Gowin_EMPU_M3 Quick Design

Reference Design

IPUG921-1.1E, 07/16/2021

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Revision History

Date	Version	Description
04/03/2020	1.0E	Initial version published.
07/16/2021	1.1E	● FPGA and MCU software version updated; ● The synthsis tool, SynplifyPro, deleted.

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1 Reference Design

1.1 Software Programming Reference Design

Gowin_EMPU_M3 provides software programming reference design in ARM Keil MDK (V5.26 and above) and GOWIN MCU Designer (V1.1 and above).

- Gowin_EMPU_M3\ref_design\MCU_RefDesign\Keil_RefDesign
- Gowin_EMPU_M3\ref_design\MCU_RefDesign\GMD_RefDesign

1.2 Hardware Reference Design

Gowin_EMPU_M3 provides hardware reference design:

Gowin_EMPU_M3\ref_design\FPGA_RefDesign

2 Hardware Reference Design

2.1 Hardware Environment

DK-START-GW2A55 V1.3: GW2A-LV55PG484C8/I7

2.2 Software Environment

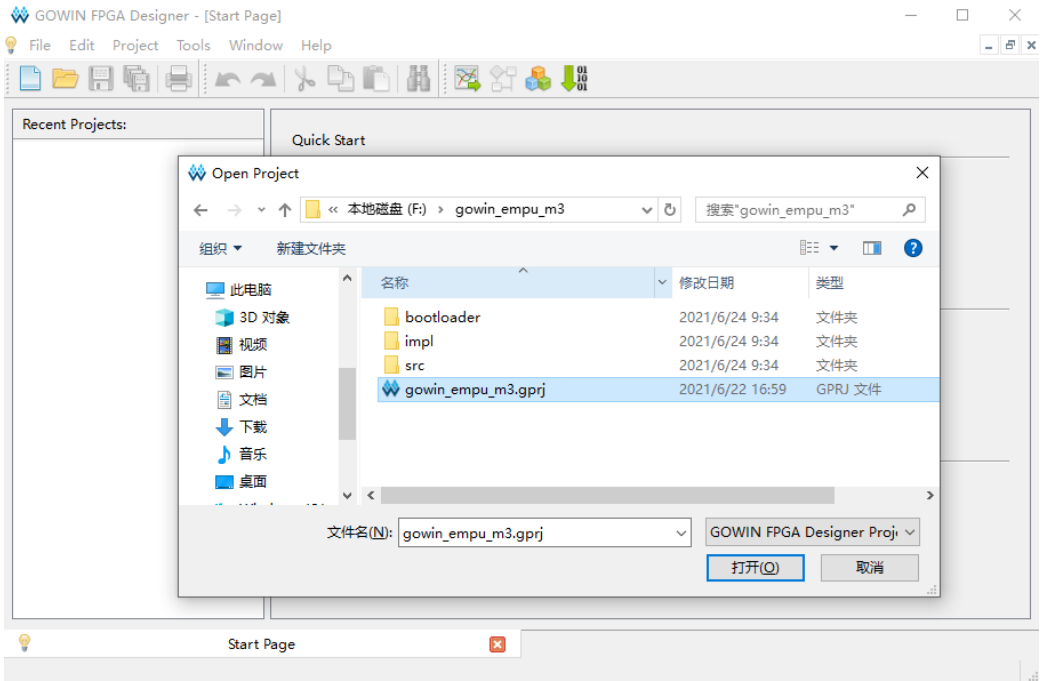
Gowin_V1.9.8 Beta and above

2.3 Import Hardware Reference Design

Take the reference design in SDK for an instance.

Double click to run Gowin software, select "File > Open > gowin_empu_m3" to import hardware reference design, as shown in Figure 2-1 .

Figure 2-1 Import Hardware Reference Design



The configuration of the hardware reference design is as shown in Table 2-1.

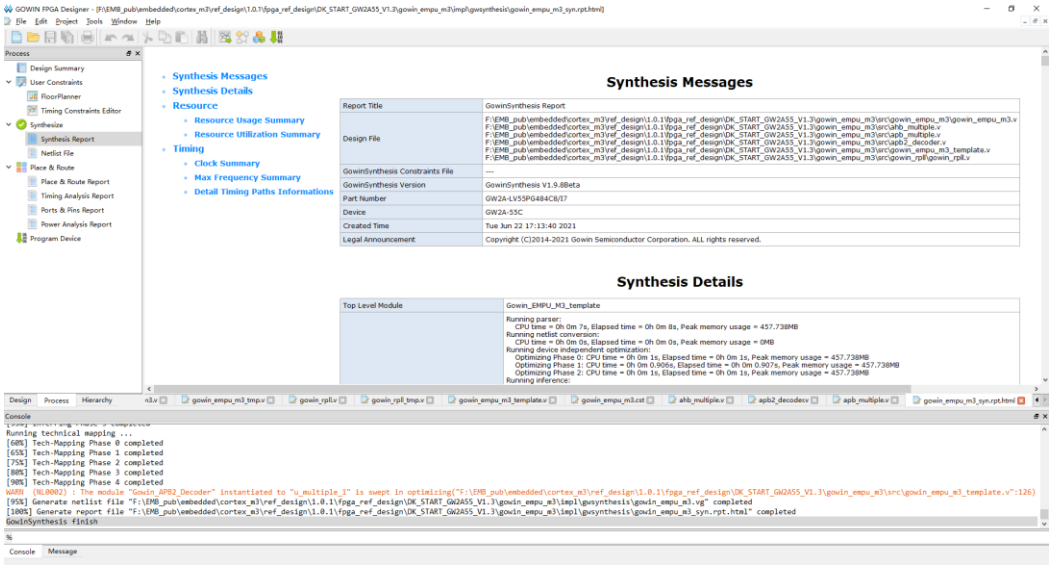
Table 2-1 Hardware Reference Design Configuration

File	Description
User Interrupts	Enable
MPU	Enable
WIC	Enable
Bit-banding	Enable
IRQ Priority Level Width	3
WIC Lines	3
Debug Level	Full debug plus DWT
Trace Level	Standard trace. ITM and DTM, No ETM
Debug Interface	JTAG and serial wire
Instruction Memory Size	64KB
Data Memory Size	64KB
GPIO	Enable
SPI-Flash	Enable
AHB2 Extension	Enable
UART0	Enable
UART1	Enable
Timer0	Enable
Timer1	Enable
WatchDog	Enable
I2C Master	Enable
SPI Master	Enable
APB2 Extension	Enable

2.4 Synthesize

Run GowinSynthesis® to synthesize the hardware reference design, amd generate netlist files, as shown in Figure 2-2.

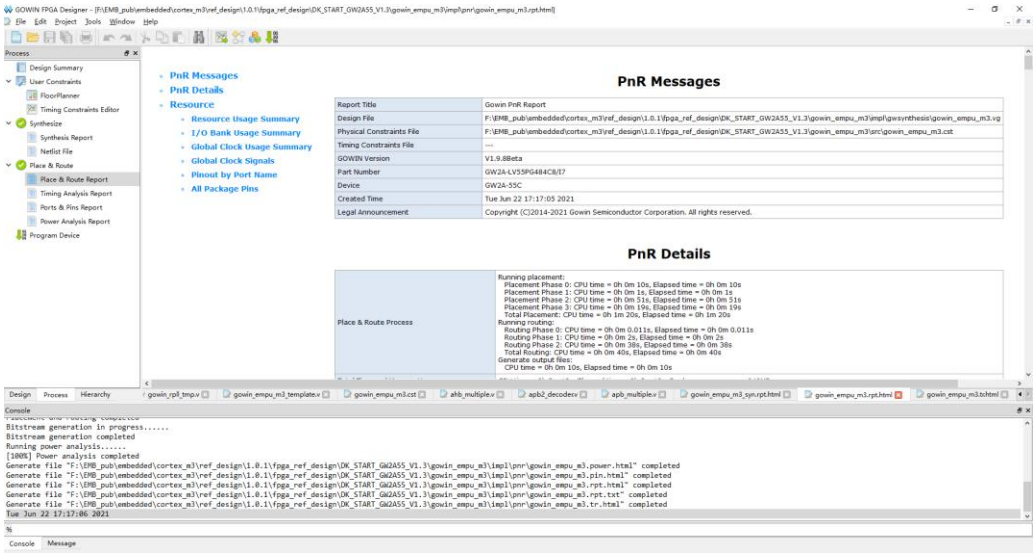
Figure 2-2 Synthesize Hardware Reference Design



2.5 Place & Route

Run Place & Route tool to generate the bitstream files in hardware design, as shown in Figure 2-3.

Figure 2-3 Place & Route



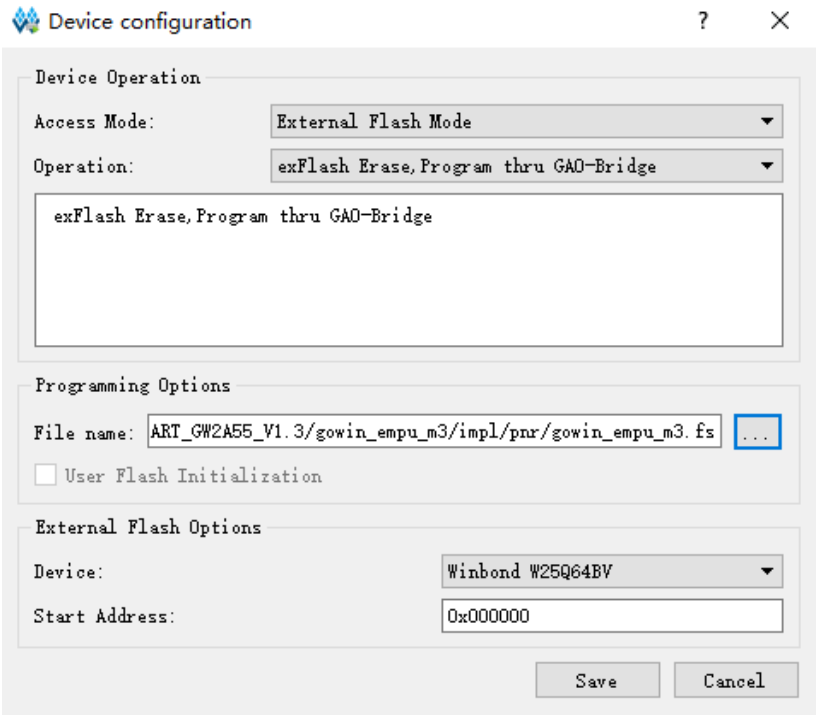
2.6 Download

Run Programmer to download the bitstream file.

Click "Edit > Configure Device" in the menu bar or "Configure Device" ( ) in the tool bar to open the "Device configuration".

- Select "External Flash Mode" in "Access Mode" drop-down list;
- Select " exFlash Erase, Program thru GAO-Bridge" or "exFlash Erase, Program, Verify thru GAO-Bridge" in "Operation" drop-down list.
- Import the required bitstream file in "Programming Options > File name" option.
- Select based on the on-board Flash in "External Flash Options > Device" (such as Winbond W25Q64BV);
- Configure the start address as "0x000000" in "External Flash Options > Start Address".
- Click "Save" as shown in Figure 2-4.

Figure 2-4 Download



After device configuration, click Program/Configure " " in the Programmer toolbar to complete bit stream files downloading.

2.7 Reference Manual

Please refer to the following manuals for Gowin_EMPU_M3 hardware design:

- IPUG923, Gowin_EMPU_M3 Hardware Design Reference Manual
- SUG100, Gowin Software User Guide
- SUG101, Gowin Design Constraints User Guide
- SUG502, Gowin Programmer User Guide.

3 Software Programming Reference Design

3.1 Software Environment

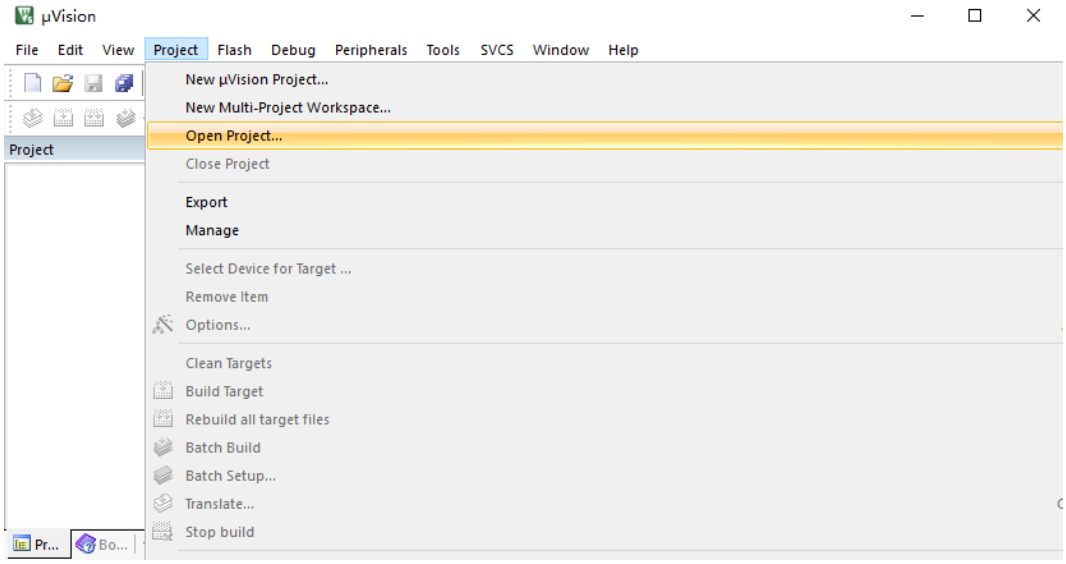
- ARM Keil MDK (V5.26 and above)
- GOWIN MCU Designer (V1.1 and above)

3.2 Import Software Reference Design

Take the reference design in Keil_RefDesign SDK for an instance.

Double click to open ARM Keil MDK, select "Project > Open Project…" to import the software programming reference design, as shown in Figure 3-1 .

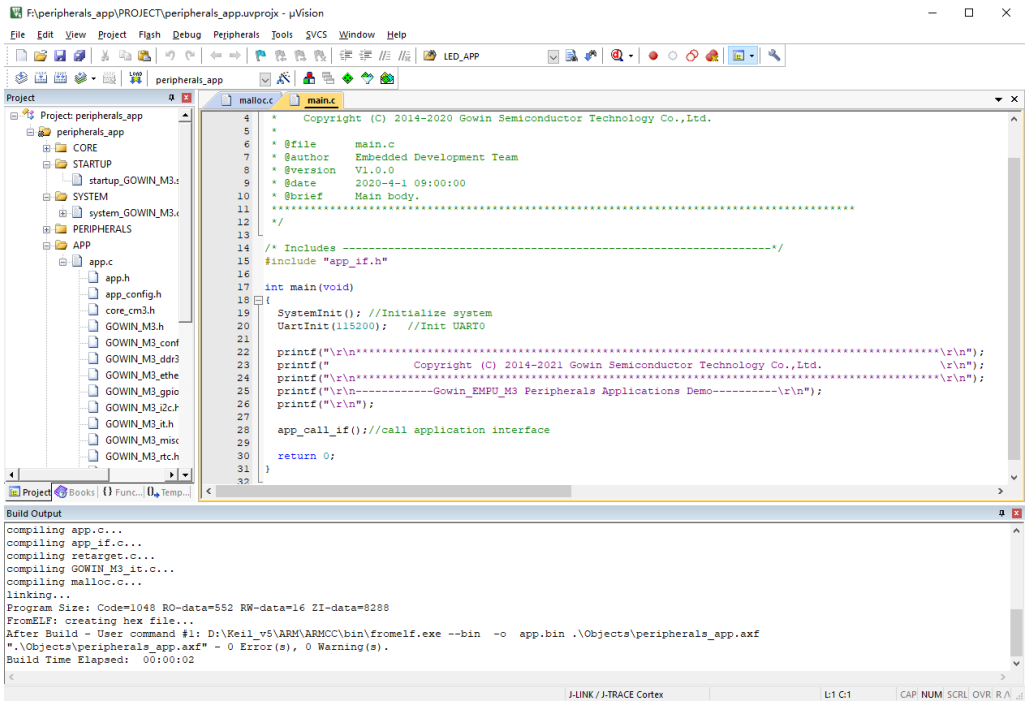
Figure 3-1 Import Software Programming Reference Design



3.3 Build

Click the "  " button to build the software programming reference design and generate the Gowin_EMPU_M3 software programming BIN file in binary format, as shown in Figure 3-2.

Figure 3-2 Build



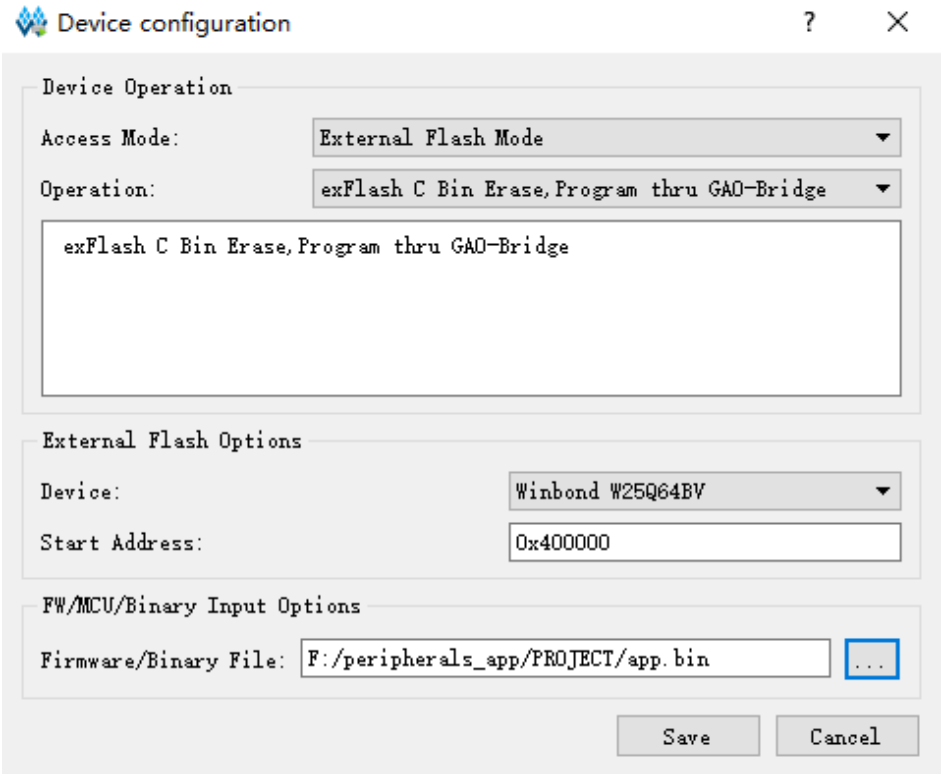
3.4 Download

After building, use Gowin Programmer to download the software programming BIN file in binary format.

Run Programmer, click "Edit > Configure Device" or Configure Device "  " in the tool bar to open the "Device configuration" dialog box.

- Select “External Flash Mode” in “Access Mode” drop-down list;
- Select “exFlash C Bin Erase, Program thru GAO-Bridge” or “exFlash C Bin Erase, Program, Verify thru GAO-Bridge” in “Operation” drop-down list.
- Import Gowin_EMPU_M3 software programming BIN file in binary format in “FW/MCU/Binary Input Options > Firmware/Binary File”.
- Select based on the on-board Flash in "External Flash Options > Device" (such as Winbond W25Q64BV);
- Configure the start address as "0x400000" in "External Flash Options > Start Address".
- Click "Save" as shown in Figure 3-3.

Figure 3-3 Download



After device configuration, click "Program/Configure" ( ) in the Programmer tool bar to complete downloading of Gowin_EMPU_M3 software programming BIN file in binary format.

3.5 Reference Manual

For Gowin_EMPU_M3 software design method, please refer to the following manuals:

- IPUG922, Gowin_EMPU_M3 Software Programming Reference Manual
- IPUG919, Gowin_EMPU_M3 IDE Software Reference Manual
- SUG502, Gowin Programmer User Guide.

4 Debugging

4.1 Hardware Debugging Method

Use Gowin Analyzer Oscilloscope (GAO) to debug the Gowin_EMPU_M3 hardware design.

4.2 Software Debugging Method

Two Gowin_EMPU_M3 software debugging methods are supported:

- Emulator Debugging
- Serial Debugging

4.2.1 Emulator Debugging

Emulator Type

Gowin_EMPU_M3 supports the following emulator to set break points for single-step debugging:

- J-LINK emulator
- U-LINK emulator

Debugging Interface

Gowin_EMPU_M3 supports the following debugging interfaces:

- JTAG
- Serial Wire

4.2.2 Serial Debugging

Use serial and serial debugging assistant to print the running status.

4.3 Reference Manual

For Gowin_EMPU_M3 software and hardware debugging method, please refer to the following manuals:

- SUG114, Gowin Analyzer Oscilloscope User Guide
- IPUG919, Gowin_EMPU_M3 IDE Software Reference Manual
- IPUG920, Gowin_EMPU_M3 Serial Debugging Reference Manual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