



**THE DATASHEET OF
BZX384-B33,115**





BZX384 series

Voltage regulator diodes

Rev. 3 — 11 October 2016

Product data sheet

1. Product profile

1.1 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 $\pm 2\%$ (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.

1.2 Features and benefits

- Total power dissipation: ≤ 300 mW
- Working voltage range: nominal 2.4 V to 75 V (E24 range)
- Two tolerance series: $\pm 2\%$ and approximately $\pm 5\%$
- Non-repetitive peak reverse power dissipation: ≤ 40 W
- AEC-Q101 qualified

1.3 Applications

- General regulation functions

1.4 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 a FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

2. 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.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BZX384 series [1]	SC-76	plastic surface-mounted package; 2 leads	SOD323

[1] The series includes 37 breakdown voltages with nominal working voltages from 2.4 V to 75 V and $\pm 2\%$ and $\pm 5\%$ tolerances.

4. Marking

Table 4. Marking codes

Type number	Marking code	Type number	Marking code	Type number	Marking code	Type number	Marking code
BZX384-B2V4	K1	BZX384-B15	M2	BZX384-C2V4	T3	BZX384-C15	DD
BZX384-B2V7	K2	BZX384-B16	M3	BZX384-C2V7	T4	BZX384-C16	DE
BZX384-B3V0	K3	BZX384-B18	M4	BZX384-C3V0	T5	BZX384-C18	DF
BZX384-B3V3	K4	BZX384-B20	M5	BZX384-C3V3	T6	BZX384-C20	DG
BZX384-B3V6	K5	BZX384-B22	M6	BZX384-C3V6	T7	BZX384-C22	DH
BZX384-B3V9	K6	BZX384-B24	M7	BZX384-C3V9	T8	BZX384-C24	DJ
BZX384-B4V3	K7	BZX384-B27	M8	BZX384-C4V3	T9	BZX384-C27	DK
BZX384-B4V7	K8	BZX384-B30	M9	BZX384-C4V7	T0	BZX384-C30	DL
BZX384-B5V1	K9	BZX384-B33	N0	BZX384-C5V1	D5	BZX384-C33	DM
BZX384-B5V6	L1	BZX384-B36	N1	BZX384-C5V6	D6	BZX384-C36	DN
BZX384-B6V2	L2	BZX384-B39	N2	BZX384-C6V2	T1	BZX384-C39	DP
BZX384-B6V8	L3	BZX384-B43	N3	BZX384-C6V8	D7	BZX384-C43	DR
BZX384-B7V5	L4	BZX384-B47	N4	BZX384-C7V5	D8	BZX384-C47	DS
BZX384-B8V2	L5	BZX384-B51	N5	BZX384-C8V2	D9	BZX384-C51	DT
BZX384-B9V1	L6	BZX384-B56	N6	BZX384-C9V1	D0	BZX384-C56	DU
BZX384-B10	L7	BZX384-B62	N7	BZX384-C10	T2	BZX384-C62	DV
BZX384-B11	L8	BZX384-B68	N8	BZX384-C11	DA	BZX384-C68	DW
BZX384-B12	L9	BZX384-B75	N9	BZX384-C12	DB	BZX384-C75	DX
BZX384-B13	M1	-	-	BZX384-C13	DC	-	-

5. 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 Table 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		-65	+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; $T_j = 25\text{ °C}$ before surge

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

6. 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 a FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Soldering point of cathode tab.

7. 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-B2V4 to BZX384-C24

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

BZX384 -xxx	Sel	Working voltage V_Z (V)		Differential resistance r_{dif} (Ω)				Reverse current I_R (μA)		Temperature coefficient S_Z (mV/K)			Diode capacitance C_d (pF) ^[1]	Non-repetitive peak reverse current I_{ZSM} (A) ^[2]
		$I_Z = 5\text{ mA}$		$I_Z = 1\text{ mA}$		$I_Z = 5\text{ mA}$		Max	V_R (V)	$I_Z = 5\text{ mA}$				
		Min	Max	Typ	Max	Typ	Max			Min	Typ	Max		
2V4	B	2.35	2.45	275	600	70	100	50	1	-3.5	-1.6	0	450	6.0
	C	2.2	2.6											
2V7	B	2.65	2.75	300	600	75	100	20	1	-3.5	-2.0	0	450	6.0
	C	2.5	2.9											
3V0	B	2.94	3.06	325	600	80	95	10	1	-3.5	-2.1	0	450	6.0
	C	2.8	3.2											
3V3	B	3.23	3.37	350	600	85	95	5	1	-3.5	-2.4	0	450	6.0
	C	3.1	3.5											
3V6	B	3.53	3.67	375	600	85	90	5	1	-3.5	-2.4	0	450	6.0
	C	3.4	3.8											
3V9	B	3.82	3.98	400	600	85	90	3	1	-3.5	-2.5	0	450	6.0
	C	3.7	4.1											
4V3	B	4.21	4.39	410	600	80	90	3	1	-3.5	-2.5	0	450	6.0
	C	4.0	4.6											
4V7	B	4.61	4.79	425	500	50	80	3	2	-3.5	-1.4	0.2	300	6.0
	C	4.4	5.0											
5V1	B	5.0	5.2	400	480	40	60	2	2	-2.7	-0.8	1.2	300	6.0
	C	4.8	5.4											
5V6	B	5.49	5.71	80	400	15	40	1	2	-2.0	1.2	2.5	300	6.0
	C	5.2	6.0											
6V2	B	6.08	6.32	40	150	6	10	3	4	0.4	2.3	3.7	200	6.0
	C	5.8	6.6											
6V8	B	6.66	6.94	30	80	6	15	2	4	1.2	3.0	4.5	200	6.0
	C	6.4	7.2											
7V5	B	7.35	7.65	30	80	6	15	1	5	2.5	4.0	5.3	150	4.0
	C	7.0	7.9											
8V2	B	8.04	8.36	40	80	6	15	0.7	5	3.2	4.6	6.2	150	4.0
	C	7.7	8.7											
9V1	B	8.92	9.28	40	100	6	15	0.5	6	3.8	5.5	7.0	150	3.0
	C	8.5	9.6											
10	B	9.8	10.2	50	150	8	20	0.2	7	4.5	6.4	8.0	90	3.0
	C	9.4	10.6											
11	B	10.8	11.2	50	150	10	20	0.1	8	5.4	7.4	9.0	85	2.5
	C	10.4	11.6											
12	B	11.8	12.2	50	150	10	25	0.1	8	6.0	8.4	10.0	85	2.5
	C	11.4	12.7											

Table 8. Characteristics per type; BZX384-B2V4 to BZX384-C24 ...continued $T_j = 25\text{ °C}$ unless otherwise specified.

BZX384 -xxx	Sel	Working voltage V_Z (V)		Differential resistance r_{dif} (Ω)				Reverse current I_R (μ A)		Temperature coefficient S_Z (mV/K)			Diode capacitance C_d (pF) ^[1]	Non-repetitive peak reverse current I_{ZSM} (A) ^[2]
		$I_Z = 5\text{ mA}$		$I_Z = 1\text{ mA}$		$I_Z = 5\text{ mA}$		Max	V_R (V)	$I_Z = 5\text{ mA}$				
		Min	Max	Typ	Max	Typ	Max			Min	Typ	Max		
13	B	12.7	13.3	50	170	10	30	0.1	8	7.0	9.4	11.0	80	2.5
	C	12.4	14.1											
15	B	14.7	15.3	50	200	10	30	0.05	10.5	9.2	11.4	13.0	75	2.0
	C	13.8	15.6											
16	B	15.7	16.3	50	200	10	40	0.05	11.2	10.4	12.4	14.0	75	1.5
	C	15.3	17.1											
18	B	17.6	18.4	50	225	10	45	0.05	12.6	12.4	14.4	16.0	70	1.5
	C	16.8	19.1											
20	B	19.6	20.4	60	225	15	55	0.05	14	14.4	16.4	18.0	60	1.5
	C	18.8	21.2											
22	B	21.6	22.4	60	250	20	55	0.05	15.4	16.4	18.4	20.0	60	1.25
	C	20.8	23.3											
24	B	23.5	24.5	60	250	25	70	0.05	16.8	18.4	20.4	22.0	55	1.25
	C	22.8	25.6											

[1] $f = 1\text{ MHz}$; $V_R = 0\text{ V}$ [2] $t_p = 100\text{ }\mu\text{s}$; square wave; $T_j = 25\text{ °C}$ before surge**Table 9. Characteristics per type; BZX384-B27 to BZX384-C75** $T_j = 25\text{ °C}$ unless otherwise specified.

BZX384 -xxx	Sel	Working voltage V_Z (V)		Differential resistance r_{dif} (Ω)				Reverse current I_R (μ A)		Temperature coefficient S_Z (mV/K)			Diode capacitance C_d (pF) ^[1]	Non-repetitive peak reverse current I_{ZSM} (A) ^[2]
		$I_Z = 2\text{ mA}$		$I_Z = 0.5\text{ mA}$		$I_Z = 2\text{ mA}$		Max	V_R (V)	$I_Z = 2\text{ mA}$				
		Min	Max	Typ	Max	Typ	Max			Min	Typ	Max		
27	B	26.5	27.5	65	300	25	80	0.05	18.9	21.4	23.4	25.3	50	1.0
	C	25.1	28.9											
30	B	29.4	30.6	70	300	30	80	0.05	21	24.4	26.6	29.4	50	1.0
	C	28.0	32.0											
33	B	32.3	33.7	75	325	35	80	0.05	23.1	27.4	29.7	33.4	45	0.9
	C	31.0	35.0											
36	B	35.3	36.7	80	350	35	90	0.05	25.2	30.4	33.0	37.4	45	0.8
	C	34.0	38.0											
39	B	38.2	39.8	80	350	40	130	0.05	27.3	33.4	36.4	41.2	45	0.7
	C	37.0	41.0											
43	B	42.1	43.9	85	375	45	150	0.05	30.1	37.6	41.2	46.6	40	0.6
	C	40.0	46.0											

Table 9. Characteristics per type; BZX384-B27 to BZX384-C75 ...continued

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

BZX384 -xxx	Sel	Working voltage V_Z (V)		Differential resistance r_{dif} (Ω)				Reverse current I_R (μA)		Temperature coefficient S_Z (mV/K)			Diode capacitance C_d (pF) ^[1]	Non-repetitive peak reverse current I_{ZSM} (A) ^[2]
				$I_Z = 2\text{ mA}$		$I_Z = 0.5\text{ mA}$	$I_Z = 2\text{ mA}$			$I_Z = 2\text{ mA}$				
		Min	Max	Typ	Max	Typ	Max	Max	V_R (V)	Min	Typ	Max	Max	Max
47	B	46.1	47.9	85	375	50	170	0.05	32.9	42.0	46.1	51.8	40	0.5
	C	44.0	50.0											
51	B	50.0	52.0	90	400	60	180	0.05	35.7	46.6	51.0	57.2	40	0.4
	C	48.0	54.0											
56	B	54.9	57.1	100	425	70	200	0.05	39.2	52.2	57.0	63.8	40	0.3
	C	52.0	60.0											
62	B	60.8	63.2	120	450	80	215	0.05	43.4	58.8	64.4	71.6	35	0.3
	C	58.0	66.0											
68	B	66.6	69.4	150	475	90	240	0.05	47.6	65.6	71.7	79.8	35	0.25
	C	64.0	72.0											
75	B	73.5	76.5	170	500	95	255	0.05	52.5	73.4	80.2	88.6	35	0.20
	C	70.0	79.0											

[1] $f = 1\text{ MHz}$; $V_R = 0\text{ V}$

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





BZX384-B/C2V4 to BZX384-B/C4V3
 $T_j = 25\text{ °C to }150\text{ °C}$

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



BZX384-B/C4V7 to BZX384-B/C12
 $T_j = 25\text{ °C to }150\text{ °C}$

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



BZX384-B/C2V4 to BZX384-B/C6V8
 $T_{amb} = 25\text{ °C}$

Fig 5. Reverse current as a function of reverse voltage; typical values



BZX384-B/C7V5 to BZX384-B/C24
 $T_{amb} = 25\text{ °C}$

Fig 6. Reverse current as a function of reverse voltage; typical values



BZX384-B/C27 to BZX384-B/C75

T_{amb} = 25 °C

Fig 7. Reverse current as a function of reverse voltage; typical values

8. Test information

8.1 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.

9. Package outline



Fig 8. Package outline SOD323 (SC-76)

10. Soldering



Fig 9. Reflow soldering footprint SOD323 (SC-76)



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

11. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BZX384_SER v.3	20161011	Product data sheet	-	BZX384_SER v.2
Modifications:	<ul style="list-style-type: none"> • The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors • Legal texts have been adapted to the new company name where appropriate. • Section 1 "Product profile": enhanced. • Table 5: T_{amb} added. • Figure 5 to Figure 7: added. • Section 8 "Test information": added. • Figure 9: replaced by minimized package outline. • Section 10 "Soldering": added. • Section 12 "Legal information": updated. 			
BZX384_SER v.2	20040322	Product data sheet	-	BZX384_SER v.1
BZX384_SER v.1	20030401	Product specification	-	-

12. Legal information

12.1 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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13. Contact information

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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