ADS5295, 8-Channel, Analog-to-Digital Converter Evaluation Module

This user's guide gives a general overview of the evaluation module (EVM) and provides a general description of the features and functions to be considered while using this module. This manual is applicable to the ADS5295 analog-to-digital converters (ADC), which, with the ADS5292 and ADS5294, are collectively referred to as ADS529x. Use this document in combination with the respective ADC data sheet. The ADS529xEVM provides a platform for evaluating the ADC under various signal, clock, reference, and power supply conditions.

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1 Quick View of Evaluation Setup

Figure 1 shows an overview of the evaluation setup that includes the ADS5295EVM evaluation module (EVM), TSW1400EVM, external equipment, personal computer (PC), and software requirements.

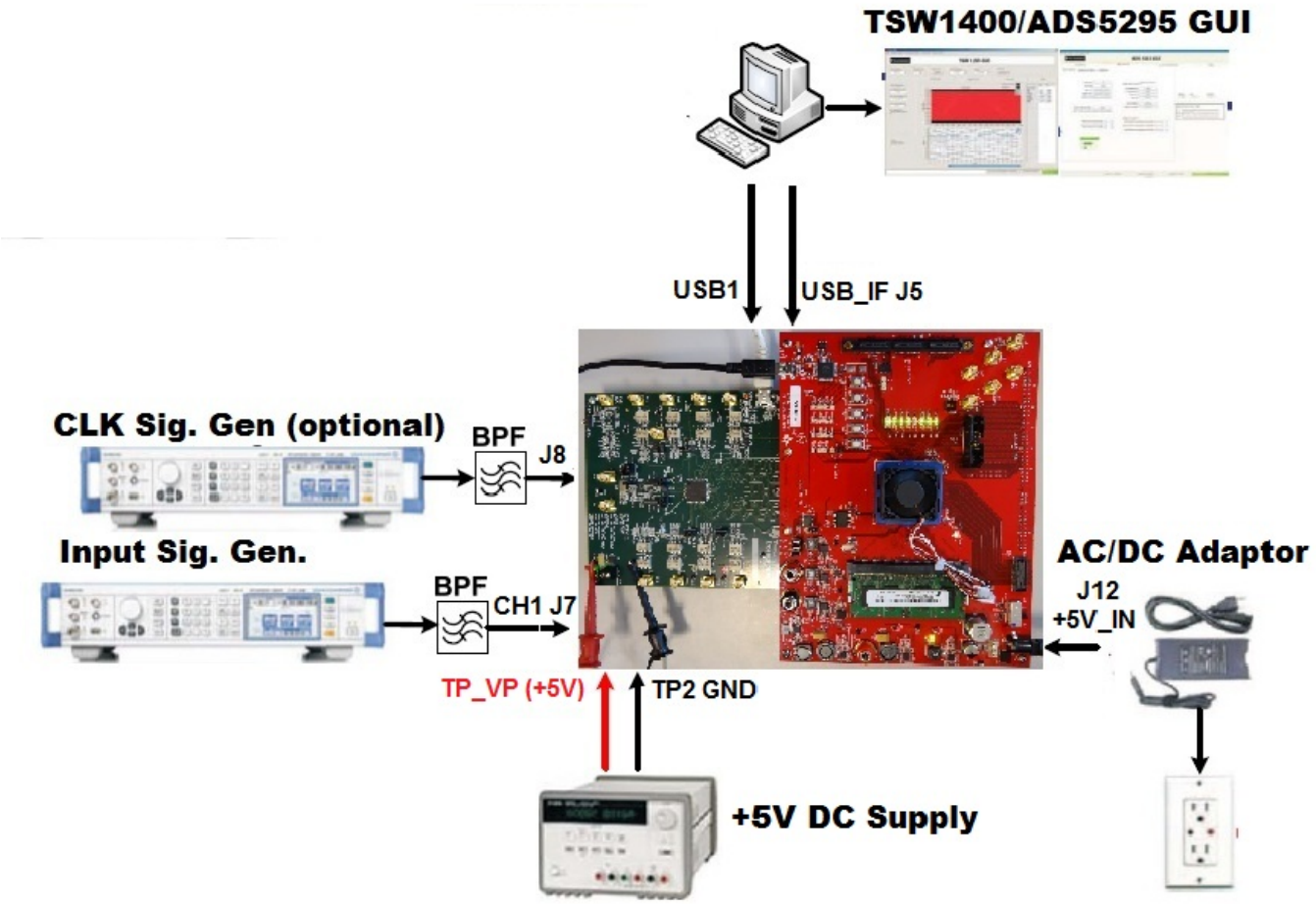


Figure 1. Evaluation Setup

TSW1400EVM/GUI: The high-speed LVDS deserializer board, TSW1400EVM, is required for capturing data from the EVM. The capture analysis uses the TSW1400 *High Speed Data Converter Pro* graphical user interface (GUI). For more information pertaining to the TSW1400EVM, see: http://focus.ti.com/docs/toolsw/folders/print/tsw1400evm.html

Equipment: Signal generators (with low-phase noise) must be used as the source of input signal and clock (optional) in order to get the desired performance. Additionally, band-pass filters (BPF) are required in signal and clock (optional) paths to attenuate the harmonics and noise from the generators.

Power Supply: A single +5-V supply powers the EVM. The supplies for the ADS5295 device are derived from the +5-V supply. The power supply must be able to source up to 1.5 A. A +5-V wall adapter supply powers the TSW1400EVM.

USB Interface to PC: The USB connection from the EVM and TSW1400EVM to the personal computer (PC) must be set up.

ADS5295GUI: Section 3.1 explains the GUI installation procedure and its operation.

2 Default Configuration

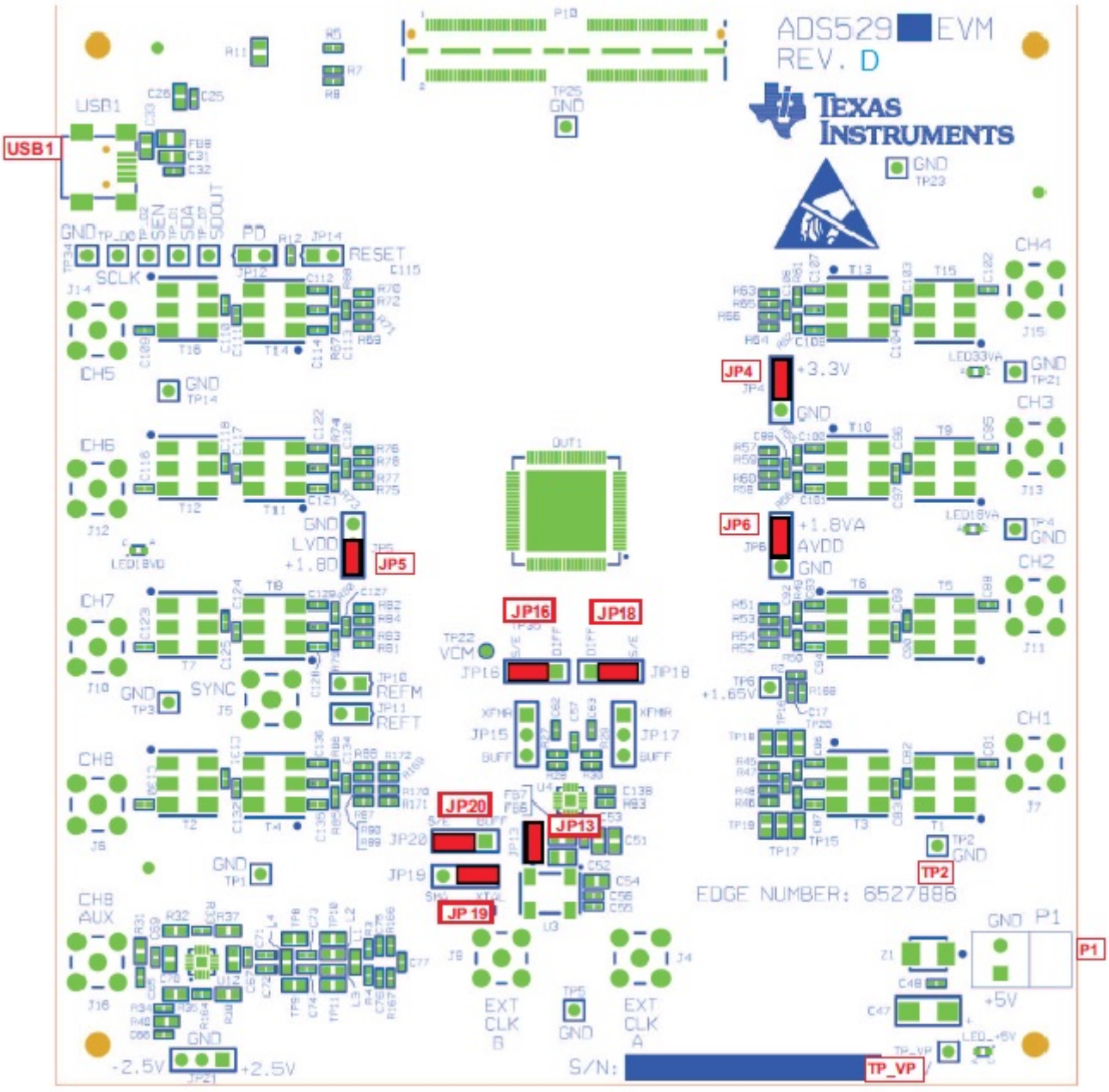


Figure 2. ADS5295EVM Basic Configuration

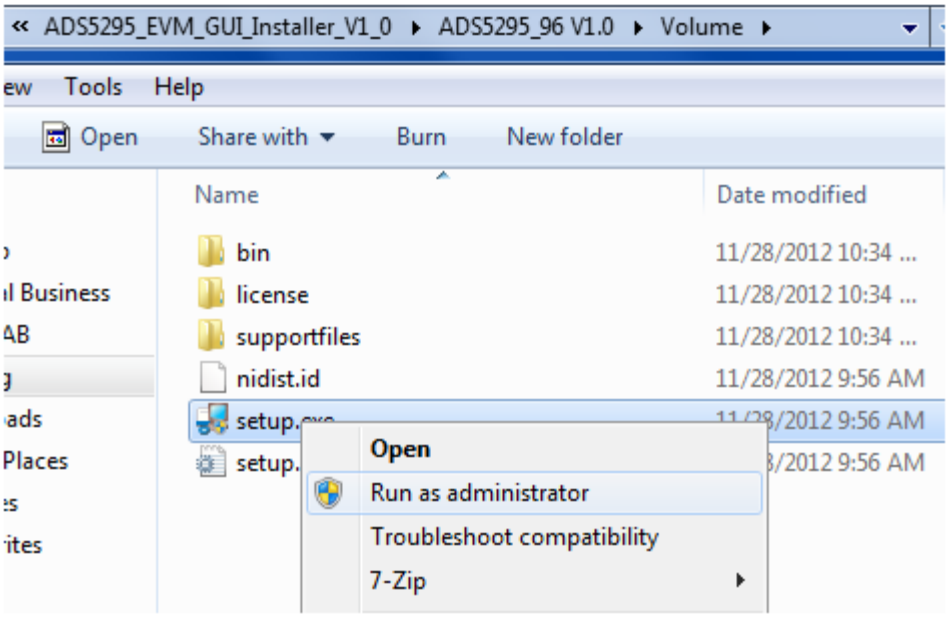
1. The EVM basic configuration uses the onboard single-ended clock as the default option. See Section 9.2 for the ADC clock, various-mode jumper settings.
2. P1 or TP_VP & TP2: +5-V power supply.
3. JP4, JP5, and JP6 are set to enable +3.3V analog, +1.8VD digital, and +1.8VA analog to device, respectively.
4. JP13: Enable onboard CMOS clock.
5. JP16, JP18, JP19, JP20: ADC clock source selection jumpers.

3 Software Installation and Operation

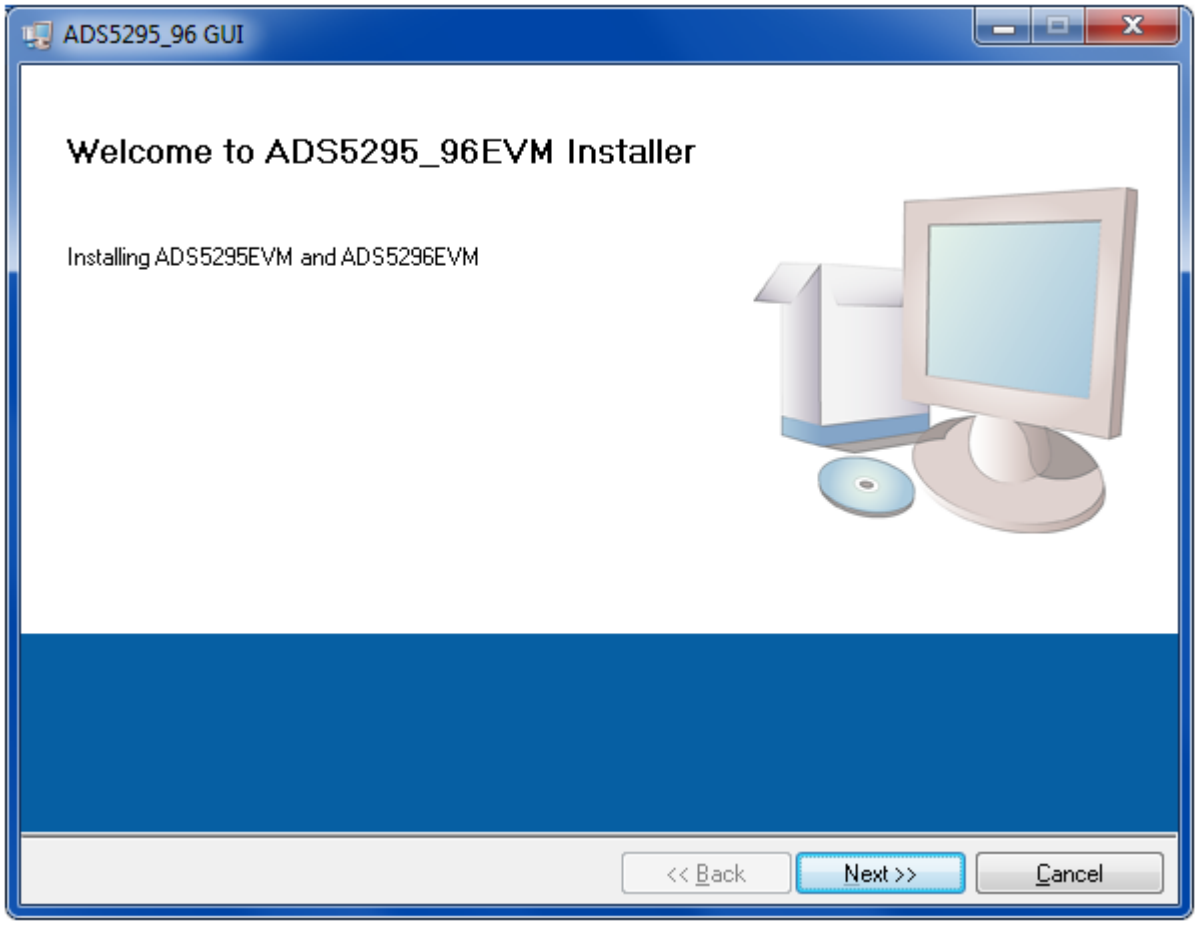
The EVM requires a software installation to invoke the GUI. In addition, the TSW1400 *High Speed Data Converter Pro* GUI (version 2.0 or higher) must be installed. The following section describes the installation procedure for the ADS5295 GUI. For instructions on installing the TSW1400 *High Speed Data Converter Pro* GUI, please visit the TI website.

3.1 GUI Installation – Mandatory

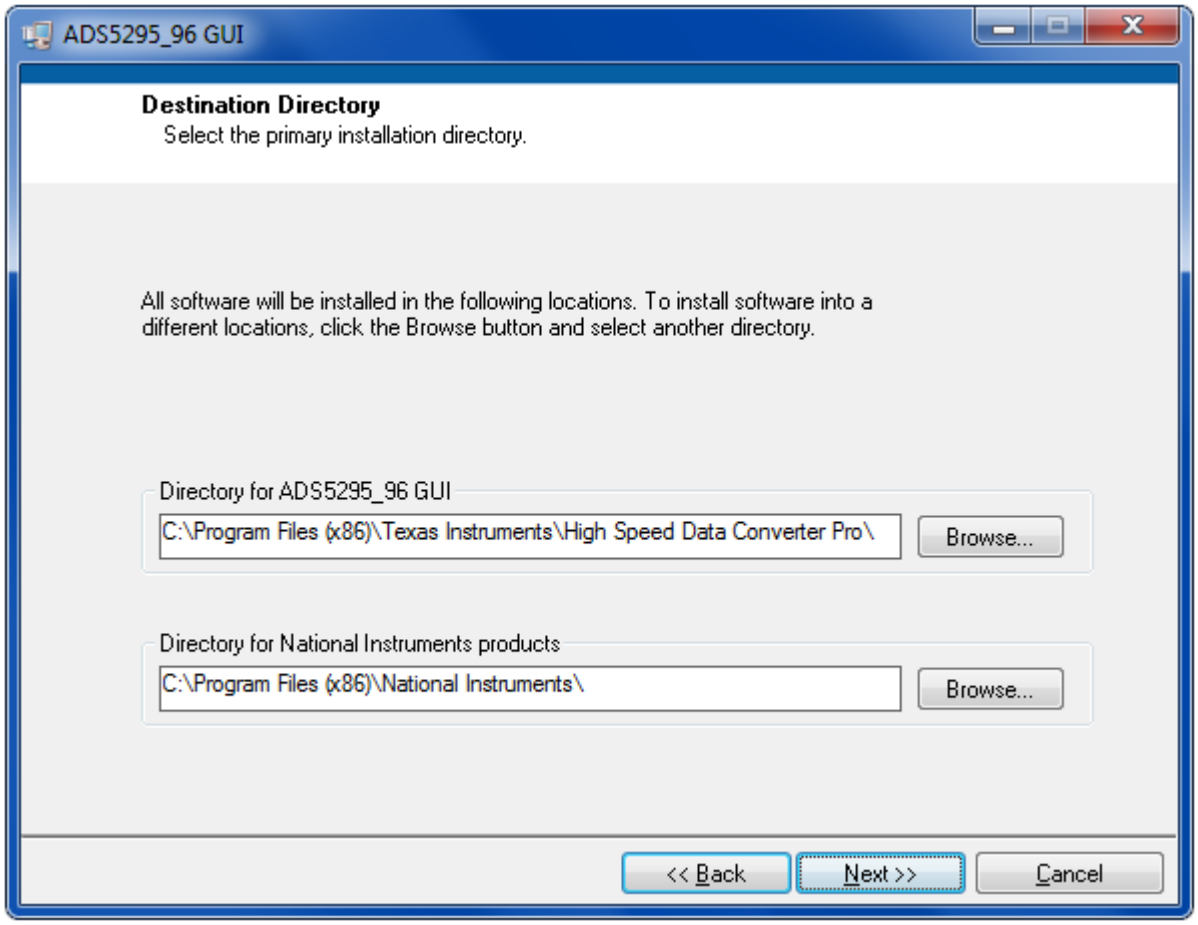
- Unzip the installer file found on the TI website. Install the GUI by running **setup.exe** as administrator.



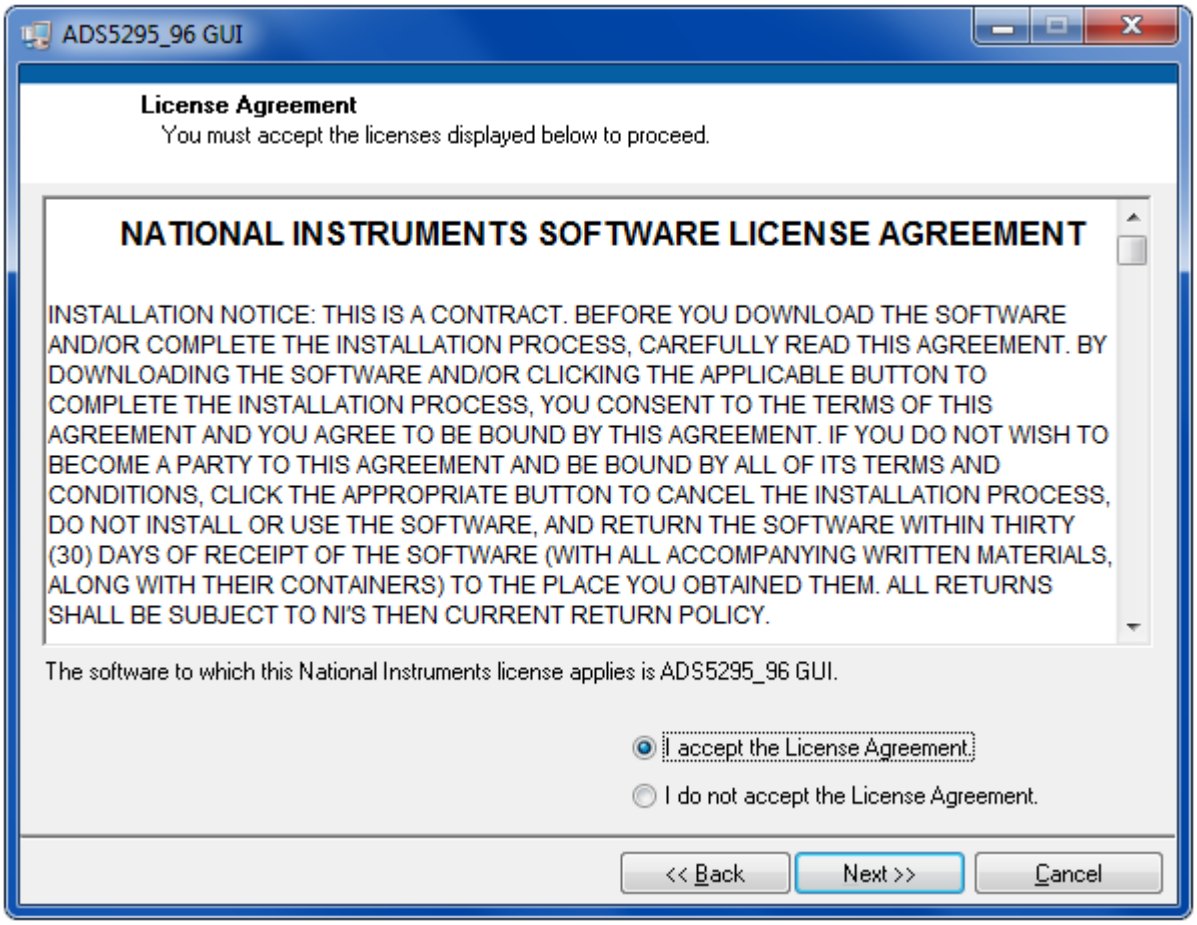
- Click *Next*.



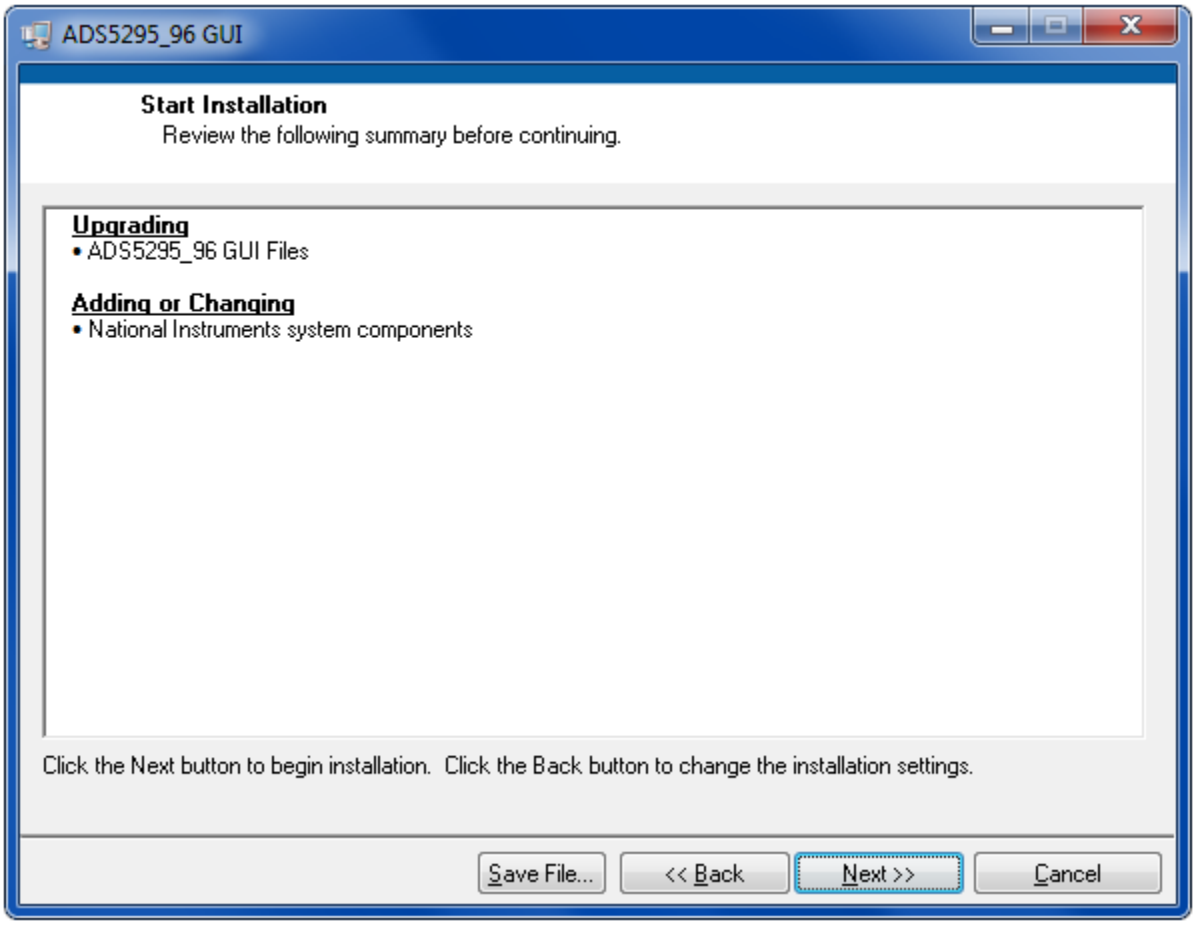
- Click *Next* to proceed with the default install paths or *Browse* to desired paths and then click *Next*.



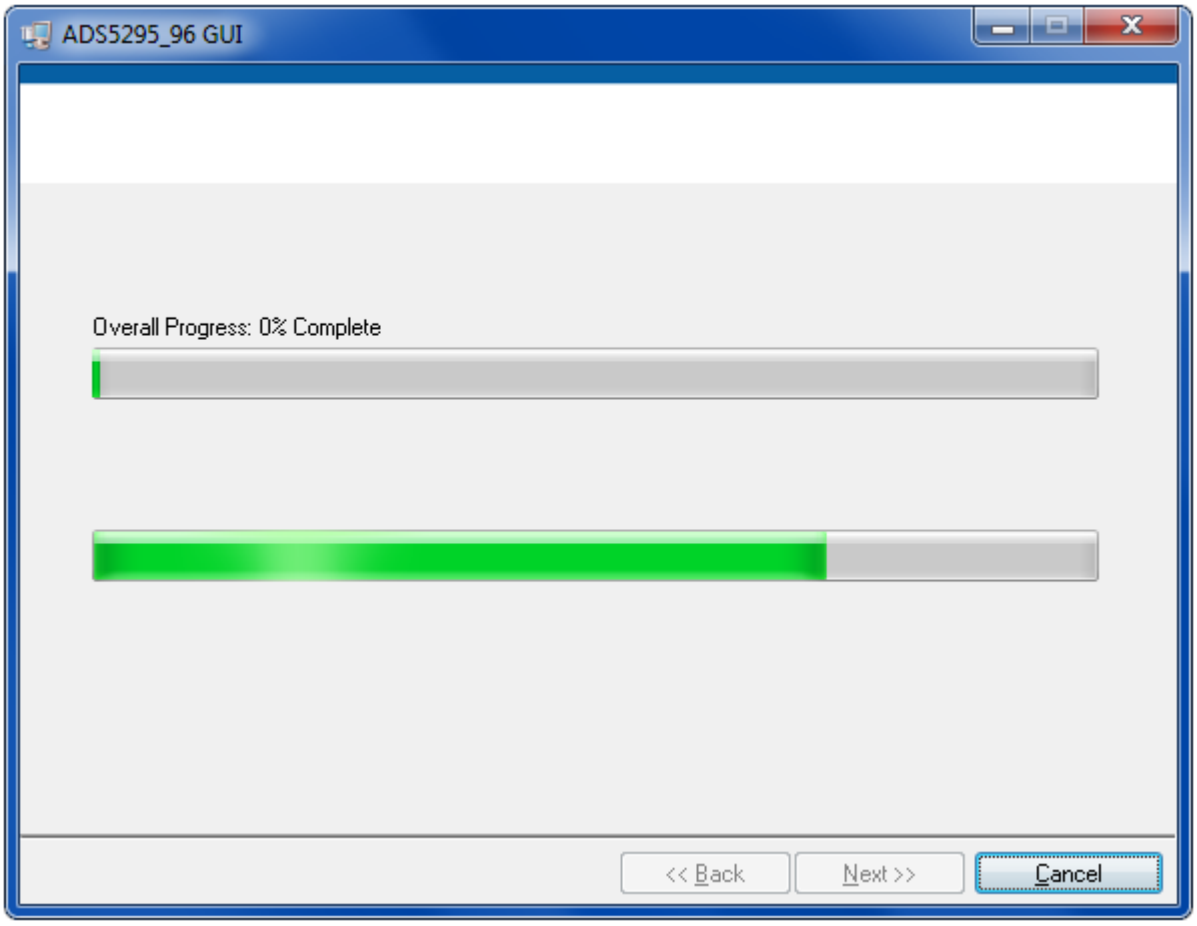
- Read the Software License Agreement and click *I accept...* and then click *Next.*



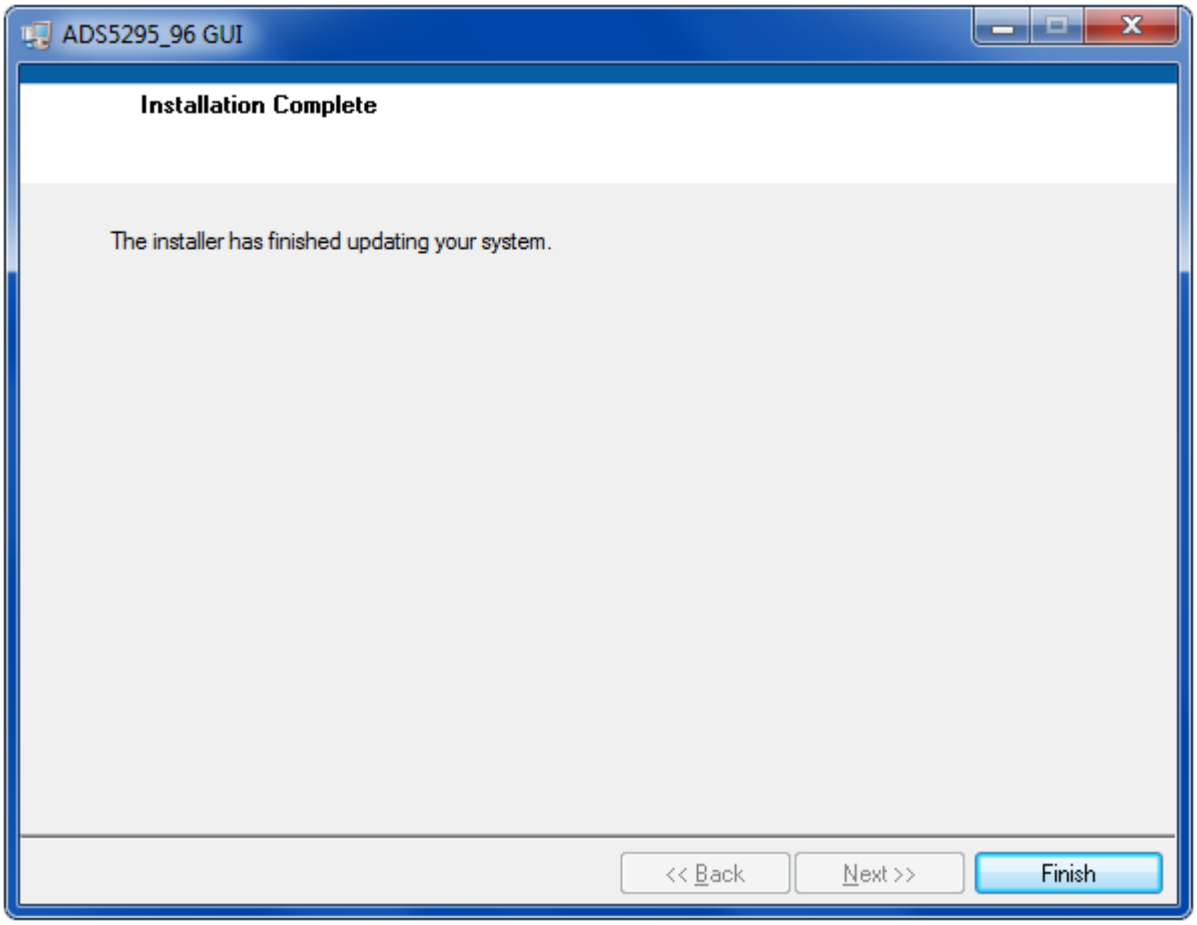
- Click *Next* to begin installation of listed components.



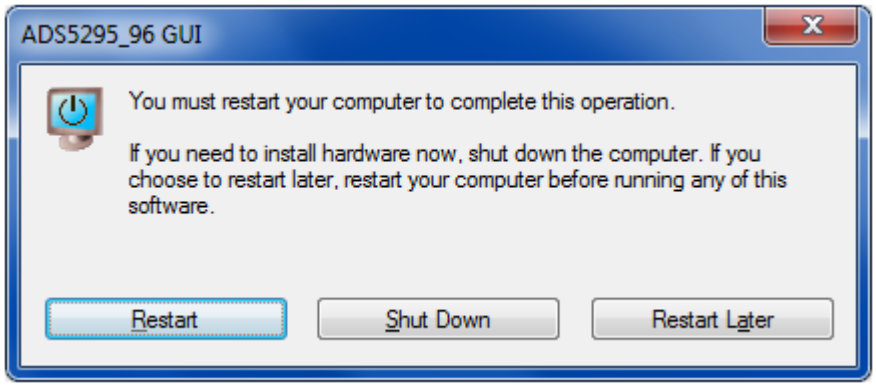
- The following window shows the installation progress:



- Clicking *Finish* completes the installation.



- The PC must be restarted to complete the installation.



4 Test Setup

To evaluate the ADS5295 device, a TSW1400EVM is required. Figure 3 shows the exact setup of these two boards and external connectors.

- Connect the **P10** connector of the ADS5295EVM to the **J3** connector of the TSW1400EVM.
- Connect a +5-V supply at the **P1** connector or across the **TP_VP** (+5 V) and **TP2** (GND).
- Connect a +5-V wall adapter to the TSW1400EVM at the **J12** connector.
- Connect a USB cable from the PC to **USB1** on the ADS5295EVM.
- Connect a USB cable from the PC to USB port **J5** of the TSW1400EVM.
- An external sampling clock is not required as the onboard 80-MHz CMOS clock oscillator is used in the default configuration.

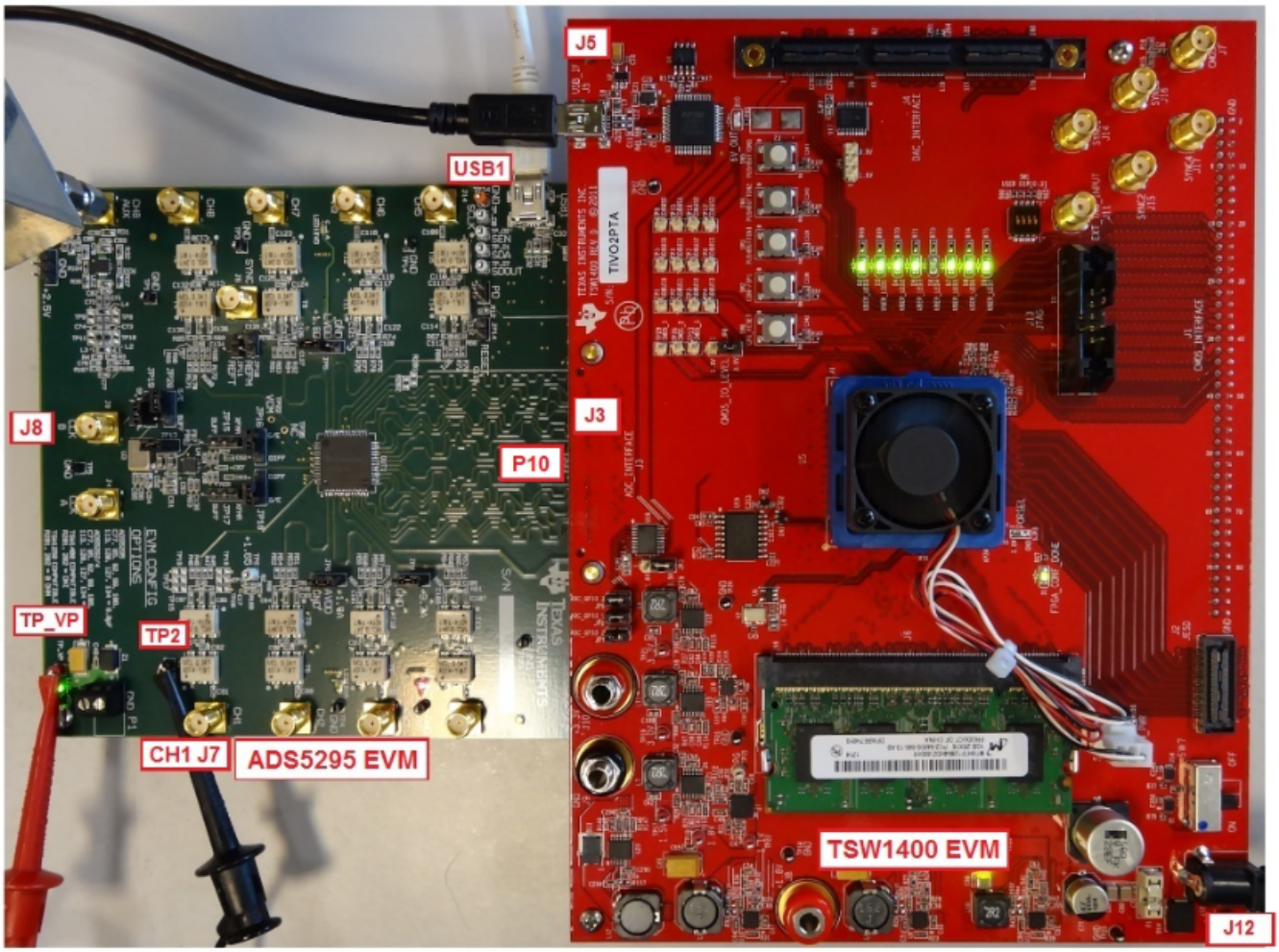


Figure 3. Hardware Setup of TSW1400EVM and ADS5295EVM

5 Power Up ADS5295

After connecting the EVM to the TSW1400 using the **P10** connector, the +5-V adapter to TSW1400EVM, and the +5-V supply (from the external power supply) across **TP_VP** and **TP2**, power up is complete. One green LED (LED_+5V) and one orange LED (LED33VA) should turn on as shown in Figure 4 (also see Figure 20).

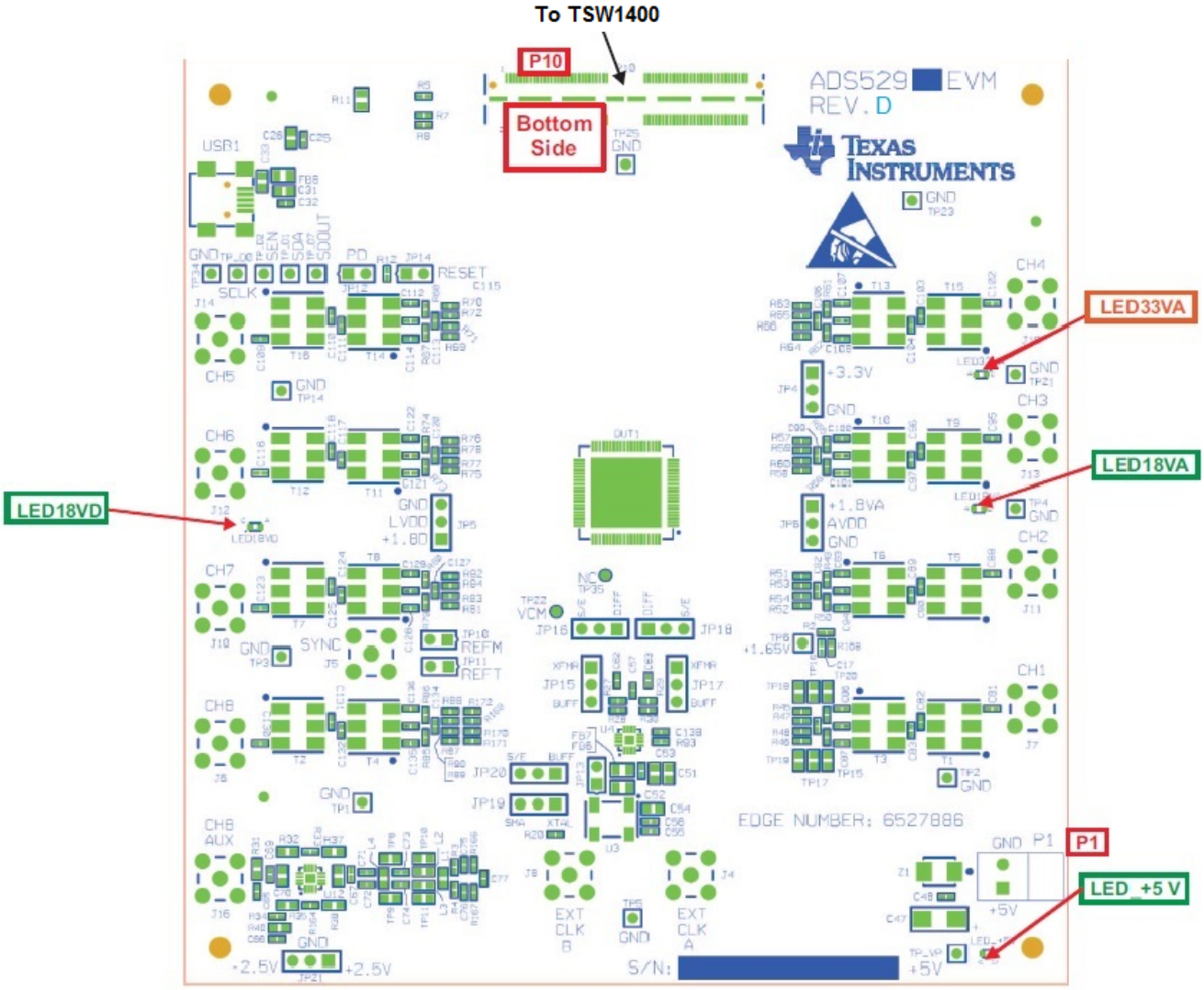


Figure 4. Power-Up Indications

6 Launch TSW1400 High Speed Data Converter Pro GUI

Upon launching the *High Speed Data Converter Pro* software, the GUI automatically detects the TSW1400EVM that is connected and reports its serial number as shown in Figure 5.

- Clicking **OK** connects to the board.

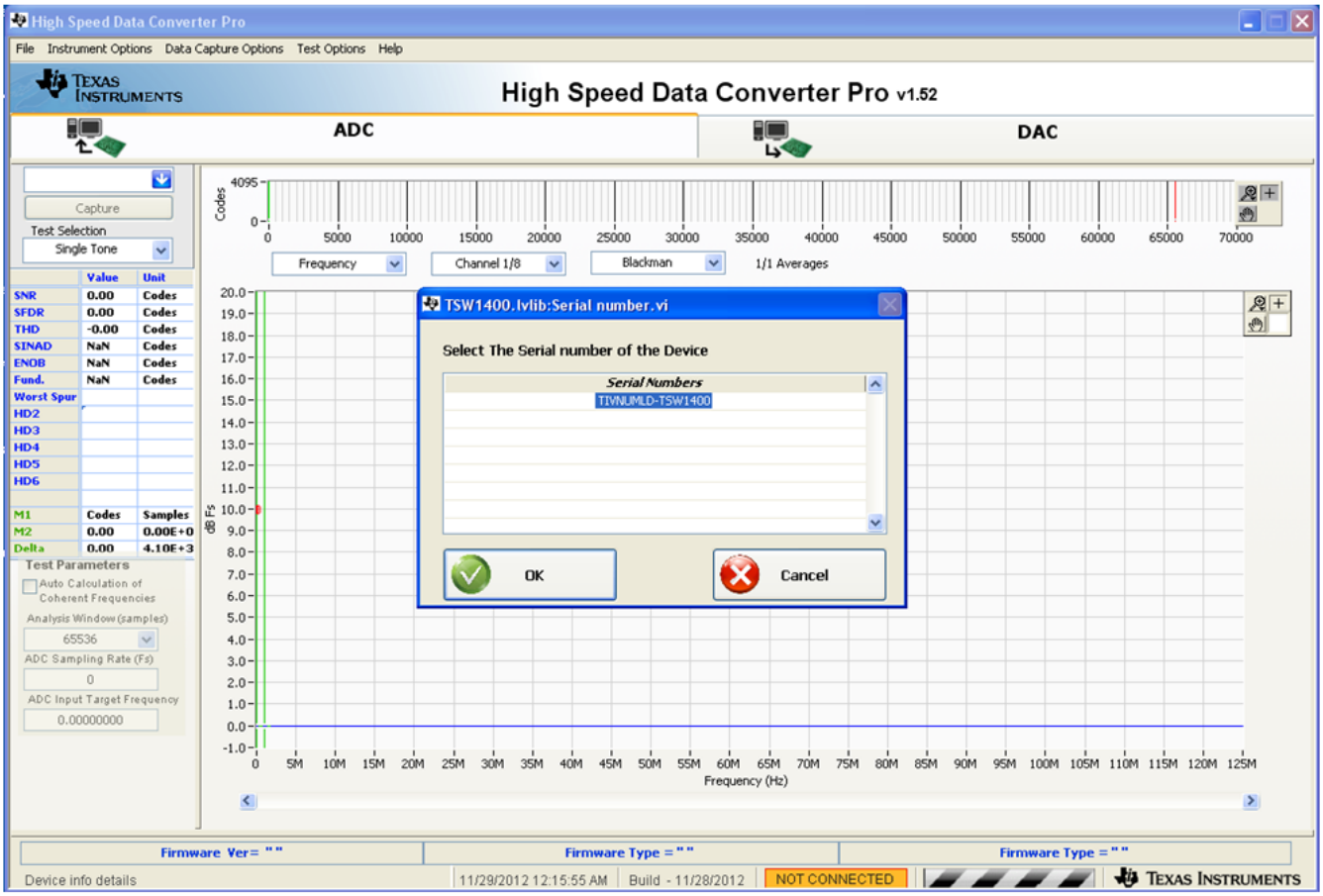
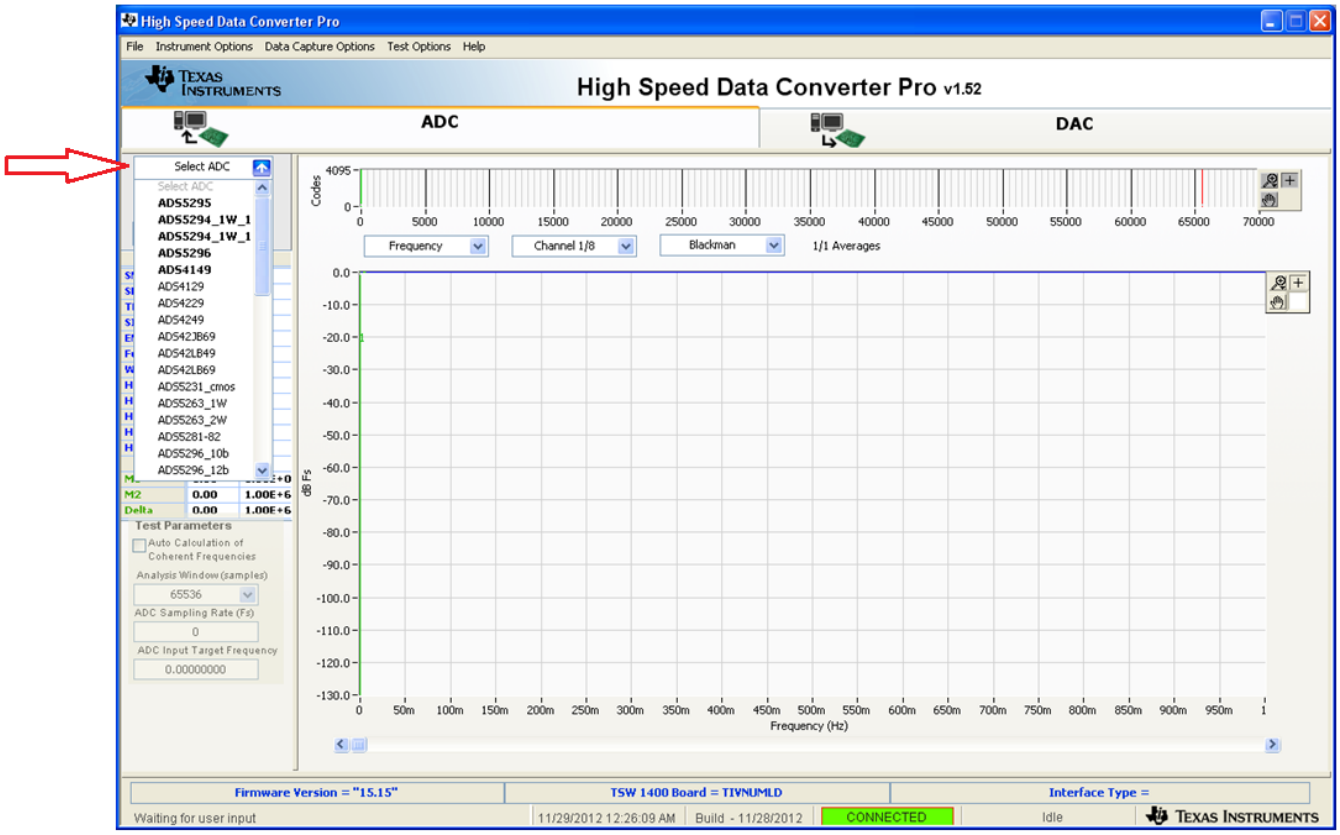
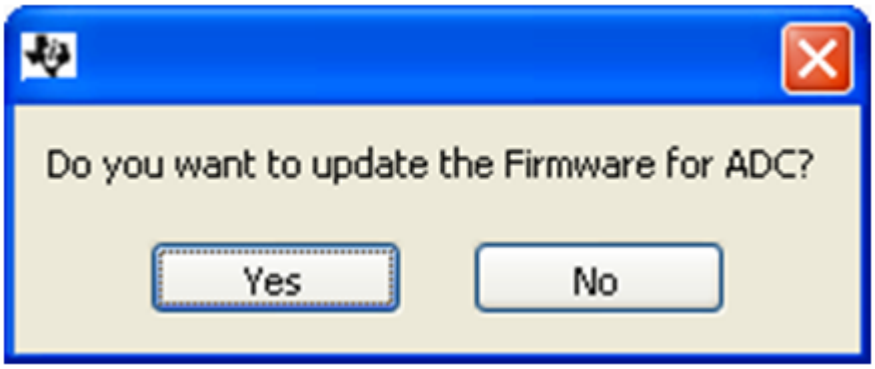


Figure 5. High Speed Data Converter Pro GUI Launch

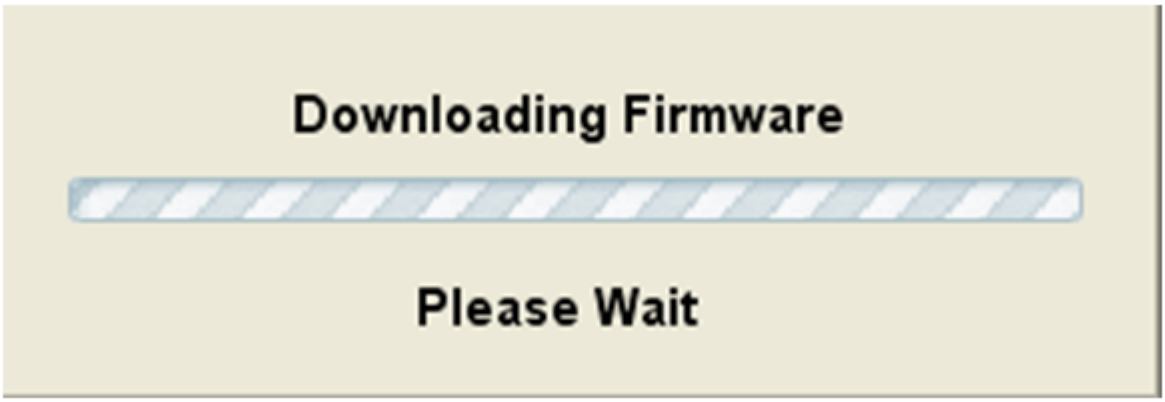
- In the upper left corner of the GUI, select **ADS5295** in the drop down menu of **Select ADC**.



- Click **Yes** to update the Firmware for the ADC.



- The following window appears while the firmware is loading.



- A new tab labeled **ADS5295 GUI** appears in the *High Speed Data Converter Pro* GUI as shown in Figure 6. This tab allows control of the ADS5295 device.

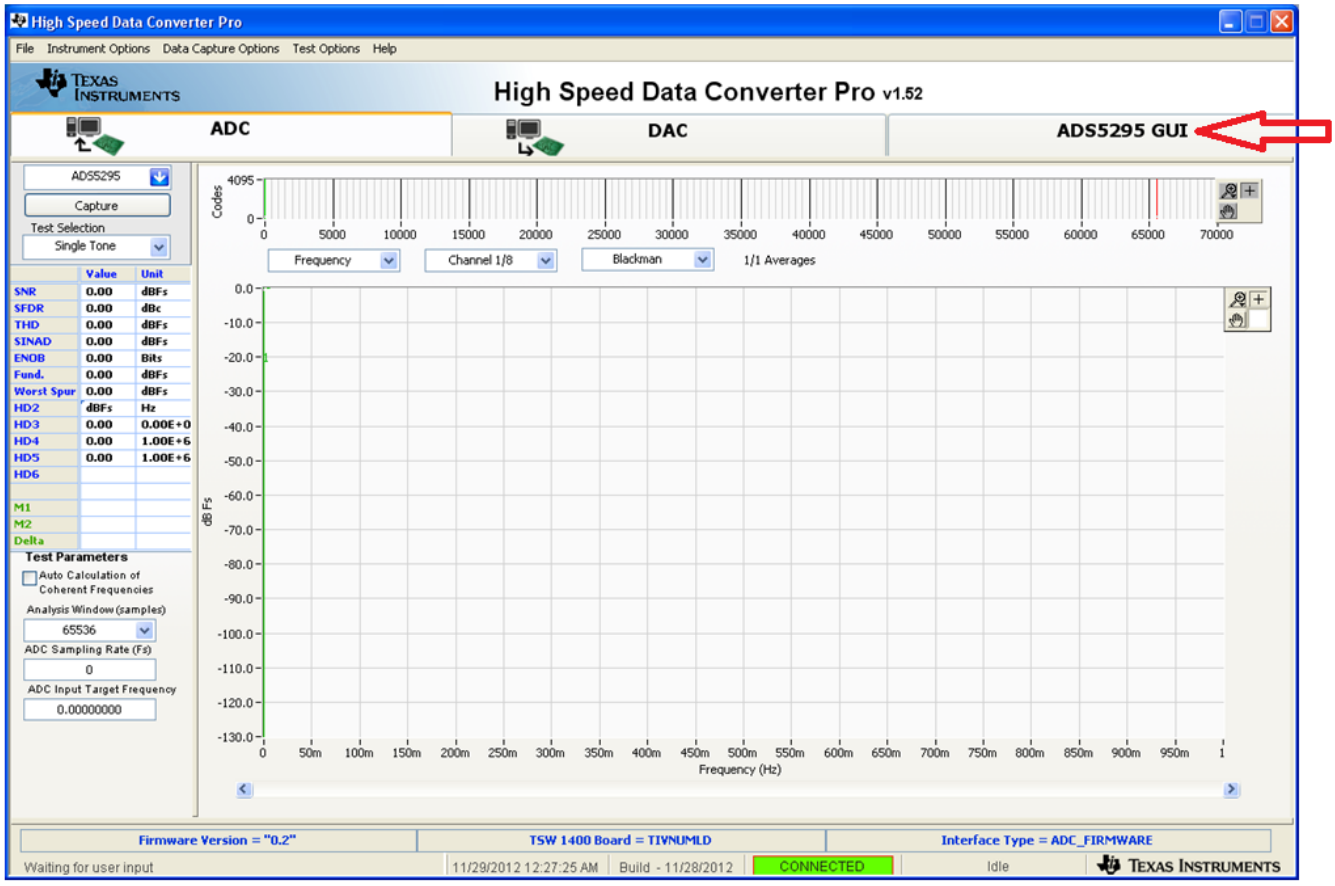


Figure 6. ADS5295 GUI

7 ADS5295 GUI Plug-In Tab

The third tab of the *High Speed Data Converter Pro* GUI labeled **ADS5295 GUI** contains all the serial register programming of the ADS5295 device.

- The **ADS5295 GUI** tab contains two sub-tabs called *Read Me First* and *High Level Test*. The default tab displayed is the *Read Me First* tab as shown in Figure 7
- A table of all operating modes that the device supports is shown in this tab. The device can be quickly configured to any of the operating modes listed by selecting the appropriate **Saved Sequence** file name once the **Playback Sequence** button is pushed. This button is located in the right side of the GUI in the *RECORD/PLAYBACK COMMAND SEQUENCE* section. (*Note: The FPGA firmware of the TSW1400 capture card is automatically updated to match the operating mode selected.*)
- Clicking the *High Level Test* tab accesses all serial registers.

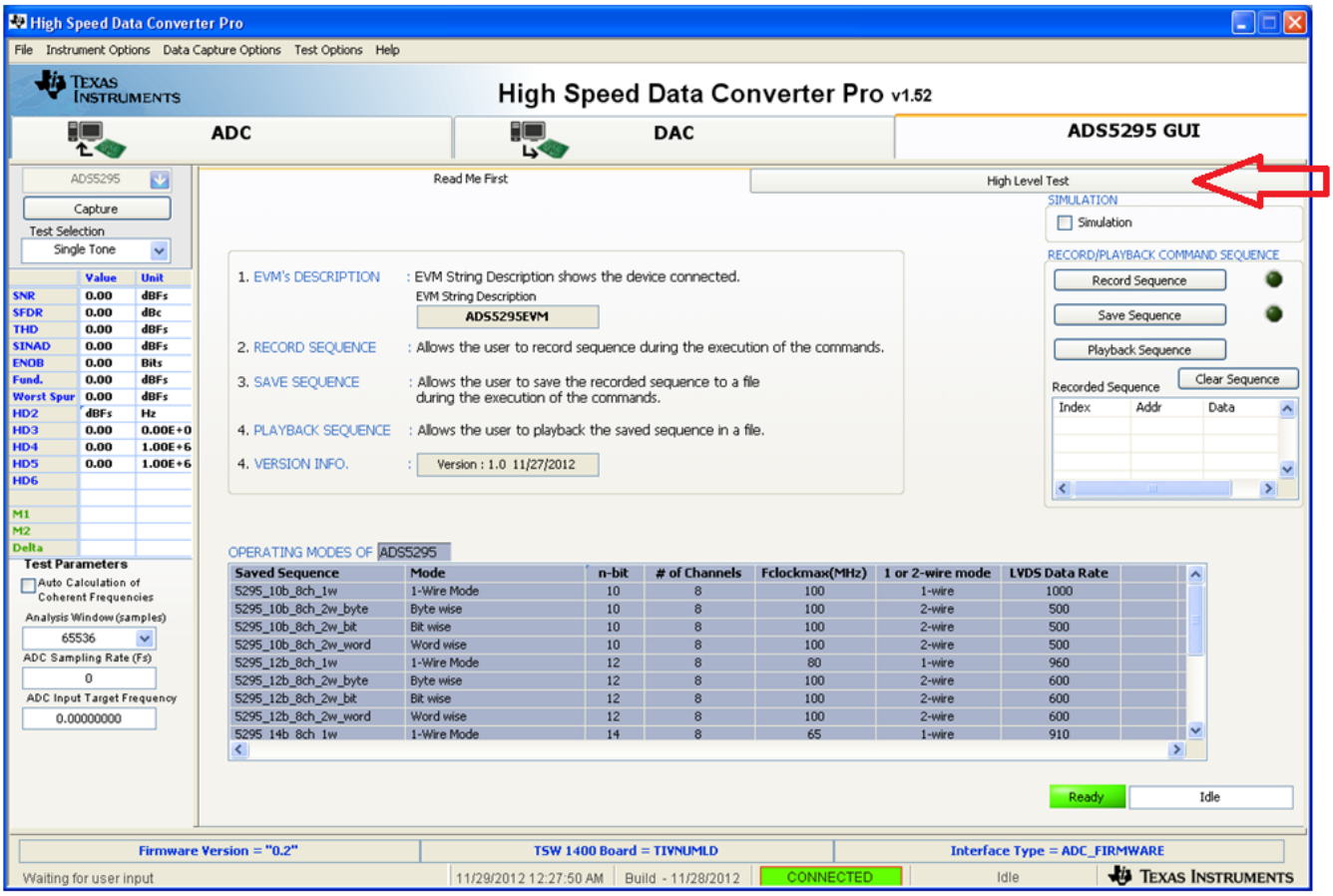


Figure 7. ADS5295 GUI Plug-In Tab

- The *High Level Test* tab contains five sub-tabs: *Top Level, Test Pattern, Dig Sig Proc, Channel Filter, IN/OUTP Map.* The default tab is the *Top Level* tab as shown in Figure 8.
- The *Top Level* tab contains four sections: *OUTPUT INTERFACE MODES, GENERAL SETUP, POWERDOWN MODES, CUSTOM READ/ WRITE.*
- To verify that communication with the ADS5295 is functioning properly, inside the *POWERDOWN MODES* section, click the checkbox labeled **PDN_COMPLETE**. The DC current from the power supply should drop to approximately 140 mA when this box is checked. Uncheck this box before continuing.

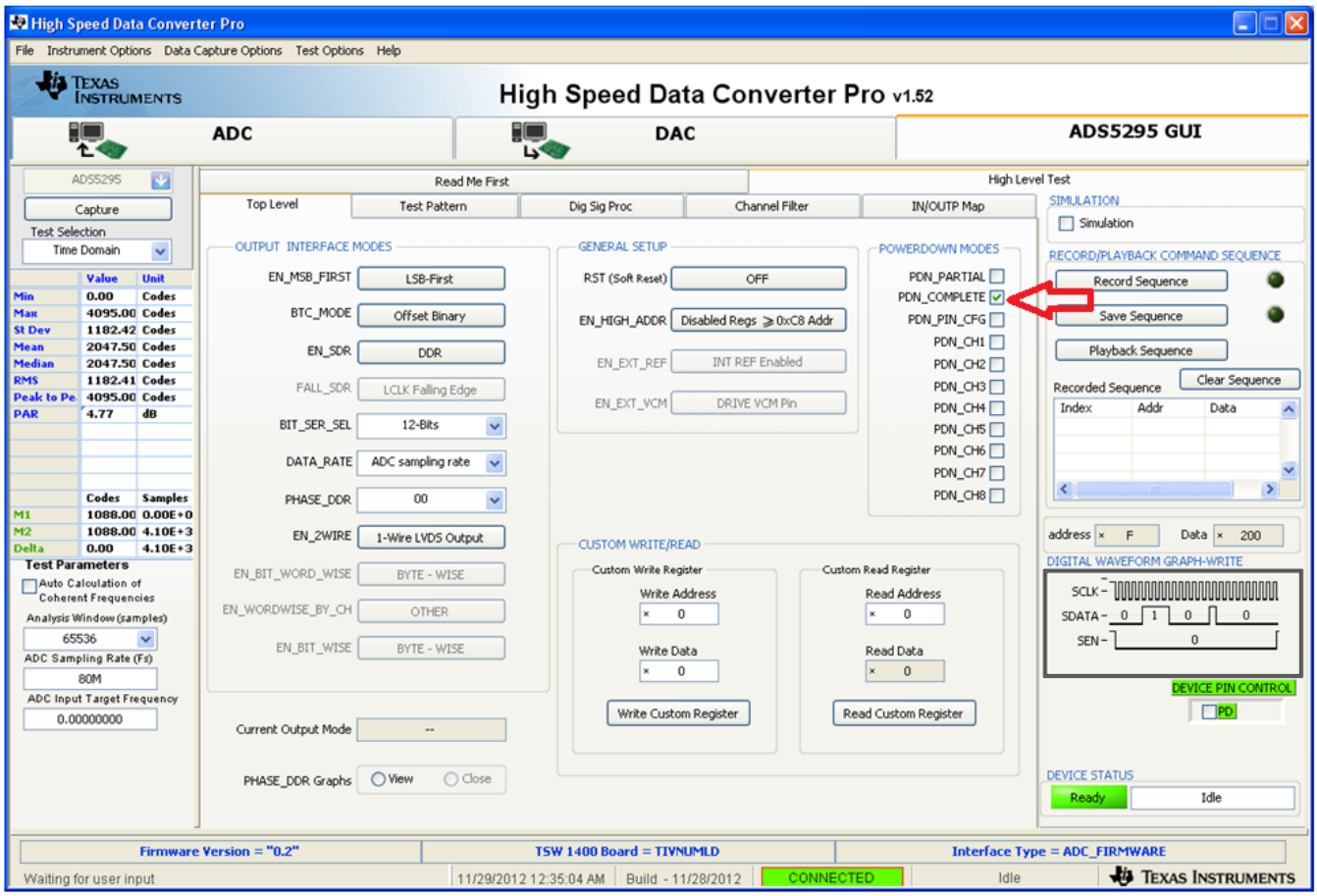
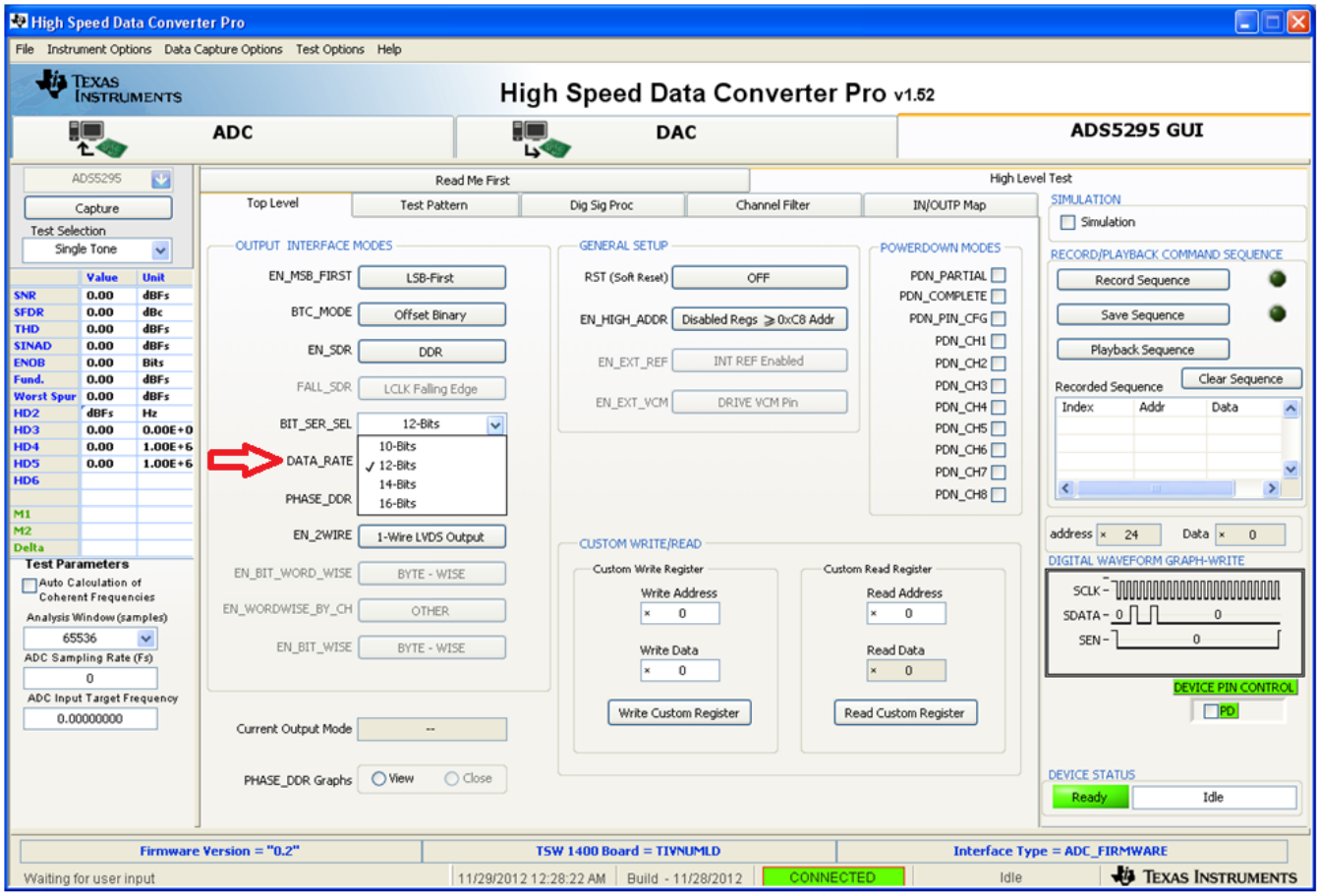


Figure 8. Top Level Tab

- The *OUTPUT INTERFACE MODES* section contains all serial registers associated with the LVDS data output format. The FPGA firmware of the TSW1400 capture card is automatically updated when one of these registers, such as **DATA_RATE**, is updated.
- The *CUSTOM WRITE/READ* section allows manual programming of a serial register's data value given it's address. In addition, the current data value of any serial register can be read from the device by inputting it's address.



8 Test ADS5295

This section describes how to test the ADS5295 device in two ways: *Time Domain* and *Single Tone*.

8.1 Step 1: Time Domain

Time Domain test consists of applying a RAMP function to the ADC inputs, capturing, and verifying that every ADC code is generated incrementally.

- Select *Test Pattern* tab.
- In the *TEST PATTERN MODES* section, select **RAMP PATTERN** in the **Enable Pattern Mode** drop down menu. *(Note: the RAMP PATTERN is applied internal to the device to all ADC channels simultaneously.)*

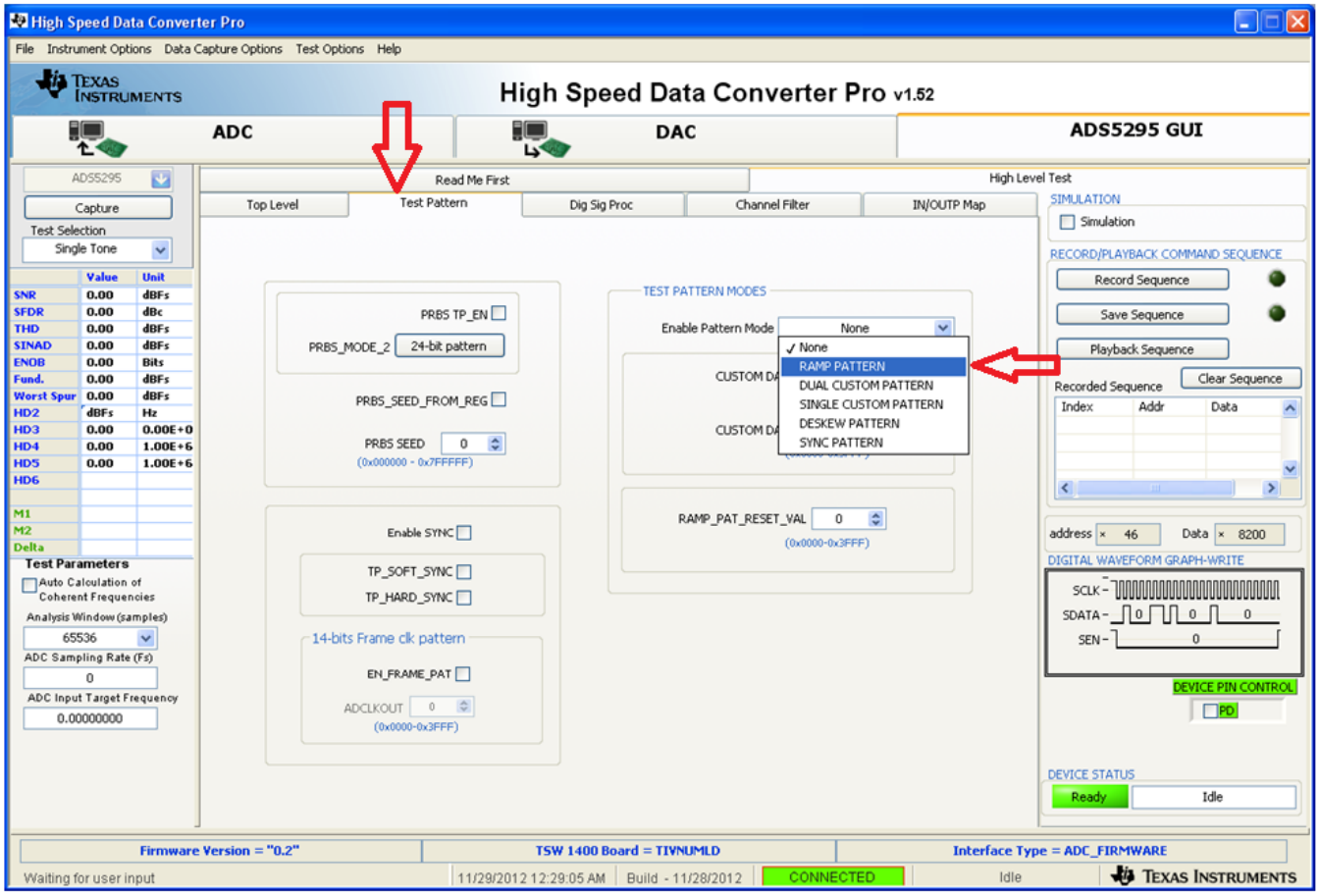


Figure 9. ADS5295 Time Domain Setup

- On the *ADC* tab of the *High Speed Data Converter Pro* GUI, select **Time Domain** from the **Test Selection** drop down menu as shown in Figure 10.

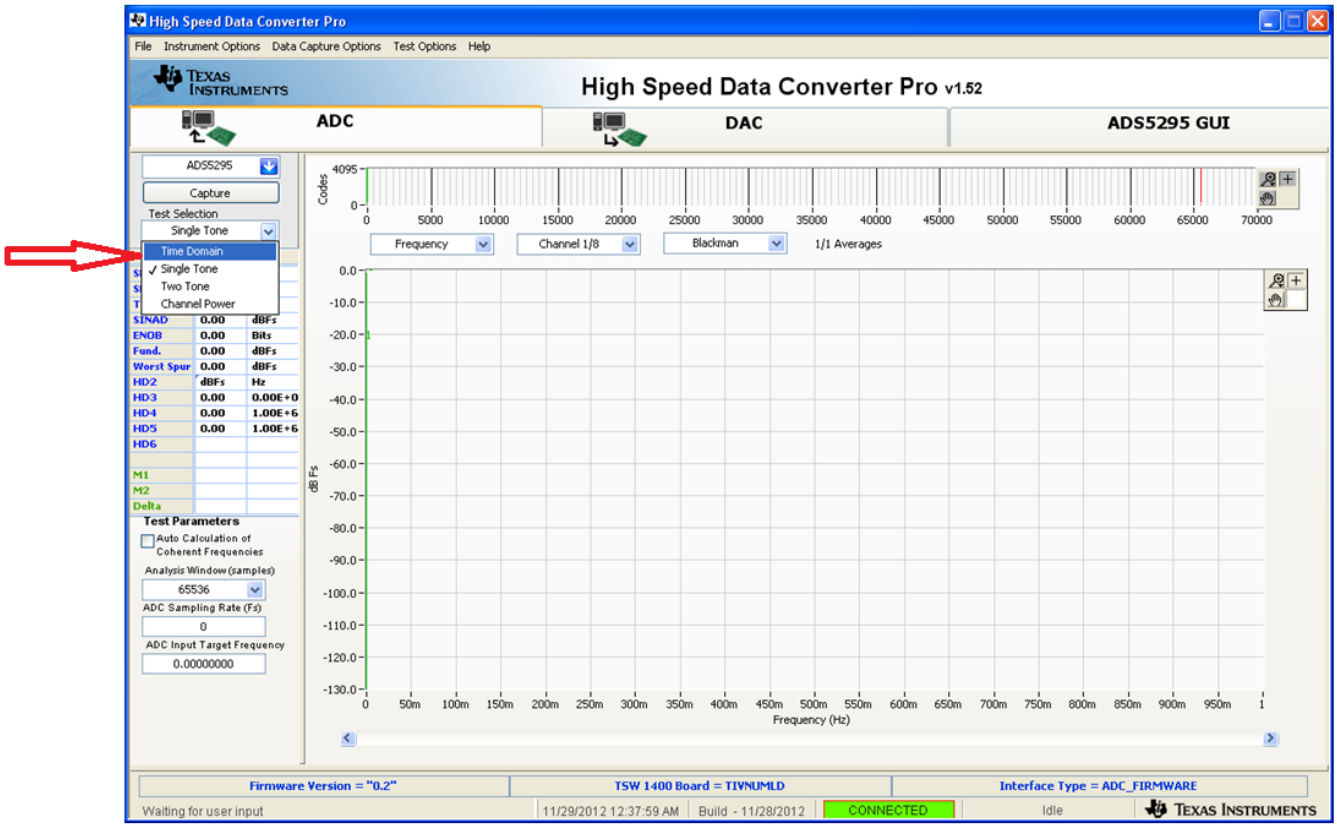


Figure 10. Time Domain Test

- Input the appropriate **ADC Sampling Rate** (80 MHz in the default configuration of ADS5295 EVM) .
- Press the **Capture** button.

- A saw tooth ramp should be captured as shown below.

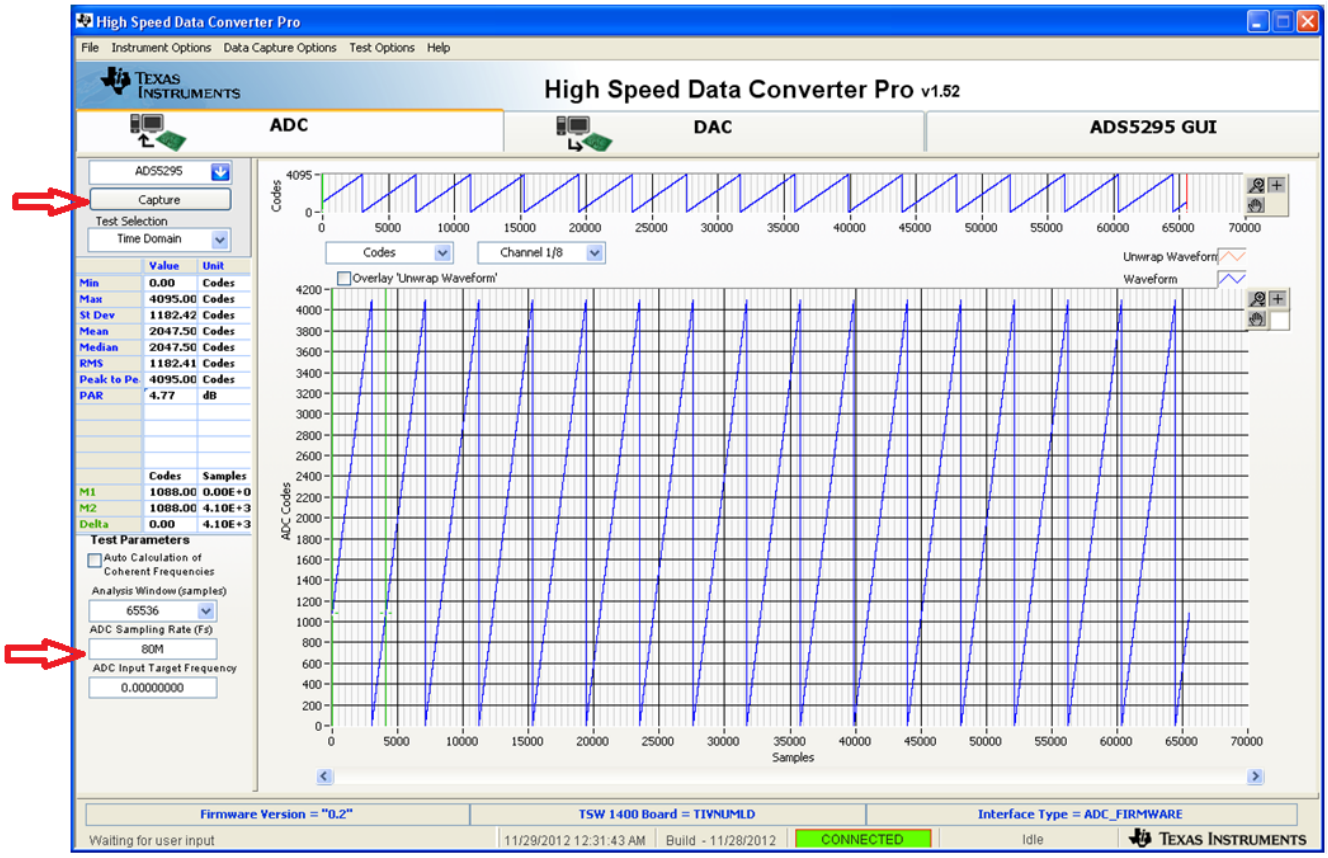


Figure 11. ADS5295 RAMP Test Pattern Capture

- Use the zoom functions provided in the *High Speed Data Converter Pro* GUI to verify that the captured RAMP is correct.

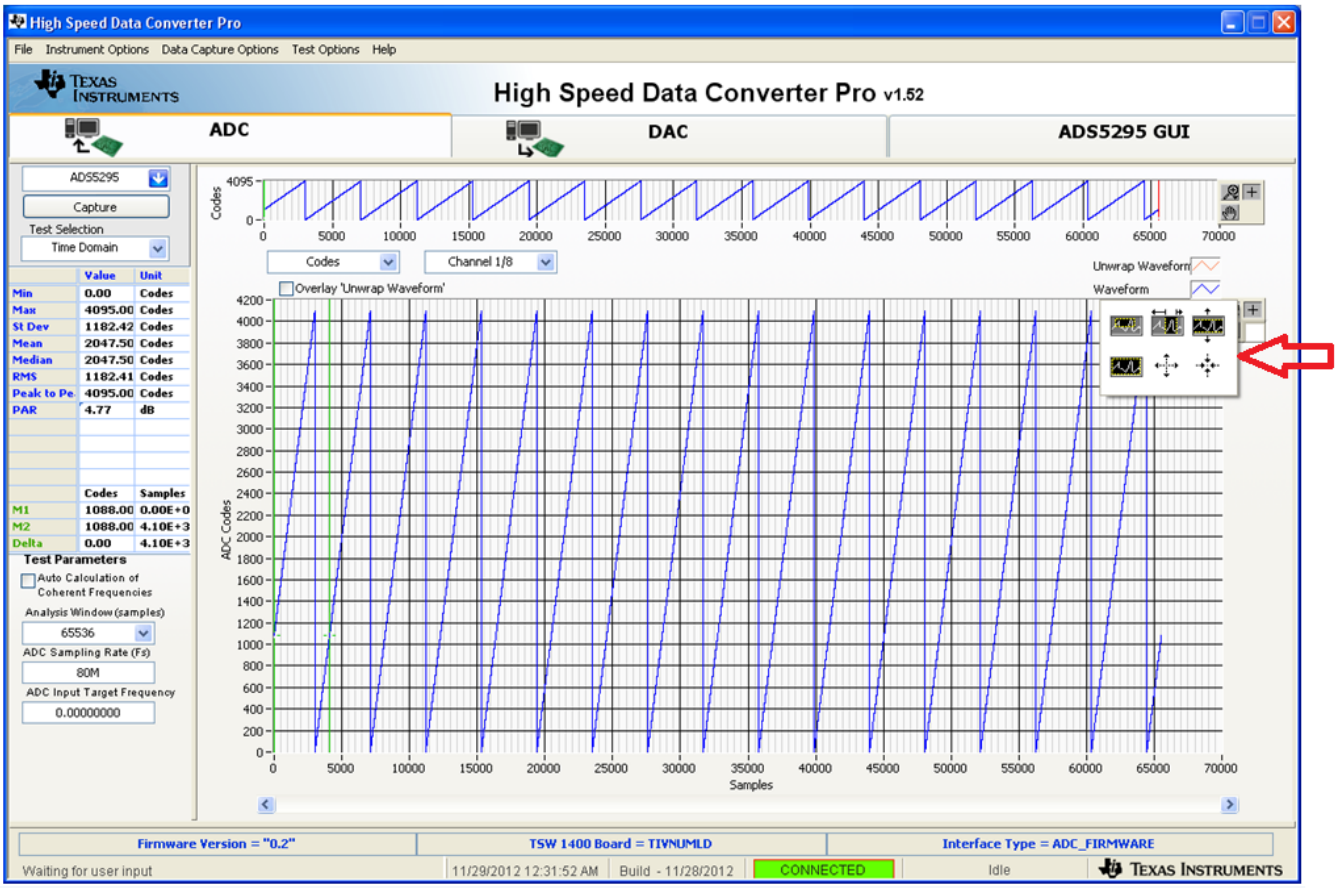


Figure 12. Graph Zoom Functions

- Zoom in on the RAMP until it is clear that every subsequent sample is an increment in ADC code as shown below.

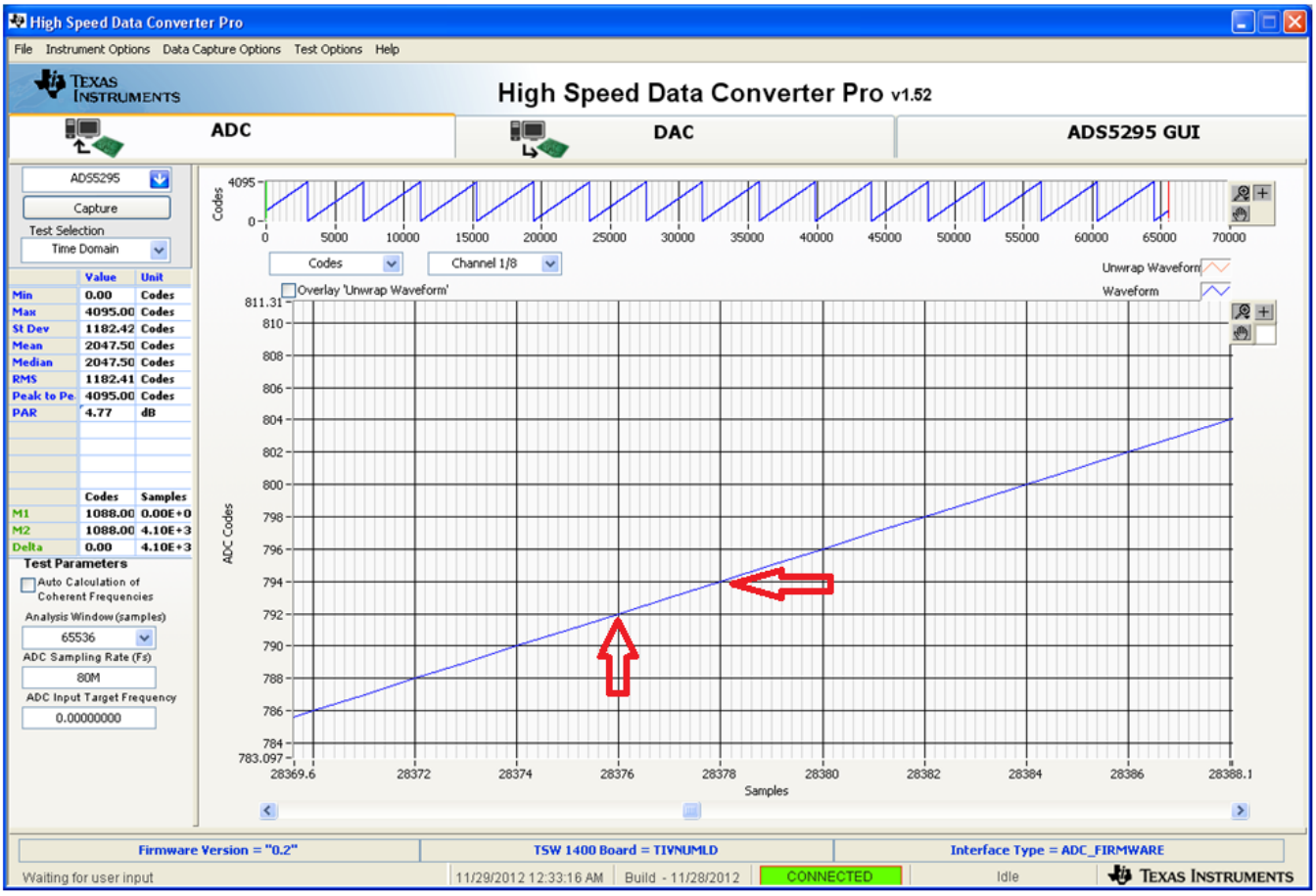


Figure 13. ADS5295 RAMP Verification

- Repeat the above procedure for all eight ADC channels using the selection box shown in Figure 14.

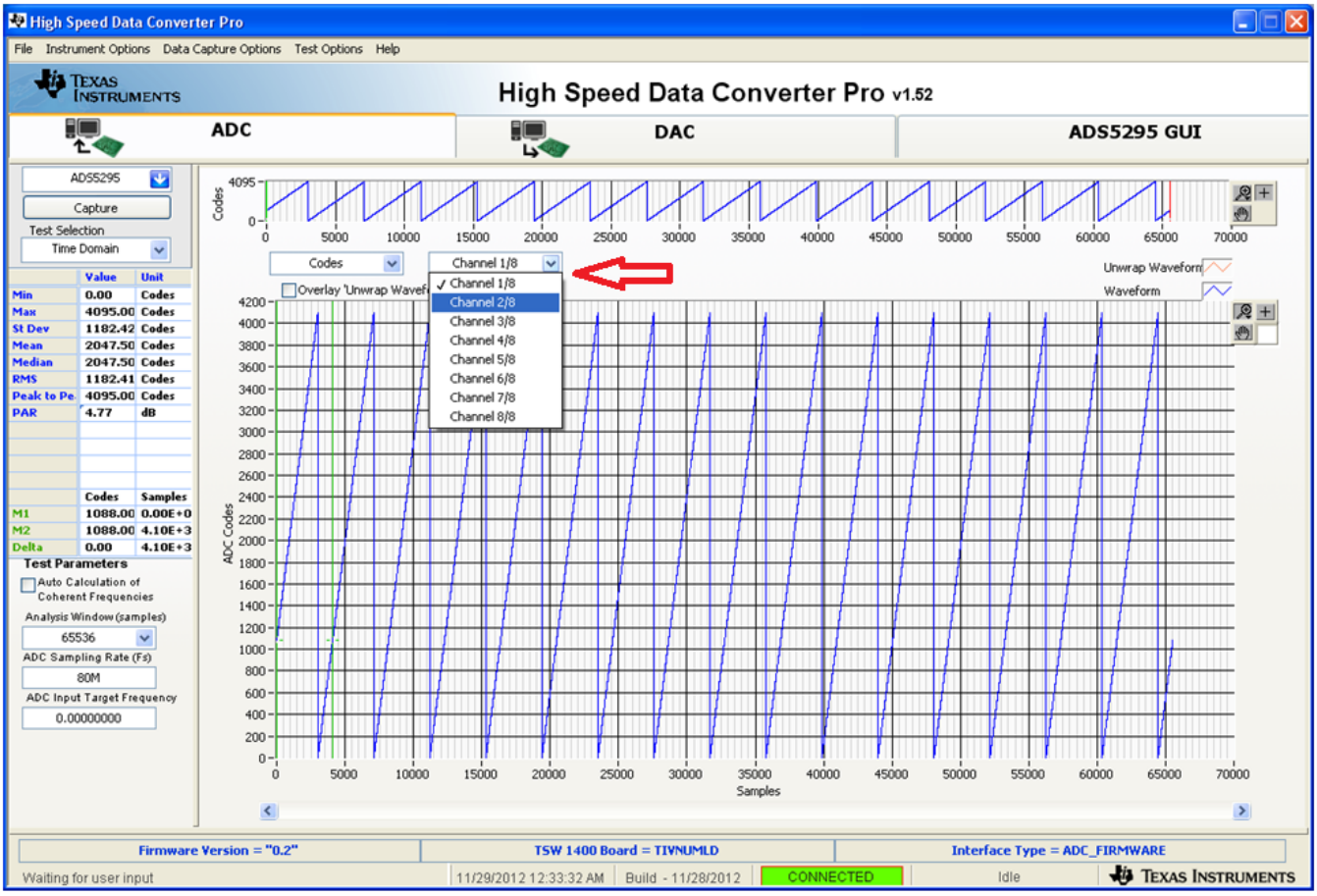


Figure 14. ADC Channel Selection

8.2 Step 2: Single Tone FFT

The *Single Tone* test consists of applying a sine wave from an external signal generator to an ADC input, capturing, and analyzing performance.

- Disable the **RAMP PATTERN** by setting the **Enable Pattern Mode** to **None**.

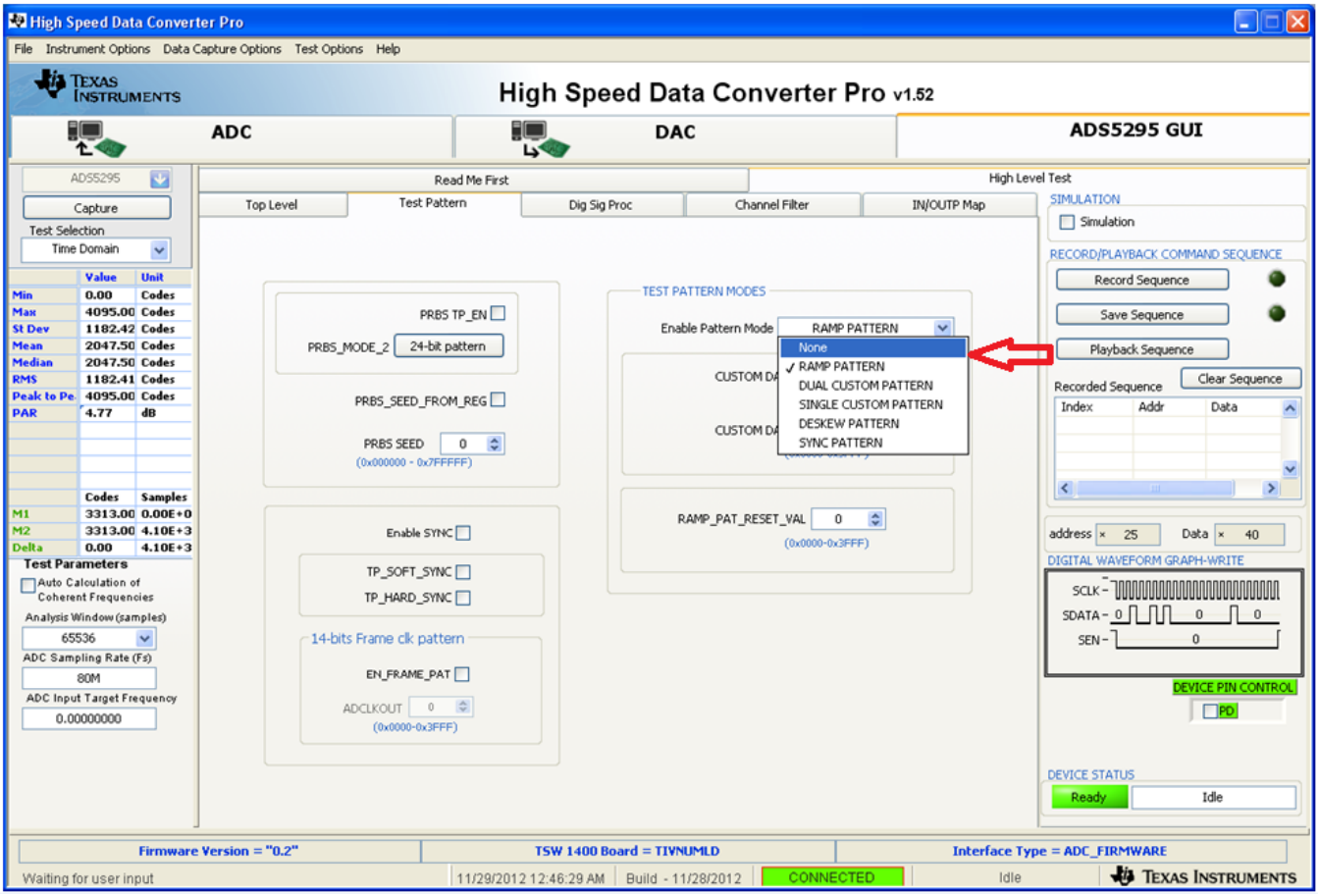


Figure 15. Disable RAMP PATTERN

- Set the **Test Selection** to **Single Tone**.
- Set the **ADC Input Target Frequency** to **1M** *(Note: the value automatically changes to the exact coherent frequency once the Auto Calculation box is checked)* .
- Check the box labeled **Auto Calculation of Coherent Frequencies**.

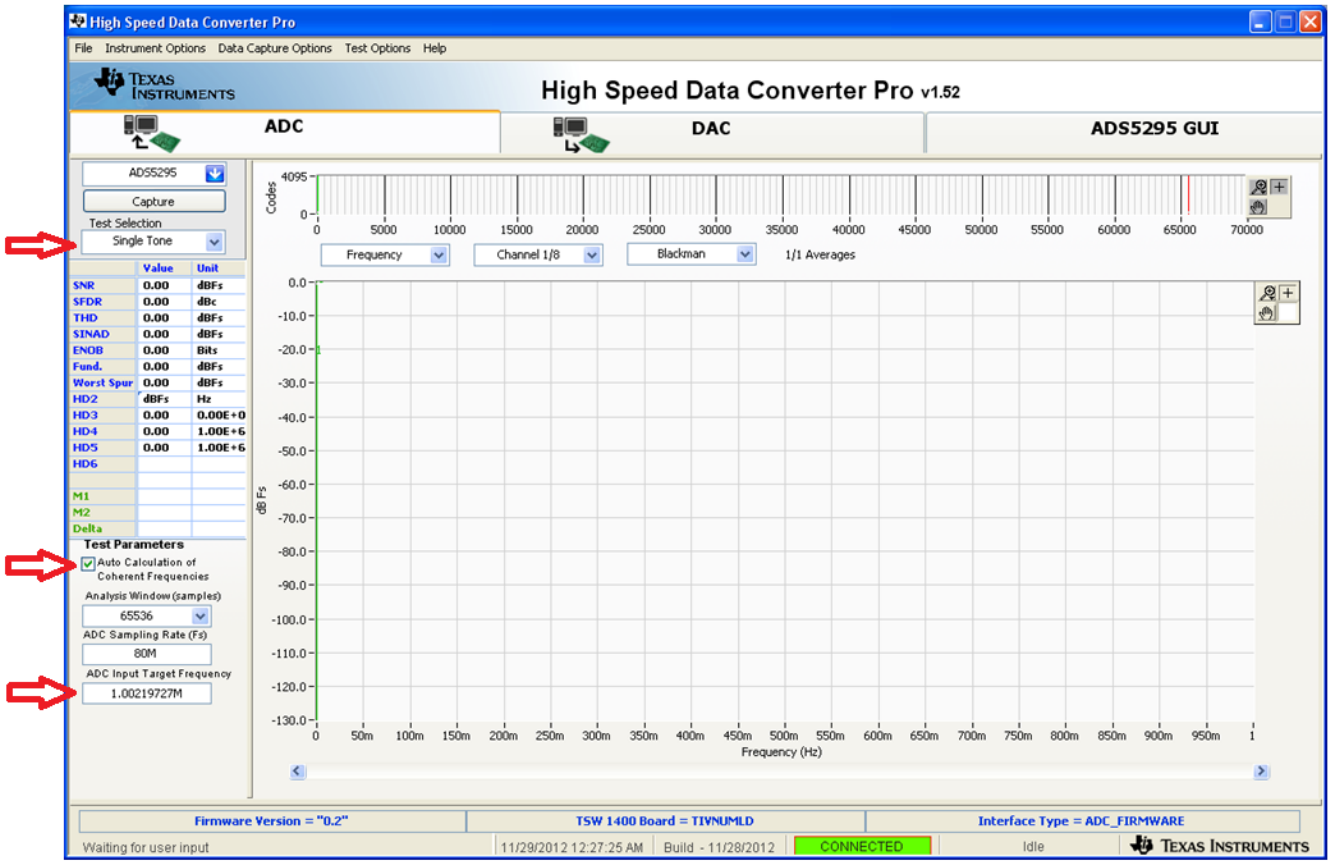


Figure 16. Single Tone Test

- Connect Channel 1 of the ADS5295EVM to a signal generator through a band-pass filter (BPF). If no **BPF** is present, the results are not good.
- The **amplitude** of the input signal is dependent on the insertion loss of the filter and cables used as well as the desired backoff from full-scale. An iterative approach is used to determine the amplitude setting required to operate at approximately -1.0 dBFS. In this test setup, the amplitude was set to **+18.4 dBm**.
- Set the **frequency** of the signal generator to that shown in the **ADC Input Target Frequency** box **(1.00219727M)**.
- Change the window option to **Hanning**, due to the fact that input signal and onboard CMOS clock are non-coherent.
- Pressing the **Capture** button returns the test result.
- Repeat for Channels 2 through 8.

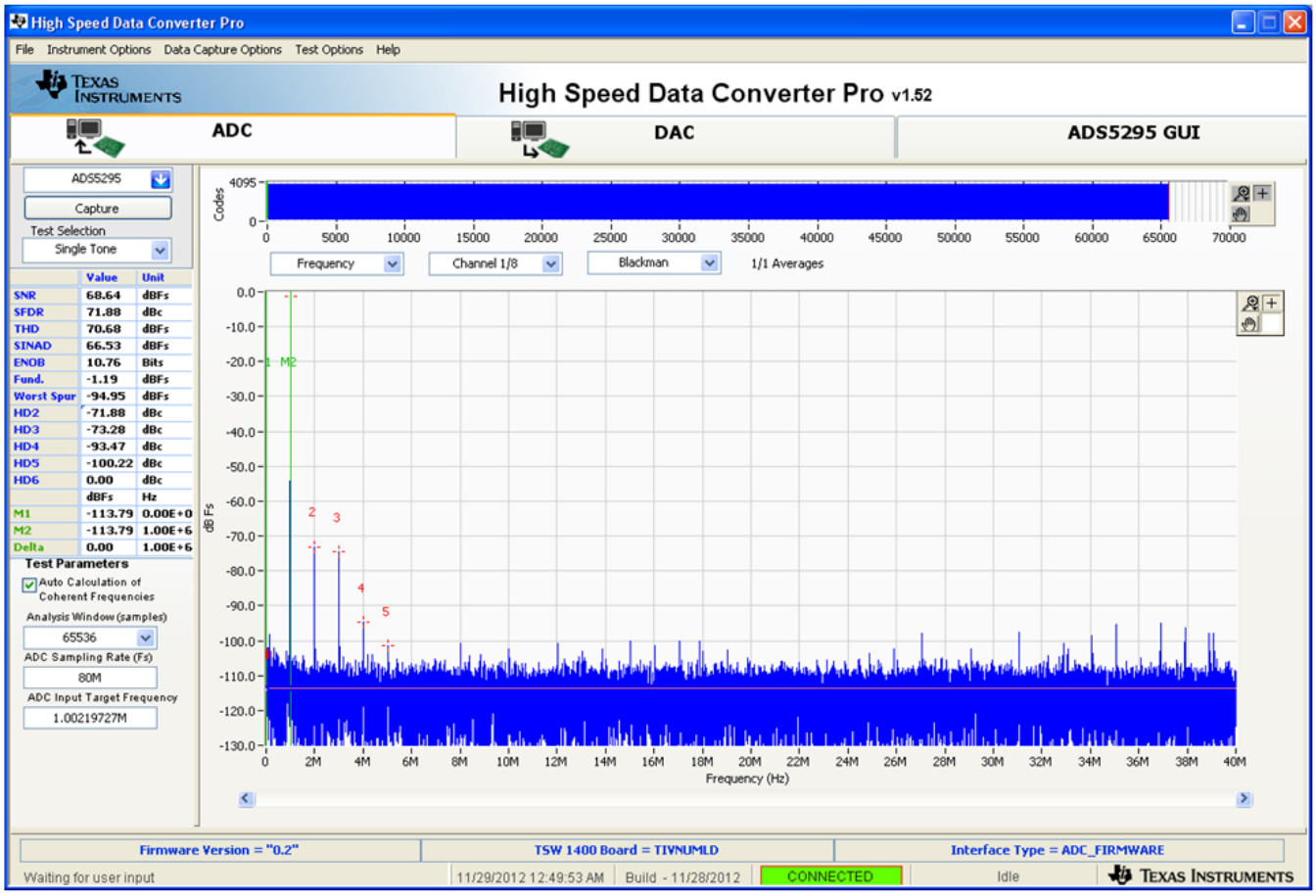


Figure 17. Single Tone Capture

9 Board Configuration

9.1 Input/Output, Power Supply, and USB

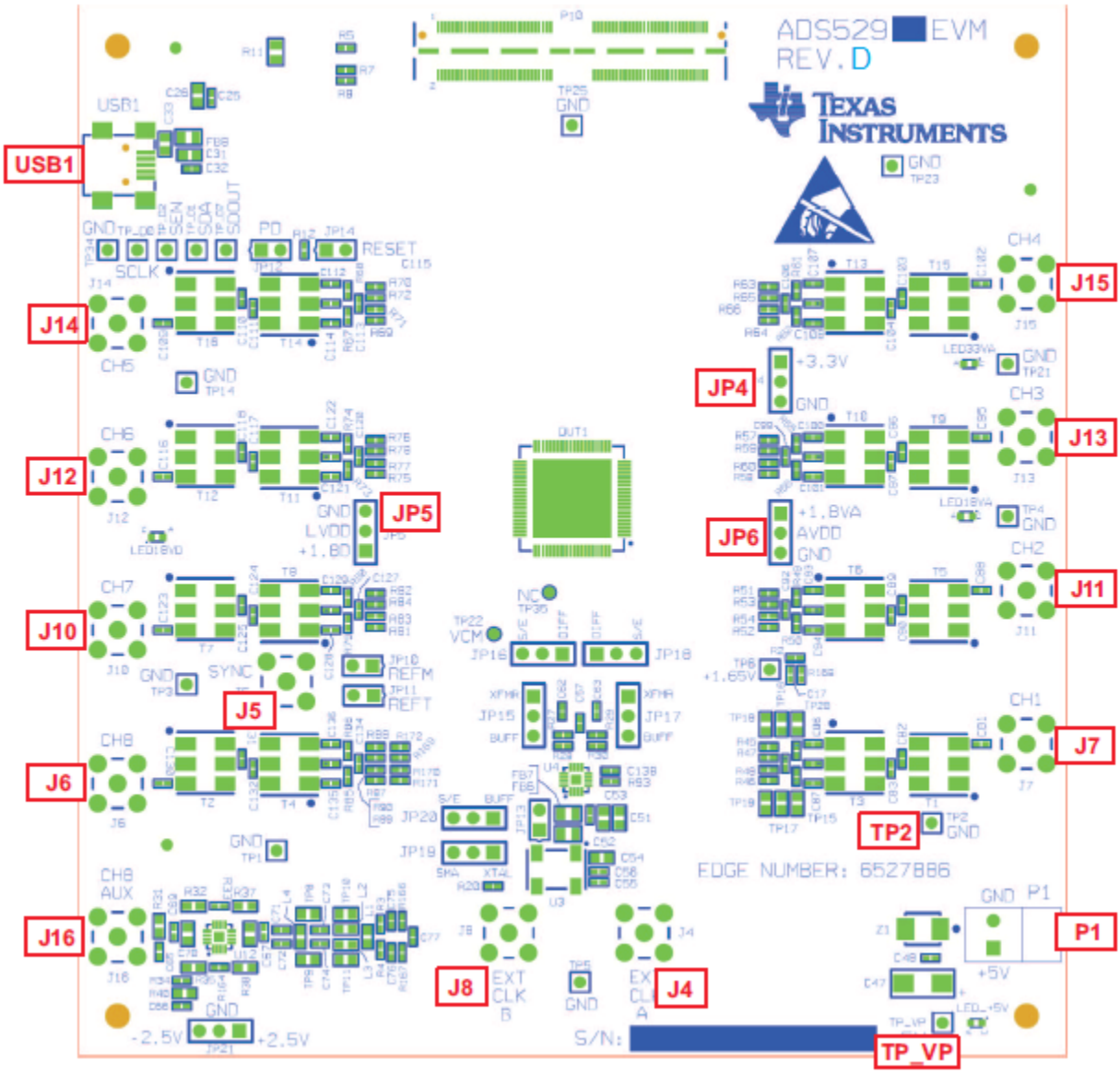


Figure 18. I/O, PWR, and USB Connector

Table 1. Input/Output, Power, and USB

Connector	Description
J6,J7,J10….J15	Analog Input signals for Ch1-Ch8. Connect to a signal generator. A band-pass filter must be applied between the generator and the SMA to get a better result.
J16	An alternative input for channel 8. Install two resistors (R169 and R170) and remove two resistors (R171 and R172) from J6.
P1/TP_VP	P1 is the +5-V power supply connector. TP_VP is the test point for +5-V power supply.
JP4	Onboard 3.3-V Analog enables. Set up as shown in Figure 2 is required to use onboard 3.3 V.
JP5	Onboard 1.8-V Digital enables. Set up as shown in Figure 2 is required to use onboard 1.8 V.
JP6	Onboard 1.8-V Analog enables. Set up as shown in Figure 2 is required to use onboard 1.8 V.

Table 1. Input/Output, Power, and USB (continued)

Connector	Description
TP1, TP2, TP3, TP4, TP5, TP14, TP21, TP23, TP25, TP34,	Ground test points.
USB1	USB interface connector

Table 2. Channel 8 Configuration

Input Interface Type	Connector	Description
Through Transformer (Default)	J6	In default configuration, R171 and R172 are already populated
Through Amplifier (Not Default)	J16	It is an alternative input for channel 8. Need to install two resistors (R169 and R170) and remove two resistors(R171 and R172) from J6.It uses TI THS4509 single-ended to differential amplifier.

9.2 ADC Clock

Five options are available for the source of the ADC clocks. Refer to Table 3 for details. In Figure 19, the EVM uses an onboard, single-ended clock as the default option.

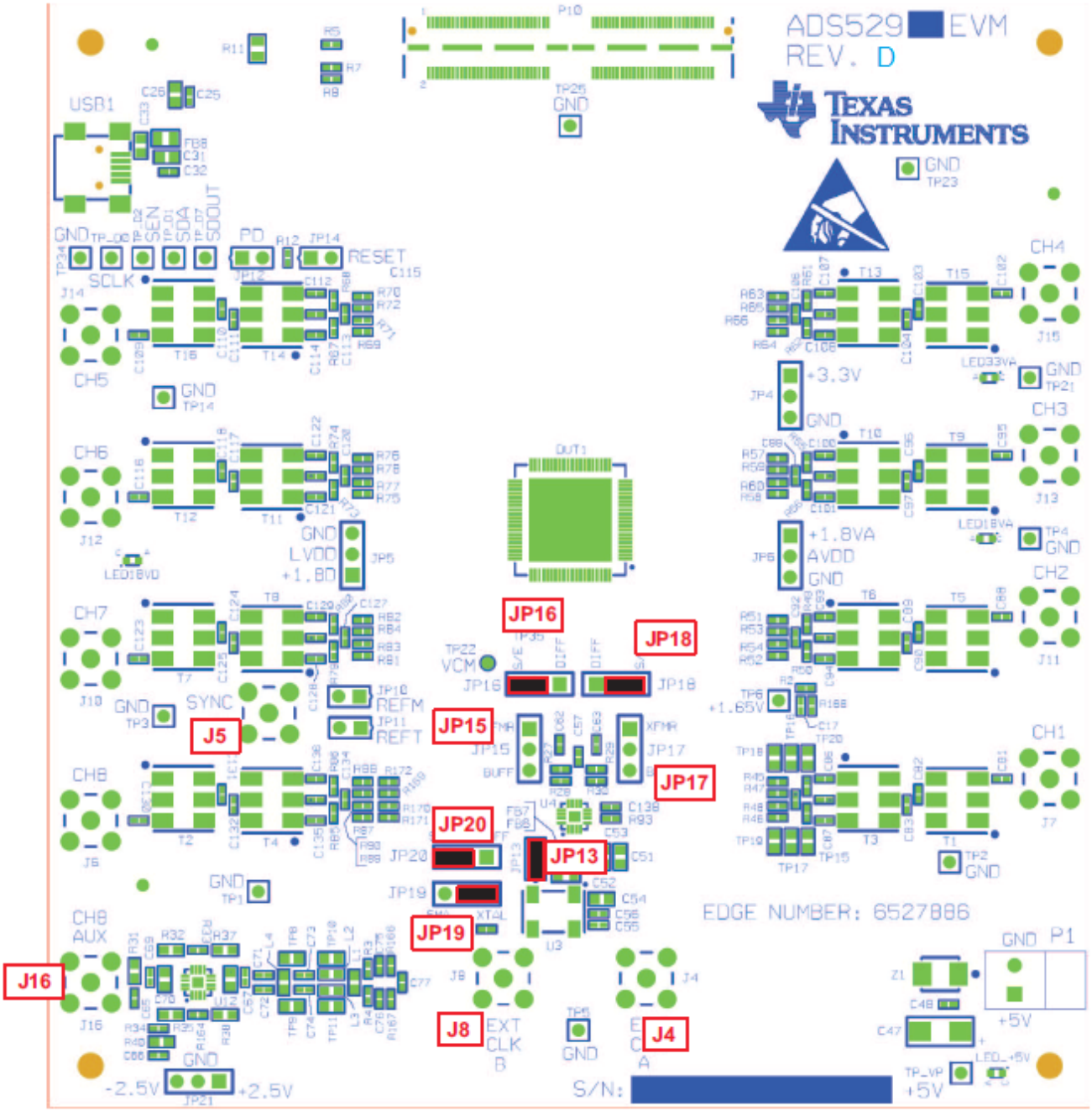
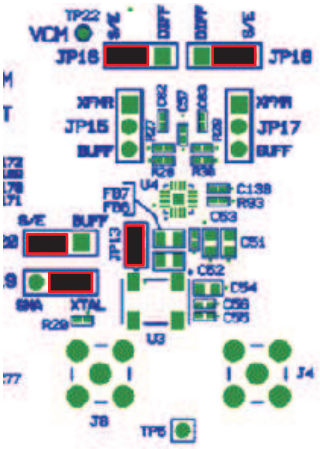


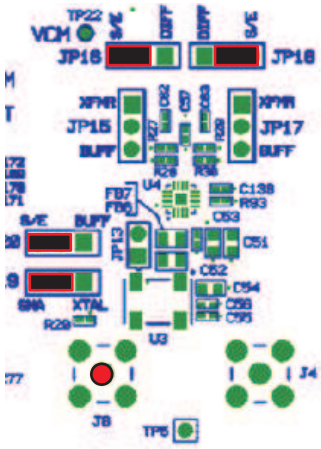
Figure 19. ADS5295EVM Default Clock Jumper Locations

Table 3. ADC Clock Various Mode Jumper Settings

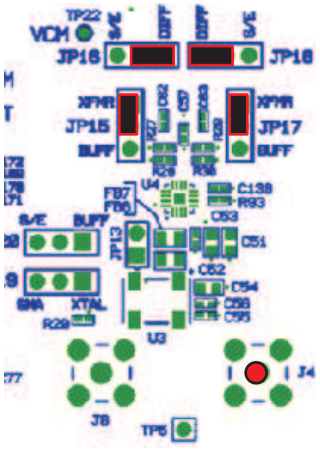
Clock Type		Reference Designator	Jumper Setting	Diagram
Single Ended	Onboard CMOS Oscillator	JP13, JP19, JP20, JP16, JP18	JP13 (1-2), JP20 (2-3), JP19 (1-2), JP16 (2-3), JP18 (2-3)	Dia. 1 (Default Option)
	External CMOS Clock Generator	J8, JP19, JP20, JP16, JP18	JP20 (2-3), JP19 (2-3), JP16 (2-3), JP18 (2-3) and Connect CMOS clock generator output at SMA connector J8.	Dia. 2
Differential Clock Signal	Transformer Based External	JP15, JP17, JP16, JP18, J4	JP15 (1-2), JP16 (1-2),JP17 (1-2), JP18 (1-2), and Connect external Clock source at SMA connector J4	Dia. 3
	Onboard Clock Buffer (CDCLVP1102,U4)	JP13, JP19, JP20, JP15, JP17, JP16, JP18	JP13 (1-2), JP20 (1-2), JP19 (1-2), JP15 (2-3), JP17 (2-3), JP16 (1-2), JP18 (1-2). This configures the onboard CMOS oscillator as clock input to buffer.	Dia. 4
		J8, JP19, JP20, JP15, JP17, JP16, JP18	JP19 (2-3), JP20 (1-2), JP15 (2-3), JP17 (2-3), JP16 (1-2), JP18 (1-2) and Connect External CMOS generator output at SMA connector J8. This configures the external CMOS source as clock input to buffer.	Dia. 5



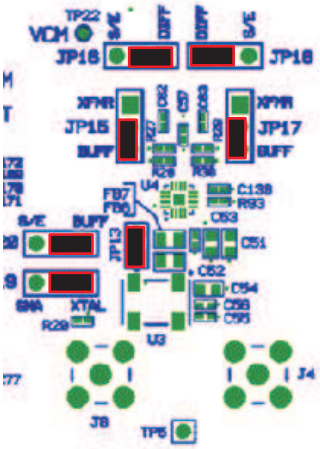
Dia.1



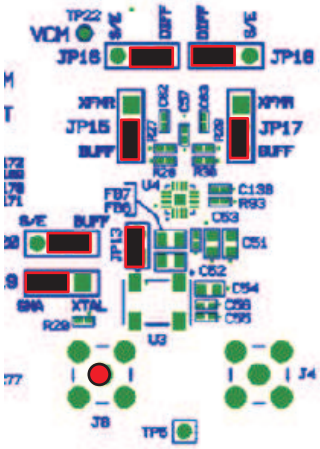
Dia.2



Dia.3



Dia.4



Dia.5

9.3 Light-Emitting Diodes (LEDs)

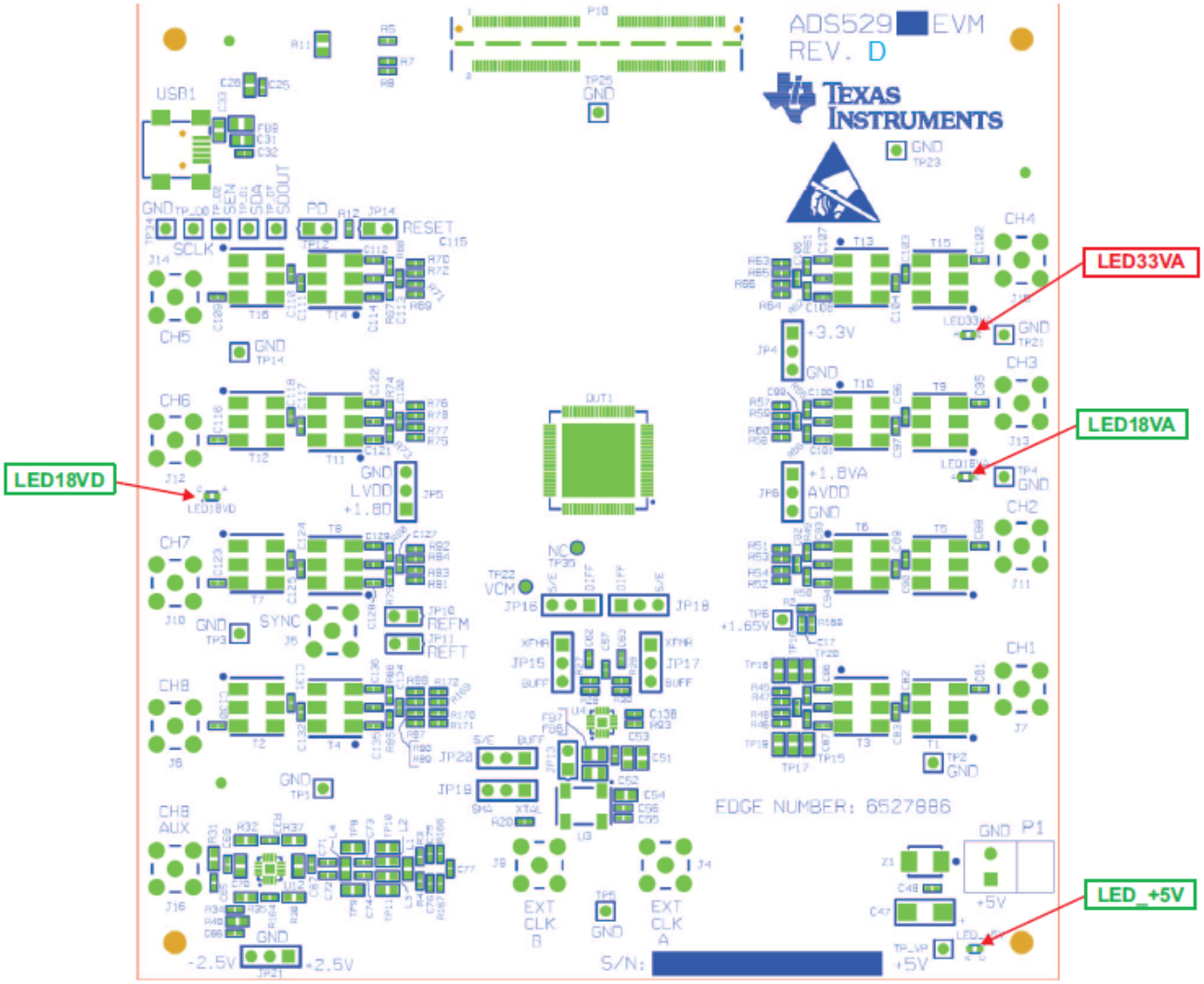


Figure 20. ADS5295EVM LED Location

Table 4. LED Indicators

Reference Designator	Power Supply	Color
LED_+5V	+5 V	Green
LED1.8VA	+1.8 VA	Off
LED1.8VD	+1.8 VD	Off
LED3.3VA	+3.3 VA	Orange

9.4 Miscellaneous Test Points

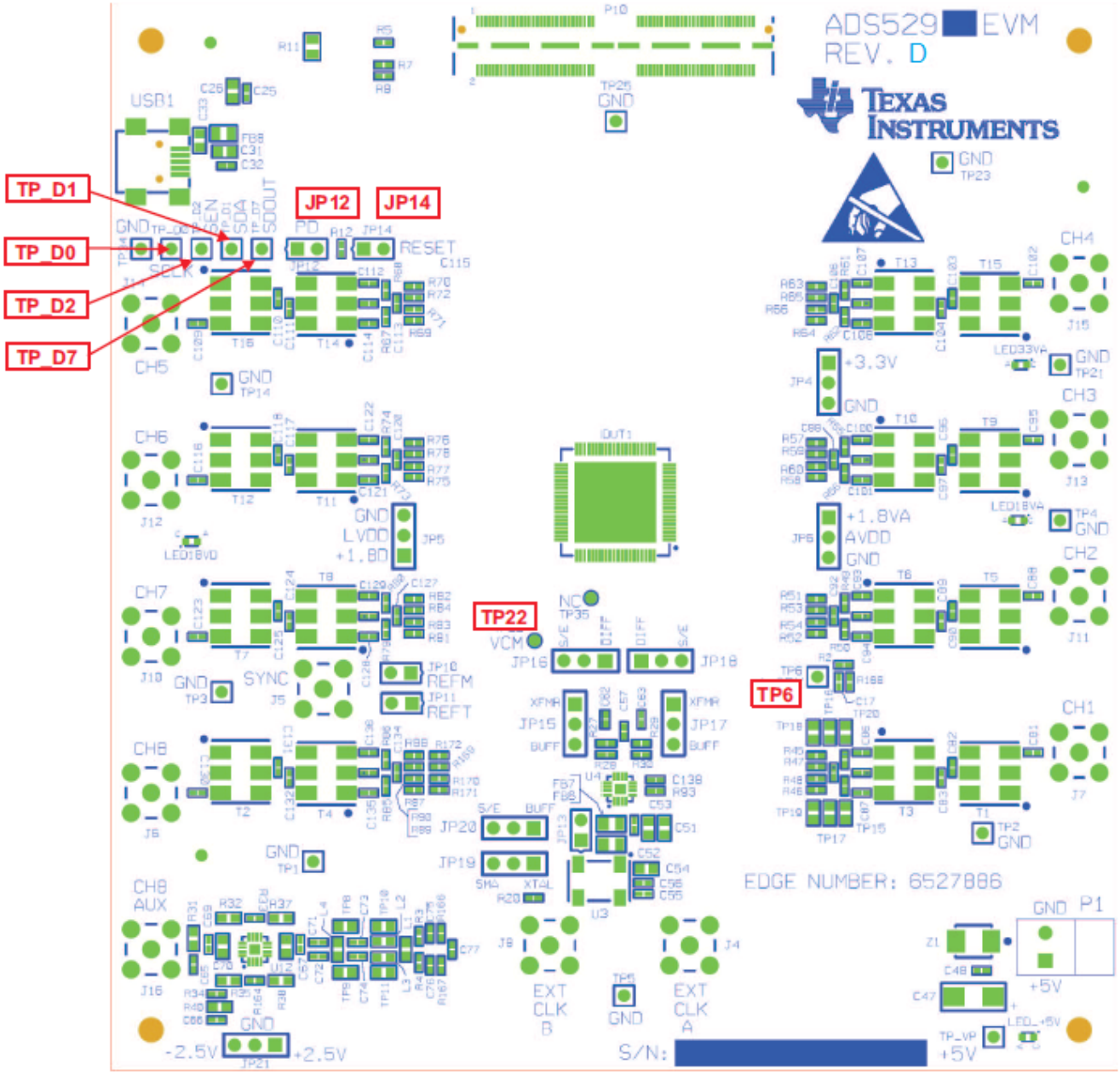


Figure 21. ADS5295EVM Test Point Locations

Table 5. Miscellaneous Test Points

Reference Designator	Description
TP22	VCM: Common-mode output pin, 0.95-V output
TP6	CDC_VTH: Fixed voltage level (1.65 V)
TP_D0	SCLK: Serial clock input
TP_D1	SDA: Serial data input
TP_D2	SEN: Serial enable chip select
TP_D7	SDOUT: Serial data output

Table 5. Miscellaneous Test Points (continued)

Reference Designator	Description
JP14	RESET: Install to reset the device (DUT1) manually
JP12	PD: Install to power down the device (DUT1) manually

10 EVM Schematics

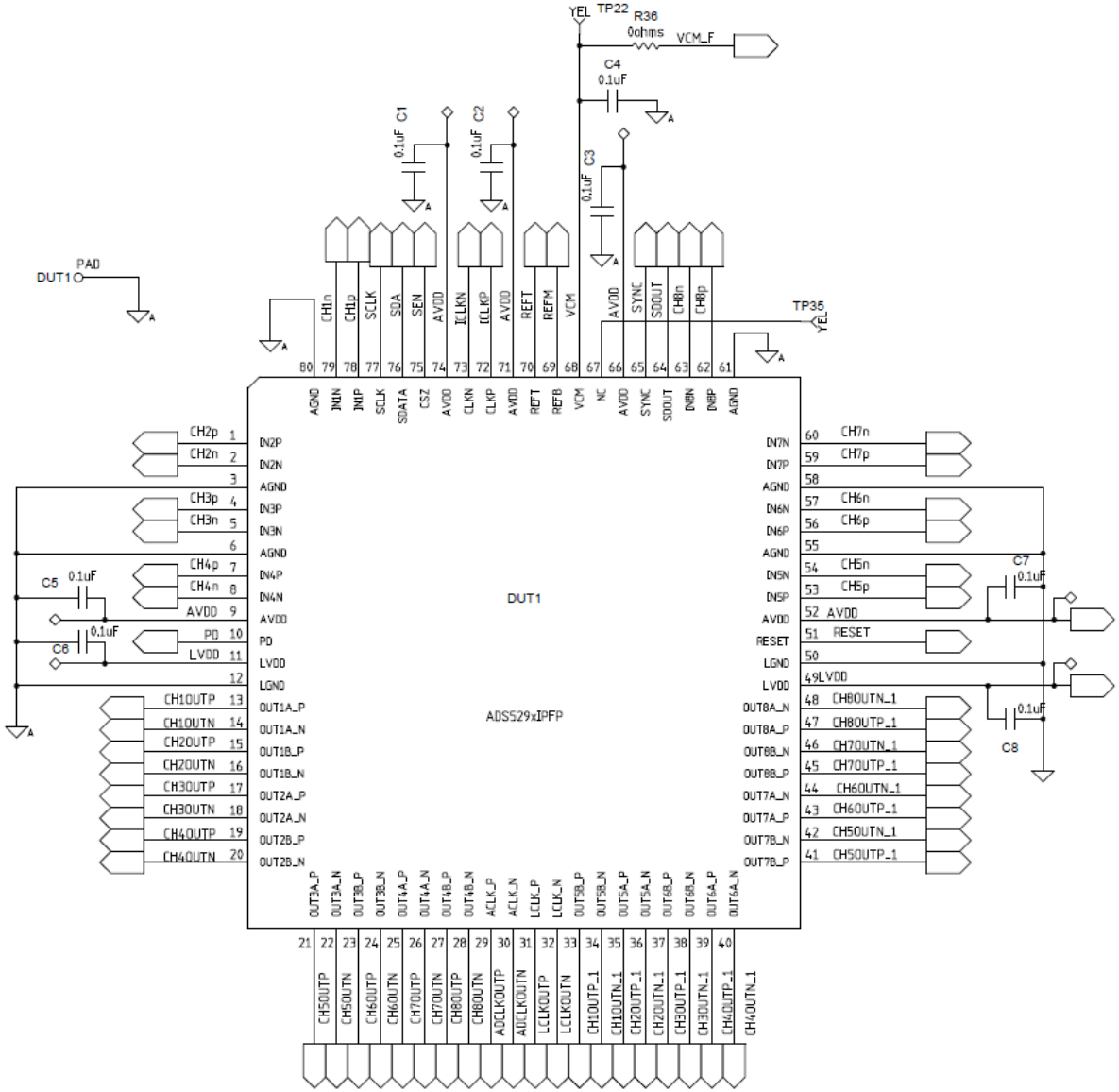


Figure 22. Schematic, Sheet 1 of 9

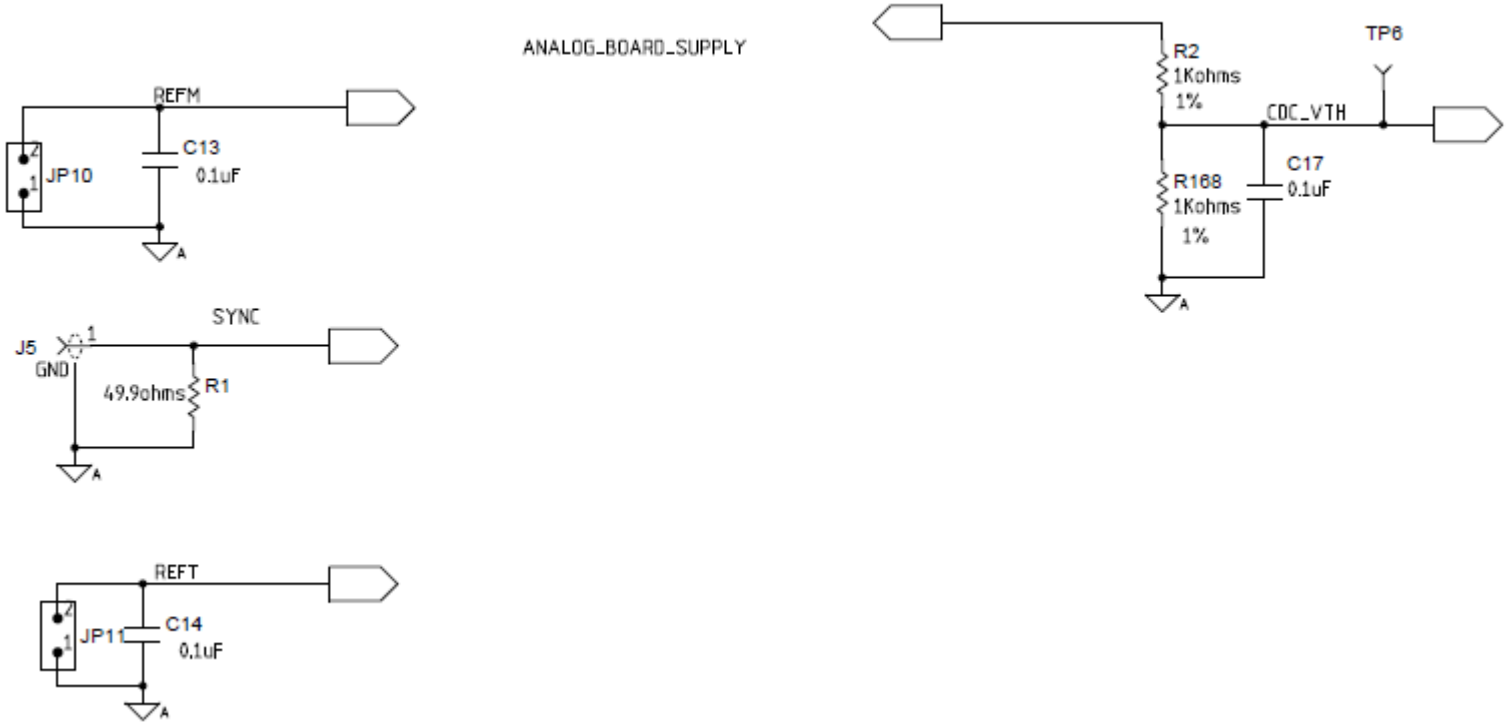


Figure 23. Schematic, Sheet 2 of 9

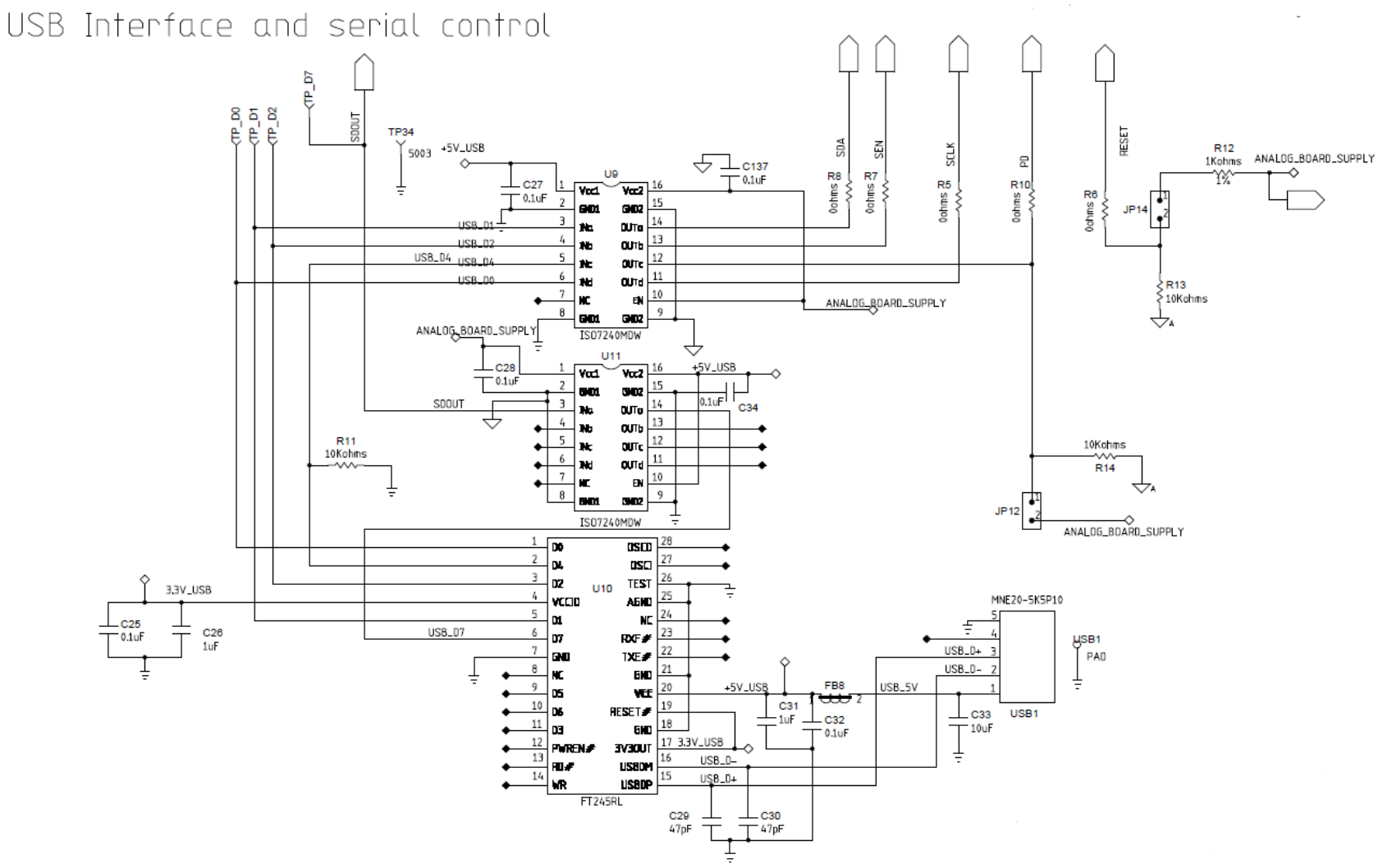


Figure 24. Schematic, Sheet 3 of 9

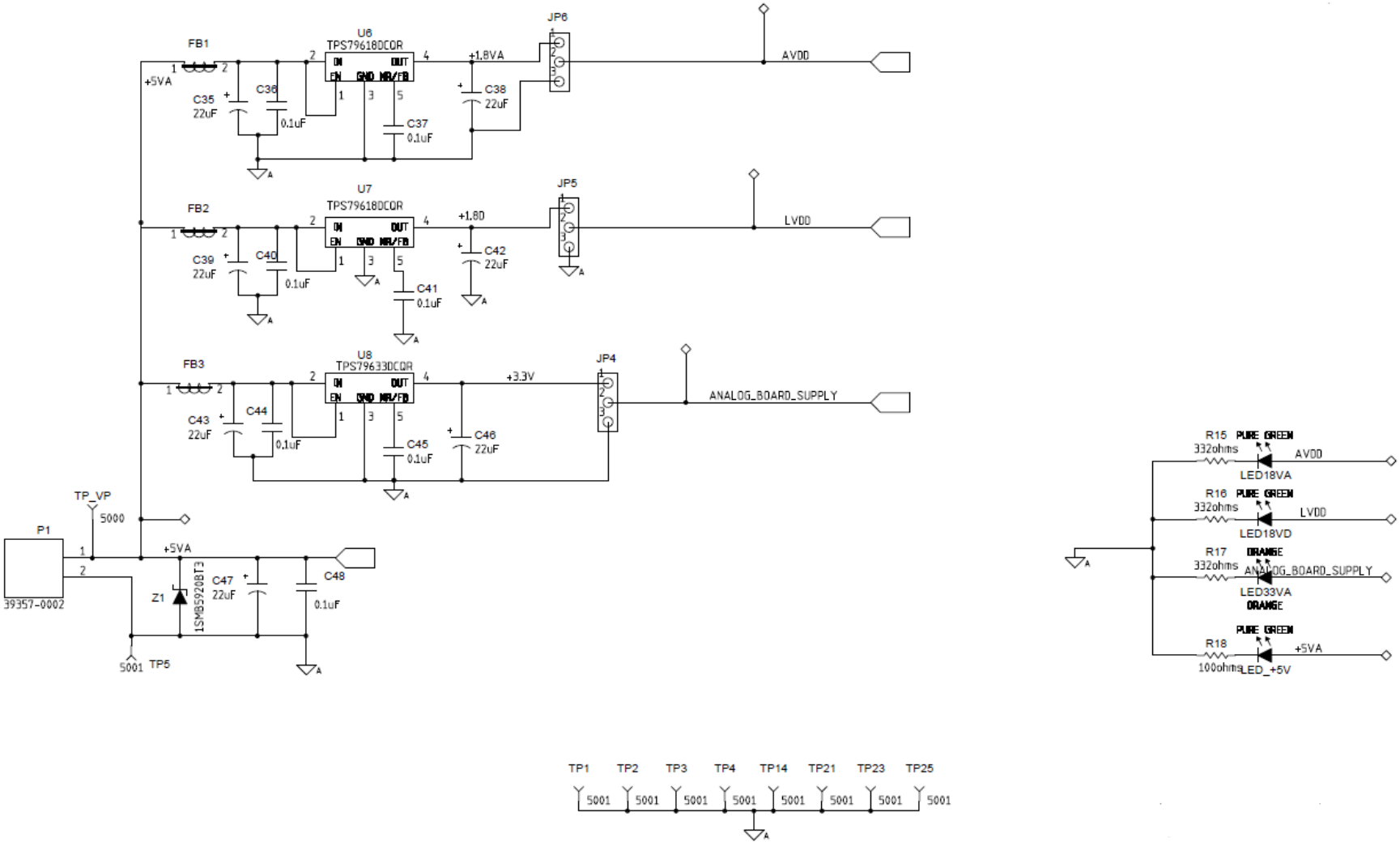


Figure 25. Schematic, Sheet 4 of 9

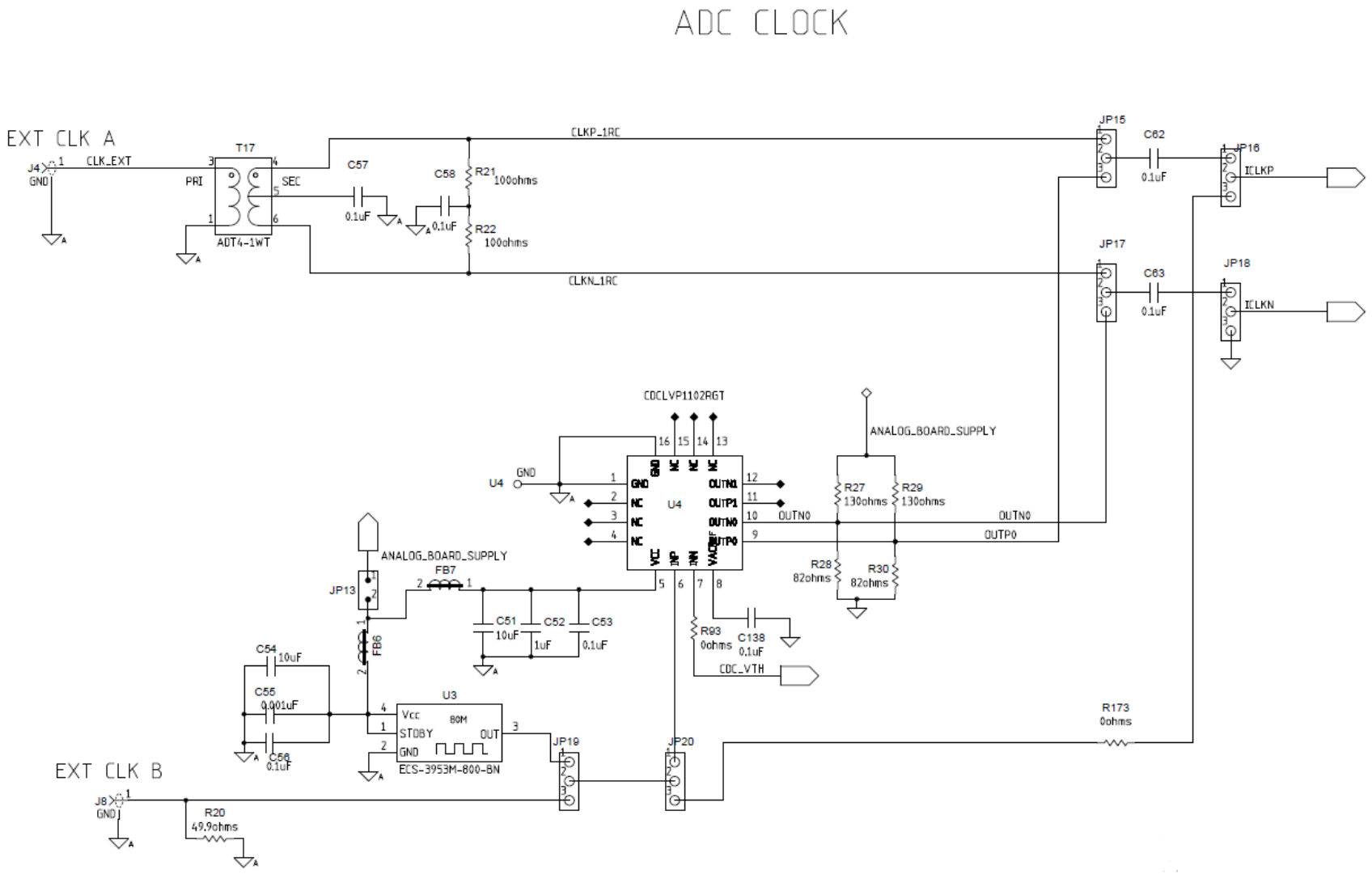


Figure 26. Schematic, Sheet 5 of 9

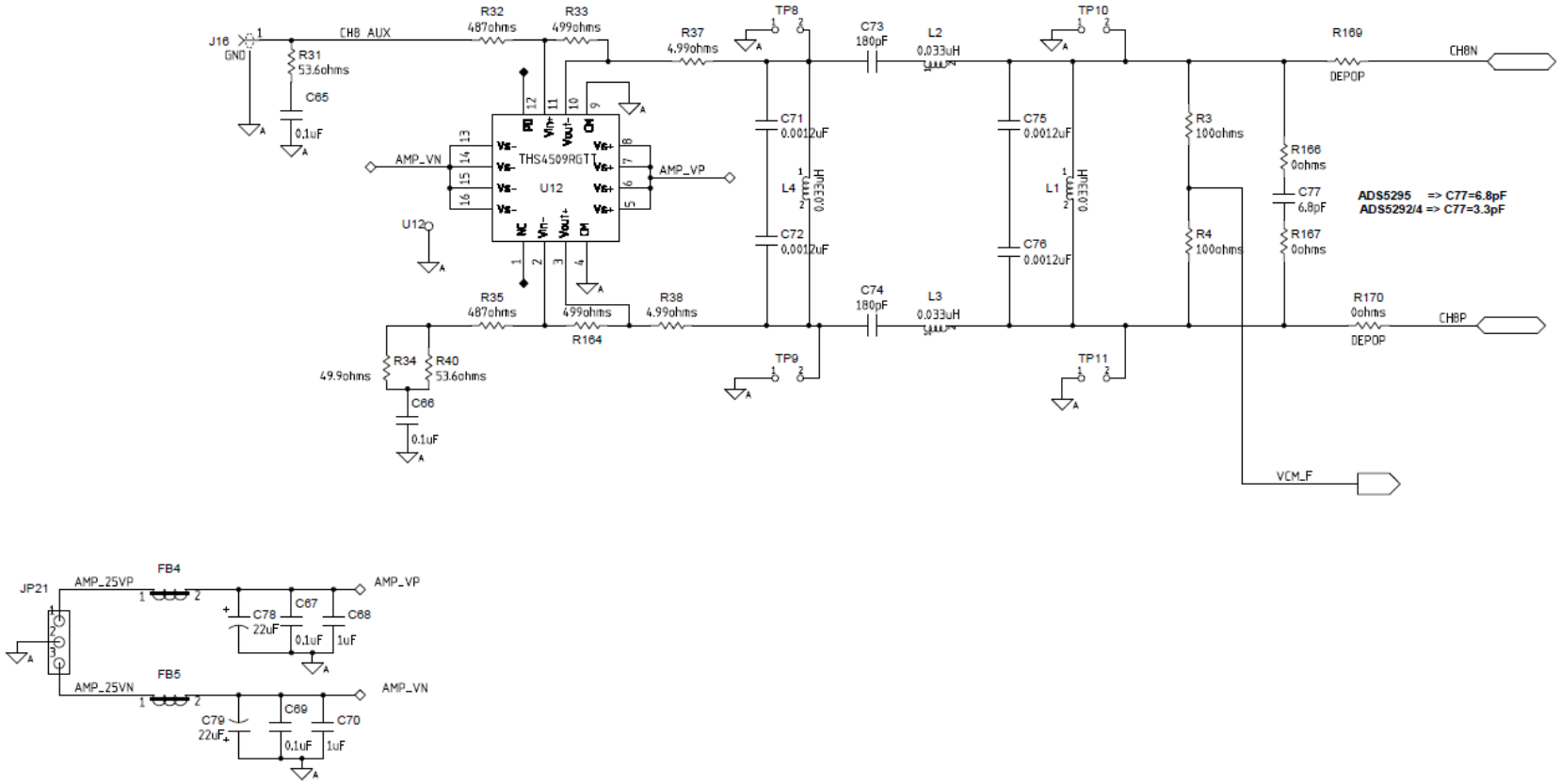


Figure 27. Schematic, Sheet 6 of 9

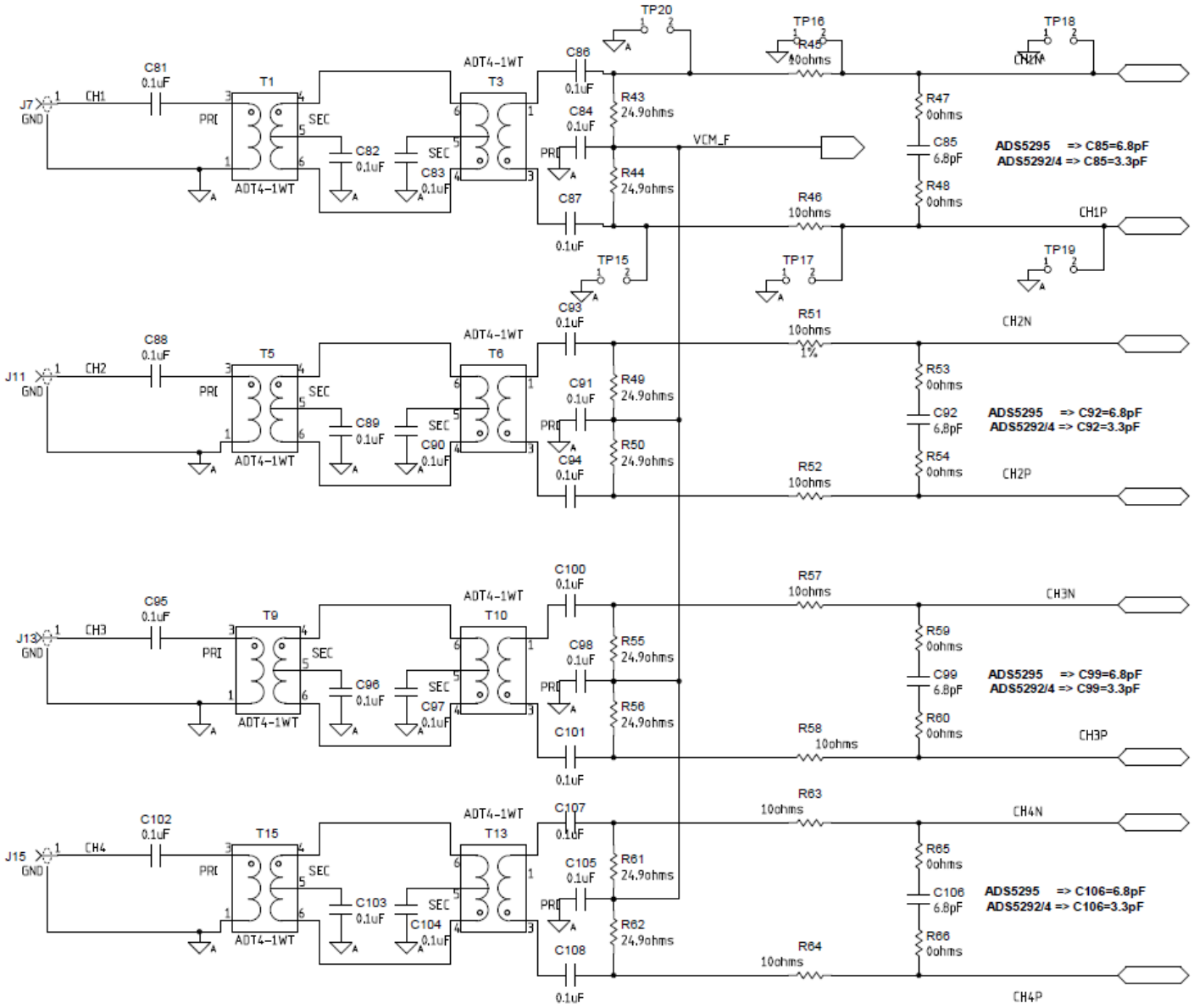


Figure 28. Schematic, Sheet 7 of 9

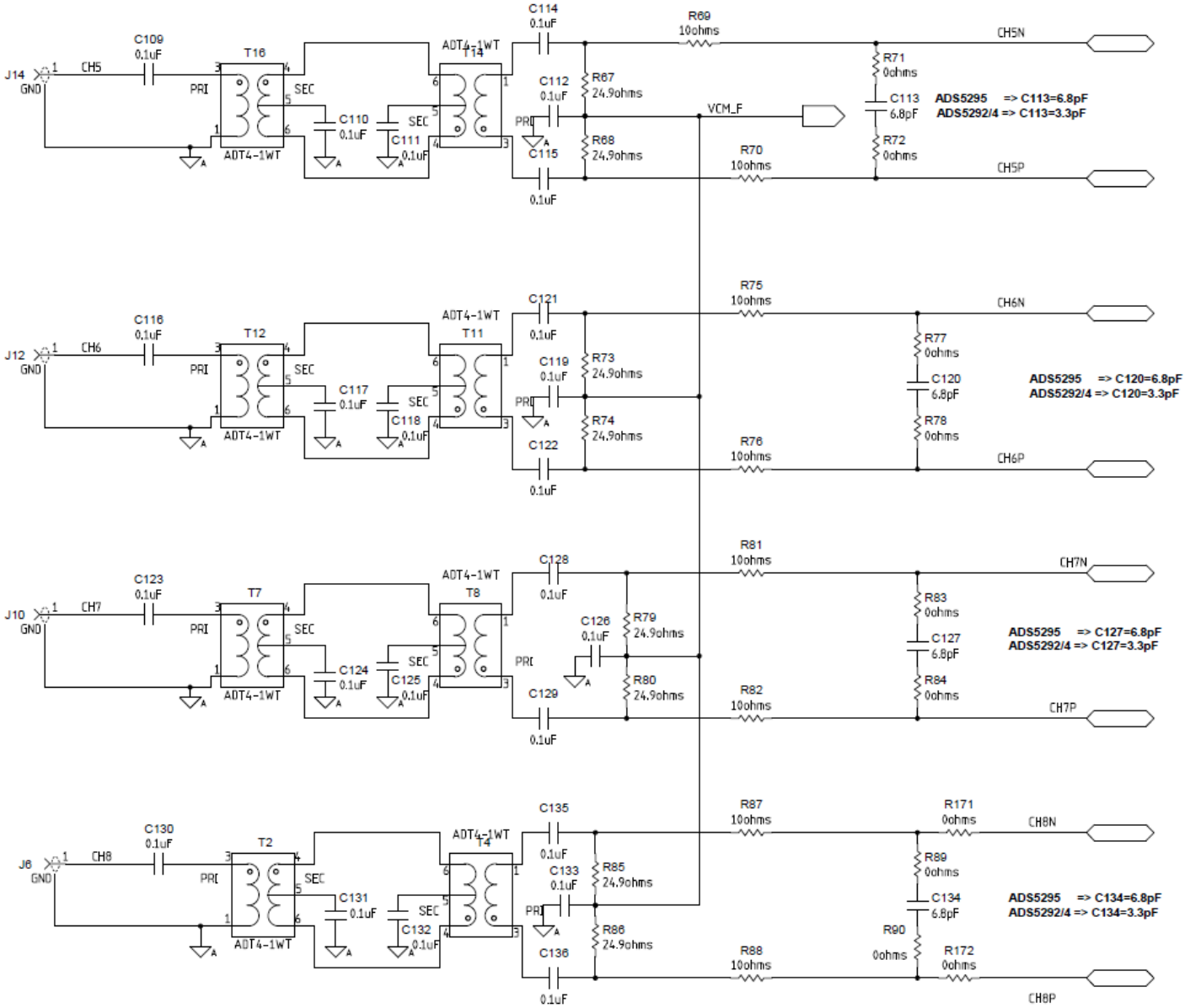


Figure 29. Schematic, Sheet 8 of 9

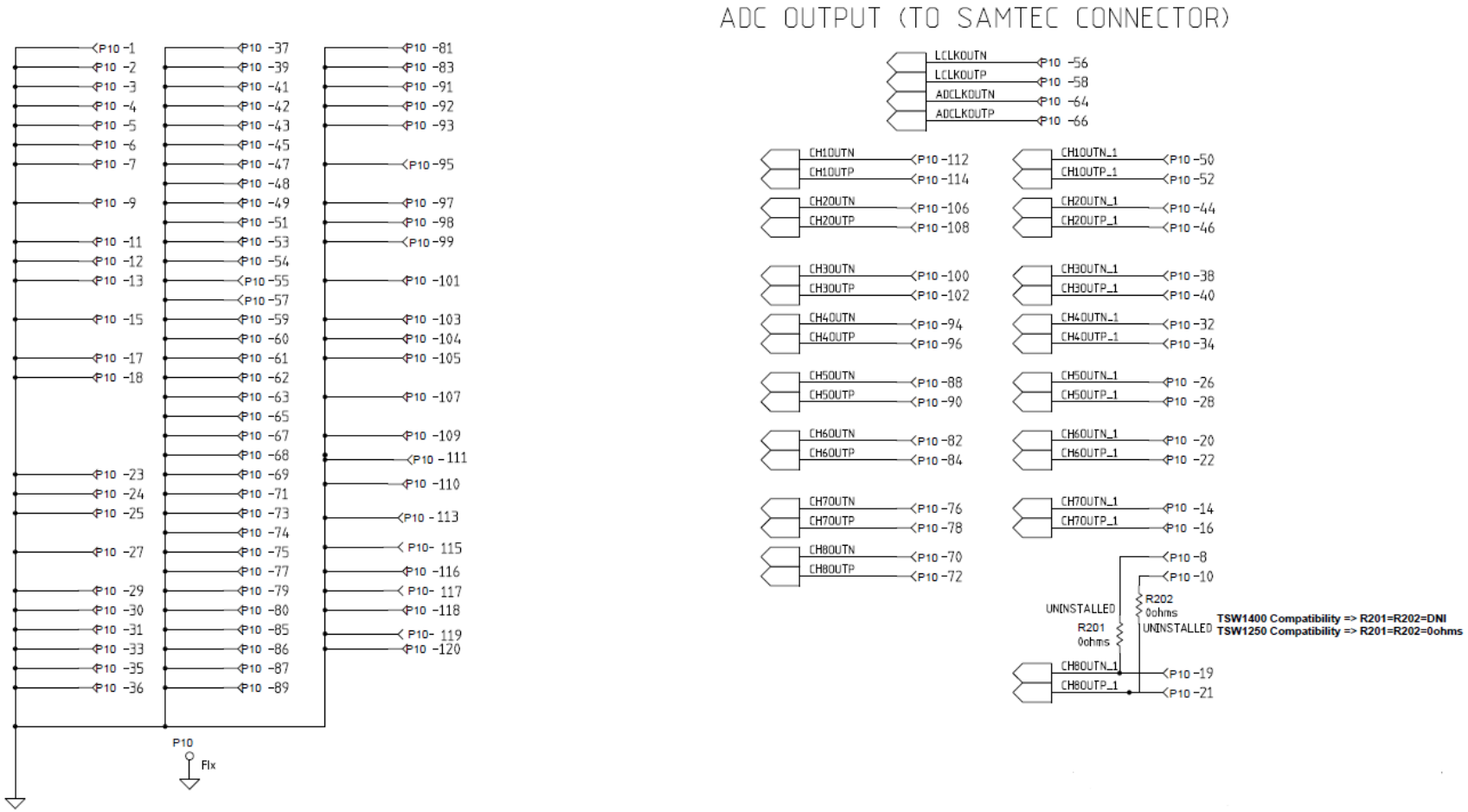


Figure 30. Schematic, Sheet 9 of 9

11 ADS5295EVM Bill of Materials

Table 6. Bill of Materials

ITEM	QTY	MFR P/N	Description	Value	MFR	RoHS	REF DES	Digi-Key P/N
1	1	ADS5295IPFP	12-Bit 8-Channel ADC	ADS5295	Texas Instruments	Yes	DUT1	Texas Instruments
2	0	ADS5294IPFP	14-Bit 8-Channel ADC	ADS5294	Texas Instruments	Yes	DUT1	Texas Instruments
3	0	ADS5292IPFP	12-Bit 8-Channel ADC	ADS5292	Texas Instruments	Yes	DUT1	Texas Instruments
4	17	ADT4-1WT+	RF TRANSFORMER WIDEBAND, 2-775 MHz, 50 OHM	ADT4-1WT+	Mini-Circuits	Yes	T1-T17	Mini-Circuits
5	1	CDCLVP1102RGT	TWO LVPECL OUTPUT CLOCK BUFFER	CDCLVP1102	Texas Instruments	Yes	U4	296-25283-1-ND
6	2	CRCW06034R99FKEA	RES 4.99 OHM 1/10W 1% 0603 SMD	4.99 Ω	Vishay/Dale	Yes	R37,R38	541-4.99HHCT-ND
7	16	CRCW040210R0FKED	RES 10.0 OHM 1/16W 1% 0402 SMD	10.0 Ω	Vishay/Dale	Yes	R45,R46,R51,R52,R57,R58,R63,R64,R69,R70, R75,R76,R81,R82, R87,R88	541-10.0LCT-ND
8	1	CRCW040249R9FKED	RES 49.9 OHM 1/16W 1% 0402 SMD	49.9 Ω	Vishay/Dale	Yes	R34	541-49.9LCT-ND
9	2	CRCW060353R6FKEA	RES 53.6 OHM 1/10W 1% 0603 SMD	53.6 Ω	Vishay/Dale	Yes	R31,R40	541-53.6HCT-ND
10	1	CRCW06030000Z0EA	RES 0.0 OHM 1/10W 0603 SMD	0.0 Ω	Vishay/Dale	Yes	R36	541-0.0GCT-ND
11	2	CRCW0603487RFKEA	RES 487 OHM 1/10W 1% 0603 SMD	487 Ω	Vishay/Dale	Yes	R32,R35	541-487HCT-ND
12	4	CRCW0402100RFKED	RES 100 OHM 1/16W 1% 0402 SMD	100 Ω	Vishay/Dale	Yes	R3,R4,R21,R22	541-100LCT-ND
13	3	CRCW04021K00FKED	RES 1.00K OHM 1/16W 1% 0402 SMD	1.00K Ω	Vishay/Dale	Yes	R2,R12,R168	541-1.00KLCT-ND
14	2	CRCW0402499RFKED	RES 499 OHM 1/16W 1% 0402 SMD	499 Ω	Vishay/Dale	Yes	R33,R164	541-499LCT-ND
15	3	CRCW080510K0FKEA	RES 10.0K OHM 1/8W 1% 0805 SMD	10.0K Ω	Vishay/Dale	Yes	R11,R13,R14	541-10.0KCCT-ND
16	7	C0402C104K8PACTU	CAP .10UF 10V CERAMIC X5R 0402	0.1uF	Kemet	Yes	C36,C37,C40,C41,C44,C45,C48	399-3027-1-ND
17	1	ECJ-0EB1H102K	CAPACITOR,SMT,0402,CER,1000pF,50V,10%,X7R	1000pF	Panasonic	Yes	C55	PCC1721CT-ND
18	4	ECJ-0EB1H122K	CAPACITOR,SMT,0402,CER,1200pF,50V,10%,X7R	1200pF	Panasonic	Yes	C71,C72,C75,C76	PCC1722CT-ND
19	2	ECJ-0EB1E181K	CAP 180PF 25V CERAMIC X7R 0402	180pF	Panasonic	Yes	C73,C74	PCC1705CT-ND
20	2	ECJ-0EC1H390J	CAP 39PF 50V CERAMIC 0402 SMD	39pF	Panasonic	Yes	C29,C30	PCC390CQCT-ND
21	5	ECJ-1V41E105M	CAP 1UF 25V CERAMIC 0603 X5S	1uF	Panasonic - ECG	Yes	C26,C31,C52,C68,C70	PCC2354CT-ND
22	1	ECS-3953M-800-BN	OSC,SMT,3.3V,50ppm,-40~85C,5nS,80.000 MHz	OSC 80 MHZ	ECS Inc	Yes	U3	XC344CT-ND
23	4	ELJ-RE33NGFA	INDUCTOR 33NH 2% 0603 SMD	33nH	Panasonic	Yes	L1,L4	PCD2008CT-ND
24	2	ERJ-2GEJ131	RESISTOR,SMT,0402,THICK FILM,5%,1/16W,130	130 Ω	Panasonic	Yes	R27,R29	P130JCT-ND
25	2	ERJ-2GEJ820	RESISTOR,SMT,0402,THICK FILM,5%,1/16W,82	82 Ω	Panasonic	Yes	R28,R30	P82JCT-ND
26	27	ERJ-2GE0R00X	RESISTOR/JUMPER,SMT,0402,0 OHM,5%,1/16W	0 Ω	Panasonic	Yes	R5,R6,R7,R8,R10,R47,R48,R53,R54,R59,R60, R65,R66,R71,R72,R77,R78,R83,R84,R89,R90, R93,R166,R167,R171,R172,R173	P0.0JCT-ND
27	16	ERJ-2RKF24R9X	RESISTOR,SMT,0402,24.9 OHM,1%,1/16W	24.9 Ω	Panasonic	Yes	R43,R44,R49,R50,R55,R56,R61,R62,R67,R68, R73,R74,R79,R80,R85,R86	P24.9LCT-ND
28	2	ERJ-2RKF49R9X	RESISTOR,SMT,0402,49.9 OHM,1%,1/16W	49.9 Ω	Panasonic	Yes	R1,R20	P49.9LCT-ND
29	3	ERJ-2RKF1000X	RESISTOR,SMT,0402,100 OHM,1%,1/10W	100 Ω	Panasonic	Yes	R15,R16, R18	P100LCT-ND
30	1	ERJ-2RKF3320X	RESISTOR,SMT,0402,332 OHM,1%,1/16W	332 Ω	Panasonic	Yes	R17	P332LCT-ND
31	1	FT245RL	USB FIFO IC INCORPORATE FTDICHIP-ID SECURITY DONGLE	USB	FTDI	Yes	U10	768-1011-1-ND
32	0	GRM1555C1H3R3CZ01D	CAP CER 3.3PF 50V C0G 0402	3.3pF	Murata	Yes	C77,C85,C92,C99,C106,C113,C120,C127,C134	490-1270-1-ND
33	9	GRM1555C1H6R8DZ01D	CAP CER 6.8PF 50V C0G 0402	6.8pF	Murata	Yes	C77,C85,C92,C99,C106,C113,C120,C127,C134	490-1276-1-ND

Table 6. Bill of Materials (continued)

ITEM	QTY	MFR P/N	Description	Value	MFR	RoHS	REF DES	Digi-Key P/N
34	8	HI0805R800R-10	FERRITE CHIP POWER 80 OHM SMD	FERRITE	Laird-Signal Integrity Products	Yes	FB1,FB2,FB3,FB4,FB5,FB6,FB7,FB8	240-2395-1-ND
35	2	ISO7240MDW	QUAD DIGITAL ISOLATORS	IC DGTL ISOL	Texas Instruments	Yes	U9,U11	296-22629-5-ND
36	3	JMK107BJ106MA-T	CAPACITOR,SMT,0603,CERAMIC,10uF,6.3V,20%,X5R	10uF	Taiyo Yuden	Yes	C33,C51,C54	587-1256-1-ND
37	10	JUMPER-0603(UN)	UNINSTALLED JUMPER,SMT0603	DNI			TP8,TP9,TP10,TP11,TP15,TP16,TP17,TP18, TP19,TP20	DNI
38	3	LNJ308G8PRA	LED,SMT,0603,PURE GREEN,2.03V	LED	Panasonic	Yes	LED18VA,LED18VD,LED_+5V	P11485CT-ND
39	1	LNJ808R8ERA	LED,SMT,0603,ORANGE,1.8V	LED	Panasonic	Yes	LED33VA	P523CT-ND
40	1	897-43-005-00-100001	CONN RECEPT MINI-USB TYPE B SMT	USB Mini B	Mill-Max	Yes	USB1	ED90341CT-ND
41	1	QTH-060-01-L-D-A	HEADER,SMT,120P,0.5mm,FEM,2BANK,RECEPTACLE,168/198H	CONN	Samtec Inc	Yes	P10	SAM8189-ND
42	2	TEST POINT YELLOW	NOT INSTALLED	DNI			TP22, TP35	DNI
43	1	THS4509QRGTRQ1	WIDEBAND,LOW NOISE,LOW DISTORTION FULLY DIFF AMP,1900 MHz	IC OPAMP	Texas Instruments	Yes	U12	296-24104-1-ND
44	9	TPSC226K016R0375	10%, 16V, 22uF	22µF	AVX	Yes	C35,C38,C39,C42,C43,C46,C47,C78,C79	478-1762-1-ND
45	2	TPS79618DCQR	ULTRALOW-NOISE HI PSRR FAST RF 1-A LDO LINEAR REGULATOR,1.8V	LDO REG 1.8V	Texas Instruments	Yes	U6,U7	296-13762-1-ND
46	1	TPS79633DCQR	ULTRALOW-NOISE HI PSRR FAST RF 1-A LDO LINEAR REGULATOR,3.3V	LDO REG 3.3V	Texas Instruments	Yes	U8	296-13766-1-ND
47	1	1SMB5921BT3G	DIODE ZENER 6.8V 3W SMB	DIODE Zener	ON Semiconductor	Yes	Z1	1SMB5921BT3GOSCT-ND
48	5	9-146285-0-02	CONN HEADR BRKWAY .100 02POS STR	CONN Header	TE Connectivity	Yes	JP10,JP11,JP12,JP13,JP14	A32700-02-ND
49	10	9-146285-0-03	CONN HEADR BRKWAY .100 03POS STR	CONN Header	TE Connectivity	Yes	JP4,JP5,JP6,JP15,JP16,JP17,JP18,JP19,JP20,JP21	A32700-03-ND
50	12	901-144-8	SMA COAX STRAIGHT PCB CURRENT P/N IS 901-144-8RFX	SMA	Amphenol	Yes	J4,J5,J6,J7,J8,J10,J11,J12,J13,J14,J15,J16	ARFX1231-ND
51	76	0402YD104KAT2A	CAP CERM .1UF 10% 16V X5R 0402	0.1uF	AVX	Yes	C1,C2,C3,C4,C5,C6,C7,C8,C13,C14,C17,C25, C27,C28,C32,C34,C53,C56,C57,C58,C62,C63, C65,C66,C67,C69,C81,C82,C83,C84,C86,C87, C88,C89,C90,C91,C93,C94,C95,C96,C97,C98, C100,C101,C102,C103,C104,C105,C107,C108, C109,C110,C111,C112,C114,C115,C116,C117, C118,C119,C121,C122,C123,C124,C125,C126, C128,C129,C130,C131,C132,C133,C135,C136, C137,C138	478-1126-1-ND
52	1	5000	TESTPOINT,THU,MINIATURE,0.1LS,120TL, RED	Test Point,Red	Keystone Electronics	Yes	TP_VP	5000K-ND
53	9	5001	TESTPOINT,THU,MINIATURE,0.1LS,120TL, BLACK	Test Point,Black	Keystone Electronics	Yes	TP1,TP2,TP3,TP4,TP5,TP14,TP21,TP23,TP25	5001K-ND
54	5	5002	TESTPOINT,THU,MINIATURE,0.1LS,120TL, WHITE	Test Point,White	Keystone Electronics	Yes	TP6,TP_D0, TP_D1,TP_D2,TP_D7	5002K-ND
55	1	5003	TESTPOINT,THU,MINIATURE,0.1LS,120TL, ORANGE	Test Point,Orange	Keystone Electronics	Yes	TP34	5003K-ND
56	1	39357-0002	HEADER, THRU, POWER, 2P,3.5MM, EUROSTYLE	CONN TERMINAL	Molex Connector Corp	Yes	P1	WM7877-ND
57	0	CRCW06030000Z0EA	RES 0.0 OHM 1/10W 0603 SMD	0.0 Ω	Vishay/Dale	Yes	R169, R170,R201, R202	541-0.0GCT-ND (DNI)
58	4	24436	STANDOFF HEX M3 THR ALUM 18MM	STANDOFF	Keystone	Yes	STANDOFF HEX M3 THR ALUM 18MM	24436K-ND
59	4	29311	SCREW STEEL M3 THR 6MM	SCREW	Keystone	Yes	SCREW STEEL M3 THR 6MM	29311K-ND

12 ADS5295EVM Printed-Circuit Board Layout

Figure 31 through Figure 42 illustrate the PCB layouts for the EVM.

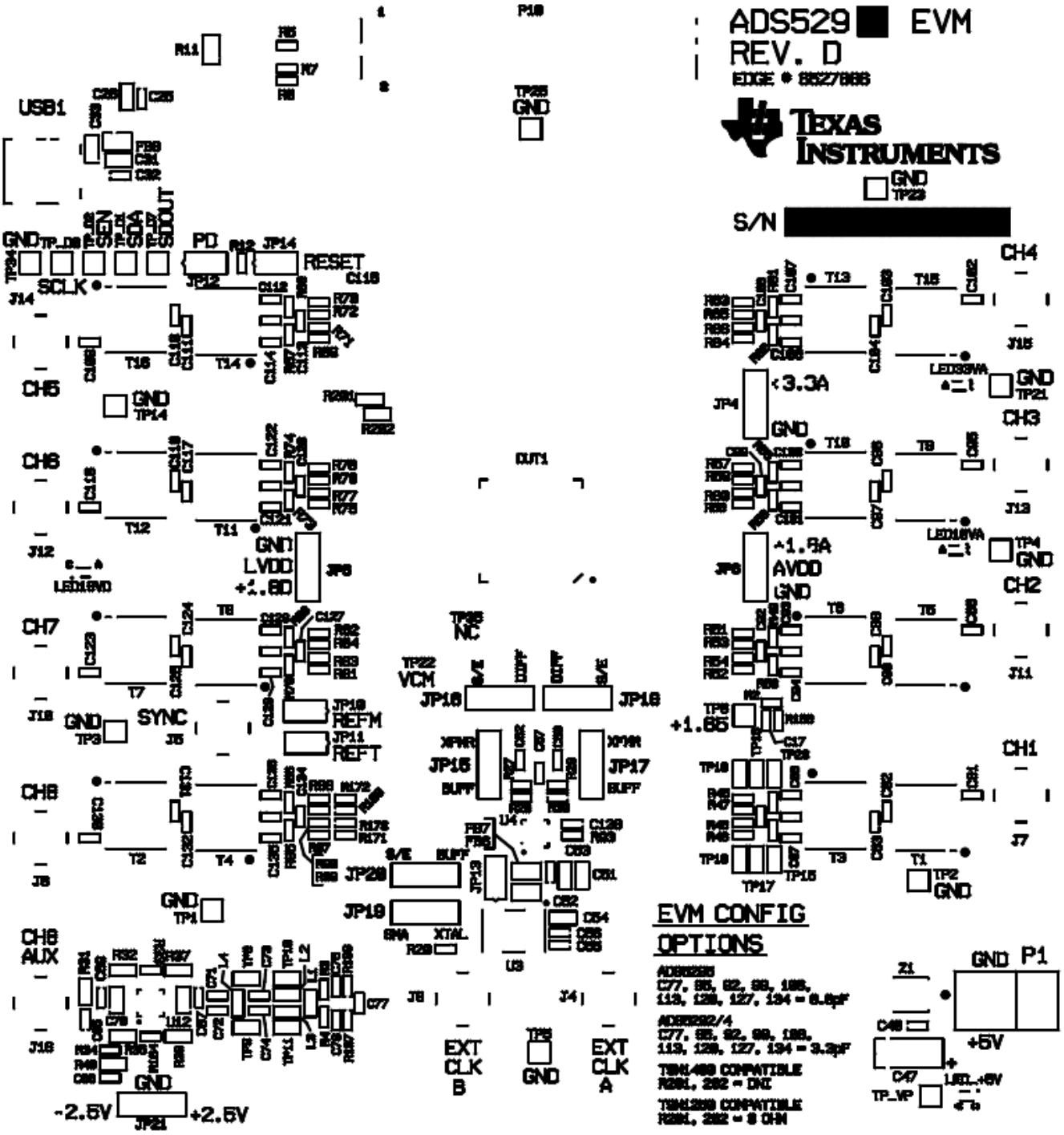


Figure 31. ADS5295EVM Top Layer Assembly Drawing – Top View

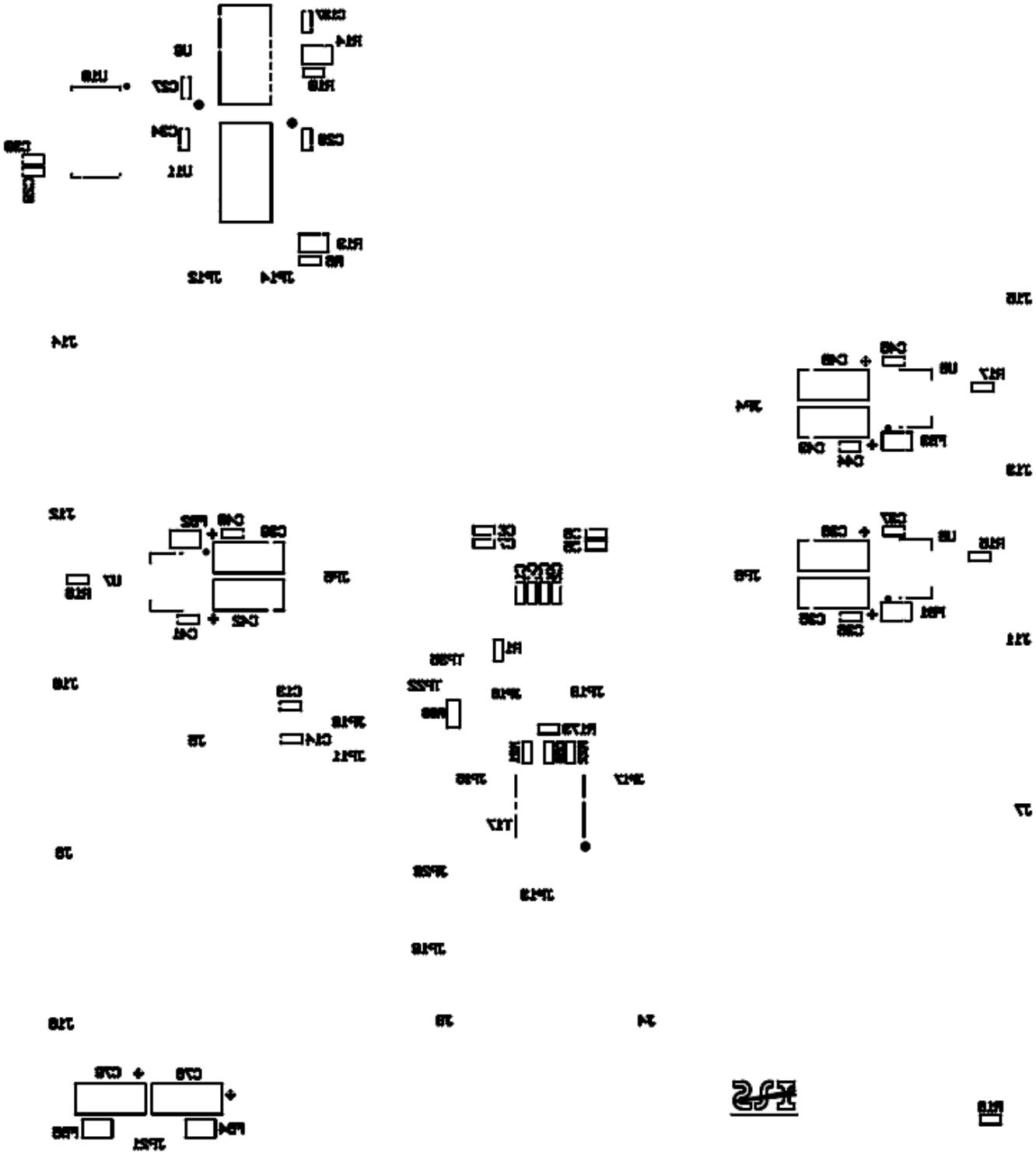


Figure 32. ADS5295EVM Bottom Layer Assembly Drawing – Bottom View

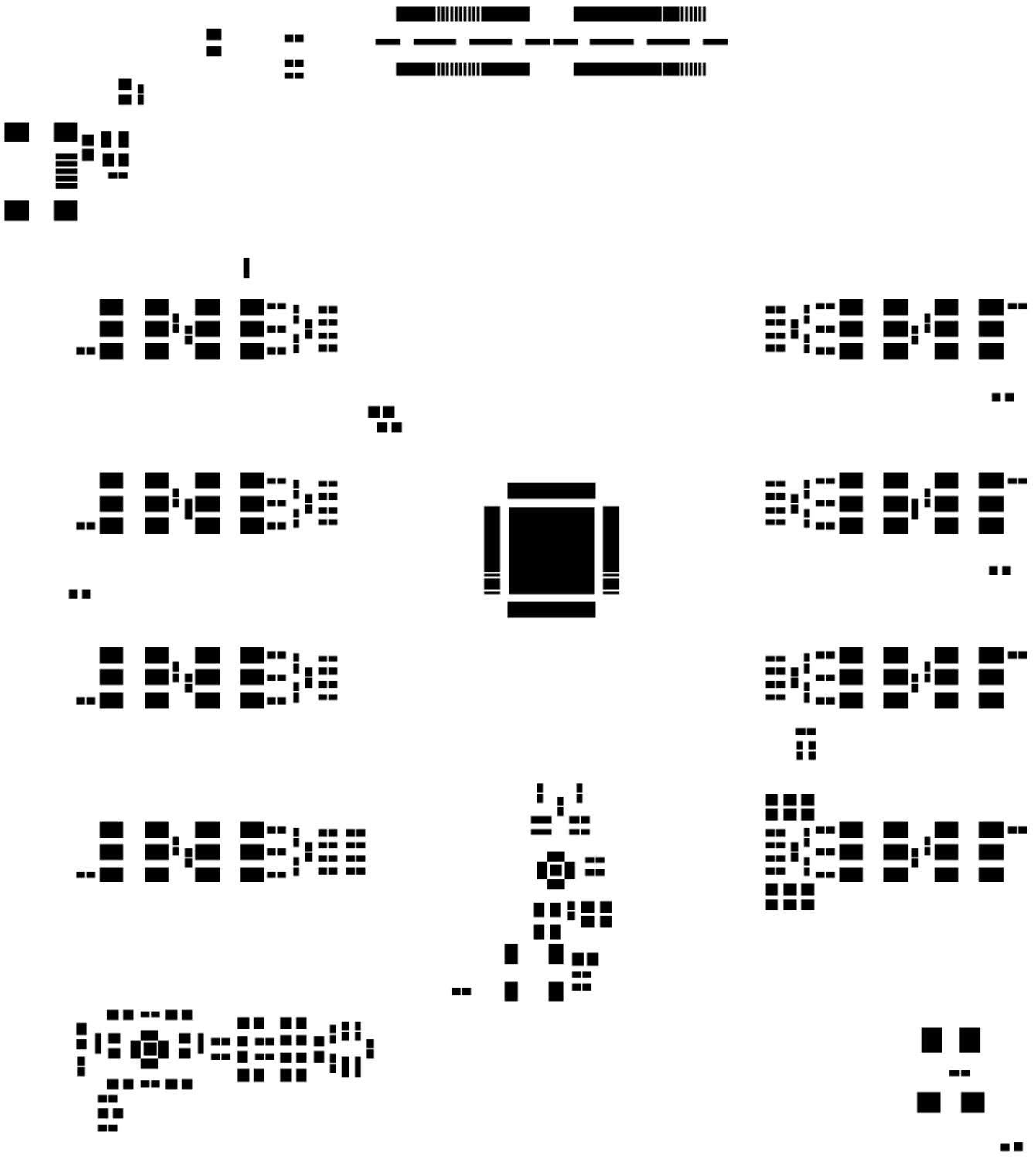


Figure 33. ADS5295EVM Solder Paste Top

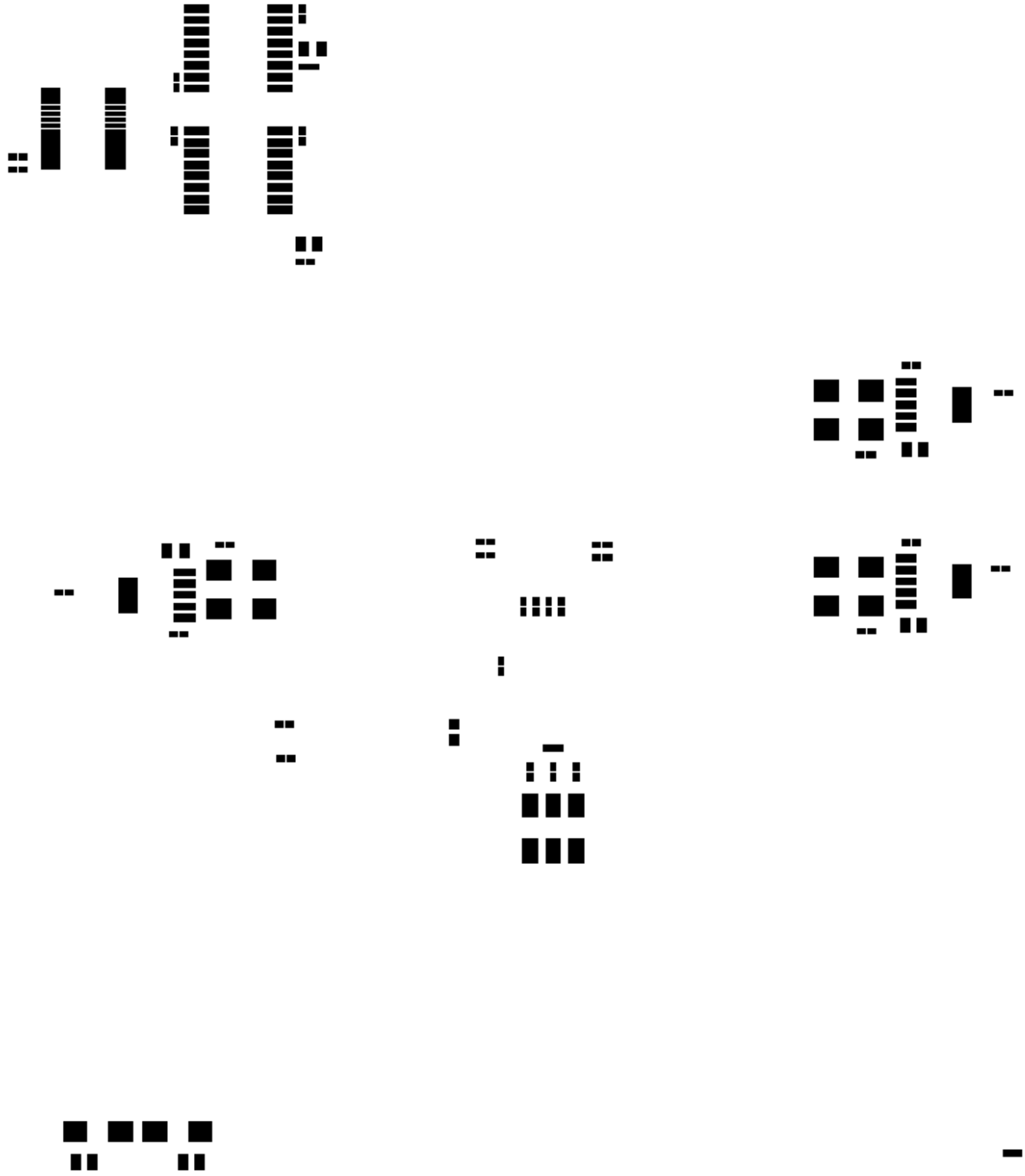


Figure 34. ADS5295EVM Solder Paste Bottom

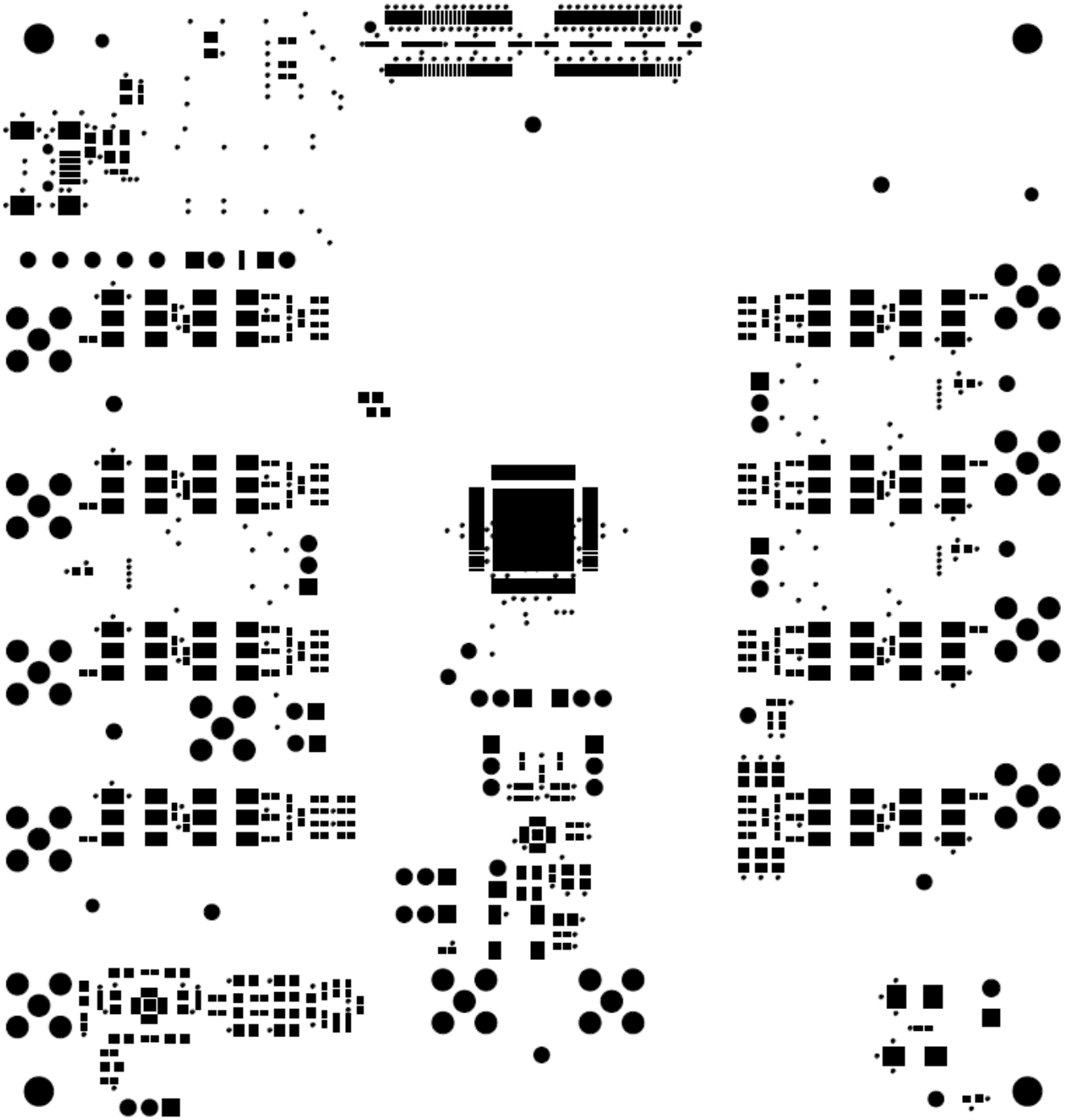


Figure 35. ADS5295EVM Soldermask Top

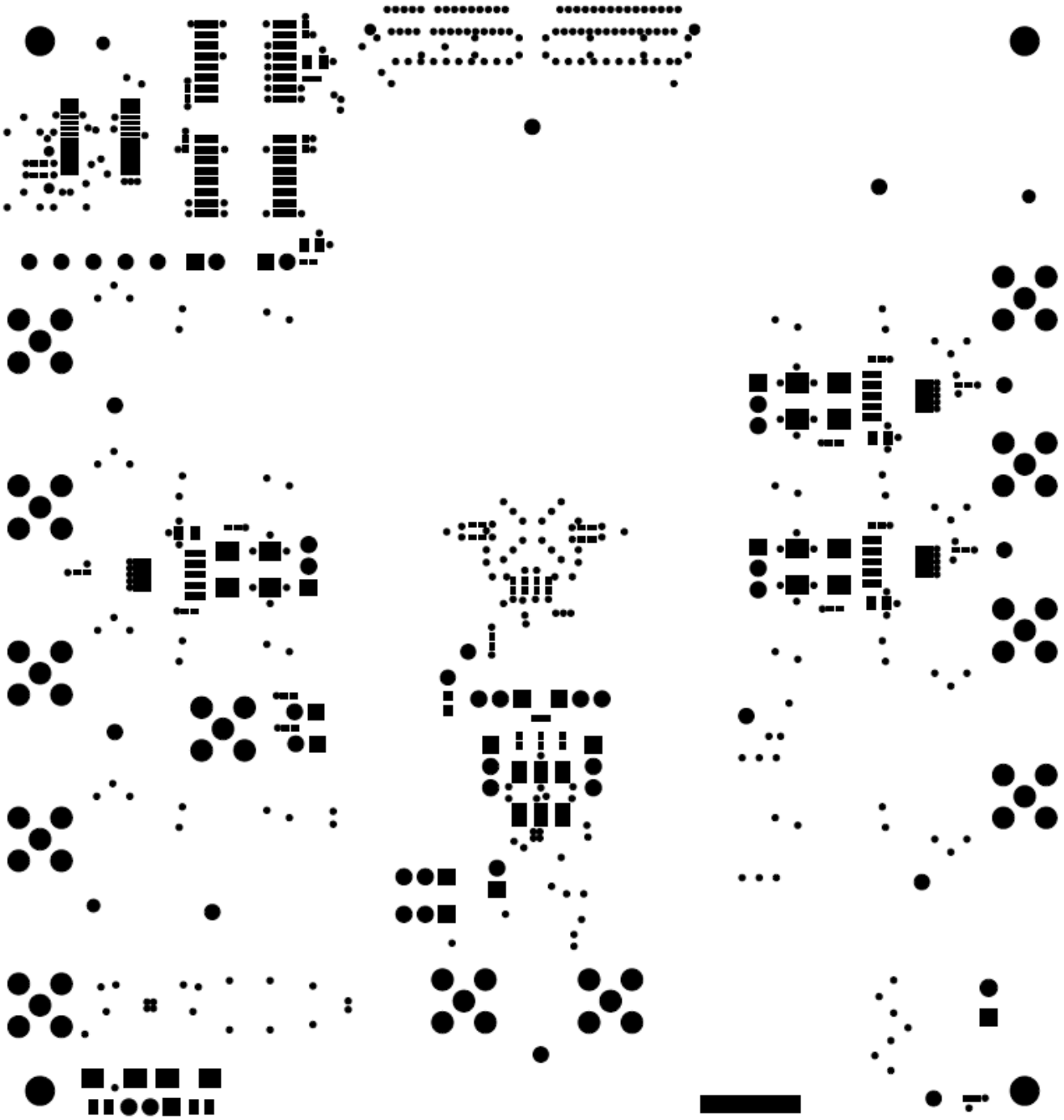


Figure 36. ADS5295EVM Soldermask Bottom

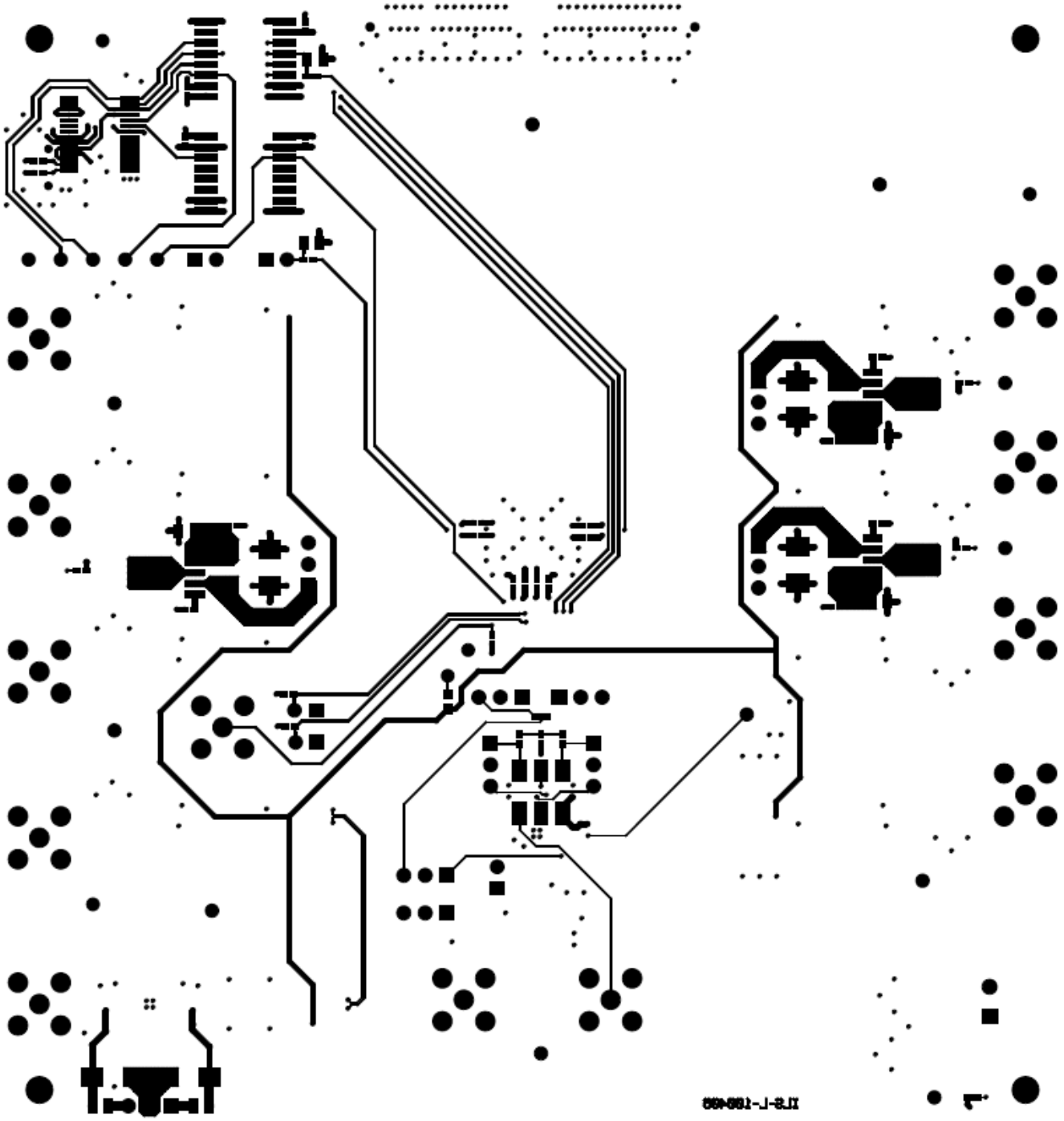


Figure 37. ADS5295EVM Bottom Layer Copper – Bottom View

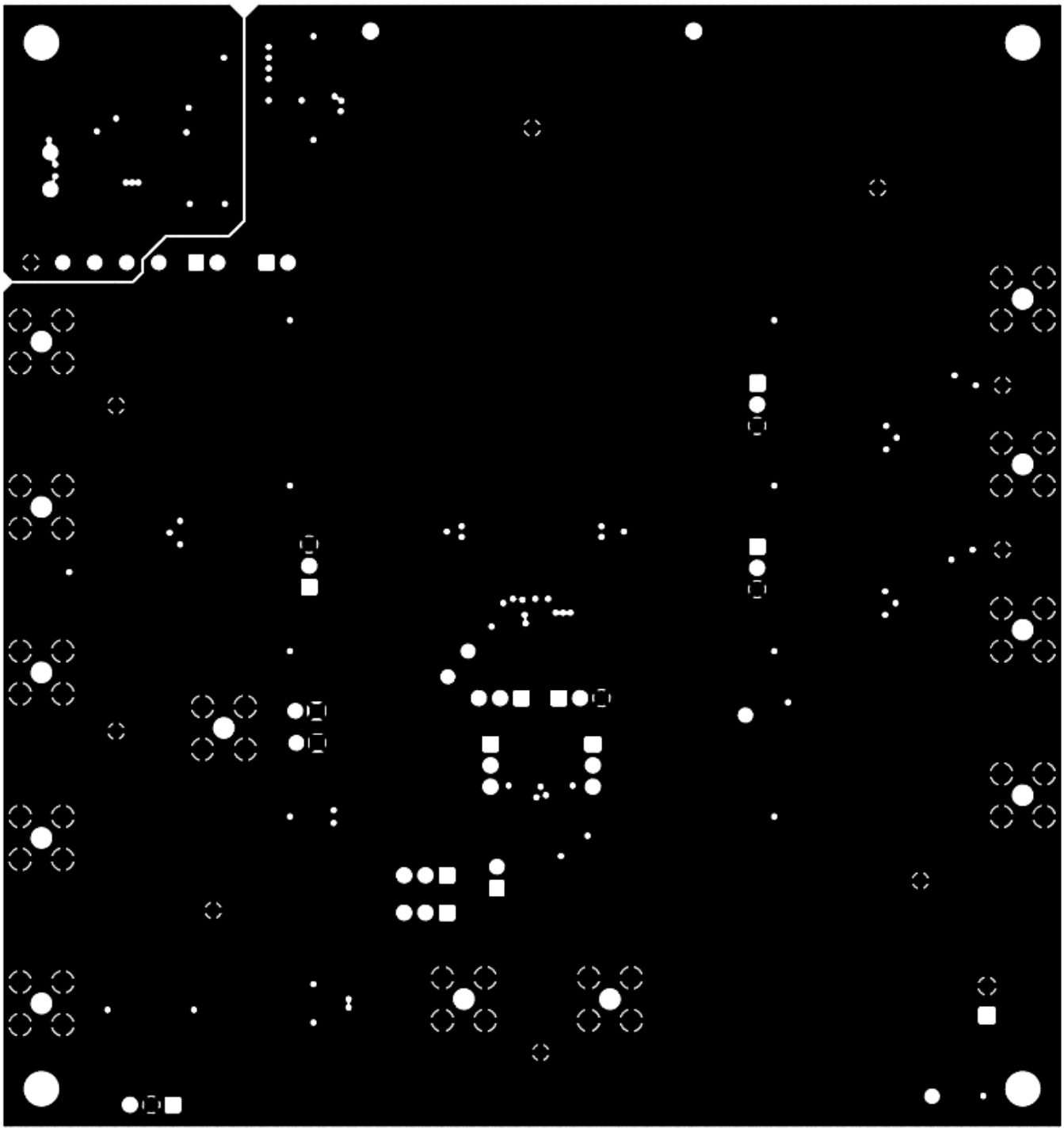


Figure 38. ADS5295EVM Layer 5 Ground Plane

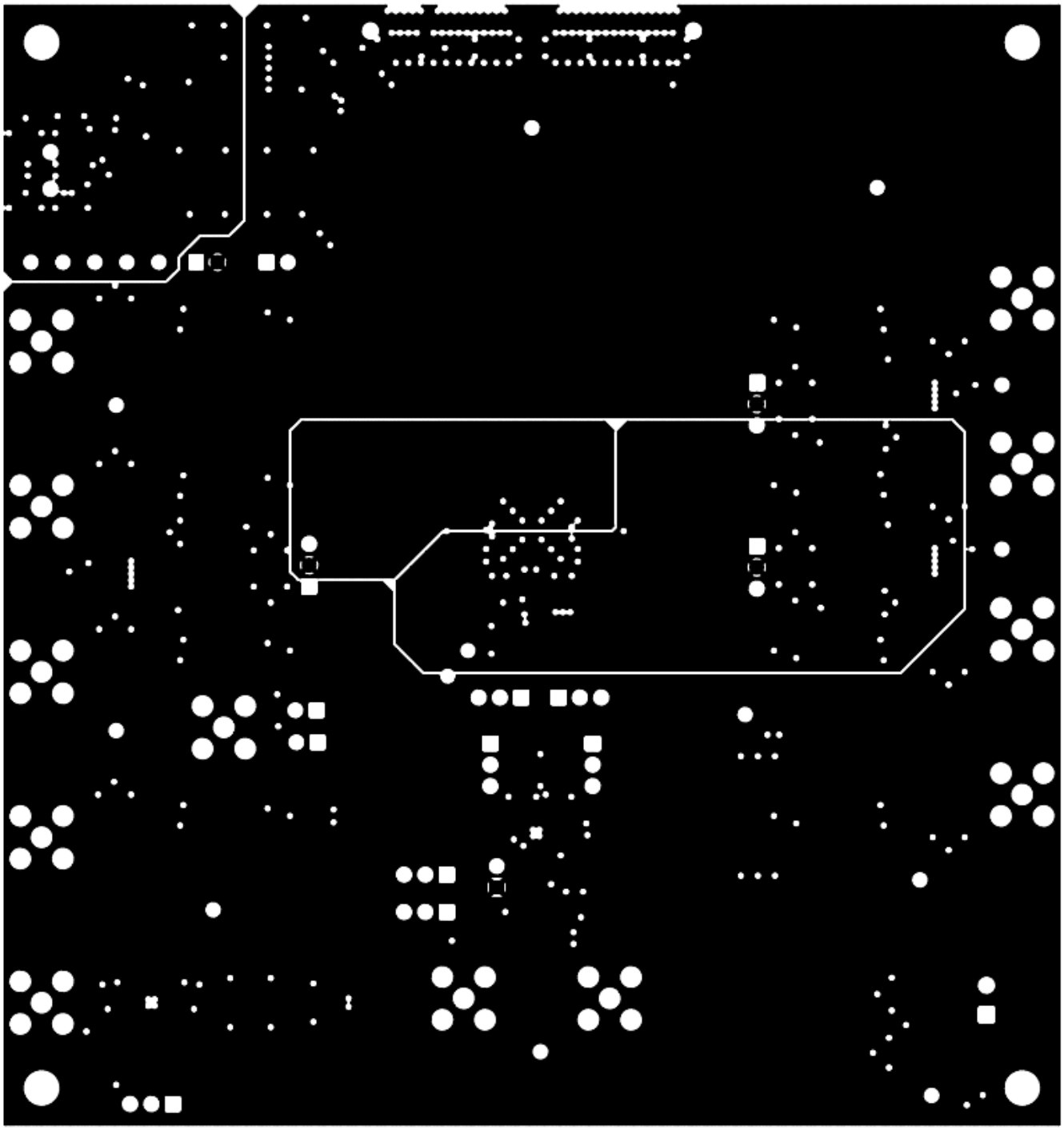


Figure 39. ADS5295EVM Layer 4 Split Power Planes

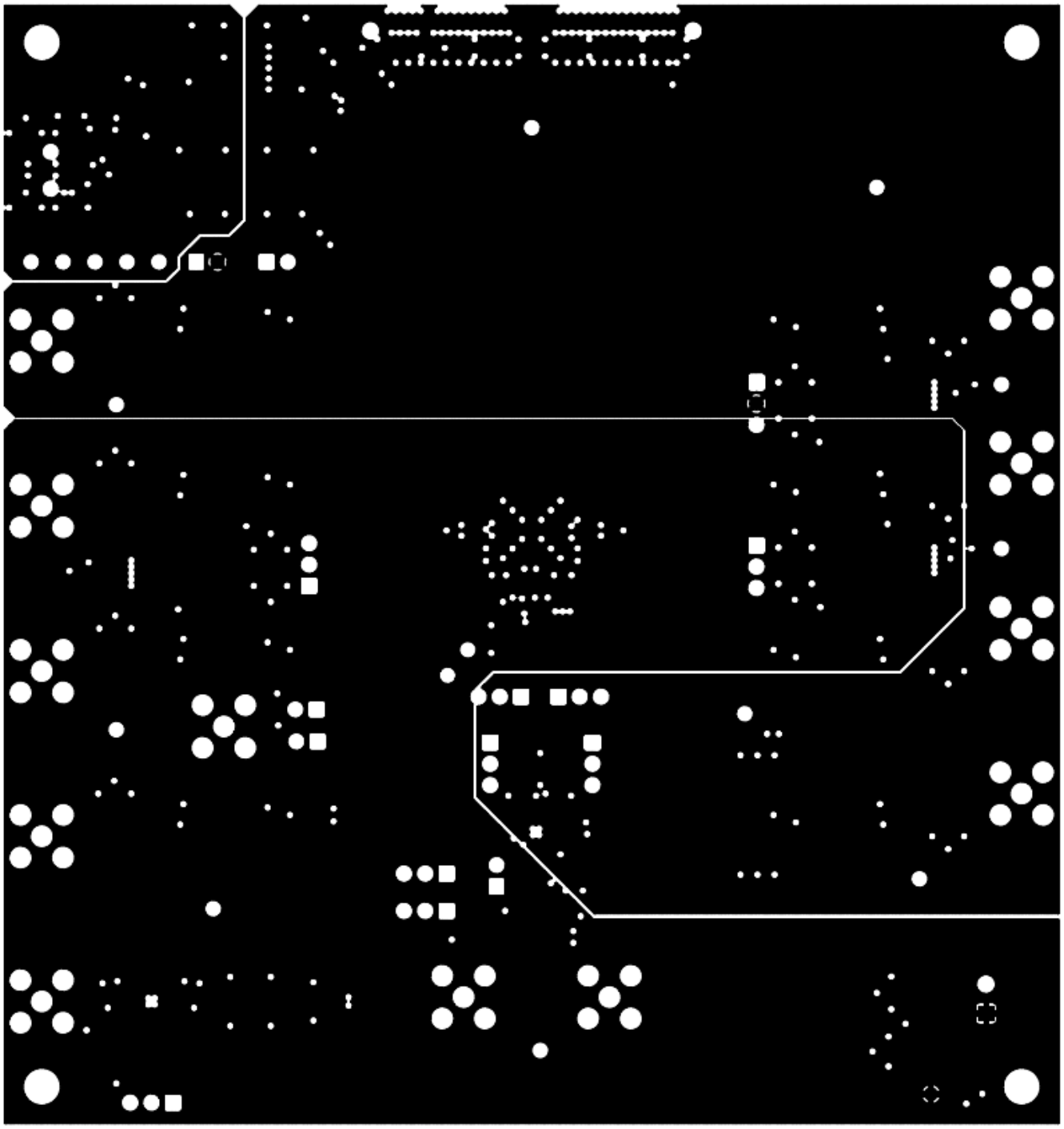


Figure 40. ADS5295EVM Layer 3 Split Power Planes

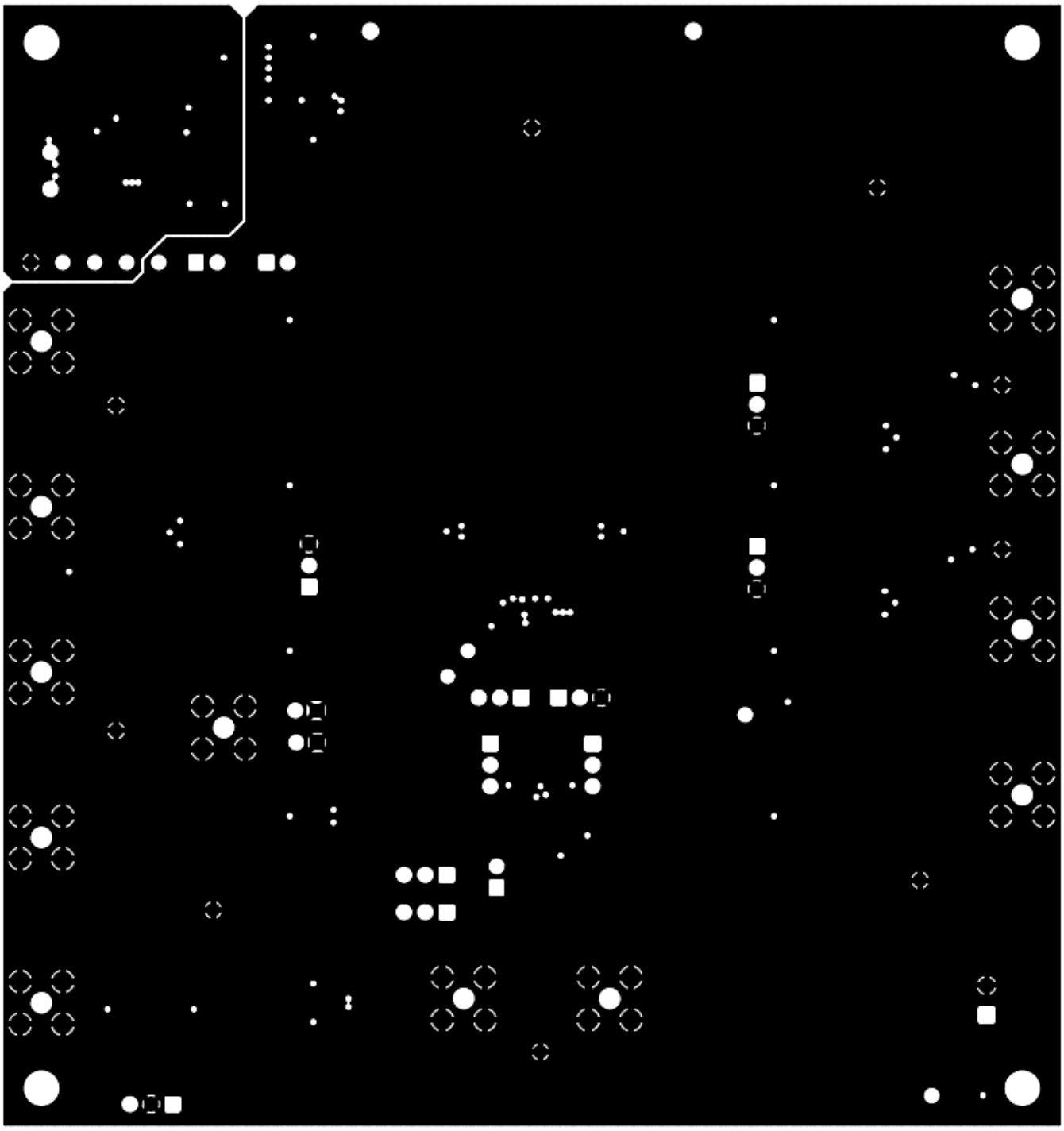


Figure 41. ADS5295EVM Layer 2 Ground Plane

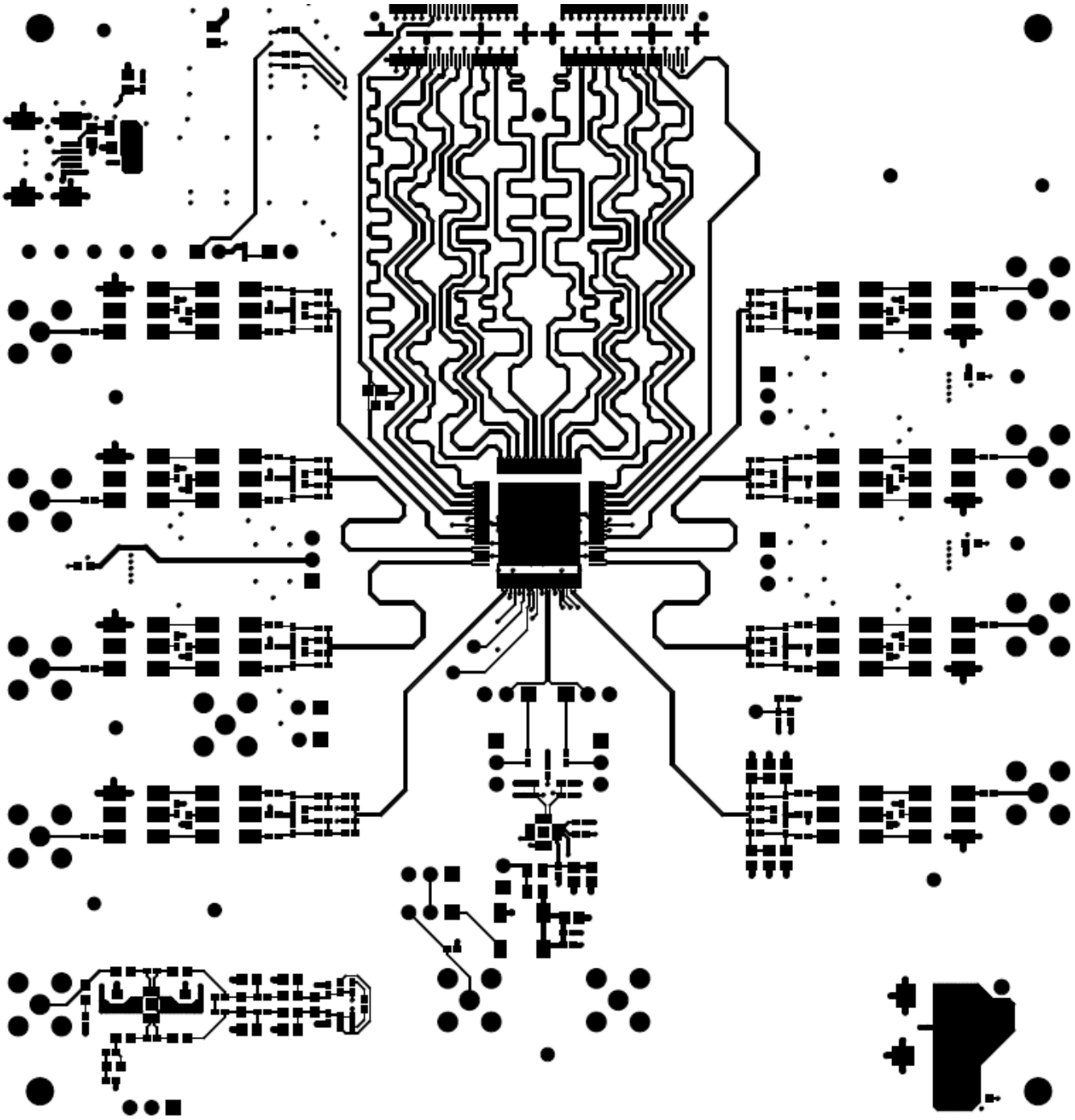


Figure 42. ADS5295EVM Top Layer Copper – Top View

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 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 this Product 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

【ご使用にあたっての注】

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２４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. 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

STANDARD TERMS FOR EVALUATION MODULES

1. *Delivery:* TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, and/or documentation which may be provided together or separately (collectively, an “EVM” or “EVMs”) to the User (“User”) in accordance with the terms set forth herein. User's acceptance of the EVM is expressly subject to the following terms.

   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 semiconductors 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 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 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 a nonconforming EVM if (a) the nonconformity was 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, (b) the nonconformity resulted from User's design, specifications or instructions for such EVMs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent TI deems necessary. TI does not test all parameters of each EVM. User's claims against TI under this Section 2 are void if User fails to notify TI of any apparent defects in the EVMs within ten (10) business days after delivery, or of any hidden defects with ten (10) business days after the defect has been detected.

   2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, 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.

WARNING

Evaluation Kits 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 shall operate the Evaluation Kit within TI’s recommended guidelines and any applicable legal or environmental requirements as well as reasonable and customary safeguards. Failure to set up and/or operate the Evaluation Kit within TI’s recommended guidelines may result in personal injury or death or property damage. Proper set up entails following TI’s instructions for electrical ratings of interface circuits such as input, output and electrical loads.

NOTE:

EXPOSURE TO ELECTROSTATIC DISCHARGE (ESD) MAY CAUSE DEGREDATION OR FAILURE OF THE EVALUATION KIT; TI RECOMMENDS STORAGE OF THE EVALUATION KIT IN A PROTECTIVE ESD BAG.

3 *Regulatory Notices:*

3.1 *United States*

3.1.1 *Notice applicable to EVMs not FCC-Approved:*

FCC NOTICE: 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 or RSS-247*

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. 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/lsds/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。

https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-delivered-in-japan.html

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 to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

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/lsds/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。https://www.ti.com/ja-jp/legal/notice-for-evaluation-kits-for-power-line-communication.html

3.4 *European Union*

3.4.1 *For EVMs subject to EU Directive 2014/30/EU (Electromagnetic Compatibility Directive)*:

This is a class A product intended for use in environments other than domestic environments that are connected to a low-voltage power-supply network that supplies buildings used for domestic purposes. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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 MATERIALS PROVIDED WITH THE EVM (INCLUDING, BUT NOT LIMITED TO, REFERENCE DESIGNS 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 EPIDEMIC FAILURE WARRANTY OR 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 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, REGARDLESS OF WHEN MADE, CONCEIVED OR ACQUIRED.

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. 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:*

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