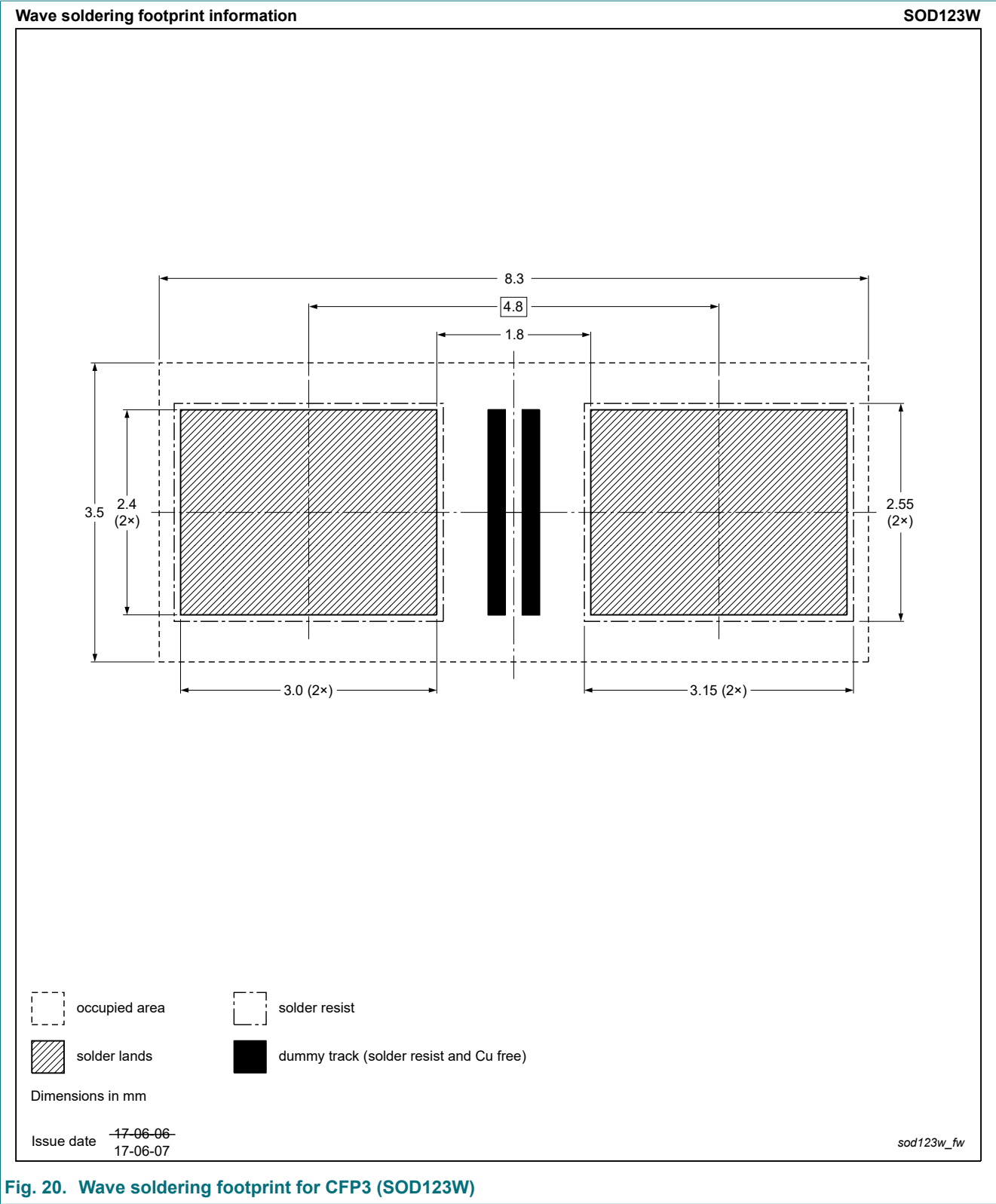


Fig. 20. Wave soldering footprint for CFP3 (SOD123W)

## 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             |
|------------------------|---------------------------------------------------------------------------|--------------------|---------------|------------------------|
| PMEG150G20ELR-Q<br>v.2 | 20210514                                                                  | Product data sheet | -             | PMEG150G20ELR-Q<br>v.1 |
| Modifications:         | • Features and benefits: added recommendation for automotive applications |                    |               |                        |
| PMEG150G20ELR-Q<br>v.1 | 20210210                                                                  | Product data sheet | -             | -                      |

## 16. 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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Date of release: 14 May 2021

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