

# PZUxBL series

## Single Zener diodes

Rev. 01 — 6 May 2008

Product data sheet

## 1. Product profile

### 1.1 General description

General-purpose Zener diodes in SOD882 leadless ultra 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:  $P_{tot} \leq 250 \text{ mW}$
- Tolerance series:  
B: approximately  $\pm 5 \%$ ;  
B2: 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][4] - | -   | 250 | mW   |

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

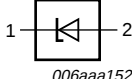
[2]  $t_p = 100 \text{ } \mu\text{s}$ ; square wave;  $T_j = 25 \text{ }^\circ\text{C}$  prior to surge

[3] Reflow soldering is the only recommended soldering method.

[4] 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     | <br>Transparent top view | <br>006aaa152 |
| 2   | anode       |                                                                                                             |                                                                                                  |

[1] The marking bar indicates the cathode.

## 3. Ordering information

Table 3. Ordering information

| Type number              | Package |                                                                            |         |
|--------------------------|---------|----------------------------------------------------------------------------|---------|
|                          | Name    | Description                                                                | Version |
| PZU2.4BL to PZU36BL[1]   | -       | leadless ultra small plastic package; 2 terminals; body 1.0 × 0.6 × 0.5 mm | SOD882  |
| PZU2.7B2L to PZU24B2L[2] |         |                                                                            |         |

[1] The series consists of 29 types with nominal working voltages from 2.4 V to 36 V.

[2] The series consists of 25 types with nominal working voltages from 2.7 V to 24 V.

## 4. Marking

Table 4. Marking codes

| Type number | Marking code | Type number | Marking code |
|-------------|--------------|-------------|--------------|
| PZU2.4BL    | H2           | PZU2.7B2L   | HZ           |
| PZU2.7BL    | H3           | PZU3.0B2L   | K1           |
| PZU3.0BL    | H4           | PZU3.3B2L   | K2           |
| PZU3.3BL    | H5           | PZU3.6B2L   | K3           |
| PZU3.6BL    | H6           | PZU3.9B2L   | K4           |
| PZU3.9BL    | H7           | PZU4.3B2L   | K5           |
| PZU4.3BL    | H8           | PZU4.7B2L   | K6           |
| PZU4.7BL    | H9           | PZU5.1B2L   | K7           |
| PZU5.1BL    | HA           | PZU5.6B2L   | K8           |
| PZU5.6BL    | HB           | PZU6.2B2L   | H1           |
| PZU6.2BL    | HC           | PZU6.8B2L   | K9           |
| PZU6.8BL    | HD           | PZU7.5B2L   | KA           |
| PZU7.5BL    | HE           | PZU8.2B2L   | KB           |
| PZU8.2BL    | HF           | PZU9.1B2L   | KC           |
| PZU9.1BL    | HG           | PZU10B2L    | KD           |
| PZU10BL     | HH           | PZU11B2L    | KE           |
| PZU11BL     | HK           | PZU12B2L    | KF           |

Table 4. Marking codes ...continued

| Type number | Marking code | Type number | Marking code |
|-------------|--------------|-------------|--------------|
| PZU12BL     | HL           | PZU13B2L    | KG           |
| PZU13BL     | HM           | PZU14B2L    | KH           |
| PZU15BL     | HN           | PZU15B2L    | KK           |
| PZU16BL     | HP           | PZU16B2L    | KL           |
| PZU18BL     | HR           | PZU18B2L    | KM           |
| PZU20BL     | HS           | PZU20B2L    | KN           |
| PZU22BL     | HT           | PZU22B2L    | KP           |
| PZU24BL     | HU           | PZU24B2L    | KR           |
| PZU27BL     | HV           | -           | -            |
| PZU30BL     | HW           | -           | -            |
| PZU33BL     | HX           | -           | -            |
| PZU36BL     | HY           | -           | -            |

## 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 <a href="#">Table 8</a> and <a href="#">9</a> |                    |
| $P_{ZSM}$ | non-repetitive peak reverse power dissipation |                                           | [1] -    | 40                                                | W                  |
| $P_{tot}$ | total power dissipation                       | $T_{amb} \leq 25\text{ }^{\circ}\text{C}$ | [2][3] - | 250                                               | mW                 |
|           |                                               |                                           | [2][4] - | 500                                               | mW                 |
| $T_j$     | junction temperature                          |                                           | -        | 150                                               | $^{\circ}\text{C}$ |
| $T_{amb}$ | ambient temperature                           |                                           | -55      | +150                                              | $^{\circ}\text{C}$ |
| $T_{stg}$ | storage temperature                           |                                           | -65      | +150                                              | $^{\circ}\text{C}$ |

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

[2] Reflow soldering is the only recommended soldering method.

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

[4] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode  $1\text{ cm}^2$ .

## 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][2] | -   | -   | 500 K/W |
|                |                                                  |             | [1][3] | -   | -   | 250 K/W |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point |             | [4]    | -   | -   | 55 K/W  |

[1] Reflow soldering is the only recommended soldering method.

[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 cm<sup>2</sup>.

[4] Soldering point of cathode tab.

## 7. Characteristics

**Table 7. Characteristics**

$T_j = 25^\circ\text{C}$  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:  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$ .

**Table 8. Characteristics per type; PZU2.4BL to PZU5.6B2L**

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

| PZUxxx | Sel | Working voltage<br>$V_Z$ (V) |      | Differential resistance<br>$r_{dif}$ ( $\Omega$ ) |     | Reverse current<br>$I_R$ ( $\mu\text{A}$ ) |           | Temperature coefficient<br>$S_Z$ (mV/K) | Diode capacitance<br>$C_d$ (pF)[1] | Non-repetitive peak reverse current<br>$I_{ZSM}$ (A)[2] |
|--------|-----|------------------------------|------|---------------------------------------------------|-----|--------------------------------------------|-----------|-----------------------------------------|------------------------------------|---------------------------------------------------------|
|        |     | $I_Z = 5\text{ mA}$          |      | $I_Z = 0.5\text{ mA}$                             |     | $I_Z = 5\text{ mA}$                        |           | $I_Z = 5\text{ mA}$                     | Max                                | Max                                                     |
|        |     | Min                          | Max  | Max                                               | Max | Max                                        | $V_R$ (V) | Typ                                     |                                    |                                                         |
| 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                                                       |
|        | B2  | 2.65                         | 2.9  |                                                   |     |                                            |           |                                         |                                    |                                                         |
| 3.0    | B   | 2.80                         | 3.20 | 1000                                              | 95  | 10                                         | 1         | -2.1                                    | 425                                | 8                                                       |
|        | B2  | 2.95                         | 3.20 |                                                   |     |                                            |           |                                         |                                    |                                                         |
| 3.3    | B   | 3.10                         | 3.50 | 1000                                              | 95  | 5                                          | 1         | -2.4                                    | 410                                | 8                                                       |
|        | B2  | 3.25                         | 3.50 |                                                   |     |                                            |           |                                         |                                    |                                                         |
| 3.6    | B   | 3.40                         | 3.80 | 1000                                              | 90  | 5                                          | 1         | -2.4                                    | 390                                | 8                                                       |
|        | B2  | 3.55                         | 3.80 |                                                   |     |                                            |           |                                         |                                    |                                                         |
| 3.9    | B   | 3.70                         | 4.10 | 1000                                              | 90  | 3                                          | 1         | -2.5                                    | 370                                | 8                                                       |
|        | B2  | 3.87                         | 4.10 |                                                   |     |                                            |           |                                         |                                    |                                                         |
| 4.3    | B   | 4.01                         | 4.48 | 1000                                              | 90  | 3                                          | 1         | -2.5                                    | 350                                | 8                                                       |
|        | B2  | 4.15                         | 4.34 |                                                   |     |                                            |           |                                         |                                    |                                                         |

**Table 8. Characteristics per type; PZU2.4BL to PZU5.6B2L ...continued** $T_j = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

| PZUxxx | Sel | Working voltage<br>$V_Z$ (V) |      | Differential resistance<br>$r_{\text{dif}}$ ( $\Omega$ ) |                     | Reverse current<br>$I_R$ ( $\mu\text{A}$ ) |           | Temperature coefficient<br>$S_Z$ (mV/K) | Diode capacitance<br>$C_d$ (pF) <sup>[1]</sup> | Non-repetitive peak reverse current<br>$I_{ZSM}$ (A) <sup>[2]</sup> |
|--------|-----|------------------------------|------|----------------------------------------------------------|---------------------|--------------------------------------------|-----------|-----------------------------------------|------------------------------------------------|---------------------------------------------------------------------|
|        |     | $I_Z = 5\text{ mA}$          |      | $I_Z = 0.5\text{ mA}$                                    | $I_Z = 5\text{ mA}$ |                                            |           | $I_Z = 5\text{ mA}$                     |                                                |                                                                     |
|        |     | Min                          | Max  | Max                                                      | Max                 | Max                                        | $V_R$ (V) | Typ                                     |                                                |                                                                     |
| 4.7    | B   | 4.42                         | 4.90 | 800                                                      | 80                  | 2                                          | 1         | -1.4                                    | 325                                            | 8                                                                   |
|        | B2  | 4.55                         | 4.75 |                                                          |                     |                                            |           |                                         |                                                |                                                                     |
| 5.1    | B   | 4.84                         | 5.37 | 250                                                      | 60                  | 2                                          | 1.5       | 0.3                                     | 300                                            | 5.5                                                                 |
|        | B2  | 4.98                         | 5.20 |                                                          |                     |                                            |           |                                         |                                                |                                                                     |
| 5.6    | B   | 5.31                         | 5.92 | 100                                                      | 40                  | 1                                          | 2.5       | 1.9                                     | 275                                            | 5.5                                                                 |
|        | B2  | 5.49                         | 5.73 |                                                          |                     |                                            |           |                                         |                                                |                                                                     |

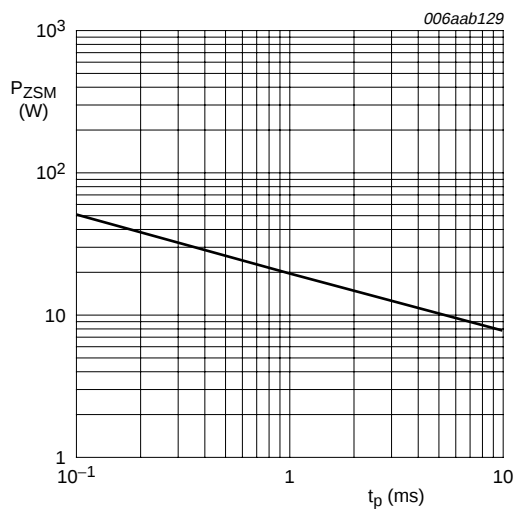
[1]  $f = 1\text{ MHz}$ ;  $V_R = 0\text{ V}$ [2]  $t_p = 100\text{ }\mu\text{s}$ ; square wave;  $T_j = 25\text{ }^{\circ}\text{C}$  prior to surge**Table 9. Characteristics per type; PZU6.2BL to PZU36BL** $T_j = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

| PZUxxx | Sel | Working voltage<br>$V_Z$ (V) |       | Differential resistance<br>$r_{\text{dif}}$ ( $\Omega$ ) |                     | Reverse current<br>$I_R$ (nA) |           | Temperature coefficient<br>$S_Z$ (mV/K) | Diode capacitance<br>$C_d$ (pF) <sup>[1]</sup> | Non-repetitive peak reverse current<br>$I_{ZSM}$ (A) <sup>[2]</sup> |
|--------|-----|------------------------------|-------|----------------------------------------------------------|---------------------|-------------------------------|-----------|-----------------------------------------|------------------------------------------------|---------------------------------------------------------------------|
|        |     | $I_Z = 5\text{ mA}$          |       | $I_Z = 0.5\text{ mA}$                                    | $I_Z = 5\text{ mA}$ |                               |           | $I_Z = 5\text{ mA}$                     |                                                |                                                                     |
|        |     | Min                          | Max   | Max                                                      | Max                 | Max                           | $V_R$ (V) | Typ                                     |                                                |                                                                     |
| 6.2    | B   | 5.86                         | 6.53  | 80                                                       | 30                  | 500                           | 3         | 2.7                                     | 250                                            | 5.5                                                                 |
|        | B2  | 6.06                         | 6.33  |                                                          |                     |                               |           |                                         |                                                |                                                                     |
| 6.8    | B   | 6.47                         | 7.14  | 60                                                       | 20                  | 500                           | 3.5       | 3.4                                     | 215                                            | 5.5                                                                 |
|        | B2  | 6.65                         | 6.93  |                                                          |                     |                               |           |                                         |                                                |                                                                     |
| 7.5    | B   | 7.06                         | 7.84  | 60                                                       | 10                  | 500                           | 4         | 4.0                                     | 170                                            | 3.5                                                                 |
|        | B2  | 7.28                         | 7.60  |                                                          |                     |                               |           |                                         |                                                |                                                                     |
| 8.2    | B   | 7.76                         | 8.64  | 60                                                       | 10                  | 500                           | 5         | 4.6                                     | 150                                            | 3.5                                                                 |
|        | B2  | 8.02                         | 8.36  |                                                          |                     |                               |           |                                         |                                                |                                                                     |
| 9.1    | B   | 8.56                         | 9.55  | 60                                                       | 10                  | 500                           | 6         | 5.5                                     | 120                                            | 3.5                                                                 |
|        | B2  | 8.85                         | 9.23  |                                                          |                     |                               |           |                                         |                                                |                                                                     |
| 10     | B   | 9.45                         | 10.55 | 60                                                       | 10                  | 100                           | 7         | 6.4                                     | 110                                            | 3.5                                                                 |
|        | B2  | 9.77                         | 10.21 |                                                          |                     |                               |           |                                         |                                                |                                                                     |
| 11     | B   | 10.44                        | 11.56 | 60                                                       | 10                  | 100                           | 8         | 7.4                                     | 108                                            | 3                                                                   |
|        | B2  | 10.76                        | 11.22 |                                                          |                     |                               |           |                                         |                                                |                                                                     |
| 12     | B   | 11.42                        | 12.60 | 80                                                       | 10                  | 100                           | 9         | 8.4                                     | 105                                            | 3                                                                   |
|        | B2  | 11.74                        | 12.24 |                                                          |                     |                               |           |                                         |                                                |                                                                     |
| 13     | B   | 12.47                        | 13.96 | 80                                                       | 10                  | 100                           | 10        | 9.4                                     | 103                                            | 2.5                                                                 |
|        | B2  | 12.91                        | 13.49 |                                                          |                     |                               |           |                                         |                                                |                                                                     |
| 14     | B2  | 13.70                        | 14.30 | 80                                                       | 10                  | 100                           | 11        | 10.4                                    | 101                                            | 2                                                                   |

**Table 9.** Characteristics per type; PZU6.2BL to PZU36BL ...continued $T_j = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

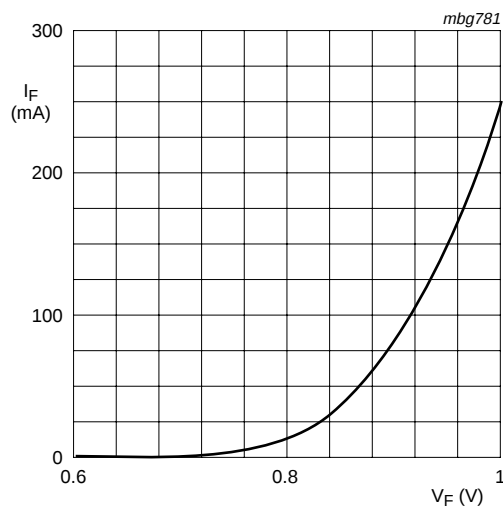
| PZUxxx | Sel | Working voltage<br>$V_Z$ (V) |       | Differential resistance<br>$r_{dif}$ ( $\Omega$ ) |                     | Reverse current<br>$I_R$ (nA) |           | Temperature coefficient<br>$S_Z$ (mV/K) | Diode capacitance<br>$C_d$ (pF) <sup>[1]</sup> | Non-repetitive peak reverse current<br>$I_{ZSM}$ (A) <sup>[2]</sup> |
|--------|-----|------------------------------|-------|---------------------------------------------------|---------------------|-------------------------------|-----------|-----------------------------------------|------------------------------------------------|---------------------------------------------------------------------|
|        |     | $I_Z = 5\text{ mA}$          |       | $I_Z = 0.5\text{ mA}$                             | $I_Z = 5\text{ mA}$ |                               |           | $I_Z = 5\text{ mA}$                     |                                                |                                                                     |
|        |     | Min                          | Max   | Max                                               | Max                 | Max                           | $V_R$ (V) | Typ                                     |                                                |                                                                     |
| 15     | B   | 13.84                        | 15.52 | 80                                                | 15                  | 50                            | 11        | 11.4                                    | 99                                             | 2                                                                   |
|        | B2  | 14.34                        | 14.98 |                                                   |                     |                               |           |                                         |                                                |                                                                     |
| 16     | B   | 15.37                        | 17.09 | 80                                                | 20                  | 50                            | 12        | 12.4                                    | 97                                             | 1.5                                                                 |
|        | B2  | 15.85                        | 16.51 |                                                   |                     |                               |           |                                         |                                                |                                                                     |
| 18     | B   | 16.94                        | 19.03 | 80                                                | 20                  | 50                            | 13        | 14.4                                    | 93                                             | 1.5                                                                 |
|        | B2  | 17.56                        | 18.35 |                                                   |                     |                               |           |                                         |                                                |                                                                     |
| 20     | B   | 18.86                        | 21.08 | 100                                               | 20                  | 50                            | 15        | 16.4                                    | 88                                             | 1.5                                                                 |
|        | B2  | 19.52                        | 20.39 |                                                   |                     |                               |           |                                         |                                                |                                                                     |
| 22     | B   | 20.88                        | 23.17 | 100                                               | 25                  | 50                            | 17        | 18.4                                    | 84                                             | 1.3                                                                 |
|        | B2  | 21.54                        | 22.47 |                                                   |                     |                               |           |                                         |                                                |                                                                     |
| 24     | B   | 22.93                        | 25.57 | 120                                               | 30                  | 50                            | 19        | 20.4                                    | 80                                             | 1.3                                                                 |
|        | B2  | 23.72                        | 24.78 |                                                   |                     |                               |           |                                         |                                                |                                                                     |
| 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;  $T_j = 25\text{ }^{\circ}\text{C}$  prior to surge



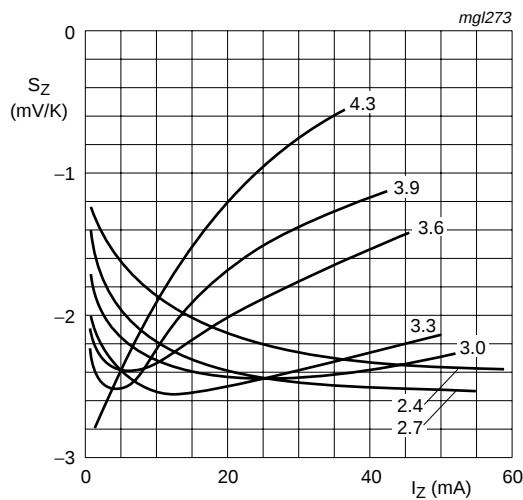
$T_j = 25\text{ }^{\circ}\text{C}$  (prior to surge)

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



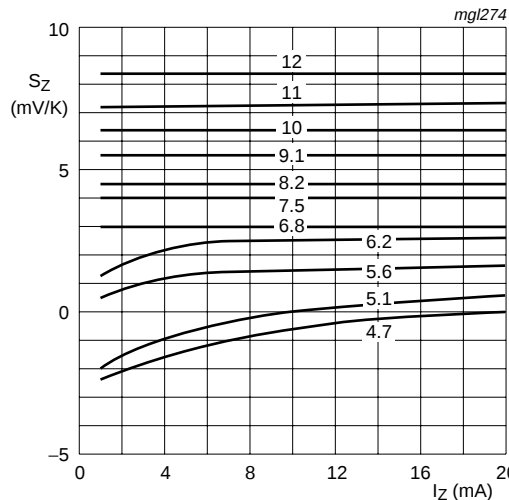
$T_j = 25\text{ }^{\circ}\text{C}$

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



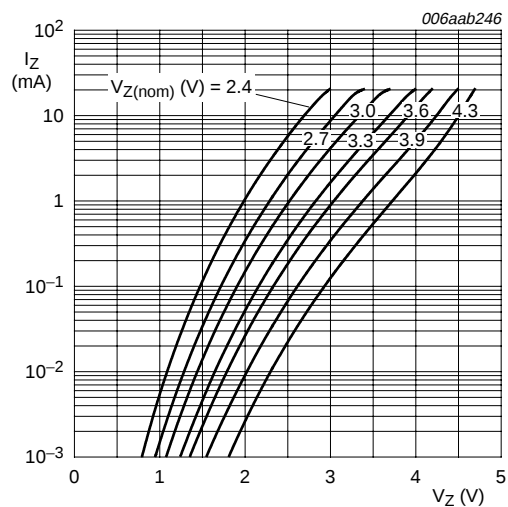
$T_j = 25\text{ }^{\circ}\text{C}$  to  $150\text{ }^{\circ}\text{C}$   
PZU2.4BL to PZU4.3B2L

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



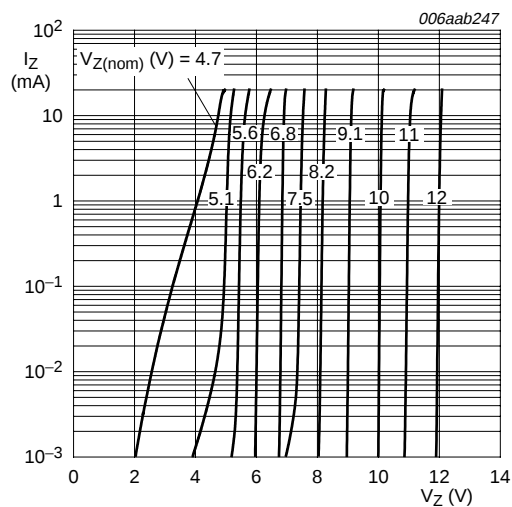
$T_j = 25\text{ }^{\circ}\text{C}$  to  $150\text{ }^{\circ}\text{C}$   
PZU4.7BL to PZU12B2L

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



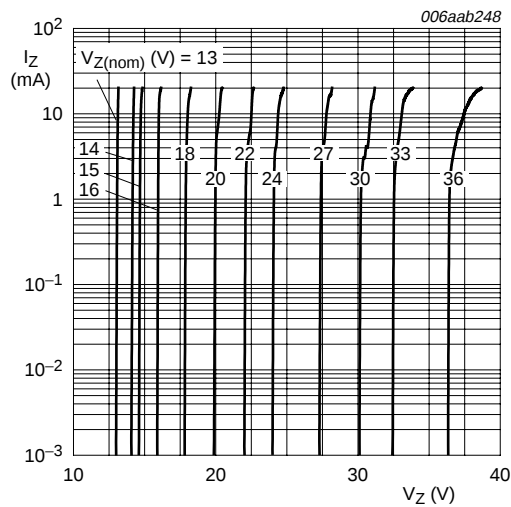
$T_j = 25\text{ }^{\circ}\text{C}$   
PZU2.4BL to PZU4.3B2L

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



$T_j = 25\text{ }^{\circ}\text{C}$   
PZU4.7BL to PZU12B2L

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



$T_j = 25\text{ }^{\circ}\text{C}$   
PZU13BL to PZU36BL

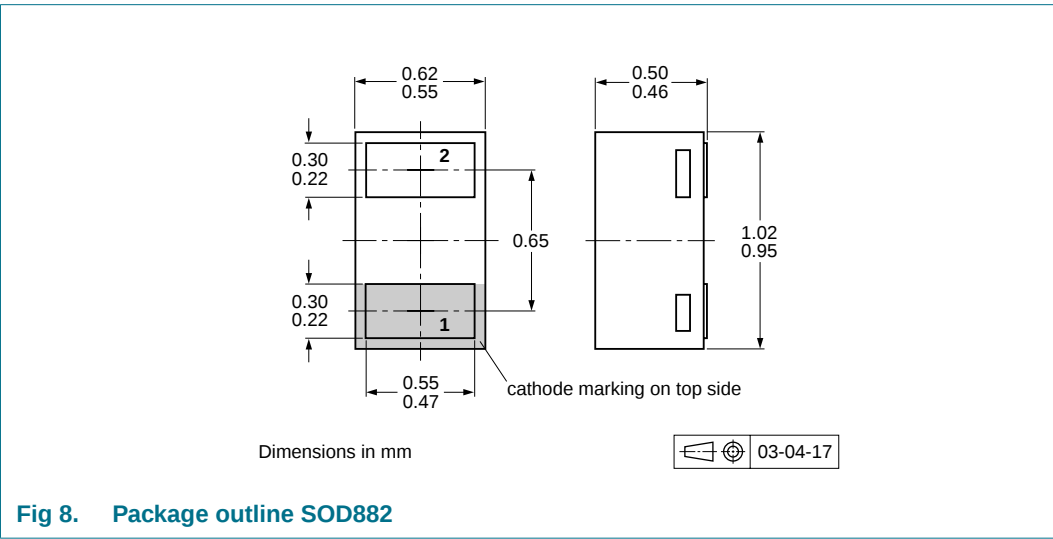
Fig 7. Working current as a function of working voltage; typical values

## 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



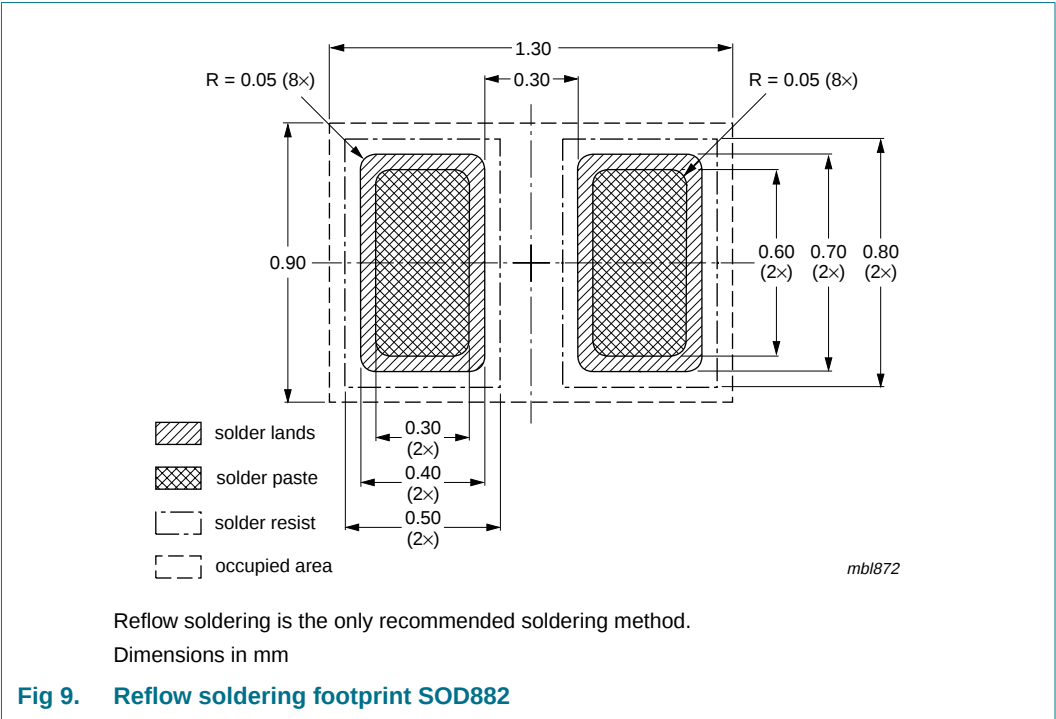
## 10. Packing information

**Table 10. Packing methods**  
The indicated -xxx are the last three digits of the 12NC ordering code.[\[1\]](#)

| Type number           | Package | Description                    | Packing quantity |
|-----------------------|---------|--------------------------------|------------------|
|                       |         |                                | 10000            |
| PZU2.4BL to PZU36BL   | SOD882  | 2 mm pitch, 8 mm tape and reel | -315             |
| PZU2.7B2L to PZU24B2L |         |                                |                  |

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

11. Soldering



12. Revision history

Table 11. Revision history

| Document ID  | Release date | Data sheet status  | Change notice | Supersedes |
|--------------|--------------|--------------------|---------------|------------|
| PZUXBL_SER_1 | 20080506     | Product data sheet | -             | -          |

## 13. Legal information

### 13.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | 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>.

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