ANALOG DEVICES

EK1HMC7043LP7F User Guide
UG-892

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Evaluating the HMC7043 High Performance, 3.2 GHz, 14-Output Fanout Buffer

FEATURES

- Simple power connection using USB connection and on-board low dropout (LDO) voltage regulator
- LDO can be bypassed for power measurements
- AC-coupled differential SMA connectors
- SMA connectors for
  - 1 clock input
  - 1 RF sync input
  - 6 clock outputs
- Microsoft® Windows®–based evaluation software with simple graphical user interface (GUI)
- Easy access to digital input/output and diagnostic signals via input/output header (GPIO)
- Status LED for diagnostic signals
- USB computer interface

EVALUATION KIT CONTENTS

- EV2HMC7043LP7F evaluation board
- USB interface board and USB cable
- EK1HMC7043LP7F user guide

GENERAL DESCRIPTION

This user guide describe the hardware and software of the HMC7043 evaluation kit. The evaluation board schematics and printed circuit board (PCB) layout artwork can be found on the HMC7043 evaluation kit page.

The HMC7043 is a high performance clock buffer for the distribution of ultralow phase noise references for high speed data converters with either parallel or serial (JESD204B type) interfaces. The HMC7043 is designed to meet the requirements of multicarrier GSM and LTE base station designs, and offers a wide range of clock management and distribution features to simplify baseband and radio card clock tree designs.

The EK1HMC7043LP7F evaluation kit is a compact, easy-to-use platform for evaluating all the features of the HMC7043. All inputs and outputs are configured as differential on the EV2HMC7043LP7F evaluation board.

Full specifications on the HMC7043 are available in the product data sheet, which should be consulted in conjunction with this user guide when working with the evaluation board.

EVALUATION BOARD PHOTOGRAPH

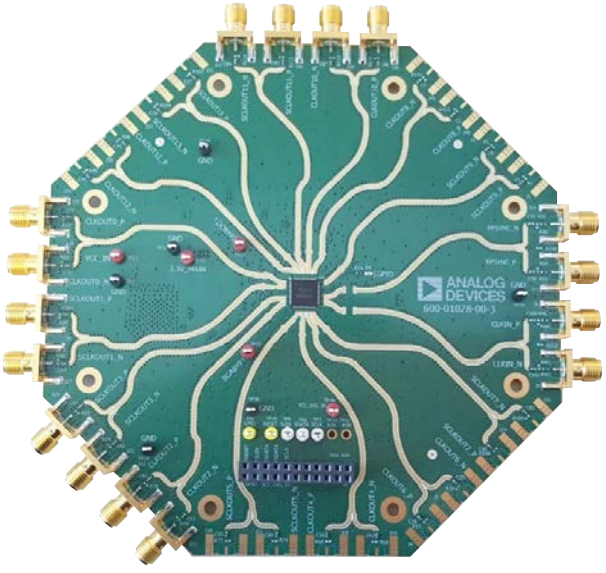

Figure 1.

TABLE OF CONTENTS

REVISION HISTORY

2/16—Revision 0: Initial Version

EVALUATION BOARD HARDWARE

The following instructions are for setting up the physical connections to the HMC7043 evaluation board.

SETTING UP THE POWER AND PC CONNECTIONS

Set up the power and PC connections as follows:

1. Install the HMC7043 evaluation software before connecting the HMC7043 evaluation board to the PC for the first time (see the Installing the Software section). Administrative privileges are required for the installation.
2. Connect a 5 V supply voltage to the VCCIN-TP14 test point of the HMC7043 evaluation board.
3. Connect the USB interface board to the HMC7043 evaluation board, as shown in Figure 2.
4. Connect the USB cable to the USB interface and the PC.
5. The **Found New Hardware Wizard** automatically appears when the USB interface connects. Select **Install the software automatically** and then click **Next**.
6. The **Found New Hardware Wizard** may appear twice during the installation.

See the Evaluation Board Software section for details on running the HMC7043 evaluation board software.

SETTING UP THE SIGNAL CONNECTIONS

After setting up the power and PC connections, use the following procedure to set up the signal connections:

1. Connect a signal generator to the CLKIN_P, J8, SMA connector. By default, the reference inputs on the HMC7043 evaluation board are ac-coupled. Terminate the CLKIN_N, J9, SMA connector with a 50 Ω termination. An amplitude setting of 6 dBm from the signal generator is sufficient.
2. Connect an oscilloscope, spectrum analyzer, or other lab equipment to any out of the CLKOUTx_P or CLKOUTx_N SMA connectors. Place a 50 Ω termination on all unused differential output pairs.

BYPASSING THE 5 V LDO POWER SUPPLY

The HMC7043 evaluation board contains an on-board, LDO regulator to regulate the 5 V to 3.3 V supply domain. The HMC7043 evaluation board can bypass the linear regulator, which is useful for measuring the power consumption of the HMC7043. See the evaluation board schematics and printed circuit board (PCB) layout artwork on the HMC7043 evaluation kit page.

Bypass the 5 V on-board LDO regulator for the HMC7043 as follows:

1. Apply 0 V to VCCIN (TP14).
2. Apply 3.3 V to 3.3V_MAIN (TP15).
3. Remove R245 and FB20.
4. Populate R12 (to isolate the serial peripheral interface (SPI) board current consumption from the HMC7043).

Connect a bench 3.3 V power supply to each of the supply pins on the 3.3 V main headers (TP15 and TP16).

It is important that the 5 V supply is not connected to TP15 of the HMC7043 evaluation board.

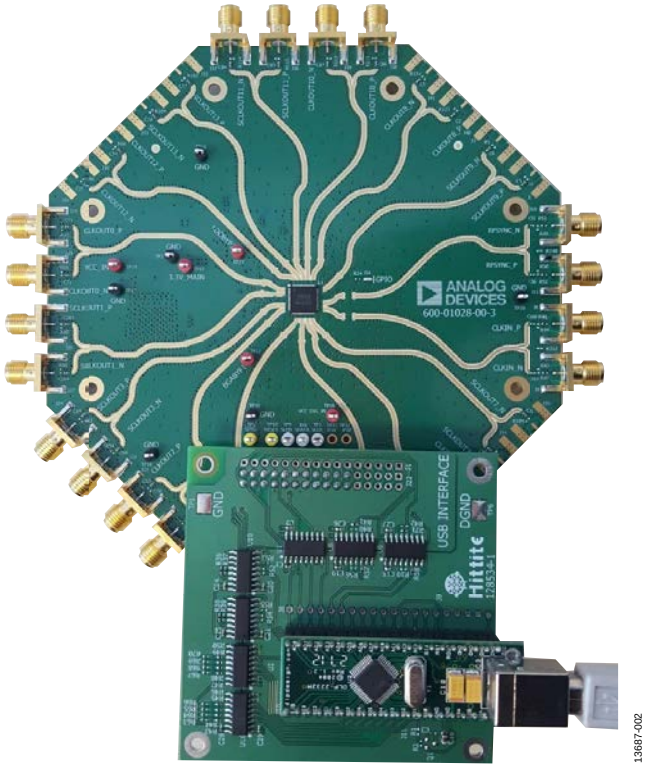

Figure 2. HMC7043 Evaluation Kit Setup

EVALUATION BOARD SOFTWARE SETUP

Follow the instructions included in this section to set up the HMC7043 evaluation software.

INSTALLING THE SOFTWARE

Do not connect the HMC7043 evaluation board until the software installation is completed. To install the software, take the following steps:

1. Download the installer from the HMC7043 product page.
2. Double-click **setup.exe** from the installer file. Follow the installation instructions. The default location for the evaluation software is **C:\Program Files (x86)\Analog Devices\Jitter Attenuator**.
3. After the installation completes, you will be prompted to install the drivers for the USB interface.

STARTING THE SOFTWARE

After the HMC7043 evaluation software is installed, run the software as follows:

1. Power up and connect the HMC7043 evaluation board to the PC.
2. Double-click **HMC7043 GUI** to run the HMC7043 evaluation software.
3. If the HMC7043 evaluation board is found, the main window of the HMC7043 evaluation software appears directly. Proceed to the Evaluation Board Software Operation section for more details about using the software.
4. If the evaluation board is not found, a dialog box appears. In this box, select either OFFLINE HMC7044 mode or OFFLINE HMC7043 mode (see Figure 3). Offline mode is useful for viewing and generating register setup files.

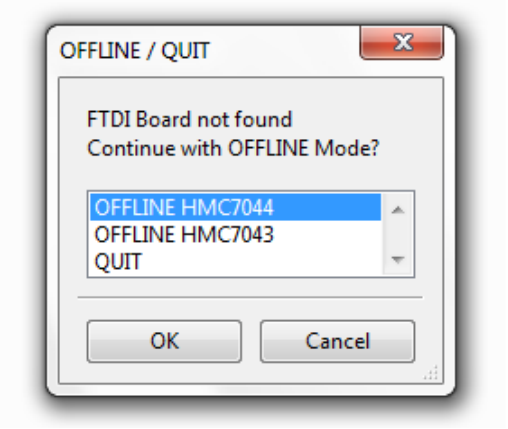

Figure 3. Select USB Device Window/Evaluation Board Not Found (Offline Mode)

5. If multiple HMC7043 evaluation boards are connected to the same PC, a hardware selection dialog box appears (see Figure 4). The text in this window is either a serial number, **OFFLINE HMC7044**, or **OFFLINE HMC7043**. Select the serial number and click **OK**.

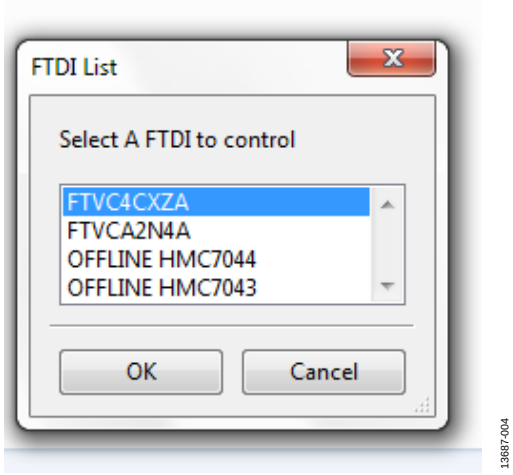

Figure 4. Select USB Device Window/Multiple Evaluation Boards Found

6. If the HMC7043 evaluation software cannot detect the HMC7043 evaluation board, restart the power supply and connect/disconnect the USB cable.

EVALUATION BOARD SOFTWARE OPERATION

The main window of the HMC7043 evaluation board software comprises five subsection tabs that correspond to the major functional blocks of the HMC7043 (see Figure 5). These subsections, most of which have their own tab, are outlined in this section. From the main window, the tab for each functional block can be accessed by clicking the appropriate tab.

The HMC7043 evaluation board software directly communicates with the HMC7043. When a widget value is changed, the new value is written to the register instantly.

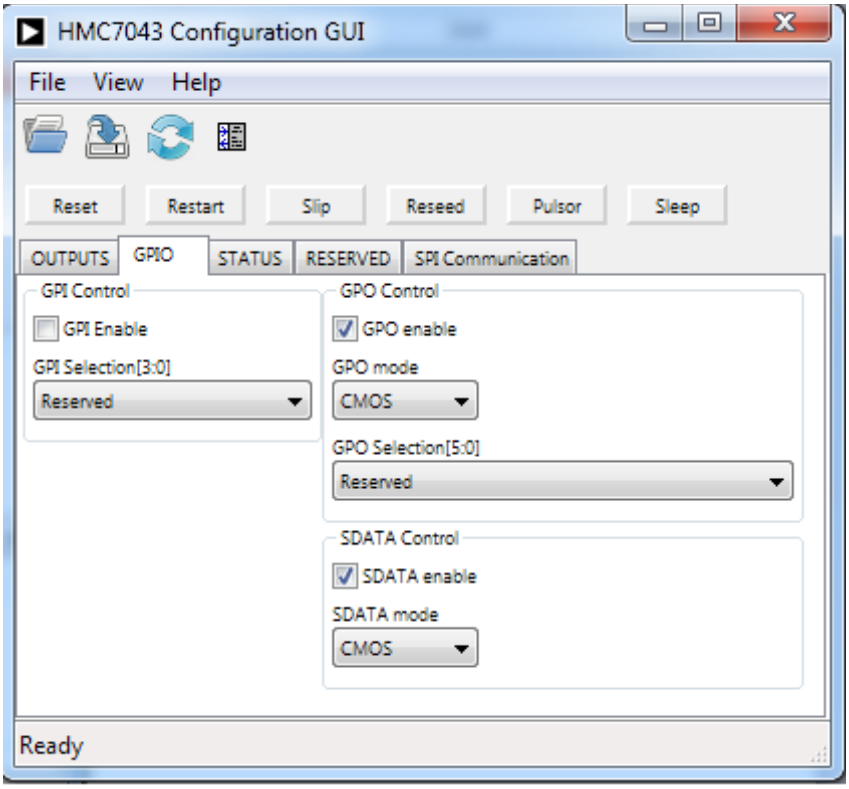

*Figure 5. GPIO Tab of the **HMC7043** **Configuration GUI***

MENU BAR OF MAIN WINDOW

File Menu

The **File** menu allows the user to load a previously saved HMC7043 configuration file or to save a new HMC7043 setup file. A setup file (.py) is a text file that contains the HMC7043 register configuration file.

To load a previously saved configuration file, select **Load Config** from the **File** menu (see Figure 6). Alternatively, to save a new configuration file, select **Save Config** from the **File** menu (see Figure 7).

The toolbar also offers shortcuts for **Save Config** and **Load Config**.

*Figure 6. **Load Config** Shortcut*

*Figure 7. **Save Config** Shortcut*

To exit the HMC7043 software, select **Exit** from the **File** menu.

Note that saving the current state helps to continue the setup in the future. However, the user must save the setup before exiting; the software does not automatically check to ensure that the existing setup is saved.

View Menu

The **Log** window, accessed by selecting the **Log Window** from the **View** menu, allows the user to follow every read or write actions in the GUI.

Help Menu

Selecting **Help** from the **Help** menu opens the **About** window, which contains information such as the revision number, region information, and contact information.

USING THE SOFTWARE TO CONTROL THE FUNCTIONAL BLOCKS OF THE HMC7043

Register W/R

The update icon (see Figure 8) issues a GUI update command by reading all registers and setting every widget according to read values.

Figure 8. Update Icon

GPIO Controls

The GPIO tab allows the user to control general-purpose input/output to monitor alarms/status indicators to determine the health of the system.

Four GPIO configurations can be controlled from this tab (see Figure 5).

OUTPUT CHANNEL CONTROLS

The output channel divider controls shown in Figure 9 are accessed via the **OUTPUTS** tab. It is usually sufficient to change only the divide ratio because the HMC7043 evaluation board software and the HMC7043 output duty cycle remains 50%.

The phase offset can be varied by three different methods, as shown in Figure 10. Two of them are based on digital delay. One is slip-based delay, which provides unlimited one full clock input cycle delay. To perform slip, the channel multislip mask must be checked, as shown in Figure 10. Enter the number of clock input cycles, and click on **Slip**.

*Figure 9. Output Clock Driver Tab of the **HMC7043** **Configuration GUI***

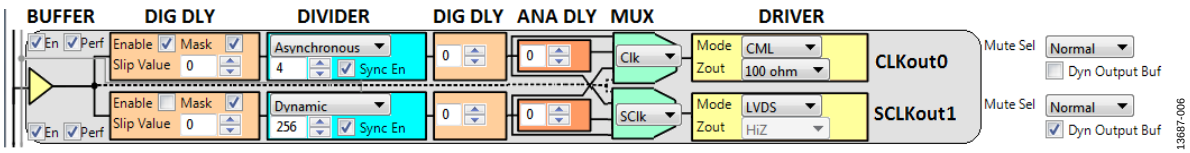

Figure 10. Example Output Channel—Configurable Blocks

Access the output termination selection shown in Figure 11 by clicking any of the drop-down lists under **DRIVER** in the **OUTPUTS** tab (see Figure 9). It is important to power down unused outputs on the HMC7043 evaluation board because they can be a major source of unwanted spurs.

Even numbered outputs (CLKOUTs) are ac-coupled with 150 Ω to ground for each leg on the HMC7043 evaluation board by default. Odd numbered outputs (SCLKOUTs) are ac-coupled with 100 Ω to VCC internally; no termination resistors are on the HMC7043 evaluation board by default. This termination scheme is ideal for current mode logic (CML) drivers.

However, this scheme degrades the complementary metal-oxide semiconductor (CMOS) driver performance. Improved CMOS driver performance is achieved by removing the termination resistors. For low voltage differential signaling (LVDS) drivers, differential 100 Ω resistor must be populated on the HMC7043 evaluation board.

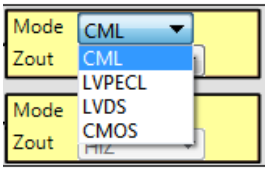

Figure 11. Output Termination Selection

QUICK START GUIDE TO THE HMC7043

The HMC7043 can be initialized from SPI settings.

To load the provided configuration file, do the following:

1. Follow the instructions provided in the Evaluation Board Software Setup section.
2. Connect a signal generator to the CLKIN_P, J9, SMA connector. By default, the reference inputs on the HMC7043 evaluation board are ac-coupled. Terminate the CLKIN_N, J8, SMA connector with a 50 Ω termination. An amplitude setting of 5 dBm from a signal generator is sufficient, and the frequency must be 2949.12 MHz.
3. Connect a 5 V supply voltage to the VCCIN-TP14 test point of the HMC7043 evaluation board.
4. Provided with the installer is a setup file, **HMC7043_initial_state.py**, located in the **Configuration Files** directory. Load this configuration file from the **File** menu in the main software window.
5. Click **Restart**.
6. Connect an oscilloscope, spectrum analyzer, or other lab equipment to any out of the CLKOUTx_P or CLKOUTx_N SMA connectors. Place a 50 Ω termination on all unused differential output pairs.

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.

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