

## 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 describes 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

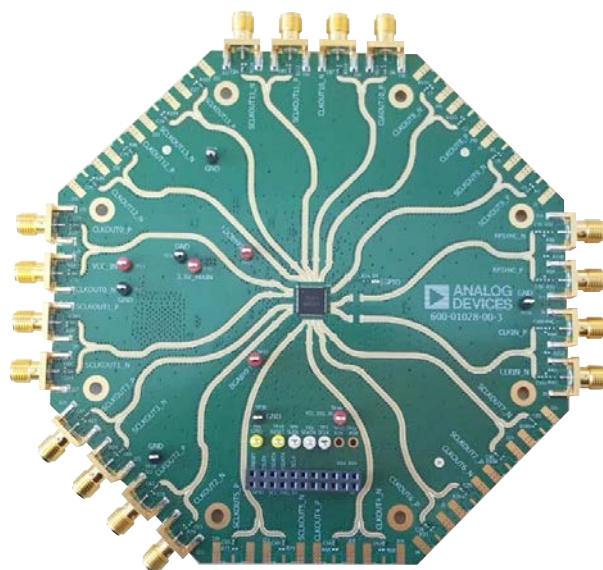


Figure 1.

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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  $\Omega$  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  $\Omega$  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.

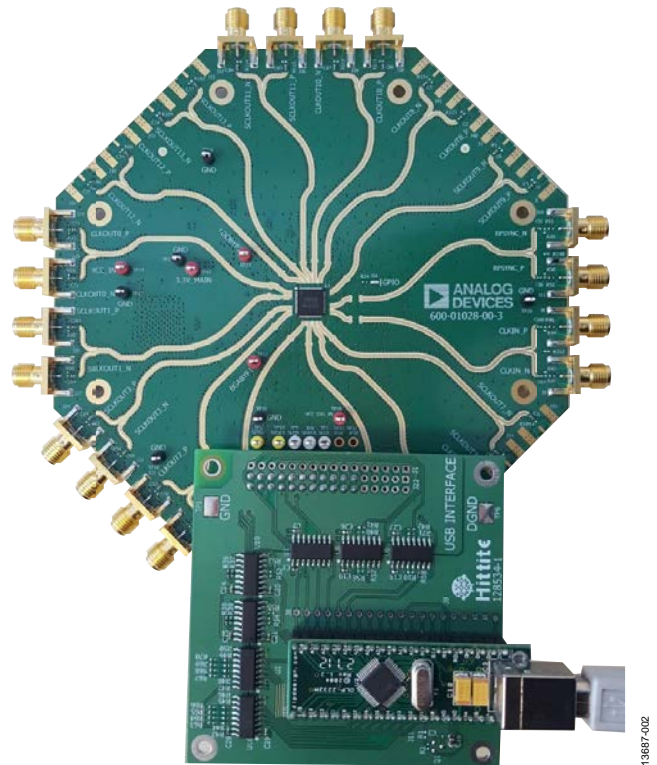


Figure 2. [HMC7043](#) Evaluation Kit Setup

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## 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.

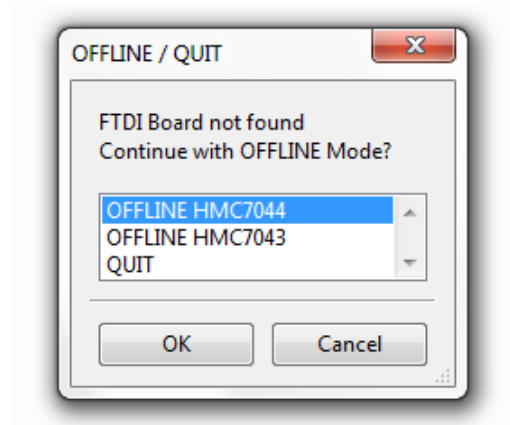


Figure 3. Select USB Device Window/Evaluation Board Not Found (Offline Mode)

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**.

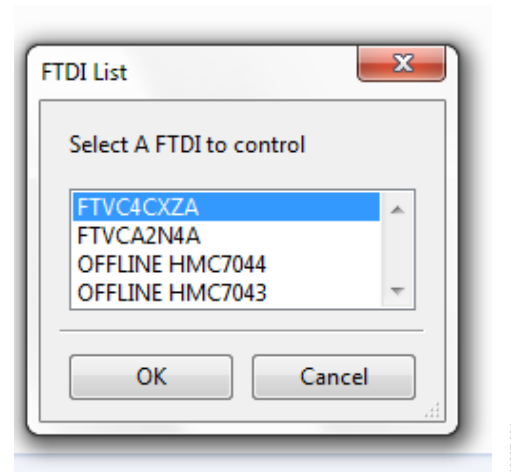


Figure 4. Select USB Device Window/Multiple Evaluation Boards Found

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.

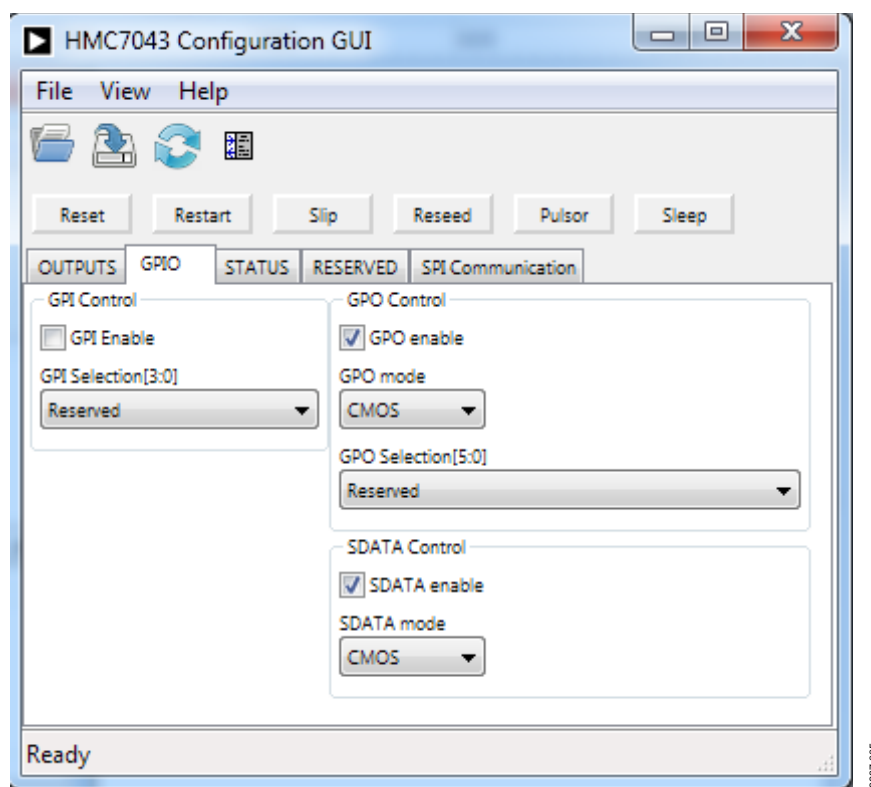


Figure 5. GPIO Tab of the [HMC7043 Configuration GUI](#)

## 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**.

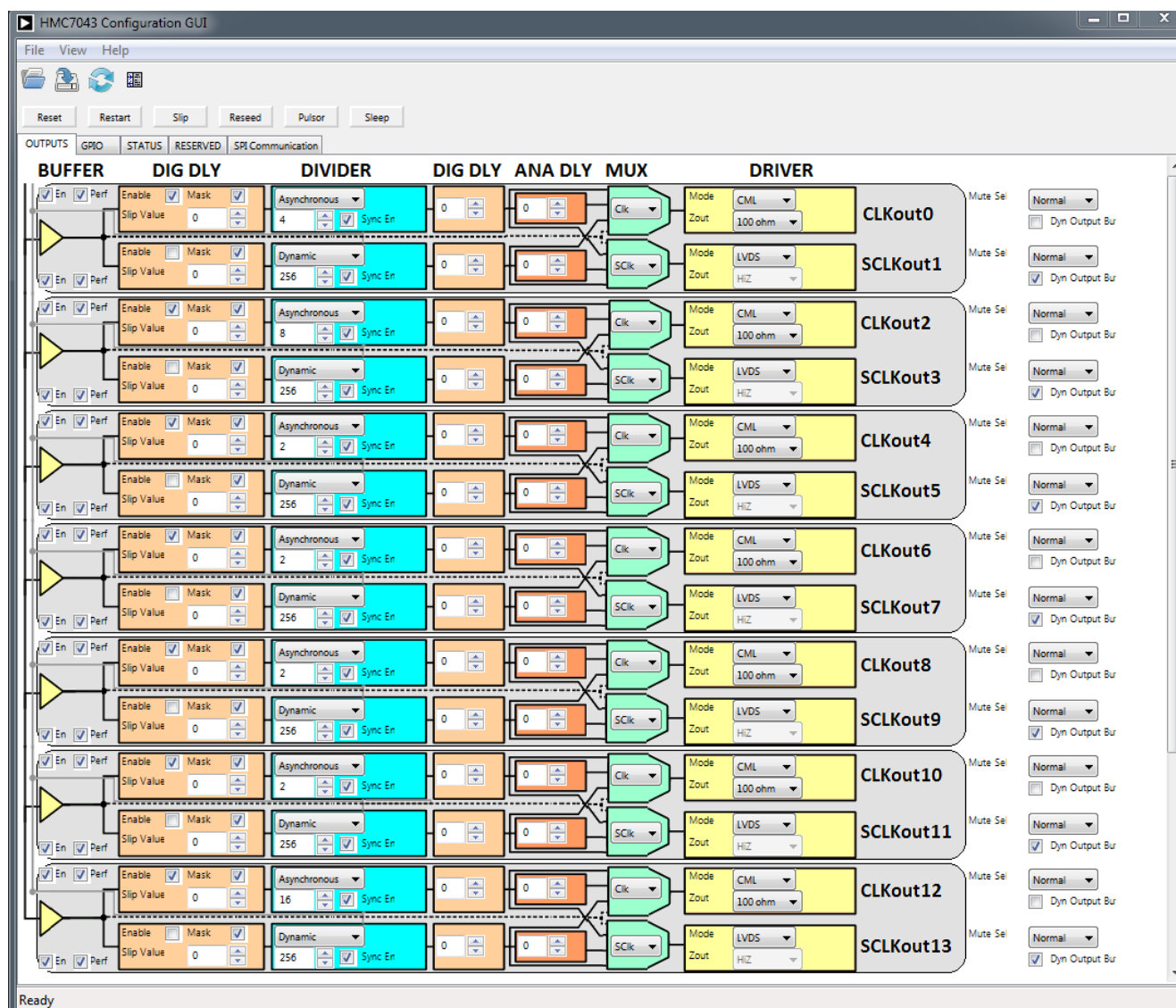


Figure 9. Output Clock Driver Tab of the **HMC7043** Configuration GUI

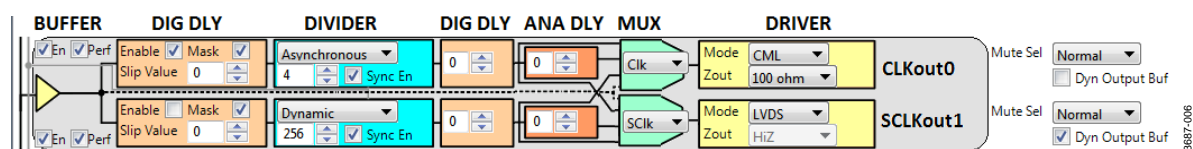


Figure 10. Example Output Channel—Configurable Blocks



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  $\Omega$  to ground for each leg on the [HMC7043](#) evaluation board by default. Odd numbered outputs (SCLKOUTs) are ac-coupled with 100  $\Omega$  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  $\Omega$  resistor must be populated on the [HMC7043](#) evaluation board.

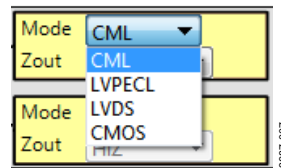


Figure 11. Output Termination Selection



## 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  $\Omega$  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  $\Omega$  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.

### Legal Terms and Conditions

By using the evaluation board discussed herein (together with any tools, components documentation or support materials, the "Evaluation Board"), you are agreeing to be bound by the terms and conditions set forth below ("Agreement") unless you have purchased the Evaluation Board, in which case the Analog Devices Standard Terms and Conditions of Sale shall govern. Do not use the Evaluation Board until you have read and agreed to the Agreement. Your use of the Evaluation Board shall signify your acceptance of the Agreement. This Agreement is made by and between you ("Customer") and Analog Devices, Inc. ("ADI"), with its principal place of business at One Technology Way, Norwood, MA 02062, USA. Subject to the terms and conditions of the Agreement, ADI hereby grants to Customer a free, limited, personal, temporary, non-exclusive, non-sublicensable, non-transferable license to use the Evaluation Board FOR EVALUATION PURPOSES ONLY. Customer understands and agrees that the Evaluation Board is provided for the sole and exclusive purpose referenced above, and agrees not to use the Evaluation Board for any other purpose. Furthermore, the license granted is expressly made subject to the following additional limitations: Customer shall not (i) rent, lease, display, sell, transfer, assign, sublicense, or distribute the Evaluation Board; and (ii) permit any Third Party to access the Evaluation Board. As used herein, the term "Third Party" includes any entity other than ADI, Customer, their employees, affiliates and in-house consultants. The Evaluation Board is NOT sold to Customer; all rights not expressly granted herein, including ownership of the Evaluation Board, are reserved by ADI. CONFIDENTIALITY. This Agreement and the Evaluation Board shall all be considered the confidential and proprietary information of ADI. Customer may not disclose or transfer any portion of the Evaluation Board to any other party for any reason. Upon discontinuation of use of the Evaluation Board or termination of this Agreement, Customer agrees to promptly return the Evaluation Board to ADI. ADDITIONAL RESTRICTIONS. Customer may not disassemble, decompile or reverse engineer chips on the Evaluation Board. Customer shall inform ADI of any occurred damages or any modifications or alterations it makes to the Evaluation Board, including but not limited to soldering or any other activity that affects the material content of the Evaluation Board. Modifications to the Evaluation Board must comply with applicable law, including but not limited to the RoHS Directive. TERMINATION. ADI may terminate this Agreement at any time upon giving written notice to Customer. Customer agrees to return to ADI the Evaluation Board at that time. LIMITATION OF LIABILITY. THE EVALUATION BOARD PROVIDED HEREUNDER IS PROVIDED "AS IS" AND ADI MAKES NO WARRANTIES OR REPRESENTATIONS OF ANY KIND WITH RESPECT TO IT. ADI SPECIFICALLY DISCLAIMS ANY REPRESENTATIONS, ENDORSEMENTS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, RELATED TO THE EVALUATION BOARD INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTY OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS. IN NO EVENT WILL ADI AND ITS LICENSORS BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES RESULTING FROM CUSTOMER'S POSSESSION OR USE OF THE EVALUATION BOARD, INCLUDING BUT NOT LIMITED TO LOST PROFITS, DELAY COSTS, LABOR COSTS OR LOSS OF GOODWILL. ADI'S TOTAL LIABILITY FROM ANY AND ALL CAUSES SHALL BE LIMITED TO THE AMOUNT OF ONE HUNDRED US DOLLARS (\$100.00). EXPORT. Customer agrees that it will not directly or indirectly export the Evaluation Board to another country, and that it will comply with all applicable United States federal laws and regulations relating to exports. GOVERNING LAW. This Agreement shall be governed by and construed in accordance with the substantive laws of the Commonwealth of Massachusetts (excluding conflict of law rules). Any legal action regarding this Agreement will be heard in the state or federal courts having jurisdiction in Suffolk County, Massachusetts, and Customer hereby submits to the personal jurisdiction and venue of such courts. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to this Agreement and is expressly disclaimed.

