

**ZRC400**  
**PRECISION 4.096 VOLT LOW KNEE CURRENT VOLTAGE REFERENCE**

**Description**

The ZRC400 uses a bandgap circuit design to achieve a precision micropower voltage reference of 4.096 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 ZRC400 design provides a stable voltage without an external capacitor and is stable with capacitive loads. The ZRC400 is recommended for operation between 23µA 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 package
- No stabilizing capacitor required
- Low knee current, 18µA typical
- Typical TC 30ppm/°C
- Typical slope resistance 0.4Ω
- 1% tolerance
- Industrial temperature range
- Operating current 23µA to 5mA
- Transient response, stable in less than 10µs
- “Green” molding compound

**Applications**

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

**Pin Assignments**

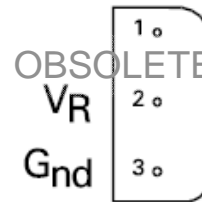
**SOT23 Package Suffix - F**



(Top View)

Pin 1 floating or connected to pin 1

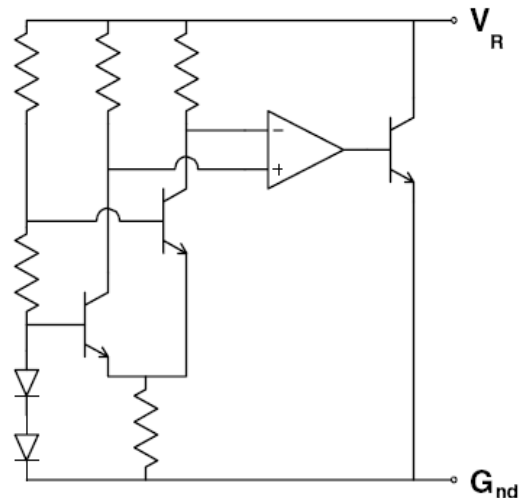
**E-Line, 3 pin Package Suffix - A**



(Bottom View)

Pin 1 floating or connected to pin 3

**Typical Application Circuit**



**Absolute Maximum Ratings** (Voltages to GND Unless Otherwise Stated)

| Parameter  | Rating     | Unit |
|--|------------|------|
| Reverse Current                                      | 25         | mA   |
| Forward Current                                      | 25         | mA   |
| Operating Temperature                                | -40 to 85  | °C   |
| Storage Temperature                                  | -55 to 125 | °C   |
| Power Dissipation (T <sub>AMB</sub> = 25°C)<br>SOT23 | 330        | mW   |

**Electrical Characteristics** (Test conditions: T<sub>amb</sub> = 25°C, unless otherwise specified.)

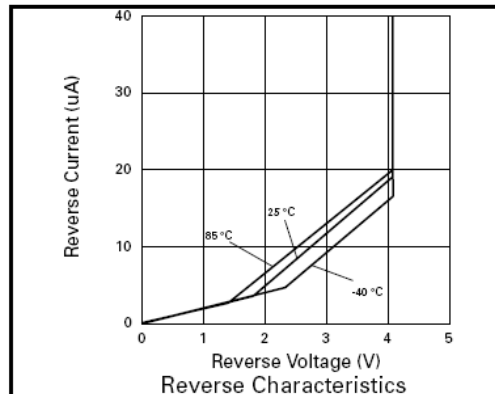
| Symbol                        | Parameter   | Condition  | Min.  | Typ.  | Max.  | Tol. (%) | Unit    |
|-------------------------------|---|--|-------|-------|-------|----------|---------|
| V <sub>R</sub>                | Reverse breakdown voltage                                 | I <sub>R</sub> = 150µA   | 4.055 | 4.096 | 4.137 | 1        | 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> <sup>(*)</sup> | Average reverse breakdown voltage temperature coefficient | I <sub>R(MIN)</sub> to I <sub>R(MAX)</sub>                               |       | 30    | 90    |          | ppm/°C  |
| R <sub>S</sub> <sup>(†)</sup> | 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> = 0.1I <sub>R</sub> |       | 0.3   | 0.8   |          | Ω       |
| E <sub>N</sub>                | Wideband noise voltage                                    | I <sub>R</sub> = 150µA<br>f = 10Hz to 10kHz                              |       | 90    |       |          | µV(rms) |

Notes:

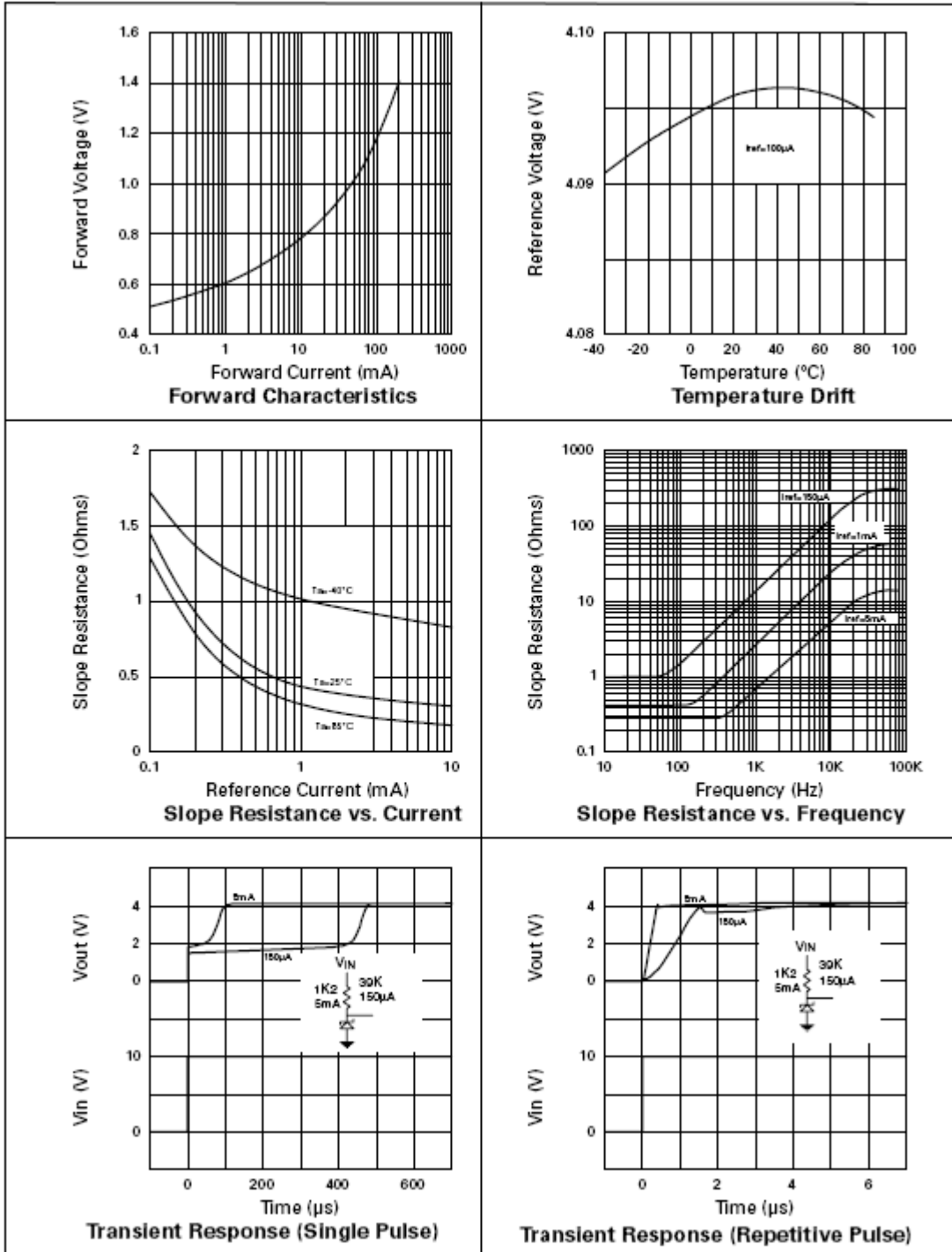
$$(*) T_C = \frac{(V_{R(MAX)} - V_{R(MIN)}) \times 1000000}{V_R \times (T_{(MAX)} - T_{(MIN)})}$$

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.

$$(†) R_S = \frac{V_R \text{ Change (I}_{R(MIN)} \text{ to I}_{R(MAX)})}{I_{R(MAX)} - I_{R(MIN)}}$$



**Typical Characteristics**



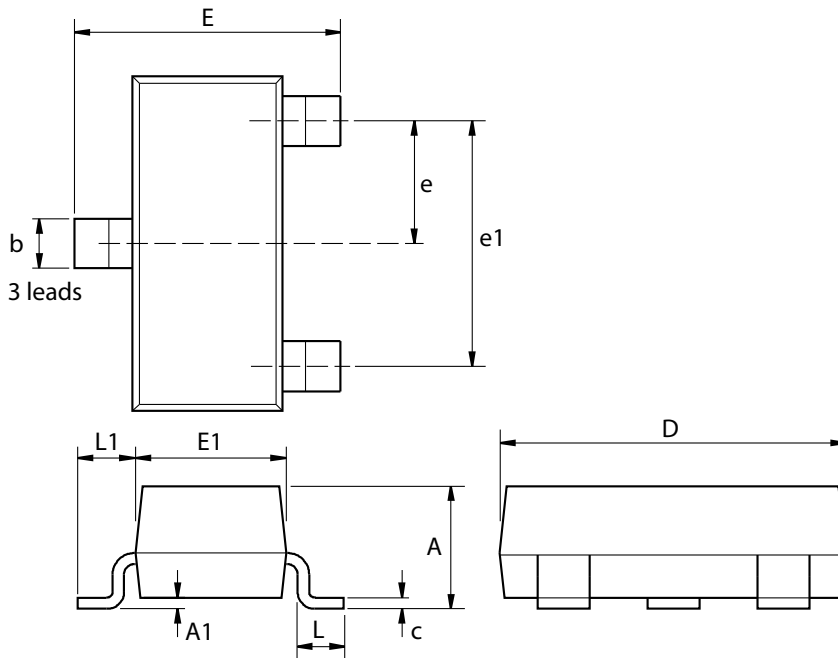
**Ordering Information\***

| Order Reference | Tol (%) | Device Mark | Status (*) | Reel Size (inches) | Quantity per reel | Tape Width (mm) |
|-----------------|---------|-------------|------------|--------------------|-------------------|-----------------|
| ZRC400F01TA     | 1       | 40H         | Released   | 7                  | 3000              | 8               |
| ZRC400F02TA     | 2       | 40G         | Obsolete   | 7                  | 3000              | 8               |
| ZRC400F03TA     | 3       | 40D         | Obsolete   | 7                  | 3000              | 8               |

Notes: \*All ZRC400A variants (E-Line) are obsolete and no longer available for sale. The closest alternative is the SOT23.

**Package Outline Dimensions**

**SOT23**

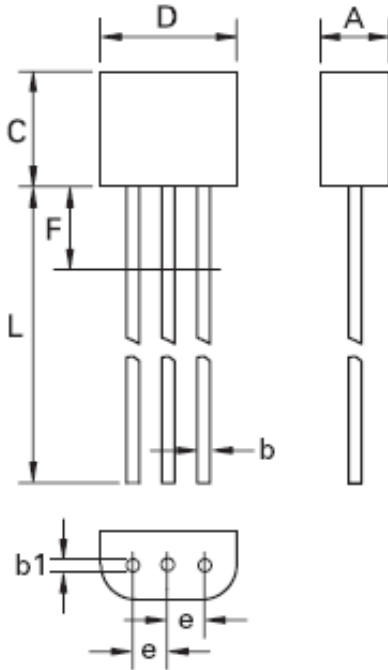


| Dim. | Millimeters |      | Inches    |       | Dim. | Millimeters |      | Inches    |        |
|------|-------------|------|-----------|-------|------|-------------|------|-----------|--------|
|      | Min.        | Max. | Min.      | Max.  |      | Min.        | Max. | Min.      | Max.   |
| A    | -           | 1.12 | -         | 0.044 | e1   | 1.90 NOM    |      | 0.075 NOM |        |
| A1   | 0.01        | 0.10 | 0.0004    | 0.004 | E    | 2.10        | 2.64 | 0.083     | 0.104  |
| b    | 0.30        | 0.50 | 0.012     | 0.020 | E1   | 1.20        | 1.40 | 0.047     | 0.055  |
| c    | 0.085       | 0.20 | 0.003     | 0.008 | L    | 0.25        | 0.60 | 0.0098    | 0.0236 |
| D    | 2.80        | 3.04 | 0.110     | 0.120 | L1   | 0.45        | 0.62 | 0.018     | 0.024  |
| e    | 0.95 NOM    |      | 0.037 NOM |       | -    | -           | -    | -         | -      |

Note: Controlling dimensions are in millimeters. Approximate dimensions are provided in inches

**Package Outline Dimensions**

**E-Line, 3 pin**



| DIM | Millimeters |       | Inches    |        |
|-----|-------------|-------|-----------|--------|
|     | Min.        | Max.  | Min.      | Max.   |
| A   | 2.16        | 2.41  | 0.085     | 0.095  |
| b   | 0.41        | 0.495 | 0.016     | 0.0195 |
| b1  | 0.41        | 0.495 | 0.016     | 0.0195 |
| D   | 4.37        | 4.77  | 0.172     | 0.188  |
| E   | 3.61        | 4.01  | 0.142     | 0.158  |
| e   | 1.27 NOM    |       | 0.050 NOM |        |
| F   | —           | 2.50  | —         | 0.098  |
| L   | 13.00       | 13.97 | 0.512     | 0.550  |

Note: Controlling dimensions are in millimeters. Approximate dimensions are provided in inches

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