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Evaluation Board for Fractional-N/Integer-N PLL Frequency Synthesizer

FEATURES

Self-contained board including PLL, VCO, loop filter (3 kHz), USB interface, and voltage regulators
Accompanying software allows control of synthesizer functions from a PC
Choice of power supply via USB or external feeding
Typical phase noise performance of −111 dBc/Hz @ 100 kHz offset from carrier (6.8 GHz output frequency)

GENERAL DESCRIPTION

The EV-ADF5355SD1Z is designed to evaluate the performance of the ADF5355 frequency synthesizer. A digital picture of the board is shown in Figure 1. It contains the ADF5355 synthesizer, a USB connector and related interface, SMA connectors for the RF outputs, and reference signal plus headers for various signals and voltages. There is also a loop filter (5 kHz) on board. An SDP-S connector is required to operate the board, this is ordered separately.

The package also contains Windows® software (XP, Vista-and Windows 7 compatible) to allow easy programming of the synthesizer.

EVALUATION KIT CONTENTS

Evaluation board software CD
USB cable
EV-ADF5355SD1Z

DIGITAL PICTURE OF EVALUATION BOARD

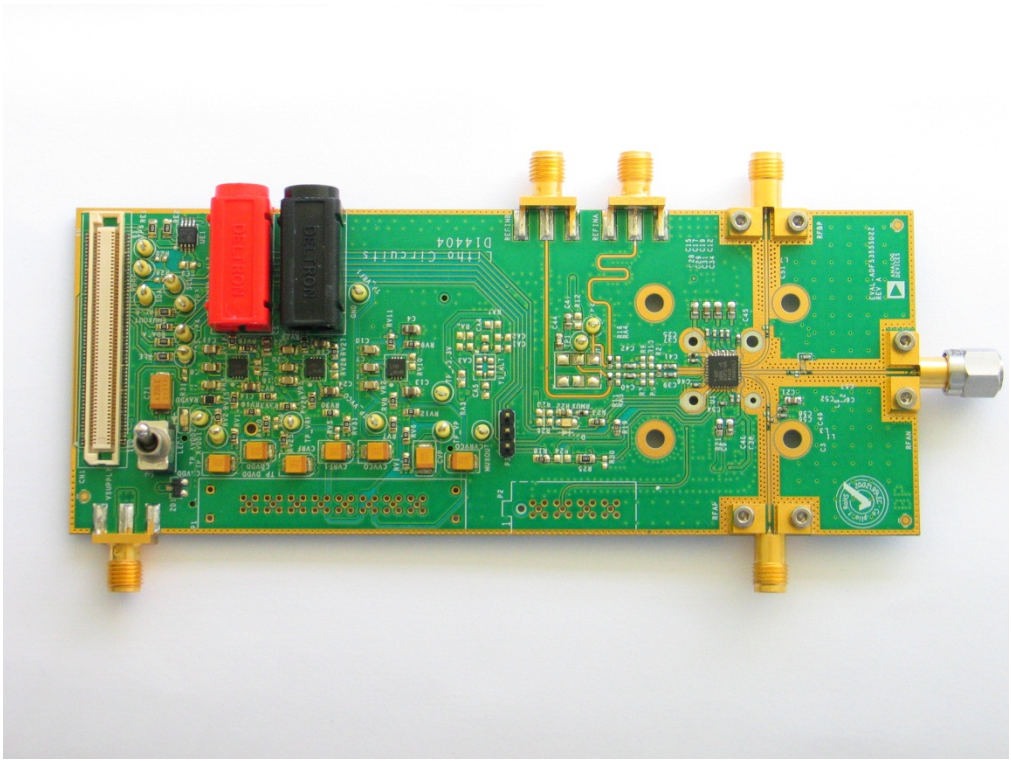

Figure 1.

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REVISION HISTORY

14/10—Revision PrC: Updated for revised components.

14/07—Revision PrB: Initial Preliminary Version

Edited description.

14/05—Revision PrA: Initial Preliminary Version

EVALUATION BOARD HARDWARE

OVERVIEW

The EV-ADF5355SD1Z requires the SPD-S platform which uses the EVAL-SDP-CS1Z**. (SDP-B is not recommended).**

POWER SUPPLIES

The EV-ADF5355SD1Zis powered from dc power connectors (4 mm banana connectors). When feeding via banana connectors, 6.0 V is a suitable feeding voltage. The power supply circuitry allows the user to use two or three separate LDOs to feed the ADF5355 (using fewer LDOs increases the risk of spur contaminated dc feeds). Ensure the switch is in the correct position to power the board. Consult the board schematic in Figure 20, Figure 21, and Figure 22 to determine a suitable setting.

The charge pump and VCO supply pins are driven from a 5V ADM7150 high performance low noise regulator. The remaining supplies are powered from 3.3V ADM7150's.

An LED, indicates when USB power is available, and another LED, indicates when the ADF5355 is powered on. **Switch S1 is used to power the ADF5355 from the external dc connectors, and should be switched to the left.**

In case the SDP processor causes spurs on the RF output signal, the user may remove this connector and measure the spurious.

RF OUTPUT

The EV-ADF5355SD1Z has one pair of SMA output connectors (differential outputs RFoutA+/-). The device is quite sensitive to impedance unbalance. If only one port of a differential pair is used, terminate the other with a 50 Ω load. If only RFoutB is used, then it can be powered off, or if left on, both RFoutA pins should be terminated in 50 Ohms.

The RFoutB contains the high frequency (6.8 – 13.6 GHz) and is a single ended RF output.

LOOP FILTER

The loop filter schematic is included in the board schematic on Figure 20. The loop filter component placements are clarified in Figure 2. Customers wishing for lowest noise at 100 kHz offset are advised to use the following components, and to use 0.9 mA charge pump current, which are inserted on the evaluation board.

C60 = 22 nF, C59 = 0.47 uF, C14 = 10 nF, C73 = 10 pF.

R14 = 220 Ohms, R1 = 470 Ohms.

Customers wishing for lowest rms phase noise should use:

C60 = 1.2 nF, C59 = 33 nF, C14 = 390 pF, C73 = 10 pF.

R14 = 1 kOhms, R17 = 3.3 kOhm.

And also program the 0.9 mA charge pump current.

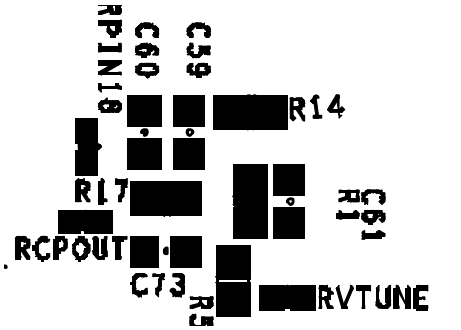

Figure 2. Loop Filter Placement

REFERENCE SOURCE

The evaluation board contains a footprint for a 122.88 MHz differential output TCXO from Vectron. If preferred, the user may supply either a single-ended or differential reference input to connectors REFINA and REFINB. Disconnect the power rail to the TCXO by removing resistor R12 first.

To use a single ended REFIN, then connect a low noise 122.88 MHz reference source to REFINB. To use a differential REFIN connect the differential signal to REFINA and REFINB. The differential REFIN can operate to 500 MHz input frequency.

If the TCXO is removed, then an external REFIN must be used.

EVALUATION SET UP

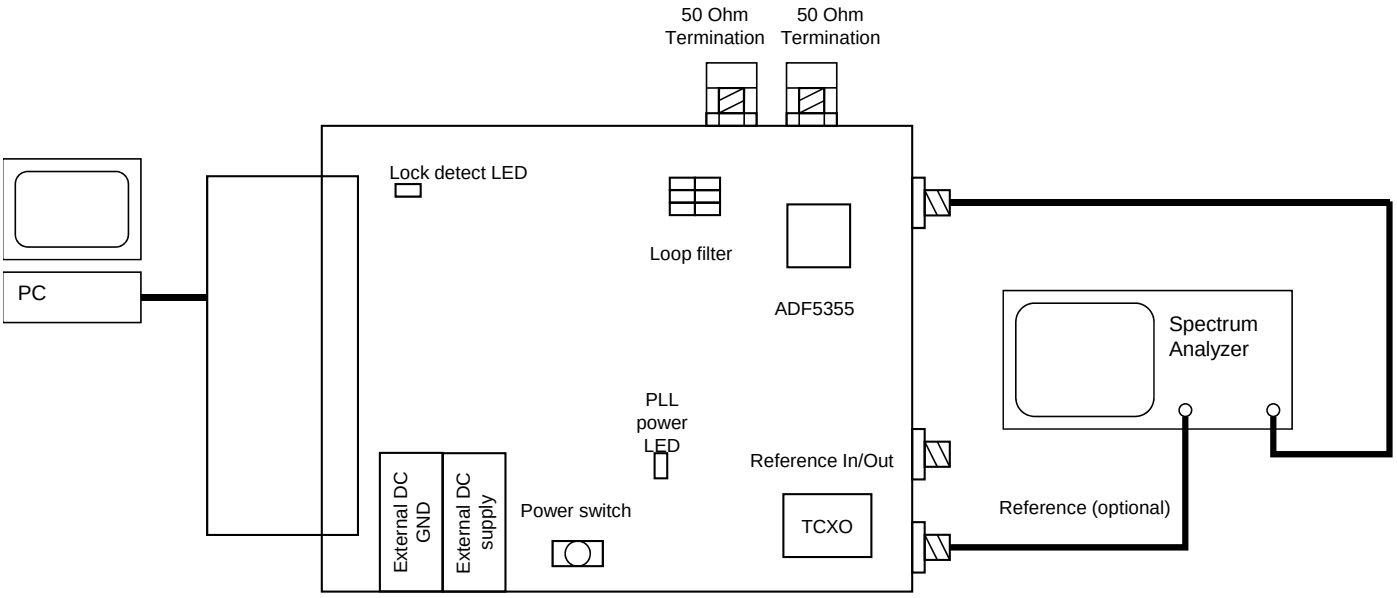

Figure 3. Evaluation Set Up

SOFTWARE INSTALLATION

Use the following steps to install the software.

1. Install the Analog Devices ADF4355 software by double-clicking **ADF4355 Setup.msi**.
   If you are using Windows XP, follow the instructions in the Windows XP Software Installation Guide section (see Figure 4 to Figure 8).
   If you are using Windows Vista or Windows 7, follow the instructions in the Windows Vista and Windows 7 Software Installation Guide section (see Figure 9 to Figure 13).
   Note that the software requires Microsoft Windows Installer and Microsoft .NET Framework 3.5 (or higher). The installer connects to the Internet and downloads Microsoft .NET Framework automatically. Alternatively, before running the **ADF4355 Setup.msi**, both the installer and .NET Framework can be installed from the CD provided.
2. Connect your board by USB.
   If you are using Windows XP, follow the steps in the Windows XP Driver Installation Guide section (see Figure 14 to Figure 17).
   On Windows Vista or Windows 7, the drivers install automatically.

Windows XP Software Installation Guide

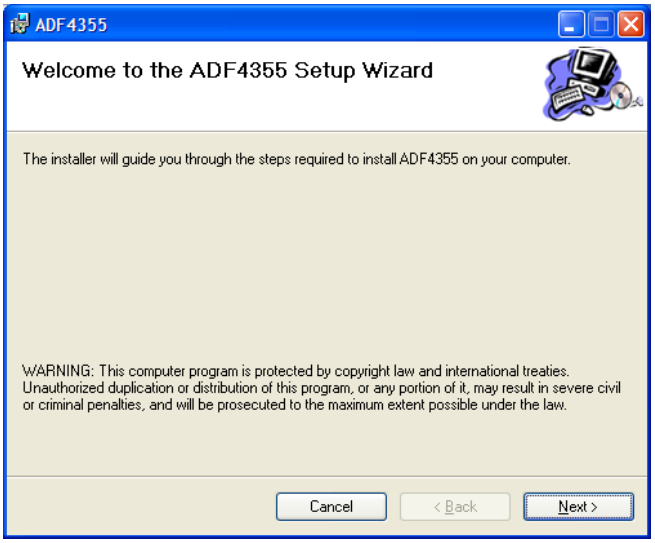

Figure 4. Windows XP ADF4355 Software Installation, Setup Wizard

1. Click **Next**.

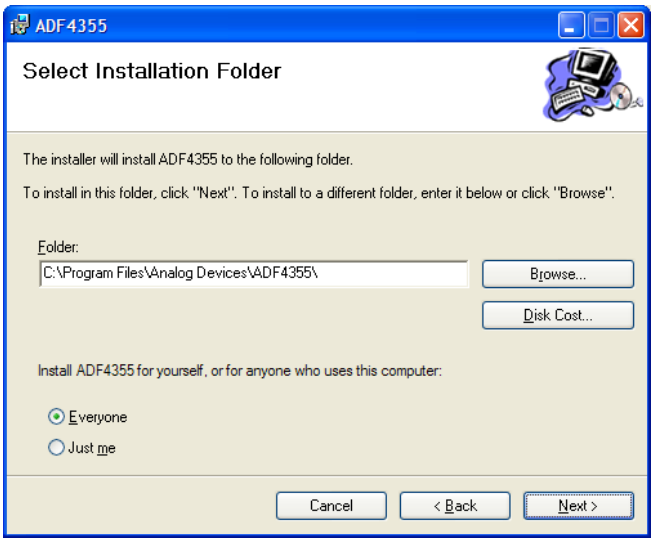

Figure 5. Windows XP ADF4355 Software Installation, Select Installation Folder

2. Choose an installation directory and click **Next.**

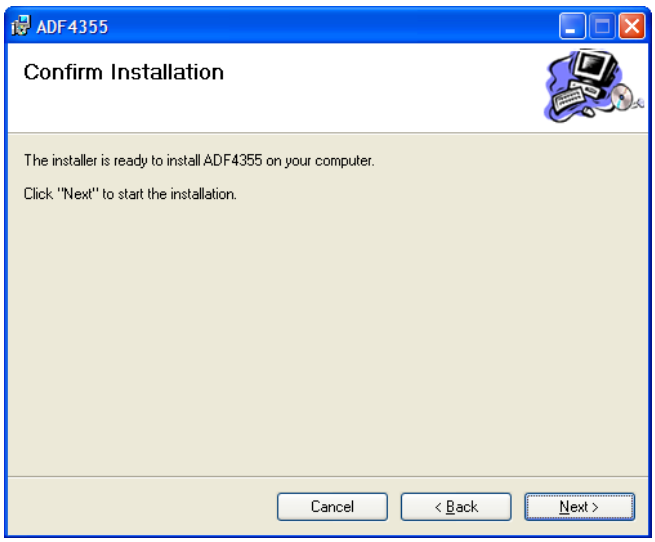

Figure 6. Windows XP ADF4355 Software Installation, Confirm Installation

3. Click **Next.**

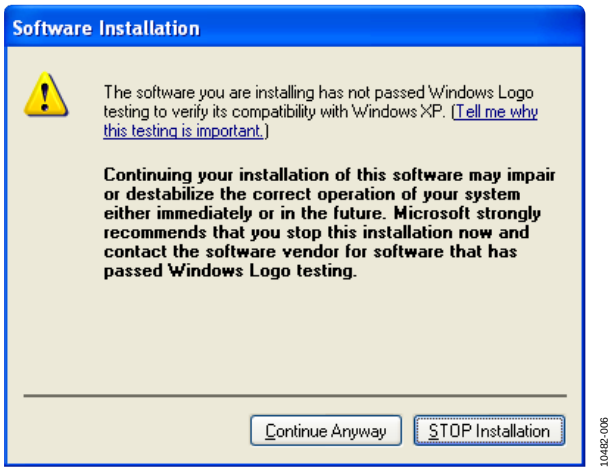

Figure 7. Windows XP ADF4355 Software Installation, Logo Testing

4. Click **Continue Anyway**.

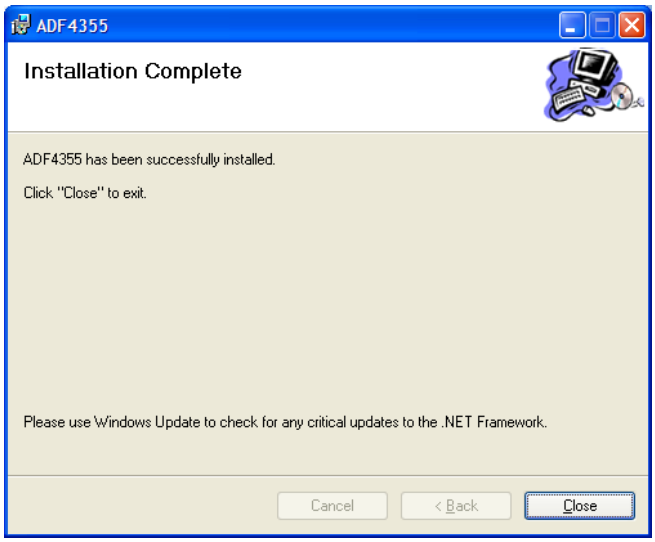

Figure 8. Windows XP ADF4355 Software Installation, Installation Complete

5. Click **Close.**

Windows Vista and Windows 7 Software Installation Guide

Figure 9. Windows Vista/7 ADF4355 Software Installation, Setup Wizard

1. Click **Next**.

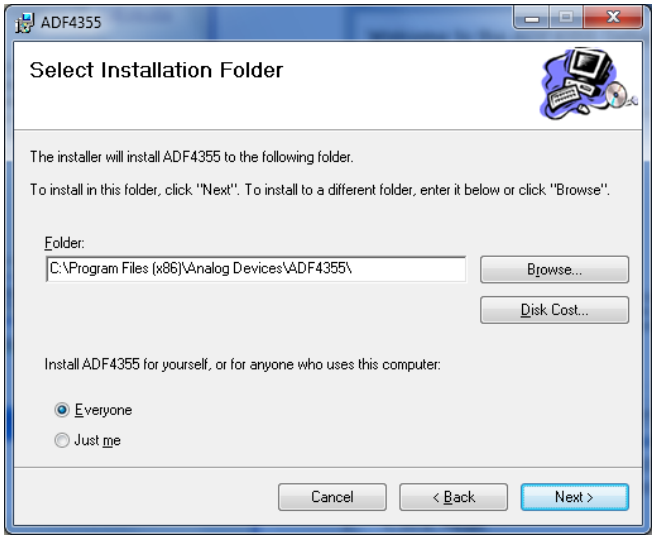

Figure 10. Windows Vista/7 ADF4355 Software Installation, Select Installation Folder

2. Choose an installation directory and click **Next.**

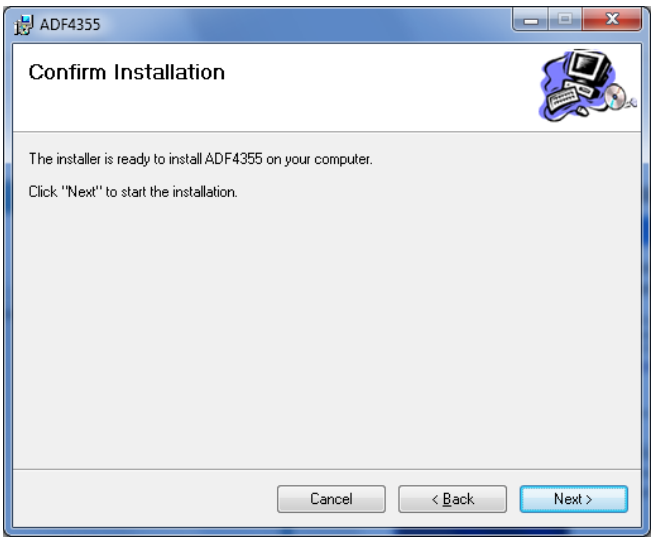

Figure 11. Windows Vista/7 ADF4355 Software Installation, Confirm Installation

3. Click **Next**.

Figure 12. Windows Vista/7 ADF4355 Software Installation, Start Installation

4. Click **Install**.

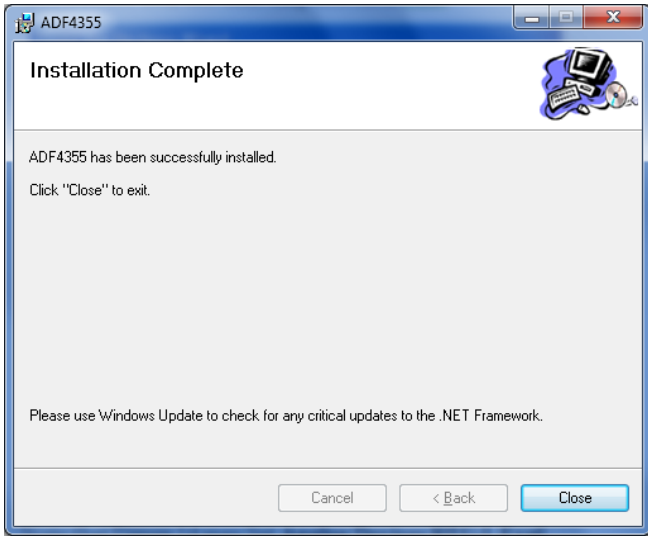

Figure 13. Windows Vista/7 ADF4355 Software Installation, Install Complete

5. Click **Close**.

Windows XP Driver Installation Guide

Figure 14. Windows XP USB Driver Installation, Found New Hardware Wizard

1. Choose **Yes, this time only** and click **Next**.

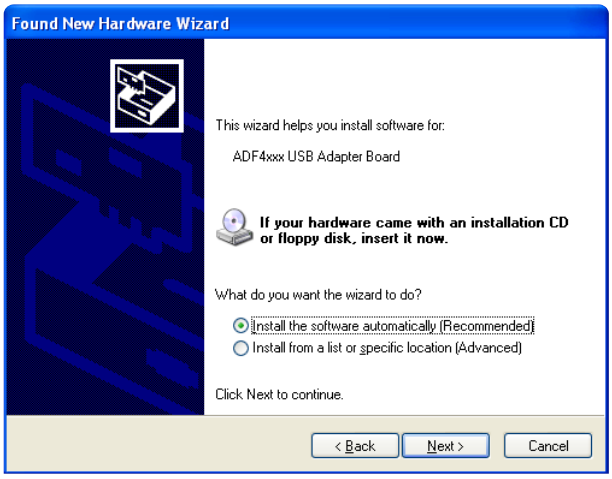

Figure 15. Windows XP USB Driver Installation, Install Options

2. Click **Next**.

Note that Figure 15 may list **Analog Devices RFG.L Eval Board** instead of **ADF4xxx USB Adapter Board**.

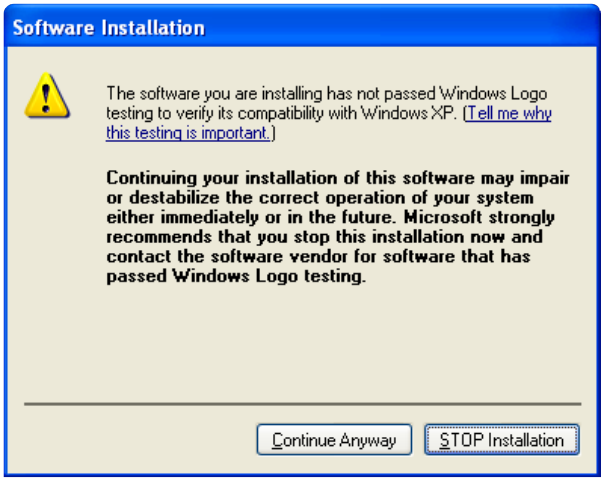

Figure 16. Windows XP USB Driver Installation, Logo Testing

3. Click **Continue Anyway**.

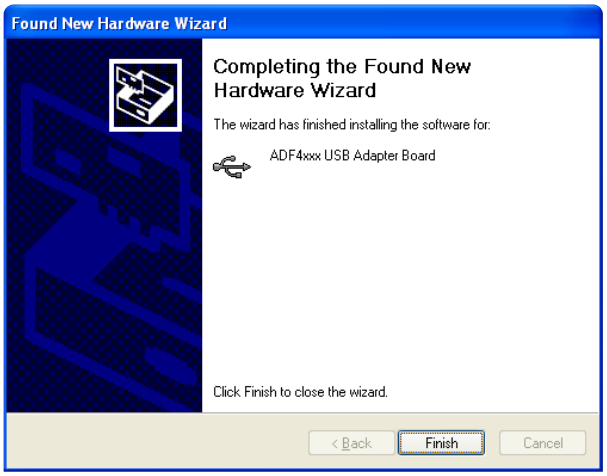

Figure 17. Windows XP USB Driver Installation, Complete Installation

4. Click **Finish**.

EVALUATION BOARD SOFTWARE

The control software for the EV-ADF5355SD1Zis available on the CD included in the evaluation kit. To install the software, see the software installation section. **Ensure to install the software first.**

To run the software, first connect the SDP board to the USB port of the PC, and the SDP board to the evaluation board and then click the **ADF4355** file on the desktop or in the **Start** menu. Select SDP board and click connect. Note that, when connecting the board, it takes about 5 sec to 10 sec for the status label to change.

If the software is started before the board is connected to USB port, an error window opens, informing that the USB device was not found, and the **No USB** message is displayed in the top right corner of the software front panel window. In this case, connect the SDP board to the USB port and click the **Connect** button.

1) Connect the SDP-S board to the EV-ADF5355 board.
2) Start the software.
3) Select SDP board as the connection method, select ADF5355 as the part.
4) Connect 6.0V to the EV-ADF5355SD1Z board, but ensure the switch s1 is in the off position.
5) Turn switch on (To the left).
6) Load configuration file (if applicable).
7) Write all registers.
8) A phase noise plot as below was taken with the register settings below.

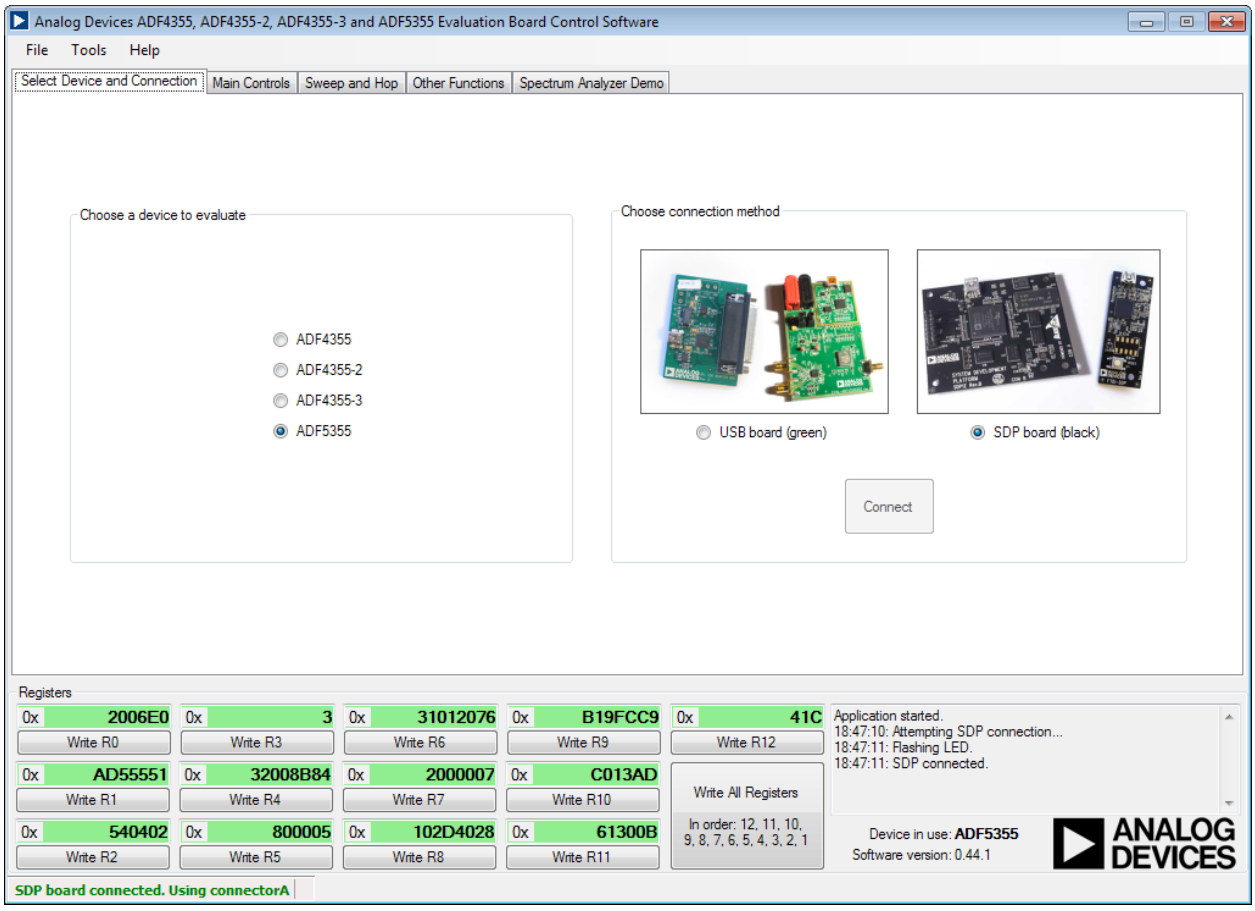

Figure 18. Software Front Panel Display—Select Device and Connection

To adjust the synthesizer parameters click the main controls tab.

Use the **Frequency** text box in the **Reference** section to set the correct reference frequency. The default reference on the software window is at 122.88 MHz which can be supplied externally. Please change to the actual REFIN frequency.

Use the **RF Frequency** section to control the output frequency. To achieve single-tone on the VCO output, type the desired output frequency text box in megahertz.

Default settings are recommended for most registers. Changing the settings on the software GUI requires the user to update the register with the register button, which is highlighted in green.

Bleed current settings may need to be modified for optimal operation.

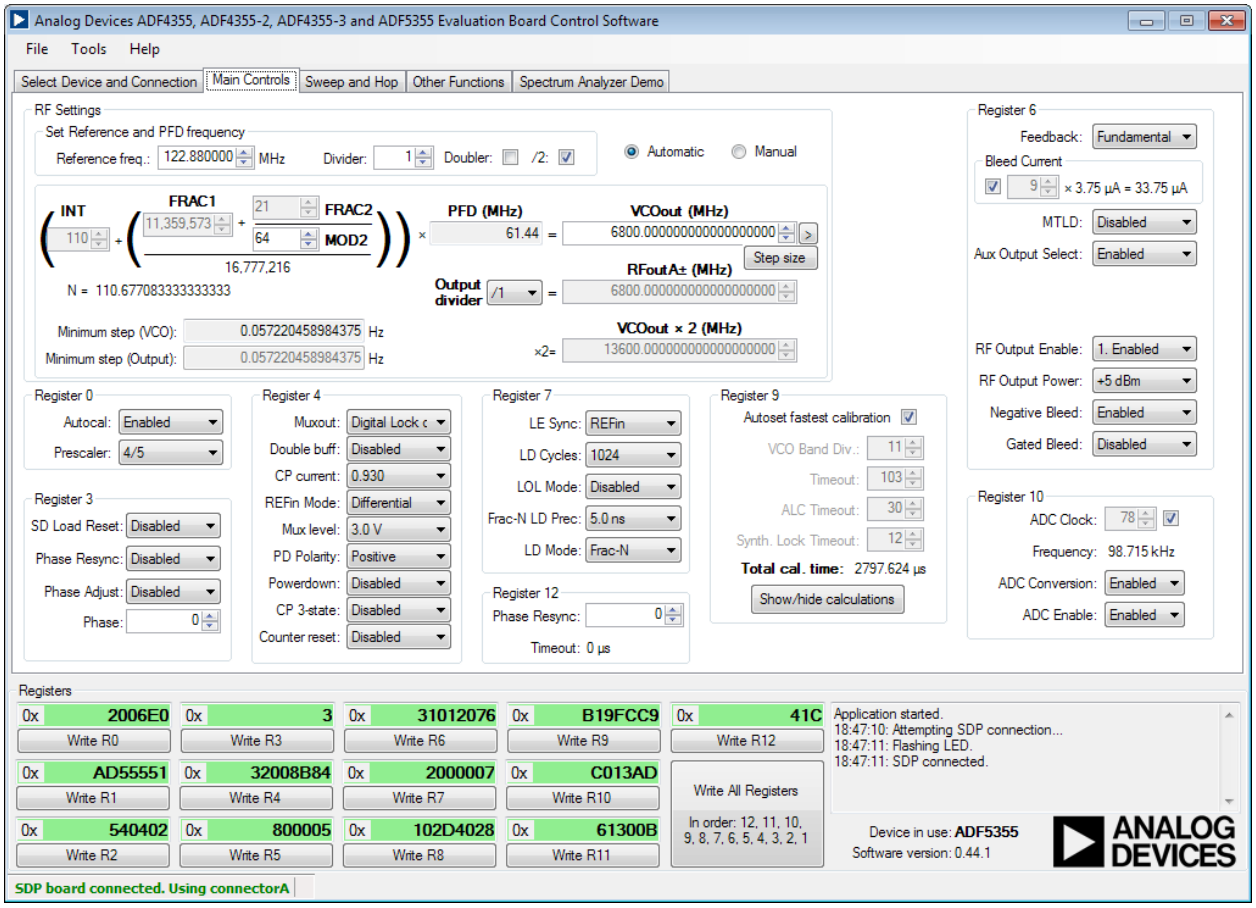

Figure 19. Register Settings

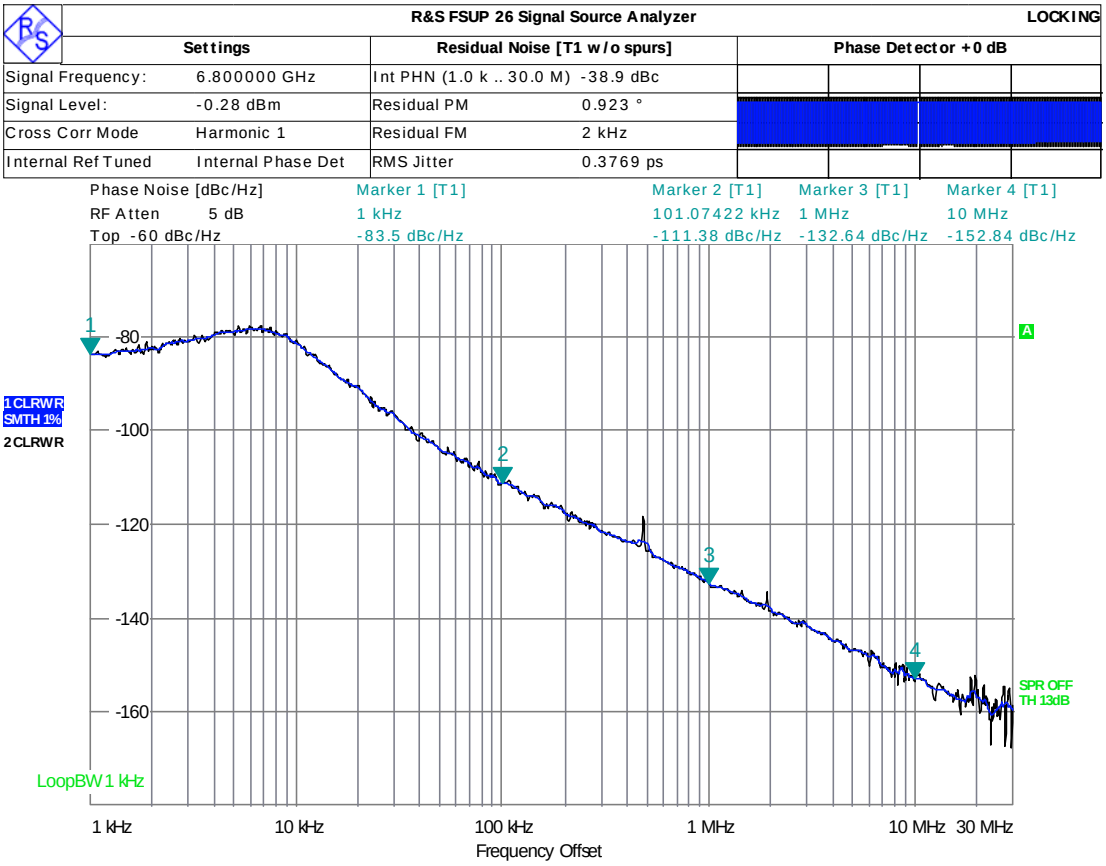

Figure20. Single Sideband Plot

EVALUATION BOARD SCHEMATICS AND ARTWORK

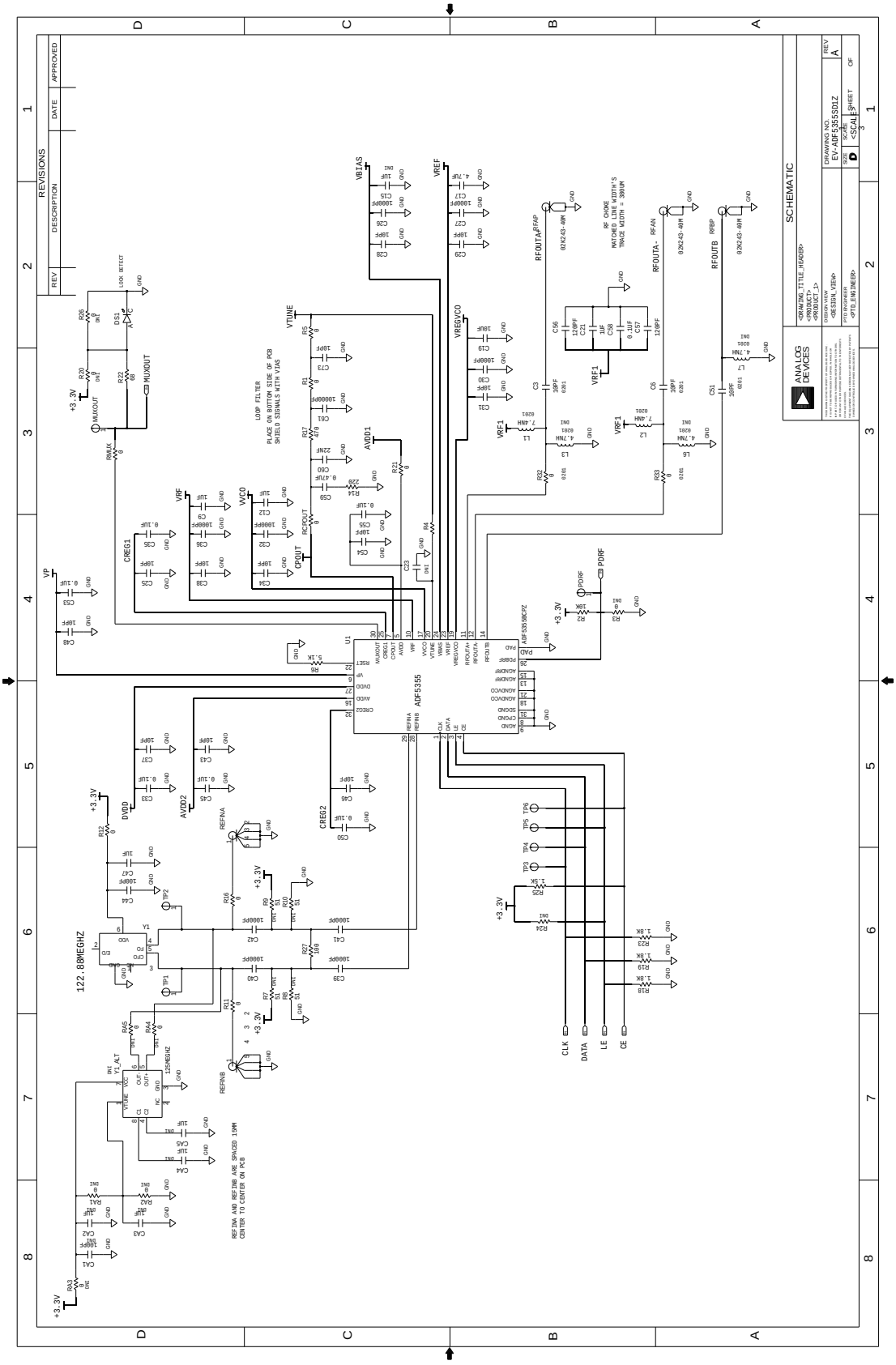

Figure 20. Evaluation Board Schematic (Page 1)

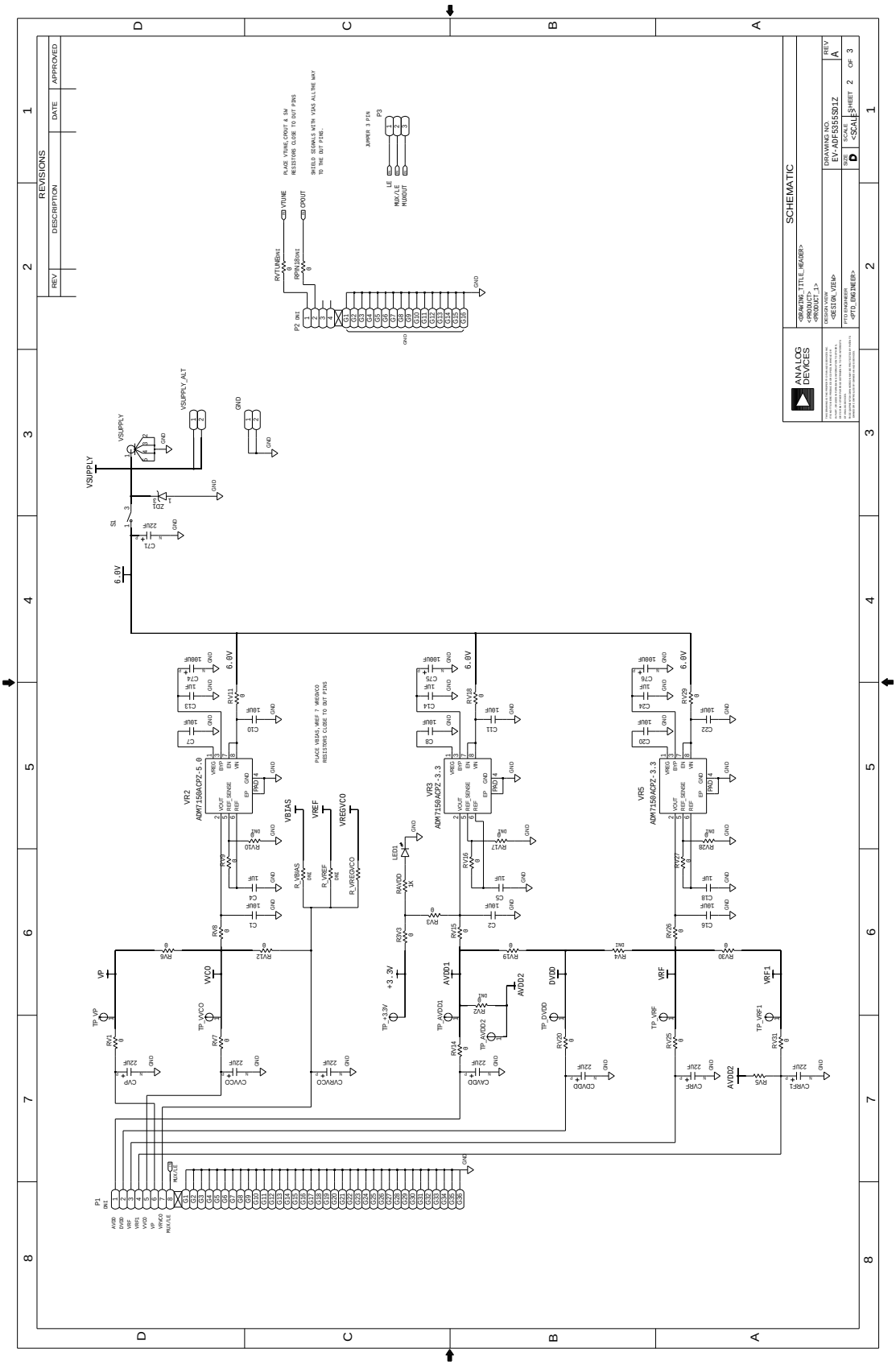

Figure 21. Evaluation Board Schematic (Page 2)

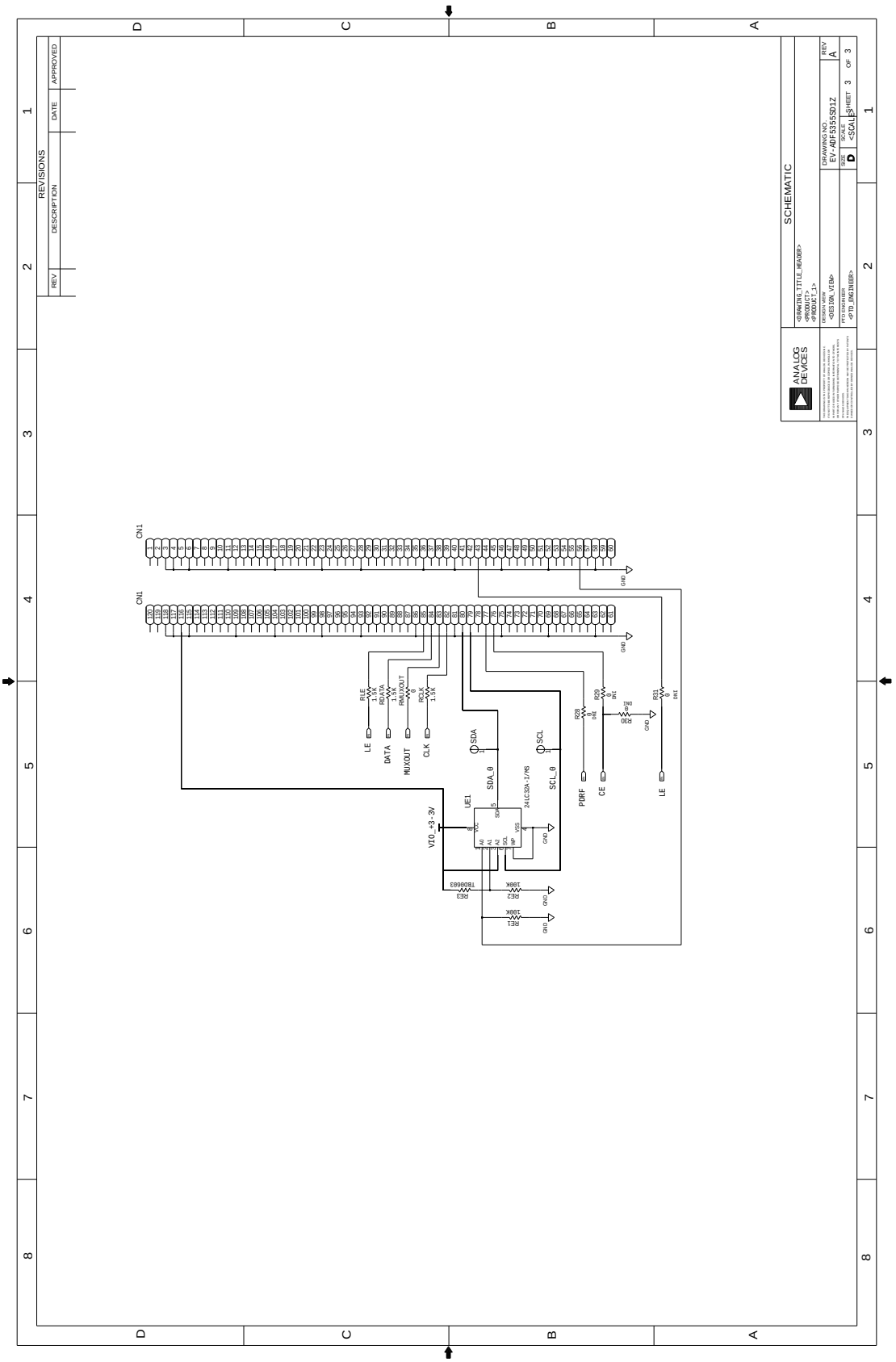

Figure 22. Evaluation Board Schematic (Page 3)

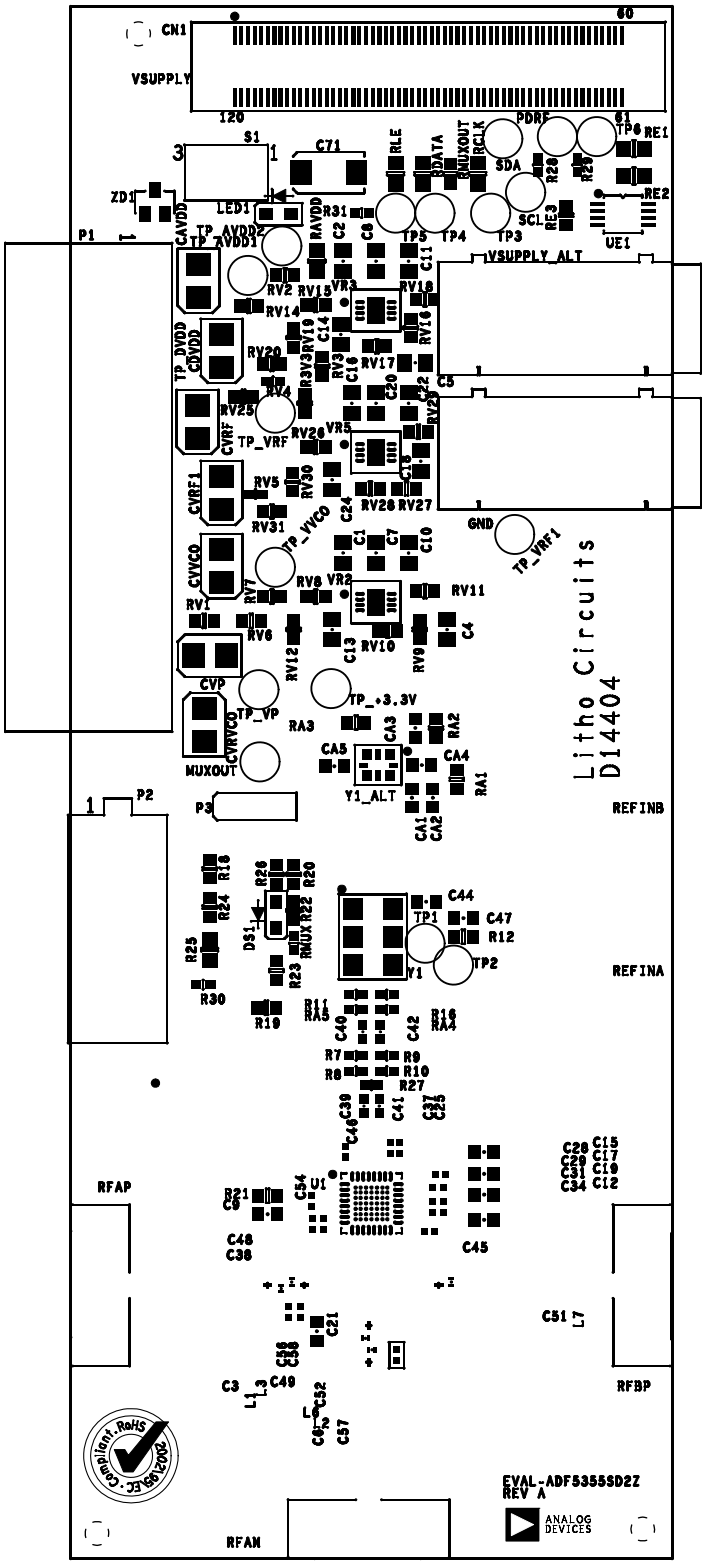

Figure 23. Evaluation Board Silk Screen(Top Side)

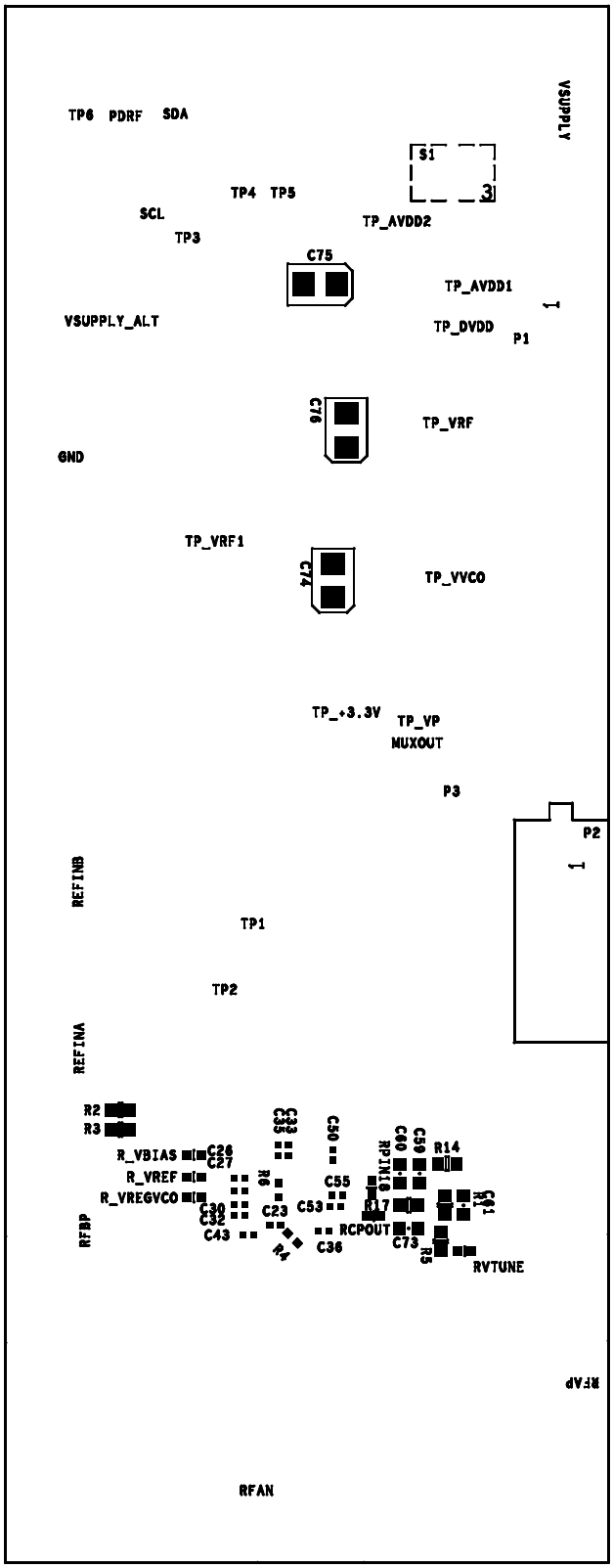

Figure 24 Evaluation Board Silk Screen, (Reverse side)

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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