

# PRECISION 4.0 VOLT MICROPOWER VOLTAGE REFERENCE

## ZRA400

ISSUE 1 - JANUARY 1996

### DEVICE DESCRIPTION

The ZRA400 uses a bandgap circuit design to achieve a precision micropower voltage reference of 4.096 volts. The device is available in small outline surface mount packages, ideal for applications where space saving is important.

The ZRA400 design provides a stable voltage without an external capacitor and is stable with capacitive loads. The ZRA400 is recommended for operation between 50 $\mu$ A and 5mA and so is ideally suited to low power and battery powered applications.

Excellent performance is maintained to a suggested 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.

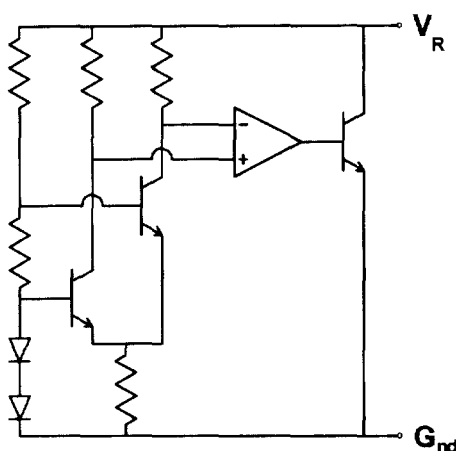
### FEATURES

- Small outline SO8, SOT23 and TO92 style packages.
- No stabilising capacitor required
- Typical  $T_C$  15ppm/ $^{\circ}$ C
- Typical slope resistance 0.55 $\Omega$
- $\pm$  3%, 2% and 1% tolerance
- Industrial temperature range
- Operating current 50 $\mu$ A to 5mA

### APPLICATIONS

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

### SCHEMATIC DIAGRAM



### CONNECTION TABLE

Pin	SO8	SOT23	E-LINE 3 pin	E-LINE 3 pin R	E-LINE 2 pin
1	N/C	-	-	Gnd	Gnd
2	N/C	Gnd	V <sub>R</sub>	V <sub>R</sub>	V <sub>R</sub>
3	N/C	V <sub>R</sub>	Gnd	-	-
4	Gnd	-	-	-	-
5	N/C	-	-	-	-
6	N/C	-	-	-	-
7	N/C	-	-	-	-
8	V <sub>R</sub>	-	-	-	-
Pack	N8	F	A	R	Y

see Diagrams Page 1 - 8

# ZRA400

## 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)

SOT23	330mW
E-line, 3 pin (TO92)	500mW
E-line, 2 pin (TO92)	500mW
S08	625mW

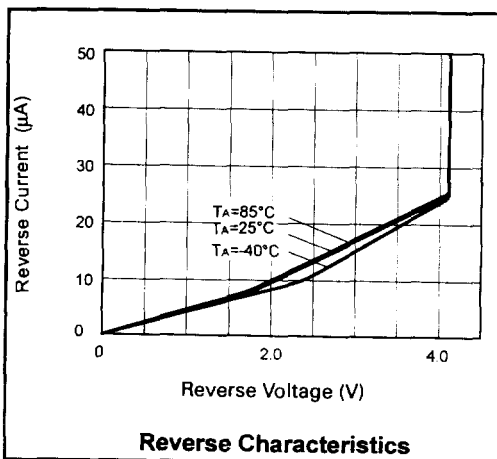
## ELECTRICAL CHARACTERISTICS

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

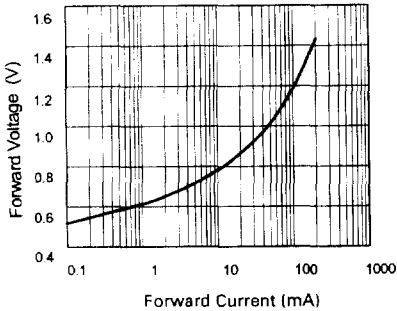
SYMBOL	PARAMETER	CONDITIONS	LIMITS			TOL. %	UNITS
			MIN	TYP	MAX		
V <sub>R</sub>	Reverse Breakdown Voltage	I <sub>R</sub> =150μA	4.05 4.01 3.97	4.096 4.096 4.096	4.14 4.18 4.22	1 2 3	V
I <sub>MIN</sub>	Minimum Operating Current			25	50		μA
I <sub>R</sub>	Recommended Operating Current		0.05		5		mA
T <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			0.55	2		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>		0.5	1.2		Ω

$$† T_C = \frac{V_R \text{ Change} \times 1000000}{V_R \times \text{Temperature Change}}$$

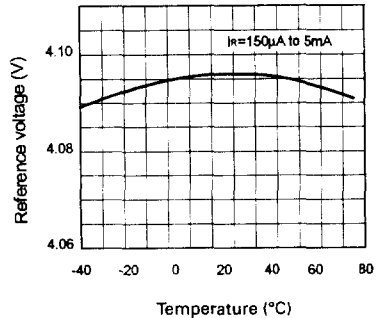
$$§ R_S = \frac{V_R \text{ Change } (I_R \text{ (min) to } I_R \text{ (max)})}{I_R \text{ (max)} - I_R \text{ (min)}}$$



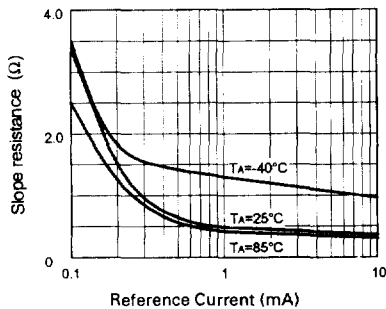
## TYPICAL CHARACTERISTICS



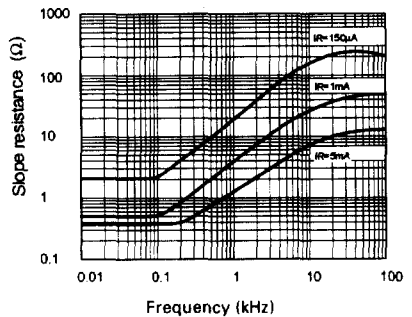
**Forward Characteristics**



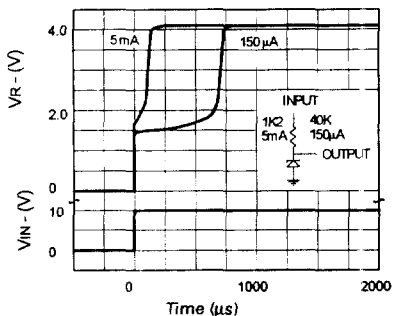
**Temperature Drift**



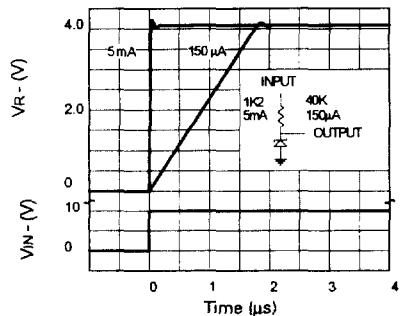
**Slope Resistance v Current**



**Slope Resistance v Frequency**



**Transient Response  
(Single Pulse)**



**Transient Response  
(Repetitive Pulse)**