

# PRECISION 4.096 VOLT LOW KNEE CURRENT VOLTAGE REFERENCE

## ZRC400

ISSUE 3 - MARCH 1998

### DEVICE DESCRIPTION

The ZRC400 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, as well as packages for through hole requirements.

The ZRC400 design provides a stable voltage without an external capacitor and is stable with capacitive loads. The ZRC400 is recommended for operation between 23 $\mu$ 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.

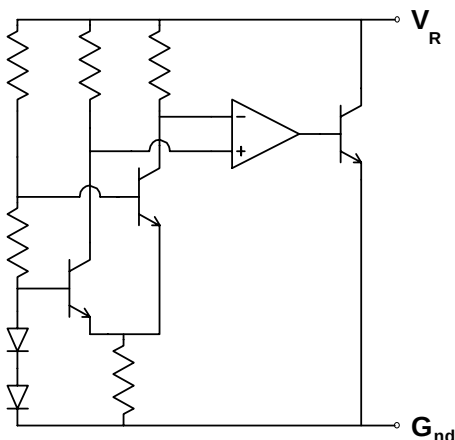
### FEATURES

- Small outline SOT23 , SO8 and TO92 style packages
- No stabilising capacitor required
- Low knee current, 18 $\mu$ A typical
- Typical  $T_C$  30ppm/ $^{\circ}$ C
- Typical slope resistance 0.4 $\Omega$
- $\pm 3\%$ , 2% and 1% tolerance
- Industrial temperature range
- Operating current 23 $\mu$ A to 5mA
- Transient response, stable in less than 10 $\mu$ s
- Optional extended current range

### APPLICATIONS

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

### SCHEMATIC DIAGRAM



# ZRC400

## ABSOLUTE MAXIMUM RATING

|                       |              |
|-----------------------|--------------|
| Reverse Current       | 25mA         |
| Forward Current       | 25mA         |
| Operating Temperature | -40 to 85°C  |
| Storage Temperature   | -55 to 125°C |

|                                                 |       |
|-------------------------------------------------|-------|
| <b>Power Dissipation (T<sub>amb</sub>=25°C)</b> |       |
| SOT23                                           | 330mW |
| E-Line, 3 pin (TO92)                            | 500mW |
| E-Line, 2 pin (TO92)                            | 500mW |
| S08                                             | 625mW |

## ELECTRICAL CHARACTERISTICS

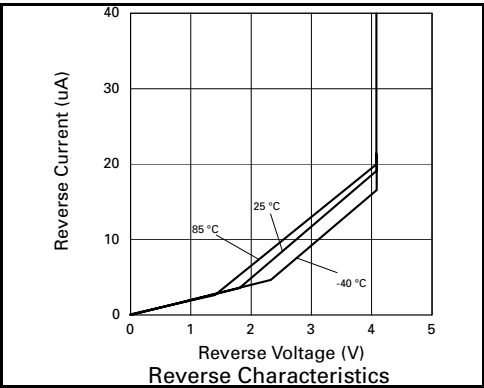
TEST CONDITIONS (Unless otherwise stated) T<sub>amb</sub>=25°C

| SYMBOL           | PARAMETER                                   | CONDITIONS                                                               | LIMITS                  |                         |                         | TOL.<br>%   | UNITS   |
|------------------|---------------------------------------------|--------------------------------------------------------------------------|-------------------------|-------------------------|-------------------------|-------------|---------|
|                  |                                             |                                                                          | MIN                     | TYP                     | MAX                     |             |         |
| V <sub>R</sub>   | Reverse Breakdown Voltage                   | I <sub>R</sub> =150μA                                                    | 4.055<br>4.014<br>3.973 | 4.096<br>4.096<br>4.096 | 4.137<br>4.178<br>4.219 | 1<br>2<br>3 | V       |
| I <sub>MIN</sub> | Minimum Operating Current                   |                                                                          |                         | 18                      | 23                      |             | μA      |
| I <sub>R</sub>   | Recommended Operating Current               |                                                                          | 0.023                   |                         | 5                       |             | mA      |
| T <sub>C</sub> † | Average Reverse Breakdown Voltage Temp. Co. | I <sub>R(min)</sub> to<br>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<br>f = 100Hz<br>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<br>f = 10Hz to<br>10kHz                           |                         | 90                      |                         |             | μV(rms) |

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

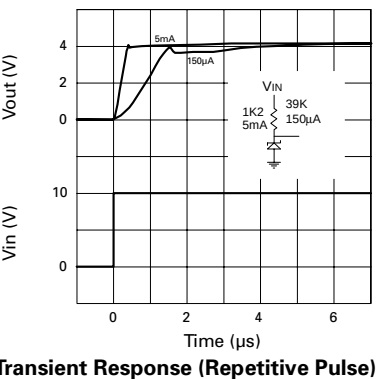
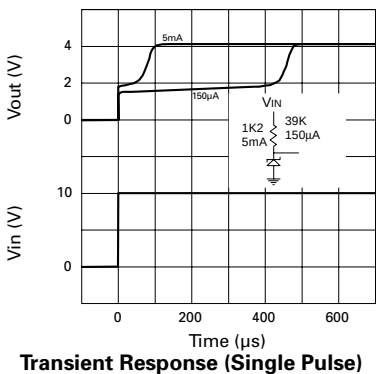
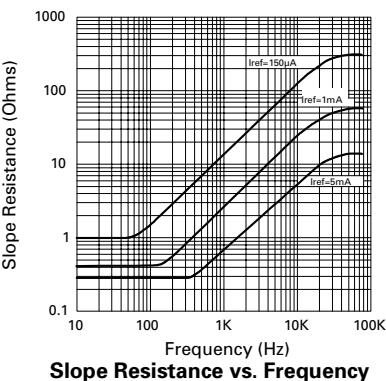
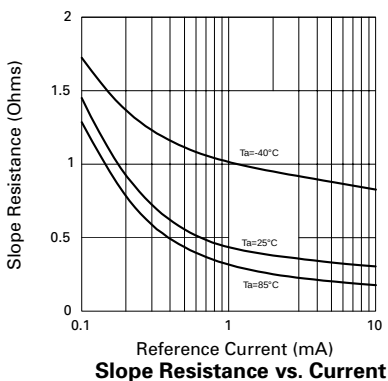
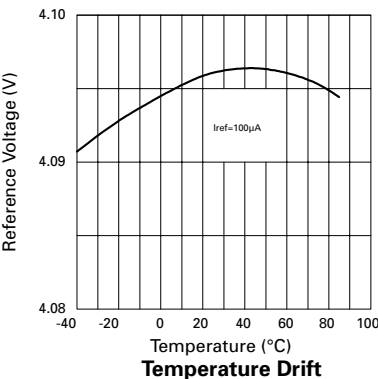
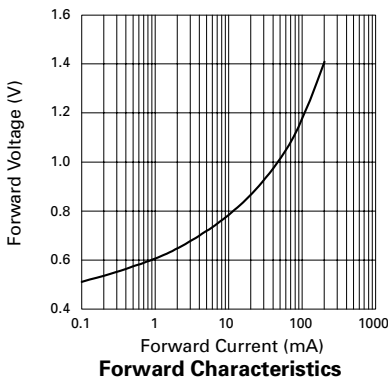
Note: V<sub>R(max)</sub> - V<sub>R(min)</sub> is the maximum deviation in reference voltage measured over the full operating temperature range.

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



# ZRC400

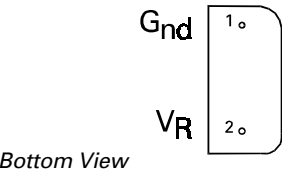
## TYPICAL CHARACTERISTICS



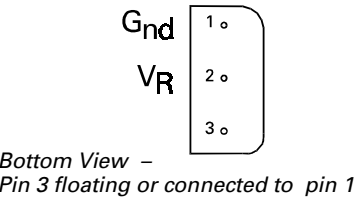
# ZRC400

## CONNECTION DIAGRAMS

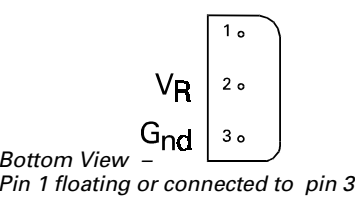
### E-Line, 2 pin Package Suffix – Y



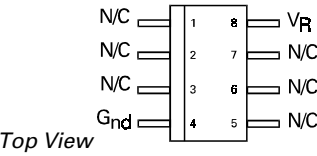
### E-Line, 3 pin, Rev Package Suffix – R



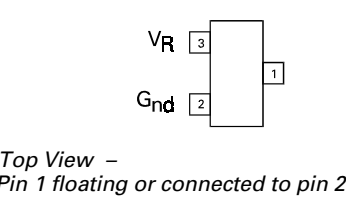
### E-Line, 3 pin Package Suffix – A



### SO8 Package Suffix – N8



### SOT23 Package Suffix – F



# ZRC400

## ORDERING INFORMATION

| Part No    | Tol% | Package  | Partmark |
|------------|------|----------|----------|
| ZRC400A03  | 3    | E-Line • | ZRC40003 |
| ZRC400A02  | 2    | E-Line • | ZRC40002 |
| ZRC400A01  | 1    | E-Line • | ZRC40001 |
| ZRC400F03  | 3    | SOT23    | 40D      |
| ZRC400F02  | 2    | SOT23    | 40G      |
| ZRC400F01  | 1    | SOT23    | 40H      |
| ZRC400N803 | 3    | SO8      | ZRC40003 |
| ZRC400N802 | 2    | SO8      | ZRC40002 |
| ZRC400N801 | 1    | SO8      | ZRC40001 |

| Part No   | Tol% | Package  | Partmark |
|-----------|------|----------|----------|
| ZRC400R03 | 3    | E-Line * | ZRC400R3 |
| ZRC400R02 | 2    | E-Line * | ZRC400R2 |
| ZRC400R01 | 1    | E-Line * | ZRC400R1 |
| ZRC400Y03 | 3    | E-Line † | ZRC40003 |
| ZRC400Y02 | 2    | E-Line † | ZRC40002 |
| ZRC400Y01 | 1    | E-Line † | ZRC40001 |

\* E-Line 3 pin Reversed

† E-Line 2 pin

• E-Line 3 pin