



# PMEG120G30ELP-Q

120 V, 3 A Silicon Germanium (SiGe) rectifier

14 May 2021

Product data sheet

## 1. General description

Silicon Germanium (SiGe) rectifier encapsulated in a CFP5 (SOD128) 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


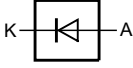
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; $f = 20$ kHz; square wave; $T_{sp} \leq 162$ °C		-	-	3	A
$V_R$	reverse voltage	$T_j = 25$ °C		-	-	120	V
$V_F$	forward voltage	$I_F = 3$ A; $T_j = 25$ °C; pulsed	[1]	-	770	840	mV
$I_R$	reverse current	$V_R = 120$ V; $T_j = 25$ °C; pulsed	[1]	-	0.5	30	nA
		$V_R = 120$ V; $T_j = 150$ °C; pulsed	[1]	-	30	300	$\mu$ 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	 CFP5 (SOD128)	 006aab040
2	A	anode		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMEG120G30ELP-Q	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
PMEG120G30ELP-Q	E9

## 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	$\delta = 1; T_{sp} \leq 158\text{ °C}$		-	4.2	A
$I_{F(AV)}$	average forward current	$\delta = 0.5; f = 20\text{ kHz};$ square wave; $T_{sp} \leq 162\text{ °C}$		-	3	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 8.3\text{ ms};$ half sine wave; $T_{j(\text{init})} = 25\text{ °C}$		-	85	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1]	-	0.75	W
			[2]	-	1.2	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<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]	-	-	200	K/W
			[2]	-	-	120	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[3]	-	-	12	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.

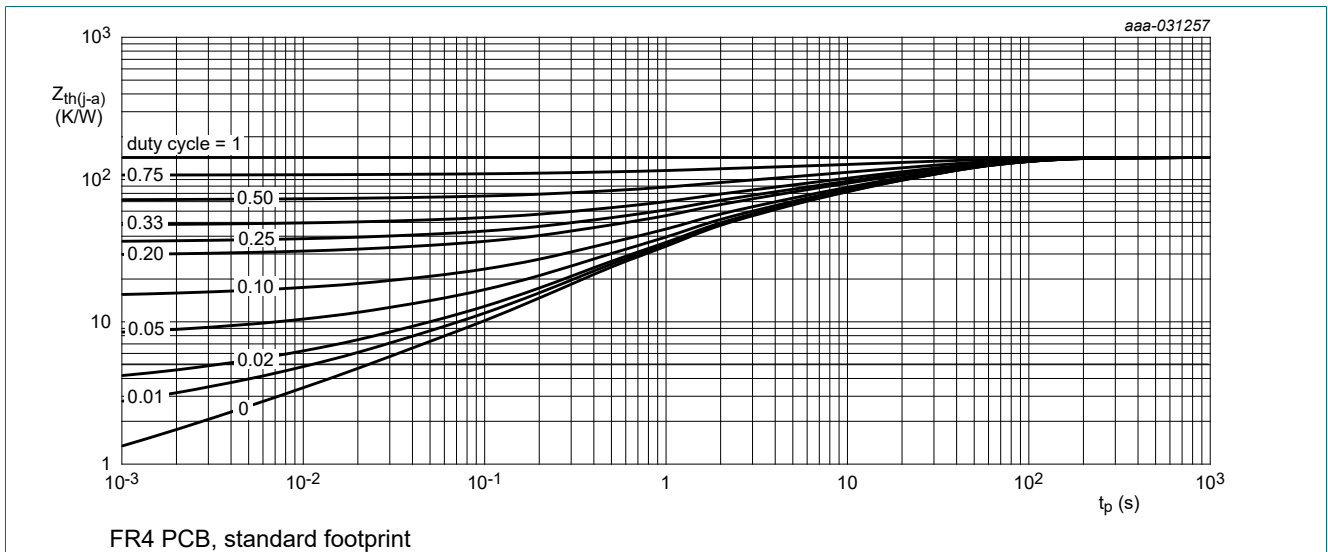


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

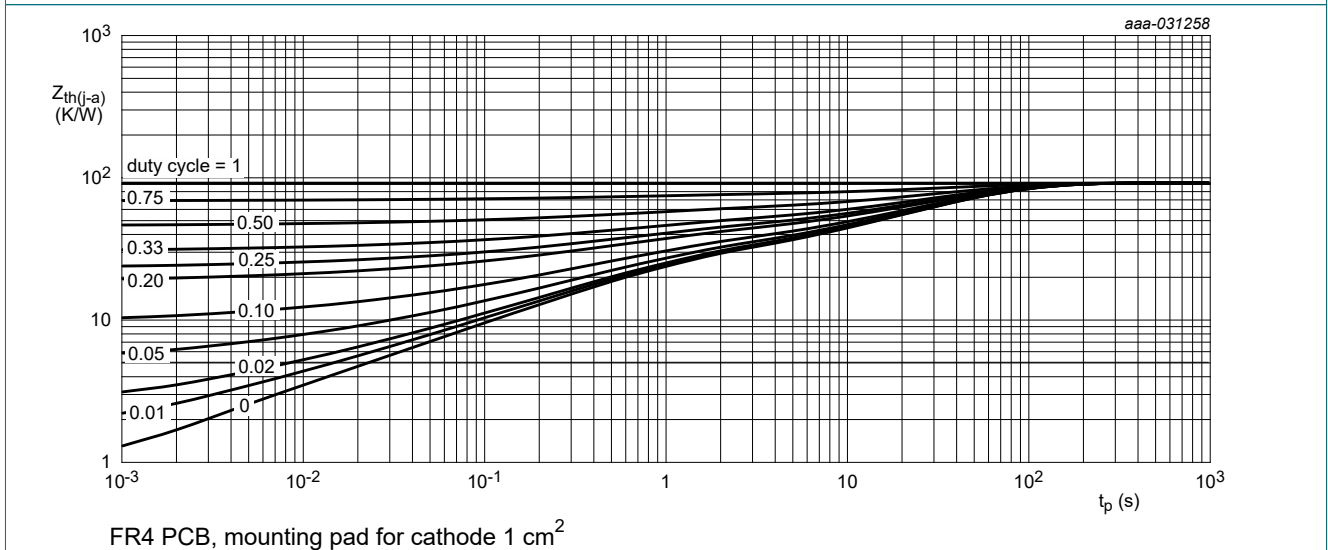


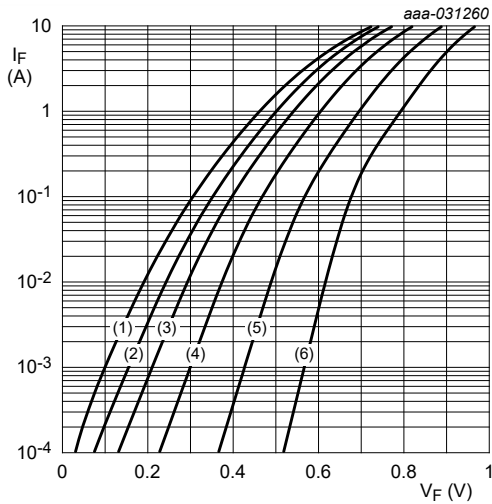
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

Table 7. Characteristics

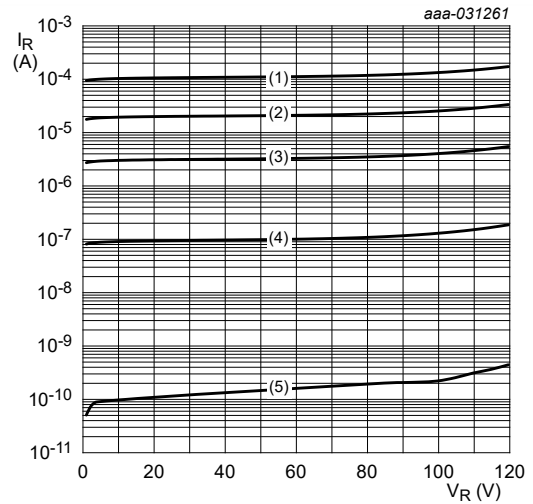
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)R}$	reverse breakdown voltage	$I_R = 1 \text{ mA}$ ; pulsed; $T_j = 25 \text{ }^\circ\text{C}$	[1]	120	-	-	V
$V_F$	forward voltage	$I_F = 0.1 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	570	660	mV
		$I_F = 0.5 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	655	740	mV
		$I_F = 1 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	700	780	mV
		$I_F = 2 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	745	820	mV
		$I_F = 3 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	770	840	mV
		$I_F = 3 \text{ A}$ ; $T_j = -40 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	860	950	mV
		$I_F = 3 \text{ A}$ ; $T_j = 125 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	630	730	mV
$I_R$	reverse current	$V_R = 120 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	0.5	30	nA
		$V_R = 120 \text{ V}$ ; $T_j = 125 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	5	60	$\mu\text{A}$
		$V_R = 120 \text{ V}$ ; $T_j = 150 \text{ }^\circ\text{C}$ ; pulsed	[1]	-	30	300	$\mu\text{A}$
$C_d$	diode capacitance	$V_R = 1 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	103	-	pF
		$V_R = 10 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	41	-	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			-	0.6	-	A
$Q_{rr}$	reverse recovery charge			-	4	-	nC
$V_{FRM}$	peak forward recovery voltage	$I_F = 0.5 \text{ A}$ ; $dI_F/dt = 20 \text{ A}/\mu\text{s}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	650	-	mV

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



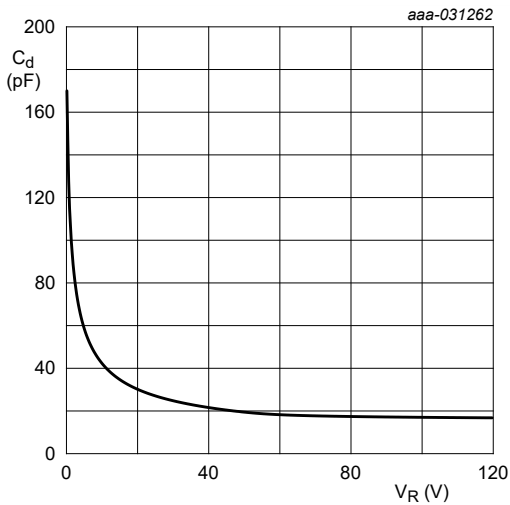
pulsed condition  
 (1)  $T_j = 175\text{ °C}$   
 (2)  $T_j = 150\text{ °C}$   
 (3)  $T_j = 125\text{ °C}$   
 (4)  $T_j = 85\text{ °C}$   
 (5)  $T_j = 25\text{ °C}$   
 (6)  $T_j = -40\text{ °C}$

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



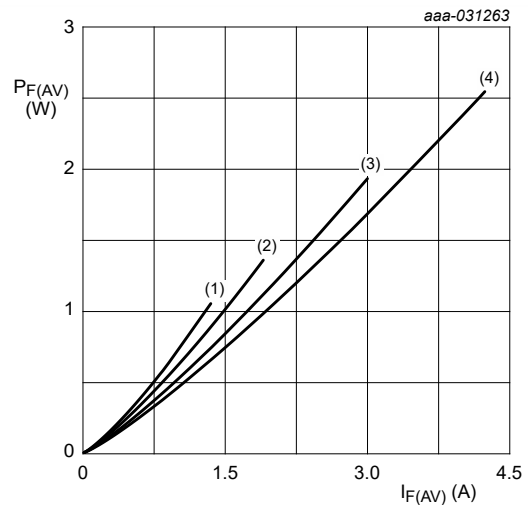
pulsed condition  
 (1)  $T_j = 175\text{ °C}$   
 (2)  $T_j = 150\text{ °C}$   
 (3)  $T_j = 125\text{ °C}$   
 (4)  $T_j = 85\text{ °C}$   
 (5)  $T_j = 25\text{ °C}$

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



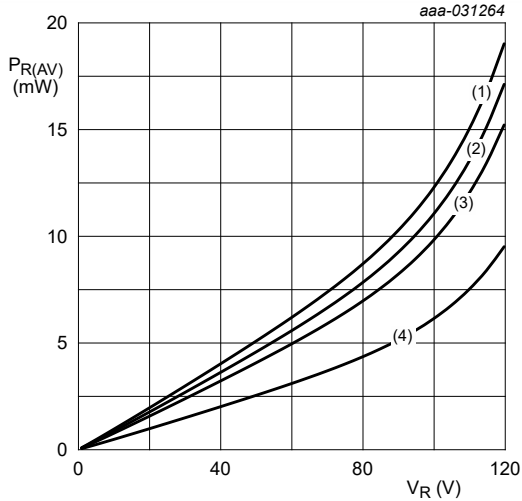
$f = 1\text{ MHz}; T_{amb} = 25\text{ °C}$

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



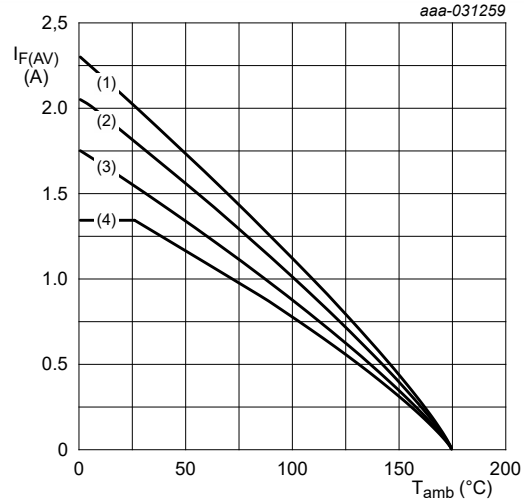
$T_j = 175\text{ °C}$   
 (1)  $\delta = 0.1$   
 (2)  $\delta = 0.2$   
 (3)  $\delta = 0.5$   
 (4)  $\delta = 1; \text{DC}$

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



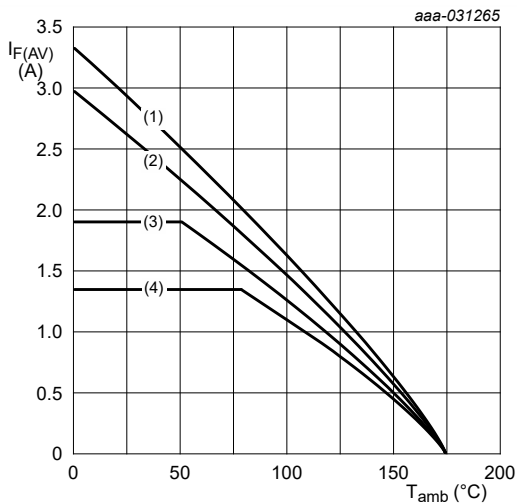
$T_j = 175\text{ }^\circ\text{C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.9$   
 (3)  $\delta = 0.8$   
 (4)  $\delta = 0.5$

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



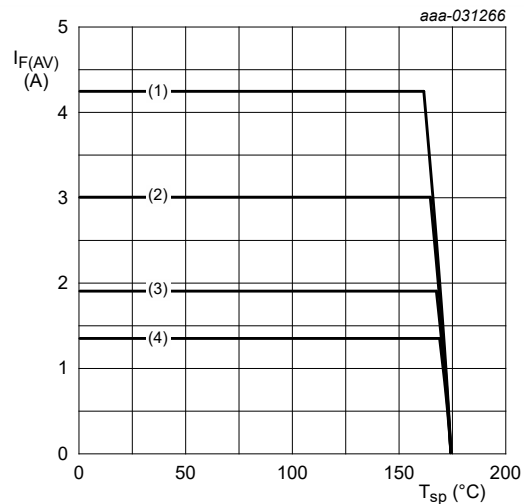
FR4 PCB, standard footprint  
 $T_j = 175\text{ }^\circ\text{C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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



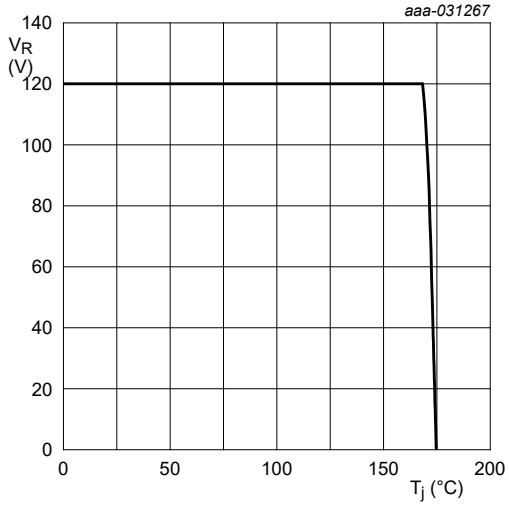
FR4 PCB, mounting pad for cathode  $1\text{ cm}^2$   
 $T_j = 175\text{ }^\circ\text{C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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



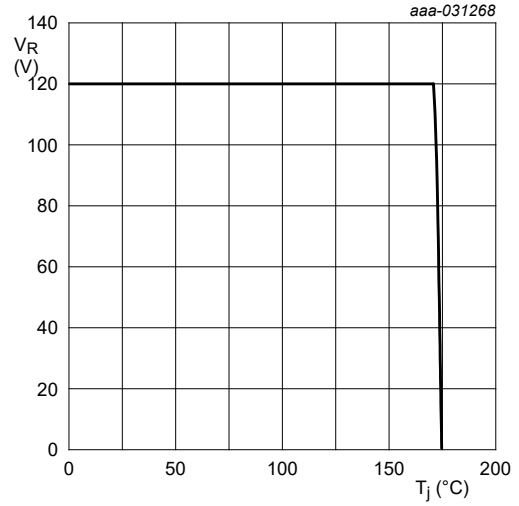
$T_j = 175\text{ }^\circ\text{C}$   
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.5$ ;  $f = 20\text{ kHz}$   
 (3)  $\delta = 0.2$ ;  $f = 20\text{ kHz}$   
 (4)  $\delta = 0.1$ ;  $f = 20\text{ kHz}$

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



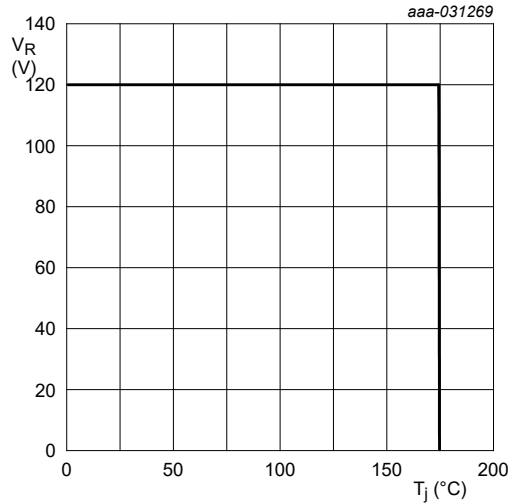
FR4 PCB, standard footprint  
 $R_{th} = 200$  K/W

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



FR4 PCB, mounting pad for cathode 1 cm<sup>2</sup>  
 $R_{th} = 120$  K/W

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



Soldering point of cathode tab  
 $R_{th} = 12$  K/W

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

11. Test information

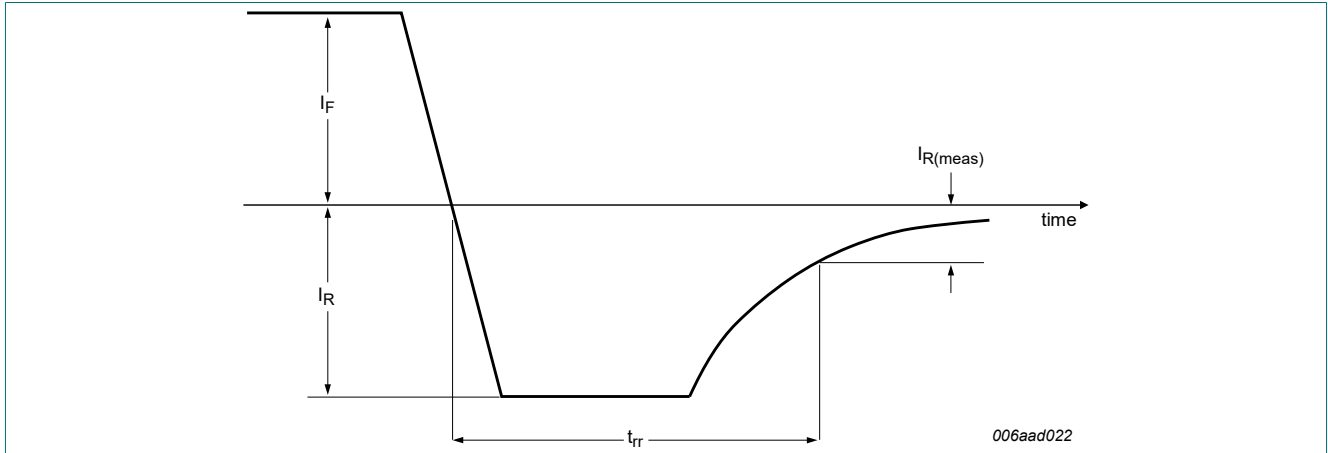


Fig. 14. Reverse recovery definition; step recovery

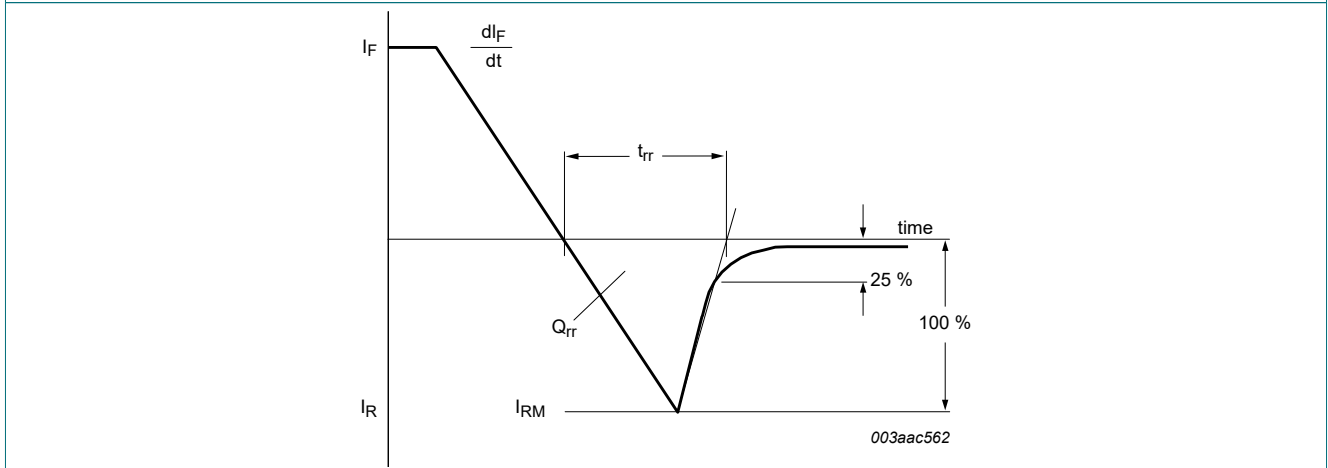


Fig. 15. Reverse recovery definition; ramp recovery

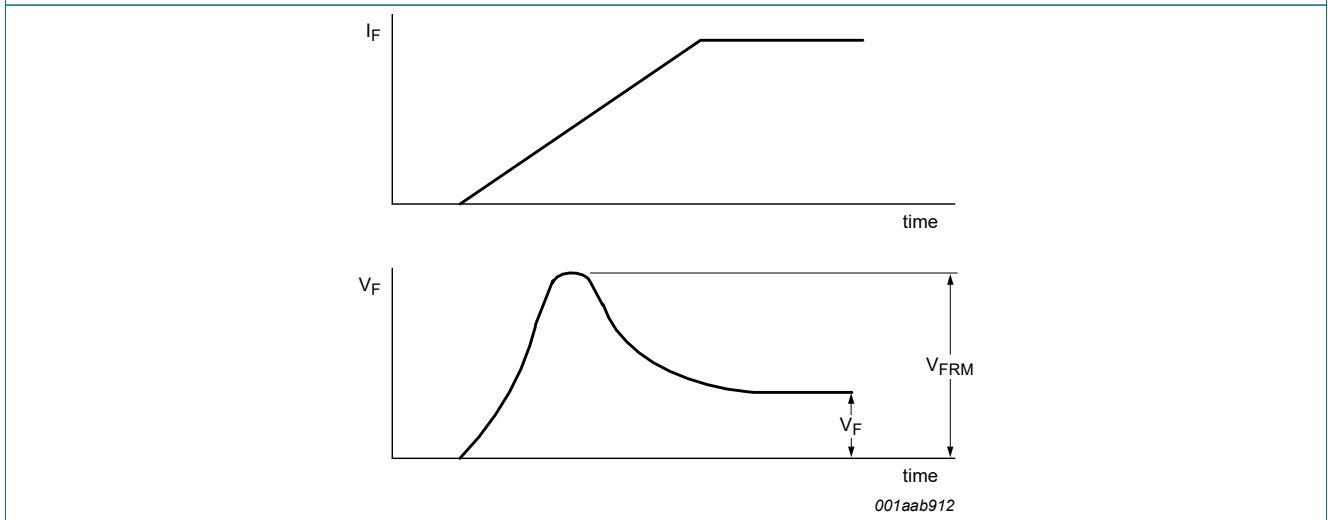


Fig. 16. Forward recovery definition

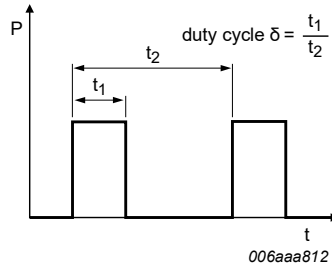


Fig. 17. Duty cycle definition

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

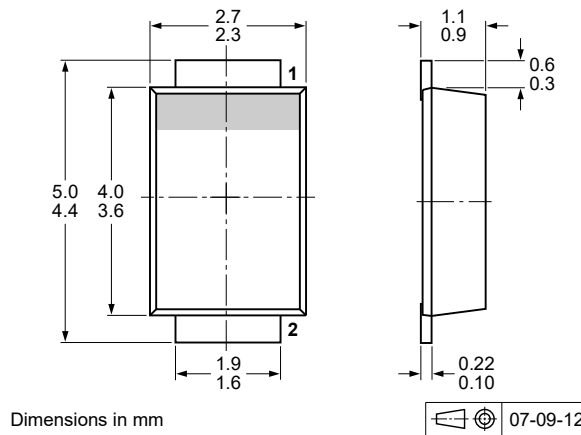


Fig. 18. Package outline CFP5 (SOD128)

### 13. Soldering

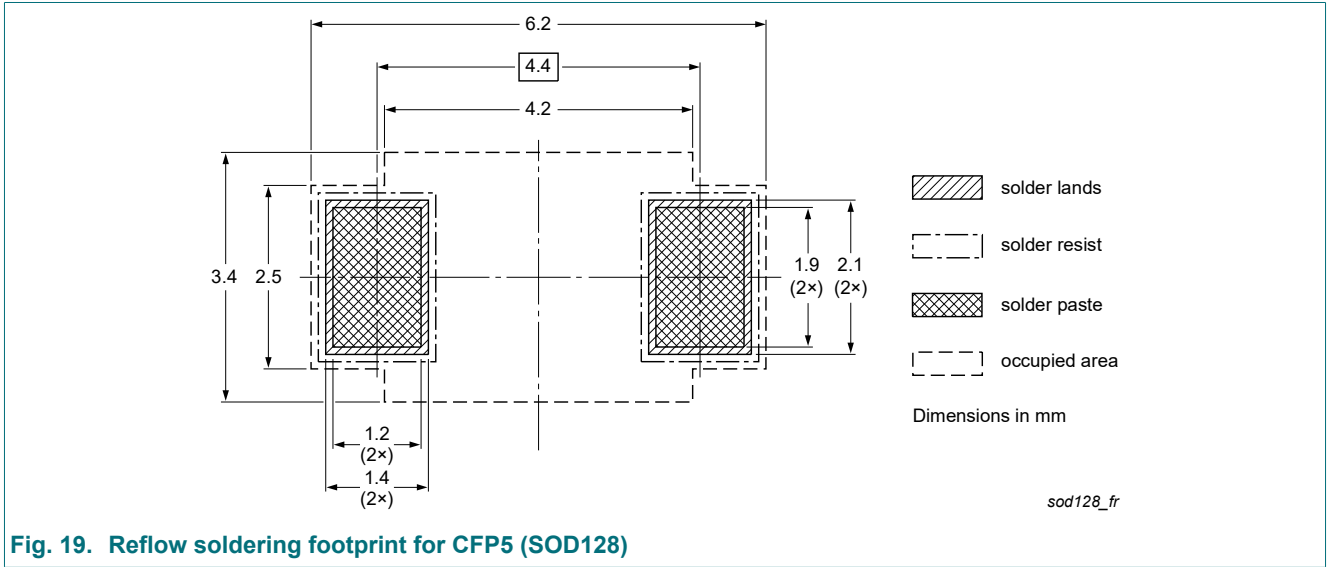
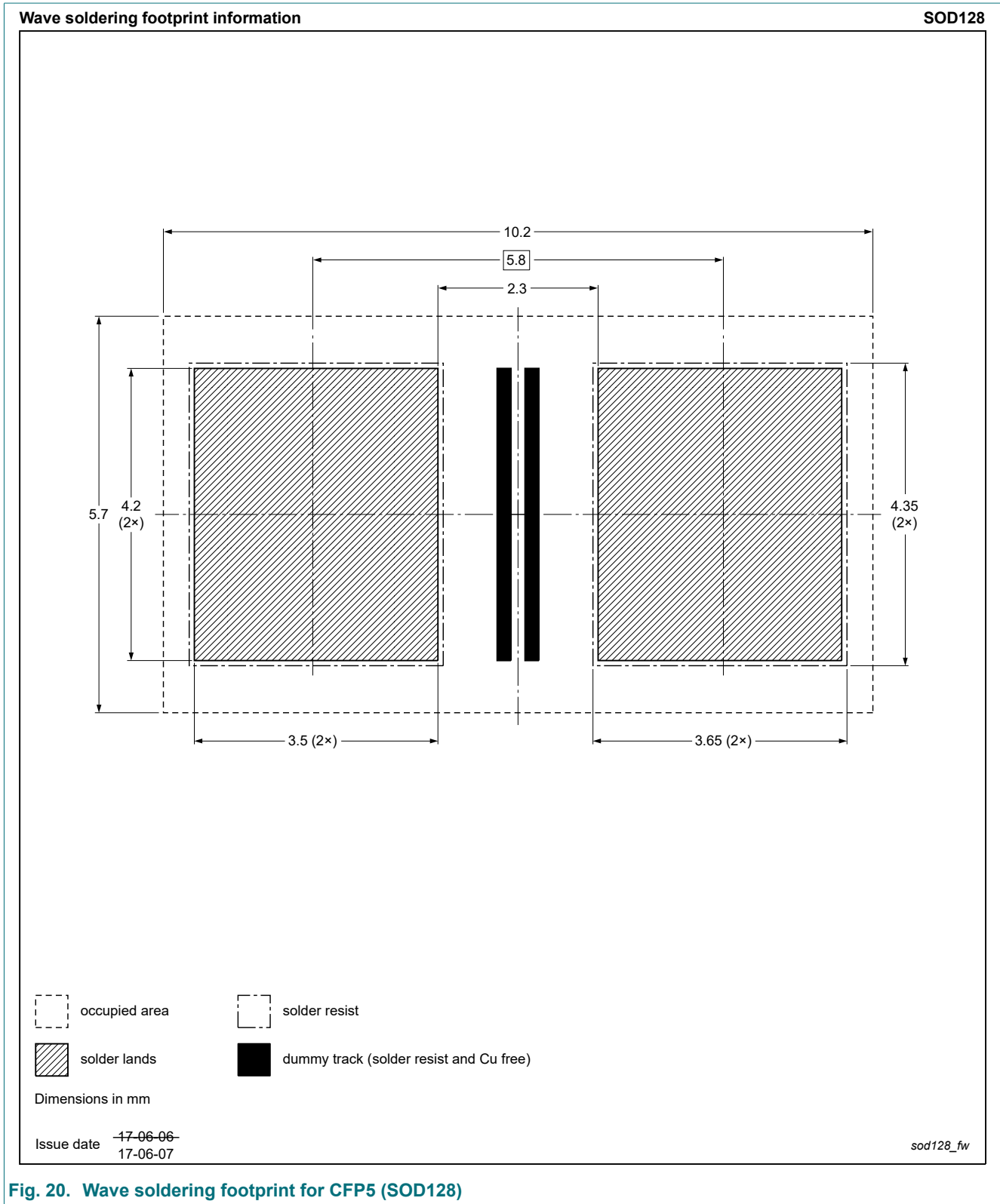


Fig. 19. Reflow soldering footprint for CFP5 (SOD128)



## 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
PMEG120G30ELP-Q v.2	20210514	Product data sheet	-	PMEG120G30ELP-Q v.1
Modifications:	• Features and benefits: added recommendation for automotive applications			
PMEG120G30ELP-Q v.1	20210210	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".
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