WTVXXXX Series
MP3 Chip Specification

Version：V1.01

Note：

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CONTENT

1. Introduction

WTVxxxx is a voice chip uses a high-performance 32-bit processor with a maximum frequency of 120MHz. It has the characteristics of low-cost, low power consumption, strong versatility, etc., and can have a built-in voice capacity of 120 seconds to 890 seconds. The existing packages of this chip include SOP8, QFN20, QFN32. Flexible control mode: UART control mode is supported; also support one-wire serial port and two-wire serial port control mode; Support button control mode (this mode needs micro-customization); Support various sensor functions, such as extended IO control, infrared proximity sensing, temperature sensing, battery power detection, pressure sensing, etc. Please refer to the selection table and manual for details. Each control mode has been fixed before leaving the factory, and the samples need to be confirmed with our salesman first.

SOP8

QFN20

QFN32

2. Characteristics

- UART control mode: standard UART communication interface with default baud rate of 9600; Support SPI-Flash as memory. With the functions of file index play, spot insertion, single loop, all tracks loop, random play, etc. Level-32 adjustable volume, which can support 128Mbit Flash plug-in at most.
- One-line and two-line serial port control mode: voice playback, stop, loop playback and volume can be controlled through the code sending end; 16-level adjustable volume, support SPI-Flash as memory: the maximum can support external 128Mbit Flash.
- 1-line and 2-line serial port control mode: after 5 seconds of power-on, you will enter deep sleep mode by default, and you need to wake up before sending code. Otherwise, the first code sending instruction will be invalid, and it will only serve as a wake-up instruction, and the second instruction will be valid within 5 seconds. Please refer to the code sending routine provided by our company.

- One-wire and two-wire serial ports. After a single voice IC goes into deep sleep, the power consumption is less than 2uA. At present, the recording/external flash circuit is powered by the LDO 3.3V inside the chip, and the power consumption is generally about 30uA-450uA. If it needs to be controlled within 2uA, it needs to be powered by other IO ports to customize the project (communicate with our salesman);
- Key control mode: the trigger mode is flexible, and any key can be randomly set to 15 types, such as pulse repeatable trigger, pulse non-repeatable trigger, invalid key, level keeping and circulating, level keeping and circulating, previous song not circulating, next song not circulating, previous song circulating, next song circulating, volume+,volume-,play/pause, stop, play/stop, etc.
- Power-on will not play by default; With BUSY status indication, BUSY is usually at low level, and it is at high level when playing.
- Support voice high-quality audio format, support MP3 format, (audio bit rate supports 8kbps~320kbps) beautiful sound.
- Operating voltage: SOP8:2.0-3.6V, qfn20 \ qfn32: 2.0-5.5v.
- Built-in 0.5W Class D power amplifier.
- Two 16-bit asynchronous frequency divider timers.
- An infrared remote control decoder.
- 16 bit high-precision ADC.
- High-power IO driving capability, which can directly drive up to 64mA.
- The power-on initialization time of the chip is 200-300ms. Generally, a 100ms chip can complete the power-on initialization, and the remaining 200ms. Because our company has added voice replacement function, we shake hands to determine whether there is a need to update voice after the power-on initialization is completed. Therefore, it is recommended that the chip be powered on for 200-300ms before sending code control. If you need to shorten the initialization time of the chip, you can contact our company for special customization, and you can initialize it within 60ms after power-on;
- When a single chip is used (using the built-in capacity), the built-in voice should be written before leaving the factory. Customers can also make and download their own voice by creating tools.
- UART update program and voice are supported. It is recommended to reserve UART serial port when drawing board. Please refer to serial port upgrade document for upgrade.
- Note: If the voice chip needs to be hung with flash. It is suggested to use "Waytronic" flash, but other manufacturers' flash can't guarantee its normal work. (It is recommended to draw the 150mil and 208mil size compatible extensions to make it easier to stock up)
- Built-in capacity description: SOP8 package: supports WTV380-8S/WTV890-8S, QFN20: WTV120-N/WTV380-N, QFN32: WTV380-P/WTV890-P.
- When the chip is powered on and not playing, it goes into normal sleep by default, and the power consumption is 30uA.

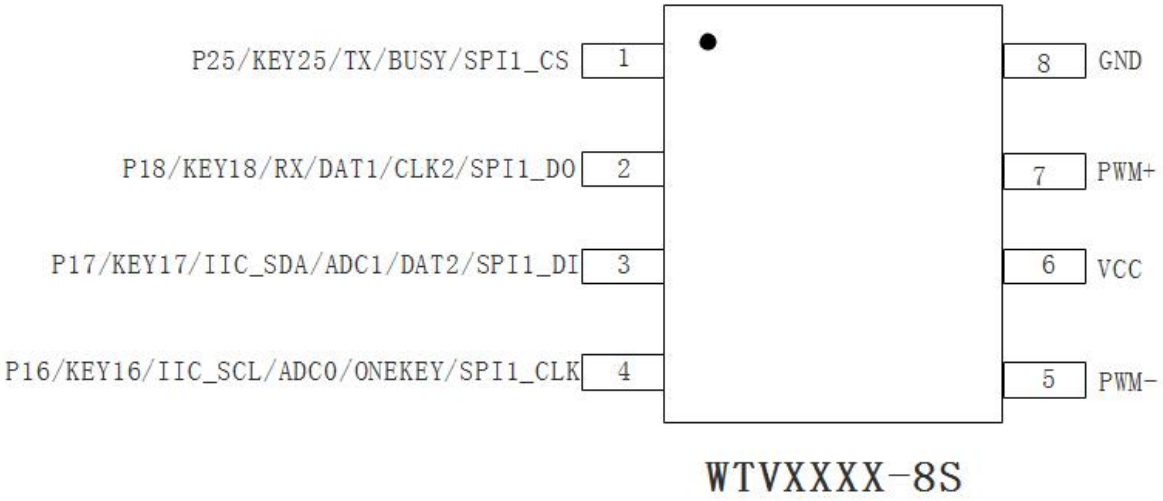
3. Selection Table

For samples: please select the corresponding chip model and function code according to the following selection table, and contact our business personnel.

Function Code	Communication Protocol	N:QFN20.P:QFN 32 8S:SOP8	Storage M ode
A04	UART	WTVxxxx-8S	Built-in storage (external Flash)
		WTVxxxx-P	
		WTVxxxx-N	
A05	One-line Serial Port(Single-byte)	WTVxxxx-8S	
		WTVxxxx-P	
		WTVxxxx-N	
A07	Two-line Serial Port(Single-byte)	WTVxxxx-8S	
		WTVxxxx-P	
		WTVxxxx-N	
A15	One-line Serial Port(Double-byte)	WTVxxxx-8S	
		WTVxxxx-P	
		WTVxxxx-N	
A17	Two-line Serial Port(Double-byte)	WTVxxxx-8S	
		WTVxxxx-P	
		WTVxxxx-N	

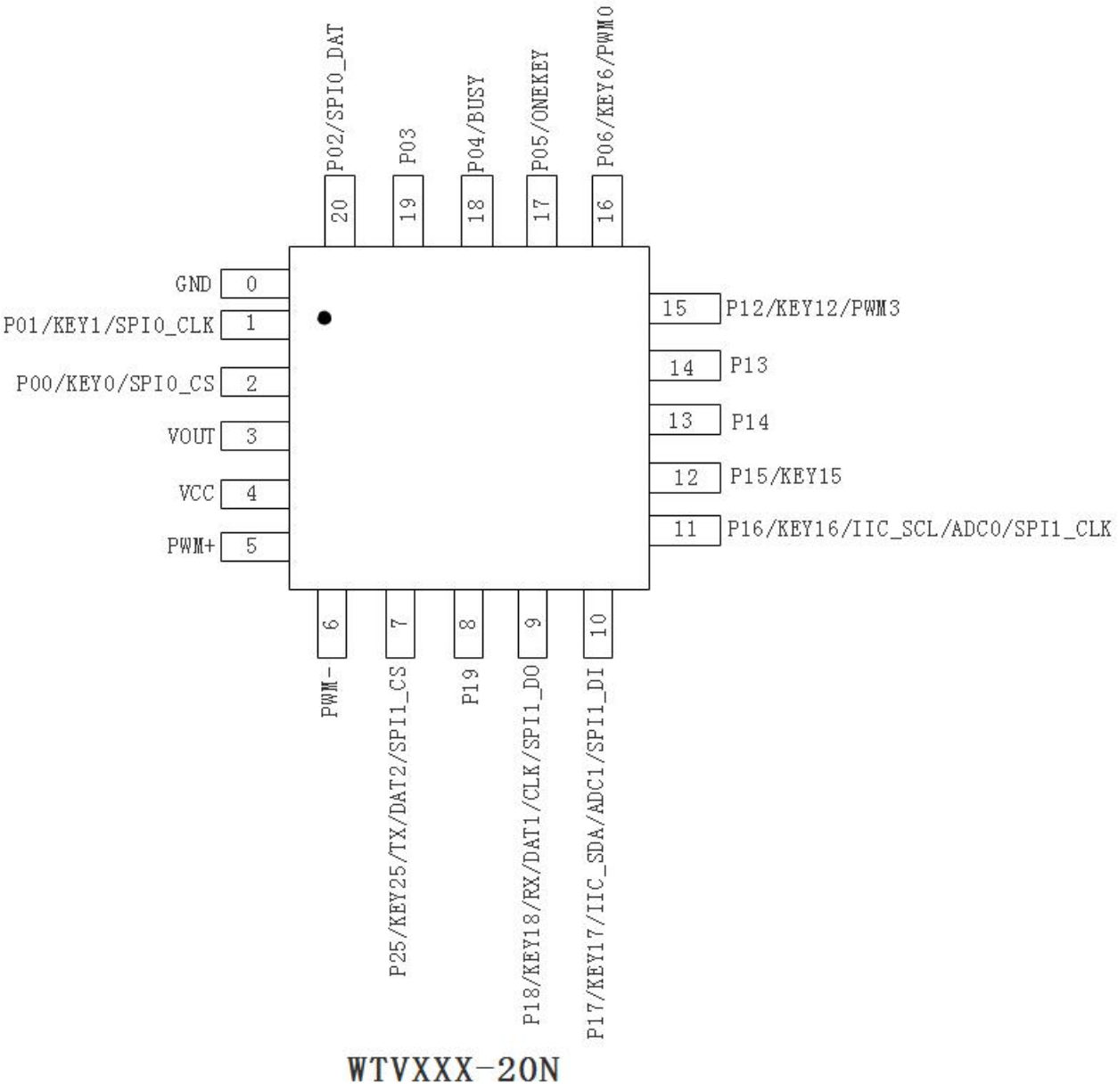
4. Pin Relevance

4.1. SOP8



Pin	Name	Type	Description
1	P25/KEY25/TX/BUSY/SPI1_CS	I/O	IO port/key 25/TX/Busy signal output /SPI1 interface chip selection
2	P18/KEY18/RX/DAT1/CLK2/SPI1_DO	I/O	IO/key 18/RX/ one-wire serial port data input/two-wire serial port clock input /SPI1 data output
3	P17/KEY17/IIC_SDA/ADC1/DAT2/SPI1_DI	I/O	IO/key 17/IIC data /ADC channel 1/ two-wire data input /SPI1 data input
4	P16/KEY16/IIC_SCL/ADC0/ONEKEY/SPI1_CLK	I/O	IO/key 16/I2C clock /ADC channel 0/ key next /SPI1 clock
5	PWM-	I/O	Horn terminal
6	VCC	P	Input (2.0~3.6V)
7	PWM+	I/O	Horn terminal
8	GND	G	GND

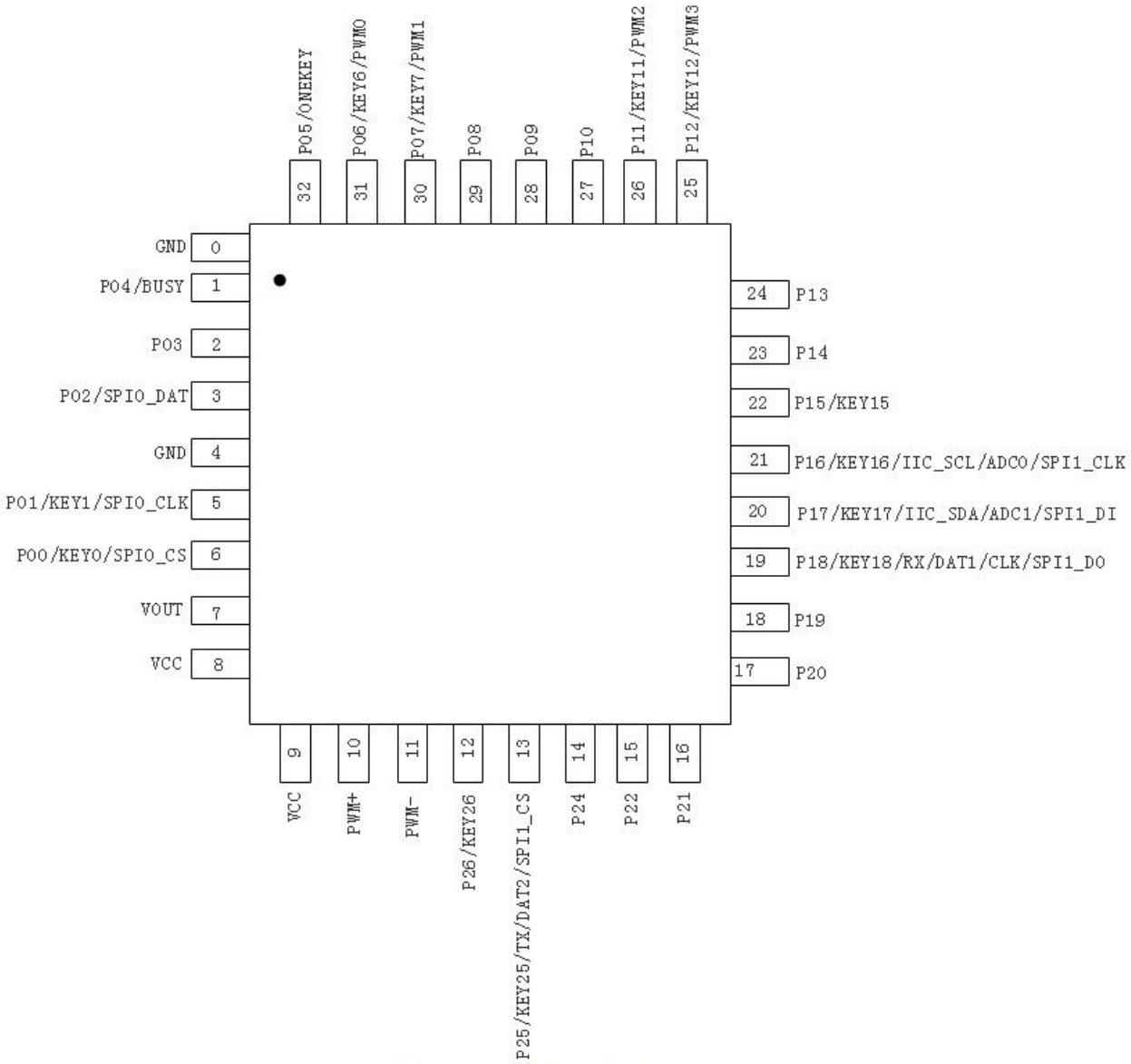
4.2. QFN20



Pin	Name	Type	Description
0	GND	G	Internal ground, must be grounded.
1	P01/KEY1/SPI0_CLK	I/O	IO port/key 1/SPI FLash serial clock signal input
2	P00/KEY0/SPI0_CS	I/O	IO/key 0/SPI Flash chip selection interface
3	VOUT	P	External memory power supply port
4	VCC	P	Input (2.0~5.5V)
5	PWM+	I/O	Horn terminal

6	PWM-	I/O	Horn terminal
7	P25/KEY25/TX/DAT2/SPI1_CS	I/O	IO port/key 25/TX/ two-wire serial port data input /SPI1 interface chip selection
8	P19	I/O	IO port
9	P18/KEY18/RX/DAT1/CLK/SPI 1_DO	I/O	IO/key 18/RX/ one-wire serial port data input/two-wire serial port clock input /SPI1 data output
10	P17/KEY17/IIC_SDA/ADC1/SP I1_DI	I/O	IO/key 17/I2C data /ADC channel 1/SPI1 data input
11	P16/KEY16/IIC_SCL/ADC0/SPI 1_CLK	I/O	IO/key 16/I2C clock /ADC channel 0/SPI1 clock
12	P15/KEY15	I/O	IO/key 15
13	P14	I/O	IO port
14	P13	I/O	IO port
15	P12/KEY12/PWM3	I/O	IO/key 12/PWM channel 3
16	P06/KEY6/PWM0	I/O	IO/key 6/PWM channel 0
17	P05/ONEKEY	I/O	IO/key next song
18	P04/BUSY	I/O	IO /Busy signal output
19	P03	I/O	IO Port
20	P02/SPI0_DAT	I/O	IO /SPI Flash data communication pin

4.3. QFN32



WTVXXXX-32N

Pin	Name	Type	Description
0	GND	G	Internal ground, must be grounded.
1	P04/BUSY	I/O	IO /Busy signal output
2	P03	I/O	IO port
3	P02/SPI0_DAT	I/O	IO /SPI Flash data communication pin
4	GND	G	Simulated ground
5	P01/KEY1/SPI0_CLK	I/O	IO port/key 1/SPI FLash serial clock signal input

6	P00/KEY0/SPI0_CS	I/OP	IO/key 0/SPI Flash chip selection interface
7	VOUT	P	External memory power supply port
8	VCC	P	Input (2.0~5.5V)
9	VCC	P	Input (2.0~5.5V)
10	PWM+	I/O	Horn terminal
11	PWM-	I/O	Horn terminal
12	P26/KEY26	I/O	IO/key 26
13	P25/KEY25/TX/DAT2/SPI1_CS	I/O	IO port/key 25/TX/ two-wire serial port data input /SPI1 interface chip selection
14	P24	I/O	IO port
15	P22	I/O	IO port
16	P21	I/O	IO port
17	P20	I/O	IO port
18	P19	I/O	IO port
19	P18/KEY18/RX/DAT1/CLK/SPI1_DO	I/O	IO/key 18/RX/ one-wire serial port data input/two-wire serial port clock input /SPI1 data output
20	P17/KEY17/IIC_SDA/ADC1/SPI1_DI	I/O	IO/key 17/I2C data /ADC channel 1/SPI1 data input
21	P16/KEY16/IIC_SCL/ADC0/SPI1_CLK	I/O	IO/key 16/I2C clock /ADC channel 0/SPI1 clock
22	P15/KEY15	I/O	IO/key 15
23	P14	I/O	IO port
24	P13	I/O	IO port
25	P12/KEY12/PWM3	I/O	IO/key 12/PWM channel 3
26	P11/KEY11/PWM2	I/O	IO/key 11/PWM channel 2
27	P10	I/O	IO port
28	P09	I/O	IO port
29	P08	I/O	IO port
30	P07/KEY7/PWM1	I/O	IO/key 7/PWM channel 1
31	P06/KEY6/PWM0	I/O	IO/key 6/PWM channel 0
32	P05/ONEKEY	I/O	IO/key next song

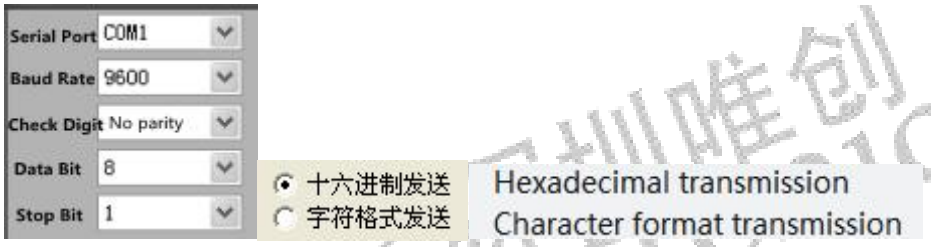
5. Control Mode

5.1. UART

Standard UART communication interface, default baud rate 9600

5.1.1. Protocol command format

UART asynchronous serial port interface is a 3.3V TTL level interface. Communication data format is: starting bit: 1 bit; Data bits: 8 bits; Parity bit: none; Stop bit: 1 bit. To use the computer serial debugging assistant, you need to set the parameters of the serial port correctly, as shown in the following figure:



Start code	length	Command code	Parameter	Accumulation and code	End code
0X7E	Check blow	Check blow	Check blow	Check blow	0XEF

Note: "Length" refers to length+command code+parameter+length of checksum, and "accumulation and checksum" refers to the low byte of the cumulative sum of length+command code+parameter.

Note: FLash voice play can realize Flash index play, combined play, and insertion.

Communication Control Instruction

CMD	Function	Parameter
A0	Specify FLASH index playback (full disk)	File Index
A1	Specify the Flash root file name.	Track Information
AA	Pause command	Nil
AB	Command to stop	Nil
AC	The next command	Nil
AD	Last song command	Nil
AE	Volume control command	Volume Series
AF	Specify the playback mode.	Cyclical pattern
B0	Combined play	Track information
B1	insert play	Track information

B8	Enter low power consumption	B8 XX

Communication Query Command

CMD	Function	Parameter
C0	Query the current software version.	C0 XX XX XX XX
C1	Query the current set volume	C1 XX
C2	Read the current working state	C2 XX
C3	Query the total number of music files in Flash	C3 XX XX
C9	Query the address of the currently playing file.	C9 XX XX
FB	Baud rate switching instruction	FB XX XX XX

5.1.2. Write Operation Instruction

5.1.2.1. Write Operation Instruction Return Code Format

Start code	**Length**	**Command code**	**parameter**	**Accumulation and code**	**End code**
0X7E	Check blow	Check blow	Check blow	Check blow	0XEF

Note: After each write command is executed, the result code corresponding to the command is returned according to the communication protocol format.

Result Code：→: 00 means：OK execution

→: 01 means：Error in Flash command, not executed.

→: 02 means：EMP does not have this file

→: 05 means：The device is not online;

5.1.2.2. Specify Flash Root Directory Index Playback (A0)

This command indexes the files in Flash to play, and the files are sorted according to the index order.The index is set before delivery.

Start code	length	command	Repertoire high byte	Repertoire low byte	Validation code	End code
7E	05	A0	00	01	XX	EF

Example：send→◇7E 05 A0 00 01 A6 EF □

receive←◆7E 04 A0 00 A4 EF

Description of track high bit/low bit: hexadecimal means that the 300th voice is 0x012C, so the track high bit is 0x01 and the track low bit is 0x2C； ; If the 67th voice is 0x43, the high bit of the track is 0x00 and the low bit of the track is 0x43.

5.1.2.3. Specify the File Name of Flash Root Directory to Play (A1)

This command can specify the file name in Flash for audio playback.（The file name is fixed with 4 characters and does not support Chinese.）

Start code	Length	Command	File name				Validation code	End code
7E	0A	A1	'30'	'30'	'30'	'31'	XX	EF

Among them, "30, 30, 30, 31" are ASCII codes of 0001, only the file names are ASCII codes, and other data are hexadecimal values; The above instructions indicate that the audio file named "0001" in the specified root directory can be played as shown in the example.

Note: The file name does not support Chinese. The file name exceeds 4 characters, so you cannot specify the file name to play.

Example：send→◇7E 07 A1 30 30 30 31 69 EF □

receive←◆7E 04 A1 00 A5 EF

5.1.2.4. Pause Playback Command (AA)

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

In the playing state, send this instruction, and then pause the playing; In the pause state, send this command, and then continue to play music from the pause.

Sending this instruction in the stopped state is invalid.

Example：send→◇7E 03 AA AD EF □

receive←◆7E 04 AA 00 AE EF

5.1.2.5. Stop Order (AB)

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

Send this command to stop playing the currently playing music.

Example：send→◇7E 03 AB AE EF □

receive←◆7E 04 AB 00 AF EF

5.1.2.6. The Next Command (AC)

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

This instruction can trigger playing the next music in the current directory, and sending this instruction can trigger playing the first music when playing the last music.

Example：send→◇7E 03 AC AF EF □

receive←◆7E 04 AC 00 B0 EF

5.1.2.7. Last song command (AD)

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

This command can trigger the playing of the previous music in the current directory, and when the first music is played, sending this command can trigger the playing of the last music.

Example：send→◇7E 03 AD B0 EF □

receive←◆7E 04 AD 00 B1 EF

5.1.2.8. Volume Control Command (AE)

There are 32 levels of volume, ranging from 0 to 31, of which 0 is mute and 1F is the maximum volume.（This command has power-down memory.）

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

In the example, the maximum volume is 31. This instruction can modify and adjust the volume in real time.

Example：send→◇7E 04 AE 1F D1 EF □

receive←◆7E 04 AE 00 B2 EF

5.1.2.9. Specify the Playback Mode (AF)

This instruction modifies the playback mode when it is powered on, and will restore the default mode when it is powered off.（This command has no power-down memory.）

Start code	Length	Command	Command	Validation code	End code
7E	04	AF	00: Single does not play in loop mode (default)	B3	EF
			01: single loop mode	B4	
			02: All tracks play in a loop mode.	B5	
			03: Random mode	B6	

Example：send→◇7E 04 AF 01 B4 EF □

receive←◆7E 04 AF 00 B3 EF

5.1.2.10. Combined Play Instruction (B0)

Start code	Length	Command	Track Number	Track 1	Track 2	Track 3	Validation code	End code
7E	07	B0	03	0001	0003	0002	XX	EF

Note: When this instruction is received, the playing track will be suspended, and then the playing track specified in this instruction will be executed. After the first specified track is played, the subsequent tracks that need to be combined will be automatically played until all the tracks are played, and the maximum number of combined tracks can be 20.

When the first multicast command is not finished, when the second multicast command is sent, the combined playing track starts playing again according to the new combined command.

Track Number：→03；means：The number of tracks to be played in combination is 3;

Track 1：→0001；means：The first track played by the combination is the first song in the memory;

Track 2：→0003；means：The second track played by the combination is the third song in the memory;

Track 3：→0002；means The combined third track is the second song in the memory;

The symbol 05 in the example indicates the combination of five songs, namely“0001 0001 000B 000A 0002”。

Example：send→◇7E 0E B0 05 00 01 00 01 00 0B 00 0A 00 02 DC EF □

receive←◆7E 04 B0 00 B4 EF

5.1.2.11. In-stream Instruction(B1)

This instruction can only be inserted in the playing state, and the insertion in the stopping state is invalid.

Start code	Length	Command	Marking Word	Track High Bit	Track Low Bit	Validation code	End code
7E	06	B1	00	00	01	XX	EF

When this instruction is sent, the playing track will be paused, and then the playing track specified in this instruction will be executed. When the playing is finished, the original paused track will be played.

When the first break-in command is not finished, the second break-in command is invalid. You can't break the music again until the first break is finished.

Example：send→◇7E 05 B1 00 04 BA EF　//Interrupt the 4th audio in Flash

receive←◆7E 04 B1 00 B5 EF

5.1.2.12. Enter Low Power Consumption (B8 00)

Send this instruction to make the chip enter the low-power sleep mode.

Start code	Length	Command	Parameter	Validation code	End code
7E	04	B8	00	BC	EF
			01	BD	

The power consumption of instruction "00" is less than 2uA, and the instruction wake-up time is 100ms.
The power consumption of instruction "01" is less than 30uA, and the wake-up time of instruction is 2ms.

Note: The chip wakes up at the falling edge of RXD pin. It is recommended to send 0x00 0x00 to wake up. When using the plug-in Flash scheme, the sleep power consumption is related to the plug-in FLash.

Example：send→◇7E 04 B8 00 BC EF □

receive←◆7E 04 B8 00 BC EF

5.1.2.13. Query the Current Software Version (C0)

This instruction is used for version confirmation, tracing and querying version problems, precise positioning, etc.

Start code	Length	Command	Validation code	End code
7E	03	C0	C3	EF

Example：send→◇7E 03 C0 C3 EF □

receive←◆7E 19 C0 57 54 43 32 32 30 33 32 36 2D 31 35 30 2D 41 32 30 56 34 2E 30 30 A1 EF

‘57 54 43 32 32 30 33 32 36 2D 31 35 30 2D 41 32 30 56 34 2E 30 30’ Hexadecimal conversion string is represented as：WTC220326-150-A20V4.00 ，”WTC”：Company Name，”220326”：On March 26th, 2022, a version of the program was released, "150": the internal code of our company, "A20": the function code of the corresponding selection table, and "V4.00": the corresponding version number.

5.1.2.14. Query the Current Set Volume (C1)

This instruction is used to query the current playing volume. The example shows that the current volume is "1f" level 31.

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

Example：send→◇7E 03 C1 C4 EF □
receive←◆7E 04 C1 1F E4 EF

5.1.2.15. Read the Current Working State (C2)

This instruction is used to query the current playing state. Example "02" means that during the playing process, the stop "AB" instruction has been sent to stop playing audio.

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

Result Code：→: 01 means：play；
→: 02 means：Stop；
→: 03 means：suspend；

Example：send→◇7E 03 C2 C5 EF □
receive←◆7E 04 C2 02 C8 EF

5.1.2.16. Query the Total Number of Music Files in FLASH (C3)

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

Example number is 11 audio = "000b"

Example：send→◇7E 03 C3 C6 EF □
receive←◆7E 05 C3 00 0B D3 EF

5.1.2.17. Query the Address of the Currently Playing File (C9)

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

The return address of is represented by two bytes.

Note: Example "00 03" indicates the address bit of the third song in the root directory when the current song is played.

Example：send→◇7E 03 C9 CC EF □

receive←◆7E 05 C9 00 03 D1 EF

5.1.2.18. Baud rate Switching Instruction (FB)

Start code	Length	Command	Parameter			Validation code	End code
7E	06	FB	01	C2	00	C4	EF

Switch baud rate FB command. This command has power-down memory (the default baud rate is 9600 at power-on), and the baud rate parameter is set to hexadecimal display. The above "parameter" value "01 C2 00" (represented by three bytes) corresponds to 115200, which means that the baud rate is set to 115200. The maximum baud rate of IC can be set to 1Mbps.

Example： send→◇7E 06 FB 00 25 80 A6 EF //Set baud rate to 9600.

receive←◆7E 04 FB 00 FF EF //After the baud rate is changed for about 100ms, the return value is returned at the baud rate of 9600.

Note: After the baud rate is switched, the baud rate of the voice chip will be updated immediately. For example, if the current communication baud rate is 9600, and the current baud rate of MCU or serial port is still set at 9600 after sending FB command, the received return code value and sending command will be abnormal. Generally, the baud rate of MCU and serial port needs to be set and modified synchronously within 100ms, and the initial set return value is 7E 04 FB 00 FF EF.

When the communication baud rate is set higher, it is necessary to determine the highest communication baud rate supported by the main control MCU and the frequency offset range to ensure that no frequency offset will occur.

5.2. First-line Serial Port Control Mode

Serial mode can use MCU to send DATA to WTVxxxx series voice chips through data line to achieve the control purpose. It can control voice playing, stopping, circulating, etc.

5.2.1. Correspondence of First-line Voice Address

Data (hexadecimal)	Function
00H	Play the 0 th speech.
01H	Play the first speech.
02H	Play the second speech.
…….	
DDH	Play paragraph 221 of voice.
DEH	Play paragraph 222 of voice.
DFH	Play paragraph 223 of voice.

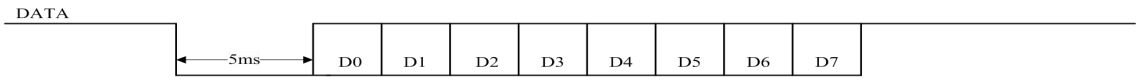
Note: If you want to play the address voice, you can automatically play the address voice by sending the address, and the time interval between the two address commands should be greater than 4ms.

5.2.2. First-line Voice and Command Code Correspondence Table

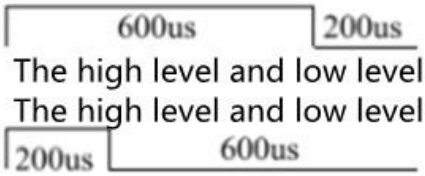
Command Code	Function	Description
F0H	Enter deep sleep mode (< =2ua)	After executing this command, the chip directly enters the deep sleep mode; After entering sleep, the chip wakes up along the falling edge of the DATA foot, and it takes 100ms to receive the command effectively. The setting is valid in the wake-up state.
E0H....EFH	E0 volume is the smallest, EF volume is the largest, and there are 16 levels of volume adjustment.	In voice playback, send this command to adjust the volume at the end of playback or in standby state.
F2H	Loops the current voice.	Execute this command to circularly play the current speech, which can be sent when the speech is played/stopped. During the execution of F2 circular instruction, it can be interrupted and invalidated by FE instruction and ordinary address instruction; It is necessary to send the play instruction first, and then send the loop play instruction.
F3H	Coded playback	F3H+ voice address A, F3H+ voice address B, F3H+ voice address C, … When playing address A, don't interrupt when you receive the following code. After playing A, play B, and then play C…. There needs to be a delay of 2ms between F3 and the address, and 40 concatenated codes are supported at most.
FEH	Stop playing the current voice	Execute this command to stop playing the current speech.

Note: If there is no command code F3H, but only the voice address, the voice playing before will be interrupted, and the concatenated command must be used in conjunction with the address (for example: F3H+00H+F3H+01H). F3H can conveniently combine different voices, F3H+ Address A+F3H+ Address B, and can combine up to 40 groups of content. The first group of instructions must be F3+ address; It is also possible to complete the combined play by judging the change of the BUSY level at the time of voice play and the BUSY level at the end of play.

5.2.3. One-line Serial Port Sequence Diagram



After the data line is pulled down for 4~20ms, it is recommended to send 8-bit data for 5 ms. The low bit is sent first, and then the high bit is sent. The ratio of high level to low level is used to represent the value of each data bit.

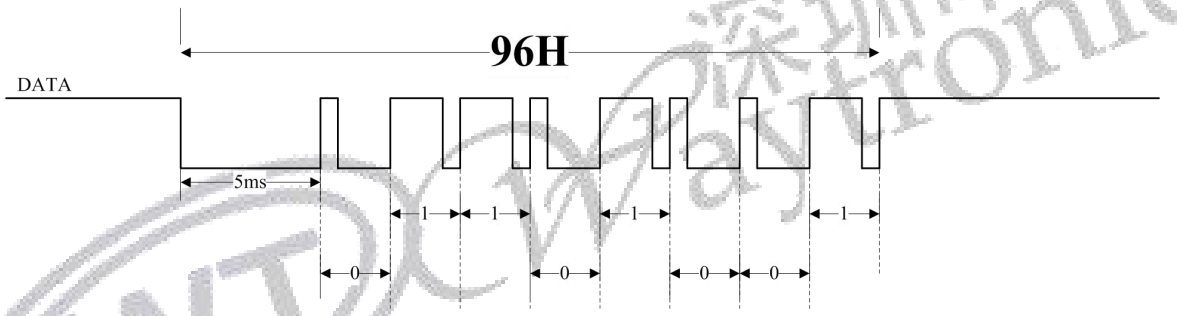


The high level and low level are 3: 1, indicating the value of 1.
The high level and low level are 1: 3, indicating the value of 0.

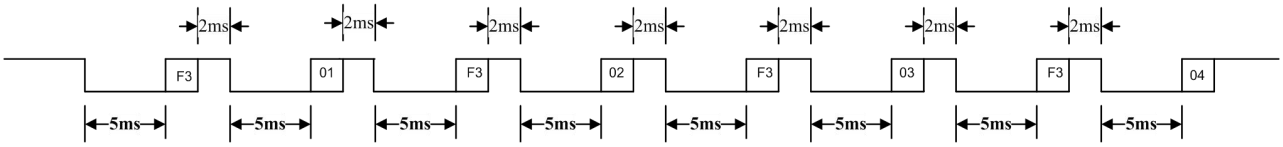
Note: The high level must be in the front and the low level in the back.

It is recommended to use 200us：600us or 400us: 1200us (when the level is widened, it is beneficial to communication stability in some cases). The upper and lower limits of values are as follows: 40us:120us ~ 400us:1200us. Pay attention to the ratio of 3:1 and 1:3 levels to ensure the stability of communication.

If we want to send 96H, first send low bits, then send high bits, then its corresponding timing diagram is as follows:



Suppose we want the chip to play the voice content of 01/02/03/04 address in turn. That is, concatenated code instruction playing, F3+01+F3+02+F3+03+F3+04. The corresponding time sequence can be shown in the following figure:



F3+01H+F3+02H+F3+03H+F3+04H

Note:

When using the concatenated code function, after sending one concatenated code address, delay 2ms before sending the next concatenated code address; But the interval between F3 and the address is still 2ms; In deep sleep mode, you must wake up the chip first. It is recommended to send 0xFE command to wake up

the chip first and wait 100ms before sending the command. In the in-situ sleep mode, you can directly send voice address commands to play; The factory defaults to deep sleep mode.

After hibernation, the chip is pulled up by default, and the DATA is pulled up after the voice playback.

5.3. Two-line Serial Port Control Mode

Two-line serial port mode can use MCU to send DATA to WTVxxxx series voice chips through CLK and DATA lines to achieve the purpose of control. It can control voice playing, stopping, circulating, etc.

5.3.1. Correspondence between Two-line voice Addresses

Data (hexadecimal)	Function
00H	Play the 0 th speech.
01H	Play the first speech.
02H	Play the second speech.
…….	
DDH	Play paragraph 221 of voice.
DEH	Play paragraph 222 of voice.
DFH	Play paragraph 223 of voice.

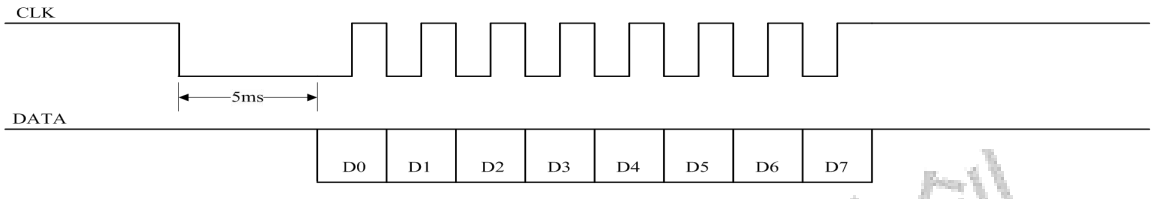
Note: If you want to play the address voice, you can automatically play the address voice by sending the address, and the time interval between the two address commands should be greater than 4ms.

5.3.2. Two-line Voice and Command Code Correspondence Table

Commend Code	Function	Description
F0H	Enter deep sleep mode (< =2ua)	After executing this command, the chip directly enters the deep sleep mode; After entering sleep, the chip wakes up at the falling edge of the CLK pin, and it takes 100ms to receive the command effectively. This command has power-down memory, and the setting is effective in the wake-up state.
F1H	Exit the sleep mode automatically.	Execute this command, and the chip will always be in the standby state after the voice playback is finished; This command has power-down memory. (This instruction is valid in the wake-up state, and is applicable to deep sleep and in-place sleep)
E0H....EFH	E0 volume is the smallest, EF volume is the largest, and there are 16 levels of volume adjustment.	In voice playback, send this command to adjust the volume at the end of playback or in standby state. The setting is valid in the wake-up state.
F2H	Loops the current voice.	In voice playback, send this command to adjust the volume at the end of playback or in standby state. The setting is valid in the wake-up state.

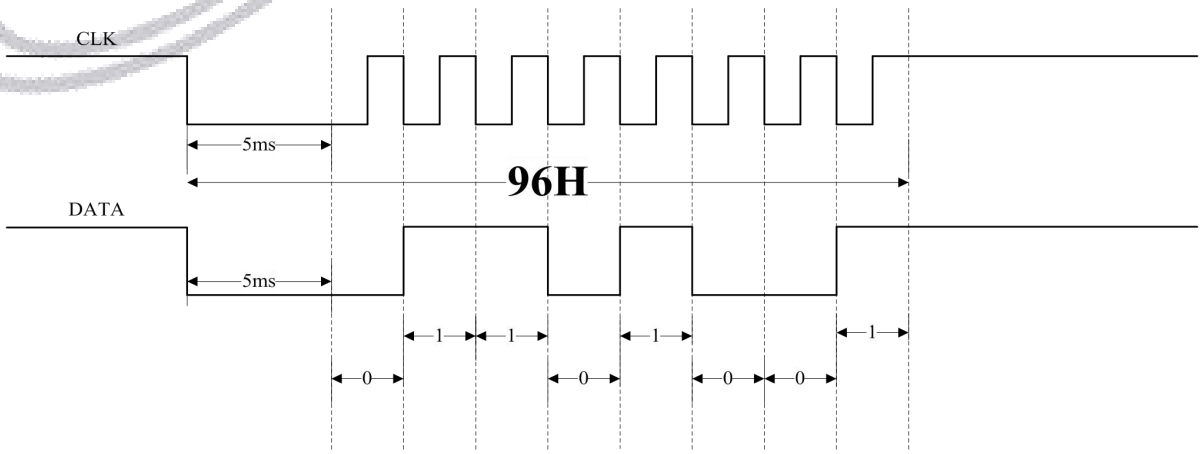
F3H	Coded playback	F3H+ voice address A, F3H+ voice address B, F3H+ voice address C, … When playing address A, don't interrupt when you receive the following code. After playing A, play B, and then play C…. There is a 2ms delay between F3 and the address. The setting is valid in the wake-up state, and it can support up to 40 concatenated codes.
FEH	Stop playing the current voice	Execute this command to stop playing the current speech, and the setting is effective in the wake-up state.

5.3.3. Sequence Diagram of Two-line Serial Port

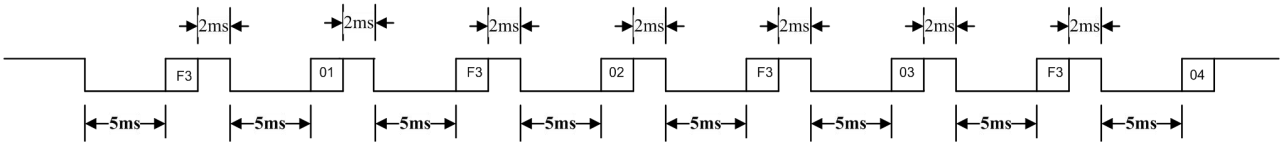


Two-line serial port control mode is controlled by chip clock CLK and DATA data. Before each byte of data is sent, the clock signal CLK is pulled low for 4ms to 20 ms. It is recommended to use 5ms to wake up WTVxxxx voice chip. The low bit of the received data comes first, and the data is received at the rising edge of the clock. The clock cycle is between 200 us and 1 ms, and it is recommended to use 300us for high and low level duration (that is, the clock cycle of one bit is 600us). When sending data, send low bits first, and then send high bits. In the data, 00H～DFH is the voice address command, E0H～EFH is the volume adjustment command, F2H is the loop play command, and FEH is the stop play command.

If we want to send 96H, then its corresponding timing diagram is as follows:



Suppose we want the chip to play the voice content of 01/02/03/04 address in turn. That is, concatenated code instruction playing, F3+01+F3+02+F3+03+F3+04. The corresponding time sequence can be shown in the following figure:



F3+01H+F3+02H+F3+03H+F3+04H

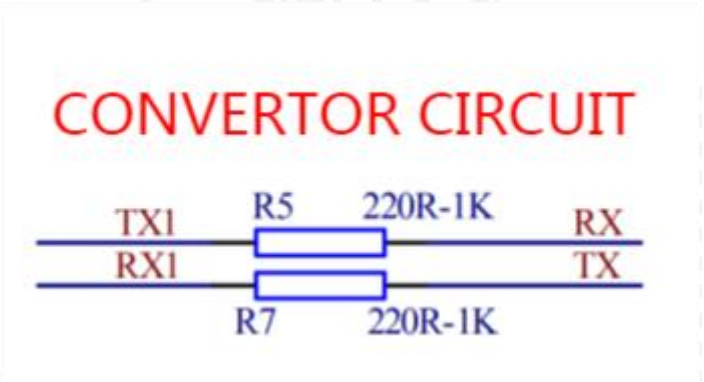
Remark:

When using the concatenated code function, one concatenated code address is sent and then the next concatenated code address is sent after 2ms delay; But the interval between F3 and the address is still 2ms; In deep sleep mode, you must wake up the chip first. It is recommended to send 0xFE command to wake up the chip first and wait 100ms before sending the command. In the in-situ sleep mode, you can directly send voice address commands to play; The factory defaults to deep sleep mode.

6. Matters Needing Attention in Circuit Design

(1) Circuit reference design reference document WTVxxxx Chip Application Circuit

(2) When the MCU level does not match the level of the voice chip, please add a level conversion circuit, as shown in the following figure:



7. Examples of Procedures

7.1. Example of One-line Serial Port Program

7.1.1. One-line Serial Port Control Program (Single Byte)

```
#define ui16 unsigned int
#define u8   unsigned char
```

```
sbit SL1_DATA=P0^1;
/*-------------------------------------
; The module name: Line_1A_WT2003H(u8 SL1_DATA)
; Function: to realize the first-line serial communication function.
; Enter: s_data is sending data.
; Participation:
;SL1_DATA    is the data port
;-------------------------------------*/
void Line_1A_WT2003H( u8 s_data)
{
u8 sl_data,i;
SL1_DATA=1;
delay_10us(200);    //Delay 2ms
SL1_DATA=0;
delay_10us(500);    //Delay 5ms
sl_data= s_data;
for(i=0;i<8;i++)
{
if(sl_data&0x01)
{
SL1_DATA=1;
delay_10us(120); //1200us delay
SL1_DATA=0;
delay_10us(40);    //Delay of 400us
}
else
{
SL1_DATA=1;
delay_10us(40); //Delay of 400us
SL1_DATA=0;
delay_10us(120); //1200us delay
}
sl_data = sl_data>>1;
}
SL1_DATA=1;
}
```

7.1.2. One-line Serial Port Program (Switching DAC Output & Playing Fixed Address)

//Reference

```
main()
{
```

```
/* * * After the internal initialization of the chip (initialization time: 200-300ms) is completed, send the DAC switching instruction * * */
/* * * The code sending interval between instructions is generally 100-200ms***/

Delay_1ms(300);

Line_1A_WT2003H( 0xF4 );

Delay_1ms(4);

Line_1A_WT2003H( 0x00 );

Delay_1ms(200);       //Delay for 100-200ms before sending other control instructions.

}


void List_1A_Play_REC_WT2003H( void )

{

Line_1A_WT2003H( 0xFE );       //If the automatic entry mode is not exited, the FE instruction can be sent to wake up the IC in advance.

Delay_1ms(200);

Line_1A_WT2003H( 0x02 );

}
```

7.1.3. One-line Serial Control Program (Serial Code Playing: F3+01+F3+02+F3+03)

//When playing concatenated codes, please refer to the following codes.

```
/*-------------------------------------
; The module name: List_1A_Play_WT2003H ()

; Function: to realize the transmission function of one-line serial connection code.

; Reference: DDATA is sending data.

; Participation:

;-------------------------------------*/


void List_1A_Play_WT2003H( void )
{
Line_1A_WT2003H( 0xFE );       //Serve as a wake-up function to wake up the IC in advance.
Delay_1ms(200);
Line_1A_WT2003H( 0xF3 );
```

```
Delay_1ms(2);      /delay 2ms
Line_1A_WT2003H(0x01 );
Delay_1ms(2);
Line_1A_WT2003H(0xF3);
Delay_1ms(2);
Line_1A_WT2003H( 0x02 );
Delay_1ms(2);
Line_1A_WT2003H( 0xF3 );
Delay_1ms(2);
Line_1A_WT2003H( 0x03 );
Delay_1ms(2);
}
```

7.2. Example of Two-line Serial Port Program

7.2.1. Two-line Serial Port Control Program (Single Byte)

```
#define ui16 unsigned int
#define u8    unsigned char
sbit SL2_DATA=P0^1;
sbit SL2_CLK=P0^2;
/*-------------------------------------
; The module name: Line_2A_WT2003H(u8 s_data)
; Function: Realize the two-wire serial communication function.
; Enter: s_data is sending data.
; Participation:
; SL2_CLK              //Clock line
; SL2_DATA    //Data line
;-------------------------------------*/
void Line_2A_WT2003H( u8 s_data)
{
      u8 txdata,i;
      txdata = s_data;
      SL2_DATA =1;
      SL2_CLK =1;
      delay_10us(500);
      SL2_CLK=0;
      delay_10us(500);

      for(i=0;i<8;i++)
      {
```

```
        SL2_CLK=0;
        if(txdata&0x01)
            SL2_DATA=1;
        else
            SL2_DATA=0;

        delay_10us(30);
        SL2_CLK=1;
        delay_10us(30);
        txdata = txdata>>1;
    }

    SL2_DATA=1;
    SL2_CLK=1;
}
```

7.2.2. Two-Lire Serial Port Control Program (Coded Playback：F3+01+F3+02+F3+03)

//When playing the fixed voice address with concatenated codes, please refer to the following codes.

```
void List_2A_Play_WT2003H( void )
{
Line_2A_WT2003H( 0xFE );       //Serve as a wake-up function to wake up the IC in advance.
Delay_1ms(200);
Line_2A_WT2003H( 0xF3 );
Delay_1ms(2);     //delay 2ms
Line_2A_WT2003H(0x01 );
Delay_1ms(2);
Line_2A_WT2003H(0xF3);
Delay_1ms(2);
Line_2A_WT2003H( 0x02 );
Delay_1ms(2);
Line_2A_WT2003H( 0xF3 );
Delay_1ms(2);
Line_2A_WT2003H( 0x03 );
Delay_1ms(2);
}
```

8. Electrical Parameter

8.1. Electrical Parameters of SOP8 Package

8.1.1. Absolute Maximum Rated Parameter

Symbol	Parameter	Min	Max	Unit
Tamb	Ambient Temperature	-40	+85	°C
Tstg	Storage temperature	-65	+150	°C
VCC	Supply Voltage	-0.3	3.6	V
VCC	Class D Audio Power Amplifier	-0.3	3.6	V
V_{VCC33}	3.3V IO Input Voltage	-0.3	3.6	V

8.1.2. PMU Characteristics

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
VCC	Voltage Input	2.0	3.3	3.6	V	_
Vvcc	Voltage Input	2.0	3.3	3.6	V	_
Vvcc	Voltage output	2.0	3.0	3.6	V	VCC = 3.7V, 100mA loading
Ivcc	Loading current	_	_	100	mA	VCC=3.3V

8.1.3. Electrical Logic Characteristics of IO Input/Output

IO intput characteristics						
Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
V_{IL}	Low-Level Input Voltage	-0.3	_	0.3* VCC	V	VCC = 3.3V
V_{IH}	High-Level Input Voltage	0.7* VCC	_	VCC+0.3	V	VCC = 3.3V
IO output characteristics						
V_{OL}	Low-Level Output Voltage	_	_	0.33	V	VCC = 3.3V

V_{OH}	High-Level Output Voltage	2.7	_	_	V	VCC = 3.3V

8.2. Electrical Parameters of QFN20 and QFN32 Packages

8.2.1. Absolute Maximum Rated Parameter

Symbol	Parameter	Min	Max	Unit
Tamb	Ambient Temperature	-40	+85	°C
Tstg	Storage temperature	-65	+150	°C
VCC	Supply Voltage	-0.3	5.5	V
PVDD	Class D Audio Power Amplifier	-0.3	5.5	V
V_{Vout33}	3.3V IO Input Voltage	-0.3	3.6	V

8.2.2. PMU Characteristics

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
VCC	Voltage Input	2.0	3.7	5.5	V	_
V_{PVDD}	Voltage Input	2.0	3.7	5.5	V	_
V_{VOUT}	Voltage output	2.0	3.0	3.4	V	VCC = 3.7V, 100mA loading
I_{VOUT}	Loading current	_	_	100	mA	VCC=3.7V

8.2.3. Electrical Logic Characteristics of IO Input/Output

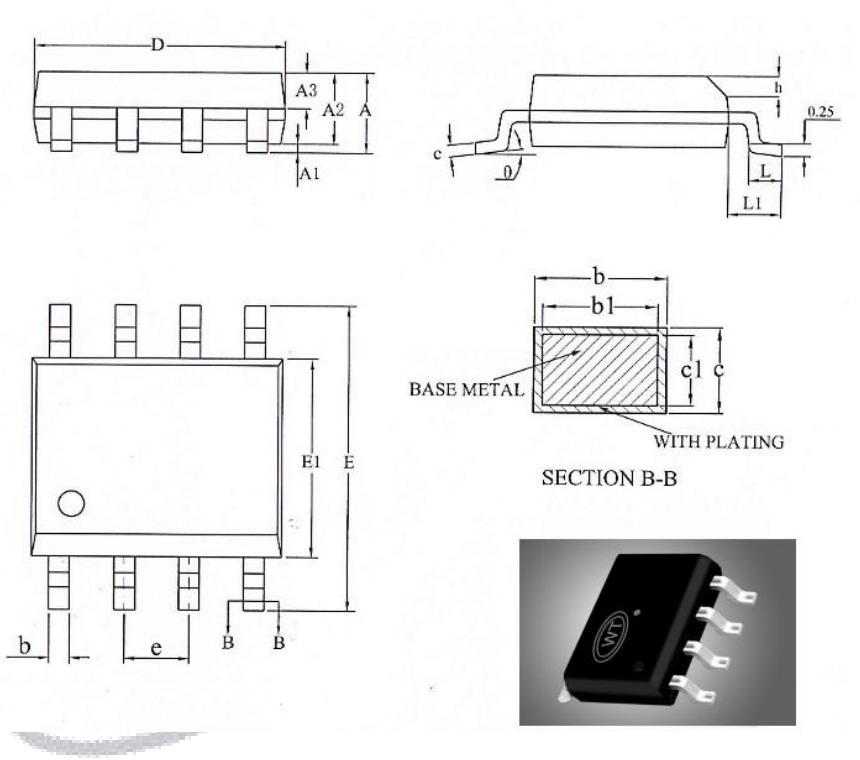
IO intput characteristics						
Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
V_{IL}	Low-Level Input Voltage	-0.3	_	0.3* VOUT	V	VOUT = 3.3V
V_{IH}	High-Level Input Voltage	0.7* VOUT	_	VOUT+0.3	V	VOUT = 3.3V
IO output characteristics						
V_{OL}	Low-Level Output Voltage	_	_	0.33	V	VOUT = 3.3V

V_{OH}	High-Level Output Voltage	2.7	–	–	V	VOUT = 3.3V

9. Package Information

9.1. The Size of SOP8 Package

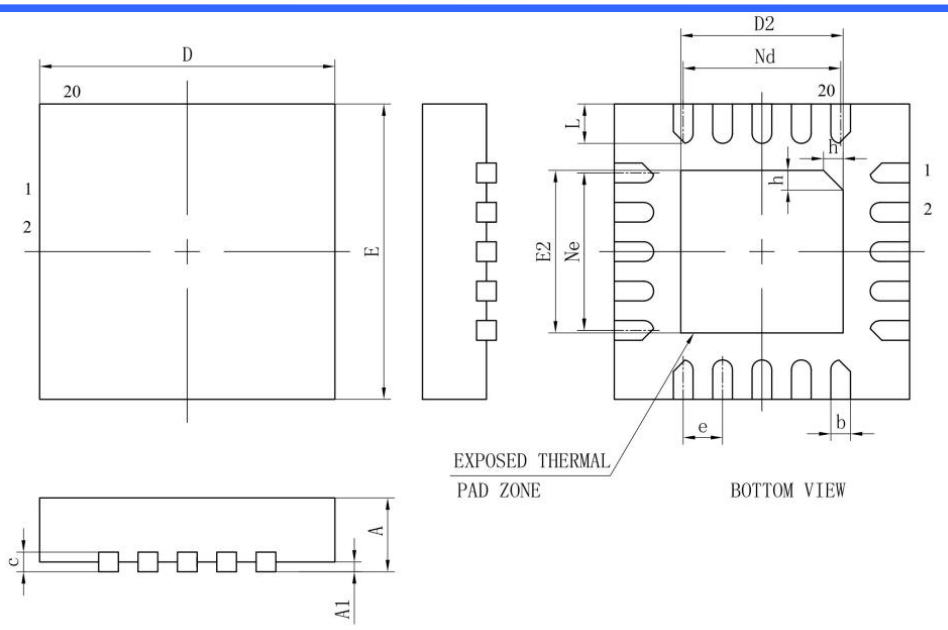
Unit：mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.75
A1	0.10	—	0.225
A2	1.30	1.40	1.50
A3	0.60	0.65	0.70
⚠1 b	0.39	—	0.47
⚠1 b1	0.38	0.41	0.44
⚠1 c	0.20	—	0.24
c1	0.19	0.20	0.21
⚠1 D	4.80	4.90	5.00
E	5.80	6.00	6.20
⚠1 E1	3.80	3.90	4.00
e	1.27BSC		
h	0.25	—	0.50
L	0.50	—	0.80
L1	1.05REF		
θ	0	—	8°

9.2. The Size of QFN20 Package

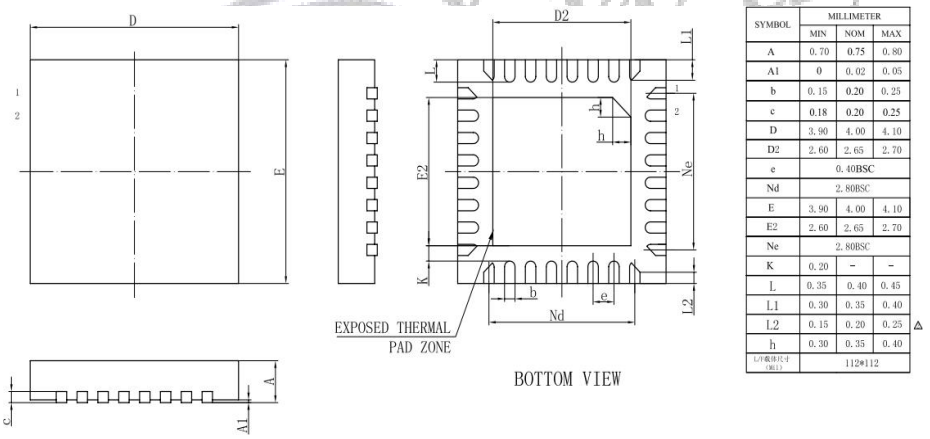
Unit：mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	—	0.02	0.05
b	0.15	0.20	0.25
c	0.18	0.20	0.25
D	2.90	3.00	3.10
D2	1.55	1.65	1.75
e	0.40BSC		
Ne	1.60BSC		
Nd	1.60BSC		
E	2.90	3.00	3.10
E2	1.55	1.65	1.75
L	0.35	0.40	0.45
h	0.20	0.25	0.30
芯片载体尺寸 (M11)	75*75		

9.3. The Size of QFN32 Package

Unit：mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0	0.02	0.05
b	0.15	0.20	0.25
c	0.18	0.20	0.25
D	3.90	4.00	4.10
D2	2.60	2.65	2.70
e	0.40BSC		
Nd	2.80BSC		
E	3.90	4.00	4.10
E2	2.60	2.65	2.70
Ne	2.80BSC		
K	0.20	-	-
L	0.35	0.40	0.45
L1	0.30	0.35	0.40
L2	0.15	0.20	0.25
h	0.30	0.35	0.40
芯片载体尺寸 (M11)	112*112		

10. Revised Version

Edition	Date	Description
V1.00	2022-07-05	Original Version
V1.01	2022-07-12	Modify some instructions.