

PRECISION 5.0 VOLT MICROPOWER VOLTAGE REFERENCE

ZREF50

ISSUE 2 - FEBRUARY 1998

DEVICE DESCRIPTION

The ZREF50 uses a bandgap circuit design to achieve a precision micropower voltage reference of 5.0 volts. The device is available in a small outline surface mount package, ideal for applications where space saving is important, as well as packages for through hole requirements.

The ZREF50 design provides a stable voltage without an external capacitor and is stable with capacitive loads. The ZREF50 is recommended for operation between 50 μ 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.

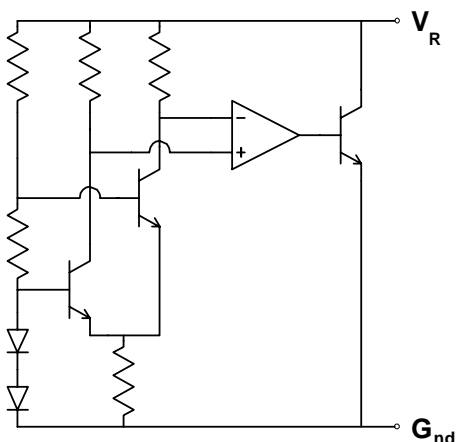
FEATURES

- Small outline SO8 and TO92 style packages
- No stabilising capacitor required
- Typical T_C 15ppm/ $^{\circ}$ C
- Typical slope resistance 0.33 Ω
- 1% tolerance
- Industrial temperature range (Military temperature range available on request)
- Operating current 50 μ A to 15mA
- Transient response, stable in less than 10 μ s
- Alternative package options and tolerances are available

APPLICATIONS

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

SCHEMATIC DIAGRAM



ZREF50

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)

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

ELECTRICAL CHARACTERISTICS

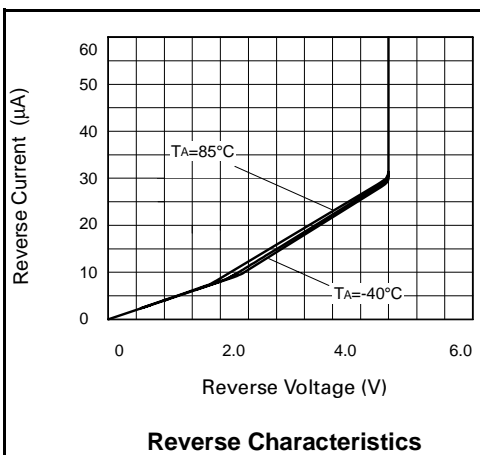
TEST CONDITIONS (Unless otherwise stated) T_{amb}=25°C

| SYMBOL | PARAMETER | CONDITIONS | LIMITS | | | TOL. % | UNITS |
|------------------|---|--|--------|------|------|--------|---------|
| | | | MIN | TYP | MAX | | |
| V _R | Reverse Breakdown Voltage | I _R =150μA | 4.95 | 5.0 | 5.05 | 1 | V |
| I _{MIN} | Minimum Operating Current | | | 30 | 50 | | μA |
| I _R | Recommended Operating Current | | 0.05 | | 15 | | mA |
| T _C † | Average Reverse Breakdown Voltage Temp. Co. | 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} =0.1 I _R | | 0.4 | 1 | | Ω |
| E _N | Wideband Noise Voltage | I _R = 150μA f = 10Hz to 10kHz | | 105 | | | μV(rms) |

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

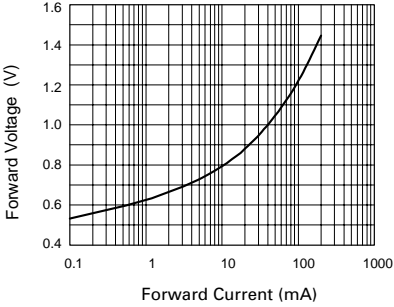
Note: V_{R(max)} - V_{R(min)} is the maximum deviation in reference voltage measured over the full operating temperature range.

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

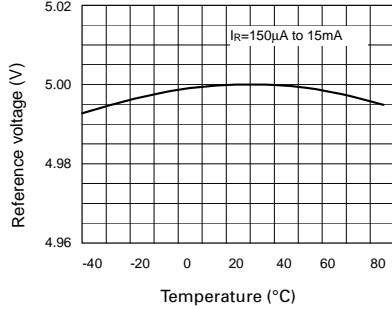


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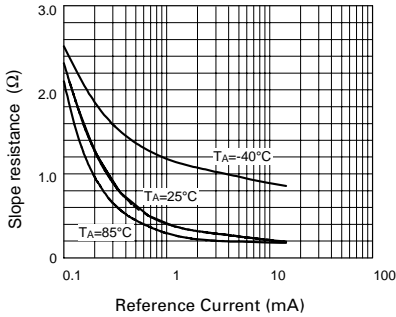
TYPICAL CHARACTERISTICS



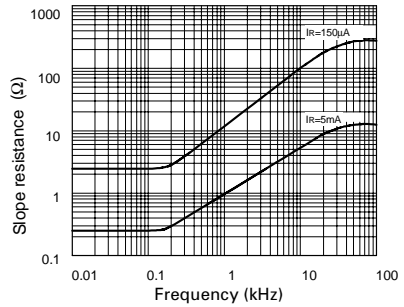
Forward Characteristics



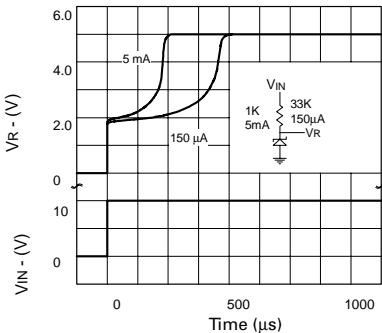
Temperature Drift



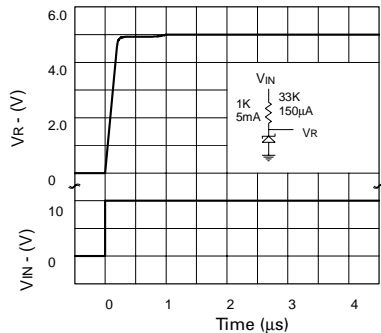
Slope Resistance v Current



Slope Resistance v Frequency



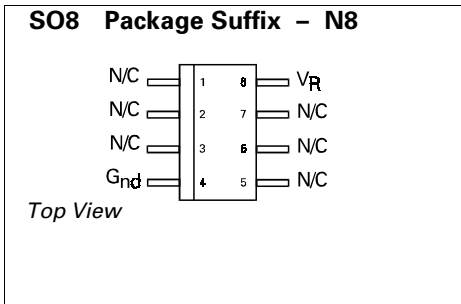
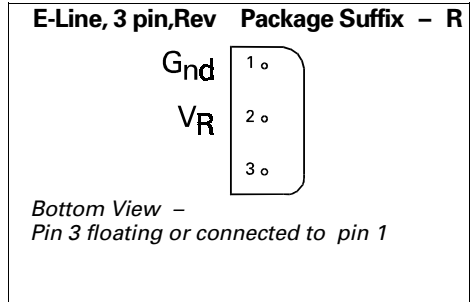
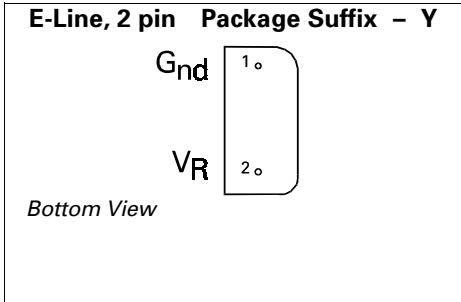
**Transient Response
(Single Pulse)**



**Transient Response
(Repetitive Pulse)**

ZREF50

CONNECTION DIAGRAMS



ORDERING INFORMATION

| Part No | Tol% | Package | Partmark |
|---------|------|----------|----------|
| ZREF50D | 1 | SO8 | ZREF50 |
| ZREF50Z | 1 | E-Line * | ZREF50 |
| ZREF50 | 1 | E-Line † | ZREF50 |

* E-Line 3 pin Reversed

† E-Line 2 pin