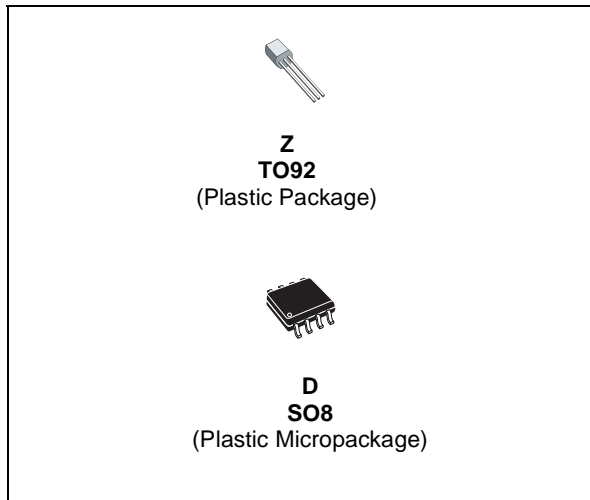




LM236 LM336,B

2.5V VOLTAGE REFERENCES

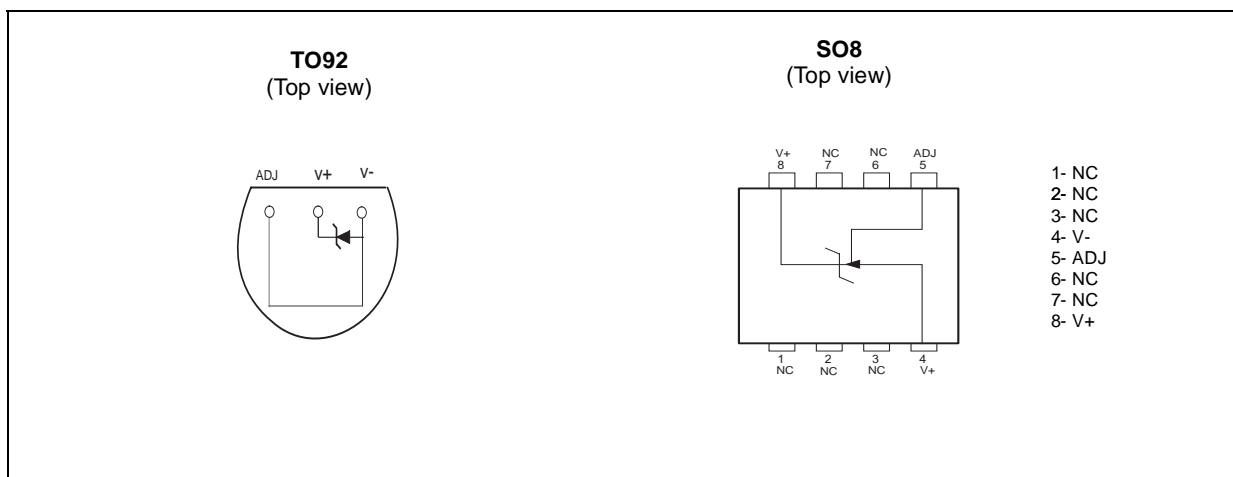
- LOW TEMPERATURE COEFFICIENT
- WIDE OPERATING CURRENT OF 400 μ A TO 10mA
- 0.2 Ω DYNAMIC IMPEDANCE
- GUARANTEED TEMPERATURE STABILITY
- FAST TURN-ON



DESCRIPTION

The LM236 and LM336 are precision 2.5V regulator diodes. These voltage reference monolithic ICs operate like 2.5V zener diodes with a low temperature coefficient and a dynamic impedance of 0.2 Ω . A third pin enables adjusting the reference voltage and the temperature coefficient.

PIN CONNECTIONS (top view)



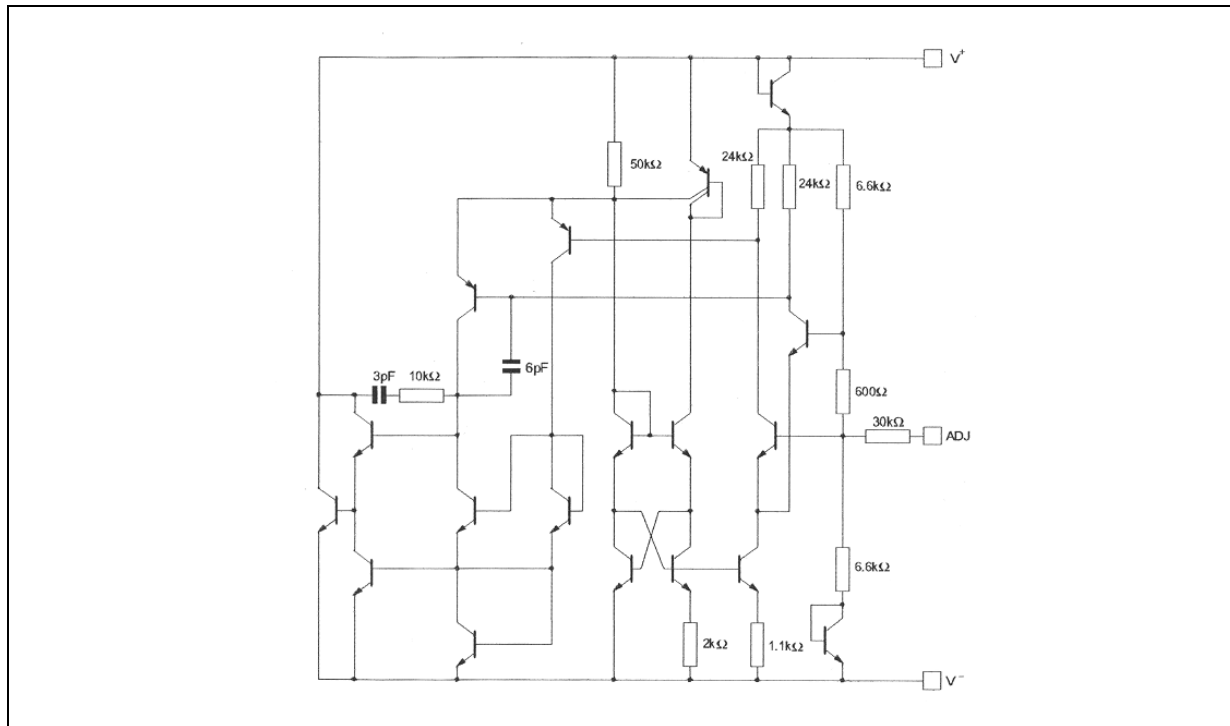
ORDER CODE

| Part Number | Temperature Range | Package | |
|-------------|-------------------|---------|---|
| | | Z | D |
| LM236 | -25°C, +85°C | • | • |
| LM336,B | 0°C, +70°C | • | • |

Z = TO92 Plastic package - also available in Bulk (Z), Tape & Reel (ZT) and Ammo Pack (AP)
D = Small Outline Package (SO) - also available in Tape & Reel (DT)

LM236 - LM336,B

SCHEMATIC DIAGRAM

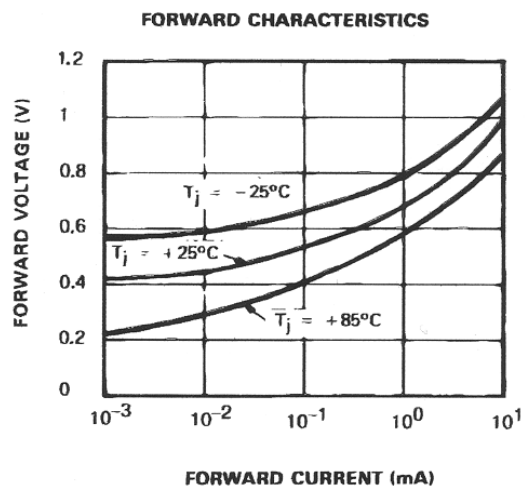
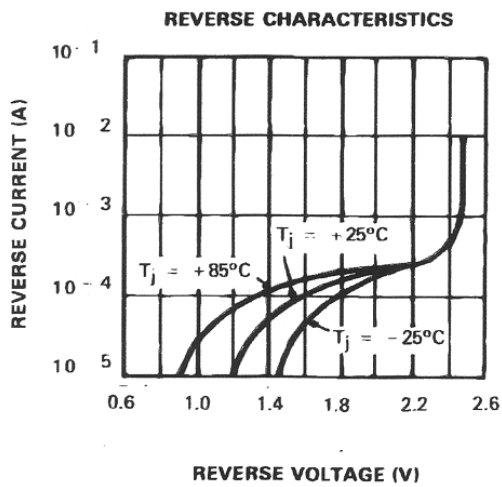
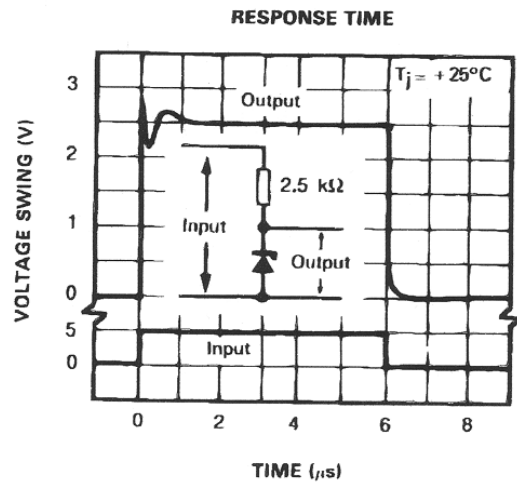
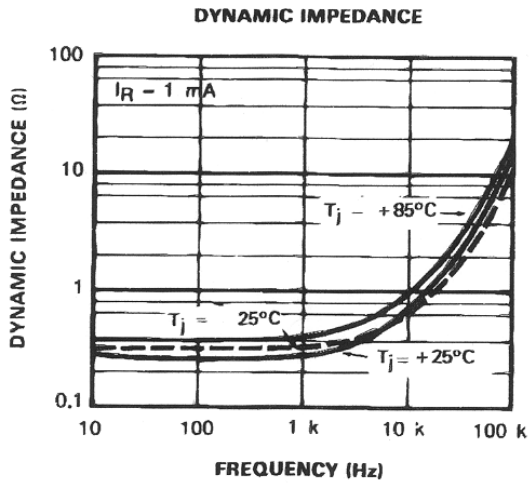
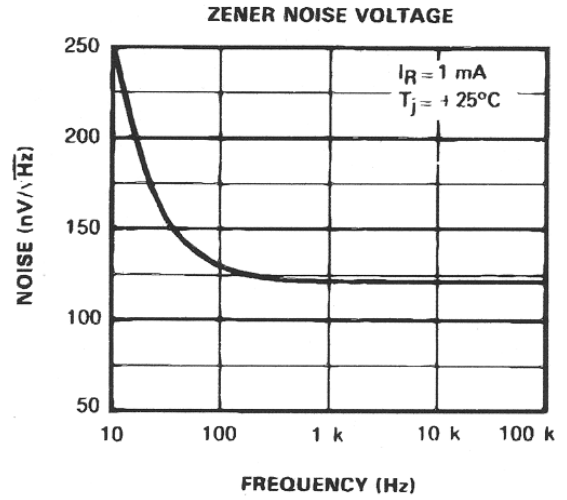
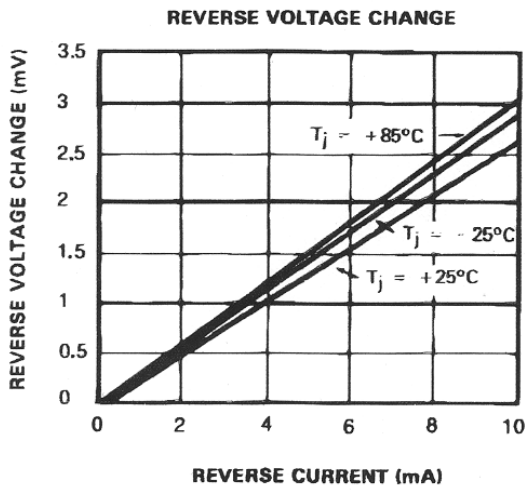


ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | LM236 | LM336,B | Unit |
|----------------|--------------------------------------|-------------|----------|------|
| I_R I_F | Current Reverse Forward | 15 10 | | mA |
| T_{oper} | Operating Free-air Temperature Range | -25 to +85 | 0 to +70 | °C |
| T_{Stg} | Storage Temperature Range | -65 to +150 | | °C |

ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | LM236 | | | LM336,B | | | Unit |
|--------------|---|-------|------------|----------|--------------|--------------|--------------|----------|
| | | Min. | Typ. | Max. | Min. | Typ. | Max. | |
| V_R | Reference Breakdown Voltage $T_{amb} = +25^\circ\text{C}$, $I_R = 1\text{mA}$ LM236, LM336 LM336B | 2.44 | 2.49 | 2.54 | 2.39 2.44 | 2.49 2.49 | 2.59 2.54 | V |
| ΔV_R | Reverse Breakdown Voltage Change with Current $400\mu\text{A} \leq I_R \leq 10\text{mA}$ $T_{amb} = +25^\circ\text{C}$ $T_{min.} \leq T_{amb} \leq T_{max.}$ | | 2.6 3 | 6 10 | | 2.6 3 | 10 12 | mV |
| Z_D | Reverse Dynamic Impedance ($I_R = 1\text{mA}$) $T_{amb} = +25^\circ\text{C}$ $T_{min.} \leq T_{amb} \leq T_{max.}$ | | 0.2 0.4 | 0.6 1 | | 0.2 0.4 | 1 1.4 | Ω |
| K_{VT} | Temperature Stability ($V_R = 2.49\text{V}$, $I_R = 1\text{mA}$) | | 3.5 | 9 | | 1.8 | 6 | mV |
| K_{VH} | Long Term Stability ($T_{amb} = +25^\circ\text{C} \pm 0.1^\circ\text{C}$, $I_R = 1\text{mA}$) | | 20 | | | 20 | | ppm |



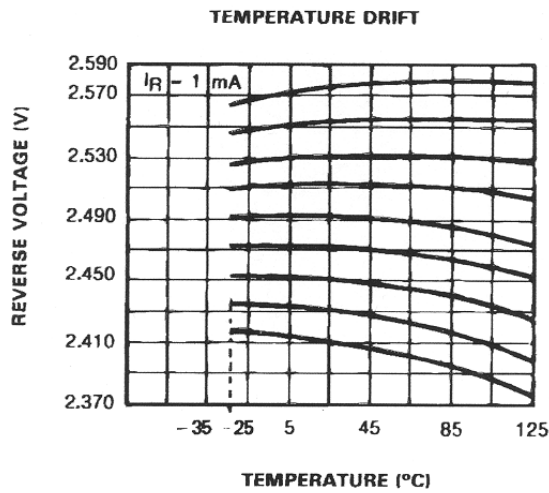
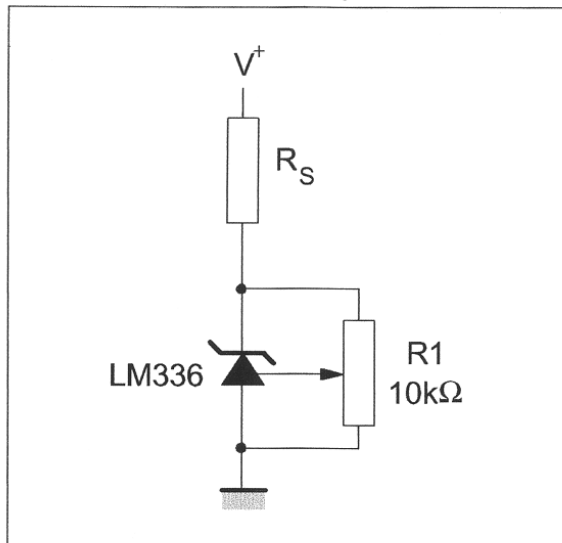


Figure 1 : The LM336 with Pot for Adjustment of Breakdown Voltage



APPLICATION HINTS

The LM236, LM336 voltage references are easier to use than zener diodes. Their low impedance and wide current range facilitate biasing in any circuits. Besides, the breakdown voltage or the temperature coefficient can be adjusted so as to optimize the performance of the circuit.

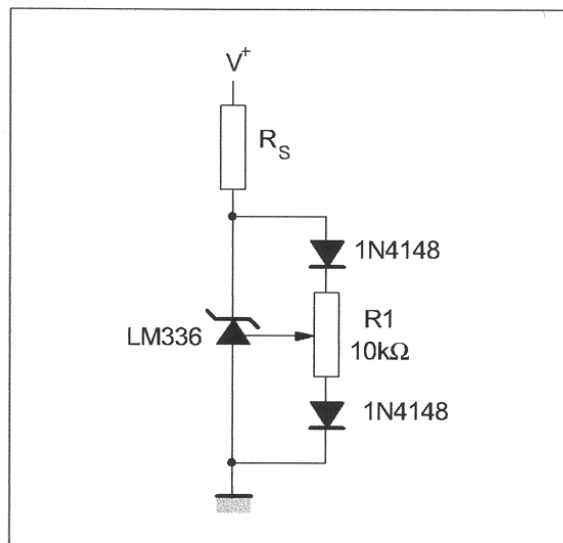
Figure 1 represents a LM336 with a 10kΩ potentiometer to adjust the reverse breakdown voltage which can be adjusted without altering the temperature coefficient of the circuit. The adjustment range is generally sufficient to adjust the initial tolerance of the circuit and the inaccuracy of the amplifier circuit.

To obtain a lower temperature coefficient two diodes can be connected in series as indicated in Figure 2.

When the circuit is adjusted to 2.49V the temperature coefficient is minimized.

For a correct temperature coefficient, the diodes should be at the same ambient temperature as the LM336. The value of $R1$ is not critical (2-20kΩ).

Figure 2 : Temperature Coefficient Adjustment



TYPICAL APPLICATIONS

Figure 3 : 2.5V Reference

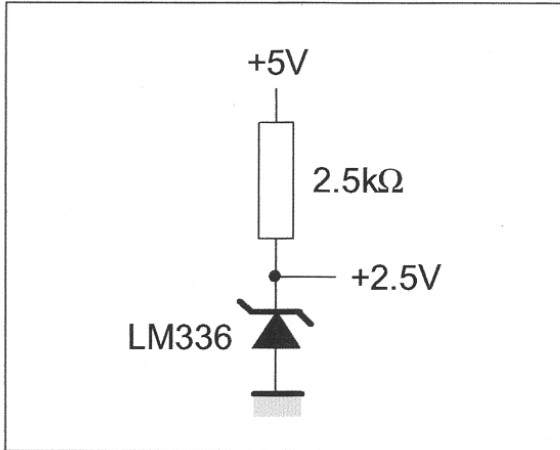


Figure 4 : Wide Input Range Reference

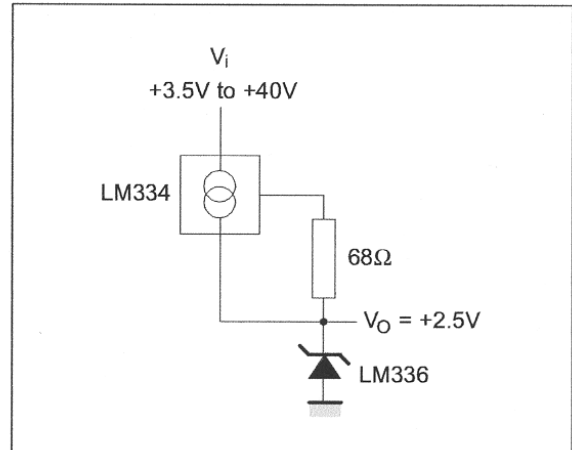


Figure 5 : Precision Power Regulator with Low Temperature Coefficient

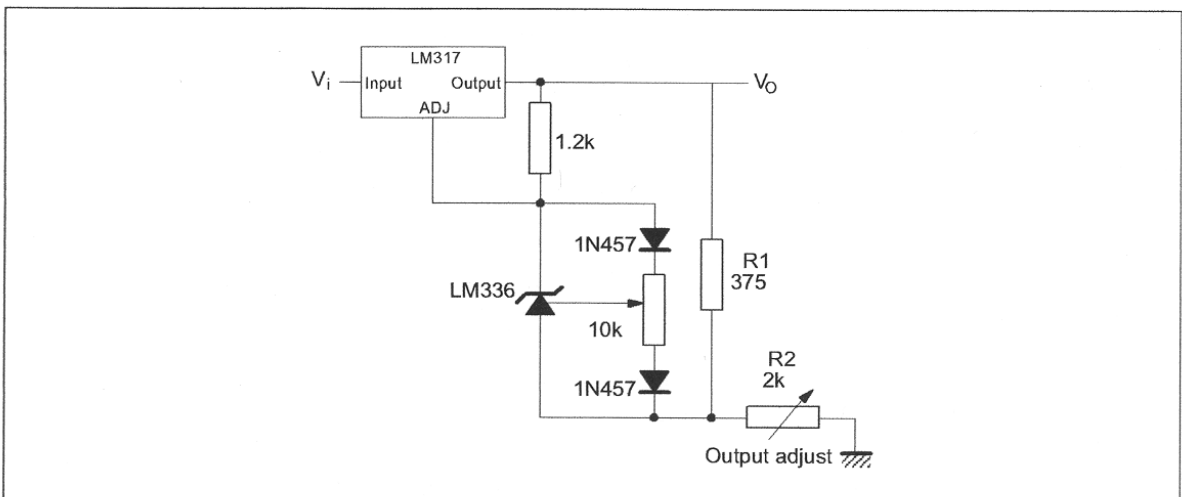


Figure 6 : Adjustable Shunt Regulator

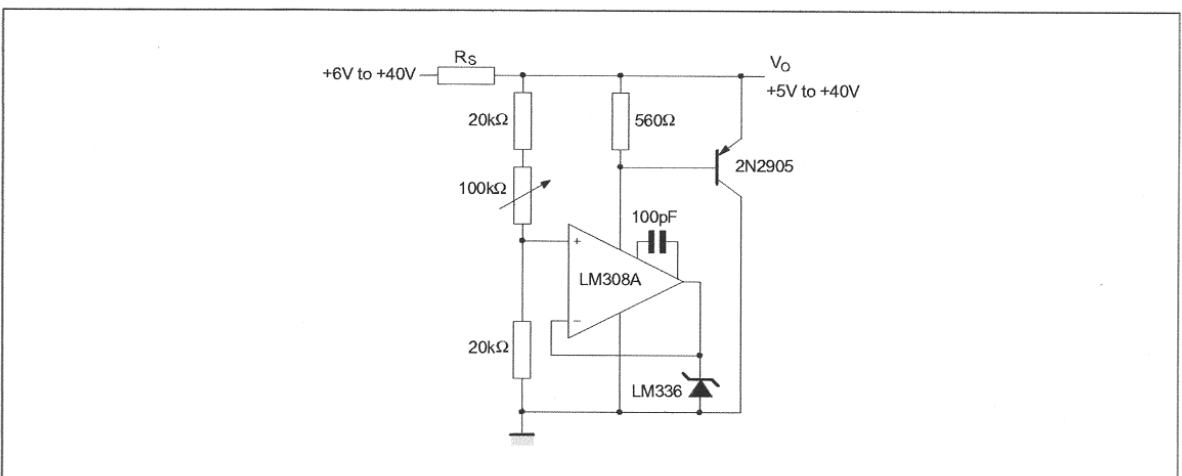


Figure 7 : Linear Ohmmeter

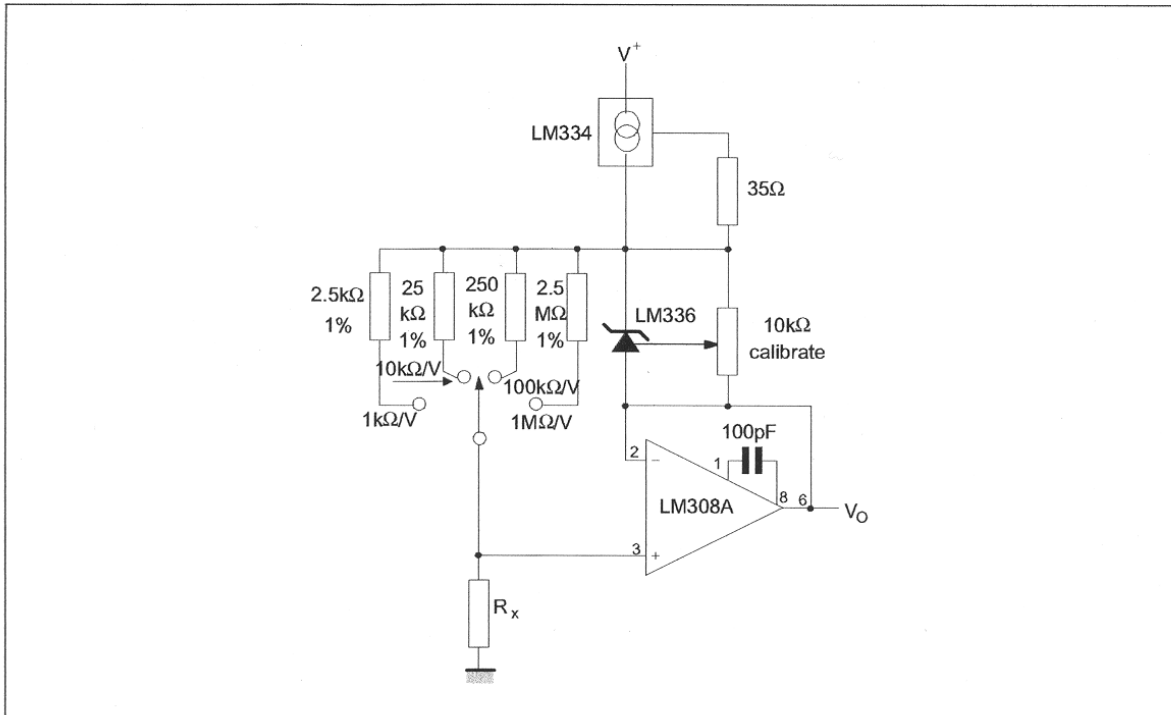


Figure 8 : Bipolar Output Reference

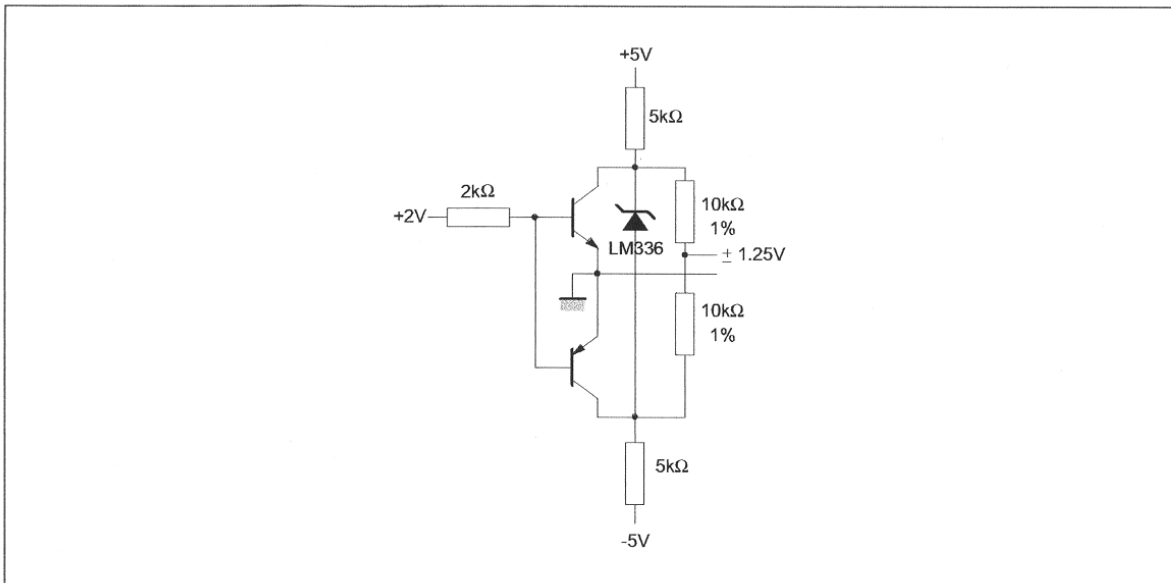


Figure 9 : 5V Buffered Reference

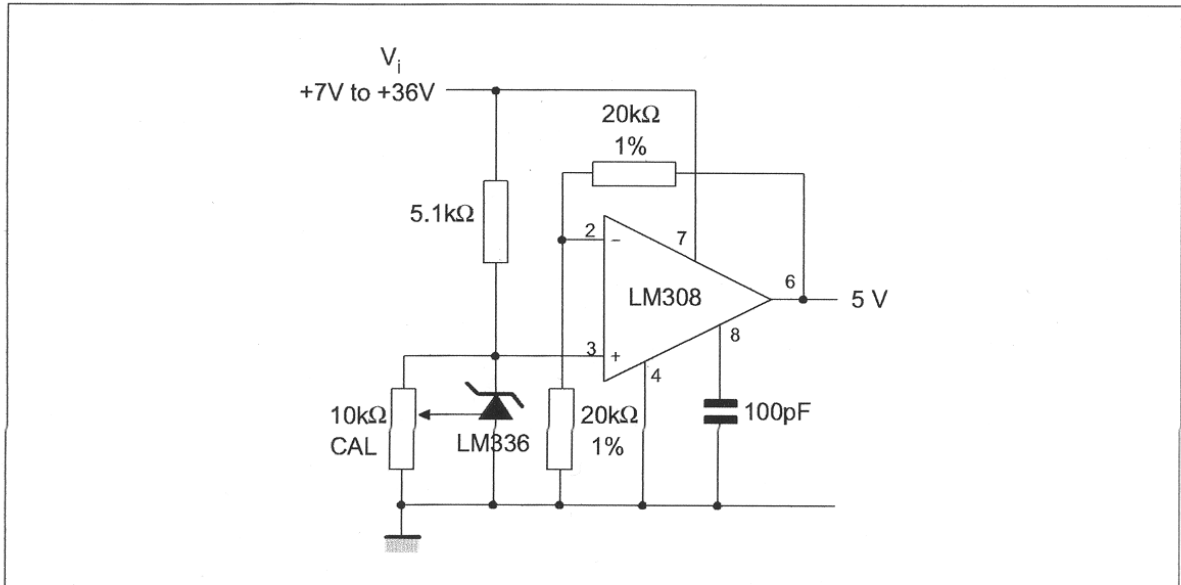
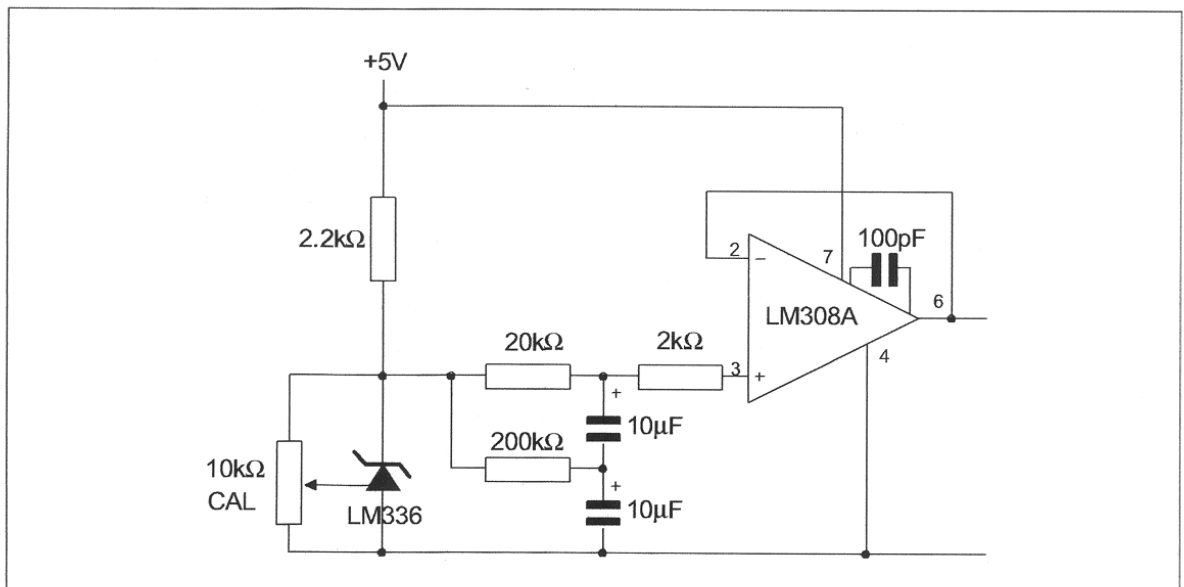


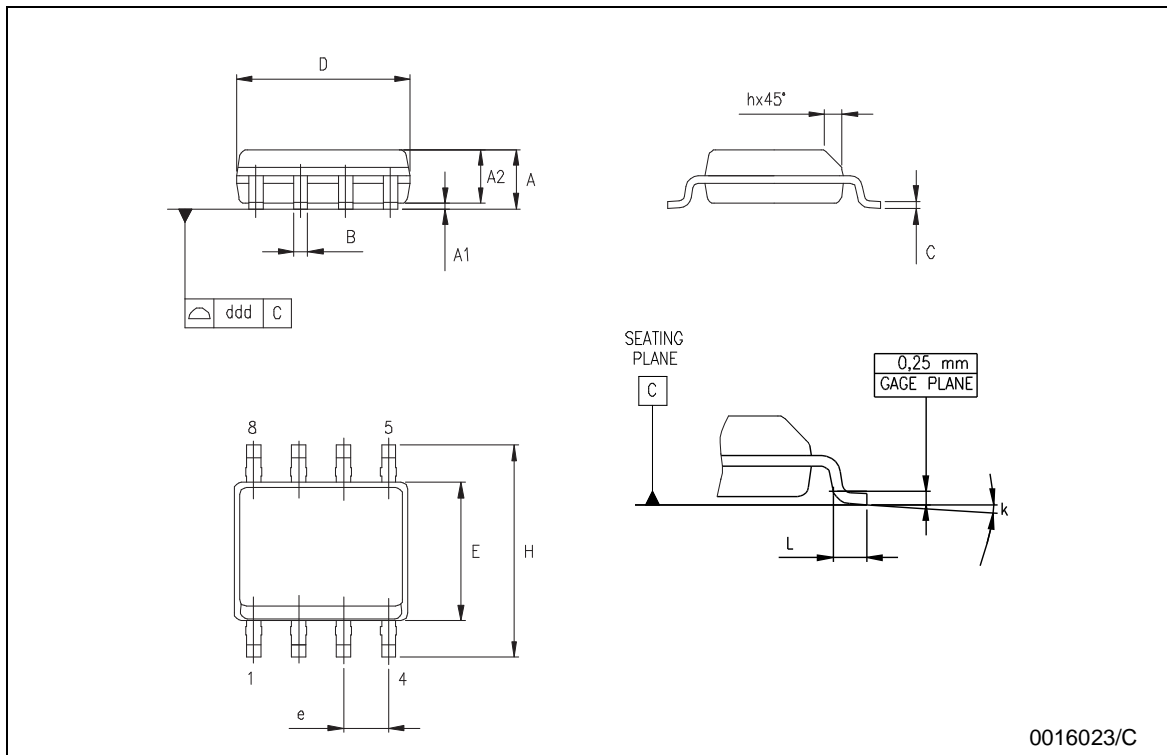
Figure 10 : Low Noise Buffered Reference



PACKAGE MECHANICAL DATA

SO-8 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|------------------|------|------|-------|-------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 1.35 | | 1.75 | 0.053 | | 0.069 |
| A1 | 0.10 | | 0.25 | 0.04 | | 0.010 |
| A2 | 1.10 | | 1.65 | 0.043 | | 0.065 |
| B | 0.33 | | 0.51 | 0.013 | | 0.020 |
| C | 0.19 | | 0.25 | 0.007 | | 0.010 |
| D | 4.80 | | 5.00 | 0.189 | | 0.197 |
| E | 3.80 | | 4.00 | 0.150 | | 0.157 |
| e | | 1.27 | | | 0.050 | |
| H | 5.80 | | 6.20 | 0.228 | | 0.244 |
| h | 0.25 | | 0.50 | 0.010 | | 0.020 |
| L | 0.40 | | 1.27 | 0.016 | | 0.050 |
| k | 8° (max.) | | | | | |
| ddd | | | 0.1 | | | 0.04 |

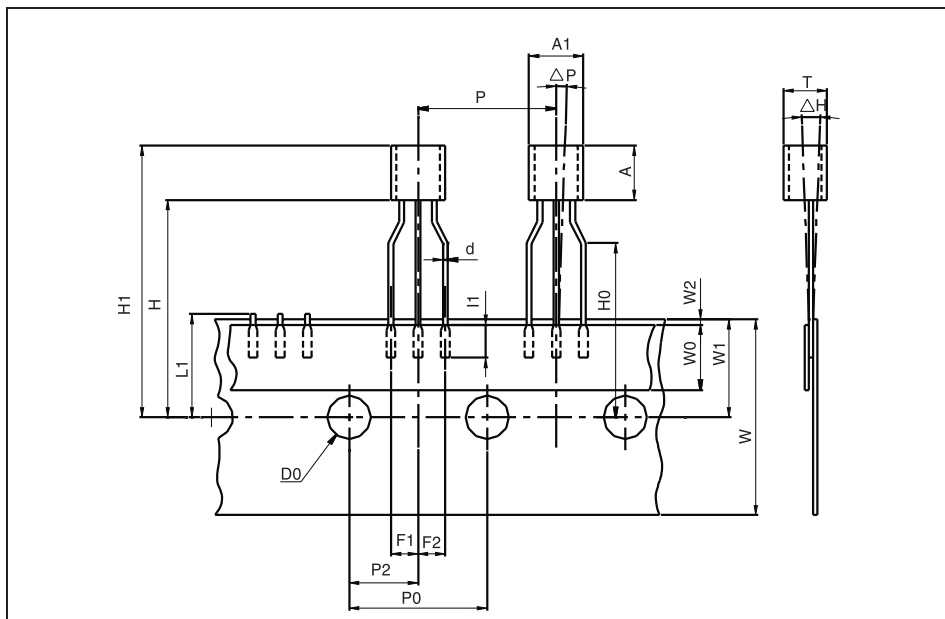


0016023/C

PACKAGE MECHANICAL DATA - TO92 TAPE AMMO PACK & TO92 TAPE & REEL

TO-92 MECHANICAL DATA

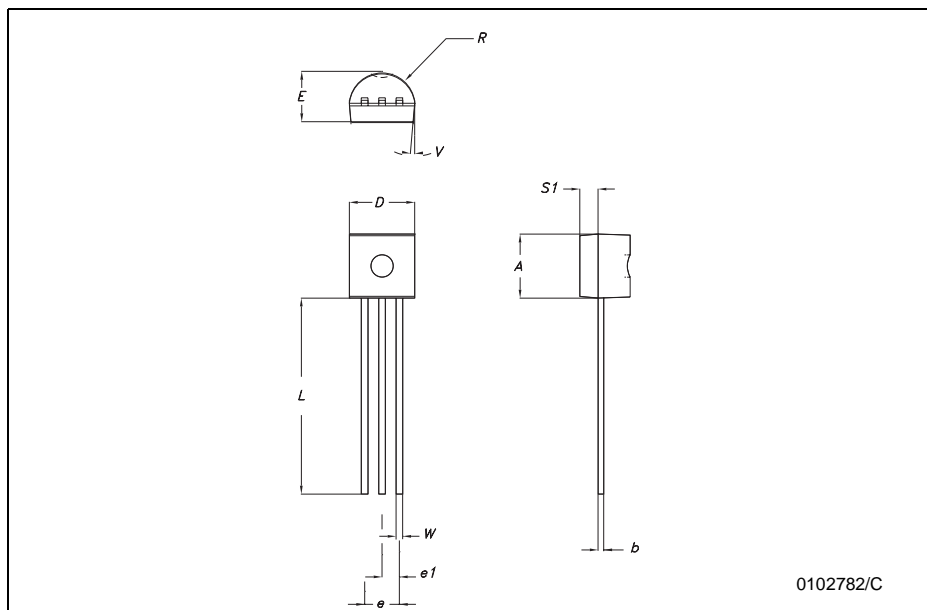
| DIM. | mm. | | | inches | | |
|-------|------|------|------|--------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| AL | | | 5.0 | | | 0.197 |
| A | | | 5.0 | | | 0.197 |
| T | | | 4.0 | | | 0.157 |
| d | | 0.45 | | | 0.018 | |
| l1 | 2.5 | | | 0.098 | | |
| P | 11.7 | 12.7 | 13.7 | 0.461 | 0.500 | 0.539 |
| PO | 12.4 | 12.7 | 13 | 0.488 | 0.500 | 0.512 |
| P2 | 5.95 | 6.35 | 6.75 | 0.234 | 0.250 | 0.266 |
| F1/F2 | 2.4 | 2.5 | 2.8 | 0.094 | 0.098 | 0.110 |
| h | -1 | 0 | 1 | -0.039 | 0 | 0.039 |
| P | -1 | 0 | 1 | -0.039 | 0 | 0.039 |
| W | 17.5 | 18.0 | 19.0 | 0.689 | 0.709 | 0.748 |
| W0 | 5.7 | 6 | 6.3 | 0.224 | 0.236 | 0.248 |
| W1 | 8.5 | 9 | 9.75 | 0.335 | 0.354 | 0.384 |
| W2 | | | 0.5 | | | 0.020 |
| H | | | 20 | | | 0.787 |
| H0 | 15.5 | 16 | 16.5 | 0.610 | 0.630 | 0.650 |
| H1 | | | 25 | | | 0.984 |
| DO | 3.8 | 4.0 | 4.2 | 0.150 | 0.157 | 0.165 |
| L1 | | | 11 | | | 0.433 |



Packing information are available at: <http://www.st.com/stonline/prodpres/packages/stdlin.htm>

PACKAGE MECHANICAL DATA - TO92 BULK

| TO-92 MECHANICA DATA | | | | | | |
|----------------------|------|------|-------|-------|------|-------|
| DIM. | mm. | | | mils | | |
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.32 | | 4.95 | 170.1 | | 194.9 |
| b | 0.36 | | 0.51 | 14.2 | | 20.1 |
| D | 4.45 | | 4.95 | 175.2 | | 194.9 |
| E | 3.30 | | 3.94 | 129.9 | | 155.1 |
| e | 2.41 | | 2.67 | 94.9 | | 105.1 |
| e1 | 1.14 | | 1.40 | 44.9 | | 55.1 |
| L | 12.7 | | 15.49 | 500.0 | | 609.8 |
| R | 2.16 | | 2.41 | 85.0 | | 94.9 |
| S1 | 0.92 | | 1.52 | 36.2 | | 59.8 |
| W | 0.41 | | 0.56 | 16.1 | | 22.0 |



Packing information are available at: <http://www.st.com/stonline/prodpres/packages/stdlin.htm>

Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a registered trademark of STMicroelectronics

© 2003 STMicroelectronics - All Rights Reserved
STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - China - Finland - France - Germany - Hong Kong - India - Italy - Japan - Malaysia - Malta - Morocco
Singapore - Spain - Sweden - Switzerland - United Kingdom
<http://www.st.com>