QUICK START GUIDE

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WT588D Voice IC and module Datasheet

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Contents

1. WT588D voice IC features

- Module package(with the SPI-Flash and periphery circuit) have DIP16、DIP28,IC package have SOP16 、SSOP20 、LQFP32.
- According to the difference of extern connect flash and build-in flash, the play time is different, support 2M-32Mbit SPI-Flash.
- Embedded DSP high-speed audio processor,fast processing speed.
- Built-in 13Bit D/A converter, 12Bit PWM output ,high quanlity sound.
- PWM output can direct drive 0.5W/8Ωspeaker, push pull current is abundant.
- Support DAC/PWM two kinds of output.
- Support wav audio format.
- Support for loading 6K ~ 22KHz sampling rate audio.
- Support play loaded voice.
- Can use the professional upper computer software, combin the sound in any way, can insert the mute,the inserted mute don't occupy memory capacity, a loaded voice can be repeatedly used to multiple addresses.
- 220 segment address bit that can be controled,a single address bit can load128 segment voice, can play the combined voice.
- Loading no more than 500 segments voice for editing.
- Download by USB port, support online and offline download, even the WT588D is power on, data also can be loaded to SPI flash
- The IC reset time is 5 ms.
- Support MP3 control mode, key control mode, 3 x 8 key combination control mode, the parallel port control mode, a line serial port control mode, the three line serial control mode, and three line serial port control I/O port extension output mode
- Switching the three-wire serial port control mode to the three-line serial port control I/O port extension output mode by simply sending the data.After switching, the last working state befor the switching can be taken into the mode after the swiching.
- Can set any BUSY output way that used to display signal of voice playing state.
- Strong anti-interference can be applied in industrial area.
- Enter into sleep mode immediately when stop playing voice, IC turn to the complete stop state.
- 15 kinds key control mode, every key can set any control mode.
- Equipped with WT588D VoiceChip upper computer software, the interface is simple and easy to use.The functions of WT588D voice MCU can be greatly used.
- Simple MCU programming way
- Single IC can extern connect multiple storage.
- The inserted mute time range is 10ms～25min.
- Working voltage DC2. 8～5. 5V
- Static dormant current is less than 10UA.
- Supports 8 chord MIDI playback, (can be developed).

2. WT588D voice IC function description

WT588D is a powerful re-programming MCU voice chip,no need to search suitable peripheral chip microcomputer circuits because of the control way, and highly integrated MCU technology is sufficient to replace complex peripheral control circuits. Equipped with WT588D VoiceChip upper computer software, can optionally replace any control mode of WT588D voice MCU chip, and download the information to SPI-Flash. The operate way of software is easy, with the speech combination technology, which greatly reduces the time of speech editing.Fully support online download, even WT588D is under the condition of power on, can download information associated SPI - Flash through the downloader ,then reset the circuit, the control mode will be updated.

Support insert the mute,the inserted mute don't occupy memory capacity, can insert 10ms～25min,mute for a address bit.

In the Mp3 control mode, this chip with mp3 player functions, such as play, pause, previous, next, volume up, volume down.

In the key control mode, the trigger mode is flexible, any key can be set as pulse retrigger, pulse no retrigger, level keep unloop, level keep loop,level hold loop, prev unloop, next unloop, prev loop, next loop, no function, pause, stop, vol+, vol- and on/off   15 kinds of trigger mode, can use 10 key to trigger output max.

In the 3x8 key combination control mode,24 addresses' voice can be triggered by the way that pulse can be triggered repeatedly.
In parallel interface control mode, 8 I/O port can be used in controlling max, only used to WT588D-32L、WT588DM02.

In one-line serial interface control mode, voice play, stop, loop play, volume adjustment can be controlled by send the command,or trigger directly any voice in the 0~229 address,signalling speed is 600us～2000us.
Three-line serial interface control mode and three-line serial interface control I/O port expand mode,can be switched via send the comand, in the three-line control mode, voice play, stop, loop playback and volume adjustment can be controlled , or direct trigger voice in 0-219 addresses. In the three-line serial control I/O port extension mode, can extend 8 bit output,switch between these two control mode, last working status still keep going in current mode.
PWM output can direct drive 0.5W/8Ω speaker, DAC output connect to external amplifier.
WT588D with a wide range of applications, such as bus reporter, alarm, reminder, alarm clock, study apparatus, household appliances, medical instrument, electronic toys, telecommunication, parking distance control and so on.

3. WT588D voice chip model

Model	Flash	I/O	Package	Key mode	Paraller mode	3X8 matrixmode	Mp3mode	One-line serial mode	Three-line serial mode
WT588D M01	16M	4	16pin module	OK	-------------	-----------	OK	OK	OK
WT588D M02	16M	11	28pin module	OK	OK	OK	OK	OK	OK
WT588D-16S	external	2	SOP16	OK	-------------	----------	----------	OK	----------
WT588D-20SS	external	4	SSOP20	OK	-------------	----------	OK	OK	OK
WT588D-32L	external	11	LQFP32	OK	OK	OK	OK	OK	OK

4. Relationship between FLASH memory and voice length

Sampling frequency at 6KHZ,when extend multiple storage,can get much storage space and voice address

CAPACITY	2M	4M	8M	16M	32M
TIME	30sec	100sec	200sec	500sec	1000sec

5. Application

6. Application block diagram
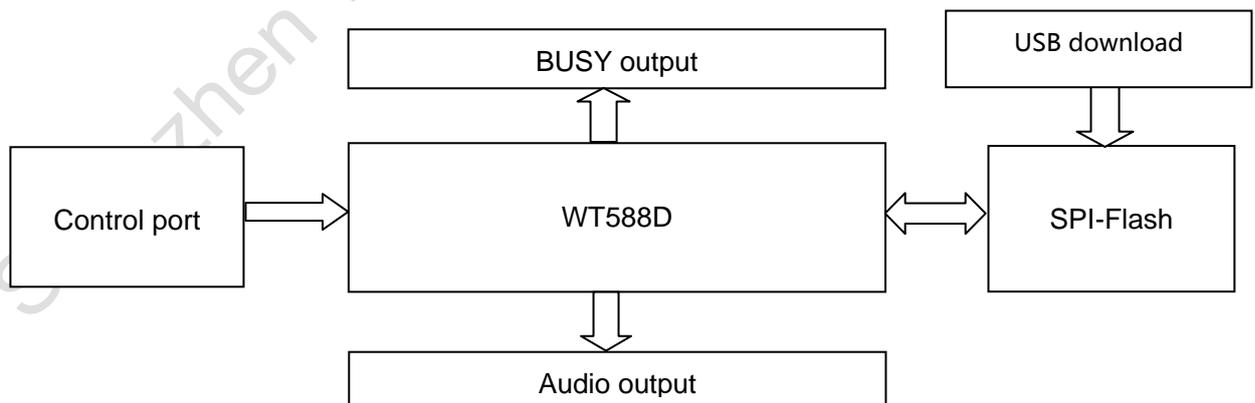
7. Package Pins Diagram

Module package(with the SPI-Flash and periphery circuit) have DIP16、DIP28,IC package have SOP16 、SSOP20 、LQFP32.

7.1. WT588D M01 module
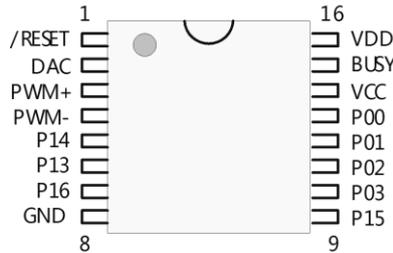
WT588D M01

PIN	Mark	Decription	Function
1	/RESET	reset	Reset pin, keep low level ≥5ms is valid
2	DAC	DAC	DAC audio output pin,need to set DAC output from software
3	PWM+	PWM+	PWM+ audio output pin,need to set PWM output from software
4	PWM-	PWM-	PWM- audio output pin,need to set PWM output from software
5	P14	DI	SPI-FLASH data input pin
6	P13	DO	SPI-FLASH data output pin
7	P16	CLK	SPI-FLASH clock pin
8	GND	GND	Ground line pin
9	P15	CS	SPI chip-select pin
10	P03	K4/CLK/DATA	Key/three line clock/one-line data input pin
11	P02	K3/CS	Key/three-line chip-select input pin
12	P01	K2/DATA	Key/three-line data input pin
13	P00	K1	Key input pin
14	VCC	VCC	Storage power input pin
15	BUSY	BUSY	Voice play busy signal output pin
16	VDD	VDD	Digtal power input pin

7.2. WT588DM02 module
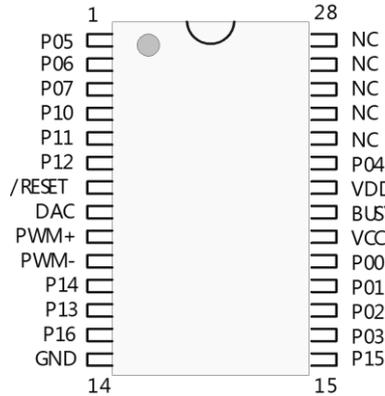
WT588DM02

PIN	Mark	Decription	Function
1	P05	K6/A4/L5	Key/parallel port address /matrix column input pin/three line serial port extend output address port
2	P06	K7/A5/L6	Key/parallel port address /matrix column input pin/three line serial port extend output address port
3	P07	K8/A6/L7	Key/parallel port address /matrix column input pin/three line serial port extend output address port
4	P10	K9/A7/R1	Key/parallel port address /matrix row input pin/three line serial port extend output address port
5	P11	K10/R2	Key /matrix row input pin/three line serial port extend output address port
6	P12	R3	matrix row input pin/three line serial port extend output address port
7	/RESET	/RESET	Reset pin, keep low level ≥5ms is valid
8	PWM+/DAC	PWM+/DAC	PWM+/DAC audio output pin,set according the function
9	PWM+/DAC	PWM+/DAC	PWM+/DAC audio output pin,set according the function
10	PWM-	PWM-	PWM- audio output pin
11	P14	DI	SPI-Flash data input pin
12	P13	DO	SPI-Flash data output pin
13	P16	CLK	SPI-Flash clock pin
14	GND	GND	Ground pin
15	P15	CS	SPI-Flash chip-select pin
16	P03	K4/A2/L3/CLK/DATA	Key/parallel port address /matrix column /three line clock/one-line data input pin
17	P02	K3/A1/L2/CS	Key/parallel port address /matrix column /three line chip-select input pin
18	P01	K2/A0/L1/DATA	Key/parallel port address /matrix column /three line data input pin

19	P00	K1/L0/SBT	Key/matrix column/SBT parallel port address trigger input pin/three line serial port extend output address port
20	VCC	VCC	Simulate power input pin
21	BUSY	BUSY	Voice play busy signal output pin
22	VDD	VDD	Digital power input pin
23	P04	K5/A3/L4	Key/parallel port address /matrix column input pin/three line serial port extend output address port
24	NC	NC	NC
25	NC	NC	NC
26	NC	NC	NC
27	NC	NC	NC
28	NC	NC	NC

7.3. WT588D-32L IC
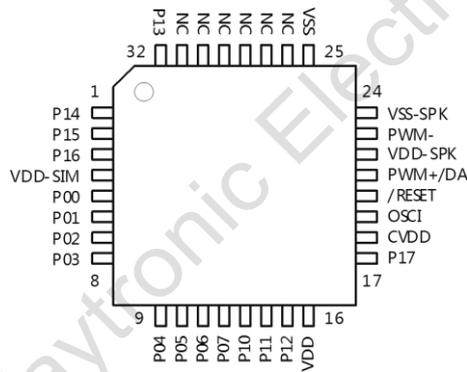
WT588D-32L

Pin	Mark	Description	Function
1	P14	DI	SPI-Flash communicate data input pin
2	P15	DO	SPI-Flash communicate chip-select pin
3	P16	CS	SPI-Flash communicate clock pin
4	VDD-SIM	CLK	Serial port power manage input pin
5	P00	VDD-SIM	Key/matrix column/SBT parallel port address trigger input pin/three line serial port extend output address port
6	P01	K2/A0/L1/DATA	Key/parallel port address /matrix column /three line data input pin
7	P02	K3/A1/L2/CS	Key/parallel port address /matrix column /three line chip-select input pin
8	P03	K4/A2/L3/CLK/DATA	Key/parallel port address /matrix column /three line clock/one-line data input pin
9	P04	K5/A3/L4	Key/parallel port address /matrix column input pin/three line serial

			port extend output address port
10	P05	K6/A4/L5	Key/parallel port address /matrix column input pin/three line serial port extend output address port
11	P06	K7/A5/L6	Key/parallel port address /matrix column input pin/three line serial port extend output address port
12	P07	K8/A6/L7	Key/parallel port address /matrix column input pin/three line serial port extend output address port
13	P10	K9/A7/R1	Key/parallel port address /matrix row input pin/three line serial port extend output address port
14	P11	K10/R2	Key /matrix row input pin/three line serial port extend output address port
15	P12	R3	Matrix row input pin/three line serial port extend output address port
16	VDD	VDD	Chip power input
17	P17	BUSY	Voice play busy signal output pin
18	CVDD	CVDD	VDD power voltage adjust pin
19	OSCI	OSCI	RC concussion input pin
20	RESET	RESET	Reset pin, keep low level ≥5ms is valid
21	PWM+/DAC	PWM+/DAC	PWM+/DAC audio output pin,set according the function
22	VDD-SPK	VDD-SPK	Audio power input pin
23	PWM-	PWM-	PWM- audio output pin
24	VSS-SPK	VSS-SPK	Audio power ground line pin
25	VSS	VSS	Ground line pin
26	NC	NC	NC
27	NC	NC	NC
28	NC	NC	NC
29	NC	NC	NC
30	NC	NC	NC
31	NC	NC	NC
32	P13	DO	SPI-Flash communicate data output pin

7.4. WT588D-20SS IC
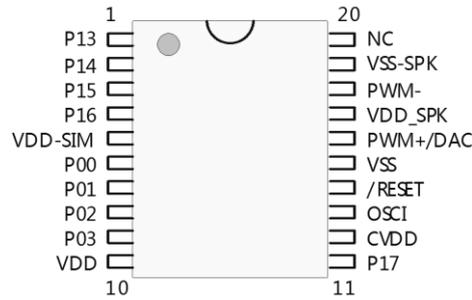
WT588D-20SS

Pin	Mark	Description	Function
1	P13	DO	SPI-Flash communicate dataoutput pin
2	P14	DI	SPI-Flash communicate data input pin
3	P15	CS	SPI-Flash communicate chip-select pin
4	P16	CLK	SPI-Flash communicate clock pin
5	VDD-SIM	VDD-SIM	Serial port power manage pin
6	P00	K1	Key
7	P01	K2/DATA	Key /three-line data input pin
8	P02	K3/CS	Key /three-line chip-select input pin
9	P03	K4/ CLK/DATA	Key /three-line clock/one-line data input pin
10	VDD	VDD	Power input pin
11	P17	BUSY	Voice play busy signal output pin
12	CVDD	CVDD	VDD power voltage adjust pin
13	OSCI	OSCI	RC concussion input pin
14	RESET	RESET	Reset pin, keep low level ≥5ms is valid
15	VSS	VSS	Ground line pin
16	PWM+/DAC	PWM+/DAC	PWM+/DAC audio output pin,set according the function
17	VDD-SPK	VDD-SPK	Audio power input pin
18	PWM-	PWM-	PWM- audio output pin
19	VSS-SPK	VSS-SPK	Audio power ground line pin
20	NC	NC	NC

7.5. WT588D-16S IC
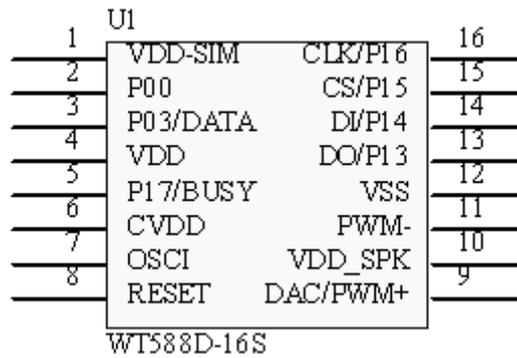
Pin	Mark	Description	Function
1	VDD-SIM	VDD-SIM	Serial port power manage pin
2	P00	K1	Key
3	P03	K4/DATA	Key/one-line data input pin
4	VDD	VDD	Power input pin
5	P17	BUSY	Voice play busy signal output pin
6	CVDD	CVDD	VDD power voltage adjust pin
7	OSCI	OSCI	RC concussion input pin
8	RESET	RESET	Reset pin, keep low level ≥5ms is valid
9	PWM+/DAC	PWM+/DAC	PWM+/DAC audio output pin,set according the function
10	VDD-SPK	VDD-SPK	Audio power input pin
11	PMW-	PWM-	PWM- audio output pin
12	VSS	VSS	Ground line pin
13	P13	DO	SPI-Flash communicate dataoutput pin
14	P14	DI	SPI-Flash communicate data input pin
15	P15	CS	SPI-Flash communicate chip-select pin
16	P16	CLK	SPI-Flash communicate clock pin

8. Pin's detailed description

Theuseof K1－K10

K1－K10 defined as I/O port of key trigger ,corresponding I/O port P00－p07、p10 and P11. Switch I/O port level by K1 －k10 or input edge to I/O port, trigger to play the voice. Trigger mode of Key K0－k9 can be setted as edge retrigger, edge no retrigger, level unloop, level loop, , level hold loop, prev unloop, next unloop, prev loop, next loop, no function, pause, stop, vol+, vol- and on/off 15 kinds of trigger mode.

KEY MODE: P00→K1   P01→K2   P02→K3   P03→K4   P04→K5

P05→K6   P06→K7   P07→K8   P10→K9   P11→K10

ONE-LINE SERIAL INTERFACE MODE: P00→K1   P04→K5   P07→K8
 P01→K2   P05→K6   P10→K9
 P02→K3   P06→K7   P11→K10

The useof R1-R3、L0－L7

In the key control mode of 3x8 matrix, I/O port defined as R－R3、L0－L7，R1－R3 as matrix row input , L0－L7 as matrix column input. A phrase can be triggered and play when short circuit R and L. In this control mode, all keys trigger mode were defined as EDGE RETRIGGER. The details please find 12.3,3 ×8 matrix key control mode.

The use of SBT and A0-A7

In the parallel control mode, I/O port P00-P07、P10 defined as SBT, A0-A7.   SBT is audition pin, A0-A7 are address, from low to high. I/O port details please find 12.4, parallel port control mode.

9. Electronic parameter

V_{DD}－V_{SS} = 4. 5V, TA = 25°C,no load

Parameter	Mark	Environmental conditions	Minimum value	Typical value	Maximum value	Unit
Working voltage	V_{DD}	F_{sys}=8MH$_Z$	2. 8	3. 3	5. 5	V
	V_{CC}	F_{SYS}=8MH$_Z$	2. 8	3. 3	3. 6	V
Download current	I_{ERA}	Erasing information,VDD=0	6. 0	7. 0	7. 8	mA
	I_{DOW}	Download information,VDD=0	0. 5	1. 0	1. 29	mA
Working current	I_{OP1}	No load	7	-	25	mA
Stop current	I_{DD2}	No load	4. 11	4. 17	4. 29	uA
Sleep mode	I_{KEY}	Key mode,no load	0. 4	0. 5	0. 6	uA
	I_{ONE}	One-wire mode,no load	4. 15	4. 17	4. 23	mA

current	I_{THR}	Three-wire mode,no load	0. 2	0. 4	0. 6	uA
Low voltage input	V_{IL}	All pins input	V_{SS}	-	0. $3V_{DD}$	V
High voltage input	V_{IH}	All pins input	0. $7V_{DD}$	-	V_{DD}	V
Input current BP1. BP2. RESET	I_{IN1}	V_{IN}=0V Pull-up impedance =500KΩ	-5	-9	-14	uA
Input current BP1. BP2. RESET	I_{IN2}	V_{IN}=0V Pull-up resistor =150KΩ	-15	-30	-45	uA
Output current （BP0）	I_{OL}	VDD=3V,VOUT=0. 4V	8	12	-	mA
	I_{OH}	VDD=3V,VOUT=2. 6V	-4	-6	-	mA
	I_{OL}	VDD=4. 5V,VOUT=1. 0V	-	25	-	mA
	I_{OH}	VDD=4. 5V,VOUT=2. 6V	-	-12	-	mA
Output current （BP1）	I_{OL}	VDD=3V,VOUT=0. 4V	4	10	-	mA
	I_{OH}	VDD=3V,VOUT=2. 6V	-4	-6	-	mA
Output current PWM+/PWM-	I_{OL1}	RL=8Ω	+40	-	-	mA
	I_{OH1}	【PWM+】--【RL】--【PWM-】	-40	-	-	mA
DAC maximum current	I_{DAC}	RL=100Ω	-2. 4 -4. 0	-3. 0 -5. 0	-3. 6 -6. 0	mA
Pull-up resistor testing	R_{PL}		75	150	225	

10. Absolute Limits of the Environment Parameters

Parameters	Mark	Environmental conditions	Rated value	Unit
Power source	V_{DD} — V_{SS}	-	-0. 3 ~ +7. 0	V
Input voltage	V_{IN}	All input	V_{SS}-0. 3 ~ V_{DD}+0. 3	V
Storage temperature	TSTG	-	-55 ~ +150	°C
Using temperature	T_{OPR}	-	-40 ~ +85	°C

11. Control Mode

11.1. Mp3 mode

In the mp3 mode, default function of 6 I/O port

I/O	P00	P01	P02	P03	P04	P05
FUNCTION	STOP	PLAY/PAUSE	NEXT	PREVIOUS	VOL+	VOL-

11.2.   Key control mode

Pins can directly trigger a function of chip to work. Each pin of the trigger can be set individually. Shockproof time of this mode time is about 10ms. There are 15 trigger ways. Including trigger impulse repetition , trigger pulse without repetition , invalidation keys, no cycle Level , recycled level , non-maintained cycle level, non-cycle for the last one ,non-cycle for the next one , cycle for the last one , cycle for the next one, volume +, volume -, play / pause, stop, play / stop, etc. . See the following trigger timing diagram. For more details, see the following chart:

11.2.1. Trigger impulse repetition
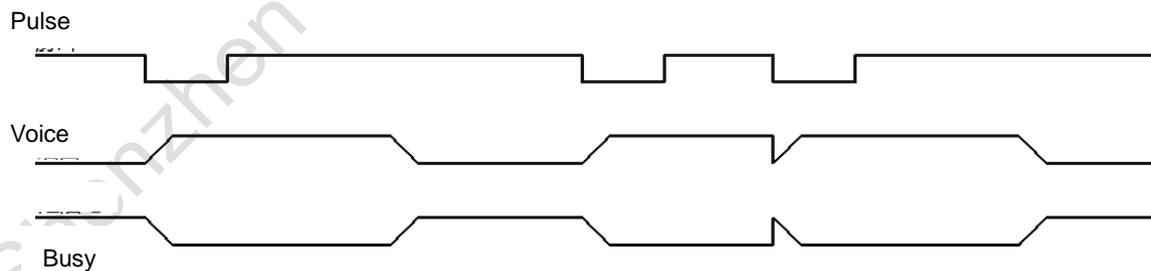
Note: Negative trigger pulse. When I / O port inspects the falling edge (for example, I / O port click short-circuit to GND more than 25ms), Voice will be broadcast.If do that again, Voice are still playing, it will be interrupted and replay. Therefore, it will be replay as long as has falling edge signal.

11.2.2. Trigger pulse without repetition
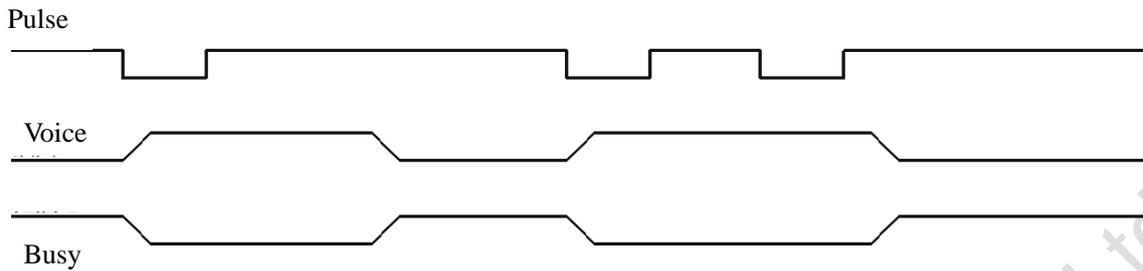
Pulse

Voice

Busy

Note: Negative trigger pulse. When I / O port inspects the falling edge (for example, I / O port click short-circuit to GND more than 25ms), Voice will be broadcast. If do that again during playing, the voice will not be interrupted and continue to broadcast. To be valid unless the voice at an end and inspects the falling edge.

11.2.3. Recycled level

pulse

Voice

Address1   Address 1   Address 1

Busy
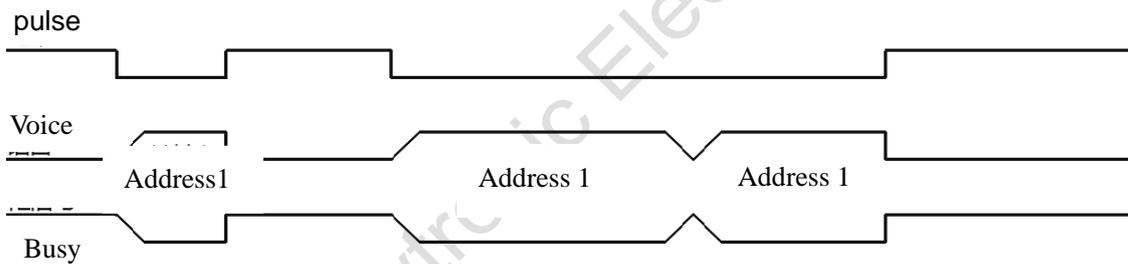
Note: High level stops when I / O port are low level and keep play. Continue to keep a low level even if the first time is over. It will go along replay until change into high level. Low level has sound. High level doesn't have.

11.2.4. No cycle Level

pulse

Voice

Address1   Address 1

Busy
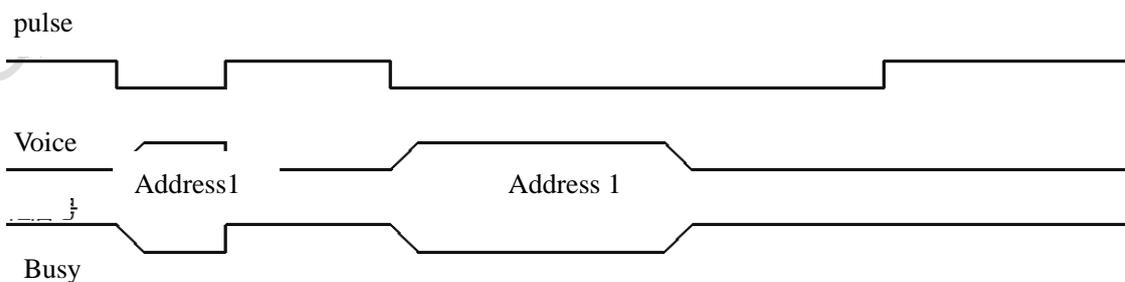
Note: Trigger level. High level stops when I / O port are low and keep play. It will be not continue to play even if the first time is over and keep a low level. The voice just plays one time after being triggered.

If you need to replay, please make I / O port at high level and then pull low. Finally, keep it at low level.

11.2.5. Non-maintained cycle level

pulse

Voice

Address 1   Address 1   Address 1

Busy
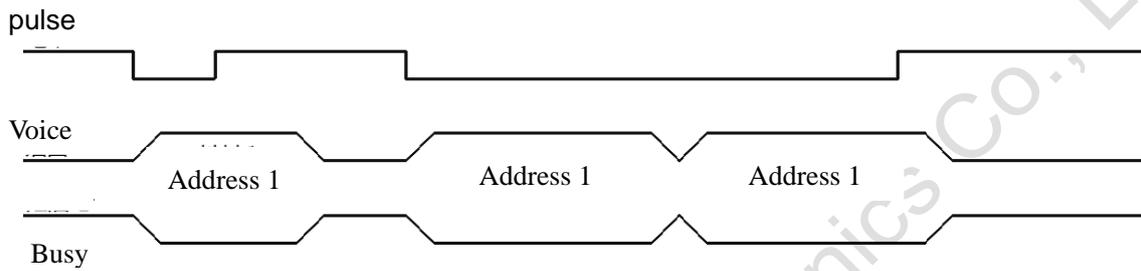
Note: Negative Pulse /trigger Level. When I / O port at low level and keep playing, at the same time, high level don't stop until the voice is over. When the end of the first time, if keep at the low level, it will continue to repeat. If not, when finish it will stop automatically.

11.2.6. Play / Stop

Pulse

Voice

Busy
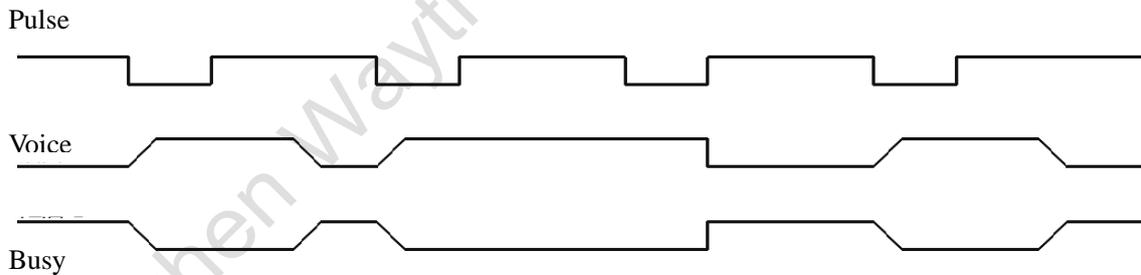
Note: Negative trigger pulse. Negative pulse (for example, I / O port click short-circuit to GND more than 25ms), starts to play when the next one stop. Whether the voice is in play or not must in accordance with this regulation. During playing, if trigger time of stop more than 246ms, it will lead to abnormal play in next time. So time of stop trigger please do not over 264ms.

11.2.7. Non-cycle for the next one
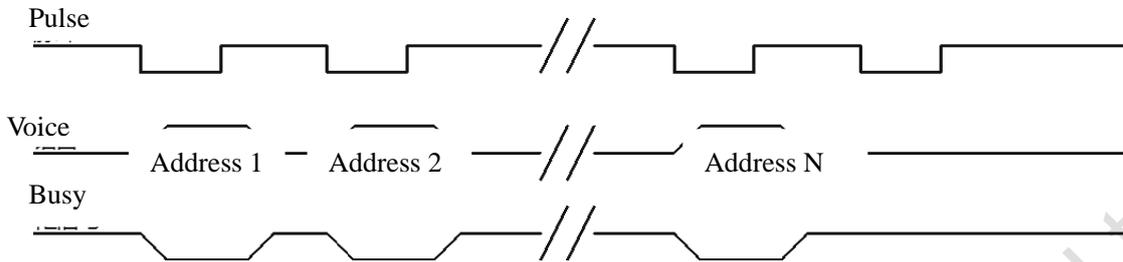
Pulse

Voice

Address 1   Address 2   Address N

Busy

Note: Negative trigger pulse. Trigger with a key to play a sound(for example, I / O port click short-circuit to GND more than 25ms). A pulse plays a piece, the next pulse plays the next piece. It doesn't stop until the last piece is finished. Repeat the same operation. It only can play to the last.

11.2.8. Non-cycle for the last one

Pulse

Voice

Addre   Address N-1   Address 0

Busy   ss N

Note: Negative trigger pulse. Trigger with a key to play a sound (for example, I / O port click short-circuit to GND more than 25ms). A pulse plays a piece; the next pulse plays the last piece. No longer trigger forward when the front voice is over. Repeat the operation; it only can play to the last.

11.2.9. Cycle for next one

Pulse

Voice

Address 1   Address 1   Address N   Address 1

Busy

Note: Negative trigger pulse. Trigger with a key to play a sound (for example, I / O port click short-circuit to GND more than 25ms). A pulse plays a piece; the next pulse plays the next piece. Repeat

the operation. It will start again from the first piece when the last shows off. Loop continuously.

11.2.10. Cycle for last one
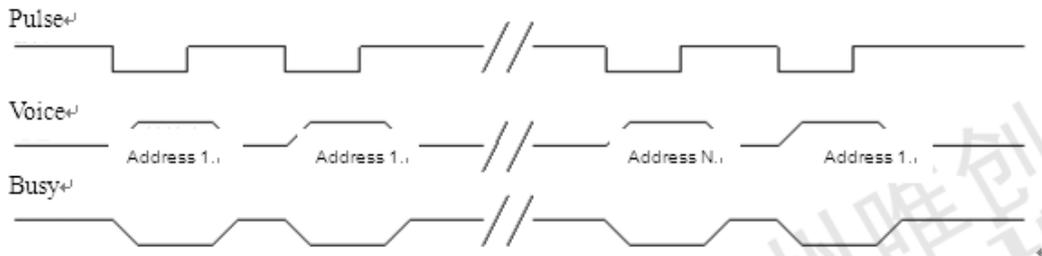
Note: Negative trigger pulse. Trigger with a key to play a sound (for example, I / O port click short-circuit to GND more than 25ms). A pulse plays a piece; the next pulse plays the next piece. Repeat the operation. It will start again from the first piece when the last shows off. Loop continuously.

11.2.11. Pause
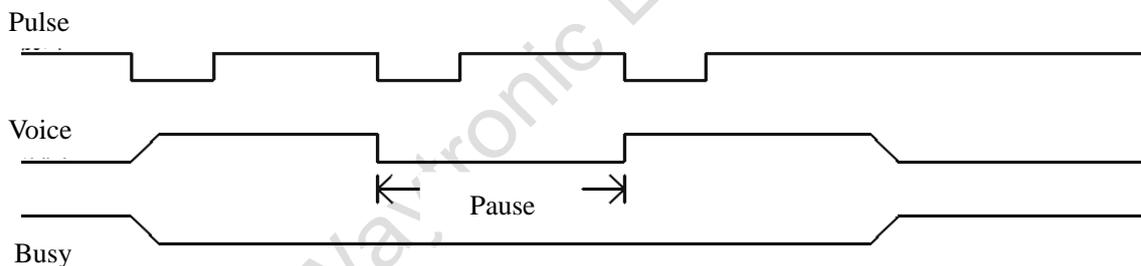
Note: Negative trigger pulse. The first pulse (for example, I / O port click short-circuit to GND more than 25ms) voice is playing but in a suspended state. The second pulse still working, which triggers the suspension of the voice. BUSY remain in this state.

11.2.12. Stop

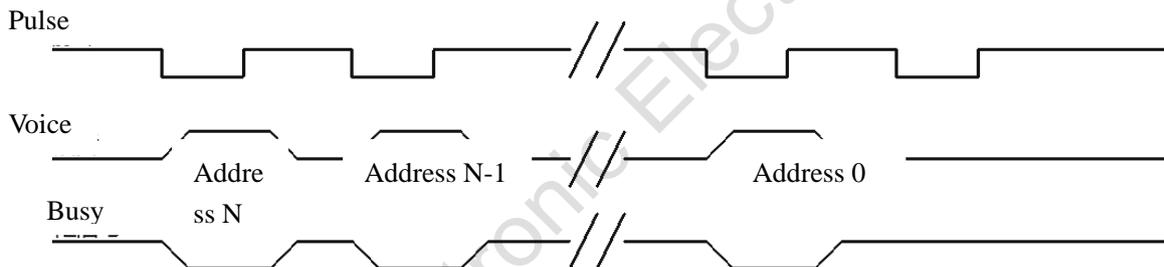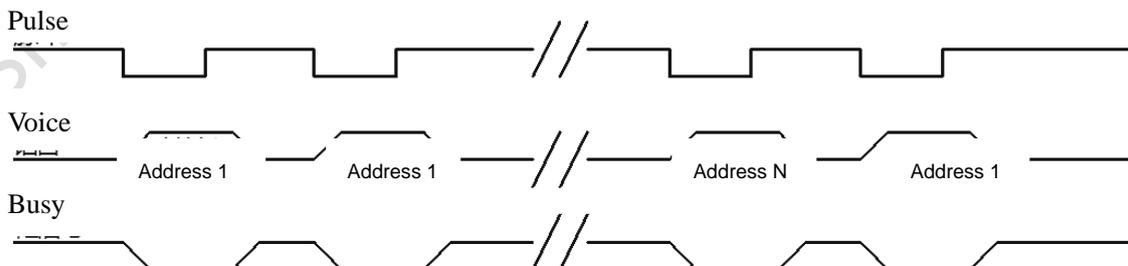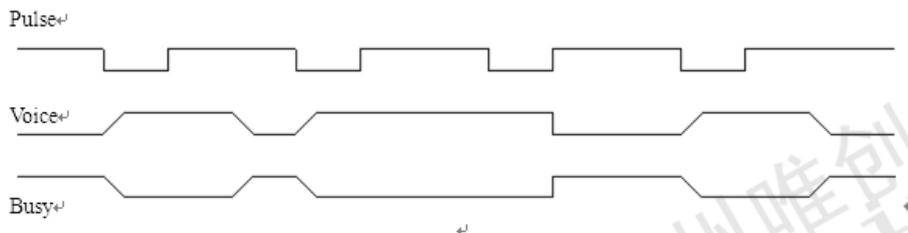
Note: Negative trigger pulse. A pulse (for example, I / O port click short-circuit to GND more than 25ms) stopped the voice, which is playing. Trigger once again invalidly when the voice is stopped.

11.3. 3X8 matrix key control mode

In this mode, all keys default as edge retrigger, can trigger 24 groups voice directly, voice addresses can be defined.

I/O	P00	P01	P02	P03	P04	P05	P06	P07
P10	Key1	Key2	Key3	Key4	Key5	Key6	Key7	Key8
P11	Key9	Key10	Key11	Key12	Key13	Key14	Key15	Key16
P12	Key17	Key18	Key19	Key20	Key21	Key22	Key23	Key24
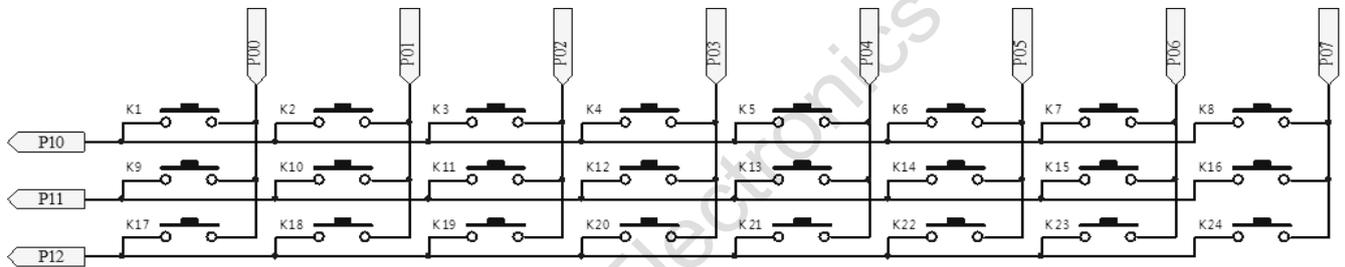
11.4. Paraller port control mode

The advantage is the control speed is fast, but will occupy more IO ports, only the WT588D-32L voice IC and WT588D M02 support paraller port control mode, P00 defined as SBT trigger feet, playingvoice by changing the address "An". Pins' definition as follows:

Package	Pin								
	P00	P01	P02	P03	P04	P05	P06	P07	P10
WT588DM02	SBT	A0	A1	A2	A3	A4	A5	A6	A7
WT588D-32L	SBT	A0	A1	A2	A3	A4	A5	A6	A7

11.4.1. Voice address corresponding list

Voice	Address pin							
	A7	A6	A5	A4	A3	A2	A1	A0
Play the voice of address 0	0	0	0	0	0	0	0	0
Play the voice of address 1	0	0	0	0	0	0	0	1
Play the voice of address 2	0	0	0	0	0	0	1	0
......	......	......	......	......	......	......	......	......
Play the voice of address 217	1	1	0	1	1	0	0	1
Play the voice of address 218	1	1	0	1	1	0	1	0
Play the voice of address 219	1	1	0	1	1	0	1	1

11.4.2. Control timing diagram

Set the addresses to I/O(P01～P10) by MCU, then play the speech by trigger the SBT feet , the trigger mode can be defined as edge retrigger, edge on retrigger, on/off, prev unloop, next unloop, prev loop, next loop,level unloop, level loop, level hold loop, pause.
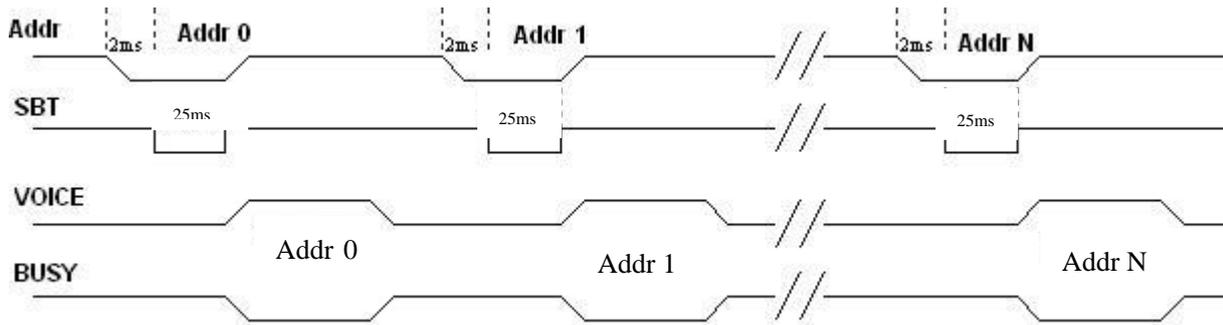
During the triggering process, the stable time of address signal is 5ms, then the SBT can be sent to trigger the voice play after the address is sent 5ms later, and the maintenance time of SBT trigger is 25ms.When sending SBT continuously, ensure that the interval between two address commands is more than 85ms.

11.5. One-Wire Serial Port Control Mode

Send data through a data line. One-wire serial port can control voice play, stop, and volume adjustment and directly trigger, etc. The key of   P00 ~ P10 can select screen or any trigger mode.

Note: In this mode, the voice chip without sleep state, after stoppingplay, the current is about 5mA, please take care when use battery supply.

11.5.1. Assignment list of I/O

Package	I/O ports of voice chips (module)									
	P00	**P01**	**P02**	**P03**	**P04**	**P05**	**P06**	**P07**	P10	P11
WT588D-16s	K1	---	---	DATA	---	---	---	---	---	---
WT588D-20SS	K1	K2	K3	DATA	---	---	---	---	---	---
WT588D-32L	K1	K2	K3	DATA	K5	K6	K7	K8	K9	K10
WT588DM01	K1	K2	K3	DATA	---	---	---	---	---	---
WT588DM02	K1	K2	K3	DATA	K5	K6	K7	K8	K9	K10

11.5.2. Command and Speech code

Command code	Function	Description
E0H ~ E7H	Volume	8 volumes can be adjusted, E0H is minimum volume, and E7H is the largest

	adjustable	volume when working or standby.
F2H	Cycle playing	The current voice addresses can be recycled When working.
FEH	Stop voice playing	Voice command to stop playing

11.5.3. The relationship betweenspeech and address

Data（hex）	Function
00H	Play the zero piece voice
01H	Play the first piece voice
02H	Play the second piece voice
……	……
D9H	Play the 217th piece voice
DAH	Play the 218th piece voice
DBH	Play the 219th piece voice

11.5.4. Control timing diagram

One-wire serial port only through a data communication line control time sequence. According to different duty cycle of levels represent different data bit. Firstly, pull low RESET signal 5ms, then set the high level more than 17ms, and then pull low data signal line 5 ms,send data at last . The duty cycle of High level and low level 1:3 means data bit 0, if 3:1 means data bit 1, high level in the former,low level in the behind, Data signals send from low to high. When send data, no need to sending command code first and then send command, send address datum directly can trigger to play voice. D0 ~ D7 means an address or command data. 00H ~ DBH of data send address order. E0H ~ E7H is volume adjustment order. F2H is Loop orders. FEH orders to stop playing. Details of time sequence in the following diagram:
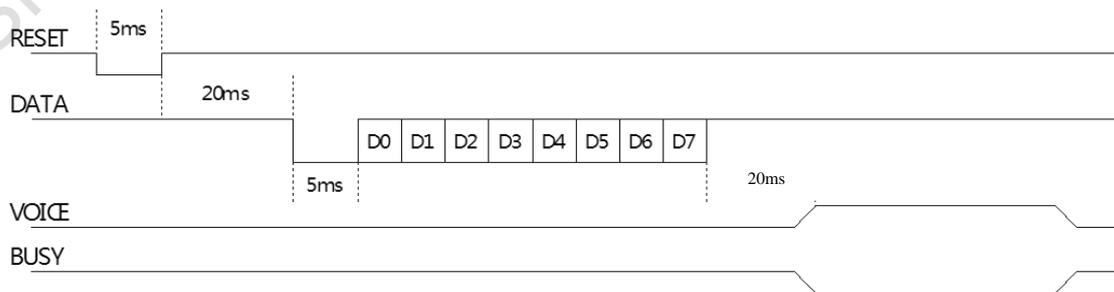
RESET is the RESET signal, and the chip is RESET before the data is sent. If it is not in a special industrial

situation, it can not use this RESET signal.Before each send data, no need to send the reset signal, send the command code or the address data directly.DATA isone-line serial port data communication line, when reset chip is stable,pull low 5 ms to awaken the chip, low bit in the former, BUSY is voice chip busy signal output, after the DATA is send succefully,wait for 20 ms, BUSY output will respond.

Details of data bit duty cycle in the following chart:
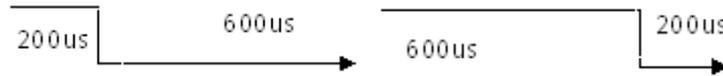
      High level:Low level=1:3 stand for 0   High level:Low level=3:1 stand for 1

One-line serial port time sequence range of high/low level is 100us：300us~~250us：750us

11.5.5. The example of one-wire serial port control time sequence

For example, sending time sequence of data 9CH chart in one-Wire Serial Port Control mode is show in figure:
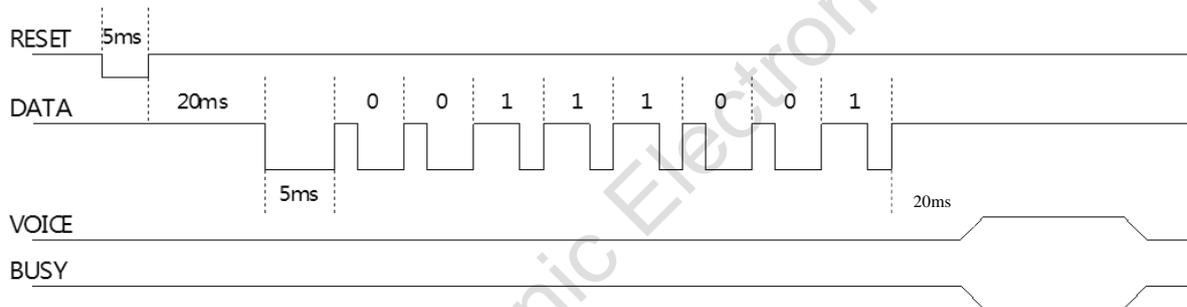
11.5.6. Models of program

Master MCU:PIC16F54,Clock frequency 4MHz

Send oneline(unsigned char addr)

```
{
rst=0;                  /* reset the IC */
delay1ms(5);       /* reset signal retain low level 5ms */
rst=1;
delay1ms(17);          /* reset signal retain high level 17ms */
sda=0;
delay1ms(5);       /* put data signal to low level 5ms */
for(i=0;i<8;i++)

{   sda=1;

if(addr & 1)

{ delay1us(600); /* High level:Low level=600us:200us, stand for send data 1 */

sda=0;
```

```
delay1us(200); }

else {

delay1us(600);        /* High level:Low level=200us : 600us , stand for send data0 */

sda=0;

delay1us(200);  }

addr>>=1;  }

sda=1;  }
```

11.6. Three-wire serial port control mode

Three-wire serial port control mode constitute by 3 communication line, respectively are CS,DATA and CLK. Time sequence is according to standard SPI communication way. Through three-wire serial port can realize command control, voice playing , Under three-wire serial port control mode, all the keys are invalid.

11.6.1. Port allocation way

Mode	I/O ports of voice chips (module)									
	P00	P01	P02	P03	P04	P05	P06	P07	P10	P11
WT588D-20SS	---	DATA	CS	CLK	---	---	---	---	---	---
WT588D-32L	---	DATA	CS	CLK	---	---	---	---	---	---
WT588DM01	---	DATA	CS	CLK	---	---	---	---	---	---
WT588DM02	---	DATA	CS	CLK	---	---	---	---	---	---

11.6.2. Voice and command code corresponding list

Command code	Function	Description
E0H ~ E7H	volume adjustment	8 volumes can be adjusted, E0H is minimum volume, and E7H is the largest volume when working or standby.

F2H	Cycle play	The current voice addresses can be recycled When working.
FEH	Stop playing	Voice command to stop playing
F5H	Enter I/O extend output	In the regular three-line serial port mode, send the command can enter the extend output status of I/O port
F6H	Exit I/O extend output	In the extend output status of I/O port,send the command can enterregular three-line serial port mode

11.6.3. The corresponding relationship between voice and address

Data（hex）	Function
00H	Play the zero piece voice
01H	Play the first piece voice
02H	Play the second piece voice
……	……
D9H	Play the 217th piece voice
DAH	Play the 218th piece voice
DBH	Play the 219th piece voice

11.6.4. I/O port extend output in the three- line serial port mode

In the three-line serial control mode, entry three-line serial I/O extension output by sending data F5H, sending the binary data and make the related I/O to output high level ,sequentially, control the periphery circuit . Send data F6H,will exit this mode, entry commond three-line serial control mode.

Address	I/O port							
	P12	P11	P10	P07	P06	P05	P04	P00
00H	0	0	0	0	0	0	0	0
01H	0	0	0	0	0	0	0	1
02H	0	0	0	0	0	0	1	0
……	……	……	……	……	……	……	……	……

|								
D9H	1	1	0	1	1	0	0	1
DAH	1	1	0	1	1	0	1	0
DBH	1	1	0	1	1	0	1	1

The data in the form, 0 represents low level output, 1 represents high level output. Switch to I/O extension output from three-line serial control mode, the last trigger mode ofthree-line serial control mode be kept. If setted loop play, the last triggered speech will keep loop playing until switch back to three-line serial mode, and change trigger mode. Switch I/O extension mode to three-line serial control mode, the last I/o extension function also be kept, in the I/O extension output,P00 setted as high level output, after switch to three-line serial control mode, P00 still keep high level output until switch back to I/O extension output and change settings.

I/O extension output can be used in the area where the MCU I/O port is in short supply, and can easily extend the output of 8 I/O ports.For example, to control 8 LED display, 8 relay (requiring triode to drive), etc.

11.6.5. Three-wire serial port control time sequence

Three-wire serial port control mode constitute by CS,DATA and CLK. Time sequence follow the communication way of standard SPI, pull low RESET signal 5ms before send the command, then pull high the high level more than 17ms, the reset signal need always remain the high level when working, CS signal pull-up 5ms-10ms to wake up WT588D voice IC,recommend use 5ms, receive data bit is in the front, receive the data in the rising edge of CLK. CLK cycle is between 300 us～1 ms, 300 us is recommended to use. Successfully received data, voice make out response after BUSY signal output more than 20ms. Sending low bit first, then high bit. After finish sending code,DATA、CLK、CS should retain high level,When send data, no need to sending command code first and then send command, D0 ~ D7 means an address or command data. 00H ~ DBH of data send address order. E0H ~ E7H is volume adjustment order. F2H is loop orders. FEH orders to stop playing. F5H is the order of enter the three-line serial port to controlextend output of I/O port,F6H is the order of exit the three-line serial port to controlextend output of I/O port.

Details of time sequence in the following diagram:
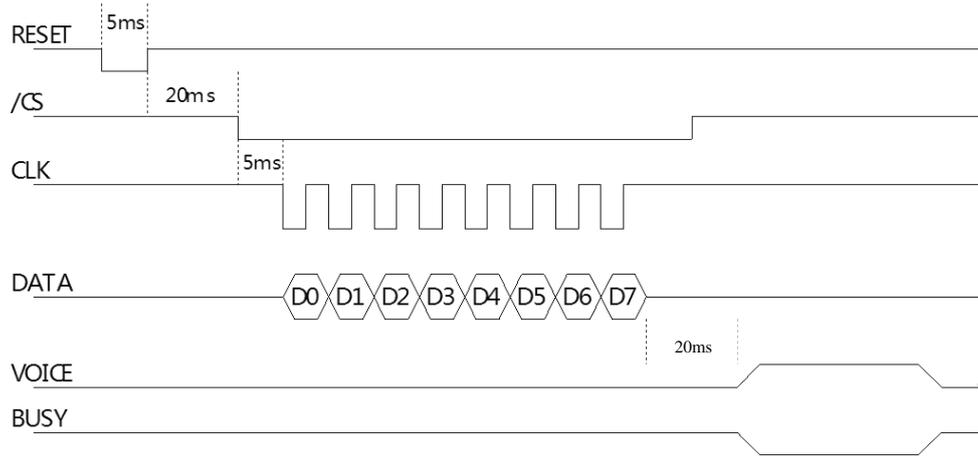
Note:Reset signal is only used in the environment of the external disturbance is strong, if not special industrial occasions, do not need to send the reset signal, can be sent directly to select-chip(cs), the clock(clk) and data signals.

Mark:Don't send the command in the time period that from the end voice to busy signal is changed.(about 24ms)

11.6.6. The send time of command code

Loop playing command F2H: The loop play command needs to be sent after the voice address signal or other command is sent about 30ms, and before finish playing, or the voice chip cannot be received effectively.
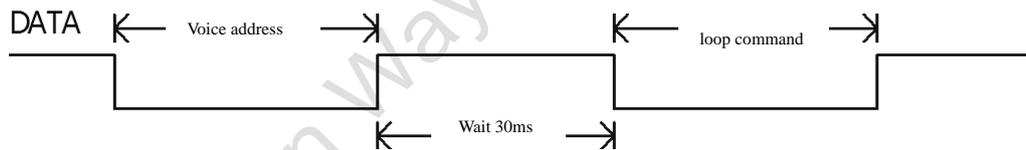
Stop playing command FEH: Sending the command can stop playing voice when playing,after send the data signal about 1 ms,and before finish playing,the command is effective.
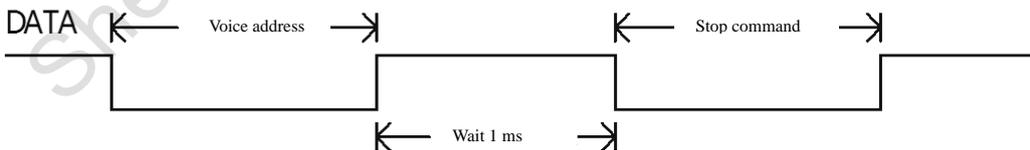
Volume adjust commandE0H ~ E7H: Sending this command in the voice chip working state can adjust the volume, no matter the voice chip is in playing state or stop state,If the address voice or other command is triggered first, it will need to wait 90ms to send the volume control command, otherwise it won't work.

DATA |← Voice address →| |← Volume adjust →|

|← Wait 90ms →|
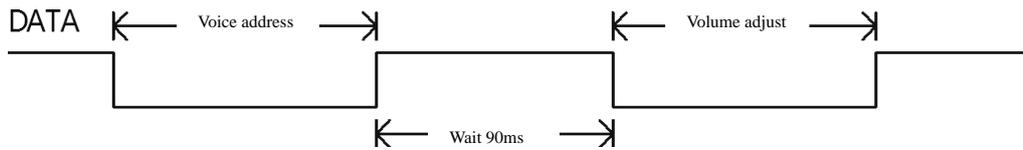
11.6.7. Models of program

Master MCU:PIC16F54,Clock frequency 4MHz
Send threelines(unsigned char addr)

```
    {
    rst=0;                      /* reset the IC */
    delay1ms(5);        /* reset signal retain low level 5ms */
    rst=1;
    delay1ms(20);            /* reset signal retain high level 20ms */
    cs=0;
    delay1ms(5);        /* select-chip signal retain low level 5ms */
    for(i=0;i<8;i++)
{   scl=0;
    if(addr & 1)sda=1;
    else sda=0;
    addr>>=1;
    delay1us(150);          /* clock cycle300us */
    scl=1;
    delay1us(150); }
    cs=1; }
```

12. Control Procedures

12.1. one-line serial port control assemble program

Description: The program is corresponding with the one-line serial port application circuit in the data (WT588D voice IC and module application circuit). test MCU IC: AT89C2051.

```
        ORG 0000H
    KEY EQU P1.1      ;key pin
    RST EQU P1.4      ;reset signal pin
    SDA EQU P3.0      ;data pin
```

```
   DAIFAZHI EQU 50H         ;Code value temporary address
MOV DAIFAZHI,#0H;The initial value of the code is 0
MOV R5,#8         ;Code 8-bit loop


   MAIN:
JB KEY,MAIN
MOV R6,#20         ;delay 20MS
LCALL DELAY1MS
JB KEY,MAIN         ;key remove shake judge
JNB KEY,$         ;wait for the key release
LCALL one_line    ;Call the one - wire code subroutine
INC DAIFAZHI      ;Code value +1
MOV A,DAIFAZHI
CJNE A,#220,XX2 ;Whether to reach the maximum of the voice segment

   XX2: JC XX3
MOV DAIFAZHI,#0H
   XX3: LJMP MAIN

   one_line:               ;////one-line code subprogram
          CLR RST
        MOV R6,#5         ;delay 5MS
   LCALL DELAY1MS
       SETB RST
       MOV R6,#20      ;delay 20MS
       LCALL DELAY1MS
       CLR SDA
       MOV R6,#5        ;delay 5MS
       LCALL DELAY1MS
   MOV A,DAIFAZHI
LOOP:     SETB SDA
       RRC A
   JNC DIDIANPIN   ;high level pulse   high:low=3:1
       LCALL DELAY200US
           LCALL DELAY200US
       LCALL DELAY200US
    CLR   SDA
       LCALL DELAY200US
       LJMP LOOP1
DIDIANPIN:                   ;low level pulse   high:low=1:3
         LCALL DELAY200US
       CLR   SDA
LCALL DELAY200US
```

```
            LCALL DELAY200US
        LCALL DELAY200US
        LOOP1:   DJNZ R5,LOOP
             MOV R5,#08H
             SETB SDA
         RET
         DELAY200US:   MOV R6,#100              ;delay 400US subprogram
                DJNZ R6,$
           RET
           DELAY1MS:                      ;Delay 1 ms subprogram,the delay time can be modified for the R6
assignment

           L1:   MOV R7,#248
             DJNZ R7,$
            DJNZ R6,L1
            RET
                   END
```

12.2. one-line serial port control C program

Description: The program is corresponding with the one-line serial port application circuit in the data (WT588D voice IC and module application circuit). test MCU IC: AT89C2051.

```
    sbit KEY=P1^1;    /*P1_1 is the second bit of p1 port*/
    sbit RST=P1^4;    /*P1_4 is the third bit of p3 port 为*/
    sbit SDA=P3^0;     /*P3_0 is the forth bit of p3 port 为*/
    void delay1ms(unsigned char count) //1MS delay subprogram
    {
    unsigned char i,j,k;
    for(k=count;k>0;k--)
     for(i=2;i>0;i--)
     for(j=248;j>0;j--);
   }

    void delay100us(unsigned char count)    //100US delay subprogram
    { unsigned char i;
    unsigned char j;
     for(i=count;i>0;i--)
     for(j=50;j>0;j--);
    }

       Send_oneline(unsigned char addr)
```

```
{
  unsigned char i;
  RST=0;
  delay1ms(5);        /*reset delay 5MS*/
  RST=1;
  delay1ms(20);            /* delay 20ms */
  SDA=0;
  delay1ms(5);           /* delay 5ms */
  for(i=0;i<8;i++)
   {SDA=1;
  if(addr & 1)
  {delay100us(6);          /* 600us */
  SDA=0;
  delay100us(2);        /* 200us */
          }
  else {
   delay100us(2);        /* 200us */
  SDA=0;
  delay100us(6);          /* 600us */
          }
  addr>>=1; }
  SDA=1;
  }

  main()
  {unsigned char FD=0;
  P3=0XFF;
  while(1)
  {
  if(KEY==0)
  {
  delay1ms(10);
  if(KEY==0)      //The increment of code value is sent by pressing P1.1

  {
  Send_oneline(FD);
          FD++;
  if(FD==220) //when is one-line serial port,the voice segment is temporarily up to 220 segments
  {
  FD=0;
  }
  while(KEY==0);   //Wait for release the key, lest a buttonmisjudge everal times

  }
```

```
        }
          }
        }
```

12.3. Three-line serial port control assemble program

Description: The program is corresponding with the three-line serial port application circuit in the data (WT588D voice IC and module application circuit). test MCU IC: AT89C2051.

```
ORG 0000H
KEY EQU P1.1      ;key pin
RST EQU P1.4      ;Reset signal pin
CS   EQU P3.1     ;Cs trigger pin
SCL EQU P3.2      ;Clk pin
SDA EQU P3.0      ;Data pin
    DAIFAZHI EQU 50H      ;Code value temporary address
  MOV DAIFAZHI,#0H;The initial value of the code is 0
MOV R5,#8          ;Code 8-bit loop

 MAIN:
JB KEY,MAIN
MOV R6,#20        ; delay 20MS
LCALL DELAY1MS
JB KEY,MAIN       ; key remove shake judge
JNB KEY,$         ; wait for the key release
LCALL THREE_LINE ; Call the three - wire code subroutine
INC DAIFAZHI      ; Code value +1
MOV A,DAIFAZHI
CJNE A,#220,XX2   ; Whether to reach the maximum of the voice segment
  XX2: JC XX3
MOV DAIFAZHI,#0H
  XX3: LJMP MAIN

 THREE_LINE:              ; ////three-line subprogram
    CLR RST
    MOV R6,#5          ; delay 5MS
LCALL DELAY1MS
    SETB RST
    MOV R6,#20         ; delay 20MS
    LCALL DELAY1MS
    CLR CS
    MOV R6,#5          ; delay 5MS
```

```
        LCALL DELAY1MS
    MOV A,DAIFAZHI
LOOP:
        CLR SCL
RRC A
MOV SDA,C
LCALL DELAY150US
SETB SCL
        LCALL DELAY150US
DJNZ R5,LOOP
MOV R5,#08H
SETB CS
RET
  DELAY150US:     MOV R6,#75          ; delay 150US subprogram
        DJNZ R6,$
     RET
    DELAY1MS:                         ; Delay 1 ms subprogram,the delay time can be modified for the R6
assignment
    L1:          MOV R7,#248
        DJNZ R7,$
    DJNZ R6,L1
       RET
     END
```

12.4. Three-line serial port control C program

Description: The program is corresponding with the three-line serial port application circuit in the data (WT588D voice IC and module application circuit). test MCU IC: AT89C2051.

```c
#include <at89x51.H>

sbit KEY=P1^1;      /*P1_1 is the second bit of P1 port*/
sbit RST=P1^4; /    *P1_4 is the third bit of P3 port*/
sbit  CS=P3^1;      /*P3_1 is the forth bit of P3*/
sbit SCL=P3^2;      /*P3_2 is the fifth bit of P3 */
sbit SDA=P3^0;      /*P3_0 is the sixth bit of P3 port*/
//sbit DENG=P3^7;  /*P3_5 is the sixth bit of P3 port*/
void delay1ms(unsigned char count) //1MS delay subprogram
{
unsigned char i,j,k;
for(k=count;k>0;k--)
for(i=2;i>0;i--)
for(j=248;j>0;j--);
```

```
    }

    void delay150us(void)   //150US delay subprogram
{
 unsigned char j;
  for(j=75;j>0;j--);
  }

  Send_threelines(unsigned char addr) //three-line subprogram
{unsigned char i;
RST=0;
delay1ms(5);
RST=1;
delay1ms(20);          /* pull high reset 20ms*/
CS=0;
delay1ms(5);           /* pull low select-chip 5ms */
for(i=0;i<8;i++)
{SCL=0;
if(addr & 1)SDA=1;
else SDA=0;
addr>>=1;
delay150us();   /* 150us */
SCL=1;
delay150us();
}
CS=1;
 }

  main()
  {unsigned char FD=0;
    P3=0XFF;
    while(1)
{
if(KEY==0)
 {
 delay1ms(20);
 if(KEY==0)      //The increment of code value is sent by pressing P1.1

 {
Send_threelines(FD);
          FD++;
if(FD==220//when is three-line serial port,the voice segment is temporarily up to 220 segments
 {
FD=0;
```

```
     }
     while(KEY==0);   //Wait for release the key, lest a buttonmisjudge everal times


     }
   }
   }
    }
```
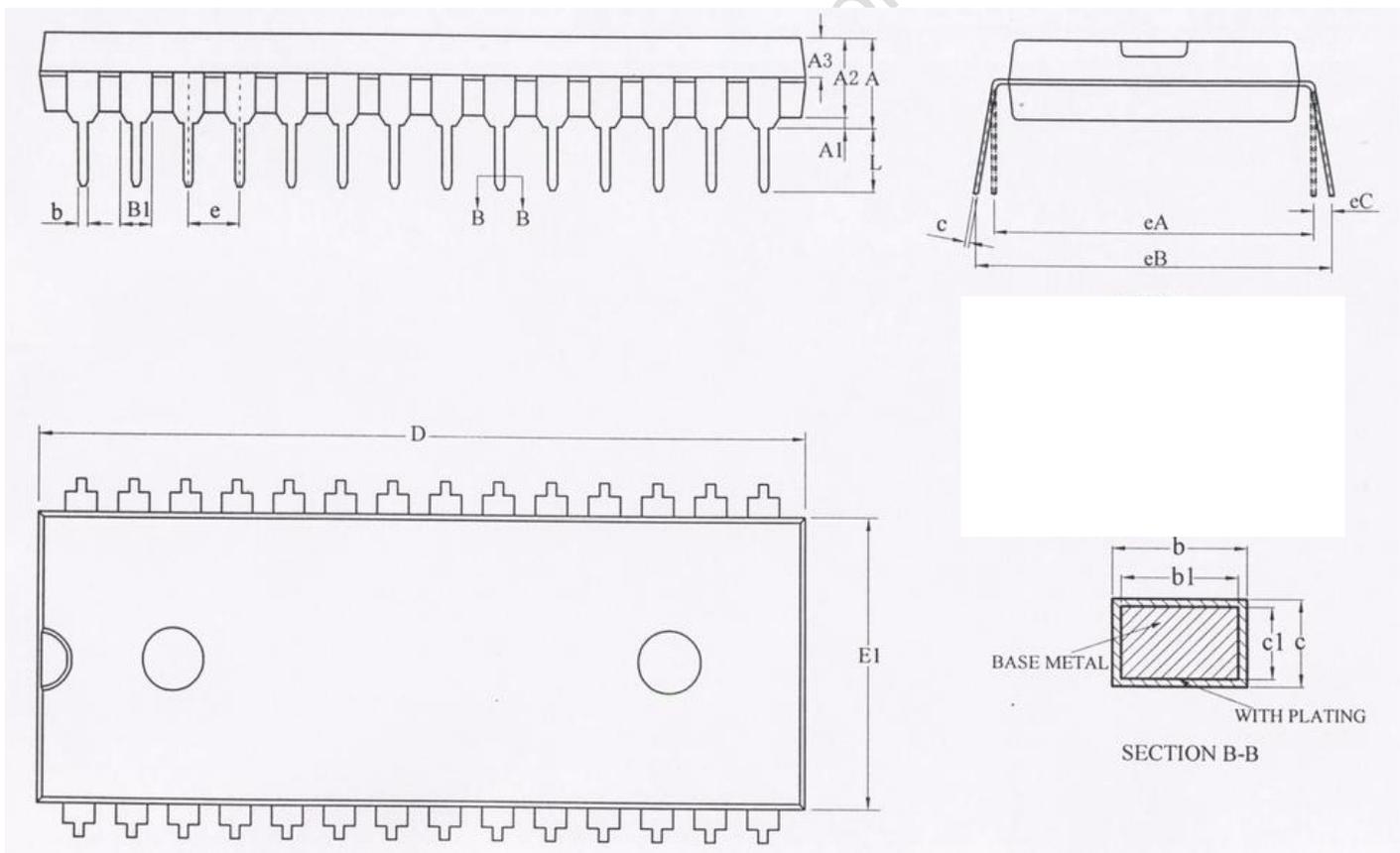
13. Package Dimension Diagram

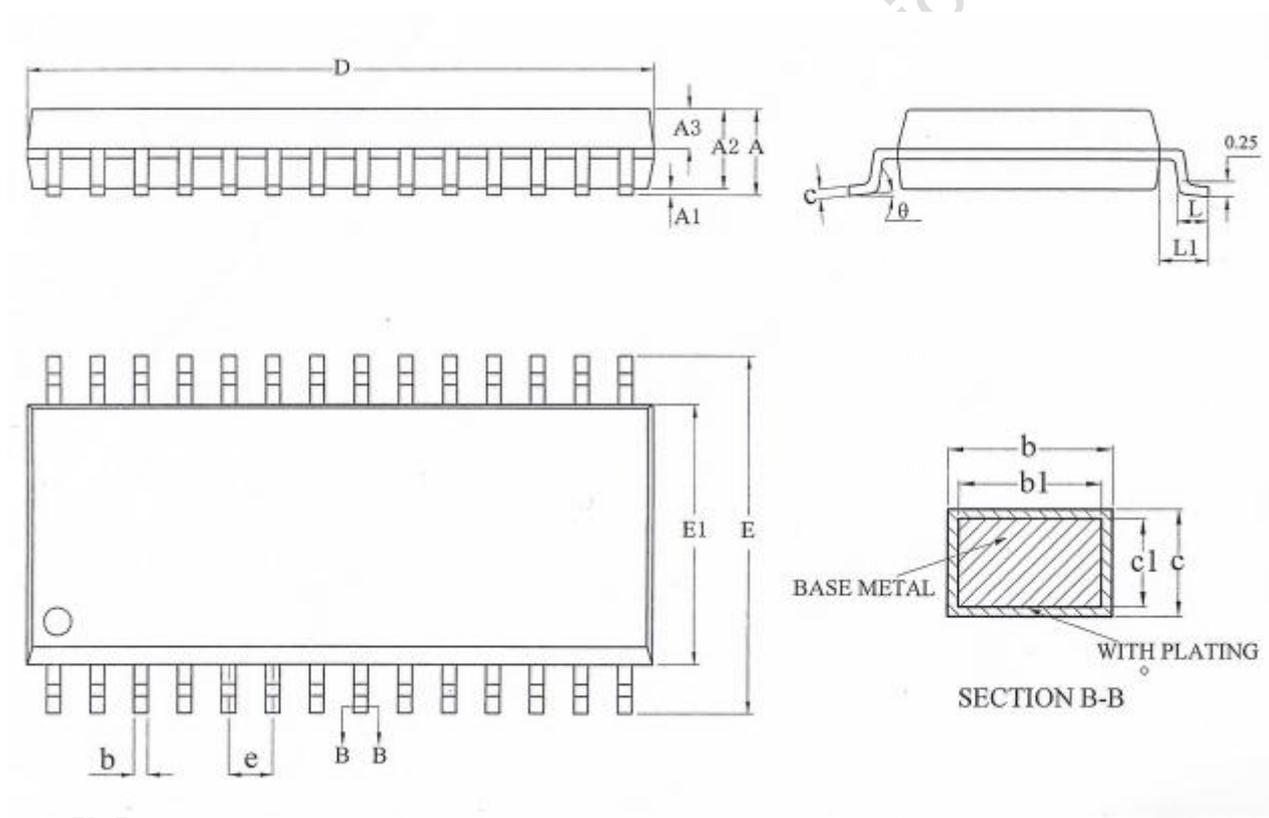## 13.1. DIP28package dimension diagram

Unit:mm

SYMBOL	MILLIMETER			SYMBOL	MILLIMETER		
	MIN	NOM	MAX		MIN	NOM	MAX
A	4. 16	4. 36	4. 56	c1	0. 24	0. 25	0. 26

A1	0.51	---	---	D	36.85	37.05	37.25
A2	3.65	3.85	4.05	E1	13.60	13.80	14.00
A3	1.69	1.79	1.89	e	2.54BSC		
b	0.44	---	0.53	eA	15.24BSC		
b1	0.43	0.46	0.48	eB	15.24	---	17.21
B1	1.52BSC			eC	0	---	0.99
c	0.25	---	0.31	L	3.00	---	---

13.2. SSOP28 package dimension diagram

L/F carrier size（mil）153×200　　　Unit:mm

SYMBOL	MILLIMETER			SYMBOL	MILLIMETER		
	MIN	NOM	MAX		MIN	NOM	MAX
A	---	---	2.00	D	10.00	10.20	10.40
A1	0.05	---	0.25	E	7.60	7.80	8.00
A2	1.65	1.75	1.85	E1	5.10	5.30	5.50

A3	0. 75	0. 80	0. 85	e	0. 65BSC		
b	0. 29	---	0. 37	L	0. 55	0. 75	0. 95
b1	0. 28	0. 30	0. 33	L1	1. 25BSC		
c	0. 15	---	0. 20	θ	0	-	8°
c1	0. 14	0. 15	0. 16				

14. History Version Record

Version	Date	Description
V1. 0	2010-3-10	Original version
V1. 1	2014-4-10	Increase information of freight source,package block diagram,modify some description

Shenzhen Waytronic Electronics Co., Ltd. (previously named Guangzhou Waytronic Electronics Co., Ltd.)-founded in 1999, is a high-tech company specializing in voice technology research, audio product design & control and other software & hardware design. Business scope relates to telephone recording of automotive electronics, multimedia, home security, communications, household appliances, medical equipment, industrial automation control, toys, interactive consumer products and other fields. With excellent IC software and hardware development capability and design experience, Waytronic upholds the concept of" Positive innovation, Courage to open up, Customer satisfaction, Teamwork", and strives to build the leading brands in voice industry.

Our company is a excellent voice chip manufacturer, engaged in the research and development of voice chip and peripheral circuit. At the same time, we formulate voice product development plans for the customers with special needs, carry out the plans effectively, and complete product development, testing, sound processing, and the practical application guidance and other services. After developing for many years, our company has formed a completely new product procedure system, with the ability to quickly develop new products and improve the products. Voice chip has a series of WT2000, WT2003, WT5001, WT588D, WTH, WTV, WTN, etc., each with our pursuit of perfect and continuous development and improvement, in order to make better quality and better practical value of voice IC. The human design of product, module, editing software, enables customers to use more conveniently. In 2006 Beijing Waytronic Hongtai branch company was established, mainly with the purpose of selling complete program and mature products, to provide better service for the domestic northern customer.

Not only that, a variety of voice modules are also introduced, such as WT2000 recording module, closer to the needs of customers through the expansion of the external circuit.

Our company is also a manufacturer of MP3 chip development. With the expansion of the company's external technology, in 2004 we began to produce MP3 chip, and provide MP3 programs. We have got high popularity in the same industry, worked out 8 MP3 solutions until now (2014-4), and widely recognized by the market. The WT2000, WT2003 and other chips have been continuously accepted and used by customers for the good sound quality and excellent performance.

In regard of audio player, we are engaged in manufacturing audio players. After many years of technical storage, we begin to expand the field of audio player and obtain the gratifying achievement, becoming a member of the audio player manufacturers. According to the probe categories, there are ultrasonic audio player, infrared human body induction audio player and photoinduction audio player. At the same time we have developed many products in different areas: self-service banking audio player, welcome alarm, voice advertising machine, doorbell and so on. It is sure that there will be more new products to be marketed to meet the majority of customers. Let our life be more intelligent and humanized.

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