

### 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

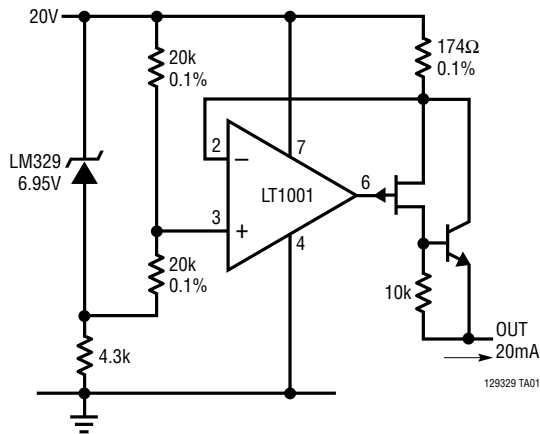
### DESCRIPTION

The **LM<sup>®</sup>329** 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.

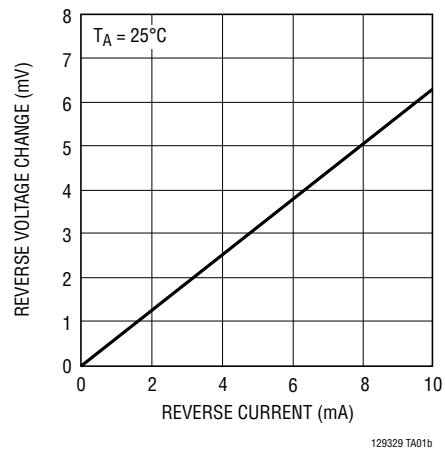
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### TYPICAL APPLICATION

20mA Positive Current Source



Reverse Voltage Change

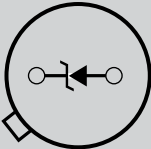
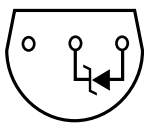


# LM129/LM329

## ABSOLUTE MAXIMUM RATINGS (Note 1)

|                                |                                            |                |
|--------------------------------|--------------------------------------------|----------------|
| Operating Temperature Range    | Lead Temperature (Soldering, 10 sec) ..... | 300°C          |
| LM129 (OBSOLETE) .....         | Reverse-Breakdown Current .....            | 30mA           |
| LM329 .....                    | Forward Current.....                       | 2mA            |
| Storage Temperature Range..... |                                            | -65°C to 150°C |

## PIN CONFIGURATION

|                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>BOTTOM VIEW</p>  <p>H PACKAGE<br/>2-LEAD TO-46 METAL CAN<br/><math>T_{JMAX} = 150^{\circ}\text{C}</math>,<br/><math>\theta_{JA} = 440^{\circ}\text{C/W}</math>, <math>\theta_{JC} = 80^{\circ}\text{C/W}</math></p> <p><b>OBSOLETE PACKAGE</b><br/>Consider the Z Package for Alternate Source</p> | <p>BOTTOM VIEW</p>  <p>Z PACKAGE<br/>3-LEAD PLASTIC TO-92<br/><math>T_{JMAX} = 150^{\circ}\text{C}</math>, <math>\theta_{JA} = 160^{\circ}\text{C/W}</math></p> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## ORDER INFORMATION

| LEAD FREE FINISH | TAPE AND REEL | PART MARKING | PACKAGE DESCRIPTION            | TEMPERATURE RANGE |
|------------------|---------------|--------------|--------------------------------|-------------------|
| LM129AH#PBF      | LM129AH#TRPBF | LM129AH      | 2-Lead Plastic TO-46 Metal Can | -55°C to 125°C    |
| LM129BH#PBF      | LM129BH#TRPBF | LM129BH      | 2-Lead Plastic TO-46 Metal Can | -55°C to 125°C    |
| LM129CH#PBF      | LM129CH#TRPBF | LM129CH      | 2-Lead Plastic TO-46 Metal Can | -55°C to 125°C    |
| LM329AH#PBF      | LM329AH#TRPBF | LM329AH      | 2-Lead Plastic TO-46 Metal Can | 0°C to 70°C       |
| LM329BH#PBF      | LM329BH#TRPBF | LM329BH      | 2-Lead Plastic TO-46 Metal Can | 0°C to 70°C       |
| LM329CH#PBF      | LM329CH#TRPBF | LM329CH      | 2-Lead Plastic TO-46 Metal Can | 0°C to 70°C       |
| LM329DH#PBF      | LM329DH#TRPBF | LM329DH      | 2-Lead Plastic TO-46 Metal Can | 0°C to 70°C       |
| LM329AZ#PBF      | LM329AZ#TRPBF | LM329BZ      | 3-Lead Plastic TO-92           | 0°C to 70°C       |
| LM329BZ#PBF      | LM329BZ#TRPBF | LM329BZ      | 3-Lead Plastic TO-92           | 0°C to 70°C       |
| LM329CZ#PBF      | LM329CZ#TRPBF | LM329BZ      | 3-Lead Plastic TO-92           | 0°C to 70°C       |
| LM329DZ#PBF      | LM329DZ#TRPBF | LM329BZ      | 3-Lead Plastic TO-92           | 0°C to 70°C       |

Consult LTC Marketing for parts specified with wider operating temperature ranges.

Consult LTC Marketing for information on non-standard lead based finish parts.

For more information on lead free part marking, go to: <http://www.linear.com/leadfree/>

For more information on tape and reel specifications, go to: <http://www.linear.com/tapeandree/>

# ELECTRICAL CHARACTERISTICS

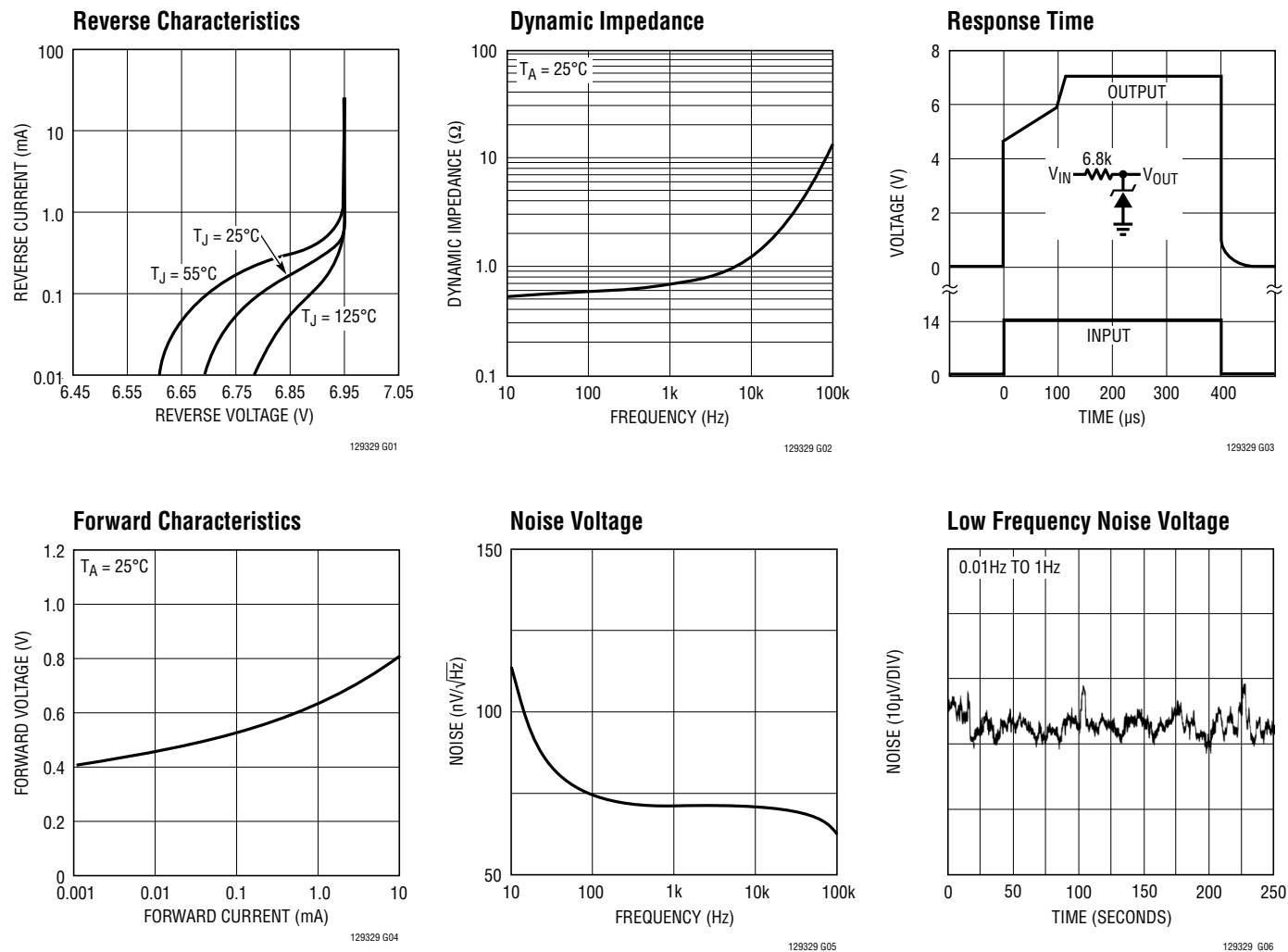
The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at  $T_A = 25^\circ\text{C}$ . (Note 2)

| SYMBOL                                  | PARAMETER                                     | CONDITIONS                                                                                                    |                  | LM129A/<br>LM129B/LM129C |               |                | LM329A/LM329B/<br>LM329C/LM329D |                     |                       | UNITS                                                                                            |
|-----------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------|------------------|--------------------------|---------------|----------------|---------------------------------|---------------------|-----------------------|--------------------------------------------------------------------------------------------------|
|                                         |                                               |                                                                                                               |                  | MIN                      | TYP           | MAX            | MIN                             | TYP                 | MAX                   |                                                                                                  |
| $V_Z$                                   | Reverse-Breakdown Voltage                     | $T_A = 25^\circ\text{C}$ , $0.6\text{mA} \leq I_R \leq 15\text{mA}$                                           |                  | 6.7                      | 6.9           | 7.2            | 6.6                             | 6.9                 | 7.25                  | V                                                                                                |
| $\frac{\Delta V_Z}{\Delta I_R}$         | Reverse-Breakdown Voltage Change with Current | $T_A = 25^\circ\text{C}$ , $0.6\text{mA} \leq I_R \leq 15\text{mA}$<br>$1\text{mA} \leq I_R \leq 15\text{mA}$ | ●                |                          | 9<br>12       | 14             |                                 | 9<br>12             | 20                    | mV<br>mV                                                                                         |
| $\frac{\Delta V_Z}{\Delta \text{Temp}}$ | Temperature Coefficient                       | $I_R = 1\text{mA}$ ,<br>LM129A/LM329A<br>LM129B/LM329B<br>LM129C/LM329C<br>LM329D                             | ●<br>●<br>●<br>● |                          | 6<br>15<br>30 | 10<br>20<br>50 |                                 | 6<br>15<br>30<br>50 | 10<br>20<br>50<br>100 | ppm/ $^\circ\text{C}$<br>ppm/ $^\circ\text{C}$<br>ppm/ $^\circ\text{C}$<br>ppm/ $^\circ\text{C}$ |
|                                         | Change in Temperature Coefficient             | $1\text{mA} \leq I_R \leq 15\text{mA}$                                                                        | ●                |                          | 1             |                |                                 | 1                   |                       | ppm/ $^\circ\text{C}$                                                                            |
| $r_Z$                                   | Dynamic Impedance                             | $T_A = 25^\circ\text{C}$ , $I_R = 1\text{mA}$<br>$1\text{mA} \leq I_R \leq 15\text{mA}$                       | ●                |                          | 0.6<br>0.8    | 1              |                                 | 0.8<br>1            | 2                     | $\Omega$<br>$\Omega$                                                                             |
| $e_n$                                   | RMS Noise                                     | $T_A = 25^\circ\text{C}$ , $10\text{Hz} \leq f \leq 10\text{kHz}$                                             |                  |                          | 7             | 20             |                                 | 7                   | 100                   | $\mu\text{V}$                                                                                    |
| $\frac{\Delta V_Z}{\Delta \text{Time}}$ | Long-Term Stability                           | $T_A = 45^\circ\text{C} \pm 0.1^\circ\text{C}$ , $I_R = 1\text{mA} \pm 0.3\%$                                 |                  |                          | 20            |                |                                 | 20                  |                       | ppm/kHr                                                                                          |

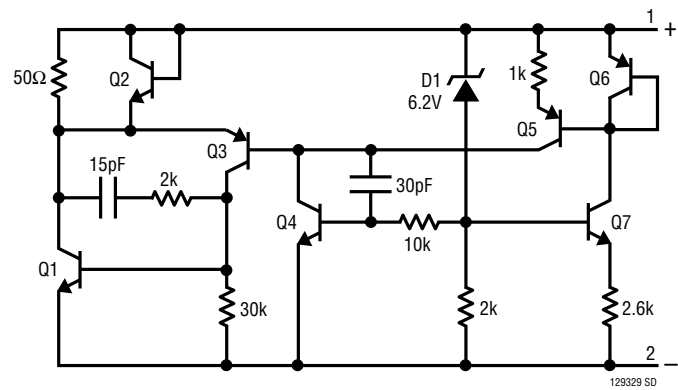
**Note 1:** Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

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

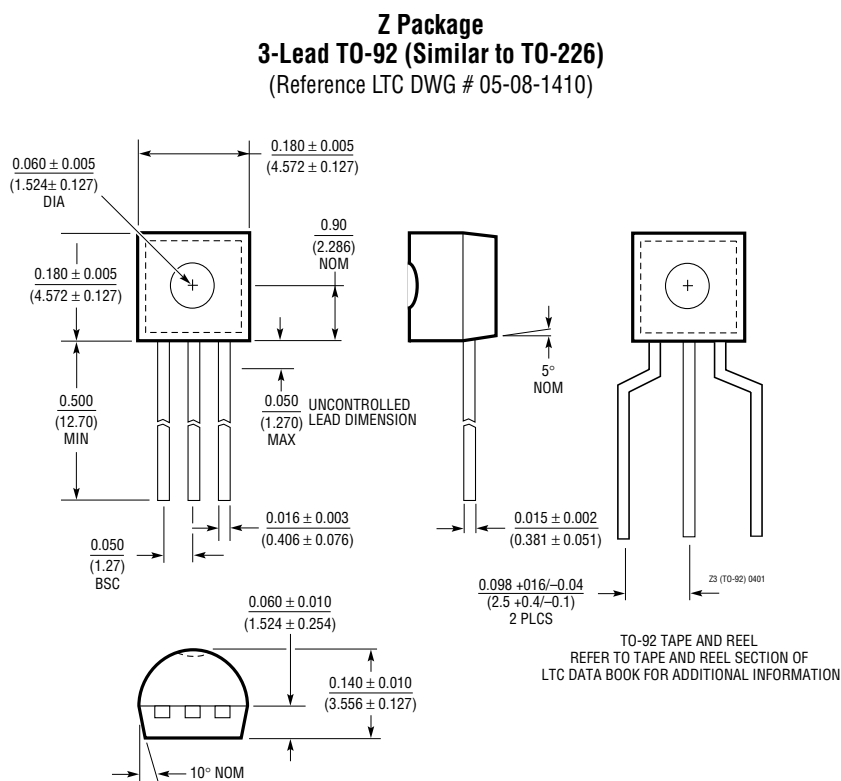
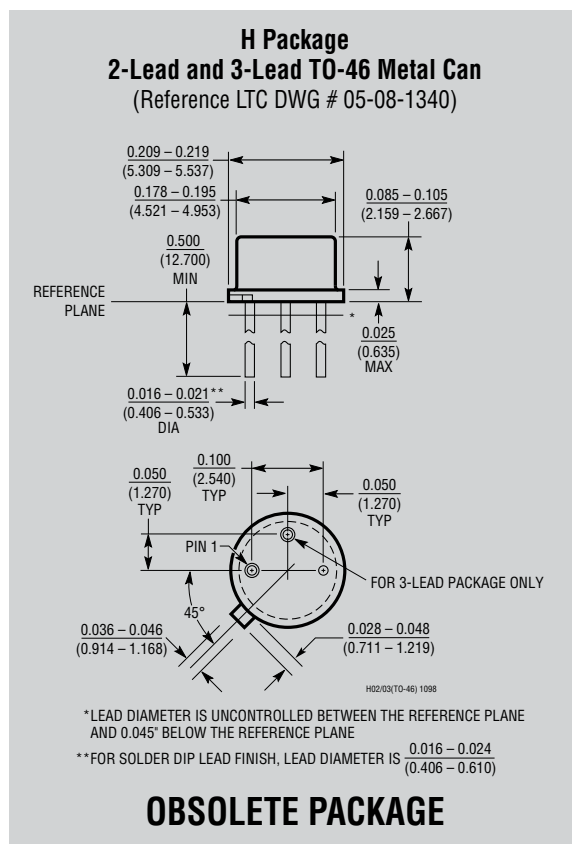
TYPICAL PERFORMANCE CHARACTERISTICS



SCHEMATIC DIAGRAM



## PACKAGE DESCRIPTION

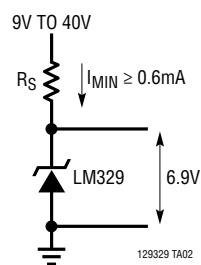


**REVISION HISTORY** (Revision history begins at Rev D)

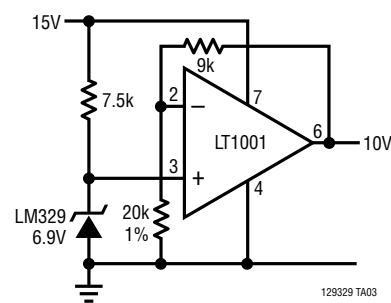
| REV | DATE  | DESCRIPTION                                                                    | PAGE NUMBER   |
|-----|-------|--------------------------------------------------------------------------------|---------------|
| D   | 12/14 | Web Links Added<br>Package/Order Information Updated<br>Revision History Added | All<br>2<br>7 |

TYPICAL APPLICATION

Common Reference



Buffered Reference Using a Single Supply



RELATED PARTS

| PART NUMBER            | DESCRIPTION                               | COMMENTS                                           |
|------------------------|-------------------------------------------|----------------------------------------------------|
| <a href="#">LT1460</a> | Micropower, Precise Series Reference      | 10ppm/°C, Output Voltages: 2.5V, 3V, 3.3V, 5V, 10V |
| <a href="#">LT1634</a> | 0.05% Accurate, 10ppm/°C, Shunt Reference | Output Voltages: 1.25V, 2.5V, 4.096V, 5V           |