QUICK START GUIDE

Shenzhen Waytronic Electronics Co.,Ltd.

WT2003B01

V1.00

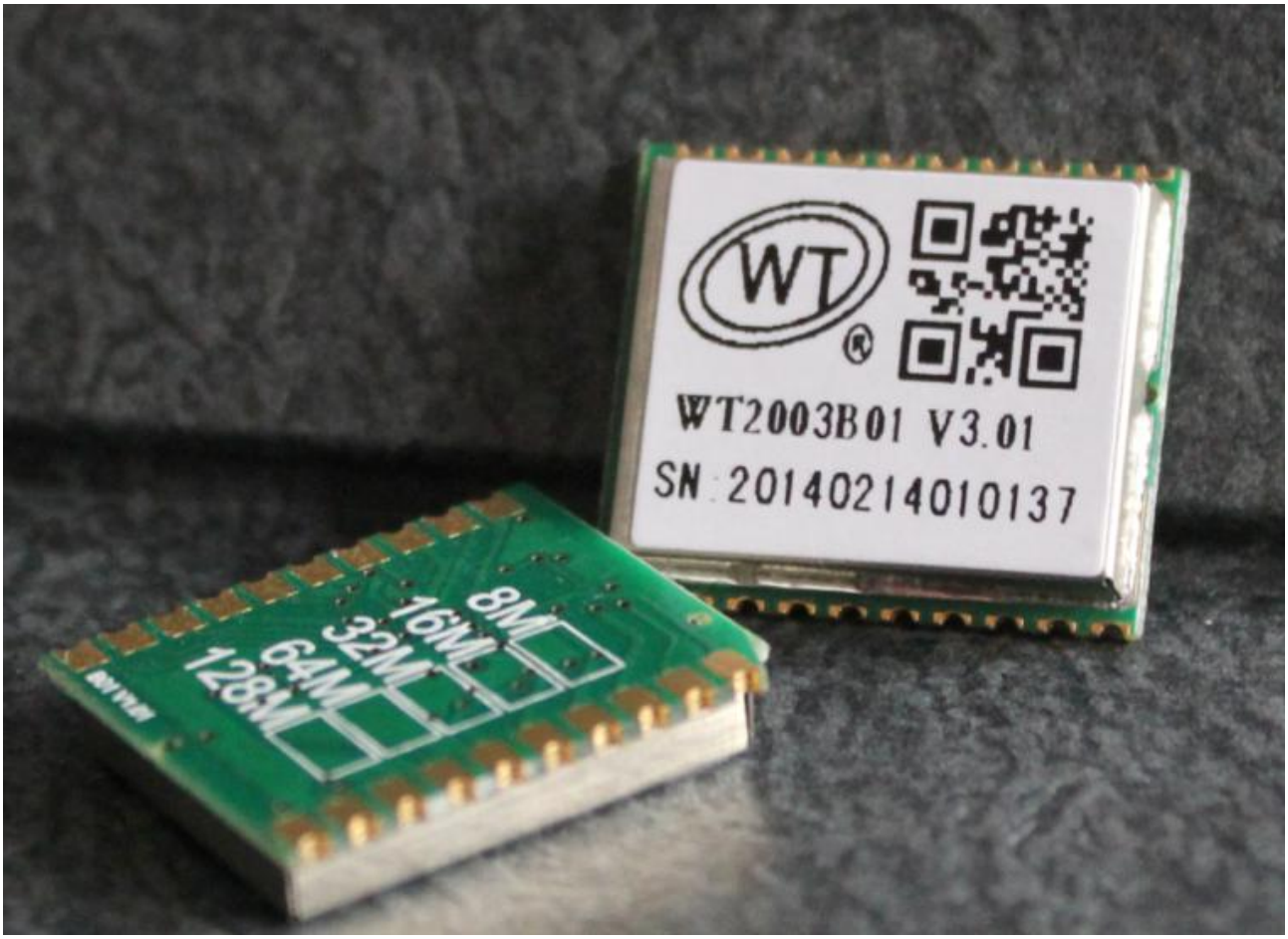
2016-01-07

Note:

WAYTRONIC ELECTRONIC CO.,LTD. reserves the right to change this document without prior notice. Information provided by WAYTRONIC is believed to be accurate and reliable. However, WAYTRONIC makes no warranty for any errors which may appear in this document. Contact WAYTRONIC to obtain the latest version of device specifications before placing your orders. No responsibility is assumed by WAYTRONIC for any infringement of patent or other rights of third parties which may result from its use. In addition, WAYTRONIC products are not authorized for use as critical components in life support devices/systems or aviation devices/systems, where a malfunction or failure of the product may reasonably be expected to result in significant injury to the user, without the express written approval of WAYTRONIC.

WT2003B01

WT2003B01 is a powerful MP3 module with high quality, support MP3 and WAV audio decoding. Support standard asynchronous serial communication baud rate 9600, control mode is flexible. Support SPI-Flash storage. With the functions of file index play, file name play in specified root directory, inter-cut, single cycle, loop playback; built in 1W power amplifier; 32-level volume adjustment and stereo I/O port output. Maximum support 128M Flash.

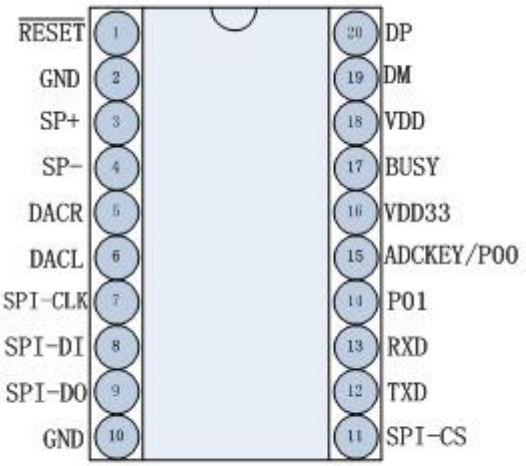


Content

1. Features

- Standard UART communication interface, default baud rate is 9600.
- specifying address play, specifying root directory file name, specifying inter-cut address to play, volume level, previous and next, stop playing, loop mode are achievable;
- By default, not play when power on; have BUSY status indicator; high level when playing at BUSY status.
- Connect with computer through USB interface, download the audio from computer into FLASH simulated removable drive (simulation U disk) (XP system, WIN7 system, WIN8system);
- Support sampling rate 8~48KHz, bit rate 8~320Kbps MP3 audio file.
- Support sampling rate 8~44.1KHz WAV audio file.
- SPI maximum support 128Mbit, minimum support 8Mbit.
- Built in 1W amplifier, DAC double channel output, and 32-level volume adjustable.

2. Pin description



WT2003B01

Pin No.	Name	Type	Function description
1	RESET	I	Reset pin（release SPI-FLASH after pull low）
2	GND	PWP	Power ground
3	SP+	AO	Speaker terminal
4	SP-	AO	Speaker terminal
5	DACR	I	DAC right channel output
6	DACL	I	DAC left channel output
7	SPI-CLK	I	Internal storage clock signal input
8	SPI-DI	I	Internal storage data signal input
9	SPI-DO	O	Internal storage data signal output

10	GND	PWP	Power ground
11	SPI-CS	I	Internal storage chip select terminal
12	TXD	I/O	TXD interface of UART
13	RXD	I/O	RXD interface of UART
14	P01	I	Next by pressing K2
15	ADCKEY/P00	I/O	ADC key input terminal/ key K1【play/pause】
16	VDD33	PWP	LDO 3.3V power output
17	BUSY	I/O	Busy signal(indicate playing status）
18	VDD	PWP	Module power supply（3.0~5.5V）
19	DM	I/O	USB data terminal DM
20	DP	I/O	USB data terminal DP

3. Technical specification

Name	Function
Audio format	Support sampling rate 8~48KHz,bit rate 8~128Kbps MP3 audio file
Storage capacity	Support 8Mbit~128Mbit SPI-FLASH Support file system:FAT16,FAT32(Not support NTFS)
Supply voltage	DC3.0~5.5V
Rated current	20~250mA（related to load）
IO port electrical level	3.3V TTL electrical level
Working temperature	-40~85 degree
Humidity	5%~95%

4. Electrical parameters

Name	Mark	Condition	Minimum value	Typical value	Maximum value	Unit
VDD	LDO input voltage	-	3.0	5.0	5.5	V
VDD33	LDO 3.3V output current	Vout3.3>3.1V	-	-	150	mA
Quiescent current	Current under no load	Non-loaded	-	30	-	mA
Working current	Current in playing state	8R/1W speaker, 32-level volume	-	390	-	mA
SNR	Signal-to-noise ratio	-	-	92	-	dB
THD+N	Total harmonic distortion	No load	-	-70	-	dB
PWRAB	DAC output power	32ohm speaker	-	-	16	mW
VPP	DAC maximum output voltage amplitude	10Kohm load	-	-	2.8	V
VPPLINE	External audio input range		-	-	2.8	V

5. Function introduction

5.1. Key control

(For the specific connection method, please refer to the typical circuit connection.)

Key	Operation	Function and operation
K1	Short press	Play/ pause
K2	Short press	Select the next file
K3	Short press	Select the previous file
K4	Short press	Stop

Note: Please refer to key reference circuit.

5.2. UART control protocol

5.2.1. Protocol command format

WT2003B01 V3.XX is built in standard UART asynchronous serial interface, which belongs to 3.3V TTL level interface and can be converted to RS232 level through MAX3232 chip.

Communication data format: 1start bit, 8 data bits, no parity bit, 1stop bit. Using computer serial debugging assistant needs to correctly set the serial port parameters, as shown in Figure:

Start code	Length	Command code	parameters	Accumulation and checking	End code
0X7E	See below	See below	See below	See below	0XEF

Note: "Length" = length +command code + parameters + check-sum;

Accumulation and checking means the low byte of the cumulative sum of "length+command code+parameter".

Communication control command

CMD	Corresponding Function	Parameter
A0	Index play in specified SPI-FLASH (overall)	File index
A1	File name play in the specified SPI-FLASH root directory	File name
AA	Suspend command	no
AB	Stop command	no
AC	Next	no
AD	Previous	no
AE	Volume control command	Volume level
AF	Specified play mode	Circulation mode
B1	Cut-play command	Track information
B2	Specified EQ format	EQ format
BA	Specify whether to need to end the return code	BA XX

Communication query command

CMD	Corresponding Function	Parameter
C1	Check the current volume setting	C1 XX
C2	Check the current working condition	C2 XX
C3	Check the total number of music files in SPI	C3 XXXX
C9	Query the song number currently playing	C9 XXXX
CA	Check the current external connection status	CA XX
CB	Query the song name currently playing	CB XX (8bytes)

5.2.2. Write operation command

5.2.2.1. Return code format

Operation code
XX

Note: After executing each write command, return the corresponding one-byte operation code.

Return code: 00 means OK command execution;

01 means FAIL command error, no execution;

02 means EMP has no such file;

No SPI-FLASH or SPI-FLASH data appear abnormal, return to 05.

5.2.2.2. File index play in specified SPI（A0）

This command can make specified operation for SPI Flash files, influenced by the order of file store.Files sort is according to the index order.

Start code	Length	Command	High order of track	Low order of track	Check code	End code
7E	05	A0	00	01	XX	EF

Note: If specified song is not exist, it will not influence currently playing. Order of file index is according to the order of file copy into SPI.

5.2.2.3. Specified SPI root directory index play(A1)

This command can according file name to play audio in specified root catalogue of SPI.(File name no more than 8 characters)

Start code	Length	Command	File name (form high to low)				Check code	End code
7E	07	A1	54‘T’	30(‘0’)	30(‘0’)	32(‘2’)	XX	EF

54, 30, 30, 32 respectively stand for ASCII code of T002, only file name adopt ASCII code value, other data as hexadecimal values. The above command means playing “T002XXX.MP3”. And the first four digit need to corresponding.

5.2.2.4. Suspend command(AA)

Start code	Length	Command	Check code	End code
7E	03	AA	AD	EF

Under playing state, sending this command will pause, while under pause state, it will start playing music from the pause.

5.2.2.5. Stop command(AB)

Start code	Length	Command	Check code	End code
7E	03	AB	AE	EF

Sending this command will stop playing the current music.

5.2.2.6. Next(AC)

Start code	Length	Command	Check code	End code
7E	03	AC	AF	EF

This command can trigger to play the next music. When playing the last music, sending this command will trigger to play the first music.

5.2.2.7. Previous(AD)

Start code	Length	Command	Check code	End code
7E	03	AD	B0	EF

This command can trigger to play the previous music. When playing the first music, sending this command will trigger to play the last music.

5.2.2.8. Volume control(AE)

There are 32 volume levels in total, from 00 to 31. 00 is mute; 31 is full volume.

Start code	Length	Command	Volume level	Check code	End code
7E	04	AE	1F	XX	EF

Example shows that sending maximum volume 31 level, it is available to adjust volume in real time.

5.2.2.9. Specified play mode(AF)

Start code	Length	Command	Parameter	Check code	End code
7E	04	AF	00: Single play, no loop Playback(default)	B3	EF
			01: Single loop play mode	B4	
			02: All tracks loop play mode	B5	
			03: Random playing mode	B6	

Note: this command modifies the playing mode in the condition of no power down. After power down it will restore the default mode. When using this command, just setting MCU once in the module initialization can realize to execute according to the settings with power on each time.

5.2.2.10 Inter-cut command (B1)

Start code	Length	Command	Mark word	High order of track	Low order of track	Check code	End code
7E	06	B1	00	00	01	XX	EF

Note: When this command is received, the current playing audio will pause and the specified audio will be played. After finishing playing, it will continue to play the pause audio (error within 1s is OK)

If the inter-cut play is not finished at the first time, the command will be invalid even sending the second command. It is not available to continue the next inter-cut play until finishing the first inter-cut play, supporting inter-cut play between the same devices or different devices.

Remark:

00 stands for inter-cut specified index address in SPI-FLASH

5.2.2.11 Specified EQ mode（B2）

Start code	Length	Command	Parameter	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	

5.2.2.12 Specify whether to need to end the return code（BA）

Start code	Length	Command	Parameter	Check code	End code
7E	04	BA	00: no need to return information (default)	BE	EF
			01: need to return information	BF	

This command will decide whether need to return the end information after finishing every audio playing，means address of currently song. Return format: BA XX XX (return the index address, 2-byte data. If the song is in the folder, the song will be returned to the index address in the folder).

5.2.2.13 Read the current volume setting（C1）

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

Return format

Operation code	**Return value**
0XC1	Volume value (00-1F)

5.2.2.14 Read the current working condition（C2）

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

Return format

Operation code	Return value
0XC2	01: play; 02: stop; 03: pause

5.2.2.15 Check the total number of music files in SPI Flash(C3)

Start code	Length	Command	Check code	End code
7E	03	C3	C6	EF

Return format

Operation code	Return value(2BYTE)
0XC5	The total number of files

5.2.2.16 Query the file track currently playing(C9)

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

Return format

Operation code	High byte of file number	Low byte of file number
0XC9	XX	XX

5.2.2.17 Check the current external connection status(CA)

Start code	Length	Command	Check code	End code
7E	**03**	**CA**	**CD**	**EF**

Return format

Operation code	Return value
0XCA	**XX**

When insert or remove SD card or U disk, WT2003S will automatically return information to make prompt. Low 4BIT of return value stands for the status of PC connection (BIT3), U disk (BIT2), SD card (BIT1) and SPI-FLASH (BIT0).

0 stands for existence; 1 stands for inexistence.

For example:

0X01: without PC connection (BIT3=0), without U disk (BIT2=0), without SD card (BIT1=0), with SPI-FLASH (BIT0=1);

0X07: without PC connection (BIT3=0), with U disk (BIT2=1), with SD card (BIT1=1), with SPI-FLASH (BIT0=1).

5.2.2.18 Query the song name of the current play (CB)

Start code	Length	Command	Check code	End code
7E	03	CB	CE	EF

Return format

Operation code	Return value
0XCB	XX(8bytes)

The return data is in the form of ASCII code. If the song name is less than 8 bytes, these without 8 bytes will be supplemented with 20H to return.

5.2.3. Automatically return code

5.2.3.1. External storage connection status

Operation code	Return value
0XCA	XX

When insert or remove SD card or U disk, WT20033B01 V3.XX will automatically return information to make prompt. Low 4BIT of return value stands for the status of PC connection (BIT3), U disk (BIT2), SD card (BIT1) and SPI-FLASH (BIT0).

0 stands for existence; 1 stands for inexistence.

For example:

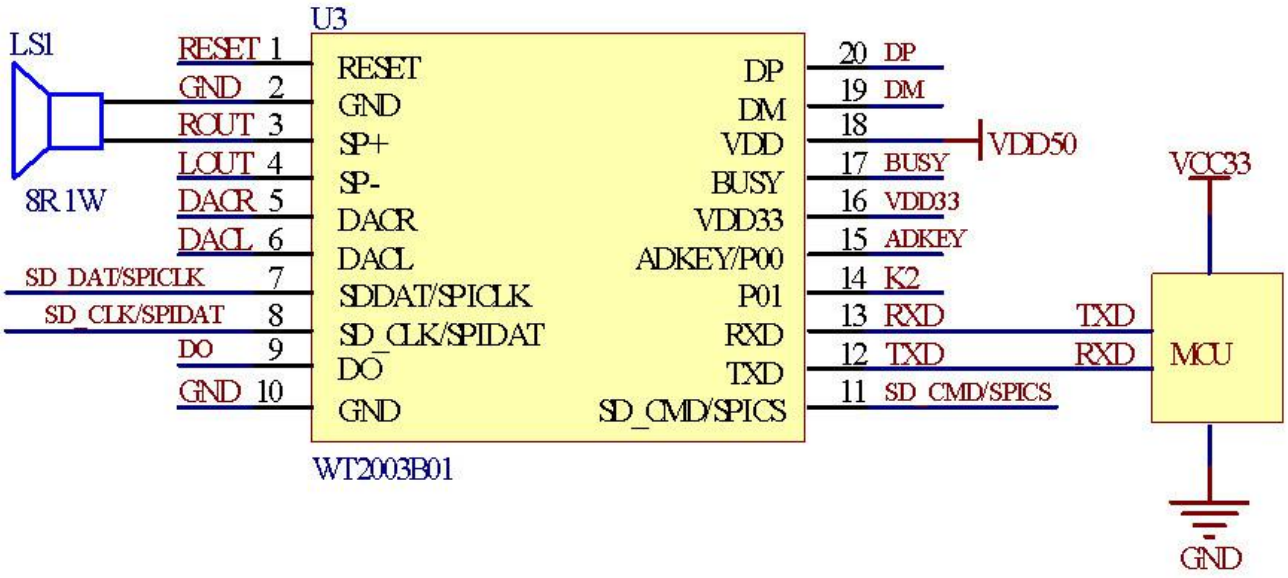
0X01: without PC connection (BIT3=0), without U disk (BIT2=0), without SD card (BIT1=0), with SPI-FLASH (BIT0=1);

0X05: without PC connection (BIT3=0), with U disk (BIT2=1), with SD card (BIT1=1), with SPI-FLASH (BIT0=1)

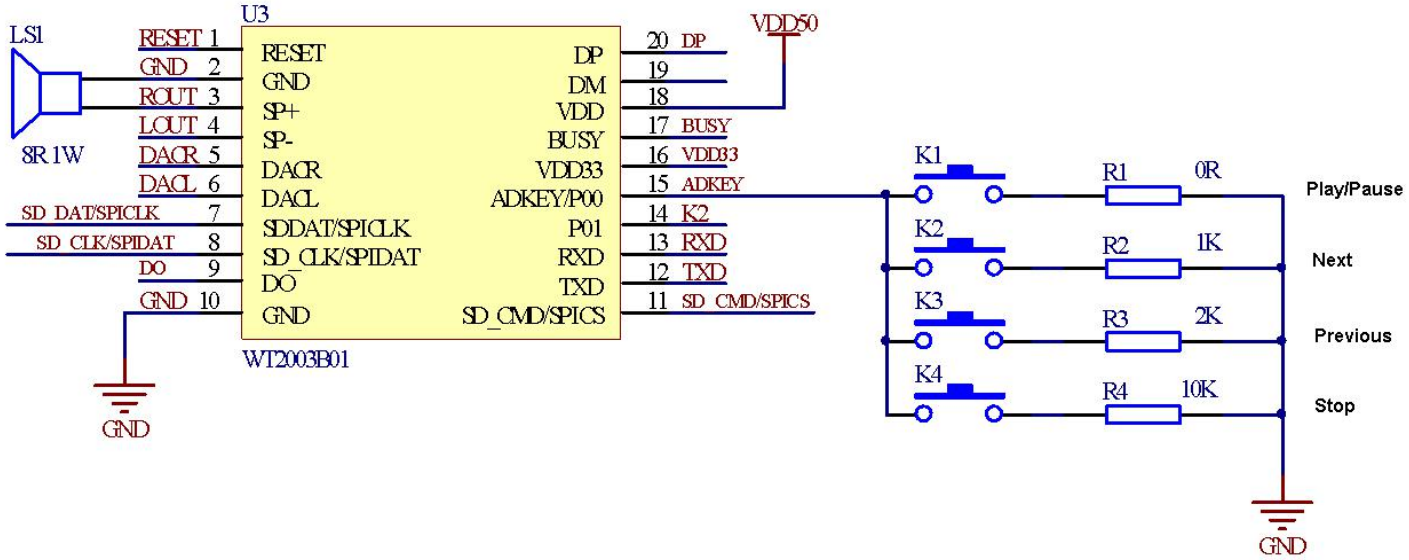
This version not support SD card, so the second bit is 0 all the time.

6. Reference circuit

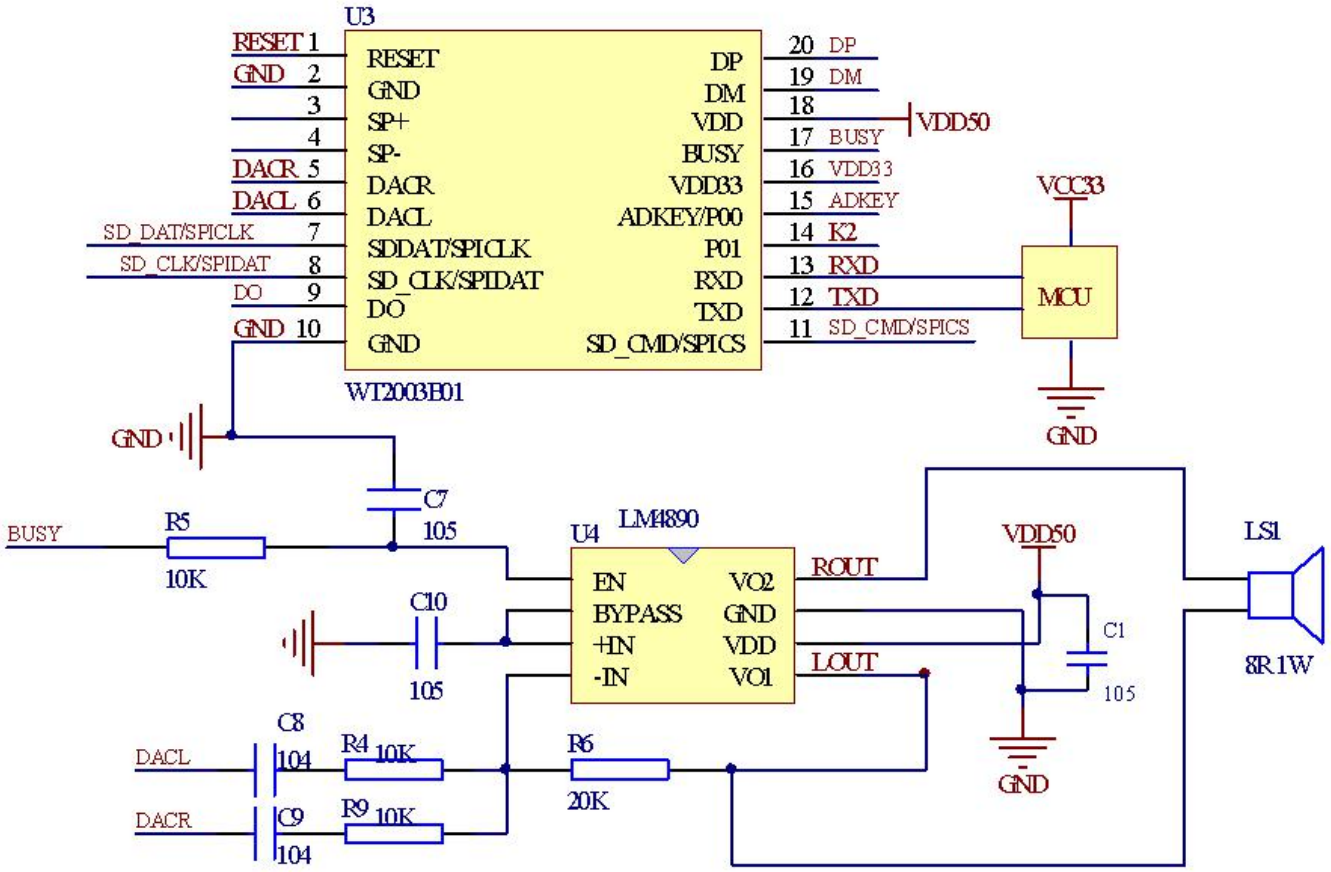
6.1 WT2003B01 V3.XX minimum control circuit



6.2 Key control circuit

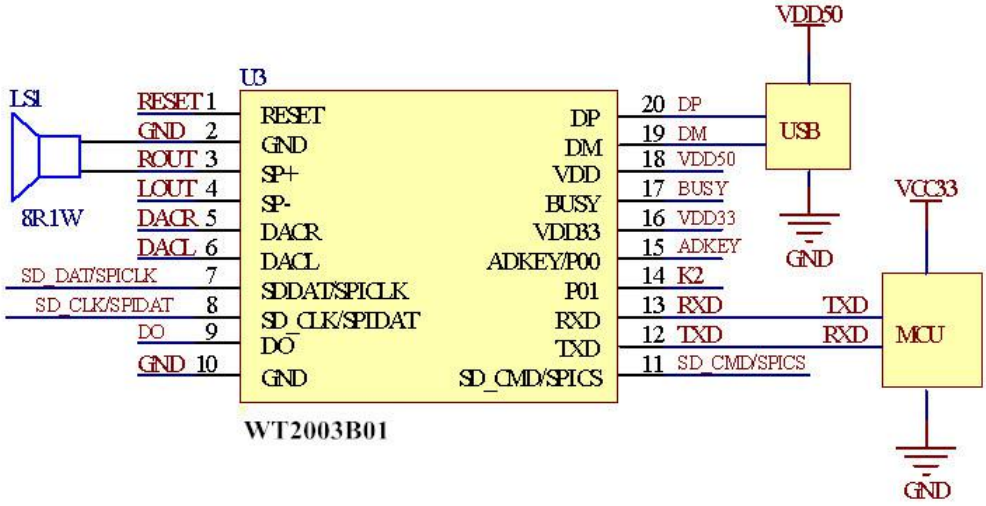


6.3 Amplifier connecting circuit



Remark: EN of LM4890 is active high level, can use BUSY or single chip to control.

6.4 USB connecting circuit



7. Audio file sort

Connect computer through USB interface, it will be a virtual removable drive on computer. First formatting the drive into FAT or FAT32 system.

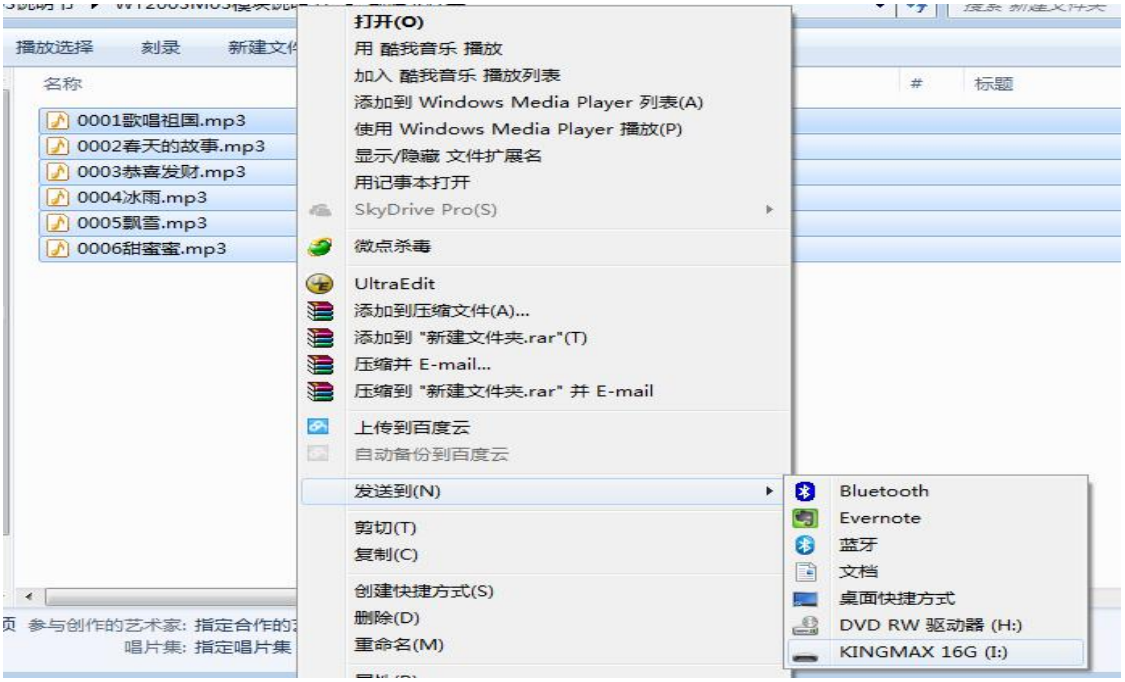
WT2003B01 V3.XX audio file index sort is according to the audio file sort order stored to SD card, not in accordance with the file name order. So when WT20003B01 V3.XX is playing file in index, the sort order is not related to the file name.

Due to file sort in windows system is according to the file name in most condition. So we suggest naming by sequence number and original file name, like 0001Ode to the motherland.mp3, 0002story of spring.mp3. It's convenient to sort for windows system. We can name all audio file on computer first, sort the order, then copy entirety to root directory storage.

Two common copying methods:

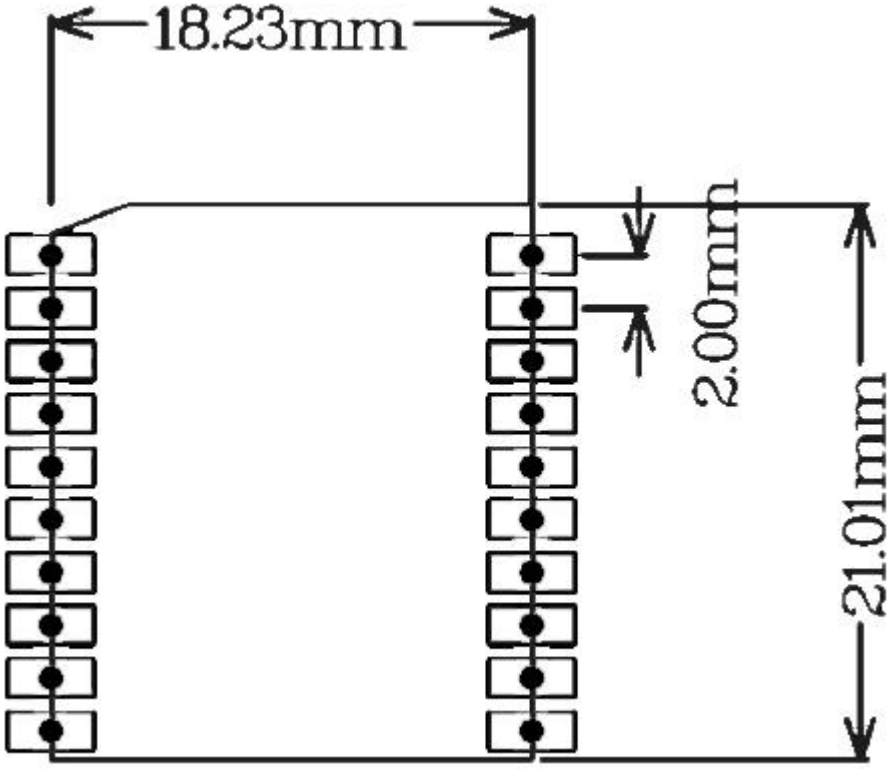
First is use shortcut key"Ctrl+C" and "Ctrl+V". But note that the mouse can not click on any of the files selected to be sent, otherwise it will start sending the file that mouse click on. This would upset file order.

Second is sorting file orderly. select the files to be sent and right click on the first file (for example, 0001 Ode to the motherland. MP3), in the right-click menu select to send to the root directory of storage. (Note that what the right click on is the first file to send; the system will begin with this file to send.)



8. Dimension

Unit: mm



9. History version

Version No.	Modifying date	Remark
V1.00	2016-01-08	Original version