Advanced Monolithic Systems

AMS4040

MICROPOWER SHUNT VOLTAGE REFERENCE

RoHS compliant

FEATURES

- **Tight Output Voltage Tolerance**
- **Low Output Noise**
- **Operating Current 250µA to 100mA**
- **Low Dynamic Impedance**
- **Low Temperature Coefficient**
- **Available in the sub-miniature SOT-23 Package**
- **1.2V Device (AMS4041) also available**

APPLICATIONS

- **Battery Powered Systems**
- **Instrumentation**
- **Energy Management**
- **Automotive**
- **Precision Audio Components**
- **Product Testing**
- **Data Acquisition Systems**

GENERAL DESCRIPTION

The AMS4040 is a two-terminal micropower band-gap voltage reference diode featuring a very low dynamic impedance and good temperature coefficient, operating over a 250µA to 100mA current range. On-chip trimming is used to provide tight voltage tolerance. Since the AMS4040 band-gap reference uses only transistors and resistors, low noise and good long term stability result. The wide dynamic operating range allows its use with widely varying supplies with excellent regulation. The extremely low power drain of the AMS4040 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.

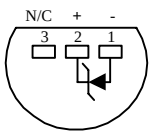
The AMS4040 is operational in the full industrial temperature range of -40°C to +85°and is available in small space saving TO-92, SO-8, SOT-89 and SOT-23 packages.

ORDERING INFORMATION:

TOL.	PACKAGE TYPE				OPERATING TEMP. RANGE
	TO-92	8 LEAD SOIC	SOT-89	3 LEAD SOT-23	
±0.25%	AMS4040AN	AMS4040AS	AMS4040AL	AMS4040AM	-40 to +85° C
±0.5%	AMS4040BN	AMS4040BS	AMS4040BL	AMS4040BM	-40 to +85° C
±1.0%	AMS4040CN	AMS4040CS	AMS4040CL	AMS4040CM	-40 to +85° C

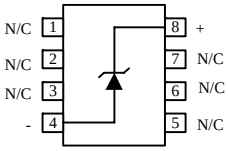
PIN CONNECTIONS

TO-92
Plastic Package (N)



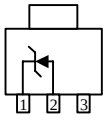
Bottom View

8L SOIC
SO Package (S)



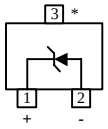
Top View

SOT-89
(L)



Top View

3L SOT-23
(M)



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

Top View

ABSOLUTE MAXIMUM RATINGS (Note 1)

Reverse Current	100mA
Forward Current	10mA
Storage temperature	-65°C to +150°C
Lead Temperature (25 sec)	265°C

Internal Power Dissipation (P_D)	
TO-92 Package	0.78W
SO-8 Package	0.71W
SOT-89 Package	0.91W
SOT-23 Package	0.28W
Thermal Resistance (θ_{JA})	
TO-92 Package	160°C/W
SO-8 Package	175°C/W
SOT-89 Package	110°C/W
SOT-23 Package	410°C/W

Note1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. For guaranteed specifications and test conditions, see the Electrical Characteristics. The guaranteed specifications apply only for the test conditions listed.

ELECTRICAL CHARACTERISTICS

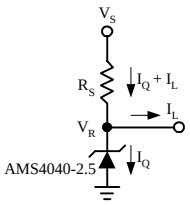
Electrical Characteristics at I_R =100 μA and T_A = +25°C unless otherwise specified.

Parameter	Conditions	AMS4040A			AMS4040B			AMS4040C			Units
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Reverse Breakdown Voltage		2.494	2.500	2.506	2.488	2.500	2.512	2.475	2.500	2.525	V
Deviation of Reverse Breakdown Voltage over Temperature	T_A = Full Range		8.0	17		8.0	17		8.0	25	mV
Reverse Breakdown Voltage Change with Operating Current Change	$I_{RMIN} \le I_R \le$ 1mA		0.3	0.8 **1.0**		0.3	0.8 **1.0**		0.3	0.8 **1.0**	mV
	1mA $\le I_R \le$ 15mA		2.5	6.0 **8.0**		2.5	6.0 **8.0**		2.5	6.0 **8.0**	mV
Reverse Breakdown Voltage Long Term Stability	T_A=25°C±.1°C T = 1000 Hr		120			120			120		ppm
Wide Band Noise	10HZ $\le$ f $\le$ 10kHz		35			35			35		μV_{rms}
Reverse Dynamic Impedance	I_R = 1mA, f = 120Hz, $I_{AC} = 0.1I_R$		0.25	0.5		0.25	0.5		0.25	0.5	Ω
Minimum Operating Current			80	2500		80	250		80	250	μA

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

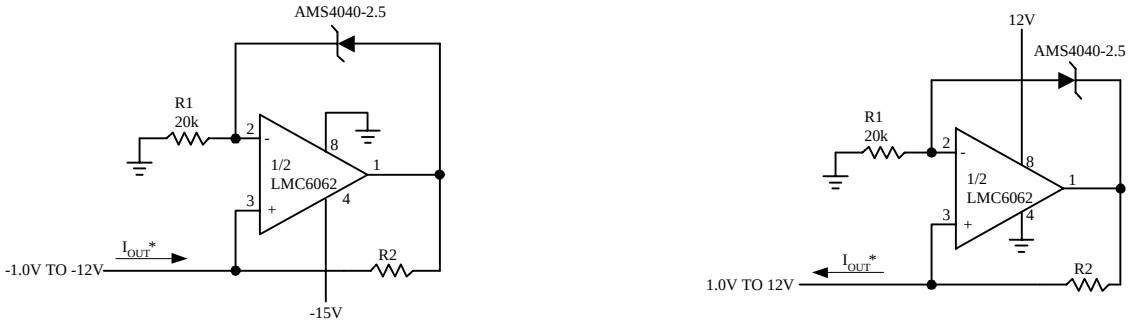
TYPICAL APPLICATIONS

Shunt Regulator



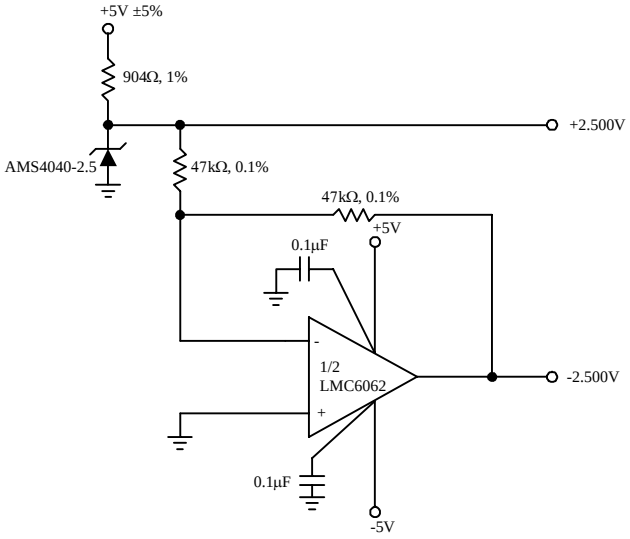
TYPICAL APPLICATIONS

Precision 1µA to 1mA Current Sources

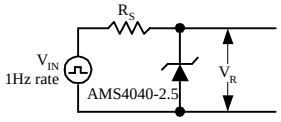


I_{OUT}=2.5V/R2

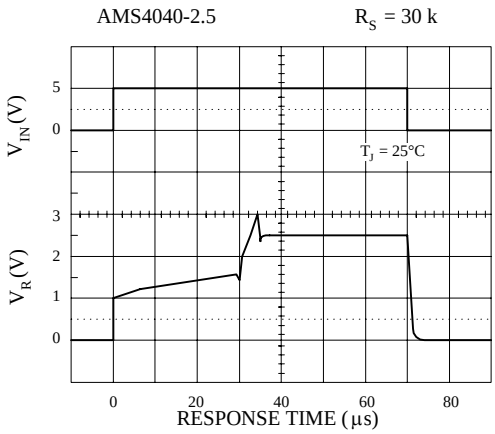
Precision ± 2.500V Reference



START-UP CHARACTERISTICS

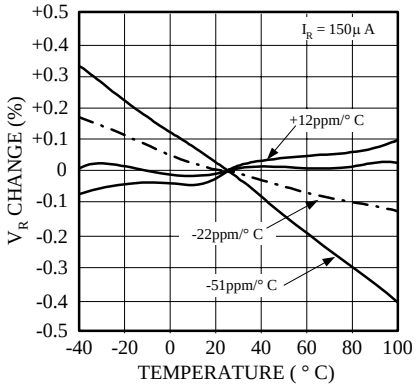


Test Circuit

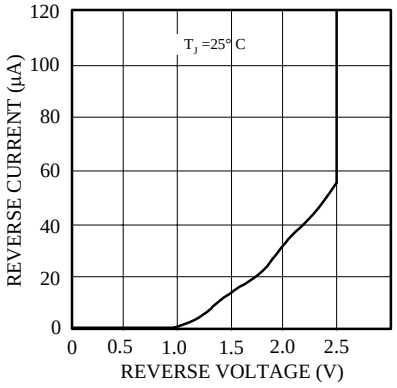


TYPICAL PERFORMANCE CHARACTERISTICS

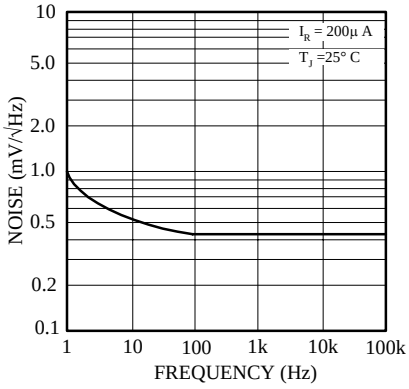
Temperature Drift for Different Average Temperature Coefficient



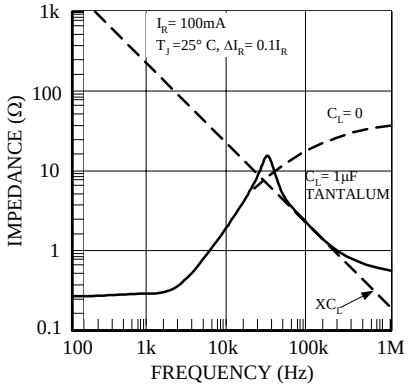
Reverse Characteristics and Minimum Operating Current



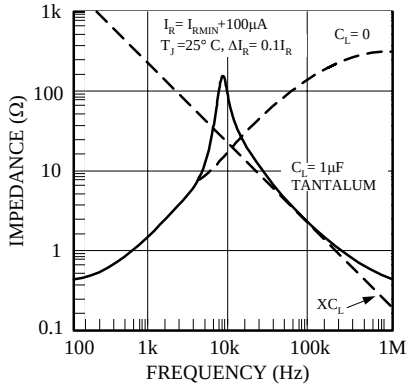
Noise Voltage vs Frequency



Ouput Impedance vs Frequency

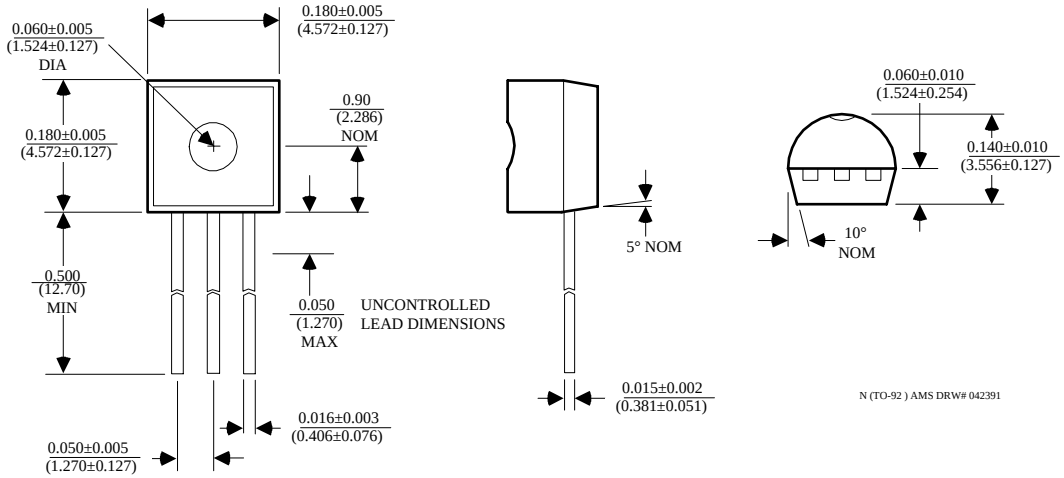


Ouput Impedance vs Frequency

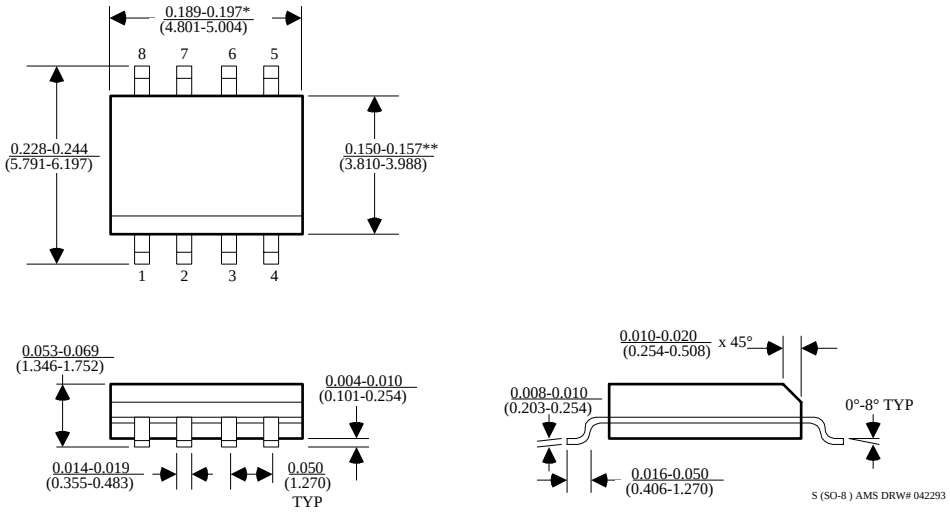


PACKAGE DIMENSIONS inches (millimeters) unless otherwise noted.

3 LEAD TO-92 PLASTIC PACKAGE (N)



8 LEAD SOIC PLASTIC PACKAGE (S)

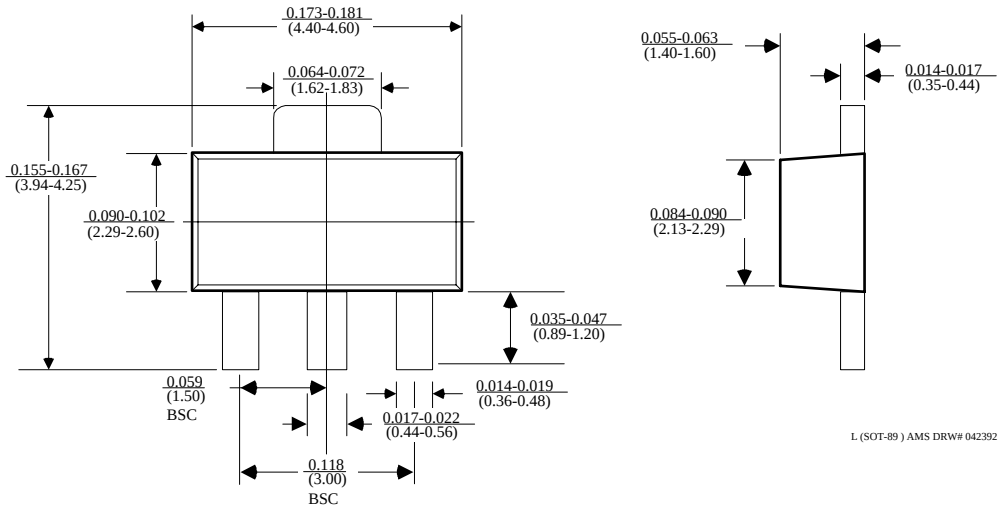


*DIMENSION DOES NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.006" (0.152mm) PER SIDE

**DIMENSION DOES NOT INCLUDE INTERLEAD FLASH. INTERLEAD FLASH SHALL NOT EXCEED 0.010" (0.254mm) PER SIDE

PACKAGE DIMENSIONS inches (millimeters) unless otherwise noted (Continued).

SOT-89 PLASTIC PACKAGE (L)



3 LEAD SOT-23 PLASTIC PACKAGE (M)