AMC1303, AMC1306, and AMC1336 Evaluation Module

This user's guide describes the characteristics, operation, and use of the AMC13xxEVM (AMC1303EVM, AMC1306EVM, and AMC1336EVM). 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	Description
AMC1303	Small, High-Precision, Reinforced Isolated Modulator with Internal Clock
AMC1306	AMC1306x Small-Size, Reinforced Isolated Delta-Sigma Modulators
AMC1336	AMC1336 Small, High-Precision, Reinforced Isolated Delta-Sigma Modulator for Voltage Sensing Applications

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1 EVM Overview

1.1 Features

This EVM supports the following features:

* Full-featured evaluation board for the AMC1303, AMC1306, or AMC1336 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, AMC1306, and AMC1336 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, AMC1306, and AMC1336 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, AMC1306EVM, or the AMC1336EVM.

2 Analog Interface

The analog input to the AMC13xxEVM 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, AMC1306, or AMC1336 depending on which device is installed on the board.

2.1 Analog Inputs

The analog input to the AMC13xxEVM 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 AMC13xxEVM is illustrated in Figure 1.
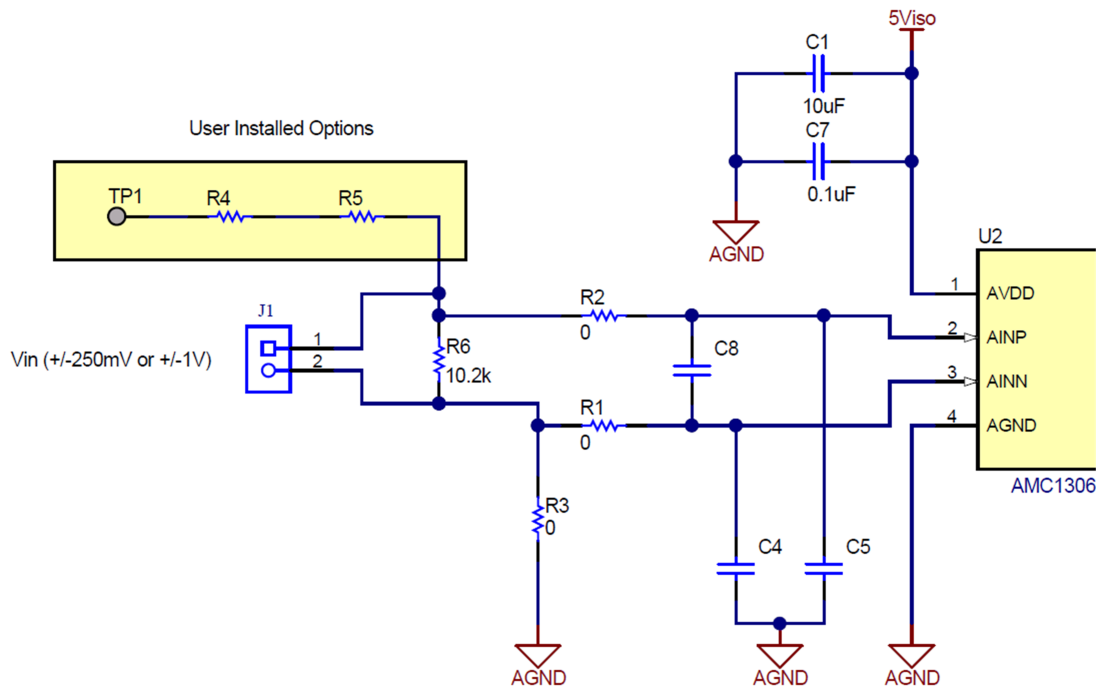
Figure 1. AMC13xxEVM Schematic: Analog Input Section

3   Digital Interface

The AMC13xxEVM 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 and AMC1336, 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.
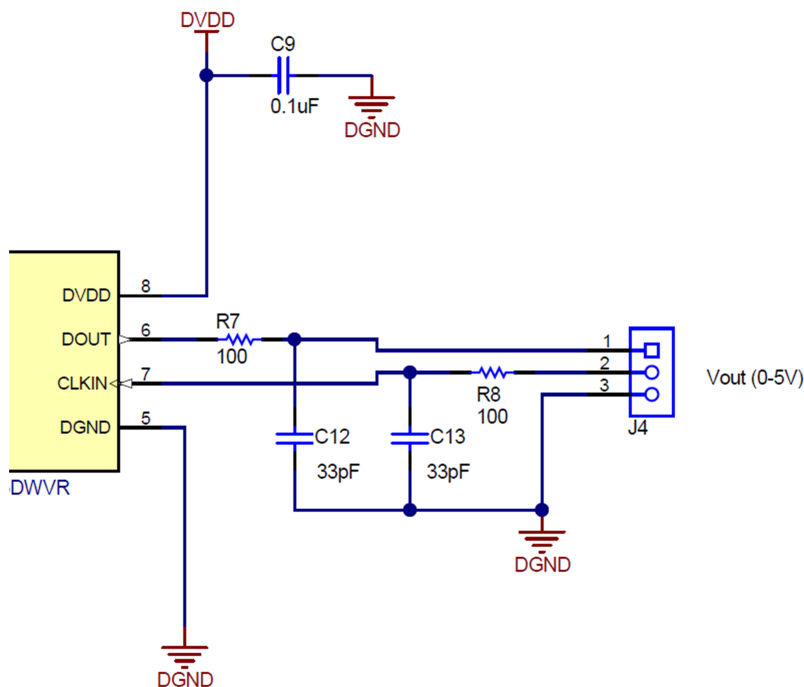

Figure 2. Digital I/O

4 Power Supplies

The AMC13xxEVM requires two separate power rails, 5 V_{ISO} and DVDD. 5 V_{ISO} is on the high voltage side of the amplifier. DVDD is on the user side of the amplifier.

4.1 AVDD 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 AVDD source when the shunt on JP1 is covering pins 1-2. The AVDD supply should be between 3 and 5.5 V_{DC}. The input power scheme is shown in Figure 3.
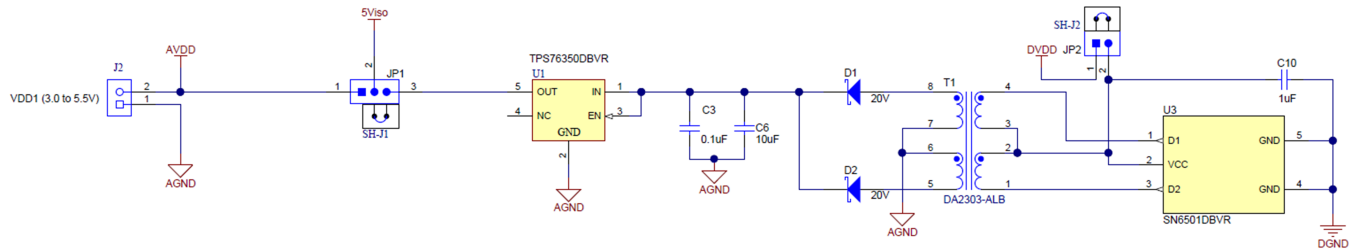

Figure 3. AVDD Input

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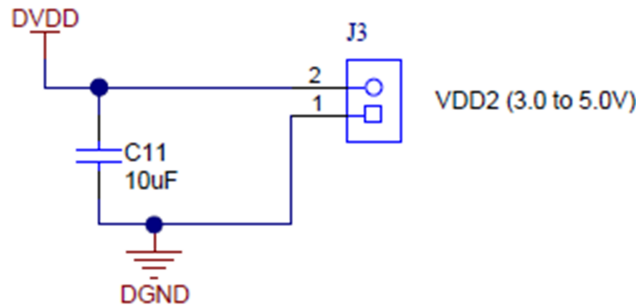

Figure 4. DVDD Input

4.2 *Isolated Power and Analog Inputs: J1 and J2*

The isolated power input to the AMC13xxEVM 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	AGND	Connection to the AMC1303, AMC1306, or AMC1336 AGND terminal (pin 4)
J2.2	AVDD	Connection to the AMC1303, AMC1306, or AMC1336 AVDD terminal (pin 1)

The analog input to the AMC13xxEVM printed circuit board (PCB) can be applied directly to J1 pins 1 and 2.

> **CAUTION**
>
> Carefully review the AMC1303, AMC1306, and AMC1336 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 for the AMC1303 and AMC1306. The EVM uses ±1 V for the AMC1336.

Table 3 lists the details of J1.

Table 3. J1: Analog Inputs

Pin Number	Signal	Description
J1.1	AINP	Noninverting analog input to the AMC1303, AMC1306, or AMC1336
J1.2	AINN	Inverting input to the AMC1303, AMC1306, or AMC1336

4.3 Device Operation

Once the analog and isolated power is applied to the AMC13xxEVM, 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, AMC1336EVM Digital Output

Pin Number	Signal	Description
J4.1	DOUT	AMC1306, AMC1336 bit stream data output
J4.2	CLOCK	AMC1306, AMC1336 modulator clock input
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 for the AMC1303 and AMC1306. The linear analog input range, (VIN+) – (VIN–), is ±1 V for the AMC1336.

For the AMC1303 and AMC1306, 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%.

For the AMC1336, as the input voltage approaches the maximum input level of +1 V, the 1s density of the modulator output approaches 92%. Likewise, when the input voltage approaches the lower limit of –1 V the 1s density is 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 AMC13xxEVM PCBs.

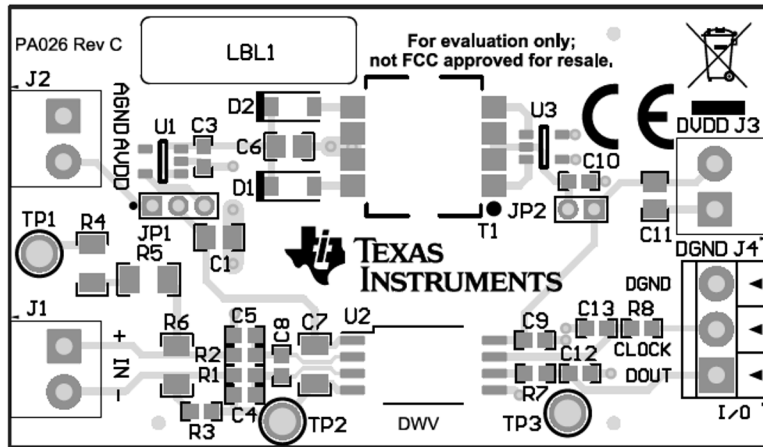## 5.1   *Printed Circuit Board Layout*

Figure 5. AMC13xxEVM Silkscreen

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5.2   Bill of Material

Table 6. AMC13xxEVM Bill of Materials

Designators	Description	Manufacturer	Mfg. Part Number
C1, C6, C11	CAP, CERM, 10 uF, 10 V, +/- 10%, X5R, 0805	Kemet	C0805C106K8PACTU
C3, C9	CAP, CERM, 0.1 uF, 25 V, +/- 10%, X7R, 0603	AVX	06033C104KAT2A
C7	CAP, CERM, 0.1 uF, 50 V, +/- 10%, X7R, 1206	Yageo America	CC1206KRX7R9BB104
C10	CAP, CERM, 1 uF, 10 V, +/- 10%, X5R, 0603	Kemet	C0603C105K8PACTU
C12, C13	CAP, CERM, 33 pF, 50 V, +/- 5%, C0G/NP0, AEC-Q200 Grade 0, 0603	TDK	CGA3E2NP01H330J080AA
D1, D2	Diode, Schottky, 20 V, 0.5 A, SOD-123	ON Semiconductor	MBR0520LT1G
J1, J2, J3	Terminal Block, 3.5mm Pitch, 2x1, TH	On-Shore Technology	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
JP2	Header, 2mm, 2x1, Tin, TH	Samtec	TMM-102-01-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, AEC-Q200 Grade 0, 0603	Panasonic	ERJ-3GEY0R00V
R7, R8	RES, 100, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	Vishay-Dale	CRCW0603100RJNEA
SH-J1, SH-J2	Shunt, 2mm, Gold plated, Black	Samtec	2SN-BK-G
T1	Transformer, 45.6 uH SMT	Coilcraft	DA2303-ALB
TP2, TP3	Terminal, Turret, TH, Double	Keystone	1573-2
U1	Single Output LDO, 150 mA, Fixed 5 V Output, 2.7 to 10 V Input, with Low IQ, 5-pin SOT-23 (DBV), -40 to 125 degC, Green (RoHS & no Sb/Br)	Texas Instruments	TPS76350DBVR
U2	Small Reinforced Isolated Modulator With +/-250mV Input and CMOS Interface, DWV0008A (SOIC-8)	Texas Instruments	AMC1306M25DWVR or AMC1303M2510DWVR AMC1336MDWVR
U3	Low-Noise 350 mA, 410 kHz Transformer Driver, DBV0005A (SOT-23-5)	Texas Instruments	SN6501DBVR
TP1	Terminal, Turret, TH, Double	Not Installed	
R4, R5, R6	RES, 10.2 k, 1%, 0.25 W, 1206	Not Installed	
C4, C5, C8	CAP, CERM, 10 pF, 50 V, +/- 5%, C0G/NP0, 0603	Not Installed	

5.3 Schematic

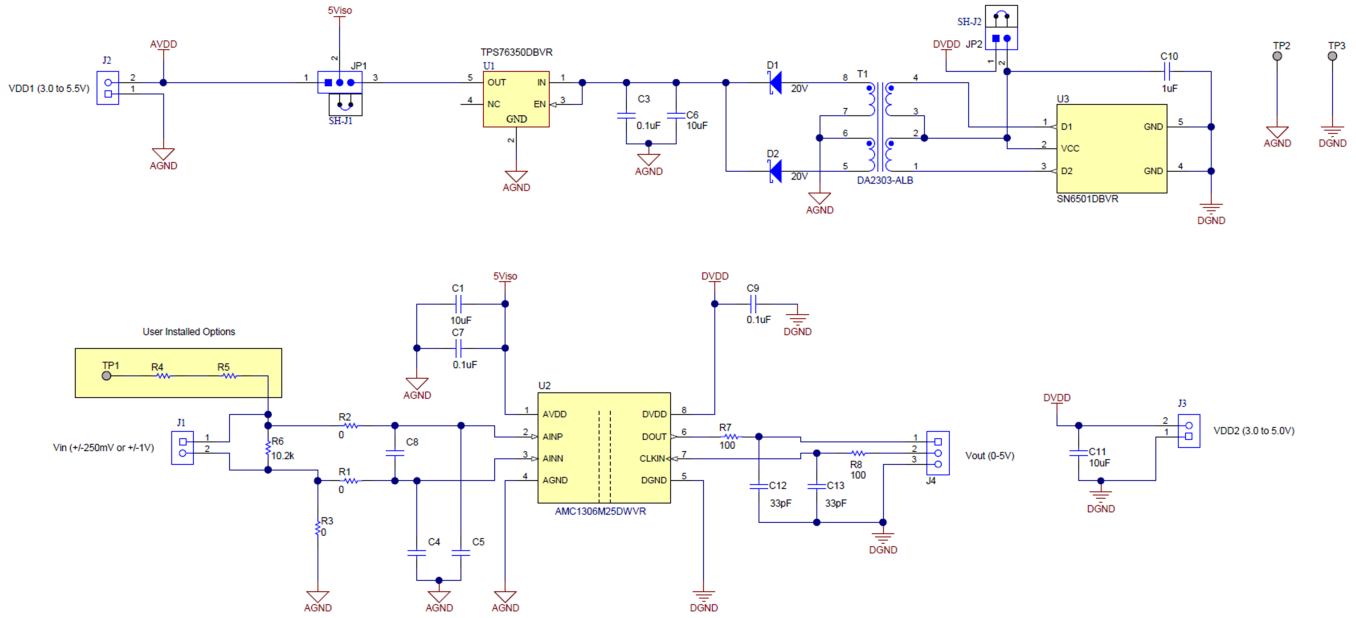illustrates the AMC1306EVM schematic.

Figure 6. AMC1306EVM Schematic

5.4 Trademarks

All trademarks are the property of their respective owners.

Revision History

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

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