JQ6500-24SS JQ6500 voice chip

1 overview

1.1 Introduction

JQ6500 is an MP3 chip that provides a serial port, which perfectly integrates the hard decoding of MP3 and WMV. Simultaneous softwareSupport TF card driver, support computer to directly update the content of spi flash, support FAT16, FAT32 file system. PassA simple serial port command can be used to complete the playback of the specified music, and how to play music and other functions, without the need for cumbersome backgroundLayer operation, easy 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 fixed voice playback

1.2 Function

(1) Support sampling rate (KHz): 8/11.025/12/16/22.05/24/32/44.1/48

(2) 24-bit DAC output, dynamic range support 90dB, signal-to-noise ratio support 85dB

(3) Fully support FAT16, FAT32 file system, maximum support 32G TF card, support 32G U disk, 64M byte NORFLASH

(4) Multiple control modes, serial port mode, AD button control mode

(5) The audio data is sorted by folder, supports up to 100 folders, and each folder can be assigned 1000 songs

(6) 30 levels of volume adjustable, 10 levels of EQ adjustable

(7) SPI flash can be connected externally, and the drive letter of the spi flash can be displayed when connected to the computer to update the content

(8) It can be controlled to play the specified music through the serial port of the single-chip microcomputer

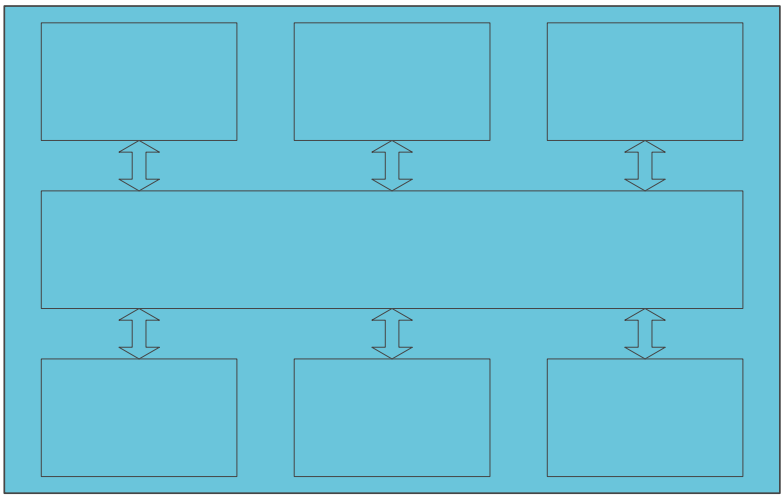
(9) Insertion function, you can insert a piece of voice when playing music, and then play that piece of music after the voice is played

(10) In the button mode, you can select the playback mode: pulse can be repeated , pulse cannot be repeated , level non-holding can loop ,Level hold can be looped

1.3 Application

1. Car navigation voice broadcast
2. Voice prompts for road transport inspections and toll stations;
3. Voice prompts for safety inspection at railway stations and bus stations;
4. Voice prompts in power, communications, and financial business halls;
5. Voice prompts for vehicle entry and exit channel verification;
6. Voice prompts of public security frontier inspection channels;
7. Multi-channel voice alarm or equipment operation guidance voice;
8. Voice announcements for safe driving of electric sightseeing vehicles;
9. Automatic alarm for mechanical and electrical equipment failure;
10. Fire voice alarm prompt;
11. Automatic broadcast equipment, regular broadcast

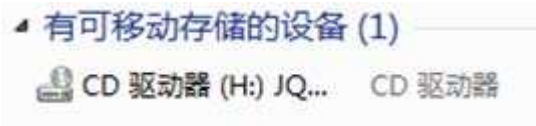
2. Chip instructions



The chip chooses the SOC solution, which integrates a 16-bit MCU and an aDSP specifically for audio decoding.The way of decoding ensures the stability and sound quality of the system. Small package size better meets the needs of embedding other productsSPI-flash change voice contentThe biggest advantage of this chip is that it can flexibly replace the voice content in the SPI-flash, eliminating the need for a traditional voice chip to be installed.The trouble of replacing the voice of the machine makes the product development and production convenient and simple.

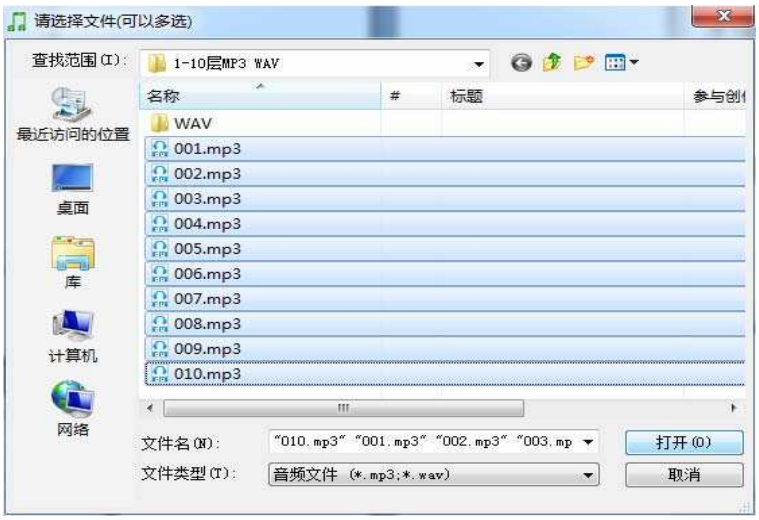
3.Update voice instructions

Connect the MINI USB of the module to the computer, open "My Computer", and double-click "CD Drive..."

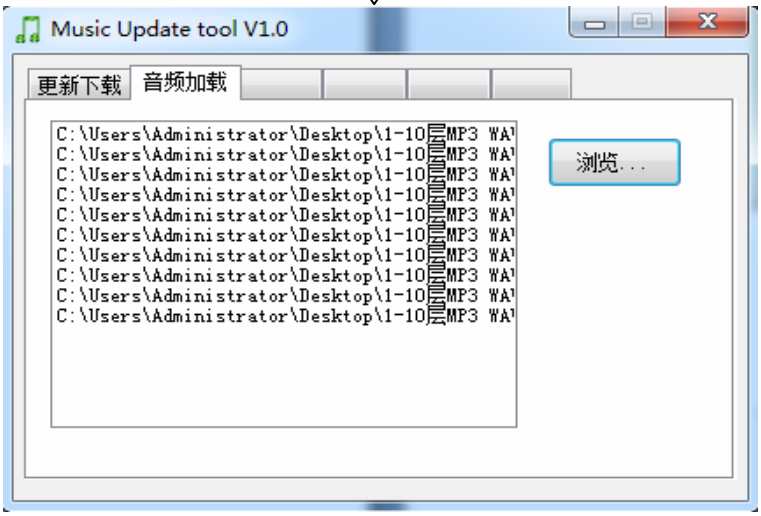


The computer will output an updated host computer software, as shown in the figure below

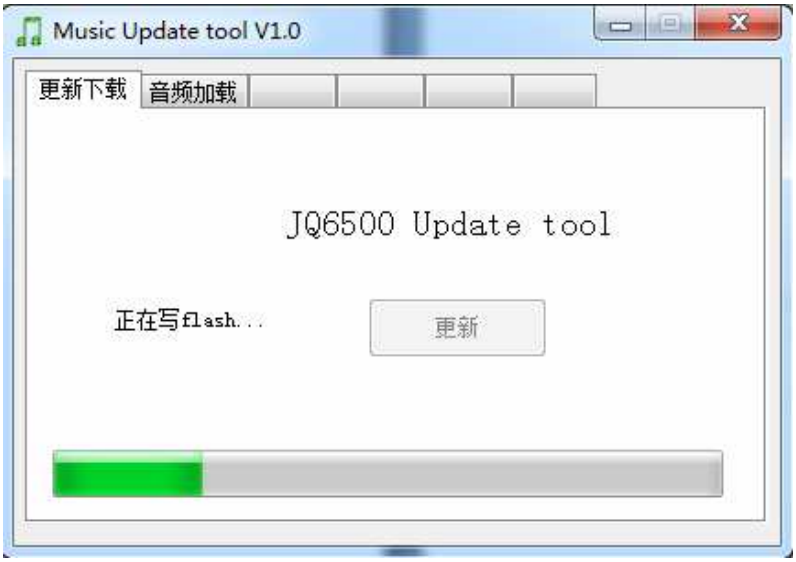
Select "Audio Load"-click "Browse"



Select the audio you want to put in, click "Open"



Audio is added to the host computer software



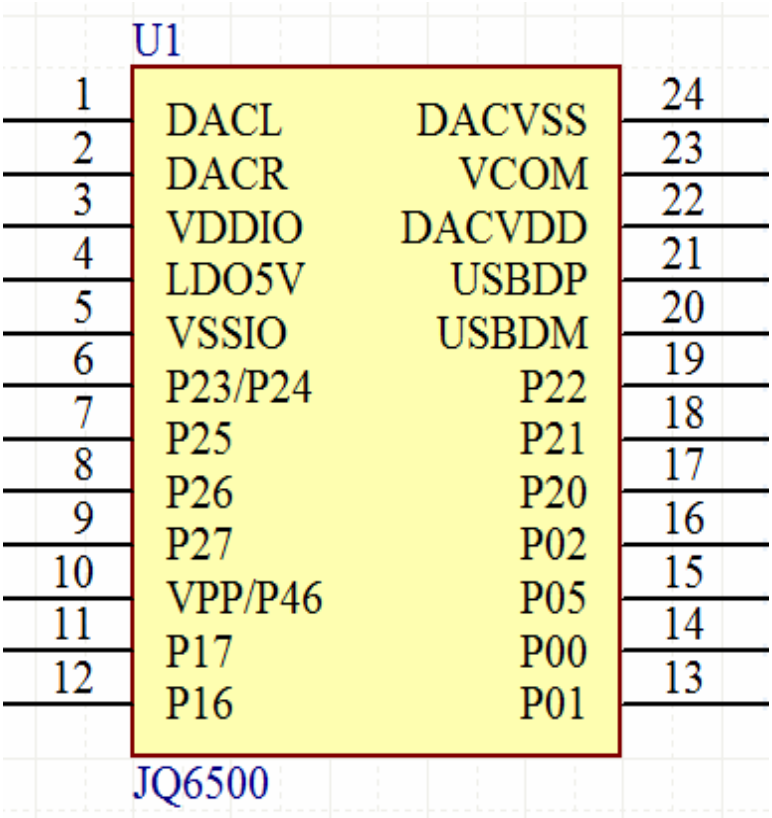
Select the "Update Download" tab, click Update, the picture shows the audio is being written

As shown in the figure, it means that the voice has been downloaded to the spi flash of the module

3.1 Hardware parameters

name	Parameter
MP3 file format	1. Support all bit rate 11172-3 and ISO13813-3 layer3 audio decoding
	2. 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 standard
UART interface	Standard serial port, TTL level, serial transmission rate can be set
Input voltage	Power supply is 3.2V-5V, the best is 4.2V
Rated current	20ma[Without U Disk]
Size	Standard SSOP24 package
Operating temperature	-40 degrees to 70 degrees
Humidity	5% to 95%

3.2 Chip pin description



Pin No.	Pin Name	Function description	Remark
1	DACL	Audio output left channel	Drive headphones, power amplifier
2	DACR	Audio output right channel	Drive headphones, power amplifier
3	VDDIO	3.3V power output	Supply power to TF card, SPI, 24C02
4	VDD	5V power input	Can not exceed 5.2V
5	VSS	Power ground	
6	TX	UART serial data output	
7	RX	UART serial data input	
8	NC	none	
9	AUXR	Play indicator	Must be connected to a triode
10	GPIOA0	Infrared remote control receiver	
11	GPIOA1	Busy output	Output high level
12	GPIOA2	SPI_CS Chip Select Bus	
13	GPIOA3	SPI_DO data bus	
14	GPIOA4	SPI_CLK data bus	
15	GPIOA5	ADKEY2 external button	22K pull up
16	GPIOA6	ADKEY1 external button	22K pull up
17	GPIOB4	SD_CLK clock bus	Connect 0 ohm resistor to 24C02 6 pin for memory
18	GPIOB3	SD_CMD command bus	Connect 0 ohm resistor to 24C02 5 pin for memory
19	GPIOB2	SD_DAT data bus	
20	GPIOB1	USB- DM	Connect the USB flash drive and the USB port of the computer
21	GPIOB0	USB+ DP	Connect the USB flash drive and the USB port of the computer
22	NC	Programming port	
23	VCOM	Decoupling	
24	DACVSS	Land	

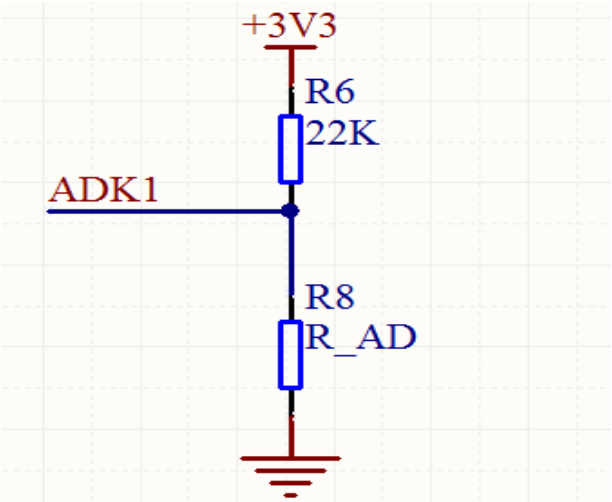
4 Description of control method

4.1 Button interface

The chip we use is the AD button method, instead of the traditional matrix keyboard connection, the advantage of this is that it makes full use ofMCU has more and more powerful AD functions. The design is simple but not simple. By default, our chip is equipped with 2 AD ports and 20 buttons.Value distribution, if used in strong electromagnetic interference or strong inductive and capacitive loads, please refer to our "Precautions"

(1) Reference schematic diagram

One	第一段语音
Two	第二段语音
Three	第三段语音
Four	第四段语音
Five	第五段语音
MODE	模式选择（选择播放SPIFLSH还是TF卡 或者U盘里面的内容）
PREV	短按上一曲长按音量减
NEXT	短按下一曲长按音量加
PLAY	播放或暂停



R_AD 值	对应功能
悬空	脉冲可重复
24K	电平保持可循环
33K	电平非保持可循环
51K	脉冲不可重复

4.2 Communication format

支援非同步串口通訊模式,通過串口接受上位機發送的命令

Communication standard:9600 bps

Data bits: 8

Check digit: none

Flow control: none

Format:$S VER Len CMD Feedback para1 para2 checksum $0		
$S	Start bit 0x7E	Each command feedback starts with $, which is 0x7E
Len	len last byte number	Len + CMD + para1 + para2
CMD	Command word	Indicates specific operations, such as play/pause, etc.
para1	Parameter 1	The high byte of the data to be queried (such as song number)
para2	Parameter 2	Low byte of data to be queried
$0	End bit	End bit 0xEF

For example, if we specify to play, we need to send: 7E 04 03 00 01 EF, red represents the number of songs, 01 represents The first song, 02 means the second song..... That is to count from 01;

The data length is 4, and these 4 bytes are [04 03 00 01]. The start and end are not counted.

Combination play:

Send continuously [7E 04 03 00 01 EF] [7E 04 03 00 02 EF] [7E 04 03 00 03 EF], then the firstOne song, second song, third song, up to ten songs can be combined, and it stops after playing.

4.3 Communication commands

1 Directly sent instructions, no need to return parameters

Command	Function	Parameters (16 bits) and corresponding command format
0x01	next track	【7E 02 01 EF】
0x02	previous piece	【7E 02 02 EF】
0x03	Specified track (NUM)	0-65535、SPI(0-200) 【7E 04 03 00 01 EF】means to play the first piece of music The red font means the number of segments played can be changed by yourself
0x04	Volume+	【7E 02 04 EF】
0x05	Volume-	【7E 02 05 EF】

0x06	Specify volume	0-30【7E 03 06 15 EF】The red font is the volumeRange 00 to 1E
0x07	Specify EQ(0/1/2/3/4/5)	Normal/Pop/Rock/Jazz/Classic/Base 【7E 03 07 01 EF】The red font can be changed from 00 to 05
0x09	Designated equipment (0/1/2/3/4)	U/TF/AUX/SLEEP/FLASH 【7E 03 09 01 EF】The red font can be changed from 00 to 05
0x0A	Go to sleep low power consumption	Pause playback 【7E 02 0A EF】
0x0C	Chip reset	【7E 02 0C EF】
0x0D	Play	【7E 02 0D EF】
0x0E	Pause	【7E 02 0E EF】
0x0F	Up and down folder switching	1:Next folder. 0:Previous folder 【7E 03 0F 00 EF】The red font can be described as 00 01
0x10	Reserve	
0x11	Loop play	0 1 2 3 4 (ALL FOL ONE RAM ONE_STOP) 【7E 03 11 00 EF】The red font is 00 01 corresponds to the corresponding Mode, 00 means all loops, 01 means single loops;For example: To play the second song in a loop, send 7E 03 11 01 EF firstSend 7E 04 03 00 02 EF again150MS apart)
0x12	Specify folder file playback	01 01 (01 at the front refers to the file folder, 01 at the back refers to the file) Remarks 1 【7E 04 12 01 01 EF】 Play the 01 file in the 01 file folder
	Insertion function	This function must exist both flash and TF card, namely TF card storageMusic, flash storage voice, can be inserted when playing musicEnter a piece of voice, after the voice is played, continue from the point where it was disconnectedPlay music. Operation mode: when playing the music of TF card, first transferChange to flash, that is, send the command: [7E 03 09 04 EF], thenWhich flash voice segment to send after: [7E 04 03 00 01EF], use BUSY to detect after playing, and then send the command to switch to TFCard, that is, send the command: [7E 03 09 01 EF], and then send the broadcastCommand: [7E 02 0D EF]

1. Query system parameters

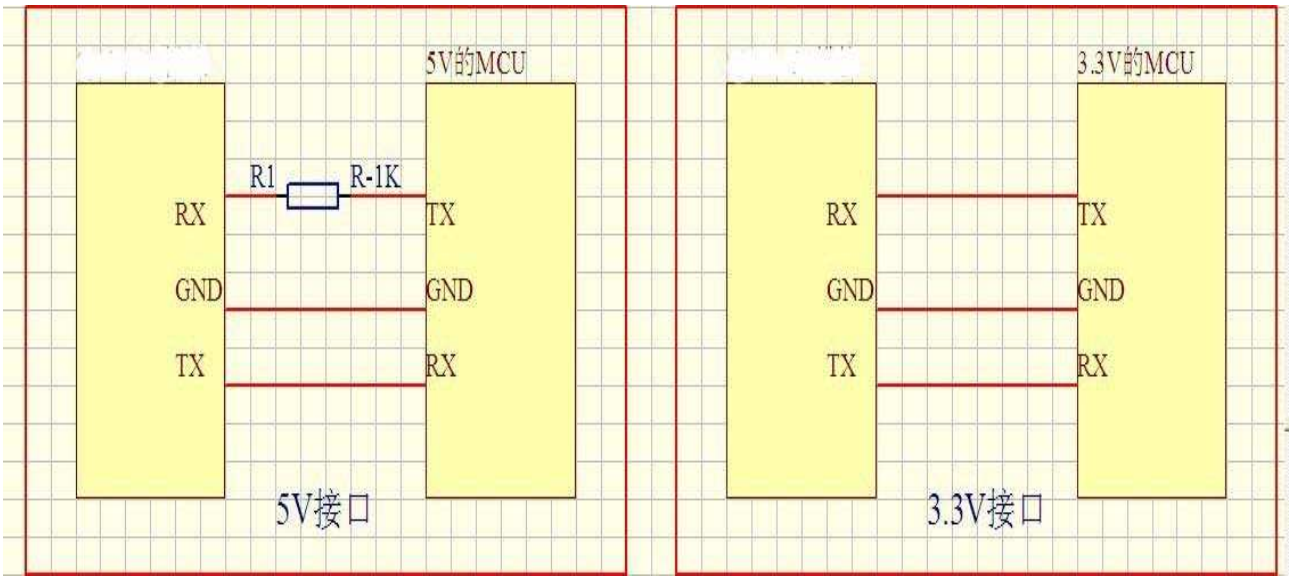
Command	Function	Description and command format
0x40	Return error, request retransmission	
0x42	Query current status	Three states of play, stop and pause 【7E 02 42 EF】
0x43	Query current volume	【7E 02 43 EF】
0x44	Query current EQ	The return value 012345 corresponds to (Normal/Pop/Rock/Jazz/Classic/Base) 【7E 02 44 EF】
0x45	Query the current play mode	The return value 0 1 2 3 4 corresponds to (ALL FOL ONE RAM ONE_STOP) 【7E 02 45 EF】
0x46	Query the current software version	【7E 02 46 EF】
0x47	Query the total number of files in the TF card	【7E 02 47 EF】
0x48	Query the total number of files in UDISK	【7E 02 48 EF】
0x49	Query the total number of files in FLASH	【7E 02 49 EF】
0x4B	Query the current track of the TF card	【7E 02 4B EF】
0x4C	Query the current track of UDISK	【7E 02 4C EF】
0x4D	Query the current track of FLASH	【7E 02 4D EF】
0x50	Query current play time	【7E 02 50 EF】
0x51	Query the total time of the currently playing song	【7E 02 51 EF】
0x52	Query the name of the currently playing song	The return value is the name of the song (SPIflsh does not support) 【7E 02 52 EF】
0x53	The total files of the current folder queried Number of clips	【7E 02 53 EF】

5、Reference circuit

Contending for the application of the chip provides a detailed design reference, so that you can get started more quickly to experience the powerful functions of the chip

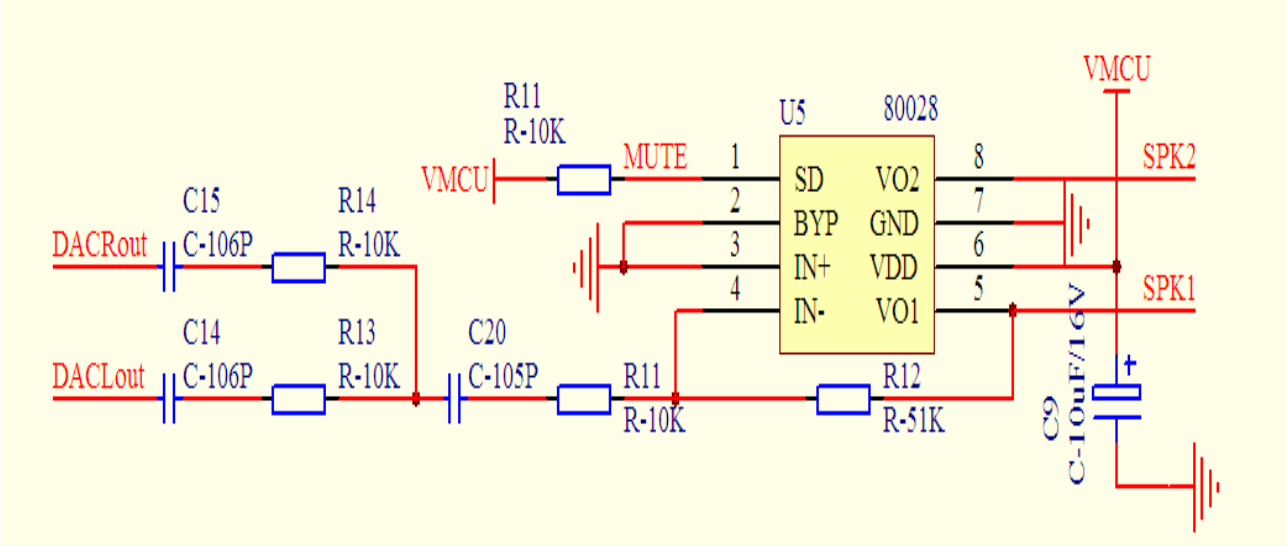
- Serial communication interface, the serial transmission rate defaults to 9600, which can be modified according to customer requirements
- The interface circuit of the external AD button, the function of the button can be customized according to customer needs
- External mono power amplifier reference circuit

5.1 Serial interface



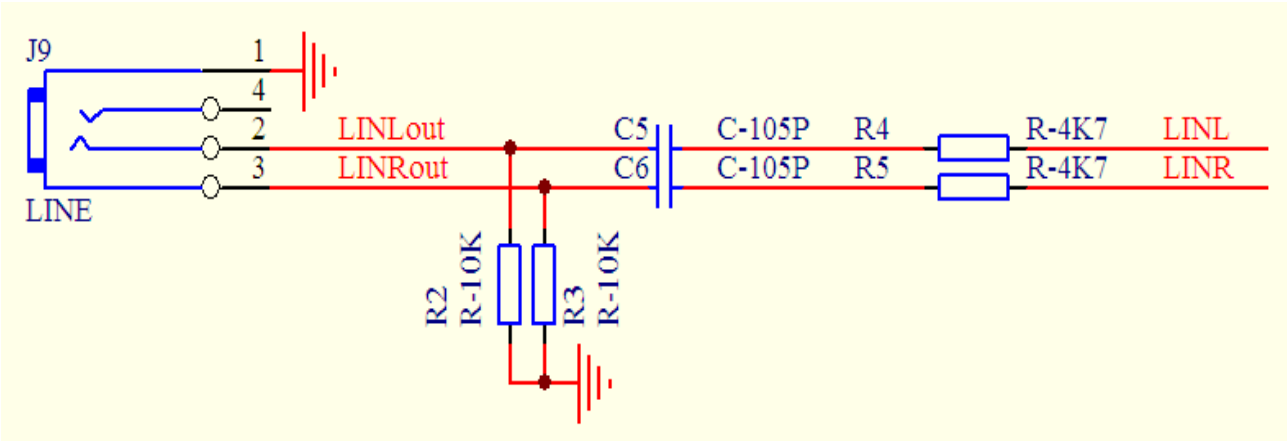
The serial port of the chip is 3.3V TTL level, so the default interface level is 3.3V. If the system is 5V. SoIt is recommended to connect a 1K resistor in series with the docking interface of the serial port. This is sufficient to meet the general requirements, if applied to strongIn the case of electromagnetic interference, please refer to the description of "Precautions". The chip is tested normally in both 5V and 3.3V systemsTried, everything is normal. All are using the direct connection method, and there is no string of 1K resistors

5.2 External mono power amplifier



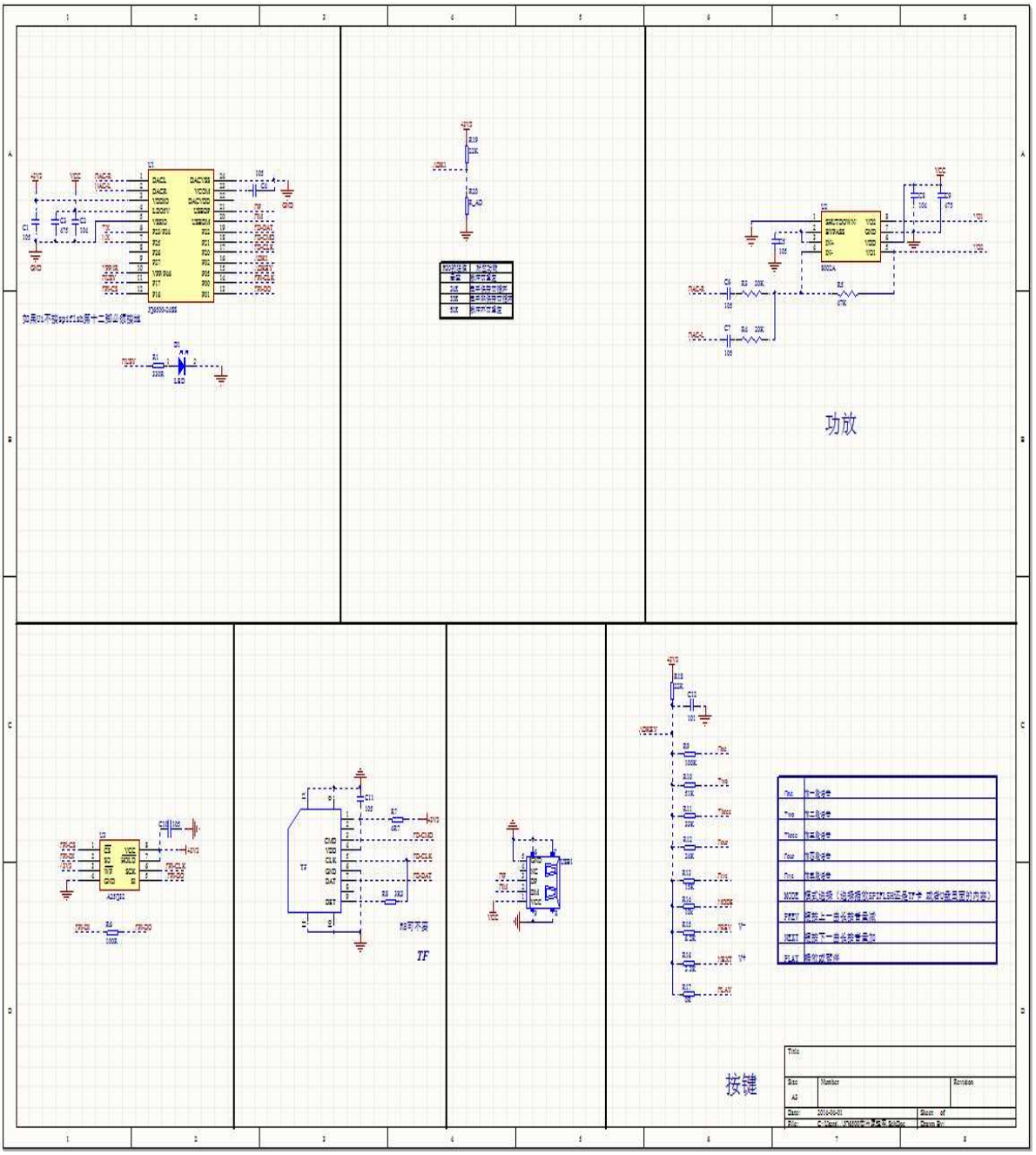
The power amplifier we use is 8002, please refer to the IC datasheet for specific parameters. It is enough for general occasions, if you pursue a higher sound quality, please find the right amplifier by yourself

5.3 External headphone circuit



R4 and R5 are limiting resistors to prevent the external sound source from being too large (the maximum value of Vp-p is 3.0V) and affecting the stability of the system. C1 and C2 are separated direct capacitor to prevent the DC level of the external audio source from affecting the internal bias of the chip. R2 and R3 reserve resistors for the design of large power amplifiers.

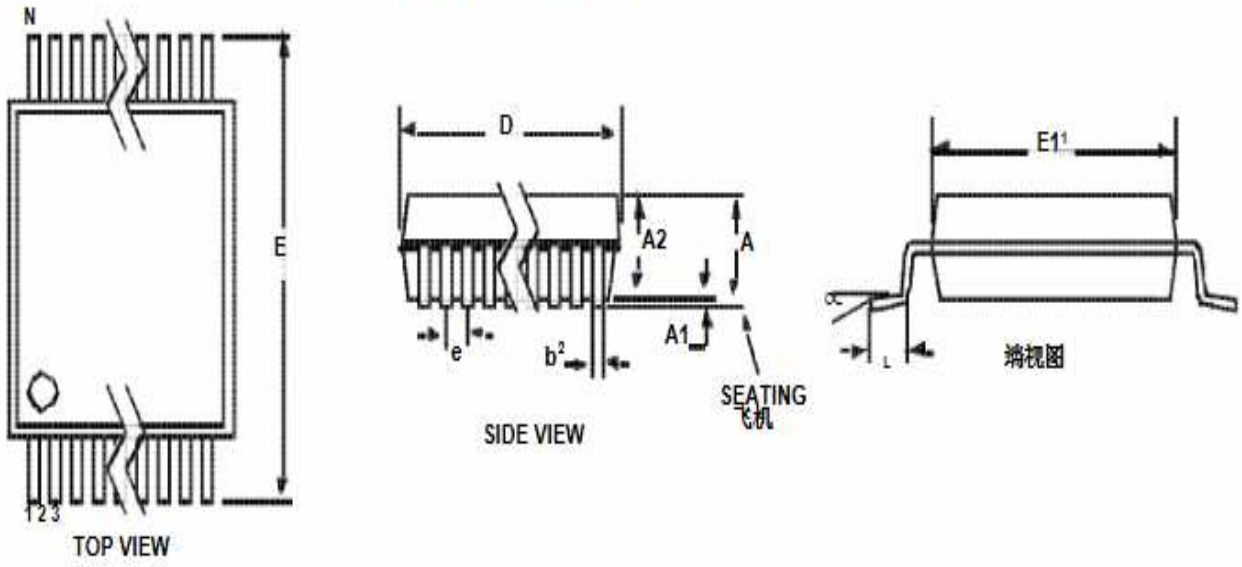
5.4 Main control circuit



The periphery of the MP3 main control chip is simple and can work without the need for resistors and capacitors.

6、JQ6500-24SS

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.

7. Matters needing attention

IO input characteristics						
Symbol	Parameter	Minimum	Typical	Maximum	Unit	test conditions
V_{IL}	Low-Level Input Voltage	-0.3	-	0.3*VDD	V	VDD=3.3V
V_{IH}	High-Level Input Voltage	0.7VDD	-	VDD+0.3	V	VDD=3.3V
IO output characteristics						
Symbol	Parameter	Minimum	Typical	Maximum	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. The external interface of the chip is 3.3V TTL level, so in the design of the hardware circuit, please pay attention to the level conversion.Change the problem. In addition, in a strong interference environment, please pay attention to some protection measures for electromagnetic compatibility. GPIO adopts optocoupler isolationAway, increase TVS, etc.

2. The values of the ADKEY buttons are in accordance with the general use environment, if in a strong inductive or capacitive load environment,Please pay attention to the power supply of the chip. It is recommended to use a separate isolated power supply, in addition to be equipped with magnetic beads and inductors to filter the power supply.The input power must be as stable and clean as possible. If there is no guarantee to reduce the number of buttons, reDefine wider voltage distribution

3. For serial communication, please pay attention to the level conversion in the general use environment. If strong interference environment, or long distanceRS485 application, please pay attention to the isolation of the signal, and design the communication circuit strictly in accordance with the industry standard

8 Disclaimer

■ Development pre-knowledge

JQ series products will provide as comprehensive development templates, drivers and application documentation as possible for the convenience of usersBut it also requires users to be familiar with the hardware platform used by their design products and the knowledge of the related C language

■ EMI and EMC

The mechanical structure of the JQ series chip determines that its EMI performance is bound to be different from the integrated circuit design. JQ series chipThe EMI can meet most applications. If users have special requirements, they must negotiate with us in advance.The EMC performance of the JQ series chips is closely related to the design of the user's backplane, especially the power supply circuit, I/O isolation,To determine the circuit, the user must fully consider the above factors when designing the backplane. We will work hard to improve the electricalMagnetic compatibility, but does not provide any guarantee for the EMC performance of the end-application product of the user

■ ESD electrostatic discharge point protection

Some components of the JQ series products have built-in ESD protection circuits, but in harsh environments, users are still recommendedProvide ESD protection measures when designing the backplane, especially the power supply and IO design, to ensure the stable operation of the product, andIn order to ensure safety when installing QY series products, please discharge the static electricity accumulated on the body, such as wearing reliable grounded static electricity.Ring, touch the water pipe connected to the earth, etc.