AMC1303/06 Evaluation Module

This user's guide describes the characteristics, operation, and use of the AMC1303EVM and the AMC1306EVM. 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
AMC1303	Small, High-Precision, Reinforced Isolated Modulator with Internal Clock
AMC1306	AMC1306x Small-Size, Reinforced Isolated Delta-Sigma Modulators

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1 EVM Overview

1.1 Features

This EVM supports the following features:

- Full-featured Evaluation Board for the AMC1303 or AMC1306 single-channel delta-sigma modulator
- Configurable AVDD and DVDD power supplies
- Screw terminals for easy access to analog inputs and outputs

1.2 Introduction

The AMC1303 and AMC1306 devices are 1-bit modulators with an output buffer separated from the input interface circuitry by a silicon dioxide (SiO2) isolation barrier. The isolation barrier provides galvanic isolation of up to 8000 V_{PEAK}. When used in combination with the AMC1210 or other digital filter, the AMC1303 and AMC1306 can be used to achieve 16-bit analog-to-digital (A/D) conversion with no missing codes.

For use in high-resolution measurement applications, an effective accuracy of 14-bits can be obtained with a digital filter bandwidth of 20 kHz at a modulator rate of 10 MHz.

Throughout this document, the abbreviation *EVM* and the term *evaluation module* are synonymous with the AMC1303EVM or the AMC1306EVM.

2 Analog Interface

The analog input to the AMC1303/06EVM is routed from a two-wire screw terminal screw at J1. This screw terminal gives the user access to the inverting and non-inverting inputs of the AMC1303 or AMC1306, depending on which device is installed on the board.

2.1 Analog Inputs

The analog input to the AMC1303/06EVM board is comprised of direct connection to AINP and AINN through 0-Ω resistors R1 and R2. If filtering is required, R/C filter circuit options are possible using the footprints for C4, C5 and C8. The input circuit for the AMC1303/06EVM is shown in Figure 1.

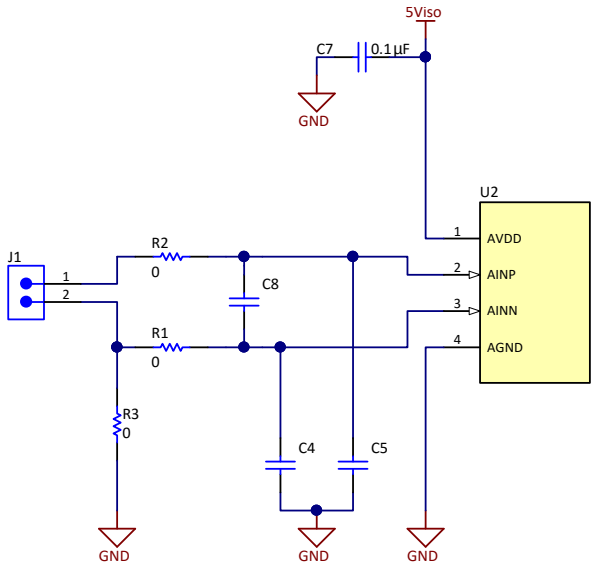

Figure 1. AMC1303/06EVM Schematic: Analog Input Section

3 Digital Interface

The AMC1303/06EVM digital input/output is a simple three terminal screw connector located at J4. J4 pin 1 is the output data from the modulator installed in location U2. For the AMC1306, pin 7 is the modulator clock input as shown below. A 5 MHz to 20 MHz modulator clock can be applied to J4.2 referenced to J4.3. For the AMC1303, pin 7 is the modulator clock output which can be monitored at J4.2 relative to J4.3.

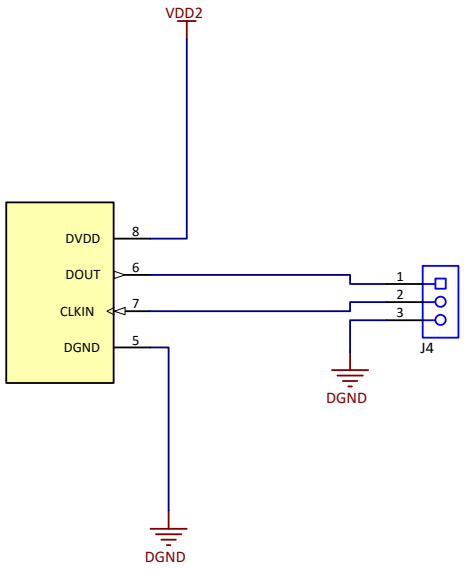

Figure 2. Digital I/O

4 Power Supplies

The AMC1303/06EVM requires two separate power rails, 5 V_{ISO} and VDD2. 5 V_{ISO} is on the high voltage side of the amplifier. VDD2 is on the user side of the amplifier.

4.1 VDD1 Input

The default configuration of the EVM provides 5 V to 5 V_{ISO} through transformer T1 via U3, an SN6501 push-pull driver. A shunt on jumper JP1 is shorting pins 2-3, which routes the regulated 5 V from U1, a TPS76350, to pin 1 of U2. The screw terminal at J2 allows the user to provide their own VDD1 source when the shunt on JP1 is covering pins 1-2. The VDD1 supply should be between 3 and 5.5 V_{DC}. The input power scheme is shown in Figure 3.

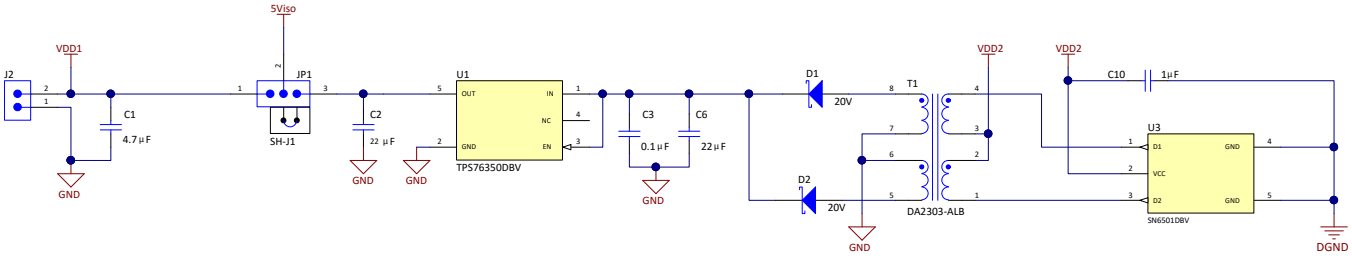

Figure 3. VDD1 Input

The screw terminal at J3 allows the user to provide the VDD2 source. The VDD2 supply should be between 3 and 5.5 V_{DC}.

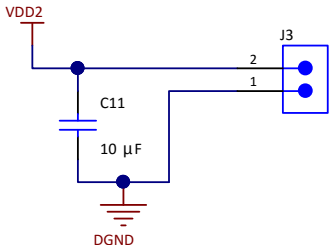

Figure 4. VDD2 Input

4.2 Isolated Power and Analog Inputs: J1 and J2

The isolated power input to the AMC1303/06EVM printed circuit board (PCB) can be applied directly to J2 pins 1 and 2.

Table 2 lists the details of J2.

Table 2. J2: Analog Inputs

Pin Number	Signal	Description
J2.1	GND	Connection to the AMC1303 or AMC1306 AGND terminal (pin 4)
J2.2	VDD1	Connection to the AMC1303 or AMC1306 AVDD terminal (pin 1)

The analog input to the AMC1303/06EVM printed circuit board (PCB) can be applied directly to J1 pins 1 and 2.

CAUTION

Carefully review the AMC1303 and AMC1306 product data sheets for the limitations of the analog input range, and ensure that the appropriate analog/digital voltages are applied prior to connecting any analog input to the EVM. The EVM uses the ±250 mV versions of the devices.

Table 3 lists the details of J1.

Table 3. J1: Analog Inputs

Pin Number	Signal	Description
J1.1	AINP	Non-inverting analog input to the AMC1303 or AMC1306
J1.2	AINN	Inverting input to the AMC1303 or AMC1306

4.3 Device Operation

Once the analog and isolated power is applied to the AMC1303/06EVM, the digital outputs become active. If the AMC1303 is installed at location U2, the device uses its own internal modulator clock. Screw terminal J4 has the connections as shown in Table 4.

Table 4. J4: AMC1303EVM Digital Output

Pin Number	Signal	Description
J4.1	DOUT	AMC1303 Bit Stream Data Output
J4.2	CLOCK	AMC1303 Modulator Clock Output
J4.3	DGND	Digital Ground Reference

If the AMC1306 is installed at location U2, the device requires an external modulator clock between 5 and 20 MHz. Screw terminal J4 has the connections as shown in Table 5.

Table 5. J4: AMC1306EVM Digital Output

Pin Number	Signal	Description
J4.1	DOUT	AMC1306 Bit Stream Data Output
J4.2	CLOCK	AMC1306 Modulator Clock Output
J4.3	DGND	Digital Ground Reference

An analog input signal may be applied directly at screw terminal J1. Refer to Figure 1 and Table 3 for details. The linear analog input range, (VIN+) – (VIN–), is ±250 mV.

As the input voltage approaches the maximum input level of +250 mV, the 1s density of the modulator output will approach 92%. Likewise, when the input voltage approaches the lower limit of -250 mV the 1s density will be approximately 8%.

5 Layout, BOM, and Schematic

This section contains the complete bill of materials, schematic diagram and printed circuit board (PCB) layout of the AMC1303/06EVM.

NOTE: Board layouts are not to scale. These are intended to show how the board is laid out; they are not intended to be used for manufacturing AMC1203EVM PCBs.

5.1 Printed Circuit Board Layout

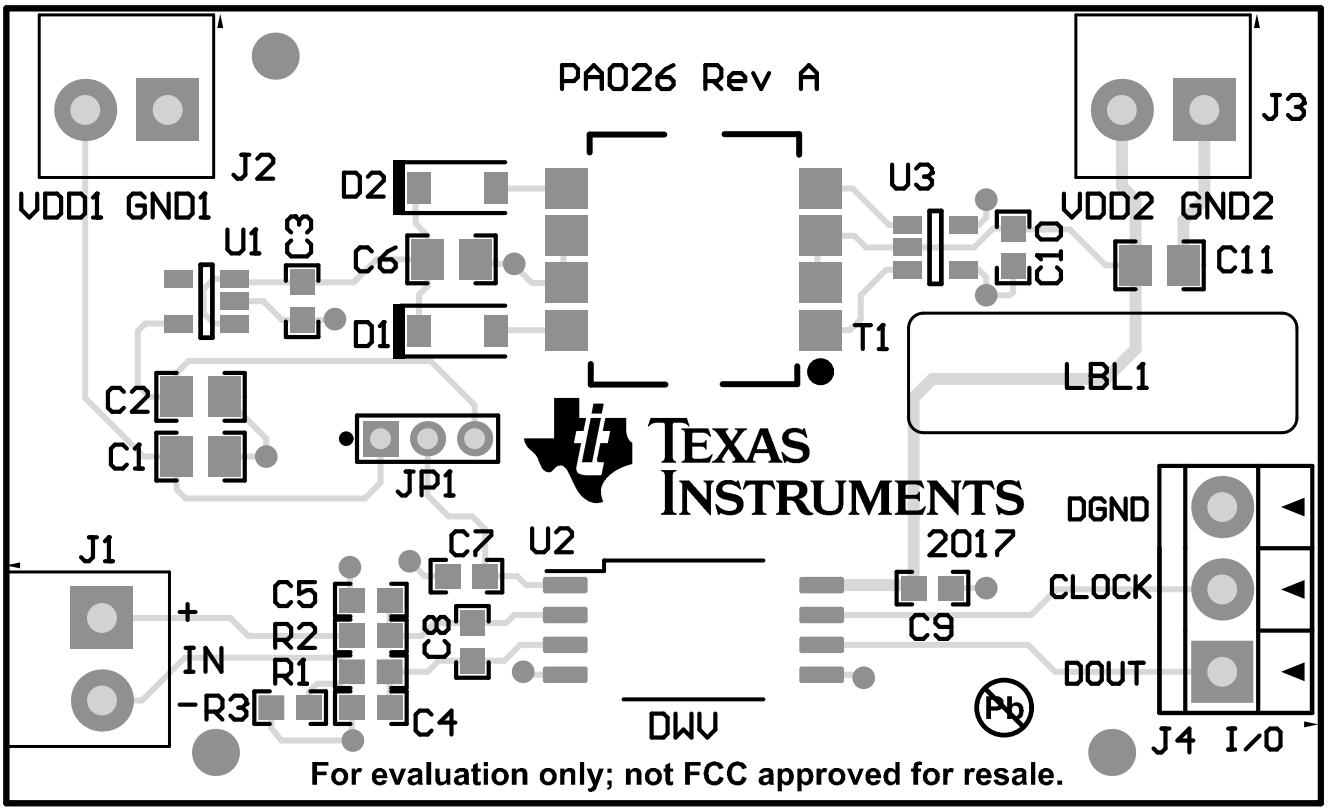

Figure 5. AMC1303/06 Silkscreen Drawing

5.2 Bill of Material

Table 6. AMC1303/06EVM Bill of Materials

Designators	Description	Manufacturer	Mfg. Part Number
C1	CAP, CERM, 4.7uF, 50V, +/-10%, X5R, 0805	TDK	C2012X5R1H475K125AB
C2, C6	CAP, CERM, 22uF, 6.3V, +/-20%, X5R, 0805	Taiyo Yuden	JMK212BJ226MG-T
C3	CAP, CERM, 0.1uF, 25V, +/-10%, X7R, 0603	AVX	06033C104KAT2A
C7, C9	CAP, CERM, 0.1uF, 25V, +/-10%, X7R, 0603	TDK	C1608X7R1E104K
C10	CAP, CERM, 1uF, 16V, +/-10%, X5R, 0603	TDK	C1608X5R1C105K
C11	CAP, CERM, 10uF, 10V, +/-10%, X5R, 0805	MuRata	GRM219R61A106KE44D
D1, D2	Diode, Schottky, 20V, 0.5A, SOD-123	ON Semiconductor	MBR0520LT1G
J1, J2, J3	Terminal Block, 6A, 3.5mm Pitch, 2-Pos, TH	On-Shore Technology, Inc.	ED555/2DS
J4	Terminal Block, 3.5mm Pitch, 3x1, TH	On-Shore Technology	ED555/3DS
JP1	Header, 2mm, 3x1, Tin, TH	Samtec	TMM-103-01-T-S
LBL1	Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	Brady	THT-14-423-10
R1, R2, R3	RES, 0, 5%, 0.1 W, 0603	Panasonic	ERJ-3GEY0R00V
SH-J1	Shunt, 2mm, Gold plated, Black	Samtec	2SN-BK-G
T1	Transformer, 45.6 uH SMT	Coilcraft	DA2303-ALB
U1	LOW-POWER 150-mA LOW-DROPOUT LINEAR REGULATOR, DBV0005A	Texas Instruments	TPS76350DBV
U2	Small, High-Precision, Reinforced Isolated Delta-Sigma Modulator with Manchester Coded Output, DWV0008A (SOIC-8)	Texas Instruments	AMC1306M25DWVR or AMC1303M2510DWVR
U3	Transformer Driver for Isolated Power Supplies, DBV0005A	Texas Instruments	SN6501DBV
C4, C5	CAP, CERM, 10pF, 50V, +/-5%, C0G/NP0, 0603	Not Installed	
C8	CAP, CERM, 330pF, 50V, +/-5%, C0G/NP0, 0603	Not Installed	

5.3 Schematic

Figure 6 illustrates the AMC1306EVM schematic.

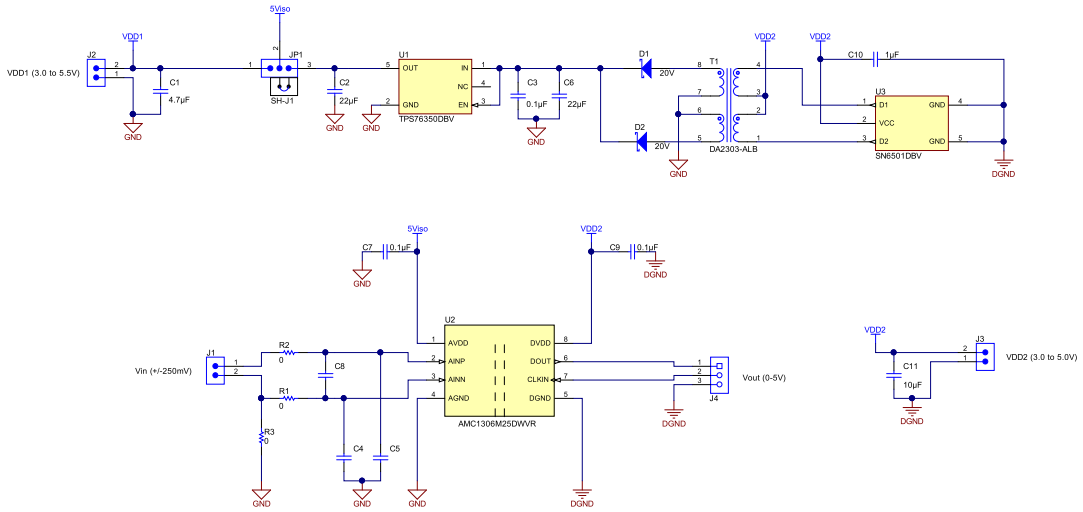

Figure 6. AMC1306EVM Schematic

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      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.

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      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.

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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*

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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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