

Evaluating the AD9276 and AD9277 Octal LNA/VGA/AAF/12-/14-Bit ADCs and CW I/Q Demodulators

FEATURES

Full featured evaluation board for the [AD9276](#) and the [AD9277](#)

SPI and alternate clock options

Internal and external reference options

VisualAnalog and SPI Controller software interfaces

EQUIPMENT NEEDED

Analog signal source and antialiasing filter

2 switching power supplies (6.0 V, 2.5 A) CUI EPS060250UH-
PHP-SZ, provided

Linear bench top dc voltage source (0 V to 1.6 V), not
required for CW Doppler mode

PC running Windows® 98 (2nd edition), Windows 2000,
Windows ME, or Windows XP

USB 2.0 port, recommended (USB 1.1 compatible)

AD9276 and AD9277 evaluation board

HSC-ADC-EVALCZ FPGA-based data capture kit

For CW Doppler mode: spectrum analyzer

DOCUMENTS NEEDED

AD9276 and AD9277 data sheets

HSC-ADC-EVALCZ data sheet, *High Speed Converter
Evaluation Platform* (FPGA-based data capture kit)

[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, *Interface to High Speed ADCs via SPI*

SOFTWARE NEEDED

VisualAnalog

SPI Controller

GENERAL DESCRIPTION

This document describes the evaluation board for the AD9276 and AD9277, which provides all of the support circuitry required to operate the AD9276 and AD9277 in their various modes and configurations. The application software used to interface with the devices is also described.

The AD9276 and AD9277 data sheets, available at www.analog.com, provide additional information and should be consulted when using the evaluation board. All documents and software tools are available at <http://www.analog.com/fifo>. For any questions, send an email to highspeed.converters@analog.com.

TYPICAL MEASUREMENT SETUP

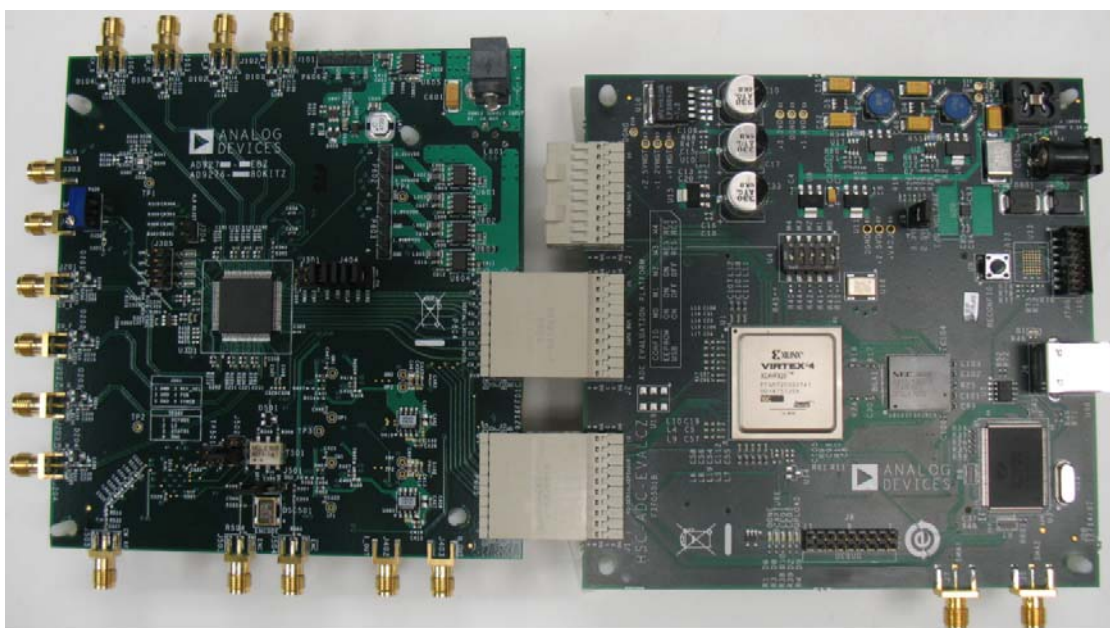


Figure 1. AD9276-65EBZ/AD9276-80KITZ/AD9277-50EBZ Evaluation Board and HSC-ADC-EVALCZ Data Capture Board

TABLE OF CONTENTS

Features	1	Default Operation and Jumper Selection Settings.....	5
Equipment Needed.....	1	Evaluation Board Software Quick Start Procedures.....	6
Documents Needed.....	1	Configuring the Board For TGC MODE.....	6
Software Needed.....	1	Using the Software for Testing.....	6
General Description	1	Using the Integrated I/Q Demodulator	
Typical Measurement Setup	1	(CW Doppler Mode)	9
Evaluation Board Hardware.....	3	Evaluation Board Schematics and Artwork.....	11
Power Supplies	3	Ordering Information.....	23
Input Signals.....	3	Bill of Materials.....	23
Output Signals.....	3	ESD Caution.....	28

10/09—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

The evaluation board for the [AD9276](#) and [AD9277](#) provides all of the support circuitry required to operate the [AD9276](#) and [AD9277](#) in their various modes and configurations. Figure 2 shows the typical bench characterization setup used to evaluate the performance of the [AD9276](#) and [AD9277](#). 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 (see the [AD9276](#) or [AD9277](#) data sheet).

See the Evaluation Board Software Quick Start Procedures section to get started and Figure 21 to Figure 32 for the complete schematics and layout diagrams that demonstrate the routing and grounding techniques that should be applied at the system level.

POWER SUPPLIES

This evaluation board comes with a wall-mountable switching power supply that provides a 6 V, 2.5 A maximum output. Connect the supply to the rated 100 V ac to 240 V ac wall outlet at 47 Hz to 63 Hz. The other end is a 2.1 mm inner diameter jack that connects to the PCB at P601. Once on the PC board, the 6 V supply is fused and conditioned before connecting to low dropout linear regulators that supply the proper bias to each of the various sections on the board.

When operating the evaluation board in a nondefault condition, L602, L603, L604, L605, L606, L607, L608, and L609 can be removed to disconnect the switching power supply. This enables the user to bias each section of the board individually. Use P602, P603, and P606 to connect a different supply for each section. At least one 1.8 V supply is needed with a 1 A current capability for 1.8 V AVDD and 1.8 V DRVDD; however, it is recommended that separate supplies be used for both analog and digital domains. An additional supply is also required to supply 3.0 V to the DUT, 3.0 V AVDD2. This should also have a 1 A current capability. 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. The 3.3 V supply, or 3.3 V AVDD, should have a 1 A current capability. To bias the CW I/Q demodulator section and differential gain drive circuitry, separate +5 V and -5 V supplies are required at P606. These should each have 1 A current capability.

INPUT SIGNALS

When connecting the TGC (time gain compensation) ADC clock, 4LO and analog source, use clean signal generators with low phase noise, such as Rohde and Schwarz SMA or HP8644B signal generators or the equivalent. Use a 1 meter shielded, RG-58, 50 Ω coaxial cable for making connections to the evaluation board. Enter the desired frequency and amplitude (refer to the specifications in the [AD9276](#) or [AD9277](#) data sheet). In the default condition, the evaluation board is set up to clock the ADC from the crystal oscillator, OSC501, when in the TGC mode.

If a different or external ADC clock source is desired, follow the instructions in the Clock section. Typically, most Analog Devices, Inc., evaluation boards can accept ~ 2.8 V p-p or 13 dBm sine wave input for the clock. When connecting the analog input source, it is recommended to use a multipole, narrow-band band-pass filter with 50 Ω terminations. Analog Devices uses TTE and K&L Microwave, Inc., band-pass filters. The filter should be connected directly to the evaluation board.

OUTPUT SIGNALS

The default TGC setup uses the FIFO5 high speed, dual-channel FIFO data capture board (HSC-ADC-EVALCZ). Two of the eight TGC channels can then be evaluated at the same time. For more information on channel settings on these boards and their optional settings, visit <http://www.analog.com/fifo>.

The default I/Q demodulator setup uses two [AD8021](#) amplifiers for I-V conversion and two [ADA4841](#) amplifiers for gain and filtering. The analog outputs can be evaluated using an oscilloscope or spectrum analyzer.

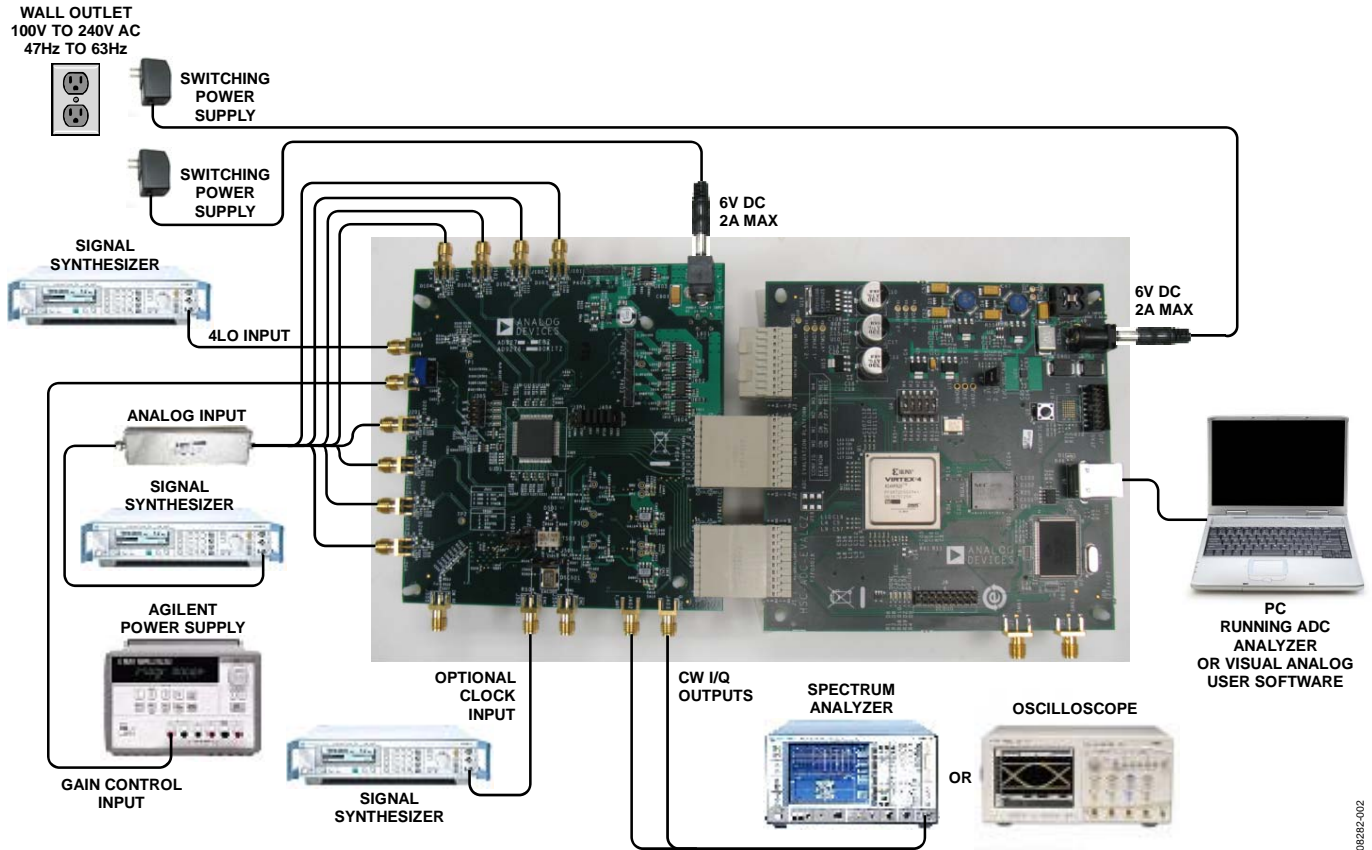


Figure 2. Evaluation Board Connection

08282-002

DEFAULT OPERATION AND JUMPER SELECTION SETTINGS

This section explains the default and optional settings or modes allowed on the evaluation board for the [AD9276](#) and [AD9277](#).

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 P601.

Analog Input Front-End Circuit

The evaluation board is set up for single-ended Kelvin connection analog input with an optimum 50 Ω impedance match of 18 MHz of bandwidth. For a different bandwidth response, use the manual tune feature and antialiasing filter settings.

VREF

VREF is set to 1.0 V. This causes the ADC to operate with the internal reference in the 2.0 V p-p full-scale range. A separate external reference option using the [ADR130](#) is also included on the evaluation board. Populate R320 with a 0 Ω resistor and remove C301. Note that ADC full-scale ranges less than 2.0 V p-p are not supported by the AD9276 and AD9277.

RBIAS

RBIAS has a default setting of 10 k Ω (R304) to ground and is used to set the ADC core bias current. However, note that using other than a 10 k Ω , 1% resistor for RBIAS may degrade the performance of the device, depending on the resistor chosen.

Clock Circuitry

The default clock input circuitry is derived from a simple transformer-coupled circuit using a high bandwidth 1:1 impedance ratio transformer (T501) 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 before entering the ADC clock inputs.

The evaluation board is already set up to be clocked from the crystal oscillator, OSC501. This oscillator is a low phase noise oscillator from Valpey Fisher (VFAC3HL-40MHz). If a different clock source is desired, remove R503, set Jumper J501 to disable

the oscillator from running, and connect the external clock source to the SMA connector, J503.

A differential LVPECL clock driver can also be used to clock the ADC input using the [AD9516](#) (U501). Populate C528 and C529 with 0.1 μ F capacitors and remove C506 and C507 to disconnect the default clock path inputs. In addition, populate C511 and C512 with a 0.1 μ F capacitor. The AD9516 has many SPI-selectable options that are set to a default mode of operation. Consult the AD9516 data sheet for more information about these and other options.

PDWN

To enable the power-down feature, short P301 (Pin 3 to Pin 4) to the on position (AVDD) on the PDWN pin.

STBY

To enable the standby feature, short P301 (Pin 1 to Pin 2) to the on position (AVDD) on the STBY pin.

GAIN+, GAIN-

To change the VGA attenuation, drive the GAIN+ pin from 0 V to 1.6 V on J401 using a linear supply. This uses the single-ended method to change the VGA gain from 0 dB to 42 dB. U411 is available for users who wish to drive the gain pins (GAIN \pm) differentially. Install R426, R435, and R436 and remove C456, C457, and R440 to connect the amplifier correctly. In differential mode, a linear supply from -0.8 V to +0.8 V on J401 is required to change the VGA gain from 0 dB to 42 dB.

If an external source is not available, remove R425, and install R438 to use the on-board resistive divider (R439) for gain adjustment in the single-ended case.

CWI/Q+, CWI/Q-

To view the CWI+/CWI- and/or CWQ+/CWQ- outputs, configure the AD9276 and AD9277 to be in CW mode and enable each channel via the SPI Controller program. Apply a 13 dBm, 20 MHz reference clock (4LO) on J303. Each enabled channel is summed and is available through J402/J403.

DOUX+, DOUX-

If an alternative data capture method to the setup described in Figure 2 is used, optional receiver terminations, R604 to R613, can be installed next to the high-speed backplane connector, P604.

EVALUATION BOARD SOFTWARE QUICK START PROCEDURES

This section provides quick start procedures for using the AD9276 and AD9277, either on the evaluation board or at the system level design. Both the default and optional settings are described.

CONFIGURING THE BOARD FOR TGC MODE

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

1. Connect the evaluation board and the HSC-ADC-EVALCZ as shown in Figure 1 and Figure 2.
2. Connect one 6 V, 2.5 A switching power supply (such as the CUI, Inc., EPS060250UH-PHP-SZ supplied) to the evaluation 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 USB cable to J6 on the HSC-ADC-EVALCZ board to the PC.
5. On the evaluation board, place jumpers on all five pin pairs of J404 to connect the SPI bus.
6. On the evaluation board, ensure that J501 (OSC_EN) is jumpered to the OFF setting to use the on-board 40 MHz Valpey Fisher VFAC3 oscillator.
7. On the evaluation board, use a clean signal generator with low phase noise to provide an input signal to the desired channel. Use a 1 meter, 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

Set Up the ADC Data Capture Block

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

1. Open VisualAnalog™ on a PC. AD9276 or AD9277 should be listed in the status bar of the **New Canvas** window. Select the template that corresponds to the type of testing to be performed (see Figure 3).

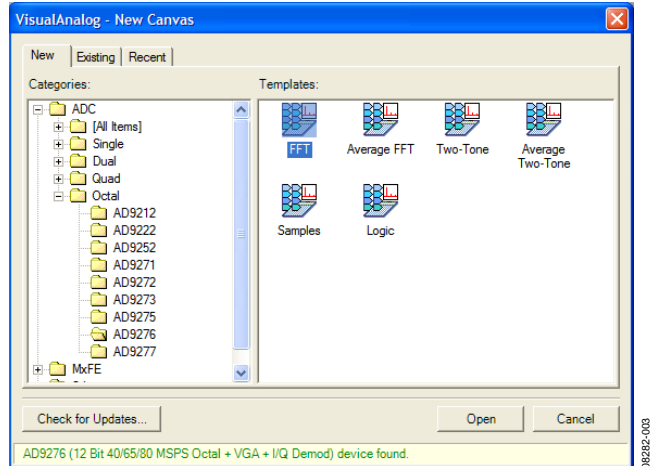


Figure 3. VisualAnalog, New Canvas Dialog Box

2. After the template is selected, a message box opens, asking if the default configuration can be used to program the FPGA (see Figure 4). Click **Yes**, and the window closes.

If a different program is desired, follow Step 3.

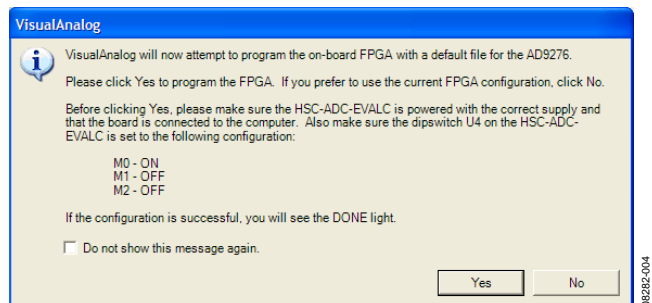


Figure 4. VisualAnalog, New Canvas Message Box

3. To view different channels or change features to settings other than the default settings, click the **Expand Display** button located on the top right corner of the VisualAnalog window, as shown in Figure 5 and Figure 6.

This process is described in the [AN-905](#) Application Note, *VisualAnalog Converter Evaluation Tool Version 1.0 User Manual*. After you are finished, click the **Collapse Display** button.

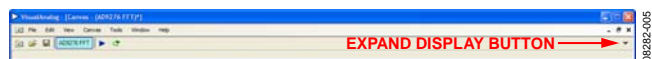


Figure 5. VisualAnalog Window Toolbar, Expand Display Button

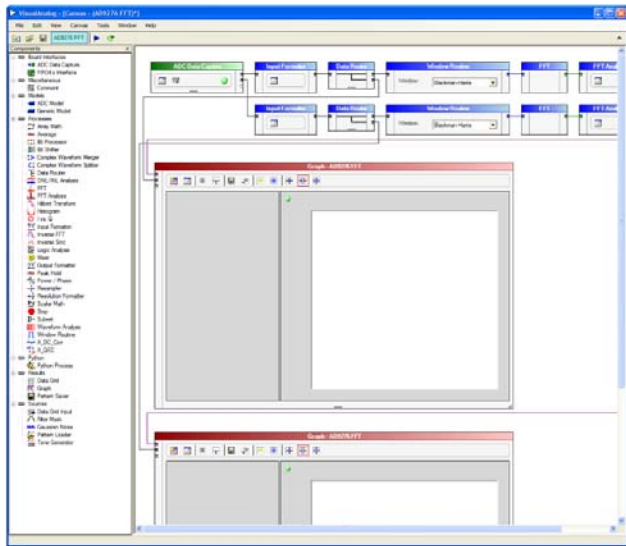


Figure 6. VisualAnalog, Main Window Expanded Display

- Program the FPGA of the HSC-ADC-EVALCZ board to a setting other than the default setting as described in Step 3. Then expand the VisualAnalog display and click the **Settings** button in the **ADC Data Capture** block (see Figure 6). The **ADC Data Capture Settings** box opens (see Figure 7).

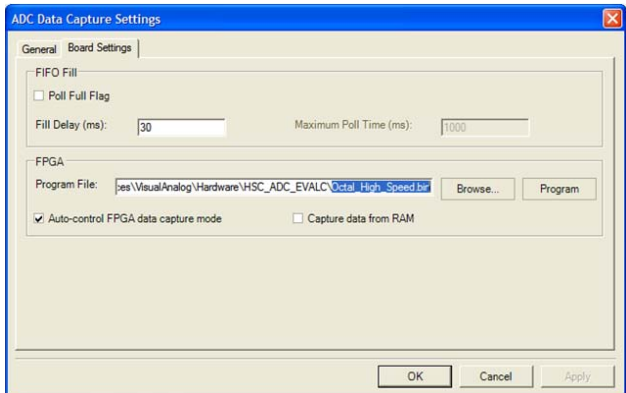


Figure 7. ADC Data Capture Settings, Board Settings Tab

- Select the **Board Settings** tab and browse to the appropriate programming file. If you are using an encode rate <28 MSPS, select **Octal_Low_Speed.bin**. If you are using an encode rate >28 MSPS, select **Octal_High_Speed.bin**. Next, click **Program**; the DONE LED in the HSC-ADC-EVALCZ board should then turn on. If more than two channels are required to be displayed, select **High_Speed_Octal_synchronous_capture.bin**. This canvas allows the user to display all the channels at once. The drawback is that each FFT display is only 8k points.

Exit the **ADC Data Capture Settings** box by clicking **OK**.

Set Up the SPI Controller

After the ADC data capture board setup has been completed, set up the SPI Controller:

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

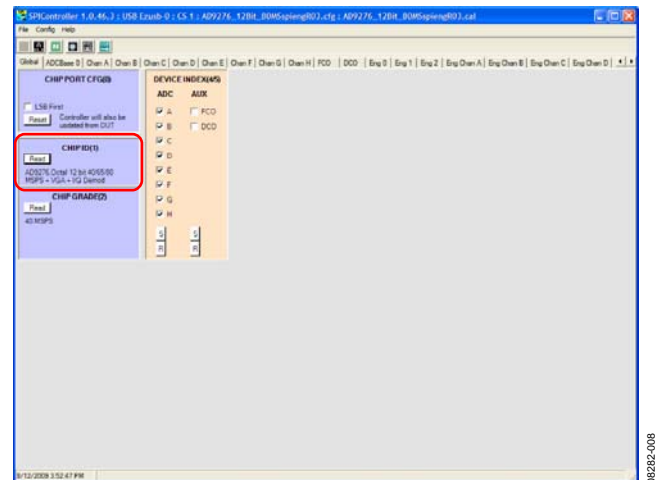


Figure 8. SPI Controller, CHIP ID(1) Box

- Click the **New DUT** button in the SPI Controller (see Figure 9).

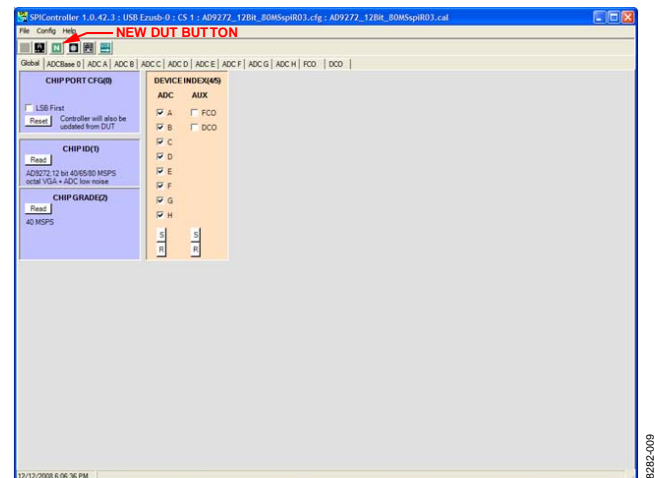


Figure 9. SPI Controller, New DUT Button

- In the **ADCBase 0** tab of the SPI Controller, find the **CHIP GRADE(2)** box. Use the drop-down list box to select the correct speed mode, if necessary. See the [AD9276](#) or [AD9277](#) data sheet, the [AN-878](#) Application Note, and the [AN-877](#) Application Note for reference.

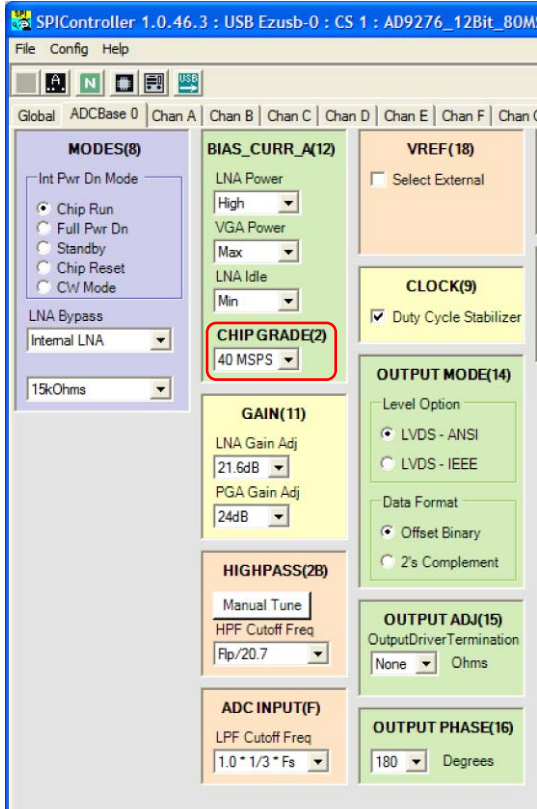


Figure 10. SPI Controller, CHIP GRADE(2)

- In the **ADCBase 0** tab of the SPI Controller, find the **HIGHPASS(2B)** box. Click the **Manual Tune** button to calibrate the antialiasing filter. See the [AD9276](#) or [AD9277](#) data sheet, the [AN-878](#) Application Note, and the [AN-877](#) Application Note for reference.

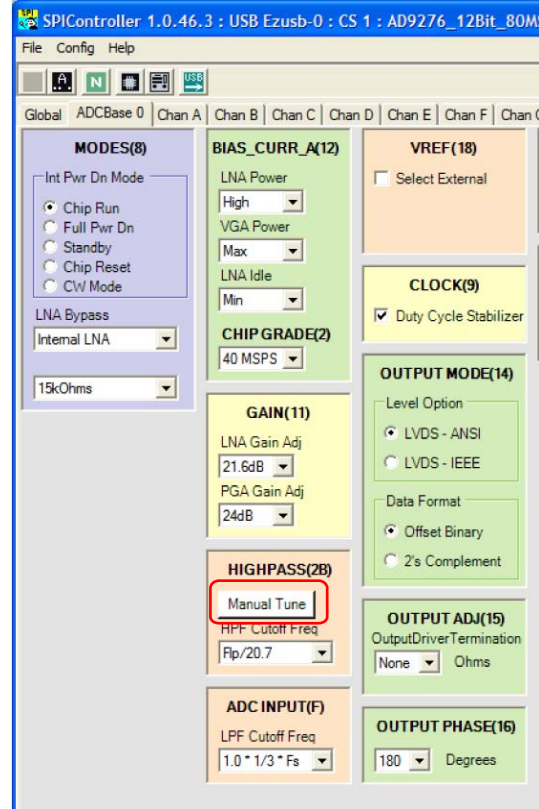


Figure 11. SPI Controller, HIGHPASS(2B)

- In the **Chan A** tab of SPI Controller, find the **OFFSET(10)** box. Use the drop-down list box labeled **Offset Adj** to perform an offset correction to the LNA if the LNA power setting **BIAS_CURR_A(12)** is set low. The default value is 32.

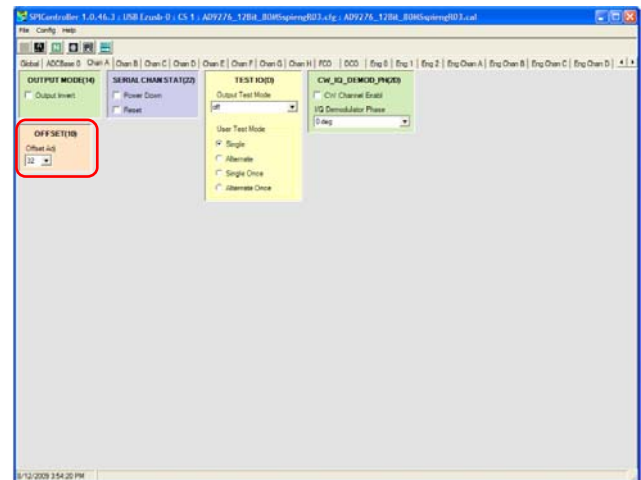


Figure 12. SPI Controller, OFFSET(10)

- Click the **Run** button in the VisualAnalog toolbar.

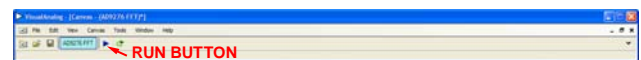


Figure 13. VisualAnalog Window Toolbar, Run Button

Adjust the Amplitude of the Input Signal

Next, 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 **VisualAnalog FFT** window). If the gain pin voltage is too low, it is not possible to reach full scale without distortion. Use a higher gain setting or a lower input level to avoid distortion. This also depends on the PGA gain setting, which can be 30 dB, 27 dB, 24 dB (default), or 21 dB. See Figure 14 and Figure 15.

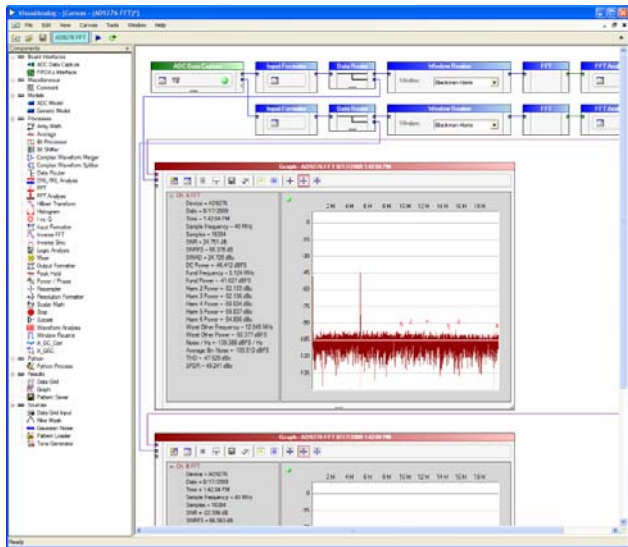


Figure 14. VisualAnalog, FFT Graph, Gain = 0 V

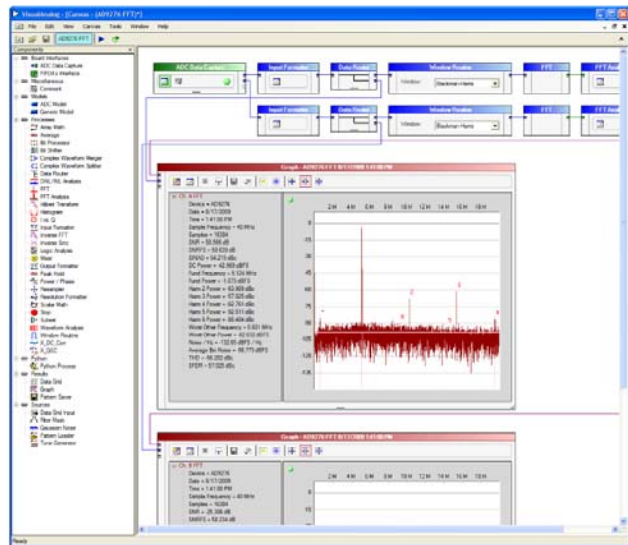


Figure 15. VisualAnalog, FFT Graph, Gain = 1.6 V

2. If another channel needs to be evaluated, change the channel setting within the ADC Data Capture block. Channels A and B are the default displayed channels. **ADC Data Capture Settings** box under the **General** tab. Clock Frequency and the number of samples can also be changed.

3. Click the disk icon within the **Graph** box to save the performance plot. See Figure 16.

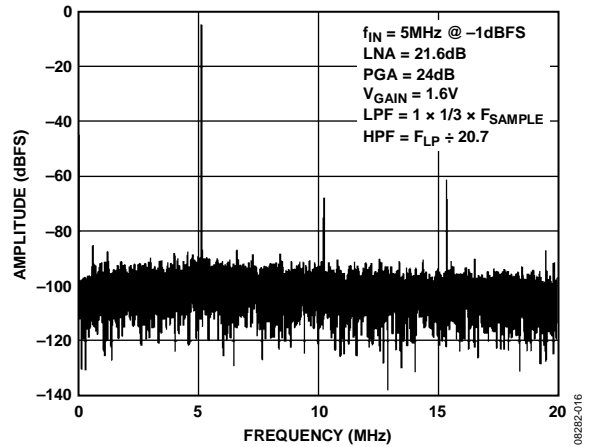


Figure 16. Typical FFT, AD9276 and AD9277

USING THE INTEGRATED I/Q DEMODULATOR (CW DOPPLER MODE)

To examine the spectrum of the CW Doppler integrated I/Q demodulator output, use the following procedure:

1. Complete the steps in the **Configuring the Board and Using the Software for Testing** sections to ensure that the evaluation board is set up correctly.
2. Optionally, remove the voltage source from the gain pin, J401. It does not affect the CW Doppler output.
3. Use a 1 meter, shielded, RG-58, 50 Ω coaxial cable to connect the spectrum analyzer to J402 and/or J403.
8. Connect a 20 MHz signal source to J303, 4LO input. Use a clean signal generator with low phase noise to provide an input clock signal. Use a 1 meter, shielded, RG-58, 50 Ω coaxial cable to connect the signal generator.
9. Connect an analog input signal, 5.0123 MHz for example, to ChA, J101. Use a clean signal generator with low phase noise to provide an input signal to the desired channel. Use a 1 meter, 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).
4. In the **ADCBase 0** tab of the **SPI Controller**, find the **MODES(8)** box. Select the **CW Mode** option (see Figure 17).

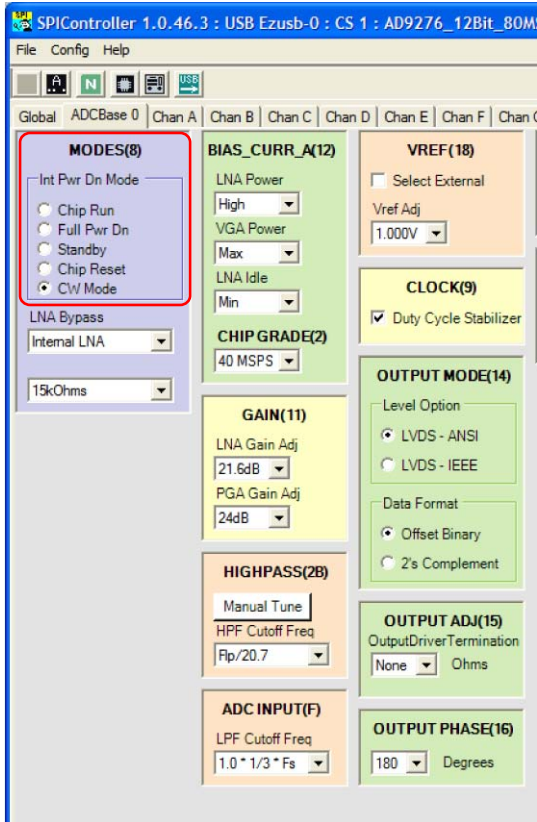


Figure 17. SPI Controller, MODES(8) Box

- In the **Chan X** tab of the SPI Controller, where **X** is the channel to which an analog input is applied, find the **CW_IQ_DEMOD_PH(2D)** box. Select the **CW Channel Enabl** check box to enable the channel. Then select the phase rotation of the channel using the **I/Q Demodulator Phase** drop-down menu.

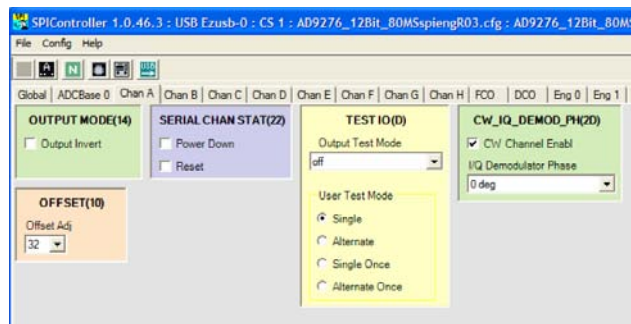


Figure 18. SPI Controller, CW_IQ_DEMOD_PH(2D) Box

- An example of the CW Doppler output, as shown in Figure 19 and Figure 20, can be seen in the frequency and time domain, respectively. Make sure to set the analog input level appropriately to achieve full scale throughout the signal chain.

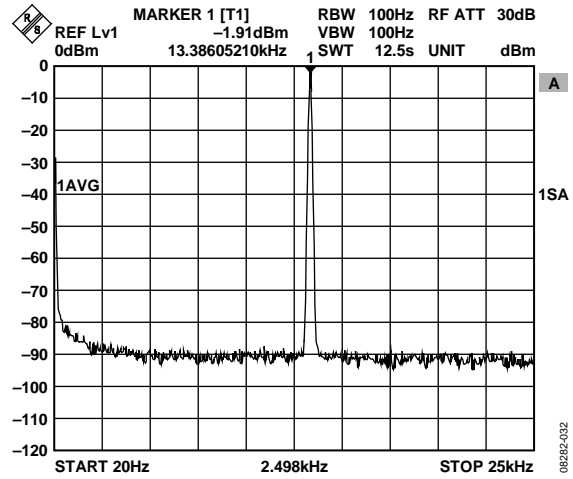


Figure 19. Typical Spectrum Analyzer Display of CWD Output

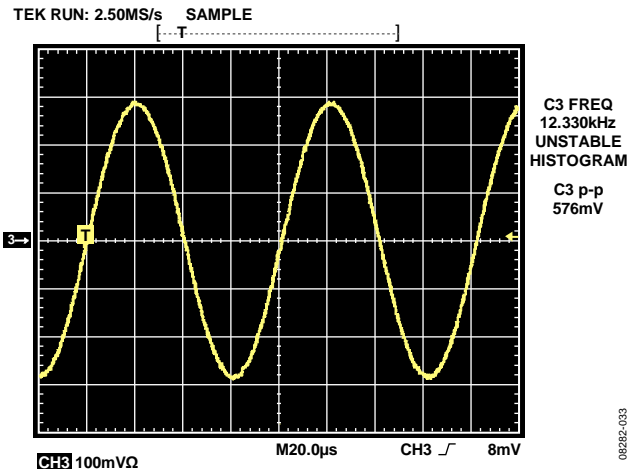
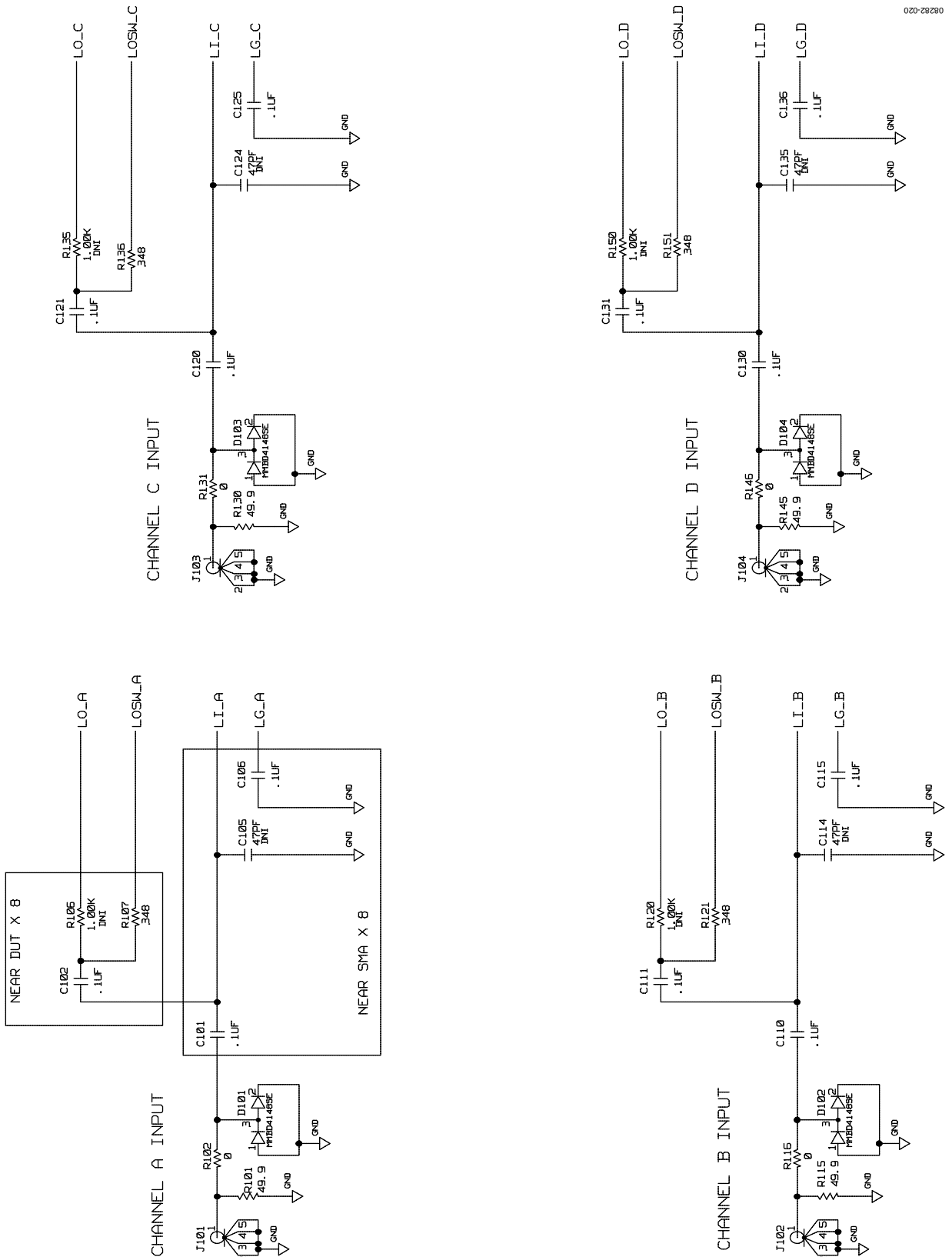


Figure 20. Typical Oscilloscope Display of CWD Output

EVALUATION BOARD SCHEMATICS AND ARTWORK

ANALOG INPUTS
CHANNELS A-D



08282-020

Figure 21. DUT Analog Input Circuits

ANALOG INPUTS
CHANNELS E-H

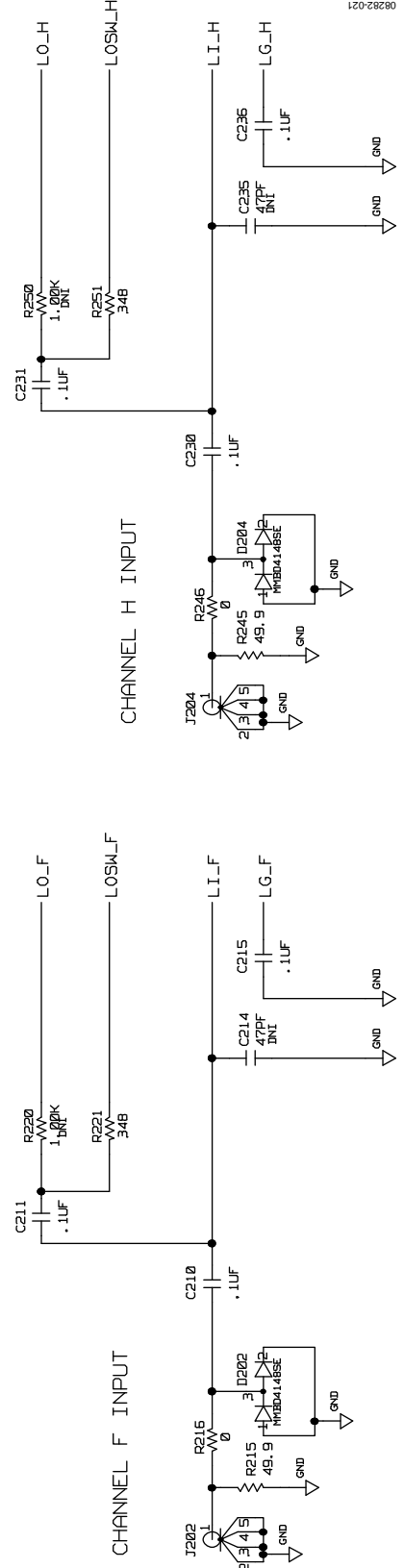
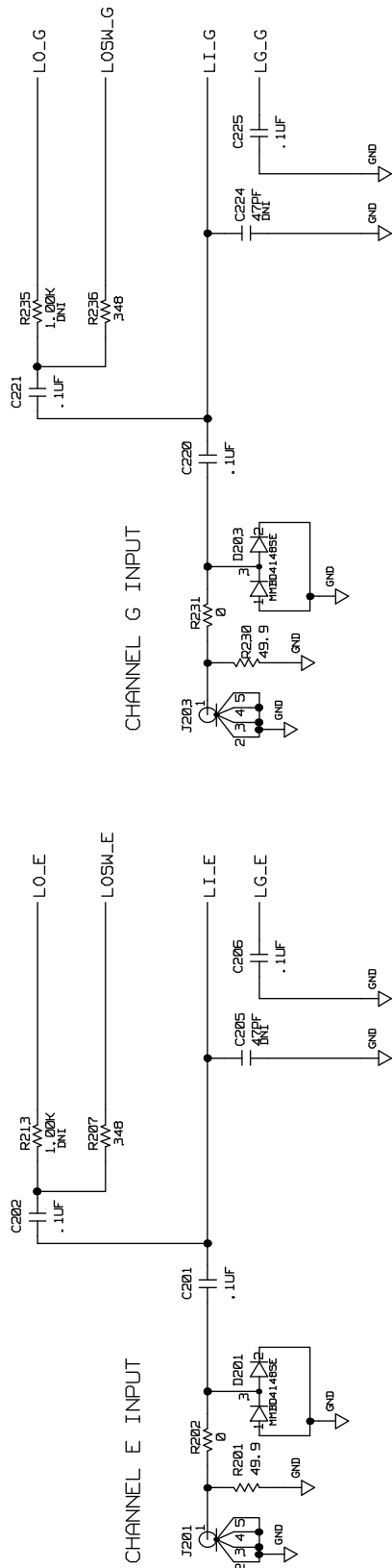


Figure 22. DUT Analog Input Circuits (Continued)

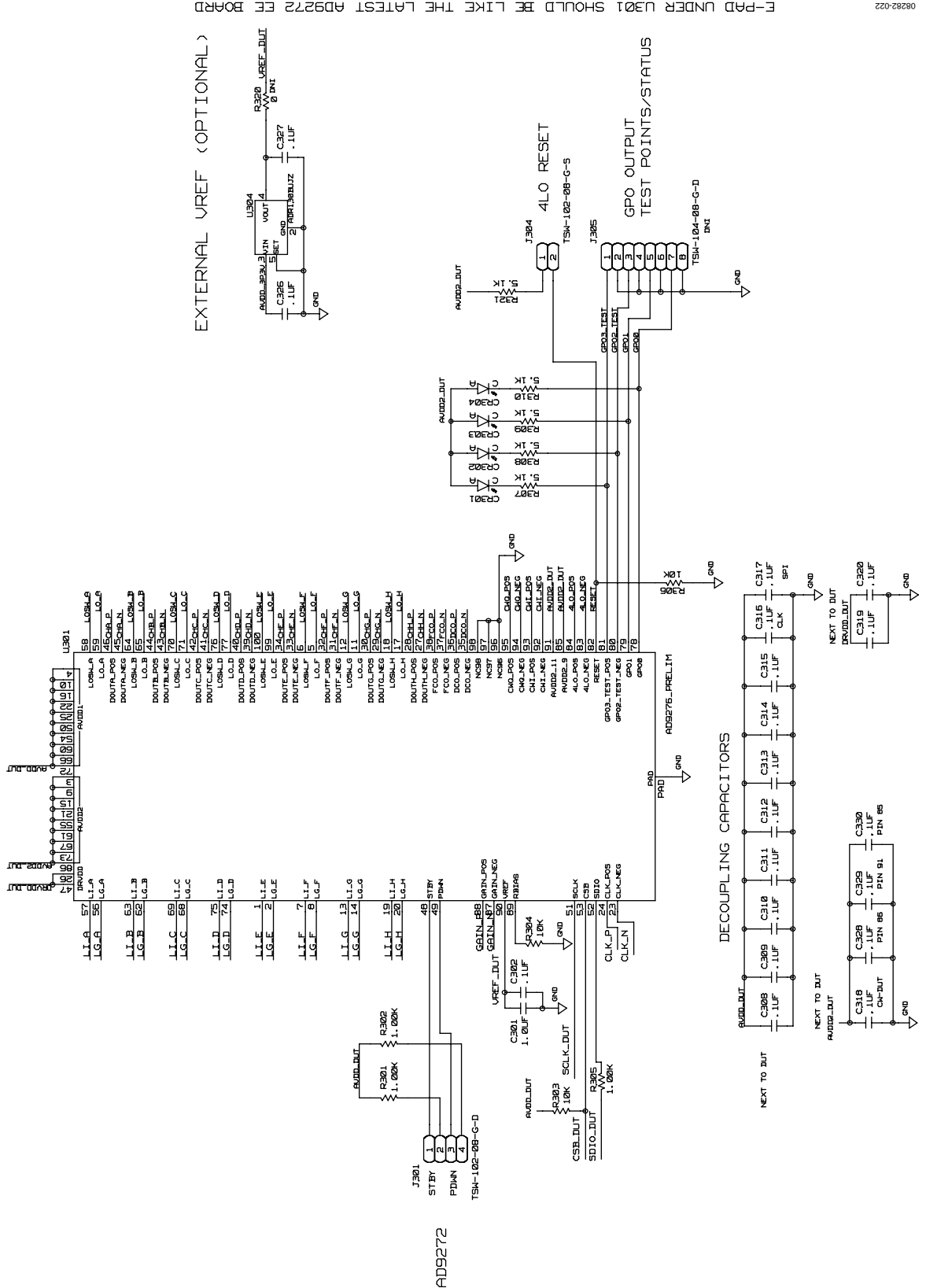


Figure 23. DUT, VREF, and Decoupling

E-PAD UNDER U301 SHOULD BE LIKE THE LATEST AD9272 EE BOARD

08282-022

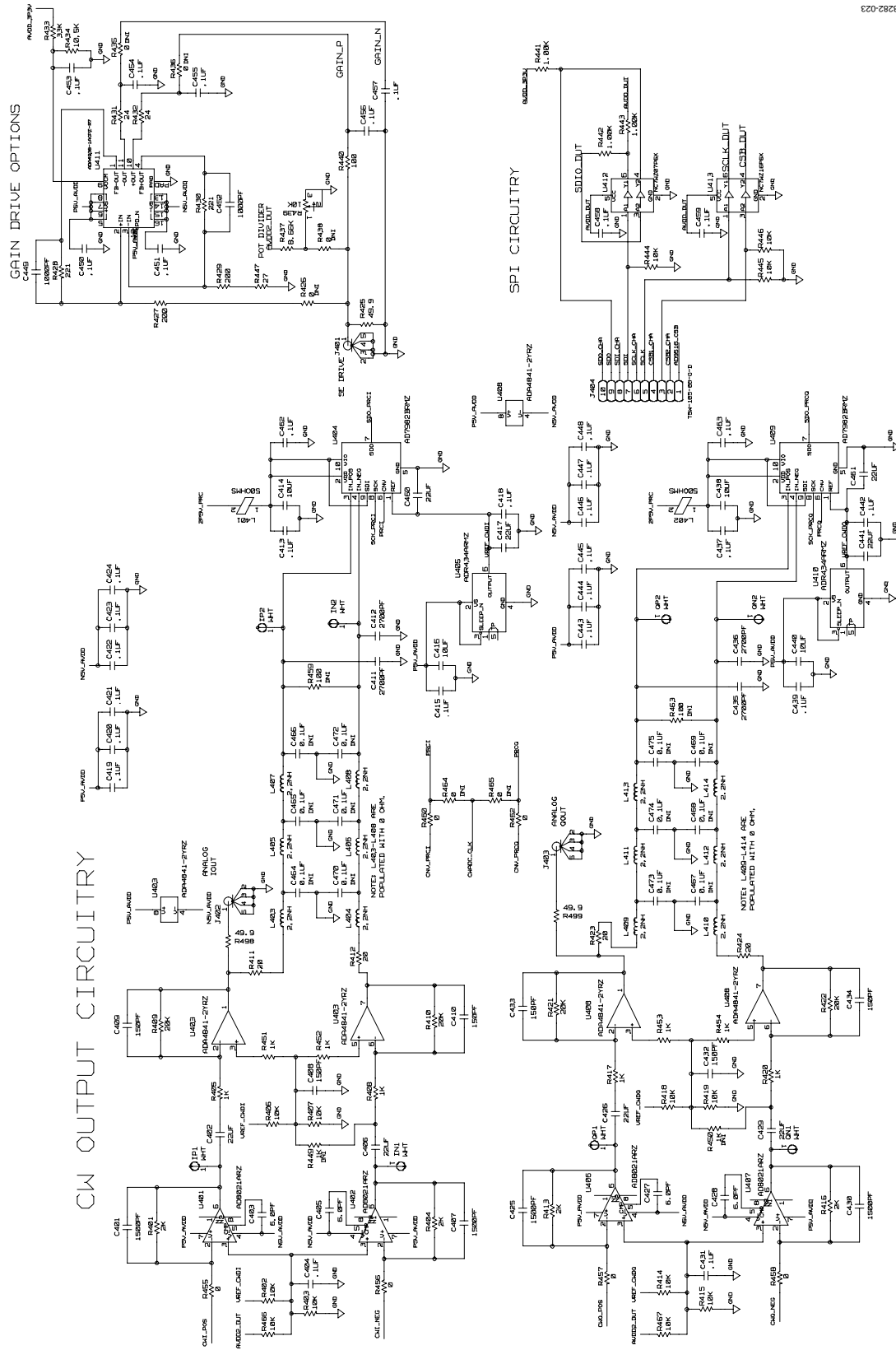
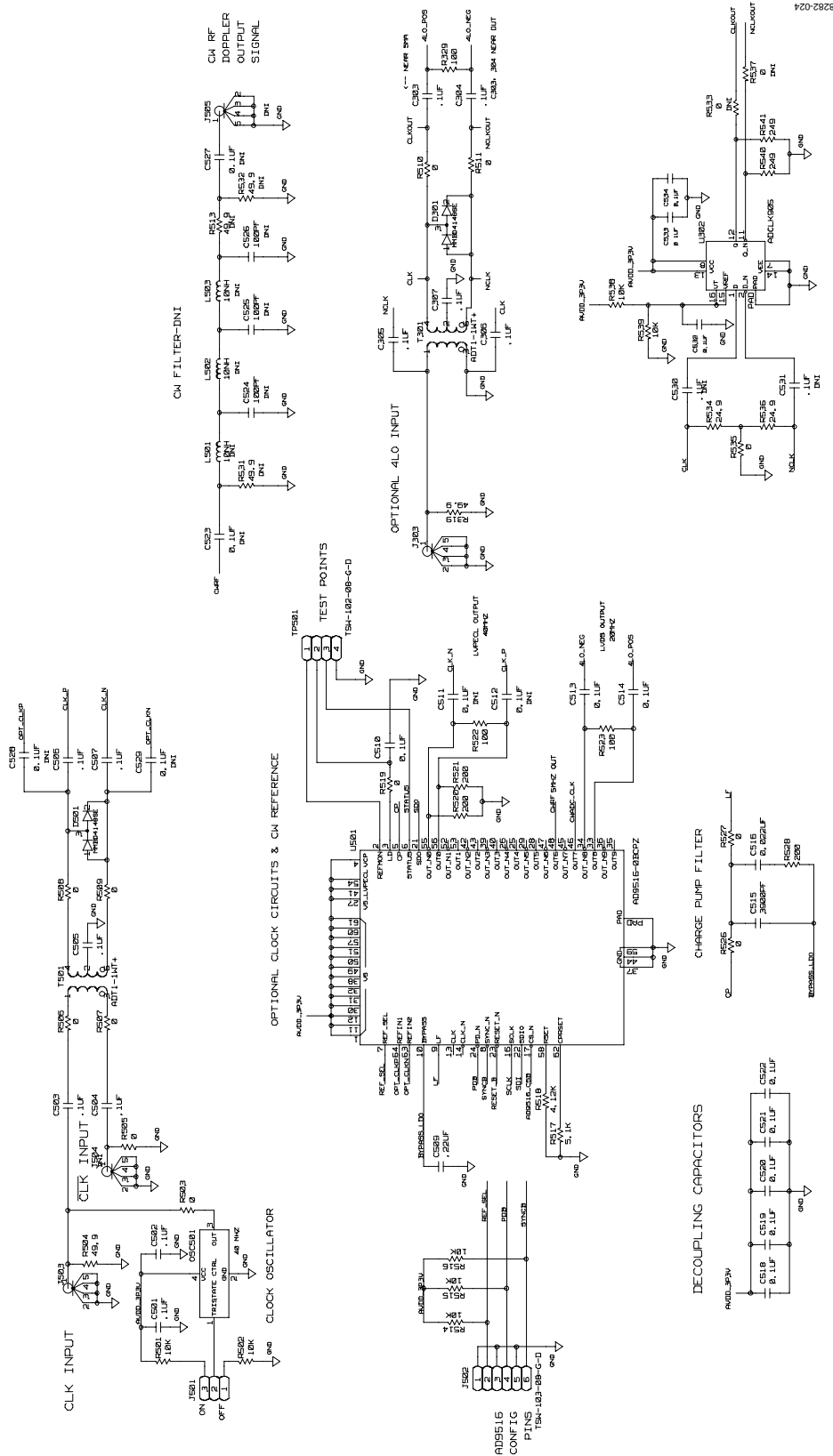


Figure 24. I/Q Demodulator, SPI, and Gain Drive Circuitry



08282-024

Figure 25. Clock Circuitry

06282-025

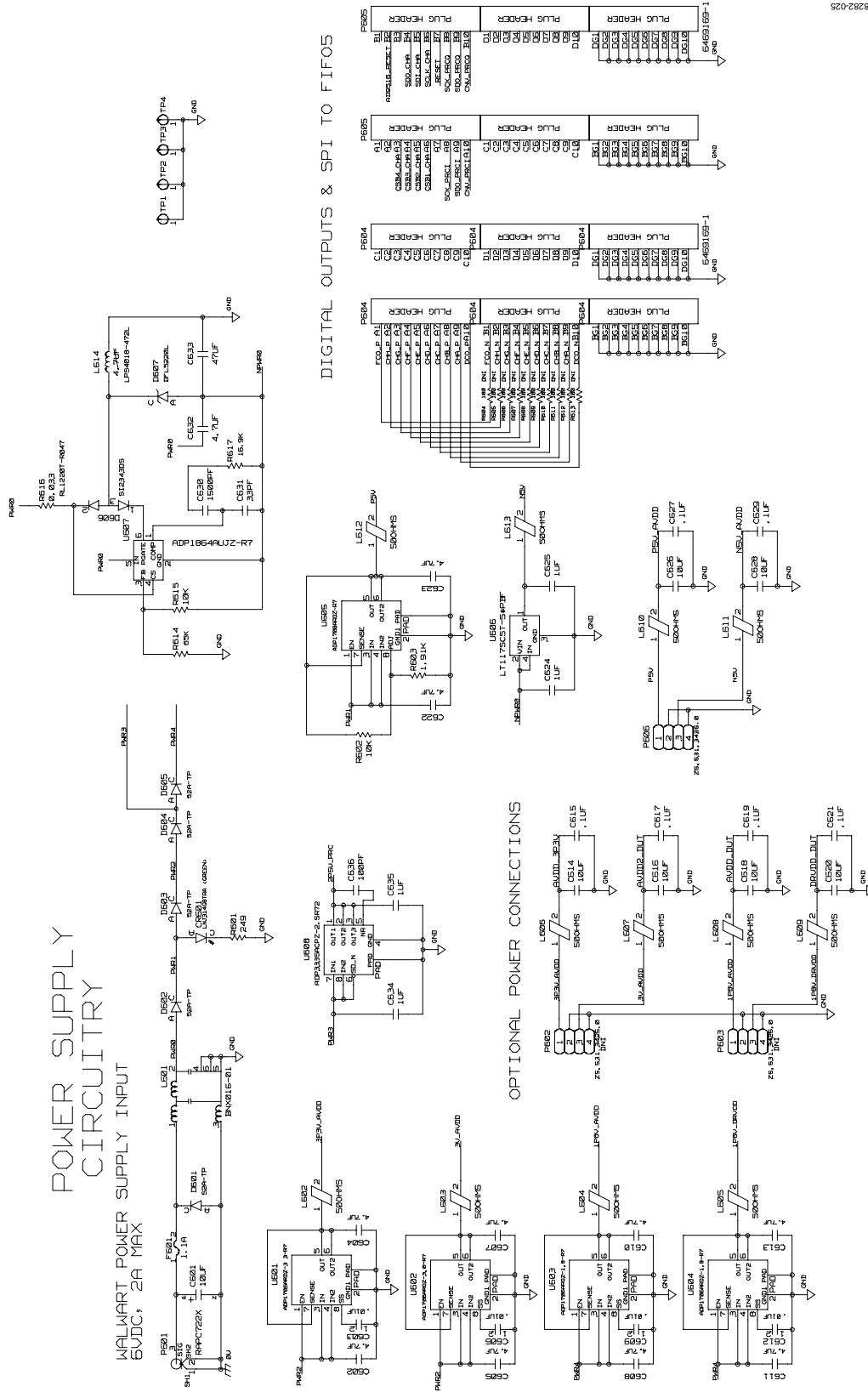


Figure 26. Power Supply, Digital Output Interface

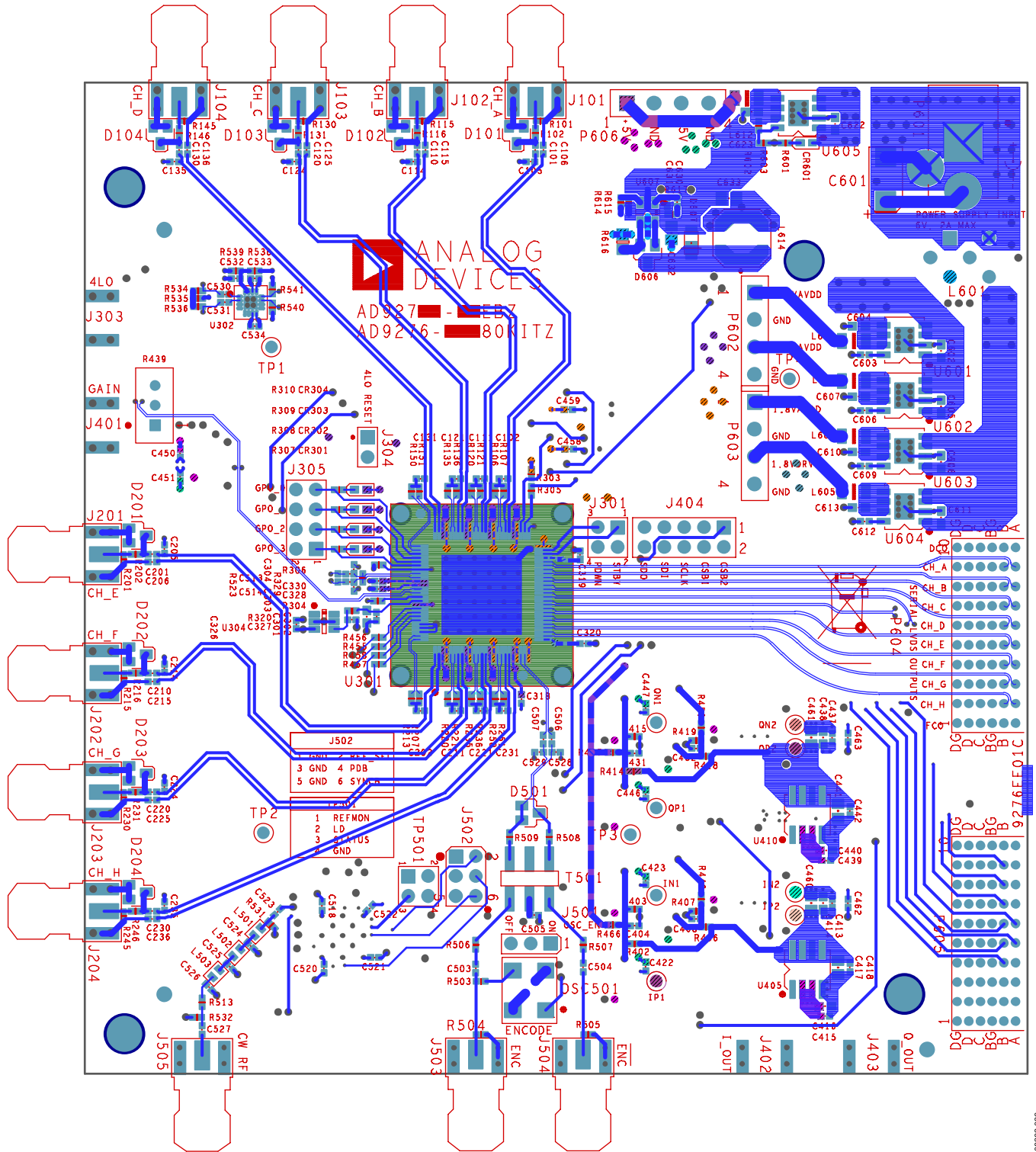


Figure 27. Top Side

092028280

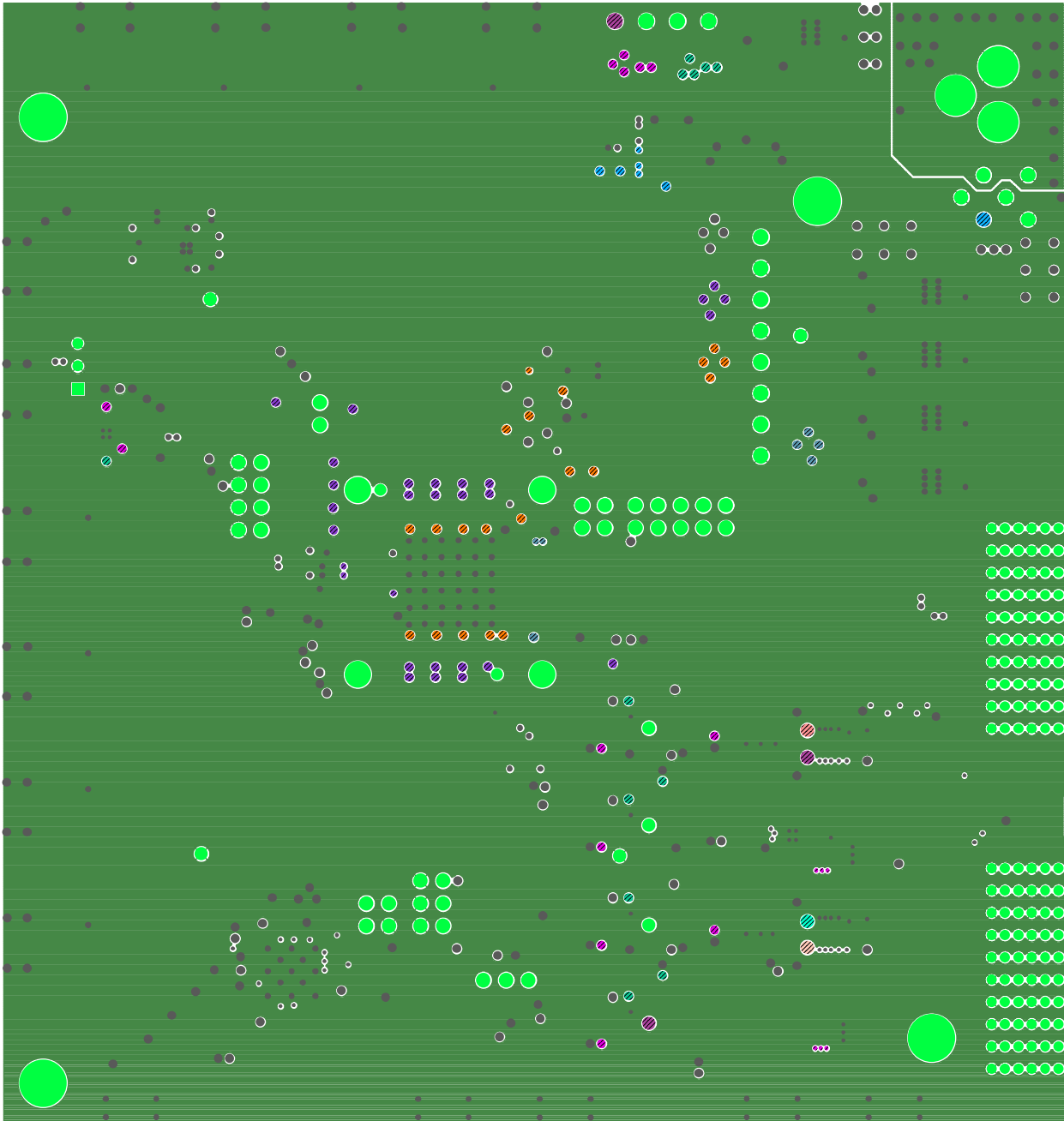


Figure 28. Ground Plane (Layer 2)

20128280

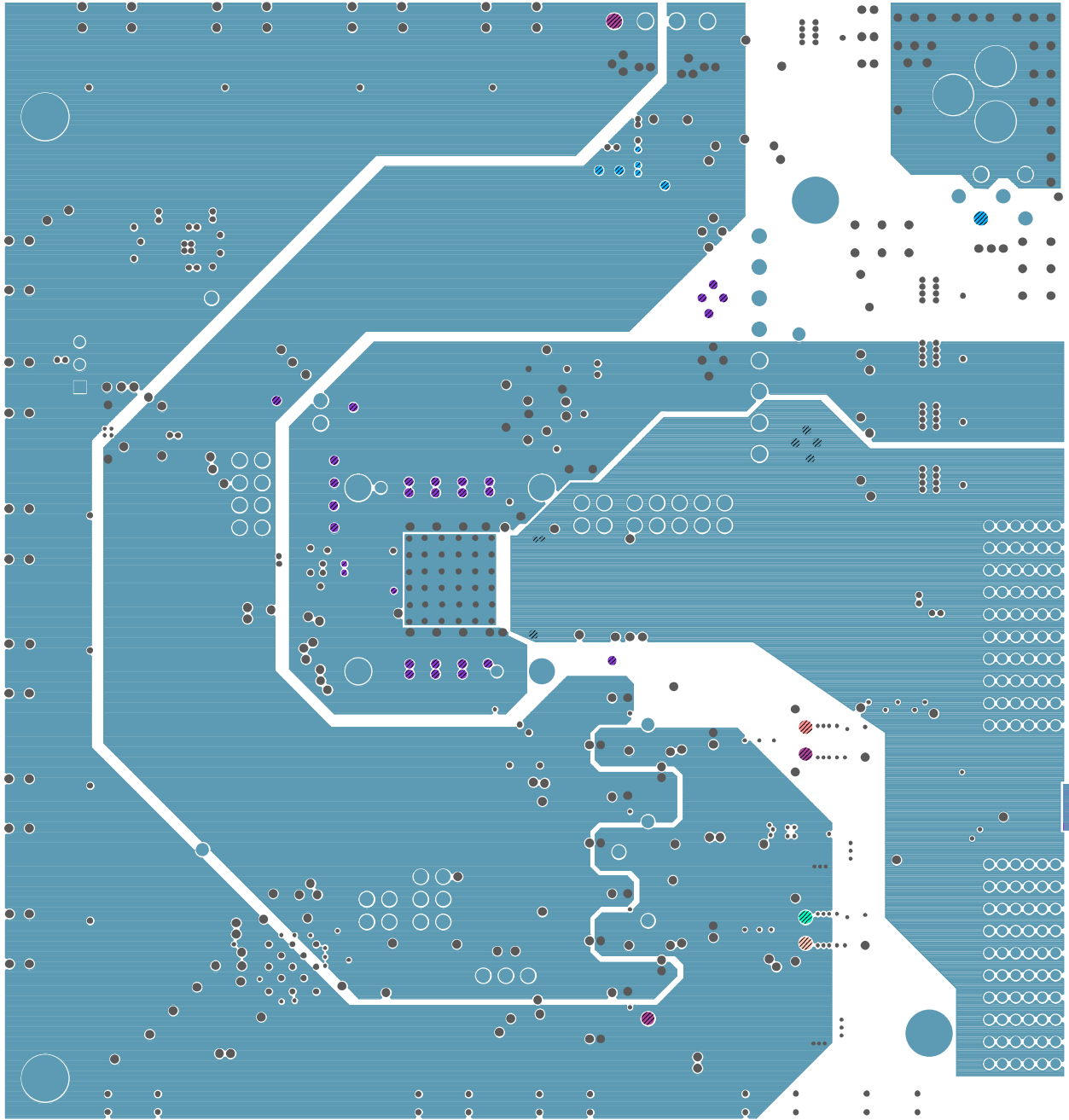
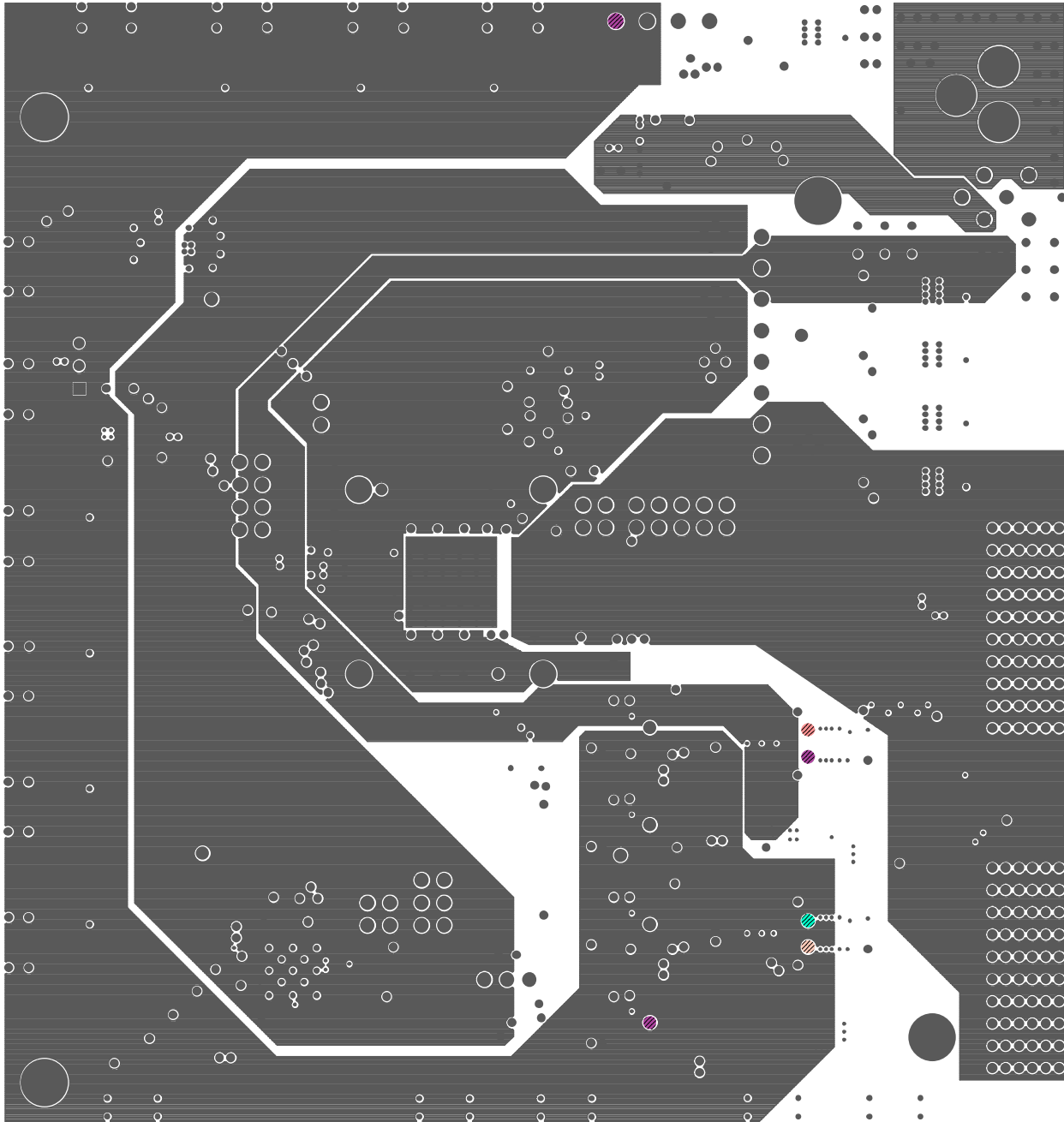


Figure 29. Power Plane (Layer 3)

018282-028



08282-029

Figure 30. Power Plane (Layer 4)

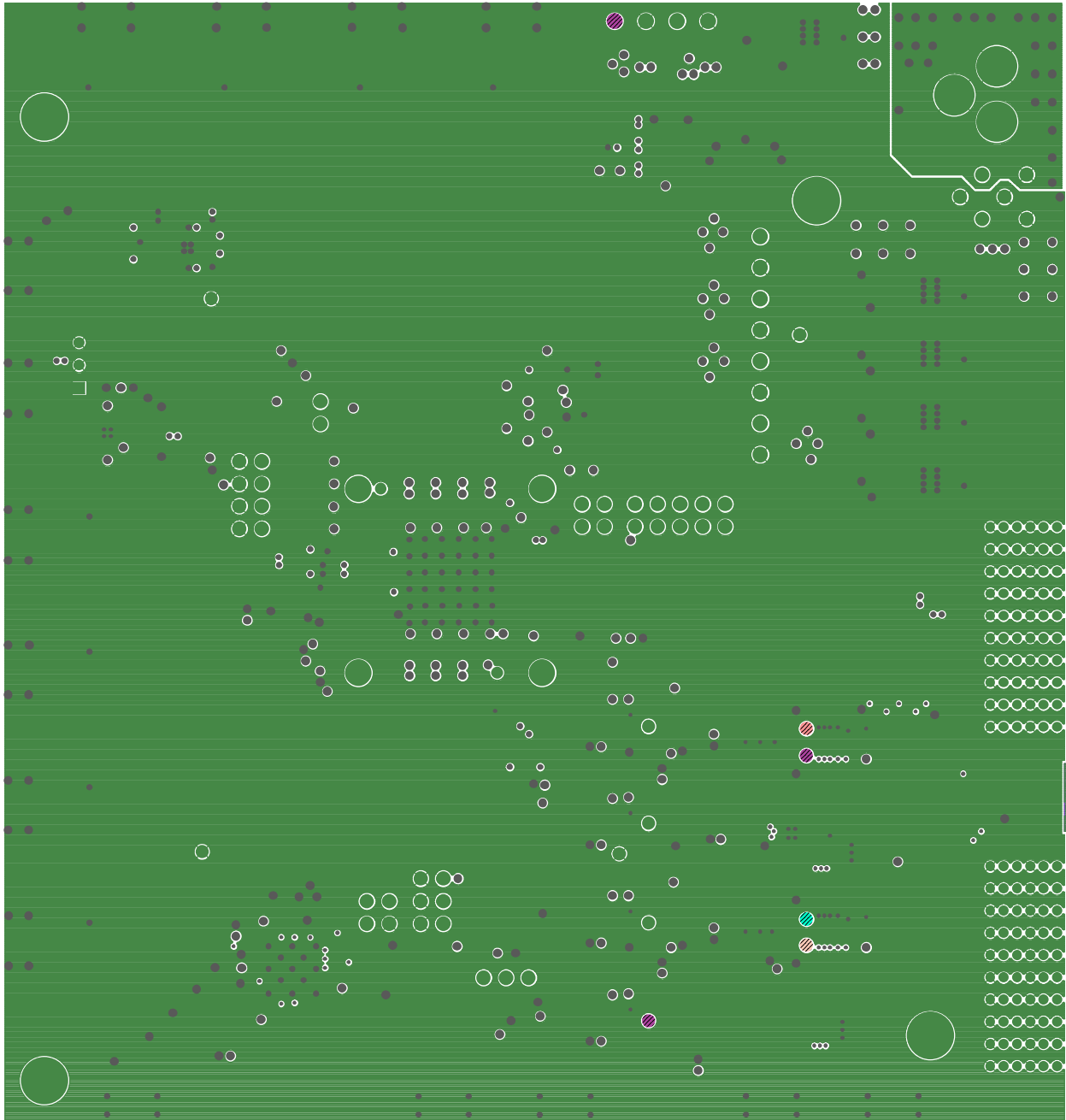


Figure 31. Ground Plane (Layer 5)

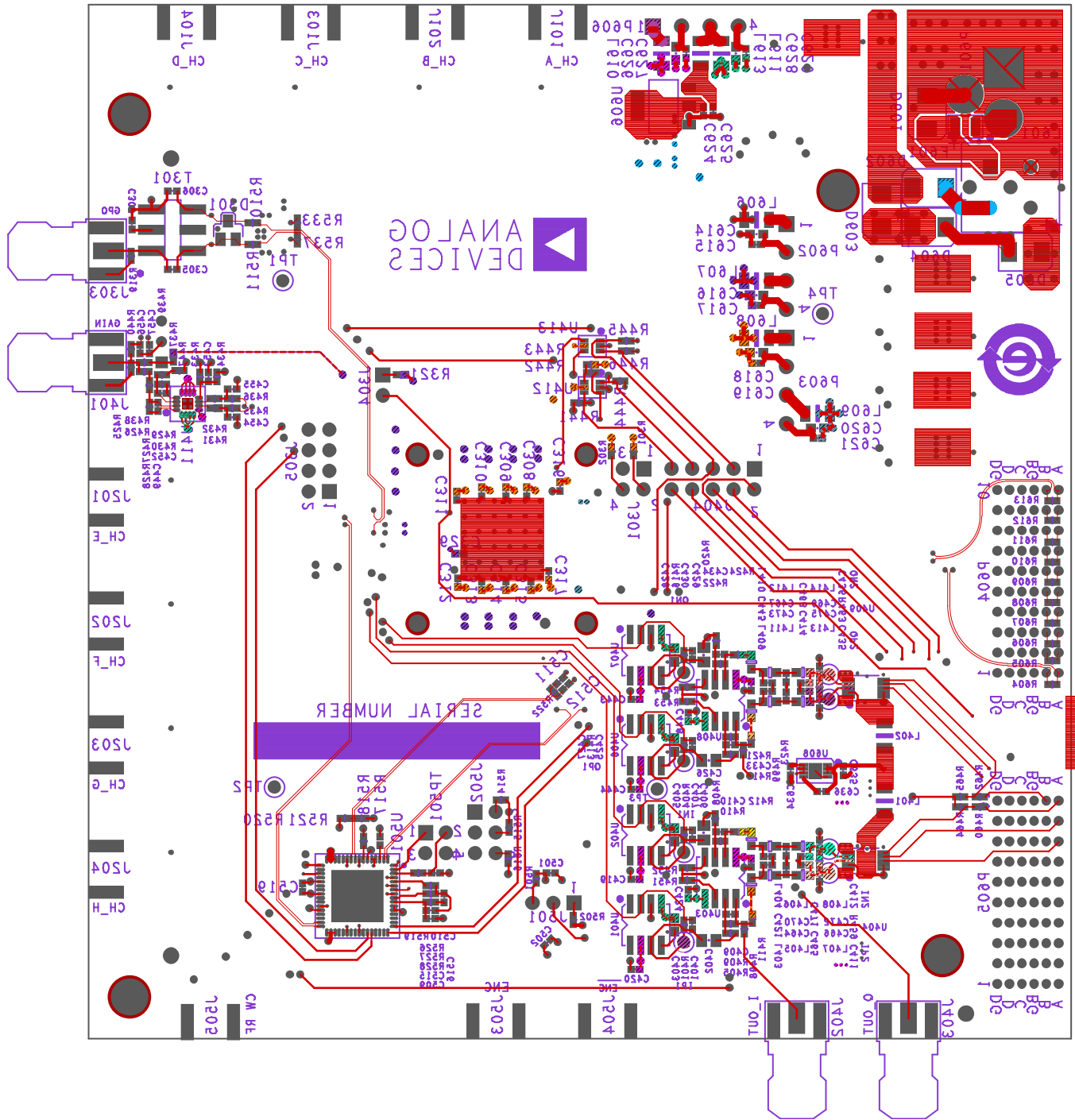


Figure 32. Bottom Side

00282-031

ORDERING INFORMATION

BILL OF MATERIALS

Table 1.

Qty	Reference Designator	Description	Manufacturer	Part Number
103	C101, C102, C106, C110, C111, C115, C120, C121, C125, C130, C131, C136, C201, C202, C206, C210, C211, C215, C220, C221, C225, C230, C231, C236, C302, C303, C304, C307, C308, C309, C310, C311, C312, C313, C314, C315, C316, C317, C318, C319, C320, C326, C327, C328, C329, C330, C404, C413, C415, C418, C419, C420, C421, C422, C423, C424, C431, C437, C439, C442, C443, C444, C445, C446, C447, C448, C450, C451, C453, C454, C455, C456, C457, C458, C459, C462, C463, C501, C502, C503, C504, C505, C506, C507, C510, C518, C519, C520, C521, C522, C523, C527, C530, C531, C532, C533, C534, C615, C617, C619, C621, C627, C629	Capacitor, 0.1 µF, 0402, X5R, ceramic, 10 V	Panasonic	ECJ-0EB1A104K
4	C624, C625, C634, C635	Capacitor, 1 µF, 0402, 6.3 V, ceramic, X5R	Panasonic	ECJ-0EB0J105M
1	C509	Capacitor, 0.22 µF, 0402, 6.3 V, ceramic	Panasonic	ECJ-0EB0J224K
1	C636	Capacitor, 100 pF, 0402, 50 V, Ceramic	Murata	GRM1555C1H101JD01B
2	C449, C452	Capacitor, 1000 pF, 0402, 50 V, ceramic, X7R	Panasonic	ECJ-0EB1H102K
5	C401, C407, C425, C430, C630	Capacitor, 1500 pF, 0402, 25 V, ceramic, X7R	Panasonic	ECJ-0EB1E152K
6	C408, C409, C410, C432, C433, C434	Capacitor, 150 pF, 0402, 25 V, ceramic, X7R	Panasonic	ECJ-0EB1H151K
4	C411, C412, C435, C436	Capacitor, 2700 pF, 0402, 25 V, ceramic, X7R	Panasonic	ECJ-0EB1E272K
1	C515	Capacitor, 3900 pF, 0402, 25 V ceramic, X7R	Panasonic	ECJ-0EB1E392K
1	C631	Capacitor, 33 pF, 0402, 25 V ceramic, X7R	Panasonic	ECJ-0EC1H330J
4	C403, C405, C427, C428	Capacitor, 5 pF, 0603, 50 V, ceramic, NPO	Yageo	CC0603CRNP09BN5R0
4	C603, C606, C609, C612	Capacitor, 10000 pF, 0402, 16 V, ceramic, X7R	Panasonic	ECJ-0EB1C103K
1	C516	Capacitor, 22000 pF, 0402, 25 V, ceramic, Y5V	Panasonic	ECJ-0EF1E223Z
1	C301	Capacitor, 1 µF, 0603, 16 V, ceramic, X5R	Panasonic	ECJ-BVB1C105M
10	C602, C604, C605, C607, C608, C610, C611, C613, C622, C623	Capacitor, 4.7 µF, 0603, 6.3 V, ceramic, X5R	Panasonic	ECJ-1VB0J475M
10	C414, C416, C438, C440, C614, C616, C618, C620, C626, C628	Capacitor, 10 µF, 0603, 6.3 V, ceramic, X5R	Panasonic	ECJ-1VB0J106M
1	C632	Capacitor, 4.7 µF, 0805, 6.3 V, ceramic X5R	Murata	GRM21BR61E475KA12L
1	C633	Capacitor, 47 µF, 0805, 6.3 V, Ceramic, X5R	Taiyo Yuden	JMK212BJ476MG-T
6	C402, C406, C426, C429, C460, C461	Capacitor, 22 µF, 0805, 6.3 V, ceramic, X5R	Panasonic	ECJ-2FB0J226M
1	C601	Capacitor, 10 µF, 6032-28, tantalum, SMT, 16 V, 10%	Kemet	T491C106K016AT
5	CR301, CR302, CR303, CR304, CR601	LED, 0603, green	Panasonic	LNJ314G8TRA
10	D101, D102, D103, D104, D201, D202, D203, D204, D301, D501	Diode Schottky GP LN 20 V SOT-23 200 mA SS	Fairchild	MMBD4148SE
5	D601, D602, D603, D604, D605	Diode, silicon rectifier, SMBJ, 2 A, 50 V	Microcommerical	S2A-TP
1	D606	MOSFET P-CH 30 V 3.1 A SOT-23	Vishay	SI2343DS-TI-E3
1	D607	Diode, Schottky, 2 A, 20 V	Diodes Inc	DFLS220L-7
1	F601	Polyswitch 1.10 A reset fuse SMD	Tyco/Raychem	NANOSMDC110F-2

Qty	Reference Designator	Description	Manufacturer	Part Number
15	J101, J102, J103, J104, J201, J202, J203, J204, J401, J402, J403, J303, J503, J504, J505	SMA, end launch, coax	Samtec	SMA-J-P-H-ST-EM1
1	J305	Header, 4 pin double row, male, 100 mil, straight	Samtec	TSW-104-07-G-D
1	J404	Header, 5 pin double row, male, 100 mil, straight	Samtec	TSW-105-07-G-D
1	J501	Header, 3 pin single row, male, 100 mil, straight	Samtec	TSW-103-07-G-S
1	J502	Header, 3 pin double row, male, 100 mil, straight	Samtec	TSW-103-07-G-D
2	J301, TP501	Header, 2 pin double row, male, 100 mil, straight	Samtec	TSW-102-07-G-D
1	J304	Header, 2 pin single row, male, 100 mil, straight	Samtec	TSW-102-07-G-S
1	P601	Power supply connector	Switchcraft	RAPC722X
2	P604, P605	Connector, 60 pin RA	Tyco	6469169-1
3	P602, P603, P606	Terminal block, 4-pin, ST	Weiland	Z5.531.3425.0
14	L401, L402, L602, L603, L604, L605, L606, L607, L608, L609, L610, L611, L612, L613	Inductor, ferrite bead, 50 Ω 3 A 1206	Muarata	BLM31PG500SN1L
1	L601	EMI filter LC block choke coil	Murata	BNX016-01
1	L614	Inductor, 4.7 μ H, shielded power	Coilcraft	LPS5015-472MLB
1	OSC501	Clock oscillator, AC/MOS/LSTTL compatible	Valpey Fisher	VFAC3H-L-40MHz
15	R101, R115, R130, R145, R201, R215, R230, R245, R319, R425, R498, R499, R504, R531, R532	Resistor, 49.9 Ω , 0402, 1/16 W, 1%	Panasonic	ERJ-2RKF49R9X
28	R102, R116, R131, R146, R202 R216, R231, R246, R503, R505, R506, R507, R508, R509, R510, R511, R519, R526, R527, R451, R453, R455, R456, R457, R458, R460, R462, R535	Resistor, 0 Ω , 0402, 1/16 W, 1%	Panasonic	ERJ-2GE0R00X
8	R107, R121, R136, R151, R207, R221, R236, R251	Resistor, 348 Ω , 0402, 1/16 W, 1%	Panasonic	ERJ-2RKF3480X
10	R301, R302, R305, R441, R442, R443, R405, R417, R449, R450	Resistor, 1.00 k Ω , 0402, 1/16 W, 1%	Panasonic	ERJ-2RKF1001X
20	R303, R304, R306, R403, R415, R444, R445, R446, R466, R467, R501, R502, R514, R515, R516, R538, R539, R602, R615	Resistor, 10.0 k Ω , 0402, 1/16 W, 1%	Panasonic	ERJ-2RKF1002X
6	R407, R409, R410, R419, R421, R422	Resistor, 20.0 k Ω , 0402, 1/16 W, 5%	Panasonic	ERJ-2GEJ203X
6	R307, R308, R309, R310, R321, R517	Resistor, 5.1 k Ω , 0402, 1/16 W, 5%	Panasonic	ERJ-2GEJ512X
5	R427, R429, R520, R521, R528	Resistor, 200 Ω , 0402, 1/16 W, 1%	Panasonic	ERJ-2RKF2000X
2	R428, R430	Resistor, 221 Ω , 0402, 1/16 W, 1%	Panasonic	ERJ-2RKF2210X
3	R440, R522, R523	Resistor, 100 Ω , 0402, 1/16 W, 1%	Panasonic	ERJ-2GEJ101X
2	R431, R432	Resistor, 24 Ω , 0402, 1/16 W, 1%	Panasonic	ERJ-2RKF24R0X
2	R534, R536	Resistor, 24.9 Ω , 0402, 1/16 W, 1%	Panasonic	ERJ-2RKF24R9X
4	R401, R404, R413, R416	Resistor, 2.00 k Ω , 0402, 1/16 W, 1%	Panasonic	ERJ-2RKF2001X
1	R447	Resistor, 27 Ω , 0402, 1/16 W, 1%	Panasonic	ERJ-2RKF27R0X
1	R433	Resistor, 33 k Ω , 0402, 1/16 W, 5%	Panasonic	ERJ-2GEJ333X
1	R434	Resistor, 10.5 k Ω , 0402, 1/16 W, 1%	Panasonic	ERJ-2RKF1052X
1	R437	Resistor, 8.66 k Ω , 0402, 1/16 W, 1%	Panasonic	ERJ-2RKF8661X
1	R439	Potentiometer, 10 k Ω sq cermet top	Copal	CT94EW103
1	R518	Resistor, 4.12 k Ω , 0402, 1/16 W, 1%	Panasonic	ERJ-2RKF4121X

Qty	Reference Designator	Description	Manufacturer	Part Number
3	R540, R541, R601	Resistor, 249 Ω, 0402, 1/16 W, 1%	Panasonic	ERJ-2RKF2490X
1	R603	Resistor, 1.91 kΩ, 0402, 1/16 W, 1%	Panasonic	ERJ-2RKF1911X
1	R614	Resistor, 64.9 kΩ, 0402	Panasonic	ERJ-2RKF6492X
1	R616	Resistor, 0.047 Ω, 0805, 1/4 W, 2%	Susumu	RL1220T-R047
1	R617	Resistor, 16.9 kΩ, 0402	Panasonic	ERJ-2RKF1692X
12	L403, L404, L405, L406, L407, L408, L409, L410, L411, L412, L413, L414	Resistor, 0 Ω, 0603 1/10 W, 5%	Panasonic	ERJ-3GEY0R00V
2	T301, T501	Transformer, RF, 1:1	Minicircuits	ADT1-1WT+
2	U403, U408	IC, amp, low PWR, noise, distortion, SO8	ADI	ADA4841-2YRZ
1	U304	IC, voltage REF, precision series, SOT23_6	ADI	ADR130BUJZ
4	U401, U402, U406, U407	IC, amp, low noise high speed, SO8	ADI	AD8021ARZ
2	U404, U409	IC, ADC, 18-bit, 1 MSPS PuLSAR 7.0 mW, RM10	ADI	AD7982BRMZ
2	U405, U410	IC, VREF, prec micropwr, low dropout, SO8	ADI	ADR434ARZ
1	U411	IC, ADC driver, ultra-low distortion diff, LFCSP16	ADI	ADA4938-1ACPZ-R7
1	U501	IC, clock gen, 14-output, 2.8 GHZ VCO, QFN64	ADI	AD9516-0BCPZ
1	U601	IC, regulator 3.3 V, low dropout CMOS, SO8	ADI	ADP1706ARDZ-3.3-R7
1	U602	IC, regulator 3.0 V, low dropout CMOS, SO8	ADI	ADP1706ARDZ-3.0-R7
2	U603, U604	IC, regulator 1.8 V, low dropout CMOS, SO8	ADI	ADP1706ARDZ-1.8-R7
1	U605	IC, regulator 0.8 V to 5.0 V, low dropout CMOS, SO8	ADI	ADP1708ARDZ-R7
1	U608	IC-ADI high ACC. 500 mA anycap low drop 2.5 V reg	ADI	ADP3335ACPZ-2.5R7
1	U412	IC, buffer, tinylogic UHS dual, SC70	FAIRCHILD	NC7WZ07P6X
1	U413	IC, buffer, tinylogic UHS dual, SC70	FAIRCHILD	NC7WZ16P6X
1	U606	IC, regulator, 500 mA neg LDO	Linear Technology	LT1175CST-5#PBF
1	U607	IC-ADI current-mode step-down dc-to-dc controller	ADI	ADP1864AUJZ-R7
1	U302	IC-ADI ultrafast SiGe ECL clock/data buffers	ADI	ADCLK905
1	U301	IC	ADI	AD9276BSVZ
10	MP101, MP102, MP103, MP104, MP105, MP106, MP107, MP108, MP109, MP110	Part of assembly	Place into J404 (Pin 1-2, 3-4, 5-6, 7-8,9-10), J301 (Pin 1-2, 3-4), J304 (Pin 1-2), J502 (Pins 3-4), J501 (Pins 2-3)	100 mil jumpers
4	MP111, MP112, MP113, MP114	Part of assembly	Insert/Snap into the large holes from the bottom side of board	14 mm height, dual locking standoffs for circuit board support
20	Do Not Install C305, C306, C511, C512, C513, C514, C528, C529, C464, C465, C466, C467, C468, C469, C470, C471, C472, C473, C474, C475	Capacitor, 0.1 μF, 0402, X5R, ceramic, 10 V	Panasonic	ECJ-0EB1A104K
3	C524, C525, C526	Capacitor, 100 pF, 0402, 50 V, ceramic, X7R	Panasonic	ECJ-0EB1H101K

Qty	Reference Designator	Description	Manufacturer	Part Number
8	C105, C114, C124, C135, C205, C214, C224, C235	Capacitor, 47 pF, 0402, X5R, ceramic, 50 V	Panasonic	ECJ-0EC1H470J
2	C417, C441	Capacitor, 1 μ F, 0805, 16 V, ceramic, Y5V	Panasonic	ECJ-2VF1C105Z
3	L501, L502, L503	Inductor, 10 nH, SMT L7144	Coilcraft	0603CS-10NXJLW
12	R106, R120, R135, R150, R213, R220, R235, R250, R408, R420, R452, R454	Resistor, 1.00 k Ω , 0402, 1/16 W, 1%	Panasonic	ERJ-2RKF1001X
2	R402, R414	Resistor, 10.0 k Ω , 0402, 1/16 W, 1%	Panasonic	ERJ-2RKF1002X
9	R320, R426, R435, R436, R438, R464, R465, R533, R537	Resistor, 0 Ω , 0402, 1/16 W, 1%	Panasonic	ERJ-2GE0R00X
13	R604, R605, R606, R607, R608, R609, R610, R611, R612, R613, R329, R459, R463	Resistor, 100 Ω , 0402, 1/16 W, 1%	Panasonic	ERJ-2GEJ101X
2	R406, R418	Resistor, 10.0 k Ω , 0402, 1/16 W, 1%		
1	R513	Resistor, 49.9 Ω , 0402, 1/16 W, 1%		
4	R411, R412, R423, R424	Resistor, 20 Ω , 0402, 1/16 W, 1%	Panasonic	ERJ-2RKF20R0X
4	TP1, TP2, TP3, TP4	Conn-PCB test point, blk	Keystone Electronics Corp	5001

NOTES

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.

Evaluation boards are only intended for device evaluation and not for production purposes. Evaluation boards are supplied "as is" and without warranties of any kind, express, implied, or statutory including, but not limited to, any implied warranty of merchantability or fitness for a particular purpose. No license is granted by implication or otherwise under any patents or other intellectual property by application or use of evaluation boards. Information furnished by Analog Devices is believed to be accurate and reliable. However, no responsibility is assumed by Analog Devices for its use, nor for any infringements of patents or other rights of third parties that may result from its use. Analog Devices reserves the right to change devices or specifications at any time without notice. Trademarks and registered trademarks are the property of their respective owners. Evaluation boards are not authorized to be used in life support devices or systems.

©2009 Analog Devices, Inc. All rights reserved. Trademarks and registered trademarks are the property of their respective owners.
UG08282-0-10/09(0)



www.analog.com