

FEATURES

- Maximum Initial Tolerance: 0.2%
- *Guaranteed* Temperature Stability
- Maximum 0.6Ω Dynamic Impedance
- Wide Operating Current Range
- Directly Interchangeable with LM136 for Improved Performance
- No Adjustments Needed for Minimum Temperature Coefficient

APPLICATIONS

- Reference for 5V Systems
- 8-Bit A/D and D/A Reference
- Digital Voltmeters
- Current Loop Measurement and Control Systems
- Power Supply Monitor

DESCRIPTION

The LT[®]1009 is a precision trimmed 2.5V shunt regulator diode featuring a maximum initial tolerance of only $\pm 5\text{mV}$. The low dynamic impedance and wide operating current range enhances its versatility. The 0.2% reference tolerance is achieved by on-chip trimming which not only minimizes the initial voltage tolerance but also minimizes the temperature drift.

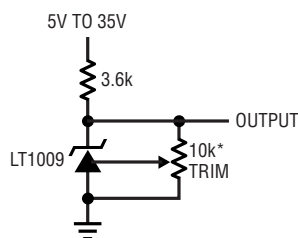
Even though no adjustments are needed with the LT1009, a third terminal allows the reference voltage to be adjusted $\pm 5\%$ to calibrate out system errors. In many applications, the LT1009 can be used as a pin-to-pin replacement of the LM136 and the external trim network eliminated.

For a lower drift 2.5V reference, see the LT1019 data sheet.

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TYPICAL APPLICATION

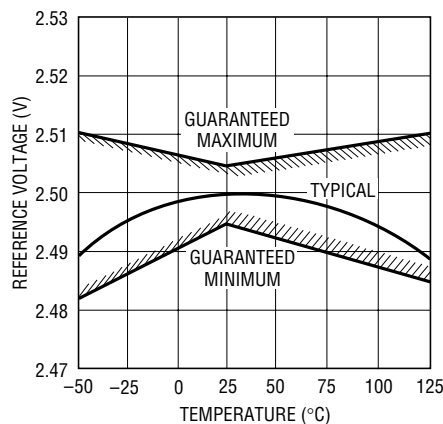
2.5V Reference



*DOES NOT AFFECT
TEMPERATURE COEFFICIENT.
 $\pm 5\%$ TRIM RANGE

1009 TA01

Output Voltage



1009 TA02

LT1009 Series

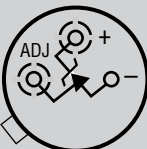
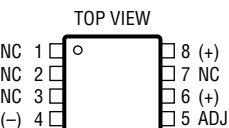
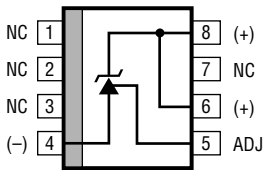
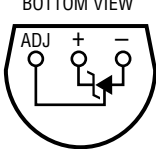
ABSOLUTE MAXIMUM RATINGS (Note 1)

Reverse Current 20mA
 Forward Current 10mA
 Storage Temperature Range -65°C to 150°C
 Lead Temperature (Soldering, 10 sec) 300°C

Operating Temperature Range

LT1009/LT1009C 0°C to 70°C
 LT1009I -40°C to 85°C
 LT1009M (**OBSOLETE**) -55°C to 125°C

PACKAGE/ORDER INFORMATION

BOTTOM VIEW  H PACKAGE 3-LEAD TO-46 METAL CAN $T_{JMAX} = 150^{\circ}\text{C}$, $\theta_{JA} = 440^{\circ}\text{C/W}$, $\theta_{JC} = 80^{\circ}\text{C/W}$ OBSOLETE PACKAGE Consider the MS8, S8 or Z Packages for Alternate Source	ORDER PART NUMBER LT1009MH LT1009CH	TOP VIEW  MS8 PACKAGE 8-LEAD PLASTIC MSOP $T_{JMAX} = 150^{\circ}\text{C}$, $\theta_{JA} = 250^{\circ}\text{C/W}$	ORDER PART NUMBER LT1009CMS8 MS8 PART MARKING LTQZ
TOP VIEW  S8 PACKAGE 8-LEAD PLASTIC SO $T_{JMAX} = 150^{\circ}\text{C}$, $\theta_{JA} = 190^{\circ}\text{C/W}$	ORDER PART NUMBER LT1009S8 LT1009IS8 S8 PART MARKING 1009 1009I	BOTTOM VIEW  Z PACKAGE 3-LEAD PLASTIC TO-92 $T_{JMAX} = 100^{\circ}\text{C}$, $\theta_{JA} = 160^{\circ}\text{C/W}$	ORDER PART NUMBER LT1009CZ LT1009IZ

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

AVAILABLE OPTIONS

TEMPERATURE	ACCURACY (%)	TEMPERATURE COEFFICIENT (ppm/°C)	PACKAGE STYLE			
			TO-46 (H) OBSOLETE	MSOP-8 (MS8)	SO-8 (S8)	TO-92 (Z)
0°C to 70°C	0.20 0.40	25 25	LT1009CH	LT1009CMS8	LT1009S8	LT1009CZ
-40°C to 85°C	0.20 0.40	35 35			LT1009IS8	LT1009IZ
-55°C to 125°C	0.20	35	LT1009MH			

ELECTRICAL CHARACTERISTICS

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

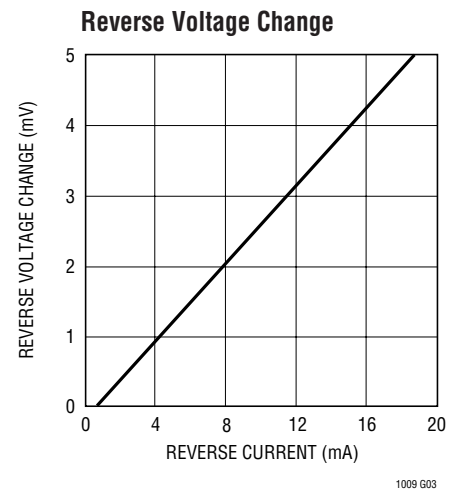
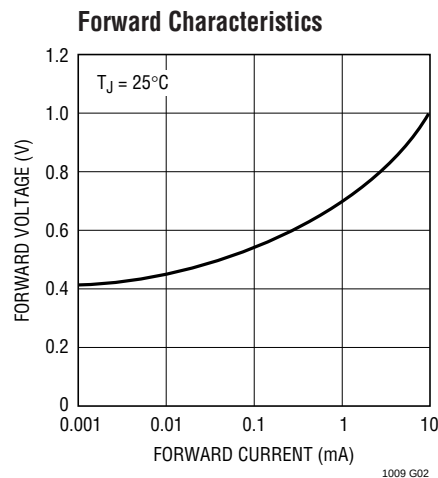
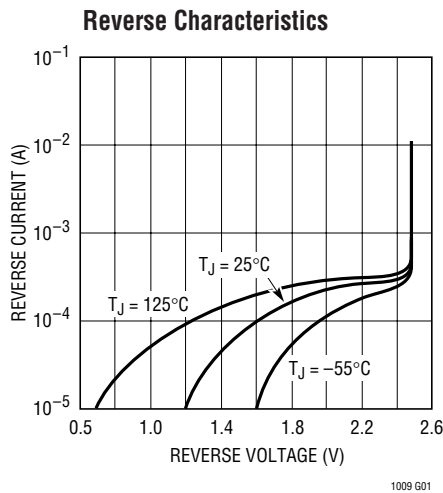
SYMBOL	PARAMETER	CONDITIONS		LT1009M			LT1009I			LT1009/LT1009C			UNITS
				MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_Z	Reverse Breakdown Voltage	$T_A = 25^\circ\text{C}$, $I_R = 1\text{mA}$, H, Z Pkg MS, S Pkg		2.495	2.500	2.505	2.495	2.500	2.505	2.495	2.500	2.505	V
$\frac{\Delta V_Z}{\Delta I_R}$	Reverse Breakdown Change with Current	$400\mu\text{A} \leq I_R \leq 10\text{mA}$	●		2.6	6		2.6	10		2.6	10	mV
r_Z	Reverse Dynamic Impedance	$I_R = 1\text{mA}$	●		0.2	0.6		0.2	1.0		0.2	1.0	Ω
	Temperature Stability	$T_{\text{MIN}} \leq T_A \leq T_{\text{MAX}}$	●			15			15		1.8	4	mV
$\frac{\Delta V_Z}{\Delta \text{Temp}}$	Average Temperature Coefficient (Notes 2, 3)	$0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$ $-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$ $-55^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$			15	25		15	25		15	25	ppm/ $^\circ\text{C}$
					25	35			35				ppm/ $^\circ\text{C}$
$\frac{\Delta V_Z}{\Delta \text{Time}}$	Long-Term Stability	$T_A = 25^\circ\text{C} \pm 0.1^\circ\text{C}$, $I_R = 1\text{mA}$			20			20			20		ppm/kHr

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

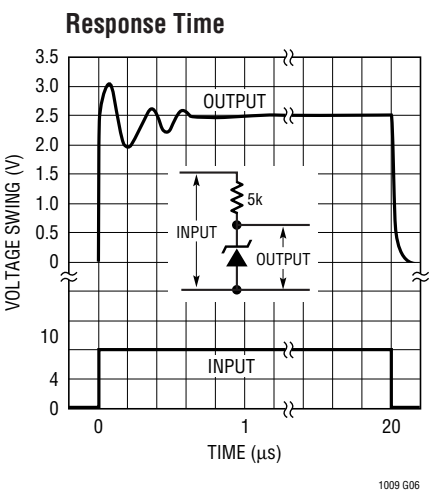
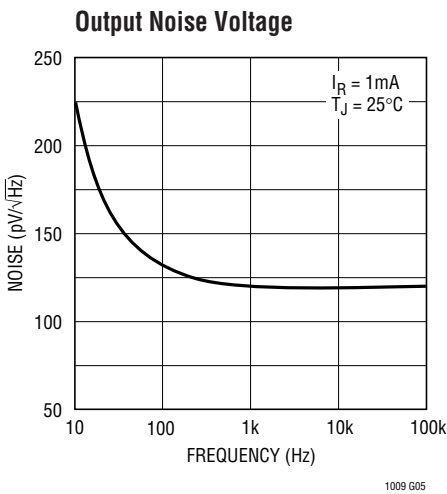
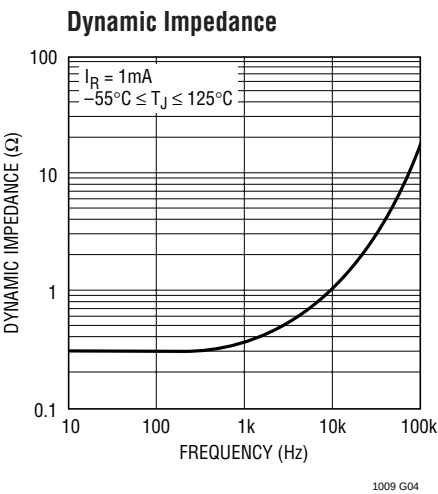
Note 2: Guaranteed by Design.

Note 3: Average temperature coefficient is defined as the total voltage change divided by the specified temperature change.

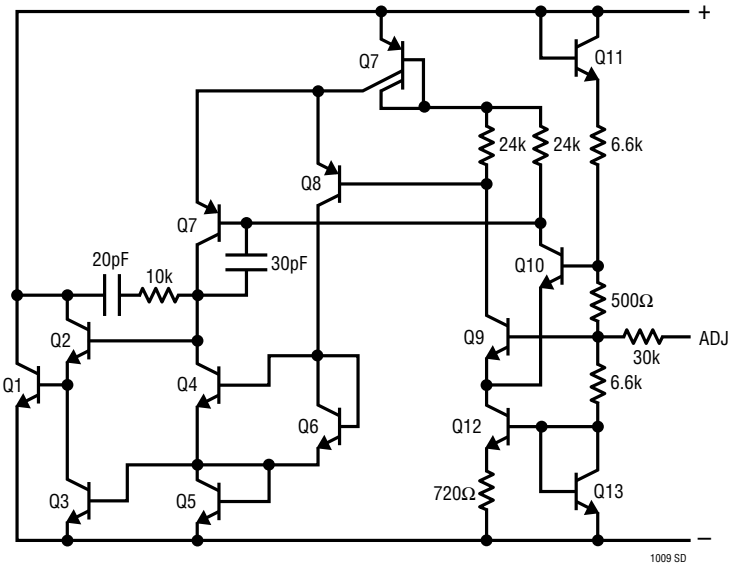
TYPICAL PERFORMANCE CHARACTERISTICS



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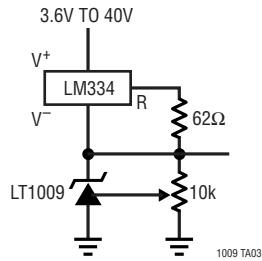


SCHEMATIC DIAGRAM

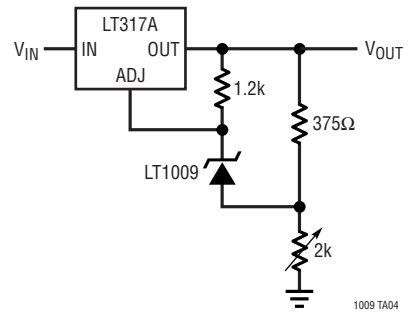


TYPICAL APPLICATIONS

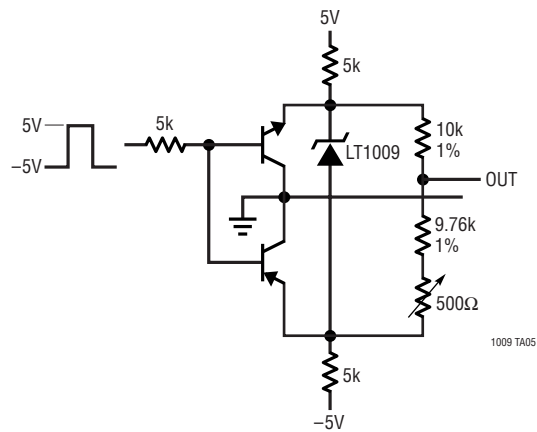
Wide Supply Range, Adjustable Reference



Low Temperature Coefficient Power Regulator

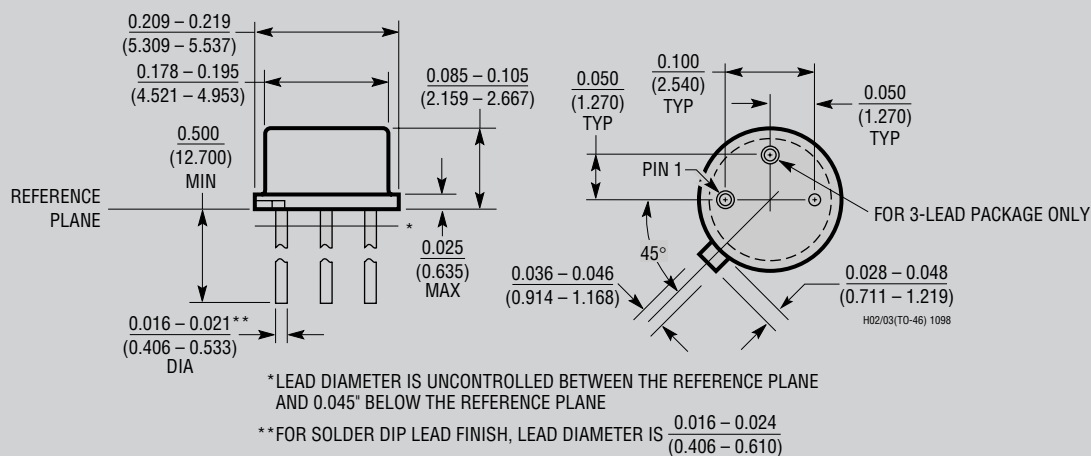


Switchable $\pm 1.25\text{V}$ Bipolar Reference



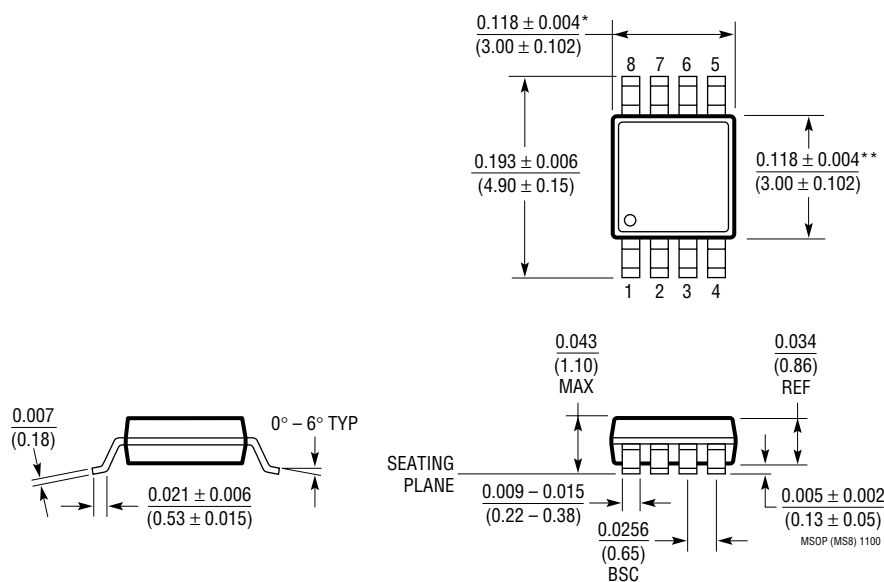
PACKAGE DESCRIPTION

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



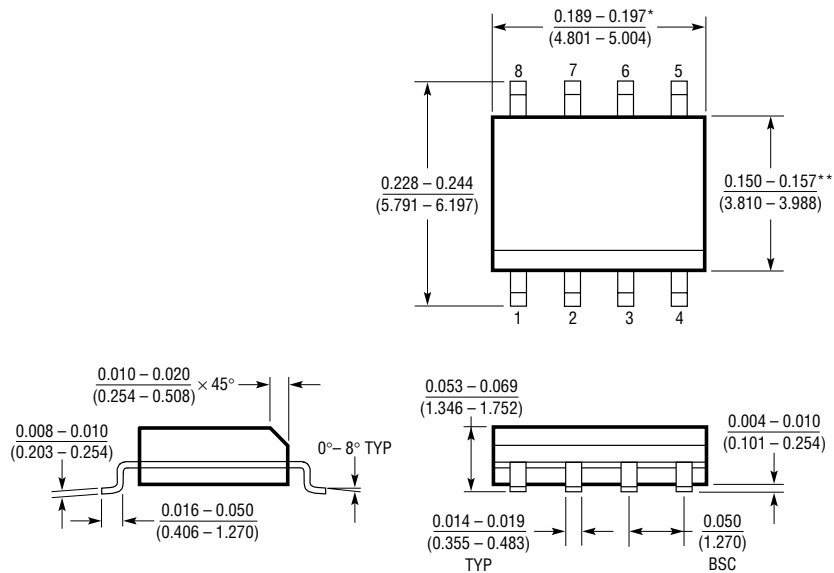
OBSOLETE PACKAGE

MS8 Package 8-Lead Plastic MSOP (Reference LTC DWG # 05-08-1660)



PACKAGE DESCRIPTION

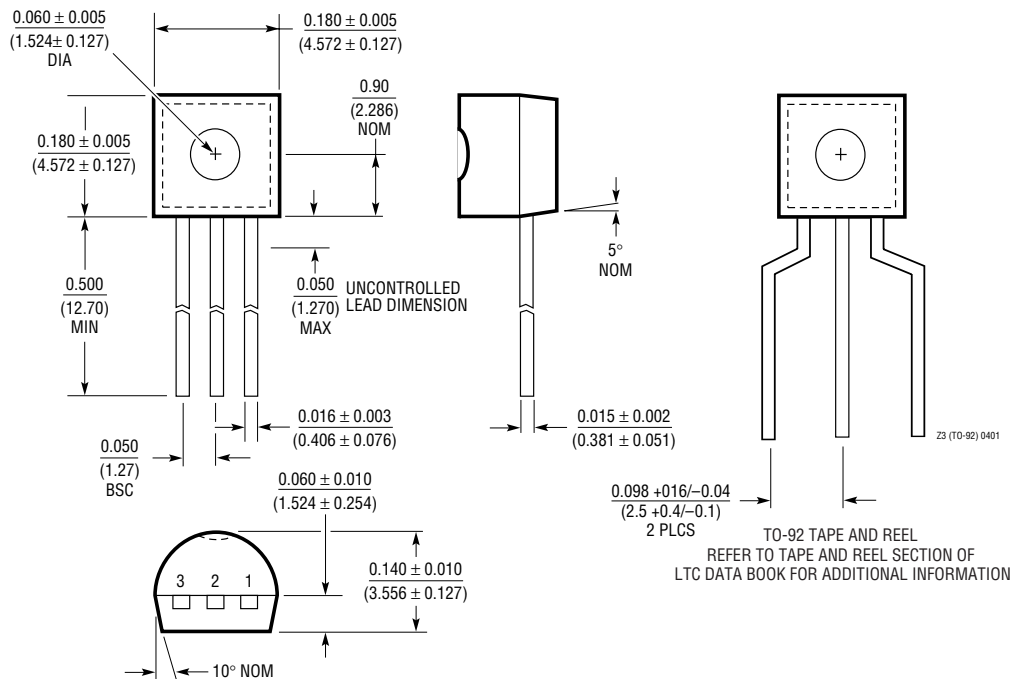
S8 Package 8-Lead Plastic Small Outline (Narrow .150 Inch) (Reference LTC DWG # 05-08-1610)



*DIMENSION DOES NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.006" (0.152mm) PER SIDE
 **DIMENSION DOES NOT INCLUDE INTERLEAD FLASH. INTERLEAD FLASH SHALL NOT EXCEED 0.010" (0.254mm) PER SIDE

S08 1298

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

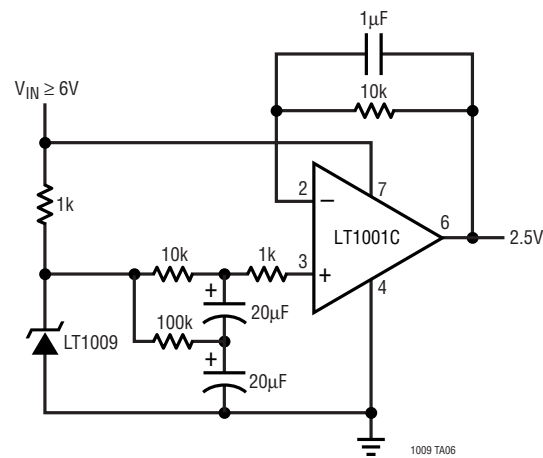


TO-92 TAPE AND REEL
 REFER TO TAPE AND REEL SECTION OF
 LTC DATA BOOK FOR ADDITIONAL INFORMATION

Z3 (TO-92) 0401

TYPICAL APPLICATION

Low Noise 2.5V Buffered Reference



RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LT1019	Precision Series Reference	Bandgap, 0.05%, 5ppm/°C
LT1236	Precision Series Reference	5V and 10V Zener-Based 5ppm/°C, SO-8 Package
LTC®1798	Micropower Low Dropout Series Reference	0.15% Max, 6.5μA Supply Current
LT1460	Micropower Precision Series Reference	Bandgap, 130μA Supply Current 10ppm/°C, Available in SOT-23
LT1634	Micropower Precision Shunt Voltage Reference	Bandgap 0.05%, 10ppm/°C, 10μA Supply Current
LT1461	Micropower Precision Series Reference	0.04% Max, 3ppm/°C Max, 35μA Supply Current