



# PMEG120G20ELR-Q

120 V, 2 A Silicon Germanium (SiGe) rectifier

12 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


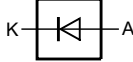
Table 1. Quick reference data

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		-	-	120	V
$V_F$	forward voltage	$I_F = 2$ A; $T_j = 25$ °C; pulsed	[1]	-	770	840	mV
$I_R$	reverse current	$V_R = 120$ V; $T_j = 25$ °C; pulsed	[1]	-	0.3	30	nA
		$V_R = 120$ V; $T_j = 150$ °C; pulsed	[1]	-	20	200	$\mu$ 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	 CFP3 (SOD123W)	 006aab040
2	A	anode		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMEG120G20ELR-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
PMEG120G20ELR-Q	L,F

## 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	$\delta = 1; T_{sp} \leq 155\text{ °C}$		-	2.8	A
$I_{F(AV)}$	average forward current	$\delta = 0.5; f = 20\text{ kHz};$ square wave; $T_{sp} \leq 160\text{ °C}$		-	2	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 8.3\text{ ms};$ half sine wave; $T_{j(init)} = 25\text{ °C}$		-	70	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  $1\text{ cm}^2$ .

## 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.

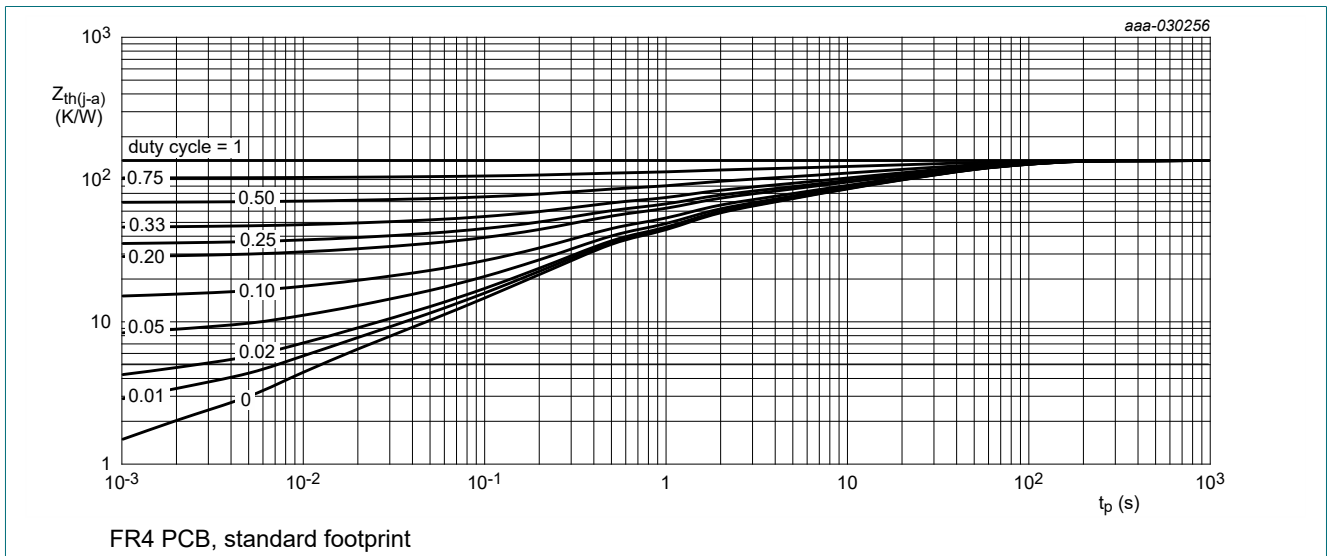


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

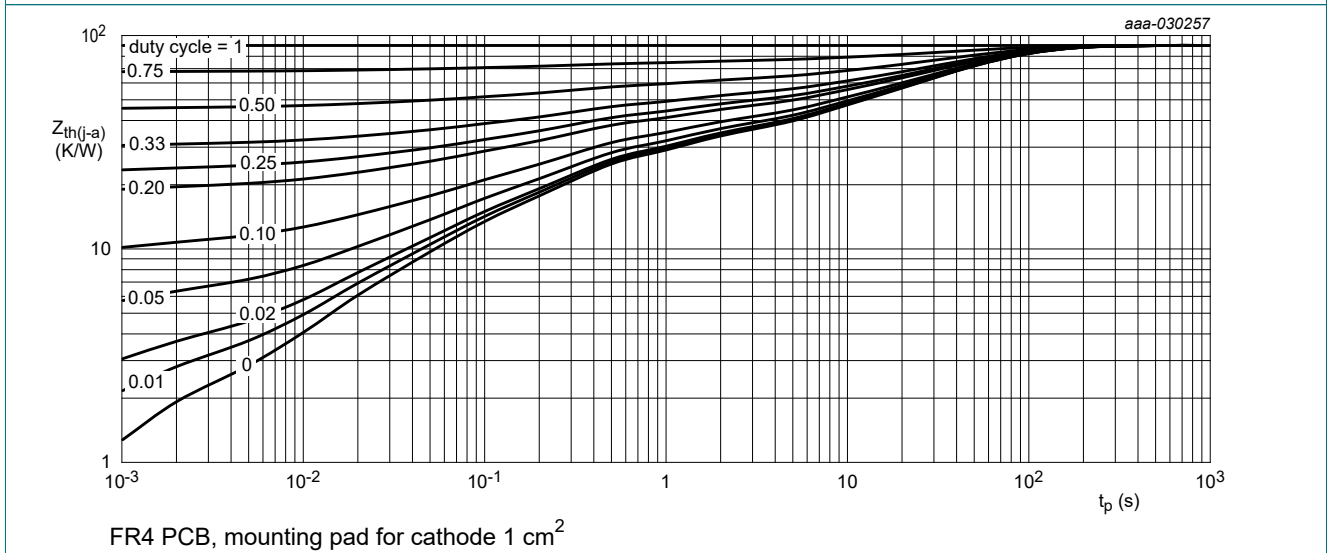


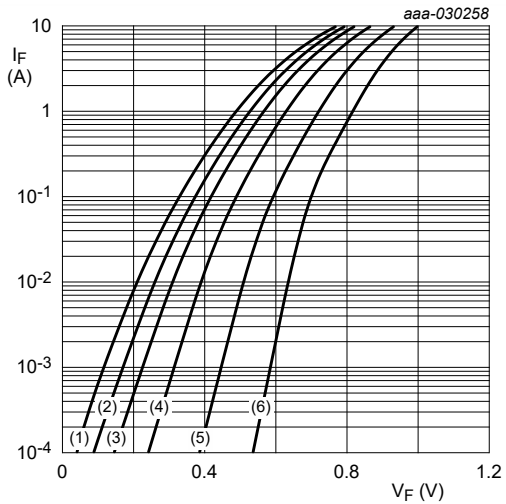
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

Table 7. Characteristics

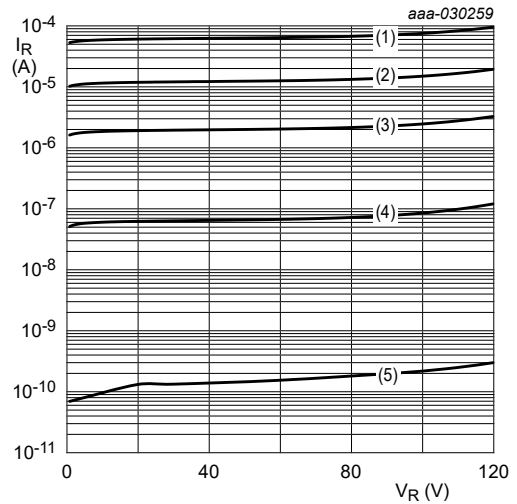
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)R}$	reverse breakdown voltage	$I_R = 1 \text{ mA}$ ; pulsed; $T_j = 25 \text{ }^\circ\text{C}$	[1]	120	-	-	V
$V_F$	forward voltage	$I_F = 0.1 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	590	670	mV
		$I_F = 0.5 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	680	760	mV
		$I_F = 1 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	720	800	mV
		$I_F = 2 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	770	840	mV
		$I_F = 2 \text{ A}$ ; $T_j = -40 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	860	950	mV
		$I_F = 2 \text{ A}$ ; $T_j = 125 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	620	720	mV
$I_R$	reverse current	$V_R = 120 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	0.3	30	nA
		$V_R = 120 \text{ V}$ ; $T_j = 125 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	3.5	40	$\mu\text{A}$
		$V_R = 120 \text{ V}$ ; $T_j = 150 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	20	200	$\mu\text{A}$
$C_d$	diode capacitance	$V_R = 1 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	75	-	pF
		$V_R = 10 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	30	-	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	$di_F/dt = 100 \text{ A}/\mu\text{s}$ ; $I_F = 1 \text{ A}$ ; $V_R = 30 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	11	-	ns
$I_{RM}$	peak reverse recovery current			-	0.7	-	A
$Q_{rr}$	reverse recovery charge			-	5	-	nC
$V_{FRM}$	peak forward recovery voltage	$I_F = 0.5 \text{ A}$ ; $di_F/dt = 20 \text{ A}/\mu\text{s}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	685	-	mV

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



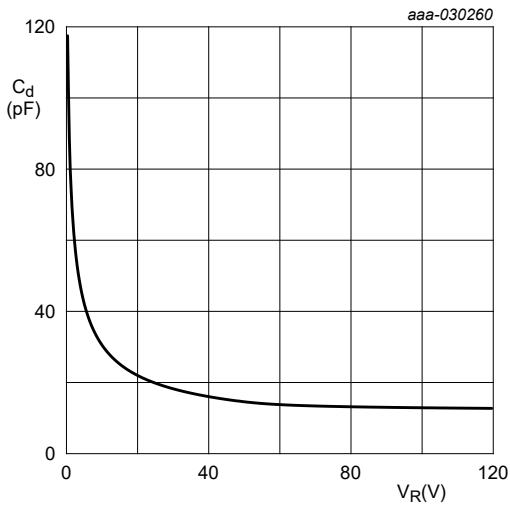
pulsed condition  
 (1)  $T_j = 175\text{ °C}$   
 (2)  $T_j = 150\text{ °C}$   
 (3)  $T_j = 125\text{ °C}$   
 (4)  $T_j = 85\text{ °C}$   
 (5)  $T_j = 25\text{ °C}$   
 (6)  $T_j = -40\text{ °C}$

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



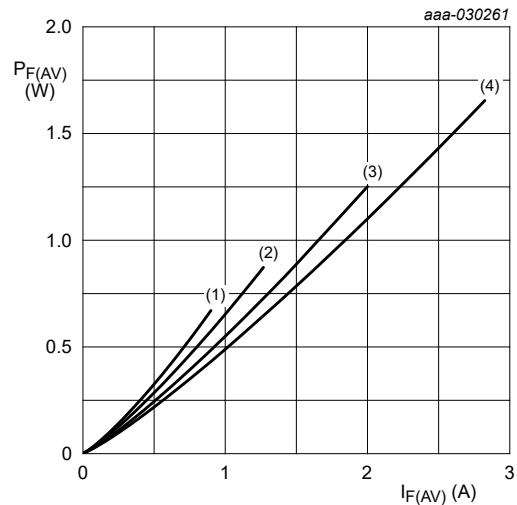
pulsed condition  
 (1)  $T_j = 175\text{ °C}$   
 (2)  $T_j = 150\text{ °C}$   
 (3)  $T_j = 125\text{ °C}$   
 (4)  $T_j = 85\text{ °C}$   
 (5)  $T_j = 25\text{ °C}$

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



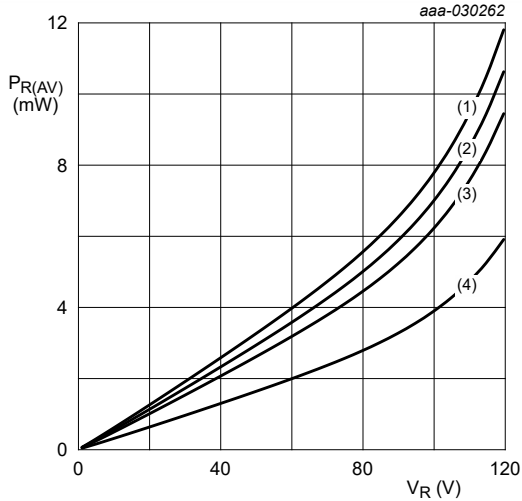
$f = 1\text{ MHz}; T_{amb} = 25\text{ °C}$

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



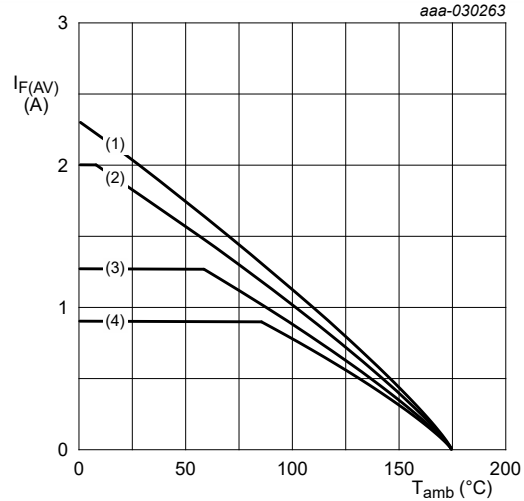
$T_j = 175\text{ °C}$   
 (1)  $\delta = 0.1$   
 (2)  $\delta = 0.2$   
 (3)  $\delta = 0.5$   
 (4)  $\delta = 1; \text{DC}$

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



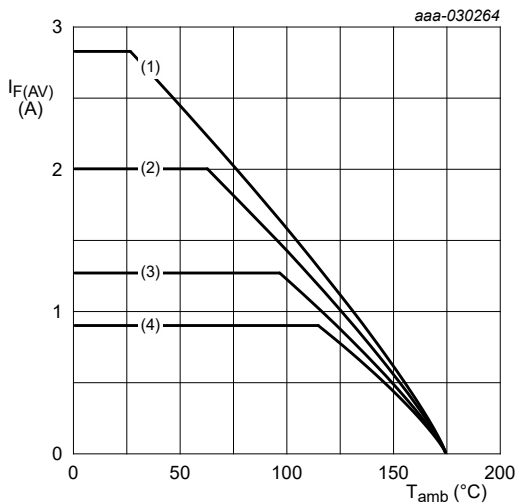
$T_j = 175\text{ }^\circ\text{C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.9$   
 (3)  $\delta = 0.8$   
 (4)  $\delta = 0.5$

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



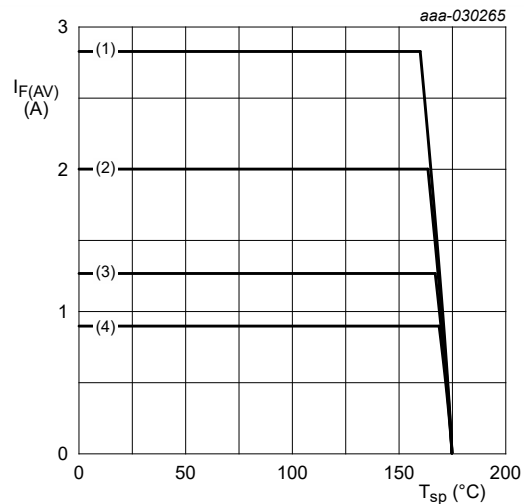
FR4 PCB, standard footprint  
 $T_j = 175\text{ }^\circ\text{C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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



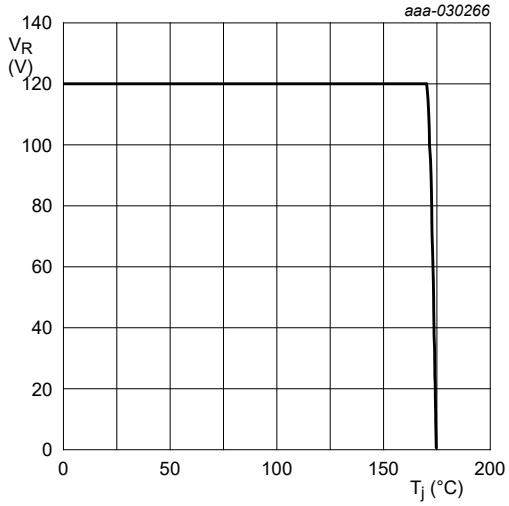
FR4 PCB, mounting pad for cathode  $1\text{ cm}^2$   
 $T_j = 175\text{ }^\circ\text{C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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



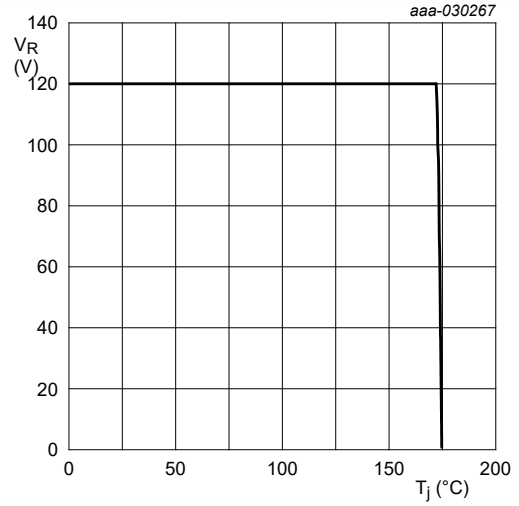
$T_j = 175\text{ }^\circ\text{C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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



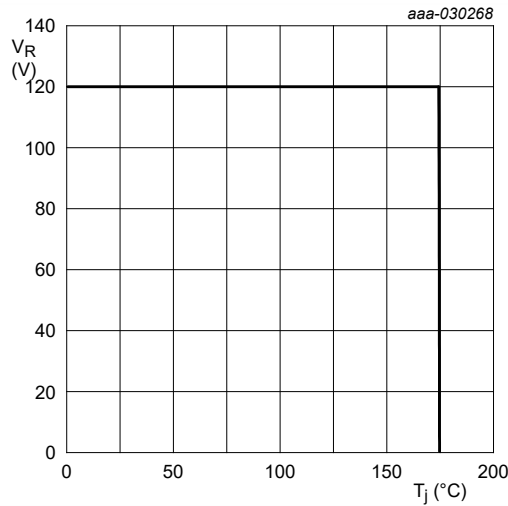
FR4 PCB, standard footprint  
 $R_{th} = 220 \text{ K/W}$

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



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

**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

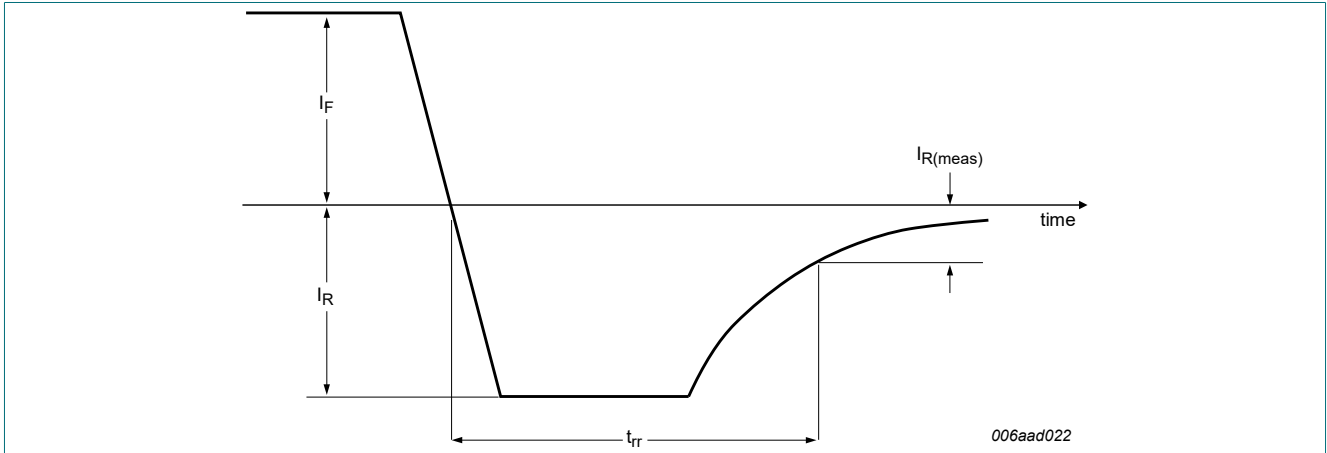


Fig. 14. Reverse recovery definition; step recovery

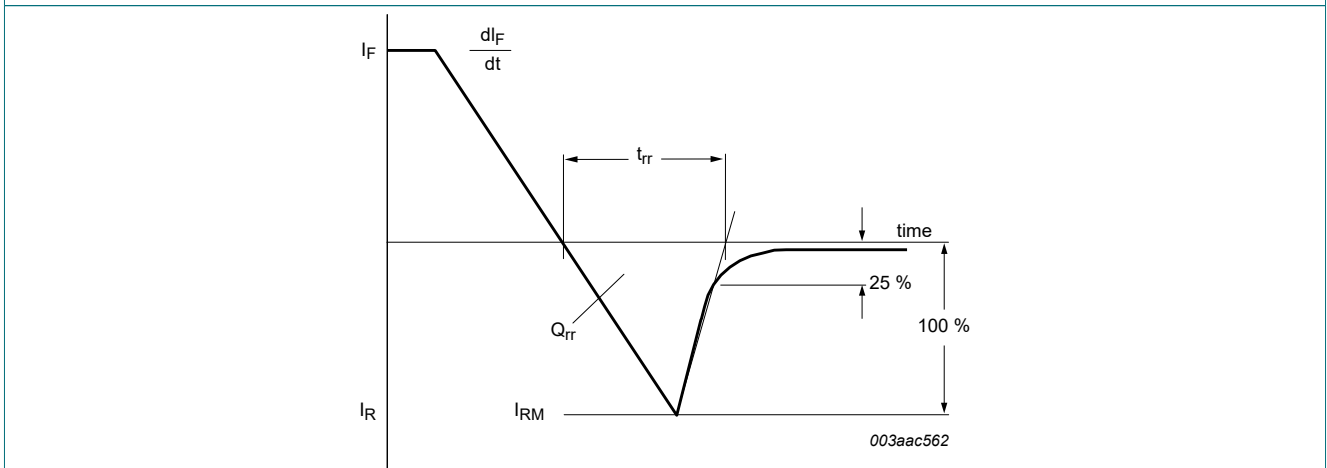


Fig. 15. Reverse recovery definition; ramp recovery

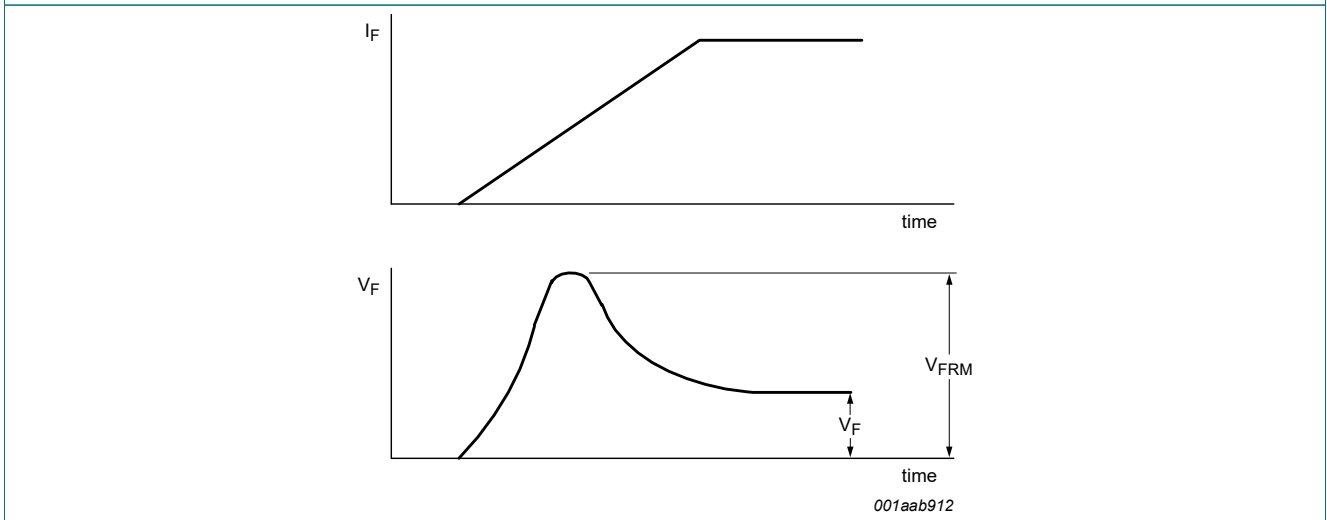


Fig. 16. Forward recovery definition

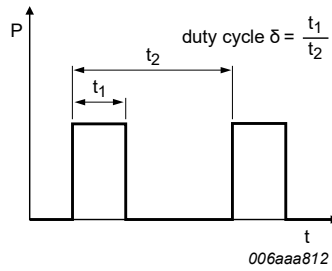


Fig. 17. Duty cycle definition

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

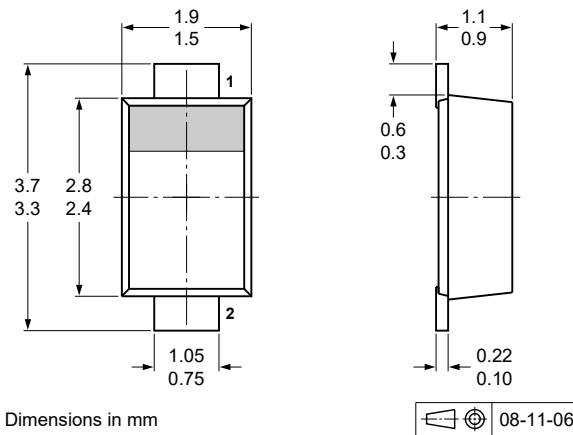
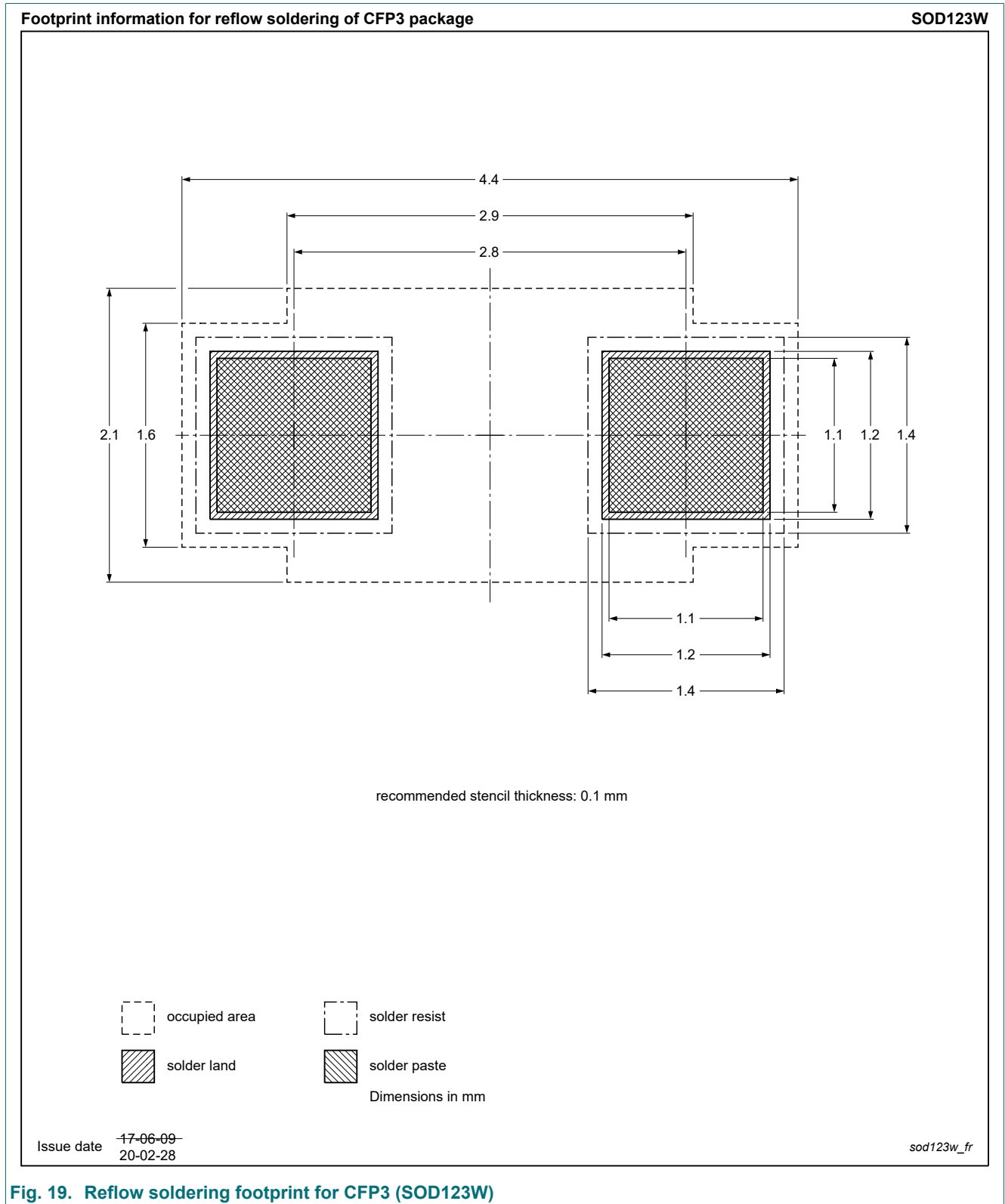
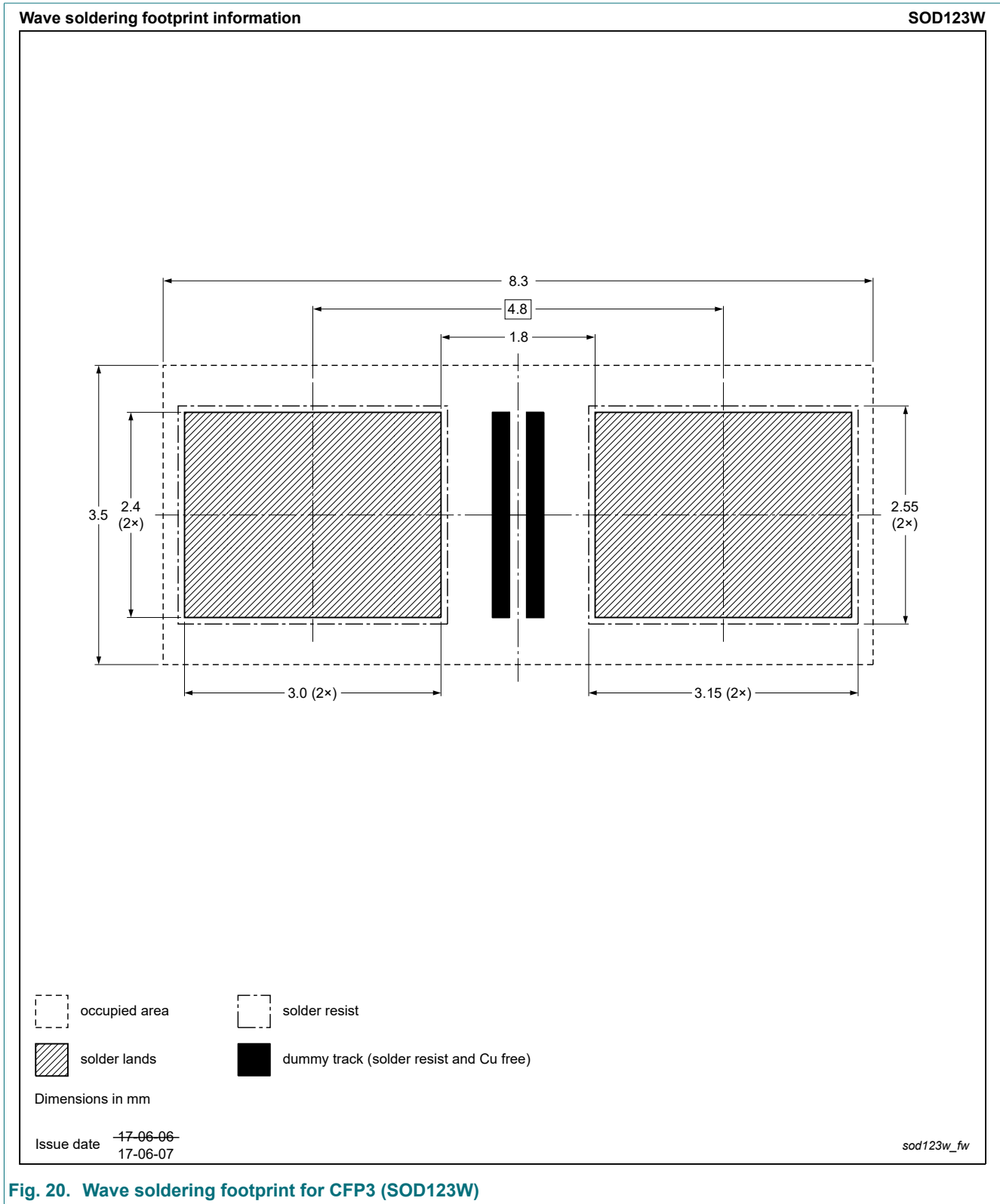


Fig. 18. Package outline CFP3 (SOD123W)

### 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
PMEG120G20ELR-Q v.2	20210512	Product data sheet	-	PMEG120G20ELR-Q v.1
Modifications:	• Features and benefits: added recommendation for automotive applications			
PMEG120G20ELR-Q v.1	20210209	Product 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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For sales office addresses, please send an email to: [salesaddresses@nexperia.com](mailto:salesaddresses@nexperia.com)

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