

STEP-MX02

Software Manual

STEP FPGA

STEP

2017/2/14

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1. Introduction

1. Introduction

Lattice Diamond® design software offers leading-edge design and implementation tools optimized for cost-sensitive, low-power Lattice FPGA architectures. Diamond is the next generation replacement for ispLEVER® featuring design exploration, ease of use, improved design flow, and numerous other enhancements. This combination of new and enhanced features allows users to complete designs faster, easier and with better results than before. Diamond software is available as a download from the Lattice website for both Windows and Linux. Once downloaded and installed, it can be used with either a free license or a subscription license.

Key Features and Benefits Design Exploration

- Explore design alternatives with Implementations & Strategies
- Run Manager for accelerating exploration and utilizing multicore processors
- Lattice Synthesis Engine (LSE) for additional synthesis exploration options.

Ease-of-Use Features

- Advanced next generation user interface
- Report view with message filtering features
- Extensive cross-probing support
- File list View for managing multiple constraint, preference, debug, timing analyzer, and power calculator files
- ECO Editor for specific physical netlist-level changes
- Platform Designer tool for mixed signal device applications
- Programmer for improved programming support

Improved Design Flow

- New Timing Analyzer view allows updated timing analysis, including clock jitter analysis, without re-implementing the design
- Simulation Wizard to easily export designs to multiple simulators

Additional Software Included with Diamond

- LatticeMico™ system integration for embedded microprocessor applications
- EPIC full-featured physical netlist-level editor

2. Installing Diamond 3.8 for Windows

2.1 Download Lattice Diamond Software

The Lattice Diamond software is available for download from the Lattice Diamond Downloads & Licensing web page located at

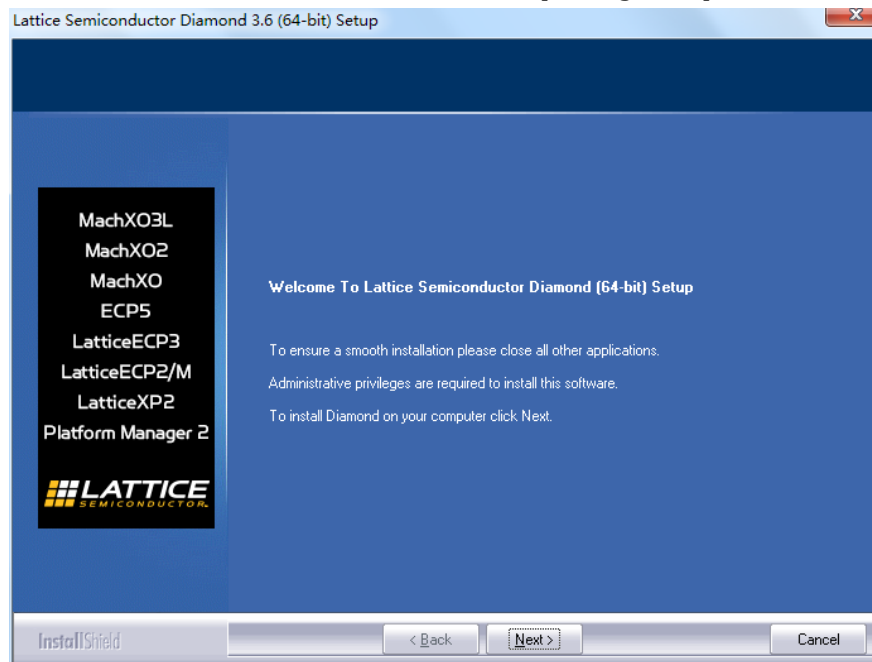
<http://www.latticesemi.com/latticediamond>.

Click the Downloads tab. Some documents and downloads are not visible to anonymous

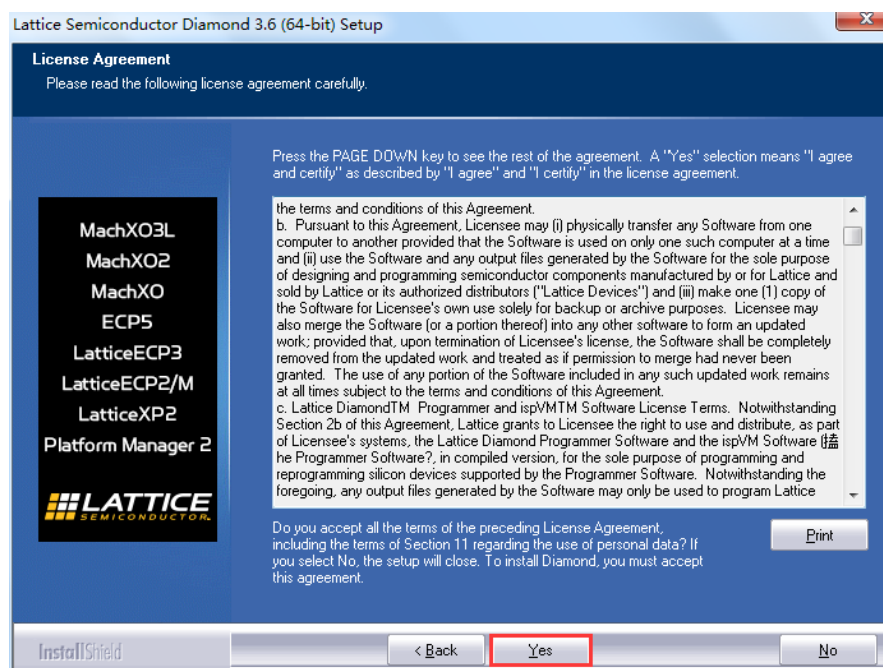
visitors. To view all items, please log in to your Lattice account. Follow the product download instructions and uncompress the software.

2.2 Installation Procedure

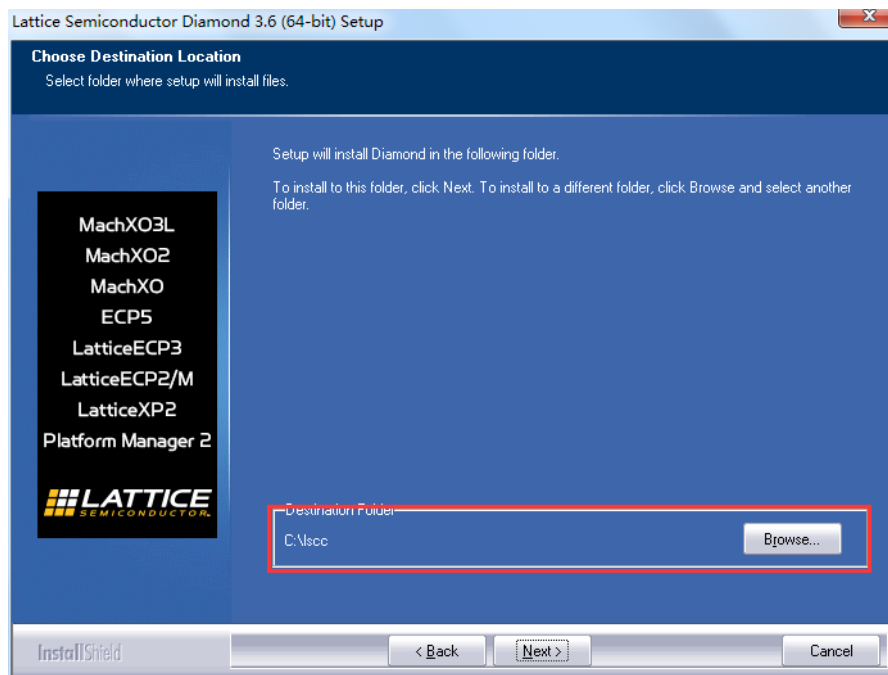
1. Close all applications before starting Diamond installation
2. Double-click on the Diamond installer you downloaded to launch the installation process.
3. The Welcome to Lattice Semiconductor Diamond Setup dialog box opens.



4. Click Next to open the License Agreement dialog box.
5. Read the license agreement. If you agree, click Yes to open the Choose Destination Location dialog box.

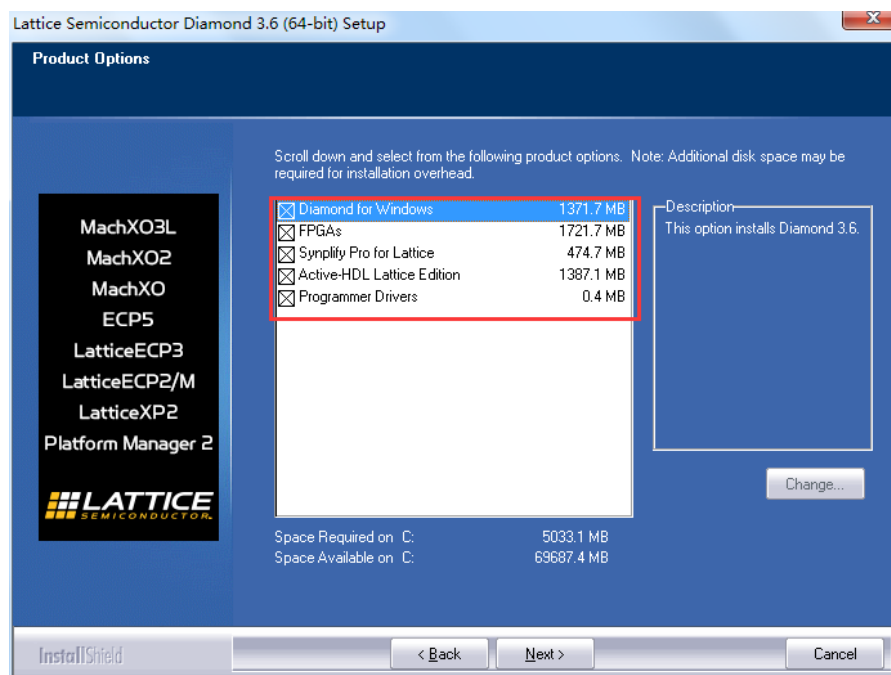


6. The default destination folder is C:\lsc. Click Browse to change the drive or destination folder.

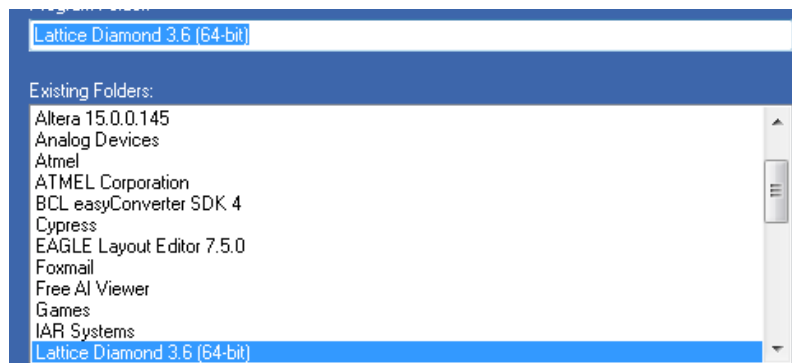


7. Click Next to open the Product Options dialog box.

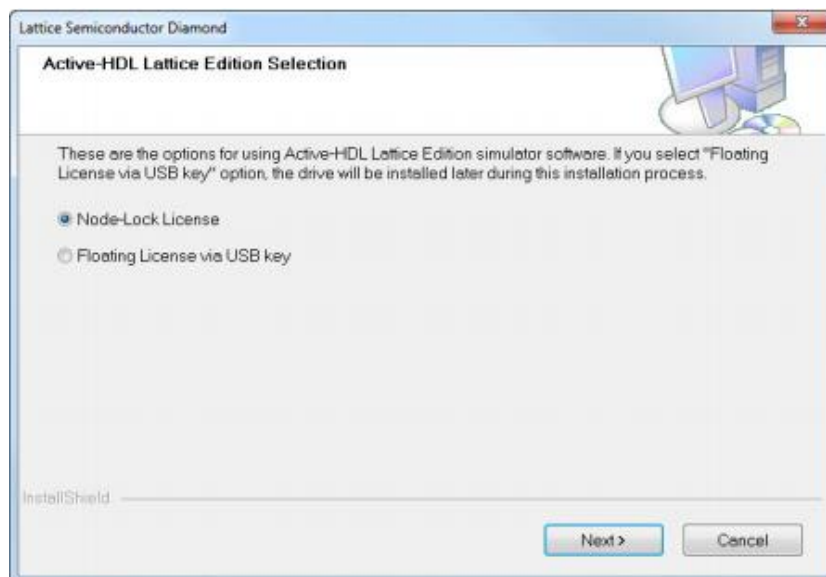
8. Select the Diamond components that you want to install by selecting or clearing each of the listed options. If you have purchased third-party synthesis and simulation tools directly from the third-party vendors, you can clear the Synplify Pro for Lattice and Active-HDL Lattice Edition product options. The FPGAs product option has additional options for selecting the Lattice FPGA devices that you want to install. To set the additional options, select FPGAs and click Change. In the pop-up Select Subfeatures dialog box, you can select or deselect the features from the list. Click Continue to come back to the Product Options dialog box.



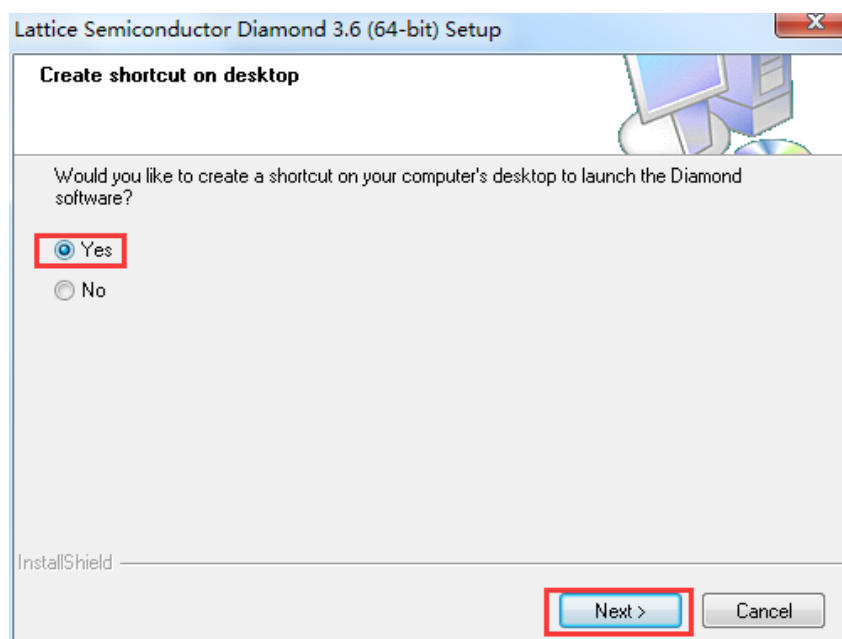
9. Click Next to open the Select Program Folder dialog box. The default name of the program group is Lattice Diamond 3.8 (or Lattice Diamond 3.8 (64-bit) if you installed the 64-bit version). If you want to change the name, change it in the Program Folder text box.



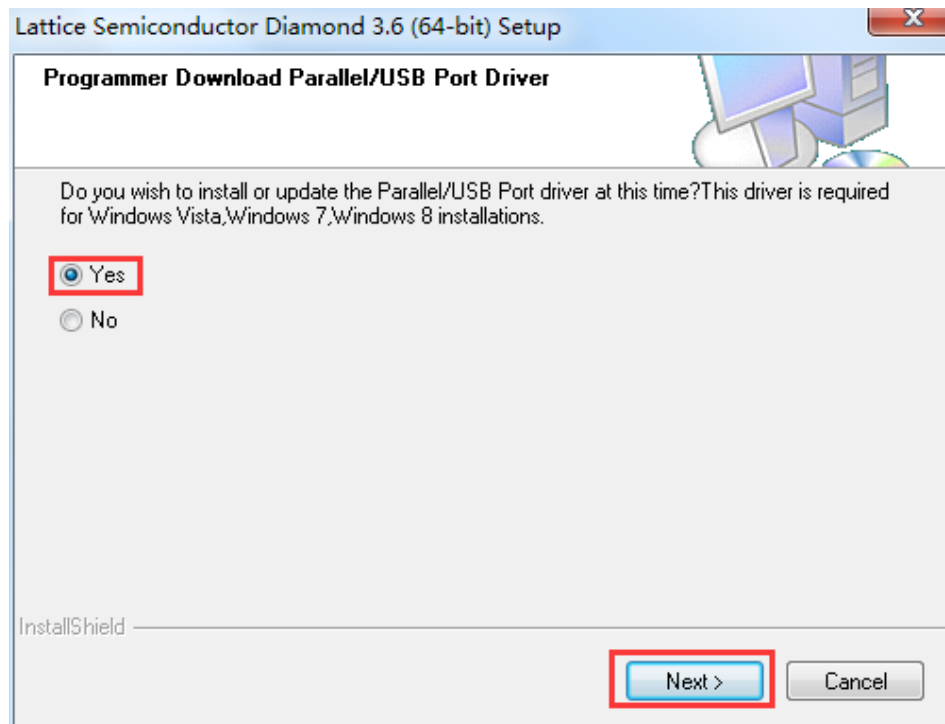
10. If you have selected the Active-HDL Lattice Edition option, you will be prompted to select a license opti3zxcdon as shown below.



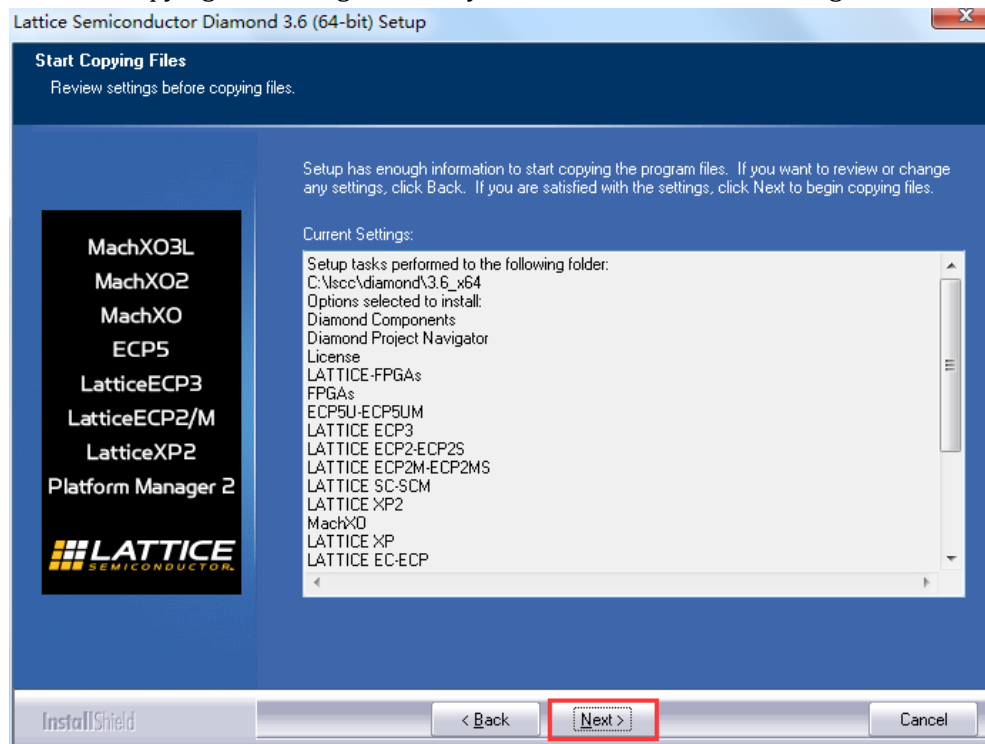
12. In the Create Shortcut on Desktop dialog box, select desired option and click Next.



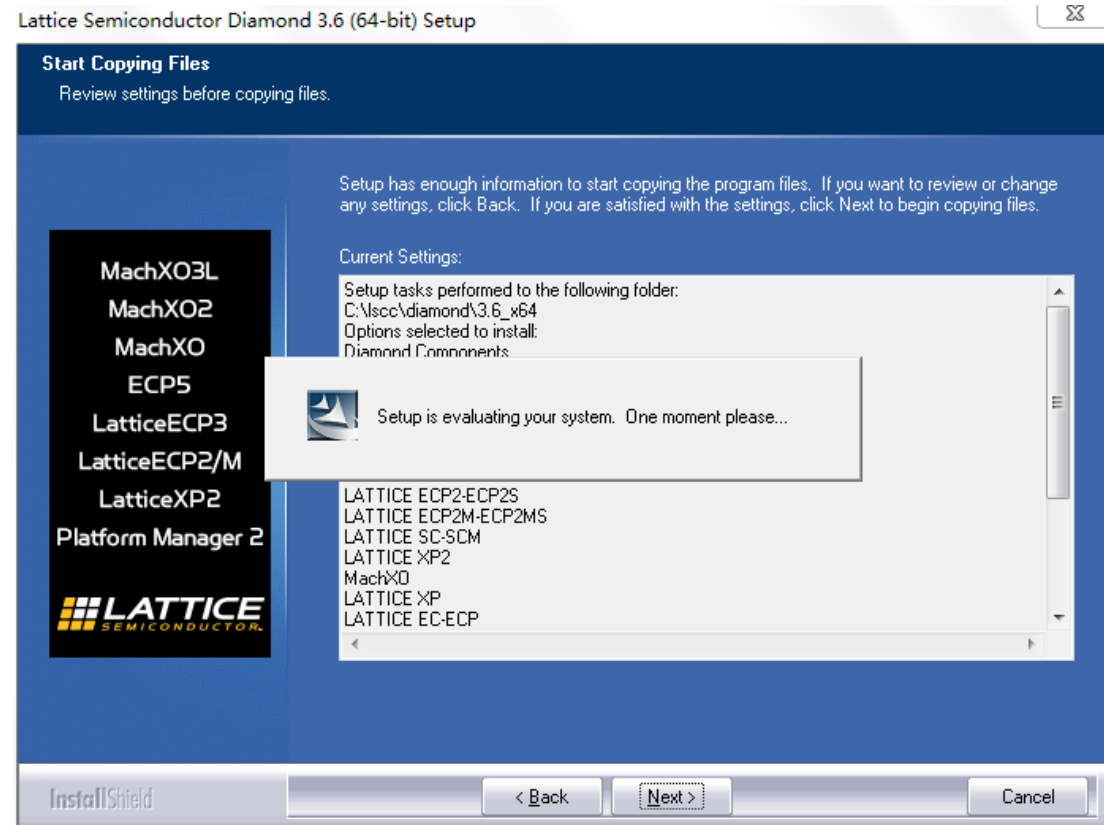
13. In the Programmer Download Parallel/USB Port Driver dialog box, select the desired license option and click Next.



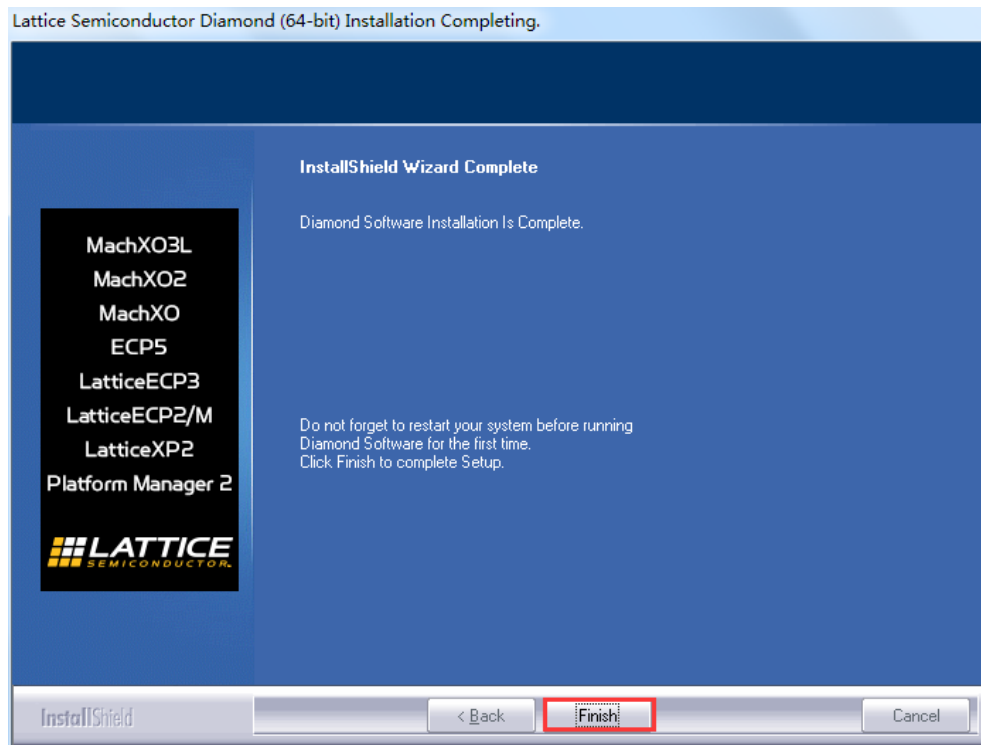
14. In the Start Copying Files dialog box, verify Diamond environment settings and click Next.



15. Setup need to evaluate your system, just wait a moment;



16. In the InstallShield Wizard Complete dialog box, read the note and click Finish.



2.3 Licensing for Diamond

At the end of the installation, you will use the Lattice website-based licensing capability to license your Diamond and stand-alone Power Estimator software.

To use the software, you must receive a Lattice Semiconductor software license based on the identification of your network interface card (NIC). The NIC ID or equivalent is the 12-character hexadecimal physical address.

License your software early to avoid any down time.

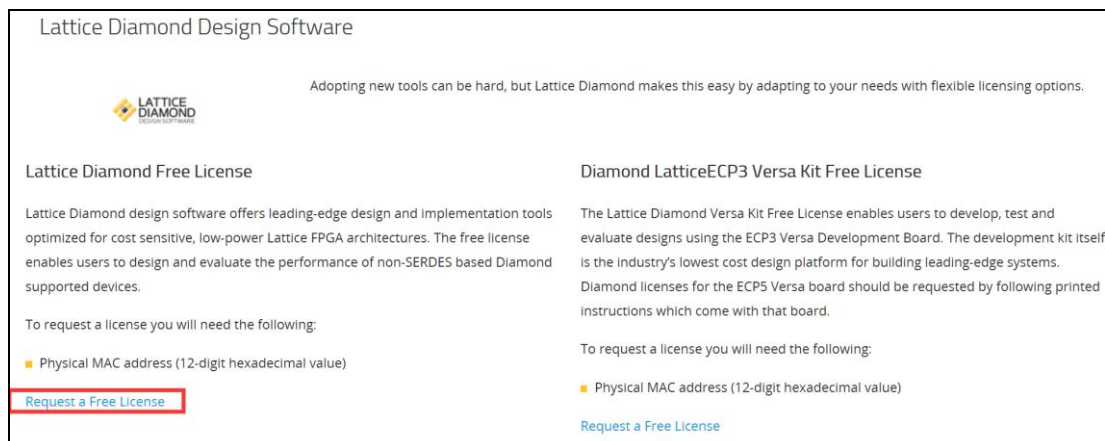
To obtain a license file for your Diamond software:

1. Go to Lattice Semiconductor Software Licensing page:

www.latticesemi.com/licensing

2. Select Lattice Diamond.

You will get the Lattice Diamond Software Licensing page.



Fill in your MAC address(12-digit hexadecimal value), Verify it, and click the “Generate License”.

Software License Request Form

Note: The license file will be sent to the web account email address:
zhangze@stepfpga.com

Host NIC (physical address) *:
 * required field

☐ verify that I am not an employee of Cadence Design Systems, Mentor Graphics Corporation, or Magma Design Automation

(click once)

NOTE: This form requires JavaScript to be enabled in your web browser in order to process your request.

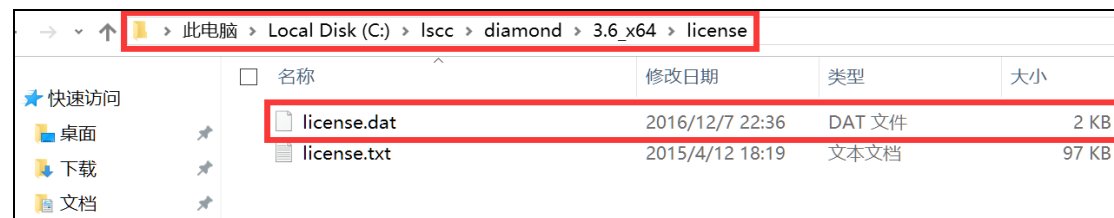
1.Fill in Physical address

2.select it

3.click the "Generate License" Button

Then the license file (**License.dat**) will be send to your e-mail.

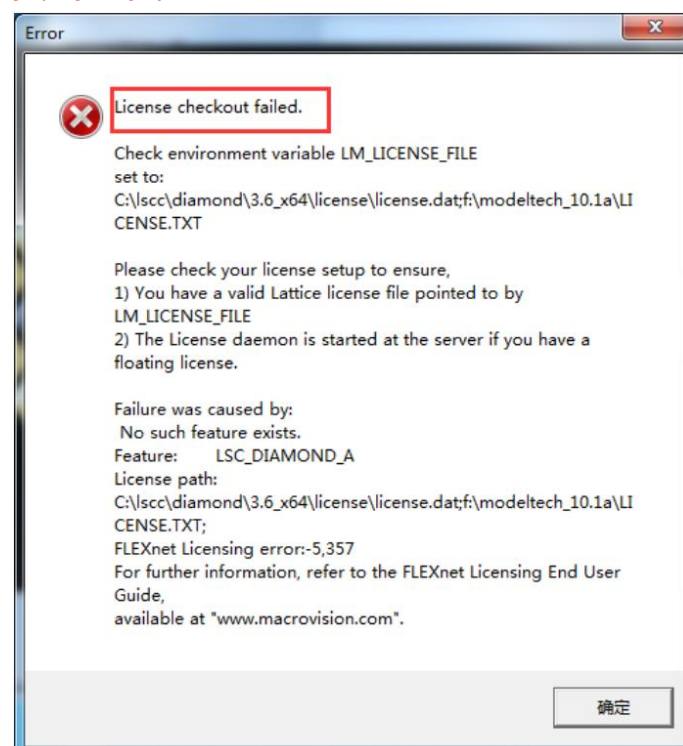
In the process of installing Diamond Software, the environment variables will be added to your system, so you just need to copy the license file(License.dat) to the Folder named “License”, For example:



Open Diamond and use it.

Notice:

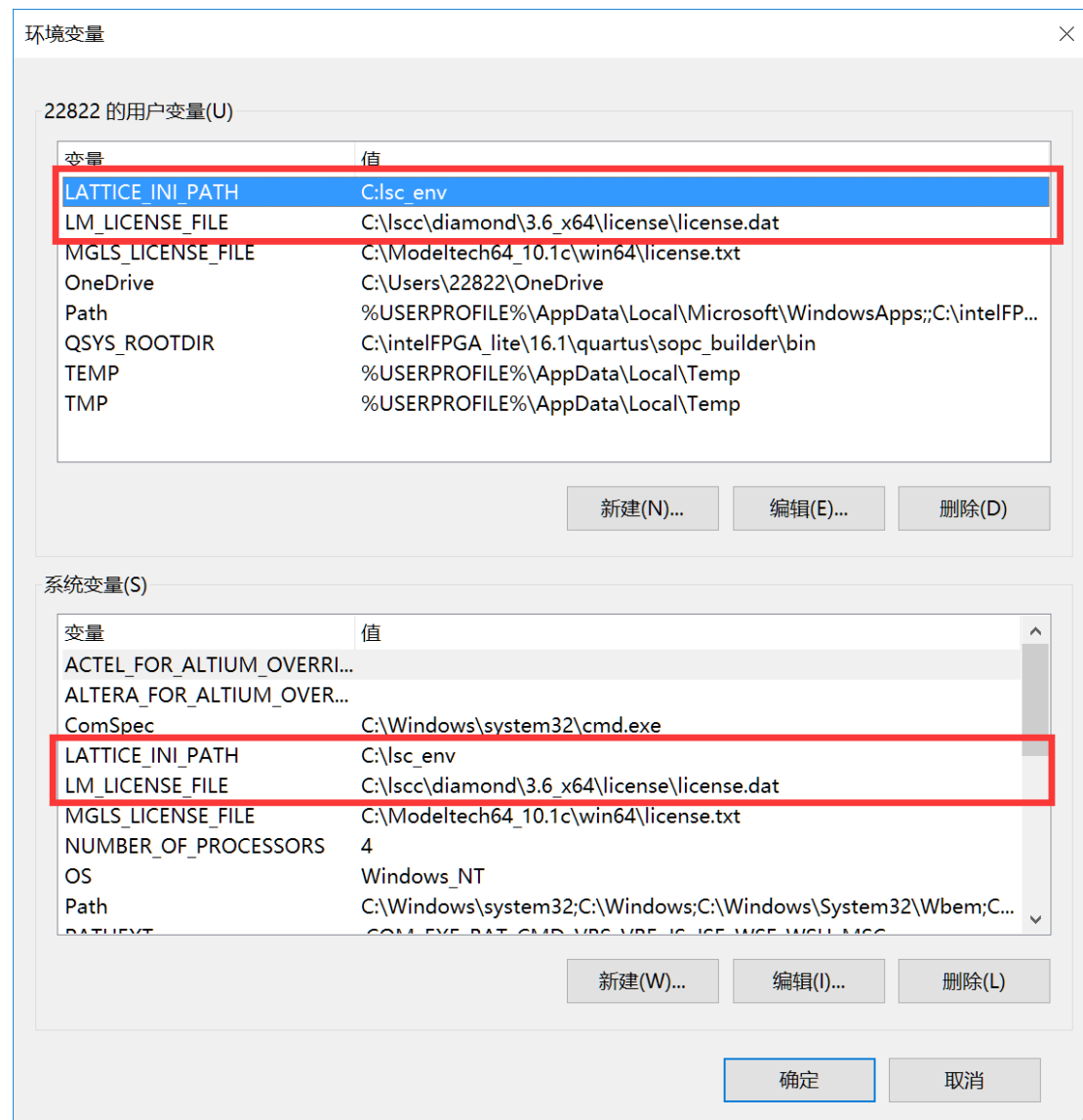
If it reports error when you open the diamond, it means that the environment variable set up error, check your environment.



First, Right Click "This PC", select "Properties" , click "Advanced system settings" .

Then, click "Environment Variables..",

Check out "user variable for PC", if there are some environment variables conflicts with system environment variables "LM_LICENSE_FILE", find and delete it(the); if there are no environment variables called "LM_LICENSE_FILE", just create it as same as the system environment variables "LM_LICENSE_FILE". For example:



3. Creating a New Project

3.1 Creating a New Project

The New Project wizard steps you through the process of creating a new project, allowing you to name the project and its implementation, add source files, and select a target device.

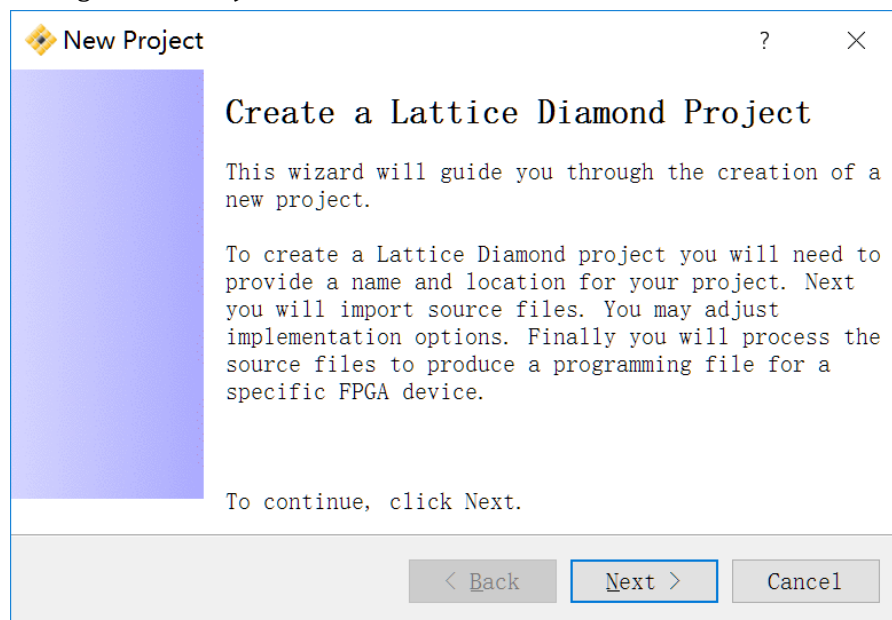
You can open the New Project Wizard using one of the following methods:

On the Start Page, select New in the Project pane.

From the File menu, choose New > Project

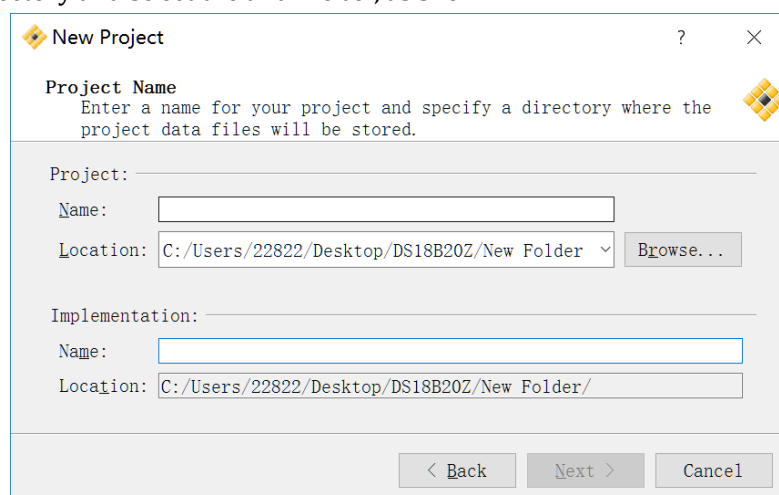
Several example project design files are included in Lattice Diamond. The following example procedure shows how to create a new project using the “and2” example.

On the Start Page, select **Project > New**.



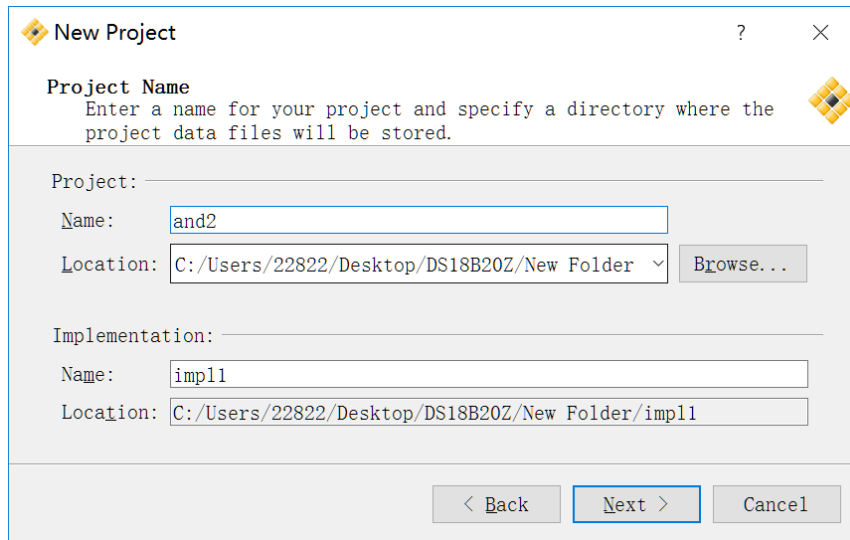
Click **Next** to open the Project Name dialog box.

Click Browse to open the Browse for Folder dialog box. Navigate to the Lattice Diamond examples directory and select the and2 folder, as shown:



Enter a Project Name: and2.

Enter an Implementation Name: impl1.



New Project ? X

Project Name
Enter a name for your project and specify a directory where the project data files will be stored.

Project: _____

Name:

Location:

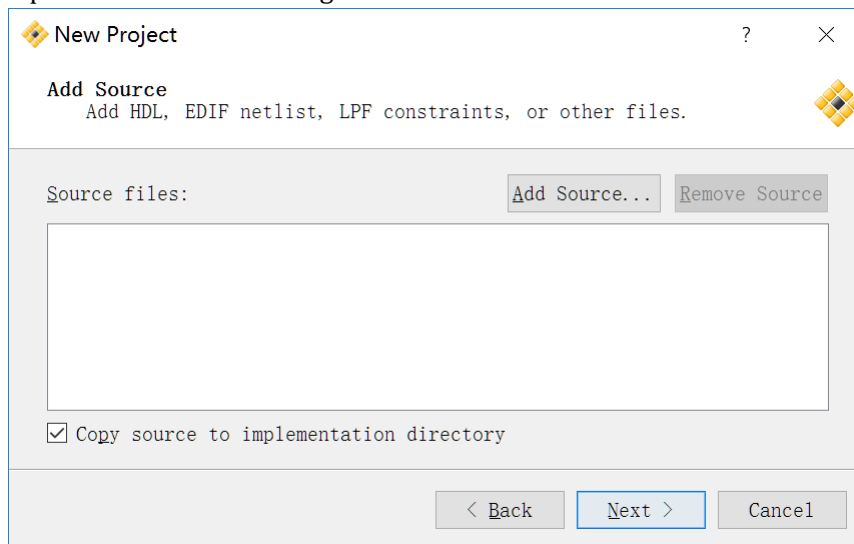
Implementation: _____

Name:

Location:

< Back **Next >** Cancel

Click **Next** to open the Add Source dialog box.



New Project ? X

Add Source
Add HDL, EDIF netlist, LPF constraints, or other files.

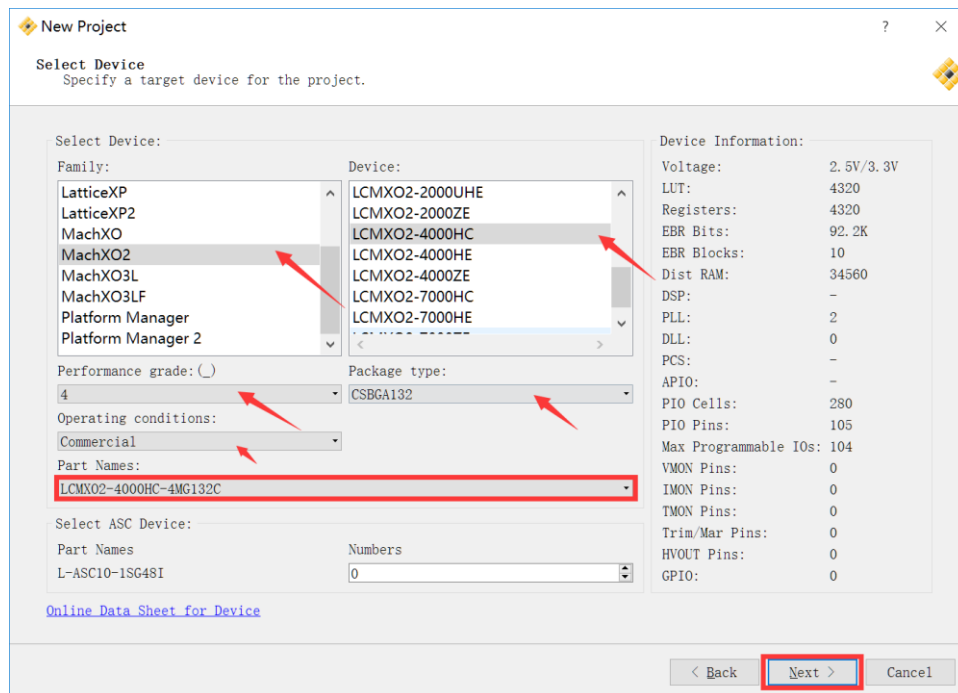
Source files:

☐ Copy source to implementation directory

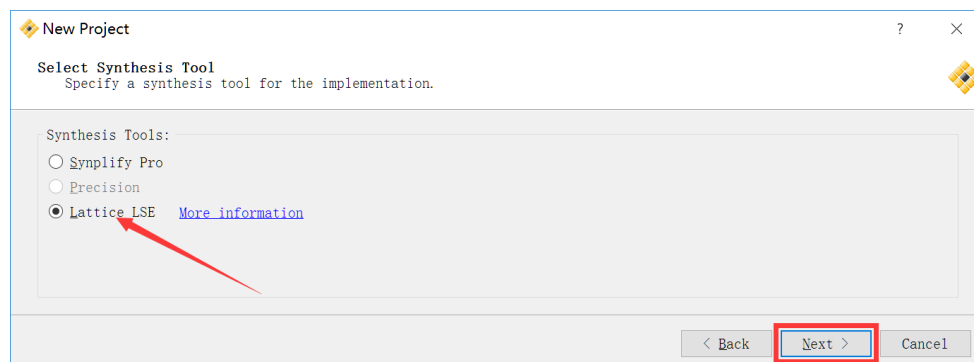
< Back **Next >** Cancel

From this dialog box, you can add Verilog or VHDL source files, EDIF netlist files, LPF constraint files, schematic, debug and analysis files or any other project files. Diamond takes the source files and places them into the correct folders for the new project.

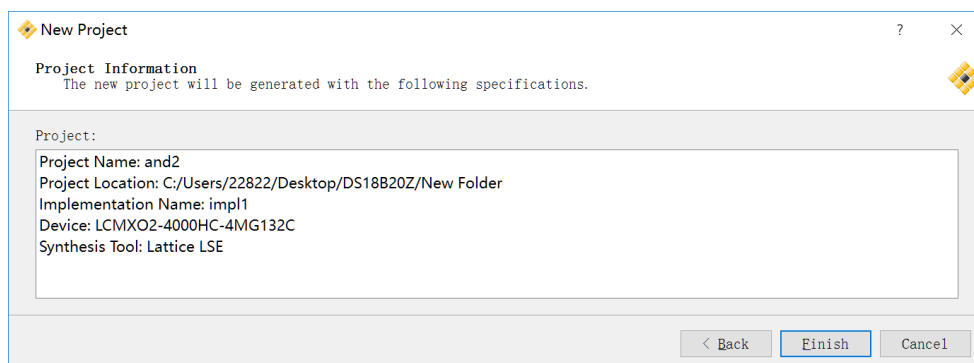
Click Next to select the device(Family: MachX02, Device: LCMX02-4000HC, Performance grade: 4, Package type: CSBGA132, Part Names: LCMX02-4000HC-4MG132C).



Click Next to open the Select Synthesis Tool dialog box. Select the synthesis tool that you want to use. If you are designing for MachXO, MachXO2, MachXO3L, or Platform Manager, you have the option of using Lattice Synthesis Engine (LSE) as your synthesis tool instead of Synplify Pro for Lattice or another third-party synthesis tool. LSE is a synthesis tool custom-built for Lattice products and fully integrated with Diamond.



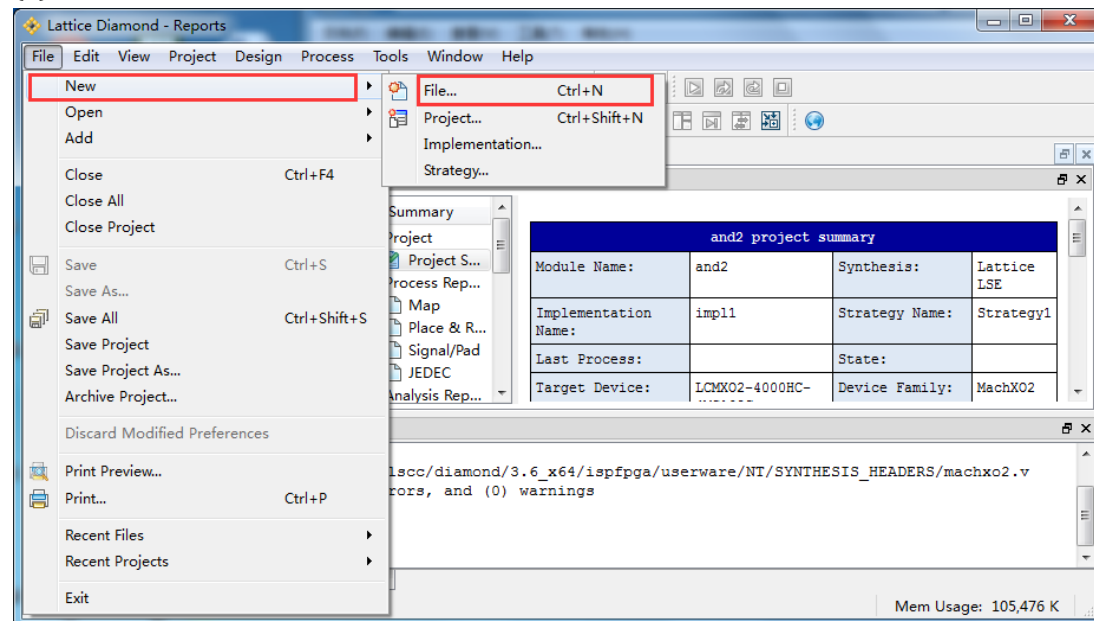
Click Next to open the Project Information summary.



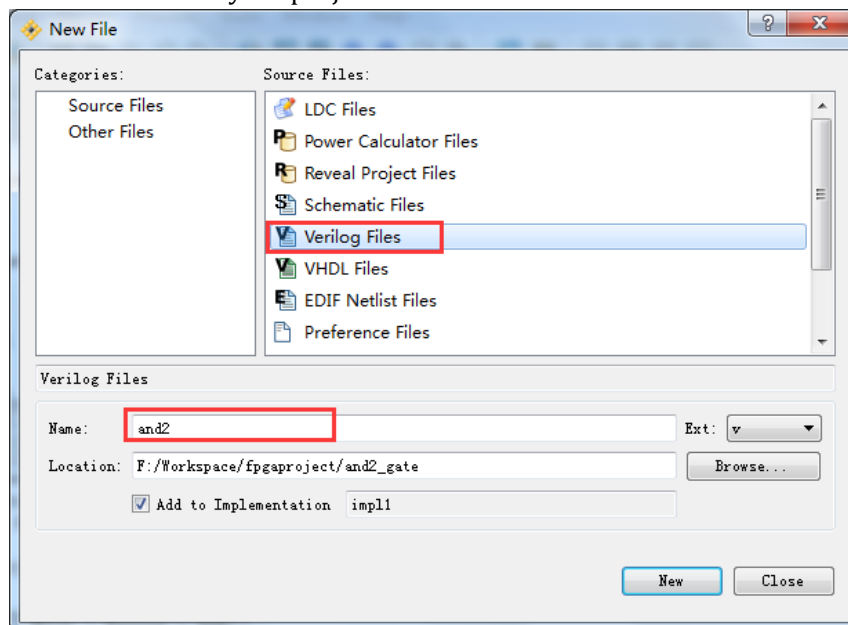
At this step or any other step in the process, you can click the Back button to review or change your selections. Click Finish. The newly created project, shown in, is now created and open.

3.2 Add the design files

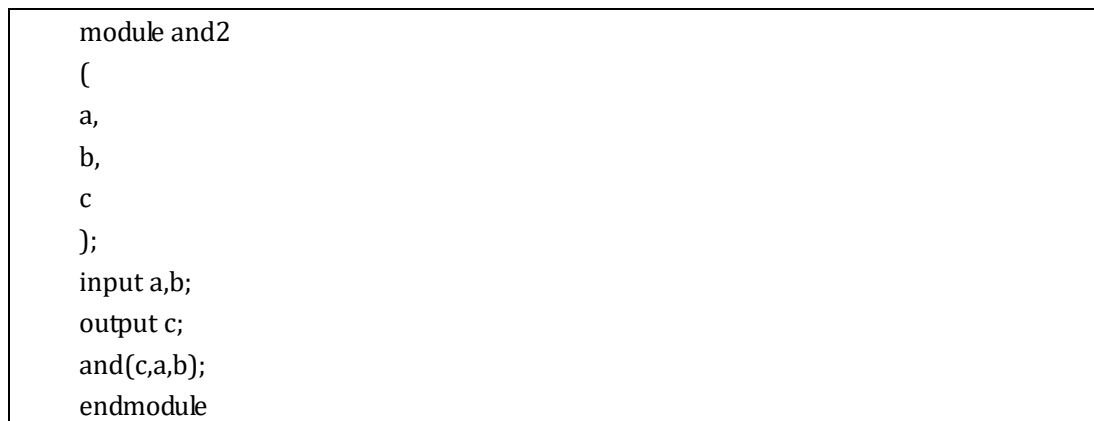
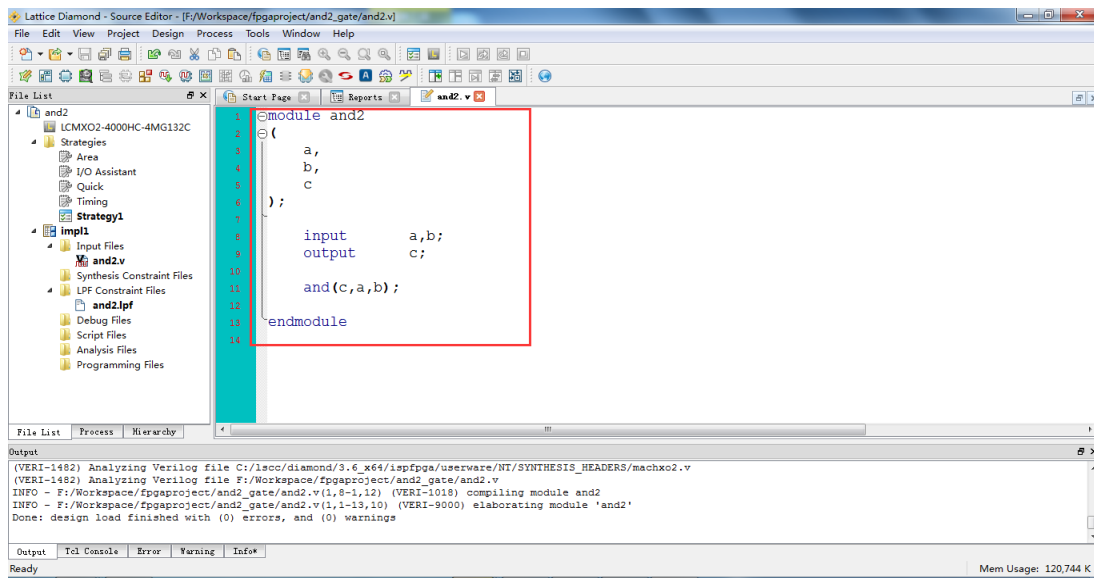
(1) Select File → New → File, create the new files.



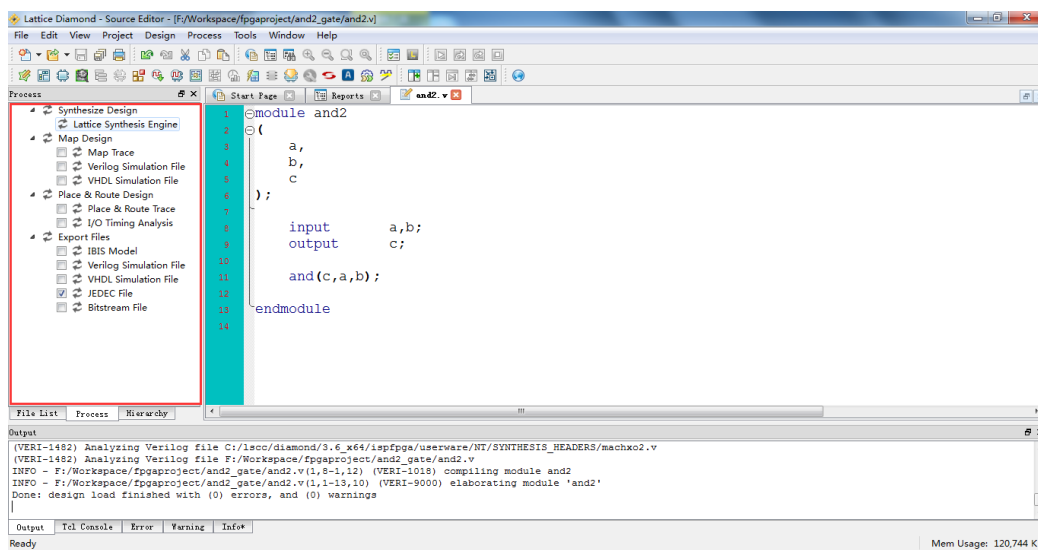
(2) Select the file type, add Verilog Files, input the name of Verilog file, then click 'Yes', the Verilog File will be created in your project.



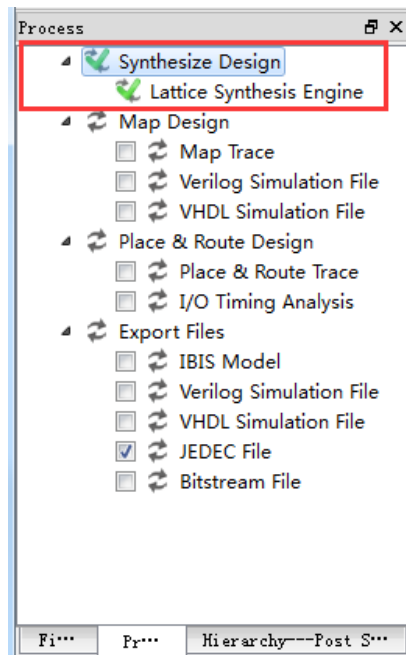
(3) Write Verilog code in this file, press Ctrl+S to save your files. The IDE will save the file to the File List. Enter the code shown below.



(4) Select 'Process' (on the left side of screen), double click 'Synthesis Design', Synthesis your design.



(5) If synthesis successfully, it will display a green tick on the left side of 'Synthesis'; if synthesis fault, it will display a red cross. Check out the error and modify your code until successful synthesis.

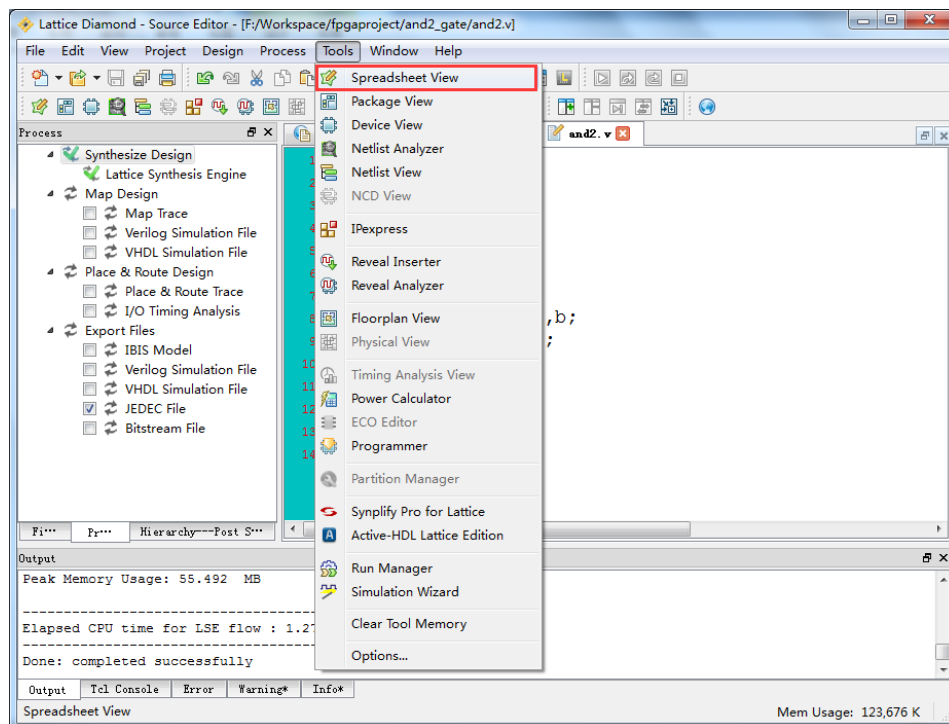


3.3 Assign Pins

(1) Select Tools → Spreadsheet View.



Or Tools->Spreadsheet View



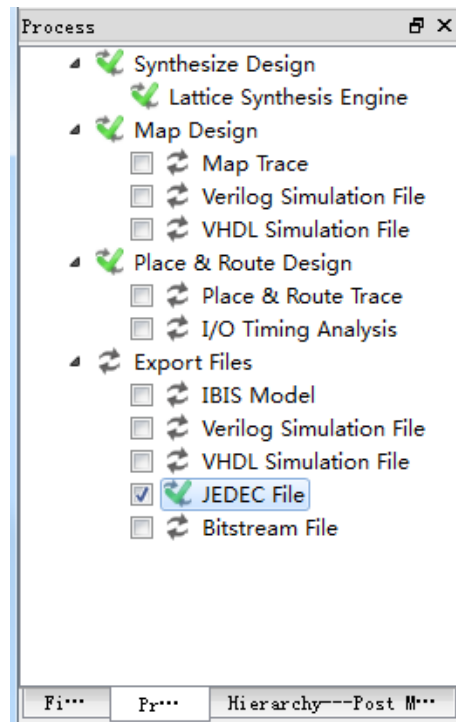
(2) Assign the a to Pin(L14), B to Pin(M13), C to Pin(N13), press Ctrl+S to save it.

	Name	Group By	Pin	BANK	BANK_VCC	VREF	IO_TYPE	PULLMODE	DRIVE	SLEWRATE	CLAMP	OPENDRAIN
1	All Ports	N/A	N/A	N/A	N/A	N/A	LVC MOS33		N/A	N/A		
1.1	Input	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1.1.1	a	N/A	L14	1	Auto	N/A	LVC MOS33	DOWN	NA	NA	ON	OFF
1.1.2	b	N/A	M13	1	Auto	N/A	LVC MOS33	DOWN	NA	NA	ON	OFF
1.2	Output	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1.2.1	c	N/A	N13	1	Auto	N/A	LVC MOS33	DOWN	8	SLOW	OFF	OFF

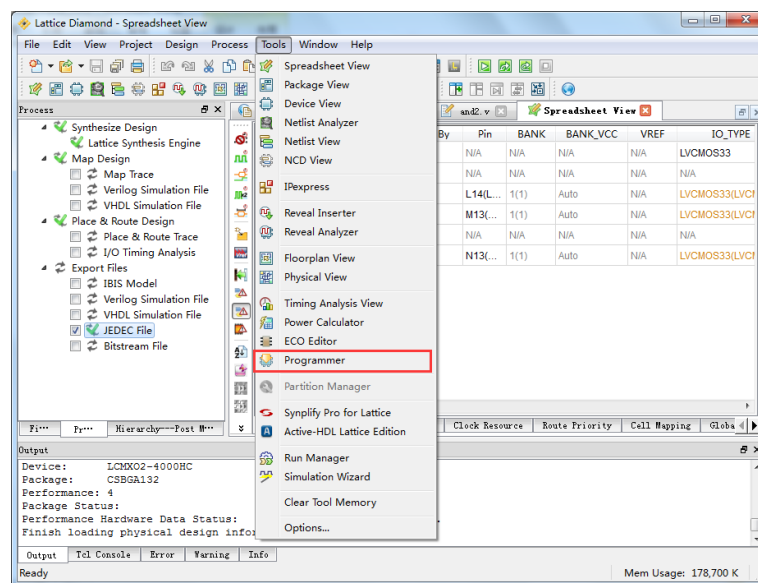
3.4 Generate the compiling files and download

(1) The design is simple, we don't tell you some of the things about Simulation, Layout, route. And we create the compiling the files directly.

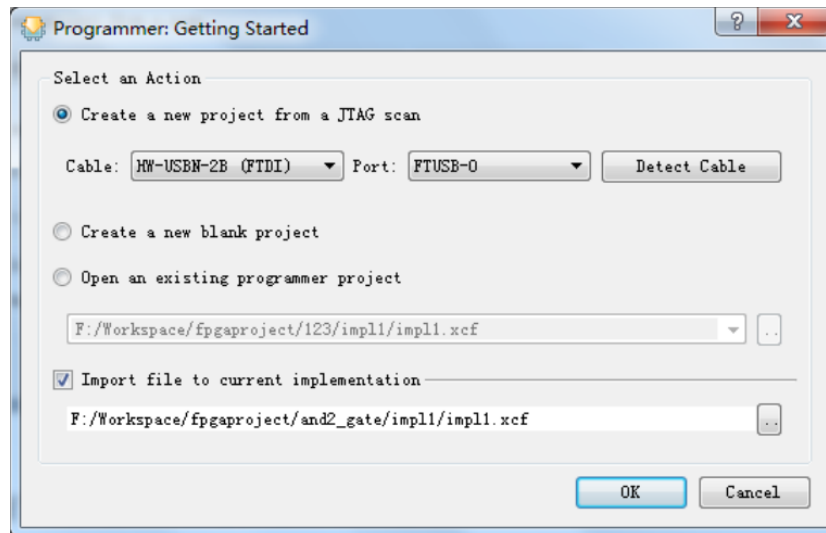
(2) Select the 'JEDEC File' and double-click the 'Export File'.



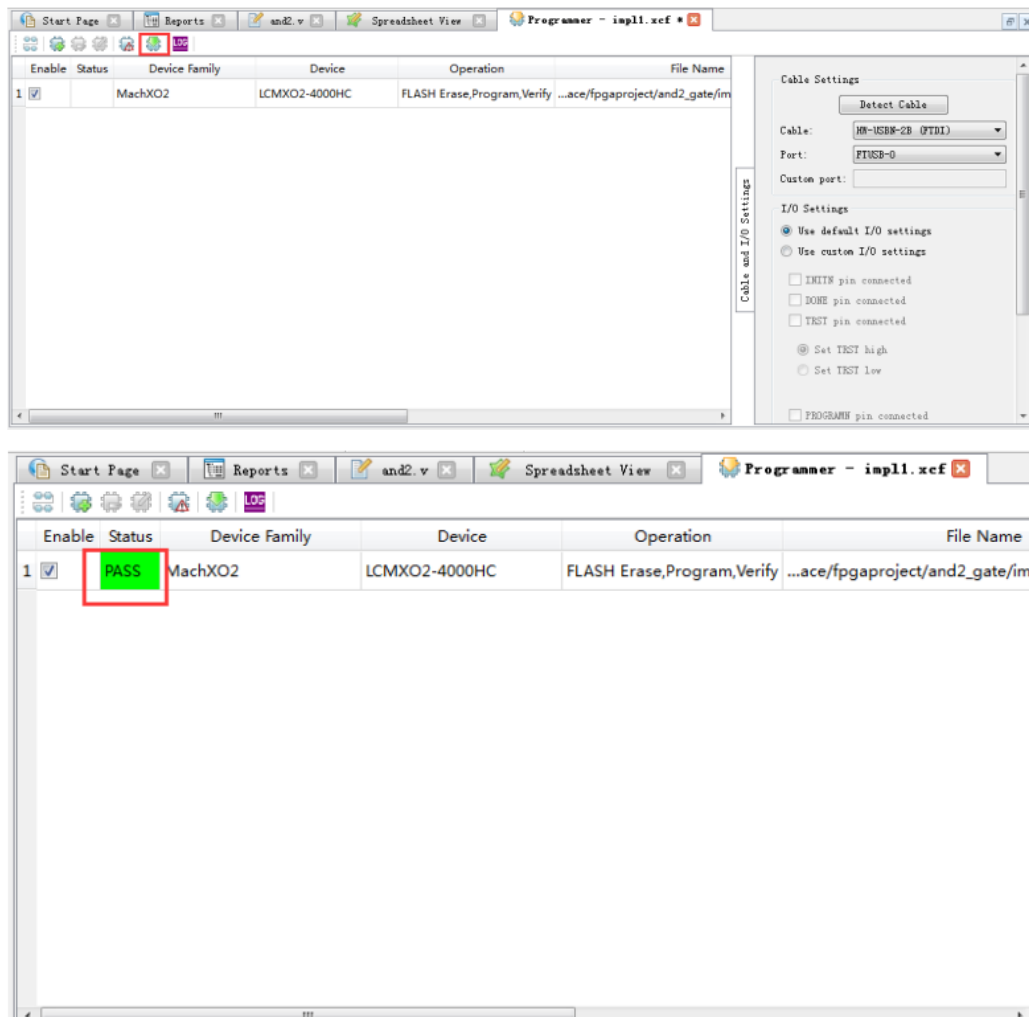
(3) Open the Programmer, Click Tools→Programmer(Don't forget connect the STEP-MX02 to PC).



(4) Before programming, the IDE will create as new project from a JTAG scan, you can click 'Detect Cable' to detect it, if your device driver install successfully, then click 'OK'.



(5) Click the program button, and when program complete, it will display 'PASS'.



Let's see the running results by STEP-FPGA MXO2. This example is a simple, two inputs logic gates 'AND', the control of a development board with the bright lights out. When the single of LED on the STEP-FPGA is low, the led will be brighten, and initial state of button is high, when

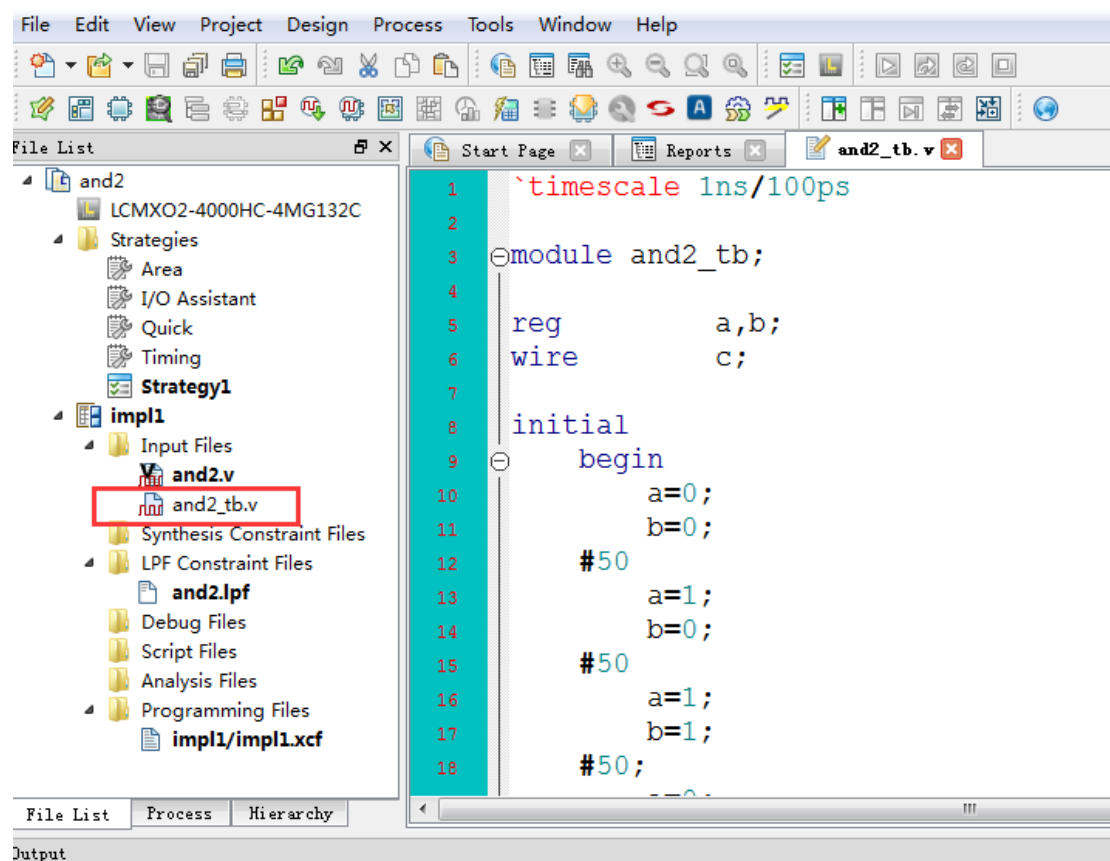
you push it, the single of button is low.

So, when the FPGA is running, the led will be brighten if you push any button.

4. Active-HDL quick start

Diamond provides you with an interface to create a new simulation project file that you can import into a standalone simulator. Diamond supports Active-HDL and ModelSim simulation file for file exports. Now let's see how to quick start to use the integrated tool Active-HDL in the Diamond for functional simulation.

- 1、First of all you can create a testbench file as Verilog source files.

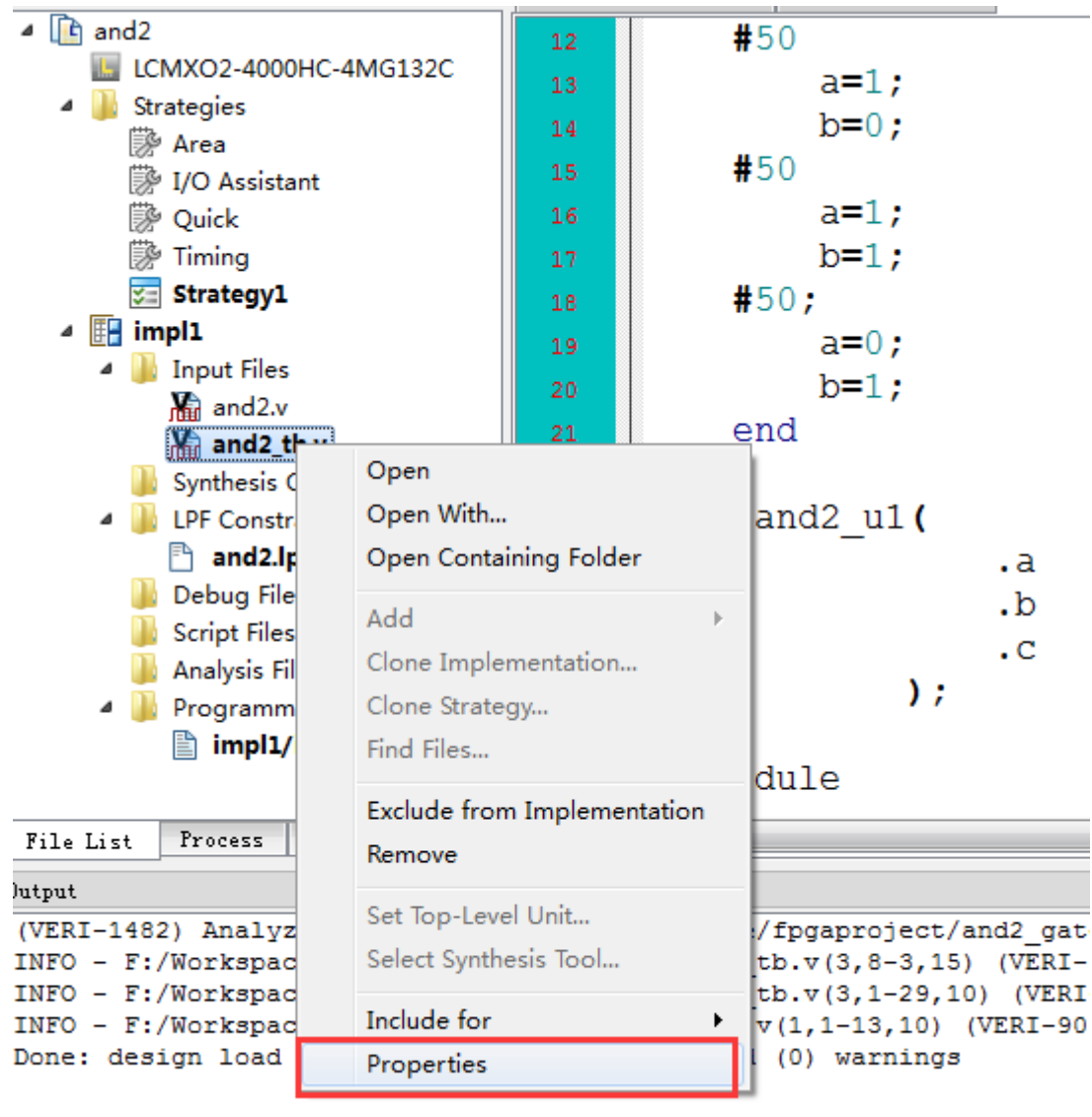


- 2、an2_tb.v :

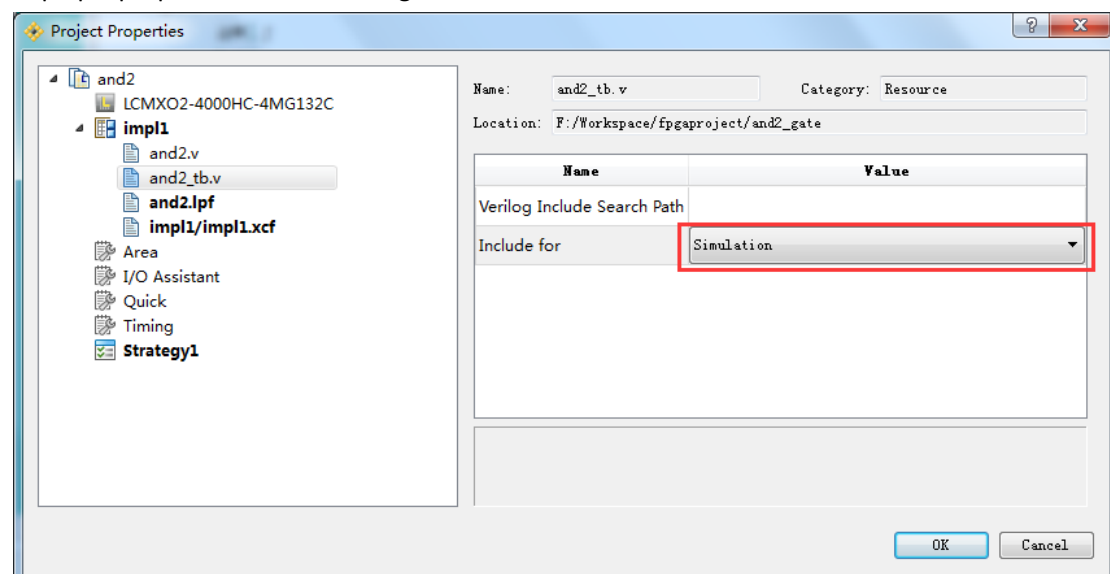
```
`timescale 1ns/100ps
module and2_tb;
reg      a,b;
wire     c;
initial
begin
    a=0;
```


```
        b=0;
        #50
        a=1;
        b=0;
        #50
        a=1;
        b=1;
        #50;
        a=0;
        b=1;
    end
    and2 and2_u1(
        .a      (a),
        .b      (b),
        .c      (c)
    );
endmodule
```

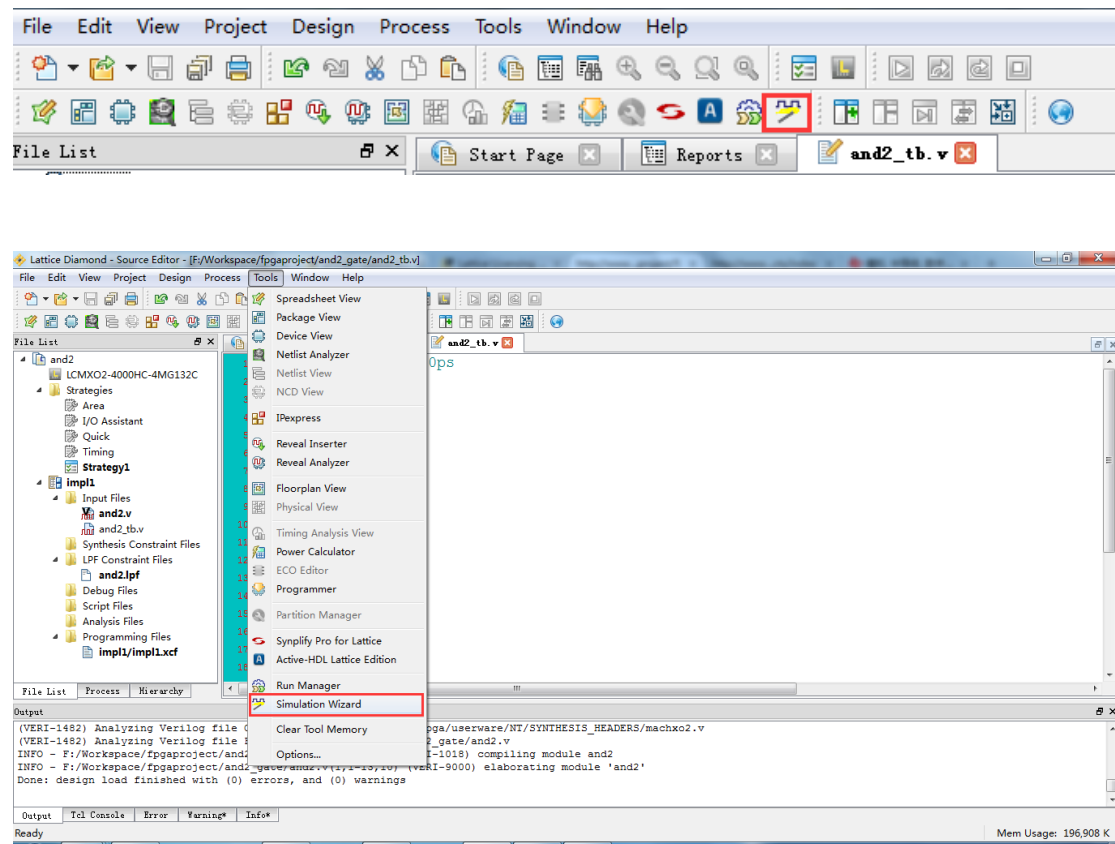
3、To note here is that the testbench files are only used for the simulation, a lot of statements are not comprehensive. You must change set up the testbench file attributes to simulation only. Right-click on and2_tb file in project directory



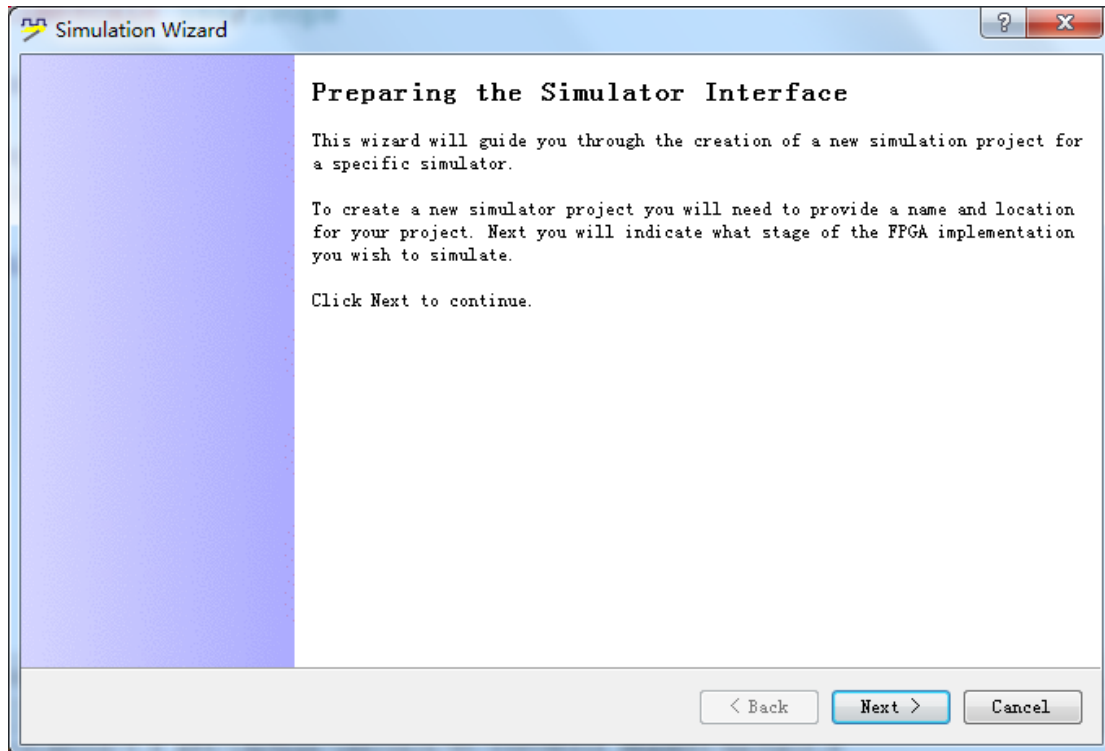
Pop up a properties window, change the file attribute value to simulation.



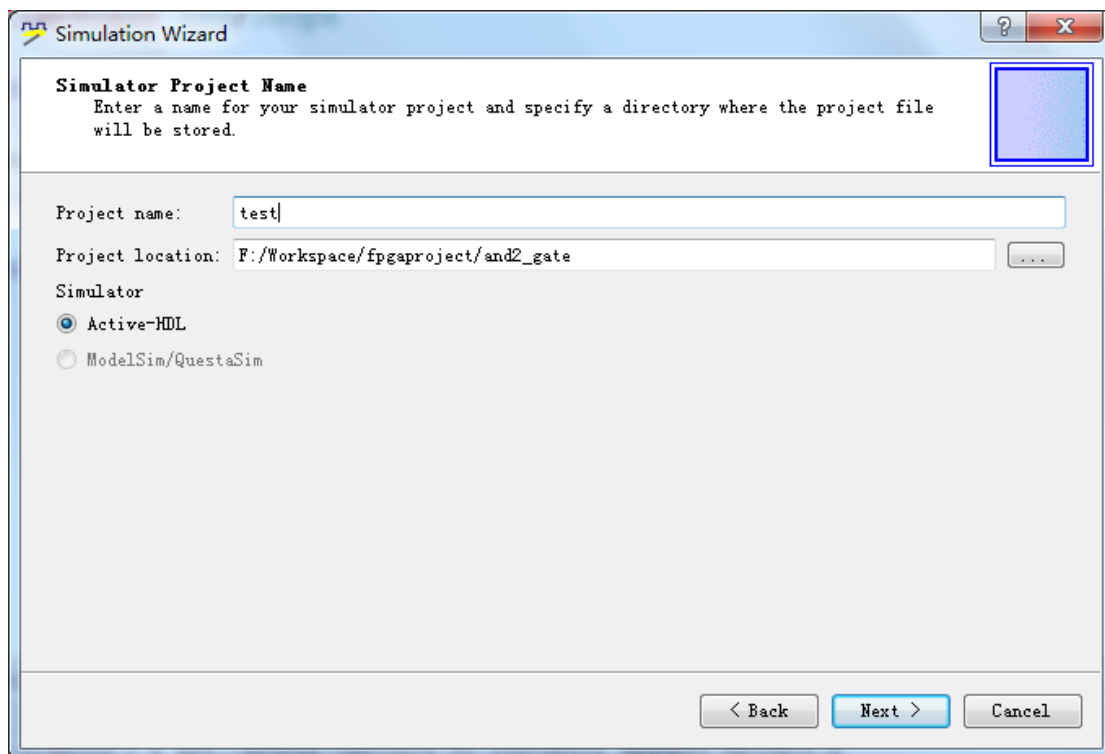
4、Choose the menu Tool -> Simulation Wizard or click the button  in the toolbar, start the simulation wizard.



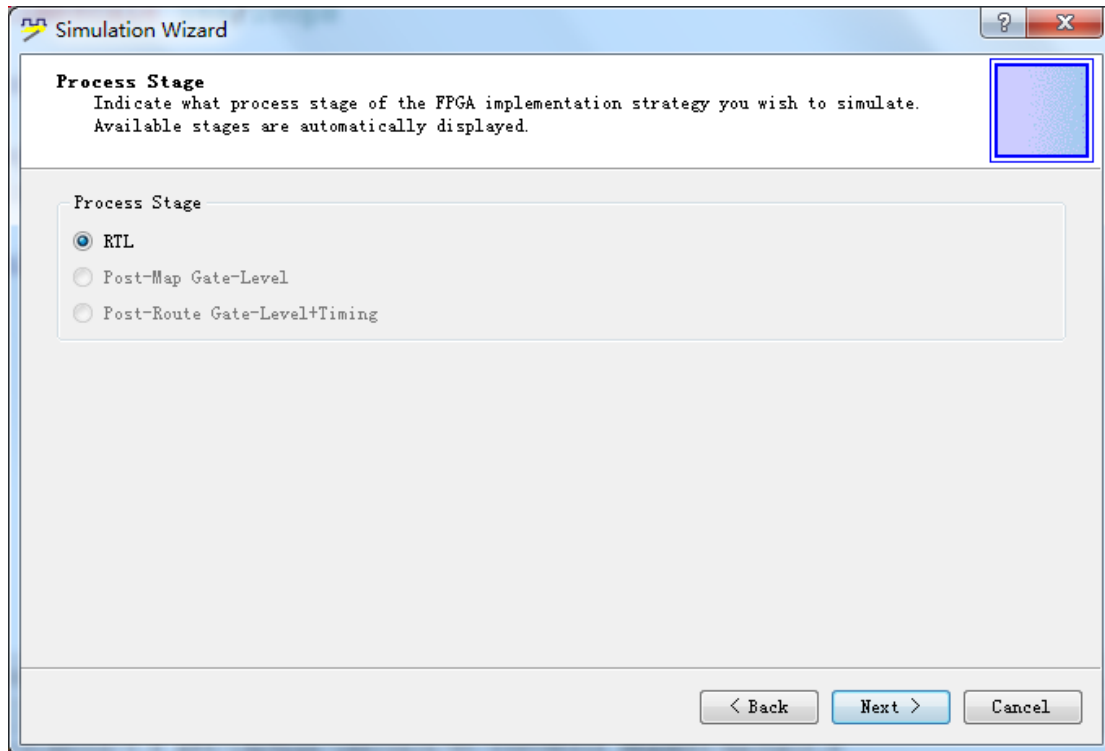
5、Pop up a simulation wizard window.



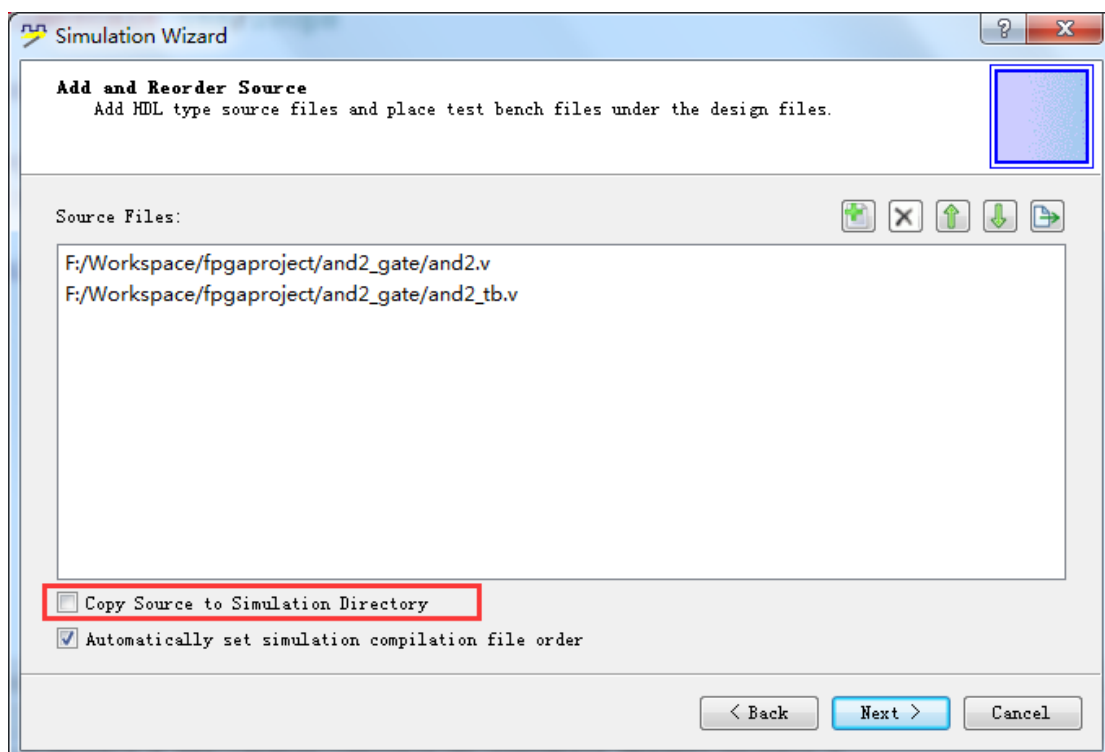
6、Set a name for the simulation project.



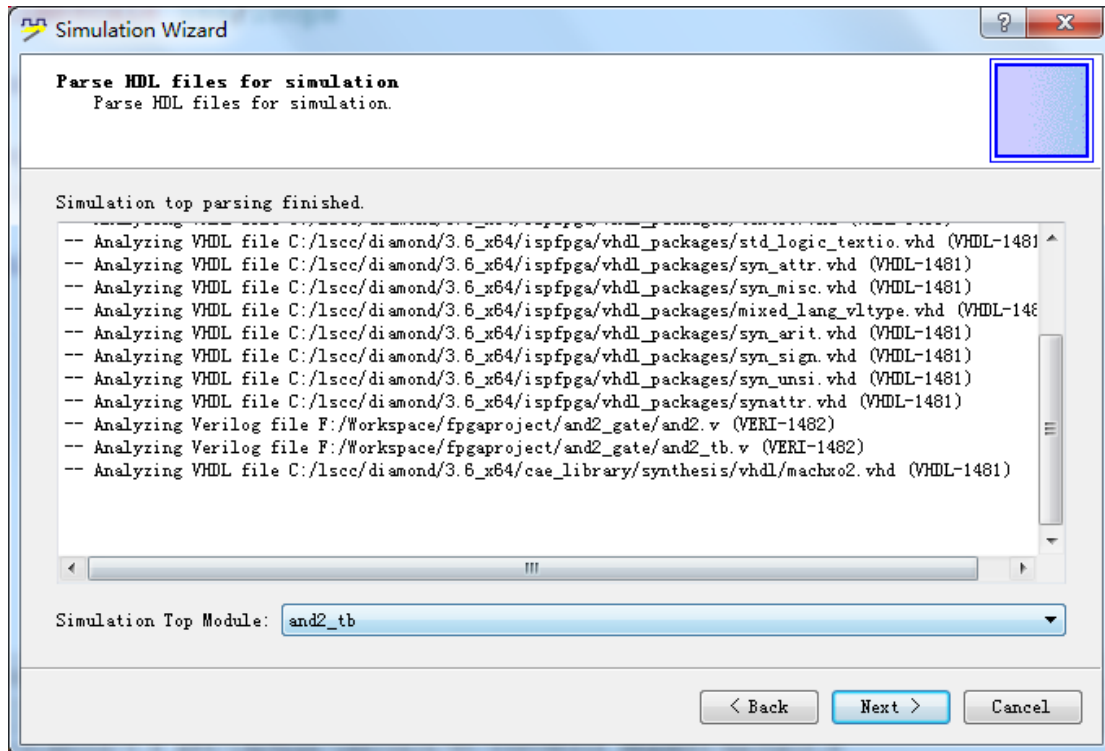
7、Choose the Process stage, now in the functional simulation you can only select RTL.



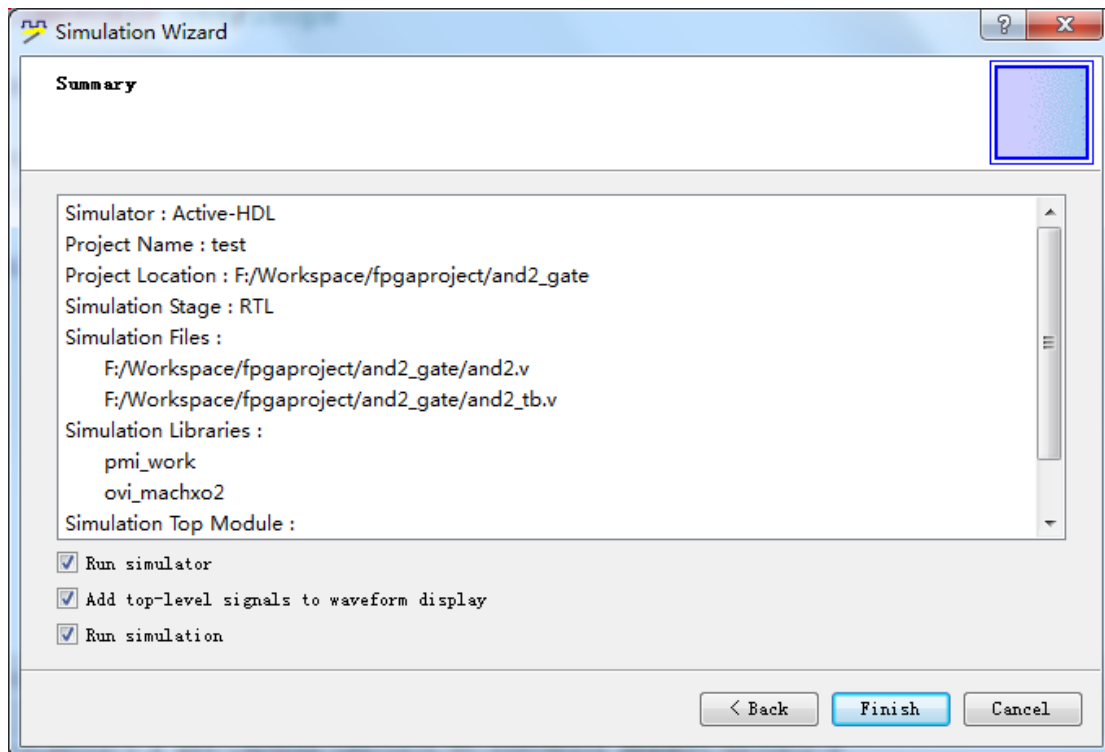
8、 Select add or remove to the Simulation of the Source files and test, if select the Copy Source to Simulation the Directory option, will copy the source file to the directory of simulation project.



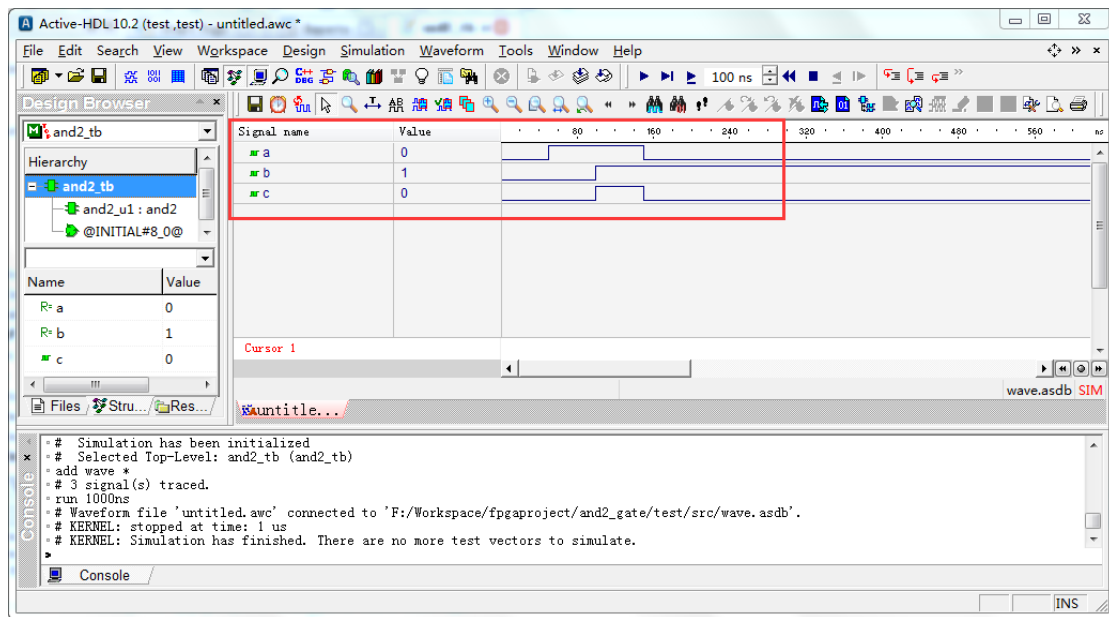
9、 You can select the simulation top module.



10. Now the simulation project has been created.



11. Finish the simulation wizard ,you can see the Wave after the simulation.



5. Version

Version number	Date	Comments
1.0	2017.2.14	Initial Version