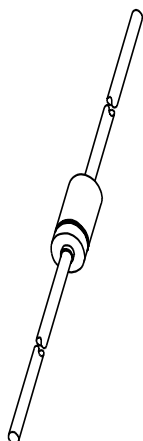


# DATA SHEET



## **BZV10 to BZV14** Voltage reference diodes

Product specification  
Supersedes data of March 1991

1996 Mar 21

Voltage reference diodes

BZV10 to BZV14

FEATURES

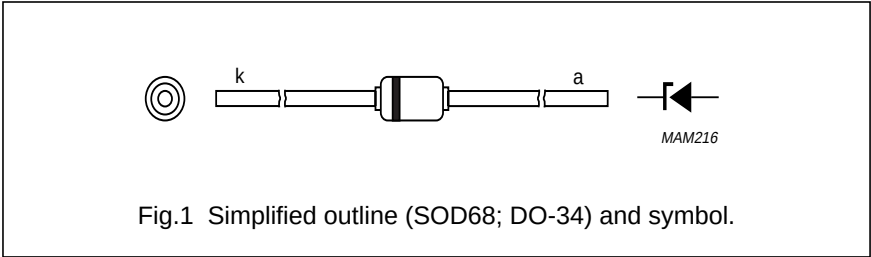
- Temperature compensated
- Reference voltage range:  
5.9 to 6.5 V (typ. 6.2 V)
- Low temperature coefficient range:  
max. 0.0005 to 0.01 %/K.

APPLICATION

- Voltage reference sources in  
measuring instruments such as  
digital voltmeters.

DESCRIPTION

Voltage reference diode in a hermetically-sealed SOD68 (DO-34) glass package.



LIMITING VALUES

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

| SYMBOL           | PARAMETER                     | CONDITIONS               | MIN. | MAX. | UNIT |
|------------------|-------------------------------|--------------------------|------|------|------|
| I <sub>z</sub>   | working current               |                          | –    | 50   | mA   |
| P <sub>tot</sub> | total power dissipation       | T <sub>amb</sub> = 50 °C | –    | 400  | mW   |
| T <sub>stg</sub> | storage temperature           |                          | –65  | +200 | °C   |
| T <sub>j</sub>   | junction temperature          |                          | –    | 200  | °C   |
| T <sub>amb</sub> | operating ambient temperature |                          | 0    | +70  | °C   |

## Voltage reference diodes

## BZV10 to BZV14

**ELECTRICAL CHARACTERISTICS**

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

| SYMBOL             | PARAMETER                   | CONDITIONS                                                                            | MIN. | TYP. | MAX.   | UNIT     |
|--------------------|-----------------------------|---------------------------------------------------------------------------------------|------|------|--------|----------|
| $V_{ref}$          | reference voltage           | $I_Z = 2\text{ mA}$                                                                   | 5.9  | 6.2  | 6.5    | V        |
| $ \Delta V_{ref} $ | reference voltage excursion | $I_Z = 2\text{ mA}$ ; test points for<br>$T_{amb}$ : 0; +25; +70 °C;<br>notes 1 and 2 | –    | –    | 46     | mV       |
|                    | BZV10                       |                                                                                       | –    | –    | 23     | mV       |
|                    | BZV11                       |                                                                                       | –    | –    | 9      | mV       |
|                    | BZV12                       |                                                                                       | –    | –    | 4.6    | mV       |
|                    | BZV13                       |                                                                                       | –    | –    | 2.3    | mV       |
|                    | BZV14                       |                                                                                       | –    | –    |        |          |
| $ S_Z $            | temperature coefficient     | $I_Z = 2\text{ mA}$ ; see Fig.2;<br>notes 1 and 2                                     | –    | –    | 0.01   | %/K      |
|                    | BZV10                       |                                                                                       | –    | –    | 0.005  | %/K      |
|                    | BZV11                       |                                                                                       | –    | –    | 0.002  | %/K      |
|                    | BZV12                       |                                                                                       | –    | –    | 0.001  | %/K      |
|                    | BZV13                       |                                                                                       | –    | –    | 0.0005 | %/K      |
|                    | BZV14                       |                                                                                       | –    | –    |        |          |
| $r_{dif}$          | differential resistance     | $I_Z = 2\text{ mA}$ ; see Fig.3                                                       | –    | 20   | 50     | $\Omega$ |

**Notes**

- The quoted values of  $\Delta V_{ref}$  are based on a constant current  $I_Z$ . Two factors can cause  $\Delta V_{ref}$  to change, namely the differential resistance  $r_{dif}$  and the temperature coefficient  $S_Z$ .
  - As the max.  $r_{dif}$  of the device can be 50  $\Omega$ , a change of 0.01 mA in the current through the reference diode will result in a  $\Delta V_{ref}$  of  $0.01\text{ mA} \times 50\text{ }\Omega = 0.5\text{ mV}$ . This level of  $\Delta V_{ref}$  is not significant on a BZV10 ( $\Delta V_{ref} < 46\text{ mV}$ ), it is however very significant on a BZV14 ( $\Delta V_{ref} < 2.3\text{ mV}$ ).
  - The temperature coefficient of the reference voltage  $S_Z$  is a function of  $I_Z$ . Reference diodes are classified at the specified test current, and the  $S_Z$  of the reference diode will be different at different levels of  $I_Z$ . The absolute value of  $I_Z$  is important, however, the stability of  $I_Z$ , once the level has been set, is far more significant. This applies particularly to the BZV13 and BZV14. The effect of the stability of  $I_Z$  on  $S_Z$  is shown in Fig.2.
- All reference diodes are characterized by the 'box method'. This guarantees a maximum voltage excursion ( $\Delta V_{ref}$ ) over the specified temperature range, at the specified test current ( $I_Z$ ), verified by tests at indicated temperature points within the range.  $V_Z$  is measured and recorded at each temperature specified. The  $\Delta V_{ref}$  between the highest and lowest values must not exceed the maximum  $\Delta V_{ref}$  given. Therefore the temperature coefficient is only given as

a reference. It may be derived from: 
$$S_Z = \frac{V_{ref1} - V_{ref2}}{T_{amb2} - T_{amb1}} \times \frac{100}{V_{ref\text{ nom}}} \text{ %/K}$$

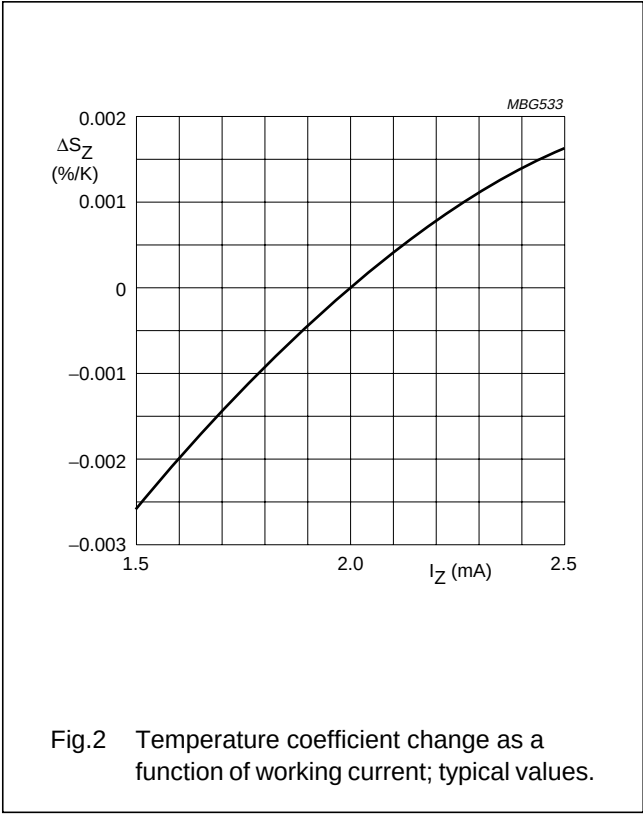
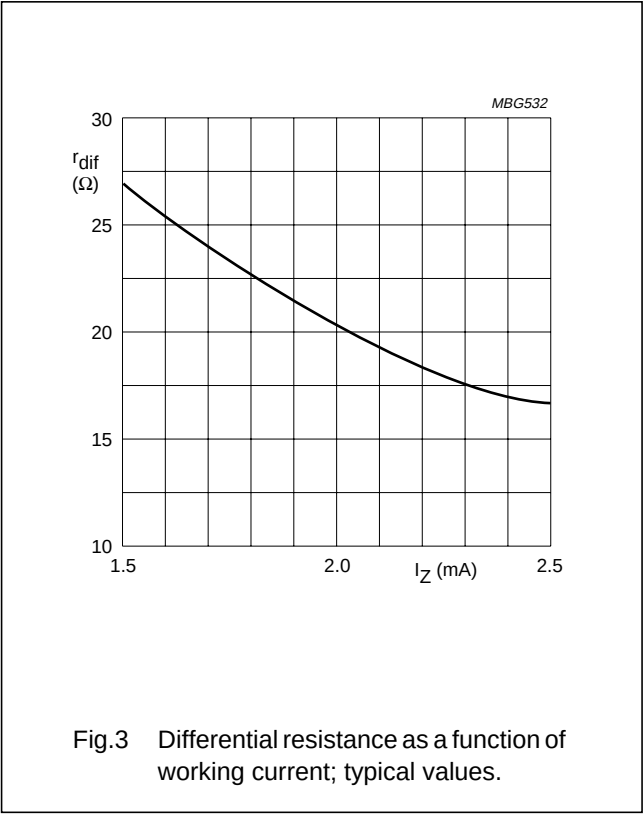
**THERMAL CHARACTERISTICS**

| SYMBOL         | PARAMETER                                     | CONDITIONS         | VALUE | UNIT |
|----------------|-----------------------------------------------|--------------------|-------|------|
| $R_{th\ j-tp}$ | thermal resistance from junction to tie-point | 8 mm from the body | 300   | K/W  |
| $R_{th\ j-a}$  | thermal resistance from junction to ambient   | lead length 10 mm  | 375   | K/W  |

Voltage reference diodes

BZV10 to BZV14

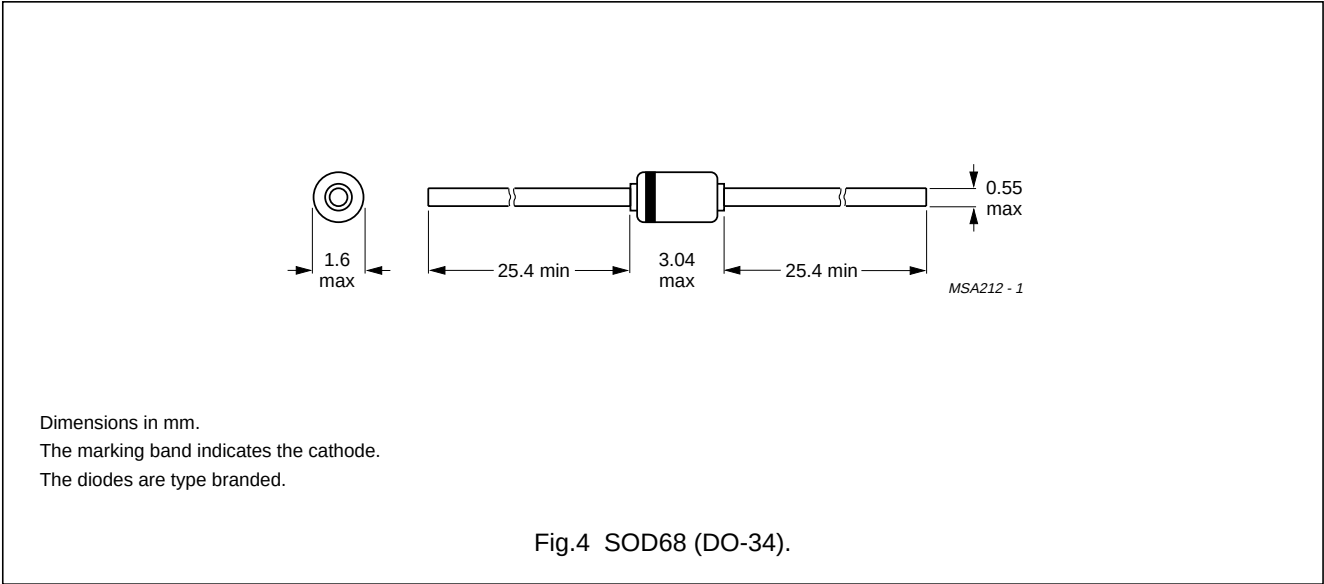
GRAPHICAL DATA



Voltage reference diodes

BZV10 to BZV14

PACKAGE OUTLINE



DEFINITIONS

| Data Sheet Status                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 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.                                |
| Limiting values                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                       |
| 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. |                                                                                       |
| Application information                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                       |
| Where application information is given, it is advisory and does not form part of the specification.                                                                                                                                                                                                                                                                                                                                                       |                                                                                       |

LIFE SUPPORT APPLICATIONS

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