

PRECISION 2.5 VOLT LOW KNEE CURRENT VOLTAGE REFERENCE

ZRC250

ISSUE 3 - MARCH 1998

DEVICE DESCRIPTION

The ZRC250 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, as well as packages for through hole requirements.

The ZRC250 design provides a stable voltage without an external capacitor and is stable with capacitive loads. The ZRC250 is recommended for operation between 20 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.

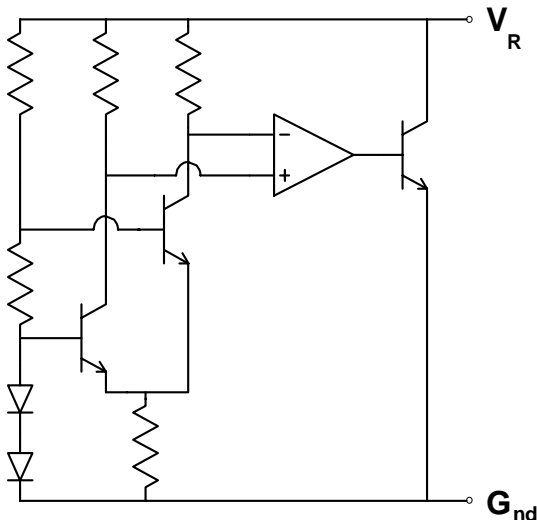
FEATURES

- Small outline SOT23 and SO8 packages
- TO92 style packages
- No stabilising capacitor required
- Low knee current, 15 μ A typical
- Typical T_C 30ppm/ $^{\circ}$ C
- Typical slope resistance 0.4 Ω
- $\pm 3, 2$ and 1% tolerance
- Industrial temperature range
- Operating current 20 μ A to 5mA
- Transient response, stable in less than 10 μ s
- Optional extended current range

APPLICATIONS

- Battery powered and portable equipment.
- Instrumentation.
- Test equipment.

SCHEMATIC DIAGRAM



ZRC250

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

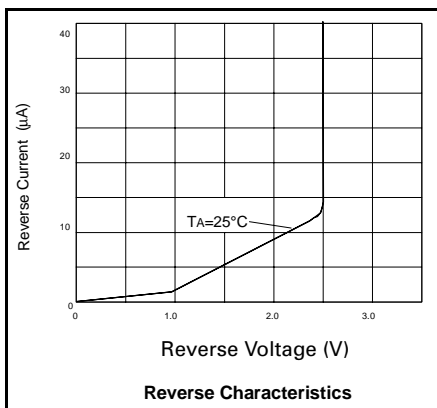
TEST CONDITIONS (Unless otherwise stated) T_{amb}=25°C

| SYMBOL | PARAMETER | CONDITIONS | LIMITS | | | TOL% | UNITS |
|------------------|---|--|------------------|-----|-------|------|---------|
| | | | MIN | TYP | MAX | | |
| V _R | Reverse Breakdown Voltage | I _R =150μA | 2.475 | 2.5 | 2.525 | 1 | V |
| | | | 2.45 | 2.5 | 2.55 | 2 | |
| | | | 2.425 | 2.5 | 2.575 | 3 | |
| I _{MIN} | Minimum Operating Current | | | 13 | 20 | | μA |
| I _R | Recommended Operating Current | | 0.02 | | 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 | 1 | |
| 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 | | 60 | | | μV(rms) |

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

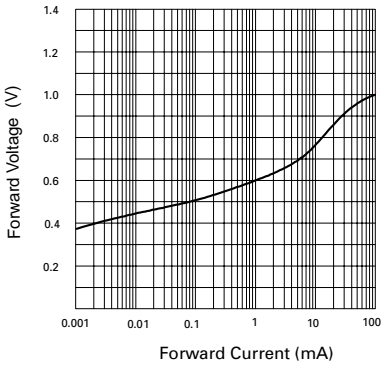
Note: V_{R(max)} - V_{R(min)} is the maximum deviation in reference voltage measured over the full operating temperature range.

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

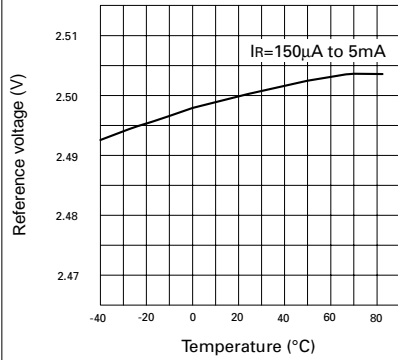


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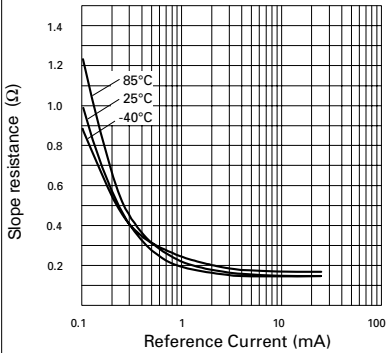
TYPICAL CHARACTERISTICS



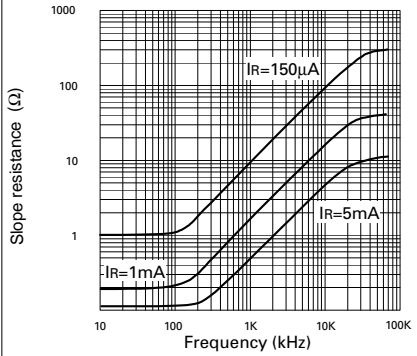
Forward Characteristics



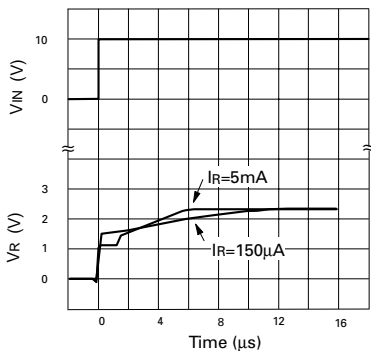
Temperature Drift



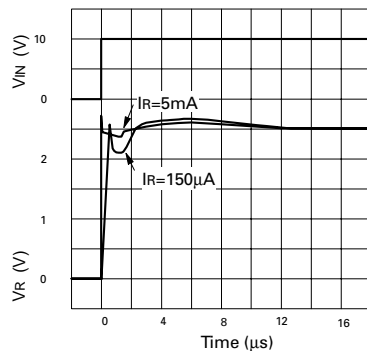
Slope Resistance v Current



Slope Resistance v Frequency



Transient Response - Single pulse

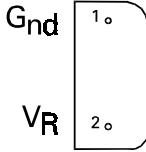


Transient Response - Repetitive Test

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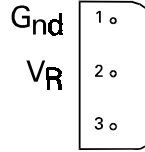
CONNECTION DIAGRAMS

E-Line, 2 pin Package Suffix - Y



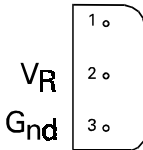
Bottom View

E-Line, 3 pin, Rev Package Suffix - R



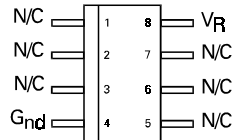
Bottom View -
Pin 3 floating or connected to pin 1

E-Line, 3 pin Package Suffix - A



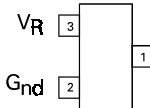
Bottom View -
Pin 1 floating or connected to pin 3

SO8 Package Suffix - N8



Top View

SOT23 Package Suffix - F



Top View -
Pin 1 floating or connected to pin 2

ZRC250

ORDERING INFORMATION

| Part No | Tol% | Package | Partmark |
|------------|------|----------|----------|
| ZRC250A03 | 3 | E-Line • | ZRC25003 |
| ZRC250A02 | 2 | E-Line • | ZRC25002 |
| ZRC250A01 | 1 | E-Line • | ZRC25001 |
| ZRC250F03 | 3 | SOT23 | 25G |
| ZRC250F02 | 2 | SOT23 | 25H |
| ZRC250F01 | 1 | SOT23 | 25J |
| ZRC250N803 | 3 | SO8 | ZRC25003 |
| ZRC250N802 | 2 | SO8 | ZRC25002 |
| ZRC250N801 | 1 | SO8 | ZRC25001 |

| Part No | Tol% | Package | Partmark |
|-----------|------|----------|----------|
| ZRC250R03 | 3 | E-Line * | ZRC250R3 |
| ZRC250R02 | 2 | E-Line * | ZRC250R2 |
| ZRC250R01 | 1 | E-Line * | ZRC250R1 |
| ZRC250Y03 | 3 | E-Line † | ZRC25003 |
| ZRC250Y02 | 2 | E-Line † | ZRC25002 |
| ZRC250Y01 | 1 | E-Line † | ZRC25001 |

* E-Line 3 pin Reversed

† E-Line 2 pin

• E-Line 3 pin