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

FEATURES

Self-contained board including PLL, VCO, loop filter (20 kHz), 10 MHz TCXO reference, 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 −99 dBc/Hz @ 1 kHz offset from carrier (1 GHz output frequency)

GENERAL DESCRIPTION

The EVAL-ADF4350EB2Z is designed to evaluate the performance of the ADF4350 frequency synthesizer. A block diagram of the board is shown in Figure 1. It contains the ADF4350 synthesizer, a USB connector and related interface, a 10 MHz TCXO reference source, SMA connectors for the RF outputs, and reference signal plus headers for various signals and voltages. There is also a loop filter (20 kHz) on board. A USB cable is included with the board to connect to a PC USB port.

The package also contains Windows® software (2000- and XP-compatible) to allow easy programming of the synthesizer.

EVALUATION KIT CONTENTS

Evaluation board software CD
USB cable
EVAL-ADF4350EB2Z

EVALUATION BOARD BLOCK DIAGRAM

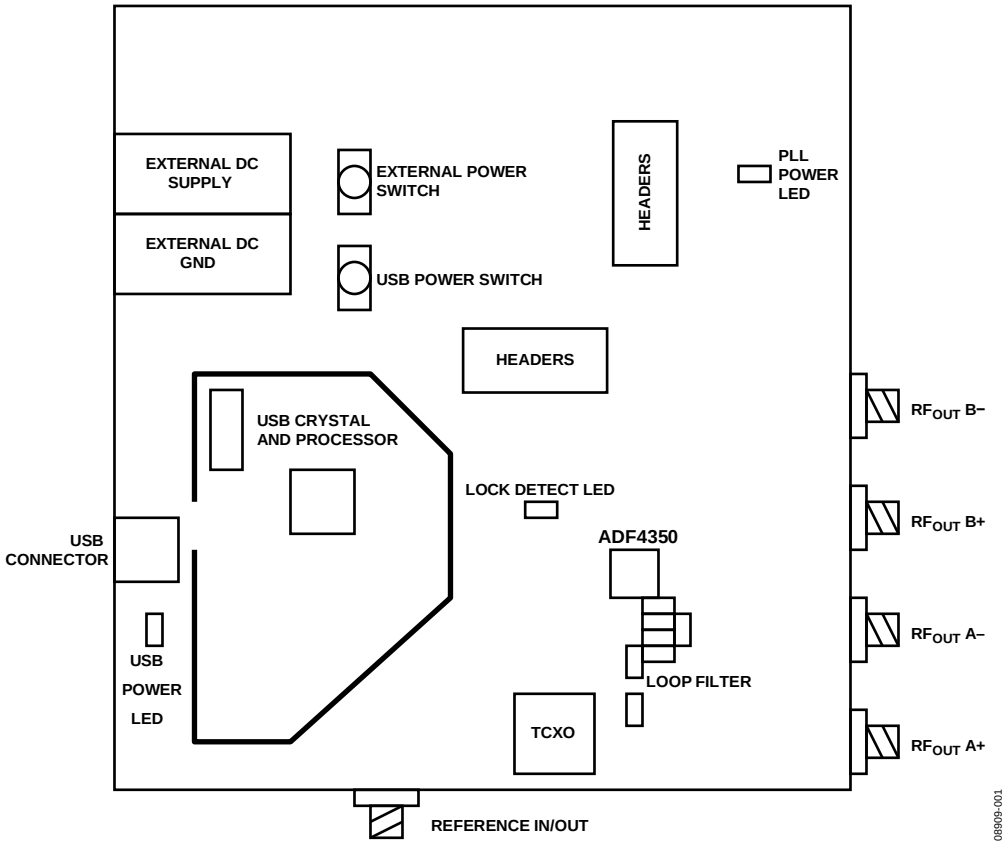

Figure 1.

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REVISION HISTORY

3/10—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

OVERVIEW

The EVAL-ADF4350EB2Z comes with a cable for connecting to the USB port of a PC. The silk screen for the evaluation board is shown in Figure 8. The board schematic is shown in Figure 5, Figure 6, and Figure 7.

POWER SUPPLIES

The EVAL-ADF4350EB2Z can be powered either from the USB port or via dc power connectors (4 mm banana connectors). When feeding via banana connectors, 3.75 V to 11 V is a suitable feeding voltage. The power supply circuitry allows the user to use one, two, or three separate LDOs to feed the ADF4350 (using fewer LDOs increases the risk of spur contaminated dc feeds). Consult the board schematic in Figure 5, Figure 6, and Figure 7 to determine a suitable jumper setting on Header J7.

An LED, D6, indicates when USB power is available, and another LED, D5, indicates when the ADF4350 is powered. Switch SW1 is used to power the ADF4350 from the USB port and Switch SW2 is used to power the part from the external dc connectors.

In case the USB processor or clock causes spurs on the RF output signal, the user may feed the evaluation board via the dc connectors and unplug the USB cable, thereby removing power from the USB interface circuitry. There is also a grounded frame surrounding the USB interface circuitry to allow mounting of a shielding box.

The J8 to J13 connectors can be populated if the user wishes to measure any spectral contamination on a specific dc voltage. Otherwise, the voltages are also present on either Header J6 or Header J7 for easy access and measurements.

RF OUTPUT

The EVAL-ADF4350EB2Z has four SMA output connectors (dual differential output). 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.

LOOP FILTER

The loop filter schematic is included in the board schematic on Figure 5. The loop filter component placements are clarified in Figure 2.

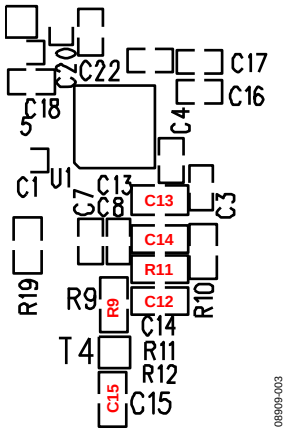

Figure 2. Loop Filter Placement

REFERENCE SOURCE

The 10 MHz TCXO from Fox Electronics provides the necessary reference signal. An external REFIN may be used if desired. In this case, disable the on-board TCXO by removing R1 and R2. R3 can be populated with 50 Ω to adjust impedance matching of the evaluation board to the external reference source.

EVALUATION SETUP

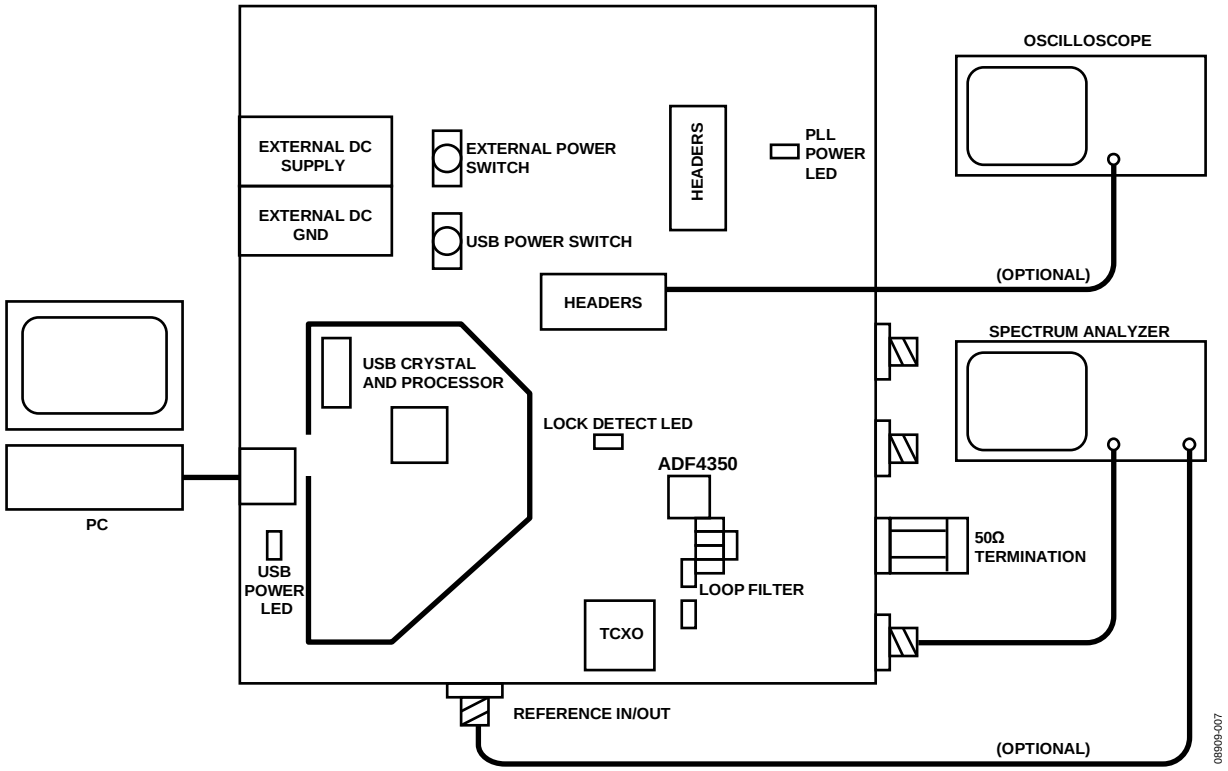

Figure 3. Evaluation Setup

EVALUATION BOARD SOFTWARE

The control software for the EVAL-ADF4350 accompanies the EVAL-ADF4350EB2Z on a CD. To install the software, use the following steps:

1. Click **setup.exe**.
2. The install wizard guides you through the installation process. The software is installed in a default directory called **C:/Program Files/Analog Devices/ADF4350**.
3. To run the software, click the **.exe** file.

The main interface window appears (see Figure 4). Confirm that **USB OK** is displayed on the right side of the screen. Otherwise, the software has no connection to the evaluation board.

It is also possible to disconnect the USB by clicking the **Disconnect USB** button. Should this happen, no data is sent to the part. This function is to be used before disconnecting the board from the USB connection. When the board is connected again, click the **USB connect** button to enable the programming of the part. This ensures the PC does not freeze up when the USB cable is disconnected.

Use the **Reference** section to set the correct reference frequency and reference frequency divider. The reference TCXO on the evaluation board runs at 10 MHz. To force the device to operate in integer-N mode, set the R divider so that the PFD frequency (displayed in the **Settings** section) equals the channel spacing (set in the **Output Frequency** section) and select the **Integer-N when possible** check box (in the **Options** section).

The **Outputs** section controls the charge pump current setting, the output power setting, and the multiplexer output setting.

Use the **Output Frequency** section to control the output frequency. You may specify two frequencies, and select which one the device operates at. For some frequencies, the device can operate in two modes: the low end of the VCO band or the high end, plus an extra divide by two. To control which mode is used, select **Minimum Output Divider** in the **Options** section.

The device can be set to toggle between the two set frequencies by selecting **Alternate** in the **Dynamic** section. The time spent on each frequency is set in the **Approximate Delay** field. To stop, click **Stop**. It is also possible to sweep from f1 to f2 with the channel spacing resolution with an approximate time delay on each frequency.

It is also possible to select **Low Spur Mode** or **Low Noise Mode** for the frac-N mode in the **Options** section. You can also set the cycle slip reduction bit.

The **Settings** section displays selected settings. Click **Registers** to display every bit of the register settings. To download these to the device, click **Update ALL**.

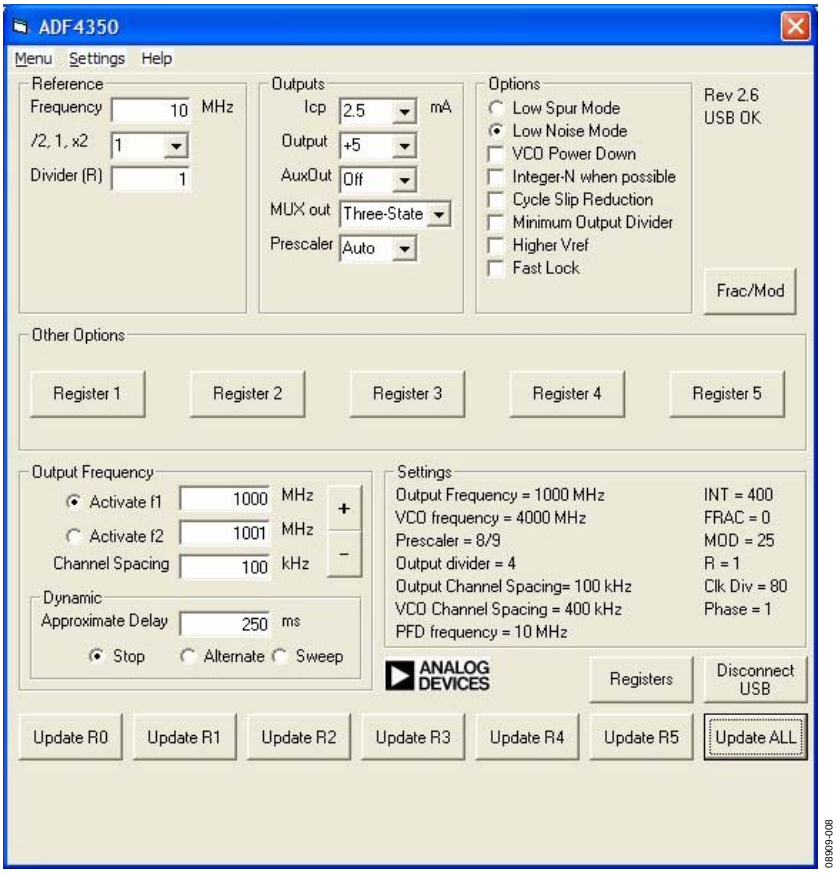

Figure 4. Software Front Panel

EVALUATION BOARD SCHEMATICS AND ARTWORK

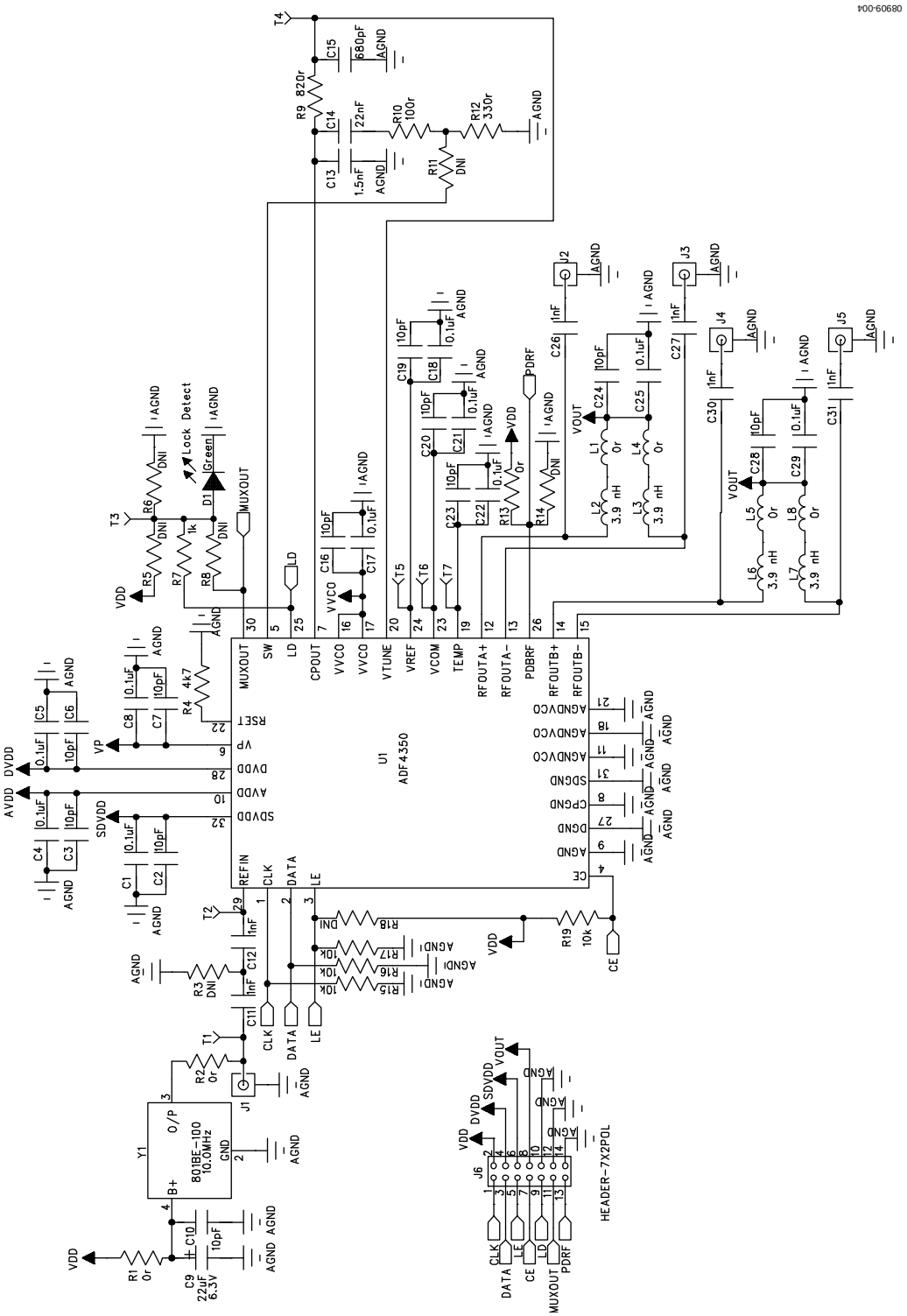

Figure 5. Evaluation Board Schematic (Page 1)

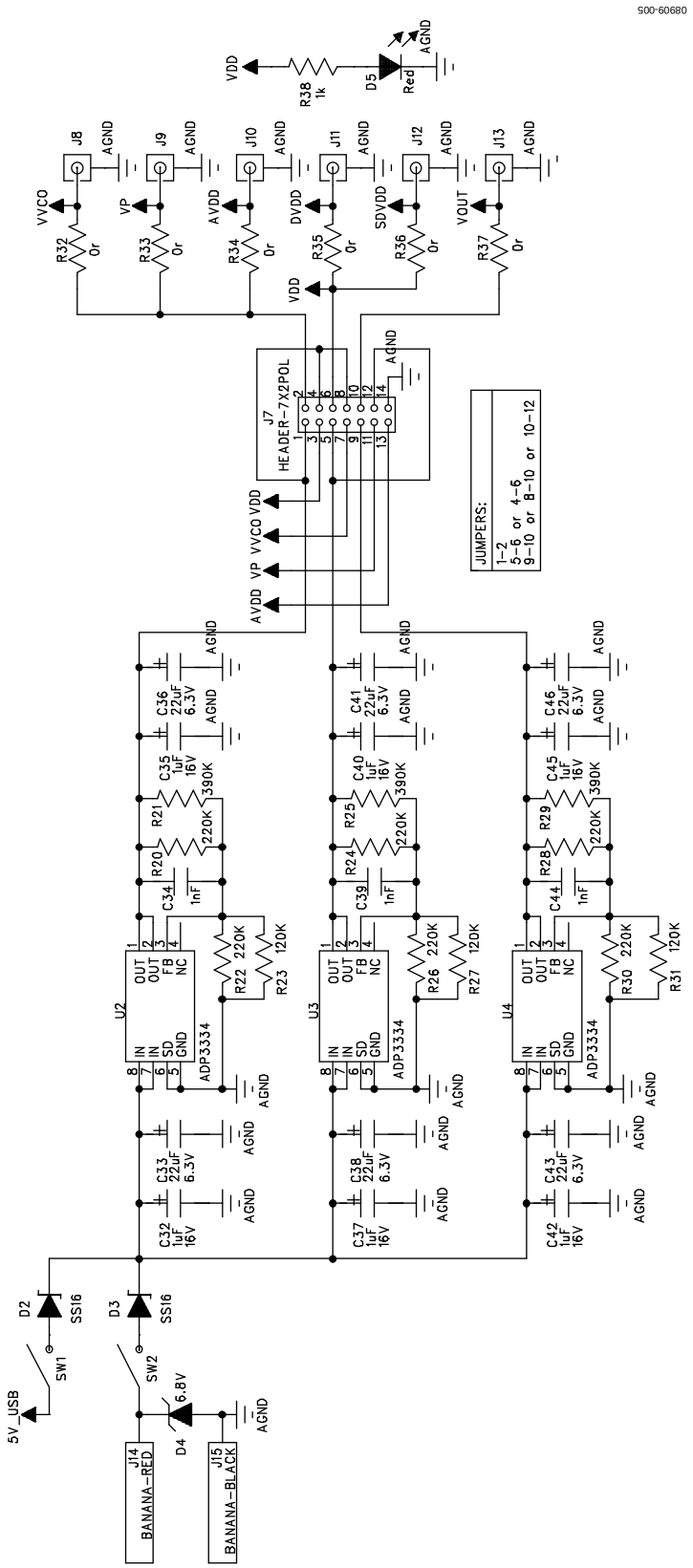

Figure 6. Evaluation Board Schematic (Page 2)

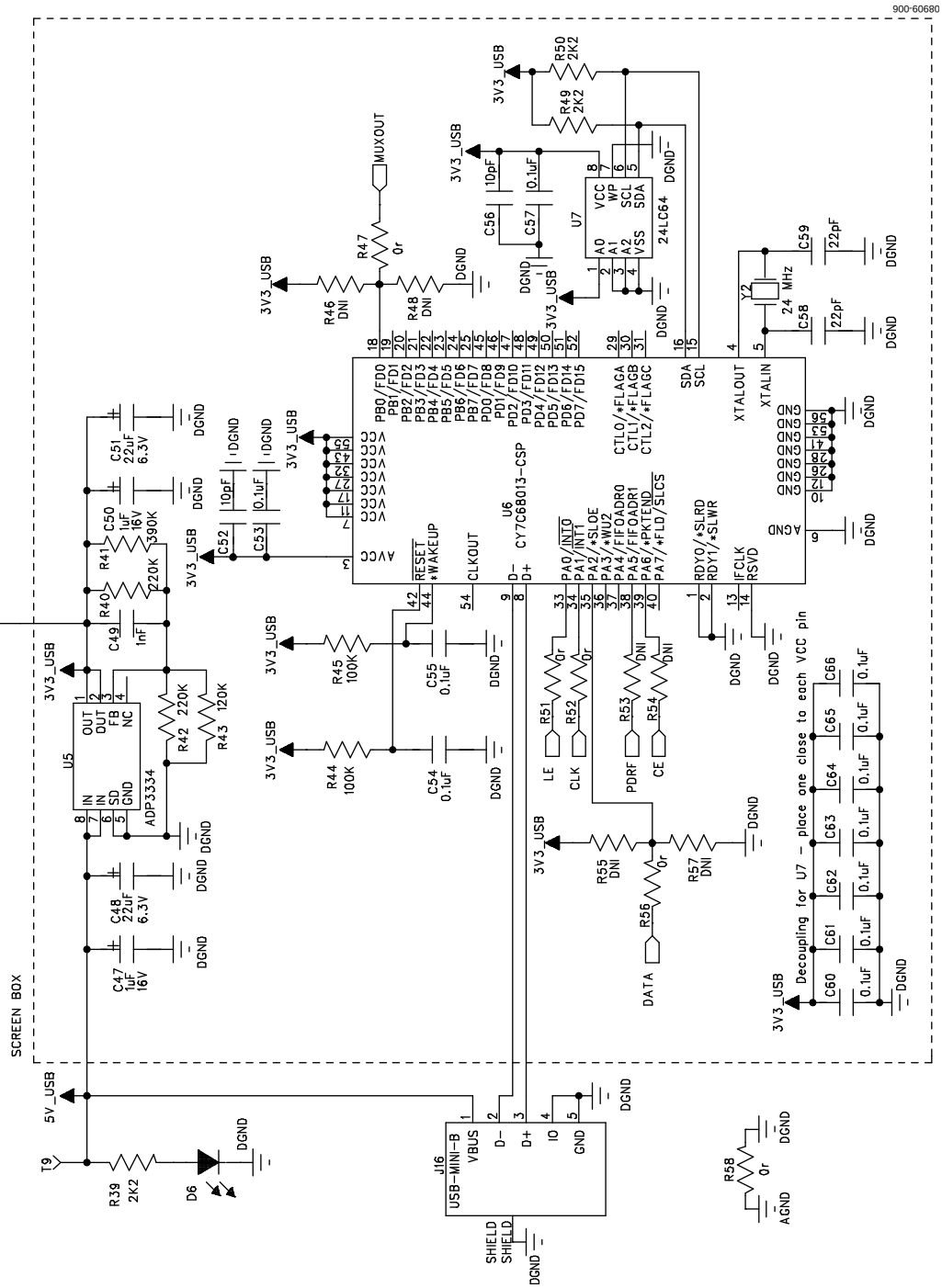

Figure 7. Evaluation Board Schematic (Page 3)

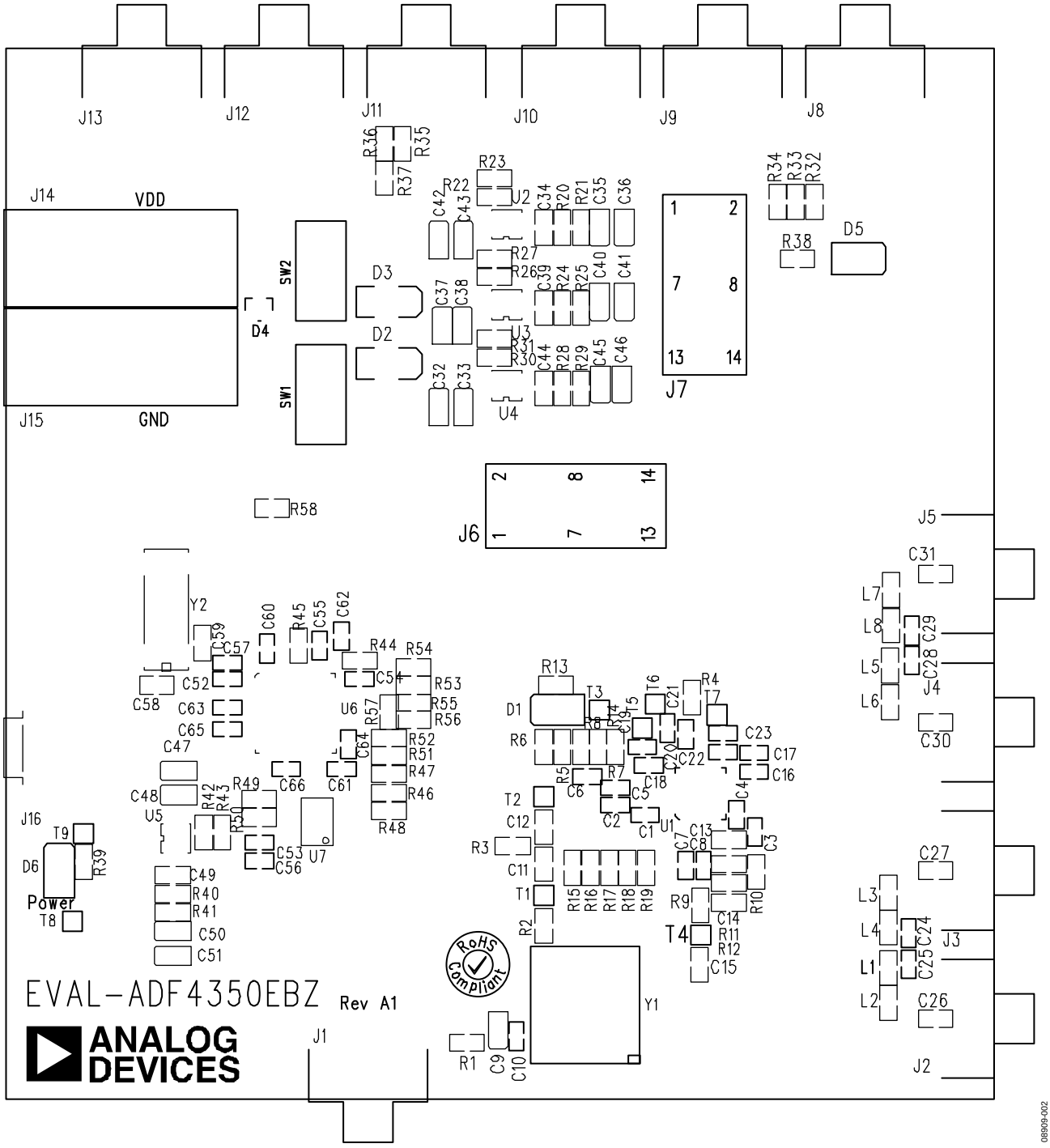

Figure 8. Evaluation Board Silk Screen

ORDERING INFORMATION

BILL OF MATERIALS

Table 1.

Qty	Reference Designator	Description
21	C1, C4, C5, C8, C17, C18, C21, C22, C25, C29, C53, C54, C55, C57, C60, C61, C62, C63, C64, C65, C66	Capacitor, 0.1 µF, 10%, 0402, 16 V, X7R
13	C2, C3, C6, C7, C10, C16, C19, C20, C23, C24, C28, C52, C56	Capacitor, 10 pF, 5%, 0402, 50 V, NPO
9	C9, C33, C36, C38, C41, C43, C46, C48, C51	Capacitor+, 22 µF, 10%, TAJ_A, 6.3 V, tantalum
10	C11, C12, C26, C27, C30, C31, C34, C39, C44, C49	Capacitor, 1 nF, 10%, 0603, 50 V, X7R
1	C13	Capacitor, 1.5 nF, 10%, 0603, 50 V, X7R
3	C14, C58, C59	Capacitor, 22 nF, 10%, 0603, 50 V, X7R
1	C15	Capacitor, 680 pF, 10%, 0603, 50 V, X7R
8	C32, C35, C37, C40, C42, C45, C47, C50	Capacitor+, 1 µF, 10%, TAJ_A, 16 V, tantalum
1	D1	LED_CHIP, light emitting diode
2	D2, D3	SS16, DO-214AC, Schottky diode, −1 A, 60 V
1	D4	Zener-diode-S, 6.8 V, 5%, SOT23, OT23
2	D5, D6	LED, LED_CHIP, light emitting diode
5	J1, J2, J3, J4, J5	SMA, SMA_CARD_EDGE_RF
2	J6, J7	HEADER-7X2POL, HEADER14-POL
6	J8 to J13	DNI, SMA_CARD_EDGE_RF
1	J14	Red, 4 mm, banana socket
1	J15	Black, 4 mm, banana socket
1	J16	USB mini-B connector (usb-otg)
4	L1, L4, L5, L8	Inductor, 0 Ω, 1%, 0603
4	L2, L3, L6, L7	Inductor, 3.9 nH, 5%, 0603, Coilcraft 0603CS
14	R1, R2, R13, R32, R33, R34, R35, R36, R37, R47, R51, R52, R56, R58	Resistor, 0 Ω, 1%, 0603
13	R3, R5, R6, R8, R11, R14, R18, R46, R48, R53, R54, R55, R57	Resistor, DNI, 1%, 0603
1	R4	Resistor, 4.7 kΩ, 1%, 0603
2	R7, R38	Resistor, 1 kΩ, 1%, 0603
1	R9	Resistor, 820 Ω, 1%, 0603
1	R10	Resistor, 100 Ω, 1%, 0603
1	R12	Resistor, 330 Ω, 1%, 0603
4	R15, R16, R17, R19	Resistor, 10 kΩ, 1%, 0603
8	R20, R22, R24, R26, R28, R30, R40, R42	Resistor, 220 kΩ, 1%, 0603
4	R21, R25, R29, R41	Resistor, 390 kΩ, 1%, 0603
4	R23, R27, R31, R43	Resistor, 120 kΩ, 1%, 0603
3	R39, R49, R50	Resistor, 2.2 kΩ, 1%, 0603
2	R44, R45	Resistor, 100 kΩ, 1%, 0603
2	SW1, SW2	SW_POWER, SW_SIP-3P, NKK SPST N/O momentary push button switch
9	T1 to T9	Testpoint
1	U1	ADF4350, LFCSP-32 PLL
4	U2 to U5	ADP3334 MSO8 adjustable LDO regulator
1	U6	CY7C68013-CSP, LFCSP-56, USB microcontroller
1	U7	24LC64, SO8NB, 64K I^2C serial EEPROM
1	Y1	OSC_TCXO, 10.0 MHz, OSC_TCXO, FOX
1	Y2	XTAL-CM309S, 24 MHz, XTAL_CM309S, CM309S SMD crystal

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.

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