DEVICE DESCRIPTION

The ZREF12 uses a bandgap circuit design to achieve a precision micropower voltage reference of 1.24 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 ZREF12 design provides a stable voltage without an external capacitor and is stable with capacitive loads. The ZREF12 is recommended for operation between 50µA 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 SO8 and TO92 style packages
- No stabilising capacitor required
- Typical TC 30ppm/°C
- Typical slope resistance 0.65Ω
- ±1% tolerance
- Industrial temperature range (Military temperature range available on request)
- Operating current 50µA to 5mA
- Transient response, stable in less than 10µs
- Alternative package options and tolerances available

APPLICATIONS

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

SCHEMATIC DIAGRAM

![Schematic Diagram](image-url)
**ZREF12**

**ABSOLUTE MAXIMUM RATING**
- Reverse Current: 25mA
- Forward Current: 25mA
- Operating Temperature: -40 to 85°C
- Storage Temperature: -55 to 125°C

**Power Dissipation (T_{amb}=25°C)**
- E-Line, 3 pin (TO92): 500mW
- E-Line, 2 pin (TO92): 500mW
- SO8: 625mW

**ELECTRICAL CHARACTERISTICS**

**TEST CONDITIONS (Unless otherwise stated) T_{amb}=25°C**

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>LIMITS</th>
<th>TOL. %</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>VR</td>
<td>Reverse Breakdown Voltage</td>
<td>I_R = 150µA</td>
<td>1.228</td>
<td>1.24</td>
<td>1.252</td>
</tr>
<tr>
<td>I_MIN</td>
<td>Minimum Operating Current</td>
<td>I_R = 150µA</td>
<td>30</td>
<td>50</td>
<td>µA</td>
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<tr>
<td>I_R</td>
<td>Recommended Operating Current</td>
<td>0.05</td>
<td>5</td>
<td>mA</td>
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<tr>
<td>T_C †</td>
<td>Average Reverse Breakdown Voltage Temp. Co.</td>
<td>I_R(min) to I_R(max)</td>
<td>30</td>
<td>90</td>
<td>ppm/°C</td>
</tr>
<tr>
<td>R_S §</td>
<td>Slope Resistance</td>
<td>V_R</td>
<td>0.65</td>
<td>2</td>
<td>Ω</td>
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<tr>
<td>Z_R</td>
<td>Reverse Dynamic Impedance</td>
<td>I_R = 1mA, f = 100Hz, I_{AC} = 0.1 I_R</td>
<td>0.5</td>
<td>1</td>
<td>Ω</td>
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<tr>
<td>E_N</td>
<td>Wideband Noise Voltage</td>
<td>I_R = 150µA, f = 100Hz to 10kHz</td>
<td>60</td>
<td></td>
<td>μV(rms)</td>
</tr>
</tbody>
</table>

† \[ T_C = \frac{(V_{R(max)} - V_{R(min)}) \times 100000}{V_R \times (T_{(max)} - T_{(min)})} \]

Note: \( V_{R(max)} - V_{R(min)} \) 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

Forward Characteristics

Reference Current (mA) vs Frequency (kHz)

Temperature Drift

Slope Resistance vs Current

Slope Resistance vs Frequency

Transient Response (I_R=150µA)

Transient Response (I_R=5mA)

Not Recommended for New Design
Please Use ZXRE125

ZREF12
ZREF12

CONNECTION DIAGRAMS

E-Line, 2 pin Package Suffix – Y

\[
\begin{array}{c}
\text{G}_{\text{nd}} \\
\text{V}_{\text{R}}
\end{array}
\]

Bottom View

E-Line, 3 pin, Rev Package Suffix – R

\[
\begin{array}{c}
\text{G}_{\text{nd}} \\
\text{V}_{\text{R}}
\end{array}
\]

Bottom View – Pin 3 floating or connected to pin 1

SO8 Package Suffix – N8

\[
\begin{array}{cccc}
\text{N/C} & 1 & 6 & \text{V}_{\text{R}} \\
\text{N/C} & 2 & 7 & \text{N/C} \\
\text{N/C} & 3 & 8 & \text{N/C} \\
\text{G}_{\text{nd}} & 4 & 5 & \text{N/C}
\end{array}
\]

Top View

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>Part No</th>
<th>Tol%</th>
<th>Package</th>
<th>Partmark</th>
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<tbody>
<tr>
<td>ZREF12</td>
<td>1</td>
<td>E-Line  †</td>
<td>ZREF12</td>
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<tr>
<td>ZREF12Z</td>
<td>1</td>
<td>E-Line *</td>
<td>ZREF12</td>
</tr>
<tr>
<td>ZREF12D</td>
<td>1</td>
<td>SO8</td>
<td>ZREF12</td>
</tr>
</tbody>
</table>

* E-Line 3 pin Reversed
† E-Line 2 pin