**Features**

- Guaranteed 10ppm/°C Temperature Coefficient
- Guaranteed 1Ω Maximum Dynamic Impedance
- Guaranteed 20μV Maximum Wideband Noise
- Wide Operating Current Range 0.6mA to 15mA

**Applications**

- Transducers
- A/D and D/A Converters
- Calibration Standards
- Instrumentation Reference

**Description**

The LM129 temperature compensated 6.9V zener references provide excellent stability over time and temperature, very low dynamic impedance and a wide operating current range. The device achieves low dynamic impedance by incorporating a high gain shunt regulator around the zener. The excellent noise performance of the device is achieved by using a “buried zener” design which eliminates surface noise phenomenon associated with ordinary zeners. To serve a wide variety of applications, the LM129 is available in several temperature coefficient grades and two package styles. A 20mA positive current source application is shown below.

**Typical Application**

![Diagram of 20mA Positive Current Source](image1)

![Graph of Reverse Voltage Change](image2)

\[ T_A = 25^\circ C \]
LM129/LM329

**ABSOLUTE MAXIMUM RATINGS** (Note 1)

Operating Temperature Range
- **LM129 (OBSOLETE) ...................... −55°C to 125°C**
- **LM329 ...................................... 0°C to 70°C**

Storage Temperature Range ................... −65°C to 150°C

Lead Temperature (Soldering, 10 sec) ........... 300°C

Reverse Breakdown Current ..................... 30mA

Forward Current ..................................... 2mA

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**PACKAGE/ORDER INFORMATION**

Consult LTC Marketing for availability of LM329AZ, LM329CZ and LM329DZ

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**ELECTRICAL CHARACTERISTICS** The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at \( T_A = 25°C \). (Note 2)

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>( T_A = 25°C ), 0.6mA ≤ ( I_R ) ≤ 15mA</th>
<th>( T_A = 25°C ), 1mA ≤ ( I_R ) ≤ 15mA</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_Z )</td>
<td>Reverse Breakdown Voltage</td>
<td>MIN</td>
<td>TYP</td>
<td>MAX</td>
<td>MIN</td>
</tr>
<tr>
<td>( \Delta V_Z )</td>
<td>Reverse Breakdown Voltage Change</td>
<td>( \Delta I_R )</td>
<td>MIN</td>
<td>TYP</td>
<td>MAX</td>
</tr>
<tr>
<td>( \Delta V_Z )</td>
<td>Temperature Coefficient</td>
<td>( I_R = 1mA )</td>
<td>MIN</td>
<td>TYP</td>
<td>MAX</td>
</tr>
<tr>
<td>( r_Z )</td>
<td>Dynamic Impedance</td>
<td>( T_A = 25°C ), ( I_R = 1mA )</td>
<td>MIN</td>
<td>TYP</td>
<td>MAX</td>
</tr>
<tr>
<td>( \varepsilon_n )</td>
<td>RMS Noise</td>
<td>( T_A = 25°C ), 10Hz ≤ ( f ) ≤ 10kHz</td>
<td>MIN</td>
<td>TYP</td>
<td>MAX</td>
</tr>
<tr>
<td>( \Delta V_Z )</td>
<td>Long Term Stability</td>
<td>( T_A = 45°C ) ±0.1°C, ( I_R = 1mA ) ±0.3%</td>
<td>MIN</td>
<td>TYP</td>
<td>MAX</td>
</tr>
</tbody>
</table>

**Note 1:** Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

**Note 2:** To determine the junction temperature as a function of the ambient temperature, see \( \theta_{JA} \) for each package.
TYPICAL PERFORMANCE CHARACTERISTICS

Reverse Characteristics

Dynamic Impedance

Response Time

Forward Characteristics

Noise Voltage

Low Frequency Noise Voltage

SCHEMATIC DIAGRAM

Information furnished by Linear Technology Corporation is believed to be accurate and reliable. However, no responsibility is assumed for its use. Linear Technology Corporation makes no representation that the interconnection of its circuits as described herein will not infringe on existing patent rights.
**TYPICAL APPLICATIONS**

Common Reference

9V TO 40V

\[ R_0 \text{ MIN} \geq 0.6\text{mA} \]

LM329 6.9V

Buffered Reference Using a Single Supply

15V

7.5k

LT1001

7

10V

LM329 6.9V

20k

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**PACKAGE DESCRIPTION**

H Package

2-Lead and 3-Lead TO-46 Metal Can

(Reference LTC DWG # 05-08-1340)

\[ 0.029 - 0.219 \text{ (0.759 - 5.537)} \]

\[ 0.178 - 0.195 \text{ (4.521 - 4.995)} \]

\[ 0.085 - 0.105 \text{ (2.159 - 2.607)} \]

\[ \text{MIN} \]

\[ \text{MAX} \]

REFERENCE PLANE

\[ 0.016 - 0.021^* \text{ (0.406 - 0.533)} \]

\[ 0.005 \text{ (0.130)} \]

\[ 0.050 \text{ (1.270)} \]

\[ 0.060 - 0.005 \text{ (1.524 - 0.127)} \]

\[ \text{DIA} \]

\[ 0.090 \text{ (2.286)} \]

\[ \text{NOM} \]

\[ 0.015 - 0.002 \text{ (0.381 - 0.050)} \]

\[ 0.098 +0.016/–0.04 \text{ (2.54 +0.40/–0.10)} \]

\[ \text{2 PCS} \]

\[ \text{TO-92 TAPE AND REEL} \]

\[ \text{REFER TO TAPE AND REEL SECTION OF LTC DATA BOOK FOR ADDITIONAL INFORMATION} \]

Z Package

3-Lead Plastic TO-92 (Similar to TO-226)

(Reference LTC DWG # 05-08-1410)

\[ 0.180 \text{ (4.572)} \]

\[ 0.050 \text{ (1.270)} \]

\[ \text{MIN} \]

\[ \text{MAX} \]

\[ 0.180 - 0.005 \text{ (4.572 - 0.127)} \]

\[ \text{DIA} \]

\[ 0.050 \text{ (1.270)} \]

\[ \text{NOM} \]

\[ 0.060 - 0.010 \text{ (1.524 - 0.254)} \]

\[ \text{UNCONTROLLED LEAD DIMENSION} \]

\[ 0.090 \text{ (2.286)} \]

\[ \text{NOM} \]

\[ 0.015 - 0.002 \text{ (0.381 - 0.050)} \]

\[ 0.098 +0.016/–0.04 \text{ (2.54 +0.40/–0.10)} \]

\[ \text{2 PCS} \]

\[ \text{TO-92 TAPE AND REEL} \]

\[ \text{REFER TO TAPE AND REEL SECTION OF LTC DATA BOOK FOR ADDITIONAL INFORMATION} \]

**RELATED PARTS**

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT1460</td>
<td>Micropower, Precise Series Reference</td>
<td>10ppm/°C, Output Voltages: 2.5V, 3V, 3.3V, 5V, 10V</td>
</tr>
<tr>
<td>LT1634</td>
<td>0.05% Accurate, 10ppm/°C, Shunt Reference</td>
<td>Output Voltages: 1.25V, 2.5V, 4.096V, 5V</td>
</tr>
</tbody>
</table>