

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 $\pm 1\%$ (BZX384-A), $\pm 2\%$ (BZX384-B) and approximately $\pm 5\%$ (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: $\pm 1\%$, $\pm 2\%$ and approximately $\pm 5\%$
- 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

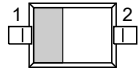
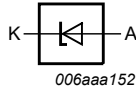
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_F	forward voltage	$I_F = 10$ mA	[1] -	-	0.9	V
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[2] -	-	300	mW

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

[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]		 006aaa152
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 $\pm 1\%$, $\pm 2\%$ and $\pm 5\%$ 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	$T_{amb} \leq 25\text{ °C}$	[2] -	300	mW
T_j	junction temperature		-	150	°C
T_{amb}	ambient temperature		-65	+150	°C
T_{stg}	storage temperature		-65	+150	°C

[1] $t_p = 100\ \mu\text{s}$; 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.

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

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

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

[1] Pulse test: $t_p \leq 100\ \mu\text{s}$; $\delta \leq 0.02$.

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

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

BZX384 -xxx	Sel	Working voltage V_Z (V) $I_Z = 5\text{ mA}$		Maximum differential resistance r_{dif} (Ω)		Reverse current I_R (μA)		Temperature coefficient S_Z (mV/K) $I_Z = 5\text{ mA}$		Diode capacitance C_d (pF) [1]	Non-repetitive peak reverse current I_{ZSM} (A) [2]
		Min	Max	$I_Z = 1\text{ mA}$	$I_Z = 5\text{ mA}$	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 (μ A)		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

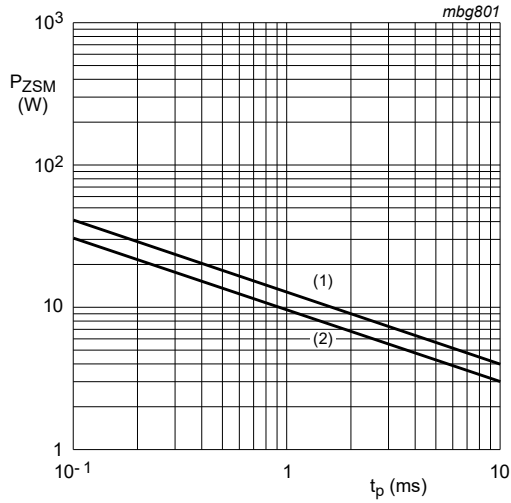
[2] $t_p = 100$ μ s; square wave; $T_j = 25$ °C

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

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

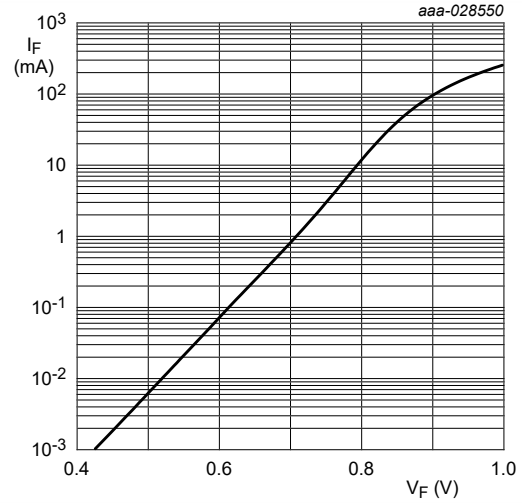
BZX384 -xxx	Sel	Working voltage V_Z (V) $I_Z = 2\text{ mA}$		Maximum differential resistance r_{dif} (Ω)		Reverse current I_R (μA)		Temperature coefficient S_Z (mV/K) $I_Z = 2\text{ mA}$		Diode capacitance C_d (pF) [1]	Non-repetitive peak reverse current I_{ZSM} (A) [2]
		Min	Max	$I_Z = 0.5\text{ mA}$	$I_Z = 2\text{ mA}$	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] $f = 1\text{ MHz}$; $V_R = 0\text{ V}$ [2] $t_p = 100\text{ }\mu\text{s}$; square wave; $T_j = 25\text{ °C}$



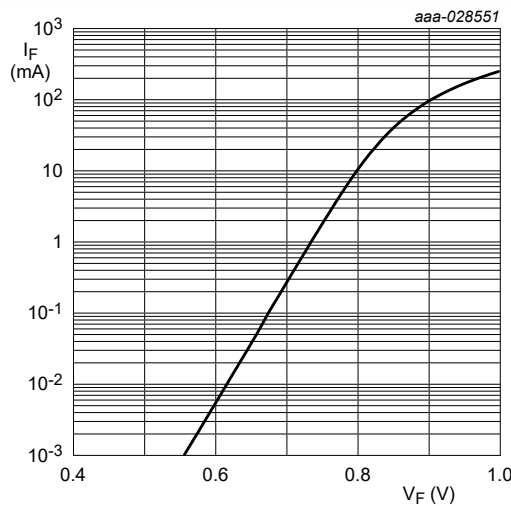
(1) $T_j = 25^\circ\text{C}$ (before surge)
 (2) $T_j = 150^\circ\text{C}$ (before surge)

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



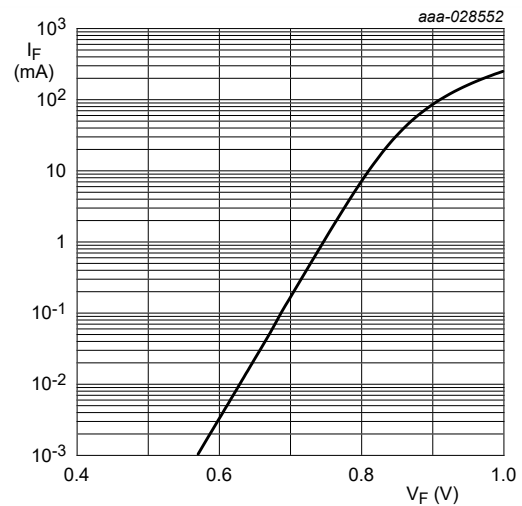
$T_j = 25^\circ\text{C}$

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



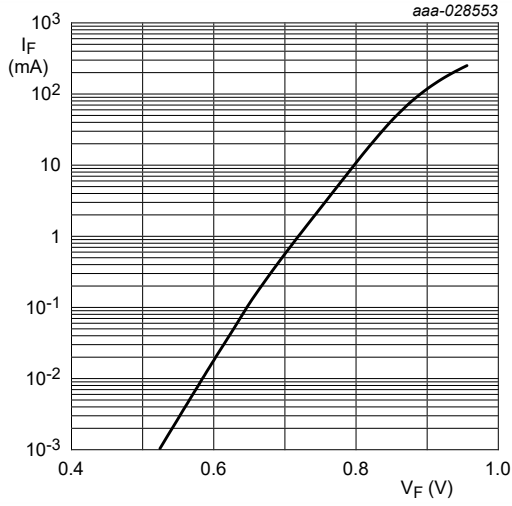
$T_j = 25^\circ\text{C}$

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



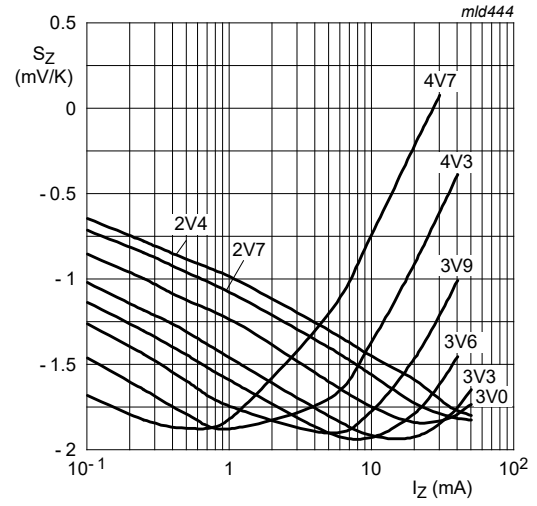
$T_j = 25^\circ\text{C}$

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



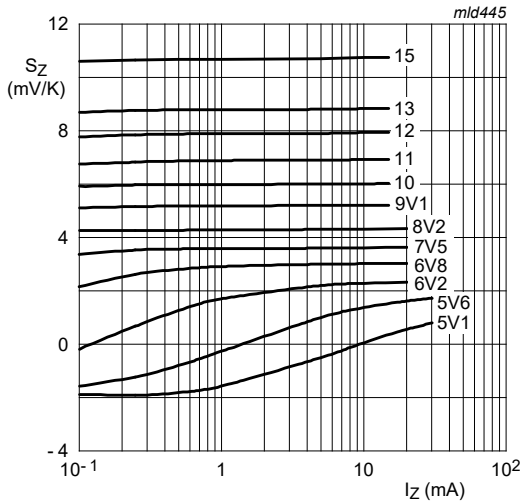
$T_j = 25\text{ }^\circ\text{C}$

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



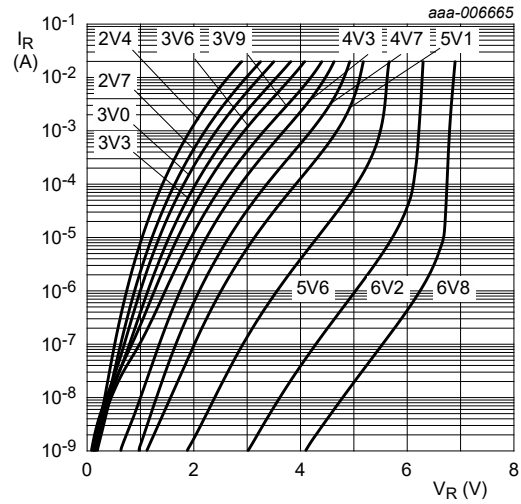
$T_j = 25\text{ }^\circ\text{C}$ to $150\text{ }^\circ\text{C}$

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



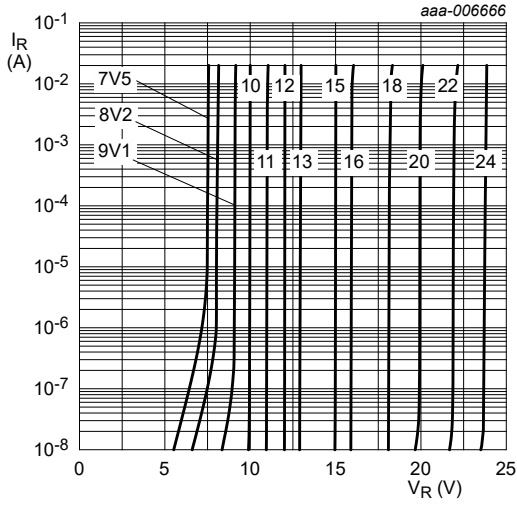
$T_j = 25\text{ }^\circ\text{C}$ to $150\text{ }^\circ\text{C}$

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



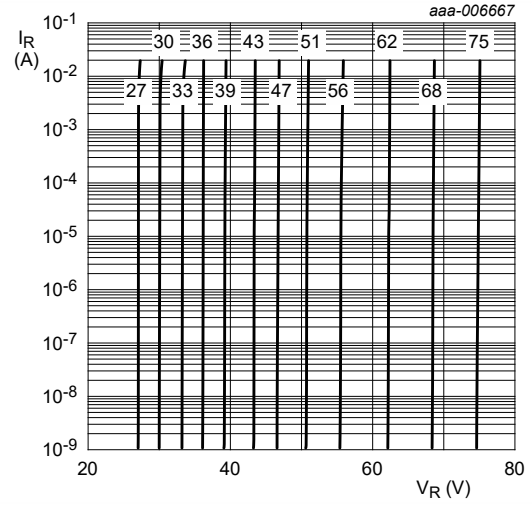
$T_j = 25\text{ }^\circ\text{C}$

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

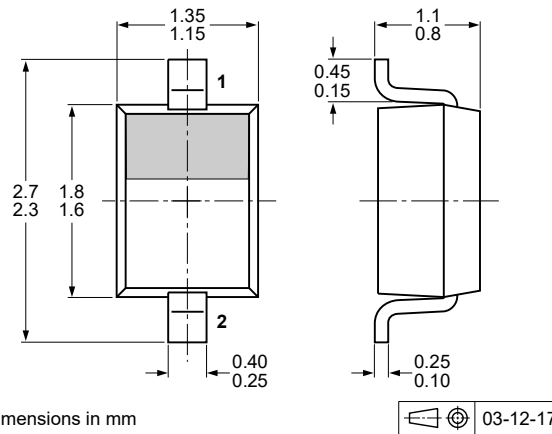


Fig. 11. Package outline SOD323

13. Soldering

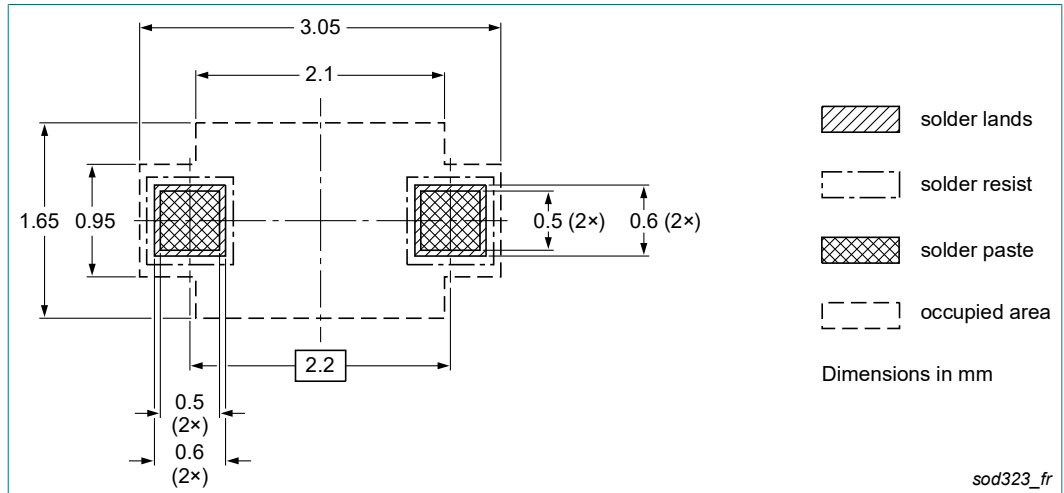


Fig. 12. Reflow soldering footprint for SOD323 (SC-76)

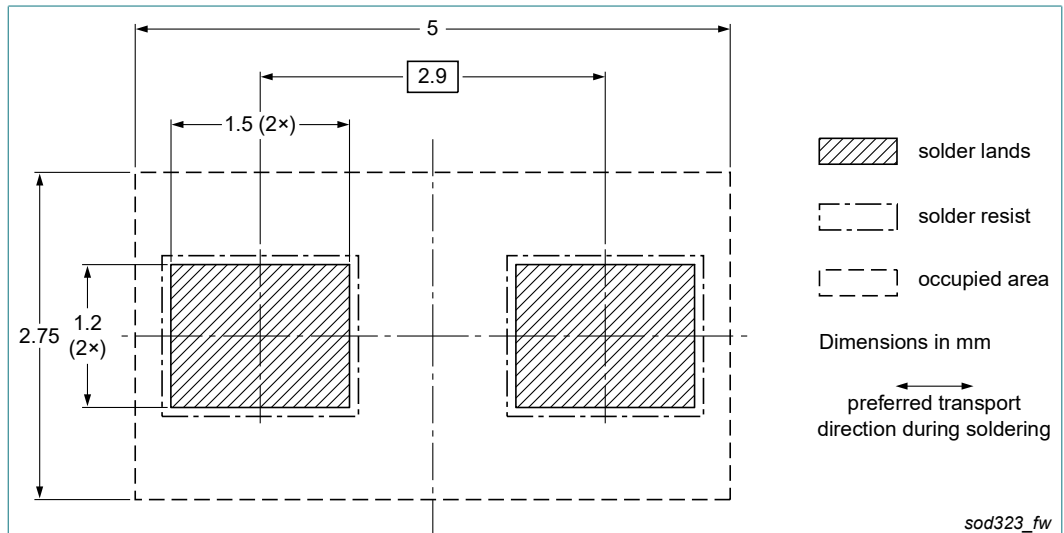


Fig. 13. Wave soldering footprint for SOD323 (SC-76)

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".
- [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>.

Definitions

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For more information, please visit: <http://www.nexperia.com>

For sales office addresses, please send an email to: salesaddresses@nexperia.com

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