

ZRB500
PRECISION 5V MICROPOWER VOLTAGE REFERENCE

Description

The ZRB500 uses a bandgap circuit design to achieve a precision micropower voltage reference of 5.0 volts. The device is available in small outline surface mount packages, ideal for applications where space saving is important, as well as packages for through hole requirements.

The ZRB500 design provides a stable voltage without an external capacitor and is stable with capacitive loads. The ZRB500 is recommended for operation between 50_A and 15mA and so is ideally suited to low power and battery powered applications.

Excellent performance is maintained to an absolute maximum of 25mA, however the rugged design and 20 volt processing allows the reference to withstand transient effects and currents up to 200mA. Superior switching capability allows the device to reach stable operating conditions in only a few microseconds.

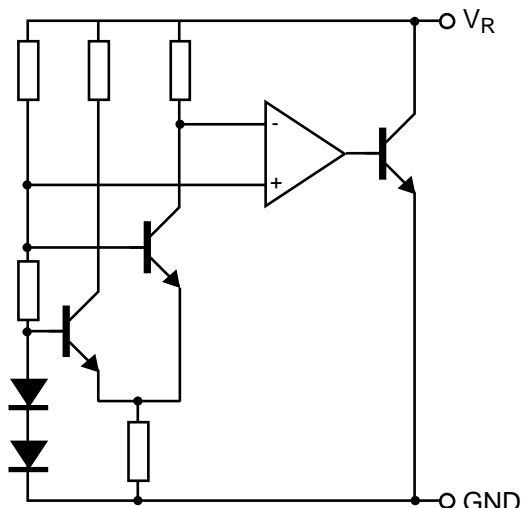
Features

- ± 2% and 1% tolerance
- Operating current 50_A to 15mA
- Typical TC 15ppm/°C
- Transient response, stable in less than 10 μ s
- Industrial temperature range
- Small outline SOT23 style package
- Green molding compound (No Br, Sb)

Applications

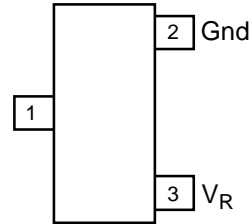
- Battery powered and portable equipment
- Metering and measurement systems
- Instrumentation
- Test equipment
- Data acquisition systems
- Precision power supplies

Typical Application Circuit



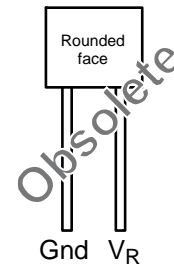
Pin Assignments

SOT23
package suffix - F

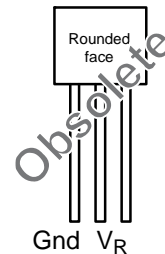


Pin 1 floating or connected to pin 2

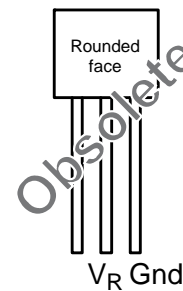
E-Line, 2 pin
package suffix - Y



E-Line, 3 pin, rev
package suffix - R



E-Line, 3 pin
package suffix - A



Absolute Maximum Ratings (Voltages to GND Unless Otherwise Stated)

| Parameter | Rating | Unit |
|--|------------|------|
| Reverse Current | 25 | mA |
| Forward Current | 25 | mA |
| Operating Temperature | -40 to 85 | °C |
| Storage Temperature | -55 to 125 | °C |
| Power Dissipation (T _{AMB} = 25°C) SOT23 | 330 | mW |

Electrical Characteristics (Test conditions: T_{amb} = 25°C, unless otherwise specified.)

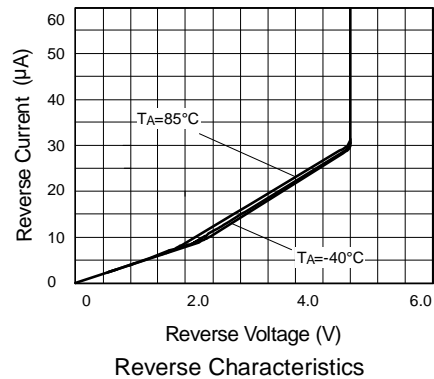
| Symbol | Parameter | Condition | Min. | Typ. | Max. | Tol. (%) | Unit |
|-------------------------------|---|--|--------------|------------|--------------|----------|---------|
| V _R | Reverse breakdown voltage | I _R = 150µA | 4.95 4.90 | 5.0 5.0 | 5.05 5.10 | 1 2 | V |
| I _{MIN} | Minimum operating current | | | 30 | 50 | | µA |
| I _R | Recommended operating current | | 0.05 | | 15 | | mA |
| T _C ^(*) | Average reverse breakdown voltage temperature coefficient | I _R (MIN) to I _R (MAX) | | 15 | 50 | | ppm/°C |
| R _S ^(†) | Slope resistance | | | 0.33 | 1.5 | | Ω |
| Z _R | Reverse dynamic impedance | I _R = 1mA f = 100Hz I _{AC} = 0.1I _R | | 0.4 | 1 | | Ω |
| E _N | Wideband noise voltage | I _R = 150µA f = 10Hz to 10kHz | | 105 | | | µV(rms) |

Notes:

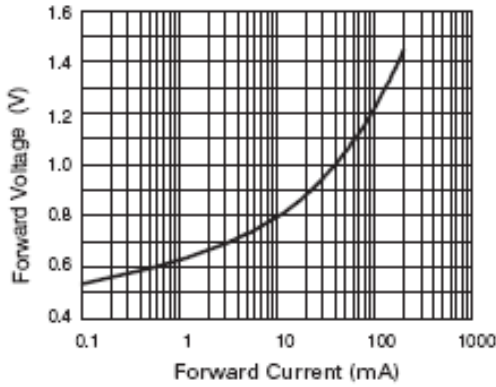
$$(*) T_C = \frac{(V_{R(MAX)} - V_{R(MIN)}) \times 1000000}{V_R \times (T_{(MAX)} - T_{(MIN)})}$$

Note: V_{R(MAX)} - V_{R(MIN)} is the maximum deviation in reference voltage measured over the full operating temperature range.

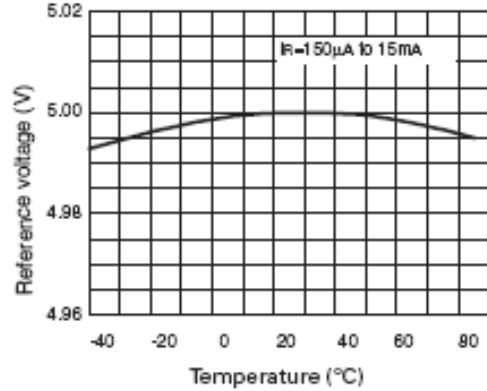
$$(†) R_S = \frac{V_R \text{ Change (I}_{R(MIN)} \text{ to I}_{R(MAX)})}{I_{R(MAX)} - I_{R(MIN)}}$$



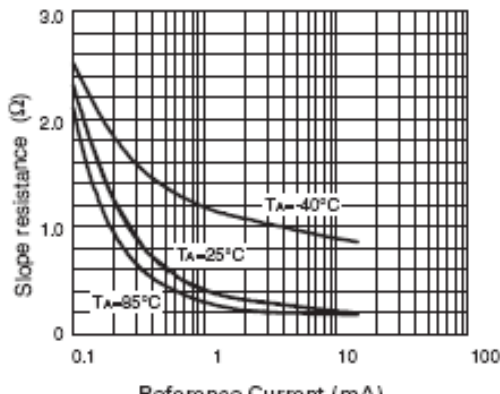
Typical Characteristics



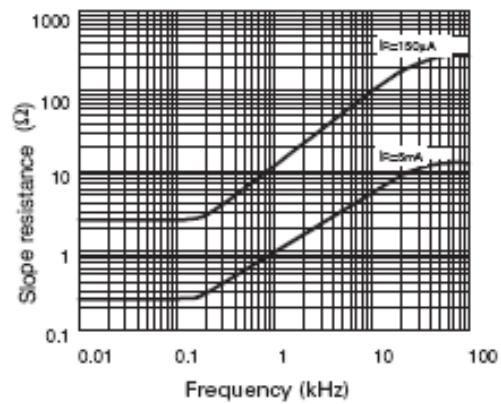
Forward Characteristics



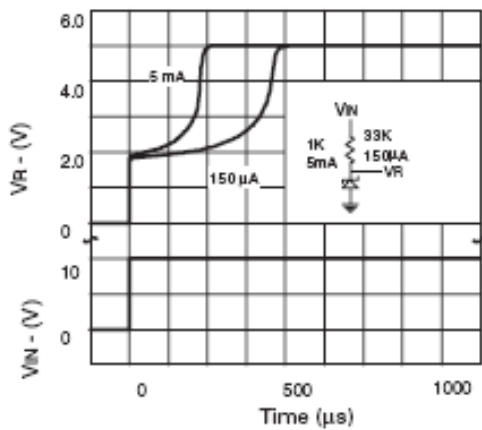
Temperature Drift



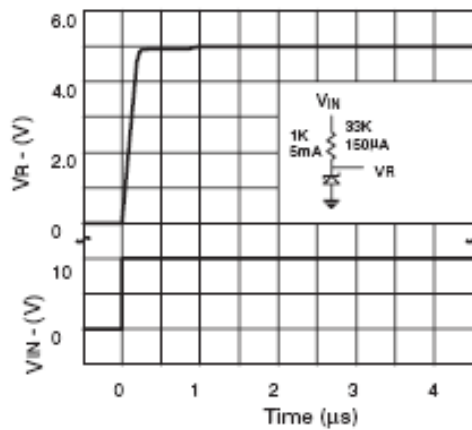
Slope Resistance v Current



Slope Resistance v Frequency



Transient Response (Single Pulse)



Transient Response (Repetitive Pulse)

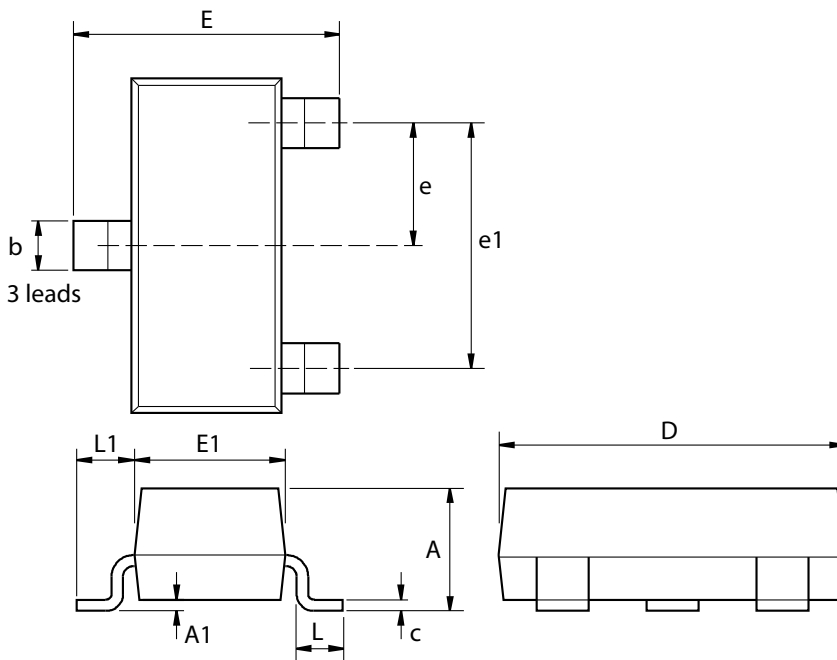
Ordering Information*

| Order Reference | Tol (%) | Device Mark | Status (*) | Reel Size (inches) | Quantity per reel | Tape Width (mm) |
|-----------------|---------|-------------|------------|--------------------|-------------------|-----------------|
| ZRB500F01TA | 1 | 50I | Released | 7 | 3000 | 8 |
| ZRB500F02TA | 2 | 50H | Released | 7 | 3000 | 8 |
| ZRB500F03TA | 3 | 50G | Obsolete | 7 | 3000 | 8 |

Notes: *All ZRB500A variants (E-Line 3-pin), ZRB500Y variants (E-Line 2-pin), ZRB500R variants (E-Line 3-pin reversed) and ZRB500N8 variants (SO-8) are obsolete no longer available for sale. The closest alternative is the SOT23.

Package Outline Dimensions

SOT23

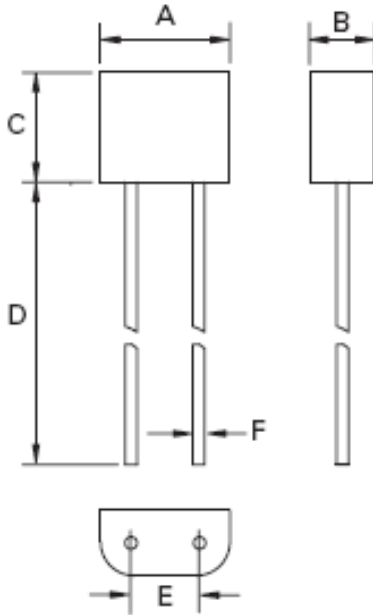


| Dim. | Millimeters | | Inches | | Dim. | Millimeters | | Inches | |
|------|-------------|------|-----------|-------|------|-------------|------|-----------|--------|
| | Min. | Max. | Min. | Max. | | Min. | Max. | Min. | Max. |
| A | - | 1.12 | - | 0.044 | e1 | 1.90 NOM | | 0.075 NOM | |
| A1 | 0.01 | 0.10 | 0.0004 | 0.004 | E | 2.10 | 2.64 | 0.083 | 0.104 |
| b | 0.30 | 0.50 | 0.012 | 0.020 | E1 | 1.20 | 1.40 | 0.047 | 0.055 |
| c | 0.085 | 0.20 | 0.003 | 0.008 | L | 0.25 | 0.60 | 0.0098 | 0.0236 |
| D | 2.80 | 3.04 | 0.110 | 0.120 | L1 | 0.45 | 0.62 | 0.018 | 0.024 |
| e | 0.95 NOM | | 0.037 NOM | | - | - | - | - | - |

Note: Controlling dimensions are in millimeters. Approximate dimensions are provided in inches

Package Outline Dimensions

SO-8-EP

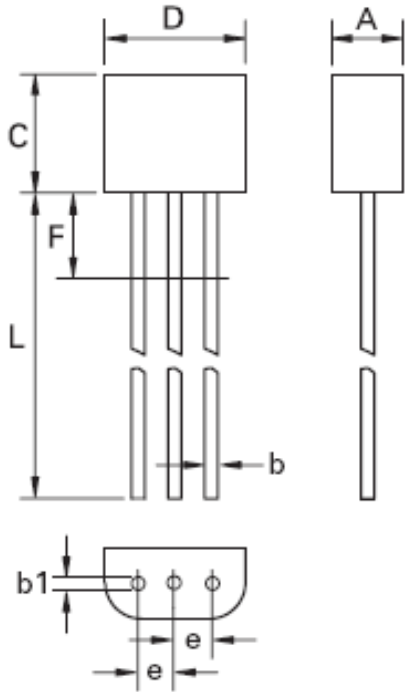


| DIM | Millimeters | | Inches | |
|-----|-------------|-------|----------|-------|
| | Min. | Max. | Min. | Max. |
| A | 4.37 | 4.77 | 0.17 | 0.18 |
| B | 2.16 | 2.41 | 0.085 | 0.095 |
| C | 3.61 | 4.01 | 0.14 | 0.16 |
| D | 13.00 | 13.97 | 0.51 | 0.55 |
| E | 2.54 NOM | | 0.10 NOM | |
| F | 0.37 | 0.495 | 0.015 | 0.019 |

Note: Controlling dimensions are in millimeters. Approximate dimensions are provided in inches

Package Outline Dimensions

E-Line, 3 pin rev.

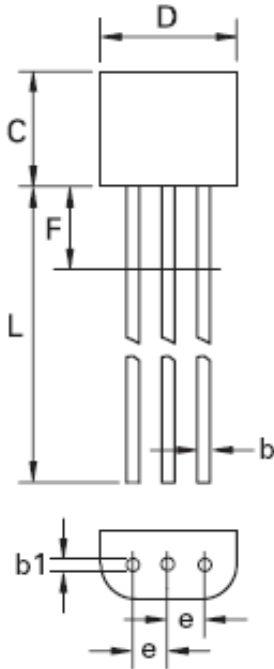


| DIM | Millimeters | | Inches | |
|-----|-------------|-------|-----------|--------|
| | Min. | Max. | Min. | Max. |
| A | 2.16 | 2.41 | 0.085 | 0.095 |
| b | 0.41 | 0.495 | 0.016 | 0.0195 |
| b1 | 0.41 | 0.495 | 0.016 | 0.0195 |
| D | 4.37 | 4.77 | 0.172 | 0.188 |
| E | 3.61 | 4.01 | 0.142 | 0.158 |
| e | 1.27 NOM | | 0.050 NOM | |
| F | — | 2.50 | — | 0.098 |
| L | 13.00 | 13.97 | 0.512 | 0.550 |

Note: Controlling dimensions are in millimeters. Approximate dimensions are provided in inches

Package Outline Dimensions

E-Line, 3 pin

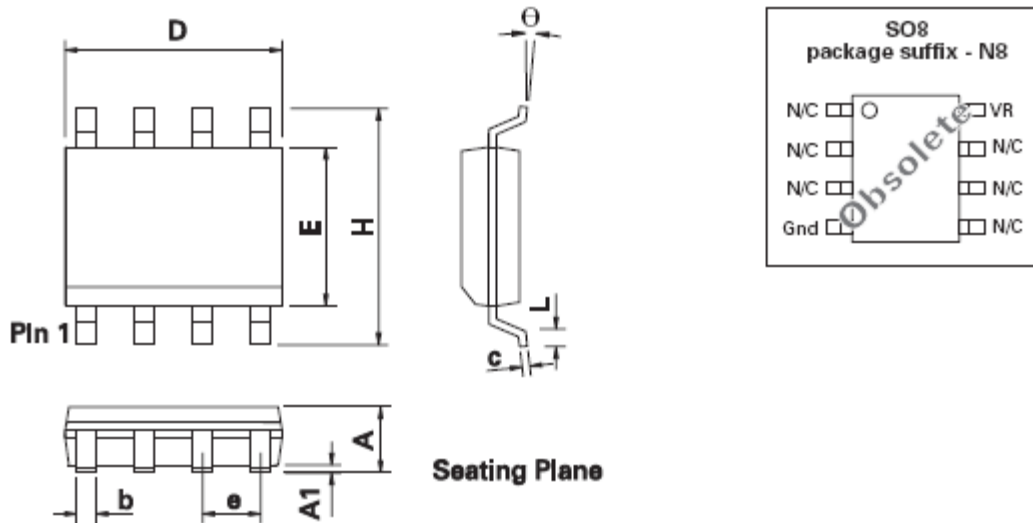


| DIM | Millimeters | | Inches | |
|-----|-------------|-------|-----------|--------|
| | Min. | Max. | Min. | Max. |
| A | 2.16 | 2.41 | 0.085 | 0.095 |
| b | 0.41 | 0.495 | 0.016 | 0.0195 |
| b1 | 0.41 | 0.495 | 0.016 | 0.0195 |
| D | 4.37 | 4.77 | 0.172 | 0.188 |
| E | 3.61 | 4.01 | 0.142 | 0.158 |
| e | 1.27 NOM | | 0.050 NOM | |
| F | — | 2.50 | — | 0.098 |
| L | 13.00 | 13.97 | 0.512 | 0.550 |

Note: Controlling dimensions are in millimeters. Approximate dimensions are provided in inches

Package Outline Dimensions

S08



| DIM | Inches | | Millimeters | | DIM | Inches | | Millimeters | |
|-----|--------|-------|-------------|------|-------|-----------|-------|-------------|------|
| | Min. | Max. | Min. | Max. | | Min. | Max. | Min. | Max. |
| A | 0.053 | 0.069 | 1.35 | 1.75 | e | 0.050 BSC | | 1.27 BSC | |
| A1 | 0.004 | 0.010 | 0.10 | 0.25 | b | 0.013 | 0.020 | 0.33 | 0.51 |
| D | 0.189 | 0.197 | 4.80 | 5.00 | c | 0.008 | 0.010 | 0.19 | 0.25 |
| H | 0.228 | 0.244 | 5.80 | 6.20 | theta | 0° | 8° | 0° | 8° |
| E | 0.150 | 0.157 | 3.80 | 4.00 | h | 0.010 | 0.020 | 0.25 | 0.50 |
| L | 0.016 | 0.050 | 0.40 | 1.27 | - | - | - | - | - |

Note: Controlling dimensions are in inches. Approximate dimensions are provided in millimeters

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Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru

moschip.ru_4

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moschip.ru_9