Advanced Monolithic Systems

AMS3100-1.2

MICROPOWER VOLTAGE REFERENCE

FEATURES

- **±6 mV (±0.5%) max. initial tolerance (A grade)**
- **Operating Current 10μA to 20mA**
- **Low Voltage Reference 1.240**
- **Max. 0.5Ω Dynamic Impedance (A grade)**
- **Low Temperature Coefficient**
- **SOT-23 Package Available**
- **Low cost**

APPLICATIONS

- **Battery Powered Systems**
- **Instrumentation**
- **A/D, D/A Converters**
- **Temperature measurement**
- **Current sources**
- **Notebook/Personal Computer**
- **Monitors/ VCR/ TV**
- **Pagers**

GENERAL DESCRIPTION

The AMS3100-1.2 are two-terminal micropower band-gap voltage reference that feature a very low dynamic impedance and good temperature coefficient, operating over a 10μA to 20mA current range. AMS3100-1.2 is trimmed at wafer test level to optimize the temperature coefficient and tight output voltage tolerance. The advanced process technology used, makes the AMS3100-1.2 exceptionally tolerant of capacitive loading, making it easy to use in almost any reference application. The wide dynamic operating range allows its use with widely varying supplies with excellent regulation. The extremely low power drain, makes these reference diodes useful for micropower circuitry. These voltage references can be used to make portable meters, regulators or general purpose analog circuitry with battery life approaching shelf life. Further more, the wide operating current allows it to replace older references with a tight tolerance part. Pin to pin compatible with other standard industry references, the AMS3100-1.2 offers the advantage of long term stability at low cost.

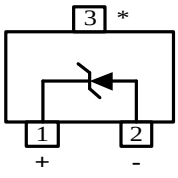
The AMS3100-1.2 is operating over a -40°C to 85°C temperature range and is available in the space saving SOT-23 package.

ORDERING INFORMATION:

TOL.	PACKAGE TYPE	OPERATING TEMPERATURE RANGE
	SOT-23	
±6mV	AMS3100-1.2AM	-40°C to 85°C
±12mV	AMS3100-1.2BM	-40°C to 85°C
±25mV	AMS3100-1.2CM	-40°C to 85°C

PIN CONNECTIONS

3L SOT-23
(M)



*This pin must be left floating or connected to pin 2

Top View

ABSOLUTE MAXIMUM RATINGS (Note 1)

Reverse Current	30mA	Lead Temperature	
Forward Current	10mA	Vapor phase (60 sec)	215°C
Operating Temperature Range	-40°C to 85°C	Infrared (15 sec.)	220°C
Storage temperature	-55°C to +150°C	Thermal Resistance (θ_{JA})	410°C/W

ELECTRICAL CHARACTERISTICS

Electrical Characteristics at I_R = 100 µA, and T_A = +25°C unless otherwise specified.

Parameter	Conditions	AMS3100A-1.2			AMS3100B-1.2			AMS3100C-1.2			Units
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Reverse Breakdown Voltage (Note 3)	I_R - 100 µA	1.229	1.235	1.241	1.223	1.235	1.249	1.210	1.235	1.260	V
Reverse Dynamic Impedance (Note 4)	I_R - 100 µA, f =20Hz		0.2	0.50		0.5			0.5		Ω
Reverse Breakdown Voltage Change with current (Note 3)	10µA ≤I_R ≤1mA 1mA ≤I_R ≤20mA		1.0 5				1.0 5			1.0 5	mV
Min. Operating Current (Note 3)			5	10 **15**		5	10 **15**		5	10 **15**	µA µA
Wide Band Noise (Note 4)	I_R - 100 µA, 10Hz ≤ f ≤ 10kHz		60			60			60		µV
Temperature Coeff. (Note 5)			**25**	**50**		**40**	**100**		**75**		ppm/°C
Long Term Stability (Note 4)	T_A=25°C±.1°C T = 1000 Hr		20			20			20		ppm

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but do not guarantee specific performance limits. For guaranteed specifications and test conditions, see the Electrical Characteristics. The guaranteed specifications apply only for the test conditions listed.

Note 2: Parameters identified with **boldface type** apply at temperature extremes. All other numbers apply at $T_A = T_J$ = 25°C.

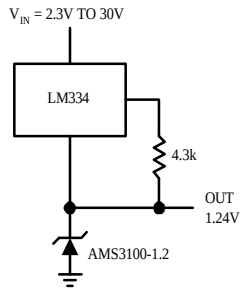
Note 3: Guaranteed and 100% production tested.

Note 4: Guaranteed but not 100% production tested. These limits are not used to calculate average outgoing quality levels.

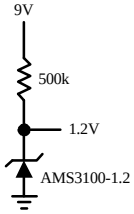
Note 5: The average temperature coefficient is defined as the maximum deviation of reference voltage at all measured temperatures between the operating T_{MAX} and T_{MIN}, divided by T_{MAX} - T_{MIN}. The measured temperatures are 0°C, 25°C, 85°C.

TYPICAL APPLICATIONS

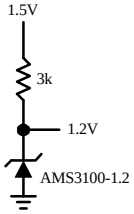
Wide Input Range Reference



Micropower Reference from 9V Battery

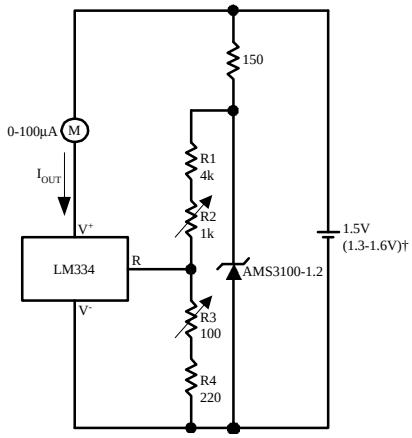


Reference from 1.5V Battery



TYPICAL APPLICATIONS (Continued)

0°C - 100°C Thermometer

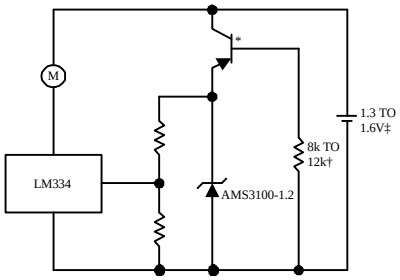


Calibration

1. Short AMS3100-1.2, adjust R3 for I_{OUT} = temp at 1µA/°K
2. Remove short, adjust R2 for correct reading in °C

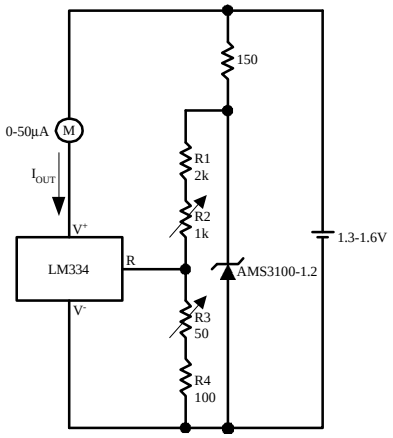
I_Q at 1.3V ≅ 500 µA
I_Q at 1.6V ≅ 2.4mA

Lower Power Thermometer



* 2N3638 or 2N2907 select for inverse $H_{FE} \cong 5$
Select for operation at 1.3V
$I_Q \cong 600\mu A$ to 900 µA

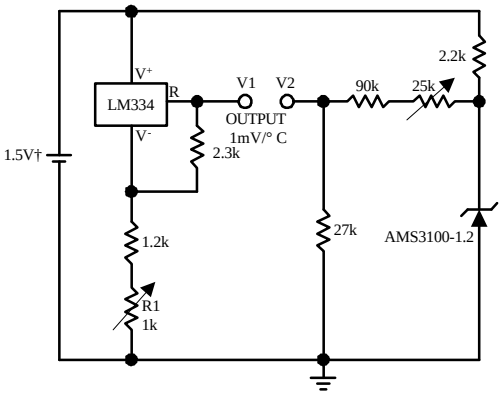
0°C - 100°C Thermometer



Calibration

1. Short AMS3100-1.2, adjust R3 for I_{OUT} = temp at 1.8µA/°K
2. Remove short, adjust R2 for correct reading in °F

Centigrade Thermometer

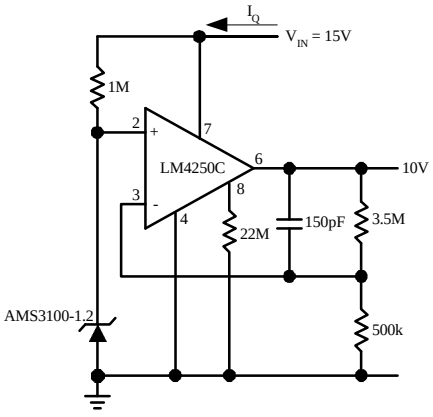


Calibration

1. Adjust R1 so that V1 = temp at 1mV/°K.
2. Adjust V2 to 273.2mV.

I_Q for 1.3V to 1.6V battery voltage = 50µA to 150µA

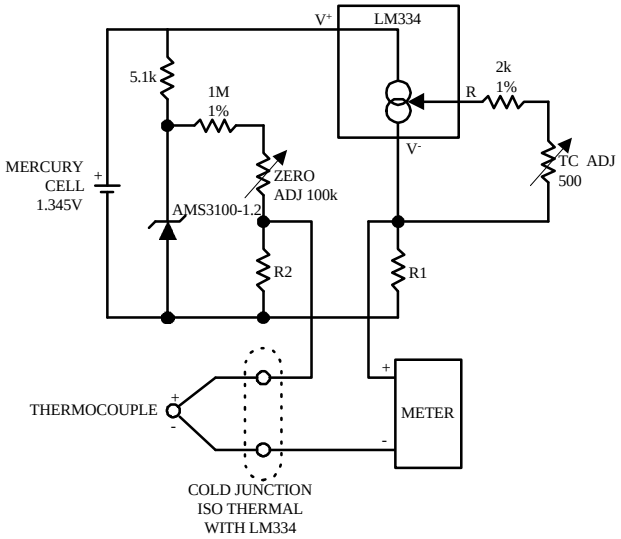
Micropower* 10V Reference



*$I_Q \cong 20\mu A$ standby current

TYPICAL APPLICATIONS (Continued)

Micropower Thermocouple Cold Junction Compensator



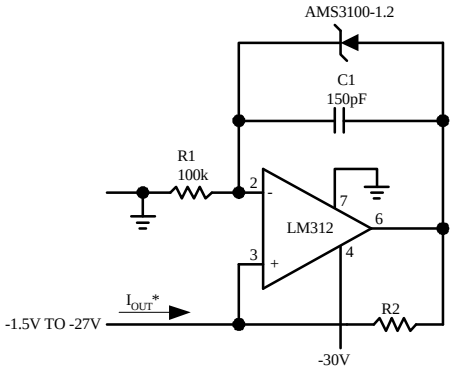
Adjustment Procedure

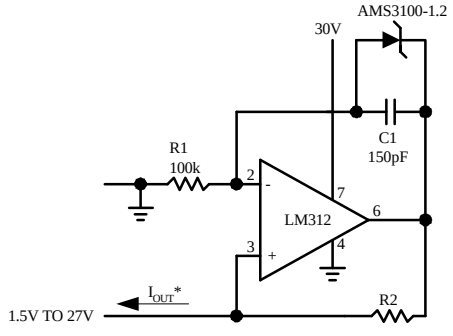
1. Adjust TC ADJ pot until voltage across R1 equals Kelvin temperature multiplied by the thermocouple Seebeck coefficient.
2. Adjust ZERO ADJ pot until voltage across R2 equals the thermocouple Seebeck coefficient multiplied by 273.2.

Thermocouple Type	Seebeck Coefficient (mV/ °C)	R1 (Ω)	R2 (Ω)	Voltage Across R1 @ 25°C (mV)	Voltage Across R2 (mV)
J	52.3	523	1.24k	15.60	14.32
T	42.8	432	1k	12.77	11.78
K	40.8	408	953Ω	12.17	11.17
S	6.4	63.4	150Ω	1.908	1.766

Typical supply current 50µA

Precision 1µA to 1mA Current Sources

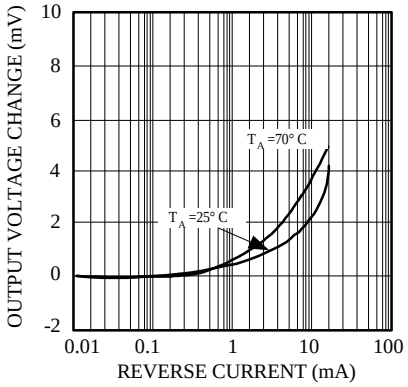




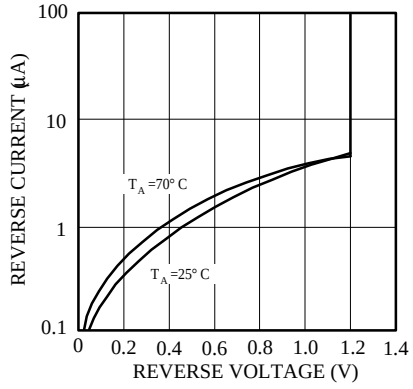
*I_{OUT} =1.23V/R2

TYPICAL PERFORMANCE CHARACTERISTICS

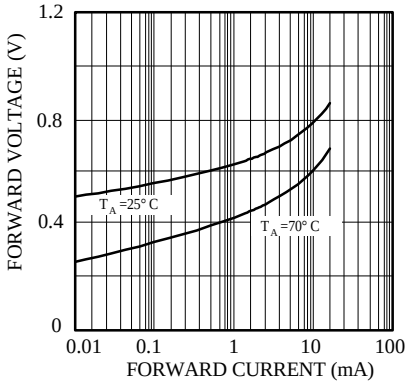
Reverse Characteristics



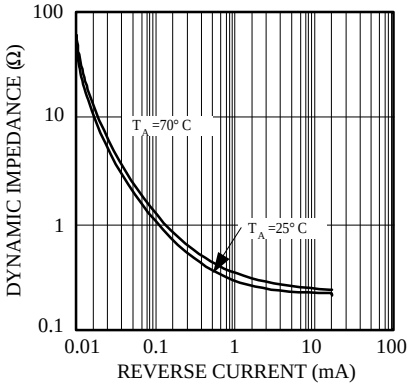
Reverse Characteristics



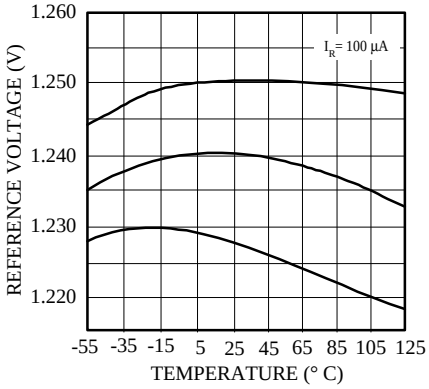
Forward Characteristics



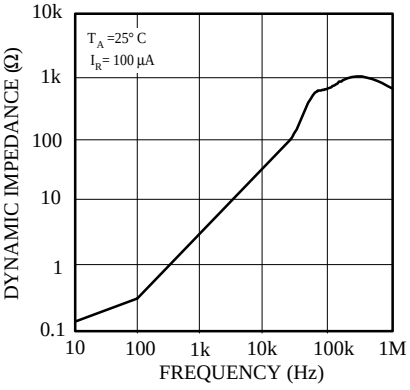
Reverse Dynamic Impedance



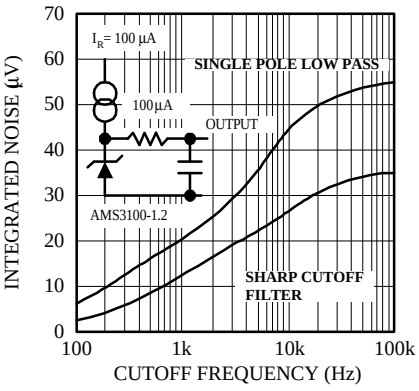
Temperature Drift of 3 Representative Units



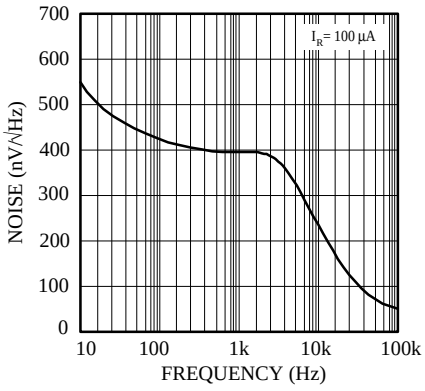
Reverse Dynamic Impedance



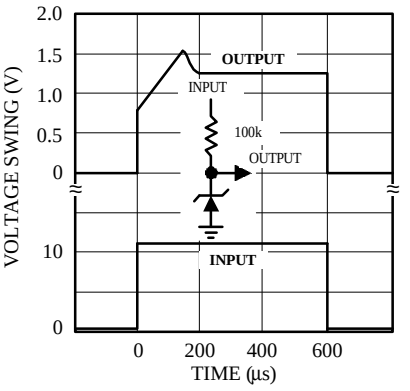
Filtered Output Noise



Noise Voltage



Response Time



PACKAGE DIMENSIONS inches (millimeters) unless otherwise noted.

3 LEAD SOT-23 PLASTIC PACKAGE (M)

