

PZUxBA series

Single Zener diodes

Rev. 01 — 19 September 2008

Product data sheet

1. Product profile

1.1 General description

General-purpose Zener diodes in a SOD323 (SC-76) very small Surface-Mounted Device (SMD) plastic package.

1.2 Features

- Non-repetitive peak reverse power dissipation: $P_{ZSM} \leq 40 \text{ W}$
- Total power dissipation: $P_{tot} \leq 320 \text{ mW}$
- Tolerance series:
B: approximately $\pm 5 \%$;
B1, B2, B3: approximately $\pm 2 \%$
- Wide working voltage range:
nominal 2.4 V to 36 V (E24 range)
- Low reverse current I_R range
- Small plastic package suitable for surface-mounted design
- 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 | $I_F = 100 \text{ mA}$ | [1] - | - | 1.1 | V |
| P_{ZSM} | non-repetitive peak reverse power dissipation | | [2] - | - | 40 | W |
| P_{tot} | total power dissipation | $T_{amb} \leq 25 \text{ }^\circ\text{C}$ | [3] - | - | 320 | mW |


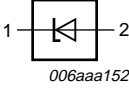
[1] Pulse test: $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$.

[2] $t_p = 100 \text{ } \mu\text{s}$; square wave; $T_j = 25 \text{ }^\circ\text{C}$ prior to surge

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

2. Pinning information

Table 2. Pinning

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

[1] The marking bar indicates the cathode.

3. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|---|---------|--|---------|
| | Name | Description | Version |
| PZU2.4BA to PZU36BA [1] | SC-76 | plastic surface-mounted package; 2 leads | SOD323 |
| PZU2.4BA/DG to PZU36BA/DG [1] [2] | | | |

[1] The series consists of 97 types with nominal working voltages from 2.4 V to 36 V.

[2] /DG: halogen-free

4. Marking

Table 4. Marking codes

| Type number ^[1] | Marking code | | | | Type number ^[1] | Marking code | | | |
|----------------------------|--------------|----|----|----|----------------------------|--------------|----|----|----|
| | B | B1 | B2 | B3 | | B | B1 | B2 | B3 |
| PZU2.4*A | X8 | - | - | - | PZU2.4*A/DG | Y8 | - | - | - |
| PZU2.7*A | X9 | XA | XB | - | PZU2.7*A/DG | Y9 | YA | YB | - |
| PZU3.0*A | XT | XU | XV | - | PZU3.0*A/DG | YT | YU | YV | - |
| PZU3.3*A | XW | XX | XY | - | PZU3.3*A/DG | YW | YX | YY | - |
| PZU3.6*A | XZ | MC | MD | - | PZU3.6*A/DG | YZ | NC | ND | - |
| PZU3.9*A | ME | MF | MG | - | PZU3.9*A/DG | NE | NF | NG | - |
| PZU4.3*A | MM | MN | MP | MR | PZU4.3*A/DG | NM | NN | NP | NR |
| PZU4.7*A | MS | MT | MU | MV | PZU4.7*A/DG | NS | NT | NU | NV |
| PZU5.1*A | MW | MX | MY | MZ | PZU5.1*A/DG | NW | NX | NY | NZ |
| PZU5.6*A | LF | LG | LH | LK | PZU5.6*A/DG | RF | RG | RH | RK |
| PZU6.2*A | LL | LM | LN | LP | PZU6.2*A/DG | RL | RM | RN | RP |
| PZU6.8*A | LR | LS | LT | LU | PZU6.8*A/DG | RR | RS | RT | RU |
| PZU7.5*A | LV | LW | LX | LY | PZU7.5*A/DG | RV | RW | RX | RY |
| PZU8.2*A | LZ | CR | CS | CT | PZU8.2*A/DG | RZ | ER | ES | ET |
| PZU9.1*A | CU | CV | CW | CX | PZU9.1*A/DG | EU | EV | EW | EX |
| PZU10*A | VA | VB | VC | VD | PZU10*A/DG | WA | WB | WC | WD |
| PZU11*A | VE | VF | VG | VH | PZU11*A/DG | WE | WF | WG | WH |
| PZU12*A | VK | VL | VM | VN | PZU12*A/DG | WK | WL | WM | WN |
| PZU13*A | VP | VR | VS | VT | PZU13*A/DG | WP | WR | WS | WT |
| PZU14*A | - | - | VU | - | PZU14*A/DG | - | - | WU | - |
| PZU15*A | VV | VW | VX | VY | PZU15*A/DG | WV | WW | WX | WY |
| PZU16*A | VZ | X1 | X2 | X3 | PZU16*A/DG | WZ | Y1 | Y2 | Y3 |
| PZU18*A | X4 | X5 | X6 | X7 | PZU18*A/DG | Y4 | Y5 | Y6 | Y7 |
| PZU20*A | XC | XD | XE | XF | PZU20*A/DG | YC | YD | YE | YF |
| PZU22*A | XG | XH | XK | XL | PZU22*A/DG | YG | YH | YK | YL |
| PZU24*A | XM | XN | XP | XR | PZU24*A/DG | YM | YN | YP | YR |
| PZU27*A | XS | - | - | - | PZU27*A/DG | YS | - | - | - |
| PZU30*A | MH | - | - | - | PZU30*A/DG | NH | - | - | - |
| PZU33*A | MK | - | - | - | PZU33*A/DG | NK | - | - | - |
| PZU36*A | ML | - | - | - | PZU36*A/DG | NL | - | - | - |

[1] * = B: tolerance series B, approximately $\pm 5\%$

* = B1, B2, B3: tolerance series B1, B2, B3: approximately $\pm 2\%$

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 | | - | 200 | 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] - | 320 | mW |
| | | | [3] - | 490 | mW |
| T_j | junction temperature | | - | 150 | °C |
| T_{amb} | ambient temperature | | -55 | +150 | °C |
| T_{stg} | storage temperature | | -65 | +150 | °C |

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

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

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm².

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] - | - | 390 | K/W |
| | | | [2] - | - | 255 | K/W |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | [3] - | - | 55 | K/W |

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

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm².

[3] 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 | | [1] | | | |
| | | $I_F = 10\text{ mA}$ | - | - | 0.9 | V |
| | | $I_F = 100\text{ mA}$ | - | - | 1.1 | V |

[1] Pulse test: $t_p \leq 300\ \mu\text{s}$; $\delta \leq 0.02$.

Table 8. Characteristics per type; PZU2.4BA to PZU5.6B3A and PZU2.4BA/DG to PZU5.6B3A/DG*T_J = 25 °C unless otherwise specified.*

| PZUxBA | 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 = 0.5 mA | I _Z = 5 mA | | | I _Z = 5 mA | | |
| | | Min | Max | Max | Max | Max | V _R (V) | Typ | Max | Max |
| 2.4 | B | 2.3 | 2.6 | 1000 | 100 | 50 | 1 | -1.6 | 450 | 8 |
| 2.7 | B | 2.5 | 2.9 | 1000 | 100 | 20 | 1 | -2.0 | 440 | 8 |
| | B1 | 2.5 | 2.75 | | | | | | | |
| | B2 | 2.65 | 2.9 | | | | | | | |
| 3.0 | B | 2.8 | 3.2 | 1000 | 95 | 10 | 1 | -2.1 | 425 | 8 |
| | B1 | 2.8 | 3.05 | | | | | | | |
| | B2 | 2.95 | 3.2 | | | | | | | |
| 3.3 | B | 3.1 | 3.5 | 1000 | 95 | 5 | 1 | -2.4 | 410 | 8 |
| | B1 | 3.1 | 3.35 | | | | | | | |
| | B2 | 3.25 | 3.5 | | | | | | | |
| 3.6 | B | 3.4 | 3.8 | 1000 | 90 | 5 | 1 | -2.4 | 390 | 8 |
| | B1 | 3.4 | 3.65 | | | | | | | |
| | B2 | 3.55 | 3.8 | | | | | | | |
| 3.9 | B | 3.7 | 4.1 | 1000 | 90 | 3 | 1 | -2.5 | 370 | 8 |
| | B1 | 3.7 | 3.97 | | | | | | | |
| | B2 | 3.87 | 4.10 | | | | | | | |
| 4.3 | B | 4.01 | 4.48 | 1000 | 90 | 3 | 1 | -2.5 | 350 | 8 |
| | B1 | 4.01 | 4.21 | | | | | | | |
| | B2 | 4.15 | 4.34 | | | | | | | |
| | B3 | 4.28 | 4.48 | | | | | | | |
| 4.7 | B | 4.42 | 4.9 | 800 | 80 | 2 | 1 | -1.4 | 325 | 8 |
| | B1 | 4.42 | 4.61 | | | | | | | |
| | B2 | 4.55 | 4.75 | | | | | | | |
| | B3 | 4.69 | 4.9 | | | | | | | |
| 5.1 | B | 4.84 | 5.37 | 250 | 60 | 2 | 1.5 | 0.3 | 300 | 5.5 |
| | B1 | 4.84 | 5.04 | | | | | | | |
| | B2 | 4.98 | 5.2 | | | | | | | |
| | B3 | 5.14 | 5.37 | | | | | | | |
| 5.6 | B | 5.31 | 5.92 | 100 | 40 | 1 | 2.5 | 1.9 | 275 | 5.5 |
| | B1 | 5.31 | 5.55 | | | | | | | |
| | B2 | 5.49 | 5.73 | | | | | | | |
| | B3 | 5.67 | 5.92 | | | | | | | |

[1] f = 1 MHz; V_R = 0 V[2] t_p = 100 μs; square wave; T_J = 25 °C prior to surge

Table 9. Characteristics per type; PZU6.2BA to PZU36BA and PZU6.2BA/DG to PZU36BA/DG

T_j = 25 °C unless otherwise specified.

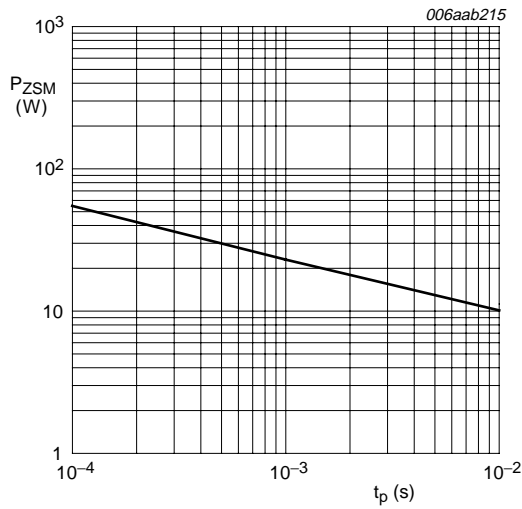
| PZUxBA | Sel | Working voltage V _Z (V) | | Differential resistance r _{dif} (Ω) | | Reverse current I _R (nA) | | Temperature coefficient S _Z (mV/K) | Diode capacitance C _d (pF) ^[1] | Non-repetitive peak reverse current I _{ZSM} (A) ^[2] |
|--------|-----|---------------------------------------|-------|---|-----------------------|--|--------------------|--|---|--|
| | | | | I _Z = 0.5 mA | I _Z = 5 mA | | | I _Z = 5 mA | | |
| | | Min | Max | Max | Max | Max | V _R (V) | Typ | Max | Max |
| 6.2 | B | 5.86 | 6.53 | 80 | 30 | 500 | 3 | 2.7 | 250 | 5.5 |
| | B1 | 5.86 | 6.12 | | | | | | | |
| | B2 | 6.06 | 6.33 | | | | | | | |
| | B3 | 6.26 | 6.53 | | | | | | | |
| 6.8 | B | 6.47 | 7.14 | 60 | 20 | 500 | 3.5 | 3.4 | 215 | 5.5 |
| | B1 | 6.47 | 6.73 | | | | | | | |
| | B2 | 6.65 | 6.93 | | | | | | | |
| | B3 | 6.86 | 7.14 | | | | | | | |
| 7.5 | B | 7.06 | 7.84 | 60 | 10 | 500 | 4 | 4.0 | 170 | 3.5 |
| | B1 | 7.06 | 7.36 | | | | | | | |
| | B2 | 7.28 | 7.60 | | | | | | | |
| | B3 | 7.52 | 7.84 | | | | | | | |
| 8.2 | B | 7.76 | 8.64 | 60 | 10 | 500 | 5 | 4.6 | 150 | 3.5 |
| | B1 | 7.76 | 8.1 | | | | | | | |
| | B2 | 8.02 | 8.36 | | | | | | | |
| | B3 | 8.28 | 8.64 | | | | | | | |
| 9.1 | B | 8.56 | 9.55 | 60 | 10 | 500 | 6 | 5.5 | 120 | 3.5 |
| | B1 | 8.56 | 8.93 | | | | | | | |
| | B2 | 8.85 | 9.23 | | | | | | | |
| | B3 | 9.15 | 9.55 | | | | | | | |
| 10 | B | 9.45 | 10.55 | 60 | 10 | 100 | 7 | 6.4 | 110 | 3.5 |
| | B1 | 9.45 | 9.87 | | | | | | | |
| | B2 | 9.77 | 10.21 | | | | | | | |
| | B3 | 10.11 | 10.55 | | | | | | | |
| 11 | B | 10.44 | 11.56 | 60 | 10 | 100 | 8 | 7.4 | 108 | 3 |
| | B1 | 10.44 | 10.88 | | | | | | | |
| | B2 | 10.76 | 11.22 | | | | | | | |
| | B3 | 11.1 | 11.56 | | | | | | | |
| 12 | B | 11.42 | 12.6 | 80 | 10 | 100 | 9 | 8.4 | 105 | 3 |
| | B1 | 11.42 | 11.9 | | | | | | | |
| | B2 | 11.74 | 12.24 | | | | | | | |
| | B3 | 12.08 | 12.6 | | | | | | | |
| 13 | B | 12.47 | 13.96 | 80 | 10 | 100 | 10 | 9.4 | 103 | 2.5 |
| | B1 | 12.47 | 13.03 | | | | | | | |
| | B2 | 12.91 | 13.49 | | | | | | | |
| | B3 | 13.37 | 13.96 | | | | | | | |

Table 9. Characteristics per type; PZU6.2BA to PZU36BA and PZU6.2BA/DG to PZU36BA/DG ...continued
 $T_j = 25\text{ °C}$ unless otherwise specified.

| PZUxBA | Sel | Working voltage V_Z (V) | | Differential resistance r_{dif} (Ω) | | Reverse current I_R (nA) | | Temperature coefficient S_Z (mV/K) | Diode capacitance C_d (pF) ^[1] | Non-repetitive peak reverse current I_{ZSM} (A) ^[2] |
|--------|-----|---------------------------|-------|---|---------------------|----------------------------|-----------|--------------------------------------|---|--|
| | | $I_Z = 5\text{ mA}$ | | $I_Z = 0.5\text{ mA}$ | $I_Z = 5\text{ mA}$ | | | $I_Z = 5\text{ mA}$ | | |
| | | Min | Max | Max | Max | Max | V_R (V) | Typ | Max | Max |
| 14 | B2 | 13.70 | 14.30 | 80 | 10 | 100 | 11 | 10.4 | 101 | 2 |
| 15 | B | 13.84 | 15.52 | 80 | 15 | 50 | 11 | 11.4 | 99 | 2 |
| | B1 | 13.84 | 14.46 | | | | | | | |
| | B2 | 14.34 | 14.98 | | | | | | | |
| | B3 | 14.85 | 15.52 | | | | | | | |
| 16 | B | 15.37 | 17.09 | 80 | 20 | 50 | 12 | 12.4 | 97 | 1.5 |
| | B1 | 15.37 | 16.01 | | | | | | | |
| | B2 | 15.85 | 16.51 | | | | | | | |
| | B3 | 16.35 | 17.09 | | | | | | | |
| 18 | B | 16.94 | 19.03 | 80 | 20 | 50 | 13 | 14.4 | 93 | 1.5 |
| | B1 | 16.94 | 17.7 | | | | | | | |
| | B2 | 17.56 | 18.35 | | | | | | | |
| | B3 | 18.21 | 19.03 | | | | | | | |
| 20 | B | 18.86 | 21.08 | 100 | 20 | 50 | 15 | 16.4 | 88 | 1.5 |
| | B1 | 18.86 | 19.7 | | | | | | | |
| | B2 | 19.52 | 20.39 | | | | | | | |
| | B3 | 20.21 | 21.08 | | | | | | | |
| 22 | B | 20.88 | 23.17 | 100 | 25 | 50 | 17 | 18.4 | 84 | 1.3 |
| | B1 | 20.88 | 21.77 | | | | | | | |
| | B2 | 21.54 | 22.47 | | | | | | | |
| | B3 | 22.23 | 23.17 | | | | | | | |
| 24 | B | 22.93 | 25.57 | 120 | 30 | 50 | 19 | 20.4 | 80 | 1.3 |
| | B1 | 22.93 | 23.96 | | | | | | | |
| | B2 | 23.72 | 24.78 | | | | | | | |
| | B3 | 24.54 | 25.57 | | | | | | | |
| 27 | B | 25.1 | 28.9 | 150 | 40 | 50 | 21 | 23.4 | 73 | 1 |
| 30 | B | 28 | 32 | 200 | 40 | 50 | 23 | 26.6 | 66 | 1 |
| 33 | B | 31 | 35 | 250 | 40 | 50 | 25 | 29.7 | 60 | 0.9 |
| 36 | B | 34 | 38 | 300 | 60 | 50 | 27 | 33.0 | 59 | 0.8 |

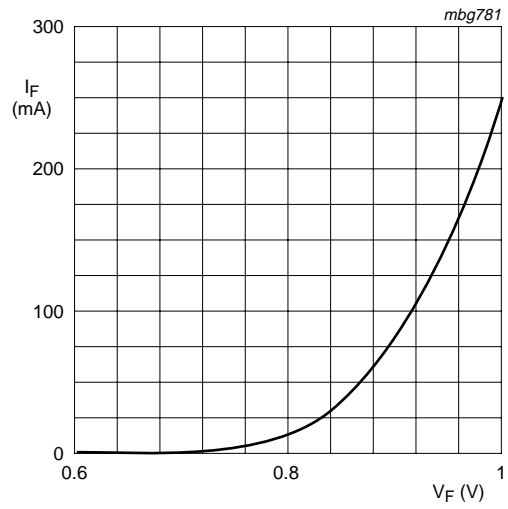
[1] $f = 1\text{ MHz}$; $V_R = 0\text{ V}$

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



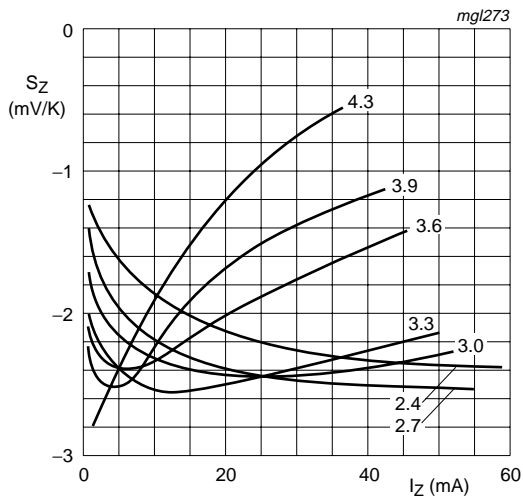
$T_j = 25\text{ }^\circ\text{C}$ (prior to surge)

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



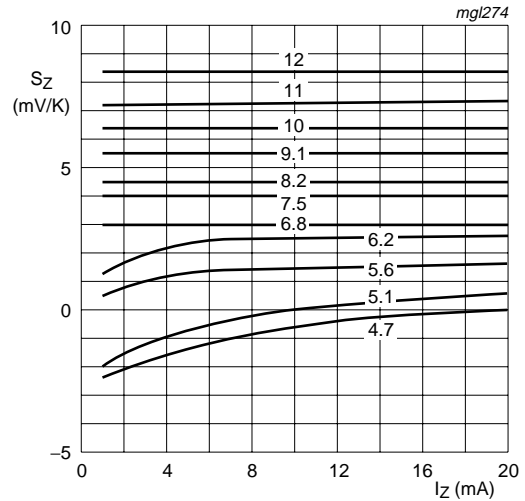
$T_j = 25\text{ }^\circ\text{C}$

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



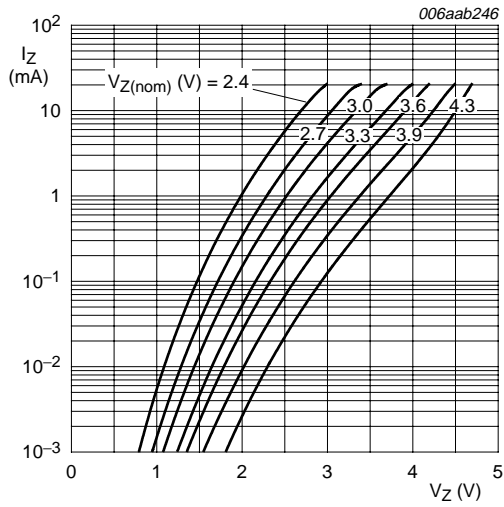
$T_j = 25\text{ }^\circ\text{C}$ to $150\text{ }^\circ\text{C}$
 $V_Z = 2.4\text{ V}$ to 4.3 V

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



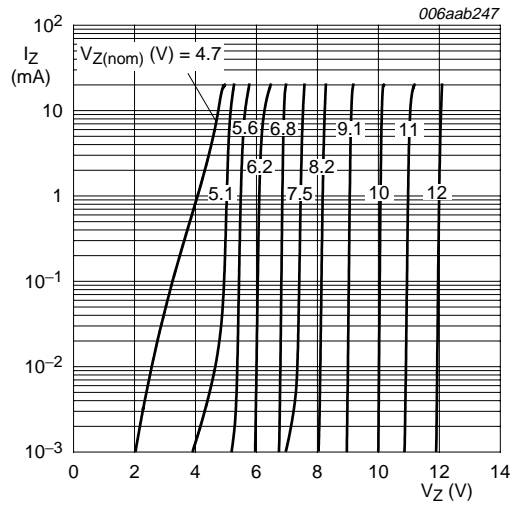
$T_j = 25\text{ }^\circ\text{C}$ to $150\text{ }^\circ\text{C}$
 $V_Z = 4.7\text{ V}$ to 12 V

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



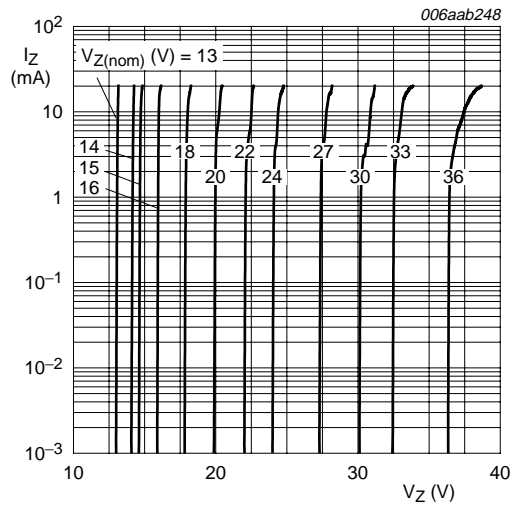
$T_j = 25\text{ }^\circ\text{C}$
 $V_Z = 2.4\text{ V to }4.3\text{ V}$

Fig 5. Working current as a function of working voltage; typical values



$T_j = 25\text{ }^\circ\text{C}$
 $V_Z = 4.7\text{ V to }12\text{ V}$

Fig 6. Working current as a function of working voltage; typical values



$T_j = 25\text{ }^\circ\text{C}$
 $V_Z = 13\text{ V to }36\text{ V}$

Fig 7. Working current as a function of working 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

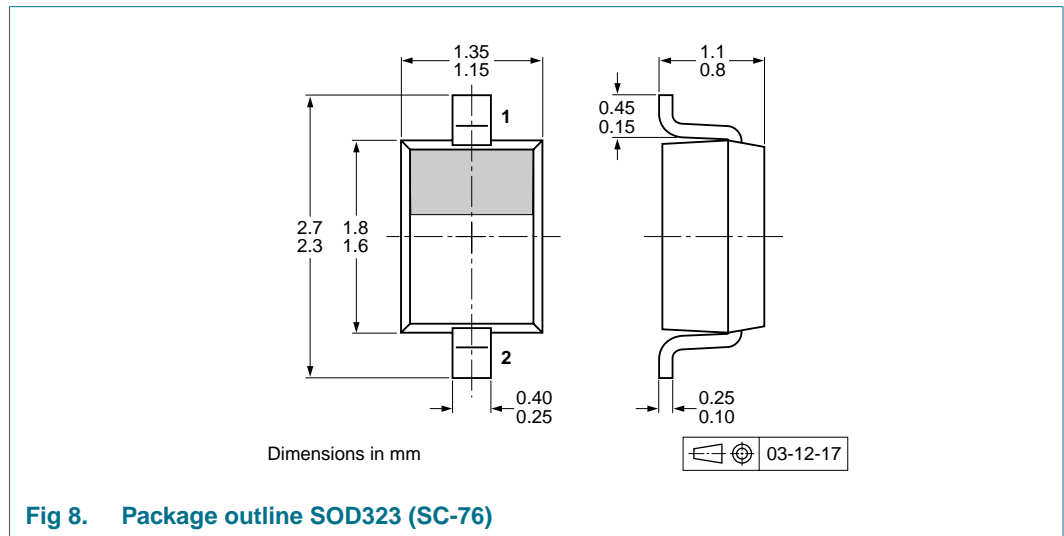


Fig 8. Package outline SOD323 (SC-76)

10. Packing information

Table 10. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.^[1]

| Type number | Package | Description | Packing quantity | |
|------------------------------|---------|--------------------------------|------------------|-------|
| | | | 3000 | 10000 |
| PZU2.4BA to PZU36BA | SOD323 | 4 mm pitch, 8 mm tape and reel | -115 | -135 |
| PZU2.4BA/DG to PZU36BA/DG | | | | |

[1] For further information and the availability of packing methods, see [Section 13](#).

11. Soldering

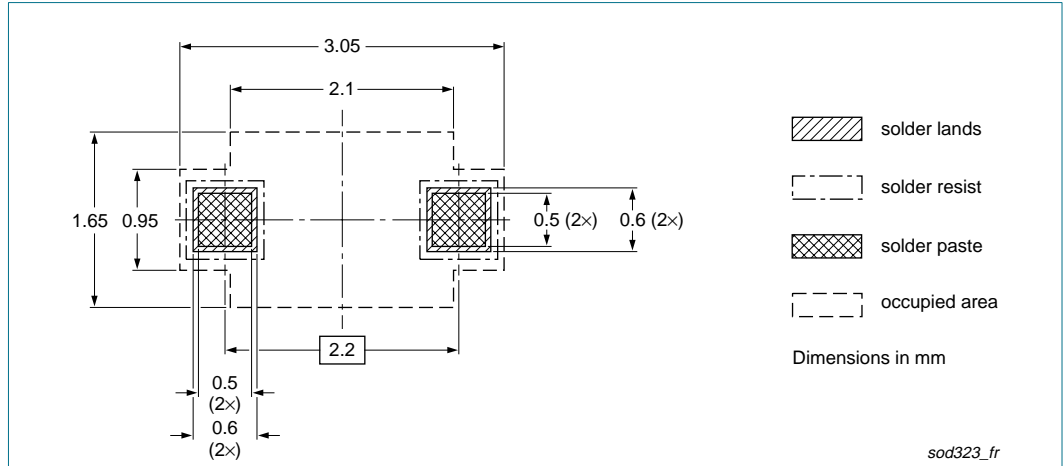


Fig 9. Reflow soldering footprint SOD323 (SC-76)

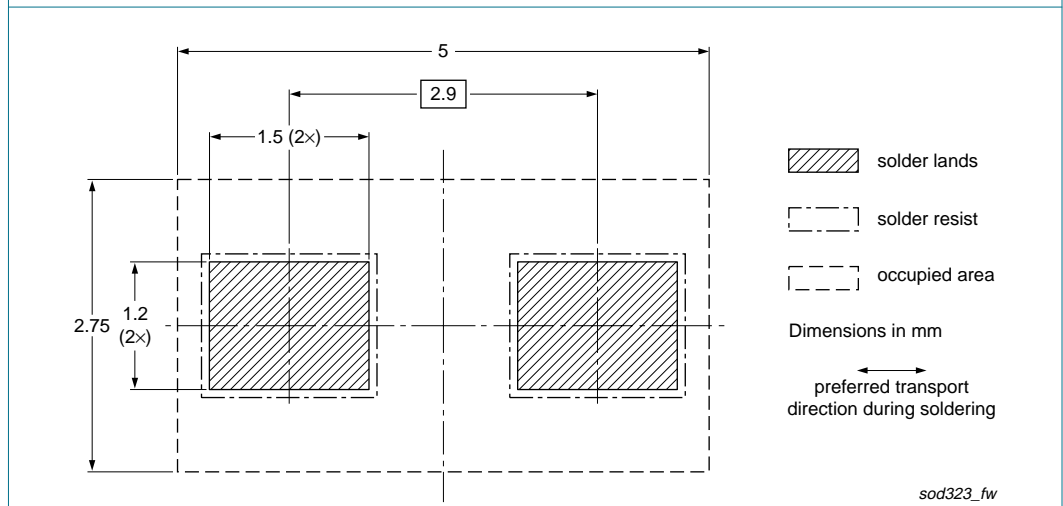


Fig 10. Wave soldering footprint SOD323 (SC-76)

12. Revision history

Table 11. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|--------------|--------------|--------------------|---------------|------------|
| PZUXBA_SER_1 | 20080919 | Product data sheet | - | - |

13. Legal information

13.1 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.nxp.com>.

13.2 Definitions

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