



**THE DATASHEET OF
PZU4.7B1A,115**



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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] |
|--------|-----|---------------------------------------|------|---|-----|--|--------------------|--|---|--|
| | | | | | | | | | | |
| | | 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

$T_j = 25\text{ }^\circ\text{C}$ 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] |
|--------|-----|---------------------------|-------|--|---------------------|----------------------------|-----------|--------------------------------------|---|--|
| | | | | $I_Z = 0.5\text{ mA}$ | $I_Z = 5\text{ mA}$ | | | $I_Z = 5\text{ mA}$ | | |
| | | Min | Max | Max | Max | Max | V_R (V) | Typ | Max | Max |
| 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 °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 mA | | I _Z = 0.5 mA | I _Z = 5 mA | | | I _Z = 5 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 MHz; V_R = 0 V

[2] t_p = 100 μs; square wave; T_j = 25 °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. |
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[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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