2-Terminal IC 1.2 V Reference

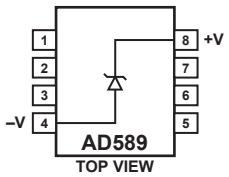
AD589

FEATURES

Superior Replacement for Other 1.2 V References
Wide Operating Range: 50 μA to 5 mA
Low Power: 60 μW Total P_D at 50 μA
Low Temperature Coefficient:
10 ppm/°C Max, 0°C to 70°C (AD589M)
2-Terminal Zener Operation
Low Output Impedance: 0.6 Ω
No Frequency Compensation Required
Low Cost
MIL-STD-883 Compliant Versions Available

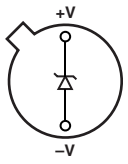
FUNCTIONAL BLOCK DIAGRAMS

SOIC (R-8)



TOP VIEW
(Not to Scale)

Metal Can (H-02)



BOTTOM VIEW

PRODUCT DESCRIPTION

The AD589 is a 2-terminal, low cost, temperature compensated band gap voltage reference that provides a fixed 1.23 V output voltage for input currents between 50 μA and 5.0 mA.

The high stability of the AD589 is primarily dependent upon the matching and thermal tracking of the on-chip components. Analog Devices' precision bipolar processing and thin-film technology combine to provide excellent performance at low cost.

Additionally, the active circuit produces an output impedance 10× lower than the typical low-TC Zener diodes. This feature allows operation with no external components required to maintain full accuracy under changing load conditions.

The AD589 is available in seven versions. The AD589J, AD589K, AD589L, and AD589M grades are specified for 0°C to +70°C operation, while the AD589S and AD589T grades are rated for the full –55°C to +125°C temperature range. All grades are available in a metal can (H-02) package. The AD589J is also available in an 8-lead SOIC package.

PRODUCT HIGHLIGHTS

1. The AD589 is a 2-terminal device that delivers a constant reference voltage for a wide range of input current.
2. Output impedance of 0.6 Ω and temperature coefficients as low as 10 ppm/°C ensure stable output voltage over a wide range of operating conditions.
3. The AD589 can be operated as a positive or negative reference. Floating operation is also possible.
4. The AD589 will operate with a total current as low as 50 μA (60 μW total power dissipation), ideal for battery-powered instrument applications.
5. The AD589 is an exact replacement for other 1.2 V references, offering superior temperature performance and reduced sensitivity to capacitive loading.
6. The AD589 is available in versions compliant with MIL-STD-883. Consult factory for 883 data sheet.

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AD589—SPECIFICATIONS (Typical @ I_{IN} = 500 μA and T_A = 25°C, unless otherwise noted.)

Model	AD589JH/ AD589JR			AD589KH			AD589LH			AD589MH			Unit
	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
OUTPUT VOLTAGE, T_A = 25°C	**1.200**	1.235	**1.250**	**1.200**	1.235	**1.250**	**1.200**	1.235	**1.250**	**1.200**	1.235	**1.250**	V
OUTPUT VOLTAGE CHANGE VERSUS CURRENT 50 μA to 5 mA			5			5			5			5	mV
DYNAMIC OUTPUT IMPEDANCE		0.6	2		0.6	2		0.6	2		0.6	2	Ω
RMS NOISE VOLTAGE 10 Hz < f < 10 kHz		5			5			5			5		μV
TEMPERATURE COEFFICIENT[1]			100			**50**			25			**10**	ppm/°C
TURN-ON SETTLING TIME TO 0.1%		25			25			25			25		μs
OPERATING CURRENT[2]	**0.05**		5	**0.05**		5	**0.05**		5	**0.05**		5	mA
OPERATING TEMPERATURE	0		70	0		70	0		70	0		70	°C
PACKAGE OPTION[3] Metal Can (H-02A) SOIC (R-8)	AD589JH AD589JR			AD589KH			AD589LH			AD589MH			

Model	AD589SH			AD589TH			Unit
	Min	Typ	Max	Min	Typ	Max	
OUTPUT VOLTAGE, T_A = 25°C	**1.200**	1.235	**1.250**	**1.200**	1.235	**1.250**	V
OUTPUT VOLTAGE CHANGE VERSUS CURRENT 50 μA to 5 mA			5			5	mV
DYNAMIC OUTPUT IMPEDANCE		0.6	2		0.6	2	Ω
RMS NOISE VOLTAGE 10 Hz < f < 10 kHz		5			5		μV
TEMPERATURE COEFFICIENT[1]			**100**			**50**	ppm/°C
TURN-ON SETTLING TIME TO 0.1%		25			25		μs
OPERATING CURRENT[2]	**0.05**		5	**0.05**		5	mA
OPERATING TEMPERATURE	–55		+125	–55		+125	°C
PACKAGE OPTION[3] Metal Can (H-02) SOIC (R-8)	AD589SH AD589JR			AD589TH			

NOTES

[1]See the Voltage Variation versus Temperature section for explanation of temperature coefficient measurement method.

[2]Optimum performance is obtained at currents below 500 μA. For current operation below 200 μA, stray shunt capacitances should be limited to 20 pF or increased to 1 μF. If strays cannot be avoided, operation at 500 μA and a shunt capacitor of at least 1000 pF are recommended.

[3]H = Hermetic Metal Can; R = SOIC.

Specifications shown in **boldface** are tested on all production units at final electrical test.

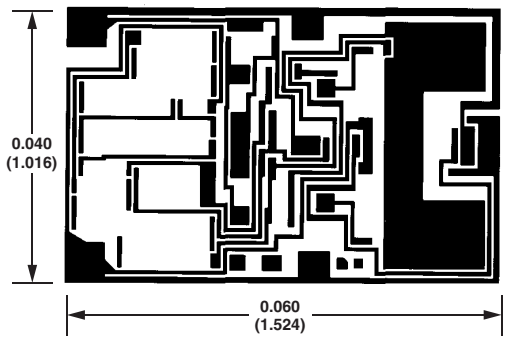
Specifications subject to change without notice.

ABSOLUTE MAXIMUM RATINGS

Current . . . . . 10 mA
Reverse Current . . . . . 10 mA
Power Dissipation* . . . . . 125 mW
Storage Temperature . . . . . –65°C to +175°C
Operating Junction Temperature Range . . . . . –55°C to +150°C
Lead Temperature (Soldering, 10 sec) . . . . . 300°C

*Absolute maximum power dissipation is limited by maximum current through the device. Maximum rating at elevated temperatures must be computed assuming $T_J \leq 150°C$ and $\theta_{JA} = 400 = C/W$.

AD589 CHIP DIMENSIONS AND PAD LAYOUT



THE AD589 IS AVAILABLE IN CHIP FORM WITH FULLY TESTED AND GUARANTEED SPECIFICATIONS. CONSULT FACTORY FOR AVAILABLE GRADES AND PRICING.

ORDERING GUIDE

Model	Temperature Coefficient (ppm/°C)	Package Description	Package Option	No. of Parts Per Reel/Tray	Temperature Range (°C)
AD589JH	100	Metal Can (TO-51)	H-02	100	0 to +70
AD589JR	100	SOIC-8	R-8	98	0 to +70
AD589JRZ*	100	SOIC-8	R-8	98	0 to +70
AD589JR-REEL	100	SOIC-8	R-8	2,500	0 to +70
AD589JRZ-REEL*	100	SOIC-8	R-8	2,500	0 to +70
AD589JCHIPS	100	DICE	—	25	0 to +70
AD589KH	50	Metal Can (TO-51)	H-02	100	0 to +70
AD589LH	25	Metal Can (TO-51)	H-02	100	0 to +70
AD589MH	10	Metal Can (TO-51)	H-02	100	0 to +70
AD589SH	100	Metal Can (TO-51)	H-02	100	–55 to +125
AD589SH/883B	100	Metal Can (TO-51)	H-02	100	–55 to +125
AD589TH	50	Metal Can (TO-51)	H-02	100	–55 to +125
AD589TH/883B	50	Metal Can (TO-51)	H-02	100	–55 to +125
AD589TCHIPS	50	DICE	—	25	–55 to +125

*Z = Pb-free part

CAUTION

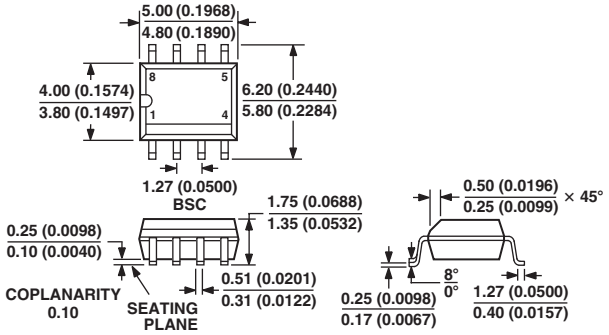
ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000V readily accumulate on the human body and test equipment and can discharge without detection. Although the AD589 features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.



OUTLINE DIMENSIONS

8-Lead Standard Small Outline Package [SOIC]
Narrow Body
(R-8)

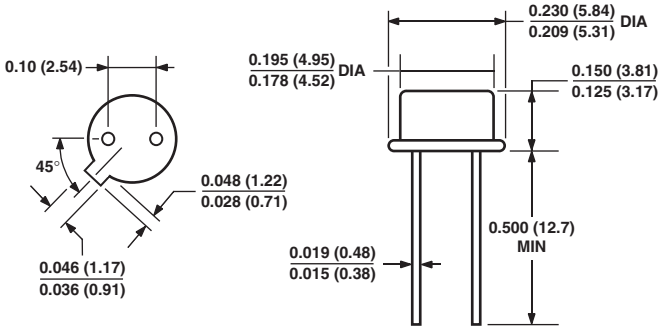
Dimensions shown in millimeters and (inches)



COMPLIANT TO JEDEC STANDARDS MS-012AA
CONTROLLING DIMENSIONS ARE IN MILLIMETERS; INCH DIMENSIONS
(IN PARENTHESES) ARE ROUNDED-OFF MILLIMETER EQUIVALENTS FOR
REFERENCE ONLY AND ARE NOT APPROPRIATE FOR USE IN DESIGN

2-Pin Metal Header Package [TO-51]
(H-02)

Dimensions shown in inches and (millimeters)



CONTROLLING DIMENSIONS ARE IN INCHES; MILLIMETERS DIMENSIONS
(IN PARENTHESES) ARE ROUNDED-OFF EQUIVALENTS FOR
REFERENCE ONLY AND ARE NOT APPROPRIATE FOR USE IN DESIGN