This user's guide describes the characteristics, operation, and use of the AMC1100EVM. This evaluation module (EVM) is an evaluation and development kit for evaluating the AMC1100, a precision isolation amplifier. A complete circuit description as well as schematic diagram and bill of materials are included.

The following related documents are available through the Texas Instruments web site at www.ti.com.

Table 1. Related Documentation

<table>
<thead>
<tr>
<th>Device</th>
<th>Literature Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMC1100</td>
<td>SBAS562</td>
</tr>
<tr>
<td>SN6501</td>
<td>SLLSEA0</td>
</tr>
</tbody>
</table>

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1 EVM Overview

1.1 Features

AMC1100EVM:

- Full-featured evaluation board for the AMC1100 single-channel precision isolation amplifier
- Screw terminals for easy access to analog inputs and outputs
- Two package options included:
  - AMC1100DUB
  - AMC1100DWV
- Optional isolated power to VDD1 from VDD2

1.2 Introduction

The AMC1100 is a precision isolation amplifier with an output separated from the input circuitry by a silicon dioxide (SiO$_2$) barrier that is highly resistant to magnetic interference. This barrier has been certified to provide basic galvanic isolation of up to 4000 V$_{PEAK}$ according to UL1577 and IEC60747-5-2 specifications.

For use in high-resolution measurement applications, the input of the AMC1100 is optimized for direct connection to shunt resistors or other low-level signal sources.

Throughout this document, the abbreviation EVM and the term evaluation module are synonymous with the AMC1100EVM.

2 Analog Interface

There are two AMC1100 devices installed on the EVM. Both analog inputs to the AMC1100 are routed from the two-wire screw terminals at J2 and J5. These screw terminals give the user access to the inverting and noninverting inputs of the AMC1100 devices installed at U1 and U2.

2.1 Analog Inputs

The analog input to the AMC1100EVM printed circuit board (PCB) consists of simple RC filter circuits. Connectors J2 and J5 have identical configurations. An example input circuit for the AMC1100 is shown in Figure 1.

![Figure 1. AMC1100EVM Schematic: Analog Input Section](image-url)
2.2 Analog Output

The analog output from the AMC1100EVM board is a fully-differential signal centered at VDD2 / 2. The output is available on the two screw terminals of J4 and J6. The portion for J4 is shown in Figure 2.

![Figure 2. AMC1100EVM Schematic: Analog Output Section](image)

3 Power Supplies

The AMC1100 requires two separate power rails, VDD1 and VDD2. VDD1 is on the high voltage side of the amplifier. VDD2 is on the user side of the amplifier.

3.1 VDD1 Input

J1 provides access to the to the VDD1 supply. For power provided from high-side isolated rails, such as from a gate drive supply, move the shunt on jumper JP1 to cover pins 1 and 2. Use a voltage between 4.5 VDC and 5.5 VDC for the user-applied VDD1 supply. In the EVM default configuration, VDD1 is provided from VDD2 by means of an isolation transformer and the SN6501 transformer driver. In the default configuration, apply 5 V to VDD2 through J3. The input power is shown in Figure 3.

![Figure 3. VDD1 Input](image)
3.2 VDD2 Input

The user side of the AMC1100 isolation amplifier is rated for 2.7 V\text{DC} to 5.5 V\text{DC} and is applied to the amplifier using J3. Figure 4 shows the power input for VDD2.

![VDD2 Input Connector](image)

Figure 4. VDD2 Input Connector

4 EVM Operation

This section describes the general operation of the AMC1100EVM.

4.1 Isolated Power and Analog Inputs: J1, J2, and J5

The isolated power input to the AMC1100EVM PCB can be applied directly to J1, pins 1 and 2. Table 2 lists the details of J1.

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1.1</td>
<td>GND1</td>
<td>Connection to the AMC1100 GND1 terminal (pin 4)</td>
</tr>
<tr>
<td>J1.2</td>
<td>VDD1</td>
<td>Connection to the AMC1100 VDD1 terminal (pin 1)</td>
</tr>
</tbody>
</table>

The analog input to the AMC1100EVM board can be applied directly to J2 and J5.

**CAUTION**

Carefully review the AMC1100 product data sheet for the limitations of the analog input range, and ensure that the appropriate analog/digital voltages are applied before connecting any analog input to the EVM.

Table 3 summarizes the details of J2 and J5.

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2.2 and J5.2</td>
<td>IN–</td>
<td>Inverting analog input to the AMC1100 (pin 3)</td>
</tr>
<tr>
<td>J2.1 and J5.1</td>
<td>IN+</td>
<td>Noninverting input to the AMC1100 (pin 2)</td>
</tr>
</tbody>
</table>
4.2 **User Power and Analog Outputs: J3, J4, and J6**

The VDD2 power input to the AMC1100EVM PCB can be applied directly to J3, pins 1 and 2. 

Table 4 lists the details of J3.

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J3.2</td>
<td>VDD2</td>
<td>Connection to the AMC1100 VDD2 terminal (pin 8)</td>
</tr>
<tr>
<td>J3.1</td>
<td>GND2</td>
<td>Connection to the AMC1100 GND2 terminal (pin 5)</td>
</tr>
</tbody>
</table>

The analog output from the AMC1100EVM board is connected directly to J4 and J6, pins 1 and 2. 

Table 5 summarizes the details of J4 and J6.

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J4.2 and J6.2</td>
<td>VOUT+</td>
<td>Noninverting analog output from the AMC1100 (pin 7)</td>
</tr>
<tr>
<td>J4.1 and J6.1</td>
<td>VOUT–</td>
<td>Inverting output from the AMC1100 (pin 6)</td>
</tr>
</tbody>
</table>

4.3 **Device Operation**

When the VDD1 and VDD2 power is applied to the AMC1100EVM, the analog output is available with a fixed gain of 8 and a dc offset equal to VDD2 / 2.

An analog input signal can be applied directly at screw terminals J2 and J5. Refer to Figure 1 and Table 3 for details. The differential analog input range, (VIN+) – (VIN–), is specified at ±250 mV with a maximum of ±320 mV before clipping occurs.

The analog output has a nominal gain of 8 through the AMC1100 isolation amplifier. With an input voltage of ±250 mV, the nominal output is therefore ±2.0 V. The output voltage is centered on VDD / 2 and provides a convenient analog input range to the embedded analog-to-digital converters (ADCs) of the MSP430 and TMS320C2000 series of digital processors.
5 BOM, Schematic, and Layout

A full-size schematic for the AMC1100EVM board is appended to this user's guide. The bill of materials is provided in Section 5.1. Figure 5 shows the AMC1100 PCB layout.

NOTE: Board layout is not to scale. Figures are intended to show how the board is laid out; they are not intended to be used for manufacturing AMC1100EVM PCBs.

Figure 5. AMC1100 Silkscreen Drawing
### 5.1 Bill of Material

**NOTE:** All components should be RoHS compliant. Some part numbers may be either leaded or RoHS. Verify that purchased components are RoHS compliant.

#### Table 6. AMC1100EVM Bill of Materials

<table>
<thead>
<tr>
<th>Item</th>
<th>Qty</th>
<th>Ref Des</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Part Number</th>
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</thead>
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<td>PCB</td>
<td>Printed Circuit Board</td>
<td>Any</td>
<td>6541046</td>
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<tr>
<td>2</td>
<td>5</td>
<td>C1, C6, C10, C12, C15</td>
<td>CAP, CERM, 0.1uF, 25V, +/-10%, X7R, 0603</td>
<td>TDK</td>
<td>C1608X7R1E104K</td>
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<tr>
<td>3</td>
<td>1</td>
<td>C2</td>
<td>CAP, CERM, 10uF, 10V, +/-10%, X5R, 0805</td>
<td>Murata</td>
<td>GRM219R61A106KE44D</td>
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<tr>
<td>4</td>
<td>2</td>
<td>C3, C8</td>
<td>CAP, CERM, 330pF, 50V, +/-5%, C0G/NP0, 0603</td>
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<td>C1608C0G1H31J</td>
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<tr>
<td>5</td>
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<td>C4, C5, C9, C11</td>
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<td>6</td>
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<tr>
<td>9</td>
<td>2</td>
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<td>Diode, Schottky, 20V, 0.5A, SOD-123</td>
<td>ON Semiconductor</td>
<td>MBR0520LT1G</td>
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<tr>
<td>10</td>
<td>6</td>
<td>J1, J2, J3, J4, J5, J6</td>
<td>Terminal Block, 6A, 3.5mm Pitch, 2-Pos, TH</td>
<td>On-Shore Technology</td>
<td>ED555/2DS</td>
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<td>11</td>
<td>1</td>
<td>JP1</td>
<td>3x1 2mm male header</td>
<td>Samtec</td>
<td>TMM-103-01-T-S</td>
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<tr>
<td>12</td>
<td>4</td>
<td>R1, R2, R3, R4</td>
<td>RES, 12.0 ohm, 1%, 0.1W, 0603</td>
<td>Yageo America</td>
<td>RC0603FR-0712RL</td>
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<td>13</td>
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<td>Isolation Transformer</td>
<td>Coilcraft</td>
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<td>14</td>
<td>1</td>
<td>U1</td>
<td>AMC1100DUB</td>
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<td>15</td>
<td>1</td>
<td>U2</td>
<td>AMC1100DWV</td>
<td>TI</td>
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<td>Samtec</td>
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Revision History

Changes from Original (February 2012) to A Revision

- Added SN6501 device to Table 1 ................................................................. 1
- Added last two bullets to Section 1.1 ....................................................... 2
- Changed Section 2 section ................................................................... 2
- Changed Section 3.1 section ................................................................. 3
- Changed Figure 4 .................................................................................. 4
- Added J5 to Section 4.1 section ............................................................. 4
- Added J6 to Section 4.2 section ............................................................. 5
- Changed Section 4.3 section ................................................................. 5
- Changed Figure 5 .................................................................................. 6
- Changed BOM (Table 6) ...................................................................... 7
- Changed schematic ............................................................................... 7

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.
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1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.

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2.1 These terms and conditions do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.

2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for any defects that are caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI. Moreover, TI shall not be liable for any defects that result from User's design, specifications or instructions for such EVMs. Testing and other quality control techniques are used to the extent TI deems necessary or as mandated by government requirements. TI does not test all parameters of each EVM.

2.3 If any EVM fails to conform to the warranty set forth above, TI's sole liability shall be at its option to repair or replace such EVM, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

3. **Regulatory Notices:**

3.1 United States

3.1.1 Notice applicable to EVMs not FCC-Approved:

This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

3.1.2 For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:

**CAUTION**

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

**FCC Interference Statement for Class A EVM devices**

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
FCC Interference Statement for Class B EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

3.2 Canada

3.2.1 For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

3.3 Japan

3.3.1 Notice for EVMs delivered in Japan: Please see http://www.tij.co.jp/sds/ti_ ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。
http://www.tij.co.jp/sds/ti_ ja/general/eStore/notice_01.page

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If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required by Radio Law of Japan to follow the instructions below with respect to EVMs:

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,

2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or

3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.
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西新宿三井ビル

3.3.3 Notice for EVMs for Power Line Communication: Please see http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_02.page

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4 EVM Use Restrictions and Warnings:

4.1 EVMs ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.

4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

4.3 Safety-Related Warnings and Restrictions:

4.3.1 User shall operate the EVM within TI’s recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.

4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User’s handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

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