Evaluating the ADAQ4216 16-Bit, 2MSPS, μModule Data-Acquisition Solution

FEATURES

- Evaluation board for the ADAQ4216
- On-board voltage reference and complete power solution
- On-board clock source and level translators
- ACE software for configuration and data analysis (time and frequency domain)
- FMC-LPC system board connector Zedboard compatible

EVALUATION BOARD KIT CONTENTS

- EVAL-ADAQ4216-FMCZ evaluation board
- Micro-SD memory card (with adapter) containing system board boot software and Linux OS

EQUIPMENT NEEDED

- PC running Windows® 10 or higher
- Digilent Zedboard with +12V wall adapter power supply
- Precision signal source (APx555 or APx2722 or SR1)
- SMA Cable (input to evaluation board)
- Standard USB A to Micro-USB cable
- Band-pass filter suitable for 16-bit testing (value based on signal frequency)

SOFTWARE NEEDED

- Analysis | Control | Evaluation (ACE) Software
- ADAQ4216 ACE plug-in

GENERAL DESCRIPTION

The EVAL-ADAQ4216-FMCZ board enables quick and easy performance evaluation of the ADAQ4216, a 16-bit, 2MSPS μModule® data-acquisition system in package (SiP) solution. The ADAQ4216 combines critical passive components and signal processing blocks necessary for optimum precision performance:

- A 16-bit, 2MSPS, successive approximation register (SAR) analog-to-digital converter (ADC)
- A low-noise, high-bandwidth programmable instrumentation amplifier
- A second-order anti-aliasing filter
- A low-noise, low-distortion, high-bandwidth ADC driver
- A 1.8V low dropout (LDO) regulator

The EVAL-ADAQ4216-FMCZ board can be directly interfaced with Digilent Zedboard by a 160-pin FMC connector, as shown in Figure 1. The EVAL-ADAQ4216-FMCZ board has the necessary support circuitry for the operation and control of the ADAQ4216.

Full specifications on the ADAQ4216 are available in the ADAQ4216 data sheet available from Analog Devices, Inc., and must be consulted with this user guide when using the EVAL-ADAQ4216-FMCZ board.

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REVISION HISTORY

12/2024—Revision 0: Initial Version

EVAL-ADAQ4216-FMCZ CONNECTION WITH ZEDBOARD

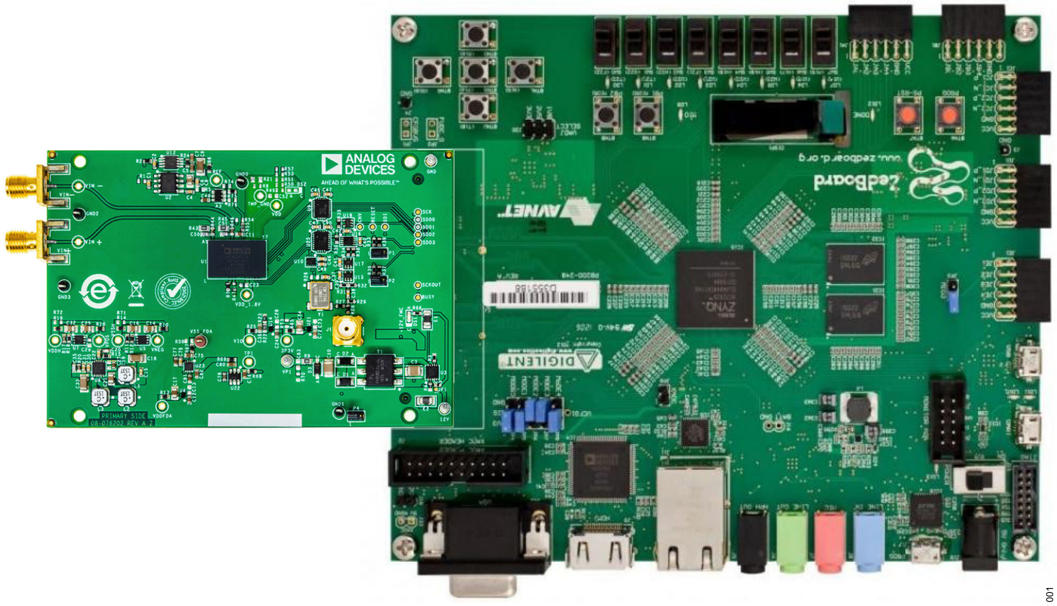

Figure 1. EVAL-ADAQ4216-FMCZ Connection with Zedboard

EVALUATION BOARD HARDWARE

Figure 2 shows the simplified EVAL-ADAQ4216-FMCZ block diagram. The EVAL-ADAQ4216-FMCZ board consists of one μModule (U1, ADAQ4216), a choice of a 4.096V reference (LTC6655, U12 or ADR4540, U2), an on-board power supply to generate necessary supply rails using the LT3999 (U3), the LT3487 (U6), the ADP7142 (U7), the ADP7182 (U5), the ADP7112 (U4, U14, U21), the LTC1983 (U22), the ADP7183 (U5), and the clock distribution circuits.

Figure 17 to Figure 19 shows the EVAL-ADAQ4216-FMCZ board schematics.

REFERENCE

The ADR4540 and LTC6655 are two options available on-board for the 4.096V reference voltage. There is an option to cascade an external reference buffer ADA4807-1 to the internal reference buffer through the REFIN pin of the ADAQ4216.

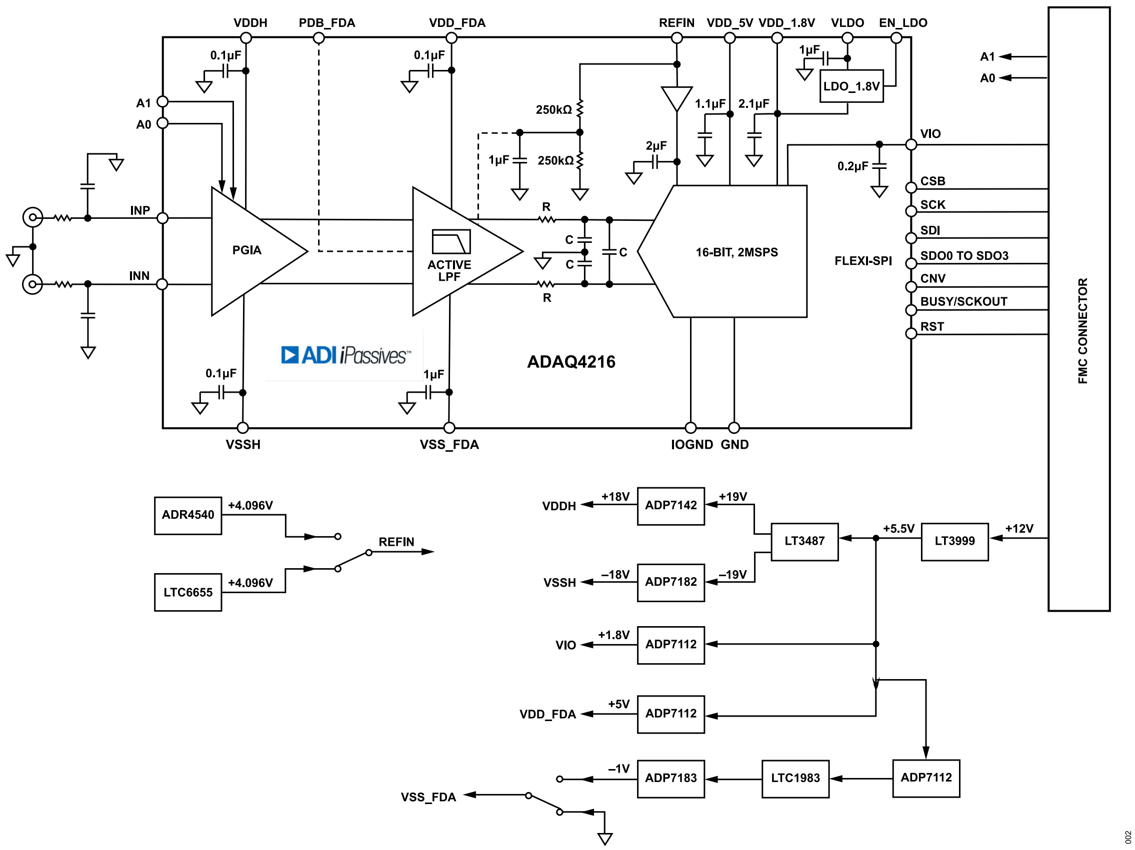

Figure 2. Simplified Evaluation Board Block Diagram

EVALUATION BOARD HARDWARE

POWER SUPPLIES

The EVAL-ADAQ4216-FMCZ board is powered by a single 12V rail coming from Zedboard FMC connector by default, which enables single supply operation. When the Zedboard is powered-up, DS1 LED indicates that the +12V supply from the FMC connector is on. This 12V input is converted to the other necessary power supply rails on the board. For the power components used to generate necessary supply rails for the ADAQ4216 and other support circuitry, see Table 1.

The LT3999 is a low noise, push-pull DC/DC driver that provides isolated power in a small solution footprint.

The LT3487 is a dual-channel switching regulator, which generates a positive and a negative output. The outputs are then connected to the ADP7142 and ADP7182, respectively, to generate the +18V/−18V rails. The ADP7112 is a low-noise linear regulator with fixed and adjustable outputs. The ADP7112 generates the +5V, +3.3V, and +1.8V voltage rails.

The VSS_FDA of the ADC driver is connected to ground (0V) by default. There is an option to connect the VSS_FDA to −1V, which is the voltage from the combination of the LTC1983 charge pump-inverter and the ADP7183 linear regulator.

Table 1. Default Power Supplies Available on the EVAL-ADAQ4216-FMCZ

Power Supply Rails	Power Components Used	Rails for ADAQ4216 and Support Circuitry
±18V	LT3999, LT3487, ADP7142, ADP7182	ADAQ4216
+5V	LT3999, ADP7112	ADAQ4216, ADR4540, LTC6655, ADA4807-1
+3.3V	LT3999, ADP7112	ADAQ4216, Clock Circuitry
+1.8V (VIO)	LT3999, ADP7112	ADAQ4216
−1.0V	LT3999, ADP7112, LTC1983, ADP7183	ADAQ4216

The EVAL-ADAQ4216-FMCZ board is powered up by the Zedboard by default. Do the following steps to power up the EVAL-ADAQ4216-FMCZ board when not connected to +12V on the Zedboard:

1. Connect the Pin 1 and Pin 2 of JP1 using a 0Ω resistor (see Figure 17).
2. Connect the EVAL-ADAQ4216-FMCZ board to the Zedboard by the 160-pin FMC connector.
3. Connect the USB and the +12V power adapter to the Zedboard.
4. Connect the +12V bench power supply to the 12V test point on the EVAL-ADAQ4216-FMCZ board (see Figure 3). Connect the bench supply ground to the GND test point, as shown in Figure 3.
5. Power up the bench top supply. The +12V supply rail draws approximately 180mA.

The EVAL-ADAQ4216-FMCZ board is now ready to use. Ensure that the recommended software and drivers are installed. For more details on using the ADAQ4216 ACE plug-in, see the Evaluation Board Software section.

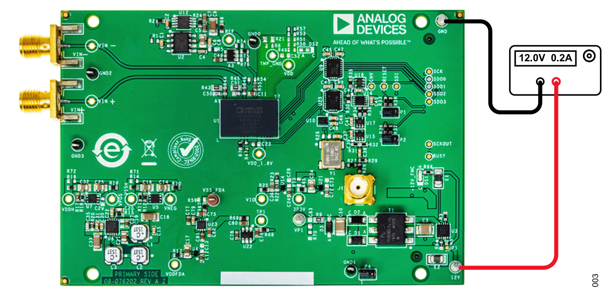

Figure 3. EVAL-ADAQ4216-FMCZ External Supply Connection

ANALOG INPUTS

The analog input signal is applied on the VIN+ and VIN−, sub-miniature version A (SMA) connectors of the EVAL-ADAQ4216-FMCZ board. The differential input signal flows through a low-pass RC filter and then to the ADAQ4216. The input voltage range and gain of the ADAQ4216 is set through the ACE software by changing the scale attribute, as shown in Figure 11. For the scale value setting and the corresponding gain and input ranges, see Table 3. When not using ACE, the gain can be manually set through jumpers P1 and P2, as shown in Table 3.

Note that by default, the EVAL-ADAQ4216-FMCZ board is setup to accept the (±12V) differential input signals at VIN+ and VIN− by SMA connectors. If a single-ended bipolar input is desired, such as ±12V, the EVAL-ADAQ4216-FMCZ board can be used by grounding one of the inputs and the other is used as single ended input.

A low-distortion audio precision signal source (such as APx555/2700 series or SR1) is recommended for testing the AC and DC performance of the ADAQ4216. A precision signal source may require additional filtering and specific connectors or cables.

Table 2. Jumper Details with Factory Default Setting

Link	Default	Function	Comment
JP1	Pin 2 and Pin 3 shorted	Board Main Power Supply Source	Board power supply comes from the Zedboard by default. Short Pin 1 and Pin 2 for an external bench power supply.
P1	Pin 1 and Pin 2 shorted	A0 Gain Control	Gain is set through ACE.
P2	Pin 1 and Pin 2 shorted	A1 Gain Control	Gain is set through ACE.
P4	Pin 1 and Pin 2 shorted	EEPROM Write Protect Control	P4 position sets the write protection on the EEPROM. Write protect is disabled by default.

EVALUATION BOARD HARDWARE

LINK CONFIGURATION FOR DIFFERENT GAIN OPTIONS

Multiple link options must be set correctly for appropriate gain configuration of the EVAL-ADAQ4216-FMCZ board. Table 3 and Figure 4 show the different P1 and P2 link configurations with the corresponding analog front-end gains. Remove R37 and R39 when the gain is manually controlled by P1 and P2 jumpers and not through the software.

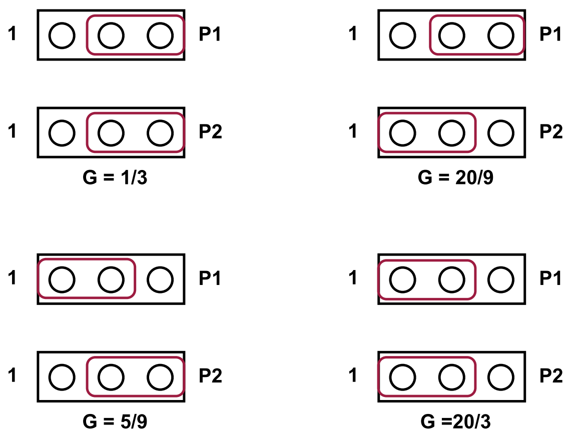

Figure 4. P1 and P2 Settings

ZEDBOARD LINK CONFIGURATIONS

Ensure that the Zedboard boot configuration jumpers are set to use the SD card, as shown in Figure 5. To avoid potential issues, ensure that the Zedboard VADJ SELECT = 2.5V, as shown in Figure 6.

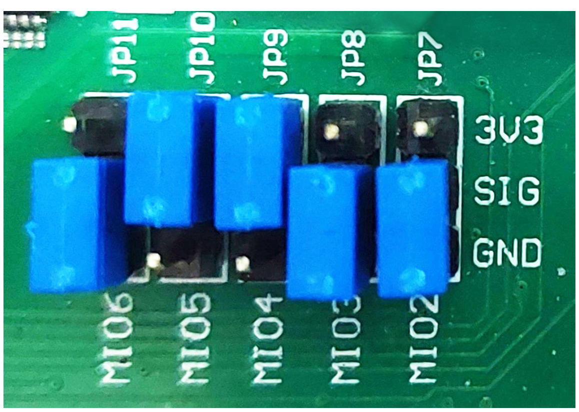

Figure 5. Zedboard Boot Link Configuration

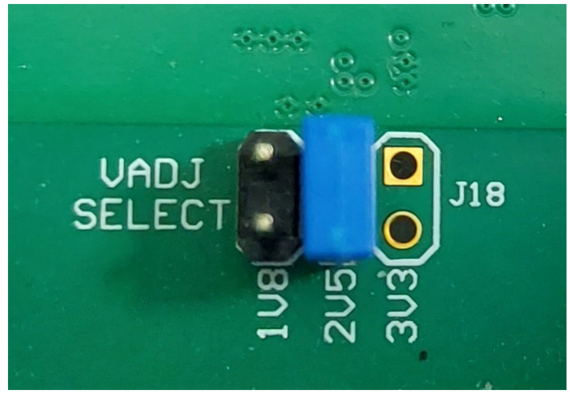

Figure 6. Zedboard VADJ Link Setting

Table 3. Input Voltage Range, Gain vs. Scale Value

Scale Attribute Value	Gain (V/V)	Input Voltage Range (REFIN = 4.096V)	P1/P2 Manual Setting
0.375000000	1/3	±12.28V	P1 = short Pin 2 to Pin 3, P2 = short Pin 2 to Pin 3.
0.225000000	5/9	±7.37V	P1 = short Pin 1 to Pin 2, P2 = short Pin 2 to Pin 3.
0.056250000	20/9	±1.84V	P1 = short Pin 2 to Pin 3, P2 = short Pin 1 to Pin 2.
0.018750000	20/3	±0.61V	P1 = short Pin 1 to Pin 2, P2 = short Pin 1 to Pin 2.

EVALUATION BOARD SOFTWARE

ACE INSTALLATION PROCEDURE

Download the ACE evaluation software from the EVAL-ADAQ4216-FMCZ evaluation board kit page. Install the software on a PC before using the EVAL-ADAQ4216-FMCZ board. Download the ADAQ4216 ACE plug-in from the EVAL-ADAQ4216-FMCZ board product page or from the plug-in manager in ACE.

Do the following steps to complete the installation process:

1. Install the ACE evaluation software. The installation steps are described on the ACE Getting Started wiki page.
2. Verify that the latest version of the software is installed in the ACE sidebar. Click **Check For Updates** option, as shown in Figure 7.
3. Install the ADAQ4216 ACE plug-in. The ACE Quickstart - Using ACE and Installing Plug-ins wiki page shows the plug-in installation guide.

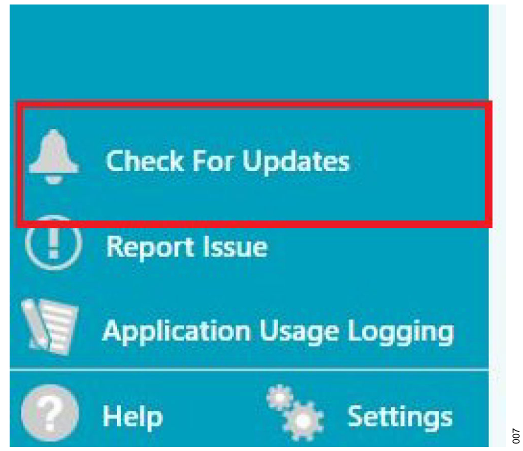

Figure 7. Updating ACE

EVALUATION BOARD SETUP PROCEDURE

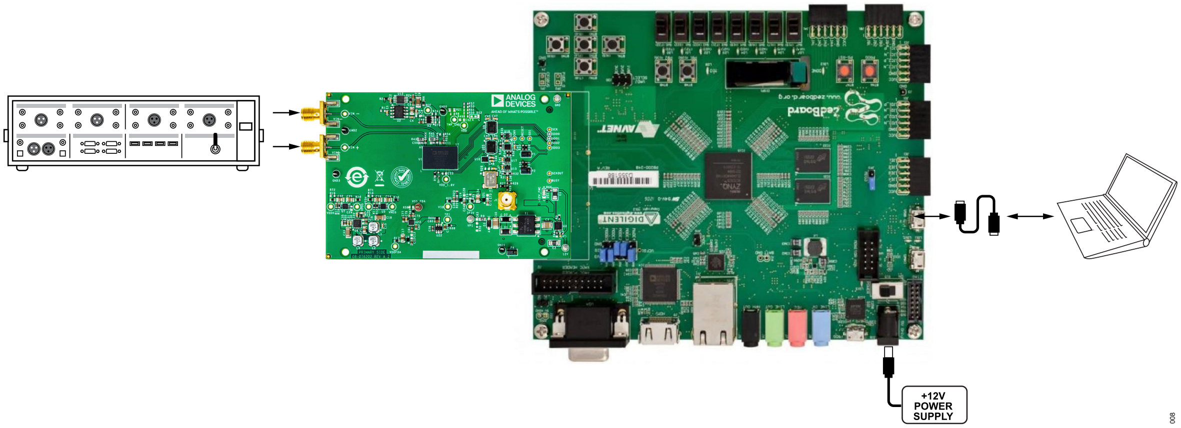

Figure 8. Evaluation Board Setup

EVALUATION BOARD SETUP PROCEDURE

Figure 8 shows a diagram of the evaluation setup for the EVAL-ADAQ4216-FMCZ board.

After installing the ACE software, do the following steps to setup the EVAL-ADAQ4216-FMCZ board and the Zedboard:

1. Ensure that all configuration links are in the appropriate positions for both the EVAL-ADAQ4216-FMCZ board and the Zedboard. For more details, see Figure 4 to Figure 6.
2. Insert the micro-SD card included in the EVAL-ADAQ4216-FMCZ board kit into the Zedboard.
3. Connect the EVAL-ADAQ4216-FMCZ board securely to the 160-pin FMC connector on the Zedboard. The EVAL-ADAQ4216-FMCZ board does not require an external bench top supply by default.
4. Connect the Zedboard to the PC using the USB cable included in the Zedboard kit.
5. Connect the +12V wall adapter from the Zedboard kit to an outlet.

ACE SOFTWARE OPERATION

LAUNCHING THE SOFTWARE

After the EVAL-ADAQ4216-FMCZ board and the Zedboard are properly connected to the PC using a USB cable, do the following steps to launch the ACE evaluation software:

1. From the **Start** menu of the PC, click **All Programs** > **Analog Devices** > **ACE** > **ACE.exe** to open the ACE software main window, as shown in Figure 9.
2. Connect the EVAL-ADAQ4216-FMCZ board and the Zedboard to the PC, as shown in Figure 8 and in the Evaluation Board Setup Procedure section.
3. Turn on SW8 on the Zedboard and wait for LD0 to start blinking. The **ADAQ4216 Eval board** icon appears in the **Attached Hardware** section on the ACE software main window, as shown in Figure 9.
4. Double-click **ADAQ4216 Eval Board** icon to open the Board view tab, as shown in Figure 10.
5. Double-click **ADAQ4216** chip icon in the Board view tab to open the Chip view tab, as shown in Figure 11. The user can set the sampling frequency, calibration registers, and the gain on the Chip view tab. Click **Restore Software Defaults** button to change back to the default settings.
6. Click **Proceed to Analysis** button to open Analysis tab. In the Analysis tab, the data capture displays as a waveform, an FFT, and in a histogram, as shown from Figure 12 to Figure 14.
7. For INL and DNL analysis, go back to the Chip view tab and click **Proceed to INL Analysis** button. On the **CAPTURE** and **INL Analysis** pane, set the sampling frequency, no. of samples, no. of iterations, truncation, and units. Before doing an INL analysis, modify the EVAL-ADAQ4216-FMCZ and install R67 and remove R59. This connects the VSS_FDA pin of the ADAQ4216 to the −1V supply. After the INL capture is done, the user can view the results in then INL and DNL views, as shown in Figure 15 and Figure 16.

DESCRIPTION OF ANALYSIS TAB

The Analysis tab allows the user to showcase the performance of the ADAQ4216. Before performing any measurements, set the values in **Capture Settings** (see the **CAPTURE** pane) and **Single Tone Analysis** and **Two Tone Analysis** (see the **ANALYSIS** pane).

Capture Pane

The **CAPTURE** pane contains the **Capture Settings**. These settings are reflected into the ADAQ4216 registers automatically before data capture.

The **Effective Sample Frequency** field allows the user to set the sampling rate of the ADAQ4216 µModule. The default maximum sampling frequency is 2MSPS.

The **No. of Samples** drop-down menu allows the user to select the number of samples per capture.

The **Coherency Calculator** field calculates the frequency setting for the signal source to have a coherent capture with the ADAQ4216.

Results Pane

The **RESULTS** pane shows the relevant performance calculations specific to the selected capture tab whether it is in waveform, FFT, or in histogram. For more details, see the **RESULTS** pane from Figure 12 to Figure 14.

Analysis Pane

The **ANALYSIS** pane contains the **General Settings** section, which allows the user to set up the preferred configuration of the FFT analysis, that includes how many tones are analyzed. The fundamental strategy is set manually.

The **Windowing** section allows the user to select the **Window** type used in the FFT analysis, set the **Number of Harmonics**, and set the number of **Fundamental Bins**, **Harmonic Bins**, **DC Bins**, and **Worst Other Bins** that must be included.

The **Single Tone Analysis** section allows the user to select the **Single Tone Fundamental** frequency included in the FFT analysis.

The **Two Tone Analysis** section allows the user to select the **First Fundamental** and **Second Fundamental** frequency included in the FFT analysis.

WAVEFORM TAB

The Waveform tab displays the discrete data vs. time with the results, as shown in Figure 12.

The waveform graph shows each successive sample of the µModule. The user can zoom in on and pan over the waveform graph using the embedded waveform tools above the graph.

Under the display units drop-down menu, select Codes above the waveform graph to select whether graph displays in units of Codes, Hex, or Volts. The axis controls are dynamic.

When either y-scale dynamic or x-scale dynamic is selected, the corresponding axis width automatically adjusts to show the entire range of µModule results after each batch of samples.

FFT TAB

The FFT tab displays fast Fourier transform (FFT) information for the last batch of samples gathered, as shown in Figure 13.

When performing an FFT analysis, the **RESULTS** pane shows the **Noise** and **Distortion** performance of the ADAQ4216. **SNR** and other noise performance measurements, such as **SINAD**, **Dynamic Range**, noise density (**Noise / Hz**), and **SFDR**, are shown in the **Noise** section. The **THD** measurements, as well as the major harmonics contributing to the THD performance, are shown in the **Distortion** section.

ACE SOFTWARE OPERATION

HISTOGRAM TAB

The Histogram tab contains the Histogram graph and the **RESULTS** pane, as shown in Figure 14. The **RESULTS** pane displays the information related to the DC performance. The Histogram graph displays the number of hits per code within the sampled data. This graph is useful for DC analysis and indicates the noise performance of the device.

DESCRIPTION OF INL ANALYSIS TAB

The INL Analysis tab allows the user to showcase the linearity performance of the ADAQ4216. Before performing any measurements, set the **Capture Settings** and **INL Settings** in the **CAPTURE** and **INL ANALYSIS** pane, respectively, as shown in Figure 15 and Figure 16. To perform linearity test, apply a +0.5dBFS amplitude sinusoidal signal from a precision signal source at the VIN+ and VIN− SMA inputs of the EVAL-ADAQ4216-FMCZ board. VSS_FDA also needs to be connected to the on-board −1V supply.

ADAQ4216 EVALUATION BOARD SOFTWARE TROUBLESHOOTING

To troubleshoot the ADAQ4216 evaluation board software, do the following steps:

1. Install the ACE software and ADAQ4216 plug-in before connecting the hardware to the PC (for more details, see the ACE Installation Procedure section).
2. Restart the ACE software after the plug-in is installed or updated from the Plug-in Manager.
3. When the user turns on the Zedboard, the LD0 LED blinks on the Zedboard, which indicates that the hardware is booted up correctly.
4. If the EVAL-ADAQ4216-FMCZ board does not function, then make sure that the EVAL-ADAQ4216-FMCZ board is connected securely to the Zedboard and that the Zedboard is recognized in the **Device Manager**.

ADAQ4216 HARDWARE TROUBLESHOOTING

To troubleshoot the hardware, do the following steps:

1. Check that the +12V power is applied through the FMC connector. DS1 LED lights up when the +12V supply is connected.
2. Using a voltmeter, measure the voltage present at each of the test points: V_{DDH} (+18V), V_{SSH} (−18V), VDD_FDA (+5V), VSS_FDA (−1V), 3P3V (+3.3V), V_{IO} (+1.8V), and V_{REF} (+4.096V).
3. Launch the ACE software and read the data. If nothing happens, exit the software.
4. Power down the EVAL-ADAQ4216-FMCZ board and relaunch the software.
5. When no data is readback, confirm that the EVAL-ADAQ4216-FMCZ board is connected to the Zedboard and that the EVAL-ADAQ4216-FMCZ board is recognized in the **Device Manager**.

ACE SOFTWARE OPERATION

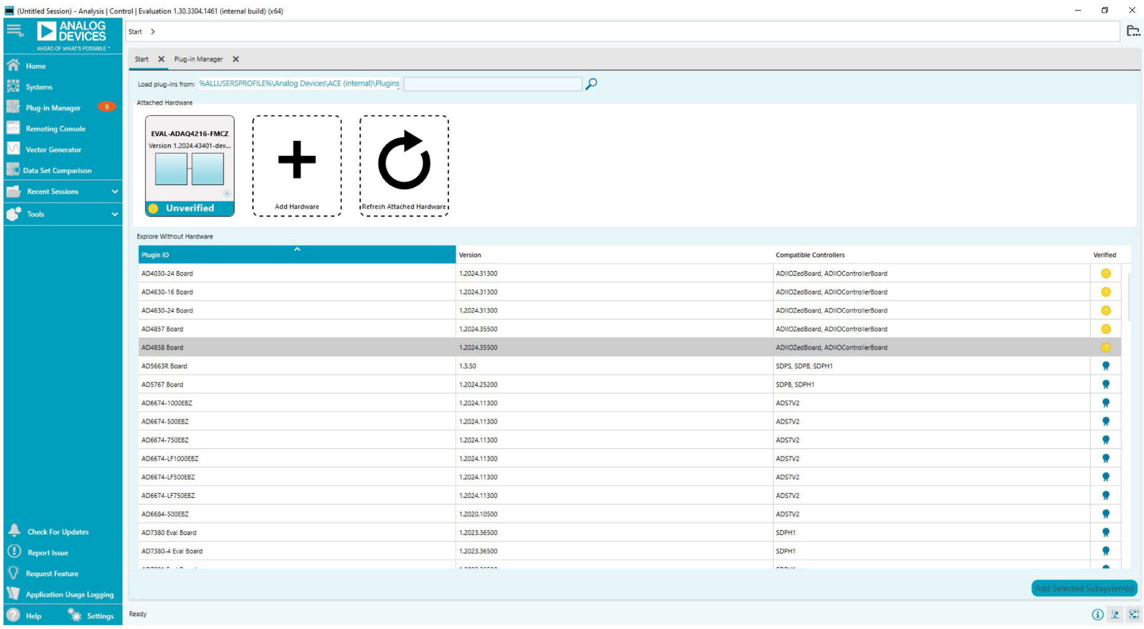

Figure 9. ACE Software Main Window

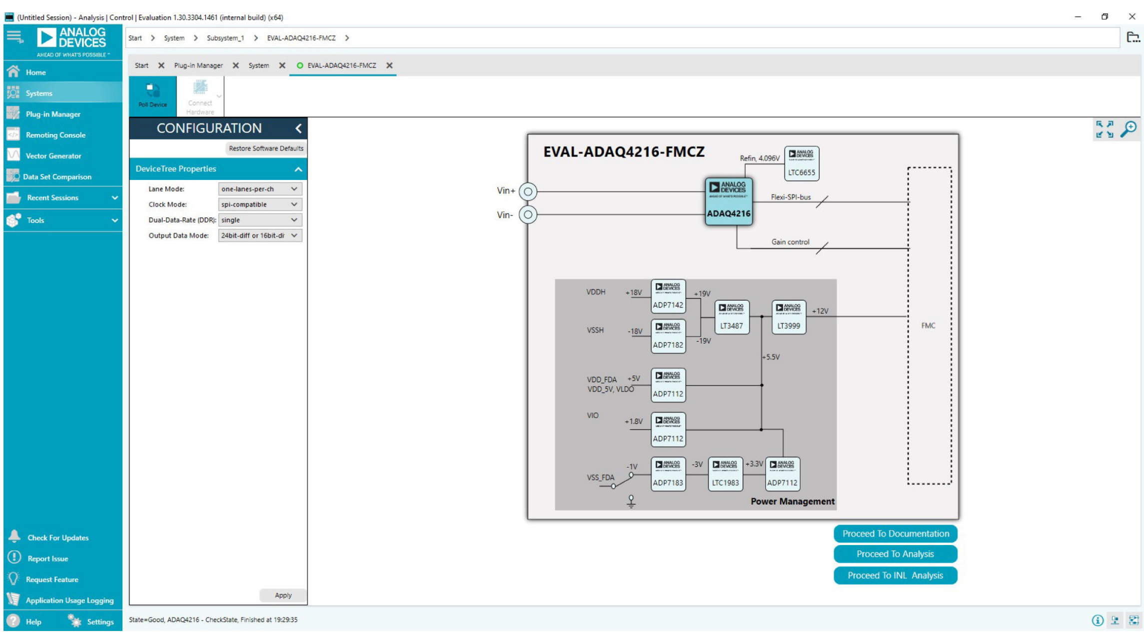

Figure 10. ADAQ4216 Board View Window

ACE SOFTWARE OPERATION

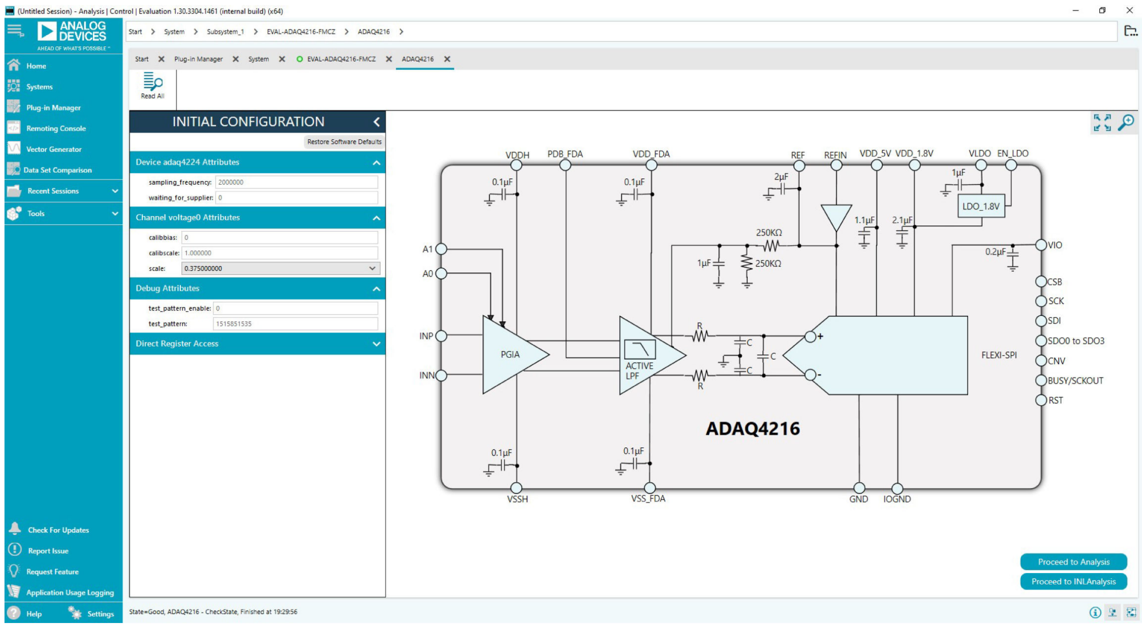

Figure 11. ADAQ4216 Chip View Window

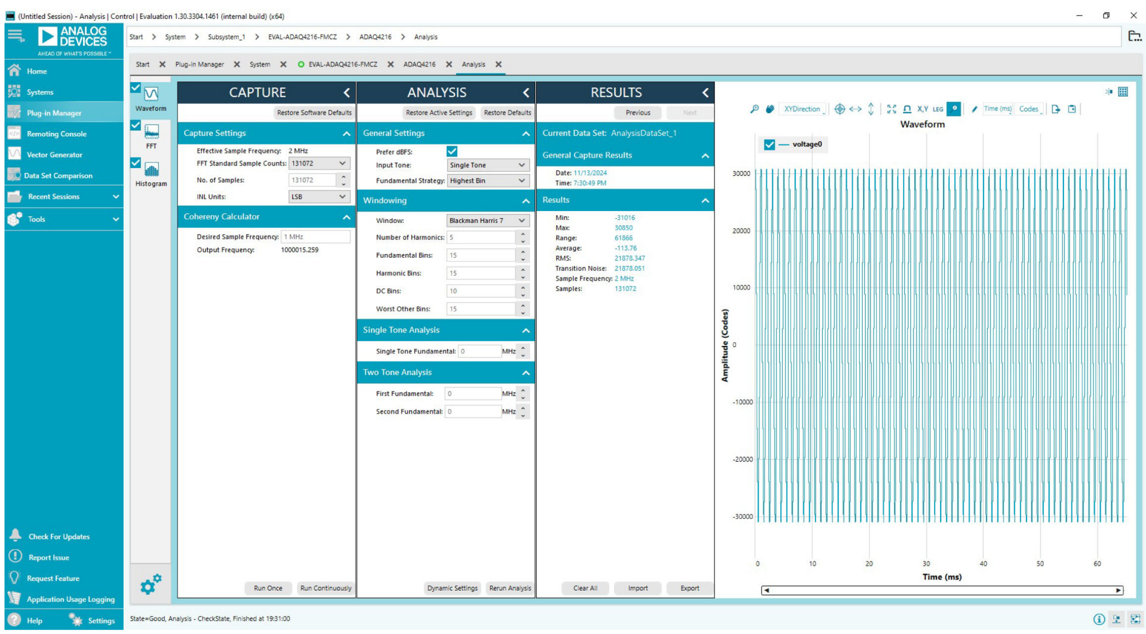

Figure 12. Analysis Tab, Waveform Display (1kHz, −0.5dBFS Input Signal)

ACE SOFTWARE OPERATION

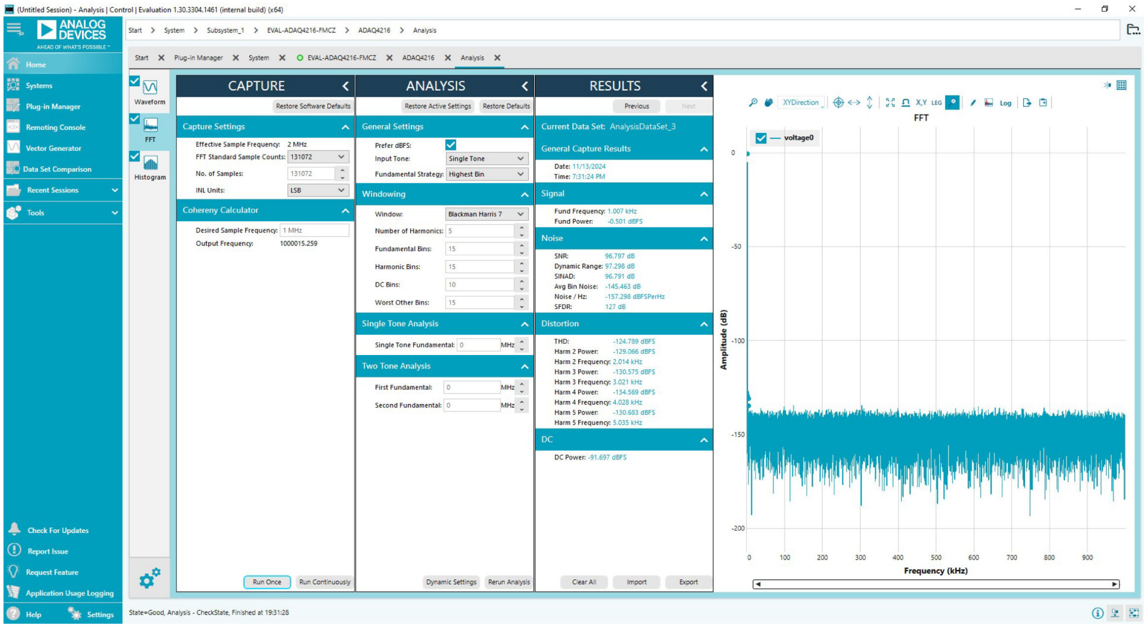

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Figure 13. Analysis Tab, FFT Display

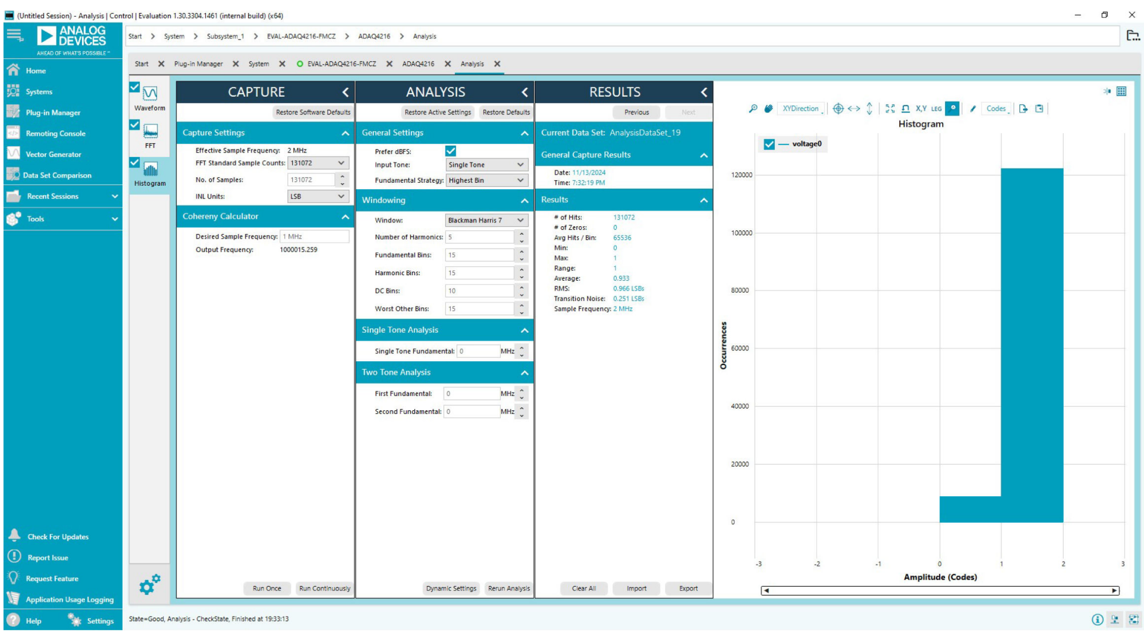

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Figure 14. Analysis Tab, Histogram Display (Grounded Inputs)

ACE SOFTWARE OPERATION

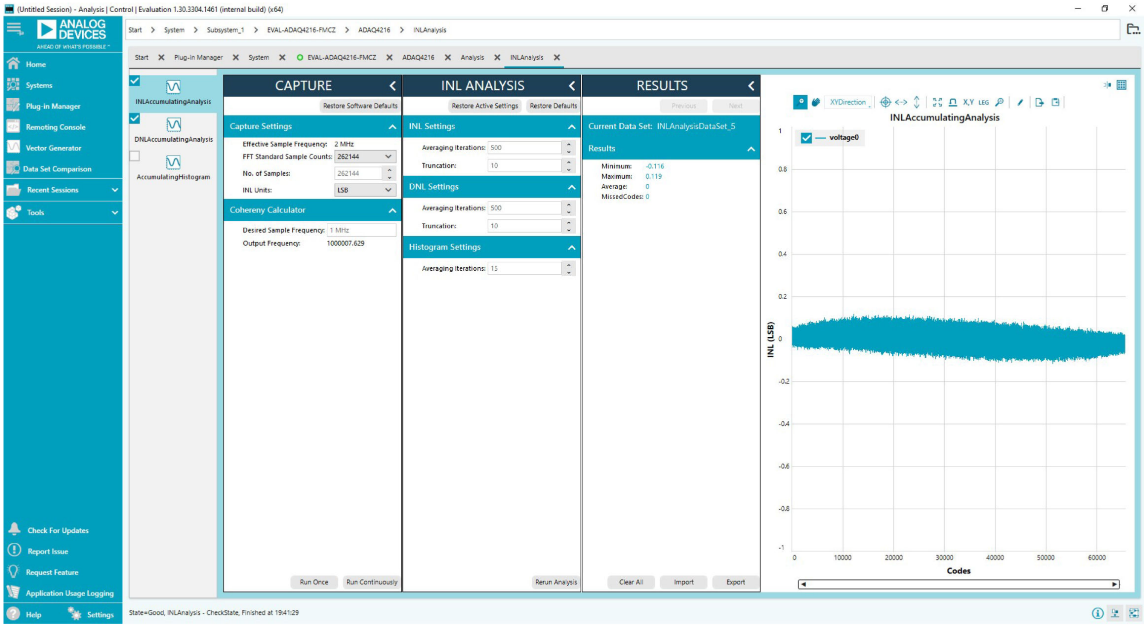

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Figure 15. INL Analysis Tab, INL View

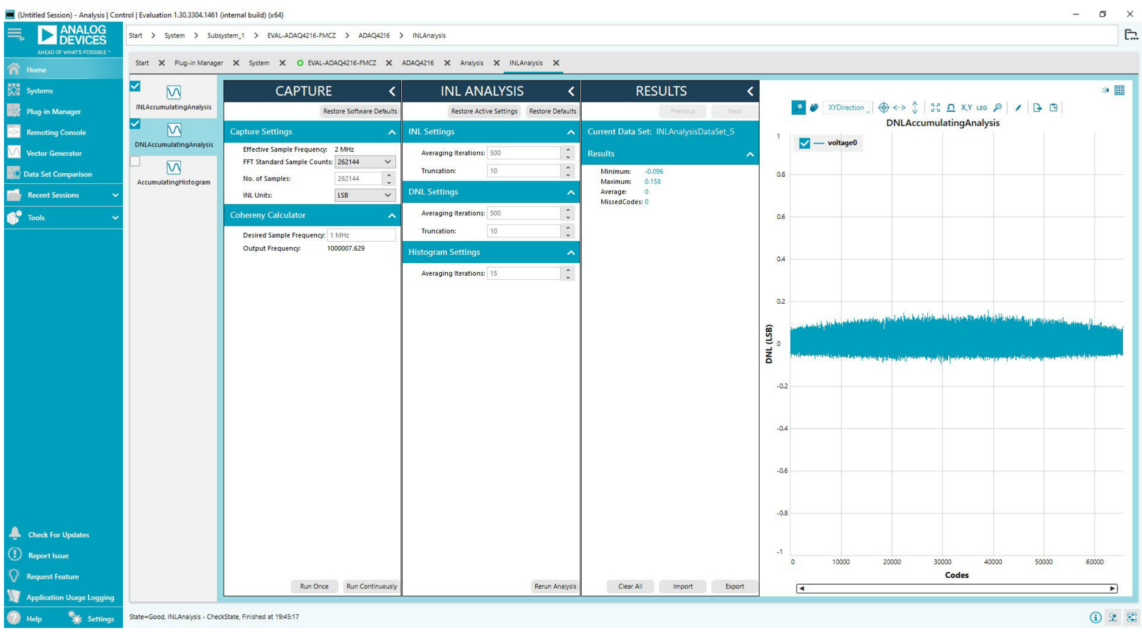

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Figure 16. INL Analysis Tab, DNL View

EVALUATION BOARD SCHEMATICS AND SILKSCREENS

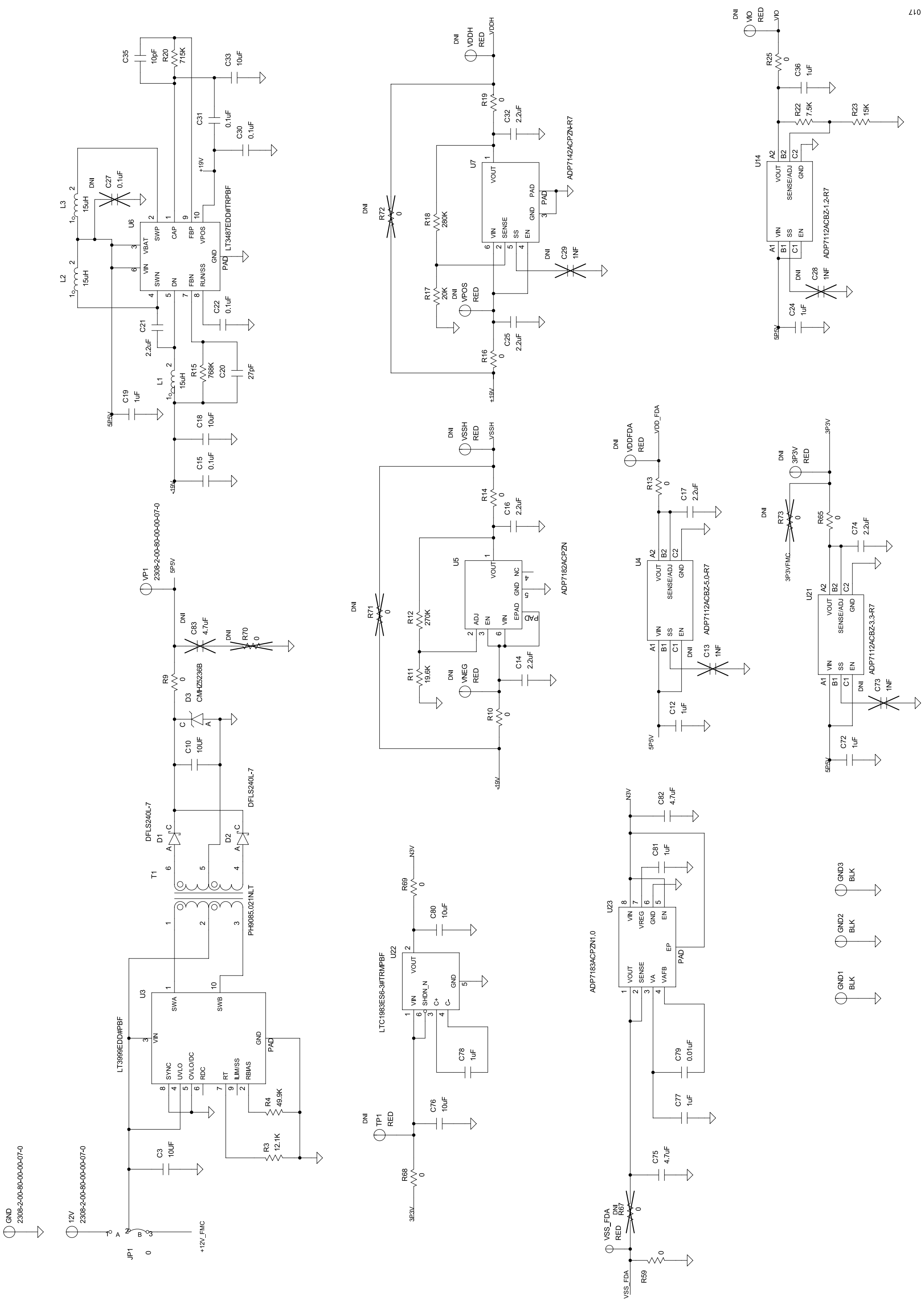

Figure 17. EVAL-ADAQ4216-FMCZ Power Section

EVALUATION BOARD SCHEMATICS AND SILKSCREENS

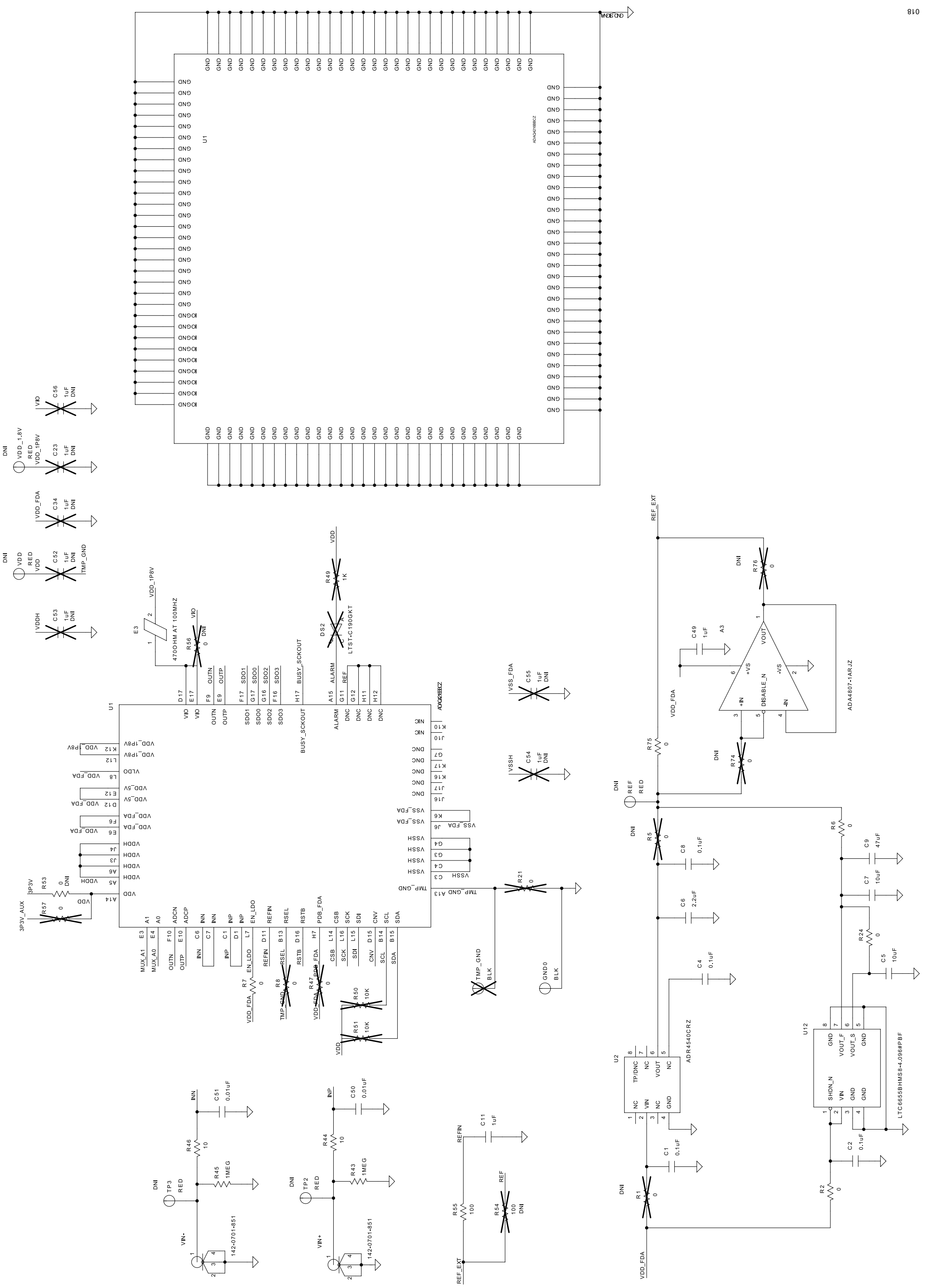

Figure 18. EVAL-ADAQ4216-FMCZ Reference Circuitry and ADAQ4216

EVALUATION BOARD SCHEMATICS AND SILKSCREENS

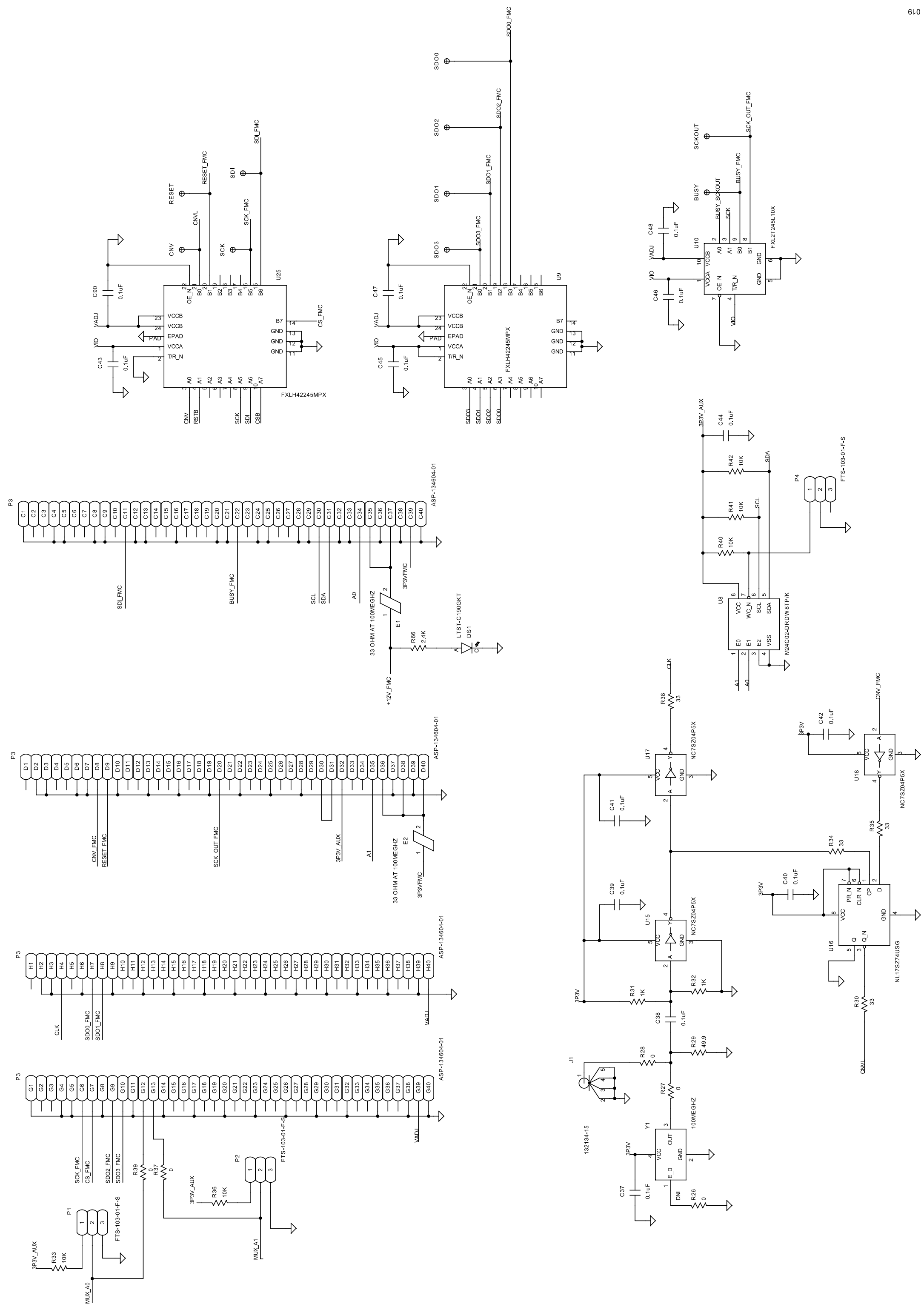

Figure 19. EVAL-ADAQ4216-FMCZ FMC Connector, Voltage Translators, and Clocking Circuitry

EVALUATION BOARD SCHEMATICS AND SILKSCREENS

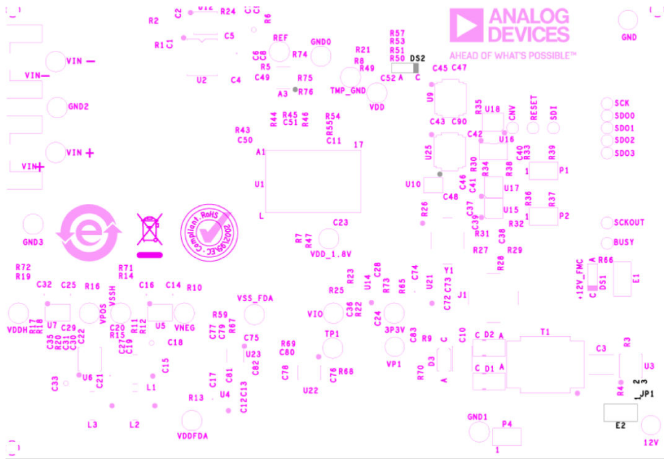
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Figure 20. EVAL-ADAQ4216-FMCZ Silkscreen, Top Layer

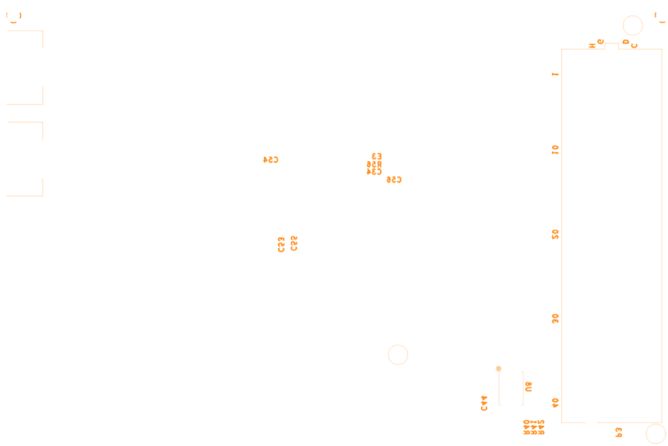
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Figure 21. EVAL-ADAQ4216-FMCZ Silkscreen, Bottom Layer

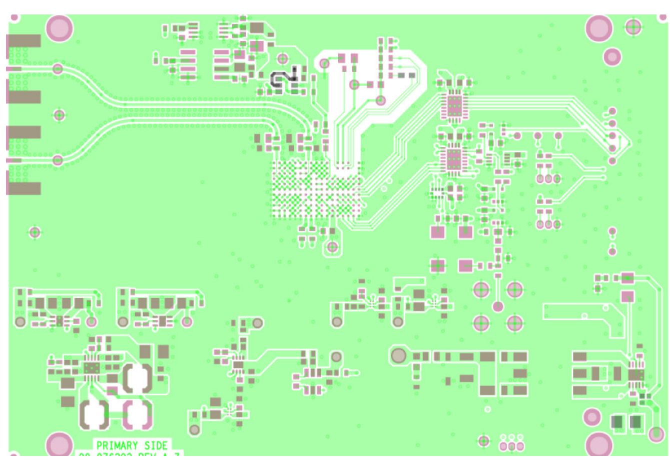
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Figure 22. EVAL-ADAQ4216-FMCZ, Top Layer 1

EVALUATION BOARD SCHEMATICS AND SILKSCREENS

Figure 23. EVAL-ADAQ4216-FMCZ, Ground Layer 2

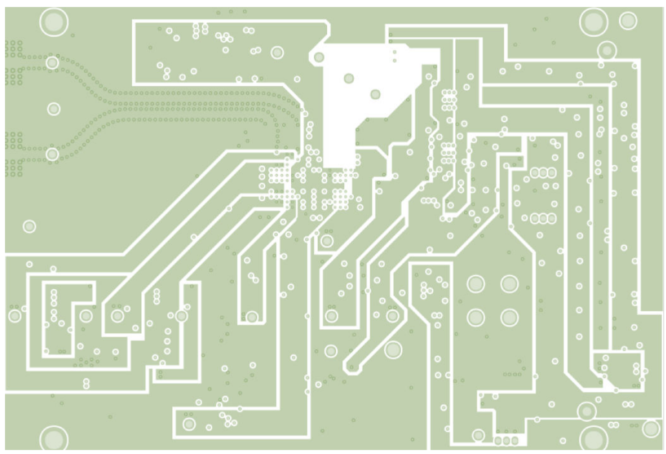

Figure 24. EVAL-ADAQ4216-FMCZ, Power Layer 3

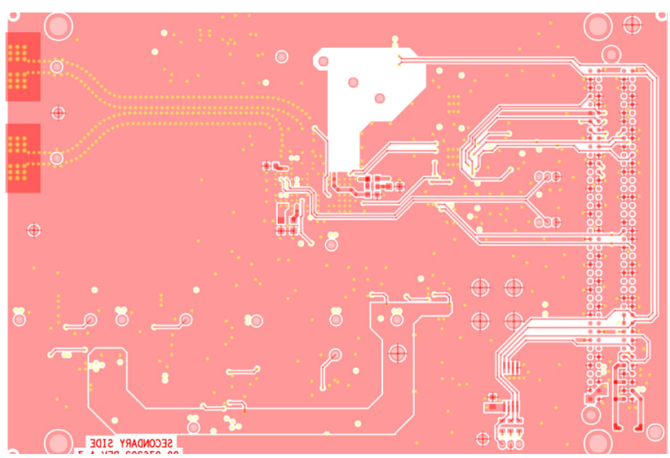

Figure 25. EVAL-ADAQ4216-FMCZ, Bottom Layer 4

ORDERING INFORMATION

BILL OF MATERIALS

Table 4. Bill of Materials for EVAL-ADAQ4216-FMCZ

Quantity	Reference Designator	Description	Manufacturer	Part Number
3	12V, GND, VP1	PCB connectors, solder terminal turrets for clip leads	Mill-Max	2308-2-00-80-00-00-07-0
1	A3	IC-ADI, 180MHz rail-to-rail I/O amplifier	Analog Devices, Inc.	ADA4807-1ARJZ-R7
15	C1, C2, C4, C8, C15, C22, C30, C31, C37, C38, C39, C40, C41, C42, C44	Ceramic capacitors, 0.1µF, 50V, 10%, X7R, 0603	AVX	06035C104KAT2A
2	C3, C10	Ceramic capacitors, 10µF, 25V, 10%, X7R, 1210, AEC-Q200	Murata	GCM32ER71E106KA57L
10	C11, C12, C19, C24, C36, C49, C72, C77, C78, C81	Ceramic capacitors, 1µF, 16V, 10%, X7R, 0603	AVX	0603YC105KAT2A
8	C6, C14, C16, C17, C21, C25, C32, C74	Ceramic capacitors, 2.2µF, 50V, 10%, X7R, 0805	Taiyo Yuden	UMK212BB7225KG-T
2	C18, C33	Ceramic capacitors, 10µF, 35V, 10%, X7R, 1206	Taiyo Yuden	GMK316AB7106KL-TR
1	C20	Ceramic capacitor, 27pF, 50V, 5%, C0G, 0603	Phycomp (Yageo)	2238 867 15279
1	C35	Ceramic capacitor, low ESR, 10pF, 50V, ±0.5pF, C0G, 0603	TDK	C1608C0G1H100D080A A
6	C43, C45, C46, C47, C48, C90	Ceramic capacitors, 0.1µF, 25V, 10%, X7R, 0603	Kemet	C0603C104K3RACTU
4	C5, C7, C76, C80	Ceramic capacitors, 10µF, 25V, 20%, X5R, 0603	Murata	GRM188R61E106MA73D
2	C50, C51	Ceramic capacitors, low ESR, 0.01µF, 50V, 5%, C0G, 0603, AEC-Q200	TDK	CGA3E2C0G1H103J080 AA
2	C75, C82	Ceramic capacitors, low ESR, 4.7µF, 10V, 10%, X7S, 0603	TDK	C1608X7S1A475K080AC
1	C79	Ceramic capacitor, 0.01µF, 10V, 10%, X7R, 0603	Wurth Elektronik	8.85E+11
1	C9	Ceramic capacitor, low ESR, 47µF, 25V, 20%, X5R, 1206	TDK	C3216X5R1E476M160A C
2	D1, D2	Diodes, 2.0A, low VF SCHOTTKY barrier rectifier	Diodes Inc.	DFLS240L-7
1	D3	Silicon Zener diode	Central Semiconductor	CMHZ5236B PBFREE
2	DS1	LED green clear chips SMD	Lite-On Technology	LTST-C190GKT
2	E1, E2	Ferrite beads, 33Ω, 100MHz, 6A, 25%, 0.009Ω, 1206	Murata	BLM31PG330SN1L
1	E3	Ferrite bead, DC resistance (DCR) (max) 0.150Ω, 1A	TDK	MPZ1608B471ATA00
5	GND0, GND1, GND2, GND3, TMP_GND	PCB test-points, black	Vero Technologies	20-2137
1	J1	PCB connector, SMA connector jack, female socket, 50Ω, surface mount with through hole solder	Amphenol RF	132134-15
1	JP1	Resistor, SMD, 0Ω, jumper, 1/10W, 0402, AEC-Q200	Panasonic	ERJ-2GE0R00X
3	L1, L2, L3	Power inductors, SMD, 15µH, shielded, 20%, 0.94A, 0.260Ω	Coilcraft	LPS4018-153MRC
3	P1, P2, P4	PCB connectors, micro low-profile terminal strips assembly	Samtec	FTS-103-01-F-S
1	P3	PCB connector, 160-position connector array, male pins, surface mount, gold contact finish, for KITT RF application, use alternate symbol	Samtec	ASP-134604-01
22	R2, R6, R7, R10, R13, R14, R16, R19, R24, R25, R27, R28, R37, R39, R59, R65, R68, R69, R75	Resistors, SMD, precision power, 0Ω, jumper, 1/10W, 0603, AEC-Q200	Vishay	CRCW06030000Z0EA
1	R11	Resistor, SMD, 19.6kΩ, ±0.5%, 1/16W, 0603,	Susumu Co., Ltd.	RR0816P-1962-D-29C
1	R12	Resistor, SMD, 270kΩ, ±1%, 1/10W, 0603, AEC-Q200	Vishay	CRCW0603270KFKEA
1	R15	Resistor, SMD, 768kΩ, ±1%, 1/10W, 0603, AEC-Q200	Panasonic	ERJ-3EKF7683V

ORDERING INFORMATION

Table 4. Bill of Materials for EVAL-ADAQ4216-FMCZ (Continued)

Quantity	Reference Designator	Description	Manufacturer	Part Number
1	R17	Resistor, SMD, 20kΩ, ±0.01%, 1/10W, 0603, AEC-Q200	Stackpole Electronics, Inc.	RNCF0603TKT20K0
1	R18	Resistor, SMD, 280kΩ, ±1%, 1/10W, 0603, AEC-Q200	Panasonic	ERJ-3EKF2803V
1	R20	Resistor, SMD, 715kΩ, ±1%, 1/10W, 0603, AEC-Q200	Vishay	CRCW0603715KFKEA
1	R22	Resistor, SMD, sulfur resistant, 7.5kΩ, ±0.1%, 0.15W, 0603, AEC-Q200	Vishay	PAT0603E7501BST1
1	R23	Resistor, SMD, high precision, high stability, 15kΩ, ±0.1%, 1/10W, 0603	Yageo	RT0603BRB0715KL
1	R29	Resistor, SMD, 49.9Ω, ±1%, 1/10W, 0603, AEC-Q200	Panasonic	ERJ-3EKF49R9V
1	R3	Resistor, SMD, 36.5kΩ, ±1%, 1/10W, 0603, AEC-Q200	Panasonic	ERJ-3EKF3652V
4	R30, R34, R35, R38	Resistors, SMD, pulse proof, 33Ω, ±1%, 1/3W, 0603, AEC-Q200	Vishay	CRCW060333R0FKEAHP
3	R31, R32	Resistors, SMD, 1kΩ, ±1%, 1/10W, 0603, AEC-Q200	Panasonic	ERJ-3EKF1001V
7	R33, R36, R40, R41, R42	Resistors, SMD, 10kΩ, ±1%, 1/10W, 0603, AEC-Q200	Panasonic	ERJ-3EKF1002V
1	R4	Resistor, SMD, high-power pulse proof, 49.9kΩ, ±1%, 1/3W, 0603, AEC-Q200	Vishay	CRCW060349K9FKEAHP
2	R43, R45	Resistors, SMD, 1MΩ, ±1%, 1/8W, 0805, AEC-Q200	Panasonic	ERJ-6ENF1004V
2	R44, R46	Resistors, SMD, sulfur resistant, high stability, 10Ω, ±0.1%, 0.21W, 0603, AEC-Q200	Vishay	TNPW060310R0BEEA
1	R55	Resistor, SMD, high reliability, 100Ω, ±0.1%, 1/10W, 0603, AEC-Q200	Panasonic	ERA-3AEB101V
1	R66	Resistor, SMD, 2.4kΩ, ±1%, 1/10W, 0603, AEC-Q200	Panasonic	ERJ-3EKF2401V
1	R9	Resistor, SMD, 0Ω, 1/10W, 0805	Multicomp (SPC)	MC01W08050R
1	T1	Isolation power transformer, turns ratio 2CT:1CT, 1.16µH, 2500V RMS	Pulse Electronics	PH9085.021NLT
1	U1	IC-ADI, 16-bit, 2MSPS, µModule data-acquisition solution	Analog Devices, Inc.	ADAQ4216BBCZ
1	U10	IC, translator, bidirectional, 2-bit per element 3-state output, 10-lead MicroPak	Onsemi	FXL2T245L10X
1	U12	IC-ADI, 0.25ppm noise, low-drift precision references, 4.096V_{OUT}	Analog Devices, Inc.	LTC6655BHMS8-4.096#PBF
1	U14	IC-ADI, low noise, CMOS LDO linear regulator, 1.2V_{OUT}	Analog Devices, Inc.	ADP7112ACBZ-1.2-R7
3	U15, U17, U18	IC TinyLogic® ultra-high speed (UHS) inverters	Onsemi	NC7SZ04P5X
1	U16	IC-TTL flip flops, D-type, positive edge	Onsemi	NL17SZ74USG
1	U2	IC-ADI, ultra-low noise, high-accuracy, 4.096V voltage reference	Analog Devices, Inc.	ADR4540CRZ
1	U21	IC-ADI, low noise, CMOS LDO linear regulator, 3.3V_{OUT}	Analog Devices, Inc.	ADP7112ACBZ-3.3-R7
1	U22	IC-ADI, 0.1A, regulated charge-pump inverters in ThinSOT	Analog Devices, Inc.	LTC1983ES6-3#TRMPBF
1	U23	IC-ADI, ultra-low noise, high PSRR, low dropout linear regulator, 1.0V_{OUT}	Analog Devices, Inc.	ADP7183ACPZN1.0-R7
2	U9, U25	IC translators, bidirectional	Onsemi	FXLH42245MPX

ORDERING INFORMATION

Table 4. Bill of Materials for EVAL-ADAQ4216-FMCZ (Continued)

Quantity	Reference Designator	Description	Manufacturer	Part Number
1	U3	IC-ADI, low noise, 1A, 1MHz push-pull DC/DC driver with duty cycle control	Analog Devices, Inc.	LT3999EDD#PBF
1	U4	IC-ADI, low noise, CMOS LDO linear regulator, $5.0V_{OUT}$	Analog Devices, Inc.	ADP7112ACBZ-5.0-R7
1	U5	IC-ADI, low noise, linear regulator, adjustable output voltage	Analog Devices, Inc.	ADP7182ACPZN-R7
1	U6	IC-ADI, boost and inverting switching regulator for CCD bias	Analog Devices, Inc.	LT3487EDD#TRPBF
1	U7	IC-ADI, low noise, CMOS LDO linear regulator	Analog Devices, Inc.	ADP7142ACPZN-R7
1	U8	EEPROM memory IC, 2kb (256 × 8), 2.5V/3.3V/5V, I^2C	ST Microelectronics	M24C02-DRDW8TP/K
2	VIN+, VIN−	PCB connectors, jack assembly end launch, SMA, 62mils board thickness, for 10mils and 30mils board thickness, use alternate symbols	Cinch	142-0701-851
1	VSS_FDA	PCB connector, red PC test point	Keystone Electronics	5000
1	Y1	IC, crystal clock oscillator	Connor Winfield	CWX813-100.0M