

Evaluating the AD6642/AD6657 Analog-to-Digital Converters

FEATURES

Full featured evaluation board for the [AD6642/AD6657](#)
 SPI interface for setup and control
 External, on-board oscillator or [AD9517](#) clocking options
 Balun/transformer or amplifier input drive options
 LDO regulator power supply
 VisualAnalog® and SPI controller software interfaces

EQUIPMENT NEEDED

Analog signal source and antialiasing filter
 Sample clock source (if not using the on-board oscillator)
 2 switching power supplies (6.0 V, 2.5 A), CUI, Inc.
 EPS060250UH-PHP-SZ, provided
 PC running Windows® 98 (2nd ed.), Windows 2000,
 Windows ME, or Windows XP
 USB 2.0 port, recommended (USB 1.1 compatible)
 AD6642 or AD6657 evaluation board
[HSC-ADC-EVALCZ](#) FPGA-based data capture kit

SOFTWARE NEEDED

VisualAnalog
 SPI controller

DOCUMENTS NEEDED

AD6642 or AD6657 data sheet
 HSC-ADC-EVALCZ data sheet
[AN-905](#) Application Note, *VisualAnalog Converter Evaluation Tool, Version 1.0 User Manual*
[AN-878](#) Application Note, *High Speed ADC SPI Control Software*
[AN-877](#) Application Note, *Interfacing to High Speed ADCs via SPI*
[AN-835](#) Application Note, *Understanding ADC Testing and Evaluation*

GENERAL DESCRIPTION

This document describes the AD6642 and AD6657 evaluation board, which provides all of the support circuitry required to operate the AD6642 or AD6657 in their various modes and configurations. The application software used to interface with the devices is also described.

The AD6642 and AD6657 data sheets provide additional information and should be consulted when using the evaluation board. All documents and software tools are available at www.analog.com/fifo. For additional information or questions, send an email to highspeed.converters@analog.com.

TYPICAL MEASUREMENT SETUP

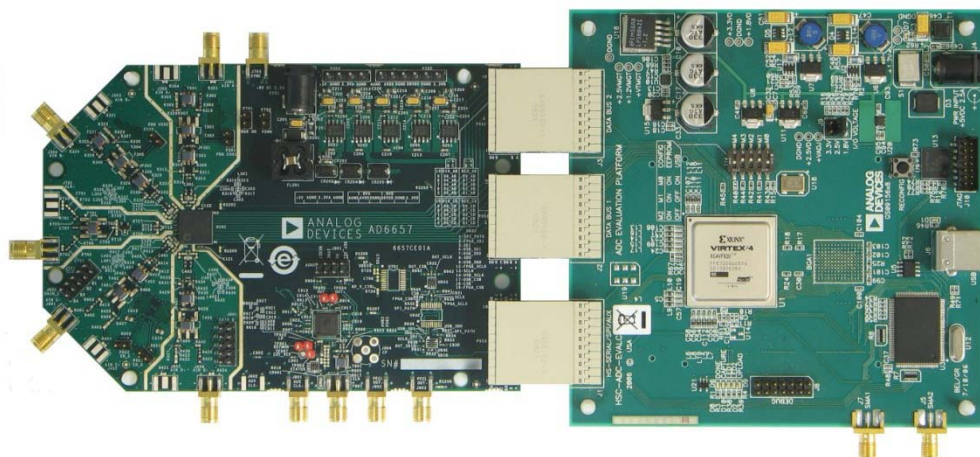


Figure 1. AD6642 and AD6657 Evaluation Board and HSC-ADC-EVALCZ Data Capture Board

00672-001

TABLE OF CONTENTS

Features	1	Input Signals.....	3
Equipment Needed.....	1	Output Signals	3
Software Needed	1	Default Operation and Jumper Selection Settings.....	5
Documents Needed.....	1	Evaluation Board Software Quick Start Procedures.....	6
General Description	1	Configuring the Board	6
Typical Measurement Setup	1	Using the Software for Testing.....	6
Revision History	2	Evaluation Board Schematics and Artwork.....	11
Evaluation Board Hardware.....	3	Ordering Information.....	25
Power Supplies	3	Bill of Materials.....	25

REVISION HISTORY

12/10—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

The [AD6642](#) and [AD6657](#) evaluation board provides all of the support circuitry required to operate these parts in their various modes and configurations. Figure 2 shows the typical bench characterization setup used to evaluate the ac performance of the AD6642 or AD6657. It is critical that the signal sources used for the analog input and clock have very low phase noise (<1 ps rms jitter) to realize the optimum performance of the signal chain. Proper filtering of the analog input signal to remove harmonics and lower the integrated or broadband noise at the input is necessary to achieve the specified noise performance.

The AD6642 and AD6657 evaluation board covers two general part families. The boards are populated slightly differently for each family. The AD6642 is one part supported by this evaluation board, and the AD6657 is the second part supported by this evaluation board. The evaluation board supports quad-channel operation for the AD6657 while supporting dual-channel operation for the AD6642.

See the Evaluation Board Software Quick Start Procedures section to get started, and see Figure 20 to Figure 36 for the complete schematics and layout diagrams. These diagrams demonstrate the routing and grounding techniques that should be applied at the system level when designing application boards using these converters.

POWER SUPPLIES

This evaluation board comes with a wall-mountable switching power supply that provides a 6 V, 2 A maximum output. Connect the supply to the rated 100 V ac to the 240 V ac wall outlet at 47 Hz to 63 Hz. The output from the supply is provided through a 2.1 mm inner diameter jack that connects to the printed circuit board (PCB) at P201. The 6 V supply is fused and conditioned on the PCB before connecting to the low dropout linear regulators (default configuration) that supply the proper bias to each of the various sections on the board.

The evaluation board can be powered in a nondefault condition using external bench power supplies. To do this, the E201, E202, E204, E205, and E207 ferrite beads can be removed to disconnect the outputs from the on-board LDOs. This enables the user to bias each section of the board individually. Use P202 and P203 to connect a different supply for each section. A 1.8 V supply is

needed with a 1 A current capability for DUT_AVDD and DRVDD; however, it is recommended that separate supplies be used for both analog and digital domains. An additional supply is also required to supply 1.8 V for digital support circuitry on the board, DVDD. This should also have a 1 A current capability and can be combined with DRVDD with little or no degradation in performance. To operate the evaluation board using the SPI and alternate clock options, a separate 3.3 V analog supply is needed in addition to the other supplies. This 3.3 V supply, or 3P3V_ANALOG, should have a 1 A current capability. This 3.3 V supply is also used to support optional input path amplifiers ([ADL5562](#)) on Channel A and Channel B. An additional supply, 5V_SUPPORT, is used to bias the optional dual input path amplifier ([AD8376](#)) on Channel C and Channel D. If used, these supplies should each have 1 A current capability.

INPUT SIGNALS

When connecting the clock and analog source, use clean signal generators with low phase noise, such as the Rohde & Schwarz SMA, or HP 8644B signal generators or an equivalent. Use a 1 m shielded, RG-58, 50 Ω coaxial cable for connecting to the evaluation board. Enter the desired frequency and amplitude (see the Specifications section in the data sheet of the respective part). When connecting the analog input source, use of a multipole, narrow-band band-pass filter with 50 Ω terminations is recommended. Analog Devices, Inc., uses TTE and K&L Microwave, Inc., band-pass filters. The filters should be connected directly to the evaluation board.

If an external clock source is used, it should also be supplied with a clean signal generator as previously specified. Typically, most Analog Devices evaluation boards can accept ~2.8 V p-p or 13 dBm sine wave input for the clock.

OUTPUT SIGNALS

The default setup uses the Analog Devices high speed converter evaluation platform ([HSC-ADC-EVALCZ](#)) for data capture. The output signals from Channel A/Channel B for the AD6642 and Channel A/Channel B/Channel C/Channel D for the AD6657 are routed through P951 and P952, respectively, to the FPGA on the data capture board.

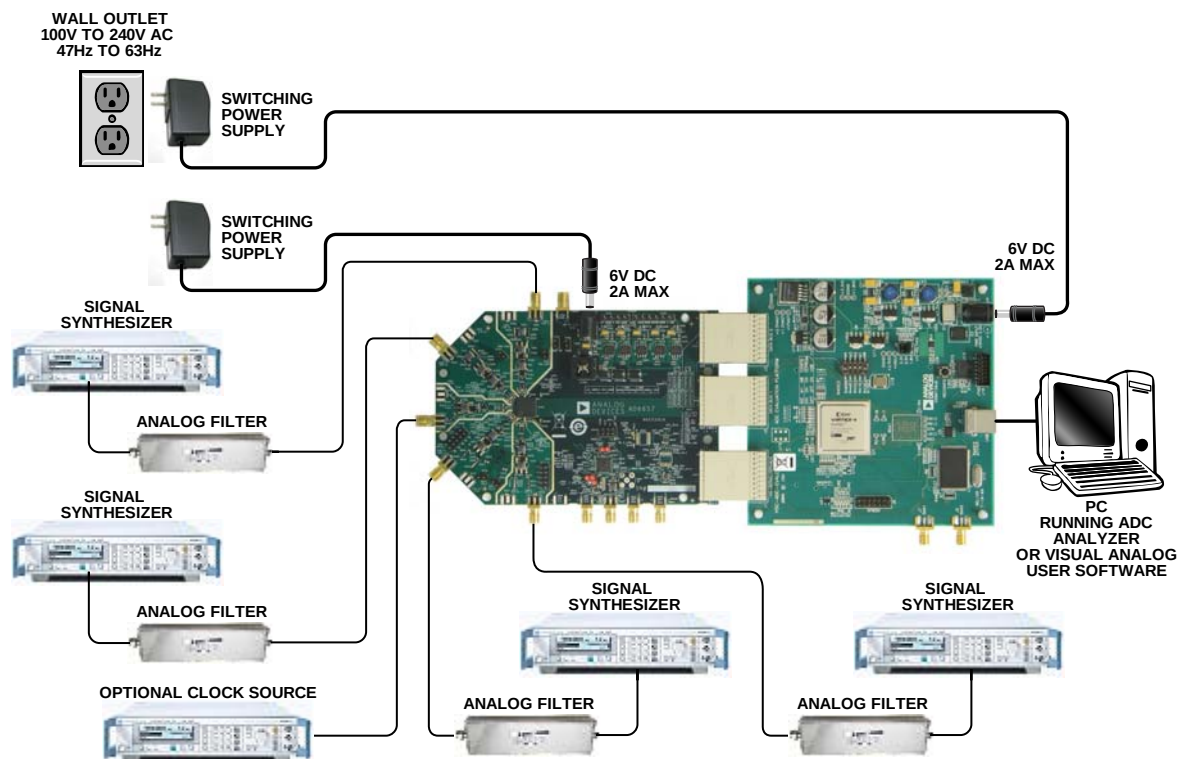


Figure 2. Evaluation Board Connection

09572-002

DEFAULT OPERATION AND JUMPER SELECTION SETTINGS

This section explains the default and optional settings or modes allowed on the [AD6642/AD6657](#) Rev. B evaluation board.

Power Circuitry

Connect the switching power supply that is supplied in the evaluation kit between a rated 100 V ac to 240 V ac wall outlet at 47 Hz to 63 Hz and P201.

Analog Input

The A and B channel inputs on the evaluation board are set up for a double balun-coupled analog input with a 50 Ω impedance. This input network is optimized to support a wide frequency band. See the AD6642 and AD6657 data sheets for additional information on the recommended networks for different input frequency ranges. The nominal input drive level is 10 dBm to achieve 2 V p-p full scale into 50 Ω . At higher input frequencies, slightly higher input drive levels are required due to losses in the front-end network.

Optionally, Channel A and Channel B inputs on the board can be configured to use the [ADL5562](#) ultralow distortion RF/IF differential amplifier. The ADL5562 components are included on the evaluation board at U501 and U502. However, the path into and out of the ADL5562 can be configured in many different ways depending on the application; therefore, the parts in the input and output path are left unpopulated. The user should see the ADL5562 data sheet for additional information on this part and for configuring the inputs and outputs. The ADL5562 by default is held in power-down mode but can be enabled by adding a jumper on P501 (Channel A) or P502 (Channel B). The ADL5562, on the Channel A and Channel B inputs, can also be substituted with the [ADA4937](#) or the [ADA4938](#) to allow evaluation of these parts with the ADC.

The Channel C and Channel D inputs are set up with an optional input path through the [AD8376](#) digitally variable gain amplifier (DVGA). Similar to Channel A and Channel B, the amplifier is included on the board at U601; however, the input-/output-related components are not included. The user should see the AD8376 data sheet for additional information on this part and for configuring the inputs and outputs. The AD8376 channels are also normally held in power-down mode and can be enabled by adding a jumper on P602 (Channel C) or P601 (Channel D).

Clock Circuitry

The default clock input circuit that is populated on the AD6642/AD6657 evaluation board uses a simple transformer-coupled circuit using a high bandwidth 1:1 impedance ratio transformer (T701) that adds a very low amount of jitter to the clock path. The clock input is 50 Ω terminated and ac-coupled to handle single-ended sine wave types of inputs. The transformer converts the single-ended input to a differential signal that is clipped by CR701 before entering the ADC clock inputs.

The board is set by default to use an external clock generator. An external clock source capable of driving a 50 Ω terminated input should be connected to J702.

A differential LVPECL clock driver output can also be used to clock the ADC input using the [AD9517](#) (U901). To place the AD9517 into the clock path, populate R727 and R728 with 0 Ω resistors and remove R713 and R714 to disconnect the default clock path inputs. In addition, populate R817 and R816 with 0 Ω resistors and remove R815 and R818 to disconnect the default clock path outputs and insert the AD9517 LVPECL Output 1. The AD9517 must be configured through the SPI controller software to set up the PLL and other operation modes. Consult the AD9517 data sheet for more information about these and other options.

PDWN

To enable the power-down feature, add a shorting jumper across P702 at Pin 1 and Pin 2 to connect the PDWN pin to AVDD.

NSR

To enable the noise shaping requantizer (NSR) feature, add a shorting jumper across P701 at Pin 1 and Pin 2 to connect the NSR ON pin to GND. The NSR feature can also be enabled via the SPI interface by writing to Register 0x3C. Writing to Bit 4 allows the user to ignore the MODE pin and enable the NSR via SPI control.

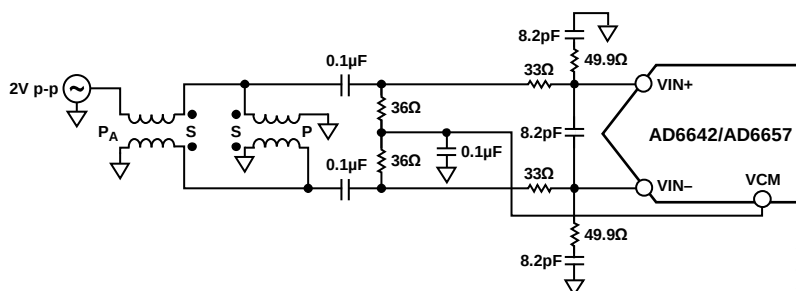


Figure 3. Default Analog Input Configuration of the AD6642/AD6657

EVALUATION BOARD SOFTWARE QUICK START PROCEDURES

This section provides quick start procedures for using the [AD6642/AD6657](#) evaluation board. Both the default and optional settings are described.

CONFIGURING THE BOARD

Before using the software for testing, configure the evaluation board as follows:

1. Connect the evaluation board to the data capture board, as shown in Figure 1 and Figure 2.
2. Connect one 6 V, 2.5 A switching power supply (such as the CUI EPS060250UH-PHP-SZ supplied) to the AD6642/AD6657 board.
3. Connect one 6 V, 2.5 A switching power supply (such as the CUI EPS060250UH-PHP-SZ supplied) to the HSC-ADC-EVALCZ board.
4. Connect the HSC-ADC-EVALCZ board (J6) to the PC with a USB cable.
5. On the ADC evaluation board, confirm that there are no jumpers installed on any of the header pins.
6. Connect a low jitter sample clock to the connector J702.
7. When using the AD6642 version of the ADC evaluation board, use a clean signal generator with low phase noise to provide an input signal to the desired A and/or B channel(s). If using the AD6657 version of the ADC evaluation board, use a clean signal generator with low phase noise to provide an input signal to the desired A, B, C, and/or D channel(s). Use a 1 m, shielded, RG-58, 50 Ω coaxial cable to connect the signal generator. For best results, use a narrow-band band-pass filter with 50 Ω terminations and an appropriate center frequency. (Analog Devices uses TTE, Allen Avionics, and K&L band-pass filters.)

USING THE SOFTWARE FOR TESTING

Setting Up the ADC Data Capture

After configuring the board, set up ADC data capture using the following steps:

1. Open VisualAnalog on the connected PC. The appropriate part type should be listed in the status bar of the **VisualAnalog – New Canvas** window. Select the template that corresponds to the type of testing to be performed (see Figure 4 where the AD6657 is shown as an example).

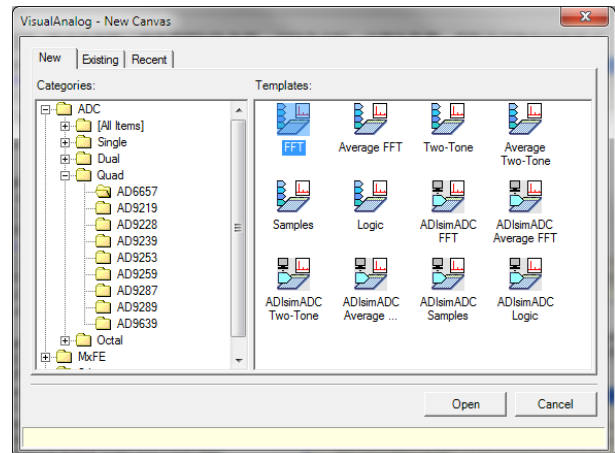


Figure 4. VisualAnalog - New Canvas Window

2. After the template is selected, a message appears asking if the default configuration can be used to program the FPGA (see Figure 5). Click **Yes**, and the window closes.

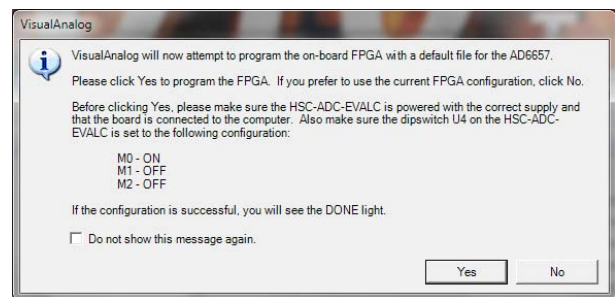


Figure 5. VisualAnalog Default Configuration Message

3. To change features to settings other than the default settings, click the **Expand Display** button, located on the bottom right corner of the window shown in Figure 6 to see what is shown in Figure 7.

Detailed instructions for changing the features and capture settings can be found in the [AN-905](#) Application Note, *VisualAnalog Converter Evaluation Tool Version 1.0 User Manual*. After the changes are made to the capture settings, click **Collapse Display** (see Figure 7).

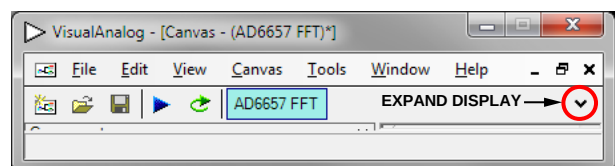


Figure 6. VisualAnalog - [Canvas - (AD6657 FFT)*] Window Toolbar, Collapsed Display

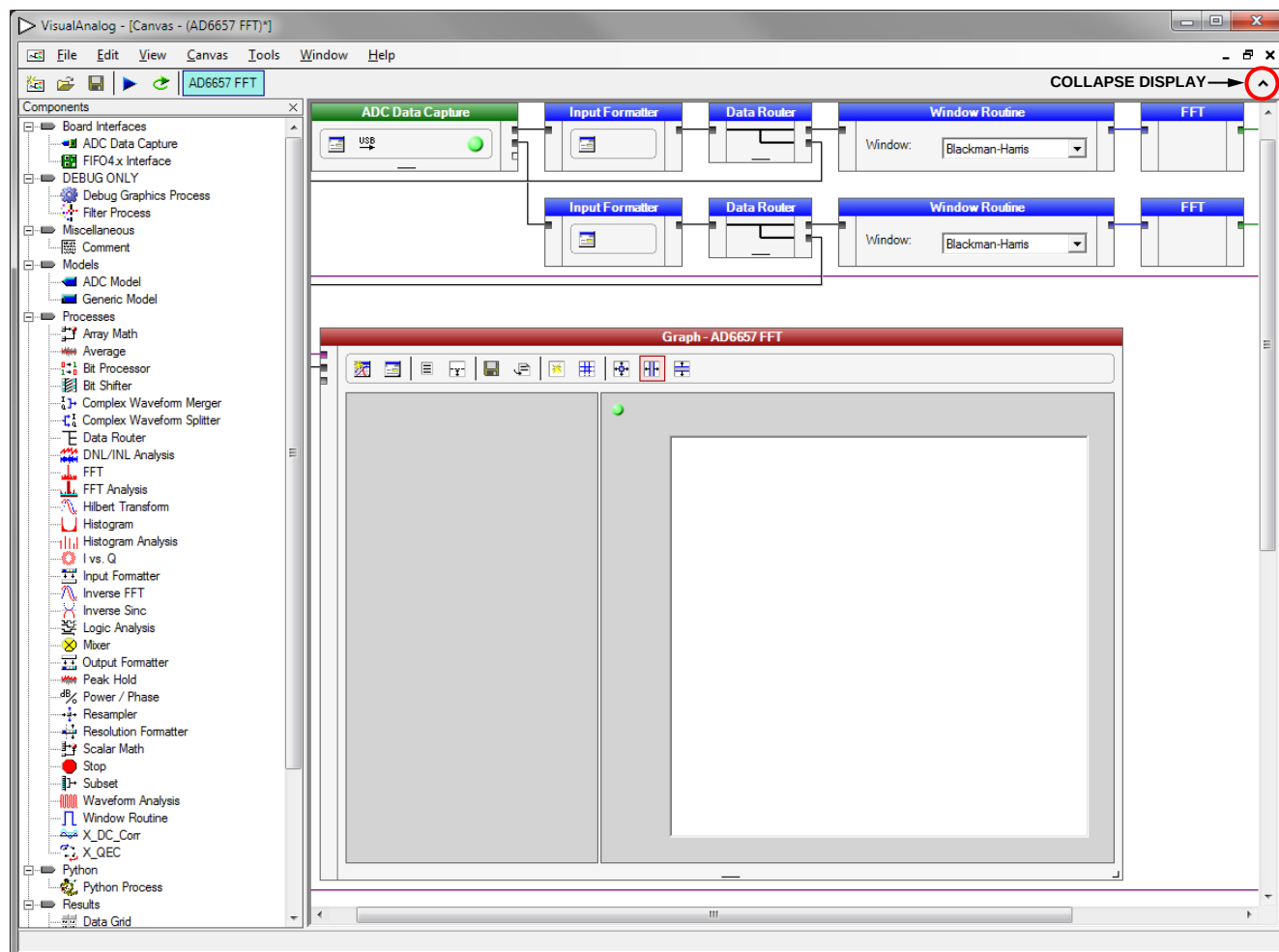


Figure 7. VisualAnalog – [Canvas – (AD6657 FFT)*], Main Window

Setting Up the SPI Controller Software

After the ADC data capture board setup is complete, set up the **SPIController** software using the following procedure:

1. Open the SPI controller software by going to the **Start** menu or by double-clicking the **SPIController** software desktop icon. If prompted for a configuration file, select the appropriate one. If not, check the title bar of the window to determine which configuration is loaded. If necessary, choose **Cfg Open** from the **File** menu and select the appropriate file based on your part type. Note that the **CHIP ID(1)** field should be filled to indicate whether the correct SPI controller configuration file is loaded (see Figure 8).

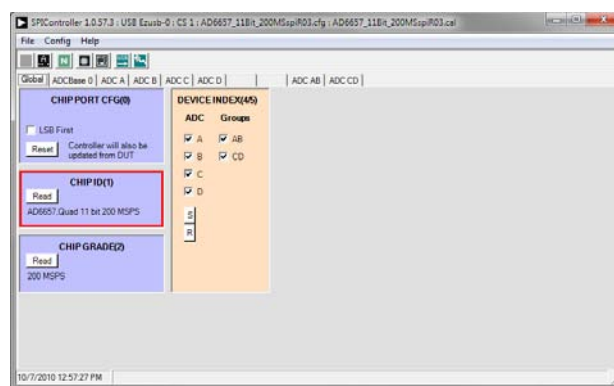


Figure 8. SPIController, CHIP ID(1) Box

- Click the **New DUT** button in the **SPIController** window (see Figure 9).

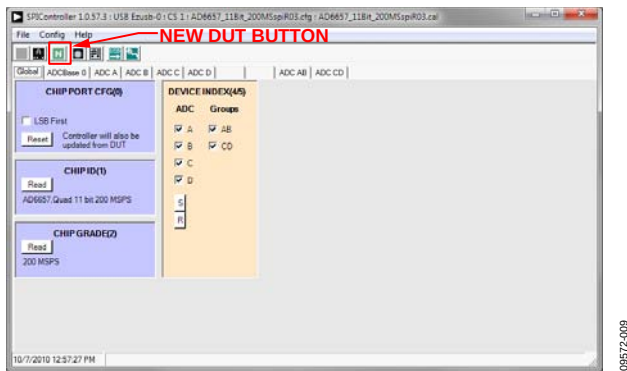


Figure 9. SPIController, New DUT Button

- In the **ADCBASE 0** tab of the **SPIController** window, find the **CLK DIV(B)** box (see Figure 10). If using the clock divider, use the drop-down box to select the correct clock divide ratio, if necessary. See the appropriate part data sheet; the [AN-878](#) Application Note, *High Speed ADC SPI Control Software*; and the [AN-877](#) Application Note, *Interfacing to High Speed ADCs via SPI*, for additional information.

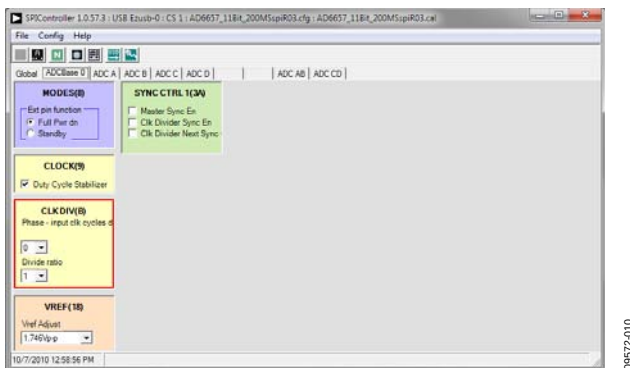


Figure 10. SPIController, CLK DIV(B) Box

- Note that other settings can be changed on the **ADCBASE 0** page (see Figure 10) and the **ADC A** and **ADC B** pages (see Figure 11) to set up the part in the desired mode (**ADC C** and **ADC D** can also be changed if using the [AD6657](#)). The **ADCBASE 0** page settings affect the entire part, whereas the settings on the **ADC A** and **ADC B** (as well as **ADC C** and **ADC D**) pages affect the selected channel only. See the appropriate part data sheet; the [AN-878](#) Application Note, *High Speed ADC SPI Control Software*; and the [AN-877](#) Application Note, *Interfacing to High Speed ADCs via SPI*, for additional information on the available settings.

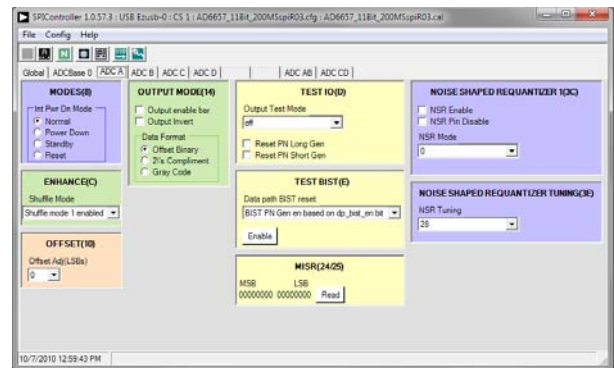


Figure 11. SPIController, Example ADC A Page

- Click the **Run** button in the **VisualAnalog – [Canvas – (AD6657 FFT)*]** toolbar (see Figure 12).

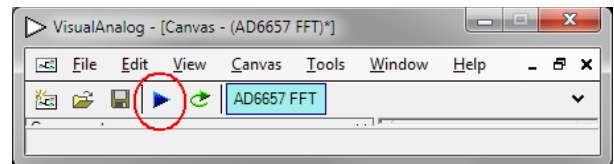


Figure 12. Run Button (Encircled in Red) in VisualAnalog – [Canvas – (AD6657 FFT)*] Toolbar, Collapsed Display

Adjusting the Amplitude of the Input Signal

The next step is to adjust the amplitude of the input signal for each channel as follows:

1. Adjust the amplitude of the input signal so that the fundamental is at the desired level. (Examine the **Fund Power** reading in the left panel of the **Graph – AD6657 Average FFT** window; see Figure 13.)

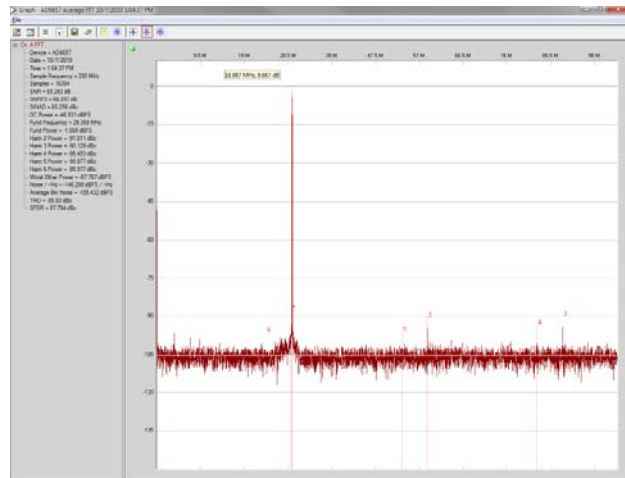


Figure 13. Graph – AD6657 Average FFT Window of VisualAnalog

2. Repeat this procedure for Channel B, Channel C, and/or Channel D.
3. Click the disk icon within the **Graph – AD6657 Average FFT** window to save the performance plot data as a .csv formatted file. See Figure 14 for an example.

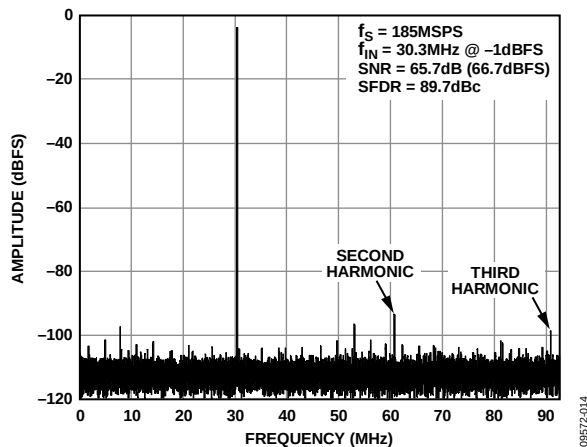


Figure 14. Typical FFT, AD6657

4. If using the NSR feature, first change the settings in the **ADC A**, **ADC B**, **ADC C**, and/or **ADC D** pages (see Figure 15) to the desired settings.

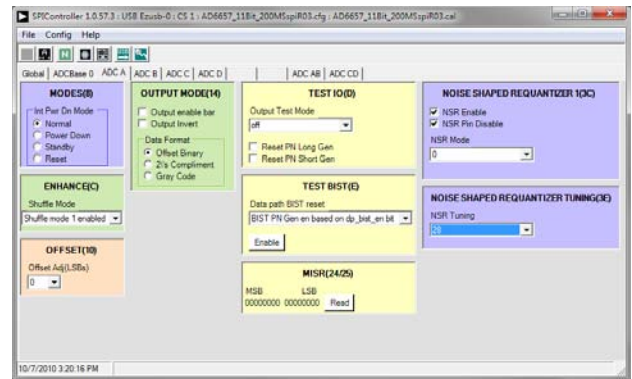


Figure 15. SPIController, Example ADC A Page – NSR Settings

5. Repeat this procedure for Channel B, Channel C, and/or Channel D.
6. Click on the button circled in the FFT Analysis box (see Figure 16) in Visual Analog to bring up the options for setting the NSR.

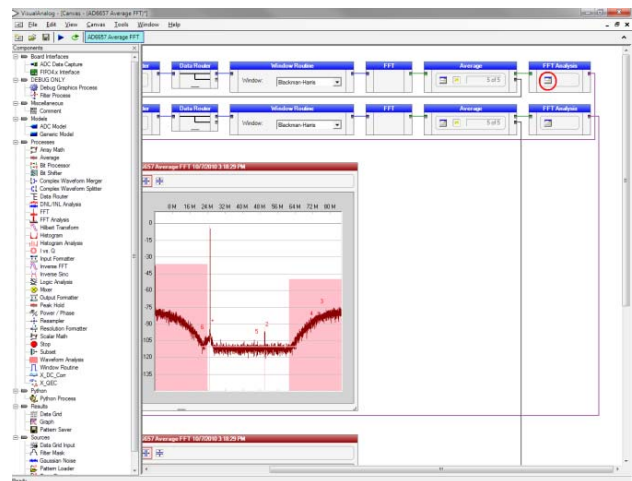


Figure 16. VisualAnalog – [Canvas – (AD6657 FFT)*] Main Window – Showing AD6657 Average FFT Analysis

7. Configure the settings in the FFT Analysis to match the settings selected for the NSR in the SPIController (see Figure 17).

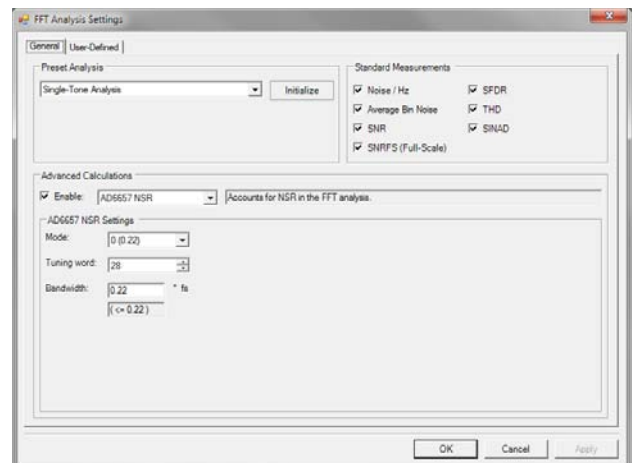


Figure 17. VisualAnalog, FFT Analysis Settings

8. The result should show an FFT plot that looks similar to Figure 18.

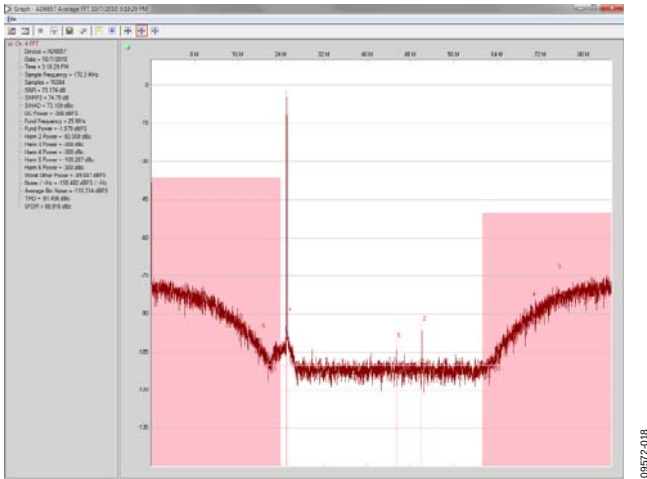


Figure 18. Graph – AD6657 Average FFT Window of VisualAnalog, NSR Enabled

9. The amplitude shows approximately 0.6 dB lower than when the NSR is disabled. The NSR circuitry introduces this loss. An amplitude of -1.6 dBFS with NSR enabled is analogous to an amplitude of -1.0 dBFS with NSR disabled.
10. Click the disk icon within the **Graph** window to save the performance plot data as a .csv formatted file. See Figure 19 for an example.

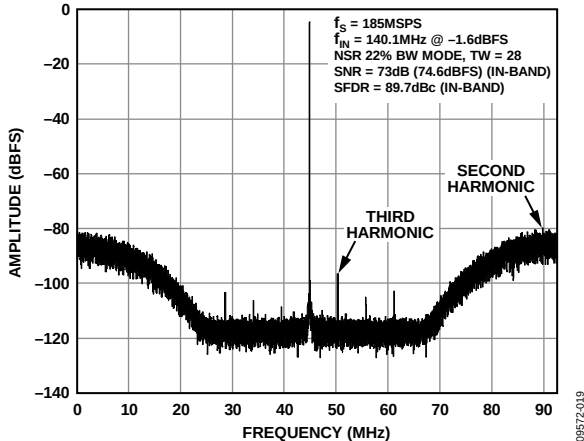


Figure 19. Typical FFT, AD6657 with NSR Enabled

Troubleshooting Tips

If the FFT plot appears abnormal, do the following:

- If you see a normal noise floor when you disconnect the signal generator from the analog input, be sure you are not overdriving the ADC. Reduce the input level, if necessary.
- In the **VisualAnalog** window, click the **Settings** button in the **Input Formatter** block. Check that **Number Format** is set to the correct encoding (offset binary by default). Repeat for the other channel.

If the FFT appears normal but the performance is poor, check the following:

- Make sure an appropriate filter is used on the analog input.
- Make sure the signal generators for the clock and the analog input are clean (low phase noise).
- Change the analog input frequency slightly if noncoherent sampling is being used.
- Make sure the SPI configuration file matches the product being evaluated.

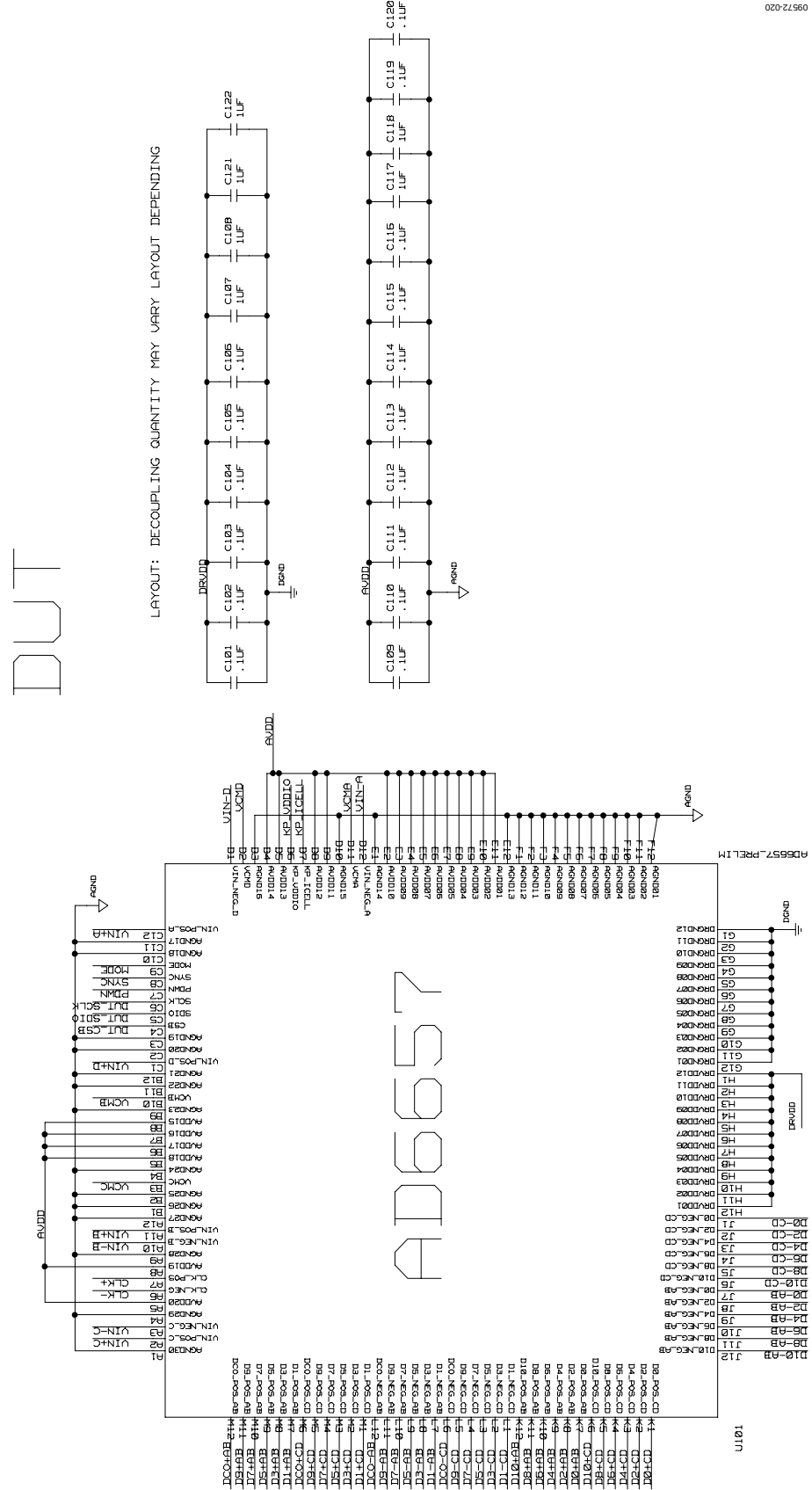
If the FFT window remains blank after clicking **Run**, do the following:

- Make sure the evaluation board is securely connected to the **HSC-ADC-EVALCZ** board
- Make sure the FPGA has been programmed by verifying that the **DONE** LED is illuminated on the HSC-ADC-EVALCZ board. If this LED is not illuminated, make sure the U4 switch on the board is in the correct position for USB CONFIG.
- Make sure the correct FPGA program was installed by selecting the **Settings** button in the **ADC Data Capture** block in the **VisualAnalog** window. Then select the **FPGA** tab and verify that the proper FPGA bin file is selected for the part.

If **VisualAnalog** indicates that the **FIFO Capture timed out**, do the following:

- Make sure all power and USB connections are secure.
- Probe the DCOAB signal at either Pin A10 or Pin B10 on the P951 connector on the evaluation board and confirm that a clock signal is present at the ADC sampling rate.

EVALUATION BOARD SCHEMATICS AND ARTWORK



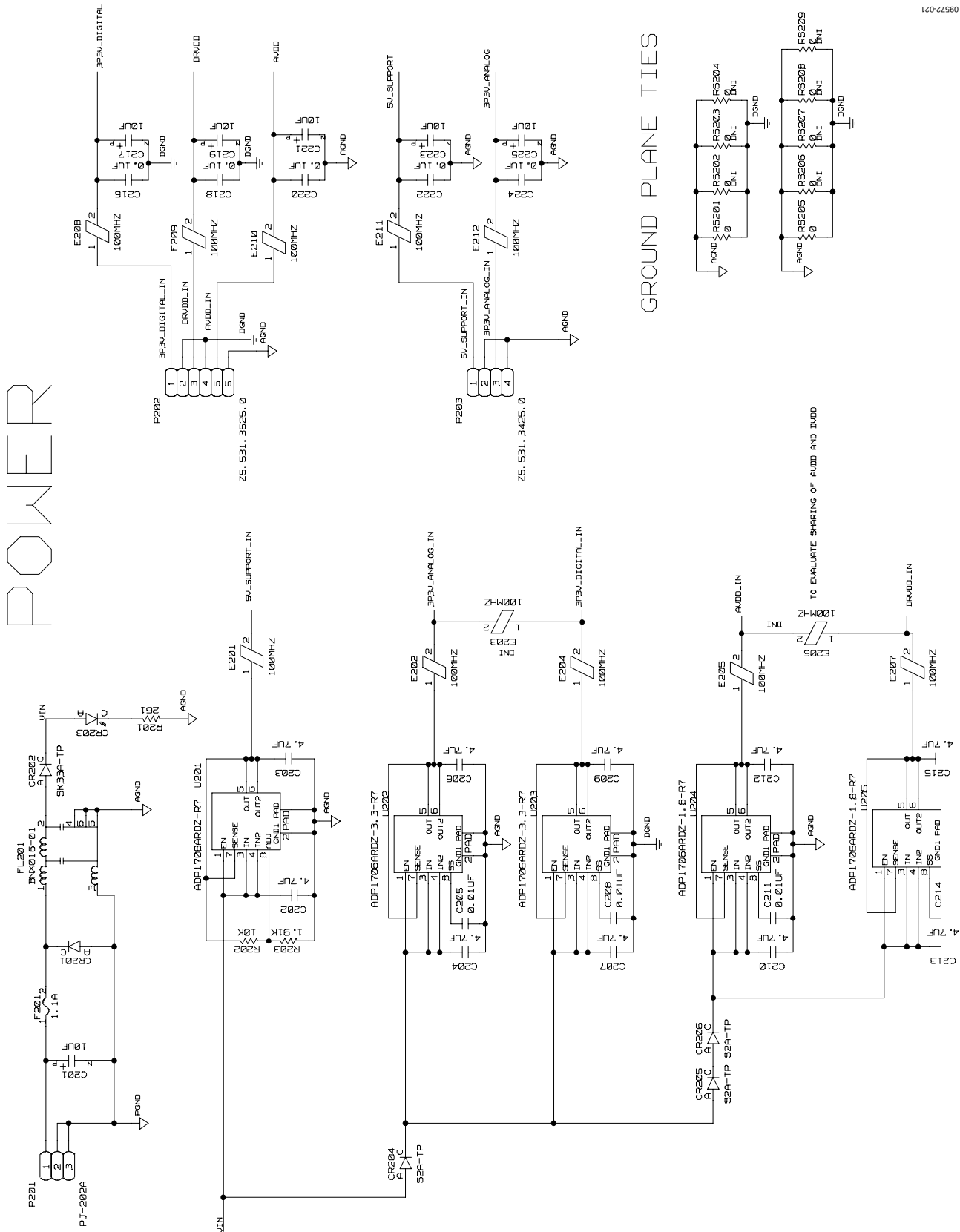


Figure 21. Board Power Input and Supply

ANALOG INPUT

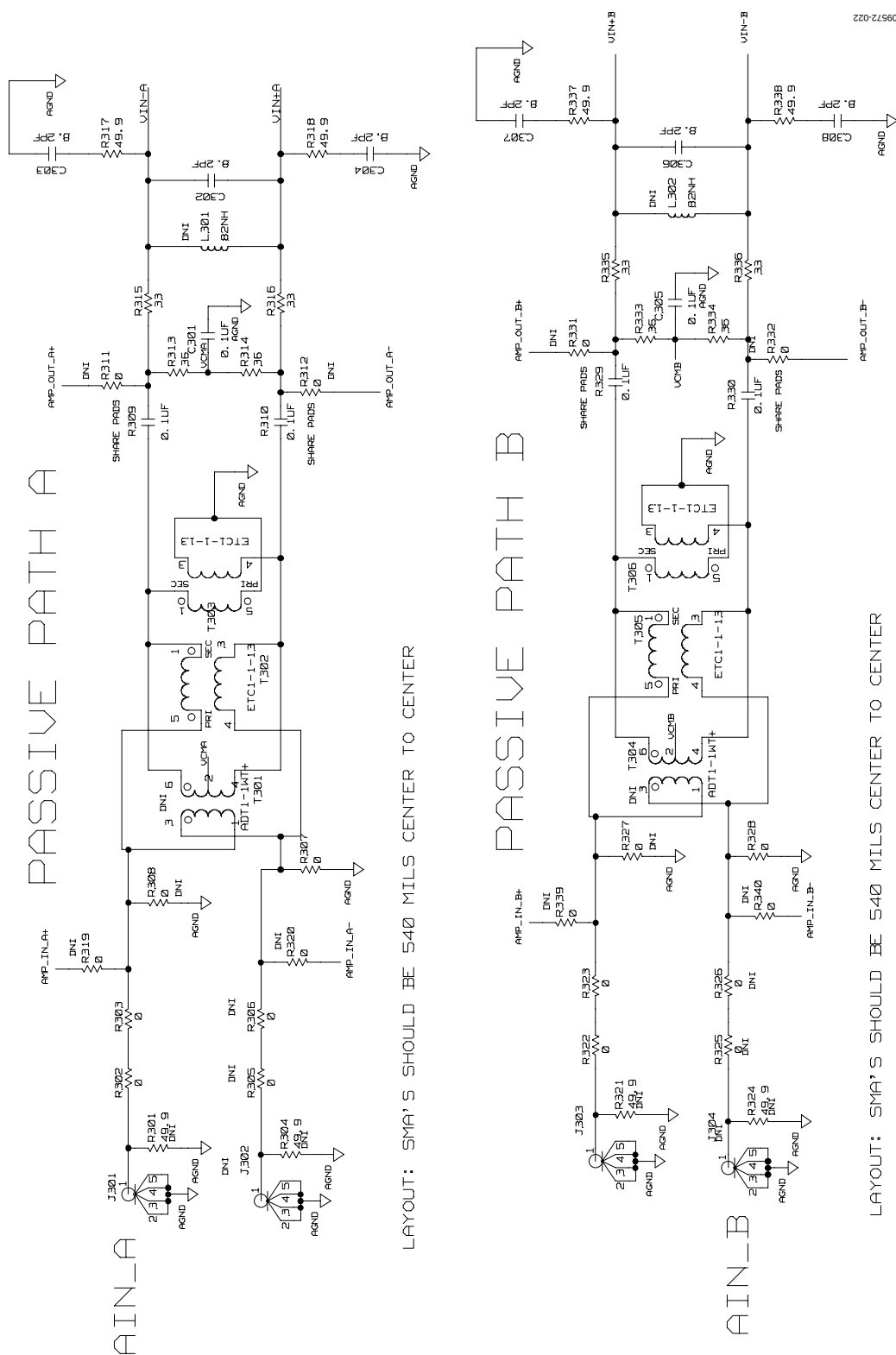
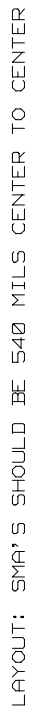


Figure 22. Passive Analog Input Circuits, Channel A and Channel B

DEATHS



DATE _____

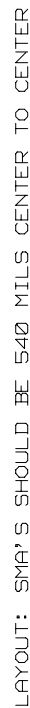
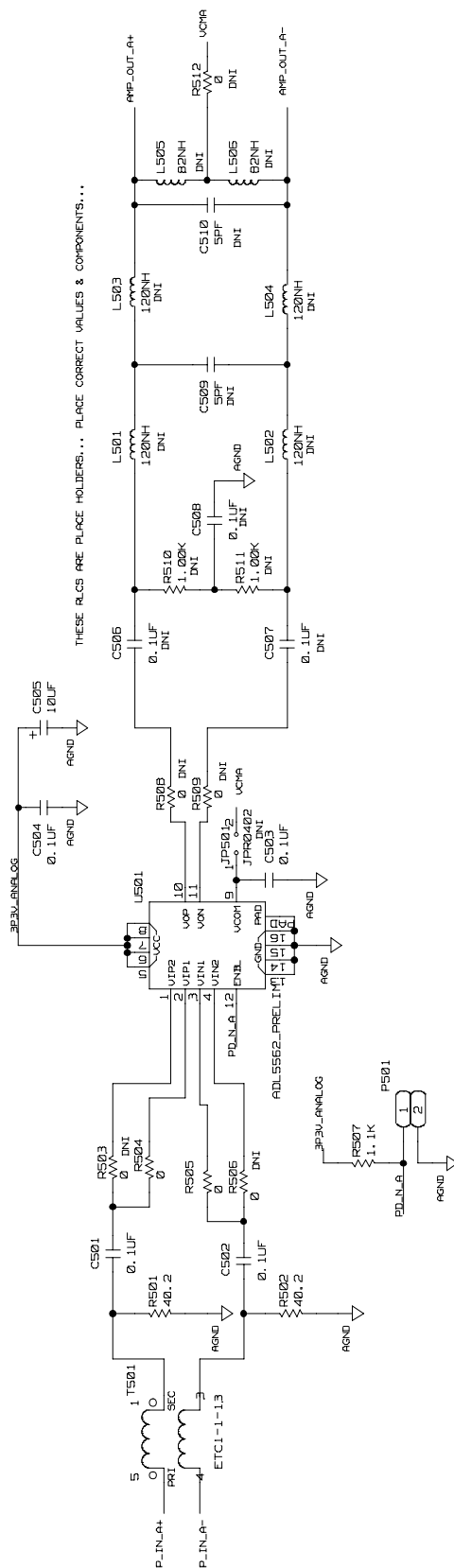


Figure 23. Passive Analog Input Circuits, Channel C and Channel D

ACTIVE PATH - CHANNEL A



ACTIVE PATH - CHANNEL B

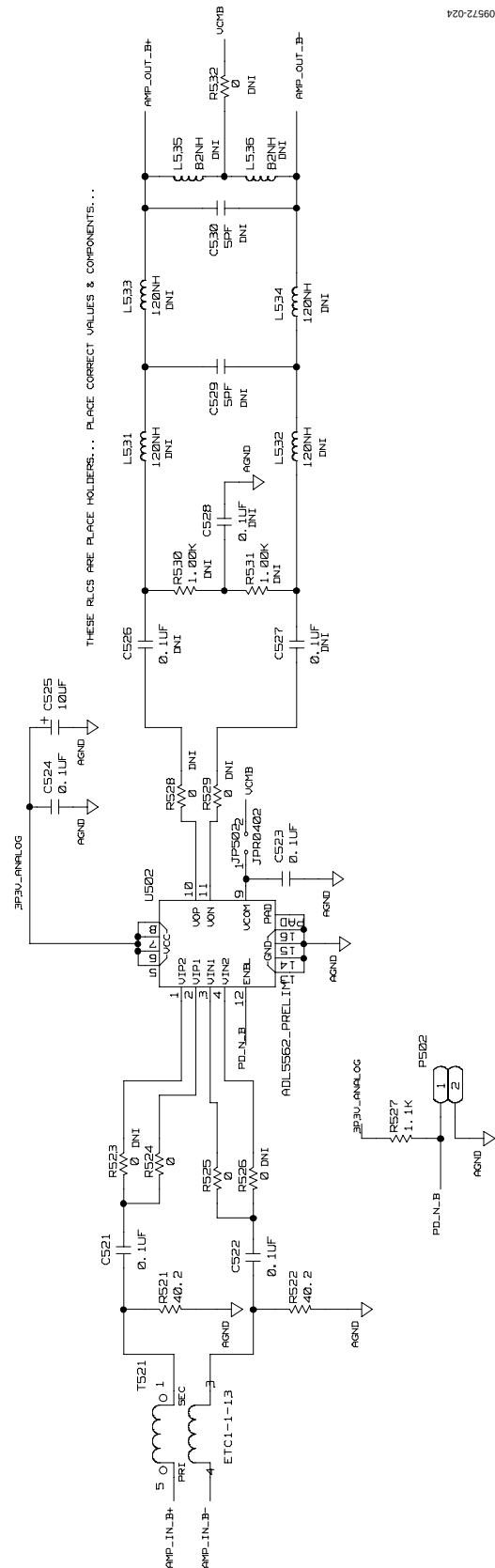


Figure 24. Optional Active Input Circuits, Channel A and Channel B

ACTIVE PATH - CHANNEL C AND D

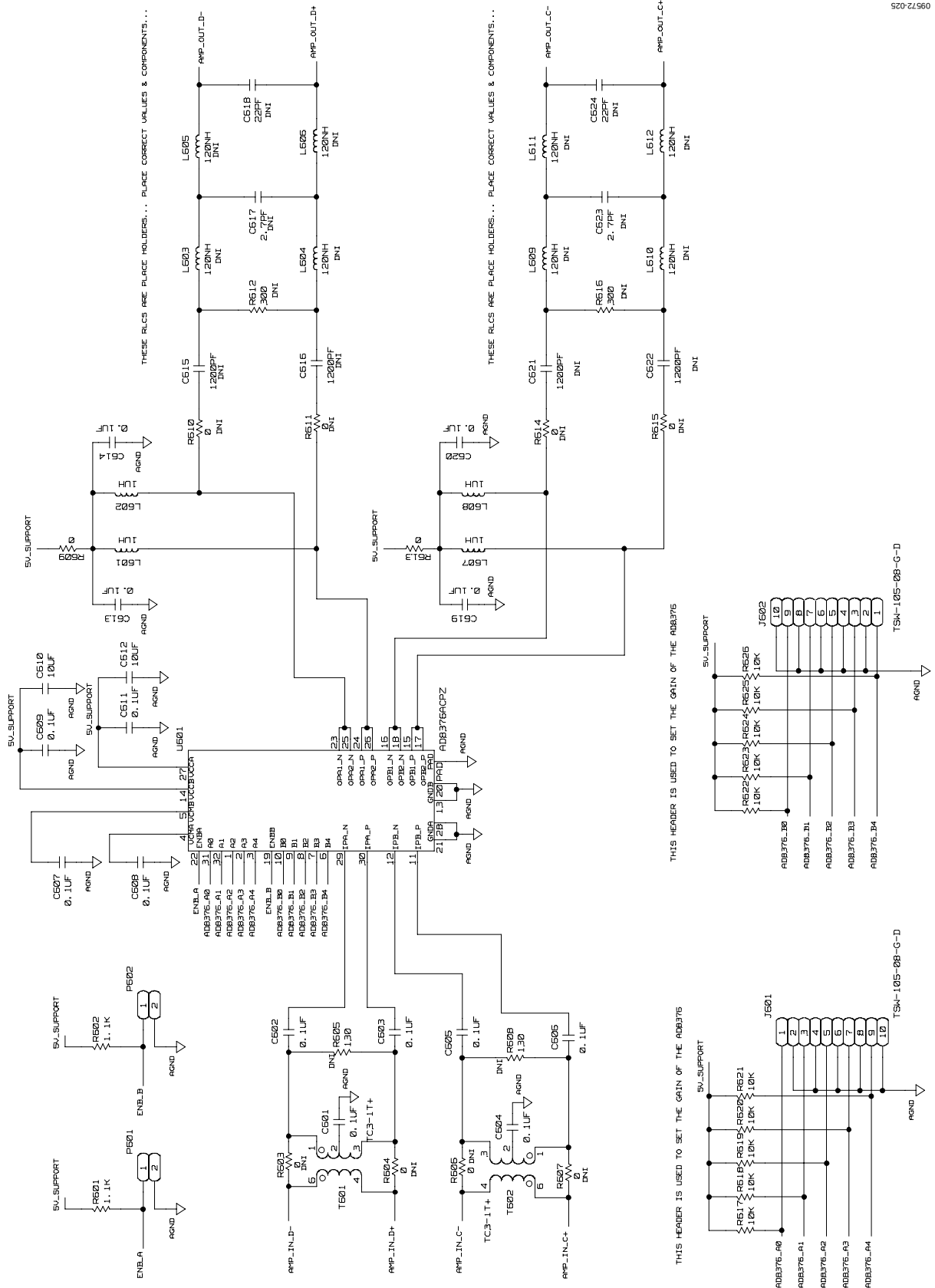
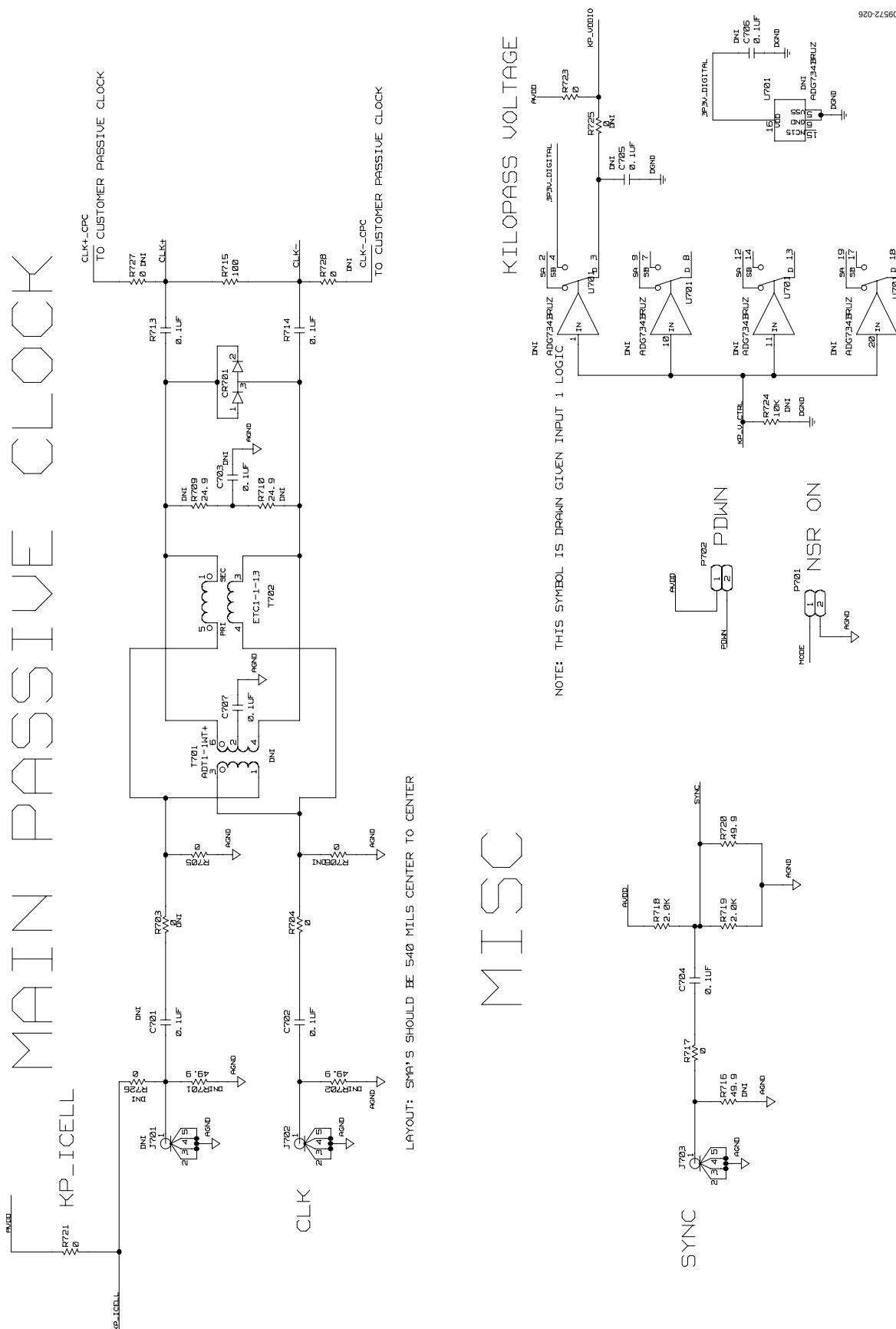


Figure 25. Optional Active Input Circuits, Channel C and Channel D



NOTES FOR THE FETTERMAN-SCOTT

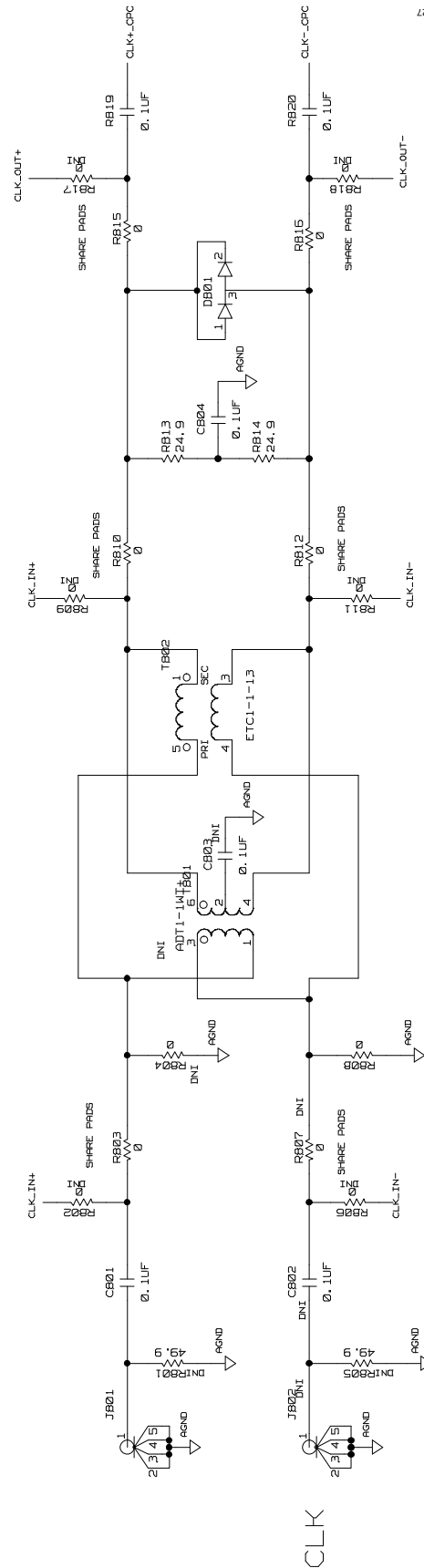


Figure 27. Optional Clock Input Circuit

09572-028

ACTIVE CLOCK PATH

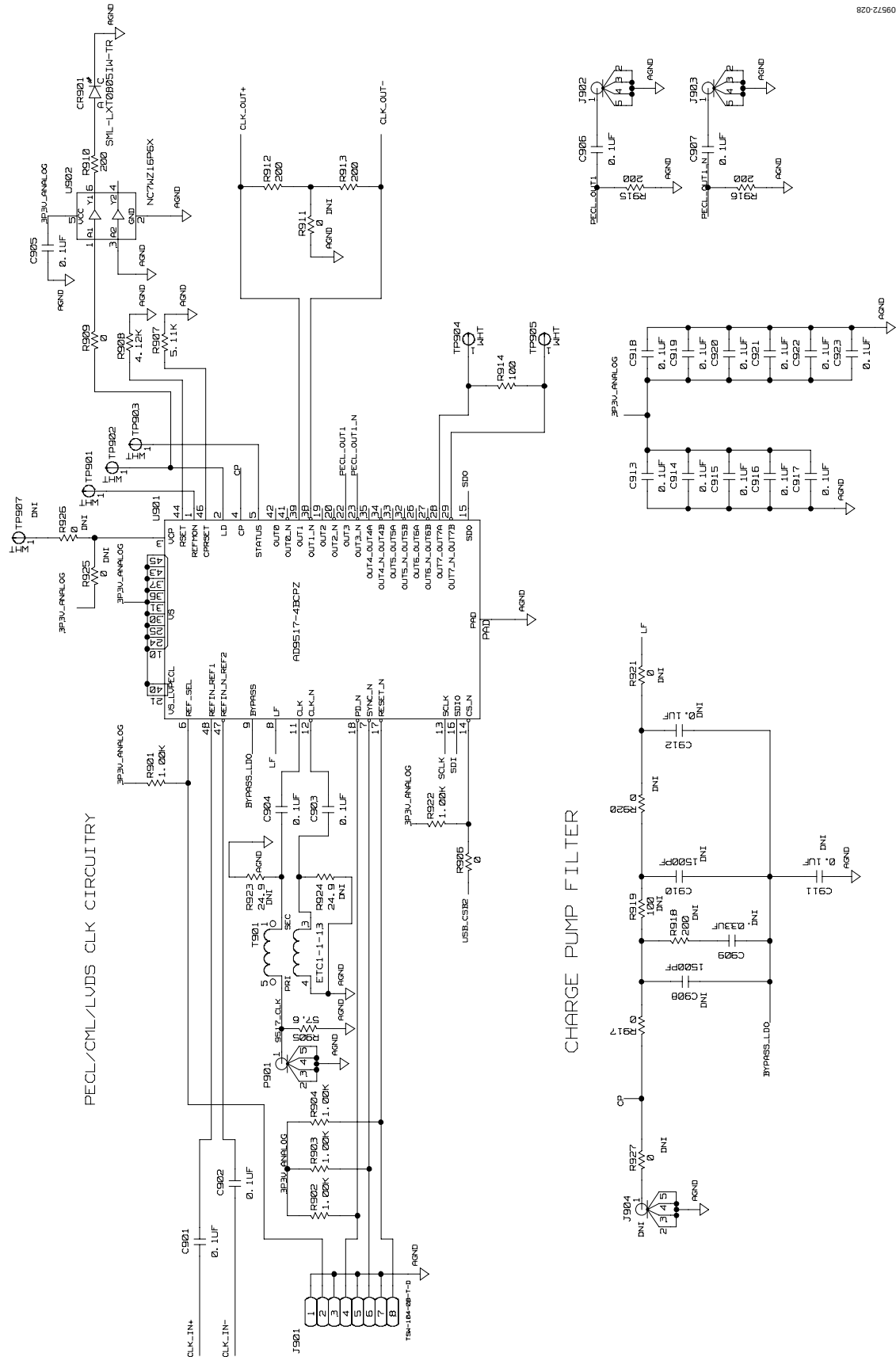


Figure 28. Optional AD9517 Clock Input Circuit

SPI

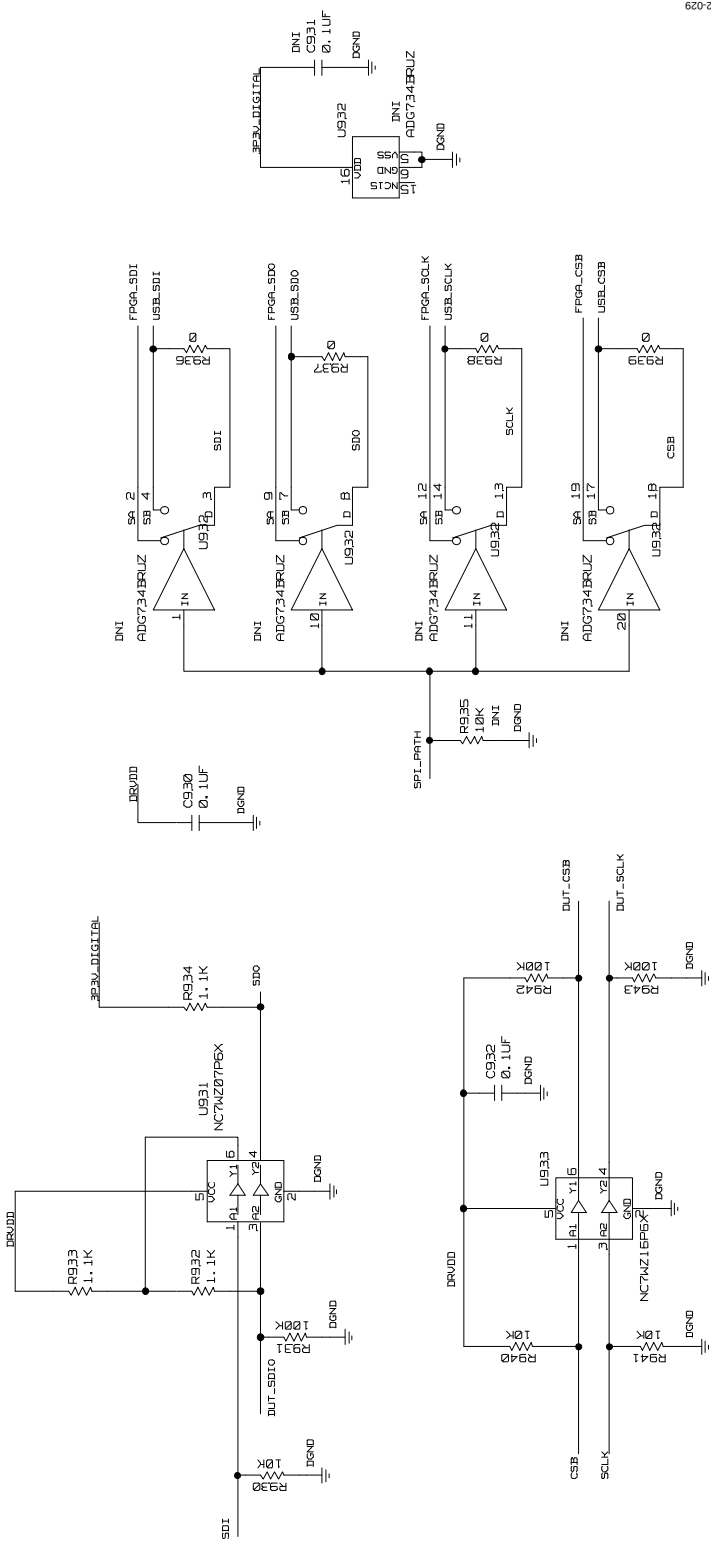


Figure 29. SPI Configuration Circuit

FIFOS CONNECTION

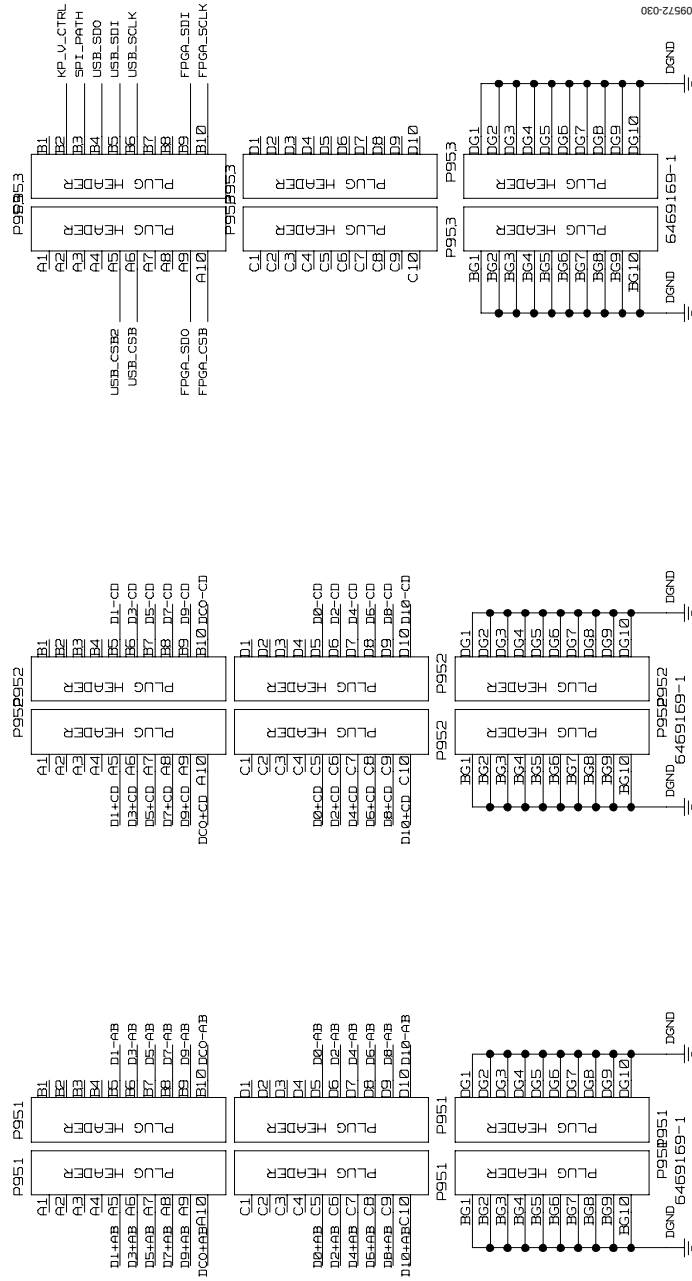


Figure 30. FIFO Board Connector Circuit



Figure 31. AD6657/AD6642 Evaluation Board, Top Side



Figure 32. AD6657/AD6642 Evaluation Board, Ground Plane (Layer 2)

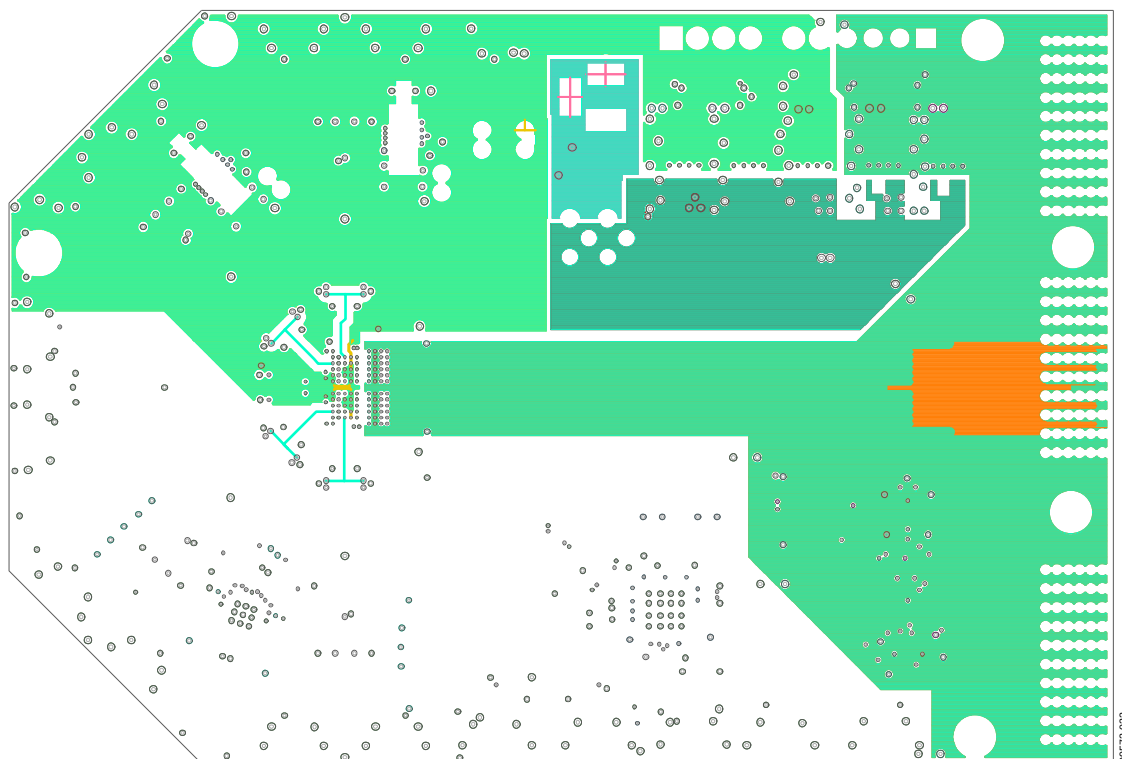


Figure 33. AD6657/AD6642 Evaluation Board, Power Plane (Layer 3)

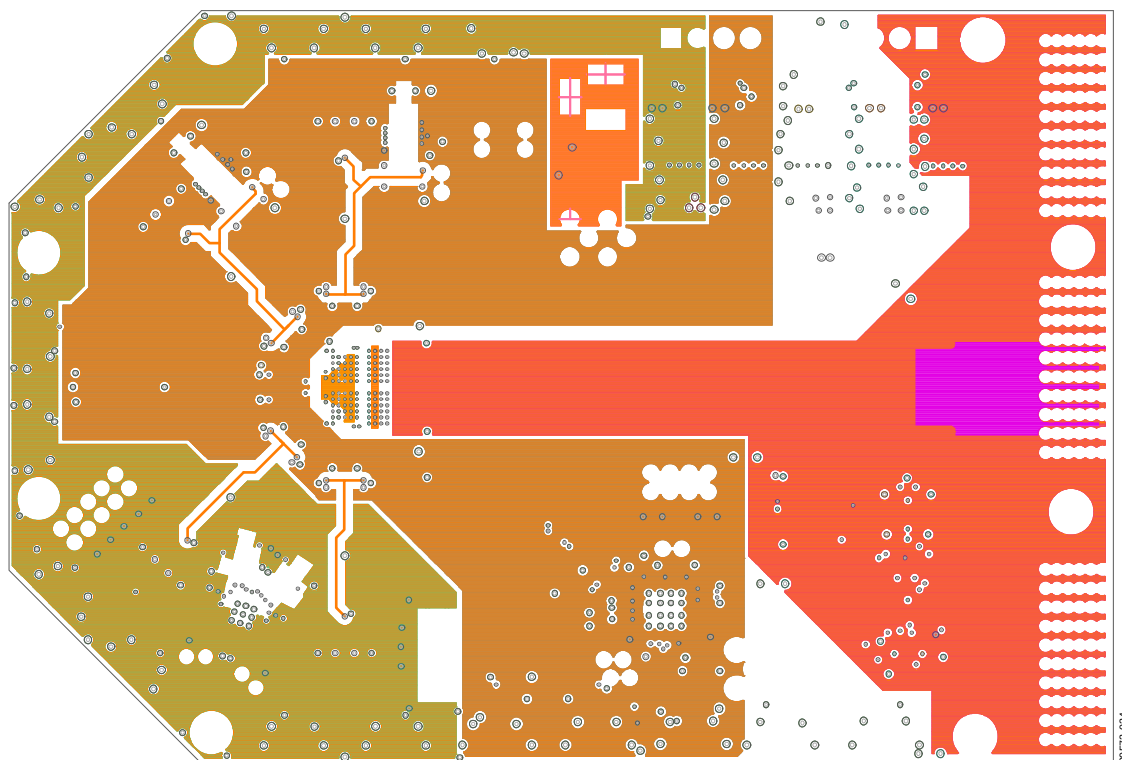


Figure 34. AD6657/AD6642 Evaluation Board, Power Plane (Layer 4)

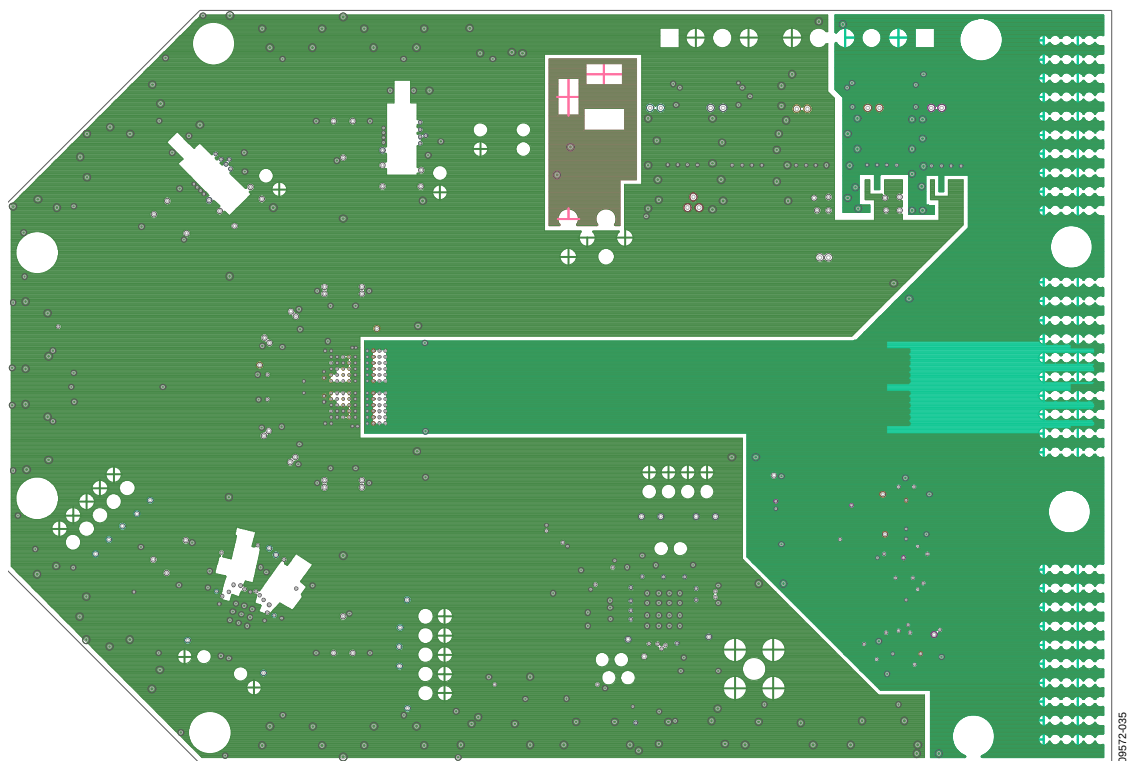


Figure 35. AD6657/AD6642 Evaluation Board, Ground Plane (Layer 5)

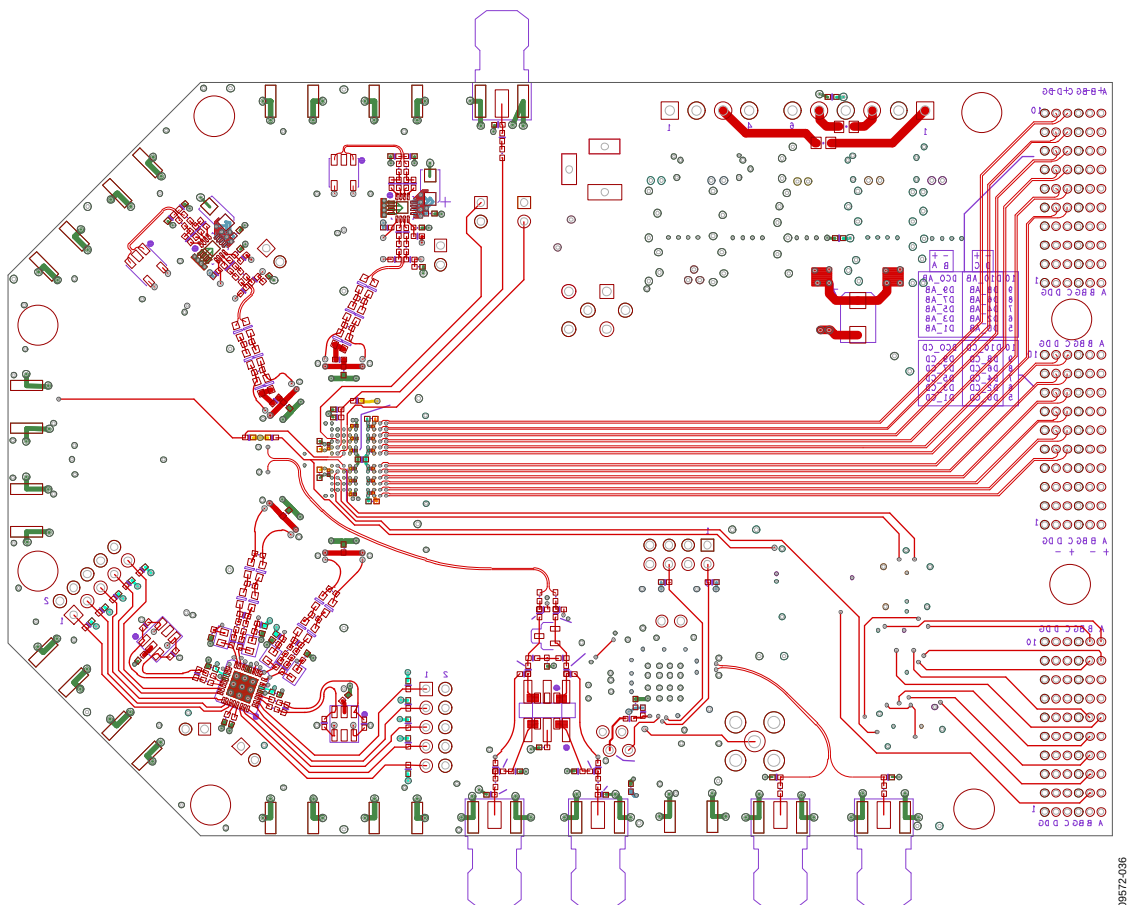


Figure 36. AD6657/AD6642 Evaluation Board, Bottom Side

ORDERING INFORMATION

BILL OF MATERIALS

Table 1. AD6642 Board BOM

Item	Qty	Reference Designator	Description	Manufacturer/Part No.
1	1	Not applicable	PCBZ	
2	16	C101, C102, C103, C104, C105, C106, C109, C110, C111, C112, C113, C114, C115, C116, C119, C120	Ceramic capacitor, 0.1 μ F, 6.3 V, X5R, 0201	Panasonic/ECJ-ZEB0J104M
3	6	C107, C108, C117, C118, C121, C122	Ceramic capacitor, 1.0 μ F, 6.3 V, 10%, X5R, 0402	Murata/GRM155R60J105KE19D
4	8	C201, C217, C219, C221, C223, C225, C505, C525	Capacitor tantalum, 10 μ F, 10 V, 10%, SMD	AVX/TAJA106K010RNJ
5	10	C202, C203, C204, C206, C207, C209, C210, C212, C213, C215	Ceramic capacitor, 4.7 μ F, 6.3 V, X5R, 0603	Panasonic/ECJ-1VB0J475M
6	4	C205, C208, C211, C214	Ceramic capacitor, 25 V, 0.01 μ F, X8R, 10%, 0402	TDK/C1005X8R1E103K
7	68	C216, C218, C220, C222, C224, C301, C305, C401, C405, C501, C502, C503, C504, C521, C522, C523, C524, C601, C602, C603, C604, C605, C606, C607, C608, C609, C611, C613, C614, C619, C620, C702, C704, C707, C801, C804, C901, C902, C903, C904, C905, C906, C907, C913, C914, C915, C916, C917, C918, C919, C920, C921, C922, C923, C930, C932, R309, R310, R329, R330, R409, R410, R429, R430, R713, R714, R819, R820	Ceramic capacitor, 16 V, 0.1 μ F, X7R, 0402	Panasonic/ECJ-0EX1C104K
8	12	C302, C303, C304, C306, C307, C308, C402, C403, C404, C406, C407, C408	Ceramic capacitor, 50 V, 8.2 pF, NP0, 0402	Yageo/0402CG829D9B200
9	2	C610, C612	Ceramic capacitor, 6.3 V, 10 μ F, X5R, 0805	Panasonic/ECJ-2FB0J106M
10	1	CR201	Diode, fast rec., 50 V, 1 A, SMB	Diode, Inc./RS1AB-13-F
11	1	CR202	Schottky diode, 3 amp rectifier	MCC/SK33A-TP
12	1	CR203	Green LED surface-mount	Panasonic/LNJ314G8TRA
13	3	CR204, CR205, CR206	Diode recovery rectifier	Micro Commercial Components Corp/S2A-TP
14	2	CR701, D801	Schottky diode, dual series	Avago/HSMS-2812BLK
15	1	CR901	Red LED surface-mount	Lumex/SML-LXT0805IW-TR
16	10	E201, E202, E204, E205, E207, E208, E209, E210, E211, E212	Inductor, bead core, 39 Ω , 4 A, 0805, SMD	Panasonic/EXC-ML20A390U
17	1	F201	Fuse, polyswitch, 1.10 A, reset fuse, SMD	Tyco Electronics/NANOSMDC110F-2
18	1	FL201	Filter, EMI, 50 M Ω , 15 A, 0.1 MHz to 1 GHz	Murata/BNX016-01
19	8	J301, J303, J702, J703, J801, J902, J903, P901	Connector, PCB, SMA, ST edge mount	Samtec/SMA-J-P-X-ST-EM1
20	2	J601, J602	Connector, PCB, HDR, ST, 10P	Samtec/TSW-105-08-G-D
21	1	J901	Connector, PCB header, 8-pin, double row	Samtec/TSW-104-08-T-D
22	4	L601, L602, L607, L608	Inductor, 1 μ H, L7144SM	Coilcraft/0603LS-102XGLB
23	1	P201	Connector PCB dc power jack SM	CUI STACK/PJ-202A
24	1	P202	Connector, PCB header, 6 POS	Wieland/Z5.531.3625.0
25	1	P203	Connector, PCB header, 4 POS	Wieland/Z5.531.3425.0
26	6	P501, P502, P601, P602, P701, P702	Connector, PCB header, 2 POS	Samtec/TSW-102-08-G-S
27	3	P951, P952, P953	Connector, PCB, 60-pin RA connector	Tyco Electronics/6469169-1

Item	Qty	Reference Designator	Description	Manufacturer/Part No.
28	1	R201	Resistor, 261 Ω , 1/10 W, 50 V, 0603, thick film SMD	NIC Comp Corp/NRC06F2610TRF
29	14	R202, R617, R618, R619, R620, R621, R622, R623, R624, R625, R626, R930, R940, R941	Resistor, 10.0 k Ω , 1 /10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF1002X
30	1	R203	Resistor, 1.91 k Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF1911X
31	4	R302, R322, R402, R422	Resistor, 0 Ω , 1/10 W, 5%, 0603, SMD	Panasonic/ERJ-3GEY0R00V
32	37	R303, R307, R323, R328, R403, R407, R423, R428, R504, R505, R524, R525, R609, R613, R704, R705, R717, R721, R723, R803, R808, R810, R812, R815, R816, R906, R909, R917, RS201, RS202, RS203, RS204, RS205, RS206, RS207, RS208, RS209	Resistor, 0 Ω , 1/10 W, 5%, 0402, SMD	Panasonic/ERJ-2GE0R00X
33	8	R313, R314, R333, R334, R413, R414, R433, R434	Resistor, 36 Ω , 1/10 W, 5%, 0402, SMD	Panasonic/ERJ-2GEJ360X
34	8	R315, R316, R335, R336, R415, R416, R435, R436	Resistor, 33 Ω , 1/10 W, 5%, 0402, SMD	Panasonic/ERJ-2GEJ330X
35	9	R317, R318, R337, R338, R417, R418, R437, R438, R720	Resistor, 49.9 Ω , 1/10 W, 5%, 0402, SMD	Panasonic/ERJ-2RKF49R9X
36	4	R501, R502, R521, R522	Resistor, 40.2 Ω , 1/10 W, 5%, 0402, SMD	Panasonic/ERJ-2RKF40R2X
37	7	R507, R527, R601, R602, R932, R933, R934	Resistor, 1.1 k Ω , 1/10 W, 5%, 0402, SMD	Panasonic/ERJ-2GEJ112X
38	2	R715, R914	Resistor, 100 Ω , 1%, ceramic, palladium term, 0402, SMD	Venkel/CR0402-16W-1000FPT
39	2	R718, R719	Resistor, 2 k Ω , thick film, 0402, 1%, 25 V, MCRMC, SMD	Multicomp/MC0402WGF2001TCE-TC
40	2	R813, R814	Resistor, 24.9 Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF24R9X
41	5	R901, R902, R903, R904, R922	Resistor, 1.00 k Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF1001X
42	1	R905	Resistor, 57.6 Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF57R6X
43	1	R907	Resistor, 5.11 k Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF5111X
44	1	R908	Resistor, 4.12 k Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF4121X
	5	R910, R912, R913, R915, R916	Resistor, 200 Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF2000X
46	3	R931, R942, R943	Resistor, 100 k Ω , 1/10 W, 5%, 0402, SMD	Panasonic/ERJ-2GEJ104X
47	4	R936, R937, R938, R939	Resistor, 0.0 Ω , 1/20 W, 5%, 0201, SMD	Panasonic/ERJ-1GE0R00C
48	13	T302, T303, T305, T306, T402, T403, T405, T406, T501, T521, T702, T802, T901	Transformer, RF 1:1, 4.5 MHz to 3000 MHz SMD	M/A-COM/MABA-007159-000000 (OLD ETC1-1-13)
49	2	T601, T602	Transformer, RF 3:1, 1 MHz to 50 MHz SMD	Mini-Circuits/TC3-1T+
50	5	TP901, TP902, TP903, TP904, TP905	Connector, PCB, testpoint, white	Components Corp/TP-104-01-09
51	1	U101	IC-ADI AD6642	Analog Devices/AD6642BBCZ
52	1	U201	IC-ADI low dropout CMOS lin reg	Analog Devices/ADP1708ARDZ-R7
53	2	U202, U203	IC-ADI low dropout CMOS lin reg	Analog Devices/ADP1706ARDZ-3.3-R7
54	2	U204, U205	IC-ADI low dropout CMOS lin reg	Analog Devices/ADP1706ARDZ-1.8-R7

Item	Qty	Reference Designator	Description	Manufacturer/Part No.
55	2	U501, U502	IC 2.6 GHz ultralow distortion diff IF/Rf amp	Analog Devices/ADL5562ACPZ
56	1	U601	IC-ADI ultralow distortion IF dual VGA	Analog Devices/AD8376ACPZ
57	1	U901	IC-ADI 12-output CLK gen with int 1.6 GHz VCO	Analog Devices/AD9517-4BCPZ
58	2	U902, U933	IC tiny logic buffer DL UHS N-INV SC706	Fairchild/NC7WZ16P6X
59	1	U931	IC TinyLogic buffer DL UHS O/ DRAIN SC706	Fairchild/NC7WZ07P6X
60 ¹		C506, C507, C508, C526, C527, C528, C701, C703, C705, C706, C802, C803, C911, C912, C931	Ceramic capacitor, 0.1 μ F, 16 V, X7R, 0402	Panasonic/ECJ-0EX1C104K
61 ¹		C509, C510, C529, C530	Ceramic capacitor, 5.0 pF, 50 V, 0402, SMD	Panasonic/ECU-E1H050CCQ
62 ¹		C615, C616, C621, C622	Ceramic capacitor, 1200 pF, 50 V, X7R, 0402	Panasonic/ECJ-0EB1H122K
63 ¹		C617, C623	Ceramic capacitor	Samsung/CL05C2R7CBNC
64 ¹		C618, C624	Ceramic capacitor, 22 pF, 50 V, NP0, 0402	Phycomp (Yageo)/0402CG220J9B200
65 ¹		C908, C910	Ceramic capacitor, 50 V, 1500 pF, X7R, 0402	Panasonic/ECJ-0EB1H152K
66 ¹		C909	Ceramic capacitor, 0.033 μ F, 10% 16 V, X5R, 0402	Panasonic/0402YD333KAT2A
67 ¹		E203, E206	Inductor, ferrite bead core, 39 Ω , 4 A, 0805, SMD	Panasonic/EXC-ML20A390U
68 ¹		J302, J304, J401, J402, J403, J404, J701, J802	Connector, PCB, SMA, ST, edge mount	Samtec/SMA-J-P-X-ST-EM1
69 ¹		J904	Connector, PCB, coax, SMA, ST	Johnson/142-0701-201
70 ¹		L301, L302, L401, L402, L505, L506, L535, L536	Inductor, 82 nH, 0603, SMD	Murata/LQW1608A82NG
71 ¹		L501, L502, L503, L504, L531, L532, L533, L534, L603, L604, L605, L606, L609, L610, L611, L612	Inductor, 120 nH, 5%, fixed, 0603, SMD	Panasonic/ELJ-RER12JF3
72 ¹		R301, R304, R321, R324, R401, R404, R421, R424, R701, R702, R716, R801, R805	Resistor, 49.9 Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF49R9X
73 ¹		R305, R325, R405, R425	Resistor, 0 Ω , 1/10 W, 5%, 0603, SMD	Panasonic/ERJ-3GEY0R00V
74 ¹		R306, R308, R311, R312, R319, R320, R326, R327, R331, R332, R339, R340, R406, R408, R411, R412, R419, R420, R426, R427, R431, R432, R439, R440, R503, R506, R508, R509, R512, R523, R526, R528, R529, R532, R603, R604, R606, R607, R610, R611, R614, R615, R703, R706, R725, R726, R727, R728, R802, R804, R806, R807, R809, R811, R817, R818, R911, R920, R921, R925, R926, R927	Resistor, 0 Ω , 1/10 W, 5%, 0402, SMD	Panasonic/ERJ-2GE0R00X
75 ¹		R510, R511, R530, R531	Resistor, 1.00 k Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF1001X
76 ¹		R605, R608	Resistor, 130 Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF1300X
77 ¹		R612, R616	Resistor, 300 Ω , 1/10 W, 5%, 0402, SMD	Panasonic/ERJ-2GEJ301X
78 ¹		R709, R710, R923, R924	Resistor, 24.9 Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF24R9X
79 ¹		R724, R935	Resistor, 10.0 k Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF1002X
80 ¹		R918	Resistor, 200 Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF2000X

Item	Qty	Reference Designator	Description	Manufacturer/Part No.
81 ¹		R919	Res film, SMD, 0402	Venkel/CR0402-16W-1000FPT
82 ¹		T301, T304, T401, T404, T701, T801	XFMR RF	Mini-Circuits/ADT1-1WT+
83 ¹		TP907	Connector, PCB, testpoint, white	Components Corp/TP-104-01-09
84 ¹		U701, U932	IC-ADI CMOS, quad SPDT switches	Analog Devices/ADG734BRUZ

¹ Do not install.

Table 2. AD6657 Board BOM

Item	Qty	Reference Designator	Description	Manufacturer/Part No.
1	1	Not applicable	PCBZ	
2	16	C101, C102, C103, C104, C105, C106, C109, C110, C111, C112, C113, C114, C115, C116, C119, C120	Ceramic capacitor, 0.1 µF, 6.3 V, X5R, 0201	Panasonic/ECJ-ZEB0J104M
3	6	C107, C108, C117, C118, C121, C122	Ceramic capacitor, 1.0 µF, 6.3 V, 10%, X5R, 0402	Murata/GRM155R60J105KE19D
4	8	C201, C217, C219, C221, C223, C225, C505, C525	Capacitor tantalum, 10 µF, 10 V, 10%, SMD	AVX/TAJA106K010RNJ
5	10	C202, C203, C204, C206, C207, C209, C210, C212, C213, C215	Ceramic capacitor, 4.7 µF, 6.3 V, X5R, 0603	Panasonic/ECJ-1VB0J475M
6	4	C205, C208, C211, C214	Ceramic capacitor, 0.01 µF, 25 V, X8R, 10%, 0402	TDK/C1005X8R1E103K
7	68	C216, C218, C220, C222, C224, C301, C305, C401, C405, C501, C502, C503, C504, C521, C522, C523, C524, C601, C602, C603, C604, C605, C606, C607, C608, C609, C611, C613, C614, C619, C620, C702, C704, C707, C801, C804, C901, C902, C903, C904, C905, C906, C907, C913, C914, C915, C916, C917, C918, C919, C920, C921, C922, C923, C930, C932, R309, R310, R329, R330, R409, R410, R429, R430, R713, R714, R819, R820	Ceramic capacitor, 0.1 µF, 16 V, X7R, 0402	Panasonic/ECJ-0EX1C104K
8	12	C302, C303, C304, C306, C307, C308, C402, C403, C404, C406, C407, C408	Ceramic capacitor, 8.2 pF, 50 V, NP0, 0402	Yageo/0402CG829D9B200
9	2	C610, C612	Ceramic capacitor, 10 µF, 6.3 V, X5R, 0805	Panasonic/ECJ-2FB0J106M
10	1	CR201	Diode fast rec, 50 V, 1 A, SMB	Diode, Inc./S1AB-13
11	1	CR202	Schottky diode, 3 amp rectifier	MCC/SK33A-TP
12	1	CR203	LED green surface mount	Panasonic/LNJ314G8TRA
13	3	CR204, CR205, CR206	Diode recovery rectifier	Micro Commercial Components Corp/S2A-TP
14	2	CR701, D801	Schottky diode, dual series	Avago/HSMS-2812BLK
15	1	CR901	LED red surface mount	Lumex/SML-LXT0805IW-TR
16	10	E201, E202, E204, E205, E207, E208, E209, E210, E211, E212	Inductor, bead core, 39 Ω, 4 A, 0805, SMD	Panasonic/EXC-ML20A390U
17	1	F201	Fuse, polyswitch, 1.10 A, reset fuse, SMD	Tyco Electronics/NANOSMDC110F-2
18	1	FL201	Filter, EMI, 50 MΩ, 15 A, 0.1 MHz to 1 GHz	Murata/BNX016-01
19	10	J301, J303, J401, J403, J702, J703, J801, J902, J903, P901	Connector, PCB, SMA, ST, edge mount	Samtec/SMA-J-P-X-ST-EM1
20	2	J601, J602	Connector, PCB, hdr, st, 10 p	Samtec/TSW-105-08-G-D
21	1	J901	Connector, PCB, header, 8-pin, double row	Samtec/TSW-104-08-T-D
22	4	L601, L602, L607, L608	Inductor, 1 µH, L7144SM	Coilcraft/0603LS-102XGLB

Item	Qty	Reference Designator	Description	Manufacturer/Part No.
23	1	P201	Connector, PCB, dc power jack, SM	CUI STACK/PJ-202A
24	1	P202	Connector, PCB, header, 6 pos	Wieland/Z5.531.3625.0
25	1	P203	Connector, PCB, header, 4 pos	Wieland/Z5.531.3425.0
26	6	P501, P502, P601, P602, P701, P702	Connector, PCB, header, 2 pos	Samtec/TSW-102-08-G-S
27	3	P951, P952, P953	Connector, PCB, 60-pin, RA connector	Tyco Electronics/6469169-1
28	1	R201	Resistor, 261 Ω , 1/10 W, 50 V, 0603, thick film SMD	NIC Comp Corp/NRC06F2610TRF
29	14	R202, R617, R618, R619, R620, R621, R622, R623, R624, R625, R626, R930, R940, R941	Resistor, 10.0 k Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF1002X
30	1	R203	Resistor, 1.91 k Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF1911X
31	4	R302, R322, R402, R422	Resistor, 0 Ω , 1/10 W, 5%, 0603, SMD	Panasonic/ERJ-3GEY0R00V
32	30	R303, R307, R323, R328, R403, R407, R423, R428, R504, R505, R524, R525, R609, R613, R704, R705, R717, R721, R723, R803, R808, R810, R812, R815, R816, R906, R909, R917, RS201, RS205	Resistor, 0 Ω , 1/10 W, 5%, 0402, SMD	Panasonic/ERJ-2GE0R00X
33	8	R313, R314, R333, R334, R413, R414, R433, R434	Resistor, 36 Ω , 1/10 W, 5%, 0402, SMD	Panasonic/ERJ-2GEJ360X
34	8	R315, R316, R335, R336, R415, R416, R435, R436	Resistor, 33 Ω , 1/10 W, 5%, 0402, SMD	Panasonic/ERJ-2GEJ330X
35	9	R317, R318, R337, R338, R417, R418, R437, R438, R720	Resistor, 49.9 Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF40R2X
36	4	R501, R502, R521, R522	Resistor, 40.2 Ω , 1/10W, 1% 0402, SMD	Panasonic/ERJ-2GEJ112X
37	7	R507, R527, R601, R602, R932, R933, R934	Resistor, 1.1 k Ω , 1/10 W, 5%, 0402, SMD	Venkel/CR0402-16W-1000FPT
38	2	R715, R914	Resistor, 100 Ω , 1%, ceramic, palladium term, 0402, SMD	Multicomp/CR10B202JT
39	2	R718, R719	Resistor, 2 k Ω , thick film, 0402, 1%, 25 V, MCRMC, SMD	Panasonic/ERJ-2RKF49R9x
40	2	R813, R814	Resistor, 24.9 Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF24R9X
41	5	R901, R902, R903, R904, R922	Resistor, 1.00 k Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF1001X
42	1	R905	Resistor, 57.6 Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF57R6X
43	1	R907	Resistor, 5.11 k Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF5111X
44	1	R908	Resistor, 4.12 k Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF4121X
	5	R910, R912, R913, R915, R916	Resistor, 200 Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF2000X
46	3	R931, R942, R943	Resistor, 100 k Ω , 1/10 W, 5%, 0402, SMD	Panasonic/ERJ-2GEJ104X
47	4	R936, R937, R938, R939	Resistor, 0.0 Ω , 1/20 W, 5%, 0201, SMD	Panasonic/ERJ-1GE0R00C
48	13	T302, T303, T305, T306, T402, T403, T405, T406, T501, T521, T702, T802, T901	Transformer RF 1:1, 4.5 MHz to 3000 MHz, SMD	M/A-COM/ETC1-1-13
49	2	T601, T602	Transformer RF 3:1, 1 MHz to 50 MHz, SMD	Mini-Circuits/TC3-1T+
50	5	TP901, TP902, TP903, TP904, TP905	Connector, PCB, testpoint, white	Components Corp/TP-104-01-09

Item	Qty	Reference Designator	Description	Manufacturer/Part No.
51	1	U101	IC-ADI AD6657	Analog Devices/AD6657_PRELIM
52	1	U201	IC-ADI low dropout CMOS lin reg	Analog Devices/ADP1708ARDZ-R7
53	2	U202, U203	IC-ADI low dropout CMOS lin reg	Analog Devices/ADP1706ARDZ-3.3-R7
54	2	U204, U205	IC-ADI low dropout CMOS lin reg	Analog Devices/ADP1706ARDZ-1.8-R7
55	2	U501, U502	IC 2.6 GHz ultralow distortion diff IF/RF amp	Analog Devices/ADL5562_PRELIM
56	1	U601	IC-ADI ultralow distortion IF dual VGA	Analog Devices/AD8376ACPZ
57	1	U901	IC-ADI 12-output CLK gen with int 1.6 GHz VCO	Analog Devices/AD9517-4BCPZ
58	2	U902, U933	IC TinyLogic buffer DL UHS N-INV SC706	FAIRCHILD/NC7WZ16P6X
59	1	U931	IC TinyLogic buffer DL UHS O/ Drain SC706	Fairchild/NC7WZ07P6X
60 ¹		C506, C507, C508, C526, C527, C528, C701, C703, C705, C706, C802, C803, C911, C912, C931	Ceramic capacitor, 0.1 µF, 16 V, X7R, 0402	Panasonic/ECJ-0EX1C104K
61 ¹		C509, C510, C529, C530	Ceramic capacitor, 5.0 pF, 50 V, 0402, SMD	Panasonic/ECU-E1H050CCQ
62 ¹		C615, C616, C621, C622	Ceramic capacitor, 1200 pF, 50 V, X7R, 0402	Panasonic/ECJ-0EB1H122K
63 ¹		C617, C623	Ceramic capacitor	Samsung/CL05C2R7CBNC
64 ¹		C618, C624	Ceramic capacitor, 22 pF, 50 V, NP0, 0402	Phycomp (Yageo)/0402CG220J9B200
65 ¹		C908, C910	Ceramic capacitor, 1500 pF, 50 V, X7R, 0402	Panasonic/ECJ-0EB1H152K
66 ¹		C909	Ceramic capacitor, 0.033 µF, 10%, 16 V, X5R, 0402	Panasonic/0402YD333KAT2A
67 ¹		E203, E206	Inductor, ferrite bead core, 39 Ω, 4 A, 0805, SMD	Panasonic/EXC-ML20A390U
68 ¹		J302, J304, J402, J404, J701, J802	Connector, PCB, SMA, ST, edge mount	Samtec/SMA-J-P-X-ST-EM1
69 ¹		J904	Connector, PCB, coax, SMA, ST	Johnson/142-0701-201
70 ¹		L301, L302, L401, L402, L505, L506, L535, L536	Inductor, 82 nH, 0603, SMD	Murata/LQW1608A82NG
71 ¹		L501, L502, L503, L504, L531, L532, L533, L534, L603, L604, L605, L606, L609, L610, L611, L612	Inductor, 120 nH, 5%, fixed, 0603, SMD	Panasonic/ELJ-RER12JF3
72 ¹		R301, R304, R321, R324, R401, R404, R421, R424, R701, R702, R716, R801, R805	Resistor, 49.9 Ω, 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF49R9X
73 ¹		R305, R325, R405, R425	Resistor, 0 Ω, 1/10 W, 5%, 0603, SMD	Panasonic/ERJ-3GEY0R00V
74 ¹		R306, R308, R311, R312, R319, R320, R326, R327, R331, R332, R339, R340, R406, R408, R411, R412, R419, R420, R426, R427, R431, R432, R439, R440, R503, R506, R508, R509, R512, R523, R526, R528, R529, R532, R603, R604, R606, R607, R610, R611, R614, R615, R703, R706, R725, R726, R727, R728, R802, R804, R806, R807, R809, R811, R817, R818, R911, R920, R921, R925, R926, R927, RS202, RS203, RS204, RS206, RS207, RS208, RS209	Resistor, 0 Ω, 1/10 W, 5%, 0402, SMD	Panasonic/ERJ-2GE0R00X
75 ¹		R510, R511, R530, R531	Resistor, 1.00 kΩ, 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF1001X
76 ¹		R605, R608	Resistor, 130 Ω, 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF1300X
77 ¹		R612, R616	Resistor, 300 Ω, 1/10 W, 5%, 0402, SMD	Panasonic/ERJ-2GEJ301X
78 ¹		R709, R710, R923, R924	Resistor, 24.9 Ω, 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF24R9X

Item	Qty	Reference Designator	Description	Manufacturer/Part No.
79 ¹		R724, R935	Resistor, 10.0 k Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF1002X
80 ¹		R918	Resistor, 200 Ω , 1/10 W, 1%, 0402, SMD	Panasonic/ERJ-2RKF2000X
81 ¹		R919	Resistor, film, SMD, 0402	Venkel/CR0402-16W-1000FPT
82 ¹		T301, T304, T401, T404, T701, T801	XFMR RF	Mini-Circuits/ADT1-1WT+
83 ¹		TP907	Connector, PCB, testpoint, white	Components Corp/TP-104-01-09
84 ¹		U701, U932	IC-ADI CMOS, quad SPDT switches	Analog Devices/ADG734BRUZ

¹ Do not install.

NOTES

**ESD Caution**

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

Legal Terms and Conditions

By using the evaluation board discussed herein (together with any tools, components documentation or support materials, the "Evaluation Board"), you are agreeing to be bound by the terms and conditions set forth below ("Agreement") unless you have purchased the Evaluation Board, in which case the Analog Devices Standard Terms and Conditions of Sale shall govern. Do not use the Evaluation Board until you have read and agreed to the Agreement. Your use of the Evaluation Board shall signify your acceptance of the Agreement. This Agreement is made by and between you ("Customer") and Analog Devices, Inc. ("ADI"), with its principal place of business at One Technology Way, Norwood, MA 02062, USA. Subject to the terms and conditions of the Agreement, ADI hereby grants to Customer a free, limited, personal, temporary, non-exclusive, non-sublicensable, non-transferable license to use the Evaluation Board FOR EVALUATION PURPOSES ONLY. Customer understands and agrees that the Evaluation Board is provided for the sole and exclusive purpose referenced above, and agrees not to use the Evaluation Board for any other purpose. Furthermore, the license granted is expressly made subject to the following additional limitations: Customer shall not (i) rent, lease, display, sell, transfer, assign, sublicense, or distribute the Evaluation Board; and (ii) permit any Third Party to access the Evaluation Board. As used herein, the term "Third Party" includes any entity other than ADI, Customer, their employees, affiliates and in-house consultants. The Evaluation Board is NOT sold to Customer; all rights not expressly granted herein, including ownership of the Evaluation Board, are reserved by ADI. **CONFIDENTIALITY.** This Agreement and the Evaluation Board shall all be considered the confidential and proprietary information of ADI. Customer may not disclose or transfer any portion of the Evaluation Board to any other party for any reason. Upon discontinuation of use of the Evaluation Board or termination of this Agreement, Customer agrees to promptly return the Evaluation Board to ADI. **ADDITIONAL RESTRICTIONS.** Customer may not disassemble, decompile or reverse engineer chips on the Evaluation Board. Customer shall inform ADI of any occurred damages or any modifications or alterations it makes to the Evaluation Board, including but not limited to soldering or any other activity that affects the material content of the Evaluation Board. Modifications to the Evaluation Board must comply with applicable law, including but not limited to the RoHS Directive. **TERMINATION.** ADI may terminate this Agreement at any time upon giving written notice to Customer. Customer agrees to return to ADI the Evaluation Board at that time. **LIMITATION OF LIABILITY.** THE EVALUATION BOARD PROVIDED HEREUNDER IS PROVIDED "AS IS" AND ADI MAKES NO WARRANTIES OR REPRESENTATIONS OF ANY KIND WITH RESPECT TO IT. ADI SPECIFICALLY DISCLAIMS ANY REPRESENTATIONS, ENDORSEMENTS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, RELATED TO THE EVALUATION BOARD INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. IN NO EVENT WILL ADI AND ITS LICENSORS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES RESULTING FROM CUSTOMER'S POSSESSION OR USE OF THE EVALUATION BOARD, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DELAY COSTS, LABOR COSTS OR LOSS OF GOODWILL. ADI'S TOTAL LIABILITY FROM ANY AND ALL CAUSES SHALL BE LIMITED TO THE AMOUNT OF ONE HUNDRED US DOLLARS (\$100.00). **EXPORT.** Customer agrees that it will not directly or indirectly export the Evaluation Board to another country, and that it will comply with all applicable United States federal laws and regulations relating to exports. **GOVERNING LAW.** This Agreement shall be governed by and construed in accordance with the substantive laws of the Commonwealth of Massachusetts (excluding conflict of law rules). Any legal action regarding this Agreement will be heard in the state or federal courts having jurisdiction in Suffolk County, Massachusetts, and Customer hereby submits to the personal jurisdiction and venue of such courts. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to this Agreement and is expressly disclaimed.