ALPHA
SEMICONDUCTOR
Excellence in Analog Power Products

AS1004

Precision Voltage Reference

FEATURES

- Initial Voltage Tolerance .....1004-1.2 ,±4mV & 1004-2.5, ±20mV
- Low Dynamic Impedance ..... 0.6 Ω Max.
- Low Operating Current ..... 1004-1.2, 10µA & 1004-2.5, 20µA
- Wide Operating Current Range..... 10µA to 20mA
- Direct Replacement for LT1004 & LM1004

APPLICATIONS

- A/D and D/A Reference
- Reference for 5V Systems
- Digital Voltmeter
- Power Supply Monitor

PRODUCT DESCRIPTION

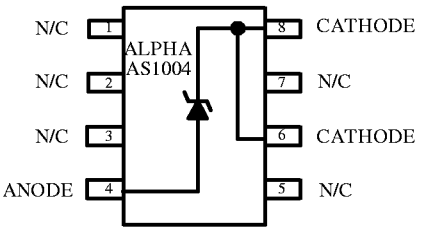
The ALPHA Semiconductor AS1004 is a 2-terminal band-gap precision voltage reference which provides a stable fixed output voltage of 1.2 and 2.5 volts with a tolerance less than ±4mV for AS1004-1.2 and ±10mV for AS1004-2.5. ALPHA Semiconductor's design, process, and precise on chip trimming enable us to achieve low temperature coefficient as low as 25ppm/°C.

The AS1004 can be used as a pin-to-pin replacement of the LT1004 and LM1004. The AS1004 is available in packages SOIC-8, SOT-89, TO-92 and Die at the operating temperature range of 0°C to 70°C.

ORDERING INFORMATION

Part Number	MAX TEMPCO[1] ppm/°C	Package Type	Oper. Temp. Range
AS1004M1	25	SOT-89	COM
AS1004S	25	SO-8	COM
AS1004N	25	TO-92	COM

SOIC (S) Alternate Pin Out

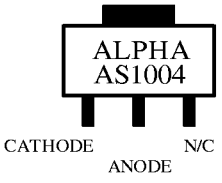


Top View

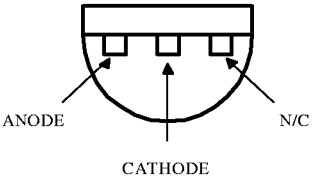
PIN CONNECTIONS

TOP VIEW

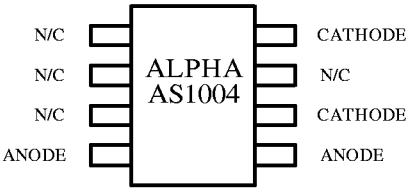
SOT-89 (M1)



TO-92 (N)



SOIC (S)



ABSOLUTE MAXIMUM RATINGS

Forward Current..... 30 mA
Reverse Current..... 30 mA
Maximum Junction Temp..... 150°C
Storage Temperature Range..... -65°C to 150°C
Lead Temperature Range (10 Sec.)..... +300°C

TYPICAL THERMAL RESISTANCES

Package	θ_{JA}	θ_{JC}	Typical Derating
TO-92	160 °C/W	80 °C/W	6.3 mW/°C
8L SOIC	175 °C/W	45 °C/W	5.7 mW/°C
SOT-89	110 °C/W	8 °C/W	9.1 mW/°C

ELECTRICAL CHARACTERISTICS

Electrical Characteristics are guaranteed over full junction temperature range (0°C to 70°C). Ambient temperature must be derated based on power dissipation and package thermal characteristics.

Parameter	Test Conditions	AS1004-1.2V Min.	AS1004-1.2V Typ.	AS1004-1.2V Max.	AS1004-2.5V Min.	AS1004-2.5V Typ.	AS1004-2.5V Max.	Units
Reverse Breakdown Voltage	I_Z = 100 µA, T_J = 25 °C	1.231	1.235	1.239	2.480	2.500	2.520	V
	0 °C ≤ T_A ≤ 70 °C	1.225	1.235	1.245	2.470	2.500	2.530	V
Average Temperature Coefficient	I_{min} ≤ I_Z ≤ 20 mA		20			60		ppm/°C
Minimum Operating Current			4	10		12	20	µA
Reverse Breakdown Voltage Change With Current	I_{min} ≤ I_Z ≤ 1 mA		0.5	1		0.5	1	mV
	Over Temperature		0.5	1.5		0.5	1.5	mV
	1 mA ≤ I_Z ≤ 20 mA		6.5	10		6.5	10	mV
	Over Temperature		6.5	20		6.5	20	mV
Reverse Dynamic Impedance	I_Z = 100 mA, f = 25 Hz		0.2	0.6		0.8	0.9	Ω
	Over Temperature		1	1.5			1.5	Ω
Wide Band Noise	I_Z = 100 µA							
	10 Hz ≤ f ≤ 10 KHz		60			60		µV
Long Term Stability	I_Z = 100 µA							
	T_A = 25 °C ± 0.1 °C		20			60		ppm/kH

Typical Performance Curves

Calculating Average Temperature Coefficient for the AS1004-1.2V Reference

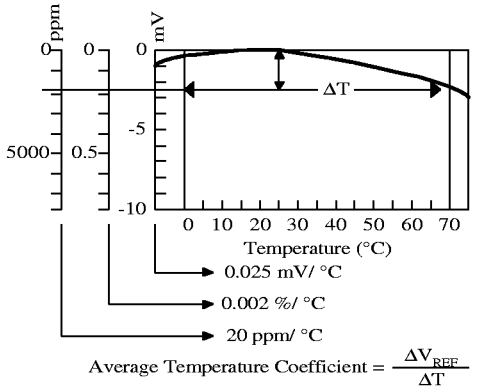


Figure 1

AS1004-1.2V Reference Voltage vs. Ambient Temperature

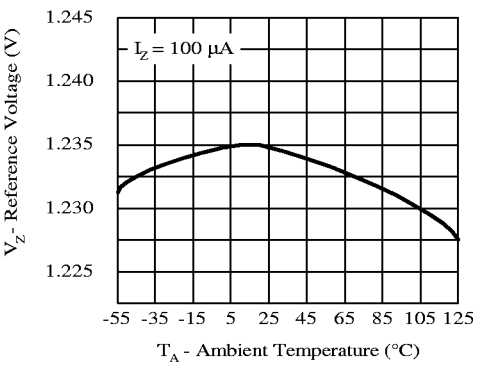
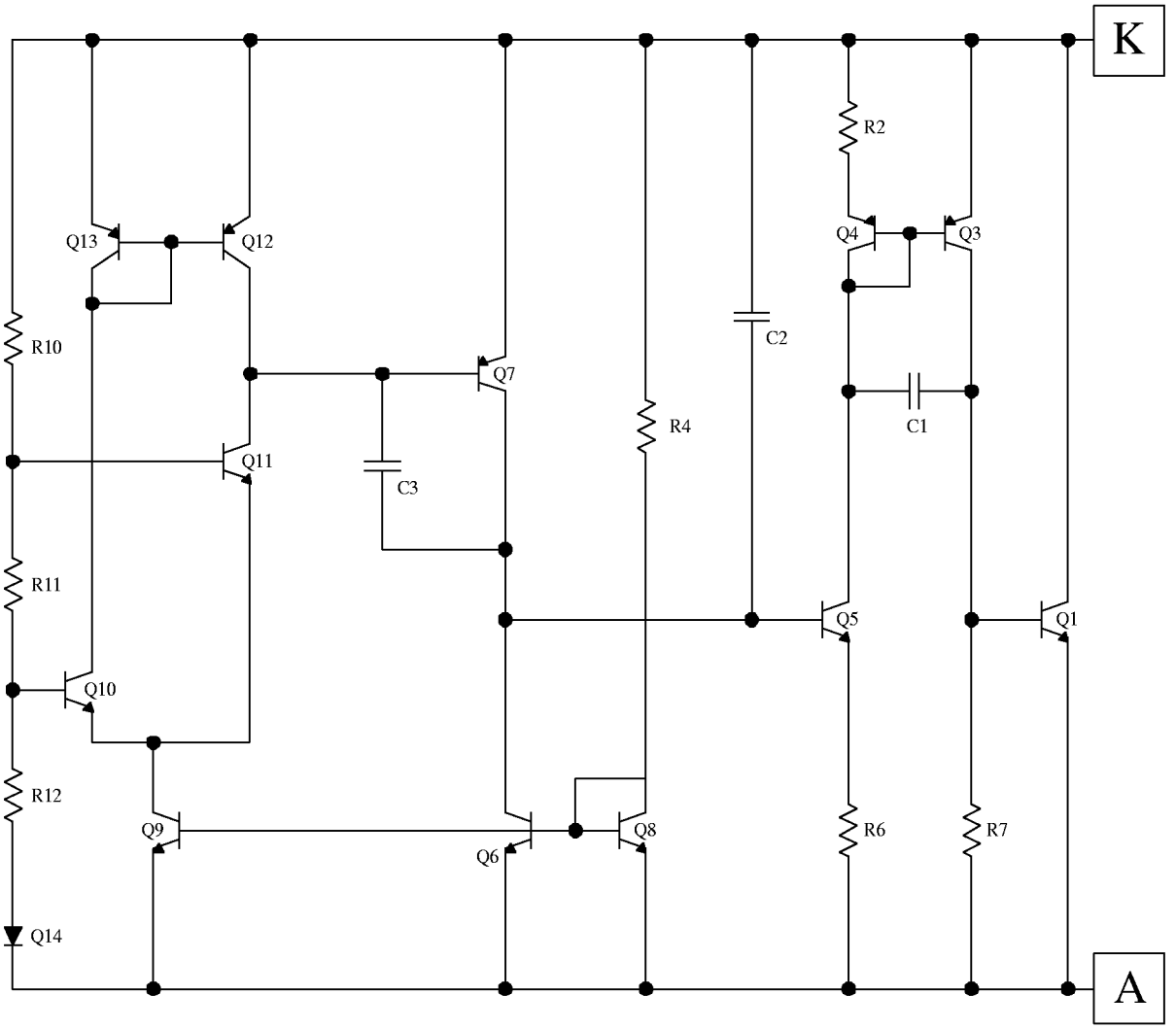


Figure 2

SIMPLIFIED SCHEMATIC



TYPICAL PERFORMANCE CURVES

Calculating Average Temperature Coefficient for the AS1004-2.5V Reference

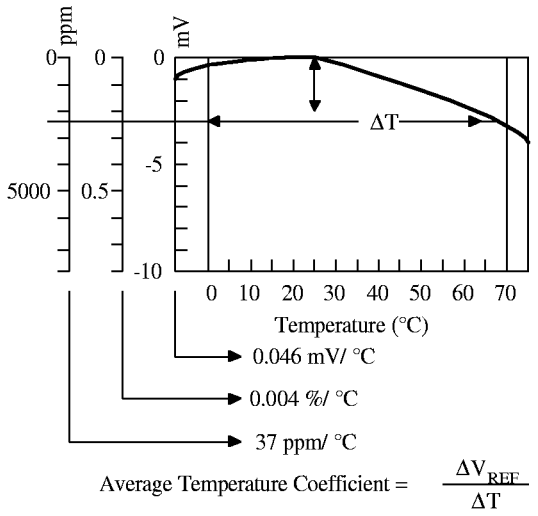


Figure 3

AS1004-2.5V Reference Voltage vs. Ambient Temperature

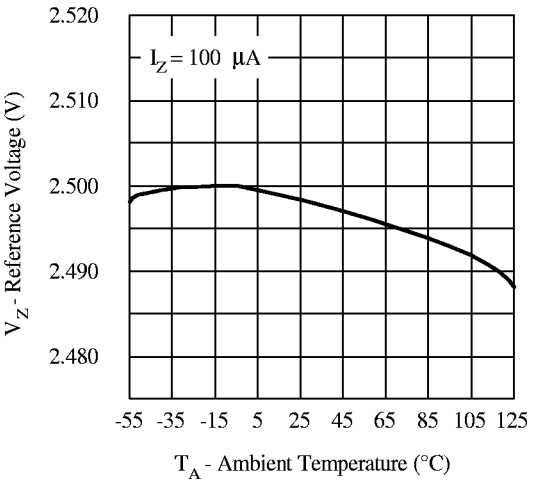


Figure 4

AS1004-1.2V Reverse Operating Characteristics

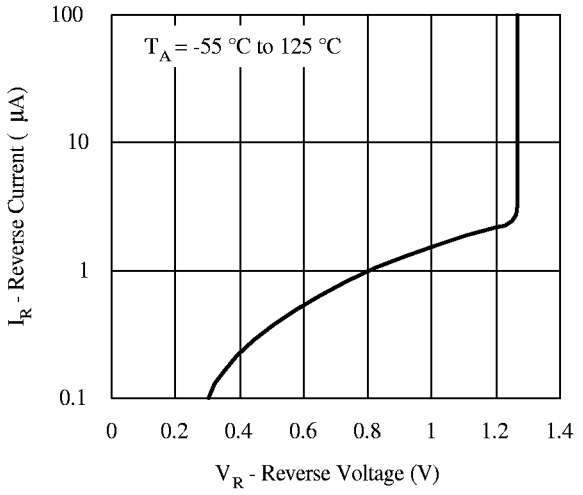


Figure 5

AS1004-2.5V Reverse Operating Characteristics

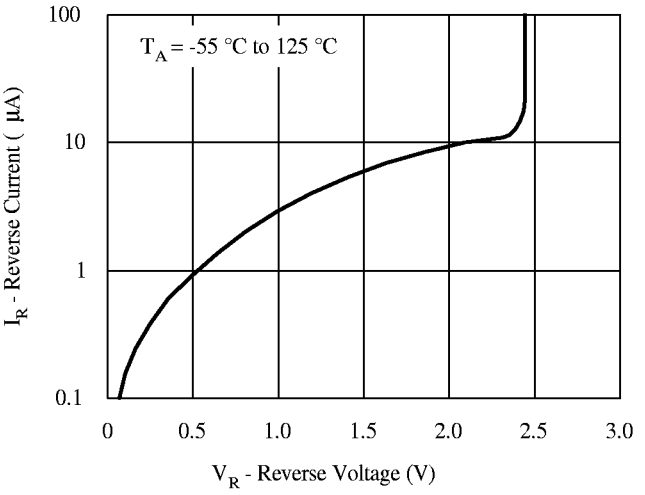


Figure 6

TYPICAL PERFORMANCE CURVES

AS1004-1.2V Change in Reference Voltage vs. Reverse Current

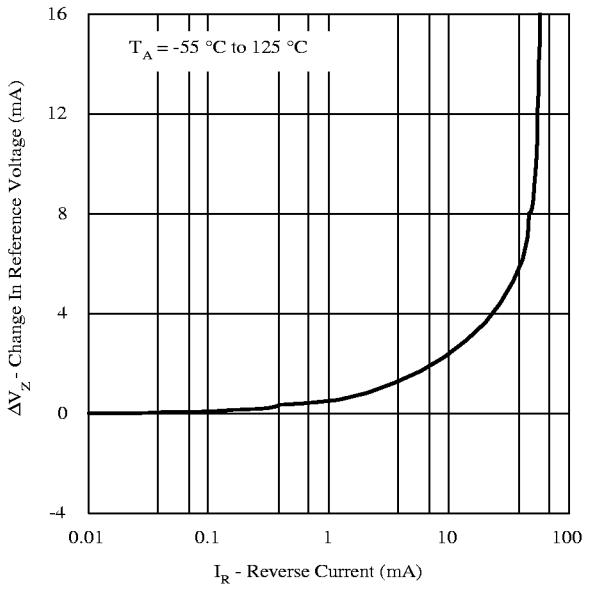


Figure 7

AS1004-2.5V Change in Reference Voltage vs. Reverse Current

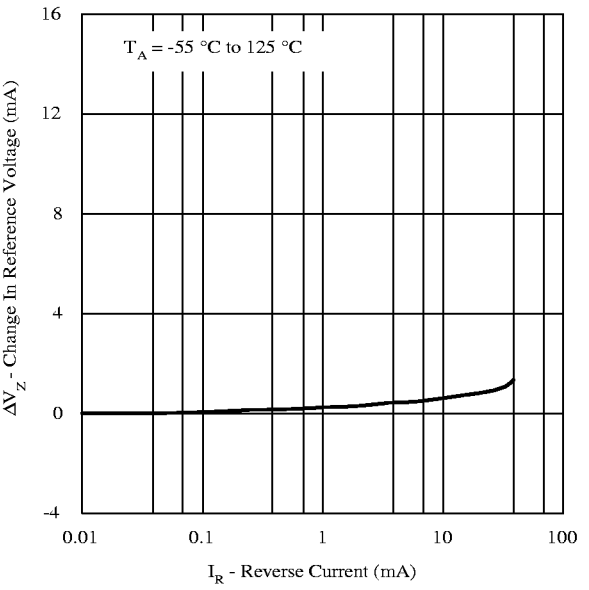


Figure 8

AS1004-1.2V Transient Response

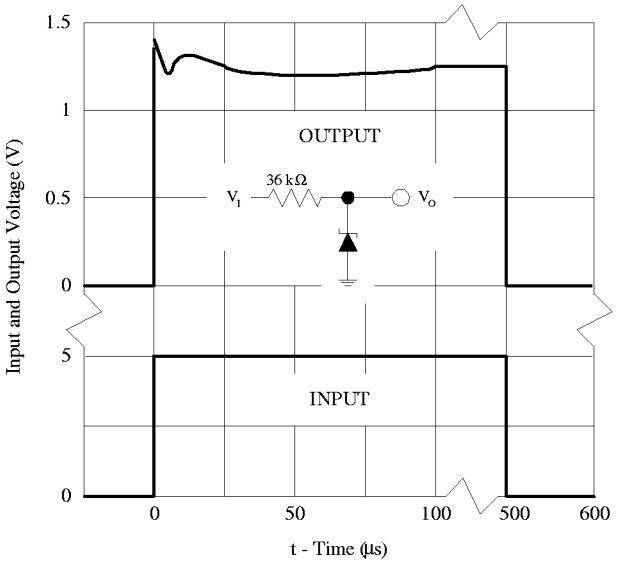


Figure 9

AS1004-2.5V Transient Response

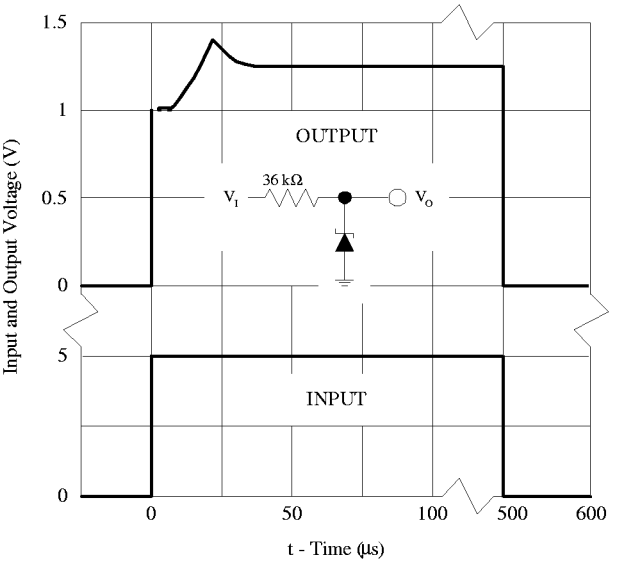


Figure 10

TYPICAL PERFORMANCE CURVES

AS1004-1.2V Reverse Dynamic Impedance

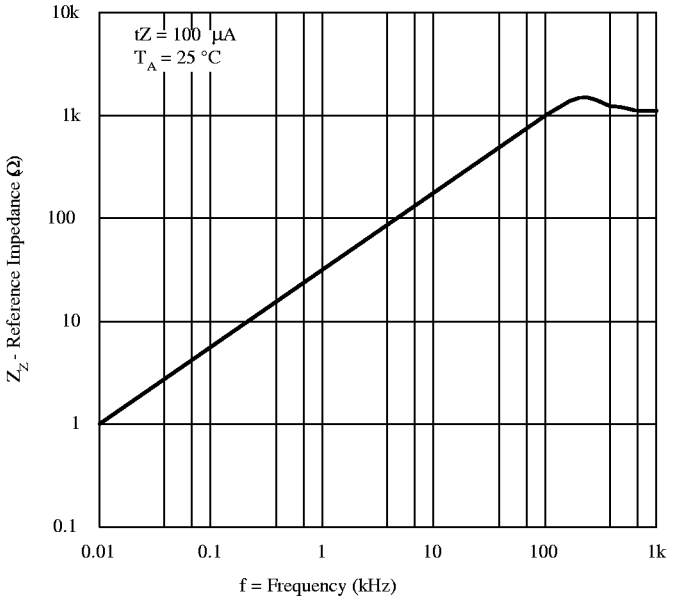


Figure 11

AS1004-2.5V Reverse Dynamic Impedance

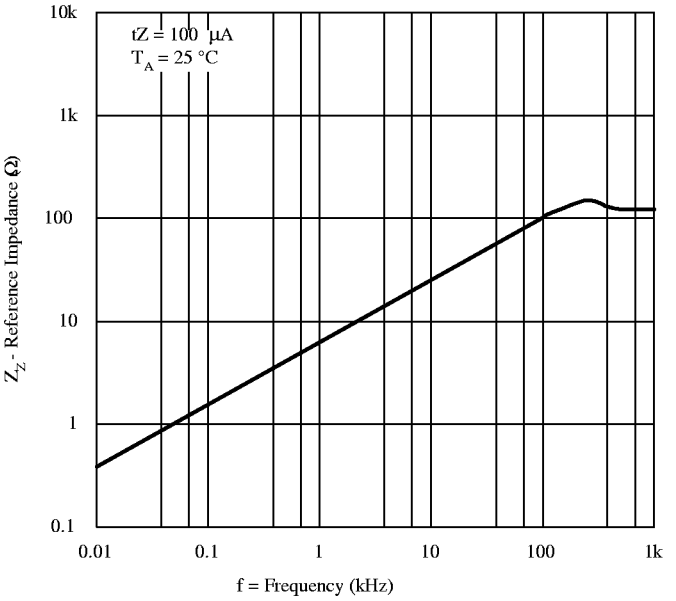


Figure 12

Forward Characteristics

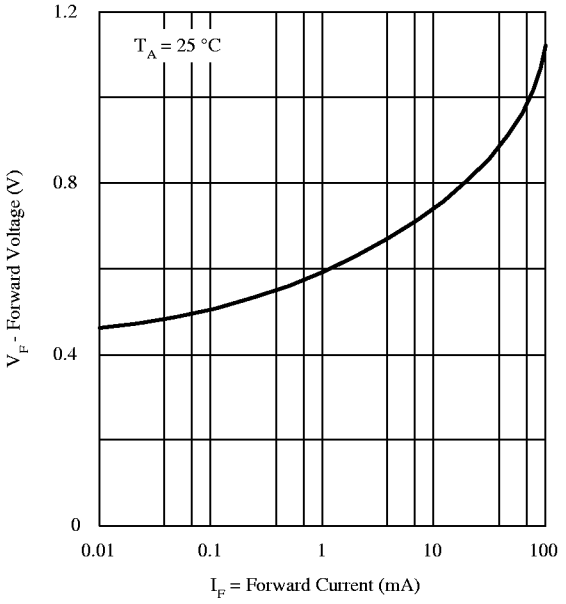


Figure 13

Low Frequency Reverse Dynamic Impedance

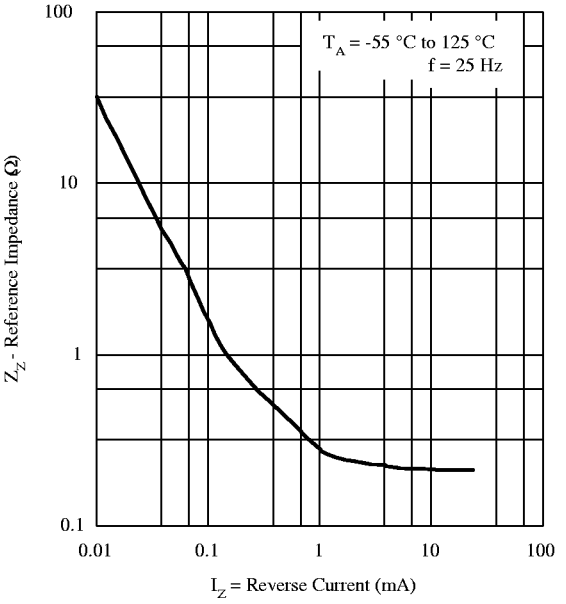


Figure 14

TYPICAL APPLICATIONS

1.235 Reference

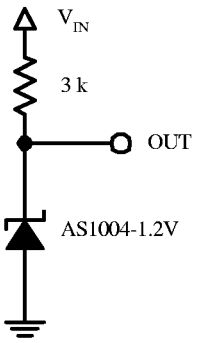


Figure 15

2.5V Reference

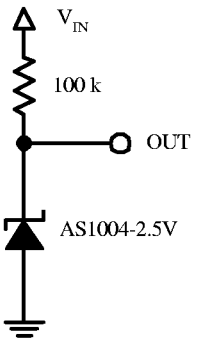


Figure 16

Low Noise Reference

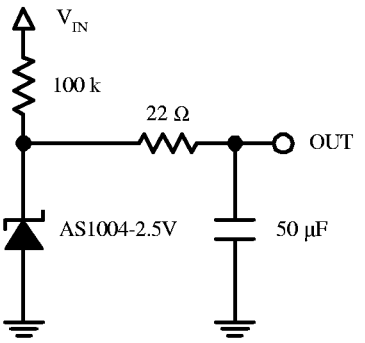


Figure 17

Variable Ourput Regulator

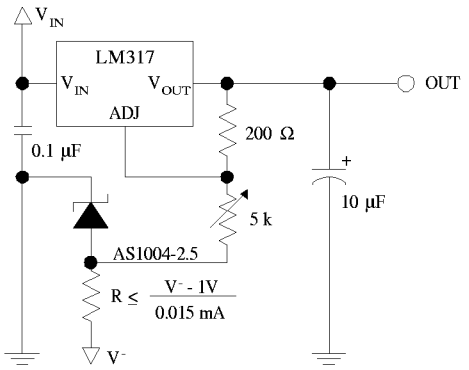


Figure 18

High Stability 5V Regulator

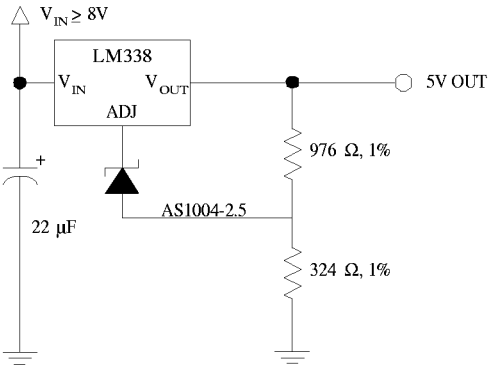


Figure 19

Lead Acid Low Battery Detector

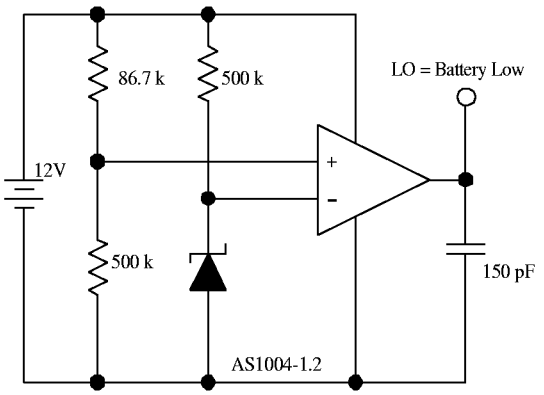


Figure 20

Micropower 10V Reference

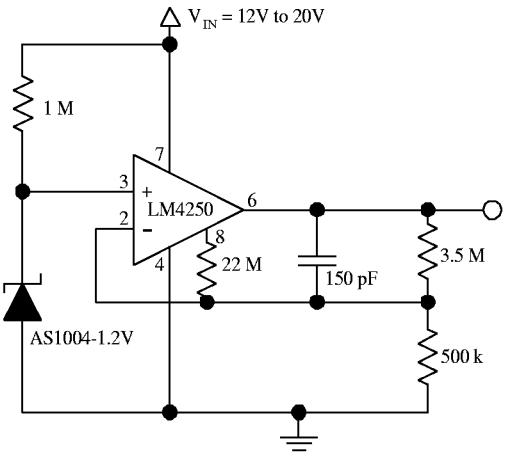


Figure 21