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
• 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 • Qualified according to AEC-Q101 and recommended for use in automotive applications	• 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	δ = 0.5; f = 20 kHz; square wave; T_{sp} ≤ 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	µA

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

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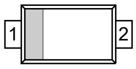
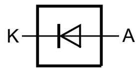
5. Pinning information

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	LF

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 °C		-	120	V
I_F	forward current	δ = 1; T_{sp} ≤ 155 °C		-	2.8	A
$I_{F(AV)}$	average forward current	δ = 0.5; f = 20 kHz; square wave; T_{sp} ≤ 160 °C		-	2	A
I_{FSM}	non-repetitive peak forward current	t_p = 8.3 ms; half sine wave; $T_{j(init)}$ = 25 °C		-	70	A
P_{tot}	total power dissipation	T_{amb} ≤ 25 °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

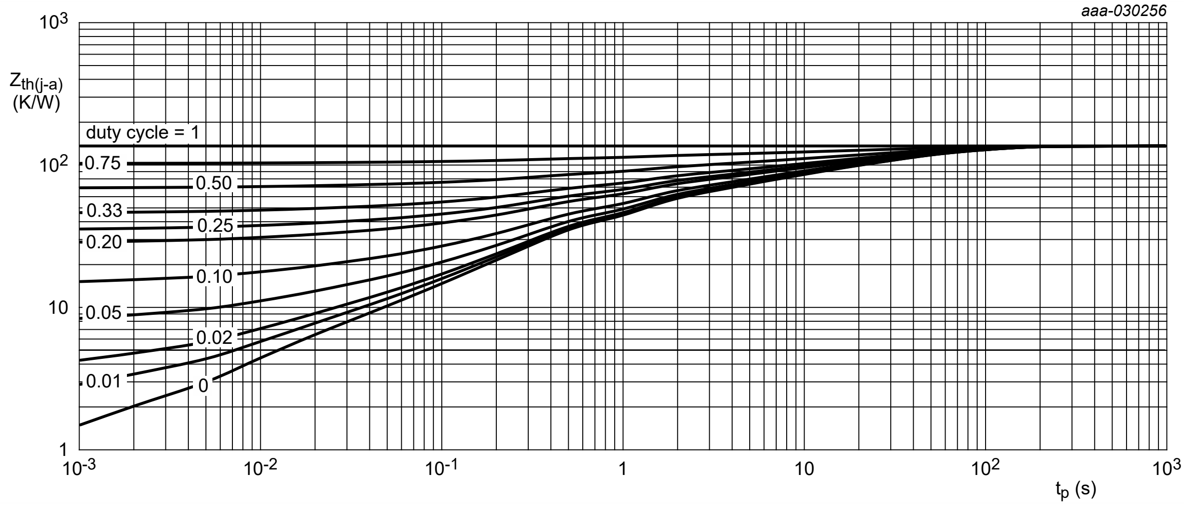
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm^2.

9. Thermal characteristics

Table 6. Thermal characteristics

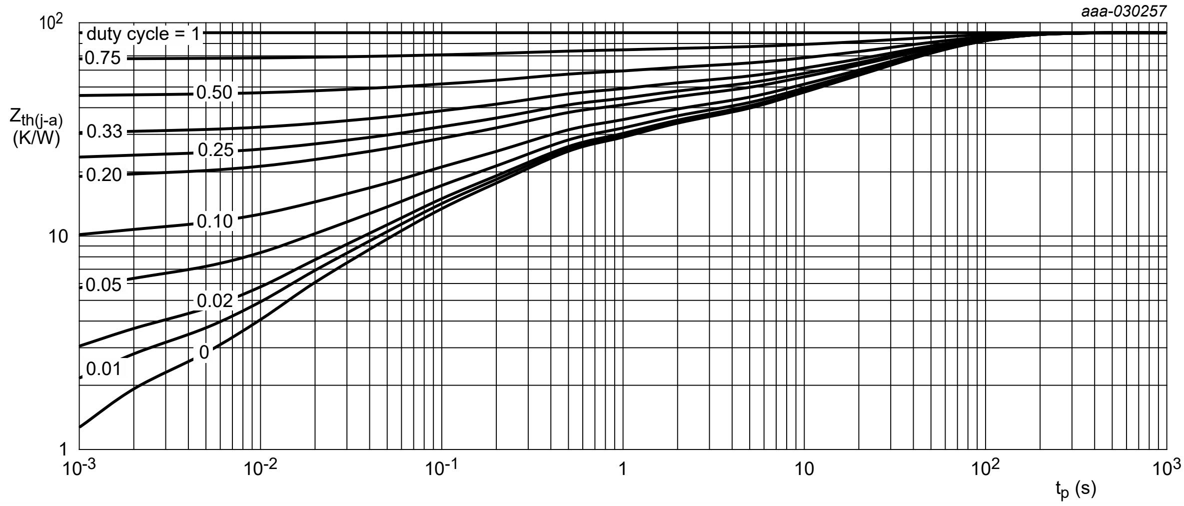
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	220	K/W
			[2]	-	-	130	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[3]	-	-	18	K/W

[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 cm^2.
[3] Soldering point of cathode tab.



FR4 PCB, standard footprint

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



FR4 PCB, mounting pad for cathode 1 cm^2

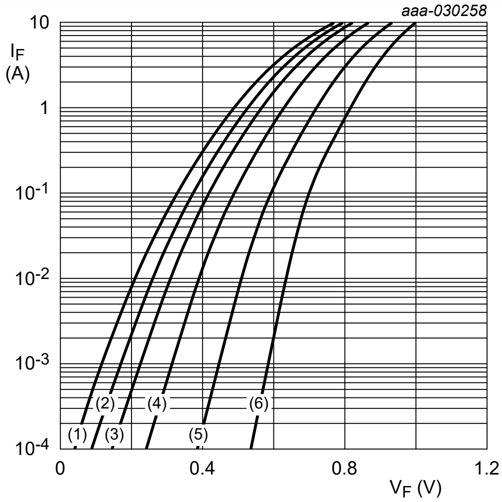
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

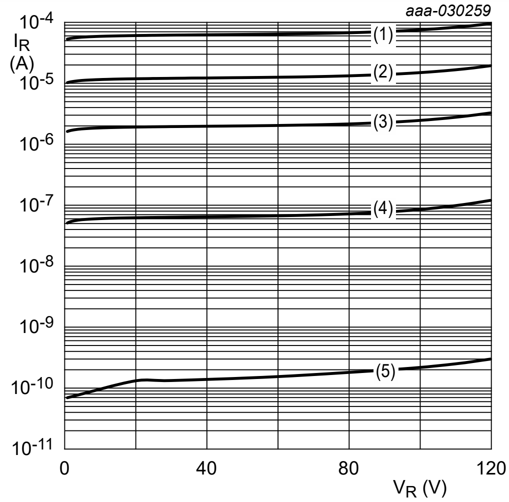
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)R}$	reverse breakdown voltage	I_R = 1 mA; pulsed; T_j = 25 °C	[1]	120	-	-	V
V_F	forward voltage	I_F = 0.1 A; T_j = 25 °C; pulsed	[1]	-	590	670	mV
		I_F = 0.5 A; T_j = 25 °C; pulsed	[1]	-	680	760	mV
		I_F = 1 A; T_j = 25 °C; pulsed	[1]	-	720	800	mV
		I_F = 2 A; T_j = 25 °C; pulsed	[1]	-	770	840	mV
		I_F = 2 A; T_j = -40 °C; pulsed	[1]	-	860	950	mV
		I_F = 2 A; T_j = 125 °C; pulsed	[1]	-	620	720	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 = 125 °C; pulsed	[1]	-	3.5	40	µA
		V_R = 120 V; T_j = 150 °C; pulsed	[1]	-	20	200	µA
C_d	diode capacitance	V_R = 1 V; f = 1 MHz; T_j = 25 °C		-	75	-	pF
		V_R = 10 V; f = 1 MHz; T_j = 25 °C		-	30	-	pF
t_{rr}	reverse recovery time step recovery	I_F = 0.5 A; I_R = 1 A; $I_{R(meas)}$ = 0.25 A; T_j = 25 °C		-	6	-	ns
	reverse recovery time ramp recovery	dI_F/dt = 100 A/µs; I_F = 1 A; V_R = 30 V; T_j = 25 °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 A; dI_F/dt = 20 A/µs; T_j = 25 °C		-	685	-	mV

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



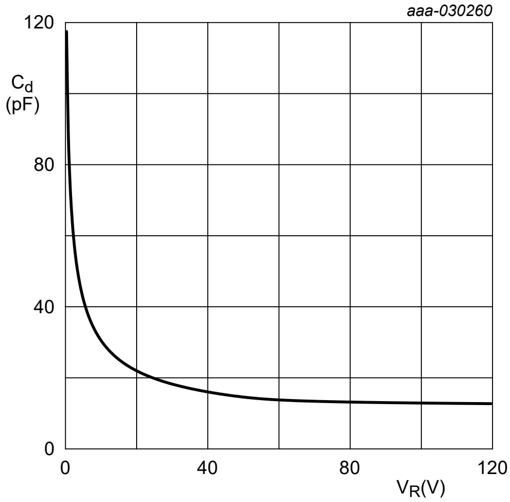
pulsed condition
(1) T_j = 175 °C
(2) T_j = 150 °C
(3) T_j = 125 °C
(4) T_j = 85 °C
(5) T_j = 25 °C
(6) T_j = -40 °C

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



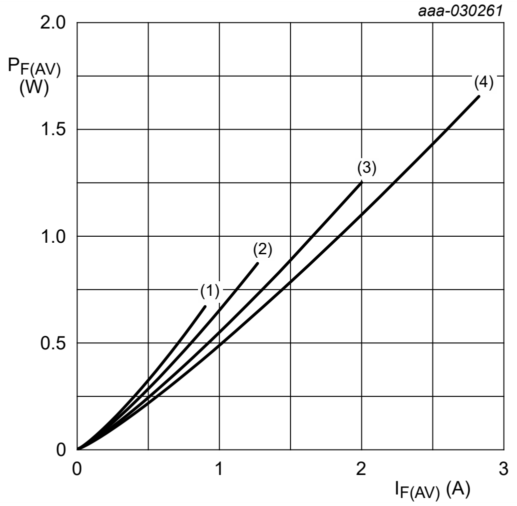
pulsed condition
(1) T_j = 175 °C
(2) T_j = 150 °C
(3) T_j = 125 °C
(4) T_j = 85 °C
(5) T_j = 25 °C

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



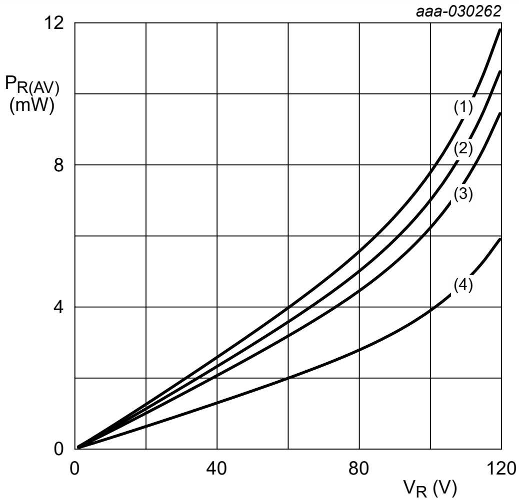
f = 1 MHz; T_{amb} = 25 °C

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



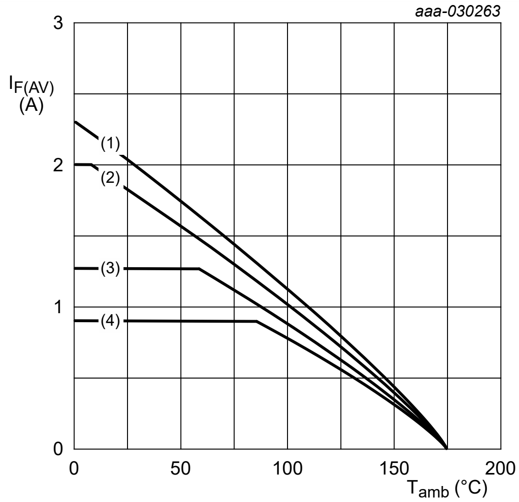
T_j = 175 °C
(1) δ = 0.1
(2) δ = 0.2
(3) δ = 0.5
(4) δ = 1; DC

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



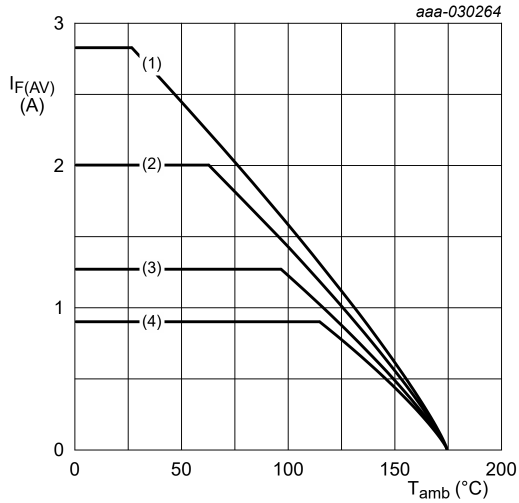
T_j = 175 °C
(1) δ = 1; DC
(2) δ = 0.9
(3) δ = 0.8
(4) δ = 0.5

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



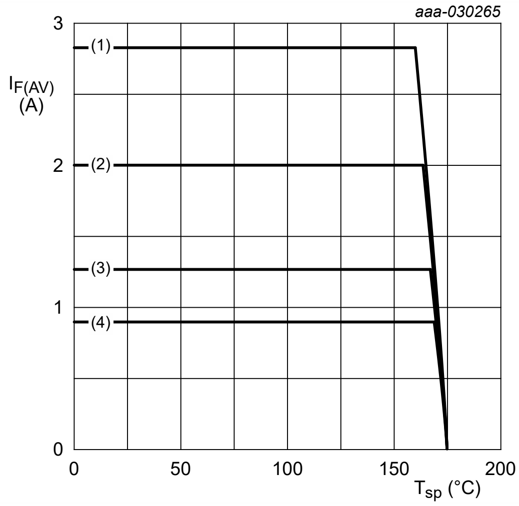
FR4 PCB, standard footprint
T_j = 175 °C
(1) δ = 1; DC
(2) δ = 0.5; f = 20 kHz
(3) δ = 0.2; f = 20 kHz
(4) δ = 0.1; f = 20 kHz

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



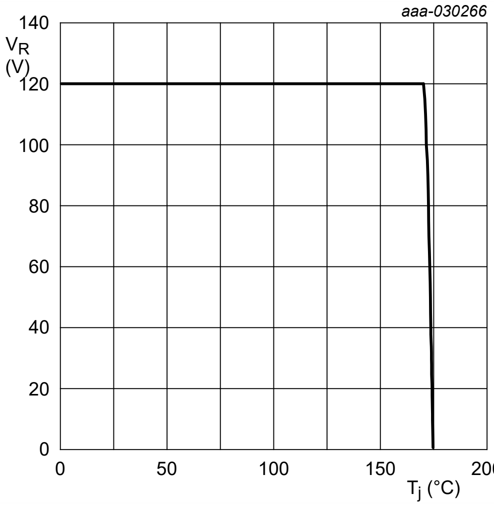
FR4 PCB, mounting pad for cathode 1 cm^2
T_j = 175 °C
(1) δ = 1; DC
(2) δ = 0.5; f = 20 kHz
(3) δ = 0.2; f = 20 kHz
(4) δ = 0.1; f = 20 kHz

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



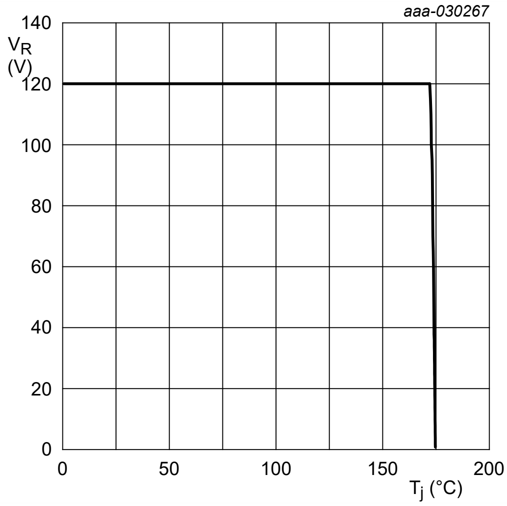
T_j = 175 °C
(1) δ = 1; DC
(2) δ = 0.5; f = 20 kHz
(3) δ = 0.2; f = 20 kHz
(4) δ = 0.1; f = 20 kHz

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



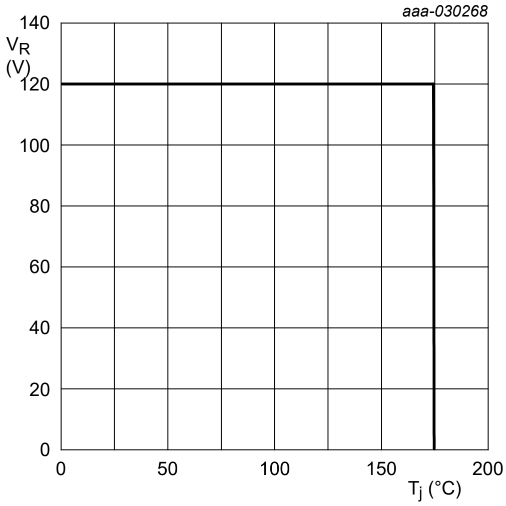
FR4 PCB, standard footprint
R_{th} = 220 K/W

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 K/W

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



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

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

11. Test information

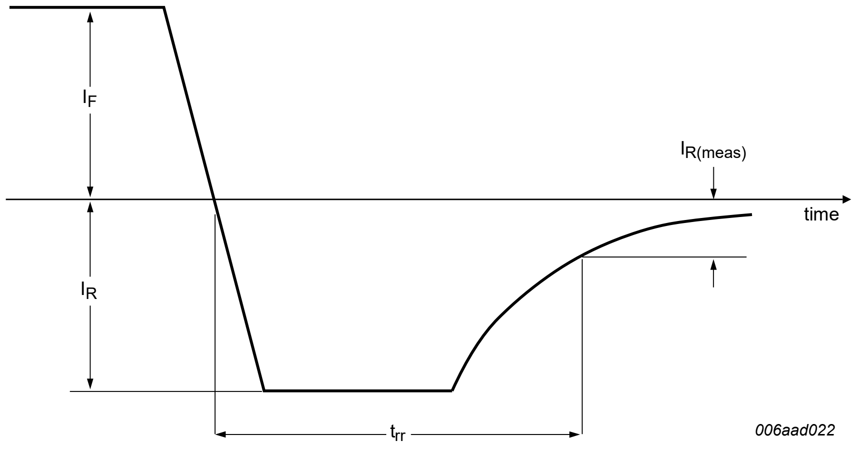


Fig. 14. Reverse recovery definition; step recovery

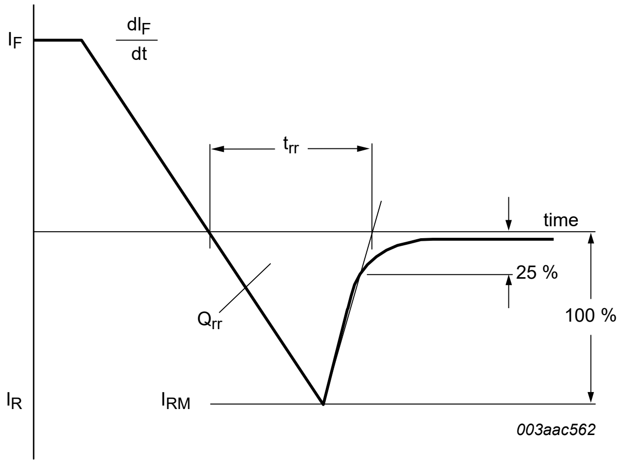


Fig. 15. Reverse recovery definition; ramp recovery

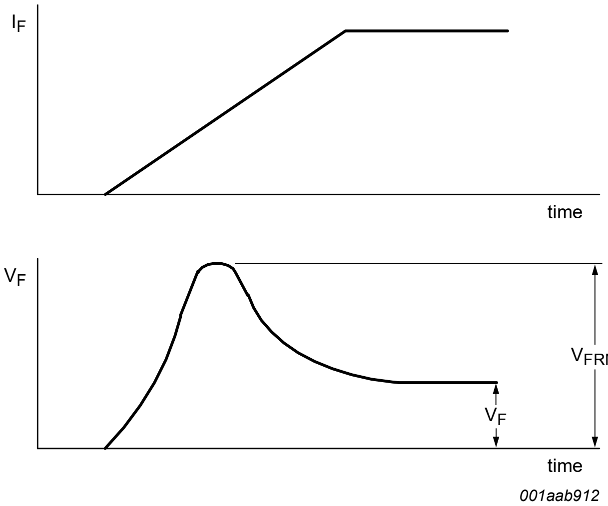


Fig. 16. Forward recovery definition

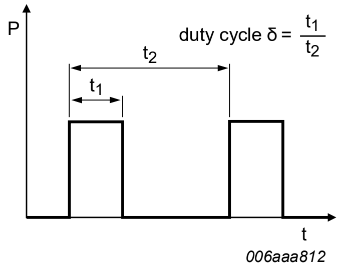


Fig. 17. Duty cycle definition

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

$I_{RMS}=I_{F(AV)}$ 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

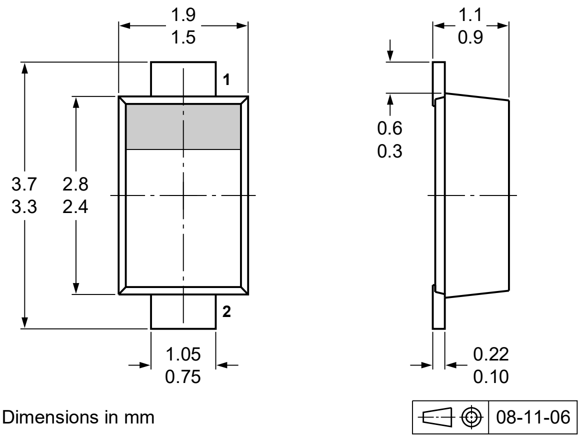


Fig. 18. Package outline CFP3 (SOD123W)

13. Soldering

Footprint information for reflow soldering of CFP3 package **SOD123W**

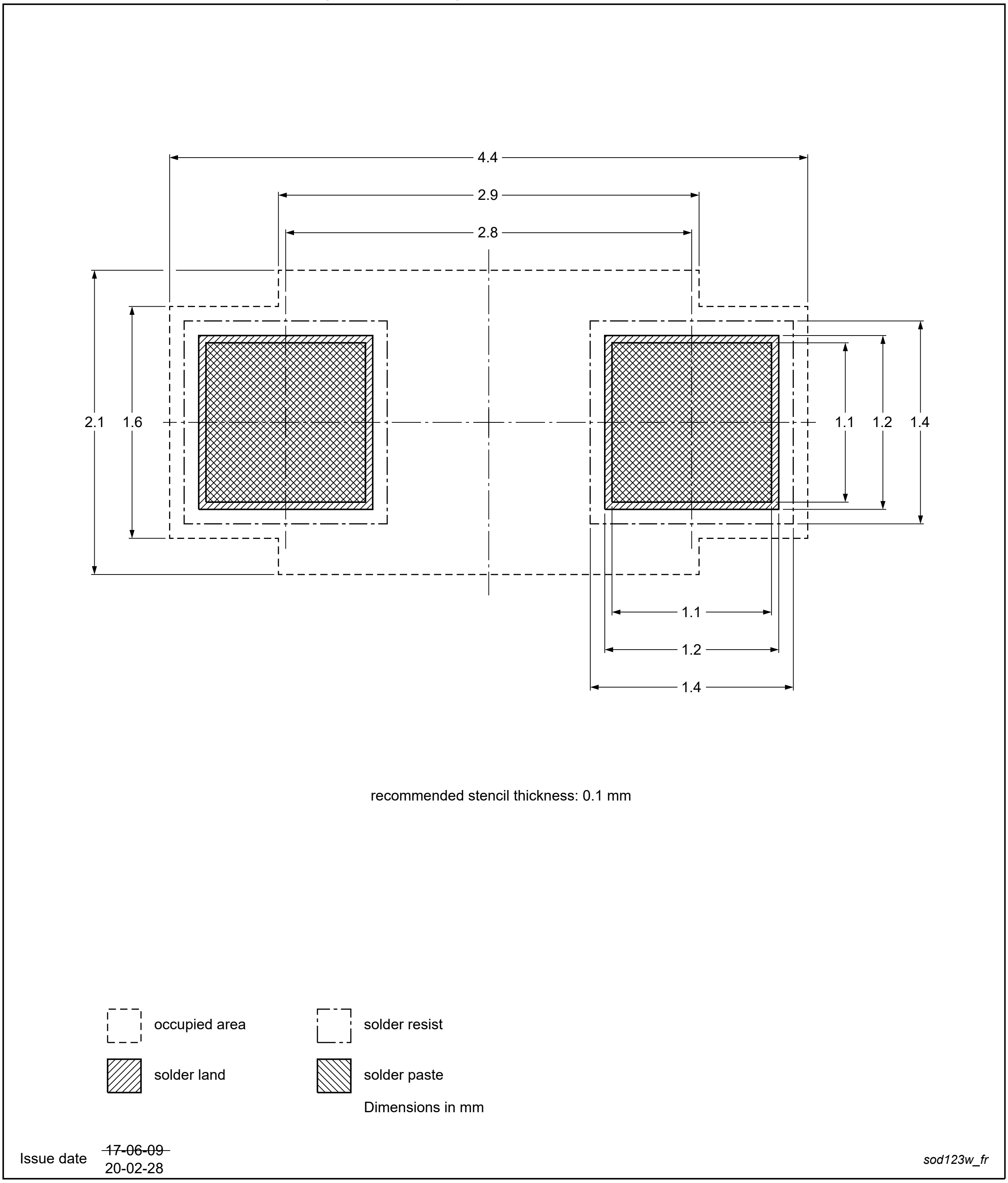


Fig. 19. Reflow soldering footprint for CFP3 (SOD123W)

Wave soldering footprint information **SOD123W**

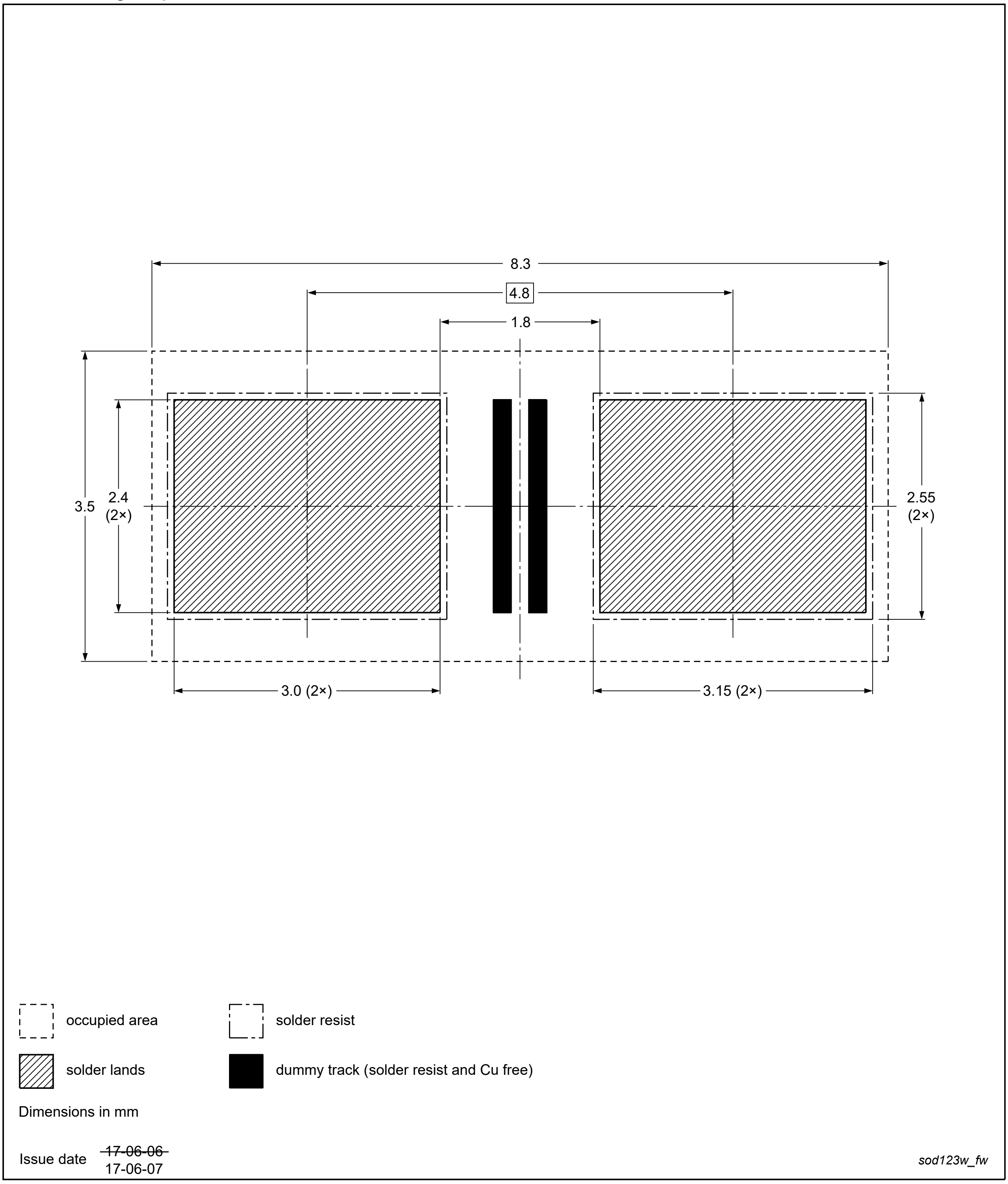


Fig. 20. Wave soldering footprint for CFP3 (SOD123W)

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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Date of release: 12 May 2021