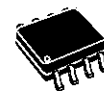


2.5V VOLTAGE REFERENCES

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



Z
TO92
(Plastic Package)



D
SO8
(Plastic Micropackage)

DESCRIPTION

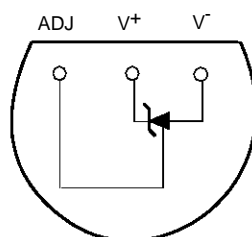
The LM236 and LM336 are precision 2.5V regulator diodes. These voltage reference monolithic ICs operate like 2.5V zener diodes with a low temperature coefficient and a dynamic impedance of 0.2 Ω . A third pin enables adjusting the reference voltage and the temperature coefficient.

ORDER CODES

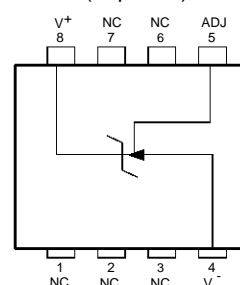
Part number	Temperature Range	Package	
		Z	D
LM236	-25°C, +85°C	•	•
LM336,B	0°C, +70°C	•	•

PIN CONNECTIONS

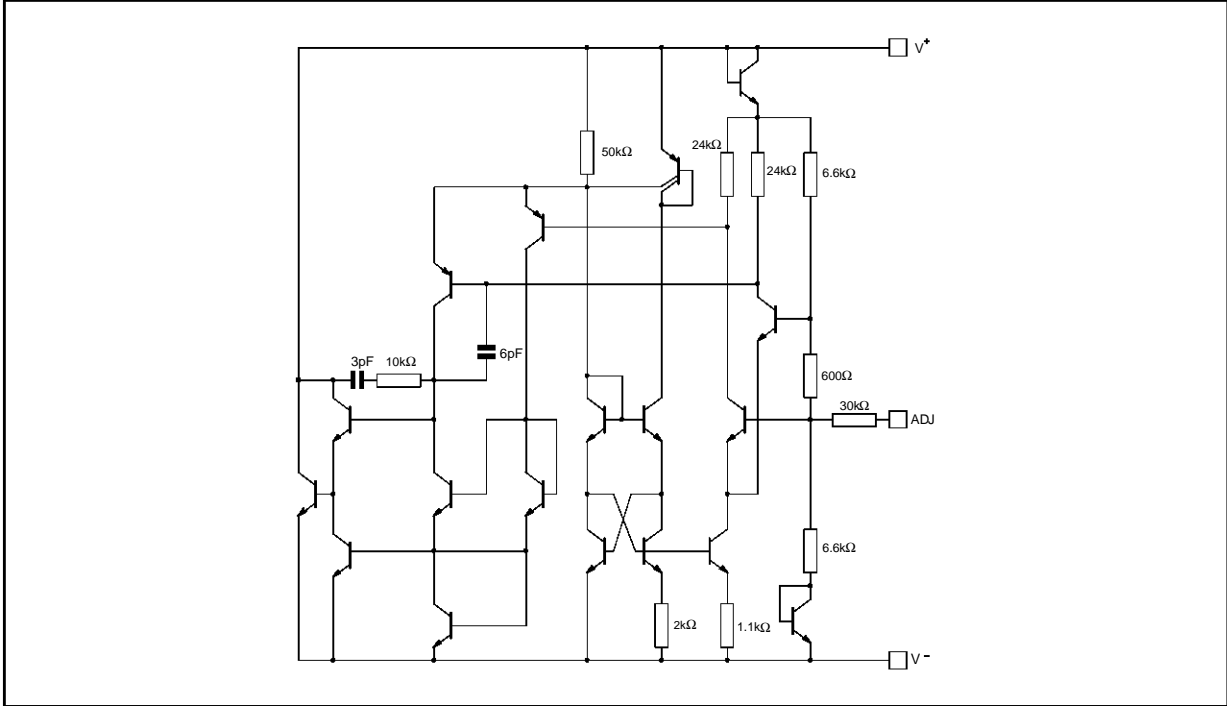
TO92
(Bottom view)



SO8
(Top view)



SCHEMATIC DIAGRAM



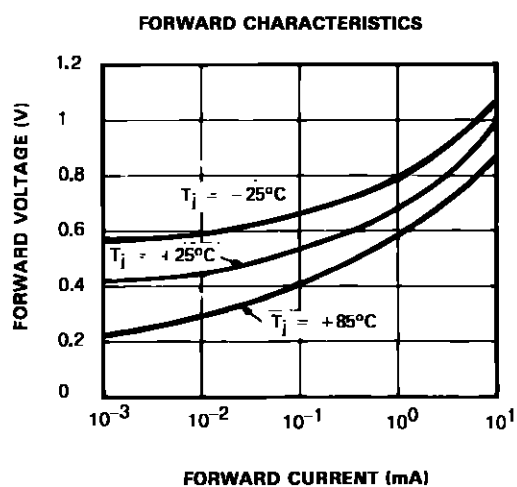
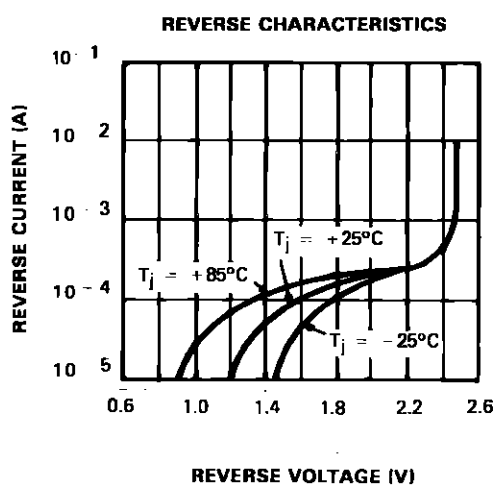
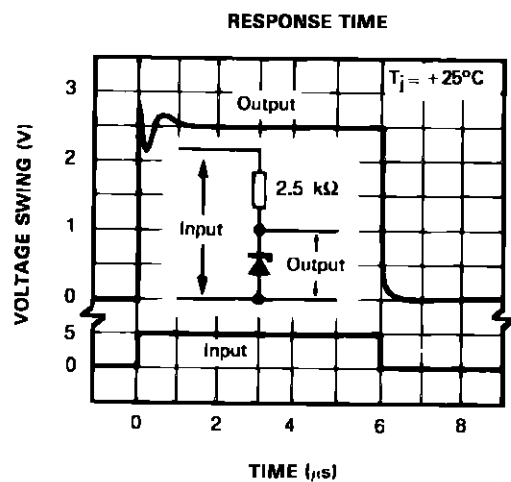
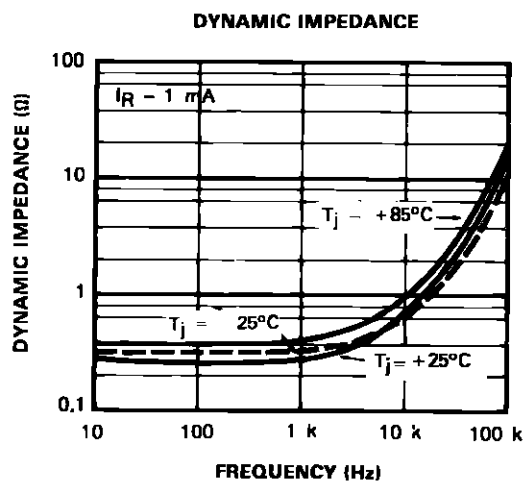
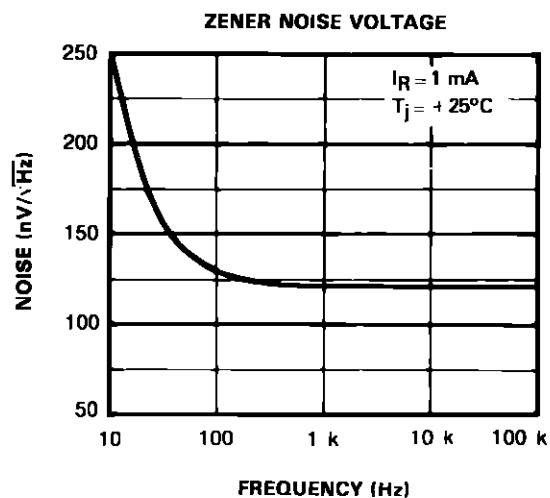
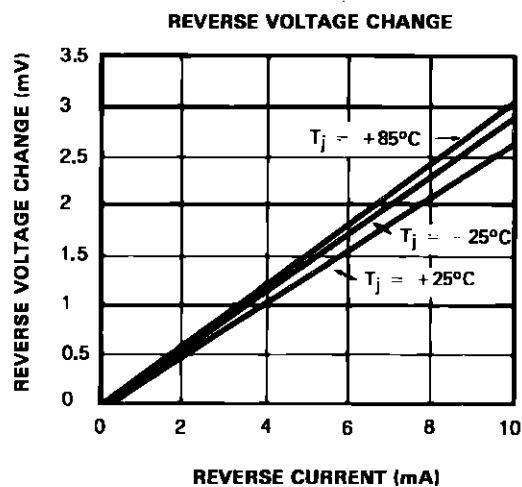
ABSOLUTE MAXIMUM RATINGS

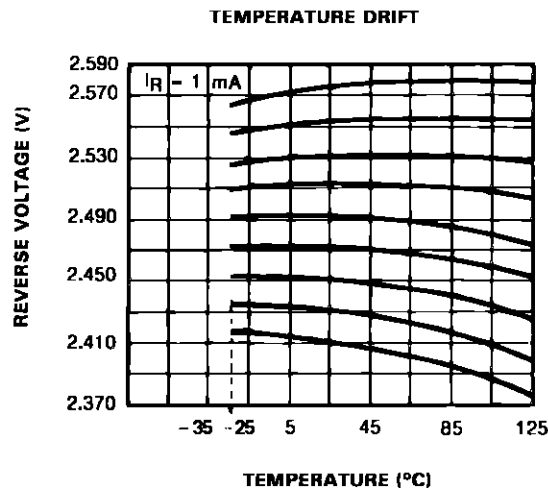
Symbol	Parameter	LM236	LM336,B	Unit
I_R I_F	Current Reverse Forward	15 10	15 10	mA
T_{oper}	Operating Free-air Temperature Range	-25 to +85	0 to +70	°C
T_{stg}	Storage Temperature Range	-65 to +150		°C

ELECTRICAL CHARACTERISTICS

LM236 $-25^{\circ}\text{C} \leq T_{amb} \leq +85^{\circ}\text{C}$
LM336,B $0^{\circ}\text{C} \leq T_{amb} \leq +70^{\circ}\text{C}$
(unless otherwise specified)

Symbol	Parameter	LM236			LM336,B			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_R	Reverse 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



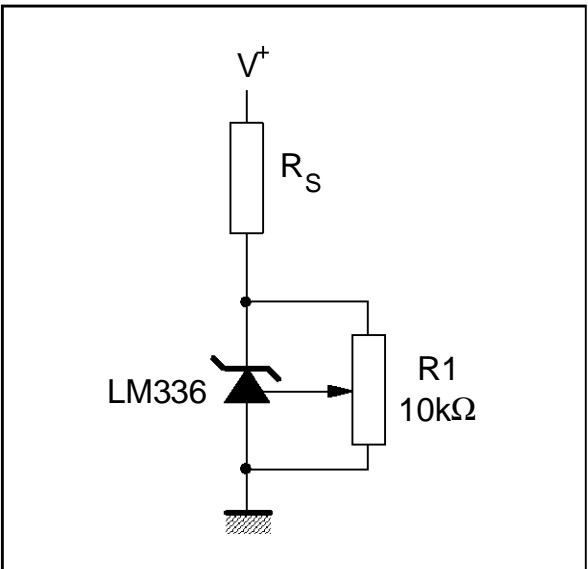


APPLICATION HINTS

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 10k Ω potentiometer to adjust the reverse breakdown voltage can be adjusted without altering the temperature coefficient.

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

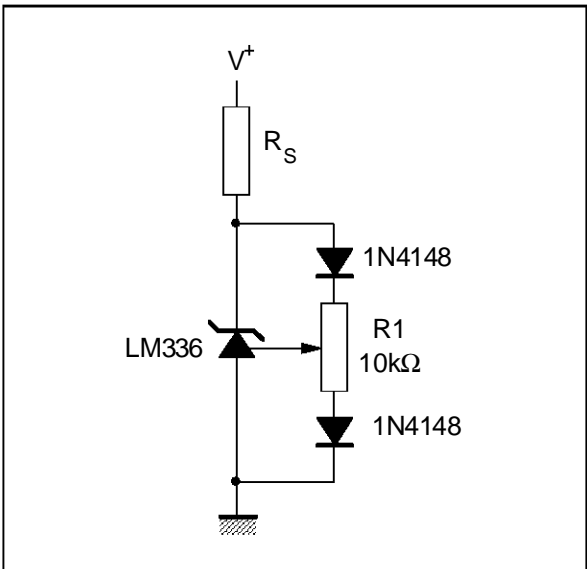


cient of the circuit. The adjustment range is generally sufficient to adjust the initial tolerance of the circuit and the inaccuracy of the amplifier circuit.

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 (2-20k Ω).

Figure 2 : Temperature Coefficient Adjustment



TYPICAL APPLICATIONS

Figure 3 : 2.5V Reference

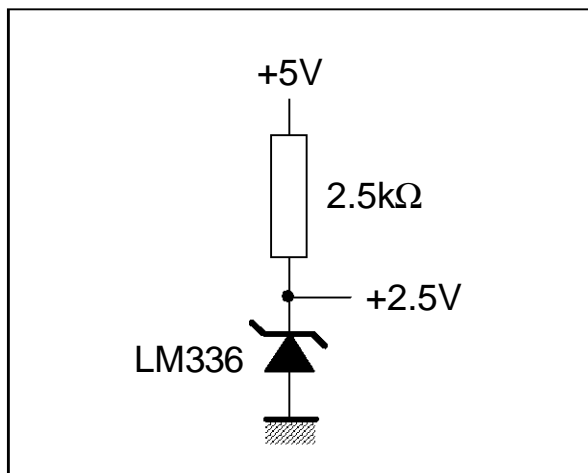


Figure 4 : Wide Input Range Reference

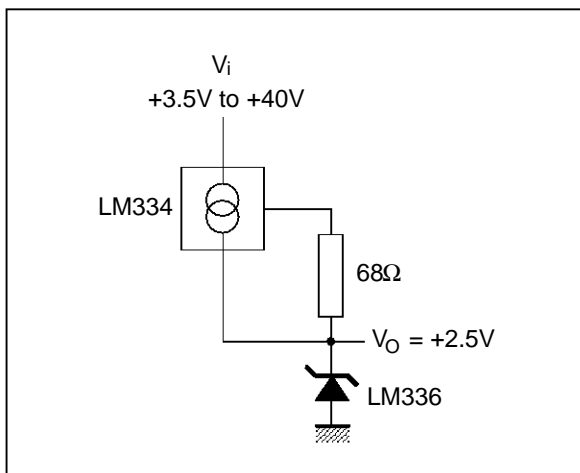


Figure 5 : Precision Power Regulator with Low Temperature Coefficient

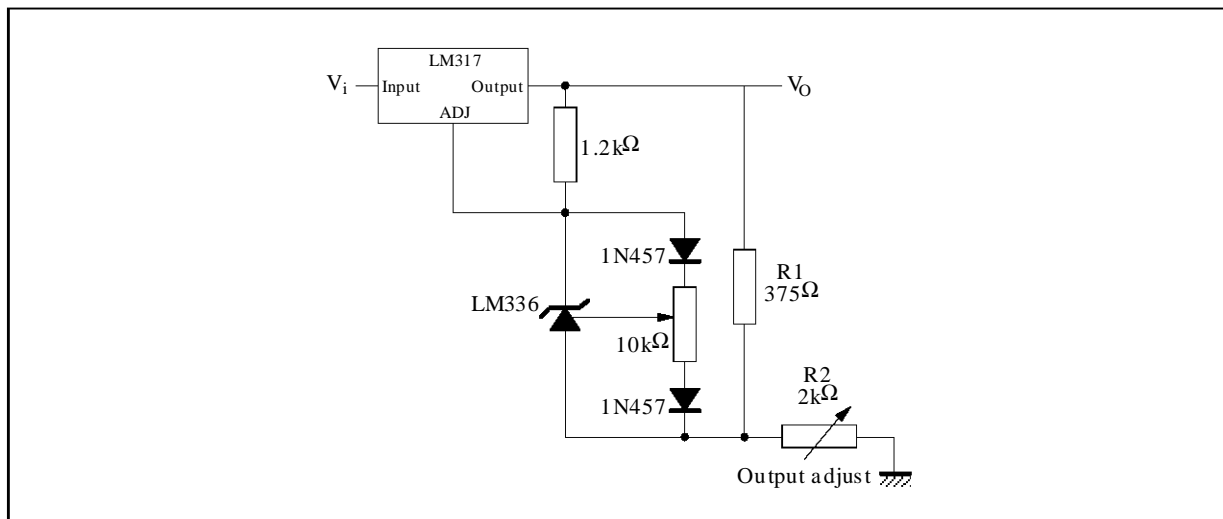
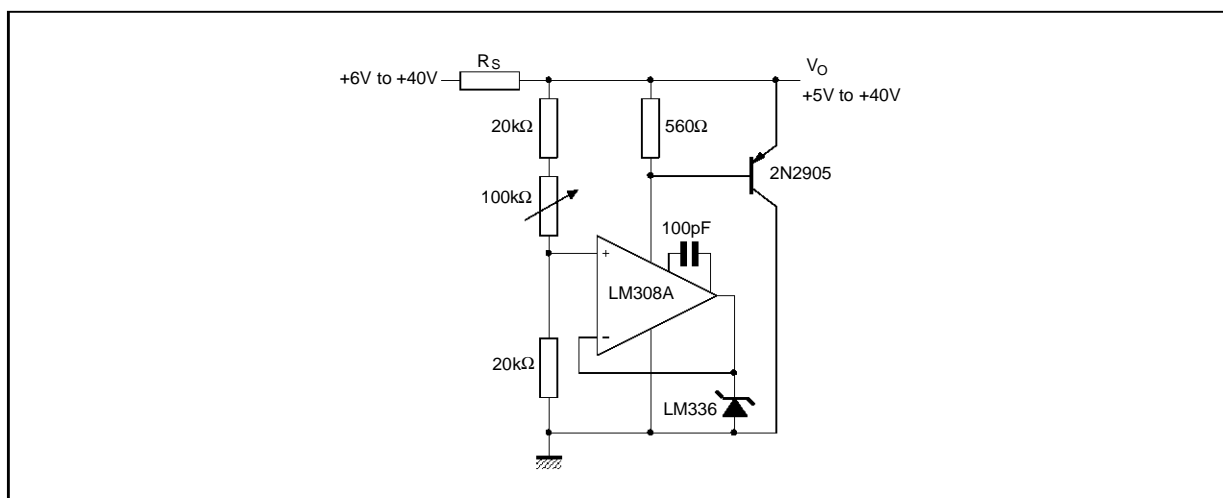


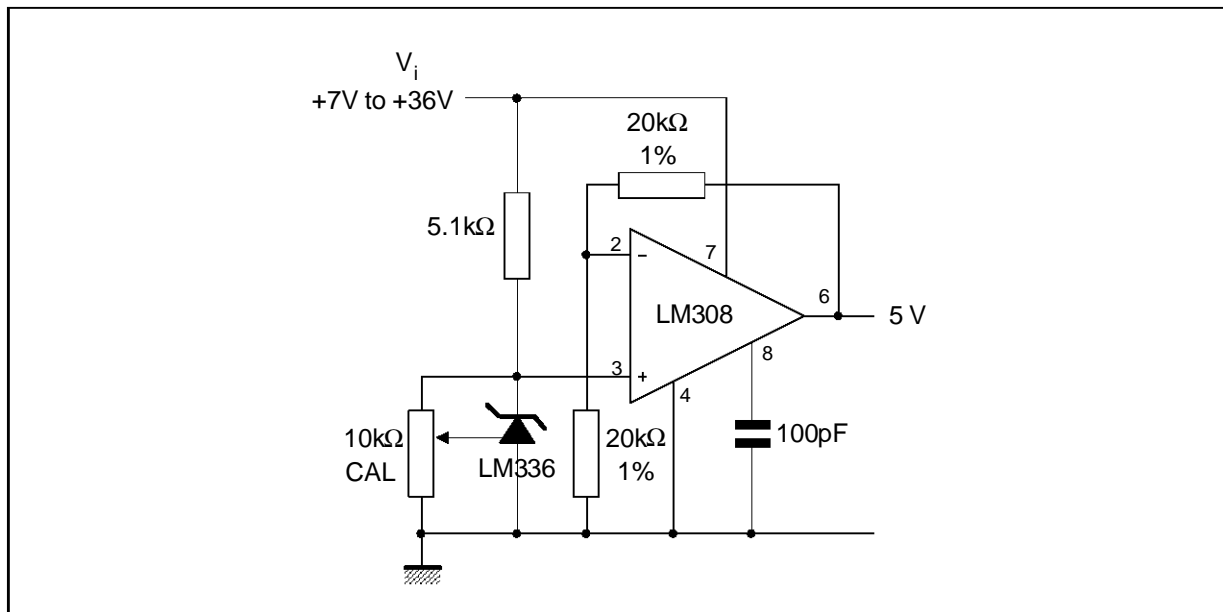
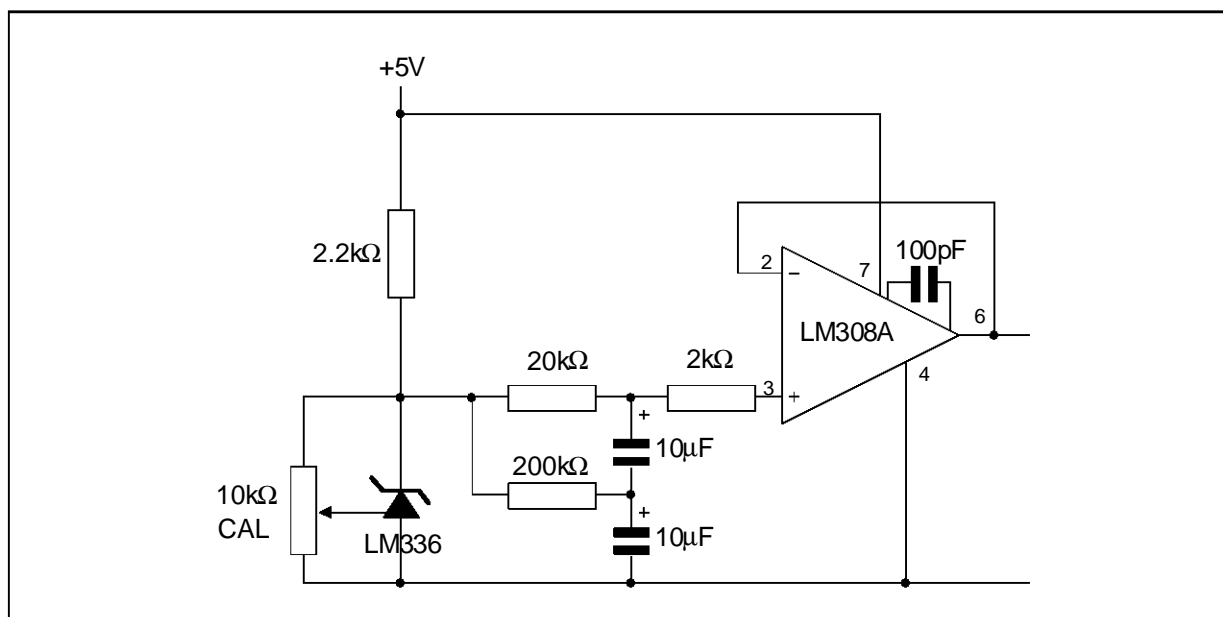
Figure 6 : Adjustable Shunt Regulator



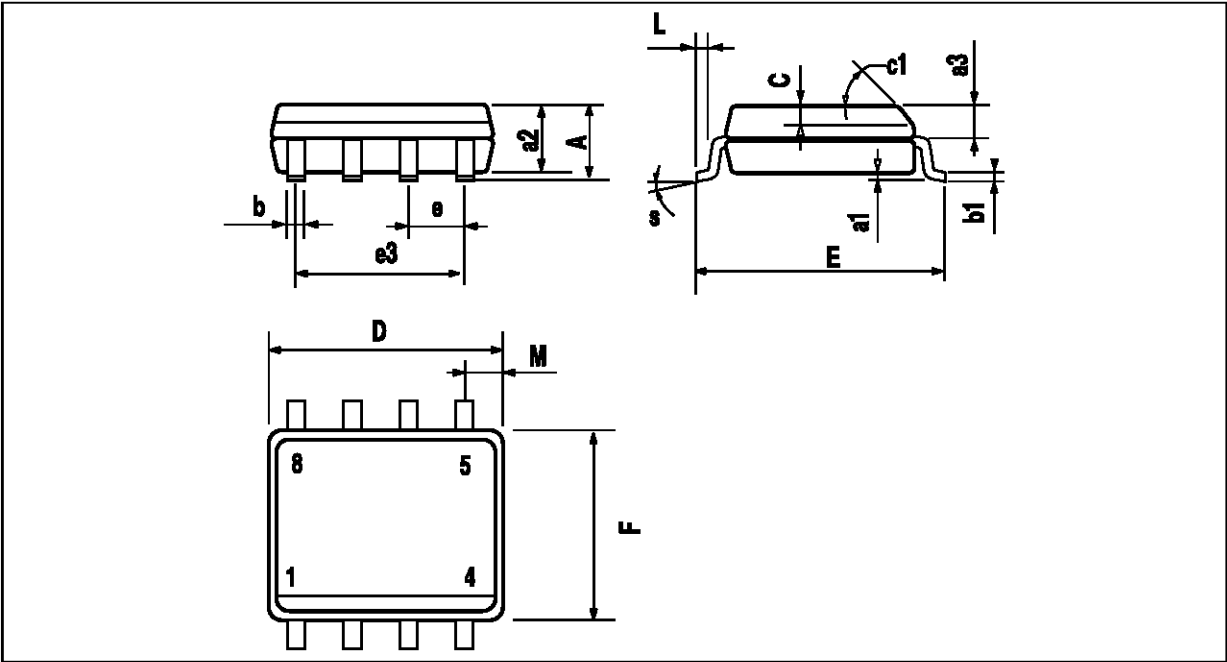
The circuit diagram shows a precision current source and transimpedance amplifier. The input is a variable resistor R_x connected to ground. The output is V_O . The circuit is powered by V^+ and ground. The components include:

- LM334**: Precision centrabitor, connected to V^+ and ground.
- LM336**: Photoconductive cell, connected to V^+ and ground.
- LM308A**: Operational amplifier, configured as a transimpedance amplifier.
- Resistors**: $2.5\text{k}\Omega$ 1%, $25\text{k}\Omega$ 1%, $250\text{k}\Omega$ 1%, $2.5\text{M}\Omega$ 1%, $10\text{k}\Omega/\text{V}$, $1\text{k}\Omega/\text{V}$, $100\text{k}\Omega/\text{V}$, $1\text{M}\Omega/\text{V}$, 35Ω , $10\text{k}\Omega$ calibrate, 100pF .

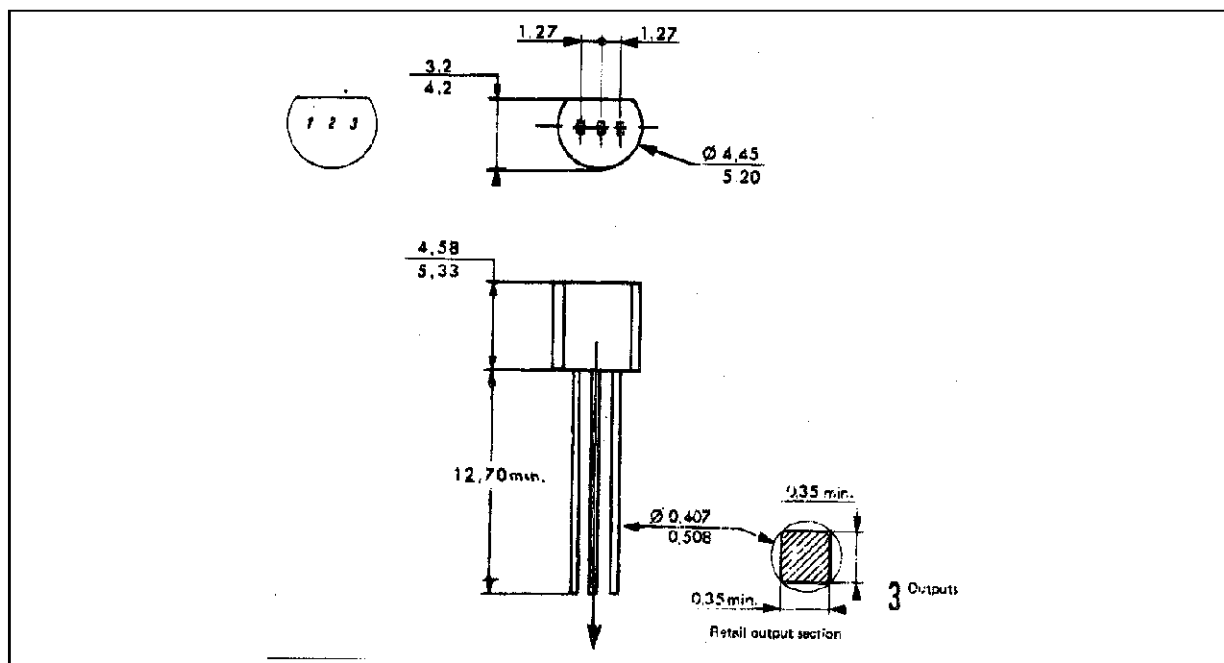
The diagram shows an LM336 precision centred voltage reference circuit. The LM336 is connected to a +5V supply through a 5kΩ resistor and to a -5V supply through another 5kΩ resistor. The output voltage is taken from the junction of two 10kΩ 1% resistors connected between the +5V and -5V supplies. The LM336 is also connected to a +2V supply through a 2kΩ resistor. The output voltage is labeled as $\pm 1.25V$.

Figure 9 : 5V Buffered Reference**Figure 10 :** Low Noise Buffered Reference

PACKAGE MECHANICAL DATA
8 PINS - PLASTIC MICROPACKAGE (SO)



Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
a3	0.65		0.85	0.026		0.033
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.020
c1	45° (typ.)					
D	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.150		0.157
L	0.4		1.27	0.016		0.050
M			0.6			0.024
S	8° (max.)					

PACKAGE MECHANICAL DATA**3 PINS - PLASTIC PACKAGE TO92**

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
L		1.27			0.05	
B	3.2	3.7	4.2	0.126	0.1457	0.1654
O1	4.45	5.00	5.2	0.1752	0.1969	0.2047
C	4.58	5.03	5.33	0.1803	0.198	0.2098
K	12.7			0.5		
O2	0.407	0.5	0.508	0.016	0.0197	0.02
a	0.35			0.0138		

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