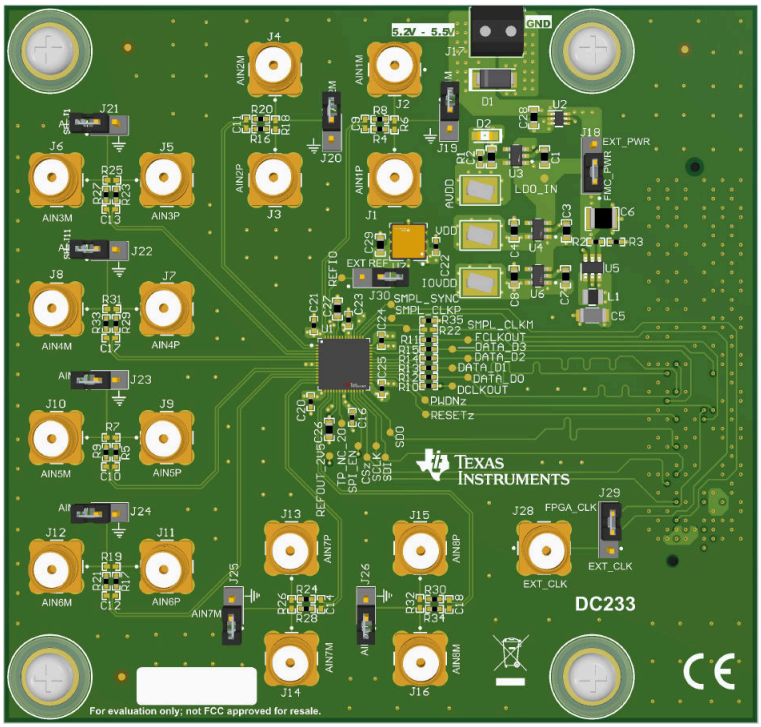
User's Guide

ADS9813 and ADS9817 Evaluation Modules

ABSTRACT

This user's guide describes the characteristics, operation, and use of the ADS9813 and the ADS9817 evaluation modules (EVM). These are evaluation platforms for the ADS9813 and ADS9817, respectively. Both devices are 8-channel, 18-bit, 2-MSPS per channel, successive approximation register (SAR) analog-to-digital converters (ADC). The EVMs ease the evaluation of the ADS9813 and ADS9817 devices with hardware, software, and computer connectivity through the universal serial bus (USB) interface. This user's guide includes complete circuit descriptions, schematic diagrams, and a bill of materials (BOM). Throughout this document, the terms *demonstration kit*, *evaluation board*, *evaluation module*, *and EVM* are synonymous with the ADS9813EVM and the ADS9817EVM.



ADS9813EVM / ADS9817EVM Evaluation Module

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1 Overview

The ADS9813EVM and the ADS9817EVM are platforms for evaluating the performance of the ADS9813 and ADS9817 SAR ADCs, both of which include a PGA front-end to support input voltages of ±12 V, ±10 V, ±7 V, ±5 V, ±3.5 V, and ±2.5 V, both in single-ended and differential configurations. Both ADC cores support 18-bit resolution at 2-MSPS/channel. The ADS9813 ADC features a simultaneous-sampling input structure, while the ADS9817 ADC features a multiplexed input structure.

Both the ADS9813EVM and ADS9817EVM include a standard FMC connector on the bottom of the PCB. The FMC connector can be used to mate with standard FPGA kits, including the TSWDC155EVM (sold separately). The TSWDC155EVM is a digital controller board that is necessary for the included EVM software GUI to communicate with the device, graph measured results, and compute common figures of merit (for example, SNR and THD).

The following related documents are available for download through the Texas Instruments web site at www.ti.com.

Table 1-1. Related Documentation

Device	Literature Number
TSWDC155EVM	SLAU870
TPS61070	SLVS510
TPS7A20	SBVS338
LM66100	SLVSEZ8
REF7040	SNAS781

1.1 ADS9813EVM and ADS9817EVM Features

The ADS9813EVM and ADS9817EVM both include the following features:

- ADS9813EVM has the hardware required for diagnostic testing and accurate performance evaluation of the ADS9813 ADC.
- ADS9817EVM has the hardware required for diagnostic testing and accurate performance evaluation of the ADS9817 ADC.
- The TSWDC155EVM controller (sold separately) provides all necessary digital I/O signals and power rails required for operating the ADS9813EVM and the ADS9817EVM.
- Easy-to-use evaluation GUI for Microsoft® Windows® 10, 64-bit operating systems requires the TSWDC155EVM (sold separately) for operation.
- The included software suite features graphical tools for data capture, histogram analysis, spectral analysis, and linearity measurements.

Figure 1-2 depicts the connections and basic subsystems of the EVM.

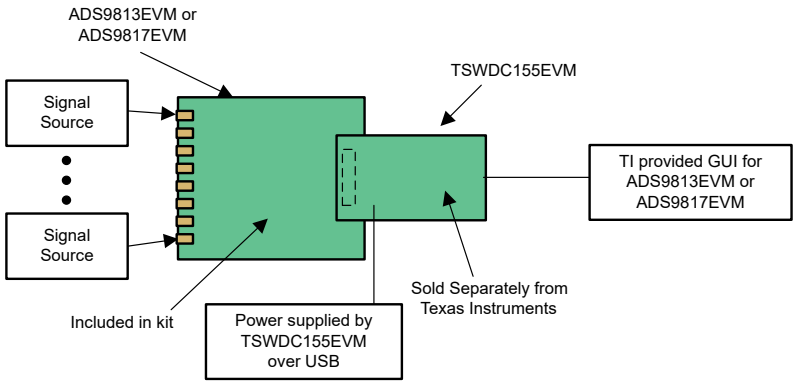

Figure 1-1. System Using GUI and TSWDC155EVM

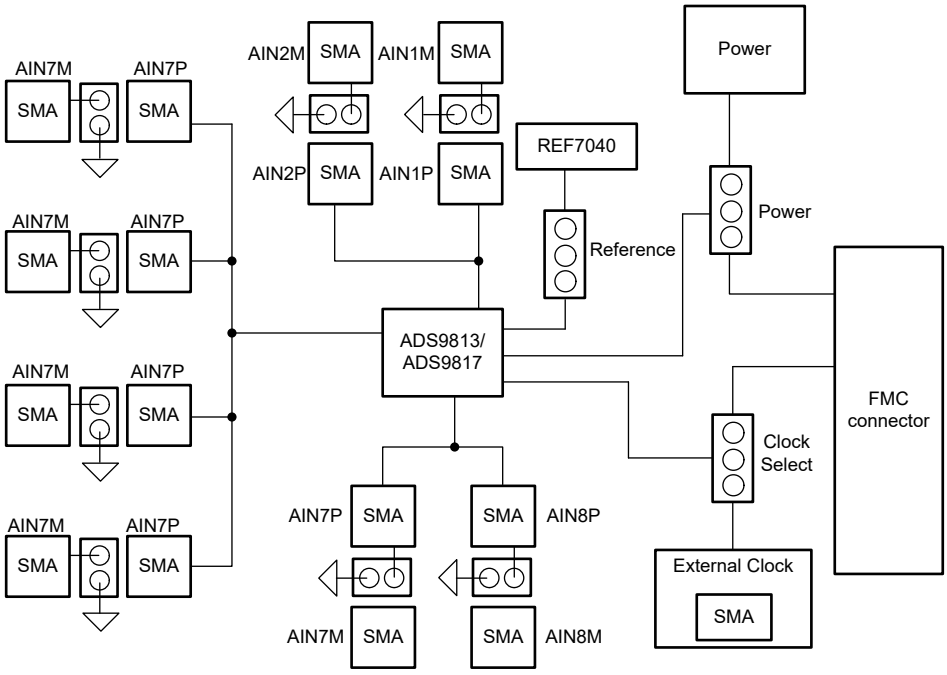

Figure 1-2. ADS9813EVM and ADS9817EVM Block Diagram

2 ADS9813EVM and ADS9817EVM Quick Start Guide

The following instructions are a step-by-step guide to connecting the ADS9817EVM to the computer and evaluating the performance of the ADS9817. The same steps can be used for setting up the ADS9813EVM.

1. Review the default jumper settings in Figure 2-1 below as well as the power guidelines in Section 5.1.
2. Physically connect J1 of the TSWDC155EVM to J27 of the ADS9817EVM. This component is the digital communications and power signal connection in default configuration.
3. Set jumper J18 to the FMC_PWR position so the TSWDC155EVM provides power. Otherwise, set J18 to EXT_PWR and connect an external 5.2-V to 5.5-V supply on screw terminal connection J17.
4. Bypass any external USB hub and connect the USB on the TSWDC155EVM directly to the computer.

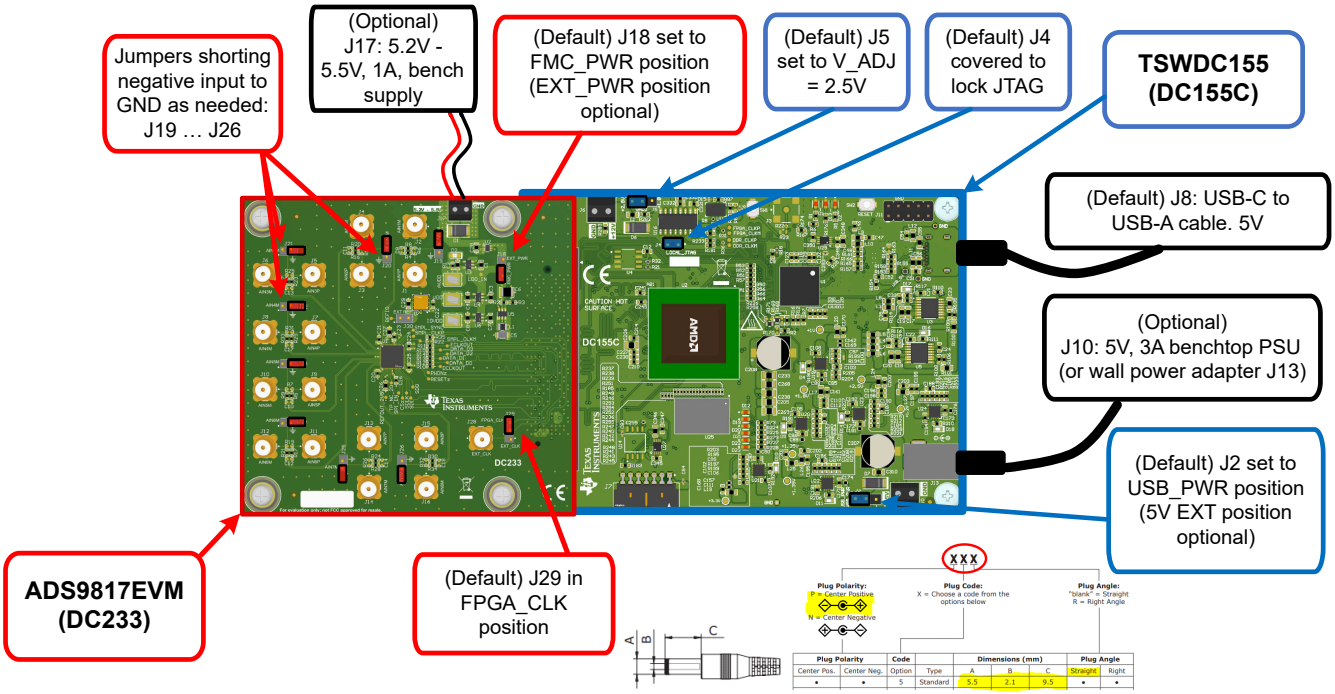

Figure 2-1. Connecting the Hardware

1. Install the GUI as described in Section 6.1.
2. Install the necessary USB drivers as described in Section 6.2.
3. Launch the GUI.
4. Press the *Initialize USB*, *Power Up*, *Program FPGA*, and *Initialize ADS98xx* buttons, in order from top to bottom, on the *Config* tab to power up and configure the EVM, (see Section 6.3 for details).
5. Connect a 10 V_{PP}, single-ended sine wave signal from a function generator to any AINxP SMA input connector.
6. Press the *EN SYNC* button on the *Capture* tab.
7. Select the number of samples to be at least 32k points, and choose the Hanning window type for best frequency domain results.
8. Press the *Start Capture* button to collect and analyze the data displayed on the appropriate CHx tab; see Figure 6-6.

3 Analog Interface

This section details the analog input connections to the ADS9813EVM and ADS9817EVM.

3.1 ADC Input SMA Connections

Each ADC channel is connected to two SMA input connectors. 0402 footprints are provided to add a first-order, low-pass filter network on all ADC channels. By default, the filter capacitors are uninstalled and the filter resistors are populated with 0 ohms. Use NP0/C0G type capacitors and low-tolerance resistors to maintain AC performance when choosing to populate these footprints with a low-pass filter circuit.

Additionally, the ADC negative input connectors (for example, AIN1M) have the option to be shorted to GND with a jumper to allow for single-ended input signals. Figure 3-1 shows the input connections for a digital interface.

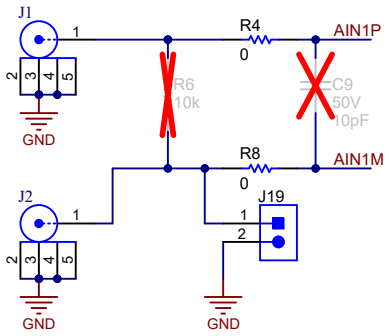

Figure 3-1. Input SMA Connections Digital Interface

3.2 Voltage Reference

The ADS9813 and ADS9817 both use an internal 4.096-V reference voltage, which can be measured on the REFIO pin when configured as an output (default). For applications which require improved drift performance, configure the REFIO pin as an input and apply an external reference voltage to the pin.

The ADS9813EVM and ADS9817EVM include a provision for evaluating the REF7040 reference IC. The REF70xx family of high precision series voltage references offers the industry's lowest noise (0.23 ppm_{p-p}), very low temperature drift coefficient (2 ppm/°C), and high accuracy (±0.025%). In addition, these precision reference devices feature high PSRR, low drop-out voltage and excellent load and line regulation to help meet strict transient requirements. The REF7040 on the EVM is the 4.096-V output voltage option. To connect the REF7040 to the ADS9813 or the ADS9817, configure the REFIO pin as an input via the GUI and then install a shunt on jumper J30.

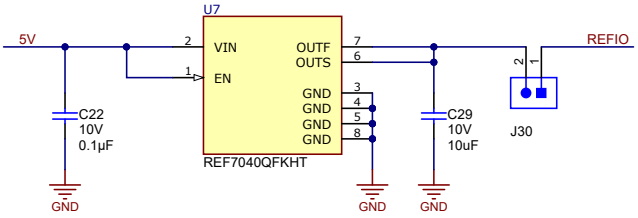

Figure 3-2. REF7040

4 Digital Interface and Clock Inputs

This section details the digital interface connections and clocking options for the ADS9813EVM and ADS9817EVM.

4.1 Digital Interface Connections

The ADS9813 and ADS9817 use SPI to configure the internal device registers (SCLK, SDI, SDO, CSn, and SPI_EN). A separate CMOS interface is used for capturing conversion data for each ADC channel using up to four output data lanes (D0, D1, D2, and D3). The SPI and CMOS interface signals connect to the FMC connector. Figure 4-1 provides the FMC connector signal definition. These signals are also available via test points for scope measurements as indicated in PCB silkscreen.

The FMC connector pinout below can also be interfaced with standard FPGA development kits. Note that the TI-provided software GUI is only compatible with the TSWDC155EVM and third-party software development is not supported.

Figure 4-1. Digital I/O

The digital communication lines for the ADS9817 ADC (shown in Figure 4-2) are CMOS interface and are connected with optional termination resistors. The digital communication lines for the ADS9813 ADC are identical and can be seen in Figure 4-2. A digital serial peripheral interface (SPI) port is used to configure registers in the device. Figure 4-2 also shows the necessary decoupling capacitors for analog supplies, digital supplies, and ADC reference voltages.

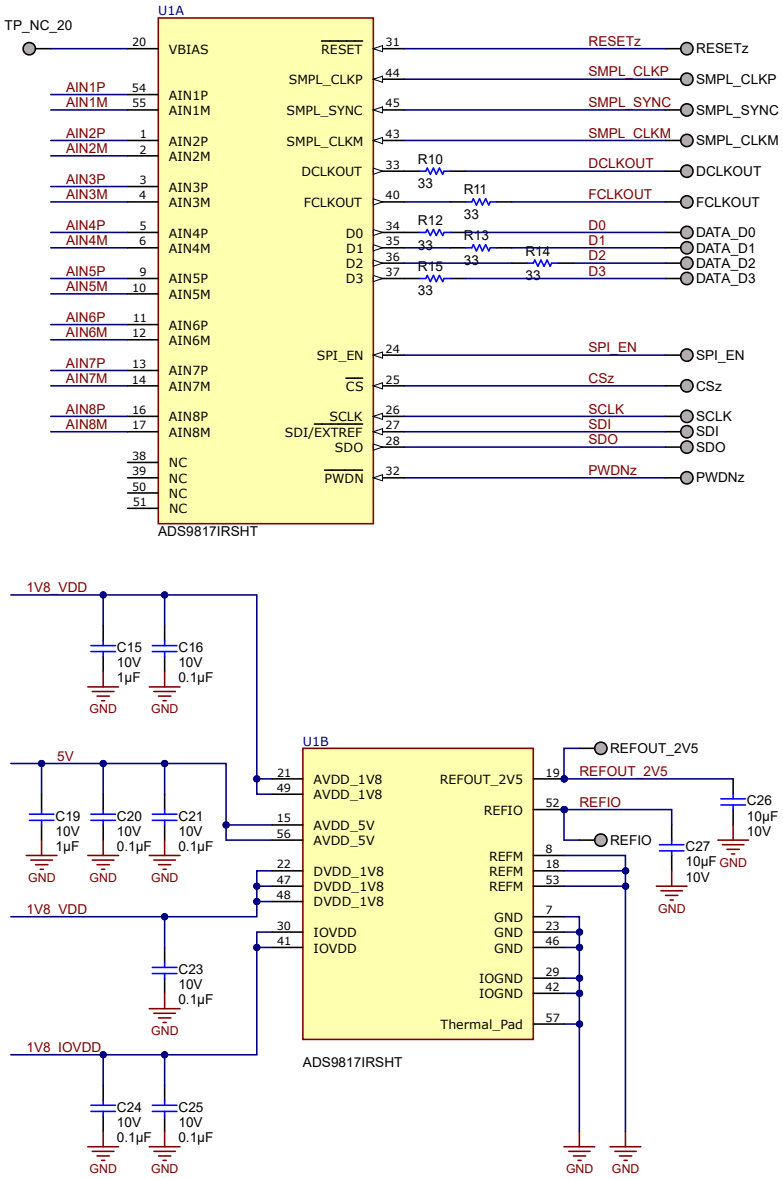

Figure 4-2. Connections to ADS9817

4.2 Clock Select

The ADS9813EVM and ADS9817EVM use single-ended sampling clock for ADC conversions. The positive sampling clock input (SMPL_CLKP) is selected using jumper J29. Install a shunt in the [2-3] position (default) to source the clock signal from the TSWDC155EVM through the FMC connector. This allows the user to select the clock frequency from the options listed in the EVM GUI.

An external clock source can also be used to control ADC conversions. Connect a low-jitter clock source to SMA connector J28 and install a shunt in the [1-2] position on J29.

The negative source of the sample clock (SMPL_CLKM) can be sourced from either the FMC connector (FMC_SMPL_CLKM) or GND through R22 or R35, respectively. By default, R35 is populated and R22 is uninstalled.

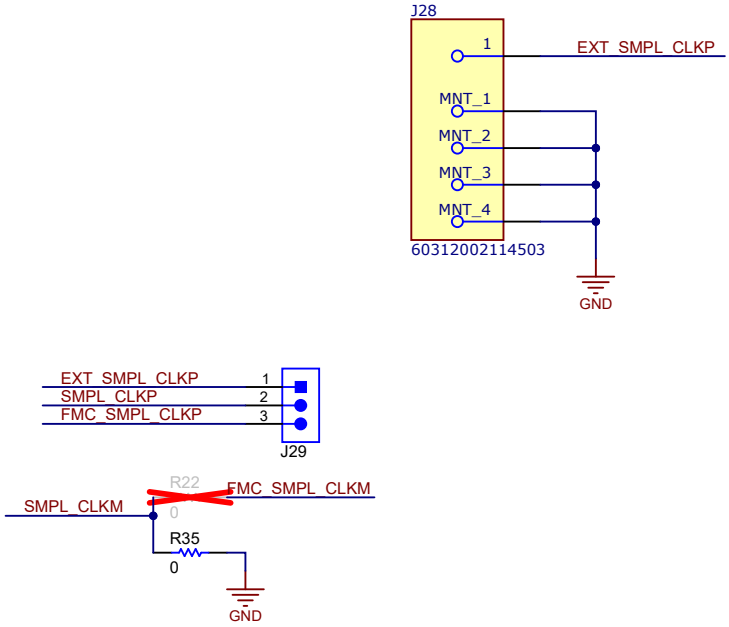

Figure 4-3. Sample Clock Selection

5 Power Supplies

By default, the TSWDC155EVM provides the ADS9813EVM and ADS9817EVM with a 3.3-V supply ("3P3V"). The ADS9813EVM and ADS9817EVM both have a TPS61070 boost converter that boosts the 3.3-V supply to 5.4 V. By default, this voltage is applied to low-dropout regulators (LDOs) to derive the AVDD, DVDD, and IOVDD supplies when J18 is in the [1-2] position. U3 (TPS7A2050) provides the 5-V AVDD supply and U4 and U6 (TPS7A2018) provide the 1.8-V DVDD and IOVDD supplies, respectively. The LDO input voltage (LDO_IN) can be changed to an external source (5.2 V to 5.5 V) applied to terminal block J17 by placing a shunt on J18 in the [2-3] position. In this case U2 (LM66100), provides reverse polarity protection if the connection is wired incorrectly. Figure 5-1 shows the power tree schematic for the ADS9813EVM and ADS9817EVM.

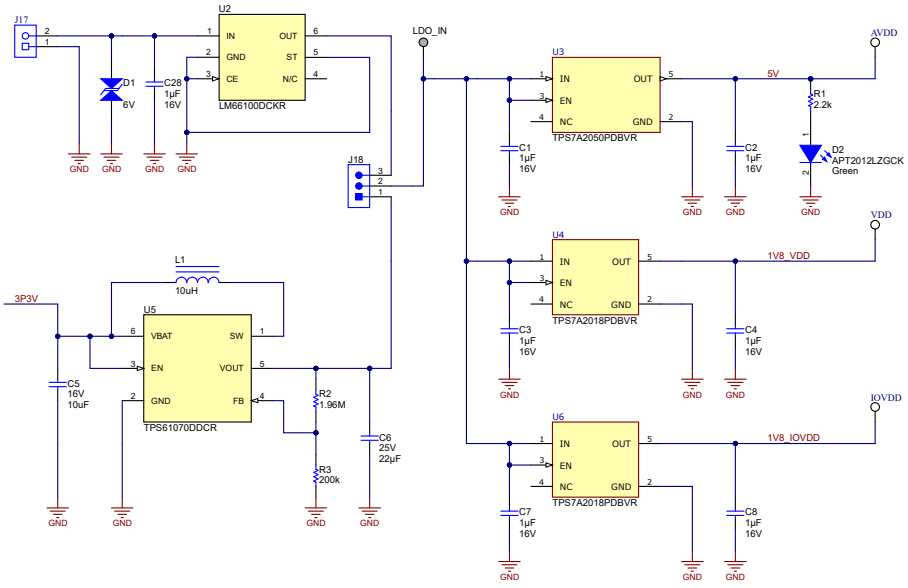

Figure 5-1. Power Entry and Regulators

5.1 USB Power and When to Power the Board Externally

As discussed in Section 2, the USB-C connector is able to provide power to the TSWDC155EVM and ADS9813EVM or ADS9817EVM using the default configuration. The combined peak current consumption reaches 600 mA (typical) during the ADC conversion process and 520 mA RMS (typical) after the ADS9813EVM or the ADS9817EVM is initialized in the GUI, as described in Section 6.3.

The TWDC155EVM is a high-power SuperSpeed (USB 3.0) device. This means a PC supplies up to 900 mA from a compliant USB 3.0 port. However, many PC USB port configurations allow much less than this limit depending on the unit load handshake process, usually resulting from other devices on the bus. Tripping the current limit on a USB can result in cutting power to the USB port, excessive power dissipation or heating, depending on the PC port configuration. As a result, TI highly recommends to consider switching to an externally powered ADS9813EVM or ADS9817EVM and/or TSWDC155EVM if:

- Only USB 1.0 or USB 2.0 ports are available.
- There are multiple devices connected to the PC by USB at the same time.
- The USB 3.0 port configuration for the PC is unknown.

To switch to the external power configuration on the ADS9813EVM or ADS9817EVM, move the jumper on J18 to the EXT_PWR position and use the J17 terminal block to provide the required 5.2-V to 5.5-V supply. To switch to the external power configuration on TSWDC155EVM, move the jumper on J2 to the 5 V (external) position and use the J10 terminal block or barrel jack connector to provide the required 5-V supply.

USB hubs can cause possible device enumeration issues and are not recommended when communicating through the TSWDC155EVM.

6 ADS9813EVM and ADS9817EVM Software Reference

6.1 ADS9813EVM-GUI and ADS9817EVM-GUI Software Installation

This section details the installation and operation of the ADS9813EVM and ADS9817EVM software graphical user interfaces (GUI). These softwares require the TSWDC155EVM (sold separately) controller to operate. The first step to installing the software (as shown in Figure 6-1) is to download the latest version of the EVM GUI installer as per Table 6-1.

Table 6-1. EVM GUI Installers

EVM	Software Download Link
ADS9813EVM	ADS9813EVM-GUI
ADS9817EVM	ADS9817EVM-GUI

Accept all the license agreements and choose the destination location, project directory, and start menu. Typically, the default values work, but these values can be customized as needed based on the user's requirements.

Note

The GUI installer and GUI buttons can differ slightly depending on which specific GUI is being installed.

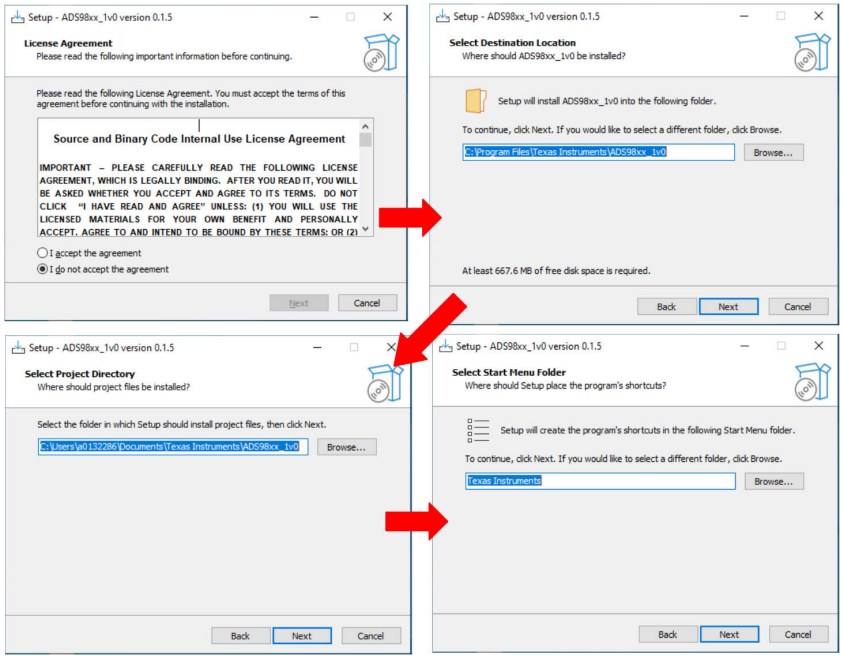

Figure 6-1. Initial Software Installation

Next, the installer prompts the user to create a desktop icon and summarize the installation plan. Clicking **Install** begins copying software onto the computer. This process takes a few minutes. At completion, the user can launch a readme text file and the application. Figure 6-2 shows these steps.

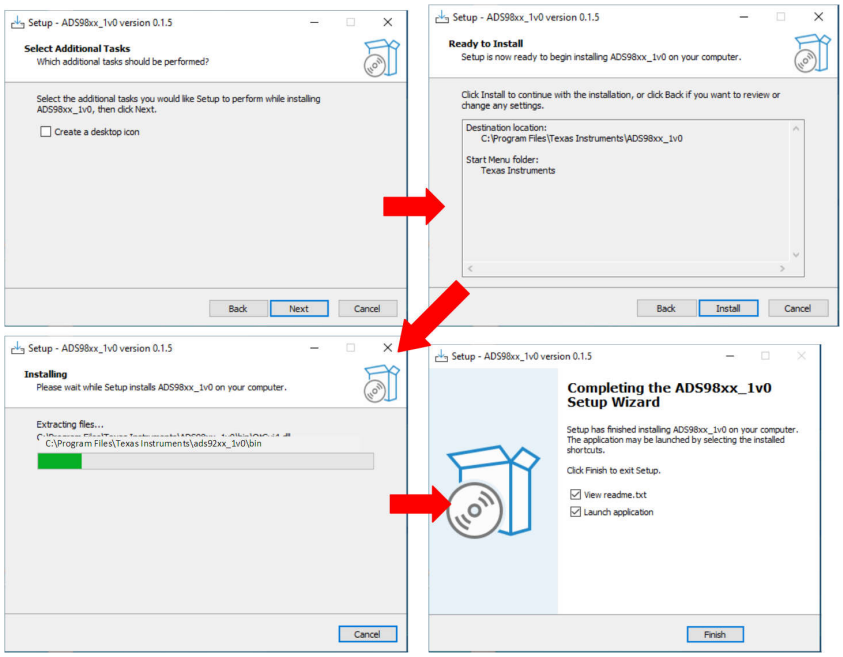

Figure 6-2. Installation Process

6.2 USB Driver Installation

This section describes the steps for installing the USB driver.

1. For the TSWDC155, connect J8 to the workstation using a USB-C to USB-A cable.
2. Bypass any USB hub and connect directly to the computer.
3. Open the Windows® Device Manager, as shown in Figure 6-3, and right-click on the *WestBridge* folder in the Device Manager window and select the *Update Driver* button (see Figure 6-4).
4. In the next window that appears, select *Browse my computer for driver software*.
5. Then select *Let me pick from a list of available drivers on my computer* in the next pop-up window.
6. Click on *Have Disk* in the pop-up window and navigate to:
   a. For ADS9813EVM: *C:\Program Files\Texas Instruments\ADS9813_1v0\bin\proj_lib\Sparrow\Bootloader*
   b. For ADS9817EVM: *C:\Program Files\Texas Instruments\ADS98xx_1v0\bin\proj_lib\Sparrow\Bootloader*

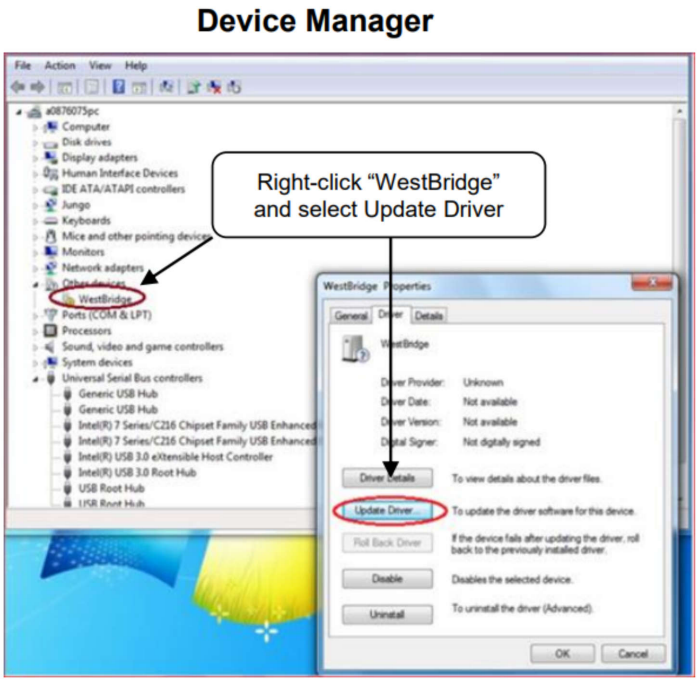

Figure 6-3. Open Device Manager

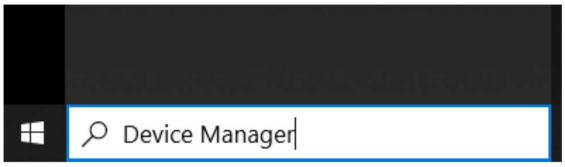

Figure 6-4. Update Driver With Device Manager

6.3 Using the CONFIG Tab

After the EVM GUI is started, press the following buttons in the order shown in Figure 6-5 below. Confirm that each step is completed before proceeding by monitoring the Status message. For the Power Up and Program FPGA buttons, some status LEDs on the hardware illuminate. After all four buttons are pressed, the power on the ADS9813EVM or ADS9817EVM is on and the ADS9813 or ADS9817 device registers are configured.

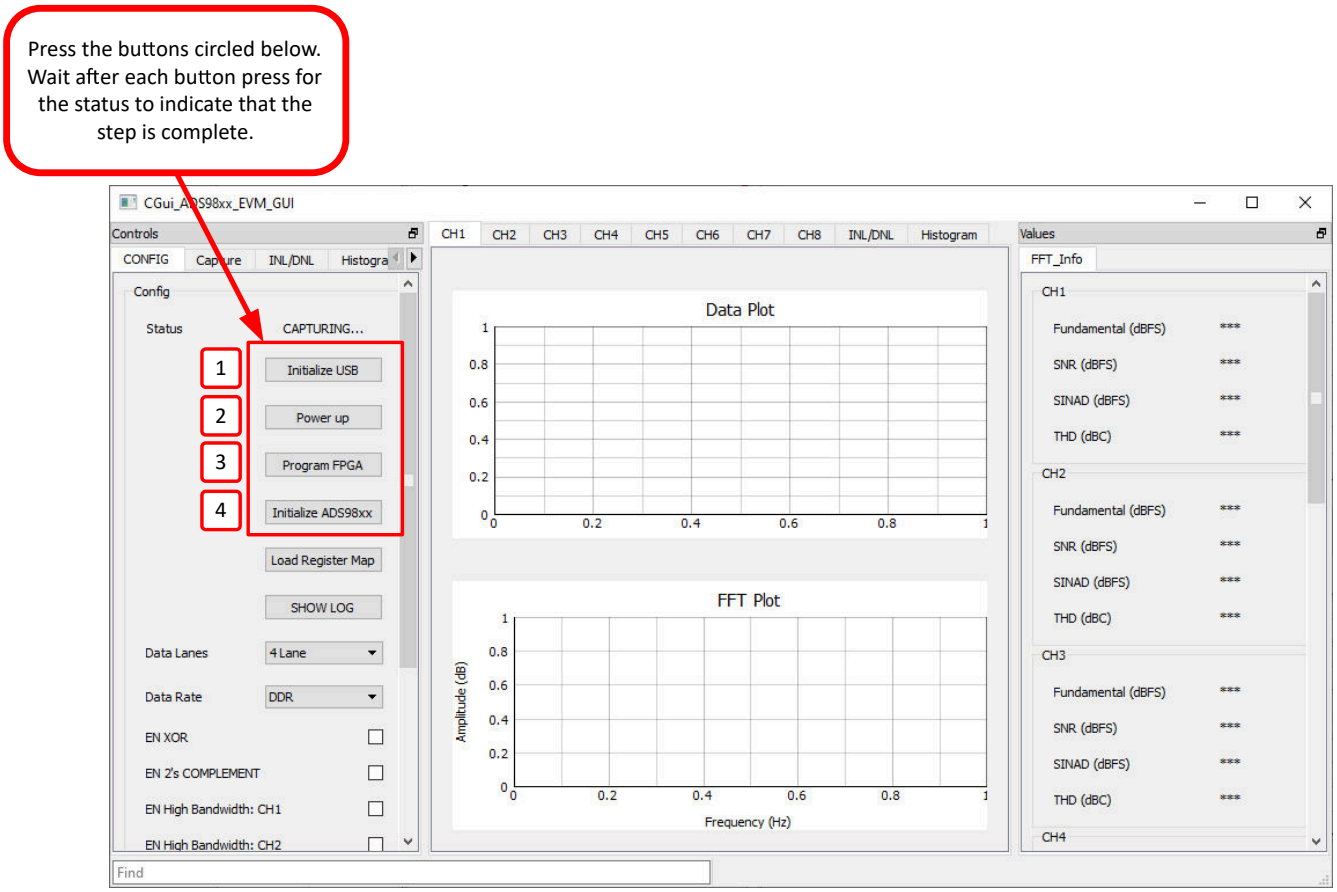

Figure 6-5. Initial Required Setup on the Config Tab

6.4 Using the Capture Tab

In Figure 6-6, shows an example data capture display. In this step, the necessary updates to the *Capture* settings are made to capture the time domain data and to get a good frequency domain result. First, the EN SYNC button is clicked to generate a synchronization (SYNC) signal. The SYNC signal is only required once during power-up. The SYNC signal resets the internal analog channel selection logic and aligns the FCLKOUT signal to the data frame. Next, update the number of samples to at least 32k to get good frequency domain results (for example, accurate FFT display, SNR data, and THD data). Finally, select the Hanning type window to eliminate spectral leakage in the FFT result.

When these changes are made, press the Start Capture button to collect time domain and frequency domain data. Select the appropriate tab to view data for channel 1 or channel 2.

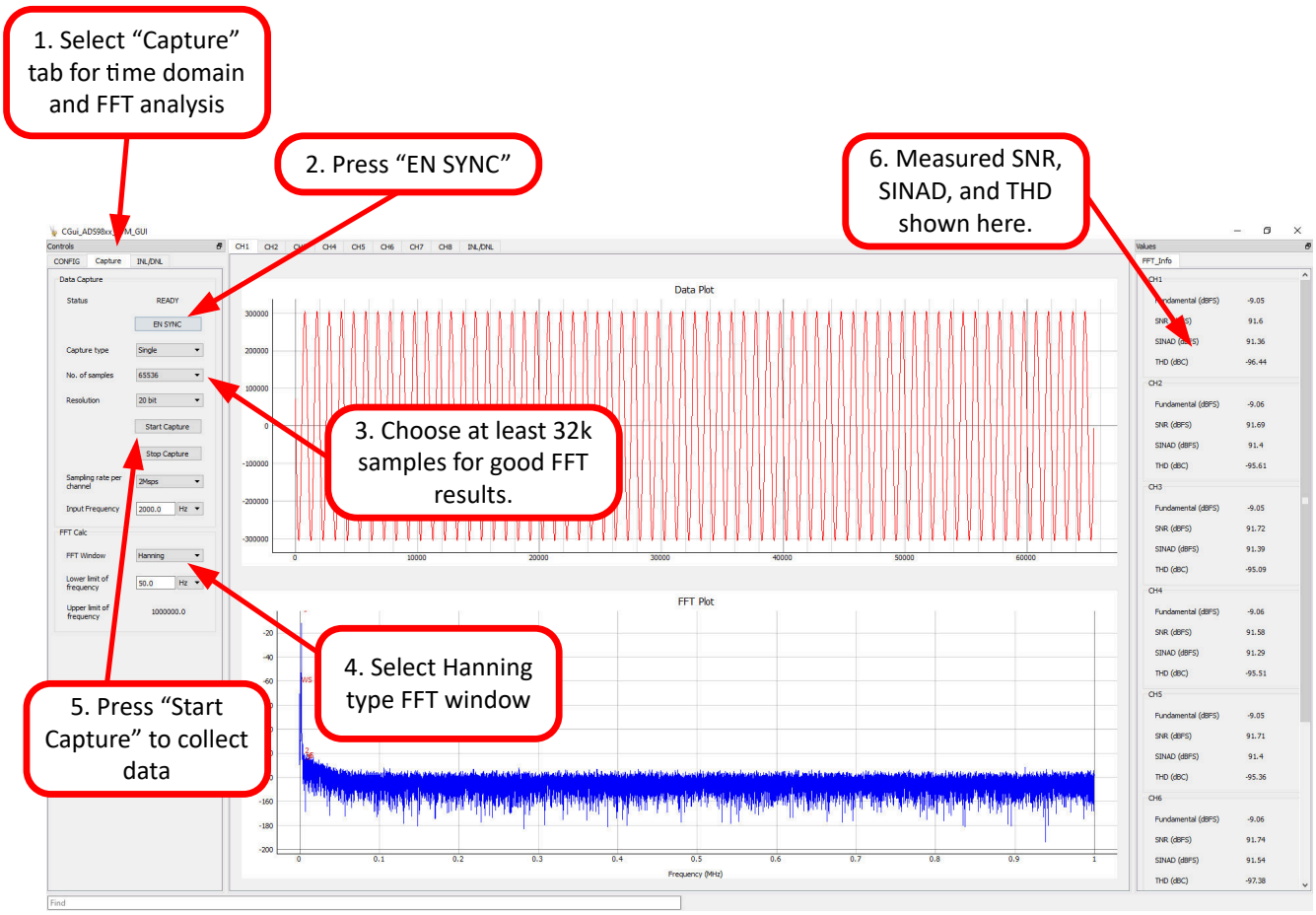

Figure 6-6. Initial Required Setup on the Capture Tab

6.5 Using the INL/DNL Tool

The INL/DNL tool measures the linearity of the of the ADS9813EVM or ADS9817EVM by applying a full-scale, low-distortion sinusoidal input signal. The accuracy improves if the number of *hits per code* is increased at the cost of extra test time. Select the channel to measure and the *hits per code*. An input signal greater than full-scale is required to verify that all ADC codes are tested. An input signal of +0.1 dBFS is sufficient. Then press the GET INL/DNL button to run this tool as shown in Figure 6-7.

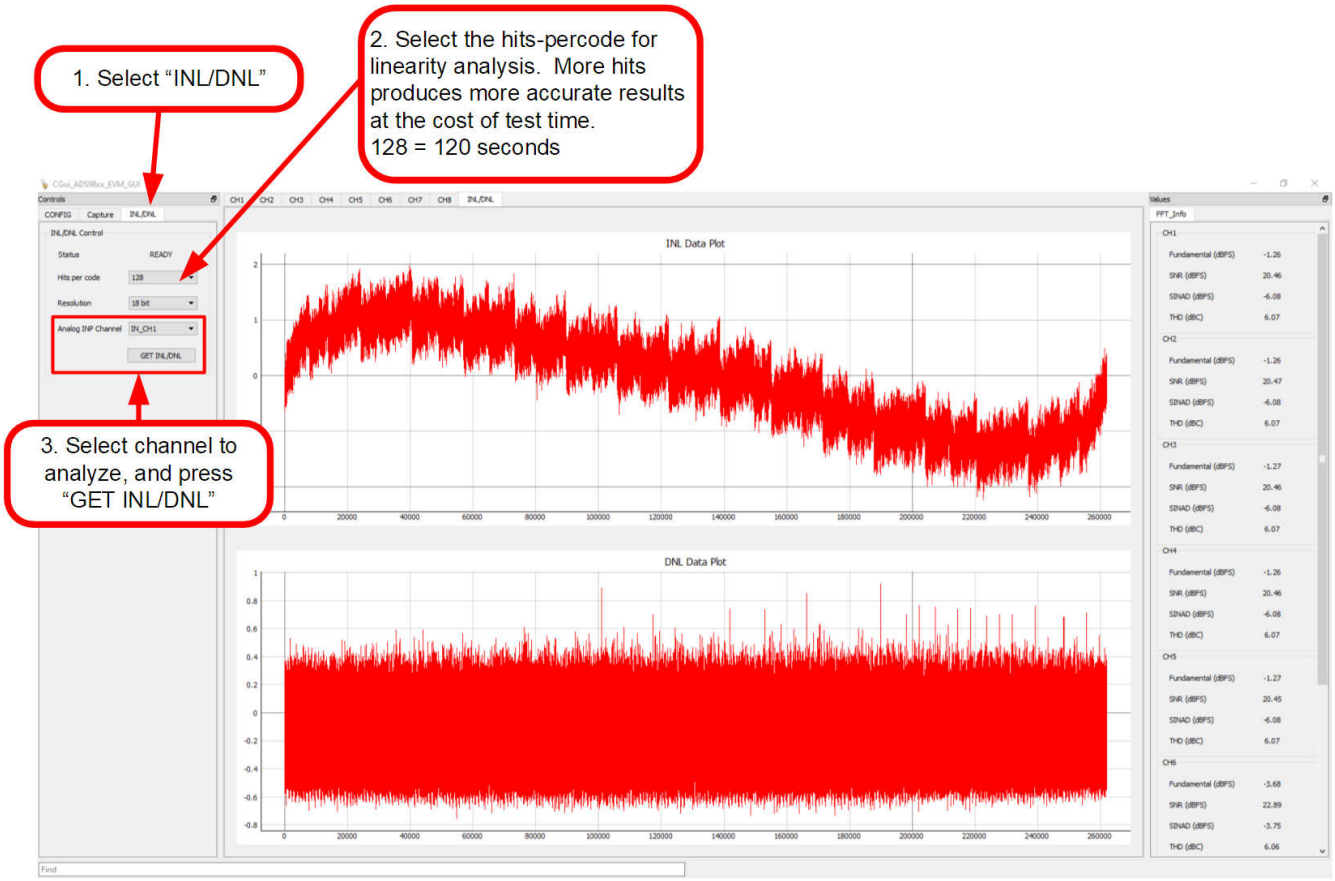

Figure 6-7. Using the INL/DNL Tool

6.6 Using the Histogram Tab

The Histogram tool represents the distribution of ADC output codes for a given sample set. The accuracy of the statistical summary can be improved by increasing *hits per code*, which increases the sample size at the cost of extra test time. Select the channel to measure and configure the *hits per code*, *channel*, *resolution*, and enter the reference voltage value. Then, press the *GET HISTOGRAM* button as shown in Figure 6-8.

The cumulative effect of noise coupling to the ADC output comes from sources such as the input drive circuits, the reference drive circuit, the ADC power supply, and the ADC. The total noise is reflected in the standard deviation of the ADC output code histogram that is obtained by performing multiple conversions of a DC input applied to a given channel. Selecting the correct reference voltage gives the result in units of voltage instead of codes.

Note that any data collected the histogram tab is not saved or stored on the *Capture Tab*. As a result, switching between the tabs results in lost data. Saving data on this screen does not provide the raw ADC codes but instead saves the histogram data presented on this tab in codes per bin. To save the raw ADC output values, use the *Capture* tab.

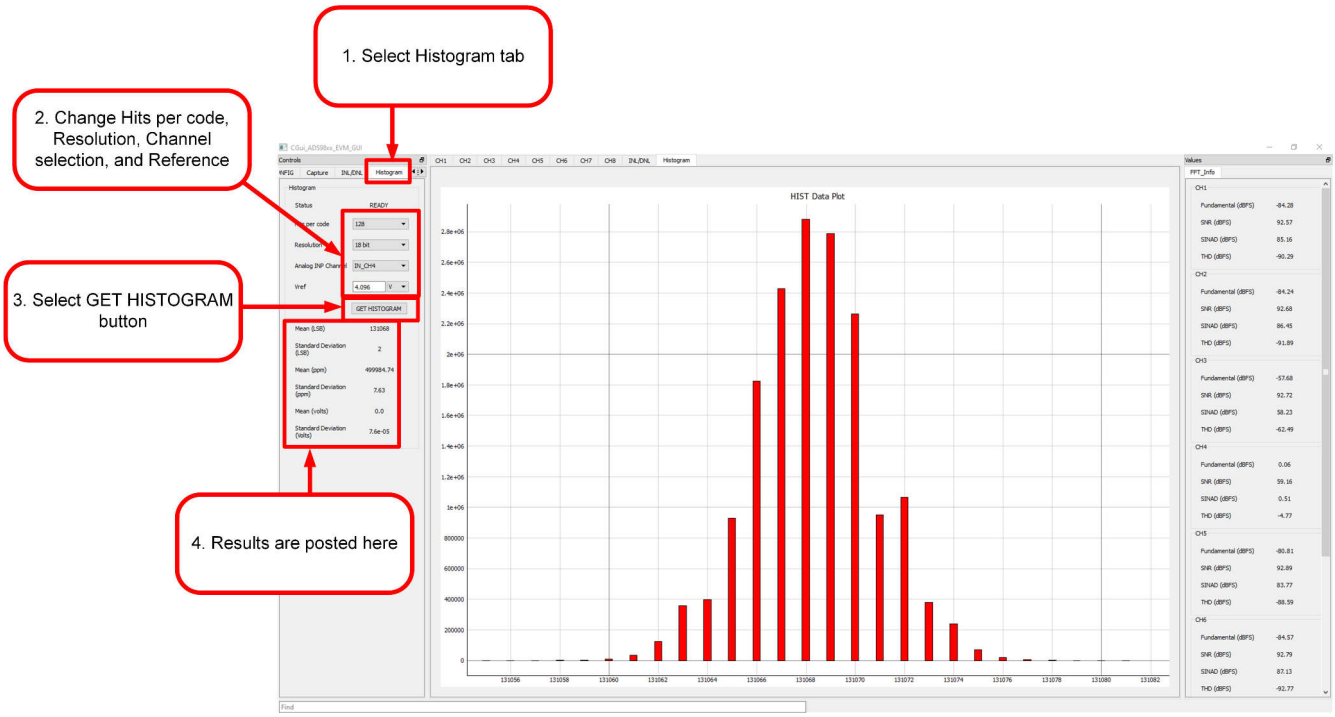

Figure 6-8. Using the Histogram Tab

7 Schematics, Layouts, and Bill of Materials

This section contains the ADS9813EVM and ADS9817EVM schematics, printed-circuit board (PCB) layout, and bill of materials (BOM).

7.1 Schematics

7.1.1 ADS9813EVM Schematics

The schematics below show the various connections to the ADS9813 device. The digital signals connect to J27, as shown in Figure 7-3, and the analog signals connect to SMA connectors and input filtering. Figure 7-1 also shows the decoupling for the device.

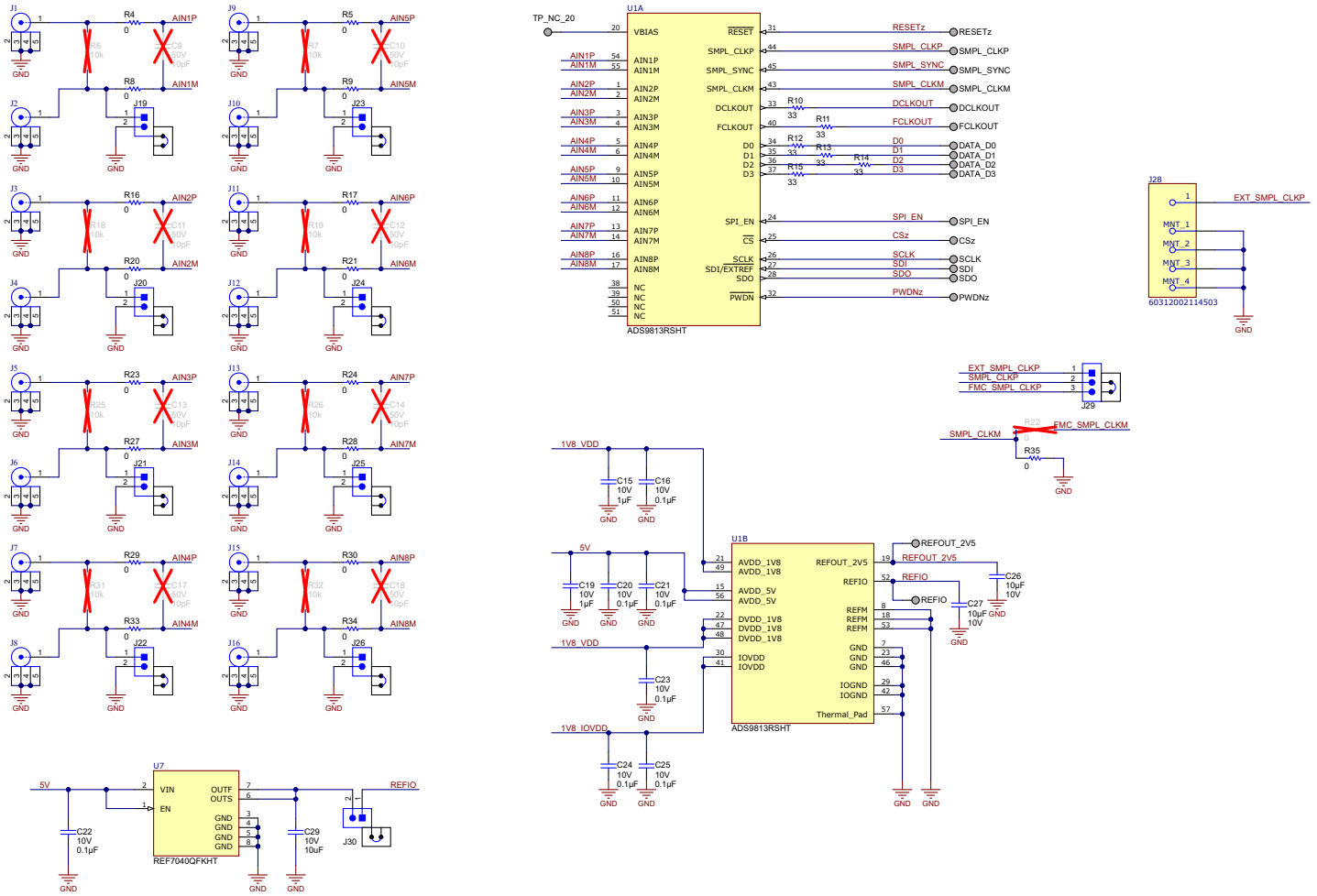

Figure 7-1. ADS9813 Device Connections Schematic

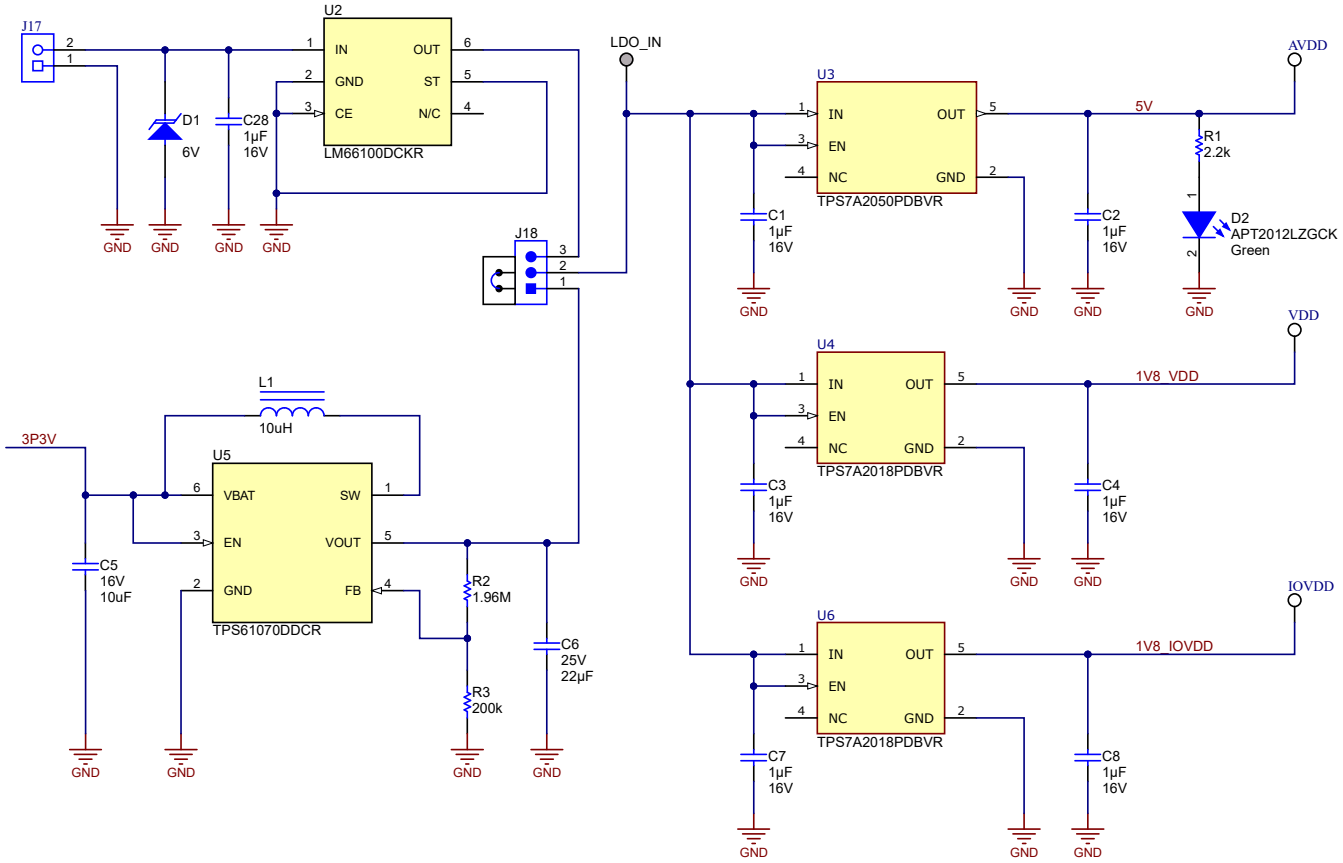

Figure 7-2. Power Connections and Regulators Schematic

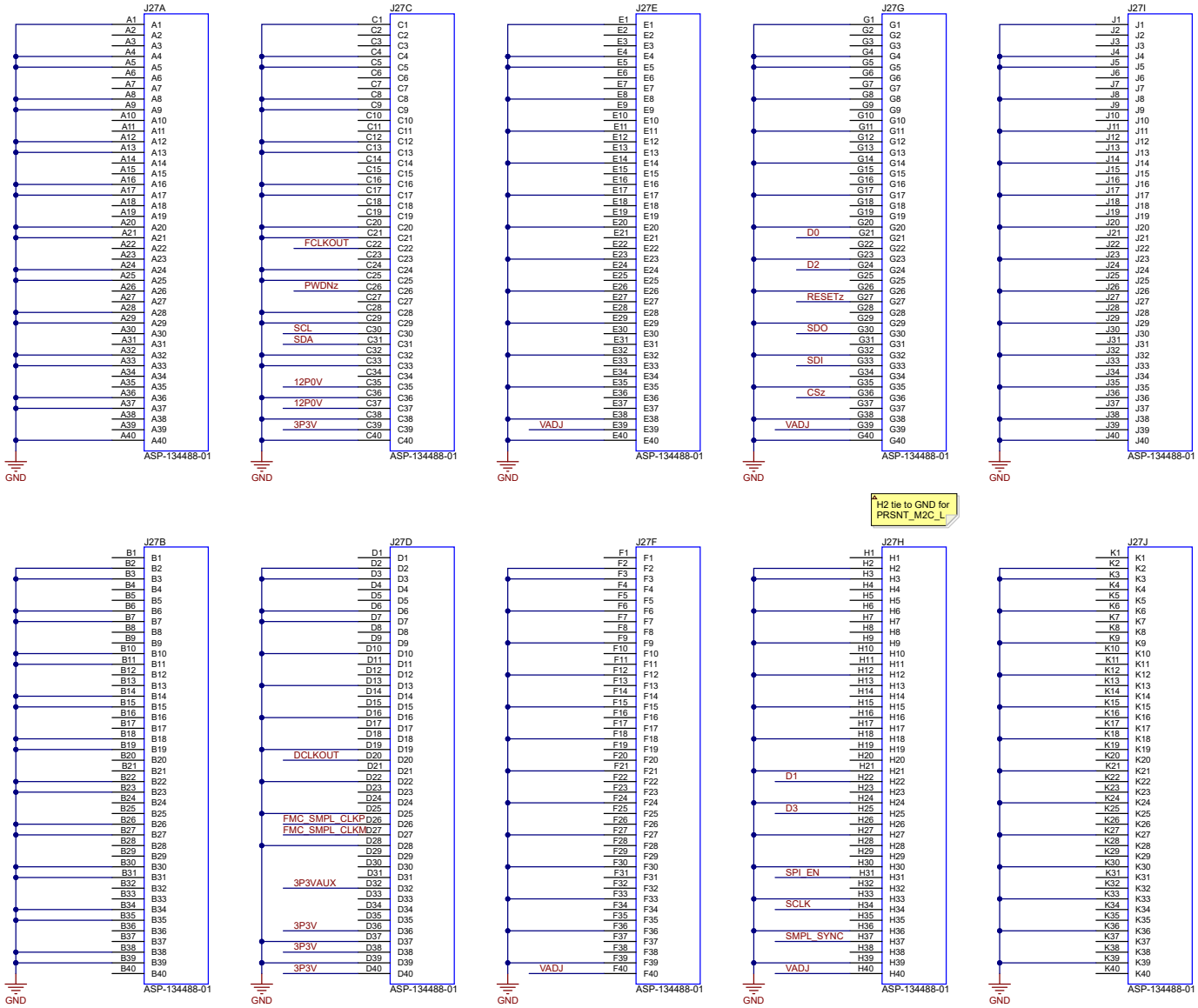

Figure 7-3. Digital Connector Schematic

7.1.2 ADS9817EVM Schematics

The schematics below show the various connections to the ADS9817 device. The digital signals connect to J27, as shown in Figure 7-6, and the analog signals connect to SMA connectors and input filtering. Figure 7-4 also shows the decoupling for the device.

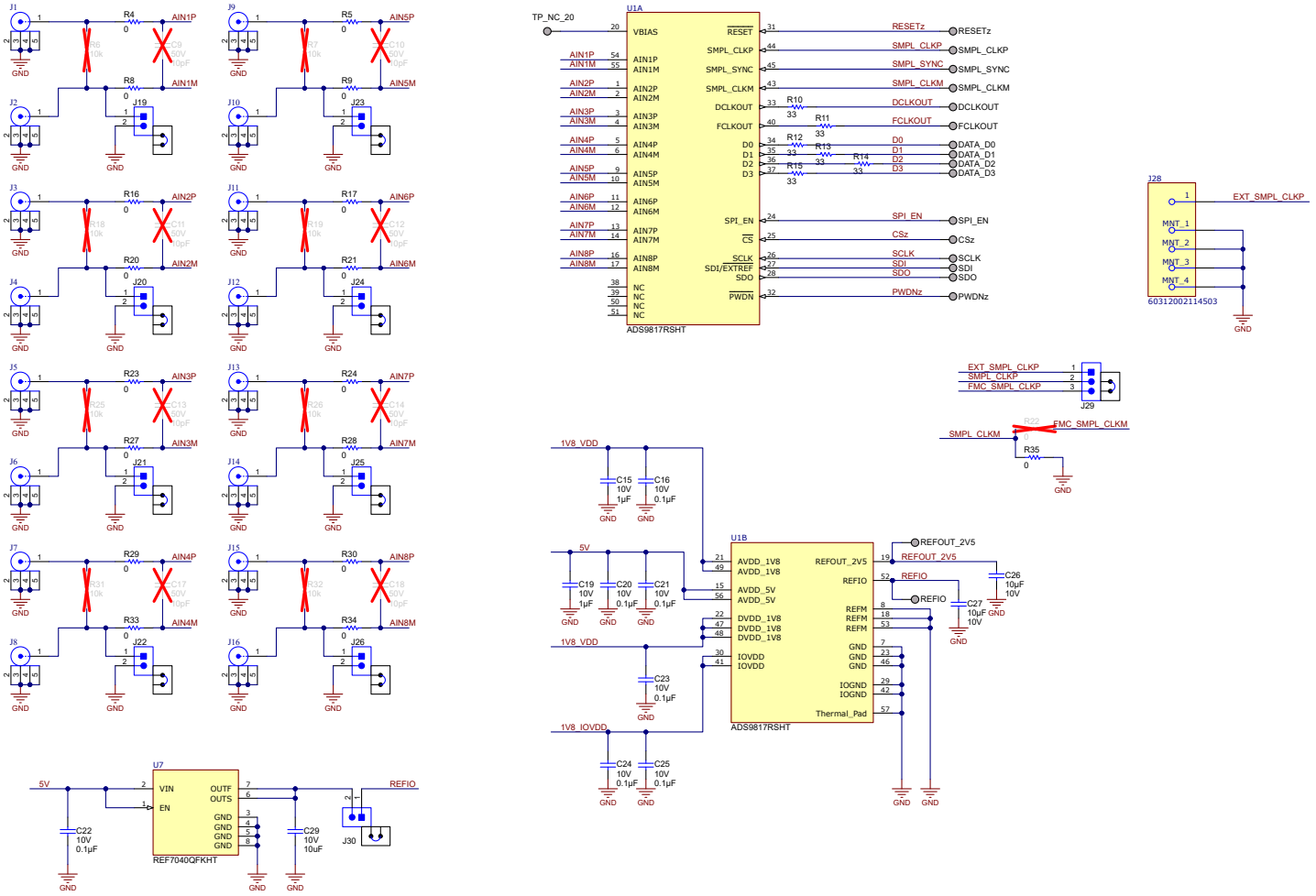

Figure 7-4. ADS9817 Device Connections Schematic

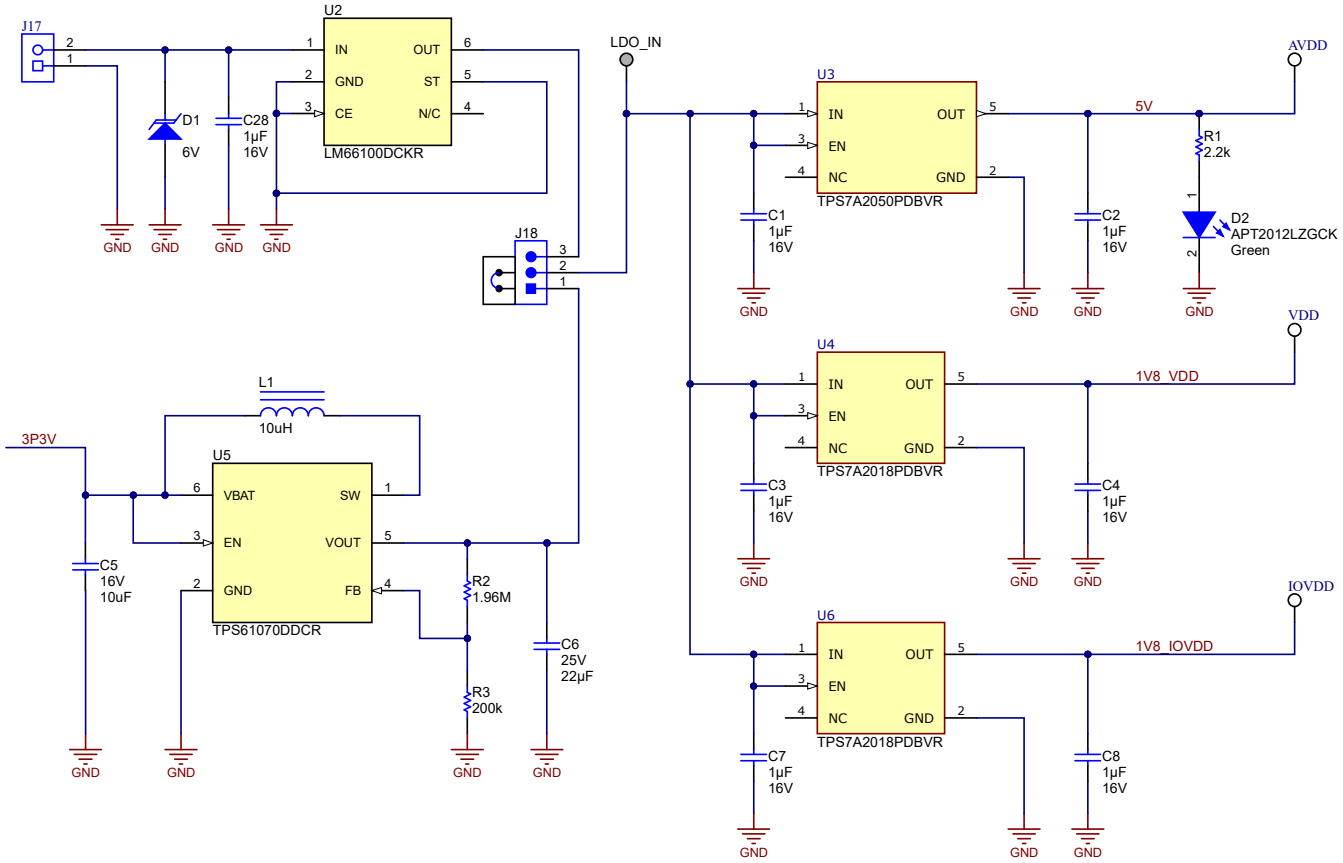

Figure 7-5. Power Connections and Regulators Schematic

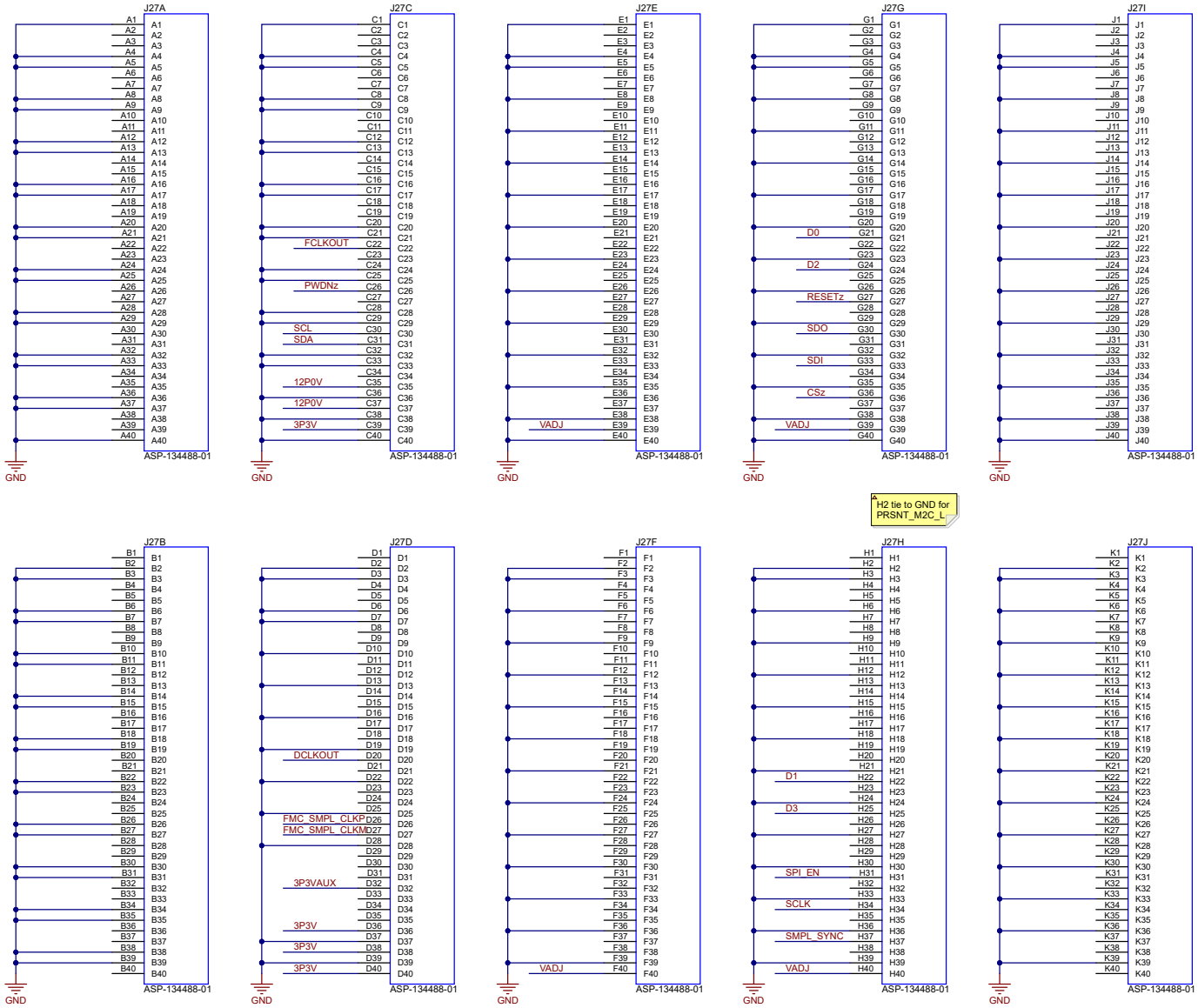

Figure 7-6. Digital Connector Schematic

7.2 Layout

The figures below show the PCB layer plots for the ADS9813EVM and the ADS9817EVM.

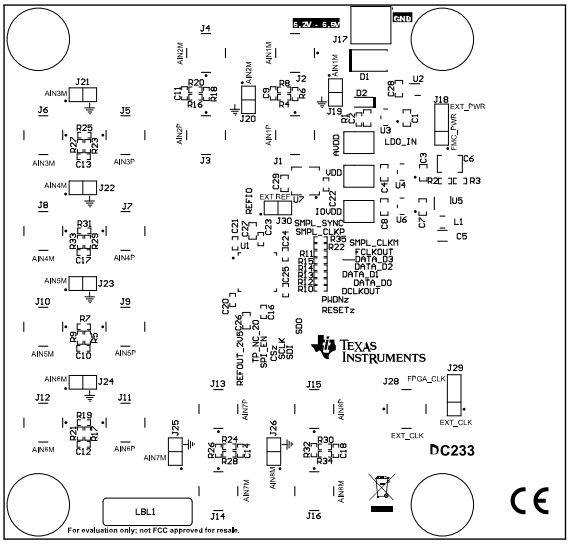

Figure 7-7. Top Overlay

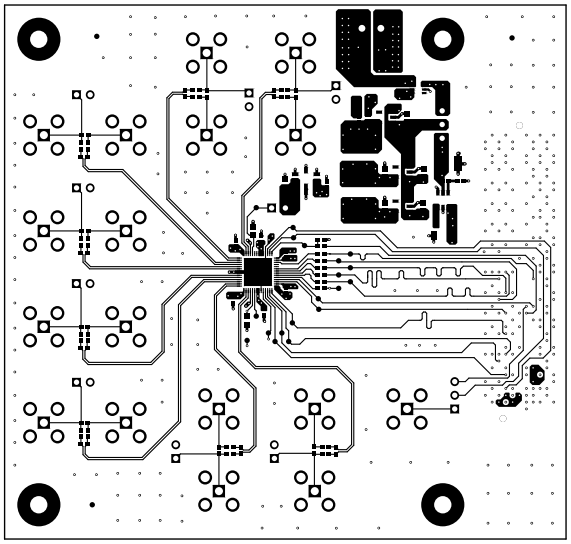

Figure 7-8. Top Layer

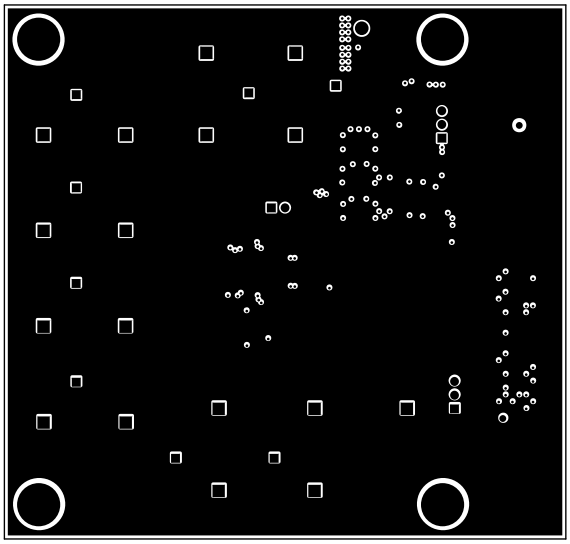

Figure 7-9. GND1 Layer

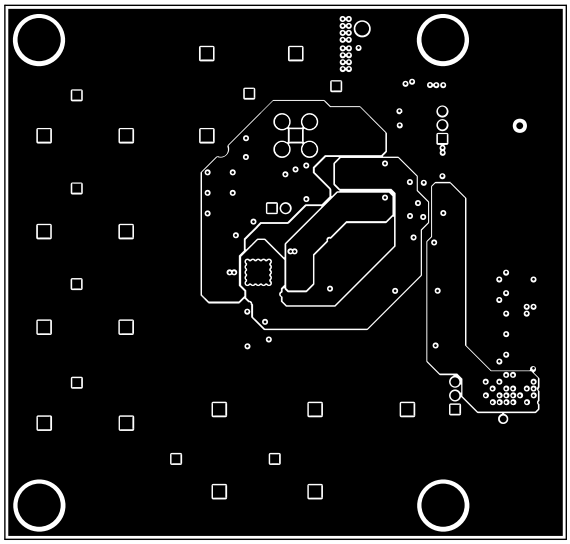

Figure 7-10. GND2 Layer

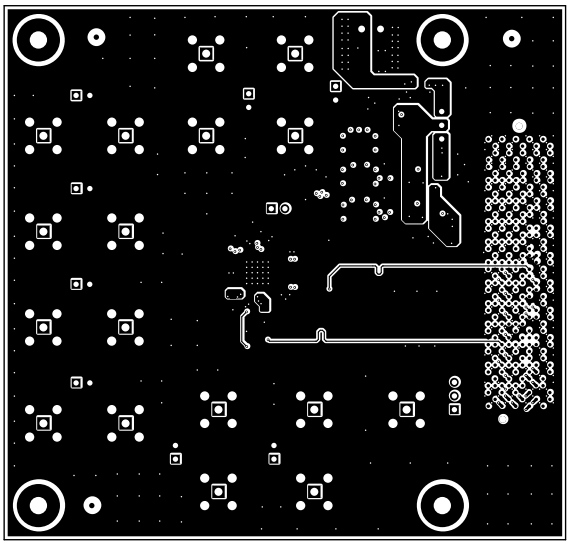

Figure 7-11. Bottom Layer

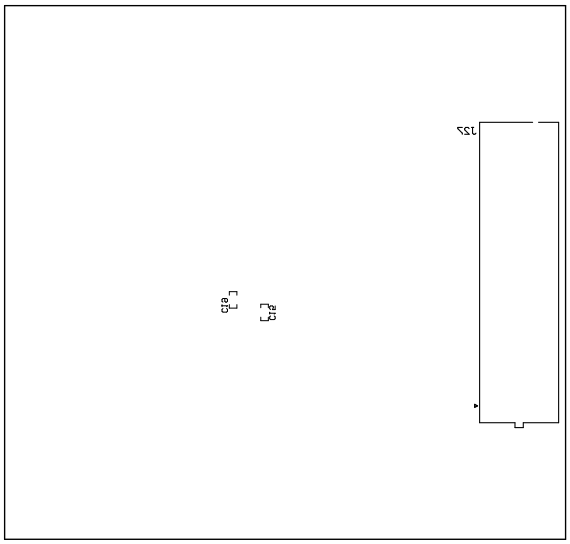

Figure 7-12. Bottom Overlay

7.3 Bill of Materials (BOM)

7.3.1 ADS9813EVM Bill of Materials (BOM)

The table below lists the ADS9813EVM bill of materials.

Table 7-1. ADS9813EVM Bill of Materials

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer
AVDD, IOVDD, VDD	3		Test Point, Compact, SMT	Testpoint_Keystone_Compact	5016	Keystone Electronics
C1, C2, C3, C4, C7, C8, C28	7	1uF	CAP, CERM, 1 uF, 16 V, +/- 10%, X7R, 0603	0603	C1608X7R1C105K080AC	TDK
C5	1	10uF	CAP, CERM, 10 uF, 16 V, +/- 10%, X7R, 1206	1206	GRM31CR71C106KAC7L	MuRata
C6	1	22uF	CAP, CERM, 22 µF, 25 V,+/- 10%, X7R, AEC-Q200 Grade 1, 1210	1210	TMK325B7226KMHP	Taiyo Yuden
C15, C19	2	1uF	CAP, CERM, 1 µF, 10 V,+/- 10%, X7R, 0603	0603	0603ZC105KAT4A	AVX
C16, C20, C21, C22, C23, C24, C25	7	0.1uF	CAP, CERM, 0.1 µF, 10 V,+/- 10%, X7R, 0402	0402	C0402C104K8RACTU	Kemet
C26, C27	2	10uF	CAP, CERM, 10 uF, 10 V, +/- 20%, X7R, 0603	0603	GRM188Z71A106MA73D	MuRata
C29	1	10uF	CAP, CERM, 10 uF, 10 V, +/- 20%, X6S, 0603	0603	GRM188C81A106MA73D	MuRata
D1	1	6 V	Diode, TVS, Uni, 6 V, 10.3Vc, 400 W, 38.8 A, SMA	SMA	SMAJ6.0A	Littelfuse
D2	1	Green	LED, Green, SMD	LED_0805	APT2012LZGCK	Kingbright
H1, H2, H3, H4	4		Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead	Screw	NY PMS 440 0025 PH	B&F Fastener Supply
H5, H6, H7, H8	4		Standoff, Hex, 0.5"L #4-40 Nylon	Standoff	1902C	Keystone
H9, H10, H11, H12	4		Bumpon, Hemisphere, 0.44 X 0.20, Clear	Transparent Bumpon	SJ-5303 (CLEAR)	3M
J1, J2, J3, J4, J5, J6, J7, J8, J9, J10, J11, J12, J13, J14, J15, J16, J28	17		SMA Connector Jack, Female Socket 50Ohm Through Hole Solder	CONN_SMA_PTH	6.0312E+13	Wurth Electronics
J17	1		Terminal Block, 3.5mm Pitch, 2x1, TH	7.0x8.2x6.5mm	ED555/2DS	On-Shore Technology
J18, J29	2		Header, 100mil, 3x1, Gold, TH	Header, 100mil, 3x1, TH	HTSW-103-07-G-S	Samtec
J19, J20, J21, J22, J23, J24, J25, J26, J30	9		Header, 100mil, 2x1, Gold, TH	Header, 100mil, 2x1, TH	HTSW-102-07-G-S	Samtec
J27	1		Connector, 1.27mm, 40x10, Black, SMT	Connector, 1.27mm, 40x10, SMT	ASP-134488-01	Samtec
L1	1	10uH	Inductor, Wirewound, Ceramic, 10 uH, 0.48 A, 0.36 ohm, SMD	2.5x1.8x1.8mm	CBC2518T100M	Taiyo Yuden

Table 7-1. ADS9813EVM Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer
LBL1	1		Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	PCB Label 0.650 x 0.200 inch	THT-14-423-10	Brady
R1	1	2.2k	RES, 2.2 k, 5%, 0.063 W, 0402	0402	CRCW04022K20JNED	Vishay-Dale
R2	1	1.96Meg	RES, 1.96 M, 1%, 0.063 W, 0402	0402	CRCW04021M96FKED	Vishay-Dale
R3	1	200k	RES, 200 k, 1%, 0.063 W, 0402	0402	CRCW0402200KFKED	Vishay-Dale
R4, R5, R8, R9, R16, R17, R20, R21, R23, R24, R27, R28, R29, R30, R33, R34, R35	17	0	RES, 0, 5%, 0.1 W, AEC-Q200 Grade 0, 0402	0402	ERJ-2GE0R00X	Panasonic
R10, R11, R12, R13, R14, R15	6	33	RES, 33, 5%, 0.063 W, 0402	0402	CRCW040233R0JNED	Vishay-Dale
SH-J1, SH-J2, SH-J3, SH-J4, SH-J5, SH-J6, SH-J7, SH-J8, SH-J9, SH-J10, SH-J11	11		Shunt, 2.54mm, Gold, Black	Shunt, 2.54mm, Black	60900213421	Wurth Elektronik
U1	1		18-Bit, 2-MSPS, 8-Channel, Simultaneous-Sampling ADC with Integrated Analog Front-End	QFN56	ADS9813RSHT	Texas Instruments
U2	1		+/-6 V, Low IQ Ideal Diode with Input Polarity Protection, DCK0006A (SOT-SC70-6)	DCK0006A	LM66100DCKR	Texas Instruments
U3	1		300-mA, ultra-low-noise, low-IQ, low-dropout (LDO) linear regulator with high PSRR 5-SOT-23 -40 to 125	SOT23-5	TPS7A2050PDBVR	Texas Instruments
U4, U6	2		Linear Voltage Regulator IC Positive Fixed 1 Output 300 mA SOT-23-5	SOT23-5	TPS7A2018PDBVR	Texas Instruments
U5	1		Adjustable, 600-mA Switch, 90% Efficient PFM/PWM Boost Converter in ThinSOT-23, DDC0006A (SOT-23-T-6)	DDC0006A	TPS61070DDCR	Texas Instruments
U7	1		2 ppm/°C Maximum Drift, 0.23 ppmp-p 1/f Noise, Precision Voltage Reference	LCCC8	REF7040QFKHT	Texas Instruments

7.3.2 ADS9817EVM Bill of Materials (BOM)

The table below lists the ADS9817EVM bill of materials.

Table 7-2. ADS9817EVM Bill of Materials

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer
AVDD, IOVDD, VDD	3		Test Point, Compact, SMT	Testpoint_Keystone_Compact	5016	Keystone Electronics
C1, C2, C3, C4, C7, C8, C28	7	1uF	CAP, CERM, 1 uF, 16 V, +/- 10%, X7R, 0603	0603	C1608X7R1C105K080AC	TDK
C5	1	10uF	CAP, CERM, 10 uF, 16 V, +/- 10%, X7R, 1206	1206	GRM31CR71C106KAC7L	MuRata
C6	1	22uF	CAP, CERM, 22 µF, 25 V,+/- 10%, X7R, AEC-Q200 Grade 1, 1210	1210	TMK325B7226KMHP	Taiyo Yuden
C15, C19	2	1uF	CAP, CERM, 1 µF, 10 V,+/- 10%, X7R, 0603	0603	0603ZC105KAT4A	AVX
C16, C20, C21, C22, C23, C24, C25	7	0.1uF	CAP, CERM, 0.1 µF, 10 V,+/- 10%, X7R, 0402	0402	C0402C104K8RACTU	Kemet
C26, C27	2	10uF	CAP, CERM, 10 uF, 10 V, +/- 20%, X7R, 0603	0603	GRM188Z71A106MA73D	MuRata
C29	1	10uF	CAP, CERM, 10 uF, 10 V, +/- 20%, X6S, 0603	0603	GRM188C81A106MA73D	MuRata
D1	1	6 V	Diode, TVS, Uni, 6 V, 10.3Vc, 400 W, 38.8 A, SMA	SMA	SMAJ6.0A	Littelfuse
D2	1	Green	LED, Green, SMD	LED_0805	APT2012LZGCK	Kingbright
H1, H2, H3, H4	4		Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead	Screw	NY PMS 440 0025 PH	B&F Fastener Supply
H5, H6, H7, H8	4		Standoff, Hex, 0.5"L #4-40 Nylon	Standoff	1902C	Keystone
H9, H10, H11, H12	4		Bumpon, Hemisphere, 0.44 X 0.20, Clear	Transparent Bumpon	SJ-5303 (CLEAR)	3M
J1, J2, J3, J4, J5, J6, J7, J8, J9, J10, J11, J12, J13, J14, J15, J16, J28	17		SMA Connector Jack, Female Socket 50Ohm Through Hole Solder	CONN_SMA_PTH	6.0312E+13	Wurth Electronics
J17	1		Terminal Block, 3.5mm Pitch, 2x1, TH	7.0x8.2x6.5mm	ED555/2DS	On-Shore Technology
J18, J29	2		Header, 100mil, 3x1, Gold, TH	Header, 100mil, 3x1, TH	HTSW-103-07-G-S	Samtec
J19, J20, J21, J22, J23, J24, J25, J26, J30	9		Header, 100mil, 2x1, Gold, TH	Header, 100mil, 2x1, TH	HTSW-102-07-G-S	Samtec
J27	1		Connector, 1.27mm, 40x10, Black, SMT	Connector, 1.27mm, 40x10, SMT	ASP-134488-01	Samtec
L1	1	10uH	Inductor, Wirewound, Ceramic, 10 uH, 0.48 A, 0.36 ohm, SMD	2.5x1.8x1.8mm	CBC2518T100M	Taiyo Yuden
LBL1	1		Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	PCB Label 0.650 x 0.200 inch	THT-14-423-10	Brady

Table 7-2. ADS9817EVM Bill of Materials (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer
R1	1	2.2k	RES, 2.2 k, 5%, 0.063 W, 0402	0402	CRCW04022K20JNED	Vishay-Dale
R2	1	1.96Meg	RES, 1.96 M, 1%, 0.063 W, 0402	0402	CRCW04021M96FKED	Vishay-Dale
R3	1	200k	RES, 200 k, 1%, 0.063 W, 0402	0402	CRCW0402200KFKED	Vishay-Dale
R4, R5, R8, R9, R16, R17, R20, R21, R23, R24, R27, R28, R29, R30, R33, R34, R35	17	0	RES, 0, 5%, 0.1 W, AEC-Q200 Grade 0, 0402	0402	ERJ-2GE0R00X	Panasonic
R10, R11, R12, R13, R14, R15	6	33	RES, 33, 5%, 0.063 W, 0402	0402	CRCW040233R0JNED	Vishay-Dale
SH-J1, SH-J2, SH-J3, SH-J4, SH-J5, SH-J6, SH-J7, SH-J8, SH-J9, SH-J10, SH-J11	11		Shunt, 2.54mm, Gold, Black	Shunt, 2.54mm, Black	60900213421	Wurth Elektronik
U1	1		18-Bit, 8-MSPS, Dual, Simultaneous-Sampling ADC with Integrated Analog Front-End	QFN56	ADS9817RSHT	Texas Instruments
U2	1		+/-6 V, Low IQ Ideal Diode with Input Polarity Protection, DCK0006A (SOT-SC70-6)	DCK0006A	LM66100DCKR	Texas Instruments
U3	1		300-mA, ultra-low-noise, low-IQ, low-dropout (LDO) linear regulator with high PSRR 5-SOT-23 -40 to 125	SOT23-5	TPS7A2050PDBVR	Texas Instruments
U4, U6	2		Linear Voltage Regulator IC Positive Fixed 1 Output 300 mA SOT-23-5	SOT23-5	TPS7A2018PDBVR	Texas Instruments
U5	1		Adjustable, 600-mA Switch, 90% Efficient PFM/PWM Boost Converter in ThinSOT-23, DDC0006A (SOT-23-T-6)	DDC0006A	TPS61070DDCR	Texas Instruments
U7	1		2 ppm/°C Maximum Drift, 0.23 ppmp-p 1/f Noise, Precision Voltage Reference	LCCC8	REF7040QFKHT	Texas Instruments

8 Revision History

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

Changes from Revision A (July 2023) to Revision B (January 2024)	Page
• Added a second variant EVM (ADS9813EVM)	1
• Updated software download instructions	11
• Added ADS9813EVM schematic	18
• Added ADS9813EVM bill of materials	26

Changes from Revision * (November 2022) to Revision A (July 2023)	Page
• Deleted all mention of PDK	1
• Changed input voltage range in *Overview* section	3
• Added *Quick Start Guide* section	5
• Added *Voltage Reference* section	6
• Added information about clock source in *Digital Interface* section	7
• Added *Clock Select* section	9
• Added *USB Power and When to Power the Board Externally* section	10
• Added *Using the Histogram Tab* section	17
• Changed schematic images	21
• Changed Layout images	24
• Changed the *Bill of Materials* table	26

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