E104-BT53 Product Specifications

BLE5.2 SMD Bluetooth Wireless Module

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目录

Ⅰ Overview

1.1 Introduction

E104-BT53 is a serial port to BLE Bluetooth module based on Bluetooth protocol version 5.2. It is small in size, low in power consumption, and works in the 2.4GHz frequency band. The E104-BT53 series modules are developed by Chengdu Ebyte Electronic Technology Co., Ltd. based on Silicon Labs' BG22C112 (E104-BT53 A1 version) / BG22C224 (E104-BT53 A3 version) chips. The module uses general AT commands, and the operation is simple and fast .

Modules can be widely used in smart wear, home automation, home security, personal health care, smart home appliances, accessories and remote controls automobiles, lighting, industrial Internet, smart data collection, smart control and other fields.

1.2 Features

- Support Bluetooth BLE 5.2 protocol;
- Simple and easy to use, without any Bluetooth protocol application experience;
- Support all features of BLE 5.2: 2M physical layer, long-distance broadcast, extended broadcast;
- Support BLE single-master role, single-slave role, master-slave role and Beacon role;
- The module can act as the master role and the slave role at the same time. When connected by other master role devices, it can also connect to other slave role devices.
- Support OTA remote upgrade function (E104-BT53A3 only);
- The master role supports multiple connections: under a single master role, up to 8 slave role devices can be connected at the same time; under the master-slave integrated role, 7 slave role devices can be connected at the same time, and can be connected as a slave role by another master role device at the same time;
- The default connection interval is 20ms, the connection is fast, and it is compatible with other BLE modules of our company;
- The user interface adopts the general serial port design, the hardware flow control supports full-duplex communication, the minimum baud rate supports 1200bps, and the maximum supports 921600bps;
- Support serial port or mobile APP to send AT commands;
- Support AT command software reset module;
- Support AT command to set connection interval to control different forwarding rates and adjust dynamic power consumption;
- Support AT command to set transmit power, broadcast interval, serial port baud rate, broadcast name, etc. For details, please refer to 5AT command;
- Support AT command to modify service UUID of slave role;

- 2K serial port cache, the serial port receives user MCU data and automatically divides it into 244 bytes, and the timeout time is 100 milliseconds;
- High-speed transparent transmission and forwarding, the actual measurement can reach 50KB/s when the signal is good;
- Support to modify the physical layer communication rate: 1M, 2M and LE Coded (125K and 500K);
- The slave role supports custom broadcast data, up to a maximum of 26 bytes;
- The slave role supports extended broadcast packets, and a maximum of 251 bytes of extended broadcast can be customized;
- Support setting long-range broadcast package (Long Range/LE_CODED);
- The module is compatible with other models of the company;
- Sleep power consumption is as low as about 2uA.

1.3 Application scenarios

- Smart Wearable
- Home automation
- Home security
- Personal health care
- Smart home appliances
- Accessories and remote controls
- Intelligent robot
- Wireless sensor
- Electronic label
- Intelligent control

Ⅱ Specifications

2.1 Limit parameters

Main parameters	Performance		Remark
	Minimum value	Maximum value	
Supply voltage (V)	1.8	3.8	Exceeding 3.8V may permanently burn the module
Blocking power (dBm)	-	10	The probability of burning at close range is small
Working temperature (℃)	-40	+85	Industrial grade

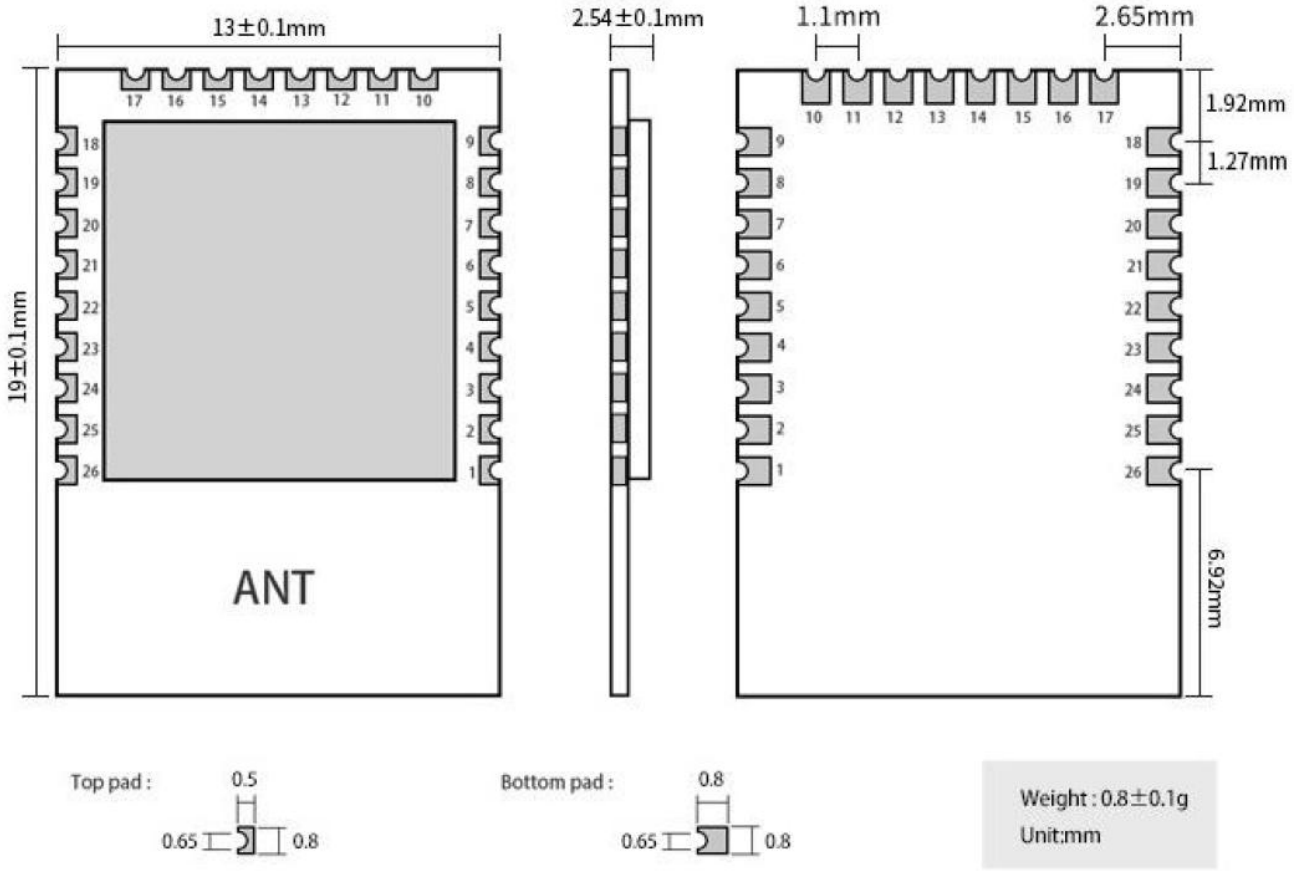
2.2 Working parameters

Main parameters		Performance			Remark
		Minimum value	Typical	Maximum value	
Working voltage (V)		1.8	3.3	3.8	≥3.3V can guarantee output power
Communication level (V)		-	3.3	-	Risk of burnout when using 5V level
Working temperature (℃)		-40	-	+85	工Industrial grade design
Working frequency band (MHz)		2400	-	2480	Support ISM band
Power consumption	Emission current (mA)		7.5		Peak transient current@6dBm(E104-BT53A3)
			3.4		Peak transient current@0dBm
	Receive current (mA)		2.5		This chip manual
	Sleep current (uA)	-	2	-	
Receive Sensitivity (dBm)		-	-98.9	-	1 Mbit/s GFSK
Receive Sensitivity (dBm)		-	-96.2	-	2 Mbit/s GFSK
Receive Sensitivity (dBm)		-	-106.7	-	125 Kbit/s GFSK

Main parameters	Description	Remark
Reference distance	70m	1Mbps Clear and open environment, height 1 meter, 0dBm, airspeed 1Mbps
	130m	1Mbps Clear and open environment, height 1 meter, 6dBm, airspeed 1Mbps

Bluetooth protocol	BLE 5.2	-
Communication Interface	UART serial port	-
Packaging method	SMD	-
Dimensions	13*19mm	-
RF interface	Onboard Antenna	Equivalent impedance is about 50Ω

Ⅲ Mechanical Dimensions and Pin Definitions

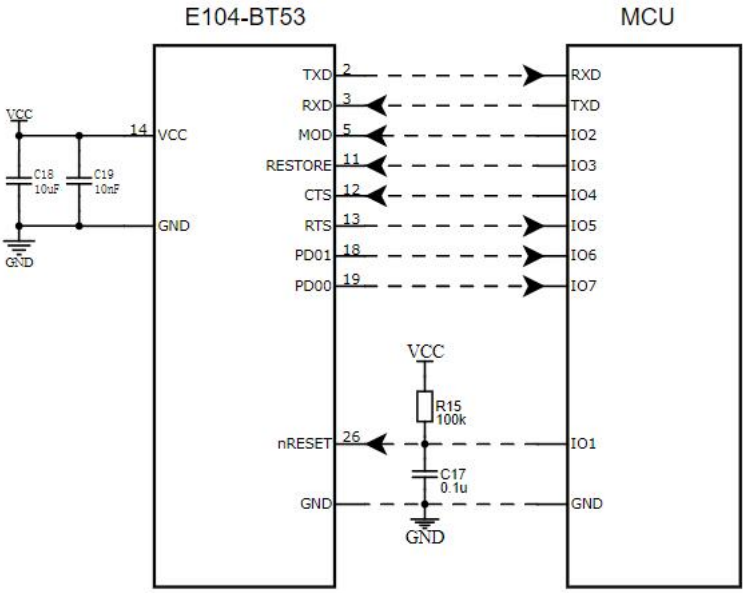


Pin number	Name	Function	Remark
1	GND	-	modular ground
2	PB02	TX	Module serial port sender
3	PB01	RX	Module serial port receiver
4	PB00	I/0	GPIO
5	PA00	MOD	Input low level for more than 200ms, the module enters configuration mode If the input high level is maintained for more than 200ms, the module enters the transparent transmission mode. (This pin has an internal pull-up and works in transparent

			transmission mode by default)
6	PA01	Serial debugging interface	SWCLK
7	PA02	Serial debugging interface	SWDIO
8	PA03	I/0	GPIO
9	GND	-	Power reference ground
10	GND	-	Power reference ground
11	PA04	RESTORE	Internal pull-up. Falling edge, then keep low level for at least 5 seconds, all parameters will be restored to factory settings and the module will automatically restart
12	PA05	CTS	(Standard hardware flow control Clear To Send) module input signal, high time meter Indicates that the MCU serial port is busy, the module will not send data to the MCU serial port, when it is low Can send data to MCU
13	PA06	RTS	(Standard hardware flow control Require To Send) Module output signal, when high Indicates that the module serial port is busy, the MCU is not allowed to send data to the module serial port, it is low can send data to the module.
14	VCC	-	Positive power supply, 1.71~3.8V, 3.3V recommended
15	VCC	-	Positive power supply, 1.71~3.8V, 3.3V recommended
16	GND	-	modular ground
17	GND	-	modular ground
18	PD01	Status indication	Indicates host connection status After the connection is successful, the pin outputs a low level Output high level after disconnection
19	PD00	Status indication	Indicates the connection status of slaves (including Beacon roles) After the connection is successful, the pin outputs a low level Output high level after disconnection
20	PC00	I/0	GPIO
21	PC01	I/0	GPIO
22	PC02	I/0	GPIO
23	PC03	I/0	GPIO
24	PC04	I/0	GPIO
25	PC05	I/0	GPIO
26	RESET	--	Module reset pin, active low, internal pull-up

Ⅳ Basic application

4.1 Recommended circuit



Picture 5-1 circuit

Ⅴ Function Description

5.1 Role description

The module supports the following 4 roles

1. From the role (slave);
2. The main role (master);
3. The role of master and slave (slave and master);
4. Beacon role;

The factory default is slave role (slave), and the role can be switched by the AT command "AT+ROLE". For details, please refer to 5 AT commands. The serial port of the module under the Beacon role is turned off every time it is powered on, and the serial port can be woken up by the rising edge of the CTS pin or Send AT commands to configure parameters through the mobile APP.

5.2 Default broadcast data

Raw data:

0x020106081B001BB12265112C0303F0FF0D094344
45425954455F42313142

Details:

LEN.	TYPE	VALUE
2	0x01	0x06
8	0x1B	0x001BB12265112C
3	0x03	0xF0FF
13	0x09	0x434445425954455F42313142

As shown in the figure above, the data with lengths 2, 8 and 3 are broadcast data, indicating the type of broadcast, MAC address information, and UUID information respectively; the data with length 13 is the data of the scan response packet, indicating the broadcast name (the last 4 bytes are the last two bytes of the MAC address).

5.3 Beacon default configuration

1. Company ID:0x4C00
2. Major UUID:0x2775
3. Minor UUID:0x848F
4. RSSI:-48 dBm
5. UUID:0xFDA50693A4E24FB1AFCFC6EB07647825

In this role, the serial port is closed by default every time the module is powered on, and can be woken up by the rising edge of the CTS pin.

5.4 Default configuration from role

1. Device name: CDEBYTE_XXXX (XXXX is the last two bytes of the module MAC address);
2. Broadcast interval: 200ms;
3. The connection interval is 20ms~40ms;
4. The broadcast type is connectable and scannable broadcast;
5. The connection timeout is 2.5 seconds;
6. UUID is 16 bits by default;

5.5 Module status

1. MODULE POWERUP: Module startup;
2. XX:XX:XX:XX:XX:XX CONNECTD P*X: The slave role is connected successfully;
3. XX:XX:XX:XX:XX:XX DISCONNECTED P: Disconnect from the role;
4. XX:XX:XX:XX:XX:XX CONNECTED B: Beacon connected successfully;
5. XX:XX:XX:XX:XX:XX DISCONNECTED B: Beacon disconnected;
6. XX:XX:XX:XX:XX:XX CONNECTD C*Y: The main role is connected successfully;
7. XX:XX:XX:XX:XX:XX DISCONNECTED C: The main role is disconnected;
8. ALREADY CONNECTED: This device is connected;
9. XX:XX:XX:XX:XX:XX CONNECT TIMEOUT: The BLE master connected to the slave device timed out;

The above status can be turned on or off by the AT command "AT+ LOGMSG", see chapter 5 AT Command for details.

5.6 Configure

1. Under the single master role, up to 8 slave role devices can be connected at the same time; under the master-slave integrated role, 7 slave role devices can be connected at the same time, and can be connected as a slave role by another master role device at the same time;

2. AT+CONNECT command fails to connect to the device prompt +ERR=3, please refer to the instruction description for the reason;

3. Multiple connections specify automatic reconnection of multiple devices. When a peer device is disconnected abnormally, the module will start automatic reconnection.

Please refer to the instruction description;

4. When there are multiple connections, the data transmission handle function specified by the command AT+TRM_HANDLE is not saved after power-off, and the device transmits data with the newly established connection device by default; if the handle device corresponding to the data transmission is disconnected, the data transmission handle value is automatically switched to the connection list.

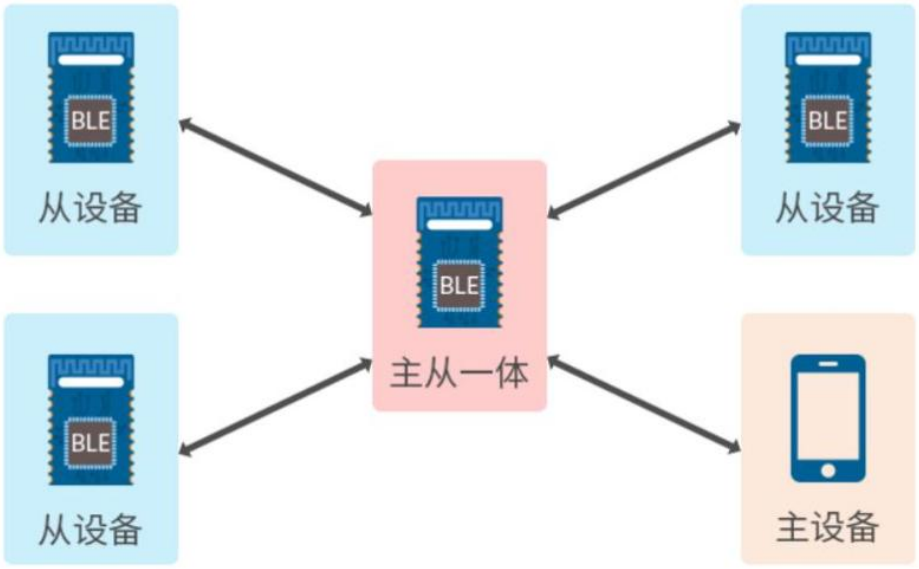
the last device in . (The handle value can be obtained from the return message "XX:XX:XX:XX:XX:XX" when the connection is successfully established

CONNECTED P*X" or by command AT+CONNECT_LIST?);

5. After the user uses the command to actively disconnect from the device that has been set to automatically reconnect, the automatic reconnection will fail this time, and the next time

It takes effect after abnormal disconnection.

Note: The source of multi-connection data transmission is more complicated, such as when the master-slave is integrated: the data may come from the following 4 devices, so the data packet should contain the data source, otherwise it is impossible to distinguish which device the data comes from.



5.7 Configuration mode

The module supports two configuration methods: serial port configuration and APP configuration. APP configuration, that is, using the BLE APP configuration module on the mobile phone, you must first verify the password through AT+AUTH, and some commands do not support APP configuration. The APP configures the authentication period to be this connection. If the device is disconnected and reconnected, re-authentication is required.

1. 1. Which configuration mode the module is in depends on the PA00 (MOD) pin level.
2. 2. The APP configuration does not need to pay attention to the state of the PA00 (MOD) pin, and can be configured at any time.
3. 3. When the PA00 (MOD) pin detects a valid change, the current state is latched. Each state change holding time is valid for more than 200ms.
4. 4. In configuration mode, the serial port sends an AT command, and it should wait for the serial port to return before sending the next AT command.

5.8 Auto update

MTU is the length of BLE single packet data; the default maximum is 247, and the maximum payload length is 244. After the module is successfully connected, the slave will actively initiate the MTU update. If the master accepts and responds, the MTU of the slave is used; if the master refuses and responds, the master and slave use the MTU of the master.

5.9 Status or event printing

Module model	Chip model	CPU speed (MHZ)	Transmit power (dBm)	FLASH(KB)	RAM(KB)
E104-BT53 A1 Version	EFR32BG22C112F352GM32	38.4	0	352	32
E104BT53 A3 Version	EFR32BG22C224F512GM32	76.8	+6	512	32

Note: A1 version does not support Long Range.

5.10 Compatibility with our other modules

When other modules of our company are connected to E104-BT53, input the MAC address of E104-BT53, and you need to pay attention to the problem of big and small ends.

Ⅵ AT Command

Note: Before sending the operation command, first ensure that the module is in the wake-up mode, otherwise it will not be able to receive the configuration command.

6.1 Instruction description

Instruction type	Instruction format	Description
query command	AT+[X]?	This command is used to query the parameters of the setting command.
set command	AT+[X]=<…>	This command is used to set user-defined parameters.
execute instruction	AT+[X]	Used for instructions without parameters, such as module reset.

- Notice:
- Serial port configuration ends with carriage return (\r) and line feed (\n) (APP configuration does not carry carriage return and line feed);
- The return results of the two configuration modes both end with (\r) and (\n), and will not be explained later;
- The default baud rate of the serial port is 115200, 8 bits of data bits, 1 bit of stop bits, no parity;
- Command parameters are in ASCII format;
- Instruction error response format +ERR:[NUM], [NUM] see 6.2 Error Code;
- <> in AT command indicates optional parameters, [] indicates required parameters; if all parameters of

AT command are optional parameters, any parameter should be filled, such as AT+ADV=,,20;

- The command part is not case-sensitive (excluding the "APP configuration authentication" command);
- When the module is in configuration mode or transparent transmission mode, APP configuration can be used;
- Some commands do not support the completion of APP configuration, such as "set extended broadcast", "AT command to send data", "main role scan", "open observer" and other AT commands that require serial port cooperation;
- All AT commands cannot contain invisible characters such as spaces and tabs.

6.2 Error code

NUM	Description	Error reason	Solution
1	Command does not exist	Input command error	Read 6.3 command list, such as setting broadcast parameters, comparing command "AT+ADV" character by character, to prevent input of wrong characters due to typing or spelling of words.
2	Parameter error	Input parameter error	Check 6.3 Command List for the description of "parameters" for each instruction table.
3	Operation not allowed or operation failed	The execution of related functions (connection, parameter setting, etc.) fails. If the module is powered on without executing the AT+SCAN command, execute AT+CONNECT=0	The parameters may have been saved, please try again or check the "Description" of each instruction table in 3.3 Instruction Table
4	Operation error	The current character does not support this command	Check 6.3 Command List "Description" for each command table

6.3 Command list

6.3.1 Test command

Command	Response
AT	+OK
Description: Used to test whether serial communication is normal.	

6.3.2 Broadcast name

Command		Response
Inquire	AT+NAME?	+ NAME =[para]
Setting	AT+NAME=[para]	+OK: Suceess

		+ERR=[NUM]：Error
Parameters	Broadcast name	
Instruction	Take effect immediately, save when power off; The length of the broadcast name is not more than 16 bytes; The factory default broadcast name is CDEBYTE_XXXX, where XXXX is the last two bytes of the MAC address.	
Example	Query the broadcast name (MAC is 2C:11:65:22:B1:1B) Command: AT+NAME? Return: +NAME=CDEBYTE_B11B Set the broadcast name to MY_TEST Command: AT+NAME=MY_TEST Return: +OK	

6.3.3 MAC Address

Command		**Response**
Inquire	AT+MAC?	+ MAC =[para]
Parameters	MAC address	
Instruction	The returned MAC address is in hexadecimal characters.	
Example	Suppose the local MAC address is 2C:11:65:22:B1:1B Command: AT+MAC? Return: +MAC=2C:11:65:22:B1:1B	

6.3.4 Module role

Command		**Response**
Inquire	AT+ROLE?	+ROLE=[para]
Parameters	AT+ROLE=[para]	+OK：success +ERR=[NUM]：error
Parameters	para	role
	0	slave,single slave (default)
	1	master,single master
	2	slave and master master-slave
	3	Beacon
Instruction	Restart to take effect, power off to save; Switching roles will clear the auto-reconnect device list; The serial port of the Beacon role is disabled by default and cannot be used, and the serial port can be woken up by the rising edge of the CTS pin).	
Example	query module role Command: AT+ROLE? Return: +ROLE=0	

	Set the module role to single host Command: AT+ROLE=1 Return: +OK

6.3.5 Transmit power

Command		Response
Inquire	AT+ PWR?	+ PWR =[para]
Setting	AT+ PWR =[para]	+OK: Suceess +ERR=[NUM]: Error
Parameters	The available value is -28, -20, -10, -5, -3,0,1,2,4,6	
Instruction	Take effect immediately, save when power off; It cannot be set when the scan, observer, or connection is enabled, otherwise error code 3 will be returned; Actual power may differ slightly from the requested value; The A1 version has a maximum transmit power of 0dBm, and the parameter range using this command is -28 to 0dBm.	
Example	Query transmit power Command: AT+PWR? Return: +PWR=0 Set the module transmit power to -5dBm Command: AT+PWR=-5 Return: +OK	

6.3.6 Broadcast parameters

Command		Response
Inquire	AT+ADV?	+ ADV =[para1],[para2],[para3]
Setting	AT+ADV=<para1>,<para2>,<para3>	+OK: Success +ERR=[NUM]: Error
Parameters	para1	Broadcast status: 0, off; 1, on;
	para2	Broadcast type: 0, can not connect to broadcast; 1, can connect to broadcast
	para3	Broadcast interval, range 20~10240, default 200ms
Instruction	Take effect immediately, save when power off; Only slave roles (including single-slave, master-slave, and beacon) support settings, and settings are not supported under single-master roles.	
Example	Query broadcast parameters Command: AT+ADV? Return: +ADV=1,1,200 Set to enable unconnectable broadcast and broadcast with an interval of 500ms Command: AT+ADV=1,0,500 or AT+ADV=,0,500 (when broadcasting is turned on)	

	Return: +OK Turn off broadcasting (the other two parameters remain unchanged) Command: AT+ADV=0,0,500 or AT+ADV=0 Return: +OK

6.3.7 Custom broadcast data

Command		Response
Inquire	AT+ADVDATA?	+ ADVDATA =[para1],[para2]
Setting	AT+ADVDATA=[para], <para2>	+OK: Success +ERR=[NUM]: Error
Setting (do not save)	AT+ADVDATA_CUR=[para], <para2>	
Parameters	para1: data input format (0: ASCII; 1: HEX) para2: custom broadcast data	
Instruction	Immediately effective, the command AT+ADVDATA is saved when power off, and the command AT+ADVDATA_CUR is not saved when power off; Returns NULL if no custom broadcast data has been set; This command is only supported for single-slave roles and master-slave roles, but not for single-host roles and Beacon roles; The data is placed in the manufacturer-defined field, and the user can define up to 26 bytes; Use the command "AT+ADVDATA=0" or "AT+ADVDATA=1" to restore the broadcast data to the default broadcast data; For applications that need to modify the broadcast data frequently, it is strongly recommended to use the AT+ADVDATA_CUR command to avoid repeatedly modifying the Flash parameters and affecting the Flash life; The APP configuration complete setting function is not supported.	
Example	Set the broadcast data to: ebyte Command: AT+ADVDATA=ebyte Return: +OK Set the broadcast data to: 0x55 0x66 0x77 0x88 0x99 Command: AT+ADVDATA=1,5566778899 Return: +OK	

6.3.8 Long Range broadcasting

Command		Response
Inquire	AT+LE_CODED?	+ LE_CODED =[para]
Setting	AT+ LE_CODED =[para]	+OK: Success +ERR=[NUM]: Error
Parameters	0: Disable long-distance broadcasting (default) 1: Turn on long-distance broadcasting	
Instruction	Take effect immediately, save when power off;	

	After enabling the long-distance broadcast, if the command "AT+ADV_EXT" is not used to set the user data, the default is the device with the broadcast name. At this time, the main role in the LE CODED physical layer (set by AT+SCAN_PHY) can scan the device and establish a connection; but after setting the user extended broadcast data, it will become an unscannable and unconnectable device; Beacon roles and single-player roles do not support this directive; The A1 version does not support this directive.
Example	Query long-distance broadcast Command: AT+LE_CODED? Return: +LE_CODED=0 Enable long-distance broadcasting Command: AT+LE_CODED=1 Return: +OK

6.3.9 Extended broadcast

Command		**Response**
Inquire	AT+ADV_EXT?	+ ADV_EXT =[para1],[para2]
Setting	AT+ ADV_EXT =[para1],[para2]	+OK：Success +ERR=[NUM]：Error
Setting (do not save)	AT+ ADV_EXT_CUR =[para1],[para2]	+OK：Success +ERR=[NUM]：Error
Parameters	para1: large broadcast data length, range 0-251 para2: Input data timeout time, range 1-5000	
Instruction	Take effect immediately, save when power off (except AT+ ADV_EXT_CUR); The user can customize the extended broadcast data up to 251 bytes. After enabling the extended broadcast, it will become an unnamed device. At the same time, the module will automatically add the broadcast length (LEN) and broadcast type (0xFF) to the front end of the data set by the user, and the device changes. For non-connectable and non-scannable devices; AT+ADV_EXT=0, restore the default extended broadcast; If the user has not set this parameter, it will return "+ADV_EXT=NULL"; Use the AT+ADV_EXT_CUR command to set custom data, after restarting, the data set by the last AT+ADV_EXT will be used; The APP configuration complete setting function is not supported. The APP configuration complete setting function is not supported.	
Example	Set the custom extended broadcast data to 100 bytes, and enter the timeout time of 5000 milliseconds Command: AT+ADV_EXT=100,5000 The above example is a custom extended broadcast with a length of 100 bytes, and the input timeout is 5000 ms. in setting Enter the broadcast data of the specified length within the valid time (the input data length cannot be less than or greater than the length, otherwise the setting will fail), and return +OK when the specified length is reached, as shown below. If the set timeout expires without reaching the specified input length, RECEIVE TIMEOUT is returned.	

	return: +OK INPUT EXT ADV: 100 Serial port sends 100 bytes: 12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890 return: +OK

6.3.10 Beacon Parameters

Command		Response
Inquire	AT+BEACON?	+ BEACON =[para1], [para2], [para3], [para4], [para5]
Setting	AT+ BEACON =<para1>, <para2>, <para3>, <para4>, <para5>	+OK：Success +ERR=[NUM]：Error
Parameters	para1:company ID, default 0x4C00 para2:Major UUID, default 0x2775 Para3: Minor UUID, default 0x848F Para4: 1 meter distance reference rssi, default -48, range -90~-10 Para5: Custom UUID, the default is 0XFDA50693A4E24FB1AFCFC6EB07647825	
Instruction	It takes effect immediately and is saved when power off.	
Example	Query Beacon Parameters Command: AT+BEACON? Return: +BEACON=4C00,2775,848F,-48,FDA50693A4E24FB1AFCFC6EB07647825 Set Beacon Parameters Command: AT+BEACON=4C00,0102,0304,-48,FDA50693A4E24FB1AFCFC6EB07647825 Return: +OK	

6.3.11 Slave role service

Command		Response
Inquire	AT+SERVICE?	+ SERVICE =<para1>, <para2>, <para3>, <para4>, <para5>, <para6>
Setting	AT+ SERVICE=<para1>, <para2>, <para3>, <para4>, <para5>, <para6>	+OK：success +ERR=[NUM]：error
Parameters	para1: UUID bits (0: 16 bits; 1: 128 bits) para2: module server UUID (3rd and 4th bytes), length 4 Para3: Module receiving channel UUID (3rd and 4th bytes of 128-bit UUID), length 4 Para4: The module sends the channel UUID (the 3rd and 4th bytes of the 128-bit UUID), length 4	

	Para5: Wireless AT command channel UUID (3rd and 4th bytes of 128-bit UUID), length 4 Para6: 128-bit basic UUID (the 3rd and 4th bytes of the basic UUID are replaced with the UUID of the above parameters to form the actual 128-bit UUID of the module), length 32
Instruction	Restart to take effect, save when power off; This directive is only valid for slave roles (single-slave, master-slave and Beacon); The base UUID of 0000xxxx-0000-1000-8000-00805F9B34FB is not usable.
Example	Query the default 16-bit slave role service Command: AT+SERVICE? Return: +SERVICE=0,FFF0,FFF1,FFF2,FFF3 Set 128-bit slave role service Command: AT+SERVICE=1,0001,0002,0003,0004,9ECADC240EE5A9E093F3A3B50000406E Return: +OK 128-bit slave role service for query settings Command: AT+SERVICE? Return: +SERVICE=1,0001,0002,0003,0004,9ECADC240EE5A9E093F3A3B50000406E

6.3.12 Master role scan

Command		**Response**
Inquire	AT+SCAN?	+ SCAN=[para1], [para2], [para3]
Setting	AT+ SCAN =[para1], <para2>, <para3>	+OK：success 0 02:83:E1:66:C2:D0 -89 1 9C:19:C2:39:7D:35 -75 ..... +ERR=[NUM]：error
Parameters	para1: current scanning state, 0: stop; 1: scanning para2: scan timeout, in seconds, the value range is 1-65535 Para3: Whether to display the bluetooth name, 0: not display 1: display (default)	
Instruction	It takes effect immediately and will not be saved when power off; This command is only valid for the master role (single master, master-slave integrated); Automatically stop scanning when the number of devices reaches 20 or when the scanning timeout period is reached; If the observer is enabled, using this command will disable the observer function.	
Example	Querying the scan parameters of the primary role Command: AT+SCAN? Return: +SCAN=0,20,1 Set main character scan parameters (start scan, do not display bluetooth name, scan time 20 seconds) Command: AT+SCAN=1,20,0 Return: +OK	

6.3.13 The master character scans the physical layer

Command		Response
Inquire	AT+SCAN_PHY?	+ SCAN=[para]
Setting	AT+ SCAN_PHY =[para]	+OK：success +ERR=[NUM]：error
Parameters	0:1M PHY(default)； 1:LE CODED PHY。	
Instruction	Take effect immediately, save when power off; After setting the scanning physical layer of the master role to LE CODED PHY, only the slave devices that are the same as the LE CODED physical layer can be scanned, and only the slave devices of this physical layer can be connected; Only the master role (single master, master-slave) supports this command; E104-BT53A1 does not support this command.	
Example	Querying the scan parameters of the primary role Command: AT+SCAN_PHY? Return: +SCAN_PHY=0 Set the primary role to scan the physical layer as LE CODED PHY Command: AT+SCAN_PHY=1 Return: +OK	

6.3.14 Master role connection

Command		Response
Setting	AT+ CONNECT=<para1>, <para2>	+OK：success +ERR=[NUM]：error
Parameters	para1: According to the "AT+SCAN" command, return the serial number or MAC address in the list to connect the specified slave device; para2: MAC address.	
Instruction	Effective immediately; Connect the specified MAC address slave device. Parameter 1 is omitted, just fill in the MAC address to be connected; the connection may fail due to a connection timeout of the connecting device. The connection timeout time is 10 seconds. After the timeout, it will prompt: "C1:02:03:04:05 CONNECT TIMEOUT" After success, the last number of the status printing prompt string is the handle that has just established the connection, and the current transparent transmission points to this handle; The master-slave role can connect up to 7 slave devices, and the single-master role can connect up to 8 slave devices; When the maximum number of connections is reached, using this command again will return +ERR=3, and it is necessary to disconnect a connected device before connecting a new device; After initiating a connection, you need to wait for the connection to complete (preferably after printing the connection information at an interval of about 1 second, because it takes	

	a certain amount of time for the host to discover the service) before initiating the next connection, otherwise +ERR=3 is returned. If the main role exceeds the maximum number of connections or the remote Bluetooth has established a connection with this module, using this command will also directly return +ERR=3.
Example	Connect the AT+SCAN command to return the slave device with serial number 5 in the parameter list Command: AT+CONNECT =5 return: +OK C1:02:03:04:05 CONNECTD C*1 The specified MAC address for the connection is C1:02:03:04:05 Command: AT+ CONNECT=, C1:02:03:04:05 return: +OK C1:02:03:04:05 CONNECTD C*1

6.3.15 Command to send data

Command		Response
Setting	AT+SEND=[para1],[para2], <para3>	+OK：success +ERR=[NUM]：error
Parameters	para1: connection handle value, range 1~8 para2: data length, range 1-300 bytes para3: send data input timeout (range 1~5000, unit ms, the default parameter is 500ms)	
Instruction	Effective immediately; In the following example, input the send data of the specified length within the set timeout period, and return +OK, if the timeout period expires but the specified input length is not reached, it will return RECEIVE TIMEOUT; In AT command mode, if BLE data is received, the prefix "+RECEIVED:" will be printed, the first parameter is the connection handle value, the second parameter is the length of the received data, and "1234567890" is the received data. The data. If it is in the transparent transmission mode, the data will be printed directly; The APP configuration complete setting function is not supported. The APP configuration complete setting function is not supported.	
Example	The connection handle is 1, the sending data (ASCII) is ABCED, and the input timeout time is 5000ms Command: AT+SEND=1,5,5000 return: +OK INPUT BLE DATA: 10 The module is in AT command mode to receive BLE data +RECEIVED:1,10	

	BLE DATA 1234567890

6.3.16 Show connected devices

Command		Response
Inquire	AT+CONNECT_LIST?	+ CONNECT_LIST =[para1], [para2]
Parameters	para1: connection handle para2: Remote device MAC address	
Instruction	Effective immediately; It is valid in master and master-slave integrated mode; This command is used in conjunction with AT+TRM_HANDLE, for example: AT+TRM_HANDLE=1 means that the main role transparently transmits data to the device whose handle value is 1 and whose MAC address is 2C:11:65:22:B0:F1; The handle value followed by the marked letter "P" indicates that the connection is the master device (mobile phone or master role module) under the slave role.	
Example	Show connected devices Command: AT+CONNECT_LIST? return: +CNT_LIST= 1P,2C:11:65:22:B0:F1 2,2C:11:65:22:AD:59	

6.3.17 Disconnect

Command		Response
Setting	AT+DISCON=[para1],[para2]	+OK: success +ERR=[NUM]: Error
Parameters	para1: current role, 0: single-slave role, 1: single-master role, 2: master-slave integration para2: The handle value that needs to be disconnected, you can use the AT command "AT+CONNECT_LIST" to query	
Instruction	Effective immediately; Note: parameter 2 must be used in the correct role (ie parameter 1 must be the role of the current device), If the device is the master role and two slave role devices have been connected, "AT+DISCONNECT=1,1" means to disconnect the slave role device whose handle is 1 from the master role connection. AT+DISCON disconnects all connections.	
Example	Disconnect the specified connection Command: AT+DISCON=1,1 return: +OK	

	2C:11:65:22:B0:F1 DISCONNECTD C Disconnect all current connections from the primary role Command: AT+DISCON return: +OK 2C:11:65:22:B0:F1 DISCONNECTD C 7D:C2:A0:35:4C:21 DISCONNECTD P

6.3.18 Auto reconnect

Command		Response
Inquire	AT+AUTO_CNT?	+ AUTO_CNT =[para1],[para2]
Setting	AT+ AUTO_CNT =[para1], <para2>	+OK: success +ERR=[NUM]: Error
Parameters	Para1:0: Disable automatic reconnection, 1: Enable automatic reconnection; Para2 (optional parameter): Add the device MAC to the automatic reconnection list. If this parameter is included, the automatic reconnection function will be disabled or enabled according to the setting value of parameter 1. At the same time, other devices in the list will be automatically reconnected. Not affected by this directive, the default value is NULL.	
Instruction	Restart to take effect, power off to save; The slave device disconnected by the "AT+DISCON" command will not be automatically reconnected this time. The automatic reconnection function can be restored under the following conditions: Connect the slave again using the command restart the module Turn off the BLE function and then turn on the BLE function (use the command "AT+SLEEP=,0" to turn off the BLE function, and then use the command "AT+SLEEP=,1" to turn on the BLE function) After using the command "AT+SLEEP=, 0" to turn off the BLE function, the module will not automatically reconnect, and the automatic reconnection function will resume when the BLE is turned on again; If the remote slave device modifies the MAC address, the automatic reconnection function of this module will be invalid.	
Example	Query the list of reconnected devices Command: AT+AUTO_CNT? Return: +OK=NULL Enable automatic reconnection and set the reconnection device MAC C2:01:02:03:04:05 Command: AT+AUTO_CNT=1,C2:01:02:03:04:05 Return: +OK Turn on auto-reconnect for all devices in the auto-reconnect list Command: AT+AUTO_CNT=1 Return: +OK Disable the automatic reconnection function of the device whose MAC is C2:01:02:03:04:05	

	Command: AT+AUTO_CNT=0,C2:01:02:03:04:05 Return: +OK

6.3.19 Remove auto-reconnect

Command		Response
Setting	AT+ DEV_DEL=[para]	+OK: success +ERR=[NUM]: Error
Parameters	para:MAC address, such as C2:01:02:03:04:05	
Instruction	Restart to take effect, power off to save; AT+DEV_DEL=ALL delete all reconnected devices; Deleting the reconnected device does not affect the current connection status; The entered MAC address does not exist in the automatic reconnection list, and error code 3 is returned.	
Example	Delete the device whose MAC address is C2:01:02:03:04:05 Command: AT+DEV_DEL=C2:01:02:03:04:05 Return: +OK Remove all reconnected devices Command: AT+DEV_DEL=ALL Return: +OK	

6.3.20 Specify the transmission device

Command		Response
Inquire	AT+TRM_HANDLE?	+OK=[para]
Setting	AT+ TRM_HANDLE =[para]	+OK: success +ERR=[NUM]: Error
Parameters	The assigned handle value, ranging from 1 to 8	
Instruction	Immediately effective, not saved when power off Only the master role (single master role, master-slave role) supports this command There are at most 8 values, that is, the module is connected to 8 devices, and each handle corresponds to a device; If the handle corresponding to the input parameter does not exist, error code 4 is returned.	
Example	Query the current data transparent transmission handle (when there is no connection) Command: AT+TRM_HANDLE? Return: +OK=NULL Set the device with handle to 1 to transmit data (use the AT+CONNECT_LIST command to obtain the handle value of the device to be transparently transmitted) Command: AT+TRM_HANDLE=1 Return: +OK	

6.3.21 Observer function

Command		Response
Inquire	AT+OBSERVER?	+ OBSERVER =[para1],[para2], [para3], [para4], [para5],[para6]
Setting	AT+ OBSERVER =[para1],<para2>,<para3>, <para4>,<para5>, <para6>	+OK: success +ERR=[NUM]: Error
Parameters	para1: 0: off (default); 1: Open the ordinary observer; 2: Turn on the scan extension broadcast observer. para2: filtering strategy bit 0: MAC address bit 1: broadcast name(128-bit UUID are not available) bit 2: RSSI value bit 3: Manufacturer ID bit 4~7: reserved para3: 6 bytes MAC address para4: broadcast name para5: Values less than RSSI will be filtered para6: 2 bytes vendor ID	
Instruction	It takes effect immediately and will not be saved when power off; If you want to enable the extended broadcast observer mode, you must first set the host scan physical layer to LE CODED PHY through "AT+SCAN_PHY", otherwise the command will only return +OK but will not start; In the observer mode, the broadcast from the surrounding slave devices will be monitored, but not every broadcast can be monitored. This is because the observer itself switches channels at the end of each scanning interval, and the device will not receive any broadcasts, and will also communicate with the surrounding devices. The number of devices is related to the signal strength (RSSI); This instruction only supports the master role (single master, master-slave integrated); If the "Main Character Scanning" function is being used, this command will stop the "Main Character Scanning"; After it is turned on, it has been scanning and printing the information of the surrounding slave devices. If you need to stop sending "AT+OBSERVER=0"; Open the scanning extended broadcast observer, "Primary PHY" is the main physical layer, "Secondary PHY" is the secondary physical layer, and "SID" is the authentication ID; The APP configuration complete setting function is not supported.	
Example	Query observer enable status Command: AT+OBSERVER? Return: +OK=0 Enable normal observer function	

	Command: AT+OBSERVER=1 Return: +OK MAC:C1:01:02:03:04:05, RSSI:-50, ADV/RSP: 0E095246737461725F3434353536370EFF524601C00340FF000098256926

6.3.22 Slave physical layer rate

Command		Response
Inquire	AT+PHY?	+PHY =[para]
Setting	AT+PHY=[para]	+OK: success +ERR=[NUM]: Error
Parameters	para: value range: 1~15 1: 1M PHY (default) 2: 2M PHY 4: 125K Coded PHY 8: 500K Coded PHY This command can set up multiple PHYs, and the parameters use the concept of bit fields. A simple conversion method, such as setting the preferred 1M PHY and 2M PHY, can use the sum of the corresponding parameters as a parameter, that is, AT+PHY=3.	
Instruction	It takes effect immediately and will not be saved when power off; This parameter takes effect under the slave role; If connected to a mobile phone, it will take effect when the mobile phone opens the notification.	
Example	Preferred physical layer when querying for connections Command: AT+PHY? Return: +OK=1 Set 2M PHY as preferred Command: AT+PHY=2 Return: +OK	

6.3.23 Serial port baud rate

Command		Response
Inquire	AT+BAUD?	+BAUD =[para]
Setting	AT+BAUD=[para]	+OK: success +ERR=[NUM]: Error
Parameters	para: serial port baud rate. Possible values: 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600, 115200, 230400, 460800, 921600. The default value is 115200.	
Instruction	Restart to take effect, power off to save.	

Example	Query the current serial port baud rate Command: AT+BAUD? Return: +BAUD=115200 Set the serial port baud rate to 9600 Command: AT+BAUD=9600 Return: +OK

6.3.24 Cnnection interval

Command		Response
Inquire	AT+CONN_INTERVAL?	+ CONN_INTERVAL =[para]
Setting	AT+ CONN_INTERVAL = [para]	+OK: success +ERR=[NUM]: Error
Parameter	para: connection interval, the parameter range is 6~3200, connection interval = parameter * 1.25, unit ms. The default is 20ms.	
Instuction	Take effect immediately, save when power off; When connecting with a mobile phone, the recommended connection interval is not less than 20ms; The longer the connection interval, the longer the update time; The larger the connection interval, the slower the data forwarding and the lower the dynamic power consumption.	
Example	query connection interval Command: AT+CONN_INTERVAL? Return: +OK=16 Set the connection interval to 100ms, 100 divided by 1.25=80 Command: AT+CONN_INTERVAL=80 Return: +OK	

6.3.25 APP configuration authentication

Command		Response
Setting	AT+AUTH =[para]	+OK: success +ERR=[NUM]: Error
Parameters	The length must be 6 characters, 0~9, default 123456	
Instruction	A single connection is valid, and re-authentication is required after reconnection. After the mobile phone and other devices are connected to the module, this command can be sent through the configuration channel. After the return is successful, all AT commands can be used through the configuration channel; This command only supports the use of mobile APP; this command must be capitalized.	
Example	APP configuration authentication Command: AT+AUTH=123456 Return: +OK	

6.3.26 APP configuration authentication password

Command		Response
Inquire	AT+UP_AUTH?	+ UP_AUTH =[para]
Setting	AT+UP_AUTH =[para]	+OK: success +ERR=[NUM]: Error
Parameters	The length is fixed to 6, and the default is 123456.	
Instruction	Take effect immediately, save when power off; Only serial port configuration is supported.	
Example	Query Over-the-Air Configuration Authentication Command: AT+UP_AUTH? Return: +OK=123456 Change Over-the-Air Configuration Authentication Password Command: AT+UP_AUTH=392578 Return: +OK	

6.3.27 Status output

Command		Response
Inquire	AT+LOGMSG?	+ OK =[para]
Setting	AT+LOGMSG =[para]	+OK: success +ERR=[NUM]: Error
Parameters	0: Status display is off 1: Status display on (default)	
Instruction	It takes effect immediately and is saved when power off.	
Example	Query the current status output function Command: AT+LOGMSG? Return: +OK=1 Set to off state output Command: AT+LOGMSG=0 Return: +OK	

6.3.28 Sleep mode

Command		Response
Inquire	AT+SLEEP?	+ OK =[para1],[para2]
Setting	AT+SLEEP=<para1>,<para2>	+ERR=[NUM]: Error
Parameters	para1: module serial port function switch (0, off; 1, on) para2: module BLE function switch (0, off; 1, on)	
Instruction	After the serial port is closed, the power consumption can be significantly reduced; After the serial port function is closed, wake up the serial port through the rising edge of	

	the CTS pin; Turn off BLE, if the module is connected, disconnect all connections and turn off broadcasting; when the module is in the master role (single master or master-slave) and the automatic connection function is enabled, the module will not automatically reconnect after turning off BLE. Turn on the BLE function to restore automatic reconnection; turn off BLE and still use the relevant BLE commands; After closing the serial port, each function pin is still valid.
Example	The module enters the lowest sleep state (closes the serial port and BLE) Command: AT+SLEEP=0,0 Return: +OK Module bluetooth is silent (only BLE is turned off) Command: AT+SLEEP=1,0 Return: +OK Module bluetooth low energy operation (only the serial port is closed) Command: AT+SLEEP=0,1 Return: +OK

6.3.29 Enable/disable watchdog

Command		Response
Inquire	AT+WDOG?	+ WDOG =[para]
Setting	AT+WDOG =[para]	+OK: success +ERR=[NUM]: Error
Parameters	0: The watchdog function is disabled 1: Watchdog function is enabled (default)	
Instruction	Restart to take effect, power off to save; After the watchdog is turned off, the overall power consumption of the module will be reduced by about 2~3uA.	
Example	Query watchdog status Command: AT+WDOG? return + OK = 1 Set to turn off watchdog Command: AT+WDOG=0 Back + OK	

6.3.30 Module soft reset

Command		Response
Command	AT+RESET	+OK
Instruction	The module software resets after a delay of 100ms.	

6.3.31 Reset

Command		Response
Command	AT+RESTORE	+OK
Instruction	After the setting is completed, the software resets after the module delays 100ms; In the process of restoring the factory settings, any form of reset is prohibited, and it is prohibited to power off before the operation is completed;	

6.3.32 Firmware version

Command		Response
Inquire	AT+VERSION?	+VERSION=[para]
Parameters	para: firmware version number	
Instruction	The last two digits of the firmware version represent the version number.	
Example	Query A1 version number Command: AT+VERSION? Return: +OK=7413-0-10 Query A3 version number Command: AT+VERSION? Return: +OK=7413-1-10	

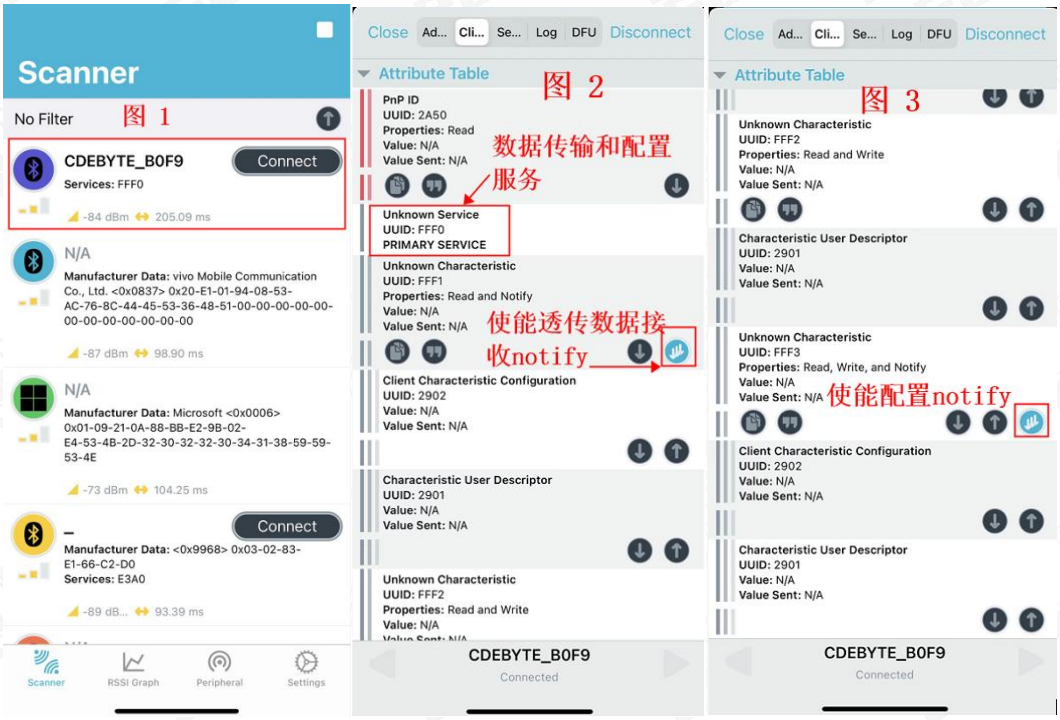
Ⅶ Mobile APP test transparent transmission function

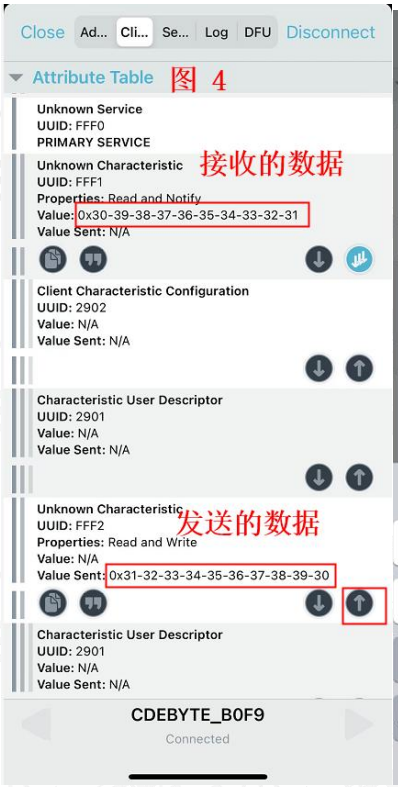
The BLE APP on the mobile phone can be downloaded from the App Store and App Market. Open the App Store or App Market, search for nRF Connect and download and install it for testing. This document uses the IOS version of nRF Connect as an example.

The module is connected to the computer through the USB-to-serial tool. If it has a bottom plate, it is directly connected to the computer, and check the computer port number used (step: right-click on the lower left corner of the win10 desktop -> Device Manager -> Port).

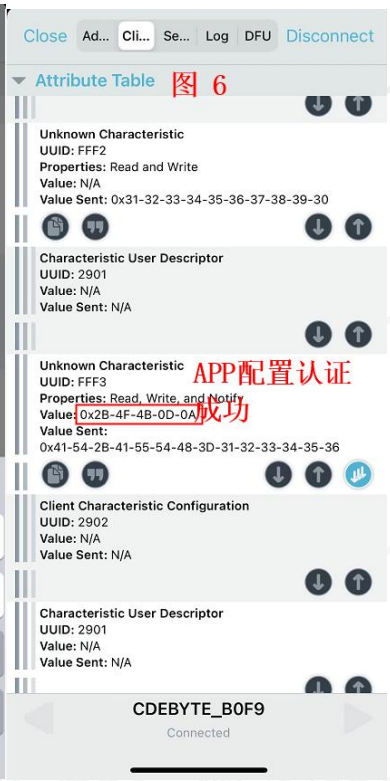
Open the serial port debugging tool, and set the correct port number and baud rate. The default serial port parameters of the module are 115200bps baud rate, 8 data bits, no parity bit, and 1 stop bit.

Open nRF Connect, search for a Bluetooth device whose Bluetooth name starts with CDEBYTE_ and connect it. After the connection is successful, Disconnect will be displayed in the upper right corner of the mobile phone, indicating that it is connected. Swipe left and right on the mobile phone interface to see the service list and log information, etc., the computer serial port debugging assistant The connection information will be printed, such as XX:XX:XX:XX:XX:XX CONNECTD P*1, find the data transmission and configuration Service in the service list, turn on the notify enable of receiving and configuration commands, and then you can perform data transmission with the module and AT commands too.

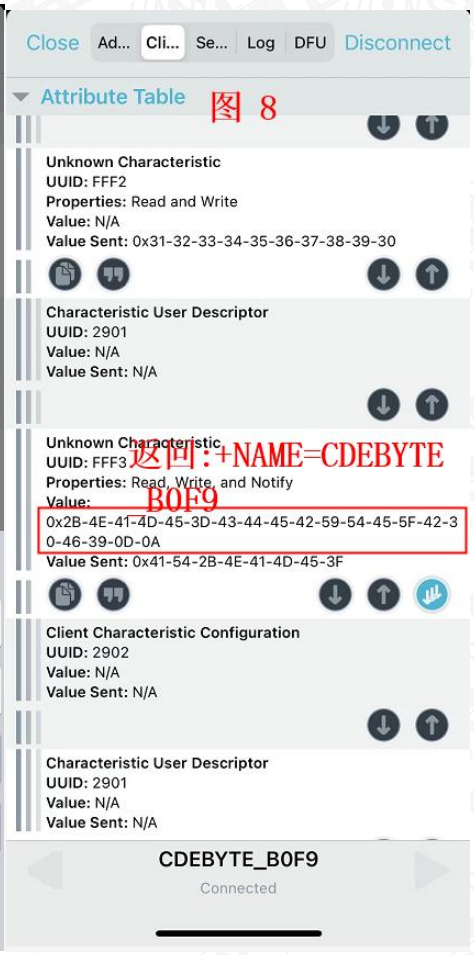



Close Ad... Cli... Se... Log DFU Disconnect
Attribute Table
图 4
Unknown Service
UUID: FFF0
PRIMARY SERVICE
Unknown Characteristic
UUID: FFF1
Properties: Read and Notify
Value: 0x30-39-38-37-36-35-34-33-32-31
Value Sent: N/A
接收的数据
Client Characteristic Configuration
UUID: 2902
Value: N/A
Value Sent: N/A
Characteristic User Descriptor
UUID: 2901
Value: N/A
Value Sent: N/A
Unknown Characteristic
UUID: FFF2
Properties: Read and Write
Value: N/A
Value Sent: 0x31-32-33-34-35-36-37-38-39-30
发送的数据
Characteristic User Descriptor
UUID: 2901
Value: N/A
Value Sent: N/A
CDEBYTE_B0F9
Connected


Close Ad... Cli... Se... Log DFU Disconnect
Attribute Table
图 5
Unknown Characteristic
UUID: FFF2
Cancel
Write Value
AT+AUTH=123456
ByteArray
UnsignedI...
Bool
UTF8
Write Type
Command
Request
Write
Value Sent: N/A
"123456"
1 2 3 4 5 6 7 8 9 0
- / : ; ( ) ¥ & @ "
#+= . , ? ! '
ABC
space
return


Close Ad... Cli... Se... Log DFU Disconnect
Attribute Table
图 6
Unknown Characteristic
UUID: FFF2
Properties: Read and Write
Value: N/A
Value Sent: 0x31-32-33-34-35-36-37-38-39-30
Characteristic User Descriptor
UUID: 2901
Value: N/A
Value Sent: N/A
Unknown Characteristic
UUID: FFF3
Properties: Read, Write, and Notify
Value: 0x2B-4F-4B-0D-0A
APP配置认证成功
Value Sent:
0x41-54-2B-41-55-54-48-3D-31-32-33-34-35-36
Client Characteristic Configuration
UUID: 2902
Value: N/A
Value Sent: N/A
Characteristic User Descriptor
UUID: 2901
Value: N/A
Value Sent: N/A
CDEBYTE_B0F9
Connected

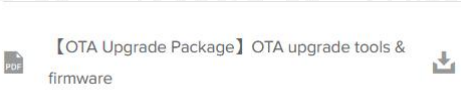

Close Ad... Cli... Se... Log DFU Disconnect
Attribute Table
图 7
Unknown Characteristic
UUID: FFF2
Cancel
Write Value
AT+NAME?
发送AT指令
ByteArray
UnsignedI...
Bool
UTF8
Write Type
Command
Request
Write
Value Sent:
I
At
I'm
[ ] { } # % ^ * + =
_ \ | ~ < > $ € £ •
123 . , ? ! '
ABC
space
return


Close Ad... Cli... Se... Log DFU Disconnect
Attribute Table
图 8
Unknown Characteristic
UUID: FFF2
Properties: Read and Write
Value: N/A
Value Sent: 0x31-32-33-34-35-36-37-38-39-30
Characteristic User Descriptor
UUID: 2901
Value: N/A
Value Sent: N/A
Unknown Characteristic
UUID: FFF3
Properties: Read, Write, and Notify
Value:
返回:+NAME=CDEBYTE
B0F9
0x2B-4E-41-4D-45-3D-43-44-45-42-59-54-45-5F-42-30-46-39-0D-0A
Value Sent: 0x41-54-2B-4E-41-4D-45-3F
Client Characteristic Configuration
UUID: 2902
Value: N/A
Value Sent: N/A
Characteristic User Descriptor
UUID: 2901
Value: N/A
Value Sent: N/A
CDEBYTE_B0F9
Connected

Ⅷ OTA upgrade function

Preparation:

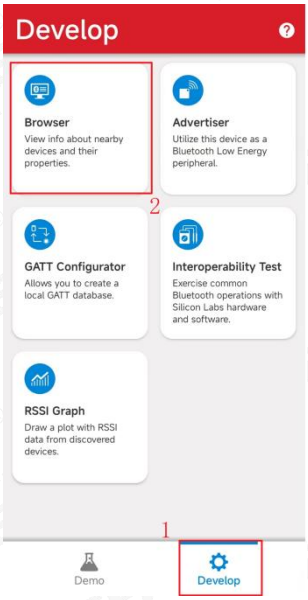
1. Download OTA upgrade package, which includes firmware upgrade APP and latest firmware.
2. Install EFR Connect



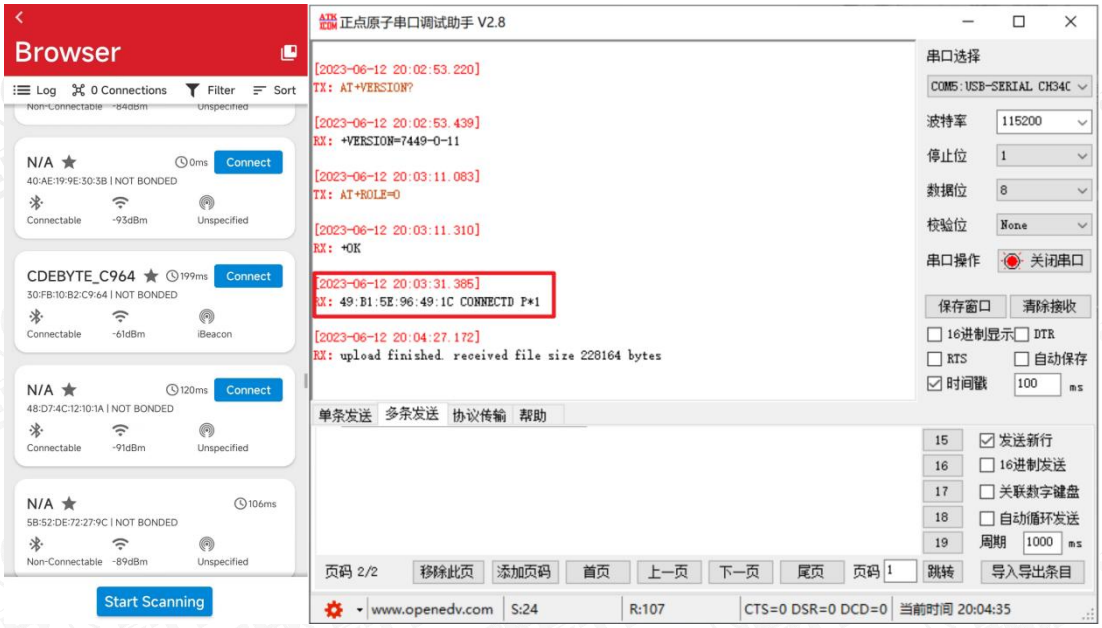
Note: OTA function is only supported by E104-BT53A3 !

8.1 Connect the serial port and send AT+VERSION? Query the current firmware version number of the module and send AT+ROLE=0 to configure the module in slave mode.

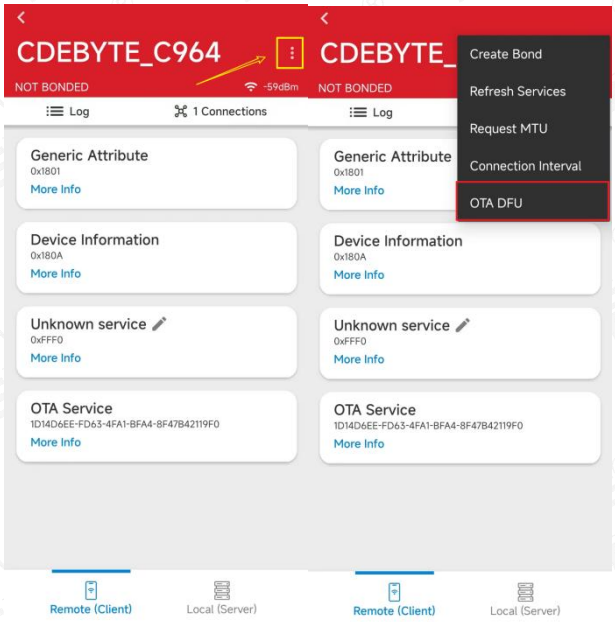
8.2 Open the EFR Connect software downloaded from the official website, click "Develop", and click "Browser".



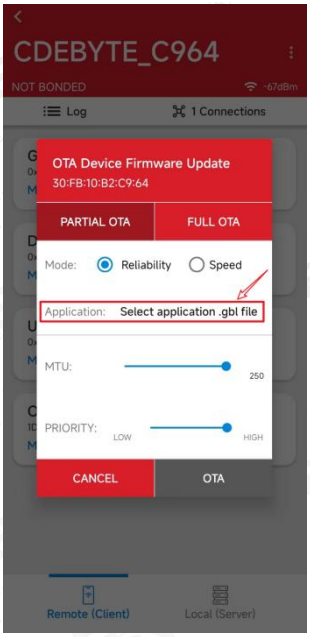
8.3 Locate the Bluetooth module to be upgraded and click "Connect". The serial debugging assistant will print the connection successfully.



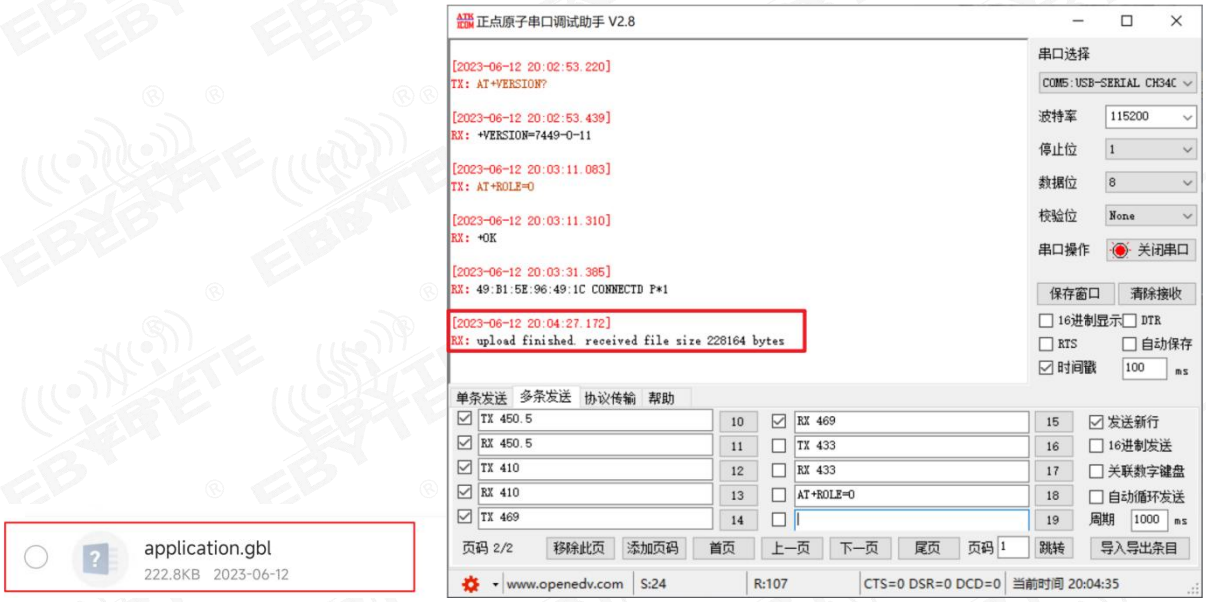
8.4 Click the feature list box in the top right corner and click "OTA DFU".



8.5Click the filename to the right of Application

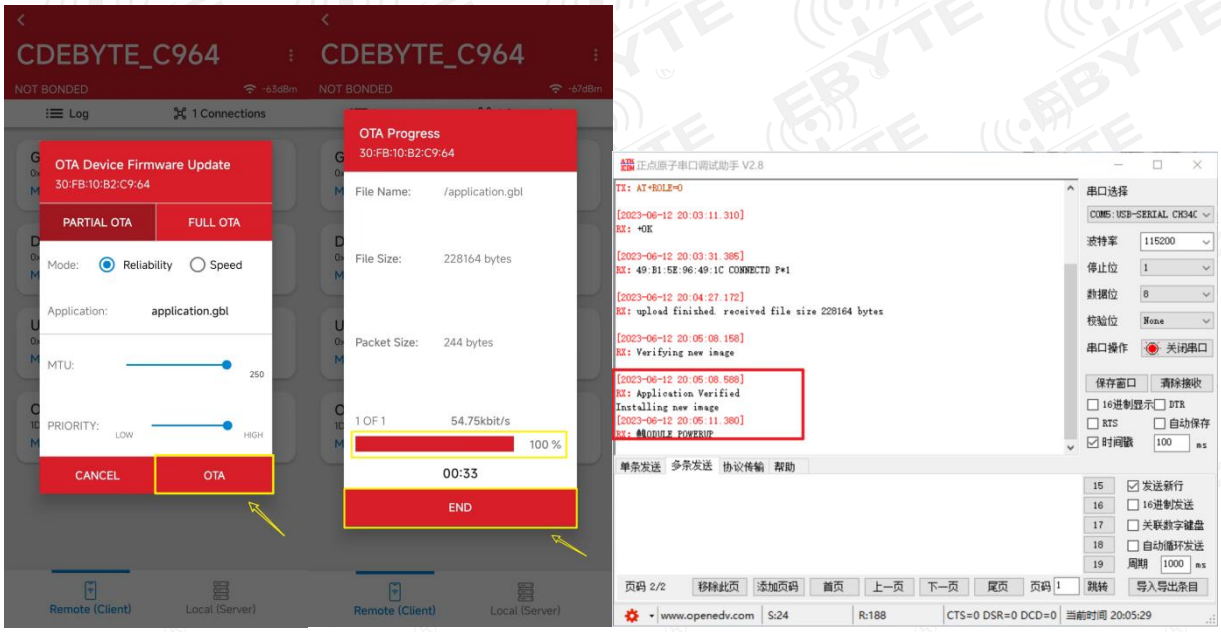


8.6 Select the firmware provided by the official website, and print "upload finished. received file size 228164 bytes" by the serial debugging assistant.



8.7 Click OTA to start firmware upgrade. After the progress is updated to 100%, click END, and the serial debugging assistant will print the firmware loading information, the module will be restarted, and the firmware update is

completed.



Ⅸ Hardware Design

- It is recommended to use a DC regulated power supply to supply power to the module, the power supply ripple coefficient should be as small as possible, and the module should be grounded reliably;
- Please pay attention to the correct connection of the positive and negative poles of the power supply, such as reverse connection may cause permanent damage to the module;
- Please check the power supply to ensure that it is between the recommended power supply voltages. If it exceeds the maximum value, the module will be permanently damaged;
- Please check the stability of the power supply, the voltage should not fluctuate greatly and frequently;
- When designing the power supply circuit for the module, it is often recommended to reserve more than 30% of the margin, so that the whole machine can work stably for a long time;
- The module should be kept as far away as possible from the power supply, transformer, high-frequency wiring and other parts with large electromagnetic interference;
- High-frequency digital traces, high-frequency analog traces, and power traces must avoid the underside of the module. If it is absolutely necessary to pass under the module, assuming that the module is soldered on the Top Layer, lay copper on the Top Layer of the contact part of the module. Copper and well grounded), must be close to the digital part of the module and routed on the Bottom Layer;
- Assuming that the module is soldered or placed on the Top Layer, it is also wrong to arbitrarily route wires on the Bottom Layer or other layers, which will affect the stray and receiving sensitivity of the module to varying degrees;
- Assuming that there are devices with large electromagnetic interference around the module, it will also greatly affect the performance of the module. It is recommended to stay away from the module according to the intensity of the interference. If the situation allows, appropriate isolation and shielding can be done;
- Assuming that there are traces with large electromagnetic interference around the module (high-frequency digital,

high-frequency analog, power traces), the performance of the module will also be greatly affected. It is recommended to stay away from the module according to the intensity of the interference. Proper isolation and shielding;

- Try to stay away from some TTL protocols whose physical layer is also 2.4GHz, such as USB3.0;
- The antenna installation structure has a great influence on the performance of the module. Make sure that the antenna is exposed, preferably vertically upward. When the module is installed inside the casing, a high-quality antenna extension cable can be used to extend the antenna to the outside of the casing;
- The antenna must not be installed inside the metal shell, which will greatly weaken the transmission distance.

X Common problem

10.1 The transmission distance is not ideal

- When there is a straight line communication obstacle, the communication distance will be correspondingly attenuated;
- Temperature, humidity, and co-channel interference will increase the communication packet loss rate;
- The ground absorbs and reflects radio waves, and the test effect close to the ground is poor;
- Seawater has a strong ability to absorb radio waves, so the seaside test effect is poor;
- If there is a metal object near the antenna, or is placed in a metal shell, the signal attenuation will be very serious;
- The power register is set incorrectly, and the air rate is set too high (the higher the air rate, the closer the distance);
- The low voltage of the power supply at room temperature is lower than the recommended value, and the lower the voltage, the lower the output power;
- The antenna used is poorly matched with the module or the quality of the antenna itself is faulty.

10.2 Module is easily damaged

- Please check the power supply to ensure that it is between the recommended power supply voltages. If it exceeds the maximum value, the module will be permanently damaged;
- Please check the stability of the power supply, the voltage should not fluctuate greatly and frequently;
- Please ensure anti-static operation during installation and use, and high-frequency components are electrostatically sensitive;
- Please ensure that the humidity during installation and use should not be too high, and some components are humidity-sensitive devices;
- If there is no special requirement, it is not recommended to use it at too high or too low temperature.

10.3 Bit error rate too high

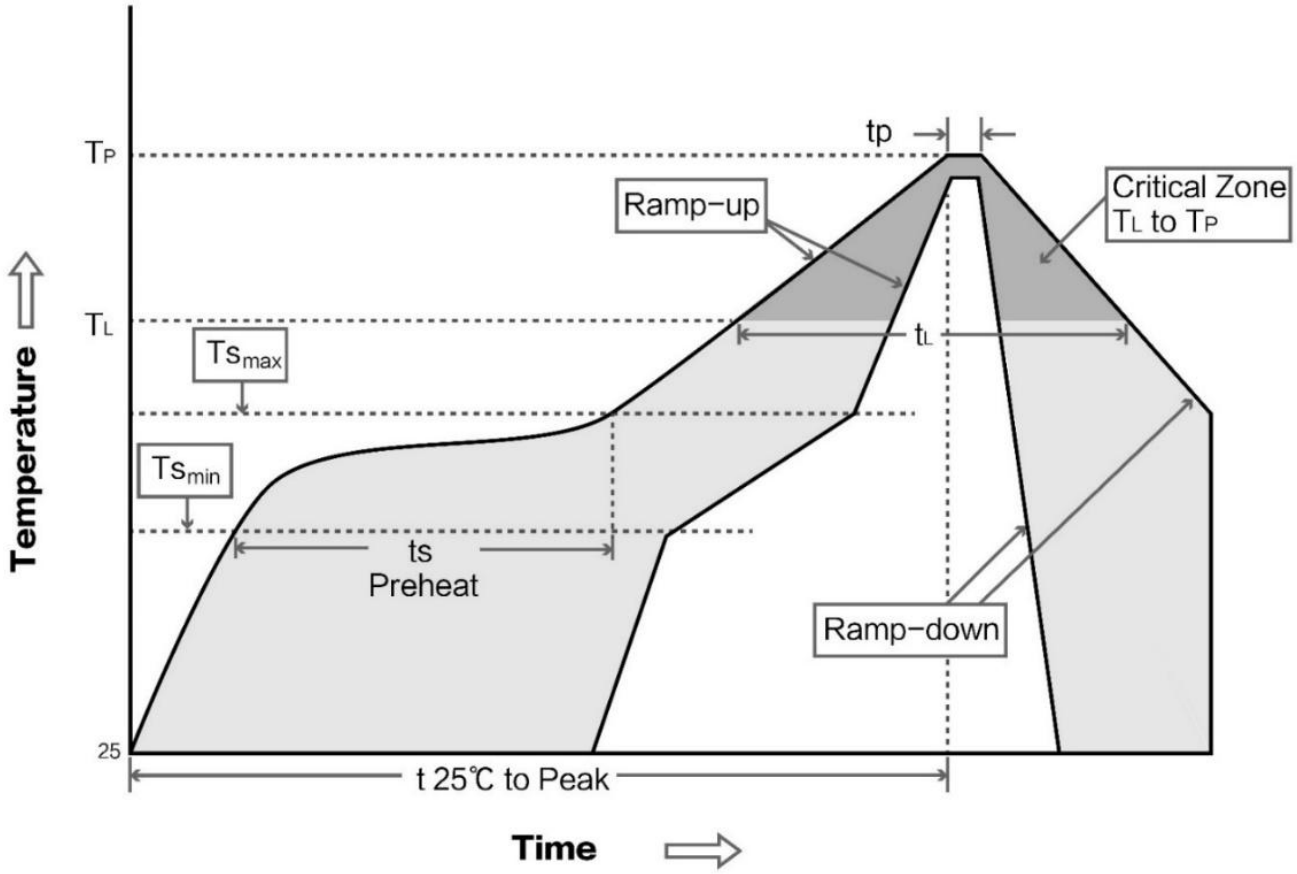
- There is co-frequency signal interference nearby, stay away from the interference source or modify the frequency and channel to avoid interference;
- If the power supply is not ideal, it may also cause garbled characters. Be sure to ensure the reliability of the power supply;
- Poor quality or too long extension lines and feeder lines will also cause a high bit error rate.

XI Welding work guide

11.1 Reflow temperature

Profile Feature	Curve feature	Sn-Pb Assembly	Pb-Free Assembly
Solder Paste	solder paste	Sn63/Pb37	Sn96.5/Ag3/Cu0.5
Preheat Temperature min （Tsmin）	Minimum preheat temperature	100℃	150℃
Preheat temperature max (Tsmax)	maximum preheat temperature	150℃	200℃
Preheat Time (Tsmin to Tsmax)(ts)	Preheat time	60-120 sec	60-120 sec
Average ramp-up rate(Tsmax to Tp)	average rate of ascent	3℃/second max	3℃/second max
Liquidous Temperature (TL)	liquidus temperature	183℃	217℃
Time（tL）Maintained Above（TL）	time above liquidus	60-90 sec	30-90 sec
Peak temperature（Tp）	peak temperature	220-235℃	230-250℃
Aveage ramp-down rate（Tp to Tsmax）	average rate of descent	6℃/second max	6℃/second max
Time 25℃ to peak temperature	Time from 25° C to peak temperature	6 minutes max	8 minutes max

11.2 Reflow Soldering Curve



XII Related Model

Product Model	IC	Working frequency Hz	Emission power dBm	Communication Interface	Supporting Protocol BLE	Product size mm	Antenna	Features
E73-2G4M04S1A	nRF52810	2.4G	4	I/O	4.2/5.0	17.5*28.7	PCB/IPX	hardware resources Secondary development
E73-2G4M04S1B	nRF52832	2.4G	4	I/O	4.2/5.0	17.5*28.7	PCB/IPX	hardware resources Secondary development
E73-2G4M08S1C	nRF52840	2.4G	8	I/O	4.2/5.0	13*18	PCB/IPX	hardware resources Secondary

								development
E104-BT01	CC2541	2.4G	0	I/O	4.0	14*22	PCB	hardware resources Secondary development
E104-BT02	DA14580	2.4G	0	TTL	4.2	14*22	PCB	Industry's lowest power consumption High-speed continuous transmission Sniffing
E72-2G4M04S2B	CC2640	2.4G	2	TTL	4.2	14*23	PCB/IPX	Built-in ARM dual core multi-role mode
E104-2G4U04A	CC2540	2.4G	0	USB	4.0	18*59	PCB	Dongle Protocol Analyzer
E104-BT5010A	nRF52810	2.4G	0	UART	5.0	11.5 * 16	Ceramic Antenna	Low power consumption, transparent transmission

Revision History

Version	Revision Date	Revision Description	Maintenance man
1.0	2022-07-01	nitial version	-
1.1	2022-7-5	Format and content corrections	Yan
1.2	2022-10-8	Error correction	Bin
1.3	2023-6-13	Content has been revised to add OTA features	Bin
1.4	2024-04-16	Error correction	Bin
1.5	2024-07-25	Error correction	Bin

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