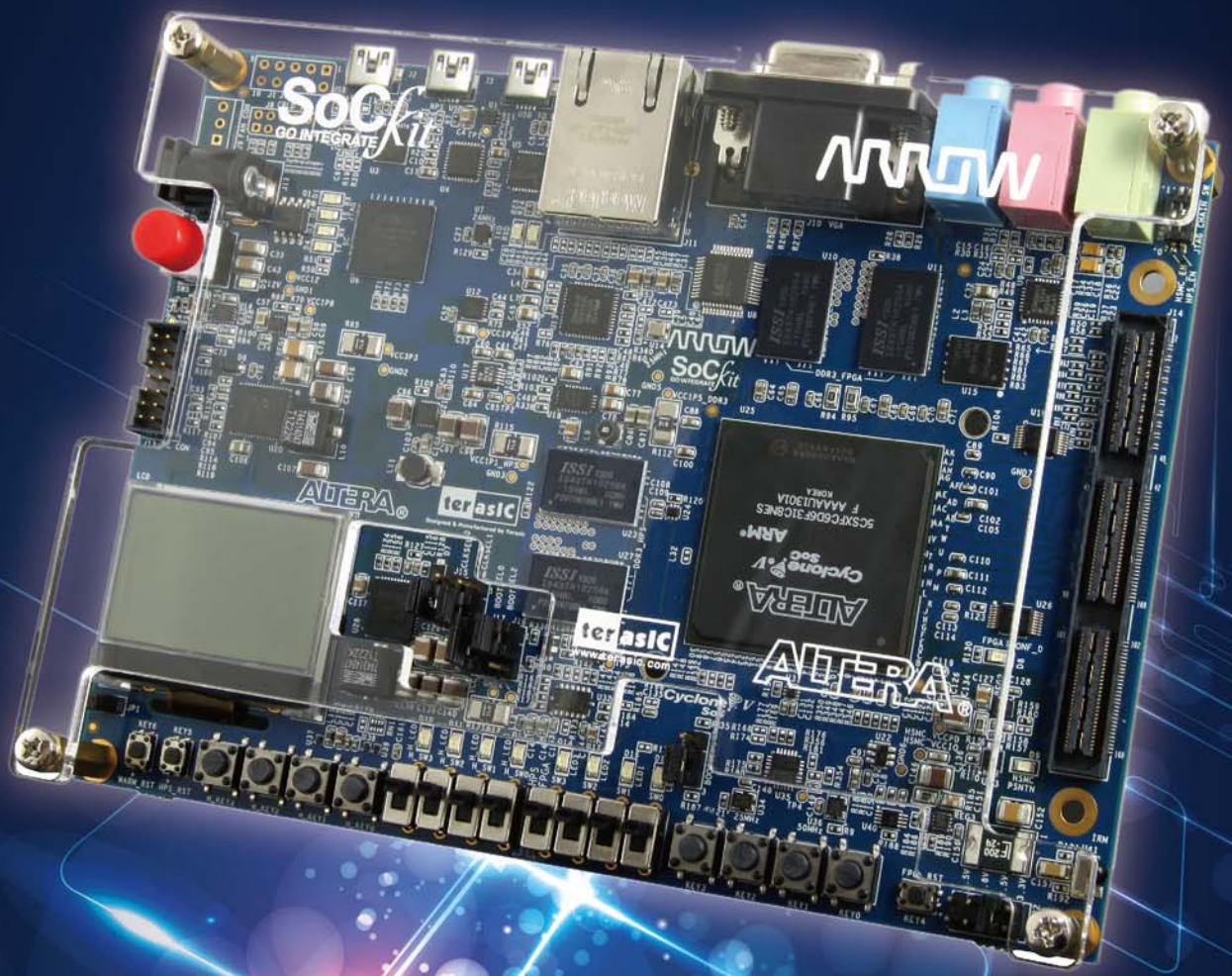
SoCKit

FPGA Development Kit

Getting Started Guide



www.terasic.com

CONTENTS

Chapter 1

About this Guide

The SoCKit Getting Started Guide contains a quick overview of the hardware and software setup including step-by-step procedures from installing the necessary software tools to using the SoCKit board. The main topics that this guide covers are listed below:

- Software Installation: Installing Quartus II and SoC EDS
- Development Board Setup: Powering on the SoCKit
- Perform FPGA System Test: Downloading an FPGA SRAM Objective File (.sof)
- Running Linux on SoCKit Board

Chapter 2

Software Installation

2.1 Introduction

This section explains how to install the following software:

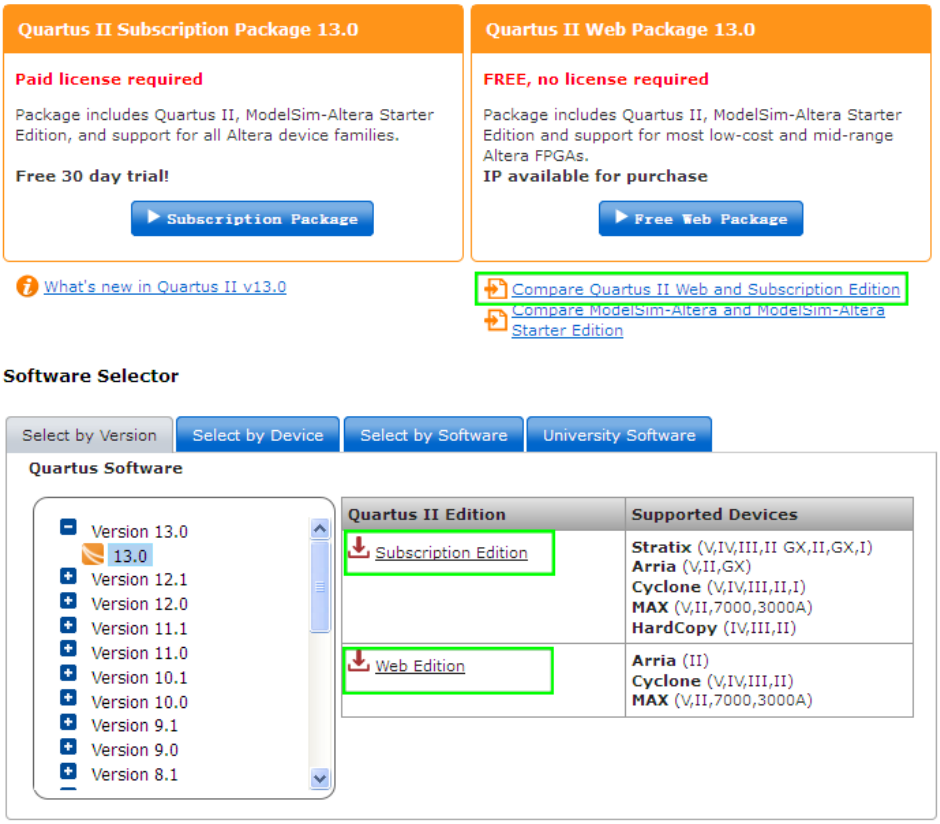
- Altera Quartus II software
- Altera SoC Embedded Design Suite

Note: 64-bit OS required

2.2 Installing Quartus II software

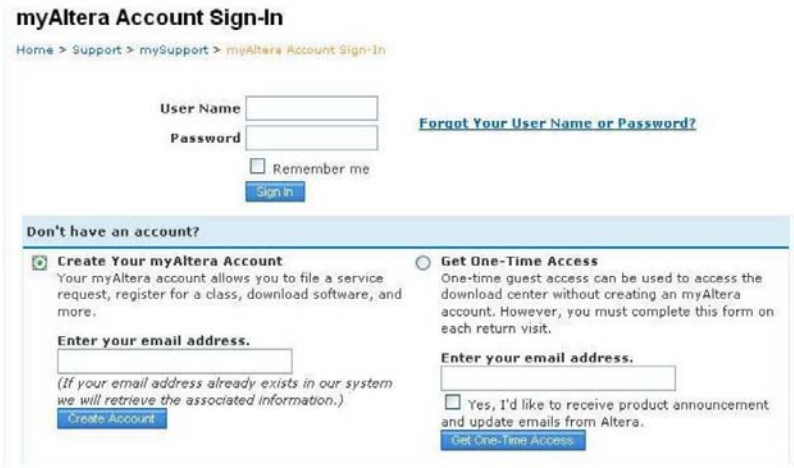
The Altera Complete Design Suite provides the necessary tools used for developing hardware and software solutions for Altera FPGAs. The Quartus II software is the primary FPGA development tool used to create reference designs along with the Nios II soft-core embedded processor integrated development environment

User can download the latest software from https://www.altera.com/download/dnl-index.jsp



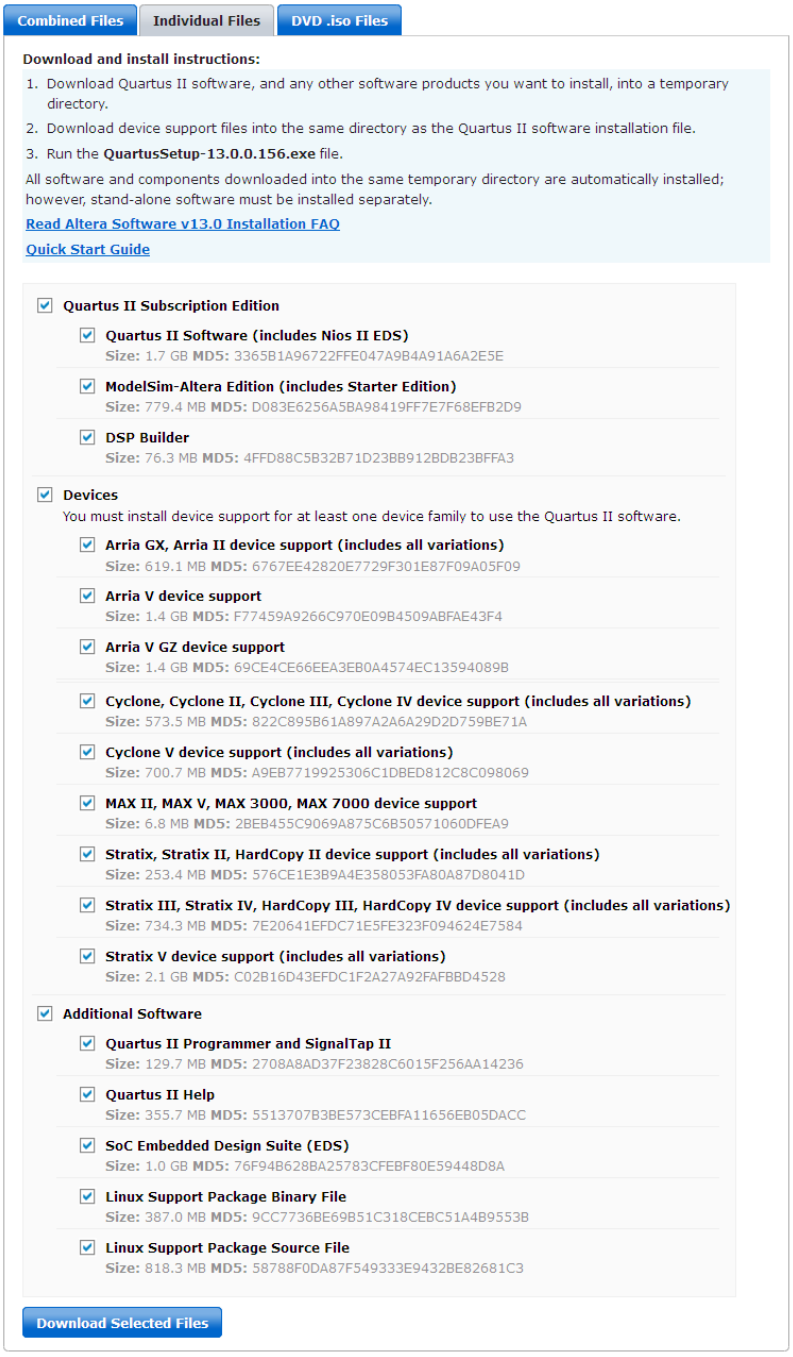
- If you choose to install the Subscription Edition, please note that a purchased license will be required. Please go to the following link for more information on the Subscription Edition: http://www.altera.com/products/software/quartus-ii/subscription-edition/qts-se-index.html

- Select the latest software version for Subscription Edition or web Edition will into "myAltera Account Sign-In" page



- Use your existing login, or get one-time Access.

- Download files from subscription or web edition page.



- After the file is downloaded on the computer, select the *.exe file, and install the software. All of the defaults are to be used.

2.3 Installing the Altera SoC Embedded Design Suite

The Altera SoC Embedded Design Suite (EDS) contains development tools, utility programs, run-time software, and application examples to enable embedded development on the Altera SoC hardware platform. User can use the Altera SoC EDS to develop firmware and application software. Users can download the software from the Altera webpage:
https://www.altera.com/download/software/soc-eds

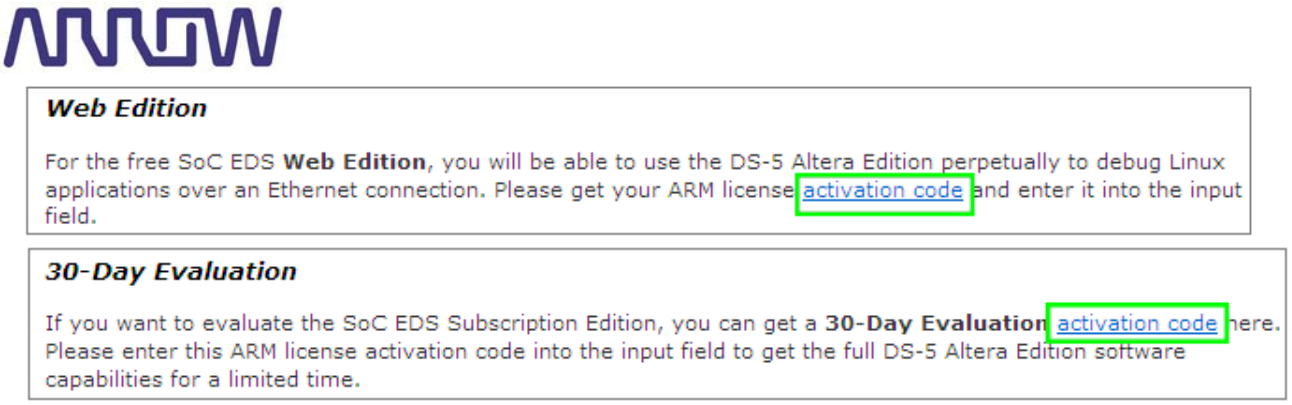
After you have installed the SoC Embedded Design Suite (EDS), you can start the ARM® Development Studio 5 (DS-5™) Altera Edition software. If this is your first time using the DS-5, a popup dialog will automatically ask if you wish to open the license manager.

For the free SoC EDS **Web Edition**, you will be able to use the DS-5 Altera Edition perpetually to debug Linux applications over an Ethernet connection. If you have purchased the SoC EDS **Subscription Edition**, you would have received an ARM license serial number. Or you can obtain a 30-day evaluation license. The following steps show how to obtain a web edition license or a 30-day evaluation license for subscription edition. If the user does not need to design in the ARM DS-5, please skip below section.

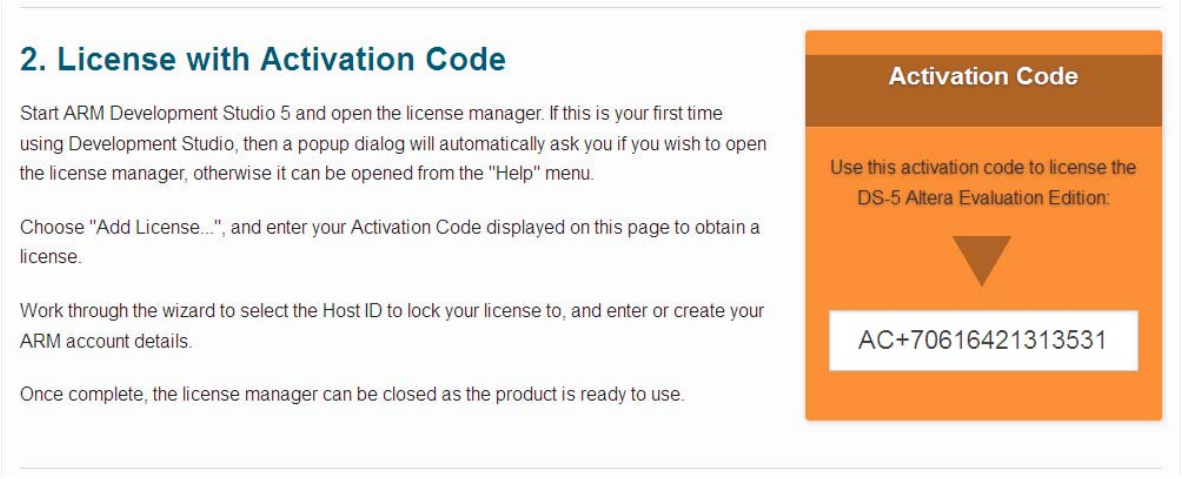
Obtain a Web Edition license or a 30-day evaluation license for Subscription Edition

In the section, we will introduce how to get a serial number from Altera website to active the ARM development Studio 5 (DS-5) Toolkit.

- Visit the website: Altera "SoC Embedded Design Suite" (https://www.altera.com/download/software/soc-eds)
- Browse the webpage to get the same information as the picture shows below, click the “activation code (Web Edition or 30-Day Evaluation) to link to the webpage: “DS-5 Community Edition".

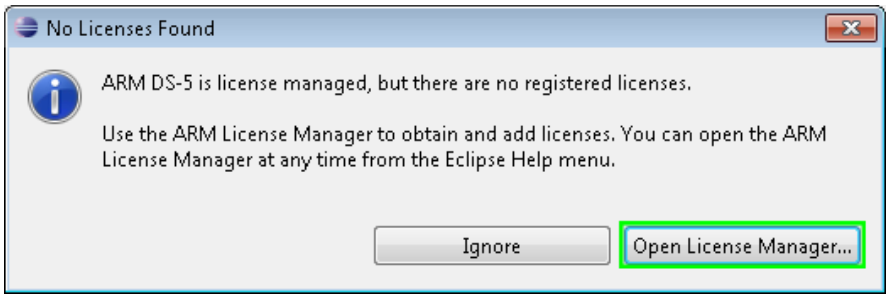


- In this page, record the Activation code displayed on the right of the picture below, such as "AC+70616421313438".

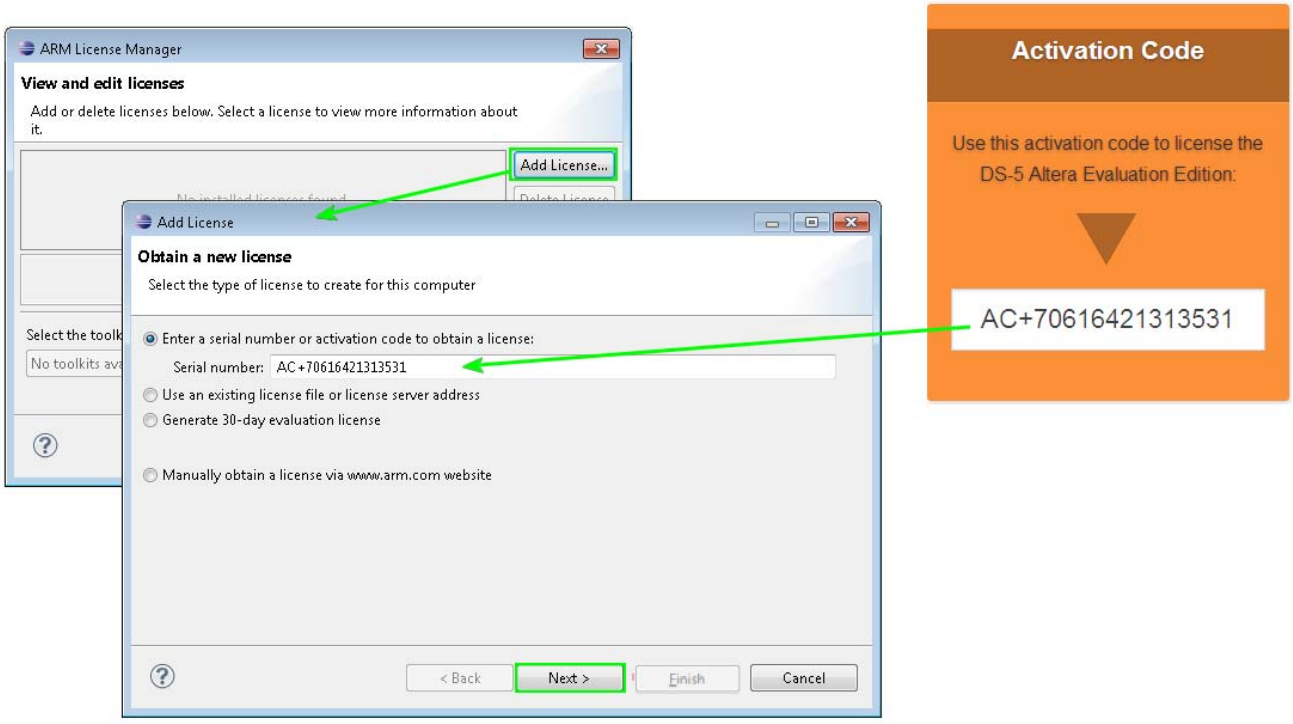


After recording this Activation code, we will continue to introduce how to active DS-5 by using this code. The steps are as follows:

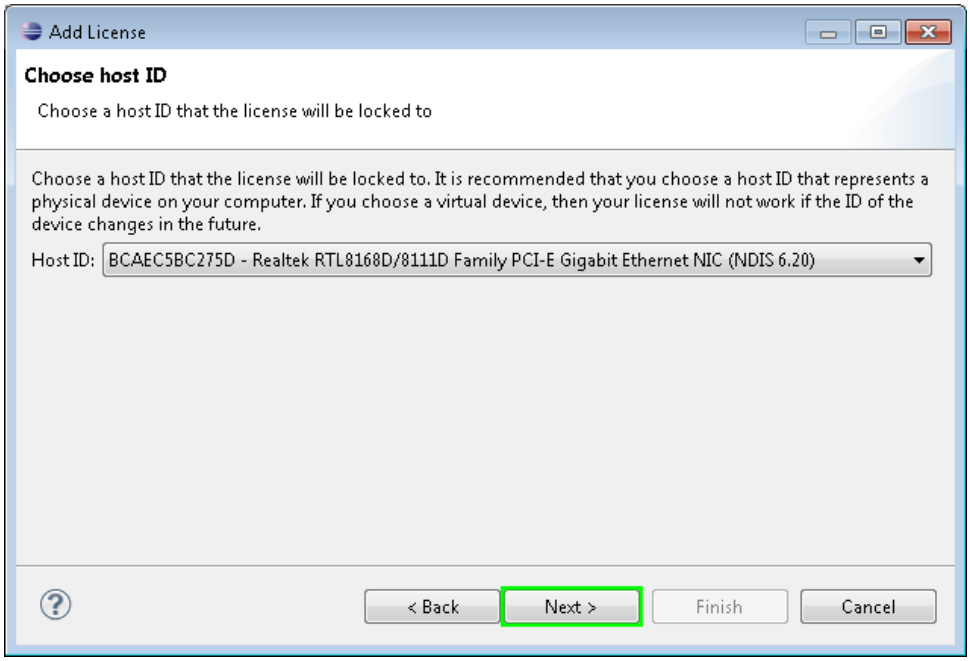
- Launch DS-5. Start --> All Programs --> ARM DS-5 --> Eclipse for DS-5
- A Workspace Launcher window will ask you to select a workspace.
- Press OK to select the default
- You will see a "No Licenses Found" Window. Select Open License Manager



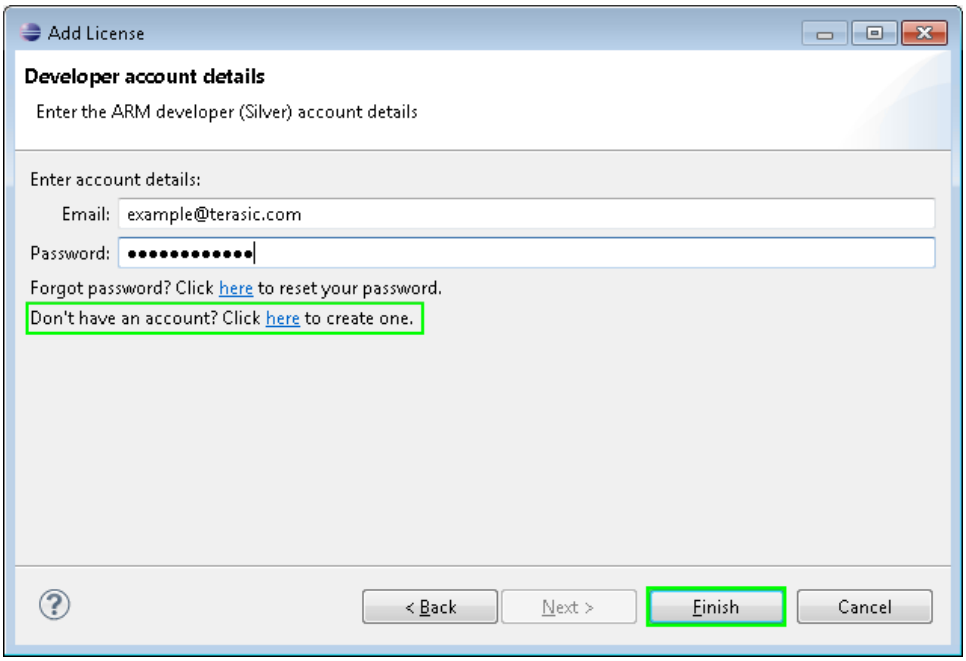
- Press the Add License Button in the ARM License Manager and Enter the activation code that you received earlier. Press the Next Button.



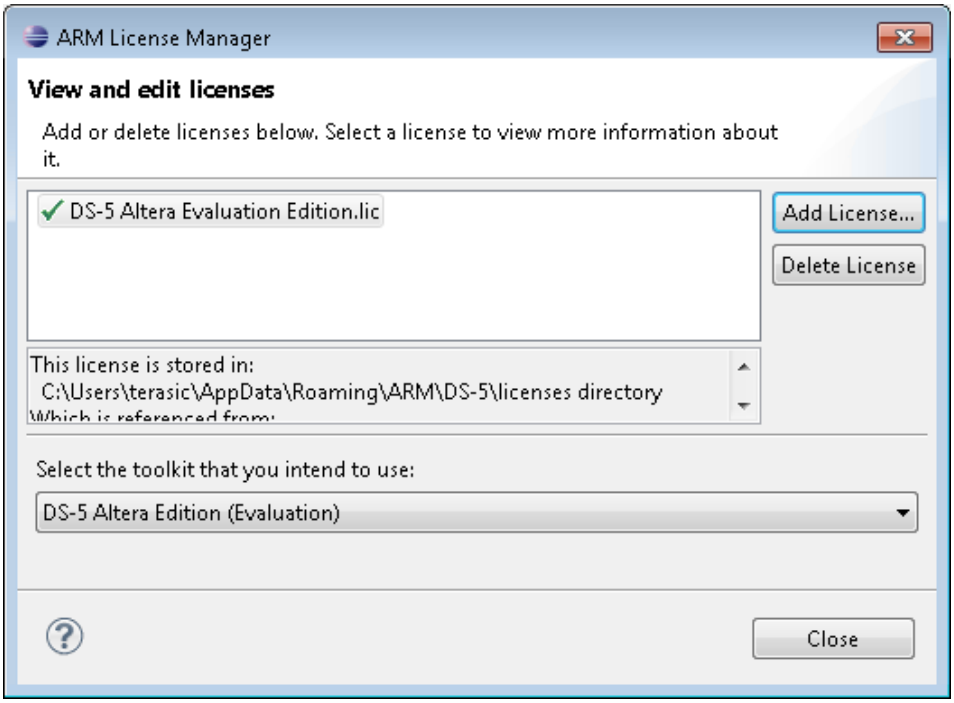
- Use the pull down menu to select a host ID. Press the Next button.



- Enter your ARM account email address and password.



- If you do not have an account then click on the link to create one.
- Press the Finish button.



- A web edition license or 30-day evaluation license for subscription edition had successfully installed.

Chapter 3

Development Board Setup

3.1 Introduction

The instructions in this section explain how to setup the SoCKit development board. The following pictures show the board overview of SoCKit board.

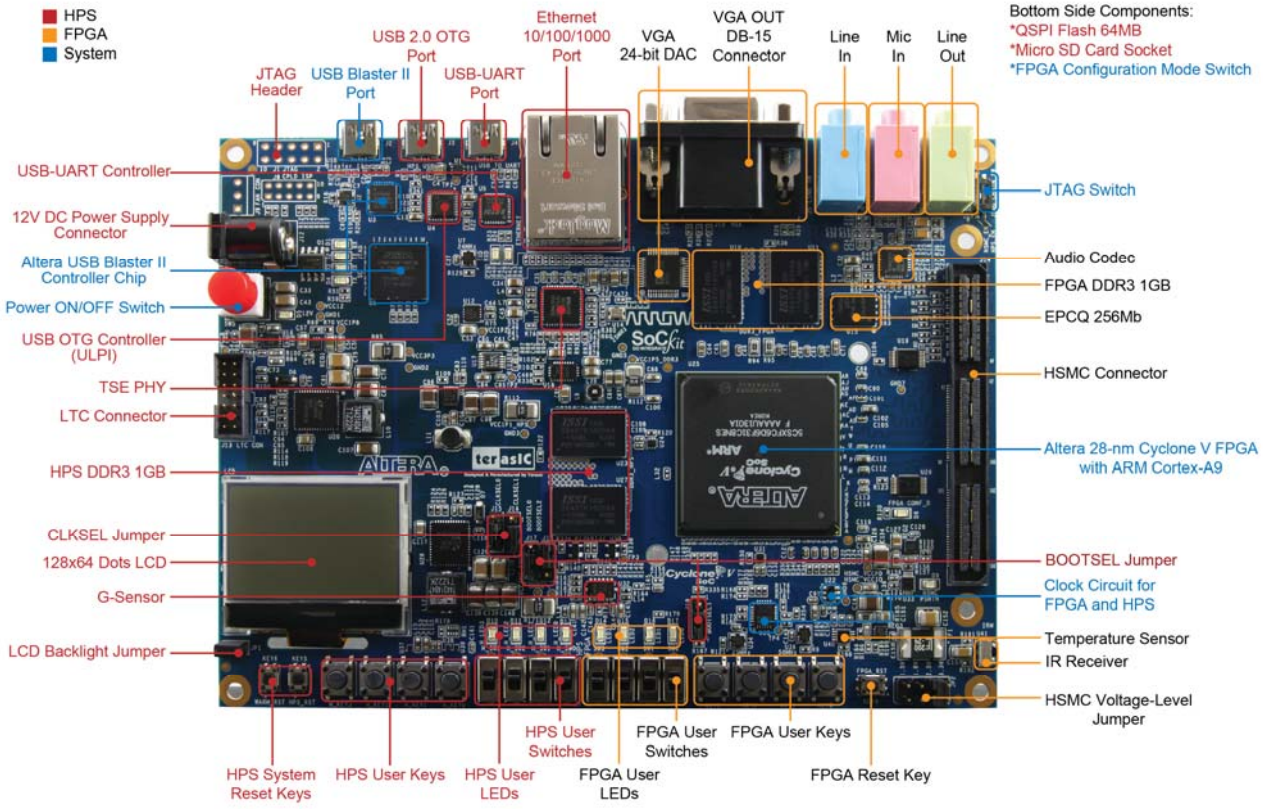


Figure 3-1 Board Top Overview

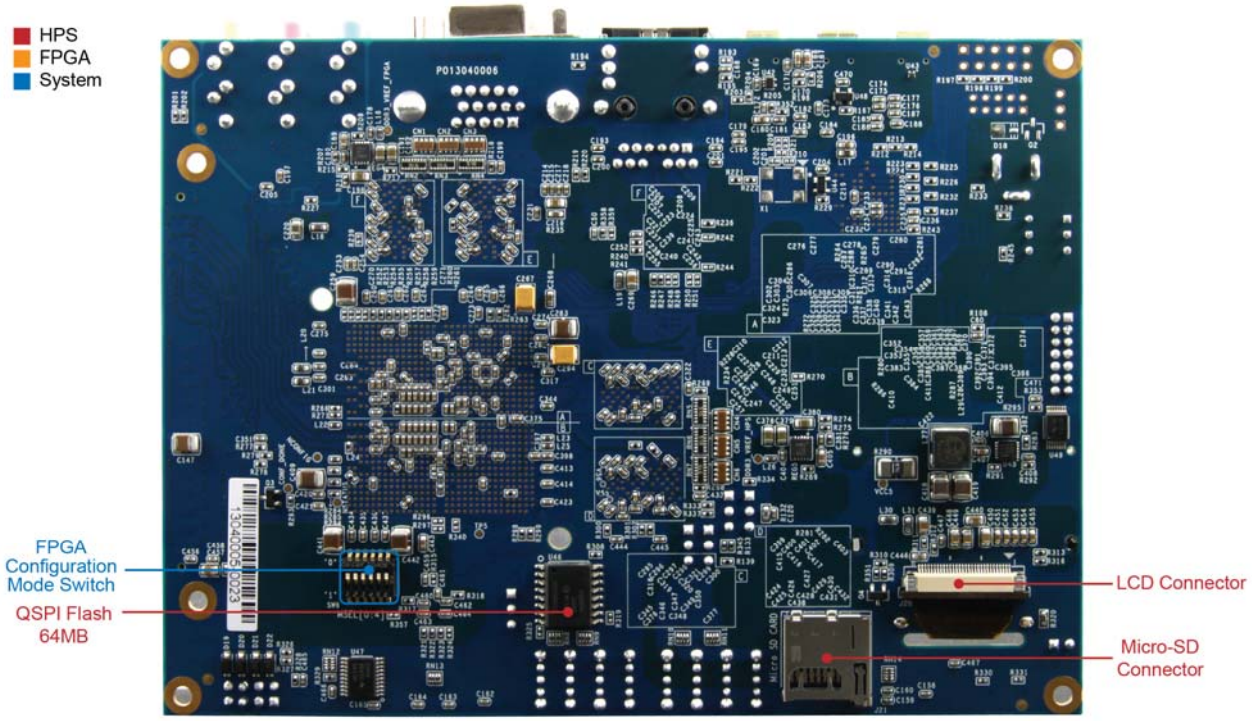


Figure 3-2 Board Bottom Overview

3.2 Default Switch/Header settings

This section describes the default settings of switches and headers on the SoCKit board. Please check the switches and set to positions describe below before moving on.

- J17~J19 BOOTSEL [2:0] = 101 represents HPS will boot from SD Card (See **Figure 3-3**).
- SW6 MSEL[4:0] = 10010 represents FPGA working in ASx4 mode(See **Figure 3-4)**.
- Set SW4.1 to off and SW4.2 to on represent HPS in JTAG chain and bypass HSMC (See **Figure 3-5**).

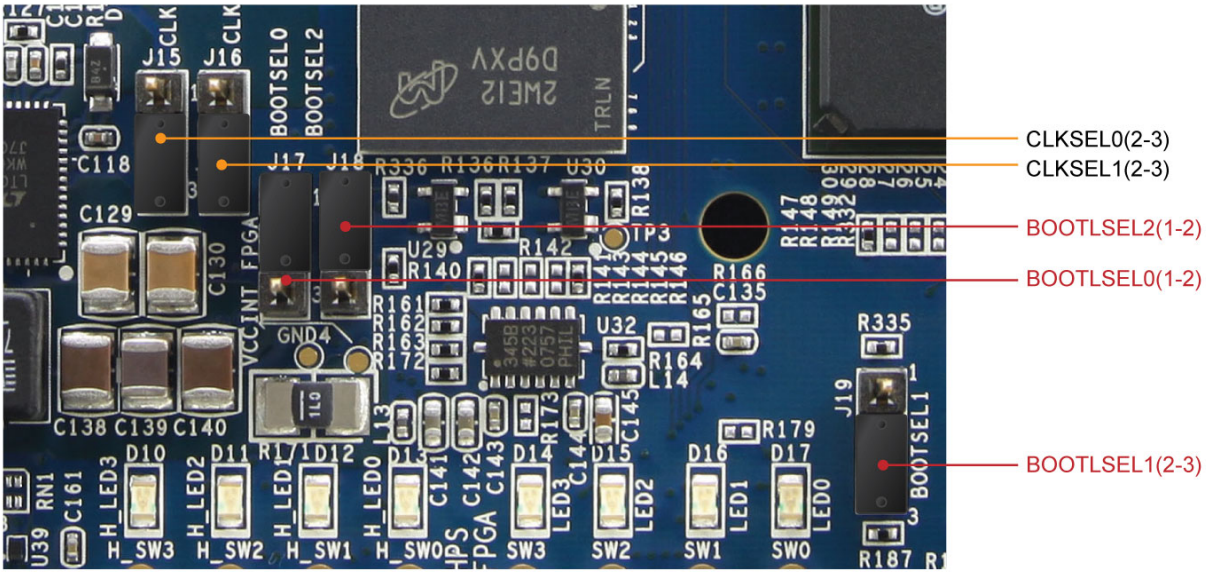


Figure 3-3 BOOTSEL and CLKSEL

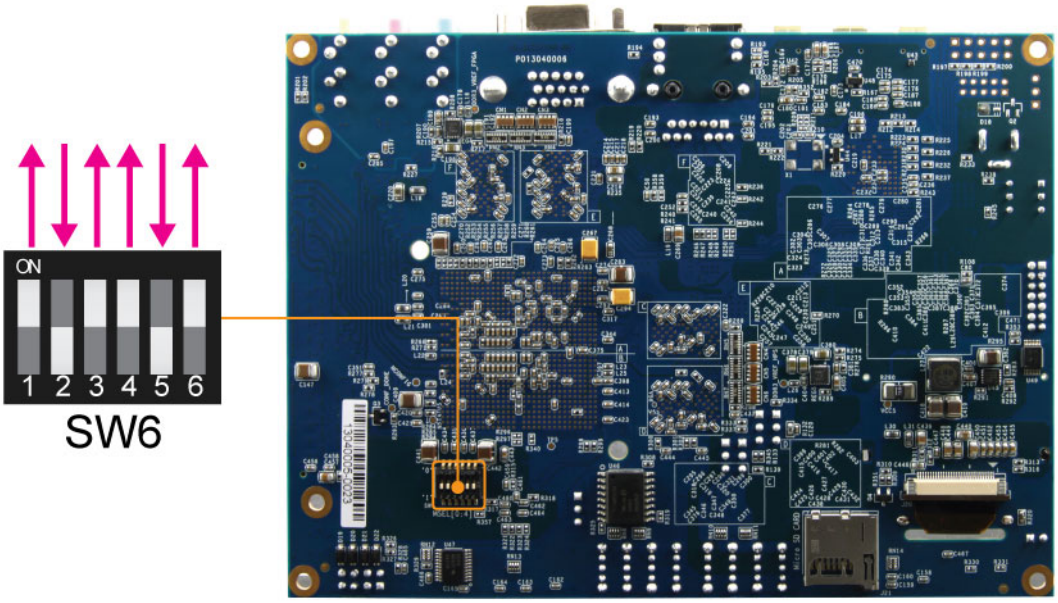


Figure 3-4 FPGA MSEL

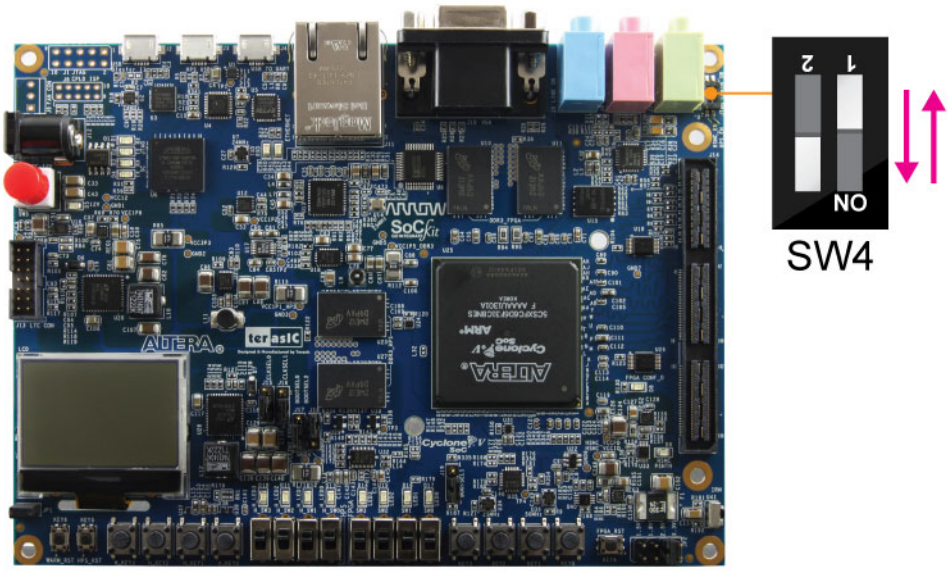


Figure 3-5 JTAG_EN

3.3 USB and Power Cables

Cable connections are shown in **Figure 3-6** as below:

Figure 3-6 USB and Power Cables

3.4 Powering up the SoCKit Board

To power-up the board, perform the following steps below:

1. Connect the provided power cord to the power supply and plug the cord into a power outlet (verify the voltage supplied is the same as the specification on the power supply).

2. Connect the supplied SoCKit power adapter to the power connector (J12) on the SoCKit board. Press the power button (SW5). At this point, you should see the 12V indicator LED (D5) turn on.

Chapter 4

Performing an FPGA System Test

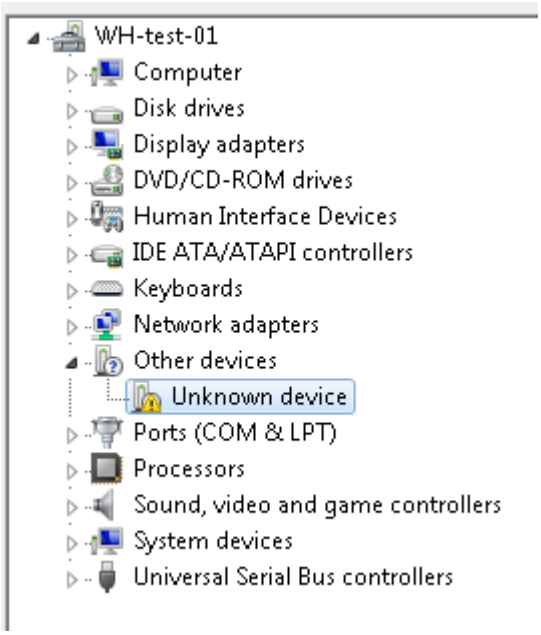
4.1 Introduction

This chapter shows how to install the USB-Blaster II driver and download an FPGA SRAM Objective (.sof) file to your FPGA board.

4.2 Installing the USB-Blaster II Driver

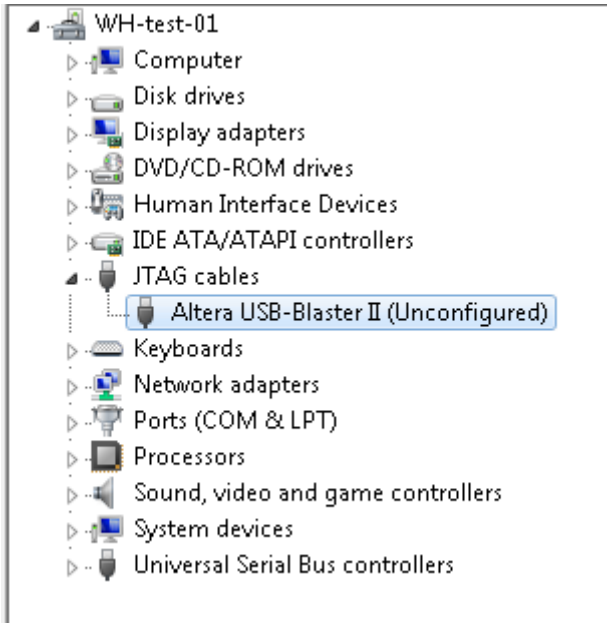
The steps below outline how to install the USB-Blaster II driver.

1. Connect your computer to the development board by plugging the USB cable into the USB connector (J2) of SoCKit (connection shown in **Figure 3-6**)
2. Power up the board and open the device manager in Windows. You will find an unknown device.



3. Select the unknown device to update the driver software. The driver file is in the \<Quartus II installation directory>\drivers\ usb-blaster-ii directory.

4. After the driver installed correctly, the device is recognized as Altera USB-Blaster II as shown in following picture.

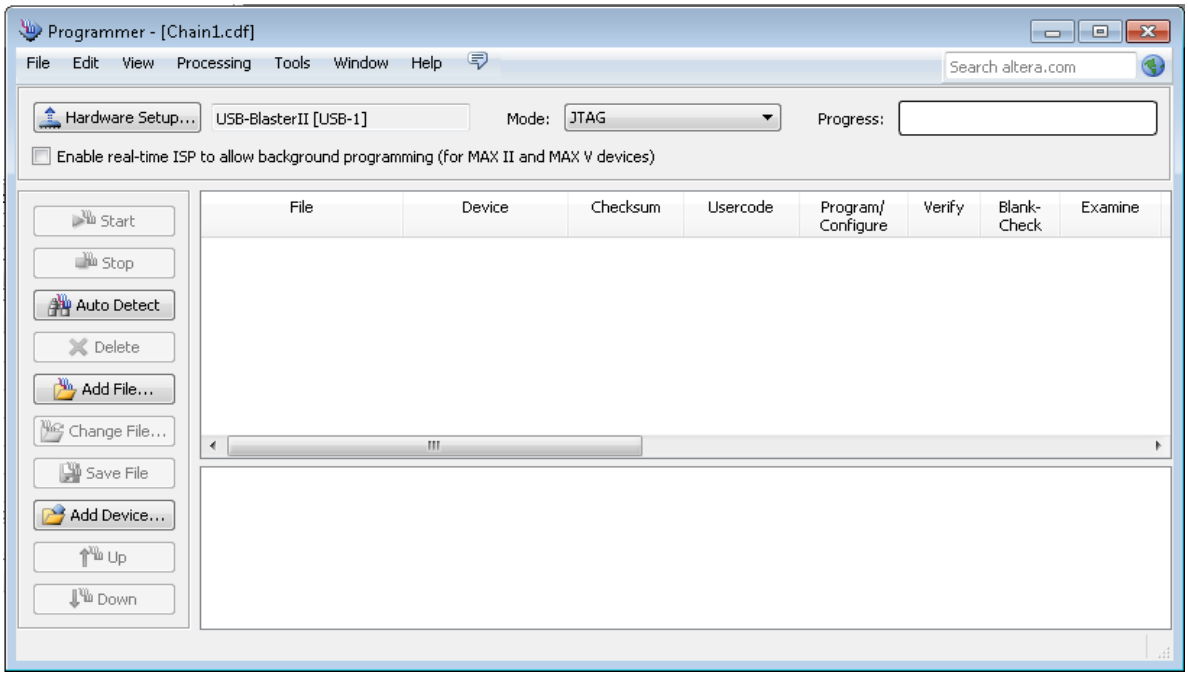


4.3 Downloading an FPGA SRAM Objective File

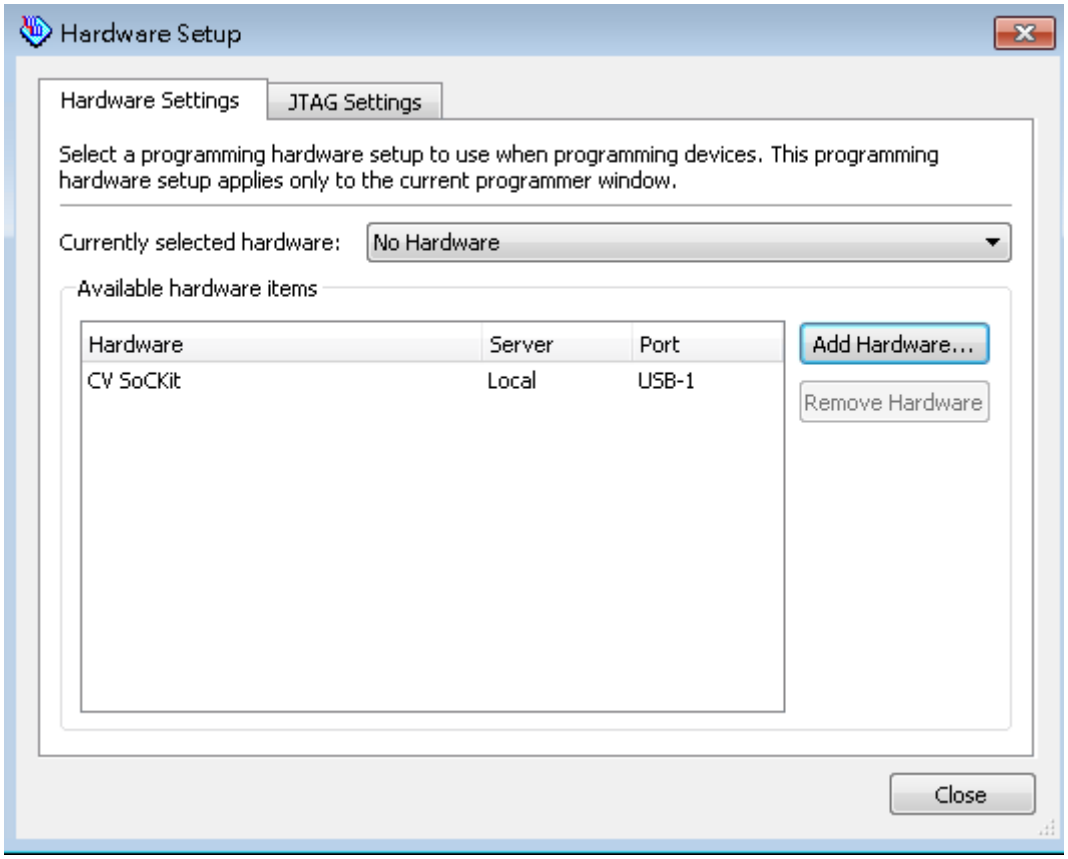
The Quartus II Programmer is used to configure the FPGA with a specific .sof file. Before configuring the FPGA, ensure that the Quartus II software and the USB-Blaster II driver are installed on the host computer.

If users would like to program their SRAM Object File (.sof) into the Cyclone V SOC FPGA device on the SoCKit board, execute the following steps:

1. Connect your computer to the SoCKit board by plugging the USB cable into the USB connector (J2) of SoCKit and power up the board (details shown in **Chapter 3**)
2. Open the Quartus II software and select Tools > Programmer. The Programmer window will appear.



3. Click Hardware **Setup**.
4. If **CV SoCKit [USB-1]** does not appear under **Currently Selected Hardware**, select that option and click **Close** shown below.

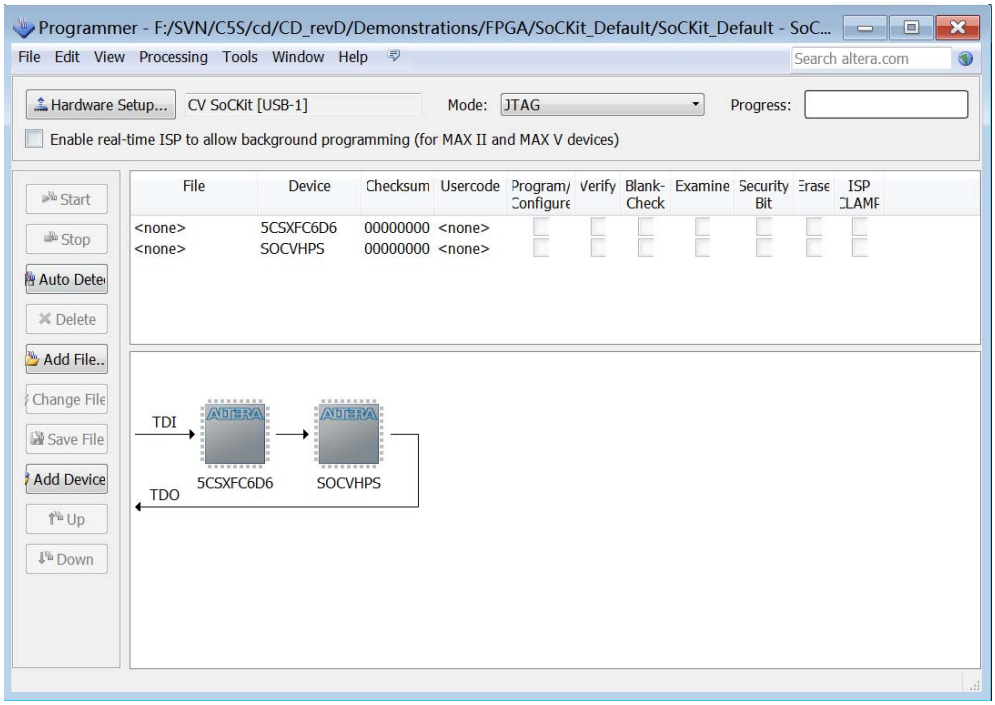


If the USB-Blaster II does not appear under hardware options list, please confirm if the USB-Blaster

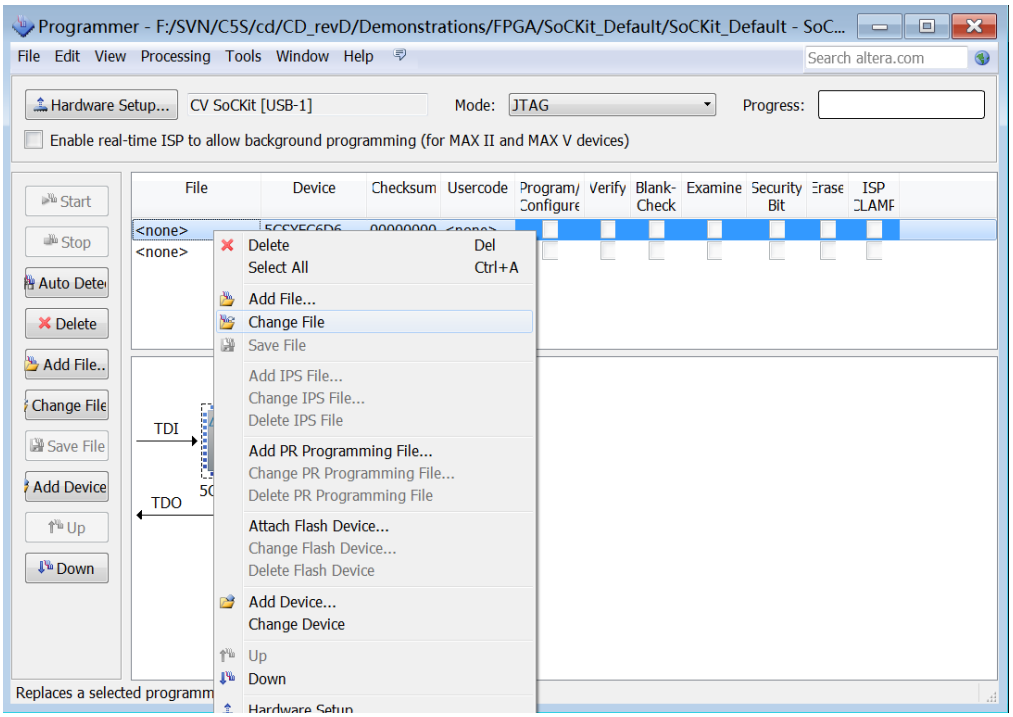
II driver has been correctly installed, and the USB cable has been properly connected between the SoCKit board and host computer.

5. Click **Auto Detect** and choose 5CSXFC6D6 and click **OK**

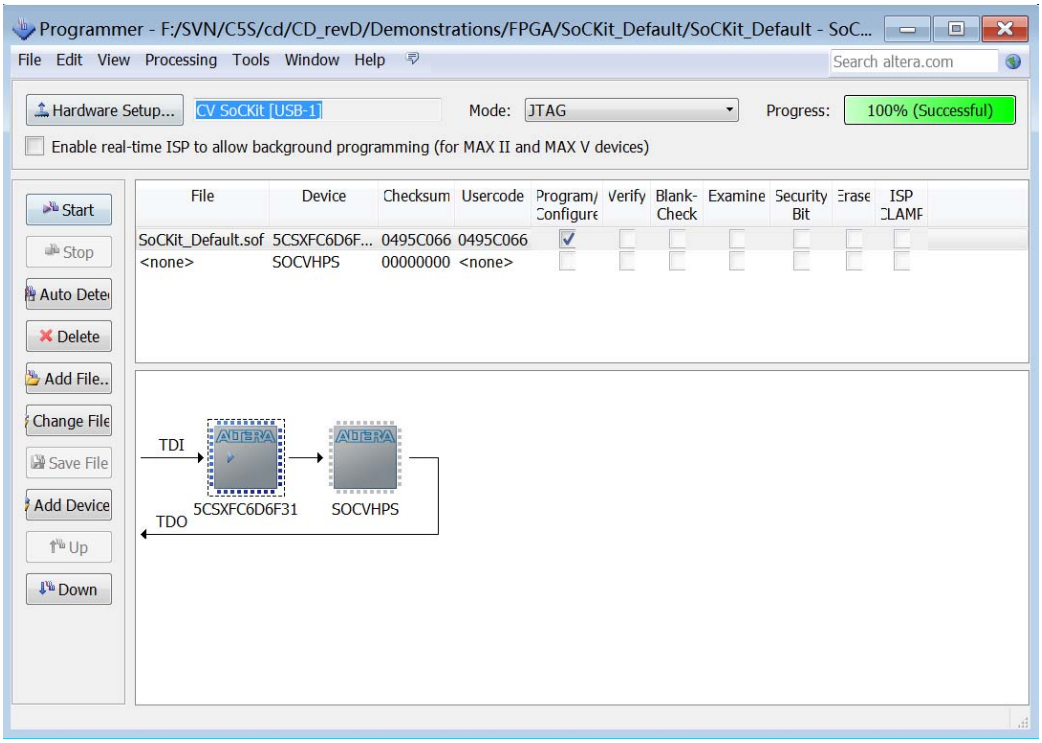
Two devices should be found.



6. Right click <none> of device 5CSXFC6D6, choose **Change File**, Select \<CD directory>\Demonstration\ FPGA\SoCKit_Default\ SoCKit_Default.sof.



7. Turn on the **Program/Configure** option that corresponds to the .sof file and click **Start,** which will automatically download the file into the SoCKit board shown below.



8. After the downloading has been complete, you should be able to find that FPGA_LEDs flashing,

meaning that the .sof has been programmed successfully.

Chapter 5

Running Linux on the SoCKit board

5.1 Introduction

This chapter demonstrates you how to create a microSD card image, set up a UART Terminal, and run Linux on SoCKit Board.

5.2 Creating a microSD Card Image

To program a microSD card Linux image you can use a free tool called **Win32DiskImager.exe** from http://sourceforge.net/projects/win32diskimager/ on a Windows machine. Win32DiskImager can also be found in \<CD directory>\Tools\ Win32DiskImager.

■ MicroSD Specification

- Capacity: 4GB minimum
- Speed: Class 4

■ Pre-built SD Card Image

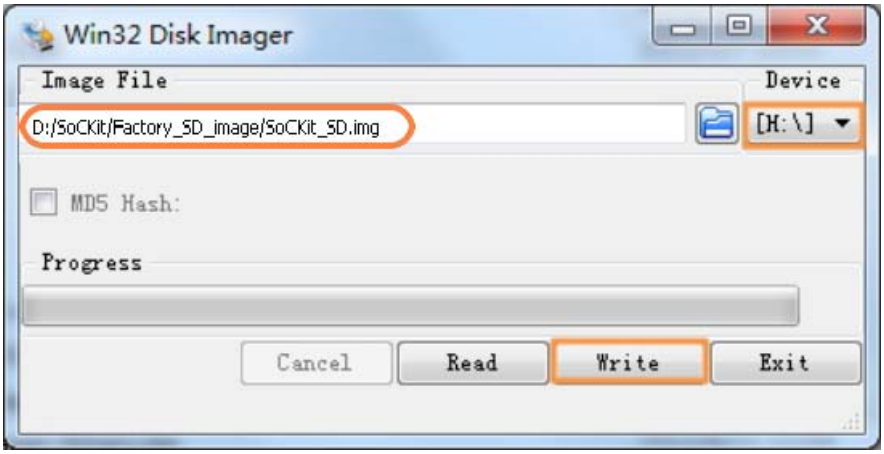
The pre-built binaries are delivered as an archive named SoCKit_SD.img. This SD card image file contains all the items that are needed to run Linux on SoCKit board. (You can find this file in \<CD directory>\Tools\Factory_SD_image\SoCKit_SD.rar, and extract file to get the image file)

SPL Pre-loader

- U-boot
- Device Tree Blob
- Linux Kernel
- Linux Root File system

The SD card image file needs to be programmed to a microSD card before it can be used. The steps below present how to create microSD card on a windows machine using Win32DiskImager.exe.

1. Connect the microSD card to a Windows PC
2. Execute Win32DiskImager.exe
3. Select the image file for microSD card
4. Select the microSD card device



5. Click “write” to start writing the image file to the microSD card. Wait until the image is written successfully.

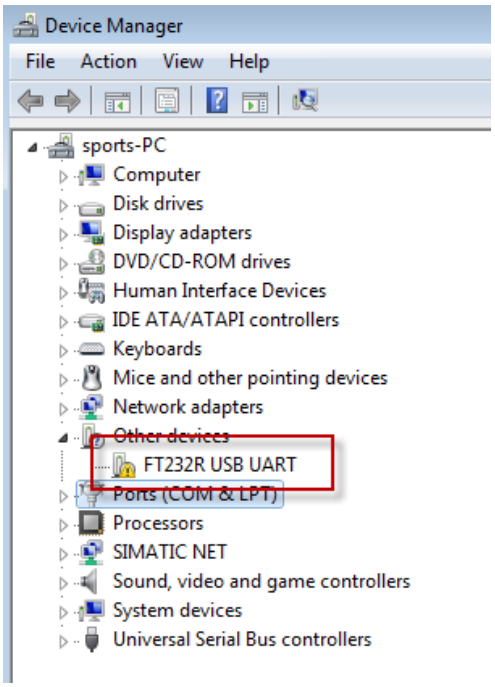
5.3 Setup UART Terminal

This section presents how to install the drivers for the USB to UART chip on the SoCKit board and set up the UART terminal on your host PC. The SoCKit board communicates with the PC through the mini USB connector J4.You should install the USB to UART driver and configure the UART terminal before you run Linux on the board.

■ Installing the Driver

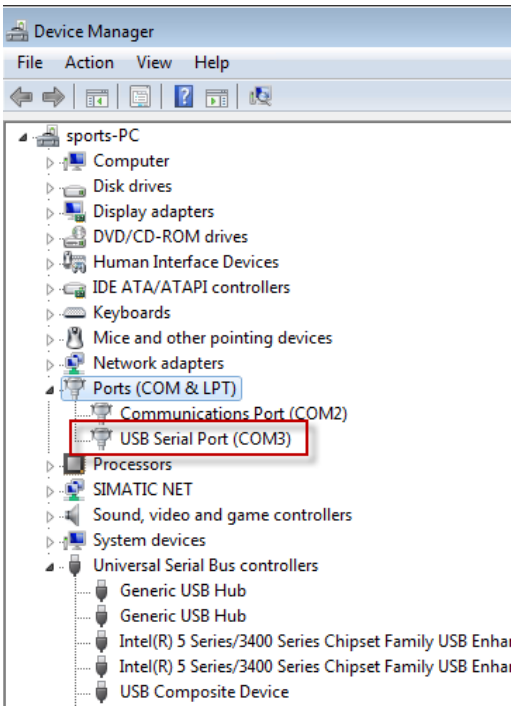
This section presents how to install the drivers for USB to UART communication. The necessary steps on Windows 7 are:

1. Connect your computer to the development board by plugging the USB cable into the mini USB connector (J4) of SoCKit (connection shown in **Figure 3-6**)
2. Power on the board then open the computer device manager in Windows. You will find an unrecognized FT232R USB UART.



Select the FT232R USB UART to update the driver software. The driver can be downloaded from http://www.ftdichip.com/Drivers/VCP.htm. or found in \<CD directory>\Tools\ USB2UART_driver.

3. After the driver has installed correctly, the USB Serial Port is recognized as a port such as ***COM3*** *(Open the device manager to know which COM port assigned in your computer)*



4. Now you can power off the SoCKit board

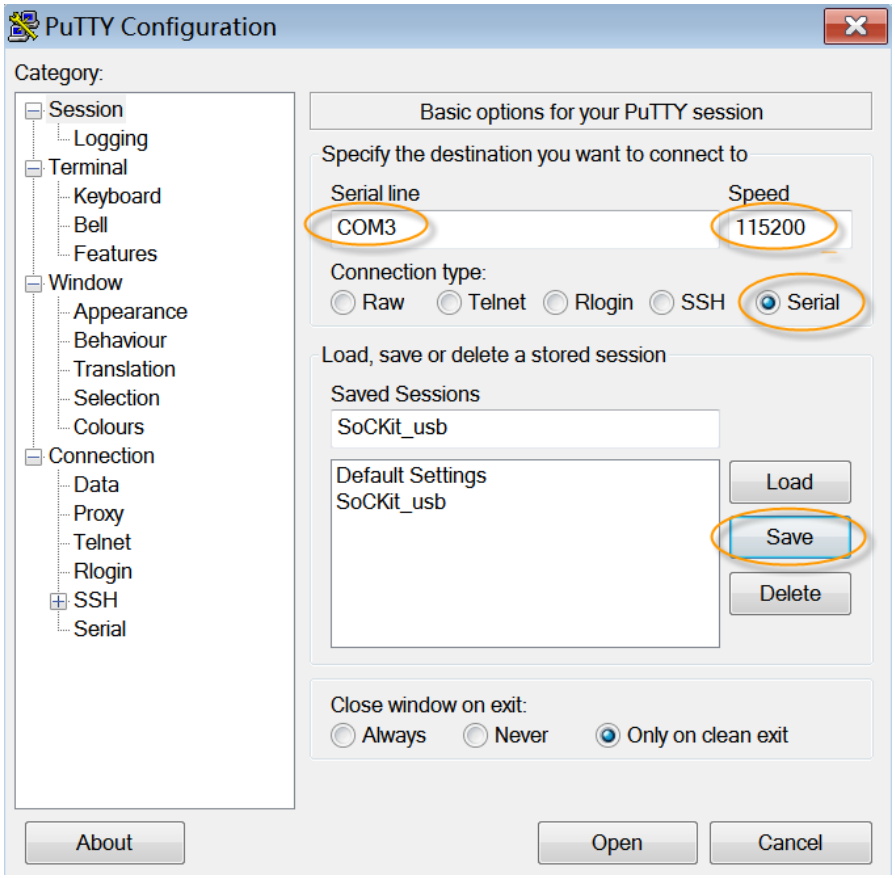
■ Configure UART terminal

UART terminal spec:

- 115200 baudrate
- no parity
- 1 stop bit
- no flow control settings

The following steps present how to configure a PuTTY terminal window (can be found in \<CD directory>\Tools\SSH.)

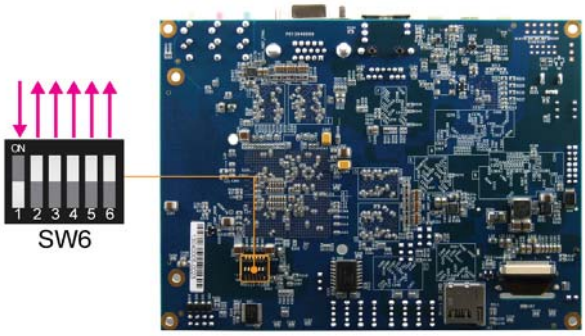
1. Open putty.exe, click ***Serial*** go to a serial configure interface.
2. Configure the window like the flowing picture and click save button to save the configuration.



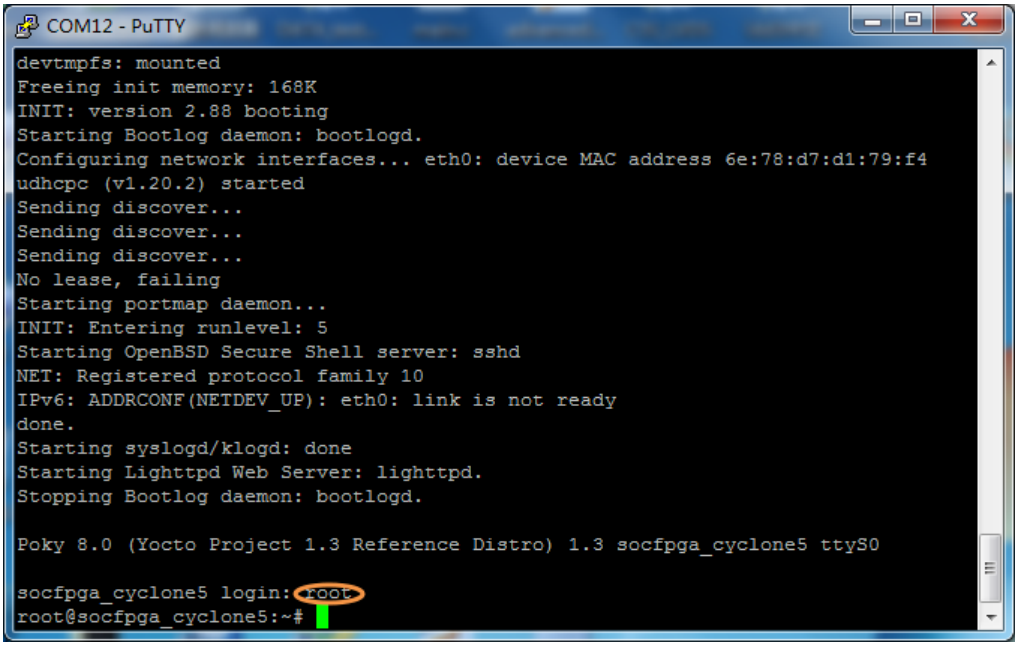
5.4 Running Linux on SoCKit board

This section presents how to run the pre-built Linux images on the SoCKit board. You can run the Linux by following the steps below:

1. Insert the microSD card with the pre-built image into the board (See Section **5.2** to prepare a microSD card)
2. Make sure HPS is set to boot from SD Card (BOOTSEL[2:0] = 101 , see **Figure 3-3)**
3. Set MSEL[4:0] (SW6) as shown in bellow



4. Press down the ***SW5*** button to Power up the board (See **Chapter 3** for details)
5. Open putty.exe, select the saved configuration **SoCKit_usb** and click open button.
6. After a successful boot, the HPS LEDs will blink several times, and Linux will ask for the login name. Type **root** and press **Enter** to login to the system.



Additional Information

Getting Help

Here are the addresses where you can get help if you encounter problems:

- Terasic Technologies
  9F., No.176, Sec.2, Gongdao 5th Rd, East Dist, Hsinchu City, 30070. Taiwan, 30070
  Email: **support@terasic.com**
  Web: **www.terasic.com**

Revision History

Date	Version	Changes
2013.04	V1.0	First Version
2013.05.23	V1.1	Modify Section 5.4
2013.06.16	V1.2	Modify Chapter 2
2013.10.23	V1.3	Modify Section 4.3
2014.8.28	V1.4	Modify Usb Connector and baudrate