E80-xxxMBL-02 Series
Evaluation Kit User Manual

Sub-GHz/2.4GHz LoRa Dual-Band Wireless Module Evaluation Kit



Chengdu Ebyte Electronic Technology Co.,Ltd.

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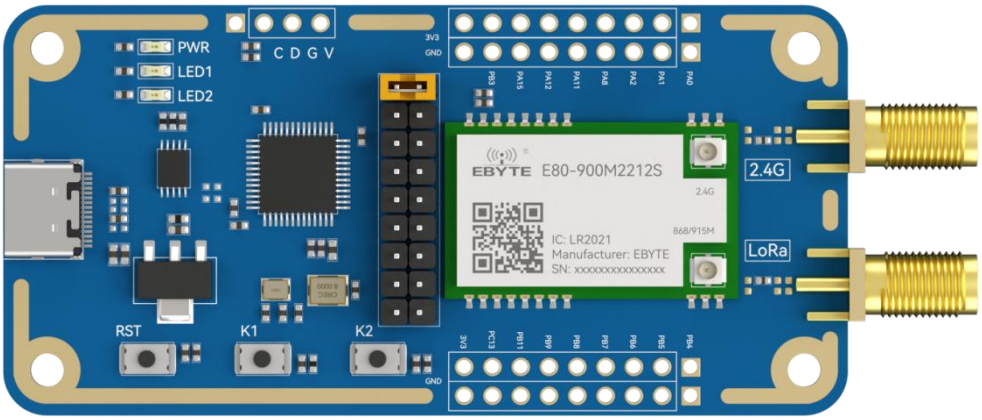
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1 Product Introduction

1.1 Brief Introduction



The E80-xxxMBL-02 series evaluation kit is designed to help users quickly evaluate EBYTE's new generation of LoRa dual-band wireless modules. It is equipped with a general-purpose MCU STM32F103C8T6 from STMicroelectronics, with most pins led out to pin headers on both sides. The kit provides simple source code examples of wireless transceiving software applications, facilitating customers to quickly start the test and development of wireless data communication. The user can complete testing and development by using the schematic and software demo of the Ebyte E80-xxxMBL-02 evaluation kit. They may also refer to the official reference examples provided by Semtech.

1.2 Supported Module List

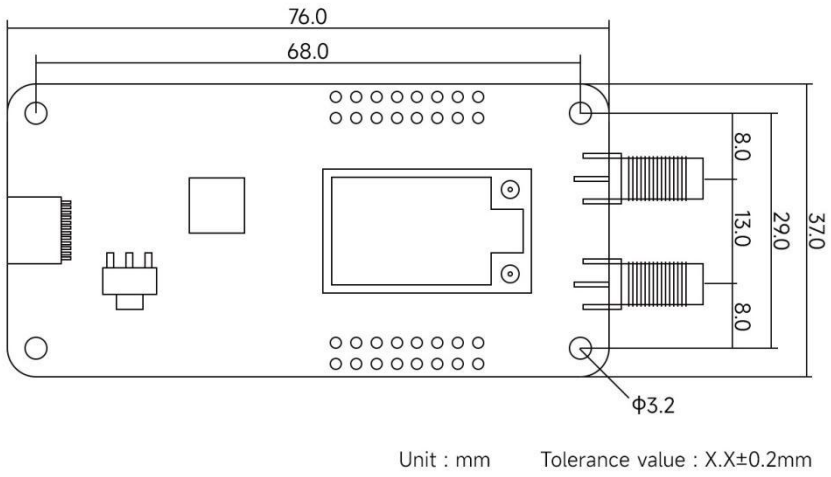
	RF Solution	Manufacturer	Module Model
1	LR2021	Semtech	E80-400M2212S(LR2021)
2	LR2021	Semtech	E80-900M2212S(LR2021)

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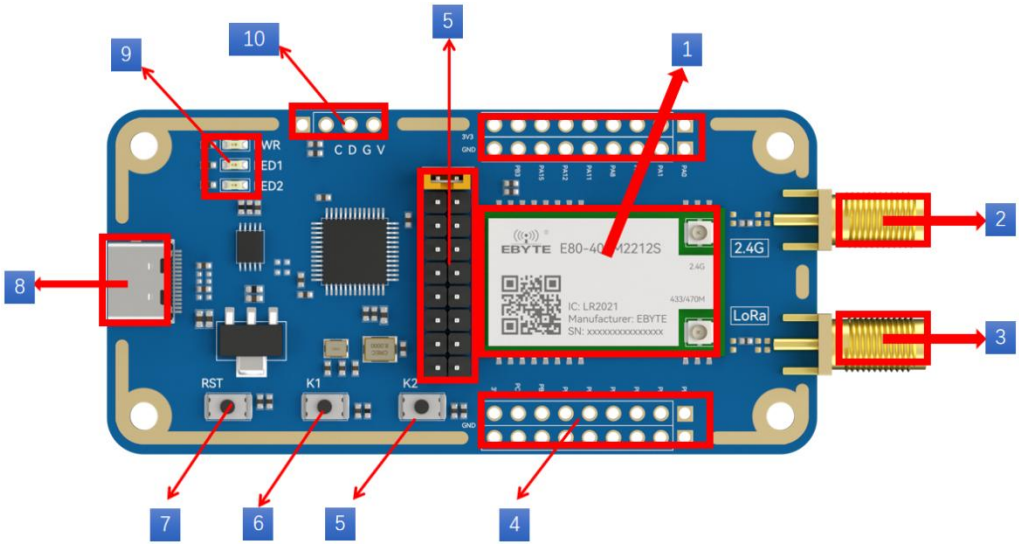
2 Mechanical Dimensions and Pin Definition

2.1 Dimension Description



Note: Pin header pitch is 2.54mm

2.2 Component Introduction



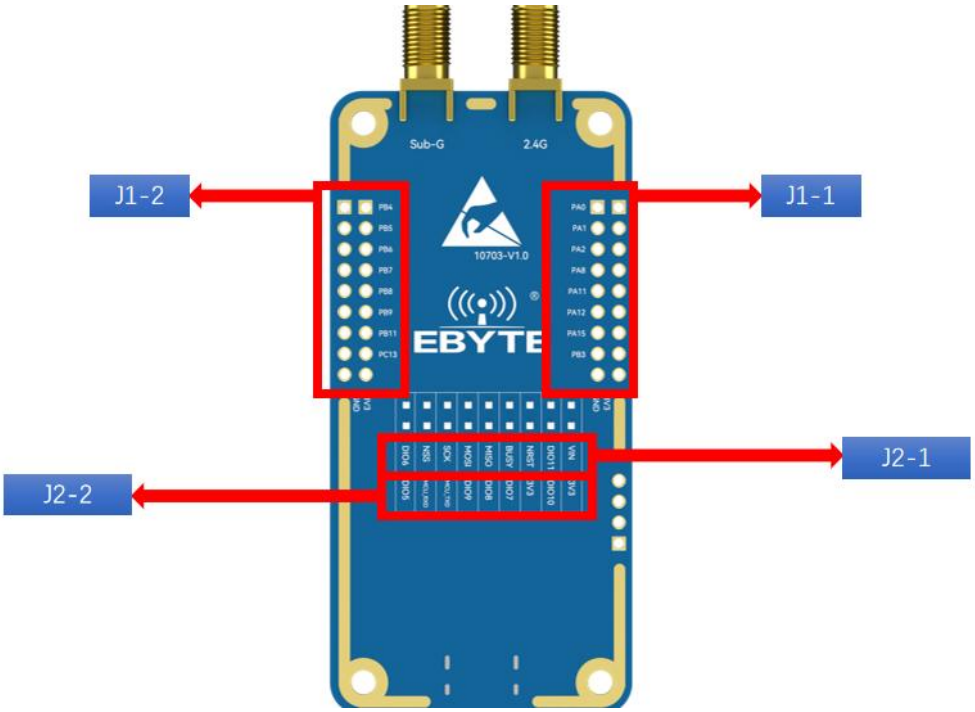
No.	Main Component	Description
1	E80-M Series Module	The E80-M series module is a self-developed dual-band SMD LoRa hardware SPI wireless module based on the LoRa Plus 4th generation LoRa® IP—LR2021 chip from SEMTECH, with transmit power of 22dBm and 12dBm respectively. For more information, please refer to E80-xxxM2212S Datasheet.

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No.	Main Component	Description
2	2.4GHz Antenna Interface	SMA-K, SMA female
3	Sub-1GHz Antenna Interface	SMA-K, SMA female
4	Pin Header（J1）	All available GPIO pins are led out to the pin header of the development board, see Pin Definition for details.
5	KEY2	-
6	KEY1	-
7	RESET	Reset button
8	USB Type-C to UART Interface	Can be used as the power supply interface of the development board, burn firmware to the chip, and also serve as a communication interface to communicate with the E80-M series module through the on-board USB to UART bridge.
9	Indicator Light	PWR: Power indicator; LED1: LINK indicator; LED2: DATA indicator
10	Debug Interface	MCU debug interface
11	Pin Header（J2）	All available GPIO pins are led out to the pin header of the development board, see Pin Definition for details.

2.3 Pin Definition



J1 Pin Definition:

No.	J1-1	J1-2
1	PA0	PB4
2	PA1	PB5
3	PA2	PB6
4	PA8	PB7
5	PA11	PB8
6	PA12	PB9
7	PA15	PB11
8	PB3	PC13
9	3.3V Power Supply	3.3V Power Supply

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J2 Pin Definition:

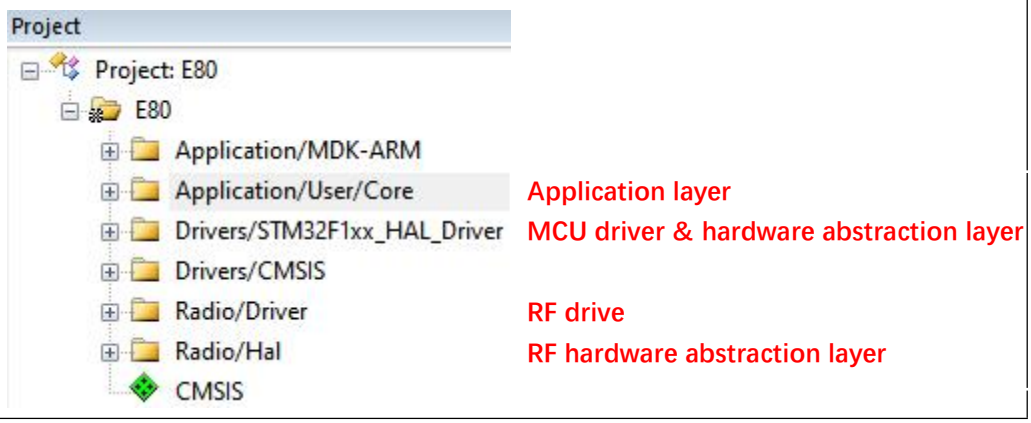
No.	J2-1	J2-2
1	VIN	3V3
2	DIO11	DIO10
3	NRST	3V3
4	BUSY	DIO7
5	MISO	DIO8
6	MOSI	DIO9
7	SCK	MCU_TXD
8	NSS	MCU_RXD
9	DIO6	DIO5

Notes: ① For detailed circuit information, refer to the schematic diagram and E80-M series product manual.

② Pins DIO8 and DIO9 are usually used for LR2021 RF interrupt output, which are low level in normal state and output a pulse signal when an interrupt occurs (it is recommended that the external main control unit GPIO pin use rising edge trigger to respond to this signal). For details of interrupt sources, refer to the chip manual.

3 Software Introduction

3.1 Software Demo Directory Structure

	Item	Description
1	File Directory	Download the Software Demo from the official EBYTE website and open it, the directory is shown in the figure. Open the project file ...\E80_DEMO\E80\MDK-ARM\E80.uvprojx with the compilation software Keil V5.38. 
2	Directory Explanation	The project directory is as follows: 

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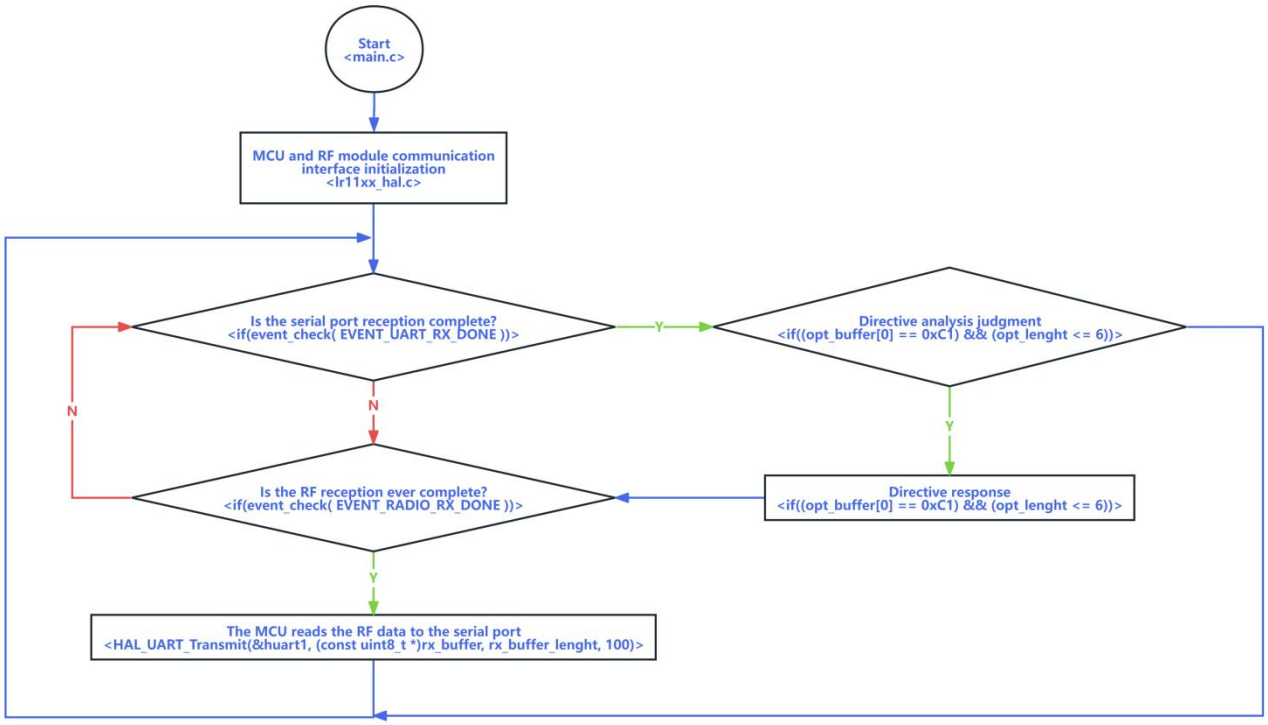
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3.2 Brief Description of Demo Functions

<main.c> is the main function entry, and the demonstration function process is simplified as follows:

	Item	Description
1	Serial Port Data to Wireless Transmission	The module automatically starts wireless transparent transmission of data after receiving data from the serial port, which also includes responses to some special commands (mainly for special testing and can be ignored by users). A user function will be automatically called back after transmission is completed for self-processing of the transmission logic.
2	Wireless Data Reception	The internal status flag of the module is generally read to determine whether there is data. The underlying driver will copy the data and transmit it to the user callback function for self-processing of the reception logic.

The software process is briefly described in the figure below:



3.3 Transmit and Receive Timing

The wireless module has multiple operating states, and specific functions can only be completed in the corresponding states. For the simplest data transmission and reception, only Transmit Mode and Receive Mode are considered.

	Item	Description
1	Receive Mode	The module automatically enters the receive mode after the default initialization is completed. Essentially, the receive function is called during initialization to enter the receive mode. Call the function radio_rx(void).

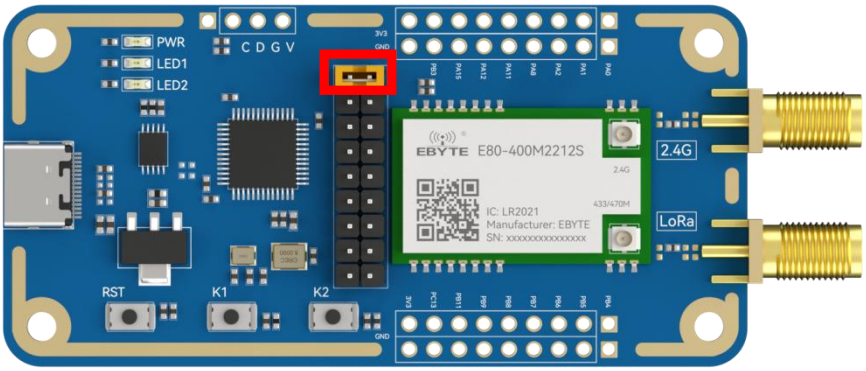
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2	Transmit Mode	When the transmit function is called, the underlying driver first switches the module to the standby mode, where modulation parameters such as frequency, power, frequency offset, etc. are usually configured. After the parameters are configured correctly, the module gradually enters some intermediate modes, enabling the internal FIFO, PA, external XTAL, etc., with the current consumption rising gradually. Finally, it switches to the transmit mode to trigger wireless data transmission, and the module automatically returns to the receive mode after completion.

4 Quick Demonstration

4.1 Signal Line Connection

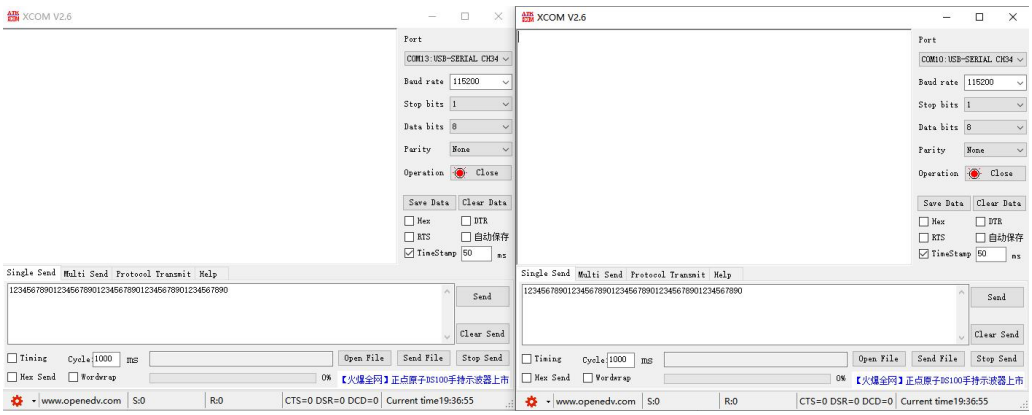
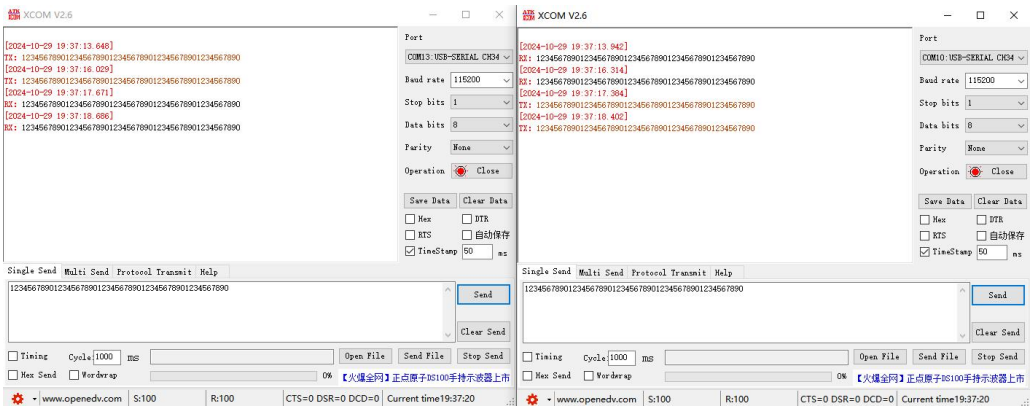
	Item	Description
1	RF Module Power Supply Jumper Cap	
2	Auxiliary Equipment	USB cable, PC, etc.

4.2 Serial Port Assistant

	Item	Description
1	Check Serial Port Number in Device Manager	

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2	Serial Port Software	
3	Serial Port Communication Example	
4	Serial Port Data Transparent Transmission	Transmit the required content directly through XCOM for serial port data transparent transmission.
5	Serial Port Special Commands (HEX Commands)	- Set Frequency: C1 00 + 4-byte frequency Example: C1 00 18 70 1A 80 (Configure frequency to 410MHz) - Single Carrier: C1 02 00 (Stop single carrier); C1 02 01 (Transmit single carrier) - RF Low Power Configuration: C1 03 00 (Exit sleep); C1 03 01 (Enter sleep, RF module current: 2uA) - Transmit Data: C1 C1 C1 (Auto transmit data)

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5 FAQ

5.1 Unideal Communication Distance

- The communication distance will be attenuated when there is an obstacle in the direct communication path;
- Temperature, humidity and co-channel interference will lead to an increase in communication packet loss rate;
- The ground absorbs and reflects radio waves, resulting in poor test results near the ground;
- Sea water has a strong ability to absorb radio waves, so the test results near the sea are poor;
- If the antenna is near metal objects or placed in a metal case, the signal attenuation will be very serious;
- Incorrect power register settings and excessively high air data rate (the higher the air data rate, the shorter the communication distance);
- The low power supply voltage is lower than the recommended value at room temperature, and the lower the voltage, the smaller the transmit power;
- Poor matching between the used antenna and the module or poor quality of the antenna itself.

5.2 Prone to Damage

- Check the power supply to ensure it is within the recommended voltage range; exceeding the maximum value will cause permanent damage to the module;
- Check the stability of the power supply, the voltage cannot fluctuate greatly and frequently;
- Ensure anti-static operation during installation and use, as high-frequency devices are susceptible to static electricity;
- Ensure that the humidity is not too high during installation and use, as some components are humidity-sensitive;
- It is not recommended to use the module at too high or too low temperatures without special requirements.

5.3 High Bit Error Rate (BER)

- There is co-channel signal interference nearby; keep away from the interference source or modify the frequency and channel to avoid interference;
- An unideal power supply may also cause garbled codes; ensure the reliability of the power supply;
- Poor quality or overlong extension cables and feeder lines will also lead to a high bit error rate.

Revision history

Version	Date	Description	Issued by
1.00	2026-3-6	Initial version	Hao

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