



# GOWIN GW1NRF Bluetooth FPGA Module User Guide

[Home](#) » [GOWIN](#) » GOWIN GW1NRF Bluetooth FPGA Module User Guide 

## GOWIN GW1NRF Bluetooth FPGA Module User Guide

### Contents

- [1 Testing GW1NRF4 Development Board Functionality](#)
- [2 Creating an GW1NRF MCU and FPGA Project](#)
- [3 Load and test MCU and FPGA designs](#)
- [4 Support and Feedback](#)
- [5 Revision History](#)
- [6 Documents / Resources](#)
  - [6.1 References](#)
- [7 Related Posts](#)

## Testing GW1NRF4 Development Board Functionality

### Step 1: Download and Install

#### Computer

- GW1NRFSocSdkSetup\_1.0.exe
- GOWIN EDA for Windows
  - Download – [https://www.gowinsemi.com/en/support/download\\_eda/](https://www.gowinsemi.com/en/support/download_eda/)
  - License – <https://www.gowinsemi.com/en/support/license/>

#### Smartphone/Tablet

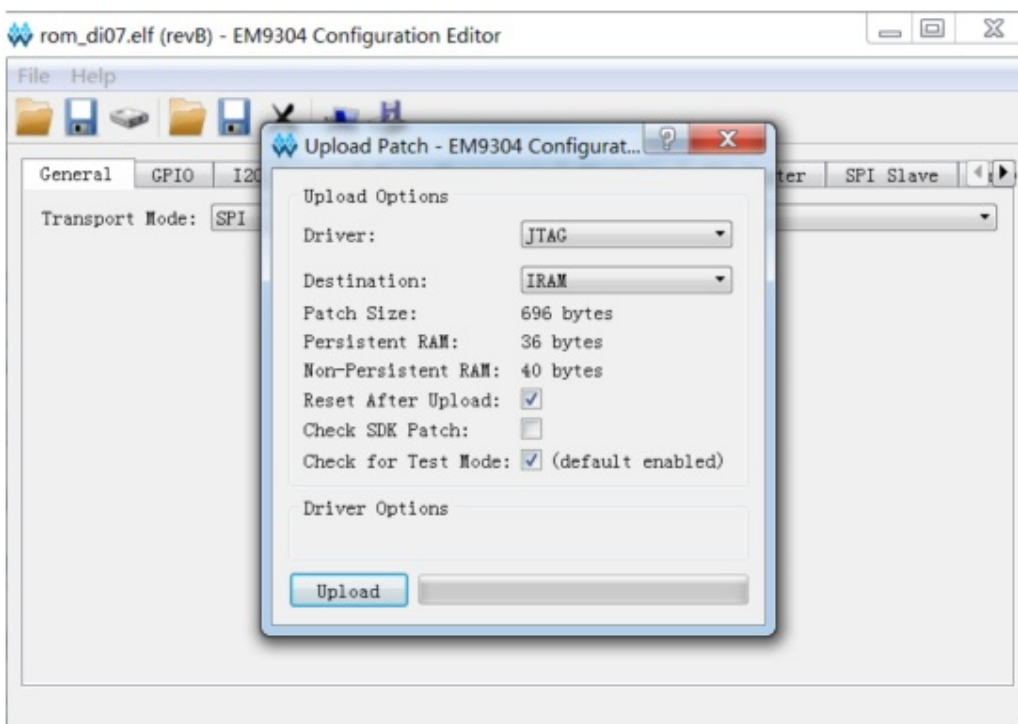
- Alpwise i-BLE App in iOS App Store or Google Play Store

## Step 2: Program and Test FPGA

1. Plug in DK-BLE-CEIT-ASSEM Development Board
2. Ensure drivers install and jumpers are set properly
3. Open GOWIN Programmer (Start → Gowin → Gowin Programmer)
4. Scan for devices
  1. Click 'Scan Device' icon
  2. Select 'GW1NRF-4B' and click 'OK'
5. Set FPGA bitstream to program
  1. Double click the blank cell under 'FS File' for the GW1NRF device
  2. Access Mode: Embedded Flash Mode
  3. File name: (Navigate to GW1NRF4\_FPGA\_BLINK\_1\_21\_2020.fs)
  4. Click Save
6. Click 'Program/Configure' icon
7. Observe blue LED blinking from successful FPGA programming

## Step 3: Program BLE and MCU

1. Start → Programs → Gowin Semiconductor → GW1NRF Config Editor.
2. Select Driver: Jtag.
3. Select 'Read from Device'.
4. File → Upload Patch.
5. Navigate to 'findme\_MCU\_GPIO7.emp'.
6. Select Driver: Jtag.
7. Destination: IRAM.
8. Check boxes 'Reset After Upload' & 'Check for Test Mode'.
9. Click Upload; Red LED should turn on after upload.



## Step 4: Test BLE and MCU

1. Open the Alpwise i-BLE App on your smartphone or tablet.
2. Click 'Play Bluetooth low energy'.
3. Click 'GW1NRF FindMe' from the list of Bluetooth devices.
4. Click the 'Find Me' Profile.
5. Push 'No Alert' → Red LED on the board should turn off.
6. Push 'High Alert' → Red LED on the board should turn on.



## Creating an GW1NRF MCU and FPGA Project

### Step 1: Setup Synopsys Metaware Lite

#### 1. Download and get license for Metaware Lite

[https://www.synopsys.com/cgi-bin/arcmtk\\_lite/reg1.cgi](https://www.synopsys.com/cgi-bin/arcmtk_lite/reg1.cgi)

#### 2. Install Metaware Lite

3. Start → Programs → Gowin Semiconductor → 'Setup Project Files'

### Step 2: Setup Metaware Lite for GW1NRF4

1. Start → Programs → Synopsys Inc → MetaWare Lite IDE P-2019.09-1
2. Create an Eclipse workspace path and click 'OK'
3. Click 'Create a New Workspace'
4. Specify the following path: 'C:\ProgramData\GW1NRFsdk'
5. Click 'OK'; Metaware Lite will reopen
6. Run the scrip of the C:\ProgramData\GW1NRFsdk\sw\ide\_project.bat'
7. File → Import → General, Existing Projects
8. Select Root Directory: 'C:\ProgramData\GW1NRFsdk\sw'
9. Click 'Finish'

### Note!

Metaware compiler version 11.8 in Metaware 2020.03 introduced new optimizations impacting functionality of GW1NRF SDK. On temporary basis, the workaround proposed is to modify include file "platform.h" in directory <libs/em\_hw\_api/includes>. The external reference to **gPlatform\_Config** declaration should be changed:

#### From:

```
extern const volatile Platform_Configuration_t gPlatform_Config;
```

**To:**  
*extern volatile Platform\_Configuration\_t gPlatform\_Config;*

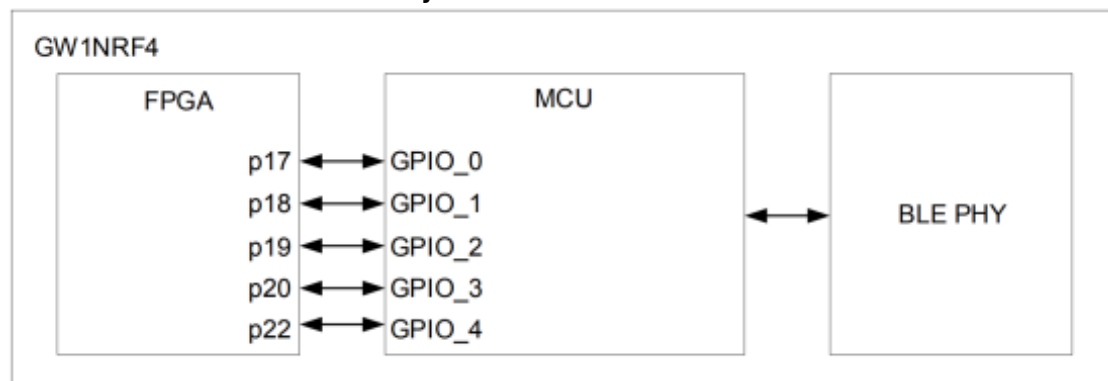
### Step 3: Compile MCU C Code

1. Navigate in Project Explorer to sw projects findme findme.c
2. On line 153 change the alert LED to GPIO 0 #define GPIO\_FINDME\_ALERT\_LED ( 0 )
3. Project Build All (if there is any error run 'clean')

### Note!

There is some path issue with the BLESW\_EM9304FOTA path in the GW1NRF SoC SDK Install.

### MCU and FPGA Connectivity



FPGA Constraint File 10 Name	MCU 10 Name
p17	GPIO 0
p18	GPIO 1
p19	GPIO 2
p20	GPIO 3
p22	GPIO 4

### Step 4: Synthesize and Load FPGA Design

1. Open GOWIN EDA
2. Open the 'fpga\_led\_blink' project
3. Observe led.v

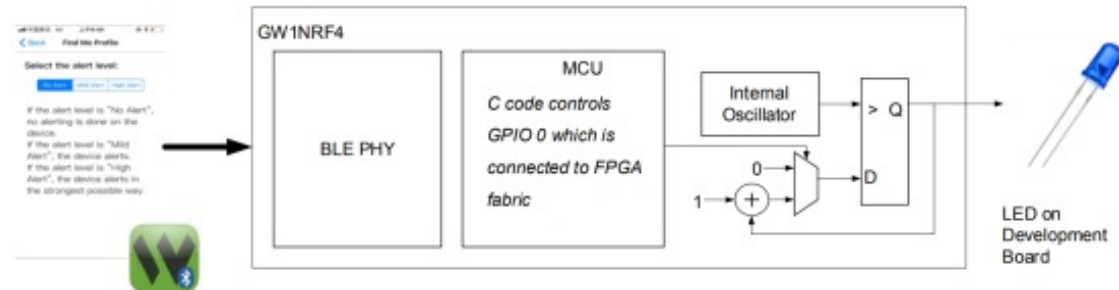
led.v creates a counter that controls an out 'led'. The counter runs when input 'enable' is active high.

#### 4. Observe led.cst

1. 'enable' is set to connect to p17, which is connected to MCU GPIO 0 based on the table in the previous slide
2. 'led' is connected to package pin 8; this is connected to the blue led on the development board

#### 5. Click the 'Process' tab in GOWIN EDA; right click on 'Place & Route' and select 'Rerun All'

### Resulting Design



Now, we use Alewise i-BLE App to control enable of a counter design in the FPGA. The enable turns the LED off or allows it to blink with the counter inside the FPGA.

## Load and test MCU and FPGA designs

### 1. Load FPGA file:

1. \*\\GW1NRF\_Getting\_Started\_v1\\fpga\_led\_blink\\impl\\pnr\\fpga\_project.fs
2. Same procedure as "Testing GW1NRF4 Development Board Functionality → **Step 2:** Program and Test FPGA"

### 2. Load MCU elf file:

1. C:\\ProgramData\\GW1NRFsdk\\sw\\projects\\findme\\findme.elf
2. Same procedure as "Testing GW1NRF4 Development Board Functionality → **Step 4:** Test BLE and MCU Step 2: Program and Test FPGA"

### 3. Test control of the FPGA led via BLE

1. Run Alewise i-BLE App
2. Same procedure as "Testing GW1NRF4 Development Board Functionality → **Step 4:** Test BLE and MCU Step 2: Program and Test FPGA"
3. led should be off or blinking based on the alert state in the Alewise App.

## 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](http://www.gowinsemi.com)

**E-mail:** [support@gowinsemi.com](mailto:support@gowinsemi.com)

## Revision History

Date	Version	Description
4/3/2020	1.0E	Initial version published.
11/10/2020	1.1E	“Step 2: Setup Metaware Lite for GW1NRF4” in the section of “Creating an GW1NRF MCU and FPGA Project” updated.
3/19/2021	1.2E	The note information in the section of “Creating an GW1NRF MCU and FPGA Project” updated.

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## Documents / Resources

	<p><b><a href="#">GOWIN GW1NRF Bluetooth FPGA Module</a> [pdf] User Guide</b>  GW1NRF Bluetooth FPGA Module, GW1NRF, Bluetooth FPGA Module</p>
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## References

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