Using Code Composer Studio v4.2.4 with the OMAP-L138 SOM-M1, TMS320C6748 SOM-M1, and AM1808 SOM-M1

Application Note 492

Logic PD // Products
Published: August 2011
Last revised: October 2011

Abstract

This application note describes how to use the Code Composer Studio v4.2.4 workspace and projects provided by Logic PD to test peripherals on the Zoom™ OMAP-L138 eXperimenter Kit, the Zoom OMAP-L138 EVM Development Kit, the Zoom AM1808 eXperimenter Kit, or the Zoom AM1808 EVM Development Kit with the Blackhawk XDS100v1 or XDS100v2.

Revision History

REV	EDITOR	DESCRIPTION	APPROVAL	DATE
A	JMO	-Initial Release	BSB	08/31/11
B	SO	-Updated tested version of CCS to v4.2.4 throughout; updated workspace references to CCSv4-2-4_with_SOM-M1_BSL_WS.zip throughout.	BSB	10/21/11

Table of Contents

Table of Figures

1 Introduction

This application note outlines how to install and use Code Composer Studio (CCS) v4.2.4 with the OMAP-L138 SOM-M1, TMS320C6748 (C6748) SOM-M1, and AM1808 SOM-M1 BSL files to test the functionality of the Zoom™ OMAP-L138 eXperimenter Kit, the Zoom OMAP-L138 EVM Development Kit, the Zoom AM1808 eXperimenter Kit, or the Zoom AM1808 EVM Development Kit.

The Blackhawk XDS100v1 and Blackhawk XDS100v2 are the targeted emulators throughout this application note. If you would like to use a different emulator or need additional information on the Blackhawk XDS100v2, please visit the following Texas Instruments (TI) wiki articles: *How to connect to EVM board using CCS*[1] and *Emulation*.[2]

1.1 Nomenclature

Throughout this application note, the term *development kit* refers to either the eXperimenter or the EVM Development Kit. Where a difference exists between the development kits, the specific name will be used.

A test ending with eXp will run on both the eXperimenter Kits and the EVM Development Kits. A test ending with EVM will only run on the EVM Development Kits.

ARM refers to a test that will run on the ARM core of the OMAP-L138 SOM-M1 or the AM1808 SOM-M1. DSP refers to a test that will run on the DSP core of the OMAP-L138 SOM-M1 or the C6748 SOM-M1.

1.2 Requirements

This application note assumes the following:

- Your OMAP-L138 or AM1808 Development Kit is properly assembled as described in the appropriate QuickStart Guide.

  - □ *Zoom OMAP-L138 eXperimenter Kit QuickStart Guide*[3]
  - □ *Zoom OMAP-L138 EVM QuickStart Guide*[4]
  - □ *Zoom AM1808 eXperimenter Kit QuickStart Guide*[5]
  - □ *Zoom AM1808 EVM QuickStart Guide*[6] with the User Interface (UI) board connected

- You are familiar with the User Guide associated with your development kit.

  - □ *Zoom OMAP-L138 eXperimenter Kit User Guide*[7]
  - □ *Zoom OMAP-L138 EVM User Guide*[8]
  - □ *Zoom AM1808 eXperimenter Kit User Guide*[9]
  - □ *Zoom AM1808 EVM User Guide*[10]

---

[1] http://processors.wiki.ti.com/index.php/How_to_connect_to_the_OMAP-L138/C6748/AM1808_EVM_board_using_CCS%3F
[2] http://processors.wiki.ti.com/index.php/Category:Emulation
[3] http://support.logicpd.com/downloads/1367/
[4] http://support.logicpd.com/downloads/1230/
[5] http://support.logicpd.com/downloads/1294/
[6] http://support.logicpd.com/downloads/1293/
[7] http://support.logicpd.com/downloads/1363/
[8] http://support.logicpd.com/downloads/1214/
[9] http://support.logicpd.com/downloads/1424/
[10] http://support.logicpd.com/downloads/1296/

■ You have the <u>Blackhawk XDS100v2 model D USB JTAG controller</u>[11] that was included with your development kit (see Figure 1.1). **IMPORTANT NOTE:** Do not attach the Blackhawk XDS100v2 until CCS v4.2 has been installed on your host PC.

Figure 1.1: Blackhawk XDS100v2 with JTAG adapter

Your Blackhawk XDS100v2 must have the latest firmware. For information on how to update to the latest firmware, please refer to TI's wiki article <u>How Can I Update the CPLD on My XDS100v2</u>.[12]

■ Your host PC has an available USB port and active internet connection.

2   Setup

This section explains how to install and set up CCS v4.2.4 to run the BSL tests on your OMAP-L138 SOM-M1, C6748 SOM-M1, or AM1808 SOM-M1. Differences between setting up Blackhawk XDS100v1 and Blackhawk XDS100v2 on the development kit will also be addressed within the setup provided below.

The projects in this workspace have been tested in CCS v4.2.4. If you are not using CCS v4.2.4, you may be given a warning that the workspace was created with a previous version of CCS; click OK and continue.
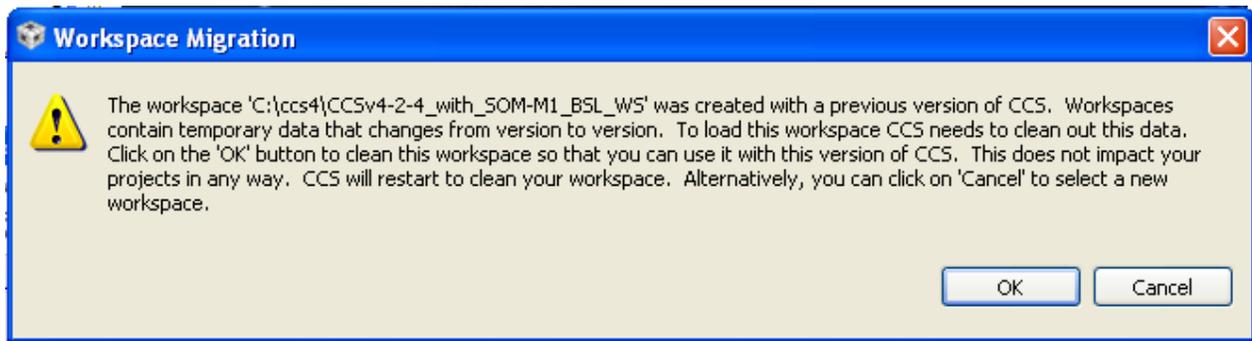
2.1   Installing CCS v4.2.4

Install CCS v4.2.4 if it is not already installed on your host PC. This <u>TI wiki article</u>[13] provides information for properly installing the software.

Again, this application note was tested on and written specifically for CCS v4.2.4.

NOTE: Once you have downloaded CCS v4.2.4, there is a bug that must be fixed if you wish to make your own target configuration .ccxml files:

1.   Go to directory *<CCS_INSTALL_DIR>/ccsv4/common/targetdb/Devices*.

---

[11] <u>http://www.blackhawk-dsp.com/products/USB100.aspx</u>
[12] <u>http://processors.wiki.ti.com/index.php/XDS100#Q:_How_can_I_update_the_CPLD_on_my_XDS100v2.3F</u>
[13] <u>http://processors.wiki.ti.com/index.php/Code_Composer_Studio_v4</u>

2. Open the device file being used in a text editor.

3. In the second line, inside the directive *<device>*, replace the parameter *desc* with *description*.

4. Save the file and restart CCS.

2.2 Setting Up the Workspace

1. Download the *OMAP-L138/TMS320C6748/AM1808 SOM-M1 Gel, CCS Setup, and BSL Files (CCS v4.2.4)*[14] from the Logic PD website. (You can also access this download under the *Software Development Tools* section of your development kit's downloads page.)

2. Extract the files to a new folder on your C: Drive. For the purposes of this application note, the folder has been named *CCS4*.

3. Launch CCS v4.2.4 by selecting Start > All Programs > Texas Instruments > Code Composer Studio v4.x.x > Code Composer Studio v4.

4. When asked to choose your workspace folder, browse to the location you extracted the files (e.g., *C:\ccs4\CCSv4-2-4_with_SOM-M1_BSL_WS*).
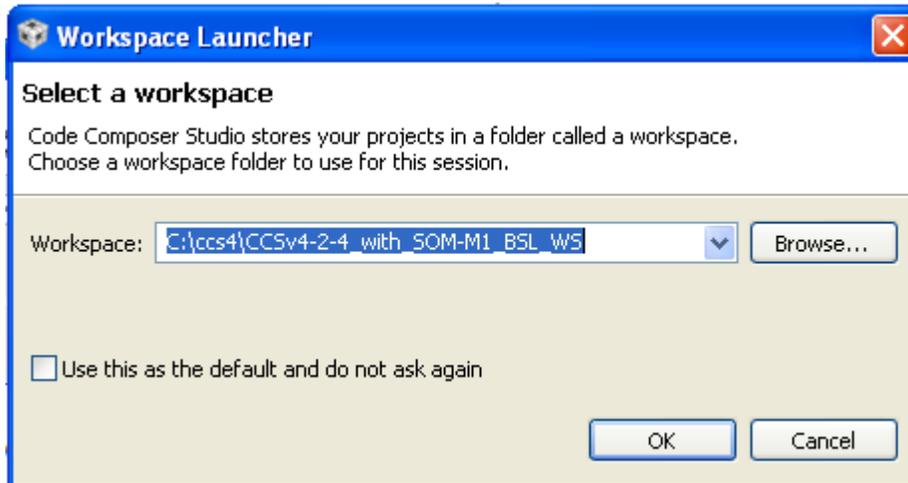
NOTE: If you would like to switch to a different workspace once you are in CCS v4.2, select File > Switch Workspace > Browse > C:\[*Your Workspace*].

---

[14] http://support.logicpd.com/downloads/1433/

2.3   Setting Up the Development Kit

2.3.1   Blackhawk XDS100v1

1. Connect the following components of your development kit as documented in the online *QuickStart Guide*. Wait to switch on the power.

    □   *Zoom OMAP-L138 eXperimenter Kit QuickStart Guide*
    □   *Zoom OMAP-L138 EVM QuickStart Guide*
    □   *Zoom AM1808 eXperimenter Kit QuickStart Guide*
    □   *Zoom AM1808 EVM QuickStart Guide*

2. Using the USB cable provided, connect the Emulation USB port to the USB port on your PC.

Figure 2.1: Connection to Emulation USB Port

3. **EVM DELOPEMENT KITS ONLY:** Carefully connect the UI Board to J28 and J29 on the baseboard.

4. On the baseboard, set DIP switches S7:5 and S7:8 to **ON** and all other switches to **OFF** (see Figure 2.2).

5. Power on your development kit as documented in the *QuickStart Guide*. **NOTE:** The Blackhawk XDS100v1 emulator is not supported on the ARM core.

2.3.2   Blackhawk XDS100v2

1. Connect the Blackhawk XDS100v2 JTAG Controller to J23 on the baseboard. (Please refer to your development kit's *User Guide* for detailed instructions on connecting the Blackhawk XDS100v2.)

2. **EVM DELOPEMENT KITS ONLY:** Verify the UI Board is connected to J28 and J29 on the baseboard.

3. On the baseboard, set DIP switches S7:5 and S7:8 to **ON** and all other switches to **OFF** (see Figure 2.2).

4. Power on your development kit as documented in the *QuickStart Guide*.
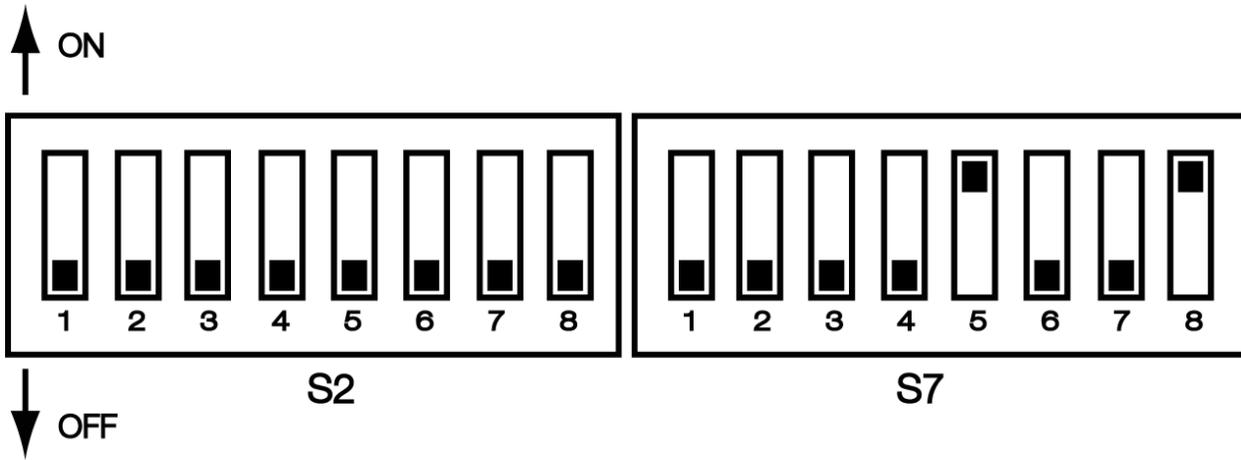
Figure 2.2: S2 & S7 DIP Switch Required Settings

2.4 Sample Tests

This section will discuss how to run a sample project in CCS v4.2.4.

NOTE:

■ The Blackhawk XDS100v1 emulator does not support the ARM core.

■ When switching from Blackhawk XDS100v2 to Blackhawk XDS100v1, you must completely remove the Blackhawk USB100v2 from the baseboard connectors and restart CCS v4.2. This is not necessary when switching from Blackhawk XDS100v1 to Blackhawk XDS100v2.

■ When switching BSLs, remember to change both the active and default projects and .ccxml files.

■ Run all tests in debug mode, not release mode.

■ Use instructions in Section 2.4.2 if you are running a sample project with the following setup: DSP core with ARM slave on the OMAP-L138 with Blackhawk XDS100v2. Use instructions in Section 2.4.1 for all other setups.

Below is a table explaining which tests can be run on which platforms and which debuggers are applicable: v1 indicates the test uses the Blackhawk XDS100v1; v2 indicates the test uses the Blackhawk XDS100v2. If a debugger is not listed, that particular project is not supported to run on that setup. The eXperimenter Kit is labeled eXp and the EVM Development Kit is labeled EVM.

Table 2.1: Supported Debuggers and Projects

Project	C6748 eXp	C6748 EVM	OMAP-L138 eXp	OMAP-L138 EVM	AM1808 eXp	AM1808 EVM
ARM_EVM Character LCD Test				v2		v2
ARM_EVM Composite Video Test				v2		v2
ARM_EVM Emac Loopback RMII Test				v2		v2
ARM_EVM Image Sensor Test				v2		v2
ARM_EVM LED and Pushbutton Test				v2		v2
ARM_EVM NAND Test				v2		v2
ARM_EVM NOR Test				v2		v2
ARM_EVM S-Video Test				v2		v2
ARM_EVM UPP Test				v2		v2
ARM_eXp Audio Test			v2	v2	v2	v2

Project	C6748 eXp	C6748 EVM	OMAP-L138 eXp	OMAP-L138 EVM	AM1808 eXp	AM1808 EVM
ARM_eXp Emac Loopback MII Test			v2	v2	v2	v2
ARM_eXp Graphics LCD Test			v2	v2	v2	v2
ARM_eXp lCD Touch Test			v2	v2	v2	v2
ARM_eXp LED_DIP Test			v2	v2	v2	v2
ARM_eXp MMCSD Test			v2	v2	v2	v2
ARM_eXp PMIC Test			v2	v2	v2	v2
ARM_eXp Ram Test			v2	v2	v2	v2
ARM_eXp Read Mac Test			v2	v2	v2	v2
ARM_eXp RTC Test			v2	v2	v2	v2
ARM_eXp SATA Test			v2	v2	v2	v2
ARM_eXp SPI Flash Test			v2	v2	v2	v2
ARM_eXp UART Test			v2	v2	v2	v2
ARM_eXp USB Test			v2	v2	v2	v2
DSP_EVM C-Video Test		v1/v2		v1/v2		
DSP_EVM Emac Loopback RMII Test		v1/v2		v1/v2		
DSP_EVM Image Sensor Test		v1/v2		v1/v2		
DSP_EVM LCD Char Test		v1/v2		v1/v2		
DSP_EVM LED PB Test		v1/v2		v1/v2		
DSP_EVM NAND Test		v1/v2		v1/v2		
DSP_EVM NOR Test		v1/v2		v1/v2		
DSP_EVM S-Video Test		v1/v2		v1/v2		
DSP_eXp Audio Test	v1/v2	v1/v2	v1/v2	v1/v2		
DSP_eXp Emac Loopback MII Test	v1/v2	v1/v2	v1/v2	v1/v2		
DSP_eXp LCD Graphics Test	v1/v2	v1/v2	v1/v2	v1/v2		
DSP_eXp LCD Touch Test	v1/v2	v1/v2	v1/v2	v1/v2		
DSP_eXp LED DIP Test	v1/v2	v1/v2	v1/v2	v1/v2		
DSP_eXp MMCSD Test	v1/v2	v1/v2	v1/v2	v1/v2		
DSP_eXp PMIC Test	v1/v2	v1/v2	v1/v2	v1/v2		
DSP_eXp RAM Test	v1/v2	v1/v2	v1/v2	v1/v2		
DSP_eXp Read Mac Test	v1/v2	v1/v2	v1/v2	v1/v2		
DSP_eXp RTC Test	v1/v2	v1/v2	v1/v2	v1/v2		
DSP_eXp SATA Test	v1/v2	v1/v2	v1/v2	v1/v2		
DSP_eXp SPI Flash Test	v1/v2	v1/v2	v1/v2	v1/v2		
DSP_eXp UART Test	v1/v2	v1/v2	v1/v2	v1/v2		
DSP_eXp UPP Test	v1/v2	v1/v2	v1/v2	v1/v2		
DSP_eXp USB Test	v1/v2	v1/v2	v1/v2	v1/v2		

2.4.1 Running a Sample Test

Now we will run a sample test to show how the test procedure works.

1. In the CCS v4.2.4 application, verify the correct emulation configuration is set as active/default.

   NOTE: The *OMAPL138_XDS100v2.ccxml* and the *AM1808_XDS100v2.ccxml* files are located in the *ARM BSL* folder. All other .ccxml files referred to are located in the *DSP BSL* folder.

   □ For using the ARM core on the OMAP-L138 with Blackhawk XDS100v2, set *OMAPL138_XDS100v2.ccxml* as active/default in the *ARM BSL* folder.

   □ For using the DSP core on the OMAP-L138 with Blackhawk XDS100v1, set *OMAPL138_XDS100v1.ccxml* as active/default in the *DSP BSL* folder.

   □ For using the DSP core with the ARM slave on the OMAP-L138 with Blackhawk XDS100v2, set *OMAPL138_XDS100v2.ccxml* as active/default in the *ARM BSL* folder.

   □ For using the C6748 with Blackhawk XDS100v1, set *C6748_XDS100v1.ccxml* as active/default in the *DSP BSL* folder.

   □ For using the C6748 with Blackhawk XDS100v2, set *C6748_XDS100v2.ccxml* as active/default in the *DSP BSL* folder.

   □ For using the AM1808 with Blackhawk XDS100v2, set *AM1808_XDS100v2.ccxml* as active/default in the *ARM BSL* folder.

   For example, to set the AM1808 with Blackhawk XDS100v2 as active/default target configuration, select View > C/C++ from the menu toolbar.

   a. In the *C/C++ Projects* window, expand the *ARM BSL* folder.

   b. Right click on the *AM1808_XDS100v2.ccxml* file and select Set as Default Target Configuration.
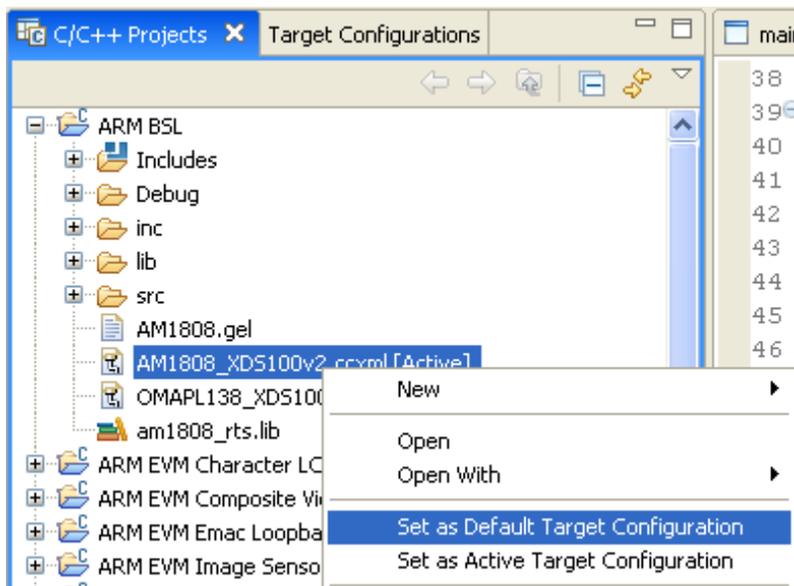
   c. Next, right-click *AM1808_XDS100v2.ccxml* again, but now select Set as Active Target Configuration.

2. Right click the *ARM eXp LCD Touch Test* folder and select Set as Active Project.
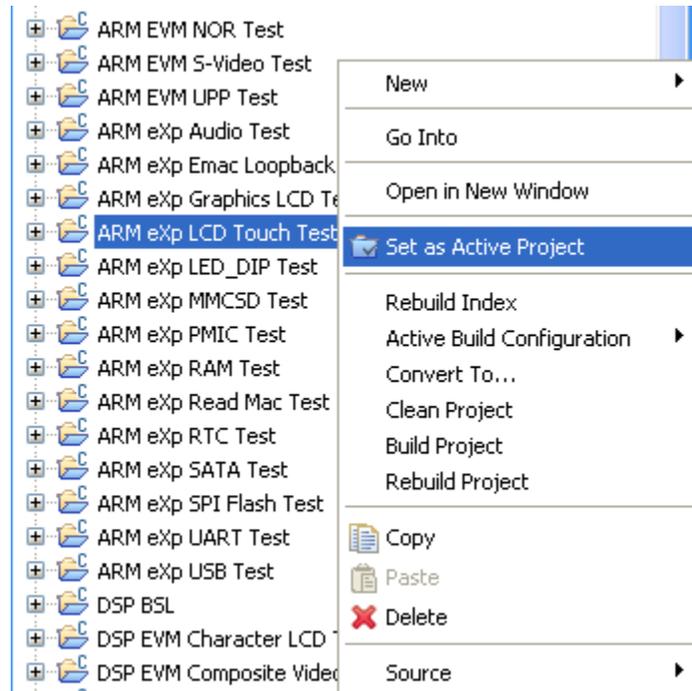
3. To start debugging, select Target > Debug Active Project from the menu toolbar. CCS v4.2.4 will begin to access your target through the Blackhawk USB100v2 JTAG Controller or the Emulator Port.

    Your development kit is now available for debugging.

4. To run the selected project, select Target > Run or press F8.

5. You should now see the console being loaded with test description information. Follow the instructions to complete the test.

    For this specific test, a set of crosshairs will appear anywhere you touch the touch-screen display.

6. You can repeat these steps to run any of the tests included in the BSL, but be sure to closely follow the directions printed to the console.

7. To stop a test from running, select Target > Terminate All.

2.4.2   Running a Sample Test on OMAP-L138 Using DSP Core with Blackhawk XDS100v2

This approach will need to be taken when using the DSP core with ARM slave on the OMAP-L138 SOM-M1 with Blackhawk XDS100v2 because both the DSP and ARM cores need to be active (or "woken up").

Now we will run a sample test to show how the test procedure works.

1. Select View > Target Configurations.
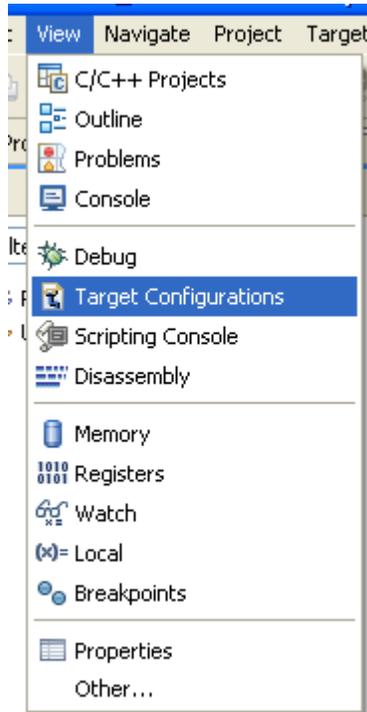
2. Right-click on the desired target and select Launch Selected Configuration.
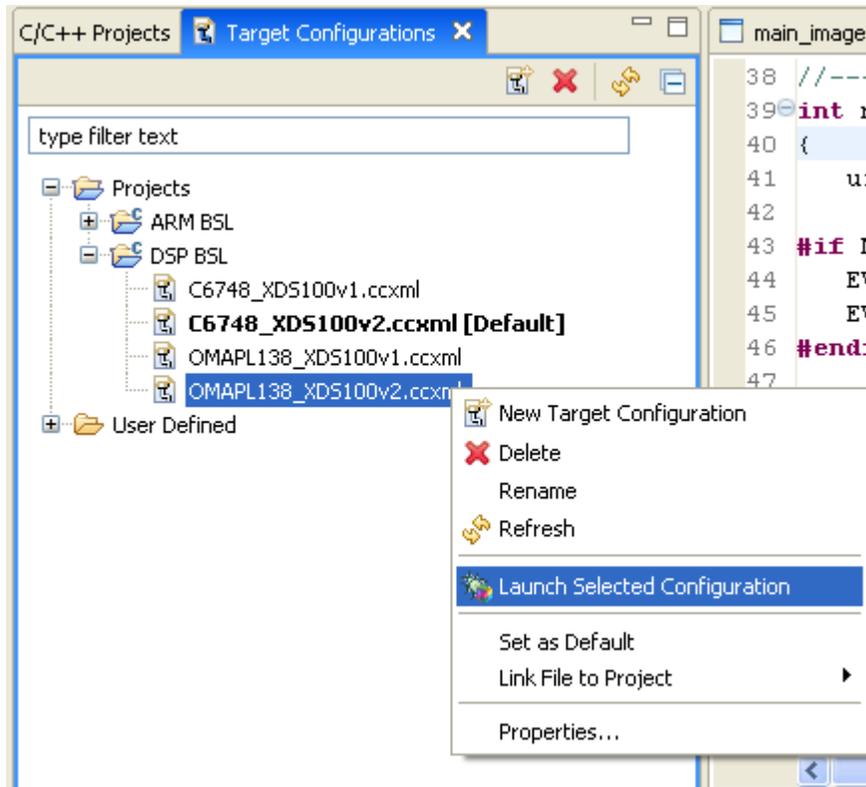
3. Once the debugger is launched, right-click on the ARM core and select Connect Target.
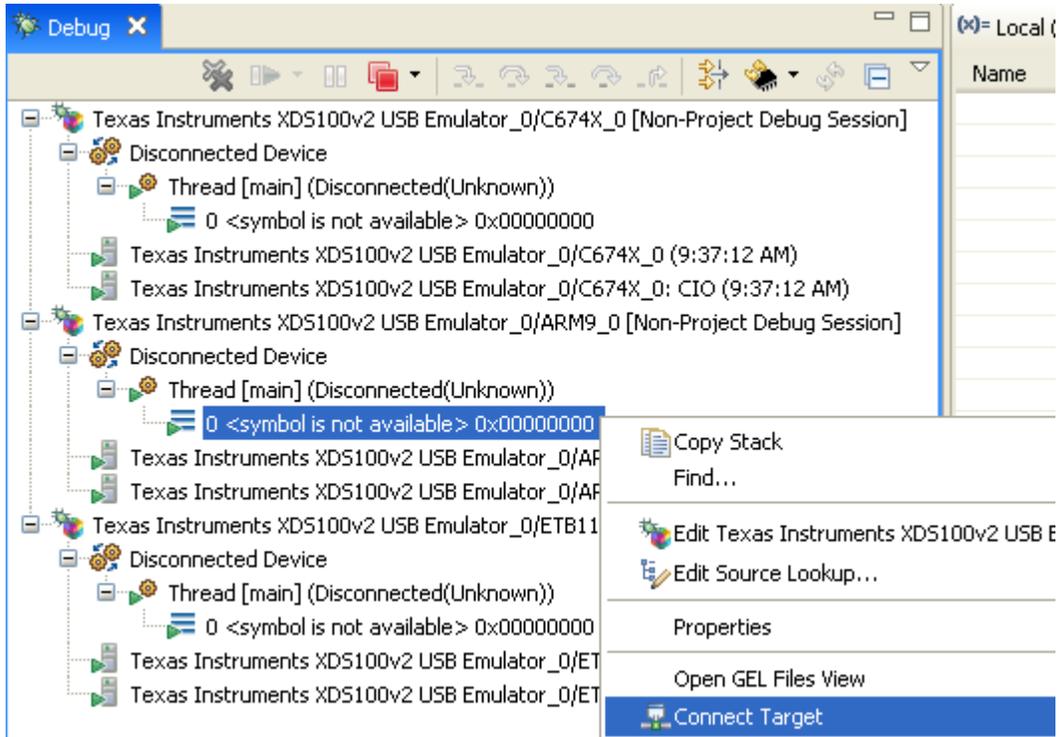
4. Right-click on the DSP core and select Connect Target.

5. Load the program to the target by selecting Target > Load Program...

   NOTE: When loading the program, you must have the DSP selected. You do this by left-clicking on the "0 <symbol…" below the Thread of the DSP (see Figure 2.3). After selecting Target > Load Program… with the DSP selected, select Browse Project and pick the project you want to build. From this point on, run the project normally by selecting Target > Run.
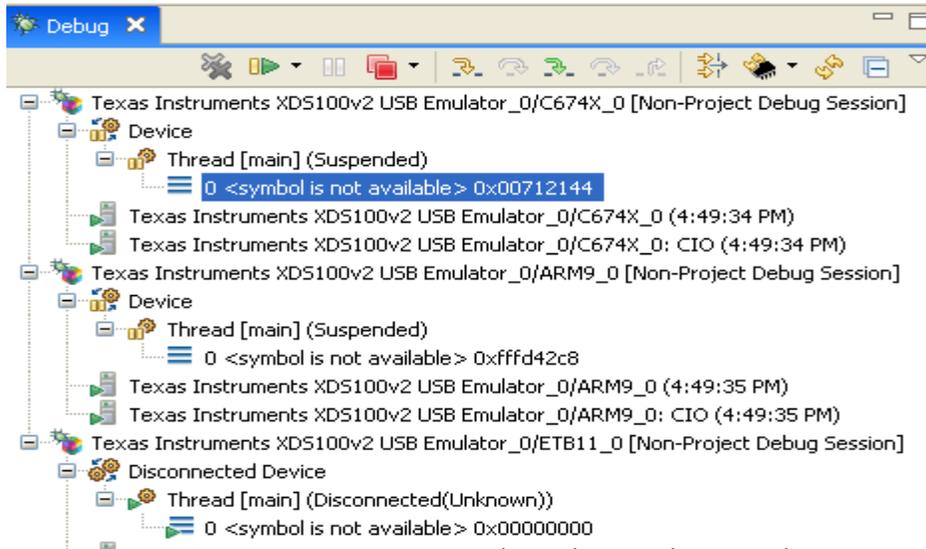
Figure 2.3: Selecting the DSP Core

2.5   Troubleshooting

If you experience difficulty getting any test to run, here are some troubleshooting actions you can take:

1. Consider cycling the power on your development kit, especially if there were recent changes to the CCXML settings.

2. Make sure that the test is in debug mode, not release mode by right-clicking [*Your Project*] and then selecting Active Build Configuration > Debug.

3. Review the <u>Debugging JTAG Connectivity Problems</u>[15] wiki article.

4. Make sure you have <u>updated the CPLD firmware on your Blackhawk XDS100v2</u>.[16]

5. If you are using the Blackhawk XDS100v2, XDS510, or XDS560 emulators, review the connection instructions in this <u>TI wiki article</u>[17] to verify your setup.

6. Search for specific articles on the <u>TI wiki web page</u>[18] pertaining to the problem you are experiencing.

3   Requirements, Summary and Known Issues of Tests

Below is a summary of all the available tests in the CCS 4.x work space, including setup procedures, additional required equipment, and expected outputs.

Items specified in the requirements list identify additional equipment that is required beyond that which is included in the development kit.

Each test has a *CCS console.txt* log file created and stored in the associated directory within \ *CCSv4-2-4_with_SOM-M1_BSL_WS \ \test_results*. This log file shows the expected output from the CCS console window when a test is passed.

3.1   eXperimenter and EVM Development Kit Tests

The following tests can be run on the eXperimenter or EVM Development Kits.

3.1.1   ARM/DSP eXp Audio Test

This test will begin by playing a five-second tone through the line-out port. The 3.5mm pass-through cable will not be required for this portion of the test. After playing the tone, audio from the line-in port will be played through the line-out port for fifteen seconds.

In order to complete this test and check the results, you must have headphones plugged into the audio line-out port on the baseboard throughout the testing procedure. After the first test has completed and the five-second tone has ended, insert an audio source into the line-in port and check that the source is being mirrored through the headphones.

■ Requirements:

  □ 3.5mm pass-through cable
  □ 3.5mm headphones

---

[15] http://processors.wiki.ti.com/index.php/Debugging_JTAG_Connectivity_Problems
[16] http://processors.wiki.ti.com/index.php/XDS100#Q:_How_can_I_update_the_CPLD_on_my_XDS100v2.3F
[17] http://processors.wiki.ti.com/index.php/How_to_connect_to_the_OMAP-L138/C6748_EVM_board_using_CCS%3F#XDS100v2.2C_XDS510_or_XDS560_external_emulator_-_DSP_.2B_ARM_.28OMAP-L138_SOM.29
[18] http://processors.wiki.ti.com/index.php/Main_Page

■ Visible Output: See the *CCS console.txt* log file

■ Known Issues: None

3.1.2   ARM/DSP eXp Emac MII Loopback Test

The test will begin by initializing the Ethernet PHY on the eXperimenter or EVM baseboard. After initializing, the PHY Activity / Link lights should be illuminated. The PHY will then be placed in loopback mode and a packet will be transmitted. The packet will be checked against the original data after it is received. Note that a loopback cable is not required.

■ Requirements: None

■ Visible Output: See the *CCS console.txt* log file

■ Known Issues: None

3.1.3   ARM/DSP eXp Graphics LCD Test

This code will configure the LCD controller to interface with a 4.3" Logic PD Display Kit. Once configured, a test pattern will be displayed on the LCD.

■ Requirements: None

■ Visible Output: See the *CCS console.txt* log file. Figure 3.1 shows the test pattern seen when running the graphics LCD Test.

■ Known Issues: None

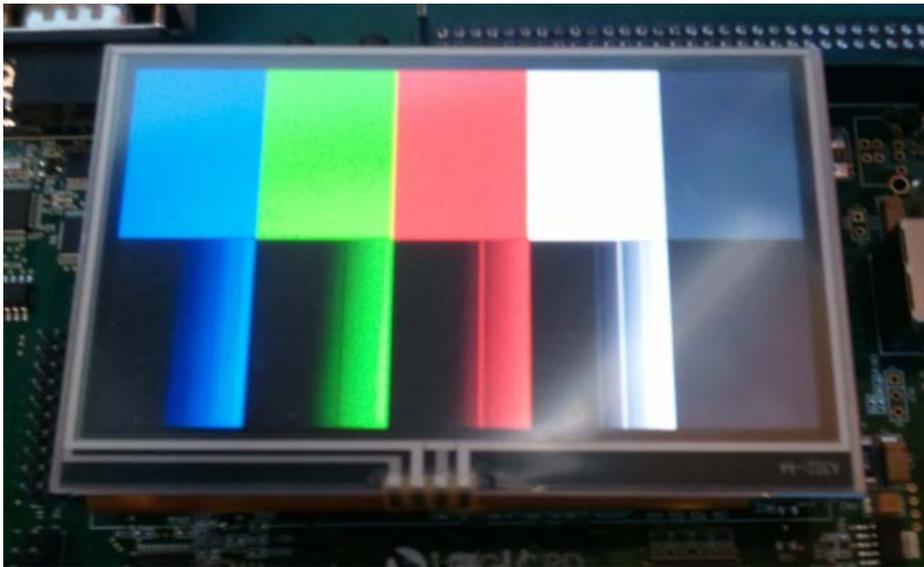*Figure 3.1: Graphics LCD Test Image*

3.1.4   ARM/DSP eXp LCD Touch Test

This code will configure the LCD controller to interface with a Logic PD Display Kit and the PMIC to output touch interrupts. Once configured, the LCD will be wiped clean and the code will loop reading touch axes and updating crosshairs drawn on the LCD.

■ Requirements: None

■ Visible Output: See the *CCS console.txt* log file

■ Known Issues:

    □ Workaround : Terminate the test and submit *Debug Active Project*

Figure 3.2: LCD Touch Test Image

3.1.5 ARM/DSP eXp LED & DIP test

This code will begin by flashing the LEDs and then sit in a forever-loop checking the S2 DIP switches. When a change in the DIP switches is detected, a message will be printed to *stdout* and an LED will be toggled.

For instance, if you move DIP switch S2:4 to the ON position and then OFF, and then move DIP switch S2:5 to the ON position and then OFF, you can expect the console to be output the following:

```
DIP switch[4] was switched on
DIP switch[4] was switched off
DIP switch[5] was switched on
DIP switch[5] was switched off
-------------------------------------------------------------------
```

USER LED1 and USER LED2 are used in this test to signify that the DIP switches have changed position. Moving DIP switches S2:1-4 will cause USER LED2 to illuminate, whereas moving DIP switches S2:5-9 will cause USER LED1 to illuminate.

■ Requirements: None

■ Visible Output: See the *CCS console.txt* log file

■ Known Issues: None

3.1.6 ARM/DSP eXp MMCSD Test

This code will read/write data to an SD card inserted into the slot located on the bottom side of the board below the audio jacks.

■ Requirements: SD card inserted into J14 of the baseboard. SDHC or MMC is not currently supported.

■ Visible Output: See the *CCS console.txt* log file

■ Known Issues: The test is not supported for the DSP core on the OMAP-L138 with Blackhawk XDS100v1, the ARM core on the OMAP-L138 with Blackhawk XDS100v2, or on the AM1808 with Blackhawk XDS100v2. If this test fails with a different setting, try using a different SD card.

3.1.7 ARM/DSP eXp PMIC Test

This test demonstrates the operation of the OMAP-L138, C6748, or AM1808 I/O at 1.8V. The OMAP-L138, C6748, or AM1808 will read the contents of the PMIC control registers and display them. The OMAP-L138, C6748, or AM1808 will also adjust its system clock frequency for additional power savings. The user should flip the 3.3V/1.8V DIP switch (S7:3) to the ON position prior to executing this test for 1.8V.

■ Requirements: None

■ Visible Output: See the *CCS console.txt* log file

■ Known Issues: None

3.1.8 ARM/DSP eXp RAM Test

This code verifies the mDDR address bus and writes/verifies data patterns to the mDDR. This test takes approximately ninety seconds to complete.

■ Requirements: None

■ Visible Output: See the *CCS console.txt* log file

■ Known Issues: None

3.1.9 ARM/DSP eXp Read MAC Test

This code reads and prints the Media Access Control (MAC) address that was written into SPI flash.

■ Requirements: None

■ Visible Output: See the *CCS console.txt* log file

■ Known Issues: None

3.1.10 ARM/DSP eXp RTC Test

This code will configure the RTC module, set the time, and verify the time is correct after ten seconds.

■ Requirements: None

■ Visible Output: See the *CCS console.txt* log file

■ Known Issues: None

3.1.11 ARM/DSP eXp SATA Test

This test will check for the connection of a SATA disk drive and attempt to spin-up the disk drive. If the connection is not detected or the spin-up is not completed, the test will fail.

■ Requirements: An externally-powered SATA disk drive will need to be connected to J32 of the baseboard before the test begins.
   □ SATA disk drive
   □ SATA cable

□ SATA external power source

■ Visible Output: See the *CCS console.txt* log file

■ Known Issues: None

3.1.12 ARM/DSP eXp SPI Flash Test

This code will configure the SPI to interface with the flash on the OMAP-L138, C6748, or AM1808 SOM-M1. Once configured, the code will read and write a portion of SPI flash.

IMPORTANT NOTE: This test takes approximately ninety seconds to complete and will modify (i.e., erase) the memory contents in SPI flash.

■ Requirements: None

■ Visible Output: See the *CCS console.txt* log file

■ Known Issues: None

3.1.13 ARM/DSP eXp UART Test

This code will configure the UART and use a microsecond timer to count to ten, printing each second. Note that the timer column (the second column from the UART terminal) will vary from machine to machine.

■ Requirements: RS232 serial cable connected to a host computer running a terminal emulator configured for 115200 baud, 8-bit, no parity, 1 stop bit, no flow control and P1 of the baseboard.

■ Visible Output: See the *CCS console.txt* log file and *uart_terminal.txt* file for expected output in the terminal emulator

■ Known Issues: None

3.1.14 ARM/DSP eXp USB Test

This test will reproduce the given console output. First, make sure nothing is connected to the USB OTG or host USB ports. After the first test is completed, use the USB A-to-mini B cable to connect the host USB port (J27) to the USB OTG port (J6).

■ Requirements: USB A-to-mini B cable

■ Visible Output: See the *CCS console.txt* log file

■ Known Issues: None

3.2 EVM Development Kit Tests Only

The following tests can only be run on the EVM Development Kits. The UI board must be attached to run these tests. Remove power from the kit when changing the board configuration.

3.2.1 ARM/DSP EVM Character LCD Test

This code scrolls a message across the character LCD on the UI board. Be sure the potentiometer between the display and the pushbuttons is set to appropriately control the backlight.

- ■ Requirements: None

- ■ Visible Output: See the *CCS console.txt* log file

- ■ Known Issues: None

Figure 3.3: Character LCD Test Display Image

3.2.2 ARM/DSP EVM Composite Video Test

This test will transmit video using a composite video connection. Connect a video output device (e.g., DVD player) to connector J6 and a video input device (e.g., TV) to connector J4. Start the video output device and execute the code. The video from the output device will be transmitted to the input device.

- ■ Requirements:
  - □ video output device (DVD player)
  - □ video input device (TV)
  - □ 2 composite video cables

- ■ Visible Output: See the *CCS console.txt* log file

- ■ Known Issues: None

3.2.3 ARM/DSP EVM Emac RMII Loopback Test

The test will begin by initializing the Ethernet PHY on the UI board. After initializing, the PHY Activity / Link lights should be illuminated. Then the PHY will be placed in loopback mode and a packet will be transmitted. The packet will be checked against the original data after it is received. Note that a loopback cable is not required for this test.

- Requirements: None

- Visible Output: See the *CCS console.txt* log file

- Known Issues: None

3.2.4 ARM/DSP EVM Image Sensor Test

Image sensor was not available at the time of creating this application note.

This code will configure an MT9V032 image sensor to output test data on the VPIF data bus and configure the VPIF for raw-capture receive mode. The code should be paused after each test pattern to allow the user to verify the data in memory.

- Requirements: Aptina MT9V032 Head Board

- Visible Output: Not available

- Known Issues: None

3.2.5 ARM/DSP EVM LED and Pushbutton Test

This code will begin by flashing the LEDs and then sit in a forever loop checking the pushbuttons. When a change in the pushbuttons is detected, a message will be printed to *stdout* and an LED will be toggled.

NOTE: For this test, the button mapping is as follows:

```
S3(baseboard) = Pushbutton[1]
S1(expansion board) = Pushbutton[2]
S2(expansion board) = Pushbutton[3]
S3(expansion board) = Pushbutton[4]
S4(expansion board) = Pushbutton[5]
S5(expansion board) = Pushbutton[6]
S6(expansion board) = Pushbutton[7]
S7(expansion board) = Pushbutton[8]
S8(expansion board) = Pushbutton[9]
--------------------------------------------------------------------------
```

For a given input pattern of pressing and releasing Pushbutton[2] and then Pushbutton[3] during this test, you can expect the console to output the following:

```
Pushbutton[2] was pressed
Pushbutton[2] was released
Pushbutton[3] was pressed
Pushbutton[3] was released
--------------------------------------------------------------------------
```

USER LED1 and USER LED2 are used to signify if a button has been pressed. Pressing Pushbutton[1-5] will cause USER LED2 to illuminate, whereas Pushbutton[6-9] will cause USER LED1 to illuminate.

- Requirements: None

- Visible Output: See the *CCS console.txt* log file

- Known Issues: None

3.2.6 ARM/DSP EVM NAND Test

This code will configure the EMIFA to interface with NAND flash on the UI board. Once configured, the code will read and write a block of the NAND flash.

- Requirements: None

- Visible Output: See the *CCS console.txt* log file

- Known Issues: None

3.2.7 ARM/DSP EVM NOR Test

This code will configure the EMIFA to interface with NOR flash on the UI board. Once configured, the code will read and write a portion of NOR.

- Requirements: None

- Visible Output: See the *CCS console.txt* log file

- Known Issues: None

3.2.8 ARM/DSP EVM S-Video Test

For this test you need to connect a video output device (e.g., DVD player) to connector J5 and a video input device (e.g., TV) to connector J3. Start the video output device and execute the code. The video from the output device will be transmitted to the input device.

- Requirements:
  - □ video output device (DVD player)
  - □ video input device (TV)
  - □ 2 s-video cables

- Visible Output: See the *CCS console.txt* log file

- Known Issues: None

3.2.9 ARM/DSP EVM UPP Test

The test will begin producing a 73.2421875 KHz sine wave on the analog-out line (left SMA connector). After twenty seconds, sixty-four samples will be collected from the ADC (right SMA connector). These samples will be output through the DAC for a period of twenty seconds.

NOTE: The DAC and ADC are inductively/capacitively coupled with their connectors. It is strongly recommended that the signal provided to the ADC have a frequency that is an integer multiple of 73.2421875 KHz and below 1.171875 MHz.

- Requirements:
  - □ oscilloscope
  - □ cable with SMA connector
  - □ function generator (pass-through test only)
  - □ second cable with SMA connector (pass-through test only)

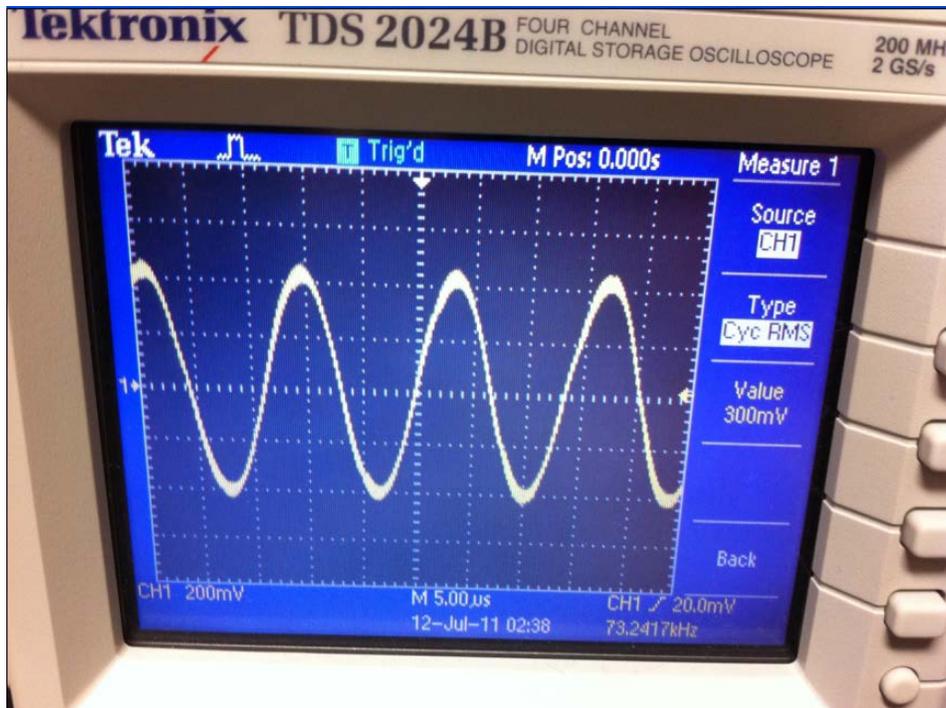- Visible Output: See the *CCS console.txt* log file

- Known Issues: None
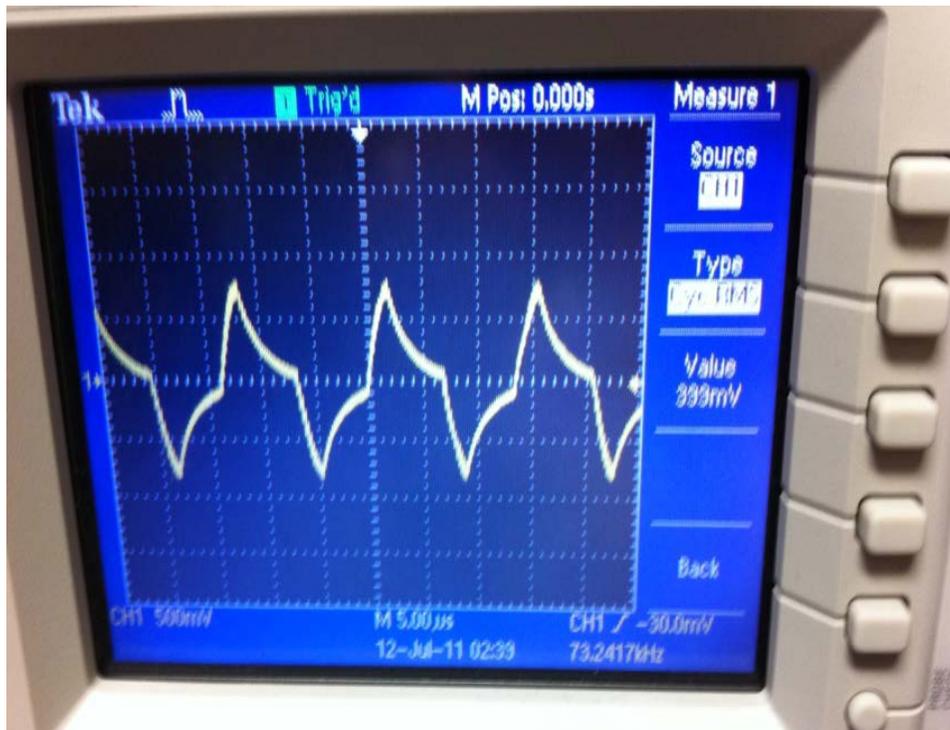
Figure 3.4: UPP Test DAC Out to Oscilloscope Image

Figure 3.5: UPP Test ADC in Samples Collected and Displayed with the Oscilloscope Image

4   Summary

This application note outlined how to install and use CCS v4.2.4 with three separate modules, namely the OMAP-L138 SOM-M1, the TMS320C6748 SOM-M1, and the AM1808 SOM-M1. Each of these modules has a corresponding eXperimenter and EVM Development Kit that can be tested with its specific projects described in Section 2 and 3. The Blackhawk XDS100v1 and Blackhawk XDS100v2 were the targeted emulators throughout the application note.

The source code for each of these tests is a good example to use as a starting point for the development of applications. The source, header, and included file lists can be found in each of the test projects included in this workspace example.