

# 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 ±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
- Two tolerance series: ±2 % and approximately ±5 %
- AEC-Q101 qualified

- Working voltage range: nominal 2.4 V to 75 V (E24 range)
- Non-repetitive peak reverse power dissipation: ≤ 40 W

### 1.3 Applications

General regulation functions

### 1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
$V_{F}$	forward voltage	I <sub>F</sub> = 10 mA [1]	-	-	0.9	V
P <sub>tot</sub>	total power dissipation	$T_{amb} \le 25  ^{\circ}C$ [2]	-	-	300	mW

<sup>[1]</sup> Pulse test:  $t_0 \le 100 \ \mu s$ ;  $\delta \le 0.02$ 



<sup>[2]</sup> 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]	. 🔙	
2	A	anode		1 2 006aaa152

<sup>[1]</sup> 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						

<sup>[1]</sup> 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						
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
l <sub>F</sub>	forward current		-	250	mA
I <sub>ZSM</sub>	non-repetitive peak reverse current	បា	-	see Table 8 and 9	
P <sub>ZSM</sub>	non-repetitive peak reverse power dissipation	[1]	-	40	W
P <sub>tot</sub>	total power dissipation	$T_{amb} \le 25  ^{\circ}C$ [2]	-	300	mW
Tj	junction temperature		-65	+150	°C
T <sub>amb</sub>	ambient temperature		-65	+150	°C
T <sub>stg</sub>	storage temperature		-65	+150	°C

<sup>[1]</sup>  $t_p = 100 \mu s$ ; square wave;  $T_i = 25 \,^{\circ}C$  before surge

### 6. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	in free air [1]	-	-	415	K/W
R <sub>th(j-sp)</sub>	thermal resistance from junction to solder point	[2]	-	-	110	K/W

<sup>[1]</sup> Device mounted on a FR4 PCB, single-sided copper, tin-plated and standard footprint.

### 7. Characteristics

Table 7. Characteristics

 $T_i = 25$  °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
$V_{F}$	forward voltage	I <sub>F</sub> = 10 mA [1]	-	-	0.9	V
		I <sub>F</sub> = 100 mA [1]	-	-	1.1	V

[1] Pulse test:  $t_p \le 100~\mu s;~\delta \le 0.02$ 

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

<sup>[2]</sup> Soldering point of cathode tab.

Table 8. Characteristics per type; BZX384-B2V4 to BZX384-C24

 $T_i = 25$  °C unless otherwise specified.

-xxx		Worki voltag V <sub>Z</sub> (V)	je	Diffe r <sub>dif</sub> (S	rential 2)	resista	ance	Reve curre I <sub>R</sub> (μΑ	ent		erature icient IV/K)	•	Diode capacitance C <sub>d</sub> (pF)[1]	Non-repetitive peak reverse current	
		I <sub>Z</sub> = 5	mA	I <sub>Z</sub> = 1	mA	$I_Z = 5$	mA			I <sub>Z</sub> = 5	mA			I <sub>ZSM</sub> (A)[2]	
		Min	Max	Тур	Max	Тур	Max	Max	V <sub>R</sub> (V)	Min	Тур	Max	Max	Max	
2V4	В	2.35	2.45	275	600	70	100	50	1	-3.5	-1.6	0	450	6.0	
	С	2.2	2.6												
2V7	В	2.65	2.75	300	600	75	100	20	1	-3.5	-2.0	0	450	6.0	
	С	2.5	2.9												
3V0	В	2.94	3.06	325	600	80	95	10	1	-3.5	-2.1	0	450	6.0	
	С	2.8	3.2												
3V3	В	3.23	3.37	350	600	85	95	5	1	-3.5	-2.4	0	450	6.0	
	С	3.1	3.5												
3V6	В	3.53	3.67	375	600	85	90	5	1	-3.5	-2.4	0	450	6.0	
	С	3.4	3.8												
3V9	В	3.82	3.98	400	600	85	90	3	1	-3.5	-2.5	0	450	6.0	
	С	3.7	4.1												
4V3	В	4.21	4.39	410	600	80	90	3	1	-3.5	-2.5	0	450	6.0	
	С	4.0	4.6												
4V7	В	4.61	4.79	425	500	50	80	3	2	-3.5	-1.4	0.2	300	6.0	
	С	4.4	5.0												
5V1	В	5.0	5.2	400	480	40	60	2	2	-2.7	-0.8	1.2	300	6.0	
	С	4.8	5.4												
5V6	В	5.49	5.71	80	400	15	40	1	2	-2.0	1.2	2.5	300	6.0	
	С	5.2	6.0												
6V2	В	6.08	6.32	40	150	6	10	3	4	0.4	2.3	3.7	200	6.0	
	С	5.8	6.6												
6V8	В	6.66	6.94	30	80	6	15	2	4	1.2	3.0	4.5	200	6.0	
	С	6.4	7.2												
7V5	В	7.35	7.65	30	80	6	15	1	5	2.5	4.0	5.3	150	4.0	
	С	7.0	7.9												
8V2	В	8.04	8.36	40	80	6	15	0.7	5	3.2	4.6	6.2	150	4.0	
	С	7.7	8.7	1											
9V1	В	8.92	9.28	40	100	6	15	0.5	6	3.8	5.5	7.0	150	3.0	
	С	8.5	9.6	1											
10	В	9.8	10.2	50	150	8	20	0.2	7	4.5	6.4	8.0	90	3.0	
	С	9.4	10.6	1											
11	В	10.8	11.2	50	150	10	20	0.1	8	5.4	7.4	9.0	85	2.5	
	С	10.4	11.6	1											
12	В	11.8	12.2	50	150	10	25	0.1	8	6.0	8.4	10.0	85	2.5	
	С	11.4	12.7												

Table 8. Characteristics per type; BZX384-B2V4 to BZX384-C24 ...continued

 $T_i = 25$  °C unless otherwise specified.

BZX384 -xxx	Sel	Working voltage V <sub>Z</sub> (V) I <sub>Z</sub> = 5 mA			Differential resistance $r_{dif}(\Omega)$			curre	current		erature icient v/K)	•	Diode capacitance C <sub>d</sub> (pF)[1]	Non-repetitive peak reverse current
				I <sub>Z</sub> = 1 mA		$I_Z = 5 \text{ mA}$				$I_Z = 5 \text{ mA}$				I <sub>ZSM</sub> (A)[2]
		Min	Max	Тур	Max	Тур	Max	Max	V <sub>R</sub> (V)	Min	Тур	Max	Max	Max
13	В	12.7	13.3	50	50 170	10	30	0.1	8	7.0	9.4	11.0	80	2.5
	С	12.4	14.1											
15	В	14.7	15.3	50	200	10	30	0.05	10.5	9.2	11.4	13.0	75	2.0
	С	13.8	15.6											
16	В	15.7	16.3	50	200	10	40	0.05	11.2	10.4	12.4	14.0	75	1.5
	С	15.3	17.1											
18	В	17.6	18.4	50	225	10	45	0.05	12.6	12.4	14.4	16.0	70	1.5
	С	16.8	19.1											
20	В	19.6	20.4	60	225	15	55	0.05	14	14.4	16.4	18.0	60	1.5
	С	18.8	21.2											
22	В	21.6	22.4	60	250	20	55	0.05	15.4	16.4	18.4	20.0	60	1.25
	С	20.8	23.3											
24	B 23.5 24.5 60 2	250	25	25 70	0.05	16.8	18.4 20.4	22.0	55	1.25				
	С	22.8	25.6								20			

<sup>[1]</sup>  $f = 1 \text{ MHz}; V_R = 0 \text{ V}$ 

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

 $T_i = 25$  °C unless otherwise specified.

BZX384 -xxx	Sel	Worki voltag V <sub>Z</sub> (V)	ge	Differential resistance $r_{dif}(\Omega)$			curre	current I <sub>R</sub> (μΑ)		erature icient nV/K)	•	Diode capacitance C <sub>d</sub> (pF)[1]	Non-repetitive peak reverse current	
		I <sub>Z</sub> = 2	I <sub>Z</sub> = 2 mA		$I_Z = 0.5 \text{ mA}  I_Z =$		I <sub>Z</sub> = 2 mA			mA			I <sub>ZSM</sub> (A)[2]	
		Min	Max	Тур	Max	Тур	Max	Max	V <sub>R</sub> (V)	Min	Тур	Max	Max	Max
27	В	26.5	27.5	65	300	25	80	0.05	18.9	21.4	23.4	25.3	50	1.0
	С	25.1	28.9											
30	В	29.4	30.6	70	300	30	80	0.05	21	24.4	26.6	29.4	50	1.0
	С	28.0	32.0											
33	В	32.3	33.7	75	325	35	80	0.05	23.1	27.4	29.7	33.4	45	0.9
	С	31.0	35.0											
36	В	35.3	36.7	80	350	35	90	0.05	25.2	30.4	33.0	37.4	45	0.8
	С	34.0	38.0											
39	В	38.2	39.8	80	350	40	130	0.05	27.3	33.4	36.4	41.2	45	0.7
	С	37.0	41.0											
43	В	42.1	43.9	85	375 4	45	150	0.05	30.1	37.6	41.2	46.6	40	0.6
	С	40.0	46.0											

<sup>[2]</sup>  $t_p$  = 100  $\mu s$ ; square wave;  $T_j$  = 25 °C before surge

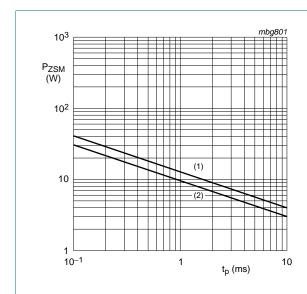
Table 9. Characteristics per type; BZX384-B27 to BZX384-C75 ...continued

 $T_i = 25$  °C unless otherwise specified.

BZX384 -xxx	Sel	Working voltage V <sub>Z</sub> (V)		Differential resistance $r_{dif}$ ( $\Omega$ )			curre	current		erature icient IV/K)	•	Diode capacitance C <sub>d</sub> (pF)[1]	Non-repetitive peak reverse current	
		I <sub>Z</sub> = 2	mA	$I_Z = 0.5 \text{ mA}$		I <sub>Z</sub> = 2 mA			-		mA			I <sub>ZSM</sub> (A)[2]
		Min	Max	Тур	Max	Тур	Max	Max	V <sub>R</sub> (V)	Min	Тур	Max	Max	Max
47	В	46.1	47.9	85	375	50 1	170	170 0.05	0.05 32.9	42.0	0 46.1	51.8	40	0.5
	С	44.0	50.0											
51	В	50.0	52.0	90	400	60	180	0.05	35.7	46.6	51.0	57.2	40	0.4
	С	48.0	54.0											
56	В	54.9	57.1	100	425	70	200	0.05	39.2	52.2	57.0	63.8	40	0.3
	С	52.0	60.0											
62	В	60.8	63.2	120	450	80	215	0.05	43.4	58.8	64.4	71.6	35	0.3
	С	58.0	66.0											
68	В	66.6	69.4	150	475	90	240	0.05	47.6	65.6	71.7	79.8	35	0.25
	С	64.0	72.0											
75	В	73.5	76.5	170	170 500 9	95	255	0.05	52.5	73.4	80.2	88.6	35	0.20
	С	70.0	79.0											

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

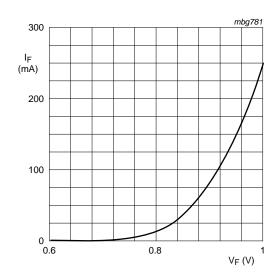
[2]  $t_p = 100 \mu s$ ; square wave;  $T_j = 25 \, ^{\circ}C$  before surge



(1)  $T_i = 25 \,^{\circ}\text{C}$  (before surge)

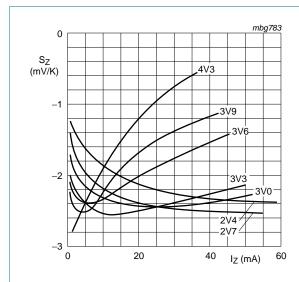
(2)  $T_j = 150 \,^{\circ}\text{C}$  (before surge)

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



T<sub>j</sub> = 25 °C

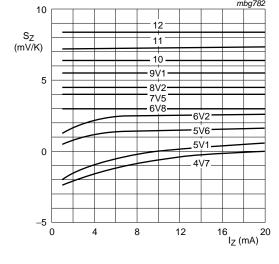
Fig 2. Forward current as a function of forward voltage; typical values



BZX384-B/C2V4 to BZX384-B/C4V3

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

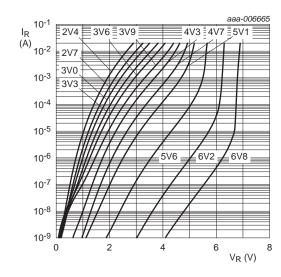
Fig 3. Temperature coefficient as a function of working current; typical values



BZX384-B/C4V7 to BZX384-B/C12

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

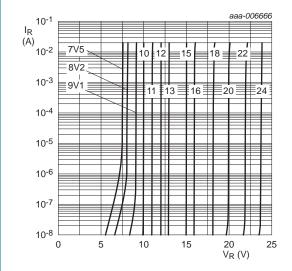
Fig 4. Temperature coefficient as a function of working current; typical values



BZX384-B/C2V4 to BZX384-B/C6V8

 $T_{amb} = 25 \, ^{\circ}C$ 

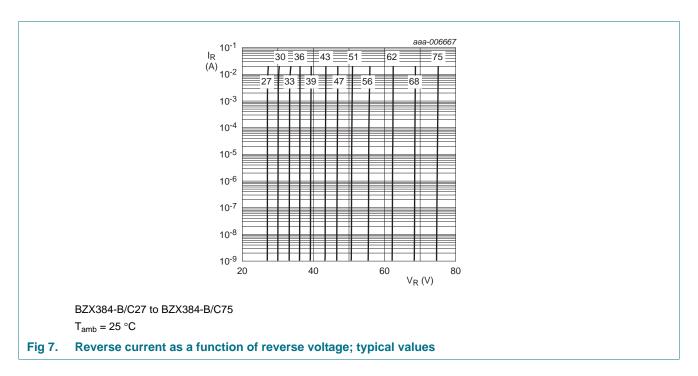
Fig 5. Reverse current as a function of reverse voltage; typical values



BZX384-B/C7V5 to BZX384-B/C24

T<sub>amb</sub> = 25 °C

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

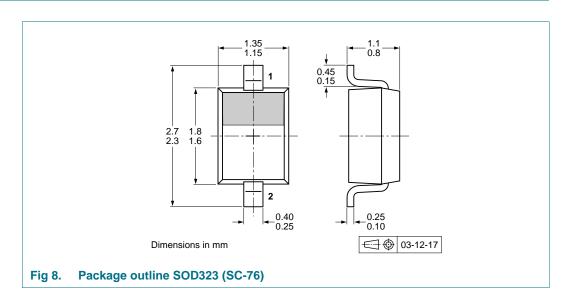


### 8. Test information

### 8.1 Quality information

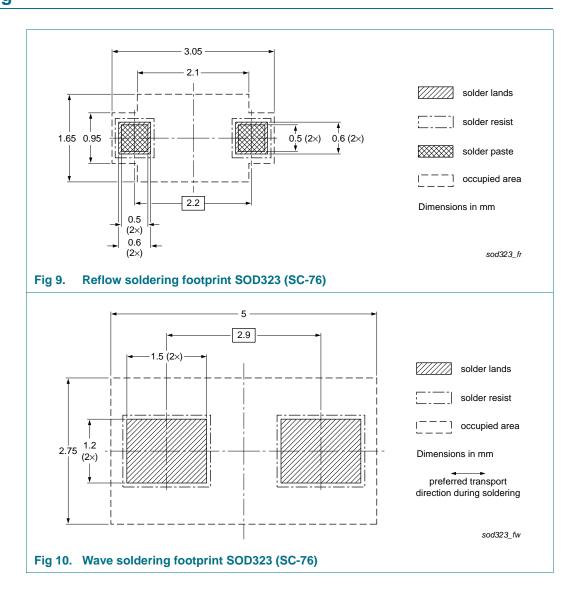
This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard *Q101 - Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

# 9. Package outline



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# 10. Soldering



# 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> <li>The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors</li> </ul>									
	<ul> <li>Legal texts have</li> </ul>	ave been adapted to the ne	w company name wh	ere appropriate.							
	Section 1 "Pr	oduct profile": enhanced.									
	• <u>Table 5</u> : T <sub>amb</sub>	added.									
	• Figure 5 to Figure 5	gure 7: added.									
	Section 8 "Te	st information": added.									
	• Figure 9: repl	aced by minimized packag	e outline.								
	Section 10 "S	Soldering": added.									
	Section 12 "Legal information": updated.										
BZX384_SER v.2	20040322	Product data sheet	-	BZX384_SER v.1							
BZX384_SER v.1	R 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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# **BZX384** series

## **Nexperia**

Voltage regulator diodes

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