BZX384-Q series

Voltage regulator diodes

Rev. 1 — 6 September 2021 Product data sheet

1. General description

Low-power voltage regulator diodes in a small SOD323 (SC-76) Surface-Mounted Device (SMD) plastic package.

The diodes are available in the normalized E24 ±1 % (BZX384-A), ±2 % (BZX384-B) and approximately ±5 % (BZX384-C) tolerance range. The series includes 37 breakdown voltages with nominal working voltages from 2.4 V to 75 V.

2. Features and benefits

- Total power dissipation: ≤300 mW
- Three tolerance series: ±1 %, ±2 % and approximately ±5 %
- Working voltage range: nominal 2.4 V to 75 V (E24 range)
- Non-repetitive peak reverse power dissipation: ≤ 40 W
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

- General regulation functions

4. Quick reference data

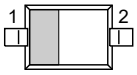
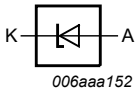
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_F	forward voltage	I_F = 10 mA	[1]	-	-	0.9	V
P_{tot}	total power dissipation	T_{amb} ≤ 25 °C	[2]	-	-	300	mW

[1] Pulse test: t_p ≤ 100 µs; δ ≤ 0.02.
[2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

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
BZX384-Q series[1]	SC-76	plastic surface-mounted package; 2 leads	SOD323

[1] The series consists of 111 types with 37 breakdown voltages with nominal working voltages from 2.4 V to 75 V and ±1 %, ±2 % and ±5 % tolerances.

7. Marking

Table 4. Marking codes

Type number	Marking code	Type number	Marking code	Type number	Marking code
BZX384-A2V4-Q	2B	BZX384-B2V4-Q	K1	BZX384-C2V4-Q	T3
BZX384-A2V7-Q	2U	BZX384-B2V7-Q	K2	BZX384-C2V7-Q	T4
BZX384-A3V0-Q	2V	BZX384-B3V0-Q	K3	BZX384-C3V0-Q	T5
BZX384-A3V3-Q	2W	BZX384-B3V3-Q	K4	BZX384-C3V3-Q	T6
BZX384-A3V6-Q	2X	BZX384-B3V6-Q	K5	BZX384-C3V6-Q	T7
BZX384-A3V9-Q	2Y	BZX384-B3V9-Q	K6	BZX384-C3V9-Q	T8
BZX384-A4V3-Q	2Z	BZX384-B4V3-Q	K7	BZX384-C4V3-Q	T9
BZX384-A4V7-Q	22	BZX384-B4V7-Q	K8	BZX384-C4V7-Q	T0
BZX384-A5V1-Q	23	BZX384-B5V1-Q	K9	BZX384-C5V1-Q	D5
BZX384-A5V6-Q	24	BZX384-B5V6-Q	L1	BZX384-C5V6-Q	D6
BZX384-A6V2-Q	25	BZX384-B6V2-Q	L2	BZX384-C6V2-Q	T1
BZX384-A6V8-Q	26	BZX384-B6V8-Q	L3	BZX384-C6V8-Q	D7
BZX384-A7V5-Q	27	BZX384-B7V5-Q	L4	BZX384-C7V5-Q	D8
BZX384-A8V2-Q	28	BZX384-B8V2-Q	L5	BZX384-C8V2-Q	D9
BZX384-A9V1-Q	29	BZX384-B9V1-Q	L6	BZX384-C9V1-Q	D0
BZX384-A10-Q	3X	BZX384-B10-Q	L7	BZX384-C10-Q	T2
BZX384-A11-Q	32	BZX384-B11-Q	L8	BZX384-C11-Q	DA
BZX384-A12-Q	33	BZX384-B12-Q	L9	BZX384-C12-Q	DB
BZX384-A13-Q	34	BZX384-B13-Q	M1	BZX384-C13-Q	DC
BZX384-A15-Q	35	BZX384-B15-Q	M2	BZX384-C15-Q	DD
BZX384-A16-Q	36	BZX384-B16-Q	M3	BZX384-C16-Q	DE
BZX384-A18-Q	37	BZX384-B18-Q	M4	BZX384-C18-Q	DF
BZX384-A20-Q	38	BZX384-B20-Q	M5	BZX384-C20-Q	DG
BZX384-A22-Q	39	BZX384-B22-Q	M6	BZX384-C22-Q	DH
BZX384-A24-Q	4N	BZX384-B24-Q	M7	BZX384-C24-Q	DJ
BZX384-A27-Q	4P	BZX384-B27-Q	M8	BZX384-C27-Q	DK
BZX384-A30-Q	5F	BZX384-B30-Q	M9	BZX384-C30-Q	DL
BZX384-A33-Q	4R	BZX384-B33-Q	N0	BZX384-C33-Q	DM
BZX384-A36-Q	4S	BZX384-B36-Q	N1	BZX384-C36-Q	DN
BZX384-A39-Q	4T	BZX384-B39-Q	N2	BZX384-C39-Q	DP
BZX384-A43-Q	4U	BZX384-B43-Q	N3	BZX384-C43-Q	DR
BZX384-A47-Q	4V	BZX384-B47-Q	N4	BZX384-C47-Q	DS
BZX384-A51-Q	4W	BZX384-B51-Q	N5	BZX384-C51-Q	DT
BZX384-A56-Q	4X	BZX384-B56-Q	N6	BZX384-C56-Q	DU
BZX384-A62-Q	4Y	BZX384-B62-Q	N7	BZX384-C62-Q	DV
BZX384-A68-Q	4Z	BZX384-B68-Q	N8	BZX384-C68-Q	DW
BZX384-A75-Q	42	BZX384-B75-Q	N9	BZX384-C75-Q	DX

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			-	250	mA
I_{ZSM}	non-repetitive peak reverse current		[1]	-	see Tables 8 and 9	
P_{ZSM}	non-repetitive peak reverse power dissipation		[1]	-	40	W
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[2]	-	300	mW
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			-65	+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.

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]	-	-	415	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[2]	-	-	110	K/W

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
[2] Soldering point of cathode tab.

10. Characteristics

Table 7. Characteristics

T_j = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_F	forward voltage	I_F = 10 mA	[1]	-	-	0.9	V
		I_F = 100 mA	[1]	-	-	1.1	V

[1] Pulse test: $t_p \leq 100$ µs; $\delta \leq 0.02$.

Table 8. Characteristics per type; BZX384-A2V4-Q to BZX384-C24-Q

T_j = 25 °C unless otherwise specified.

BZX384 -xxx	Sel	Working voltage V_Z (V) I_Z = 5 mA		Maximum differential resistance r_{dif} (Ω)		Reverse current I_R (μA)		Temperature coefficient S_Z (mV/K) I_Z = 5 mA		Diode capacitance C_d (pF) [1]	Non-repetitive peak reverse current I_{ZSM} (A) [2]
		Min	Max	I_Z = 1 mA	I_Z = 5 mA	Max	V_R (V)	Min	Max	Max	Max
2V4-Q	A	2.37	2.43	600	100	50	1	-3.5	0.0	450	6.0
	B	2.35	2.45								
	C	2.20	2.60								
2V7-Q	A	2.67	2.73	600	100	20	1	-3.5	0.0	450	6.0
	B	2.65	2.75								
	C	2.50	2.90								
3V0-Q	A	2.97	3.03	600	95	10	1	-3.5	0.0	450	6.0
	B	2.94	3.06								
	C	2.80	3.20								
3V3-Q	A	3.26	3.34	600	95	5	1	-3.5	0.0	450	6.0
	B	3.23	3.37								
	C	3.10	3.50								
3V6-Q	A	3.56	3.64	600	90	5	1	-3.5	0.0	450	6.0
	B	3.53	3.67								
	C	3.40	3.80								
3V9-Q	A	3.86	3.94	600	90	3	1	-3.5	0.0	450	6.0
	B	3.82	3.98								
	C	3.70	4.10								
4V3-Q	A	4.25	4.35	600	90	3	1	-3.5	0.0	450	6.0
	B	4.21	4.39								
	C	4.00	4.60								
4V7-Q	A	4.65	4.75	500	80	3	2	-3.5	0.2	300	6.0
	B	4.61	4.79								
	C	4.40	5.00								
5V1-Q	A	5.04	5.16	480	60	2	2	-2.7	1.2	300	6.0
	B	5.00	5.20								
	C	4.80	5.40								
5V6-Q	A	5.54	5.66	400	40	1	2	-2.0	2.5	300	6.0
	B	5.49	5.71								
	C	5.20	6.00								
6V2-Q	A	6.13	6.27	150	10	3	4	0.4	3.7	200	6.0
	B	6.08	6.32								
	C	5.80	6.60								
6V8-Q	A	6.73	6.87	80	15	2	4	1.2	4.5	200	6.0
	B	6.66	6.94								
	C	6.40	7.20								
7V5-Q	A	7.42	7.58	80	15	1	5	2.5	5.3	150	4.0
	B	7.35	7.65								
	C	7.00	7.90								

BZX384 -xxx	Sel	Working voltage V_Z (V) I_Z = 5 mA		Maximum differential resistance r_{dif} (Ω)		Reverse current I_R (μA)		Temperature coefficient S_Z (mV/K) I_Z = 5 mA		Diode capacitance C_d (pF) [1]	Non-repetitive peak reverse current I_{ZSM} (A) [2]
		Min	Max	I_Z = 1 mA	I_Z = 5 mA	Max	V_R (V)	Min	Max	Max	Max
8V2-Q	A	8.11	8.29	80	15	0.7	5	3.2	6.2	150	4.0
	B	8.04	8.36								
	C	7.70	8.70								
9V1-Q	A	9.00	9.20	100	15	0.5	6	3.8	7.0	150	3.0
	B	8.92	9.28								
	C	8.50	9.60								
10-Q	A	9.90	10.10	150	20	0.2	7	4.5	8.0	90	3.0
	B	9.80	10.20								
	C	9.40	10.60								
11-Q	A	10.89	11.11	150	20	0.1	8	5.4	9.0	85	2.5
	B	10.80	11.20								
	C	10.40	11.60								
12-Q	A	11.88	12.12	150	25	0.1	8	6.0	10.0	85	2.5
	B	11.80	12.20								
	C	11.40	12.70								
13-Q	A	12.87	13.13	170	30	0.1	8	7.0	11.0	80	2.5
	B	12.70	13.30								
	C	12.40	14.10								
15-Q	A	14.85	15.15	200	30	0.05	10.5	9.2	13.0	75	2.0
	B	14.70	15.30								
	C	13.80	15.60								
16-Q	A	15.84	16.16	200	40	0.05	11.2	10.4	14.0	75	1.5
	B	15.70	16.30								
	C	15.30	17.10								
18-Q	A	17.82	18.18	225	45	0.05	12.6	12.4	16.0	70	1.5
	B	17.60	18.40								
	C	16.80	19.10								
20-Q	A	19.80	20.20	225	55	0.05	14	14.4	18.0	60	1.5
	B	19.60	20.40								
	C	18.80	21.20								
22-Q	A	21.78	22.22	250	55	0.05	15.4	16.4	20.0	60	1.25
	B	21.60	22.40								
	C	20.80	23.30								
24-Q	A	23.76	24.24	250	70	0.05	16.8	18.4	22.0	55	1.25
	B	23.50	24.50								
	C	22.80	25.60								

[1] f = 1 MHz; V_R = 0 V
[2] t_p = 100 μs; square wave; T_j = 25 °C

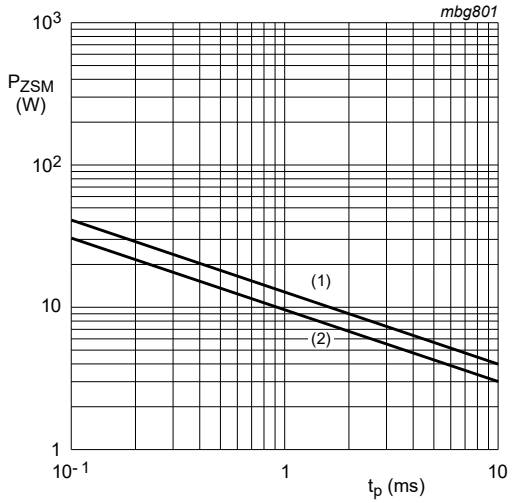
Table 9. Characteristics per type; BZX384-A27-Q to BZX384-C75-Q

T_j = 25 °C unless otherwise specified.

BZX384 -xxx	Sel	Working voltage V_Z (V) I_Z = 2 mA		Maximum differential resistance r_{dif} (Ω)		Reverse current I_R (μA)		Temperature coefficient S_Z (mV/K) I_Z = 2 mA		Diode capacitance C_d (pF) [1]	Non-repetitive peak reverse current I_{ZSM} (A) [2]
		Min	Max	I_Z = 0.5 mA	I_Z = 2 mA	Max	V_R (V)	Min	Max	Max	Max
27-Q	A	26.73	27.27	300	80	0.05	18.9	21.4	25.3	50	1.0
	B	26.50	27.50								
	C	25.10	28.90								
30-Q	A	29.70	30.30	300	80	0.05	21	24.4	29.4	50	1.0
	B	29.40	30.60								
	C	28.00	32.00								
33-Q	A	32.67	33.33	325	80	0.05	23.1	27.4	33.4	45	0.9
	B	32.30	33.70								
	C	31.00	35.00								
36-Q	A	35.64	36.36	350	90	0.05	25.2	30.4	37.4	45	0.8
	B	35.30	36.70								
	C	34.00	38.00								
39-Q	A	38.61	39.39	350	130	0.05	27.3	33.4	41.2	45	0.7
	B	38.20	39.80								
	C	37.00	41.00								
43-Q	A	42.57	43.43	375	150	0.05	30.1	37.6	46.6	40	0.6
	B	42.10	43.90								
	C	40.00	46.00								
47-Q	A	46.53	47.47	375	170	0.05	32.9	42.0	51.8	40	0.5
	B	46.10	47.90								
	C	44.00	50.00								
51-Q	A	50.49	51.51	400	180	0.05	35.7	46.6	57.2	40	0.4
	B	50.00	52.00								
	C	48.00	54.00								
56-Q	A	55.44	56.56	425	200	0.05	39.2	52.2	63.8	40	0.3
	B	54.90	57.10								
	C	52.00	60.00								
62-Q	A	61.38	62.62	450	215	0.05	43.4	58.8	71.6	35	0.3
	B	60.80	63.20								
	C	58.00	66.00								
68-Q	A	67.32	68.68	475	240	0.05	47.6	65.6	79.8	35	0.25
	B	66.60	69.40								
	C	64.00	72.00								
75-Q	A	74.25	75.75	500	255	0.05	52.5	73.4	88.6	35	0.20
	B	73.50	76.50								
	C	70.00	79.00								

[1] f = 1 MHz; V_R = 0 V

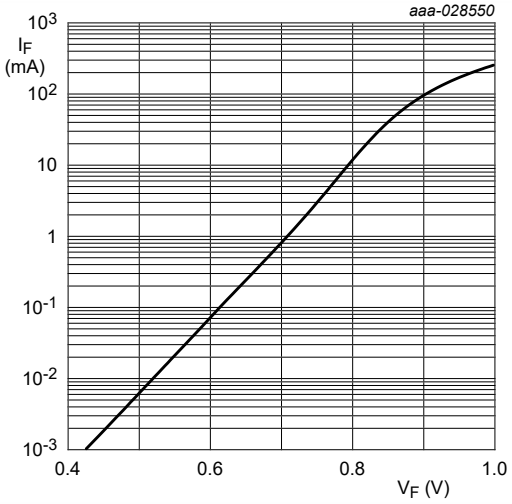
[2] t_p = 100 μs; square wave; T_j = 25 °C



(1) T_j = 25 °C (before surge)

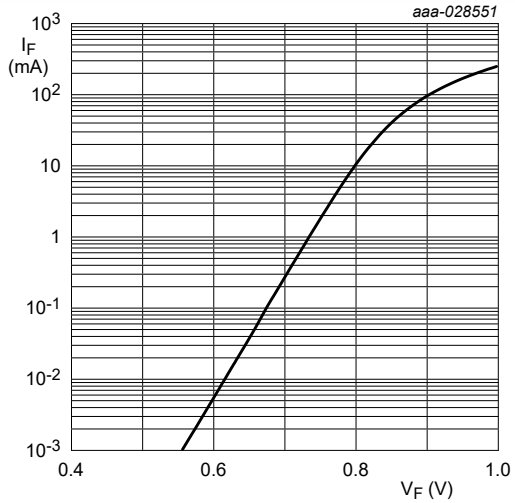
(2) T_j = 150 °C (before surge)

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



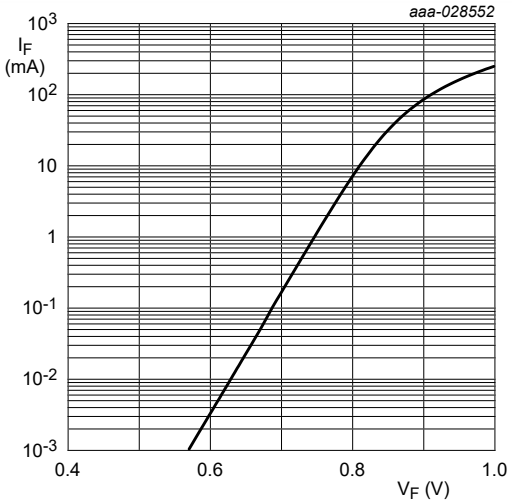
T_j = 25 °C

Fig. 2. Forward current as a function of forward voltage; typical values (BZX384-A/B/C2V4-Q)



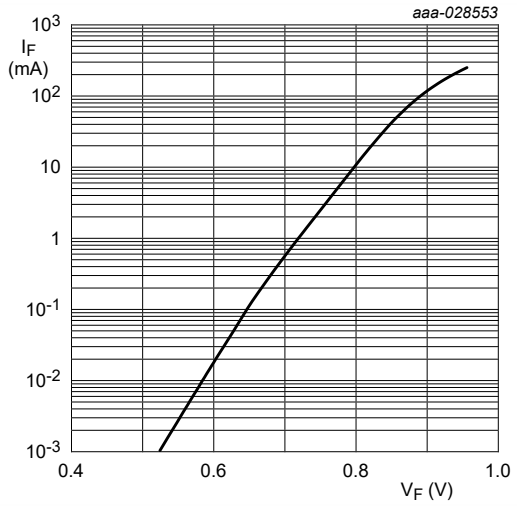
T_j = 25 °C

Fig. 3. Forward current as a function of forward voltage; typical values (BZX384-A/B/C6V8-Q)



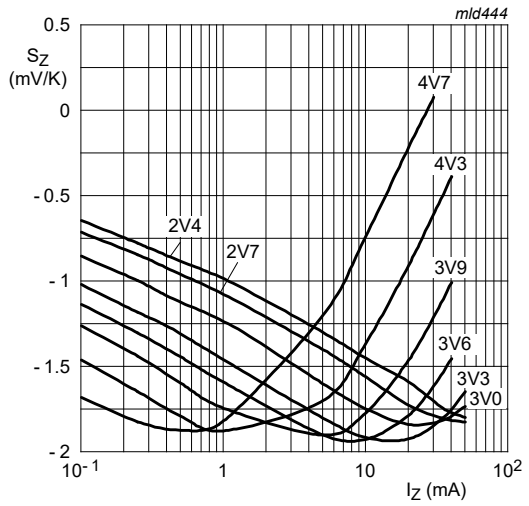
T_j = 25 °C

Fig. 4. Forward current as a function of forward voltage; typical values (BZX384-A/B/C7V5-Q)



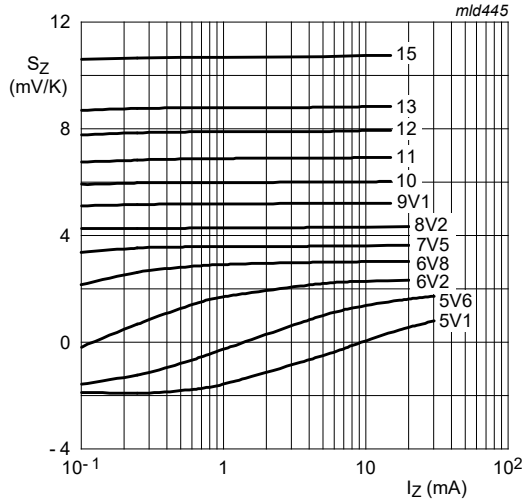
T_j = 25 °C

Fig. 5. Forward current as a function of forward voltage; typical values (BZX384-A/B/C75-Q)



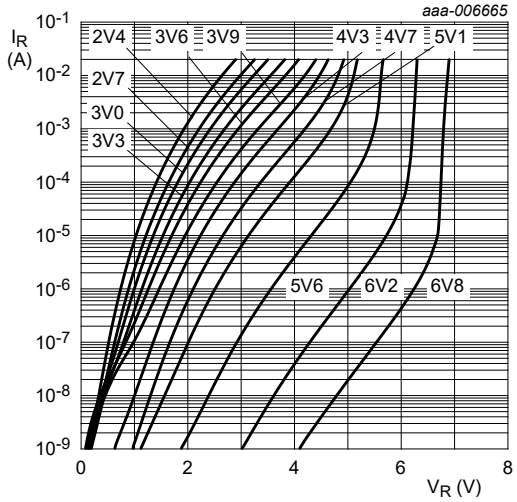
T_j = 25 °C to 150 °C

Fig. 6. Temperature coefficient as a function of working current; typical values (BZX384-A/B/C2V4-Q to BZX384-A/B/C4V7-Q)



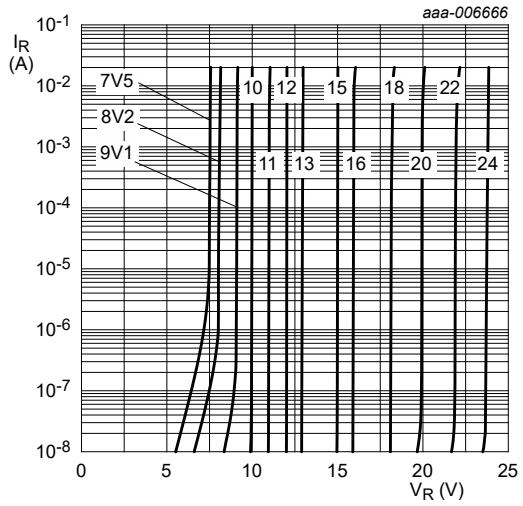
T_j = 25 °C to 150 °C

Fig. 7. Temperature coefficient as a function of working current; typical values (BZX384-A/B/C5V1-Q to BZX384-A/B/C15-Q)



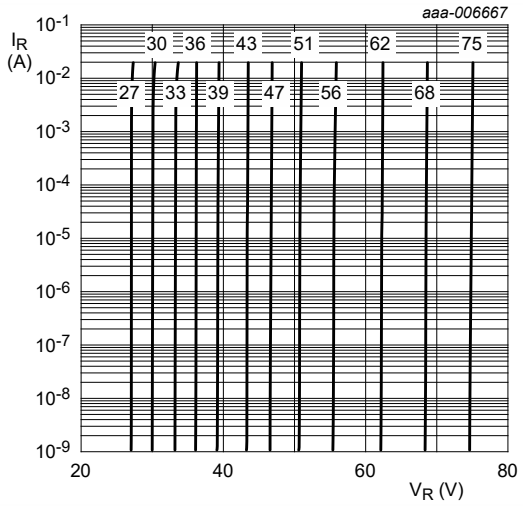
T_j = 25 °C

Fig. 8. Reverse current as a function of reverse voltage; typical values (BZX384-A/B/C2V4-Q to BZX384-A/B/C6V8-Q)



T_j = 25 °C

Fig. 9. Reverse current as a function of reverse voltage; typical values (BZX384-A/B/C7V5-Q to BZX384-A/B/C24-Q)



T_j = 25 °C

Fig. 10. Reverse current as a function of reverse voltage; typical values (BZX384-A/B/C27-Q to BZX384-A/B/C75-Q)

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

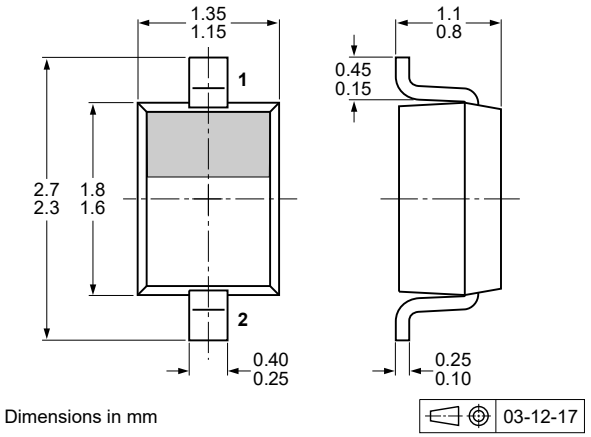


Fig. 11. Package outline SOD323

13. Soldering

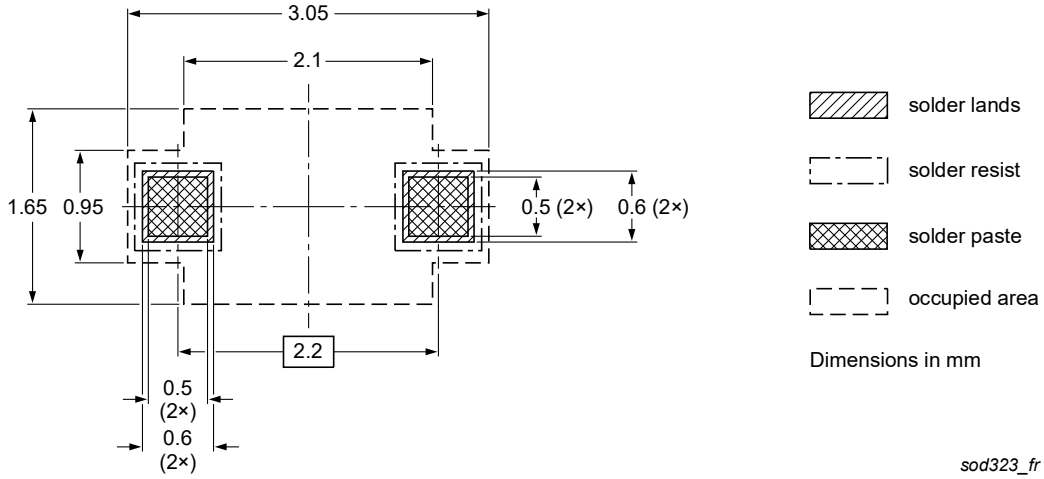


Fig. 12. Reflow soldering footprint for SOD323 (SC-76)

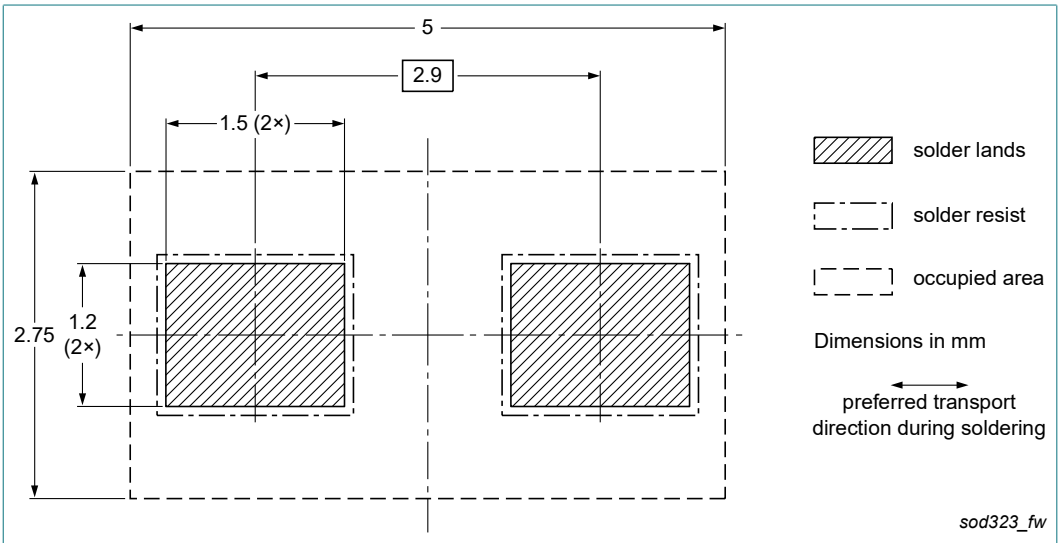


Fig. 13. Wave soldering footprint for SOD323 (SC-76)

14. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BZX384-Q_SER v.1	20210906	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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