Gowin Programmer

User Guide

SUG502-1.1E,08/06/2018

Disclaimer

Revision History

Date	Version	Description
04/06/2017	1.0E	Initial version published.
08/06/2018	1.1E	Contents of device programming operation modified.

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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 Windows 1.8.0 Beta. 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 Supported Products

The information presented in this guide applies to the following products:

- GW1N(R) series of FPGA products: GW1N-1，GW1N-2，and GW1N(R)-4.
- GW2A(R) series of FPGA products: GW2A(R)-18 and GW2A-55.

1.3 Related Documents

The latest user guides are available on the Gowin website. Refer to the related documents at www.gowinsemi.com:

- Gowin Software User Guide
- Gowin FPGA Product JTAG Configuration Manual
- Gowin FPGA Product Configuration Manual

1.4 Abbreviations and Terminology

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

Table 1-1 Abbreviations and Terminology

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

1.5 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 using the information provided below.

Website: www.gowinsemi.com

E-mail: support@gowinsemi.com

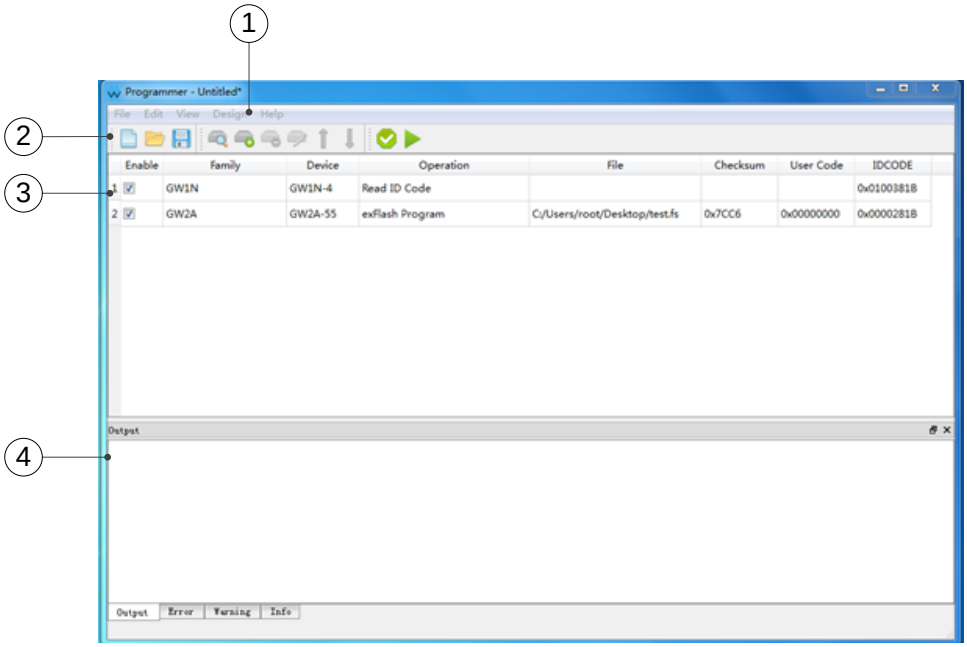
Tel: +86 755 8262 0391

2 Introduction

The Gowin Programmer software generates the data stream file for the FPGA. Before using, install the downloader first (it is installed by default) and ensure that the download cable for the Gowin FPGA is connected, see downloader in " Install > driver".

The Gowin Programmer view includes menu①, tool②, device table③ , and output panel④, as shown in Figure 2-1.

Figure 2-1 Gowin Programmer



① Menu ② Tool
③ Device Table ④ Output Panel

2.1 Device Table

In the device table, all the devices that will be programmed in daisy chain are displayed via automatically scanning or manual configuration. Each row in the table represents a device, and each column can be

displayed or hidden via the view options. The column options available in the table are outlined in Table 2-1.

Table 2-1 Device Table

Options	Description
Enable	Editable, click to choose whether to program the device. Note! If "Enable" is not checked, the editor will be regarded as not in the chain, and the row will be grayed out. Before editing pins, security, programming download, etc., the device must be removed from the daisy chain.
Vendor	Hidden by default.
Family	Editable, click to edit.
Device	Editable, click to edit.
Package	Hidden by default, editable, click to edit.
Operation	Non-editable, double-click to open the Device Configuration Dialog to configure. Refer to *3.6 Device Programming Configuration* for the details.
File	Editable, click to edit.
Checksum	Non-editable, double-click to open the Device Configuration Dialog to configure. Refer to *3.6 Device Programming Configuration* for the details.
User Code	Non-editable, double-click to open the Device Configuration Dialog to configure. Refer to *3.6 Device Programming Configuration* for the details.
IR Length	Hidden by default.
IDCODE	Non-editable, double-click to open the Device Configuration Dialog to configure. Refer to *3.6 Device Programming Configuration* for the details.

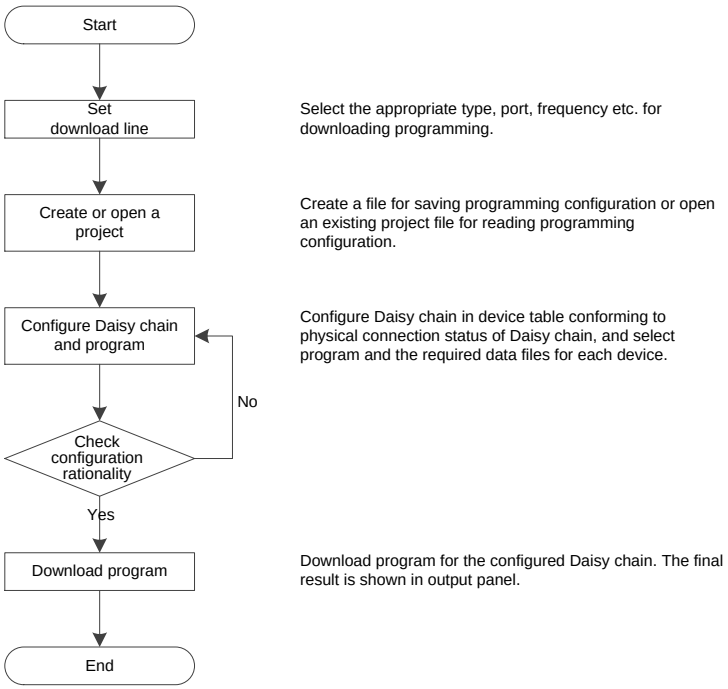
2.2 Output Panel

The output panel contains Output, Error, Warning, and Info, which respectively display all the information related to error messages, warning messages, etc.

3 Programming Download

Programming download is the process of transferring data stream files to the SRAM, embedded flash or external flash of FPGA via a download cable. The programming download process is shown in Figure 3-1.

Figure 3-1 Operation Process of Programming Download

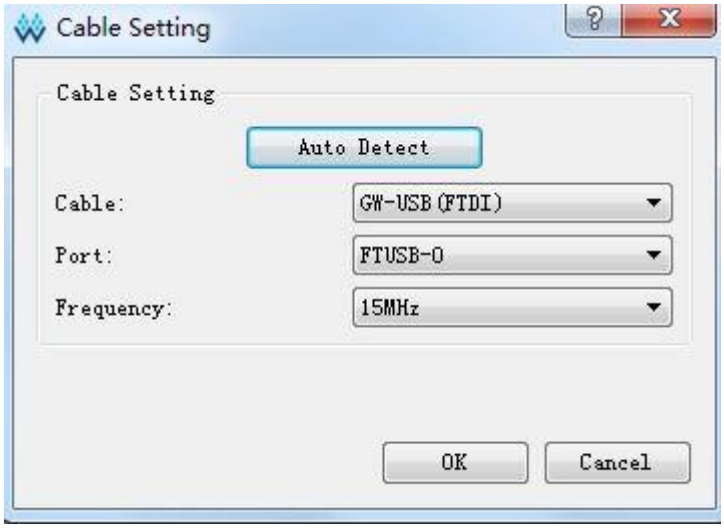


3.1 Download Cable Setting

The Download Cable Setting functionality allows users to select the available download cable type, port, and frequency for the programming download. Gowin Programmer selects the first available download cable port by default, with a frequency of 15M Hz by default.

Select "Edit > Setting > Cable" from the menu and open "Cable Setting", as shown in Figure 3-2.

Figure 3-2 Cable Setting



A description of the parameters that are available in the cable setting is presented in Table 3-1.

Table 3-1 Cable Setting Parameters

Options	Description
Auto Detect	Automatically detects all download cables connected to the computer. The first available download cable will be selected by default.
Cable	Download cable type. GW - USB (FTDI) is selected by default.
Port	Port available for download cable. The first available port will be selected by default.
Frequency	Download cable frequency. Optional 30 MHz, 15 MHz, 2.5 MHz, 2 MHz, 1.5 MHz, 0.75 MHz, 0.1 MHz. The default is 2 MHz.

3.2 Create New Project

Note!

The current project will be closed if a new project is created.

Creating a new project results in the creation of a new file for saving the programming configuration. Users can create new projects in three ways:

- A new project will be created automatically when the programmer is opened.
- In menu, select "File > New" to create a new project.
- Click "  " to create a new project.

3.3 Open Existing Project

Note!

- The current project will be closed if a new project is opened.
- Before opening the project file, set the download cable and ensure that the download cable and daisy chain configuration are consistent in the project file. See *3.1 Download Cable Setting* for details on setting the download cable. See *3.5 Daisy Chain Configuration* for details about the daisy chain configuration.

Opening an existing project involves opening the existing project file and reading the programming configuration. Users can open an existing project in two ways:

- In menu, select "File > Open" to open an existing project.
- Click "  " to open an existing project.

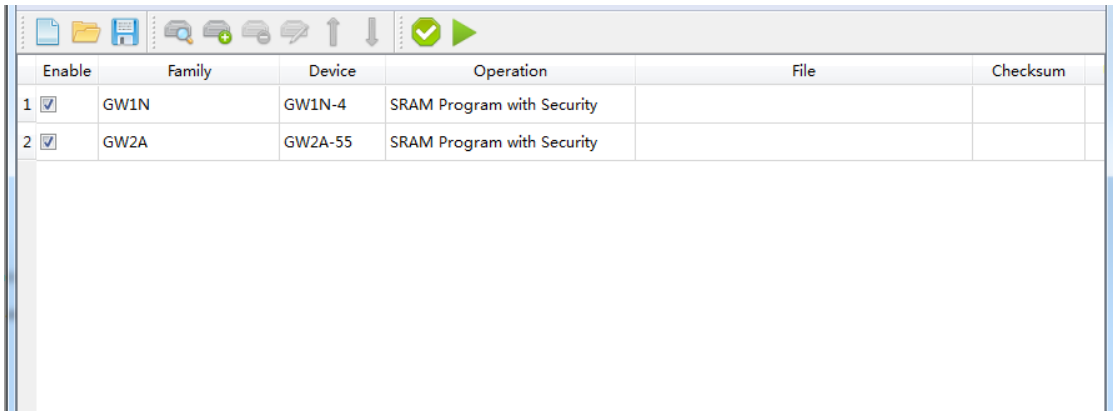
3.4 Scan Daisy Chain

Programmer automatically scans the daisy chain connected to the computer. The daisy chain can be scanned in two ways:

- From the menu, select "Design > Scan." The daisy chain connected to the computer will be scanned.
- Click on the "  " icon to scan the daisy chain connected to the computer.

After scanning, all devices are shown in the device table of the Gowin Programmer in the order of chain, as shown in Figure 3-3.

Figure 3-3 Device Table



Note!

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

3.5 Daisy Chain Configuration

Programmer supports the manual configuration of daisy chains. It includes the ability to add a device, remove equipment, and modify the position of the device in the chain.

3.5.1 Add Device

Follow the steps outlined below to add a device:

1. Select "Edit > Add Device" or click on the "  " icon in the menu to add a new device.

2. Click "Family" to select the device using the drop-down menu.
3. Click "Device" to select a specific device type using the drop-down menu.

Note!

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

3.5.2 Remove Device

Refer to following steps to remove a device:

1. Select the line containing the device.
2. Select "Edit→Remove Device" or click on the "  " icon in the menu to remove the device.

3.5.3 Modify Device Position in Chain

Refer to the following steps to modify the position of the device in the chain:

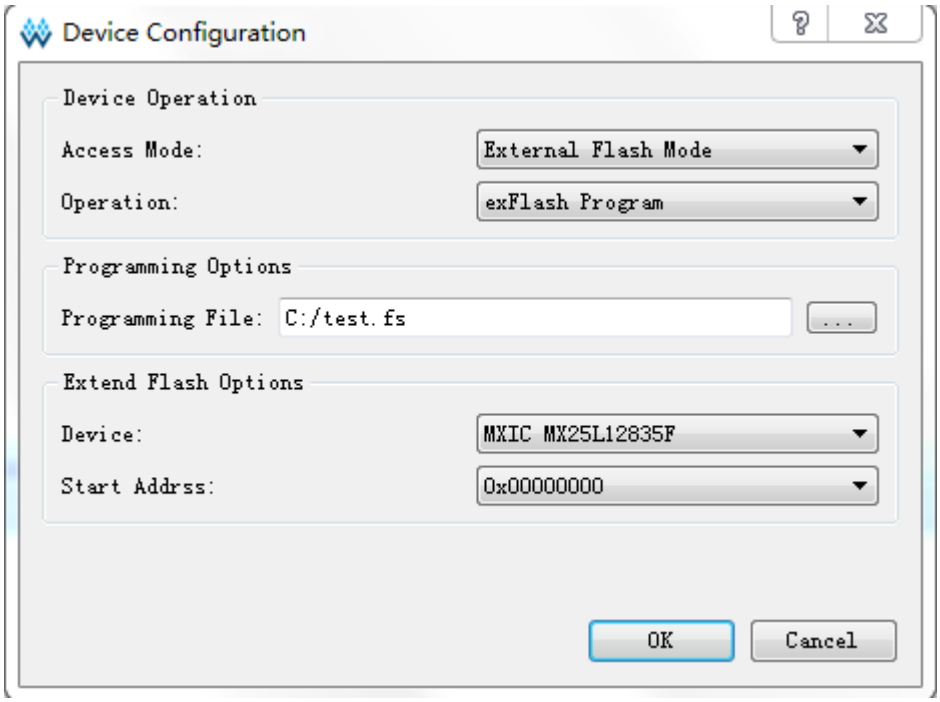
1. Select the line containing the device.
2. Select "Edit > Up/Down" from the menu, or click on the "  " or"  " icons to adjust the device position in the chain.

3.6 Device Programming Configuration

Select the line containing the device and open "Device Configuration" using one of the following three ways:

1. Select "Edit > Configure Device" from the menu.
2. Click on the "  " icon.
3. Double-click on the "Operation" option and open "Device Configuration", as shown in Figure 3-4.

Figure 3-4 Device Configuration



The parameters available in the device configuration window are described in Table 3-2.

Table 3-2 Device Configuration Parameters

Name	Description
Access Mode	Select the programming mode of the device.
Operation	See Table 3-3 for programming operation of the device.
Instruction Register Length	For JTAG-NOOP, select the length of the device command register.
Programming File	Select the programming data file.
Device	In external flash mode, select external flash model.
Start Address	In external flash mode, select the start address of SPI flash. The minimum address unit is 1 Sector (4096 Bytes).

Table 3-3 Device Programming Configuration

Access Mode	Operation	Description
SRAM Mode	Bypass	Bypass
	Read ID Code	Read ID Code
	Read Status Register	Read Status Register
	Reprogram	Reprogram
	SRAM Program	SRAM Program
	SRAM program and Verify[2]	SRAM Program and Verify
Embedded Flash Mode[1]	embFlash Erase, Program	exFlash Erase，Program
	embFlash Erase, Program, Verify	embFlash Erase, Program, Verify
	embFlash Erase Only	embFlash Erase Only
External Flash Mode	exFlash Erase，Program[3]	embFlash Erase, Program.
	exFlash Erase，Program and Verify	exFlash Erase，Program and Verify.
	exFlash Erase Only	exFlash Erase Only.
	exFlash Erase，Program in bscan	exFlash Erase，Program in bscan.
	exFlash Erase，Program and Verify in bscan	exFlash Erase，Program and Verify in bscan.
	exFlash Erase Only in bscan	exFlash Erase Only in bscan.

Note!

- The GW2A/GW2AR series of FPGA products do not support embedded flash mode.
- Security bit cannot be used in the FS file for SRAM verification.
- When performing a non-boundary scan, ensure that config-mode [2:0] = 011

3.6.1 SRAM Configuration

Follow the steps outlined below to configure the SRAM mode:

1. Select the line containing the device.
2. Open "Device Configuration" using one of the three ways described below:
   a). Select "Edit > Configure Device" from the menu.
   b). Click on the "  " icon.
   c). Double-click on the "Operation" option and open "Device Configuration", as shown in Figure 3-4.
3. Select "SRAM Mode" in "Access Mode".
4. Select operation in "Operation" as required.

   Note!

   For JTAG-NOP (JTAG - NOP only support Bypass), you need 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 "OK" to finish configuring.

3.6.2 EmbFlash Configuration - GW1N (R) Series of FPGA Products

The GW1N (R) series of FPGA Products include EmbFlash; the corresponding programming model is embedded flash mode.

1. Select the line containing the device.
2. Open "Device Configuration" using one of the following three ways:
   a). Select "Edit > Configure Device" from the menu options.
   b). Click on the "  " icon.
   c). Double-click on the "Operation" option and open "Device Configuration", as shown in Figure 3-4.
3. Select "Embedded Flash Mode" in "Access Mode".
4. Select operation in "Operation" as required.
5. Click on the "  " icon corresponding to the "Programming File" to select the programming data stream file.
6. Click "OK" to finish configuring.

3.6.3 ExFlash Configuration

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

1. Select the line containing the device.
2. Open "Device Configuration" using one of the three methods described below:
   a). Select "Edit > Configure Device" from the menu options.
   b). Click on the "  " icon.
   c). Double-click on the "Operation" option and open "Device Configuration", as shown in Figure 3-4.

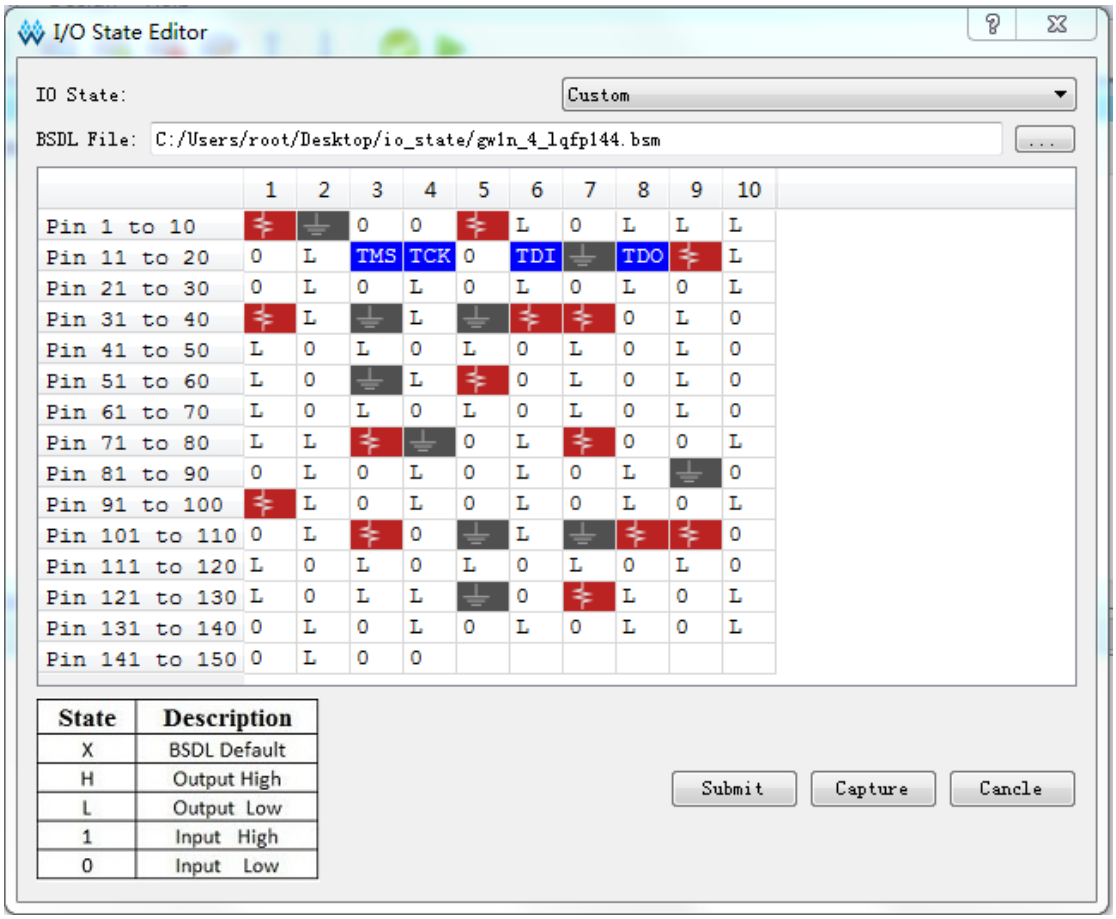
3. Select "External Flash Mode" in "Access Mode".
4. Select operation in "Operation" as required. If "exFlash Program" is selected in "Operation", the corresponding programming data stream file needs to be selected in the "Programming File".
5. Select the external flash in "Device".
6. Select the starting address of the external Flash in "Start Address", by default 0x00;
7. Click "OK" to finish configuring.

3.7 Edit Pin State

Programmer edits the I/O pin value via the I/O State Editor, which can be set before running the download program. Refer to the following steps to edit the pin state:

1. Select the line containing the device.
2. Select "Edit > Edit I/O State" from the menu options or right-click on the line corresponding to the device. Select "Edit I/O State", and open the "I/O State Editor", as shown in Figure 3-5.
3. Select the BSDL file that correlates with the device model and package.
4. 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



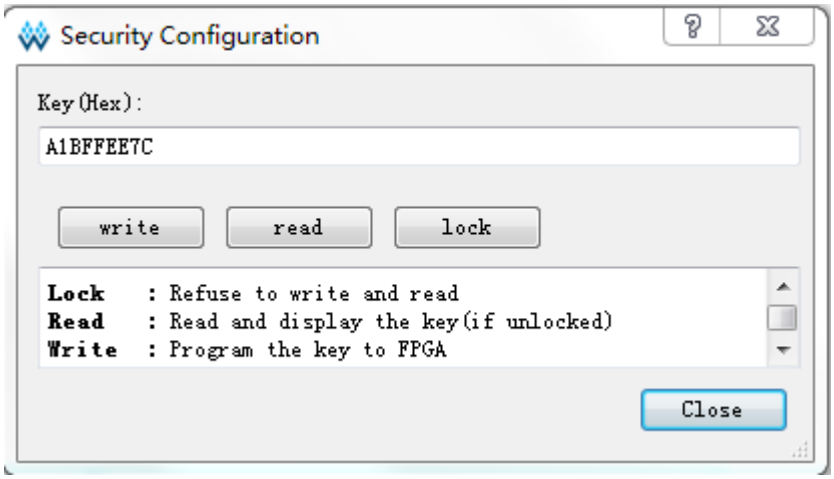
3.8 Key Programming

When programming with encrypted bitstream files, you need to write the key of the bitstream file to FPGA. Select the line containing the device, select "Edit > Configure Security" from the menu or right-click to select "Configure Security". The "Security Configuration" window will appear, as shown in Figure 3-6.

The total length of the key is 128 bits, and the initial state is 0x0, which is a non-volatile and one-time programming fuse. Each bit that is written as 1 can't be changed to 0.

If locked, the key cannot be programmed and read.

Figure 3-6 Security Configuration



The parameters that are available in the security configuration window are described in Table 3-4.

Table 3-4 Security Configuration Parameters

Name	Description
Write	Write the specified key value to FPGA.
Read	Read and display the key value in FPGA in the case of unlocking.
Lock	Lock key in FPGA. The key cannot be read or written after locking.

Note!

Programmer will prompt "lock" if the key has been locked. "Security Configuration" will not display.

3.9 Check the Current Configuration

Before saving the files and downloading the program, you need to check the current configuration.

Select "Design > Check" from the menu options or click on the "" icon to check the current configuration is reasonable.

3.10 Save the Current Configuration to the Project File

After completing the configuration, save the download cable and daisy chain in the project file.

Select "File > Save" or click on the "" icon to save in the menu.

3.11 Download Program

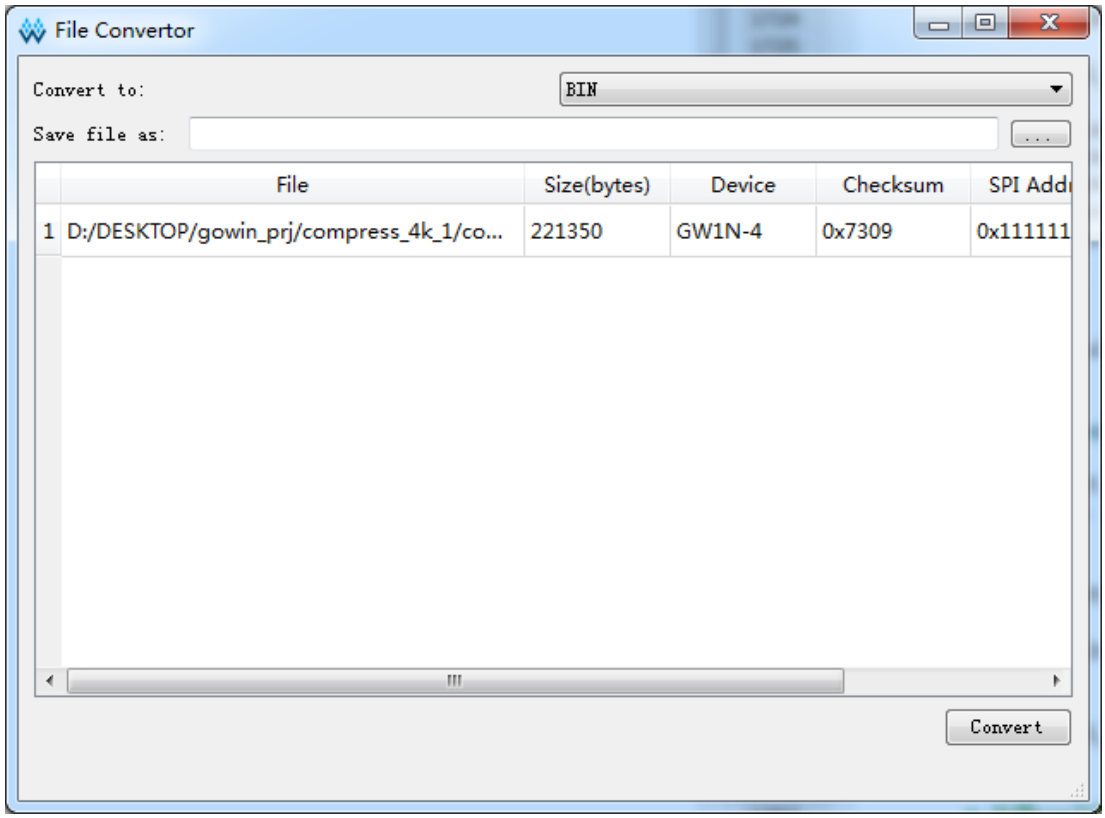
After configuring the download cable and daisy chain, select "Design > Run" from the menu options or click on the "" icon to program and download the device. The final result will be displayed in the output panel.

3.12 File Convertor

A conversion tool for the data stream file format is available to convert raw data flow (.fs) files into binary files.

The original data stream file is an ASCII text file that is easy to read, and binary files are pure data stream data files.

Figure 3-7 File Convertor

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