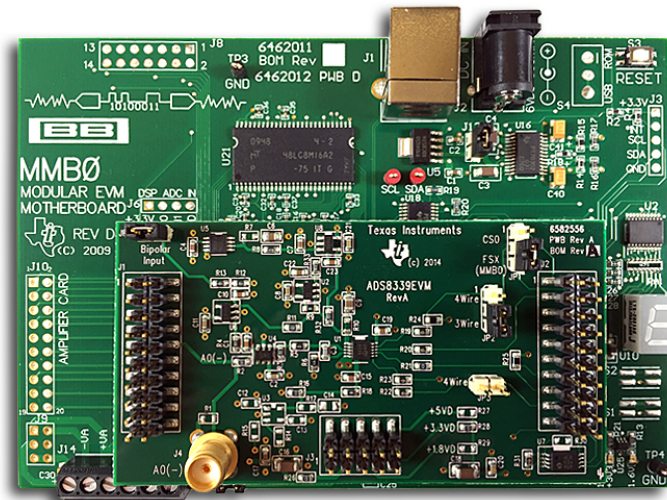


## ADS8339EVM-PDK



**ADS8339EVM-PDK**

This user's guide describes the operation and use of the [ADS8339](#) evaluation module (EVM). The ADS8339 is a 16-bit, pseudo-differential, unipolar, successive approximation register (SAR), analog-to-digital converter (ADC) with a maximum throughput of 250-KSPS. The device is a very low-power ADC with excellent noise and distortion performance for ac or dc signals. The performance demonstration kit (PDK) eases EVM evaluation with additional hardware and software for computer connectivity through a universal serial bus (USB). The [ADS8339EVM-PDK](#) includes the ADS8339EVM as a daughter card, MMB0 motherboard, and an A-to-B USB cable. This user's guide covers circuit description, schematic diagram, and bill of materials for the ADS8339EVM daughter card. Throughout this document, the abbreviation EVM and the term evaluation module are synonymous with the ADS8339EVM-PDK.

The following related documents are available through the Texas Instruments web site at [www.ti.com](http://www.ti.com).

### Related Documentation

Device	Literature Number
<a href="#">ADS8339</a>	<a href="#">SBAS677</a>
<a href="#">OPA333</a>	<a href="#">SBOS351</a>
<a href="#">OPA376</a>	<a href="#">SBOS406</a>
<a href="#">OPA836</a>	<a href="#">SLOS712</a>
<a href="#">REF5045</a>	<a href="#">SBOS410</a>
<a href="#">THS4281</a>	<a href="#">SLOS432</a>

ADCPro is a trademark of Texas Instruments.  
 Windows is a registered trademark of Microsoft Corporation.  
 SPI is a trademark of Motorola, Inc.  
 Samtec is a trademark of Samtec, Inc.  
 All other trademarks are the property of their respective owners.

## Contents

1	ADS8339EVM-PDK Overview .....	3
2	EVM Analog Interface .....	4
3	EVM Digital Interface .....	6
4	EVM Power-Supply Inputs.....	7
5	EVM Digital Configuration .....	8
6	PDK Kit Setup .....	9
7	PDK Kit Operation.....	12
8	Bill of Materials, Layout, and Schematic .....	15

## List of Figures

1	Bipolar-Input Signal Configuration .....	4
2	Unipolar-Input Signal Configuration .....	4
3	THS4281 Reference Driver with Complementary OPA333 for Drift and Offset Correction .....	5
4	Serial 3-Wire Configuration.....	8
5	Serial 4-Wire Configuration.....	8
6	MMB0 Driver Installer .....	9
7	Plug-In Installer .....	10
8	MMB0 Motherboard Jumper Configuration .....	11
9	ADS8339EVM Jumper Configuration.....	11
10	Loading EVM Plug-In .....	12
11	ADS8339EVM Plug-In: Device-Configuration Tab.....	13
12	ADCPro Test Plug-ins .....	14
13	ADS8339EVM PCB: Top Layer .....	16
14	ADS8339EVM PCB: Ground Layer .....	16
15	ADS8339EVM PCB: Power Layer .....	17
16	ADS8339EVM PCB: Bottom Layer .....	17
17	Schematic .....	18

## List of Tables

1	Analog Inputs.....	4
2	J2: Serial Interface Header .....	6
3	J3: Power-Supply Interface Header .....	7
4	ADS8339EVM Bill of Materials .....	15

## 1 ADS8339EVM-PDK Overview

The ADS8339EVM is an evaluation module built to TI's modular EVM specifications; for more information, see [SLAA185](#), *Designing Modular EVMs for Data Acquisition Products*. The EVM by itself has no microprocessor and cannot run software. The EVM is available as part of the ADS8339EVM-PDK kit that combines the ADS8339EVM as a daughterboard with the digital signal processor (DSP) based MMB0 motherboard using ADCPro™ software as a graphical user interface (GUI).

ADCPro software collects, records, and analyzes data from ADC evaluation boards. ADCPro also runs different plug-in programs to easily expand testing and data collection capabilities. In combination with the ADS8339EVM plug-in program, ADCPro offers a comprehensive evaluation environment for the ADS8339. For more details on ADCPro, see [SBAU128](#), *ADCPro Analog-to-Digital Converter Evaluation Software User's Guide*, available for download from [www.ti.com](http://www.ti.com).

### 1.1 ADS8339EVM Daughterboard Features

- Includes support circuitry as a design example to match ADC performance
- 3.3-V slave serial peripheral interface (SPI™)
- Serial interface header for easy connection to TI DSP-based communication systems
- Compatible with the TI Modular EVM system
- Designed for 5-V analog supply
- Onboard 4.5-V voltage reference
- Bipolar (–2.15 V to +2.15 V) or unipolar (0.1 V to 4.4 V) input range

### 1.2 ADS8339EVM-PDK Kit Additional Features

- USB port for computer interfacing
- Regulated 5-V and 3.3-V supplies for powering EVM daughterboard
- Easy-to-use evaluation software for Windows® operating system
- Data collection to text files
- Built-in analysis tools including scope, FFT, and histogram displays
- Easily expandable with new analysis plug-in tools from Texas Instruments

## 2 EVM Analog Interface

The ADS8339EVM is designed to easily interface to multiple analog sources. SMA connectors allow the EVM to have input signals connected through coaxial cables. In addition, the Samtec™ connector provides a convenient 10-pin, dual-row, header and socket combination at J1. Consult Samtec at [www.samtec.com](http://www.samtec.com) or call 1-800-SAMTEC-9 for a variety of mating connector options. The analog inputs are buffered by an [OPA836](#) high-speed operational amplifier in order to properly drive the ADS8339 ADC input.

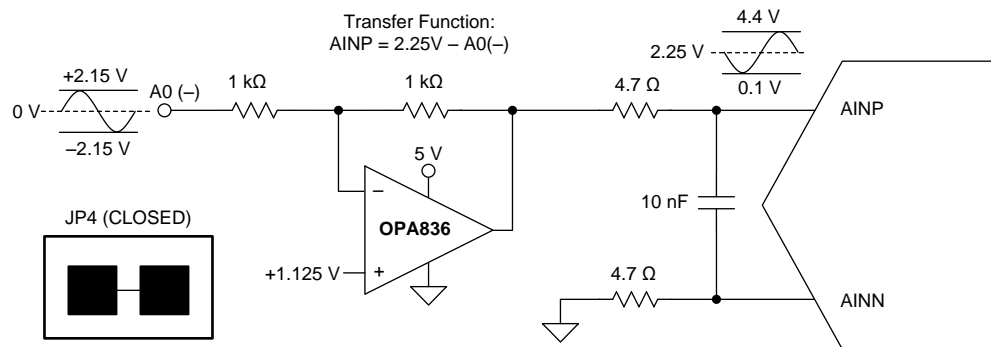
Use appropriate caution when handling these pins. [Table 1](#) summarizes the pinout for analog interface J1.

**Table 1. Analog Inputs**

Connector	Pin Number	Signal	Description
Samtec 10 x 2	J1.10	A0(-)	CH0 inverted EVM input
SMA	J4	A0(-)	CH0 inverted EVM input

### 2.1 Bipolar-Input Signal Configuration

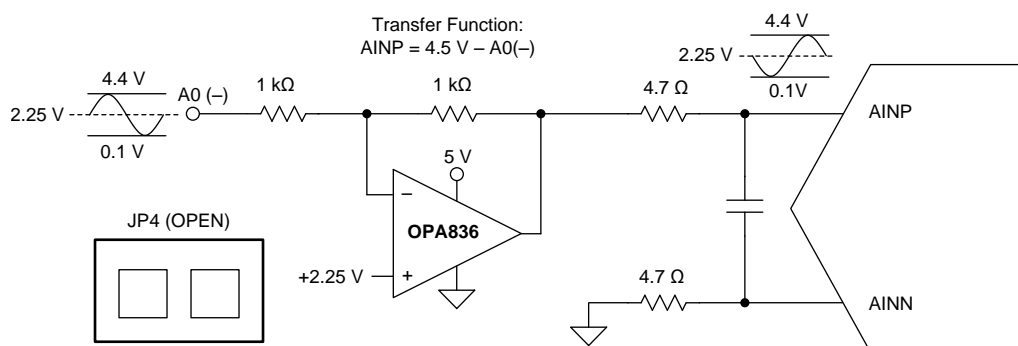
With JP4 closed, the OPA836 positive input is biased with 1.125 V, created by dividing the 4.5-V onboard reference by four. This bias becomes a 2.25-V offset at the output of the OPA836 that allows input signals with a 0-V common mode voltage. To keep the OPA836 distortion as low as possible, limit the input signal swing from -2.15 V to +2.15 V, as shown in [Figure 1](#).



**Figure 1. Bipolar-Input Signal Configuration**

### 2.2 Unipolar-Input Signal Configuration

With JP4 open, the OPA836 positive input is biased with +2.25 V, created by dividing the 4.5-V onboard reference by two. This bias becomes a 4.5-V offset at the output of the OPA836 that allows input signals with a 2.25-V common mode voltage. To keep the OPA836 distortion as low as possible, limit the input signal swing from +0.1 V to +4.4 V, as shown in [Figure 2](#).



**Figure 2. Unipolar-Input Signal Configuration**

### 2.3 Voltage Reference

Because the EVM is powered by a 5-V analog supply, make sure to use a value below 5 V for the reference. This EVM uses a 4.5-V reference, created by the onboard REF5045, as shown in Figure 3. The REF5045 output is filtered by an RC filter with a 160-Hz cutoff frequency to minimize noise contribution. The EVM is buffered by the THS4281, which drives the 10  $\mu$ F capacitor required at the ADC reference input. The OPA333 with additional feedback is optional, but does complement the THS4281, and minimizes offset and drift.

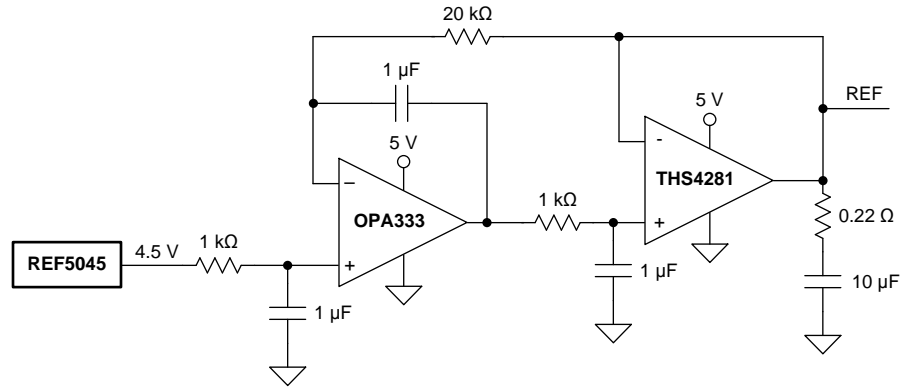


Figure 3. THS4281 Reference Driver with Complementary OPA333 for Drift and Offset Correction

### 3 EVM Digital Interface

Samtec part numbers SSW-110-22-F-D-VS-K and TSM-110-01-L-DV-P provide convenient 10-pin, dual-row, header and socket combinations at P1. The header and socket provide access to the ADC digital control pins. Consult Samtec at [www.samtec.com](http://www.samtec.com) or call 1-800-SAMTEC-9 for a variety of mating connector options.

Table 2 summarizes the pinouts for digital interface J2.

**Table 2. J2: Serial Interface Header**

Pin Number	Signal	Description
J2.1	$\overline{\text{CS}}$ or CONVST	Chip-select input that can be used as a convert start
J2.3	SCLK	Serial clock input
J2.7	$\overline{\text{CS}}$ or CONVST	Input used as convert start by the MMB0 motherboard
J2:13	SDO or MISO	SDO or MISO output
J2.15	INT	Interrupt output for detecting end of conversion with BUSY bit
J2.17	CONVST	Direct connection to the convert start pin if JP3 is installed
J2.4, J2.10, and J2.18	GND	Grounded pins
J2.16, J2.20	I <sup>2</sup> C bus	I <sup>2</sup> C bus; used only to program the U4 EEPROM on the EVM board
J2.2, J2.5-6, J2.8-9, J2.11-12, J2.14, and J2:19	Unused	Unused

#### 3.1 Serial Interface (SPI)

The ADS8339 ADC uses SPI serial communication to send conversion results to the MMB0 motherboard, and subsequently, to a computer using universal serial bus (USB). The serial clock signal (SCLK) is created by the MMB0 motherboard as the SPI host, with a frequency that is programmable up to 25-MHz to obtain the maximum sampling rate of 250-kSPS.

#### 3.2 I<sup>2</sup>C Bus for Onboard EEPROM

The ADS8339EVM has an I<sup>2</sup>C bus used by the MMB0 motherboard to communicate with the onboard EEPROM. The bus is not used in any form by the ADS8339 converter.

## 4 EVM Power-Supply Inputs

J3 is the power-supply input connector. [Table 3](#) lists the configuration details for J3.

**Table 3. J3: Power-Supply Interface Header**

Pin Number	Pin Name	Function	Required
J3.3	+5VA	5-V analog supply	Yes
J3.5	GND	Analog and digital ground (single ground board)	Yes
J3.6	GND	Analog and digital ground (single ground board)	Yes
J3.7	+ 1.8VD	1.8-V digital supply	No
J3.9	+3.3VD	3.3-V digital supply	Yes
J3.10	+5VD	5-V digital supply	Optional
P3.1-2, P3.4, and P3.7-8	Unused	Unused	No

### 4.1 Analog Power Options

The ADS8339EVM board functions with a 5-V supply provided at J3.3 by the MMB0 motherboard, powering the onboard reference, op amps, and the analog supply of the ADS8339.

### 4.2 Digital Power Options

The ADS8339EVM connects the digital power supply of the ADS8339 to +3.3VD (J3.10) to match the 3.3-V logic level of the MMB0 motherboard.

### 4.3 Analog and Digital Grounds

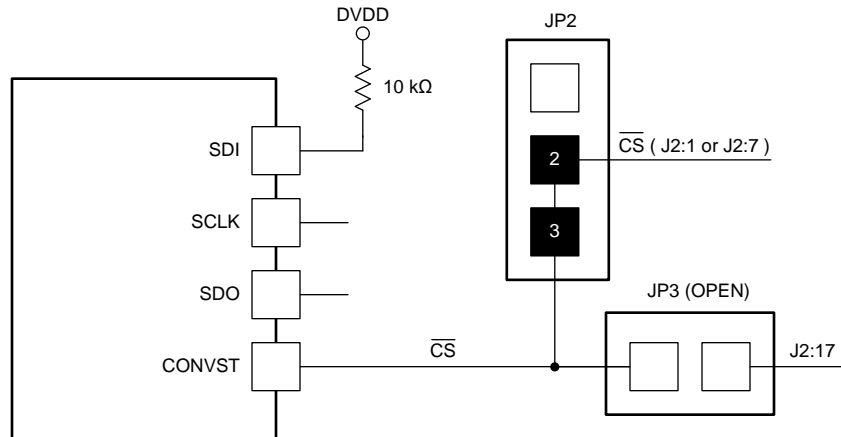
The EVM only has one ground plane for all analog and digital supplies; pins J3.5 and J3.6 are tied together to this ground plane. Therefore, connect both supply grounds to pins J3.5 and J3.6 so they share the same ground.

## 5 EVM Digital Configuration

The EVM offers two jumpers (JP2 and JP3) to configure the EVM in either 3-wire SPI mode or 4-wire SPI mode.

### 5.1 SPI 3-Wire Mode (JP2:2–3 and JP3:OPEN)

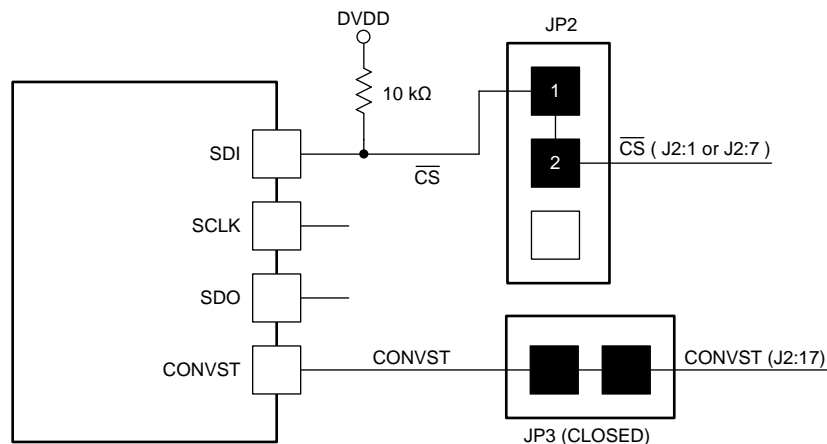
This mode is used to communicate with the MMB0 motherboard. Use the chip-select signal to bring the ADS8339 digital output out of tri-state mode and initialize conversions. The rising edge of the chip-select signal starts a conversion, and after the conversion time, the falling edge of the chip-select signal brings the digital output out of tri-state mode. [Figure 4](#) shows the serial configuration for this mode.



**Figure 4. Serial 3-Wire Configuration**

### 5.2 SPI 4-Wire Mode (JP2:1–2 and JP3:CLOSED)

The chip-select signal is used to bring the ADS8339 digital output out of tri-state. However, conversion is initialized from J3:17 as an independent signal. The rising edge of J3:17 (CONVST) starts a conversion, and after the conversion time, the falling edge of the chip-select signal brings the digital output out of tri-state. [Figure 5](#) shows the serial configuration for this mode.



**Figure 5. Serial 4-Wire Configuration**



## 6 PDK Kit Setup

**NOTE:** Do not connect the ADS8339EVM-PDK to a PC before completing [Section 6](#). Failure to observe this caution may cause Microsoft Windows to disregard the ADS8339EVM-PDK as a connected device.

This section presents the steps required to setup the ADS8339EVM-PDK kit before operation. [Section 7](#) explains how to operate the kit to acquire and analyze data.

The steps to setup the kit are as follows and must be completed before attempting to capture data:

- Step 1. Download and install the ADCPro software (if not already installed) on a PC.
- Step 2. Download and install MMB0 motherboard drivers.
- Step 3. Download and install the ADS8339EVM-PDK EVM plug-in software.
- Step 4. Configure the ADS8339EVM-PDK hardware.
- Step 5. Power up the ADS8339EVM-PDK.

Each task is described in the subsequent sections of this document.

### 6.1 Install ADCPro Software

ADCPro is the primary program used to evaluate the ADS8339. ADCPro is available at [www.ti.com/tool/adcpro](http://www.ti.com/tool/adcpro). Refer to [SBAU128](#), *ADCPro User's Guide*, for detailed installation instructions.

### 6.2 Install MMB0 Motherboard Drivers

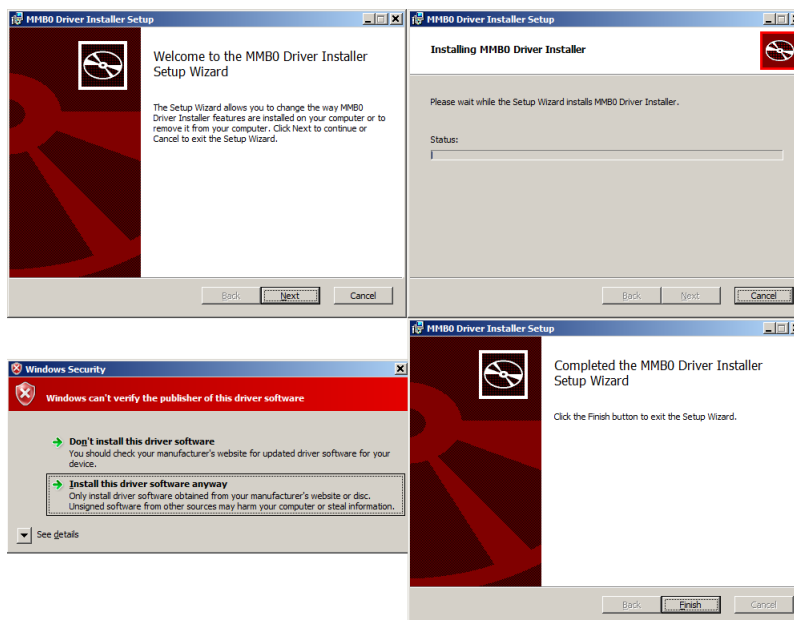
**NOTE:** The user must have administrator privileges before attempting to install the MMB0 motherboard drivers.

The driver installer is located at TI's FTP site:

[ftp://ftp.ti.com/pub/data\\_acquisition/ADCPro2/misc/drivers/64bit/mmb0\\_driver\\_install\\_x64-v1.0.0.0.msi](ftp://ftp.ti.com/pub/data_acquisition/ADCPro2/misc/drivers/64bit/mmb0_driver_install_x64-v1.0.0.0.msi).

Download and double-click the file, and then follow the instructions.

[Figure 6](#) shows the initial and completed installer screen shots.



**Figure 6. MMB0 Driver Installer**

### 6.3 Install ADS8339EVM-PDK Plug-In Software

**NOTE:** Install ADCPro before installing the ADS8339EVM-PDK plug-in software.

The installation file link for the PDK plug-in is in the ADS8339EVM-PDK product folder at [www.ti.com/tool/ADS8339evm-pdk](http://www.ti.com/tool/ADS8339evm-pdk). In the software section, look for a link with a file named **ads8339evm-adcproplugin-<version #>.exe**, where <version #> refers to the installation file version number, and increments with software version releases. Download and double-click the file, and then follow the instructions.

Figure 7 shows the initial and completed installer screen shots.

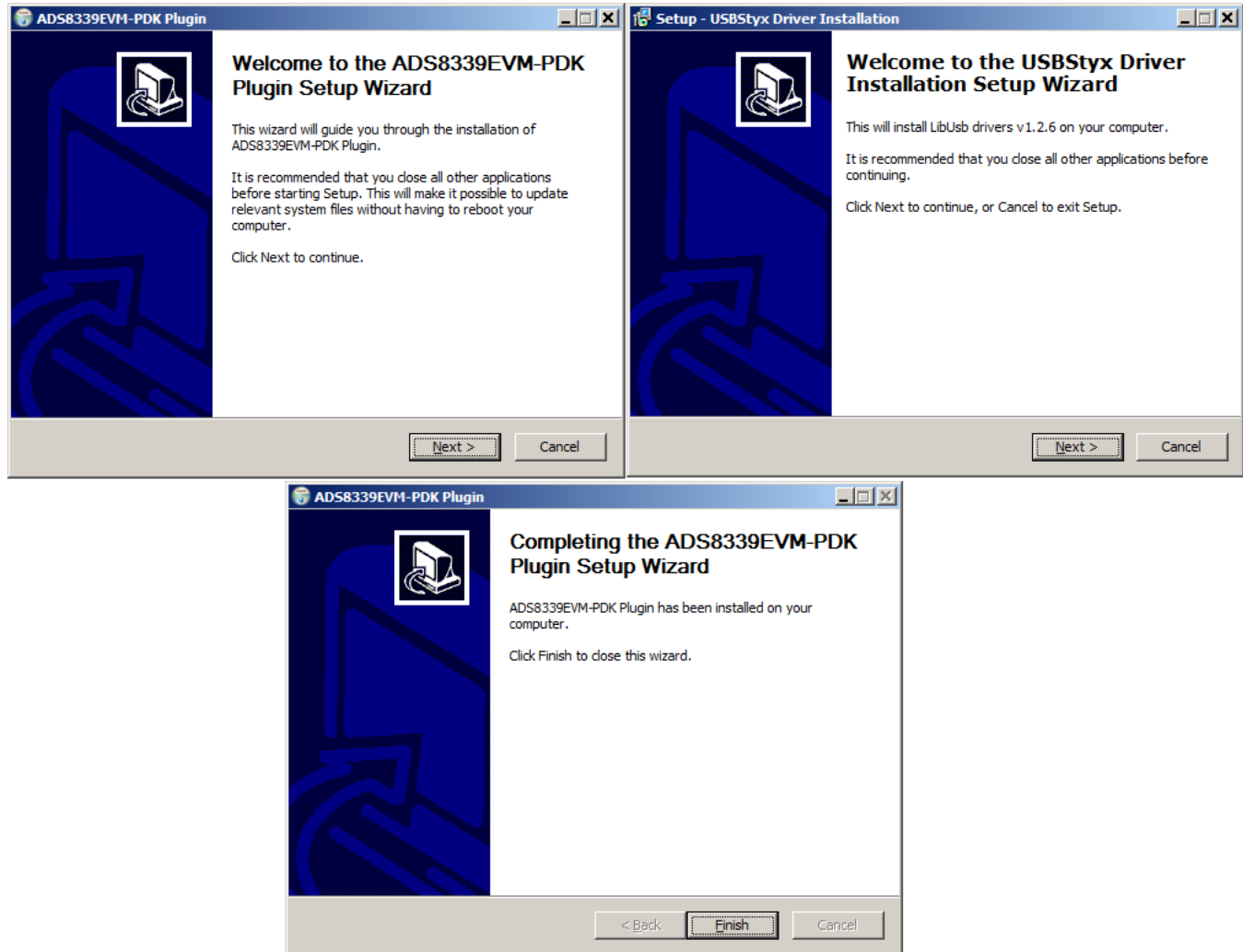


Figure 7. Plug-In Installer

### 6.4 Configure ADS8339EVM-PDK Hardware

The ADS8339EVM-PDK contains both the ADS8339EVM and the MMB0 motherboard; however, the devices may be shipped unconnected or configured incorrectly. Follow these steps to verify that the ADS8339EVM-PDK kit is properly configured and connected:

- Step 1. Unpack the ADS8339EVM-PDK kit.
- Step 2. Set J12 to closed, J13A to open, and J13B to closed on the MMB0, as shown in [Figure 8](#).
  - J12 must be closed. This setting allows the wall supply to power up the MMB0 and ADS8339EVM through J2 (6-VDC input), and the onboard LDOs to regulate the input down to 5 V, 3.3 V, and 1.8 V.
  - J13B must be closed. This setting connects the 5-V analog power supply with the 5-V digital power supply.
  - J13A must be opened. This setting allows the 5-V analog power supply to be regulated on board.

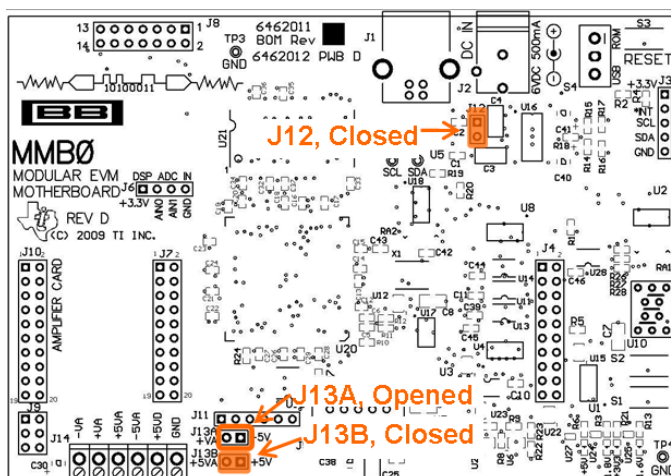


Figure 8. MMB0 Motherboard Jumper Configuration

- Step 3. Set JP1:2–3, JP2:2–3, JP3:open, and JP4:closed on the ADS8339EVM, as shown in [Figure 9](#).

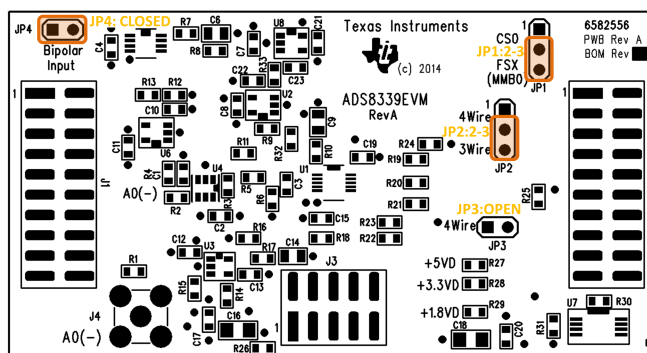


Figure 9. ADS8339EVM Jumper Configuration

- Step 4. Plug the ADS8339EVM into the MMB0.

**CAUTION**

To avoid damage to the EVM, do not misalign the pins when plugging the ADS8339EVM into the MMB0. Check the pin alignment carefully before applying power to the PDK.

## 6.5 Power Up ADS8339EVM-PDK

When the ADS8339EVM-PDK kit is configured, power can be applied to the MMB0. This power comes from a wall supply that delivers 6 VDC to the MMB0 through J2 on the MMB0 motherboard. The wall power supply adapter is not included with this PDK. TI recommends using an external power-supply adapter that complies with the applicable regional safety standards (such as UL, CSA, VDE, PSE, and so forth). The functional requirements of the power-supply adapter are as follows:

- Nom output voltage: 5.6 VDC to 15 VDC
- Current capacity: 500 mA or more
- Uses a 2.5-mm center positive barrel connector for mating with the on-board power jack

After the power supply is connected, four green light-emitting diodes (LEDs) in the bottom right-hand corner of the MMB0 motherboard light up. If these LEDs do not light up, disconnect the power and verify that J12 is closed on the MMB0 motherboard.

## 7 PDK Kit Operation

The evaluation software is based on ADCPro. This program operates with a variety of plug-ins. To use ADCPro, load an EVM plug-in and a test plug-in (select these plug-ins from the EVM and test menus, respectively). To unload a plug-in, select the unload option from the corresponding menu.

The following sections describe how to use ADCPro and the ADS8339EVM plug-in to acquire data.

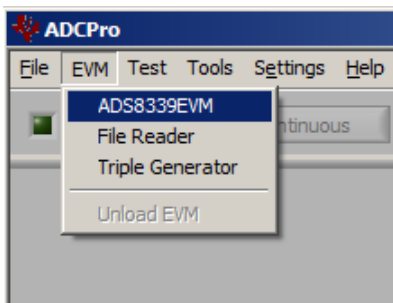
### 7.1 About MMB0

The MMB0 is a modular EVM system motherboard. The MMB0 provides the USB interface between the PC and the ADS8339EVM. The MMB0 is designed around the [TMS320VC5509](#), a DSP with an onboard USB interface from Texas Instruments. The MMB0 also has 16 MB of SDRAM installed.

The MMB0 is not sold as a DSP development board, and is not available separately. TI cannot offer support for the MMB0 except as part of an EVM kit. For schematics or other information about the MMB0, contact Texas Instruments.

### 7.2 Load ADS8339EVM-PDK Plug-In

- Step 1. Make sure the PDK kit is configured and powered up, as explained in [Section 6](#). Then, press the *Reset* button on the MMB0 (in the top right-hand corner) one time to clear the board memory.
- Step 2. Connect the MMB0 to a PC using the USB cable provided with the kit.
- Step 3. Start ADCPro from the Windows *Start* menu.
- Step 4. Load the ADS8339EVM plug-in from the ADCPro *EVM* drop-down menu, as shown in [Figure 10](#). Note that only one EVM plug-in can be loaded at a time. If a different plug-in is selected, the previous plug-in is unloaded and the MMB0 restarted.



**Figure 10. Loading EVM Plug-In**

- Step 5. When the plug-in is loaded, the plug-in searches for the board. A series of messages in the status area indicates this action, eventually displaying *Connected to EVM*.

The plug-in is now loaded and ready to function with the ADS8339EVM.

### 7.3 ADS8339EVM Plug-In Operation

Figure 11 shows the device-configuration tab of the ADS8339EVM plug-in that is used to change acquisition parameters, such as sample rate and voltage reference.

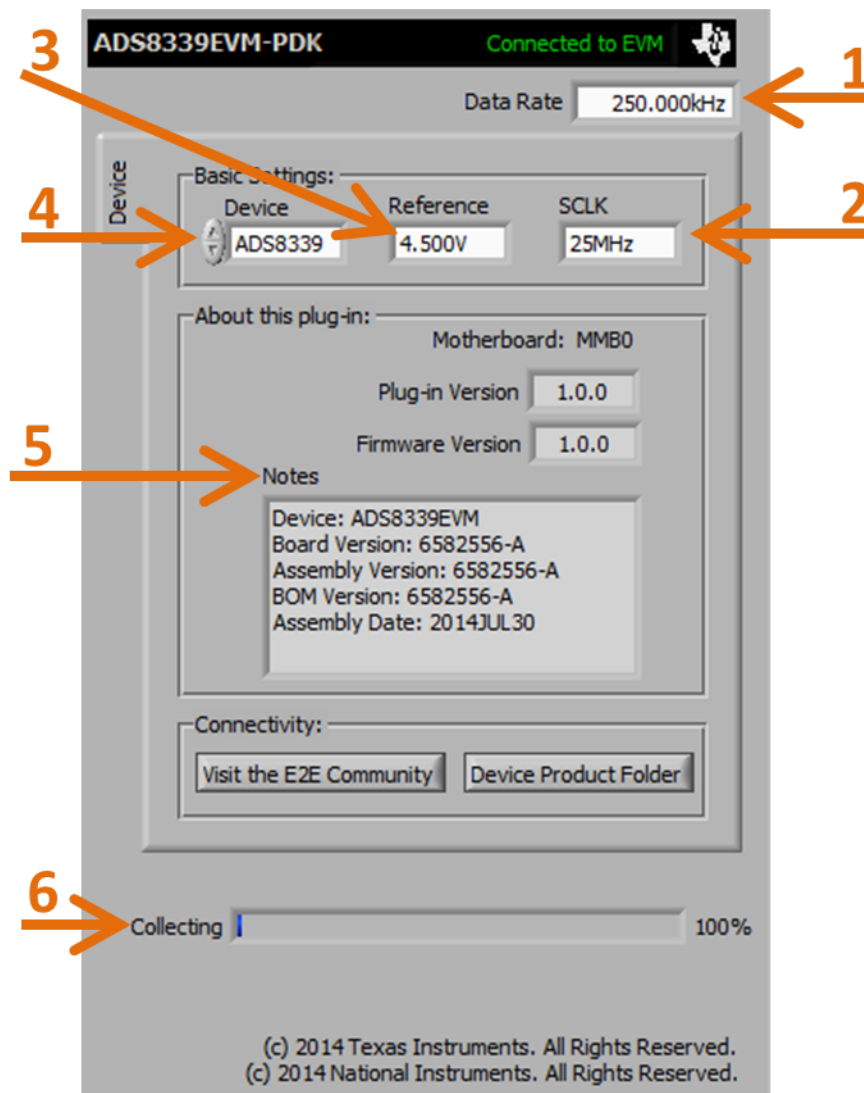


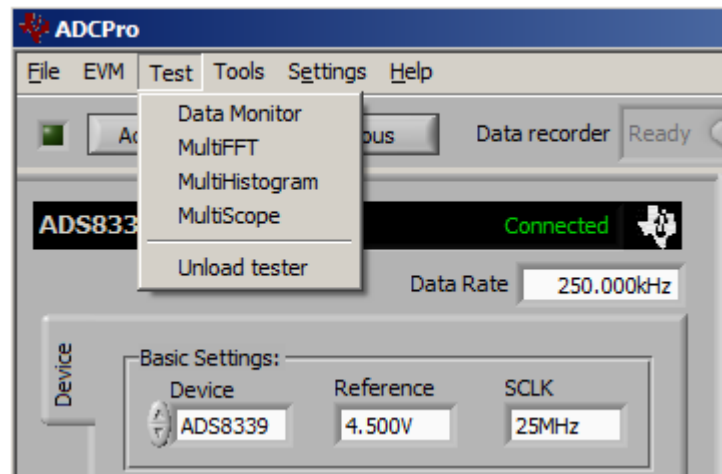
Figure 11. ADS8339EVM Plug-In: Device-Configuration Tab

The device-configuration tab contains the following controls:

1. **Data Rate:** By default, the data rate is at 250-KSPS. This control shows the data rate or sampling frequency used by the ADC to acquire data. With SCLK frequency at 25-MHz, set data rate to a value from 6.105-KSPS to 250-KSPS. With SCLK frequency at 400 KHz, set the data rate to a value from 3.960-kSPS to 21.052-kSPS.
2. **SCLK:** By default, SCLK is at 25-MHz. SCLK sets the clock frequency used by the SPI interface to capture data. Note that reducing SCLK frequency also reduces the maximum data rate.
3. **Reference:** 4.5 V is the default reference value, and matches the onboard reference of the EVM. To read accurate voltages, set the value of this control to be the exact value of the reference.
4. **Device:** ADS8339 is the only device available for this plug-in.
5. **About this plug-in:** This control shows the plug-in version, MMB0 firmware version, assembly date, and board revision information.
6. **Collecting:** This feature shows the percentage of data collected during an acquisition session.

## 7.4 Load Test Plug-in

When the ADS8339EVM plug-in is configured, to acquire data, use the *Test* drop-down menu to load one of the four test plug-ins, as shown in [Figure 12](#). Note that only one test plug-in can be loaded at a time. If a different plug-in is selected, the previous plug-in is unloaded.



**Figure 12. ADCPro Test Plug-ins**

There are four different test options available for the ADS8339EVM:

- **Data Monitor:** This test option acquires and exports data in a table format as hexadecimal data.
- **MultiFFT:** This test option acquires data and create an FFT graph of power versus frequency to display data.
- **MultiHistogram:** This option acquires data and creates a histogram of code values.
- **MultiScope:** This feature acquires and displays data in a graph of voltage versus time.

For further details regarding how to set up and use the various test plug-ins, refer to [SBAU128](#), *ADCPro User's Guide*.

## 7.5 Acquire Data

When the ADS8339EVM is configured for the desired test scenario, press the *Acquire* button to start the data collection process. The software collects the number of data points located in the test plug-in *Block Size* field (512 by default; see [SBAU128](#)). During data acquisition, the ADS8339EVM plug-in disables all front-panel controls and the collection process bar displays the completion progress.

## 7.6 Troubleshooting

If the ADS8339EVM plug-in cannot find the ADS8339EVM-PDK, press the *RESET* button on the MMB0 and try again.

If ADCPro stops responding while the ADS8339EVM-PDK is connected, shut down and restart the ADCPro software. If restarting the software does not restore functionality, unplug the USB cable from the MMB0 and then plug the cable back in.

## 8 Bill of Materials, Layout, and Schematic

The bill of materials is provided in [Table 4](#). [Section 8.2](#) shows the printed circuit board (PCB) layout for the ADS8339EVM. [Section 8.3](#) shows the schematic for the ADS8339EVM.

### 8.1 Bill of Materials

**NOTE:** All components should be compliant with the European Union Restriction on Use of Hazardous Substances (RoHS) directive. Some part numbers may be either leaded or RoHS. Verify that purchased components are RoHS-compliant. (For more information about TI's position on RoHS compliance, refer to [www.ti.com](http://www.ti.com).)

**Table 4. ADS8339EVM Bill of Materials**

Item No.	Qty	Value	Ref Des	Description	Manufacturer	Part Number
1	1	—		Printed Circuit Board, 3.2 in x 1.7 in. x 0.062 in.	Texas Instruments	6582556
2	8	1 $\mu$ F	C1, C4, C7, C10, C15, C19, C22, C23	Capacitor, X7R Ceramic +/-10%, 25WV, 0603	Murata	GRM188R71E105KA12D
3	4	0.1 $\mu$ F	C2, C8, C11, C21	Capacitor, X7R Ceramic +/-10%, 25WV, 0603	Murata	GRM188R71E104KA01D
4	1	10000 pF	C3	Capacitor, C0G Ceramic +/-5%, 50WV, 0603	TDK	C1608C0G1H103J
5	2	10 $\mu$ F	C6, C9	Capacitor, X7R Ceramic +/-10%, 10WV, 0805	Murata	GRM21BR71A106KE51L
6	3	—	C12, C13, C14	Do Not Install (DNI)	—	—
7	2	10 $\mu$ F	C16, C18	Capacitor, X7R Ceramic +/-10%, 16WV, 1206	TDK	C3216X7R1C106K
8	2	1000 pF	C17, C20	Capacitor, C0G Ceramic +/-5%, 50WV, 0603	Murata	GRM1885C1H102JA01D
9	2	—	J1, J2 (Top)	Header 20 Pin SMT Plug, .100" Gold (2x10)	Samtec	TSM-110-01-L-DV-P
10	2	—	J1, J2 (Bottom)	Header 20 Pin SMT Socket, .100" Gold (2x10)	Samtec	SSW-110-22-F-D-VS-K
11	1	—	J3 (Top)	Header 10 Pin SMT Plug, .100" Gold (2x5)	Samtec	TSM-105-01-L-DV-P
12	1	—	J3 (Bottom)	Header 10 Pin SMT Socket, .100" Gold (2x5)	Samtec	SSW-105-22-F-D-VS-K
13	1	—	J4	CONN SMA JACK STRAIGHT PCB	Amphenol	132134
14	2	—	JP1, JP2	Header Strip, 3 pin .100" Gold (1x3)	Samtec	TSW-103-07-L-S
15	2	—	JP3, JP4	Header Strip, 2 pin .100" Gold (1x2)	Samtec	TSW-102-07-L-S
16	7	—	R1, R14, R15, R17, R27, R29, R30	Do Not Install (DNI)	—	—
17	2	1k	R2, R3	Resistor, Metal Film Chip, 0.1%, 1/10W, 0603	Panasonic	ERA-3AEB102V
18	1	100	R4	Resistor, Thick Film Chip, 1%, 1/10W, 0603	Panasonic	ERJ-3EKF1000V
19	2	4.7	R5, R6	Resistor, Thick Film Chip, 1%, 1/10W, 0603	Vishay/Dale	CRCW06034R70FKEA
20	2	0.22	R7, R10	Resistor, Thin Film Chip, 1%, 1/5W, 0603	Susumu	RL0816S-R22-F
21	2	1k	R8, R33	Resistor, Thick Film Chip, 1%, 1/10W, 0603	Panasonic	ERJ-3EKF1001V
22	2	10	R9, R18	Resistor, Thick Film Chip, 1%, 1/10W, 0603	Vishay/Dale	CRCW060310R0FKEA
23	3	20k	R11, R12, R32	Resistor, Metal Film Chip, 0.1%, 1/10W, 0603	Panasonic	ERA-3AEB203V
24	1	10k	R13	Resistor, Metal Film Chip, 0.1%, 1/10W, 0603	Panasonic	ERA-3AEB103V
25	4	0	R16, R21, R26, R28	Resistor, Thick Film Chip, 1/10W, 0603	Panasonic	ERJ-3GEY0R00V
26	5	47	R19, R20, R22, R23, R31	Resistor, Thick Film Chip, 1%, 1/10W, 0603	Panasonic	ERJ-3EKF47R0V
27	2	10k	R24, R25	Resistor, Thick Film Chip, 1%, 1/10W, 0603	Panasonic	ERJ-3EKF1002V
28	1	—	U1	IC ADC 16BIT 1MSPS PSEUDO-DIFF 10-MSOP	Texas Instruments	ADS8339IDGS
29	1	—	U2	IC OPAMP VFB R-R 95MHZ SOT23-5	Texas Instruments	THS4281DBV
30	1	—	U3	Do Not Install (DNI)	—	—
31	1	—	U4	IC OPAMP VFB RRO 205MHZ SOT23-6	Texas Instruments	OPA836IDBV
32	1	—	U5	IC VREF SERIES PREC 4.5V 8-MSOP	Texas Instruments	REF5045IDGK
33	1	—	U6	IC OPAMP GP 5.5MHZ SGL SOT23-5	Texas Instruments	OPA376AIDBV
34	1	—	U7	IC EEPROM 256KBIT 400KHZ 8TSSOP	Microchip	24LC256-I/ST
35	1	—	U8	IC OPAMP CHOP R-R 350KHZ SOT23-5	Texas Instruments	OPA333AIDBV

## 8.2 PCB Layout

Figure 13 through Figure 16 show the PCB layout for the ADS8339EVM.

**NOTE:** Board layouts are not to scale. These figures are intended to show how the board is laid out; they are not intended to be used for manufacturing ADS8339EVM PCBs.

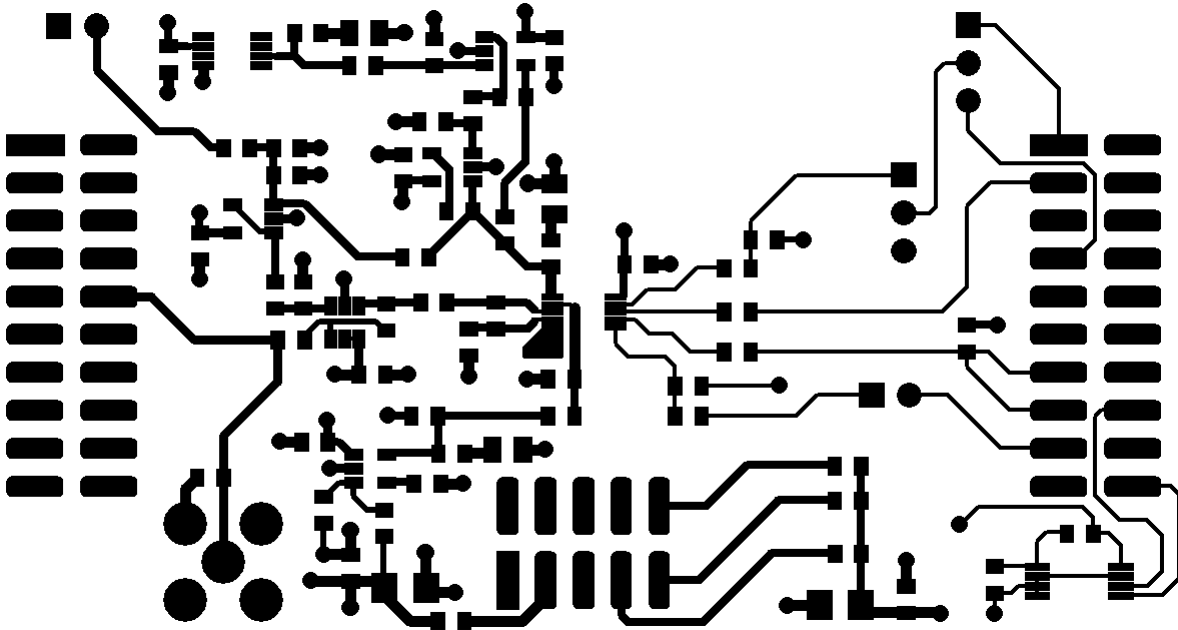


Figure 13. ADS8339EVM PCB: Top Layer

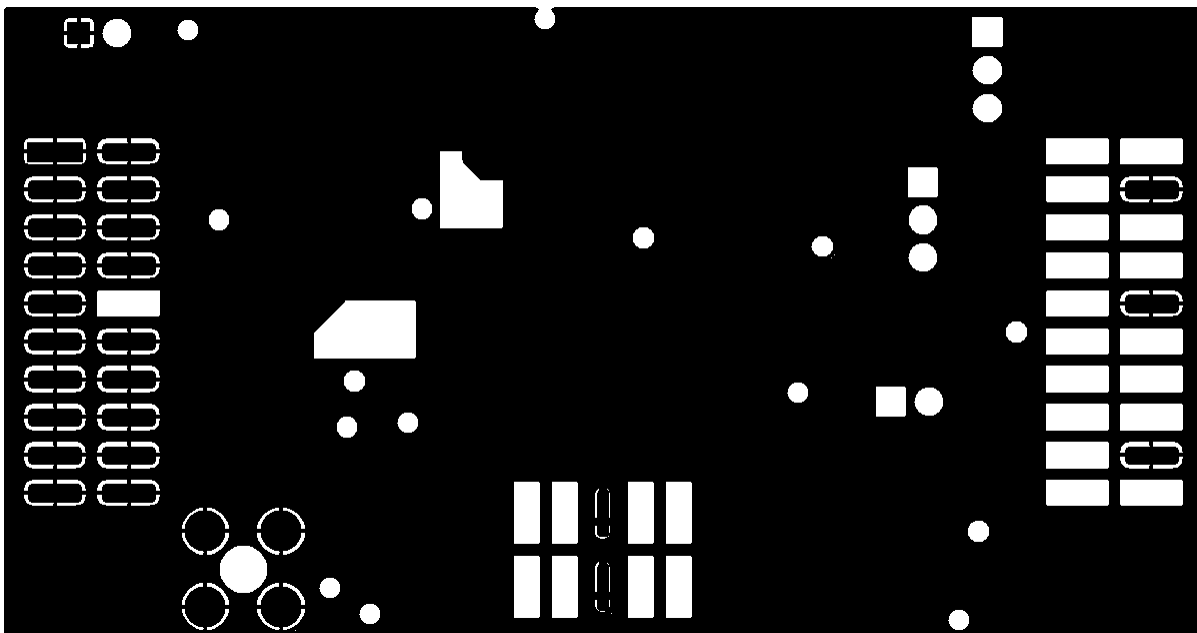


Figure 14. ADS8339EVM PCB: Ground Layer



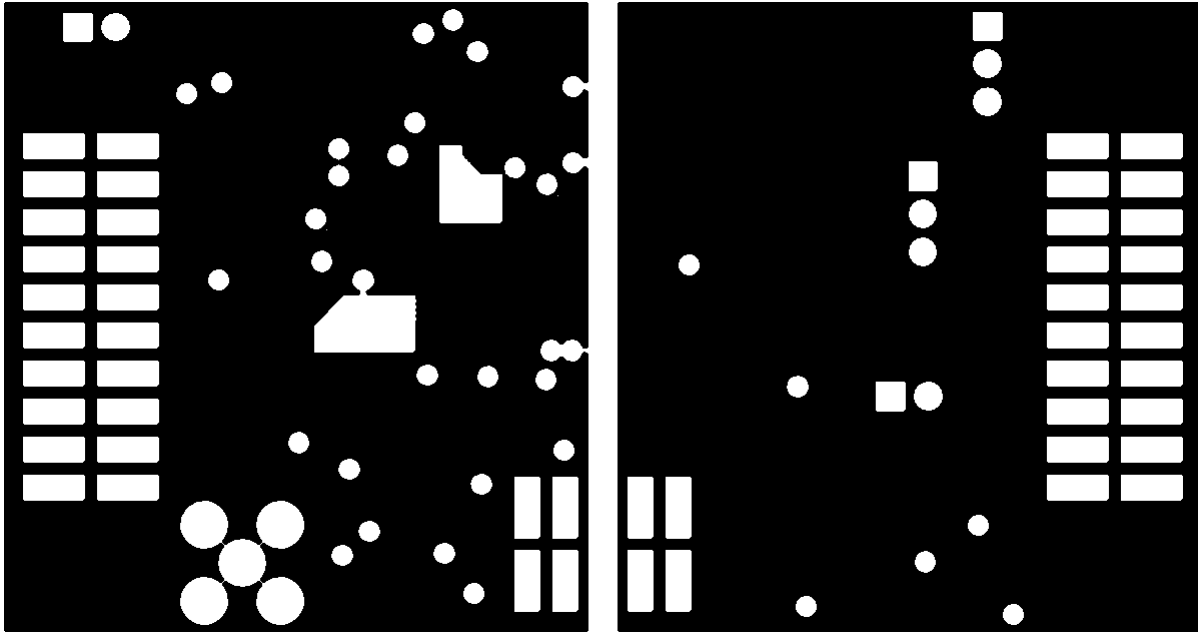


Figure 15. ADS8339EVM PCB: Power Layer

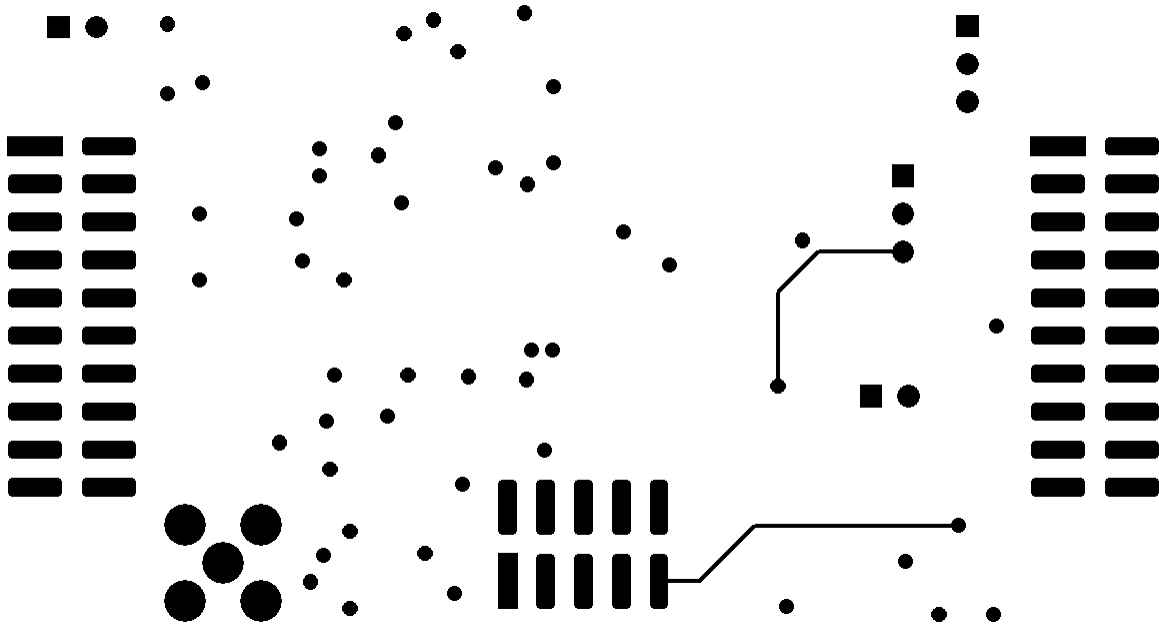
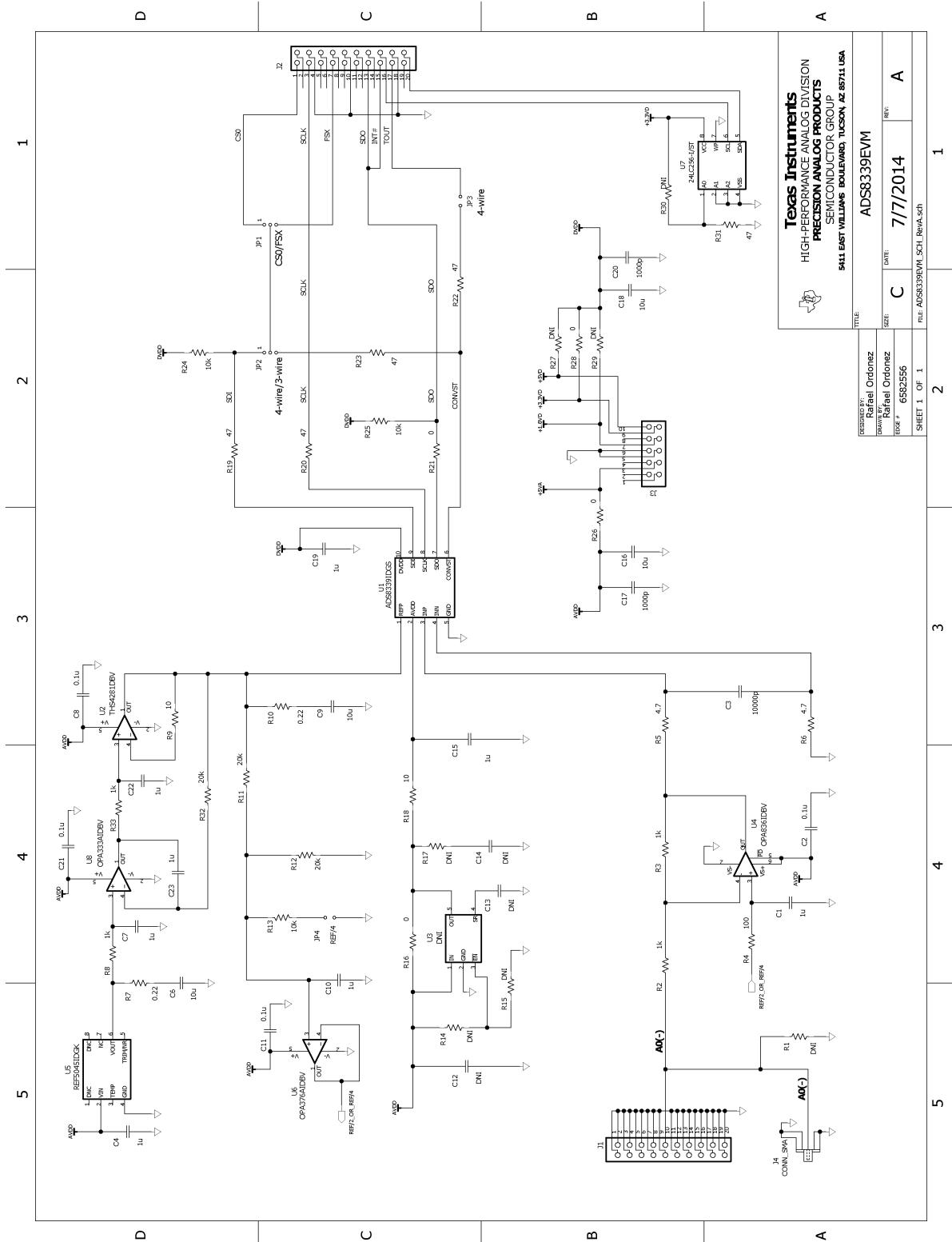


Figure 16. ADS8339EVM PCB: Bottom Layer

**8.3 Schematic**



---

## Revision History

<b>Changes from Original (October 2014) to A Revision</b>	<b>Page</b>
• Changed list of items included in the ADS8339EVM-PDK in first paragraph .....	1
• Changed first paragraph of <i>Power Up ADS8339EVM-PDK</i> section .....	12

---

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

## STANDARD TERMS AND CONDITIONS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, or documentation (collectively, an "EVM" or "EVMs") to the User ("User") in accordance with the terms and conditions set forth herein. Acceptance of the EVM is expressly subject to the following terms and conditions.
  - 1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductor products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM ("Software") shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms and conditions that accompany such Software
  - 1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.
2. *Limited Warranty and Related Remedies/Disclaimers:*
  - 2.1 These terms and conditions do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.
  - 2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for any defects that are caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI. Moreover, TI shall not be liable for any defects that result from User's design, specifications or instructions for such EVMs. Testing and other quality control techniques are used to the extent TI deems necessary or as mandated by government requirements. TI does not test all parameters of each EVM.
  - 2.3 If any EVM fails to conform to the warranty set forth above, TI's sole liability shall be at its option to repair or replace such EVM, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.
3. *Regulatory Notices:*
  - 3.1 *United States*
    - 3.1.1 *Notice applicable to EVMs not FCC-Approved:*

This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.
    - 3.1.2 *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

*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

*NOTE: 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.

### 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.

#### 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.

#### 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.

### 3.3 Japan

3.3.1 *Notice for EVMs delivered in Japan:* Please see [http://www.tij.co.jp/lstds/ti\\_ja/general/eStore/notice\\_01.page](http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_01.page) 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。  
[http://www.tij.co.jp/lstds/ti\\_ja/general/eStore/notice\\_01.page](http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_01.page)

3.3.2 *Notice for Users of EVMs Considered "Radio Frequency Products" in Japan:* EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required by Radio Law of Japan to follow the instructions below with respect to EVMs:

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
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.

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】 開発キットの中には技術基準適合証明を受けていないものがあります。技術適合証明を受けていないものご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。

1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
2. 実験局の免許を取得後ご使用いただく。
3. 技術基準適合証明を取得後ご使用いただく。

なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。

上記を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。日本テキサス・インスツルメンツ株式会社  
東京都新宿区西新宿 6 丁目 2 4 番 1 号  
西新宿三井ビル

3.3.3 *Notice for EVMs for Power Line Communication:* Please see [http://www.tij.co.jp/llds/ti\\_ja/general/eStore/notice\\_02.page](http://www.tij.co.jp/llds/ti_ja/general/eStore/notice_02.page)  
電力線搬送波通信についての開発キットをお使いになる際の注意事項については、次のところをご覧ください。[http://www.tij.co.jp/llds/ti\\_ja/general/eStore/notice\\_02.page](http://www.tij.co.jp/llds/ti_ja/general/eStore/notice_02.page)

#### 4 *EVM Use Restrictions and Warnings:*

- 4.1 EVMS ARE NOT FOR USE IN FUNCTIONAL SAFETY AND/OR SAFETY CRITICAL EVALUATIONS, INCLUDING BUT NOT LIMITED TO EVALUATIONS OF LIFE SUPPORT APPLICATIONS.
- 4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.
- 4.3 *Safety-Related Warnings and Restrictions:*
  - 4.3.1 User shall operate the EVM within TI's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.
  - 4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.
- 4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5. *Accuracy of Information:* To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.

6. *Disclaimers:*

6.1 EXCEPT AS SET FORTH ABOVE, EVMS AND ANY WRITTEN DESIGN MATERIALS PROVIDED WITH THE EVM (AND THE DESIGN OF THE EVM ITSELF) ARE PROVIDED "AS IS" AND "WITH ALL FAULTS." TI DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING SUCH ITEMS, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADE SECRETS OR OTHER INTELLECTUAL PROPERTY RIGHTS.

6.2 EXCEPT FOR THE LIMITED RIGHT TO USE THE EVM SET FORTH HEREIN, NOTHING IN THESE TERMS AND CONDITIONS SHALL BE CONSTRUED AS GRANTING OR CONFERRING ANY RIGHTS BY LICENSE, PATENT, OR ANY OTHER INDUSTRIAL OR INTELLECTUAL PROPERTY RIGHT OF TI, ITS SUPPLIERS/LICENSORS OR ANY OTHER THIRD PARTY, TO USE THE EVM IN ANY FINISHED END-USER OR READY-TO-USE FINAL PRODUCT, OR FOR ANY INVENTION, DISCOVERY OR IMPROVEMENT MADE, CONCEIVED OR ACQUIRED PRIOR TO OR AFTER DELIVERY OF THE EVM.

7. *USER'S INDEMNITY OBLIGATIONS AND REPRESENTATIONS.* USER WILL DEFEND, INDEMNIFY AND HOLD TI, ITS LICENSORS AND THEIR REPRESENTATIVES HARMLESS FROM AND AGAINST ANY AND ALL CLAIMS, DAMAGES, LOSSES, EXPENSES, COSTS AND LIABILITIES (COLLECTIVELY, "CLAIMS") ARISING OUT OF OR IN CONNECTION WITH ANY HANDLING OR USE OF THE EVM THAT IS NOT IN ACCORDANCE WITH THESE TERMS AND CONDITIONS. THIS OBLIGATION SHALL APPLY WHETHER CLAIMS ARISE UNDER STATUTE, REGULATION, OR THE LAW OF TORT, CONTRACT OR ANY OTHER LEGAL THEORY, AND EVEN IF THE EVM FAILS TO PERFORM AS DESCRIBED OR EXPECTED.

8. *Limitations on Damages and Liability:*

8.1 *General Limitations.* IN NO EVENT SHALL TI BE LIABLE FOR ANY SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF THESE TERMS AND CONDITIONS OR THE USE OF THE EVMS PROVIDED HEREUNDER, REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, COST OF REMOVAL OR REINSTALLATION, ANCILLARY COSTS TO THE PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, RETESTING, OUTSIDE COMPUTER TIME, LABOR COSTS, LOSS OF GOODWILL, LOSS OF PROFITS, LOSS OF SAVINGS, LOSS OF USE, LOSS OF DATA, OR BUSINESS INTERRUPTION. NO CLAIM, SUIT OR ACTION SHALL BE BROUGHT AGAINST TI MORE THAN ONE YEAR AFTER THE RELATED CAUSE OF ACTION HAS OCCURRED.

8.2 *Specific Limitations.* IN NO EVENT SHALL TI'S AGGREGATE LIABILITY FROM ANY WARRANTY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS AND CONDITIONS, OR ANY USE OF ANY TI EVM PROVIDED HEREUNDER, EXCEED THE TOTAL AMOUNT PAID TO TI FOR THE PARTICULAR UNITS SOLD UNDER THESE TERMS AND CONDITIONS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM AGAINST THE PARTICULAR UNITS SOLD TO USER UNDER THESE TERMS AND CONDITIONS SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

9. *Return Policy.* Except as otherwise provided, TI does not offer any refunds, returns, or exchanges. Furthermore, no return of EVM(s) will be accepted if the package has been opened and no return of the EVM(s) will be accepted if they are damaged or otherwise not in a resalable condition. If User feels it has been incorrectly charged for the EVM(s) it ordered or that delivery violates the applicable order, User should contact TI. All refunds will be made in full within thirty (30) working days from the return of the components(s), excluding any postage or packaging costs.

10. *Governing Law:* These terms and conditions shall be governed by and interpreted in accordance with the laws of the State of Texas, without reference to conflict-of-laws principles. User agrees that non-exclusive jurisdiction for any dispute arising out of or relating to these terms and conditions lies within courts located in the State of Texas and consents to venue in Dallas County, Texas. Notwithstanding the foregoing, any judgment may be enforced in any United States or foreign court, and TI may seek injunctive relief in any United States or foreign court.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2015, Texas Instruments Incorporated

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

### Products

Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
DLP® Products	<a href="http://www.dlp.com">www.dlp.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
OMAP Applications Processors	<a href="http://www.ti.com/omap">www.ti.com/omap</a>
Wireless Connectivity	<a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a>

### Applications

Automotive and Transportation	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
Communications and Telecom	<a href="http://www.ti.com/communications">www.ti.com/communications</a>
Computers and Peripherals	<a href="http://www.ti.com/computers">www.ti.com/computers</a>
Consumer Electronics	<a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>
Energy and Lighting	<a href="http://www.ti.com/energy">www.ti.com/energy</a>
Industrial	<a href="http://www.ti.com/industrial">www.ti.com/industrial</a>
Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
Space, Avionics and Defense	<a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a>
Video and Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>

### TI E2E Community

[e2e.ti.com](http://e2e.ti.com)