



Gowin Programmer User Guide

SUG502-1.3E, 02/17/2020

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Revision History

Date	Version	Description
04/06/2017	1.0E	Initial version published.
08/06/2017	1.1E	Device programming operation modified.
10/28/2019	1.2E	<ul style="list-style-type: none">● Slave SPI Mode added;● SVF File Creation added;● User Flash Initialization added.
02/17/2020	1.3E	The description of installing and starting Programmer added.

Contents

Contents	i
List of Figures	ii
List of Tables.....	iii
1 About This Guide	1
1.1 Purpose.....	1
1.2 Related Documents	1
1.3 Terminology and Abbreviations.....	1
1.4 Support and Feedback	2
2 Introduction	3
2.1 Install and Start Programmer.....	3
2.1.1 The First Method to Install	3
2.1.2 The Second Method to Install	3
2.1.3 Start Programmer	4
2.2 Software Interface.....	5
2.3 Software Version.....	6
3 Programming Download.....	7
3.1 Download Cable Setting	7
3.2 Scan Daisy Chain	8
3.3 Daisy Chain Configuration	9
3.3.1 Add Device.....	9
3.3.2 Remove Device.....	9
3.3.3 Modify Device Position in Chain	9
3.4 Device Programming Configuration.....	9
3.4.1 SRAM Configuration	11
3.4.2 Embedded Flash Configuration of LittleBee® Series of FPGA Products	11
3.4.3 ExFlash Configuration.....	11
3.4.4 Slave SPI Mode	12
3.5 Edit Pin State	12
3.6 Device Security.....	13
3.7 Programming Download	14
3.8 SVF File Creation	14
3.9 User Flash Initialization.....	15

List of Figures

Figure 2-1 Install Programmer	3
Figure 2-2 Install Programmer Driver.....	4
Figure 2-3 Start programmer.exe.....	4
Figure 2-4 Shortcut Key to Start Programmer	5
Figure 2-5 Programmer Main Window	5
Figure 2-6 Version Number	6
Figure 3-1 Gowin USB Cable.....	8
Figure 3-2 LPT	8
Figure 3-3 Device Table	8
Figure 3-4 Device Configuration Interface	9
Figure 3-5 I/O State Editor	13
Figure 3-6 Security Configuration	14
Figure 3-7 Create SVF File	15
Figure 3-8 User Flash Initialization	15

List of Tables

Table 1-1 Terminology and Abbreviations	1
Table 3-1 Device Operations Description	10
Table 3-2 User Flash Reference	15

1 About This Guide

1.1 Purpose

This guide describes how to use the Gowin Programmer.

The software screenshots and the supported products listed in this guide are based on 1.9.3.01Beta. As the software is subject to change without notice, some information may not remain relevant and may need to be adjusted according to the software that is in use.

1.2 Related Documents

The latest user guides are available on GOWINSEMI Website. You can find the related documents at www.gowinsemi.com:

- [SUG100](#), Gowin Software User Guide
- [TN653](#), Gowin FPGA Products JTAG Programming and Configuration Manual
- [UG290](#), Gowin FPGA Products Programming and Configuration Manual

1.3 Terminology and Abbreviations

Table 1-1 shows the abbreviations and terminology used in this guide.

Table 1-1 Terminology and Abbreviations

Terminology and Abbreviations	Meaning
FPGA	Field Programmable Gate Array
SRAM	Static Random Access Memory
I/O	Input/Output
BSDL	Boundary Scan Description Language

1.4 Support and Feedback

Gowin Semiconductor provides customers with comprehensive technical support. If you have any questions, comments, or suggestions, please feel free to contact us directly by the following ways.

Website: www.gowinsemi.com

E-mail: support@gowinsemi.com

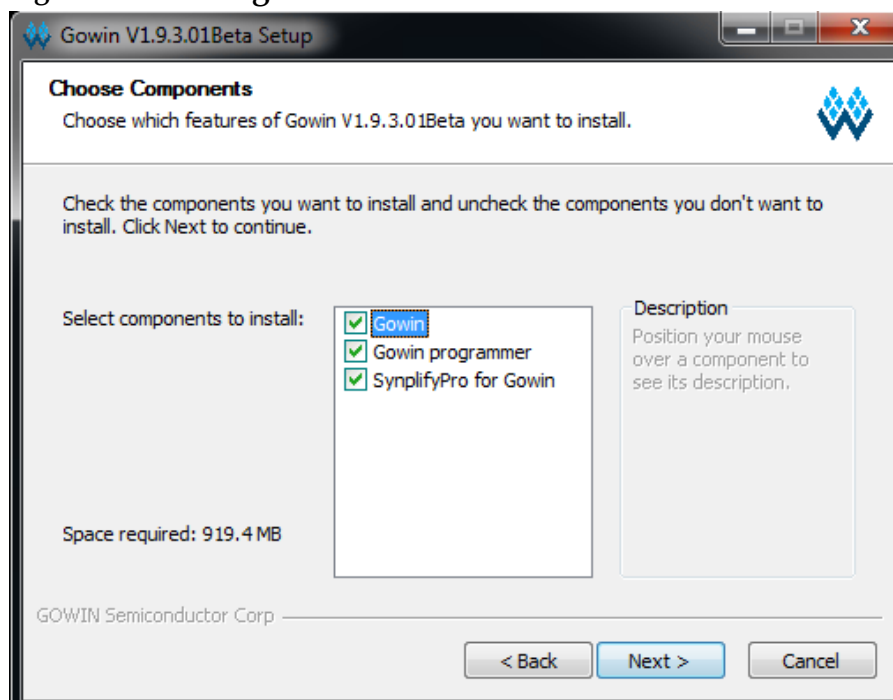
2 Introduction

2.1 Install and Start Programmer

2.1.1 The First Method to Install

When Gowin Software is installed by default, Gowin Programmer is installed, as shown in Figure 2-1. For details on the software installation and application, please refer to [SUG100](#), Gowin Software User Guide.

Figure 2-1 Install Pgrammer



2.1.2 The Second Method to Install

Download Gowin Programmer installation package at official website: https://www.gowinsemi.com/en/support/download_eda/. After unzipping the installation package, open directory of programmer2\driver. Choose corresponding driver according to your own computer system, as shown in Figure 2-2.

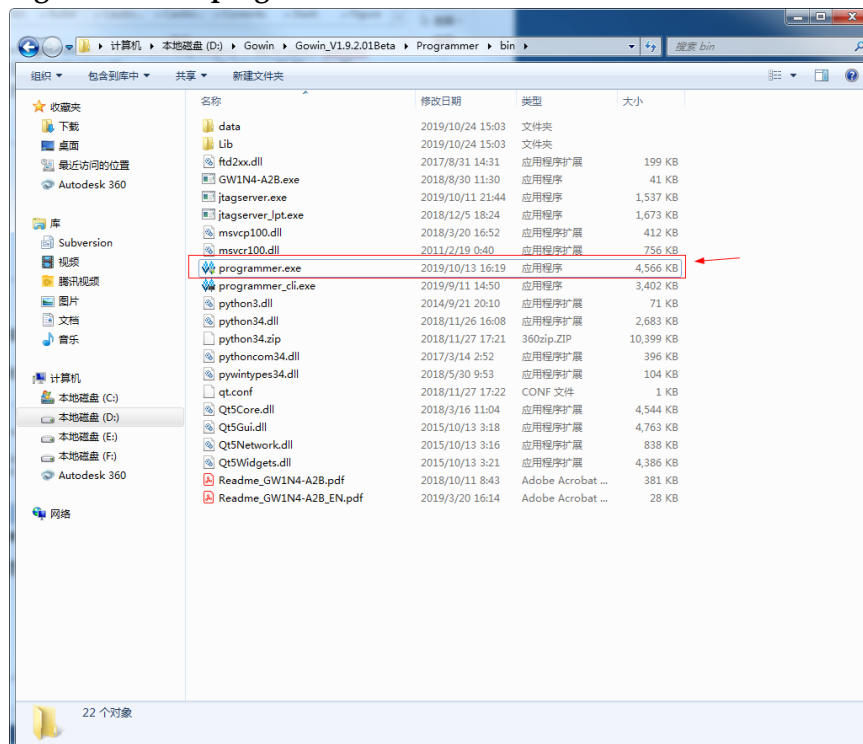
Figure 2-2 Install Programmer Driver



2.1.3 Start Programmer

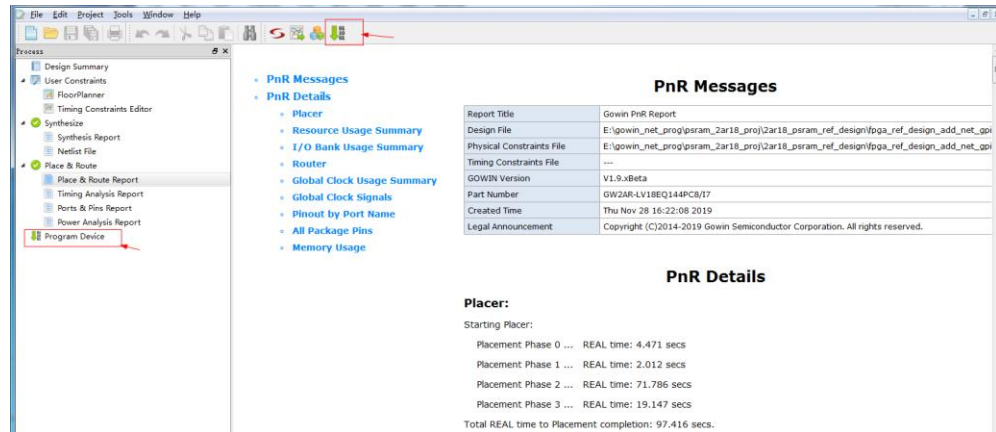
1. After installation, the .exe file is under \x.x\Programmer\bin\protocol.exe; Double-click on programmer.exe to start the software, as shown in Figure 2-3.

Figure 2-3 Start programmer.exe



2. This software can be started by the shortcut key of Gowin Software, as shown in Figure 2-4.

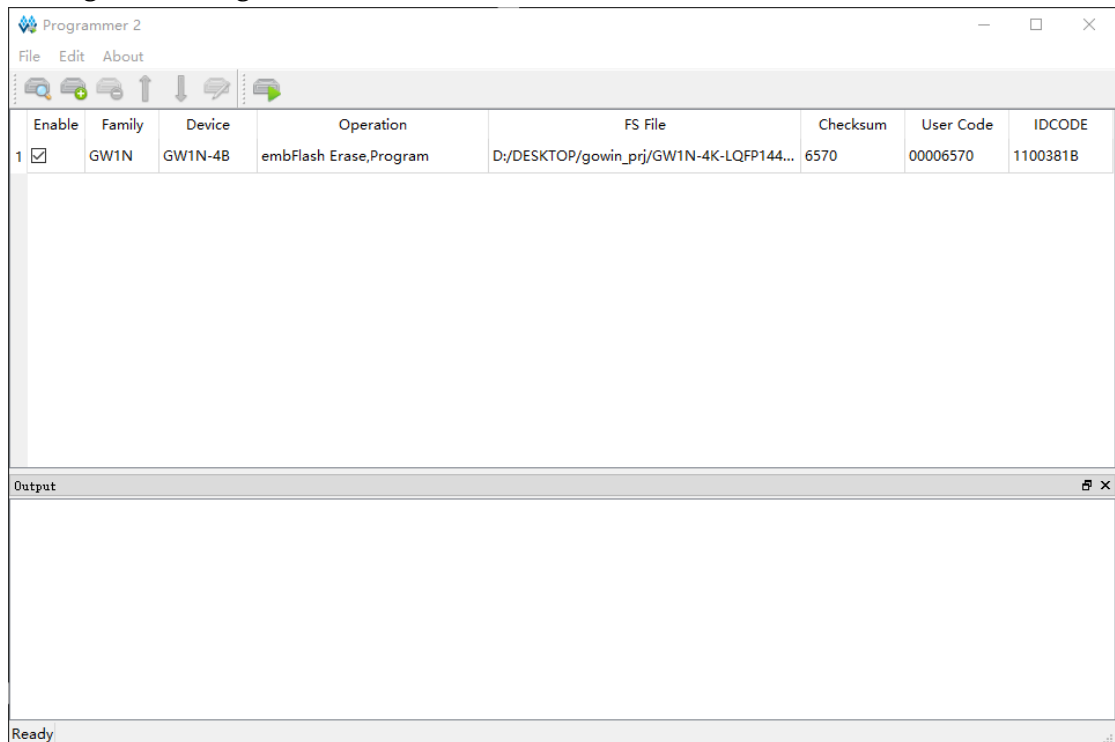
Figure 2-4 Shortcut Key to Start Programmer



2.2 Software Interface

Gowin Programmer interface includes menu bar, tool bar, device table, output area as shown in Figure 2-5 .

Figure 2-5 Programmer Main Window



In the device table, all the devices that will be programmed in daisy chain are displayed via automatically scanning or manual configuration. Each row of the table represents a device, which can be programmed or not via Enable column.

The device table includes Enable, Family, Device, Operation, FS File, Checksum, User Code, and IDCODE options. Enable, Family, Device, Operation, and FS files are editable and can be edited with clicking. Double-click to open Device Configuration Dialog to configure the other options. Please refer to [3.4 Device Programming Configuration](#) for the details.

Output area includes Output, Error, Warning, and Info, which respectively displays all information, error information, warning information, and instructions information.

Note!

If "Enable" is not checked, the programmer treats the device as if it is not in the chain. The device row is not editable.

2.3 Software Version

Gowin Programmer and Gowin IDE have separate software version number, which can be viewed by "About" of software interface, as shown in Figure 2-6.

Figure 2-6 Version Number



3 Programming Download

Programming download is the process of transmitting the data stream files to SRAM, embedded Flash or external Flash of FPGA via download cable, and programming download process is as follows: Start > Setting download cable > Scanning device > Device programming configuration > Downloading.

1. Download Cable Setting (selectable): Select the download cable type, port, and frequency for the programming download.

Note!

The first available port will be selected by default. And the default frequency is 2MHz.

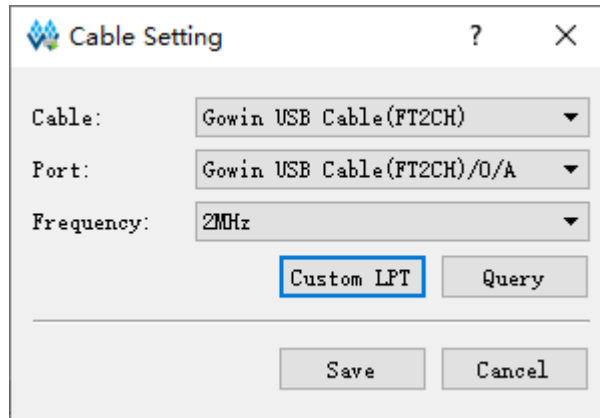
2. Daisy chain configuration and programming: Configure daisy chain in the device table to match the actual physical connection of daisy chain, and select the programming operation and required data file for each device with the uppermost layer being near the Programmer side.
3. Programming download: Download the daisy chain that has been configured, and the final result will be displayed in the output area.

3.1 Download Cable Setting

The Download Cable Setting allows users to select the available download cable type, port, and frequency for the programming download. Select "Edit > Setting > Cable Setting" in the menu bar to open "Cable Setting". Two types of cables are supported currently: Gowin USB Cable and LPT.

1. Gowin USB Cable (FT2CH) is as shown in Figure 3-1.
 - Cable: Gowin USB Cable.
 - Port: The first available port will be selected by default. The last character A represents the channel number of programmer. There are three channels: S, A and B
 - Frequency: JTAG, 30 MHz, 15 MHz, 2.5 MHz, 2 MHz, 1.5 MHz, 0.75 MHz, 0.1 MHz. The default is 2 MHz.

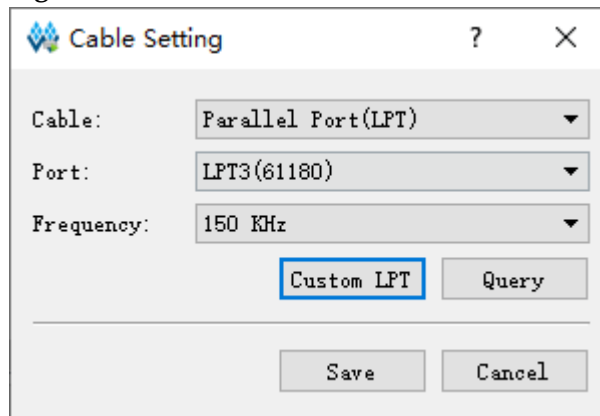
Figure 3-1 Gowin USB Cable



2. LPT is as shown in Figure 3-2.

- Cable: Paralle Port (LPT)
- Port: The port available for the download cable is selected according to the PCI property of the computer.
- Frequency: JTAG frequency simulation, 150KHz.

Figure 3-2 LPT



3.2 Scan Daisy Chain


Programmer automatically scans the daisy chain connected to the computer. Click "" to scan daisy chain connected to the computer. After scanning, all devices are shown in device table of Gowin Programmer in the order of chain, as shown in Figure 3-3.

Figure 3-3 Device Table

Enable	Family	Device	Operation	FS File	Checksum	User Code	IDCODE
1 <input checked="" type="checkbox"/>	GW1N	GW1N-4B	embFlash Erase,Program	D:/DESKTOP/gowin_prj/GW1N-4K-LQFP144...	6570	00006570	1100381B


Note!

Some devices have the same ID (such as GW2A - 18/GW2AR-18), which requires users to manually specify the corresponding equipment after scanning.

Programmer supports the manual configuration of daisy chain. It includes the operations of adding device, removing device and modifying the position of the device in the chain.

3.3 Daisy Chain Configuration


3.3.1 Add Device

1. Select "Edit > Add Device" or click " " in menu to add a new device;
2. Click "Family" to select device from drop-down menu;
3. Click "Device" to select a specific device type from drop-down menu.



Note!

When selected, the new device is added to the selected location or the end of the daisy chain.

3.3.2 Remove Device

Select the device row and remove device by clicking "Edit > Remove Device" or the " ".

3.3.3 Modify Device Position in Chain

Select the device row and modify the device position in the chain by clicking "Edit > Up (or Down) " or the " " or " ".

3.4 Device Programming Configuration


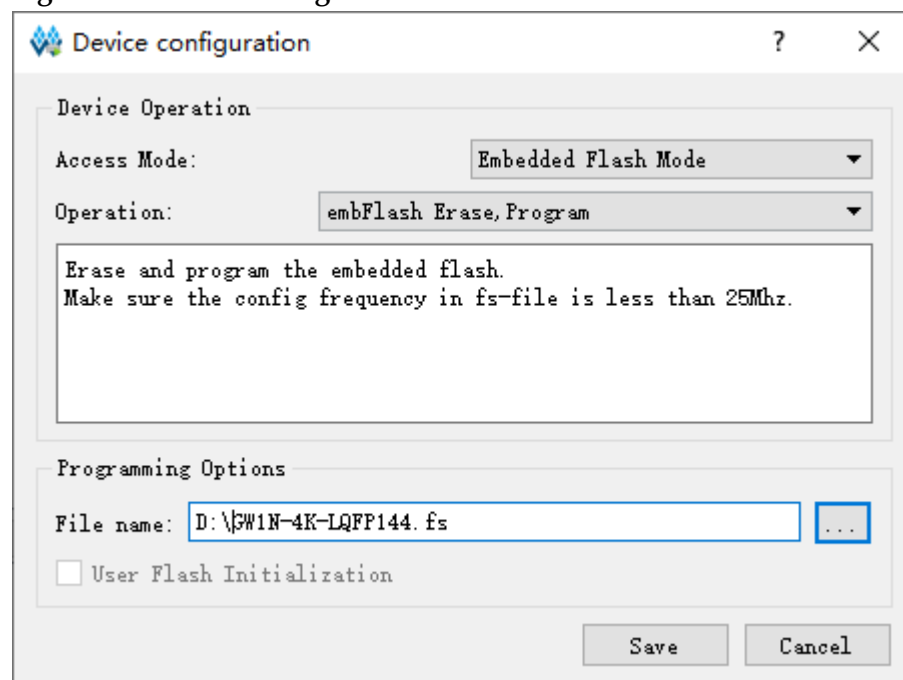
Select the device row and open the Device Configuration dialog by clicking "Edit > Configure Device" or " " or double-clicking "Operation", as shown in Figure 3-4.

Figure 3-4 Device Configuration Interface



- Access Mode: Select programming mode.
- Operation: Select programming operation, please see Table 3-1 for details.
- Instruction Register Length: When the device is selected as JTAG-NOP, select instruction register length.
- Programming File: Select programming data file.
- Device: When the programming mode is selected as External Flash Mode, select External Flash.
- Start Address: When the programming mode is selected as External Flash Mode, select initial address of External Flash.

Table 3-1 Device Operations Description


Access Mode	Operation	Description
SRAM Mode	Bypass	Bypass
	Read Device Code	Read Device ID, User Code, Status Code
	Read User Code	Read Device User Code
	Read Status Register	Read Status Register
	Reprogram	–
	SRAM Program JTAG 1149	JTAG writes pure data and does not support CRC validation Encrypted or compressed datastream file is not supported currently.
	SRAM Erase	Erase SRAM
	SRAM Program	Configure the data stream file to FPGA SRAM
	SRAM program and Verify	Write data to SRAM and verify
Embedded Flash Mode	embFlash Erase, Program	Erase embflash, then write data
	embFlash Erase, Program, Verify	Erase embflash, then write data and verify
	EmFlash Erase Only	Erase embFlash only
External Flash Mode	exFlash Erase, Program	Erase external flash, then write data to external flash
	exFlash Erase, Program, Verify	Erase external flash, then write data and verify
	exFlash Program Without Erasure	Write data to external flash without erasure
	exFlash Bulk Erase	Erase external Flash
	exFlash Verify	Verify external flash
	exFlash Erase, Program in bscan	Erase external flash and write data to external flash in bscan
	exFlash Erase, Program, Verify in bscan	Erase external flash, write data to external flash and verify in bscan
	exFlash Verify in bscan	–
	exFlash Program in bscan without erasure.	Write data to external flash without erasure in bscan.
	exFlash Bulk Erase in bscan	Verify external flash in bscan
exFlash C Bin Erase, Program	Erase external flash, then write RISC-V bin files to external flash	

Access Mode	Operation	Description
	exFlash C Bin Erase, Program, Verify	Erase external flash, then write RISC-V bin files to external flash and verify
	exFlash C Bin Program	Write RISC-V bin files to external flash
	Slave SPI Read ID Code	Read ID Code in Slave SPI
Slave SPI Mode	Slave SPI Scan exFlash	Scan exFlash in SSPI
	Slave SPI Program SRAM	Write data to SRAM in SSPI

Note!

GW2A/GW2AR series chips do not have embedded flash and does not support this mode.

3.4.1 SRAM Configuration


1. Select the device row and open the Device Configuration dialog by clicking "Edit > Configure Device" or " " or double-clicking "Operation".
2. Select SRAM Mode in "Access Mode" drop-down list;
3. Select operation in "Operation" drop-down list as required;
4. For non-Gowin devices, it needs to manually specify the length of the instruction register or instruct the programmer to read the length of the instruction register of the BSDL file.
5. Click "Save" to complete the configuration.

Note!

Non-Gowin device (JTAG-NOP) only supports Bypass.


3.4.2 Embedded Flash Configuration of LittleBee® Series of FPGA Products

The GW1N/GW1NZ series of FPGA products includes EmbFlash; The corresponding programming model is embedded flash mode.

1. Select the device row and open the Device Configuration dialog by clicking "Edit> Configure Device" or " " or double-clicking "Operation".
2. Select Embedded Flash Mode in "Access Mode" drop-down list;
3. Select operation in "Operation" drop-down list as required;
4. Programming File: Select programming data stream file.
5. Click "Save" to complete the configuration.

3.4.3 ExFlash Configuration


The Gowin programmer supports ExFlash programming. The external flash configuration process is as follows:

1. Select the device row and open the Device Configuration dialog by clicking "Edit> Configure Device" or " " or double-clicking "Operation".
2. Select "External Flash Mode" in "Access Mode" drop-down list;

3. Select operation in "Operation" as required;
4. If selected "exFlash Program" in "Operation", the corresponding programming data stream file needs to be selected in "Programming File";
5. For external Flash models, the LittleBee[®] and Arora family support SPI Flash with the read command 0x03 or 0x0B;
6. If there is no flash selected in the menu, please select Generic flash to try to automatically program;
7. Select the initial address of the external Flash. Currently, the default is 0x000000;
8. Click "Save" to complete the configuration.

3.4.4 Slave SPI Mode

In Slave SPI Mode, the download cable shall be connected to the pin used by SSPI, please see [TN652](#), Gowin FPGA Products Slave SPI Configuration Manual.

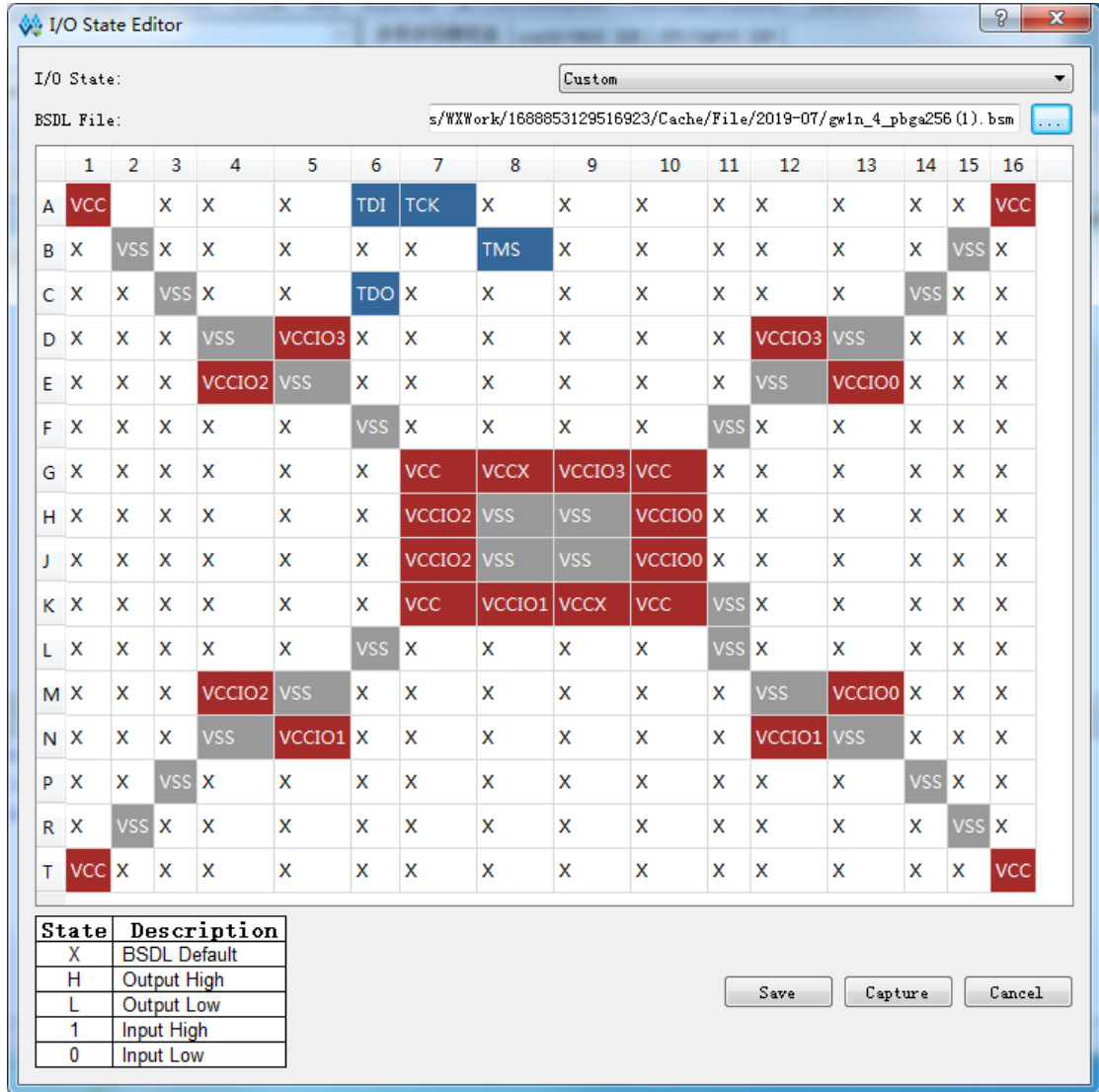
1. Select the device row and open the Device Configuration dialog by clicking "Edit> Configure Device" or " " or double-clicking "Operation".
2. Select "Slave SPI Mode" in "Access Mode" drop-down list;
3. Select operation in "Operation" drop-down list as required;
4. If selected "Slave SPI Program SRAM" in "Operation", the corresponding programming data stream file needs to be selected in "Programming File";
5. Click "Save" to complete the configuration.

3.5 Edit Pin State

Programmer edits the I/O pin value via the I/O State Editor, which can be set before programming.

1. Select the device row and open I/O State Editor by clicking "Edit > I/O State" or right clicking "I/O State";
2. Select the BSDL file that conforms with the device model and package;
3. Change the pin state by clicking on the cell location or set the same state for all pins by right-clicking on the menu.

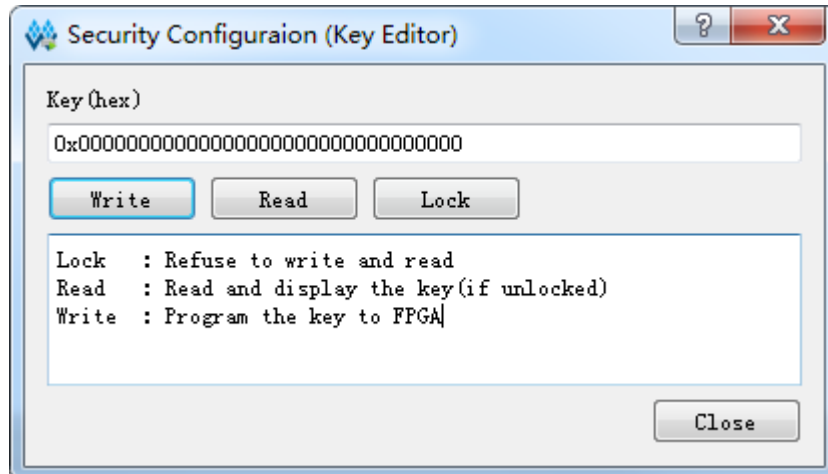
Figure 3-5 I/O State Editor



3.6 Device Security

When programming with encrypted bitstream files, it needs to write the key of the bitstream file to FPGA. Select the device row and open Security Configuration dialog by clicking "Edit > Configure Security" from the menu or right-clicking "Security Key Setting", as shown in Figure 3-6.

Figure 3-6 Security Configuration



- Write: Write the specified key value to FPGA.
- Read: Read and display key value in FPGA in the case of unlocking.
- Lock: Lock key in FPGA, and the key is unable to read and write after locking.

After the decryption key is written successfully, readback the written value via the "Read" button on the interface to verify.

After key is written successfully, lock it in FPGA via the Lock command. Once you have performed this operation, any read and write key operations will be invalid, the key value cannot be modified, and all read bits are all 1.

After the decryption key is set, the encrypted bitstream data will only work when the data matches the decryption key. The key does not affect the non-encrypted bitstream data.

Note!

The initial value of the Gowin FPGA keys is 0. If a key value is changed to 1, it cannot be changed back to 0. For example, the key value written during an operation 00000000-00000000-00000000-00000001, and the last bit of the modified key must be 1. For more detailed information, please refer to [TN654](#), GW2A(R) series of FPGA Products AES Programming Guide.

3.7 Programming Download

After configuring the download cable and daisy chain, select "Design > Run" from the menu or click "▶" to program and download the device. The final result will be displayed in the output panel.

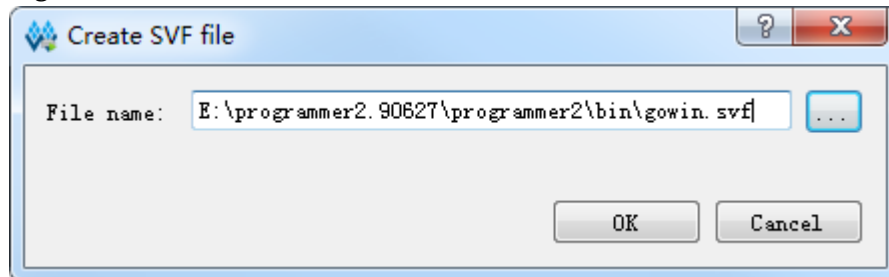
3.8 SVF File Creation

SVF file creation is supported by fs file. Currently, only GW1N-4 SVF file creation is supported currently.

1. Configure embedded Flash mode according to the GW1N/GW1NZ and select select GW1N4 device.
2. Select the device chain and open the Create SVF File dialog by clicking, "Edit> SVF File Create" or right-clicking "SVF File Create".

3. The generated SVF file name can be named in File Name and it can choose SVF save path, as shown in Figure 3-7.
4. Click "OK" to complete the creation of the SVF file.

Figure 3-7 Create SVF File



3.9 User Flash Initialization

LittleBee[®] series provides users with User Flash space. User Flash data can be used to program embedded Flash and User Flash space at the same time. For the security design, this operation only support user flash programming on programmer side and do not support readback. The user can choose user flash initialization file with .fi suffix when programming, as shown in Figure 3-8 .

Figure 3-8 User Flash Initialization

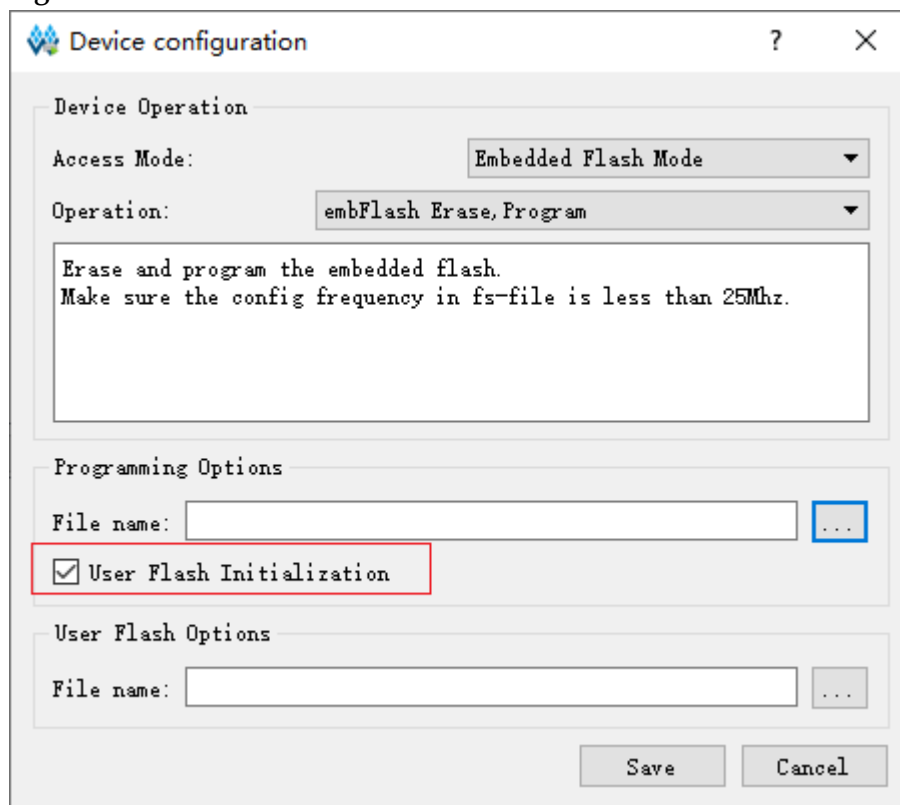


Table 3-2 User Flash Reference

Series	Device	Flash Type	Address	Data Width
GW1N	GW1N-1	FLASH96K	48* 64	32Bits
	GW1N-1S			

Series	Device	Flash Type	Address	Data Width
	GW1N-2	FLASH256K	128* 64	
	GW1N-2B			
	GW1N-4			
	GW1N-4B			
	GW1N-6	FLASH608K	304* 64	
	GW1N-9			
GW1NR	GW1NR-4	FLASH256K	128* 64	
	GW1NR-4B			
	GW1NR-9	FLASH608K	304* 64	
GW1NS	GW1NS-2	FLASH128K	32786	
	GW1NS-2C			
GW1NSR	GW1NSR-2	FLASH128K	32786	
	GW1NSR-2C			
GW1NZ	GW1NZ-1	FLASH64KZ	32* 64	

