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Evaluating the ADMV1013 24 GHz to 44 GHz, Wideband Microwave Upconverter

FEATURES

Fully featured evaluation board for the ADMV1013
On-board USB for SPI control
5 V operation
ACE software interface for SPI control

EVALUATION KIT CONTENTS

ADMV1013-EVALZ evaluation board

EQUIPMENT NEEDED

5 V dc power supply
RF frequency generator
Spectrum analyzer
180° hybrid from 5.4 GHz to 10.25 GHz
Power supply cables, 2.92 mm coaxial cables
PC
Mini USB to USB cable

DOCUMENTS NEEDED

ADMV1013 data sheet

SOFTWARE NEEDED

ACE software
ADMV1013 plugins
ADMV1013-EVALZ USB driver

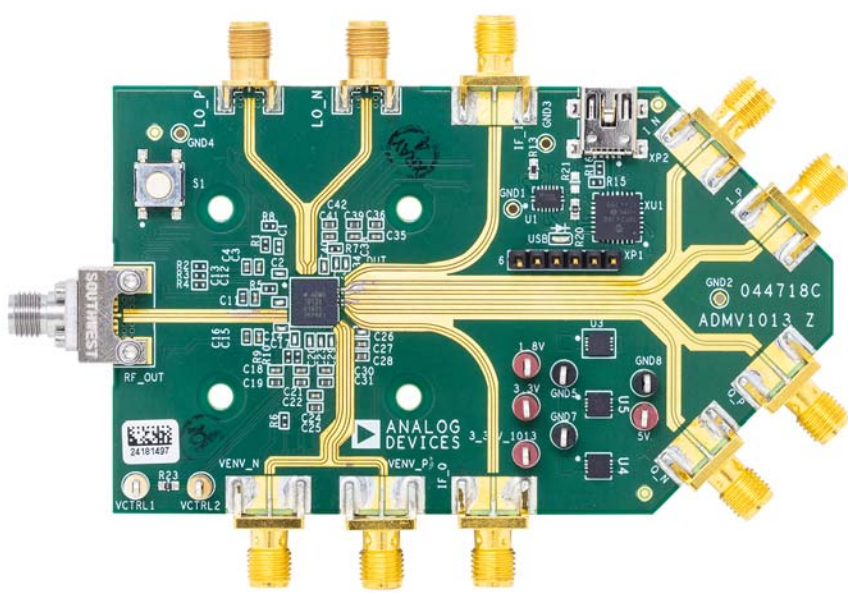
GENERAL DESCRIPTION

The ADMV1013-EVALZ evaluation board incorporates the ADMV1013 with a microcontroller, low dropout (LDO) regulators, and the AD5601 *nano*DAC® to allow the quick and easy evaluation of the ADMV1013. The microcontroller allows the user to configure the ADMV1013 register map through the Analysis, Control, Evaluation (ACE) software. The LDO regulators allow the ADMV1013 to be powered on by a single supply, and offer power supply ripple rejection. The AD5601 *nano*DAC allows the user to attenuate the radio frequency (RF) power from the mixer of the ADMV1013 without using an external power supply.

The ADMV1013 is a silicon germanium (SiGe) design, wideband, microwave upconverter optimized for point to point microwave radio designs operating in a frequency range of 24 GHz to 44 GHz.

The ADMV1013 comes in a compact, thermally enhanced, 6 mm × 6 mm LGA package, and operates over a temperature range of −40°C to +85°C. For full details on the ADMV1013, see the ADMV1013 data sheet. Consult the data sheet in conjunction with this user guide when using the ADMV1013-EVALZ evaluation board.

EVALUATION BOARD PHOTOGRAPH



17268-001

Figure 1.

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12/2018—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

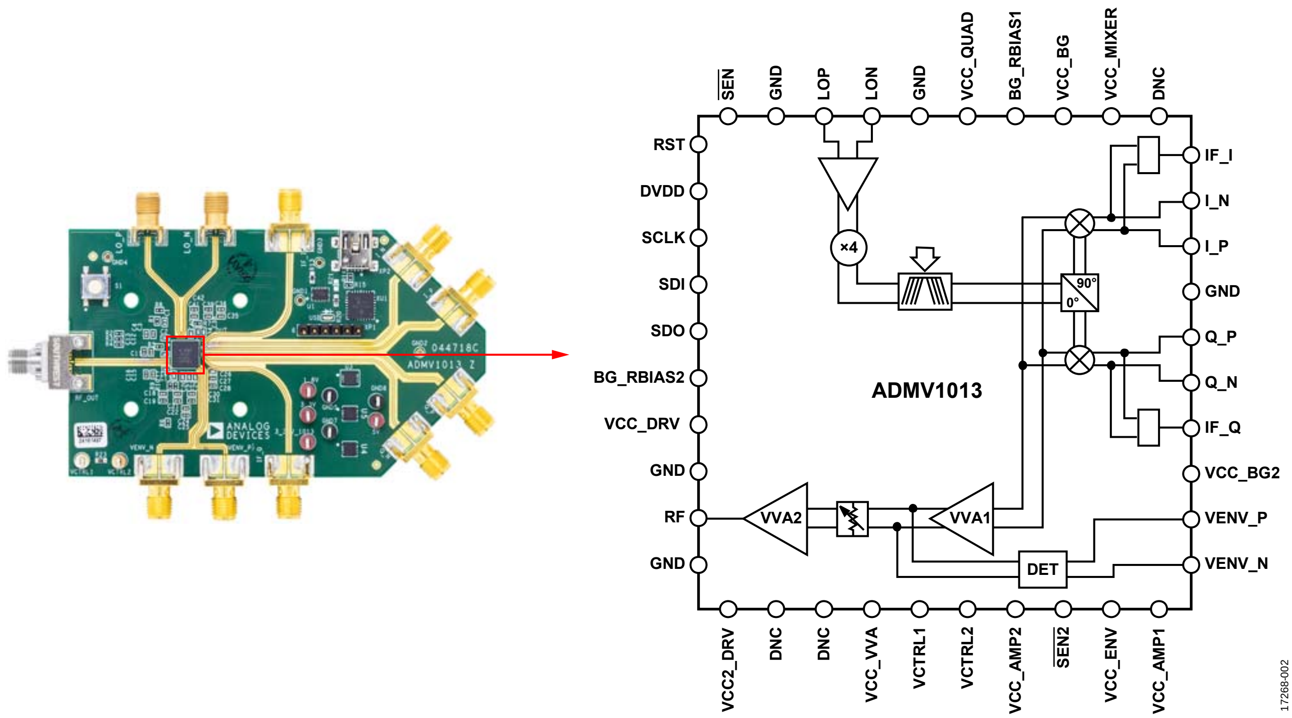

Figure 2. Evaluation Board Configuration

The ADMV1013-EVALZ evaluation board contains a built in ADMV1013 chip. Figure 2 shows the location of this chip on the ADMV1013-EVALZ evaluation board and the block diagram of the ADMV1013. The local oscillator (LO) input path shown in Figure 3 operates from 5.4 GHz to 10.25 GHz with an LO amplitude range of –6 dBm to +6 dBm. The LO input path also has an internal quadrupler and a programmable band-pass filter. Program the LO band-pass filter from QUAD_FILTERS (Register 0x09, Bits[3:0]).

The LO path operates differentially or single-ended. LOP and LON are the inputs to the LO path. Switch the LO path from differential to single-ended, or vice versa, by setting the QUAD_SE_MODE (Register 0x09, Bits[9:6]) through the serial peripheral interface (SPI). Refer to the ADMV1013 data sheet for the appropriate setting.

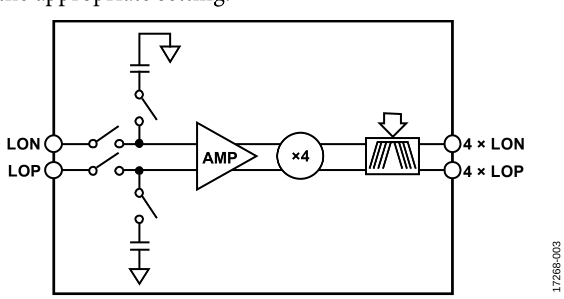

Figure 3. LO Input Path Block Diagram

The ADMV1013-EVALZ evaluation board has two IF inputs, IF_I and IF_Q, for single sideband upconversion, and four I/Q inputs, I_P, I_N, Q_P, and Q_N, for direct conversion from I/Q to RF. To evaluate the device in IF mode, connect the IF inputs to a frequency generator through a 90° hybrid. To evaluate the device in IF mode, the I/Q inputs must be kept floating without the jumper, in this case Jumper J1 to Jumper J4. To evaluate the device in I/Q mode, connect the I/Q inputs, I_P, I_N, Q_P, and Q_N, to an I/Q baseband generator, and use Jumper J1 to Jumper J4 with the I/Q inputs. The ADMV1013-EVALZ evaluation board operates on a 5 V dc supply. Figure 4 shows the top view of the ADMV1013-EVALZ evaluation board, and is for evaluation purposes only with no implied guarantee of performance or reliability.

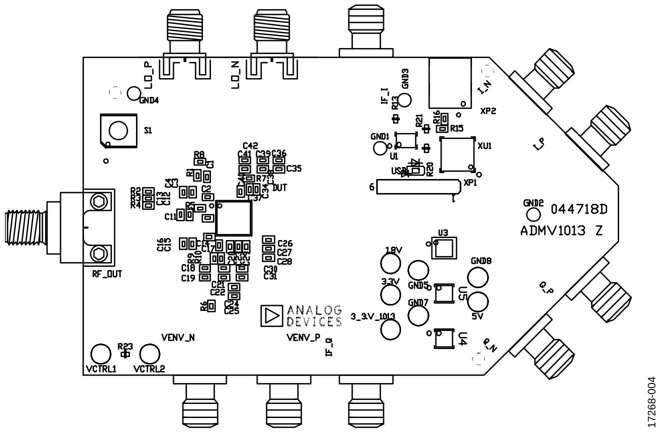

Figure 4. Top View of the ADMV1013-EVALZ

Connect the 5 V dc power supply to the 5V test point, and the ground connection to the GND8 test point. The 3.3V and 1.8V test points are for evaluation purposes only. Connect the spectrum analyzer to the Southwest SRI 2.92 mm connector, RF_OUT. Connect the Southwest SRI 2.92 mm connectors, LO_N and LO_P, differentially to the low phase noise frequency generator. Use a 180° hybrid from 5.4 GHz to 10.25 GHz for the differential inputs. In IF mode, connect the IF_I and IF_Q inputs to the frequency generator through a 90° hybrid from 800 MHz to 6 GHz for the quadrature inputs. Keep the I/Q inputs floating and remove any jumpers from the ADMV1013-EVALZ evaluation board.

In I/Q mode, connect the I_P, I_N, Q_N, and Q_P inputs to the I/Q baseband generator. Plug the USB cable into the mini USB connector XP2to connect the PC to the ADMV1013-EVALZ evaluation board (see Figure 5, Figure 6, and Figure 7). Use the AD5601 *nano*DAC on the ADMV1013-EVALZ evaluation board to generate the control voltage (V_{CTRL}) voltage. See the Setting V_{CTRL} Voltage for the ADMV1013 section for additional details. If the ADMV1013 needs a hard reset, use Reset Button S1 to hard reset the ADMV1013-EVALZ evaluation board.

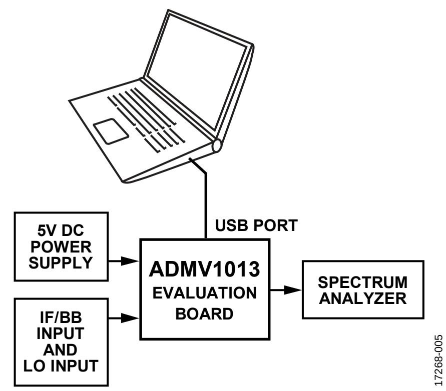

Figure 5. Block Diagram of the ADMV1013 Lab Bench Setup

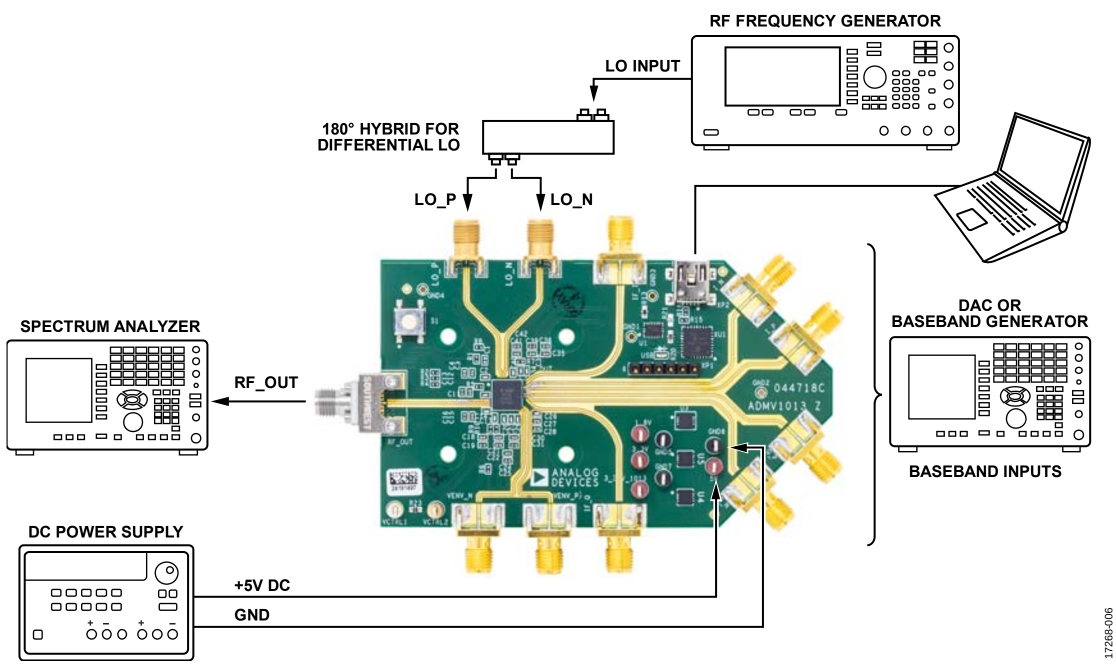

Figure 6. ADMV1013-EVALZ Lab Bench Setup for the I/Q Inputs

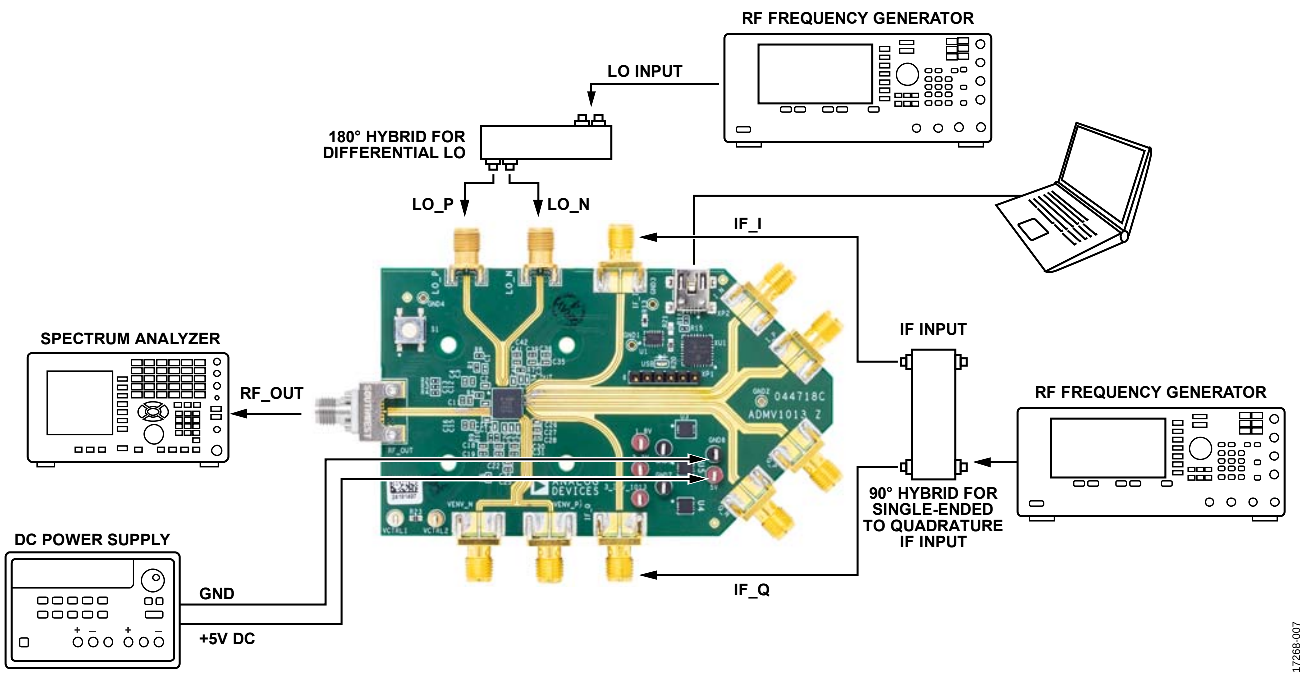

Figure 7. ADMV1013-EVALZ Lab Bench Setup for the IF Inputs

EVALUATION BOARD SOFTWARE QUICK START PROCEDURES

INSTALLING THE ACE SOFTWARE, ADMV1013 PLUGINS, AND ADMV1013 USB DRIVERS

Installing the ACE Software

The ADMV1013-EVALZ software uses the Analog Devices, Inc., ACE software. Instructions on how to install and use the ACE software are available on the ACE software page. If the ACE software has already been installed, ensure that the software is the latest version as shown on the ACE software page. If the ACE software installed is not the latest version, update the software with the latest version.

To update previously installed ACE software with the latest version,

1. Uninstall the current version of ACE software on the PC.
2. Delete the **ACE** folder in **C:\ProgramData\Analog Devices**.
3. Install the latest version of ACE software. During the installation, check the **SDP Drivers**, **LRF Drivers** and **.NET 40 Client** driver installations as well (see Figure 8).

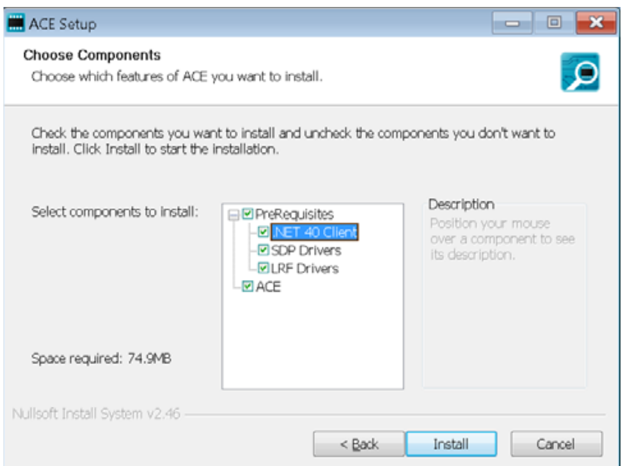

Figure 8. Drivers Required with ACE

Installing the USB Driver

After the ACE software is installed, take the following steps to install the ADMV1013 USB driver, which allows proper usage of the ADMV1013-EVALZ evaluation board:

1. Go to the **Evaluation Kits** section of the ADMV1013 product page on www.analog.com.
2. Click the **ADMV1013 USB Driver** link. The ADMV1013 USB driver downloads automatically.
3. In the folder where the ADMV1013 USB driver is downloaded, right click the downloaded file and click **Extract All**.
4. In the extracted folder, double click the **ADMV1013EvaluationBoardUSBDriver.Exe** file to install the ADMV1013 USB driver. An internet connection is required for this installation.

Installing the ADMV1013 Plugin

After installing the ACE software and ADMV1013 USB driver, take the following steps to install the ADMV1013 plugin on the ACE software:

1. After installing the ADMV1013 USB drivers, download the **Board.ADMV1013.acezip** file from the ACE software page anywhere on the PC.
2. When the download is complete, double click the **Board.ADMV1013.acezip** file to install the ADMV1013 plugin on the ACE software.
3. Alternatively, in the main ACE window, click **Plugins Marketplace**, and then click **Available Packages**. Search for the **Board.ADMV1013** plugin. Highlight the search result and click **Install Selected** (see Figure 9).

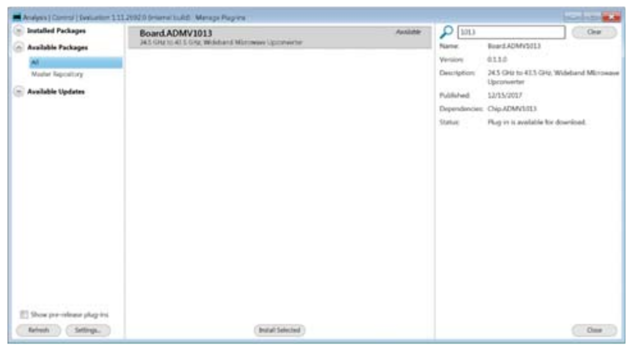

Figure 9. Installing the ADMV1013 Plugin from ACE Software

When the installations are complete and the ACE software starts, the ADMV1013-EVALZ plugin appears (see Figure 10).

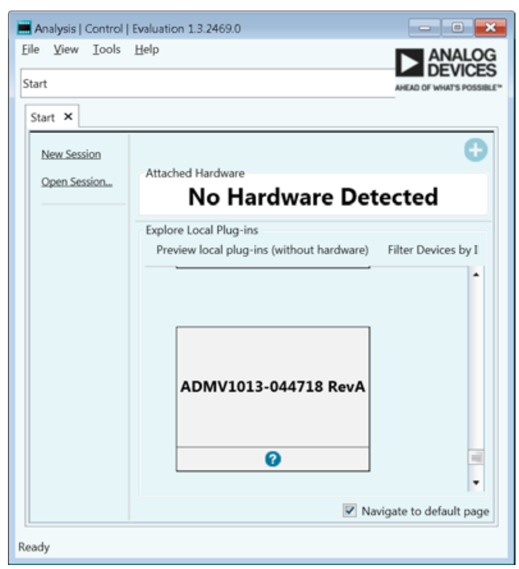

Figure 10. ADMV1013-EVALZ Plugin Window After Opening the ACE Software

INITIAL SETUP

To set up the ADMV1013-EVALZ evaluation board, take the following steps:

1. Connect the USB cable to the PC, and then connect the USB cable to the ADMV1013-EVALZ evaluation board.
2. Power up the ADMV1013-EVALZ evaluation board with the 5 V dc power supply. Connect the 5 V dc connection to the 5V test point and connect the ground connection to the GND8 test point. When the USB cable connects to the PC, the blue light emitting diode (LED) illuminates. The PC recognizes the ADMV1013-EVALZ evaluation board as **ADMV1013-044718, Rev. A**.
3. Press the **S1** button to hard reset the device.
4. Open the ACE software. The **ADMV1013-044718, Rev. A** plugin (ADMV1013-EVALZ) appears in the **Attached Hardware** section shown in Figure 11. Double click the **ADMV1013-044718 RevA** plugin within the **Attached Hardware** section.

Note that when the device is turned off and on while the ACE software is open, or when the USB cable is unplugged and plugged back in while the ACE software is open, contact with the ADMV1013-EVALZ evaluation board is lost. To regain contact, click the **System** tab, then click the **USB** symbol on the **ADMV1013-044718 RevA** subsystem, and then click **Acquire**. This command allows the user to reconnect to the ADMV1013-EVALZ evaluation board. This procedure may not be successful and the user must close the ACE session by clicking the **File** menu and then clicking **Close Session**.

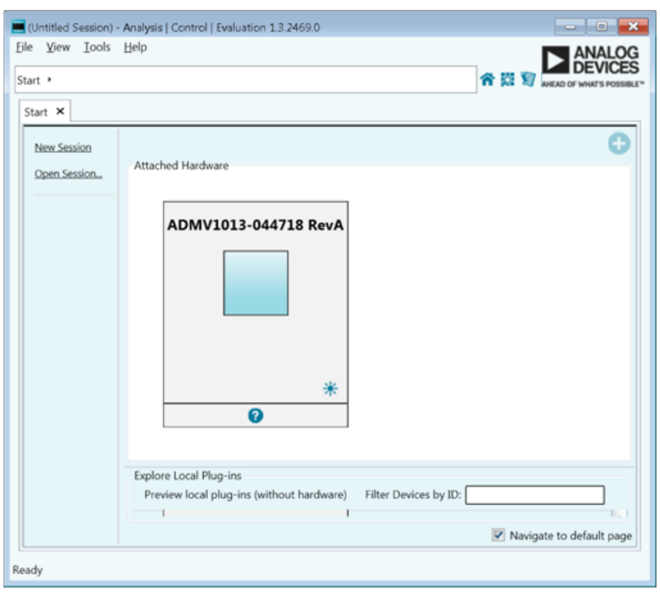

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*Figure 11. **Attached Hardware** Section When the **ADMV1013-044718, Rev. A** (ADMV1013-EVALZ) is Connected*

5. When the ADMV1013-EVALZ plugin is double clicked, the **ADMV1013-044718 RevA** tab shown in Figure 12 opens. On the left side of the window, open the **INITIAL CONFIGURATION** section, click **Gain Setup**, and enter the V_{CTRL} in the **VCTRL1 and VCTRL2 Voltage (mV)** box. Note that 1800 mV is the highest gain setting for the device.
6. Click **Apply** and then click **Reset Board** to set the V_{CTRL} voltage. This action resets the ADMV1013-EVALZ evaluation board and allows it to start in the correct configuration.
7. Double click the **ADMV1013** button shown on the right side of the window, and click **Reset Board** each time the USB is plugged into the PC for optimal performance. When the **ADMV1013** button is double clicked, the ADMV1013 block diagram shown in Figure 13 appears.

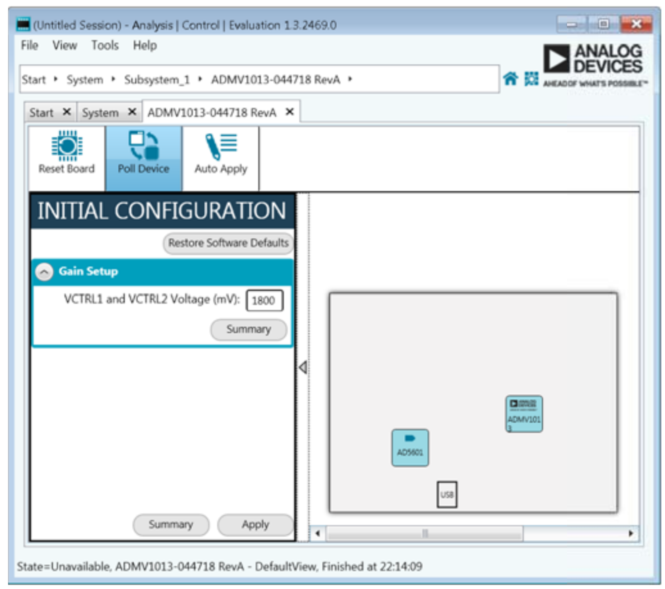

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Figure 12. Initial Configuration for the Gain Setup and Board Plugin View

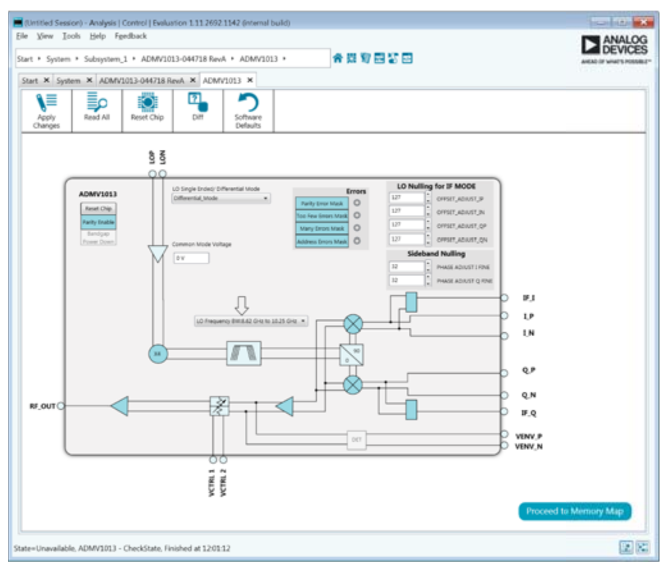

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Figure 13. ADMV1013 Block Diagram in the ACE Software

ADMV1013 BLOCK DIAGRAM AND FUNCTIONS

The ADMV1013 plugin appears similar to the block diagram shown in the ADMV1013 data sheet. The similarities between the plugin and the block diagram make it easy to correlate the functions on the ADMV1013-EVALZ evaluation board with the corresponding descriptions in the ADMV1013 data sheet. The ADMV1013 data sheet provides a full description of each block and register, as well as the corresponding settings. Some blocks and functions pertain to the ADMV1013-EVALZ evaluation board. Figure 14 shows the full screen ADMV1013 block diagram with labels, and Table 1 describes the functionality of each block.

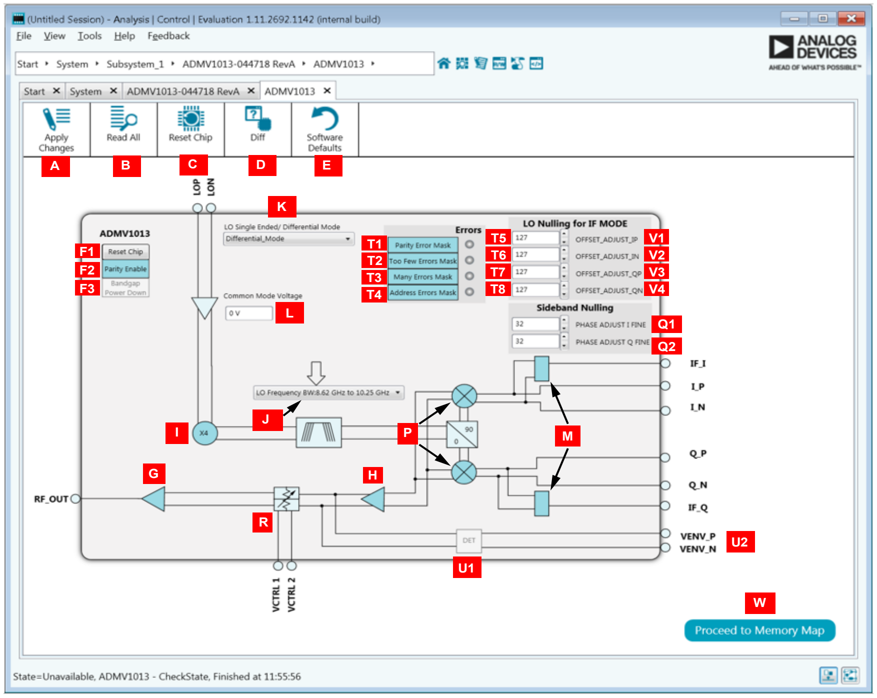

Figure 14. ADMV1013 Block Diagram with Labels

Table 1. ADMV1013 Block Diagram Label Functions (See Figure 14)

Label	Function
A	To apply all register values to the device, click **Apply Changes** (Label A). When **Auto Apply** is highlighted in the **ADMV1013-044718, Rev. A** tab, the **Apply Changes** feature and the **Read All** feature (Label B) continuously run every few seconds, and the **Apply Changes** and **Read All** buttons do not need to be clicked to apply or read back the block diagram settings.
B	To read back all SPI registers of the device, click **Read All** (Label B). When **Auto Apply** is highlighted in the **ADMV1013-044718, Rev. A** tab, the **Apply Changes** feature and the **Read All** feature continuously run every few seconds, and the **Apply Changes** and **Read All** buttons do not need to be clicked to apply or read back the block diagram settings.
C	Click **Reset Chip** (Label C) to reset the 1.8 V SPI including the SPI_SOFT_RESET bit. The functionality of the **Reset Chip** command is the same as the functionality of the **Reset Chip** button (Label F1).
D	Click **Diff** (Label D) to show registers that are different on the device.
E	Click **Software Defaults** (Label E) to load the software defaults on to the device, and then click **Apply Changes**.
F1	Click the **Reset Chip** button (Label F1) to set the following bits: SPI_SOFT_RESET bit (Bit 14, Register 0x00) to 0x1. PARITY_EN bit (Bit 15, Register 0x00) to 0x1. VVA_TEMPERATURE_COMPENSATION bits (Bits[15:0], Register 0x0A) to 0xE700. Mixer_OFF_ADJ_I_P bits (Bits[15:9], Register 0x07) to 0x3F. Mixer_OFF_ADJ_I_N bits (Bits[8:2], Register 0x07) to 0x3F. Mixer_OFF_ADJ_Q_P bits (Bits[15:9], Register 0x08) to 0x3F. Mixer_OFF_ADJ_Q_N bits (Bits[8:2], Register 0x08) to 0x3F.
F2	Click **Parity Enable** (Label F2), and then click **Apply Changes** to set the PARITY_EN bit (Bit 15, Register 0x00). When **Parity Enable** is highlighted, the PARITY_EN bit is enabled. When **Parity Enable** is not highlighted, the PARITY_EN bit is disabled. For proper functionality of the ADMV1013-EVALZ evaluation board, it is recommended to always keep **Parity Enable** highlighted.

Label	Function
F3	Click **Bandgap Power Down** (Label F3), and then click **Apply Changes** to set the BG_PD bit (Bit 10, Register 0x03). When **Bandgap Power Down** is highlighted, the band gap is powered down. When the **Bandgap Power Down** button is not highlighted, the band gap is powered up.
G or H	Click **VGA Power down** (Label G and Label H), then click **Apply Changes** to set the VGA_PD bit (Bit 15, Register 0x03). When **VGA Power down** is highlighted, the VGA is powered on. When the **VGA Power down** is not highlighted, the VGA is powered down.
I	Click **Quadrupler On** (Label I), then click **Apply Changes** to set the QUAD_PD bits (Bits[13:11], Register 0x03). When **Quadrupler On** is highlighted, these three bits are disabled. When **Quadrupler On** is not highlighted, these three bits are enabled and the quadrupler is powered down.
J	Click the dropdown list on the band-pass filter to set the **LO Bandpass Filter** (Label J), and then click **Apply Changes** to set the QUAD_FILTERS bits (Bits[3:0], Register 0x09) to choose the appropriate LO input bandwidth. The four bandwidth options include the following: LO frequency bandwidth of 8.62 GHz to 10.25 GHz. LO frequency bandwidth of 6.6 GHz to 9.2 GHz. LO frequency bandwidth of 5.4 GHz to 8 GHz. LO frequency bandwidth of 5.4 GHz to 7 GHz.
K	Choose the appropriate **LO Single Ended/ Differential Mode** (Label K), and then click **Apply Changes** to set the QUAD_SE_MODE bits (Bits[9:6], Register 0x09). There are three options: differential, single-ended positive side disable, and single-ended negative side disable.
L	Enter a value for the common-mode voltage (V_{CM}) in the **Common Mode Voltage** (Label L) box, and then click **Apply Changes**. The **Common Mode Voltage** value corresponds to MIXER_VGATE bits (Bits[6:0], Register 0x05). The **Common Mode Voltage** box accepts values between 0.0 V and 2.6 V. The MIXER_VGATE decimal value is calculated by the following equations: 0 V to 1.8 V: MIXER_VGATE = $23.89 \times V_{CM} + 81$ >1.8 V to 2.6 V: MIXER_VGATE = $23.75 \times V_{CM} + 1.25$
M	Click **IF Enable** (Label M), and then click **Apply Changes** to set the MIXER_IF_EN bit (Bit 7, Register 0x03). When **IF Enable** is highlighted, the bit is enabled. When **IF Enable** is not highlighted, the bit is disabled.
P	Click **Mixer Powerdown** (Label P), and then click **Apply Changes** to set the MIXER_PD bit (Bit 14, Register 0x03). When **Mixer Powerdown** is highlighted, the MIXER_PD bit is disabled and the mixer is powered down.
Q1 to Q2	Use the sideband nulling blocks as follows: Use the scroll arrows or enter a value between 0 and 127 in the **PHASE ADJUST IFINE** box (Label Q1), and then click **Apply Changes** to set the LOAMP_PH_ADJ_I_FINE bits (Bits[13:7], Register 0x05). Use the scroll arrows or enter a value between 0 and 127 in the **PHASEA ADJUST QFINE** box (Label Q2), and then click **Apply Changes** to set the LOAMP_PH_ADJ_Q_FINE bits (Bits[13:7], Register 0x06). See the Setting V_{CTRL} Voltage for the ADMV1013 section for additional details.
R	**VCTRL Voltage** (Label R). See the Setting V_{CTRL} Voltage for the ADMV1013 section for additional details.
T1 to T8	Use the error mask and readback blocks as follows: Click **Parity Error Mask** (Label T1), and then click **Apply Changes** to set the PARITY_ERROR_MASK bit (Bit 15, Register 0x02). When **Parity Error Mask** is highlighted, the PARITY_ERRORS_MASK bit is enabled. When **Parity Errors Mask** is not highlighted, the PARITY_ERROR_MASK bit is disabled. Click **Too Few Errors Mask** (Label T2), and then click **Apply Changes** to set the TOO_FEW_ERRORS_MASK bit (Bit 14, Register 0x02). When **Too Few Errors Mask** is highlighted, the TOO_FEW_ERRORS_MASK bit is enabled. When **Too Few Errors Mask** is not highlighted, the TOO_FEW_ERRORS_MASK bit is disabled. Click **Many Errors Mask** (Label T3), and then click **Apply Changes** to set the TOO_MANY_ERRORS_MASK bit (Bit 13, Register 0x02). When **Many Errors Mask** is highlighted, the TOO_MANY_ERRORS_MASK bit is enabled. When **Many Errors Mask** is not highlighted, the TOO_MANY_ERRORS_MASK bit is disabled. Click **Address Errors Mask** (Label T4), and then click **Apply Changes** to set the ADDRESS_RANGE_ERROR_MASK bit (Bit 12, Register 0x02). When **Address Errors Mask** is highlighted, the ADDRESS_RANGE_ERROR_MASK bit is enabled. When **Address Errors Mask** is not highlighted, the ADDRESS_RANGE_ERROR_MASK bit is disabled. When the PARITY_ERROR_MASK bit (Bit 15, Register 0x02) is set, **Parity Error** (Label T5) is red when toggling the PARITY_ERROR bit (Bit 15, Register 0x01). When the TOO_FEW_ERRORS_MASK bit (Bit 14, Register 0x02) is set, **Too Few Errors** (Label T6) is red when toggling the TOO_FEW_ERRORS bit (Bit 14, Register 0x01). When the TOO_MANY_ERRORS_MASK bit (Bit 13, Register 0x02) is set, **Many Errors** (Label T7) is red when toggling the TOO_MANY_ERRORS bit (Bit 13, Register 0x01). When the ADDRESS_RANGE_ERROR_MASK red bit (Bit 12, Register 0x02) is set, **Address Errors** (Label T8) lights up red when toggling the ADDRESS_RANGE_ERROR bit (Bit 12, Register 0x01).

Label	Function
U1 to U2	Use the detector as follows: Click **Detector Enable** (Label U1), and then click **Apply Changes** to set the DET_EN bit (Bit 5, Register 0x03) and turn on the detector. When **Detector Enable** is highlighted, the DET_EN bit is enabled. When **Detector Enable** is highlighted, the DET_EN bit is disabled. The output of the envelope detector is on the **VENV_P** and **VENV_N** (Label U2) connectors and is differential.
V1 to V4	Use the LO nulling section as follows: Use the scroll or enter a value between 0 and 127 in the **OFFSET_ADJUST_IP** box (Label V1) and click **Apply Changes** to set the MXER_OFF_ADJ_I_P bits (Bits[15:9], Register 0x07). Use the scroll arrows or enter a value between 0 and 127 in the **OFFSET_ADJUST_IN** box (Label V2) and click **Apply Changes** to set the MXER_OFF_ADJ_I_N bits (Bits[8:2], Register 0x07). Use the scroll arrows or enter a value between 0 and 127 in the **OFFSET_ADJUST_QP** box (Label V3) and click **Apply Changes** to set the MXER_OFF_ADJ_Q_P bits (Bits[15:9], Register 0x08). Use the scroll arrows or enter a value between 0 and 127 in the **OFFSET_ADJUST_QN** box (Label V4) and click **Apply Changes** to set the MXER_OFF_ADJ_Q_N bits (Bits[8:2], Register 0x08).
W	Click **Proceed to Memory Map** (Label W) to open the **ADMV1013 Memory Map** tab (see Figure 15).

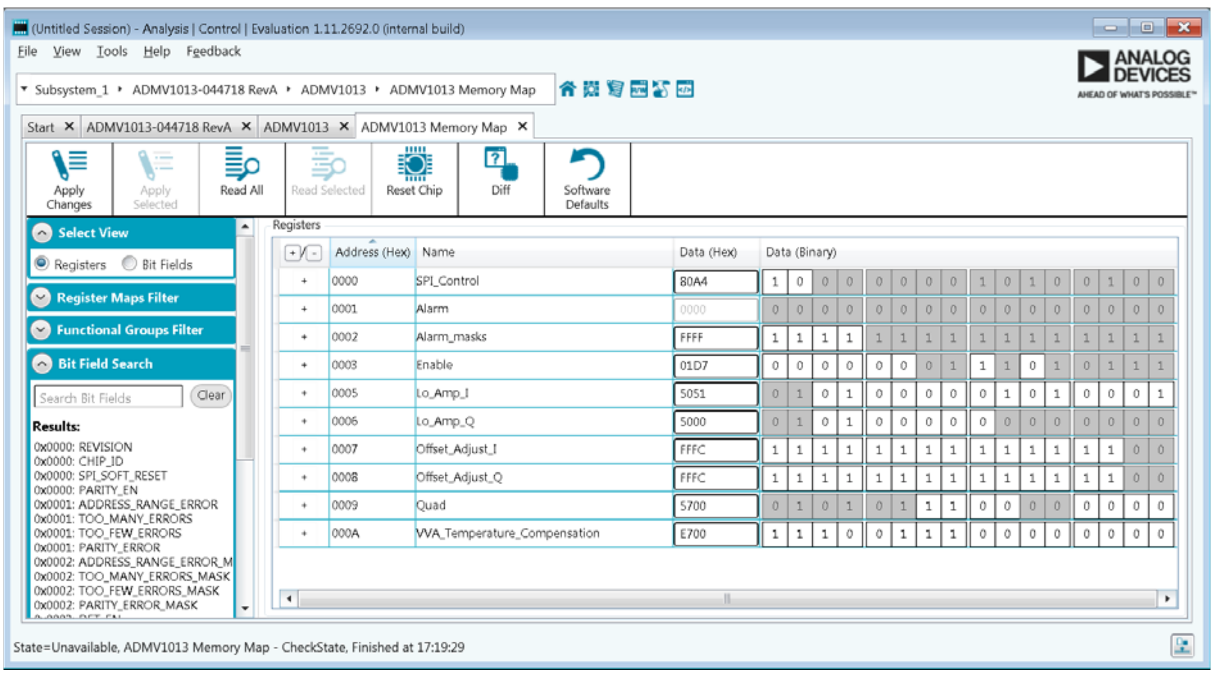

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*Figure 15. **ADMV1013 Memory Map** Tab in the ACE Software*

SETTING V_{CTRL} VOLTAGE FOR THE ADMV1013

The ADMV1013-EVALZ evaluation board comes with the AD5601 *nano*DAC. The AD5601 *nano*DAC sets the V_{CTRL} voltage for the VCTRL1 and VCTRL2 pins of the ADMV1013. When the ADMV1013 plugin opens, enter the V_{CTRL} voltage in the **VCTRL1 and VCTRL2 Voltage (mV)** box in the **INITIAL CONFIGURATION** section to set the voltage (see Figure 12). Note that 1800 mV is the highest gain setting for the devices.

When using an external power supply for the V_{CTRL} voltage, use the AD5601 *nano*DAC plugin to change the voltage or power down the AD5601 *nano*DAC. To open the AD5601 *nano*DAC plugin, double click the **AD5601** button in the **ADMV1013-044718 RevA** tab (see Figure 12). Figure 16 shows the AD5601 *nano*DAC user interface. The user interface contains the **Power Down Modes** box, the **VCTRL1 and VCTRL2 Voltage (mV)** box, and the **Equivalent Decimal Value** box.

To power up or power down the AD5601 *nano*DAC, enter a value in the **Power-Down Modes** box, or use the scroll arrows to adjust the value. To use the AD5601 *nano*DAC, set the **Power-Down Modes** box to 0. When the V_{CTRL} voltage is being applied externally through the test loop, set the **Power Down Modes** box to 1, 2, or 3. For more information on the different power-down modes of the AD5601 *nano*DAC, see the AD5601 data sheet.

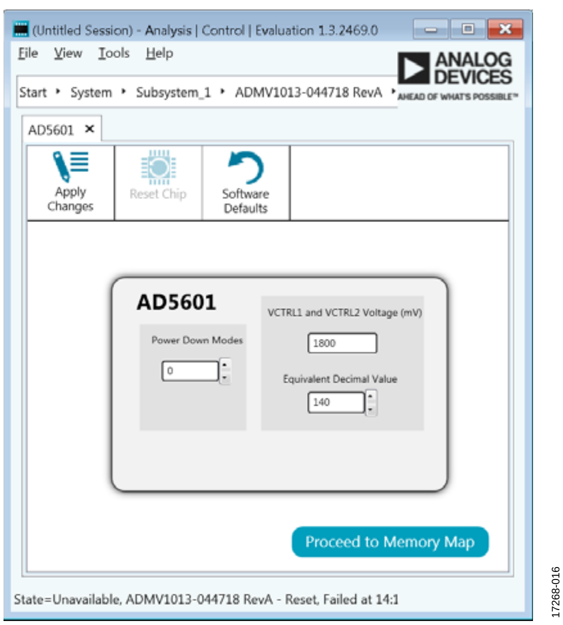


Figure 16. AD5601 nanoDAC User Interface

To set the V_{CTRL} voltage, enter a value in the **VCTRL1 and VCTRL2 Voltage (mV)** box, or type the corresponding decimal number for an 8-bit register in the **Equivalent Decimal Value** box. The V_{CTRL} voltage range available is 0 mV to 3300 mV. Set the **VCTRL1 and VCTRL2 Voltage (mV)** value to 0 mV for the lowest gain of the ADMV1013, and to set it to 1800 mV for the highest gain of the ADMV1013. There is no change in the gain of the ADMV1013 for V_{CTRL} values above 1800 mV.

After making any changes to the voltage or to the power-down mode, click **Apply Changes** (see Figure 16). To allow the changes to take place automatically, select **Auto Apply** in the **ADMV1013-044718 RevA** tab. There is no need to click **Apply Changes** after selecting **Auto Apply**.

UPDATING REGISTER 0X0A SEQUENCE

When Register 0x0A needs to be updated, the update must follow a specific sequence. The ACE software automatically follows this sequence when Register 0x0A is in need of an update. The sequence that the ACE software carries out is as follows:

1. Disable PARITY_EN bit (Bit 15, Register 0x00).
2. Write to Register 0x0A.
3. Enable PARITY_EN bit (Bit 15, Register 0x00).

TEST RESULTS

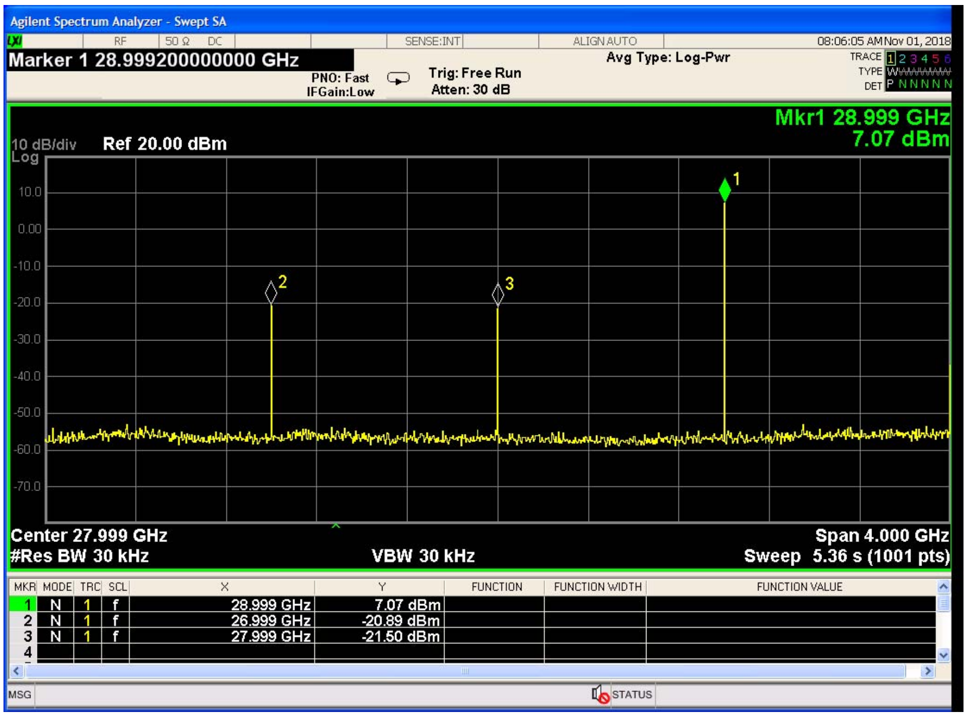
The following results test results of the ADMV1013-EVALZ evaluation board are the expected results. V_{CTRL} = 1800 mV is used for both the IF results and the I/Q results.

IF RESULTS

Jumper J1 to Jumper J4 are excluded from the IF measurements that follow. The hybrids and evaluation board RF traces have not been de-embedded.

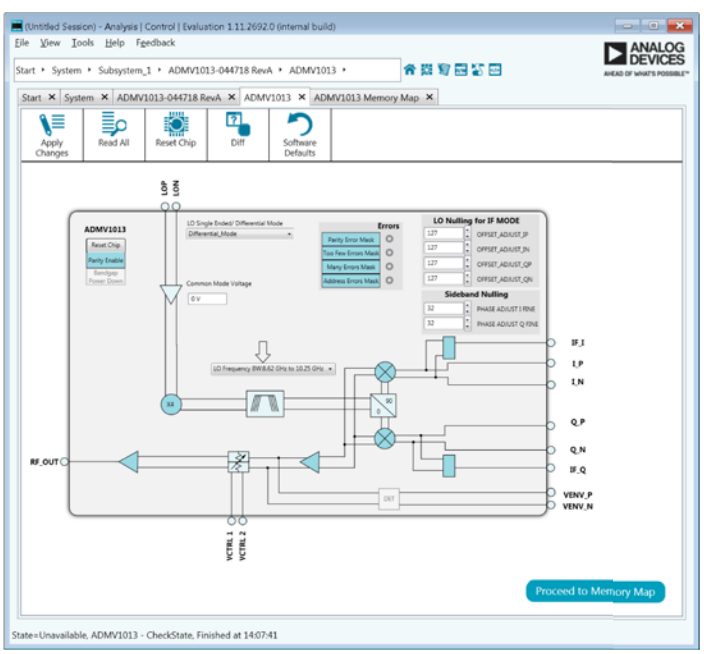
Figure 17 shows the results of an IF input of 1000 MHz at −10 dBm, single tone mixed, with a 7 GHz LO at 0 dBm to an RF output of 29 GHz for upper sideband settings.

See Figure 18 for the graphical user interface (GUI) settings that produce the results shown in Figure 17.



17268-017

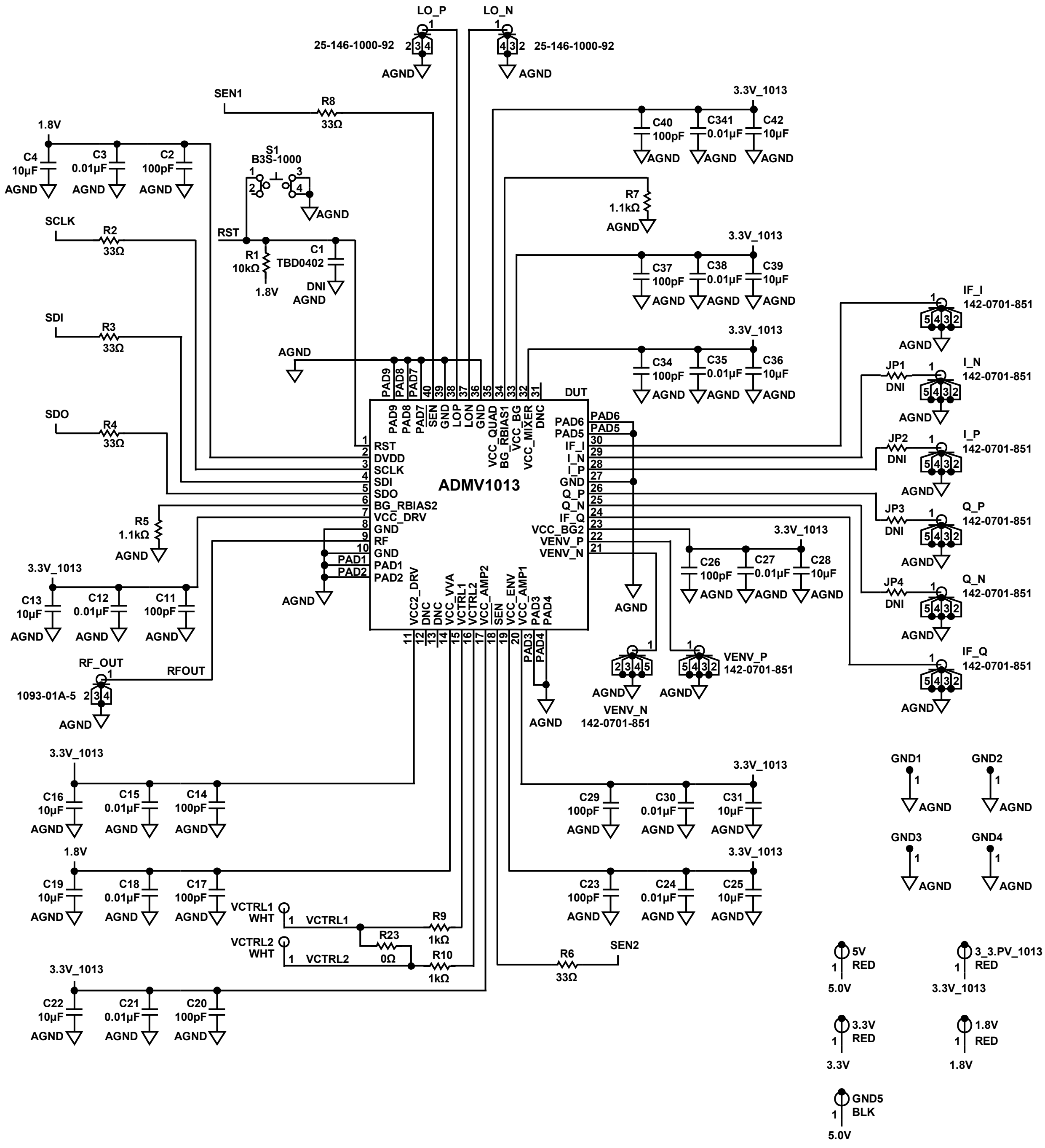
Figure 17. ADMV1013 Results for IF Mode with Upper Sideband Settings



17268-018

Figure 18. ADMV1013 GUI Settings for an LO with Upper Sideband Settings and Set to IF Mode

EVALUATION BOARD SCHEMATICS AND ARTWORK



NOTES
1. CONFIGURATION OPTIONS:
DEFAULT: JP1 TO JP4 = DO NOT INSTALL
IF MODE: JP1 TO JP4 = DO NOT INSTALL
IQ MODE: JP1 TO JP4 = 0Ω

17268-019

Figure 19. ADMV1013 Connections

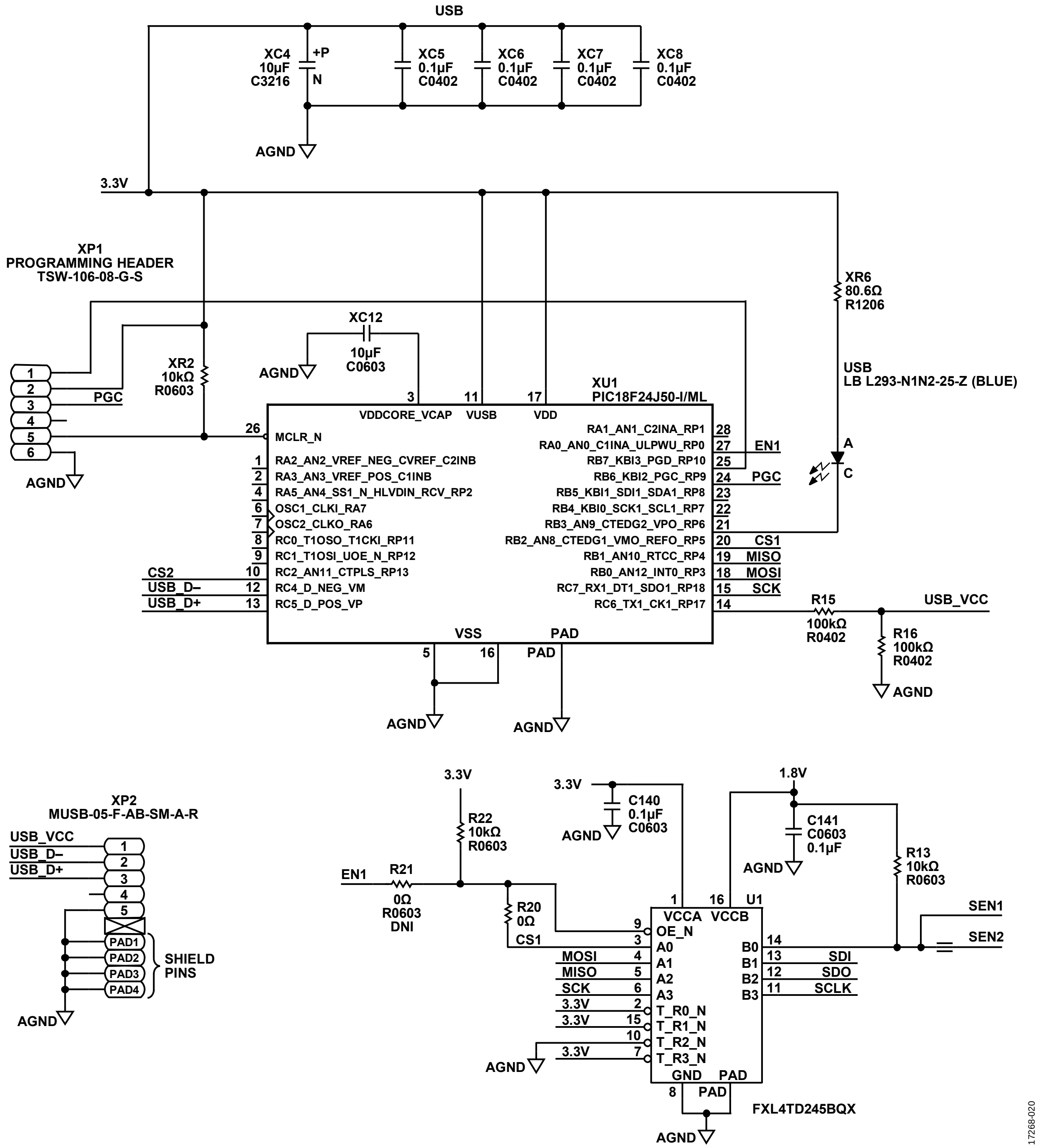


Figure 20. Microcontroller and Level Shifter Connections

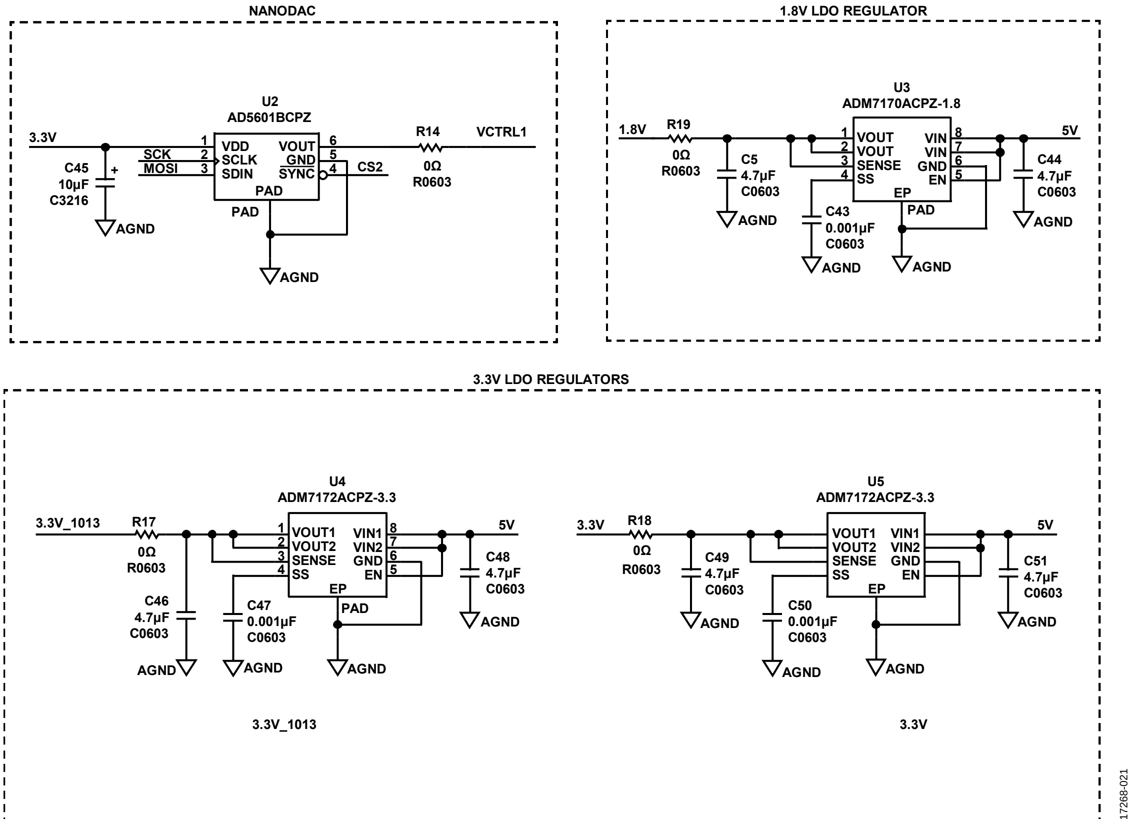


Figure 21. LDO Regulator Connections

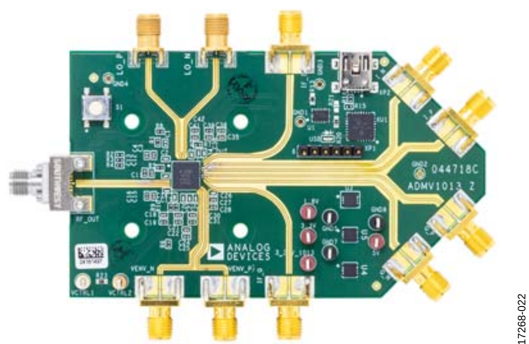
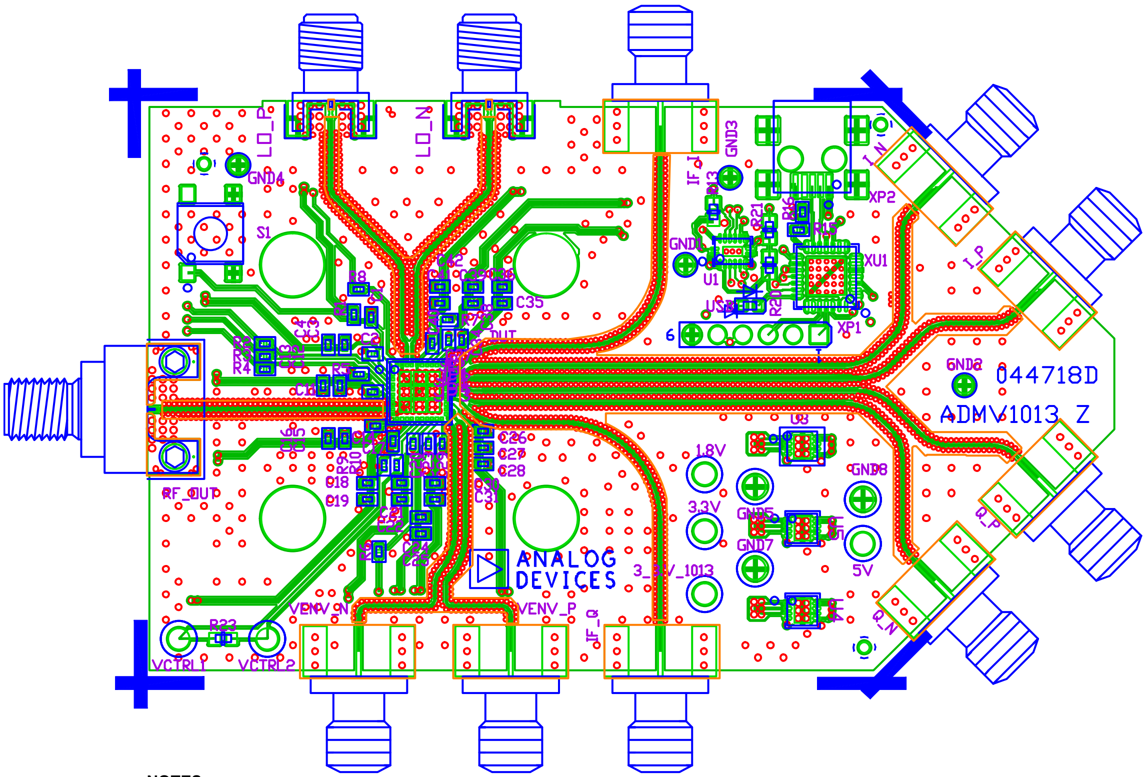


Figure 22. ADMV1013-EVALZ Evaluation Board Top

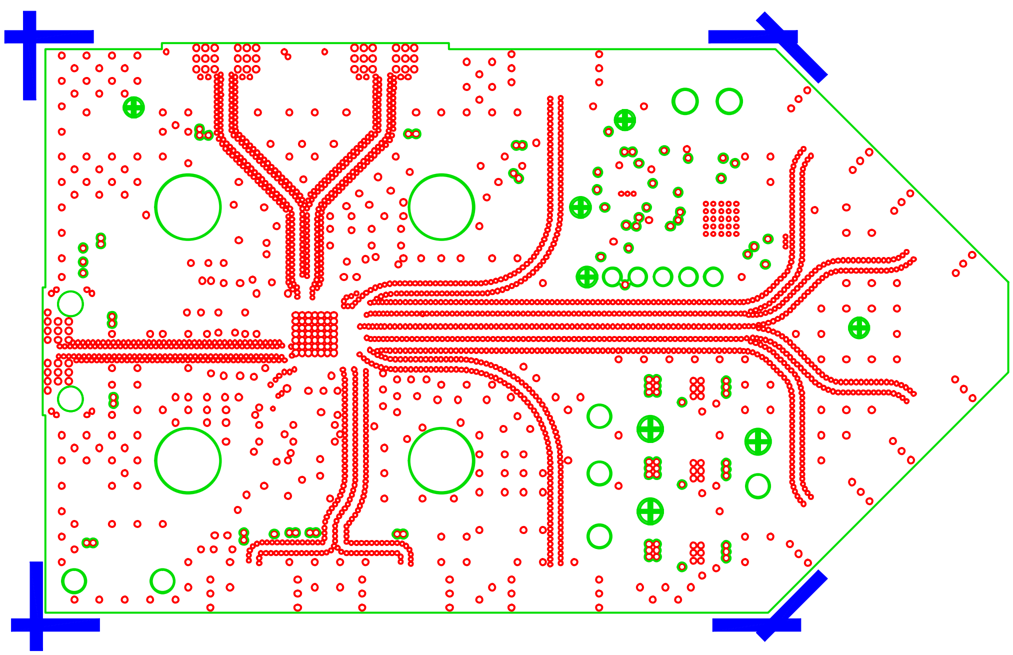
Figure 23. ADMV1013-EVALZ Evaluation Board Bottom



NOTES
1. SILKSCREEN MIGHT BE SLIGHTLY DIFFERENT DEPENDING ON THE REVISION OF THE BOARD.

17268-024

Figure 24. ADMV1013-EVALZ Evaluation Board Printed Circuit Board (PCB), Top Layer



17268-025

Figure 25. ADMV1013-EVALZ Evaluation Board PCB, Second Layer

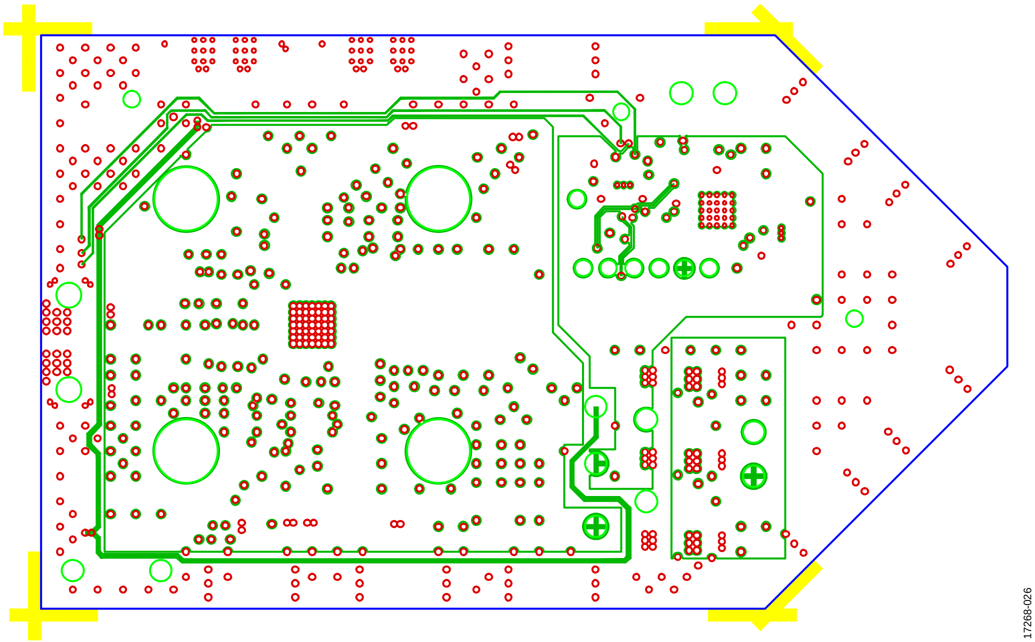
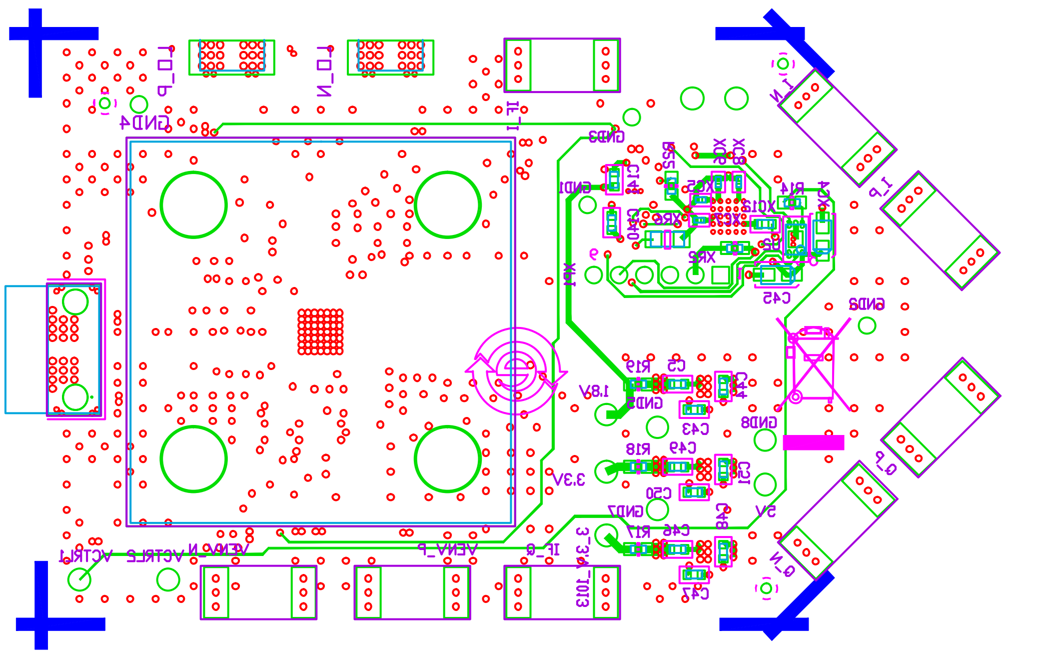


Figure 26. ADMV1013-EVALZ Evaluation Board PCB, Third Layer



NOTES
1. SILKSCREEN MIGHT BE SLIGHTLY DIFFERENT DEPENDING ON THE REVISION OF THE BOARD.

Figure 27. ADMV1013-EVALZ Evaluation Board PCB, Bottom Layer

CONFIGURATION OPTIONS

Table 2. ADMV1013-EVALZ Configuration Options

Component	Function	Default Condition
1.8 V, 3.3_1013, 3.3 V, 5 V, GND	Power supplies and ground	Not applicable
LON, LOP, IF_I, IF_Q, Q_P, Q_N, I_N, I_P, RF_OUT, VENV_N, VENV_P	RF data and clock local oscillator and envelope signal	Not applicable
R2 to R4, R6, R8	33 Ω series resistors for SPI pins	R2, R3, R4, R6, R8 = 33 Ω (0402)
R5, R7	1.1 kΩ series resistors for BG_RBIASx pins	R5, R7 = 1.1 kΩ (0402)
5V, 3.3V, 3.3V_1013, 1.8V, VCTRL1, VCTRL2, GND1	Test points	Not applicable
R14, R15, R17, R18, R19, R20, R23, XR6	Shorts or power supply decoupling resistors	R17, R18, R19 = 0 Ω (0603), R15 = 100 kΩ (0402), R14, R20, R23 = 0 Ω (0402), XR6 = 80.6 Ω (1206)
R1, R13, R16, R22, XR2	Pull-up or pull-down resistors	XR2, R1, R13, R22 = 10 kΩ (0603), R16 = 100 kΩ (0402)
C2 to C4, C5, C11 to C31, C34 to C42, C43 to C51, C140, C141, XC12, XC4 to XC8	Capacitors provide the required decoupling of the supply related pins	XC4, C4, C13, C16, C19, C22, C25, C28, C31, C36, C39, C42, C45 = 10 μF (3216), XC12 = 10 μF (0603), C5, C44, C46, C48, C49, C51 = 4.7 μF (0603), XC5, XC6, XC7, XC8 = 0.1 μF (0402), C43, C47, C50 = 0.001 μF (0603) C3, C12, C15, C18, C21, C24, C27, C30, C35, C38, C41 = 0.01 μF (0402), C2, C11, C14, C17, C20, C23, C26, C29, C37, C40 = 100 pF, C24 = 0.01 μF, C140, C141, XC5 to XC8 = 0.1 μF (0603)
JP1 to JP4	IQ path configuration	Default: JP1 to JP4 = do not install IF mode: JP1 to JP4 = do not install IQ mode: JP1 to JP4 = 0 Ω
C1, R21	Do not install	C1, R21 = 0402
XP1	Programming header	Not applicable
XP2	Mini USB connector	Connect the mini USB cable to XP2 to interface with the SPI
S1	Reset button	Push the reset button to reset the device.
USB	Red LED	LED is blue when the USB is connected to XP2, and the PC and the ADMV1013-EVALZ evaluation board are powered on with a 5 V supply
XU1	Microcontroller	PIC18F24J50
U1	Level shifter	FXL4TD245BQX
U3 to U5	3.3 V and 1.8 V regulators	ADM7170 (U3) = 1.8 V regulator, ADM7172 (U5) = 3.3 V regulator, ADM7172 (U4) = 3.3 V regulator for ADMV1013
U2	AD5601 *nano*DAC	Not applicable
DUT	ADMV1013 device under test	Not applicable
PCB	PCB, ADMV1013-EVALZ[1]	Not applicable

[1] The ADMV1013-EVALZ evaluation board material between Layer 1 and Layer 2 is made of 10.7 mil Rogers 4350B LoPRo®.

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.

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