GOWIN
PROGRAMMING FOR FUTURE

GW1NS-2C MCU

# Quick Design Reference Manual

**RN515-1.1E,2018-11-26**

## Disclaimer

Revision

| Date | Version | Description |
|---|---|---|
| 2018/08/21 | 1.0E | Initial version. |
| 2018/11/26 | 1.1E | Supports debugging, optimization and update of the emulator. |

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# 1 Reference Design

## 1.1 MCU Soft Core Reference Design

Gowin provides MCU soft core reference design:

Gowin GW1NS-2C MCU PACK\Gowin_GW1NS-2C_MCU_RefDesign\FPGA_RefDesign

## 1.2 MCU Software Programming Reference Design

Gowin provides MCU software programming reference design based on ARM KEIL and GNU MCU Eclipse:

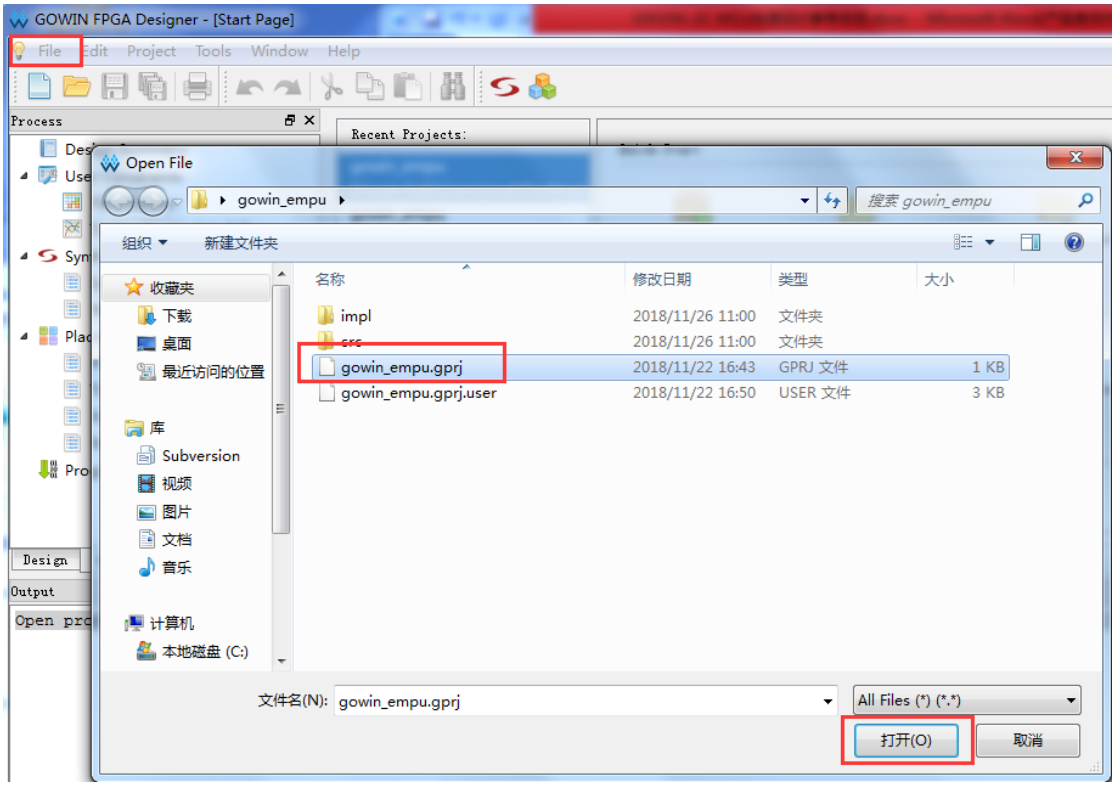
Gowin GW1NS-2C MCU PACK\Gowin_GW1NS-2C_MCU_RefDesign\MCU_RefDesign

# 2MCU soft core design

## 2.1 Import reference design

Double-click to open the Gowin YunYuan Software, select the Open option in the File list of the menu bar, and select the MCU soft core reference design gowin_empu provided by Gowin above, as shown in Figure 2-1.

**Figure 2-1 Import MCU soft core reference design**



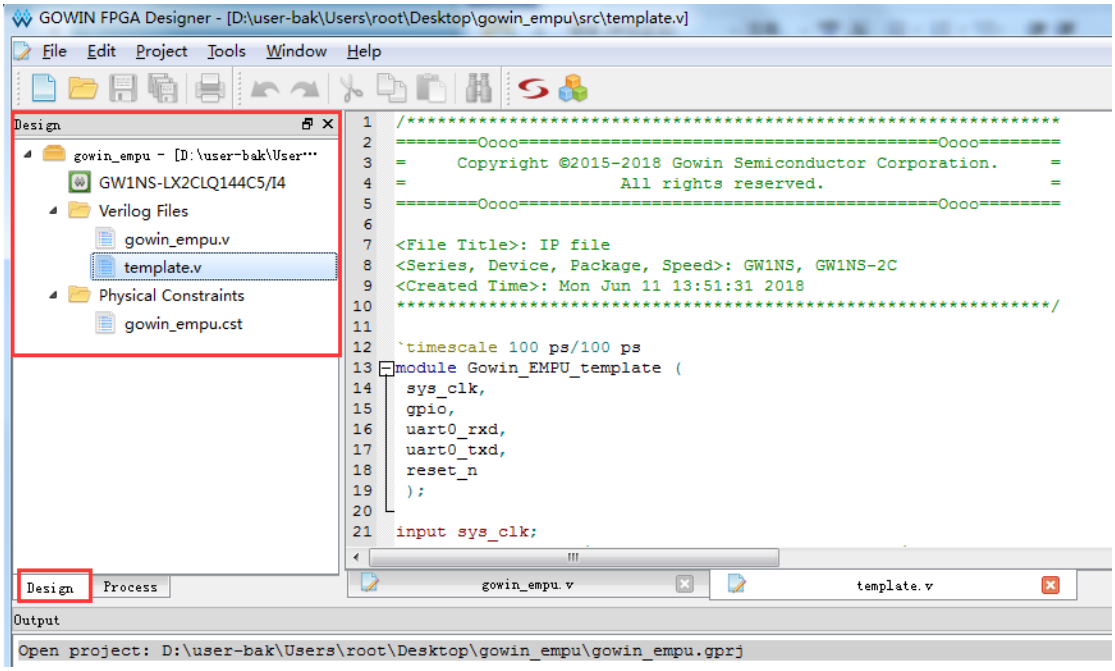

The reference design project includes the following documents, as shown in Figure 2-2.

- gowin_empu.v：Use the MCU soft core generated by the IP Core

Generator, UART0 and GPIO have been selected in this reference design.

- template.v： Example of instantiating an MCU soft core module
- gowin_empu.cst： Physical constraints, including the IO constraint location of the system clock port, system reset port, UART0 port, and GPIO port.

**Figure 2-2 Reference Design Engineering**




For the MCU soft core generation method, please refer to *GW1NS-2C MCU Hardware Design Reference Manual*.

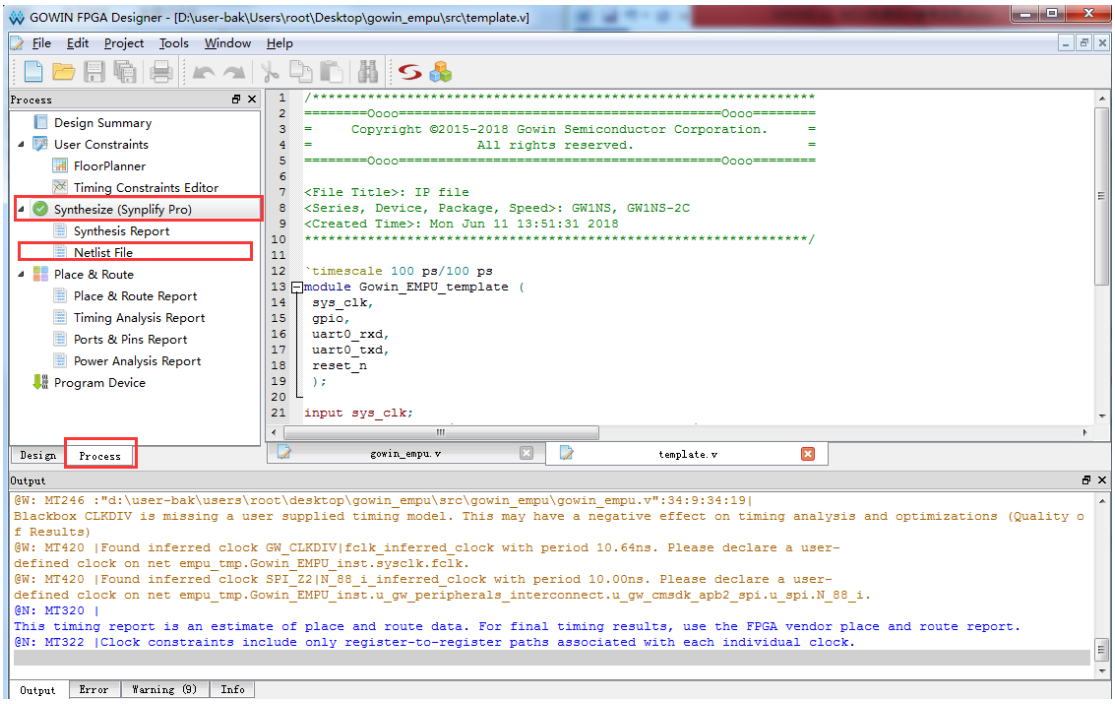
Please refer to *Gowin YunYuan Software User Guide* for how to use Gowin YunYuan Software.

Please refer to *Gowin Design Constraints Guide* for the method of generating physical constraint files.

# 2.2 Synthesis

Run the synthesis tool Synplify_Pro to generate a netlist file based on the synthesized reference design, as shown in Figure 2-3.

**Figure 2-1 Synthesized reference design**

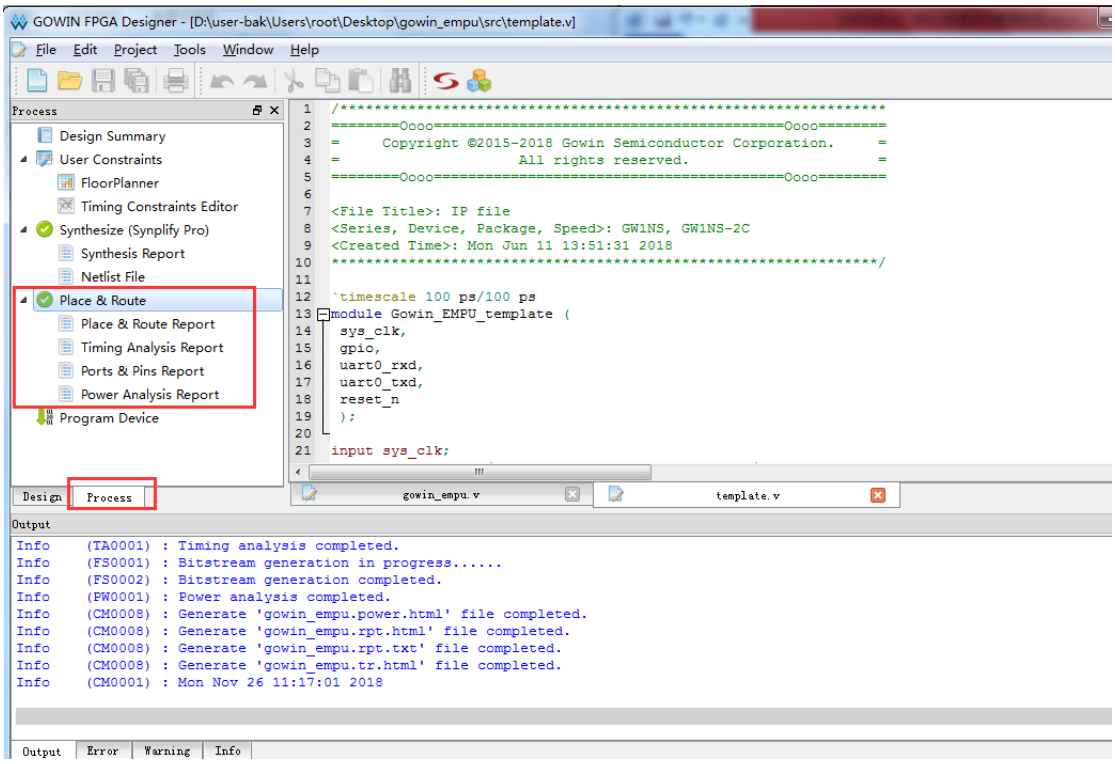



Please refer to *Gowin YunYuan Software User Guide* for how to use the synthesized tools.

# 2.3 Place and Route

After the synthesis is complete, run the Place and Route tool, to generate the code stream file, as shown in Figure 2-4.

**Figure 2-2 Place and Route**

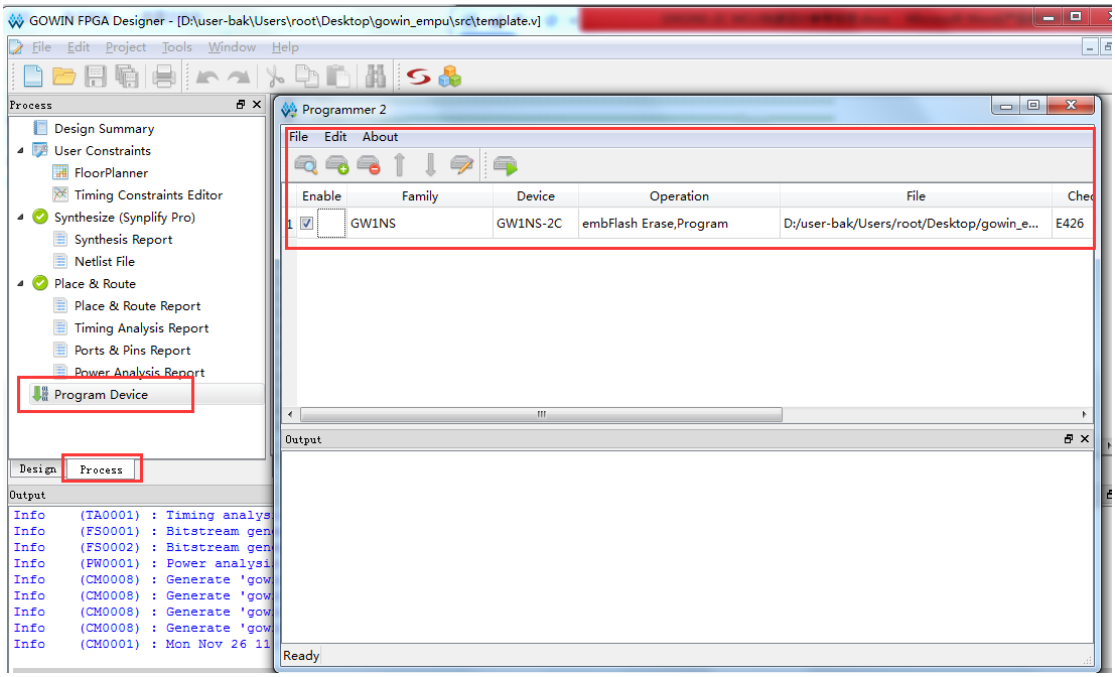



Please refer to *Gowin YunYuan Software User Guide* for how to use the place and route tools.

# 2.4 Programmer

After the stream file is generated, use the Programmer to program the stream file to the FPGA Flash, as shown in Figure 2-5.

**Figure 2-3 Programming code stream**




Please refer to *Gowin Programmer User Guide* for how to use the Programmer.

# 2.5 Debugging

Gowin uses the GAO online logic analyzer to debug the FPGA design.

Please refer to *GAO Online Logic Analyzer User Guide* for how to use GAO.

# 3 MCU software programming

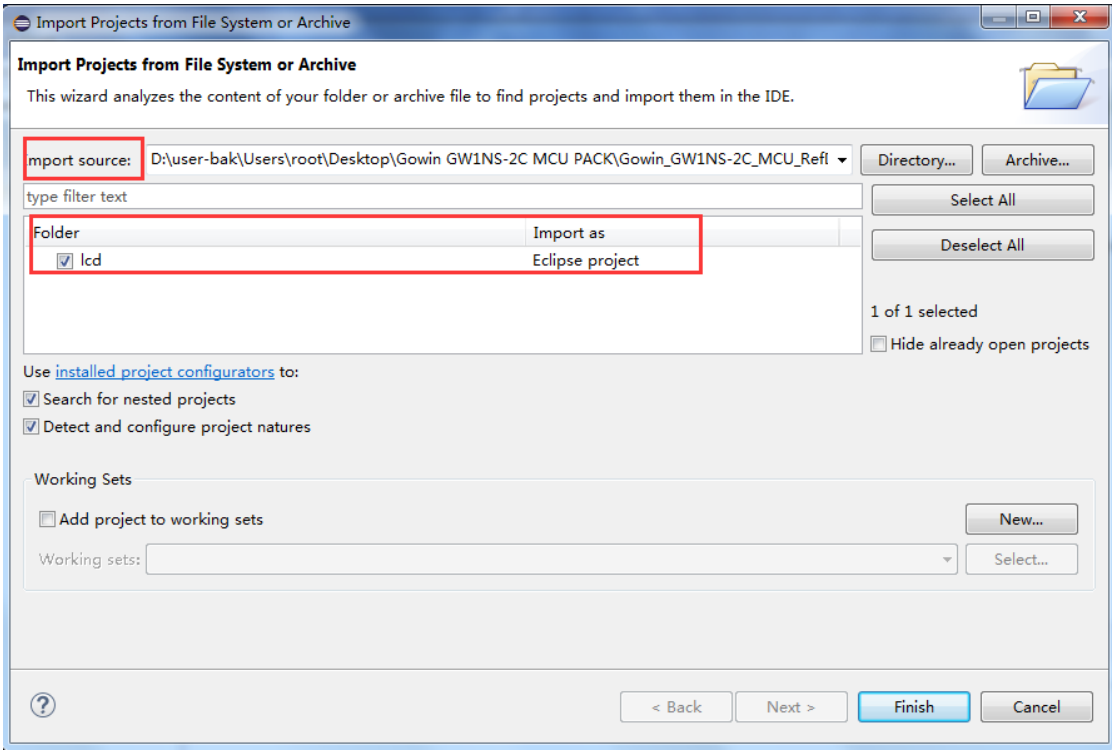
Gowin provides software programming reference designs based on ARM KEIL and GNU MCU Eclipse, including

- LED water light example
- LCD display example
- uC/OS-III operating system example
- FreeRTOS operating system example
- Timer example
- Watchdog example
- Serial port debugging example

## 3.1 Import reference design

Double-click to open the Eclipse IDE, select Open Projects from File System in the File list of the menu bar, and import the reference design lcd, as shown in Figure 3-1.

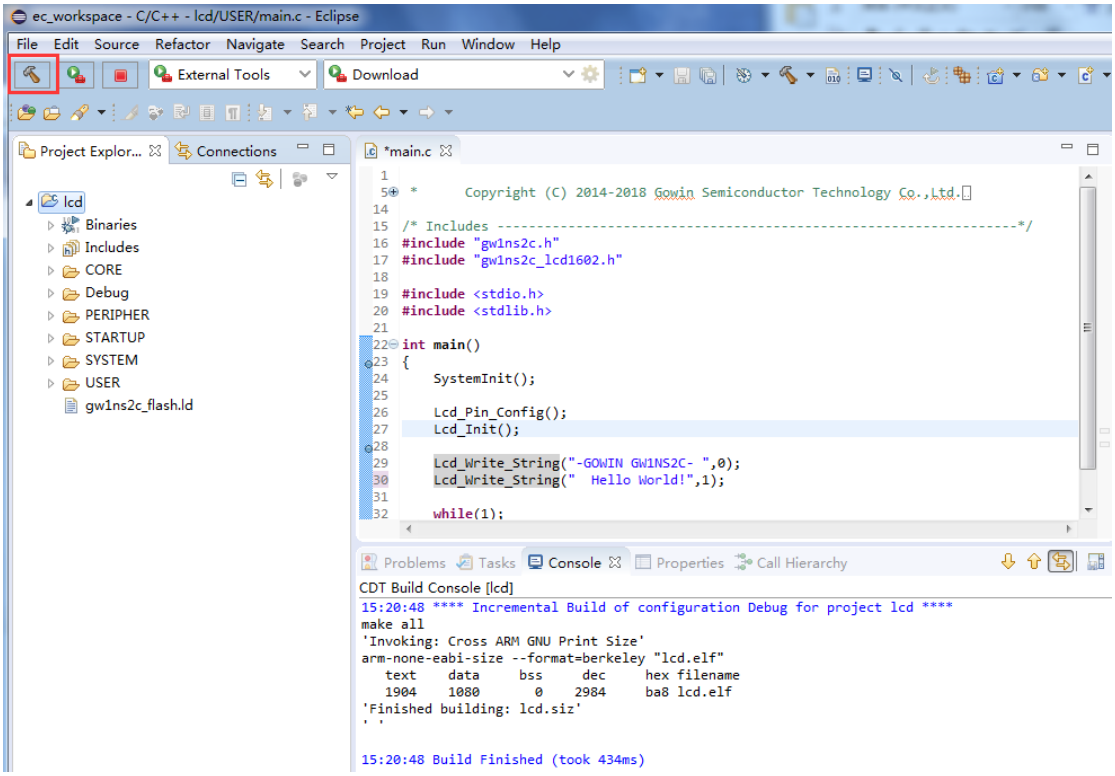
**Figure 3-1 Import reference design**




# 3.2 Compilation

Click the toolbar compile button to compile the reference design and generate the MCU image file, as shown in Figure 3-2.

**Figure 3-2 Compilation**



Please refer to *GW1NS-2C MCU IDE Software Reference Manual* for how to use GNU MCU Eclipse.

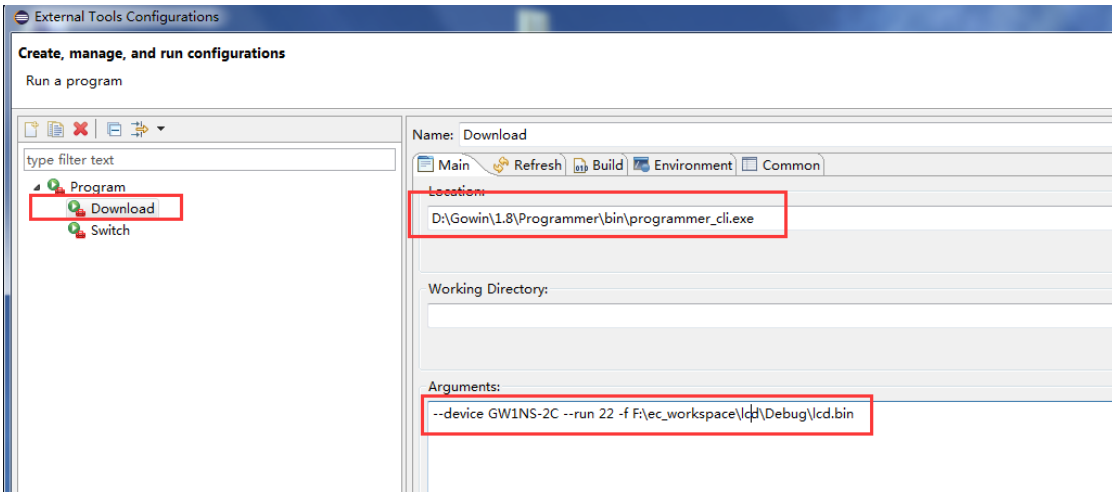
# 3.3 Programmer

## 3.3.1 Configuring the Programmer Tool

Gowin uses the Programmer to program the MCU image file.

Select External Tools in the Run list of the menu bar, select External Tools Configurations..., and configure the programmer tool path to the local installation path and the MCU image file to be programmed, as shown in Figure 3-3.

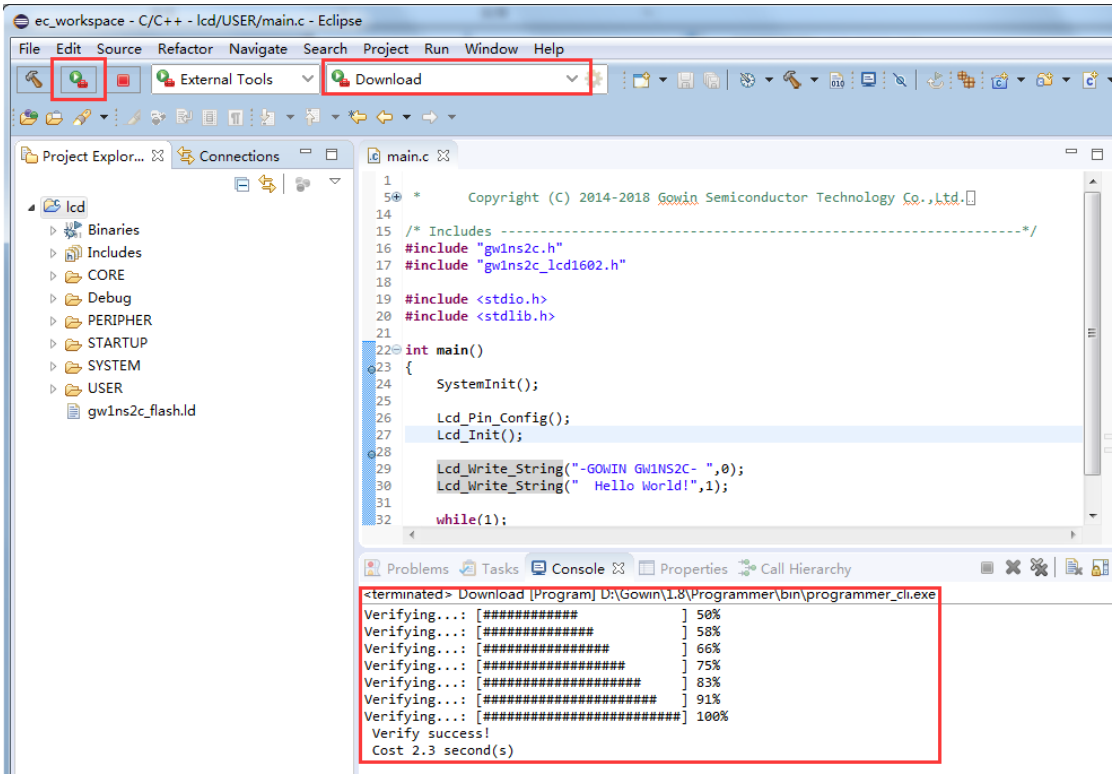
**Figure 3-3 Configuring the Programmer Tool**




## 3.3.2 Programmer

Complete the Programmer tool configuration, click the Toolbar Programmer button, and program the MCU image file to the MCU Flash-Rom, as shown in Figure 3-4.

**Figure 3-4 Programmer**




Please refer to *Gowin Programmer User Guide* for programmer use method.

# 3.4 Programmer

Gowin supports two types of MCU software programming debugging methods:

- Emulator debugging
- Serial debugging

## 3.4.1 Emulator debugging

GNU MCU Eclipse supports the J-LINK emulator to set breakpoints for one-step debugging.

Please refer to *GW1NS-2C MCU IDE Software Reference Manual*.

## 3.4.2 Serial port debugging

Use the serial port and serial port debugging assistant to track the running status.

Please refer to *GW1NS-2C MCU Serial Porting Reference Manual*.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