PZUxBA-Q series

Zener voltage regulator diodes

Rev. 3 — 16 August 2024 Product data sheet

1. General description

General-purpose Zener diodes in a SOD323F (SC-90) very small and flat lead Surface Mounted Device (SMD) plastic package.

2. Features and benefits

- Total power dissipation: 550 mW
- Tolerance series: B: approximately 5 %; B1, B2, B3: sequential, approximately 2 %
- Small plastic package suitable for surface mounted design
- Wide working voltage range: nominal 2.4 V to 51 V
- Very low leakage current for a given reverse voltage for types PZU5.1B-Q - PZU10B-Q
- PZU5.1B2-Q - 10B-Q: Very low dynamic impedances at low currents, very low leakage current, hard breakdown knee
- PZU11B2-Q - 51B-Q: Intentional minor rise of leakage current for optimized fast switching and noise reduction [Ref. AN90031]
- Qualified according to AEC-Q101 and recommended for use in automotive applications

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 mA	[1]	-	-	1.1	V
P_{ZSM}	non-repetitive peak reverse power dissipation		[2]	-	-	40	W
P_{tot}	total power dissipation	T_{amb} ≤ 25 °C	[3]	-	-	320	mW

[1] Pulse test: t_p ≤ 300 µs; δ ≤ 0.02
[2] t_p = 100 µs; square wave; T_j = 25 °C prior to surge.
[3] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

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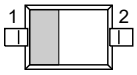
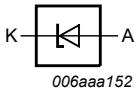
5. Pinning information

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-Q to PZU51BA-Q [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-Q	X8	-	-	-	PZU12*A-Q	VK	VL	VM	VN
PZU2.7*A-Q	X9	XA	XB	-	PZU13*A-Q	VP	VR	VS	VT
PZU3.0*A-Q	XT	XU	XV	-	PZU14*A-Q	-	-	VU	-
PZU3.3*A-Q	XW	XX	XY	-	PZU15*A-Q	VV	VW	VX	VY
PZU3.6*A-Q	XZ	MC	MD	-	PZU16*A-Q	VZ	X1	X2	X3
PZU3.9*A-Q	ME	MF	MG	-	PZU18*A-Q	X4	X5	X6	X7
PZU4.3*A-Q	MM	MN	MP	MR	PZU20*A-Q	XC	XD	XE	XF
PZU4.7*A-Q	MS	MT	MU	MV	PZU22*A-Q	XG	XH	XK	XL
PZU5.1*A-Q	MW	MX	MY	MZ	PZU24*A-Q	XM	XN	XP	XR
PZU5.6*A-Q	LF	LG	LH	LK	PZU27*A-Q	XS	-	-	-
PZU6.2*A-Q	LL	LM	LN	LP	PZU30*A-Q	MH	-	-	-
PZU6.8*A-Q	LR	LS	LT	LU	PZU33*A-Q	MK	-	-	-
PZU7.5*A-Q	LV	LW	LX	LY	PZU36*A-Q	ML	-	-	-
PZU8.2*A-Q	LZ	CR	CS	CT	PZU39*A-Q	5R	-	5G	-
PZU9.1*A-Q	CU	CV	CW	CX	PZU43*A-Q	5S	-	5H	-
PZU10*A-Q	VA	VB	VC	VD	PZU47*A-Q	5T	-	5J	-
PZU11*A-Q	VE	VF	VG	VH	PZU51*A-Q	5U	-	5K	-

[1] * = B: tolerance series B, approximately ±5 %
* = B1, B2, B3: tolerance series B1, B2, B3: approximately ±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	$T_{amb} \leq 25$ °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 µs; square wave; T_j = 25 °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 1cm^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 mA T_{amb} = 25 °C	[1]	-	-	0.9	V
		I_F = 100 mA T_{amb} = 25 °C	[1]	-	-	1.1	V

[1] Pulse test: $t_p \leq 300$ µs; $\delta \leq 0.02$

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

T_j = 25 °C unless otherwise specified

PZUxBA-Q	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 mA		I_Z = 0.5 mA	I_Z = 5 mA			I_Z = 5 mA	f = 1 MHz; V_R = 0 V	t_p = 100 μs; square wave; T_j = 25 °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	-2.0	440	8
	B1	2.5	2.75							
	B2	2.65	2.9							
3.0	B	2.80	3.20	1000	95	10	1	-2.1	425	8
	B1	2.80	3.05							
	B2	2.95	3.20							
3.3	B	3.10	3.50	1000	95	5	1	-2.4	410	8
	B1	3.10	3.35							
	B2	3.25	3.50							
3.6	B	3.40	3.80	1000	90	5	1	-2.4	390	8
	B1	3.40	3.65							
	B2	3.55	3.80							
3.9	B	3.70	4.10	1000	90	3	1	-2.5	370	8
	B1	3.70	3.97							
	B2	3.87	4.10							
4.3	B	4.01	4.48	1000	90	3	1	-2.5	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	-1.4	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							

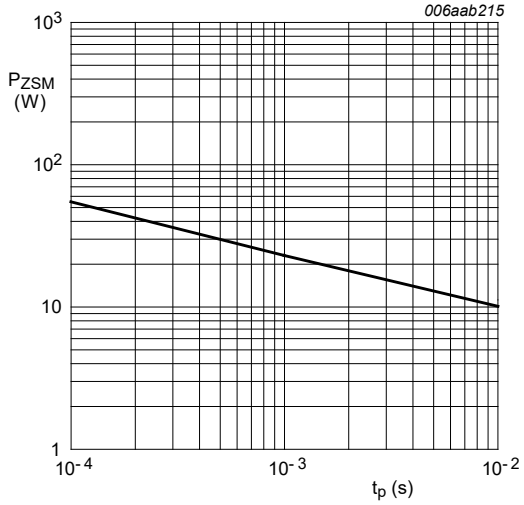
PZUxBA-Q	Sel	Working voltage V_Z (V)		Maximum differential resistance r_{dif} (Ω)		Reverse current I_R (nA)		Temperature coefficient S_Z (mV/K)	Diode capacitance C_d (pF)	Non-repetitive peak reverse current I_{ZSM} (A)
		I_Z = 5 mA		I_Z = 0.5 mA	I_Z = 5 mA			I_Z = 5 mA	f = 1 MHz; V_R = 0 V	t_p = 100 µs; square wave; T_j = 25 °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							

PZUxBA-Q	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 µs; square wave; T_j = 25 °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-Q to PZU51BA-Q

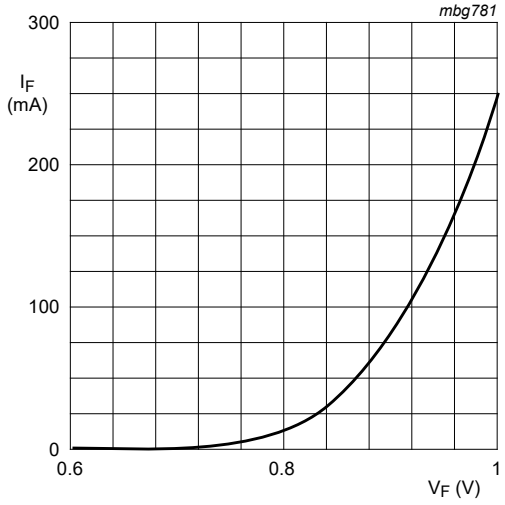
T_j = 25 °C unless otherwise specified

PZUxBA-Q	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 mA		I_Z = 0.5 mA	I_Z = 2 mA			I_Z = 2 mA	f = 1 MHz; V_R = 0 V	t_p = 100 µs; square wave; T_j = 25 °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							



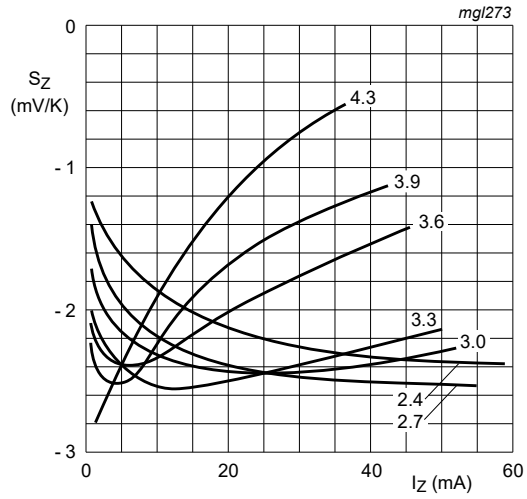
T_j = 25 °C (prior to surge)

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



T_j = 25 °C

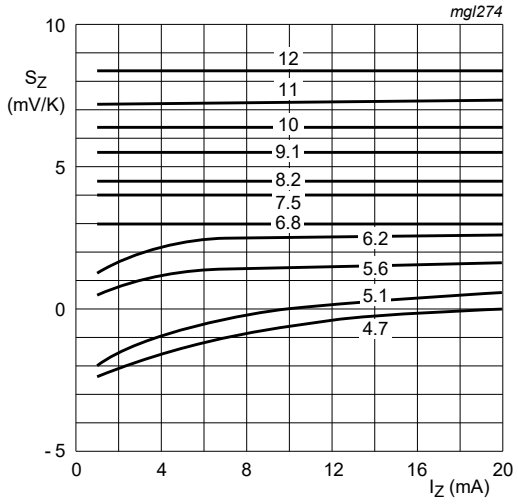
Fig. 2. Forward current as a function of forward voltage; typical values



T_j = 25 °C to 150 °C

V_Z = 2.4 V to 4.3 V

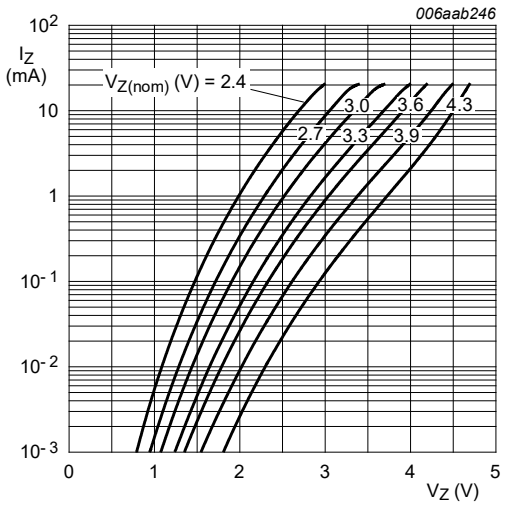
Fig. 3. Temperature coefficient as a function of working current; typical values



T_j = 25 °C to 150 °C

V_Z = 4.7 V to 12 V

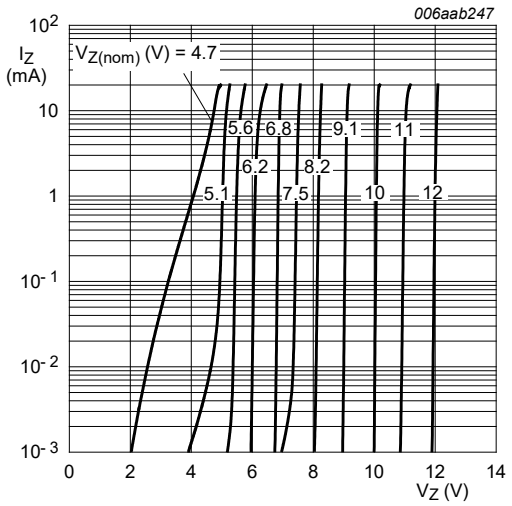
Fig. 4. Temperature coefficient as a function of working current; typical values



T_j = 25 °C

V_Z = 2.4 V to 4.3 V

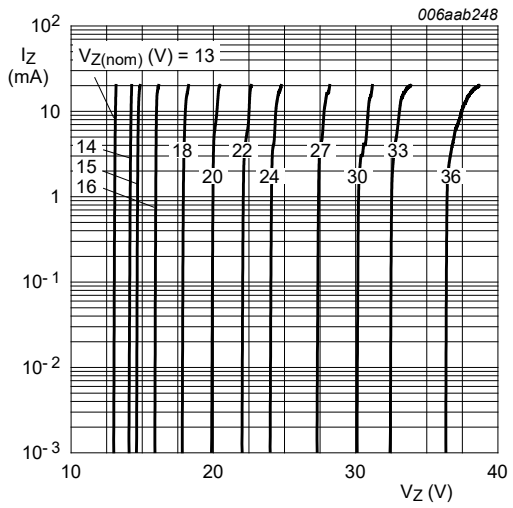
Fig. 5. Working current as a function of working voltage; typical values



T_j = 25 °C

V_Z = 4.7 V to 12 V

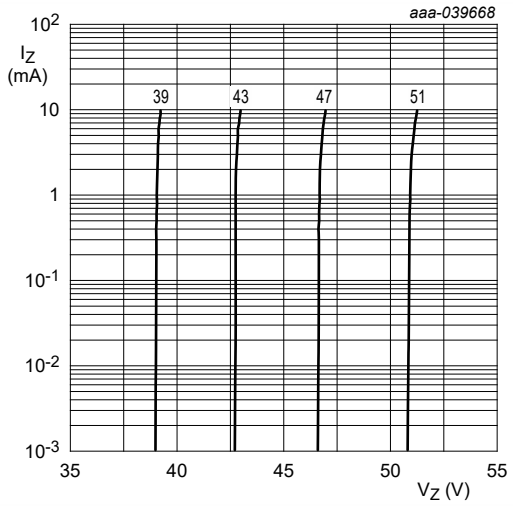
Fig. 6. Working current as a function of working voltage; typical values



T_j = 25 °C

V_Z = 13 V to 36 V

Fig. 7. Working current as a function of working voltage; typical values



T_j = 25 °C

V_Z = 39 V to 51 V

Fig. 8. Working current as a function of working voltage; typical 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

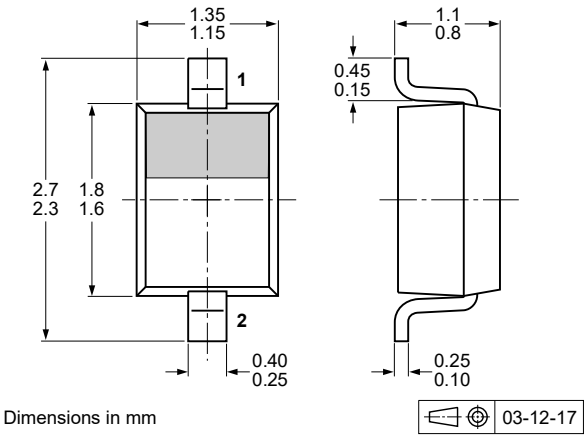


Fig. 9. Package outline SOD323 (SC-76)

13. Soldering

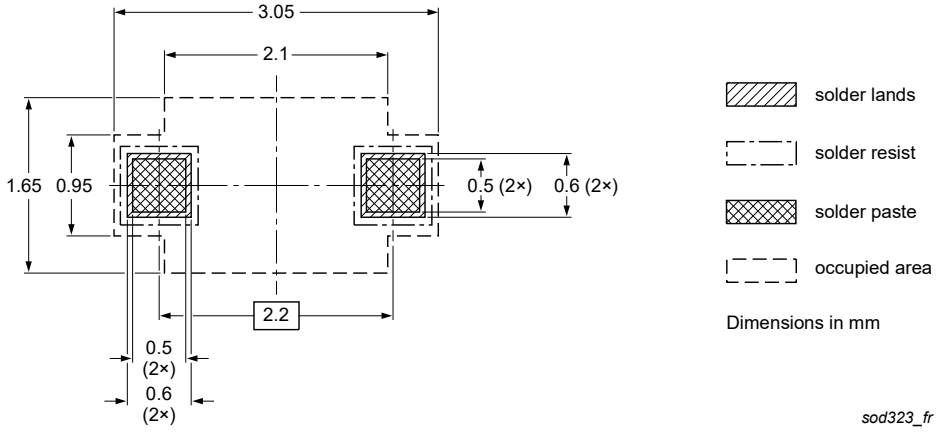


Fig. 10. Reflow soldering footprint SOD323 (SC-76)

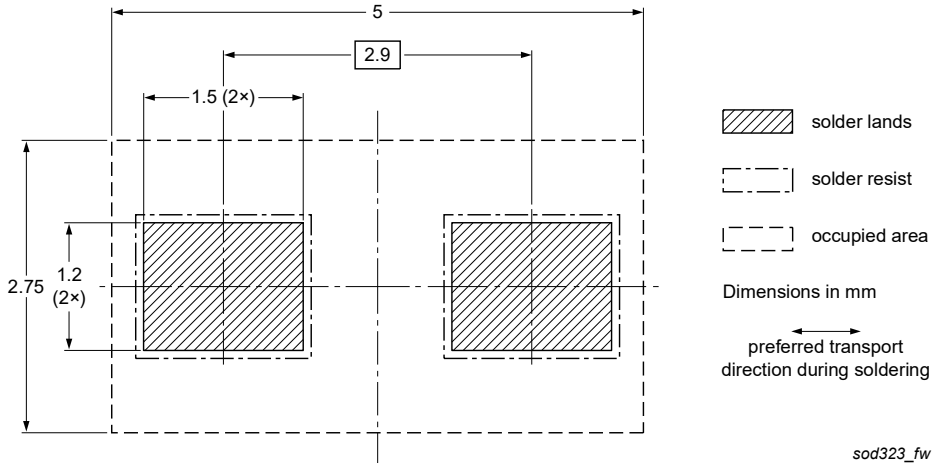


Fig. 11. Wave soldering footprint SOD323 (SC-76)

14. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Supersedes
PZUXBA-Q_SER v. 3	20240816	Product data sheet	PZUXBA-Q_SER v. 2
Modifications:	• Subtitle of the data sheet changed • Selections B/C 39 V to 51 V added		
PZUXBA-Q_SER v. 2	20240405	Product data sheet	PZUXBA-Q_SER v. 1
PZUXBA-Q_SER v. 1	20220810	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".
[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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For sales office addresses, please send an email to: salesaddresses@nexperia.com
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