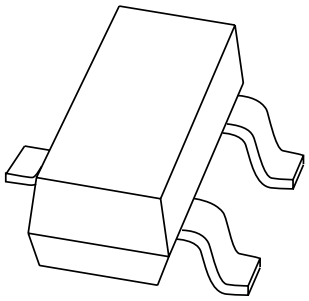
# DATA SHEET



# BZX84 series
## Voltage regulator diodes

Product data sheet
Supersedes data of 1999 May 18

2003 Apr 10

NXP founded by Philips

# Voltage regulator diodes BZX84 series

## FEATURES

- Total power dissipation: max. 250 mW
- Three tolerance series: ±1%, ±2% and approx. ±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 ±1% (BZX84-A), ±2% (BZX84-B) and approx. ±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 |

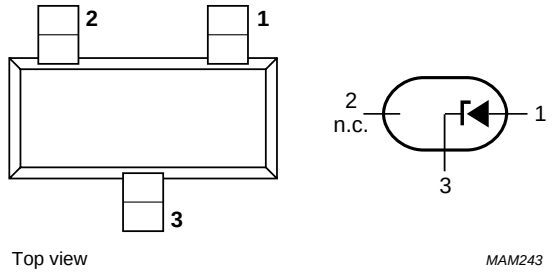



Fig.1 Simplified outline (SOT23) and symbol.

**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**

1. ∗ = p : Made in Hong Kong.
   ∗ = t : Made in Malaysia.
   ∗ = W : Made in China.

## 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 μs; square wave; $T_j$ = 25 °C prior to surge | see Tables 1 and 2 | | |
| $P_{tot}$ | total power dissipation | $T_{amb}$ = 25 °C; note 1 | – | 250 | mW |
| $P_{ZSM}$ | non-repetitive peak reverse power dissipation | $t_p$ = 100 μs; square wave; $T_j$ = 25 °C prior to surge; see Fig.2 | – | 40 | W |
| $T_{stg}$ | storage temperature | | −65 | +150 | °C |
| $T_j$ | junction temperature | | −65 | +150 | °C |

**Note**

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

## ELECTRICAL CHARACTERISTICS

### Total BZX84-A and B and C series

$T_j$ = 25 °C unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MAX. | UNIT |
|---|---|---|---|---|
| $V_F$ | forward voltage | $I_F$ = 10 mA; see Fig.3 | 0.9 | V |
| $I_R$ | reverse current | | | |
| | BZX84-A/B/C2V4 | $V_R$ = 1 V | 50 | μA |
| | BZX84-A/B/C2V7 | $V_R$ = 1 V | 20 | μA |
| | BZX84-A/B/C3V0 | $V_R$ = 1 V | 10 | μA |
| | BZX84-A/B/C3V3 | $V_R$ = 1 V | 5 | μA |
| | BZX84-A/B/C3V6 | $V_R$ = 1 V | 5 | μA |
| | BZX84-A/B/C3V9 | $V_R$ = 1 V | 3 | μA |
| | BZX84-A/B/C4V3 | $V_R$ = 1 V | 3 | μA |
| | BZX84-A/B/C4V7 | $V_R$ = 2 V | 3 | μA |
| | BZX84-A/B/C5V1 | $V_R$ = 2 V | 2 | μA |
| | BZX84-A/B/C5V6 | $V_R$ = 2 V | 1 | μA |
| | BZX84-A/B/C6V2 | $V_R$ = 4 V | 3 | μA |
| | BZX84-A/B/C6V8 | $V_R$ = 4 V | 2 | μA |
| | BZX84-A/B/C7V5 | $V_R$ = 5 V | 1 | μA |
| | BZX84-A/B/C8V2 | $V_R$ = 5 V | 700 | nA |
| | BZX84-A/B/C9V1 | $V_R$ = 6 V | 500 | nA |
| | BZX84-A/B/C10 | $V_R$ = 7 V | 200 | nA |
| | BZX84-A/B/C11 | $V_R$ = 8 V | 100 | nA |
| | BZX84-A/B/C12 | $V_R$ = 8 V | 100 | nA |
| | BZX84-A/B/C13 | $V_R$ = 8 V | 100 | nA |
| | BZX84-A/B/C15 to 75 | $V_R = 0.7V_{Znom}$ | 50 | nA |

**Table 1** Per type BZX84-**A/B/C2V4** to **A/B/C24**

$T_j$ = 25 °C unless otherwise specified.

| BZX84-Axxx Bxxx Cxxx | WORKING VOLTAGE $V_Z$ (V) at $I_{Ztest}$ = 5 mA | | | | | | DIFFERENTIAL RESISTANCE $r_{dif}$ (Ω) | | | | TEMP. COEFF. $S_Z$ (mV/K) at $I_{Ztest}$ = 5 mA (see Figs 4 and 5) | | | DIODE CAP. $C_d$ (pF) at f = 1 MHz; $V_R$ = 0 V | NON-REPETITIVE PEAK REVERSE CURRENT $I_{ZSM}$ (A) at $t_p$ = 100 μs; $T_{amb}$ = 25 °C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Tol. ±1% (A) | | Tol. ±2% (B) | | Tol. approx. ±5% (C) | | at $I_{Ztest}$ = 1 mA | | at $I_{Ztest}$ = 5 mA | | | | | | |
| | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | TYP. | MAX. | TYP. | MAX. | MIN. | TYP. | MAX. | MAX. | 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 |

**Table 2** Per type BZX84-**A/B/C27** to **A/B/C75**

$T_j$ = 25 °C unless otherwise specified.

| BZX84-Axxx Bxxx Cxxx | WORKING VOLTAGE $V_Z$ (V) at $I_{Ztest}$ = 2 mA | | | | | | DIFFERENTIAL RESISTANCE $r_{dif}$ (Ω) | | | | TEMP. COEFF. $S_Z$ (mV/K) at $I_{Ztest}$ = 2 mA (see Figs 4 and 5) | | | DIODE CAP. $C_d$ (pF) at f = 1 MHz; $V_R$ = 0 V | NON-REPETITIVE PEAK REVERSE CURRENT $I_{ZSM}$ (A) at $t_p$ = 100 μs; $T_{amb}$ = 25 °C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Tol. ±1% (A) | | Tol. ±2% (B) | | Tol. approx. ±5% (C) | | at $I_{Ztest}$ = 0.5 mA | | at $I_{Ztest}$ = 2 mA | | | | | | |
| | 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 |

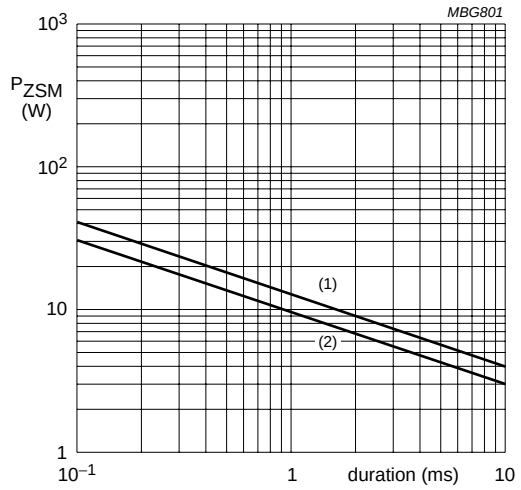
**THERMAL CHARACTERISTICS**

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

**Note**

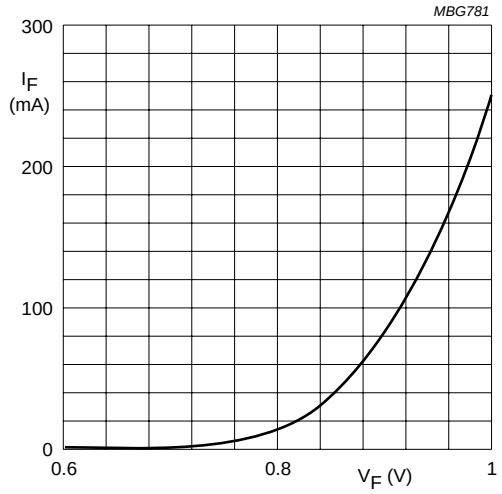
1. Device mounted on an FR4 printed circuit-board.

## GRAPHICAL DATA



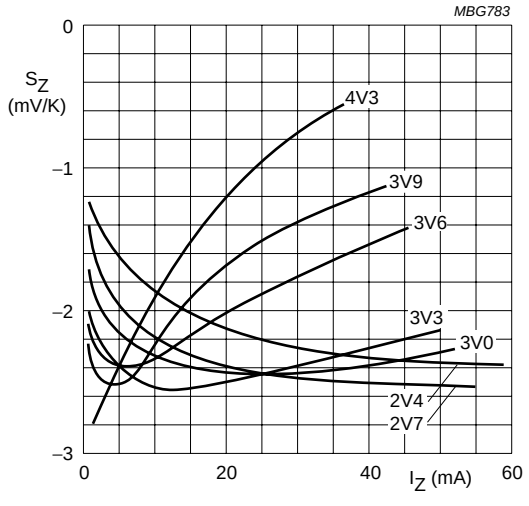

(1) $T_j$ = 25 °C (prior to surge).
(2) $T_j$ = 150 °C (prior to surge).

Fig.2 Maximum permissible non-repetitive peak reverse power dissipation versus duration.



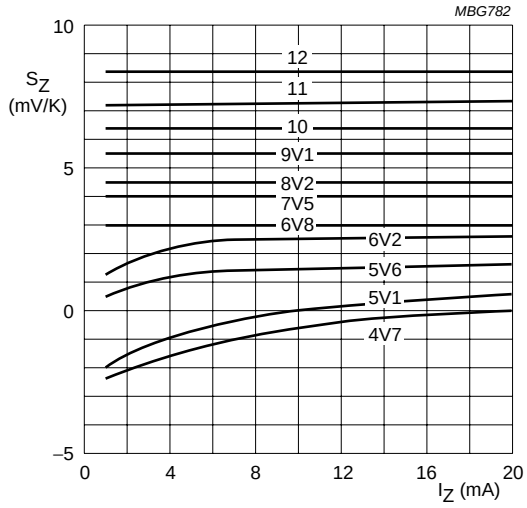

$T_j$ = 25 °C.

Fig.3 Forward current as a function of forward voltage; typical values.




**BZX84-A/B/C2V4 to A/B/C4V3.**
$T_j$ = 25 to 150 °C.

Fig.4 Temperature coefficient as a function of working current; typical values.

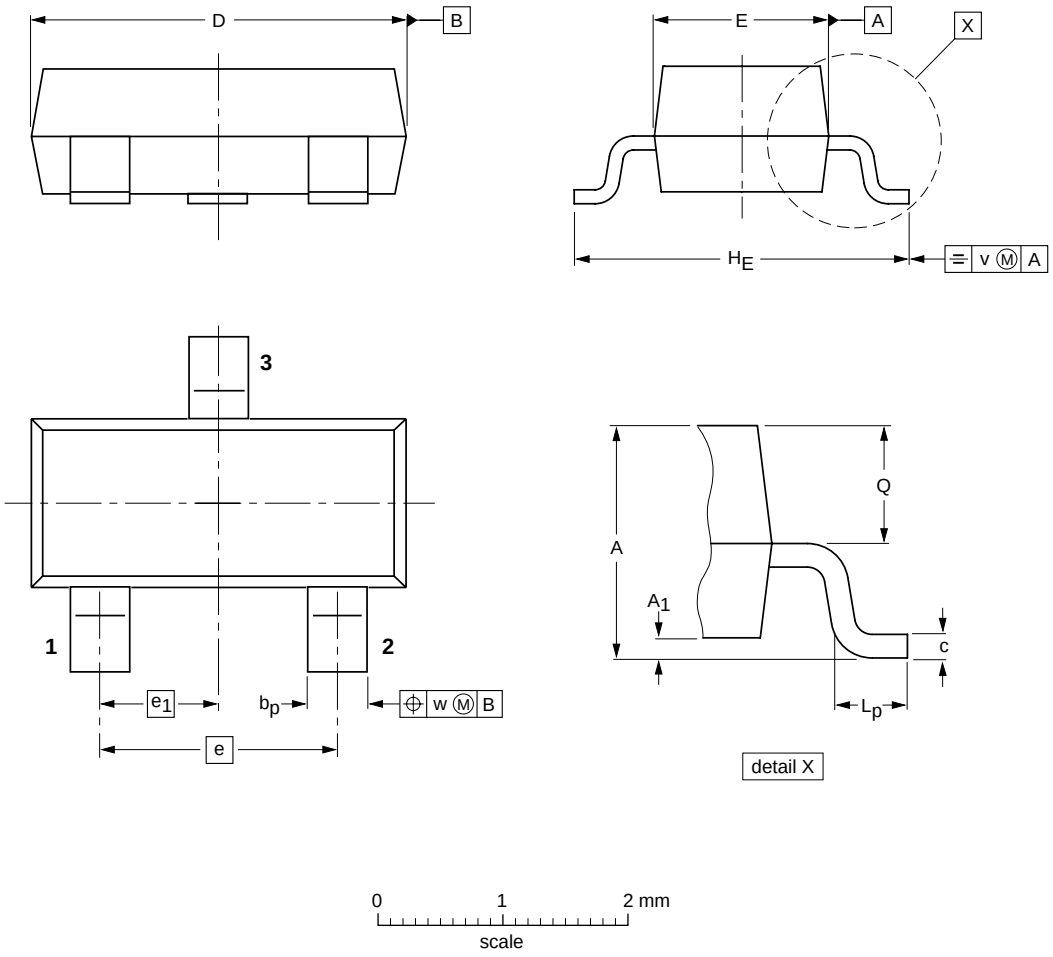



**BZX84-A/B/C4V7 to A/B/C12.**
$T_j$ = 25 to 150 °C.

Fig.5 Temperature coefficient as a function of working current; typical values.

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

**DATA SHEET STATUS**

| DOCUMENT STATUS[1] | PRODUCT STATUS[2] | DEFINITION |
|---|---|---|
| Objective data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary data sheet | Qualification | This document contains data from the preliminary specification. |
| Product data sheet | Production | This document contains the product specification. |

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