



**THE DATASHEET OF
BZX384-B56,115**





BZX384 series

Voltage regulator diodes

Rev. 3 — 11 October 2016

Product data sheet

1. Product profile

1.1 General description

Low-power voltage regulator diodes in a small SOD323 (SC-76) Surface-Mounted Device (SMD) plastic package.

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

1.2 Features and benefits

- Total power dissipation: ≤ 300 mW
- Working voltage range: nominal 2.4 V to 75 V (E24 range)
- Two tolerance series: $\pm 2\%$ and approximately $\pm 5\%$
- Non-repetitive peak reverse power dissipation: ≤ 40 W
- AEC-Q101 qualified

1.3 Applications

- General regulation functions

1.4 Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------|-------------------------|----------------------|-----|-----|-----|------|
| V_F | forward voltage | $I_F = 10$ mA | [1] | - | 0.9 | V |
| P_{tot} | total power dissipation | $T_{amb} \leq 25$ °C | [2] | - | 300 | mW |

[1] Pulse test: $t_p \leq 100$ μ s; $\delta \leq 0.02$

[2] Device mounted on a FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

2. Pinning information

Table 2. Pinning

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-----------------------------|---|---|
| 1 | K | cathode [1] |  |  |
| 2 | A | anode | | |

[1] The marking bar indicates the cathode.

3. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-----------------------------------|---------|--|---------|
| | Name | Description | Version |
| BZX384 series [1] | SC-76 | plastic surface-mounted package; 2 leads | SOD323 |

[1] The series includes 37 breakdown voltages with nominal working voltages from 2.4 V to 75 V and $\pm 2\%$ and $\pm 5\%$ tolerances.

4. Marking

Table 4. Marking codes

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

5. Limiting values

Table 5. Limiting values

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

| Symbol | Parameter | Conditions | Min | Max | Unit |
|-----------|---|-----------------------------|-------|---|------|
| I_F | forward current | | - | 250 | mA |
| I_{ZSM} | non-repetitive peak reverse current | | [1] - | see Table 8 and 9 | |
| P_{ZSM} | non-repetitive peak reverse power dissipation | | [1] - | 40 | W |
| P_{tot} | total power dissipation | $T_{amb} \leq 25\text{ °C}$ | [2] - | 300 | mW |
| T_j | junction temperature | | -65 | +150 | °C |
| T_{amb} | ambient temperature | | -65 | +150 | °C |
| T_{stg} | storage temperature | | -65 | +150 | °C |

[1] $t_p = 100\ \mu\text{s}$; square wave; $T_j = 25\text{ °C}$ before surge

[2] Device mounted on a FR4 PCB, single-sided copper, tin-plated and standard footprint.

6. Thermal characteristics

Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------|--|-------------|-------|-----|-----|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] - | - | 415 | K/W |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | [2] - | - | 110 | K/W |

[1] Device mounted on a FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Soldering point of cathode tab.

7. Characteristics

Table 7. Characteristics

$T_j = 25\text{ °C}$ unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------|-----------------|-----------------------|-------|-----|-----|------|
| V_F | forward voltage | $I_F = 10\text{ mA}$ | [1] - | - | 0.9 | V |
| | | $I_F = 100\text{ mA}$ | [1] - | - | 1.1 | V |

[1] Pulse test: $t_p \leq 100\ \mu\text{s}$; $\delta \leq 0.02$

Table 8. Characteristics per type; BZX384-B2V4 to BZX384-C24

 $T_j = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

| BZX384 -xxx | Sel | Working voltage V_Z (V) | | Differential resistance r_{dif} (Ω) | | | | Reverse current I_R (μA) | | Temperature coefficient S_Z (mV/K) | | | Diode capacitance C_d (pF) ^[1] | Non-repetitive peak reverse current I_{ZSM} (A) ^[2] |
|----------------|-----|------------------------------|------|---|-----|---------------------|-----|--|-----------|---|------|------|--|---|
| | | $I_Z = 5\text{ mA}$ | | $I_Z = 1\text{ mA}$ | | $I_Z = 5\text{ mA}$ | | Max | V_R (V) | $I_Z = 5\text{ mA}$ | | | | |
| | | Min | Max | Typ | Max | Typ | Max | | | Min | Typ | Max | | |
| 2V4 | B | 2.35 | 2.45 | 275 | 600 | 70 | 100 | 50 | 1 | -3.5 | -1.6 | 0 | 450 | 6.0 |
| | C | 2.2 | 2.6 | | | | | | | | | | | |
| 2V7 | B | 2.65 | 2.75 | 300 | 600 | 75 | 100 | 20 | 1 | -3.5 | -2.0 | 0 | 450 | 6.0 |
| | C | 2.5 | 2.9 | | | | | | | | | | | |
| 3V0 | B | 2.94 | 3.06 | 325 | 600 | 80 | 95 | 10 | 1 | -3.5 | -2.1 | 0 | 450 | 6.0 |
| | C | 2.8 | 3.2 | | | | | | | | | | | |
| 3V3 | B | 3.23 | 3.37 | 350 | 600 | 85 | 95 | 5 | 1 | -3.5 | -2.4 | 0 | 450 | 6.0 |
| | C | 3.1 | 3.5 | | | | | | | | | | | |
| 3V6 | B | 3.53 | 3.67 | 375 | 600 | 85 | 90 | 5 | 1 | -3.5 | -2.4 | 0 | 450 | 6.0 |
| | C | 3.4 | 3.8 | | | | | | | | | | | |
| 3V9 | B | 3.82 | 3.98 | 400 | 600 | 85 | 90 | 3 | 1 | -3.5 | -2.5 | 0 | 450 | 6.0 |
| | C | 3.7 | 4.1 | | | | | | | | | | | |
| 4V3 | B | 4.21 | 4.39 | 410 | 600 | 80 | 90 | 3 | 1 | -3.5 | -2.5 | 0 | 450 | 6.0 |
| | C | 4.0 | 4.6 | | | | | | | | | | | |
| 4V7 | B | 4.61 | 4.79 | 425 | 500 | 50 | 80 | 3 | 2 | -3.5 | -1.4 | 0.2 | 300 | 6.0 |
| | C | 4.4 | 5.0 | | | | | | | | | | | |
| 5V1 | B | 5.0 | 5.2 | 400 | 480 | 40 | 60 | 2 | 2 | -2.7 | -0.8 | 1.2 | 300 | 6.0 |
| | C | 4.8 | 5.4 | | | | | | | | | | | |
| 5V6 | B | 5.49 | 5.71 | 80 | 400 | 15 | 40 | 1 | 2 | -2.0 | 1.2 | 2.5 | 300 | 6.0 |
| | C | 5.2 | 6.0 | | | | | | | | | | | |
| 6V2 | B | 6.08 | 6.32 | 40 | 150 | 6 | 10 | 3 | 4 | 0.4 | 2.3 | 3.7 | 200 | 6.0 |
| | C | 5.8 | 6.6 | | | | | | | | | | | |
| 6V8 | B | 6.66 | 6.94 | 30 | 80 | 6 | 15 | 2 | 4 | 1.2 | 3.0 | 4.5 | 200 | 6.0 |
| | C | 6.4 | 7.2 | | | | | | | | | | | |
| 7V5 | B | 7.35 | 7.65 | 30 | 80 | 6 | 15 | 1 | 5 | 2.5 | 4.0 | 5.3 | 150 | 4.0 |
| | C | 7.0 | 7.9 | | | | | | | | | | | |
| 8V2 | B | 8.04 | 8.36 | 40 | 80 | 6 | 15 | 0.7 | 5 | 3.2 | 4.6 | 6.2 | 150 | 4.0 |
| | C | 7.7 | 8.7 | | | | | | | | | | | |
| 9V1 | B | 8.92 | 9.28 | 40 | 100 | 6 | 15 | 0.5 | 6 | 3.8 | 5.5 | 7.0 | 150 | 3.0 |
| | C | 8.5 | 9.6 | | | | | | | | | | | |
| 10 | B | 9.8 | 10.2 | 50 | 150 | 8 | 20 | 0.2 | 7 | 4.5 | 6.4 | 8.0 | 90 | 3.0 |
| | C | 9.4 | 10.6 | | | | | | | | | | | |
| 11 | B | 10.8 | 11.2 | 50 | 150 | 10 | 20 | 0.1 | 8 | 5.4 | 7.4 | 9.0 | 85 | 2.5 |
| | C | 10.4 | 11.6 | | | | | | | | | | | |
| 12 | B | 11.8 | 12.2 | 50 | 150 | 10 | 25 | 0.1 | 8 | 6.0 | 8.4 | 10.0 | 85 | 2.5 |
| | C | 11.4 | 12.7 | | | | | | | | | | | |

Table 8. Characteristics per type; BZX384-B2V4 to BZX384-C24 ...continued $T_j = 25\text{ °C}$ unless otherwise specified.

| BZX384 -xxx | Sel | Working voltage V_Z (V) | | Differential resistance r_{dif} (Ω) | | | | Reverse current I_R (μA) | | Temperature coefficient S_Z (mV/K) | | | Diode capacitance C_d (pF) ^[1] | Non-repetitive peak reverse current I_{ZSM} (A) ^[2] |
|----------------|-----|------------------------------|------|--|-----|---------------------|-----|--|-----------|---|------|------|--|---|
| | | $I_Z = 5\text{ mA}$ | | $I_Z = 1\text{ mA}$ | | $I_Z = 5\text{ mA}$ | | Max | V_R (V) | $I_Z = 5\text{ mA}$ | | | | |
| | | Min | Max | Typ | Max | Typ | Max | | | Min | Typ | Max | | |
| 13 | B | 12.7 | 13.3 | 50 | 170 | 10 | 30 | 0.1 | 8 | 7.0 | 9.4 | 11.0 | 80 | 2.5 |
| | C | 12.4 | 14.1 | | | | | | | | | | | |
| 15 | B | 14.7 | 15.3 | 50 | 200 | 10 | 30 | 0.05 | 10.5 | 9.2 | 11.4 | 13.0 | 75 | 2.0 |
| | C | 13.8 | 15.6 | | | | | | | | | | | |
| 16 | B | 15.7 | 16.3 | 50 | 200 | 10 | 40 | 0.05 | 11.2 | 10.4 | 12.4 | 14.0 | 75 | 1.5 |
| | C | 15.3 | 17.1 | | | | | | | | | | | |
| 18 | B | 17.6 | 18.4 | 50 | 225 | 10 | 45 | 0.05 | 12.6 | 12.4 | 14.4 | 16.0 | 70 | 1.5 |
| | C | 16.8 | 19.1 | | | | | | | | | | | |
| 20 | B | 19.6 | 20.4 | 60 | 225 | 15 | 55 | 0.05 | 14 | 14.4 | 16.4 | 18.0 | 60 | 1.5 |
| | C | 18.8 | 21.2 | | | | | | | | | | | |
| 22 | B | 21.6 | 22.4 | 60 | 250 | 20 | 55 | 0.05 | 15.4 | 16.4 | 18.4 | 20.0 | 60 | 1.25 |
| | C | 20.8 | 23.3 | | | | | | | | | | | |
| 24 | B | 23.5 | 24.5 | 60 | 250 | 25 | 70 | 0.05 | 16.8 | 18.4 | 20.4 | 22.0 | 55 | 1.25 |
| | C | 22.8 | 25.6 | | | | | | | | | | | |

[1] $f = 1\text{ MHz}$; $V_R = 0\text{ V}$ [2] $t_p = 100\text{ }\mu\text{s}$; square wave; $T_j = 25\text{ °C}$ before surge**Table 9. Characteristics per type; BZX384-B27 to BZX384-C75** $T_j = 25\text{ °C}$ unless otherwise specified.

| BZX384 -xxx | Sel | Working voltage V_Z (V) | | Differential resistance r_{dif} (Ω) | | | | Reverse current I_R (μA) | | Temperature coefficient S_Z (mV/K) | | | Diode capacitance C_d (pF) ^[1] | Non-repetitive peak reverse current I_{ZSM} (A) ^[2] |
|----------------|-----|------------------------------|------|--|-----|---------------------|-----|--|-----------|---|------|------|--|---|
| | | $I_Z = 2\text{ mA}$ | | $I_Z = 0.5\text{ mA}$ | | $I_Z = 2\text{ mA}$ | | Max | V_R (V) | $I_Z = 2\text{ mA}$ | | | | |
| | | Min | Max | Typ | Max | Typ | Max | | | Min | Typ | Max | | |
| 27 | B | 26.5 | 27.5 | 65 | 300 | 25 | 80 | 0.05 | 18.9 | 21.4 | 23.4 | 25.3 | 50 | 1.0 |
| | C | 25.1 | 28.9 | | | | | | | | | | | |
| 30 | B | 29.4 | 30.6 | 70 | 300 | 30 | 80 | 0.05 | 21 | 24.4 | 26.6 | 29.4 | 50 | 1.0 |
| | C | 28.0 | 32.0 | | | | | | | | | | | |
| 33 | B | 32.3 | 33.7 | 75 | 325 | 35 | 80 | 0.05 | 23.1 | 27.4 | 29.7 | 33.4 | 45 | 0.9 |
| | C | 31.0 | 35.0 | | | | | | | | | | | |
| 36 | B | 35.3 | 36.7 | 80 | 350 | 35 | 90 | 0.05 | 25.2 | 30.4 | 33.0 | 37.4 | 45 | 0.8 |
| | C | 34.0 | 38.0 | | | | | | | | | | | |
| 39 | B | 38.2 | 39.8 | 80 | 350 | 40 | 130 | 0.05 | 27.3 | 33.4 | 36.4 | 41.2 | 45 | 0.7 |
| | C | 37.0 | 41.0 | | | | | | | | | | | |
| 43 | B | 42.1 | 43.9 | 85 | 375 | 45 | 150 | 0.05 | 30.1 | 37.6 | 41.2 | 46.6 | 40 | 0.6 |
| | C | 40.0 | 46.0 | | | | | | | | | | | |

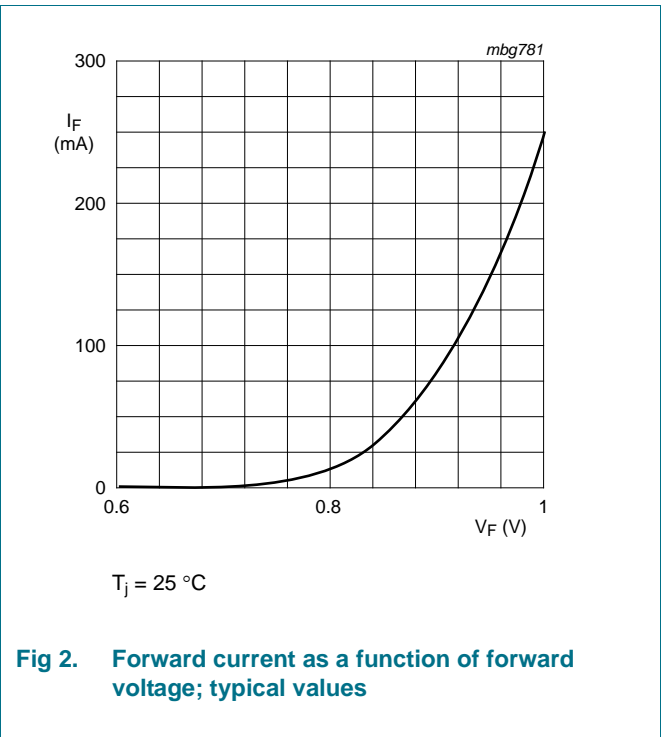
Table 9. Characteristics per type; BZX384-B27 to BZX384-C75 ...continued

$T_j = 25\text{ °C}$ unless otherwise specified.

| BZX384 -xxx | Sel | Working voltage V_Z (V) | | Differential resistance r_{dif} (Ω) | | | | Reverse current I_R (μA) | | Temperature coefficient S_Z (mV/K) | | | Diode capacitance C_d (pF) ^[1] | Non-repetitive peak reverse current I_{ZSM} (A) ^[2] |
|----------------|-----|------------------------------|------|--|-----|-----------------------|---------------------|--|-----------|---|------|------|--|---|
| | | | | $I_Z = 2\text{ mA}$ | | $I_Z = 0.5\text{ mA}$ | $I_Z = 2\text{ mA}$ | | | $I_Z = 2\text{ mA}$ | | | | |
| | | Min | Max | Typ | Max | Typ | Max | Max | V_R (V) | Min | Typ | Max | Max | Max |
| 47 | B | 46.1 | 47.9 | 85 | 375 | 50 | 170 | 0.05 | 32.9 | 42.0 | 46.1 | 51.8 | 40 | 0.5 |
| | C | 44.0 | 50.0 | | | | | | | | | | | |
| 51 | B | 50.0 | 52.0 | 90 | 400 | 60 | 180 | 0.05 | 35.7 | 46.6 | 51.0 | 57.2 | 40 | 0.4 |
| | C | 48.0 | 54.0 | | | | | | | | | | | |
| 56 | B | 54.9 | 57.1 | 100 | 425 | 70 | 200 | 0.05 | 39.2 | 52.2 | 57.0 | 63.8 | 40 | 0.3 |
| | C | 52.0 | 60.0 | | | | | | | | | | | |
| 62 | B | 60.8 | 63.2 | 120 | 450 | 80 | 215 | 0.05 | 43.4 | 58.8 | 64.4 | 71.6 | 35 | 0.3 |
| | C | 58.0 | 66.0 | | | | | | | | | | | |
| 68 | B | 66.6 | 69.4 | 150 | 475 | 90 | 240 | 0.05 | 47.6 | 65.6 | 71.7 | 79.8 | 35 | 0.25 |
| | C | 64.0 | 72.0 | | | | | | | | | | | |
| 75 | B | 73.5 | 76.5 | 170 | 500 | 95 | 255 | 0.05 | 52.5 | 73.4 | 80.2 | 88.6 | 35 | 0.20 |
| | C | 70.0 | 79.0 | | | | | | | | | | | |

[1] $f = 1\text{ MHz}$; $V_R = 0\text{ V}$

[2] $t_p = 100\text{ }\mu\text{s}$; square wave; $T_j = 25\text{ °C}$ before surge





BZX384-B/C2V4 to BZX384-B/C4V3
 $T_j = 25\text{ °C to }150\text{ °C}$

Fig 3. Temperature coefficient as a function of working current; typical values



BZX384-B/C4V7 to BZX384-B/C12
 $T_j = 25\text{ °C to }150\text{ °C}$

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



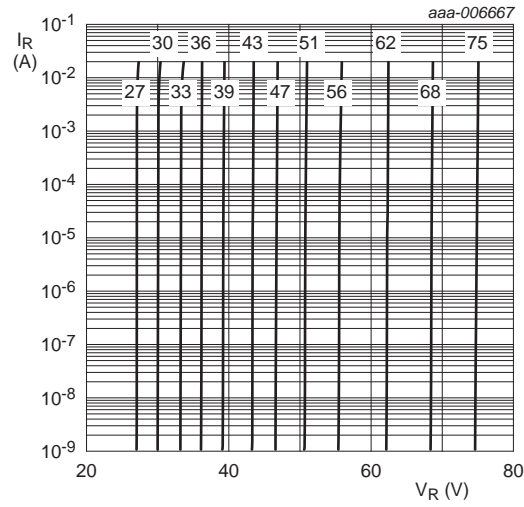
BZX384-B/C2V4 to BZX384-B/C6V8
 $T_{amb} = 25\text{ °C}$

Fig 5. Reverse current as a function of reverse voltage; typical values



BZX384-B/C7V5 to BZX384-B/C24
 $T_{amb} = 25\text{ °C}$

Fig 6. Reverse current as a function of reverse voltage; typical values



BZX384-B/C27 to BZX384-B/C75

T_{amb} = 25 °C

Fig 7. Reverse current as a function of reverse voltage; typical values

8. Test information

8.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - *Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

9. Package outline

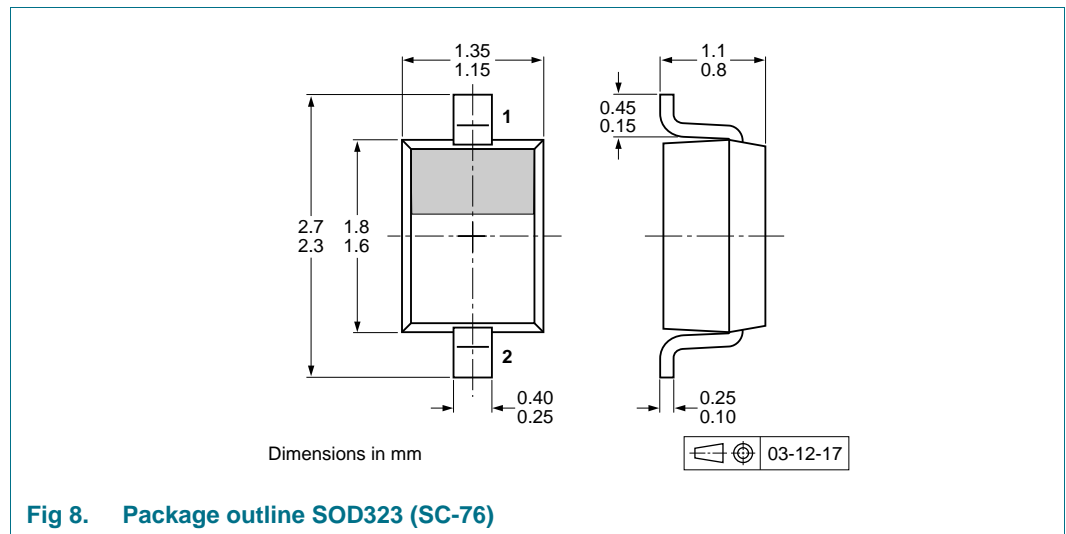


Fig 8. Package outline SOD323 (SC-76)

10. Soldering

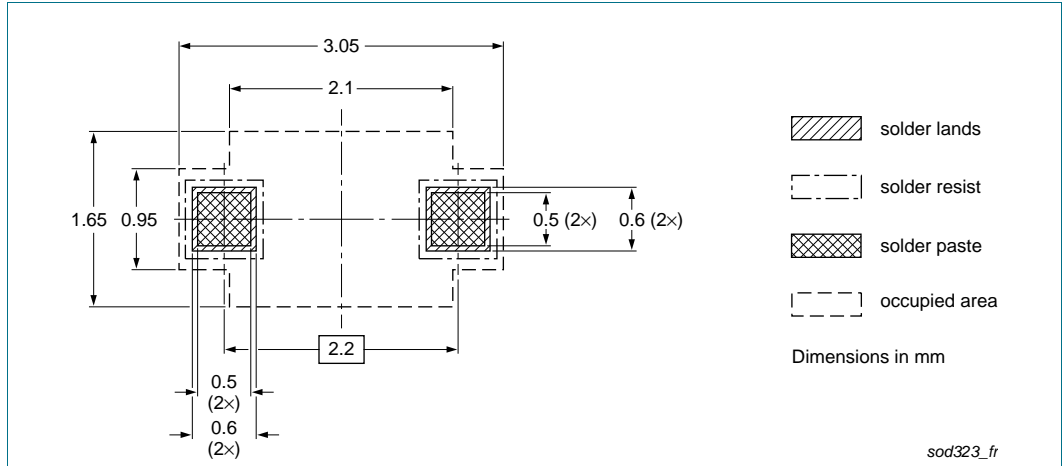


Fig 9. Reflow soldering footprint SOD323 (SC-76)

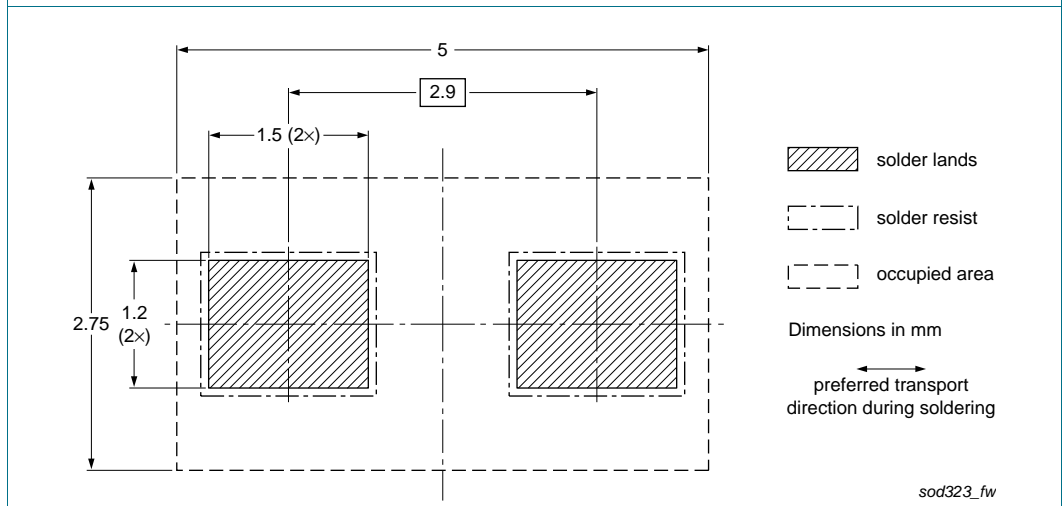


Fig 10. Wave soldering footprint SOD323 (SC-76)

11. Revision history

Table 10. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|---|-----------------------|---------------|----------------|
| BZX384_SER v.3 | 20161011 | Product data sheet | - | BZX384_SER v.2 |
| Modifications: | <ul style="list-style-type: none"> • The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors • Legal texts have been adapted to the new company name where appropriate. • Section 1 “Product profile”: enhanced. • Table 5: T_{amb} added. • Figure 5 to Figure 7: added. • Section 8 “Test information”: added. • Figure 9: replaced by minimized package outline. • Section 10 “Soldering”: added. • Section 12 “Legal information”: updated. | | | |
| BZX384_SER v.2 | 20040322 | Product data sheet | - | BZX384_SER v.1 |
| BZX384_SER v.1 | 20030401 | Product specification | - | - |

12. Legal information

12.1 Data sheet status

| Document status ^{[1][2]} | Product status ^[3] | Definition |
|-----------------------------------|-------------------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nexperia.com>.

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13. Contact information

For more information, please visit: <http://www.nexperia.com>



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