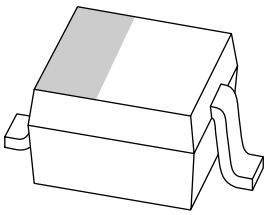
# DATA SHEET



# BZX384 series
## Voltage regulator diodes

Product data sheet
Supersedes data of 2003 Apr 01

2004 Mar 22

NXP founded by Philips

# Voltage regulator diodes BZX384 series

## FEATURES

- Total power dissipation: max. 300 mW
- Two tolerance series: ±2% and approx. ±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.

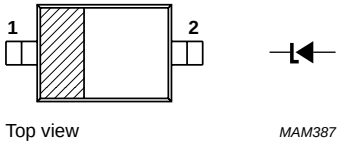
## DESCRIPTION

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

The diodes are available in the normalized E24 ±2% (BZX384-B) and approx. ±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 |




Top view MAM387

The marking bar indicates the cathode.

Fig.1 Simplified outline (SOD323; SC-76) and symbol.

**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 | | | |

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

**Note**

1. Refer to SOD323 standard mounting conditions.

## CHARACTERISTICS

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

**Table 1** Per type BZX384-**B/C2V4** to **B/C24**

$T_j$ = 25 °C unless otherwise specified.

| BZX-Bxxx Cxxx | WORKING VOLTAGE $V_Z$ (V) at $I_{Ztest}$ = 5 mA | | | | DIFFERENTIAL RESISTANCE $r_{dif}$ (Ω) | | | | TEMPERATURE COEFFICIENT $S_Z$ (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. ±2% (B) | | Tol. ±5% (C) | | at $I_{Ztest}$ = 1 mA | | at $I_{Ztest}$ = 5 mA | | | | | | |
| | MIN. | MAX. | MIN. | MAX. | TYP. | MAX. | TYP. | MAX. | MIN. | TYP. | MAX. | MAX. | 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 |

**Table 2** Per type BZX384-**B/C27** to **B/C75**

$T_j$ = 25 °C unless otherwise specified.

| BZX-Bxxx Cxxx | WORKING VOLTAGE $V_Z$ (V) at $I_{Ztest}$ = 2 mA | | | | DIFFERENTIAL RESISTANCE $r_{dif}$ (Ω) | | | | TEMPERATURE COEFFICIENT $S_Z$ (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. ±2% (B) | | Tol. ±5% (C) | | at $I_{Ztest}$ = 0.5 mA | | at $I_{Ztest}$ = 2 mA | | | | | | |
| | MIN. | MAX. | MIN. | MAX. | TYP. | MAX. | TYP. | MAX. | MIN. | TYP. | MAX. | MAX. | 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 |

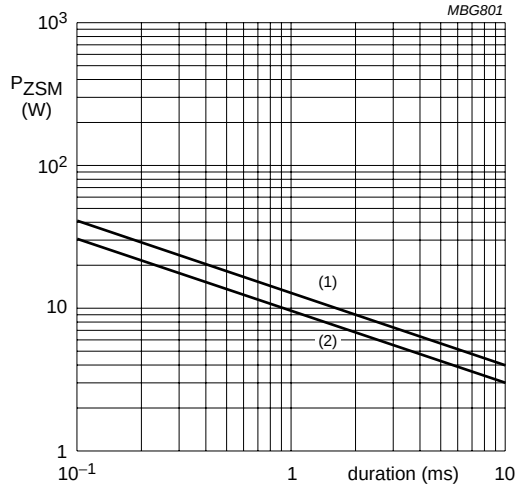
**THERMAL CHARACTERISTICS**

| 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**

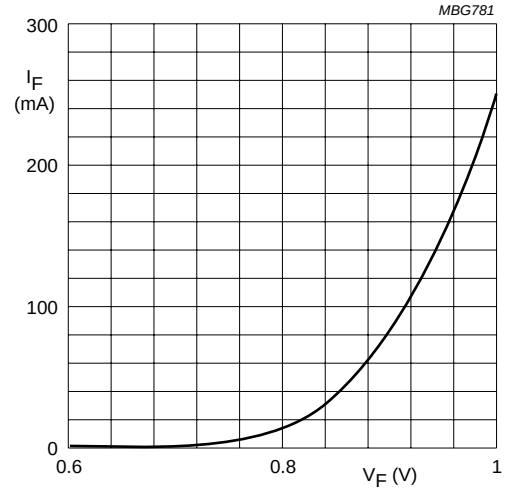
1. Device mounted on an FR4 printed-circuit board.
2. Soldering point of the cathode tab.

## GRAPHICAL DATA



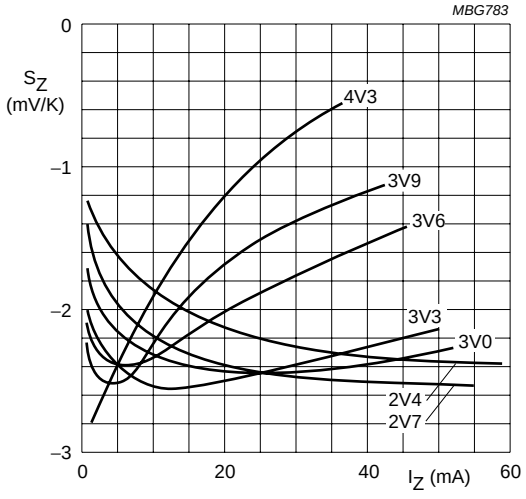

(1) $T_j$ = 25 °C (prior to surge).
(2) $T_j$ = 150 °C (prior to surge).

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



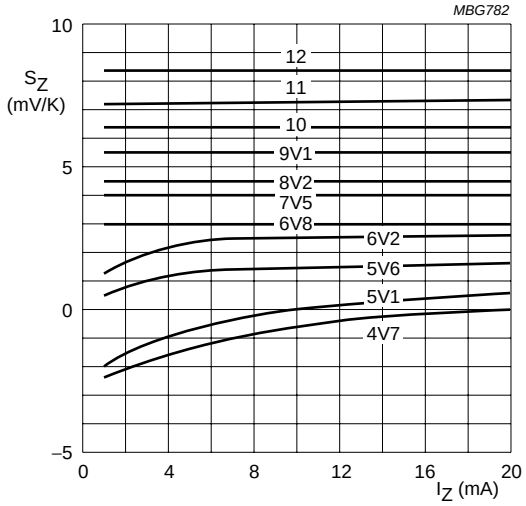

$T_j$ = 25 °C.

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




**BZX384-B/C2V4 to B/C4V3.**
$T_j$ = 25 to 150 °C.

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

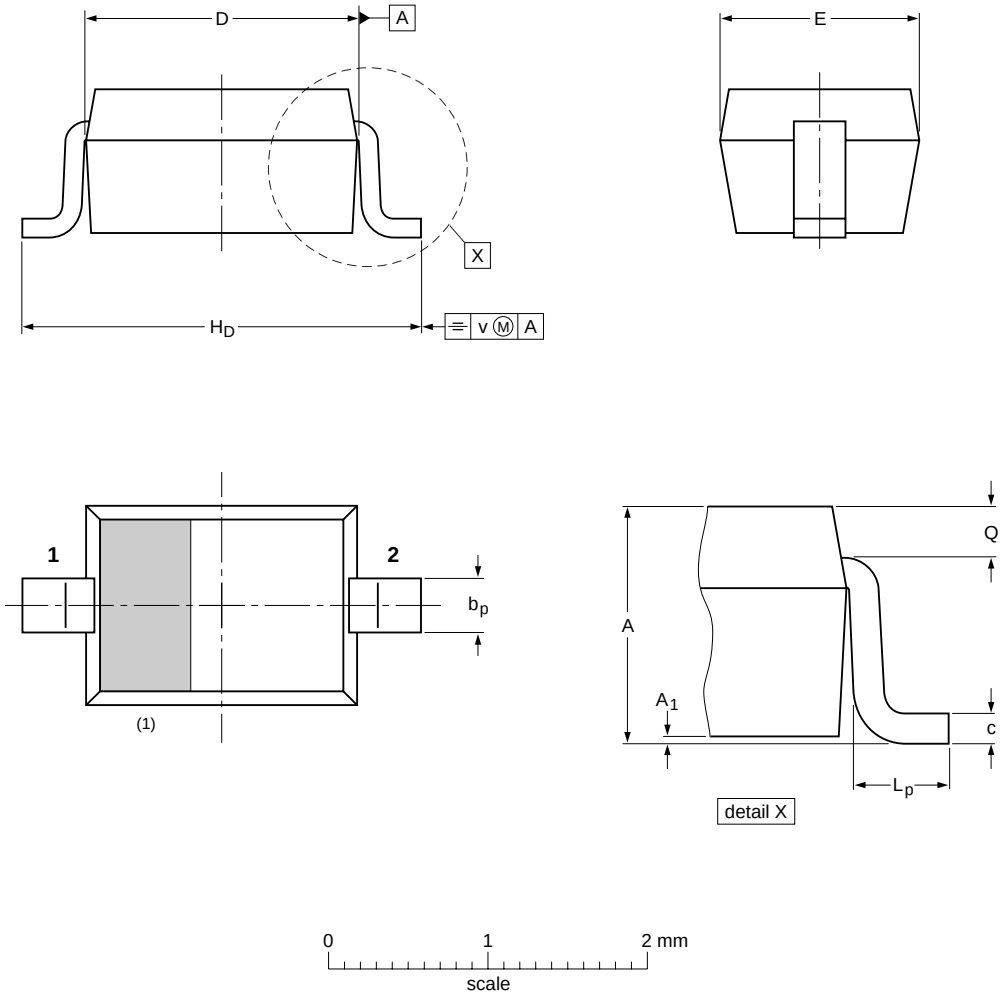



**BZX384-B/C4V7 to B/C12.**
$T_j$ = 25 to 150 °C.

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

## PACKAGE OUTLINE

**Plastic surface-mounted package; 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<br>0.8 | 0.05 | 0.40<br>0.25 | 0.25<br>0.10 | 1.8<br>1.6 | 1.35<br>1.15 | 2.7<br>2.3 | 0.45<br>0.15 | 0.25<br>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 | | | ~~03-12-17~~<br>06-03-16 |

**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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# *NXP Semiconductors*

**Customer notification**

This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content, except for package outline drawings which were updated to the latest version.

**Contact information**

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