

LM329

Precision Reference

General Description

The LM329 is a precision multi-current temperature-compensated 6.9V zener reference with dynamic impedance a factor of 10 to 100 less than discrete diodes. Constructed in a single silicon chip, the LM329 uses active circuitry to buffer the internal zener allowing the device to operate over a 0.5 mA to 15 mA range with virtually no change in performance. The LM329 is available with a temperature coefficient of 0.01%/°C. This reference also has excellent long term stability and low noise.

A new subsurface breakdown zener used in the LM329 gives lower noise and better long-term stability than conventional IC zeners. Further the zener and temperature compensating transistor are made by a planar process so they are immune to problems that plague ordinary zeners. For example, there is virtually no voltage shift in zener voltage due to temperature cycling and the device is insensitive to stress on the leads.

The LM329 can be used in place of conventional zeners with improved performance. The low dynamic impedance simpli-

fies biasing and the wide operating current allows the replacement of many zener types.

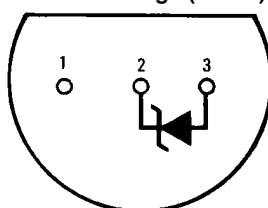
The LM329 for operation over 0°C to 70°C is available in a TO-92 epoxy package.

Features

- 0.6 mA to 15 mA operating current
- 0.8Ω dynamic impedance at any current
- Available with temperature coefficient of 0.01%/°C
- 7μV wideband noise
- 5% initial tolerance
- 0.002% long term stability
- Low cost
- Subsurface zener

Connection Diagram

Plastic Package (TO-92)

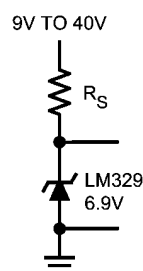


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Bottom View
Order Number LM329DZ
See NS Package Z03A

Typical Applications

Simple Reference



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Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/ Distributors for availability and specifications.

Operating Temperature Range

LM329

0°C to +70°C

Storage Temperature Range

–55°C to +150°C

Soldering Information

TO-92 package: 10 sec.

260°C

Reverse Breakdown Current

30 mA

Forward Current

2 mA

Electrical Characteristics (Note 2)

Parameter	Conditions	Min	Typ	Max	Units
Reverse Breakdown Voltage	$T_A = 25^\circ\text{C}$, $0.6\text{ mA} \leq I_R \leq 15\text{ mA}$	6.6	6.9	7.25	V
Reverse Breakdown Change with Current (Note 3)	$T_A = 25^\circ\text{C}$, $0.6\text{ mA} \leq I_R \leq 15\text{ mA}$		9	20	mV
Reverse Dynamic Impedance (Note 3)	$T_A = 25^\circ\text{C}$, $I_R = 1\text{ mA}$		0.8	2	Ω
RMS Noise	$T_A = 25^\circ\text{C}$, $10\text{ Hz} \leq F \leq 10\text{ kHz}$		7	100	μV
Long Term Stability (1000 hours)	$T_A = 45^\circ\text{C} \pm 0.1^\circ\text{C}$, $I_R = 1\text{ mA} \pm 0.3\%$		20		ppm
Temperature Coefficient	$I_R = 1\text{ mA}$		50	100	ppm/°C
Change In Reverse Breakdown Temperature Coefficient	$1\text{ mA} \leq I_R \leq 15\text{ mA}$		1		ppm/°C
Reverse Breakdown Change with Current	$1\text{ mA} \leq I_R \leq 15\text{ mA}$		12		mV
Reverse Dynamic Impedance	$1\text{ mA} \leq I_R \leq 15\text{ mA}$		1		Ω

Note 1: "Absolute Maximum Ratings" indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits.

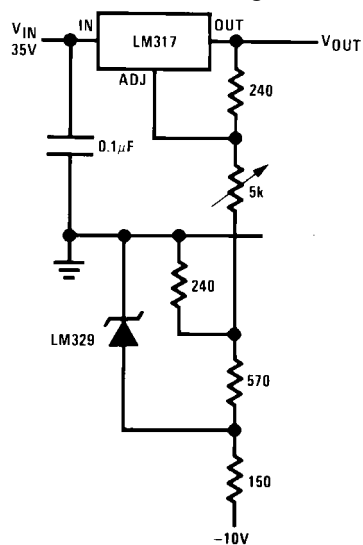
Note 2: These specifications apply for $0^\circ\text{C} \leq T_A \leq +70^\circ\text{C}$ for the LM329 unless otherwise specified. The maximum junction temperature for a LM329 is 100°C . For operating at elevated temperature. The TO-92 package, the derating is based on 180°C/W junction to ambient with 0.4 leads from a PC board and 160°C/W junction to ambient with 0.125 lead length to a PC board.

Note 3: These changes are tested on a pulsed basis with a low duty-cycle. For changes versus temperature, compute in terms of tempco.

Note 4:

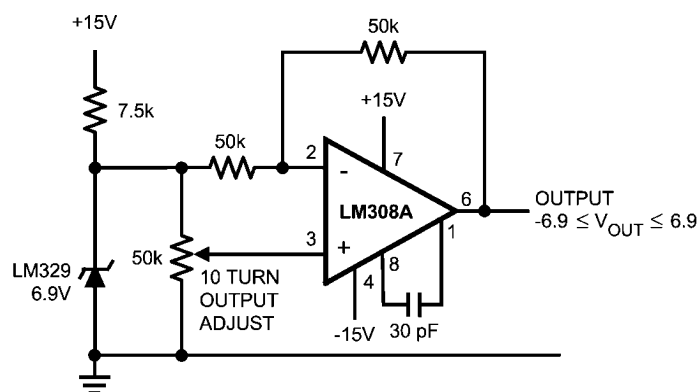
Typical Applications

Low Cost 0–25V Regulator



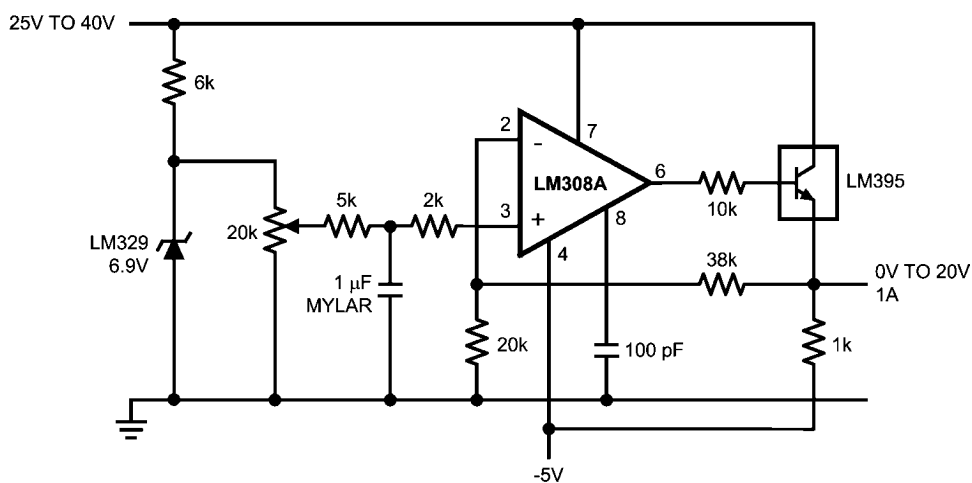
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Adjustable Bipolar Output Reference



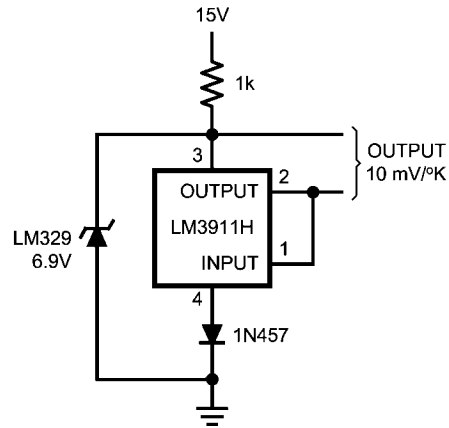
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0V to 20V Power Reference



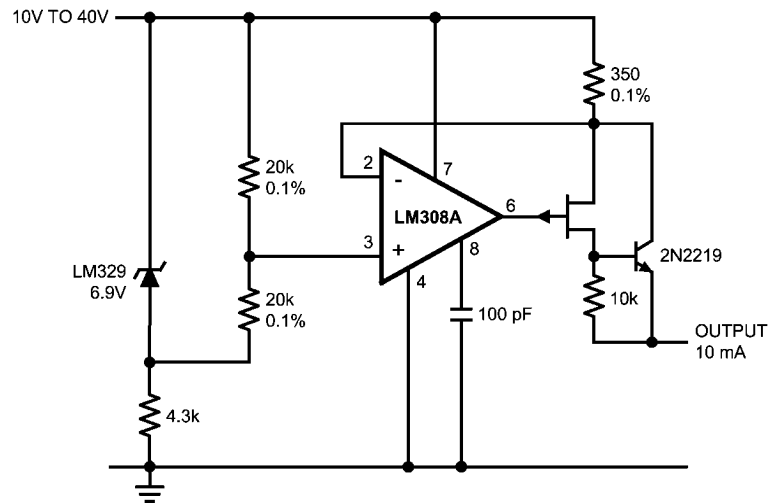
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External Reference for Temperature Transducer



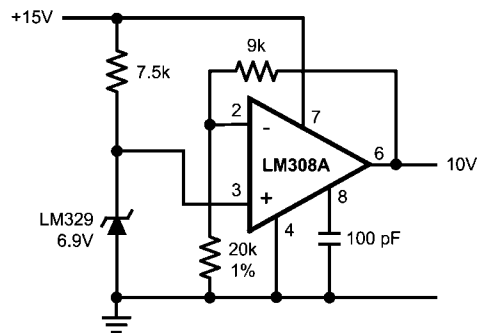
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Positive Current Source



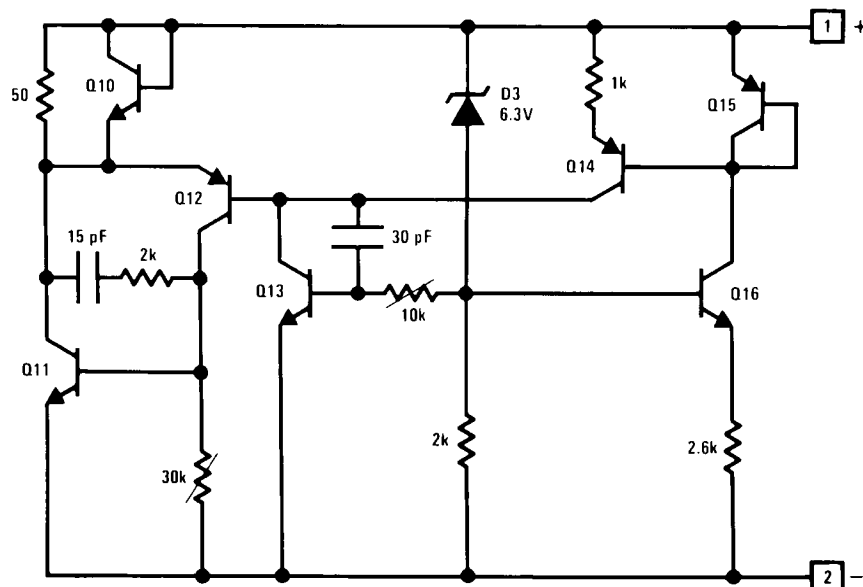
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Buffered Reference with Single Supply



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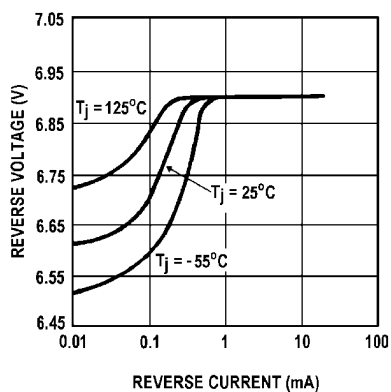
Schematic Diagram



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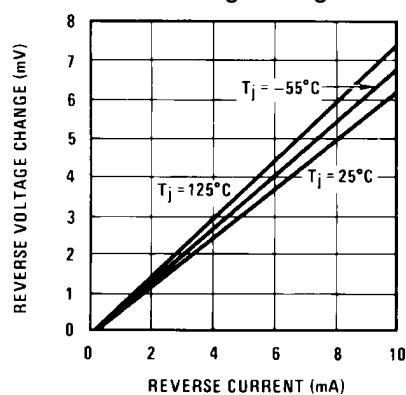
Typical Performance Characteristics

Reverse Characteristics



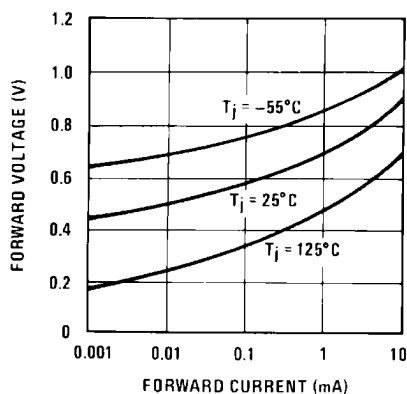
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Reverse Voltage Change



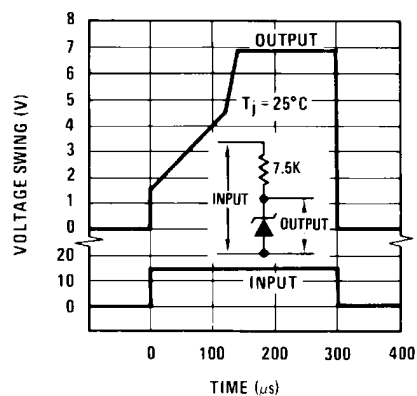
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Forward Characteristics

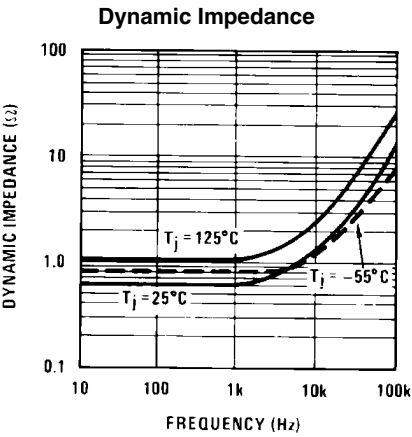


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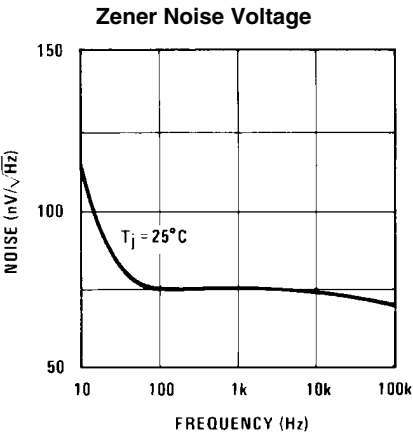
Response Time



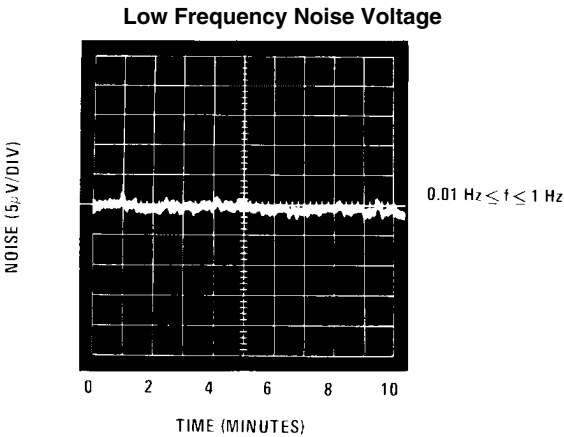
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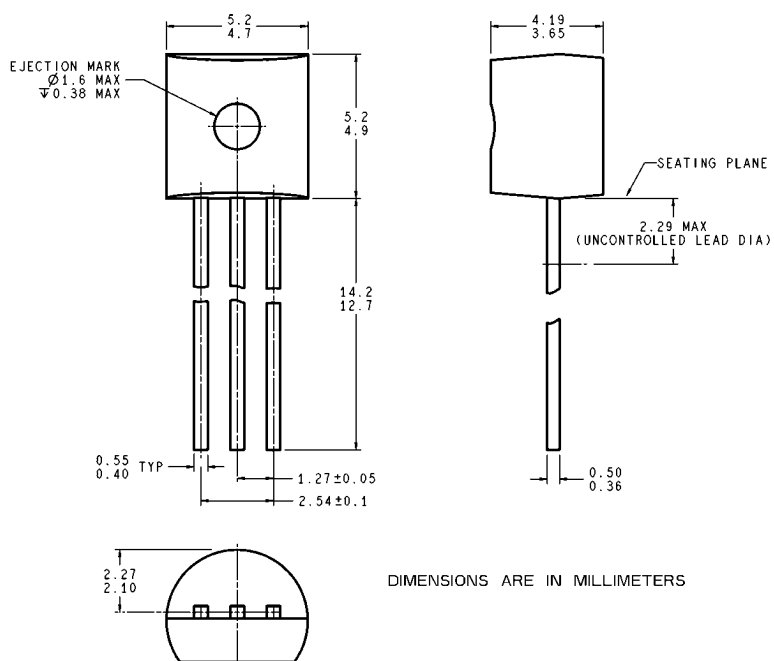


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Physical Dimensions inches (millimeters) unless otherwise noted



Z03A (Rev. G)

Plastic Package
Order Number LM329DZ,
NS Package Z03A

Notes

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