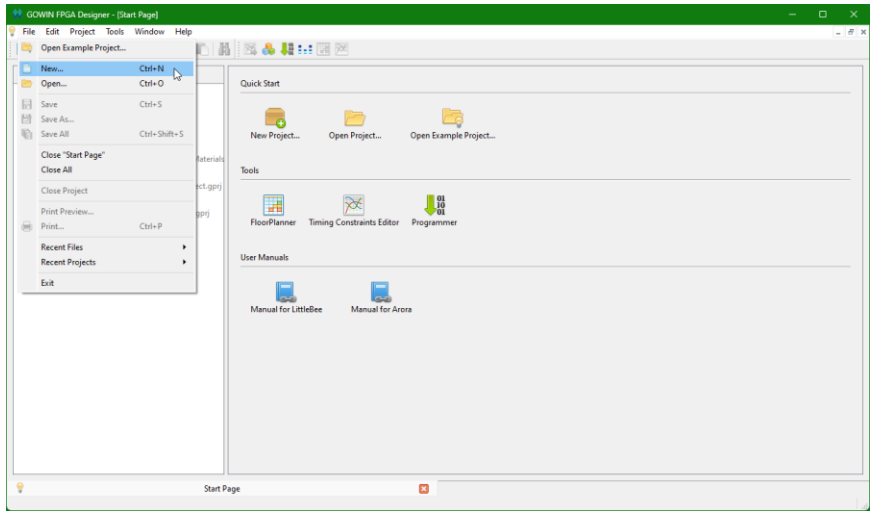
GOWIN FPGA Guide for HaHa v3.0 Board

Contents

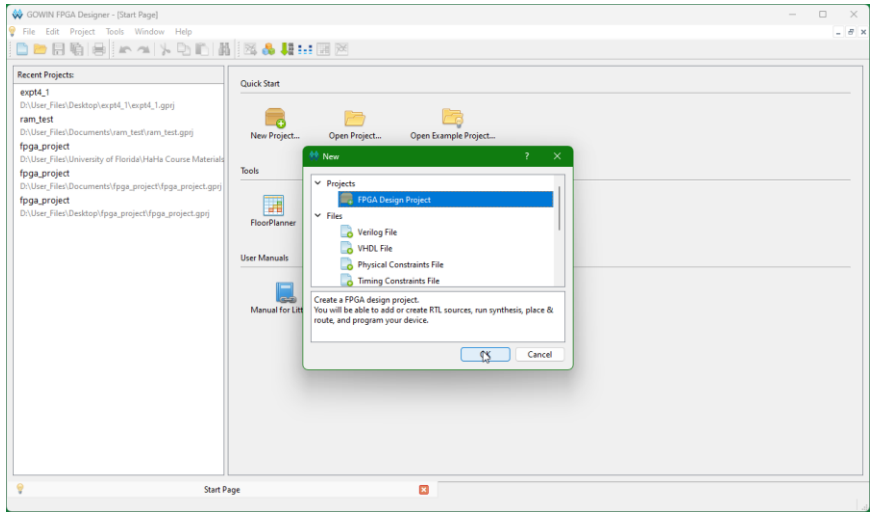
Instructor: Dr. Swarup Bhunia
Co-Instructor: Reiner Dizon-Paradis

Starting a GOWIN FPGA Designer Project

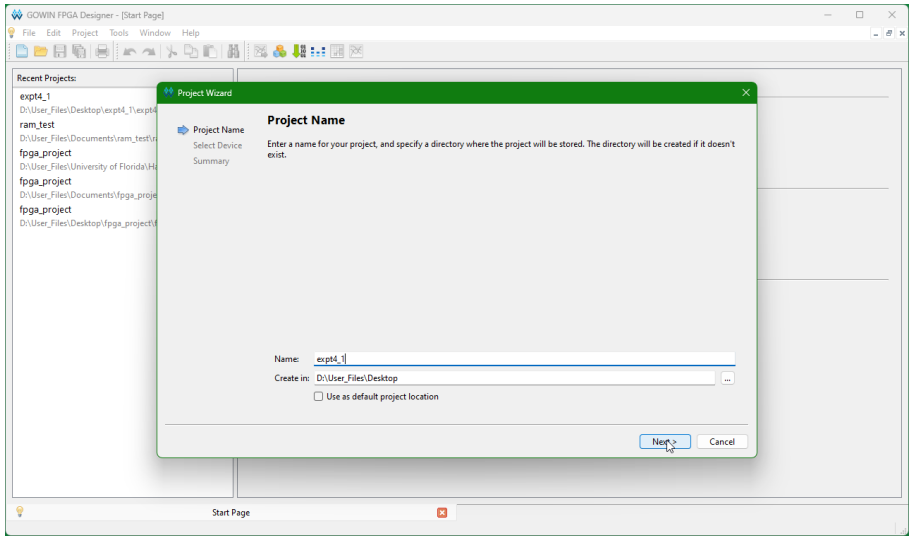
1. Go to **File** > **New**.



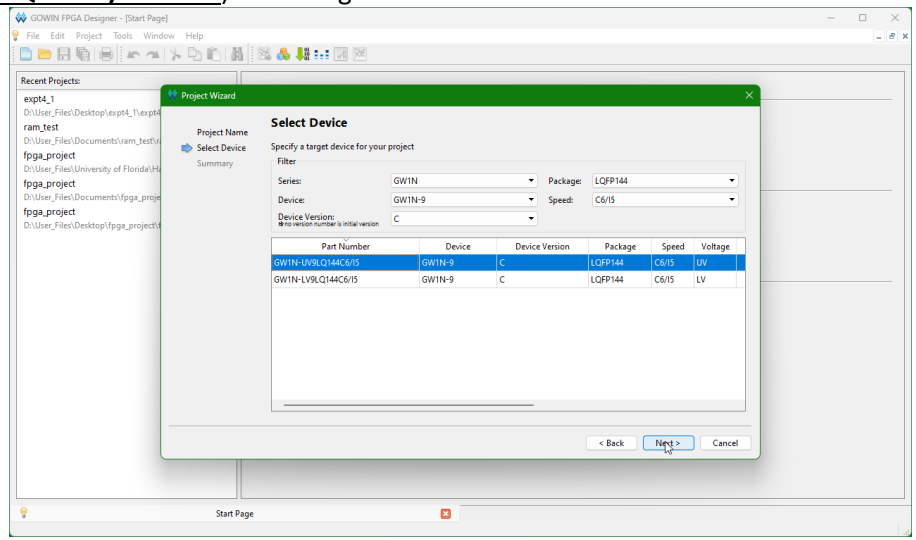
2. Select **FPGA Design Project**. Click **OK**.



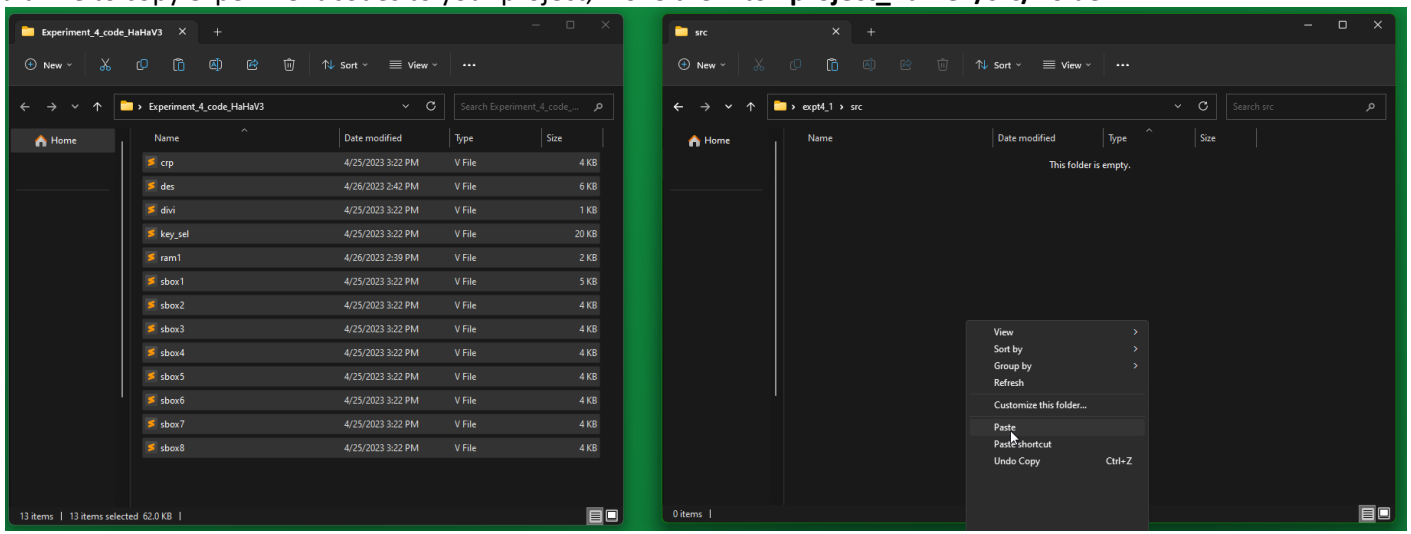
3. Type the name of the project and its location. Click **Next**.



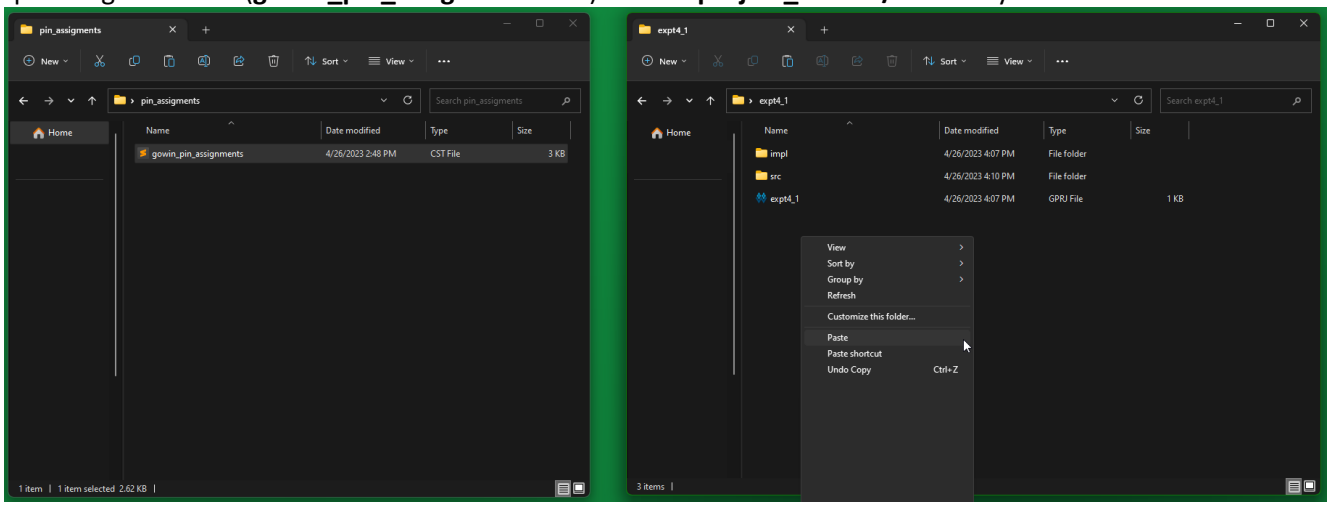
4. Select the device (**GW1N-UV9LQ144C6/I5 ver. C**) according to the screenshot below. Click **Next** and then **Finish**.



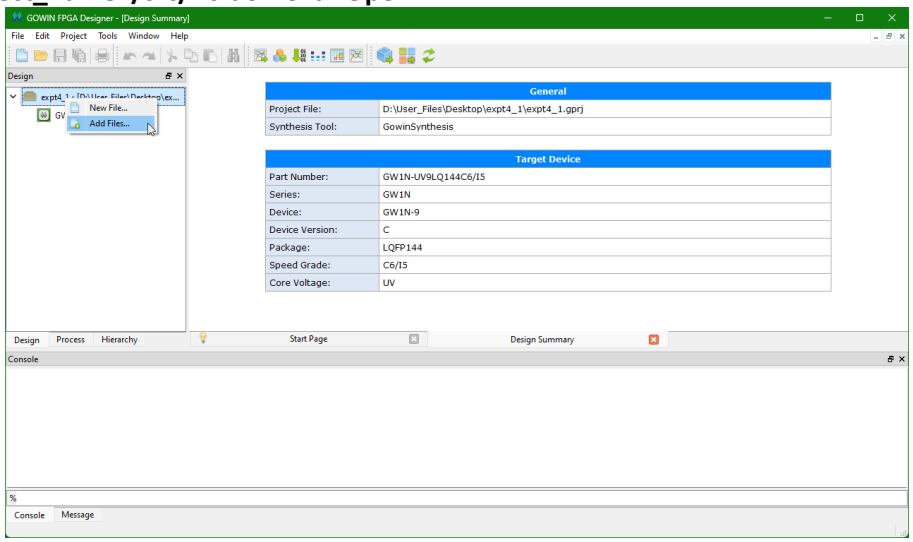
5. If you would like to copy experiment codes to your project, move them to **<project_name>/src/** folder.



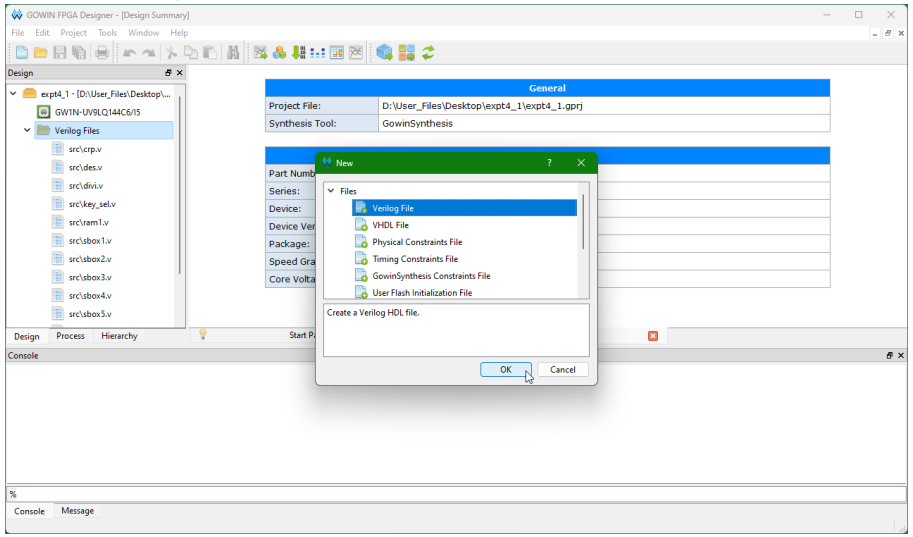
6. Copy GOWIN pin assignment file (**gowin_pin_assignments.cst**) to the **<project_name>/** directory.



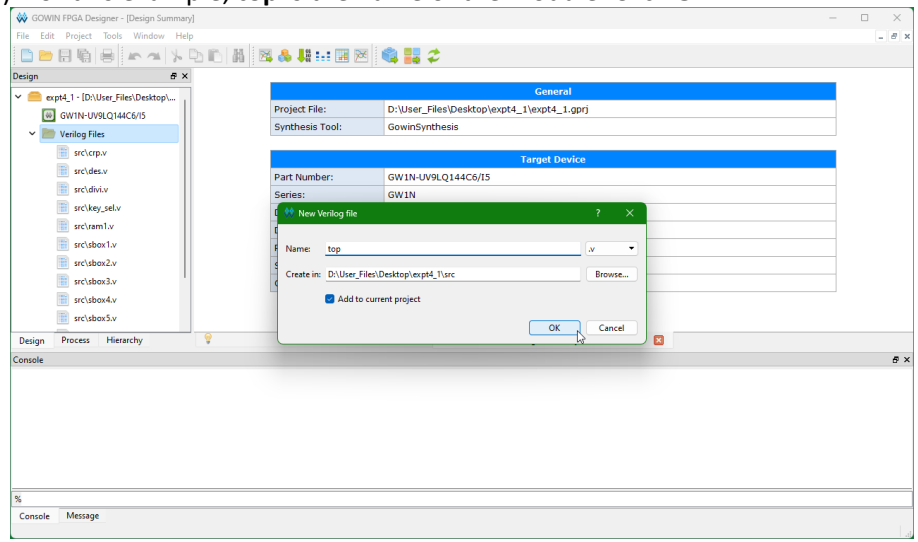
7. In the GOWIN FPGA Designer window, add existing files by right clicking on **<project_name>** on the left sidebar. Click **Add Files…** button. Select all the files inside **<project_name>/src/** folder. Click **Open**.



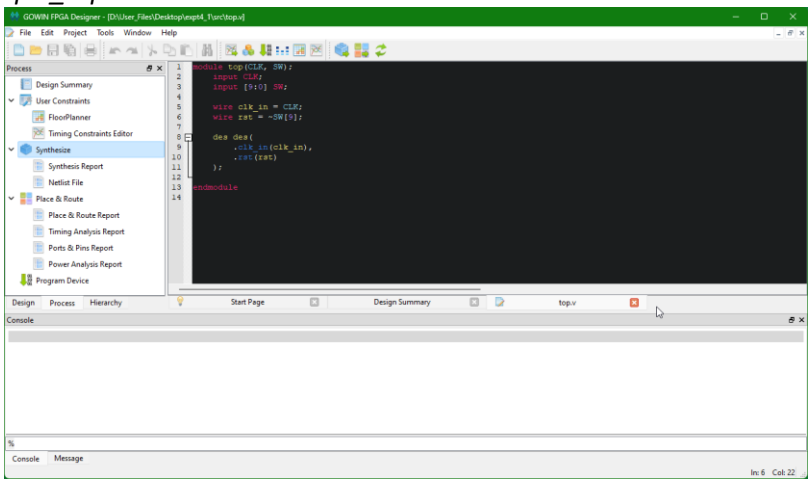
8. If you need to create a new file, right click on the left sidebar and clicking **New File…** button. You can select any of the listed file types. For this example, **Verilog File** was selected. Then, click **OK**.



9. Name your file (no extensions). For this example, **top** is the name of the module. Click **OK**.

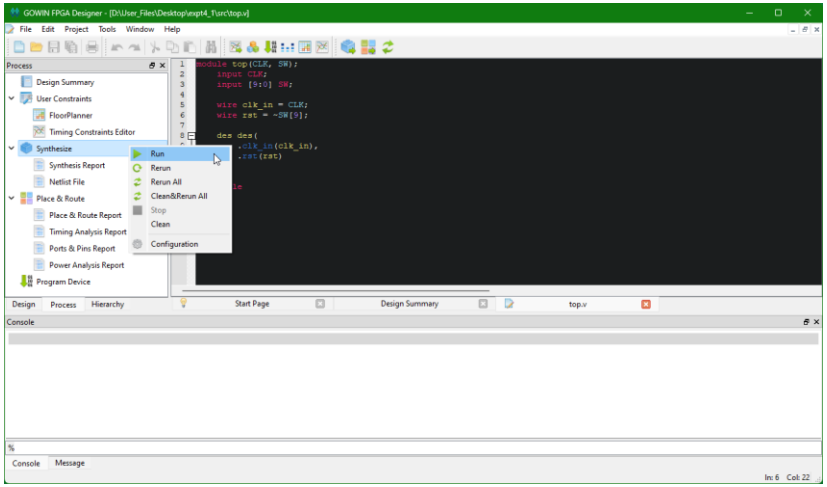


10. For this example, a top module was created as a blank text file. **IT IS HIGHLY RECOMMENDED TO USE THE *sample_top.v* INSIDE THE *HaHav3_helpful_codes.zip* FILE**. This file ensures the pin assignments file map to the correct port names in this file. The module below is a slightly modified version of the *sample_top.v* file. DO NOT USE THE BELOW VERILOG CODE.

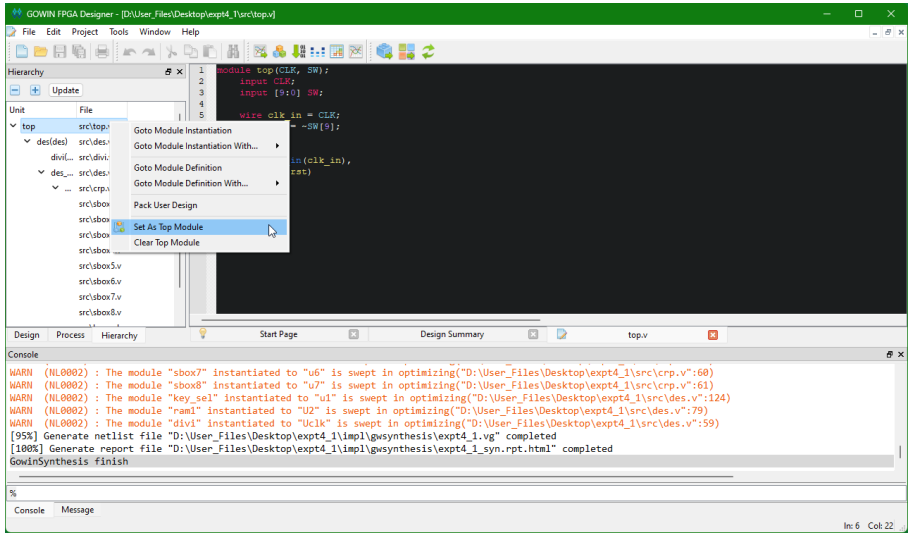


Synthesizing a circuit and assigning pins

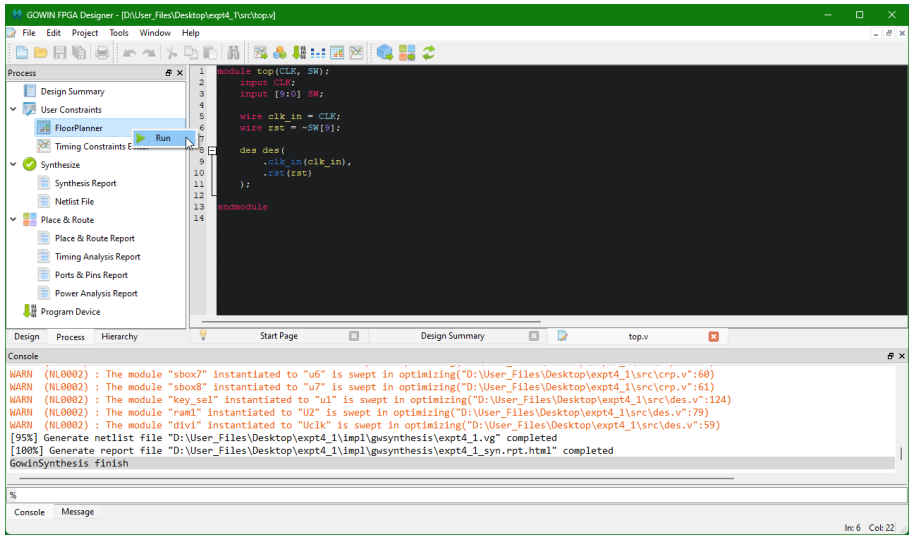
1. Run the synthesis tool by changing the left sidebar to **Process**. Right click on **Synthesize** and Click **Run**.



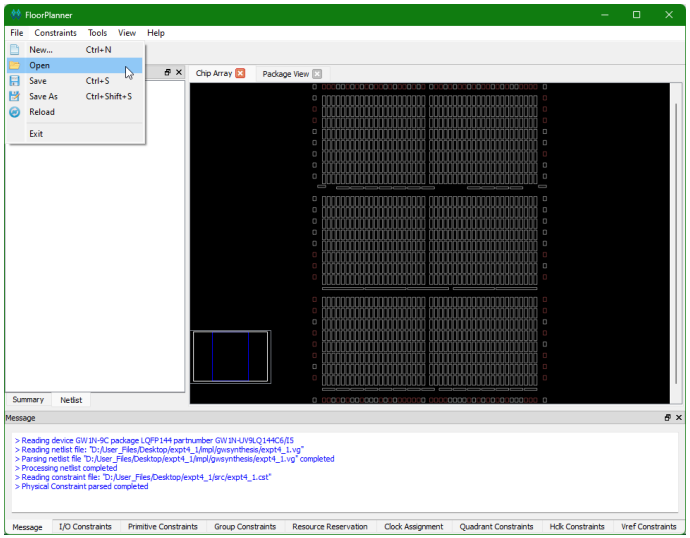
2. Change the left sidebar to **Hierarchy** tab. Right click on **top** and select **Set As Top Module**.



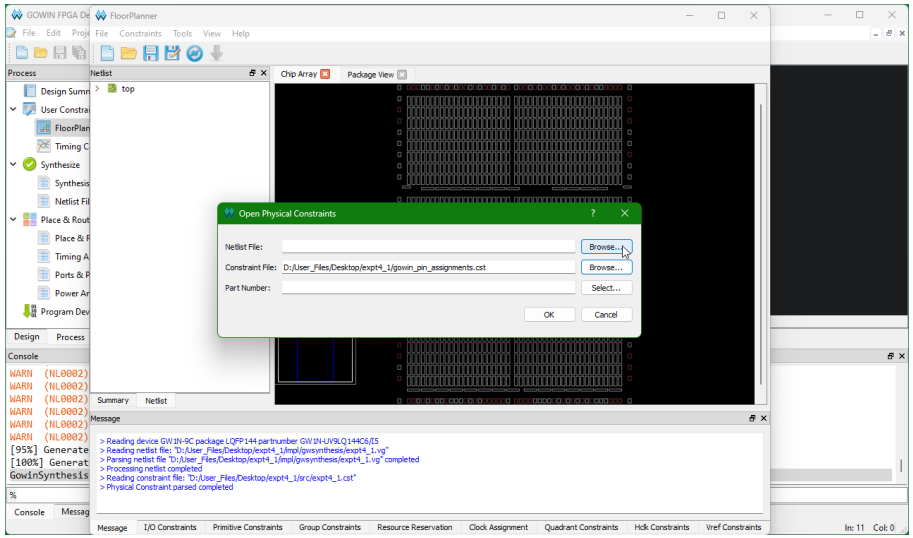
3. Switch back to **Process** tab on the left sidebar. Right click on **FloorPlanner** and select **Run**. Click **Yes** when it prompts to create a CST file.



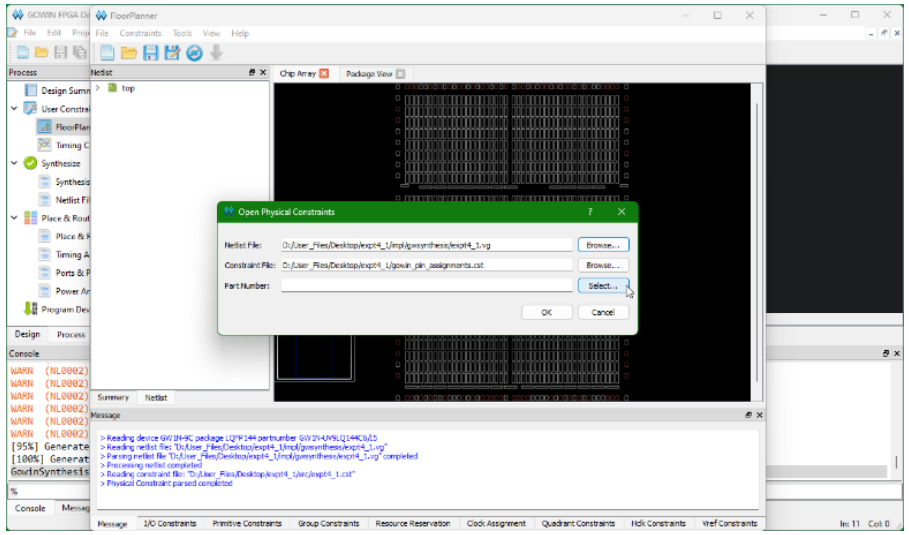
4. In the **FloorPlanner** tool, go to **File** > **Open**.



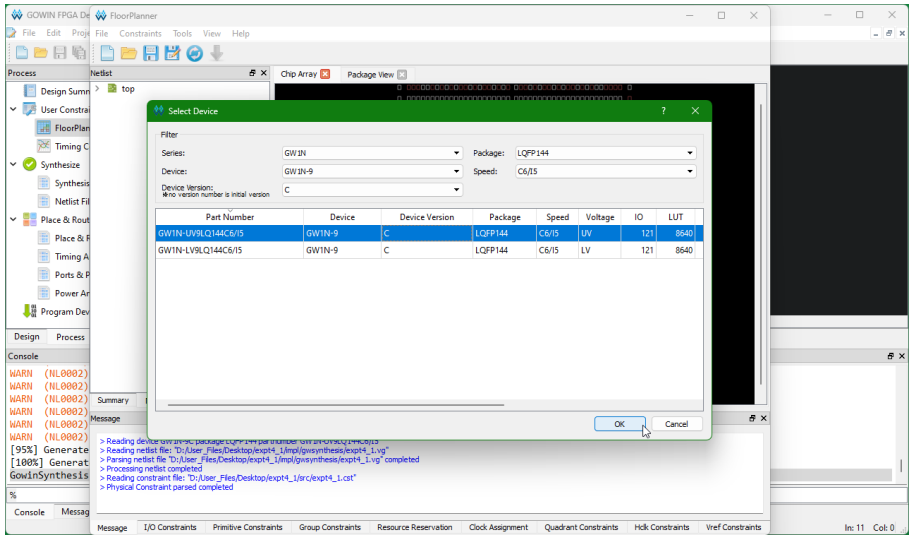
5. In the Open Physical Constraints window, click **Browse** next to Constraint File. Open the ***<project_name>\gowin_pin_assignments.cst*** file.



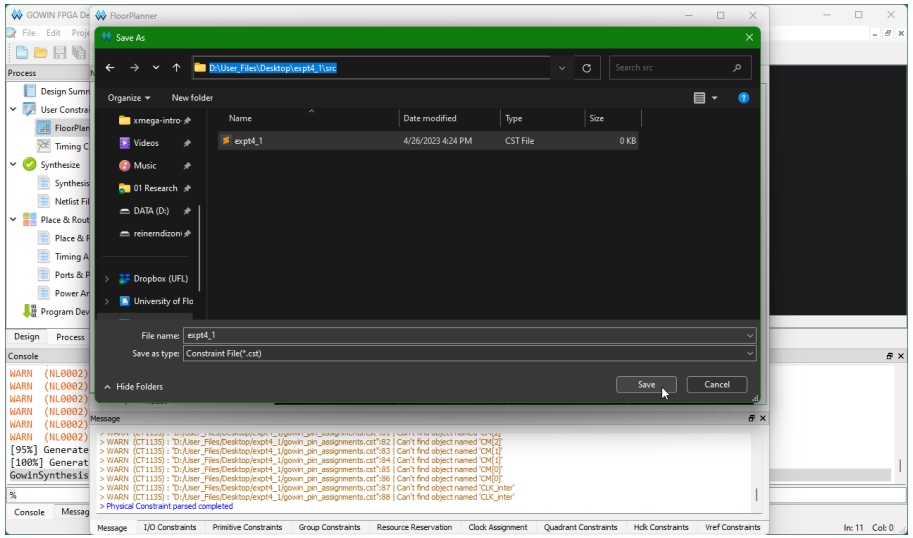
6. Click **Browse** next to Netlist File. Open the ***<project_name>/impl/gwsynthsis/<project_name>.vg*** file.



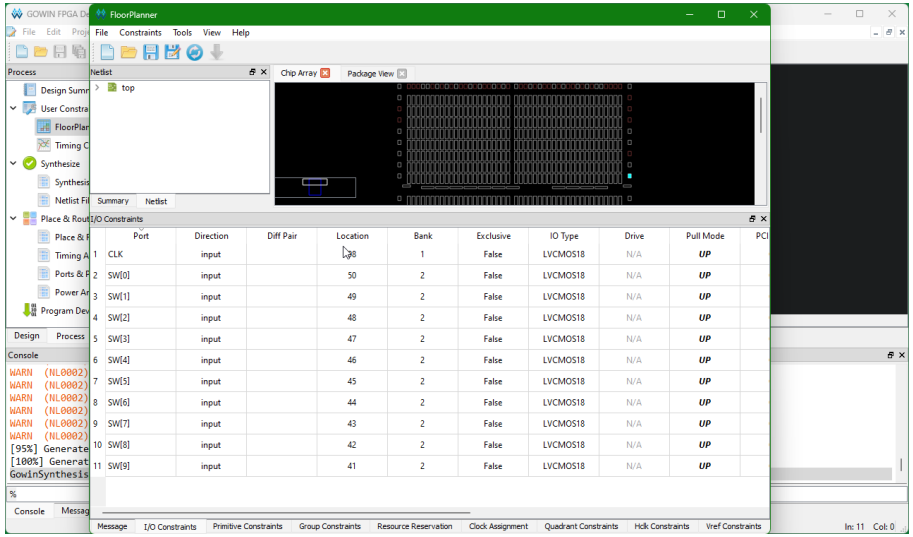
7. Click **Browse** next to Part Number. Configure the device as follows and click **OK**. Click **OK** again.



8. On the FloorPlanner window, click **File** > **Save As…** button. Navigate to **<project_name>*src*\<project_name>*.cst*** file. You can overwrite.

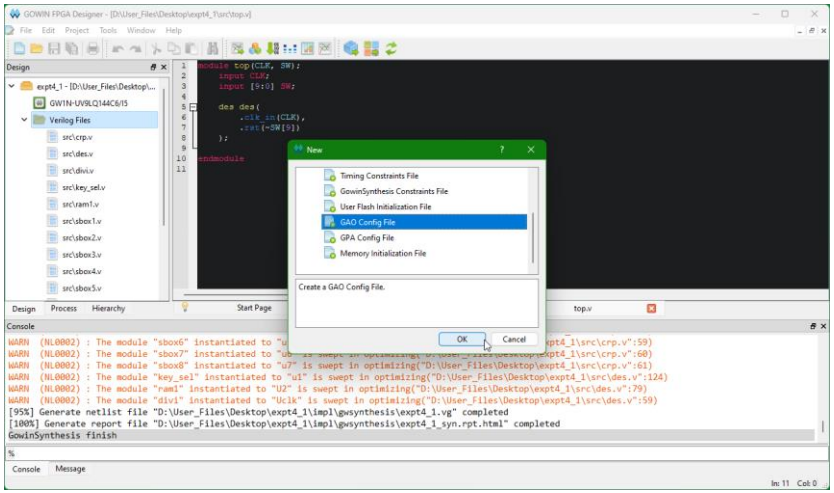


9. Change the bottom tab to I/O constraints. Review the pin assignments below. The next section is optional. If you want to program the FPGA, go to Appendix D.

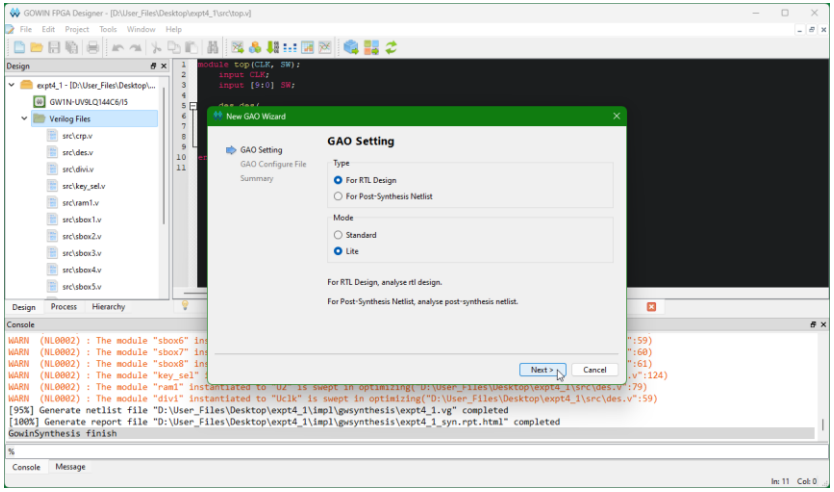


Setup GOWIN Analyzer Oscilloscope file (*Optional*)

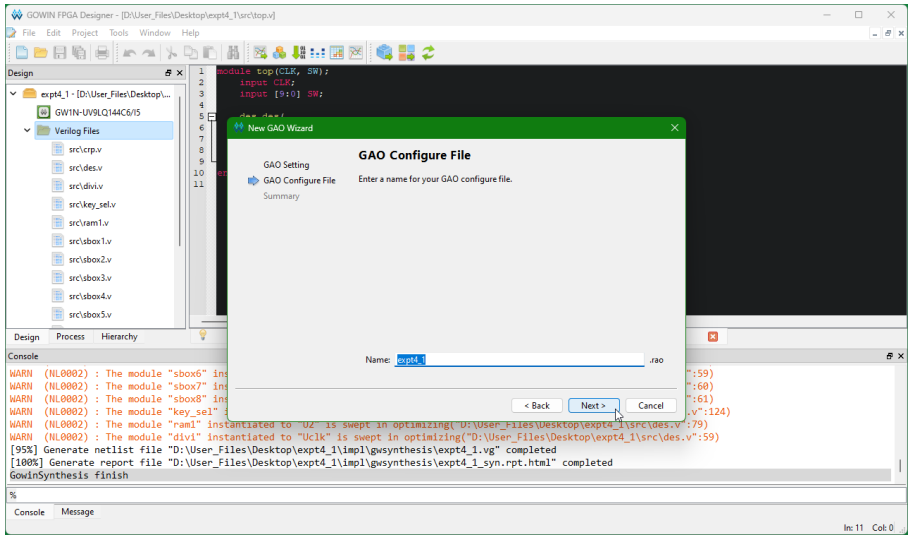
1. Create a new file with type **GAO Config File**. Click **OK**.



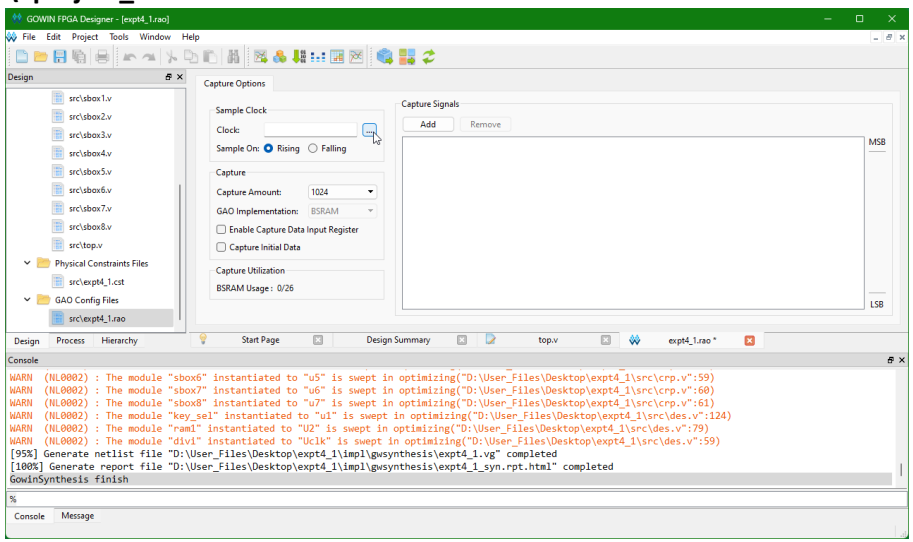
2. Change the mode to **Lite**. Click **Next**.



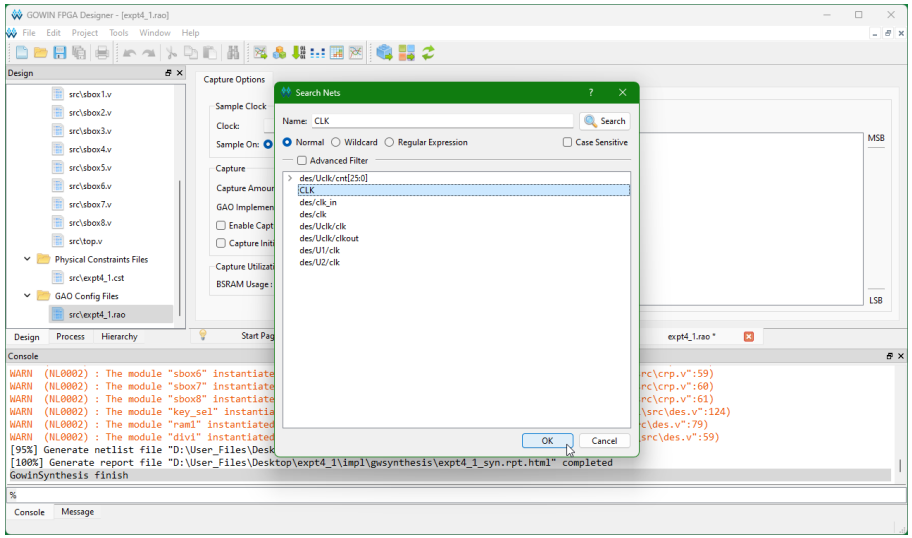
3. Enter a name or leave it as it is. Click **Next** and then **Finish**.



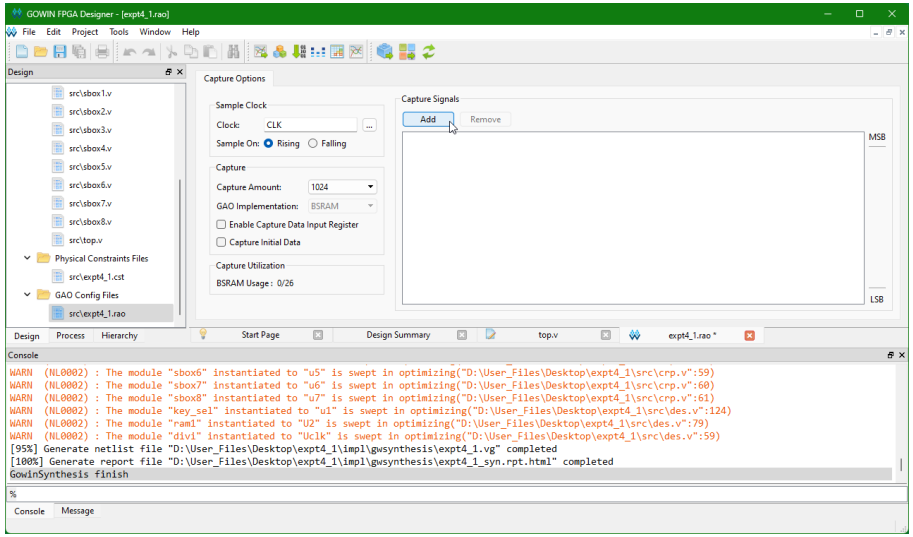
4. In the Design tab, open the **src\<project_name>.rao** file. Click on **…** button next to **Clock**.



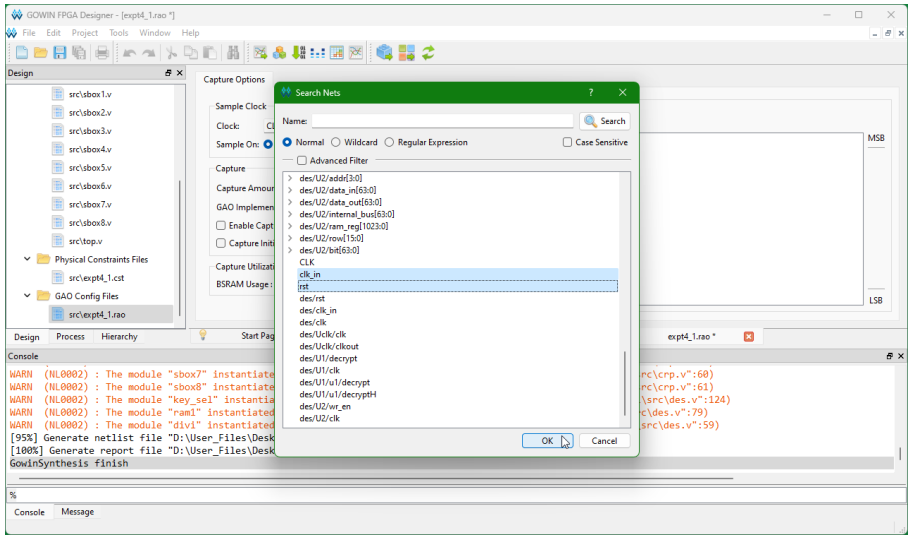
5. Search for **CLK** or *whatever clock signal you used*. Click **OK**.



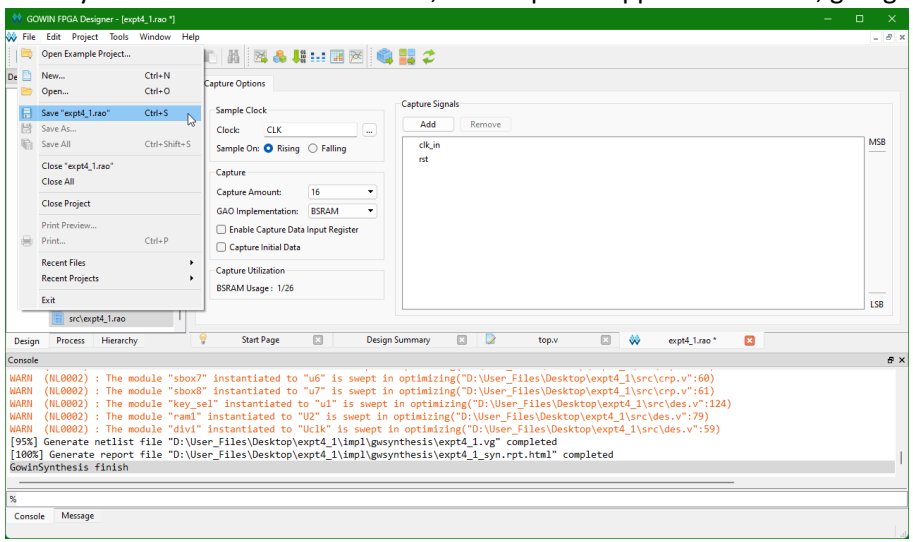
6. Click on **Add** below Capture Signals.



7. Search for any signal you want to monitor (you must choose at least one). Click **OK**.

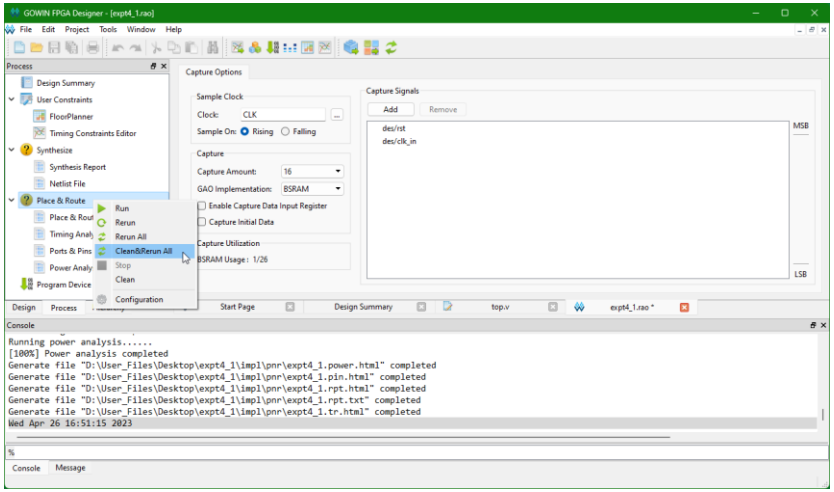


8. Save the **<project_name>.rao** file. If you want to run the GAO tool, run Step 1 of Appendix D. Then, go right into Appendix E afterwards.

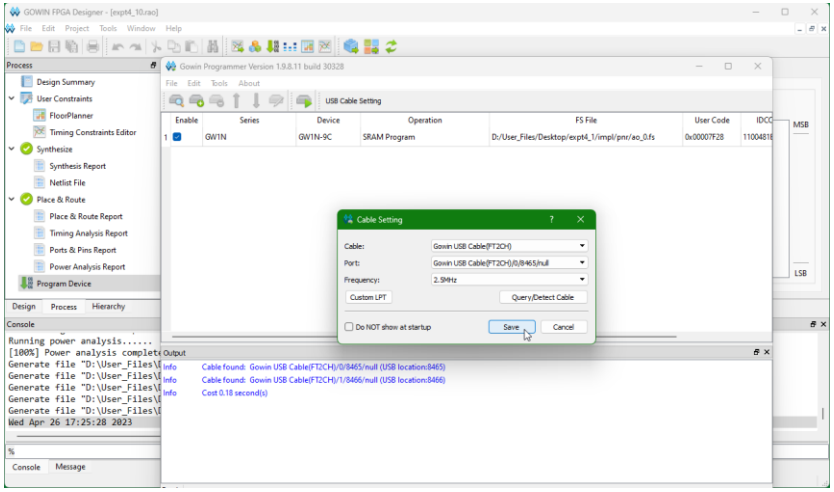


Running Place/Route tool & Programming the FPGA

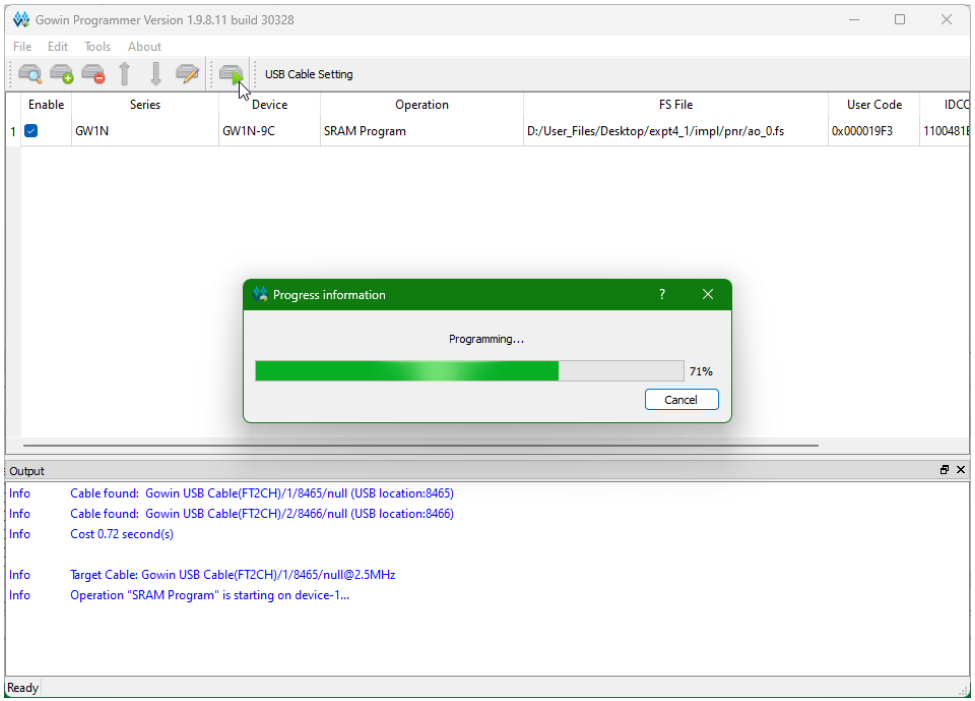
1. Go to Process tab on the left sidebar. Right click on **Place & Route** and click **Clean&Rerun All**.



2. Double click on **Program Device** on the Process tab. Make sure the Port is set to "*Gowin USB Cable(FT2CH)/0/…*" If this is not the case, unplug all USBs and plug in the HaHa FPGA again. Then, click **Save** on the new window.

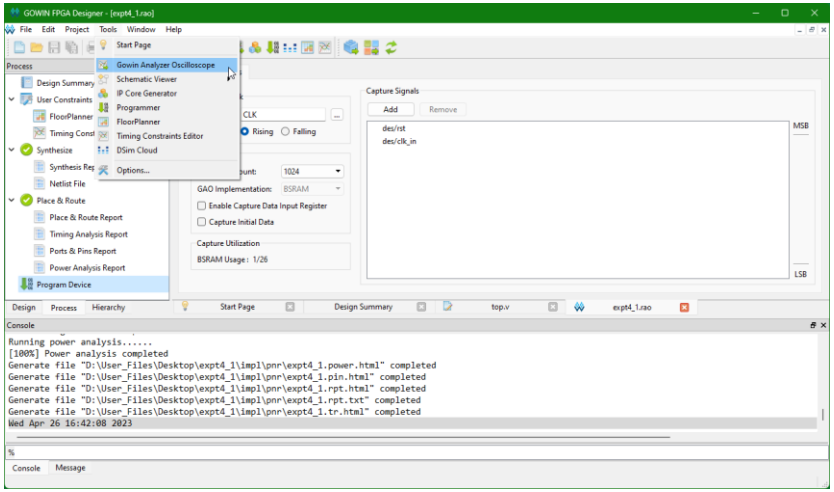


3. Click on the play button. The bitstream will then be programmed to the FPGA.

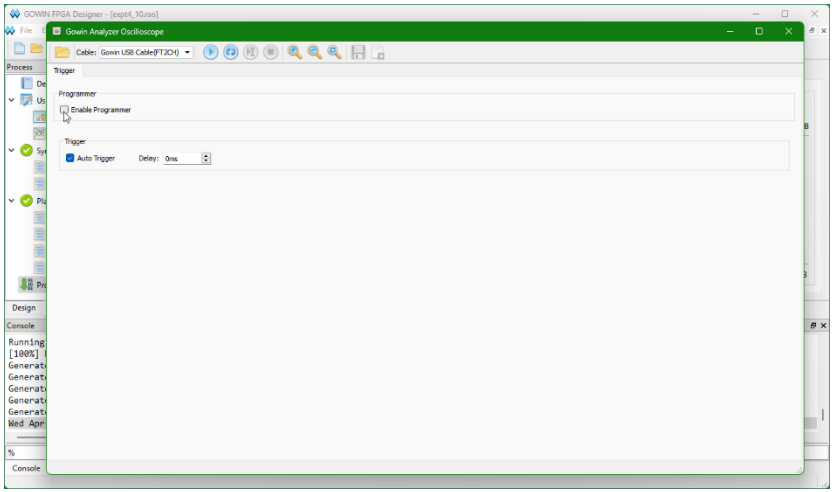


Running the GOWIN Analyzer Oscilloscope tool (*Optional*)

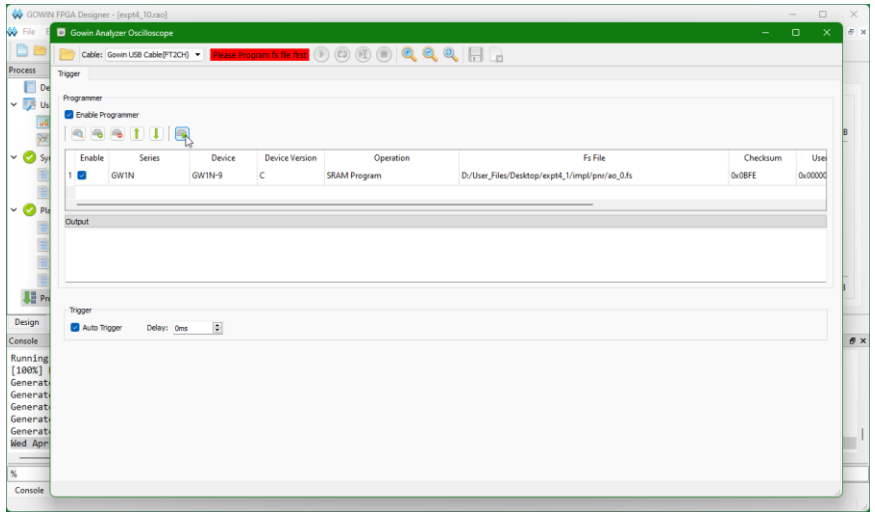
1. Go to **Tools** > **Gowin Analyzer Oscilloscope**.



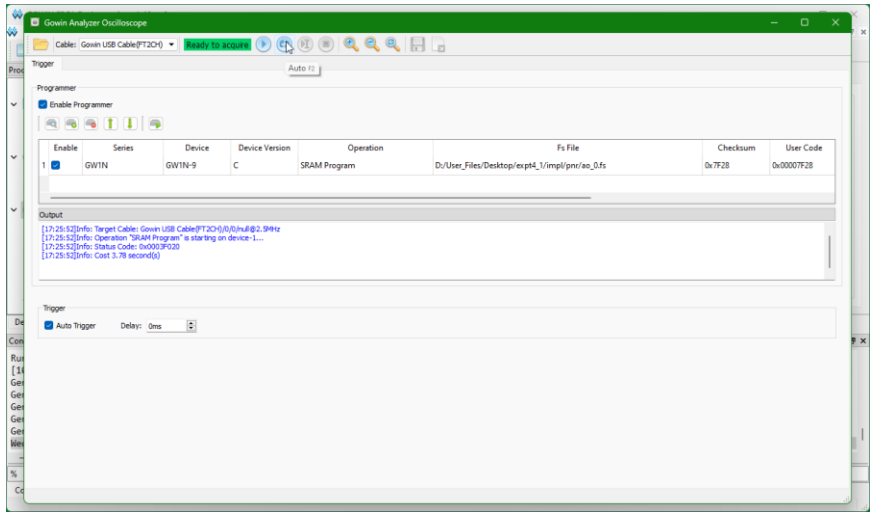
2. Click on **Enable Programmer**.



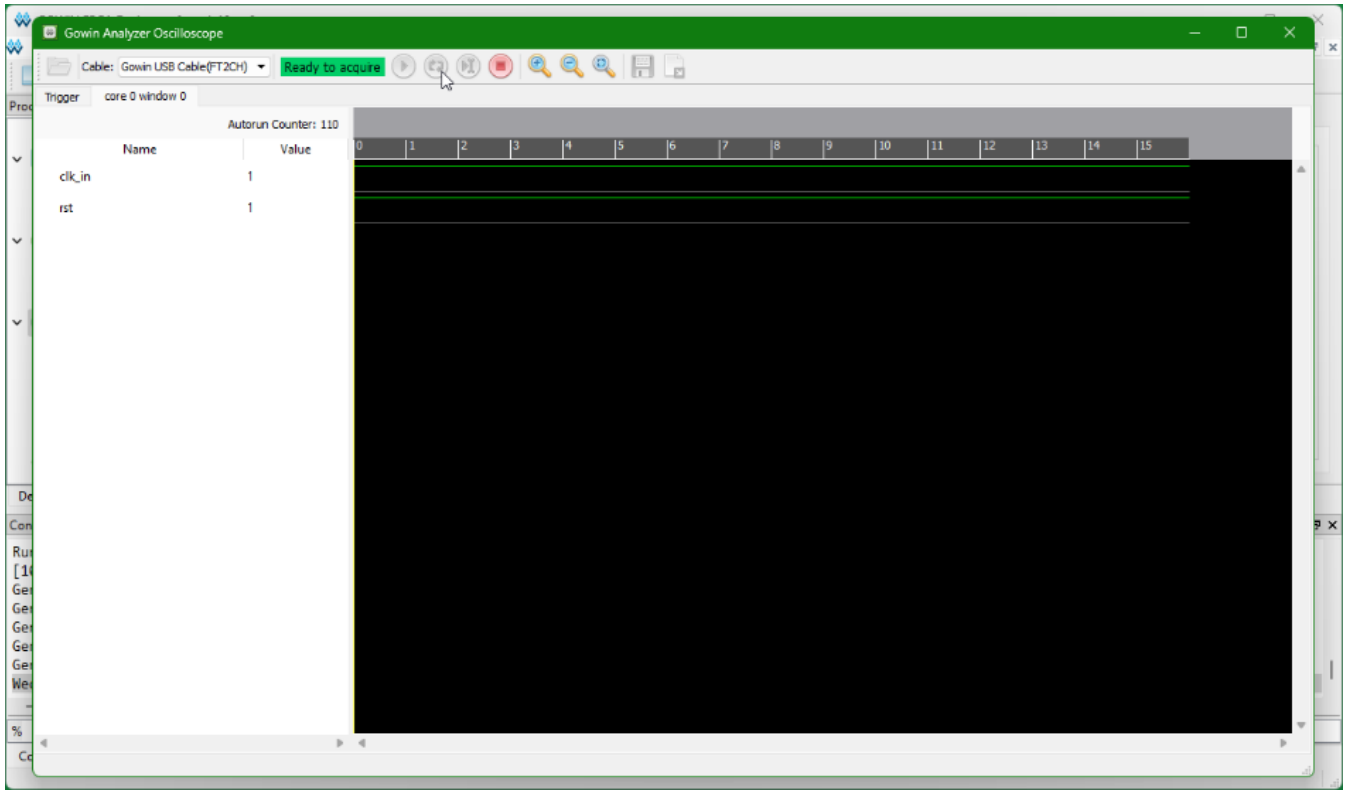
3. Click on the play button.



4. Click on the **Auto** button to start capturing signals.

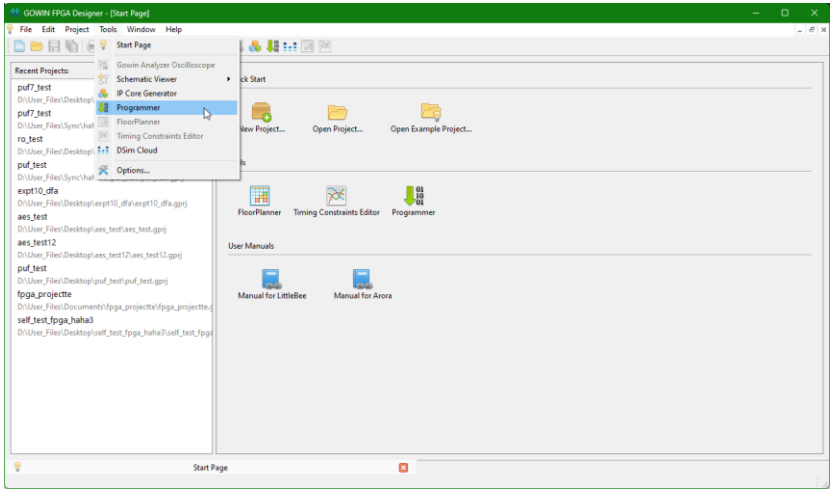


5. You will now see the captured signals that you set up in the RAO file.

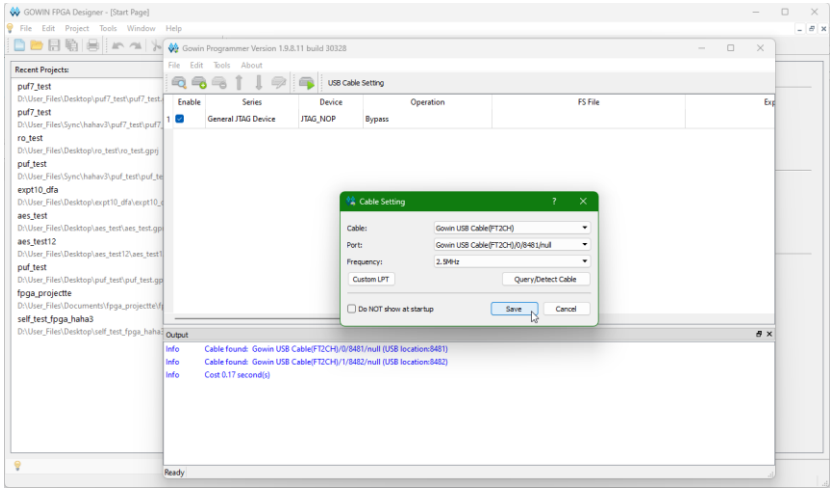


Programming FPGA without project creation

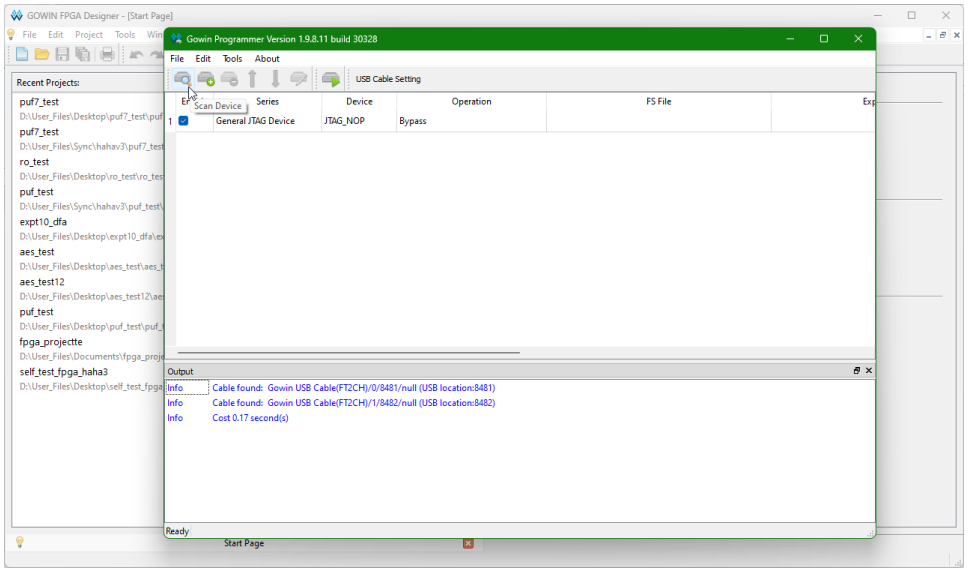
1. Open GOWIN FPGA Designer. Go to **Tools > Programmer**. The *Programmer* window will appear with another window called *Cable Setting*.



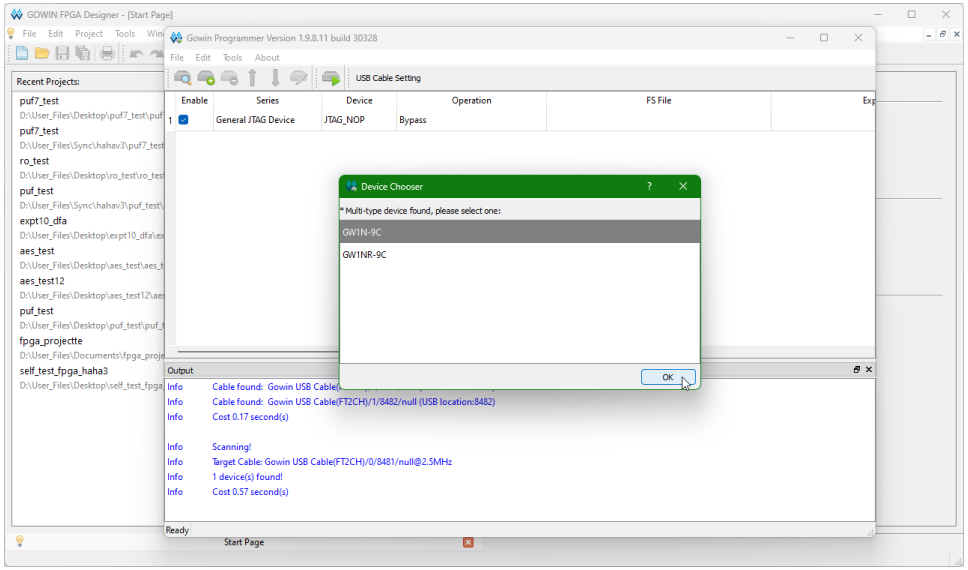
2. Make sure the *Port* is set to "Gowin USB Cable(FT2CH)/0/…" If this is not the case, try unplugging all USB cables and only plugging in the USB A-to-B cable from the HaHa v3.0 board. Otherwise, press **Save**.



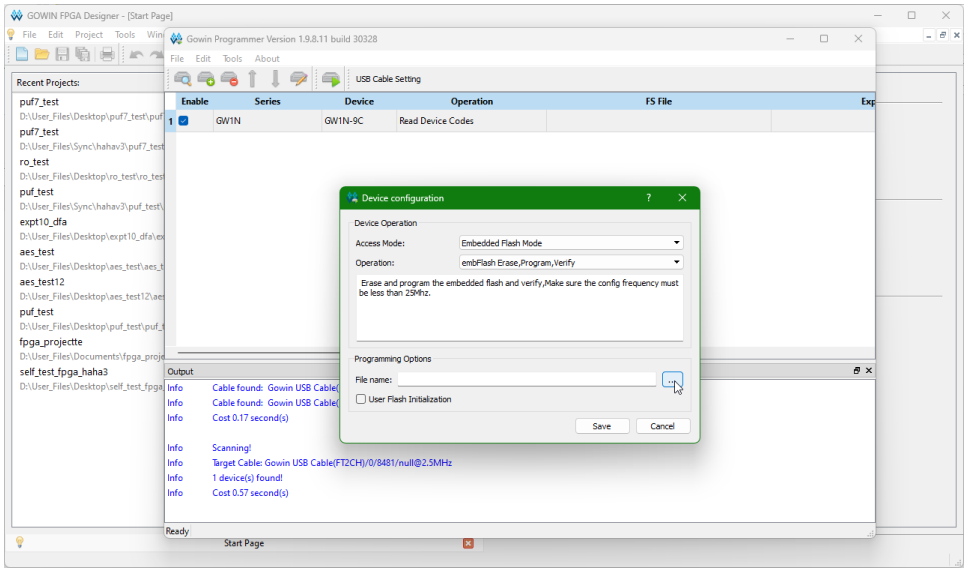
3. Click on the **Find Device** button (first button below menu bar that has a magnifying glass).



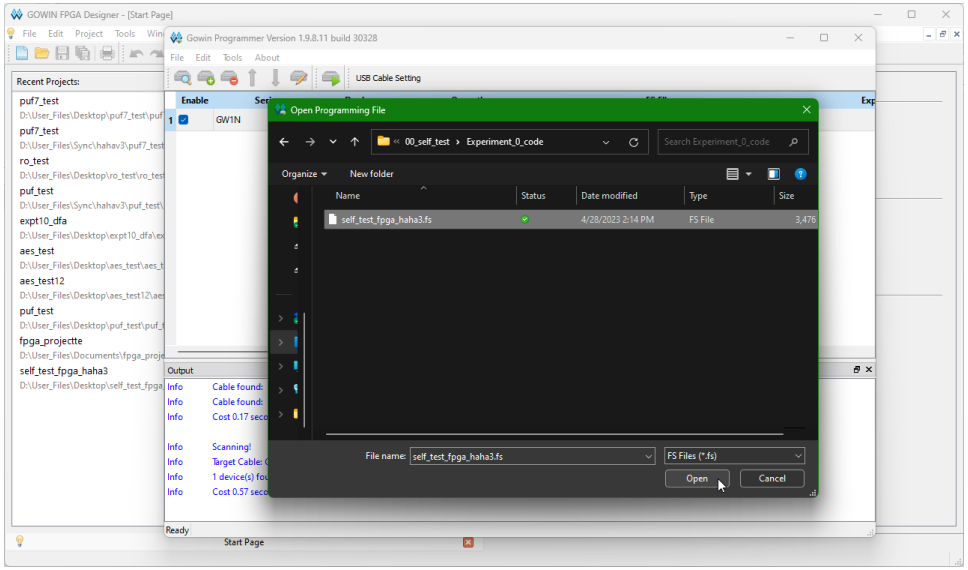
4. Double click on the **GW1N-9C** device.



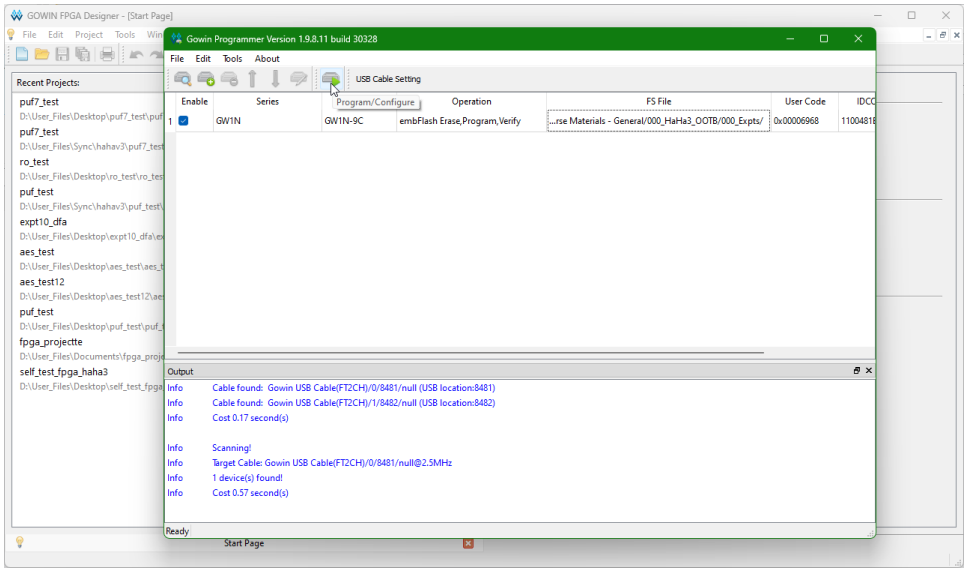
5. Double click on *Read Device Codes* and change the following settings and then Press **Save**. Then, browse for an FS file using "…" button.



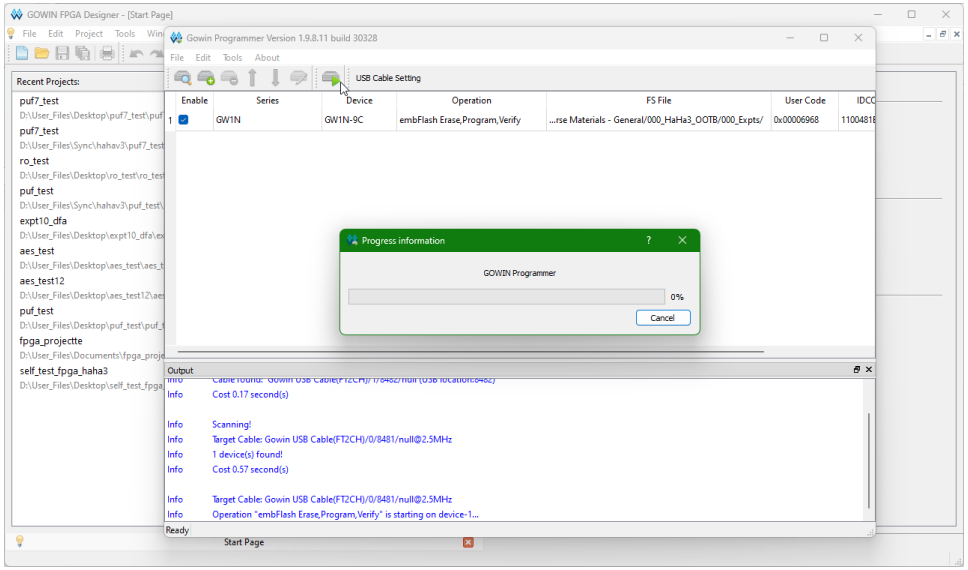
6. Locate your intended FS file and click **Open**.



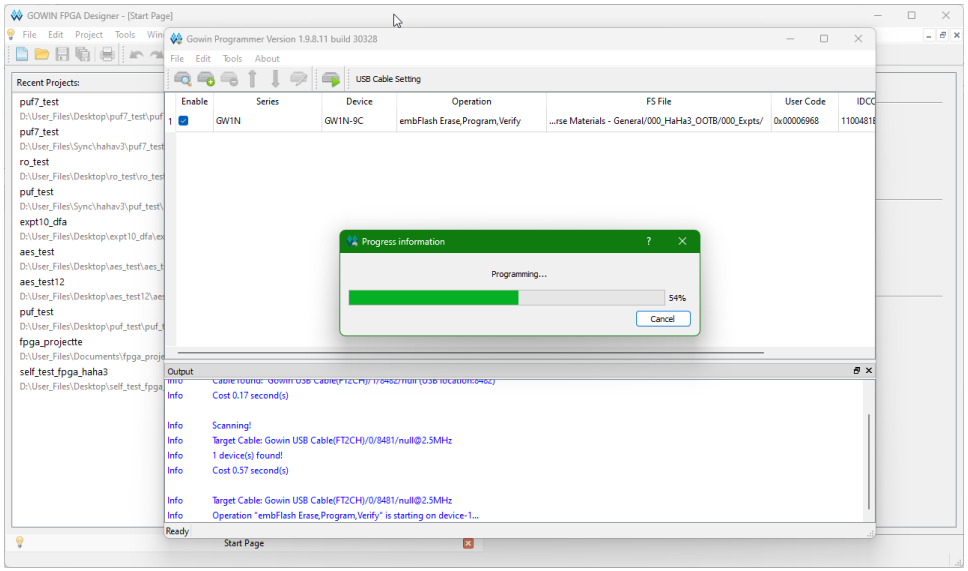
7. Click on **Program/Configure** (play button).



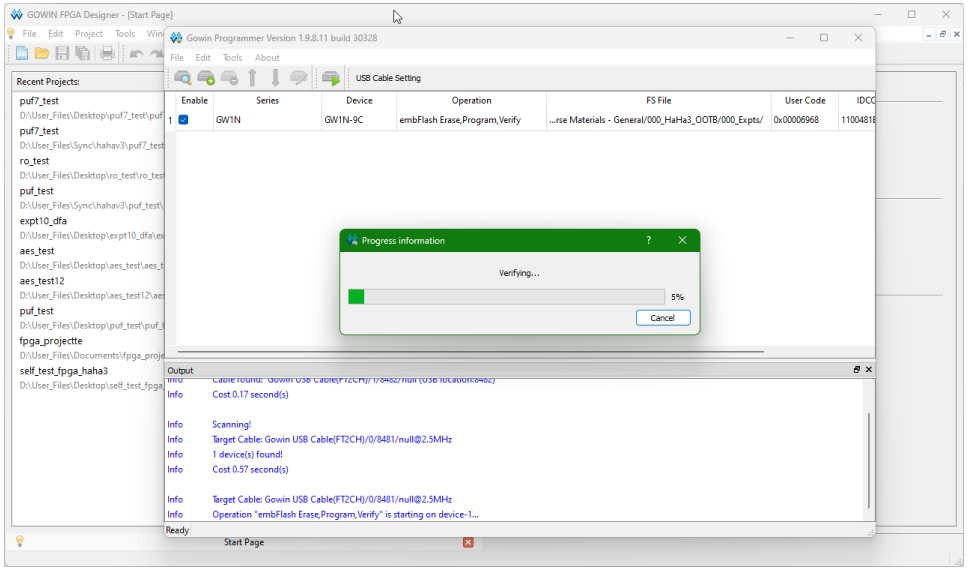
8. FPGA programming will now start.



9. The bitstream is then programmed to the embedded Flash.



10. After programming, the Programmer will verify the programmed bitstream.



11. If the programming is successful, you should see the message in the bottom of the Programmer window.