User's Guide
SLOU429A–December 2015–Revised February 2016

AFE5816 16-Channel Analog Front End Evaluation Module (EVM Rev. C)

This user's guide gives a general overview of the AFE5816 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 AFE5816 analog front-end, and to the Rev. C version of the EVM hardware. The AFE5816 EVM provides a platform for evaluating the AFE under various signal, clock, reference, and ADC output formats. In addition, the EVM supports the testing of the LVDS interface. Note that if using the LVDS interface, the TSW1400EVM capture card is required.

This user's guide refers to software HMC-DAQ GUI v.2.8 or higher, and HSDCPro Software v.4.1 or higher and requires Microsoft® Windows® 7 to function.

For any further questions regarding the EVM, GUI or device, please contact: AFE5816-support@list.ti.com

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1 EVM Hardware Overview

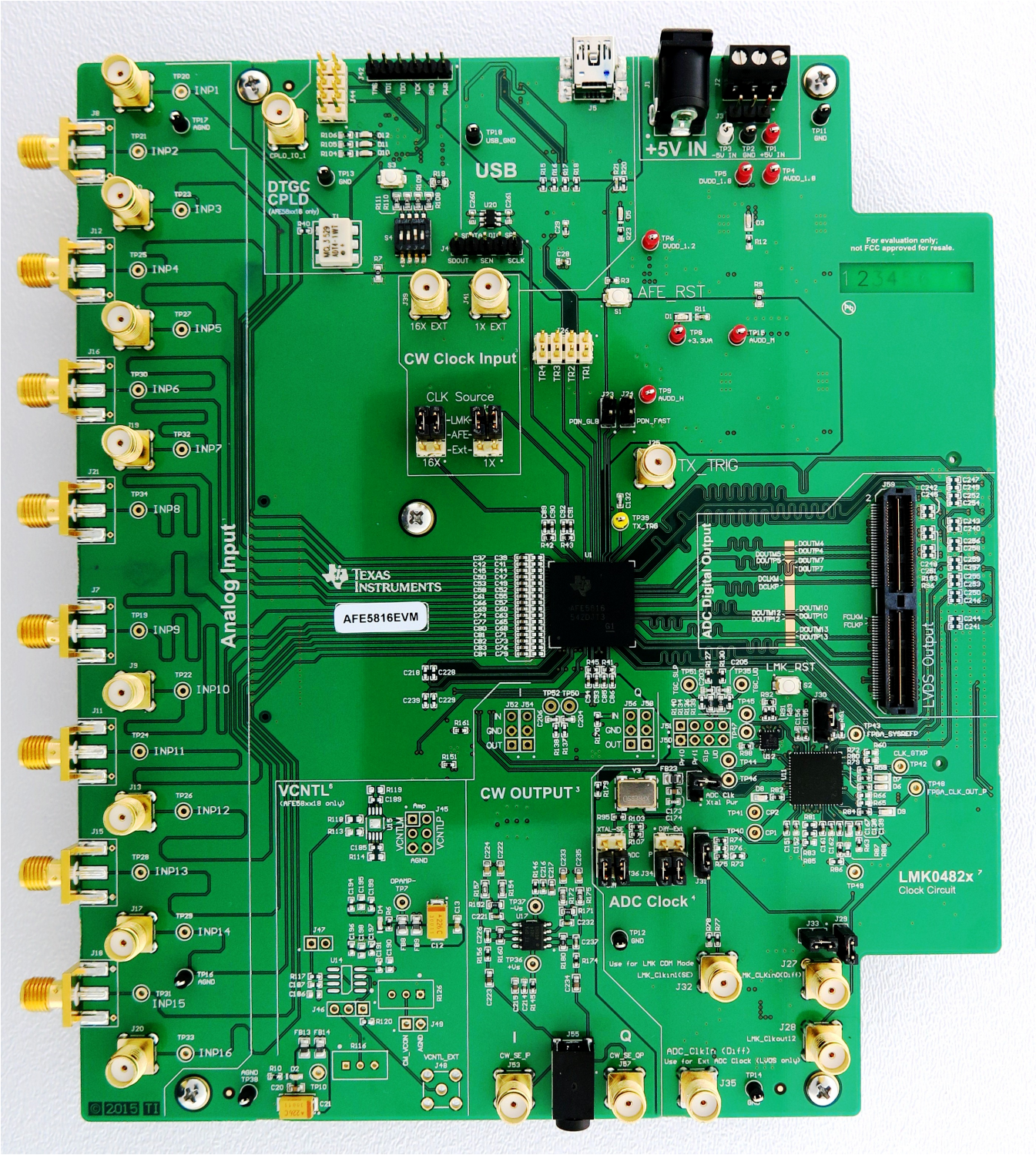


Figure 1. AFE5816 EVM Hardware Overview

The EVM received should resemble Figure 1. For more hardware details and the default jumper map, see Appendix B.

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The AFE5816 EVM kit contains the following items:

1. AFE5816 EVM
2. 1 mini-USB cable
3. Power cable with barrel connector



Figure 2. Provided Power Cable for J1 Connector

2 GUI Software Installation

The AFE5816 EVM and the TSW capture card EVM have individual software and both require software installations. Ensure that no USB connections are made to the EVMs until after the installations are complete. This user's guide refers to software HMC-DAQ GUI v.2.8 or higher, and HSDCPro Software v.4.1 or higher.

See the HSDCPro Installation section for information on the installation of the TSW EVM Software GUI (HSDCPro). For information on the installation of the AFE5816 EVM Software GUI (HMC-DAQ GUI), see the HMC-DAQ GUI Installation section.

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3 Quick Views of Evaluation Setups for LVDS Interface

The AFE5816 EVM is tested using the TSW1400EVM for LVDS data interface.

3.1 Equipment Setup Overview

As shown in Figure 3, mating the AFE5816 EVM with a TSW EVM allows for testing using the data interface.

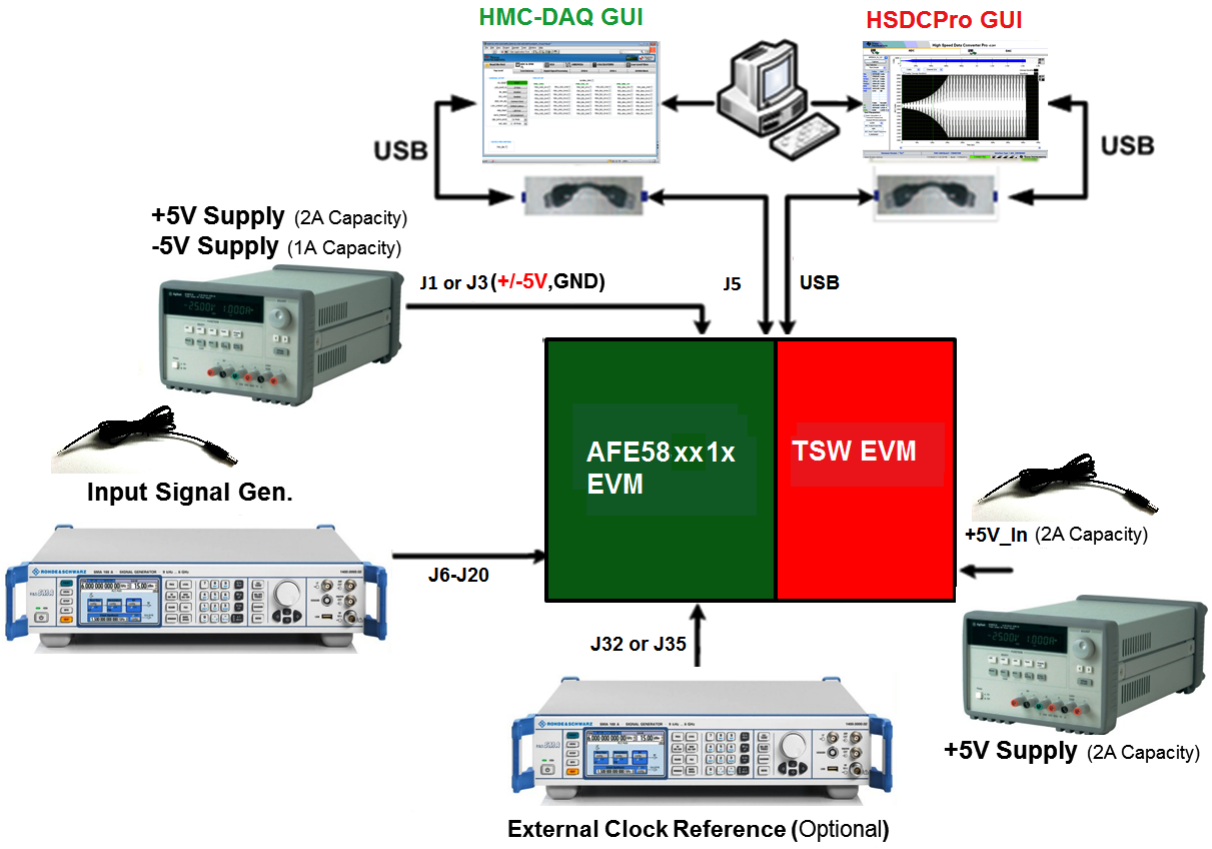


Figure 3. LVDS Evaluation Setup Overview

TSW Capture Card EVM: The TSW1400 EVM is required for capturing data from the AFE5816EVM and its analysis using the graphical user interface (GUI), called High Speed Data Converter Pro (HSDCPro).

For more information on the TSW1400EVM, see: TSW1400EVM.

Power Supply: A barrel connector power cable is provided with the EVM and is connected at J1, but does not support the –5 V needed for the CW mode circuit. This requires an additional cable, not provided.

This 5-V power supply must be able to source up to 2 A, and –5-V supply must provide up to 1 A. The –5-V supply is used for the negative supply of amplifiers in the CW output external circuitry. The TSW1400 EVM is powered through a power cable similar to Figure 2 that is provided with its own EVM kit.

USB Interface to PC: The USB connections from the AFE5816EVM and TSW EVM to the PC are used for communication from the GUIs to the boards. USB 2.0 or 3.0 ports are both acceptable.

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Equipment: Signal generators (with low-phase noise) must be used as source of the input signal (0.01 MHz to 40 MHz) for optimal performance. An on-board crystal oscillator option is provided so that an external clock source is not needed for basic capture. Additionally, for best performance a band-pass filter (BPF) is recommended on the analog input signal to attenuate the harmonics and noise from the signal. For coherent sampling or custom sample rate, an external clock is provided to J35 (GUI configuration is required for the external clock configuration). For more information on clock configuration, see Section B.1.3.

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4 Testing the EVM Data Capture With LVDS

This section outlines (1) the external connections required to test the AFE5816 EVM using the LVDS interface, (2) how to setup the GUIs for testing, and (3) how to capture an analog input signal.

4.1 EVM Hardware Setup

Make the connections shown in Figure 4 or for proper hardware setup.

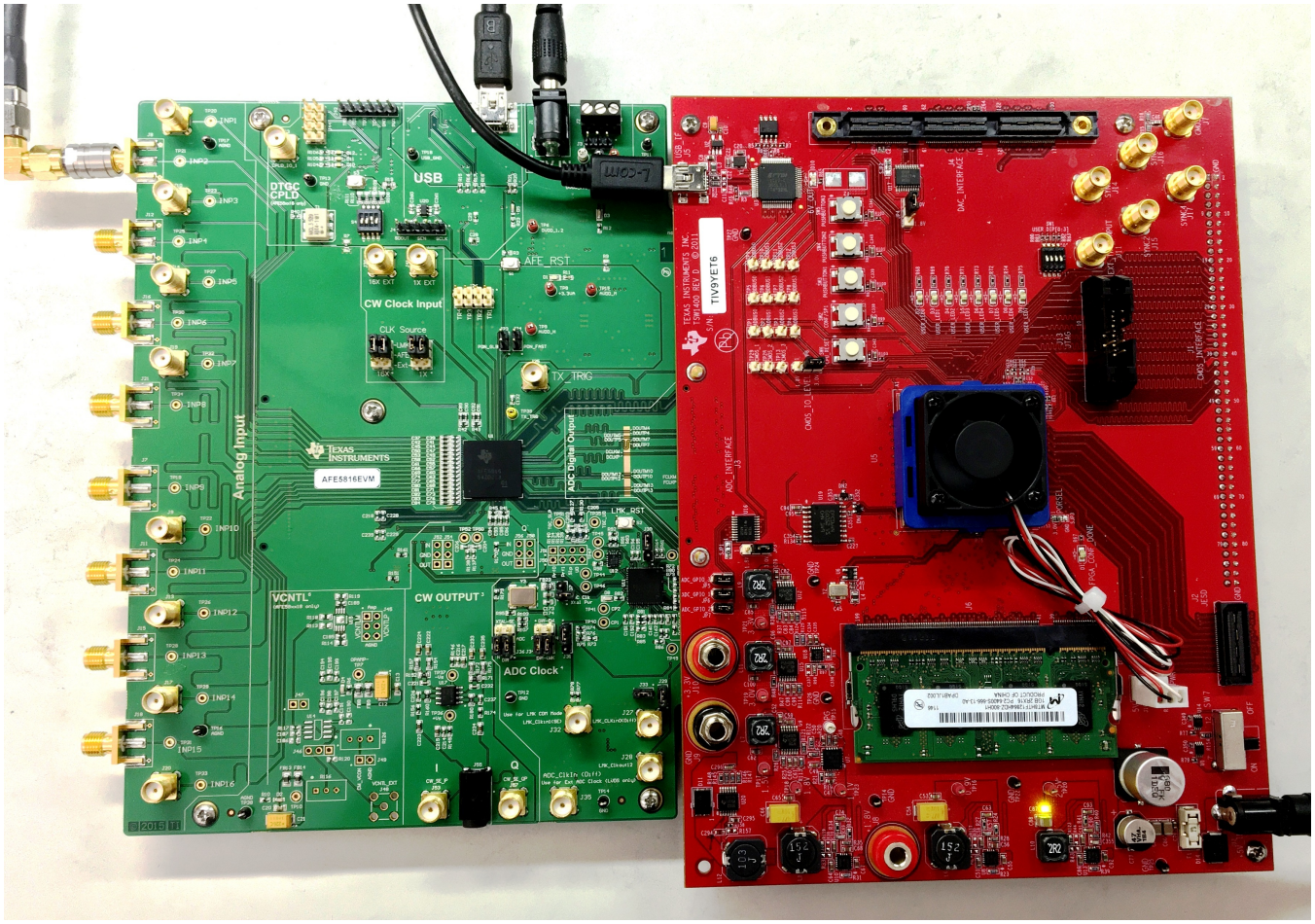


Figure 4. TSW1400EVM and AFE5816 EVM Hardware Setup for LVDS Capture

1. **Board Mating:** For LVDS data, mate the TSW1400 EVM at connector **J3** to the AFE5816 EVM at connector **J59** through the high-speed ADC interface connector.
2. **Power Supply:** Connect a 5-V (2-A) power supply using the provided power cable to **J12 (+5V_IN)** of the TSW1400 EVM. See the TSW manual for more information, if needed.

   Next, connect a 5-V (2-A) power supply using the provided power cable to **J1** of the AFE5816 EVM. **Connect the white-striped side of this cable to the 5-V power supply.** Optionally, connect a –5-V (1-A) supply at J3 or TP3 if using the CW circuit. No cable is provided for this.

   Turn on the TSW1400 at the SW7 switch.
3. **USB:** After installing the GUIs as shown in Appendix A, connect the USB cable from PC to **J5 (USB)** located on the top side of the AFE5816 EVM. Connect the USB cable from PC to **J5 (USB_IF)** of the TSW1400 EVM. USB 2.0 or 3.0 ports are both acceptable for both EVMs. *Note: TI recommends that the PC USB port be able to support USB2.0. If unsure, always choose the USB ports at the back of the PC chassis over ones located on the front or sides.*
4. **Equipment:** Connect a sine wave generator to SMA **J6, INP1**. Set the frequency to 5 MHz and the amplitude to –30 dBm. For best performance, a 5-MHz band-pass filter (BPF) is recommended on the

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analog input signal to attenuate the harmonics and noise from the signal.

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4.2 Capturing an Analog Input Signal With the LVDS Interface

This section describes the software setup for capturing an analog input using the AFE5816 EVM. If there is any issue with a data capture, refer to the troubleshooting section.

Data capture is confirmed by using only the Quick Setup page of the HMC-DAQ GUI. Assuming the hardware is connected correctly as in Section 4.1, follow these steps to acquire data:

HSDCPro Actions:

1. Connect both EVMs to the PC using two USB cables as instructed in Section 4.1.
2. Open HSDCPro GUI using *Run as Administrator*. **Do not open the HMC-DAQ GUI before this step because it opens automatically. If it is already open, close it.**
3. If the TSW Hardware is already connected to the USB, then a pop-up window should appear to connect the HSDCPro GUI to the EVM Hardware.

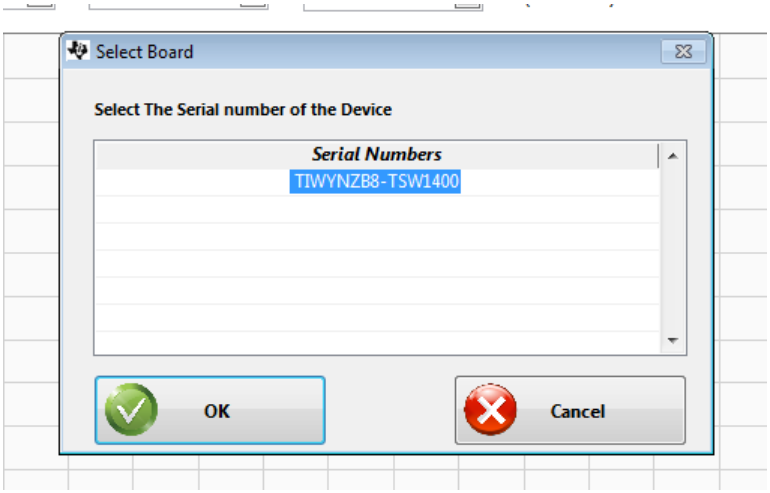


Figure 5. Connect to TSW EVM (TSW1400 Shown)

4. A pop-up window prompts the user to choose a firmware to download to the TSW EVM FPGA.

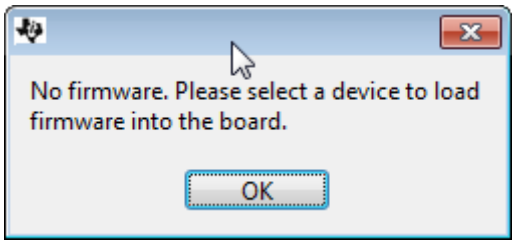


Figure 6. Connect to TSW EVM

5. Select firmware as ' *AFE5816*'. **Be sure to choose the correct device to match the hardware or the HMC-DAQ GUI shows an error when launching.**

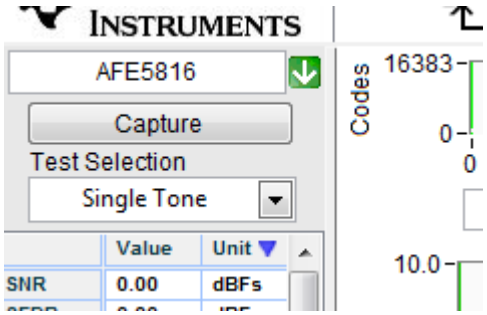


Figure 7. Choose Firmware (AFE5818 Shown)

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6. When prompted to update firmware, click the *Yes* button.

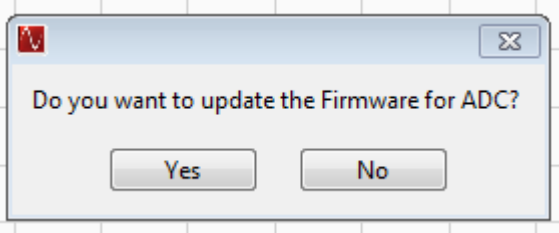


Figure 8. Update Firmware?

7. The firmware begins downloading to the FGPA on the TSW EVM.

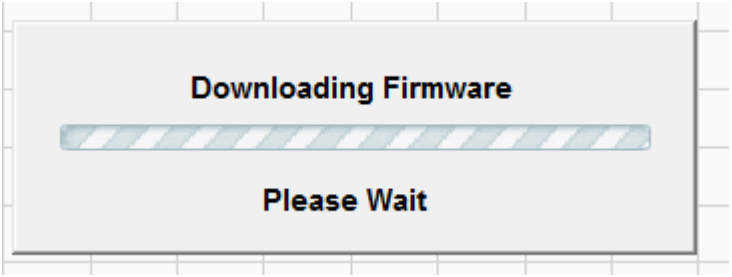


Figure 9. Firmware Download Progress Bar

8. When the firmware has finished downloading, several Green LEDs are lit on the TSW EVM. For the TSW1400, D5 (USER_LED3) may be on, and D6 is off.

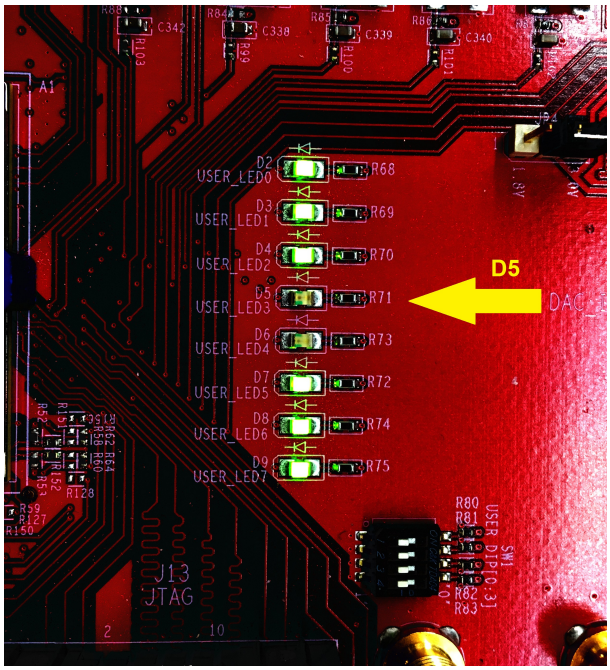


Figure 10. TSW LEDs Turn On After FW Download

9. The AFE5816 EVM GUI (HMC-DAQ) opens automatically at this time. Wait until this is finished to continue. If any errors arise at this time, consult a TI engineer.

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Figure 11. Launching Device GUI EXE

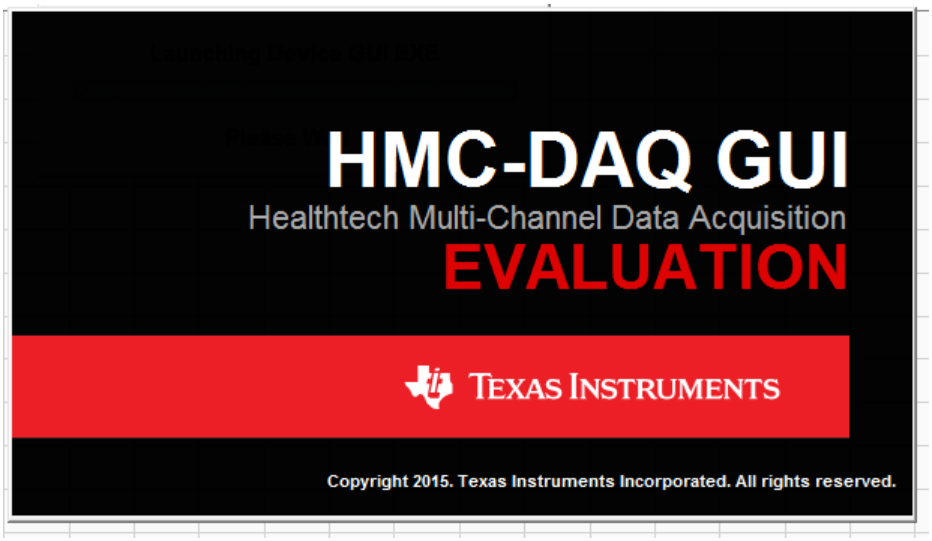


Figure 12. HMC-DAQ GUI Launches

10. In HSDCPro, change the Test Selection to *Single Tone'*
11. In HSDCPro, change the window type to *Blackman*

HMC-DAQ GUI Actions:

1. Verify the clock configuration by matching J36, J34, J31, and J37 to Figure 13.

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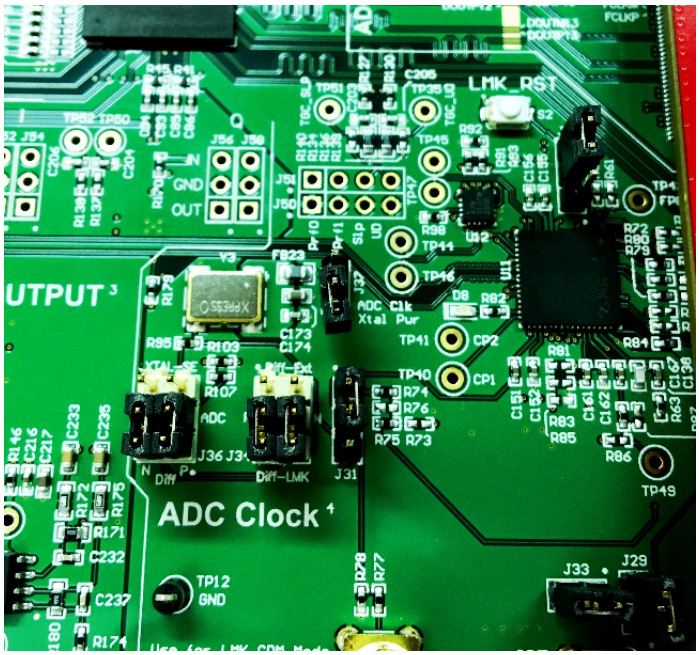


Figure 13. Clock Configuration on AFE EVM for LVDS

2. Press the AFE_RST button on the AFE EVM, located above the AFE device (SW1). Hold for 1 second. Alternatively, press the *DUT RESET* button on the HMC-DAQ GUI.

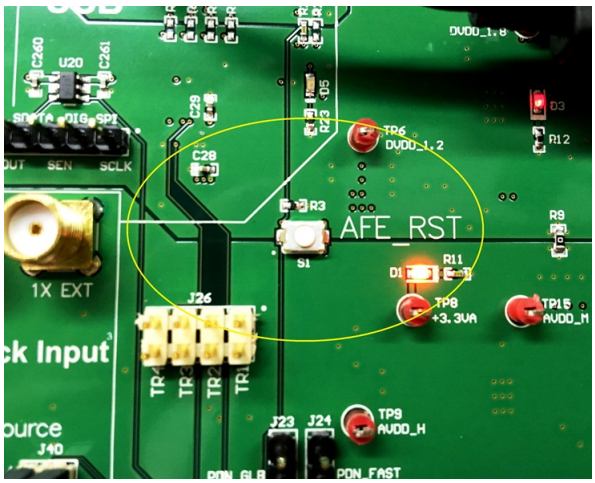


Figure 14. AFE_RST Hardware Reset Button



Figure 15. Software Reset Button

3. Press the *Initialize Device* button on the HMC-DAQ GUI. The progress bar indicates the device is configured over SPI.

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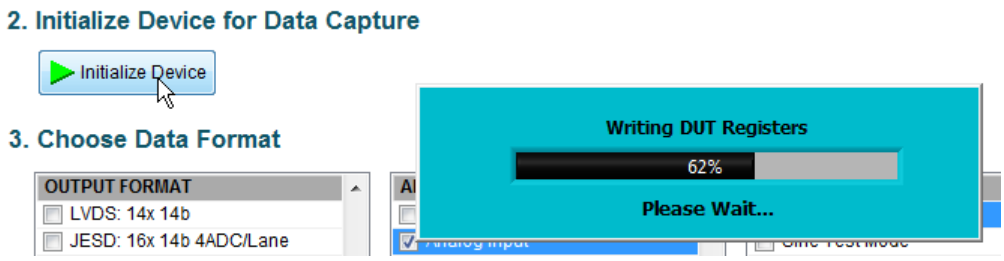


Figure 16. Initialize Device

4. Choose the desired serialized data format in the *Output Format* control.
5. The default ADC Format is *Analog Input*. This requires no action.

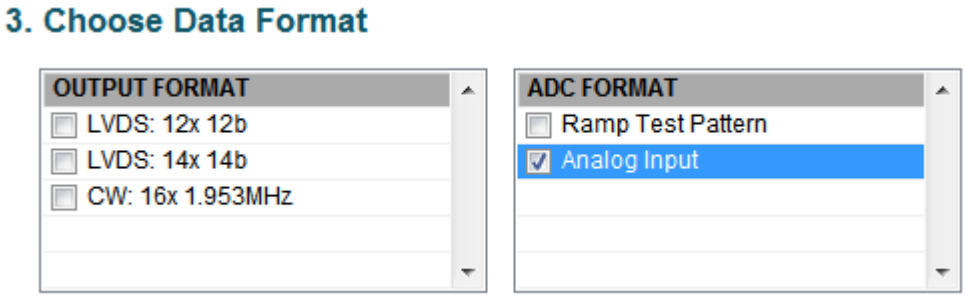


Figure 17. GUI Quick Start Setup: Output Data Configuration

6. At this point, D5 on the TSW1400 EVM should turn on. If this is not the case, please consult the Appendix F section. There is most likely an ADC clock issue.

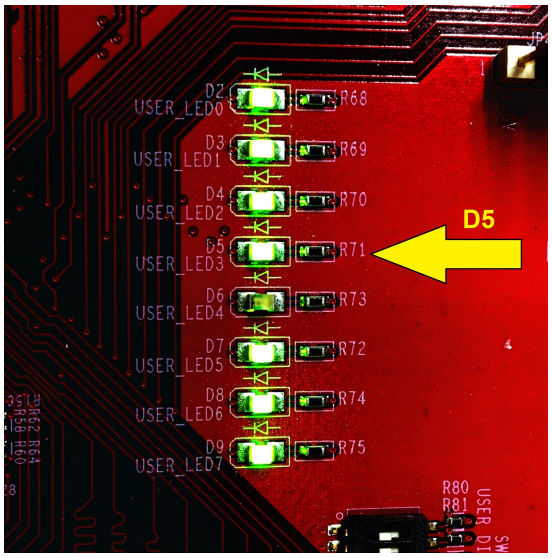


Figure 18. LED D5 Turns On When ADC is Ready

1. Choose VCA GAIN as *Mid Gain*.

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Figure 19. Choose VCA Gain

2. Return to HSDCPro, and press the *Capture* button. A capture similar to that shown in Figure 21 appears. The quality of the output spectrum depends heavily on the coherency and the purity of the input signal and clock. Since it is not possible to sync the input signal with the on-board clock, TI recommends using a window in HSDCPro (found at the top of the spectrum graph). *Blackman* or *Hanning* works, do not use *Rectangular*.

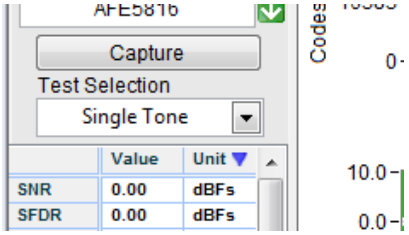


Figure 20. Capture Button

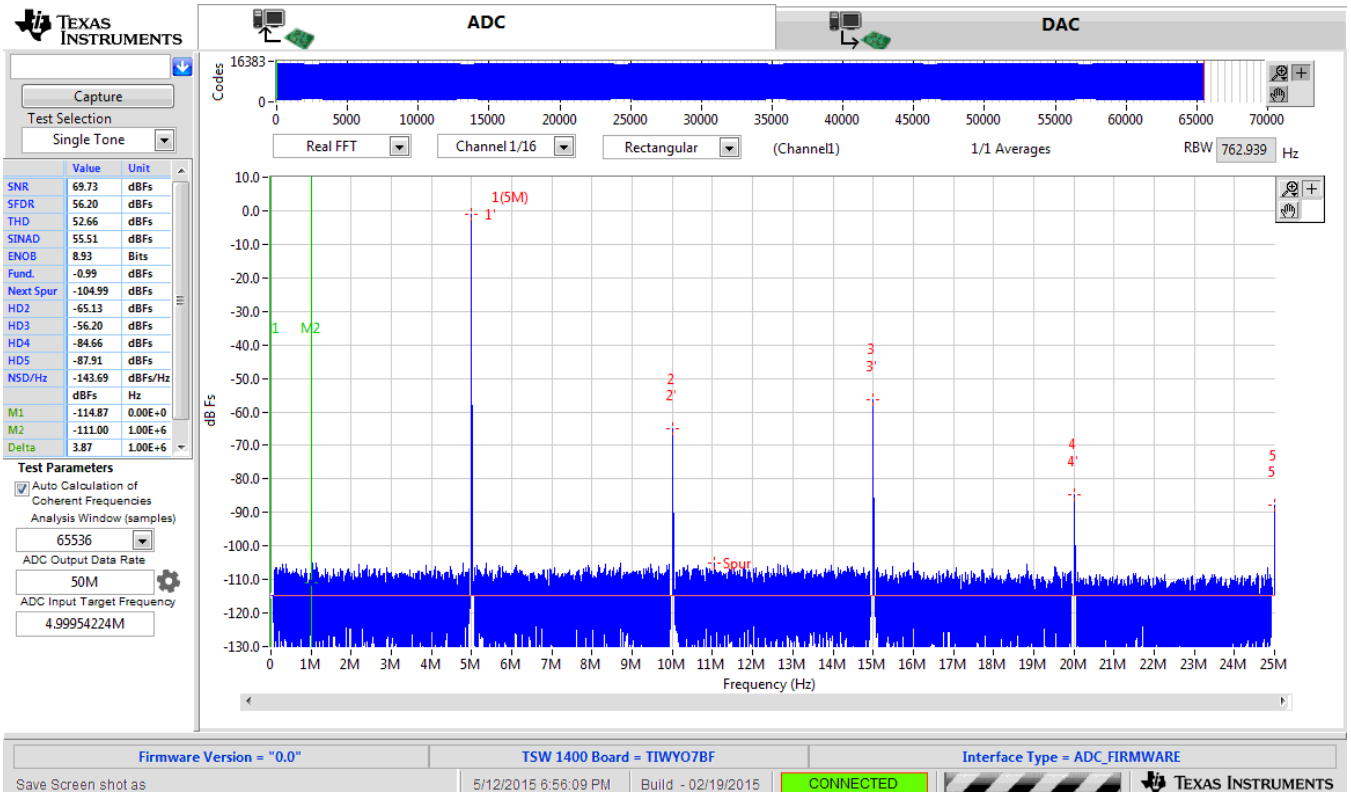


Figure 21. Analog Input Capture

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5 Testing the EVM in CW Mode

Demonstrating the CW mixer in the AFE is done by following these steps:

1. In the HMC-DAQ GUI, initialize the device by pressing the *Initialize Device* button.

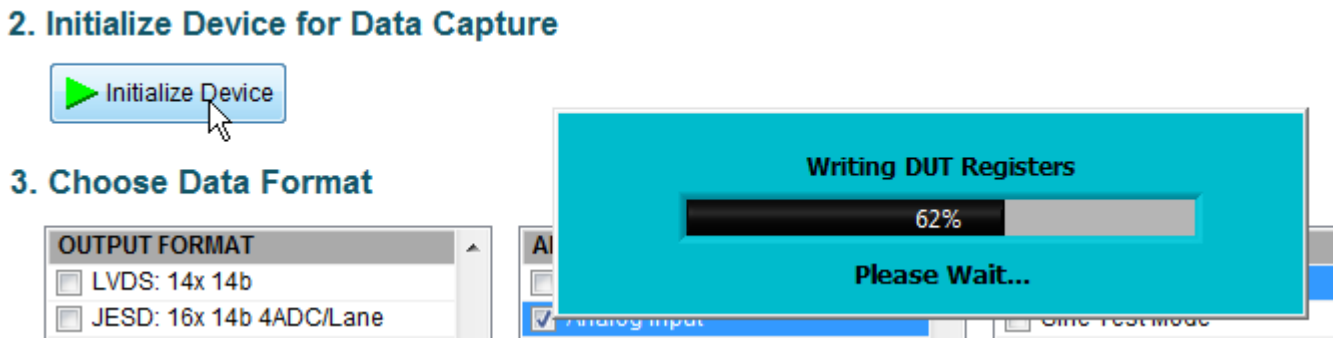


Figure 22. Initialize Device

2. Choose "CW: 16x 1.953 MHz"

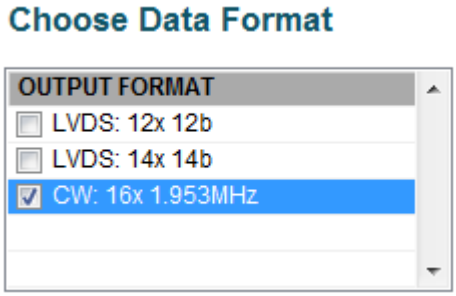


Figure 23. CW Mode Preset

3. Connect a sine wave generator to SMA **J6, INP1** or any other channel. Set the frequency to 1.963125 MHz and the amplitude to –20 dBm.
4. Connect two cables to an oscilloscope with timebase 40 µs and 500 mV/div. Input resistance should be 50 Ω on each scope channel.
5. Connect those two cables to SMAs, J53 and J57.
6. The oscilloscope displays the frequency I and Q signals at 10 kHz as shown in Figure 24. The amplitude should be around 1.3 Vpp ±200 mVpp, though this amplitude may change. The frequency should be 10 kHz and signals should be 90 degrees out of phase.
7. Trigger the oscilloscope on either channel.

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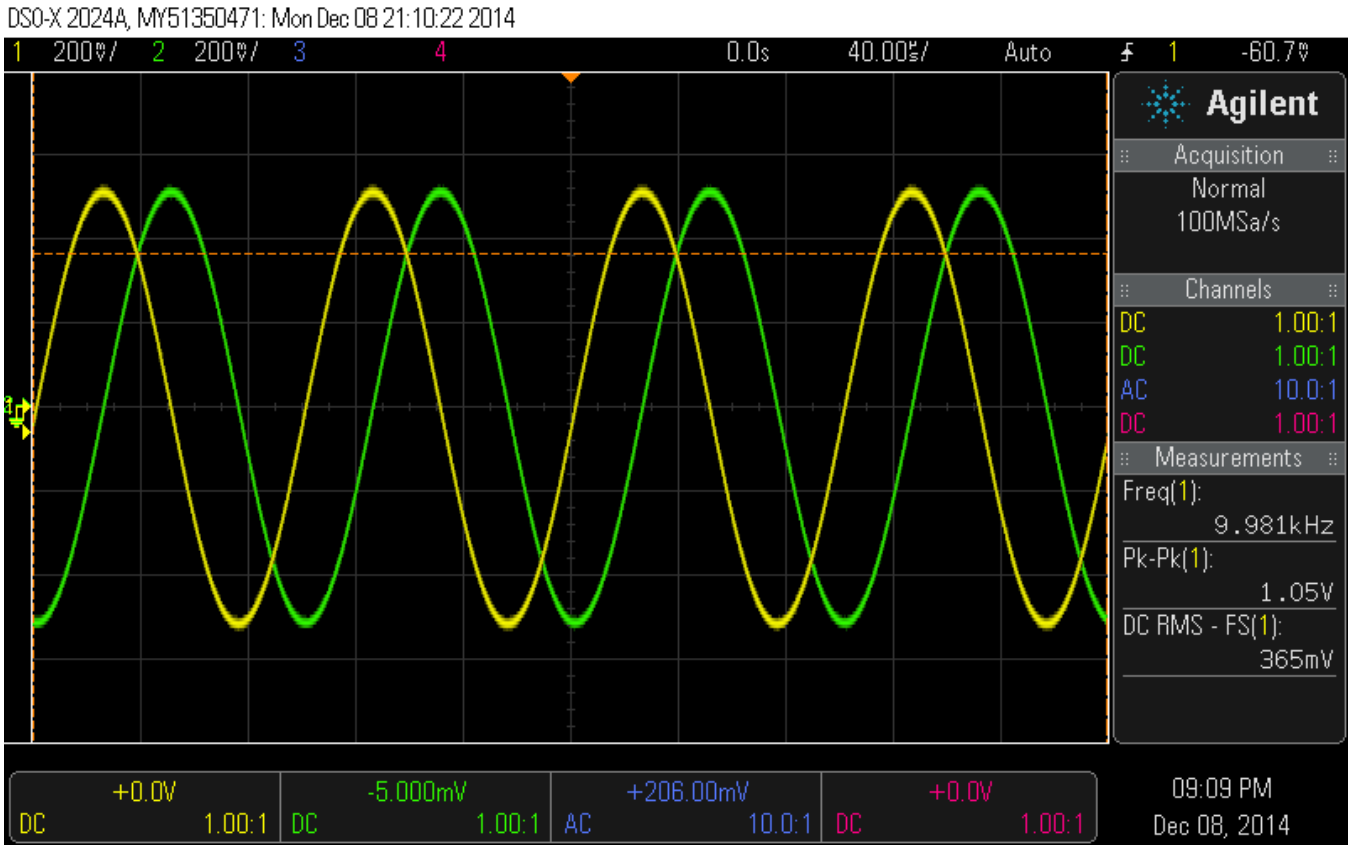


Figure 24. CW Output

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Software Installation

Section A.1 provides detailed procedures for installing High Speed Data Converter Pro (HSDCPro), the software GUI used to control a suite of FPGA capture solutions including the TSW1400. Section A.2 provides details for installing Healthtech Multi-Channel Data Acquisition (HMC-DAQ), the software GUI which controls a suite of AFE and ADC solutions, including the AFE5816.

A.1 High Speed Data Converter Pro (HSDCPro) GUI Installation

Go to the HSDCPro website. Under **Technical Documents**, find the **Software** section and download and save the **High Speed Data Converter Pro GUI Installer** to the local PC hard drive.

1. Unzip the saved file and run the installer executable (*Run as Administrator*) to obtain the menu shown in Figure 25.
2. Click the *Next* button.

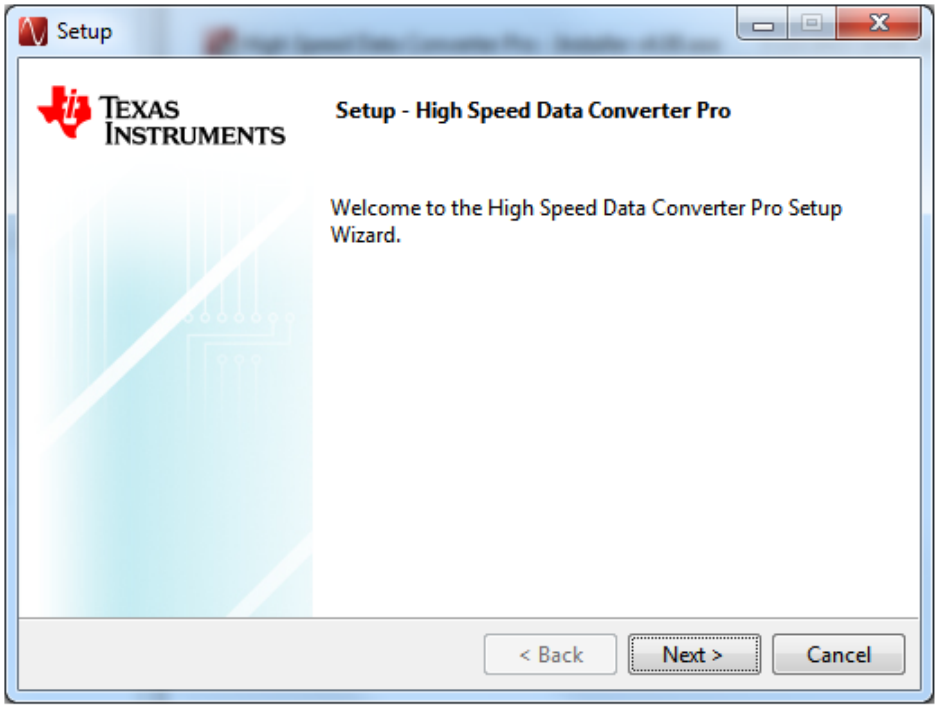


Figure 25. HSDCPro Install (Begin)

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3. Read the License Agreement from Texas Instruments and select *I accept the License Agreement*, then press the *Next* button as shown in Figure 26.

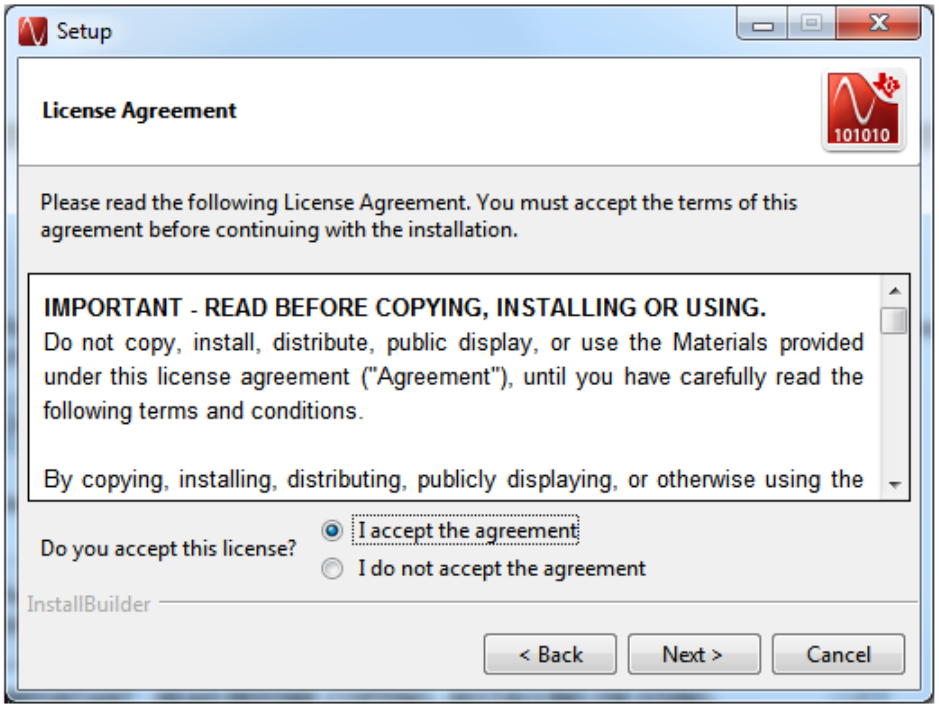


Figure 26. HSDCPro Install (TI License Agreement)

4. Read the License Agreement from Texas Instruments and select *I accept the agreement*, then press the *Next* button as shown in Figure 27.

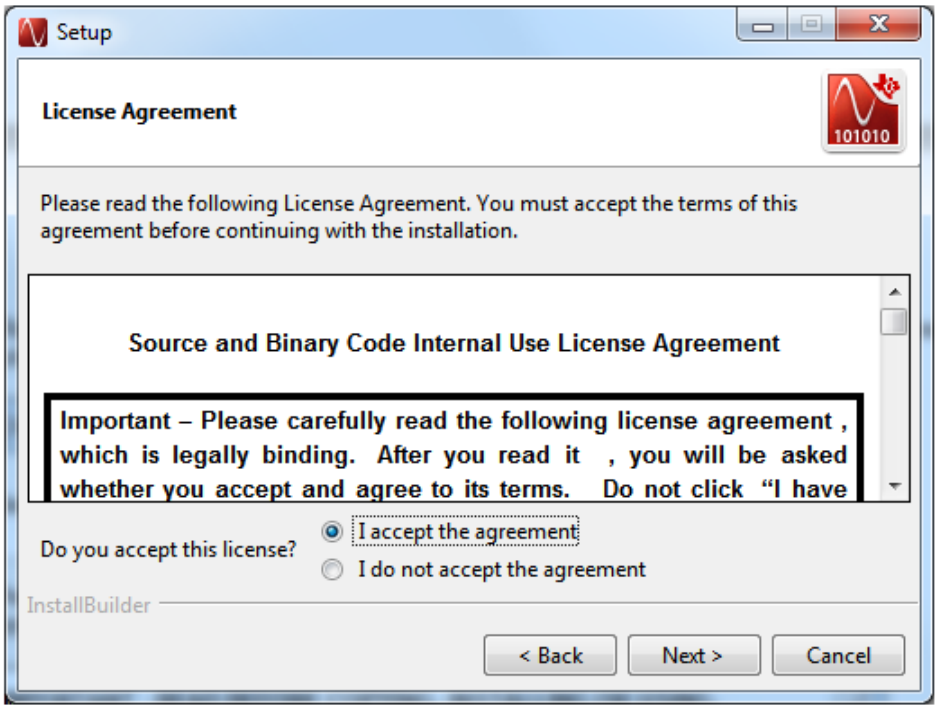


Figure 27. HSDCPro Install (TI License Agreement)

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5. Allow the installation to be placed in the default directory by clicking *Next*, as in Figure 28.

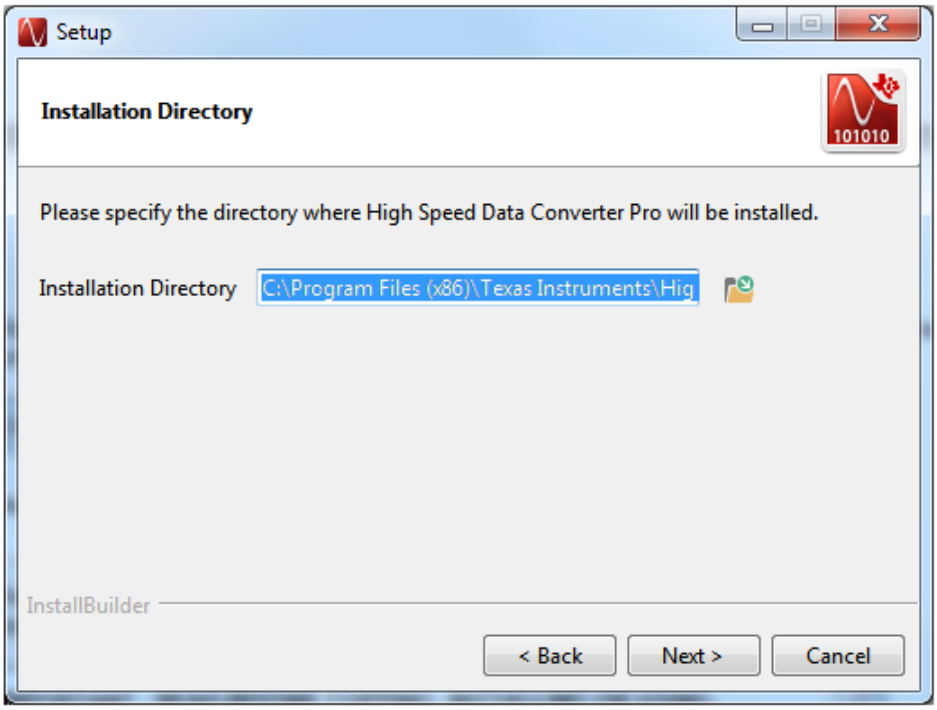


Figure 28. HSDCPro Install (Install Directory)

6. Click *Next* to begin the installation, as in Figure 29.

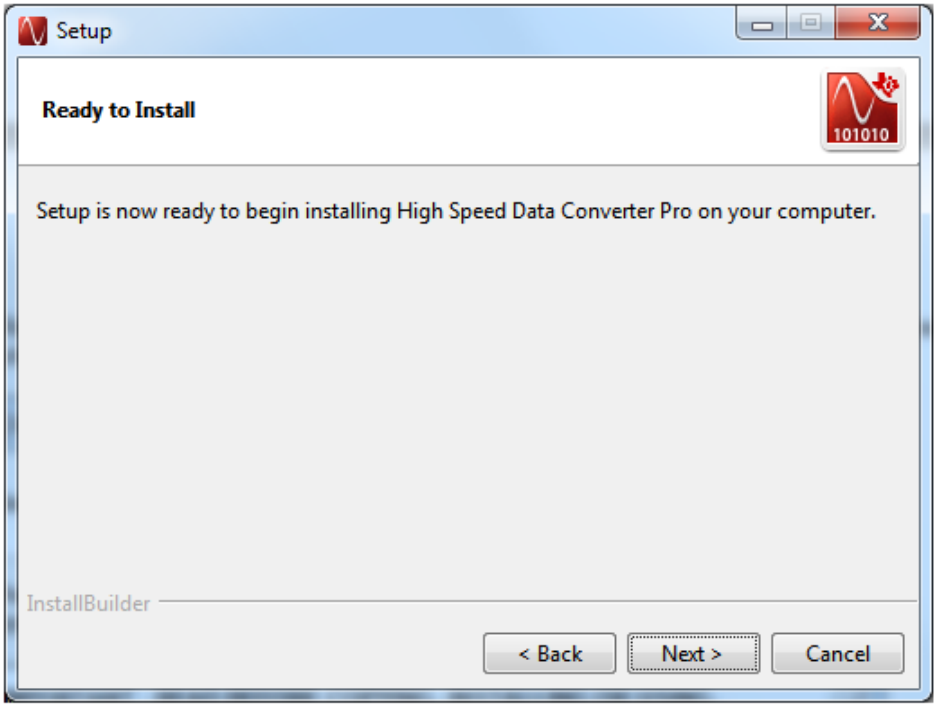


Figure 29. HSDCPro Install (Installation Ready)

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7. The Cypress Driver begins installing as shown in Figure 30.

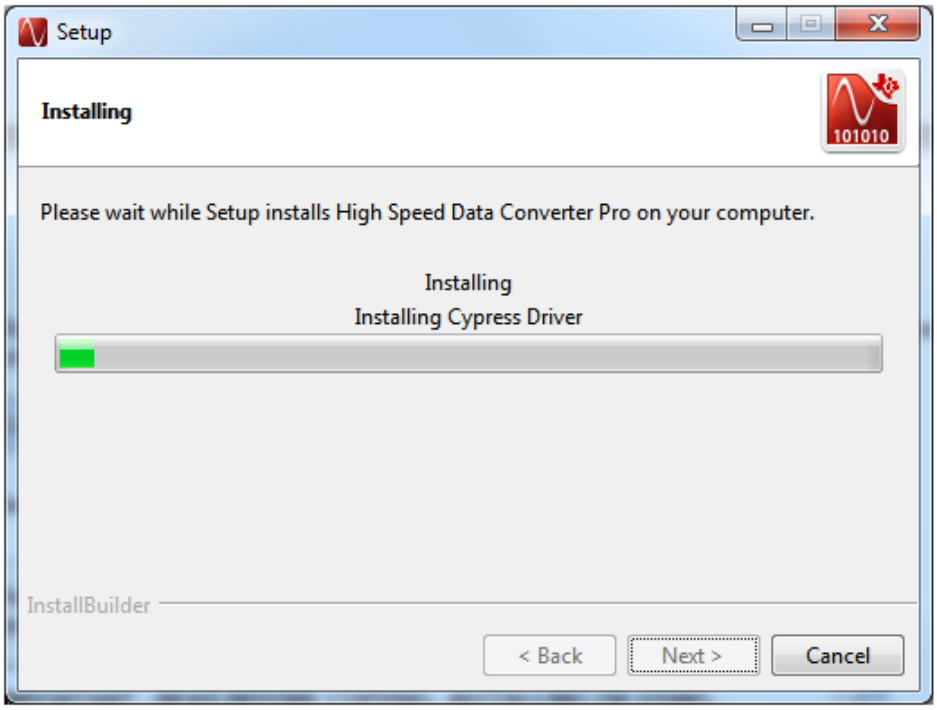


Figure 30. HSDCPro Install (Cypress Driver Install)

8. Click *Finish* to continue installation, as shown in Figure 31.

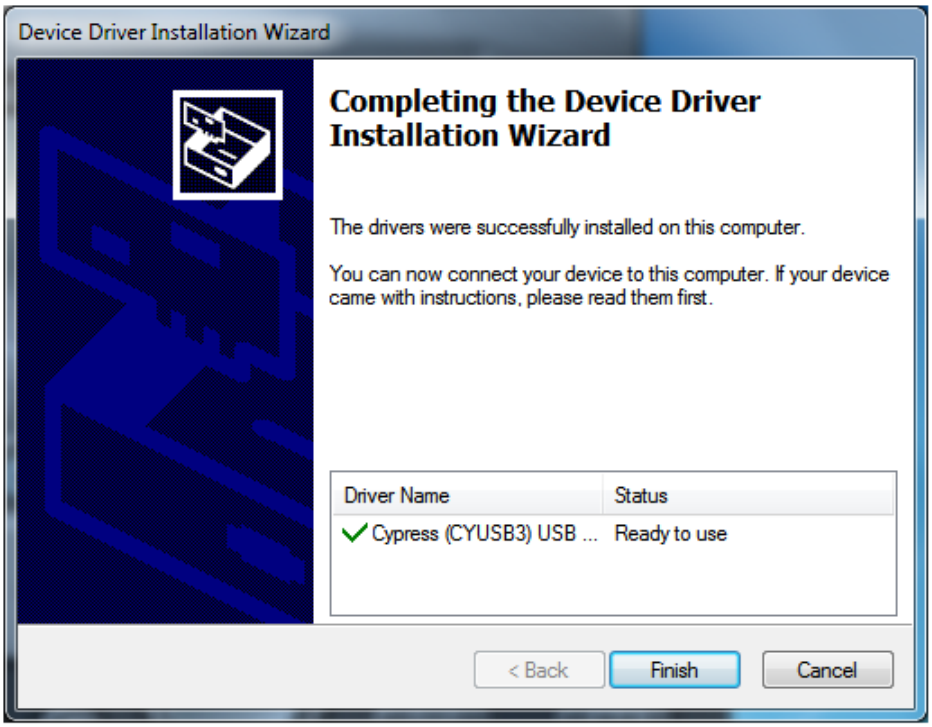


Figure 31. HSDCPro Install (Continue Cypress Driver Installation)

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9. Continue Driver Installation, as in Figure 32.

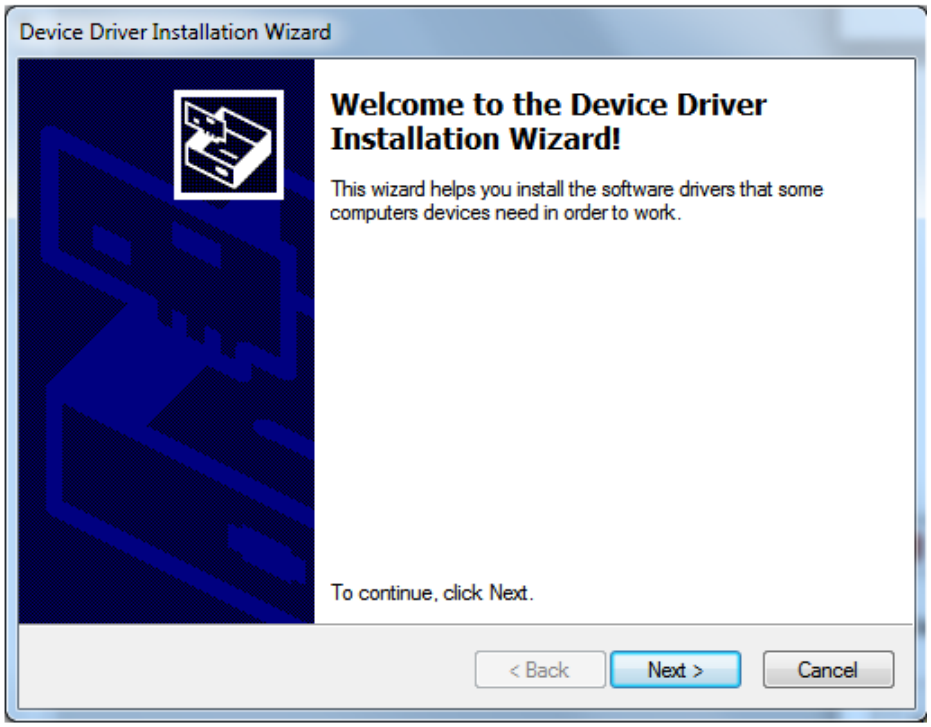


Figure 32. HSDCPro Install (Continue Driver Installation)

10. Finish HSDCPro installation by choosing the installation options and pressing *Finish*, as in Figure 33.

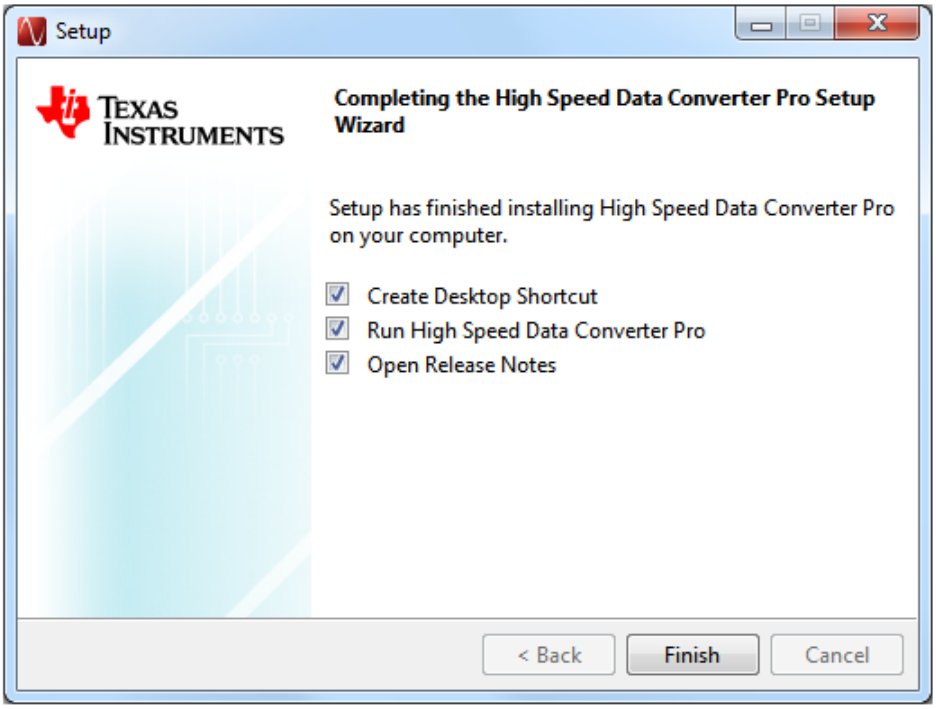


Figure 33. HSDCPro Install (Finish Installation)

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A.2 HMC-DAQ GUI Installation

Check the ti.com product folder for the relevant device, such as http://www.ti.com/tool/AFE5816EVM. Scroll down the page to the *Software* section for the software GUI link.

1. Unzip the saved file and run the installer executable as administrator by right clicking on the file and selecting *Run as Administrator*. Press the *Next* button once the graphic in Figure 34 appears.

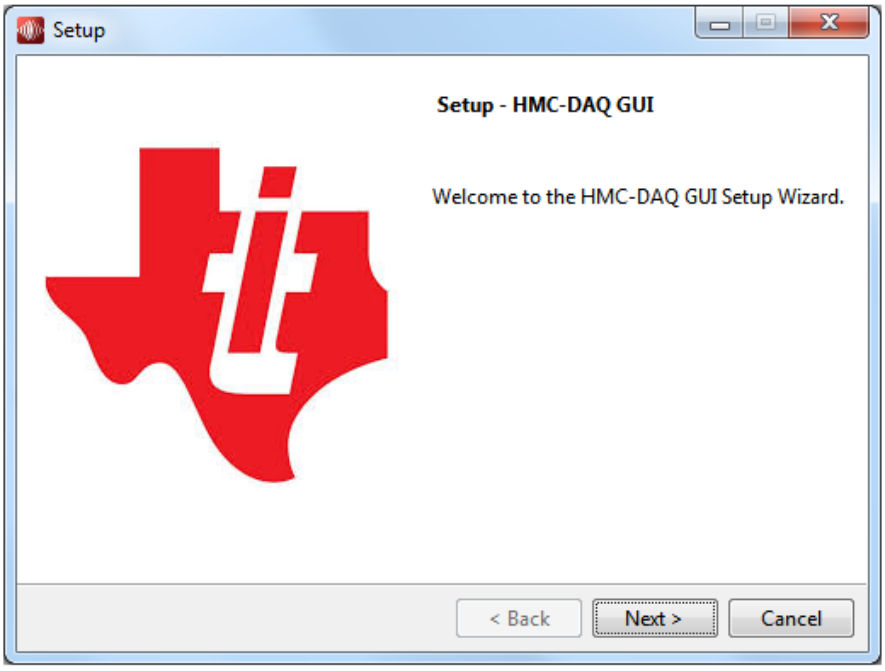


Figure 34. HMC-DAQ GUI Install (Begin Installation)

2. Read the Texas Instruments License Agreement and select *I accept the agreement* followed by the *Next* button, as in Figure 35.

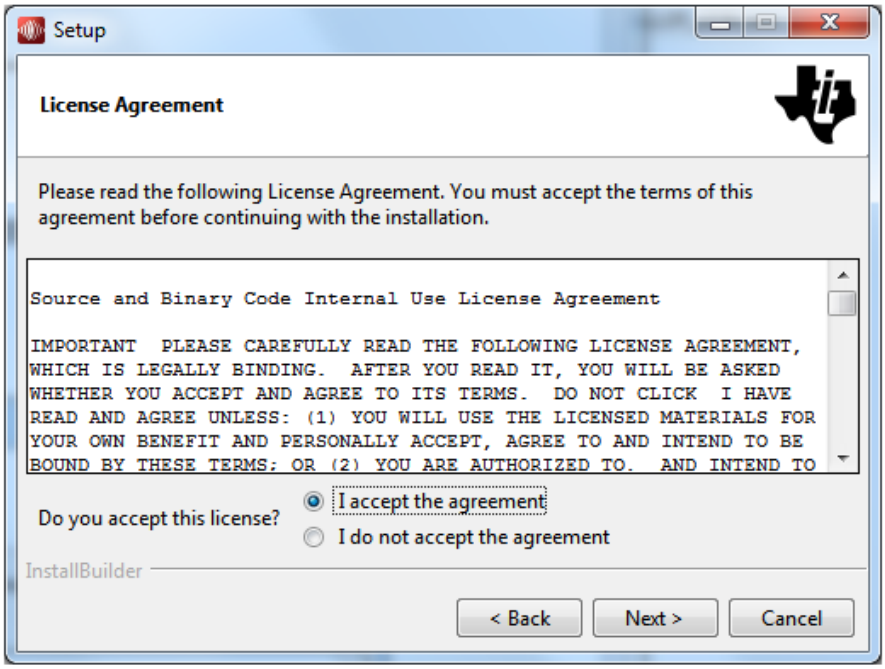


Figure 35. HMC-DAQ GUI Install (TI License Agreement)

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3. Read the National Instruments License Agreement and select I accept the agreement followed by the *Next* button, as in Figure 36.

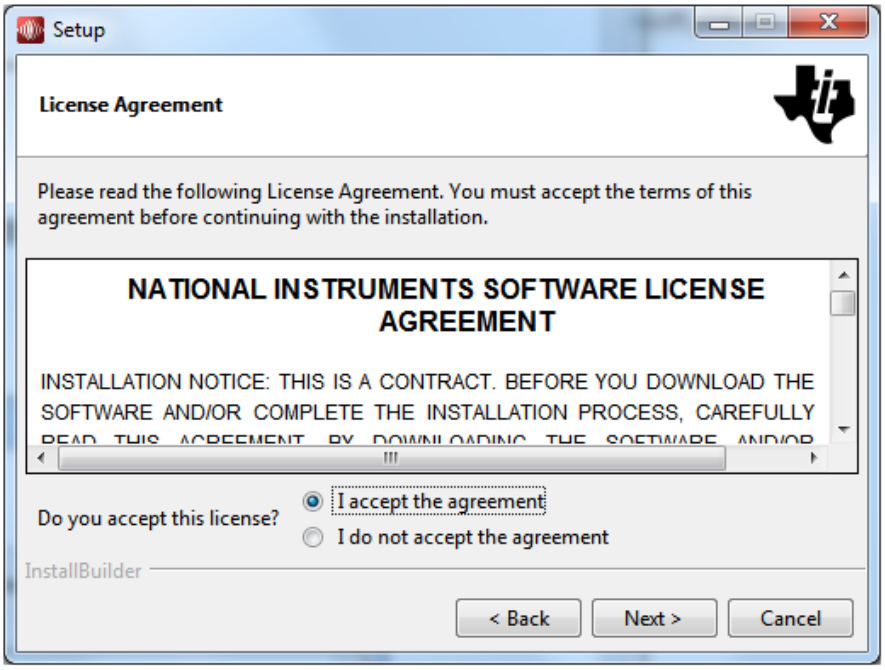


Figure 36. HMC-DAQ GUI Install(NI License Agreement)

4. Allow the software to be installed in the default location by pressing the *Next* button, as in Figure 37.

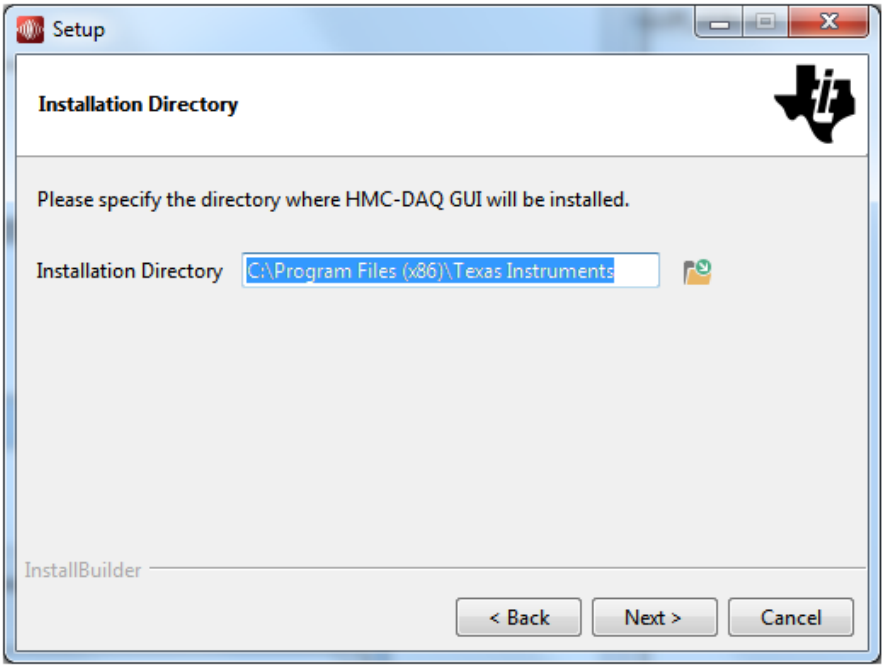


Figure 37. HMC-DAQ GUI Install (Install Directory)

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5. Pressing the *Next* button begins installation, as shown in Figure 38.

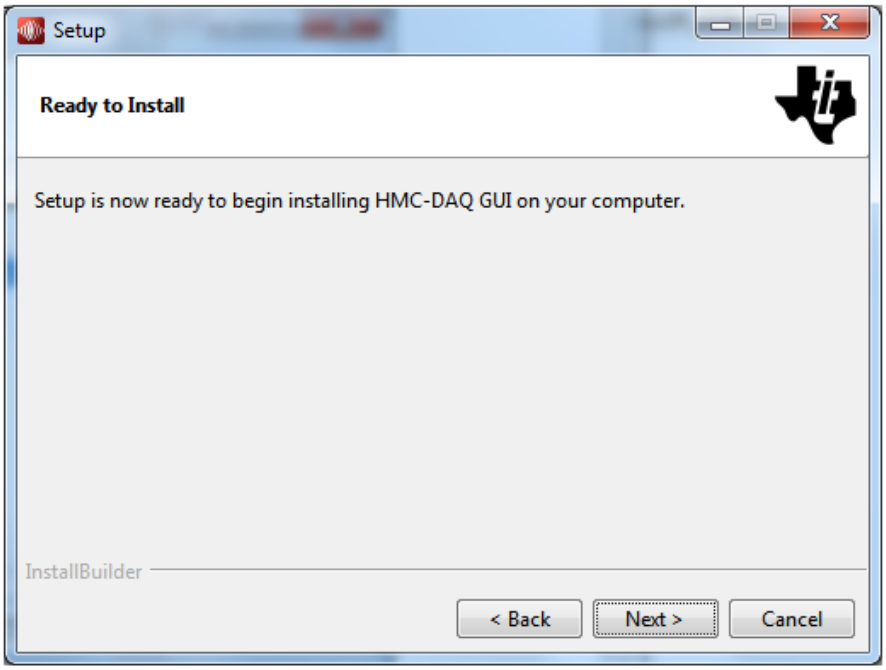


Figure 38. HMC-DAQ GUI Install (Installation Ready)

6. The window shown in Figure 39 appears showing that the installation is in progress.

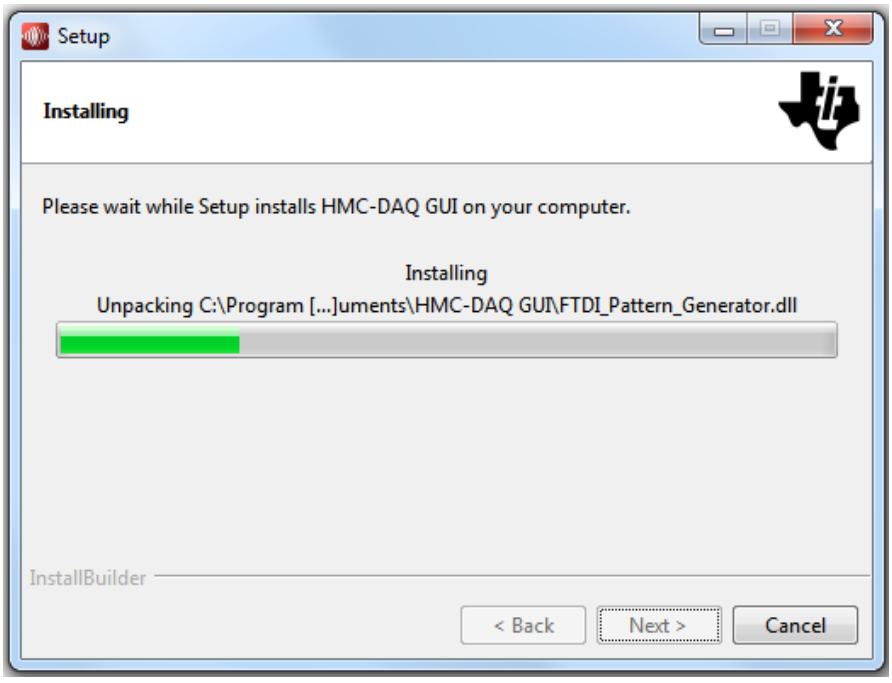


Figure 39. HMC-DAQ GUI Install (Installation Progress)

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7. Press the *Next* button to install the required Labview Run Time Engine, as in Figure 40.



Figure 40. HMC-DAQ GUI Install (LabView Run-time Engine Installation)

8. Press the *Next* button, as in Figure 41.

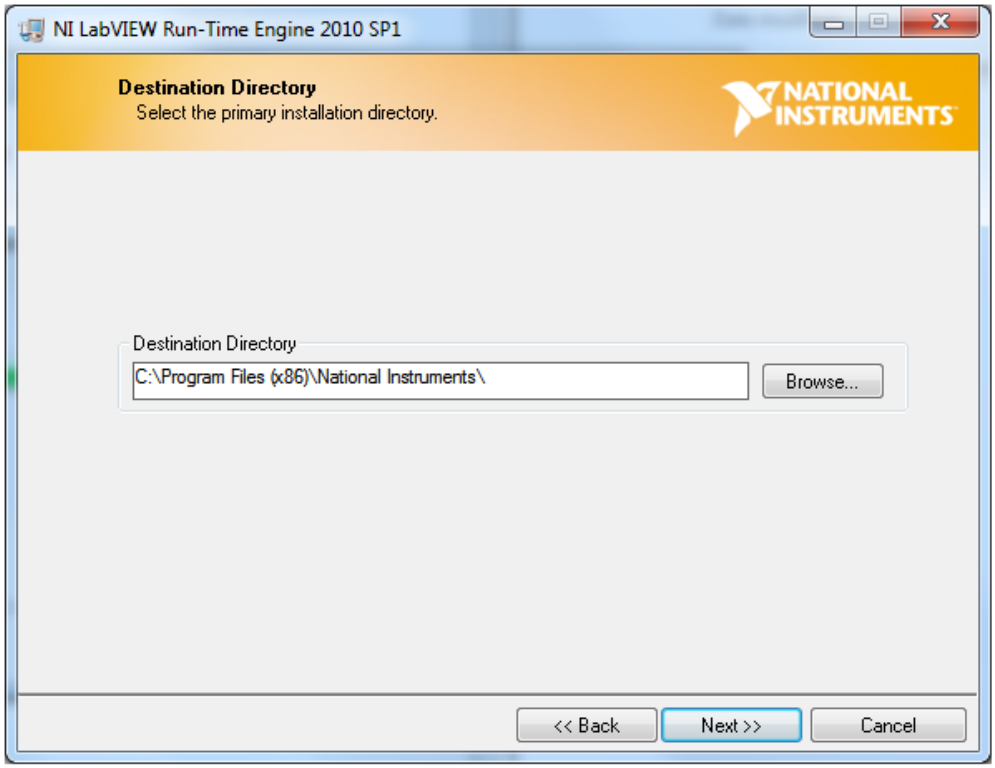


Figure 41. HMC-DAQ GUI Install (LabView Run-time Engine Installation)

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9. Press the *Next* button, as in Figure 42.

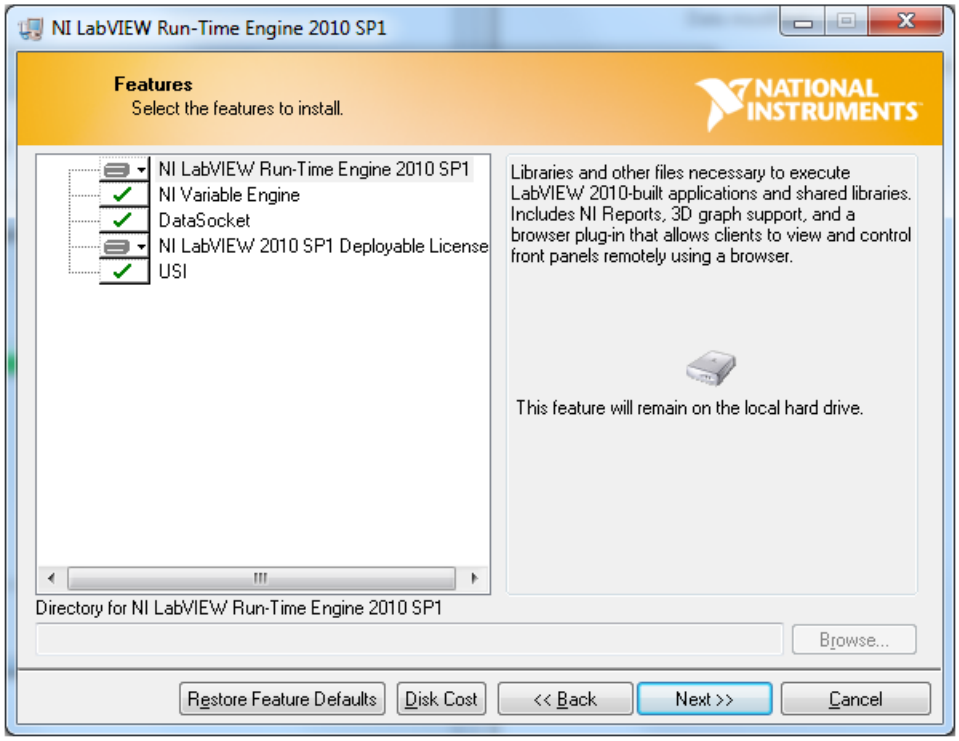


Figure 42. HMC-DAQ GUI Install (LabView Run-time Engine Installation)

10. Press the *Next* button, as in Figure 43.

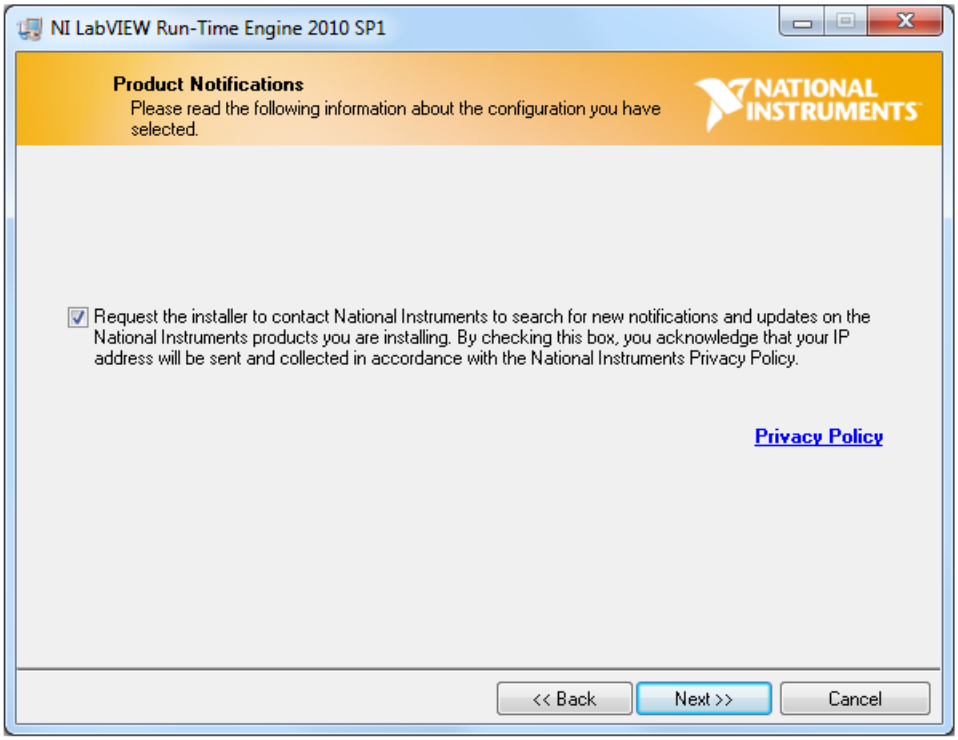


Figure 43. HMC-DAQ GUI Install (LabView Run-time Engine Installation)

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11. Press the *Next* button, as in Figure 44.

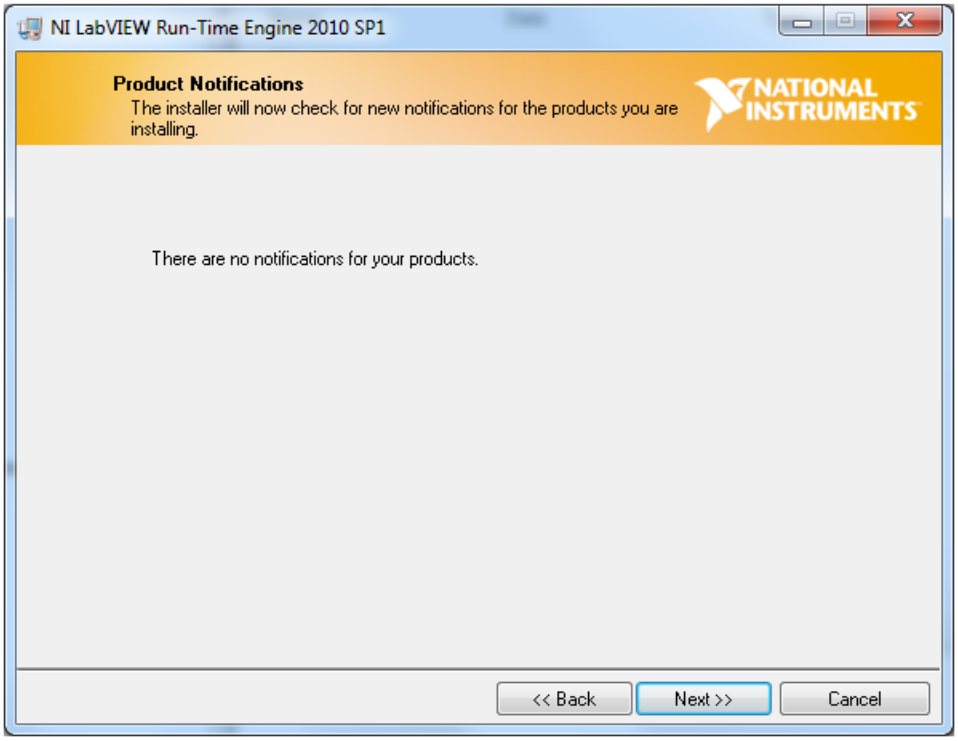


Figure 44. HMC-DAQ GUI Install (LabView Run-time Engine Installation)

12. The run-time engine installs unless it has already been detected as should be the case if the HSDCPro GUI was already installed. In this case, the following message appears. Press the Cancel button, as in Figure 45.

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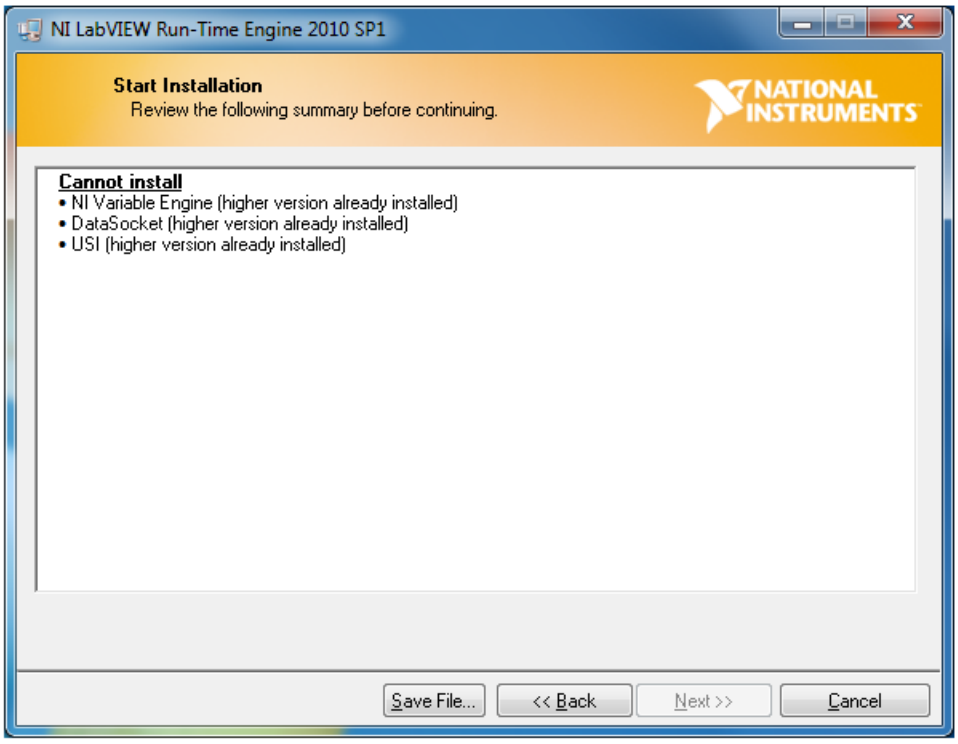


Figure 45. HMC-DAQ GUI Install (LabView Run-time Engine Installation)

13. Press the *Yes* button to confirm, as in Figure 46.

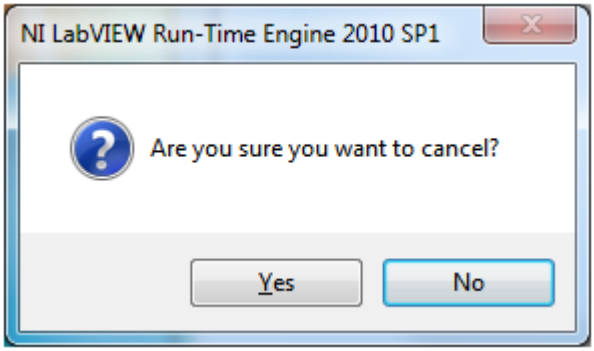


Figure 46. HMC-DAQ GUI Install: (LabView RTE Cancel, if Installed Already)

14. Press the *Finish* button, as in Figure 47.

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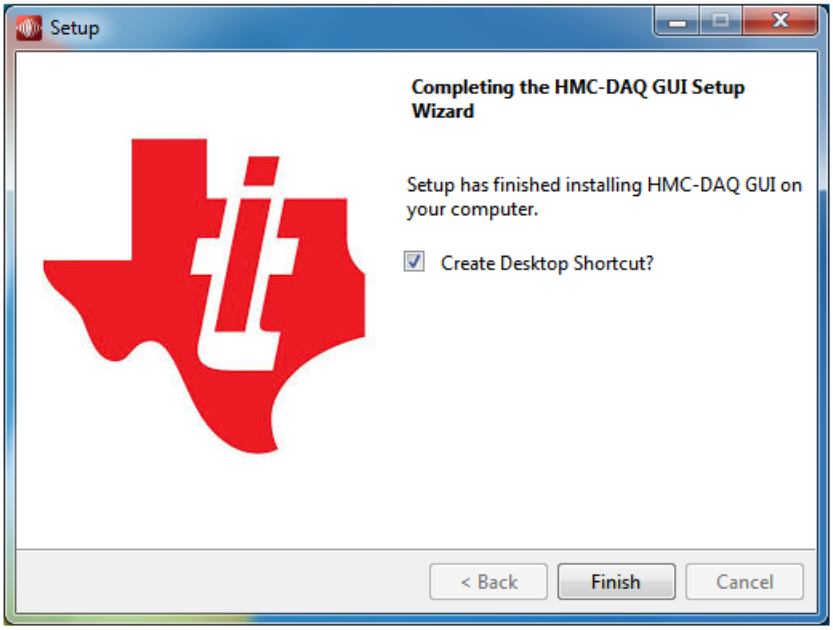


Figure 47. HMC-DAQ GUI Install (Finished)

HMC-DAQ is launched automatically from HSDCPro, once a device has been selected. Therefore, there is no need to launch HMC-DAQ manually and there is no need for a desktop shortcut.

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B.1 EVM Headers, Test Points, and Configuration

This section describes the functions of the headers on the EVM. It also provides a list of test points on the EVM that are useful for debug and general-use purposes.

B.1.1 EVM Header Configuration

The AFE5816 EVM is flexible in its configurability through the use of 2- and 3-pin headers. The default configuration of the EVM is set to facilitate initial testing, requiring minimal bench equipment. Figure 48 shows the default positions of all headers.

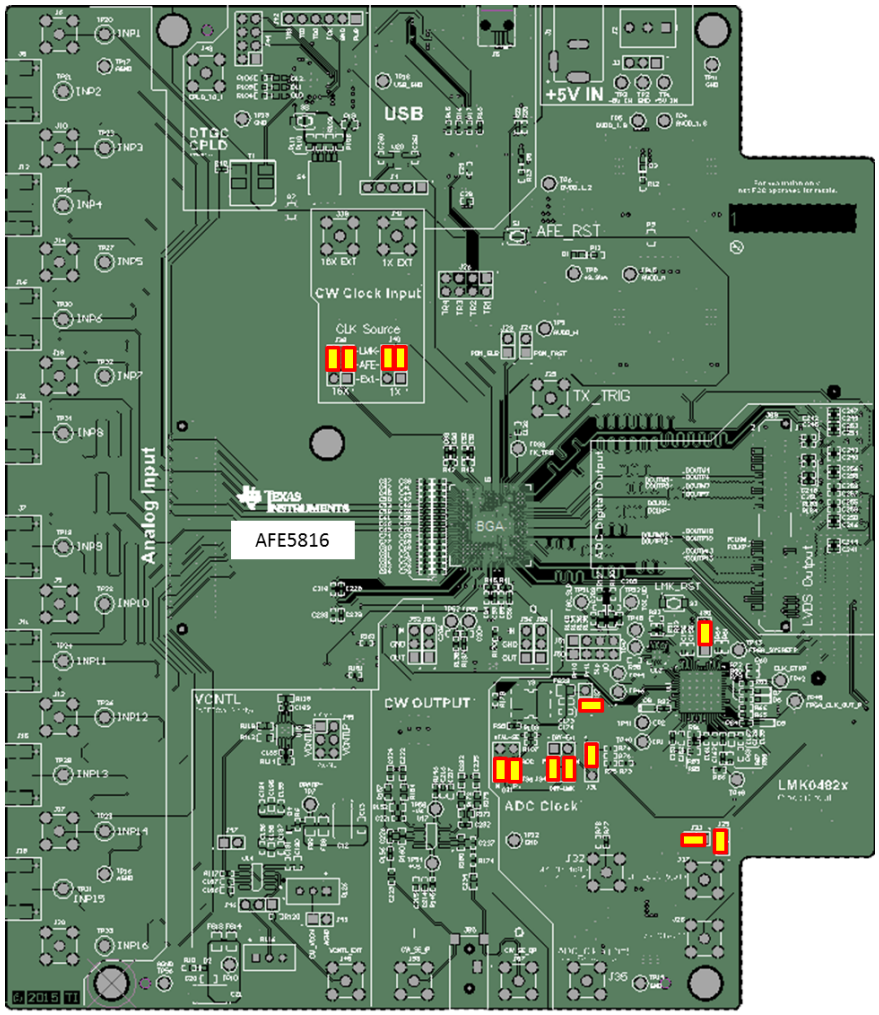


Figure 48. Default Jumper Positions

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Table 1 lists the default header configurations and descriptions.

Table 1. Default Header Configuration Table Rev.C

Jumper	Circuit	Description	Pin Numbers	Selection
J3	Power Supply	±5V Input Power Connector	-	-
J4	USB/SPI	SPI Signals Probe Point	–	–
J23	PDN	PDN_Global	–	–
J24	PDN	PDN_Fast	–	–
J37	ADC Clock	OSC1 Xtal Power supply +3.3VD	1-2	3.3V
J36	ADC Clock	Clk source selector for SE Xtal or Diff	2-4,1-3	Differential
J34	ADC Clock	Diff CLK Source selector, Ext Xfmr or LMK	3-5, 4-6	LMK CLK
J38	CW CLK	16x CLK Source Selector	1-2	Ext
J40	CW CLK	1x CLK Source Selector	1-2	Ext
J50	DTGC	DTGC Digital Input Signals	–	–
J51	DTGC	GND for Dig Input Signals	–	–
J42	DTGC	CPLD JTAG Programming Header	–	–
J44	DTGC	CPLD GPIO	–	–
J30	LMK	LMK Chip Reset	–	–
J29	LMK	LMK Supply for 125M Xtal	–	–
J33	LMK	PS for 100 MHz VCO	1-2	3.3V
J31	LMK	Input Clk selector for Clkin1 (xtal/J32 SMA)	1-2	125 MHz Xtal
J45	Vcnt	VCntl AFE pin selector, GND or Amp	2-3	Amp
J46	Vcnt	Vcntl Amp voltage source, pot or SMA	2-3	Pot
J47	Vcnt	SE-to-Diff Amp Bypass	1-2	Bypassed
J49	Vcnt	Vcntl Amp CM voltage to GND	–	–
J26	LNA TR Enable	TR_EN 1-4	–	–
J52/54	CW Output	CW In-phase Output M/P	–	–
J56/58	CW Output	CW Quadrature-phase Output M/P	–	–

B.1.2 EVM Testpoints

Table 2 lists all test points on the AFE5816 EVM and their purposes.

Table 2. EVM Rev.C Testpoints

Testpoint	Circuit	Label	Testpoint Description
TP2,11–14	GND	GND	Digital Ground Reference for EVM
TP16,17,56	GND	AGND	Analog Ground Reference for EVM
TP18	GND	USB_GND	USB Ground Reference for EVM
TP1	Power Supply	+5V_IN	+5V_IN
TP3	Power Supply	-5V_IN	-5V supply for Op-Amp circuitry
TP4	Power Supply	AVDD_1.8	AFE +1.8V analog supply
TP5	Power Supply	DVDD_1.8	AFE +1.8V digital supply
TP6	Power Supply	DVDD_1.2	AFE +1.2V digital supply
TP7	Power Supply	OPAMP-	-5V Supply for Vcntl circuit
TP8	Power Supply	+3.3VA	+3.3VA
TP9	Power Supply	AVDD_H	AFE analog supply for 5V or 3.3V
TP10	Power Supply	None	+5V Supply for Op Amp circuitry
TP15	Power Supply	AVDD_M	AFE analog supply for 1.9V or 3.3V
TP36	Power Supply	+Vs	+5V Supply for CW Op Amp circuitry
TP37	Power Supply	–Vs	-5V Supply for CW Op Amp circuitry
TP19–34	Analog Inputs	INPx	Analog Input Channel 1-16
TP39	DEMOD	TX_TRG	TX_Trig input
TP52	DTGC	None	Ext TGC_Profile2 Input
TP50	DTGC	None	Ext TGC_Profile1 Input

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Table 2. EVM Rev.C Testpoints (continued)

Testpoint	Circuit	Label	Testpoint Description
TP51	DTGC	TGC_SLP	Ext TGC_Slope
TP35	DTGC	TGC_UD	Ext TGC_Up/Down
TP40,41	LMK Clock Circuit	CP1,CP2	LMK Output CP1,CP2
TP42	LMK Clock Circuit	CLK_GTXP	LMK GTX CLK to FPGA P
TP43	LMK Clock Circuit	FPGA_SYSREF P	LMK SYSREF CLK to FPGA P
TP44,46	LMK Clock Circuit	None	LMK ADC Clock to Dut P/N
TP45,47	LMK Clock Circuit	None	LMK SYSREF Clock to Dut P/N
TP48	LMK Clock Circuit	FPGA_CLK_OUT _P	LMK ADC CLK to FPGA P
TP49	LMK Clock Circuit	None	LMK VCXO output

B.1.3 ADC Clock Source Configuration

The AFE clock input can be driven differentially (sine wave, LVPECL, or LVDS) or single-ended (LVCMOS). The clock input of the device has an internal buffer and clock amplifier which is enabled or disabled automatically, depending on the type of clock provided (auto detect feature). Therefore, the EVM allows for two options of clock input for LVDS mode (S-E and Differential), and two options of clock input for JESD204B mode (Differential).

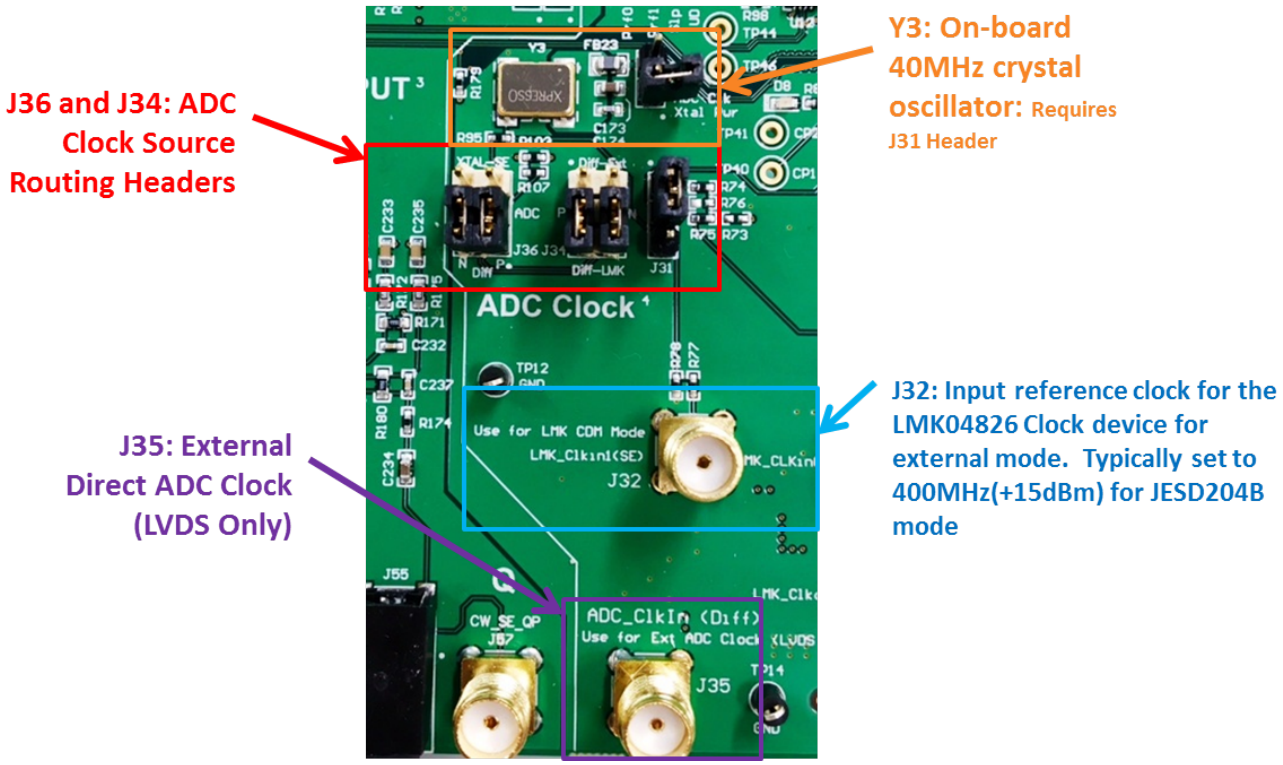


Figure 49. EVM ADC Clock Source Configuration

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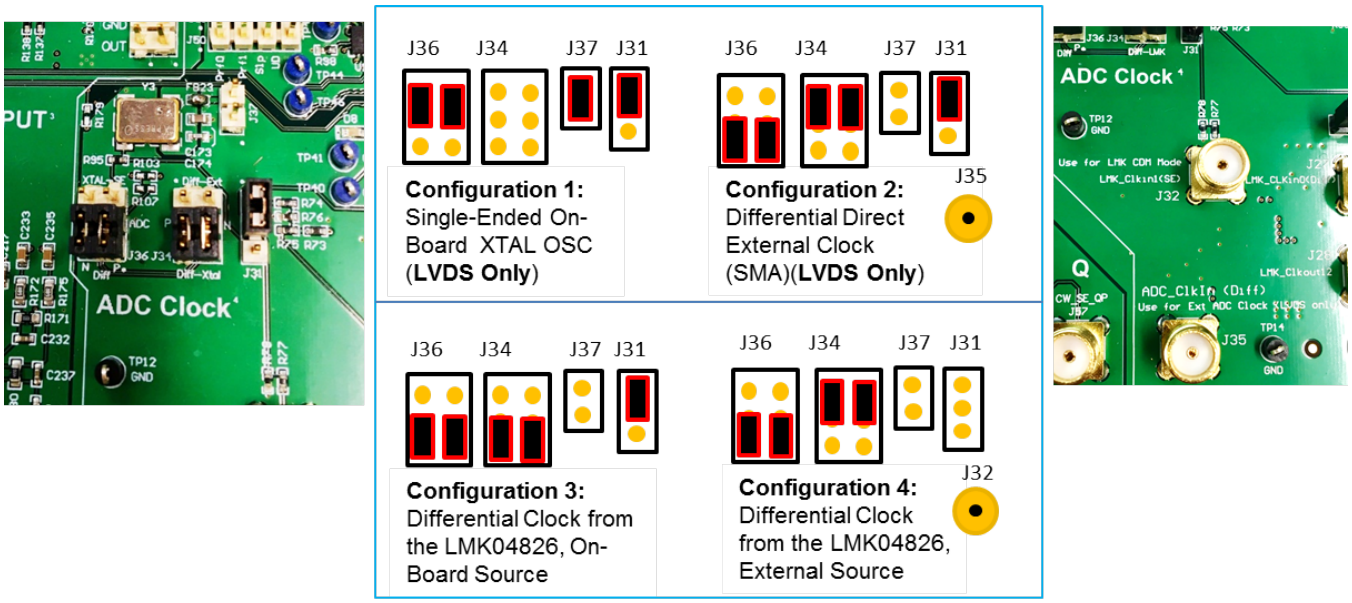


Figure 50. EVM ADC Clock Source Configuration Examples

Configuration 1 (LVDS Only): To use the on-board single-ended crystal oscillator as the clock source for the AFE, connect shunt jumpers for configuration 1 (as seen in Figure 50). Use this configuration for LVDS Data output only, not JESD204B. Note: J37 powers the on-board oscillator with 3.3 V, due to the power limitations of the VCC1-3B3-40M0000 low-jitter crystal oscillator. The recommended ADC clock input for new designs is to use low-jitter square signals (LVCMOS levels, 1.8-V amplitude.)

Configuration 2 (LVDS Only): To use the differential direct external clock as the clock source for the AFE, connect shunt jumpers for configuration 2. Use this configuration for LVDS Data output only, not JESD204B. Also, connect a single-ended external clock generator to SMA J35. Set the clock source to an appropriate frequency, such as 10 MHz to 80 MHz, and +15-dBm amplitude.

Configuration 3 (Default): This mode uses an on-board crystal to stimulate the LMK04826 in Dual-PLL mode. To use the differential outputs from the LMK04826 as the clock source for the AFE, connect shunt jumpers for configuration 3. Ensure that jumper J29 is installed.

Configuration 4: This mode uses an external generator at J32 to stimulate the LMK04826 in Clock Distribution mode. To use the differential outputs from the LMK04826 as the clock source for the AFE, connect shunt jumpers for configuration 4. Also, connect an external clock generator to J32. Set the clock source to 400 MHz, and +15-dBm amplitude. Consult a TI engineer to use this mode.

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Software Trigger

One method of triggering the TSW EVM, AFE EVM as well as other bench equipment such as function generators is to generate the trigger from the TSW EVM itself. This requires a feedback loop from the TSW trigger output to the TSW trigger input using a short SMA cable. Secondly, a second trigger output from the TSW board can be routed to the AFE EVM, if needed, or to external bench equipment such as a function generator. See the TSW or HSDCPro manual for more information.

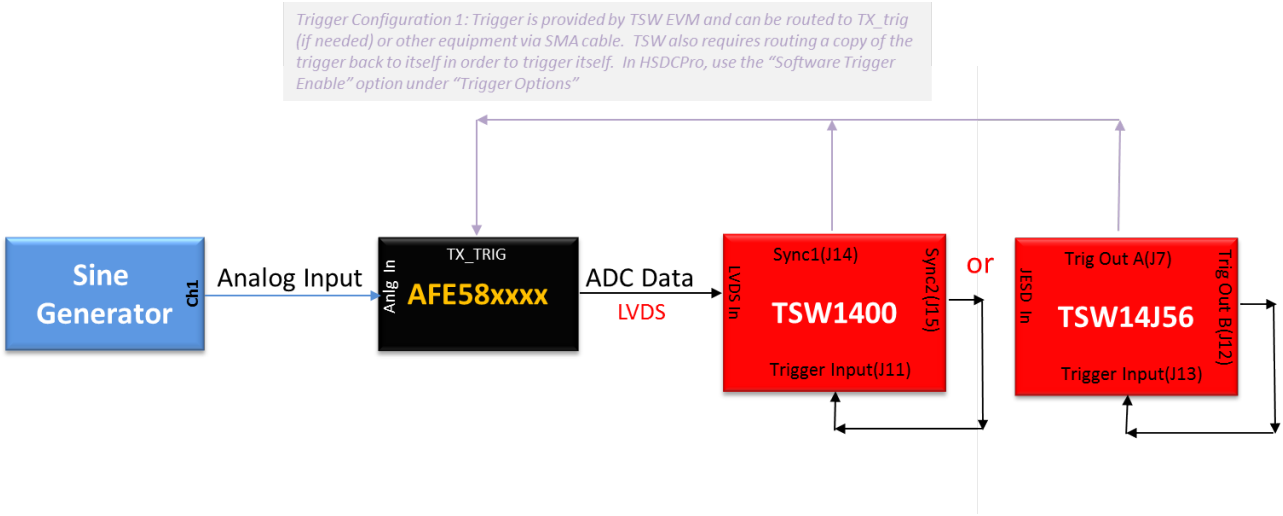


Figure 51. HSDCPro Trigger Configuration for SW

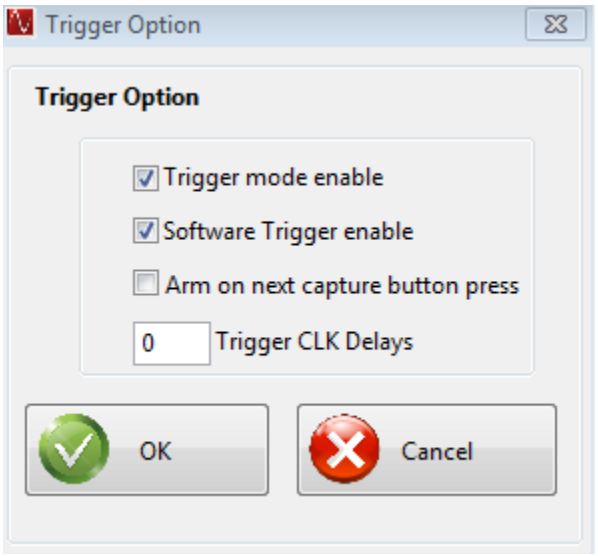


Figure 52. HSDCPro Trigger Configuration for SW trigger

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External Trigger

Another method of triggering the TSW EVM and AFE EVM as well as other bench equipment such as function generators is to generate the trigger from a bench trigger source such as the function generator. This requires feeding the trigger source to the TSW trigger input using an SMA cable. Secondly, a second trigger output from the trigger source can be routed to the AFE EVM, if needed. See the TSW or HSDCPro manual for more information.

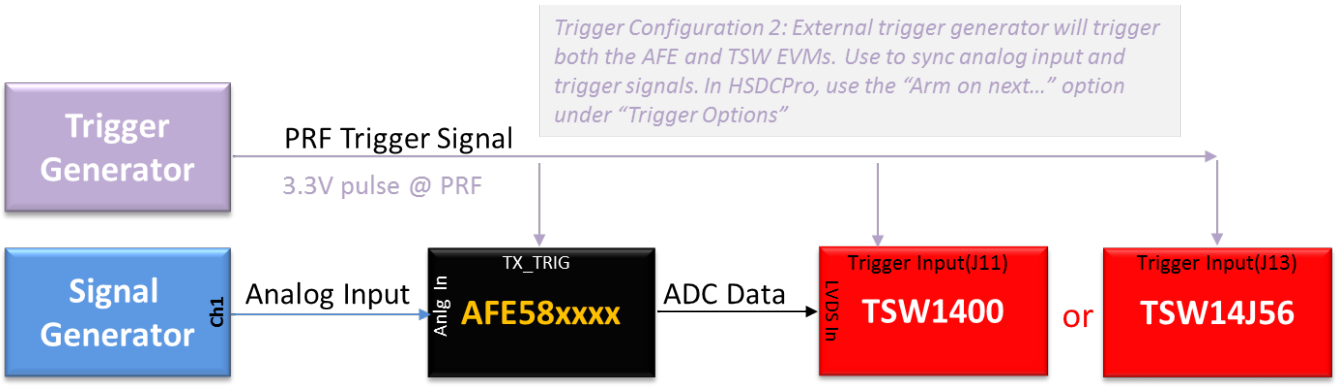


Figure 53. HSDCPro Trigger Configuration for HW

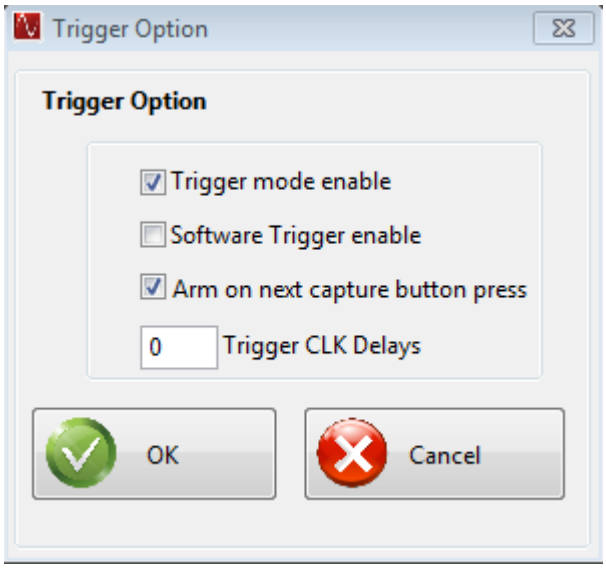


Figure 54. HSDCPro Trigger Configuration for HW External Trigger

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Common Hardware Modifications

Low Frequency Support

For low-frequency applications, such as SONAR, that require bandwidth below 200 kHz, the default assembly of the EVM results in attenuation in this range, and the EVM requires hardware modification. Simply change all INP and INM capacitors on the LNA inputs to 1 µF (0402). Also, set the internal HPF in the AFE to the lowest setting. This should support a bandwidth as low 50 kHz, or lower.

External SPI Programming

The AFE EVM allows for external access to the SPI bus for the AFE only, not the LMK device. This is done by connecting SPI signals at J4 and removing R22 near U9 on the bottom side of the board.

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E.1 AFE5816 EVM Hardware Overview

The following images give an overview illustration of the EVM hardware.

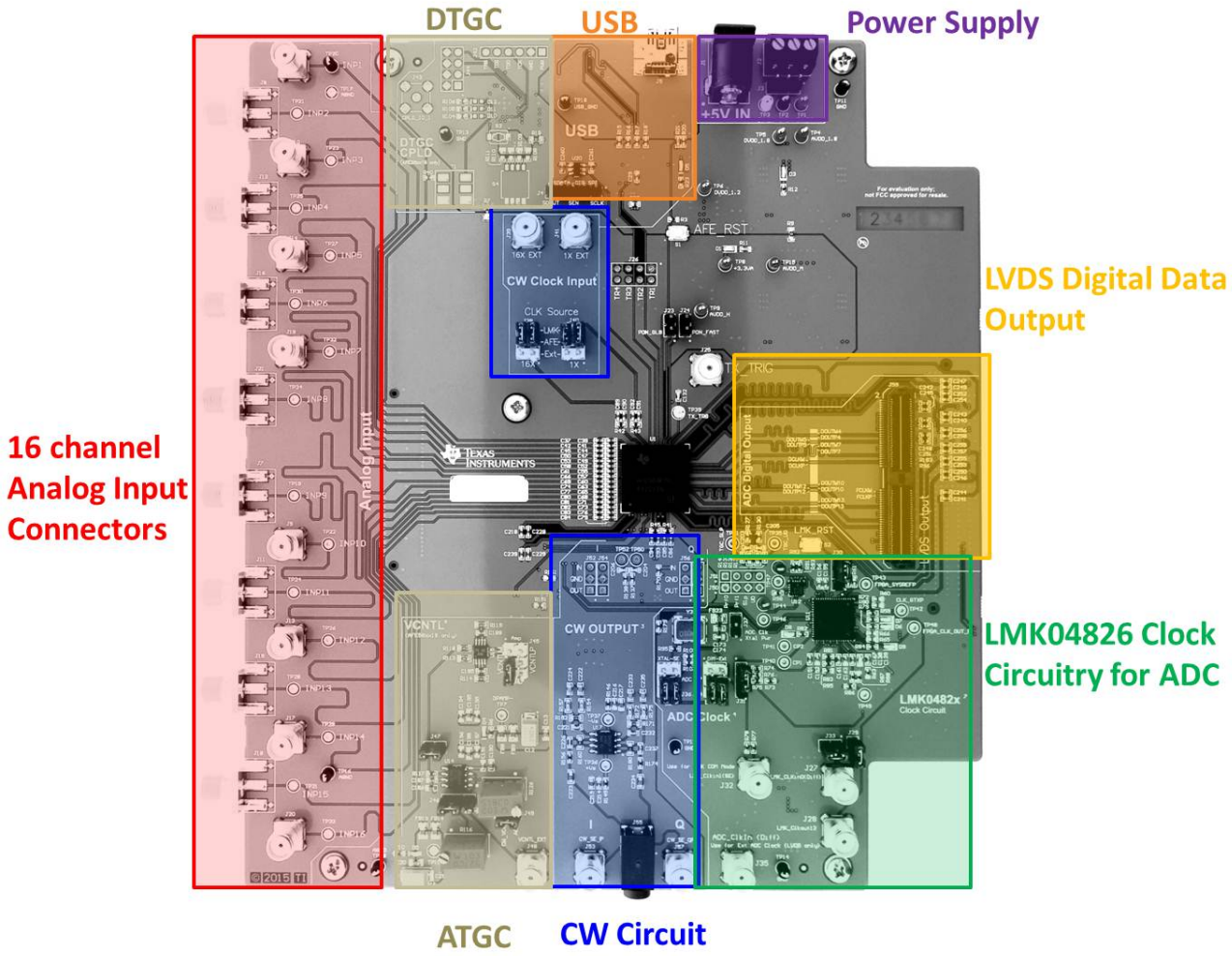


Figure 55. AFE5816 EVM Circuits Map

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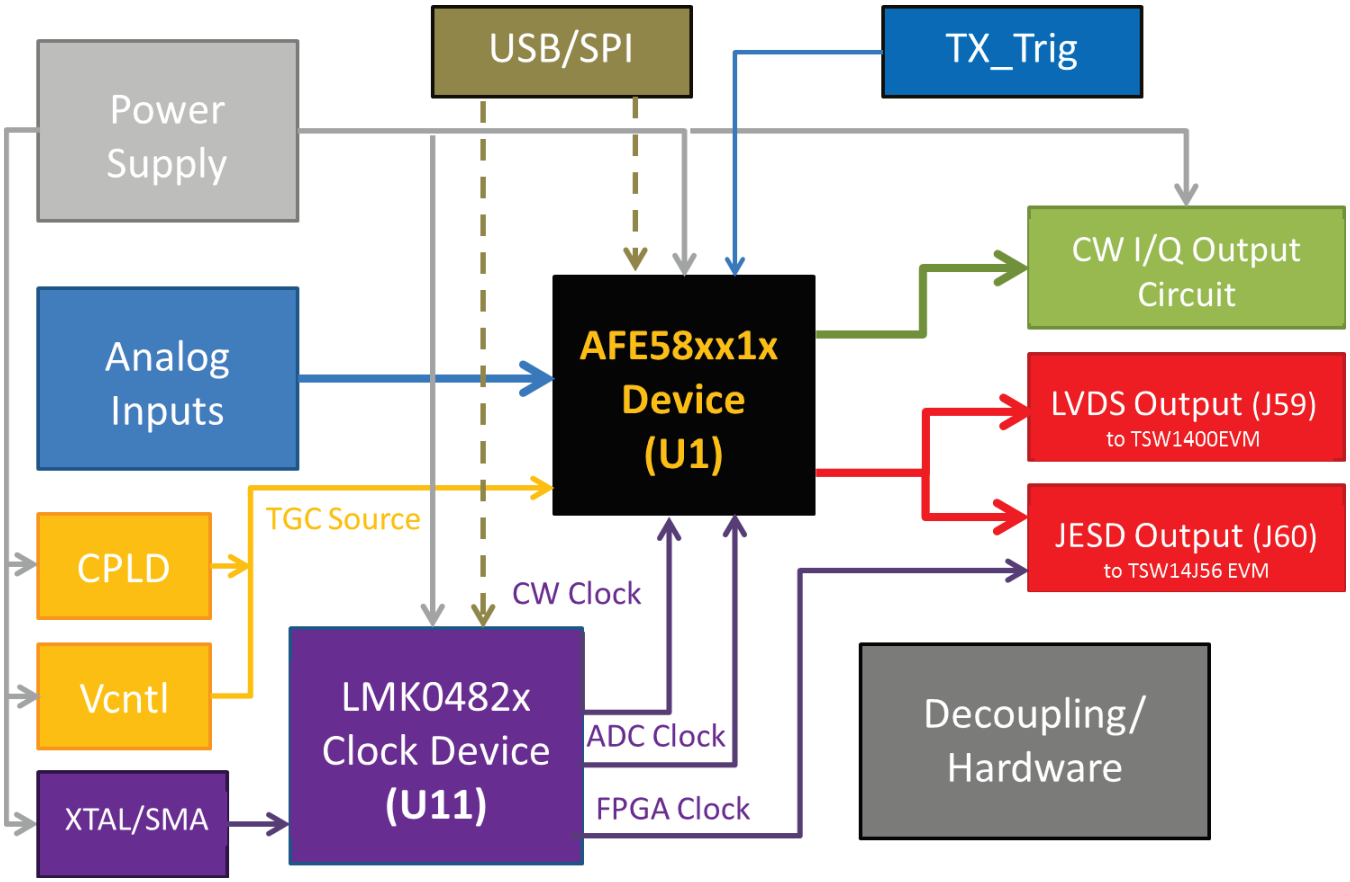


Figure 56. AFE5816 EVM Block Diagram

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E.2 AFE5816 EVM Schematic

Figure 57 through Figure 69 illustrate the EVM schematics.

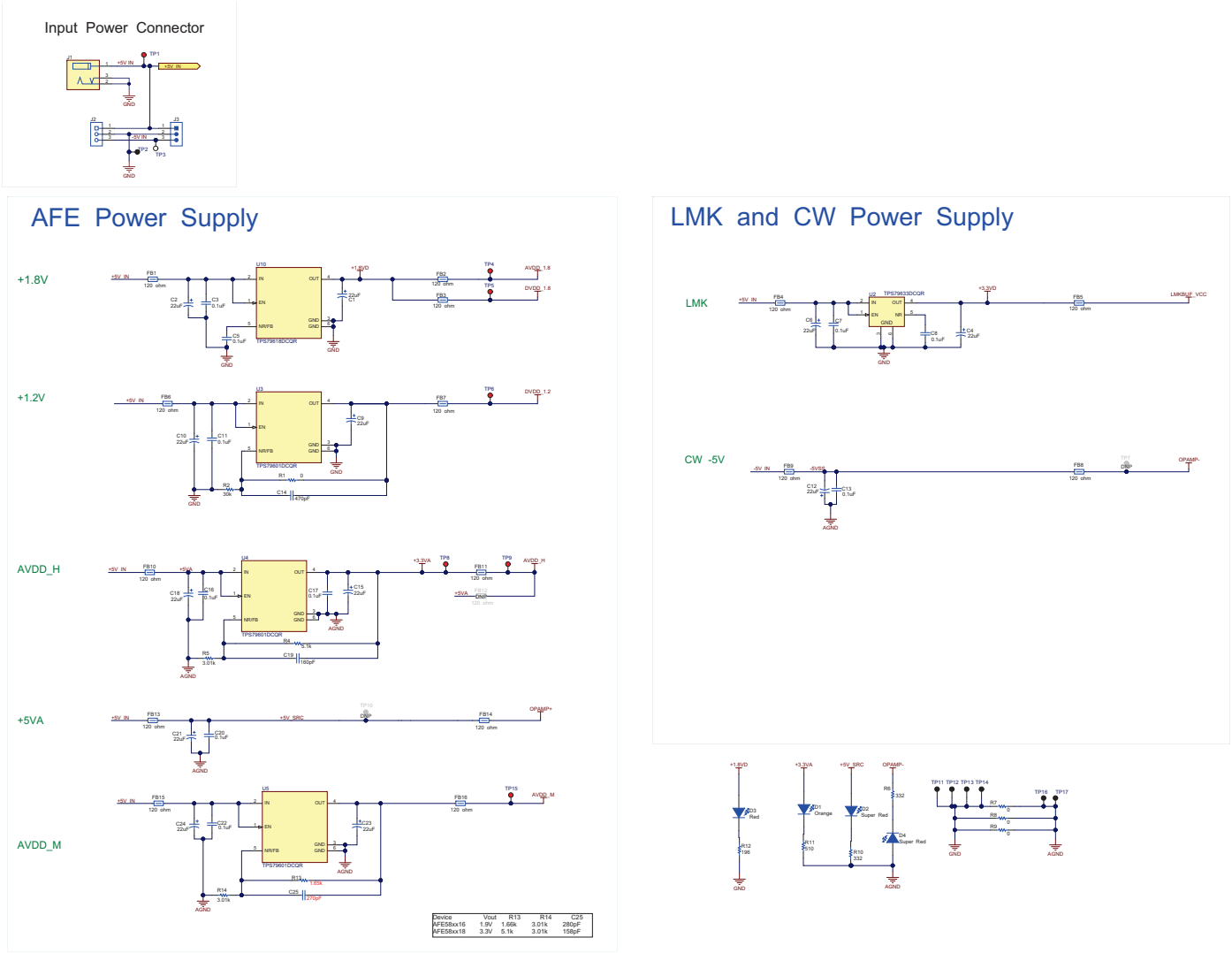


Figure 57. AFE5816 Rev C EVM Schematic

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USB

USB Connector and FTDI Port

Digital Isolator

Level Translator

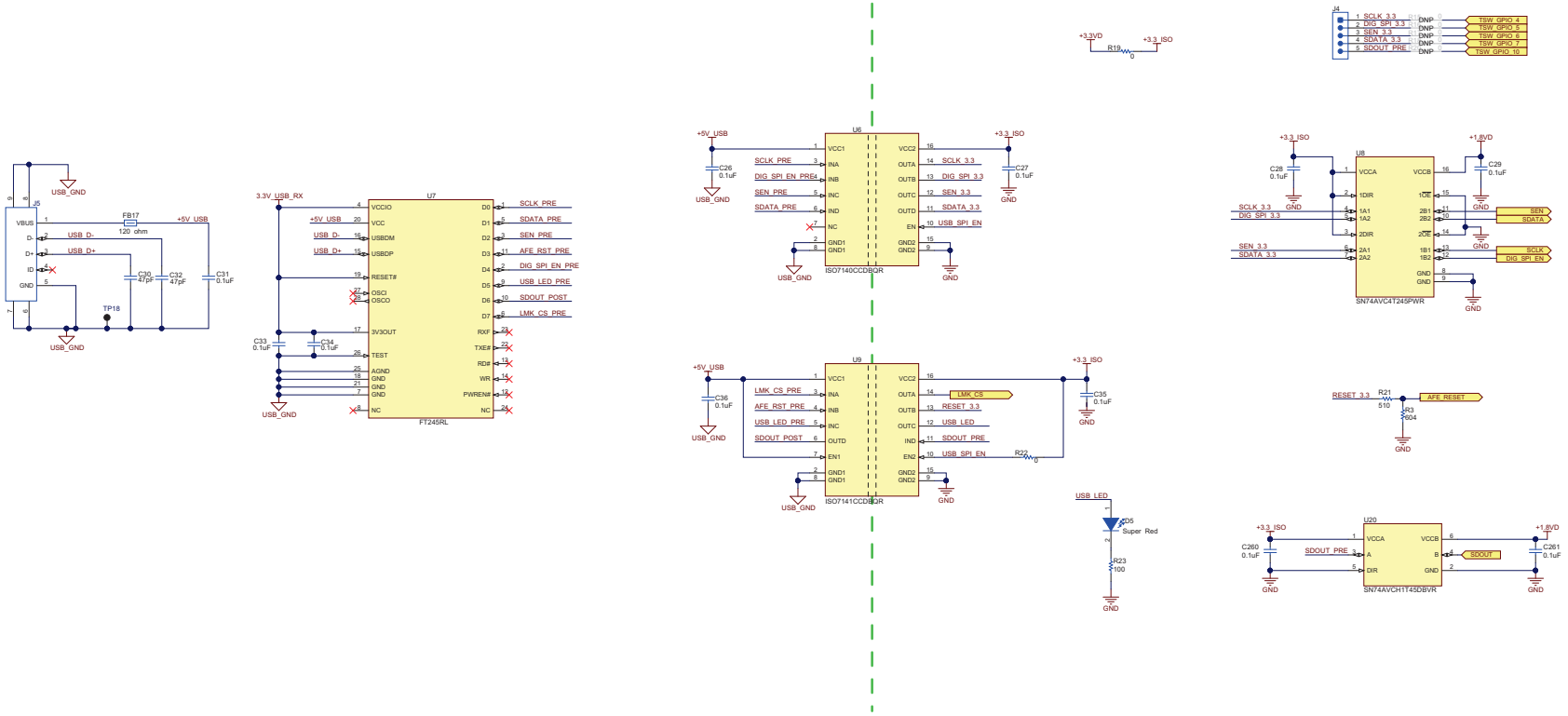


Figure 58. AFE5816 Rev C EVM Schematic

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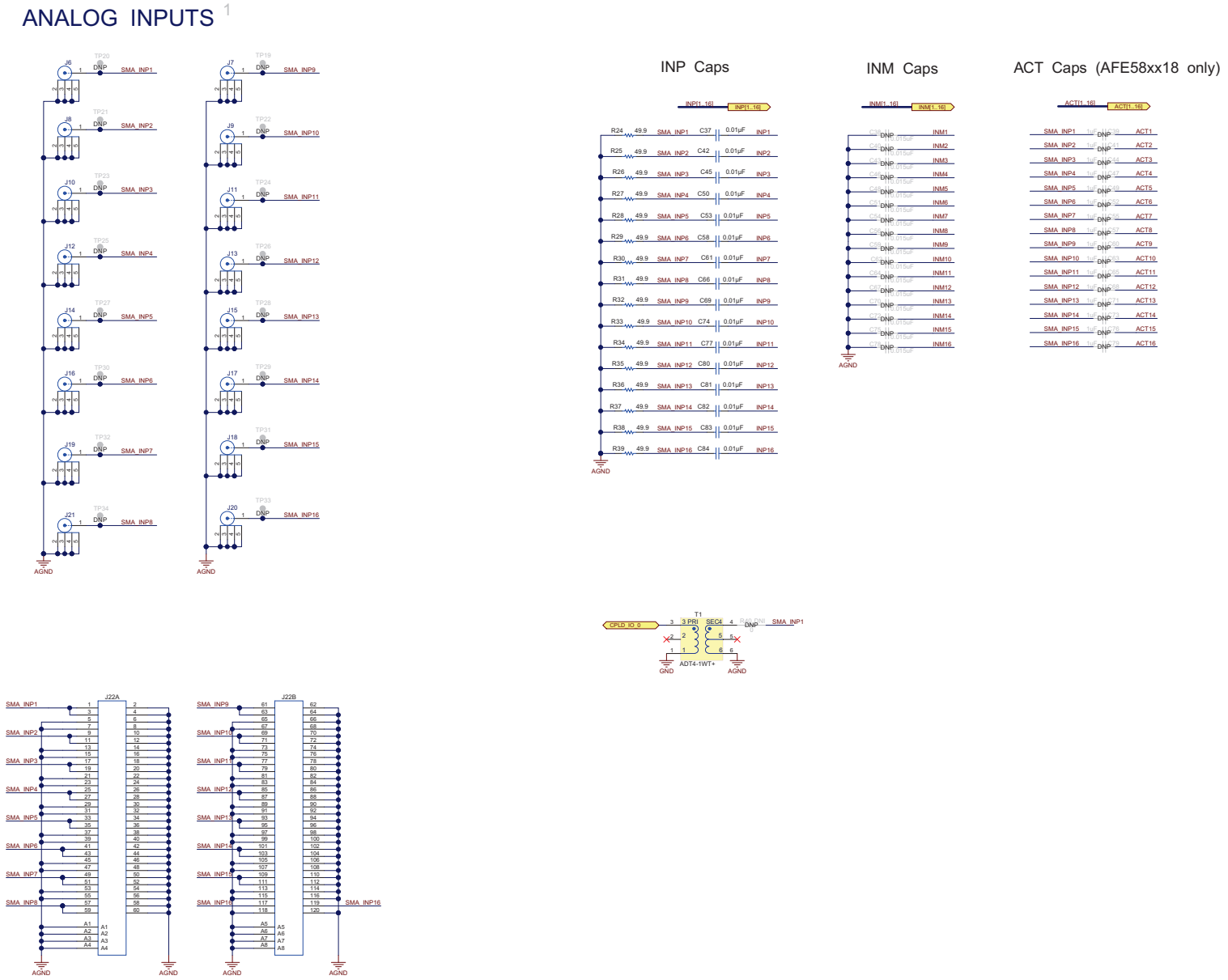
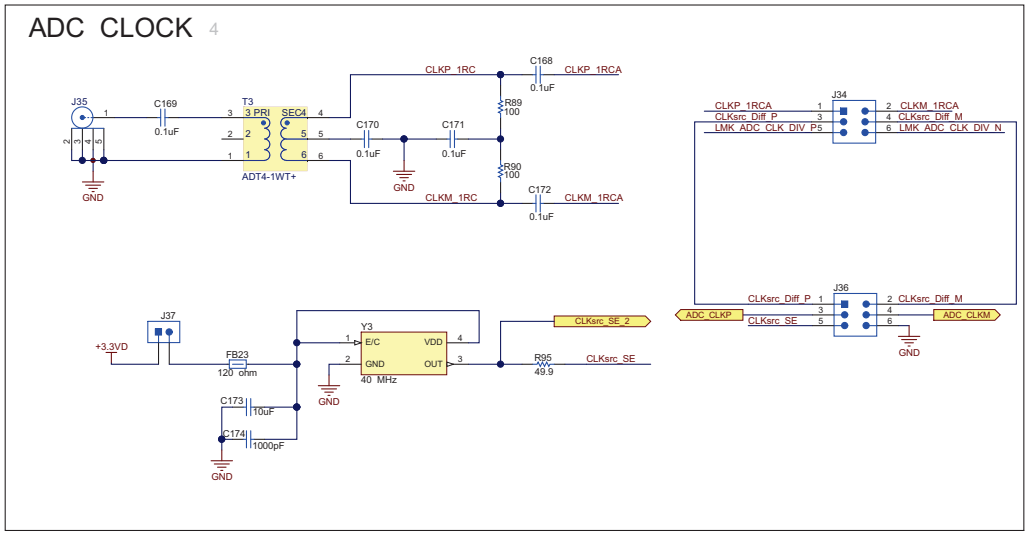
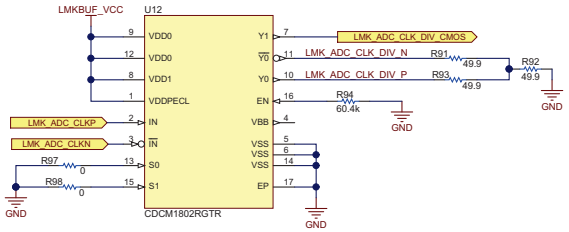


Figure 59. AFE5816 Rev C EVM Schematic

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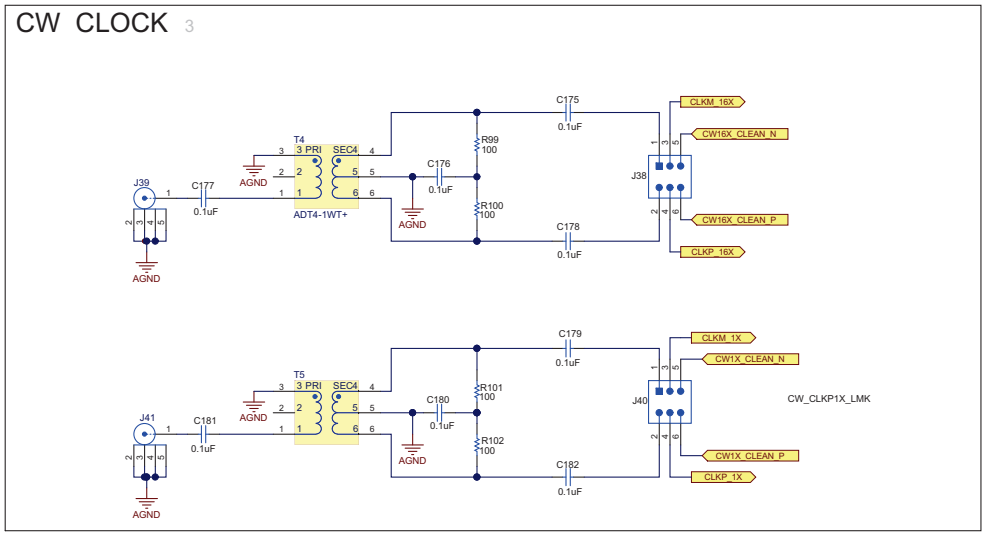


Figure 60. AFE5816 Rev C EVM Schematic

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LMK0482x

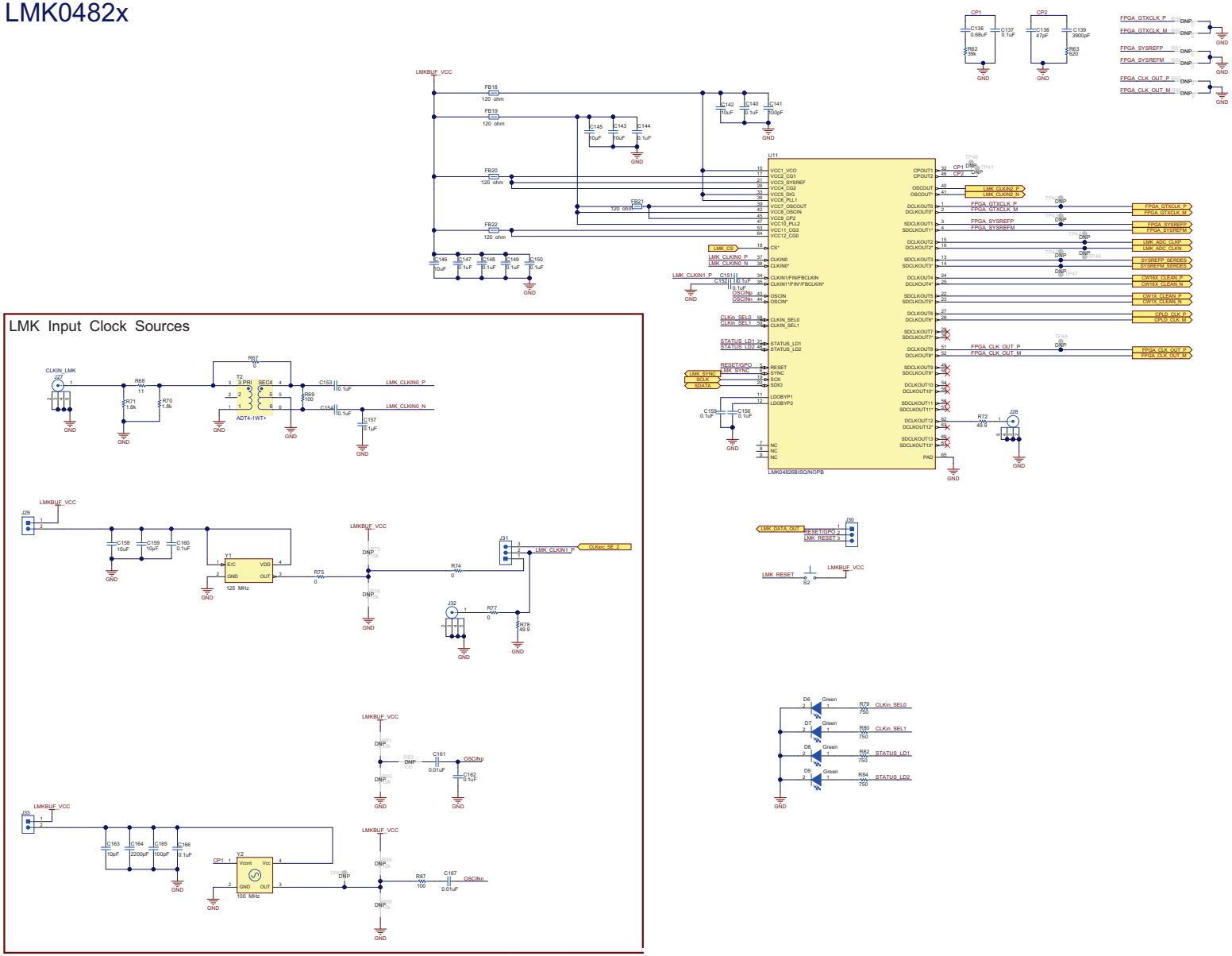


Figure 61. AFE5816 Rev C EVM Schematic

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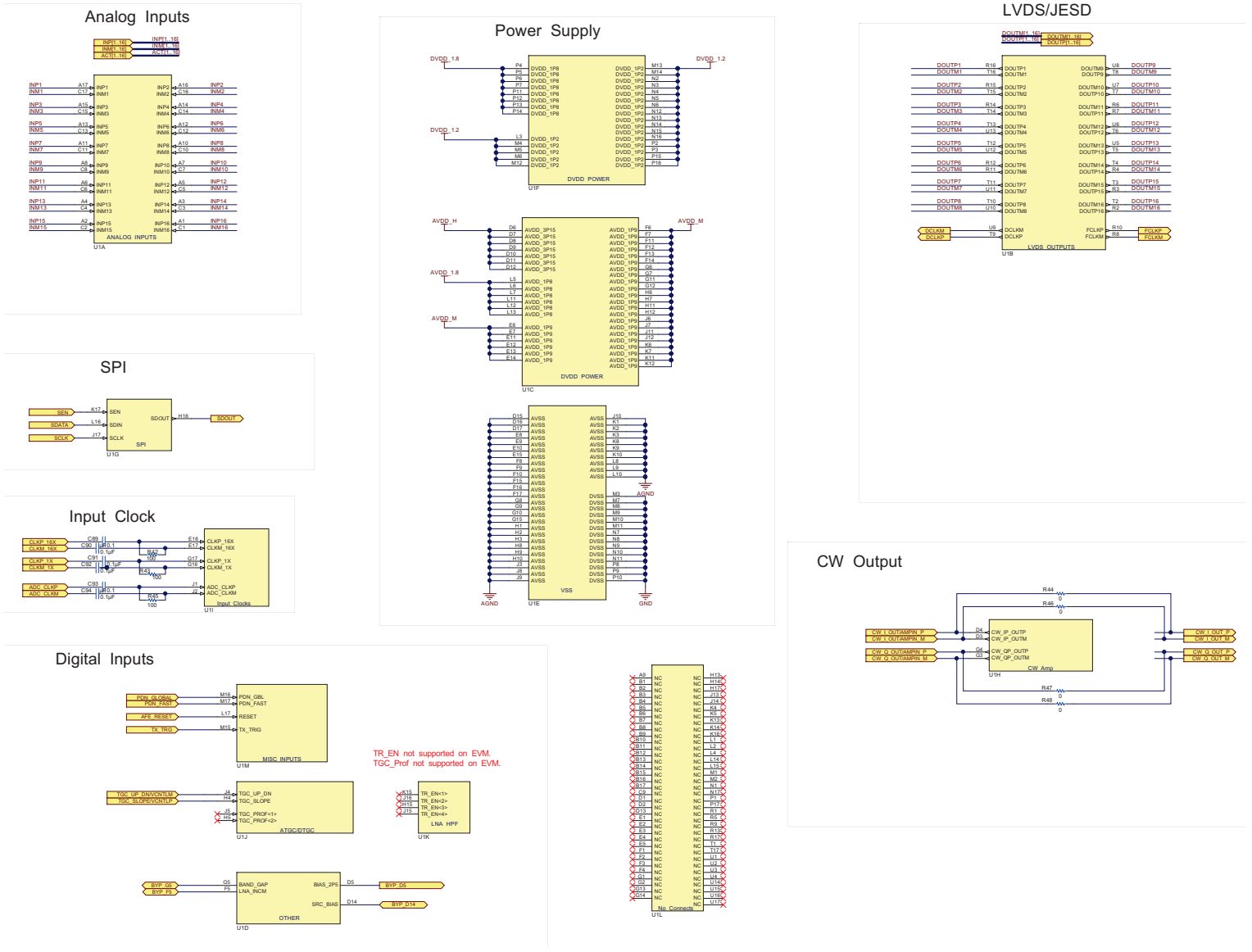


Figure 62. AFE5816 Rev C EVM Schematic

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ADC LVDS OUTPUT

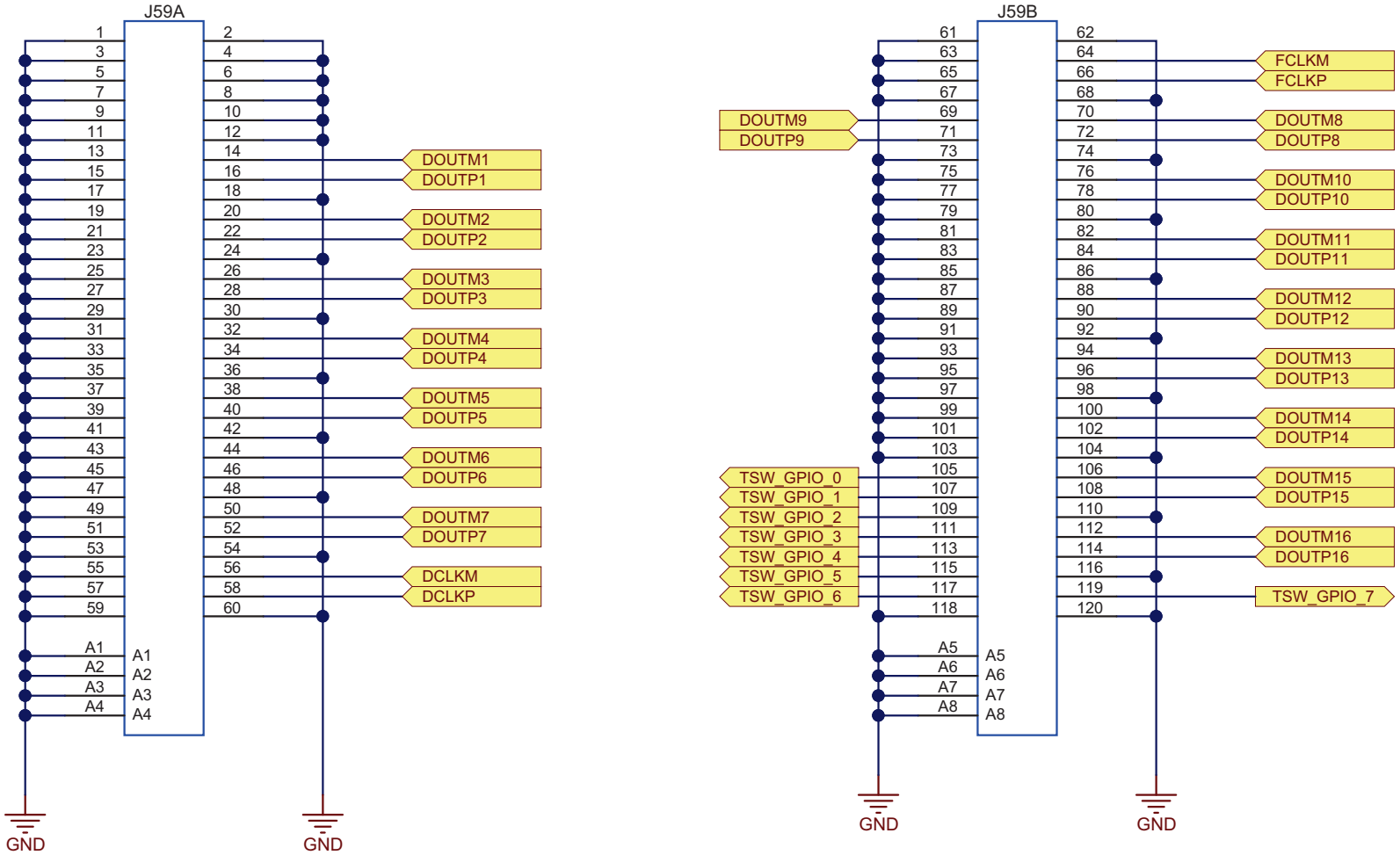


Figure 63. AFE5816 Rev C EVM Schematic

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CW I/V OUTPUT

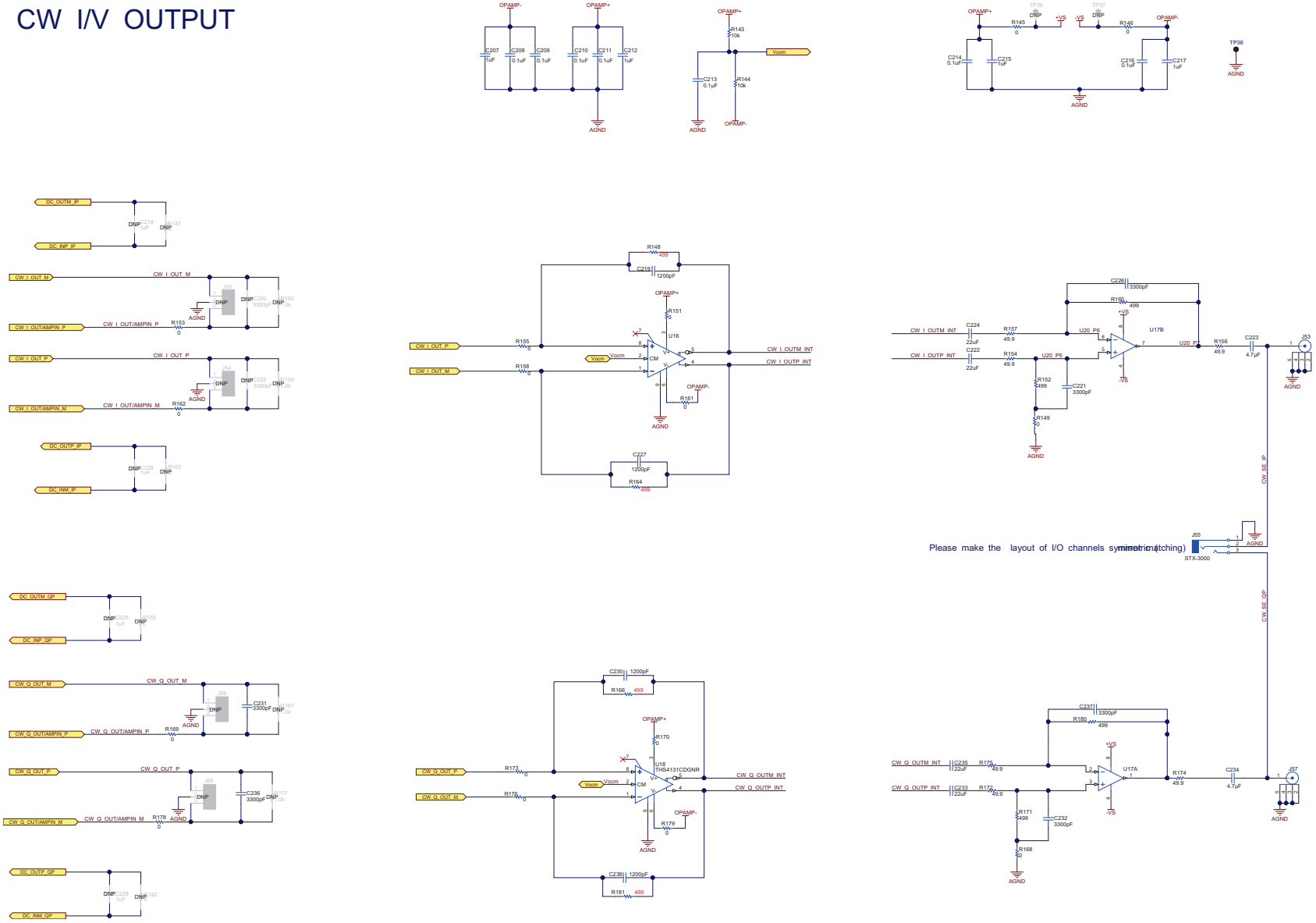


Figure 64. AFE5816 Rev C EVM Schematic

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DTGC CPLD (AFE58JD16 Only)

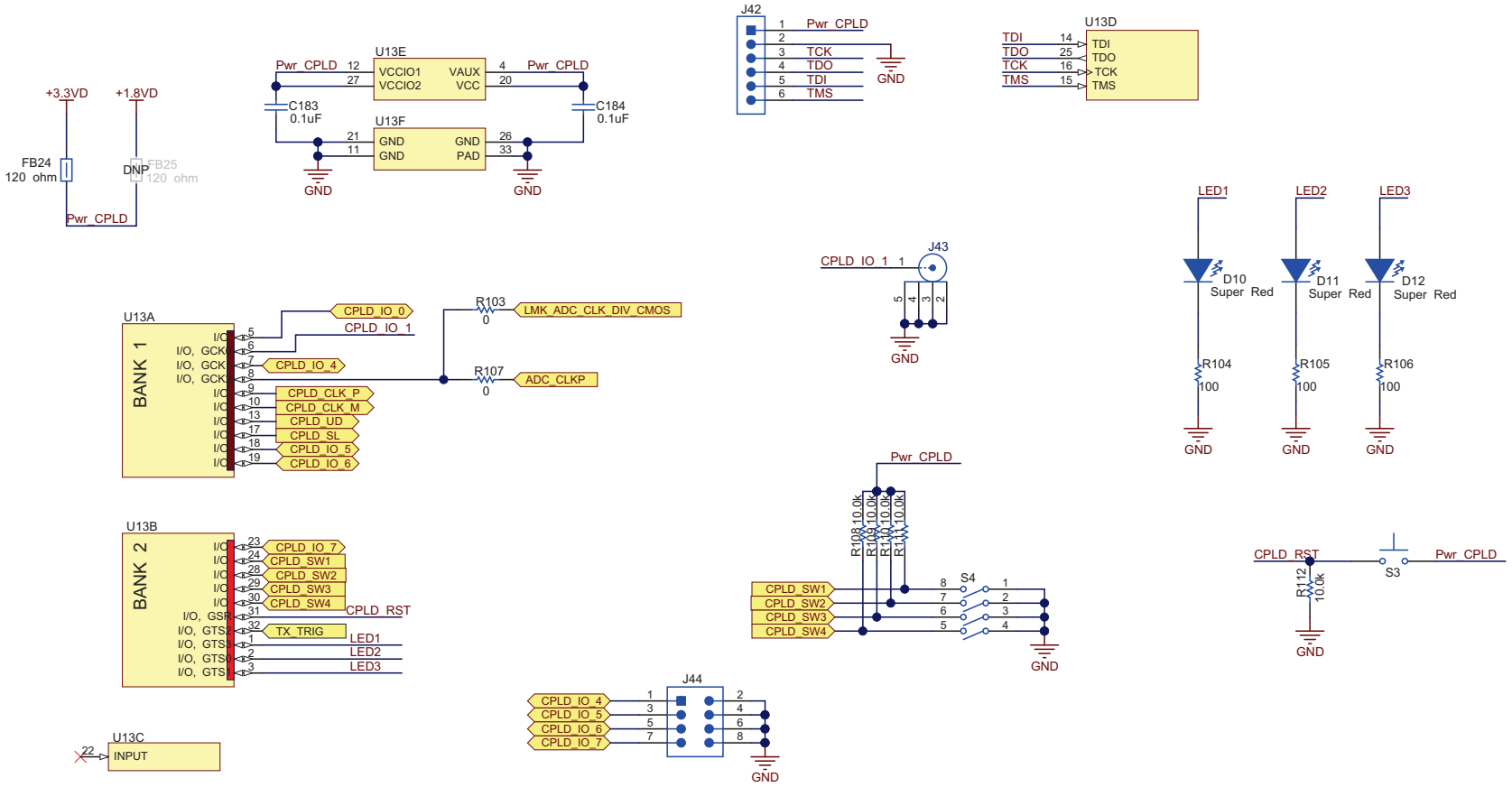


Figure 65. AFE5816 Rev C EVM Schematic

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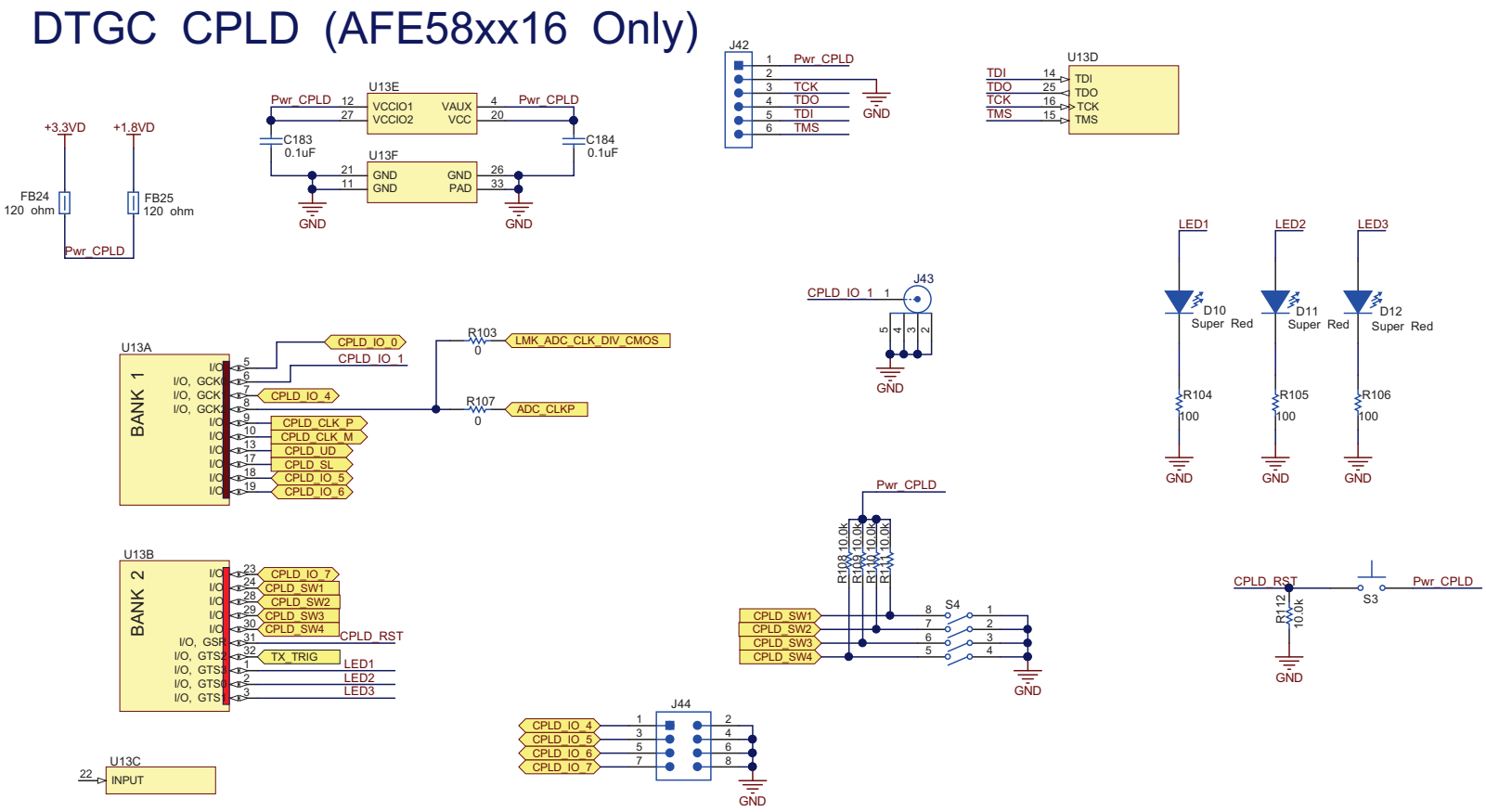
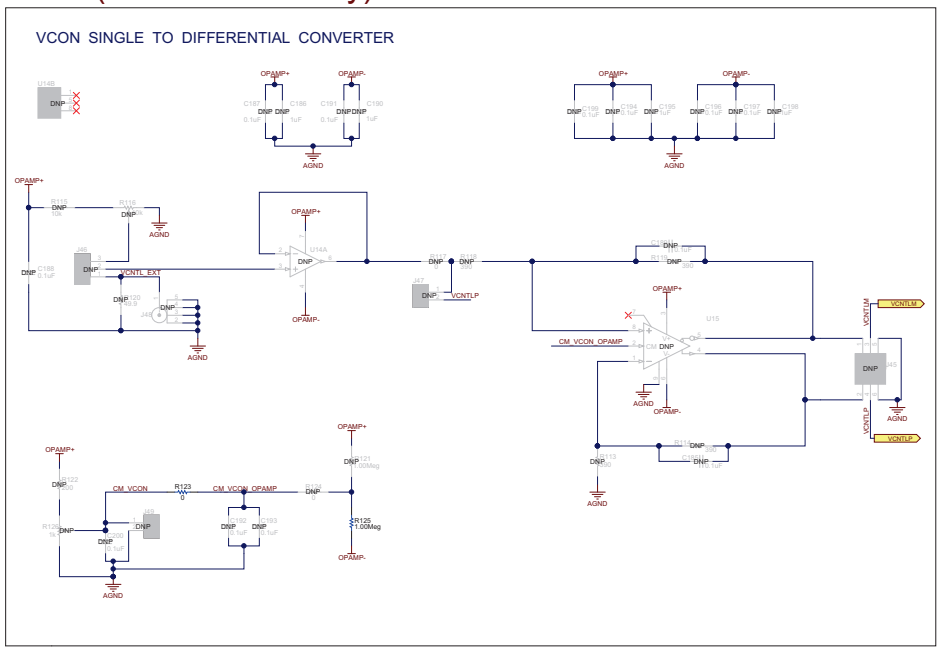


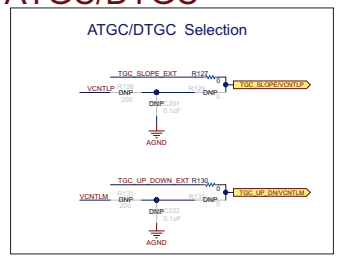
Figure 66. AFE5816 Rev C EVM Schematic

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VCntl (AFE58xx18 Only)



ATGC/DTGC



DTGC(AFE58xx16 Only)

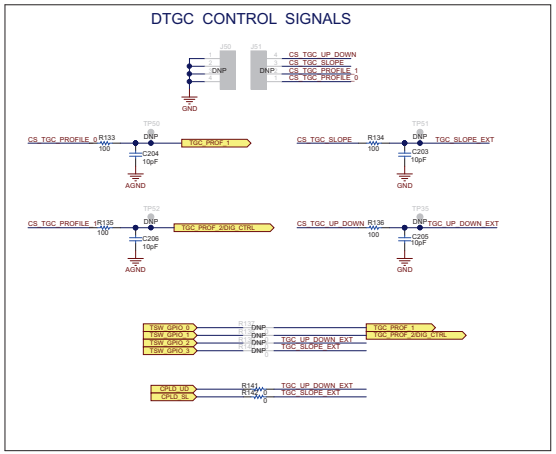


Figure 67. AFE5816 Rev C EVM Schematic

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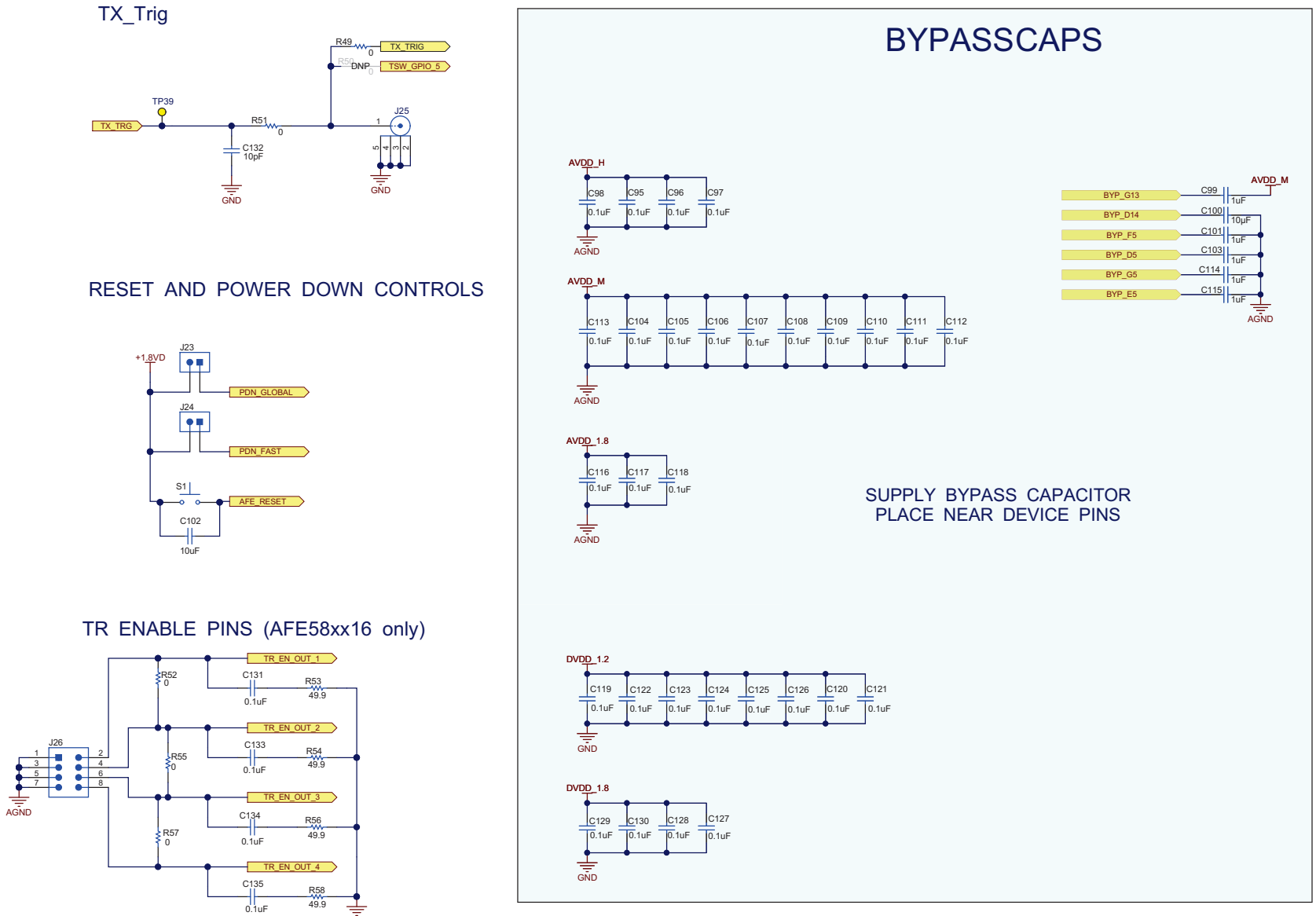
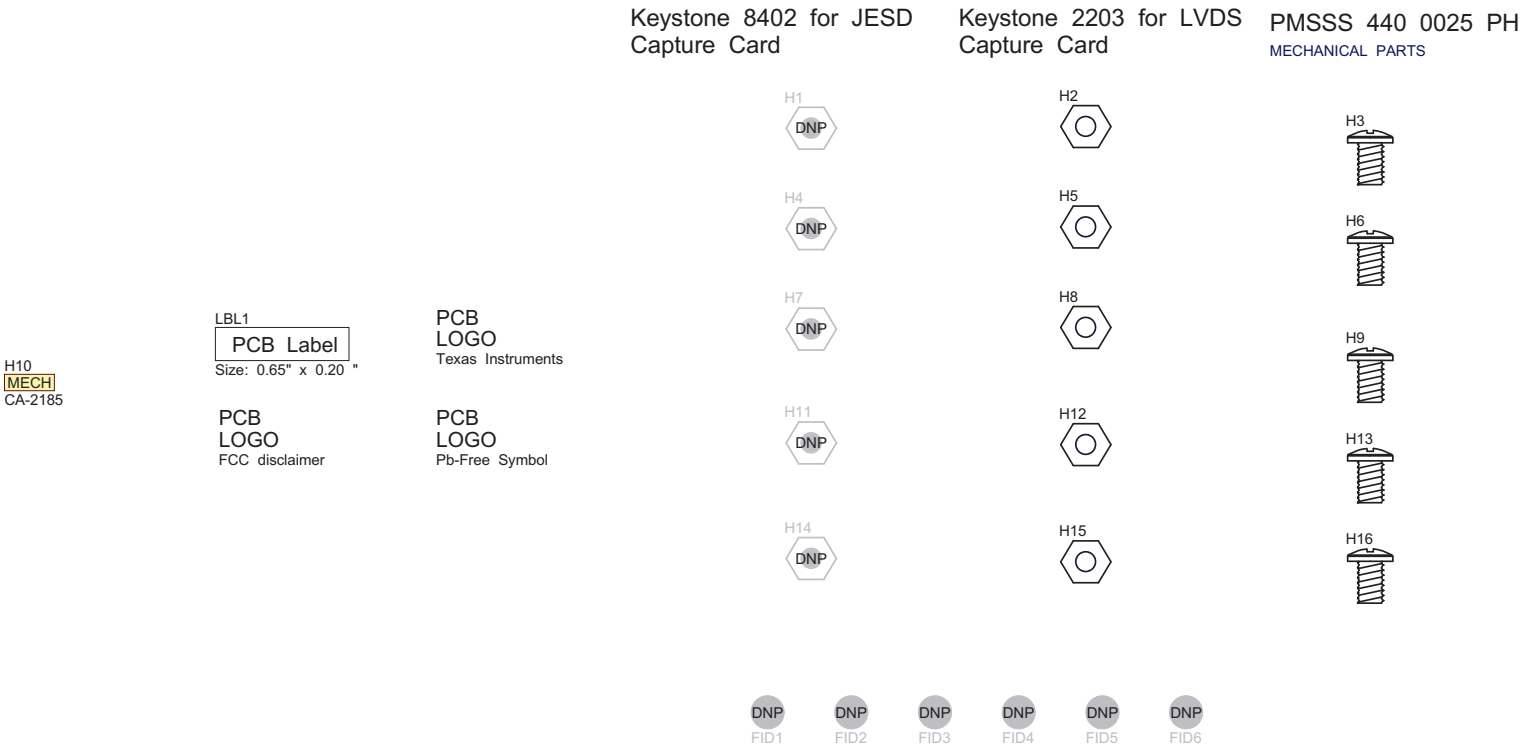


Figure 68. AFE5816 Rev C EVM Schematic

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ZZ1
Label Assembly Note
This Assembly Note is for PCB labels only

ZZ2
Assembly Note
These assemblies are ESD sensitive, ESD precautions shall be observed.

ZZ3
Assembly Note
These assemblies must be clean and free from flux and all contaminants. Use of no clean flux is not acceptable.

ZZ4
Assembly Note
These assemblies must comply with workmanship standards IPC-A-610 Class 2, unless otherwise specified.

ZZ5
Assembly Note
Indication for all LEDs has been marked with their cathode side.

Label Table	
Variant	Label Text
001	AFE58JD18EVM
002	AFE58JD16EVM
003	AFE5818EVM
004	AFE5816EVM

Figure 69. AFE5816 Rev C EVM Schematic

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E.3 EVM Bill of Materials

Table 3 lists the AFE5816 EVM bill of materials (BOM).

Table 3. AFE5816 EVM Bill of Materials (1)

Designator	Qty	Value	Description	Package Reference	Part Number	MFR	Alternate Part Number	Alternate MFR
C1, C2, C4, C6, C9, C10, C12, C15, C18, C21, C23, C24	12	22 µF	CAP, TA, 22 µF, 16V, +/-10%, 0.375 ohm, SMD	6032-28	TPSC226K016R0375	AVX		
C3, C5, C7, C8, C11, C13, C16, C17, C20, C22, C183, C184	12	0.1 µF	CAP, CERM, 0.1 µF, 16V, +/-10%, X5R, 0603	0603	GRM188R61C104KA01D	Murata		
C14	1	470pF	CAP, CERM, 470pF, 50V, +/-5%, C0G/NP0, 0603	0603	06035A471JAT2A	AVX		
C19	1	160pF	CAP, CERM, 160 pF, 50 V, +/- 5%, C0G/NP0, 0603	0603	GRM1885C1H161JA01D	Murata		
C25	1	270pF	CAP, CERM, 270 pF, 100 V, +/- 5%, C0G/NP0, 0603	0603	GRM1885C2A271JA01D	Murata		
C26, C27, C28, C29, C31, C33, C34, C35, C36, C85, C86, C89, C90, C91, C92, C93, C94, C95, C96, C97, C98, C104, C105, C106, C107, C108, C109, C110, C111, C112, C113, C116, C117, C118, C119, C120, C121, C122, C123, C124, C125, C126, C127, C128, C129, C130, C131, C133, C134, C135, C137, C140, C143, C147, C148, C149, C150, C151, C152, C153, C154, C155, C156, C157, C160, C162, C166, C168, C169, C170, C171, C172, C175, C176, C177, C178, C179, C180, C181, C182, C208, C209, C210, C211, C213, C214, C216, C260, C261	89	0.1 µF	CAP, CERM, 0.1 µF, 16 V, +/- 10%, X7R, 0402	0402	GRM155R71C104KA88D	Murata		
C30, C32	2	47pF	CAP, CERM, 47 pF, 50 V, +/- 1%, C0G/NP0, 0402	0402	GRM1555C1H470FA01D	Murata		
C37, C42, C45, C50, C53, C58, C61, C66, C69, C74, C77, C80, C81, C82, C83, C84	16	0.01 µF	CAP, CERM, 0.01 µF, 6.3 V, +/- 10%, X7R, 0402	0402	GRM155R70J103KA01D	Murata		
C99, C101, C103, C114, C115	5	1 µF	CAP, CERM, 1 µF, 6.3 V, +/- 20%, X5R, 0402	0402	GRM152R60J105ME15D	Murata		
C100, C173	2	10 µF	CAP, CERM, 10 µF, 6.3 V, +/- 20%, X5R, 0603	0603	C0603C106M9PACTU	Kemet		
C102	1	10 µF	CAP, CERM, 10 µF, 6.3 V, +80/-20%, Y5V, 0805_140	0805_140	GRM21BF50J106ZE01L	Murata		
C132, C163, C203, C204, C205, C206	6	10pF	CAP, CERM, 10 pF, 50 V, +/- 5%, C0G/NP0, 0402	0402	GRM1555C1H100JA01D	Murata		
C136	1	0.68 µF	CAP, CERM, 0.68 µF, 10 V, +/- 10%, X5R, 0603	0603	C0603C684K8PACTU	Kemet		
C138	1	47pF	CAP, CERM, 47 pF, 100 V, +/- 5%, C0G/NP0, 0603	0603	GRM1885C2A470JA01D	Murata		
C139	1	3900pF	CAP, CERM, 3900 pF, 50 V, +/- 10%, X7R, 0402	0402	GRM155R71H392KA01D	Murata		

(1) Unless otherwise noted in the Alternate Part Number and/or Alternate Manufacturer columns, all parts may be substituted with equivalents.

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Table 3. AFE5816 EVM Bill of Materials (1) (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	MFR	Alternate Part Number	Alternate MFR
C141, C144, C159, C165	4	100pF	CAP, CERM, 100 pF, 50 V, +/- 10%, X7R, 0402	0402	CC0402KRX7R9BB101	Yageo America		
C142, C145, C146, C158	4	10 µF	CAP, CERM, 10 µF, 6.3 V, +/- 20%, X5R, 0603	0603	GRM188R60J106ME47D	Murata		
C161, C167	2	0.01 µF	CAP, CERM, 0.01 µF, 25V, +/-10%, X7R, 0402	0402	C1005X7R1E103K	TDK		
C164	1	2200pF	CAP, CERM, 2200 pF, 50 V, +/- 10%, X7R, 0402	0402	GRM155R71H222KA01D	Murata		
C174	1	1000pF	CAP, CERM, 1000 pF, 25 V, +/- 5%, C0G/NP0, 0402	0402	C1005C0G1E102J	TDK		
C207, C212, C215, C217	4	1 µF	CAP, CERM, 1 µF, 16 V, +/- 10%, X5R, 0603	0603	C0603C105K4PACTU	Kemet		
C219, C227, C230, C238	4	1200pF	CAP, CERM, 1200 pF, 50 V, +/- 10%, X7R, 0603	0603	GRM188R71H122KA01D	Murata		
C221, C226, C231, C232, C236, C237	6	3300pF	CAP, CERM, 3300 pF, 50 V, +/- 10%, X7R, 0402	0402	GRM155R71H332KA01D	Murata		
C222, C224, C233, C235	4	22 µF	CAP, CERM, 22 µF, 6.3 V, +/- 20%, X5R, 0603	0603	C1608X5R0J226M080AC	TDK		
C223, C234	2	4.7 µF	CAP, CERM, 4.7 µF, 10 V, +/- 10%, X5R, 0603	0603	C0603C475K8PACTU	Kemet		
D1	1	Orange	LED, Orange, SMD	0.8x1.6mm	HSMD-C190	Avago		
D2, D4, D5, D10, D11, D12	6	Super Red	LED, Super Red, SMD	LED, 1.6x.6x.8mm	SML-LX0603SRW-TR	Lumex		
D3	1	Red	LED, Red, SMD	0.8x1.6mm	HSMC-C190	Avago		
D6, D7, D8, D9	4	Green	LED, Green, SMD	0.8x1.6mm	HSMG-C190	Avago		
FB1, FB2, FB3, FB4, FB5, FB6, FB7, FB8, FB9, FB10, FB11, FB13, FB14, FB15, FB16, FB18, FB19, FB20, FB21, FB22, FB23, FB24	22	120 ohm	Ferrite Bead, 120 ohm @ 100 MHz, 0.8 A, 0805	0805	BLM21AG121SN1D	Murata		
FB17	1	120 ohm	Ferrite Bead, 120 ohm @ 100 MHz, 3 A, 0603	0603	BLM18SG121TN1D	Murata		
H2, H5, H8, H12, H15	5		HEX STANDOFF 4-40 ALUMINUM 1/2"	HEX STANDOFF 4-40 ALUMINUM 1/2"	2203	Keystone		
H3, H6, H9, H13, H16	5		MACHINE SCREW PAN PHILLIPS 4-40	Machine Screw, 4-40, 1/4"	PMSSS 440 0025 PH	B&F Fastener Supply		
H10	1		CABLE ASSY STR 2.1MM 6' 24 AWG		CA-2185	Tensility		
J1	1		Power Jack, mini, 2.1mm OD, R/A, TH	Jack, 14.5x11x9mm	RAPC722X	Switchcraft		
J2	1		Terminal Block, 3.5 mm, 3x1, Tin, TH	Terminal Block, 3.5 mm, 3x1, TH	39357-0003	Molex		
J3, J30, J31	3		Header, 100mil, 3x1, Gold, TH	3x1 Header	TSW-103-07-G-S	Samtec		
J4	1		Header, 100mil, 5x1, Gold, TH	5x1 Header	TSW-105-07-G-S	Samtec		
J5	1		Connector, Receptacle, USB - mini AB, R/A, SMD	Receptacle, 5-Leads, Body 9.9x9mm, R/A	67803-8020	Molex		
J6, J9, J10, J13, J14, J17, J19, J20, J25, J27, J28, J32, J35, J39, J41, J43, J53, J57	18		SMA Straight PCB Socket Die Cast, 50 Ohm, TH	SMA Straight PCB Socket Die Cast, TH	5-1814832-1	TE Connectivity		

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Table 3. AFE5816 EVM Bill of Materials [(1)] (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	MFR	Alternate Part Number	Alternate MFR
J7, J8, J11, J12, J15, J16, J18, J21	8		Connector, End launch SMA, 50 ohm, SMT	End Launch SMA	142-0701-801	Johnson		
J22, J59	2		Socket, 0.5MM, 60x2, Gold, SMT	Socket, Female, 0.5MM, 60x2, SMT	QTH-060-01-L-D-A	Samtec		
J23, J24, J29, J33, J37	5		Header, 100mil, 2x1, Gold, TH	2x1 Header	TSW-102-07-G-S	Samtec		
J26, J44	2		Header, 100mil, 4x2, Gold, TH	4x2 Header	TSW-104-07-G-D	Samtec		
J34, J36, J38, J40	4		Header, 100mil, 3x2, Gold, TH	3x2 Header	TSW-103-07-G-D	Samtec		
J42	1		Header, 100mil, 6x1, Gold, TH	6x1 Header	TSW-106-07-G-S	Samtec		
J55	1		Audio Jack, 3.5 mm, Stereo, R/A, TH	Connector, 3-Leads, 3.5mm Stereo Jack R/A, TH	STX-3000	Kycon Inc		
LBL1	1		Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll	PCB Label 0.650"H x 0.200"W	THT-14-423-10	Brady	-	-
R1, R7, R8, R9, R19	5	0	RES, 0, 5%, 0.1 W, 0603	0603	RC0603JR-070RL	Yageo America		
R2	1	30k	RES, 30k ohm, 5%, 0.125W, 0805	0805	CRCW080530K0JNEA	Vishay-Dale		
R3	1	604	RES, 604, 1%, 0.063 W, 0402	0402	CRCW0402604RFKED	Vishay-Dale		
R4	1	5.1k	RES, 5.1k ohm, 5%, 0.1W, 0603	0603	CRCW06035K10JNEA	Vishay-Dale		
R5, R14	2	3.01k	RES, 3.01k ohm, 1%, 0.1W, 0603	0603	CRCW06033K01FKEA	Vishay-Dale		
R6, R10	2	332	RES, 332, 1%, 0.063 W, 0402	0402	CRCW0402332RFKED	Vishay-Dale		
R11, R21	2	510	RES, 510, 5%, 0.063 W, 0402	0402	CRCW0402510RJNED	Vishay-Dale		
R12	1	196	RES, 196, 1%, 0.063 W, 0402	0402	CRCW0402196RFKED	Vishay-Dale		
R13	1	1.65k	RES, 1.65 k, 1%, 0.1 W, 0603	0603	CRCW06031K65FKEA	Vishay-Dale		
R22, R44, R46, R47, R48, R49, R51, R52, R55, R57, R67, R74, R75, R77, R97, R98, R103, R107, R123, R127, R130, R141, R142, R145, R146, R149, R151, R153, R155, R158, R161, R162, R168, R169, R170, R173, R176, R178, R179	39	0	RES, 0, 5%, 0.063 W, 0402	0402	CRCW04020000Z0ED	Vishay-Dale		
R23, R41, R42, R43, R45, R69, R87, R89, R90, R99, R100, R101, R102, R104, R105, R106	16	100	RES, 100, 1%, 0.1 W, 0402	0402	ERJ-2RKF1000X	Panasonic		
R24, R25, R26, R27, R28, R29, R30, R31, R32, R33, R34, R35, R36, R37, R38, R39, R53, R54, R56, R58, R72, R78, R91, R92, R93, R95, R156, R174	28	49.9	RES, 49.9, 1%, 0.063 W, 0402	0402	CRCW040249R9FKED	Vishay-Dale		
R62	1	39k	RES, 39 k, 5%, 0.063 W, 0402	0402	CRCW040239K0JNED	Vishay-Dale		
R63	1	620	RES, 620, 5%, 0.063 W, 0402	0402	CRCW0402620RJNED	Vishay-Dale		
R68	1	11	RES, 11, 5%, 0.063 W, 0402	0402	CRCW040211R0JNED	Vishay-Dale		
R70, R71	2	1.8k	RES, 1.8 k, 5%, 0.063 W, 0402	0402	CRCW04021K80JNED	Vishay-Dale		
R79, R80, R82, R84	4	750	RES, 750, 5%, 0.063 W, 0402	0402	CRCW0402750RJNED	Vishay-Dale		
R94	1	60.4k	RES, 60.4k ohm, 1%, 0.063W, 0402	0402	CRCW040260K4FKED	Vishay-Dale		
R108, R109, R110, R111, R112	5	10.0k	RES, 10.0 k, 1%, 0.1 W, 0603	0603	ERJ-3EKF1002V	Panasonic		
R125	1	1.00Meg	RES, 1.00 M, 1%, 0.1 W, 0603	0603	CRCW06031M00FKEA	Vishay-Dale		
R133, R134, R135, R136	4	100	RES, 100, 1%, 0.1 W, 0603	0603	CRCW0603100RFKEA	Vishay-Dale		

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Table 3. AFE5816 EVM Bill of Materials (1) (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	MFR	Alternate Part Number	Alternate MFR
R143, R144	2	10k	RES, 10 k, 5%, 0.063 W, 0402	0402	CRCW040210K0JNED	Vishay-Dale		
R148, R164, R166, R181	4	499	RES, 499, 1%, 0.063 W, 0402	0402	CRCW0402499RFKED	Vishay-Dale		
R152, R160, R171, R180	4	499	RES, 499, 1%, 0.1 W, 0603	0603	CRCW0603499RFKEA	Vishay-Dale		
R154, R157, R172, R175	4	49.9	RES, 49.9, 0.1%, 0.1 W, 0603	0603	RT0603BRD0749R9L	Yageo America		
S1, S2, S3	3		Switch, Tactile, SPST-NO, 0.05A, 12V, SMT	Switch, 4.4x2x2.9 mm	TL1015AF160QG	E-Switch		
S4	1		Switch, SPST, 4 Pos, Top Actuated, SMD	SMD, 8-Leads, Pitch 1.27mm	1571983-5	TE Connectivity		
SH-5, SH-6, SH-7, SH-8	4	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec	969102-0000-DA	3M
T1, T2, T3, T4, T5	5		RF Transformer, 50 ohm, 2 to 775 MHz, SMT	CD542	ADT4-1WT+	Minicircuits		
TP1, TP4, TP5, TP6, TP8, TP9, TP15	7	Red	Test Point, Miniature, Red, TH	Red Miniature Testpoint	5000	Keystone		
TP2, TP11, TP12, TP13, TP14, TP16, TP17, TP18, TP38	9	Black	Test Point, Miniature, Black, TH	Black Miniature Testpoint	5001	Keystone		
TP3	1	White	Test Point, Miniature, White, TH	White Miniature Testpoint	5002	Keystone		
TP39	1	Yellow	Test Point, Miniature, Yellow, TH	Yellow Miniature Testpoint	5004	Keystone		
U1	1		16-Channel, Ultrasound, Analog Front-End with 140-mW/Channel Power, 0.75-nV/vHz Noise, 14-Bit, 65-MSPS or 12-Bit, 80-MSPS ADC, and Passive CW Mixer, ZBV0289A	ZBV0289A	AFE5816ZBV	Texas Instruments		Texas Instruments
U2	1		Single Output High PSRR LDO, 1 A, Fixed 3.3 V Output, 2.7 to 5.5 V Input, 6-pin SOT-223 (DCQ), -40 to 125 degC, Green (RoHS & no Sb/Br)	DCQ0006A	TPS79633DCQR	Texas Instruments	Equivalent	None
U3, U4, U5	3		Ultralow-Noise, High PSRR, Fast, RF, 1A, Low-Dropout Linear Regulator, DCQ0006A	DCQ0006A	TPS79601DCQR	Texas Instruments		Texas Instruments
U6	1		4242-VPK Small-Footprint and Low-Power Quad Channels Digital Isolators, DBQ0016A	DBQ0016A	ISO7140CCDBQR	Texas Instruments	ISO7140CCDBQ	Texas Instruments
U7	1		USB FIFO IC, 28SSOP	SSOP28	FT245RL	FTDI		
U8	1		4-Bit Dual-supply Bus Transceiver with Configurable Voltage Translation and 3-State Outputs, PW0016A	PW0016A	SN74AVC4T245PWR	Texas Instruments		Texas Instruments
U9	1		4242-VPK Small-Footprint and Low-Power Quad Channels Digital Isolators, DBQ0016A	DBQ0016A	ISO7141CCDBQR	Texas Instruments	ISO7141CCDBQ	Texas Instruments
U10	1		Ultralow-Noise, High PSRR, Fast, RF, 1A Low-Dropout Linear Regulator, DCQ0006A	DCQ0006A	TPS79618DCQR	Texas Instruments		Texas Instruments
U11	1		Ultra Low-Noise JESD204B Compliant Clock Jitter Cleaner with Dual Loop PLLs, NKD0064A	NKD0064A	LMK04826BISQ/NOPB	Texas Instruments		Texas Instruments
U12	1		CLOCK BUFFER WITH PROGRAMMABLE DIVIDER, LVPECL I/O + ADDITIONAL LVCMOS OUTPUT, RGT0016A	RGT0016A	CDCM1802RGTR	Texas Instruments	CDCM1802RGTT	Texas Instruments
U13	1		CoolRunner-II CPLD, QFG32	5x5 QFN32	XC2C32A-6QFG32C	Xilinx		

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Table 3. AFE5816 EVM Bill of Materials (1) (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	MFR	Alternate Part Number	Alternate MFR
U16, U18	2		HIGH-SPEED, LOW-NOISE, FULLY-DIFFERENTIAL I/O AMPLIFIERS, DGN0008D	DGN0008D	THS4131CDGNR	Texas Instruments	THS4131CDGN	Texas Instruments
U17	1		Dual, High Gain Bandwidth, High Output Current, Operational Amplifier with Current Limit, 5 to 12 V, -40 to 85 degC, 8-pin SOIC (D8), Green (RoHS & no Sb/Br)	D0008A	OPA2614ID	Texas Instruments	Equivalent	Texas Instruments
U20	1		SINGLE-BIT DUAL-SUPPLY BUS TRANSCEIVER WITH CONFIGURABLE VOLTAGE TRANSLATION AND 3-STATE OUTPUTS, DBV0006A	DBV0006A	SN74AVCH1T45DBVR	Texas Instruments	SN74AVCH1T45DBVT	Texas Instruments
Y1	1		OSC, 3.3 V, 125 MHz, 15 pF, SMD	7x5mm	VCC1-B3B-125M000000	Vectron		
Y2	1		VCXO, 100 MHz, 3.3V, SMD	CVHD-950-4	CVHD-950-100.000	Crystek Corporation		
Y3	1		OSC, 3.3 V, 40 MHz, SMD	SMD, 4-Leads, Body 7x5mm	FXO-HC735-40	Fox Electronics		
C38, C40, C43, C46, C48, C51, C54, C56, C59, C62, C64, C67, C70, C72, C75, C78	0	0.015 µF	CAP, CERM, 0.015 µF, 16 V, +/- 10%, X7R, 0402	0402	GRM155R71C153KA01D	Murata		
C39, C41, C44, C47, C49, C52, C55, C57, C60, C63, C65, C68, C71, C73, C76, C79, C218, C228, C229, C239	0	1 µF	CAP, CERM, 1 µF, 6.3 V, +/- 20%, X5R, 0402	0402	C1005X5R0J105M	TDK		
C87, C88, C185, C187, C188, C189, C191, C192, C193, C194, C196, C197, C199, C200, C201, C202, C240, C241, C242, C243, C244, C245, C246, C247, C248, C249, C250, C251, C252, C253, C254, C255, C256, C257, C258, C259	0	0.1 µF	CAP, CERM, 0.1 µF, 16 V, +/- 10%, X7R, 0402	0402	GRM155R71C104KA88D	Murata		
C186, C190, C195, C198	0	1 µF	CAP, CERM, 1 µF, 16 V, +/- 10%, X5R, 0603	0603	C0603C105K4PACTU	Kemet		
C220, C225	0	3300pF	CAP, CERM, 3300 pF, 50 V, +/- 10%, X7R, 0402	0402	GRM155R71H332KA01D	Murata		
FB12, FB25	0	120 ohm	Ferrite Bead, 120 ohm @ 100 MHz, 0.8 A, 0805	0805	BLM21AG121SN1D	Murata		
H1, H4, H7, H11, H14	0		HEX, M-F STANDOFF 4-40 ALUMINUM 5/8"	HEX, M-F STANDOFF 4-40 ALUMINUM 5/8"	8402	Keystone		
J45	0		Header, 100mil, 3x2, Gold, TH	3x2 Header	TSW-103-07-G-D	Samtec		
J46, J52, J54, J56, J58	0		Header, 100mil, 3x1, Gold, TH	3x1 Header	TSW-103-07-G-S	Samtec		
J47, J49	0		Header, 100mil, 2x1, Gold, TH	2x1 Header	TSW-102-07-G-S	Samtec		
J48	0		SMA Straight PCB Socket Die Cast, 50 Ohm, TH	SMA Straight PCB Socket Die Cast, TH	5-1814832-1	TE Connectivity		
J50, J51	0		Header, 100mil, 4x1, Gold, TH	4x1 Header	TSW-104-07-G-S	Samtec		
J60	0		Connector, Male, 1.27 mm, 40x4, SMD	Connector, Male, 1.27 mm, 40x4, SMD	ASP-134602-01	Samtec		
R15, R16, R17, R18, R20, R40, R50, R59, R60, R61, R64, R65, R66, R117, R124, R129, R132, R137, R138, R139, R147, R163, R165, R182, R183	0	0	RES, 0, 5%, 0.063 W, 0402	0402	CRCW04020000Z0ED	Vishay-Dale		

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Table 3. AFE5816 EVM Bill of Materials (1) (continued)

Designator	Qty	Value	Description	Package Reference	Part Number	MFR	Alternate Part Number	Alternate MFR
R73, R76, R81, R85, R86, R88, R115	0	10k	RES, 10 k, 5%, 0.063 W, 0402	0402	CRCW040210K0JNED	Vishay-Dale		
R83	0	100	RES, 100, 1%, 0.1 W, 0402	0402	ERJ-2RKF1000X	Panasonic		
R96, R140	0		RES, 0, 5%, 0.063 W, 0402	0402	CRCW04020000Z0ED	Vishay-Dale		
R113, R114, R118, R119	0	390	RES, 390, 0.1%, 0.1 W, 0603	0603	RG1608P-391-B-T5	Susumu Co Ltd		
R116	0	10k	Trimmer, 10k ohm, 0.5W, TH	9.5x10x4.8mm	3296W-1-103LF	Bourns		
R120	0	49.9	RES, 49.9, 1%, 0.063 W, 0402	0402	CRCW040249R9FKED	Vishay-Dale		
R121	0	1.00Meg	RES, 1.00 M, 1%, 0.1 W, 0603	0603	CRCW06031M00FKEA	Vishay-Dale		
R122	0	200	RES, 200 ohm, 0.1%, 0.125W, 0805	0805	RG2012P-201-B-T5	Susumu Co Ltd		
R126	0	1k	Trimmer, 1k ohm, 0.5W, TH	9.5x10x4.8mm	3296W-1-102LF	Bourns		
R128, R131	0	200	RES, 200, 1%, 0.1 W, 0603	0603	CRCW0603200RFKEA	Vishay-Dale		
R150, R159, R167, R177	0	1.0k	RES, 1.0 k, 5%, 0.1 W, 0603	0603	CRCW06031K00JNEA	Vishay-Dale		
SH-1, SH-2, SH-3, SH-4	0	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec	969102-0000-DA	3M
TP7, TP37	0	White	Test Point, Miniature, White, TH	White Miniature Testpoint	5002	Keystone		
TP10, TP36	0	Red	Test Point, Miniature, Red, TH	Red Miniature Testpoint	5000	Keystone		
TP19, TP20, TP21, TP22, TP23, TP24, TP25, TP26, TP27, TP28, TP29, TP30, TP31, TP32, TP33, TP34, TP35, TP50, TP51, TP52	0	Orange	Test Point, Miniature, Orange, TH	Orange Miniature Testpoint	5003	Keystone		
TP40, TP41, TP42, TP43, TP44, TP45, TP46, TP47, TP48, TP49	0	Blue	Test Point, Miniature, Blue, TH	Blue Miniature Testpoint	5117	Keystone		
U14	0		1.1 nV/rtHz Noise, Low Power, Precision Operational Amplifier, 4.5 to 36 V, -40 to 125 degC, 8-pin SOIC (D0008A), Green (RoHS & no Sb/Br)	D0008A	OPA211AIDR	Texas Instruments	Equivalent	None
U15	0		HIGH-SPEED, LOW-NOISE, FULLY-DIFFERENTIAL I/O AMPLIFIERS, DGN0008D	DGN0008D	THS4131CDGNR	Texas Instruments	THS4131CDGN	Texas Instruments
U19	0		64K I2C Smart Serial EEPROM, SOIC-8	SOIC-8, 208mil wide	24LC65-I/SM	Microchip		

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F.1 Common Issues

The following section illustrates some of the common problems seen when attempting to use the EVM hardware and software.

F.1.1 Issues

- **Windows 8 and Windows 10 support:** Officially, the EVM software is only supported for Windows 7. Windows 8 and 10, however, are often known to work but might require enabling .NET FRAMEWORK 3.5. In *Control Panel*, choose *Programs and Features*, choose *Turn Windows features on or off*, and then select the .NET Framework 3.5 (includes .NET 2.0 and 3.0) check box. This option requires an internet connection. Do not select the child items.

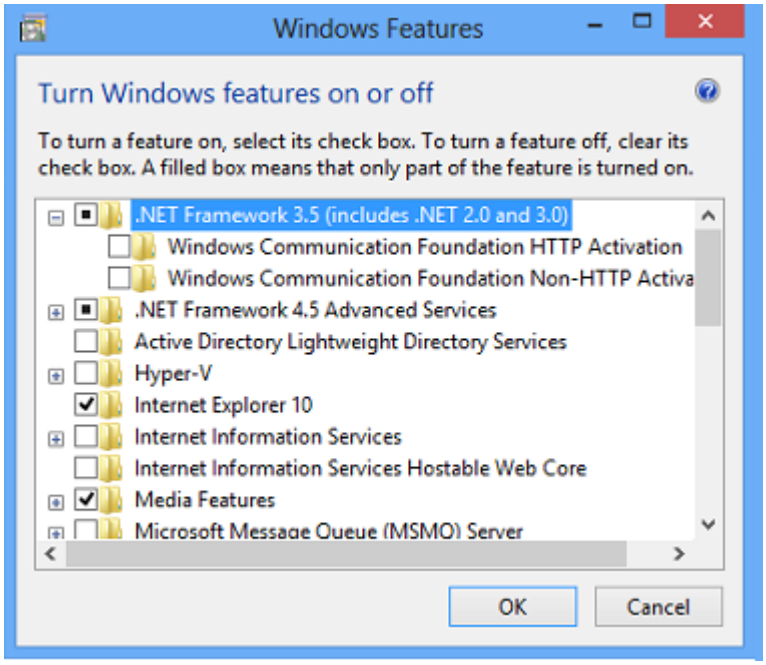


Figure 70. Enable .NET Framework

- **Power supply capacity:** It is likely that both the AFE EVM and the TSW EVM do not have a wall power supply. Instead, they include the ability to connect to a bench-top supply via the provided cable. It is critical that each of these EVMs has access to 2 A of current capacity.
- **No Capture in HSDCPro:** It is possible that once the GUIs and EVMs are configured for capture, and the capture button in HSDCPro is pressed, that nothing seems to happen and eventually the GUI will timeout and a pop-up an error appears as seen in Figure 71. Reasons for this can include the following:
  - Incorrect firmware loaded
  - Current starvation on at least one EVM, 2 A is sufficient
  - Missing Data output clock from the AFE to the FGPA. With LVDS, this could be the FCLK or DCLK. D5 of the TSW1400 should turn on, and if not, this is probably the reason. With JESD204B data, a

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missing GTX Clk or SysRef clock to the FPGA could be the reason.

- ❏ Verify that the EVMs are mechanically mated correctly
- ❏ Verify power supply to both EVMs
- ❏ Verify jumper settings on the AFE EVM. Particularly inspect J29, J33, J37, J31, J34, and J36.
- ❏ Use an oscilloscope to test the frequency of the clock at header J36 or J34. This should be a 50-MHz square wave. TP44 should be 200 MHz. If using JESD, also check TP42 near the LMK04826, this should be either 200 MHz or 400 MHz, by default. Also check TP43.

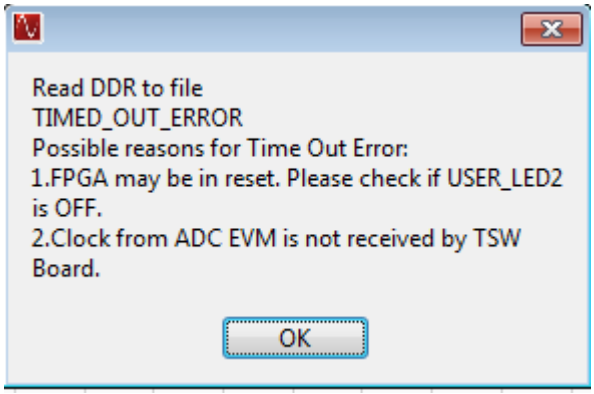


Figure 71. Read DDR Error for No Capture

Revision History

Changes from Original (October 2015) to A Revision	Page
• Modified the abstract.	1
• Changed board image and text and renamed the *EVM Hardware Overview* section.	4
• Moved and changed text in the *GUI Software Installation* section.	5
• Moved and changed the section name of the *Quick Views of Evaluation Setups for LVDS Interface* section.	6
• Changed text in the *Quick Views of Evaluation Setups for LVDS Interface* section.	6
• Changed text and section name in the *Testing the EVM Data Capture with LVDS* section.	8
• Completely overhauled the *Software Installation* section.	18
• Added the *Hardware Configuration* section.	31
• Added the *Triggering Options* section.	35
• Added the *Common Hardware Modifications* section.	37
• Added the *AFE5816 EVM Hardware Overview* and *Schematics* sections to Appendix E.	38
• Updated the *Bill of Materials* in Appendix E.	38
• Added the *FAQ and Troubleshooting* section.	59

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

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      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.

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FCC Interference Statement for Class B EVM devices

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- *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.*

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3.2.1 *For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210*

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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.

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http://www.tij.co.jp/lsds/ti_ja/general/eStore/notice_01.page

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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.

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