table of Contents

1. Outline

1.1 Brief introduction

YX5200 It is to provide a serial port MP3 Chip, perfectly integrated MP3 , WMV The hardware decoding. Meanwhile Software Support TF Card driver to support FAT16 , FAT32 File system. By simple serial command to complete the specified music player, and to play music and other functions, without tedious low-level, easy to use, stable and reliable is the most important feature of this product. In addition, this chip is the depth of customized products, designed for USB Card reader, USB Sound card, fixed voice playing field to develop low-cost solutions.

1.2 Features

1 It supports sampling rates (KHz): 8 / 11.025 / 12/16 / 22.05 / 24/32 / 44.1 / 48 2 , twenty four Place DAC Output dynamic range support 90dB SNR support 85dB 3 Full support for FAT16 , FAT32 File system, maximum support 32G of TF Card support 32G of U plate, 64M Byte

NORFLASH 4 , A variety of control modes, control mode parallel port, serial port mode, AD Key control mode

5 Spots feature, broadcasting language, you can pause a live background music

6 The audio data sorted by folder, supports up to 100 Folder, every folder can be assigned 1000 Song

7 , 30 Level adjustable volume, 10 level EQ Adjustable

1.3 application

1 , Car navigation voice broadcast

2 , Road transport inspectors, toll station voice prompts;

3 , Train, bus safety inspection voice prompts;

4 , Electricity, communications, finance and business offices voice prompts;

5 , Into the vehicle, a tunnel authentication voice prompt;

6 , Public security frontier inspection channel voice prompts;

7 , Multi-channel voice alarm or voice guidance device operation;

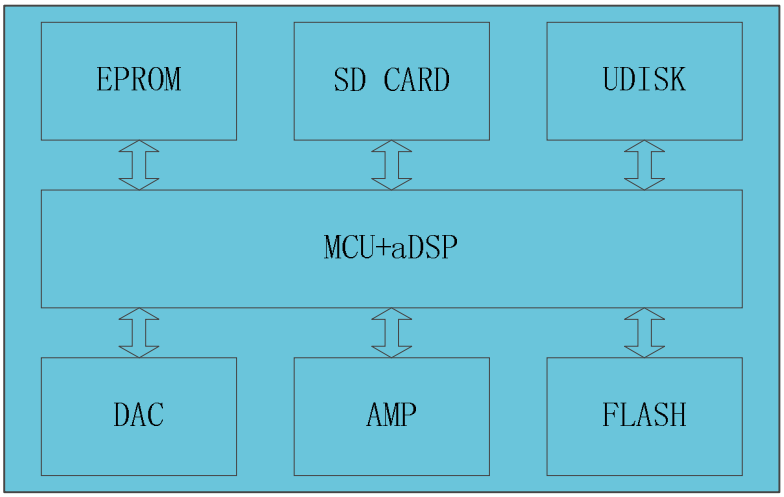
8 , Electric sightseeing bus safety with voice announcement;

9 , Electrical Equipment failure alarm;

10 , Voice fire alarm;

11 , Automatic broadcasting apparatus, broadcast the timing

2. Chip instructions

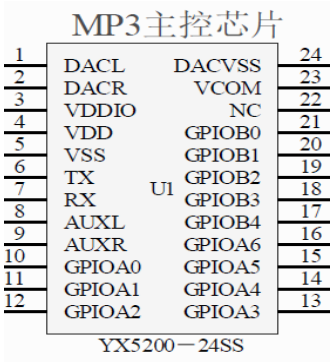


The chip used is SOC Program integrates a 16 Bit MCU And a specific audio decoding aDSP Using hardware decoding manner, and to further ensure the stability of the sound system. More compact package size to meet the needs of other product embedded

2.1 Hardware parameters

name	parameter
MP3 file format	1, all the bit rates supported 11172-3 and ISO13813-3 layer3 audio decoder 2, the sampling rate
	support (KHZ): 8 / 11.025 / 12/16 / 22.05 / 24/32 / 44.1 / 48
	3, support Normal, Jazz, Classic, Pop, Rock and other sound effects
USB interface	2.0
UART interface	Standard serial port, TTL level, the baud rate can be set
Input voltage	In the preferred 3.2V-5V power supply is 4.2V
Current Rating	20mA [U disk without]
size	Standard package SSOP24
Operating temperature	0 ° to 70 °
humidity	5% to 95%

2.2 Chip Pin Description



Pin Number	Pin Name	Functional Description	Remark
1	DACL	Audio output left channel	Drive headphones, amplifier
2	DACR	Right channel audio output	Drive headphones, amplifier
3	VDDIO	3.3V power output	To TF card, SPI, 24C02 power supply
4	VDD	5V power input	Not exceed 5.2V
5	VSS	Power Ground	
6	TX	UART serial data output	
7	RX	UART serial data input	
8	NC	no	
9	AUXR	Play indicator	You will need to take triode
10	GPIOA0	Infrared remote control receiver	
11	GPIOA1	Busy output	Output high
12	GPIOA2	Chip select bus SPI_CS	
13	GPIOA3	SPI_DO data bus	
14	GPIOA4	SPI_CLK data bus	
15	GPIOA5	ADKEY2 external button	22K pullup
16	GPIOA6	ADKEY1 external button	22K pullup
17	GPIOB4	SD_CLK clock bus	0 ohm series 24C02 6 feet to make memory
18	GPIOB3	SD_CMD command bus	0 ohm series 24C02 5 feet to make memory
19	GPIOB2	SD_DAT data bus	
20	GPIOB1	USB- DM	Then U disk and the computer's USB port
twenty one	GPIOB0	USB + DP	Then U disk and the computer's USB port
twenty two	NC	Programming port	
twenty three	VCOM	Decoupling	
twenty four	DACVSS	Ground	

3. Serial communication protocol

Serial commonly used as a control in the field of communication, we optimize the industrial level, the added parity frames, retransmission, error handling measures, greatly enhance the stability and reliability of communication, while based on the extended stronger RS485

For networking functions, serial communication baud rate can be set on their own, default 9600

3.1 Communication format

It supports asynchronous serial communication mode via the serial port of a host computer to accept

Communication Standard: 9600

bps Data bits: 1 parity bit: none

Flow control: none

Format: $ S VER Len CMD Feedback para1 para2 checksum $ O		
$ S	Start bit 0x7E	Each command $ feedback are beginning, that is, 0x7E
VER	version	Version Information
Len	After the number of bytes len	The checksum is not counted
CMD	Command word	A specific operations, such as play / pause, etc.
Feedback	Command feedback	The need for feedback, feedback, feedback is not 0
para1	Parameter 1	Query the high byte of data (such as song number)
para2	Parameter 2	Low byte data query
checksum	Checksum	Accumulation and verification [excluding the start bit $]
$ O	End position	End bit 0xEF

For example, if we specify Play NORFLASH , You need to send: 7E 10 06 09 00 00 04 FF dd EF

Data length 6, This 6 Bytes are [100609000004] . Not counting the start, end, and verification. example

3.2 Communication instruction

1 , Instructions directly transmitted, no return parameters

Detailed CMD (command)	The corresponding function	Parameters (16)
0x01	next track	
0x02	previous piece	
0x03	Specify the track (NUM)	0-2999
0x04	Volume +	
0x05	volume-	
0x06	Specifies the volume	0-30
0x07	Specify the EQ (0/1/2/3/4/5)	Normal / Pop / Rock / Jazz / Classic / Base
0x08	Specify the playback mode (0/1/2/3) loop / loop folder / song cycle / Random	
0x09	Specified device (0/1/2/3/4)	U / TF / AUX / SLEEP / FLASH
0x0A	Goes to sleep - Low power consumption	
0x0B	normal work	
0x0C	Chip reset	
0x0D	Broadcast	
0x0E	time out	
0x0F	Specified folder player	1-10 (needs its own set)
0x10	PA Set	{DH = 1: PA-Open} {DL: gain setting, 0-31}
0x11	Loop	{1: {0} loop: Loop stop}

2 Parameters, query system

CMD command Detailed (check Inquiry)	The corresponding function	Parameters (16)
0x3C	STAY	
0x3D	STAY	
0x3E	STAY	
0x3F	Send initialization parameters	0 - 0x0F (the lower four bits each represent a device)
0x40	Returns an error, a retransmission request	
0x41	answer	
0x42	Query the current status	
0x43	Query current volume	
0x44	Query the current EQ	
0x45	Query current play mode	
0x46	Query the current software version	
0x47	The total number of file queries TF card	
0x48	The total number of file queries UDISK	
0x49	The total number of file queries FLASH	
0x4A	Retention	
0x4B	Queries TF card of the current track	
0x4C	Query of the current track UDISK	
0x4D	FLASH query of the current track	

3.3 Chip returned data

Chip will have to be returned data in key areas. For the user to control the working status of the chip

- Successful on-chip power-on initialization data
- Chip finished playing the current track data
- **Chip successfully receives the return instruction ACK (answer)**
- The chip receives a data error [forfeiture includes data integrity verification error in both cases]
- When the chip is busy, the data over the chip will return busy instruction
- **U plate, TF Card insertion and removal, the data are returned**

3.3.1. On-chip power returned data

(1) , On power-up, initialization will take some time, this time is the need to U plate, TF card, flash , General file determines how much of the other equipment in 1.5 ~ 3S This time. If this time is exceeded chip initialization data has not been sent out, described chip initialization error, please power reset chip, additional connection hardware detection

(2) Chip initialization data including line equipment, such as transmission 7E 10 06 3F 00 00 01 xx xx EF

DL = 0x01 Description power over the Cheng, only U Disk online. Referring to the other data table, a relationship between devices or

U disk - Online	7E 10 06 3F 00 00 01 xx xx EF	Or is the relationship between devices
TF - Online	7E 10 06 3F 00 00 02 xx xx EF	
PC - Online	7E 10 06 3F 00 00 04 xx xx EF	
FLASH - online 7E 10 06 3F 00 00 08 xx xx EF U disk, TF - online 7E		
10 06 3F 00 00 03 xx xx EF		

(3) , MCU After the chip initialization must wait to issue instructions to send the corresponding control command, or instruction sent by the chip will not be processed. But it will also affect the normal initialization of the chip.

3.3.2 Track has finished playing the returned data

U disk finished playing the first one	7E 10 06 3C 00 00 01 xx xx EF U disk play the first one s completed
U disk finished playing the first two	7E 10 06 3C 00 00 02 xx xx EF U disk player completed the first two
TF card finishes playing the first one	7E 10 06 3D 00 00 01 xx xx EF TF card play the first one is completed
TF card finished playing the first two	7E 10 06 3D 00 00 02 xx xx EF TF card play the first two completed
FLASH finished playing the first one	7E 10 06 3E 00 00 01 xx xx EF FLASH play the first one is completed
FLASH finished playing the first two	7E 10 06 3E 00 00 02 xx xx EF FLASH play the first two completed

1 To fight for a lot of demand triggered the play, we play after the chip is corrected automatically enter a suspended state. If you need this type of application. Only you need to specify the tracks to play. In this way, the track has finished playing automatically pauses, waiting for instructions

2 In addition, we opened up a special IO As an indication of state of the decoder and pause. See 6 foot, GPIO1 (1) , Play status output high

(2) , Playback pause status, output low. Chip sleep. It is low

3 , Fight for the continuous playback application, can be achieved. if U After the first song is finished disc player, will return

7E 10 06 3C 00 00 01 xx xx EF 3C

- - - - It represents the U disk command

00 01 ---- represents finished playing track.

If the external MCU receive this instruction. Please wait 100ms. And then sends a play command [7E 10 06 0D 00 00 00 FF DD EF]. Because the internal chip information will be initialized the next track. In this case, the chip can do continuous playback.

4, if a first current song playing, after finished playing, track pointer automatically directed to the second header, if the transmission "Play next track" command, then the chip will play third song, please the user knows. Also, if player finished the last one chip

After that, the play pointer will automatically jump to the first song, pause.

5, after the specified device, chip play pointer will point to the root directory of the first track, and enters the paused state. Instruction waiting user selections.

3.3.3 Chip response data returned

FLASH finished playing the first one	7E 10 06 3E 00 00 01 xx xx EF FLASH play the first one is completed	

(1) In order to strengthen the stability of the data communication between, we have increased the response processing, ACKB Whether the need is to set byte reply response. The benefit of this is to ensure that each communication has a handshake, receiving the response says MCU Data transmission, the chip has been successfully received and handled immediately.

(2) For general applications, customers are free to choose, without this response processing is also possible.

3.3.4 Chip error data returned

The chip is busy	7E 10 06 40 00 00 00 xx xx EF	
A reception data is not completed	7E 10 06 40 00 00 01 xx xx EF	
Check error	7E 10 06 40 00 00 02 xx xx EF	

(1) In order to strengthen the stability of the data communication between, we have added a data error handling mechanism. Chip receive non-compliant data format, all information will be fed back out

(2) In the environment is a bad situation, strongly recommends that customers process this command. If the application environment in general, can not handle.

(3) Chip return to busy, on-chip power-on initialization time will return, because the chip need to initialize the file system is basically

3.3.5 Message insertion and removal device

U disk into	7E 10 06 3A 00 00 01 xx xx EF	
Insert TF	7E 10 06 3A 00 00 02 xx xx EF	
PC insert	7E 10 06 3A 00 00 04 xx xx EF using this instruction, please contact technical support	
U disk pull out	7E 10 06 3B 00 00 01 xx xx EF	
TF pull out	7E 10 06 3B 00 00 02 xx xx EF	
PC pull out	7E 10 06 3B 00 00 04 xx xx EF using this instruction, please contact technical support	

(1) In order flexibility of the chip, we have increased, the device is plugged in, pull out the instruction feedback. User to know the working status of the chip.

(2) , When the device is plugged into the root directory of the default playback device we first track. As audition, if the user does not need this feature, you can serial message after receiving the device insert, waiting 100ms . Send commands to pause playback.

3.4 Detailed instructions Serial

We conducted the following detailed description of key areas:

- Specify the track playback [must first specify to track after a specified device]
- Specifies the volume of playback
- Specify the play equipment
- Specify a folder to play [according to the user to customize this feature]
- FLASH Fixed voice stored in the test

3.4.1. Specify the song play command

Our instructions are given to support the specified track is playing, the choice of songs is 0 to 2999. In fact, it can support more, because it involves the cause of the file system to support too many songs, will lead to a slow operating system, the general application does not need the support of so many files. If the customer has unconventional application, please communicate with us in advance.

(1) , For example, select the first song playback, the serial transmission section 7E 10 06 03 00 00 01 FF E6 EF 7E --- Start command

10 --- Version Information

06 --- The data length (not including parity)

03 --- No representative of the product

00 --- Need to answer [0x01: We need to answer, 0x00: No return answer]

00 --- High byte track [DH] 01 --- Low byte track [DL], Here it represents the first song to play

FF --- High byte parity

E6 --- Low byte parity

EF --- End command

(2) For selections, if you select the first 100 First, first 100 Converted to 16 Hex, the default is double-byte, it is 0x0064 .

DH = 0x00; DL = 0x64 (3) If you choose the first 1000 The first play, first 1000 Converted to 16 Hex, the default is double-byte, it is 0x03E8 DH = 0x03; DL = 0xE8 (4) Other operations and so on can be, because the use of the embedded field 16 Radix is the most convenient method of operating.

3.4.2 Specifies the volume of playback instruction

(1) We default volume on the system power is 30 Level, to set the volume, then the corresponding instruction can be transmitted directly

(2) Such as a designated volume 15 Level, the serial transmission of commands: 7E 10 06 06 00 00 0F FF D5 EF (3) , DH = 0x00; DL = 0x0F , 15 Converted to 16 Hex is 0x000F . Can be described with reference to playing track portion

3.4.3 Specify the playback device

(1) Our chip is supported by default 4 Types of playback devices, only the device can be specified device to play online

Device is online, our software will automatically detect, without user relationship.

(2) , See table, select the appropriate command transmitted

(3) , After the specified device. Chip will automatically enter a suspended state, waiting for the user to specify a track to play. Information from the specified device to the internal chip initialization file. Probably need 200ms . Please wait 200ms After resending command specified track.

-U disk playback device specified	7E 10 06 09 00 00 01 xx xx EF xx xx: represents the check
Specify the playback device -TF card	7E 10 06 09 00 00 02 xx xx EF
Specify the playback device -AUX	7E 10 06 09 00 00 03 xx xx EF
Specify the playback device -FLASH	7E 10 06 09 00 00 04 xx xx EF
Specify the playback device -PC	7E 10 06 09 00 00 05 xx xx EF Means [card, a sound card] Mode
Specify the playback device -SLEEP	7E 10 06 09 00 00 05 xx xx EF

3.4.4 Specify the file playback

01 specified folder inside 001.mp3	7E 10 06 0F 00 01 01 xx xx EF
11 specified folder inside 100.mp3	7E 10 06 0F 00 0B 64 xx xx EF
99 specified folder inside 255.mp3	7E 10 06 0F 00 63 FF xx xx EF

(1) Specify the folder to play our developed extensions, naming the default folder is " 01 "," 11 " This way because our chip does not support Chinese characters of the name of the folder name recognition, stability and speed of the song in order to switch the system under each folder the default maximum support 255 The song, most support 99 Classification folders, if customers have special requirements, the need to classify according to the English name, we also can be achieved, but the name can only be " GUSHI "" ERGE "And the English name of the composition.

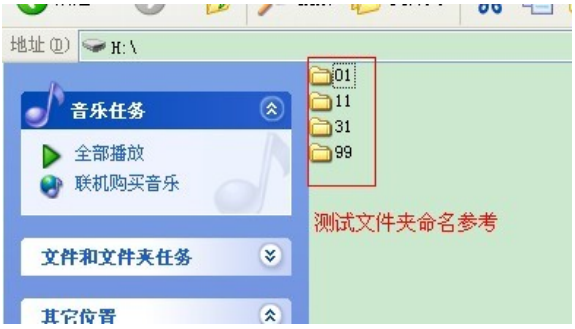
(2) , For example, specify " 01 " Folder 100.MP3 File, serial port to send commands to: 7E 10 06 0F 00 01 64 xx xx EF DH: It represents the name of the folder, the default support 99 Files that 01--99 Named

DL: On behalf of the tracks, most default 255 Song that 0x01 ~ 0xFF

Please refer to the above track set track set rules.

(3) In order standard of chips, be sure to specify the folder and file names, to lock a file. Specify a separate folder or specify the file name alone is possible, but to manage such files will be worse.

(4) The following two sectional view illustrating the folder and file names designated [two left and right in FIG]



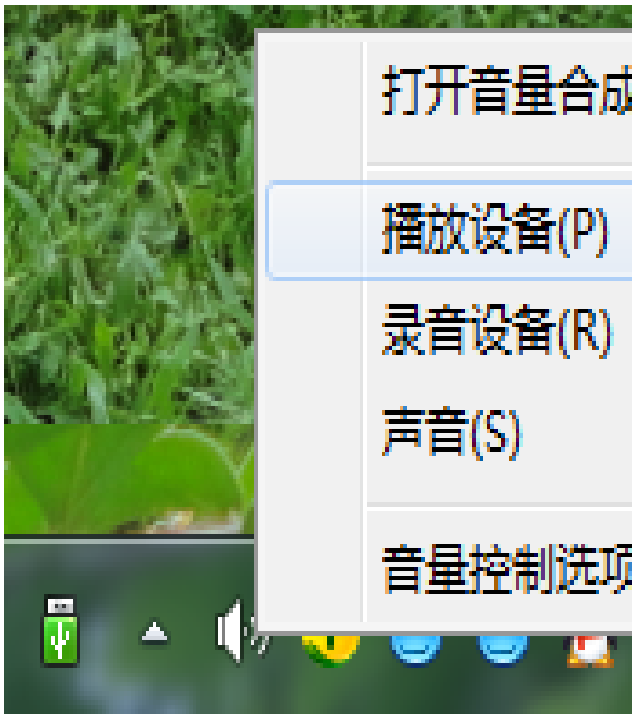
3.4.5 FLASH Fixed voice information stored

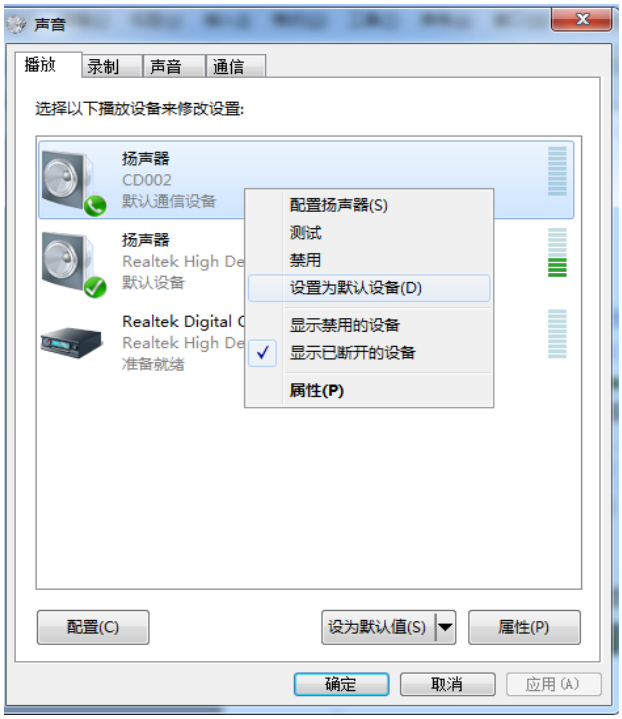
Track number	Track names	Track number	Track names
1	0.mp3	2	1.mp3
3	2.mp3	4	3.mp3
5	4.mp3	6	5.mp3
7	6.mp3	8	7.mp3
9	8.mp3	10	9.mp3
11	Female 10 da da .mp3	12	11Mp3 ringtones .mp3
13	12 Bund18 .mp3	14	13 home .wav
15	14 have to love .wav	16	

Note: which contains the MP3 , WAV Format audio files. Are without any compressed audio file

3.4.6 Sound card function

Chip USB Mouth with a computer connection, you can YX5200 Play sound chip computer, but the computer's output to be set at right-click the bottom right corner of the computer's small speakers, such as 1 Map, and then left-click "playback device" dialog box, such as 2 FIG, right-click 'speaker CD002 'Right click the "set as the default device" here YX5200 There is sound output.

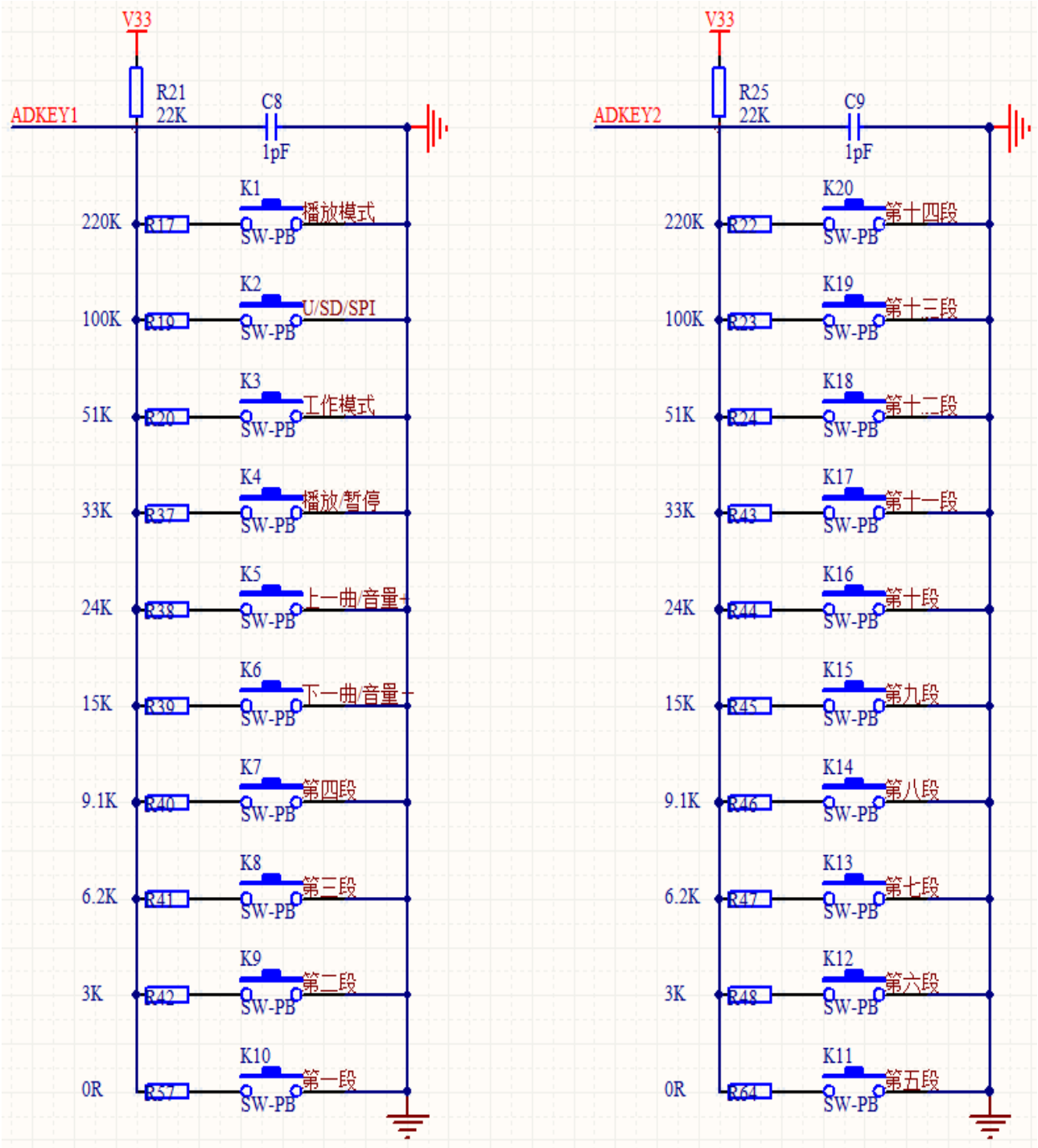




3.5 Button interface

We use the chip AD Mode keys, to replace the traditional keyboard matrix connection, the benefits of doing so is to take full advantage of the MCU Increasingly powerful AD Features. Design simple but not simple, we chip the default configuration 2 More AD mouth, 20 Resistance distribution of keys, if used in strong electromagnetic interference or strong inductive, capacitive load occasions, please refer to our "Notes."

(1) Reference schematics



(2) , 2 0 Function keys allocation table

button	dog	Press	Remark
K1	Play Mode		Break switching / not interrupted
K2	Playback device is switched		U / TF / SPI / sleep
K3	Operating mode		Full cycle
K4	Play / Pause K5		
	previous piece	Volume +	
K6	next track	volume-	
K7	4	Loop 4	Press that loops until power down or press another button
K8	3	Loop 3	Press that loops until power down or press another button
K9	2	Loop 2	Press that loops until power down or press another button
K10	1	Loop 1	Press that loops until power down or press another button
K11	5	Loop 5	Press that loops until power down or press another button
K12	6	Loop 6	Press that loops until power down or press another button
K13	7	Loop 7	Press that loops until power down or press another button
K14	8	Loop 8	Press that loops until power down or press another button
K15	9	Loop 9	Press that loops until power down or press another button
K16	10	Loop 10	Press that loops until power down or press another button
K17	11	Loop 11	Press that loops until power down or press another button
K18	12	Loop 12	Press that loops until power down or press another button
K19	13	Loop 13	Press that loops until power down or press another button
K20	14	Loop 14	Press that loops until power down or press another button

3.6 Remote control function

button	dog	Remark
CH-	Operating mode	Interrupt / not interrupt
CH	Playback device is switched	U / TF / SPI / sleep
CH +	Play Mode	Full cycle
PREV	previous piece	Press and rapid volume -
NEXT	next track	Press and rapid volume +
PLAY / PAUSE	play / Pause	
VOL-	volume-	
VOL +	Volume +	
EQ	EQ switch	Normal / Pop / Rock / Jazz / Classic / Base
0	0	
100+	Sleeping	
200+	OK button	
1	1	
2	2	
3	3	
4	4	
5	5	
6	6	
7	7	
8	8	
9	9	

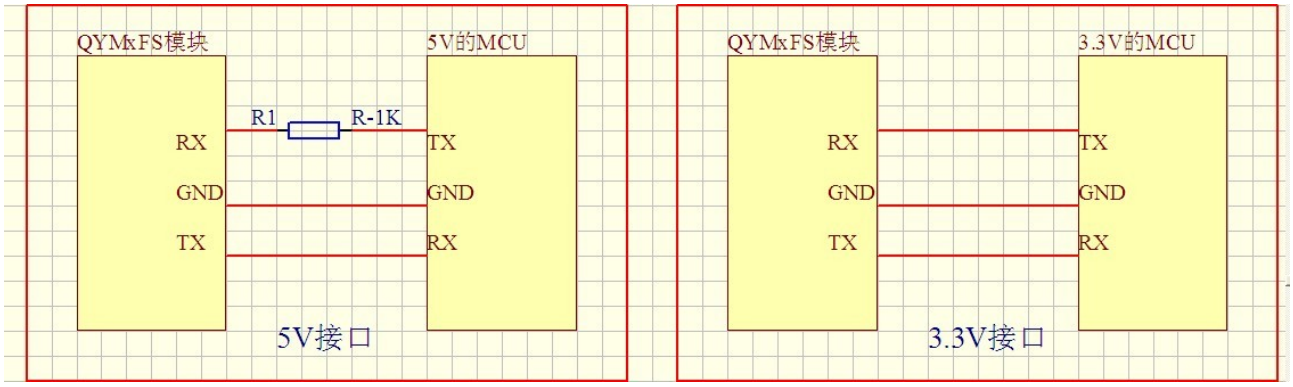
Remote control numeric keys with a specified function, such as by 1 Press the corresponding first paragraph 2 Corresponding to the second segment Determined according to the physical locations of the memory of the remote control number key functional combination, such as by 2 Press 1 , To play twenty one segment

4 , Reference circuit

Contention for the application of the chip, we provide a detailed reference design, so you can quickly get started to experience the powerful features of the chip

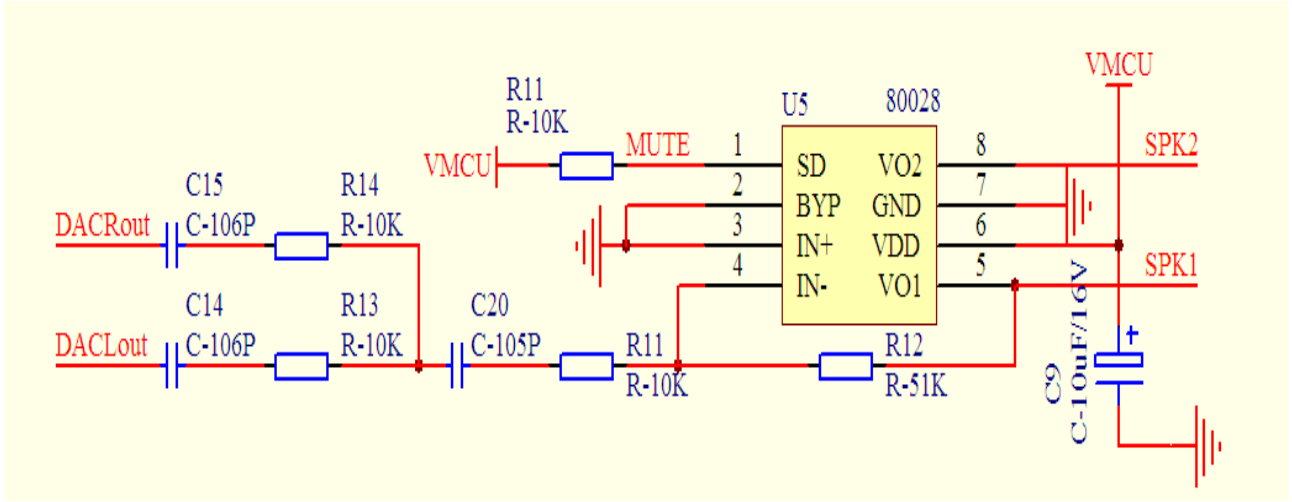
- A serial communication interface, the default baud 9600 Can be modified according to customer requirements
- external AD Key interface circuit, the function keys can be customized according to the needs of
- Mono external reference amplifier circuit

4.1 Serial Interface



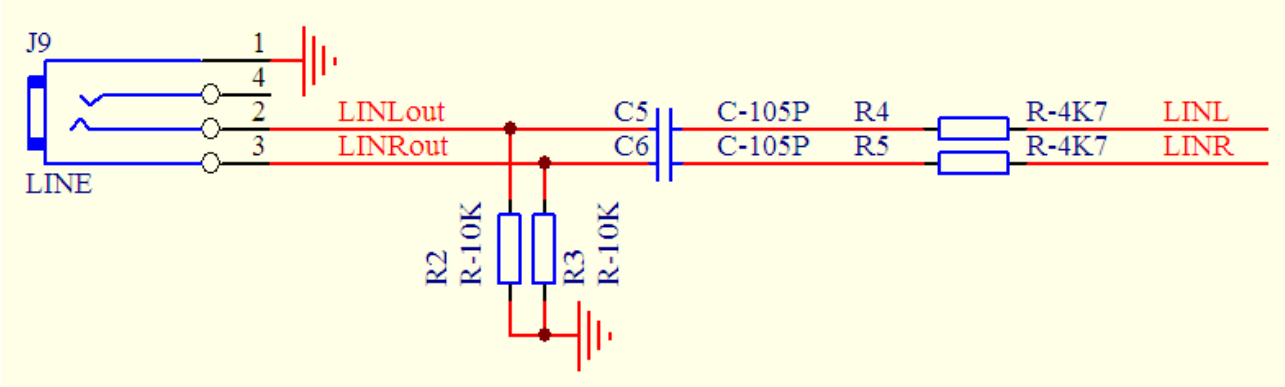
Chip serial port is 3.3V of TTL Level, so the default level interface for 3.3V . If the system is 5V . It is recommended that a series of serial ports in the docking interface 1K The resistance. This is sufficient to meet the general requirements, if applied in the case of strong electromagnetic interference, please refer to the description "Notes" of. Chip 5V with 3.3V The systems tested were normal, everything is normal. They are employed in the direct way, and not a string 1K The resistance.

4.2 External mono amplifier



Here we use the power amplifier 8002 , Please refer to the specific parameters IC of datasheet . General enough to apply to the occasion, if the pursuit of higher quality, customers find any other suitable amplifier.

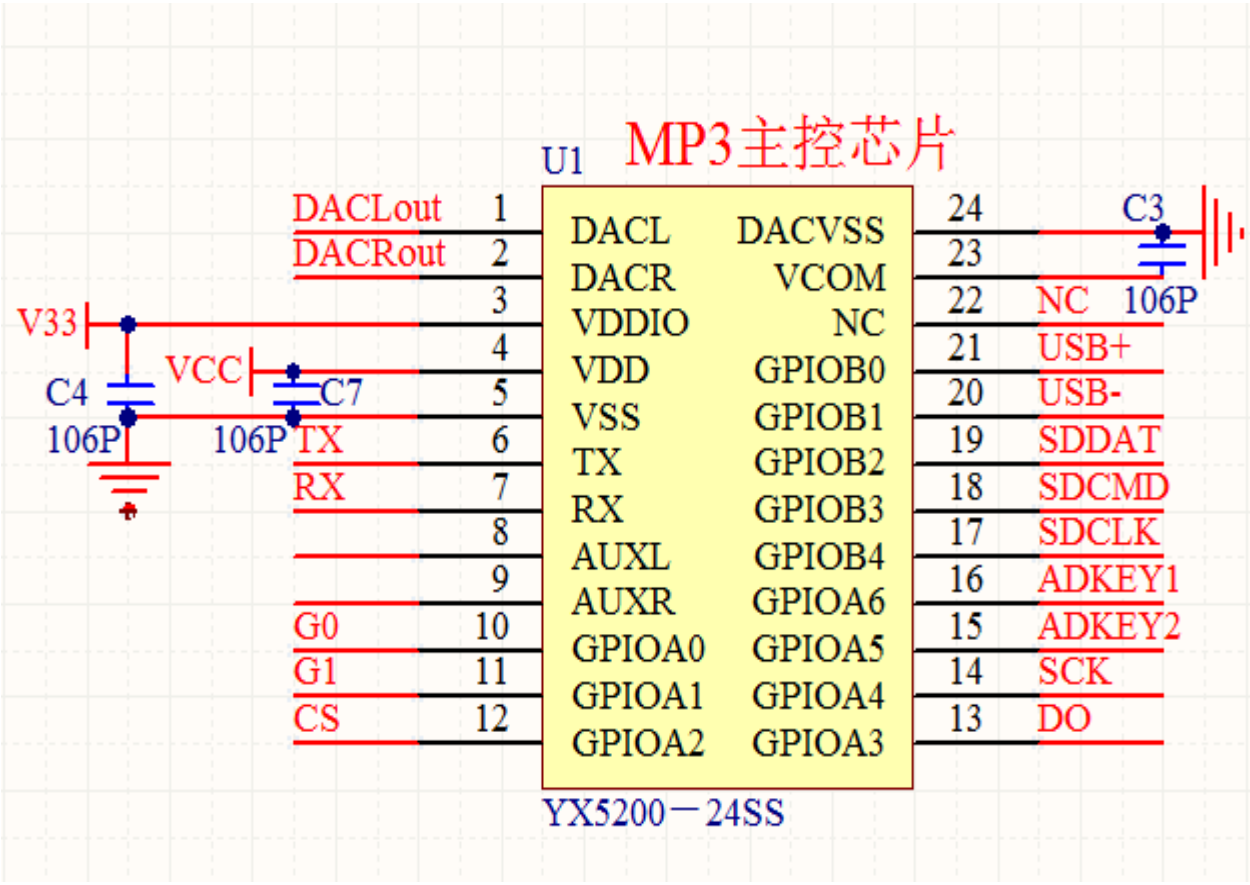
4.3 External headphone circuit



Here R4 with R5 It is a limiting resistor, to prevent excessive external audio amplitude (Vp-p A maximum of 3.0V) Affect system stability, C1

with C2 Blocking capacitor to prevent external audio sources affect the DC level of the internal chip offset; R2 with R3 Reserved for large power amplifier design with a resistor

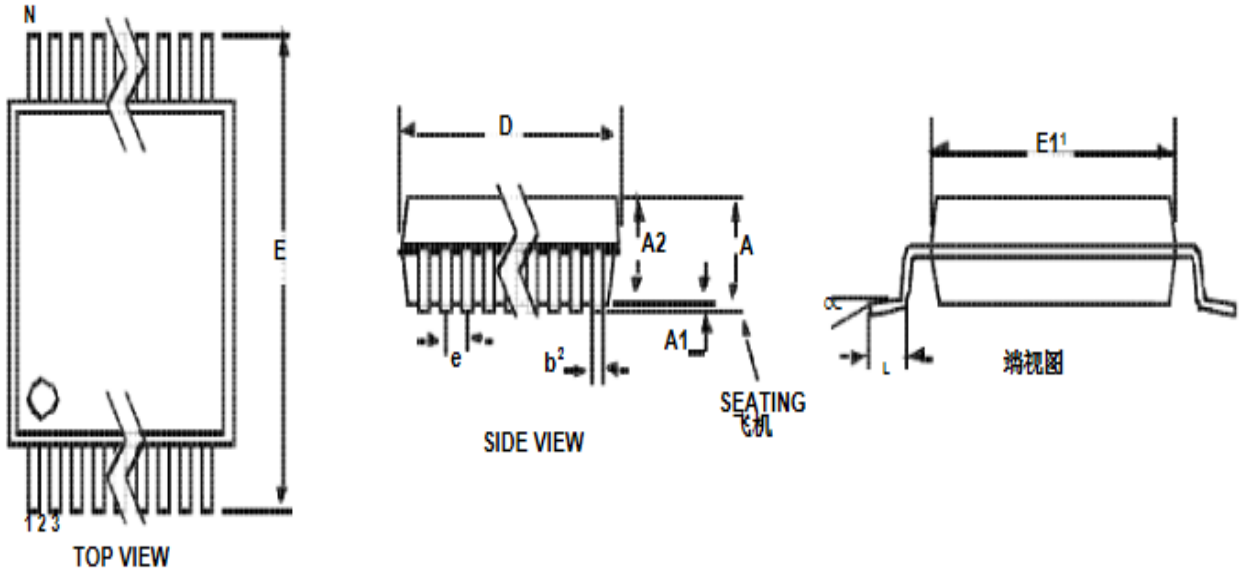
4.4 The main control circuit



MP3 Simple master chip may not require the peripheral resistance and capacitance can still work

5 , YX5200-24SS Package FIG.

24L SSOP封装图



	INCHES			MILLIMETERS			注:
DIM	MIN	NOM	MAX	MIN	NOM	MAX	
A	--	--	0.084	--	--	2.13	
A1	0.002	0.006	0.010	0.05	0.13	0.25	
A2	0.064	0.068	0.074	1.62	1.73	1.88	
b	0.009	--	0.015	0.22	--	0.38	2,3
D	0.311	0.323	0.335	7.90	8.20	8.50	1
E	0.291	0.307	0.323	7.40	7.80	8.20	
E1	0.197	0.209	0.220	5.00	5.30	5.60	1
e	0.022	0.026	0.030	0.55	0.65	0.75	
L	0.025	0.03	0.041	0.63	0.75	1.03	
∝	0°	4°	8°	0°	4°	8°	

JEDEC #: MO-150

控制尺寸为毫米.

注: 3. "D"和"E1"是参考数据,不包括塑模毛边或突起,但不包括模具
不匹配,并测量在分模线上,模具毛边或突起不得超过0.20毫米,每边.

4.尺寸"b"不包括丹巴尔症/入侵.应允许丹巴尔症
在"B"尺寸超过0.13 mm总在最大的物质条件.丹巴尔入侵不得减少尺寸"b"至少大于0.07毫米的物质条件.

5.这些尺寸适用于0.10和0.25毫米的导线头间的导线的扁平部分.

6 ,Precautions

IO input characteristics						
Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
V_{IL}	Low-Level Input Voltage	- 0.3		0.3 * VDD	V	VDD = 3.3V
V_{IH}	High-Level Input Voltage	0.7VD D		- VDD + 0.3	V	VDD = 3.3V
IO output characteristics						
Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
V_{OL}	Low-Level Output Voltage	-		0.33	V	VDD = 3.3V
V_{OH}	High-Level Output Voltage	2.7		- V		VDD = 3.3V

1 , External interface chip are 3.3V of TTL Level, so the hardware design, note that the level of power conversion problems. Also in strong interference environment, note that some protective measures electromagnetic compatibility, GPIO Using optocoupler isolation, increase TVS and many more

2 , ADKEY The key values are in accordance with the general use environment, if a strong inductive or capacitive load environment, note that the chip power supply, recommended to use separate isolated power supply, and additional beads inductor matched filtering a power supply to to ensure a clean and stable power supply input as possible. If it can not be guaranteed, please contact us to reduce the number of keys, redefine wider voltage distribution.

3 , Serial communication, in the general environment, pay attention to a good level conversion. If strong interference environment, or long distance RS485 Application, please note that signal isolation, strictly in accordance with standard industrial design communication circuit. You can contact us, we offer a reference design