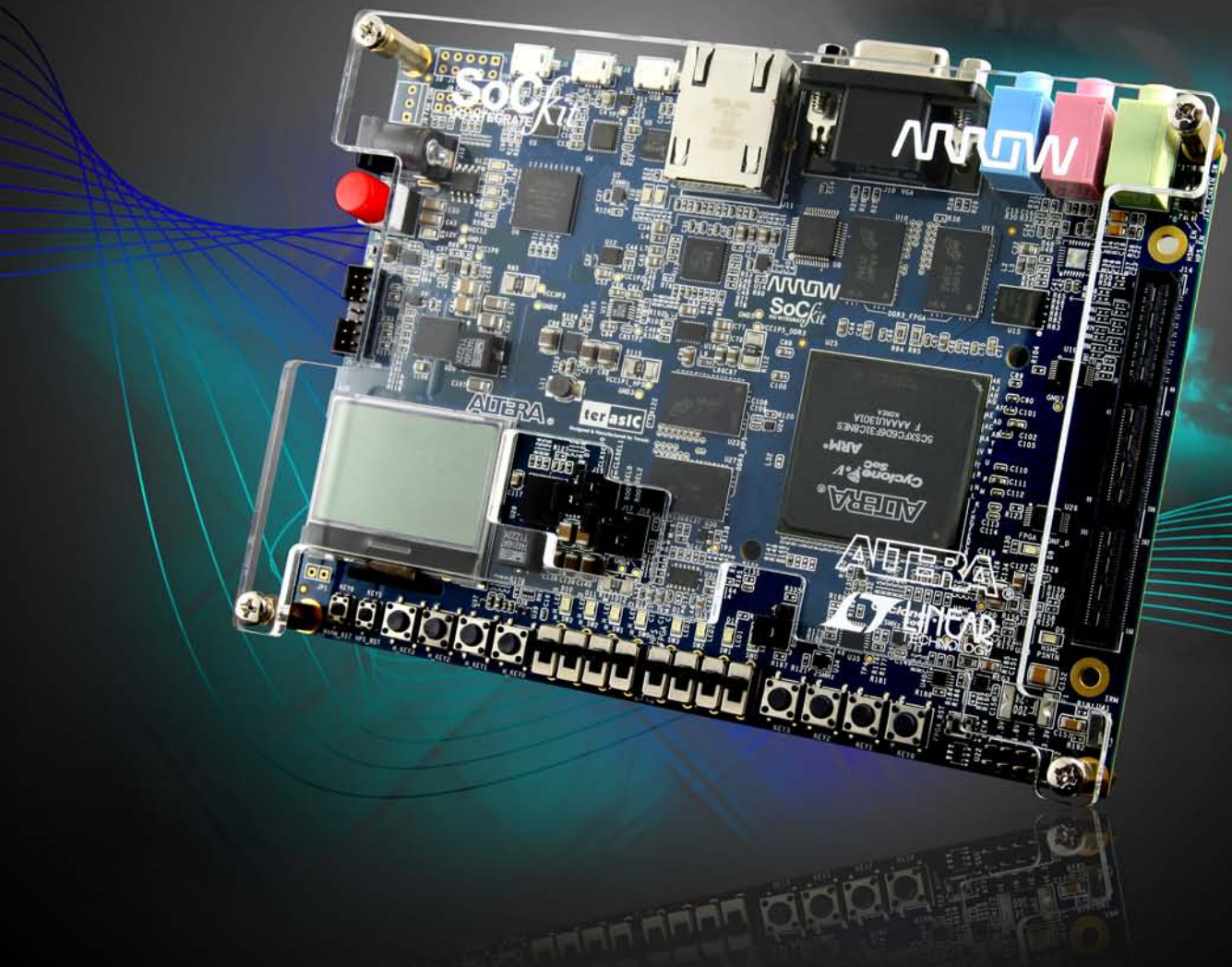
SoCKit

FPGA DEVELOPMENT KIT

Getting Started Guide



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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
- ARM DS-5 Altera Edition Toolkit
- Getting the latest Softwares from Altera website

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, which are both included in the package DVD. Install the following software accompanied from the DVD or download the software from the Altera webpage: www.altera.com/download
The kit contents contain a Quartus II CD with a Subscription Edition and Web Edition. The Web Edition of Quartus II does not require a license. The figure below shows the CD.

The Web Edition of Quartus II supports developing and programming the Cyclone V SX device on the SoCKit. 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

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.

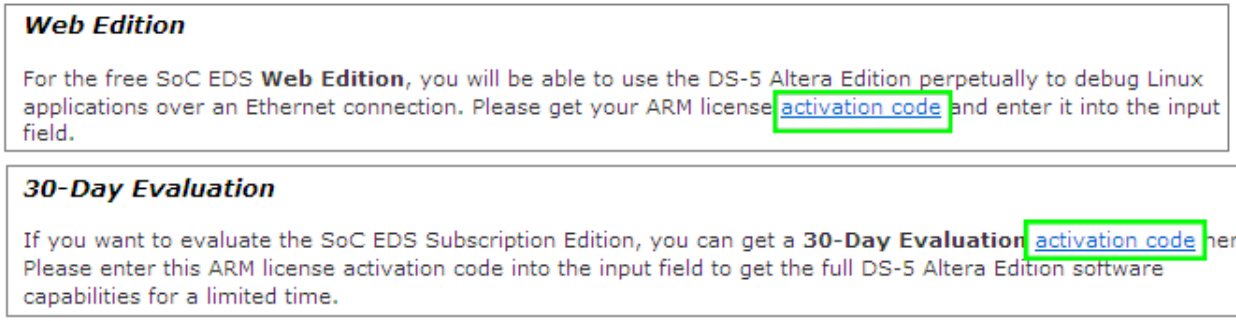
Install the software accompanied from the DVD or download the software from the Altera webpage: https://www.altera.com/download/software/soc-eds

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.

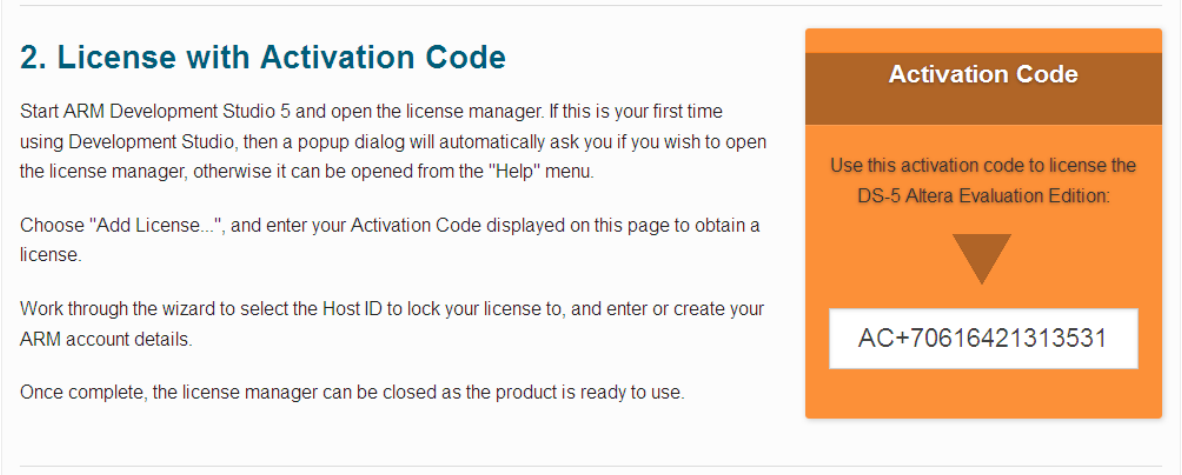
For the free SoC EDS **Web Edition**, you will be able to use the DS-5 Altera Edition perpetually to debug Linux applications over an Ethernet connection. If you have purchased the SoC EDS **Subscription Edition**, you would have received an ARM license serial number. Or you can obtain a 30-day evaluation license. The following steps show how to obtain a web edition license or a 30-day evaluation license for subscription edition.

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

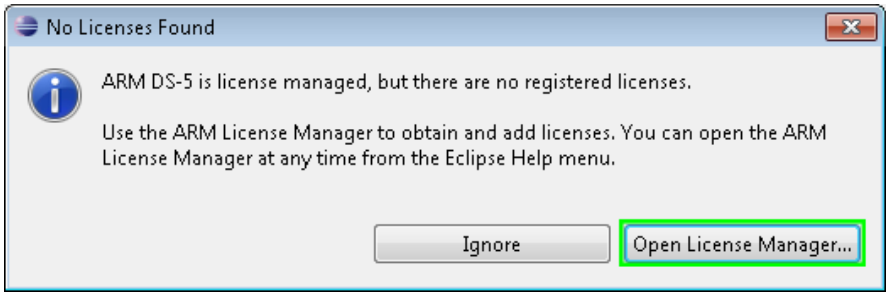
- Clicking the activation code link on the same download page under the heading Web Edition or 30-Day Evaluation. https://www.altera.com/download/software/soc-eds



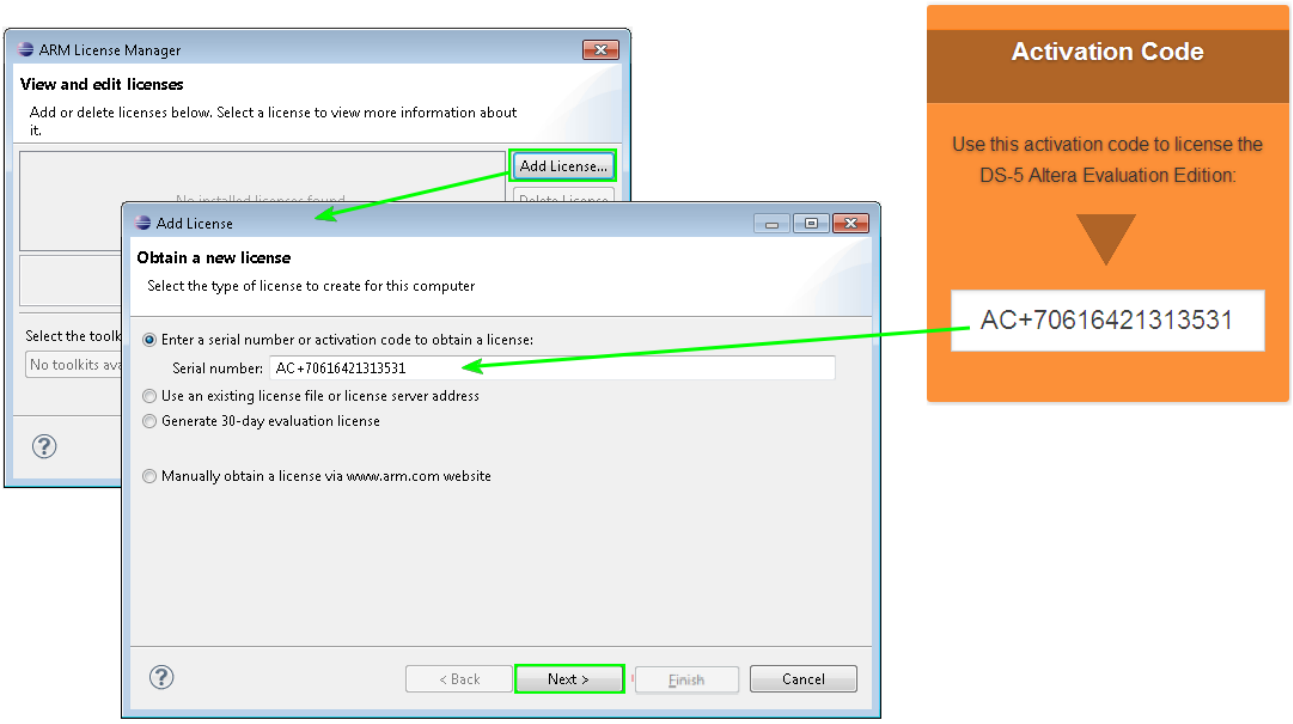
- You will be provided with an activation code. Use this code when prompted by the ARM licensing manager.



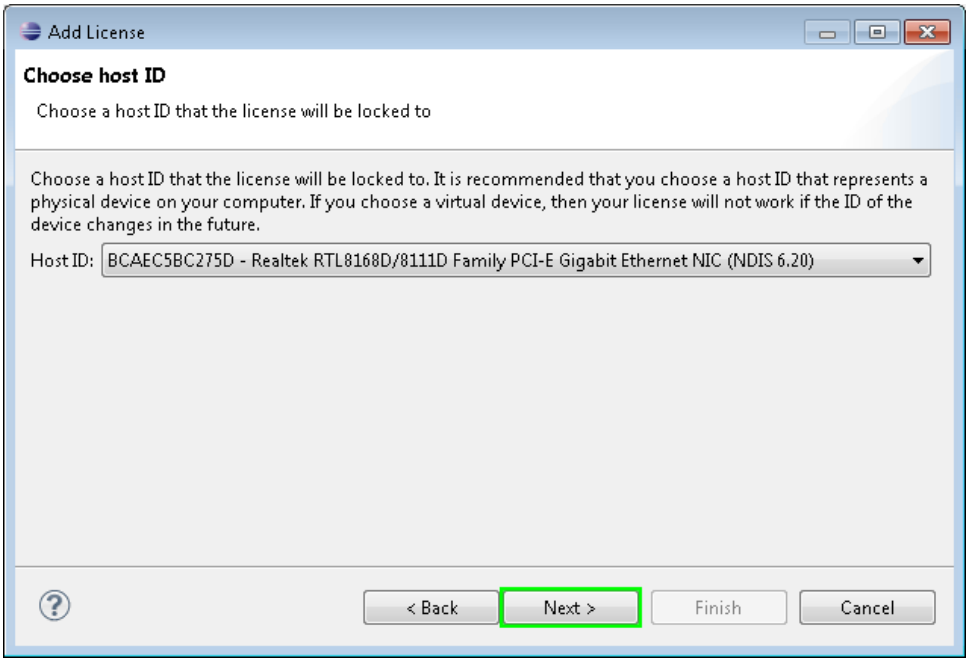
- Launch DS-5. Start --> All Programs --> ARM DS-5 --> Eclipse for DS-5
- A Workspace Launcher window will ask you to select a workspace.
- Press OK to select the default
- You will see a "No Licenses Found" Window. Select Open License Manager



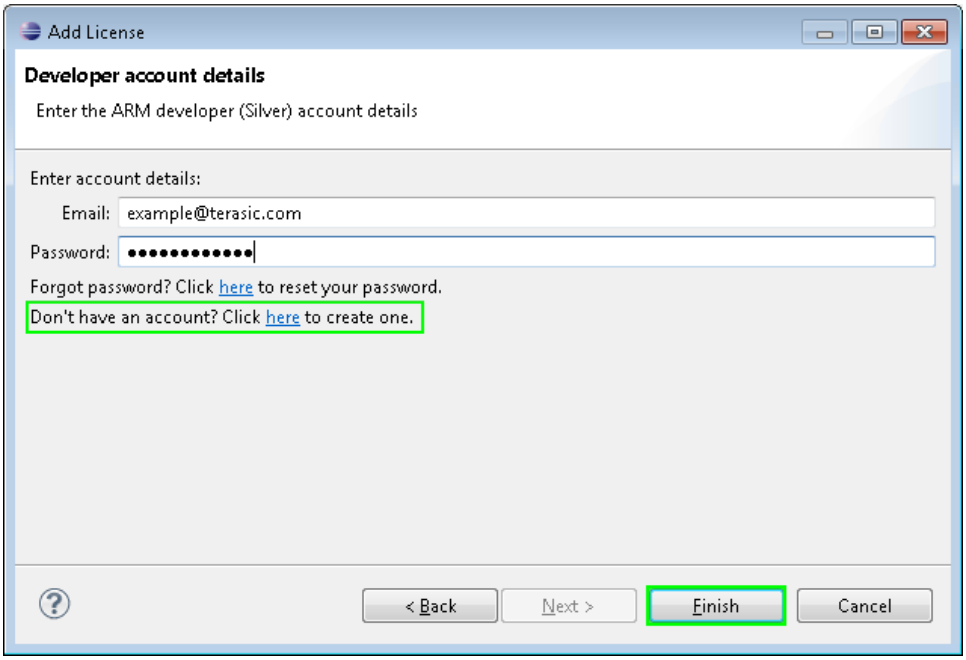
- Press the Add License Button in the ARM License Manager and Enter the activation code that you received earlier. Press the Next Button.



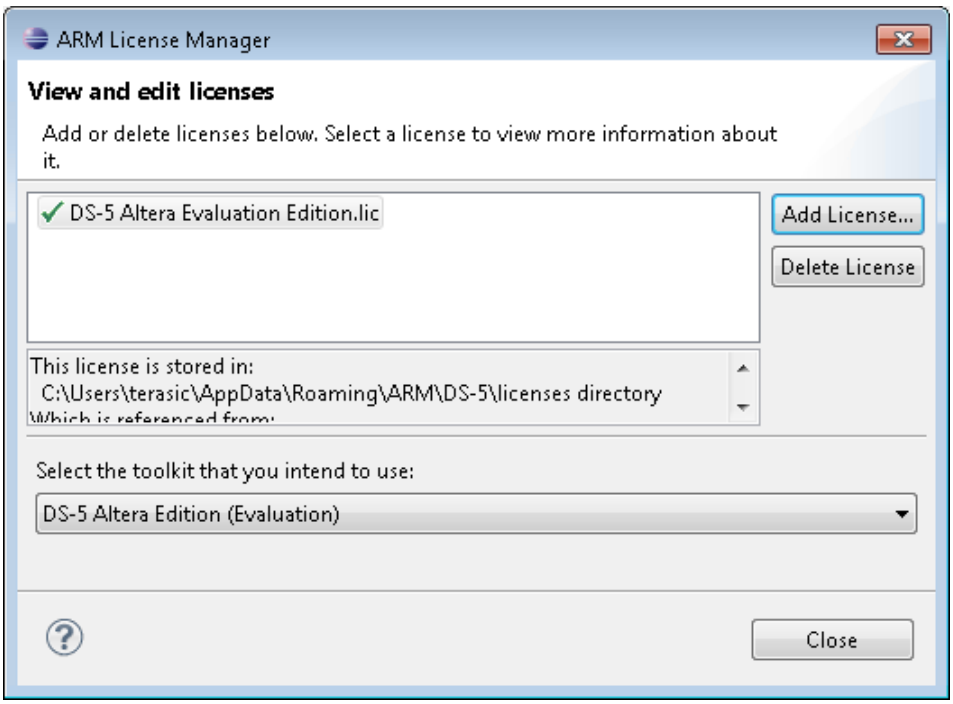
- Use the pull down menu to select a host ID. Press the Next button.



- 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.

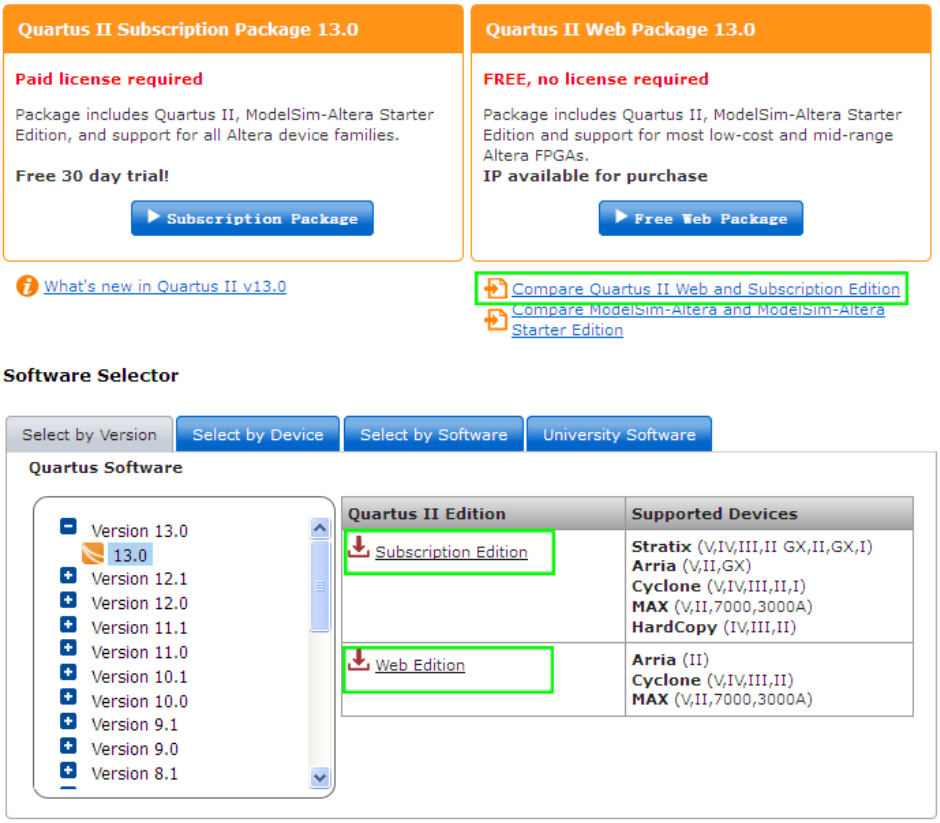


- A web edition license or 30-day evaluation license for subscription edition had successfully installed.

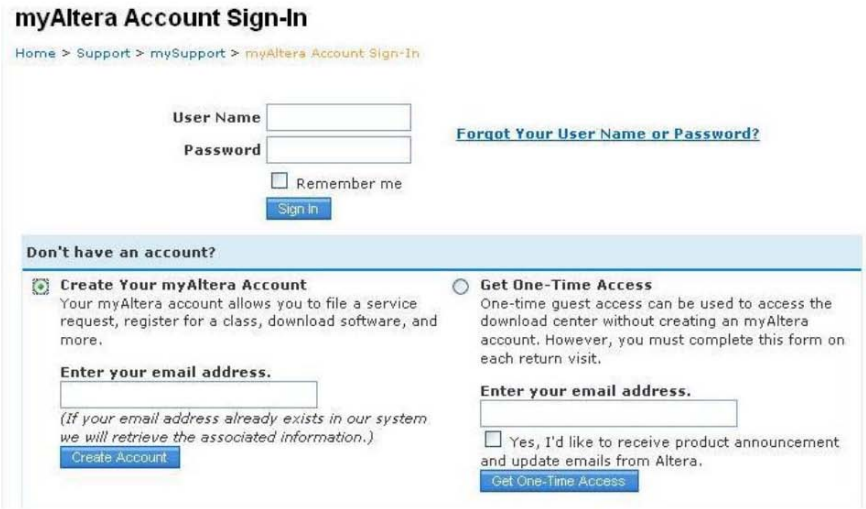
2.4 Getting the latest Softwares from Altera website

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

- Select the latest software version for Subscription Edition or web Edition



- Login to myAltera account.
- Use your existing login, or get one-time Access.



- Download files from subscription or web edition page.

Combined Files | Individual Files | DVD .iso Files

Download and install instructions:

1. Download Quartus II software, and any other software products you want to install, into a temporary directory.
2. Download device support files into the same directory as the Quartus II software installation file.
3. Run the **QuartusSetup-13.0.0.156.exe** file.

All software and components downloaded into the same temporary directory are automatically installed; however, stand-alone software must be installed separately.

Read Altera Software v13.0 Installation FAQ

Quick Start Guide

- [x] **Quartus II Subscription Edition**
  - [x] **Quartus II Software (includes Nios II EDS)**
    Size: 1.7 GB **MD5:** 3365B1A96722FFE047A9B4A91A6A2E5E
  - [x] **ModelSim-Altera Edition (includes Starter Edition)**
    Size: 779.4 MB **MD5:** D083E6256A5BA98419FF7E7F68EFB2D9
  - [x] **DSP Builder**
    Size: 76.3 MB **MD5:** 4FFD88C5B32B71D23BB912BDB23BFFA3
- [x] **Devices**
  You must install device support for at least one device family to use the Quartus II software.
  - [x] **Arria GX, Arria II device support (includes all variations)**
    Size: 619.1 MB **MD5:** 6767EE42820E7729F301E87F09A05F09
  - [x] **Arria V device support**
    Size: 1.4 GB **MD5:** F77459A9266C970E09B4509ABFAE43F4
  - [x] **Arria V GZ device support**
    Size: 1.4 GB **MD5:** 69CE4CE66EEA3EB0A4574EC13594089B
  - [x] **Cyclone, Cyclone II, Cyclone III, Cyclone IV device support (includes all variations)**
    Size: 573.5 MB **MD5:** 822C895B61A897A2A6A29D2D759BE71A
  - [x] **Cyclone V device support (includes all variations)**
    Size: 700.7 MB **MD5:** A9EB7719925306C1DBED812C8C098069
  - [x] **MAX II, MAX V, MAX 3000, MAX 7000 device support**
    Size: 6.8 MB **MD5:** 2BEB455C9069A875C6B50571060DFEA9
  - [x] **Stratix, Stratix II, HardCopy II device support (includes all variations)**
    Size: 253.4 MB **MD5:** 576CE1E3B9A4E358053FA80A87D8041D
  - [x] **Stratix III, Stratix IV, HardCopy III, HardCopy IV device support (includes all variations)**
    Size: 734.3 MB **MD5:** 7E20641EFDC71E5FE323F094624E7584
  - [x] **Stratix V device support (includes all variations)**
    Size: 2.1 GB **MD5:** C02B16D43EFDC1F2A27A92FAFBBD4528
- [x] **Additional Software**
  - [x] **Quartus II Programmer and SignalTap II**
    Size: 129.7 MB **MD5:** 2708A8AD37F23828C6015F256AA14236
  - [x] **Quartus II Help**
    Size: 355.7 MB **MD5:** 5513707B3BE573CEBFA11656EB05DACC
  - [x] **SoC Embedded Design Suite (EDS)**
    Size: 1.0 GB **MD5:** 76F94B628BA25783CFEBF80E59448D8A
  - [x] **Linux Support Package Binary File**
    Size: 387.0 MB **MD5:** 9CC7736BE69B51C318CEBC51A4B9553B
  - [x] **Linux Support Package Source File**
    Size: 818.3 MB **MD5:** 58788F0DA87F549333E9432BE82681C3

Download Selected Files

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.

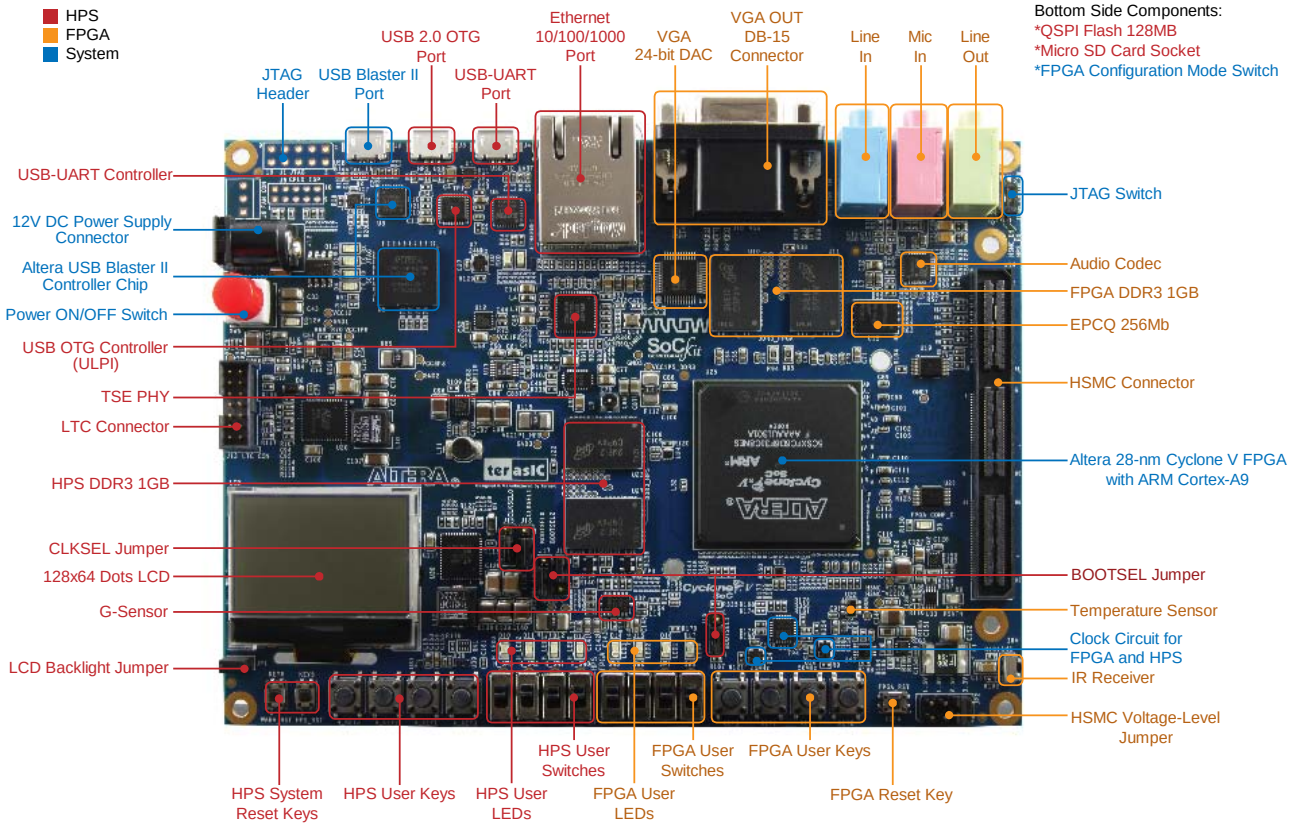


Figure 3-1 Board Top Overview

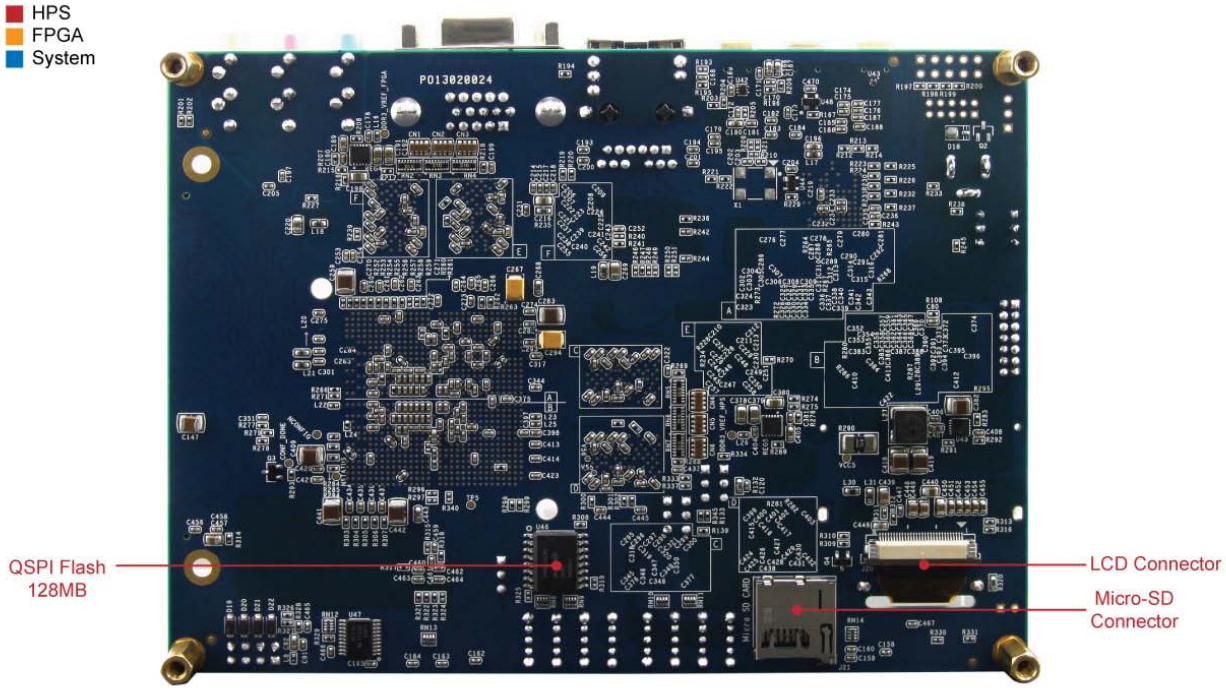


Figure 3-2 Board Bottom Overview

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.

BOOTSEL [2:0] = 100 represents HPS will boot from a 1.8V SD/MMC Flash memory device. Refer to Chapter 3 of SoCKit User manual for details.

Table 3-1 HPS BOOTSEL and CLKSEL Setting Headers

Board Reference	*Signal Name*	*Setting*	*Default*
J17	BOOTSEL0	Short Pin 1 and 2: Logic 1 Short Pin 2 and 3: Logic 0	Short Pin 1 and 2
J19	BOOTSEL1	Short Pin 1 and 2: Logic 1 Short Pin 2 and 3: Logic 0	Short Pin 2 and 3
J18	BOOTSEL2	Short Pin 1 and 2: Logic 1 Short Pin 2 and 3: Logic 0	Short Pin 1 and 2
J15	CLKSEL0	Short Pin 1 and 2: Logic 1 Short Pin 2 and 3: Logic 0	Short Pin 2 and 3
J16	CLKSEL1	Short Pin 1 and 2: Logic 1 Short Pin 2 and 3: Logic 0	Short Pin 2 and 3

Table 3-2 SW4 JTAG Control DIP Switch

Board Reference	*Signal Name*	*Description*	*Default*
SW4.1	JTAG_HSMC_EN	On: Bypass HSMC Off: HSMC In-chain	On
SW4.2	JTAG_HPS_EN	On: Bypass HPS Off: HPS In-chain	On

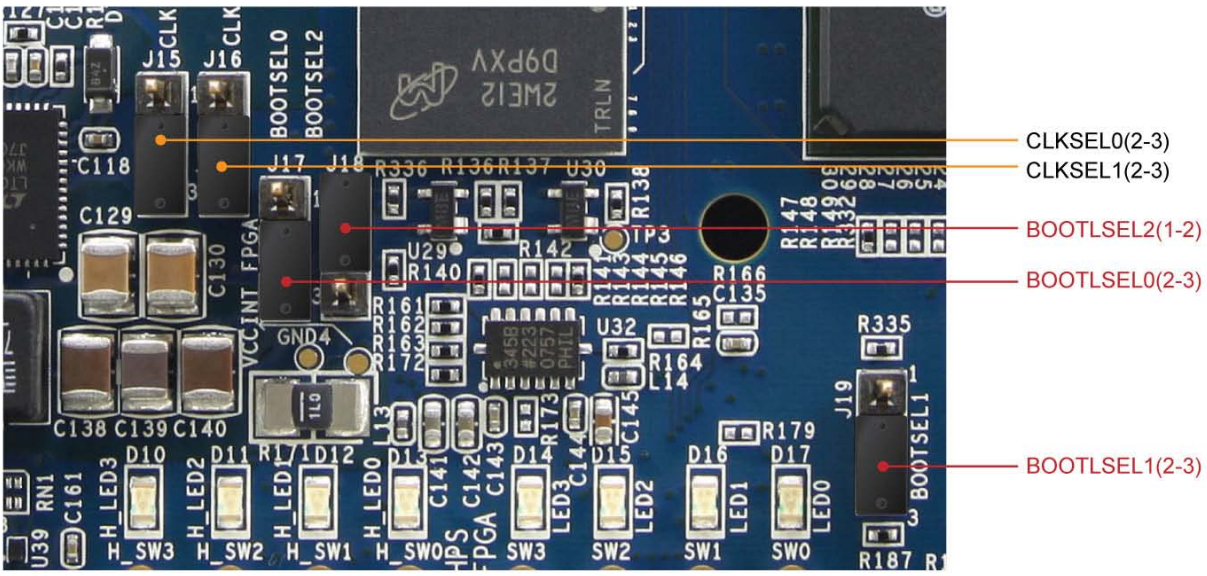


Figure 3-3 BOOTSEL and CLKSEL

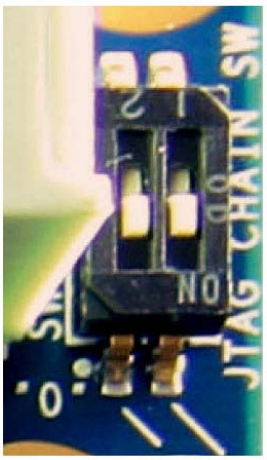


Figure 3-4 JTAG_EN

3.3 USB and Power Cables

Cable connections are shown in **Figure 3-5** as below:

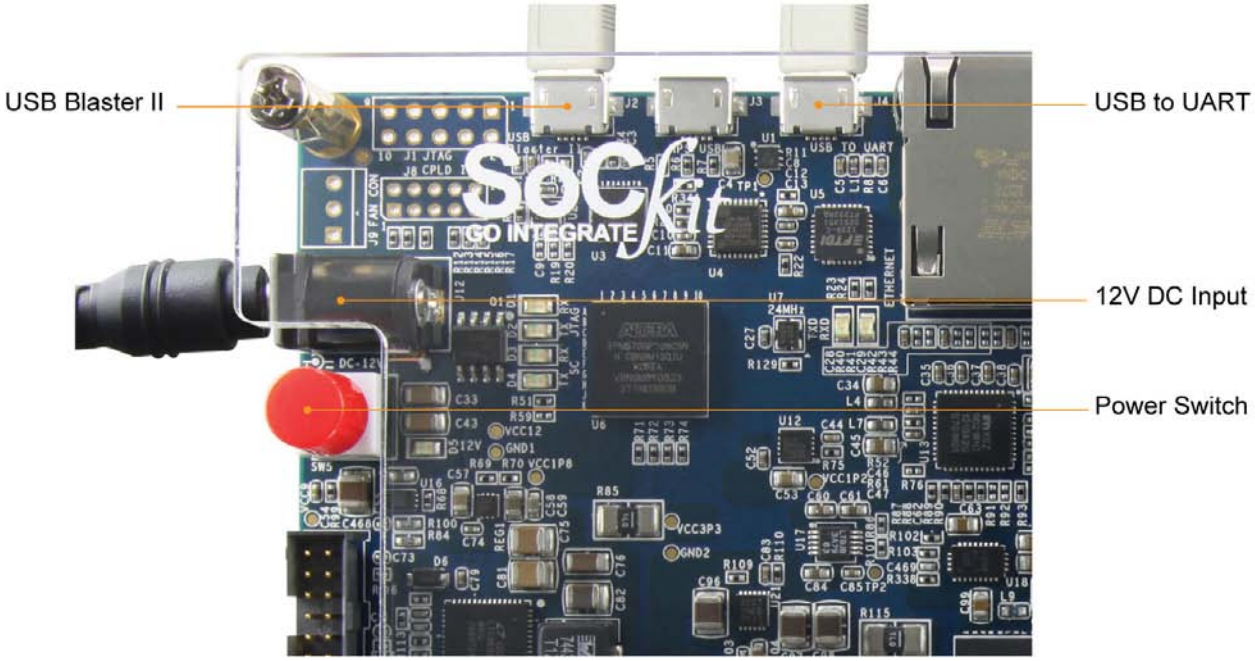


Figure 3-5 USB and Power Cables

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

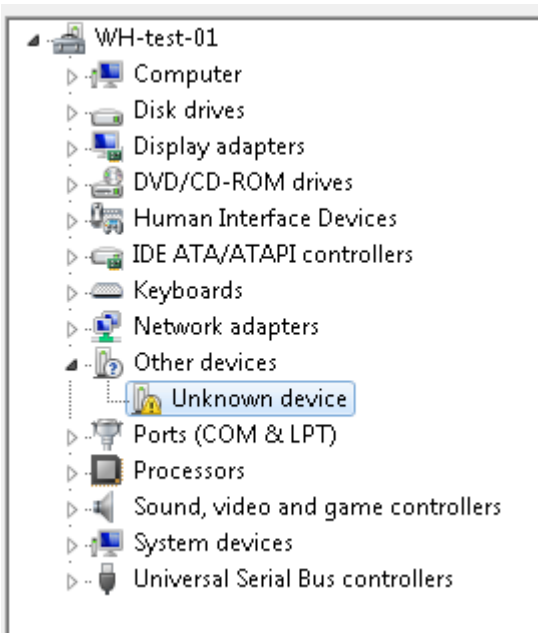
4.1 Introduction

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

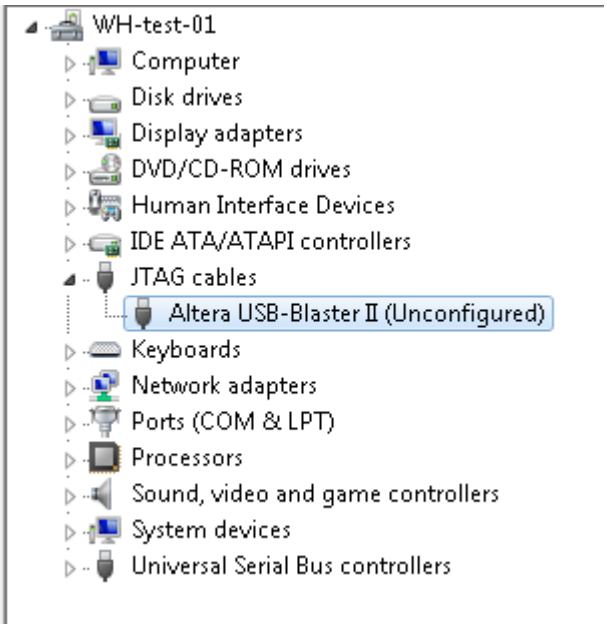
4.2 Installing the USB-Blaster II Driver

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 3-5**)
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.

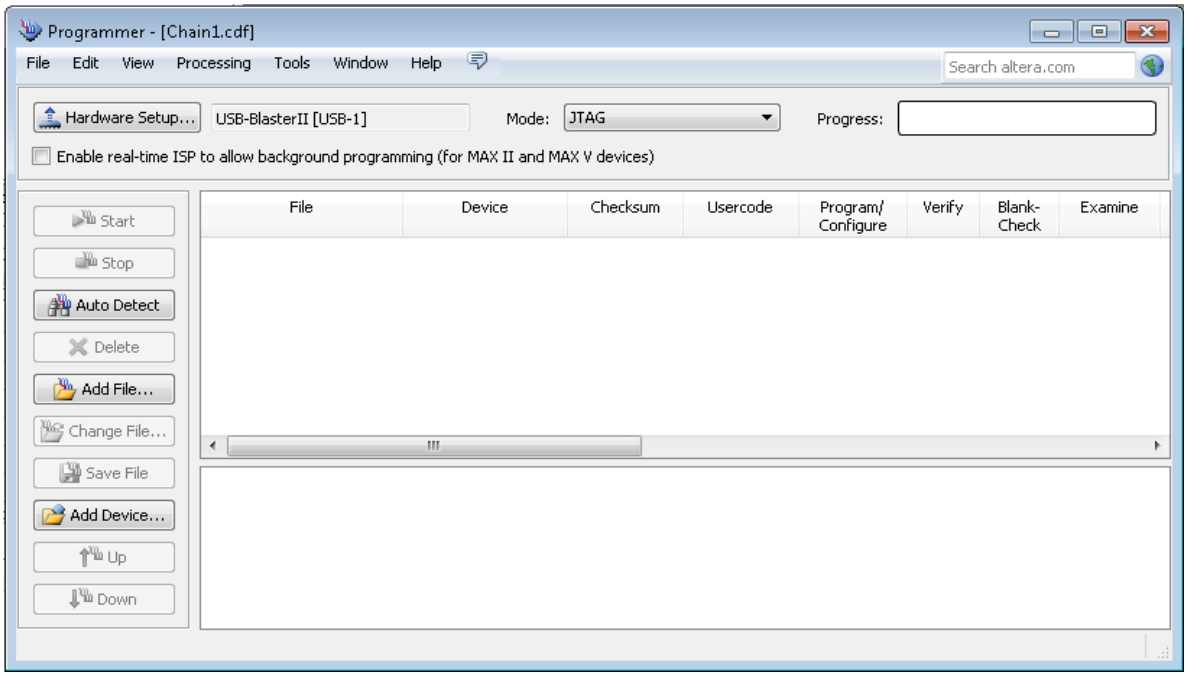


4.3 Downloading an FPGA SRAM Objective File

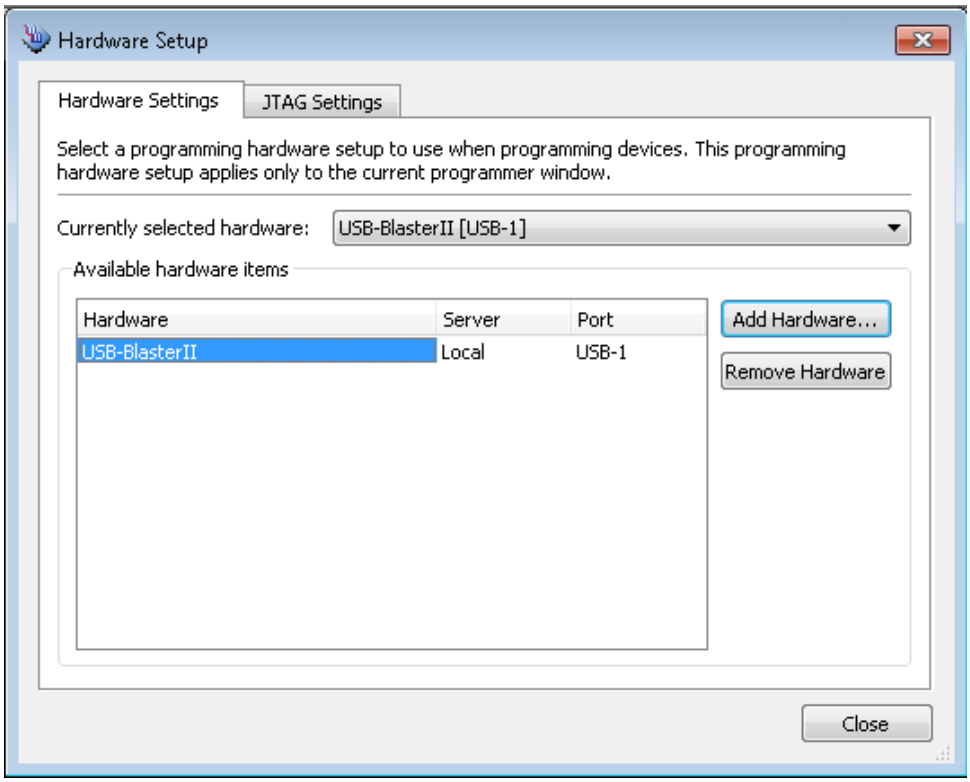
The Quartus II Programmer is used to configure the FPGA with a specific .sof file. Before configuring the FPGA, ensure that the Quartus II software and the USB-Blaster II driver are installed on the host computer.

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.

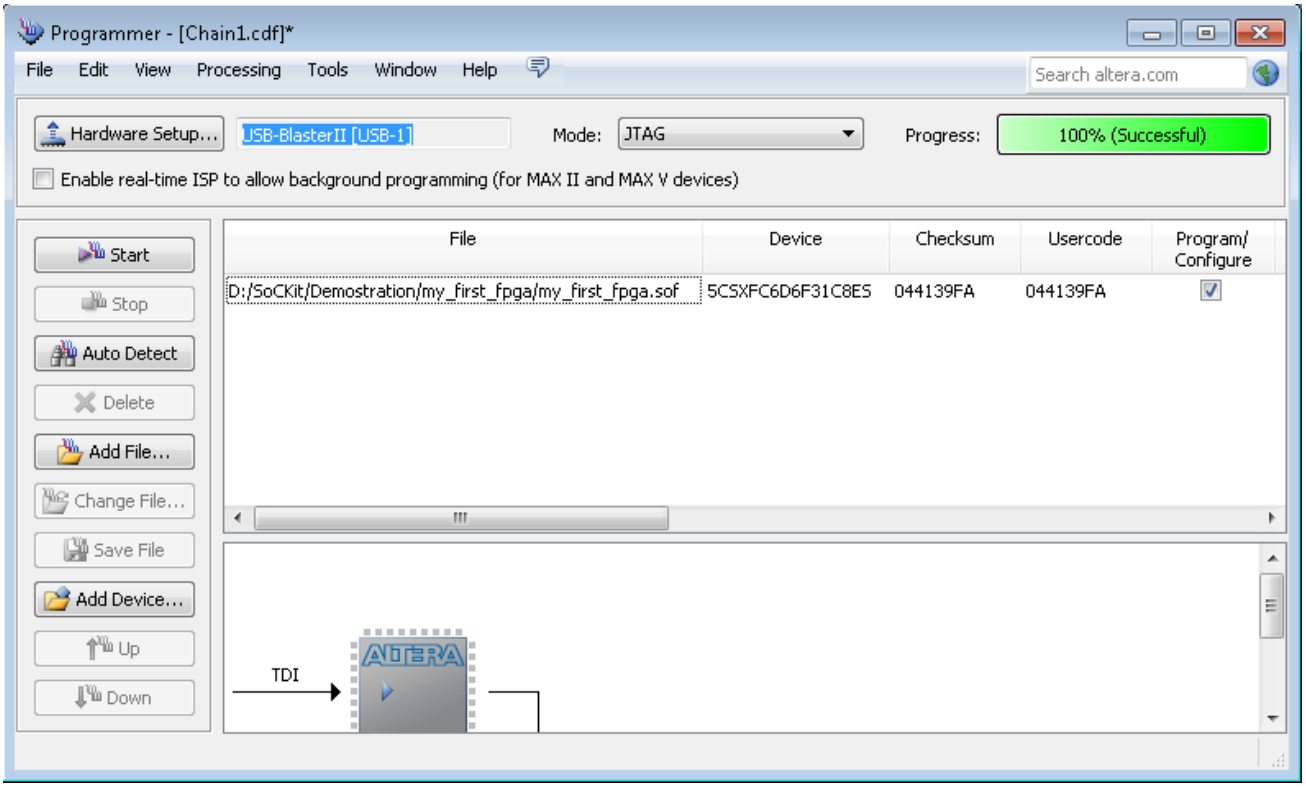


3. Click Hardware **Setup**.
4. If **USB-Blaster [USB-1]** does not appear under **Currently Selected Hardware**, select that option and click **Close** shown below.



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 **Add** File to select the .sof file and click **Open.**
6. Select \<CD directory>\Demonstration\my_first_fpga\my_first_fpga.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

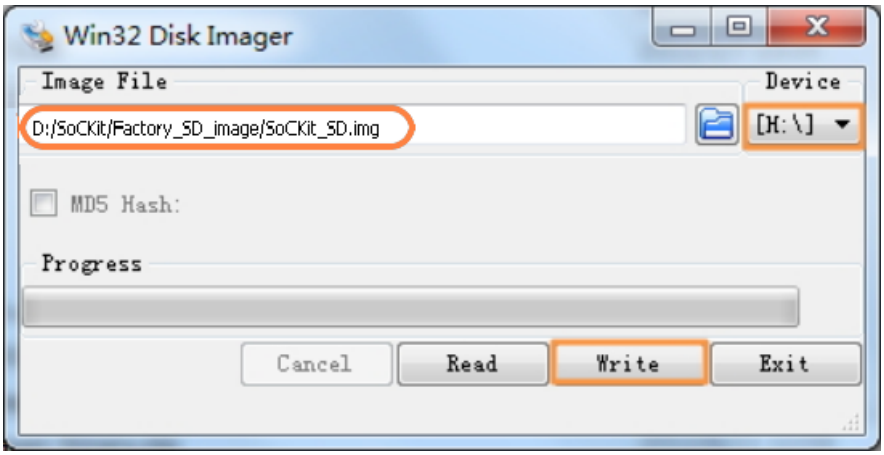
The pre-built binaries are delivered as an archive named SoCKit_SD.img. This SD card image file contains all the items that are needed to run Linux on SoCKit board. (You can find this file in \<CD directory>\Tools\Factory_SD_image\SoCKit_SD.rar, and extract file to get the image file)

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.

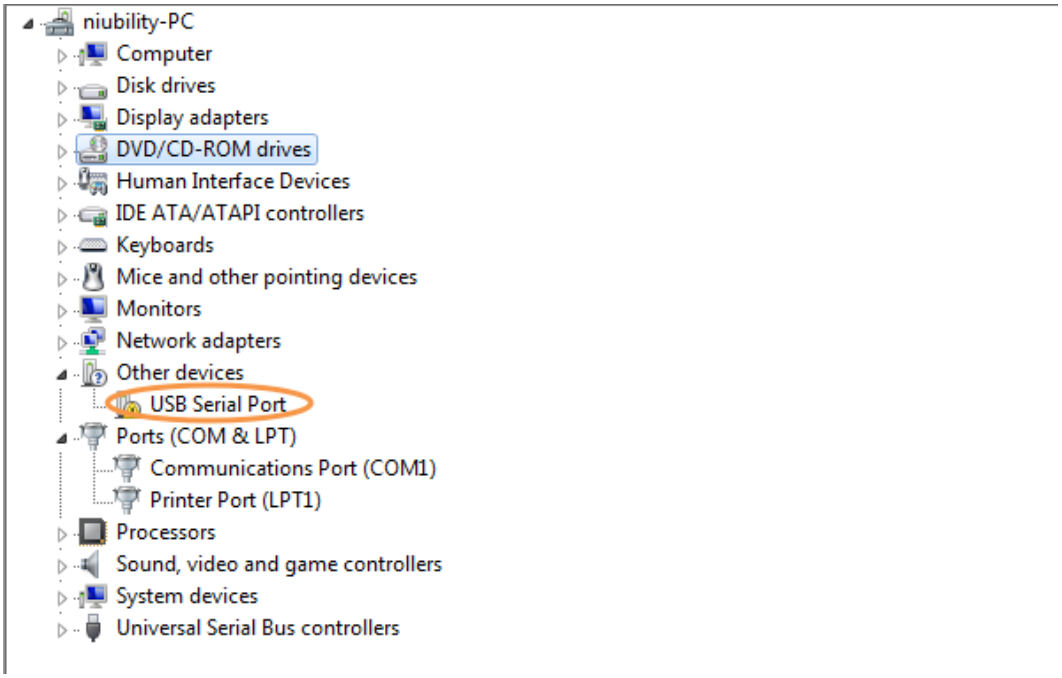
5.3 Setup UART Terminal

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 micro 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 micro USB connector (J4) of SoCKit (connection shown in **Figure 3-5**)
2. Power on the board then open the computer device manager in Windows. You will find an unrecognized USB Serial Port.



Select the USB Serial Port 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 ***COM12*** *(Open the device manager to know which COM port assigned in your computer)*
4. Now you can power off the SoCKit board

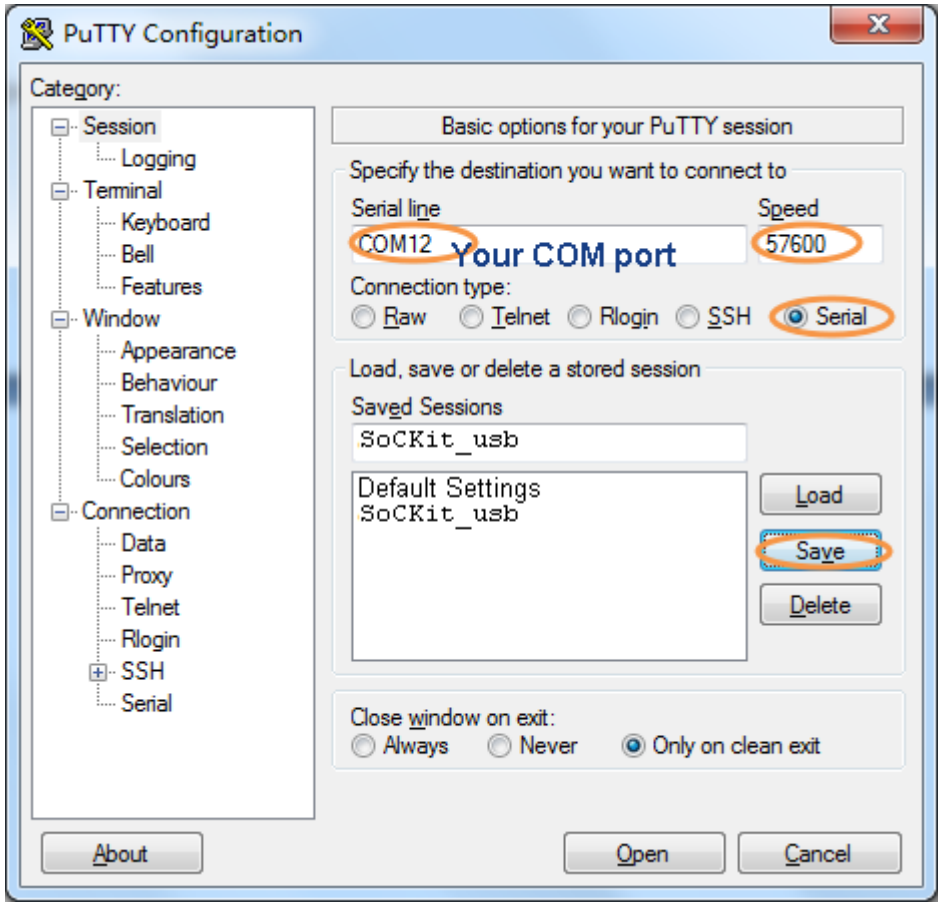
Configure UART terminal

UART terminal spec:

- 57600 baud rate
- 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.)

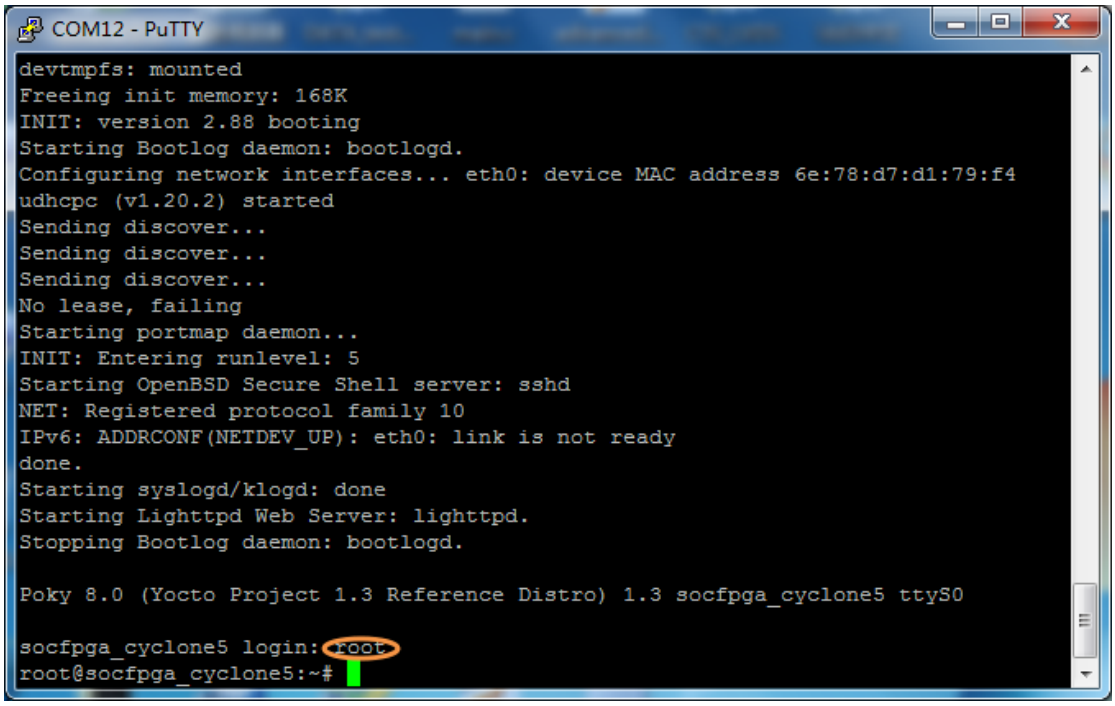
1. Open putty.exe, click ***Serial*** go to a serial configure interface.
2. Configure the window like the flowing picture and click save button to save the configuration.



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 5.2 to prepare a microSD card)
2. Press down the ***SW5*** button to Power up the board (See **Chapter 3** for details)
3. Open putty.exe, select the saved configuration **SoCKit_usb** and click open button.
4. 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.


COM12 - PuTTY
devtmpfs: mounted
Freeing init memory: 168K
INIT: version 2.88 booting
Starting Bootlog daemon: bootlogd.
Configuring network interfaces... eth0: device MAC address 6e:78:d7:d1:79:f4
udhcpc (v1.20.2) started
Sending discover...
Sending discover...
Sending discover...
No lease, failing
Starting portmap daemon...
INIT: Entering runlevel: 5
Starting OpenBSD Secure Shell server: sshd
NET: Registered protocol family 10
IPv6: ADDRCONF(NETDEV_UP): eth0: link is not ready
done.
Starting syslogd/klogd: done
Starting Lighttpd Web Server: lighttpd.
Stopping Bootlog daemon: bootlogd.
Poky 8.0 (Yocto Project 1.3 Reference Distro) 1.3 socfpga_cyclone5 ttyS0
socfpga_cyclone5 login: root
root@socfpga_cyclone5:~#

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