

# PRECISION 2.5 VOLT MICROPOWER VOLTAGE REFERENCE

## ZR285-2.5

ISSUE 5 – FEBRUARY 1998

### DEVICE DESCRIPTION

The ZR285 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, as well as packages for through hole requirements.

The ZR285 design provides a stable voltage without an external capacitor and is stable with capacitive loads. The ZR285 is recommended for operation between 20 $\mu$ A and 20mA and so is ideally suited to low power and battery powered applications.

Excellent performance is maintained to an absolute maximum of 30mA, 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.

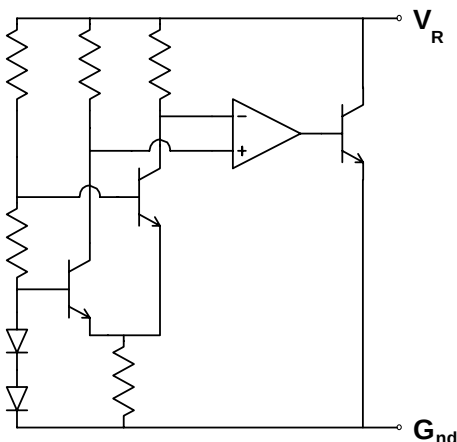
### FEATURES

- Small outline SOT23 and SO8 packages
- TO92 style packages
- No stabilising capacitor required
- Low knee current, 15 $\mu$ 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 20 $\mu$ A to 20mA

### APPLICATIONS

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

### SCHEMATIC DIAGRAM



# ZR285-2.5

## ABSOLUTE MAXIMUM RATING

|                       |              |
|-----------------------|--------------|
| Reverse Current       | 30mA         |
| Forward Current       | 25mA         |
| Operating Temperature | -40 to 85°C  |
| Storage Temperature   | -55 to 125°C |

## Power Dissipation (T<sub>amb</sub>=25°C)

|                    |       |
|--------------------|-------|
| SO8                | 625mW |
| SOT23              | 330mW |
| E-Line,2 Pin(TO92) | 500mW |
| E-Line,3 Pin(TO92) | 500mW |

## ELECTRICAL CHARACTERISTICS

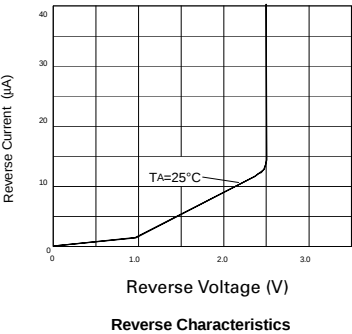
### TEST CONDITIONS (Unless otherwise stated) T<sub>amb</sub>=25°C

| SYMBOL           | PARAMETER                                   | CONDITIONS                                                               | LIMITS                 |                   |                        | TOL.<br>%   | UNITS    |
|------------------|---------------------------------------------|--------------------------------------------------------------------------|------------------------|-------------------|------------------------|-------------|----------|
|                  |                                             |                                                                          | MIN                    | TYP               | MAX                    |             |          |
| V <sub>R</sub>   | Reverse Breakdown Voltage                   | I <sub>R</sub> =150μA                                                    | 2.475<br>2.45<br>2.425 | 2.5<br>2.5<br>2.5 | 2.525<br>2.55<br>2.575 | 1<br>2<br>3 | V        |
| I <sub>MIN</sub> | Minimum Operating Current                   |                                                                          |                        | 13                | 20                     |             | μA       |
| I <sub>R</sub>   | Recommended Operating Current               |                                                                          | 0.02                   |                   | 20                     |             | mA       |
| T <sub>C</sub> † | Average Reverse Breakdown Voltage Temp. Co. | I <sub>R</sub> = 1mA to 20mA                                             |                        | 30                | 90                     |             | ppm/°C   |
| R <sub>S</sub> § | Slope Resistance                            |                                                                          |                        | 0.4               | 1                      |             | 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 10kHz                              |                        | 60                |                        |             | μV (rms) |

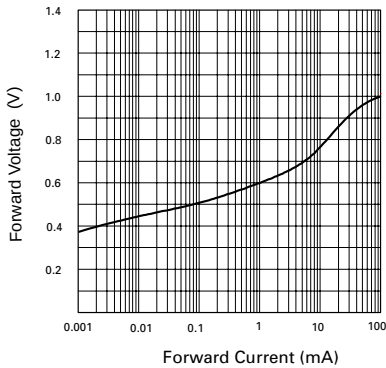
$$\dagger \quad T_C = \frac{(V_{R(max)} - V_{R(min)}) \times 1000000}{V_R \times (T_{(max)} - T_{(min)})}$$

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.

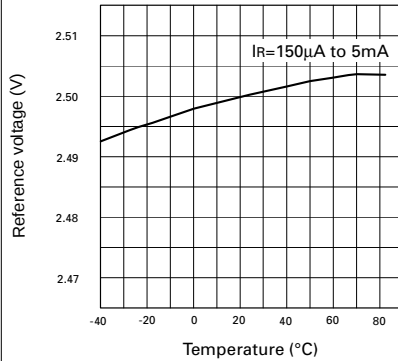
$$\S \quad R_S = \frac{V_R \text{ Change}(I_R(min) \text{ to } I_R(max))}{I_R(max) - I_R(min)}$$



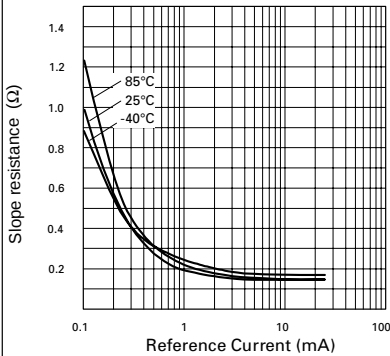
## TYPICAL CHARACTERISTICS



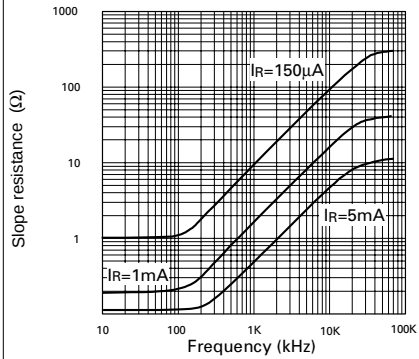
**Forward Characteristics**



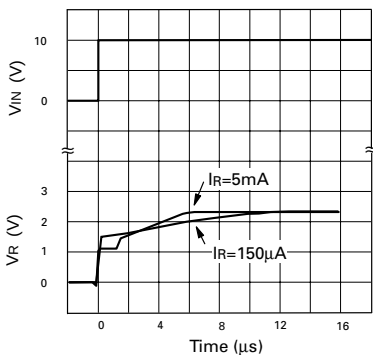
**Temperature Drift**



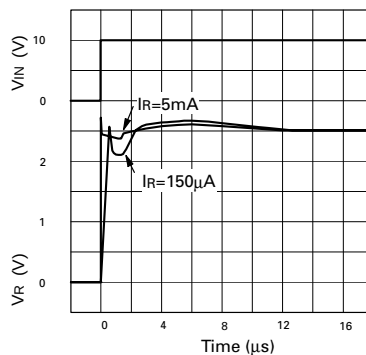
**Slope Resistance v Current**



**Slope Resistance v Frequency**



**Transient Response - Single pulse**

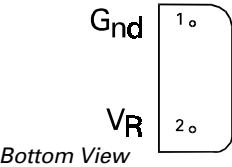


**Transient Response - Repetitive Test**

# ZR285-2.5

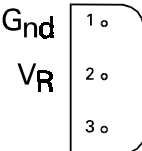
## CONNECTION DIAGRAMS

### E-Line, 2 pin Package Suffix – Y



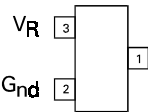
Bottom View

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



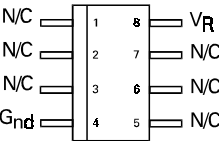
Bottom View –  
Pin 3 floating or connected to pin 1

### SOT23 Package Suffix – F



Top View –  
Pin 1 floating or connected to pin 2

### SO8 Package Suffix – N8



Top View

## ORDERING INFORMATION

| Part No   | Tol% | Package  | Partmark |
|-----------|------|----------|----------|
| ZR285F03  | 3    | SOT23    | 28A      |
| ZR285F02  | 2    | SOT23    | 28B      |
| ZR285F01  | 1    | SOT23    | 28C      |
| ZR285N803 | 3    | SO8      | ZR285803 |
| ZR285N802 | 2    | SO8      | ZR285802 |
| ZR285N801 | 1    | SO8      | ZR285801 |
| ZR285R03  | 3    | E-Line * | ZR28503  |
| ZR285R02  | 2    | E-Line * | ZR28502  |

| Part No  | Tol% | Package  | Partmark |
|----------|------|----------|----------|
| ZR285R01 | 1    | E-Line * | ZR28501  |
| ZR285Y03 | 3    | E-Line † | ZR28503  |
| ZR285Y02 | 2    | E-Line † | ZR28502  |
| ZR285Y01 | 1    | E-Line † | ZR28501  |

\* E-Line 3 pin Reversed

† E-Line 2 pin