

# PRECISION 5.0 VOLT MICROPOWER VOLTAGE REFERENCE

## ZREF50

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### 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 $\mu$ 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.

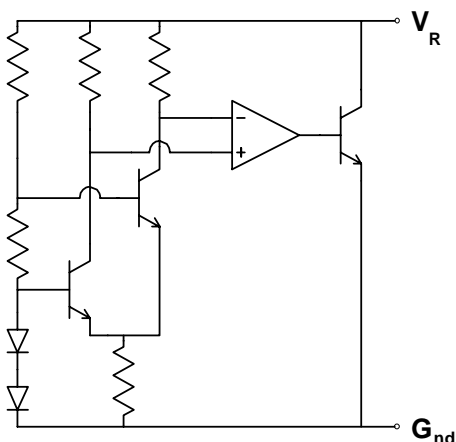
### FEATURES

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

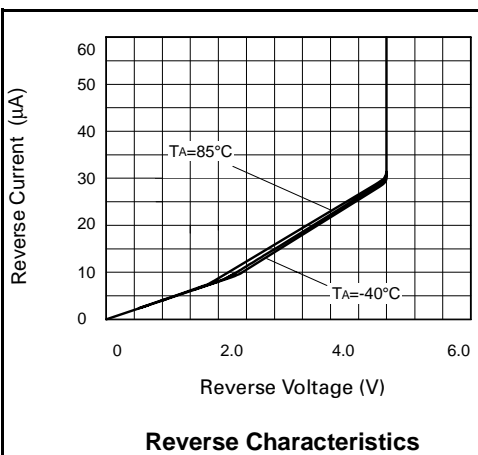
### TEST CONDITIONS (Unless otherwise stated) T<sub>amb</sub>=25°C

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)

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

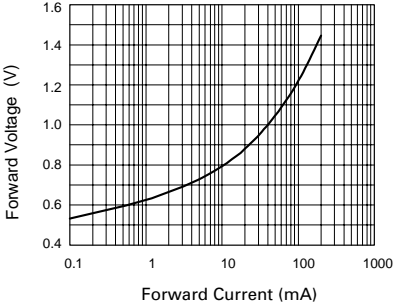
Note: V<sub>R(max)</sub> - V<sub>R(min)</sub> is the maximum deviation in reference voltage measured over the full operating temperature range.

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

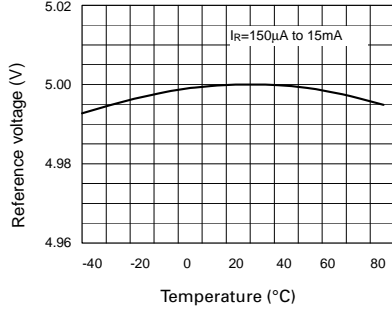


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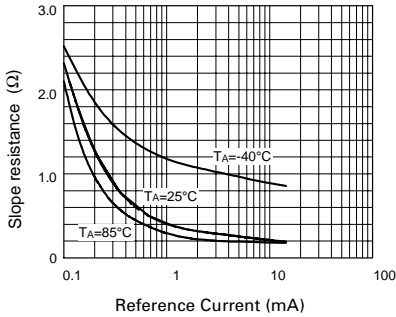
## TYPICAL CHARACTERISTICS



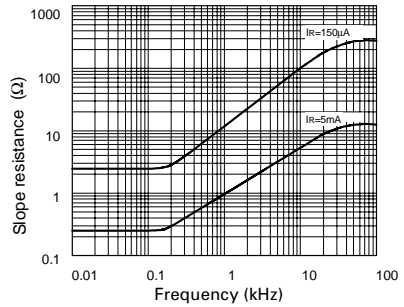
**Forward Characteristics**



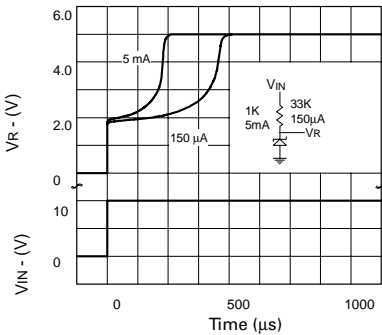
**Temperature Drift**



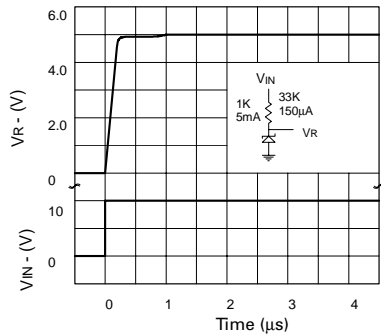
**Slope Resistance v Current**



**Slope Resistance v Frequency**



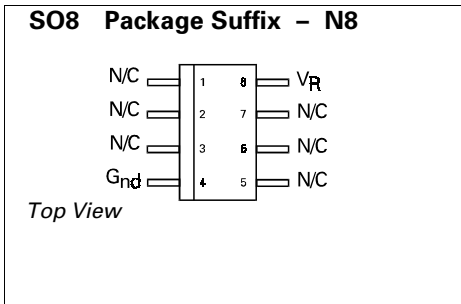
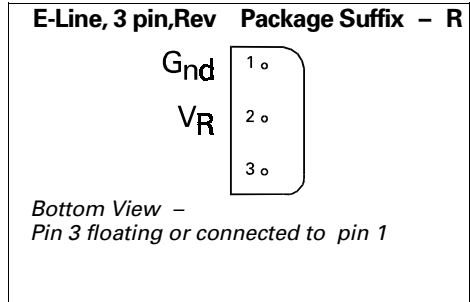
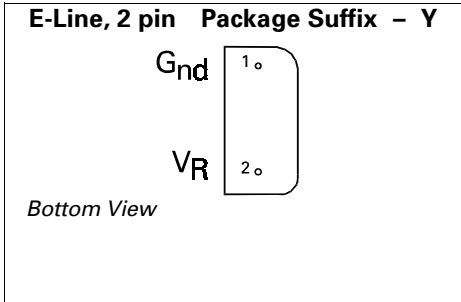
**Transient Response  
(Single Pulse)**



**Transient Response  
(Repetitive Pulse)**

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## 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