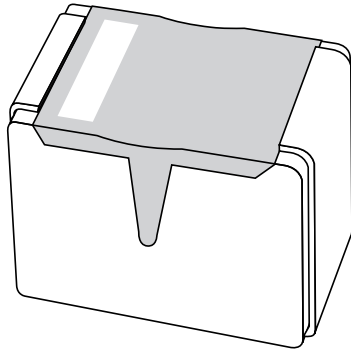


# DATA SHEET



## **BZX284 series** Voltage regulator diodes

Product specification  
Supersedes data of 1996 Apr 17

1999 Apr 19

## Voltage regulator diodes

## BZX284 series

## FEATURES

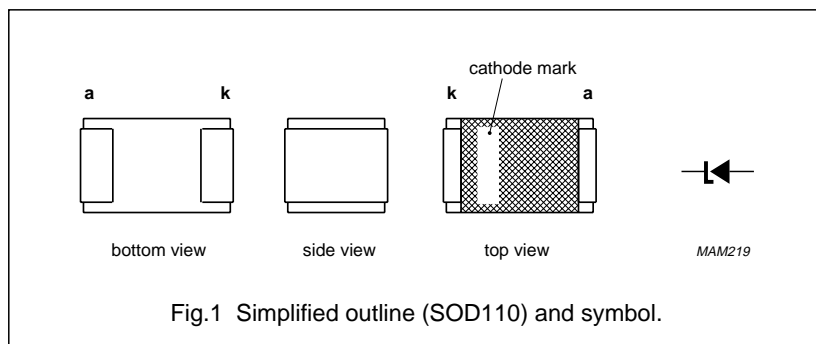
- Total power dissipation:  
max. 400 mW
- Two tolerance series:  
 $\pm 2\%$  and  $\pm 5\%$
- Working voltage range:  
nom. 2.4 to 75 V (E24 range).

## APPLICATIONS

- General regulation functions.

## DESCRIPTION

Low-power voltage regulator diodes in a small ceramic SMD SOD110 package. The diodes are available in the normalized E24  $\pm 2\%$  (BZX284-B) and  $\pm 5\%$  (BZX284-C) tolerance range. The series consists of 37 types with nominal working voltages from 2.4 to 75 V.



## MARKING

| TYPE NUMBER | MARKING CODE | TYPE NUMBER | MARKING CODE | TYPE NUMBER | MARKING CODE | TYPE NUMBER | MARKING CODE |
|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|
| BZX284-B2V4 | WO           | BZX284-B15  | XH           | BZX284-C2V4 | YO           | BZX284-C15  | ZH           |
| BZX284-B2V7 | WP           | BZX284-B16  | XI           | BZX284-C2V7 | YP           | BZX284-C16  | ZI           |
| BZX284-B3V0 | WQ           | BZX284-B18  | XJ           | BZX284-C3V0 | YQ           | BZX284-C18  | ZJ           |
| BZX284-B3V3 | WR           | BZX284-B20  | XK           | BZX284-C3V3 | YR           | BZX284-C20  | ZK           |
| BZX284-B3V6 | WS           | BZX284-B22  | XL           | BZX284-C3V6 | YS           | BZX284-C22  | ZL           |
| BZX284-B3V9 | WT           | BZX284-B24  | XM           | BZX284-C3V9 | YT           | BZX284-C24  | ZM           |
| BZX284-B4V3 | WU           | BZX284-B27  | XN           | BZX284-C4V3 | YU           | BZX284-C27  | ZN           |
| BZX284-B4V7 | WV           | BZX284-B30  | XO           | BZX284-C4V7 | YV           | BZX284-C30  | ZO           |
| BZX284-B5V1 | WW           | BZX284-B33  | XP           | BZX284-C5V1 | YW           | BZX284-C33  | ZP           |
| BZX284-B5V6 | WX           | BZX284-B36  | XQ           | BZX284-C5V6 | YX           | BZX284-C36  | ZQ           |
| BZX284-B6V2 | WY           | BZX284-B39  | XR           | BZX284-C6V2 | YY           | BZX284-C39  | ZR           |
| BZX284-B6V8 | WZ           | BZX284-B43  | XS           | BZX284-C6V8 | YZ           | BZX284-C43  | ZS           |
| BZX284-B7V5 | XA           | BZX284-B47  | XT           | BZX284-C7V5 | ZA           | BZX284-C47  | ZT           |
| BZX284-B8V2 | XB           | BZX284-B51  | XU           | BZX284-C8V2 | ZB           | BZX284-C51  | ZU           |
| BZX284-B9V1 | XC           | BZX284-B56  | XV           | BZX284-C9V1 | ZC           | BZX284-C56  | ZV           |
| BZX284-B10  | XD           | BZX284-B62  | XW           | BZX284-C10  | ZD           | BZX284-C62  | ZW           |
| BZX284-B11  | XE           | BZX284-B68  | XX           | BZX284-C11  | ZE           | BZX284-C68  | ZX           |
| BZX284-B12  | XF           | BZX284-B75  | XY           | BZX284-C12  | ZF           | BZX284-C75  | ZY           |
| BZX284-B13  | XG           | —           | —            | BZX284-C13  | ZG           | —           | —            |

## Voltage regulator diodes

## BZX284 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;<br>$T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ prior to surge | see Tables 1 and 2 |      |                  |
| $P_{\text{tot}}$ | total power dissipation             | $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ ; note 1   | –                  | 400  | 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 printed-circuit board:  $11 \times 25 \times 1.6 \text{ mm}$ .

**ELECTRICAL CHARACTERISTICS****Total BZX284-B and 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.4  | 0.9  | V             |
|                    |                            | $I_F = 100 \text{ mA}$ ; see Fig.4 | 1.1  | V             |
| $I_R$              | reverse current            |                                    |      |               |
|                    | BZX284-B/C2V4              | $V_R = 1 \text{ V}$                | 50   | $\mu\text{A}$ |
|                    | BZX284-B/C2V7              | $V_R = 1 \text{ V}$                | 20   | $\mu\text{A}$ |
|                    | BZX284-B/C3V0              | $V_R = 1 \text{ V}$                | 10   | $\mu\text{A}$ |
|                    | BZX284-B/C3V3              | $V_R = 1 \text{ V}$                | 5    | $\mu\text{A}$ |
|                    | BZX284-B/C3V6              | $V_R = 1 \text{ V}$                | 5    | $\mu\text{A}$ |
|                    | BZX284-B/C3V9              | $V_R = 1 \text{ V}$                | 3    | $\mu\text{A}$ |
|                    | BZX284-B/C4V3              | $V_R = 1 \text{ V}$                | 3    | $\mu\text{A}$ |
|                    | BZX284-B/C4V7              | $V_R = 2 \text{ V}$                | 3    | $\mu\text{A}$ |
|                    | BZX284-B/C5V1              | $V_R = 2 \text{ V}$                | 2    | $\mu\text{A}$ |
|                    | BZX284-B/C5V6              | $V_R = 2 \text{ V}$                | 1    | $\mu\text{A}$ |
|                    | BZX284-B/C6V2              | $V_R = 4 \text{ V}$                | 3    | $\mu\text{A}$ |
|                    | BZX284-B/C6V8              | $V_R = 4 \text{ V}$                | 2    | $\mu\text{A}$ |
|                    | BZX284-B/C7V5              | $V_R = 5 \text{ V}$                | 1    | $\mu\text{A}$ |
|                    | BZX284-B/C8V2              | $V_R = 5 \text{ V}$                | 700  | nA            |
|                    | BZX284-B/C9V1              | $V_R = 6 \text{ V}$                | 500  | nA            |
|                    | BZX284-B/C10               | $V_R = 7 \text{ V}$                | 200  | nA            |
| BZX284-B/C11       | $V_R = 8 \text{ V}$        | 100                                | nA   |               |
| BZX284-B/C12       | $V_R = 8 \text{ V}$        | 100                                | nA   |               |
| BZX284-B/C13       | $V_R = 8 \text{ V}$        | 100                                | nA   |               |
| BZX284-B/C15 to 75 | $V_R = 0.7V_{Z\text{nom}}$ | 50                                 | nA   |               |

## Voltage regulator diodes

## BZX284 series

**Table 1** Per type BZX284-B/C2V4 to B/C24 $T_j = 25\text{ }^\circ\text{C}$  unless otherwise specified.

| BZX284-B or C<br>XXX | WORKING VOLTAGE<br>$V_Z$ (V)<br>at $I_{Z\text{test}} = 5\text{ mA}$ |       |                    |      | DIFFERENTIAL RESISTANCE<br>$r_{\text{dir}}$ ( $\Omega$ ) |      |                                     |      | TEMP. COEFF.<br>$S_Z$ (mV/K)<br>at $I_{Z\text{test}} = 5\text{ mA}$<br>(see Figs 5 and 6) | DIODE CAP.<br>$C_d$ (pF)<br>at $f = 1\text{ MHz}$ ;<br>$V_R = 0\text{ V}$ | NON-REPETITIVE PEAK<br>REVERSE CURRENT<br>$I_{ZSM}$ (A) at $t_p = 100\text{ }\mu\text{s}$ ;<br>$T_{\text{amb}} = 25\text{ }^\circ\text{C}$ |
|----------------------|---|-------|--------------------|------|--|------|-------------------------------------|------|---|---|--|
|                      | Tol. $\pm 2\%$ (B)  |       | Tol. $\pm 5\%$ (C) |      | at $I_{Z\text{test}} = 1\text{ mA}$                      |      | at $I_{Z\text{test}} = 5\text{ mA}$ |      |   |   |  |
|                      | MIN.  | MAX.  | MIN.               | MAX. | TYP.   | MAX. | TYP.                                | MAX. |   |   |  |
| 2V4                  | 2.35  | 2.45  | 2.2                | 2.6  | 275  | 400  | 70                                  | 100  | -1.6  | 450   | 12.0   |
| 2V7                  | 2.65  | 2.75  | 2.5                | 2.9  | 300  | 450  | 75                                  | 100  | -2.0  | 440   | 12.0   |
| 3V0                  | 2.94  | 3.06  | 2.8                | 3.2  | 325  | 500  | 80                                  | 95   | -2.1  | 425   | 12.0   |
| 3V3                  | 3.23  | 3.37  | 3.1                | 3.5  | 350  | 500  | 85                                  | 95   | -2.4  | 410   | 12.0   |
| 3V6                  | 3.53  | 3.67  | 3.4                | 3.8  | 375  | 500  | 85                                  | 90   | -2.4  | 390   | 12.0   |
| 3V9                  | 3.82  | 3.98  | 3.7                | 4.1  | 400  | 500  | 85                                  | 90   | -2.5  | 370   | 12.0   |
| 4V3                  | 4.21  | 4.39  | 4.0                | 4.6  | 410  | 600  | 80                                  | 90   | -2.5  | 350   | 12.0   |
| 4V7                  | 4.61  | 4.79  | 4.4                | 5.0  | 425  | 500  | 50                                  | 80   | -1.4  | 325   | 12.0   |
| 5V1                  | 5.00  | 5.20  | 4.8                | 5.4  | 400  | 480  | 40                                  | 60   | -0.8  | 300   | 12.0   |
| 5V6                  | 5.49  | 5.71  | 5.2                | 6.0  | 80   | 400  | 15                                  | 40   | 1.2   | 275   | 12.0   |
| 6V2                  | 6.08  | 6.32  | 5.8                | 6.6  | 40   | 150  | 6                                   | 10   | 2.3   | 250   | 12.0   |
| 6V8                  | 6.66  | 6.94  | 6.4                | 7.2  | 30   | 80   | 6                                   | 15   | 3.0   | 215   | 12.0   |
| 7V5                  | 7.35  | 7.65  | 7.0                | 7.9  | 15   | 80   | 2                                   | 10   | 4.0   | 170   | 4.0  |
| 8V2                  | 8.04  | 8.36  | 7.7                | 8.7  | 20   | 80   | 2                                   | 10   | 4.6   | 150   | 4.0  |
| 9V1                  | 8.92  | 9.28  | 8.5                | 9.6  | 20   | 100  | 2                                   | 10   | 5.5   | 120   | 3.0  |
| 10                   | 9.80  | 10.20 | 9.4                | 10.6 | 20   | 150  | 2                                   | 10   | 6.4   | 110   | 3.0  |
| 11                   | 10.80   | 11.20 | 10.4               | 11.6 | 25   | 150  | 2                                   | 10   | 7.4   | 108   | 2.5  |
| 12                   | 11.80   | 12.20 | 11.4               | 12.7 | 25   | 150  | 2                                   | 10   | 8.4   | 105   | 2.5  |
| 13                   | 12.70   | 13.30 | 12.4               | 14.1 | 25   | 170  | 2                                   | 10   | 9.4   | 103   | 2.5  |
| 15                   | 14.70   | 15.30 | 13.8               | 15.6 | 25   | 200  | 3                                   | 15   | 11.4  | 99  | 2.0  |
| 16                   | 15.70   | 16.30 | 15.3               | 17.1 | 25   | 200  | 4                                   | 20   | 12.4  | 97  | 1.5  |
| 18                   | 17.60   | 18.40 | 16.8               | 19.1 | 25   | 225  | 4                                   | 20   | 14.4  | 93  | 1.5  |
| 20                   | 19.60   | 20.40 | 18.8               | 21.2 | 30   | 225  | 4                                   | 20   | 16.4  | 88  | 1.5  |
| 22                   | 21.60   | 22.40 | 20.8               | 23.3 | 30   | 250  | 5                                   | 25   | 18.4  | 84  | 1.25   |
| 24                   | 23.50   | 24.50 | 22.8               | 25.6 | 30   | 250  | 6                                   | 30   | 20.4  | 80  | 1.25   |

## Voltage regulator diodes

## BZX284 series

**Table 2** Per type BZX284-B/C27 to B/C75 $T_j = 25\text{ °C}$  unless otherwise specified.

| BZX284-<br>B or C<br>XXX | WORKING VOLTAGE<br>$V_Z$ (V)<br>at $I_{Z\text{test}} = 2\text{ mA}$ |       |                    |      | DIFFERENTIAL RESISTANCE<br>$r_{\text{dir}}$ ( $\Omega$ ) |      |                                     |      | TEMP. COEFF.<br>$S_Z$ (mV/K)<br>at $I_{Z\text{test}} = 2\text{ mA}$ | DIODE CAP.<br>$C_d$ (pF)<br>at $f = 1\text{ MHz}$ ;<br>$V_R = 0\text{ V}$ | NON-REPETITIVE PEAK<br>REVERSE CURRENT<br>$I_{ZSM}$ (A) at $t_p = 100\text{ }\mu\text{s}$ ;<br>$T_{\text{amb}} = 25\text{ °C}$ |
|--------------------------|---|-------|--------------------|------|--|------|-------------------------------------|------|---|---|--|
|                          | Tol. $\pm 2\%$ (B)  |       | Tol. $\pm 5\%$ (C) |      | at $I_{Z\text{test}} = 0.5\text{ mA}$                    |      | at $I_{Z\text{test}} = 2\text{ mA}$ |      |   |   |  |
|                          | MIN.  | MAX.  | MIN.               | MAX. | TYP.   | MAX. | TYP.                                | MAX. |   |   |  |
| 27                       | 26.50   | 27.50 | 25.1               | 28.9 | 35   | 250  | 8                                   | 40   | 23.4  | 73  | 1.0  |
| 30                       | 29.40   | 30.60 | 28.0               | 32.0 | 35   | 250  | 10                                  | 40   | 26.6  | 66  | 1.0  |
| 33                       | 32.30   | 33.70 | 31.0               | 35.0 | 40   | 275  | 11                                  | 40   | 29.7  | 60  | 0.9  |
| 36                       | 35.30   | 36.70 | 34.0               | 38.0 | 40   | 300  | 15                                  | 60   | 33.0  | 59  | 0.8  |
| 39                       | 38.20   | 39.80 | 37.0               | 41.0 | 40   | 300  | 25                                  | 75   | 36.4  | 58  | 0.7  |
| 43                       | 42.10   | 43.90 | 40.0               | 46.0 | 45   | 325  | 30                                  | 80   | 41.2  | 56  | 0.6  |
| 47                       | 46.10   | 47.90 | 44.0               | 50.0 | 45   | 325  | 30                                  | 90   | 46.1  | 55  | 0.5  |
| 51                       | 50.00   | 52.00 | 48.0               | 54.0 | 45   | 350  | 35                                  | 110  | 51.0  | 52  | 0.4  |
| 56                       | 54.90   | 57.10 | 52.0               | 60.0 | 50   | 375  | 40                                  | 120  | 57.0  | 49  | 0.3  |
| 62                       | 60.80   | 63.20 | 58.0               | 66.0 | 60   | 400  | 50                                  | 140  | 64.4  | 44  | 0.3  |
| 68                       | 66.60   | 69.40 | 64.0               | 72.0 | 75   | 400  | 55                                  | 160  | 71.7  | 40  | 0.25   |
| 75                       | 73.50   | 76.50 | 70.0               | 79.0 | 85   | 400  | 70                                  | 175  | 80.2  | 35  | 0.2  |

## Voltage regulator diodes

## BZX284 series

## THERMAL CHARACTERISTICS

| SYMBOL        | PARAMETER                                   | CONDITIONS | VALUE | UNIT |
|---------------|---|------------|-------|------|
| $R_{th\ j-a}$ | thermal resistance from junction to ambient | note 1     | 315   | K/W  |

## Note

1. Device mounted on a printed-circuit board:  $11 \times 25 \times 1.6$  mm.

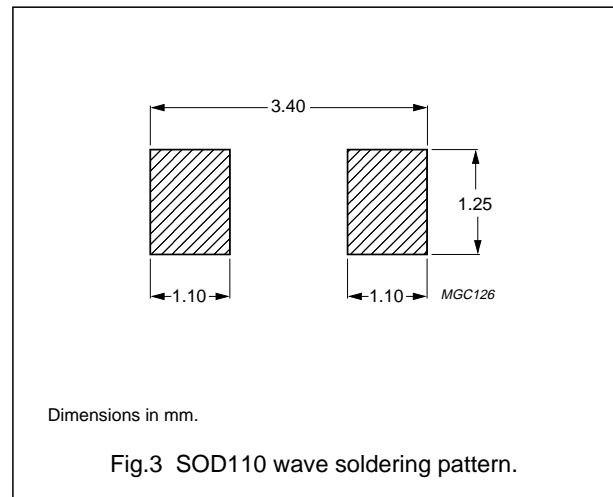
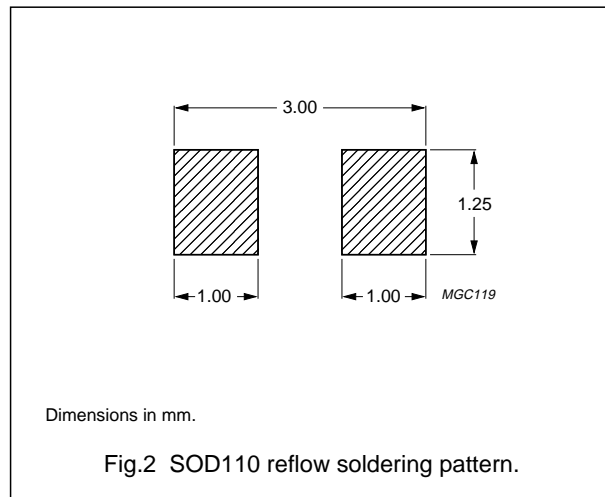
## MOUNTING

## Reflow soldering

Follow standard reflow soldering techniques to ensure correct application of solder paste and placement of the SOD110 package (see Fig.2).

## Wave soldering

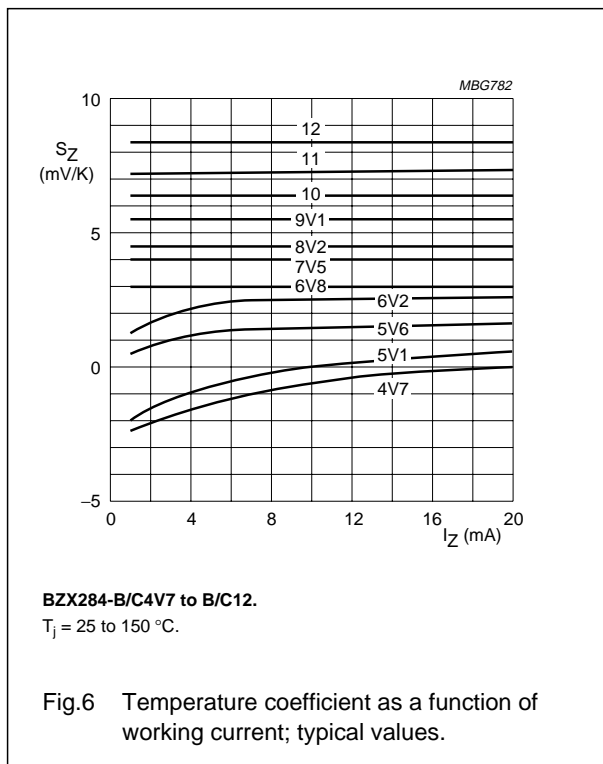
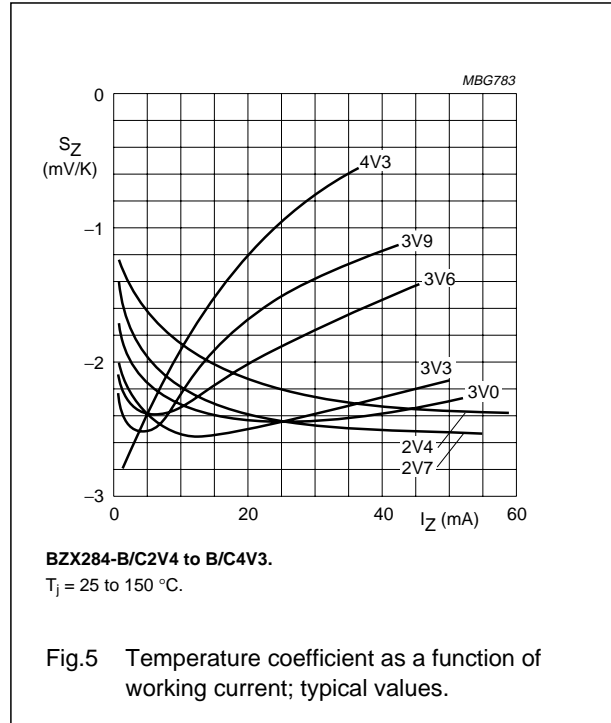
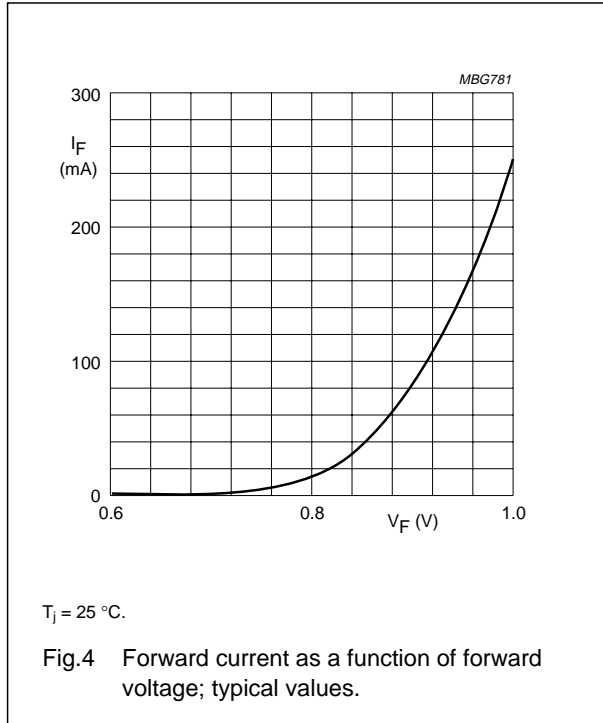
Before wave soldering, attach SOD110 packages to the printed-circuit boards using a small dot of thermo-setting epoxy or UV-curing adhesive centred between the soldering lands (see Fig.3).



Voltage regulator diodes

BZX284 series

GRAPHICAL DATA



Voltage regulator diodes

BZX284 series

PACKAGE OUTLINE

Very small ceramic rectangular surface mounted package

SOD110

**DIMENSIONS (mm are the original dimensions)**

| UNIT | A max. | D            | E            | y   |
|------|--------|--------------|--------------|-----|
| mm   | 1.6    | 2.10<br>1.90 | 1.40<br>1.10 | 0.1 |

| OUTLINE VERSION | REFERENCES |       |      |  | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|------|--|---------------------|------------|
|                 | IEC        | JEDEC | EIAJ |  |                     |            |
| SOD110          |            |       |      |  |                     | 97-04-14   |

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

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.



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Voltage regulator diodes

BZX284 series

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**NOTES**

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Voltage regulator diodes

BZX284 series

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**NOTES**

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Voltage regulator diodes

BZX284 series

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**NOTES**

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