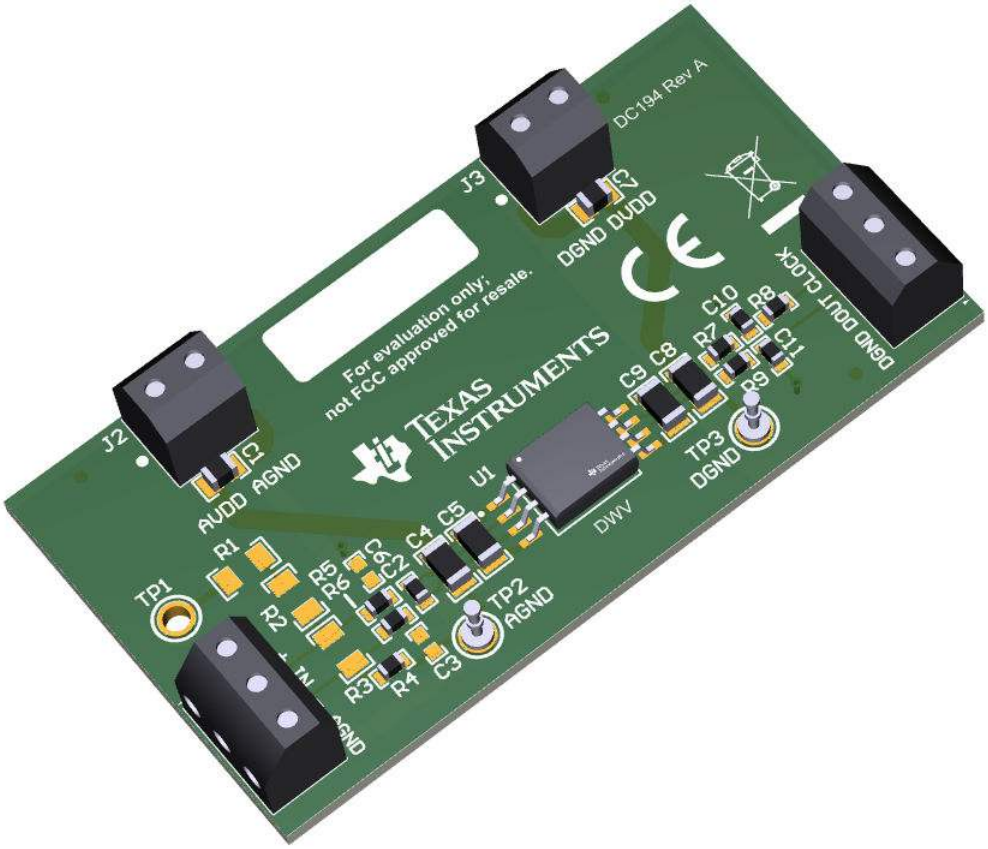
User's Guide

AMC1333M10 Evaluation Module

ABSTRACT

This user's guide describes the characteristics, operation, and use of the AMC1333M10EVM. A complete circuit description as well as a schematic diagram and bill of materials are included.

Throughout this document, AMC1333M10EVM is shortened to AMC1333EVM and the abbreviation *EVM* and the term *evaluation module* are synonymous with the AMC1333EVM.



AMC1333EVM

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Trademarks

1 EVM Overview

1.1 Features

This EVM supports the following features:

- Full-featured evaluation board for the AMC1333 single-channel, delta-sigma modulator
- Screw terminals for the external AVDD and DVDD supplies
- Screw terminals for easy access to the analog inputs and digital outputs

1.2 Introduction

The AMC1333 is a 1-bit modulator 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 a digital filter, the AMC1333 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.

Table 1-1 lists the related documents available through the Texas Instruments web site at www.ti.com.

Table 1-1. Related Documentation

Document	Literature Number
AMC1333 data sheet	SBASA71
Comparing Isolated Amplifiers and Isolated Modulators technical white paper	SBAA359

2 Analog Interface

The analog input to the AMC1333EVM is routed from a three-wire screw terminal screw at J1. This screw terminal provides access to the inverting and noninverting inputs of the AMC1333.

2.1 Analog Inputs

The analog input to the AMC1333EVM board allows connection to AINP and AINN through an R/C filter with 10-Ω resistors (R5 and R6) and a 10-nF capacitor (C2). If filtering is not required, the C2 capacitor can be removed and the R5 and R6 resistors can be replaced with 0-Ω resistors.

The user optional resistor divider network that consists of R1, R2, and R3 is not populated by default. Populating this resistor divider network allows the user to select values of R1, R2, and R3 to generate a voltage across R3 for voltage sensing. Figure 2-1 shows an input circuit schematic for the AMC1333EVM and Table 2-1 lists the screw terminal connections.

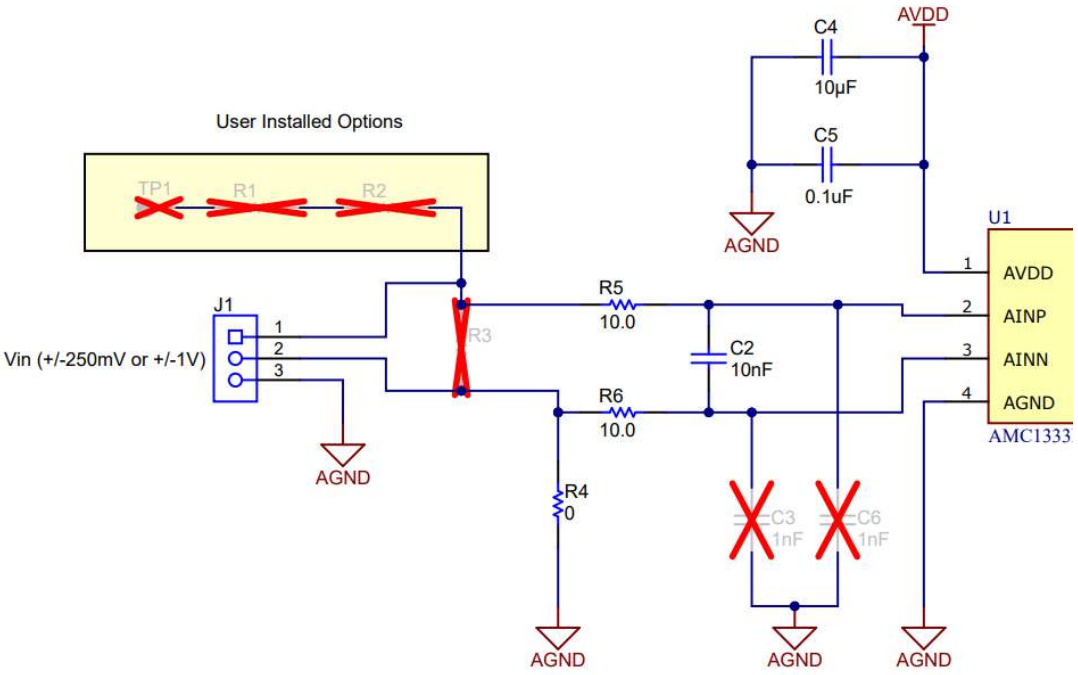

Figure 2-1. AMC1333EVM Schematic: Analog Input Section

Table 2-1. J1: Analog Inputs

Pin Number	Signal	Description
J1.1	AINP	Noninverting analog input to the AMC1333
J1.2	AINN	Inverting input to the AMC1333
J1.3	AGND	Analog ground reference

CAUTION

Carefully review the AMC1333 product data sheet for the limitations of the analog input range, and ensure that the appropriate analog and digital voltages are applied prior to connecting any analog input to the EVM. The EVM uses ±1 V for the AMC1333 and is not certified for high-voltage operation.

3 Digital Interface

The AMC1333EVM digital input/output is a simple three-terminal screw connector located at J4. J4.2 is the output data from the modulator installed in location U1. As shown in Figure 3-1, pin 7 of U1 is the modulator clock output. The clock output can be monitored at J4.3 relative to J4.1. Figure 3-1 shows the digital I/O circuitry for the AMC1333EVM. Table 3-1 lists the digital output signals relative to J4.

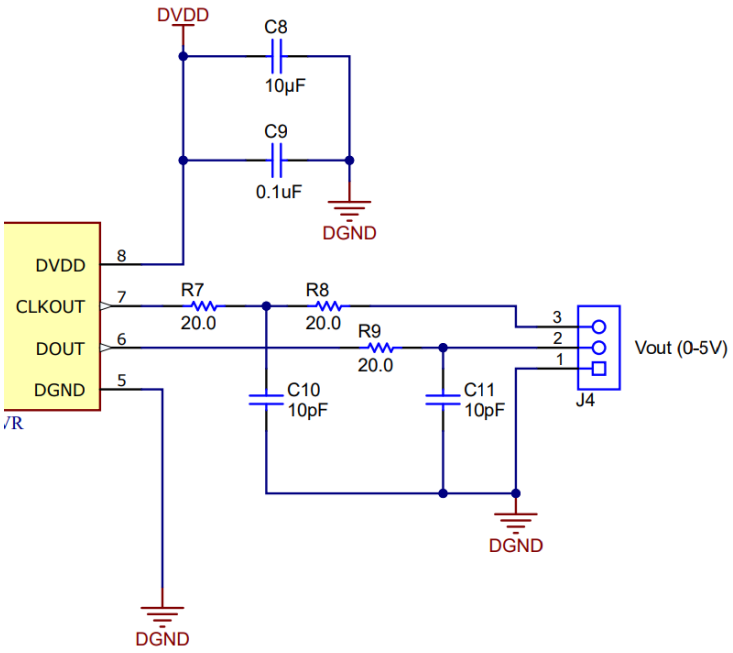

Figure 3-1. Digital I/O Schematic

Table 3-1. J4: AMC1333EVM Digital Output

Pin Number	Signal	Description
J4.1	DGND	Digital ground reference
J4.2	DOUT	Modulator bit stream data output
J4.3	CLOCK	Modulator clock

4 Power Supplies and Device Operation

The AMC1333EVM requires two separate external power rails, AVDD and DVDD. AVDD is on the high voltage side of the modulator and DVDD is on the user side of the modulator.

4.1 AVDD and DVDD Inputs: J2 and J3

There are two screw terminals that allow external supplies to be connected. The J2 screw terminal allows the user to externally provide power to AVDD and the screw terminal J3 allows the user to externally provide power to DVDD. The AVDD supply must be between 3 V_{DC} and 5.5 V_{DC} and the DVDD supply must be between 3 V_{DC} and 5 V_{DC}. Figure 4-1 shows the input power scheme.

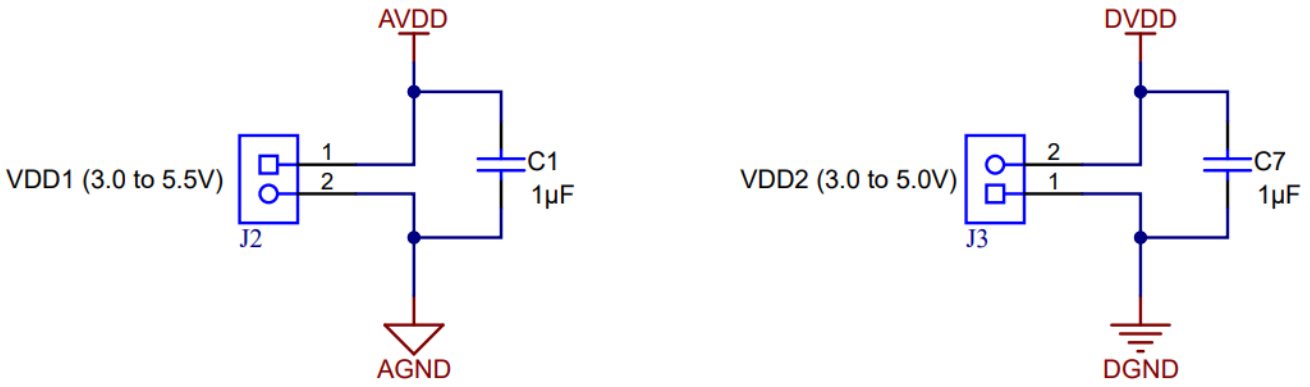

Figure 4-1. AVDD and DVDD Inputs

4.2 Device Operation

When the analog power supplies are applied to the AMC1333EVM, the digital outputs become active. The AMC1333 uses its own internal modulator clock. Screw terminal J4 has the connections as listed in Table 3-1.

An analog input signal can be applied directly at screw terminal J1; see Figure 2-1 and Table 2-1 for details. The linear analog input range, (VIN+) – (VIN–), is ±1 V for the AMC1333.

For the AMC1333, when the input voltage approaches the maximum input level of +1 V, the 1's density of the modulator output approaches 92%. Likewise, when the input voltage approaches the lower limit of –1 V, the 1's density is approximately 8%.

5 Layout, Bill of Materials, and Schematic

This section contains the printed circuit board (PCB) layout, complete bill of materials (BOM), and schematic diagram for the AMC1333EVM.

Note

Board layouts are not to scale and are intended to show how the board is laid out. These graphics are not intended to be used for manufacturing AMC1333EVM PCBs.

5.1 Printed Circuit Board Layout

Figure 5-1 shows the PCB layout for the AMC1333EVM.

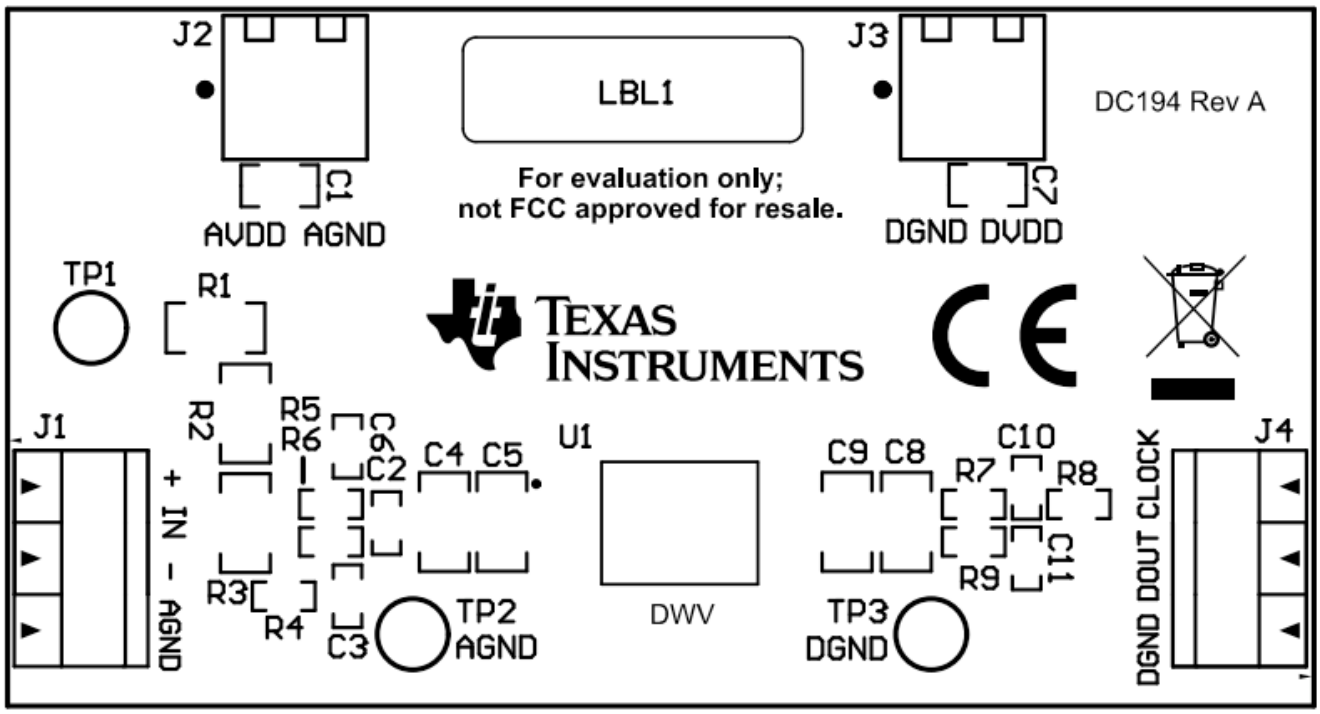

Figure 5-1. AMC1333EVM Silkscreen

5.2 Bill of Materials

Table 5-1 shows the AMC1333EVM bill of materials (BOM).

Table 5-1. Bill of Materials

Designator	Description	Manufacturer	Mfg. PartNumber
C1, C7	CAP, CERM, 1 µF, 16 V,+/- 10%, X7R, AEC-Q200 Grade 1, 0805	MuRata	GCM219R71C105KA37D
C2	CAP, CERM, 0.01 uF, 16 V, +/- 10%, X7R, 0603	Kemet	C0603C103K4RACTU
C4, C8	CAP, CERM, 10 µF, 50 V,+/- 10%, X7R, AEC-Q200 Grade 1, 1206	TDK	CGA5L1X7R1H106K160AE
C5, C9	CAP, CERM, 0.1 uF, 50 V, +/- 10%, X7R, 1206	Yageo America	CC1206KRX7R9BB104
C10, C11	CAP, CERM, 10 pF, 50 V, +/- 1%, C0G/NP0, 0603	Kemet	C0603C100F5GAC7867
J1, J4	Terminal Block, 3.5mm Pitch, 3x1, TH	On-Shore Technology	ED555/3DS
J2, J3	Terminal Block, 3.5mm Pitch, 2x1, TH	On-Shore Technology	OSTTE020161
LBL1	Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	Brady	THT-14-423-10
R4	RES, 0, 5%, 0.1 W, AEC-Q200 Grade 0, 0603	Panasonic	ERJ-3GEY0R00V
R5, R6	RES, 10.0, 0.1%, 0.1 W, 0603	Bourns	CRT0603-BY-10R0ELF
R7, R8, R9	RES, 20.0, 0.1%, 0.1 W, 0603	Yageo America	RT0603BRD0720RL
TP2, TP3	Terminal, Turret, TH, Double	Keystone	1573-2
U1	Small, High-Precision, Reinforced Isolated Delta-Sigma Modulator for Voltage Sensing Applications SOIC8	Texas Instruments	AMC1333M10DWVR
C3, C6	CAP, CERM, 1000 pF, 16 V, +/- 10%, X7R, 0603	Not Installed	
R1, R2, R3	RES, 10.2 k, 1%, 0.25 W, 1206	Not Installed	
TP1	Terminal, Turret, TH, Double	Not Installed	

5.3 Schematic

Figure 5-2 shows the AMC1333EVM schematic.

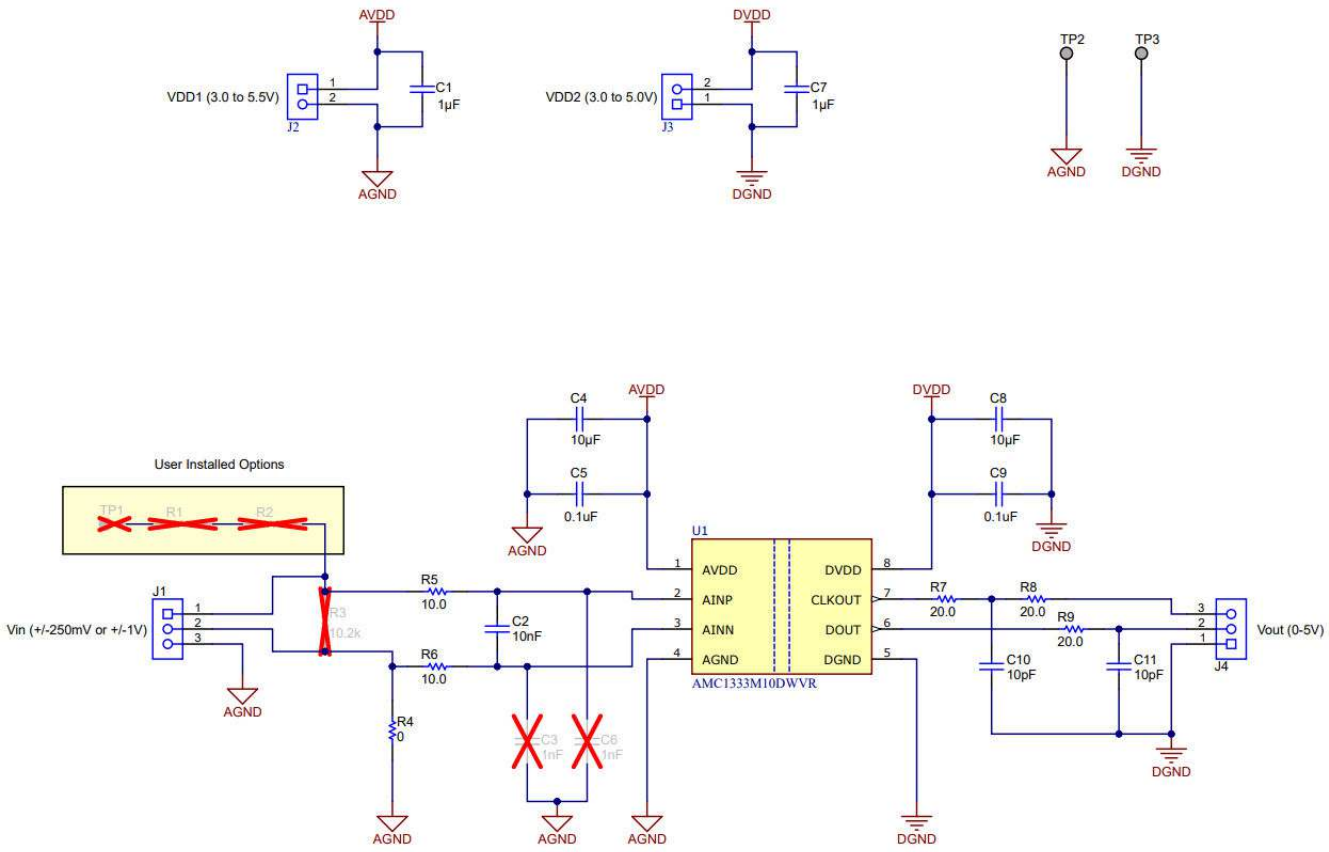

Figure 5-2. AMC1333EVM Schematic

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