E104-BT05 User Manual

BLE5.0 Low Power

Bluetooth to UART Module

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Content

1. Overview

1.1 Brief Introduction

E104-BT05 is a serial-to-BLE Bluetooth slave module based on Bluetooth protocol version 5.0. It features with small size, low power consumption and works in 2.4GHz band.

E104-BT05 module which uses AT commands to set parameters, and it is easy and fast to operate. The module only supports Bluetooth slave mode. The module supports low power broadcast, data transparent transmission, air configuration, IO port level reading, IO port level setting and variable frequency PWM output.

Modules can be widely used in intelligent wearable device, home automation, home security, personal health care, Smart home appliance, accessories and remote control, automobile, lighting, industrial Internet, intelligent data acquisition, intelligent control etc. Maximum support baud rate 256000bps data transmission.

1.2 Features

- Support Bluetooth BLE 5.0 Protocol;
- Support adjustable Bluetooth packet length;
- Support 3 operating modes: configuration, transparent transmission and sleep mode;
- Support boot-up automatic broadcasting, automatic connection;
- Support Beacon and IBeacon broadcast;
- Support UART wake-up function;
- Support MAC address binding;
- Support serial port transparent transmission;
- Support multiple serial mode and baud rate;
- Support custom 16-bit UUID and 128-bit UUID;
- PCB board antenna without external antenna;
- Support Bluetooth parameter configuration over air;
- Maximum communication distance is: 75m;
- Support ultra-low power sleep, synchronous broadcasting;
- Support IO port level reading (new features);
- Support IO port level output (new features);
- Support PWM output (new features) .

1.3 Application

- Wireless Sensor for Meter Reading

- Smart home
- Industrial remote control and telemetry
- Intelligent Building
- Automatic Data Acquisition
- Health sensor
- Intelligent Wearing device
- Intelligent Robot
- Wireless Sensor
- Electronic label
- Intelligent Control

2. Specification and parameter

2.1 Limit parameter

Main parameter	Performance		Remark
	Min.	Max.	
Power supply（V）	0	3.6	Voltage over 3.6V will cause permanent damage to module
Blocking power（dBm）	-	10	Chances of burn is slim when modules are used in short distance
Operating temperature（℃）	-40	+85	/

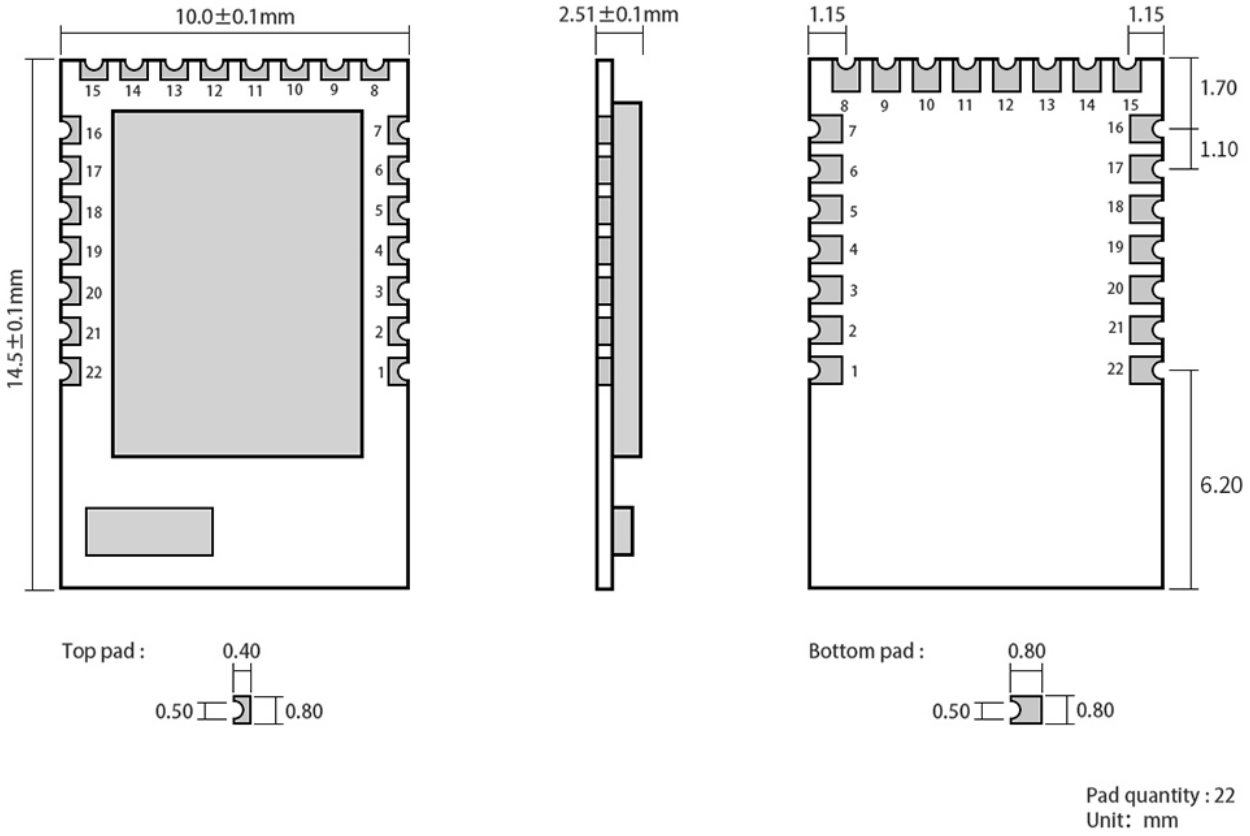
2.2 Operating parameter

Main parameter		Performance			Remark
		Min	Typ	Max	
Operating voltage（V）		2.5	3.3	3.6	≥3.3V ensures output power
Communication level（V）			3.3		For 5V TTL,it maybe at risk of buring down
Operating temperature（℃）		-40	-	+85	Industrial Design
Operating frequency（MHz）		2402	-	2480	ISM band
Power consumption	TX current（mA）	-	13	19	-
	RX current（mA）	-	13	-	-
	Sleep current（μA）	-	8	-	-
Max Tx power（dBm）		-	8	-	-

Receiving sensitivity (dBm)	-	-92	-	
Random I/O	VIL/VIH	GND/0.84	GND/VCC	0.36/VCC
	VOL/VOH	GND/1.88	GND/VCC	0.47/VCC
Sleep broadcast current (default)	-	173	-	Unit：uA The default broadcast gap is 1s
Wake up broadcast current (default)	-	8.70	-	Unit：mA。 The default broadcast gap is 1s
Wake up no broadcast current (default)	-	8.68	-	Unit：mA The default broadcast gap is 1s
Wake-up connection current (default)	-	8.78	-	Unit：mA

Main parameter	Description	Remark
Distance for reference	70m	Clear and open area, height: 2.5m
TX length	128Byte	-
Bluetooth protocol	BLE5.0	-
Communication interface	UART	-
Package	SMD	-
Connector	1.27 mm	-
Size	10*14.5 mm	-
Antenna	Ceramic antenna	50 ohm impedance

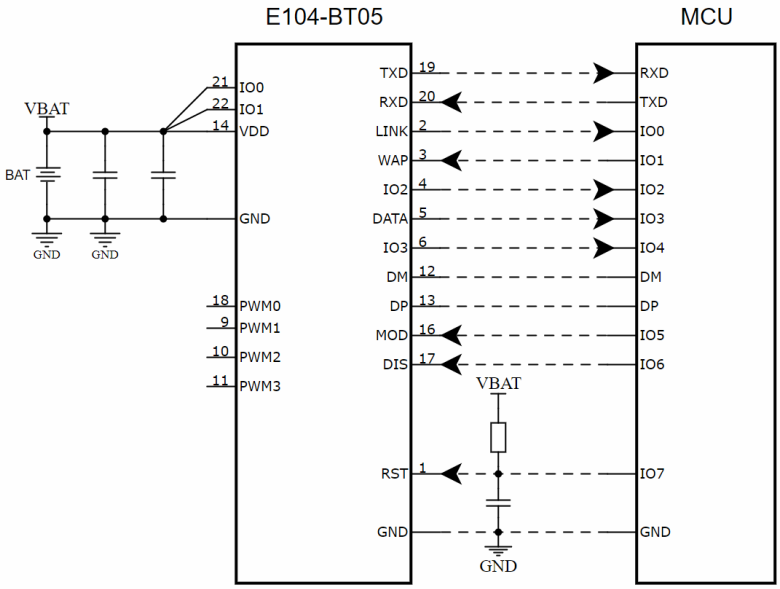
3. Size and pin definition and recommended wiring diagrams



No	Name	Direction	Function	Remark
1	RST	Input	Power reset	Low Level Effective；RST reset cannot be used in low power consumption mode;
2	LINK	Output	Status	Connection status indicating low level validity
3	WKP	Input	Wake-up pin	Low level wake-up
4	IO2	Output	Level output	Output high and low level according to AT command
5	DATA	Output	Data indication	Data Indicator Pin
6	IO3	Output	Level output	Output high and low level according to AT command
7	GND	-	Ground	Power ground
8	SWS	/	/	/
9	PWM1	Output	PWM output	Output PWM wave according to AT command
10	PWM2	Output	PWM output	Output PWM wave according to AT command
11	PWM3	Output	PWM output	Output PWM wave according to AT command
12	DM	-	-	USB data Minus
13	DP	-	-	USB data Positive
14	VDD	-	Positive power supply	Positive power supply
15	GND	-	Power ground	Power ground

16	MOD	Input	Mode selection	Configuration mode selection pin
17	DIS	Input	External reset	Active at low level; In the low power consumption mode, this reset pin can be used to reset;
18	PWM0	Output	PWM output	Output PWM wave according to AT command
19	TXD	Output	Serial port output	Serial port output
20	RXD	Input	Serial port input	Serial port input
21	IO0	Input	Level read	IO0 Level read
22	IO1	Input	Level read	IO1 Level read

3.2 Recommended wiring diagram



4. Operation modes

4.1 Low Power Mode

Low-power mode: The module enters the low-power mode at once by AT command “AT+SLEEP”, or enter the low-power mode after disconnecting the “AT+DISCSLEEP=1”setting, the serial port output “STA：sleep”when the command enters the low-power mode at once, if the broadcast function module is not turned off, the broadcast gap as the wake-up time will broadcast. See 6.37 Get to sleep mode at once

Description：

1. If broadcasting is turned on in low power mode, the host can scan the broadcast and establish a connection with the module, and the module wakes up at once after the connection is established.
2. The module enter low-power mode to support serial data wake-up (the first frame data will be lost as wake-up source data).

4.2 Wake-Up mode

WKP pin: When the module enters the low power mode, the user can pull down the wake-up via WKP pin.

Serial port wake-up: When the module enters the low-power mode, any data received by the serial port will wake up the module. The frame data module does not operate on it. At this time, the serial port outputs "STA: wakeup".

In wake-up mode, the module can broadcast, can enter configuration mode, can be scanned and connected. If the main device is connected to the module, the serial port output "STA: connect", the module can transmit data transparently, after the device is disconnected, the serial port output "STA: disconnect".

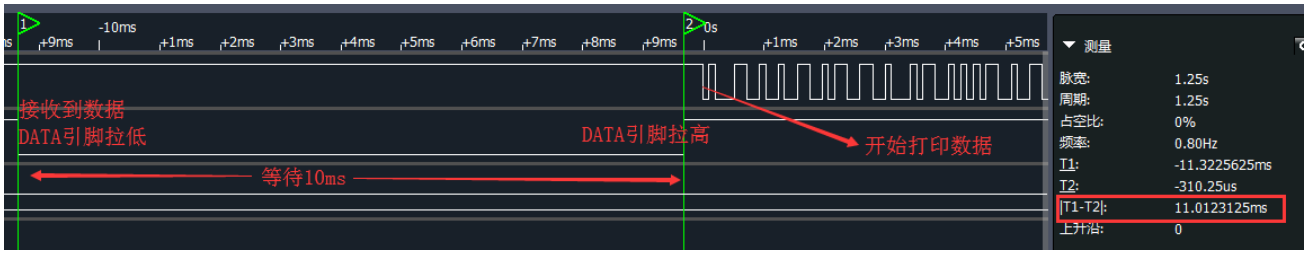
4.3 Configuration mode

Configuration mode: AT command can be operated by default when the module is powered on (See 6. Instruction operation). If the MOD pin is pulled down in connection state, the module will also enter the configuration mode.

Description: Bluetooth communication is interrupted in configuration mode, data cannot be sent or received.

4.4 Data valid indication

In the transparent transmission mode, the user can set the delayed output data by “AT++DATDLY=1” command. After the delay output is set, the DATA_LINK pin of the module will output low level 10ms before the data is sent, so as to wake up the external MCU. After 10 ms, the data will be sent, and the DATA_LINK pin is pulled high after the data transmission is completed. As shown in the figure:



4.5 IO level reading

The user can request the specified IO pin level by AT command AT+IO0?" or "AT+IO1?"(See 6.39 Read IO0 inpu and 6.40 Read IO1 input)

4.6 IO output

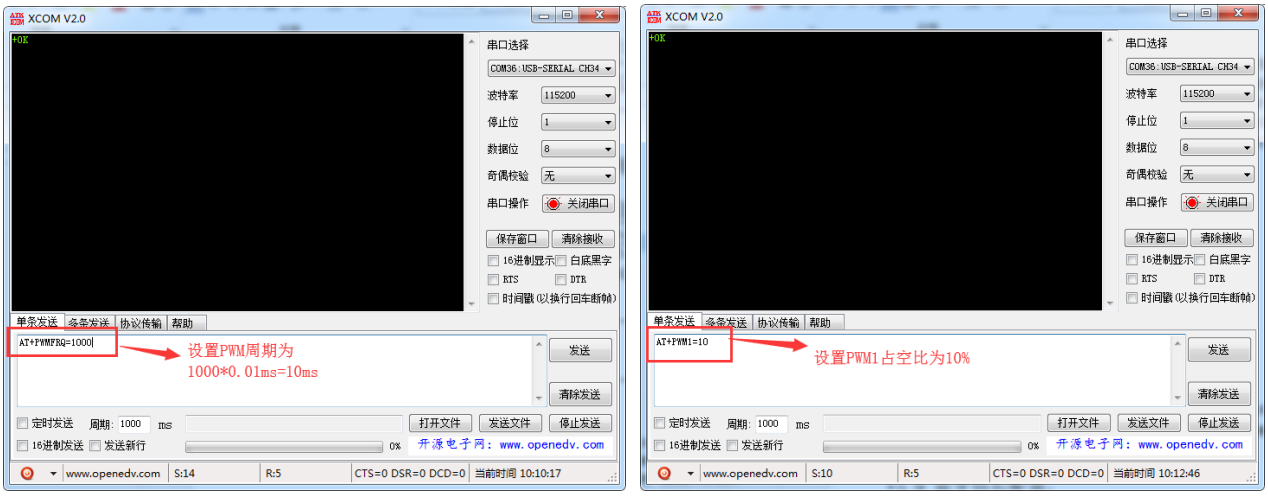
The user can request IO2 output level by AT command "AT+IO2=1" or "AT+IO2=0"
(See 6.41 Set IO2 output and 6.42 Set IO3 output).

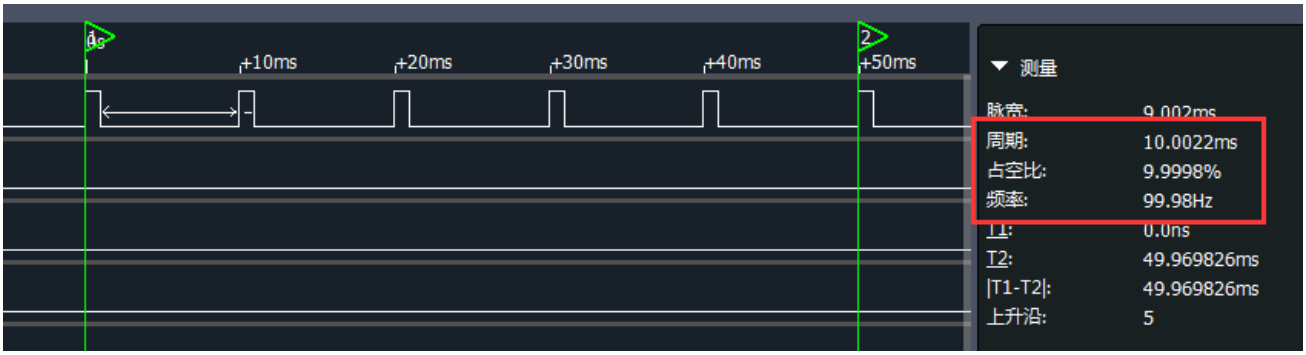
4.7 PWM output

The user can set the PWM cycle by AT command "AT + PWMFRQ = xx" and set the PWM0 duty cycle by AT command "AT + PWM0 = xx".

See more details about PWM setting (6.43 Read/Set PWM0 duty cycle, PWM output cycle setting 6.47 Request/Set PWM output cycle

PWM output example as following:





4.8 MAC address bonding

When E104-BT05 sets the binding connection address, opens the binding enable, retrieves whether the host MAC address is a binding address before accepting the host connection request, the connection is established if the address matches successfully, otherwise, the slave will continue to broadcast.

See more details: 6.23 Read MAC binding status, turn MAC binding on and off.

4.9 Bluetooth single packet byte length MTU Configuration

The user can configure the maximum single-packet data length by AT command "AT+MTU=xx". The default is 20 bytes, and 20~128 bytes is optional. The packet length can be increased to realize the big packet data transmission.

Description: The next Bluetooth connection will take effect after the packet length is configured.

4.10 UUID configuration

The module supports UUID flexible configuration. It can turn on 128-bit UUID function by command "AT + UUIDTYPE = 1" , and customize the transparent transmission service UUID, receiving feature field UUID, sending feature field UUID by command "AT+ +UUIDSVR=xx", UUIDCHAR1 = xx", "AT + UUIDCHAR2 = xx"

See more details from 6.26 Request/Set transparent transmission service UUID length ,

4.11 Broadcast data switchable

The E104-BT05 supports general broadcasting and iBeacon broadcast. The command can be configured to select the broadcast mode. (Note: Since the default MTU length is 20 bytes, if the data length is longer than 20 bytes when setting the broadcast data, the user needs to modify the MTU length before setting broadcasting data.

General Broadcast packet format:

The broadcast information includes advertising and scan response, advertising is the active broadcast, and scan response is a broadcast report that is replied after receiving a host scan request.

Advertising：

Fixed field	Len	Vendor field	Manufa data
020106	N	0xFF	Configurable，maximum 26 bytes

Example：02010611AFF4C000215524144495500 4E4554574F524B53434F00010002D2

See more details about the broadcast data setting 6.6 Request/Set broadcast data （Save when power off）

Scan response：

Len	16 bit UUID	UUID	Len	Broadcast name	Device name
0x03	0x03	Configurable	N	0x09	Configurable, maximum 22 bytes
Example：0303F0FF1009453130342D4254303034					

iBeacon Broadcast packet format：

1、 The command configures UUID, Major, Minor, RSSI separately.

2、 The instruction AT+ADV=2 is configured to work in the iBeacon broadcast mode and broadcast at once

3、 Bluetooth connection is not supported in iBeacon broadcast mode

Advertising：

iBeacon Prefix	UUID	Major	Minor	RSSI
9B	16B	2B	2B	1B
Example：0201061AFF4C000215FDA50693A4E24FB1AFCFC6EB07647825 2775848F00				

The iBeacon broadcast data format is fixed, only the Majo and Minor and RSSI parts can be modified. See more details about the iBeacon data seeting from 6.8-6.10 6.8 Request/Set IBeacon Major broadcast data

4.12 Configuration over air

The air configuration refers to the terminal device (such as mobile phone, tablet, etc.) that supports the BLE function, and reading and writing module parameters through wireless mode.The configuration process uses the FFF3 feature value of the FFF0 service to implement the instruction transceiving. Its attribute is read/write/notification, and the configuration instructions refer to Chapter 6 Instruction operation. The air configuration can realize all parameter configuration operations of the module, including special IO read/write commands and PWM output control.

Air configuration method:

1. After the connection is established, the terminal device sends an AT command to the FFF3 feature value under the FFF0 service

2. "Air Configuration" requires password authentication. Send authentication information by command "AT+AUTH=xxx", after the authentication is successful, the configuration status can be entered.

3. The authentication is successful until the connection is disconnected.

4. MOD pin has no effect on the air configuration process

5. See more details for air configuration operation instructions, see 6.33 Request/Authenticate Air configuration password and 8.2 Transport transmission and Air configuration mode.

4.13 Status or event printing

1、 Instruction AT+LOGMSG configuration open state information serial port printing function

2、 State information includes: connection, disconnection, wake-up, sleep.

Format as followings：

State	Print message

Connection succeeded	\r\n STA:connect\r\n
Disconnect	\r\n STA:disconnect\r\n
System wake up	\r\n STA:wakeup\r\n
Sleep mode	\r\n STA:sleep\r\n

5. Instruction operation

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

1. Instructions:

1. All AT instructions need not add carriage return (\r), line break (\n)

2. The return result of AT instruction ends with \r\n

3. The AT instruction format is "AT+xxx", such as:

Send the instruction "AT + NAME" to query the device name.

2. Instruction returning

Return value	Description
-1	Unrecognized instruction
-2	Parameter length error
-3	Invalid parameter
-4	Air configuration authentication failed
-5	Invalid operation

3、Factory parameters

E104-BT05 Default	Device	E104-BT05
	Broadcast data	CDEBYTE
	Air configuration password	123456
	Version	V1.0
	IBC_Major	0x27, 0x75
	IBC_Minor	0x84, 0x8F
	2-byte service UUID	0xF0, 0xFF
	16-byte service UUID	0x10, 0x19, 0x0d, 0x0c, 0x0b, 0x0a, 0x09, 0x08, 0x07,0x06, 0x05, 0x04, 0x03, 0x02, 0x01, 0x00
	2-byte client UUID1	0xF1, 0xFF
	16 byte UUID1	0xF1, 0xFF, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,0x00, 0x00, 0x00, 0x00,

parameters		0x00, 0x00, 0x00
	2-byte client UUID2	0xF2, 0xFF
	16 byte UUID2	0xF2, 0xFF, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00,0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00
	Parity bit	NONE
	Stop bit	1
	Baud rate	115200
	Broadcast type	General broadcasting
	TXPWR（RSSI）	0XCF
	Broadcast gap	1s
	Maximum connection gap	40ms
	Minimum connection gap	40ms
	Connection timeout	5s
	Default UUID type	2 bytes
	Transmitting power	8dBm
	Status printing	Open
	MTU length	20
	MAC binding enable	Close
	MAC Binding Address	0x31, 0x32, 0x33, 0x34, 0x35, 0x36
	Delayed output enable	Close
	Disconnect low power enable	Close
	PWM cycle	40ms
	PWM duty cycle	0
	IO2、IO3 Output	Low level（0）

5.1 AT Instruction test

Command	Respond	Parameter
AT	+OK	/
Explanation: None		

5.2 Read and configure baud rate

Command	Respond	Parameter
Request:AT+BAUD?	+OK=[para]	Para:0~8 ASCII 0=2400 1=4800 2=9600 3=19200 4=38400 5=57600 6=76800 7=115200 8=256000
Set：AT+BAUD=[para]	+OK：success +ERR=[NUM]：error	
Description: Restart takes effect, save when power off		

5.3 Read and configure stop bits

Command	Respond	Parameter
Request：AT+STOPB?	+OK=[para]	Para:0,1 ASCII 0：1 stop bit 1：2 stop bit
Set：AT+STOPB=[para]	+OK：success +ERR=[NUM]：error	
Description: Restart takes effect, save when power off		

5.4 Read/Set serial verification bits

Command	Respond	Parameter
Request：AT+PARI?	+OK=[para]	Para:0,1,2 ASCII 0：No parity; 1：Odd Parity; 2：even parity;
Set：AT+PARI=[para]	+OK：success +ERR=[NUM]:error	
Description: Restart takes effect, save when power off		

5.5 Check current broadcasting status, turn on general broadcasting, IBeacon broadcasting, turn off broadcasting

Command	Respond	Parameter
Request：AT+ADVEN?	+OK=[para]	Para:0、1、2 ASCII 0：Turn off the broadcast 1：General broadcasting 2：iBeacon broadcast
Set：AT+ADVEN=[para]	+OK：success +ERR=[NUM]：error	

Description: It takes effect after the connection is disconnected, save when power off

5.6 Request/Set broadcast data （Save when power off）

Command	Respond	Parameter
Request：AT+ADVDAT?	+OK=[para]	Para: ASCII、HEX 1、Length not more than 26 bytes
Set：AT+ADVDAT=[para]	+OK：success +ERR=[NUM]：error	
Description: The next broadcast will take effect，Save when power off For example change to string “CDEBYT”：AT+ADVDAT=CDEBYT		

5.7 Request/Set broadcast data(Do not save when power off)

Command	Respond	Parameter
Request：AT+ADVDAT1?	+OK=[para]	Para: ASCII、HEX 1、Length is no more than 26 bytes
Set：AT+ADVDAT1=[para]	+OK：success +ERR=[NUM]：error	
Description：The next broadcast will take effect, do not save when power off, can be sent as a string or as a hexadecimal For example, change to a string “CDEBYT”：AT+ADVDAT=CDEBYT		

5.8 Request/Set IBeacon Major broadcast data

Command	Respond	Parameter
Request：AT+IBCMAJOR?	+OK=[para1]	Para1：0000H~FFFFH HEX
Set：AT+IBCMAJOR=[para1]	+OK：success +ERR=[NUM]：error	
Description: Be effective at once，save when power-off，sent in hexadecimal For example change to hex “31 32”： AT+IBCMAJOR=12（12 is ASCII , convert to hexadecimal is 31 32）		

5.9 Request/Set IBeacon Minor broadcast data

Command	Respond	Parameter
Request：AT+IBCMINOR?	+OK=[para1]	Para1：0000H~FFFFH HEX
Set：AT+ IBCMINOR =[para1]	+OK：success +ERR=[NUM]：error	
Description: Be effective at once，save when power-off，sent in hexadecimal For example change to hex “31 32”： AT+IBCMINOR =12（12 is ASCII, convert to hexadecimal is:31 32）		

5.10 Request/Set iBeacon UUID

Command	Respond	Parameter
Request：AT+IBCNUUID?	+OK=[para1]	Para1：16 位 UUID HEX
Set：AT+IBCNUUID=[para1]	+OK：success +ERR=[NUM]:error	
Description: Be effective at once Example：Set iBeacon UUID as “FDA50693A4E24FB1AFCFC6EB07647825” 41 54 2B 49 42 43 4E 55 55 49 44 3D FDA50693A4E24FB1AFCFC6EB07647825		

5.11 Request/Set IBCTXPWR

Command	Respond	Parameter
Request：AT+IBCTXPWR?	+OK=[para1]	Para1：00H~FFH HEX
Set：AT+ IBCTXPWR =[para1]	+OK：success +ERR=[NUM]：error	
Description：Be effective at once，save when power off，sent in hexadecimal For example change to hex"31 32”： AT+IBCTXPWR =12（12 is ASCII, convert to hexadecimal is: 31 32）		

5.12 Read/Set device name（save when power off)

Command	Respond	Parameter
Request：AT+NAME?	+OK=[para]	Para: broadcast device name, HEX、ASCII broadcast name not more than 22 bytes
Set：AT+NAME=[para]	+OK：success +ERR=[NUM]：error	
Description：The next broadcast will take effects,save when power off For example, set to “E104-BT05”：AT+NAME=E104-BT05		

5.13 Read/Set device name(Do not save when power off）

Command	Respond	Parameter
Request：AT+NAME1?	+OK=[para]	Para: broadcast device name , HEX、ASCII broadcast name not more than 22 bytes
Set：AT+NAME1=[para]	+OK：success +ERR=[NUM]：error	
Description：The next broadcast will take effects，do not save when power off For example, set to “E104-BT05”：AT+NAME1=E104-BT05		

5.14 Read software version number

Command	Respond	Parameter
Request：AT+VER?	+OK=[para]	Para: Version number ASCII
Description :Be effective at once		

5.15 Read/Set broadcasting gap

Command	Respond	Parameter
Request：AT+ADVINTV?	+OK=[para]	Para:32~16000 ASCII Example：para=1600 Actual gap： 1600*0.625ms=1s
Set：AT+ADVINTV=[para]	+OK：success +ERR=[NUM]：error	
Description: The next broadcast will take effects, save when power off		

5.16 Read/Set min connecting gap

Command	Respond	Parameter
Request：AT+CONMIN?	+OK=[para]	Para: 6~3200 ASCII Example：8 8*1.25ms=10ms
Set：AT+CONMIN=[para]	+OK：success +ERR=[NUM]：error	
Description: The next connection takes effect, save when power off Note: The minimum connection gap must be less than or equal to the maximum connection gap and less than the timeout period		

5.17 Read/Set max connecting gap

Command	Respond	Parameter
Request：AT+CONMAX?	+OK=[para]	Para: 6~3200 ASCII Example：8 8*1.25ms=10ms
Set：AT+ CONMAX=[para]	+OK：success +ERR=[NUM]：error	
Description: The next connection takes effect, save when power off Note: The maximum connection gap must be greater than or equal to the minimum connection gap and less than the timeout period		

5.18 Read/Set connecting timeout

Command	Respond	Parameter

Request：AT+CONTO?	+OK=[para]	Para: 100~3200 ASCII Example：500 500*10ms=5s
Set：AT+CONTO=[para]	+OK：success +ERR=[NUM]：error	
Description :The next connection takes effect, save when power off		

5.19 Disconnect present connection

Command	Respond	Parameter
Request：AT+DISCON	+OK	None
Description: Be effective at once		

5.20 Request present connection status

Command	Respond	Parameter
Request：AT+CONSTA?	+OK=[para]	Para: Connected：Connection setup Disconnect：Connection break
Description: Be effective at once		

5.21 Request local MAC address

Command	Respond	Parameter
Request：AT+MAC?	+OK=[para]	Para:MAC address Example：F0E1D2C3B4A5

5.22 Request MAC address of connected devices

Command	Respond	Parameter
Request：AT+PEERMAC?	+OK=[para]	Para:MAC address Example：F0E1D2C3B4A5
Description: Be effective at once		

5.23 Read MAC binding status, turn MAC binding on and off

Command	Respond	Parameter
Request：AT+BOND?	+OK=[para]	Para:0,1 ASCII 0：Bind off 1：Bind on
Set：AT+BOND=[para]	+OK：success +ERR=[NUM]：error	
Description: Be effective at once, save when power-off		

5.24 MAC Read/Set bonded MAC address

Command	Respond	Parameter
Request：AT+BONDMAC?	+OK=[para]	Para:MAC address HEX Example：F0E1D2C3B4A5
Set：AT+BONDMAC=[para]	+OK：success +ERR=[NUM]：error	
Description: be effective at once, save when power-off For example, set the bound MAC to “313233343536”: AT+BONDMAC=123456 (123456 is ASCII, convert to hexadecimal is: 313233343536)		

5.25 Request/Set MTU length

Command	Respond	Parameter
Request：AT+MTU?	+OK=[para]	Para: ASCII 0：1 stop bit 1：2 stop bit
Set：AT+MTU=[para]	+OK：success +ERR=[NUM]：error	
Description: Restart takes effect, save when power-off		

5.26 Request/Set transparent transmission service UUID length

Command	Respond	Parameter
Request：AT+UUIDTYPE?	+OK=[para1]	Para: ASCII mtu length: 20-128 byte
Set：AT+UUIDTYPE=[para1]	+OK：success +ERR=[NUM]：error	
Description : Reconnection takes effect, save when power-off		

5.27 Request/ Set Bluetooth service UUID

Command	Respond	Parameter
Request：AT+UUIDSVR?	+OK=[para2]	Para1: UUID value HEX
Set：AT+UUIDSVR=[para2]	+OK：success +ERR=[NUM]：error	
Description: Reconnection takes effect, save when power-off, according to UUID length settings, saves in little endian mode For example, set 2-byte UUID to “FFFO”：41 54 2B 55 55 49 44 53 56 52 3D F0FF For example,16-byte UUID “11223344556677889900AABBCCDDEEFF”： 41 54 2B 55 55 49 44 53 56 52 3D FFEEDDCCBBAA00998877665544332211		

5.28 Request/Set Bluetooth reading service UUID

Command	Respond	Parameter
Request：AT+UUIDCHAR1?	+OK=[para1]	Para1：UUID value HEX
Set：AT+UUIDCHAR1=[para1]	+OK：success +ERR=[NUM]：error	
Description::Reconnection takes effect, save when power-off, saves in little endian mode For example, set 2-byte UUID to “FFF1”：41 54 2B 55 55 49 44 43 48 41 52 31 3D F1FF For example,16-byte UUID “11223344556677889900AABBCCDDEEF1”： 41 54 2B 55 55 49 44 53 56 52 3D F1EEDDCCBBAA00998877665544332211		

5.29 Request/ Set Bluetooth writing service UUID

Command	Respond	Parameter
Request：AT+UUIDCHAR2?	+OK=[para1]	Para1：UUID HEX
Set：AT+UUIDCHAR2=[para1]	+OK：success +ERR=[NUM]：error	
Description: From the new connection to take effect, save when power-off ,follow the small-end mode. For example, set 2-byte UUID to "FFF2：41 54 2B 55 55 49 44 43 48 41 52 32 3D F2FF For example,16-byte UUID “11223344556677889900AABBCCDDEEF2”： 41 54 2B 55 55 49 44 53 56 52 3D F2EEDDCCBBAA00998877665544332211		

5.30 Request/ Close/Open serial port delay

Command	Respond	Parameter
Request：AT+DATDLY?	+OK=[para]	Para:0、1 ASCII 0：Close 1、Open
Set：AT+DATDLY=[para]	+OK：success +ERR=[NUM]：error	
Description: Be effective at once, save when power-off		

5.31 Restart command

Command	Respond	Parameter
AT+RESET	+OK	None
Description: Be effective at once		

5.32 Restore factory settings

Command	Respond	Parameter

AT+RESTORE	+OK	None
Description: Be effective at once		

5.33 Request/Authenticate Air configuration password

Command	Respond	Parameter
Request：AT+AUTH?	+OK：success +ERR=[NUM]：error	para：6-byte password HEX、ASCII
Set：AT+AUTH =[para]	+OK：success +ERR=[NUM]：error	
Description : 1. Password cannot be changed before authentication is successful. 2. The command is only used in air configuration		

5.34 Update air configuration password

Command	Respond	Parameter
Request：AT+UPAUTH=[para]	+OK:success +ERR=[NUM]：error	para: 6-byte password
Description : The configuration will take effect after entering the air next time, save when power off		

5.35 Request/Set transmitting power

Command	Respond	Parameter
Request：AT+ PWR?	+OK=[para]	Para: 0~9 ASCII 0:+8dBm 1:+4dBm 2: 0dBm 3:-4dBm 4:-8dBm 5:-10dBm 6:-14dBm 7:-18dBm 8:-24dBm 9:-30dBm
Set：AT+ PWR =[para]	+OK：success +ERR=[NUM]：error	
Description: Be effective at once, save when power off		

5.36 Request/Set sleep after disconnection

Command	Respond	Parameter

Request：AT+DISCSLEEP?	+OK=[para]	Para: 0、1 ASCII 0：Close 1：Open
Set：AT+DISCSLEEP =[para]	+OK：success +ERR=[NUM]：error	
Description: Be effective at once, save when power off		

5.37 Get to sleep mode at once

Command	Respond	Parameter
Request：AT+SLEEP	STA:sleep	None
Description :Be effective at once, if the broadcast is not turned off, the broadcast gap as the wake-up time will continue broadcasting		

5.38 Request/Set print status

Command	Respond	Parameter
Request：AT+LOGMSG?	+OK=[para]	Para: 0、1 ASCII 0：Close 1：Open
Set：AT+LOGMSG=[para]	+OK：success +ERR=[NUM]：error	
Description: Be effective at once, save when power off		

5.39 Read IO0 input

Command	Respond	Parameter
Request：AT+ IO0?	+OK=[para]	Para: 0，1 ASCII 0：low level 1：High level
Description: Be effective at once, save when power off		

5.40 Read IO1 input

Command	Respond	Parameter
Request：AT+ IO1?	+OK=[para]	Para: 0，1 ASCII 0：low level 1：High level
Description: Be effective at once		

5.41 Set IO2 output

Command	Respond	Parameter
Request：AT+ IO2=[para]	+OK：success	Para: 0，1 ASCII

	+ERR=[NUM]：error	1：high level 0：low level
Description: 1.Be effective at once, save when power off 2.IO Keep setting level after next power-on		

5.42 Set IO3 output

Command	Respond	Parameter
Request：AT+ IO3=[para]	+OK：success +ERR=[NUM]：error	Para: 0，1 ASCII 1：High level 0：Low level
Description: 1. Be effective at once, save when power off. 2.IO Keep setting level after next power-on		

5.43 Read/set PWM0 duty cycle

Command	Respond	Parameter
Request：AT+PWM0?	+OK=[para]	Para: 0~100% ASCII 0 close PWM
Set：AT+PWM0=[para]	+OK：success +ERR=[NUM]：error	
Description: Be effective at once, save when power off.		

5.44 Read/Set PWM1 duty cycle

Command	Respond	Parameter
Request：AT+PWM1?	+OK=[para]	Para: 0~100% ASCII 0 close PWM
Set：AT+PWM1=[para]	+OK：success +ERR=[NUM]：error	
Description: Be effective at once, save when power off.		

5.45 Read/set PWM2 duty cycle

Command	Respond	Parameter
Request：AT+PWM2?	+OK=[para]	Para: 0~100% ASCII 0 close PWM
Set：AT+PWM2=[para]	+OK：success +ERR=[NUM]：error	
Description: Be effective at once, save when power off.		

5.46 Read/Set PWM3 duty cycle

Command	Respond	Parameter
Request：AT+PWM3?	+OK=[para]	Para: 0~100% ASCII 0 close PWM
Set：AT+PWM3=[para]	+OK：success +ERR=[NUM]：	
Description: Be effective at once, save when power off.		

5.47 Request/Set PWM output cycle

Command	Respond	Parameter
Request：AT+PWMFRQ?	+OK=[para]	Para: 5000T~25T ASCII T=0.01ms Example: Set 5 ms cycle AT+PWMFRQ=500
Set：AT+PWMFRQ=[para]	+OK：success +ERR=[NUM]：error	
Description: 1. Be effective at once, save when power off. 2. 4 PWM output frequencies are identical.		

PWM Period calculating method description:

Assuming that the required target cycle is t ,and the input parameter is para (i.e. "AT+PWMFRQ=para"), then t=T*para,means para=t/T.

For example, the setting cycle is 5ms: then para=5ms/0.01ms=500.

6. UUID description

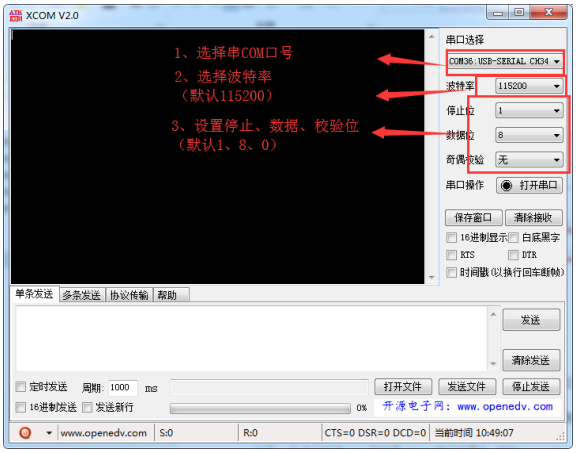
Channel name	UUID	HANDLE	Property	Description
BLE DATA BUFF	0xFFF1 （default）	33	Read only, inform	This channel is for receiving UART data and it returns to Bluetooth master by informing. The biggest data length for a single packet is 20 bytes. NOTE: If IPHONE or Android mobile phone is set as the master, the Notification function should be activated for receiving module data.
CENTER DATA BUFF	0xFFF2 （default）	37	Read, write	This channel is for master to transmit data. The biggest data length for a single packet is 20 Bytes The transmitted data will be outputted via serial port.
BLE DATA CONFIG	0xFFF3 （default）	40	Read, write inform	Air Configuration Channel

7. Quick start

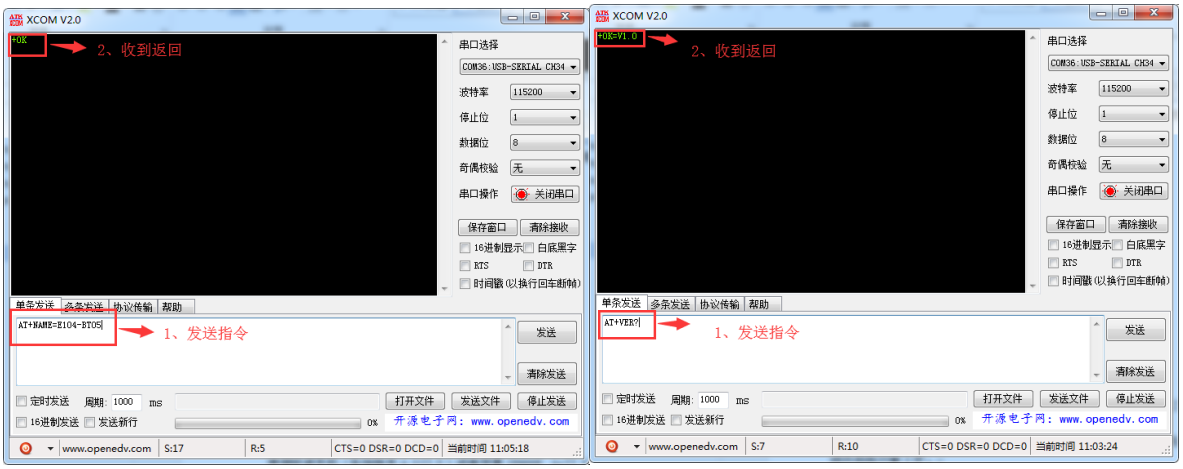
7.1 Quick use guide for configuration mode

Using XCOM Serial Port Assistant software demonstration configuration mode on PC, other software with serial port can also be used.

1、 Open “Xcom V2.0.exe”software,and set parameters.



2、 According to Chapter 6 Operating Instructions, configure parameters. Here show how to set the device name and read the version number.



3、 The air configuration mode involves transparent transmissions, see 8.2 Transport transmission and air configuration mode

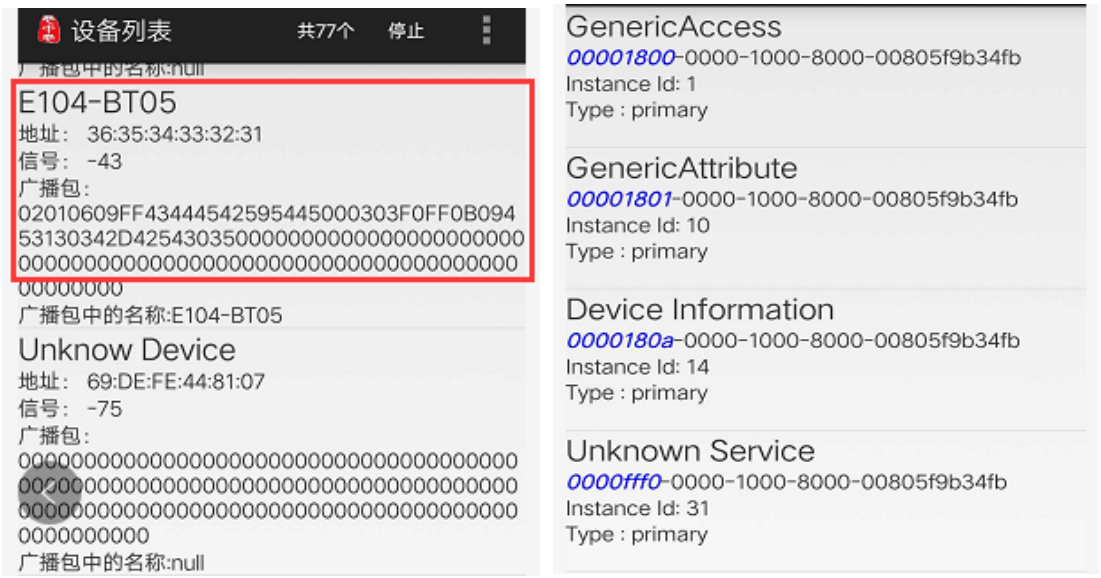
7.2 Transport transmission and air configuration mode

Use Android mobile phone (version 4.3 and above), IPHONE 4s and above version or Ipad with BLE function to achieve connection and communication with the module.

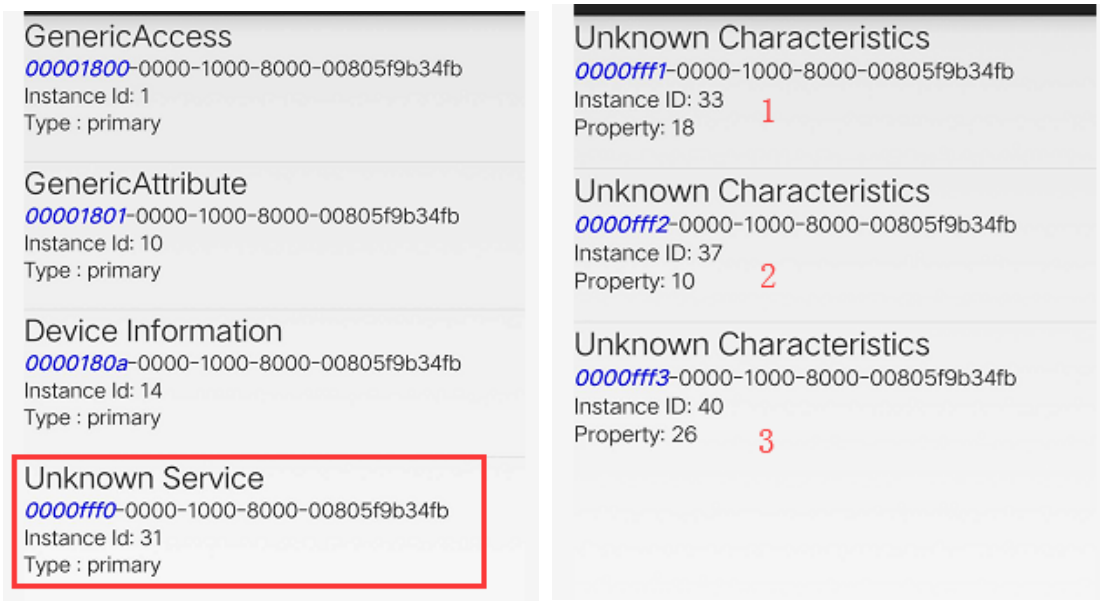
Take Android as an example:

1. Download and install “BLE Test Tool”

2. Open “BLE Test Tool”, found E104-BT04 module. Click and connect E104-BT05 Bluetooth devices. After successful vertical connection, there will be four service lists on the right side (tips: If the establishment of a connection fails or the list of services cannot be refreshed, it is generally the reason of the mobile phone APP, then exit and connect again), after the success of step 3, otherwise continue to implement step 2.

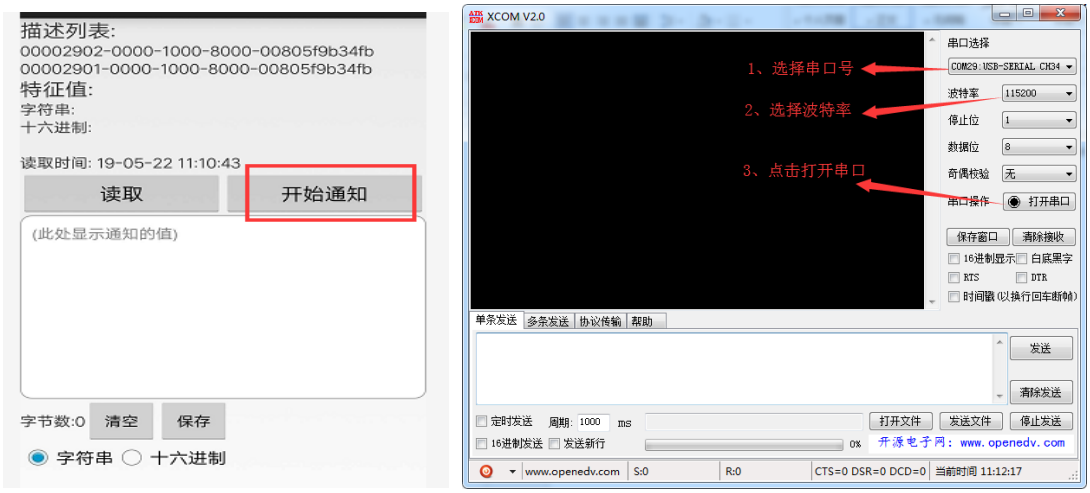


3. If step 2 is successful, click on the fourth service to enter the custom service of Ebyte. After success, enter step 4, otherwise continue to implement step 3.

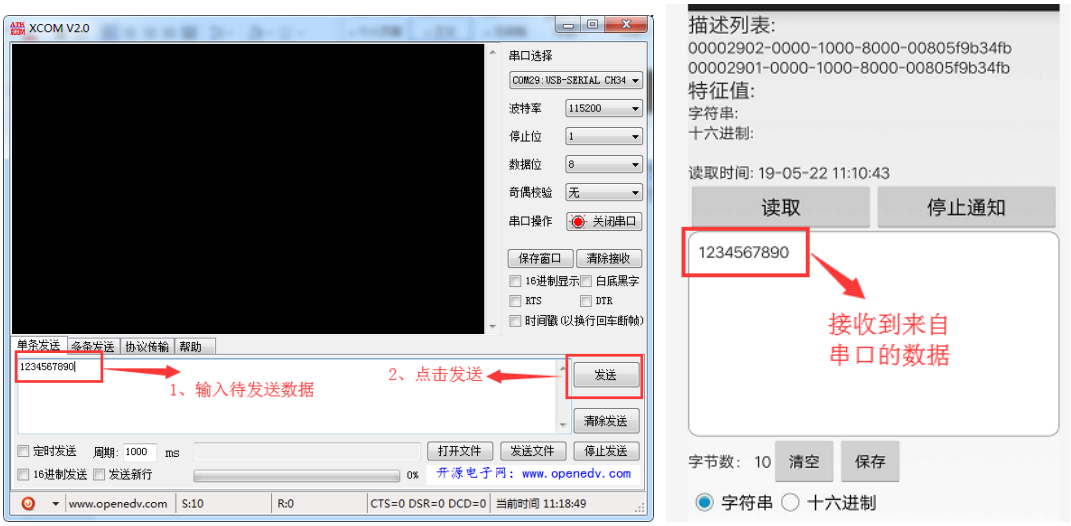


Note:1 is the notification channel, 2 is the write channel and 3 is the air configuration channel.

4.After step 3 is successful, click Enter Service 1, and then click Start Notification. Turn on the computer serial debugging assistant, set it as shown in the figure. After success, enter step 5, otherwise continue to implement step 4.

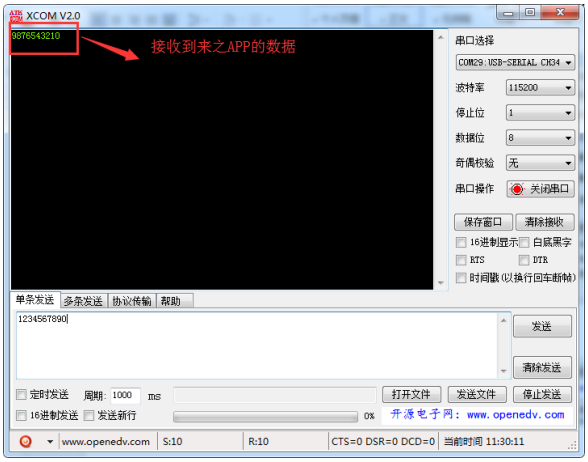


5.After the fourth step is completed, input data in the serial port, click Send can be received on APP.

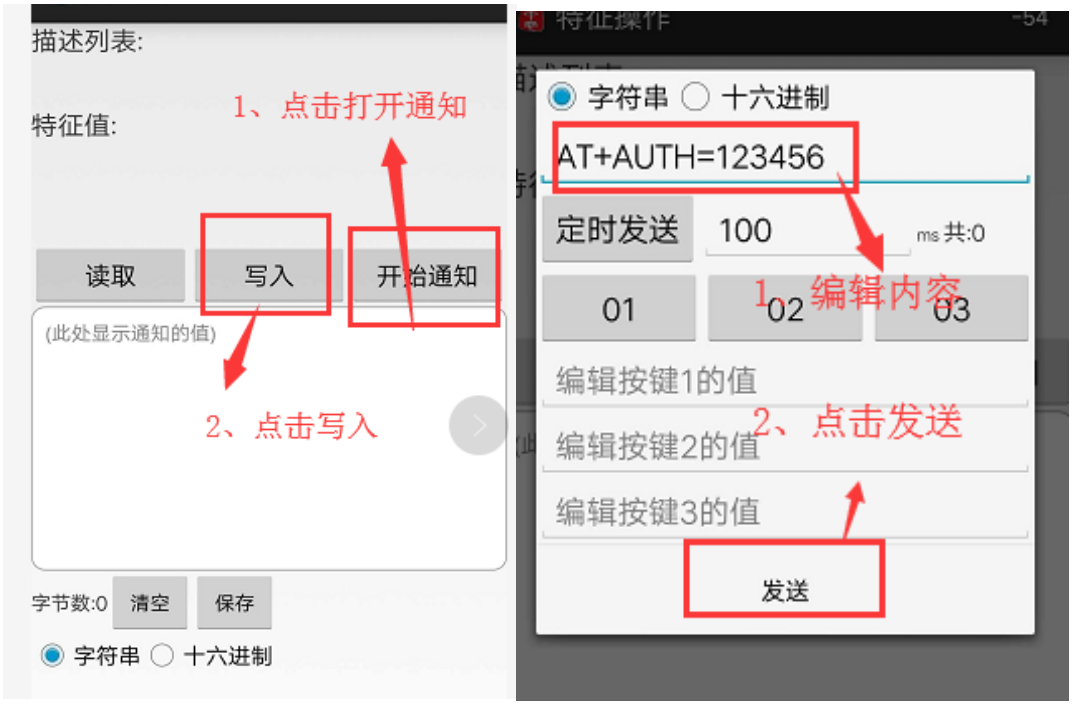


6. Return to the previous directory and enter Step 4. Click Service 2 to enter the write operation.

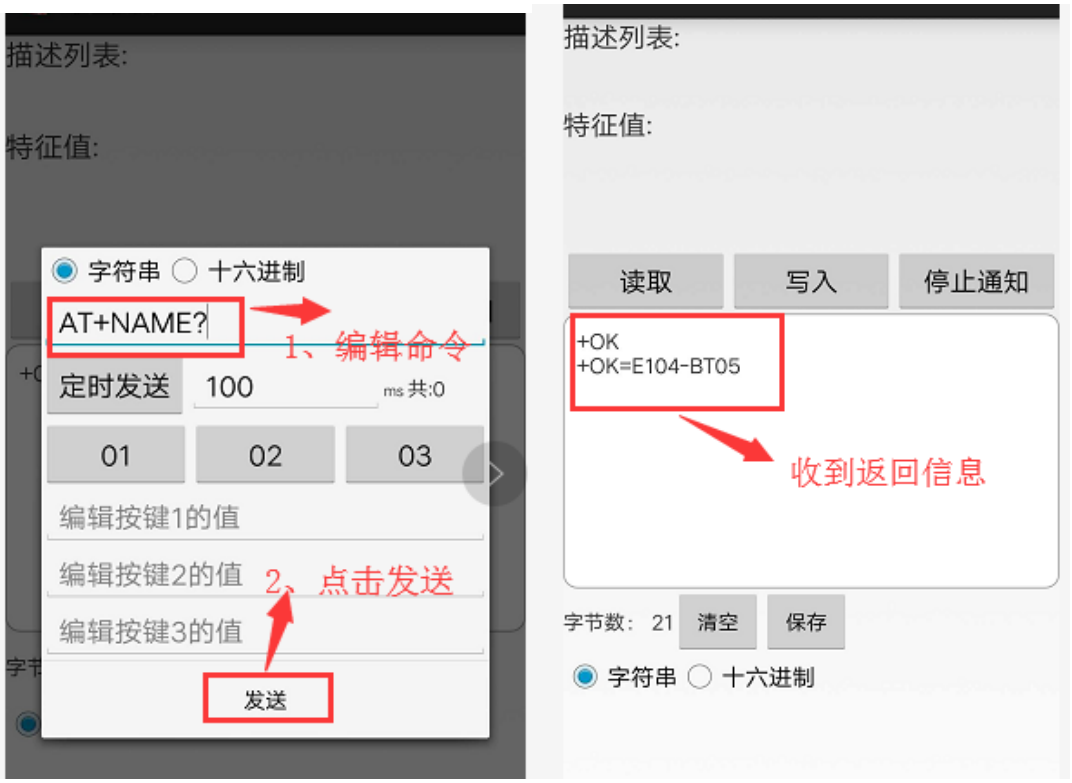
After completion, the data sent by APP can be seen on the serial debugging assistant.



7、Air configuration, return to the parent directory ,and enter to step 4, click Service 3, enter the air configuration mode, in the air configuration needs to verify the password (tips: when configuring passwords in edit control, it is important to note that all character input must be in English mode, otherwise error will occur.).



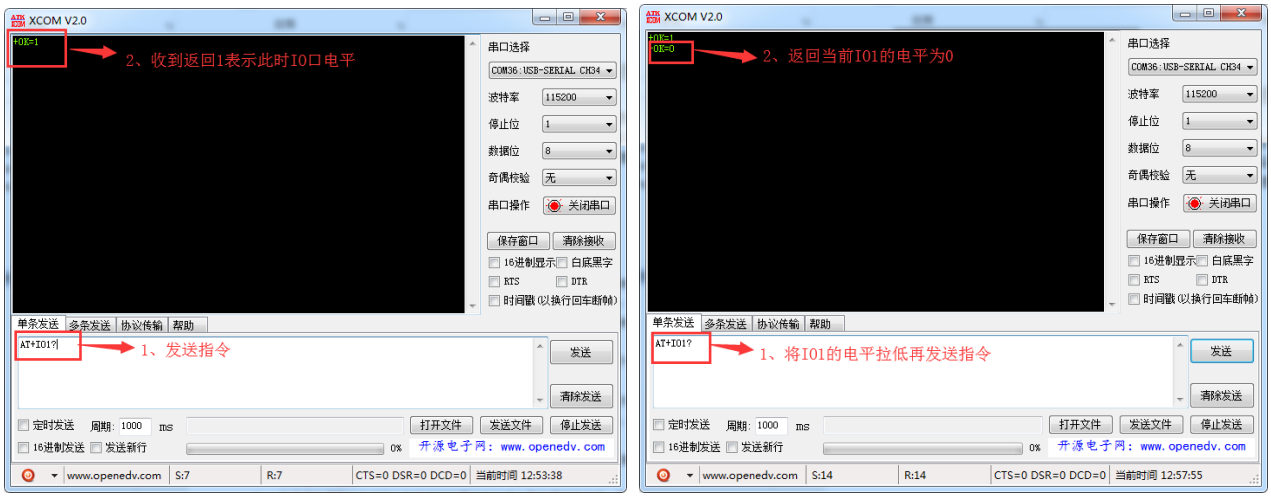
After the password authentication is successful, the return information "+0K" will be obtained. At this point, you can configure it in the air. Here is a demonstration of reading the device name.



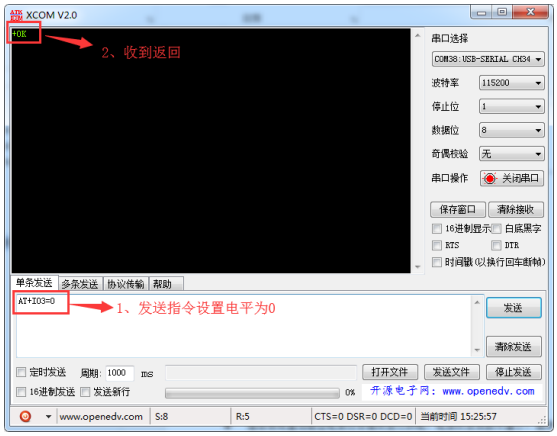
7.3 Quick use guide for IO reading, IO output and PWM output

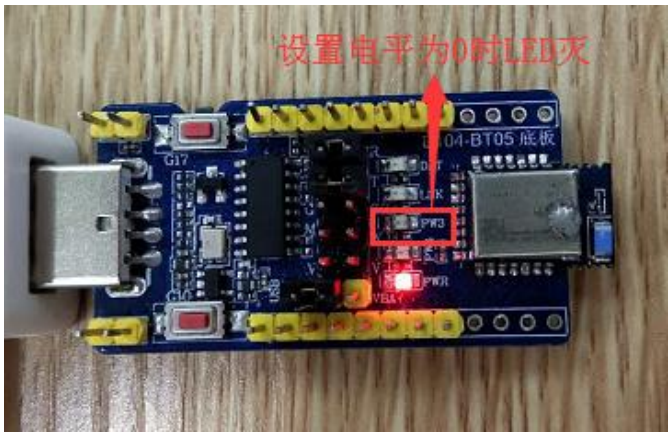
For the functions of IO reading, IO output and PWM output of E104-BT05, a guide is given here. In some cases, MCU is required to collect and control some signals. The E104-BT05 module can be used to replace MCU in collecting signals and controlling equipment.

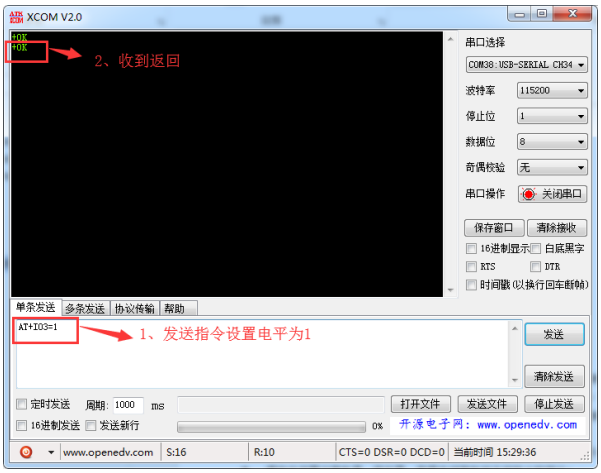
1、Read the IO1 input signal value, use AT instruction "AT+IO1?" to read the signal of IO port. (This pin can be set as signal acquisition device according to the demand, and then the signal can be acquired through other devices or mobile phone APP)

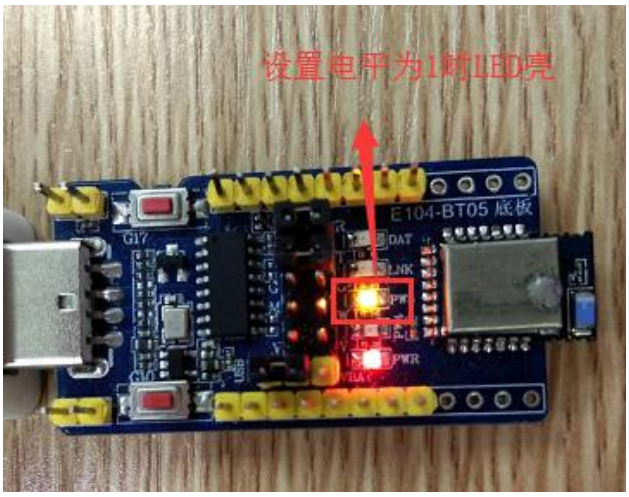


2、Set the IO2 output. Set the output level by using AT instruction "AT+IO2=xx". (This pin can be set as control pin according to the requirement, and the target device can be controlled by other devices or mobile APP)

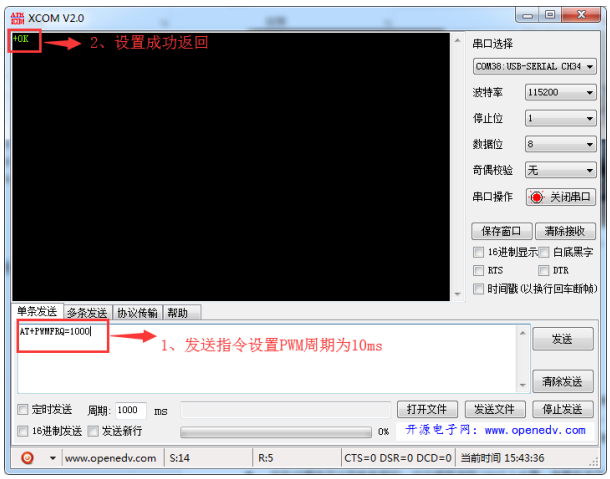


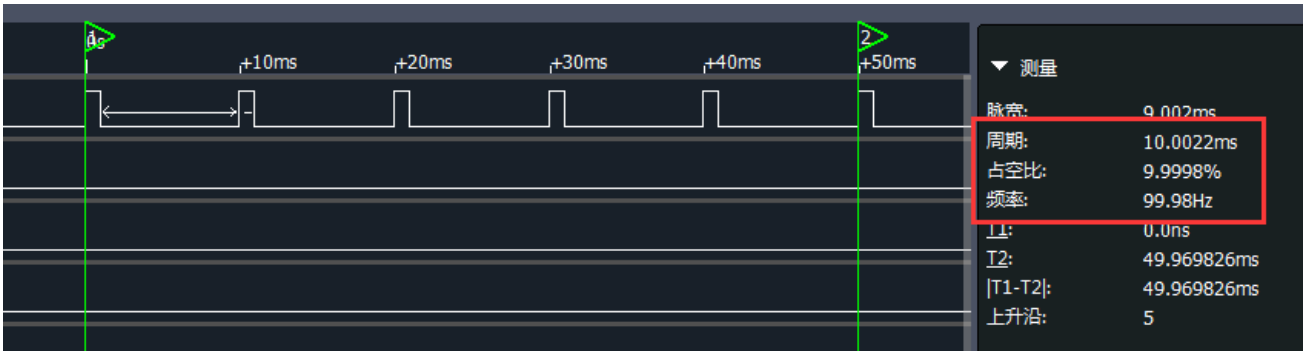






3、 Set PWM output, use AT instruction "AT + PWMFRQ = xx" to set the PWM cycle, and use AT instruction "AT + PWM1 = xx" to set the PWM duty cycle. The calculation method of PWM cycle is as follows: within the module, we set the precision to T=0.01ms, that is, the minimum cycle is 0.01ms. We can pass in parameters when setting, if need to set the cycle to 10ms, then t=T*para, bring in T=0.01ms, t=10ms, and calculate para=1000





8. Hardware design

- It is recommended to use a DC stabilized power supply. The power supply ripple factor is as small as possible, and the module needs to be reliably grounded.;
- Please pay attention to the correct connection of the positive and negative poles of the power supply. Reverse connection may cause permanent damage to the module;
- Please check the power supply to ensure it is within the recommended voltage otherwise when it exceeds the maximum value the module will be permanently damaged;
- Please check the stability of the power supply, the voltage can not be fluctuated frequently;
- When designing the power supply circuit for the module, it is often recommended to reserve more than 30% of the margin, so the whole machine is beneficial for long-term stable operation.;
- The module should be as far away as possible from the power supply, transformers, high-frequency wiring and other parts with large electromagnetic interference.;
- High-frequency digital routing, high-frequency analog routing, and power routing must be avoided under the module. If it is necessary to pass through the module, assume that the module is soldered to the Top Layer, and the copper is spread on the Top Layer of the module contact part(well grounded), it must be close to the digital part of the module and routed in the Bottom Layer;
- Assuming the module is soldered or placed over the Top Layer, it is wrong to randomly route over the Bottom Layer or other layers, which will affect the module's spurs and receiving sensitivity to varying degrees;
- It is assumed that there are devices with large electromagnetic interference around the module that will greatly affect the performance. It is recommended to keep them away from the module according to the strength of the interference. If necessary, appropriate isolation and shielding can be done;
- Assume that there are traces with large electromagnetic interference (high-frequency digital, high-frequency analog, power traces) around the module that will greatly affect the performance of the module. It is recommended to stay away from the module according to the strength of the interference.If necessary, appropriate isolation and shielding can be done.
- If the communication line uses a 5V level, a 1k-5.1k resistor must be connected in series (not recommended, there is still a risk of damage);
- Try to stay away from some physical layers such as TTL protocol at 2.4GHz , for example: USB3.0;
- The mounting structure of antenna has a great influence on the performance of the module. It is necessary to ensure that the antenna is exposed, preferably vertically upward. When the module is mounted inside the case, use a good antenna extension cable to extend the antenna to the outside;
- The antenna must not be installed inside the metal case, which will cause the transmission distance to be greatly

weakened.

9. FAQ

9.1 Communication range is too short

- The communication distance will be affected when obstacle exists.
- Data lose rate will be affected by temperature, humidity and co-channel interference.
- The ground will absorb and reflect wireless radio wave, so the performance will be poor when testing near ground.
- Sea water has great ability in absorbing wireless radio wave, so performance will be poor when testing near the sea.
- The signal will be affected when the antenna is near metal object or put in a metal case.
- Power register was set incorrectly, air data rate is set as too high (the higher the air data rate, the shorter the distance).
- The power supply low voltage under room temperature is lower than 2.5V, the lower the voltage, the lower the transmitting power.
- Due to antenna quality or poor matching between antenna and module.

9.2 Module is easy to damage

- Please check the power supply source, ensure it is 2.0V~3.6V, voltage higher than 3.6V will damage the module.
- Please check the stability of power source, the voltage cannot fluctuate too much.
- Please make sure antistatic measure are taken when installing and using, high frequency devices have electrostatic susceptibility.
- Please ensure the humidity is within limited range, some parts are sensitive to humidity.
- Please avoid using modules under too high or too low temperature.

9.3 BER(Bit Error Rate) is high

- There are co-channel signal interference nearby, please be away from interference sources or modify frequency and channel to avoid interference;
- Poor power supply may cause messy code. Make sure that the power supply is reliable.
- The extension line and feeder quality are poor or too long, so the bit error rate is high;

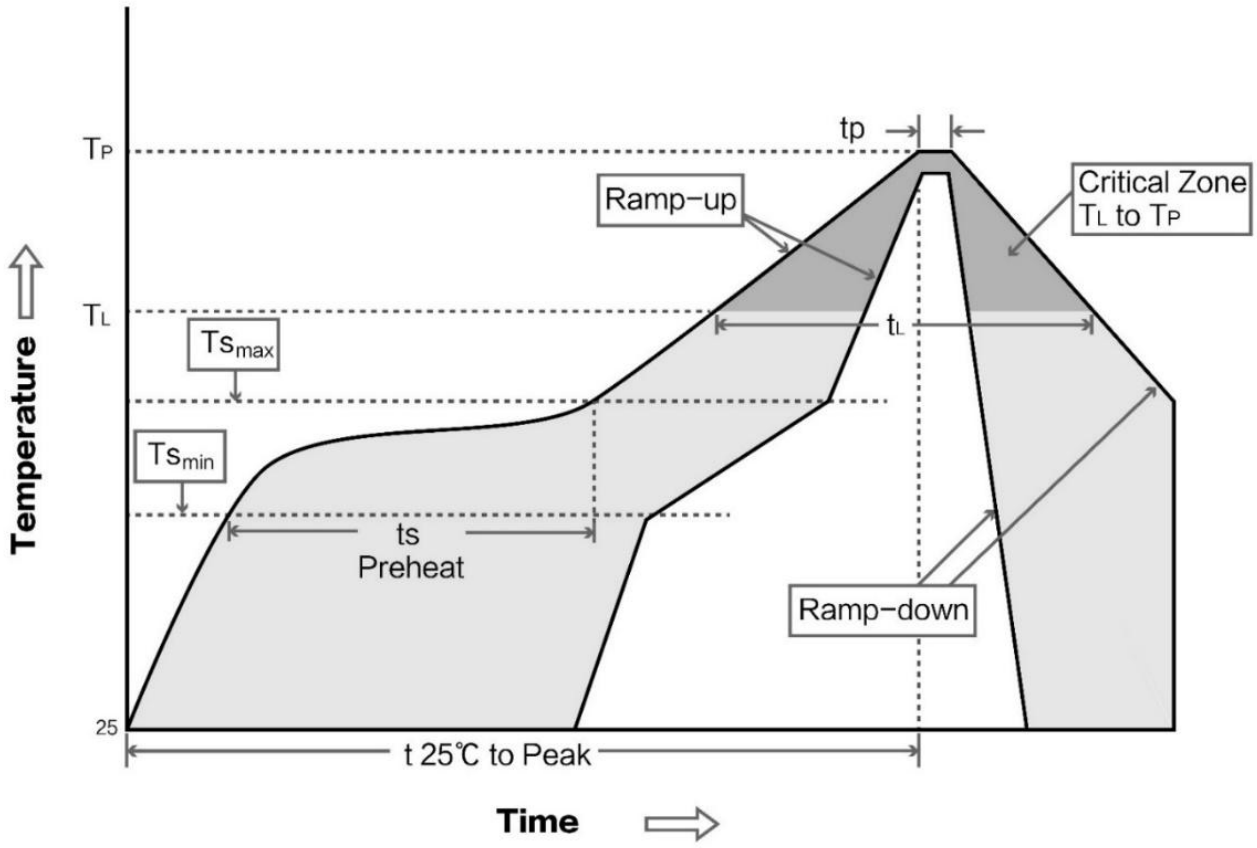
10. Production guidance

10.1 Reflow soldering temperature

Profile Feature	Curve characteristics	Sn-Pb Assembly	Pb-Free Assembly
Solder Paste	Solder paste	Sn63/Pb37	Sn96.5/Ag3/Cu0.5
Preheat Temperature min （Tsmin）	Min preheating temp.	100℃	150℃
Preheat temperature max (Tsmax)	Mx preheating temp.	150℃	200℃

Preheat Time (Tsmin to Tsmax)(ts)	Preheating time	60-120 sec	60-120 sec
Average ramp-up rate(Tsmax to Tp)	Average ramp-up rate	3℃/second max	3℃/second max
Liquidous Temperature (TL)	Liquid phase temp.	183℃	217℃
Time（tL）Maintained Above（TL）	Time below liquid phase line	60-90 sec	30-90 sec
Peak temperature（Tp）	Peak temp.	220-235℃	230-250℃
Aveage ramp-down rate（Tp to Tsmax）	Aveage ramp-down rate	6℃/second max	6℃/second max
Time 25℃ to peak temperature	Time to peak temperature for 25℃	max 6 minutes	max 8 minutes

10.2 Reflow soldering curve

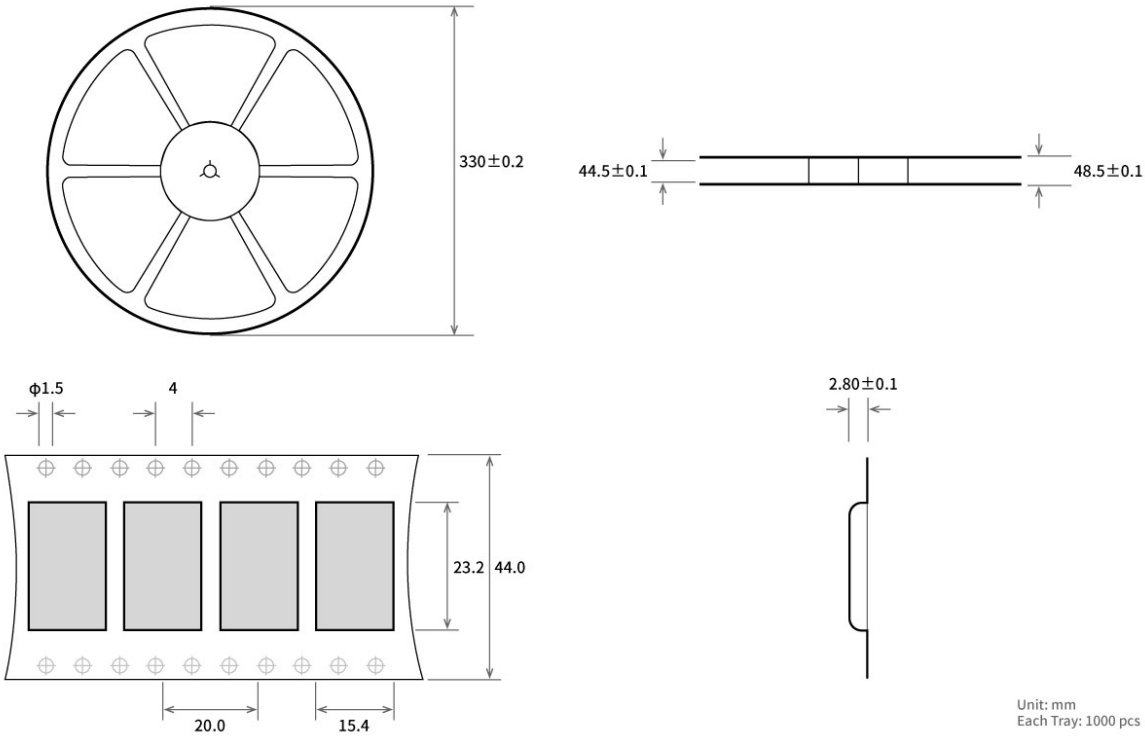


11. Related series

Model number	IC	Frequency Hz	Power dBm	Interface	BLE Protocol	Size mm	Antenna type	Functional characteristics
E72-2G4M05S1B	CC2640	2.4G	5	I/O	4.2	17.5*28.7	PCB/IPX	Secondary development

E73-2G4M04S1A	nRF52810	2.4G	4	I/O	4.2/5.0	17.5*28.7	PCB/IPX	Secondary development
E73-2G4M04S1B	nRF52832	2.4G	4	I/O	4.2/5.0	17.5*28.7	PCB/IPX	Secondary development
E73-2G4M08S1C	nRF52840	2.4G	8	I/O	4.2/5.0	13*18	PCB/IPX	Secondary development
E73-2G4M04S1D	nRF51822	2.4G	4	I/O	4.2	17.5*28.7	PCB/IPX	Secondary development
E104-BT01	CC2541	2.4G	0	I/O	4.0	14*22	PCB	Secondary development
E104-BT02	DA14580	2.4G	0	TTL	4.2	14*22	PCB	Low Power Consumption
E72-2G4M04S2B	CC2640	2.4G	2	TTL	4.2	14*23	PCB/IPX	Built-in dual-core ARM
E104-2G4U04A	CC2540	2.4G	0	USB	4.0	18*59	PCB	Dongle Protocol
E104-BT05	-	2.4G	0	I/O	4.2	10*14.5	PCB	IO acquisition, IO output, PWM output

12. Package for batch order



Revision history

Version	Date	Description	Operator
1.0	2019-5-9	Initial version	huaa
1.1	2019-12-24	Content modification (welding pad spacing modification, recommended connection diagram)	Linson
1.2	2019-02-26	Dimension drawing weld pad and bottom spacing modification	Linson
1.3	2022-10-11	Error correction	Bin
1.4	2022-12-8	Error correction	Bin
1.7	2024-08-16	Error correction	Bin
1.8	2025-01-13	Error correction	Bin
1.9	2025-06-03	Error correction	Bin

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