user manual

(TD5322A chip)

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brief introduction

TD5322A chip is a digital transmission chip that supports Bluetooth BLE and SPP, Bluetooth version 5.1. The advantages of the chip are small size (SOP-8 package), strong performance, low price, and support for custom UUID, custom broadcast packets, master-slave mode switching and other powerful features, through a simple transmission and serial AT command operation, greatly reducing the development of Bluetooth functionality to increase the development of other electronic products in the difficulty and cost.

Features:

- Transmission Distance: >50m (specific to RF transmit power and antenna design);
- Supports SPP and BLE protocols and BLE low power mode;
- Transmission rate: BLE 15kbps, SPP 20kpbs;
- Support for custom UUIDs;
- Support for customized broadcast packets;
- Operating modes: master and slave modes.

Application Scenario: Bluetooth Serial Port Transmission

Demo Module Introduction (TD601)

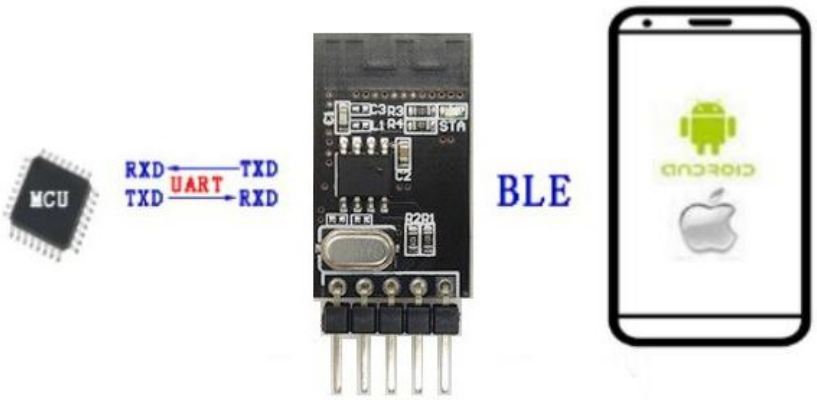
TD601 module, mainly facilitates customers to quickly perform functional verification and debugging.

GND:电源地
TXD:UART输出口
RXD:UART输入口
VCC:电源脚，输入电压范围1.8～3.4V
STA:未连接蓝牙时高低电平交替输出，连接后高电平输出（可悬空）。

产品参数

蓝牙协议：BLE5.1;
工作频率：2.4G;
模块尺寸：15.1*33.8mm;
工作电压：1.8V～3.4V;
通讯距离：65m;
传输速率：20kbps;
发射功率：-20dBM～4dBM;
通讯接口：UART串口;
波特率：2400～1000000;
灵敏度：-96dBM;
天线：PCB板载天线;
工作温度：-40℃～85℃;
工作模式：主&从模式;

Connection schematic:



从模式

主从模式

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1. summarize

1.1 Chip Basic Information

Default Bluetooth name: TD5322A_XXX (can be modified by AT command) Bluetooth Serial Port

Transmission Service UUID: 0XFF00

Eigenvalue attribute of chip data to cell phone UUID: 0XFF01 Eigenvalue

attribute of cell phone sending data to chip UUID: 0XFF02 Default serial port baud

rate: 115200

Connection status indication: Unconnected Bluetooth alternating high and low level output, connected high level output (can be configured to be low when not connected)

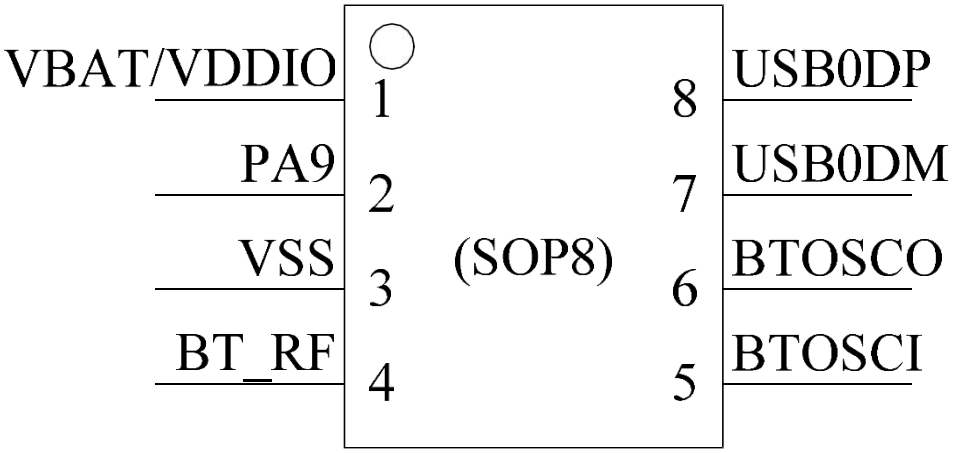
Continuous data sending power consumption: 5.1mA, broadcasting can be connected power consumption: 120uA (when the broadcasting interval is 1S)

Supply voltage: 1.8~3.4V

Operating Temperature Range: -40℃～+85℃

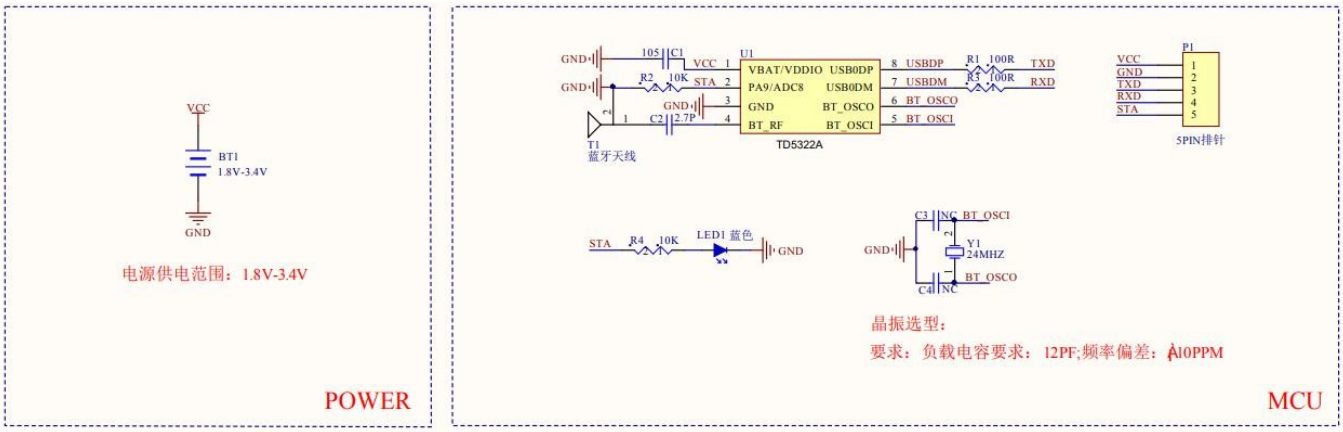
1.2 Hardware Description

The pin definitions are as follows:



pin	name (of a thing)	typology	functionality
1	VCC	POWER	1.8-3.4V, 3.3V recommended
2	STA	I/O	Status port, default Bluetooth not connected blinking, connected always on (High) level), configurable
3	GND	GND	GND
4	BTRF	/	bluetooth antenna
5	BTOSCI	Input	Crystal input pin
6	BTOSCO	Output	crystal output pin
7	RXD	I/O	Serial receive pin
8	TXD	I/O	serial port transmitter pin

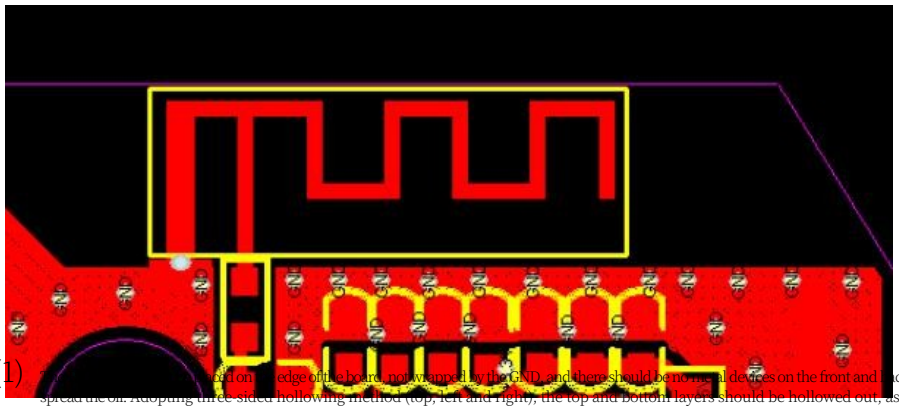
The hardware schematic is shown below:



1.3 Hardware Design Considerations

VBAT supply voltage	1.8-3.4V, do not exceed 3.4V.
Serial port and MCU connection	The IO port voltage is equal to the VCC voltage. When connecting the serial port and MCU, pay attention to the level of both ends. RXD, TXD according to the voltage can be strung 100 ohms or larger resistors.
bluetooth antenna	Please copy and paste into your own PCB according to the component library provided by our company.
24M crystal	Crystal specification:24M 12pF 10PPM The crystal should be placed close to the main control and the alignment should not be too long. Crystal must be selected, good stability, consistency, frequency deviation within ± 10PPM. (Recommended to use the matching crystal, cover 49S, 3225)
Reserve upgrade points	VCC, RXD, TXD, GND, four feet reserved for test points, as a program upgrade point. Prevent batch problems, can be burned back.

Description of the Bluetooth antenna



(1) The Bluetooth chip antenna is placed on the edge of the board, not wrapped by the GND, and there should be no metal devices on the front and back sides, and do not spread the oil. Adopting three-sided hollowing method (top, left and right), the top and Bottom layers should be hollowed out, as shown in the figure above.

(2) Underneath the Bluetooth chip antenna, the ground is wrapped with an over-hole.

1.4 Connection Status Description

The test can be done by connecting the Bluetooth module with a USB to TTL tool and sending AT commands with a serial debugging assistant on the computer side.

Serial port printing after module power up '' IM
READ\r\n'' Connection success prints ''
BLE_CONN\r\n'' BLE Disconnect Successful Print "
BLE_DISC\r\n'' SPP Connect Successful Print ''
SPP_CONN\r\n'' SPP Disconnect Successfully Printed ''
SPP_DISC\r\n"

Note: The above status connection information can be turned on or off with the AT+LOG command (on by default, see AT command set description).

2. AT serial protocol

AT command is used as a configuration command in this chip, it can only be used when Bluetooth is not connected, when Bluetooth is connected, AT command will not work. At this time, you can input "AT> 9" to force AT instruction channel, after configuration, input "AT> 8" to return to BLE transmission mode, input "AT> 10" to return to SPP transmission mode.

2.1 newsletter format

Baud rate: **115200 bps(default)** Data bits
:8

Stop position : 1
Check digit :none
Flow control :none

2.2 AT command set

Note: All commands are terminated with \r\n, please check the "Add Carriage Return Line Feed" checkbox in the Serial Assistant, or enter the full command, e.g. AT+BLENAME\r\n;

The following AT command sets are under constant improvement. Please contact us for more information about new features.

AT command set			
Directives	**equivalent function**	**return value**	**Remarks**
AT	AT test, communication is OK.	\r\nok\r\n	
AT+RESET	Chip save configuration and reboot	\r\nok\r\n	
AT+RESTORE	Chip restores factory settings and reboots	\r\nok\r\n	
AT+VER	Query Module Software Version	\r\n +VER=**** \r\n OK	
AT+BLENAME	Query current BLE Bluetooth name	\r\n +NAME=**** \r\n OK	
AT+SPPNAME	Query the current SPP Bluetooth name	\r\n +NAME=**** \r\n OK	Effective only in BLE & SPP dual-mode version
AT+BLEMAC	Query module BLE MAC address	\r\n +MAC:********** \r\n OK	
AT+SPPMAC	Query module SPP MAC address	\r\n +MAC:********** \r\n OK	Effective only in BLE & SPP dual-mode version
AT+BAUD	Baud rate of the query system	\r\n +BAUD=**** \r\n OK	
AT+UUID	Query all UUIDsof the chip		
AT+MODE	Query Supported Modes	\r\n +MODE=* \r\n OK	Effective only in BLE & SPP dual-mode version 0 Delegates support BLE 1 Representatives support BLE & SPP
AT+SECURITY	Check Pairing Status	\r\n +SECURITY=* \r\n OK	0 stands for Cancel Password Pairing 1 Delegates turn on Easy Pairing 2 stands for Open Password Pairing
AT+PIN	Query Pairing Password	\r\n +PIN=****** \r\n	
		OK	

AT+ADVDATA	Query broadcast packet data	\r\n +ADVDATA:*** \r\n OK	
AT+ADVPARAM	Query broadcast interval	\r\n +ADVPARAM:*** \r\n OK	
AT+LPM	Query low-power status	\r\n +LPM=* \r\n OK	Low Power Mode is only available in Slave Mode on the BLE version 0 for non-low power mode 1 means in low power mode
AT+LOG	Query Chip Log Status	\r\n +LOG=* \r\n OK	0 means to turn off the Log messages actively output by the chip. 1 means to turn on the Log message actively output by the chip.
AT+LED	Query LED status port display method	\r\n +LED:X \r\n OK	0 means off (low level) when not connected, always on (high level) when connected. 1 means that it blinks quickly when it is not connected, and lights up when it is connected (both are square wave outputs). out) (chip default setting is 1)
AT+ROLE	Query the current role of the chip	\r\n +ROLE=**** \r\n OK	SERVER Represents the current role as a slave (chip default) CLIENT Represents the current role as a master
AT+VBAT	Query VAT voltage	\r\n +PIN=****** \r\n OK	Query VAT voltage, if 3.3V then return 330
AT+BAUD=XXXX	Set serial port baud rate, reset to take effect.	\r\nok\r\n	Parameters **2400**, **4800**, **9600**, etc., see **2.3** for details.
AT+MODE=X	Setup Mode	\r\n +MODE=* \r\n OK	Effective only in BLE & SPP dual-mode version 0 for BLE single mode 1 stands for BLE & SPP Dual Mode
AT+BLENAME=XXXX	Set the Bluetooth name of BLE channel, reset to take effect.	\r\nok\r\n	
AT+SPPNAME=XXXX	Set SPP channel Bluetooth name, reset to take effect	\r\nok\r\n	
AT+SECURITY=0	Cancel pairing, reset to take effect	\r\nok\r\n	
AT+SECURITY=1	Turn on simple pairing and reset to take effect.	\r\nok\r\n	
AT+SECURITY=2	Turn on password pairing and reset to take effect.	\r\nok\r\n	
AT+PIN=XXXXXX	Set the pairing password to XXXXXXX,reset the raw efficacy	\r\nok\r\n	The BLE channel password needs to be 6 digits; (Default password: 000000)
AT+BLEMAC=XXXX	Set BLE MAC address (12 digit hexadecimal number) value), the reset takes effect.	\r\nok\r\n	
AT+SPPMAC=XXXX	Set the SPP MAC address (12-bit hexadecimal number) value), the reset takes effect.	\r\nok\r\n	Effective only in BLE & SPP dual-mode version
AT+ADV=X	Enable and disable broadcasting, reset to take effect	\r\nok\r\n	0 means off
			1 for on (default)

AT+ADVDATA=XXX	Set broadcast packet data	\r\nok\r\n	
AT+ADVPARAM=X	Setting the broadcast interval 10<=X<=4000, in ms	\r\nok\r\n	The longer the interval, the lower the power consumption and the longer the connection time.
AT+RFPWR	Setting the transmit power 0-9	\r\nok\r\n	Set the transmit power (default level is 9).
AT+LED=X	Setting LED indicators	\r\nok\r\n	0 means that it is off (low level) when it is not connected, and always on (high level) when it is connected. 1 for fast flash when not connected (all square wave output), after connected Always on (high level)
AT+LPM=0	Turn off low power consumption, reset to take effect.	\r\nok\r\n	
AT+LPM=1	Turn on low power consumption, reset to take effect.	\r\nok\r\n	Effective only in BLE low-power slave mode
AT+ROLE=X	Set the chip role, reset to take effect	\r\nok\r\n	For master-slave mode switching
AT+CONN=XXX	The host role initiates the connection operation	\r\nok\r\n	XXX represents the MAC address of the slave device to be connected.
AT+SLEEP	Setting up a soft shutdown	\r\nok\r\n	
AT>X	Cut to the specified channel	\r\nok\r\n	0 for host channel 8 for BLE slave channel 9 AT command channel 10 SPP channels
AT+DISC=X	Master or slave active disconnect operation	\r\nok\r\n	0 for host-initiated disconnection 8 Active disconnection on behalf of the BLE slave 10 Represents SPP slave active disconnection Note: Before executing this command, you need to execute the AT>9 cut to AT command first conduit
AT+LOG=X	Turns on or off the active output from the chip Log messages	\r\nok\r\n	0 means to turn off the Log messages actively output by the chip. 1 means to turn on the Log message actively output by the chip.

AT commands for host functions only			
Directives	**equivalent function**	**return value**	**Remarks**
AT+ROLE	Query the current role of the chip	\r\nok\r\n	AT+ROLE command to switch master and slave (reboot effective) Enter AT+ROLE=1 to set as master Enter AT+ROLE=0 to set as slave Enter AT+ROLE to query whether it is currently a host or a slave, the host returns "CLIENT" and the slave returns "SERVER".
AT+SCAN=1	Turn on scanning	\r\nok\r\n	
AT+SCANM=0,0	Setting the number of host mode search devices and setting the host mode search device timeout Time (UNIT: seconds)	\r\nok\r\n	0 =< number of searches <= 15 (default is 5) 0 =< timeout <= 40 (default is 5) The default return is 5,5;
AT+SCANPARAM=0,0,0	Setting the scanning mode, scanning period, and scanning window	\r\nok\r\n	First value: 0: passive scanning 1: active scanning (default is 1) Second value: set the host scanning period length (default is 20) Third value: set the host scanning window size (default is 15) Note: The value of the scan period needs to be larger than the scan window.

AT+CLRBIND	Clear saved slave addresses	\r\nok\r\n	
AT+TARGETUUID	Set the UUID (service/feature) to connect to	\r\nok\r\n	Set the UUID (service/feature) to connect to, must contain NOTIFY, WRITE/WRITE NO RESPONSE attribute, otherwise will fail to connect

2.3 Baud rate list

The list of serial port baud rates supported by this chip are: 2400, 4800, 9600, 14400, 19200, 38400, 56000, 57600, 115200, 230400,

256000, 460800, 530000, 1000000.

3. Detailed description of Bluetooth Transmission - BLE

3.1 UUID description of the BLE

1. The service UUID is "FF00";
2. The UUID of feature 1 is "FF01" and the attribute is "notify";
3. The UUID of feature 2 is "FF02" and the attribute is "write";

To query the current UUID status of the chip, use the following query command: AT+UUID\r\n
The UUID supports 16-bit or 128-bit. If you need to use other UUID, the chip supports customized UUID, the operation details are as follows: AT+UUID=[UUID Serial Number],[Target UUID Value]\r\n

AT+RESET\r\n

Examples:

1. Change the UUID of the picture labeled "3" to FF47 AT+UUID=3,FF47\r\n

AT+RESET\r\n

2, the picture labeled " " UUID to 00112233445566778899AABBCCDDEEFF, the specific operation is as follows: AT+UUUID=3,FFEEDDCCBBAA99887766554433221100\r\n //need to input byte by byte (i.e. every two characters) in reverse order AT+RESET\r\n //After the modification is completed, the cell phone needs to be re-paired or restart the Bluetooth in order to display normally.

Other: If you want to restore the default UUID of the chip, you only need to execute AT+RESTORE to restore the chip's factory settings.

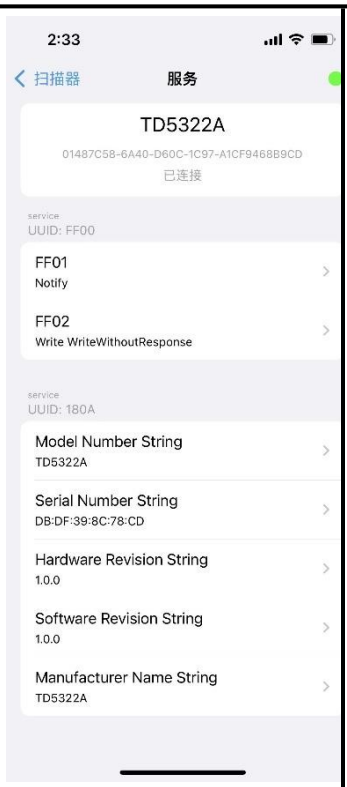
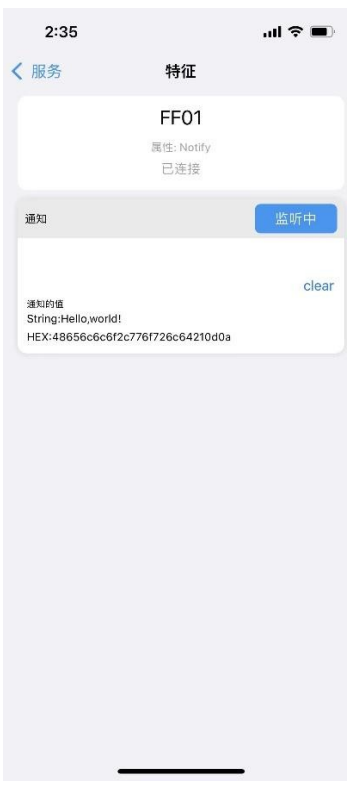
3.2 Test Notes for BLE

APP Andorid test, recommend to use our Demo app (in the Demo APP catalog, currently only support BLE mode, SPP mode is still under development)
Other professional testing software: nRF Connect (Android version is available in this catalog, IOS version can be downloaded from App Store). APP IOS end test recommended to use "BLE Tools" software, you can directly search in the "APP Store" to download.

For APP customization needs, feel free to contact us for development.

The test steps are as follows:

We use BLETools (IOS version, download from the App Store)

			
Step one: 1. Launch the BLETools app; 2. Tap the device with the corresponding Bluetooth name, such as "TD5322A", and click Connect	second step 1、Interface after connecting the chip 2. You can see the name and service	Step Three: 1. Find the service you need, which is FF01; 2. Click "Listening"; 3、Send test characters from the serial port (e.g., simulated with a computer's serial port debugging tool); 4. The cell phone shows that the relevant characters have been received;	Step Four: 1. Find the service you need, which is FF02; 2. Click "Write"; 3. Enter the test characters; 4, Bluetooth transmitting will transfer the relevant data out of the Bluetooth chip serial port side to send (can be used in the computer's serial port debugging tools to) (analog reception);

3.3 BLE Power Consumption Details

The chip has two modes of operation: normal operation mode and low power operation mode. **Power consumption related instructions are described:**

The chip turns off the low power consumption by default, and the command AT+LPM is used to query whether the low power mode is currently turned on or not;

Broadcast low power mode can be turned on with the instruction AT+LPM=1 and turned off with AT+LPM=0. After the AT+LPM instruction has been configured, a reset or repowering of AT+RESET is required to take effect;

With the low power mode on, the serial port AT command can be configured 5 seconds before power on, and every AT command received will be re-timed, and if the AT command is not received for 5 consecutive seconds, it will enter the low power consumption;

After entering the low power mode, the serial port configuration AT command is invalidated, and the data can be sent and received normally after connecting Bluetooth. Low power consumption is only effective in the slave mode of the low power version, and is not supported in the host mode.

In addition, the power consumption of this broadcasting state is directly related to the broadcasting interval, so you can set the appropriate broadcasting interval according to the specific project, and then turn on the low-power mode. **Note**: At present, the chip mainly realizes the low power consumption in broadcast state (unconnected), and the low power consumption in connected state is still under development.

Chip power consumption measured data is as follows:

paradigm	test condition	numerical value	note
Low Power Mode	Broadcast interval 250MS Average current	420uA	The test conditions are as follows: 1. The test will last 3 minutes; 2. Broadcast packet bytes:22.
	Broadcast interval 500MS Average current	220uA	
	Broadcast interval 750MS Average current	170uA	
	Broadcast interval 1000MS Average current	120uA	
	Broadcast interval 2000MS Average current	80uA	
	Broadcast interval 4000MS Average current	34uA	
	Holding Connection Average Current	5.1mA	

Note: The broadcast interval setting size not only affects the power consumption size, but also directly affects the connection speed with APP, please set the corresponding value reasonably.

3.4 Large Data Volume Testing of BLE

awaiting perfection

3.5 Customizing the setup of BLE broadcast packages - advertisData

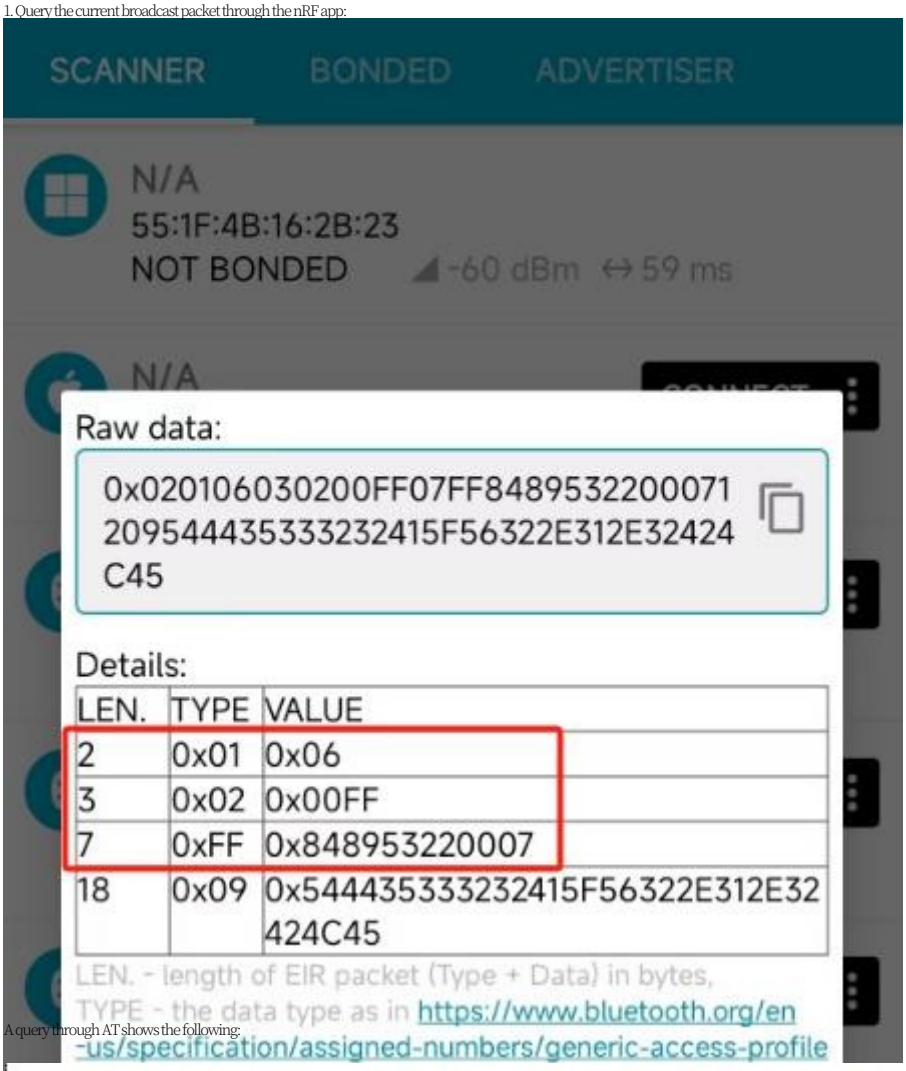
This chip supports querying or customizing the setting of broadcast packet data by AT instruction.

AT+ADVDATA //Query the current broadcast packet data

AT+ADVDATA=XXX //Set broadcast packet data

Examples are given below:

1. Query the current broadcast packet through the nRF app:



A query through AT shows the following:

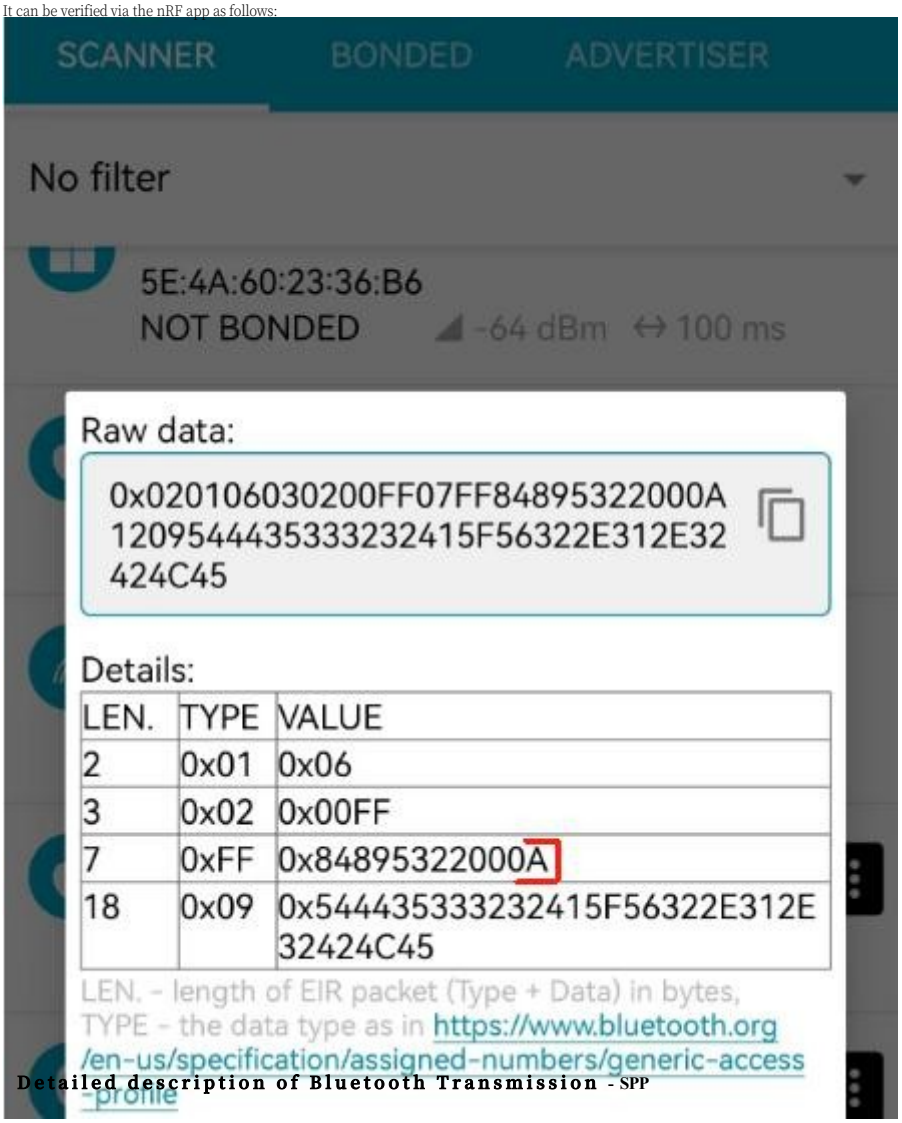
Comparing the data, we can find that the data string in Figure 2 is the sequential group of LEN1+TYPE1+VALUE1+ LEN2+TYPE2+VALUE2+ LEN3+TYPE3+VALUE3 from Figure 1.

Success.

Execute a modification instruction such as AT+ADVDATA=020106030200ff07ff84895322000A

The new data will take effect immediately.

It can be verified via the nRF app as follows:



4. Detailed description of Bluetooth Transmission - SPP

1, Spp is still the classic bluetooth 2.1 protocol, no longer recommended to use, new products are recommended to use BLE directly;

2, the current low-power version does not support the SPP function, you need to buy the BLE&SPP version in order to use it;

3, Android phone test using "Bluetooth serial port" this app can be used, in the cell phone "Application treasure" download;

4, SPP digital transmission and BLE are mutually exclusive, if you only use SPP digital transmission, then please turn off BLE.

4.1 SPP Power Consumption Details

The average current in SPP mode is: 5.3mA when not connected and 6.2mA when kept connected.

5. Detailed description of the AT command and passthrough data

1. At present, our serial port commands support AT commands and Bluetooth data transmission;

2, AT instruction is present in the entire life cycle of the chip, as long as the chip initializes Bluetooth, then Bluetooth data transmission, will always run in the background, whether connected or unconnected state, support AT instruction.

6. Master-Slave Switching Instructions

1. initiate a connection

   AT+ROLE=1 //cut to host role AT+RESET

   //Reboot to take effect

   AT+SCAN 1= //scan the peripheral slave devices and return the device list, the device information contains MAC address (the default is to return up to 5 devices, if you need to scan more devices, use //AT+SCANM command to set)

   AT+CONN=XXX //XXX represents the MAC address of the slave device you want to connect, such as 8c25848f5ead Through the above command, the device side returns the following information in turn:

   Ok\r\n BLE_CONN\r\n
   EN_NOTIFY_SUCC\r\n

   It means that the connection is successful and the master and slave devices can communicate normally in both directions.

2. Test Master-Slave Passthrough

   The serial port sends data to the host, which will be passed to the slave through BLE and then printed through the slave's serial port; the serial port sends data to the slave, which will be passed to the host through BLE and then printed through the host's serial port.

3. Disconnect

   AT>9 //Switch to AT command channel, only for host side AT+DISC

   //Actively disconnect

   With the above commands, the device side returns the following information in turn: Ok\r\n

   BLE_DISC\r\n

   This means that the master and slave are disconnected.

4. (sth. or sb) else

   If you need to permanently connect a slave device, you can use the command: AT+SERVER on the host side, and after setting it up, the host will automatically pair and connect the specified slave when it starts up, as follows:

   AT+SERVER=XXX //XXX is the slave MAC address, such as 8c25848f5ead AT+RESET //Reboot to take effect, the chip will automatically perform the connection operation after reboot

7. Frequently Asked Questions

Q: What is Bluetooth Transmission and what are its features?

A: Bluetooth Data Transmission means that the upper computer MCU sends any data through the serial port, and the Bluetooth chip receives it and forwards it to the cell phone directly through Bluetooth, and at the same time, if the cell phone sends any data, the Bluetooth chip receives it and sends it to the MCU through the serial port, and we do not need any instructions or settings for Bluetooth Transmission in our program.

Q: How can I quickly test the functionality and performance of a chip?

A: It is recommended to purchase the matching TD601 Demo board (the chip on the Demo board uses the TD5322A), which is convenient for intuitively testing the relevant functions and performance.

Q: How can I quickly integrate this part of the functionality in my project?

A: It is recommended to use the Demo board to test the relevant functions and performance, to meet the project expectations, and then use the Demo module directly if the volume is not large, and then integrate the chip into your project according to the information provided, and then purchase the relevant chip from our company in bulk.

Q:Does this chip support WeChat small program?

A: WeChat small program, data interaction is BLE channel, that is, support BLE can support WeChat small program, our company can develop small program on your behalf, or you can develop your own.

Q: What is the maximum number of characters I can set for the name of my customized Bluetooth? A: A maximum of 28 can be set.

Q: Can I connect to any Bluetooth from other manufacturers in host mode?

A: Cannot connect. Because each family's Bluetooth UUID and other configurations are not the same, can not be normal pairing communication. If you have this demand, you can find our company customized development.

Q: Can I customize the development?

A: Yes, you can set up a business project in our company, please contact our online customer service.