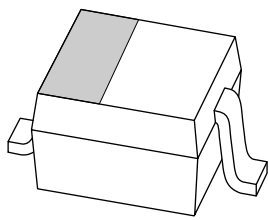


DATA SHEET



BZX384 series Voltage regulator diodes

Product specification
Supersedes data of 2003 Apr 01

2004 Mar 22

Voltage regulator diodes

BZX384 series

FEATURES

- Total power dissipation: max. 300 mW
- Two tolerance series: $\pm 2\%$ and approx. $\pm 5\%$
- Working voltage range: nominal 2.4 to 75 V (E24 range)
- Non-repetitive peak reverse power dissipation: max. 40 W.

APPLICATIONS

- General regulation functions.

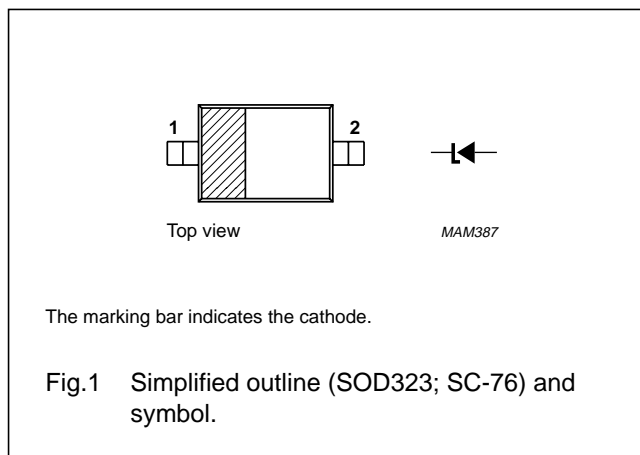
DESCRIPTION

Low-power voltage regulator diodes encapsulated in a very small SOD323 (SC-76) plastic SMD package.

The diodes are available in the normalized E24 $\pm 2\%$ (BZX384-B) and approx. $\pm 5\%$ (BZX384-C) tolerance range. The series consists of 37 types with nominal working voltages from 2.4 to 75 V.

PINNING

| PIN | DESCRIPTION |
|-----|-------------|
| 1 | cathode |
| 2 | anode |



Voltage regulator diodes

BZX384 series

MARKING

| TYPE NUMBER | MARKING CODE | TYPE NUMBER | MARKING CODE | TYPE NUMBER | MARKING CODE | TYPE NUMBER | MARKING CODE |
|--|--------------|-------------|--------------|-------------|--------------|-------------|--------------|
| Marking codes for BZX384-B2V4 to BZX384-B75 | | | | | | | |
| BZX384-B2V4 | K1 | BZX384-B6V2 | L2 | BZX384-B16 | M3 | BZX384-B43 | N3 |
| BZX384-B2V7 | K2 | BZX384-B6V8 | L3 | BZX384-B18 | M4 | BZX384-B47 | N4 |
| BZX384-B3V0 | K3 | BZX384-B7V5 | L4 | BZX384-B20 | M5 | BZX384-B51 | N5 |
| BZX384-B3V3 | K4 | BZX384-B8V2 | L5 | BZX384-B22 | M6 | BZX384-B56 | N6 |
| BZX384-B3V6 | K5 | BZX384-B9V1 | L6 | BZX384-B24 | M7 | BZX384-B62 | N7 |
| BZX384-B3V9 | K6 | BZX384-B10 | L7 | BZX384-B27 | M8 | BZX384-B68 | N8 |
| BZX384-B4V3 | K7 | BZX384-B11 | L8 | BZX384-B30 | M9 | BZX384-B75 | N9 |
| BZX384-B4V7 | K8 | BZX384-B12 | L9 | BZX384-B33 | N0 | | |
| BZX384-B5V1 | K9 | BZX384-B13 | M1 | BZX384-B36 | N1 | | |
| BZX384-B5V6 | L1 | BZX384-B15 | M2 | BZX384-B39 | N2 | | |
| Marking codes for BZX384-C2V4 to BZX384-C75 | | | | | | | |
| BZX384-C2V4 | T3 | BZX384-C6V2 | T1 | BZX384-C16 | DE | BZX384-C43 | DR |
| BZX384-C2V7 | T4 | BZX384-C6V8 | D7 | BZX384-C18 | DF | BZX384-C47 | DS |
| BZX384-C3V0 | T5 | BZX384-C7V5 | D8 | BZX384-C20 | DG | BZX384-C51 | DT |
| BZX384-C3V3 | T6 | BZX384-C8V2 | D9 | BZX384-C22 | DH | BZX384-C56 | DU |
| BZX384-C3V6 | T7 | BZX384-C9V1 | D0 | BZX384-C24 | DJ | BZX384-C62 | DV |
| BZX384-C3V9 | T8 | BZX384-C10 | T2 | BZX384-C27 | DK | BZX384-C68 | DW |
| BZX384-C4V3 | T9 | BZX384-C11 | DA | BZX384-C30 | DL | BZX384-C75 | DX |
| BZX384-C4V7 | T0 | BZX384-C12 | DB | BZX384-C33 | DM | | |
| BZX384-C5V1 | D5 | BZX384-C13 | DC | BZX384-C36 | DN | | |
| BZX384-C5V6 | D6 | BZX384-C15 | DD | BZX384-C39 | DP | | |

ORDERING INFORMATION

| TYPE NUMBER | PACKAGE | | |
|---------------------------|---------|--|---------|
| | NAME | DESCRIPTION | VERSION |
| BZX384-B2V4 to BZX384-B75 | - | plastic surface mounted package; 2 leads | SOD323 |
| BZX384-C2V4 to BZX384-C75 | | | |

Voltage regulator diodes

BZX384 series

LIMITING VALUES

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

| 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; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$; prior to surge | see Tables 1 and 2 | | A |
| P_{ZSM} | non-repetitive peak reverse power dissipation | $t_p = 100 \mu\text{s}$; square wave; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$; prior to surge | – | 40 | W |
| P_{tot} | total power dissipation | $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$; note 1 | – | 300 | mW |
| T_{stg} | storage temperature | | –65 | +150 | $^\circ\text{C}$ |
| T_j | junction temperature | | –65 | +150 | $^\circ\text{C}$ |

Note

1. Refer to SOD323 standard mounting conditions.

CHARACTERISTICS**Total BZX384-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 |
| | | $I_F = 100 \text{ mA}$; see Fig.3 | 1.1 | V |
| I_R | reverse current; | | | |
| | BZX384-B/C2V4 | $V_R = 1 \text{ V}$ | 50 | μA |
| | BZX384-B/C2V7 | $V_R = 1 \text{ V}$ | 20 | μA |
| | BZX384-B/C3V0 | $V_R = 1 \text{ V}$ | 10 | μA |
| | BZX384-B/C3V3 | $V_R = 1 \text{ V}$ | 5 | μA |
| | BZX384-B/C3V6 | $V_R = 1 \text{ V}$ | 5 | μA |
| | BZX384-B/C3V9 | $V_R = 1 \text{ V}$ | 3 | μA |
| | BZX384-B/C4V3 | $V_R = 1 \text{ V}$ | 3 | μA |
| | BZX384-B/C4V7 | $V_R = 2 \text{ V}$ | 3 | μA |
| | BZX384-B/C5V1 | $V_R = 2 \text{ V}$ | 2 | μA |
| | BZX384-B/C5V6 | $V_R = 2 \text{ V}$ | 1 | μA |
| | BZX384-B/C6V2 | $V_R = 4 \text{ V}$ | 3 | μA |
| | BZX384-B/C6V8 | $V_R = 4 \text{ V}$ | 2 | μA |
| | BZX384-B/C7V5 | $V_R = 5 \text{ V}$ | 1 | μA |
| | BZX384-B/C8V2 | $V_R = 5 \text{ V}$ | 700 | nA |
| | BZX384-B/C9V1 | $V_R = 6 \text{ V}$ | 500 | nA |
| BZX384-B/C10 | $V_R = 7 \text{ V}$ | 200 | nA | |
| BZX384-B/C11 | $V_R = 8 \text{ V}$ | 100 | nA | |
| BZX384-B/C12 | $V_R = 8 \text{ V}$ | 100 | nA | |
| BZX384-B/C13 | $V_R = 8 \text{ V}$ | 100 | nA | |
| BZX384-B/C15 to 75 | $V_R = 0.7V_{Z\text{nom}}$ | 50 | nA | |

Voltage regulator diodes

BZX384 series

Table 1 Per type BZX384-B/C2V4 to B/C24 $T_j = 25\text{ °C}$ unless otherwise specified.

| BZX- Bxxx Cxxx | WORKING VOLTAGE V_Z (V) at $I_{Ztest} = 5\text{ mA}$ | | | | DIFFERENTIAL RESISTANCE r_{dif} (Ω) | | | | TEMPERATURE COEFFICIENT 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. $\pm 2\%$ (B) | | Tol. $\pm 5\%$ (C) | | at $I_{Ztest} = 1\text{ mA}$ | | at $I_{Ztest} = 5\text{ mA}$ | | MIN. | TYP. | MAX. | MAX. | MAX. |
| | MIN. | MAX. | MIN. | MAX. | TYP. | MAX. | TYP. | MAX. | | | | | |
| 2V4 | 2.35 | 2.45 | 2.2 | 2.6 | 275 | 600 | 70 | 100 | -3.5 | -1.6 | 0 | 450 | 6.0 |
| 2V7 | 2.65 | 2.75 | 2.5 | 2.9 | 300 | 600 | 75 | 100 | -3.5 | -2.0 | 0 | 450 | 6.0 |
| 3V0 | 2.94 | 3.06 | 2.8 | 3.2 | 325 | 600 | 80 | 95 | -3.5 | -2.1 | 0 | 450 | 6.0 |
| 3V3 | 3.23 | 3.37 | 3.1 | 3.5 | 350 | 600 | 85 | 95 | -3.5 | -2.4 | 0 | 450 | 6.0 |
| 3V6 | 3.53 | 3.67 | 3.4 | 3.8 | 375 | 600 | 85 | 90 | -3.5 | -2.4 | 0 | 450 | 6.0 |
| 3V9 | 3.82 | 3.98 | 3.7 | 4.1 | 400 | 600 | 85 | 90 | -3.5 | -2.5 | 0 | 450 | 6.0 |
| 4V3 | 4.21 | 4.39 | 4.0 | 4.6 | 410 | 600 | 80 | 90 | -3.5 | -2.5 | 0 | 450 | 6.0 |
| 4V7 | 4.61 | 4.79 | 4.4 | 5.0 | 425 | 500 | 50 | 80 | -3.5 | -1.4 | 0.2 | 300 | 6.0 |
| 5V1 | 5.00 | 5.20 | 4.8 | 5.4 | 400 | 480 | 40 | 60 | -2.7 | -0.8 | 1.2 | 300 | 6.0 |
| 5V6 | 5.49 | 5.71 | 5.2 | 6.0 | 80 | 400 | 15 | 40 | -2.0 | 1.2 | 2.5 | 300 | 6.0 |
| 6V2 | 6.08 | 6.32 | 5.8 | 6.6 | 40 | 150 | 6 | 10 | 0.4 | 2.3 | 3.7 | 200 | 6.0 |
| 6V8 | 6.66 | 6.94 | 6.4 | 7.2 | 30 | 80 | 6 | 15 | 1.2 | 3.0 | 4.5 | 200 | 6.0 |
| 7V5 | 7.35 | 7.65 | 7.0 | 7.9 | 30 | 80 | 6 | 15 | 2.5 | 4.0 | 5.3 | 150 | 4.0 |
| 8V2 | 8.04 | 8.36 | 7.7 | 8.7 | 40 | 80 | 6 | 15 | 3.2 | 4.6 | 6.2 | 150 | 4.0 |
| 9V1 | 8.92 | 9.28 | 8.5 | 9.6 | 40 | 100 | 6 | 15 | 3.8 | 5.5 | 7.0 | 150 | 3.0 |
| 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 | 11.20 | 10.4 | 11.6 | 50 | 150 | 10 | 20 | 5.4 | 7.4 | 9.0 | 85 | 2.5 |
| 12 | 11.80 | 12.20 | 11.4 | 12.7 | 50 | 150 | 10 | 25 | 6.0 | 8.4 | 10.0 | 85 | 2.5 |
| 13 | 12.70 | 13.30 | 12.4 | 14.1 | 50 | 170 | 10 | 30 | 7.0 | 9.4 | 11.0 | 80 | 2.5 |
| 15 | 14.70 | 15.30 | 13.8 | 15.6 | 50 | 200 | 10 | 30 | 9.2 | 11.4 | 13.0 | 75 | 2.0 |
| 16 | 15.70 | 16.30 | 15.3 | 17.1 | 50 | 200 | 10 | 40 | 10.4 | 12.4 | 14.0 | 75 | 1.5 |
| 18 | 17.60 | 18.40 | 16.8 | 19.1 | 50 | 225 | 10 | 45 | 12.4 | 14.4 | 16.0 | 70 | 1.5 |
| 20 | 19.60 | 20.40 | 18.8 | 21.2 | 60 | 225 | 15 | 55 | 14.4 | 16.4 | 18.0 | 60 | 1.5 |
| 22 | 21.60 | 22.40 | 20.8 | 23.3 | 60 | 250 | 20 | 55 | 16.4 | 18.4 | 20.0 | 60 | 1.25 |
| 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

BZX384 series

Table 2 Per type BZX384-B/C27 to B/C75 $T_j = 25\text{ °C}$ unless otherwise specified.

| BZX- Bxxx Cxxx | WORKING VOLTAGE V_Z (V) at $I_{Ztest} = 2\text{ mA}$ | | | | DIFFERENTIAL RESISTANCE r_{dif} (Ω) | | | | TEMPERATURE COEFFICIENT 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. $\pm 2\%$ (B) | | Tol. $\pm 5\%$ (C) | | at $I_{Ztest} = 0.5\text{ mA}$ | | at $I_{Ztest} = 2\text{ mA}$ | | MIN. | TYP. | MAX. | MAX. | MAX. |
| | MIN. | MAX. | MIN. | MAX. | TYP. | MAX. | TYP. | MAX. | | | | | |
| 27 | 26.50 | 27.50 | 25.1 | 28.9 | 65 | 300 | 25 | 80 | 21.4 | 23.4 | 25.3 | 50 | 1.0 |
| 30 | 29.40 | 30.60 | 28.0 | 32.0 | 70 | 300 | 30 | 80 | 24.4 | 26.6 | 29.4 | 50 | 1.0 |
| 33 | 32.30 | 33.70 | 31.0 | 35.0 | 75 | 325 | 35 | 80 | 27.4 | 29.7 | 33.4 | 45 | 0.9 |
| 36 | 35.30 | 36.70 | 34.0 | 38.0 | 80 | 350 | 35 | 90 | 30.4 | 33.0 | 37.4 | 45 | 0.8 |
| 39 | 38.20 | 39.80 | 37.0 | 41.0 | 80 | 350 | 40 | 130 | 33.4 | 36.4 | 41.2 | 45 | 0.7 |
| 43 | 42.10 | 43.90 | 40.0 | 46.0 | 85 | 375 | 45 | 150 | 37.6 | 41.2 | 46.6 | 40 | 0.6 |
| 47 | 46.10 | 47.90 | 44.0 | 50.0 | 85 | 375 | 50 | 170 | 42.0 | 46.1 | 51.8 | 40 | 0.5 |
| 51 | 50.00 | 52.00 | 48.0 | 54.0 | 90 | 400 | 60 | 180 | 46.6 | 51.0 | 57.2 | 40 | 0.4 |
| 56 | 54.90 | 57.10 | 52.0 | 60.0 | 100 | 425 | 70 | 200 | 52.2 | 57.0 | 63.8 | 40 | 0.3 |
| 62 | 60.80 | 63.20 | 58.0 | 66.0 | 120 | 450 | 80 | 215 | 58.8 | 64.4 | 71.6 | 35 | 0.3 |
| 68 | 66.60 | 69.40 | 64.0 | 72.0 | 150 | 475 | 90 | 240 | 65.6 | 71.7 | 79.8 | 35 | 0.25 |
| 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

BZX384 series

THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | VALUE | UNIT |
|---------------|---|-------------------|--------------|-------------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | note 1 | 415 | K/W |
| $R_{th(j-s)}$ | thermal resistance from junction to soldering point | note 2 | 110 | K/W |

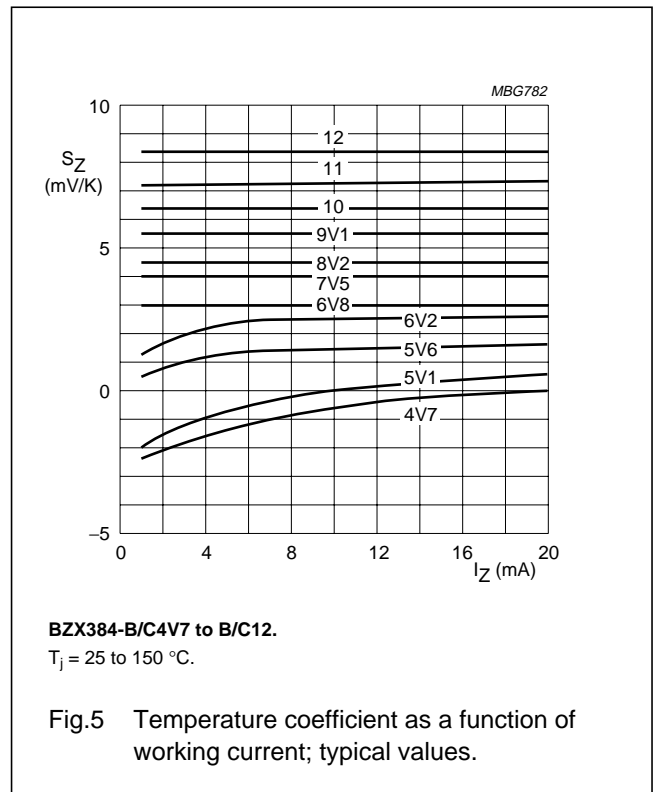
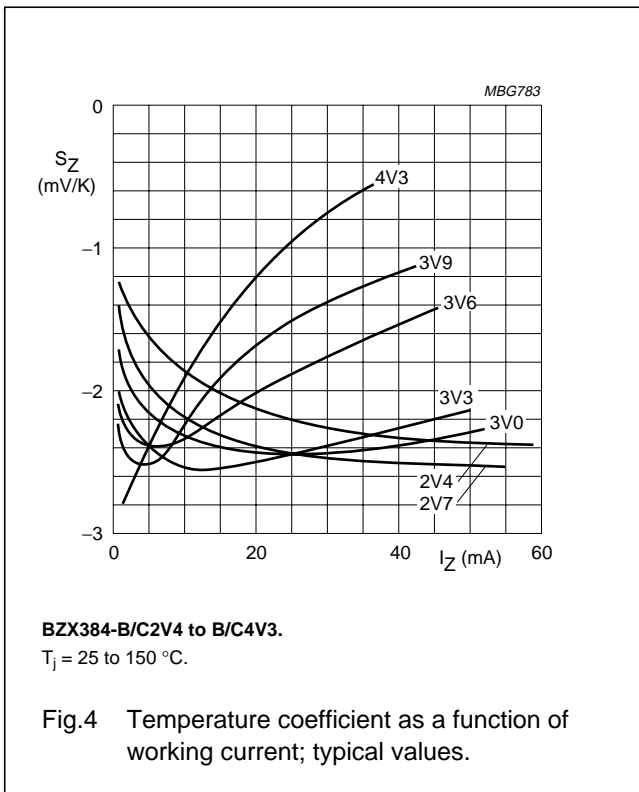
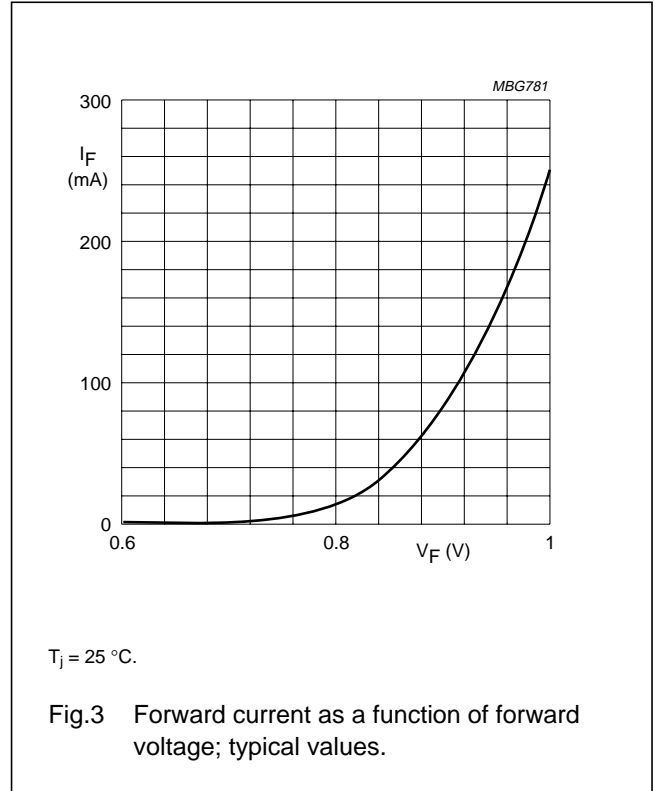
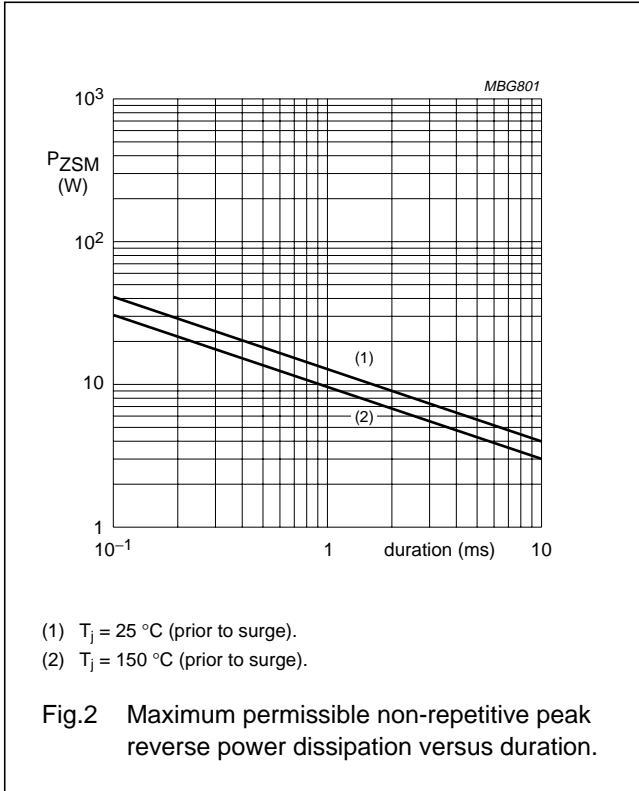
Notes

1. Device mounted on an FR4 printed-circuit board.
2. Soldering point of the cathode tab.

Voltage regulator diodes

BZX384 series

GRAPHICAL DATA



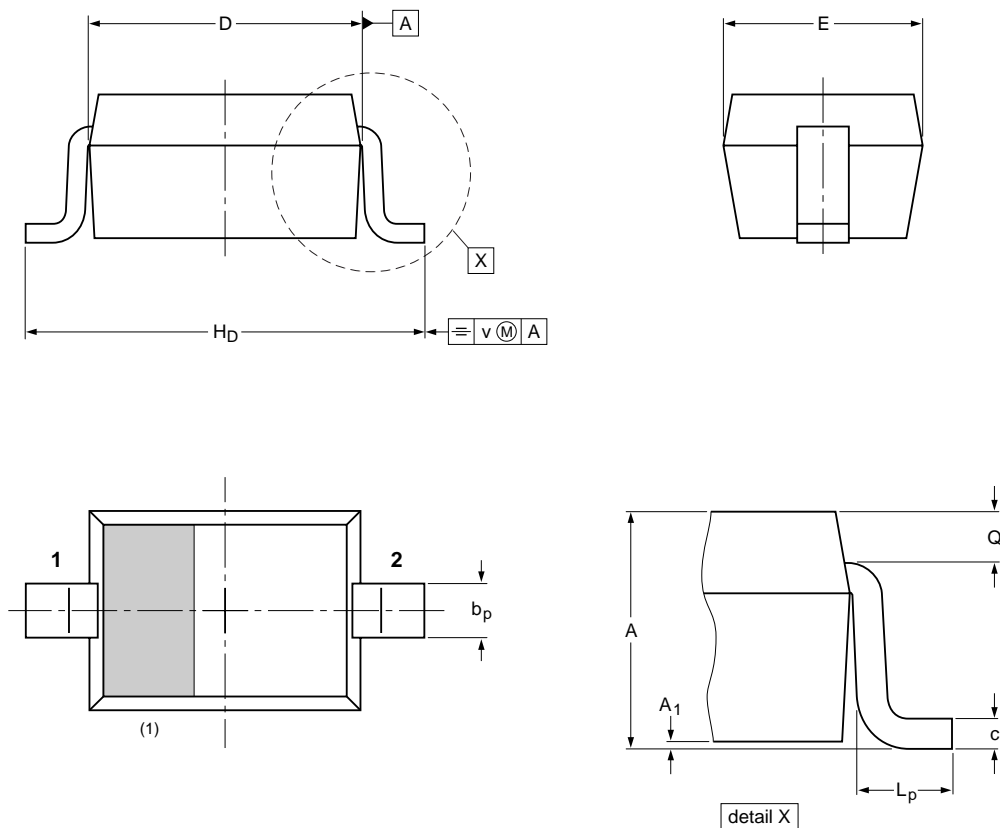
Voltage regulator diodes

BZX384 series

PACKAGE OUTLINE

Plastic surface mounted package; 2 leads

SOD323



DIMENSIONS (mm are the original dimensions)

| UNIT | A | A ₁ max | b _p | c | D | E | H _D | L _p | Q | v |
|------|------------|-----------------------|----------------|--------------|------------|--------------|----------------|----------------|--------------|-----|
| mm | 1.1 0.8 | 0.05 | 0.40 0.25 | 0.25 0.10 | 1.8 1.6 | 1.35 1.15 | 2.7 2.3 | 0.45 0.15 | 0.25 0.15 | 0.2 |

Note

1. The marking bar indicates the cathode

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|--------------------|------------|-------|-------|--|------------------------|------------------------|
| | IEC | JEDEC | JEITA | | | |
| SOD323 | | | SC-76 | | | -99-09-13- 03-12-17 |

Voltage regulator diodes

BZX384 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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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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