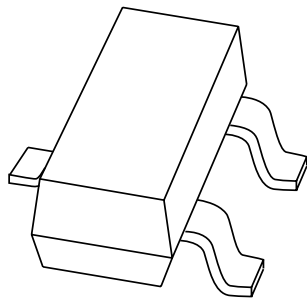


# DATA SHEET



## **BZX99 series** Voltage regulator diodes

Product specification  
Supersedes data of 1999 May 31

1999 Oct 20

Voltage regulator diodes

BZX99 series

FEATURES

- Total power dissipation: max. 300 mW
- Tolerance:  $\pm 5\%$
- Working voltage range: nom. 2.4 to 15 V (E24 range)
- Improved  $I_Z/V_Z$  characteristics 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 small SOT23 plastic SMD packages.

The diodes are available in the normalized E24  $\pm 5\%$  tolerance range. The series consists of 20 types with nominal working voltages from 2.4 to 15 V.

PINNING

| PIN | DESCRIPTION   |
|-----|---------------|
| 1   | anode         |
| 2   | not connected |
| 3   | cathode       |

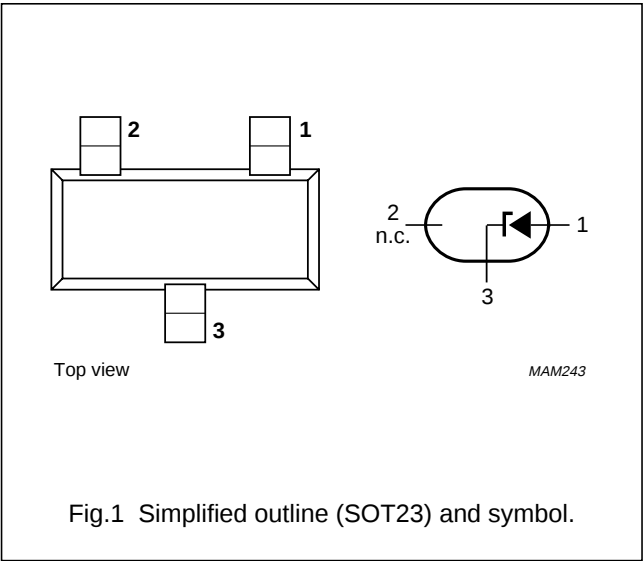


Fig.1 Simplified outline (SOT23) and symbol.

MARKING

| TYPE NUMBER | MARKING CODE | TYPE NUMBER | MARKING CODE | TYPE NUMBER | MARKING CODE | TYPE NUMBER | MARKING CODE |
|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|
| BZX99-C2V4  | XL           | BZX99-C3V9  | XS           | BZX99-C6V2  | XD           | BZX99-C10   | XX           |
| BZX99-C2V7  | XM           | BZX99-C4V3  | XT           | BZX99-C6V8  | XE           | BZX99-C11   | XY           |
| BZX99-C3V0  | XN           | BZX99-C4V7  | XA           | BZX99-C7V5  | XU           | BZX99-C12   | XZ           |
| BZX99-C3V3  | XP           | BZX99-C5V1  | XB           | BZX99-C8V2  | XV           | BZX99-C13   | X2           |
| BZX99-C3V6  | XR           | BZX99-C5V6  | XC           | BZX99-C9V1  | XW           | BZX99-C15   | X3           |

## Voltage regulator diodes

## BZX99 series

## LIMITING VALUES

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

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

## Note

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

## ELECTRICAL CHARACTERISTICS

## Total BZX99-C series

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

| SYMBOL | PARAMETER       | CONDITIONS                         | MAX. | UNIT    |
|--------|-----------------|------------------------------------|------|---------|
| $V_F$  | forward voltage | $I_F = 10 \text{ mA}$ ; see Fig.4  | 0.9  | V       |
|        |                 | $I_F = 100 \text{ mA}$ ; see Fig.4 | 1    | V       |
| $I_R$  | reverse current |                                    |      |         |
|        | BZX99-C2V4      | $V_R = 1 \text{ V}$                | 0.2  | $\mu A$ |
|        | BZX99-C2V7      | $V_R = 1 \text{ V}$                | 0.05 | $\mu A$ |
|        | BZX99-C3V0      | $V_R = 1 \text{ V}$                | 0.02 | $\mu A$ |
|        | BZX99-C3V3      | $V_R = 2 \text{ V}$                | 2    | $\mu A$ |
|        | BZX99-C3V6      | $V_R = 2 \text{ V}$                | 1    | $\mu A$ |
|        | BZX99-C3V9      | $V_R = 2 \text{ V}$                | 0.5  | $\mu A$ |
|        | BZX99-C4V3      | $V_R = 2 \text{ V}$                | 0.1  | $\mu A$ |
|        | BZX99-C4V7      | $V_R = 3 \text{ V}$                | 2    | $\mu A$ |
|        | BZX99-C5V1      | $V_R = 3 \text{ V}$                | 1    | $\mu A$ |
|        | BZX99-C5V6      | $V_R = 4 \text{ V}$                | 1    | $\mu A$ |
|        | BZX99-C6V2      | $V_R = 5 \text{ V}$                | 0.1  | $\mu A$ |
|        | BZX99-C6V8      | $V_R = 5 \text{ V}$                | 0.01 | $\mu A$ |
|        | BZX99-C7V5      | $V_R = 5 \text{ V}$                | 0.1  | $\mu A$ |
|        | BZX99-C8V2      | $V_R = 6 \text{ V}$                | 0.2  | $\mu A$ |
|        | BZX99-C9V1      | $V_R = 7 \text{ V}$                | 0.1  | $\mu A$ |
|        | BZX99-C10       | $V_R = 7 \text{ V}$                | 0.1  | $\mu A$ |
|        | BZX99-C11       | $V_R = 8 \text{ V}$                | 0.05 | $\mu A$ |
|        | BZX99-C12       | $V_R = 9 \text{ V}$                | 0.05 | $\mu A$ |
|        | BZX99-C13       | $V_R = 10 \text{ V}$               | 0.05 | $\mu A$ |
|        | BZX99-C15       | $V_R = 10.5 \text{ V}$             | 0.01 | $\mu A$ |

## Voltage regulator diodes

## BZX99 series

**Table 1** Per type BZX99-C2V4 to C15 $T_j = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

| BZX99-C<br>XXX | WORKING VOLTAGE<br>V <sub>Z</sub> (V)<br>at I <sub>Z</sub> = 50 μA |       | VOLTAGE<br>CHANGE<br>ΔV <sub>Z</sub> (V) <sup>(1)</sup> | TEMP. COEFF.<br>S <sub>Z</sub> (mV/K)<br>I <sub>Ztest</sub> = 50 μA<br>(see Figs 2 and 3) | DIODE CAP.<br>C <sub>d</sub> (pF)<br>at f = 1 MHz;<br>V <sub>R</sub> = 0 V | NON-REPETITIVE PEAK<br>REVERSE CURRENT<br>I <sub>ZSM</sub> (A)<br>at t <sub>p</sub> = 100 μs;<br>T <sub>amb</sub> = 25 °C |
|----------------|--------------------------------------------------------------------|-------|---------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
|                | Tol. ±5%                                                           |       |                                                         |                                                                                           |                                                                            |                                                                                                                           |
|                | MIN.                                                               | MAX.  | MAX.                                                    | TYP.                                                                                      | MAX.                                                                       | MAX.                                                                                                                      |
| 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  $100\text{ }\mu\text{A}$  minus  $V_Z$  at  $10\text{ }\mu\text{A}$

**THERMAL CHARACTERISTICS**

| SYMBOL              | PARAMETER                                       | CONDITIONS | VALUE | UNIT |
|---------------------|-------------------------------------------------|------------|-------|------|
| $R_{\text{th j-a}}$ | thermal resistance from junction to ambient     | note 1     | 415   | K/W  |
| $R_{\text{th j-s}}$ | thermal resistance from junction to solderpoint | note 2     | 195   | K/W  |

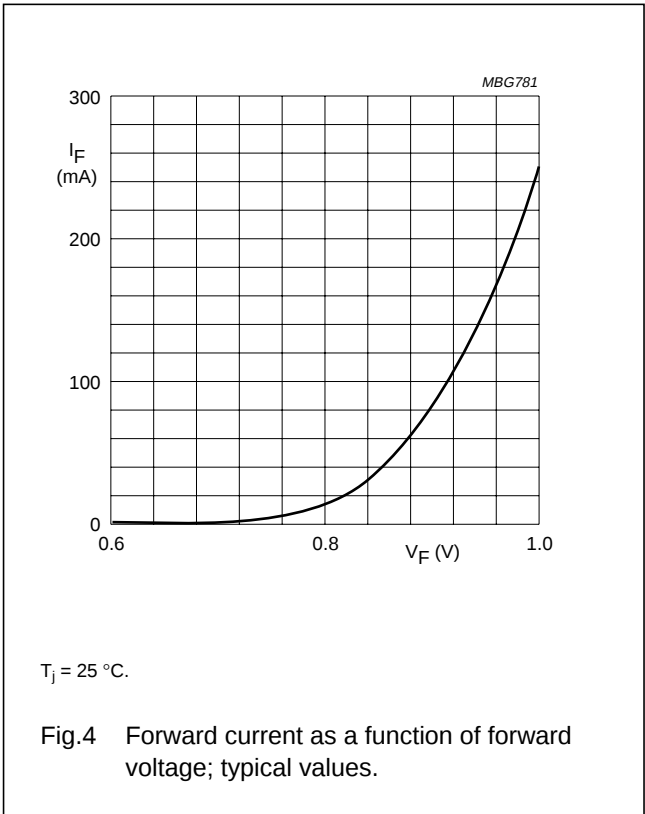
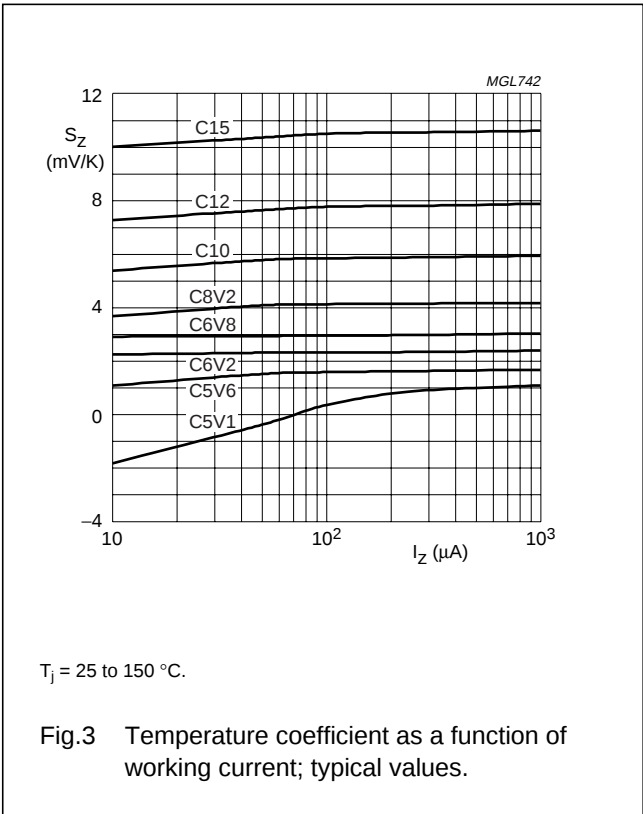
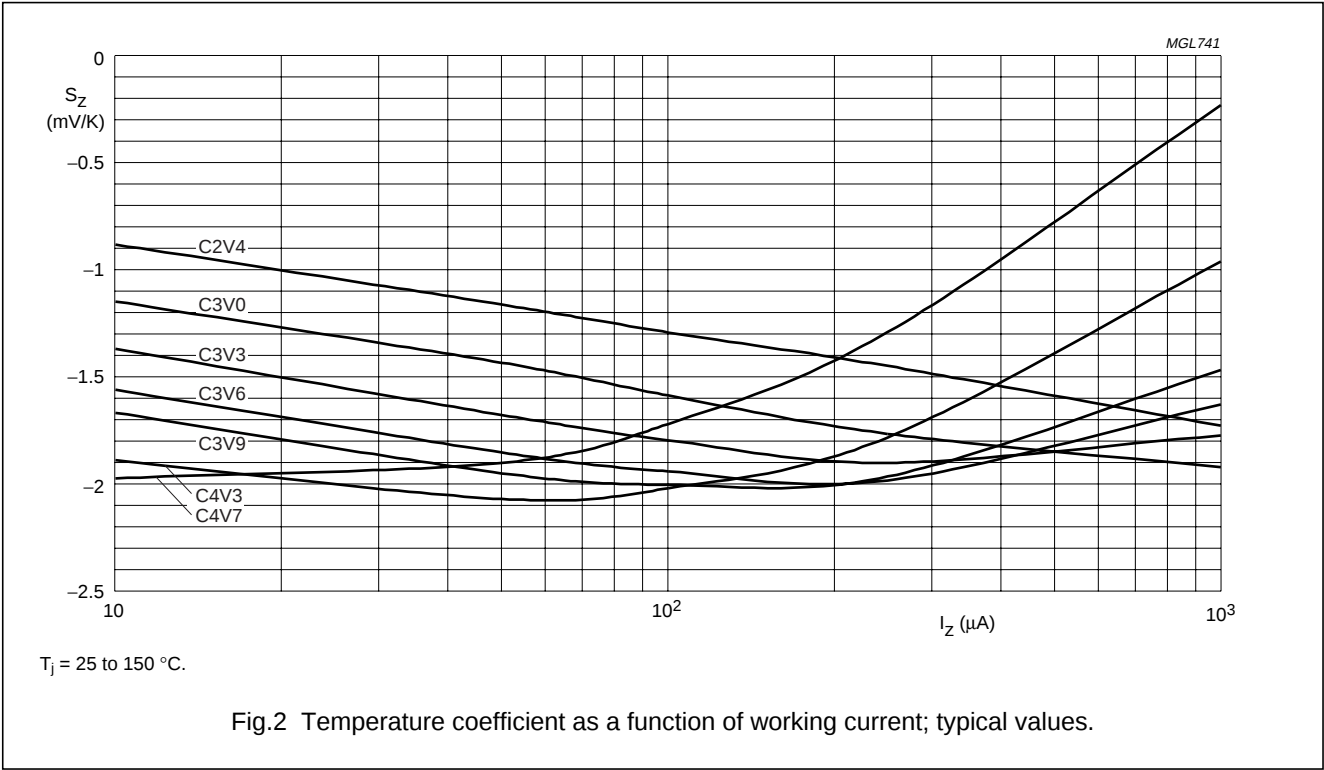
**Notes**

1. Device mounted on an FR4 printed-circuit board.
2. Solderpoint of cathode tab.

Voltage regulator diodes

BZX99 series

GRAPHICAL DATA



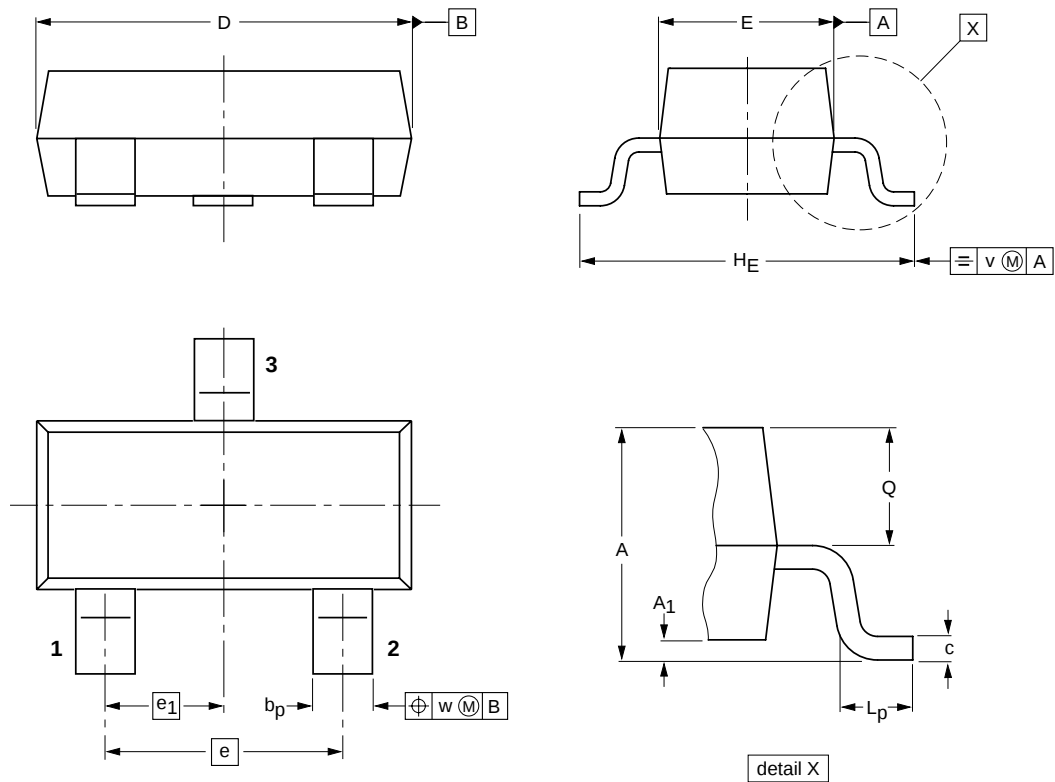
Voltage regulator diodes

BZX99 series

PACKAGE OUTLINE

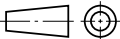
Plastic surface mounted package; 3 leads

SOT23



DIMENSIONS (mm are the original dimensions)

| UNIT | A          | A <sub>1</sub><br>max. | b <sub>p</sub> | c            | D          | E          | e   | e <sub>1</sub> | H <sub>E</sub> | L <sub>p</sub> | Q            | v   | w   |
|------|------------|------------------------|----------------|--------------|------------|------------|-----|----------------|----------------|----------------|--------------|-----|-----|
| mm   | 1.1<br>0.9 | 0.1                    | 0.48<br>0.38   | 0.15<br>0.09 | 3.0<br>2.8 | 1.4<br>1.2 | 1.9 | 0.95           | 2.5<br>2.1     | 0.45<br>0.15   | 0.55<br>0.45 | 0.2 | 0.1 |

| OUTLINE<br>VERSION | REFERENCES |          |      |  | EUROPEAN<br>PROJECTION                                                                | ISSUE DATE           |
|--------------------|------------|----------|------|--|---------------------------------------------------------------------------------------|----------------------|
|                    | IEC        | JEDEC    | EIAJ |  |                                                                                       |                      |
| SOT23              |            | TO-236AB |      |  |  | 97-02-28<br>99-09-13 |

## Voltage regulator diodes

## BZX99 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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