



# HPZR-Q series

## 5.5 W high power voltage regulator diodes

Rev. 6 — 18 January 2024

Product data sheet

### 1. General description

High power voltage regulator diodes in a CFP3 (SOD123W) small and flat lead low-profile Surface-Mounted Device (SMD) plastic package.

### 2. Features and benefits

- Total power dissipation:  $\leq 5.5 \text{ W}$  @  $T_{sp} = 75 \text{ }^\circ\text{C}$ , measured zero lead length
- Tolerance series: Approximately  $\pm 5 \%$
- Working voltage range: nominal 3.0 V to 75 V
- ESD maximum rating 30 kV according IEC 61000-4-2 (contact discharge)
- Qualified according to AEC-Q101 and recommended for use in automotive applications

### 3. Applications

- Low-current general regulation functions

### 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_F$	forward voltage	$I_F = 100 \text{ mA}$	[1]	-	-	1	V
$P_{ZSM}$	non-repetitive peak power dissipation	square wave; $t_p \leq 100 \text{ } \mu\text{s}$		-	-	800	W
$P_{tot}$	total power dissipation	$T_{sp} \leq 75 \text{ }^\circ\text{C}$	[2]	-	-	5500	mW
		$T_{amb} \leq 25 \text{ }^\circ\text{C}$	[3]	-	-	1154	mW


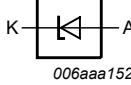
[1] Pulse test:  $t_p \leq 300 \text{ } \mu\text{s}$ ;  $\delta \leq 0.02$

[2] DC Power Dissipation @  $T_{sp} = 75 \text{ }^\circ\text{C}$ , measured zero lead length

[3] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, mounting pad for cathode  $1 \text{ cm}^2$

## 5. Pinning information

Table 2. Pinning

Pin	Symbol	Description		Simplified outline	Graphic symbol
1	K	cathode	[1]		
2	A	anode			

[1] The marking bar indicates the cathode.

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
HPZR-Q series	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	Type number	Marking code	Type number	Marking code
HPZR-C3V0-Q	NB	HPZR-C10-Q	LV	HPZR-C30-Q	MC
HPZR-C3V3-Q	NC	HPZR-C11-Q	LW	HPZR-C33-Q	MD
HPZR-C3V6-Q	MU	HPZR-C12-Q	LX	HPZR-C35-Q	ME
HPZR-C3V9-Q	MV	HPZR-C13-Q	LY	HPZR-C39-Q	MF
HPZR-C4V3-Q	MW	HPZR-C14-Q	M2	HPZR-C42-Q	MG
HPZR-C4V7-Q	MX	HPZR-C15-Q	M3	HPZR-C47-Q	MH
HPZR-C5V1-Q	MY	HPZR-C17-Q	M4	HPZR-C50-Q	MJ
HPZR-C5V6-Q	LM	HPZR-C18-Q	M5	HPZR-C53-Q	MK
HPZR-C6V7-Q	LN	HPZR-C19-Q	M6	HPZR-C56-Q	ML
HPZR-C7V0-Q	LP	HPZR-C20-Q	M7	HPZR-C60-Q	MM
HPZR-C7V6-Q	LR	HPZR-C21-Q	M8	HPZR-C63-Q	MN
HPZR-C8V2-Q	LS	HPZR-C23-Q	M9	HPZR-C68-Q	MP
HPZR-C8V8-Q	LT	HPZR-C26-Q	MA	HPZR-C70-Q	MR
HPZR-C9V4-Q	LU	HPZR-C28-Q	MB	HPZR-C75-Q	MS

## 8. Limiting values

**Table 5. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit	
$I_F$	forward current		-	400	mA	
$P_{ZSM}$	non-repetitive peak power dissipation	square wave; $t_p \leq 100 \mu s$	-	800	W	
$I_{FSM}$	non-repetitive peak forward current	single half-sine wave; $t_p = 8.3 ms$	-	50	A	
$P_{tot}$	total power dissipation	$T_{amb} \leq 25 \text{ }^\circ\text{C}$	[1]	-	682	mW
			[2]	-	1154	mW
			[3]	-	2143	mW
		$T_{sp} \leq 75 \text{ }^\circ\text{C}$	[4]	-	5500	mW
$T_j$	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 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  $1 \text{ cm}^2$ .

[3] Device mounted on ceramic PCB,  $\text{Al}_2\text{O}_3$ , standard footprint.

[4] DC Power Dissipation @  $T_{sp} = 75 \text{ }^\circ\text{C}$ , measured zero lead length

**Table 6. ESD maximum ratings**

Symbol	Parameter	Conditions	Min	Max	Unit
<b>Per diode</b>					
$V_{ESD}$	electrostatic discharge voltage	IEC 61000-4-2 (contact discharge)	[1] [2]	- 30	kV

[1] Device stressed with ten non-repetitive ElectroStatic Discharge (ESD) pulses.

[2] Soldering point of cathode tab.

**Table 7. ESD standard compliance**

Test and measurement	Conditions
<b>Per diode</b>	
IEC 61000-4-2; level 4 (ESD)	> 15 kV (air); > 8 kV (contact)
MIL-STD-883; class 3 (human body model)	> 8 kV

## 9. Thermal characteristics

Table 8. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	in free air	[1]	-	-	220	K/W
			[2]	-	-	130	K/W
			[3]	-	-	70	K/W
R <sub>th(j-sp)</sub>	thermal resistance from junction to solder point		[4]	-	-	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] Device mounted on ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.
- [4] Soldering point of cathode tab.

## 10. Characteristics

Table 9. Characteristics

T<sub>j</sub> = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
V <sub>F</sub>	forward voltage	I <sub>F</sub> = 100 mA	[1]	-	-	1	V

- [1] Pulse test: t<sub>p</sub> ≤ 300 μs; δ ≤ 0.02

Table 10. Characteristics per type; HPZR-C3V0-Q to HPZR-C5V1-Q

T<sub>j</sub> = 25 °C unless otherwise specified.

HPZR -Cxxx-Q	Working voltage V <sub>Z</sub> (V) I <sub>Z</sub> = 100 mA		Reverse current I <sub>R</sub> (μA)		Differential resistance R <sub>Z</sub> (Ω) I <sub>Z</sub> = 100 mA
	Min	Max	Max	V <sub>R</sub> (V)	Max
3V0	2.80	3.20	80	1.0	8.0
3V3	3.10	3.50	60	1.0	8.0
3V6	3.40	3.80	16	1.0	8.0
3V9	3.70	4.10	11	1.0	8.0
4V3	4.00	4.60	8.5	1.0	7.0
4V7	4.40	5.00	1.1	1.0	7.0
5V1	4.80	5.40	0.75	1.0	6.0

Table 11. Characteristics per type; HPZR-C5V6-Q to HPZR-C8V2-Q

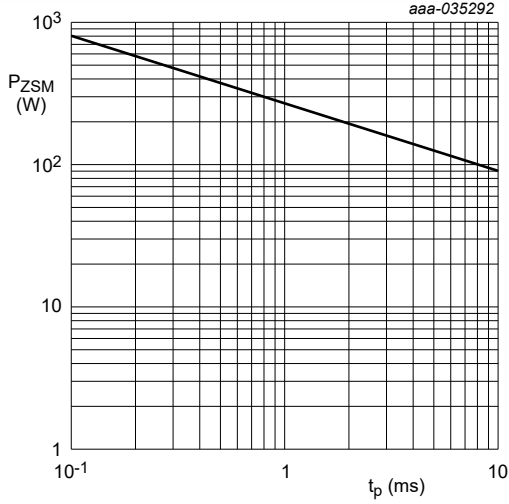
T<sub>j</sub> = 25 °C unless otherwise specified.

HPZR -Cxxx-Q	Working voltage V <sub>Z</sub> (V) I <sub>Z</sub> = 10 mA		Reverse current I <sub>R</sub> (μA)		Differential resistance R <sub>Z</sub> (Ω) I <sub>Z</sub> = 20 mA
	Min	Max	Max	V <sub>R</sub> (V)	Max
5V6	5.20	6.00	600	3.3	63.60
6V7	6.40	7.00	400	5.0	42.40
7V0	6.67	7.37	400	6.0	4.77
7V6	7.22	7.98	250	6.5	11.60
8V2	7.78	8.60	100	7.0	13.25

Table 12. Characteristics per type; HPZR-C8V8-Q to HPZR-C75-Q

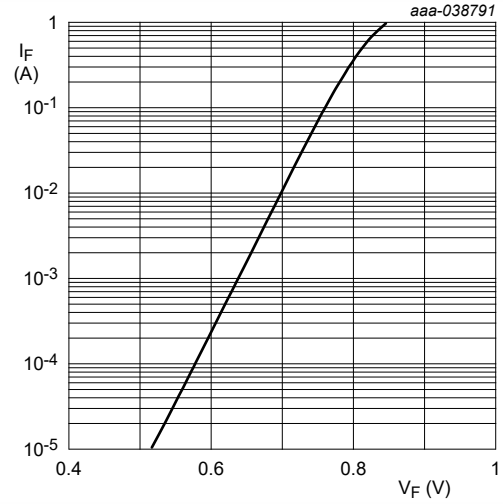
 $T_j = 25\text{ °C}$  unless otherwise specified.

HPZR -Cxxx-Q	Working voltage $V_Z$ (V) $I_Z = 1\text{ mA}$		Reverse current $I_R$ ( $\mu\text{A}$ )		Differential resistance $R_Z$ ( $\Omega$ ) $I_Z = 20\text{ mA}$
	Min	Max	Max	$V_R$ (V)	Max
8V8	8.33	9.21	50	7.5	14.84
9V4	8.89	9.83	25	8.0	16.43
10	9.44	10.40	10	8.5	18.02
11	10.00	11.10	5	9	19.61
12	11.10	12.30	2.5	10	21.20
13	12.20	13.50	2.5	11	22.79
14	13.30	14.70	2.5	12	24.38
15	14.40	15.90	0.1	13	25.97
17	15.60	17.20	0.1	14	27.56
18	16.70	18.50	0.1	15	29.15
19	17.80	19.70	0.1	16	30.74
20	18.90	20.90	0.1	17	32.33
21	20.00	22.10	0.1	18	33.92
23	22.20	24.50	0.1	20	35.51
26	24.40	26.90	0.1	22	36.57
28	26.70	29.50	0.1	24	37.10
30	28.90	31.90	0.1	26	40.28
33	31.10	34.40	0.1	28	43.46
35	33.30	36.80	0.1	30	46.64
39	36.70	40.60	0.1	33	49.82
42	40.00	44.20	0.1	36	53.00
47	44.40	49.10	0.1	40	56.18
50	47.80	52.80	0.1	43	59.36
53	50.00	55.30	0.1	45	62.54
56	53.30	58.90	0.1	48	65.72
60	56.70	62.70	0.1	51	68.90
63	60.00	66.30	0.1	54	72.08
68	64.40	71.20	0.1	58	75.26
70	66.70	73.70	0.1	60	76.32
75	71.10	78.60	0.1	64	77.38



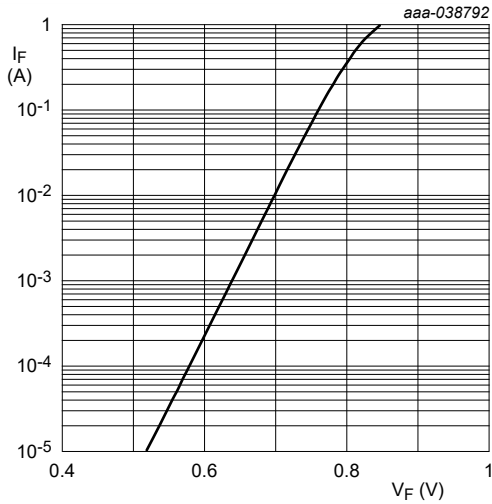
(1)  $T_j = 25\text{ }^\circ\text{C}$  (before surge)

**Fig. 1. Non-repetitive peak reverse power dissipation as a function of pulse duration; maximum values**



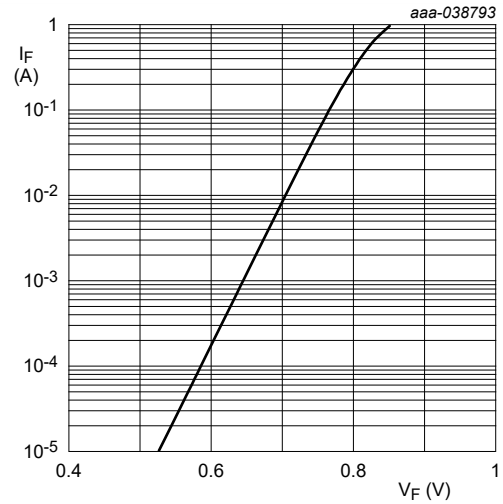
$T_j = 25\text{ }^\circ\text{C}$

**Fig. 2. Forward current as a function of forward voltage; typical values (HPZR-C3V0-Q)**



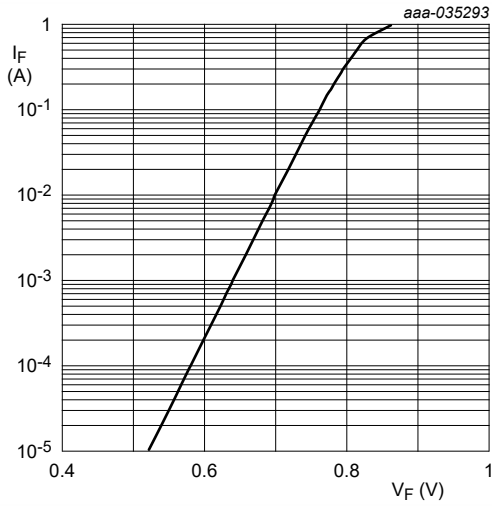
$T_j = 25\text{ }^\circ\text{C}$

**Fig. 3. Forward current as a function of forward voltage; typical values (HPZR-C3V3-Q)**



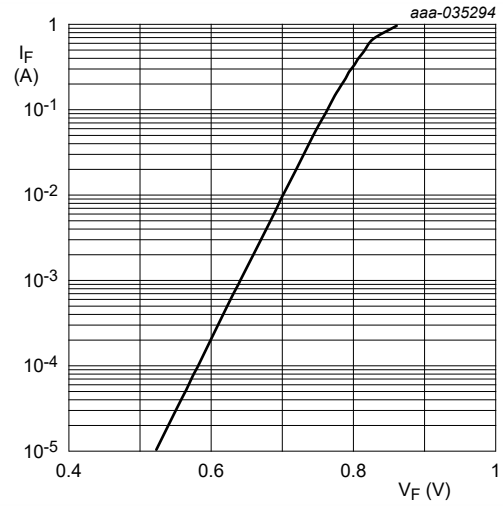
$T_j = 25\text{ }^\circ\text{C}$

**Fig. 4. Forward current as a function of forward voltage; typical values (HPZR-C5V1-Q)**



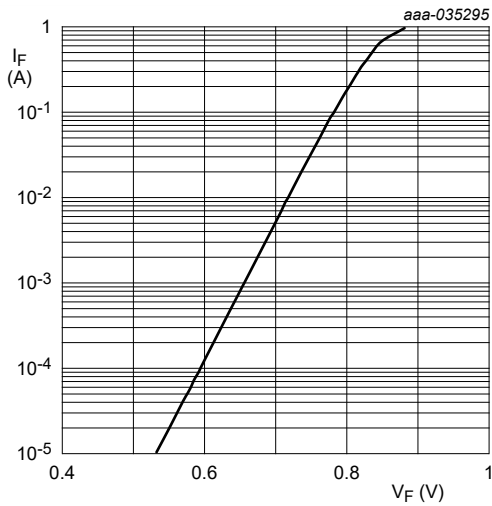
$T_j = 25\text{ }^\circ\text{C}$

**Fig. 5.** Forward current as a function of forward voltage; typical values (HPZR-C5V6-Q)



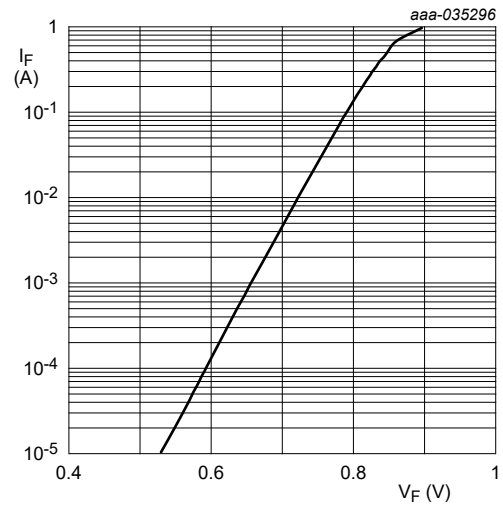
$T_j = 25\text{ }^\circ\text{C}$

**Fig. 6.** Forward current as a function of forward voltage; typical values (HPZR-C7V0-Q)



$T_j = 25\text{ }^\circ\text{C}$

**Fig. 7.** Forward current as a function of forward voltage; typical values (HPZR-C8V2-Q)



$T_j = 25\text{ }^\circ\text{C}$

**Fig. 8.** Forward current as a function of forward voltage; typical values (HPZR-C68-Q)

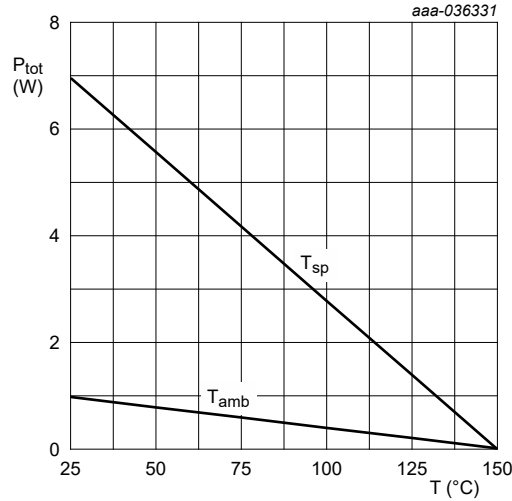


Fig. 9. Total power dissipation as a function of temperature; maximum values

## 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

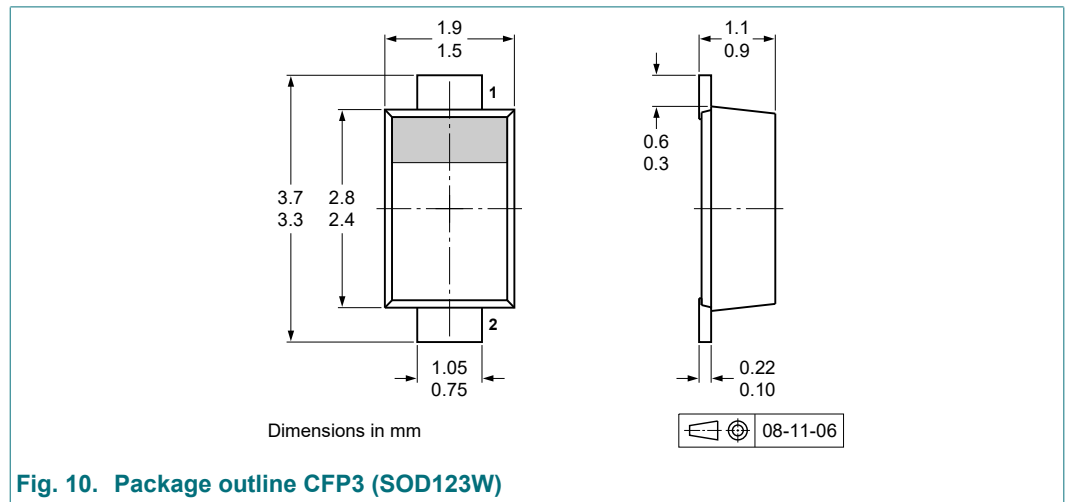
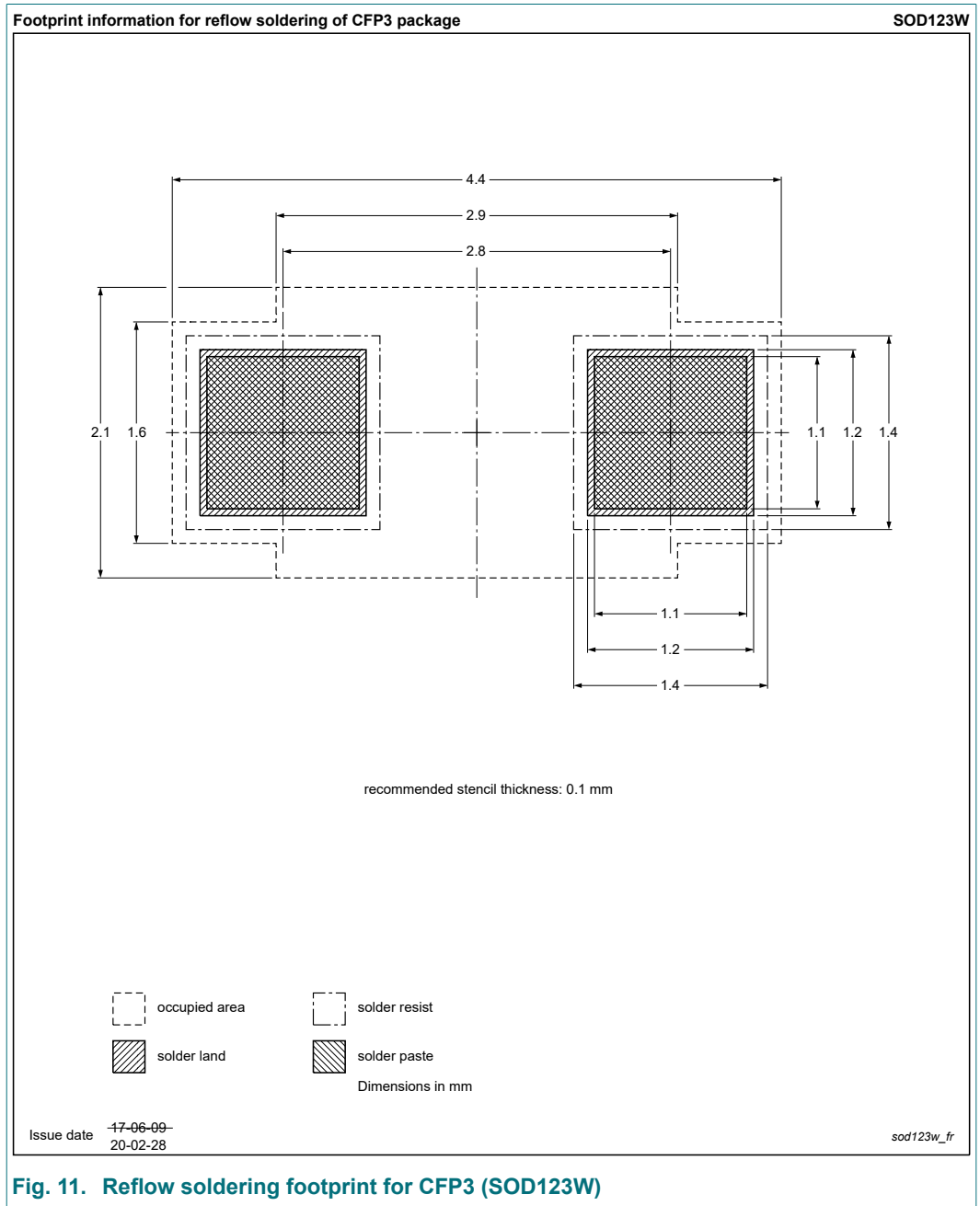
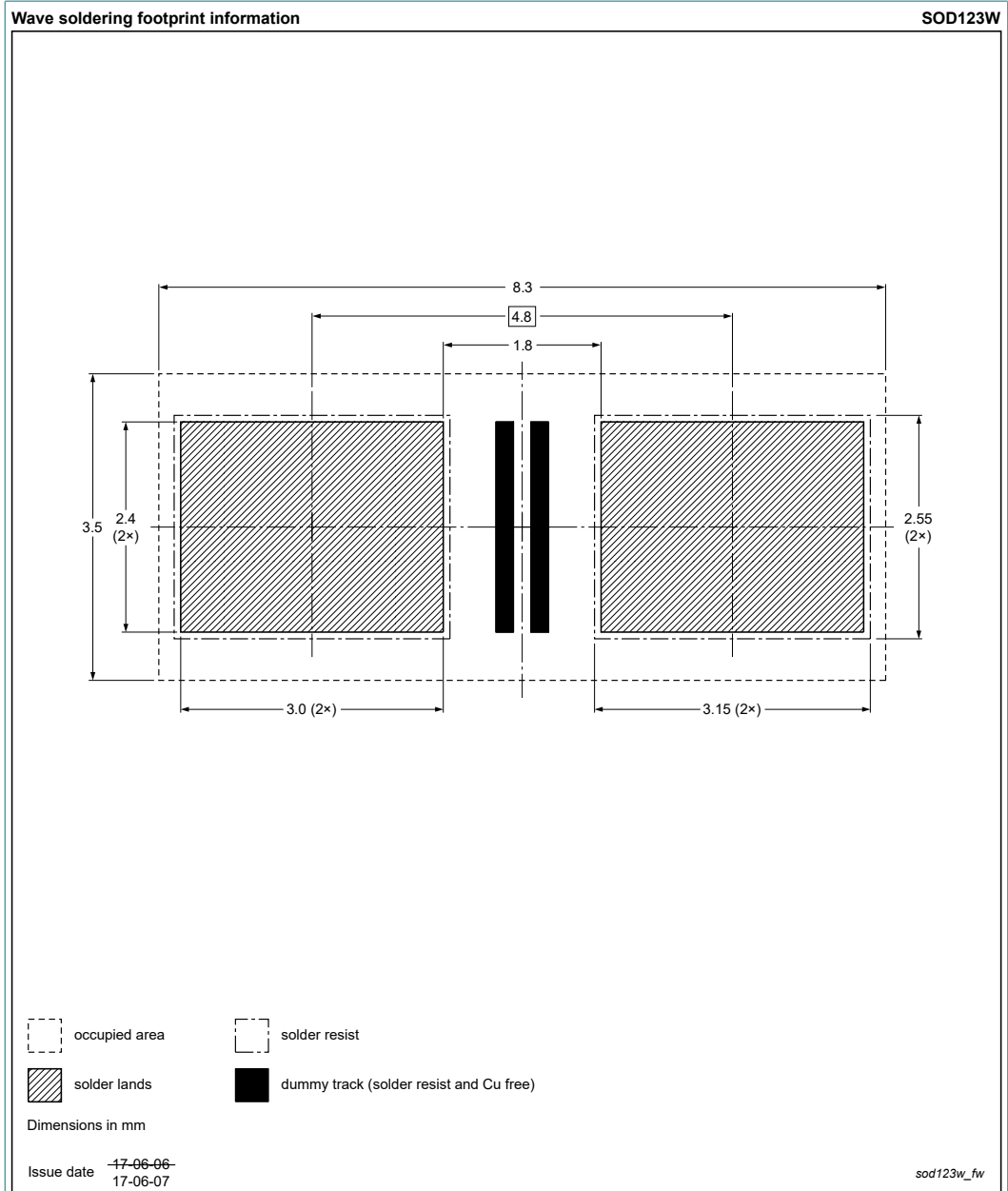


Fig. 10. Package outline CFP3 (SOD123W)



13. Soldering





**Fig. 12. Wave soldering footprint for CFP3 (SOD123W)**

## 14. Revision history

**Table 13. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
HPZR-Q_SER v.6	20240118	Product data sheet	-	HPZR-Q_SER v.5
Modifications:	• Added working voltages 3V0 to 5V1			
HPZR-Q_SER v.5	20230310	Product data sheet	-	HPZR-Q_SER v.4
HPZR-Q_SER v.4	20230302	Product data sheet	-	HPZR-Q_SER v.3
HPZR-Q_SER v.3	20230216	Product data sheet	-	HPZR-Q_SER v.2
HPZR-Q_SER v.2	20220912	Product data sheet	-	HPZR-Q_SER v.1
HPZR-Q_SER v.1	20220520	Objective 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.

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## Contents

---

1. General description.....	1
2. Features and benefits.....	1
3. Applications.....	1
4. Quick reference data.....	1
5. Pinning information.....	2
6. Ordering information.....	2
7. Marking.....	2
8. Limiting values.....	3
9. Thermal characteristics.....	4
10. Characteristics.....	4
11. Test information.....	8
12. Package outline.....	8
13. Soldering.....	9
14. Revision history.....	11
15. Legal information.....	12

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