QUICK START GUIDE

WT

WT2003 B02

V1.00
2015-12-30

WT2003B02

Product Introduction

WT2003B02 standard module is a powerful MP3 module with newly high quality, support MP3, WAV audio decoding, meet customer's demand from many aspects. Support file name specified play and indexing serial number play two play mode, more flexible to organize the audio file. Can classify by folder, play according to appointed file name in folder or indexing serial number. Support SD card and U disk storage, with mass memory.

Contents

1. Product features

➢ Support WAV, MP3 audio format

➢ Support 8~48KHz sampling rate, 8~320Kbps bit rate MP3 audio file.

➢ Support 8~44.1KHz sampling rate WAV audio file.

➢ Use SD card and U disk as storage, change audio freely, maximum support 32G SD card and 32G U disk.

➢ Through USB interface to change SD card audio.

➢ Support key control and UART asynchronous serial communication simultaneously, with standard interface protocol, and stronger function, more flexible and convenient control.

➢ Support inter-cut play between different storage.

➢ Support combination play.

➢ Inner 1W amplifier, directly drive 8ohm/1w speaker, with 32-level volume.

➢ DC 5V power supply.

2. Pin description
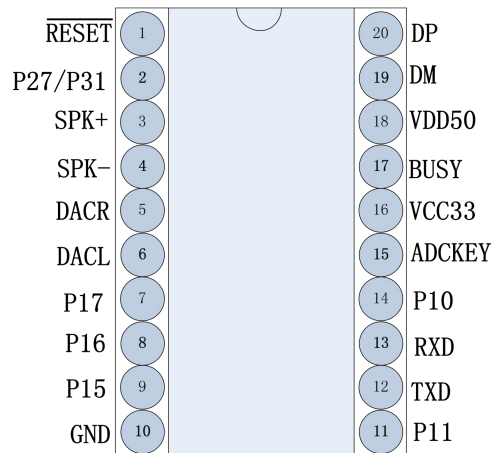
WT2003B02 V2.XX

Pin NO.	Name	Type	Function Description
1	RESET/P35	I	Unused
2	P27/P31	I	control the enable port of power amplifier; low level when not playing, high level at playing time.
3	SPK+	AO	Speaker connector
4	SPK-	AO	Speaker connector
5	DACR	IO	DAC right channel output
6	DACL	IO	DAC left channel output
7	P17	I	Unused
8	P16	I	Unused

9	P15	I/O	Unused
10	GND	PWP	Power ground
11	P11	I/O	Unused
12	TXD	O	UART asynchronous serial data output terminal
13	RXD	I	UART asynchronous serial data input terminal
14	P10	I	External SD card interface clock signal input terminal
15	ADKEY	I	ADK key connecting pin
16	VCC33	PWP	LDO 3.3V power output
17	BUSY	O	Working status indicate I/O port
18	VDD50	PWP	Module power terminal
19	DM	IO	USB data terminal DM
20	DP	IO	USB data terminal DP

Remark: I/O port of WT2003B02 V2.XX is 3.3V. "XX" of V2.XX means the version number of module.

3. Technical specification

Name	Function
Audio format	Support 8~48KHz sampling rate, 8~320Kbps bit rate MP3 audio file Support 8~44.1KHz sampling rate WAV audio file.
Memory capacity	Maximum support 32G SD card and 32G U disk. Support file system: FAT16, FAT32 (no support NSDS)
USB interface	Full speed 2.0
Supply voltage	DC3.0~5.5V
Rated current	20~250mA(related to load)
IO port level	3.3V TTL level
Size	18.23mm*21.01mm
Operating temperature	-40~85 degree
Humidity	5%~95%

4. Electronic parameters

Name	Mark	Condition	Min.	Typical	Max.	Unit
VDD50	LDO input voltage	-	2.8V	5.0	5.5	V
VDD33	LDO 3.3V output current	Vout3.3>3.1V	-	-	150	mA
Quiescent current	Non-loaded current	Non-loaded	-	30	-	mA
Working current	Current in playing state	8R/1W speaker, 32 level volume	-	390	-	mA
SNR	Signal Noise Ratio	-	-	92	-	dB
THD+N	Total harmonic distortion	No-load	-	-70	-	dB
PWRAB	DAC output power	32 Ohm speaker	-	-	16	mW

VPP	DAC maximum output amplitude voltage	10K ohm load	-	-	2.8	V
Ps1	Standby power consumption(with SD card)	Relate to SD card power dissipation	-	27.6	-	Ma
P	Power dissipation in playing state(No-load)	Relate to SD card power dissipation	-	28.7	-	Ma
VPPLINE	External audio input range		-	-	2.8	V

5. Control mode

5.1 Key control

(Specific connection method refer to typical circuit connection)

Key	Corresponding resistance	Function and operation
K1	0R	Short press, play/pause
K2	1K	Short press, next play
K3	2K	Short press, previous play
K4	3.3K	Short press, volume+
K5	5.1K	Short press, volume-
K6	10K	Short press, stop play

5.2 Serial port control

5.2.1 Protocol command format

WT2003B02 V2.XX module is built in standard UART asynchronous serial interface, belongs to 3.3V TTL level interface. Can change into RS232 level through MAX3232 chip.

Communication data format:start bit:1bit; data bit: 8bit; parity bit: no; stop bit:1bit. Use computer serial debugging assistant, need to correctly set serial port parameters, as shown below:

Serial port :	COM1	
Baud rate :	9600	
Check bit :	None	
Stop bit :	8	⊙ Send in Hex format
Data bit :	1	○ Send in Chars format

Start code	Length	Command code	Parameter	Cumulative sum check	End code
0X7E	See below	See below	See below	See below	0XEF

Attention: "Length" means length (1 byte)+command code(several bytes)+parameter(several bytes)+check sum(1 byte). Cumulative sum check means the low byte of cumulative sum of length + command code + parameter .

5.2.2 Command list

Communication control command

CMD	Corresponding function	Parameters
A2	Index Play in Specified SD Card Root Directory	File index
A3	Specified Play File Name in SD Card	File name
A4	File Index Playing in Specified SD Card Folder	Folder name, file index
A5	Specified Play File Name in SD Card folder	Folder, file name
A6	Index Play in Specified U disk Root Directory	file index
A7	Specified Play File Name in U disk	file name
A8	File Index Playing in Specified U disk Folder	Folder, file index
A9	File Name Play in Specified U disk Folder	Folder, file name
AA	Pause command	No
AB	Stop command	No
AC	Next command	No
AD	Previous command	No
AE	Volume control command	Volume level
AF	Specified play mode	Cycle mode
B0	Combination play	Work Drive
B1	Inter-cut command	Work Drive, file index
B2	Specified EQ mode	EQ code
BA	Whether need return code	BA XX
D2	Switch to Current Work Drive	Work Drive

Communication inquiry command

CMD	Corresponding function	Parameters
C1	Check current volume setting	C1 XX
C2	Read current working state	C2 XX
C5	Check the Total Number of Audio File in SD card	C5 XXXXX
C6	Check the Total Number of Audio File of Specified Folder in SD Card	C6 XXXX
C7	Check the Total Number of Audio File in U disk	C7 XXXX
C8	Check the Total Number of Audio File of Specified Folder in U disk	C8 XXXX
C9	Check the Audio of Current Playing	C9 XXXX
CA	Check Current External Device Connection Status	CA XX
CB	Check the Audio name of Current Playing	CB XX XX(Only support SD card and U disk)

5.2.3 Writing operation command

5.2.3.1 Return Code Format

Operation code
XX

Remark: after executing each write command, return to the corresponding command one byte operating code.

return code:→ 00 means: OK command execute;

→ 01means: FAIL command make mistake, no execute;

→ 02means: EMP no file;

When there is no SD card or SD circuit abnormal or SD data abnormal, sending command will return 05.

5.2.3.2 File Index Play in Specified SD Card(A2)

This command can play specified file in SD card, influenced by file store sequence. File order according to the index order.

Start code	Length	Command	High-order of song	Low-order of song	Check Code	End code
7E	05	A2	00	01	XX	EF

Note: If specified audio is not exist, it will not influence playing when specified playing**.**

5.2.3.3 Specified Play File Name in SD Card (A3)

This command according file name to play in root directory of specified SD card (File name, 8 characters at most)

Start Code	Length	Command	File Name (from high to low)				Check code	End code
7E	07	A3	54'T'	30('0')	30('0')	32('2')	XX	EF

54,30,30,32 respectively stand for T002 and ASCII code, 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.

5.2.3.4 File Index Playing in Specified SD Card Folder (A4)

This command can play file index in specified root directory folder (folder name fixed 5 character)

Start Code	Length	Command	File Name (from high to low)					File index (from high to low)		Check code	End code
7E	0A	A4	'M'	'U'	'S'	'I'	'C'	00	01	XX	EF

File name adopt ASCII code value, other data as hexadecimal values. The above command means playing the second audio file of "MUSIC" in specified root directory folder(index number is 0001).

5.2.3.5 Specified Play File Name in SD Card folder (A5)

Start code	Length	Command	File name(from high to low)					File name(from high to low)				Check code	End code
7E	0C	A5	'M'	'U'	'S'	'I'	'C'	54 'T'	30 '0'	30 '0'	32 '2'	XX	EF

5.2.3.6 Index Play in Specified U disk Root Directory(6)

This command can play specified file in U disk, but influenced by file order. The order is according index.

Start Code	Length	Command	The high order of audio	The low order of audio	Check code	End code
7E	05	A6	00	01	XX	EF

Note: If specified audio is not exist when playing specified audio, it will not affect current playing.

5.2.3.7 Specified File Name Play in U Disk (A7)

This command can according file name to play audio in specified root directory of U disk.

Start Code	Length	Command	File Name (from high to low)				Check code	End code
7E	07	A7	54'T'	30('0')	30('0')	32('2')	XX	EF

54,30,30,32 respectively stand for T002 and ASCII code, 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.

5.2.3.8 Specified File Index Playing in specified U Disk Folder (A8)

This command can play file index in specified root directory folder (folder name fixed 5 character)

Start Code	Length	Command	Folder Name (from high to low)					File Index (from high to low)		Check code	End code
7E	0A	A8	'M'	'U'	'S'	'I'	'C'	00	01	XX	EF

File name adopt ASCII code value, other data as hexadecimal values. The above command means playing the second audio file of "MUSIC" in specified root directory folder (Index No. 0001).

5.2.3.9 File Name Play in Specified U disk Folder(A9)

Start code	Length	Command	Folder name(high-low)					Folder name(high-low)				Check code	End code
7E	0C	A9	'M'	'U'	'S'	'I'	'C'	54 'T'	30 '0'	30 '0'	32 '2'	XX	EF

"54, 30, 30, 32" are ASCII codes of T002, and only file name and folder name are in the form of ASCII code; above commands mean T002XXX.mp3 audio play under the specified root directory; only corresponding to the first 4 bits is OK.

5.2.3.10 Pause Playback Command (AA)

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

Playing state, sending this command, it will pause to play audio,pause state , resend command, it will continue to play audio from pause.

5.2.3.11 Stop Command (AB)

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

If send this command, it will stop to play current audio.

5.2.3.12 Next Command (AC)

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

This command can trigger play next audio, when play the last audio, send this command can play first audio.

5.2.3.13 Previous Command (AD)

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

This command can trigger play previous audio, when play the first audio, send this command can play the previous audio.

5.2.3.14 Volume Control Command (AE)

The level of volume with 32, from 00 to 31, 00 as dormant, 31 level is the biggest volume.

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

The example is 31 level volume, this command can modify real adjust volume.

5.2.3.15 Specified Play Mode (AF)

Start Code	Length	Command	Parameter	Check code	End code
7E	04	AF	00: single play(dormant)	B3	EF
			01: single cycle	B4	
			02: all audio cycle play	B5	
			03: random mode	B6	

Note: this command will recover dormant mode after power down if modify play mode without power down. When use this command, suggested operate to setting in MCU initialized module. It will execute in this way when electrify in every time.

5.2.3.16 Combination Play Command (B0)

This command can continue play certain file in specified current catalogue, this command only use

for index play.

Start Code	Length	Command	Mark Word	Check code	End code
7E	04	B0	01	XX	EF

Start Code	Length	Command	The high order of audio	The low order of audio	Check code	End code
7E	05	B0	00	01	XX	EF

Start Code	Length	Command	Mark Word	Check code	End code
7E	04	B0	FF	XX	EF

Combination play means continue to send 10 or less music group code to WT2003S-16S, WT2003S-16S according receive order code to play. The different from direct sending file name to control music is before not complete play music to send next code, it will not interrupt, after receive command, it will deal with FIFO. For example: When WT2000 continue receive the seven group of "7E 04 B0 01 B5 EF", "7E 05 B0 00 01 B8 EF", "7E 05 B0 00 02 B9 EF", "7E 05 B0 00 03 BA EF", "7E 05 B0 00 04 BB EF", "7E 05 B0 00 05 BC EF", "7E 04 B0 FF B3 EF", it will order play the first, second, third, fourth, fifth audio file in SD card. 7E 04 B0 01 B5 EF is start code, 7E 04 B0 FF B3 EF is end code.

Note:

A. Before combination, if want to play file in other store mode, start to send specified store mode play command is available, audio play the first one of combination play command, and send behind audio command to realize combination play or direct switching mode.

Mark word: →01 stand for inter-cut specific index address in SD card.

            →02 stand for inter-cut specific index address in U disk.

B. Continue combination max support 10 groups. During playing, if has new play command, it will be interrupt and execute new command.

Note:

1. Judge overtime: for example: if only send the code of 7E 04 B0 01 XX EF, start reckon by time. If timekeeping over 3s with no response, need to delete relative information.

2. After sending 7E 04 B0 01 XX EF, if have receive command with 7E 06 B0 01 00 01 XX EF and other command, please delete recorded time and reckon by time again until over 10 groups, receive end code

or waiting more than 3s. If receive start code and address code but end code, after overtime or over 10 command, it will direct start to play audio according command. In other words, after sending address code of combination play, it will start to play received data.

3. During execute combination playing, send other command will lead interrupt combination play.

5.2.3.17 Inter-cut Command (B1)

Start Code	Length	Command	Remark word	The high order of audio	The low order of audio	Check code	End code
7E	06	B1	01	00	01	XX	EF

Note: When receive this command, it will pause current playing audio and execute this command specified audio, after complete playing, it will continue to play the pause audio (error within 1s is available).

First time inter-cut play and haven't finish, when send the second command, the order is not available. After finish the first inter-cut, the second one is available. It support between same devices or different devices inter-cut.

Mark Word:

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

01 stand for inter-cut specified index address in SD card

02 stand for inter-cut specified index address in U disk

Note: Only play SD card or U disk can use the inter-cut function, and inter-cut in multi-device, playing audio in Flash, is not support inter-cut, return to 02.

Inter-cut finished, BUSY will have a 50MS low pulse.

5.2.3.18 Switch to Current Work Drive (D2)

Start Code	Length	Command	Parameter	Check code	End code
7E	04	D2	01: SD card (in default)	D7	EF
			02: U disk	D8	

5.2.4 Read Operation Command

5.2.4.1 Check Current Setting Volume (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）

5.2.4.2 Read 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: play 02 stop; 03: pause

5.2.4.3 Check the Total Number of Audio File in SD card(C5)

Start Code	Length	Command	Check code	End code
7E	03	C5	C8	EF

Return Format

Operation Code	Return Value(2BYTE)
0XC5	The total number of file

5.2.4.4 Check the Total Number of Audio File of Specified Folder in SD Card (C6)

Start Code	Length	Command	Folder Name (from high to low)					Check code	End code
7E	08	C6	'M'	'U'	'S'	'I'	'C'	XX	EF

The file folder name store in ASCII code, above command means read the total number of folder name

as "MUSIC" file in root directory.

Return Format (C600 00 means no audio file or without the folder)

Operation Code	Return Value(2BYTE)
0XC6	The total number of file

5.2.4.5 Check the Total Number of Audio File in U Disk (C7)

Start Code	Length	Command	Check Code	End code
7E	03	C7	CA	EF

Return Format

Operation Code	Return Value(2 BYTE)
0XC7	The total number of file

5.2.4.6 Check the Total Number of Audio File in Specified Folder of U Disk (C8)

Start Code	Length	Command	File Folder (from high to low)					Check Code	End code
7E	08	C8	'M'	'U'	'S'	'I'	'C'	XX	EF

The file folder name store in ASCII code, above command means read the total number of folder name

as "MUSIC" file in root directory.

Return Format (C800 00 means no audio file or without the folder)

Operation Code	Return Value (2 BYTE)
0XC8	The total number of file

5.2.4.7 Check the Audio of Current Playing (C9)

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

Return Format

Operation Code	Document Number High Type	Document Number Low Type
0XC9	XX	XX

5.2.4.8 Check Current External Device 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 SD card or U disk plug in or pull out, WT2000 will automatic return data to prompt. Return value of Low 4BIT stand for the status of PC connect with (BIT3), U disk (BIT2), SD card (BIT1) and SPI-FLASH (bit0).

0: stand for existence

1: stand for not exist

For example:

0x01: without PC connect (BIT3=0), without U disk (BIT2=0), without SD card (BIT1=0), with SPI-FLASH (BIT0=1)

0x07: without PC connect (BIT3=0), without U disk (BIT2=1), without SD card (BIT1=1), with SPI-FLASH (BIT0=1)

5.2.4.9. Check the Audio name of Current Playing (CB)

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

Return Format

Operation Code	Return Value
0XCB	XX (8byte)

Return data express by ASCLL code, if the audio name not satisfied 8byte, it will replenish return with 20H.

5.3 Attention

✧ The interval time of sending command should not be less than300ms.

✧   After sending control command, ensure the command execution by detecting return code to make

sure whether it is executed correctly.

6. Audio File Sort

WT2003B02 V2.XX audio file index sort, is according to the storage first and last sort of audio file

into SD card, not the sort order of file name. So WT200S play file as the index, not relate to the sort of

order and file name, only relate to the order when copy file.

We can build a folder on computer, copy all the file into this folder. Then arrange the file according to

your mind in the folder. Next, according to the following two method copy into SD card or U disk. (If you

want to download into SPI, copy into SD card or U disk first, then send command or through copy button

copy it into SPI.)

Two common copy methods:

1. Use the shortcut key "Ctrl+C" and "Ctrl+V",but notice that mouse can't click any picked up file,or it

will send from the file clicked by mouse.It will disorganize the order of file.

2. Arrange the order of file, choose the file need to be sent, then use the right key to click the first

file(for example001 singing motherland.mp3), in right key menu choose the root directory, send to

SD card. (Note that the right key click the first file being sending,system will send from this file.)
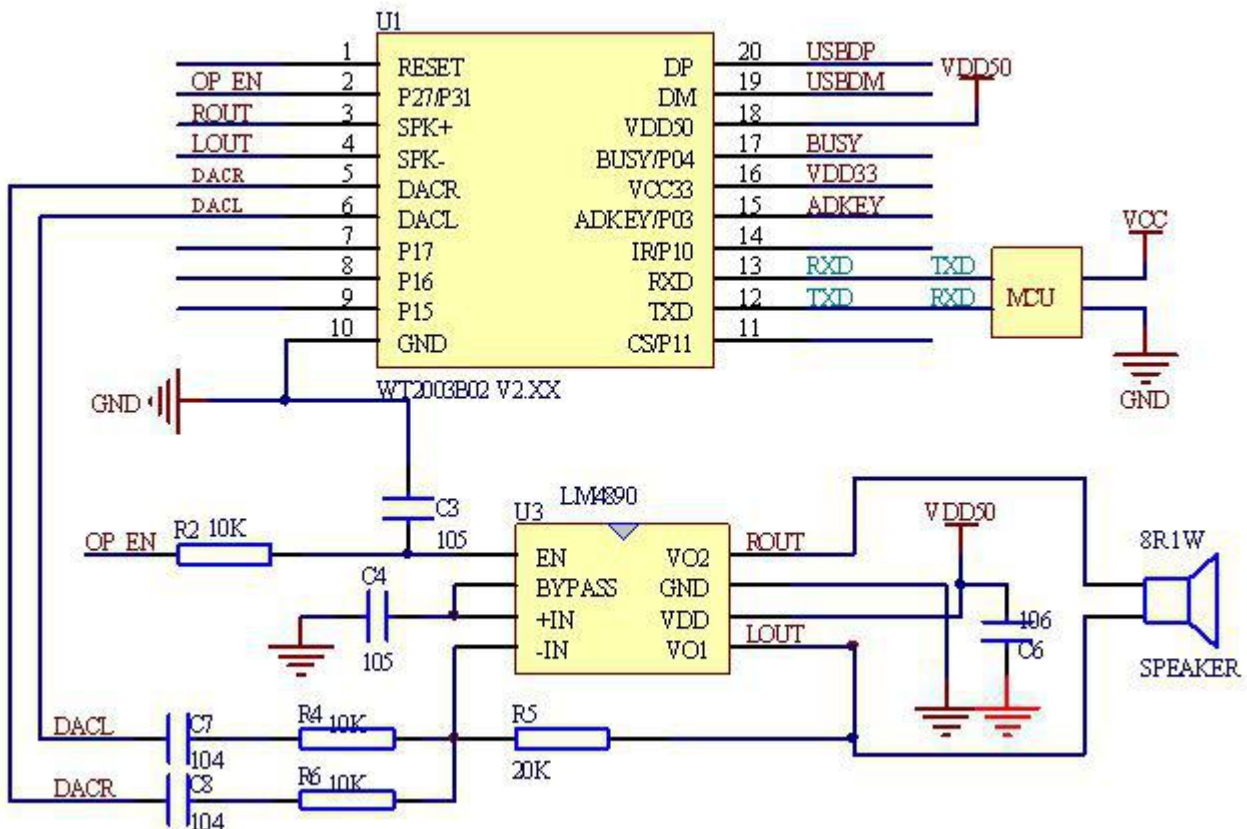
7. Application Circuit
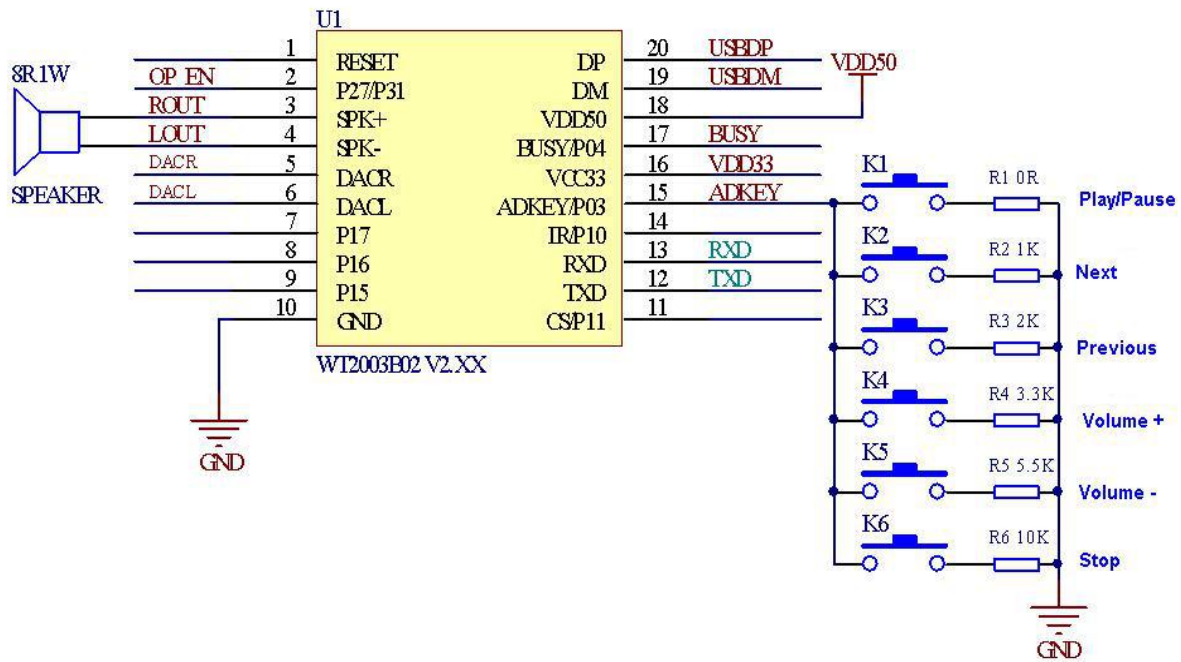
7.1 WT2003B02 V2.XX direct Drive Speaker
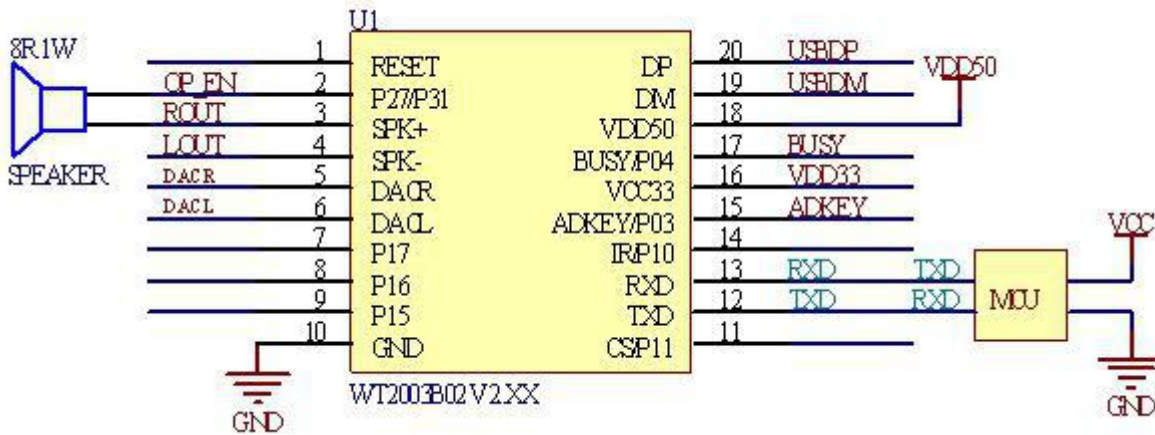
Note: IO port of WT2003B02 V2.XX is 3.3V level.
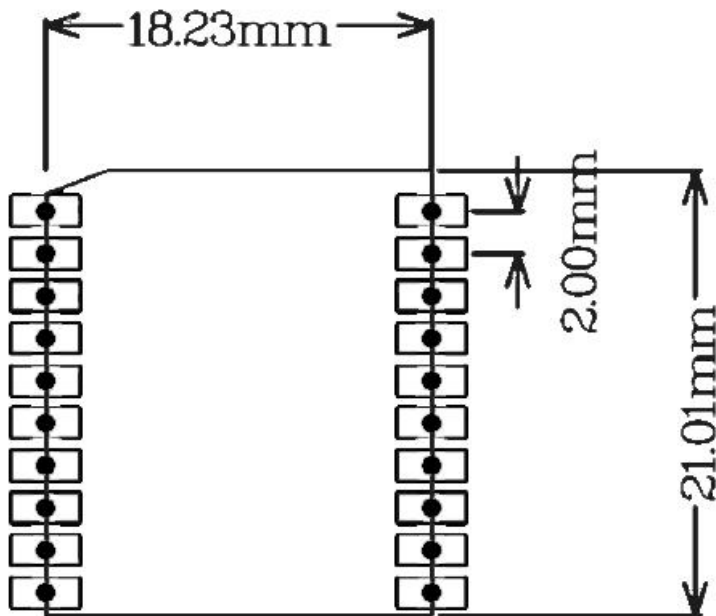
7.2 WT2003B02 V2.XX external Amplifier

1) IO port of WT2003SB02 is 3.3V level.

2) Coupling capacitor C7 and C8 is in the range of 0.1UF-10uF.

7.3 WT2003B02 V2.XX external button

8. Dimension

9. History Version

Version NO.	Modify Date	Description
V1.00	2016-01-09	Original Version