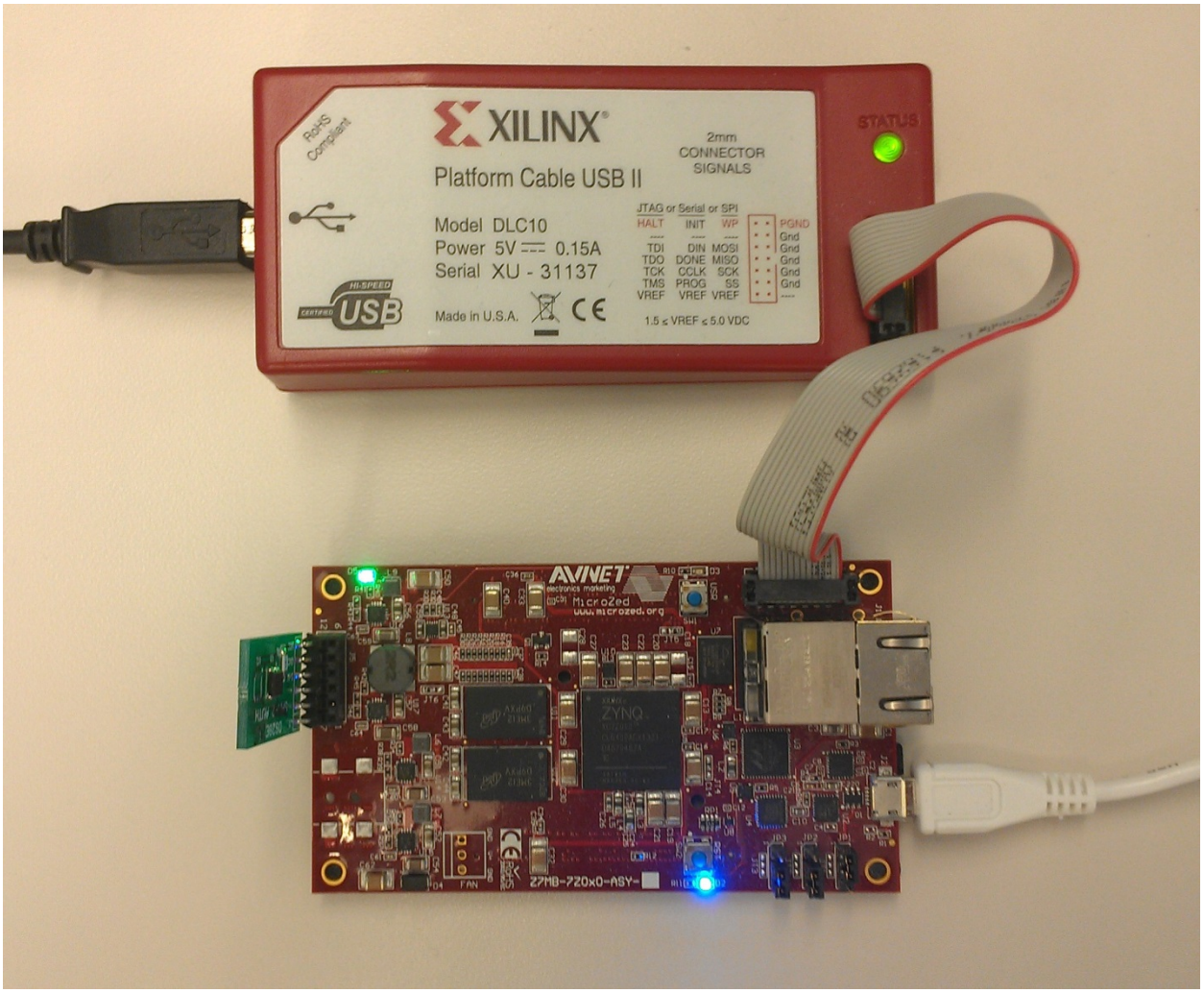
MAXREFDES44# MicroZed Quick Start Guide

Rev 0; 5/15



Maxim Integrated 160 Rio Robles, San Jose, CA 95134 USA 1-408-601-1000

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1. Required Equipment

- PC with 1GB RAM and Windows® 7, Windows 7 Service Pack 1 (SP1), and Windows 8.1 Professional OS
  - www.xilinx.com/design-tools/vivado/memory.htm
- MicroZed™ Development Board (available for purchase separately)
  - http://microzed.org/
- MAXREFDES44# Reference Design
- A-to-B Micro-USB Cable
- Maxim DS28E35 Evaluation System (DS28E35EVKIT#) (2nd generation with DS2475 available for purchase separately), **used for programming only**
- Xilinx Platform Cable USB or equivalent
- A terminal program such as Tera Term or HyperTerminal
- Embedded Design Tools (Xilinx SDK 2014.2)
  - www.xilinx.com/support/download/index.htm
- Firmware Files (**MAXREFDES44_NDA_FW.zip**)
  - Available by request with a nondisclosure agreement (NDA) on the Maxim MAXREFDES44# webpage. Refer to the “Design Resources” tab at **www.maximintegrated.com/MAXREFDES44**.

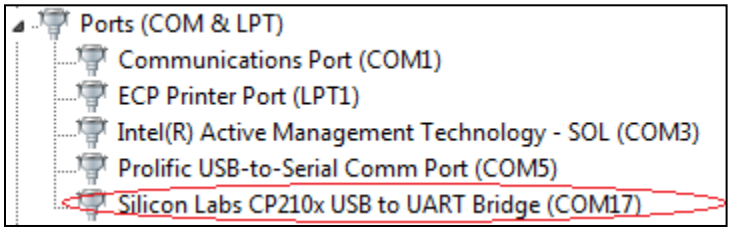
2. Overview

The MAXREFDES44# (also referred to as “Cheyenne”) software can be downloaded to the MicroZed development board. Use the Xilinx SDK to download the board bitstream and executable files. This approach allows the source code to be modified and is explained in detail in Section 5: Running the MAXREFDES44# (Cheyenne) Application.

3. Installing MicroZed Development Board's UART Driver and Virtual COM Port

If the MicroZed development board has not been connected to the PC before, it is necessary to install the software driver for the virtual COM port per the following procedure:

1. Follow the instructions in the *Silicon Labs CP210x USB-to-UART Setup Guide* to complete the installation of the USB driver for the MicroZed, located here:
   - www.silabs.com/products/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx
2. Connect an A-to-B Micro-USB cable to the host PC and connector J2 on the MicroZed development board.
3. Windows 7 will automatically assign a virtual COM port to the board. The **Device Manager** shows which COM port is assigned and also allows the user to select a COM port. For example, in this system, the default virtual COM port is COM17. Look in the **Ports (COM & LPT)** listing and look for the **Silicon Labs CP210x USB to UART Bridge** item. Take note of the COM port assigned by the system.



4. Setting Up the MicroZed Development Board

Use the following procedure to set up the MicroZed development board application:

1. Plug the MAXREFDES44#, component side facing the MicroZed board (Figure 1), into J5 that is the row with pin 7 marked. **Note: The MAXREFDES44# should be preprogrammed per Appendix A: Setup and Program the MAXREFDES44# before plugging into the system**.
2. Connect the USB-JTAG cable with pod and ribbon connector between the JTAG connector on the board and a USB port on the PC.
3. Plug the USB cable into the PC and port J2 on the MicroZed board. LED D5 will illuminate indicating power good (see Figure 2).

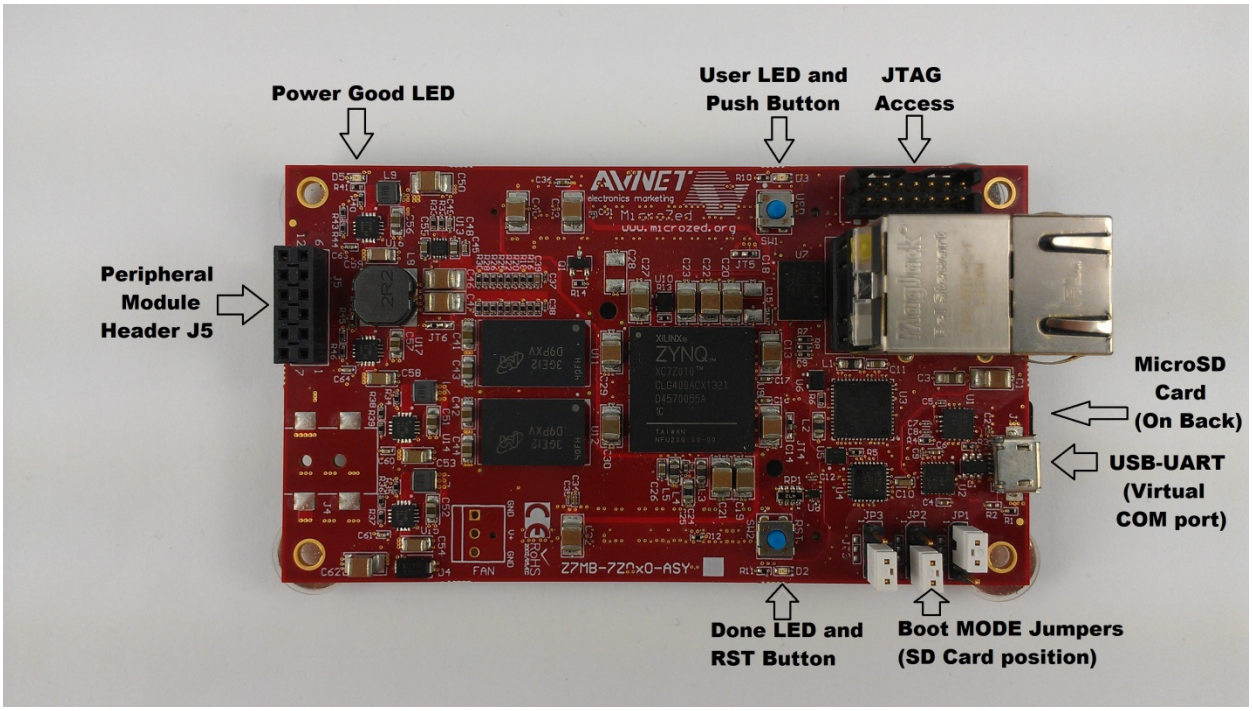


Figure 1. MicroZed Development Board

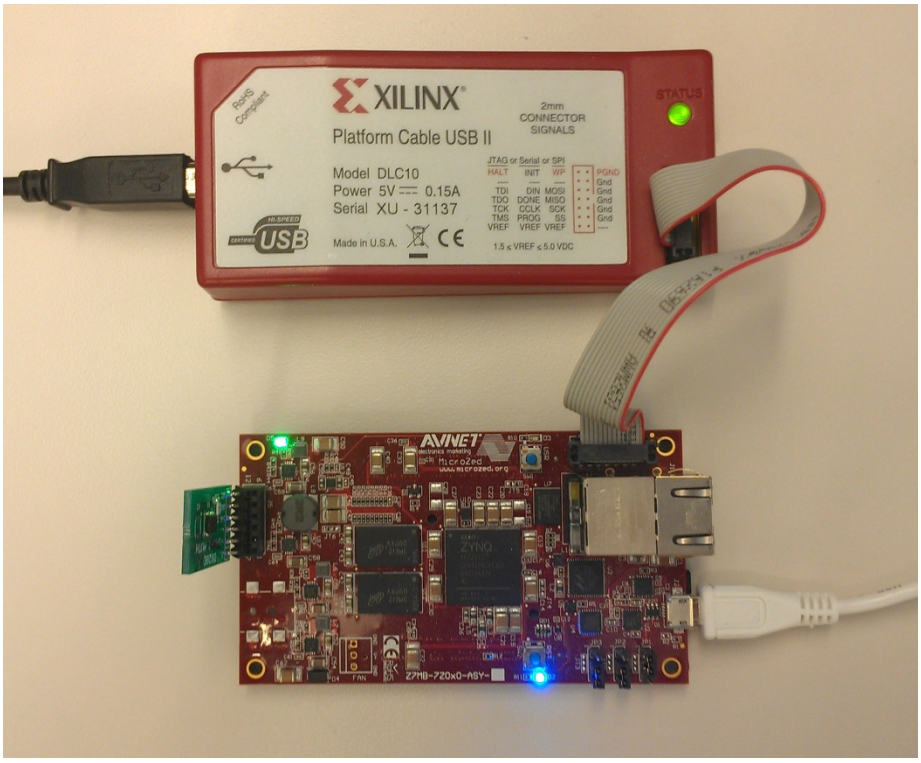
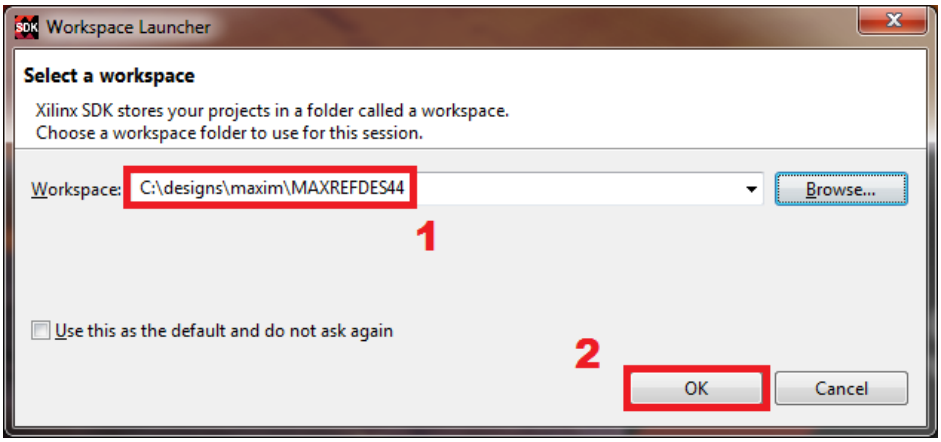


Figure 2. MAXREFDES44# Board Connected to MicroZed Development Board

5. Running the MAXREFDES44# (Cheyenne) Application

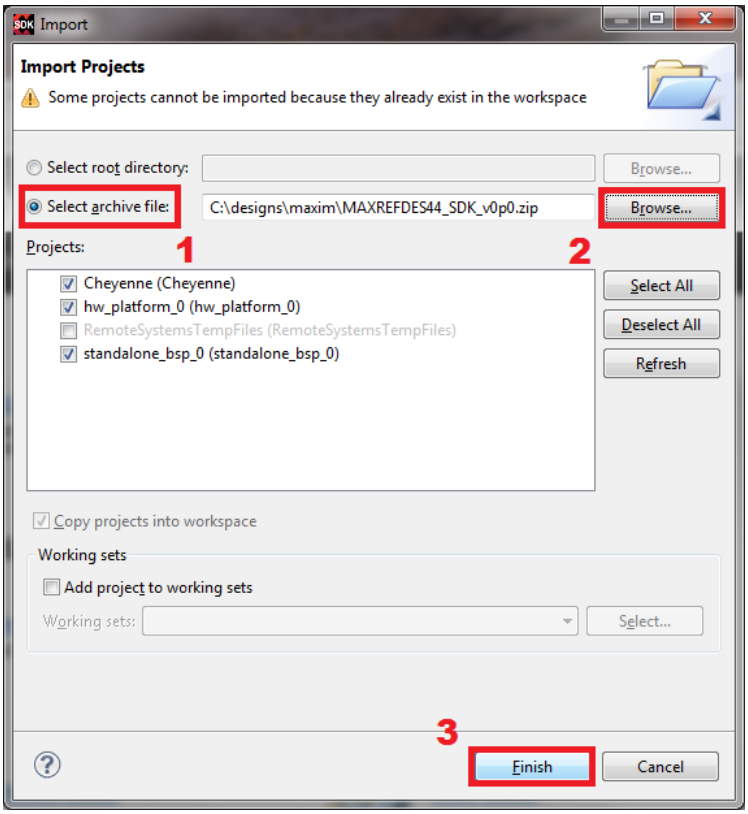
The MAXREFDES44# (Cheyenne) application can be loaded into the MicroZed board and then run without rebuilding the Xilinx Vivado® design by using prebuilt exported files for the SDK. The system hardware should be set up per the Installing MicroZed Development Board's UART Driver and Virtual COM Port and Setting Up the MicroZed Development Board sections. Below is the quick procedure to run the application:

1. If not already done, follow the install directions of the Installing MicroZed Development Board's UART Driver and Virtual COM Port section.
2. Set up the MicroZed board as described in Setting Up the MicroZed Development Board section.
3. Start a Tera Term or HyperTerminal session and set the serial port parameters to your virtual **COM** port, **115200** baud rate, **no** parity, **8** bits, **1** stop bit, and no flow control.
4. Create a working directory path (e.g., **C:\designs\maxim\MAXREFDES44**) and open the **Xilinx SDK 2014.2**.
5. Select the working directory path and click **OK**.

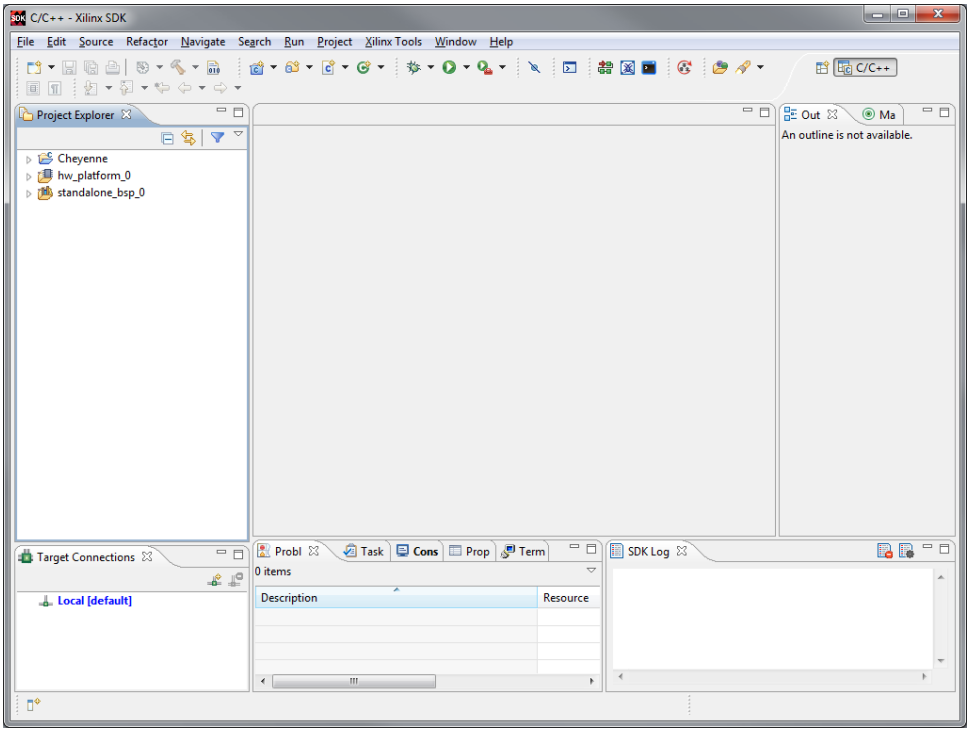


6. Click on **Import Project** when the Xilinx SDK GUI opens.

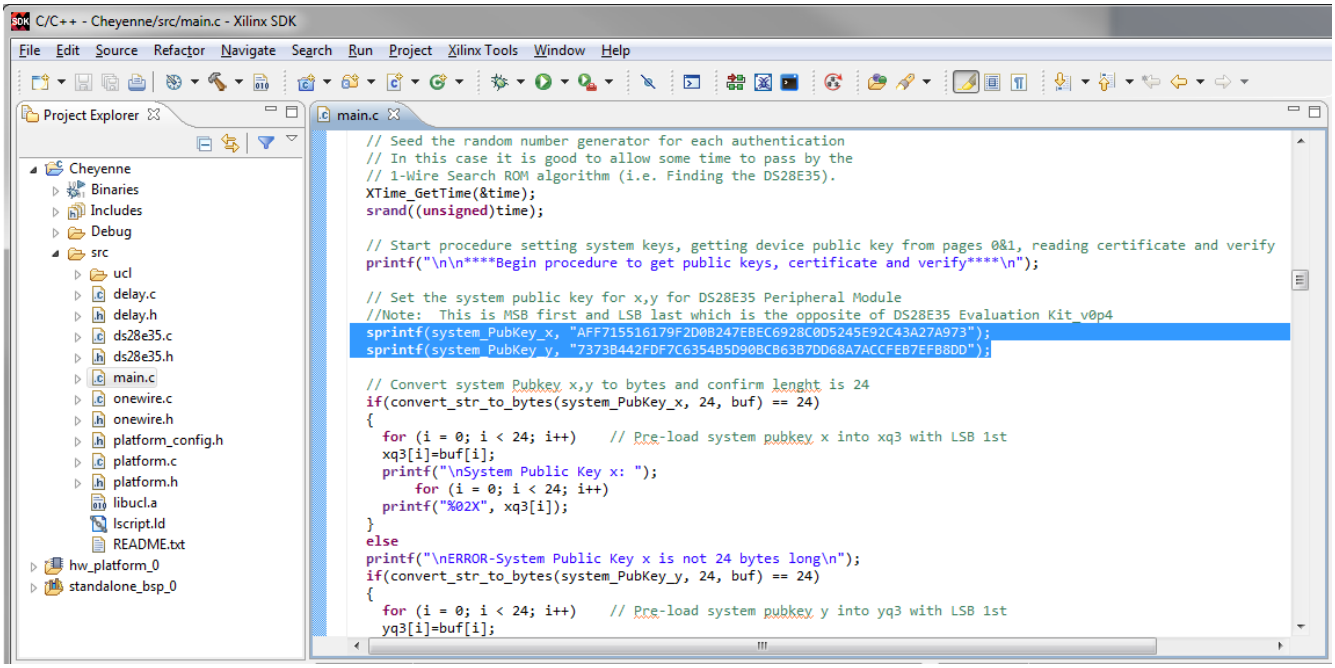
7. Choose **Select archive file:**, then click **Browse** to choose the location of the **MAXREFDES44_SDK_v0p0.zip**, and finally click **Finish**.



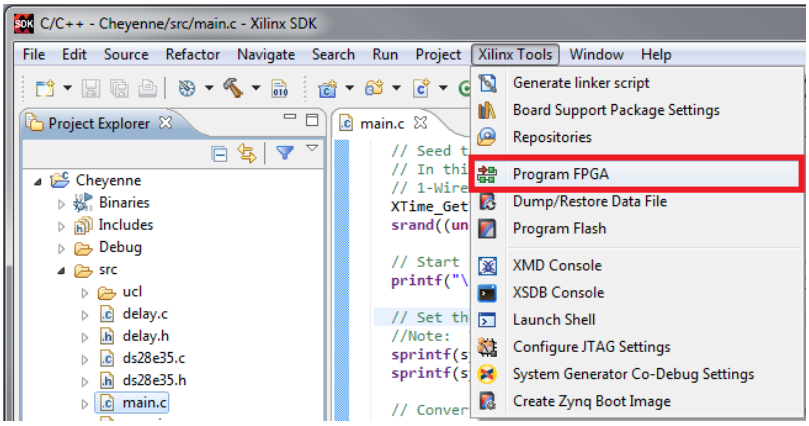
8. The project should now display in the Xilinx SDK GUI as shown below.



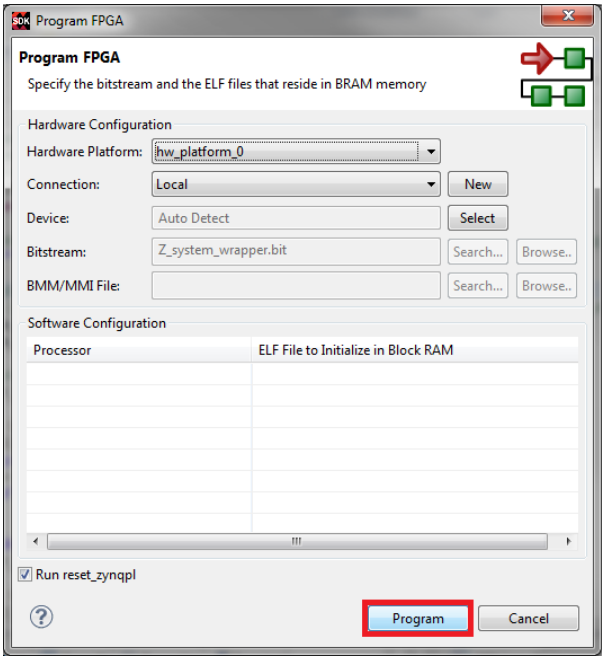
9. Expand the **Project Explorer** to view all the source files and double-click on **main.c** to open the file. When the **main.c** is open, scroll down to line **189**. The system public x/y keys in **main.c** need to be the same as what was programmed in DS28E35 using Appendix A: Set Up and Program the MAXREFDES44#. In your final design, it is important to make sure the system public x/y keys are from your unique system key pair.



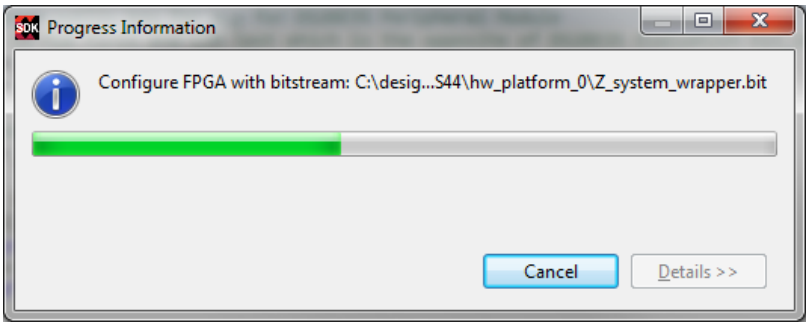
10. Go to the file menu and select **Xilinx Tools | Program FPGA**.



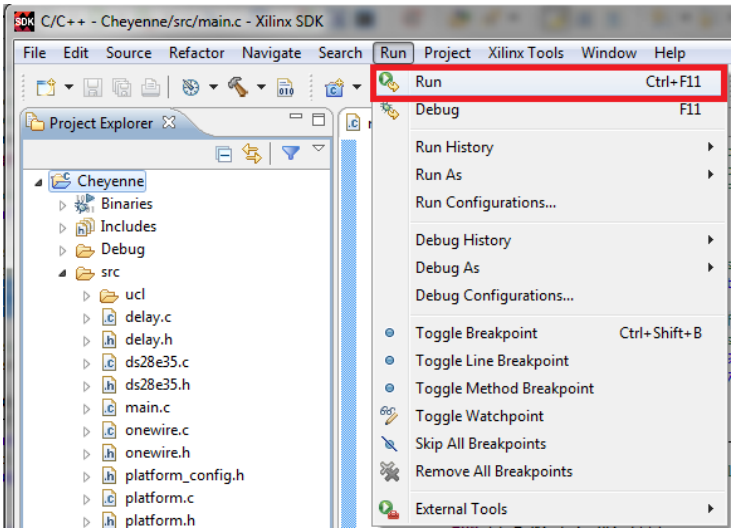
11. Click on **Program** from the **Program FPGA** window that opens.



12. A status window should now appear showing the FPGA programming.

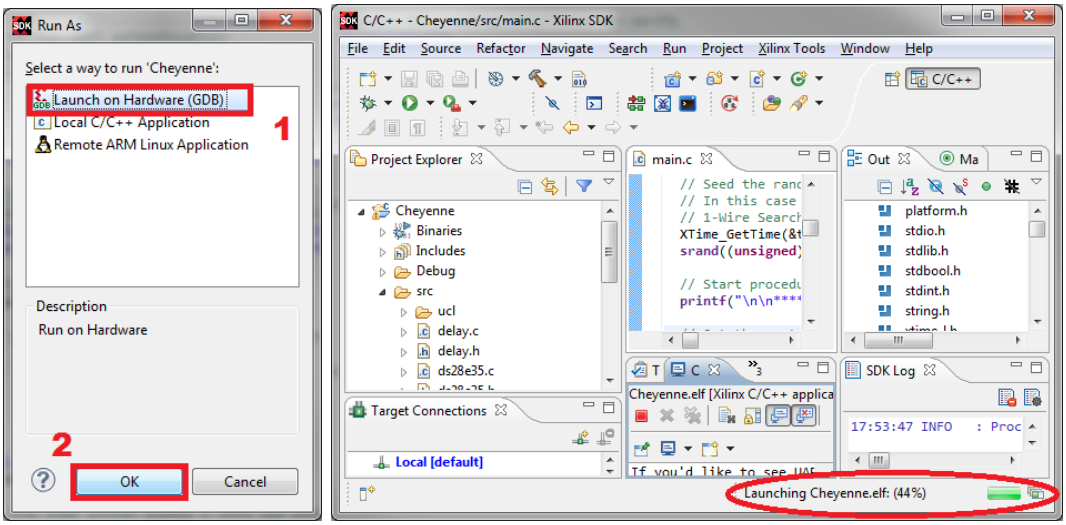


13. After the FPGA programming completes, go to the file menu and select **Run | Run**.



14. Select **Launch on Hardware (GDB)** and click **OK**.

The tools will now initialize the processor, download the **'Cheyenne.elf'** to DDR, and then the Cheyenne application will run. This takes approximately 5 seconds to complete, depending on the USB traffic. The progress is shown in the lower right corner of the Xilinx SDK GUI.



15. Observe the output in the Tera Term or HyperTerminal session.

    Take note that if everything is correct at the end of the print output, **SUCCESS** will be shown indicating the DS28E35 is authentic.

6. Summary

This reference design provides designers an example of using the MicroZed development board to interface with a DS28E35 Peripheral Module and verify whether or not it is authentic without the need to hide a system private key in the SoC's memory. The final design should only need to write-protect the MAXREFDES44# Cheyenne code residing in SoC flash memory. Additionally, this reference design can be used as a starting point to protect IP or prevent counterfeiting of a peripheral using the Xilinx Zynq® SoC with the DS28E35.

7. Appendix A: Set Up and Program the MAXREFDES44#

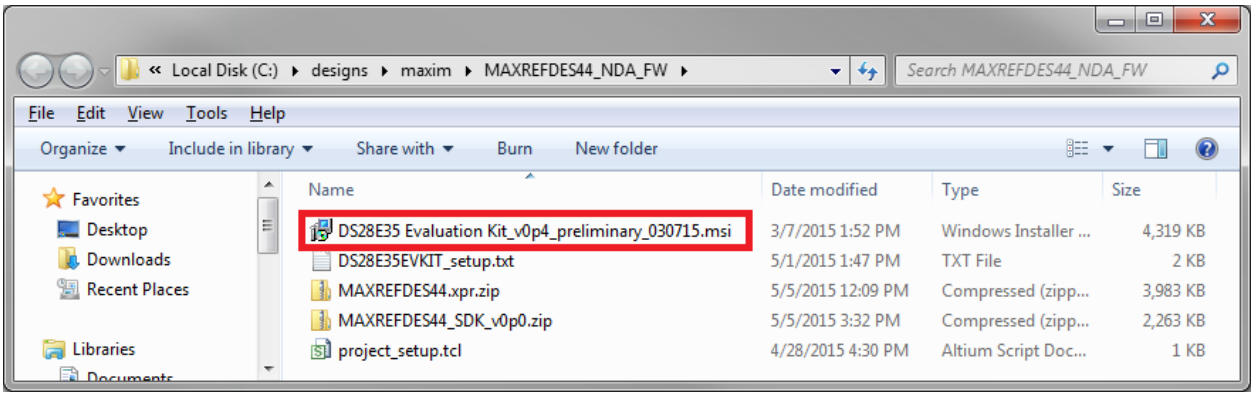
The MAXREFDES44# ships with a blank DS28E35 device (i.e., device public keys and private key are not loaded). To ensure it is ready to be used in the Cheyenne application it must be programmed.

Setup Procedure

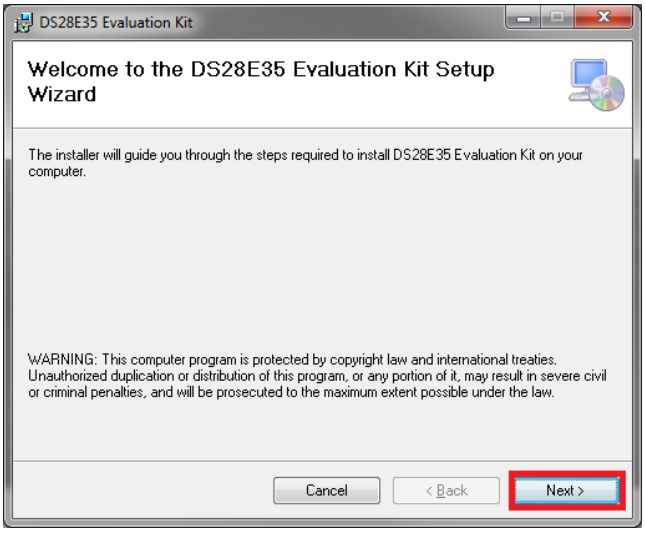
The following steps were performed on a PC with Windows 7 OS to set up the DS28E35EVKIT GUI:

1. Obtain and unpack the **DS28E35 Evaluation Kit_v0p4_preliminary_030715.msi** contained within the **MAXREFDES44_NDA_FW.zip** or request the latest from the DS28E35EVKIT webpage at **www.maximintegrated.com/DS28E35EVKIT**.

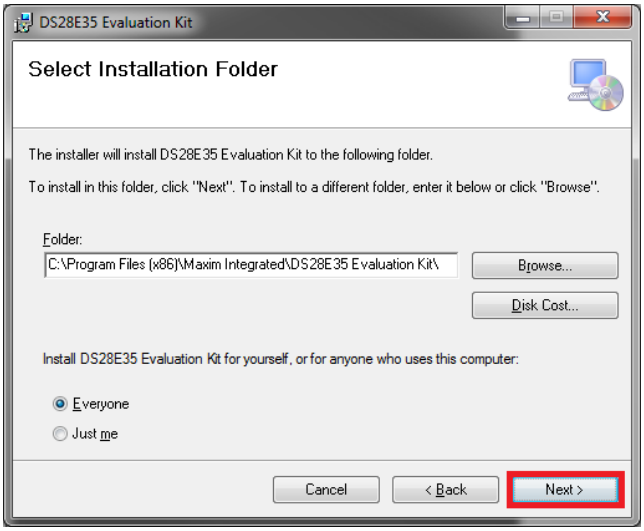
2. In a file viewer double-click the **DS28E35 Evaluation Kit_v0p4_preliminary_030715.msi** to begin the installation.



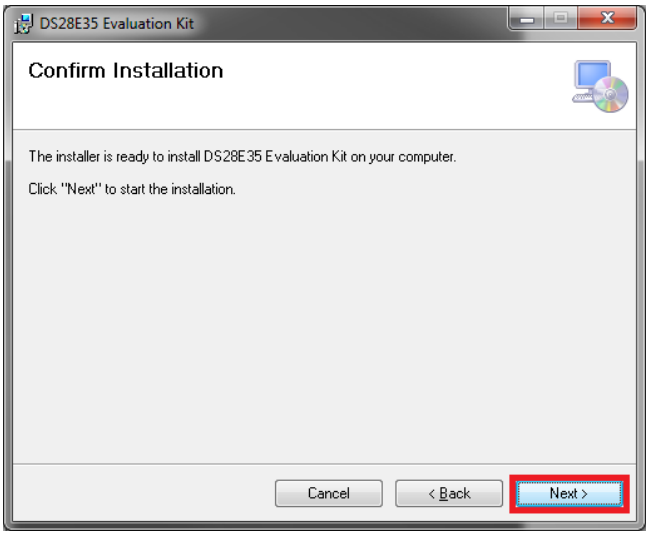
3. The setup wizard will open. Click **Next** as shown below:



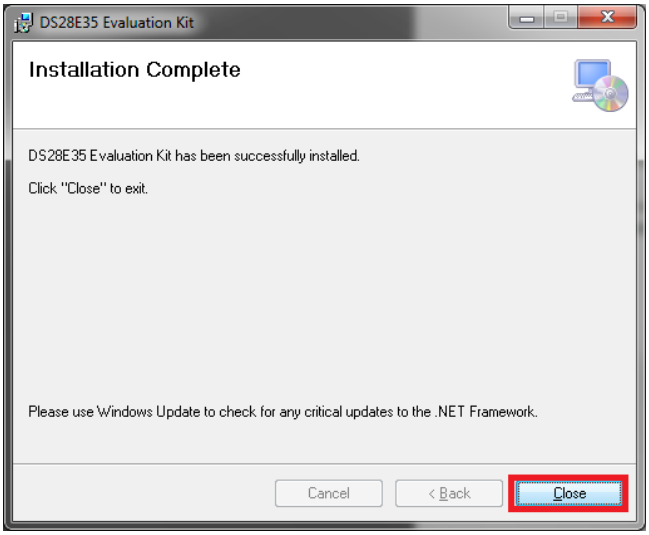
4. Click **Next** again to install to the selected folder.



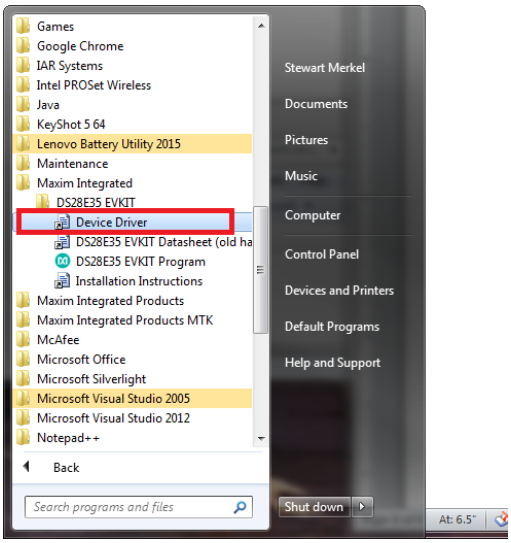
5. Click **Next** again to confirm installation.



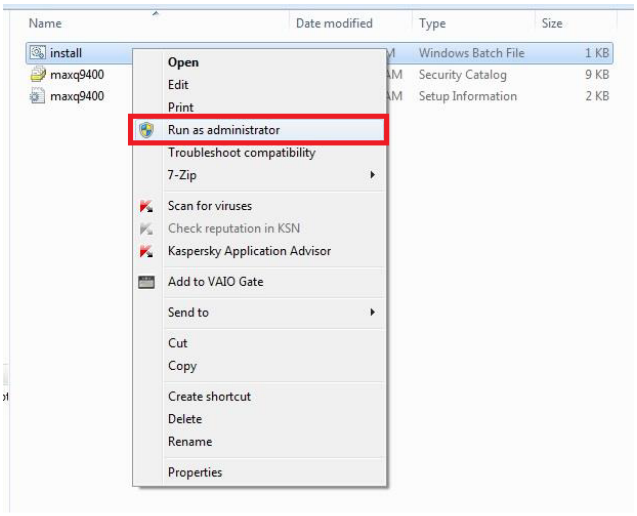
6. When the **Installation Complete** window opens, click **Close**.



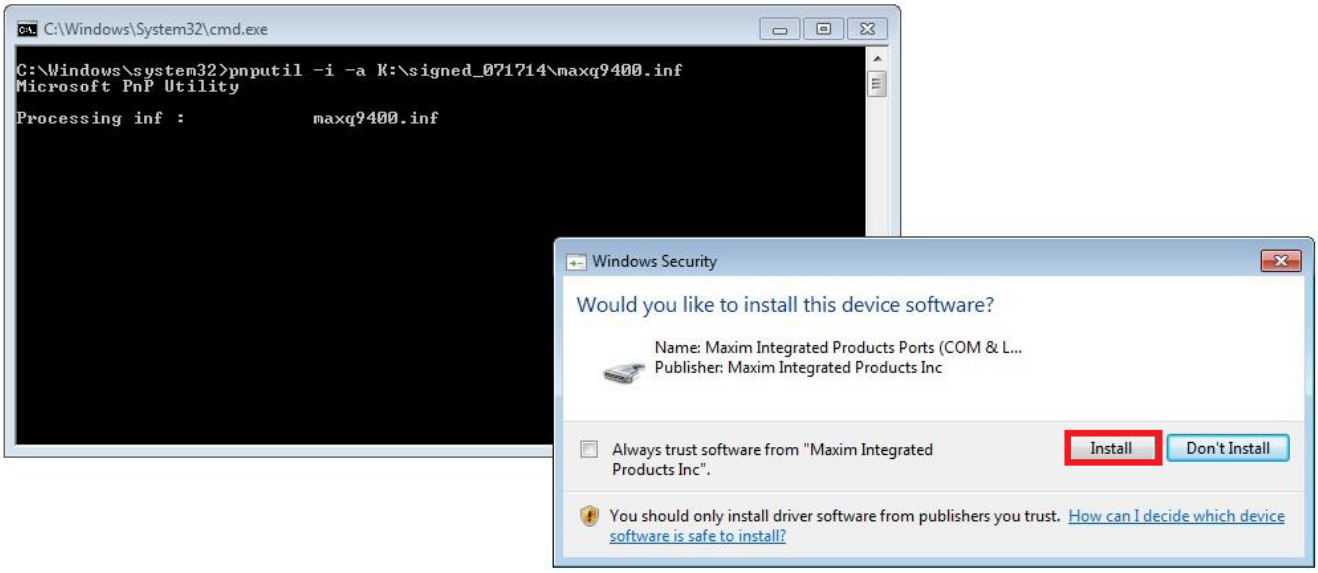
7. Next, from the Windows **Start** button, under **All Programs** navigate to the **Device Driver**.



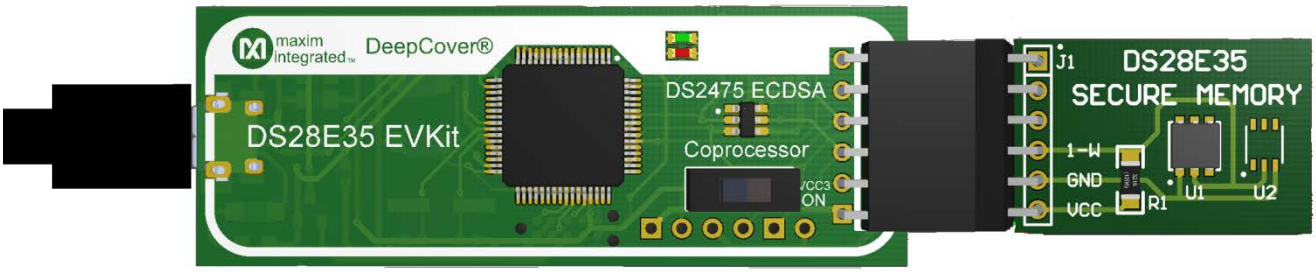
8. Right-click on the **install** file and then choose **Run as administrator**.



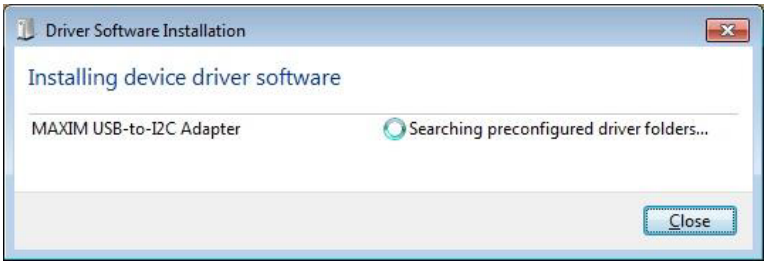
9. A command window will open with a prompt asking to install the device driver. Click **Install**.



10. Plug in the DS28E35EVKIT board to the PC with the MAXREFDES44# connected as shown below. Make sure the switch is set to the left of VCC3 ON.



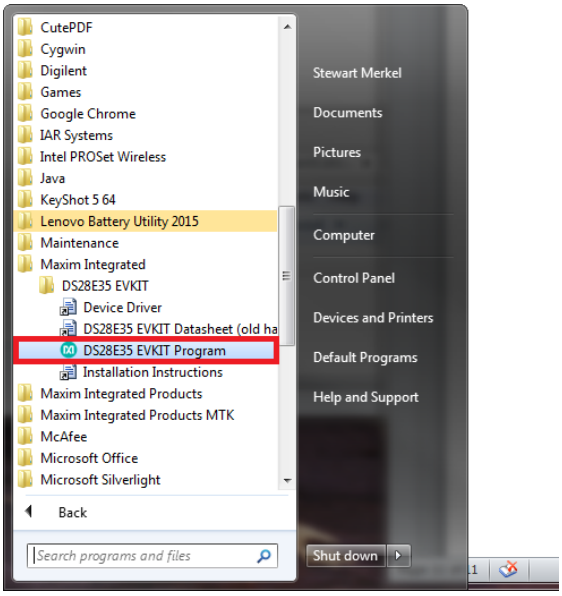
11. The device driver will now be automatically installed.



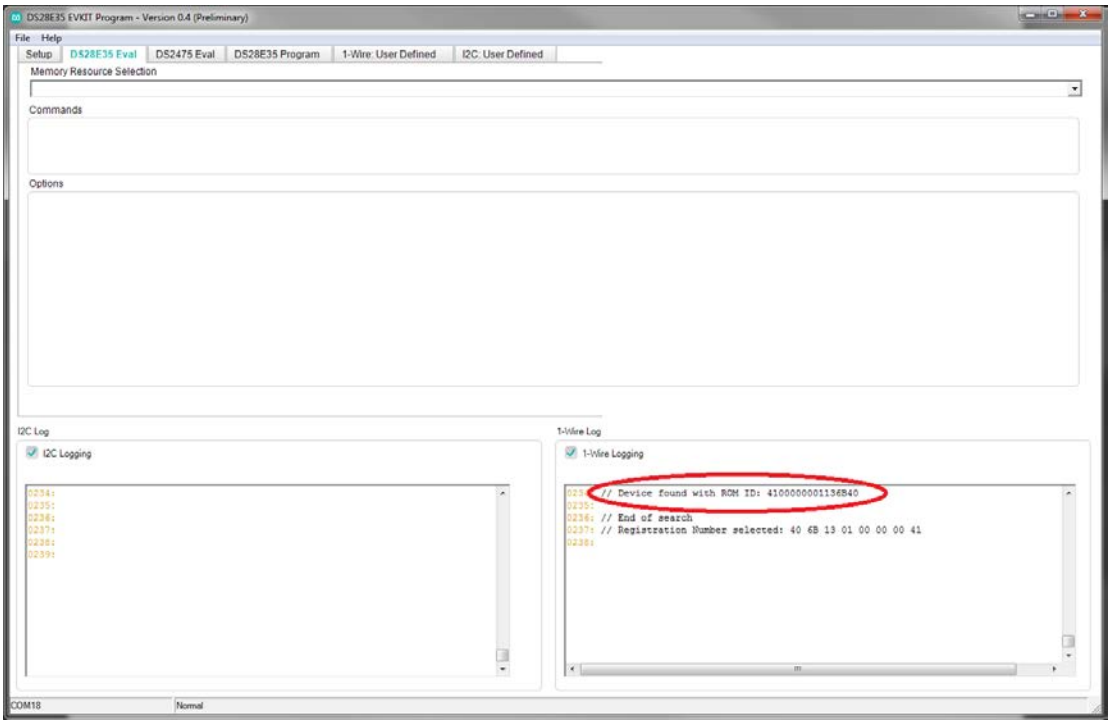
Programming Procedure

The following steps were performed on a PC with Windows 7 OS to program the MAXREFDES44#:

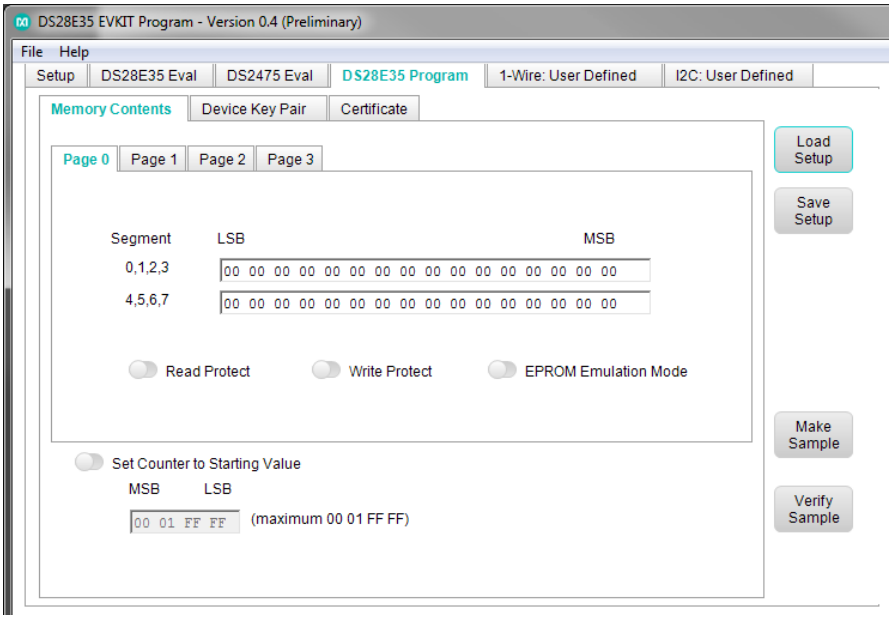
1. Click and open the **DS28E35 EVKIT Program**.



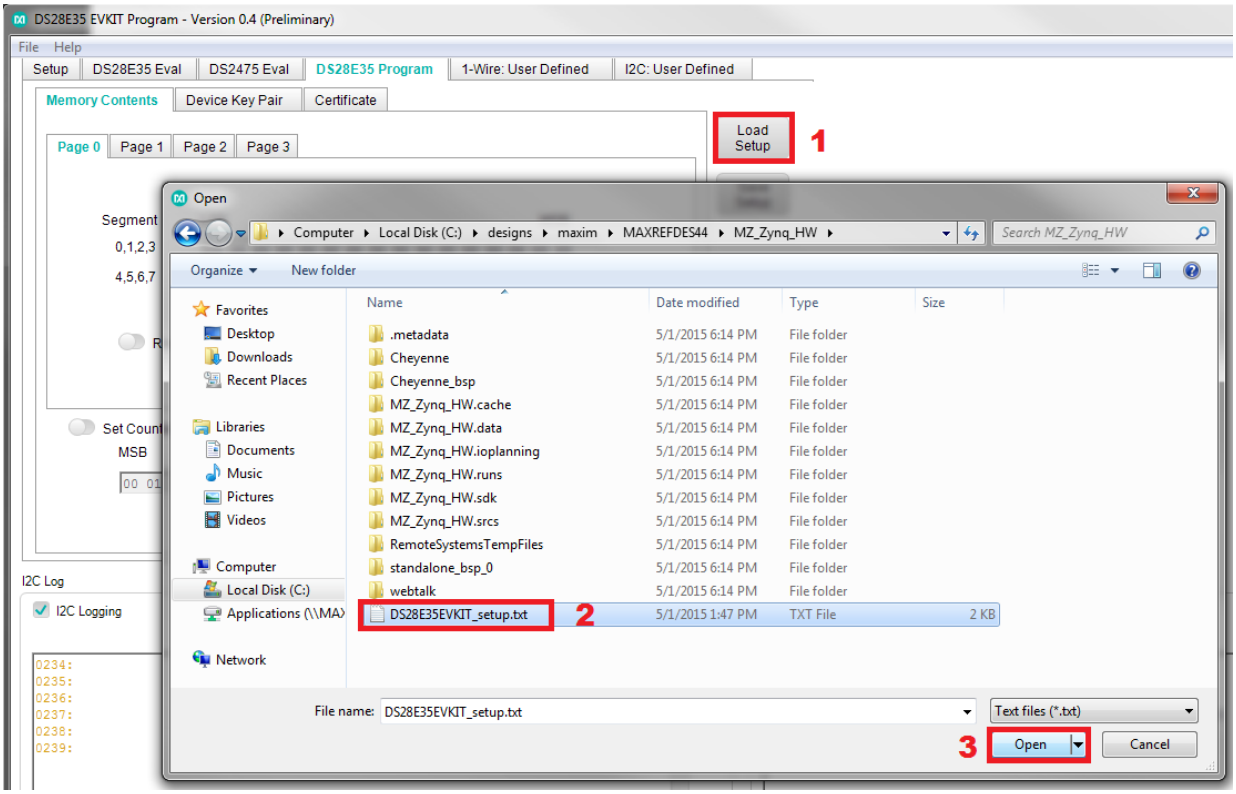
2. The DS28E35 EVKIT Program GUI will open as below. If everything is connected correctly, the DS28E35 ROM ID will be found.



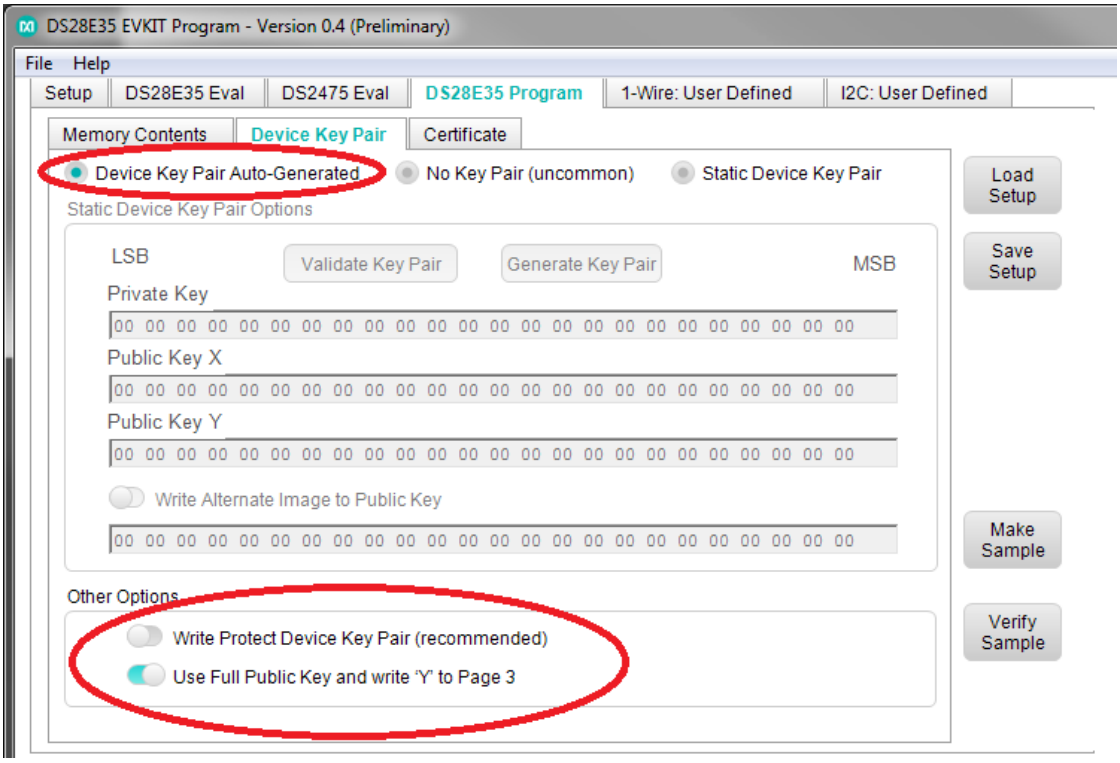
3. Click on the **DS28E35 Program** tab.



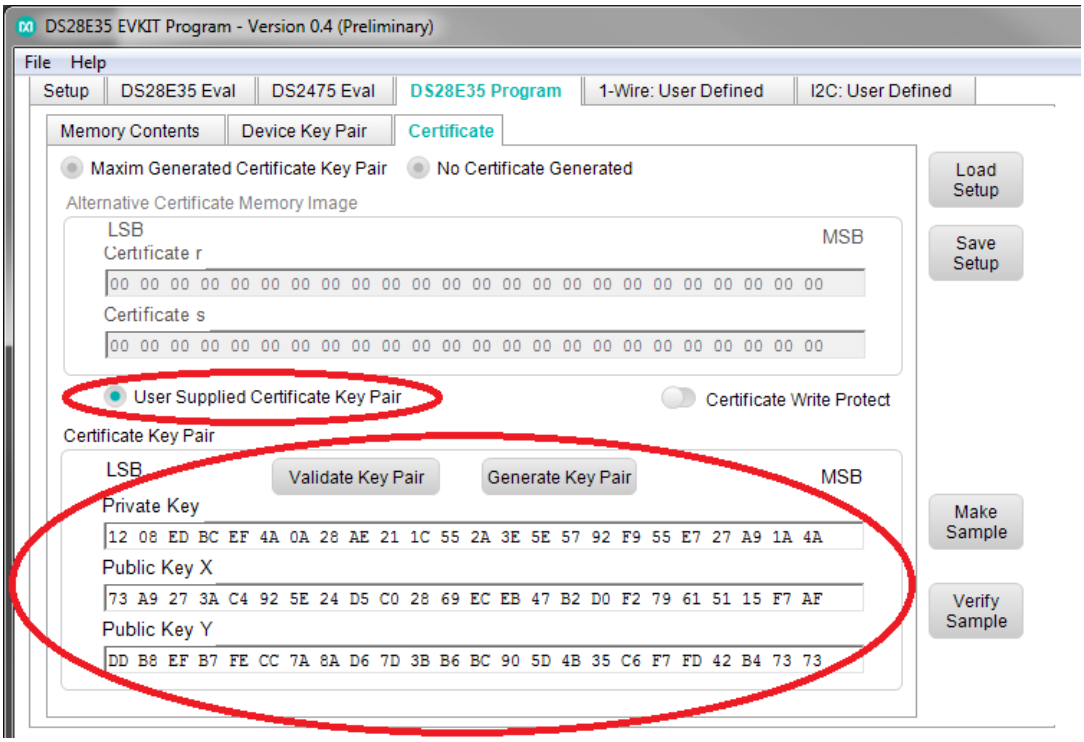
4. First click on **Load Setup**, then select the **DS28E35EVKIT_setup.txt** file that contains the saved system key pair (located in **MAXREFDES_NDA_FW.zip**), and finally click **Open** as shown below. Notice the subtab **Memory Contents** pages are all zeros. This could have been programmed with other values for configuration data, but is not essential to have filled in for authentication.



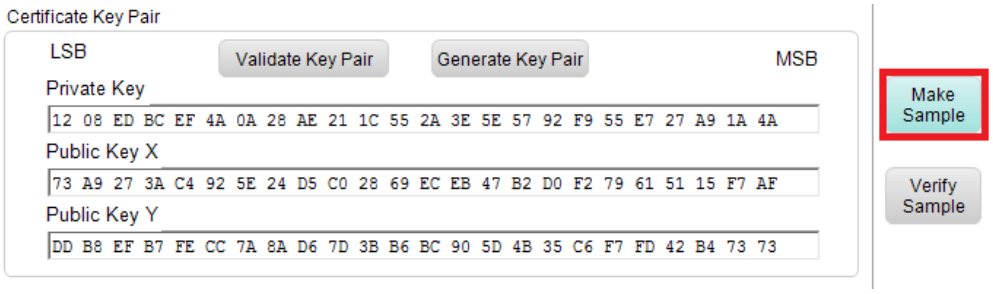
5. Click on the subtab **Device Key Pair**. Confirm the settings are shown as below for the device key pair. For setup the **Write Protect Device Key Pair** is not protected. If this is the final design, it is recommended to always have this set. Also, note that each DS28E35 will have a device key pair with the private key hidden using DeepCover® technology and the device public key x/y stored as visible to the public.



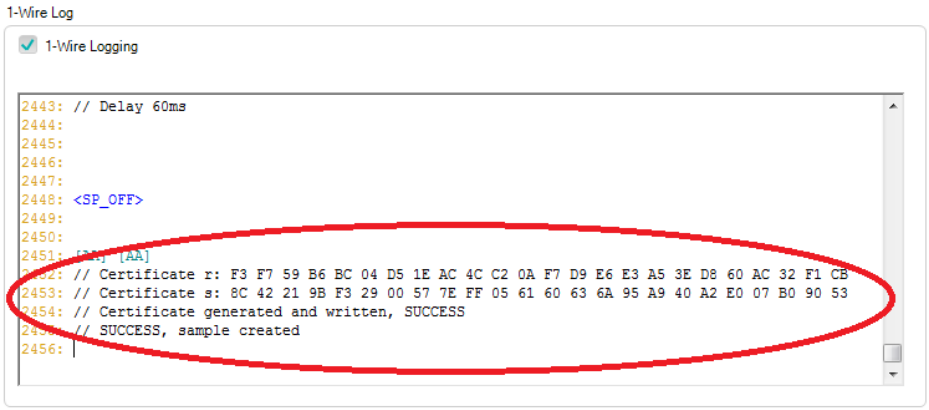
6. Click on the subtab **Certificate**. Confirm the settings shown below for the system key pair (**Certificate Key Pair**). Observe the system key pair values are the same below. The Cheyenne application in its 'C' code uses only the system public x/y keys for authentication. The system private key is to never be made public and is only needed during programming of DS28E35 at the factory. Each DS28E35 programmed will use this same system key pair to generate its unique certificate. If this is the final design, a *new generated key pair* should be used and saved off since this system key pair is only for demo purposes.



7. Click on **Make Sample**.



8. Confirm **SUCCESS** from the output **1-Wire Logging** text box of the certificate created, completing the programming of DS28E35.



8. Trademarks

1-Wire is a registered trademark of Maxim Integrated Products, Inc.
DeepCover is a registered trademark of Maxim Integrated Products, Inc.
MicroZed is a trademark of Avnet, Inc.
Vivado is a registered trademark of Xilinx, Inc.
Windows is a registered trademark and registered service mark of Microsoft Corporation.
Xilinx is a registered trademark and registered service mark of Xilinx, Inc.
Zynq is a registered trademark of Xilinx, Inc.

9. Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	5/15	Initial release	—