AMC1100EVM User's Guide

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

Device	Literature Number
AMC1100	SBAS562
SN6501	SLLSEA0

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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.

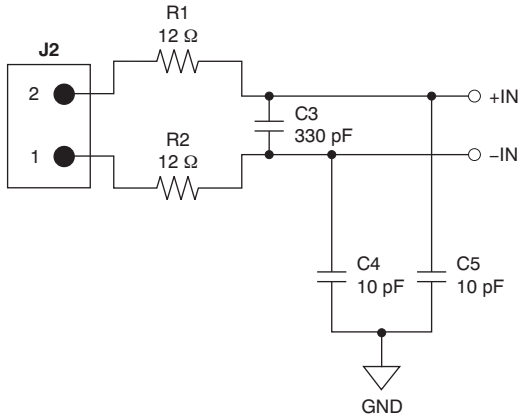

Figure 1. AMC1100EVM Schematic: Analog Input Section

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.

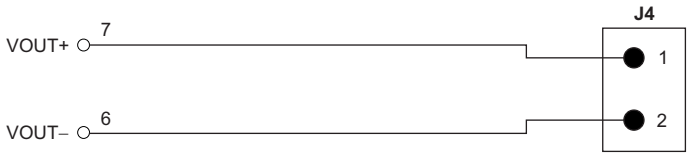

Figure 2. AMC1100EVM Schematic: Analog Output Section

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.

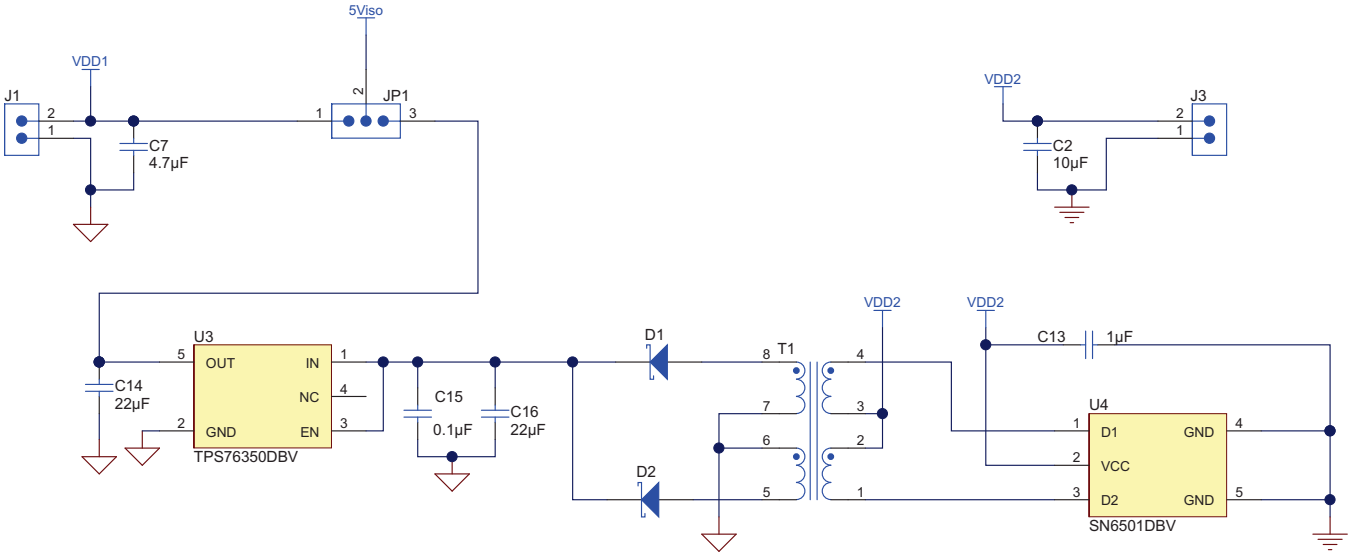

Figure 3. VDD1 Input

3.2 VDD2 Input

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

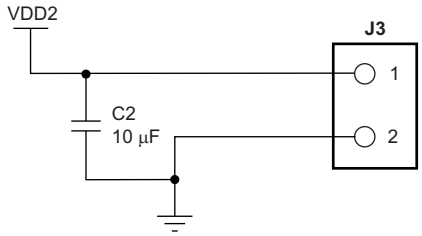

Figure 4. VDD2 Input Connector

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 2. J1: Isolated Power

Pin Number	Signal	Description
J1.1	GND1	Connection to the AMC1100 GND1 terminal (pin 4)
J1.2	VDD1	Connection to the AMC1100 VDD1 terminal (pin 1)

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 3. J2: Analog Inputs

Pin Number	Signal	Description
J2.2 and J5.2	IN–	Inverting analog input to the AMC1100 (pin 3)
J2.1 and J5.1	IN+	Noninverting input to the AMC1100 (pin 2)

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 4. J3: VDD2 Power

Pin Number	Signal	Description
J3.2	VDD2	Connection to the AMC1100 VDD2 terminal (pin 8)
J3.1	GND2	Connection to the AMC1100 GND2 terminal (pin 5)

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 5. J4: Analog Output

Pin Number	Signal	Description
J4.2 and J6.2	VOUT+	Noninverting analog output from the AMC1100 (pin 7)
J4.1 and J6.1	VOUT–	Inverting output from the AMC1100 (pin 6)

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.

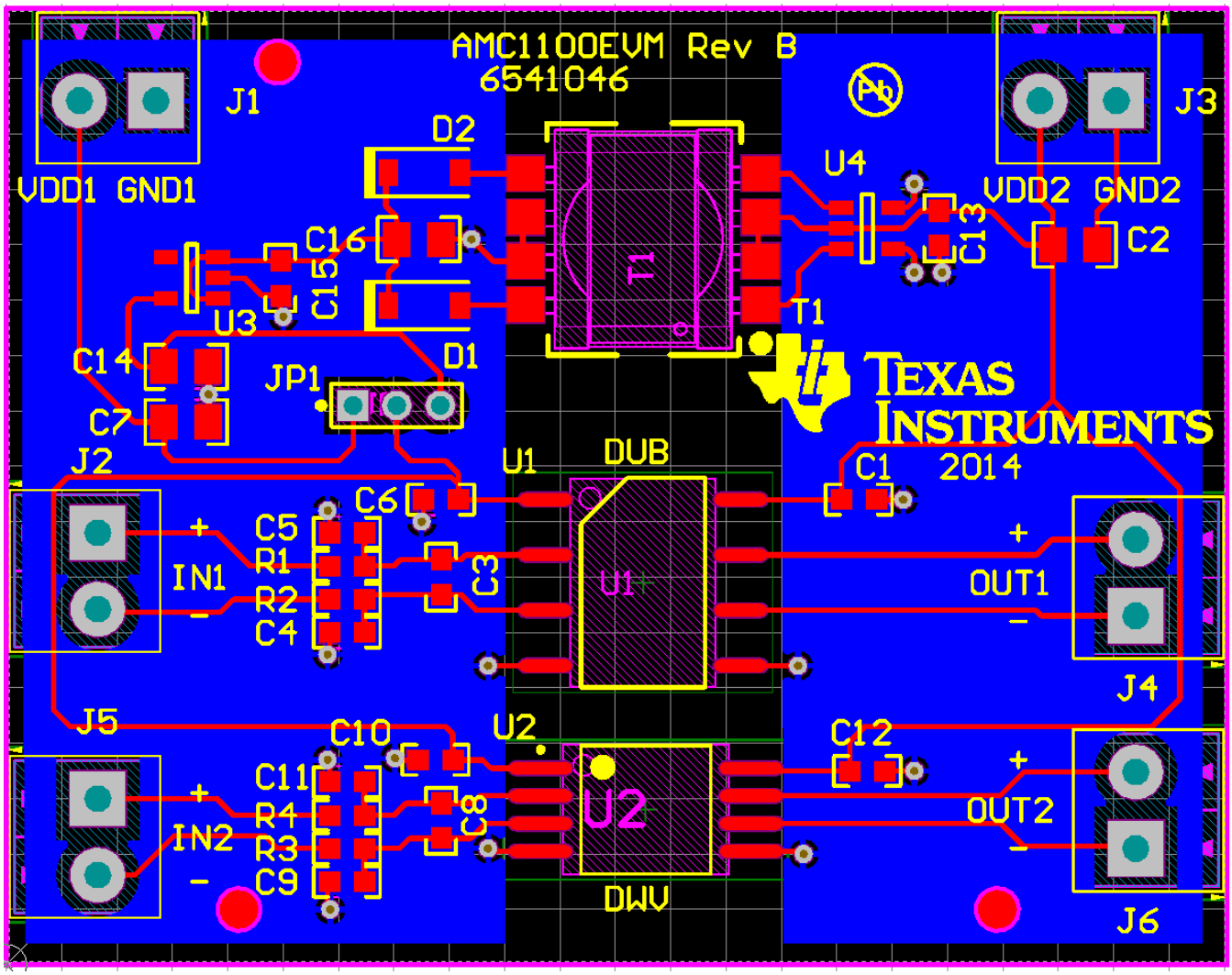

Figure 5. AMC1100 Silkscreen Drawing

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

Item	Qty	Ref Des	Description	Manufacturer	Part Number
1	1	PCB	Printed Circuit Board	Any	6541046
2	5	C1, C6, C10, C12, C15	CAP, CERM, 0.1uF, 25V, +/-10%, X7R, 0603	TDK	C1608X7R1E104K
3	1	C2	CAP, CERM, 10uF, 10V, +/-10%, X5R, 0805	Murata	GRM219R61A106KE44D
4	2	C3, C8	CAP, CERM, 330pF, 50V, +/-5%, C0G/NP0, 0603	TDK	C1608C0G1H331J
5	4	C4, C5, C9, C11	CAP, CERM, 10pF, 50V, +/-5%, C0G/NP0, 0603	AVX	06035A100JAT2A
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	AMC1100DUB	TI	AMC1100DUB
15	1	U2	AMC1100DWV	TI	AMC1100DWV
16	1	U3	TPS76350DBV	TI	TPS76350DBV
17	1	U4	SN6501DBV	TI	SN6501DBV
18	1	N/A	Shunt	Samtec	2SN-BK-G

Revision History

Changes from Original (February 2012) to A Revision **Page**

- 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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      CAUTION

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      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

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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.*

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.

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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

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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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