



# Evaluation Board For PLL Frequency Synthesizer

EVAL-ADF421XEB1

## FEATURES

General Purpose PLL Evaluation Board excluding Synthesizer, VCOs, Loop Filters for generating generic PLL standards.

Compatible with ADF4210 and ADF4216 synthesizer families.

Accompanying Software allows complete control of synthesizer functions from PC

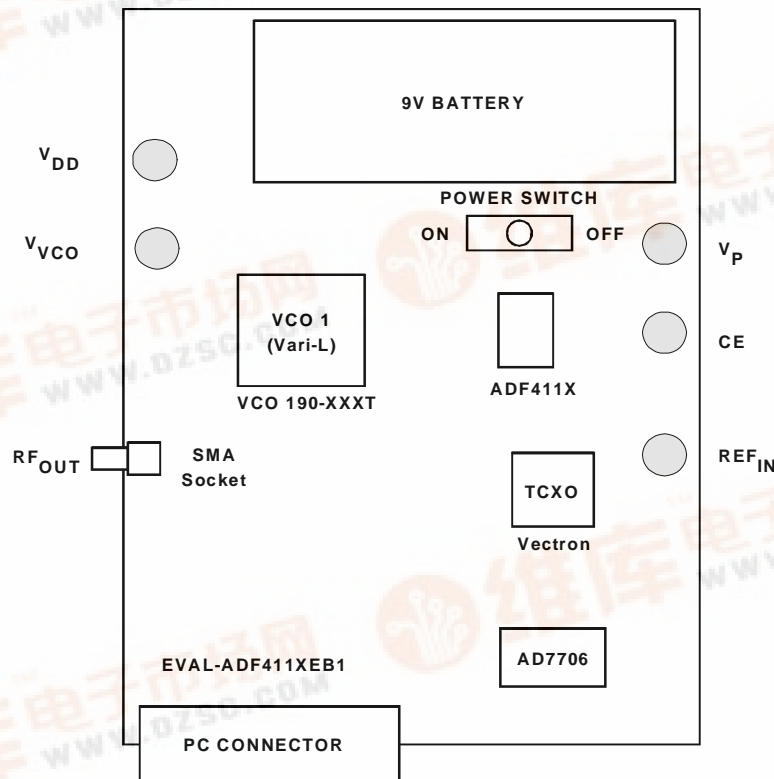
Battery Operated: Choice of 3V or 5V supplies

## GENERAL DESCRIPTION

This board is designed to allow the user to evaluate the performance of the ADF421X Frequency Synthesizer for PLL's (Phase Locked Loops). The block diagram of the board is shown below. It contains the footprint for a ADF421X synthesizer, a pc connector, SMA connector for the reference input, power supplies and RF output. There is also a footprint for a loop filter and a VCO for both the RF and IF section on board. 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



## 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.

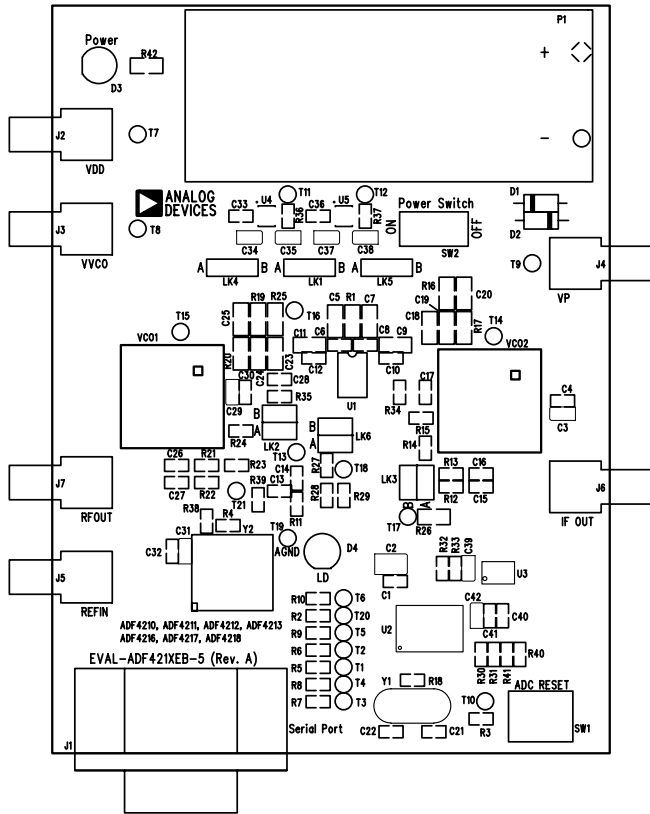


Figure 1. Evaluation Board Silkscreen

The board is powered from a single 9V battery. The power supply circuitry allows the user to choose either 3V or 5V for the ADF4113  $V_{DD}$  and  $V_p$ , and for the VCO supply. The default settings are 3V for the ADF411X  $V_{DD}$  and 5V for the ADF411X  $V_p$  and for the VCO supply. **It is very important to note that the ADF4113  $V_{DD}$  should never exceed the ADF411X  $V_p$ . This can damage the device.**

All components necessary for LO generation are catered for on-board. The TCXO connector provides the necessary Reference Input. The PLL is made up of the ADF411X, passive loop filter and the VCO 190-XXXX 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.

The AD7706 A/D converter is used to monitor the power supply voltage and current consumption of the ADF411X. This helps the user pick the optimum synthesizer settings for power consumption and also provides an alert if the battery

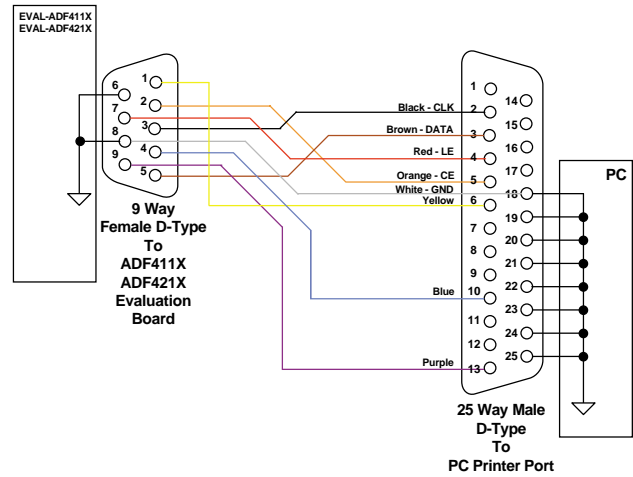


Figure 2. PC Cable Diagram

voltage is too low to sustain the required 3V or 5V for the board supply.

Loop component values shown in the circuit diagram are for 900MHz RF output, 5mA CP current, VCO190-902T, 200kHz channel spacing and 20kHz loop bandwidth.

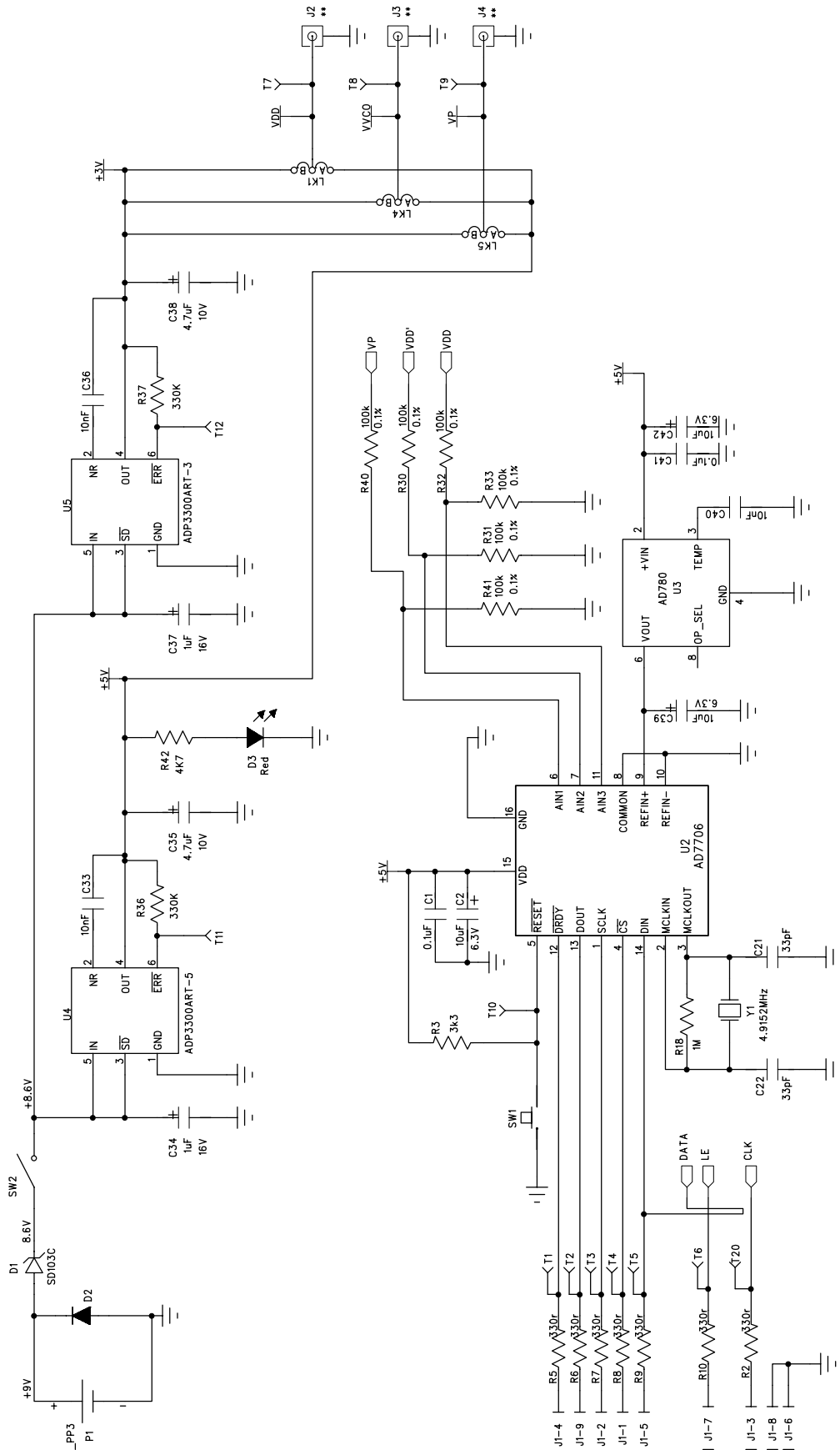


Figure 3. Evaluation Board Circuit Diagram (Page 1)

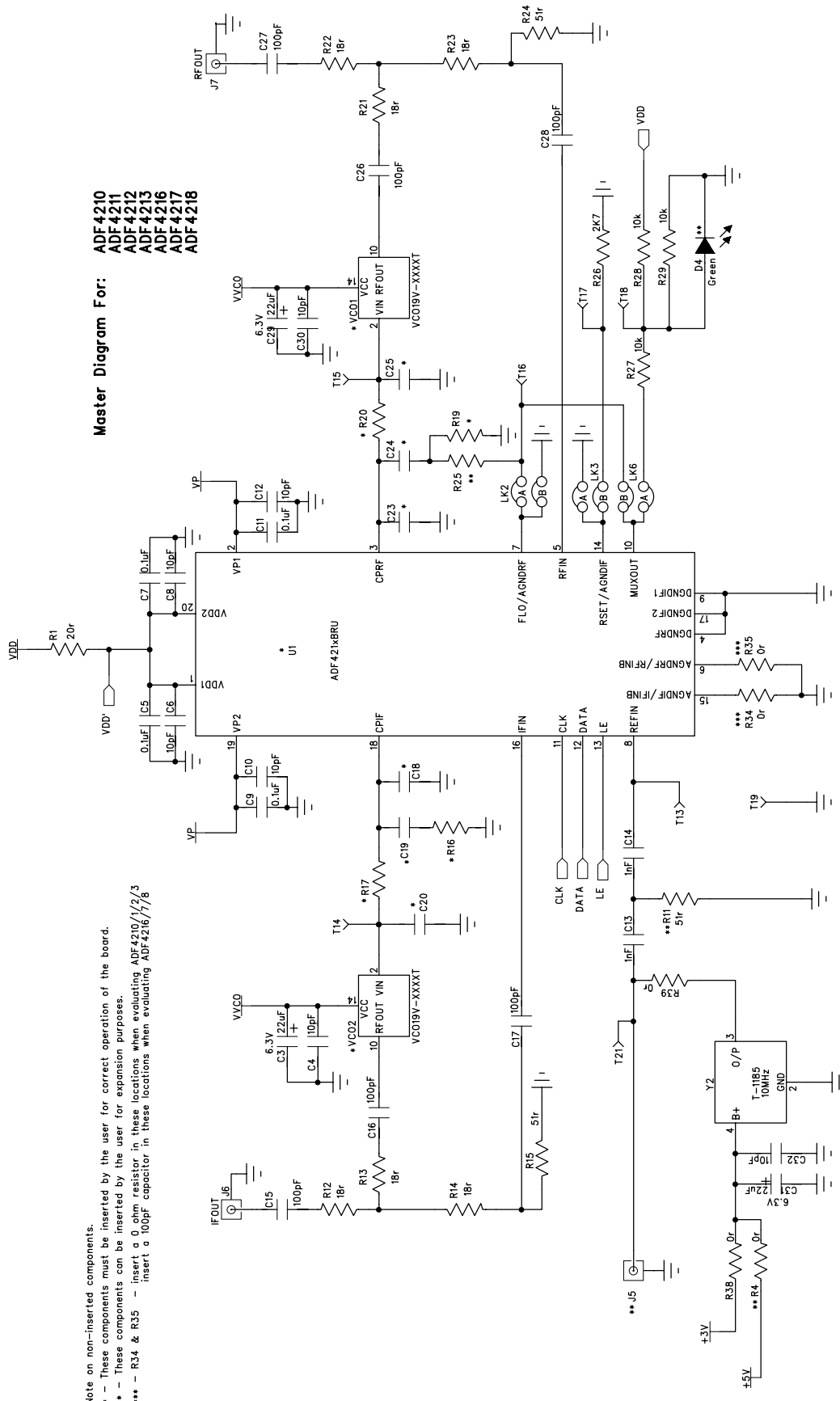


Figure 4. Evaluation Board Circuit Diagram (Page 2)

### Software Description

The software comes on a set of two floppy disks (Disk 1 and Disk 2). If the user double clicks on "setup.exe" on Disk 1, 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/Project1". To run the software, simply double-click on "adf411X.exe".

The front panel of the evaluation board software is shown below.

When the main software screen appears, follow the steps below for initial setup to interface to the part.

Click on Choose Device, and the Device window will appear. Choose the device being evaluated and click OK.

Click on Choose Port, and the Port Connector window will appear. Choose the port that the cable is connected to on the PC and click OK. (Normally LPT1)

Click on Osc In, and the Crystal Frequency window will appear. Enter the reference frequency being used and click OK.

Click on RF VCO Output Frequency, and the Output Frequency window will appear. Enter the output frequency and PFD reference frequency, and click OK.

Click On Prescaler, and the Prescaler window will appear. Grab the pointer, and choose the desired prescaler value.

Click OK.

Click on the RF PD Polarity button to set the RF PD Polarity bit High.

Click on Charge Pump Current Setting 2 or Charge Pump Current Setting 1 and the Current Setting window will appear. Grab the pointer to set the Charge Pump Current Setting. Click OK.

The data is now set up, and other features can now be examined by the user.

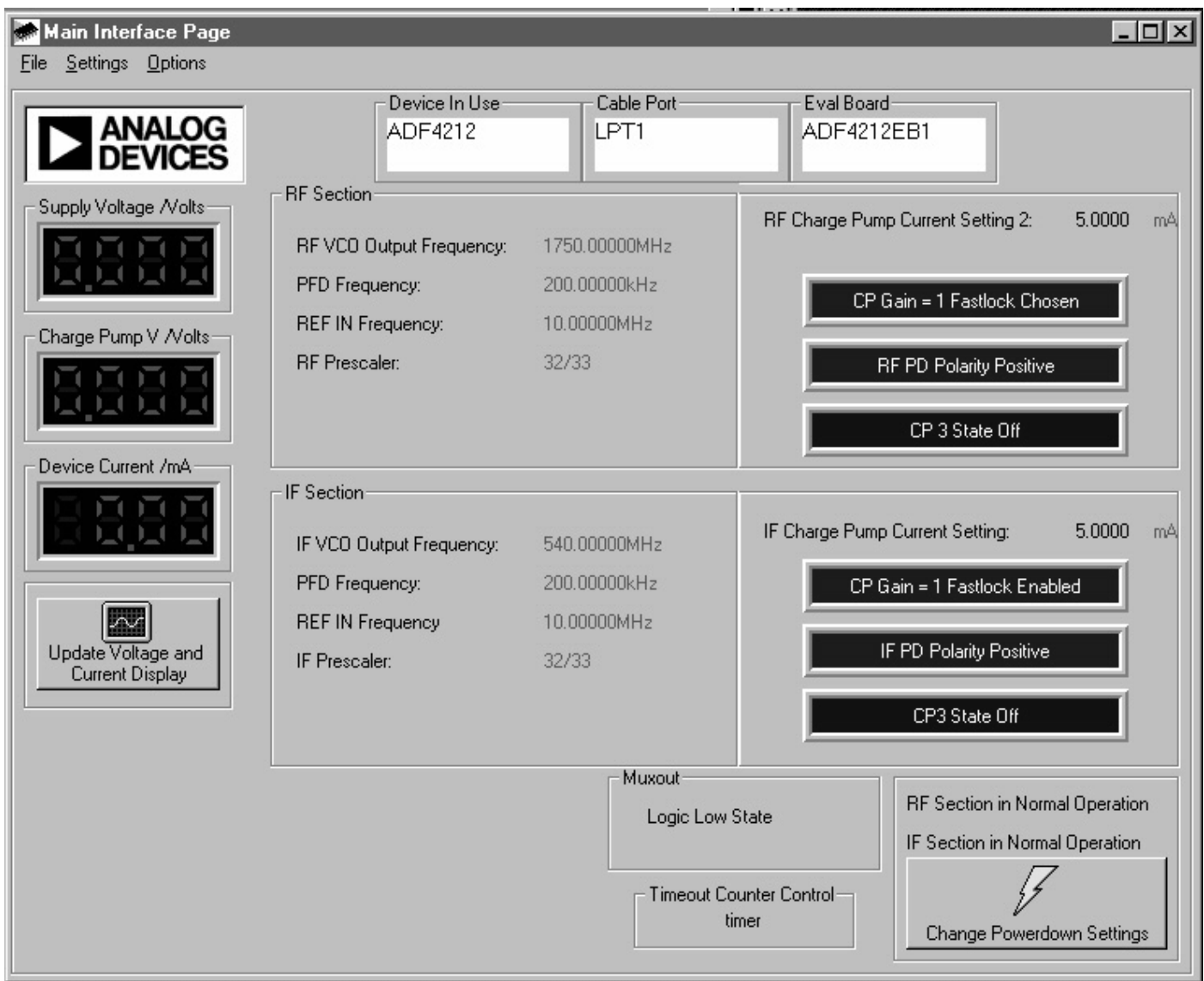


Figure 5. Software Front Panel

# EVAL-ADF421XEB1

**Table 1. Bill of Materials for the EVAL-ADF411XEB1**

Qty	Reference	Description	Manufacturer	PCB DECAL	VALUE
1	U1	Do Not Insert	ADI	TSSOP-20	
1	U2	AD7706BR	ADI	SO16WB	AD7706BR
1	U3	AD780AR	ADI	SO8NB	AD780AR
1	U4	ADP3300ART-5	ADI	SOT23-6	ADP3300ART-5
1	U5	ADP3300ART-3	ADI	SOT23-6	ADP3300ART-3
1	VCO1	Do Not Insert	Vari-L		
1	VCO2	Do Not Insert	Vari-L		
1	Y1	4.9152MHz Crystal	Vectron International	HC49 low profile	VXA1-1011
1	Y2	10 MHz TCXO	Vectron International		T-1185
1	D1	SD103C Schottky Di	General Semiconductor	DO35	SD103C
1	D2	IN4001		D035	FEC 365-117
1	D3	Red Low Power LED	Vishay	LED	FEC 657-130
1	D4	Green Low Power LED (Do Not Insert)	Vishay	LED	FEC 657-141
6	C1 C5 C7 C9 C11 C41	Multi Layer Ceramic Capacitor	Murata	Case 06	0.1uF
1	C2	Tantalum Capacitor	AVX	CAP\TAJ B	10uF 6.3V
3	C3 C29 C31	Tantalum Capacitor	AVX	CAP\TAJ A	22uF 6.3V
7	C4 C6 C8 C10 C12 C30 C32	Multi Layer Ceramic Capacitor	Murata	Case 06	10pF
2	C13-14	Multi Layer Ceramic Capacitor	Murata	Case 06	1nF
6	C15-17 C26-28	Multi Layer Ceramic Capacitor	Murata	Case 06	100pF
1	C18	Do Not Insert	Murata	Case 08	
1	C19	Do Not Insert	Murata	Case 08	
1	C20	Do Not Insert	Murata	Case 08	
2	C21-22	Multi Layer Ceramic Capacitor	Murata	Case 06	33pF
1	C23	Do Not Insert	Murata	Case 08	
1	C24	Do Not Insert	Murata	Case 08	
1	C25	Do Not Insert	Murata	Case 08	
3	C33 C36 C40	Multi Layer Ceramic Capacitor	Murata	Case 06	10nF
2	C34 C37	Tantalum Capacitor	AVX	CAP\TAJ A	1uF 16V
2	C35 C38	Tantalum Capacitor	AVX	CAP\TAJ A	4.7uF 10V
2	C39 C42	Tantalum Capacitor	AVX	CAP\TAJ A	10uF 6.3V
1	R1	Resistor (Surface Mount	Bourns	Case 08	20r 1.0%
7	R2 R5-10	Resistor (Surface Mount	Bourns	Case 06	330r 1.0
1	R3	Resistor (Surface Mount	Bourns	Case 06	3k3 1.0
1	R4	Do Not Insert	Bourns	Case 06	
1	R11	Do Not Insert	Bourns	Case 06	
6	R12-14 R21-23	Resistor (Surface Mount	Bourns	Case 06	18r 1.0%
2	R15 R24	Resistor (Surface Mount	Bourns	Case 06	51r 1.0%
1	R16	Do Not Insert		Case 08	
1	R17	Do Not Insert		Case 08	
1	R18	Resistor (Surface Mount	Bourns	Case 06	1M 1.0%
1	R19	Do Not Insert		Case 08	
1	R20	Do Not Insert		Case 08	
1	R25	Do Not Insert		Case 08	
1	R26	Resistor (Surface Mount	Bourns	Case 06	2k7 1.0
3	R27-29	Resistor (Surface Mount	Bourns	Case 06	10k 1.0
6	R30-33 R40-41	Resistor (Surface Mount	Meggitt	Case 06	100k 0.1%
2	R34-35	Do Not Insert		Case 06	
2	R36 R37	Resistor (Surface Mount	Bourns	Case 06	330k 1.0%
2	R38 R39	Resistor (Surface Mount	Bourns	Case 06	0r 1.0%
1	R42	Resistor (Surface Mount	Bourns	Case 06	4k7 1.0
1	SW1	Push Button Switch	Omron	SW\PB-SMALL	FEC 176-986
1	SW2	SPDT Switch - (Washable)	Apem	SW SIP-3P	FEC 150-559
21	T1-21	Red Testpoint	W Hughes	TESTPOINT	FEC-240-345
1	J1	9 PIN D-TYPE MALE (HORIZ)	McMurdo	DCON9M	FEC 150-750
4	J2 J3 J4 J5 J6	Do Not Insert		SMA	
2	J6 J7	GOLD 50Ω SMA SOCKET	Pasternack	SMA	PE4118
3	LK1 LK4 LK5	3 pin header	Harwin	SIP-3P	FEC 512-047
3	LK2 LK3 LK6	4 pin header (2x2)	Harwin		FEC 512-035
6	LK1-6	Shorting Shunt	Harwin		FEC 150-410
4	Each Corner	Rubber Stick-On Feet	3M		FEC 148-922
2	P1	Pair PCB snap-on battery connector	Keystone	BATT_PP3	FEC 723-988
1	P1	9V PP3 Battery	Duracell		FEC 908-526
1	PCB	EVAL-ADF421XEB-5 (Rev. A)			
		Parts Free issued by ADI.			