

GW1NS-2C MCU

Quick Design Reference Manual

RN515-1.1E,2018-11-26

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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

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2_{MCU} 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.

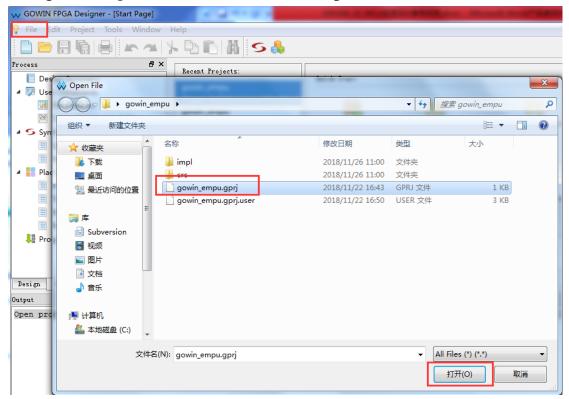


Figure 2-1 Import MCU soft core reference design

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

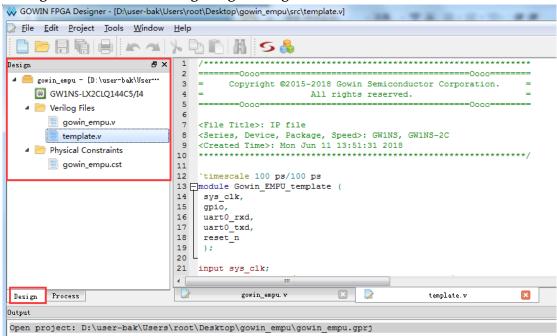
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2MCU soft core design 2.2Synthesis

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 <u>GW1NS-2C</u> MCU Hardware Design Reference Manual.

Please refer to <u>Gowin Yun Yuan Software User Guide</u> for how to use Gowin Yun Yuan Software.

Please refer to <u>Gowin Design Constraints Guide</u> for the method of generating physical constraint files.

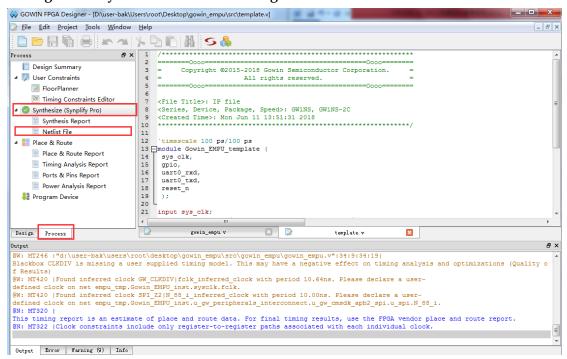
2.2 Synthesis

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

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2MCU soft core design 2.3Place and Route

Figure 2-1 Synthesized reference design



Please refer to <u>Gowin Yun Yuan Software User Guide</u> for how to use the synthesized tools.

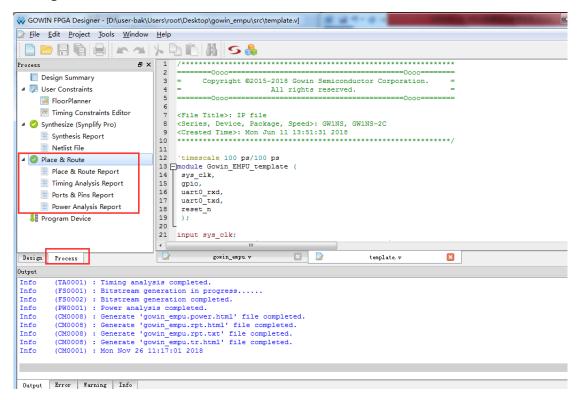
2.3 Place and Route

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

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2MCU soft core design 2.4Programmer

Figure 2-2 Place and Route



Please refer to <u>Gowin Yun Yuan Software User Guide</u> 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.

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2MCU soft core design 2.5Debugging

W GOWIN FPGA Designer - [D:\user-bak\Users\root\Desktop\gowin_empu\src\template.v] ₽ × Programmer 2 Process Design Summary File Edit About △ 🥦 User Constraints Q 🔫 🔫 🕆 FloorPlanner M Timing Constraints Editor Enable Device Operation Che ■ O Synthesize (Synplify Pro) GW1NS GW1NS-2C embFlash Erase,Program D:/user-bak/Users/root/Desktop/gowin_e... E426 Synthesis Report Netlist File 🛮 🥝 Place & Route Place & Route Report Timing Analysis Report Ports & Pins Report **↓** Program Device ₽× Process Output (TA0001) : Timing analy (FS0001) : Bitstream ge (FS0002) : Bitstream ge (FS0002): Bitstream ge: (FW0001): Power analys: (CM0008): Generate 'go: (CM0008): Generate 'go: (CM0008): Generate 'go: (CM0008): Generate 'go: (CM0001): Mon Nov 26 1 Info

Figure 2-3 Programming code stream

Please refer to <u>Gowin Programmer User Guide</u> 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.

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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.

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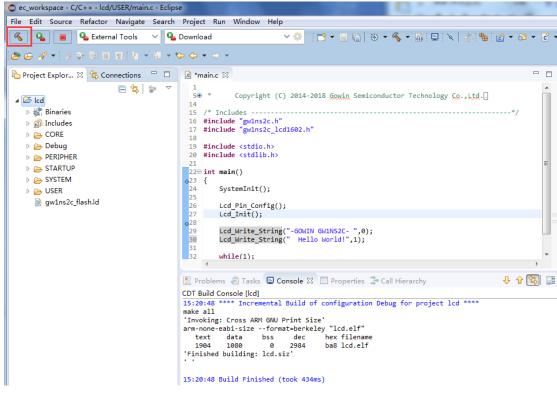
Import Projects from File System or Archive - - X Import Projects from File System or Archive This wizard analyzes the content of your folder or archive file to find projects and import them in the IDE. mport source: D:\user-bak\Users\root\Desktop\Gowin GW1NS-2C MCU PACK\Gowin_GW1NS-2C_MCU_Refl • Directory... Archive... type filter text Select All Folder Deselect All √ Icd Eclipse project 1 of 1 selected Hide already open projects Use installed project configurators to: ✓ Search for nested projects Detect and configure project natures Working Sets Add project to working sets New... Working sets: Select. ? Next > Finish Cancel

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



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Please refer to <u>GW1NS-2C MCU IDE Software Reference Manual</u> for how to use GNU MCU Eclipse.

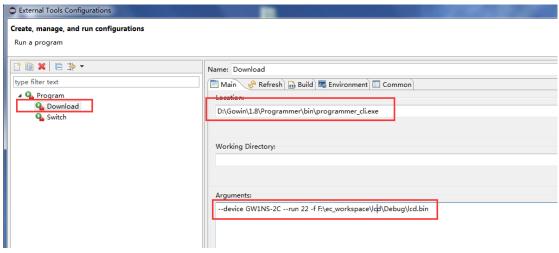
3.3 Programmer

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

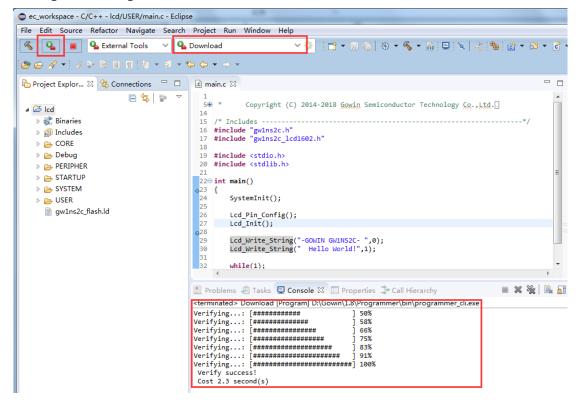


3.3.2 Programmer

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.

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Figure 3-4 Programmer



Please refer to <u>Gowin Programmer User Guide</u> 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 <u>GW1NS-2C MCU IDE Software Reference Manual</u>.

3.4.2 Serial port debugging

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

Please refer to <u>GW1NS-2C MCU Serial Porting Reference</u> Manual.

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