

## FEATURES

- *Guaranteed* 10 ppm/°C temperature coefficient
- *Guaranteed* 1.0Ω max. dynamic impedance
- *Guaranteed* 20μV max. wideband noise
- Wide operating current range 0.6mA to 15mA

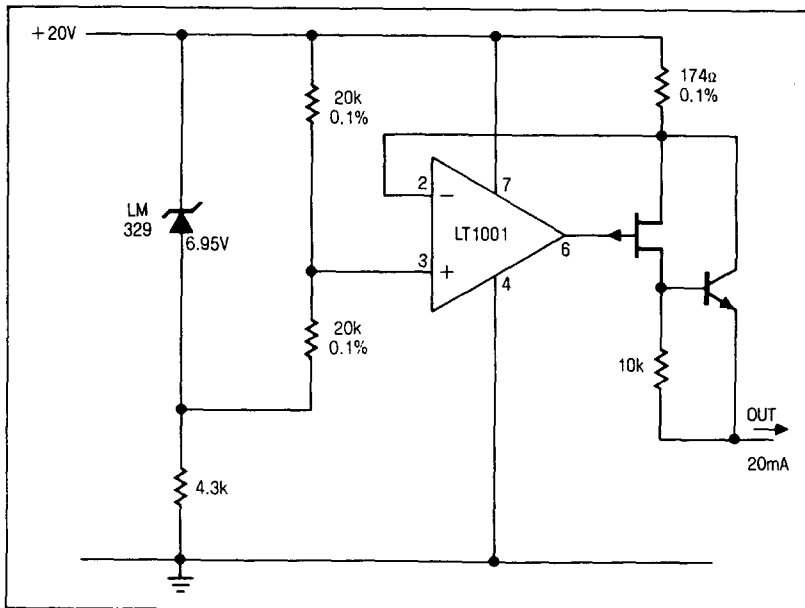
## APPLICATIONS

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

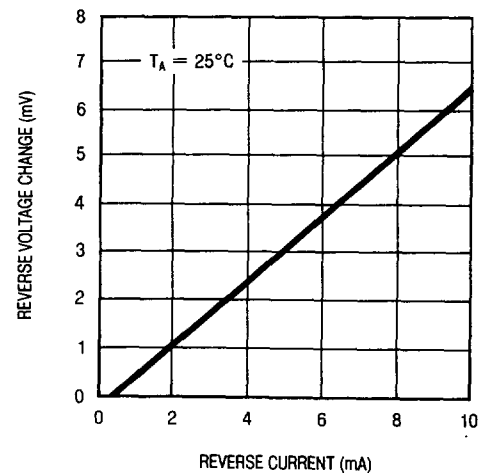
## DESCRIPTION

The LM129 temperature compensated 6.9 Volt 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.

20mA Positive Current Source



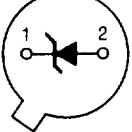

Reverse Voltage Change



**ABSOLUTE MAXIMUM RATINGS**

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

**PACKAGE/ORDER INFORMATION**

 H PACKAGE TO-46 METAL CAN	LM129AH LM329AH
	LM129BH LM329BH
	LM129CH LM329CH
 Z PACKAGE TO-92 PLASTIC	LM329DH
	LM329AZ
	LM329BZ
	LM329CZ
	LM329DZ

**ELECTRICAL CHARACTERISTICS (See Note 1)**

SYMBOL	PARAMETER	CONDITIONS	LM129A,B,C			LM329A,B,C,D			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	$T_A = 25^\circ\text{C}$ $0.6\text{mA} \leq I_R \leq 15\text{mA}$		9	14		9	20	mV
$\frac{\Delta V_Z}{\Delta I_R}$	Reverse Breakdown Voltage Change with Current	$1\text{mA} \leq I_R \leq 15\text{mA}$	●	12			12		mV
$\frac{\Delta V_Z}{\Delta \text{Temp}}$	Temperature Coefficient	$I_R = 1\text{mA}$ LM129A/LM329A	●	6	10		6	10	ppm/°C
		LM129B/LM329B	●	15	20		15	20	ppm/°C
		LM129C/LM329C	●	30	50		30	50	ppm/°C
		LM329D	●				50	100	ppm/°C
	Change in Temperature Coefficient	$1\text{mA} \leq I_R \leq 15\text{mA}$	●	1			1		ppm/°C
$r_Z$	Dynamic Impedance (Note 2)	$T_A = 25^\circ\text{C}$ , $I_R = 1\text{mA}$ ( $10\text{Hz} \leq f \leq 100\text{Hz}$ )		0.6	1		0.8	2	$\Omega$
$r_Z$	Dynamic Impedance (Note 2)	$1\text{mA} \leq I_R \leq 15\text{mA}$ ( $10\text{Hz} \leq f \leq 100\text{Hz}$ )	●	0.8			1		$\Omega$
$e_n$	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

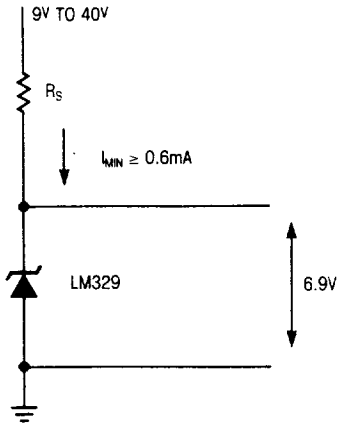
The ● denotes the specifications which apply over full operating temperature range.

**Note 1:** These specifications apply over the full operating temperature range unless otherwise noted. To determine the junction temperature as a function of the ambient temperature, see  $\theta_{JA}$  for each package.

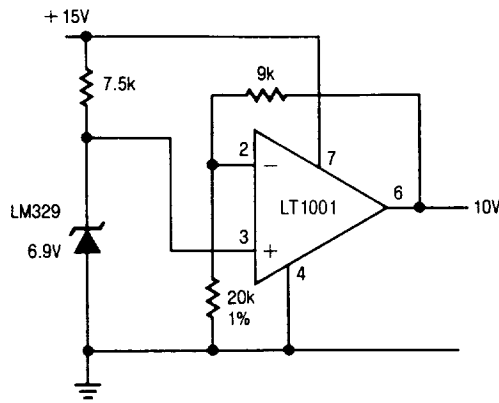
**Note 2:** Dynamic impedance guaranteed by "Reverse Breakdown Voltage Change with Current".

# TYPICAL APPLICATIONS

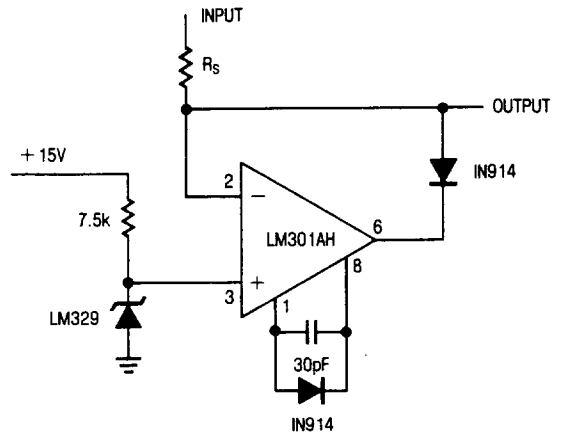
**Common Reference**



**Buffered Reference Using a Single Supply**



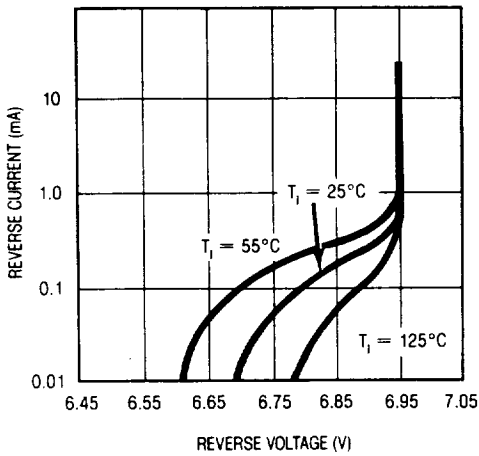
**Precision Clamp**



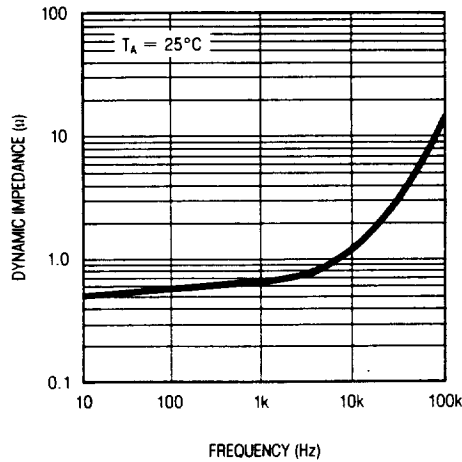
# TYPICAL PERFORMANCE CHARACTERISTICS

3

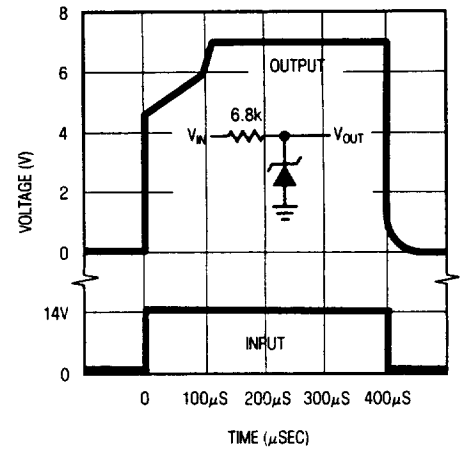
**Reverse Characteristics**



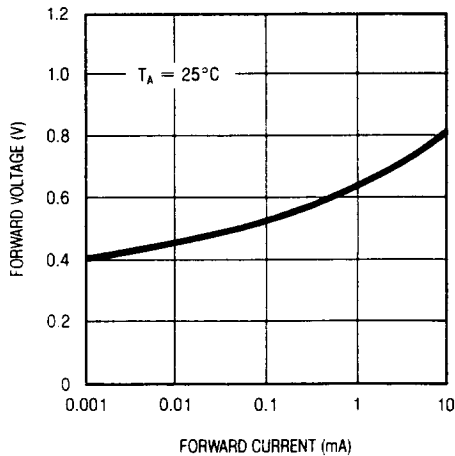
**Dynamic Impedance**



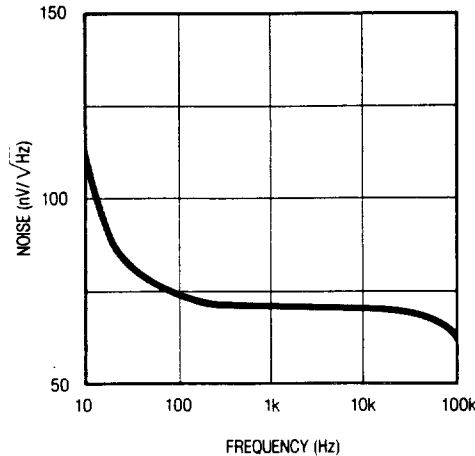
**Response Time**



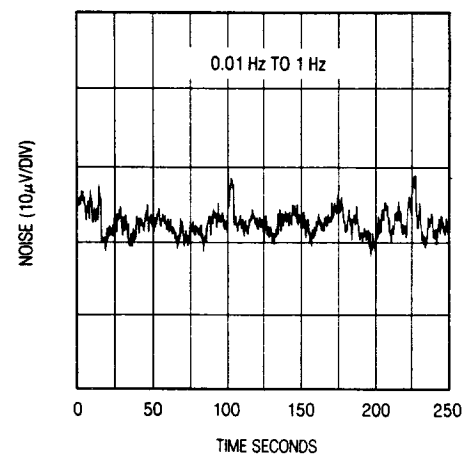
**Forward Characteristics**



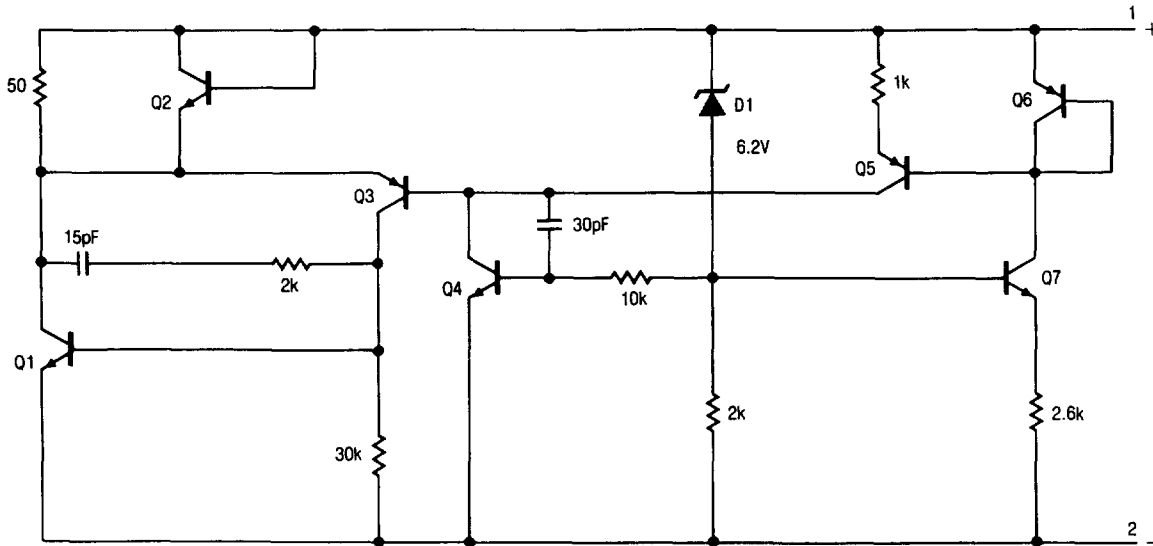
**Noise Voltage**



**Low Frequency Noise Voltage**

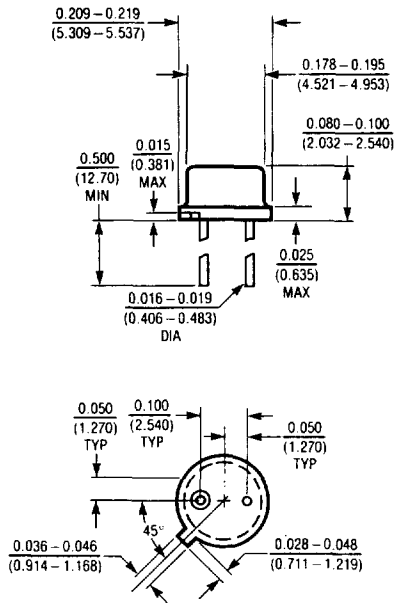


**SCHEMATIC DIAGRAM**



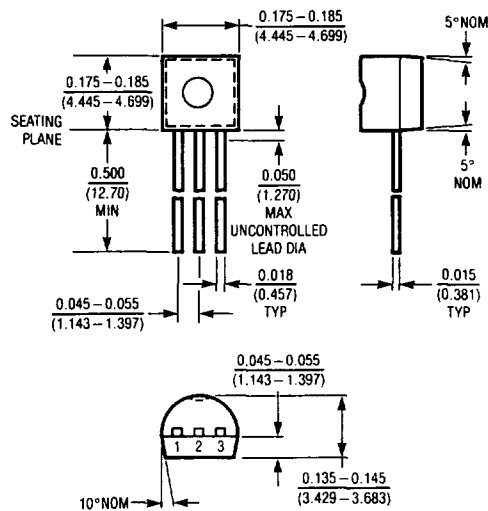
**PACKAGE DESCRIPTION**

**H Package, 2 Lead TO-46 Metal Can**



$T_{jmax}$	$\theta_{ja}$	$\theta_{jc}$
150°C	440°C/W	80°C/W

**Z Package, 3 Lead TO-92 Plastic**



$T_{jmax}$	$\theta_{ja}$
100°C	160°C/W