Evaluation Board for Fractional-N PLL Frequency Synthesizer

EVAL-ADF4156

FEATURES

Self-contained board including
- **Synthesizer**
- **VCO**
- **10 MHz TCXO for reference frequency**
- **Loop filter (5.8 GHz)**

Designed for
- **10 MHz PFD frequency**
- **200 kHz channel spacing**
- **Minimum charge pump current**
- **20 kHz loop bandwidth**

Accompanying software allows complete control of synthesizer functions from a PC

Battery operated: Choice of 3 V or 5 V supply

Typical phase noise performance of −85 dBc/Hz @ 1 kHz offset from 5.8 GHz carrier

GENERAL DESCRIPTION

The EVAL-ADF4156 allows the user to evaluate the performance of the ADF4156 frequency synthesizer for PLLs (phase-locked loops).

A block diagram of the evaluation board is shown in Figure 1. It contains the ADF4156 synthesizer, a PC connector, and SMA connectors for the power supplies and RF output. There is also a low-pass loop filter (20 kHz) and a VCO (Z-COMM V940ME03-LF 5.8 GHz) on board.

The evaluation board is set up for a 10 MHz PFD comparison frequency. An on-board TCXO provides the 10 MHz reference frequency. A cable is included with the board to connect to a PC printer port.

The package also contains software that is compatible with Windows® 2000 and Windows® XP to allow easy programming of the synthesizer.

FUNCTIONAL BLOCK DIAGRAM

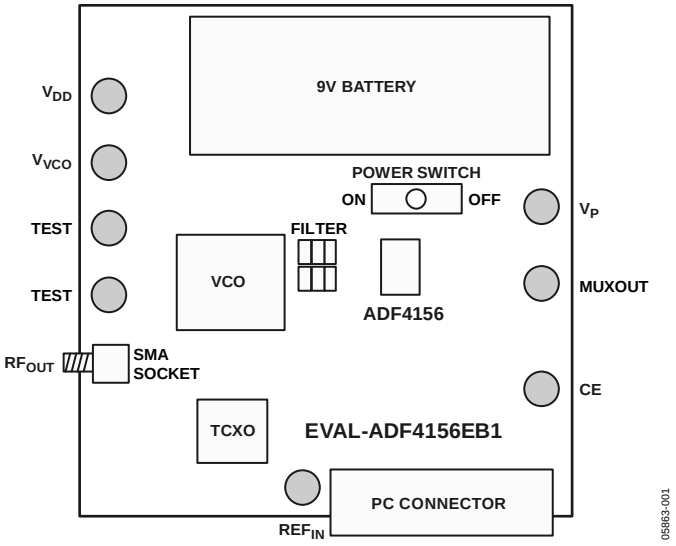

Figure 1.

Rev. 0

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REVISION HISTORY

5/07—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

OVERVIEW

The EVAL-ADF4156 comes with a cable for connecting to the printer port of a PC (see Figure 2 for a PC cable diagram and Figure 3 for a test setup configuration).

The evaluation board schematics are shown in Figure 5 and Figure 6.

POWER SUPPLIES

The EVAL-ADF4156 is powered from a single 9 V battery. The power supply circuitry allows the user to choose 3 V for the ADF4156 V_{DD}, and either 3 V or 5 V for the ADF4156 V_P and VCO supply. The default settings are 3 V for the ADF4156 V_{DD} and 5 V for the ADF4156 V_P and for the VCO supply.

It is important to note that the ADF4156 V_{DD} should never exceed the ADF4156 V_P. This can cause damage to the device. If desired, external power supplies can be used. In this case, the user needs to insert SMA connectors as shown on the silkscreen and in the block diagram (Figure 1).

LOCAL OSCILLATOR COMPONENTS

The 10 MHz TCXO provides the reference frequency. The on-chip R divider should be set to 1 so that the PFD frequency is also 10 MHz. The PLL is made up of the 10 MHz TCXO, the ADF4156, a passive loop filter (20 kHz bandwidth), and the V940ME03-LF VCO from Z-Communications, Inc. The output is available at RF_{OUT} through a standard SMA connector.

The on-board loop filter has been designed for a charge pump current of 0.3125 mA. ADIsimPLL can be used to design other loop filters.

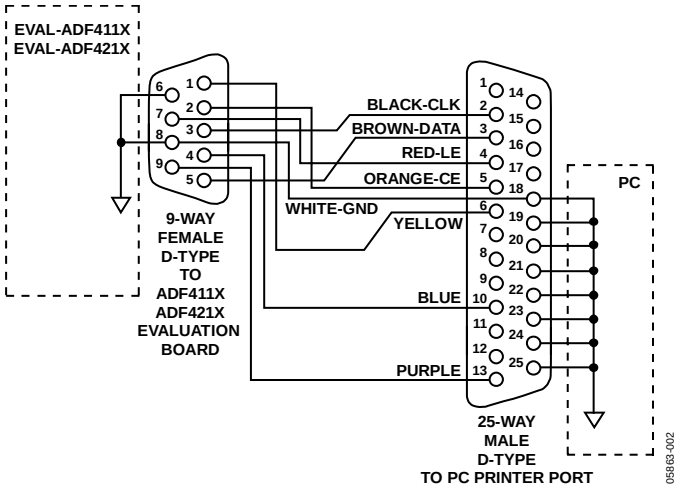

Figure 2. PC Cable Diagram

TEST SETUP

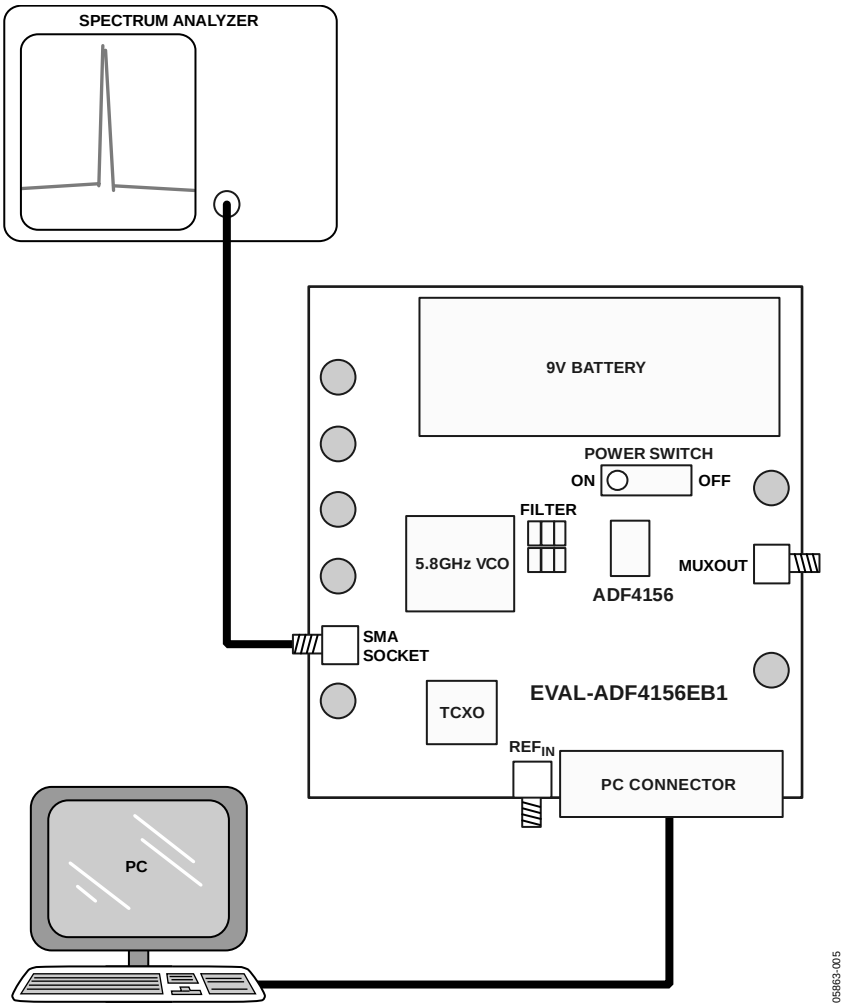

Figure 3. Test Setup

EVALUATION BOARD SOFTWARE

SOFTWARE INSTALLATION AND SETUP

The control software for the EVAL-ADF4156 is provided on the CD that accompanies the board. To install the software:

1. Click the **setup.exe** file.
2. Follow the on-screen instructions. The software is installed in a default directory called **C:/Program Files/Analog Devices/ADF4x5x**.
3. To run the software, click **ADF_Frac_Rev2_7.exe**.
4. Before the main window appears (see Figure 4), the device window opens, asking you to choose which device is to be evaluated.
5. Select **ADF4156** and click **OK**.

SOFTWARE OPERATION

When the main window (shown in Figure 4) opens, perform the following tasks:

1. In the **RF Section** of the window, click **REF IN Frequency**. A new window appears. Change the reference frequency to 10 MHz.
2. In this window, click **Update R0 and R1 (Normal Mode)** and then **Exit Window**.
3. Click **Update All Registers**. The data is now set up. The window should look like Figure 4.

Other features can now be examined. For example, to change the VCO output frequency and/or channel spacing, click **RF VCO Output Frequency**. The output frequency window then appears and the values can be changed. The on-board loop filter has been designed for a charge pump current of 0.3125 mA.

To examine the cycle slip reduction feature, click the **CSR Disabled** button in the main window. Note that the PFD duty cycle must be 50:50, and the charge pump current must be set to minimum to take advantage of this feature. See the ADF4156 data sheet for more information on cycle slip reduction.

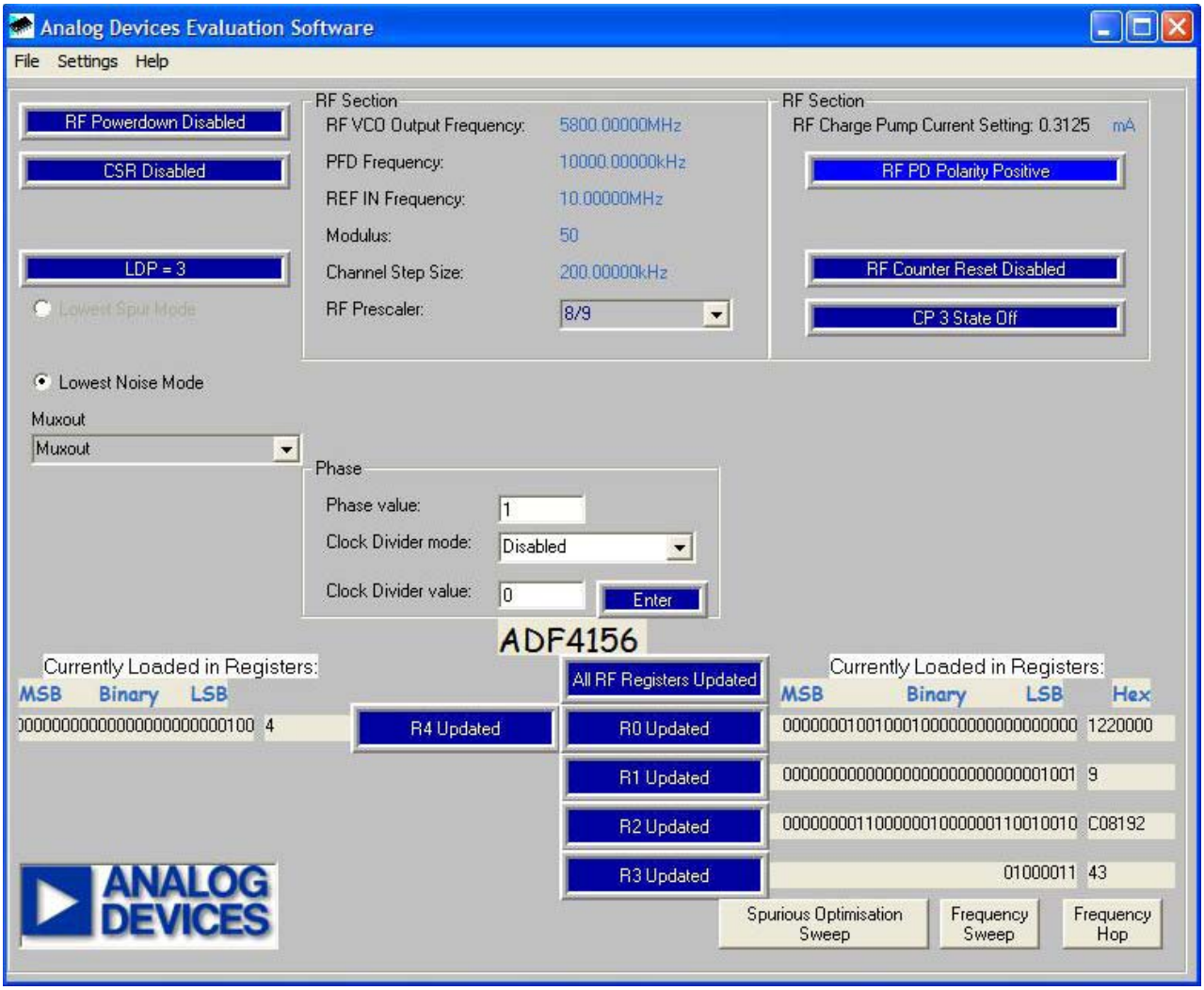

Figure 4. Evaluation Software, Main Window

SCHEMATICS

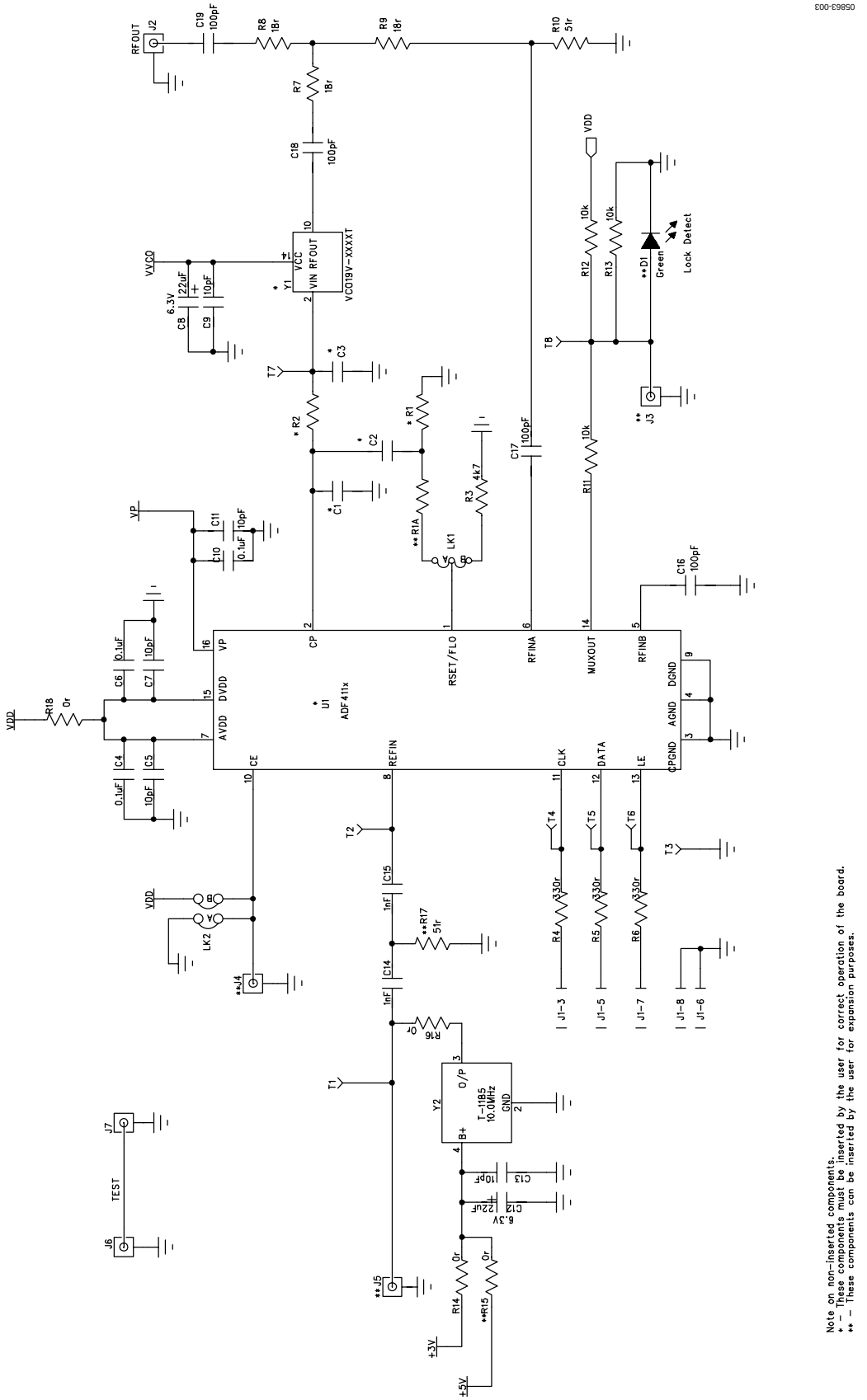

Figure 5. Evaluation Board Schematics (Page 1)

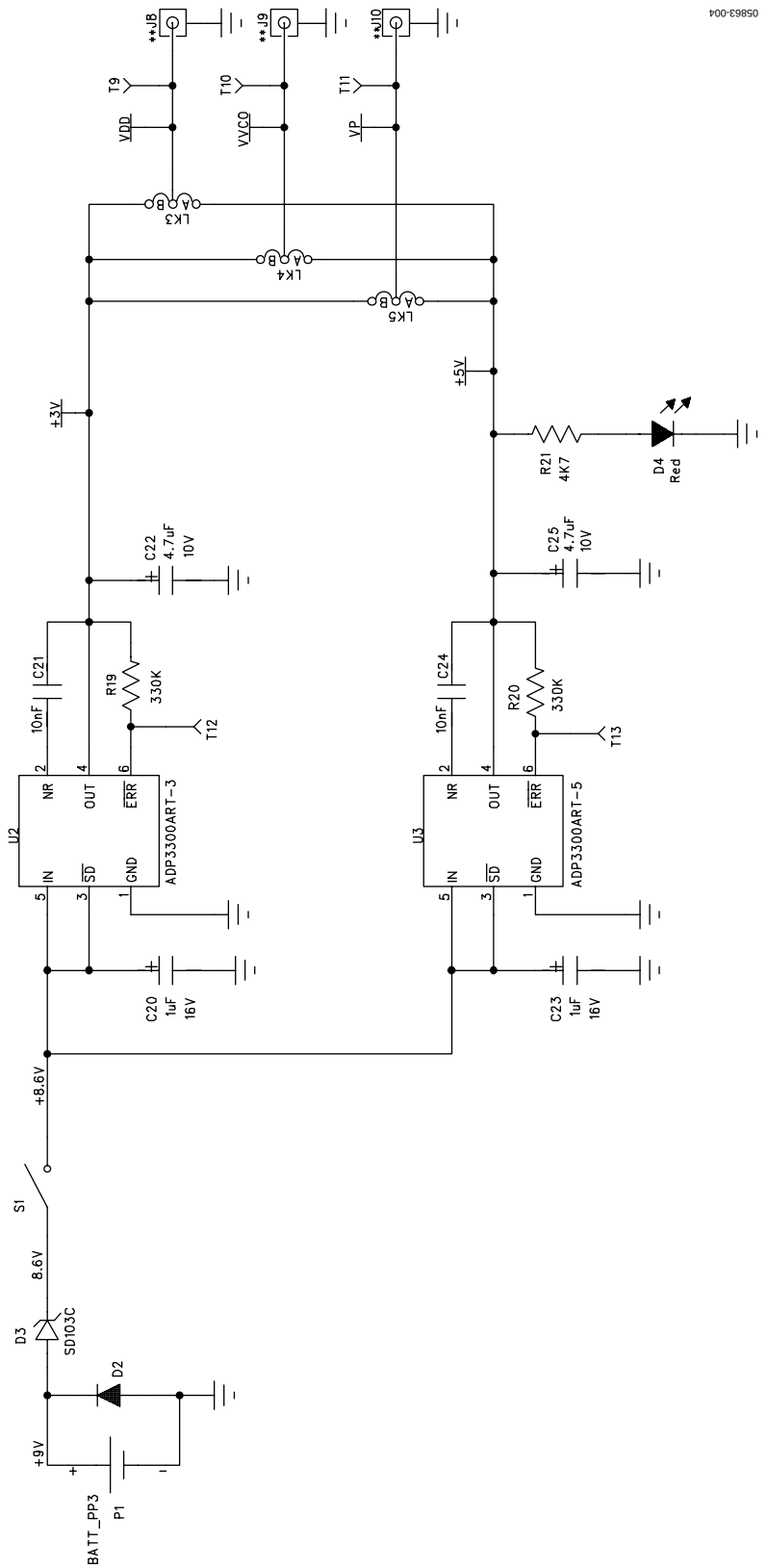

Figure 6. Evaluation Board Schematics (Page 2)

ORDERING INFORMATION

BILL OF MATERIALS

Table 1.

Name	Part Type	Value	PCB Decal	Stock Code	Assemble
C1	CAP	680 pF	0805	FEC 718543	Yes
C2	CAP	10 nF	0805	FEC 8820074	Yes
C3	CAP	270 pF	0805	FEC 718490	Yes
C4	CAP	0.1 µF	0603	FEC 499675	Yes
C5	CAP	10 pF	0603	FEC 499110	Yes
C6	CAP	0.1 µF	0603	FEC 499675	Yes
C7	CAP	10 pF	0603	FEC 499110	Yes
C8	CAP+	22 µF 6.3 V	CAP\TAJ_A	FEC 197038	Yes
C9	CAP	10 pF	0603	FEC 499110	Yes
C10	CAP	0.1 µF	0603	FEC 499675	Yes
C11	CAP	10 pF	0603	FEC 499110	Yes
C12	CAP+	22 µF 6.3 V	CAP\TAJ_A	FEC 197038	Yes
C13	CAP	10 pF	0603	FEC 499110	Yes
C14	CAP	1 nF	0603	FEC 317202	Yes
C15	CAP	1 nF	0603	FEC 317202	Yes
C16	CAP	100 pF	0603	FEC 499122	Yes
C17	CAP	100 pF	0603	FEC 499122	Yes
C18	CAP	100 pF	0603	FEC 499122	Yes
C19	CAP	100 pF	0603	FEC 499122	Yes
C20	CAP+	1 µF 16 V	CAP\TAJ_A	FEC 498701	Yes
C21	CAP	10 nF	0603	FEC 499146	Yes
C22	CAP+	4.7 µF 10 V	CAP\TAJ_A	FEC 498658	Yes
C23	CAP+	1 µF 16 V	CAP\TAJ_A	FEC 498701	Yes
C24	CAP	10 nF	0603	FEC 499146	Yes
C25	CAP+	4.7 µF 10 V	CAP\TAJ_A	FEC 498658	Yes
D1	LED	Green	LED	Not Inserted	No
D2	DIODE		DO35	FEC 9564993	Yes
D3	SD103C	6.2 V	DO35	Digi-Key SD103CTPMSCT-ND	Yes
D4	LED	Red	LED	FEC 1045504	Yes
J1	CON-DB9HM		DB9-HM	FEC 1071806	Yes
J2	SMA		SMA_EDGE	FEC 1019325	Yes
J3	SMA		SMA_EDGE	Johnson Components 142-0701-851	No
J4	SMA		SMA_EDGE	Johnson Components 142-0701-851	No
J5	SMA		SMA_EDGE	Johnson Components 142-0701-851	No
J6	SMA		SMA_EDGE	Johnson Components 142-0701-851	No
J7	SMA		SMA_EDGE	Johnson Components 142-0701-851	No
J8	SMA		SMA_EDGE	Johnson Components 142-0701-851	No
J9	SMA		SMA_EDGE	Johnson Components 142-0701-851	No
J10	SMA		SMA_EDGE	Johnson Components 142-0701-851	No
LK1	JUMPER2\SIP3		LINK-3P	FEC 1022248, FEC 150410	Yes
LK2	JUMPER_2		JUMPER_2	Hard-Wire Connection in Loc B	Yes
LK3	JUMPER2\SIP3		LINK-3P	FEC 1022248, FEC 150410	Yes
LK4	JUMPER2\SIP3		LINK-3P	FEC 1022248, FEC 150410	Yes
LK5	JUMPER2\SIP3		LINK-3P	FEC 1022248, FEC 150410	Yes
P1	BATT_PP3		BATT_PP3	FEC 723988	Yes
P1	9 V PP3 Battery			FEC 3785786	Yes

Name	Part Type	Value	PCB Decal	Stock Code	Assemble
R1A	RES		0805	Not Inserted	No
R1	RES	2.4 kΩ	0603	FEC 9330879	Yes
R2	RES	5.1 kΩ	0603	FEC 9331301	Yes
R3	RES	5.1 kΩ	0603	FEC 9331301	Yes
R4	RES	330 Ω	0603	FEC 9331018	Yes
R5	RES	330 Ω	0603	FEC 9331018	Yes
R6	RES	330 Ω	0603	FEC 9331018	Yes
R7	RES	18 Ω	0603	FEC 9330747	Yes
R8	RES	18 Ω	0603	FEC 9330747	Yes
R9	RES	18 Ω	0603	FEC 9330747	Yes
R10	RES	51 Ω	0603	FEC 9331336	Yes
R11	RES	10 kΩ	0603	FEC 9331662	Yes
R12	RES	10 kΩ	0603	Not Inserted	No
R13	RES	10 kΩ	0603	Not Inserted	No
R14	RES	0 Ω	0603	FEC 9331662	Yes
R15	RES	0 Ω	0603	Not Inserted	No
R16	RES	0 Ω	0603	FEC 9331662	Yes
R17	RES	51 Ω	0603	Not Inserted	No
R18	RES	0 Ω	0603	FEC 9331662	Yes
R19	RES	330 kΩ	0603	FEC 9331042	Yes
R20	RES	330 kΩ	0603	FEC 9331042	Yes
R21	RES	4.7 kΩ	0805	FEC 9331247	Yes
S1	SW_POWER		SW_SIP-3P	FEC 1082496	Yes
T1	TESTPOINT		TESTPOINT	FEC 8731144	Yes
T2	TESTPOINT		TESTPOINT	FEC 8731144	Yes
T3	TESTPOINT		TESTPOINT	FEC 8731144	Yes
T4	TESTPOINT		TESTPOINT	FEC 8731144	Yes
T5	TESTPOINT		TESTPOINT	FEC 8731144	Yes
T6	TESTPOINT		TESTPOINT	FEC 8731144	Yes
T7	TESTPOINT		TESTPOINT	FEC 8731144	Yes
T8	TESTPOINT		TESTPOINT	FEC 8731144	Yes
T9	TESTPOINT		TESTPOINT	FEC 8731144	Yes
T10	TESTPOINT		TESTPOINT	FEC 8731144	Yes
T11	TESTPOINT		TESTPOINT	FEC 8731144	Yes
T12	TESTPOINT		TESTPOINT	FEC 8731144	Yes
T13	TESTPOINT		TESTPOINT	FEC 8731144	Yes
U1	ADF411x		TSSOP-16	ADF4156BRUZ	Yes
U2	ADP3300		SOT23-6	ADP3300ARTZ-3-RL7	Yes
U3	ADP3300		SOT23-6	ADP3300ARTZ-5REEL7	Yes
Y1	VCO940ME03-LF		VCO190-1750T	Z-COMM V940ME03-LF	Yes
Y2	OSC_TCXO	10.0 MHz	OSC_TCXO	FOX801BELF	Yes

ORDERING GUIDE

Model	Description
EVAL-ADF4156EBZ1[1]	ADF4156 Evaluation Board

[1] Z = RoHS Compliant Part.

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.

NOTES

NOTES

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