# THE DATASHEET OF

# BZX384-B6V2,115

# 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 ±2 % (BZX384-B) and approximately ±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
- Two tolerance series: ±2 % and approximately ±5 %
- AEC-Q101 qualified
- Working voltage range: nominal 2.4 V to 75 V (E24 range)
- Non-repetitive peak reverse power dissipation: ≤ 40 W

### 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 | $T_{amb}$ ≤ 25 °C | [2] | - | - | 300 | mW |

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

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

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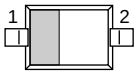
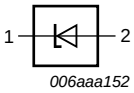
## 2. Pinning information

**Table 2. Pinning**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | K | cathode [1] |   |   006aaa152 |
| 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 ±2 % and ±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 | - | - |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## 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 | $T_{amb} \leq 25$ °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] $t_p = 100$ μs; square wave; $T_j = 25$ °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**

*$T_j = 25$ °C unless otherwise specified.*

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

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


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

*$T_j$ = 25 °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 mA | | $I_Z$ = 1 mA | | $I_Z$ = 5 mA | | | | $I_Z$ = 5 mA | | | | |
| | | Min | Max | Typ | Max | Typ | Max | Max | $V_R$ (V) | Min | Typ | Max | Max | 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 | | | | | | | | | | | |


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

*$T_j$ = 25 °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 mA | | $I_Z$ = 1 mA | | $I_Z$ = 5 mA | | | | $I_Z$ = 5 mA | | | | |
| | | Min | Max | Typ | Max | Typ | Max | Max | $V_R$ (V) | Min | Typ | Max | Max | 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 MHz; $V_R$ = 0 V

[2] $t_p$ = 100 μs; square wave; $T_j$ = 25 °C before surge

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

*$T_j$ = 25 °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 mA | | $I_Z$ = 0.5 mA | | $I_Z$ = 2 mA | | | | $I_Z$ = 2 mA | | | | |
| | | Min | Max | Typ | Max | Typ | Max | Max | $V_R$ (V) | Min | Typ | Max | Max | 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 | | | | | | | | | | | |


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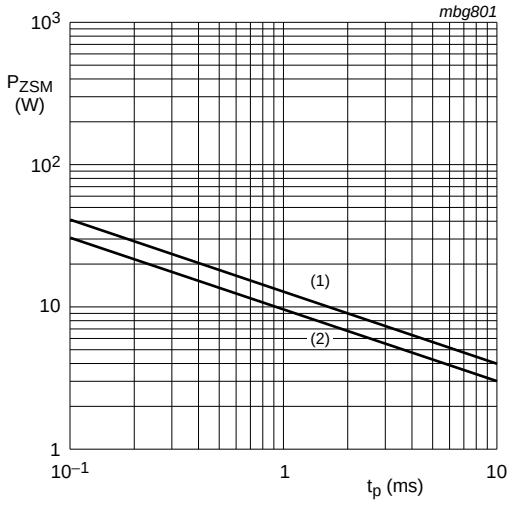
**Table 9. Characteristics per type; BZX384-B27 to BZX384-C75** *…continued*

*$T_j$ = 25 °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 mA | | $I_Z$ = 0.5 mA | | $I_Z$ = 2 mA | | | | $I_Z$ = 2 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 MHz; $V_R$ = 0 V

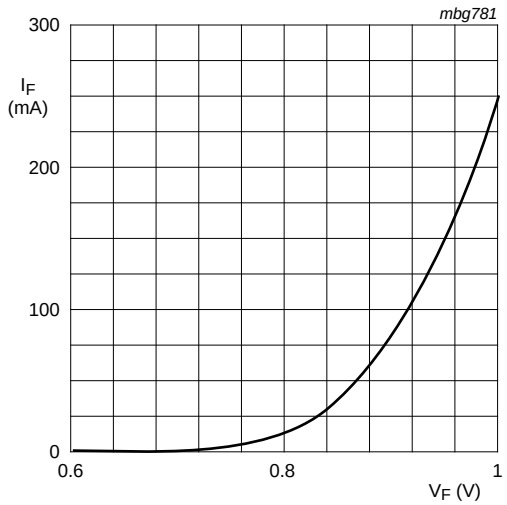
[2] $t_p$ = 100 μs; square wave; $T_j$ = 25 °C before surge




(1) $T_j$ = 25 °C (before surge)

(2) $T_j$ = 150 °C (before surge)

**Fig 1. Non-repetitive peak reverse power dissipation as a function of pulse duration; maximum values**




$T_j$ = 25 °C

**Fig 2. Forward current as a function of forward voltage; typical values**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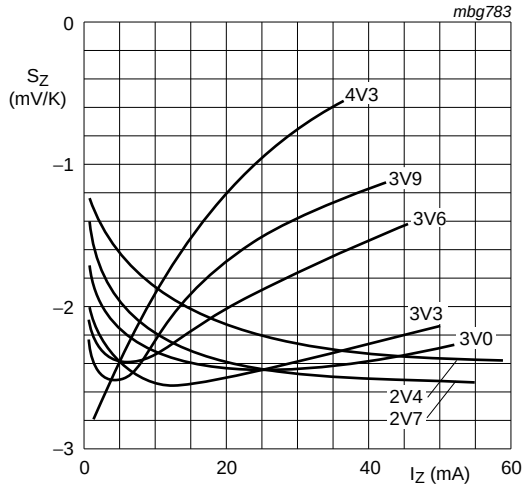
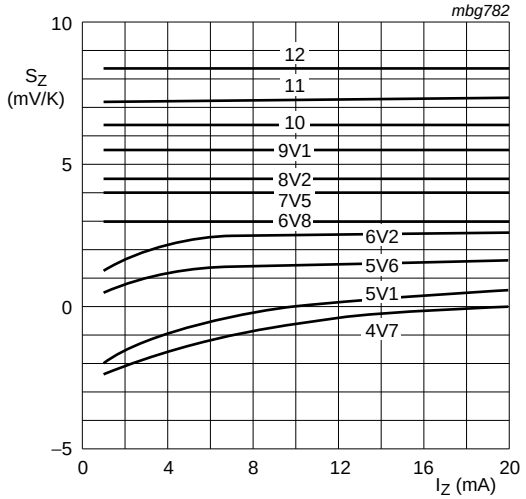



BZX384-B/C2V4 to BZX384-B/C4V3

$T_j$ = 25 °C to 150 °C

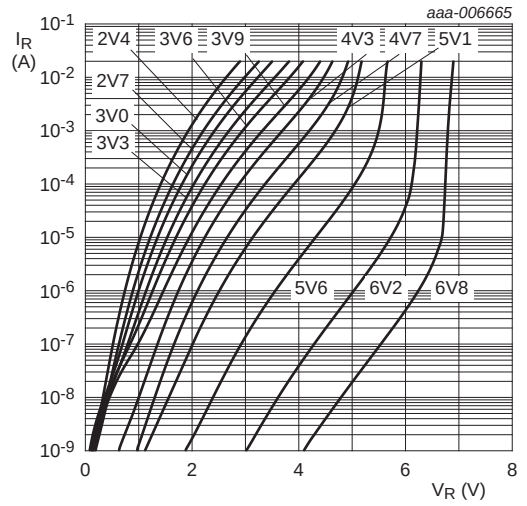
**Fig 3. Temperature coefficient as a function of working current; typical values**




BZX384-B/C4V7 to BZX384-B/C12

$T_j$ = 25 °C to 150 °C

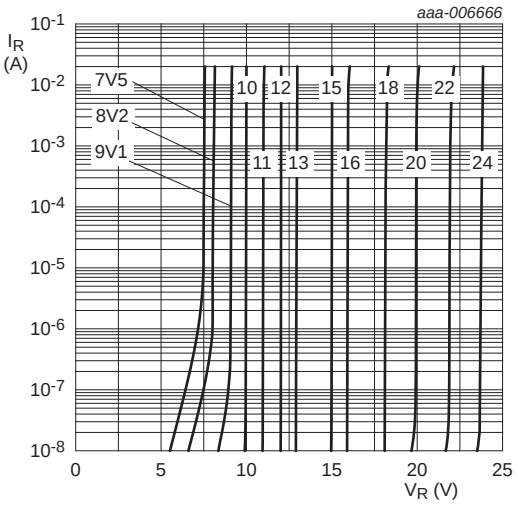
**Fig 4. Temperature coefficient as a function of working current; typical values**




BZX384-B/C2V4 to BZX384-B/C6V8

$T_{amb}$ = 25 °C

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




BZX384-B/C7V5 to BZX384-B/C24

$T_{amb}$ = 25 °C

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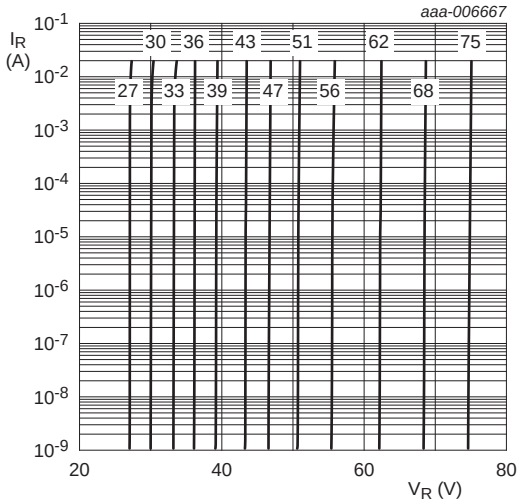


BZX384-B/C27 to BZX384-B/C75

$T_{amb}$ = 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

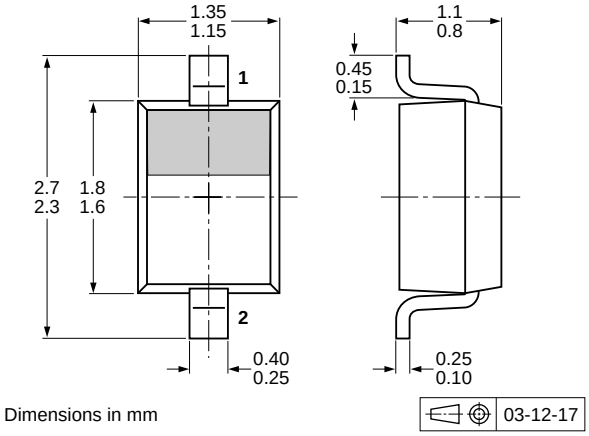


**Fig 8. Package outline SOD323 (SC-76)**


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## 10. Soldering

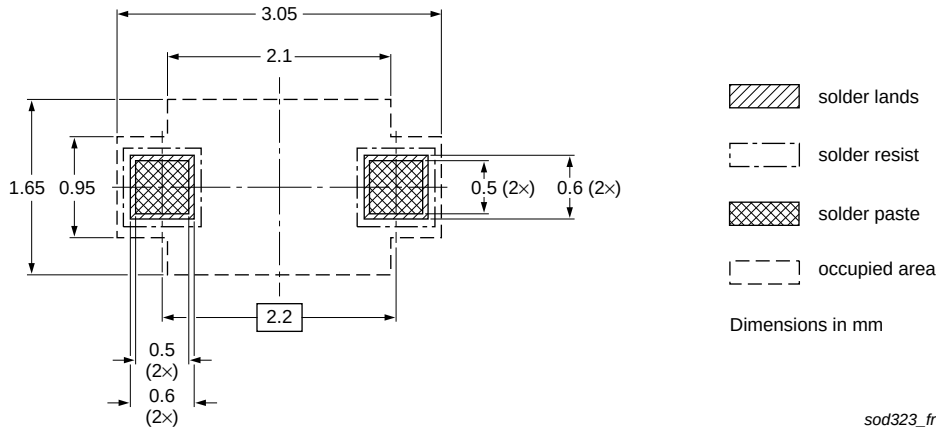


**Fig 9. Reflow soldering footprint SOD323 (SC-76)**

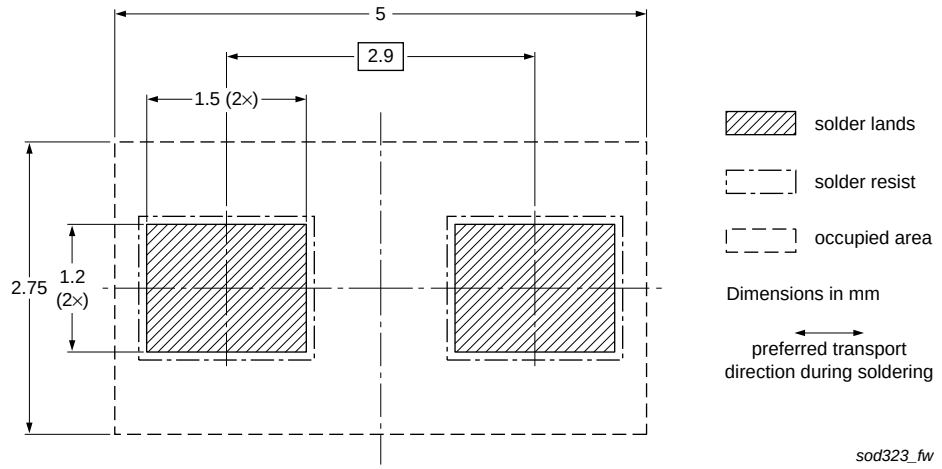


**Fig 10. Wave soldering footprint SOD323 (SC-76)**


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## 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: | • The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors<br>• Legal texts have been adapted to the new company name where appropriate.<br>• Section 1 “Product profile”: enhanced.<br>• Table 5: $T_{amb}$ added.<br>• Figure 5 to Figure 7: added.<br>• Section 8 “Test information”: added.<br>• Figure 9: replaced by minimized package outline.<br>• Section 10 “Soldering”: added.<br>• Section 12 “Legal information”: updated. | | | |
| BZX384_SER v.2 | 20040322 | Product data sheet | - | BZX384_SER v.1 |
| BZX384_SER v.1 | 20030401 | Product specification | - | - |


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| 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".

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