

# **ADC14DC105EB and ADC12DC105EB Evaluation Boards**

This User's guide applies to the ADC14DC105EB and ADC12DC105EB evaluation boards which are used to evaluate the ADC14DC105 and ADC12DC105 A/D Converters, respectively. These ADCs belong to a family of 12 and 14 bit converters that provide data at rates of up to 105MHz. Further reference in this manual to the ADC14DC105 is meant to also include the other listed parts unless otherwise specified.

The evaluation board is designed to be used with the WaveVision5™ Data Capture Board which is connected to a personal computer through a USB port and running WaveVision5™ software, operating under Microsoft Windows. The software can perform an FFT on the captured data upon command and, in addition to a frequency domain plot, shows dynamic performance in the form of SNR, SINAD, THD SFDR and ENOB. The latest WaveVision 5 data capture board and WaveVision 5 Software is available through the Texas Instruments website.

### Contents

1	Board Assembly .....	1
2	Quick Start .....	3
3	Functional Description .....	3
	3.1 Analog Input .....	3
	3.2 ADC Reference Circuitry .....	4
	3.3 ADC Clock Circuit .....	4
	3.4 Digital Data Output .....	4
	3.5 Data Format/Duty Cycle Stabilizer .....	4
	3.6 Power Supply Connections .....	4
4	Installing the ADC14DC105 Evaluation Board .....	5
5	Evaluation Board Layout .....	6
6	Hardware Schematic .....	10
7	Evaluation Board Bill of Materials .....	13
Appendix A .....		15

### List of Figures

1	Major Component and Jumper Locations .....	2
2	Test Set Up .....	2
3	Analog Input Network for $F_{IN} > 70\text{MHz}$ .....	3
4	Analog Input Network for $F_{IN} < 70\text{MHz}$ .....	4
5	Layer 1: Component Side .....	6
6	Layer 2: Ground .....	7
7	Layer 3: Power .....	8
8	Layer 4: Circuit Side .....	9

### List of Tables

1	ADC12DC105/ADC14DC105 Evaluation Board BOM (rev 6) .....	13
---	--	----

## **1 Board Assembly**

The ADC14DC105 Evaluation Board comes pre-assembled. Refer to the [Bill of Materials in Section 7](#) for a description of components, to [Figure 1](#) for major component placement and to [Section 5](#) for the [Evaluation Board schematic](#).

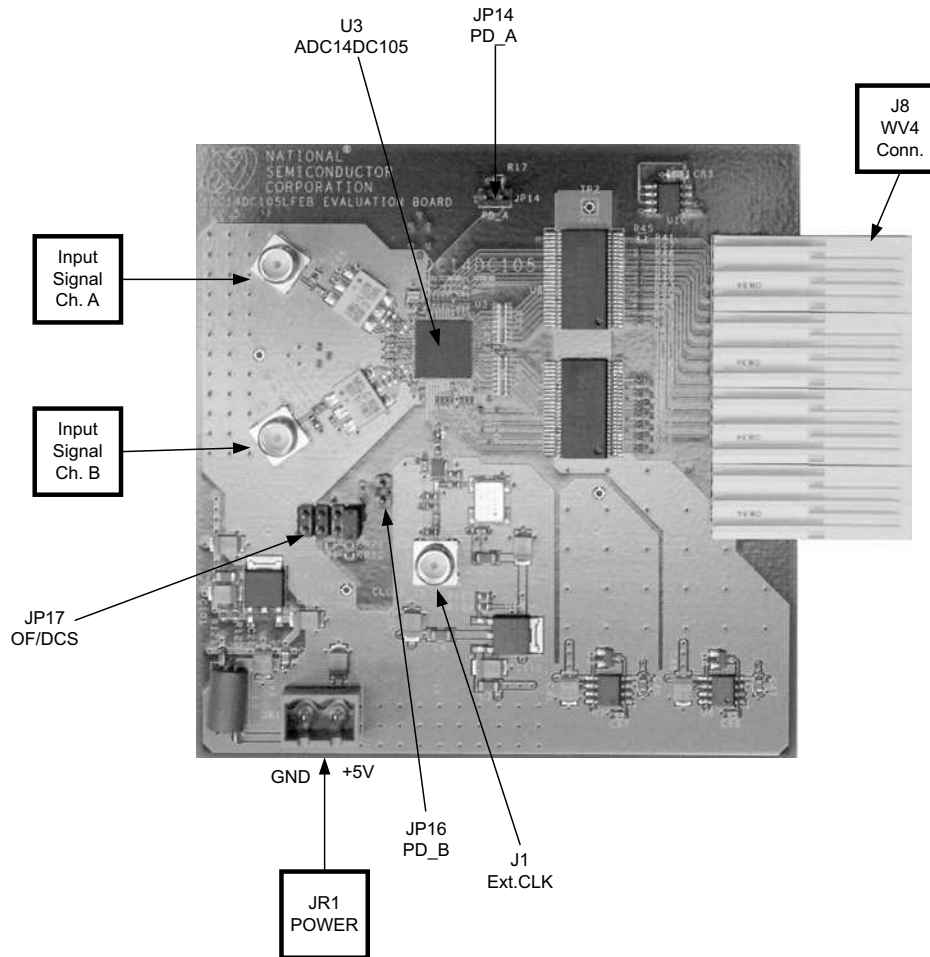


Figure 1. Major Component and Jumper Locations

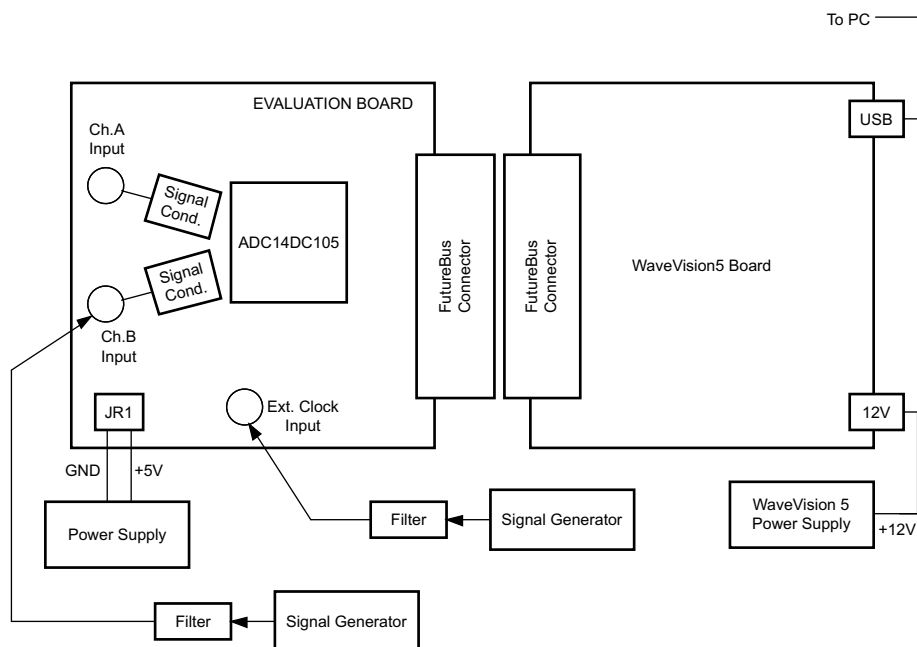


Figure 2. Test Set Up

## 2 Quick Start

Refer to [Figure 1](#) for locations of jumpers, test points and major components. Refer to [Figure 2](#) for the test set up. The board is configured by default to use a crystal clock source and internal reference. Refer to [Section 3.0](#) and [Appendix A](#) for more information on jumper settings. The input network of this board is configured for input frequencies greater than 70MHz. Refer to the [Analog Input section](#) for more information about input networks.

You must have version the WaveVision5™ data capture board and WaveVision 5 software to properly test this board. You can download the latest version from:

<http://www.ti.com/tool/wavevision5>  
<http://www.ti.com/tool/wavevsn-brd-5.1>

1. Apply power to the WaveVision5™ board and connect it to the computer using a USB cable. See the WaveVision5™ Board Manual for operation of that board. Connect the evaluation board to the WaveVision5™ Data Capture Board.  
**NOTE: power to the WaveVision5 Data Capture Board should be applied before the power to the Evaluation Board to insure that the FPGA on the WaveVison5 Data Capture Board is not damaged.**
2. Connect a clean +5V power supply to pin 2 of Power Connector JR1. Pin 1 is ground.
3. Connect a signal from a 50-Ω source to connector J9. Be sure to use a bandpass filter before the Evaluation Board to filter out noise and distortion from the clock signal generator.
4. Connect a signal from a 50-Ω source to connector J1. Set the amplitude to +14dBm and the frequency to the desired sampling rate. This signal power must result in >2Vpp signal at the SMA input to the EVM. Be sure to use a bandpass filter before the Evaluation Board to filter out noise and distortion from the clock signal generator. See [Section 3.3](#) for more information on signal filtering and appropriate signal generators.
5. Adjust the input signal amplitude as needed to ensure that the signal does not over-range by examining a histogram of the output data with the WaveVision™ software.

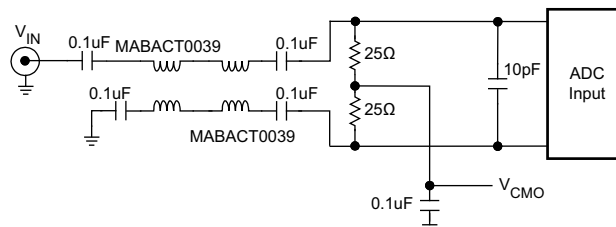
## 3 Functional Description

The Evaluation Board schematic is shown in the [Hardware Schematic Section](#). A list of test points and jumper settings can be found in [Appendix A](#).

### 3.1 Analog Input

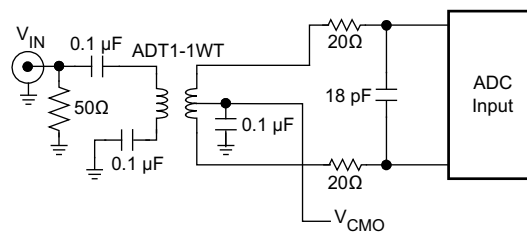
To obtain the best distortion results the analog input network must be optimized for the signal frequency being applied. The Evaluation Board comes configured for input frequencies greater than 70MHz as seen in [Figure 3](#). The input network is intended to accept a low-noise sine wave signal of up to 2V peak-to-peak amplitude. To accurately evaluate the dynamic performance of this converter, the input test signal will have to be passed through a high-quality bandpass filter.

For input frequencies below 70MHz the circuit of [Figure 3](#) may be used.



**Figure 3. Analog Input Network for  $F_{IN} > 70\text{MHz}$**

For input frequencies below 70MHz the circuit of [Figure 4](#) may be used.



**Figure 4. Analog Input Network for  $F_{IN} < 70\text{MHz}$**

### 3.2 ADC Reference Circuitry

The ADC14C105 can use an internal or external 1.2V reference. This Evaluation Board is configured to use the internal reference.

### 3.3 ADC Clock Circuit

Solder jumpers are used to select the path of the clock to the ADC. While not as convenient as pin-type jumpers, these introduce less noise into the clock signal.

By default, the board requires an external signal generator to provide a low noise clock at connector J1. The clock signal must be filtered by a bandpass filter to remove noise and distortion. On the board, the signal is buffered by U11 (NC7WV125) and applied to the ADC's clock input pin.

This EVM requires a 2.0-3.3 V<sub>pp</sub> signal swing at the clock SMA which translates to +10-14.4dBm signal power into the J1 (50-Ω) input. The chosen bandpass filter in the clock path attenuates the signal power from the signal generator, so the generator power must set to overcome the attenuation. Different filters have different attenuations (insertion losses). Setting +17dBm assumes a 4dB insertion loss and +13dBm at the SMA input. The recommendation of +14dBm assumes a filter attenuation of less than 4dB.

As an option, a Pletronics SM7745 or Vectron VCC1 type device crystal clock may be placed on the board. For this option open the pins of solder jumper JP4 and short the pins of JP10 and place component L5.

### 3.4 Digital Data Output

The digital output data for Channel A is available at pins B4 (MSB) through B17 of the WaveVision™ connector J8. The digital output data for Channel B is available at pins A4 (MSB) through A17 of the WaveVision™ connector J8.

### 3.5 Data Format/Duty Cycle Stabilizer

Output data format and the duty cycle stabilizer (DCS) are controlled by jumper JP17.

Shorting pins 1-2 of JP17 sets the output format to 2's complement with DCS Off.

Shorting pins 3-4 of JP17 sets the output format to 2's complement with DCS On.

Shorting pins 5-6 of JP17 sets the output format to offset binary with DCS On.

Shorting pins 7-8 of JP17 sets the output format to offset binary with DCS Off. This is the default setting.

### 3.6 Power Supply Connections

Power to this board is supplied through power connector JR1. The only supply needed is +5V at pin 2 plus ground at pin 1.

Voltage and current requirements for the ADC14DC105 Evaluation Board are:

- +5.0V at 500 mA

## 4 Installing the ADC14DC105 Evaluation Board

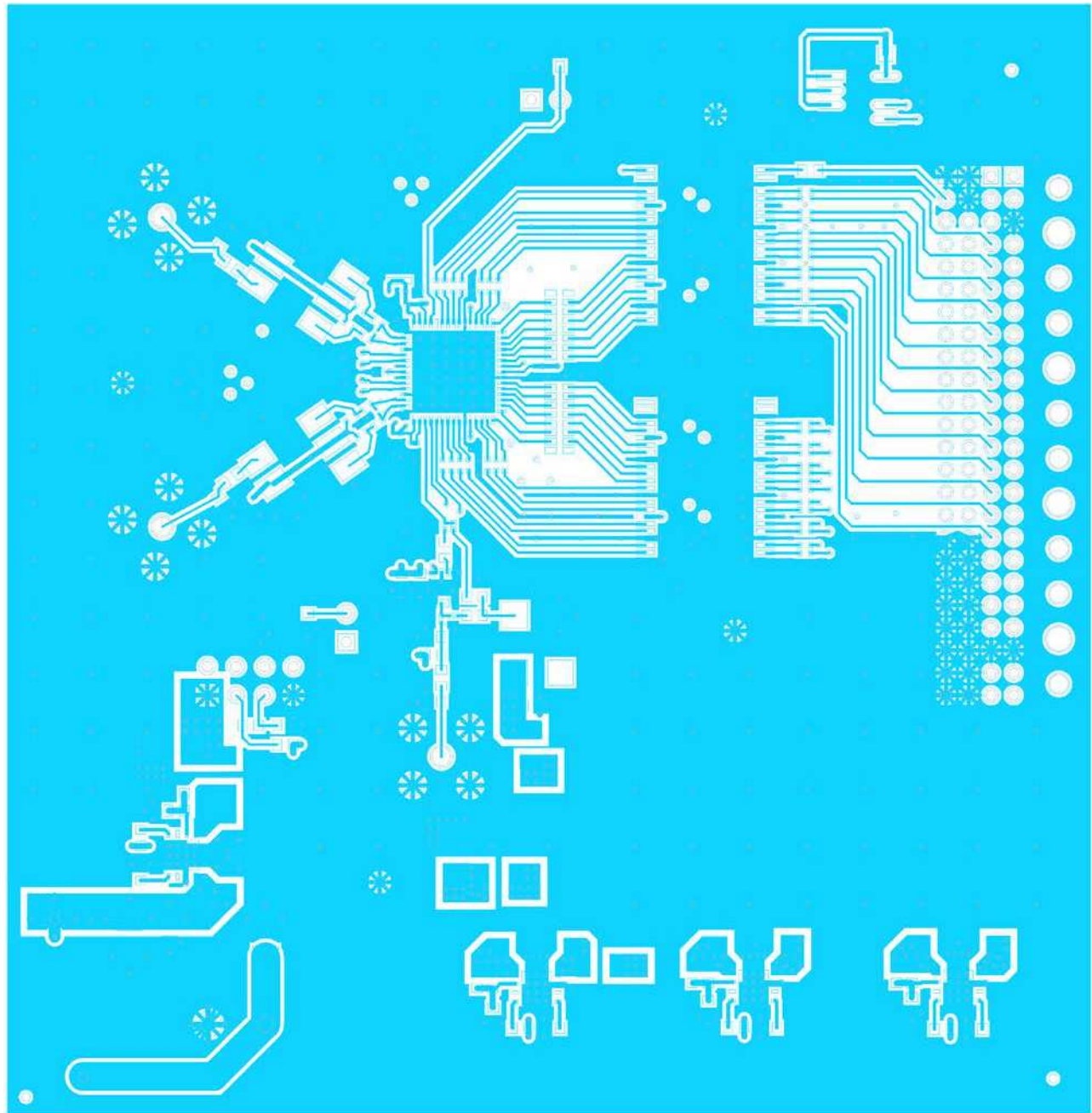
The evaluation board requires a single power supply as described in [Power Supply Connections](#).

**NOTE: power to the WaveVision4 Data Capture Board should be applied before the power to the ADC14DC105 Evaluation Board to insure that the FPGA on the WaveVision5 Data Capture Board is not damaged.**

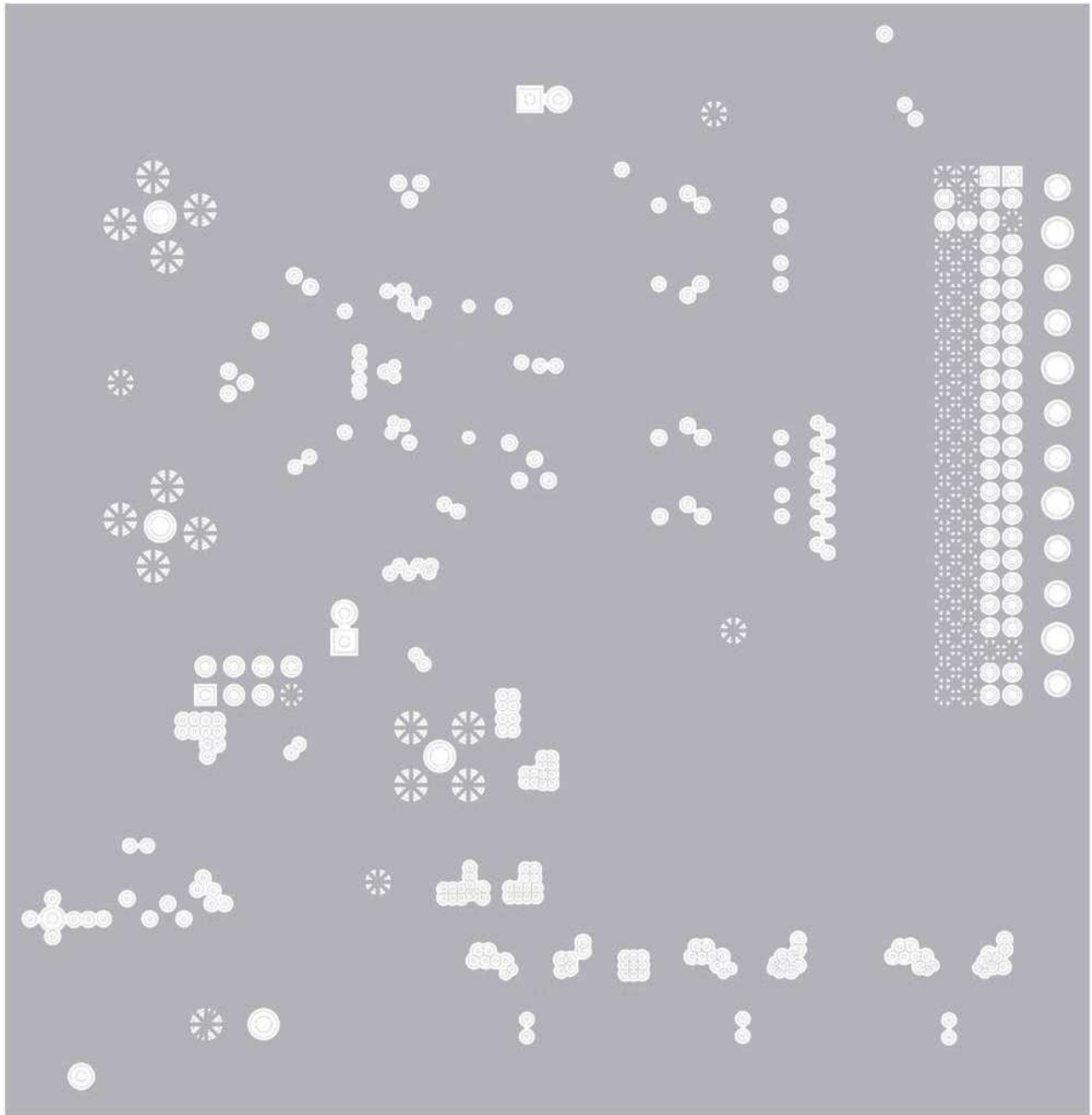
An appropriate signal source should be connected to the Signal Input SMA connector J9 (Channel A) or J5 (Channel B). When evaluating dynamic performance, an appropriate signal generator (such as the HP8644B or the R&S SME-03) with 50 Ohm source impedance should be connected to the Analog Input connector through an appropriate bandpass filter as even the best signal generator available can not produce a signal pure enough to evaluate the dynamic performance of an ADC. A low noise signal generator should also be connected to the clock input J1 through a bandpass filter.

If this board is used in conjunction with the the WaveVision5™ Data Capture Board and WaveVision5™ software, a USB cable must be connected between the Data Capture Board and the host. See the WaveVision5™ Data Capture Board manual for details.

## 5 Evaluation Board Layout



**Figure 5. Layer 1: Component Side**



**Figure 6. Layer 2: Ground**

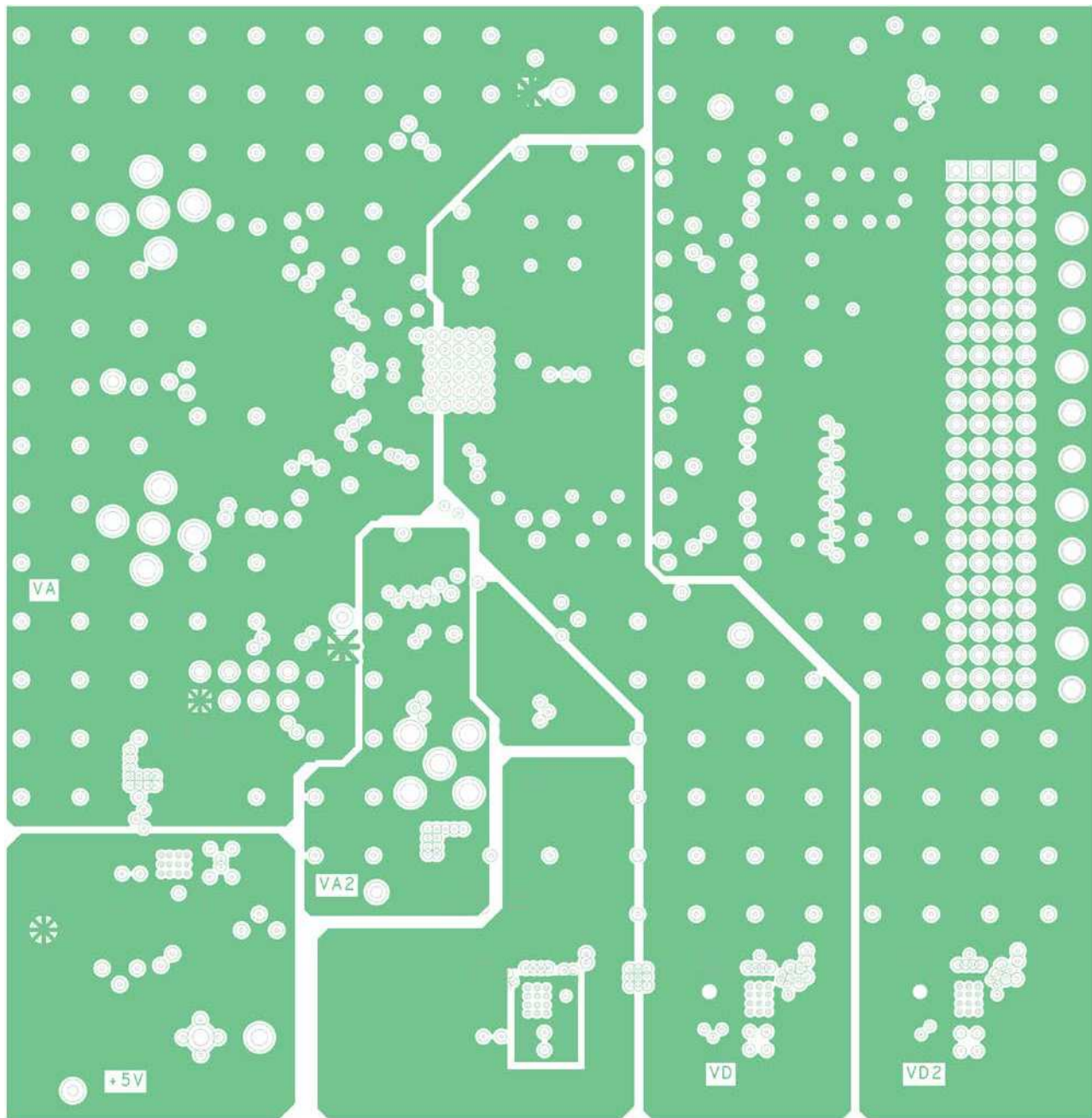


Figure 7. Layer 3: Power



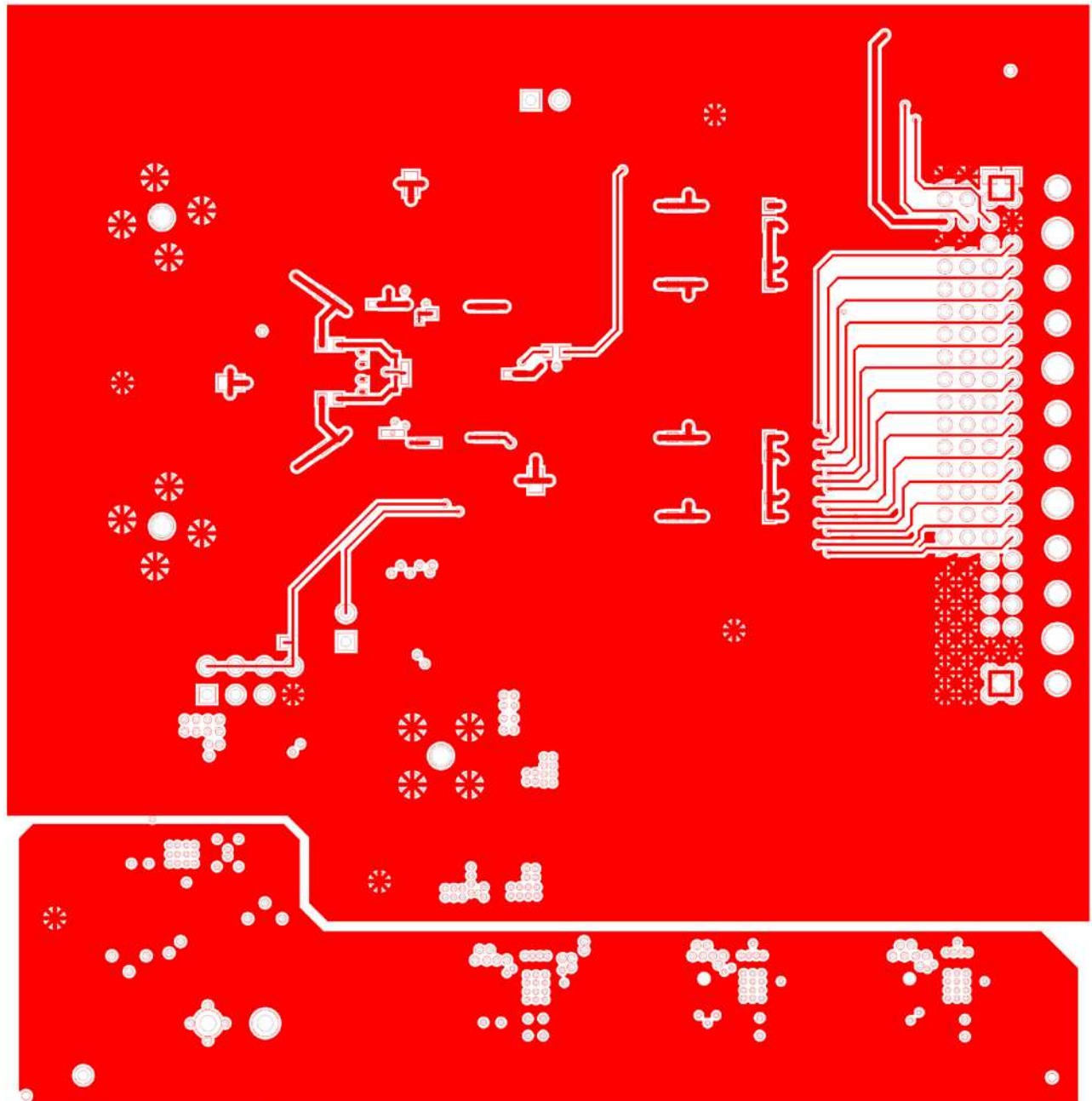
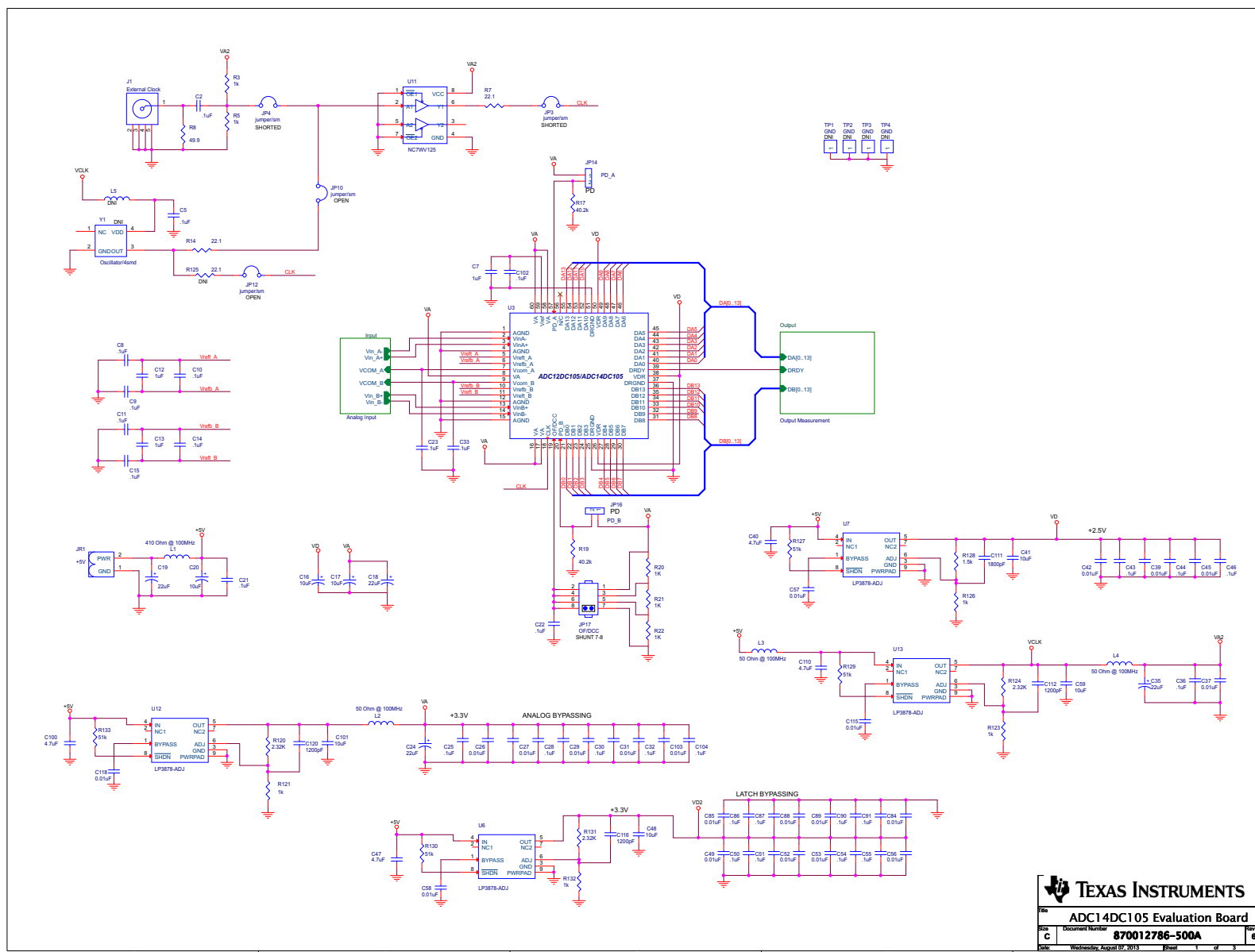


Figure 8. Layer 4: Circuit Side

## 6 Hardware Schematic



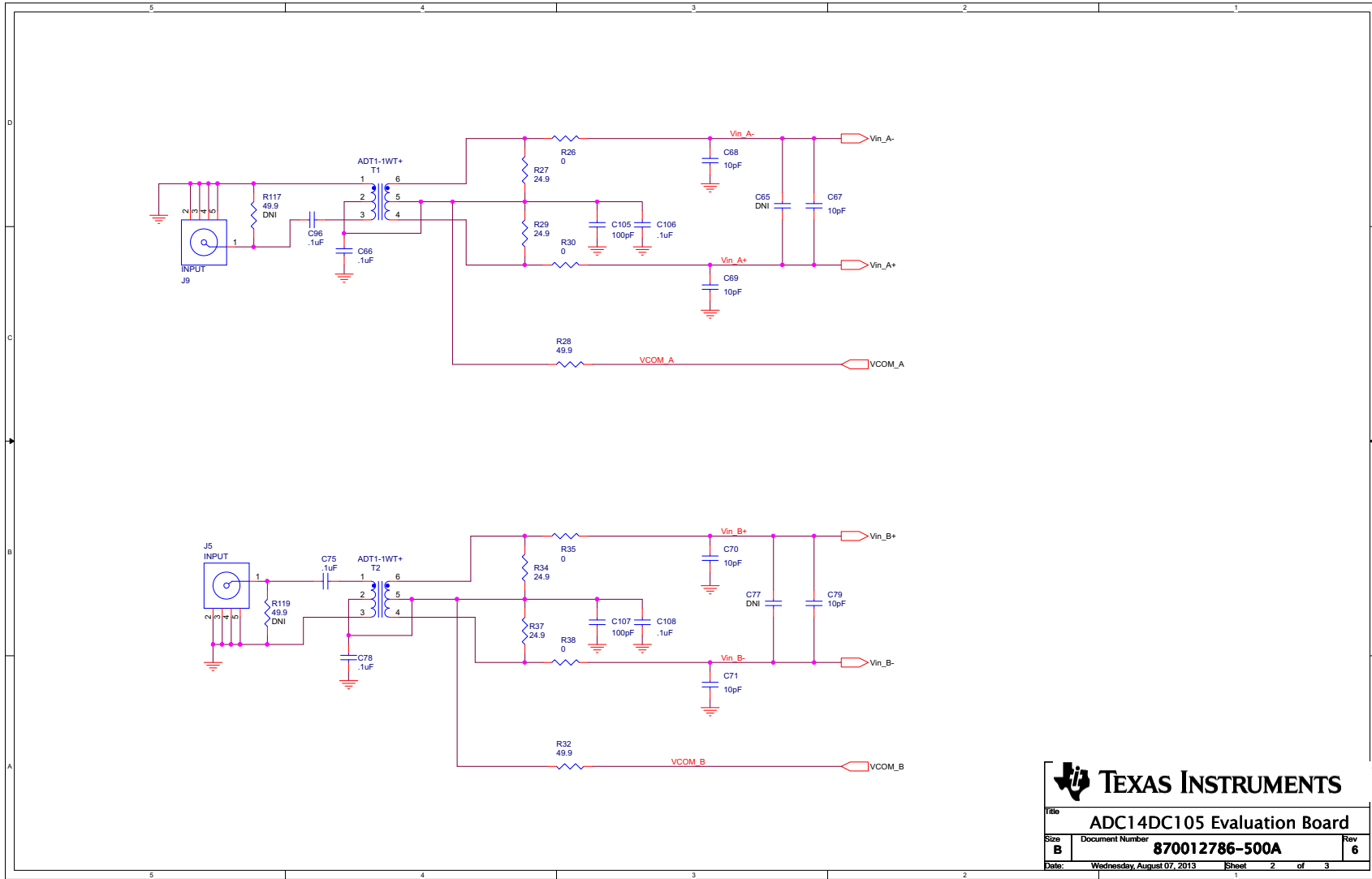
TEXAS INSTRUMENTS

File: ADC14DC105 Evaluation Board

Doc: 870012786-500A

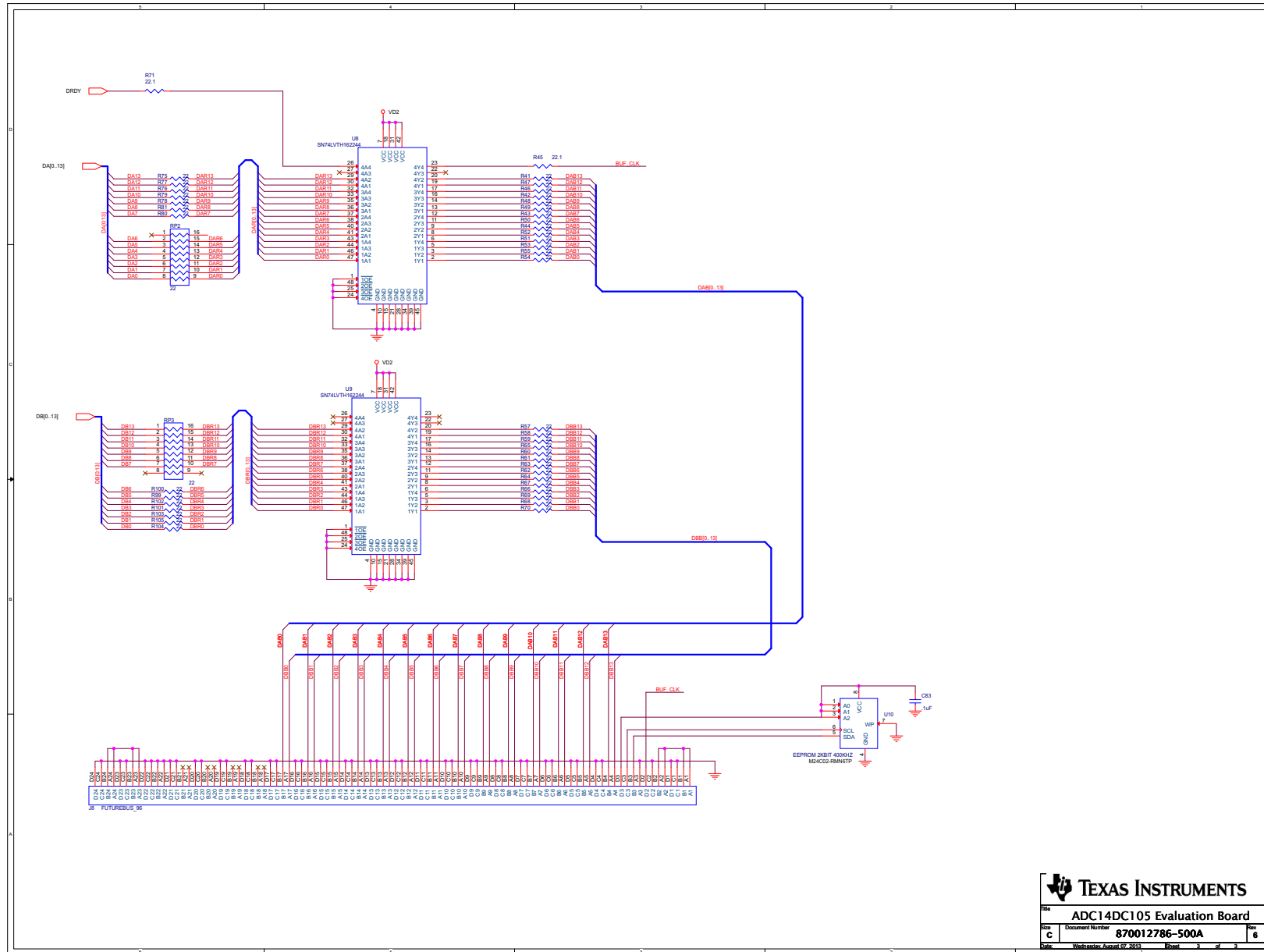
Rev: 6

Date: Wednesday, August 07, 2013 Page: 1 of 3



**TEXAS INSTRUMENTS**

Title		
ADC14DC105 Evaluation Board		
Size	Document Number	Rev
B	870012786-500A	6
Date:	Wednesday, August 07, 2013	Sheet 2 of 3



TEXAS INSTRUMENTS

ADC14DC105 Evaluation Board

Document Number 870012786-500A

Rev C

Page 6

Webster, August 07, 2013

## 7 Evaluation Board Bill of Materials

**Table 1. ADC12DC105/ADC14DC105 Evaluation Board BOM (rev 6)**

Item	QTY	Reference	Note	Part	Part Number	Manufacturer	Foot Print	Tol
1	2	C2, C5		0.1uF	C1608X7R1E104K080AA	TDK	c0603	
2	1	C7		1uF	C1608X5R1C105K080AA	TDK	c0603	10%
3	9	C8, C9, C11, C15, C23, C33, C66, C78, C102		0.1uF	C1005X5R1A104K050BA	TDK	c0402_no_ss	10%
4	2	C10, C14		0.1uF	C0603X5R0J104K030BC	TDK	c0201_no_ss	10%
5	2	C12, C13		1uF	GRM155R60J105ME19D	Murata	c0402_no_ss	20%
6	2	C16, C17		10uF	T491A106K006AT	Kemet	ct3216	10%
7	1	C18		22uF	T491A226M010AT	Kemet	ct3216	20%
8	3	C19, C24, C35		22uF	T491B226M016AT	Kemet	c3528	20%
9	1	C20		10uF	T491T106K016AT	Kemet	c3528	10%
10	2	C21, C83		0.1uF	C2012X7R1H104K085AA	TDK	c0805	10%
11	14	C22, C36, C50, C51, C54, C55, C75, C86, C87, C90, C91, C96, C106, C108		0.1uF	C1608X7R1E104K080AA	TDK	c0603	10%
12	8	C25, C28, C30, C32, C43, C44, C46, C104		0.1uF	05083C104MAT2A	AVX	c0508_no_ss	20%
13	8	C26, C27, C29, C31, C39, C42, C45, C103		0.01uF	C1005X7R1V103K050BB	TDK	c0402_no_ss	10%
14	13	C37, C49, C52, C53, C56, C57, C58, C84, C85, C88, C89, C115, C118		0.01uF	C1608X7R1H103K080AA	TDK	c0603	10%
15	4	C40, C47, C100, C110		4.7uF	CL21B475KPFNNNE	Samsung	c0805	10%
16	4	C41, C48, C59, C101		10uF	CL21B106K0QNNNE	Samsung	c0805	10%
17	0	C65, C77	DNI	CAPACITOR NON-POL			c0402_no_ss	
18	6	C67, C68, C69, C70, C71, C79		10pF	C0603C0G1E100D030BA	TDK	c0201_no_ss	0.5pF
19	2	C105, C107		100pF	C1608C0G2E101J080AA	TDK	c0603	5%
20	1	C111		1800pF	GRM188R71H182KA01D	Murata	c0603	10%
21	3	C112, C116, C120		1200pF	GRM188R71H122KA01D	Murata	c0603	10%
22	2	JP3, JP4	SHORTED with solder	jumper/sm	SMD PADS		sm_jumper	
22a	2	JP10, JP12	OPEN					
23	1	JP14		PD_A	PRPC001DAAN-RC	Sullins	blkcon_2x1	
24	1	JP16		PD_B	PRPC001DAAN-RC	Sullins	blkcon_2x1	
25	1	JP17	SHUNT 7-8 (ITEM 54)	OF/DCC	PRPC004DAAN-RC	Sullins	blkcon_4x2	
26	1	JR1		+5V	1755736	Phoenix Contact	MSTBVA_p200	
27	1	J1		External Clock	901-144-8RFX	Amphenol-RF Division	sma_v_clr	
28	2	J5, J9		INPUT	142-0701-801	Emerson	sma_v_clr	
29	1	J8	supplied by TI	FUTUREBUS_96	223514-1		fbus_rs_96_ecl	
30	1	L1		410 Ω @ 100MHz	FB20020-4B-RC	Bourns	ferrite_choke	
31	3	L2, L3, L4		50 Ω @ 100MHz	BLM31PG500SN1L	Murata	I1206	
32	0	L5	DNI	50 Ω @ 100MHz	BLM31PG500SN1L	Murata	I1206	
33	2	RP2, RP3		22	742C163220JP	CTS	soic16_p50m_wg63_J252	5%
34	9	R3, R5, R20, R21, R22, R121, R123, R126, R132		1k	ERJ-3EKF1001V	Panasonic	r0603	1%
35	4	R7, R14, R45, R71		22.1	ERJ-3EKF22R1V	Panasonic	r0603	1%
36	3	R8, R28, R32		49.9	ERJ-3EKF49R9V	Panasonic	r0603	1%
37	2	R17, R19		40.2k	ERJ-3EKF4022V	Panasonic	r0603	1%
38	4	R26, R30, R35, R38		0	RC0402JR-070RL	Yageo	r0402_no_ss	5%
39	4	R27, R29, R34, R37		24.9	ERJ-3EKF24R9V	Panasonic	r0402_no_ss	1%

**Table 1. ADC12DC105/ADC14DC105 Evaluation Board BOM (rev 6) (continued)**

Item	QTY	Reference	Note	Part	Part Number	Manufacturer	Foot Print	Tol
40	42	R41, R42, R43, R44, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55, R57, R58, R59, R60, R61, R62, R63, R64, R65, R66, R67, R68, R69, R70, R75, R76, R77, R78, R79, R80, R81, R99, R100, R101, R102, R103, R104, R105		22	ERJ-2RKF22R0X	Panasonic	r0402_no_ss	1%
41	0	R117, R119	DNI	49.9	ERJ-3EKF49R9V	Panasonic	r0603	1%
42	3	R120, R124, R131		2.32K	ERJ-3EKF2321V	Panasonic	r0603	1%
43	0	R125	DNI	22.1	ERJ-3EKF22R1V	Panasonic	r0603	1%
44	4	R127, R129, R130, R133		51k	ERJ-3EKF5102V	Panasonic	r0603	1%
45	1	R128		1.5k	ERJ-3EKF1501V	Panasonic	r0603	1%
46	0	TP1, TP2, TP3, TP4	DNI	GND			tp40	
47	2	T1, T2		ADT1-1WT+	ADT1-1WT+	Mini Circuits	soic6_100_wg280_l310	
48	1	U3		ADC12DC105 or ADC14DC105	ADC12DC105CISQ/NOPB or ADC14DC105CISQ/NOPB	Texas Instruments	LLP60_P5M_9X9_EP	
49	4	U6, U7, U12, U13		LP3878-ADJ	LP3878SD-ADJ/NOPB	Texas Instruments	SON_NGT_8	
50	2	U8, U9		SN74LVTH162244	SN74LVTH162244DLR	Texas Instruments	SSOP48_P025_WG420_L650	
51	1	U10		EEPROM 2KBIT 400kHz	M24C02-RMN6TP	STMicroelectronics	soic8_050_wg244_l200	
52	1	U11		NC7WV125	NC7WV125K8X	Fairchild Semi.	soic8_50m_wg3p10_l2p0	
53	0	Y1	DNI	Oscillator/4smd			SM_xtl_5X7	
54	1	SHN1		SHUNT, HEADER	MJ-5.97-G or equivalent	Keltron		
55	4	BMP1, BMP2, BMP3, BMP4	Legs for PCB	BUMPON HEMISPHERE 0.44 x 0.20 BLACK	SJ-5003	3M		

## Appendix A

### A.1 Operating in the Computer Mode

The ADC14C105 Evaluation Board is compatible with the WaveVision5™ Data Capture Board and WaveVision5™ software. When connected to the WaveVision5™ Board, data capture is easily controlled from a personal computer operating in the Windows environment. The data samples that are captured can be observed on the PC video monitor in the time and frequency domains. The FFT analysis of the captured data yields insight into system noise and distortion sources and estimates of ADC dynamic performance such as SINAD, SNR, THD, SFDR and ENOB.

### A.2 Summary Tables of Test Points, Connectors, and Jumper Settings

#### A.2.1 Test Points

Test Points on the ADC14DC105 Evaluation Board	
TP1-4	Ground

#### A.2.2 Connectors

JR1 Connector - Power Supply Connections		
JR1-2	+5V	+5V Power Supply
JR1-1	GND	Power Supply Ground

#### A.2.3 Jumper Settings

Note: Default settings are in **bold**

JP14 : Power Down Channel A	
Connect 1-2	ADC Channel A is powered down
<b>1-2 OPEN</b>	<b>ADC Channel A is operating</b>

JP16 : Power Down Channel B	
Connect 1-2	ADC Channel A is powered down
<b>1-2 OPEN</b>	<b>ADC Channel A is operating</b>

JP17 : Data Format / Duty Cycle Stabilizer	
Connect 1-2	Select Output format of 2's complement, Duty Cycle Stabilizer is OFF
Connect 3-4	Select Output format of 2's complement, Duty Cycle Stabilizer is ON
Connect 5-6	Select Output format of Offset Binary, Duty Cycle Stabilizer is ON
<b>Connect 7-8</b>	<b>Select Output format of Offset Binary, Duty Cycle Stabilizer is OFF</b>

#### A.2.4 Solder Jumper Settings

The default clock configuration is to use an external signal generator to supply the clock signal via the J1 CLOCK\_IN SMA connector. For this configuration, JP4 and JP3 must be shorted while JP10 is open. Alternatively, a crystal clock source can be populated at Y1. For this crystal configuration, solder jumpers JP3 and JP10 must be shorted while JP4 is open.

## EVALUATION BOARD/KIT/MODULE (EVM) ADDITIONAL TERMS

Texas Instruments (TI) provides the enclosed Evaluation Board/Kit/Module (EVM) under the following conditions:

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods.

Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

Please read the User's Guide and, specifically, the Warnings and Restrictions notice in the User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please visit [www.ti.com/esh](http://www.ti.com/esh) or contact TI.

No license is granted under any patent right or other intellectual property right of TI covering or relating to any machine, process, or combination in which such TI products or services might be or are used. TI currently deals with a variety of customers for products, and therefore our arrangement with the user is not exclusive. TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein.

## REGULATORY COMPLIANCE INFORMATION

As noted in the EVM User's Guide and/or EVM itself, this EVM and/or accompanying hardware may or may not be subject to the Federal Communications Commission (FCC) and Industry Canada (IC) rules.

For EVMs **not** subject to the above rules, this evaluation board/kit/module is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION OR EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

### 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.

### **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.

### **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.

## **【Important Notice for Users of EVMs for RF Products in Japan】**

**This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan**

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product 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 this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
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.

**Texas Instruments Japan Limited**  
**(address) 24-1, Nishi-Shinjuku 6 chome, Shinjuku-ku, Tokyo, Japan**

<http://www.tij.co.jp>

### **【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】**

本開発キットは技術基準適合証明を受けておりません。

本製品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

<http://www.tij.co.jp>

## EVALUATION BOARD/KIT/MODULE (EVM) WARNINGS, RESTRICTIONS AND DISCLAIMERS

**For Feasibility Evaluation Only, in Laboratory/Development Environments.** Unless otherwise indicated, this EVM is not a finished electrical equipment and not intended for consumer use. It is intended solely for use for preliminary feasibility evaluation in laboratory/development environments by technically qualified electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems and subsystems. It should not be used as all or part of a finished end product.

Your Sole Responsibility and Risk. You acknowledge, represent and agree that:

1. You have unique knowledge concerning Federal, State and local regulatory requirements (including but not limited to Food and Drug Administration regulations, if applicable) which relate to your products and which relate to your use (and/or that of your employees, affiliates, contractors or designees) of the EVM for evaluation, testing and other purposes.
2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure 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.
3. Since the EVM is not a completed product, it may not meet all applicable regulatory and safety compliance standards (such as UL, CSA, VDE, CE, RoHS and WEEE) which may normally be associated with similar items. You assume full responsibility to determine and/or assure compliance with any such standards and related certifications as may be applicable. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

**Certain Instructions.** It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please 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 result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM User's 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, some circuit components may have case temperatures greater than 60°C as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

**Agreement to Defend, Indemnify and Hold Harmless.** You agree to 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 use of the EVM that is not in accordance with the terms of the agreement. This obligation shall apply whether Claims arise under law of tort or contract or any other legal theory, and even if the EVM fails to perform as described or expected.

**Safety-Critical or Life-Critical Applications.** If you intend to evaluate the components for possible use in safety critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, such as devices which are classified as FDA Class III or similar classification, then you must specifically notify TI of such intent and enter into a separate Assurance and Indemnity Agreement.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2013, 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)