AD5790 FMC-SDP Interposer & Evaluation Board / Xilinx KC705 Reference Design

Supported Devices

• AD5790

Evaluation Boards

• EVAL-AD5790SDZ

Overview

This document presents the steps to setup an environment for using the **EVAL-AD5790SDZ** evaluation board together with the Xilinx KC705 FPGA board and the Xilinx Embedded Development Kit (EDK). Below is presented a picture of the EVAL-AD5790SDZ Evaluation Board with the Xilinx KC705 board.

For component evaluation and performance purposes, as opposed to quick prototyping, the user is directed to use the part evaluation setup. This consists of:

- 1. A controller board like the SDP-B (EVAL-SDP-CS1Z)
- 2. The component SDP compatible product evaluation board
- 3. Corresponding PC software (shipped with the product evaluation board)

The SDP-B controller board is part of Analog Devices System Demonstration Platform (SDP). It provides a high speed USB 2.0 connection from the PC to the component evaluation board. The PC runs the evaluation software. Each evaluation board, which is an SDP compatible daughter board, includes the necessary installation file required for performance testing.

Note: it is expected that the analog performance on the two platforms may differ.

28 Sep 2012 09:32 · Adrian Costina

Below is presented a picture of **SDP-B** Controller Board with the **EVAL-AD5790SDZ** Evaluation Board.
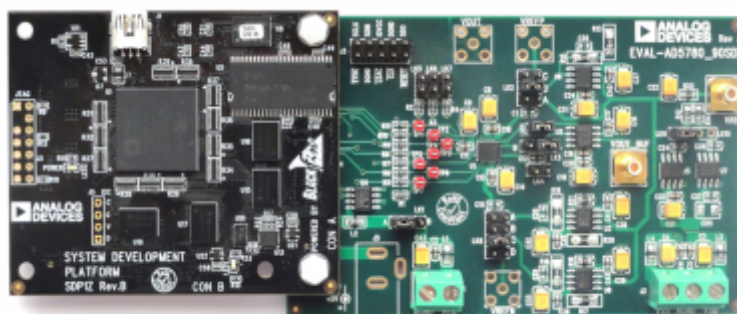
The AD5790 is a single 20-bit, voltage out DAC that operates from a bipolar supply up to 33V.

Reference buffers are also provided on-chip. The AD5790 accepts a positive reference input in the range of 5V to VDD – 2.5V and a negative reference input in the range of VSS + 2.5v to 0V. The AD5790 offers a relative accuracy of +/-2 LSB's max and operation is guaranteed monotonic with a -1 LSB to +3 LSB's DNL specification.

The **EVAL-AD5790** evaluation board is a full-featured evaluation board, designed to allow the user to easily evaluate all features of the AD5790 voltage output, 20-bit DAC. The AD5790 pins are accessible at on-board connectors for external connection.

More information

- AD5790 Product Info - pricing, samples, datasheet
- EVAL-AD5790SDZ evaluation board user guide
- Xilinx KC705 FPGA board

Getting Started

The first objective is to ensure that you have all of the items needed and to install the software tools so that you are ready to create and run the evaluation project.

Required Hardware

- Xilinx KC705 FPGA board
- FMC-SDP adapter board
- **EVAL-AD5790** evaluation board

Required Software

- Xilinx ISE 14.6.
- UART Terminal (Termite/Tera Term/Hyperterminal), baud rate 115200.
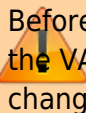- The EVAL-AD5790 reference project for Xilinx KC705 FPGA.
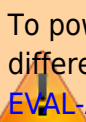
Downloads

- **AD5790 Driver:**
  https://github.com/analogdevicesinc/no-OS/tree/master/device_drivers/AD5791
- **AD5790 Commands:**
  https://github.com/analogdevicesinc/no-OS/tree/master/device_commands/AD5791
- **Xilinx Boards Common Drivers:**
  https://github.com/analogdevicesinc/no-OS/tree/master/platform_drivers/Xilinx/SDP_Common
- **EDK KC705 Reference project:**
  https://github.com/analogdevicesinc/fpgahdl_xilinx/tree/master/cf_sdp_kc705

Run the Demonstration Project

Hardware setup

Before connecting the ADI evaluation board to the Xilinx KC705 make sure that the VADJ_FPGA voltage of the KC705 is set to 3.3V. For more details on how to change the setting for VADJ_FPGA visit the Xilinx KC705 product page.

- Use the FMC-SDP interposer to connect the ADI evaluation board to the Xilinx KC705 board on the FMC LPC connector.
- Connect the JTAG and UART cables to the KC705 and power up the FPGA board.

To power on the EVAL-AD5790 evaluation board, you need to provide external differential supply voltage to J2 connector(for more information see: EVAL-AD5790SDZ evaluation board user guide) and a 5V reference voltage to VREF connector on the evaluation board. VREFN will be connected to AGND (LK8 option=B, LK2 option=B, LK3 option=B, LK4 inserted).
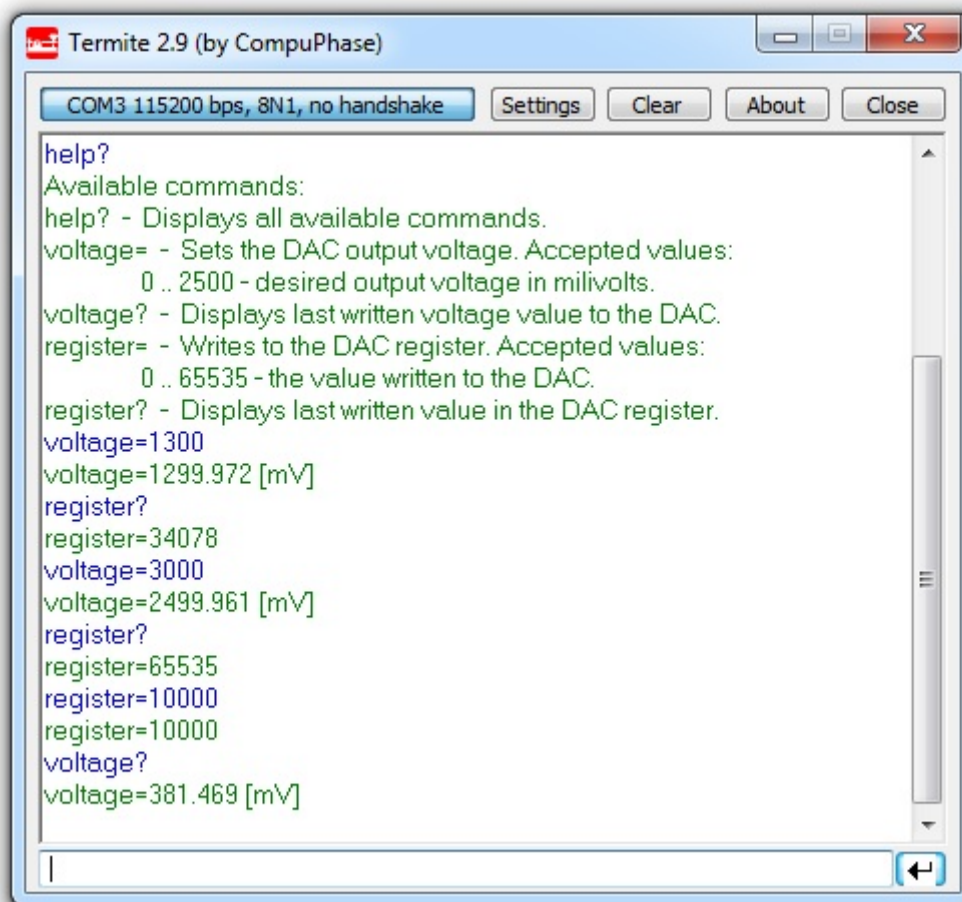
Reference Project Overview

The following commands were implemented in this version of EVAL-AD5790 reference project for

```



```

Xilinx KC705 FPGA board.

Command	Description
help?	Displays all available commands.
reset!	Resets the device.
coding=	Selects the coding style. Accepted values: 0 - Two's complement coding.(default) 1 - Offset binary coding.
coding?	Display the current coding style.
register=	Writes to the DAC register. Accepted values: 0 .. 1048575 - the value written to the DAC.
register?	Displays last written value to the DAC register.
voltage=	Sets the DAC output voltage. Accepted values: -10 .. +10 - desired output voltage in volts.
voltage?	Displays the output voltage.
output=	Selects the DAC output state. Accepted values: 0 - Normal state. 1 - Clamped via 6KOhm to AGND.(default) 2 - Tristate.
output?	Displays the DAC output state.
rbuf=	Sets/resets the RBUF bit from control register. Accepted values: 0 - RBUF is reset. 1 - RBUF is set.(default)
rbuf?	Displays the value of RBUF bit from control register.

Commands can be executed using a serial terminal connected to the UART peripheral of Xilinx KC705 FPGA.

The following image shows a generic list of commands in a serial terminal connected to Xilinx KC705 FPGA's UART peripheral.

```
Termite 2.9 (by CompuPhase)

COM3 115200 bps, 8N1, no handshake    Settings    Clear    About    Close

help?
Available commands:
help? - Displays all available commands.
voltage= - Sets the DAC output voltage. Accepted values:
        0 .. 2500 - desired output voltage in milivolts.
voltage? - Displays last written voltage value to the DAC.
register= - Writes to the DAC register. Accepted values:
        0 .. 65535 - the value written to the DAC.
register? - Displays last written value in the DAC register.
voltage=1300
voltage=1299.972 [mV]
register?
register=34078
voltage=3000
voltage=2499.961 [mV]
register?
register=65535
register=10000
register=10000
voltage?
voltage=381.469 [mV]
```

Software Project Setup

The hardware platform for each reference projects with FMC-SDP interposer and KC705 evaluation board is common. The next steps should be followed to recreate the software project of the reference design:

- First download the **KC705 Reference project** from Github on your computer. You can do this by clonning this repository: https://github.com/analogdevicesinc/fpgahdl_xilinx.
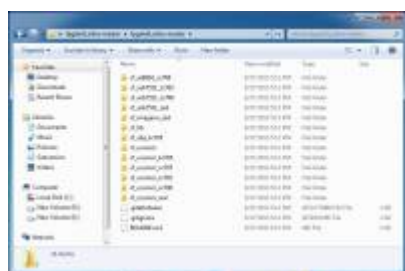

- From this entire repository you will use **cf_sdp_kc705** folder. This is common for all KC705 projects.
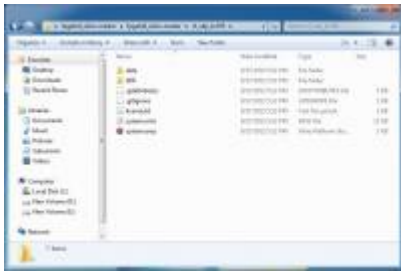
- Open the Xilinx SDK. When the SDK starts, it asks you to provide a folder where to store the workspace. Any folder can be provided. Make sure that the path where it is located does not contain any spaces.
- In the SDK select the **File→Import** menu option to import the software projects into the workspace.
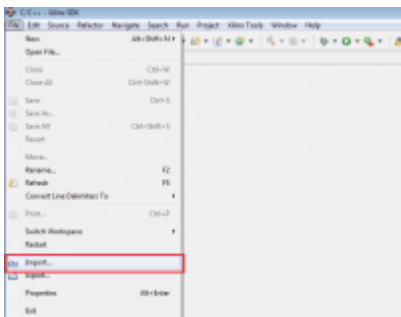

- In the *Import* window select the **General→Existing Projects into Workspace** option.
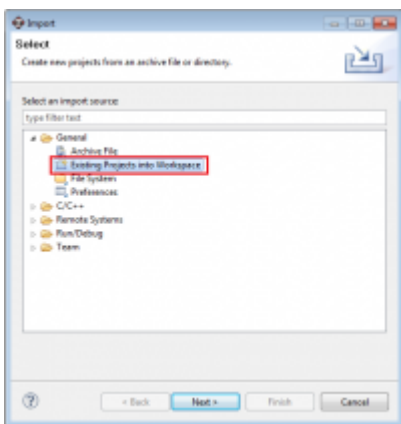
- In the *Import Projects* window select the **cf_sdp_kc705** folder as root directory and check the **Copy projects into workspace** option. After the root directory is chosen the projects that reside in that directory will appear in the *Projects* list. Press *Finish* to finalize the import process.
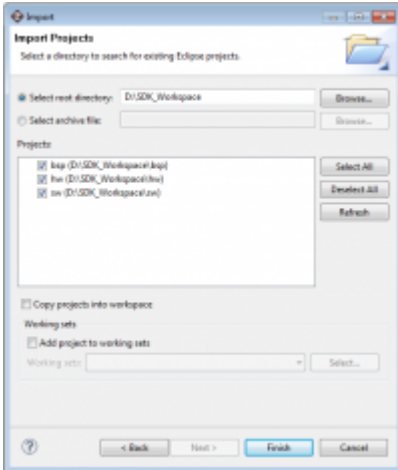
- The *Project Explorer* window now shows the projects that exist in the workspace without software files.
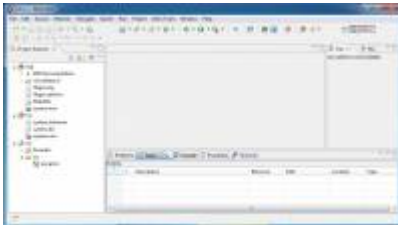
- Now the software must be added in your project. For downloading the software, you must use 3 links from Github given in **Downloads** section. From there you'll download the specific driver, the specific commands and the Xilinx Boards Common Drivers(which are commons for all Xilinx boards). All the software files downloaded must be copied in **src** folder from sw folder.

- Before compilation in the file called **Communication.h** you have to uncomment the name of the device that you currently use. In the picture below there is an example of this, which works only with AD5629R project. For another device, uncomment only the respective name. You can have one driver working on multiple devices, so the drivers's name and the uncommented name may not be the same for every project.
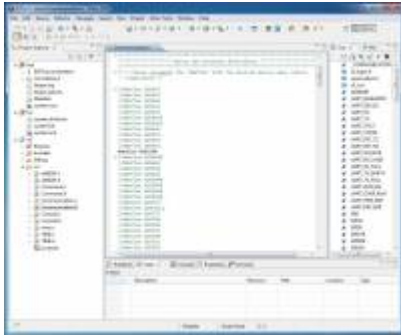
- The SDK should automatically build the project and the *Console* window will display the result of the build. If the build is not done automatically, select the **Project→Build Automatically** menu option.
- If the project was built without any errors, you can program the FPGA and run the software application.

13 Aug 2013 08:22 · Lucian Sin

More information

- AD5790 IIO DAC Linux Driver

- ask questions about the FPGA reference design
- Example questions:
  - Changing reference design for ZedBoard with FMCOMM1 without OS by MiTfreak
  - AD9361 no-os drivers: enable & txnrx by labianco
  - Which way would you recommend me to develop further on Zedboard and AD-FMCOMMS3 system? And could you present more pratical guidance? by yanjiesh
  - Getting Data From FMCADC2 from VC707 by acwvh4
  - FMC interposer connecting Xilinx ZC706 and HMC6450 by janerikh

28 May 2012 14:18

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