PTVSxS1UR-Q series

400 W Transient Voltage Suppressor

1 June 2022 Product data sheet

1. General description

400 W unidirectional Transient Voltage Suppressor (TVS) in a SOD123W small and flat lead Surface-Mounted Device (SMD) plastic package, designed for transient overvoltage protection.

2. Features and benefits

- Rated peak pulse power: P_{PPM} = 400 W (350 W for 3V3)
- Reverse standoff voltage range: V_{RWM} = 3.3 V to 64 V
- Reverse current: I_{RM} = 0.001 µA
- Very low package height: 1 mm
- Small plastic package suitable for surface-mounted design
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

- Power supply protection
- Automotive application
- Industrial application
- Power management

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
P_{PPM}	rated peak pulse power		[1] [2]	-	-	400	W
V_{RWM}	reverse standoff voltage	T_j = 25 °C		3.3	-	64	V

[1] In accordance with IEC 61643-321 (10/1000 µs current waveform).
[2] For PTVS3V3S1UR-Q: P_{PPM} = 350W.

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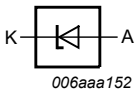
5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode[1]	 CFP3 (SOD123W)	
2	A	anode		

[1] The marking bar indicates the cathode.

6. Ordering information

Table 3. Ordering information

Type number[1]	Package		
	Name	Description	Version
PTVSxS1UR-Q series	CFP3	plastic, surface mounted package; 2 terminals; 2.6 mm x 1.7 mm x 1 mm body	SOD123W

[1] The series consists of 35 types with reverse standoff voltages from 3.3 V to 64 V.

7. Marking

Table 4. Marking codes

Type number	Marking code	Type number	Marking code
PTVS3V3S1UR-Q	A1	PTVS20VS1UR-Q	AL
PTVS5V0S1UR-Q	A2	PTVS22VS1UR-Q	AM
PTVS6V0S1UR-Q	A3	PTVS24VS1UR-Q	AN
PTVS6V5S1UR-Q	A4	PTVS26VS1UR-Q	AP
PTVS7V0S1UR-Q	A5	PTVS28VS1UR-Q	AR
PTVS7V5S1UR-Q	A6	PTVS30VS1UR-Q	AS
PTVS8V0S1UR-Q	A7	PTVS33VS1UR-Q	AT
PTVS8V5S1UR-Q	A8	PTVS36VS1UR-Q	AU
PTVS9V0S1UR-Q	A9	PTVS40VS1UR-Q	AV
PTVS10VS1UR-Q	AA	PTVS43VS1UR-Q	AW
PTVS11VS1UR-Q	AB	PTVS45VS1UR-Q	AX
PTVS12VS1UR-Q	AC	PTVS48VS1UR-Q	AY
PTVS13VS1UR-Q	AD	PTVS51VS1UR-Q	AZ
PTVS14VS1UR-Q	AE	PTVS54VS1UR-Q	B1
PTVS15VS1UR-Q	AF	PTVS58VS1UR-Q	B2
PTVS16VS1UR-Q	AG	PTVS60VS1UR-Q	B3
PTVS17VS1UR-Q	AH	PTVS64VS1UR-Q	B4
PTVS18VS1UR-Q	AK	-	-

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
P_{PPM}	rated peak pulse power		[1] [2]	-	400	W
I_{PPM}	rated peak pulse current		[1]	-	see table 7 and 8	A
I_{FSM}	non-repetitive peak forward current	single half-sine wave; t_p = 8.3 ms		-	50	A
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			-55	150	°C
T_{stg}	storage temperature			-65	150	°C
ESD maximum ratings						
V_{ESD}	electrostatic discharge voltage	IEC 61000-4-2; contact discharge	[3]	-	30	kV
		MIL-STD-883; human body model (HBM)		-	4	kV

[1] In accordance with IEC 61643-321 (10/1000 µs current waveform).
[2] For PTVS3V3S1UR-Q: P_{PPM} = 350W.
[3] Device stressed with ten non-repetitive ESD pulses.

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
			[3]	-	-	70	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[4]	-	-	18	K/W

[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.
[3] Device mounted on a ceramic PCB, Al_2O_3, standard footprint.
[4] Soldering point of cathode tab.

10. Characteristics

Table 7. Characteristics per type; PTVS3V3S1UR-Q to PTVS7V0S1UR-Q

T_j = 25°C unless otherwise specified.

Type number PTVSxS1UR-Q	Reverse standoff voltage V_{RWM} (V)	Breakdown voltage V_{BR} (V)			Reverse leakage current I_{RM} (µA)		Clamping voltage V_{CL} (V)	
		I_R = 10 mA			at V_{RWM} (V)			
	Max	Min	Typ	Max	Typ	Max	Max	I_{PPM} (A)
3V3	3.3	5.20	5.60	6.00	5	600	8.0	43.8
5V0	5.0	6.40	6.70	7.00	5	400	9.2	43.5
6V0	6.0	6.67	7.02	7.37	5	400	10.3	38.8
6V5	6.5	7.22	7.60	7.98	5	250	11.2	35.7
7V0	7.0	7.78	8.20	8.60	3	100	12.0	33.3

Table 8. Characteristics per type; PTVS7V5S1UR-Q to PTVS64VS1UR-Q

T_j = 25°C unless otherwise specified.

Type number PTVSxS1UR-Q	Reverse standoff voltage V_{RWM} (V)	Breakdown voltage V_{BR} (V)			Reverse leakage current I_{RM} (µA)		Clamping voltage V_{CL} (V)	
		I_R = 1 mA			at V_{RWM} (V)			
	Max	Min	Typ	Max	Typ	Max	Max	I_{PPM} (A)
7V5	7.5	8.33	8.77	9.21	0.2	50	12.9	31.0
8V0	8.0	8.89	9.36	9.83	0.03	25	13.6	29.4
8V5	8.5	9.44	9.92	10.40	0.01	10	14.4	27.8
9V0	9.0	10.00	10.55	11.10	0.005	5	15.4	26.0
10V	10	11.10	11.70	12.30	0.005	2.5	17.0	23.5
11V	11	12.20	12.85	13.50	0.005	2.5	18.2	22.0
12V	12	13.30	14.00	14.70	0.005	2.5	19.9	20.1
13V	13	14.40	15.15	15.90	0.001	0.1	21.5	18.6
14V	14	15.60	16.40	17.20	0.001	0.1	23.2	17.2
15V	15	16.70	17.60	18.50	0.001	0.1	24.4	16.4
16V	16	17.80	18.75	19.70	0.001	0.1	26.0	15.4
17V	17	18.90	19.90	20.90	0.001	0.1	27.6	14.5
18V	18	20.00	21.00	22.10	0.001	0.1	29.2	13.7
20V	20	22.20	23.35	24.50	0.001	0.1	32.4	12.3
22V	22	24.40	25.60	26.90	0.001	0.1	35.5	11.3
24V	24	26.70	28.10	29.50	0.001	0.1	38.9	10.3
26V	26	28.90	30.40	31.90	0.001	0.1	42.1	9.5
28V	28	31.10	32.80	34.40	0.001	0.1	45.4	8.8
30V	30	33.30	35.10	36.80	0.001	0.1	48.4	8.3
33V	33	36.70	38.70	40.60	0.001	0.1	53.3	7.5
36V	36	40.00	42.10	44.20	0.001	0.1	58.1	6.9
40V	40	44.40	46.80	49.10	0.001	0.1	64.5	6.2
43V	43	47.80	50.30	52.80	0.001	0.1	69.4	5.8
45V	45	50.00	52.65	55.30	0.001	0.1	72.7	5.5

Type number PTVSxS1UR-Q	Reverse standoff voltage V_{RWM} (V)	Breakdown voltage V_{BR} (V)			Reverse leakage current I_{RM} (µA)		Clamping voltage V_{CL} (V)	
		I_R = 1 mA			at V_{RWM} (V)			
	Max	Min	Typ	Max	Typ	Max	Max	I_{PPM} (A)
48V	48	53.30	56.10	58.90	0.001	0.1	77.4	5.2
51V	51	56.70	59.70	62.70	0.001	0.1	82.4	4.9
54V	54	60.00	63.15	66.30	0.001	0.1	87.1	4.6
58V	58	64.40	67.80	71.20	0.001	0.1	93.6	4.3
60V	60	66.70	70.20	73.70	0.001	0.1	96.8	4.1
64V	64	71.10	74.85	78.60	0.001	0.1	103.0	3.9

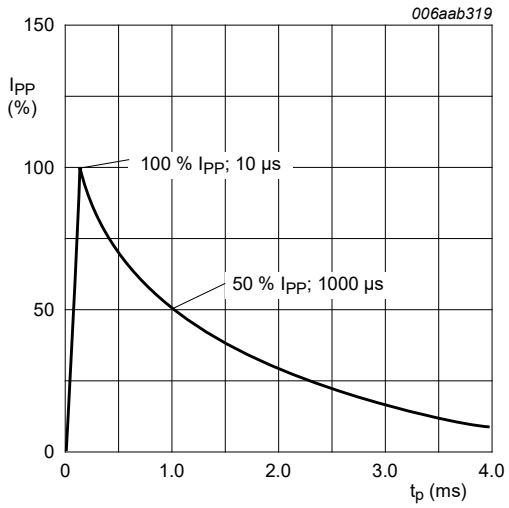


Fig. 1. 10/1000 µs pulse waveform according to IEC 61643-321

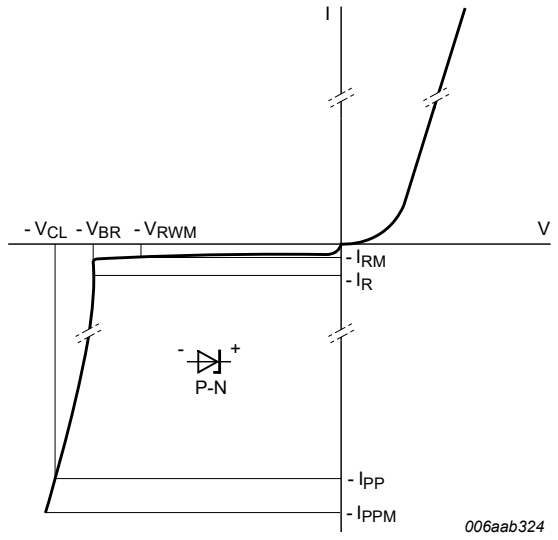


Fig. 2. V-I characteristics for a unidirectional TVS protection diode

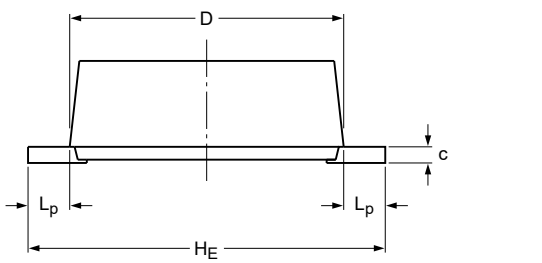
11. Test information

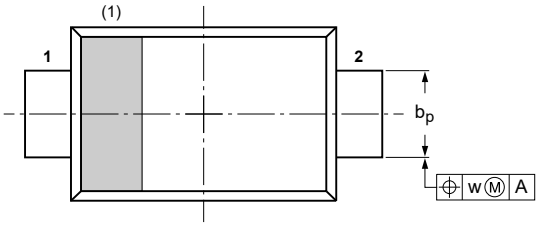
Quality information

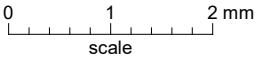
This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - *Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

12. Package outline

Plastic surface-mounted package; 2 leads **SOD123W**







DIMENSIONS (mm are the original dimensions)

UNIT	A	b_p	c	D	E	H_E	L_p	w
mm	1.1 0.9	1.05 0.75	0.22 0.10	2.8 2.4	1.9 1.5	3.7 3.3	0.6 0.3	0.13

Note

1. The marking bar indicates the cathode.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOD123W						~~07-06-28~~ 08-11-06

Fig. 3. Package outline CFP3 (SOD123W)

13. Soldering

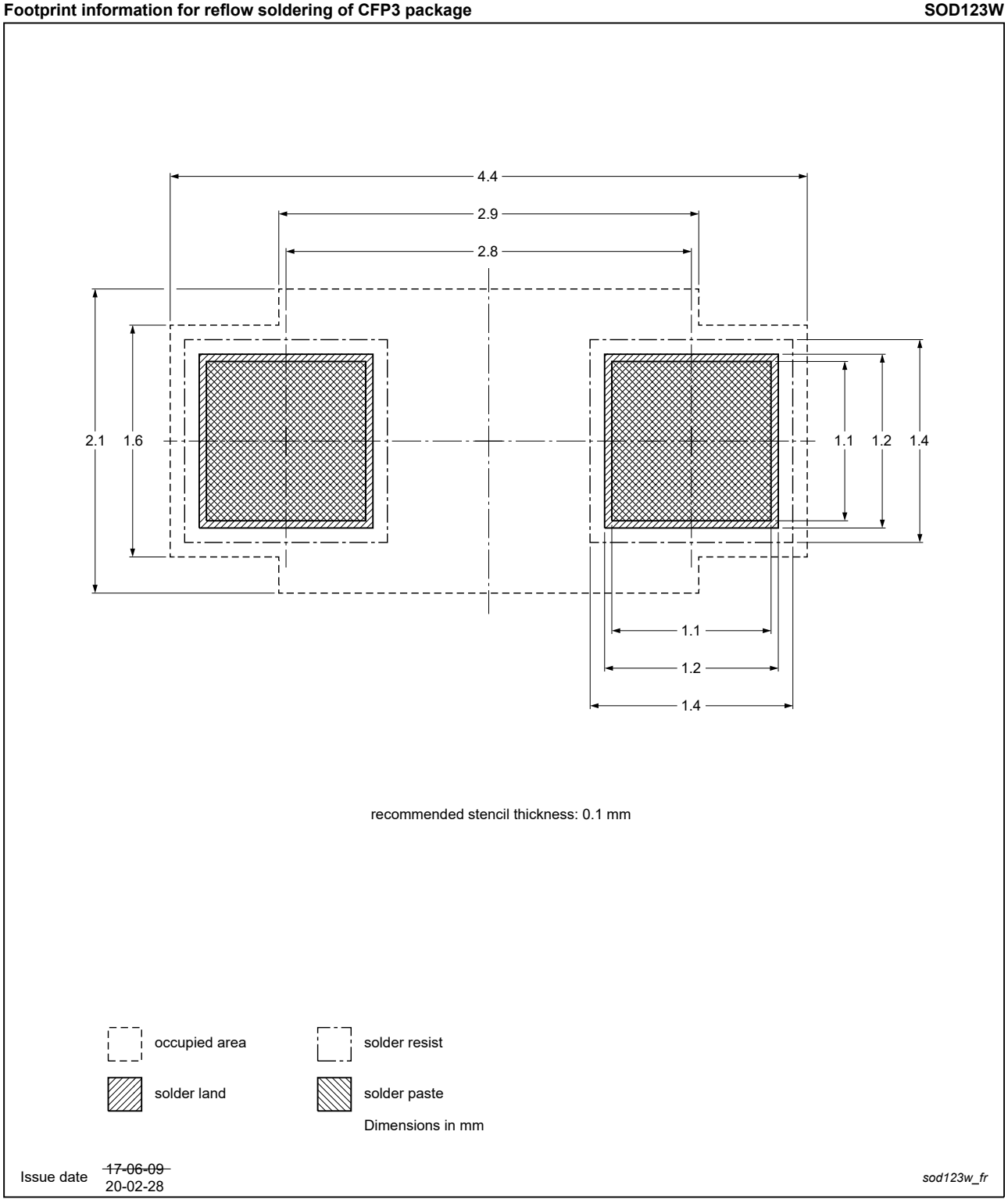


Fig. 4. Reflow soldering footprint for CFP3 (SOD123W)

Wave soldering footprint information **SOD123W**

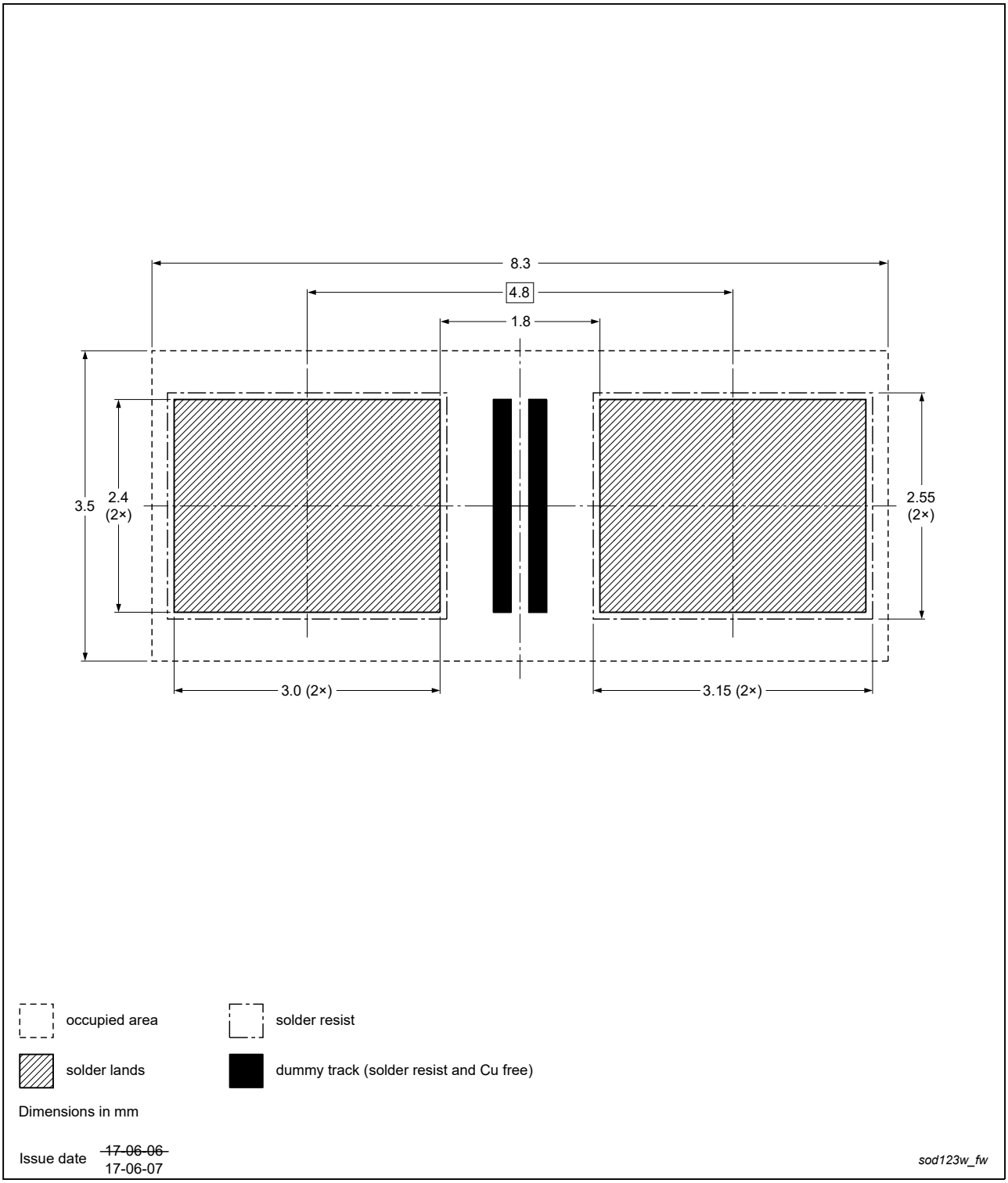


Fig. 5. Wave soldering footprint for CFP3 (SOD123W)

14. Revision history

Table 9. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PTVSxS1UR-Q_SER v.1	20220601	Product data sheet	-	-

15. 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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