E28-2G4MBX-SC Series Development Kit
User Manual

Next-generation packaged compatible 2.4GHz ISM band wireless module kit



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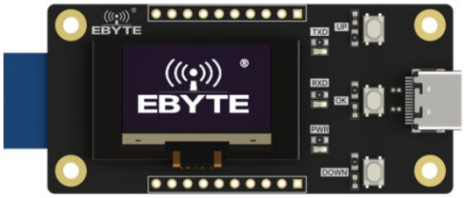
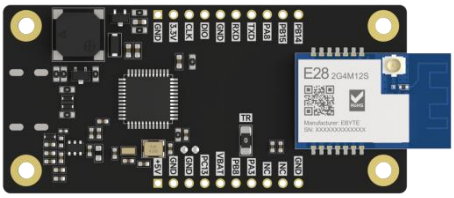
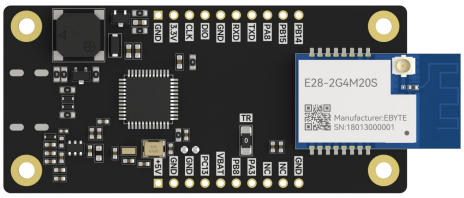
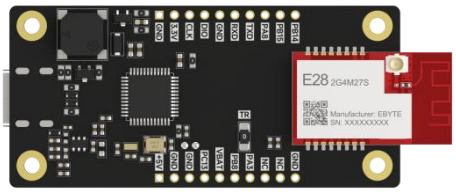
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1. Product Overview

1.1 Product Introduction

	model	front	back
Low power kit	**E28-2G4MBL-SC**		
Mid-power kit	**E28-2G4MBM -SC**		
High-power kit	**E28-2G4MBH-SC**		

The SC series Development kit is designed to help users quickly evaluate EBIRT's next-generation package-compatible wireless modules. The MCU uses the STM32F103C8T6, with all available pins brought out to the side headers. Developers can easily connect various peripheral devices via jumpers according to their needs, facilitating secondary development.

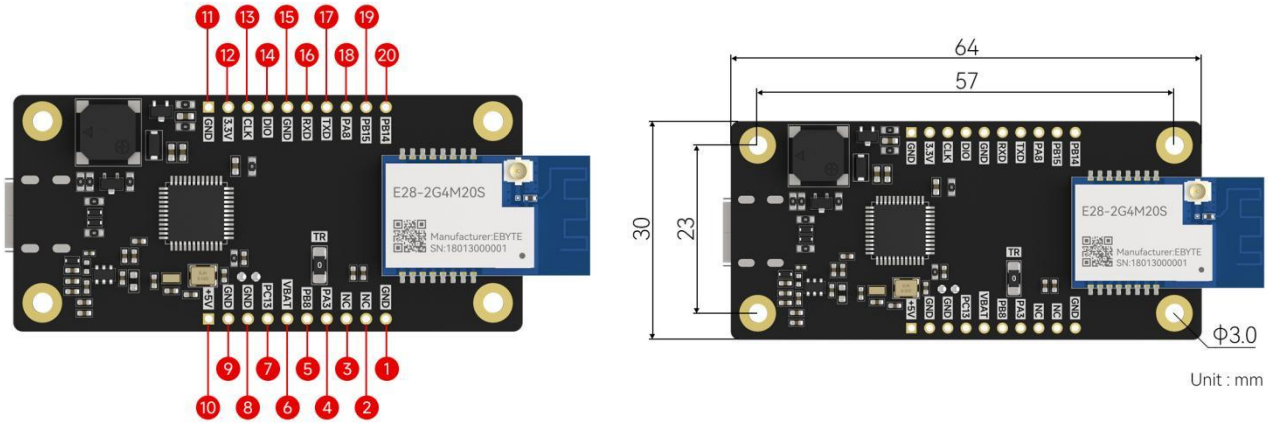
This kit provides complete software application examples to help customers quickly get started with wireless data communication development. Different types of Sub-1G wireless modules can be onboard to meet customer needs. All supported modules have pin-compatible packages for quick replacement.

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1.2 Pin Definitions

E28 -2G4MBL/ MBM/ MBH-SC



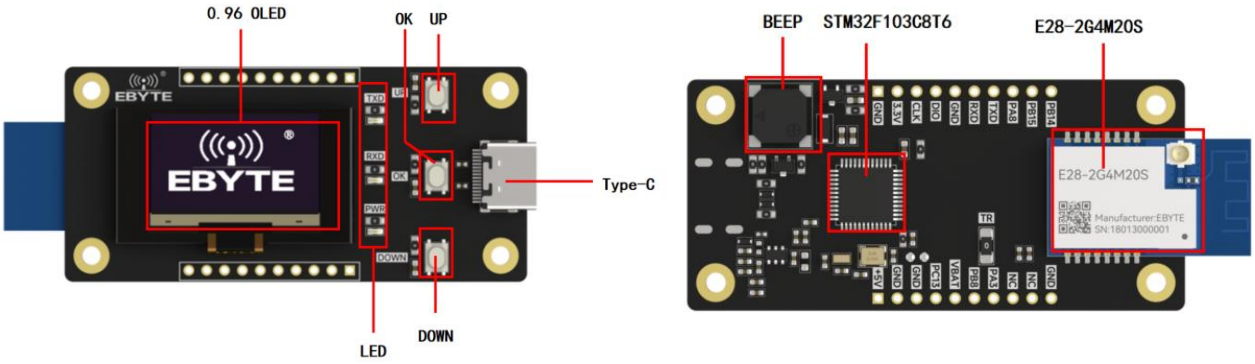
Pin number	definition	Function Description
1	GND	Base plate ground wire
2	NC	Suspended, without function
3	NC	Suspended, without function
4	PA 3	MCU_PA pin 3
5	PB8	MCU_PB8 pin
6	VBAT	MCU_VBAT pin
7	PC13	MCU_PC13 pin
8	GND	Base plate ground wire
9	GND	Base plate ground wire
10	+5V	5V power supply interface
11	GND	Base plate ground wire
12	3.3V	3.3V power supply interface
13	CLK	SWCLK
14	DIO	SWDIO
15	GND	Base plate ground wire
16	RXD	MCU PA10 data input pin , not used in factory program.
17	TXD	MCU PA9 data output pin , not used in factory program.
18	PA8	MCU_PA8 pin
19	PB15	MCU_PB15 pin
20	PB14	MCU_PB14 pin

Note: The pin definitions are the same for all three test kits.

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1.3 Function Introduction



Referring to the E28-400MBL-SC in the image above, the hardware functions of other models in the SC series are the same.

Display screen	0.96 OLED	Displays current configuration, test parameters, and version information, etc.
button	Up	The up arrow key is used to select or add points; continuous clicking is supported when setting frequency and power.
	Confirm/OK	Press the confirmation button to proceed to the next page or exit to the last page.
	Down	The down arrow key is used to select or decrease the frequency; continuous clicking is supported when setting frequency and power.
indicator lights	TXD	The transmit indicator light flashes once for each transmission.
	RXD	The receiver indicator light flashes once for each received signal.
	PWR	The power indicator light stays on when the power is on.
Test resistance	TR	Remove the test resistor and connect an ammeter in series to test the module current.
buzzer	BEEP	A beep sounds once when a button is pressed (this can be turned off internally).

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1.4 Parameter Introduction

Serial Number	Parameter name	Parameter value			Notes
		MBL-SC	M B M -SC	MBH-SC	
1	Test board size	64mm*30mm*1.6mm			-
2	Production process	Lead-free process, machine mounting			Machine-applied stamping ensures batch consistency and reliability.
3	Antenna Interface	IPEX or onboard PCB antenna			-
3	Power interface	Type-C			USB to Type-C
4	Operating temperature	-40 ~ +85℃			-
5	Operating humidity	10% ~ 90%			-
6	Storage temperature	-40 ~ +125℃			-

1.5 Compatibility List

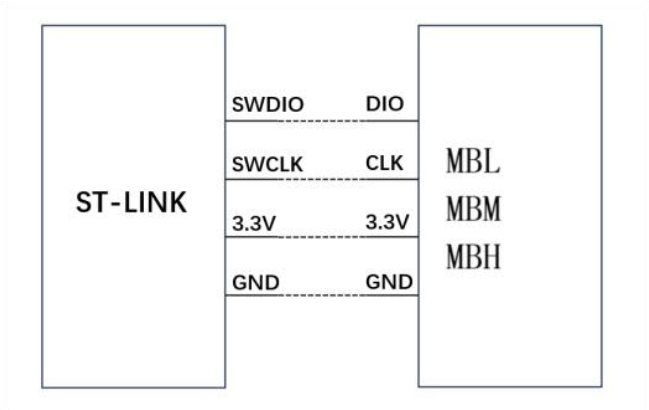
Module type	Communication interface	Serial Number	Module model	Corresponding base plate model
Low power module	SPI	1	E28-2G4M12S/SX	E28-2G4M BL-SC
medium power module		2	E28-2G4M20S/SX	E28-2G4M B M -SC
High power module		3	E28-2G4M27S/SX	E28-2G4M B H -SC

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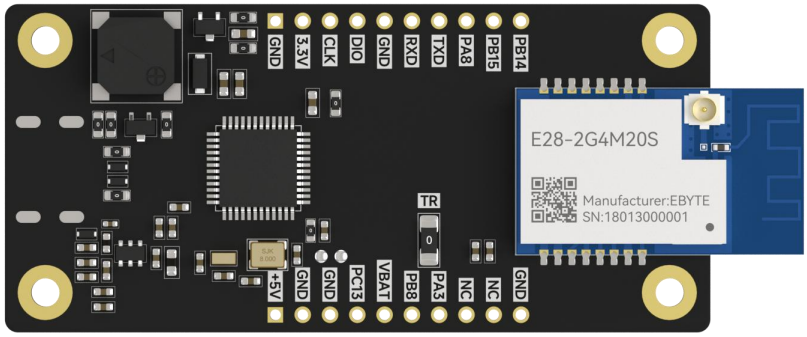
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1.6 Program Download Interface

Download interface diagram .



Take E28-400MBM -SC as an example .



The MCU can be programmed via ST-LINK. Please compile the program before programming.



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2 Software Introduction

2.1 Development Environment

2.1.1 STM32CubeMX

Recommended tool version : ≥ v6.16.0



STM32 firmware version ≥ v1.8.6



2.1.2 MDK-ARM

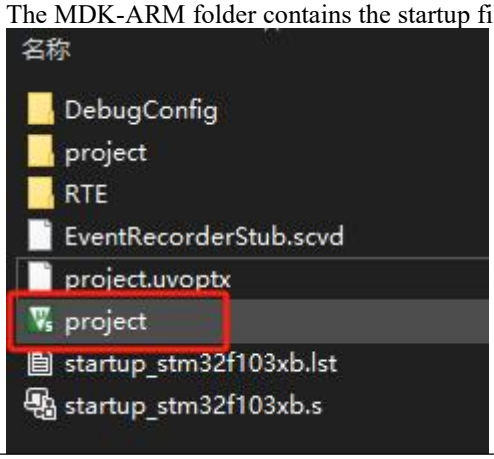
Keil version ≥ v5.31.0



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2.2 Directory Structure

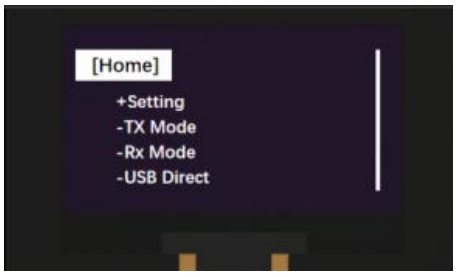
	matter	illustrate
1	File Directory	The sample project can be downloaded from the official website. The directory is shown in the image below.
2	Project Launch	The MDK-ARM folder contains the startup files. 
3	Module driver	The Drivers folder contains the corresponding RF chip drivers , for sx1280 and sx1281. Use the same driver file 
4	Module application	The Core/Src folder contains the corresponding e 28 _demo example. 

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3 Function Demonstration

3.1 Quick Start

<table>
<tr><th>Serial Number</th><th>matter</th><th>illustrate</th></tr>
<tr><td>1</td><td>front page</td><td>Upon power-on, the system will default to the home page, and all configuration parameters will be restored to their default settings.
</td></tr>
<tr><td>2</td><td>Enter page</td><td>Clicking the physical confirmation button will take you to the corresponding options page.</td></tr>
<tr><td>3</td><td>Basic parameter settings</td><td>1.The module's Setting page offers various LoRa parameters that can be adjusted as needed. For airspeed calculation, it is recommended to use the official Semtech LoRa calculation tool.
2.After configuration, select [Exit] to confirm and return to the previous page .

3.The configuration is as follows:

Functional explanation:
<table>
<tr><th colspan="3">M series</th></tr>
<tr><td>LoRa SF</td><td>Symbol rate</td><td rowspan="3">Airspeed needs to be calculated in conjunction with SF, BW, and CR.</td></tr>
<tr><td>LoRa BW</td><td>Channel bandwidth</td></tr>
<tr><td>LoRa CR</td><td>Encoding rate</td></tr>
<tr><td>Frequency</td><td>Operating frequency</td><td>Select frequency point</td></tr>
</table>
</td></tr>
</table>

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<table>
<tr><td></td><td></td><td>
<table>
<tr><td>TX Power</td><td>Transmit power</td><td>Configure transmit power</td></tr>
<tr><td>TX Count</td><td>Number of times sent</td><td>Configure the number of sends</td></tr>
<tr><td>Back Color</td><td>Background color</td><td>Reverse display screen background color</td></tr>
<tr><td>Buzzer</td><td>Buzzer switch</td><td>Control whether the buzzer responds when a button is pressed.</td></tr>
</table>
</td></tr>
<tr><td>4</td><td>Send test</td><td>4.Once Tx Mode is entered, it will automatically start sending data packets according to the user-defined parameters (default 10 bytes per packet).
5.Press the "OK" button on the page to exit and return to the previous page .
6.After sending, press the "down" key to resend.

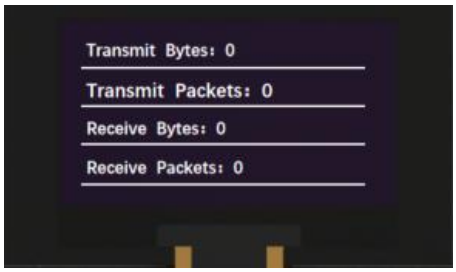
7.The TX sending interface is as follows:
</td></tr>
<tr><td>5</td><td>Receive test</td><td>1.Once Rx Mode is entered, it will automatically begin waiting to receive wireless data according to the user-defined parameters .
2.Press the "OK" button on the page to exit and return to the previous page .
3.After sending, press the "down" key to start receiving again .

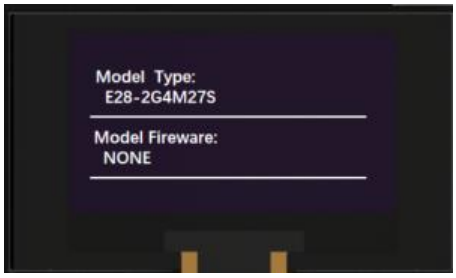
4.The RX receiver interface is shown below:
</td></tr>
<tr><td>6</td><td>USB pass-through</td><td>1.Once USB Direct mode is entered, the RF will be automatically configured according to the user-set parameters. In this mode, a serial port debugging assistant can be used for data</td></tr>
</table>

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<table>
<tr><td></td><td></td><td>transmission and reception. See section 3.2 for details .
2.Press the "OK" button on the page to exit and return to the previous page .
3.After sending, press the "down" or "down" key to start receiving again .


4.The USB direct transmit/receive mode interface is shown below:

</td></tr>
<tr><td>7</td><td>Version information</td><td>1.Displays basic information such as module model; if the M series module has no internal firmware, it displays NONE.


2.The version information interface is as follows:

</td></tr>
<tr><td>7</td><td>Reset</td><td>1.Select Reset, click OK to confirm, reset the configuration and return to the homepage.

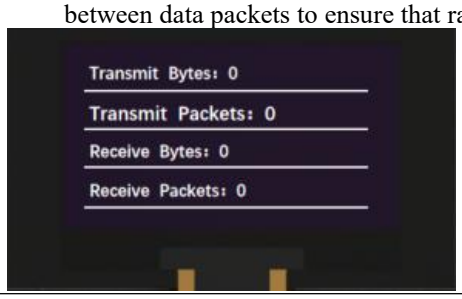


</td></tr>
</table>

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3.2 Implementing Pass-through Function via USB Serial Port

Serial Number	matter	illustrate
1	front page	Upon power-on, the system will default to the home page, and all configuration parameters will be restored to their default settings. 
2	menu	Press any key to enter the menu page, then press the "DOWN" key to select " USB Direct ", and then press the "OK" key to enter the settings mode. 
3	Mode Introduction	1.In " USB Direct " mode, from top to bottom, the page displays "RF Transmitted Bytes", "RF Transmitted Packets", "RF Received Bytes", and "RF Received Packets". 2.Press the "DOWN" or "UP" button to clear the counter; 3.Press the "OK" button to exit this mode ; 4.The maximum length of a single packet is limited to 64 bytes (this can be changed in the program). 5.Since there is no data buffering mechanism, it is recommended to allow sufficient time between data packets to ensure that radio frequency data transmission is completed. 
4	Pattern usage	Open the serial port tool , select the corresponding serial port, and you can achieve transparent transmission with modules of the same series . Note: The kit's configuration parameters are at their default values at this time. The test baseboard will statistically analyze the transmitted and received data.

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4 Frequently Asked Questions

4.1 Transmission distance is not ideal

- When there are obstacles in line-of-sight communication, the communication distance will be reduced accordingly;
- Temperature, humidity, and co-channel interference can all lead to increased packet loss rates in communications.
- The ground absorbs and reflects radio waves, and the test results are poor when the ground is close to the ground.
- Seawater has a strong ability to absorb radio waves, so testing results are poor at the seaside.
- If there are metal objects near the antenna, or if it is placed inside a metal casing, the signal attenuation will be very severe.
- Power register settings are incorrect; air speed is set too high (the higher the air speed, the shorter the distance).
- At room temperature, the power supply voltage is lower than the recommended value; the lower the voltage, the lower the power output.
- The antenna may be poorly matched with the module or have quality issues.

4.2 The module is easily damaged.

- Please check the power supply and ensure it is within the recommended voltage range. Exceeding the maximum value will cause permanent damage to the module.
- Please check the power supply stability; the voltage should not fluctuate significantly or frequently.
- Please ensure anti-static operation during installation and use, as high-frequency devices are sensitive to electrostatic discharge.
- Please ensure that the humidity is not too high during installation and use, as some components are humidity-sensitive.
- Unless there are special requirements, it is not recommended to use it at excessively high or low temperatures.

4.3 The error rate is too high.

- If there is interference from a co-channel signal nearby, move away from the source of interference or change the frequency or channel to avoid the interference.
- An inadequate power supply can also cause garbled characters, so it is essential to ensure the reliability of the power supply.
- Poor quality or excessive length of extension lines or feeders can also lead to a high bit error rate.

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5 Revision History

Version	Revision Date	Revision Notes	maintainer
1.0	2025-12-1 1	Initial version	Hao

6 Contact Us

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Documents and RF Setting download link: https://www.cdebyte.com

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