

## 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
- Available in 8-Lead SO and MSOP Packages and 3-Lead TO-92 Package

## 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

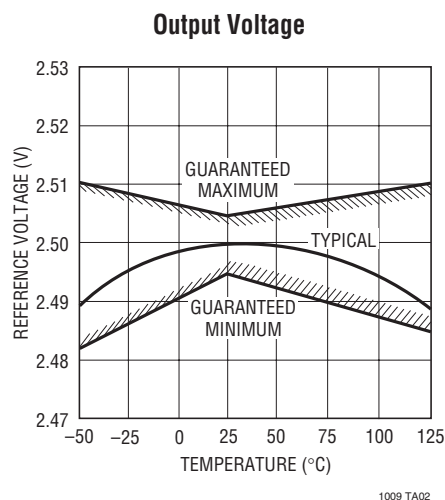
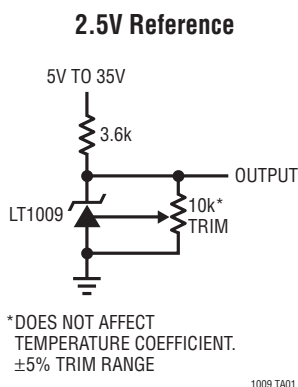
The LT<sup>®</sup>1009 is a precision trimmed 2.5V shunt regulator diode featuring a maximum initial tolerance of only  $\pm 5\text{mV}$ . The low dynamic impedance and wide operating current range enhances its versatility. The 0.2% reference tolerance is achieved by on-chip trimming which not only minimizes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



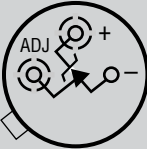
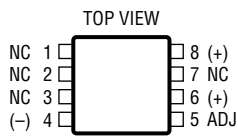
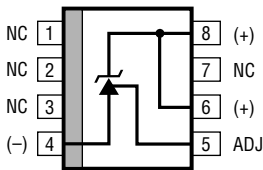
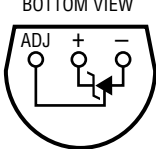
# LT1009 Series

## 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

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

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

## AVAILABLE OPTIONS

| TEMPERATURE    | ACCURACY (%) | TEMPERATURE COEFFICIENT (ppm/°C) | PACKAGE STYLE         |              |            |           |
|----------------|--------------|----------------------------------|-----------------------|--------------|------------|-----------|
|                |              |                                  | TO-46 (H)<br>OBSOLETE | MSOP-8 (MS8) | SO-8 (S8)  | TO-92 (Z) |
| 0°C to 70°C    | 0.20         | 25                               | LT1009CH              | LT1009CMS8   | LT1009S8   | LT1009CZ  |
|                | 0.40         | 25                               |                       |              |            |           |
| -40°C to 85°C  | 0.20         | 35                               |                       |              | LT10098IS8 | LT1009IZ  |
|                | 0.40         | 35                               |                       |              |            |           |
| -55°C to 125°C | 0.20         | 35                               | LT1009MH              |              |            |           |

# ELECTRICAL CHARACTERISTICS

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

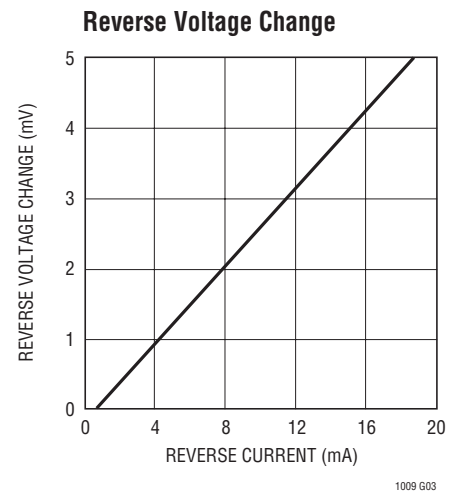
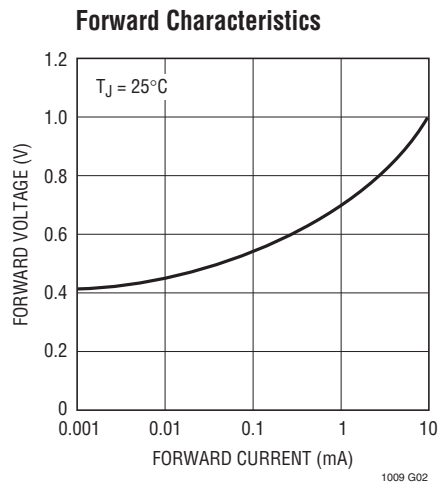
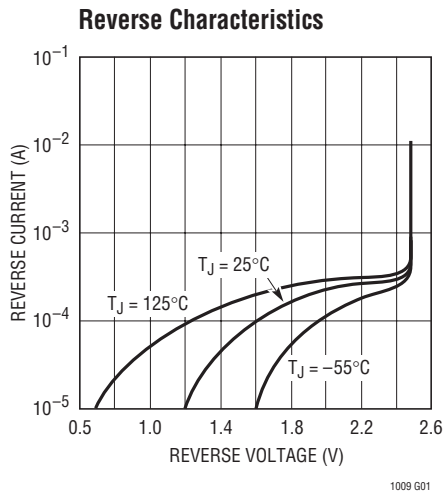
| SYMBOL                                  | PARAMETER                                    | CONDITIONS  | LT1009M |            |            | LT1009I    |            |            | LT1009/LT1009C |            |            | UNITS   |
|---|--|---|---------|------------|------------|------------|------------|------------|----------------|------------|------------|---|
|   |  |   | MIN     | TYP        | MAX        | MIN        | TYP        | MAX        | MIN            | TYP        | MAX        |   |
| $V_Z$                                   | Reverse Breakdown Voltage                    | $T_A = 25^\circ\text{C}$ , $I_R = 1\text{mA}$<br>H, Z Pkg<br>MS, S Pkg  | 2.485   | 2.500      | 2.505      | 2.495      | 2.500      | 2.505      | 2.495          | 2.500      | 2.505      | V<br>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<br>3.0 | 6<br>10    | 2.6<br>3.0 | 10<br>12   | 2.6<br>3.0 | 10<br>12       | 2.6<br>3.0 | 10<br>12   | mV<br>mV  |
| $r_Z$                                   | Reverse Dynamic Impedance                    | $I_R = 1\text{mA}$  | ●       | 0.2<br>0.4 | 0.6<br>1.0 | 0.2<br>0.4 | 1.0<br>1.4 | 0.2<br>0.4 | 1.0<br>1.4     | 0.2<br>0.4 | 1.0<br>1.4 | $\Omega$<br>$\Omega$  |
|   | 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) | $0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$<br>$-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$<br>$-55^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$ |         | 15         | 25         | 15         | 25<br>35   |            | 15             | 25         |            | ppm/ $^\circ\text{C}$<br>ppm/ $^\circ\text{C}$<br>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.

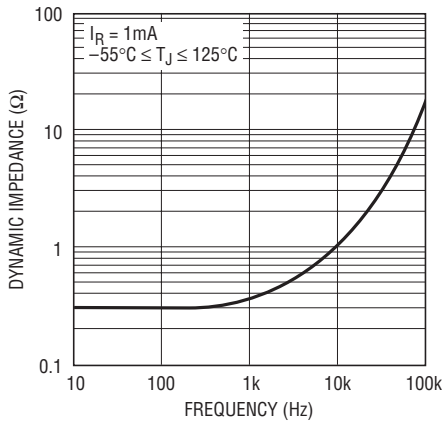
**Note 3:** Average temperature coefficient is defined as the total voltage change divided by the specified temperature change.

# TYPICAL PERFORMANCE CHARACTERISTICS



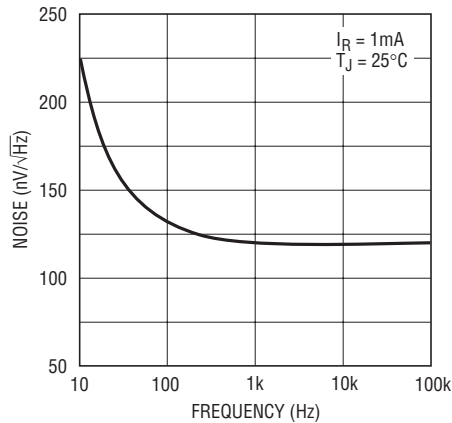
# TYPICAL PERFORMANCE CHARACTERISTICS

Dynamic Impedance



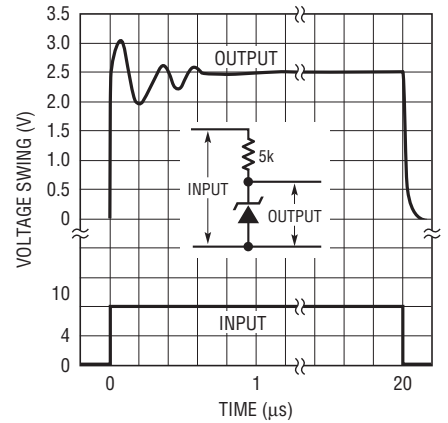
1009 G04

Output Noise Voltage



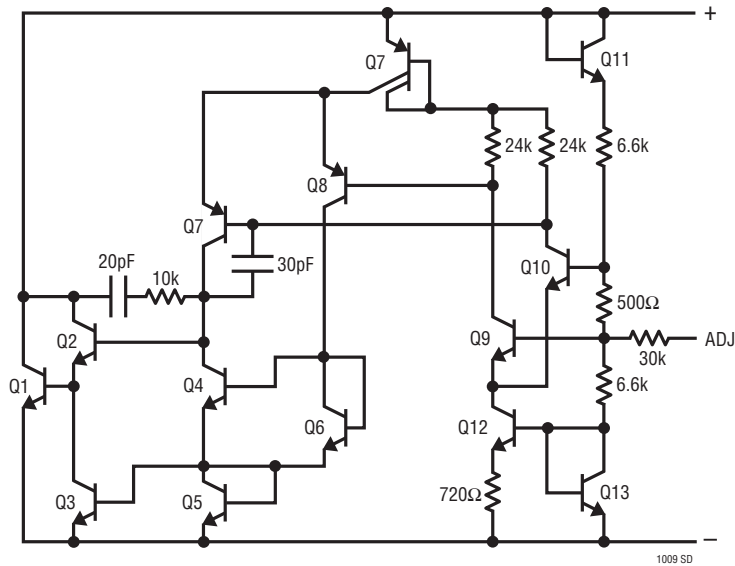
1009 G05

Response Time



1009 G06

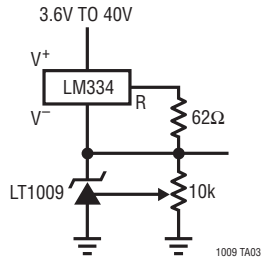
# SCHEMATIC DIAGRAM



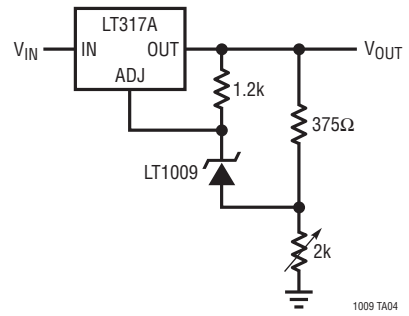
1009 SD

# TYPICAL APPLICATIONS

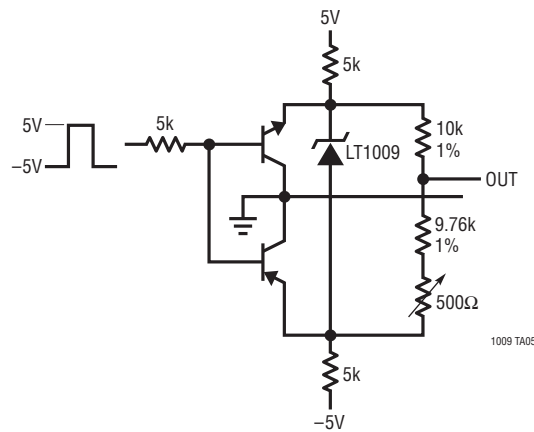
Wide Supply Range, Adjustable Reference



Low Temperature Coefficient Power Regulator

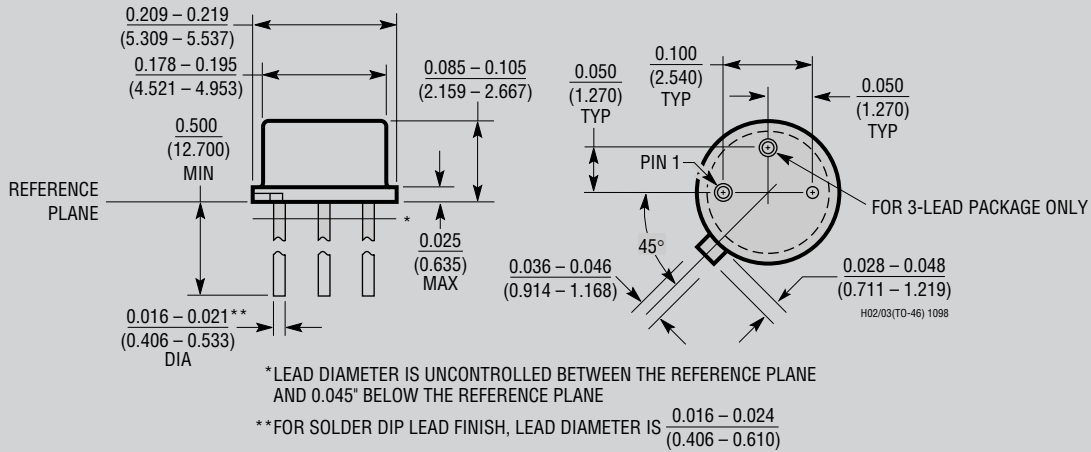


Switchable  $\pm 1.25V$  Bipolar Reference



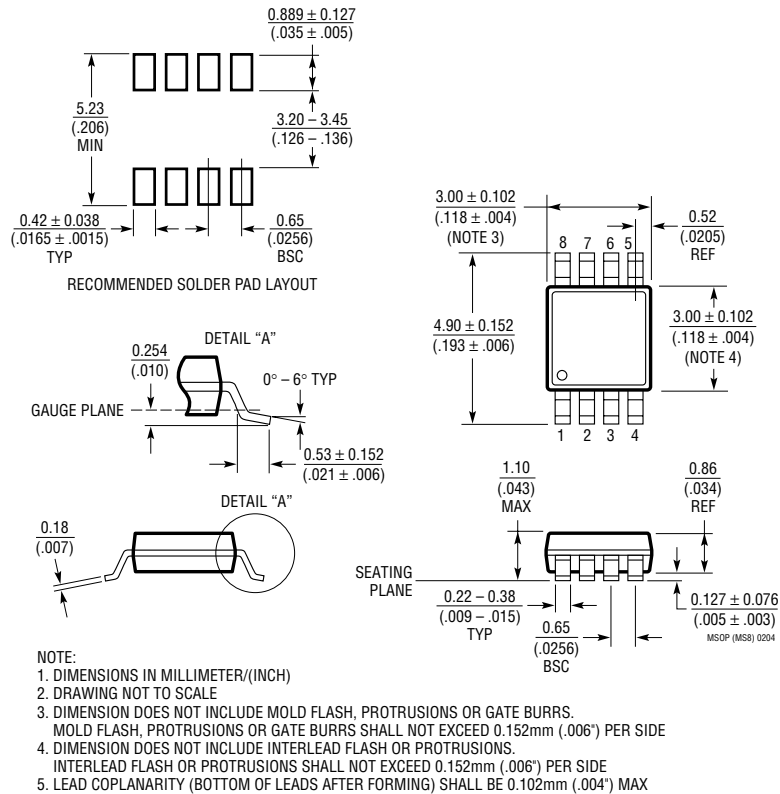
**PACKAGE DESCRIPTION**

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



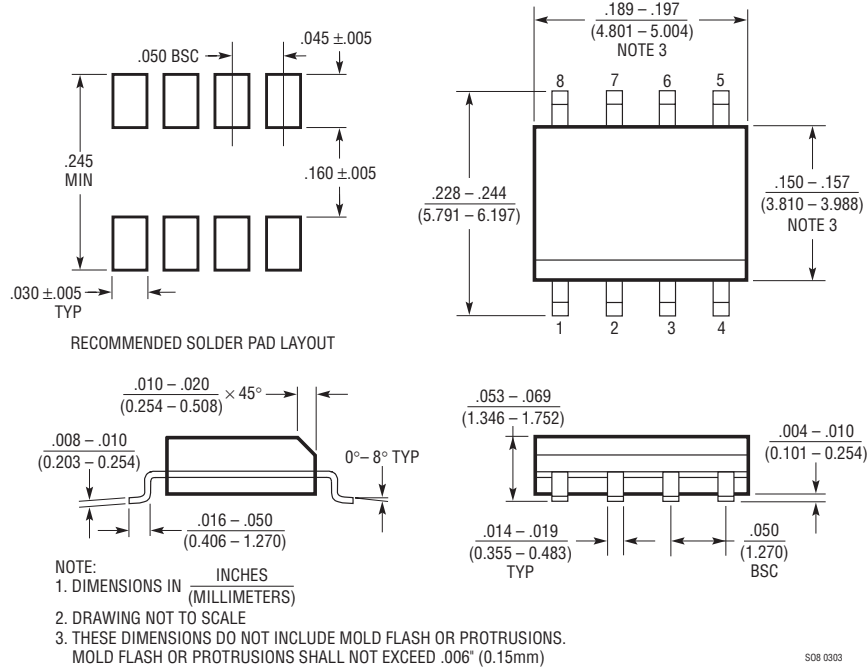
**OBsolete PACKAGE**

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

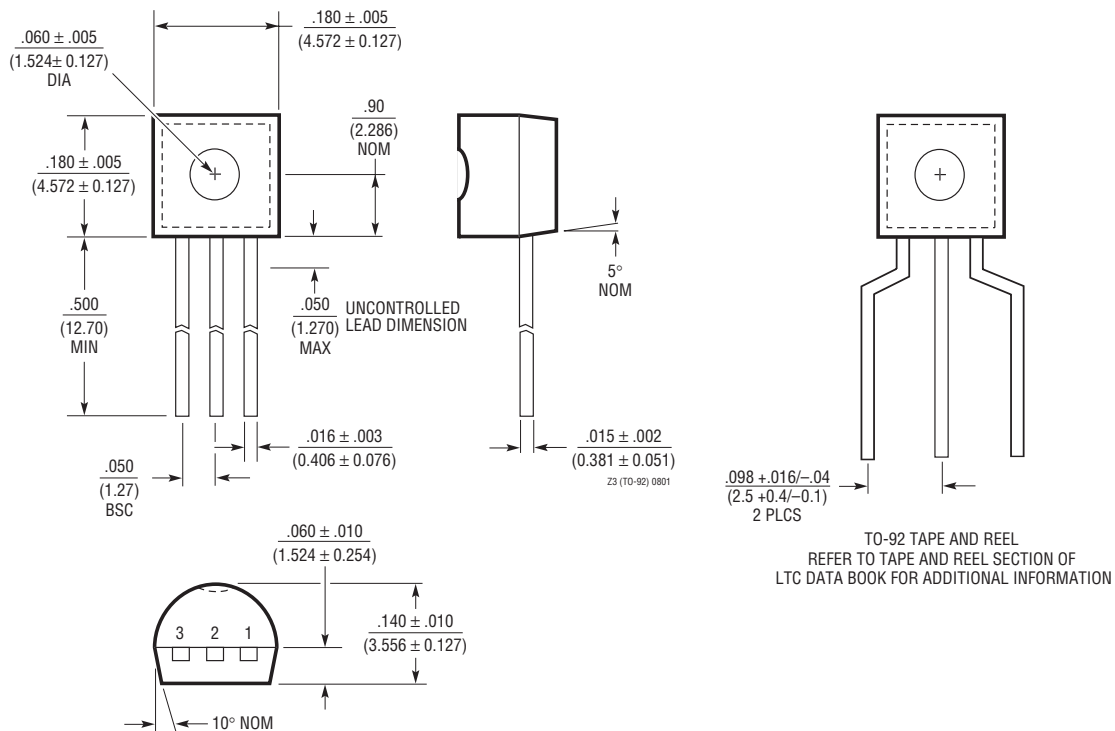


# PACKAGE DESCRIPTION

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

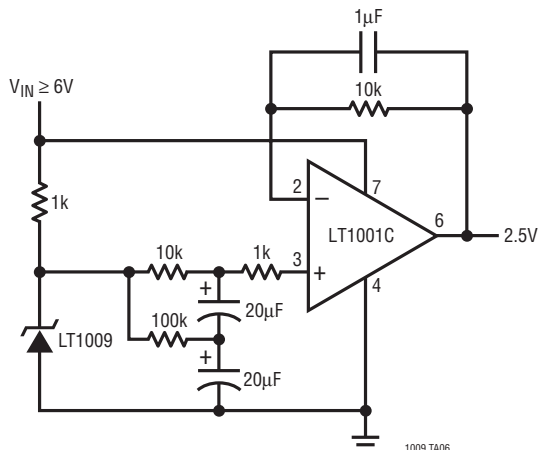


## Z Package 3-Lead Plastic TO-92 (Similar to TO-226) (Reference LTC DWG # 05-08-1410)



## 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 <sup>®</sup> 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                 |





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Электрон  
Связь**

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