Evaluation Board For Fractional-N PLL Frequency Synthesizer

EVAL-ADF4153EB1

FEATURES

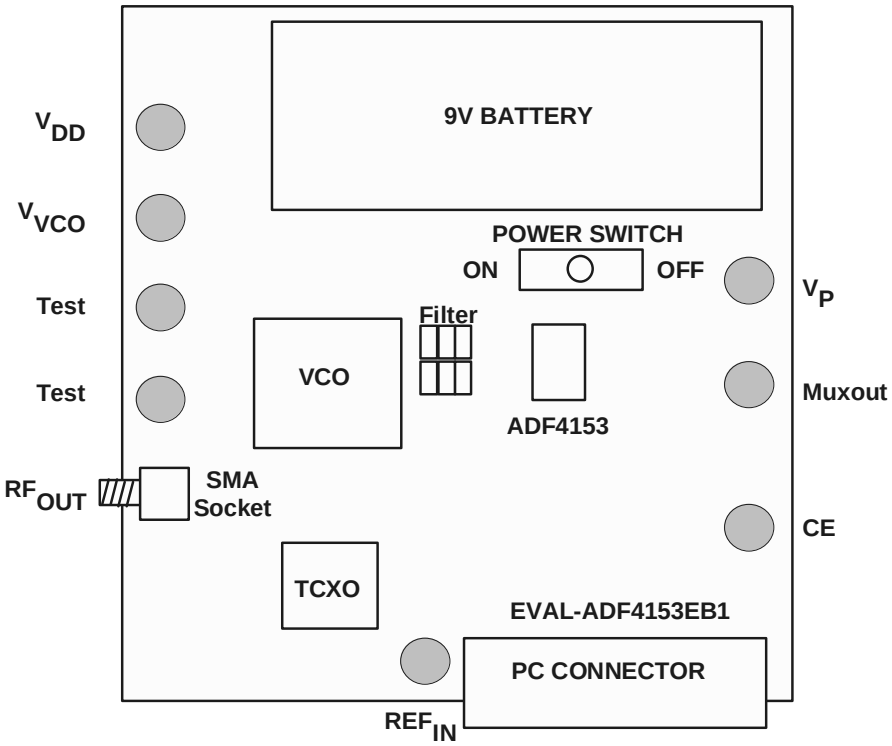
Self-Contained Board including Synthesizer, VCO and Loop Filter (1.7 to 1.8GHz)
Designed for 10MHz PFD Spacing & 20kHz Loop Bandwidth
Accompanying Software allows complete control of synthesizer functions from PC
Battery Operated: Choice of 3V or 5V supplies
Typical Phase Noise Performance of -103dBc/Hz @ 1kHz offset

GENERAL DESCRIPTION

This board is designed to allow the user to evaluate the performance of the ADF4106 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, 10MHz TCXO for the reference input, SMA connectors for the power supplies and RF output. There is also a low pass loop filter (20kHz) and a VCO (Vaari-L VCO190-1750T) on board. The eval board is setup for a 10MHz PFD comparison frequency. A cable is included with the board to connect to a pc printer port.

The package also contains windows software to allow easy programming of the synthesizer.

BLOCK DIAGRAM



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Tel: 781-329-4700 **Fax: 781-326-8703**

Hardware Description

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 3 and 4.

Loop Filter Components:

Loop component values shown in the circuit diagram are for 1.75GHz RF output, 2.5mA CP current, VCO190-1750T VCO, 10MHz PFD frequency, 20kHz loop bandwidth, phase margin = 45 degrees. N = 175.

On the evaluation kit CD is a copy of ADIsimPLL software. This allows the user to create new filter designs and model the frequency and time domain responsees of these loops. It also has a useful report and schematic option.

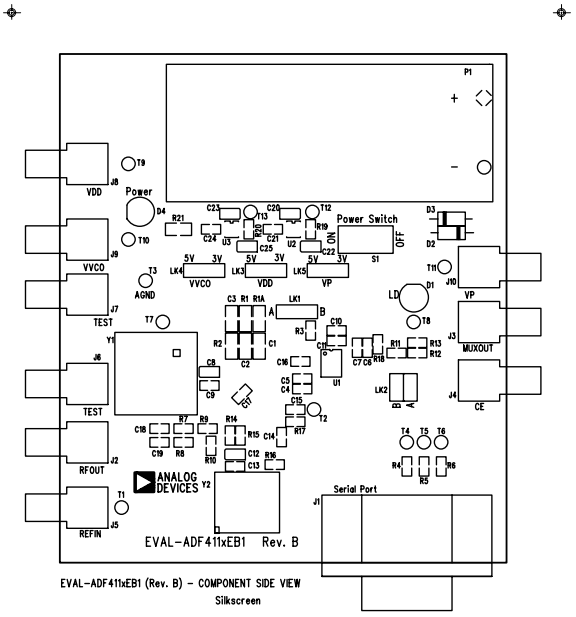
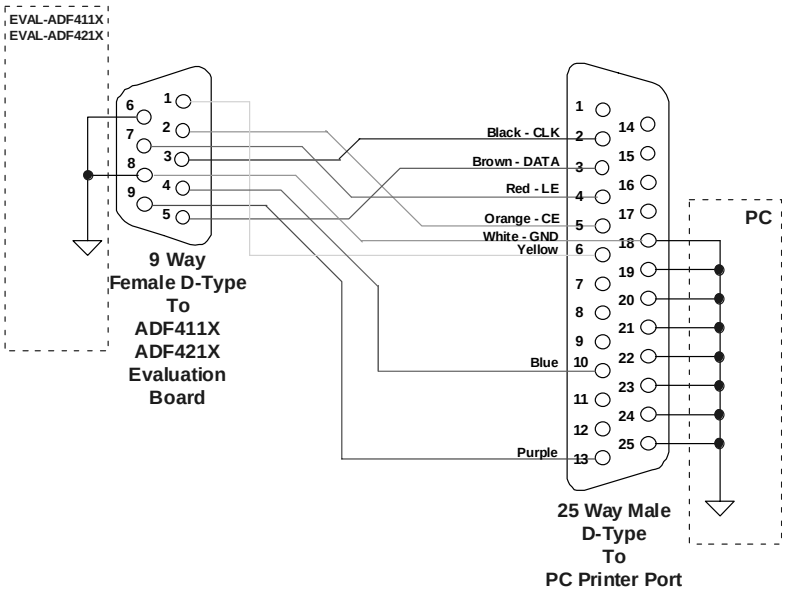


Figure 1. Evaluation Board Silkscreen

The board is powered from a single 9V battery. The power supply ciruitry allows the user to choose 3V for the ADF4153 V_{DD} and either 3V or 5V for the ADF4106 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 damage the device.**

All components necessary for LO generation are catered for on-board. The 10MHz TCXO from Fox provides the necessary Reference Input. The PLL is made up of the ADF4153, passive loop filter (20kHz) and the VCO190-1750T VCO from Vari-L. The output is available at RFOUT through a standard SMA connector. If the user wishes they may use their own power supplies and reference input. In this case, they need to insert SMA connectors to as shown on the silkscreen and block diagram.



ADF411X/ADF421X CABLE CONNECTIONS Rev 2 (15/3/99)

Figure 2. PC Cable Diagram

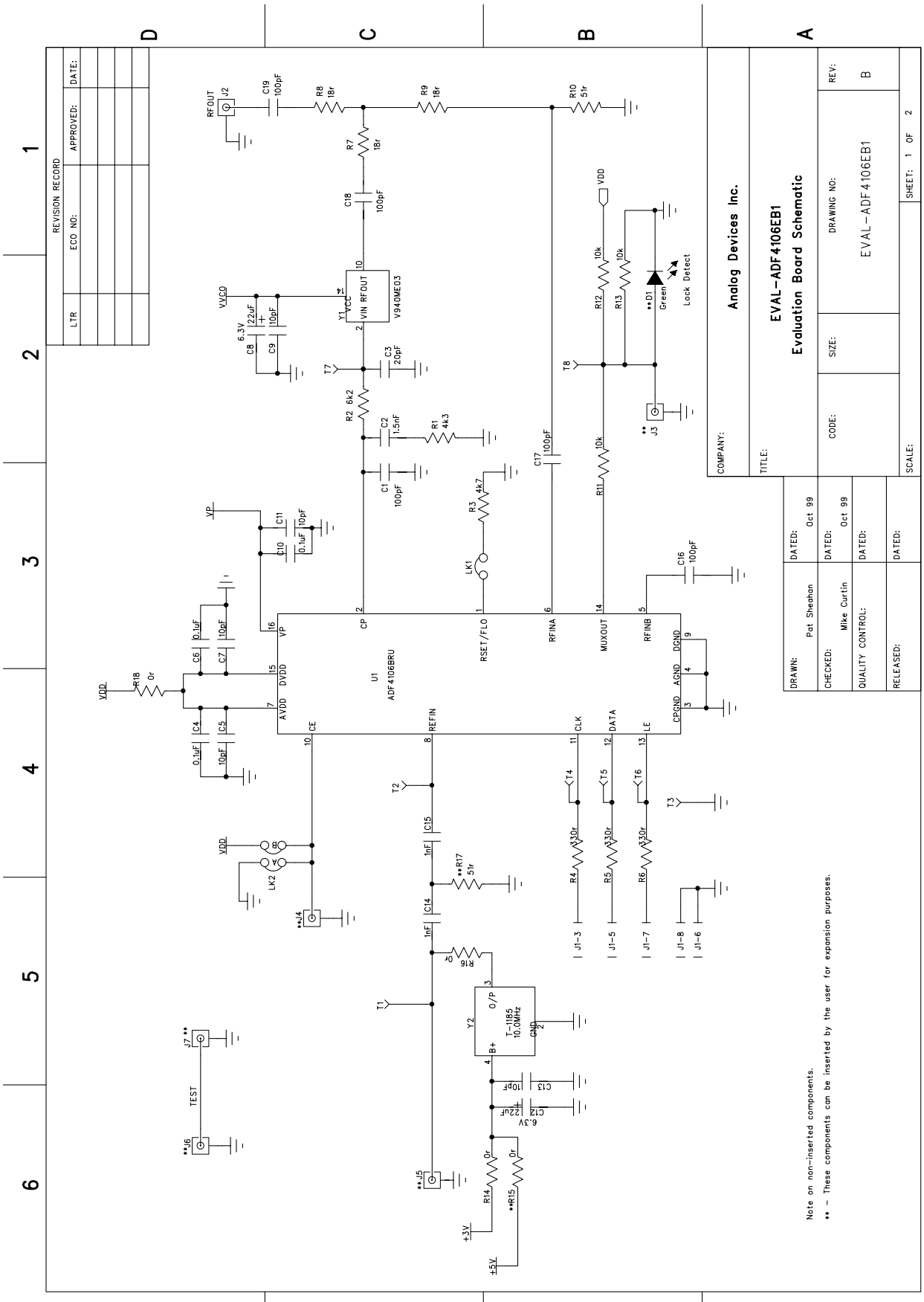


Figure 3. Evaluation Board Circuit Diagram (Page 1)

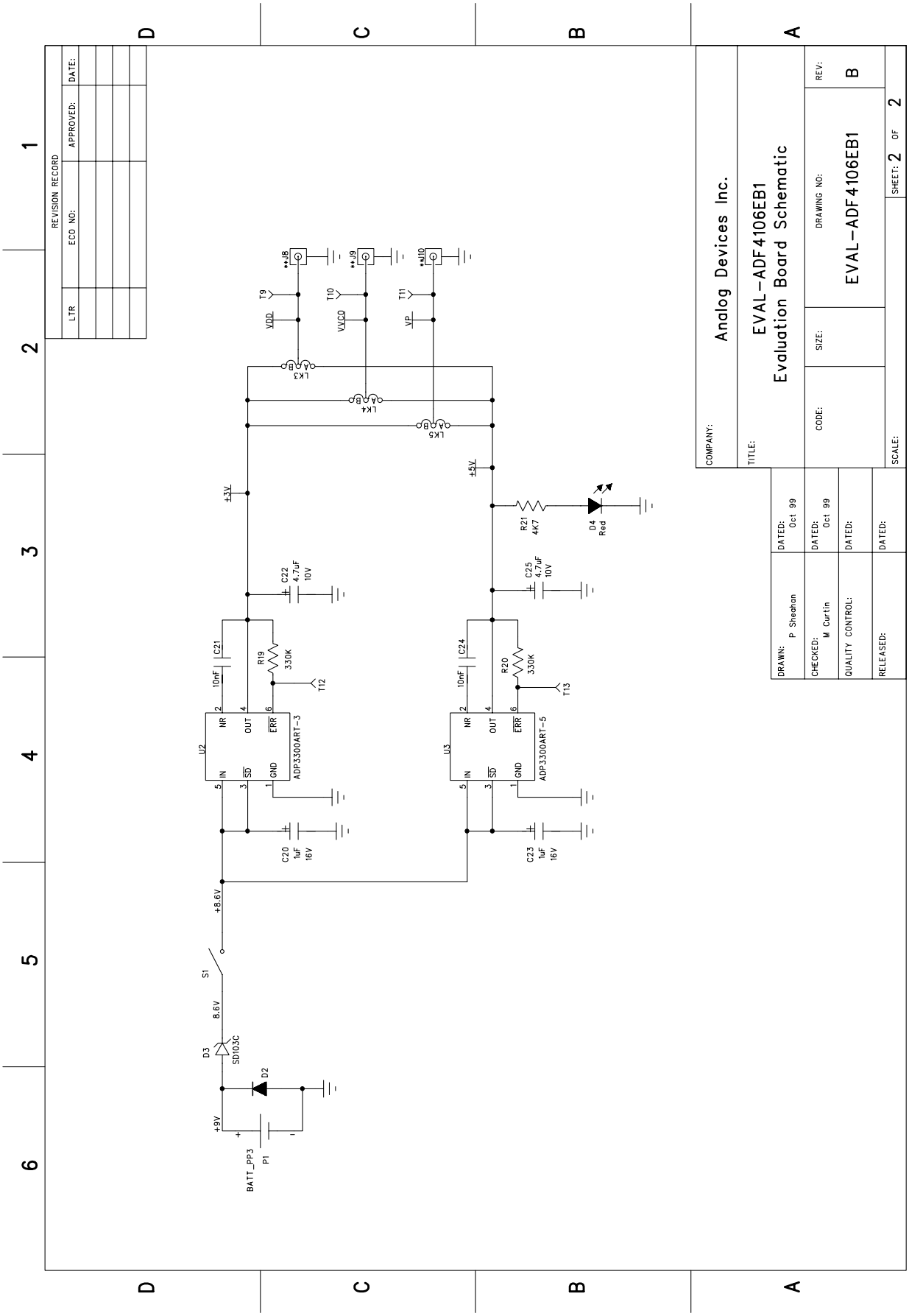
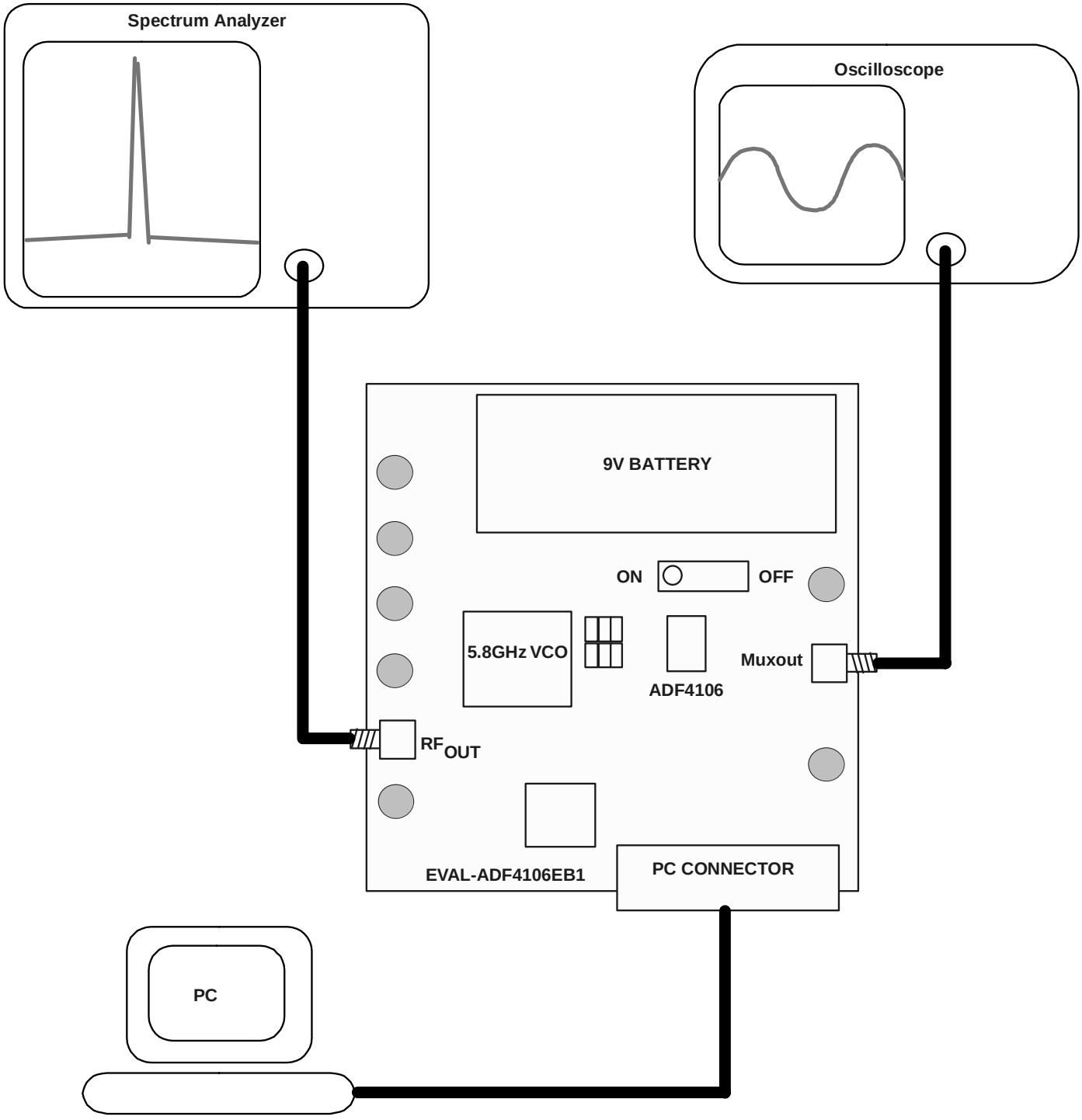


Figure 4. Evaluation Board Circuit Diagram (Page 2)



Evaluation Setup

Software Description

The software comes on a CD. If the user double clicks on "setup.exe", then the install wizard installs the software. Follow the on-screen directions. The software will be installed in a default directory called "C:/Program Files/ Analog Devices/ADF_Frac". To run the software, click on ADF_Frac_Rev2.exe.

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

The Main Interface window will now appear. (See Figure 5)

Click on Update All registers. The data is now set up, and other features can now be examined by the user.

To change RF VCO Output Frequency and/or channel spacing, click on the text of the RF VCO Output Frequency. The Output Frequency window will appear. Click on Charge Pump Current Setting and the Current Setting window will appear. Grab the pointer to set the Charge Pump Current Setting. Click OK.

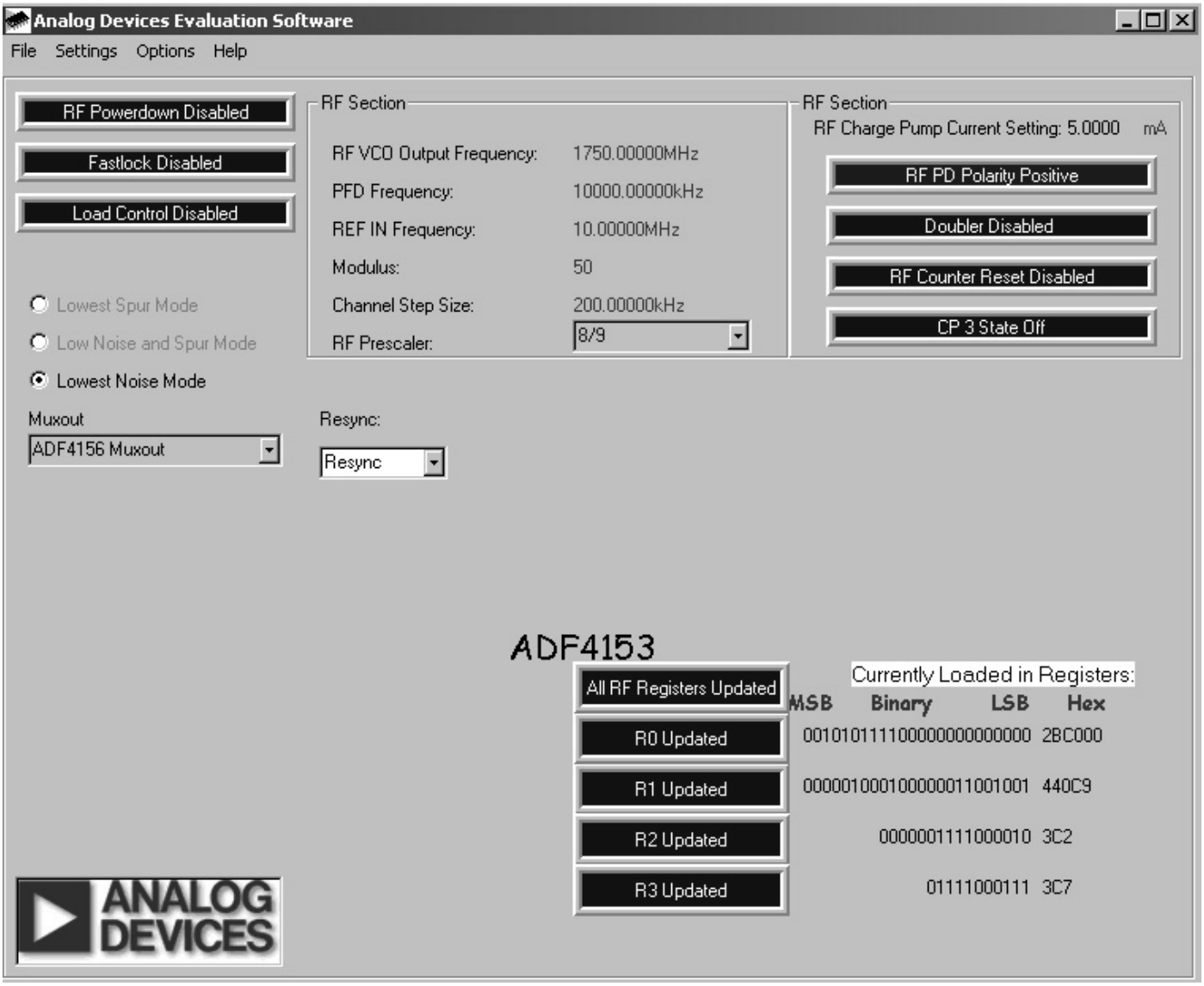


Figure 5. Software Front Panel

Table 1. Bill of Materials for the EVAL-ADF4153EB1 (page 1 of 2)

Name	Part Type	Value	PCB Decal	Stock Code	SMD	Assemble	Layer Name	Pos X	Pos Y
C1	CAP	100pF	0805	FEC 499-171	Yes	Yes	Top	1400	-2025
C2	CAP	1.5nF	0805	Digikey PCC2156CT-ND	Yes	Yes	Top	1300	-2025
C3	CAP	20pF	0805		Yes	Yes	Top	1200	-1825
C4	CAP	0.1uF	0603	FEC 499-675	Yes	Yes	Top	1737.5	-2262.5
C5	CAP	10pF	0603	FEC 499-110	Yes	Yes	Top	1662.5	-2262.5
C6	CAP	0.1uF	0603	FEC 499-675	Yes	Yes	Top	2112.5	-2037.5
C7	CAP	10pF	0603	FEC 499-110	Yes	Yes	Top	2187.5	-2037.5
C8	CAP+	22uF 6.3V	CAP\TAJ_A	FEC 197-038	Yes	Yes	Top	1037.5	-2212.5
C9	CAP	10pF	0603	FEC 499-110	Yes	Yes	Top	1037.5	-2312.5
C10	CAP	0.1uF	0603	FEC 499-675	Yes	Yes	Top	1950	-1875
C11	CAP	10pF	0603	FEC 499-110	Yes	Yes	Top	1975	-1975
C12	CAP+	22uF 6.3V	CAP\TAJ_A	FEC 197-038	Yes	Yes	Top	1225	-2812.5
C13	CAP	10pF	0603	FEC 499-110	Yes	Yes	Top	1225	-2900
C14	CAP	1nF	0603	FEC 317-202	Yes	Yes	Top	1562.5	-2687.5
C15	CAP	1nF	0603	FEC 317-202	Yes	Yes	Top	1662.5	-2487.5
C16	CAP	100pF	0603	FEC 499-122	Yes	Yes	Top	1700	-2137.5
C17	CAP	100pF	0603	FEC 499-122	Yes	Yes	Top	1500	-2200
C18	CAP	100pF	0603	FEC 499-122	Yes	Yes	Top	675	-2625
C19	CAP	100pF	0603	FEC 499-122	Yes	Yes	Top	675	-2725
C20	CAP+	1uF	CAP\TAJ_A	FEC 498-701	Yes	Yes	Top	1625	-1062.5
C21	CAP	10nF	0603	FEC 499-146	Yes	Yes	Top	1500	-1175
C22	CAP+	4.7uF 10V	CAP\TAJ_A	FEC 498-658	Yes	Yes	Top	1775	-1300
C23	CAP+	1uF	CAP\TAJ_A	FEC 498-701	Yes	Yes	Top	1187.5	-1062.5
C24	CAP	10nF	0603	FEC 499-146	Yes	Yes	Top	1050	-1175
C25	CAP+	4.7uF 10V	CAP\TAJ_A	FEC 498-658	Yes	Yes	Top	1312.5	-1300
D1	LED	Green	LED		No	No	Top	2525	-1625
D2	DIODE		DO35	FEC 365-117	No	Yes	Top	3000	-1200
D3	SD103C	6.2V	DO35	SD103C	No	Yes	Top	2600	-1100
D4	LED	Red	LED	FEC 657-130	No	Yes	Top	175	-300
J1	CON-DB9HM		DB9-HM	FEC 150-750	No	Yes	Top	2525	-3700
J2	SMA		SMA_90DEG	Pasternack PE4118	No	Yes	Top	150	-700
J3	SMA		SMA_90DEG		No	No	Top	150	-1250
J4	SMA		SMA_90DEG		No	No	Top	3000	-1450
J5	SMA		SMA_90DEG		No	No	Top	150	-3200
J6	SMA		SMA_90DEG		No	No	Top	3000	-2275
J7	SMA		SMA_90DEG		No	No	Top	150	-2725
J8	SMA		SMA_90DEG		No	No	Top	3000	-1850
J9	SMA		SMA_90DEG		No	No	Top	150	-1650
J10	SMA		SMA_90DEG		No	No	Top	150	-2300
LK1	JUMPER2\SIP3		LINK-3P	FEC 512-047 & FEC 150-410	No	Yes	Top	1575	-1775
LK2	JUMPER-2		JUMPER_2	FEC 512-035 & FEC 150-410	No	Yes	Top	2500	-2275
LK3	JUMPER2\SIP3		LINK-3P	FEC 512-047 & FEC 150-410	No	Yes	Top	1350	-1475
LK4	JUMPER2\SIP3		LINK-3P	FEC 512-047 & FEC 150-410	No	Yes	Top	900	-1475
LK5	JUMPER2\SIP3		LINK-3P	FEC 512-047 & FEC 150-410	No	Yes	Top	1800	-1475
P1	BATT_PP3		BATT_PP3	FEC 723-988	No	Yes	Top	2925	-225
P1	9V PP3 Battery			FEC 908-526	No	Yes	Top	2925	-225
R1A	RES		0805		Yes	No	Top	1400	-1825
R1	RES	4k3	0805	FEC 321-8132	Yes	Yes	Top	1300	-1825
R2	RES	6k2	0805	FEC 321-8156	Yes	Yes	Top	1200	-2025
R3	RES	4k7	0603	FEC 911-318	Yes	Yes	Top	1775	-1912.5
R4	RES	330R	0603	FEC 911-143	Yes	Yes	Top	2525	-3000
R5	RES	330R	0603	FEC 911-143	Yes	Yes	Top	2625	-3000
R6	RES	330R	0603	FEC 911-143	Yes	Yes	Top	2725	-3000
R7	RES	18R	0603	FEC 911-021	Yes	Yes	Top	850	-2625
R8	RES	18R	0603	FEC 911-021	Yes	Yes	Top	850	-2725
R9	RES	18R	0603	FEC 911-021	Yes	Yes	Top	1025	-2625
R10	RES	51r	0603	Digikey 311-51GCT-ND	Yes	Yes	Top	1050	-2750

Table 1. Bill of Materials for the EVAL-ADF4153EB1 (page 2 of 2)

R11	RES	10K	0603	FEC 911-355	Yes	Yes	Top	2400	-2075
R12	RES	10K	0603	FEC 911-355	Yes	Yes	Top	2550	-2075
R13	RES	10K	0603	FEC 911-355	Yes	Yes	Top	2550	-2000
R14	RES	0r	0603	FEC 772-227	Yes	Yes	Top	1187.5	-2650
R15	RES	0r	0603		Yes	No	Top	1262.5	-2650
R16	RES	0r	0603	FEC 772-227	Yes	Yes	Top	1512.5	-2887.5
R17	RES	51r	0603		Yes	No	Top	1662.5	-2575
R18	RES	0r	0603	FEC 772-227	Yes	Yes	Top	2262.5	-2037.5
R19	RES	330K	0603	FEC 911-537	Yes	Yes	Top	1775	-1175
R20	RES	330K	0603	FEC 911-537	Yes	Yes	Top	1325	-1175
R21	RES	4K7	0805	FEC 911-318	Yes	Yes	Top	500	-300
S1	SW_POWER		SW_SIP-3P	FEC 150-559	No	Yes	Top	2275	-1250
T1	TESTPOINT		TESTPOINT	FEC-240-345	No	Yes	Top	400	-3200
T2	TESTPOINT		TESTPOINT	FEC-240-345	No	Yes	Top	1800	-2487.5
T3	TESTPOINT		TESTPOINT	FEC-240-345	No	Yes	Top	575	-1550
T4	TESTPOINT		TESTPOINT	FEC-240-345	No	Yes	Top	2675	-2625
T5	TESTPOINT		TESTPOINT	FEC-240-345	No	Yes	Top	2675	-2725
T6	TESTPOINT		TESTPOINT	FEC-240-345	No	Yes	Top	2675	-2825
T7	TESTPOINT		TESTPOINT	FEC-240-345	No	Yes	Top	700	-1850
T8	TESTPOINT		TESTPOINT	FEC-240-345	No	Yes	Top	2525	-1850
T9	TESTPOINT		TESTPOINT	FEC-240-345	No	Yes	Top	450	-700
T10	TESTPOINT		TESTPOINT	FEC-240-345	No	Yes	Top	450	-1250
T11	TESTPOINT		TESTPOINT	FEC-240-345	No	Yes	Top	2750	-1450
T12	TESTPOINT		TESTPOINT	FEC-240-345	No	Yes	Top	1787.5	-1050
T13	TESTPOINT		TESTPOINT	FEC-240-345	No	Yes	Top	1337.5	-1050
U1	ADF411X		TSSOP-16	ADF4153BRU	Yes	Yes	Top	1925	-2150
U2	ADP3300		SOT23-6	ADP3300ART-5	Yes	Yes	Top	1650	-1175
U3	ADP3300		SOT23-6	ADP3300ART-3	Yes	Yes	Top	1200	-1175
Y1	VCO190-1750T		VCO190-1750T	Vari-L VCO190-1750T	Yes	Yes	Top	650	-2225
Y2	OSC_TCXO	10.0MHz	OSC_TCXO	Fox 801BE	Yes	Yes	Top	1312.5	-3162.5
Corners	Rubber Stick-On Feet x4			FEC 148-922					
	Bare PCB			Eval-ADF411xEB1 Rev. B					
	RF Eval Board Cable			Aragorn Services					
	CD & Sleeve			ADI Issue					