

# PRECISION 2.5 VOLT MICROPOWER VOLTAGE REFERENCE

ISSUE 5 - JANUARY 2006

ZRA250

## DEVICE DESCRIPTION

The ZRA250 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.

The ZRA250 design provides a stable voltage without an external capacitor and is stable with capacitive loads. The ZRA250 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 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.

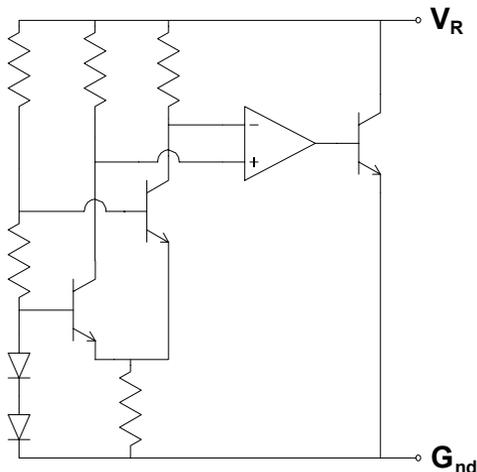
## FEATURES

- Small outline SOT23, SO8 and TO92 style packages.
- No stabilising capacitor required
- Typical  $T_C$  30ppm/ $^{\circ}$ C
- Typical slope resistance 0.4 $\Omega$
- $\pm$  3%, 2%, 1% and 0.5% tolerance
- Industrial temperature range
- Operating current 50 $\mu$ A to 5mA
- Transient response, stable in less than 10 $\mu$ s
- Optional extended current range

## APPLICATIONS

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

## SCHEMATIC DIAGRAM



### Note:

3%, 2% and 1% tolerance devices are not recommended for new designs.

Refer to ZRC250

# ZRA250

## 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
SO8	625mW

## ELECTRICAL CHARACTERISTICS

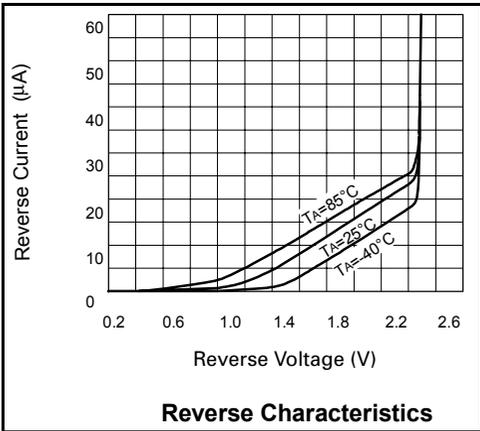
### TEST CONDITIONS (Unless otherwise stated) T<sub>amb</sub>=25°C

SYMBOL	PARAMETER	CONDITIONS	LIMITS			TOL. %	UNITS
			MIN	TYP	MAX		
V <sub>R</sub>	Reverse Breakdown Voltage	I <sub>R</sub> =150μA	2.4875	2.5	2.5125	0.5	V
			2.475	2.5	2.525	1	
			2.45	2.5	2.55	2	
			2.425	2.5	2.575	3	
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>		30	90		ppm/°C
R <sub>S</sub> §	Slope Resistance			0.4	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>		0.3	0.8		Ω
E <sub>N</sub>	Wideband Noise Voltage	I <sub>R</sub> = 150μA f = 10Hz to 10kHz		45			μV(rms)

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

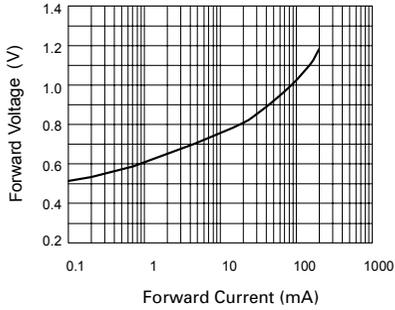
Note: V<sub>R(max)</sub> - V<sub>R(min)</sub> is the maximum deviation in reference voltage measured over the full operating temperature range.

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

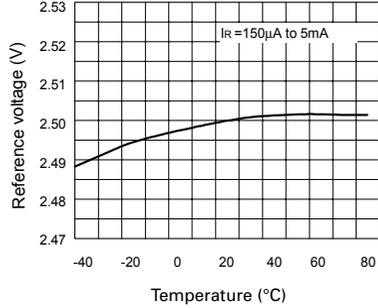


# ZRA250

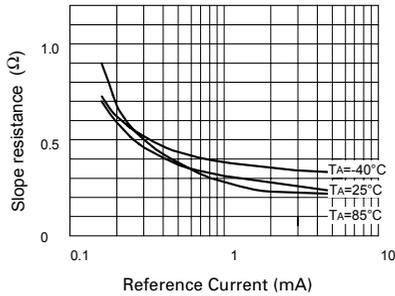
## TYPICAL CHARACTERISTICS



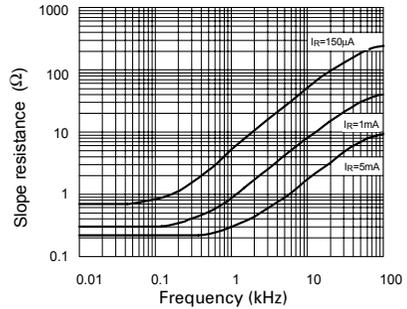
**Forward Characteristics**



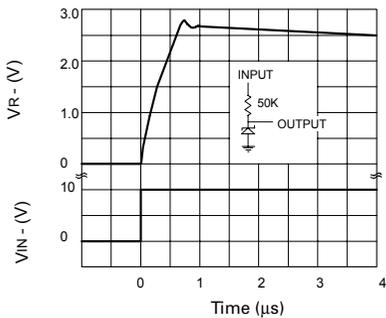
**Temperature Drift**



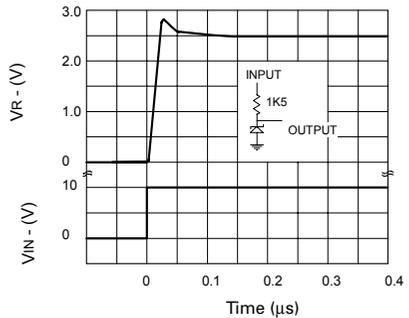
**Slope Resistance v Current**



**Slope Resistance v Frequency**



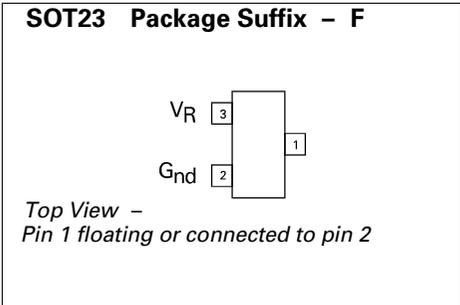
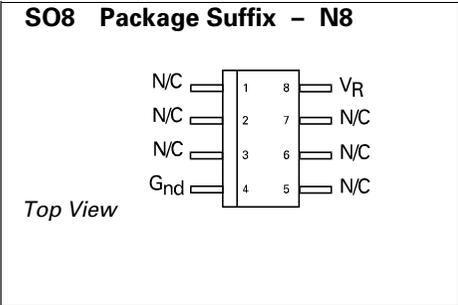
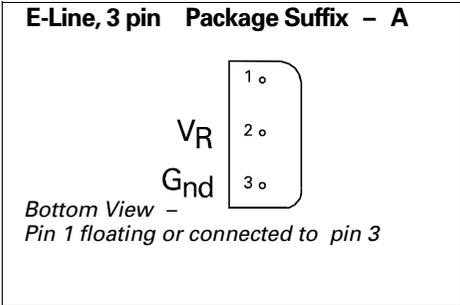
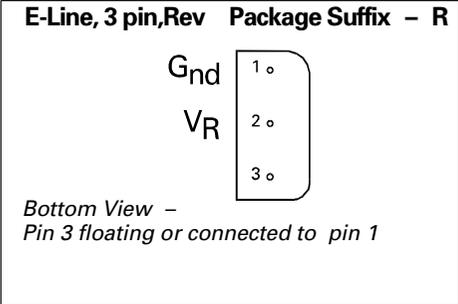
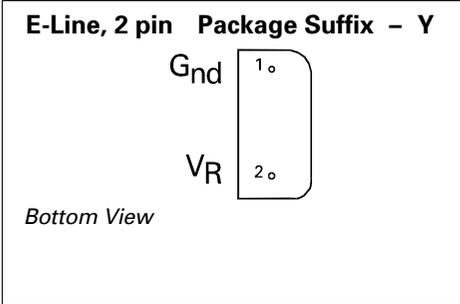
**Transient Response ( $I_R=150\mu\text{A}$ )**



**Transient Response ( $I_R=5\text{mA}$ )**

# ZRA250

## CONNECTION DIAGRAMS



# ZRA250

## ORDERING INFORMATION

Part No	Tol%	Package	Partmark	Part No	Tol%	Package	Partmark
ZRA250A03	3	E-Line •	ZRA25003	ZRA250R03	3	E-Line *	ZRA250R3
ZRA250A02	2	E-Line •	ZRA25002	ZRA250R02	2	E-Line *	ZRA250R2
ZRA250A01	1	E-Line •	ZRA25001	ZRA250R01	1	E-Line *	ZRA250R1
ZRA250A005	0.5	E-Line •	ZRA250005	ZRA250R005	0.5	E-Line *	ZRA250R05
ZRA250F03	3	SOT23	25A	ZRA250Y03	3	E-Line †	ZRA25003
ZRA250F02	2	SOT23	25C	ZRA250Y02	2	E-Line †	ZRA25002
ZRA250F01	1	SOT23	25B	ZRA250Y01	1	E-Line †	ZRA25001
ZRA250F005	0.5	SOT23	25Y	ZRA250Y005	0.5	E-Line †	ZRA250005
ZRA250N803	3	SO8	ZRA25003				
ZRA250N802	2	SO8	ZRA25002				
ZRA250N801	1	SO8	ZRA25001				
ZRA250N8005	0.5	SO8	ZRA250005				

\* E-Line 3 pin Reversed

† E-Line 2 pin

• E-Line 3 pin

### Note:

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