



Evaluation Board For Fractional-N PLL Frequency Synthesizer

Evaluation Board Tech Note

EVAL-ADF4153EB1

FEATURES

Self-Contained Board Including Synthesizer, VCO and Loop Filter

Designed For 1750MHz Application:

25 MHz PFD Frequency, 200 kHz Channel Spacing, 20 kHz Loop Bandwidth. Charge Pump Current 0.625mA Reference is external

Accompanying Software Allows Complete Control of Synthesizer Functions from PC

Battery Operated: Choice of 3V or 5V Supplies (Vdd always 3V)

Typical Phase Noise Performance of -103 dBc/Hz @ 1 kHz Offset from Carrier

GENERAL DESCRIPTION

This board is designed to allow the user to evaluate the performance of the ADF4153 Frequency Synthesizer for PLL's (Phase Locked Loops). The block diagram of the board is shown below. It contains the ADF4153 synthesizer, a pc connector SMA connectors for the power supplies, Frequency Reference and RF output.

There is also a low pass loop filter (20kHz) and a VCO (Sirena VCO190-1750T) on board. The evaluation board is set up for a 25MHz PFD comparison frequency.

A cable is included with the board to connect to a PC printer port. The package also contains windows software (2000 and XP compatible) to allow easy programming of the synthesizer.

BLOCK DIAGRAM

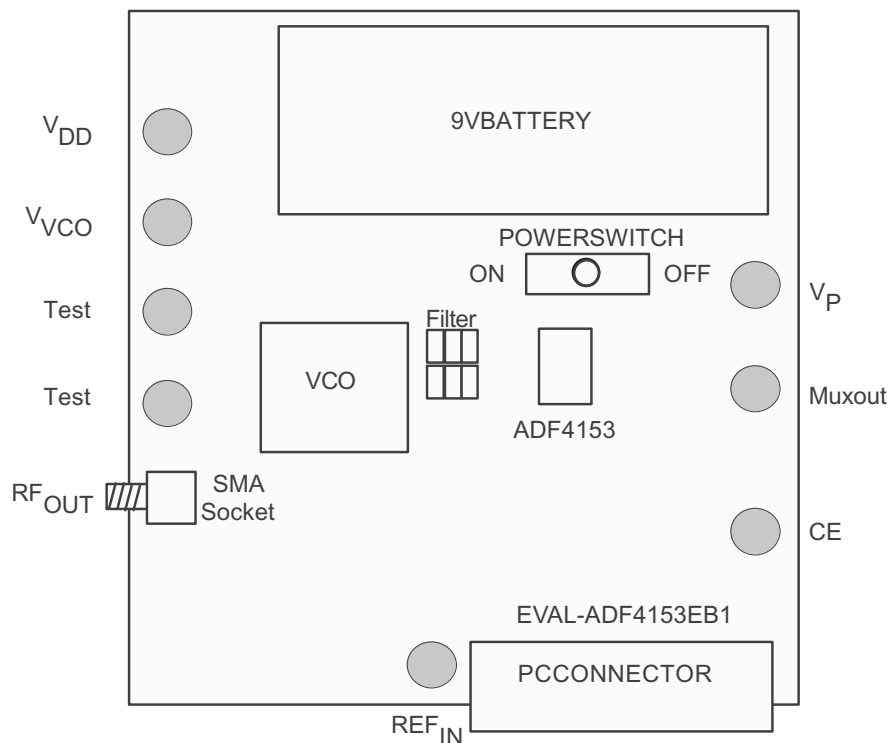


Figure 1.

PR. B

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HARDWARE DESCRIPTION

OVERVIEW

The evaluation board comes with a cable for connecting to the printer port of a PC. The silk screen and cable diagram for the evaluation board are shown below. The board schematic is shown on pages 4 and 5.

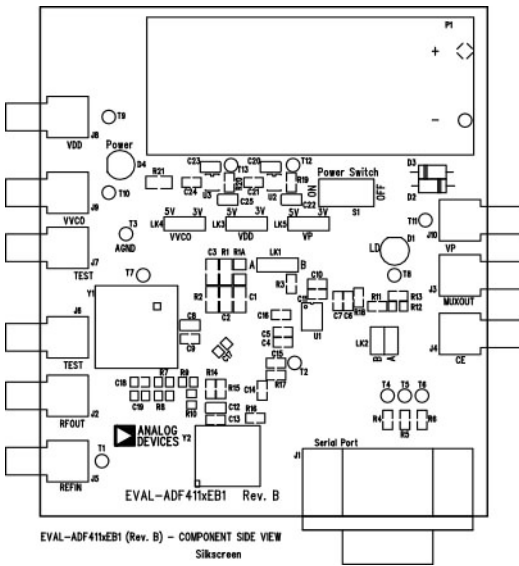


Figure 2. Evaluation Board Silk Screen

POWER SUPPLIES

The board is powered from a single 9V battery. The power supply circuitry allows the user to choose 3V for the ADF4153V_{DD} and either 3V or 5V for the ADF4153 V_P and for the VCO supply. The default settings are 3V for the ADF4153 V_{DD} and 5V for the ADF4153 V_P and for the VCO supply.

It is very important to note that the ADF4153V_{DD} should never exceed the ADF4153 V_P. This can cause damage to the device.

If the user wishes, external power supplies may be used. In this case, you need to insert SMA connectors as shown on the silk screen and block diagram.

LOCAL OSCILLATOR COMPONENTS

All components necessary for Local Oscillator (LO) generation are included on the board. The board needs an external frequency reference to generate the 25MHz PFD from an external RF source. A suitable frequency reference must be chosen so that the phase noise performance of the PLL can be realised. One possibility is to use a 250MHz frequency reference and divide by 10 to achieve the 25MHz PFD. The PLL is made up of the ADF4153, a passive loop filter (20 kHz bandwidth), and the VCO190-1750T VCO from Sirenza Microdevices. The loop bandwidth has been set to 20kHz. The output is available at RFOUT through a standard SMA connector. Note that on the evaluation board there is the possibility to fit a 25MHz VCXO/TCXO to use as the frequency reference.

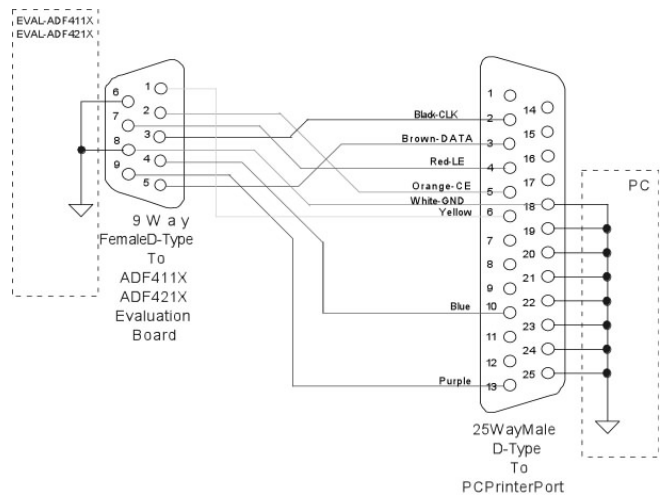


Figure 3. PC Cable Diagram

SCHEMATICS

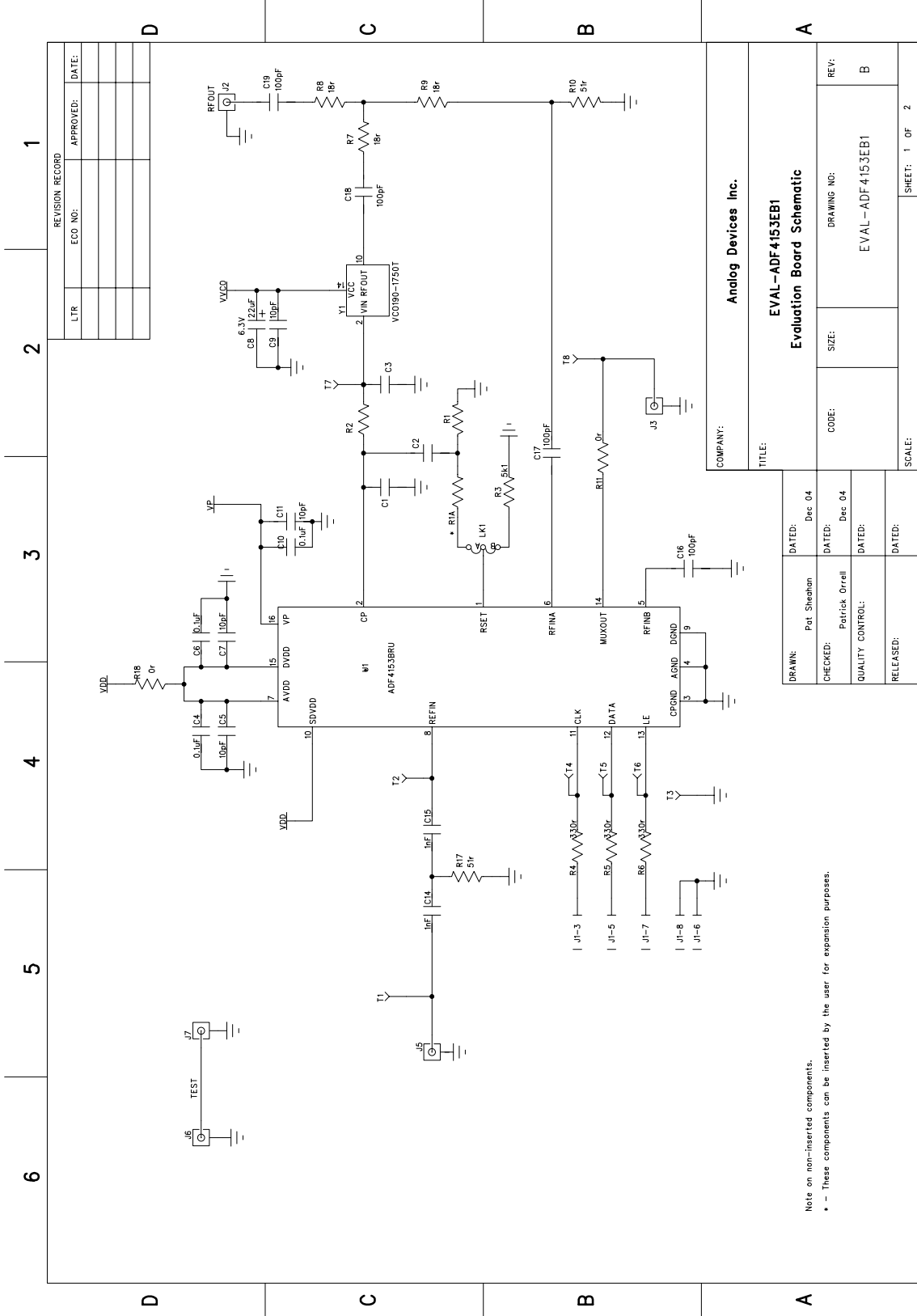


Figure 4. Evaluation Board Schematic (Page 1)

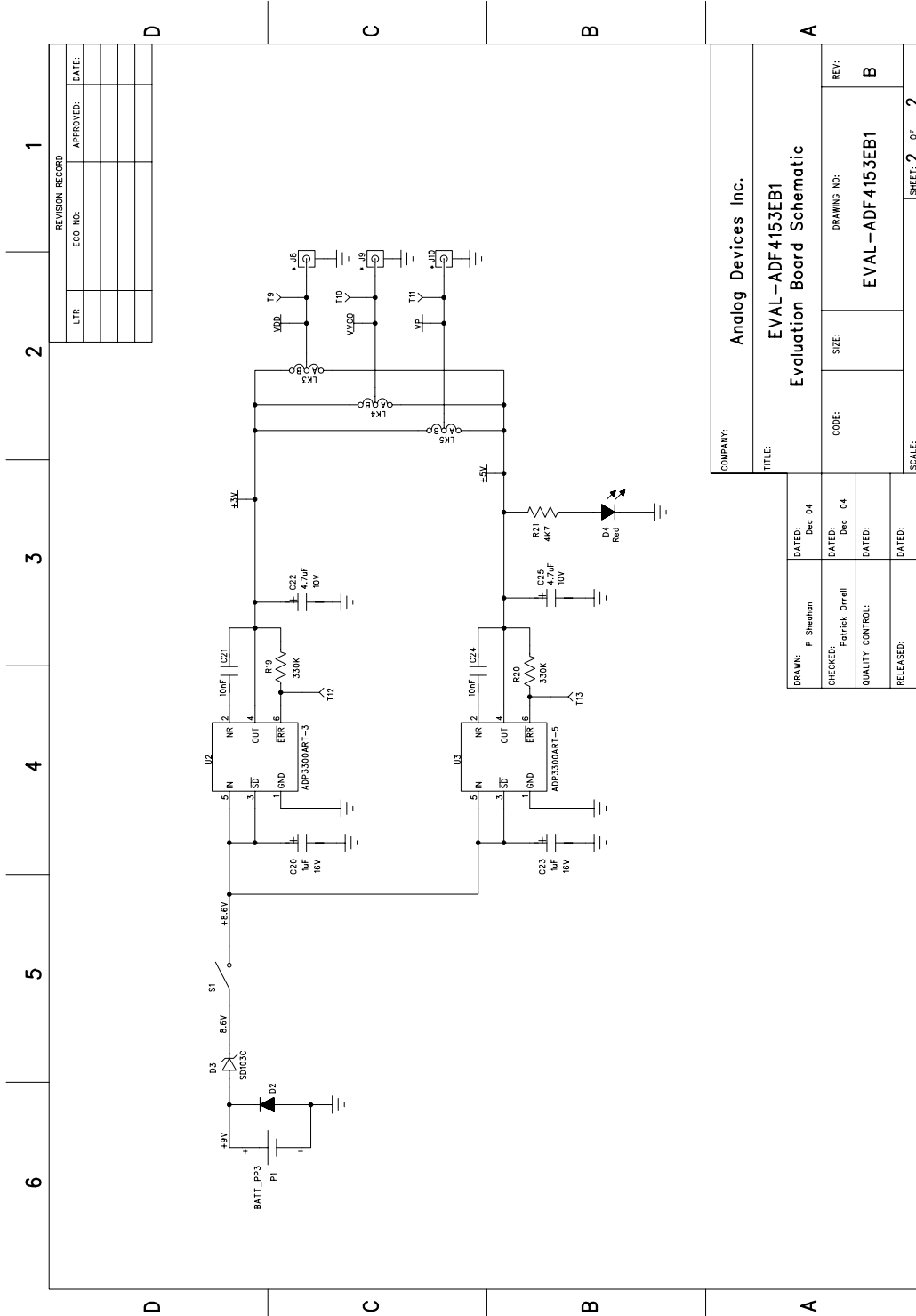


Figure 5. Evaluation Board Schematic (Page 2)

TEST SET UP

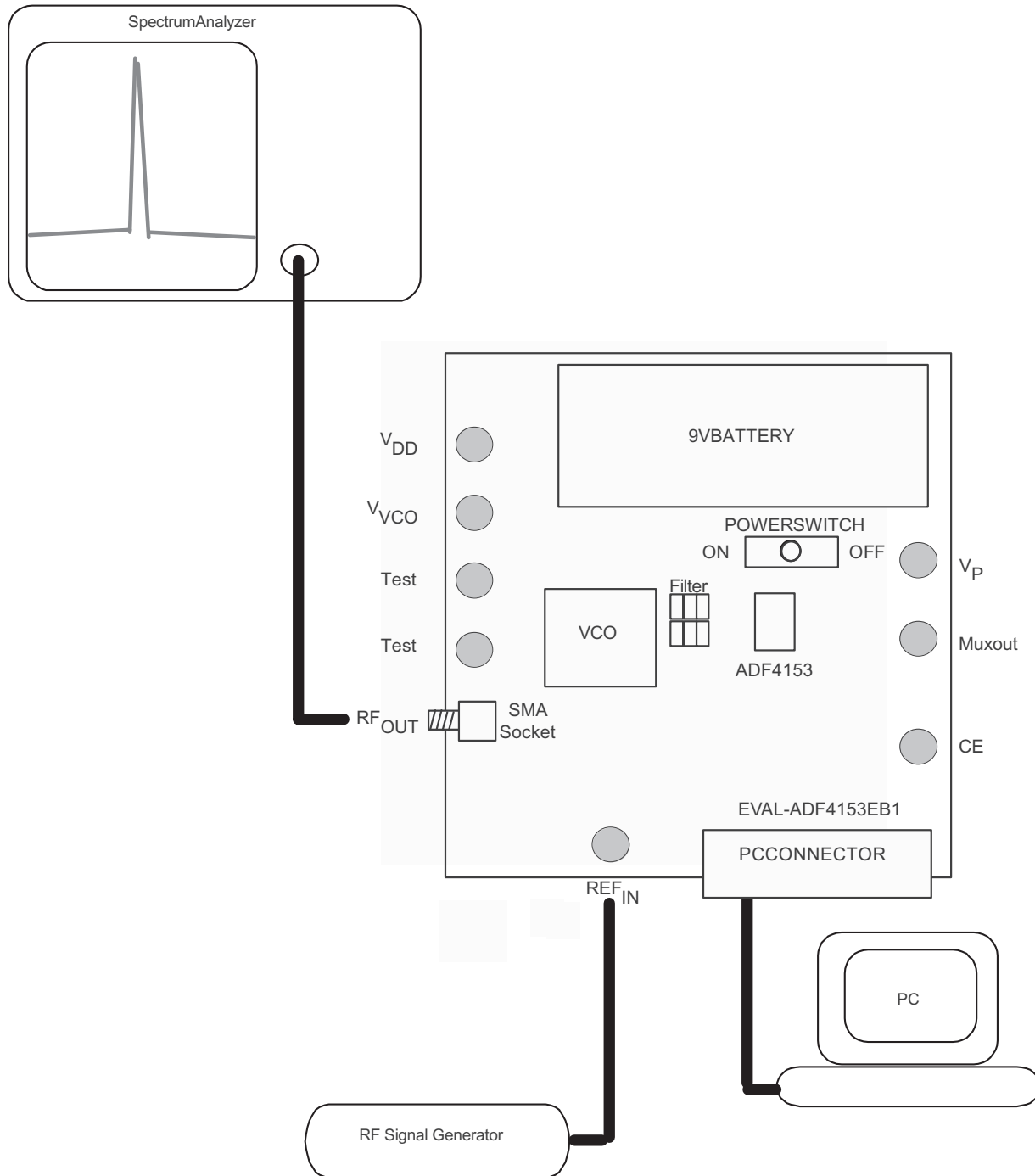


Figure 6. Test Set Up

SOFTWARE

BASIC OPERATION

The control software for EVAL-ADF4153EB1 is on the CD which accompanies the board. If the user clicks on “setup.exe”, then the install wizard guides the user through the install process. Simply follow the on-screen instructions. The software will be installed in a default directory call “C:/Program Files/Analog Devices/ADF_Frac”. To run the software, click on ADF_Frac__.exe.

Before the main software screen appears, the Device Window is shown. This will ask the user to choose which device is being evaluated. Choose ADF4153 and click OK.

The Main Interface Window will now appear (Figure 7). In the RF Section enter the PLL information as shown (Figure 8) and Update R0 and R1 (Normal Mode). Now exit the window and the main interface will now appear again as in Figure 7. Note

that for a 25MHz PFD and RF Output of 1750 MHz the Prescaler of 4/5 must be used as shown on the panel.

Click on “Update All Registers” and an RF spectrum should appear at the output. The data is now set up and other features can be examined by the user. Note that the charge pump current is 0.625mA to allow for current boosting in Fast lock Mode. To change the VCO output frequency and/or channel spacing, click on the text of the “RF VCO Output Frequency”. The output frequency window will appear and you can change this value. In addition frequency hopping and sweeping can now be performed

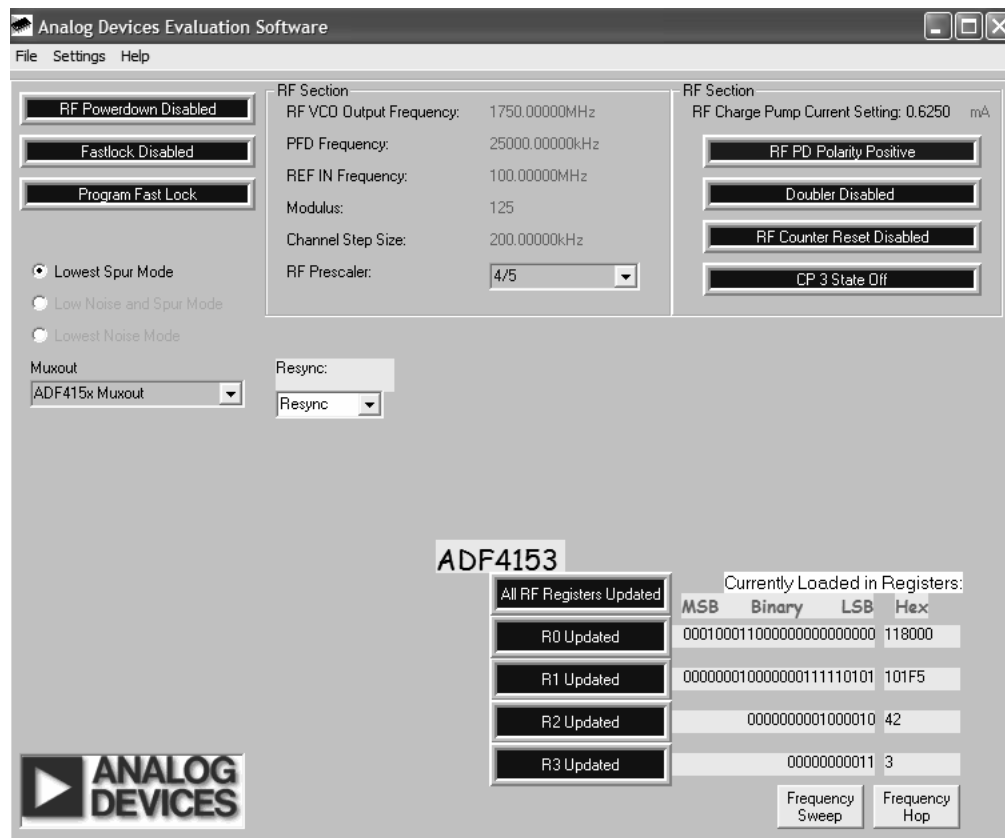


Figure 7. Software Front Panel

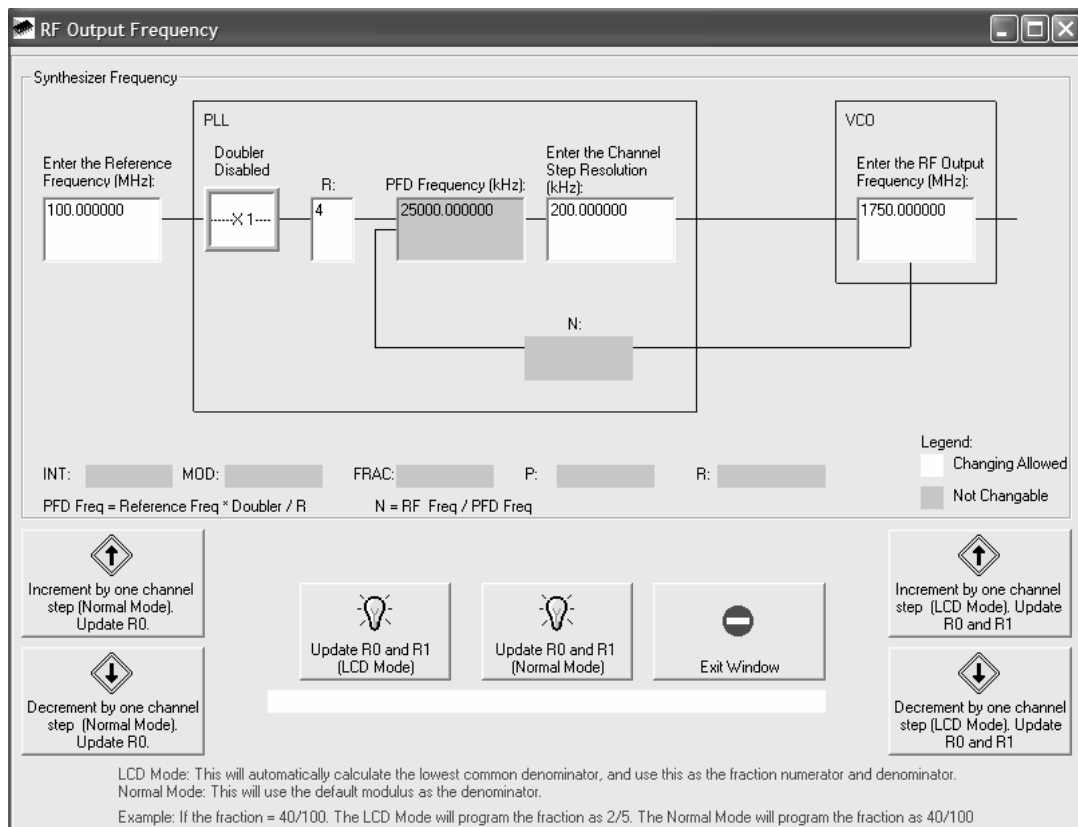
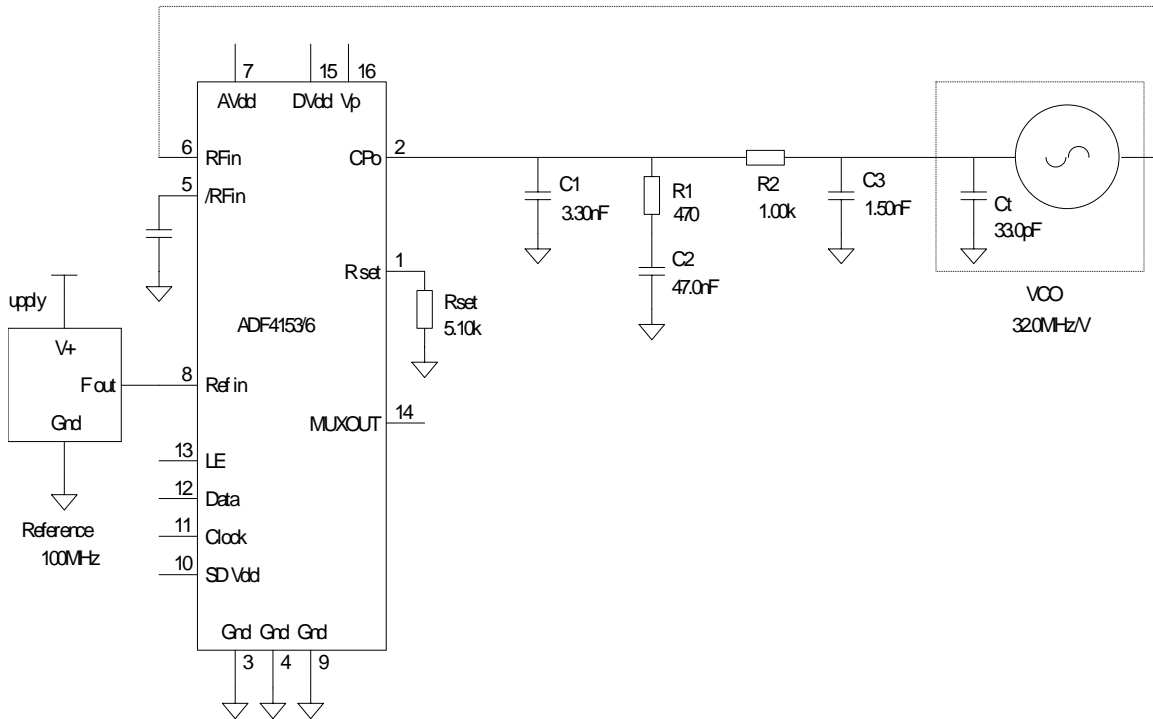
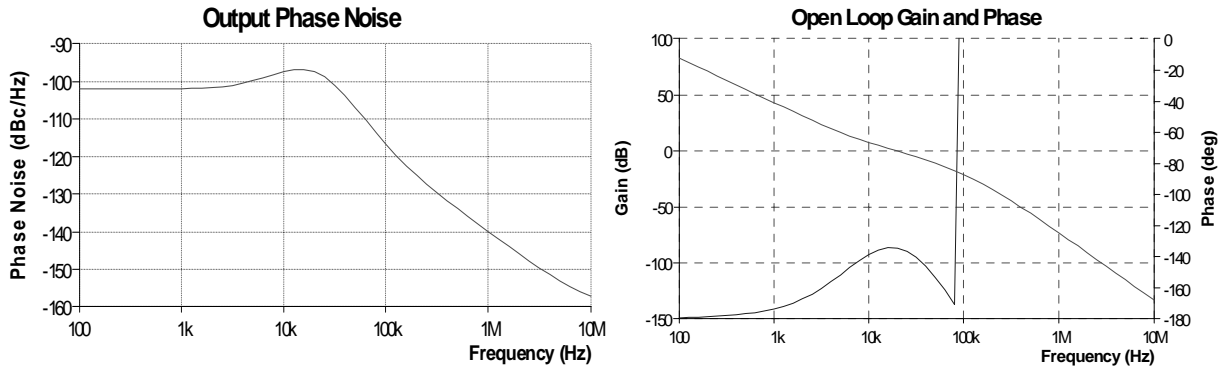


Figure 8 . RF Front Panel

PLL SIMULATIONS

The ADF4153 performance can be simulated using ADI simPLL v2.5. The file has been provided on the CD that shows the performance of the evaluation board. The latest version of simPLL can be downloaded at www.analog.com/pll



- Notes:
1. TSSOP pin numbers shown
 2. AVdd Analog Power supply
 3. DVdd Digital Power Supply
 4. Vp Charge Pump power supply
 5. AVdd = DVdd, Vp >= DVdd, AVdd
 6. Consult manufacturer's data sheet for full details

Figure 12. ADIsimPLL

BILL OF MATERIALS

C1	CAP	3.3nF	2012	Mouser 810-C2012COG1H332J
C2	CAP	47nF	0805	FEC 578-204
C3	CAP	1.5nF	1618	Mouser 810-C1618COG1H152J
C4	CAP	0.1uF	0603	FEC 499-675
C5	CAP	10pF	0603	FEC 499-110
C6	CAP	0.1uF	0603	FEC 499-675
C7	CAP	10pF	0603	FEC 499-110
C8	CAP+	22uF 6.3V	CAP\TAJ_A	FEC 197-038
C9	CAP	10pF	0603	FEC 499-110
C10	CAP	0.1uF	0603	FEC 499-675
C11	CAP	10pF	0603	FEC 499-110
C12	CAP+	22uF 6.3V	CAP\TAJ_A	FEC 197-038
C13	CAP	10pF	0603	FEC 499-110
C14	CAP	1nF	0603	FEC 317-202
C15	CAP	1nF	0603	FEC 317-202
C16	CAP	100pF	0603	FEC 499-122
C17	CAP	100pF	0603	FEC 499-122
C18	CAP	100pF	0603	FEC 499-122
C19	CAP	100pF	0603	FEC 499-122
C20	CAP+	1uF	CAP\TAJ_A	FEC 498-701
C21	CAP	10nF	0603	FEC 499-146
C22	CAP+	4.7uF 10V	CAP\TAJ_A	FEC 498-658
C23	CAP+	1uF	CAP\TAJ_A	FEC 498-701
C24	CAP	10nF	0603	FEC 499-146
C25	CAP+	4.7uF 10V	CAP\TAJ_A	FEC 498-658
D1	LED	Green	LED	
D2	DIODE		DO35	FEC 365-117
D3	SD103C	6.2V	DO35	SD103C
D4	LED	Red	LED	FEC 657-130
J1	CON-DB9HM		DB9-HM	FEC 150-750
J2	SMA		SMA_EDGE	Johnson Components 142-0701-851
J3	SMA		SMA_EDGE	Johnson Components 142-0701-851
J4	SMA		SMA_EDGE	Johnson Components 142-0701-851
J5	SMA		SMA_EDGE	Johnson Components 142-0701-851
J6	SMA		SMA_EDGE	Johnson Components 142-0701-851
J7	SMA		SMA_EDGE	Johnson Components 142-0701-851
J8	SMA		SMA_EDGE	Johnson Components 142-0701-851
J9	SMA		SMA_EDGE	Johnson Components 142-0701-851
J10	SMA		SMA_EDGE	Johnson Components 142-0701-851
LK1	JUMPER2\SIP3		LINK-3P	FEC 512-047 & FEC 150-410
LK2	JUMPER-2		JUMPER_2	FEC 512-035 & FEC 150-410

LK3	JUMPER2\SIP3		LINK-3P	FEC 512-047 & FEC 150-410
LK4	JUMPER2\SIP3		LINK-3P	FEC 512-047 & FEC 150-410
LK5	JUMPER2\SIP3		LINK-3P	FEC 512-047 & FEC 150-410
P1	BATT_PP3		BATT_PP3	FEC 723-988
P1	9V PP3 Battery			FEC 908-526
R1A	RES		0805	
R1	RES	470R	0603	FEC 911-197
R2	RES	1K	0603	FEC 911-239
R3	RES	5k1	0603	FEC 357-1488
R4	RES	330R	0603	FEC 911-143
R5	RES	330R	0603	FEC 911-143
R6	RES	330R	0603	FEC 911-143
R7	RES	18R	0603	FEC 911-021
R8	RES	18R	0603	FEC 911-021
R9	RES	18R	0603	FEC 911-021
R10	RES	51r	0603	Digikey 311-51GCT-ND
R11	RES	0R	0603	FEC 772-227
R12	RES	10K	0603	FEC 911-355
R13	RES	10K	0603	FEC 911-355
R14	RES	0r	0603	FEC 772-227
R15	RES	0r	0603	
R16	RES	0r	0603	FEC 772-227
R17	RES	51r	0603	
R18	RES	0r	0603	FEC 772-227
R19	RES	330K	0603	FEC 911-537
R20	RES	330K	0603	FEC 911-537
R21	RES	4K7	0805	FEC 911-318
S1	SW_POWER		SW_SIP-3P	FEC 150-559
T1	TESTPOINT		TESTPOINT	FEC-240-345
T2	TESTPOINT		TESTPOINT	FEC-240-345
T3	TESTPOINT		TESTPOINT	FEC-240-345
T4	TESTPOINT		TESTPOINT	FEC-240-345
T5	TESTPOINT		TESTPOINT	FEC-240-345
T6	TESTPOINT		TESTPOINT	FEC-240-345
T7	TESTPOINT		TESTPOINT	FEC-240-345
T8	TESTPOINT		TESTPOINT	FEC-240-345
T9	TESTPOINT		TESTPOINT	FEC-240-345
T10	TESTPOINT		TESTPOINT	FEC-240-345
T11	TESTPOINT		TESTPOINT	FEC-240-345
T12	TESTPOINT		TESTPOINT	FEC-240-345
T13	TESTPOINT		TESTPOINT	FEC-240-345
U1	ADF411X		TSSOP-16	ADF4153BRU
U2	ADP3300		SOT23-6	ADP3300ART-3
U3	ADP3300		SOT23-6	ADP3300ART-5
Y1	VCO190-1750T		VCO190-1750T	Vari-L VCO190-1750T
Y2	OSC_TCXO	10.0MHz	OSC_TCXO	Fox 801BE
Corners	Rubber Stick-On Feet x4			FEC 148-922

	Bare PCB			Eval-ADF411xEB1 Rev. B1
	RF Eval Board Cable			Aragorn Services
	Fractional-N Synthesizer CD			ADI Issue
	Barcode Label			Eval-ADF4153EB1
	Eval Board Box			Europaks K-645/1
	Anti-Static Bag			FEC 522-764
	Anti-Static Bubble Wrap			

NOTES

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