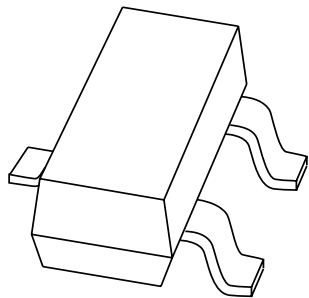


DATA SHEET



BZX84 series Voltage regulator diodes

Product specification
Supersedes data of 1999 May 18

2003 Apr 10

Voltage regulator diodes

BZX84 series

FEATURES

- Total power dissipation: max. 250 mW
- Three tolerance series: $\pm 1\%$, $\pm 2\%$ and approx. $\pm 5\%$
- Working voltage range: nom. 2.4 to 75 V (E24 range)
- Non-repetitive peak reverse power dissipation: max. 40 W.

APPLICATIONS

- General regulation functions.

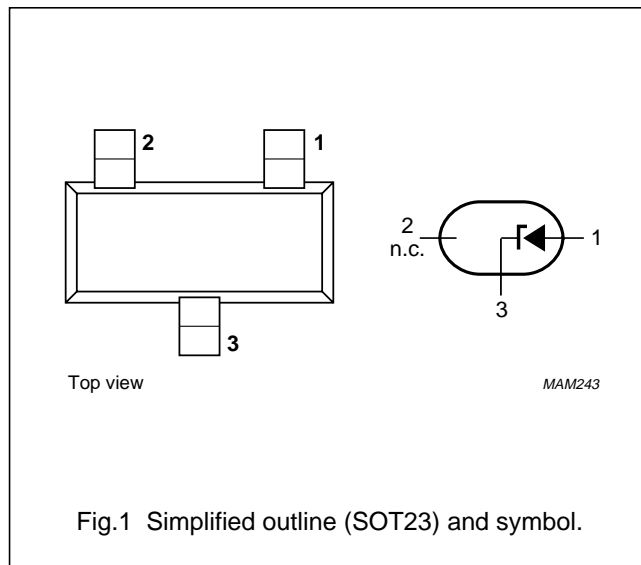
DESCRIPTION

Low-power voltage regulator diodes in small SOT23 plastic SMD packages.

The diodes are available in the normalized E24 $\pm 1\%$ (BZX84-A), $\pm 2\%$ (BZX84-B) and approx. $\pm 5\%$ (BZX84-C) tolerance range. The series consists of 37 types with nominal working voltages from 2.4 to 75 V.

PINNING

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



Voltage regulator diodes

BZX84 series

MARKING

| TYPE NUMBER | MARKING CODE ⁽¹⁾ | TYPE NUMBER | MARKING CODE ⁽¹⁾ | TYPE NUMBER | MARKING CODE ⁽¹⁾ | TYPE NUMBER | MARKING CODE ⁽¹⁾ |
|--|-----------------------------|-------------|-----------------------------|-------------|-----------------------------|-------------|-----------------------------|
| Marking codes for BZX84-A2V4 to BZX84-A75 | | | | | | | |
| BZX84-A2V4 | Y50 or *50 | BZX84-A6V2 | Y60 or *60 | BZX84-A16 | Y70 | BZX84-A43 | Y80 or *C5 |
| BZX84-A2V7 | Y51 or *51 | BZX84-A6V8 | Y61 or *61 | BZX84-A18 | Y71 | BZX84-A47 | Y81 |
| BZX84-A3V0 | Y52 or *52 | BZX84-A7V5 | Y62 or *62 | BZX84-A20 | Y72 or *C2 | BZX84-A51 | Y82 or *C6 |
| BZX84-A3V3 | Y53 | BZX84-A8V2 | Y63 or *63 | BZX84-A22 | Y73 | BZX84-A56 | Y83 |
| BZX84-A3V6 | Y54 or *C1 | BZX84-A9V1 | Y64 or *64 | BZX84-A24 | Y74 | BZX84-A62 | Y84 |
| BZX84-A3V9 | Y55 or *55 | BZX84-A10 | Y65 or *65 | BZX84-A27 | Y75 or *75 | BZX84-A68 | Y85 |
| BZX84-A4V3 | Y56 or *56 | BZX84-A11 | Y66 or *04 | BZX84-A30 | Y76 | BZX84-A75 | Y86 or *86 |
| BZX84-A4V7 | Y57 or *57 | BZX84-A12 | Y67 or *67 | BZX84-A33 | Y77 | – | – |
| BZX84-A5V1 | Y58 or *58 | BZX84-A13 | Y68 or *C0 | BZX84-A36 | Y78 or *C3 | – | – |
| BZX84-A5V6 | Y59 or *59 | BZX84-A15 | Y69 or *69 | BZX84-A39 | Y79 or *C4 | – | – |
| Marking codes for BZX84-B2V4 to BZX84-B75 | | | | | | | |
| BZX84-B2V4 | Z50 or *Z0 | BZX84-B6V2 | Z60 or *R5 | BZX84-B16 | Z70 or *70 | BZX84-B43 | Z80 or *S5 |
| BZX84-B2V7 | Z51 or *Z1 | BZX84-B6V8 | Z61 or *R6 | BZX84-B18 | Z71 or *71 | BZX84-B47 | Z81 or *S6 |
| BZX84-B3V0 | Z52 or *S1 | BZX84-B7V5 | Z62 or *R8 | BZX84-B20 | Z72 or *72 | BZX84-B51 | Z82 or *S9 |
| BZX84-B3V3 | Z53 or *S2 | BZX84-B8V2 | Z63 or *R9 | BZX84-B22 | Z73 or *73 | BZX84-B56 | Z83 or *R0 |
| BZX84-B3V6 | Z54 or *S3 | BZX84-B9V1 | Z64 or *T1 | BZX84-B24 | Z74 or *74 | BZX84-B62 | Z84 or *R3 |
| BZX84-B3V9 | Z55 or *S4 | BZX84-B10 | Z65 or *66 | BZX84-B27 | Z75 or *Z5 | BZX84-B68 | Z85 or *R4 |
| BZX84-B4V3 | Z56 or *S7 | BZX84-B11 | Z66 or *Z6 | BZX84-B30 | Z76 or *Z4 | BZX84-B75 | Z86 or *R7 |
| BZX84-B4V7 | Z57 or *S8 | BZX84-B12 | Z67 or *Z7 | BZX84-B33 | Z77 or *Y1 | – | – |
| BZX84-B5V1 | Z58 or *R1 | BZX84-B13 | Z68 or *Z8 | BZX84-B36 | Z78 or *Y2 | – | – |
| BZX84-B5V6 | Z59 or *R2 | BZX84-B15 | Z69 or *Z9 | BZX84-B39 | Z79 or *S0 | – | – |
| Marking codes for BZX84-C2V4 to BZX84-C75 | | | | | | | |
| BZX84-C2V4 | Z11 or *T3 | BZX84-C6V2 | Z4* | BZX84-C16 | Y5* | BZX84-C43 | Y15 or *B4 |
| BZX84-C2V7 | Z12 or *T4 | BZX84-C6V8 | Z5* | BZX84-C18 | Y6* | BZX84-C47 | Y16 or *B5 |
| BZX84-C3V0 | Z13 or *T9 | BZX84-C7V5 | Z6* | BZX84-C20 | Y7* | BZX84-C51 | Y17 or *B7 |
| BZX84-C3V3 | Z14 or *B1 | BZX84-C8V2 | Z7* | BZX84-C22 | Y8* | BZX84-C56 | Y18 or *B8 |
| BZX84-C3V6 | Z15 or *B2 | BZX84-C9V1 | Z8* | BZX84-C24 | Y9* | BZX84-C62 | Y19 or *B9 |
| BZX84-C3V9 | Z16 or *B3 | BZX84-C10 | Z9* | BZX84-C27 | Y10 or *T2 | BZX84-C68 | Y20 or *B0 |
| BZX84-C4V3 | Z17 or *B6 | BZX84-C11 | Y1* | BZX84-C30 | Y11 or *T5 | BZX84-C75 | Y21 or *A1 |
| BZX84-C4V7 | Z1* | BZX84-C12 | Y2* | BZX84-C33 | Y12 or *T6 | – | – |
| BZX84-C5V1 | Z2* | BZX84-C13 | Y3* | BZX84-C36 | Y13 or *T7 | – | – |
| BZX84-C5V6 | Z3* | BZX84-C15 | Y4* | BZX84-C39 | Y14 or *T8 | – | – |

Note

- * = p : Made in Hong Kong.
* = t : Made in Malaysia.
* = W : Made in China.

Voltage regulator diodes

BZX84 series

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134).

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|-----------|---|---|-----------------------|------|------------------|
| I_F | continuous forward current | | – | 200 | mA |
| I_{ZSM} | non-repetitive peak reverse current | $t_p = 100 \mu\text{s}$; square wave; $T_j = 25 \text{ }^\circ\text{C}$ prior to surge | see Tables 1 and 2 | | |
| P_{tot} | total power dissipation | $T_{amb} = 25 \text{ }^\circ\text{C}$; note 1 | – | 250 | mW |
| P_{ZSM} | non-repetitive peak reverse power dissipation | $t_p = 100 \mu\text{s}$; square wave; $T_j = 25 \text{ }^\circ\text{C}$ prior to surge; see Fig.2 | – | 40 | W |
| T_{stg} | storage temperature | | –65 | +150 | $^\circ\text{C}$ |
| T_j | junction temperature | | –65 | +150 | $^\circ\text{C}$ |

Note

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

ELECTRICAL CHARACTERISTICS**Total BZX84-A and 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.3 | 0.9 | V |
| I_R | reverse current | | | |
| | BZX84-A/B/C2V4 | $V_R = 1 \text{ V}$ | 50 | μA |
| | BZX84-A/B/C2V7 | $V_R = 1 \text{ V}$ | 20 | μA |
| | BZX84-A/B/C3V0 | $V_R = 1 \text{ V}$ | 10 | μA |
| | BZX84-A/B/C3V3 | $V_R = 1 \text{ V}$ | 5 | μA |
| | BZX84-A/B/C3V6 | $V_R = 1 \text{ V}$ | 5 | μA |
| | BZX84-A/B/C3V9 | $V_R = 1 \text{ V}$ | 3 | μA |
| | BZX84-A/B/C4V3 | $V_R = 1 \text{ V}$ | 3 | μA |
| | BZX84-A/B/C4V7 | $V_R = 2 \text{ V}$ | 3 | μA |
| | BZX84-A/B/C5V1 | $V_R = 2 \text{ V}$ | 2 | μA |
| | BZX84-A/B/C5V6 | $V_R = 2 \text{ V}$ | 1 | μA |
| | BZX84-A/B/C6V2 | $V_R = 4 \text{ V}$ | 3 | μA |
| | BZX84-A/B/C6V8 | $V_R = 4 \text{ V}$ | 2 | μA |
| | BZX84-A/B/C7V5 | $V_R = 5 \text{ V}$ | 1 | μA |
| | BZX84-A/B/C8V2 | $V_R = 5 \text{ V}$ | 700 | nA |
| | BZX84-A/B/C9V1 | $V_R = 6 \text{ V}$ | 500 | nA |
| | BZX84-A/B/C10 | $V_R = 7 \text{ V}$ | 200 | nA |
| BZX84-A/B/C11 | $V_R = 8 \text{ V}$ | 100 | nA | |
| BZX84-A/B/C12 | $V_R = 8 \text{ V}$ | 100 | nA | |
| BZX84-A/B/C13 | $V_R = 8 \text{ V}$ | 100 | nA | |
| BZX84-A/B/C15 to 75 | $V_R = 0.7V_{Znom}$ | 50 | nA | |

Voltage regulator diodes

BZX84 series

Table 1 Per type BZX84-A/B/C2V4 to A/B/C24 $T_j = 25\text{ °C}$ unless otherwise specified.

| BZX84- Axxx Bxxx Cxxx | WORKING VOLTAGE V_Z (V) at $I_{Ztest} = 5\text{ mA}$ | | | | | | DIFFERENTIAL RESISTANCE r_{dif} (Ω) | | | | TEMP. COEFF. S_Z (mV/K) at $I_{Ztest} = 5\text{ mA}$ (see Figs 4 and 5) | | | DIODE CAP. C_d (pF) at $f = 1\text{ MHz}$; $V_R = 0\text{ V}$ | NON-REPETITIVE PEAK REVERSE CURRENT I_{ZSM} (A) at $t_p = 100\text{ }\mu\text{s}$; $T_{amb} = 25\text{ °C}$ |
|--------------------------------|--|-------|--------------------|-------|-------------------------------|------|--|------|---------------------------------|------|--|------|------|---|---|
| | Tol. $\pm 1\%$ (A) | | Tol. $\pm 2\%$ (B) | | Tol. approx. $\pm 5\%$ (C) | | at $I_{Ztest} = 1\text{ mA}$ | | at $I_{Ztest} = 5\text{ mA}$ | | MIN. | TYP. | MAX. | MAX. | MAX. |
| | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | TYP. | MAX. | TYP. | MAX. | | | | | |
| 2V4 | 2.37 | 2.43 | 2.35 | 2.45 | 2.2 | 2.6 | 275 | 600 | 70 | 100 | -3.5 | -1.6 | 0 | 450 | 6.0 |
| 2V7 | 2.67 | 2.73 | 2.65 | 2.75 | 2.5 | 2.9 | 300 | 600 | 75 | 100 | -3.5 | -2.0 | 0 | 450 | 6.0 |
| 3V0 | 2.97 | 3.03 | 2.94 | 3.06 | 2.8 | 3.2 | 325 | 600 | 80 | 95 | -3.5 | -2.1 | 0 | 450 | 6.0 |
| 3V3 | 3.26 | 3.34 | 3.23 | 3.37 | 3.1 | 3.5 | 350 | 600 | 85 | 95 | -3.5 | -2.4 | 0 | 450 | 6.0 |
| 3V6 | 3.56 | 3.64 | 3.53 | 3.67 | 3.4 | 3.8 | 375 | 600 | 85 | 90 | -3.5 | -2.4 | 0 | 450 | 6.0 |
| 3V9 | 3.86 | 3.94 | 3.82 | 3.98 | 3.7 | 4.1 | 400 | 600 | 85 | 90 | -3.5 | -2.5 | 0 | 450 | 6.0 |
| 4V3 | 4.25 | 4.35 | 4.21 | 4.39 | 4.0 | 4.6 | 410 | 600 | 80 | 90 | -3.5 | -2.5 | 0 | 450 | 6.0 |
| 4V7 | 4.65 | 4.75 | 4.61 | 4.79 | 4.4 | 5.0 | 425 | 500 | 50 | 80 | -3.5 | -1.4 | 0.2 | 300 | 6.0 |
| 5V1 | 5.04 | 5.16 | 5.00 | 5.20 | 4.8 | 5.4 | 400 | 480 | 40 | 60 | -2.7 | -0.8 | 1.2 | 300 | 6.0 |
| 5V6 | 5.54 | 5.66 | 5.49 | 5.71 | 5.2 | 6.0 | 80 | 400 | 15 | 40 | -2.0 | 1.2 | 2.5 | 300 | 6.0 |
| 6V2 | 6.13 | 6.27 | 6.08 | 6.32 | 5.8 | 6.6 | 40 | 150 | 6 | 10 | 0.4 | 2.3 | 3.7 | 200 | 6.0 |
| 6V8 | 6.73 | 6.87 | 6.66 | 6.94 | 6.4 | 7.2 | 30 | 80 | 6 | 15 | 1.2 | 3.0 | 4.5 | 200 | 6.0 |
| 7V5 | 7.42 | 7.58 | 7.35 | 7.65 | 7.0 | 7.9 | 30 | 80 | 6 | 15 | 2.5 | 4.0 | 5.3 | 150 | 4.0 |
| 8V2 | 8.11 | 8.29 | 8.04 | 8.36 | 7.7 | 8.7 | 40 | 80 | 6 | 15 | 3.2 | 4.6 | 6.2 | 150 | 4.0 |
| 9V1 | 9.00 | 9.20 | 8.92 | 9.28 | 8.5 | 9.6 | 40 | 100 | 6 | 15 | 3.8 | 5.5 | 7.0 | 150 | 3.0 |
| 10 | 9.90 | 10.10 | 9.80 | 10.20 | 9.4 | 10.6 | 50 | 150 | 8 | 20 | 4.5 | 6.4 | 8.0 | 90 | 3.0 |
| 11 | 10.80 | 11.11 | 10.80 | 11.20 | 10.4 | 11.6 | 50 | 150 | 10 | 20 | 5.4 | 7.4 | 9.0 | 85 | 2.5 |
| 12 | 11.88 | 12.12 | 11.80 | 12.20 | 11.4 | 12.7 | 50 | 150 | 10 | 25 | 6.0 | 8.4 | 10.0 | 85 | 2.5 |
| 13 | 12.87 | 13.13 | 12.70 | 13.30 | 12.4 | 14.1 | 50 | 170 | 10 | 30 | 7.0 | 9.4 | 11.0 | 80 | 2.5 |
| 15 | 14.85 | 15.15 | 14.70 | 15.30 | 13.8 | 15.6 | 50 | 200 | 10 | 30 | 9.2 | 11.4 | 13.0 | 75 | 2.0 |
| 16 | 15.84 | 16.16 | 15.70 | 16.30 | 15.3 | 17.1 | 50 | 200 | 10 | 40 | 10.4 | 12.4 | 14.0 | 75 | 1.5 |
| 18 | 17.82 | 18.18 | 17.60 | 18.40 | 16.8 | 19.1 | 50 | 225 | 10 | 45 | 12.4 | 14.4 | 16.0 | 70 | 1.5 |
| 20 | 19.80 | 20.20 | 19.60 | 20.40 | 18.8 | 21.2 | 60 | 225 | 15 | 55 | 14.4 | 16.4 | 18.0 | 60 | 1.5 |
| 22 | 21.78 | 22.22 | 21.60 | 22.40 | 20.8 | 23.3 | 60 | 250 | 20 | 55 | 16.4 | 18.4 | 20.0 | 60 | 1.25 |
| 24 | 23.76 | 24.24 | 23.50 | 24.50 | 22.8 | 25.6 | 60 | 250 | 25 | 70 | 18.4 | 20.4 | 22.0 | 55 | 1.25 |

Voltage regulator diodes

BZX84 series

Table 2 Per type BZX84-A/B/C27 to A/B/C75 $T_j = 25\text{ °C}$ unless otherwise specified.

| BZX84- Axxx Bxxx Cxxx | WORKING VOLTAGE V_Z (V) at $I_{Ztest} = 2\text{ mA}$ | | | | | | DIFFERENTIAL RESISTANCE r_{dif} (Ω) | | | | TEMP. COEFF. S_Z (mV/K) at $I_{Ztest} = 2\text{ mA}$ (see Figs 4 and 5) | | | DIODE CAP. C_d (pF) at $f = 1\text{ MHz}$; $V_R = 0\text{ V}$ | NON-REPETITIVE PEAK REVERSE CURRENT I_{ZSM} (A) at $t_p = 100\text{ }\mu\text{s}$; $T_{amb} = 25\text{ °C}$ |
|--------------------------------|--|-------|--------------------|-------|-------------------------------|------|--|------|---------------------------------|------|--|------|------|---|---|
| | Tol. $\pm 1\%$ (A) | | Tol. $\pm 2\%$ (B) | | Tol. approx. $\pm 5\%$ (C) | | at $I_{Ztest} = 0.5\text{ mA}$ | | at $I_{Ztest} = 2\text{ mA}$ | | MIN. | TYP. | MAX. | MAX. | MAX. |
| | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | TYP. | MAX. | TYP. | MAX. | MIN. | TYP. | MAX. | MAX. | MAX. |
| 27 | 26.73 | 27.27 | 26.50 | 27.50 | 25.1 | 28.9 | 65 | 300 | 25 | 80 | 21.4 | 23.4 | 25.3 | 50 | 1.0 |
| 30 | 29.70 | 30.30 | 29.40 | 30.60 | 28.0 | 32.0 | 70 | 300 | 30 | 80 | 24.4 | 26.6 | 29.4 | 50 | 1.0 |
| 33 | 32.67 | 33.33 | 32.30 | 33.70 | 31.0 | 35.0 | 75 | 325 | 35 | 80 | 27.4 | 29.7 | 33.4 | 45 | 0.9 |
| 36 | 35.64 | 36.36 | 35.30 | 36.70 | 34.0 | 38.0 | 80 | 350 | 35 | 90 | 30.4 | 33.0 | 37.4 | 45 | 0.8 |
| 39 | 38.61 | 39.39 | 38.20 | 39.80 | 37.0 | 41.0 | 80 | 350 | 40 | 130 | 33.4 | 36.4 | 41.2 | 45 | 0.7 |
| 43 | 42.57 | 43.43 | 42.10 | 43.90 | 40.0 | 46.0 | 85 | 375 | 45 | 150 | 37.6 | 41.2 | 46.6 | 40 | 0.6 |
| 47 | 46.53 | 47.47 | 46.10 | 47.90 | 44.0 | 50.0 | 85 | 375 | 50 | 170 | 42.0 | 46.1 | 51.8 | 40 | 0.5 |
| 51 | 50.49 | 51.51 | 50.00 | 52.00 | 48.0 | 54.0 | 90 | 400 | 60 | 180 | 46.6 | 51.0 | 57.2 | 40 | 0.4 |
| 56 | 55.44 | 56.56 | 54.90 | 57.10 | 52.0 | 60.0 | 100 | 425 | 70 | 200 | 52.2 | 57.0 | 63.8 | 40 | 0.3 |
| 62 | 61.38 | 62.62 | 60.80 | 63.20 | 58.0 | 66.0 | 120 | 450 | 80 | 215 | 58.8 | 64.4 | 71.6 | 35 | 0.3 |
| 68 | 67.32 | 68.68 | 66.60 | 69.40 | 64.0 | 72.0 | 150 | 475 | 90 | 240 | 65.6 | 71.7 | 79.8 | 35 | 0.25 |
| 75 | 74.25 | 75.75 | 73.50 | 76.50 | 70.0 | 79.0 | 170 | 500 | 95 | 255 | 73.4 | 80.2 | 88.6 | 35 | 0.2 |

Voltage regulator diodes

BZX84 series

THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | VALUE | UNIT |
|----------------|---|-------------------|--------------|-------------|
| $R_{th\ j-tp}$ | thermal resistance from junction to tie-point | | 330 | K/W |
| $R_{th\ j-a}$ | thermal resistance from junction to ambient | note 1 | 500 | K/W |

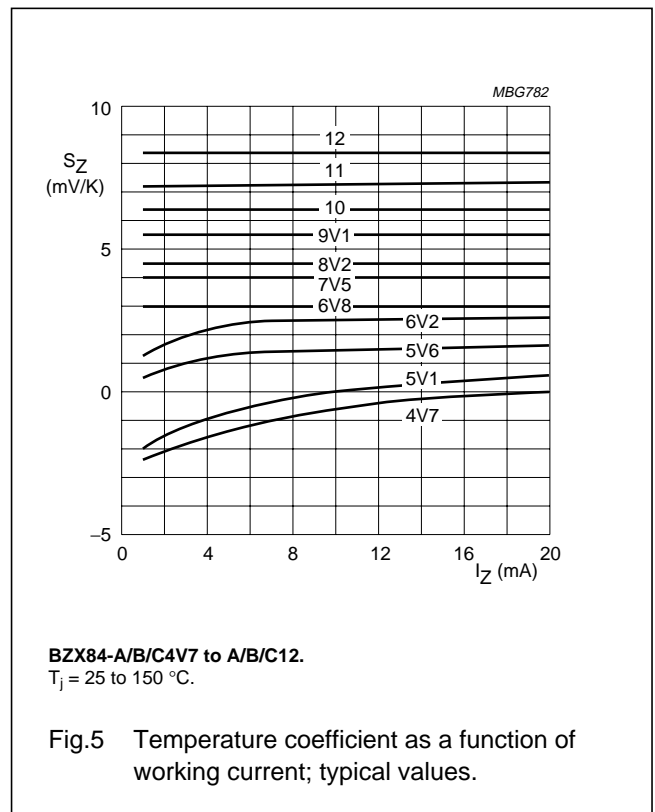
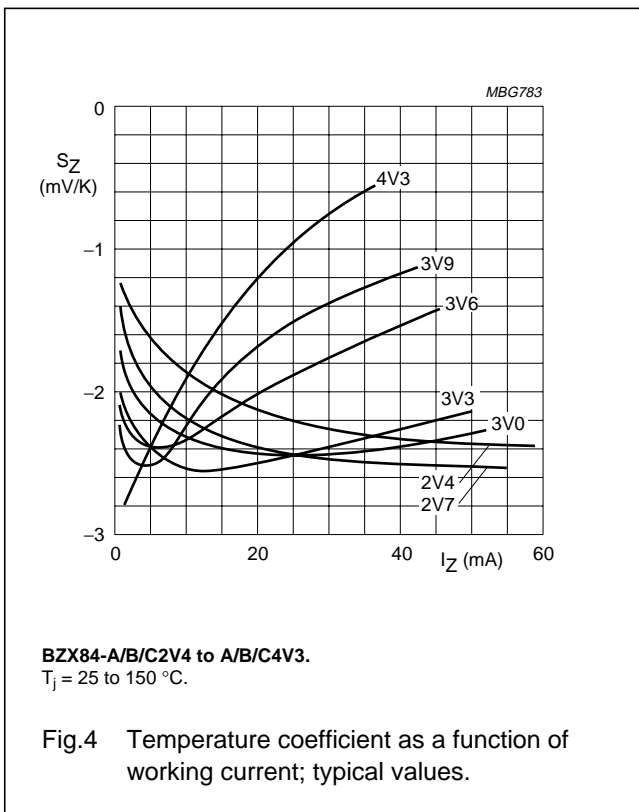
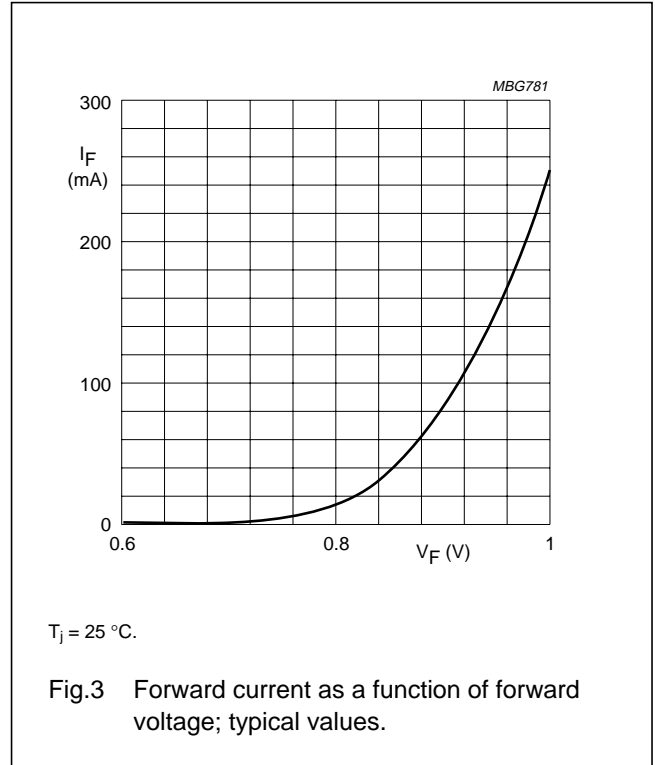
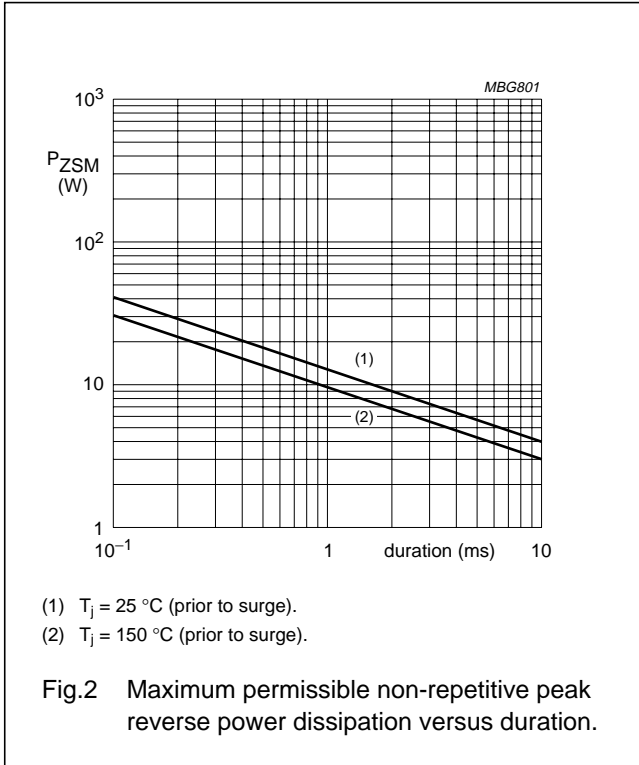
Note

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

Voltage regulator diodes

BZX84 series

GRAPHICAL DATA



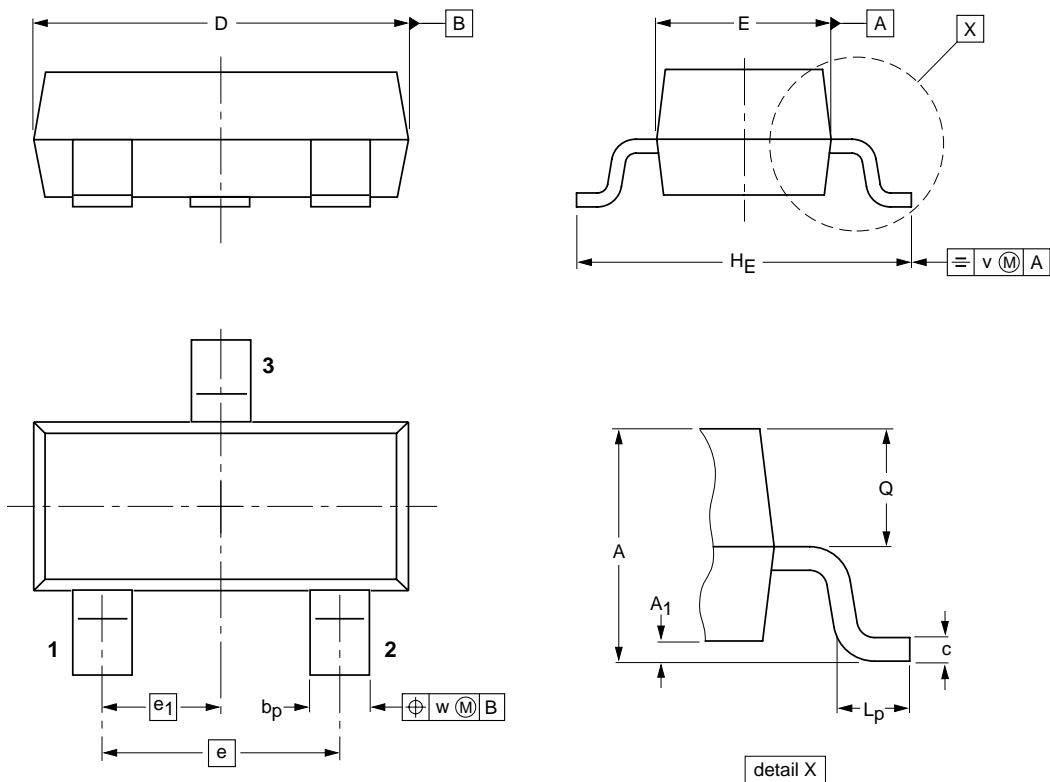
Voltage regulator diodes

BZX84 series

PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT23



DIMENSIONS (mm are the original dimensions)

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

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

Voltage regulator diodes

BZX84 series

DATA SHEET STATUS

| LEVEL | DATA SHEET STATUS ⁽¹⁾ | PRODUCT STATUS ⁽²⁾⁽³⁾ | DEFINITION |
|-------|----------------------------------|----------------------------------|--|
| I | Objective data | Development | This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice. |
| II | Preliminary data | Qualification | This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product. |
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Notes

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2. The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.
3. For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

DEFINITIONS

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). 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.

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Voltage regulator diodes

BZX84 series

NOTES

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