

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

### Evaluating the CN-0285 Wideband Tx Modulator Solution

#### **FEATURES**

Self-contained board including ADF4351 wideband PLL + VCO ADL5375 wideband IQ modulator Ultralow noise voltage regulators: ADP150, ADP3334 25 MHz TCXO reference USB interface Accompanying ADF4351 software allows control of synthesizer functions from PC

#### **ONLINE RESOURCES**

Documents Needed ADF4351 Data Sheet ADL5375 Data Sheet ADP150 Data Sheet ADP3334 Data Sheet Required Software ADF435x programming software

#### **Design and Integration Files**

Schematics, Layout Files, Bill of Materials

### **EQUIPMENT NEEDED**

A standard PC running Windows® XP, Windows Vista (32-bit), or Windows 7 with a USB port EVAL-CN0285-EB1Z circuit evaluation board 5.5 V power supplies An IQ signal source, such as the Rohde & Schwarz AMIQ

A spectrum analyzer, such as the Rohde & Schwarz FSQ8

### **GENERAL DESCRIPTION**

The EVAL-CN0285-EB1Z is the evaluation board described in the Circuits From the Lab<sup>™</sup> Circuit Note CN-0285, *Broadband Low EVM Direct Conversion Transmitter*. A photo of the board is shown in Figure 1. It contains the ADF4351 synthesizer, the ADL5375 wideband transmit modulator, and ultralow noise LDOs. The board can be controlled using the ADF4351 programming software. A USB cable is included with the board to connect to a PC USB port.

Additional information, including other PLL data sheets, technical notes, articles, and ADIsimPLL<sup>™</sup> PLL simulation software from Analog Devices, Inc., is available at www.analog.com/pll.



### PHOTO OF THE EVALUATION BOARD

Figure 1. EVAL-CN0285-EB1Z

## TABLE OF CONTENTS

Features	1
Online Resources	1
Equipment Needed	1
General Description	1
Photo of the Evaluation Board	1
Revision History	2
Evaluation Board Hardware	3

# **Evaluation Board User Guide**

Power Supplies	3
IQ Inputs	3
RF/LO Outputs	3
Loop Filter and Charge Pump Current	3
Reference Source	3
Evaluation Board Software Quick Start Procedures	4

### **REVISION HISTORY**

3/13—Revision 0: Initial Version

## **EVALUATION BOARD HARDWARE** POWER SUPPLIES

The user must apply 5.5 V to the VSUPPLY power connectors (4 mm banana connectors). An LED, D6, indicates when USB power is available, and another LED, D5, indicates when the main board is powered. Switch SW-EXT is used to switch in the 5.5 V supply.

### **IQ INPUTS**

The ADL5375 has four differential IQ inputs. These are accessible from the SMA connectors and should be connected to an appropriate analog baseband IQ source such as the Rhode & Schwarz AMIQ. Set the dc bias voltage for the IQ inputs at 0.5 V.

### **RF/LO OUTPUTS**

The ADL5375 RF output is ac-coupled out to the RFOUT SMA. There are also two LO output SMA connectors that can be used to view the filtered ADF4351 RF outputs on a spectrum analyzer. When connecting to an analyzer, terminate the unused LO output with a 50  $\Omega$  termination. When measuring EVM or adjacent channel leakage current (ACLR), disconnect these LO outputs by removing Capacitors C72 and C73 to prevent loading the circuit.

### LOOP FILTER AND CHARGE PUMP CURRENT

The loop filter schematic is included in the evaluation board and can be found at www.analog.com/CN0285-DesignSupport.

The default loop filter is set to 70 kHz. Using a charge pump setting of 2.5 mA is recommended.



#### Figure 2. Loop Filter Layout

### **REFERENCE SOURCE**

The 25 MHz TCXO from Rakon provides the necessary reference signal. An external REFIN can be used if desired. In this case, disable the on-board TCXO by removing R59. R9 can be populated with 50  $\Omega$  to match the impedance of the evaluation board to the external reference source.

1267-003

## **EVALUATION BOARD SOFTWARE QUICK START PROCEDURES**

The control software for EVAL-CN0285-EB1Z uses the standard ADF4351 programming software. For more details on the installation of this software, consult UG-435, *Evaluation Board for the ADF4351 Fractional-N PLL Frequency Synthesizer*.

After installing the software, run the software by clicking the **ADI ADF435x** file on the desktop or in the **Start** menu. The software front panel opens (see Figure 3).

Confirm that **Analog Devices RFG.L Eval Board connected** is displayed in the bottom left corner of the window. Otherwise, the software has no connection to the evaluation board. In this case, check that the cable connection and USB drivers are correctly installed.

Program the RF output frequency in the **Main Controls** tab of the software front panel.

Analog Devices ADF435x Software	
File Tools Help	
Select Device and Connection Main Controls Registers Sweep a	and Hop Other Functions Features
RF Settings	Register 2 Register 4
RF Frequency: 2140 4280 MHz	Low Noise/Spur Mode: Low noise mode 🔻 LDP: 10 ns 🔹 VCO Powerdown: Disabled 💌
Channel spacing: 100 200 kHz	Muxout: 3-state output  PD Polarity: Positive  MTLD: Disabled
Output divider: 2	Double buff: Disabled   Powerdown: Disabled   Aux Output Select: Divided
Reference Frequency: 25 MHz	Charge pump current: 2.50   CP 3-state: Disabled   Aux Output Enable: 0. Disabled
B counter: 1 (1) :Ref Doubler (1) :Ref /2 (1)	LDF: FRAC-N  Counter reset: Disabled  Aux Output Power: -4 dBm
	Register 3 RF Output Enable: 1. Enabled
Presedency. 2.3 MHz	RF Output Power: +5 dBm 💌
	CSR: Disabled   Band Select Clock
Feedback signal: Fundamental	Clock Divider Value: 150 - Divider: 200 - Divider:
$(171 + \frac{1}{5})x = 171.2$	CLK Div Mode: Clock Divider Off  Freq (kHz): 125.000  Register 5  LD Pin Mode: Digital Lock Detect
Phase Value: 1	
0x 558008 0x 8008029 0x	4E42 0x 4B3 0x 9C803C 0x 580005
Write R0 Write R1	Write R2         Write R3         Write R4         Write R5         Registers
1:53:57: 0x4E42 witten to device. 1:53:57: Writing R1 1:53:57: 0x8008029 witten to device. 1:53:57: Writing R0 1:53:57: 0x558008 witten to device.	Device in use: ADF4350
Analog Devices RFG.L Eval Board connected.	

Figure 3. Software Front Panel

## NOTES

# NOTES

## NOTES