

## **AMC1200EVM**

This user's guide describes the characteristics, operation, and use of the AMC1200EVM. This evaluation module (EVM) is an evaluation and development kit for evaluating the [AMC1200](#), 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](http://www.ti.com).

**Table 1. Related Documentation**

Device	Literature Number
<a href="#">AMC1200</a>	<a href="#">SBAS542</a>
<a href="#">SN6501</a>	<a href="#">SLLSEA0</a>

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## 1 EVM Overview

### 1.1 Features

- Full-featured evaluation board for the AMC1200 single-channel precision isolation amplifier
- Screw terminals for easy access to analog inputs and outputs
- Two package options included:
  - AMC1200BDUB
  - AMC1200BDWV
- Optional isolated power to VDD1 from VDD2

### 1.2 Introduction

The AMC1200 is a precision isolation amplifier with an output separated from the input circuitry by a silicon dioxide ( $\text{SiO}_2$ ) barrier that is highly resistant to magnetic interference. This barrier has been certified to provide basic galvanic isolation of up to  $4000 V_{\text{PEAK}}$  according to UL1577 and IEC60747-5-2 specifications.

For use in high-resolution measurement applications, the input of the AMC1200 is optimized for direct connection to shunt resistors or other low-level signal sources.

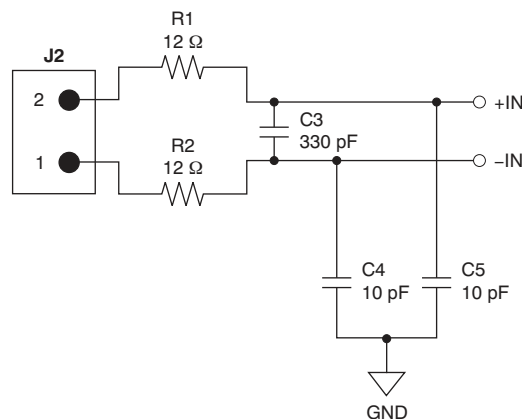
Throughout this document, the abbreviation *EVM* and the term *evaluation module* are synonymous with the AMC1200EVM.

## 2 Analog Interface

There are two AMC1200 devices installed on the EVM. Both of the analog inputs to the AMC1200 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 AMC1200 devices installed at U1 and U2.

### 2.1 Analog Inputs

The analog inputs to the AMC1200EVM printed circuit board (PCB) consists of simple RC filter circuits. Connectors J2 and J4 have identical configurations. An example input circuit for the AMC1200 is shown in Figure 1.



**Figure 1. AMC1200EVM Schematic: Analog Input Section**

## 2.2 Analog Outputs

The analog outputs from the AMC1200EVM board are fully-differential signals centered at  $VDD2 / 2$ . The outputs are available on the two screw terminals of J4, as Figure 2 shows.

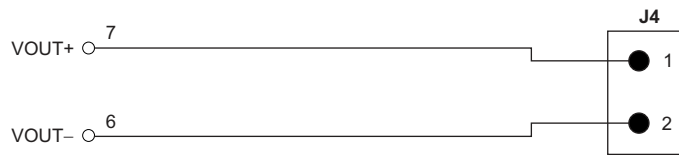


Figure 2. AMC1200EVM Schematic: Analog Output Section

## 3 Power Supplies

The AMC1200 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 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.

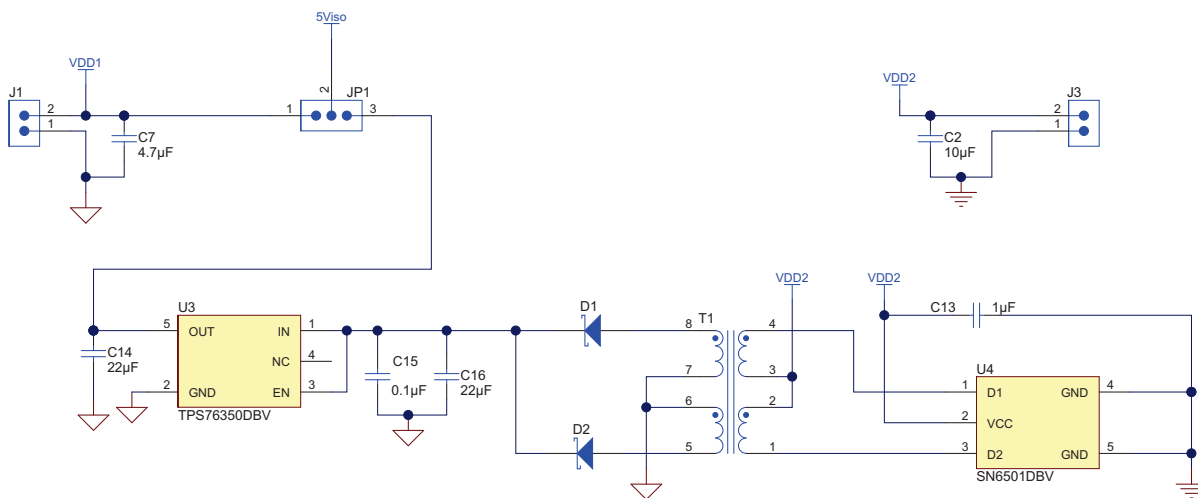


Figure 3. VDD1 Input

### 3.2 VDD2 Input

The user side of the AMC1200 isolation amplifier is rated for 2.7  $V_{DC}$  to 5.5  $V_{DC}$  and is applied to the amplifier using J3. Figure 4 illustrates the power input for VDD2.

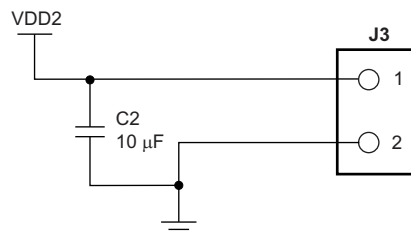


Figure 4. VDD2 Input Connector

## 4 EVM Operation

This section describes the general operation of the AMC1200EVM.

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

The isolated power input to the AMC1200EVM PCB can be applied directly to J1, pins 1 and 2. [Table 2](#) lists the details of J1.

**Table 2. J1: Isolated Power**

Pin Number	Signal	Description
J1.1	GND1	Connection to the AMC1200 GND1 terminal (pin 4)
J1.2	VDD1	Connection to the AMC1200 VDD1 terminal (pin 1)

The analog input to the AMC1200EVM board can be applied directly to J2 pins 1 and 2.

#### CAUTION

Carefully review the [AMC1200 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 3. J2 and J5: Analog Inputs**

Pin Number	Signal	Description
J2.1 and J5.1	IN+	Inverting input to the AMC1200 (pin 2)
J2.2 and J5.2	IN–	Noninverting analog input to the AMC1200 (pin 3)

### 4.2 User Power and Analog Outputs: J3, J4, and J6

The VDD2 power input to the AMC1200EVM PCB can be applied directly to J3, pins 1 and 2. [Table 4](#) lists the details of J3.

**Table 4. J3: VDD2 Power**

Pin Number	Signal	Description
J3.1	GND2	Connection to the AMC1200 GND2 terminal (pin 5)
J3.2	VDD2	Connection to the AMC1200 VDD2 terminal (pin 8)

The analog output from the AMC1200EVM board is applied directly to J4, pins 1 and 2. [Table 5](#) summarizes the details of J4.

**Table 5. J4 and J6: Analog Outputs**

Pin Number	Signal	Description
J4.1 and J6.1	VOUT+	Noninverting analog output from the AMC1200 (pin 7)
J4.2 and J6.2	VOUT–	Inverting output from the AMC1200 (pin 6)

### 4.3 Device Operation

After the VDD1 and VDD2 power is applied to the AMC1200EVM, the analog outputs are available with a fixed gain of 8 and a dc offset equal to  $VDD2 / 2$ .

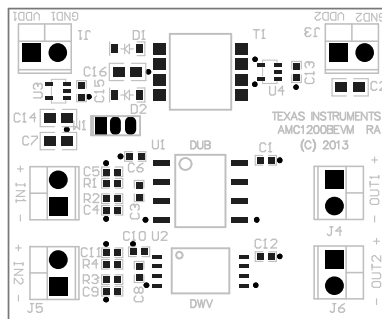
An analog input signal may be applied directly at screw terminal J2 or J5. Refer to [Figure 1](#) and [Table 3](#) for details. The differential analog input range,  $(V_{IN+}) - (V_{IN-})$ , is specified at  $\pm 250$  mV with a maximum of  $\pm 320$  mV before clipping occurs.

The analog outputs have a nominal gain of 8 through the AMC1200 isolation amplifiers. With an input voltage of  $\pm 250$  mV, the nominal output is therefore  $\pm 2.0$  V. The output voltage is centered on  $V_{DD} / 2$  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 AMC1200EVM board is appended to the end of this user's guide. The bills of material is provided in [Section 5.1](#). [Figure 5](#) shows the AMC1200 PCB layout.

**NOTE:** Board layouts are not to scale. These figures are intended to show how the board is laid out; they are not intended to be used for manufacturing AMC1200EVM PCBs.



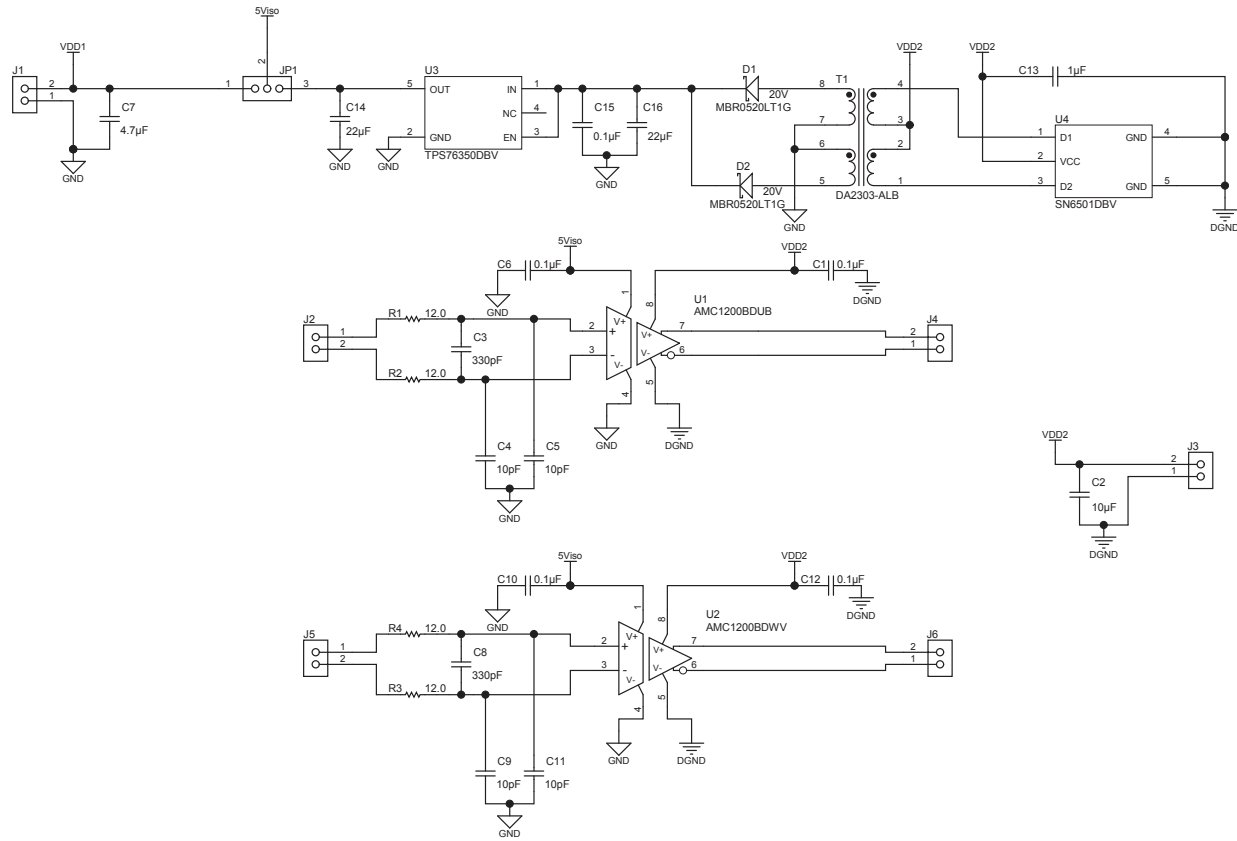
**Figure 5. AMC1200 Silkscreen Drawing**

## 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. AMC1200EVM Bill of Materials**

Item	Qty	Ref Des	Description	Manufacturer	Part Number
1	3	C1, C10, C12	CAP, CERM, 0.1uF, 25V, +/-10%, X7R, 0603	TDK	C1608X7R1E104K
2	1	C2	CAP, CERM, 10uF, 10V, +/-10%, X5R, 0805	Murata	GRM219R61A106KE44D
3	2	C3, C8	CAP, CERM, 330pF, 50V, +/-5%, C0G/NP0, 0603	TDK	C1608C0G1H331J
4	4	C4, C5, C9, C11	CAP, CERM, 10pF, 50V, +/-5%, C0G/NP0, 0603	AVX	06035A100JAT2A
5	2	C6, C15	CAP, CERM, 0.1uF, 25V, +/-10%, X7R, 0603	AVX	06033C104KAT2A
6	1	C7	CAP, CERM, 4.7uF, 50V, +/-10%, X5R, 0805	TDK	C2012X5R1H475K125AB
7	1	C13	CAP, CERM, 1uF, 16V, +/-10%, X5R, 0603	TDK	C1608X5R1C105K
8	2	C14, C16	CAP, CERM, 22uF, 6.3V, +/-20%, X5R, 0805	Taiyo Yuden	JMK212BJ226MG-T
9	2	D1, D2	Diode, Schottky, 20V, 0.5A, SOD-123	ON Semiconductor	MBR0520LT1G
10	6	J1, J2, J3, J4, J5, J6	Terminal Block, 6A, 3.5mm Pitch, 2-Pos, TH	On-Shore Technology	ED555/2DS
11	1	JP1	3x1 2mm male header	Samtec	TMM-103-01-T-S
12	4	R1, R2, R3, R4	RES, 12.0 ohm, 1%, 0.1W, 0603	Yageo America	RC0603FR-0712RL
13	1	T1	Isolation Transformer	Coilcraft	DA2303-ALB
14	1	U1	AMC1200DUB	TI	AMC1200BDUB
15	1	U2	AMC1200BDWV	TI	AMC1200BDWV
16	1	U3	TPS76350DBV	TI	TPS76350DBV
17	1	U4	SN6501DBV	TI	SN6501DBV
18	1	N/A	Shunt	Samtec	2SN-BK-G



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Number: 6525452	Rev: B	Designed for Public Release	Mod Date: 10/25/2013
SVN Rev: Not in version control	Assembly Variant: Variant name not interpreted	Project Title: Change in menu Project\Project Options\Parameter	Sheet Title:
Drawn By:	File: 6525452_amc1200_sch_b.SchDoc	Engineer: Enter name of project lead	Contact: http://www.ti.com/support
Sheet 1 of 1		Size: B	
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## Revision History

<b>Changes from Original (April 2011) to A Revision</b>	<b>Page</b>
• Added SN6501 device to <a href="#">Table 1</a> .....	1
• Added two new bullets to <a href="#">Section 1.1</a> .....	2
• Changed <a href="#">Section 2</a> .....	2
• Changed <a href="#">Section 2.1</a> .....	2
• Changed <a href="#">Section 2.2</a> .....	3
• Changed <a href="#">Section 3.1</a> .....	3
• Changed <a href="#">Figure 3</a> .....	3
• Changed <a href="#">Figure 4</a> .....	3
• Added J5 to <a href="#">Section 4.1</a> .....	4
• Changed <a href="#">Table 2</a> title (typo) .....	4
• Added J5 to <a href="#">Table 3</a> .....	4
• Changed rows in <a href="#">Table 3</a> .....	4
• Added J6 to <a href="#">Section 4.2</a> .....	4
• Changed rows in <a href="#">Table 4</a> .....	4
• Added J6 to <a href="#">Table 5</a> .....	4
• Changed <a href="#">Section 4.3</a> .....	4
• Changed <a href="#">Figure 5</a> .....	5
• Changed BOM ( <a href="#">Table 6</a> ) .....	6
• Changed schematic .....	6

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.



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### General Statement for EVMs including a radio

*User Power/Frequency Use Obligations:* This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

### 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

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**

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- 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.

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This Class A or B digital apparatus complies with Canadian ICES-003.

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### **Concerning EVMs including radio transmitters**

This device complies with Industry Canada licence-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.

### **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.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

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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.

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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.

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**This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan**

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product 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 this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
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3. Since the EVM is not a completed product, it may not meet all applicable regulatory and safety compliance standards (such as UL, CSA, VDE, CE, RoHS and WEEE) which may normally be associated with similar items. You assume full responsibility to determine and/or assure compliance with any such standards and related certifications as may be applicable. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

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