

PRECISION 2.5 VOLT MICROPOWER VOLTAGE REFERENCE

ISSUE 5 - JANUARY 2006

ZRA250

DEVICE DESCRIPTION

The ZRA250 uses a bandgap circuit design to achieve a precision micropower voltage reference of 2.5 volts. The device is available in small outline surface mount packages, ideal for applications where space saving is important.

The ZRA250 design provides a stable voltage without an external capacitor and is stable with capacitive loads. The ZRA250 is recommended for operation between 50 μ A and 5mA 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.

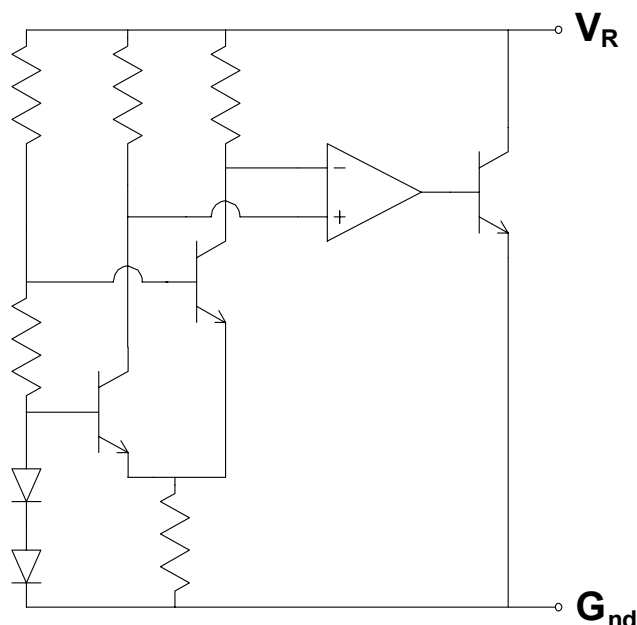
FEATURES

- Small outline SOT23, SO8 and TO92 style packages.
- No stabilising capacitor required
- Typical T_C 30ppm/ $^{\circ}$ C
- Typical slope resistance 0.4 Ω
- \pm 3%, 2%, 1% and 0.5% tolerance
- Industrial temperature range
- Operating current 50 μ A to 5mA
- Transient response, stable in less than 10 μ s
- Optional extended current range

APPLICATIONS

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

SCHEMATIC DIAGRAM



Note:

3%, 2% and 1% tolerance devices are not recommended for new designs.

Refer to ZRC250

ZRA250

ABSOLUTE MAXIMUM RATING

| | |
|-----------------------|--------------|
| Reverse Current | 25mA |
| Forward Current | 25mA |
| Operating Temperature | -40 to 85°C |
| Storage Temperature | -55 to 125°C |

Power Dissipation (T_{amb}=25°C)

| | |
|----------------------|-------|
| SOT23 | 330mW |
| E-Line, 3 pin (TO92) | 500mW |
| E-Line, 2 pin (TO92) | 500mW |
| SO8 | 625mW |

ELECTRICAL CHARACTERISTICS

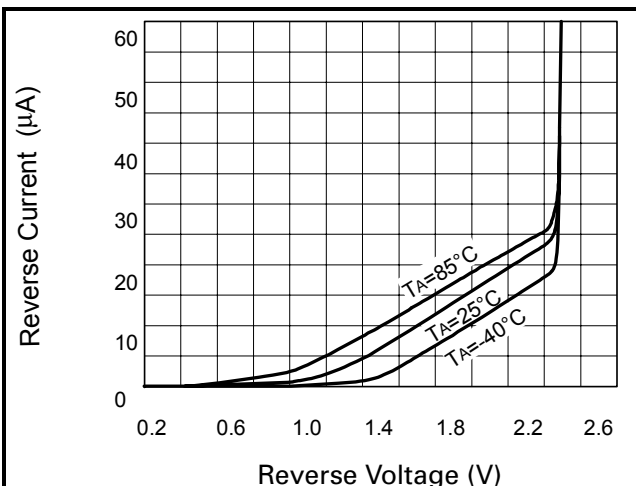
TEST CONDITIONS (Unless otherwise stated) T_{amb}=25°C

| SYMBOL | PARAMETER | CONDITIONS | LIMITS | | | TOL. % | UNITS |
|------------------|---|--|----------------------------------|--------------------------|----------------------------------|--------------------|---------|
| | | | MIN | TYP | MAX | | |
| V _R | Reverse Breakdown Voltage | I _R =150μA | 2.4875 2.475 2.45 2.425 | 2.5 2.5 2.5 2.5 | 2.5125 2.525 2.55 2.575 | 0.5 1 2 3 | V |
| I _{MIN} | Minimum Operating Current | | | 25 | 50 | | μA |
| I _R | Recommended Operating Current | | 0.05 | | 5 | | mA |
| T _C † | Average Reverse Breakdown Voltage Temp. Co. | I _{R(min)} to I _{R(max)} | | 30 | 90 | | ppm/°C |
| R _S § | Slope Resistance | | | 0.4 | 2 | | Ω |
| Z _R | Reverse Dynamic Impedance | I _R = 1mA f = 100Hz I _{AC} =0.1 I _R | | 0.3 | 0.8 | | Ω |
| E _N | Wideband Noise Voltage | I _R = 150μA f = 10Hz to 10kHz | | 45 | | | μV(rms) |

$$\dagger T_C = \frac{(V_{R(max)} - V_{R(min)}) \times 1000000}{V_R \times (T_{(max)} - T_{(min)})}$$

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

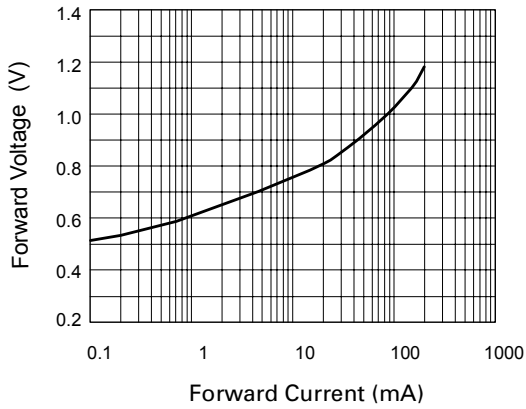
$$\S R_S = \frac{V_R \text{ Change } (I_R \text{ (min) to } I_R \text{ (max)})}{I_R \text{ (max)} - I_R \text{ (min)}}$$



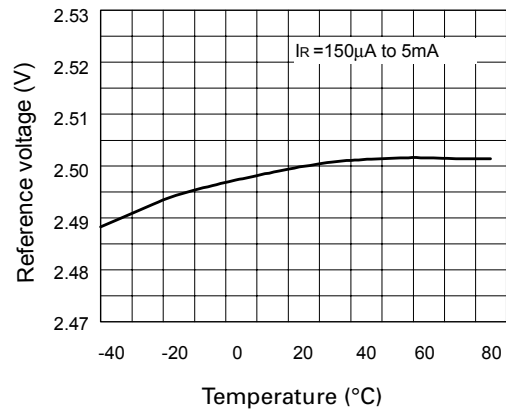
Reverse Characteristics

ZRA250

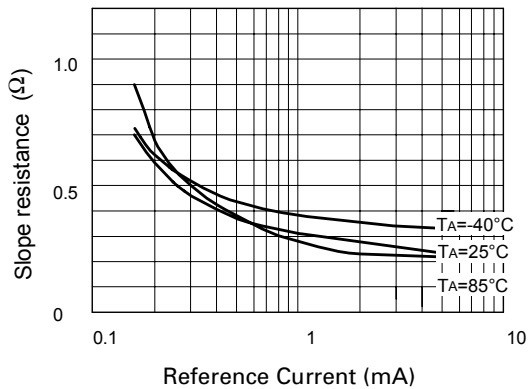
TYPICAL CHARACTERISTICS



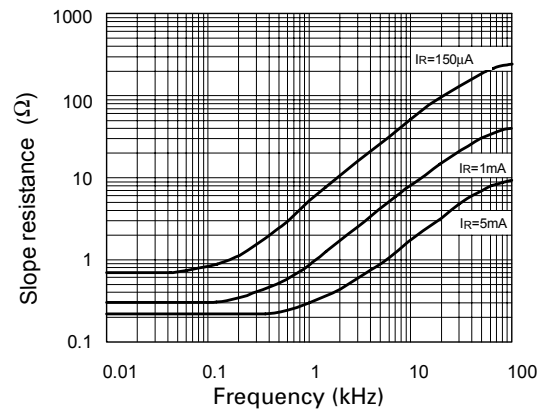
Forward Characteristics



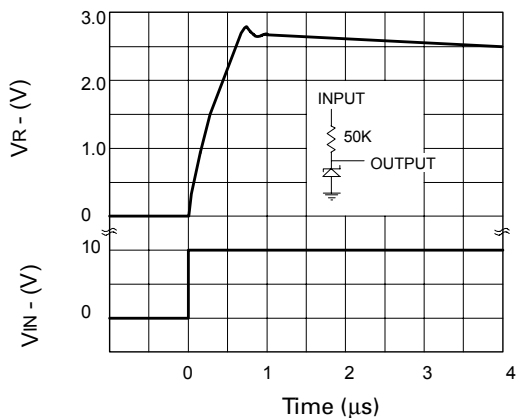
Temperature Drift



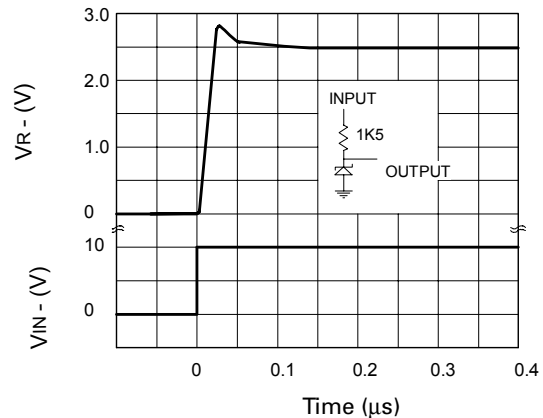
Slope Resistance v Current



Slope Resistance v Frequency



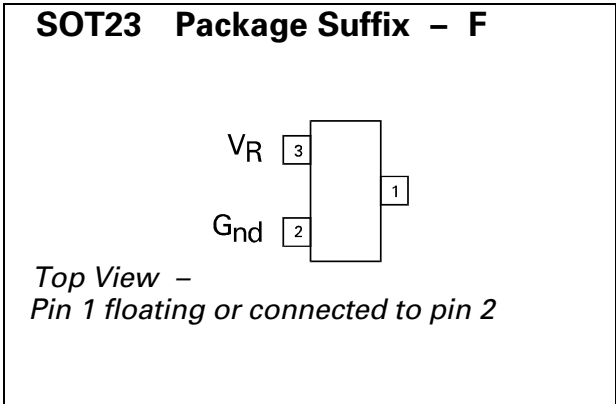
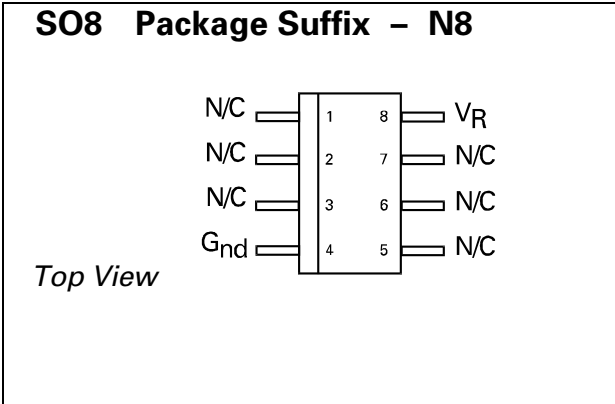
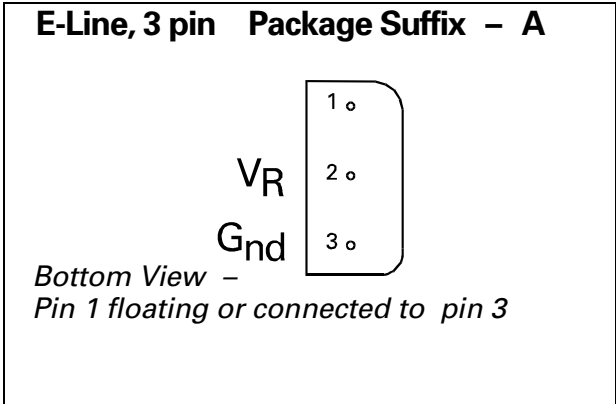
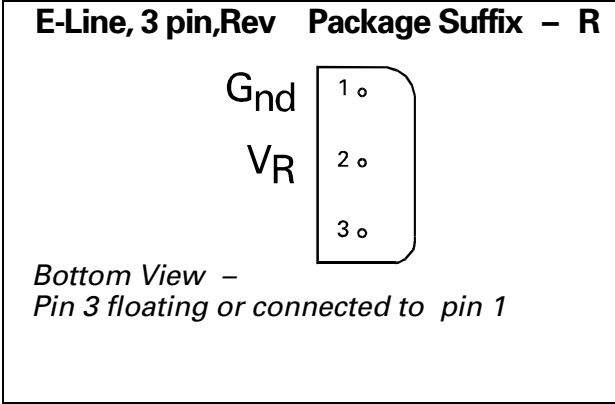
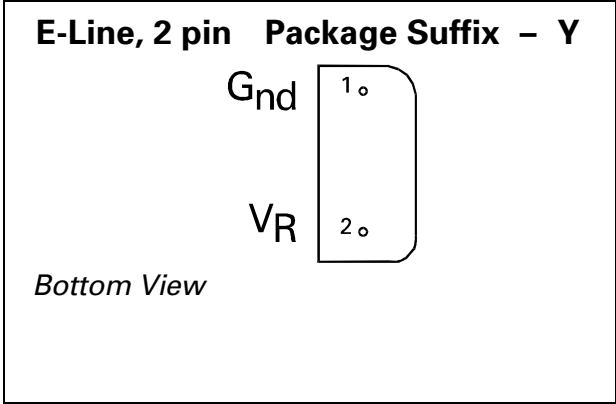
Transient Response ($I_R = 150\mu\text{A}$)



Transient Response ($I_R = 5\text{mA}$)

ZRA250

CONNECTION DIAGRAMS



ZRA250

ORDERING INFORMATION

| Part No | Tol% | Package | Partmark |
|-------------|------|----------|-----------|
| ZRA250A03 | 3 | E-Line • | ZRA25003 |
| ZRA250A02 | 2 | E-Line • | ZRA25002 |
| ZRA250A01 | 1 | E-Line • | ZRA25001 |
| ZRA250A005 | 0.5 | E-Line • | ZRA250005 |
| ZRA250F03 | 3 | SOT23 | 25A |
| ZRA250F02 | 2 | SOT23 | 25C |
| ZRA250F01 | 1 | SOT23 | 25B |
| ZRA250F005 | 0.5 | SOT23 | 25Y |
| ZRA250N803 | 3 | SO8 | ZRA25003 |
| ZRA250N802 | 2 | SO8 | ZRA25002 |
| ZRA250N801 | 1 | SO8 | ZRA25001 |
| ZRA250N8005 | 0.5 | SO8 | ZRA250005 |

| Part No | Tol% | Package | Partmark |
|------------|------|----------|-----------|
| ZRA250R03 | 3 | E-Line * | ZRA250R3 |
| ZRA250R02 | 2 | E-Line * | ZRA250R2 |
| ZRA250R01 | 1 | E-Line * | ZRA250R1 |
| ZRA250R005 | 0.5 | E-Line * | ZRA250R05 |
| ZRA250Y03 | 3 | E-Line † | ZRA25003 |
| ZRA250Y02 | 2 | E-Line † | ZRA25002 |
| ZRA250Y01 | 1 | E-Line † | ZRA25001 |
| ZRA250Y005 | 0.5 | E-Line † | ZRA250005 |

* E-Line 3 pin Reversed

† E-Line 2 pin

• E-Line 3 pin

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