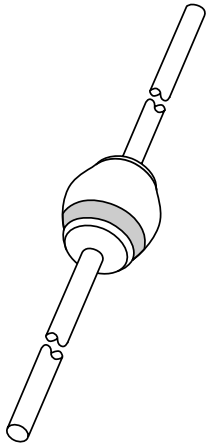


# DATA SHEET



## **BZW03 series** Voltage regulator diodes

Product specification  
Supersedes data of April 1992

1996 May 14

# Voltage regulator diodes

# BZW03 series

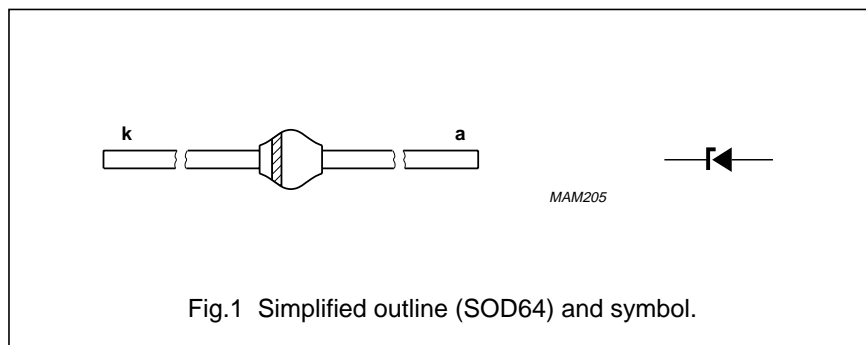
### FEATURES

- Glass passivated
- High maximum operating temperature
- Low leakage current
- Excellent stability
- Zener working voltage range: 7.5 to 270 V for 38 types
- Transient suppressor stand-off voltage range: 6.2 to 430 V for 45 types
- Available in ammo-pack
- Also available with preformed leads for easy insertion.

### DESCRIPTION

Rugged glass SOD64 package, using a high temperature alloyed

construction. This package is hermetically sealed and fatigue free as coefficients of expansion of all used parts are matched.



### LIMITING VALUES

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

| SYMBOL           | PARAMETER                                     | CONDITIONS   | MIN. | MAX. | UNIT |
|------------------|---|--|------|------|------|
| P <sub>tot</sub> | total power dissipation                       | T <sub>tp</sub> = 25 °C; lead length 10 mm; see Fig.2                                      | –    | 6.00 | W    |
|                  |   | T <sub>amb</sub> = 45 °C; see Fig.2; PCB mounted (see Fig.6)                               | –    | 1.75 | W    |
| P <sub>ZRM</sub> | repetitive peak reverse power dissipation     |  | –    | 20   | W    |
| P <sub>ZSM</sub> | non-repetitive peak reverse power dissipation | t <sub>p</sub> = 100 μs; square pulse; T <sub>j</sub> = 25 °C prior to surge; see Fig.3    | –    | 1000 | W    |
| P <sub>RSM</sub> | non-repetitive peak reverse power dissipation | 10/1000 μs exponential pulse (see Fig.7); T <sub>j</sub> = 25 °C prior to surge; see Fig.4 | –    | 500  | W    |
| T <sub>stg</sub> | storage temperature                           |  | –65  | +175 | °C   |
| T <sub>j</sub>   | junction temperature                          |  | –65  | +175 | °C   |

## Voltage regulator diodes

## BZW03 series

## ELECTRICAL CHARACTERISTICS

## Total series

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

| SYMBOL | PARAMETER       | CONDITIONS                     | MAX. | UNIT |
|--------|-----------------|--------------------------------|------|------|
| $V_F$  | forward voltage | $I_F = 1\text{ A}$ ; see Fig.5 | 1.2  | V    |

## Per type when used as voltage regulator diodes

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

| TYPE No.<br>SUFFIX<br>(1) | WORKING VOLTAGE    |      |      | DIFFERENTIAL RESISTANCE         |      | TEMPERATURE COEFFICIENT |      | TEST CURRENT<br>$I_Z$ (mA) | REVERSE CURRENT at REVERSE VOLTAGE |              |
|---------------------------|--------------------|------|------|---------------------------------|------|-------------------------|------|----------------------------|------------------------------------|--------------|
|                           | $V_Z$ (V) at $I_Z$ |      |      | $r_{dif}$ ( $\Omega$ ) at $I_Z$ |      | $S_Z$ (%/K) at $I_Z$    |      |                            | $I_R$ ( $\mu\text{A}$ )<br>MAX.    | at $V_R$ (V) |
|                           | MIN.               | NOM. | MAX. | TYP.                            | MAX. | MIN.                    | MAX. |                            |                                    |              |
| C7V5                      | 7.0                | 7.5  | 7.9  | 0.7                             | 1.5  | 0.00                    | 0.07 | 175                        | 1500                               | 5.6          |
| C8V2                      | 7.7                | 8.2  | 8.7  | 0.8                             | 1.5  | 0.03                    | 0.08 | 150                        | 1200                               | 6.2          |
| C9V1                      | 8.5                | 9.1  | 9.6  | 0.9                             | 2.0  | 0.03                    | 0.08 | 150                        | 40                                 | 6.8          |
| C10                       | 9.4                | 10   | 10.6 | 1.0                             | 2.0  | 0.05                    | 0.09 | 125                        | 20                                 | 7.5          |
| C11                       | 10.4               | 11   | 11.6 | 1.1                             | 2.5  | 0.05                    | 0.10 | 125                        | 15                                 | 8.2          |
| C12                       | 11.4               | 12   | 12.7 | 1.1                             | 2.5  | 0.05                    | 0.10 | 100                        | 10                                 | 9.1          |
| C13                       | 12.4               | 13   | 14.1 | 1.2                             | 2.5  | 0.05                    | 0.10 | 100                        | 4                                  | 10           |
| C15                       | 13.8               | 15   | 15.6 | 1.2                             | 2.5  | 0.05                    | 0.10 | 75                         | 2                                  | 11           |
| C16                       | 15.3               | 16   | 17.1 | 1.3                             | 2.5  | 0.06                    | 0.11 | 75                         | 2                                  | 12           |
| C18                       | 16.8               | 18   | 19.1 | 1.3                             | 2.5  | 0.06                    | 0.11 | 65                         | 2                                  | 13           |
| C20                       | 18.8               | 20   | 21.2 | 1.5                             | 3.0  | 0.06                    | 0.11 | 65                         | 2                                  | 15           |
| C22                       | 20.8               | 22   | 23.3 | 1.6                             | 3.5  | 0.06                    | 0.11 | 50                         | 2                                  | 16           |
| C24                       | 22.8               | 24   | 25.6 | 1.8                             | 3.5  | 0.06                    | 0.11 | 50                         | 2                                  | 18           |
| C27                       | 25.1               | 27   | 28.9 | 2.5                             | 5    | 0.06                    | 0.11 | 50                         | 2                                  | 20           |
| C30                       | 28                 | 30   | 32   | 4                               | 8    | 0.06                    | 0.11 | 40                         | 2                                  | 22           |
| C33                       | 31                 | 33   | 35   | 5                               | 10   | 0.06                    | 0.11 | 40                         | 2                                  | 24           |
| C36                       | 34                 | 36   | 38   | 6                               | 11   | 0.06                    | 0.11 | 30                         | 2                                  | 27           |
| C39                       | 37                 | 39   | 41   | 7                               | 14   | 0.06                    | 0.11 | 30                         | 2                                  | 30           |
| C43                       | 40                 | 43   | 46   | 10                              | 20   | 0.07                    | 0.12 | 30                         | 2                                  | 33           |
| C47                       | 44                 | 47   | 50   | 12                              | 25   | 0.07                    | 0.12 | 25                         | 2                                  | 36           |
| C51                       | 48                 | 51   | 54   | 14                              | 27   | 0.07                    | 0.12 | 25                         | 2                                  | 39           |
| C56                       | 52                 | 56   | 60   | 18                              | 35   | 0.07                    | 0.12 | 20                         | 2                                  | 43           |
| C62                       | 58                 | 62   | 66   | 20                              | 42   | 0.08                    | 0.13 | 20                         | 2                                  | 47           |
| C68                       | 64                 | 68   | 72   | 22                              | 44   | 0.08                    | 0.13 | 20                         | 2                                  | 51           |
| C75                       | 70                 | 75   | 79   | 25                              | 45   | 0.08                    | 0.13 | 20                         | 2                                  | 56           |
| C82                       | 77                 | 82   | 87   | 30                              | 65   | 0.08                    | 0.13 | 15                         | 2                                  | 62           |
| C91                       | 85                 | 91   | 96   | 40                              | 75   | 0.09                    | 0.13 | 15                         | 2                                  | 68           |

## Voltage regulator diodes

## BZW03 series

| TYPE<br>No.<br>SUFFIX<br>(1) | WORKING VOLTAGE                      |      |      | DIFFERENTIAL<br>RESISTANCE             |      | TEMPERATURE<br>COEFFICIENT             |      | TEST<br>CURRENT     | REVERSE CURRENT at<br>REVERSE VOLTAGE |                       |
|------------------------------|--------------------------------------|------|------|--|------|--|------|---------------------|---------------------------------------|-----------------------|
|                              | V <sub>Z</sub> (V) at I <sub>Z</sub> |      |      | r <sub>dif</sub> (Ω) at I <sub>Z</sub> |      | S <sub>Z</sub> (%/K) at I <sub>Z</sub> |      | I <sub>Z</sub> (mA) | I <sub>R</sub> (μA)                   | at V <sub>R</sub> (V) |
|                              | MIN.                                 | NOM. | MAX. | TYP.                                   | MAX. | MIN.                                   | MAX. |                     | MAX.                                  |                       |
| C100                         | 94                                   | 100  | 106  | 45                                     | 90   | 0.09                                   | 0.13 | 12                  | 2                                     | 75                    |
| C110                         | 104                                  | 110  | 116  | 65                                     | 125  | 0.09                                   | 0.13 | 12                  | 2                                     | 82                    |
| C120                         | 114                                  | 120  | 127  | 90                                     | 170  | 0.09                                   | 0.13 | 10                  | 2                                     | 91                    |
| C130                         | 124                                  | 130  | 141  | 100                                    | 190  | 0.09                                   | 0.13 | 10                  | 2                                     | 100                   |
| C150                         | 138                                  | 150  | 156  | 150                                    | 330  | 0.09                                   | 0.13 | 8                   | 2                                     | 110                   |
| C160                         | 153                                  | 160  | 171  | 180                                    | 350  | 0.09                                   | 0.13 | 8                   | 2                                     | 120                   |
| C180                         | 168                                  | 180  | 191  | 210                                    | 430  | 0.09                                   | 0.13 | 5                   | 2                                     | 130                   |
| C200                         | 188                                  | 200  | 212  | 250                                    | 500  | 0.09                                   | 0.13 | 5                   | 2                                     | 150                   |
| C220                         | 208                                  | 220  | 233  | 350                                    | 700  | 0.09                                   | 0.13 | 5                   | 2                                     | 160                   |
| C240                         | 228                                  | 240  | 256  | 450                                    | 900  | 0.09                                   | 0.13 | 5                   | 2                                     | 180                   |
| C270                         | 251                                  | 270  | 289  | 600                                    | 1200 | 0.09                                   | 0.13 | 5                   | 2                                     | 200                   |

**Note**

- To complete the type number the suffix is added to the basic type number, e.g. BZW03-C100.

## Voltage regulator diodes

## BZW03 series

Per type when used as transient suppressor diodes

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

| TYPE<br>NUMBER | REVERSE<br>BREAKDOWN<br>VOLTAGE  | TEMPERATURE<br>COEFFICIENT |      | TEST<br>CURRENT    | CLAMPING<br>VOLTAGE |                               | REVERSE<br>CURRENT at<br>STAND-OFF<br>VOLTAGE |                 |
|----------------|----------------------------------|----------------------------|------|--------------------|---------------------|-------------------------------|---|-----------------|
|                | $V_{(BR)R}$ (V)<br>at $I_{test}$ | $S_Z$ (%/K) at $I_{test}$  |      | $I_{test}$<br>(mA) | $V_{(CL)R}$<br>(V)  | at $I_{RSM}$<br>(A)<br>note 1 | $I_R$ ( $\mu$ A)                              | at $V_R$<br>(V) |
|                | MIN.                             | MIN.                       | MAX. |                    | MAX.                |                               | MAX.  |                 |
| BZW03-C7V5     | 7.0                              | 0.00                       | 0.07 | 175                | 11.3                | 44.2                          | 3000  | 6.2             |
| BZW03-C8V2     | 7.7                              | 0.03                       | 0.08 | 150                | 12.3                | 40.6                          | 2400  | 6.8             |
| BZW03-C9V1     | 8.5                              | 0.03                       | 0.08 | 150                | 13.3                | 37.6                          | 100   | 7.5             |
| BZW03-C10      | 9.4                              | 0.05                       | 0.09 | 125                | 14.8                | 34.0                          | 40  | 8.2             |
| BZW03-C11      | 10.4                             | 0.05                       | 0.10 | 125                | 15.7                | 31.8                          | 30  | 9.1             |
| BZW03-C12      | 11.4                             | 0.05                       | 0.10 | 100                | 17.0                | 29.4                          | 20  | 10              |
| BZW03-C13      | 12.4                             | 0.05                       | 0.10 | 100                | 18.9                | 26.4                          | 10  | 11              |
| BZW03-C15      | 13.8                             | 0.05                       | 0.10 | 75                 | 20.9                | 23.9                          | 10  | 12              |
| BZW03-C16      | 15.3                             | 0.06                       | 0.11 | 75                 | 22.9                | 21.8                          | 10  | 13              |
| BZW03-C18      | 16.8                             | 0.06                       | 0.11 | 65                 | 25.6                | 19.5                          | 10  | 15              |
| BZW03-C20      | 18.8                             | 0.06                       | 0.11 | 65                 | 28.4                | 17.6                          | 10  | 16              |
| BZW03-C22      | 20.8                             | 0.06                       | 0.11 | 50                 | 31.0                | 16.1                          | 10  | 18              |
| BZW03-C24      | 22.8                             | 0.06                       | 0.11 | 50                 | 33.8                | 14.8                          | 10  | 20              |
| BZW03-C27      | 25.1                             | 0.06                       | 0.11 | 50                 | 38.1                | 13.1                          | 10  | 22              |
| BZW03-C30      | 28                               | 0.06                       | 0.11 | 40                 | 42.2                | 11.8                          | 10  | 24              |
| BZW03-C33      | 31                               | 0.06                       | 0.11 | 40                 | 46.2                | 10.8                          | 10  | 27              |
| BZW03-C36      | 34                               | 0.06                       | 0.11 | 30                 | 50.1                | 10.0                          | 10  | 30              |
| BZW03-C39      | 37                               | 0.06                       | 0.11 | 30                 | 54.1                | 9.2                           | 10  | 33              |
| BZW03-C43      | 40                               | 0.07                       | 0.12 | 30                 | 60.7                | 8.2                           | 10  | 36              |
| BZW03-C47      | 44                               | 0.07                       | 0.12 | 25                 | 65.5                | 7.6                           | 10  | 39              |
| BZW03-C51      | 48                               | 0.07                       | 0.12 | 25                 | 70.8                | 7.0                           | 10  | 43              |
| BZW03-C56      | 52                               | 0.07                       | 0.12 | 20                 | 78.6                | 6.3                           | 10  | 47              |
| BZW03-C62      | 58                               | 0.08                       | 0.13 | 20                 | 86.5                | 5.8                           | 10  | 51              |
| BZW03-C68      | 64                               | 0.08                       | 0.13 | 20                 | 94.4                | 5.3                           | 10  | 56              |
| BZW03-C75      | 70                               | 0.08                       | 0.13 | 20                 | 103.5               | 4.8                           | 10  | 62              |
| BZW03-C82      | 77                               | 0.08                       | 0.13 | 15                 | 114.0               | 4.3                           | 10  | 68              |
| BZW03-C91      | 85                               | 0.09                       | 0.13 | 15                 | 126                 | 3.9                           | 10  | 75              |
| BZW03-C100     | 94                               | 0.09                       | 0.13 | 12                 | 139                 | 3.6                           | 10  | 82              |
| BZW03-C110     | 104                              | 0.09                       | 0.13 | 12                 | 152                 | 3.3                           | 10  | 91              |
| BZW03-C120     | 114                              | 0.09                       | 0.13 | 10                 | 167                 | 3.0                           | 10  | 100             |
| BZW03-C130     | 124                              | 0.09                       | 0.13 | 10                 | 185                 | 2.7                           | 10  | 110             |
| BZW03-C150     | 138                              | 0.09                       | 0.13 | 8                  | 204                 | 2.4                           | 10  | 120             |
| BZW03-C160     | 153                              | 0.09                       | 0.13 | 8                  | 224                 | 2.2                           | 10  | 130             |

## Voltage regulator diodes

## BZW03 series

| TYPE NUMBER | REVERSE BREAKDOWN VOLTAGE     | TEMPERATURE COEFFICIENT   |      | TEST CURRENT    | CLAMPING VOLTAGE |                         | REVERSE CURRENT at STAND-OFF VOLTAGE |              |
|-------------|-------------------------------|---------------------------|------|-----------------|------------------|-------------------------|--------------------------------------|--------------|
|             | $V_{(BR)R}$ (V) at $I_{test}$ | $S_Z$ (%/K) at $I_{test}$ |      | $I_{test}$ (mA) | $V_{(CL)R}$ (V)  | at $I_{RSM}$ (A) note 1 | $I_R$ ( $\mu$ A)                     | at $V_R$ (V) |
|             | MIN.                          | MIN.                      | MAX. |                 | MAX.             |                         | MAX.                                 |              |
| BZW03-C180  | 168                           | 0.09                      | 0.13 | 5               | 249              | 2.0                     | 10                                   | 150          |
| BZW03-C200  | 188                           | 0.09                      | 0.13 | 5               | 276              | 1.8                     | 10                                   | 160          |
| BZW03-C220  | 208                           | 0.09                      | 0.13 | 5               | 305              | 1.6                     | 10                                   | 180          |
| BZW03-C240  | 228                           | 0.09                      | 0.13 | 5               | 336              | 1.5                     | 10                                   | 200          |
| BZW03-C270  | 251                           | 0.09                      | 0.13 | 5               | 380              | 1.3                     | 10                                   | 220          |
| BZW03-C300  | 280                           | 0.09                      | 0.13 | 5               | 419              | 1.2                     | 10                                   | 240          |
| BZW03-C330  | 310                           | 0.09                      | 0.13 | 5               | 459              | 1.1                     | 10                                   | 270          |
| BZW03-C360  | 340                           | 0.09                      | 0.13 | 5               | 498              | 1.0                     | 10                                   | 300          |
| BZW03-C390  | 370                           | 0.09                      | 0.13 | 5               | 537              | 0.93                    | 10                                   | 330          |
| BZW03-C430  | 400                           | 0.09                      | 0.13 | 5               | 603              | 0.83                    | 10                                   | 360          |
| BZW03-C470  | 440                           | 0.09                      | 0.13 | 5               | 655              | 0.76                    | 10                                   | 390          |
| BZW03-C510  | 480                           | 0.09                      | 0.13 | 5               | 707              | 0.71                    | 10                                   | 430          |

**Note**

1. Non-repetitive peak reverse current in accordance with "IEC 60-1, Section 8" (10/1000  $\mu$ s pulse); see Fig.7.

**THERMAL CHARACTERISTICS**

| SYMBOL         | PARAMETER                                     | CONDITIONS          | VALUE | UNIT |
|----------------|---|---------------------|-------|------|
| $R_{th\ j-tp}$ | thermal resistance from junction to tie-point | lead length = 10 mm | 25    | K/W  |
| $R_{th\ j-a}$  | thermal resistance from junction to ambient   | note 1              | 75    | K/W  |

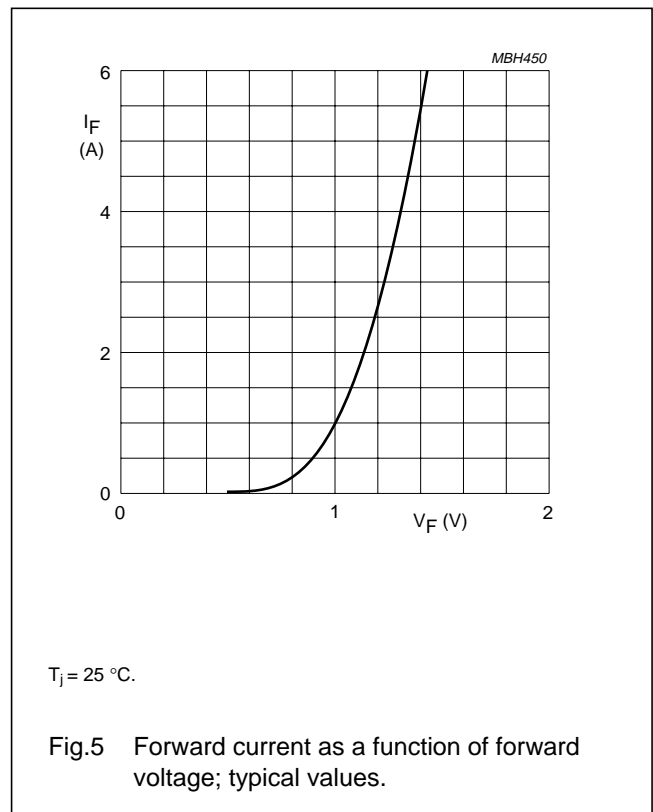
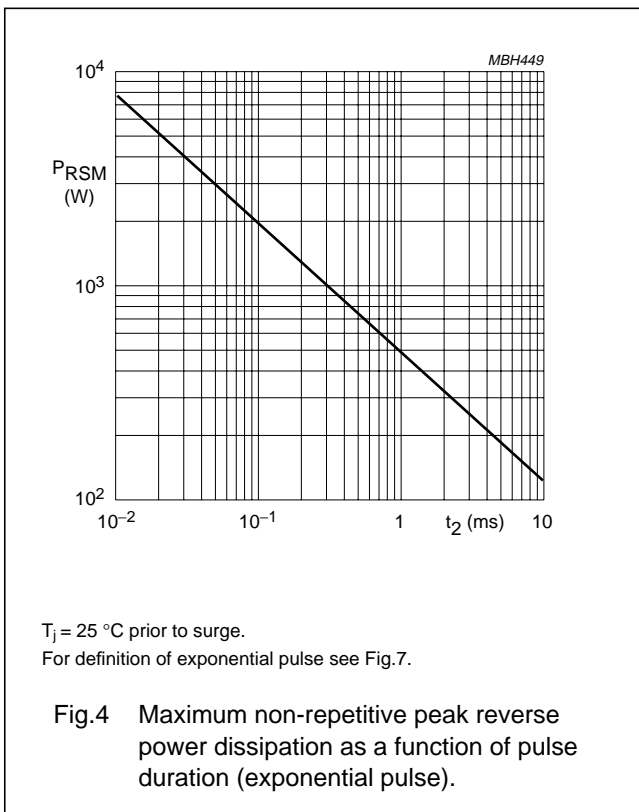
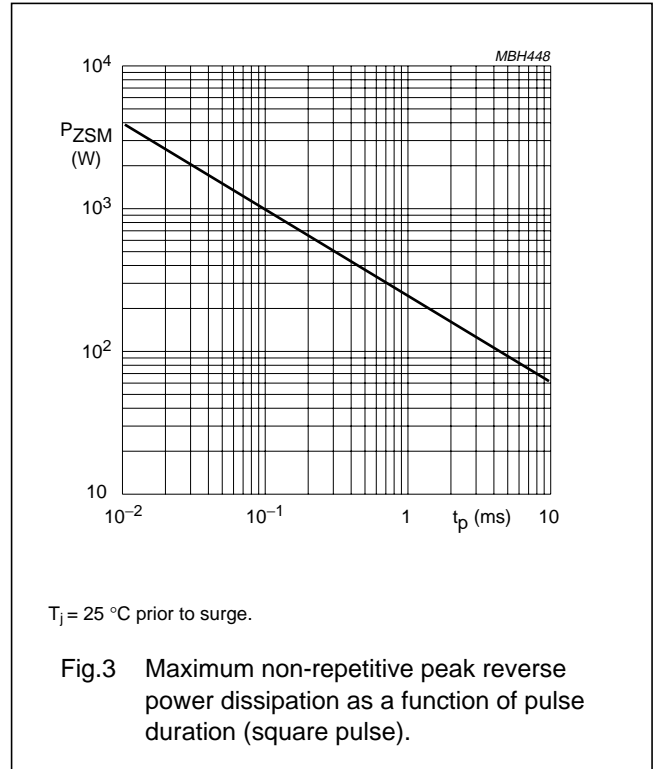
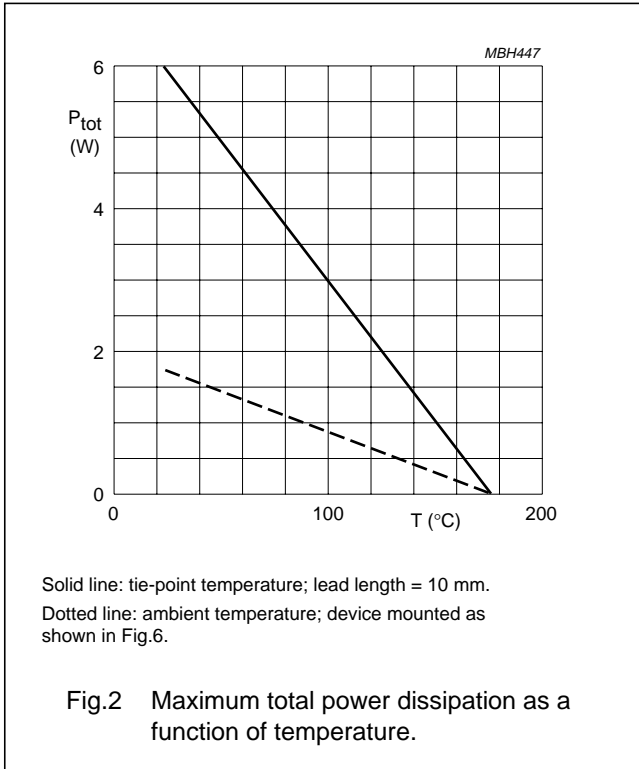
**Note**

1. Device mounted on an epoxy-glass printed-circuit board, 1.5 mm thick; thickness of Cu-layer  $\geq 40\ \mu$ m, see Fig.6. For more information please refer to the "General Part of associated Handbook".

Voltage regulator diodes

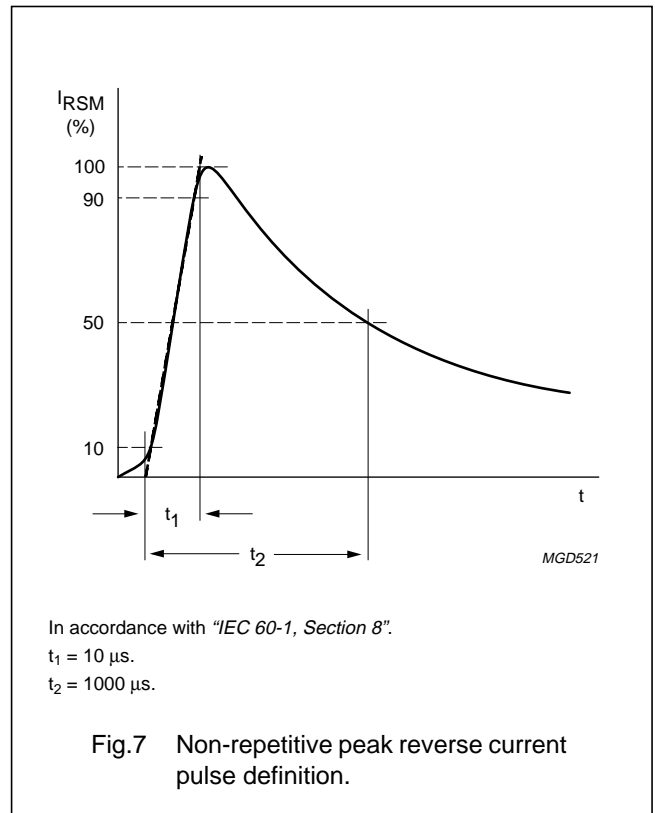
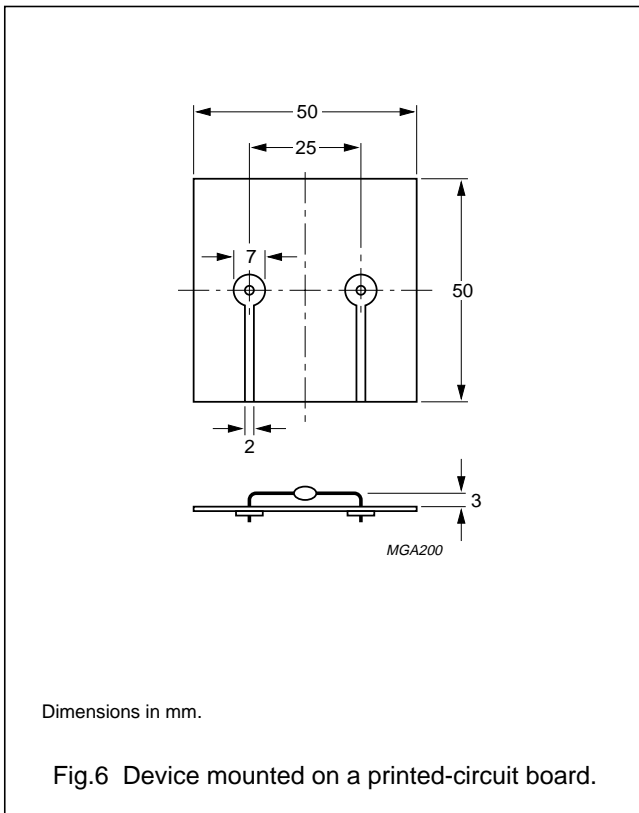
BZW03 series

GRAPHICAL DATA



Voltage regulator diodes

BZW03 series

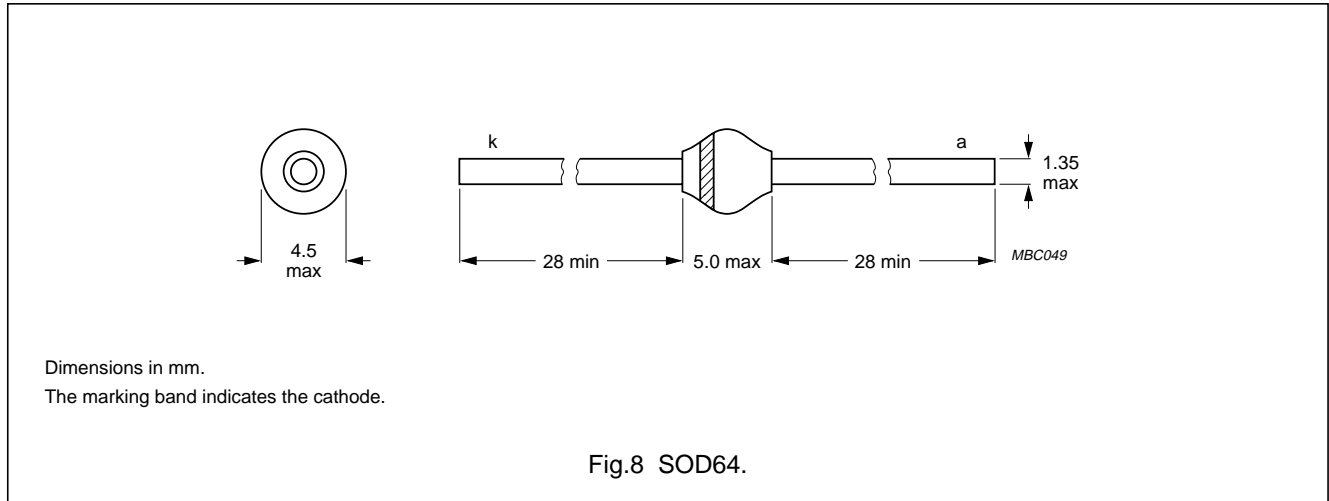




Voltage regulator diodes

BZW03 series

PACKAGE OUTLINE



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.   |   |

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.