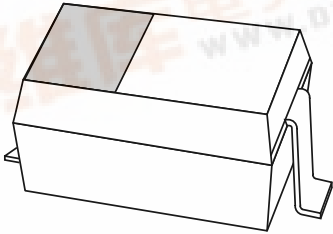


**DISCRETE SEMICONDUCTORS**

# DATA SHEET



## **BZX399 series** Voltage regulator diodes

Product specification

1999 Jun 04

## Voltage regulator diodes

## BZX399 series

### FEATURES

- Total power dissipation: max. 300 mW
- Tolerance:  $\pm 5\%$
- Working voltage range: nom. 1.8 to 43 V (E24 range)
- Improved  $I_Z/V_Z$  characteristic at low currents ( $I_Z = 50 \mu A$ ). This results in a noise free and sharp breakdown knee.

### APPLICATIONS

- General regulation functions, where low noise at low currents is required
- Low power consumption applications (e.g. hand-held applications).

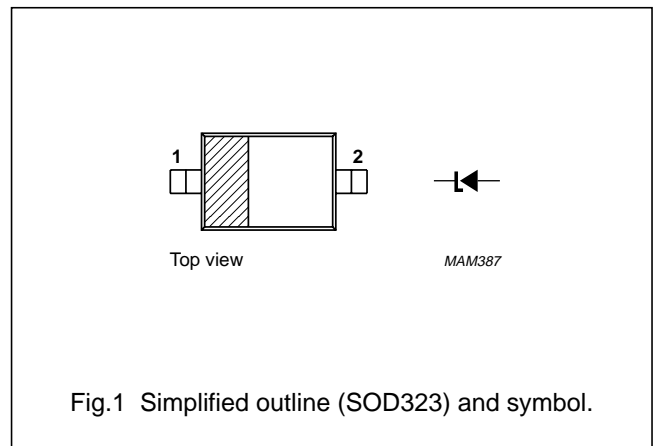
### DESCRIPTION

Low-power low noise voltage regulator diodes in SOD323 plastic SMD package.

The diodes are available in the normalized E24  $\pm 5\%$  tolerance range. The series consists of 34 types with nominal working voltages from 1.8 to 43 V.

### PINNING

PIN	DESCRIPTION
1	cathode
2	anode



### MARKING

TYPE NUMBER	MARKING CODE	TYPE NUMBER	MARKING CODE	TYPE NUMBER	MARKING CODE	TYPE NUMBER	MARKING CODE
BZX399-C1V8	B1	BZX399-C4V3	B0	BZX399-C10	BJ	BZX399-C24	BT
BZX399-C2V0	B2	BZX399-C4V7	BA	BZX399-C11	BK	BZX399-C27	BU
BZX399-C2V2	B3	BZX399-C5V1	BB	BZX399-C12	BL	BZX399-C30	BV
BZX399-C2V4	B4	BZX399-C5V6	BC	BZX399-C13	BM	BZX399-C33	BW
BZX399-C2V7	B5	BZX399-C6V2	BD	BZX399-C15	BN	BZX399-C36	BX
BZX399-C3V0	B6	BZX399-C6V8	BE	BZX399-C16	BP	BZX399-C39	BY
BZX399-C3V3	B7	BZX399-C7V5	BF	BZX399-C18	BQ	BZX399-C43	BZ
BZX399-C3V6	B8	BZX399-C8V2	BG	BZX399-C20	BR		
BZX399-C3V9	B9	BZX399-C9V1	BH	BZX399-C22	BS		

## Voltage regulator diodes

## BZX399 series

**LIMITING VALUES**

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$I_F$	continuous forward current		–	250	mA
$I_{ZSM}$	non-repetitive peak reverse current	$t_p = 100 \mu\text{s}$ ; square wave; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ prior to surge	see Tables 1 and 2		
$P_{\text{tot}}$	total power dissipation	$T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ ; note 1	–	300	mW
$T_{\text{stg}}$	storage temperature		–65	+150	$^\circ\text{C}$
$T_j$	junction temperature		–	150	$^\circ\text{C}$

**Note**

1. Device mounted on a FR4 printed circuit-board.

**ELECTRICAL CHARACTERISTICS****Total BZX399-C series** $T_j = 25 \text{ }^\circ\text{C}$  unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
$V_F$	forward voltage	$I_F = 10 \text{ mA}$ ; see Fig.5	0.9	V
		$I_F = 100 \text{ mA}$ ; see Fig.5	1.0	V
$I_R$	reverse current			
	BZX399-C1V8	$V_R = 1 \text{ V}$	2	$\mu\text{A}$
	BZX399-C2V0	$V_R = 1 \text{ V}$	1	$\mu\text{A}$
	BZX399-C2V2	$V_R = 1 \text{ V}$	0.5	$\mu\text{A}$
	BZX399-C2V4	$V_R = 1 \text{ V}$	0.2	$\mu\text{A}$
	BZX399-C2V7	$V_R = 1 \text{ V}$	0.05	$\mu\text{A}$
	BZX399-C3V0	$V_R = 1 \text{ V}$	0.02	$\mu\text{A}$
	BZX399-C3V3	$V_R = 2 \text{ V}$	2	$\mu\text{A}$
	BZX399-C3V6	$V_R = 2 \text{ V}$	1	$\mu\text{A}$
	BZX399-C3V9	$V_R = 2 \text{ V}$	0.5	$\mu\text{A}$
	BZX399-C4V3	$V_R = 2 \text{ V}$	0.1	$\mu\text{A}$
	BZX399-C4V7	$V_R = 3 \text{ V}$	2	$\mu\text{A}$
	BZX399-C5V1	$V_R = 3 \text{ V}$	1	$\mu\text{A}$
	BZX399-C5V6	$V_R = 4 \text{ V}$	1	$\mu\text{A}$
	BZX399-C6V2	$V_R = 5 \text{ V}$	0.1	$\mu\text{A}$
	BZX399-C6V8	$V_R = 5 \text{ V}$	0.01	$\mu\text{A}$
	BZX399-C7V5	$V_R = 5 \text{ V}$	0.1	$\mu\text{A}$
	BZX399-C8V2	$V_R = 6 \text{ V}$	0.2	$\mu\text{A}$
	BZX399-C9V1	$V_R = 7 \text{ V}$	0.1	$\mu\text{A}$
	BZX399-C10	$V_R = 7 \text{ V}$	0.1	$\mu\text{A}$
BZX399-C11	$V_R = 8 \text{ V}$	0.05	$\mu\text{A}$	
BZX399-C12	$V_R = 9 \text{ V}$	0.05	$\mu\text{A}$	
BZX399-C13	$V_R = 10 \text{ V}$	0.05	$\mu\text{A}$	
BZX399-C15 to 43	$V_R = 0.7V_{Z\text{nom}}$	0.01	$\mu\text{A}$	

## Voltage regulator diodes

## BZX399 series

**Table 1** Per type BZX399-C1V8 to C15 $T_j = 25\text{ °C}$  unless otherwise specified.

BZX399-C XXX	WORKING VOLTAGE $V_Z$ (V) $I_Z = 50\ \mu\text{A}$		VOLTAGE CHANGE $\Delta V_Z$ (V) (note 1)	TEMP. COEFF. $S_Z$ (mV/K) $I_Z = 50\ \mu\text{A}$ (see Figs 2, 3 and 4)	DIODE CAP. $C_d$ (pF) at $f = 1\ \text{MHz}$ ; $V_R = 0\ \text{V}$	NON-REPETITIVE PEAK REVERSE CURRENT $I_{ZSM}$ (A) at $t_p = 100\ \mu\text{s}$ ; $T_{amb} = 25\text{ °C}$
	Tol. $\pm 5\%$					
	MIN.	MAX.	MAX.	TYP.	MAX.	MAX.
1V8	1.71	1.89	0.65	-0.85	425	6.0
2V0	1.90	2.10	0.70	-0.95	410	6.0
2V2	2.09	2.31	0.75	-1.05	390	6.0
2V4	2.28	2.52	0.80	-1.15	370	6.0
2V7	2.57	2.84	0.85	-1.35	350	6.0
3V0	2.85	3.15	0.90	-1.50	325	6.0
3V3	3.14	3.47	0.93	-1.65	310	6.0
3V6	3.42	3.78	0.95	-1.80	300	6.0
3V9	3.71	4.10	0.97	-1.95	290	6.0
4V3	4.09	4.52	0.99	-2.05	280	6.0
4V7	4.47	4.94	0.97	-1.90	275	6.0
5V1	4.85	5.36	0.60	0.15	300	5.0
5V6	5.32	5.88	0.20	1.75	275	4.0
6V2	5.89	6.51	0.10	2.35	250	3.0
6V8	6.46	7.14	0.10	3.00	215	3.0
7V5	7.13	7.88	0.15	3.60	170	3.0
8V2	7.79	8.61	0.15	4.25	150	3.0
9V1	8.65	9.56	0.10	5.00	120	3.0
10	9.50	10.50	0.10	5.80	110	3.0
11	10.45	11.55	0.11	6.70	110	2.5
12	11.40	12.60	0.12	7.65	105	2.5
13	12.35	13.65	0.13	8.60	105	2.5
15	14.25	15.75	0.15	10.50	100	2.0

**Note**1.  $\Delta V_Z = V_Z$  at  $100\ \mu\text{A}$  minus  $V_Z$  at  $10\ \mu\text{A}$ .

## Voltage regulator diodes

## BZX399 series

**Table 2** Per type BZX399-C16 to C43 $T_j = 25\text{ °C}$  unless otherwise specified.

BZX399- C XXX	WORKING VOLTAGE $V_Z$ (V) $I_Z = 50\ \mu\text{A}$		VOLTAGE CHANGE $\Delta V_Z$ (V) (note 1)	TEMP. COEFF. $S_Z$ (mV/K) $I_Z = 50\ \mu\text{A}$ (see Fig.4)	DIODE CAP. $C_d$ (pF) at $f = 1\ \text{MHz}$ ; $V_R = 0\ \text{V}$	NON-REPETITIVE PEAK REVERSE CURRENT $I_{ZSM}$ (A) at $t_p = 100\ \mu\text{s}$ ; $T_{amb} = 25\text{ °C}$
	Tol. $\pm 5\%$					
	MIN.	MAX.	MAX.	TYP.	MAX.	MAX.
16	15.20	16.80	0.16	11.4	95	1.5
18	17.10	18.90	0.18	13.3	95	1.5
20	19.00	21.00	0.20	15.3	90	1.5
22	20.90	23.10	0.22	17.2	85	1.25
24	22.80	25.20	0.24	19.2	80	1.25
27	25.65	28.35	0.27	22.0	75	1.0
30	28.50	31.50	0.30	25.2	65	1.0
33	31.35	34.65	0.30	28.5	60	0.9
36	34.20	37.80	0.30	32.0	60	0.8
39	37.05	40.95	0.30	35.1	60	0.7
43	40.85	45.15	0.30	39.4	55	0.6

**Note**1.  $\Delta V_Z = V_Z$  at  $100\ \mu\text{A}$  minus  $V_Z$  at  $10\ \mu\text{A}$ .**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-a}$	thermal resistance from junction to ambient	note 1	415	K/W
$R_{th\ j-s}$	thermal resistance from junction to soldering point	note 2	110	K/W

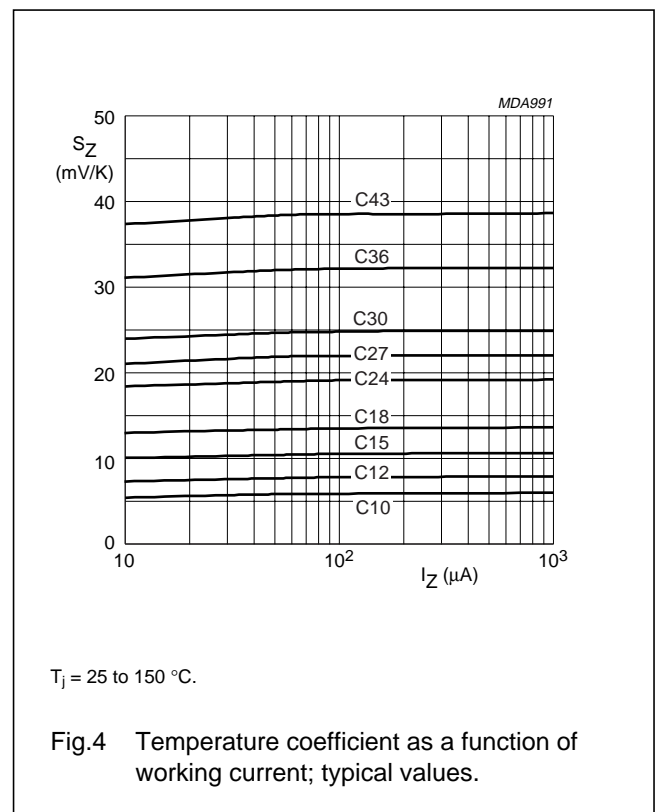
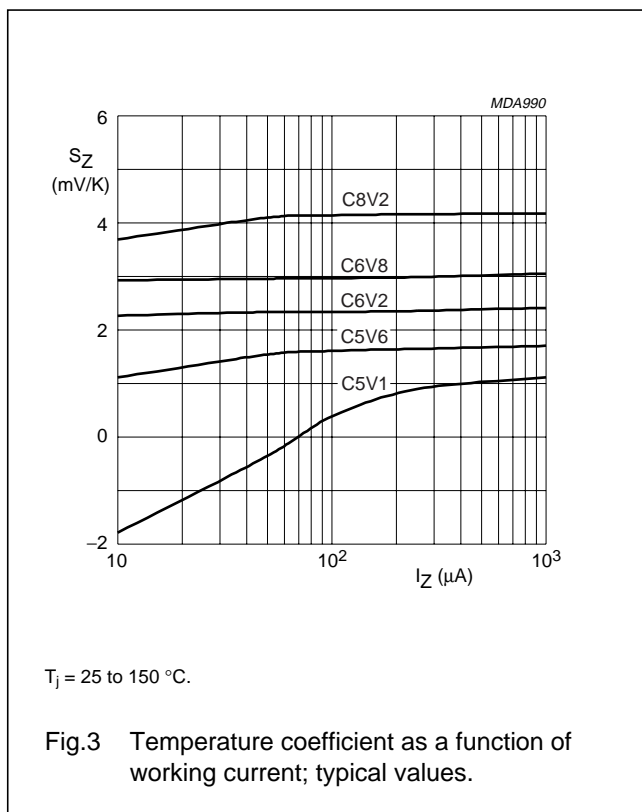
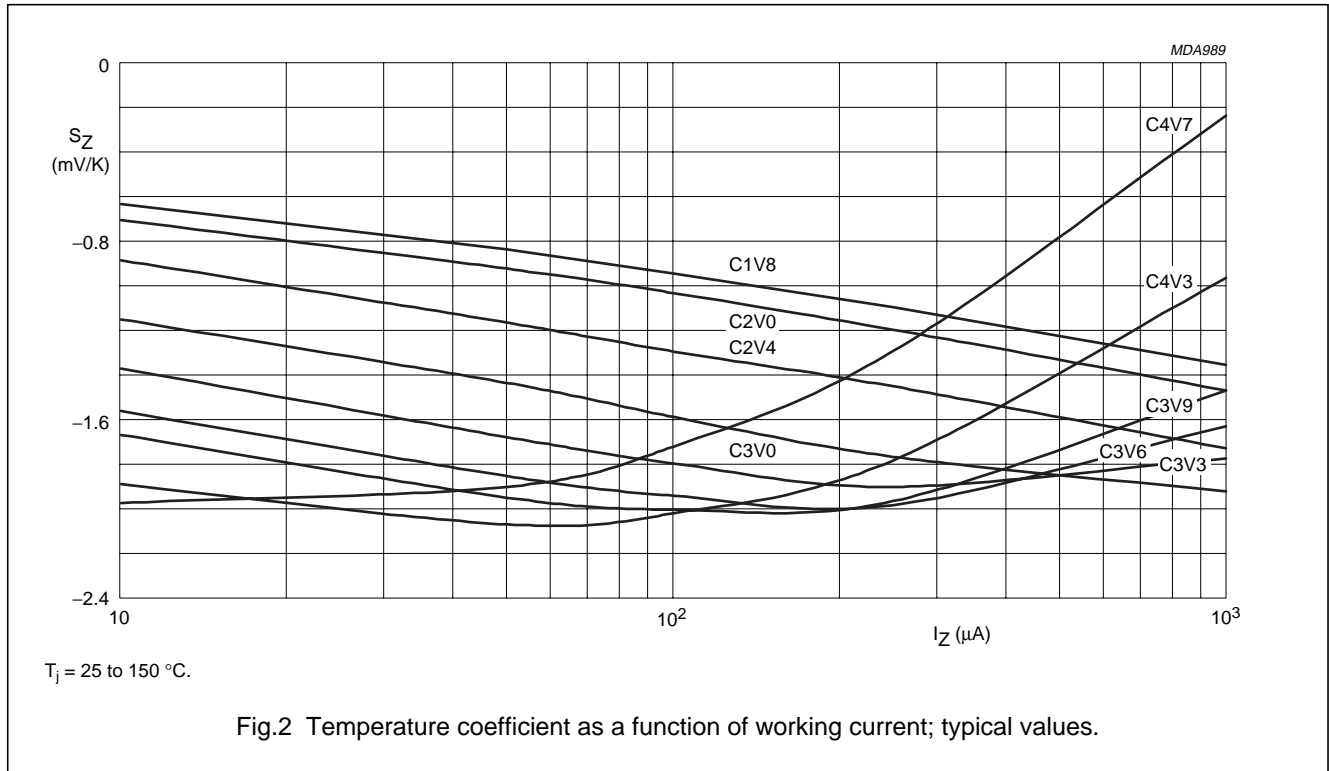
**Notes**

1. Device mounted on a FR4 printed circuit-board.
2. Soldering point of the cathode tab.

Voltage regulator diodes

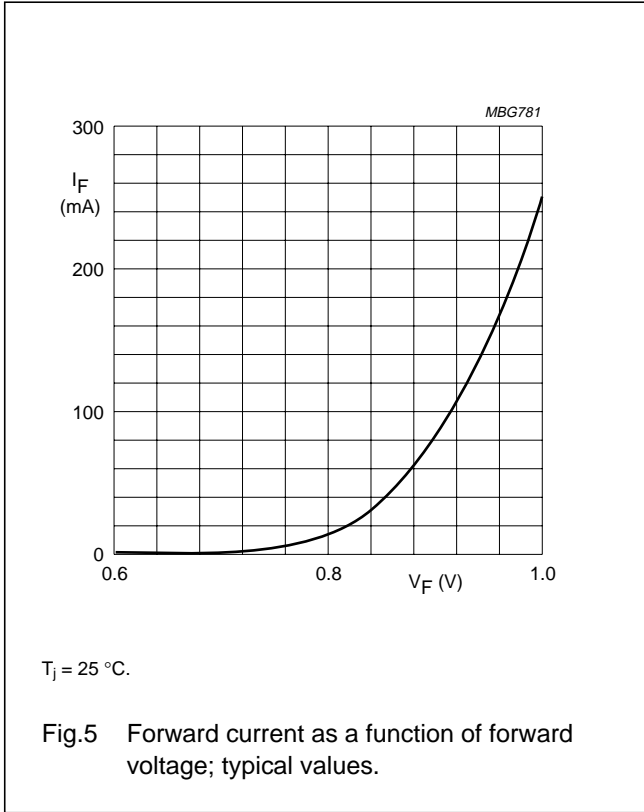
BZX399 series

GRAPHICAL DATA



Voltage regulator diodes

BZX399 series



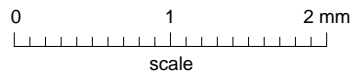
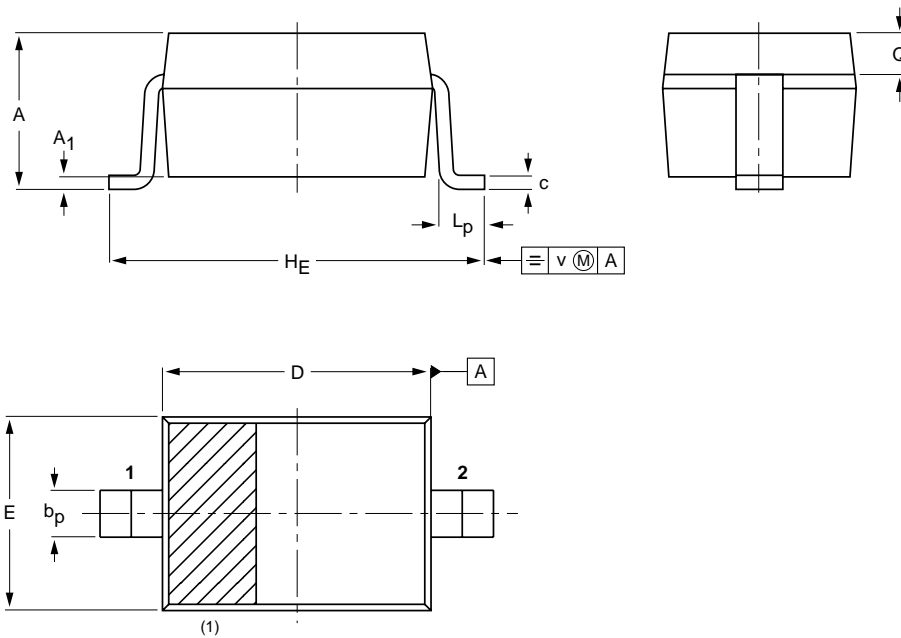
Voltage regulator diodes

BZX399 series

PACKAGE OUTLINE

Plastic surface mounted package; 2 leads

SOD323



DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub> max.	b <sub>p</sub>	c	D	E	H <sub>E</sub>	L <sub>p</sub>	Q	v
mm	1.1 0.8	+0.05 -0.05	0.40 0.25	0.25 0.10	1.8 1.6	1.35 1.15	2.7 2.3	0.45 0.15	0.25 0.15	0.2

Note

1. The marking bar indicates the cathode.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOD323						98-09-14



## Voltage regulator diodes

## BZX399 series

**DEFINITIONS**

<b>Data sheet status</b>	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
<b>Limiting values</b>	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

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Voltage regulator diodes

BZX399 series

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**NOTES**

Voltage regulator diodes

BZX399 series

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**NOTES**

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