AMC1100EVM

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.

Related Documentation

Device	Literature Number
AMC1100	SBAS562

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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

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

The analog input to the AMC1100 is routed from a two-wire screw terminal screw at J4. This screw terminal gives the user access to the inverting and noninverting inputs of the AMC1100.

2.1 Analog Inputs

The analog input to the AMC1100EVM printed circuit board (PCB) consists of simple RC filter circuits. The input circuit for the AMC1100 is shown in Figure 1.

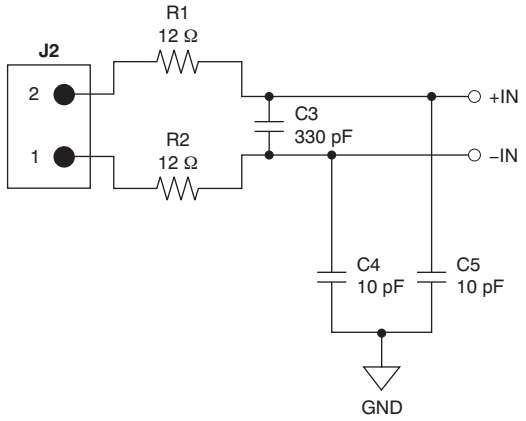


Figure 1. AMC1100EVM Schematic: Analog Input Section

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 as Figure 2 shows.

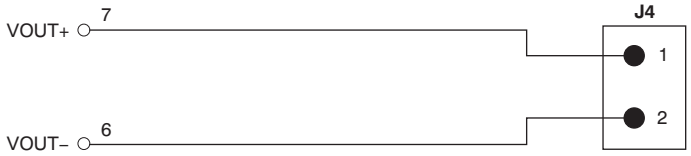


Figure 2. AMC1100EVM Schematic: Analog Output Section

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, zener diode D1 may be installed by the user. Depending on the characteristics of the zener diode, resistor R1 (default 0 Ω) may need to be resized and replaced. The VDD1 supply should be between 4.5 V_{DC} and 5.5 V_{DC}. The input power is shown in Figure 3.

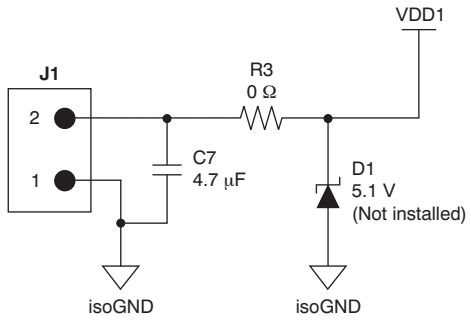


Figure 3. VDD1 Input

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 illustrates the power input for VDD2.

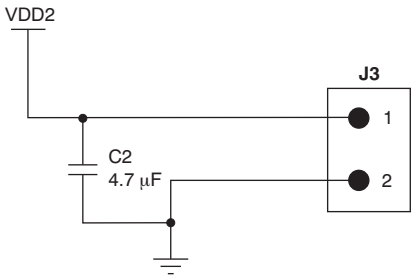


Figure 4. VDD2 Input Connector

4 EVM Operation

This section describes the general operation of the AMC1100EVM.

4.1 Isolated Power and Analog Inputs: J1 and J2

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

Table 1. J3: VDD2 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 pins 1 and 2.

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 2 summarizes the details of J2.

Table 2. J2: Analog Inputs

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

4.2 User Power and Analog Outputs: J3 and J4

The VDD2 power input to the AMC1100EVM PCB can be applied directly to J3, pins 1 and 2. Table 3 lists the details of J3.

Table 3. J3: VDD2 Power

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

The analog output from the AMC1100EVM board is applied directly to J4, pins 1 and 2. Table 4 summarizes the details of J4.

Table 4. J4: Analog Output

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

4.3 Device Operation

Once 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 may be applied directly at screw terminal J2. Refer to Figure 1 and Table 2 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.

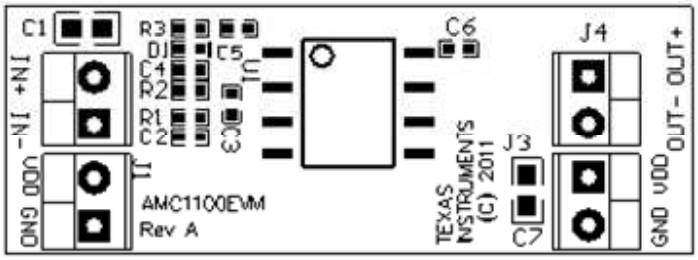


Figure 5. AMC1100 Silkscreen Drawing

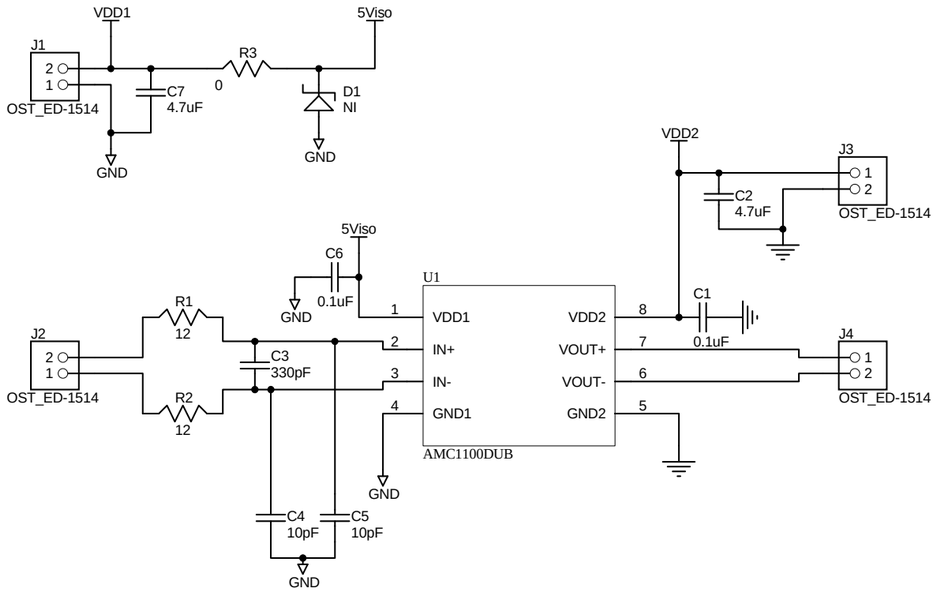
5.1 Bill of Material

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

Table 5. AMC1100EVM Bill of Materials

Item	Qty	Ref Des	Description	Manufacturer	Part Number
1	1	N/A	Printed wiring board	TI	6541046
2	1	C1	Capacitor, ceramic 10000 pF 50 V X7R 10% 0805	TDK	C2012X7R1H103K
3	2	C2	Capacitor, ceramic 4.7 µF 16 V X5R 10% 0603	Taiyo Yuden	EMK107ABJ475KA-T
4	1	C3	Capacitor, ceramic 330 pF 50 V C0G 5% 0603	TDK	C1608C0G1H331J
5	2	C4, C5	Capacitor, ceramic 10 pF 50 V C0G 0603	TDK	C1608C0G1H100D
6	1	C6	Capacitor, ceramic 0.1 µF 50 V 10% X7R 0603	Murata	GRM188R71H104KA93D
7	1	C7	Capacitor, ceramic 4.7 µF 16 V X5R 0805	Murata	GRM21BR61C475KA88L
8	0	D1	Not installed	—	—
9	4	J1, J2, J3, J4	Terminal block 3.5 mm 2-pos PCB	On Shore	ED555/2DS
10	2	R1, R2	Resistor, 12.0 Ω 1/10 W 1% 0603 SMD	Yageo	RC0603FR-0712RL
11	1	R3	Resistor, 0.0 Ω 1/10 W 0603 SMD	Yageo	RC0603JR-070RL
12	1	U1	IC Delta-Sigma Modulator, 1-bit 8-SOP	TI	AMC1100DUB

REVISION HISTORY		
REV	ENGINEERING CHANGE NUMBER	APPROVED



ENGINEER **Tom Hendrick**			
DRAWN BY **Tom Hendrick**			
DOCUMENT CONTROL NO. **6541046**	SIZE **A**	DATE **05AUG10**	REV **A**
SHEET **1** OF **1**	FILE **C:\Userdata\projects\amc1100\AMC1100_a.ddb - Documents\SCH\AMC1100**		

TEXAS INSTRUMENTS

Precision Analog
HIGH-PERFORMANCE ANALOG DIVISION
SEMICONDUCTOR GROUP

12500 TI Blvd, Dallas, TX 75243

TITLE

AMC1100EVM

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Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

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During normal operation, some circuit components may have case temperatures greater than +30°C. The EVM is designed to operate properly with certain components above +50°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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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

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.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

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

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

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.

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 this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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