One Technology Way • P.O. Box 9106 • Norwood, MA 02062-9106, U.S.A. • Tel: 781.329.4700 • Fax: 781.461.3113 • www.analog.com

GSM900 Evaluation Board for PLL Frequency Synthesizer

FEATURES

Self-contained board including synthesizer, VCO, and loop filter, for generating GSM frequencies (819 MHz to 915 MHz)
Designed for 20 kHz loop bandwidth
Accompanying software allows complete control of synthesizer functions from a PC
Battery operated: choice of 3 V or 5 V supplies
Typical phase noise performance of −91 dBc/Hz at 1 kHz offset
Typical spurious performance of better than −90 dBc at 200 kHz offset from carrier

GENERAL DESCRIPTION

The EVAL-ADF411xEBZ1 is designed to allow users to evaluate the performance of the ADF4113 frequency synthesizer for phase lock loops (PLLs). The block diagram of the board is shown in Figure 1. It contains the ADF4113 synthesizer, a pc connector, an SMA connector for the reference input, power supplies, and an RF output. There is also a loop filter (20 kHz bandwidth) and an on-board VCO. 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.

EVALUATION BOARD CONNECTION DIAGRAM

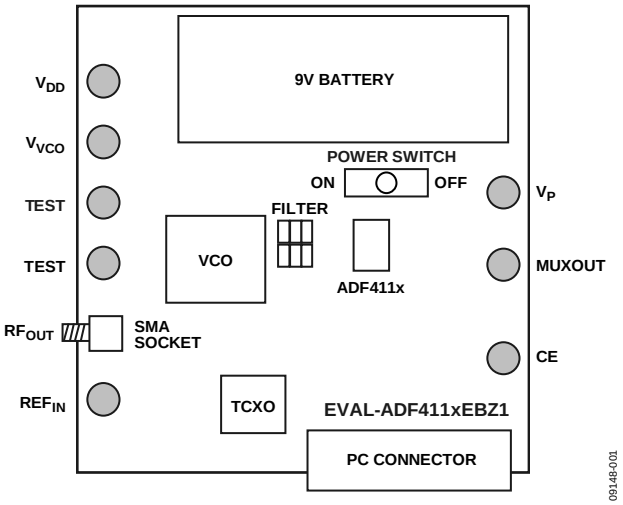

Figure 1.

TABLE OF CONTENTS

REVISION HISTORY

5/11—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

HARDWARE DESCRIPTION

The evaluation board comes with a cable for connecting it to the printer port of a PC. The silkscreen and cable diagram for the evaluation board are shown in Figure 2 and Figure 3. The board schematics are shown in Figure 5 and Figure 6.

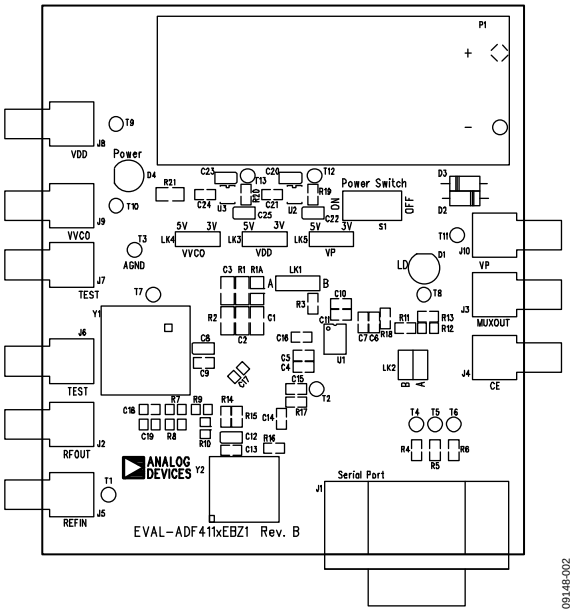

Figure 2. Evaluation Board Silkscreen

The board is powered from a single 9 V battery. The power supply circuitry allows the user to choose either 3 V or 5 V for the ADF4113 V_{DD} and V_P, and for the VCO supply. The default settings are 3 V for the ADF4113 V_{DD}, and 5 V for the ADF4113 V_P and VCO supply. Note that the ADF4113 V_{DD} should never exceed the ADF4113 V_P because it can damage the device. All components necessary for LO generation are on board. The 13 MHz TCXO from Vectron provides the necessary reference input. The PLL is made up of the ADF4113, a passive loop filter (20 kHz bandwidth), and the VCO190-902T from Vari-L. The output is available at RF_{OUT} through a standard SMA connector. Users can use their own power supplies and reference input. In this case, they need to insert SMA connectors as shown on the silkscreen and block diagram.

Loop filter components include the following:

- C1 = 470 pF
- C2 = 4.7 nF
- C3 = 20 pF
- R1 = 7.5 kΩ
- R2 = 20 kΩ

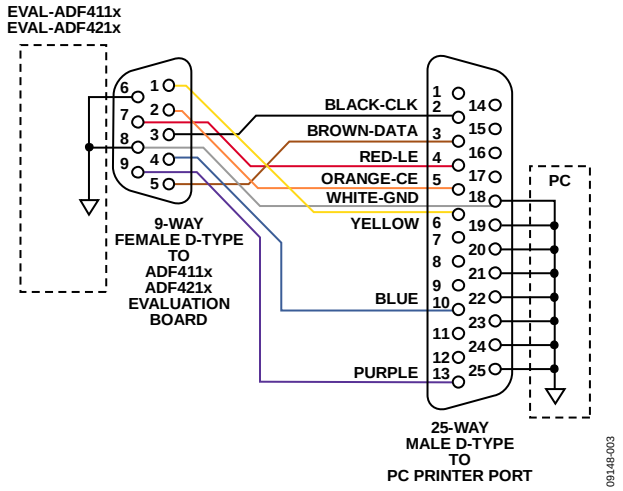

Figure 3. PC Cable Diagram

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

EVALUATION BOARD SOFTWARE

SOFTWARE DESCRIPTION

The evaluation board comes with the software on a CD. The software is suitable for all the ADF411x devices. To install, use the following steps:

1. Click **Setup.exe**. The install wizard installs the software. Note that administrator access is required on the PC to install the software.
2. Follow the on-screen directions. The software is installed in a default directory: **C:/Program Files/Analog Devices**. To run the software, click **ADF4XXX_revx**.

Prior to the **Main Interface Page**, a window appears to select the device being evaluated. Choose the ADF4113EBZ1 and click **OK**. The **Main Interface Page** now appears (see Figure 4). The synthesizer is now programmed with the correct settings for a GSM system working at 900 MHz. A 200 kHz PFD frequency is set up, a 32/33 prescaler is chosen, and a charge pump current of 5 mA is programmed.

PROGRAMMABLE SOFTWARE SETTINGS

To program the software, complete the following:

1. Click **REF IN Frequency**, insert the desired frequency in MHz, and click **OK**.
2. Click **RF VCO Output Frequency** for the **Output Frequency** window to appear. Enter the **Output Frequency** and click **OK**.
3. Click **PFD Frequency**, insert the desired frequency in kHz, and click **OK**.
4. Click **RF Charge Pump Current Setting 2** or **RF Charge Pump Current Setting 1** and the current setting window will appear. Enter the value used for the loop filter and click **OK**.
5. Click **RF PD Polarity Positive** to set the PD polarity bit to positive, which ensures that all registers are loaded.

At this point, the data is now set up, and the user can modify other features.

The software also allows monitoring of the device supply voltage, supply current, and the charge pump voltage. Click **Update Voltage and Current Display** to get an up-to-date reading.

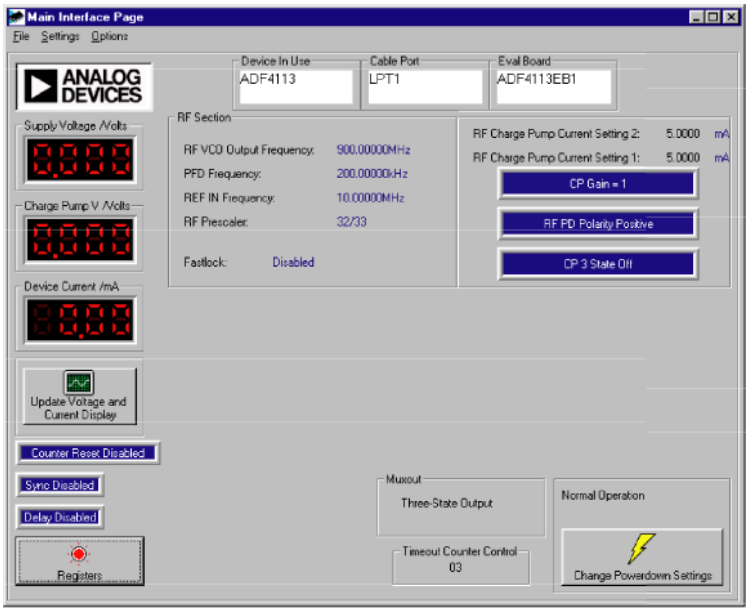

Figure 4. Software Front Panel

EVALUATION BOARD SCHEMATICS

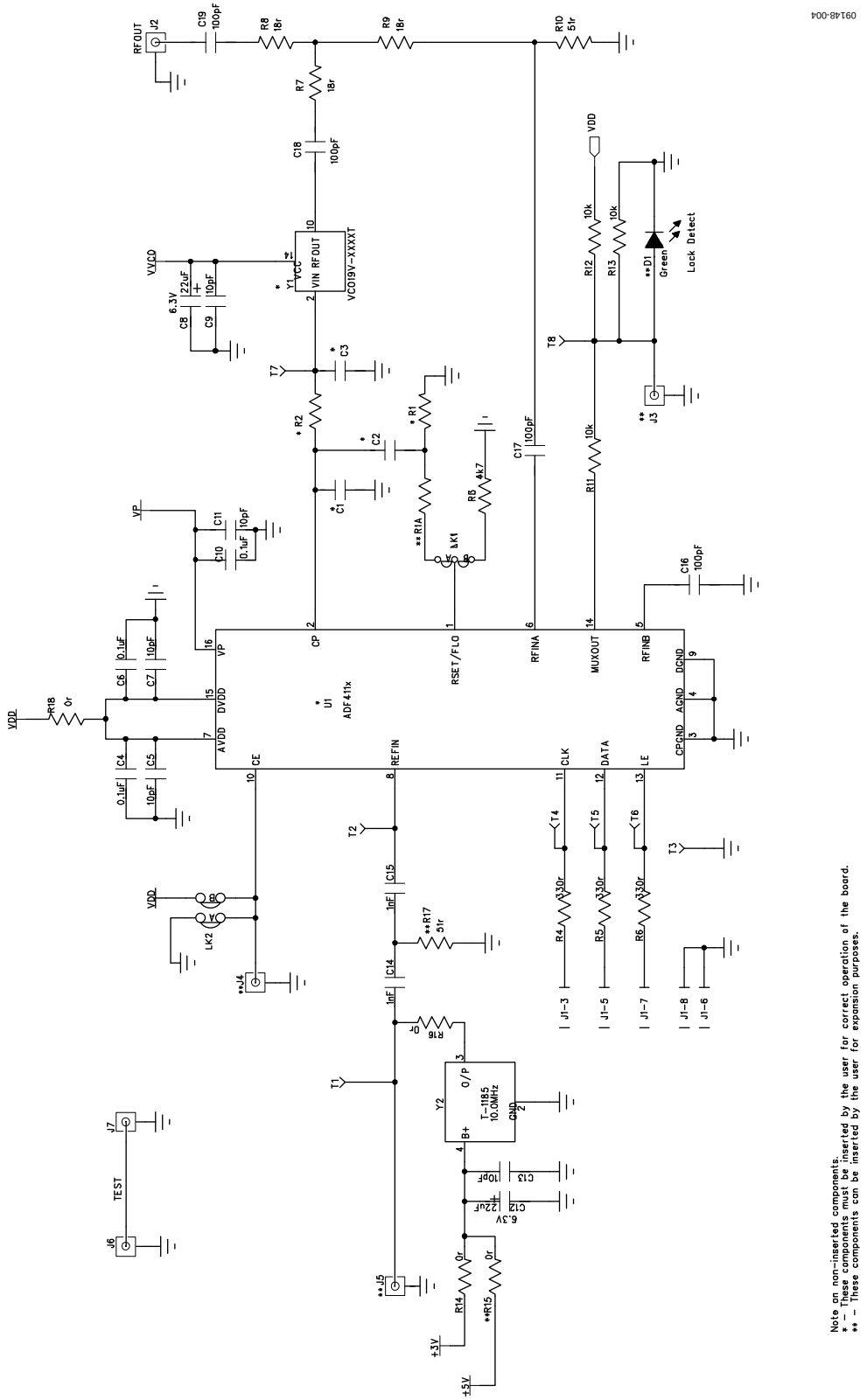

Figure 5. Evaluation Board Circuit Diagram (Page 1)

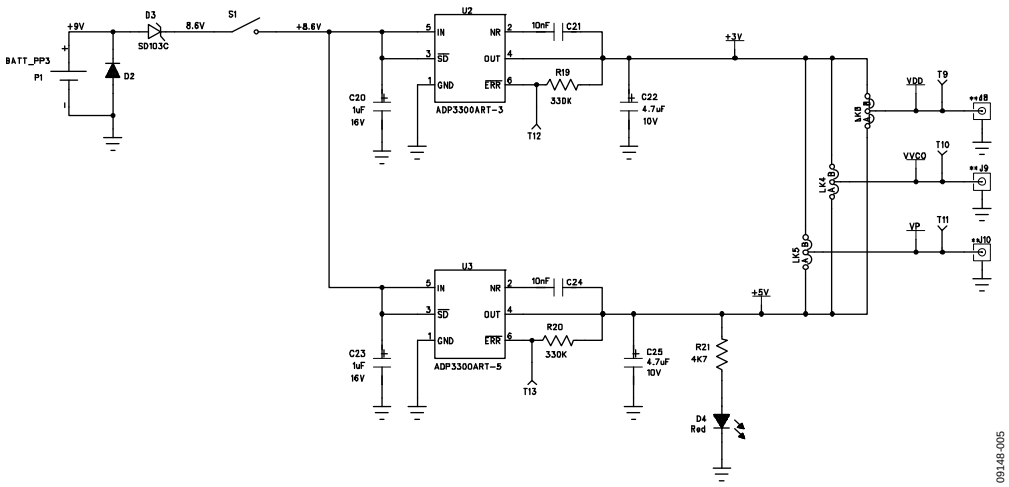

Figure 6. Evaluation Board Circuit Diagram (Page 2)

NOTES

NOTES

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.

UG09148-0-5/11(0)

www.analog.com

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Analog Devices Inc.:

EVAL-ADF4113EBZ2