Evaluation Board for ADF4360-0 Integrated PLL & VCO Frequency Synthesizer

EVAL-ADF4360-0EB1

FEATURES

Self contained board for generating RF frequencies.

Flexibility for reference input, PFD frequency and loop bandwidth.

Accompanying software allows complete control of synthesizer functions from PC.

Battery operated: 9V supplies.

Typical phase noise performance of -140 dBc / Hz @ 3 MHz offset.
Typical spurious performance of -70 dBc @ 200 kHz offset, (2.5 GHz Output).

GENERAL DESCRIPTION

The ADF4360-0EB1 Evaluation board is designed to allow the user to evaluate the performance of the ADF4360-0 Frequency Synthesizer consisting of integrated PLL & VCO. A photograph is shown below. It contains the ADF4360-0BCP, a PC connector, plus SMA connectors for the RF outputs. Unpopulated SMA footprints are available for the power supplies, Chip enable (CE) and external reference input. It also contains the loop filter to complete the PLL. The evaluation board can be modified as necessary for the customers PLL requirements. A cable is included with the board to connect a PC parallel port to allow software programmability.

The package also contains windows software on CD to allow quick, user friendly programming of the synthesizer. The CD also contains numerous other PLL datasheets, tech notes, articles and ADISimPLL V2.70, Analog Devices PLL simulation software. More information is available from www.analog.com/pll

EVALUATION BOARD

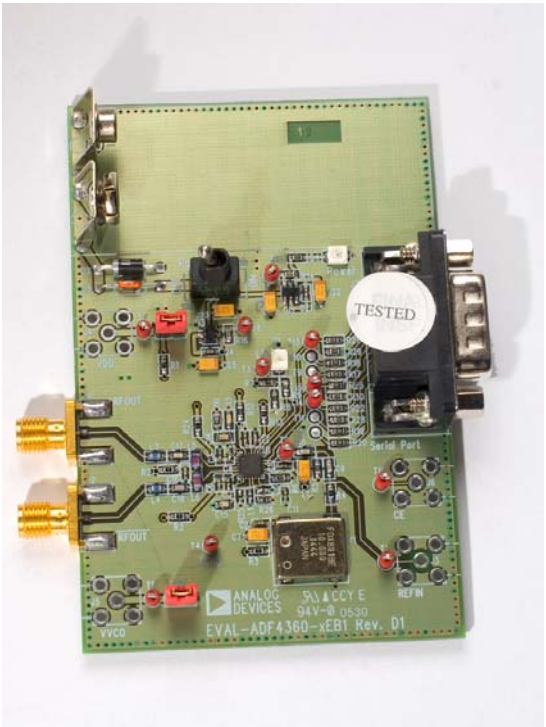

Figure 1: Evaluation Board

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One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781.329.4700 **www.analog.com**
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 4 & 5.

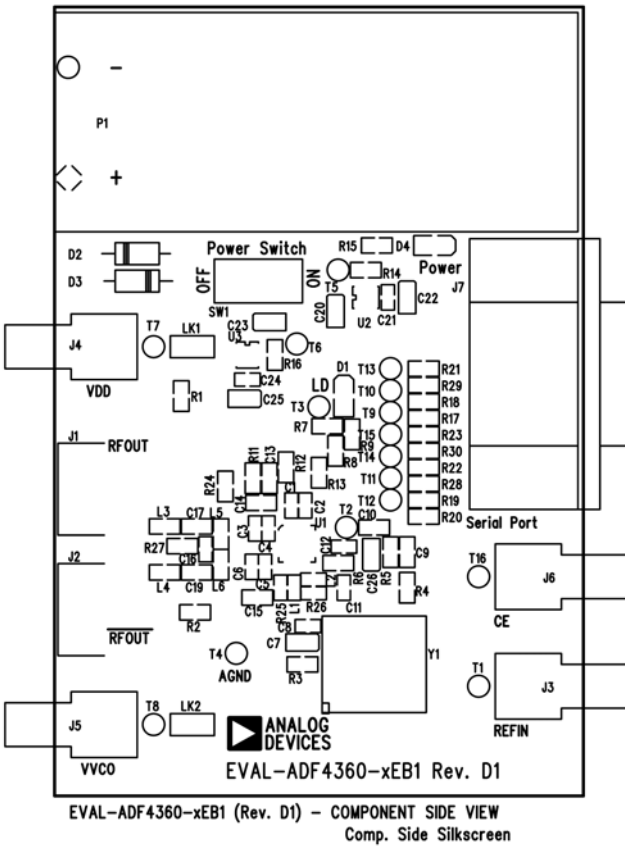

Figure 2: Evaluation Board Silkscreen – top view

The board is powered from a single 9V battery. All components necessary for LO generation are catered for on-board. A 10 MHz TCXO from Fox provides the necessary reference input. Otherwise an external reference signal can be connected via J3. The PLL comprises the ADF4360-0BCP and a passive loop filter. The VCO output from $RF_{OUT}A$ is available through the standard SMA connector J1, and the complementary $RF_{OUT}B$ VCO output is available from J2.

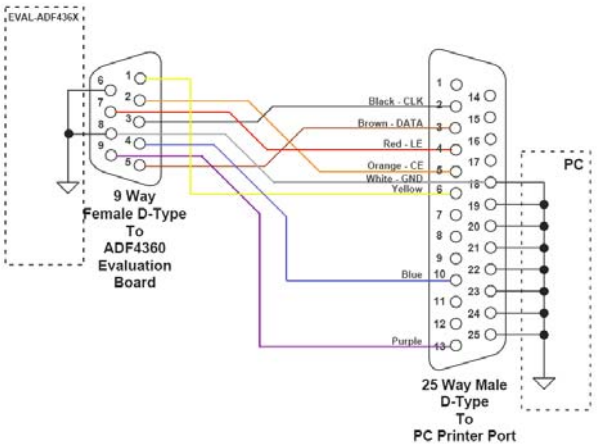

Figure 3: PC Cable Diagram

If the user wishes they may use their own power supplies using connectors J4 & J5 as shown on the silkscreen. Hardware power down using the CE pin can be controlled by inserting an SMA connector into J6 and removing R12.

The on board filter is a third order passive low pass filter. This contains three capacitors (C13, C14 & C15) plus two resistors (R10 & R11). The footprint for R10 is located on the underside of the board. The design parameters for the loop filter are for a centre frequency of 2500 MHz, PFD frequency of 200 kHz and a low pass filter bandwidth of 10 kHz. To design a filter for different frequency setups, please use ADIsimPLL.

RF OUTPUT STAGES

The output stage of the board contains a tuned load for the particular frequency of operation. The particular network inserted in the board is optimized for 2500 MHz operation. This consists of a 4.7 nH shunt inductor, a 10 pF series capacitor and a zero ohm resistor. If in doubt use a 50 Ohm resistor instead of the shunt inductor, a 100 pF bypass capacitor and a series zero ohm resistor. **It is very important that the same components be placed on the $RF_{OUT}A$ and $RF_{OUT}B$ lines, also it is essential that BOTH outputs be terminated with 50 Ohm loads.** Otherwise the output power will not be optimum, and in some cases the part may malfunction.

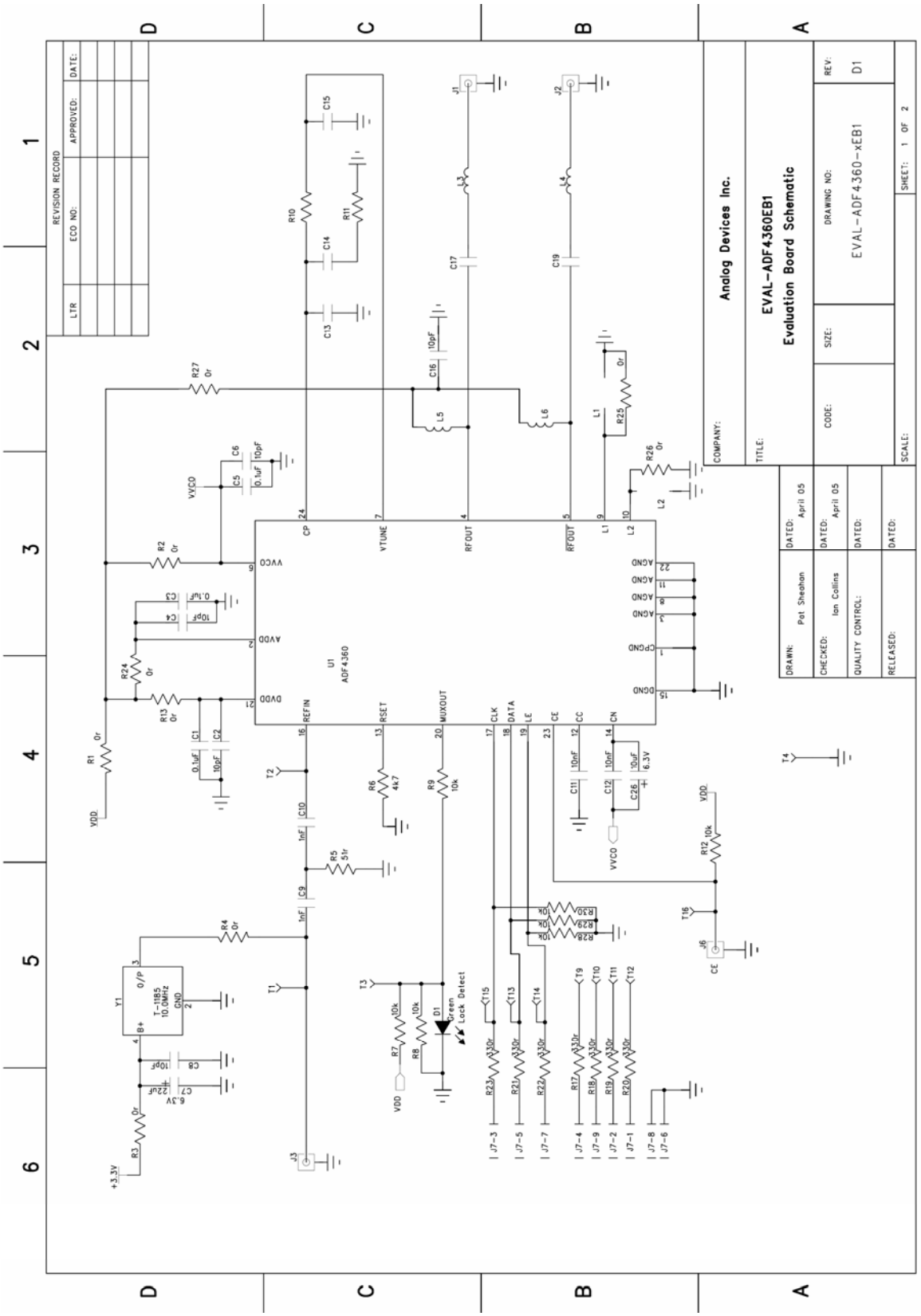

Figure 4. EVAL-ADF4360-0EB1 Circuit Diagram

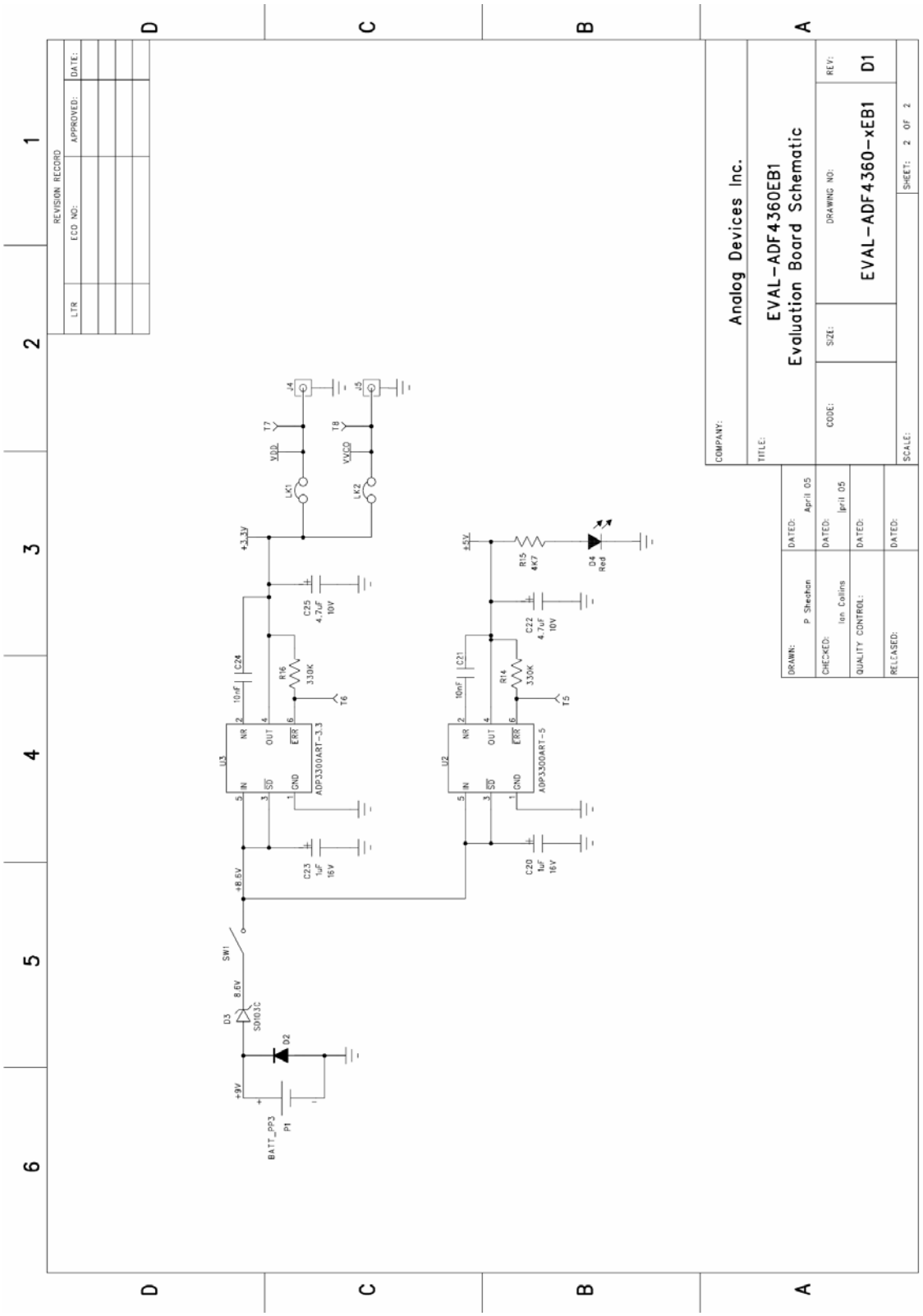

Figure 5. EVAL-ADF4360-0EB1 Circuit Diagram

SOFTWARE DESCRIPTION

The ADF4360-x software comes on a bundled installation CD. This is suitable for all the ADF4360-x devices. To install, simply double click on setup.exe and the install wizard installs the software, (Please note, administrator access on the PC is required to install the software) Follow the on-screen instructions. The software will be installed in a default directory called "C:/Program Files/Analog Devices/ADF4360". To run the software from this directory simply double click on ADF4360.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 appropriate version of the ADF4360 and click OK. The main interface window should now appear, (figure 6).

PROGRAMMABLE SOFTWARE SETTINGS

Click on RF VCO Output Frequency, and the Output Frequency window will appear. Enter the desired PFD frequency (in kHz) and click OK. Click on Reference frequency and insert the desired frequency in MHz.

To modify charge pump setting 1 or 2, simply click over the text and the eight programmable settings for each will appear and can be modified. In a similar fashion the pre-scaler settings can be changed.

It may be necessary to adjust the core power level and the output power setting to give optimum operation. These settings are clearly marked in the window below.

Click on RF PD Polarity button to set the PD polarity bit positive, this ensures all registers are loaded.

The part should now be setup, and other features can now be modified by the user. To examine the contents written to each register, the registers button can be selected. This also shows the hexadecimal number written to each register. As stated on the parts datasheet, the correct sequence of register writes is to the R counter, The Control latch and finally the N counter. Please note that a small delay needs to be maintained between programming the Control latch and the N counter

Figure 6. Software Front Panel Display

TABLE 1: BILL OF MATERIALS FOR EVAL-ADF4360-0EB1:

Name	Part Descriptio	Value	Tolera	PCB Decal	SMD	Layer Nam	PART DESC	STOCK CODE
C1, C3, C5	CAP	0.1uF		0402	Yes	Top	Multilayer Ceramic Capacitor	FEC 301-9482
C2, C4, C6, C8	CAP	10pF		0402	Yes	Top	Multilayer Ceramic Capacitor	FEC 301-9160
C7	CAP+	22uF		CAP\TAJ_A	Yes	Top	6.3V Tantalum Capacitor	FEC 197-038
C9, C10	CAP	1nF		0603	Yes	Top	Multilayer Ceramic Capacitor	FEC 317-202
C11, C12, C21, C24	CAP	10nF		0402	Yes	Top	Multilayer Ceramic Capacitor	FEC 301-9421
C13	CAP	470pF		0603	Yes	Top	Multilayer Ceramic Capacitor - Loop Filter	FEC 722-157
C14	CAP	6.8nF		0603	Yes	Top	Multilayer Ceramic Capacitor - Loop Filter	FEC 722-224
C15	CAP	220pF		0603	Yes	Top	Multilayer Ceramic Capacitor - Loop Filter	FEC 722-133
C16, C17, C19	CAP	10pF		0402	Yes	Top	Multilayer Ceramic Capacitor	FEC 301-9160
C20, C23	CAP+	1uF		CAP\TAJ_A	Yes	Top	6.3V Tantalum Capacitor	FEC 498-701
C22, C25	CAP+	4.7uF		CAP\TAJ_A	Yes	Top	6.3V Tantalum Capacitor	FEC 498-598
C23	CAP+	1uF		CAP\TAJ_A	Yes	Top	6.3V Tantalum Capacitor	FEC 498-701
C26	CAP+	10uF		CAP\TAJ_A	Yes	Top	6.3V Tantalum Capacitor	FEC 197-014
D1	LED			LED_CHIP	Yes	Top	Green Low Power LED	FEC 515-620
D2	DIODE			DO35	No	Top	IN4001	FEC 365-117
D3	SD103C	6.2v		DO35	No	Top	SD103C Schottky Diode	SD103C
D4	LED			LED_CHIP	Yes	Top	Red Low Power LED	FEC 515-607
J1 - J2	SMA			SMA_CARD_EDGE_RF	Yes	Top	50Ω Edge Mount SMA Connector	Johnson Components 142-0701-851
J3 - J6	SMA			SMA_90DEG	No	Top	Gold 90° 50Ω SMA Socket	Not Inserted
J7	CON-DB9HM			DB9-HM	No	Top	90° 9 pin D-Type Male Connector	FEC 150-750
L1, L2	IND			0402	Yes	Top	Inductor	Not Inserted
L3, L4	IND	0r		0603	Yes	Top	SMD Resistor	FEC 772-227
L5, L6	IND	4.7nH		0603	Yes	Top	Inductor	Coilcraft 0603CS4N7X-BC
LK1, LK2	JUMPER			SIP-2P	No	Top	2 pin header & Shunt	FEC 512-035 & FEC 150-410
P1	BATT_PP3			BATT_PP3	No	Top	Pair PCB snap-on battery connector	FEC 723-988
R1 - R4	RES	0r	1%	0603	Yes	Top	SMD Resistor	FEC 772-227
R5	RES	51r	1%	0603	Yes	Top	SMD Resistor	FEC 357-1245
R6	RES	4k7	1%	0603	Yes	Top	SMD Resistor	FEC 911-318
R7	RES	10k	1%	0603	Yes	Top	SMD Resistor	FEC 911-355
R8	RES	10k	1%	0603	Yes	Top	SMD Resistor	FEC 911-355
R9	RES	100r	1%	0603	Yes	Top	SMD Resistor	FEC 612-364
R10	RES	13k	1%	0603	Yes	Bottom	SMD Resistor - Loop Filter	FEC 321-8193
R11	RES	6.8k	1%	0603	Yes	Top	SMD Resistor - Loop Filter	FEC 911-951
R12	RES	10k	1%	0603	Yes	Top	SMD Resistor	FEC 911-355
R13	RES	0r	1%	0603	Yes	Top	SMD Resistor	FEC 772-227
R14, R16	RES	330k	1%	0603	Yes	Top	SMD Resistor	FEC 911-537
R15	RES	4k7	1%	0603	Yes	Top	SMD Resistor	FEC 911-318
R17 - R23	RES	330r	1%	0603	Yes	Top	SMD Resistor	FEC 911-173
R24, R25, R26, R27	RES	0r	1%	0603	Yes	Top	SMD Resistor	FEC 772-227
R28, R29, R30	RES	10k	1%	0603	Yes	Top	SMD Resistor	FEC 911-355
SW1	SW_POWER			SW_SIP-3P	No	Top	SPDT Switch - (Washable)	FEC 150-559
T1 - T16	TESTPOINT			TESTPOINT	No	Top	TESTPOINT	FEC 873-1144
U1	ADF4360-0			LFCSP-24	Yes	Top	Synthesizer	ADF4360-0BCP
U2	ADP3300-5			SOT23-6	Yes	Top	5V Regulator	ADP3300ART-5
U3	ADP3300-3.3			SOT23-6	Yes	Top	3.0V Regulator	ADP3300ART-3
Y1	OSC_TCXO	10.0MHZ		OSC_TCXO	Yes	Top	10 MHz TCXO (Fox-801)	Fox-801
				Fully Assembled/Tested Board - Eval-ADF4360-xEB1 Rev. D1				
				Anti-Static Bag				FEC 522-764
				ADI Proprietary RF-Group Printer Port Cable - 1 printer cable included in each box.				
				Software CD				ADI Free Issue
				Bar Code Box Label - Eval-ADF4360-0EB1				ADI Free Issue
				Rubber Stick-On Feet (x4)				FEC 148-922
				9V PP3 Battery				FEC 908-526
				Evaluation Board Box - Small size				Europacks - K-645/1