

## 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

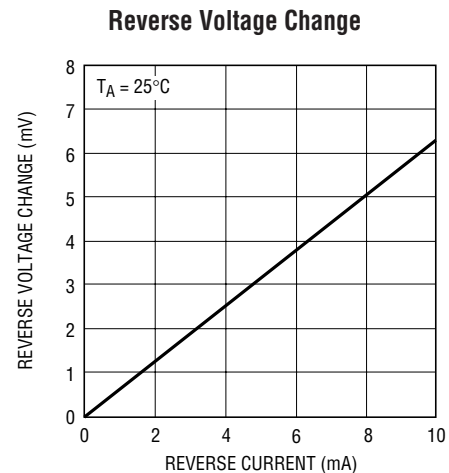
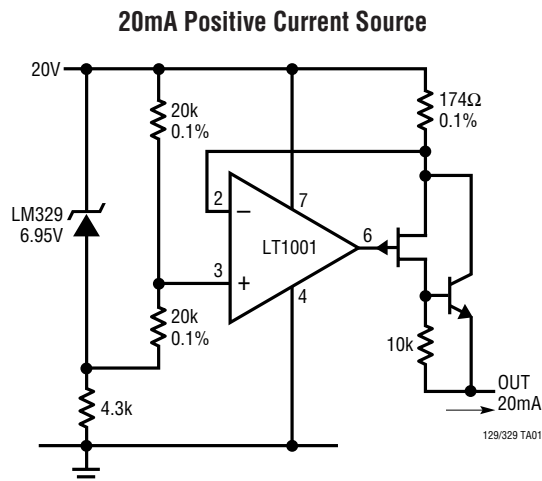
- Transducers
- A/D and D/A Converters
- Calibration Standards
- Instrumentation Reference

## 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.

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## TYPICAL APPLICATION

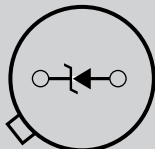
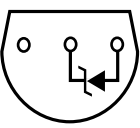


# LM129/LM329

## ABSOLUTE MAXIMUM RATINGS (Note 1)

Operating Temperature Range	Lead Temperature (Soldering, 10 sec)..... 300°C
LM129 (OBSOLETE) ..... -55°C to 125°C	Reverse Breakdown Current ..... 30mA
LM329 ..... 0°C to 70°C	Forward Current ..... 2mA
Storage Temperature Range ..... -65°C to 150°C	

## PACKAGE/ORDER INFORMATION

 <p>BOTTOM VIEW</p> <p>H PACKAGE 2-LEAD TO-46 METAL CAN</p> <p><math>T_{JMAX} = 150^{\circ}C</math>, <math>\theta_{JA} = 440^{\circ}C/W</math>, <math>\theta_{JC} = 80^{\circ}C/W</math></p> <p><b>OBSOLETE PACKAGE</b> Consider the Z Package for Alternate Source</p>	ORDER PART NUMBER	 <p>BOTTOM VIEW</p> <p>Z PACKAGE 3-LEAD PLASTIC TO-92</p> <p><math>T_{JMAX} = 150^{\circ}C</math>, <math>\theta_{JA} = 160^{\circ}C/W</math></p>	ORDER PART NUMBER
	LM129AH LM329AH LM129BH LM329BH LM129CH LM329CH LM329DH		LM329AZ LM329BZ LM329CZ LM329DZ

Consult LTC Marketing for availability of LM329AZ, LM329CZ and LM329DZ

## ELECTRICAL CHARACTERISTICS

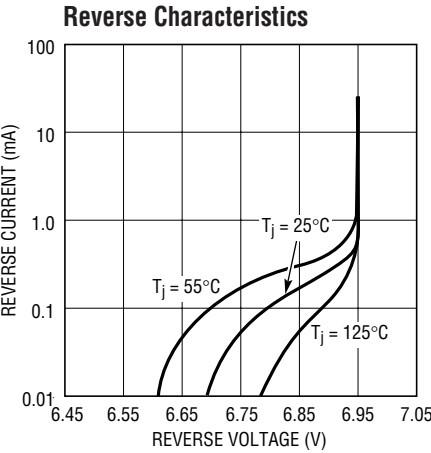
The ● denotes the specifications which apply over the full operating temperature range, otherwise specifications are at  $T_A = 25^{\circ}C$ . (Note 2)

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

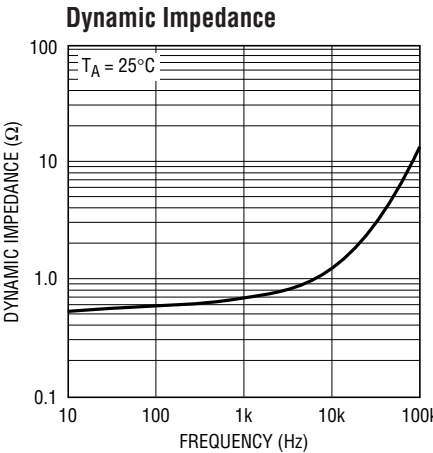
**Note 1:** Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

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

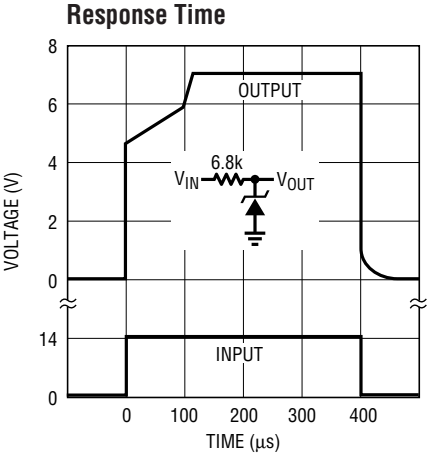
# TYPICAL PERFORMANCE CHARACTERISTICS



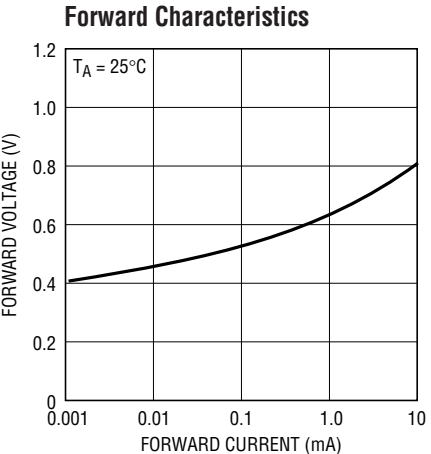
129/329 G01



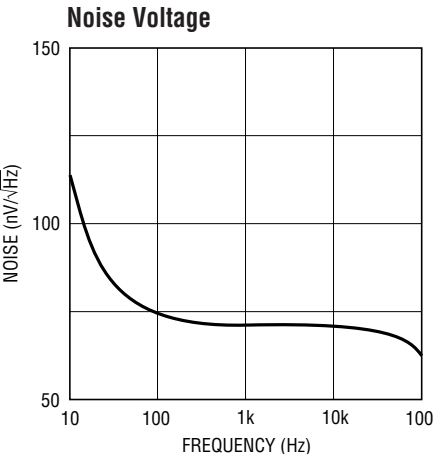
129/329 G02



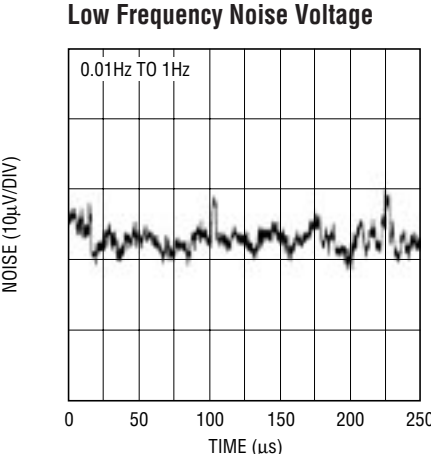
129/329 G03



129/329 G04

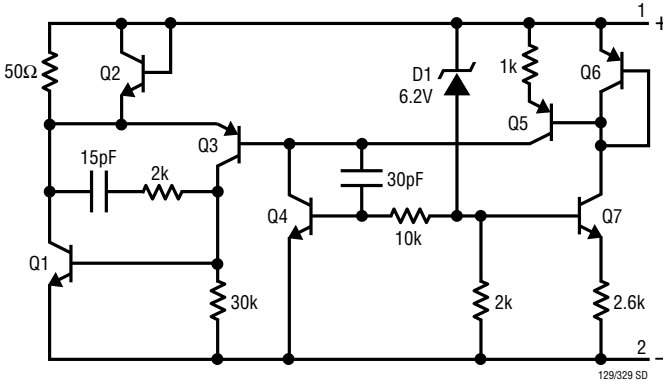


129/329 G05



129/329 G06

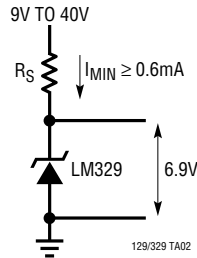
# SCHEMATIC DIAGRAM



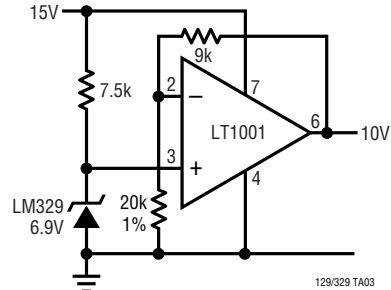
129/329 SD

## TYPICAL APPLICATIONS

### Common Reference

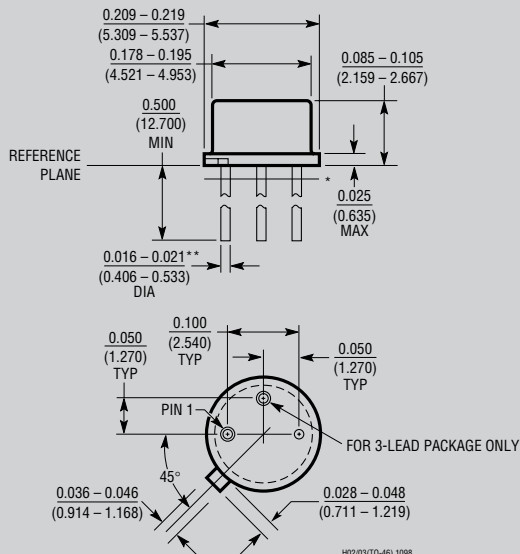


### Buffered Reference Using a Single Supply



## PACKAGE DESCRIPTION

### H Package 2-Lead and 3-Lead TO-46 Metal Can (Reference LTC DWG # 05-08-1340)

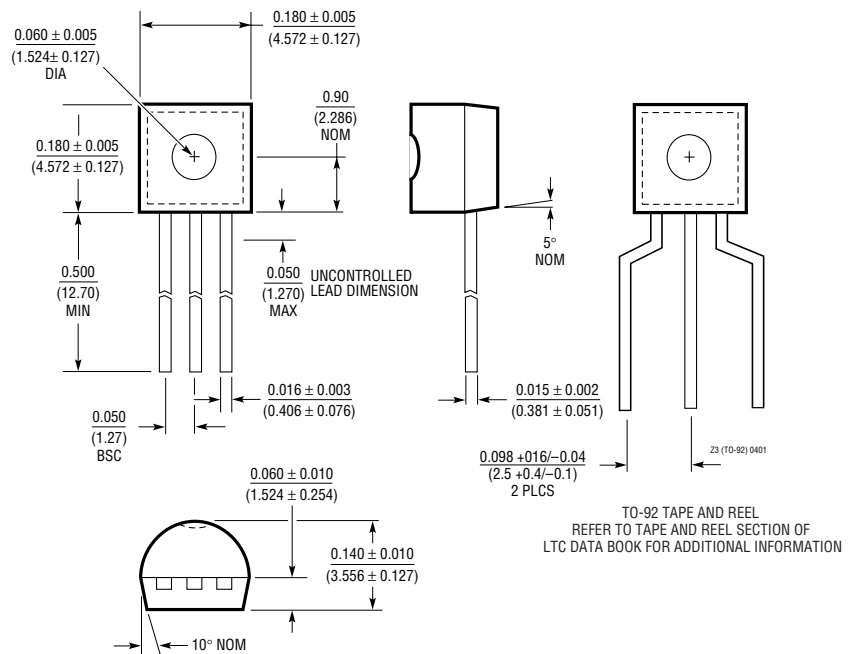


\* LEAD DIAMETER IS UNCONTROLLED BETWEEN THE REFERENCE PLANE AND 0.045" BELOW THE REFERENCE PLANE

\*\* FOR SOLDER DIP LEAD FINISH, LEAD DIAMETER IS 0.016 - 0.024 (0.406 - 0.610)

**OBSOLETE PACKAGE**

### Z Package 3-Lead Plastic TO-92 (Similar to TO-226) (Reference LTC DWG # 05-08-1410)



TO-92 TAPE AND REEL  
REFER TO TAPE AND REEL SECTION OF  
LTC DATA BOOK FOR ADDITIONAL INFORMATION

## RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LT1460	Micropower, Precise Series Reference	10ppm/°C, Output Voltages: 2.5V, 3V, 3.3V, 5V, 10V
LT1634	0.05% Accurate, 10ppm/°C, Shunt Reference	Output Voltages: 1.25V, 2.5V, 4.096V, 5V