

# 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  $50\mu\text{A}$  and  $15\text{mA}$  and so is ideally suited to low power and battery powered applications.

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

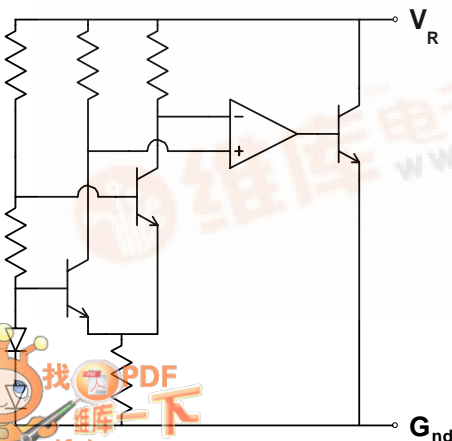
## FEATURES

- Small outline SO8 and TO92 style packages
- No stabilising capacitor required
- Typical  $T_C$   $15\text{ppm}/^\circ\text{C}$
- Typical slope resistance  $0.33\Omega$
- 1% tolerance
- Industrial temperature range (Military temperature range available on request)
- Operating current  $50\mu\text{A}$  to  $15\text{mA}$
- Transient response, stable in less than  $10\mu\text{s}$
- 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<sub>amb</sub>=25°C)

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

## ELECTRICAL CHARACTERISTICS

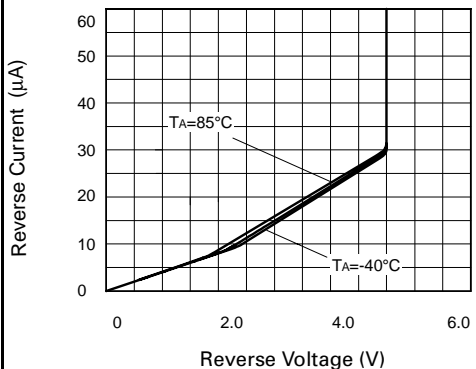
### TEST CONDITIONS (Unless otherwise stated) T<sub>amb</sub>=25°C

SYMBOL	PARAMETER	CONDITIONS	LIMITS			TOL. %	UNITS
			MIN	TYP	MAX		
V <sub>R</sub>	Reverse Breakdown Voltage	I <sub>R</sub> =150μA	4.95	5.0	5.05	1	V
I <sub>MIN</sub>	Minimum Operating Current			30	50		μA
I <sub>R</sub>	Recommended Operating Current		0.05		15		mA
T <sub>C</sub> †	Average Reverse Breakdown Voltage Temp. Co.	I <sub>R(min)</sub> to I <sub>R(max)</sub>		15	50		ppm/°C
R <sub>S</sub> §	Slope Resistance			0.33	1.5		Ω
Z <sub>R</sub>	Reverse Dynamic Impedance	I <sub>R</sub> = 1mA f = 100Hz I <sub>AC</sub> =0.1 I <sub>R</sub>		0.4	1		Ω
E <sub>N</sub>	Wideband Noise Voltage	I <sub>R</sub> = 150μA f = 10Hz to 10kHz		105			μV(rms)

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

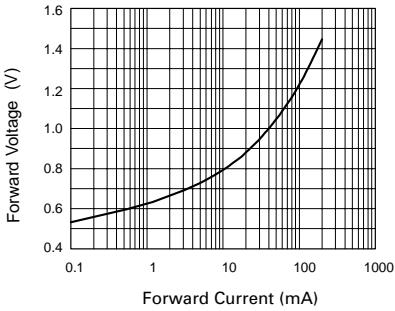
Note: V<sub>R(max)</sub> - V<sub>R(min)</sub> is the maximum deviation in reference voltage measured over the full operating temperature range.

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

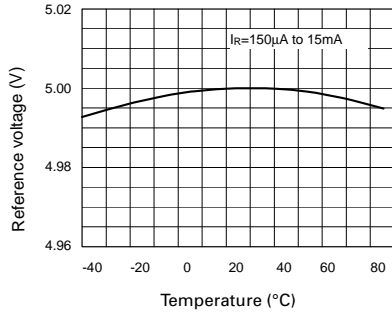


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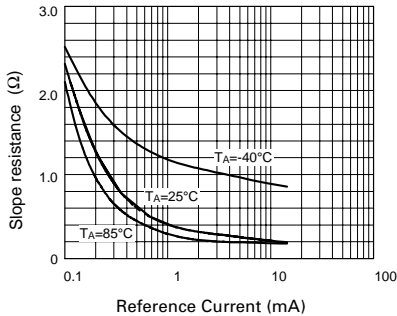
## TYPICAL CHARACTERISTICS



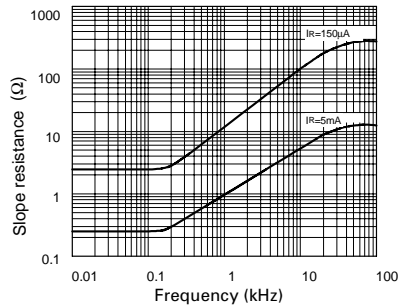
**Forward Characteristics**



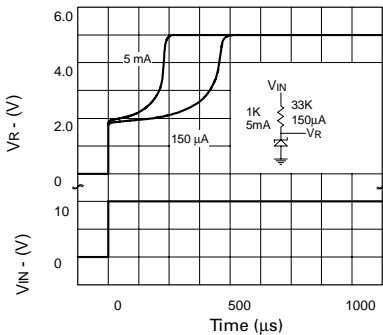
**Temperature Drift**



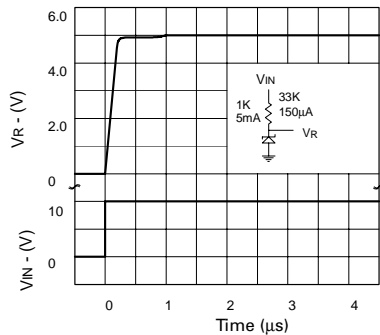
**Slope Resistance v Current**



**Slope Resistance v Frequency**



**Transient Response  
(Single Pulse)**

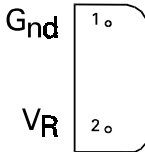


**Transient Response  
(Repetitive Pulse)**

# ZREF50

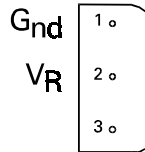
## CONNECTION DIAGRAMS

**E-Line, 2 pin Package Suffix – Y**



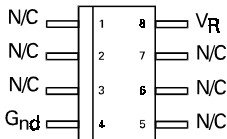
*Bottom View*

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



*Bottom View –  
Pin 3 floating or connected to pin 1*

**SO8 Package Suffix – N8**



*Top View*

## 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