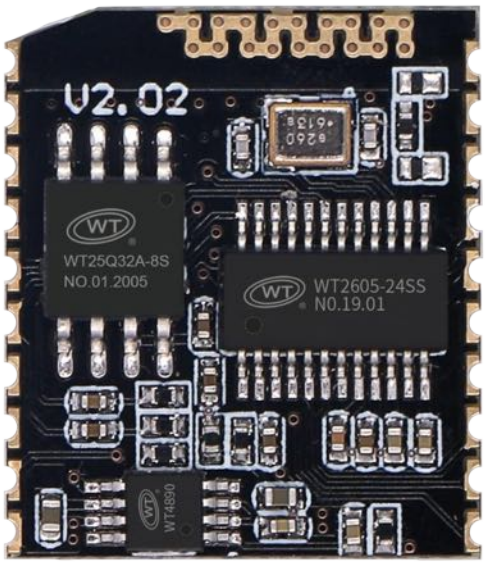
WT2605B03
Bluetooth Module
Specification

Version: V1.03



Note :

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CONTENT

1. Overview

WT2605B03-B audio Bluetooth module is an intelligent wireless audio data transmission and MP3 audio playback product independently developed by Shenzhen Waytronic Electronics. It is a low-cost and high-efficiency recording scheme with the characteristics of high integration, small size, low power consumption and stable transmission. Only a few components can be added to the periphery of the module to realize wireless reception of high-quality audio. Self-drive-free mode, no complicated bottom operation, convenient use, stability and reliability are the biggest features of this product. In addition, the chip is also a deeply customized product, a low-cost solution specially developed for the field of recording and playing.

WT2605B03-B has three main features: MP3 function, dual-mode Bluetooth function and UART serial port control. With built-in Flash.

2. Application

The chip is mainly used for short-distance music transmission, and can be easily connected with Bluetooth devices of notebook computers, mobile phones, pads and other digital products to realize wireless music transmission.

- Bluetooth audio
- Bluetooth stereo headphones
- Car navigation voice broadcast;
- Electronic musical instrument products;

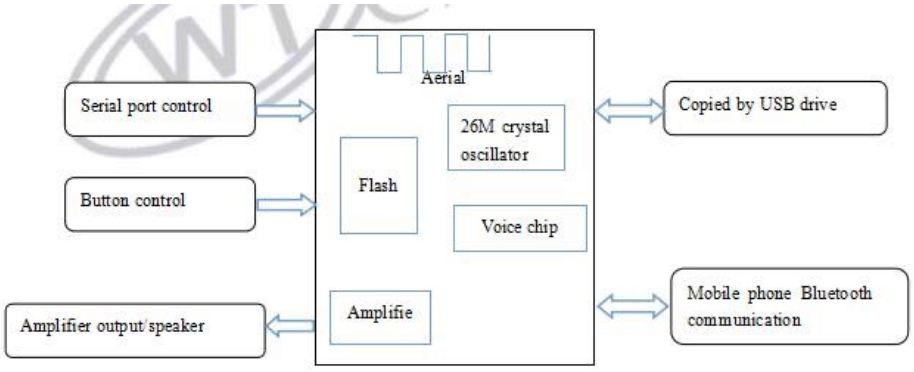
- Automatic broadcasting equipment, which broadcasts regularly;
- Electronic dictionary and jukebox;
- Fire voice alarm prompt;
- Voice notice for safe driving of electric sightseeing bus.

3. Characteristics

- Audio codec supports 16-bit stereo DAC and two-channel 16-bit ADC.
- High performance stereo, ADC with 90dB signal-to-noise ratio.
- Three sets of multifunctional 32-bit timers, supporting capture and PWM modes.
- The USB interface can automatically switch between the host (USB HID) and the slave (USB card reader) and the USB sound card.
- SPI-FLASH is stored as a fixed sound source area, and the contents can be changed with U disk.
- The 32M Flash is standard, and the maximum Flash is 128M. It supports FAT file system and MP3 format voice.
- Support USB flash drive offline upgrade program.
- Dual-mode Bluetooth function conforms to Bluetooth 5.0 and BLE specifications, with audio Bluetooth distance up to 20 meters and transparent Bluetooth effective distance of 7 meters.
- Support customized special functions: key control mode, touch control mode, etc.

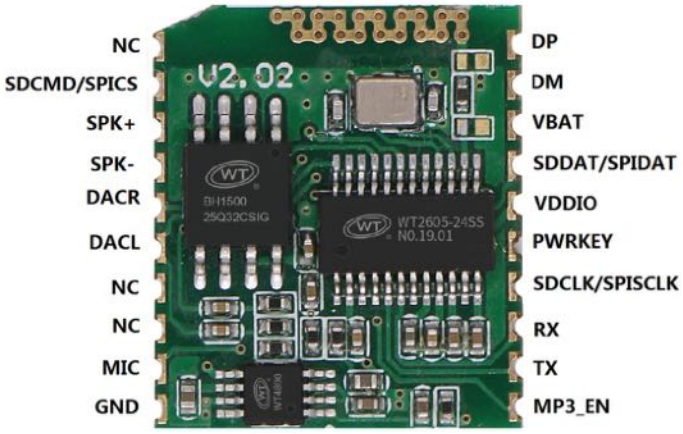
4. Introduction of Functional Block Diagram

Internal structure of the module: audio chip, Flash, 26M crystal oscillator, antenna and 1W power amplifier (when not in use, it can be directly connected to the external output through resistors).



5. Description of PIN

Description of WT2605B03-B's pin



- Pin numbers are arranged in the order shown above.

Pin	Name	Type	Description
1	NC		Empty foot
2	SPICS	I/O	Chip select terminal of SPI-FLASH internal memory
3	SPK+	O	Horn terminal 1W 8R
4	SPK-	O	Horn terminal 1W 8R
5	DAC_R	O	DAC right channel output
6	DAC_L	O	DAC left channel output
7	NC		Empty foot
8	NC		Empty foot
9	MIC	I	Microphone terminal
10	GND	POW	Power ground
11	MP3_EN		Empty foot
12	TXD	I/O	UART serial port data output terminal
13	RXD	I/O	UART asynchronous serial port data input terminal
14	SPISCLK	I/O	FLASH clock pin
15	PWRKEY	I	Key foot
16	VDDIO	POW	Internal 3.3V digital power output
17	SPIDA	I	FLASH data pin
18	VBAT	POW	Module power supply terminal (3.6V~5.0V)
19	DM	I/O	USB data terminal DM
20	DP	I/O	USB data terminal DP

6. Introduction of the Detailed Functions

6.1. Introduction of BLE Function

Usage of BLE:

WT2605B03-B module can make MCU interact with APP through BLE Bluetooth.

1. Connect the module with the MCU through Uart serial port, and then connect the BLE Bluetooth on the module with the mobile phone.

2. After connecting with BLE Bluetooth, the data can be sent by the APP to the MCU through BLE Bluetooth.

3. When the MCU sends data to the APP through BLE Bluetooth, first pull the PWRKEY (module 15 pin) pin down twice (that is, double click) quickly to enter BLE Bluetooth mode.

4. After the module enters BLE Bluetooth mode, the data of MCU can be sent to APP through BLE Bluetooth.

5. When the PWRKEY (pin 15 of the module) pin is pulled down again (i.e. stand-alone machine), the BL Bluetooth mode will be exited and the audio Bluetooth mode will be entered.

The transmission rate of BLE Bluetooth is about 100B/S, so this function is generally used for sending and receiving small data.

Main application fields of BLE Bluetooth:

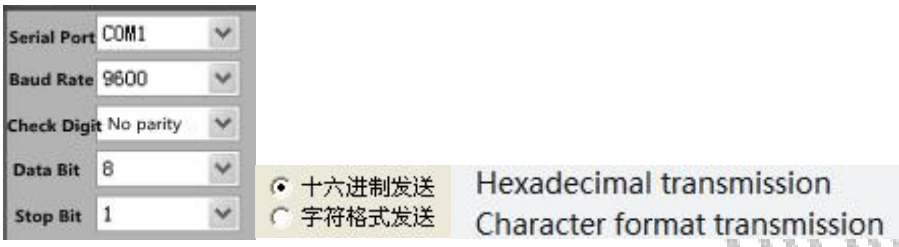
The positioning of mobile devices, automotive electronic devices, health medical supplies (heartbeat belt, sphygmomanometer, etc.) should be used (indoor positioning, underground positioning, etc.), short-distance data acquisition (wireless meter reading, wireless telemetry, etc.), data transmission (smart home indoor control, Bluetooth dimming, printer, etc.)

BLE 操作视频观看请点击此处！←Click here to watch the operation video!

6.2. Serial Port Control Part

6.2.1. Protocol Command Format

WT2605B03-B has built-in standard UART asynchronous serial interface, which belongs to 3.3V TTL level interface. It can be converted to RS232 level by MAX3232 chip. The format of communication data is: start bit: 1 bit; Data bits: 8 bits; Parity bit: none; Stop bit: 1 bit. Send instructions are in hexadecimal format. To use the computer serial port debugging assistant, you need to set the serial port parameters correctly, as shown in the figure:



Start Code	Length	Command Code	Parameters	Accumulation and verification	Ending Code
0X7E	As follows	As follows	As follows	As follows	0XEF

Note: "Length" refers to the length+command code+parameter+checksum, and "accumulation and checksum" refers to the lower eight bits of the accumulated sum of length+command code+parameter.

control command	
CMD (hexadecimal format)	Corresponding function
AA	Pause playback command
AB	Stop command
AC	Next song command
AD	Last song command
AE	Volume control command
AF	Specify the playback mode.
Play instruction	
CMD (hexadecimal format)	Corresponding function

A0	FLASH index play

Delete instruction	
CMD (hexadecimal format)	Corresponding function
E6	Delete all

Inquiry instruction	
CMD (hexadecimal format)	Corresponding function
C0	Query version number
C1	Query the currently set volume.
C2	Query the current working status
C9	Query the currently playing file track
CA	Query the current peripheral connection status.
CC	Query the total number of FLASH tracks
D0	Query the current working disk letter.
E1	Inquire about electricity quantity

Functional instruction	
CMD (hexadecimal format)	Corresponding function
E7	U disk copy

Bluetooth command	
CMD (hexadecimal format)	Corresponding function
BC	answer a call
BD	hang up
BF	Disconnect Bluetooth link
D1	Modify Bluetooth name
D2	Query the current Bluetooth name
D3	Query Bluetooth Mac address

D6	Set whether to automatically answer the incoming call.
D7	Set the answering channel during the call
DB	Redial last call instruction

Table 2 Communication control instructions

Write operation instruction

operation code
XX

Note: After each command is executed, the operation code of the corresponding byte of the command is returned.

Return code→:00 means that the command is executed normally;

→:01 means that the command format is wrong and will not be executed;

→:02 or 05 indicates that the command is executed incorrectly or the device to be operated is not online.

6.3. Control Command

Pause playback command (AA)

Start Code	Length	Command	Check Code	Ending Code
7E	03	AA	AD	EF

If the instruction is sent when the audio is playing, pause the audio playing and send it again.

Data, the audio continues to play from where it was paused.

Stop Code(AB)

Start Code	Length	Command	Check Code	Ending Code
7E	03	AB	AE	EF

If the audio is playing, send this command to stop playing the currently playing music.

Command of playing next(AC)

Start Code	Length	Command	Check Code	Ending Code
7E	03	AC	AF	EF

This command can trigger the next piece of music to be played, and when the last piece of music is played, sending this command can trigger the first piece of music to be played.

Command of playing previous(AD)

Start Code	Length	Command	Check Code	Ending Code
7E	03	AD	B0	EF

Volume control command (AE)

There are 31 levels of volume, ranging from 00 to 30, of which 00 is silent and 30 is the maximum volume.

Start Code	Length	Command	Voice Volume Level	Check Code	Ending Code
7E	04	AE	1E	XX	EF

In the example, in order to send the maximum volume of 30 levels, this instruction can modify the volume in real time.

Specify the playback mode (AF)

Start Code	Length	Command	Parameters	Check Code	Ending Code
7E	04	AF	00: No-loop single playback mode	B3	EF
			01: Single loop playback mode	B4	
			02: All tracks loop playback mode (default)	B5	
			03: Folder rotation mode	B6	
			04: Random mode	B7	

Note: This instruction modifies the playback mode without power failure, and will not restore the default mode after power failure.

6.4. Play Instruction

Index FLASH (A0)

This command can specify the files in Flash to play, which is affected by the order in which the files are stored. The files are sorted in index order.

Start Code	Length	Command	Track high position	Low track	Check Code	End Code
7E	05	A0	00	01	XX	EF

Among them, "7E05A0001A6EF" means that the voice with index number 01 is played in Flash. Check code = length+command+high track position+low track position. Note: When specified to play, if the specified track does not exist, it will not affect the current play.

Note: the index number of playback needs to start from 01.

6.5. Delete Instruction

Delete all(E6)

Start Code	Length	Command	Check Code	End Code
7E	03	E6	E9	EF

Note: Delete all voices of the current letter.

6.6. Inquiry Instruction

Query version number (C0)

Start Code	Length	Command	Check Code	End Code
7E	03	C0	C3	EF

Return Format

Operation Code	Return Value (hexadecimal)
0XC0	XX XX XX XX

Query the currently set volume (C1)

Start Code	Length	Command	Check Code	End Code
7E	03	C1	C4	EF

Return Format

Operation Code	Return Value (hexadecimal)
0XC1	Volume value (00-1E)

Query the current working status (C2)

Start Code	Length	Command	Check Code	End Code
7E	03	C2	C5	EF

Return Format

Operation Code	Return Value
0XC2	01: MP3 play; 02: MP3 stops; 03: MP3 pause; 04: Bluetooth play; 05: answering status; 06: ringing state; 07: Bluetooth connection (no playback, no answer); 08: Bluetooth disconnected (completed); 09: Bluetooth is not connected; 0A: Bluetooth is in the state of disconnecting (not yet finished); 0B: Bluetooth music is paused;

Query the currently playing file track (C9)

Start Code	Length	Command	Check Code	End Code
7E	03	C9	CC	EF

Return Format

Operation Code	The file number is eight digits high.	The file number is lower eight digits.
0XC9	XX	XX

Query the current peripheral connection status (CA)

Start Code	Length	Command	Check Code	End Code
7E	03	CA	CD	EF

Return format

Operation Code	Return Value (hexadecimal)
0XCA	XX

0-exists, 1-does not exist.

Example: 0X01: No PC connection (BIT3=0), no U disk (BIT2=0), no TF card (BIT1=0), and SPI-flash (bit 0 = 1);

0X03: No PC connection (BIT3=0), no U disk (BIT2=0), TF card (BIT1=1) and SPI-flash (Bit0 = 1);

0X05: No PC connection (BIT3=0), U disk (BIT2=1), no TF card (BIT1=0), SPI-flash (Bit0 = 1);

0X07: No PC connection (BIT3=0), U disk (BIT2=1), TF card (BIT1=1) and SPI-FLASH(BIT0=1).

Query the total number of FLASH tracks (CC)

Start Code	Length	Command	Check Code	End Code
7E	03	CC	CF	EF

Return Format

Operation Code	Return Value (hexadecimal)
0XCC	XX (8 bytes)

Query Current Work (D0)

Start Code	Length	Command	Check Code	End Code
7E	03	D0	D3	EF

Return Format

Operation Code	Return Value (hexadecimal)
0XD0	0、SPI-flash 3、Bluetooth 4、PC

Inquire about electricity quantity (E1)

Start Code	Length	Command	Check Code	End Code
7E	03	E1	E4	EF

Return Format

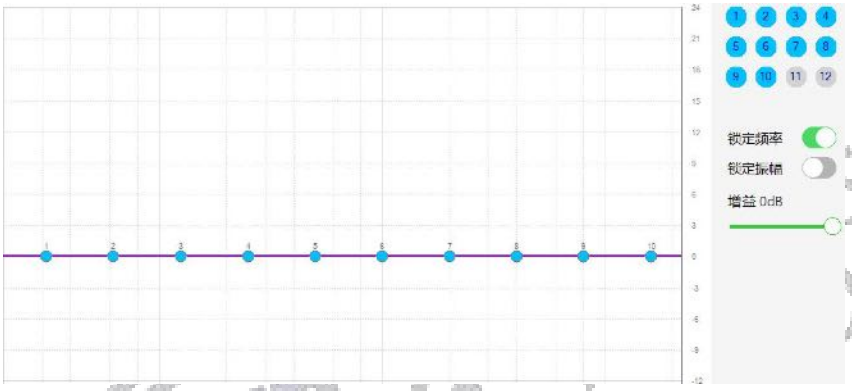
Operation Code	Return Value (hexadecimal)
0XE1	XX (6 bytes)

Specify EQ mode (B2)

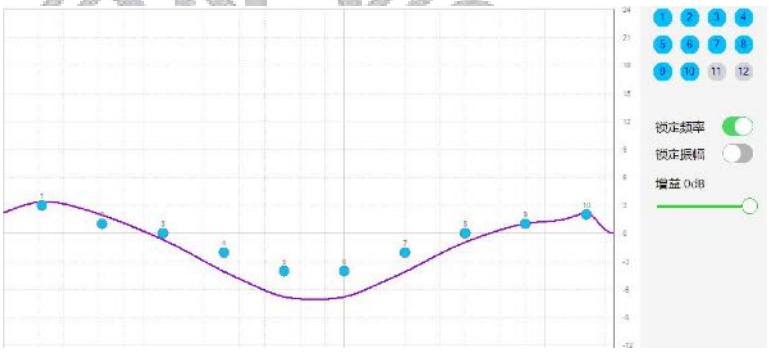
Start Code	Length	Command	Parameters	Check Code	End Code
7E	04	B2	00：Normal (default)	B6	EF
			01：Pop	B7	
			02：Rock	B8	
			03：Jazz	B9	
			04：Classic	BA	
			05：Base	BB	

This command can adjust the audio playing effect, and there are five playing effects in total.

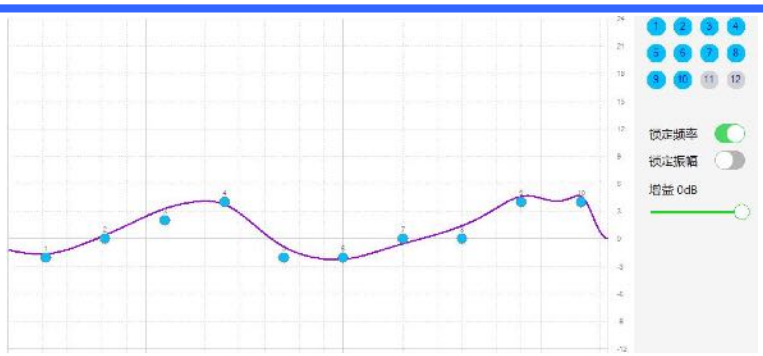
Normal (default):



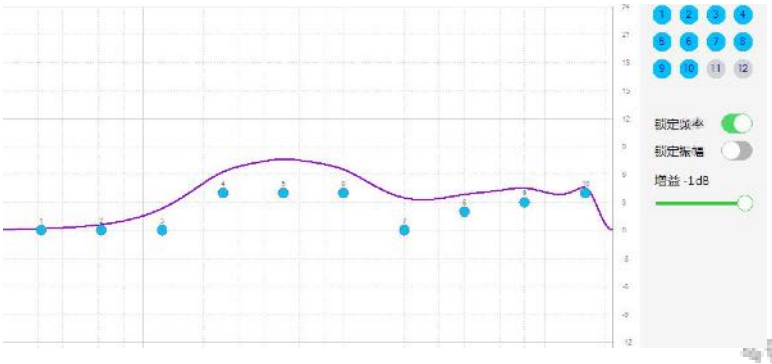
Pop:



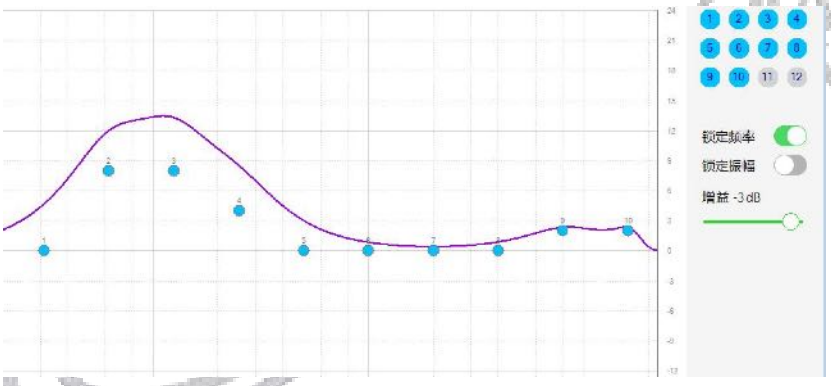
Rock:



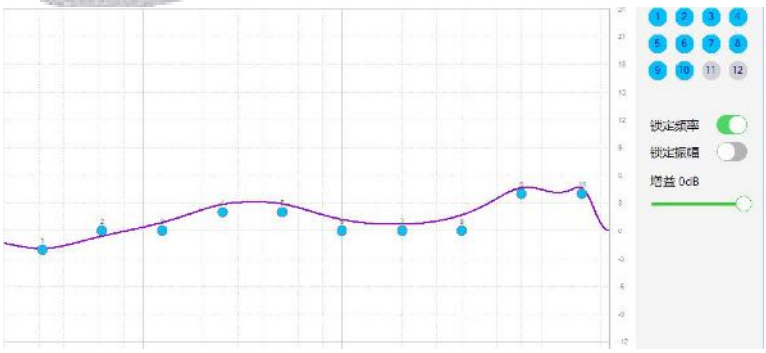
Jazz:



Classic:



Base:



U disk Copy (E7)

Start Code	Length	Command	Check Code	End Code
7E	03	E7	EA	EF

Note: The time required to copy the U disk is related to the size of the voice file. The larger the file, the longer it takes.

6.8. Bluetooth command

Answer the Telephone Instruction（BC）

Start Code	Length	Command	Check Code	End Code
7E	03	BC	BF	EF

Enter this command when calling to connect the phone. Note: It must be valid in Bluetooth mode.

Hang-up Instruction (BD)

Start Code	Length	Command	Check Code	End Code
7E	03	BD	C0	EF

Enter this command when the phone is connected to hang up the phone. Note: It must be valid in Bluetooth mode.

Disconnect Bluetooth link (BF)

Start Code	Length	Command	Check Code	End Code
7E	03	BF	C2	EF

After Bluetooth is disconnected, if the Bluetooth device wants to connect the module again, it needs to be manually connected.

Modify Bluetooth name (D1) (maximum 20 bytes)

Start Code	Length	Command	Parameter1	Parameter2	Check Code	End Code
7E	XX	D1	XX	XX (0~20Byte)	XX	EF

Note: Bluetooth name is written in ASCLL code, which can support up to 20 bytes (length, parameters and check code should be calculated according to Bluetooth name), for example: 7e0dd101 57 54 32 36 35 5f4c53 55ef.

Length: 0D, command: D1, parameter 1: 00 as audio Bluetooth; 01 is BLE Bluetooth, parameter 2: 57 54 32 36 30 35 5F 4C53 (namely Bluetooth name), check code: 55, after setting, the Bluetooth name can be changed to WT2605_LS; ; When modifying, if the song is playing, it will stop playing. After modifying, you must switch to Bluetooth mode or power on again before updating the Bluetooth name.

Query the current Bluetooth name (D2)

Start Code	Length	Command	Parameters	Check Code	End Code
7E	04	D2	XX	XX	EF

Parameter: 00 means→Audio Bluetooth

01 means→BLE Bluetooth

Return Format

Operation Code	Return Value (hexadecimal)
0XD2	XX(4~32 bytes)

Query the current Bluetooth MAC address (D3)

Start Code	Length	Command	Command Code	Bundle Code
7E	03	D3	D6	EF

Return Format

Operation Code	Return Value (hexadecimal)
0XD3	XX (6 byte)

Set up automatic answering when calling (D6)

Start Code	Length	Command	Parameters	Check Code	End Code
7E	04	D6	XX	XX	EF

Parameters: 01 means→Don't answer the call automatically.

02 means→Automatically answer incoming calls.

Set the receiving channel during the call (D7)

Start Code	Length	Command	Parameters	Check Code
7E	03	D7	DA	EF

Note: When the module is in the call state, send this command to switch the call channel between the mobile phone and Bluetooth.

Redial last call instruction (DB)

Start Code	Length	Command	Parameters	Check Code
7E	03	DB	DE	EF

Note: This command is used to replay the last call.

6.9. Operating video

Video Link:

1、BLE 蓝牙使用方法 How to use BLE Bluetooth

2、常用播放指令 Commonly used play instructions

7. Relevant Parameters

7.1. Audio Playing Parameters

Audio Format	Sampling rate	Bit Rate	sound channel	Position speed	Flash
MP3	≤48K	≤320Kbps	1/2	16	√

Table 3 Audio Parameters

7.2. Bluetooth Radio Frequency Characteristics

transmitting terminal	Unit	Minimum	Typical Value	Maximum	Bluetooth Specification
Radio frequency output power	dBm	0	3	5	-6~5
frequency range	GHz	2.4	-	2.4835	2.4~2.5
Initial carrier frequency tolerance	KHz	-50	-20	50	-75~75
Carrier frequency drift	KHz/50us	-	2	20	<=20

Table 4 Characteristics of transmitter

receiving terminal	Unit	Minimum	Typical Value	Maximum	Bluetooth Specification
sensitivity	dBm	-80	-75	-70	<=-70
Maximum received signal	dBm	-20	-10	-	>=-20

Table 5 Receiver characteristics

7.3. Electrical Parameters

Power Consumption: Supply Voltage 3.6V

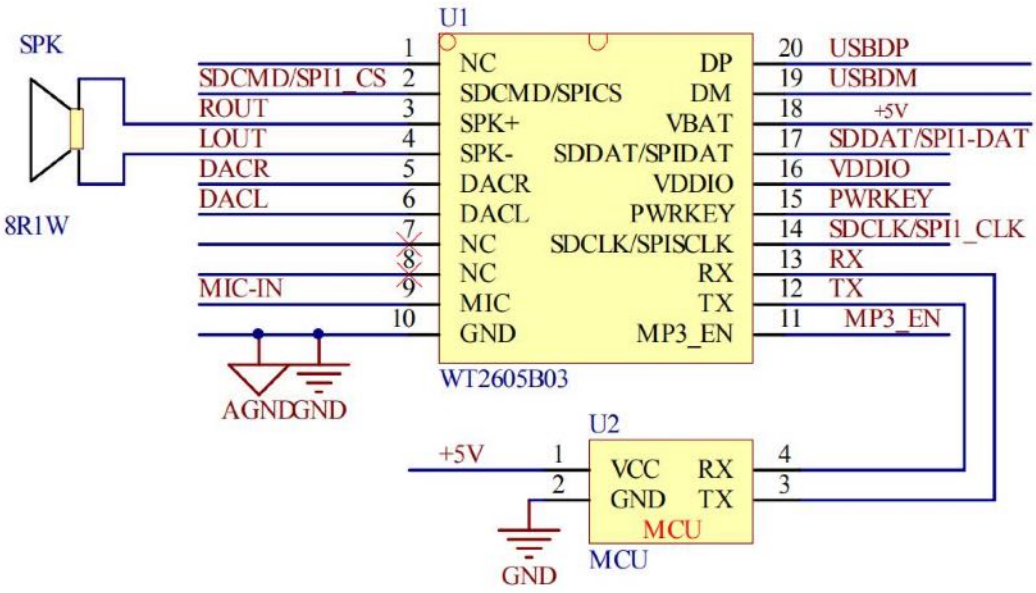
Functional Mode	Play missed speakers	Play missed speakers	Connected Bluetooth is not playing
Electrical Current (mA)	20	15	18

7.4. Temperature Range

Operating temperature: -40℃ ~ +85℃

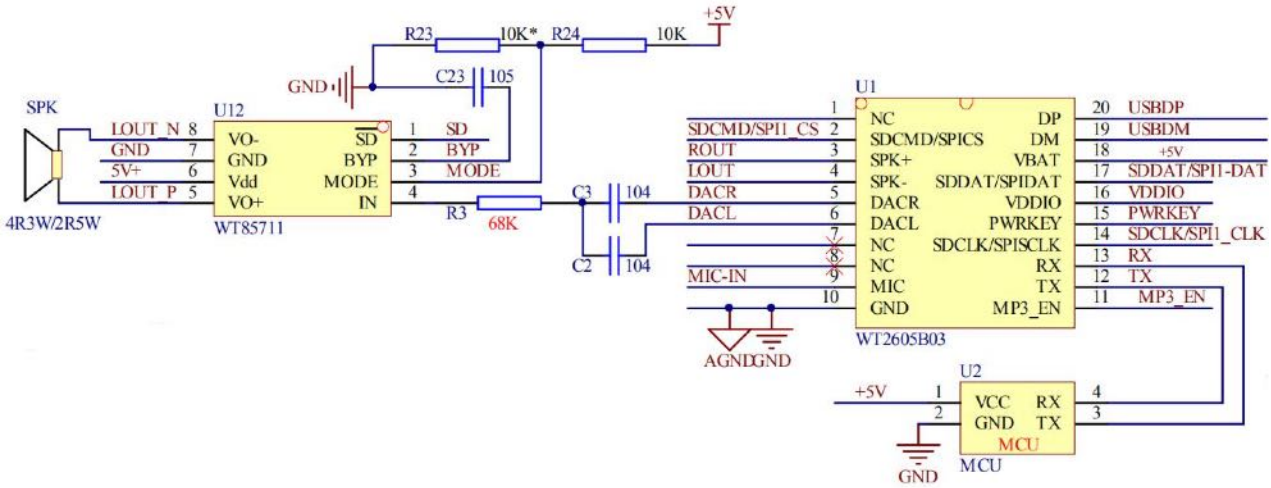
8. Application Circuit Diagram

8.1. Application Circuit for Directly Driving Horn



Note: The IO port of WT2605B03-B is 3.3V level, so it can be directly connected with the 3.3V MCU. Connecting with 5V single chip computer needs to add level conversion circuit.

8.2. External Power Amplifier Circuit



The SD pin of the power amplifier is turned on by pulling high and turned off by pulling low. It is recommended to use MCU to control it. When MCU has no extra IO port, it is recommended to connect 10K pull-up resistor.

If you need the PCB gallery of the module, you can communicate with the engineers.

9. Pay Special Attention to

- The position of Bluetooth chip should not be wired or copper laid as far as possible, especially near the antenna.
- Usually, the antenna of Bluetooth chip is placed as close to the edge of PCB as possible, and the PCB antenna is slotted.
- In order to make the performance of the antenna intact, the antenna transmission line should be straight as far as possible, and the antenna should be placed on the top or bottom floor, and no holes should be punched. The distance between the antenna and copper laying should be more than twice that of normal copper laying.
- The trace length of the antenna transmission line should be as short as possible, and the surface layer should be taken.

The length of the antenna is generally 30mm.

- AGND and GND outside the chip need to be interconnected at a single point at the power inlet.
- The working voltage range of the chip is 3.6V-5.0V If it is lower than (possibly noisy) or higher than the working voltage range, it is easy to cause the chip to work unsteadily.

10. Chip Size Drawing