



PZUxBA series

Zener voltage regulator diodes

Rev. 4 — 16 August 2024

Product data sheet

1. General description

General-purpose Zener diodes in a SOD323 (SC-76) very small Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- Non-repetitive peak reverse power dissipation: $P_{ZSM} \leq 40 \text{ W}$
- Total power dissipation: $P_{tot} \leq 320 \text{ mW}$
- Tolerance series:
 - B: approximately $\pm 5 \%$
 - B1, B2, B3: approximately $\pm 2 \%$
- Wide working voltage range: nominal 2.4 V to 51 V (E24 range)
- Low reverse current I_R range
- Small plastic package suitable for surface-mounted design
- PZU5.1BA - 10BA: Very low dynamic impedances at low currents, very low leakage current, hard breakdown knee
- PZU11B2A-51BA: Intentional minor rise of leakage current for optimized fast switching and noise reduction [Ref. [AN90031](#)]

3. Applications

- 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] -	-	1.1	V
P_{ZSM}	non-repetitive peak reverse power dissipation		[2] -	-	40	W
P_{tot}	total power dissipation	$T_{amb} \leq 25 \text{ }^\circ\text{C}$	[3] -	-	320	mW


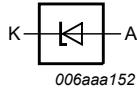
[1] Pulse test: $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$

[2] $t_p = 100 \text{ } \mu\text{s}$; square wave; $T_j = 25 \text{ }^\circ\text{C}$ prior to surge.

[3] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

5. Pinning information

Table 2. Pinning

Pin	Description		Simplified outline	Symbol
1	cathode	[1]		
2	anode			

[1] The marking bar indicates the cathode

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PZU2.4BA to PZU51BA [1]	SC-76	plastic, surface-mounted package; 2 leads; 1.3 mm pitch; 1.7 mm x 1.25 mm x 0.95 mm body	SOD323

[1] The series consists of 105 types with nominal working voltages from 2.4 V to 51 V.

7. Marking

Table 4. Marking codes

Type number [1]	Marking code				Type number	Marking code			
	B	B1	B2	B3		B	B1	B2	B3
PZU2.4*A	X8	-	-	-	PZU12*A	VK	VL	VM	VN
PZU2.7*A	X9	XA	XB	-	PZU13*A	VP	VR	VS	VT
PZU3.0*A	XT	XU	XV	-	PZU14*A	-	-	VU	-
PZU3.3*A	XW	XX	XY	-	PZU15*A	VV	VW	VX	VY
PZU3.6*A	XZ	MC	MD	-	PZU16*A	VZ	X1	X2	X3
PZU3.9*A	ME	MF	MG	-	PZU18*A	X4	X5	X6	X7
PZU4.3*A	MM	MN	MP	MR	PZU20*A	XC	XD	XE	XF
PZU4.7*A	MS	MT	MU	MV	PZU22*A	XG	XH	XK	XL
PZU5.1*A	MW	MX	MY	MZ	PZU24*A	XM	XN	XP	XR
PZU5.6*A	LF	LG	LH	LK	PZU27*A	XS	-	-	-
PZU6.2*A	LL	LM	LN	LP	PZU30*A	MH	-	-	-
PZU6.8*A	LR	LS	LT	LU	PZU33*A	MK	-	-	-
PZU7.5*A	LV	LW	LX	LY	PZU36*A	ML	-	-	-
PZU8.2*A	LZ	CR	CS	CT	PZU39*A	5R	-	5G	-
PZU9.1*A	CU	CV	CW	CX	PZU43*A	5S	-	5H	-
PZU10*A	VA	VB	VC	VD	PZU47*A	5T	-	5J	-
PZU11*A	VE	VF	VG	VH	PZU51*A	5U	-	5K	-

[1] * = B: tolerance series B, approximately $\pm 5\%$

* = B1, B2, B3: tolerance series B1, B2, B3: approximately $\pm 2\%$

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		-	200	mA
I_{ZSM}	non-repetitive peak reverse current		[1] -	see: Table 8	
P_{ZSM}	non-repetitive peak reverse power dissipation		[1] -	40	W
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[2] -	320	mW
			[3] -	490	mW
T_j	junction temperature		-	150	°C
T_{amb}	ambient temperature		-55	+150	°C
T_{stg}	storage temperature		-65	+150	°C

[1] $t_p = 100\ \mu\text{s}$; square wave; $T_j = 25\text{ °C}$ prior to surge

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[3] 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] -	-	390	K/W
			[2] -	-	255	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[3] -	-	55	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.

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_F	forward voltage	$I_F = 10\text{ mA}$ $T_{amb} = 25\text{ °C}$	[1] -	-	0.9	V
		$I_F = 100\text{ mA}$ $T_{amb} = 25\text{ °C}$	[1] -	-	1.1	V

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

Table 8. Characteristics per type; PZU2.4BA to PZU36BA

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

PZU xBA	Sel	Working voltage V_Z (V)		Maximum differential resistance r_{dif} (Ω)		Reverse current I_R (μA)		Temperature coefficient S_Z (mV/K)	Diode capacitance C_d (pF)	Non-repetitive peak reverse current I_{ZSM} (A)
		$I_Z = 5\text{ mA}$		$I_Z = 0.5\text{ mA}$	$I_Z = 5\text{ mA}$			$I_Z = 5\text{ mA}$	$f = 1\text{ MHz};$ $V_R = 0\text{ V}$	$t_p = 100\text{ }\mu\text{s};$ square wave; $T_j = 25\text{ °C};$ prior to surge
		Min	Max	Max	Max	Max	V_R (V)	Typ	Max	Max
2.4	B	2.3	2.6	1000	100	50	1	-1.6	450	8
2.7	B	2.5	2.9	1000	100	20	1		440	8
	B1	2.5	2.75							
	B2	2.65	2.9							
3.0	B	2.80	3.20	1000	95	10	1		425	8
	B1	2.80	3.05							
	B2	2.95	3.20							
3.3	B	3.10	3.50	1000	95	5	1		410	8
	B1	3.10	3.35							
	B2	3.25	3.50							
3.6	B	3.40	3.80	1000	90	5	1		390	8
	B1	3.40	3.65							
	B2	3.55	3.80							
3.9	B	3.70	4.10	1000	90	3	1		370	8
	B1	3.70	3.97							
	B2	3.87	4.10							
4.3	B	4.01	4.48	1000	90	3	1		350	8
	B1	4.01	4.21							
	B2	4.15	4.34							
	B3	4.28	4.48							
4.7	B	4.42	4.90	800	80	2	1		325	8
	B1	4.42	4.61							
	B2	4.55	4.75							
	B3	4.69	4.90							
5.1	B	4.84	5.37	250	60	2	1.5	0.3	300	5.5
	B1	4.84	5.04							
	B2	4.98	5.20							
	B3	5.14	5.37							

PZU xBA	Sel	Working voltage V_Z (V)		Maximum differential resistance r_{dif} (Ω)		Reverse current I_R (nA)		Temperature coefficient S_Z (mV/K)	Diode capacitance C_d (pF)	Non-repetitive peak reverse current I_{ZSM} (A)
		$I_Z = 5$ mA		$I_Z = 0.5$ mA	$I_Z = 5$ mA			$I_Z = 5$ mA	$f = 1$ MHz; $V_R = 0$ V	$t_p = 100$ μ s; square wave; $T_j = 25$ $^{\circ}$ C ; prior to surge
		Min	Max	Max	Max	Max	V_R (V)	Typ	Max	Max
5.6	B	5.31	5.92	100	40	1000	2.5	1.9	275	5.5
	B1	5.31	5.55							
	B2	5.49	5.73							
	B3	5.67	5.92							
6.2	B	5.86	6.53	80	30	500	3	2.7	250	5.5
	B1	5.86	6.12							
	B2	6.06	6.33							
	B3	6.26	6.53							
6.8	B	6.47	7.14	60	20	500	3.5	3.4	215	5.5
	B1	6.47	6.73							
	B2	6.65	6.93							
	B3	6.86	7.14							
7.5	B	7.06	7.84	60	10	500	4	4.0	170	3.5
	B1	7.06	7.36							
	B2	7.28	7.60							
	B3	7.52	7.84							
8.2	B	7.76	8.64	60	10	500	5	4.6	150	3.5
	B1	7.76	8.10							
	B2	8.02	8.36							
	B3	8.28	8.64							
9.1	B	8.56	9.55	60	10	500	6	5.5	120	3.5
	B1	8.56	8.93							
	B2	8.85	9.23							
	B3	9.15	9.55							
10	B	9.45	10.55	60	10	100	7	6.4	110	3.5
	B1	9.45	9.87							
	B2	9.77	10.21							
	B3	10.11	10.55							
11	B	10.44	11.56	60	10	100	8	7.4	108	3
	B1	10.44	10.88							
	B2	10.76	11.22							
	B3	11.10	11.56							
12	B	11.42	12.60	80	10	100	9	8.4	105	3
	B1	11.42	11.90							
	B2	11.74	12.24							
	B3	12.08	12.60							

PZU xBA	Sel	Working voltage V_Z (V)		Maximum differential resistance r_{dif} (Ω)		Reverse current I_R (nA)		Temperature coefficient S_Z (mV/K)	Diode capacitance C_d (pF)	Non-repetitive peak reverse current I_{ZSM} (A)
		$I_Z = 5$ mA		$I_Z = 0.5$ mA	$I_Z = 5$ mA			$I_Z = 5$ mA	$f = 1$ MHz; $V_R = 0$ V	$t_p = 100$ μ s; square wave; $T_j = 25$ $^{\circ}$ C ; prior to surge
		Min	Max	Max	Max	Max	V_R (V)	Typ	Max	Max
13	B	12.47	13.96	80	10	100	10	9.4	103	2.5
	B1	12.47	13.03							
	B2	12.91	13.49							
	B3	13.37	13.96							
14	B2	13.70	14.30	80	10	100	11	10.4	101	2
15	B	13.84	15.52	80	15	50	11	11.4	99	2
	B1	13.84	14.46							
	B2	14.34	14.98							
	B3	14.85	15.52							
16	B	15.37	17.09	80	20	50	12	12.4	97	1.5
	B1	15.37	16.01							
	B2	15.85	16.51							
	B3	16.35	17.09							
18	B	16.94	19.03	80	20	50	13	14.4	93	1.5
	B1	16.94	17.70							
	B2	17.56	18.35							
	B3	18.21	19.03							
20	B	18.86	21.08	100	20	50	15	16.4	88	1.5
	B1	18.86	19.70							
	B2	19.52	20.39							
	B3	20.21	21.08							
22	B	20.88	23.17	100	25	50	17	18.4	84	1.3
	B1	20.88	21.77							
	B2	21.54	22.47							
	B3	22.23	23.17							
24	B	22.93	25.57	120	30	50	19	20.4	80	1.3
	B1	22.93	23.96							
	B2	23.72	24.78							
	B3	24.54	25.57							
27	B	25.1	28.9	150	40	50	21	23.4	73	1
30	B	28	32	200	40	50	23	26.6	66	1
33	B	31	35	250	40	50	25	29.7	60	0.9
36	B	34	38	300	60	50	27	33.0	59	0.8

Table 9. Characteristics per type; PZU39BA to PZU51BA

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

PZU xBA	Sel	Working voltage V_Z (V)		Maximum differential resistance r_{dif} (Ω)		Reverse current I_R (nA)		Temperature coefficient S_Z (mV/K)	Diode capacitance C_d (pF)	Non-repetitive peak reverse current I_{ZSM} (A)
		$I_Z = 2\text{ mA}$		$I_Z = 0.5\text{ mA}$	$I_Z = 2\text{ mA}$			$I_Z = 2\text{ mA}$	$f = 1\text{ MHz};$ $V_R = 0\text{ V}$	$t_p = 100\text{ }\mu\text{s};$ square wave; $T_j = 25\text{ °C};$ prior to surge
		Min	Max	Max	Max	Max	V_R (V)	Typ	Max	Max
39	B2	38.20	39.80	350	130	50	27.3	36.4	45	0.7
	B	37.00	41.00							
43	B2	42.10	43.90	375	150	50	30.1	41.2	40	0.6
	B	40.00	46.00							
47	B2	46.10	47.90	375	170	50	32.9	46.1	40	0.5
	B	44.00	50.00							
51	B2	50.00	52.00	400	180	50	35.7	51.0	40	0.4
	B	48.00	54.00							

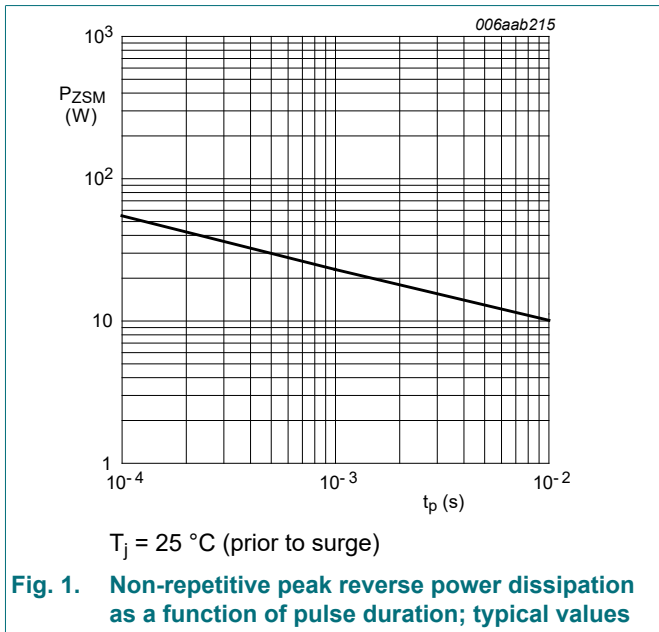


Fig. 1. Non-repetitive peak reverse power dissipation as a function of pulse duration; typical values

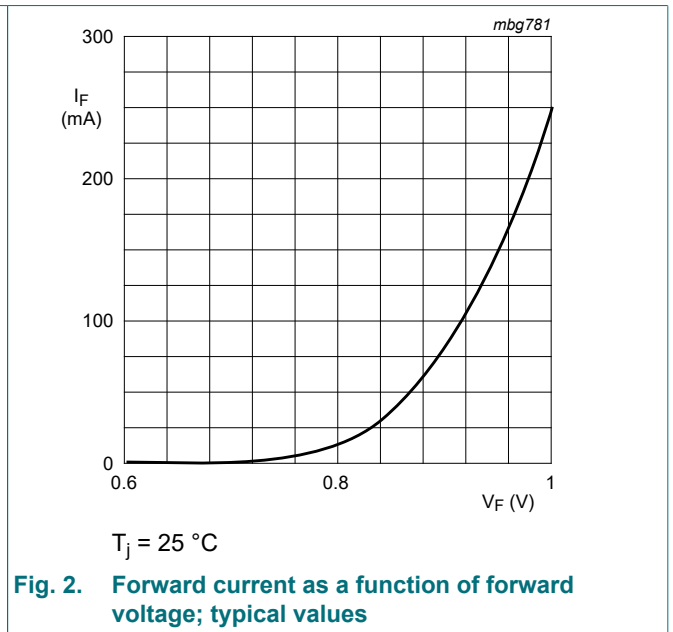
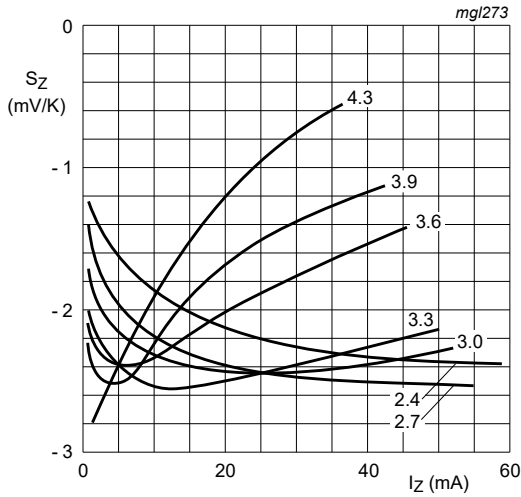
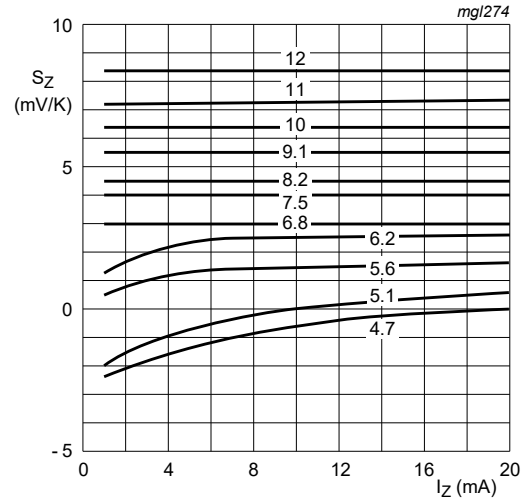


Fig. 2. Forward current as a function of forward voltage; typical values



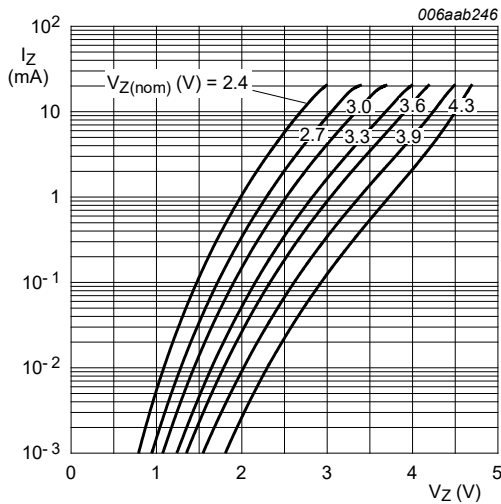
$T_j = 25\text{ }^\circ\text{C}$ to $150\text{ }^\circ\text{C}$
 $V_Z = 2.4\text{ V}$ to 4.3 V

Fig. 3. Temperature coefficient as a function of working current; typical values



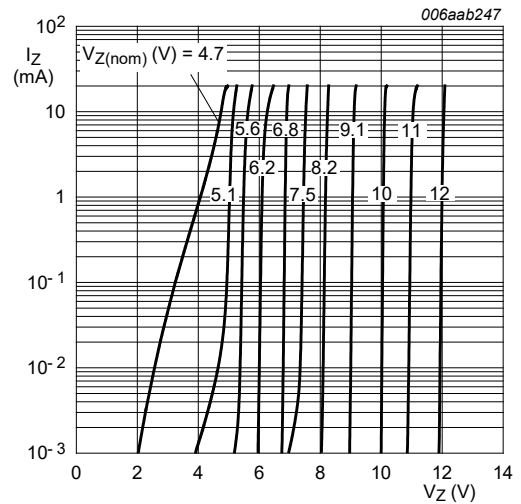
$T_j = 25\text{ }^\circ\text{C}$ to $150\text{ }^\circ\text{C}$
 $V_Z = 4.7\text{ V}$ to 12 V

Fig. 4. Temperature coefficient as a function of working current; typical values



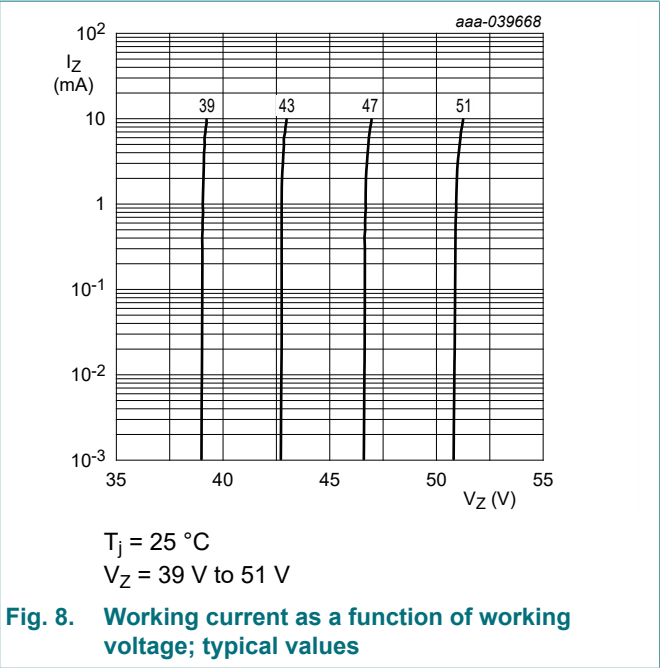
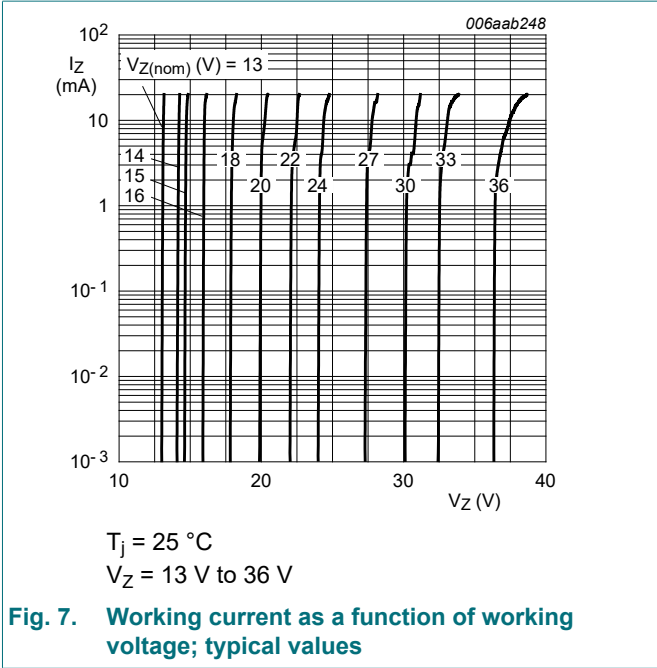
$T_j = 25\text{ }^\circ\text{C}$
 $V_Z = 2.4\text{ V}$ to 4.3 V

Fig. 5. Working current as a function of working voltage; typical values

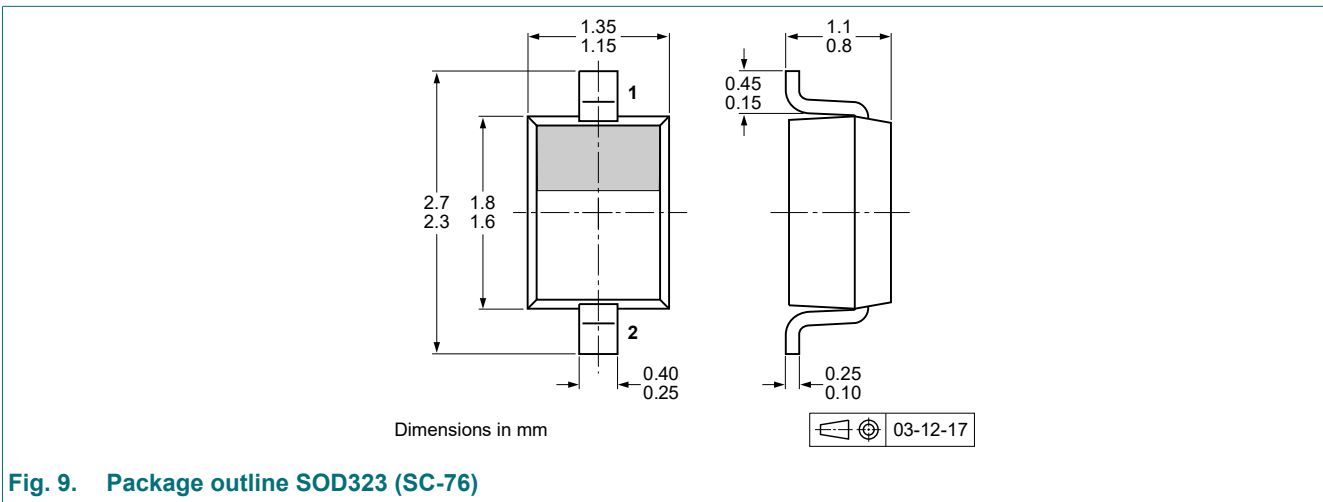


$T_j = 25\text{ }^\circ\text{C}$
 $V_Z = 4.7\text{ V}$ to 12 V

Fig. 6. Working current as a function of working voltage; typical values



11. Package outline



12. Soldering

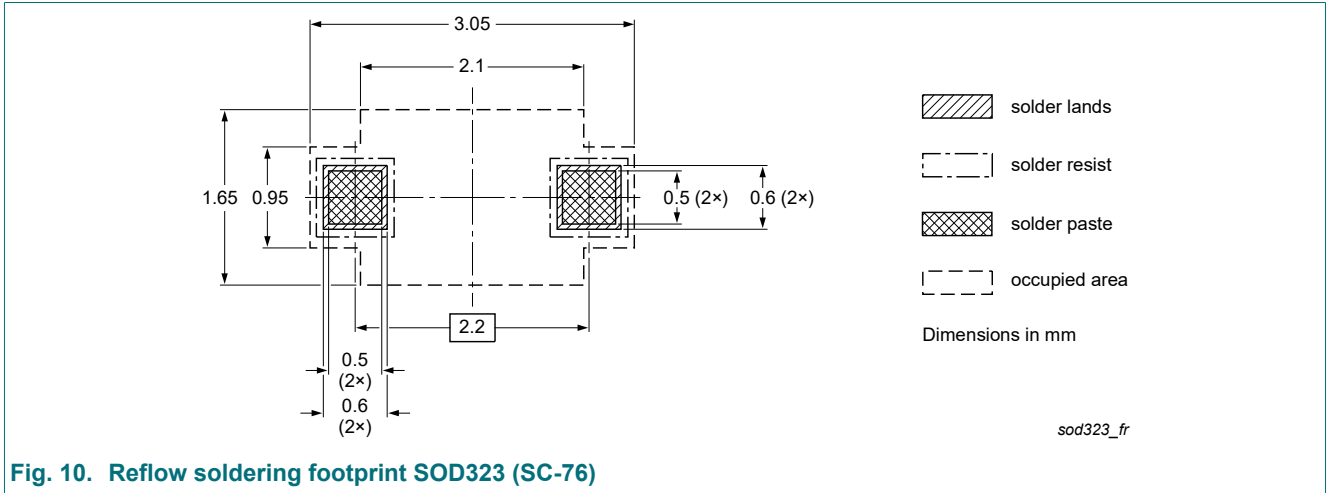


Fig. 10. Reflow soldering footprint SOD323 (SC-76)

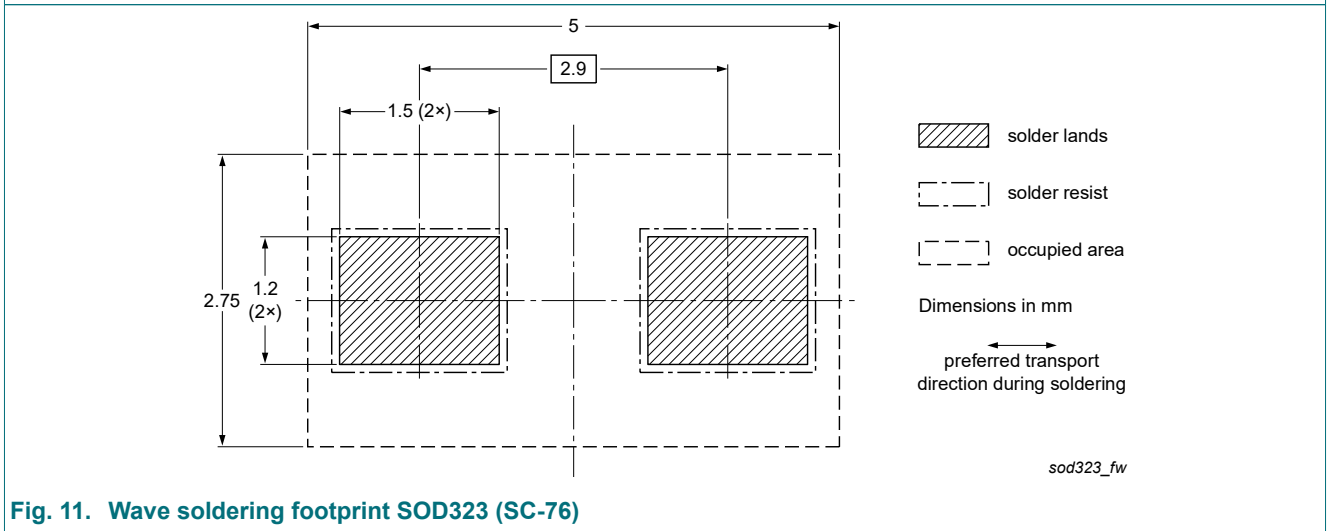


Fig. 11. Wave soldering footprint SOD323 (SC-76)

13. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Supersedes
PZUXBA_SER v. 4	20240816	Product data sheet	PZUXBA_SER v. 3
Modifications:	<ul style="list-style-type: none">• Subtitle of the data sheet changed• Selections B/C 39 V to 51 V added		
PZUXBA_SER v. 3	20240405	Product data sheet	PZUXBA_SER v. 2
PZUXBA_SER v. 2	20231012	Product data sheet	PZUXBA_SER v. 1
PZUXBA_SER v. 1	20220810	Product data sheet	-

14. 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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