

DE10-Lite and Quartus Setup Guide

August 22, 2018

1 Installing Quartus

1.1 Windows 10

1. Go to <http://www.terasic.com.tw/cgi-bin/page/archive.pl?Language=English&CategoryNo=234&No=1021&PartNo=4>
2. Click on the CD in the row that says "Quartus Download"

The screenshot shows the 'DE10-Lite Board' download page. On the left is a navigation menu with categories like 'DE Main Boards', 'SoC Platform', 'Bundle Solution', 'Robotic Kits', 'All FPGA Main Boards', 'Daughter Cards', and 'USB Blaster Cable'. The main content area is titled 'DE10-Lite Board' and includes a 'Documents' table with one entry: 'DE10-Lite User Manual'. Below this is a 'Daughter Card Demonstrations' table with three entries: 'DEM-GPIO', 'LT24', and 'MTL2'. The 'CD-ROM' section contains a table with three entries: 'DE10-Lite CD-ROM', 'ControlPanel', and 'Quartus Download'. The 'Quartus Download' entry is highlighted with a yellow background. At the bottom, there is a '3D-Printer-Case' table with two entries: 'Top cover' and 'Bottom cover'. A note at the bottom states: 'Please note that all the source codes are provided "as-is". For further support or modification, please contact Terasic Support and your request will be transferred to Terasic Design Service. More resources about IP and Dev. Kit are available on Altera User Forums.'

Title	Version	Size(KB)	Date Added	Download
DE10-Lite User Manual	1.5	6140	2018-05-11	

Title	Version	Size(KB)	Date Added	Download
DEM-GPIO			2017-05-18	
LT24			2016-09-19	
MTL2			2016-09-19	

Title	Version	Size(KB)	Date Added	Download
DE10-Lite CD-ROM	2.0.2		2018-05-11	
ControlPanel	1.0.3		2018-05-10	
Quartus Download	15.1.2		2016-06-21	

Title	Version	Size(KB)	Date Added	Download
Top cover		106	2016-08-18	
Bottom cover		33	2016-08-18	

Figure 1

3. Click on the latest version, and the click on "Lite Edition"

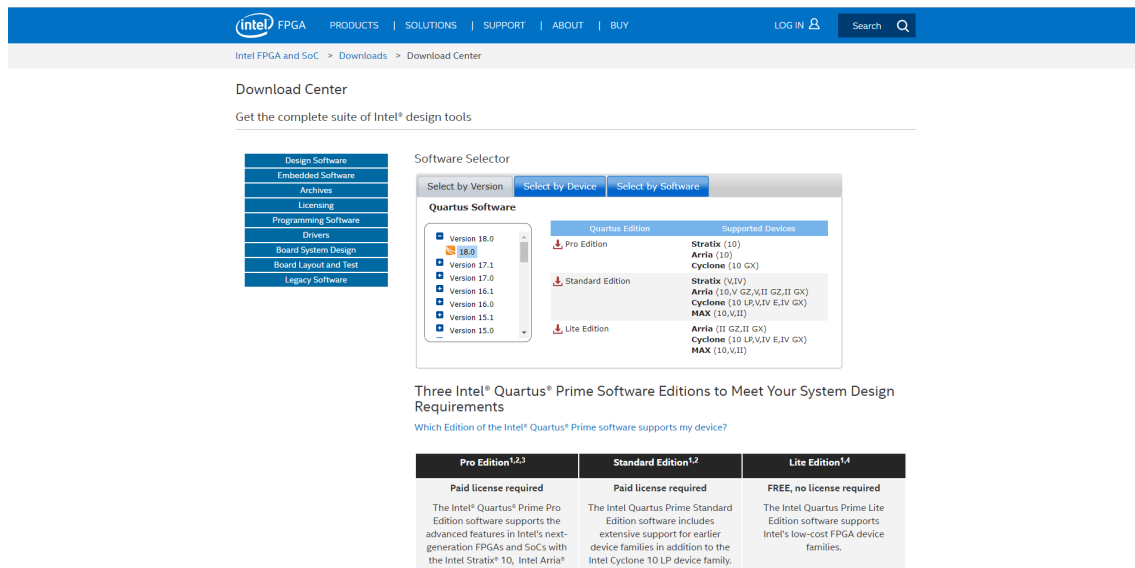


Figure 2

4. Select your operating system, and then under the "Combined Files" tab, make sure "Quartus Prime Lite Edition Software (Device support included)" is checked. Then click "Download Selected Files" (this may require you to create an intel account)

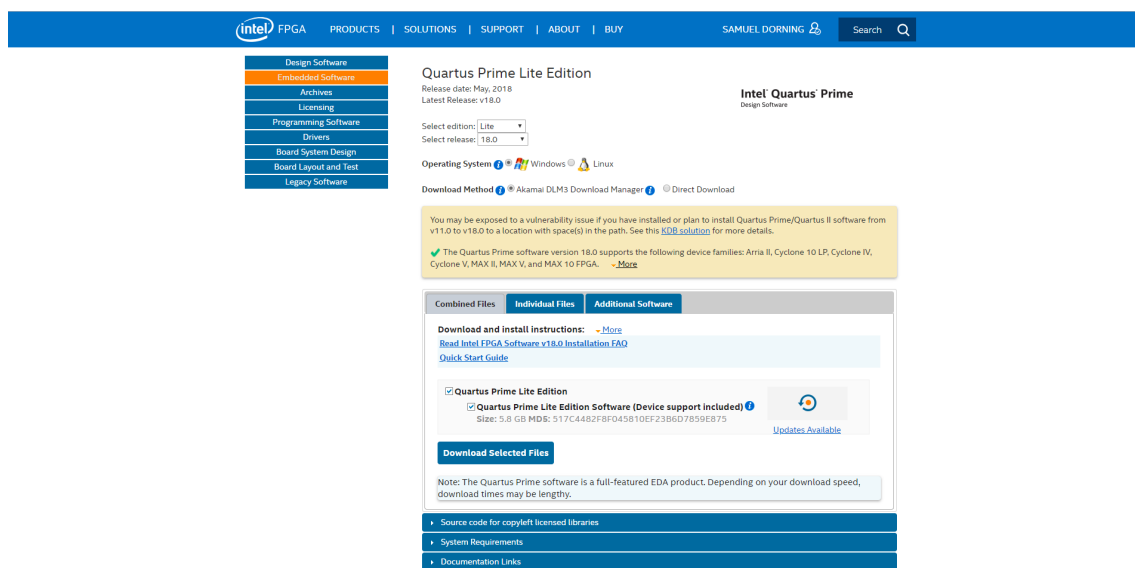


Figure 3

5. Click "download the installer" in the window that pops up

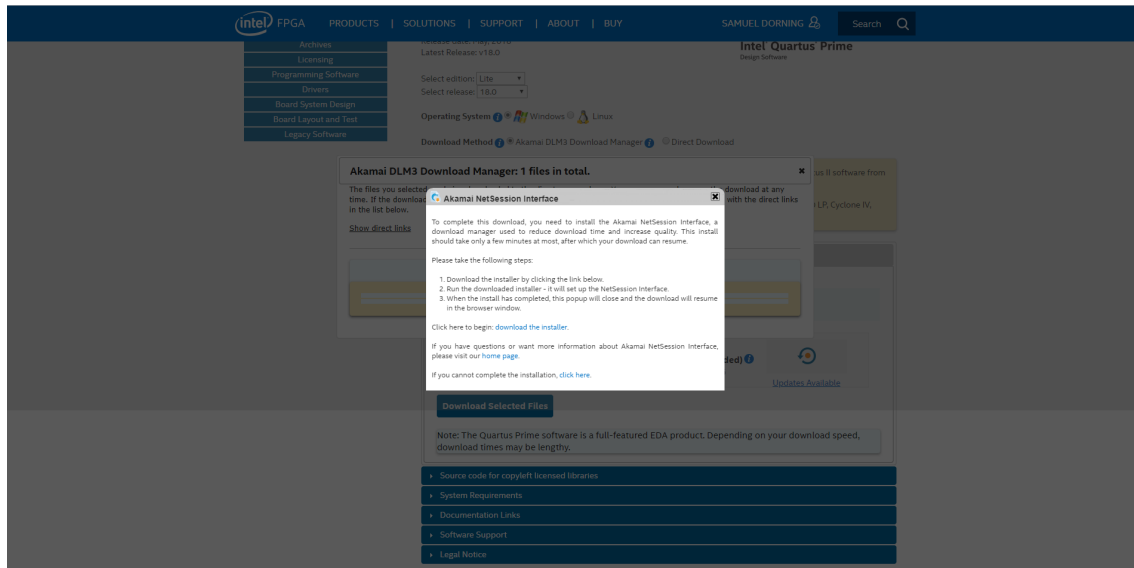


Figure 4

6. Run the installer. The installer will download the necessary files for the program. After the download has completed, it will create a tar file in the directory you chose. Extract the tar file, and then run the setup.bat file.
7. Follow the onscreen instructions to install Quartus
8. When you first run the Quartus software it will ask you to select a licensing option. Select "Run the Quartus Prime software"

1.2 Ubuntu 16.04

1. Go to <http://dl.altera.com/?edition=lite>. Select Quartus Prime, ModelSim-Intel, and MAX 10 FPGA. You may be required to use direct links to download.

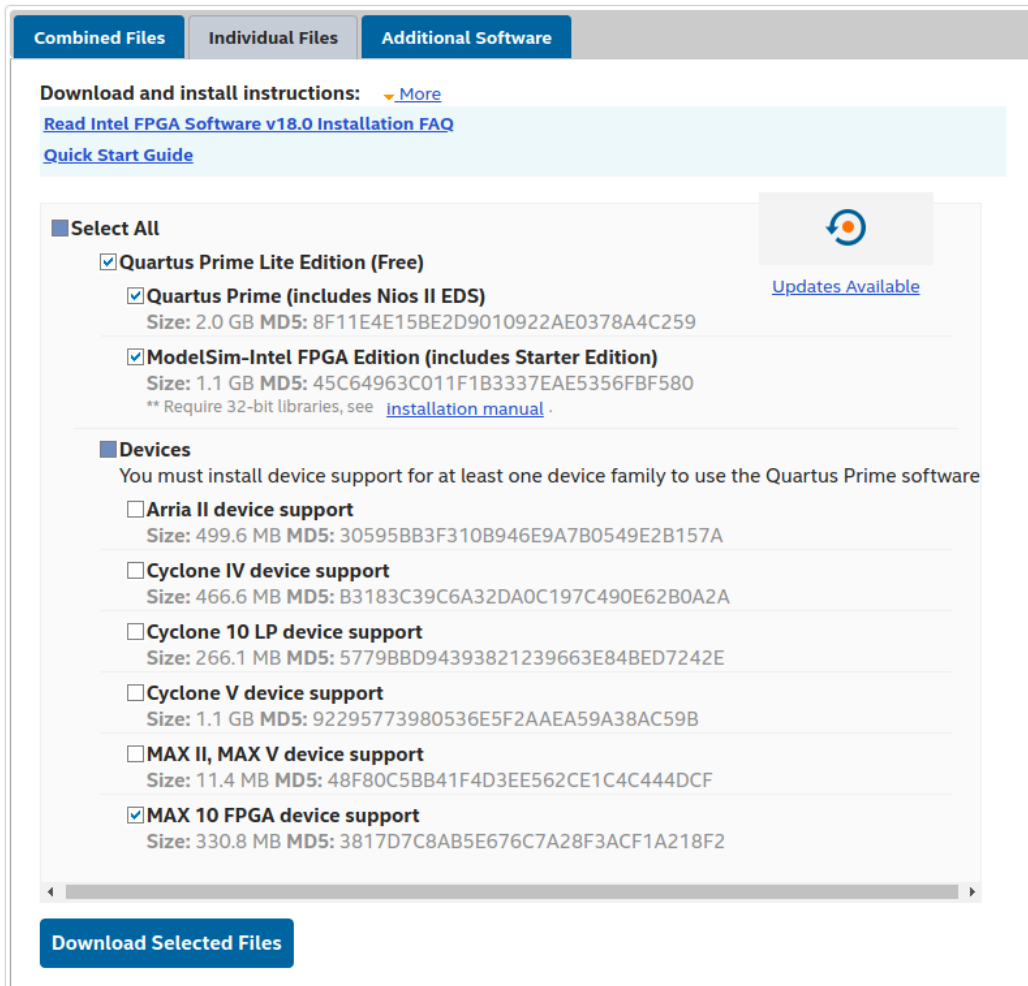


Figure 5

2. Within the downloads directory, run the following commands:

```
sudo chmod +x QuartusLiteSetup-18.0.0.614-linux.run  
sudo QuartusLiteSetup-18.0.0.614-linux.run
```

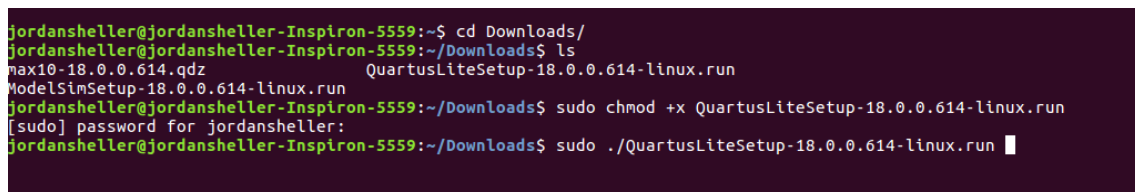


Figure 6

3. Click next though the installer, the default will work.

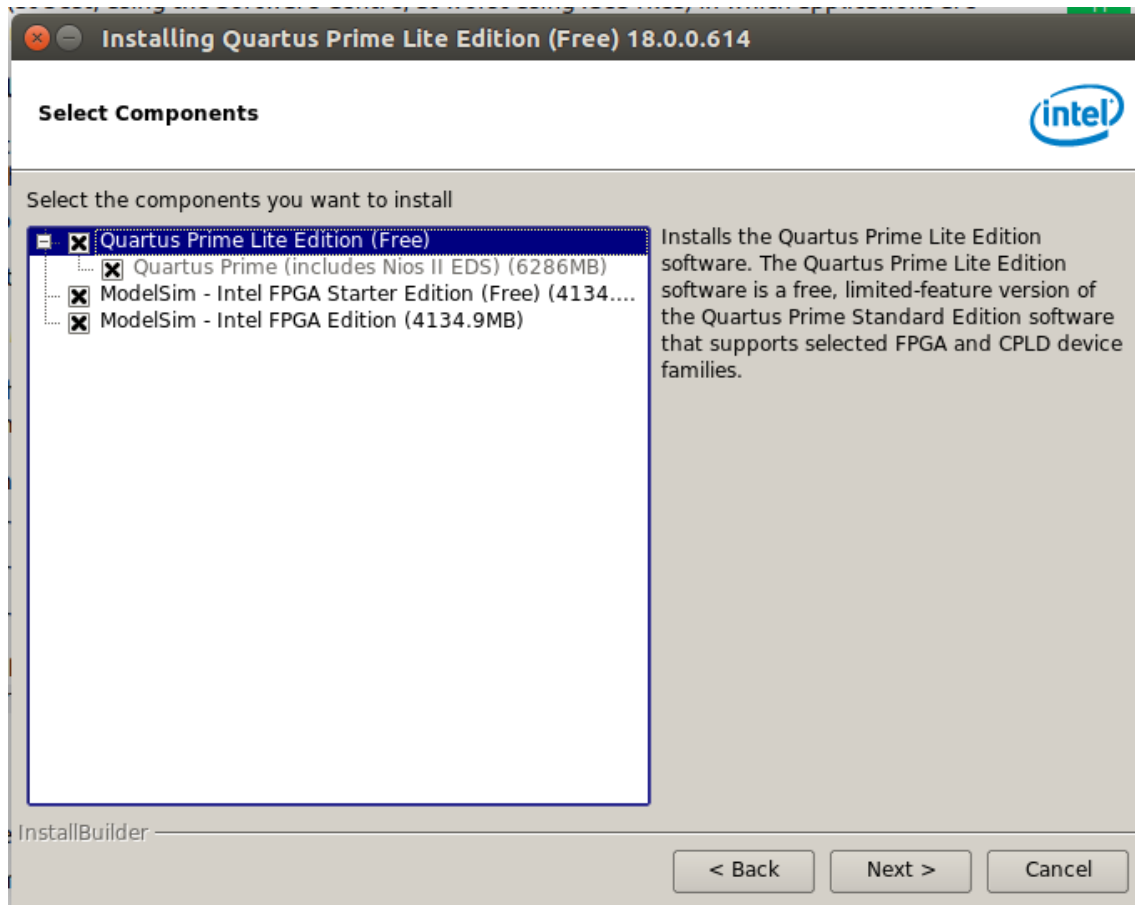


Figure 7

4. Once the installer finishes, open the Quartus software, and chose "Run the Quartus prime software" option.
5. Select add devices, and point to the directory where the MAX 10 package was downloaded.
6. Close the Quartus program.
7. With the DE10-lite plugged in, run the following command and record the ID number. This number will likely be 6001

```
lsusb | grep Altera
```

```
jordansheller@jordansheller-Inspiron-5559:~$ lsusb|grep Altera
Bus 001 Device 010: ID 09fb:6001 Altera Blaster
jordansheller@jordansheller-Inspiron-5559:~$
```

Figure 8

8. In terminal, navigate to `/etc/udev/rules.d`
9. Type the command :

```
sudo vim 51-usbblaster.rules
```

10. Type the following into the file (replace the idProduct value with the recorded value from above if different)[1]:

```
# For Altera USB-Blaster permissions.
SUBSYSTEM=="usb", \
ENV{DEVTYPE}=="usb_device", \
ATTR{idVendor}=="09fb", \
ATTR{idProduct}=="6001", \
MODE="0666", \
NAME="bus/usb/${env{BUSNUM}}/${env{DEVNUM}}", \
RUN+="/bin/chmod_0666_%c"
```

11. Save and exit from the file
12. Run the command
`sudo udevadm control --reload`
13. Reboot the system
14. The Quartus installation is now complete

2 Using Quartus

2.1 Creating a New Project

1. Open up Quartus and click on "New Project Wizard"

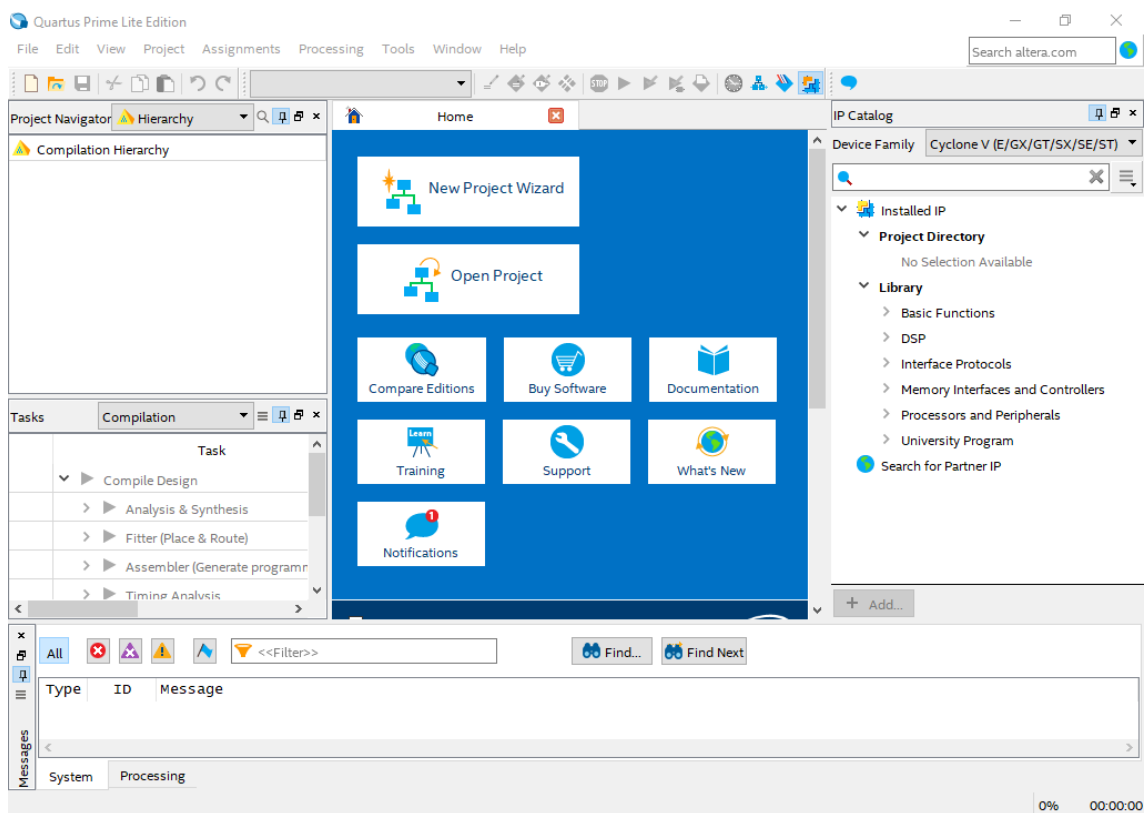


Figure 9

2. Click "Next" on the introduction page

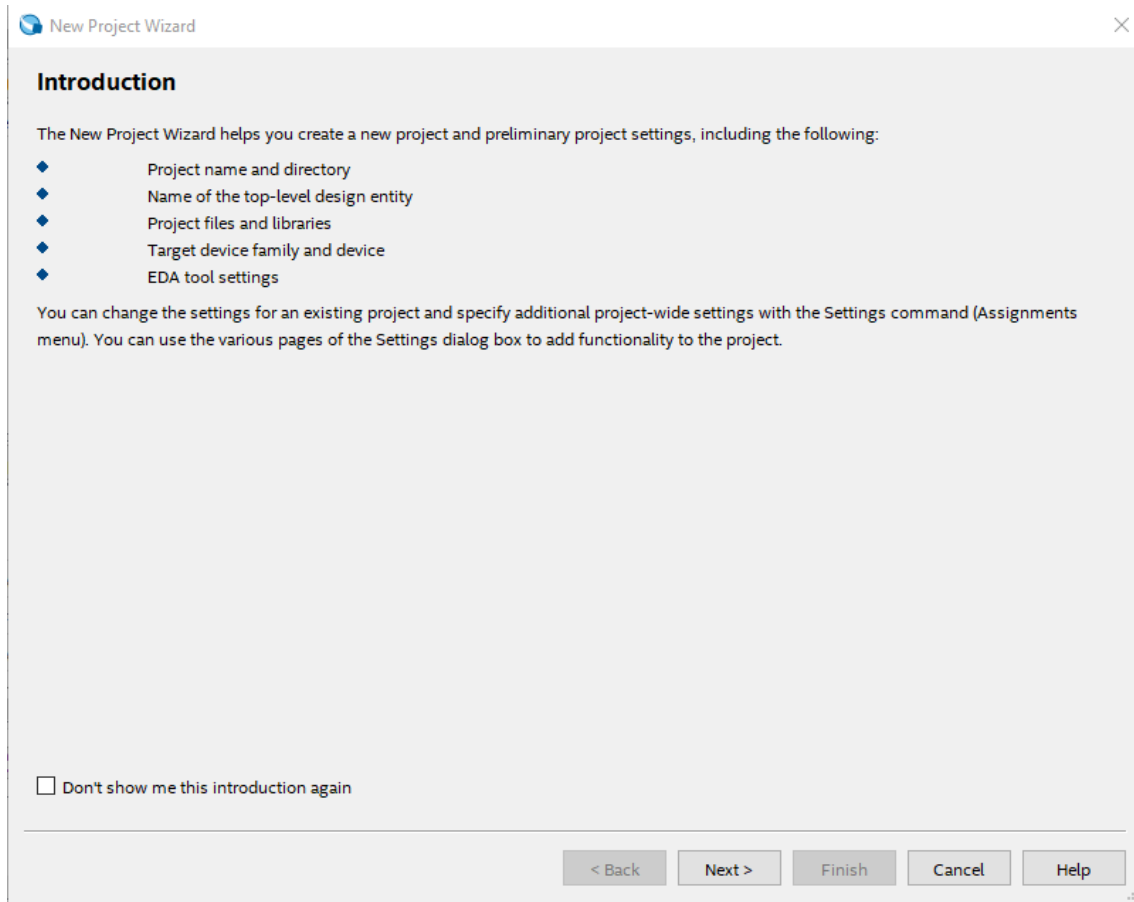
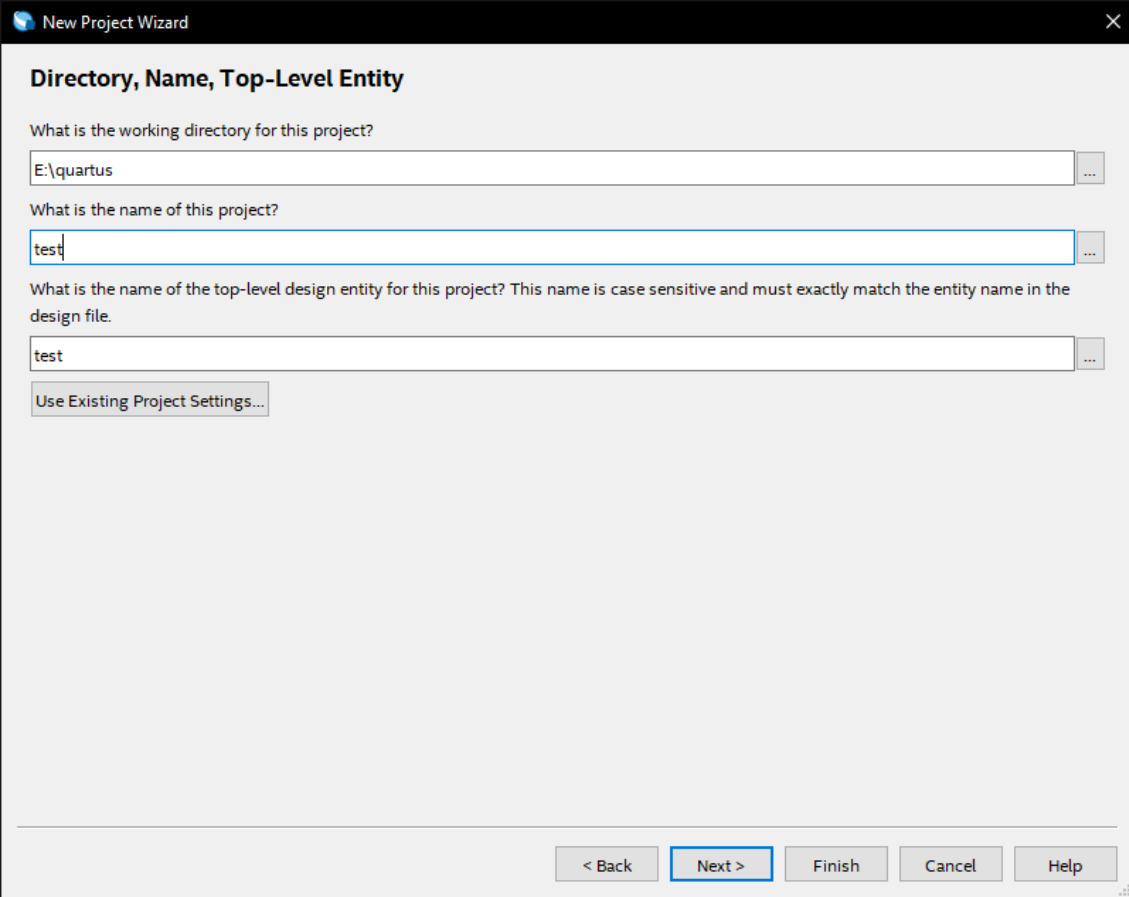


Figure 10

3. Choose where the project will be saved, and pick a name for the project and the project's top module. Afterwards, hit "Next"



The image shows a 'New Project Wizard' dialog box with a title bar containing a blue icon and the text 'New Project Wizard'. The main area is titled 'Directory, Name, Top-Level Entity'. It contains three text input fields, each with a browse button (three dots) to its right. The first field is labeled 'What is the working directory for this project?' and contains 'E:\quartus'. The second field is labeled 'What is the name of this project?' and contains 'test'. The third field is labeled 'What is the name of the top-level design entity for this project? This name is case sensitive and must exactly match the entity name in the design file.' and contains 'test'. Below these fields is a button labeled 'Use Existing Project Settings...'. At the bottom of the dialog are five buttons: '< Back', 'Next >', 'Finish', 'Cancel', and 'Help'. The 'Next >' button is highlighted with a blue border.

Directory, Name, Top-Level Entity

What is the working directory for this project?

E:\quartus

What is the name of this project?

test

What is the name of the top-level design entity for this project? This name is case sensitive and must exactly match the entity name in the design file.

test

Use Existing Project Settings...

< Back Next > Finish Cancel Help

Figure 11

4. Select "Empty Project," then hit "Next"

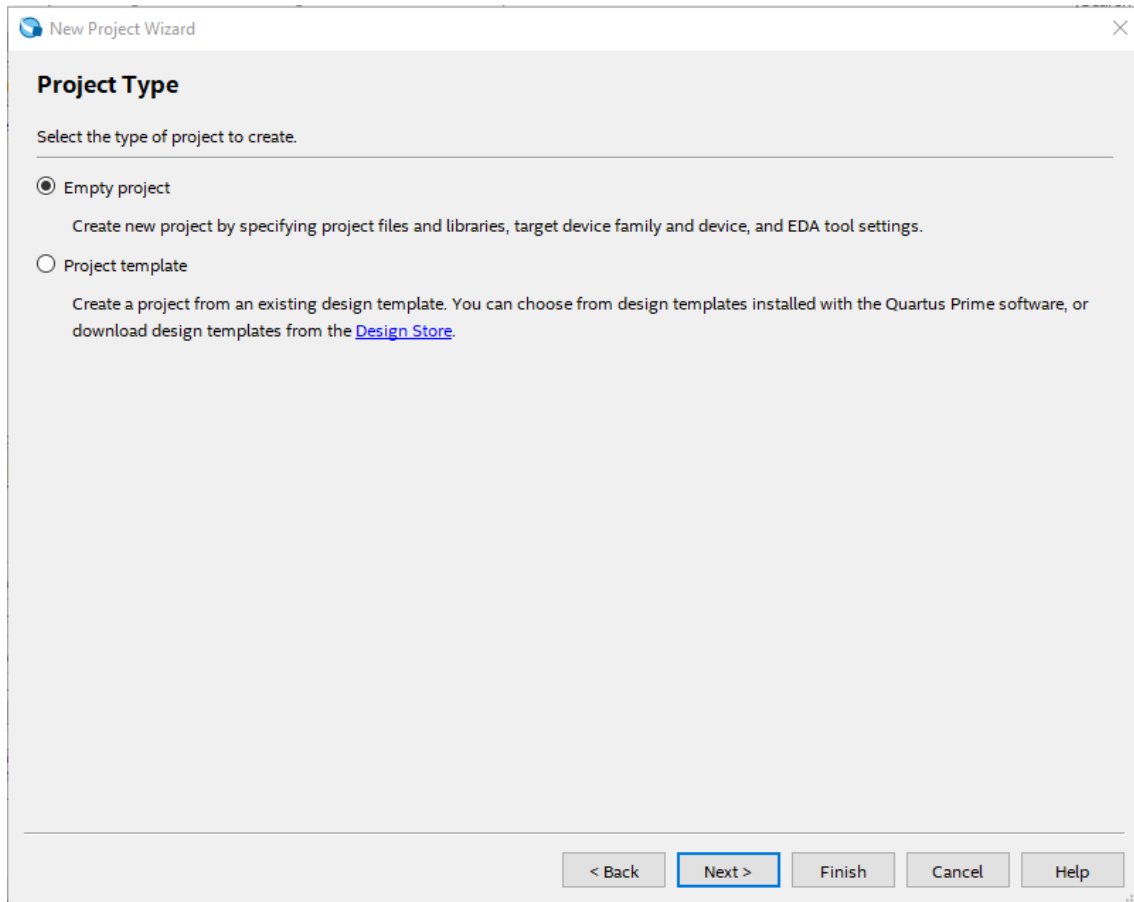


Figure 12

5. Add any existing design files to the project (this can also be done later), then hit "Next"

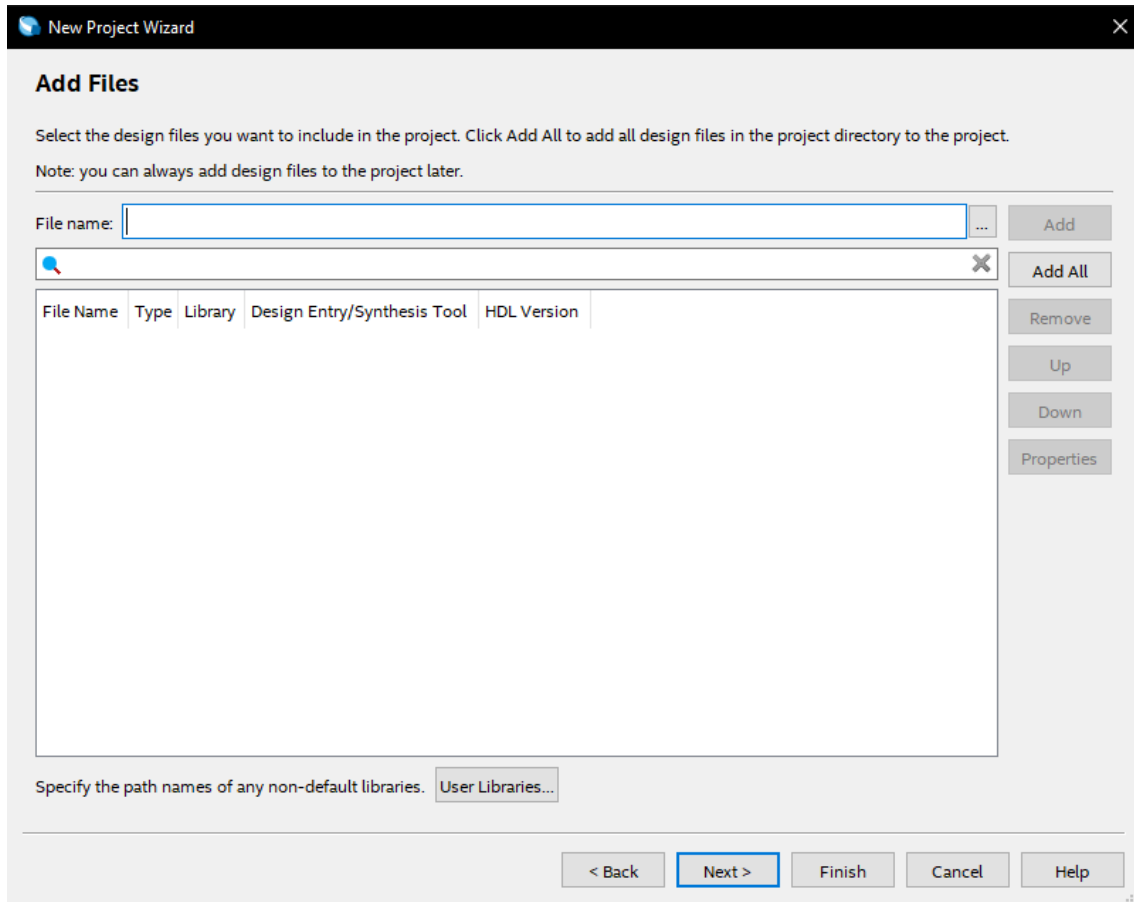


Figure 13

6. In the "Device" tab, find the box that says "Device Family." In this box, change the family to "MAX 10 (DA/DF/DC/SA/SC)," and change the device to "All." Then, in the "Board" tab, change family to "MAX 10," and change development kit to "MAX 10 DE10-Lite." Finally, uncheck "Create top-level design file" that is located near the bottom of the window. Hit "Next."

New Project Wizard

Family, Device & Board Settings

Device

Board

Select the family and device you want to target for compilation.
You can install additional device support with the Install Devices command on the Tools menu.

To determine the version of the Quartus Prime software in which your target device is supported, refer to the [Device Support List](#) webpage.

Device family

Family: MAX 10 (DA/DF/DC/SA/SC)

Device: All

Target device

☐ Auto device selected by the Fitter

☒ Specific device selected in 'Available devices' list

☐ Other: n/a

Show in 'Available devices' list

Package: Any

Pin count: Any

Core speed grade: Any

Name filter:

☒ Show advanced devices

Available devices:

Name	Core Voltage	LEs	Total I/Os	GPIOs	Memory Bits	Embedded multiplier
10M08DAF484C8G	1.2V	8064	250	250	387072	48

< Back

Next >

Finish

Cancel

Help

Figure 14

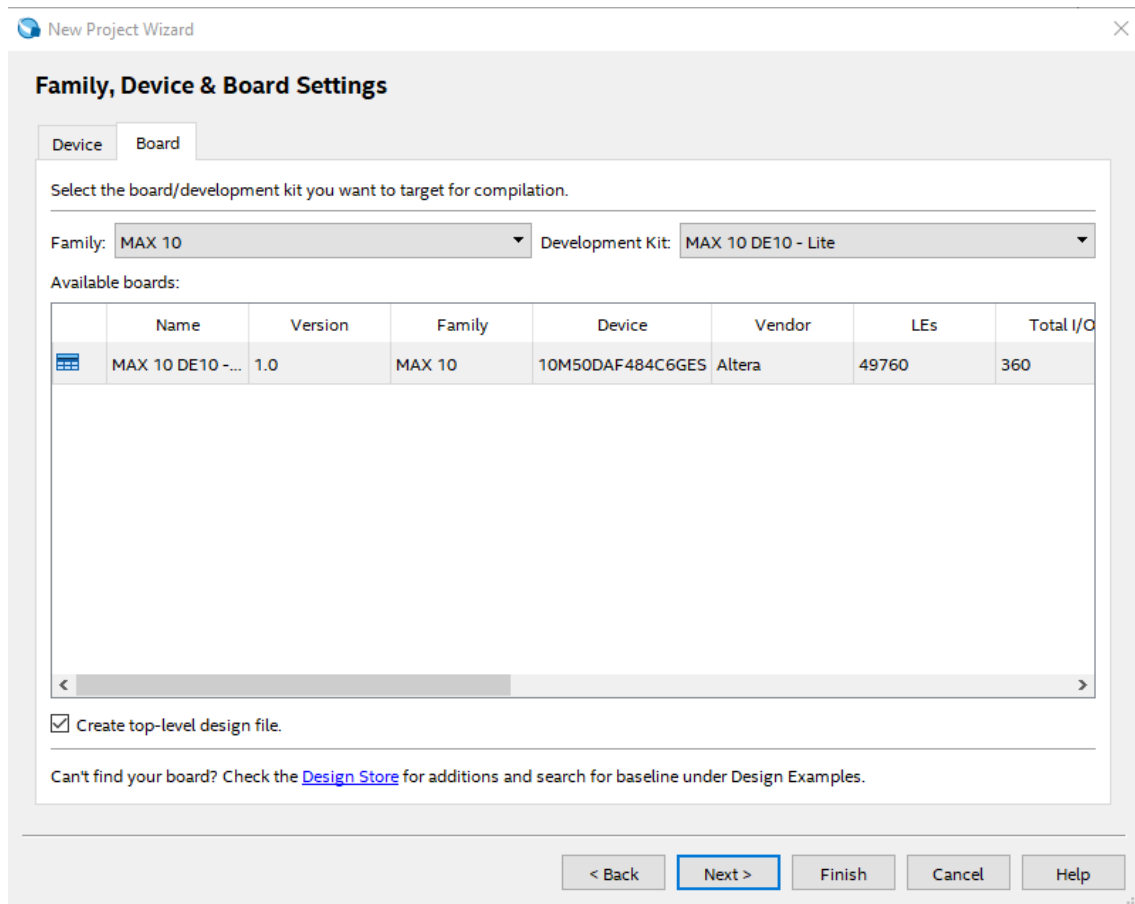



Figure 15

7. Select any EDA tools that you want to use. These can be changed later. Hit "Next."


New Project Wizard
✕

EDA Tool Settings

Specify the other EDA tools used with the Quartus Prime software to develop your project.

EDA tools:

Tool Type	Tool Name	Format(s)	Run Tool Automatically
Design Entry/Synth...	Synplify Pro	VQM	<input type="checkbox"/> Run this tool automatically to synthesize the current design
Simulation	ModelSim	SystemVerilog HDL	<input type="checkbox"/> Run gate-level simulation automatically after compilation
Board-Level	Timing	STAMP	
	Symbol	ViewDraw	
	Signal Integrity	IBIS	
	Boundary Scan	<None>	

< Back
Next >
Finish
Cancel
Help

Figure 16

8. Review the settings you have selected. Then, hit "Finish" to create your project.

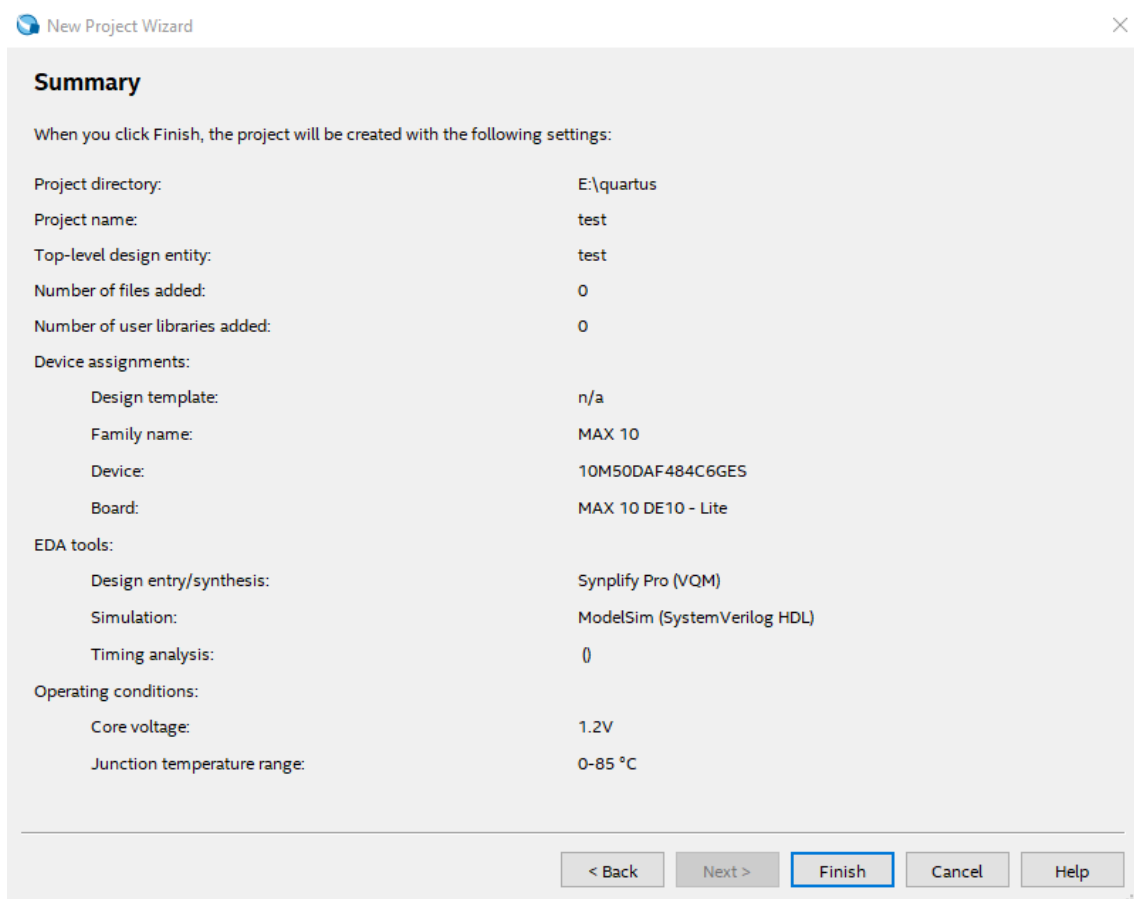


Figure 17

2.2 Tips and Tricks

2.2.1 DE10_LITE_Golden_Top.v

When you first create a project, Quartus may add a file called "DE10_LITE_Golden_Top.v." This file is unnecessary and should be removed. To remove it, find the "Project Navigator" panel on the left side of the screen. Select "Files" from the dropdown menu. This will display all the files in your current project. Right click on "DE10_LITE_Golden_Top.v," and select "Remove File from Project."

2.2.2 Adding Files to the Project

In Quartus, you can create new HDL files for your project, or you can add existing HDL files. To create new files, click the "New" button in the toolbar near the top of the window. Select "System Verilog HDL File" from the window that pops up, and then select "OK." This will open a new file. To add it to your project, just save it by pressing control-s (this will require you to enter text into the file beforehand). The file will appear in the left-hand "Project Navigator" under "Files." To add existing files to your project, click on "Project" at the top of the window. Next, click "Add/Remove Files in Project." After, click on the button with three periods in the window that pops up. This button is located next to the box labeled "File name." Clicking this button will allow you to locate the file that you want to add. Once you find the desired file, click "Open."

2.2.3 Specifying a Top Module

Quartus requires you select a top module for the project. To do this, select "Files" in the dropdown menu of the "Project Navigator" panel. Right click on the file that you want to be set as the top module, and click "Set as Top-Level Entity."

2.2.4 Compiling Your Design

To compile your design, select "Compilation" from the dropdown menu in the "Task" panel on the left. Next, double click on "Compile Design." When green checkmarks appear next to all the tasks in this panel, your project has been compiled successfully. If red X's appear, there is an error. See the messages box at the bottom for information on why your project did not compile.

2.2.5 Pin Assignments

To assign the inputs and outputs of your project to pins on your board, click on "Assignments" at the top of the page, and then select "Pin Planner" from the dropdown menu. This will open a new window. This window has a spreadsheet towards the bottom that shows the inputs and outputs of your project. It may also show many other nodes that your project has not mentioned. Such nodes have blue diamonds to the left of their names. These nodes and their pin assignments should be deleted because they prevent you from assigning pins to your inputs and outputs. To delete them, select all of these nodes, right click on the selected group, mouse over "Edit," and click "Delete." For each pin, a window will pop up. Click "Yes" on these windows. After all the default pin assignments have been deleted from the spreadsheet, you can update the pin assignments for your inputs and outputs. To do this, enter the pin name (Ex "PIN_A8") in the "Location" box for each input and output (pin names can be found in the user manual located here: https://www.altera.com/content/dam/altera-www/global/en_US/portal/dsn/42/doc-us-dsnbk-42-2912030810549-de10-lite-user-manual.pdf). After all the pin assignments have been made, exit the pin planner window and recompile your project.

2.2.6 Programming Your Board

1. With your the Quartus project open, double click "Compile Design" in the bottom left corner.

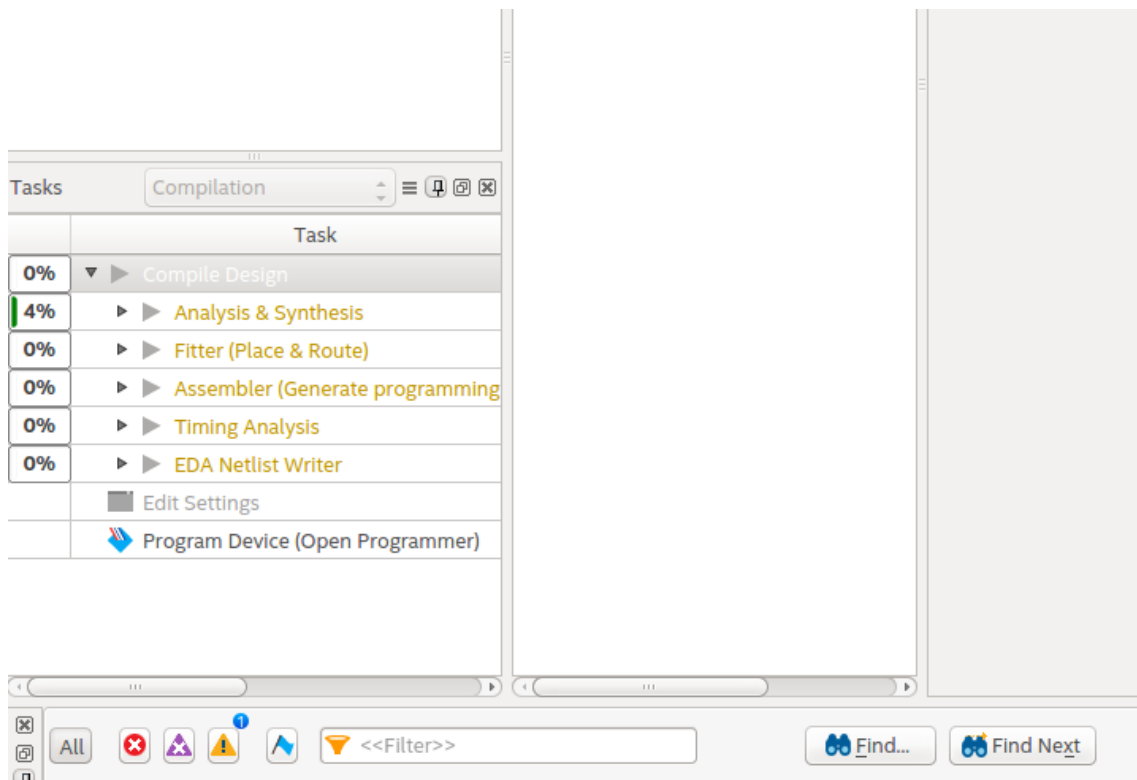


Figure 18

2. Once all sections have completed compiling, double click on "Program Device"

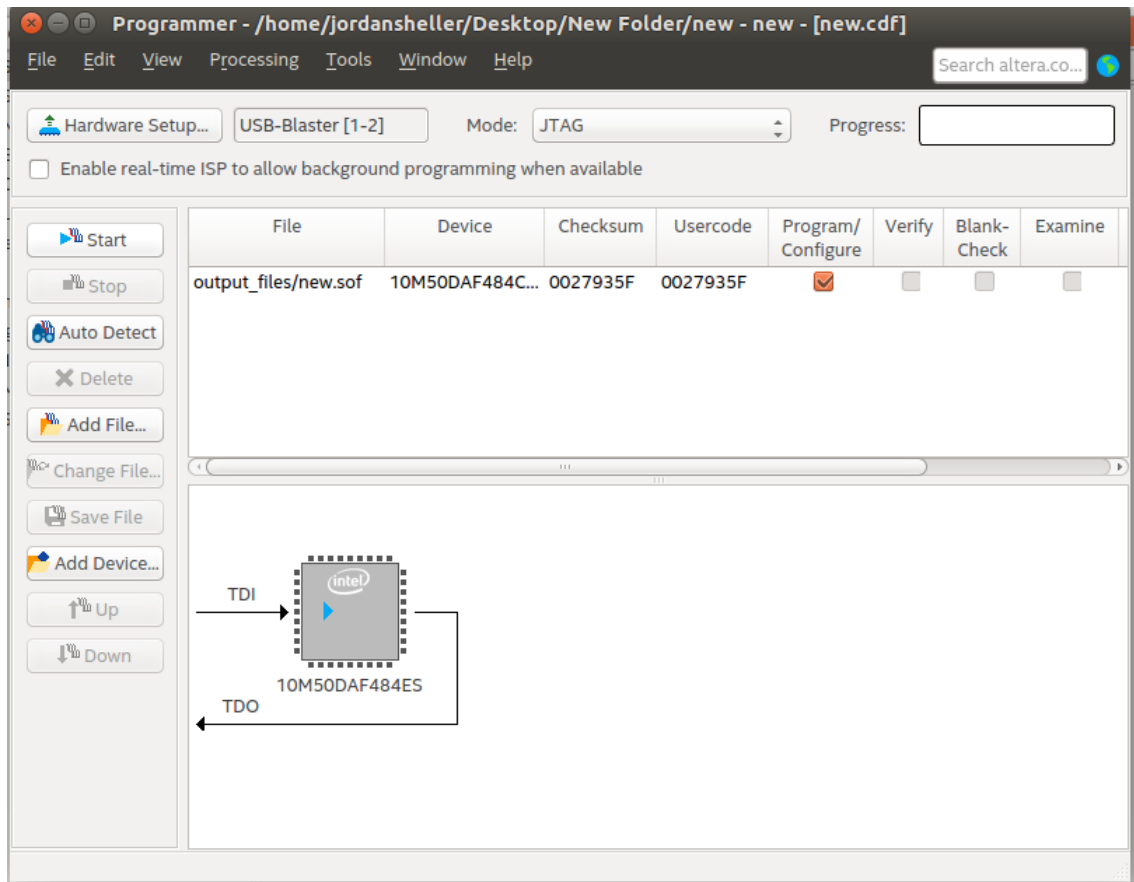


Figure 19

3. Click on "Hardware Setup"

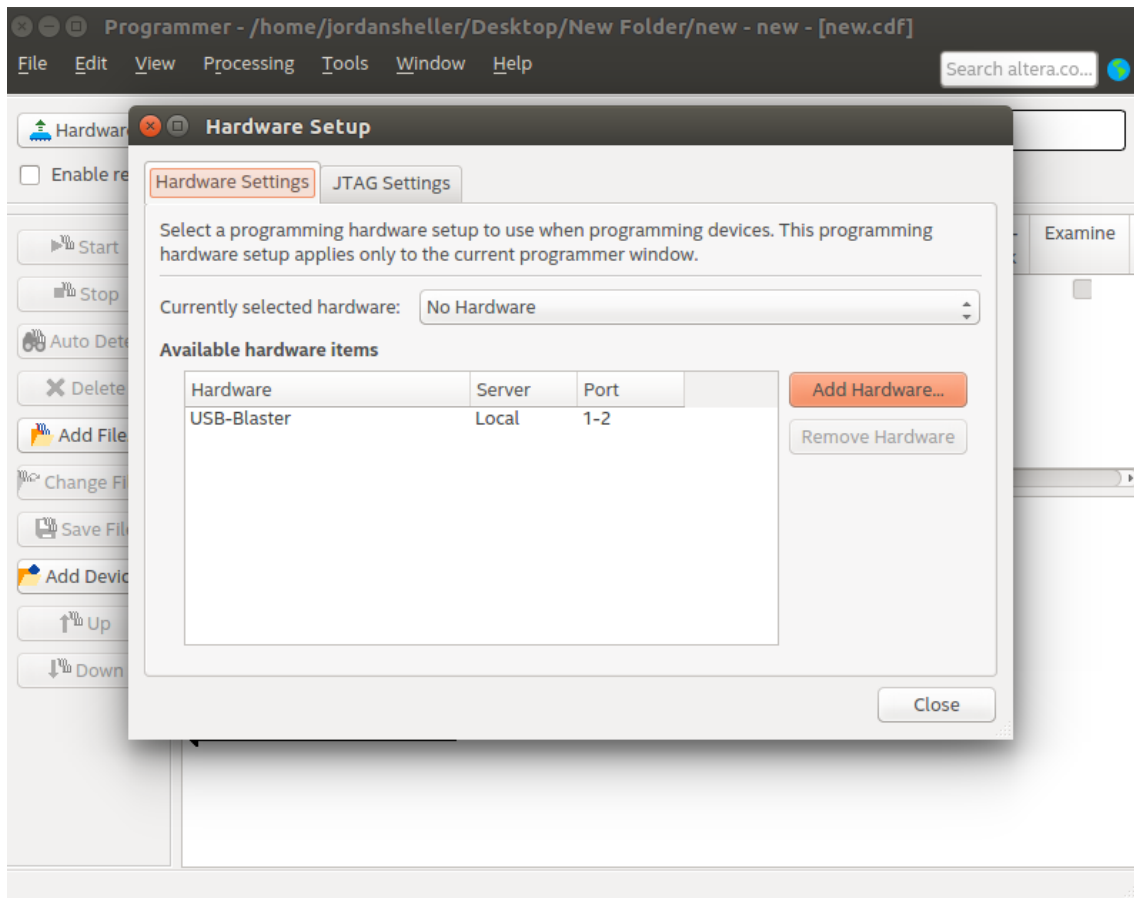


Figure 20

4. Double click on USB-Blaster and then close.
5. Click on "Start". If everything was completed successfully, the board will be programmed.
6. If Quartus does not detect your board, you will need to install the USB-Blaster drivers. To do this, go to the Quartus directory that you chose during the installation process. In this directory, go to the "quartus/drivers" directory. Run the program called "DPInst.exe." This executable will install the USB-Blaster drivers necessary for Quartus to detect the DE10-Lite.

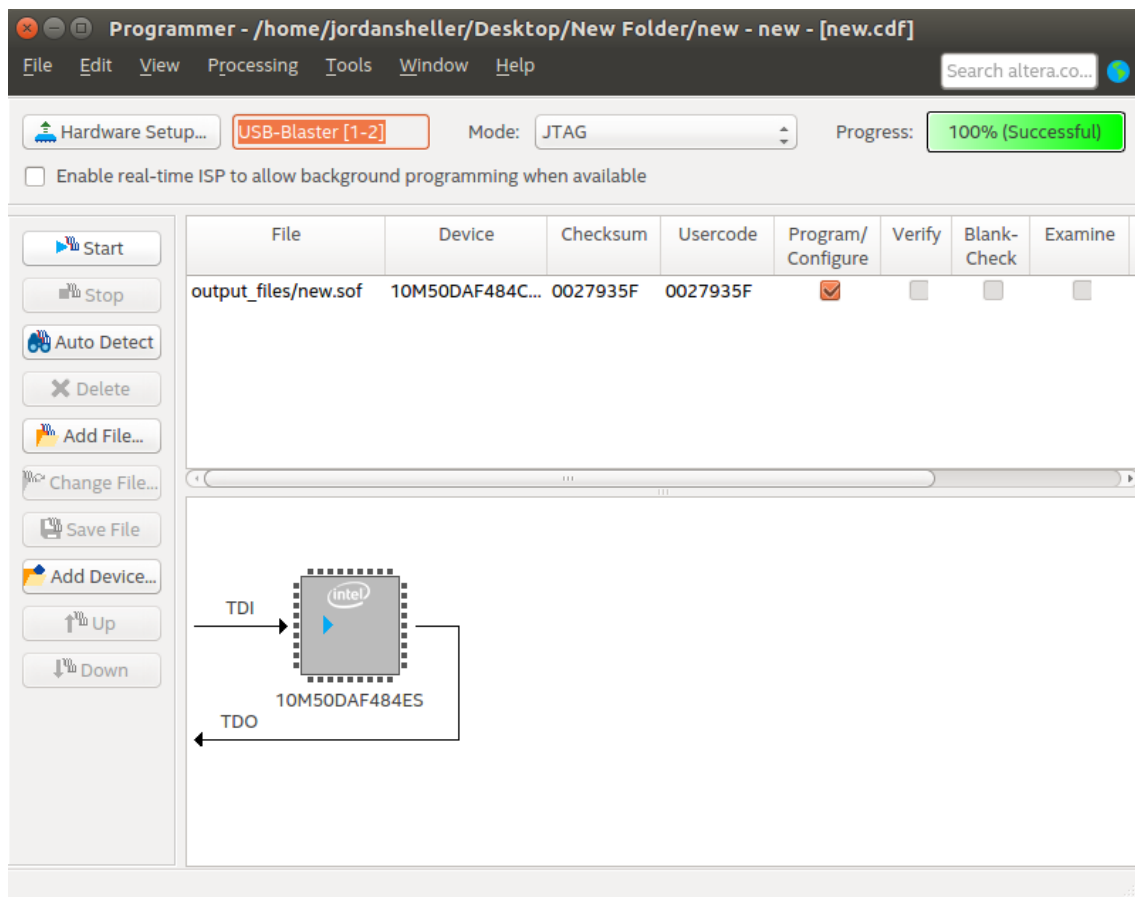


Figure 21

References

- [1] Carl, “Altera usb-blaster with ubuntu 14.04.” <http://www.fpga-dev.com/altera-usb-blaster-with-ubuntu/>, 2014.