Guangzhou Yuexin Electronic Technology Co., Ltd. www.YX080.com YX5200-24SS chip instruction manual

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Taobao: http://mk020.taobao.com/ QQ: 2213825928 Mobile: 13862211855 Phone: 020-36776060

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1. Overview

1.1 Introduction

YX5200-24SS is a voice chip that provides serial port, which integrates MP3, WAV and WMA perfectly.
Hard decoding. At the same time, the software supports TF card driver and supports FAT16 and FAT32 file systems. Through a simple serial port
So that you can finish playing the specified music, and how to play music and other functions, without the cumbersome underlying operation, the user
Stable and reliable is the biggest feature of this product.

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, support up to 32G TF card, support 32G U disk, 64M bytes NORFLASH

4. A variety of control modes are available. IO control mode, serial mode, AD button control mode

5. The broadcast language insertion function can pause the background music being played. After the ad is finished playing, return to the background sound and continue playing.

6, audio data sorted by folder, up to 100 folders, 255 tracks per folder

7, 30 levels adjustable, 6 EQ options

1.3 Application

1, car navigation voice broadcast

2. Road transportation inspection and voice prompts of toll stations;

3, the railway station, bus station security check voice prompts;

4. Voice prompts for power, communication and financial business halls;

5. The voice prompt is verified by the vehicle entrance and exit channels;

6. Voice prompts for public security frontier inspection channels;

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

8, electric sightseeing car safe driving voice notice;

9. Automatic alarm of mechanical and electrical equipment failure;

10, fire alarm alarm prompts;

11, automatic broadcast equipment, scheduled broadcast

2. Module instructions

The module selects the SOC scheme, integrates a 16-bit MCU, and a dedicated aDSP for audio decoding.
The way of decoding ensures the stability and sound quality of the system. Small package size for more embedded products

2.1 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, baud rate can be set
Input voltage	3.3V-5V
Rated current	15ma [without U disk]
size	23 (length) * 20 (width) [unit: mm]
Operating temperature	-40 degrees - 80 degrees
humidity	5% ~ 95%

2.2 pin description

Pin number	Pin name	Functional description	Remarks
1	DACL	Audio output left channel	Drive headphones, amplifier
2	DACR	Audio output right channel	Drive headphones, amplifier
3	VDDIO	3.3V power output	Powering 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	no	
9	AUXR	Play indicator	Must be connected to the triode
10	GPIOA0	Infrared remote control reception	
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	String 0 ohm resistor connected to 24C02 6 feet for memory
18	GPIOB3	SD_CMD command bus	String 0 ohm resistor connected to 24C02 5 feet for memory
19	GPIOB2	SD_DAT data bus	
20	GPIOB1	USB-DM	USB port and computer USB port
twenty one	GPIOB0	USB+ DP	USB port and computer USB port

twenty two	NC	Burning port
twenty three	VCOM	Decoupling
twenty four	DACVSS	Ground

3. Serial communication protocol

As a kind of communication commonly used in the field of control, the serial port is optimized at the industrial level, the verification of the added fra
Measures such as error handling greatly enhance the stability and reliability of communication, and at the same time expand the more powerful RS485 on
For the networking function, the communication baud rate of the serial port can be set by itself. The default is 9600.

3.1 Communication format

Support asynchronous serial communication mode, accept commands sent by host computer through serial port

Communication standard: 9600 bps
Data bits: 1
Check digit: none
Flow control: none
Format: $S VER Len CMD Feedback para1 para2 checksum $O

$S	Start bit 0x7E	Each command feedback starts with $, which is 0x7E
VER	version	Version information [currently defaults to 0xff]
Len	Number of bytes after len	Checksum is not counted
CMD	Command word	Indicates specific actions, such as play/pause, etc.
Feedback	Command feedback	Whether feedback is needed, 1 feedback, 0 no feedback
Para1	Parameter 1	Query data high byte (such as song number)
Para2	Parameter 2	Query data low byte
Checksum	Checksum [occupies two bytes]	Accumulate and check [excluding start bit $]
$O	End position	End bit 0xEF

For example, if we specify to play NORFLASH, we need to send: 7E FF 06 09 00 00 04 FF dd EF
The data length is 6, and these 6 bytes are [FF 06 09 00 00 04]. Start, end, and check are not calculated. Then then get
The result is in the meal

3.2 communication instructions

1 , directly sent instructions, no need to return parameters

CMD command (instruction)	Corresponding function	Parameter (16 bits)
0x01	next track	
0x02	previous piece	
0x03	Specified track (NUM)	1-2999
0x04	Volume +	
0x05	volume-	
0x06	Specified volume	0-30
0x07	Designated EQ0/1/2/3/4/5	Normal/Pop/Rock/Jazz/Classic/Bass
0x08	Single loop specified track playback	0-2999
0x09	Designated playback setting	1/2/3/4/5 U/SD/AUX/SLEEP/FLASH
0x0A	Going to sleep -- low power consumption	
0x0B	Reserved	
0x0C	Module reset	
0x0D	Play	
0x0E	time out	
0x0F	Specified folder playback	1-10 (need to set it yourself)
0x10	PA settings (none)	[DH=1: Turn on the sound] [DL: Set the gain 0-31]
0x11	Loop all	[1: Loop play] [0: Stop loop playback]
0x12	Specify MP3 folder tracks	0--9999
0x13	Interstitial ad	0--9999
0x14	Support 15 folders	See the detailed instructions below for details.
0x15	Stop inserting, play background	
0x16	Stop play	

2 , query the parameters of the system

Detailed CMD command (check Inquiry)	Corresponding function	Parameter (16 bits)
0x3C	STAY	
0x3D	STAY	
0x3E	STAY	
0x3F	Send initialization parameters	0 - 0x0F (lower four digits represent one device)
0x40	Return error, request resend	
0x41	Answer	
0x42	Query current status	

0x43	Query current volume	
0x44	Query current EQ	
0x45	Query current play mode	This version retains this feature
0x46	Query current software version	This version retains this feature
0x47	Query the total number of files in UDISK	
0x48	Query the total number of files in the TF card	
0x49	Query the total number of files in FLASH	
0x4A	Reserved	
0x4B	Query the current track of UDISK	
0x4C	Query the current track of the TF card	
0x4D	Query the current track of FLASH	

3.3 data returned by the module

The module will return data in key locations. For the user to control the working state of the module

- ■ The module successfully initializes the data after power-on.
- ■ The module plays the data of the current track
- ■ The module successfully received an ACK (response) returned by the instruction.
- ■ The module receives one frame of data error [including data incomplete and verification error]
- ■ When the module is busy, data comes over and the module returns a busy command.
- ■ U disk and TF card are inserted and removed, and all data is returned.

3.3.1 Data returned by the module power-on

(1), the module is powered on, it takes a certain amount of time to initialize. This time is required according to the U disk, TF card, flash and other devices Less decided, the general situation is 1.5 ~ 3S this time. If the initialization data of the module has not been sent yet,

Description Module initialization error, please reset the power of the module, and check the hardware connection.

(2), module initialization data includes online devices, such as sending 7E FF 06 3F 00 00 01 xx xx EF

DL = 0x01 indicates that only the USB flash drive is online during power-on.

For other data, please refer to the table below. The relationship between each device is OR

U disk -- online	7E FF 06 3F 00 00 01 xx xx EF	The relationship between the devices
TF -- online	7E FF 06 3F 00 00 02 xx xx EF	
PC -- online	7E FF 06 3F 00 00 04 xx xx EF	
FLASH -- online		

7E FF 06 3F 00 00 08 xx xx EF
U disk, TF -- online 7E FF 06 3F 00 00 03 xx xx EF

(3), the MCU must wait for the module initialization command to be sent before sending the corresponding control command, otherwise the sent commanc
For processing. It also affects the normal initialization of the module.

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3.3.2 Data returned after the track has been played

U disk played the first song	7E FF 06 3C 00 00 01 xx xx EF U disk playback 1st song completed
U disk played the second song	7E FF 06 3C 00 00 02 xx xx EF U disk playback second song completed
TF card played the first song	7E FF 06 3D 00 00 01 xx xx EF TF card playback 1st song completed
TF card played the second song	7E FF 06 3D 00 00 02 xx xx EF TF card playback 2nd song completed
FLASH played the first song	7E FF 06 3E 00 00 01 xx xx EF FLASH Play the first song
FLASH plays the second song	7E FF 06 3E 00 00 02 xx xx EF FLASH Play the second song

1. For many trigger-type playback requirements, our module correction automatically enters the stop state after playing a song. If the user needs
Such an application. Just specify the track to play. In this way, the track will automatically stop when it finishes playing, waiting for the command.

2. In addition, we specifically open up an IO as a status indicator for decoding and stopping. See pin 6, GPIO1

(1), playback status output low level [many amplifiers have silent feet, you can directly control through this IO]

(2), play pause state, output high level. Module sleep state. Also high

3, for the continuous play application, can be achieved. If the U disk plays the first song, it will return
7E FF 06 3C 00 00 01 xx xx EF

3C ---- indicates the U disk command

00 01 ---- Indicates the track that has finished playing. At this point, the instruction to play the next song is sent, and the loop can be played in sequence.

4. After the module is powered on, the initialization is normal, and the module will automatically enter the device playback state.
And stop decoding, waiting for the user to send the broadcast
Related instructions

5. After the user specifies the device, it needs to wait for 200ms and then send the specified track, because once the track is specified,
The system will initialize the file system for the specified device. If the specified track command is sent immediately, the module will not receive it.

3.3.3 module response returned data

FLASH played the first song	7E FF 06 3E 00 00 01 xx xx EF FLASH Play the first song

(1) In order to enhance the stability between data communication, we have added the response processing, and the ACKB byte is to set whether it needs to answer. The advantage of this is to ensure that there is a handshake signal for each communication, and the response is sent to the data sent by the MCU.
Received and processed immediately.

(2) For general applications, the customer is free to choose, and it is also possible to add this response.

3.3.4 Data returned by module error

Return busy	7E FF 06 40 00 00 01 xx xx EF module at file system initialization
Currently in sleep mode	7E FF 06 40 00 00 02 xx xx EF Sleep mode only supports specified devices
Serial port receiving error	7E FF 06 40 00 00 03 xx xx EF Serial port one frame of data has not been received
Verification error	7E FF 06 40 00 00 04 xx xx EF and check error
Specified file out of range	7E FF 06 40 00 00 05 xx xx EF file specification exceeds the set range
The specified file was not found	7E FF 06 40 00 00 06 xx xx EF specified as file not found
Insert instruction error	7E FF 06 40 00 00 07 xx xx EF Current status does not accept insertions

(1) In order to enhance the stability between data communication, we have increased the data error handling mechanism.
The module receives data that does not conform to the format.
There will be feedback from the information

(2) In the case of a harsh environment, customers are strongly advised to handle this order.
If the application environment is normal, you can do it without processing.

(3), the module returns busy, basically it will return when the module is powered on, because the module needs to initialize the file system.

(4) After the module is powered on, the device status is entered. The order of the device is U disk--TF card--FLASH. If both the U disk and the TF card
If it is not online, it will automatically enter the FLASH state. If all devices are not online, the module will go to sleep

(5), as long as we refer to the test SDK program we gave, transplant the serial port operation part, there will be no verification error, here
Users are strongly advised to use the verification method we have given. Because no one can guarantee that the transmission of data will not go wrong.

(6), the file specified part of the error, please refer to the "Specified file name playback detailed description" below

3.3.5 Device Insertion and Removal Messages

U disk insertion	7E FF 06 3A 00 00 01 xx xx EF
TF insertion	7E FF 06 3A 00 00 02 xx xx EF
PC insertion	7E FF 06 3A 00 00 04 xx xx EF
U disk pull out	7E FF 06 3B 00 00 01 xx xx EF
TF pull out	7E FF 06 3B 00 00 02 xx xx EF
PC pull out	7E FF 06 3B 00 00 04 xx xx EF

(1) In order to enhance the flexibility of the module, we have added a special feedback on the insertion and removal of the device.
User-friendly to know the module
Working status.

(2) When the device is plugged in, we enter the device waiting state by default. If the user inserts a USB flash drive, you can see U.
The disc light flashes. You can also receive serial port messages inserted by the device.

3.4 serial port instructions

Below we give a detailed description of the key areas:

■ Specify track playback [for playback in physical order of storage]

■ Specify the volume to play

■ Specify the device to play

■ Specify folder playback [There are many ways to do this, see the detailed description below]

■ All loop playback instructions

3.4.1 Specify song playback instructions

The instruction we give is to support the specified track playback. The song selection range is 0~2999. In fact, it can support more.
Because of the file system involved, supporting too many songs will cause the system to operate slowly, and the general application does not need to suppo
A lot of files. If the customer has an unconventional application, please communicate with us beforehand.

(1) For example, select the first song to play, the transmission part of the serial port 7E 10 06 03 00 00 01 FF E6 EF

7E --- Start command

FF --- version information

06 --- Data length (without verification)

03 --- represents the command byte

00 --- Do you need to answer [0x01: need to answer, 0x00: no need to return a response]

00 --- High byte of track [DH]

01 --- Low byte [DL] of the track, here represents the first song to play

FF --- check the high byte

E6 --- Low byte of verification

EF --- End command

(2) For the selected song, if you select the 100th first, first convert 100 to hexadecimal. The default is double-byte, which is 0x0064.

DH = 0x00 ; DL = 0x64

(3) If you select the 1000th first to play, first convert 1000 to hexadecimal, the default is double byte, it is 0x03E8

DH = 0x03 ; DL = 0xE8

(4), other operations can be analogized, because the use of hexadecimal in the embedded field is the most convenient operation.

3.4.2 Specify the volume playback command

(1), our system power-on default volume is 30, if you want to set the volume, you can directly send the corresponding command

(2) For example, the specified volume is 15 levels, and the command sent by the serial port: 7E FF 06 06 00 00 0F FF D5 EF

(3), DH = 0x00; DL = 0x0F, 15 is converted to hexadecimal 0x000F. You can refer to the instructions for playing the track section.

3.4.3 Specifying a playback device

(1), our module supports 4 types of playback devices by default, only the device can be specified to play the device online.
Whether the device is online or not, our software will automatically detect it without user relationship.

(2), look at the table below, select the appropriate command to send

(3) After specifying the device. The module will automatically enter the stop decoding state, waiting for the user to specify the track to play.
From receiving the specified device to
The module internally completes the initialization of the file system. It takes about 200ms.
Please wait for 200ms before sending the instruction for the specified track.

Specify playback device - U disk	7E FF 06 09 00 00 01 xx xx EF xx xx: stands for verification
Specify playback device - SD disk	7E FF 06 09 00 00 02 xx xx EF

Designated playback device - AUX 7E FF 06 09 00 00 03 xx xx EF
Designated playback device - FLASH 7E FF 06 09 00 00 04 xx xx EF
Designated playback device - PC 7E FF 06 09 00 00 05 xx xx EF Refers to [Read Card, Sound Card] mode
Designated playback device - SLEEP 7E FF 06 09 00 00 06 xx xx EF

3.4.4 Specifying a folder to play

Specify 001xxx.mp3 in folder 01	7E FF 06 0F 00 01 01 xx xx EF
Specify 100xxx.mp3 in folder 11.	7E FF 06 0F 00 0B 64 xx xx EF
Specify 255xxx.mp3 in folder 99	7E FF 06 0F 00 63 FF xx xx EF

(1), the specified folder playback is an extension function we have developed, the default folder naming method is "01", "11" way because of me
Our module does not support folder name recognition for Chinese character names, for system stability and song switching speed, under each folder
The default maximum support 255 songs, up to 99 categories of folders, if the customer has special requirements, you need to follow the English name
Classification, we can also be achieved, but the name can only be composed of English names such as "GUSHI" and "ERGE". But mp3 text
The piece needs to be prefixed, and can be changed to "002 has to love .mp3" on the basis of "have to love .mp3".
(2) For example, specify the 100xxx.MP3 file of the "01" folder, and the command sent by the serial port is: 7E FF 06 0F 00 01 64 xx xx EF
DH: represents the name of the folder. By default, 99 files are supported, that is, the name of 01 -- 99
DL: represents the track, the default is up to 255 songs, ie 0x01 ~ 0xFF
(3) In order to standardize the module, you must specify a folder and file name to lock a file. Specify a folder or single
It is also possible to specify a file name uniquely, but the management of such a file will be worse.
The specified folder and the specified track are supported by MP3, WAV
(4), the following two figures illustrate the designation of the folder and file name [two points left and right]

3.4.5 Specifying the track play in the **MP3** folder

Specify MP3 folder 7E FF 06 12 00 00 01 FE E8 EF "MP3" folder, track is "0001"
7E FF 06 12 00 00 02 FE E7 EF "MP3" folder, track "0002"
7E FF 06 12 00 00 FF FD EA EF "MP3" folder, track is "0255"
7E FF 06 12 00 07 CF FE 13 EF "MP3" folder, track "1999"
7E FF 06 12 00 0B B8 FE 26 EF "MP3" folder, track is "3000"

(1), based on the specified folder and file name, we extend the function of a single folder, the folder must be named "MP3"
(2), support up to 65536 tracks, but due to the operating speed of the file system, the track may change as the file increases.
The speed will slow down accordingly.
(3) The specified files are named as follows:

3.4.6 Inserting ads under the **ADVERT** folder

Interstitial ad	7E FF 06 13 00 00 01 FE E7 EF "ADVERT" folder, track "0001"
	7E FF 06 13 00 00 02 FE E6 EF "ADVERT" folder, track is "0002"
	7E FF 06 13 00 00 FF FD E9 EF "ADVERT" folder, track is "0255"
	7E FF 06 13 00 07 CF FE 12 EF "ADVERT" folder, track "1999"
	7E FF 06 13 00 0B B8 FE 25 EF "ADVERT" folder, track is "3000"

(1), we support the insertion of other tracks during the song selection process, so that it can meet the needs of background music playback.
In the process of inserting the demand for advertising.

(2) After sending the 0x13 command, the system will store the IDV3 information of the track currently playing, and then play the specified interlaced track
After the inserted track has finished playing, the system will return to the saved playback breakpoint to continue playing. Until the playback is complete.

(3) The format is set to create a folder with the name "ADVERT" in the device, and store the tracks that need to be inserted in the device.
Yes, the track is set to "0xxx+track name.MP3/WAV"

(4) In addition, if the system is currently in the pause or stop state, the insertion of the insert instruction will not be responded, and there will be an error m
return. If you are in the process of inserting, you can continue to insert other tracks, but after playing, you will return to the first storage.

IDV3 Information Office.

(5), the specified interstitial ads are set as follows:

3.4.7 Single folder supports **1000** tracks

Support 1000 7E FF 06 14 00 10 FF FD D8 EF Folder designated as "01", track is "0255"

7E FF 06 14 00 17 CF FE 01 EF The folder designated as "01", the track is "1999"

7E FF 06 14 00 C0 01 FE 26 EF A folder designated as "12", the track is "0001"

7E FF 06 14 00 C0 FF FD 28 EF A folder designated as "12", the track is "0255"

7E FF 06 14 00 C7 CF FD 51 EF A folder designated as "12", the track is "1999"

For many customers, we require 10 folders, each of which can manage the requirements of 1000 tracks. We specially add this instruction.
The user calls, the detailed description is as follows:

(1), the command byte of the serial port is 0x14

(2), the parameter is two bytes, if "specified as "12" folder, the track is "1999"

Serial port data: 7E FF 06 14 00 C7 CF FD 51 EF

Where 0xC7 and 0xCF are parameters, which are combined to be 0xC7CF. A total of 16 bits

The high 4 digits represent the name of the folder, where C represents 12

The lower 12 bits indicate the name of the file name, where 7CF stands for 1999, which is the track with the file prefix "1999".

(3), the folder is named as follows:

3.4.8 Fixed voice information stored in **FLASH**

Track number	Track name	Track number	Track name
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	10 female voices.mp3	12	11Mp3 ringtones.mp3
13	12 Bund 18th. mp3	14	13 home.wav
15	14 have to love .wav	16	

Note: It contains audio files in MP3 and WAV format. All are audio files without any compression. Does not contain any folders,
Located at the root of the file system

3.4.8 All loop playback instructions

(1), for some of the requirements of the loop below the root directory, we need to add this control command 0x11.

Loop start 7E FF 06 11 00 00 01 xx xx EF	Loop all tracks
Loop playback stopped 7E FF 06 11 00 00 00 xx xx EF	Stop looping to play tracks

(2), during the loop playback, you can play/pause normally, the previous song, the next song, the volume adjustment, including EQ, etc.

(3) After the loop playback starts, the module will continuously play the tracks in the device according to the physical order of storage. After the broadcast

Will continue to play aside until it receives the completion of the play, or pauses, etc.

3.4.9 single loop playback command

Loop start 7E FF 06 08 00 00 01 xx xx EF	Loop the first song
Loop playback stopped 7E FF 06 08 00 00 02 xx xx EF	Looping the second song

(1), for some requirements that require a single loop, we improve this control command 0x08.

(2), during the loop playback, you can play/pause normally, the previous song, the next song, the volume adjustment, including EQ, etc. And the state is still looping. You can turn off looping by specifying a single to trigger playback or go to sleep.

3.4.10 Play Status Query Command

Now Playing	7E FF 06 42 00 00 01 xx xx EF Now playing
Pause playback	7E FF 06 42 00 00 02 xx xx EF is suspended during playback
Stop play	7E FF 06 42 00 00 00 xx xx EF playback completed

当前在睡眠状态7E FF 06 42 00 00 08 xx xx EF 无设备在线或者被指定睡眠

(1)、模块在解码过程中会有四种状态对用户开放。用户可以通过指令查询获取模块的当前状态

(2)、播放暂停是指，正在播放一首曲目，人为的发送指令暂停播放，
播放停止是指，一首曲目播放完毕，模块就处于播放停止的状态

3.4.11播放停止指令

停止播放广告	7E FF 06 15 00 00 00 FE E6 EF 停止当广告，回到背景音乐继续播
停止播放	7E FF 06 16 00 00 00 FE E5 EF 停止软件解码

(1)、在模块的播放过程中，我们有两种停止方式，一种是停止当前的插播广告，回到当前断点处继续播放背景音乐。另一种是停止所有的播放，包括背景音乐

(2)、假如当前在播放插播广告，这时发送停止指令0x16，芯片会停止所有播放任务

3.4.12指定文件夹循环播放

指定文件夹循环播放	7E FF 06 17 00 00 02 FE E2 EF	指定02文件夹循环播放
	7E FF 06 17 00 00 01 FE E3 EF	指定01文件夹循环播放

(1)、文件夹的命名方式必须是”01” --- “99”。不可以超过99

(2)、指定文件夹之后，就会在指定的文件夹内部循环播放，不会停止，除非发送停止指令等等

3.4.13随机播放设备文件

随机播放	7E FF 06 17 00 00 02 FE E2 EF	所有文件随机循环播放

(1)、此指令时随机播放设备里面存储的语音文件，是按照物理顺序随机播放，不分设备里面是否带有文件夹。并且播放的第一个语音文件必须是设备里面的第一个语音文件

3.4.14对当前的曲目设置为循环播放

指定文件循环播放	7E FF 06 19 00 00 00 FE E2 EF	单曲循环播放开启
	7E FF 06 19 00 00 01 FE E1 EF	单曲循环播放关闭

(1)、在播放的过程中发送此指令，会循环播放当前的曲目。如果当前是处理暂停或者停止状态，则芯片不会响应此指令

(2)、如果要关闭单曲循环播放，发送关闭的指令即可，这样会把当前的曲目播放完毕之后，就停止。

3.4.15开启和关闭**DAC**

设置 **DAC**	7E FF 06 1A 00 00 00 FE E1 EF	开DAC
	7E FF 06 1A 00 00 01 FE E0 EF	关DAC[高阻]

(1)、在一些用户需要叠加自己音源的场合，可以先暂停当前播放的语音，再将我们芯片的DAC 输出设置为高阻，这样用户就可以一个功放来播放自己的音源了，但是DAC 的开启和关闭，会有一声po 音，请用户朋友们注意。

、芯片任何时候都可以关闭DAC。如果当前正在播放语音，关闭了DAC，芯片还会继续播放，只是没有声音而已了。芯片上电之后是默认开启DAC 的，只有被设置为关闭之后，才会被关闭。如果再需要打开，就需要通过指令打开DAC 了

3.4.12声卡功能

模块的USB 口跟电脑连接，就可以通过MP3-TF-16P 模块播放电脑的声音，但电脑的输出要设置一下

右击电脑右下角的小喇叭，如1 图，再左击“播放设备”弹出对话框，如2 图，右击'扬声器CD002'后右击“设置为默认设备”这里MP3-TF-16P 就有声音输出了。

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3.5按键接口

模块我们采用的是AD 按键的方式，取代了传统了矩阵键盘的接法，这样做的好处是充分利用了MCU 越来越强大的AD 功能。设计简约而不简单，我们模块默认配置2 个AD 口，20 个按键的阻值分配，如果使用在强电磁干扰或者强感性、容性负载的场合，请参考我们的“注意事项”。

(1)、参考原理图

(2)、20 个按键的功能分配表

按键	短按	长按	Remarks
K1	播放模式		切换打断/不可打断
K2	播放设备切换		U/TF/SPI/睡眠
K3	工作模式		全部循环
K4	播放/暂停		
K5	上一曲	音量+	
K6	下一曲	音量-	
K7	4	循环播放4	长按就是一直循环到掉电或按别的按键
K8	3	循环播放3	长按就是一直循环到掉电或按别的按键
K9	2	循环播放2	长按就是一直循环到掉电或按别的按键
K10	1	循环播放1	长按就是一直循环到掉电或按别的按键
K11	5	循环播放5	长按就是一直循环到掉电或按别的按键
K12	6	循环播放6	长按就是一直循环到掉电或按别的按键
K13	7	循环播放7	长按就是一直循环到掉电或按别的按键
K14	8	循环播放8	长按就是一直循环到掉电或按别的按键
K15	9	循环播放9	长按就是一直循环到掉电或按别的按键
K16	10	循环播放10	长按就是一直循环到掉电或按别的按键
K17	11	循环播放11	长按就是一直循环到掉电或按别的按键
K18	12	循环播放12	长按就是一直循环到掉电或按别的按键
K19	13	循环播放13	长按就是一直循环到掉电或按别的按键
K20	14	循环播放14	长按就是一直循环到掉电或按别的按键

3.6遥控功能

按键	短按	Remarks
CH-	工作模式	打断/不打断
CH	播放设备切换	U/TF/SPI/睡眠
CH+	播放模式	全部循环
PREV	上一曲	长按快速音量－
NEXT	下一曲	长按快速音量+
PLAY/PAUSE	播放/暂停	
VOL-	音量－	
VOL+	音量+	
EQ	EQ 切换	Normal/Pop/Rock/Jazz/Classic/Base
0	0	
100+	睡眠	
200+	确定键	
1	1	
2	2	
3	3	
4	4	
5	5	
6	6	
7	7	
8	8	
9	9	

遥控器数字键有指定的功能，比如按1 对应第一段按2 对应第二段按存储器的物理位置决定
遥控器数字键有组合的功能，比如按2 再按1，就播放21 段

4 、参考电路

争对芯片的应用，我们提供了详细的设计参考，让您可以更快的上手体验到该芯片的强大功能
3、串行通信接口，波特率默认9600，可以根据客户的要求修改
4、外部AD 按键的接口电路,按键的功能可以按照客户需求订制
5、外部单声道功放参考电路

4.1串行接口

芯片的串口为3.3V 的TTL 电平，所以默认的接口的电平为3.3V。如果系统是5V。那么建议在串口的对接接口串联一个1K 的电阻。这样足以满足一般的要求，如果应用于强电磁干扰的场合，请参考“注意事项”的说明。芯片在5V 和3.3V 的系统中均正常的测试过，一切正常。均在采用的是直连的方式，并没有串1K 的电阻。

4.2外接单声道功放

这里功放我们采用的是8002，具体参数请参考IC的datasheet。应用于一般场合足以，如果追求更高的音质，请客户自行寻找合适的功放。

4.3外接耳机电路

这里R4 和R5 为限幅电阻，防止外部音源幅度过大(Vp-p 最大值为3.0V)，影响系统的稳定性，C1 和C2 为隔直电容，防止外部音源的直流电平影响到芯片内部的偏置;R2 和R3 预留电阻给大功放设计用

4.4主控电路

MP3 主控芯片外围简单可以不需要电阻电容照样可以工作

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5 、 YX5200-24SS封装图

1 、注意事项

模块的使用,关键的地方做如下说明:

■ 模块的GPIO 的特性
■ 应用的中注意事项
■ 串口编程部分的注意

6.1 GPIO的特性

IO 输入特性

符号参数		最小	典型	最大	unit	测试条件
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 输出特性

符号参数		最小	典型	最大	unit	测试条件
V_{OL}	Low-Level Output Voltage	-	-	0.33	V	VDD=3.3V
V_{OH}	High-Level Output Voltage	2.7	-	-	V	VDD=3.3V

6.2应用中的注意点

1、模块对外的接口均是3.3V 的TTL 电平，所以在硬件电路的设计中，请注意电平的转换问题。另外在强干扰的环境中，请注意电磁兼容的一些保护措施，GPIO 采用光耦隔离，增加TVS 等等

2、ADKEY 的按键取值均按照一般的使用环境，如果在强感性或者容性负载的环境下，请注意模块的供电，建议采用单独的隔离供电，另外再配上磁珠和电感对电源的滤波，一定要尽可能的保证输入电源的稳定和干净。如果实在无法保证，请联系我们，减少按键的数量，重新定义更宽的电压分配。

6、串口通信，在一般的使用环境下，注意好电平转换即可。如果强干扰环境，或者长距离的RS485应用，那么请注意信号的隔离，严格按照工业的标准设计通信电路。可以联系我们，我们提供设计参考

7、我们支持音频文件的采样率最低为8KHZ。也就是说低于8KHZ 的音频文件是不支持的，不能正常解码播放。用户可以使用音频处理软件，提高音频文件的采样率来解决这个问题。

5、模块在睡眠状态的电流在12ma 左右，播放TF 卡，在15ma 左右。功耗会比较大。如果使用在低功耗场合，请用户控制模块或者芯片的供电。这样可以减小芯片的功耗

6、该模块模块支持MP3、WAV、WMA 三种主流的音频格式。但是默认发货烧录的软件支持的是MP3、WAV 这两种格式。如果特别需要支持WMA 格式的需求，请提前说明

3、我们的模块支持8/11.025/12/16/22.05/24/32/44.1/48KHZ 采样率的音频文件，这些也是网络上绝大多数的音频文件的参数。如果用户的音频文件的采样率不在此范围内，是不支持播放的，但是可以通过专用的软件转换一下即可。

6.3串口操作

串口部分的操作，参见下面的流程，我们提供了完整的参照例程，供用户参考:

■ 串口的操作流程

■ 串口编程参考的说明
■ 串口操作需要延时的注意事项

6.3.1串口操作流程

1、我司提供的所有模块的串口部分的操作，均是一样的协议，所以不用担心不同模块的不兼容
2、如果对串口的操作，有任何不明白的，请一定联系我们，索取串口编程参考例程。
3、我们产品的更新，也一定会按照当前的协议版本，做到向下兼容。

6.3.2串口编程参考的说明

目前我们提供的串口编程参考代码，有两部分，第一部分是我们测试版的测试代码，相关的串口操作比较全面，另一个是基本版，只是指定曲目的范例。请用户耐心消化

6.3.3串口编程需要适当延时的注意点

1、模块上电之后，需要大概1S-1.5S 时间进行初花的相关操作，初始化完毕之后，会有初始化的相关数据发送出来。用户也可以直接不理会这些数据
2、当指定设备播放之后，需要延时200ms 的时间，再发送指定曲目等等相关指令。
3、因为模块自带文件系统，正常情况下，在曲目不大于1000 首的话，响应速度是低于50ms 的
曲目超过3000 首之后，文件系统的切换速度会变慢一点，响应速度在100ms --- 1S 之间不等

4 、免责声明

■ 开发预备知识

产品将提供尽可能全面的开发模版、驱动程序及其应用说明文档以方便用户使用但也需要用户熟悉自己设计产品所采用的硬件平台及相关C 语言的知识

■ **EMI**和**EMC**

模块机械结构决定了其EMI 性能必然与一体化电路设计有所差异。模块的EMI 能满足绝大部分应用场合，用户如有特殊要求，必须事先与我们协商.

模块的EMC 性能与用户底板的设计密切相关，尤其是电源电路、I/O 隔离、复位电路，用户在设计底板时必须充分考虑以上因素。我们将努力完善模块的电磁兼容特性，但不对用户最终应用产品EMC 性能提供任何保证.

■ 修改文档的权力

千乐微电子能保留任何时候在不事先声明的情况下对相关文档的修改权力

■ **ESD**静电放点保护

产品部分元器件内置ESD 保护电路，但在使用环境恶劣的场合，依然建议用户在设计底板时提供ESD 保护措施，特别是电源与IO 设计，以保证产品的稳定运行，安装产品为确保安全请先将积累在身体上的静电释放，例如佩戴可靠接地的静电环，触摸接入大地的自来水管等

5 、版本历史

version	日期	原因
V1.0	2013/06/10	初步确立整理
V1.1	2013/06/20	1、增加模块的错误处理，详见模块串口返回部分 2、增加指定文件夹和指定文件名操作
V1.2	2013/07/07	1、开机进入设备状态，不进入睡眠 2、增加0x11这一条全部循环播放的指令 3、AD 按键更新为10个按键的稳定版本 6、版本缺省默认为0xFF
V1.3	2013/07/18	7、增加循环播放指令0x08 1、更新播放部分的上一曲指令的bug 2、增加状态查询指令0x42 8、增加指定MP3文件夹歌曲播放
V1.4	2013/08/25	9、增加ADKEY 选择功能，接地开始顺序播放 1、在1.4版本的基础上增加广告插播功能 2、增加10个文件夹，每个文件夹支持1000首曲目 3、支持停止当前插播广告，返回背景音乐继续播放
V1.5	2013/09/18	4、支持停止解码功能 1、指定文件夹循环播放0x17 2、增加循环播放指令0x18 3、增加随机播放指令0x19
V1.6	2013/12/1	4、增加DAC 开启和关闭指令0x1A

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