FEATURES

• Tight Output Voltage Tolerance
• Low Output Noise
• Operating Current 60µA to 100mA
• Low Dynamic Impedance
• Low Temperature Coefficient
• Available in the sub-miniature SOT-23 Package
• 2.5V Device (AMS4040) also available

APPLICATIONS

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

GENERAL DESCRIPTION

The AMS4041 is a two-terminal micropower band-gap voltage reference diode featuring a very low dynamic impedance and good temperature coefficient, operating over a 60µA to 100mA current range. On-chip trimming is used to provide tight voltage tolerance. Since the AMS4041 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 AMS4041 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 AMS4041 is operational in the full industrial temperature range of -40°C to 85°C and is available in small space saving TO-92, SO-8, SOT-89 and SOT-23 packages.

ORDERING INFORMATION:

<table>
<thead>
<tr>
<th>TOL.</th>
<th>PACKAGE TYPE</th>
<th>OPERATING TEMP. RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TO-92 8 LEAD SOIC SOT-89 3 LEAD SOT-23</td>
<td></td>
</tr>
<tr>
<td>±0.25%</td>
<td>AMS4041AN AMS4041AS AMS4041AL AMS4041AM</td>
<td>-40 to +85°C</td>
</tr>
<tr>
<td>±0.5%</td>
<td>AMS4041BN AMS4041BS AMS4041BL AMS4041BM</td>
<td>-40 to +85°C</td>
</tr>
<tr>
<td>±1.0%</td>
<td>AMS4041CN AMS4041CS AMS4041CL AMS4041CM</td>
<td>-40 to +85°C</td>
</tr>
</tbody>
</table>

PIN CONNECTIONS

TO-92
Plastic Package (N)

8L SOIC
SO Package (S)

SOT-89
(L)

3L SOT-23
(M)

*This pin must be left floating or connected to pin 2.
ABSOLUTE MAXIMUM RATINGS (Note 1)

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

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 IR=100 µA and T_A = +25°C unless otherwise specified.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Conditions</th>
<th>AMS4041A</th>
<th>AMS4041B</th>
<th>AMS4041C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reverse Breakdown Voltage</td>
<td>1.222 1.225 1.228</td>
<td>1.219 1.225 1.231</td>
<td>1.213 1.225 1.237</td>
<td></td>
</tr>
<tr>
<td>Deviation of Reverse Breakdown Voltage over Temperature</td>
<td>TA = Full Range</td>
<td>8.0 17</td>
<td>8.0 17</td>
<td>8.0 25 mV</td>
</tr>
<tr>
<td>Reverse Breakdown Voltage Change with Operating Current Change</td>
<td>I_MIN ≤ I_k ≤ 1mA</td>
<td>0.7 1.5 2.0</td>
<td>0.7 1.5 2.0</td>
<td>0.7 2.0 2.5 mV</td>
</tr>
<tr>
<td></td>
<td>I_MIN ≤ 1mA ≤ 15mA</td>
<td>4.0 6.0 8.0</td>
<td>2.5 6.0 8.0</td>
<td>2.5 8.0 10.0 mV</td>
</tr>
<tr>
<td>Reverse Breakdown Voltage Long Term Stability</td>
<td>T_A=25°C±1°C, T = 1000 Hr</td>
<td>120</td>
<td>120</td>
<td>120 ppm</td>
</tr>
<tr>
<td>Wide Band Noise</td>
<td>10HZ ≤ f ≤ 10kHz</td>
<td>20</td>
<td>20</td>
<td>20 µVrms</td>
</tr>
<tr>
<td>Reverse Dynamic Impedance</td>
<td>I_k=1mA, f = 120Hz,</td>
<td>0.5 1.5</td>
<td>0.5 1.5</td>
<td>0.5 2.0 Ω</td>
</tr>
<tr>
<td>Minimum Operating Current</td>
<td>60 80 100</td>
<td>60 80 100</td>
<td>60 80 100 µA</td>
<td></td>
</tr>
</tbody>
</table>

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

TYPICAL APPLICATIONS

Shunt Regulator

Advanced Monolithic Systems, Inc.  www.advanced-monolithic.com  Phone (925) 443-0722  Fax (925) 443-0723
TYPICAL APPLICATIONS

Precision 1μA to 1mA Current Sources

\[ I_{\text{OUT}} = \frac{1.2V}{R2} \]

Programmable Current Source

\[ I_{\text{OUT}} = 1.2V/123\Omega(1/\text{gain set #}) \]
START-UP CHARACTERISTICS

Test circuit

AMS4041

R = 30 k

RESPONSE TIME (µs)

0 20 40 60 80

AMS4041

V_R (V)

0 1 2 3 4 5

V_R (V)

TJ = 25°C

RESPONSE TIME (µs)

0 20 40 60 80

TYPICAL PERFORMANCE CHARACTERISTICS

Temperature Drift for Different Average Temperature Coefficient

Reverse Characteristics and Minimum Operating Current

Noise Voltage vs Frequency

Output Impedance vs Frequency

Output 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 0.060" (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)**

![Diagram of SOT-89 PLASTIC PACKAGE (L)]

**3 LEAD SOT-23 PLASTIC PACKAGE (M)**

![Diagram of 3 LEAD SOT-23 PLASTIC PACKAGE (M)]