

WT588D Voice IC and module Datasheet

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Contents

1. WT588D voice IC features 3

2. WT588D voice IC function description..... 4

3. WT588D voice chip model 5

4. Relationship between FLASH memory and voice length 5

5. Application 6

6. Application block diagram 6

7. Package Pins Diagram..... 7

 7.1. WT588D M01 module..... 7

 7.2. WT588DM02 module..... 8

WT588DM02..... 8

 7.3. WT588D-32L IC 9

 7.4. WT588D-20SS IC 11

 7.5. WT588D-16S IC..... 12

8. Pin's detailed description 13

9. Electronic parameter 13

10. Absolute Limits of the Environment Parameters..... 14

11. Control Mode 15

 11.1. Mp3 mode..... 15

 11.2. Key control mode 15

 11.2.1. Trigger impulse repetition..... 15

 11.2.2. Trigger pulse without repetition..... 16

 11.2.3. Recycled level 16

 11.2.4. No cycle Level..... 16

 11.2.5. Non-maintained cycle level..... 17

 11.2.6. Play / Stop..... 17

 11.2.7. Non-cycle for the next one 18

 11.2.8. Non-cycle for the last one 18

 11.2.9. Cycle for next one 18

 11.2.10. Cycle for last one 19

 11.2.11. Pause..... 19

 11.2.12. Stop..... 19

 11.3. 3X8 matrix key control mode 20

 11.4. Paraller port control mode 20

 11.4.1. Voice address corresponding list 21

 11.4.2. Control timing diagram 21

 11.5. One-Wire Serial Port Control Mode 22

 11.5.1. Assignment list of I/O..... 22



11.5.2. Command and Speech code 22

11.5.3. The relationship between speech and address 23

11.5.4. Control timing diagram 23

11.5.5. The example of one-wire serial port control time sequence..... 24

11.5.6. Models of program..... 24

11.6. Three-wire serial port control mode 25

11.6.1. Port allocation way..... 25

11.6.2. Voice and command code corresponding list..... 25

11.6.3. The corresponding relationship between voice and address..... 26

11.6.4. I/O port extend output in the three- line serial port mode 26

11.6.5. Three-wire serial port control time sequence 27

11.6.6. The send time of command code 28

11.6.7. Models of program..... 29

12. Control Procedures 29

12.1. one-line serial port control assemble program..... 29

12.2. one-line serial port control C program..... 31

12.3. Three-line serial port control assemble program 33

12.4. Three-line serial port control C program 34

13. Package Dimension Diagram 36

13.1. DIP28 package dimension diagram 36

13.2. SSOP28 package dimension diagram..... 37

14. History Version Record 38



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 quality 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 controlled, 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 before the switching can be taken into the mode after the switching.
- 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 Voice Chip 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 Voice Chip 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, signaling 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 command, 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

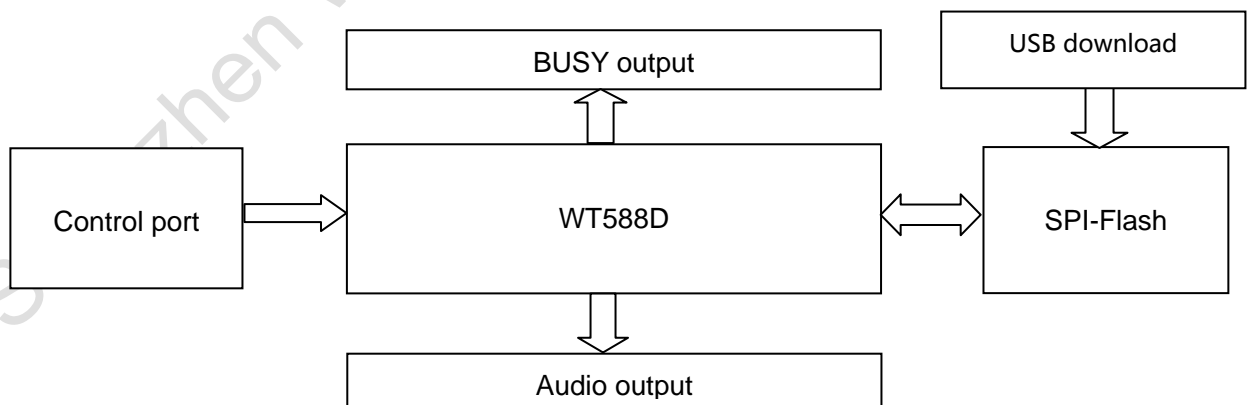
Sampling frequency at 6KHZ,when extend multiple storage, can get much storage space and voice address

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

5. Application



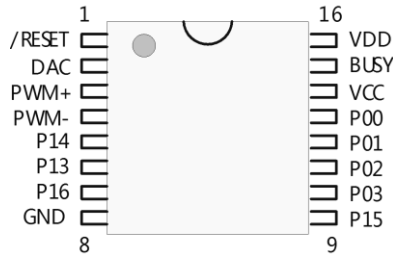
6. Application block diagram



7. Package Pins Diagram

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

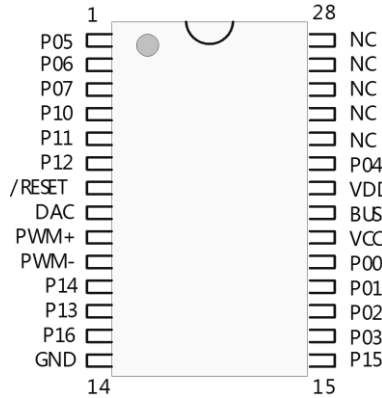
7.1. WT588D M01 module



WT588D M01

PIN	Mark	Description	Function
1	/RESET	reset	Reset pin, keep low level $\geq 5\text{ms}$ 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	Digital power input pin

7.2. WT588DM02 module

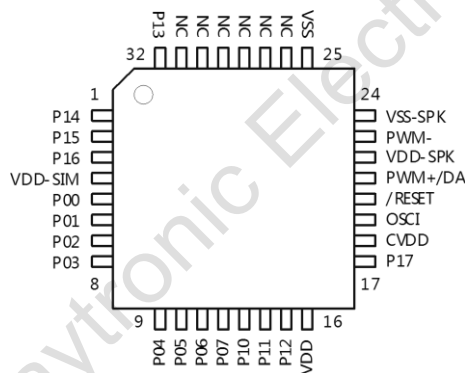


WT588DM02

PIN	Mark	Description	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 $\geq 5ms$ 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



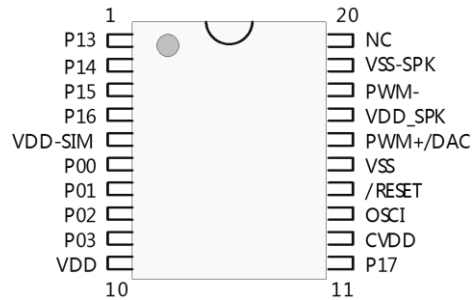
WT588D-32L

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 $\geq 5\text{ms}$ is valid
21	PWM+/D AC	PWM+/DAC	PWM+/DAC audio output pin, set according the function
22	VDD-SP K	VDD-SPK	Audio power input pin
23	PWM-	PWM-	PWM- audio output pin
24	VSS-SP K	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

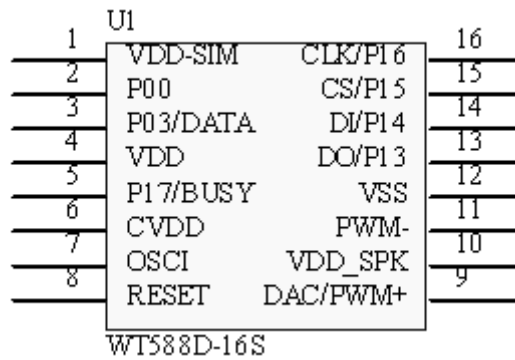
7.4. WT588D-20SS IC



WT588D-20SS

Pin	Mark	Description	Function
1	P13	DO	SPI-Flash communicate data output 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 $\geq 5\text{ms}$ 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 $\geq 5ms$ 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 data output 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

The use of 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 set 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 use of 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

$V_{DD} - V_{SS} = 4.5V$, $T_A = 25^{\circ}C$, no load

Parameter	Mark	Environmental conditions	Minimum value	Typical value	Maximum value	Unit
Working voltage	V_{DD}	$F_{sys}=8MHz$	2.8	3.3	5.5	V
	V_{CC}	$F_{SYS}=8MHz$	2.8	3.3	3.6	V
Download current	I_{ERA}	Erasing information, $V_{DD}=0$	6.0	7.0	7.8	mA
	I_{DOW}	Download information, $V_{DD}=0$	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	μA
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 =500K Ω	-5	-9	-14	μA
Input current BP1. BP2. RESET	I_{IN2}	$V_{IN}=0V$ Pull-up resistor =150K Ω	-15	-30	-45	μA
Output current (BP0)	I_{OL}	$V_{DD}=3V, V_{OUT}=0.4V$	8	12	-	mA
	I_{OH}	$V_{DD}=3V, V_{OUT}=2.6V$	-4	-6	-	mA
	I_{OL}	$V_{DD}=4.5V, V_{OUT}=1.0V$	-	25	-	mA
	I_{OH}	$V_{DD}=4.5V, V_{OUT}=2.6V$	-	-12	-	mA
Output current (BP1)	I_{OL}	$V_{DD}=3V, V_{OUT}=0.4V$	4	10	-	mA
	I_{OH}	$V_{DD}=3V, V_{OUT}=2.6V$	-4	-6	-	mA
Output current PWM+/PWM-	I_{OL1}	$RL=8\Omega$	+40	-	-	mA
	I_{OH1}	【PWM+】--【RL】--【PWM-】	-40	-	-	mA
DAC maximum current	I_{DAC}	$RL=100\Omega$	-2.4	-3.0	-3.6	mA
			-4.0	-5.0	-6.0	
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	$V_{SS}-0.3 \sim V_{DD}+0.3$	V
Storage temperature	TSTG	-	-55 ~ +150	$^{\circ}C$
Using temperature	T_{OPR}	-	-40 ~ +85	$^{\circ}C$

11. Control Mode

11.1. Mp3 mode

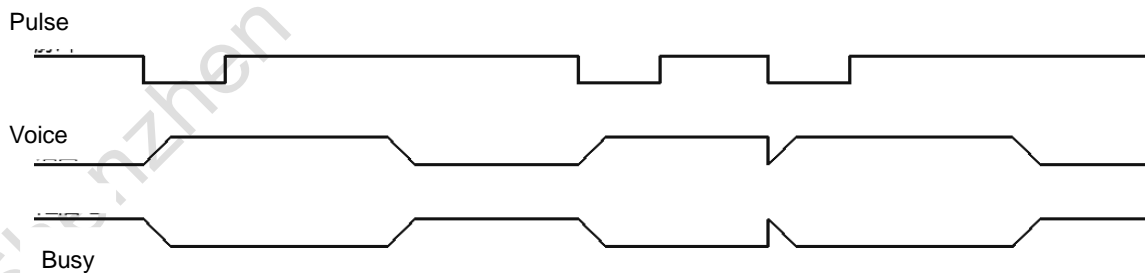
In the mp3 mode, default function of 6 I/O port

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

11.2. Key control mode

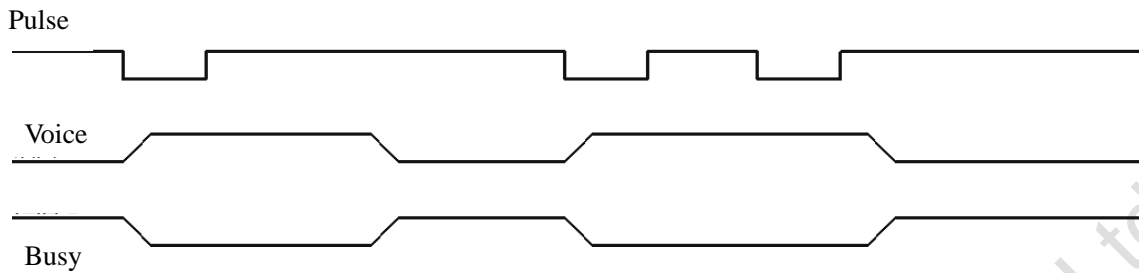
Pins can directly trigger a function of chip to work. Each pin of the trigger can be set individually. Shockproof time of this mode time is about 10ms. There are 15 trigger ways. Including trigger impulse repetition , trigger pulse without repetition , invalidation keys, no cycle Level , recycled level , 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



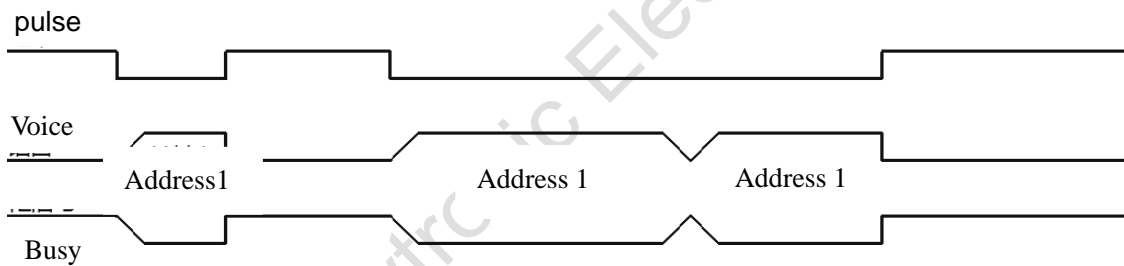
Note: Negative trigger pulse. When I / O port inspects the falling edge (for example, I / O port click short-circuit to GND more than 25ms), Voice will be broadcast. If do that again, Voice are still playing, it will be interrupted and replay. Therefore, it will be replay as long as has falling edge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

11.2.2. Trigger pulse without repetition



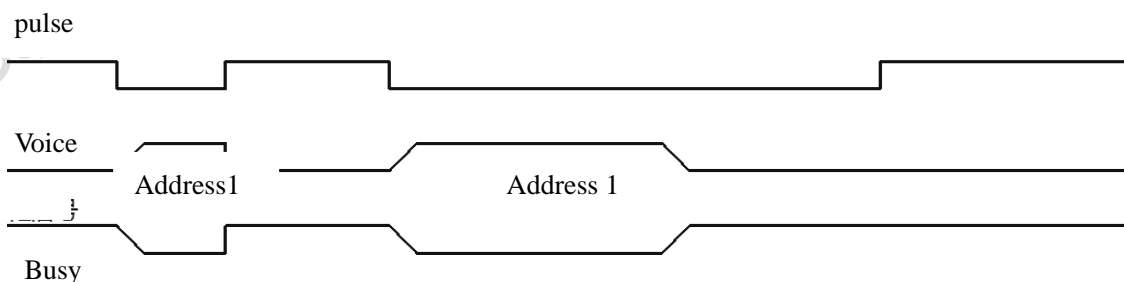
Note: Negative trigger pulse. When I / O port inspects the falling edge (for example, I / O port click short-circuit to GND more than 25ms), Voice will be broadcast. If do that again during playing, the voice will not be interrupted and continue to broadcast. To be valid unless the voice at an end and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

11.2.3. Recycled level



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.

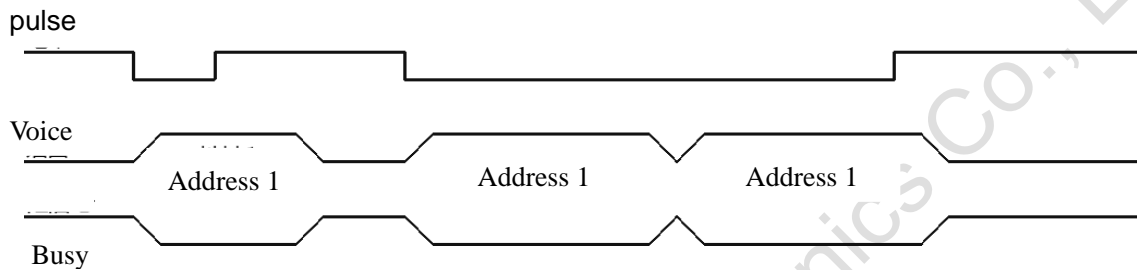
11.2.4. No cycle Level



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.

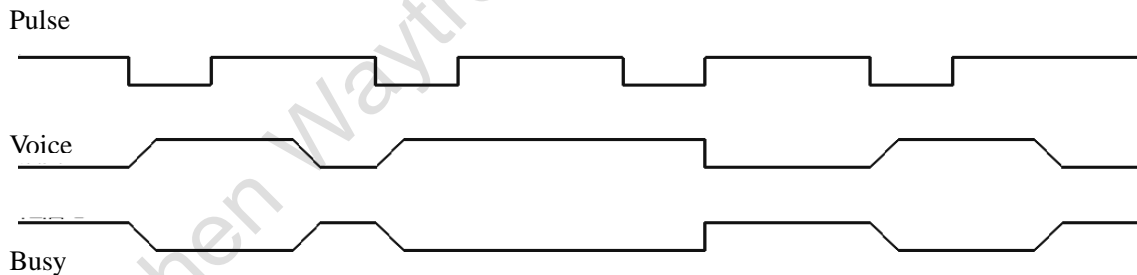
If you need to replay, please make I / O port at high level and then pull low. Finally, keep it at low level.

11.2.5. Non-maintained cycle level



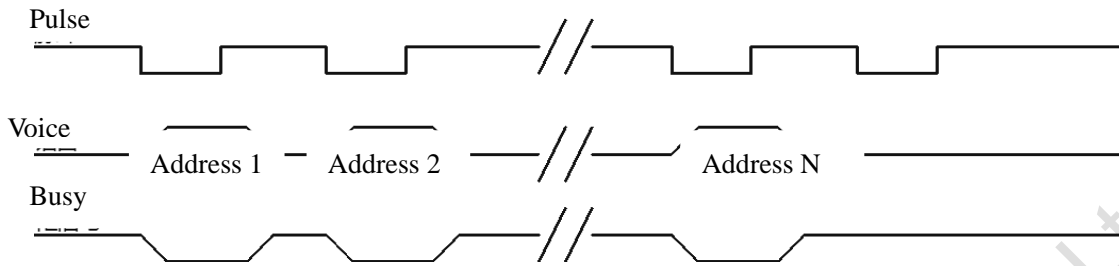
Note: Negative Pulse /trigger Level. When I / O port at low level and keep playing, at the same time, high level don't stop until the voice is over. When the end of the first time, if keep at the low level, it will continue to repeat. If not, when finish it will stop automatically.

11.2.6. Play / Stop



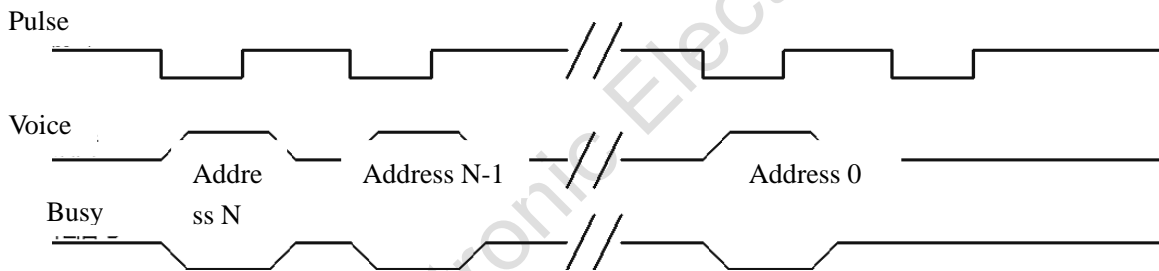
Note: Negative trigger pulse. Negative pulse (for example, I / O port click short-circuit to GND more than 25ms), starts to play when the next one stop. Whether the voice is in play or not must in accordance with this regulation. During playing, if trigger time of stop more than 246ms, it will lead to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

11.2.7. Non-cycle for the next one



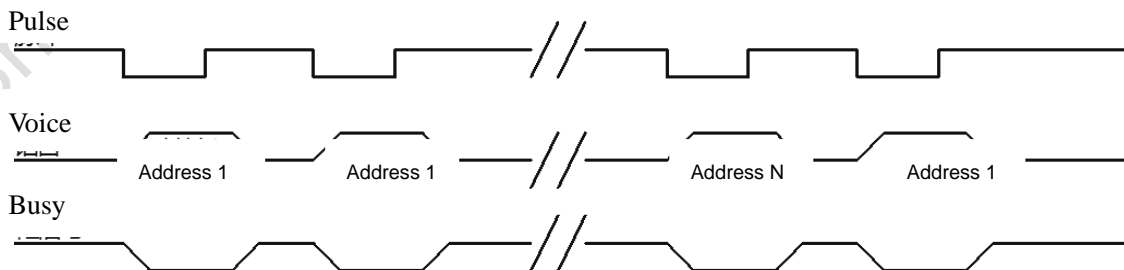
Note: Negative trigger pulse. Trigger with a key to play a sound (for example, I / O port click short-circuit to GND more than 25ms). A pulse plays a piece, the next pulse plays the next piece. It doesn't stop until the last piece is finished. Repeat the same operation. It only can play to the last.

11.2.8. Non-cycle for the last one



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



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

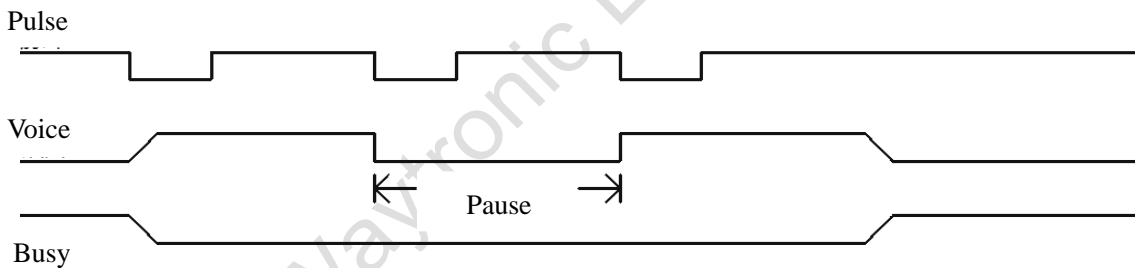
the operation. It will start again from the first piece when the last shows off. Loop continuously.

11.2.10. Cycle for last one



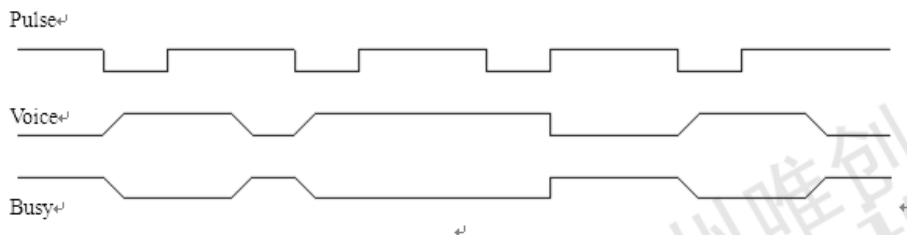
Note: Negative trigger pulse. Trigger with a key to play a sound (for example, I / O port click short-circuit to GND more than 25ms). A pulse plays a piece; the next pulse plays the next piece. Repeat the operation. It will start again from the first piece when the last shows off. Loop continuously.

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

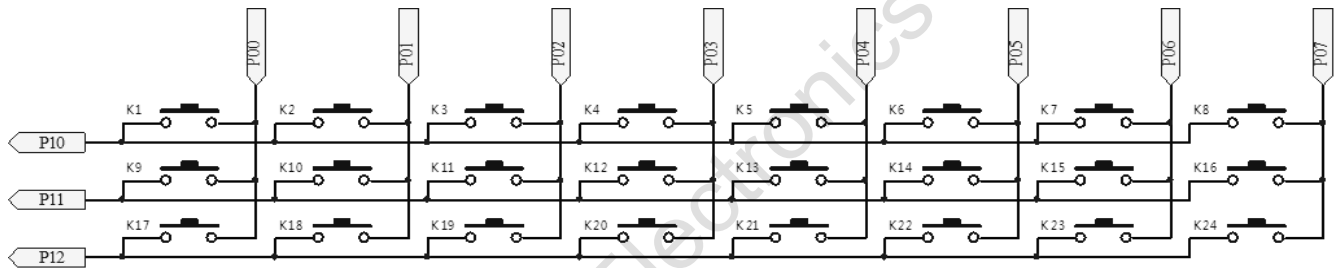


Note: Negative trigger pulse. A pulse (for example, I / O port click short-circuit to GND more than 25ms) stopped the voice, which is playing. Trigger once again invalidly when the voice is stopped.

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, playing voice by changing the address “An”. Pins’ definition as follows:

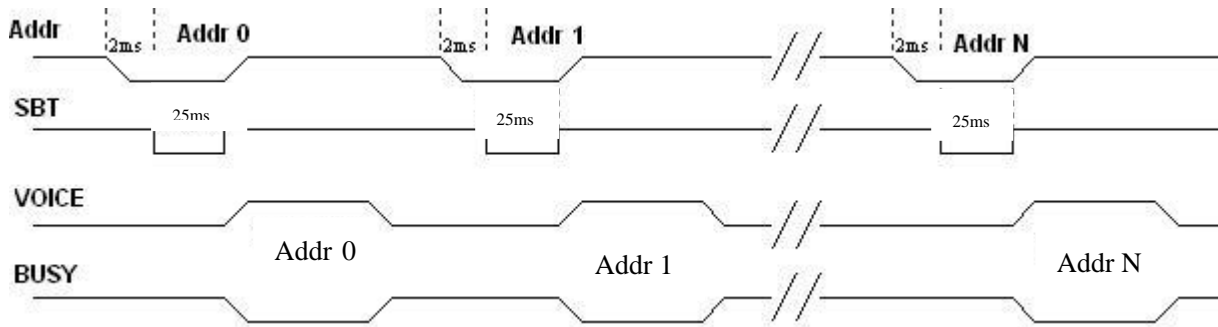
Package	Pin								
	P00	P01	P02	P03	P04	P05	P06	P07	P10
WT588DM02	SBT	A0	A1	A2	A3	A4	A5	A6	A7
WT588D-32L	SBT	A0	A1	A2	A3	A4	A5	A6	A7

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 stopping play, 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



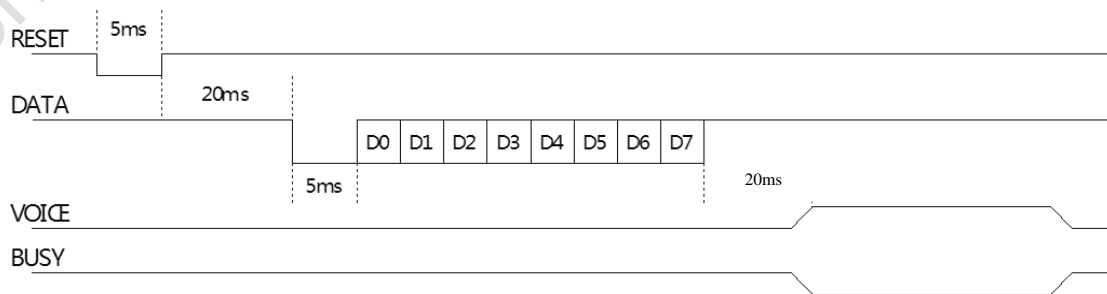
	adjustable	volume when working or standby.
F2H	Cycle playing	The current voice addresses can be recycled When working.
FEH	Stop voice playing	Voice command to stop playing

11.5.3. The relationship between speech 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

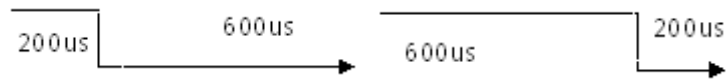
One-wire serial port only through a data communication line control time sequence. According to different duty cycle of levels represent different data bit. Firstly, pull low RESET signal 5ms, then set the high level more than 17ms, and then pull low data signal line 5 ms, send data at last . The duty 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 is one-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 successfully, wait for 20 ms, BUSY output will respond.

Details of data bit duty cycle in the following chart:



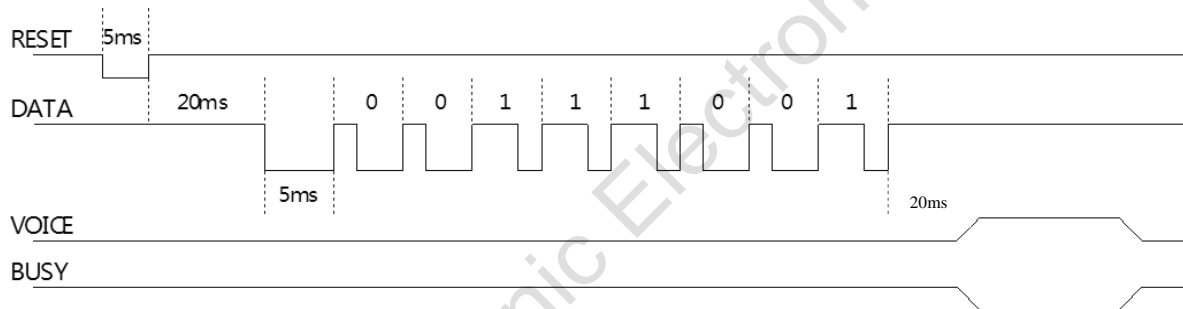
High level: Low level=1:3 stand for 0

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 online(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 enter regular 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 command 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

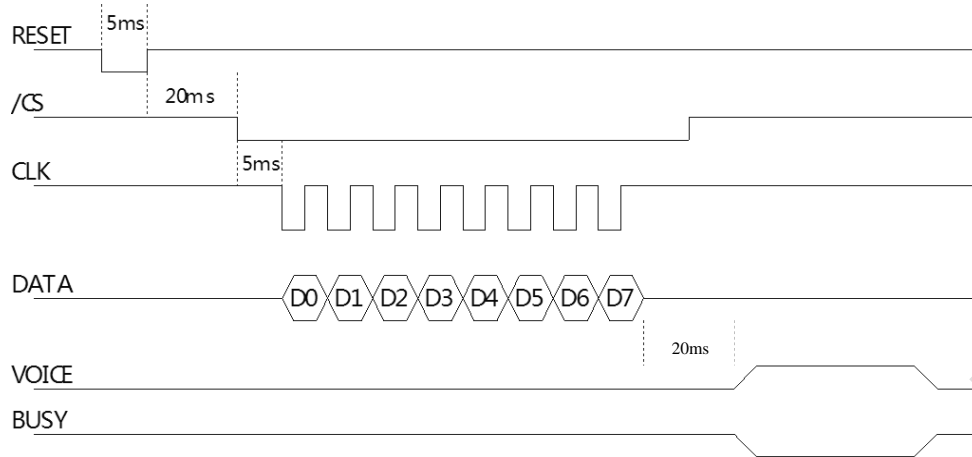
The data in the form, 0 represents low level output, 1 represents high level output. Switch to I/O extension output from three-line serial control mode, the last trigger mode of three-line serial control mode be kept. If set loop play, the last triggered speech will keep loop playing until switch back 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 set 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 control extend output of I/O port, F6H is the order of exit the three-line serial port to control extend output of I/O port.

Details of time sequence in the following diagram:

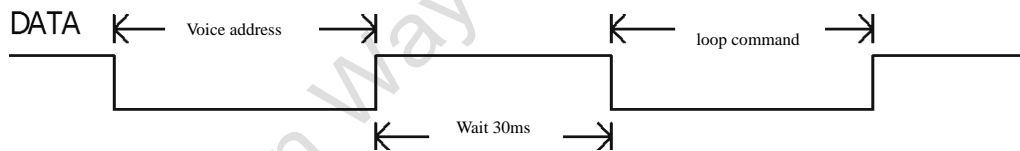


Note: Reset signal is only used in the environment of the external disturbance is strong, if not special industrial occasions, do not need to send the reset signal, can be sent directly to select-chip(cs), the clock(clk) and data signals.

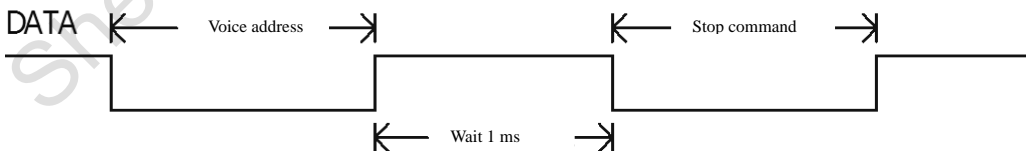
Mark: Don't send the command in the time period that from the end voice to busy signal is changed.(about 24ms)

11.6.6. The send time of command code

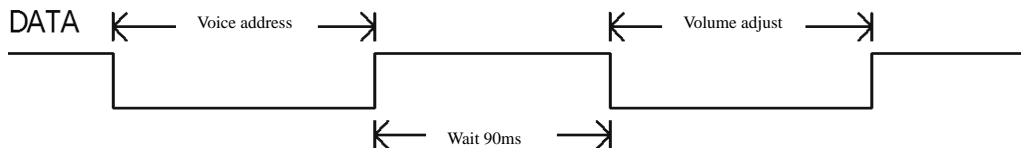
Loop playing command F2H: The loop play command needs to be sent after the voice address signal or other command is sent about 30ms, and before finish playing, or the voice chip cannot be received effectively.



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 command E0H ~ 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.



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: LJMPL 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
    LJMPL 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_online(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_online(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 sub program, 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.

```

#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;

```

```

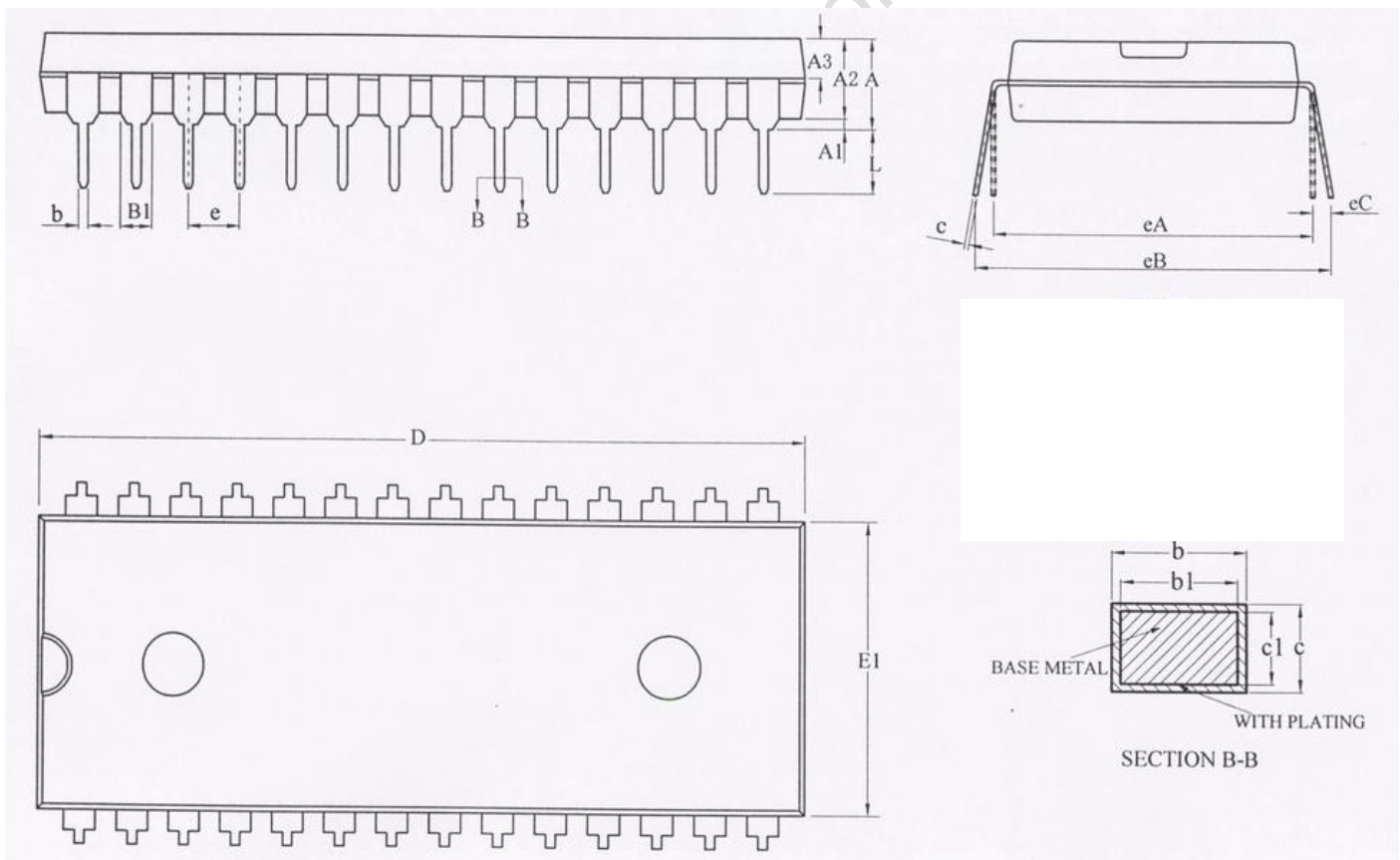
}
while(KEY==0); //Wait for release the key, lest a buttonmisjudge everal times

}
}
}
}
}

```

13.Package Dimension Diagram

13.1. DIP28package dimension diagram

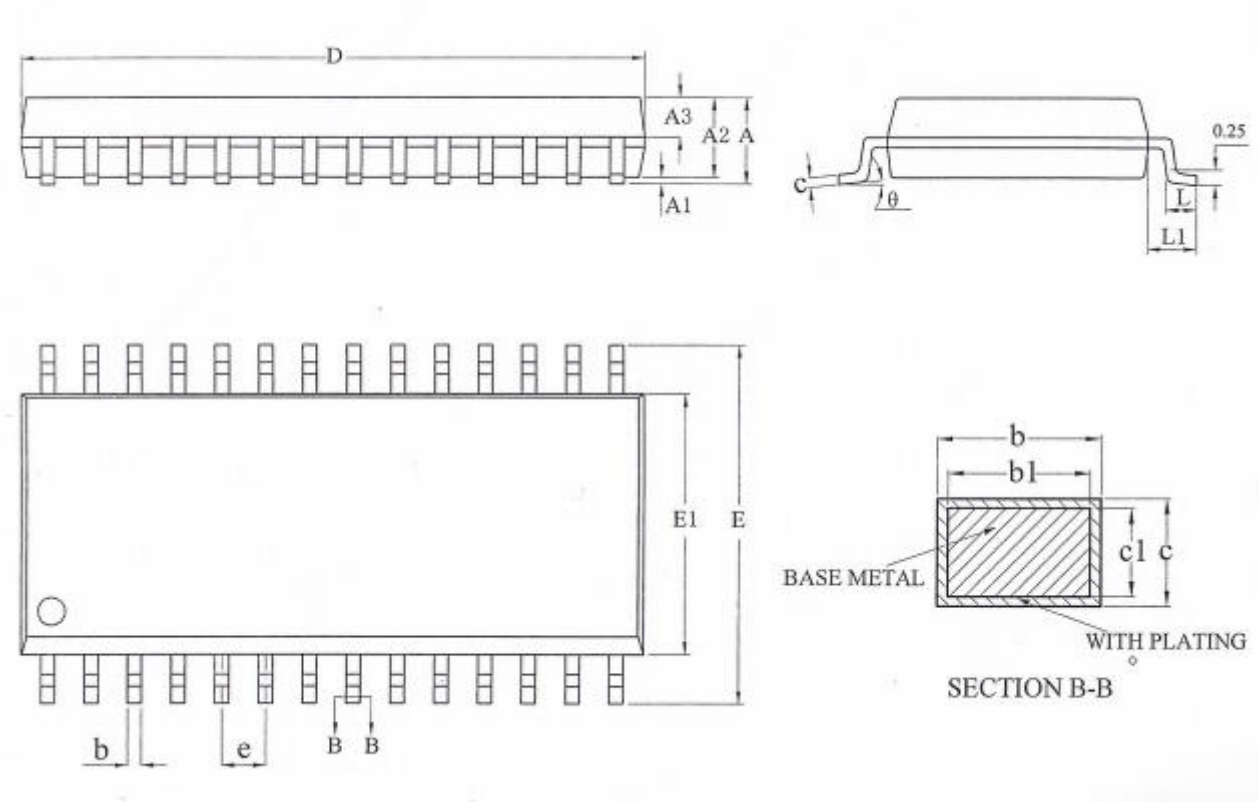


Unit:mm

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) 153x200

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