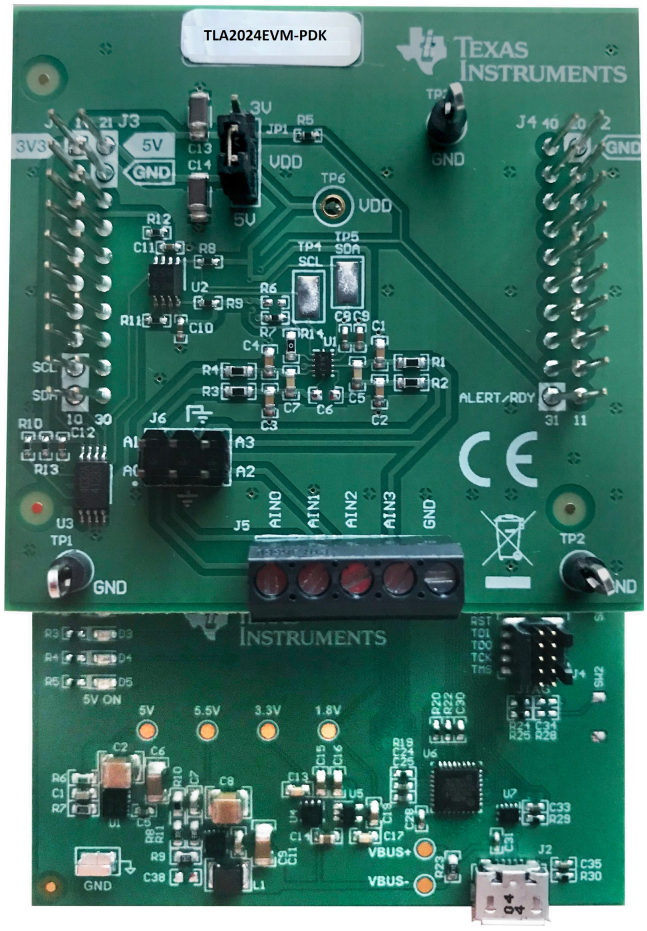
User's Guide

TLA2024EVM-PDK User's Guide

ABSTRACT

The TLA2024EVM-PDK is comprised of the TLA2024 Evaluation Module (EVM) and the PAMBoard motherboard. The combination of the EVM and PAMBoard allows users to evaluate the functionality of the Texas Instruments 12-bit TLA2024 device. The TLA2024 is an ultra-small, low-power analog-to-digital converter (ADC). The TLA2024 has inputs that can be configured as four single-ended or two differential inputs. This document describes both the EVM hardware platform and the graphical user interface (GUI) software used to configure and operate the device. The user's guide also includes the EVM schematic diagram, board layout, and bill of materials. The EVM-PDK platform eases the evaluation of the TLA2024 device with hardware, software, and computer connectivity through the universal serial bus (USB) interface.



TLA2024 Evaluation Module

Related Documentation

Device	Literature Number
TLA2024	SBAS846
TCA9406	SCPS221

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1 Introduction

The TLA2024EVM-PDK is a fully-assembled evaluation platform designed to highlight the TLA2024 features and modes of operation that make this device suitable for low-power applications. The EVM sits on top of an accompanying Precision ADC Motherboard (PAMBoard) used as a USB-to-PC GUI communication bridge. The board combination also serves as an example implementation of connecting a microcontroller (MCU) to communicate with the TLA2024 device through an Inter-Integrated Circut interface (I^2C).

Note

The TLA2024 EVM requires an external controller to evaluate the TLA2024 device.

The PAMBoard is controlled by commands received from the TLA2024EVM-PDK GUI, and returns data to the GUI for display and analysis. If the PAMBoard is not used, the EVM plug-in module format allows for an alternative external host to communicate with the TLA2024 by connection through the pin headers J1 through J4. Connections to the header are identified on the PCB silkscreen and listed in Table 3-1.

The combined TLA2024EVM and PAMBoard make up the TLA2024EVM-PDK and incorporates the following features:

- TLA2024, four input-channel ADC with header or screw terminal block input connections
- Voltage selection of 3.3 V or 5 V operation for the TLA2024 with level-shifting to the 3.3-V MCU
- Full-scale ranges from 256 mV to 6.144 V
- I^2C for communication and configuration

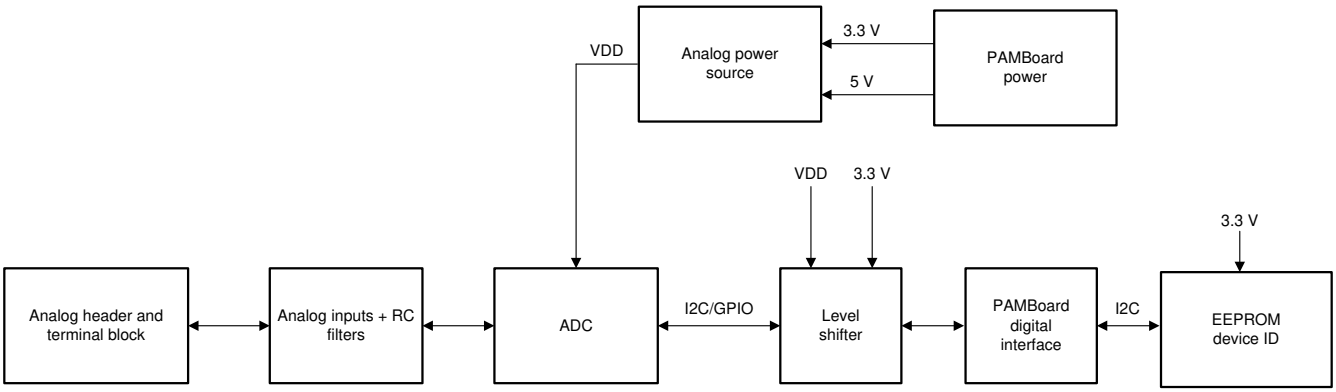

Figure 1-1. TLA2024EVM-PDK Functional Block Diagram

2 Quick Start

The quick start shows a minimalist startup process to get the GUI working with the EVM and to see a simple example for data collection. Details on each step are found elsewhere within the user's guide. Specifics regarding the GUI installation steps are found in Section 4.2.

2.1 Step 1 - Hardware Setup

The EVM hardware configuration consists of verifying the supply settings and adding a source voltage to be converted.

1. Verify that the TLA2024 supply voltage is set to the 5-V setting at JP1.
2. Connect an input voltage to AIN0. The PAMBoard supply voltage can be used as a voltage source to the TLA2024. Use the 3.3-V source found at header J1 pin 1 and with a wire jumper connect to the J6 header at pin 1 (A0).

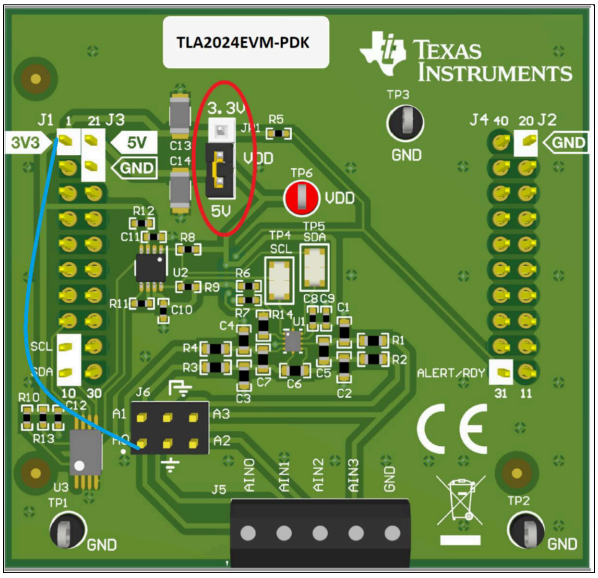

Figure 2-1. Hardware Setup

2.2 Step 2 - USB Connection and GUI Startup

The TLA2024EVM GUI software can be run from a browser window. Additional software may need to be installed if not installed previously. See Section 4.2 for additional details. Once the GUI has started, plug the TLA2024VM-PDK into an available USB port on the PC.

2.3 Step 3 - Configuration and Data Collection

Once the GUI has recognized the EVM, go to the chart window as identified in Figure 2-2.

1. Open the slide-out configuation from the right side of the GUI and *Show Capture Settings*. Select the MUX input for *AINP = AIN0 and AINN = GND* from the *Select MUX Channels* drop-down menu selection.

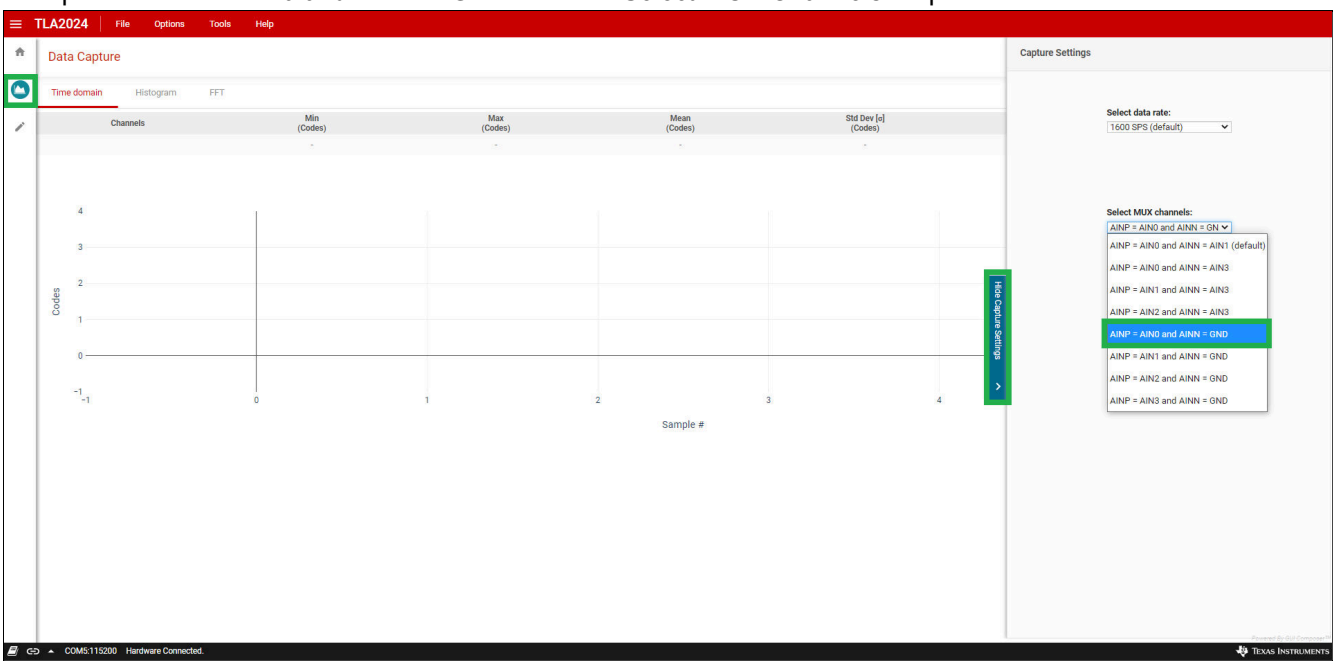

Figure 2-2. Capture Setting – MUX

2. Select the *FSR = ±4.096V* from the *Select FSR* drop-down menu as shown in Figure 2-3. The selection is needed to increase the full-scale range to measure the 3.3-V input.

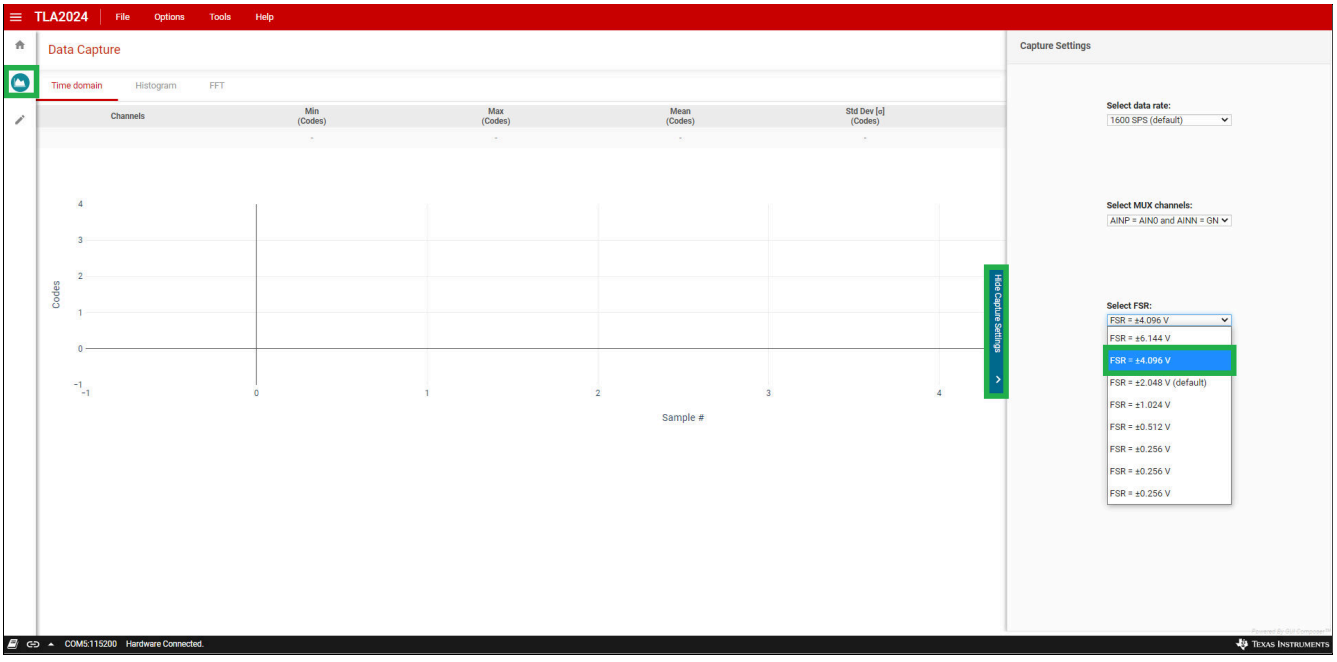

Figure 2-3. Capture Setting – Full-Scale Range (FSR)

3. Close the slide-out configuration window by selecting *Hide Capture Settings*.
4. Choose *Volts* from the chart window for the *Y-axis* drop-down menu. See Figure 2-4.
5. Press the *COLLECT DATA* button to capture the data.

6. The collected data appears in the chart window once the collection completes.

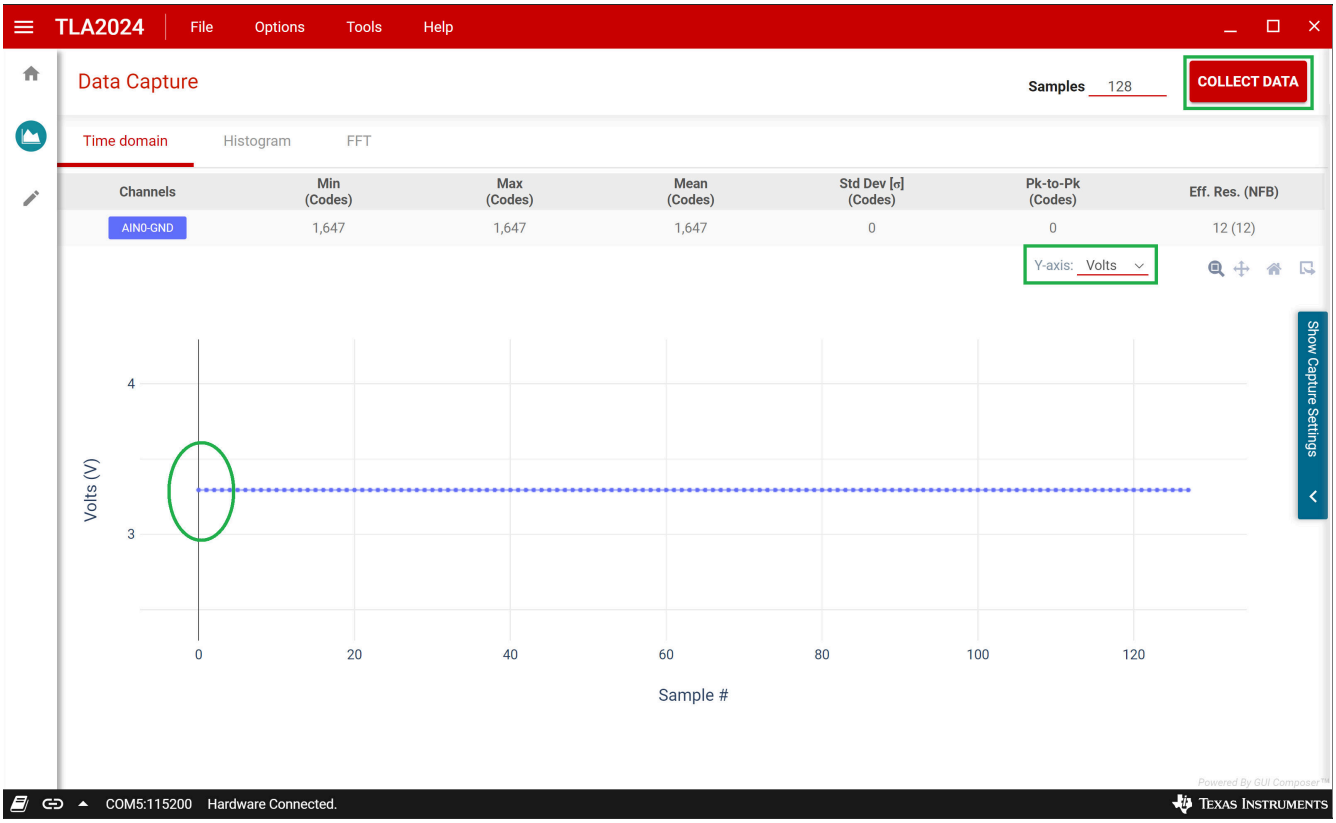

Figure 2-4. Data Capture

3 TLA2024EVM-PDK Overview

Various onboard components are used to interface the analog input, digital interface, and provide power to the TLA2024 device. The functional block diagram shows a TLA2024EVM-PDK board overview.

3.1 TLA2024EVM-to-PAMBoard Interface

The TLA2024 supports the digital I^{2}C and functional modes as detailed in the TLA2024 Ultra-Small, 12-Bit Analog-to-Digital Data Sheet. The PAMBoard operates at a 3.3-V logic level and the digital I/O lines of the ADC are level shifted to match the operating voltage of the TLA2024.

Digital interface connections to the PAMBoard include power and I^{2}C for communication. The digital connections are highlighted in the silkscreen as shown in Figure 3-1. Details regarding the connections are shown in Table 3-1.

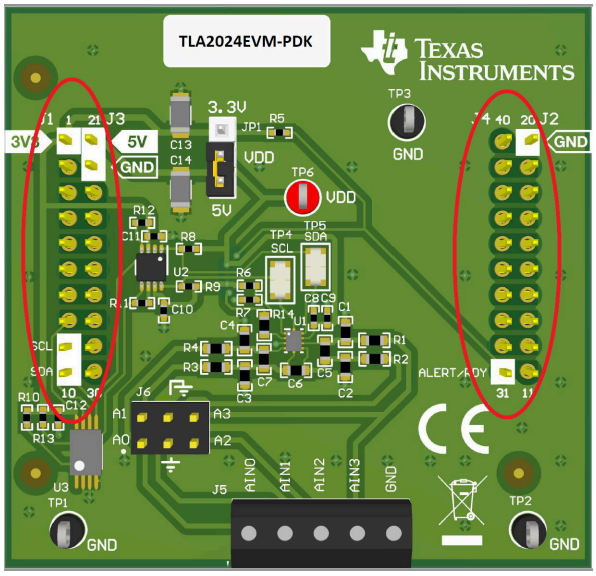

Figure 3-1. TLA2024EVM-to-PAMBoard Connections

Table 3-1. TLA2024EVM-PDK Header Pinout and Description

Description	Connector	Connector	Description	Description	Connector	Connector	Description
+3.3 V	J1:1	J3:21	+5 V		J4:40	J2:20	GND
	J1:2	J3:22	GND		J4:39	J2:19	
	J1:3	J3:23			J4:38	J2:18	
	J1:4	J3:24			J4:37	J2:17	
	J1:5	J3:25			J4:36	J2:16	
	J1:6	J3:26			J4:35	J2:15	
	J1:7	J3:27			J4:34	J2:14	
	J1:8	J3:28			J4:33	J2:13	
I2C SCL	J1:9	J3:29			J4:32	J2:12	
I2C SDA	J1:10	J3:30		N/A	J4:31	J2:11	

3.2 Digital Interface

As noted in TLA2024EVM-to-PAMBoard Interface, the TLA2024 interfaces with the PAMBoard. The PAMBoard communicates with the computer over USB. The two devices on the EVM requiring communication are the TLA2024 ADC (U1) and the electrically-erasable programmable read-only memory (EEPROM) (U3) using I^2C (see Figure 6-5). The EEPROM is preprogrammed with the information required to configure and initialize the TLA2024EVM-PDK GUI software platform. Once the hardware is initialized through the software, the EEPROM is no longer used.

The PAMBoard and EEPROM (U3) use 3.3 V for the device interface logic levels. The TLA2024 can operate at either 3.3 V or 5 V as desired by jumper selection JP1. To allow the TLA2024 to operate at 5-V logic levels, a logic level translator (U2) is used.

3.3 Analog Input Connections

The TLA2024 device is designed for easy interface to an external sensor that is differential or single-ended using either a header (J6) or a screw terminal block (J5). Connector J6 provides an easy interface connection for differential input pairs with each pair separated by analog ground. Table 3-2 lists the channel input connections for J5 and Table 3-3 shows the input connections for J6. Both connectors are clearly labeled on the PCB silkscreen for easy input connection identification.

Connector J5 is a screw terminal block for attaching an external sensor with bare wire connections. The terminal block includes all four inputs and a connection point for analog ground. See Figure 3-2 for the input layout.

Table 3-2. Terminal Block Input (J5)

J5 Terminal Block Inputs	Description
J5:1	Analog input for AIN0 of the ADC
J5:2	Analog input for AIN1 of the ADC
J5:3	Analog input for AIN2 of the ADC
J5:4	Analog input for AIN3 of the ADC
J5:5	Analog Ground

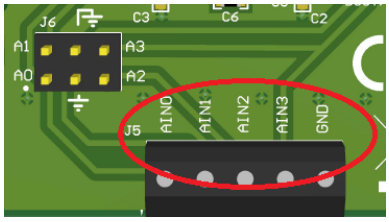

Figure 3-2. Analog Input Terminal Block (J5)

Connector J6 is a 100-mil spaced dual-row header. Jumper wire or clip leads can be used for connections. The header includes all four inputs and two analog ground connections. See Figure 3-3 for the input layout.

Table 3-3. Terminal Block Input (J6)

J6 Terminal Block Inputs	Description
J6:1	Analog input for AIN0 of the ADC
J6:2	Analog input for AIN1 of the ADC
J6:3 and J6:4	Analog Ground
J6:5	Analog input for AIN2 of the ADC
J6:6	Analog input for AIN3 of the ADC

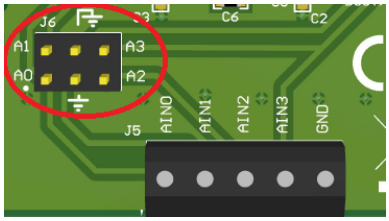

Figure 3-3. Analog Input Header (J6)

Each analog input includes a single-order low-pass filter. The single-ended input filter cutoff frequency is 67.9 kHz. Up to four separate single-ended measurements are possible.

Instead of single-ended measurements, up to two differential input pair combinations are possible. The filter design for the differential input pair filtering has a cutoff frequency of 3.4 kHz. The filter is populated on the TLA2024EVM-PDK for input pair combinations of AIN0 and AIN1 or AIN2 and AIN3. The input combination of AIN1 and AIN2 is possible by adding a 47-nF capacitor at C6 (see location in the schematic).

CAUTION

The configuration options for the TLA2024 allow for a potential full-scale range (FSR) greater than the supply. This is useful when an input voltage slightly exceeds the next lower FSR. However, the input voltage should not exceed the range of the VDD supply selected at JP1. The absolute input voltage is bounded by VDD + 0.3 V and GND – 0.3 V. Damage to the TLA2024 may occur if the absolute input range is exceeded.

3.4 Power-Supply Options

The TLA2024 supports a wide range of supply voltage from 2 V to 5.5 V. The TLA2024EVM ADC voltage (VDD) can operate from either 3.3 V or 5 V. The power is supplied from the USB 5-V source to the PAMBoard. However, the USB power supply voltage is not consistent from PC to PC. A DC/DC converter increases the USB output to 5.5 V. A linear low drop out (LDO) regulator uses the 5.5 V to establish a clean and stable 5 V and 3.3 V for the TLA2024EVM-PDK.

When the USB cable is plugged into the PC, two LEDs will light on the PAMBoard (see Figure 3-4). The bottom LED (D5) indicates that the 5-V output is active. The top LED (D1) indicates that the TLA2024EVM-PDK is ready to communicate with the GUI.

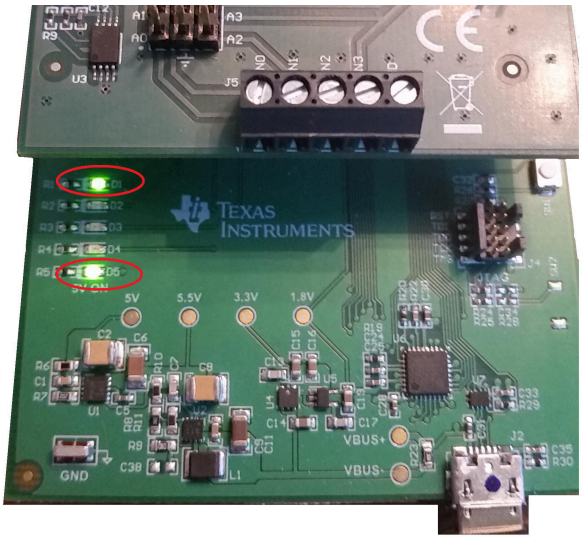

Figure 3-4. LED Indicators D1 and D5

Jumper JP1 selects the operating voltage for the TLA2024 (see Figure 3-5). When jumper JP1 is in the bottom position, the VDD to the TLA2024 is set to 5-V and when in the top position, the VDD supply is set 3.3-V.

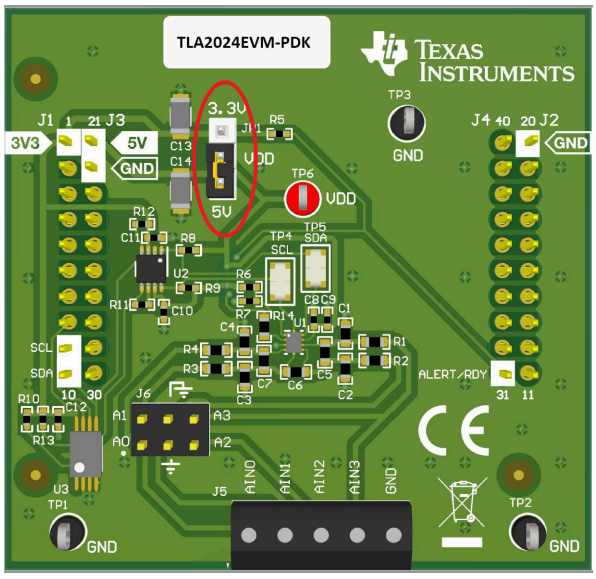

Figure 3-5. TLA2024 Supply Setting Jumper (JP1)

4 TLA2024EVM-PDK Setup and Operation

The TLA2024EVM-PDK requires a communication driver and GUI software for device configuration and data collection. Driver installation is automatic. The USB enumerates as a composite device for Communications Device Class (CDC) and Bulk. The sending of commands is through CDC while data collection is by Bulk transfers from the PAMBoard. Additional information regarding any driver issues is located within this FAQ.

4.1 EVM Plug-in Instructions

Install jumper JP1 to the desired TLA2024 operating voltage. Connect the USB micro cable to the PAMBoard and attach the other end of the cable to an available USB port on the PC.

4.2 TLA2024EVM-PDK GUI and TI Cloud Agent Installation

The following steps describe the TLA2024EVM GUI software installation:

1. Verify that the micro USB to USB cable from the PAMBoard to a USB port on the computer is connected.
2. On the EVM landing page (TLA2024EVM-PDK), the software is available through a web-based GUI. Connecting to the GUI may require a login to a user account for access (Software GUI).
3. First-time users may be prompted to download and install the browser extension for Firefox™ or Chrome™ and the TI Cloud Agent Application as shown in Figure 4-1. Installing the TI Cloud Agent is a one time download and installation.
4. Refresh the GUI. The GUI should connect to the hardware. A green signal displays, and the *Hardware Connected* indication shows on the bottom (see Figure 5-3).

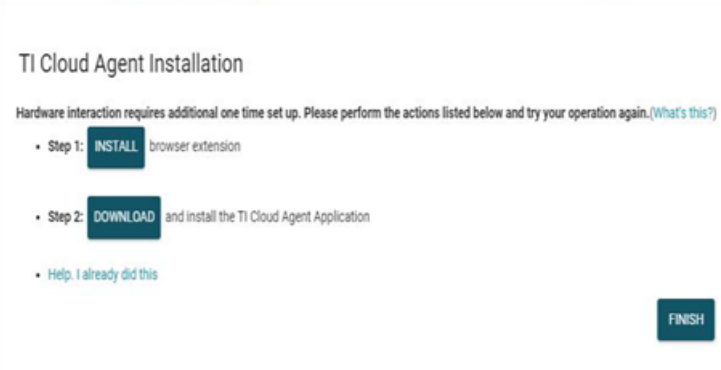

Figure 4-1. Browser Extension and TI Cloud Agent Installation

5 TLA2024EVM-PDK GUI

The *Home* page is the GUI start-up landing page. The *Home* page provides a high-level overview of the TLA2024 device. The horizontal menu bar at the top of the GUI shows the menu options:

- File
- Options
- Tools
- Help

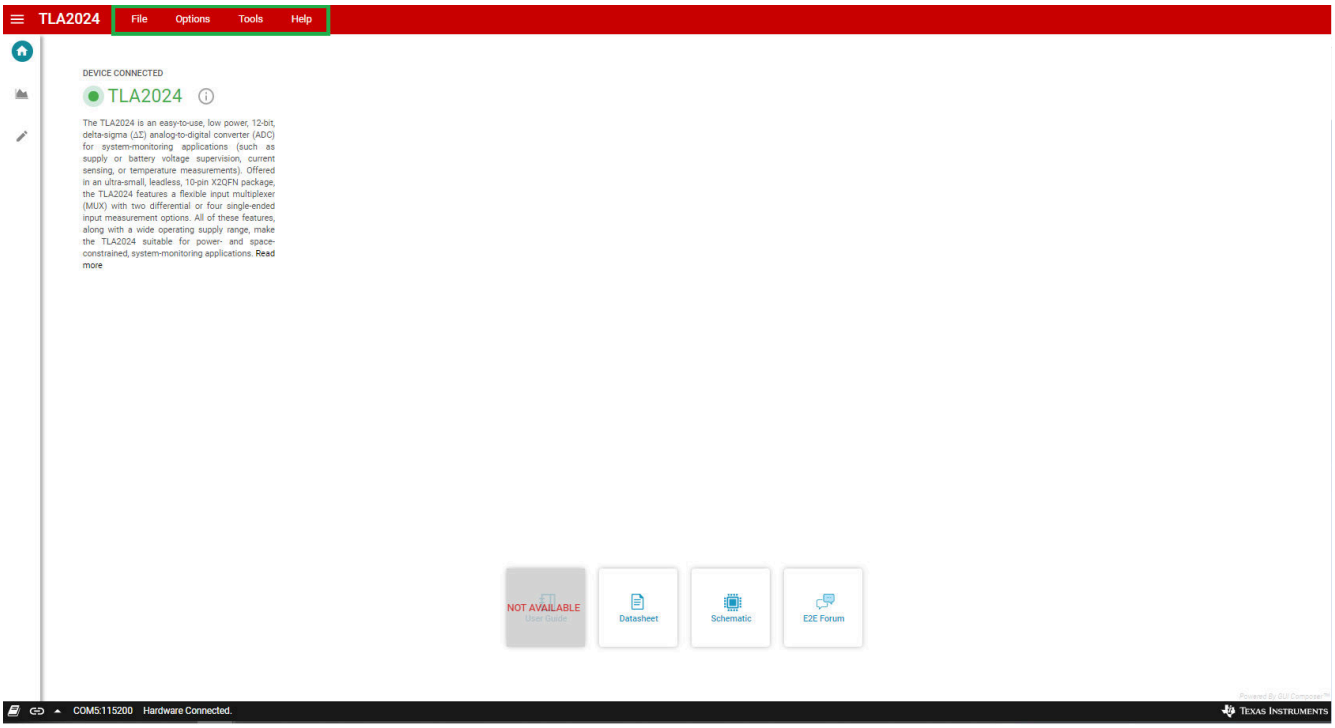

Figure 5-1. Menu Bar Options

The upper corner of the GUI shows vertical tabs available to navigate through the various GUI displays. The vertical tabs starting at the top icon include:

- Home
- Chart
- Configuration

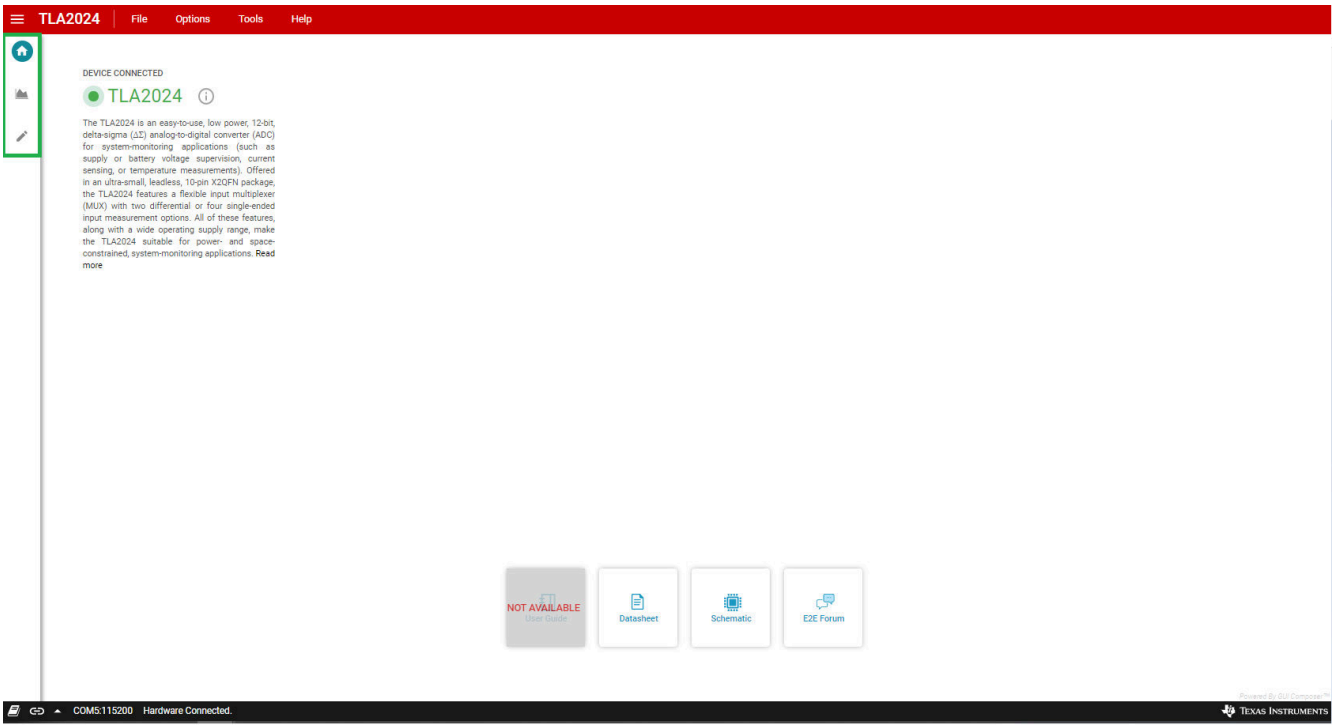

Figure 5-2. GUI Navigation Bar Options

The black ribbon at the bottom of the GUI shows connection status and log information. On GUI startup, the software attempts to identify and verify that the EVM connected matches with the GUI. An EEPROM on the TLA2024EVM-PDK contains information specific to the EVM connected. A properly connected and identified EVM displays as *Device Connected* with a green indicator and at the bottom as *Hardware Connected* in the status ribbon.

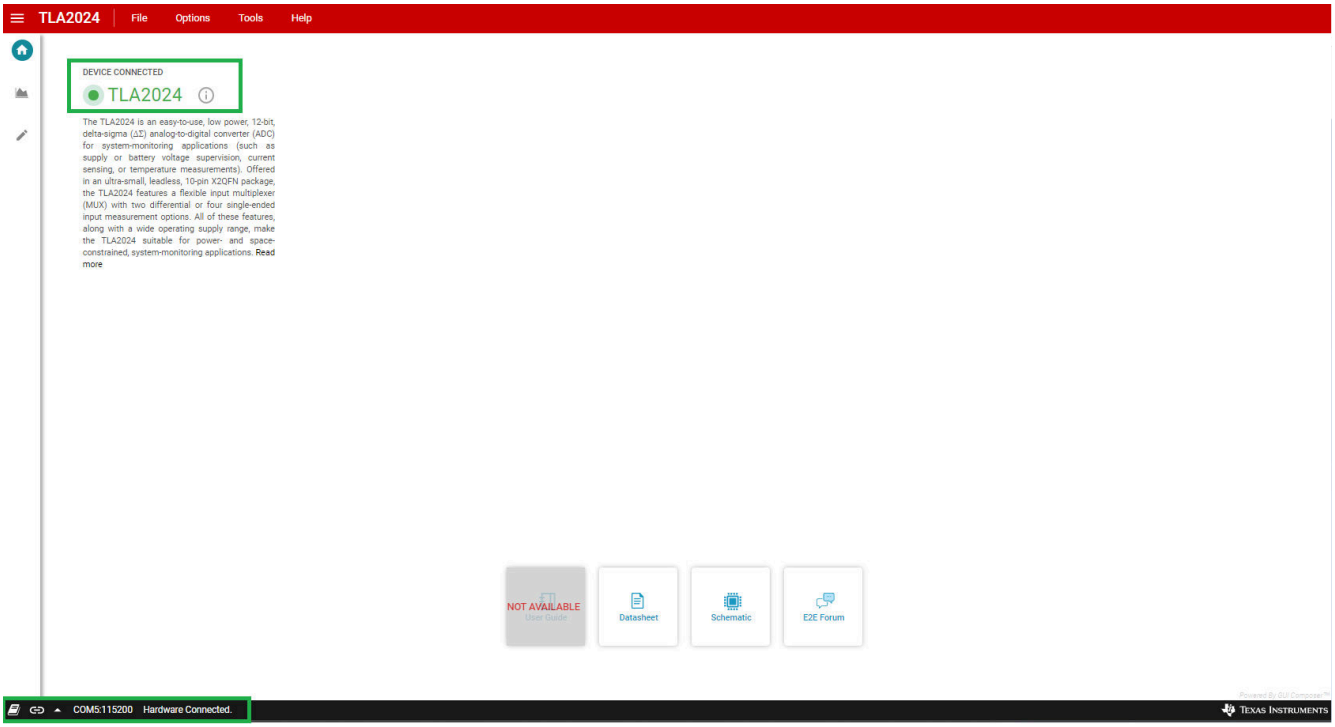

Figure 5-3. TLA2024 EVM Connected GUI

5.1 Menu Bar

The *Menu* bar across the top of the GUI displays the device name used on the EVM along with a number of drop-down menu options.

5.1.1 File Menu

The *File* drop-down menu displays available options. The options include:

- Program Device
- Analysis Data
  - Save data
  - Load data
- Register Data
  - Save register settings
  - Load register settings

Figure 5-4. File Menu

The *Program Device* option should only be necessary if an important firmware change is required. If reprogramming the PAMBoard firmware becomes necessary, an additional pop-up box displays with information on the programming procedure.

By using the *Save data* option the *Analysis Data* is saved to a comma-separated values (CSV) formatted file for further analysis using external programs. The data can also be loaded back into the GUI for further review or analysis by selecting *Load data*.

Figure 5-5. Analysis Data Options

Register Data can be saved for a particular configuration by selecting *Save register settings*. A previously-saved configuration can be loaded back into the GUI again when testing various device configurations by using *Load register settings*.

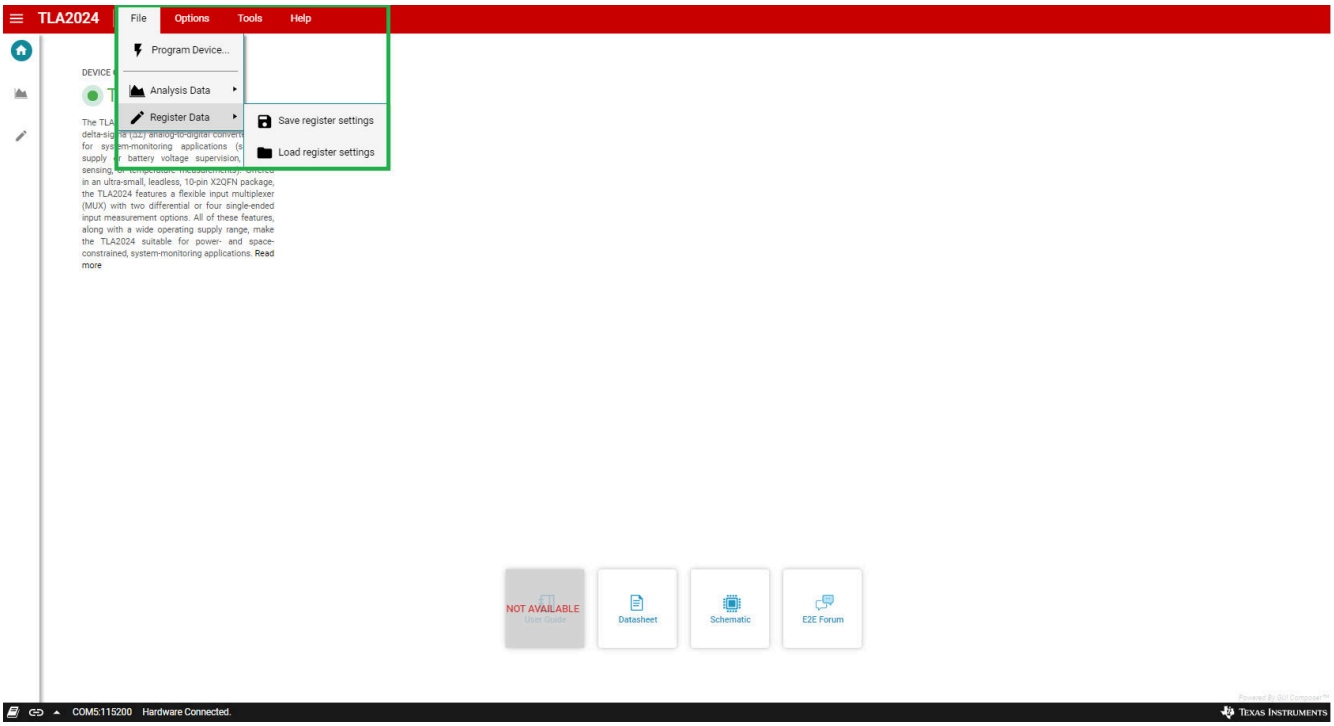

Figure 5-6. Register Data Options

5.1.2 Options Menu

The *Options* drop-down provides information regarding the serial COM port the GUI is using. By selecting *Serial Port*, the serial COM port information displays the current COM port settings in a pop-up dialog with options to change the COM port or reconfigure the settings as necessary.

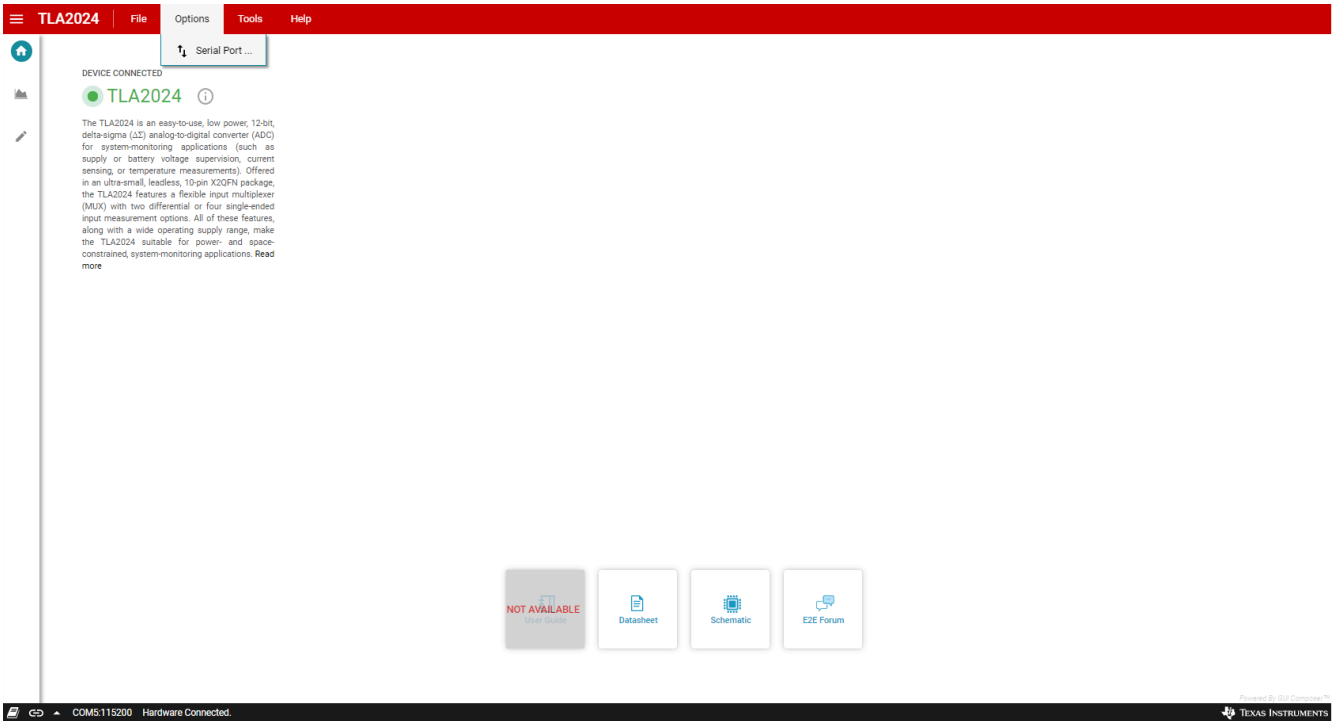

Figure 5-7. Options Menu

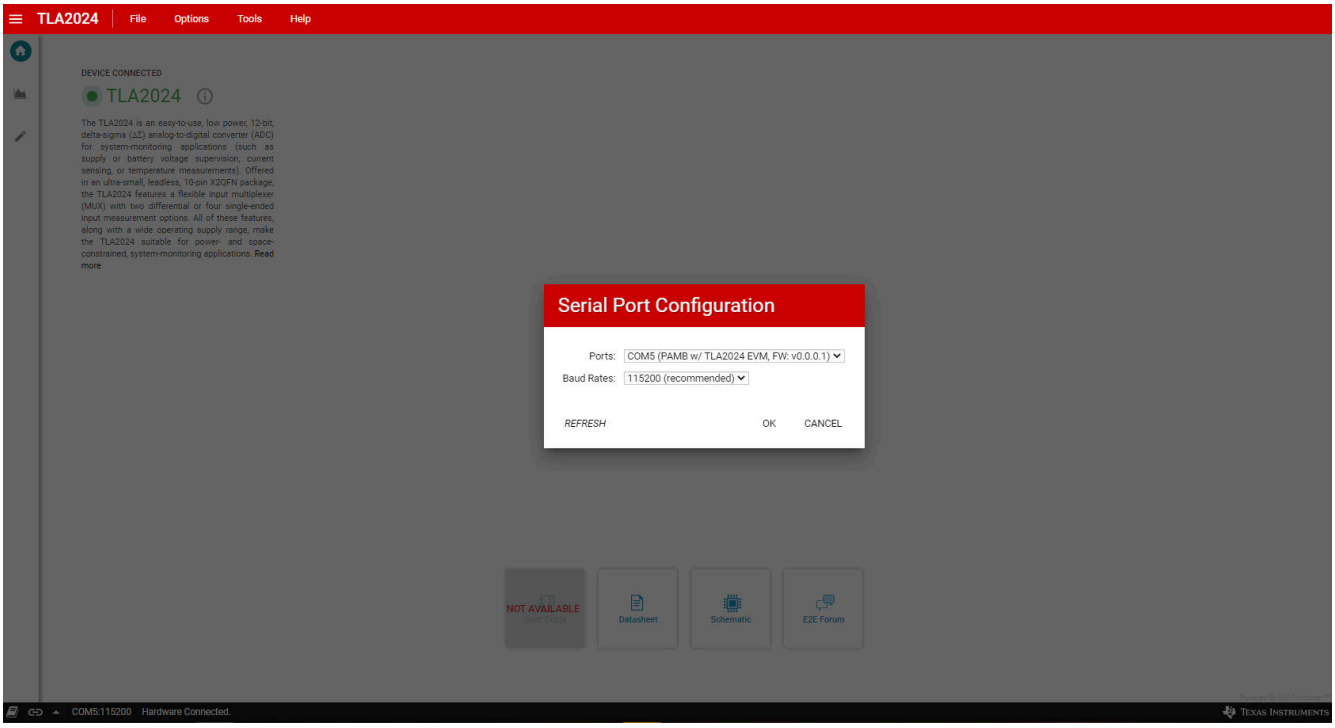

Figure 5-8. Serial Port Configuration Settings

5.1.3 Tools Menu

The *Tools* drop-down menu displays the *Log pane* option. The *Log pane* displays the activity information log at the bottom of the GUI. The *Log pane* displays the same information as when clicking the book icon in the status ribbon.

Figure 5-9. Tools Menu

Figure 5-10. Logs Display

5.1.4 Help Menu

The *Help* drop-down menu displays the following:

- *E2E Support Forum* providing a link to the E2E forum for asking questions or searching the E2E forum.
- *View README.md* displays pertinent startup information not necessarily included in this guide.
- *About* displays specific information regarding the GUI and EVM hardware.

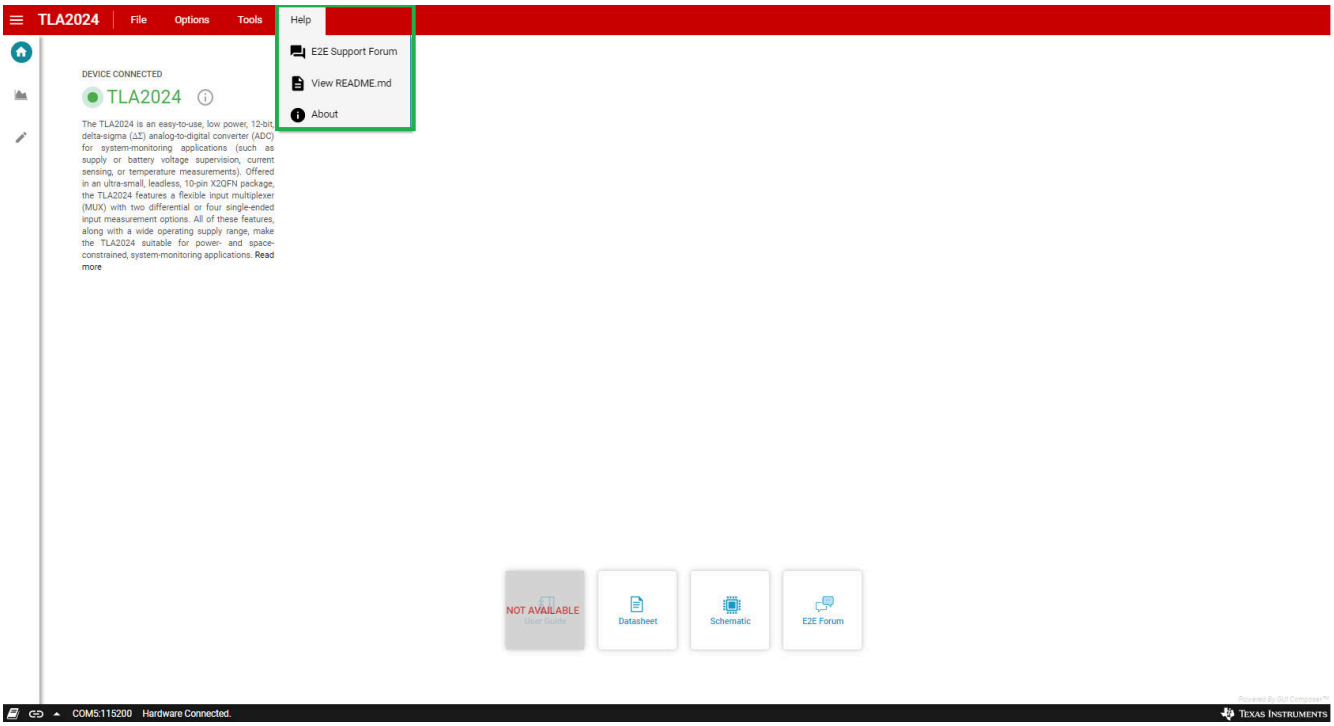

Figure 5-11. Help Menu

Information specific to the GUI build and the connected hardware is found by selecting *About* from the drop-down *Help* menu.

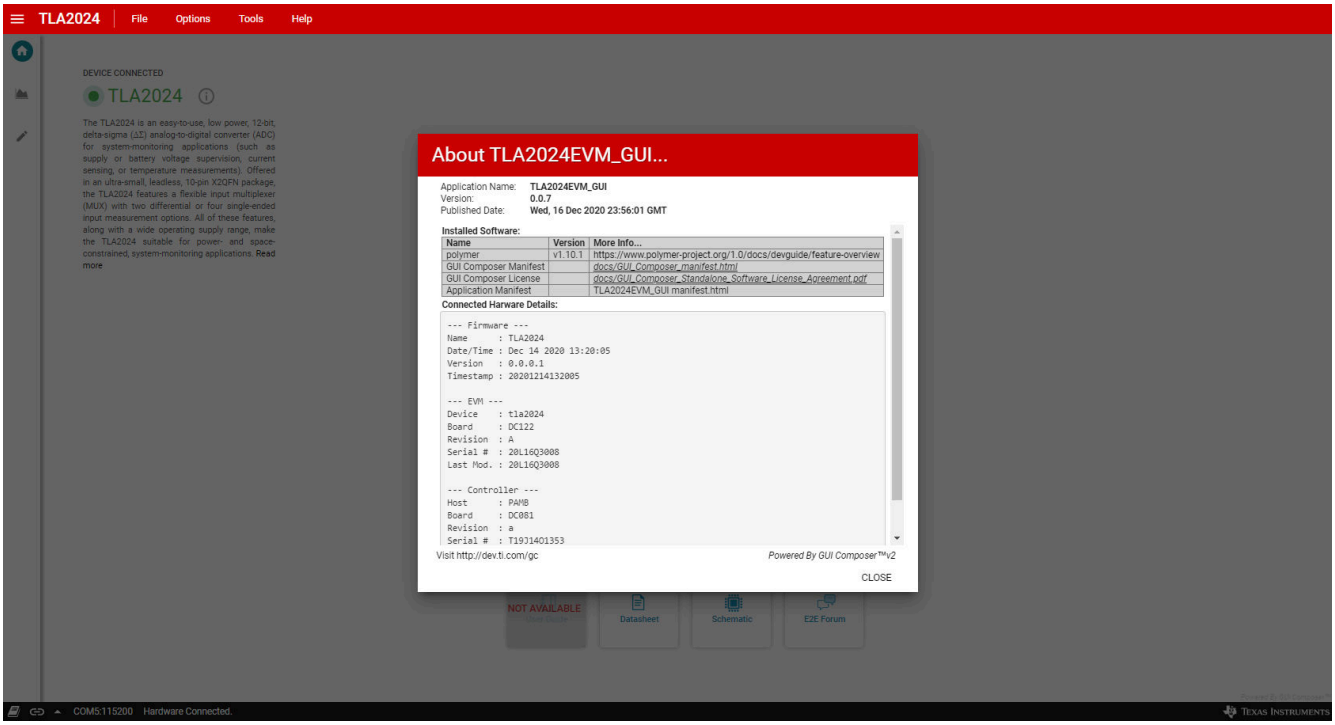

Figure 5-12. Help Information (About)

5.2 Navigation Bar

5.2.1 Home

The *Home* page includes links to a variety of information. The links include this user's guide, the EVM schematic, as well as support resources. Next to the connection status indicator is an information icon. Clicking the icon displays specific information regarding the TLA2024EVM-PDK.

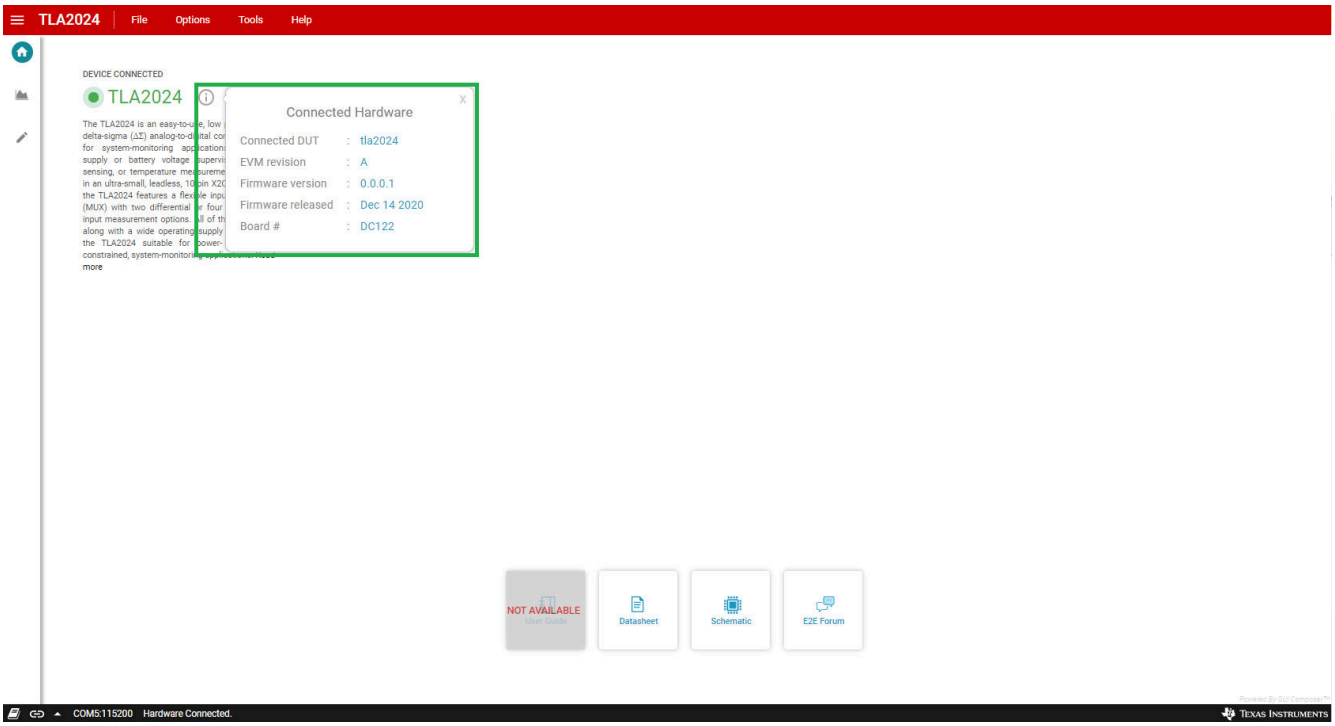

Figure 5-13. Connected Hardware Information

At the bottom of the GUI is a black ribbon with status information. The status shows if the hardware successfully connects to the PC and the COM port used. The status ribbon displays regardless of the navigation page selected.

5.2.2 Chart

The *Chart* icon selects the available charting options for displaying conversion data. The data options include a *Time Domain*, *Histogram*, and *FFT* displays.

The *Chart* tab allows configuration of the *Data Capture* for the TLA2024. At the upper right of the capture window is the setting for the number of *Samples* to collect. To capture data, press the *Collect Data* button displayed at the upper corner of the window.

Figure 5-14. Data Capture Window

Conversion data collects when the *Collect Data* button is pressed. The button will change to *Stop Collect* and by pressing the button while in this state the collection of conversion data will stop, otherwise the data is collected for the number of *Samples* as given. The number of *Samples* can be changed prior to pressing *Collect Data* by selecting the *Samples* and directly entering the desired number of samples or by clicking on the up and down arrows. The number of samples cannot be changed while the data is being collected.

When the *Collect Data* operation is complete, the data will display with the calculated channel statistics and a plot of the data in the chart window. Various icons for viewing the data include zoom, pan, and home. The home icon restores the graph to show all data collected. The viewing icons are underneath the statistics information on the right side of the GUI.

Also on the right side of the chart window is a slide-out menu where configuration settings are displayed and changes can be made for data collection.

5.2.2.1 Channel Statistics

When data collection completes, statistical information displays along with the charted data. The statistical display for *Time Domain* and *Histogram* are the same, but the *FFT* statistics differ. As the TLA2024 is primarily a DC measurement device, the FFT plot and information may have little meaning.

5.2.2.1.1 Time Domain and Histogram Statistics

The *Time Domain* and *Histogram* plots share the same statistical information:

- Input *Channels* selected
- *Min* code within the data set
- *Max* code within the data set
- *Mean* code value within the data set
- *Std Dev* representing the standard deviation within the data set
- *Pk-to-Pk* representing the total noise peak-to-peak within the data set
- *Eff. Res* representing the effective resolution as number of bits with the value in parenthesis showing the noise-free number of bits

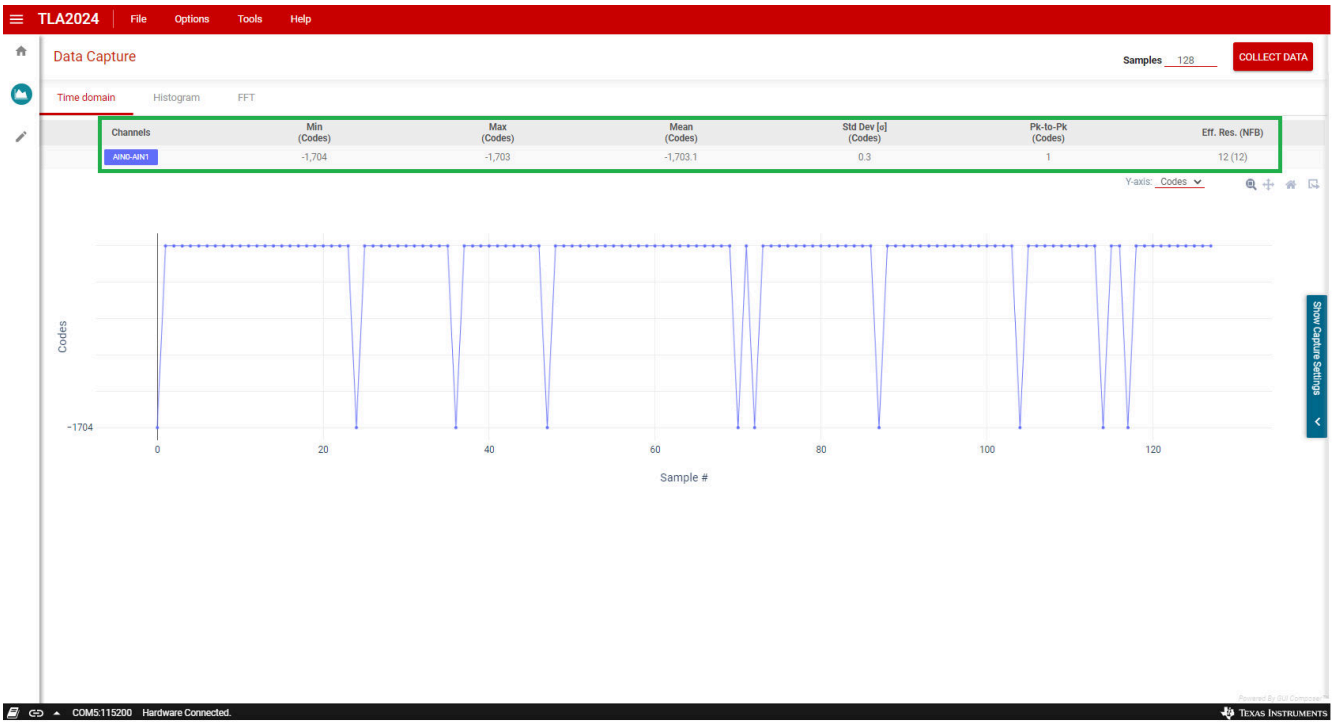

Figure 5-15. Capture Statistics

5.2.2.1.2 FFT Statistics

The FFT plot displays the following statistics:

- Input *Channels* selected
- *Fundamental frequency*
- *Fundamental power*
- *Noise floor*
- *SNR* or signal-to-noise ratio
- *SFDR* or spurious free dynamic range
- *THD* or total harmonic distortion
- *SINAD* or signal-to-noise and distortion
- *ENOB* or effective number of bits
- *Harmonics*

Figure 5-16. FFT Statistics

5.2.2.2 Time Domain Plot

The *Time Domain* plot displays the sample count number in the X-axis. The *Y-axis* is displayed as either codes or volts with the selection in a drop-down menu. The *Y-axis* drop-down menu displays next to the charting icons near the right side of the GUI below the statistics.

Figure 5-17. Time Domain Plot

5.2.2.3 Histogram Plot

The *Histogram* plot shows the number of occurrences a code or group of codes appear. User selection includes a choice of:

- *# of Bins* selecting the number of bins to include in the plot
- *Bin Size* selecting the number of unique codes to include in each bin

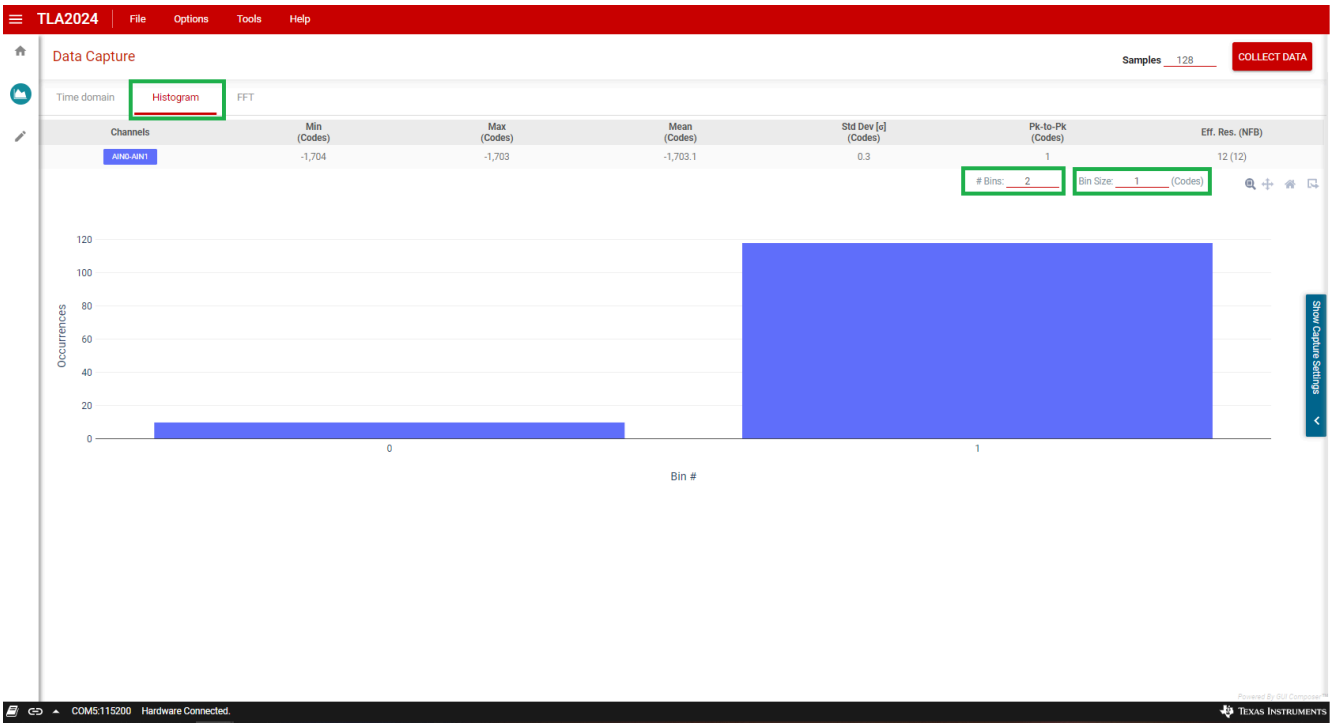

Figure 5-18. Histogram Plot

The *# Bins* and *Bin Size* are selectable options and display next to the charting icons near the right side of the GUI below the statistics.

5.2.2.4 FFT Plot

The *FFT* plot is rather meaningless for DC input voltages. However, a low-frequency AC signal can be analyzed and the *FFT* plot displayed.

Figure 5-19. FFT Plot

5.2.2.5 Capture Configuration Settings

A slide-out menu is viewable on the right side of the *Chart* window. By clicking the slide-out for *Show Capture Settings* various configurations display and are selectable. The drop-down menu *Capture Settings* are:

- *Select data rate* for the data output conversion rate
- *Select MUX channels* by choosing the desired input channels to be converted
- *Select FSR* for choosing the voltage input measurement range

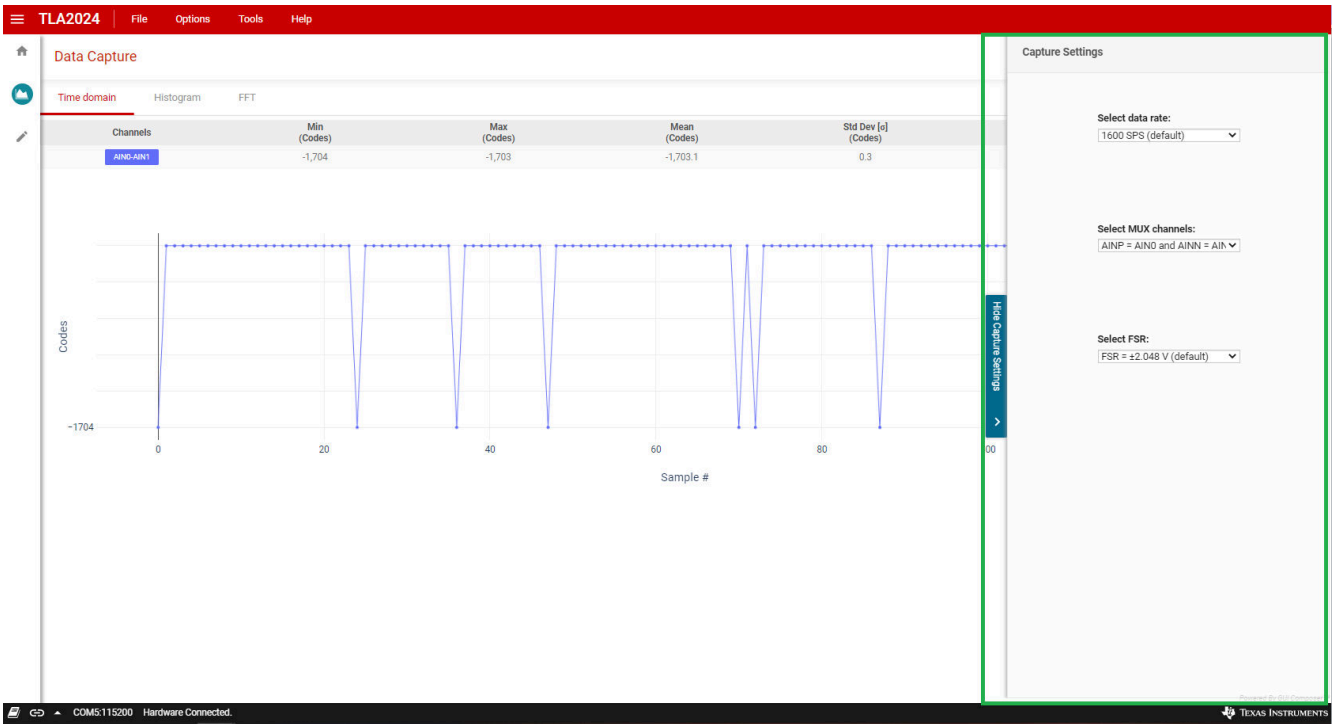

Figure 5-20. Capture Settings

5.2.3 Configuration

The *Register Map* window contains information about the configuration and the last conversion data from the TLA2024 device. The *Conversion* register contains the value of the last 12-bit conversion result read from the TLA2024. The conversion data are 12-bit left-justified in the 16-bit register.

As the TLA2024 is a programmable device, the *Config* register is the only programmable register and is 16 bits in length.

A number of control buttons and drop-down menus exist to configure the *Register Map* read and write operations when data are written and read from the TLA2024.

Throughout the *Register Map* window question mark icons appear. Clicking on these icons open details pertaining to the items in the locations where they appear.

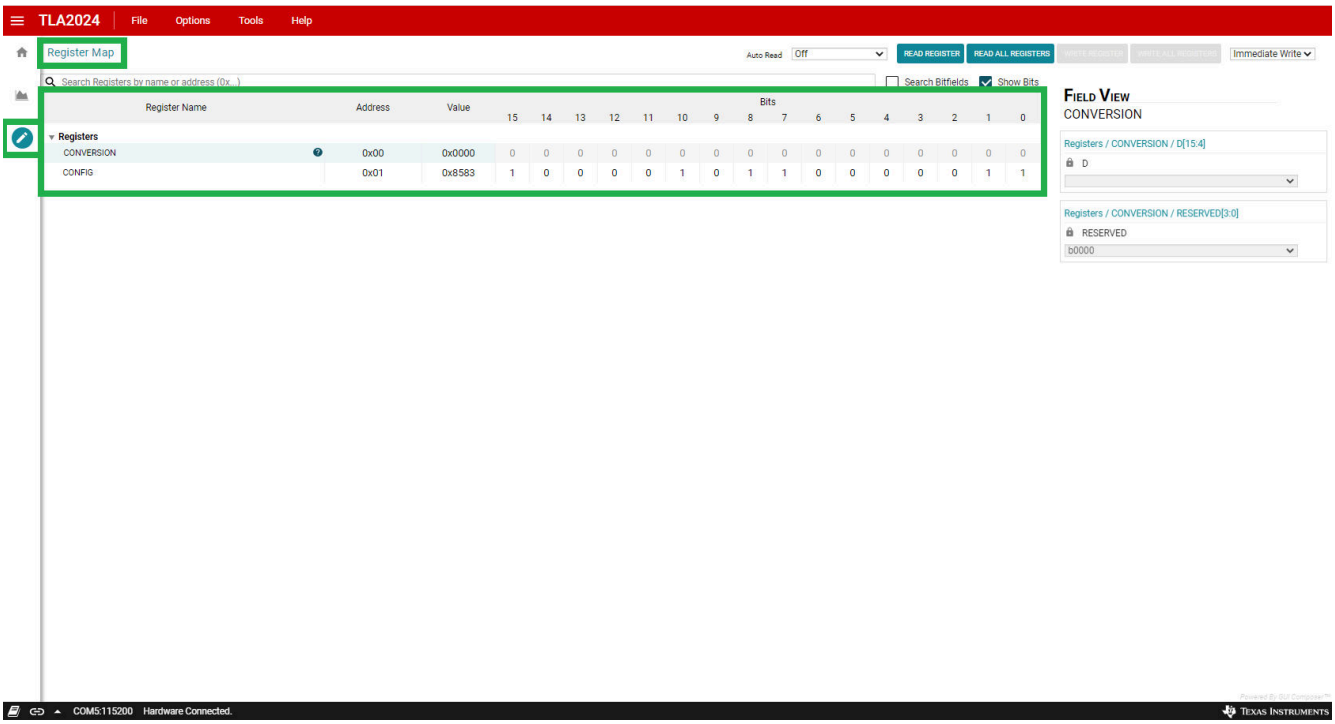

Figure 5-21. Register Map

The GUI displays two registers even though there is only one configurable register in the TLA2024 device. For the firmware to remain in synchronization with the GUI, all communication is first directed to a pointer register internal to the device and either points to the conversion register or the configuration register.

Configuration of the TLA2024 device is accomplished using the drop-down menu and click options shown in the *Field View* on the right side of the GUI window. It is also possible to double-click on the various bits to toggle the bit settings. As the bit settings change, the *Field View* options will also change to correspond to the selection.

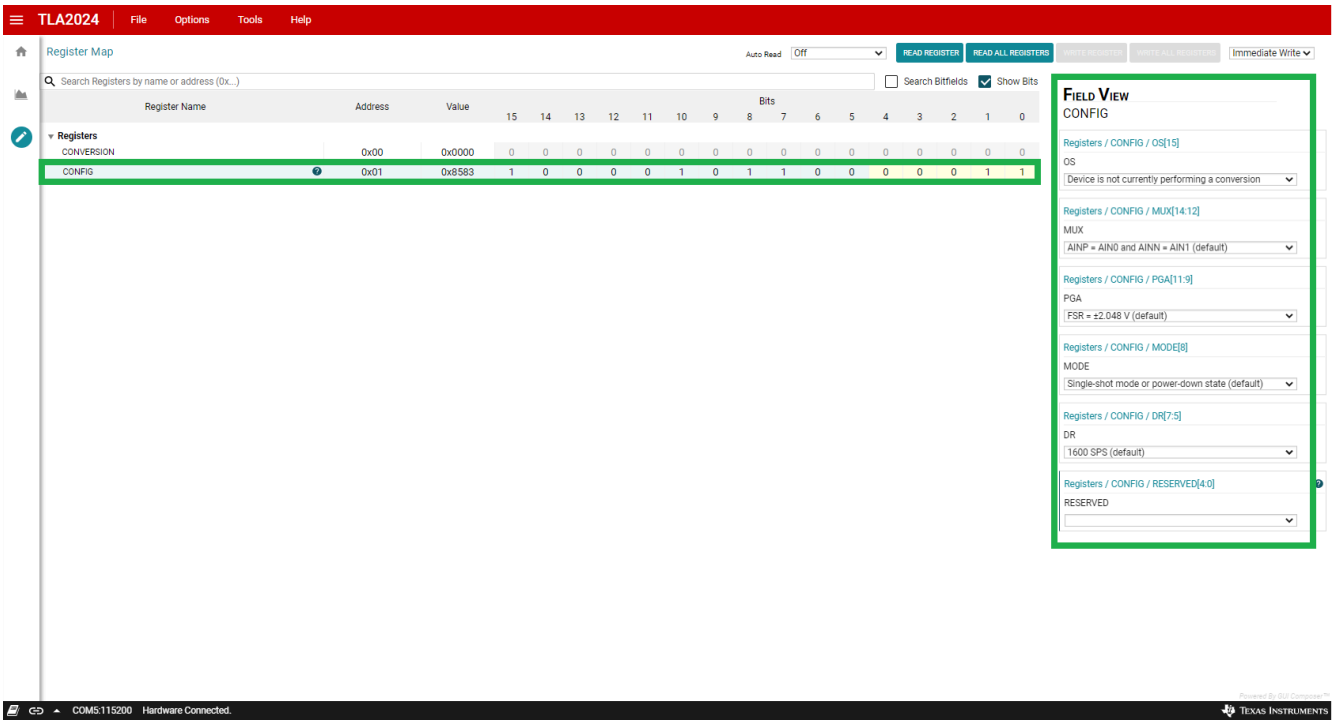

Figure 5-22. TLA2024 Configuration

5.2.3.1 Register Read and Write Options

At the top and right side of the *Register Map* window are controls for reading and writing to the registers. The startup default control values are to *Immediately Write* the *Config* register when options change. The *Auto Read* register function is turned off.

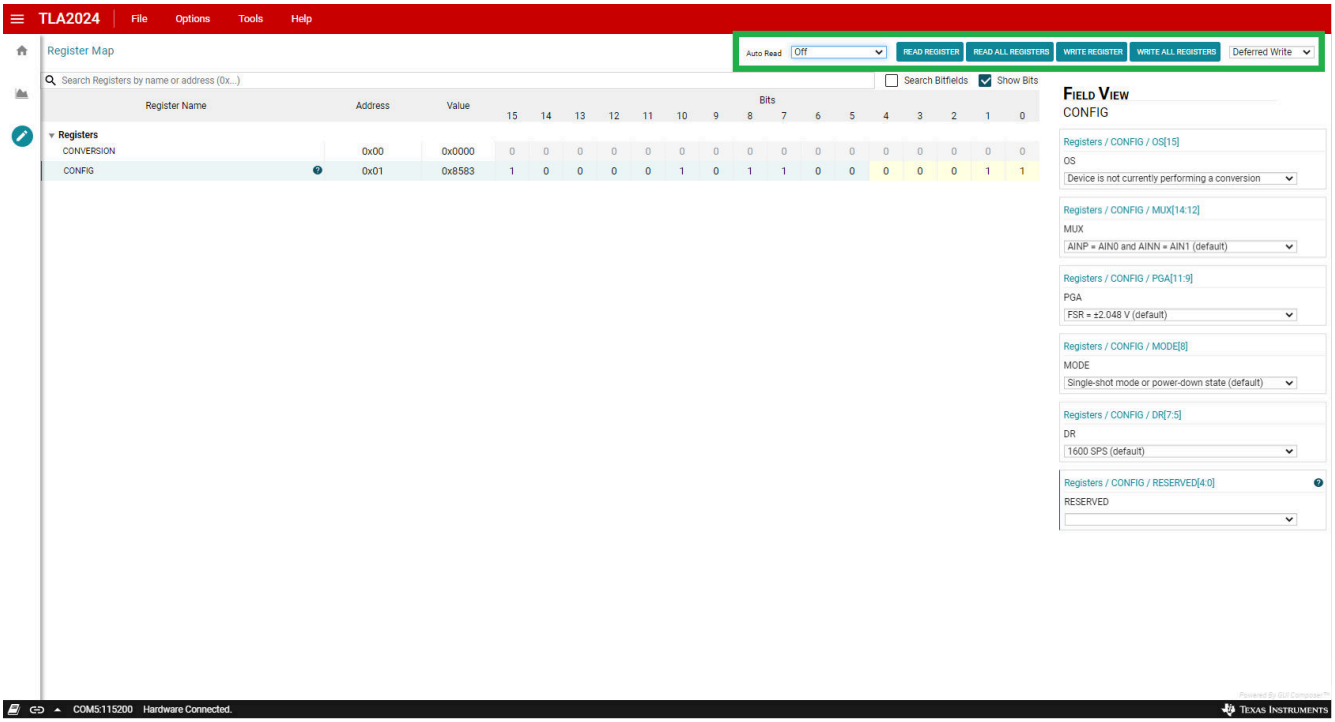

Figure 5-23. Register Read and Write Controls

5.2.3.1.1 Read Register Options

The default GUI configuration is to have the *Auto Read* functionality turned off and instead manually read the registers using the *READ REGISTER* and *READ ALL REGISTERS* buttons. The *READ REGISTER* button reads only the selected register. The *READ ALL REGISTERS* button reads all registers available for the TLA2024 device. The advantage of manually reading the register contents is a reduction in USB communication between the TLA2024EVM-PDK and the GUI.

The registers can be read automatically from the TLA2024 at a variety of intervals from once a second to as fast as possible. The intervals can be seen and selected by using the *Auto Read* drop-down menu selection. The *READ REGISTER* and *READ ALL REGISTER* button options are only enabled when the *Auto Read* selection is turned *off*.

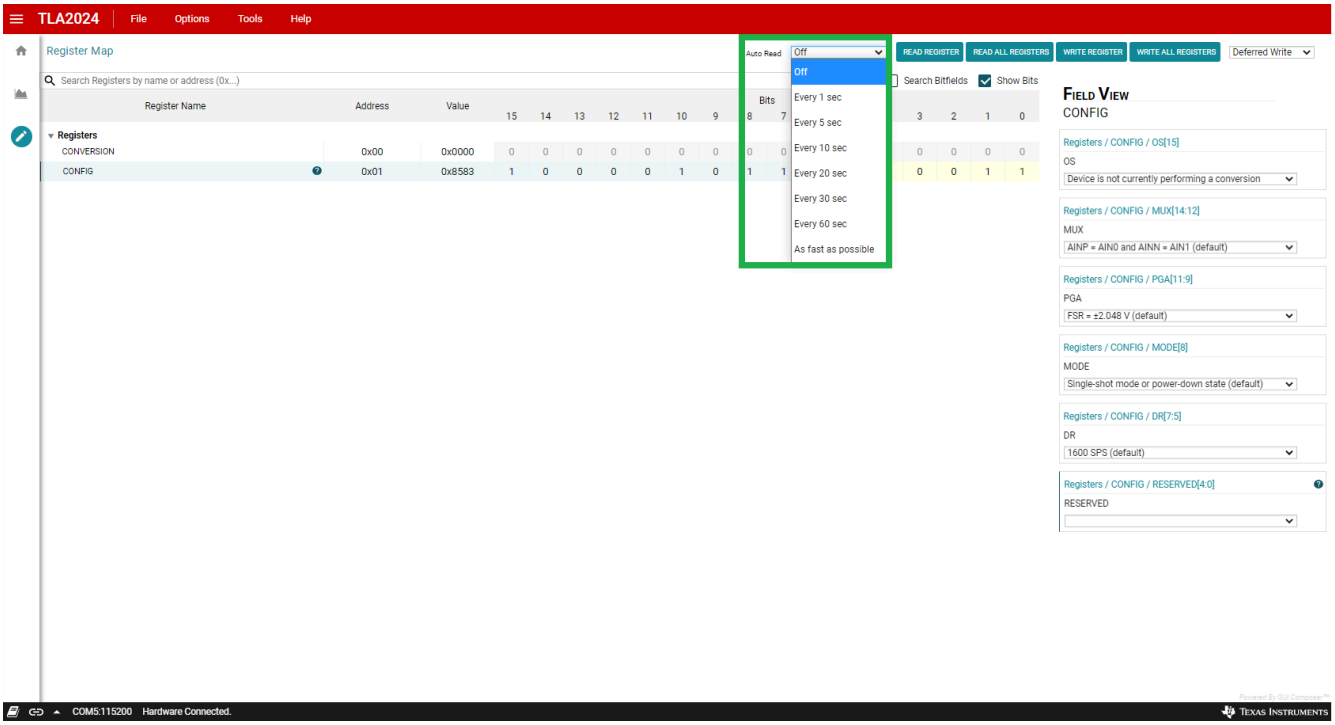

Figure 5-24. Auto Read Options

5.2.3.1.2 Write Register Options

The GUI default option for register writes is *Immediate Write*. When *Immediate Write* is selected, any register configuration changes are immediately written from the GUI to the TLA2024 device. Using the *Immediate Write* option ensures that what is being displayed is what is configured in the TLA2024.

If the write register drop-down menu selection is for a *Deferred Write*, then the write register buttons *WRITE REGISTER* and *WRITE ALL REGISTERS* become enabled. Similar to the functionality of the read register buttons, the *WRITE REGISTER* button will write the configuration for the currently selected register. When selecting the *WRITE ALL REGISTERS* button all configurable registers will be written.

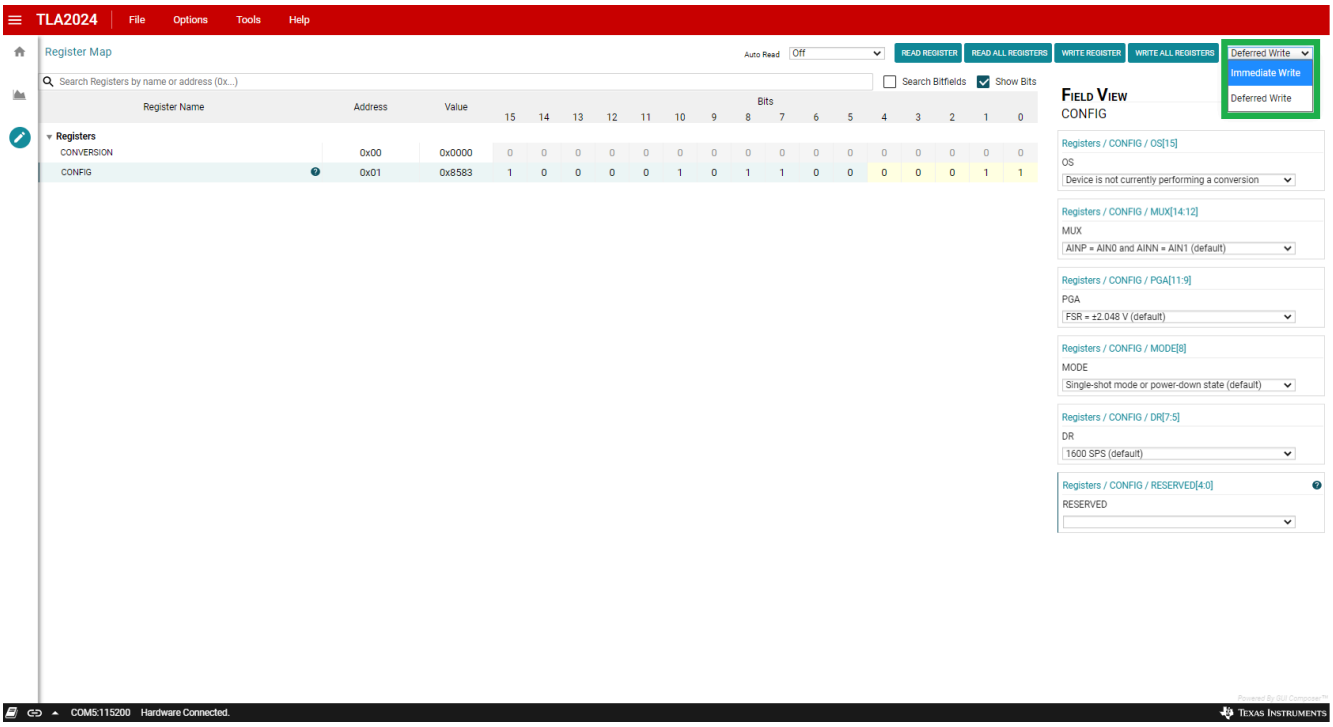

Figure 5-25. Register Write Options

5.3 Connection Status

Connection status shows at the bottom of the GUI in the black status ribbon. At the left side of the status ribbon is a book icon that when selected, allows for the log information to be displayed. Next to the book icon is a connection icon. The icon is showing the visual representation of the connection status also displayed as text. The icon shows as a connected link when the EVM and GUI are connected, and appears as a broken link when not connected. Clicking on the icon will attempt to connect if disconnected and will disconnect if the EVM is currently connected. The last icon shows as an arrow and clicking the icon toggles the display of connection details.

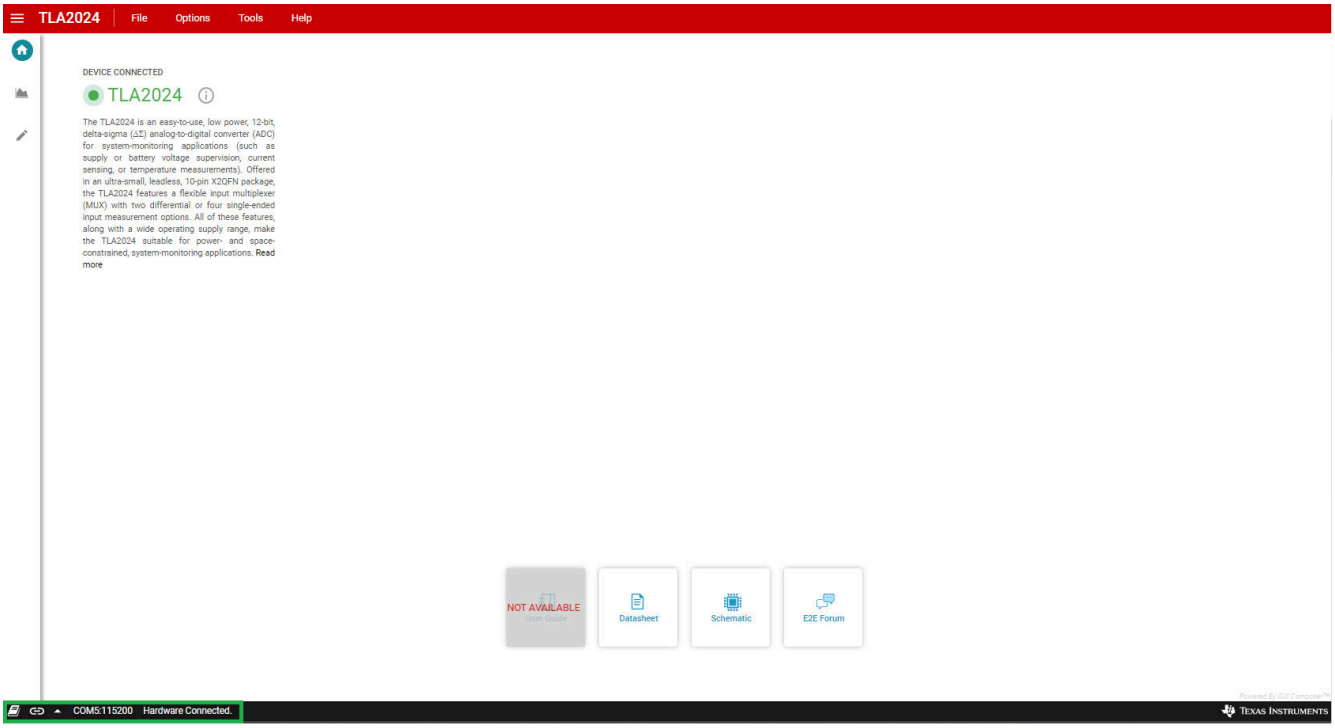

Figure 5-26. Status Information

6 Bill of Materials, Printed Circuit Board Layout, and Schematics

This section contains the TLA2024EVM-PDK bill of materials (BOM), printed-circuit board (PCB) layout, and board schematic.

6.1 Bill of Materials

Table 6-1 lists the bill of materials (BOM) for the TLA2024EVM-PDK.

Table 6-1. Bill of Materials

Designator	QTY	Description	ManufacturerPart Number	Manufacturer
C1, C2, C3, C4	4	CAP, CERM, 4700 pF, 50 V, +/- 5%, X7R, 0603	C0603C472J5RACTU	Kemet
C5, C7	2	CAP, CERM, 0.047 uF, 50 V, +/- 10%, X7R, 0603	C1608X7R1H473K080AA	TDK
C8, C10, C11, C12	4	CAP, CERM, 0.1 uF, 10 V, +/- 10%, X7R, 0402	CL05B104KP5NNNC	Samsung Electro-Mechanics
C9	1	CAP, CERM, 1 uF, 10 V, +/- 10%, X7S, 0402	C1005X7S1A105K050BC	TDK
C13, C14	2	CAP, CERM, 10 µF, 25 V,+/- 5%, X7R, AEC-Q200 Grade 1, 1206	C1206C106J3RACAUTO	Kemet
J1/J3, J2/J4	2	Receptacle, 2.54mm, 10x2, Tin, TH	SSQ-110-03-T-D	Samtec
J5	1	Terminal Block, 3.5mm Pitch, 5x1, TH	ED555/5DS	On-Shore Technology
J6	1	Header, 100mil, 3x2, Gold, TH	TSW-103-07-G-D	Samtec
JP1	1	0.025" SQ Post Header, Through-hole, Vertical, -55 to 125 degC, 2.54 mm Pitch, 3-Pin, Male, RoHS	TSW-103-07-G-S	Samtec
R1, R2, R3, R4	4	RES, 499, 1%, 0.1 W, 0603	RC0603FR-07499RL	Yageo
R7, R10, R13	3	RES, 10 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0402	ERJ-2GEJ103X	Panasonic
R8, R9, R11, R12	4	RES, 4.70 k, 1%, 0.1 W, 0402	ERJ-2RKF4701X	Panasonic
SH-J1	1	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Samtec
TP1, TP2, TP3	3	Test Point, Multipurpose, Black, TH	5011	Keystone
U1	1	12-Bit 3300SPS, 4-Ch Delta-Sigma ADC w/ PGA, Oscillator, Voltage Reference, & I2C , RUG0010A (X2QFN-10)	TLA2024IRUGR	Texas Instruments
U2	1	TCA9406 Dual Bidirectional 1-MHz I2C-BUS and SMBus Voltage Level-Translator, 1.65 to 3.6 V, -40 to 85 degC, 8-pin SM8 (DCT), Green (RoHS & no Sb/Br)	TCA9406DCTR	Texas Instruments
U3	1	I2C BUS EEPROM (2-Wire), TSSOP-B8	BR24G32FVT-3AGE2	Rohm
C6	0	CAP, CERM, 0.047 uF, 50 V, +/- 10%, X7R, 0603	C1608X7R1H473K080AA	TDK
R5, R6	0	RES, 10 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0402	ERJ-2GEJ103X	Panasonic
R14	0	RES, 0, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	RMCF0603ZT0R00	Stackpole Electronics Inc
TP4, TP5	0	Test Point, Miniature, SMT	5019	Keystone
TP6	0	Test Point, Multipurpose, Red, TH	5010	Keystone

6.2 Printed Circuit Board Layout

Figure 6-1 to Figure 6-4 depict the TLA2024EVM-PDK PCB layout.

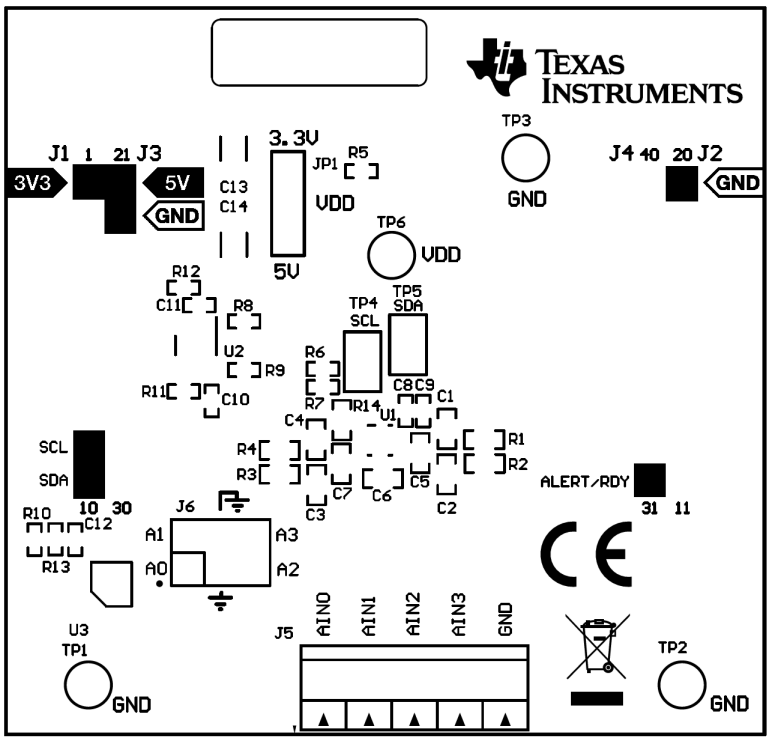

Figure 6-1. Top Silkscreen

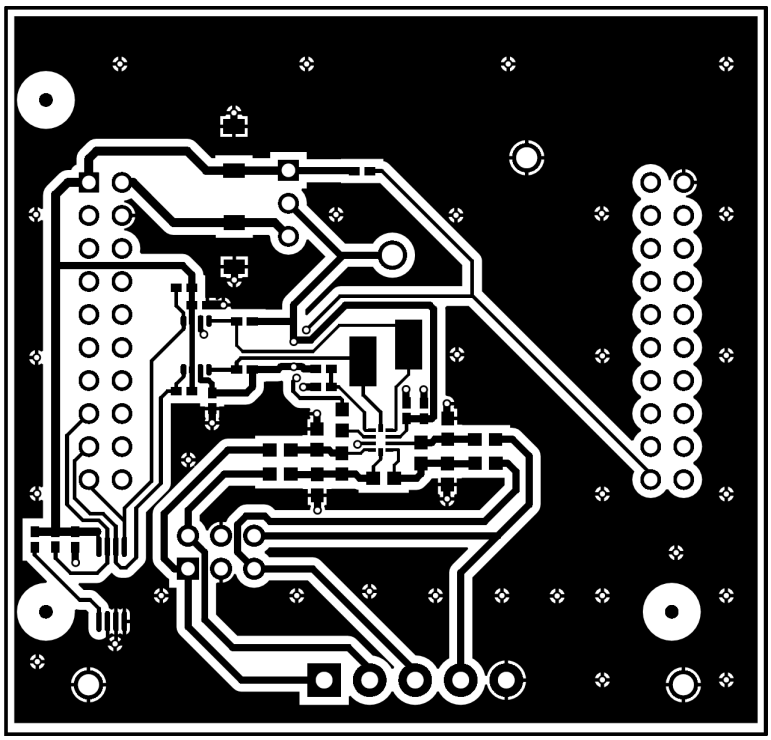

Figure 6-2. Top Layer

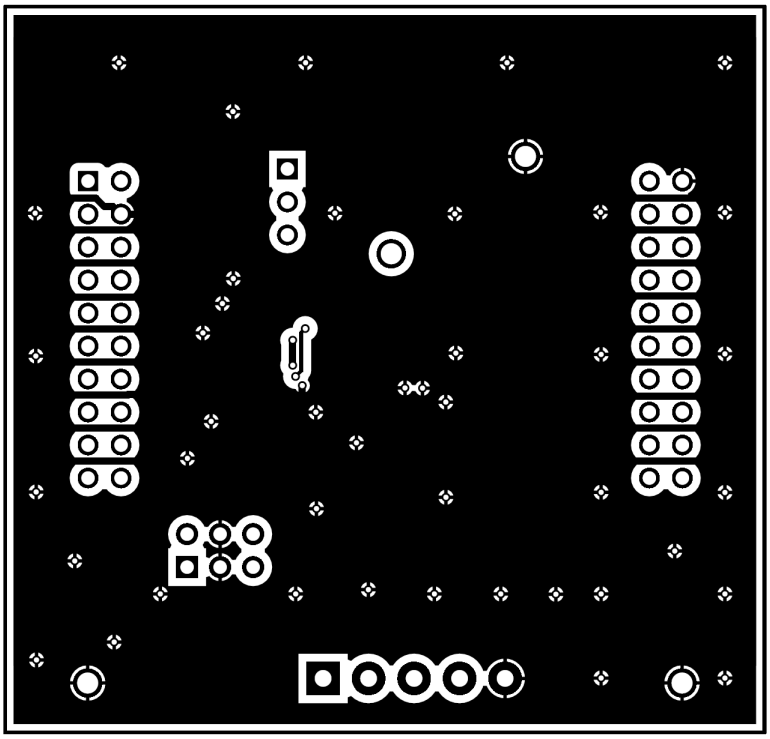

Figure 6-3. Bottom Layer

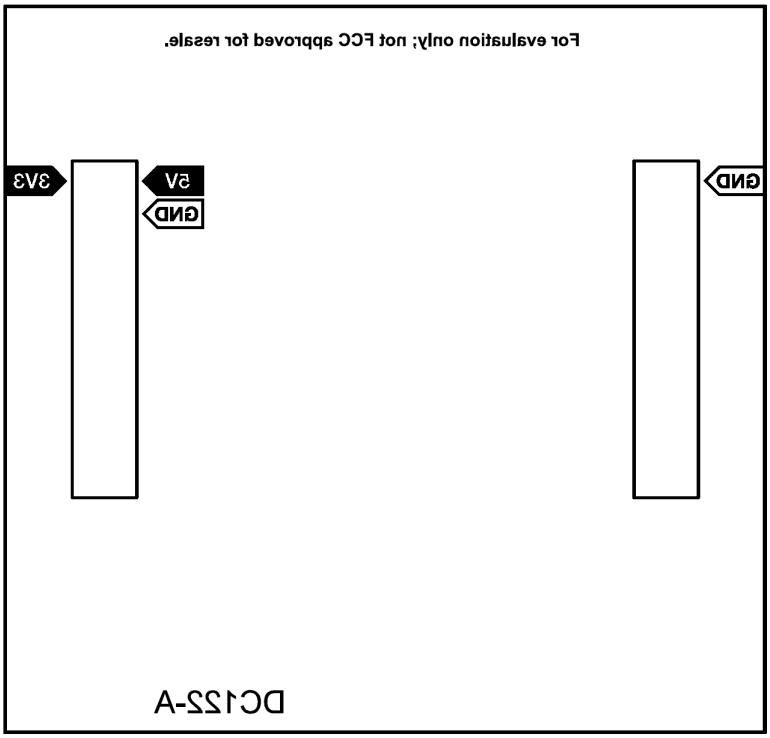

Figure 6-4. Bottom Silkscreen

6.3 Schematics

Figure 6-5 shows the TLA2024EVM-PDK schematic.

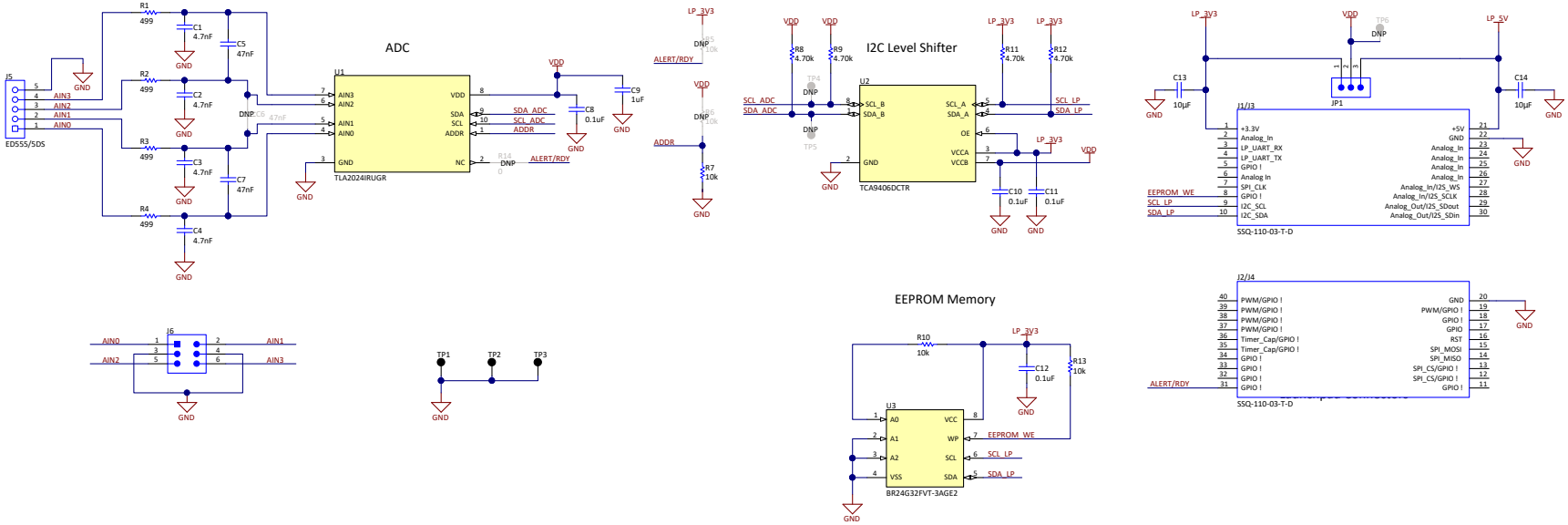

Figure 6-5. TLA2024EVM-PDK Schematic

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