# WTV010 & WTV020
# Datasheet

## 1.Features

*OTP(one time programmable) VOICE-CHIP

*Operating voltage:2.5V-3.6V

* WTV010 with 10seconds , WTV020 with 20seconds duration at 6KHz .

*Sampling rate supported form 6KHz ,8KHz,10KHZ …. 32KHz max.

*Higher sampling rate better sound quality and shorter duration.

*With DAC and PWM audio output .

*DAC output connect to amplifier . PWM output can direct a 0.5W/8ohms speaker

*Equipped with 16 bits DAC

* Mute will not take up any memory space.

* The same voices can be re-use and will not take up memory space.

*Multiple control modes: key mode(keyboard), parallel (COM+SBT), one line serial , two lines serial , three lines serial

* Quiescent current 2uA

*Support WAV ,16Bit, mono format.

*Equip with PC software for project editing.

## 2. Chip models

WTV010/WTV020

| Model | WTV010-DIP16/SOP16/TSSOP 16 | WTV020-DIP16/SOP16/TSSOP 16 | WTV020-SOP20 |
|---|---|---|---|
| Duration | 10 s | 20 s | 20 s |
| Track | Mono | Mono | Mono |
| Audio output | DAC/PWM | DAC/PWM | DAC/PWM |
| Key board trigger I/O | 4 | 4 | 7 |
| Parallel address | 4 | 4 | 7 |
| Control modes | Keyboard / parallel(COM+SBT)/Serial | Keyboard / parallel(COM+SBT)/Serial | Keyboard / parallel(COM+SBT)/Serial |

Note:The duation caculate at 6KHz sampling rate ,Control modes can be chosen in PC software.

## 3. Package sketch map

WTV010 with DIP 16 ans SOP 16 packages. And WTV020 with DIP 16 , SOP 16,TSSOP16 and SOP 20 packages.
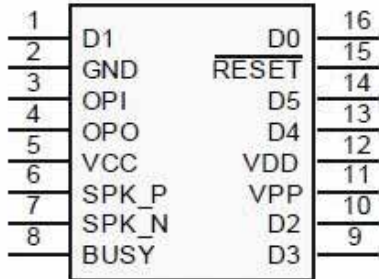
WTV020 TSSOP16/DIP16/SOP16
WTV010 DIP16/SOP16
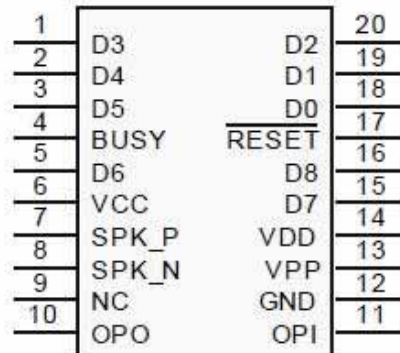
WTV020 SOP20

## 4.Pin's descriptions

4.1 For WTV010/WTV020 DIP16/SOP16/TSSOP16 package

| Pin No. | Pin name | Brief | Descriptions |
|---|---|---|---|
| 1 | D1 | K2/A0/CS | Keyboard trigger I/O / Parallel address / Three lines serial CS(Chip select) |
| 2 | GND | GND | GND |
| 3 | OPI | OPI | Internal amplifier reactive input |
| 4 | OPO | OPO | Internal amplifier reactive output |
| 5 | VCC | VCC | Chip analog power |
| 6 | SPK-P | SPK-P | DAC /PWM audio output |
| 7 | SPK-N | SPK-N | DAC /PWM audio output |
| 8 | BUSY | BUSY | Busy |
| 9 | D3 | K4/A2/DI | Keyboard trigger I/O , Parallel address/ one line data /two lines serial data / three lines serial data |
| 10 | D2 | K3/A1/SCK | Keyboard trigger I/O / Parallel address / Two lines serial Clock/Three lines serial Clock |
| 11 | VPP | VPP | Chip program power |
| 12 | VDD | VDD | Chip digital power |
| 13 | D4 | A3 | Parallel address |
| 14 | D5 | D5 | Data |
| 15 | RESET | RESET | Chip reset   (keep low level 2ms to reset) |
| 16 | D0 | K1           / TEST/SBT | Keyboard trigger I/O / Parallel address trigger SBT |

## 4.2. WTV020 SOP20 package

| Pin No. | Pin name | Brief | Descriptionss |
|---|---|---|---|
| 1 | D3 | K3/A5 | Keyboard trigger I/O / Parallel address |
| 2 | D4 | K4/A1/SCK | Keyboard trigger I/O /Two lines serial Clock/Three lines serial Clock / Parallel address |
| 3 | D5 | K5/A2/DI | Keyboard trigger I/O , Parallel address/ one line serial data / two lines serial data / three lines serial data |
| 4 | BUSY | BSUY | Busy |
| 5 | D6 | K6/A6 | Keyboard trigger I/O / Parallel address |
| 6 | VCC | VCC | Chip analog power |
| 7 | SPK-P | SPK-P | DAC/PWM audio output |
| 8 | SPK-N | SPK-N | DAC/PWM audio output |
| 9 | NC | NC | N/C |
| 10 | OPO | OPO | Internal amplifier reactive output |
| 11 | OPI | OPI | Internal amplifier reactive input |
| 12 | GND | GND | GND |
| 13 | VPP | VPP | Chip program power |
| 14 | VDD | VDD | Chip digital power |
| 15 | D7 | A3 | Parallel address |
| 16 | D8 | -- | Parallel address |
| 17 | RESET | RESET | Chip reset   (keep low level 2ms to reset) |
| 18 | D0 | K0/SBT | Keyboard trigger I/O / Parallel address trigger pin |
| 19 | D1 | K1/CS/A0 | Keyboard trigger I/O / Parallel address/ three lines serial CS (chip select) |
| 20 | D2 | K2/A4 | Keyboard trigger I/O / Parallel address |

## 5. Electric parameters

| Pin names | Parameters | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| D7 D8 | Drive current | | 4 | | mA | VOH=2.7 |
| OP_O | Drive current | | 4 | | mA | |
| SPK_P SPK_N | Drive current | | | 80～150 | mA | RL=8 |
| D0 D1 | Output current | | 4 | | mA | VOL=0.3 |
| OP_O | Output current | | 4 | | mA | VOL=0.3 |
| SPK_P SPK_N | Output current | | | 80～150 | mA | RL=8 |
| I_STD | Quiescent current | 0.5 | 1 | 2 | uA | |

## 6.Absolute maximum ratings

| Item | | Range | Unit |
|---|---|---|---|
| VCC-GND | | -0.5～4.5 | V |
| Vin | | GND-0.3<Vin<VCC+0.3 | V |
| Vout | | GND<Vout<VCC | V |
| T(Operation) | DIP | -30~+75 | °C |
| | SOP | -40~+85 | °C |
| T(Junction) | | -30~+120 | °C |
| T(Storage) | | -45~+125 | °C |

## 7. Pins detail functions (D0～D8)

The pins functions in different control mode for DIP16/SOP16/TSSOP package

In the Parallel mode, D0 works as trigger Pin (SBT) .In the keyboard mode , D0~D6 can be defined as pulse retrigger, pulse trigger, low level trigger, low level retrigger, ON/OFF, up(previous) ,down (next) ,up loop, down loop .

D1 is defined as key trigger I/O ,/ three lines serial CS / and parallel address A0

D2 is defined as key trigger I/O /two lines serial clock / three lines serial clock / parallel address A1

D3 is defined as key trigger I/O / one line serial data in / two lines serial data in / three lines serial data in / parallel address A2

D4 is defined as key trigger I/O / parallel address A3

The pins functions in different control mode for SOP20 package

In the parallel interface , D0 works as trigger pin (SBT) .

D1 is defined as key trigger I/O / three lines serial CS(chip select) / parallel address A0

D2 is defined as key trigger I/O / parallel address A4

D3 is defined as key trigger I/O / parallel address A5

D4 is defined as key trigger I/O /two lines serial clock / three lines serial clock / parallel address A1

D5 is defined as key trigger I/O / one line serial data   / two lines serial data   / three lines serial data   / parallel address A2

D6 is defined as key trigger I/O / parallel address A6

D7 is defined as parallel address A3

VDD ,VCC,GND

VDD is chip digital power input, VCC is chip analog power input , voltage range from 2.6V～3.6V .

GND is power ground .

OPO , OPI , SPK-P, SPK-N

OPO is chip internal amplifier reactive output pin, OPI is chip internal amplifier reactive input pin . When use the PWM output to direct speaker , the reactive circuit should be connected .When use DAC output to connect external amplifier , reactive circuit is not needed. SPK－P and SPK-N are audio output , connect 0.5W/8ohms speaker when PWM output . When DAC output, OPO connect a capacitor to amplifier input, and share GND. Pls see the application circuit.

RESET ,BUSY

Low level reset the chip , this low level not less than 2ms ,after reset , pull up not less than 5ms , will let the chip into working.   Busy can be set to low or high output in the software .

## 8.Control modes

WTV010/WTV020 with keyboard, one line serial , two lines serial , three lines serial and parallel interface control modes. User can choose the mode in the PC software before program sounds into the chip.

### 8.1. Keyboard

In this mode, each I/O can trigger one ground of sound ,and the trigger mode can be set individually. Debounce time is 10ms in key mode. The trigger mode include Pulse retrigger, pulse trigger, level retrigger, level trigger, on/off, down, up ,down loop , up loop , the detail function please see the waveform.

#### 8.1.1.Pulse retrigger
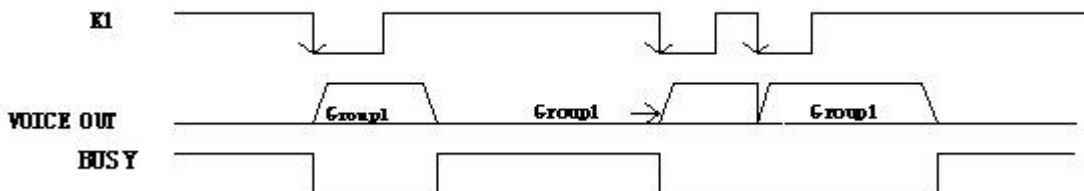


Negative pulse trigger, when I/O port detect falling edge (such as short touch the I/O port to the GND), trigger and play voice. During the playing , falling edge was detected again, the voice will be interrupted and re-play.
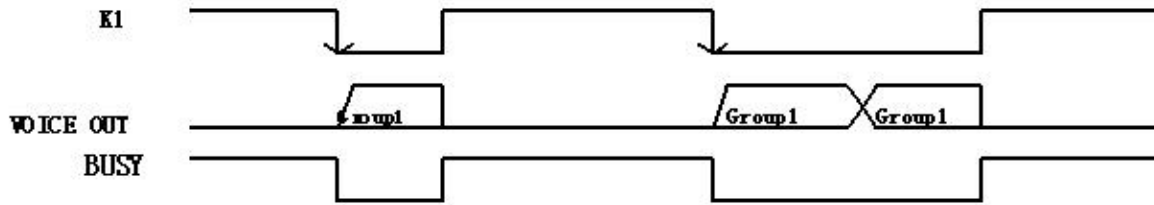
#### 8.1.2. Pulse trigger
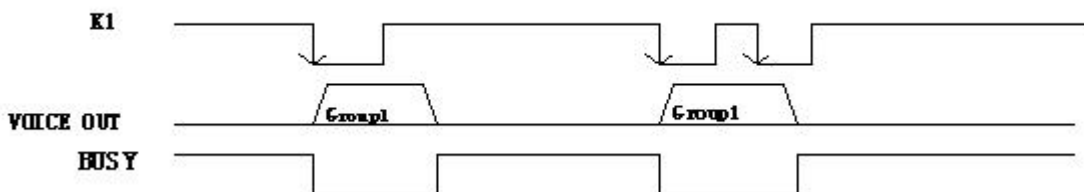


Negative pulse trigger, when I/O port detect falling edge (such as short touch the I/O port to the GND), trigger and play voice. During playing ,even falling edge was detected again, the chip will not take other action.After voice played over, falling edge become valid to trigger sound .

#### 8.1.3. Level retrigger

LEVEL RETRIGGER

K1

VOICE OUT

BUSY

Level retrigger. When I/O port is low level, keep playing , high level will stop. it will re-play until high level.

### 8.1.4 Level trigger

LEVEL IRRETRIGGER

K1

VOICE OUT

BUSY
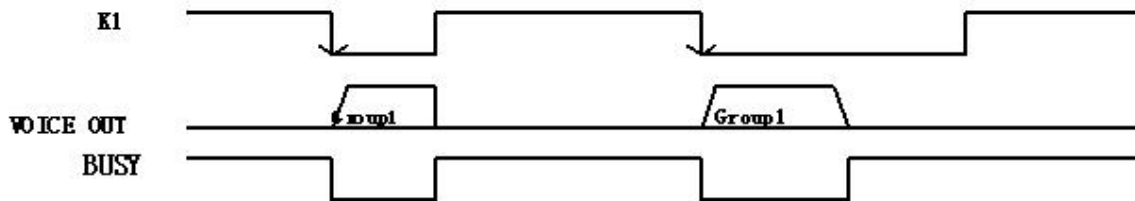
Level trigger. When I/O port is low level, keep playing , high level will stop. After first play is over it won't replay even keep low level. Unless pull high then pull low and keep low level, it will be the second play .

### 8.1.5. On/off

ON\OFF

K1

VOICE OUT

BUSY
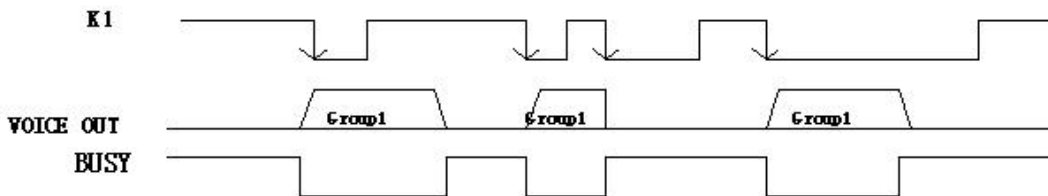
A negative pulse start to play, next negative pulse to stop.

### 8.1.6. Down (Next)

NEXT

K1

VOICE OUT

BUSY
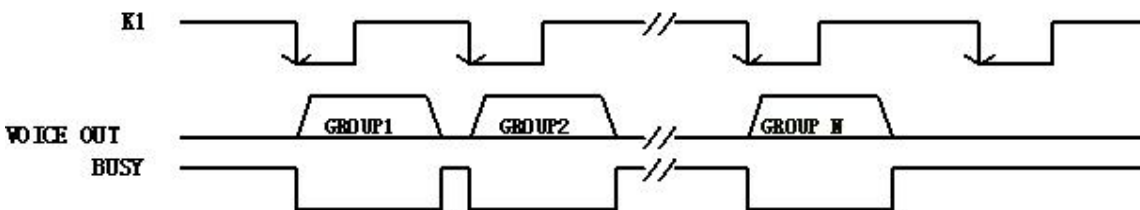
Next(down)   .A negative trigger play a group, next negative trigger play next group,   untill last group, then no more voice can be triggered.

### 8.1.7.Up (Previous)
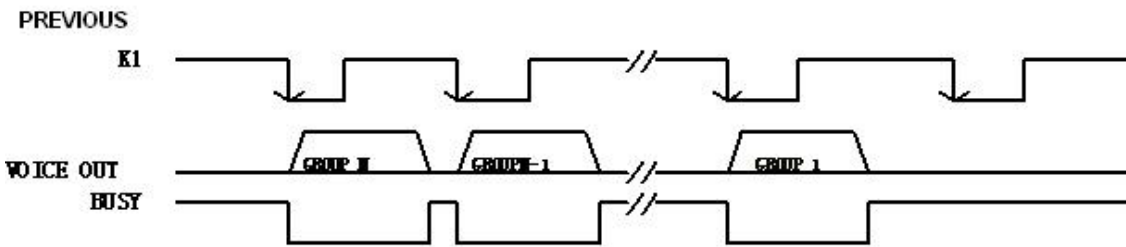
Previous (Up). A negative pulse trigger to play a group, next negative pulse trigger to play previous group . it will not loop after all voices triggered.

### 8.1.8. Down loop
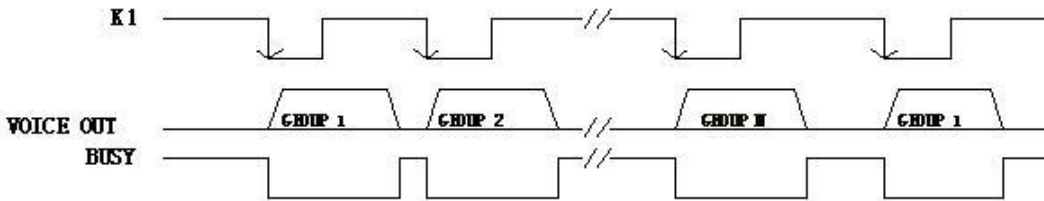


Next loop(down loop). A negative pulse trigger to play a group, next negative pulse trigger to play next group . It can be loop by trigger.

### 8.1.9. Up loop
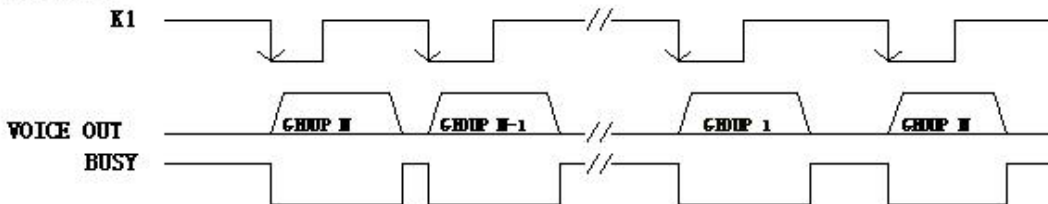


Previous loop( up loop). A negative pulse trigger to play a group, next negative pulse trigger to play previous group .   It can be loop by trigger.

### 8.2. Parallel interface (COM+SBT)

In this mode, D0 works as trigger Pin (SBT) , trigger different voices in different address .

### 8.2.1 Assignment of I/O

| Package | Pins | | | | | | | | |
|---------|------|------|------|------|------|------|------|------|------|
| | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| DIP16 | -- | -- | -- | -- | A3 | A2 | A1 | A0 | SBT |
| SOP16 | -- | -- | -- | -- | A3 | A2 | A1 | A0 | SBT |
| SOP20 | -- | A3 | A6 | A2 | A1 | A5 | A4 | A0 | SBT |

**8.2.2. The relation of address and voice for WTV020/WTV010 DIP16、SOP16、TSSOP16**

| Group N | Address pins | | | |
|---------|----|----|----|----|
| | A3 | A2 | A1 | A0 |
| Group1 | 0 | 0 | 0 | 0 |
| Group2 | 0 | 0 | 0 | 1 |
| Group3 | 0 | 0 | 1 | 0 |
| …… | …… | …… | …… | …… |
| Group14 | 1 | 1 | 0 | 1 |
| Group15 | 1 | 1 | 1 | 0 |
| Group16 | 1 | 1 | 1 | 1 |

**8.2.3. The relation of address and voice for SOP20 package**

| Group N | Address pins | | | | | | | |
|---------|----|----|----|----|----|----|----|----|
| | A7 | A6 | A5 | A4 | A3 | A2 | A1 | A0 |
| Group1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Group2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Group3 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| …… | …… | …… | …… | …… | …… | …… | …… | …… |
| Group126 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 |
| Group127 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 |
| Group128 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 |

**8.2.4. Timing waveform for Parallel interface (COM+SBT)**

Put the address first and trigger by SBT . the trigger mode can be changed in software.
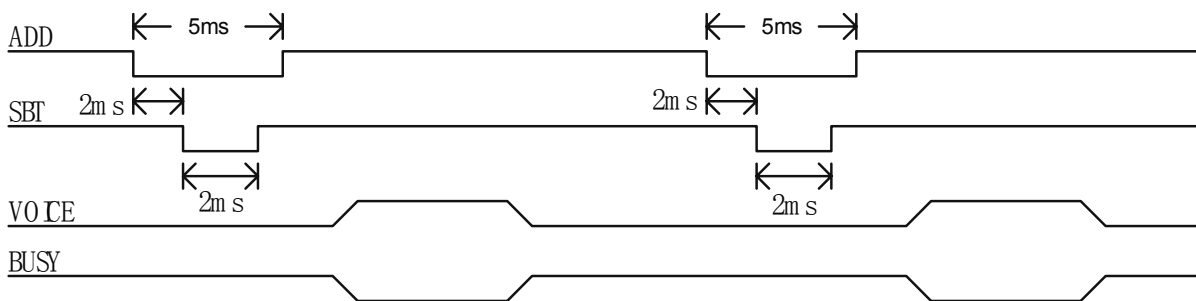


Note: ADD signal pull low 2ms ,SBT trigger and keep 2ms low level . avoid trigger other voices, after 1ms after SBT trigger finish , pull high ADD signal.

**8.3. One line serial interface.**

**8.3.1. Assignment of I/O**

| Package | PIns | | | | | | | | |
|---------|----|----|----|----|----|----|----|----|----|
| | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| DIP16 | -- | -- | -- | -- | -- | DATA | -- | -- | TEST |

| SOP16 | -- | -- | -- | -- | -- | DATA | -- | -- | TEST |
|-------|----|----|----|----|----|------|----|----|------|
| SOP20 | -- | -- | -- | DATA | -- | -- | -- | -- | TEST |

Note: D0 for voice test , negative pulses can trigger the voices .

### 8.3.3. Code descriptions

| Code | Definition | Descriptions |
|------|-----------|--------------|
| E0H~EFH | Adjust volume | In standby or playing, there are 16 level volume can be adjusted, E0H is min. EFH is max. |
| F0H ～ F1H | Built-in amplifier On or off | F0H turn off built-in amplifer，F1H turn on built-in amplifier，there should be 1ms delay after send this code |
| F2H | Repeat | During playing,send this code can repeat current voice |
| FEH | Stop | Stop the voice playing |

Voices and addresses relationship

| Code（HEX） | Function |
|------------|----------|
| 00H | Play group 1 voice |
| 01H | Play group 2 voice |
| 02H | Play group 3 voice |
| …… | …… |
| CDH | Play group 206 voice |
| CEH | Play group 207 voice |
| CFH | Play group 208 voice |

### 8.3.3. Timing waveform for one line serial interface

In one line serial mode , only have one DATA line , to represent different data bit by the different rate of low level and high level . High level : Low level =1:3 means "0 ' , High level : Low level =3:1   means "1" .   High level first , then low level . Data , send low first , then send high .Please see the following waveform.
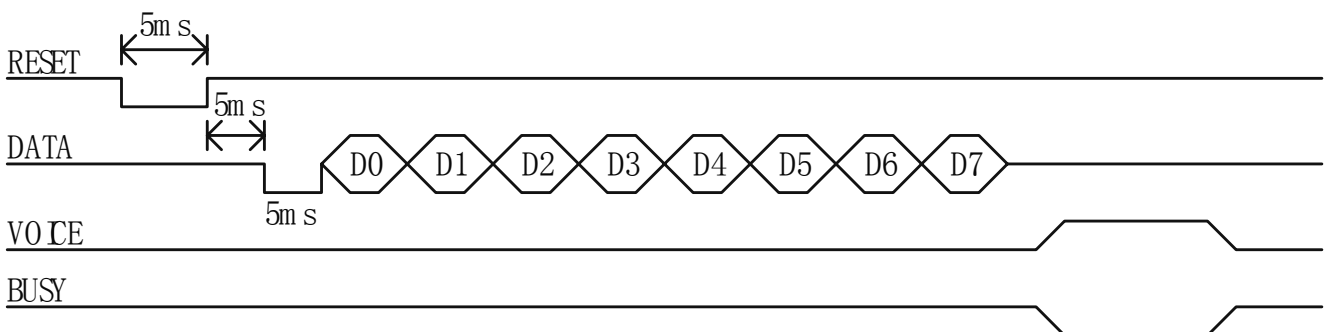


Note: Reset the chip before sending the data , if use battery power supply , this reset is not necessary . DATA pin is for data communication in one line serial interface . Waiting 5ms after reset ,then pull low 5ms to wake up the chip , then send data , high first , then low.   20ms after sent data, BUSY will have response. The data bit rate please see follows.

High level：Low level=1：3　means "0"　　　High level : Low level =3：1　means 1
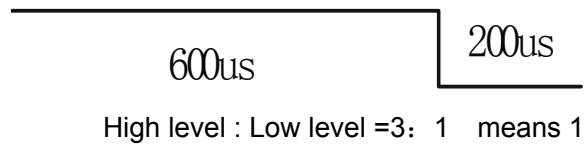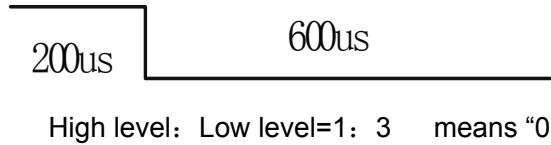
### 8.3.4. Program examples
Please see at "13. one line serial interface program."

### 8.4. Two lines serial interface (For external SD card using)

Ignore

### 8.5. Three lines serial interface.

There are CS ,CLK ,DATA　three lines communication. Imitate SPI communication .

### 8.5.1. Assignment of I/O

| Package | Pins | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| DIP16 | -- | -- | -- | -- | -- | DATA | CLK | CS | TEST |
| SO16 | -- | -- | -- | -- | -- | DATA | CLK | CS | TEST |
| SOP20 | -- | -- | -- | DATA | CLK | -- | -- | CS | TEST |

Note: D0 for test , negative pulse trigger can play voices in all addresses .

### 8.5.2. Code descriptions

| Code | Function | Descriptions |
|---|---|---|
| E0H~EFH | Adjust Volume | In playing or standby, send the code can adjust　16 level volume . E0H is minimum，EFH is maximum. |
| F0H～F1H | Turn on/ off Am | F0H turn off internal amplifier，F1H turn on internal amplifier. It will be 1ms delay after send the code. |
| F2H | Repeat | During playing, send this code will repeat current address voice |
| FEH | Stop | Stop playing |

The relationship between voices and addresses.

| Data（Hex.） | Functions |
|---|---|
| 00H | Play gourp 1 voice |
| 01H | Play gourp 2 voice |
| 02H | Play gourp 3 voice |
| …… | …… |
| CDH | Play gourp 206 voice |
| CEH | Play gourp 207 voice |
| CFH | Play gourp 208 voice |

### 8.5.3. Timing waveform for three lines serial interface.

In three lines serial interface have CS , CLK and DATA . it is imitate SPI communication .

Reset should be pull low 5ms before send code ,then pull high not less than 5ms . Reset should stay high level. CS signal pull low 5ms to wake up chip , then send LCK and DATA , Clock cycle between 200us to 1ms , we suggest 400us .Data should send low first , then high . After data received , CS, CLK,DATA set to high level . After 20ms , BUSY will have response.
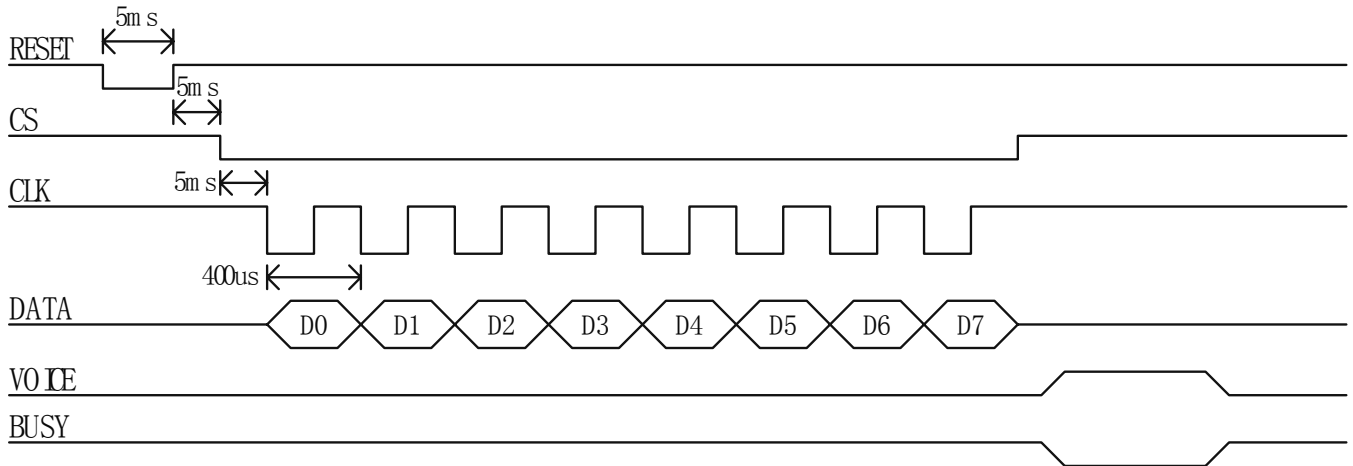


### 8.5.4. Program examples

Please see at

### 9.Typical application circuits

### 9.1. Keyboard mode PWM output (Direct drive speaker)
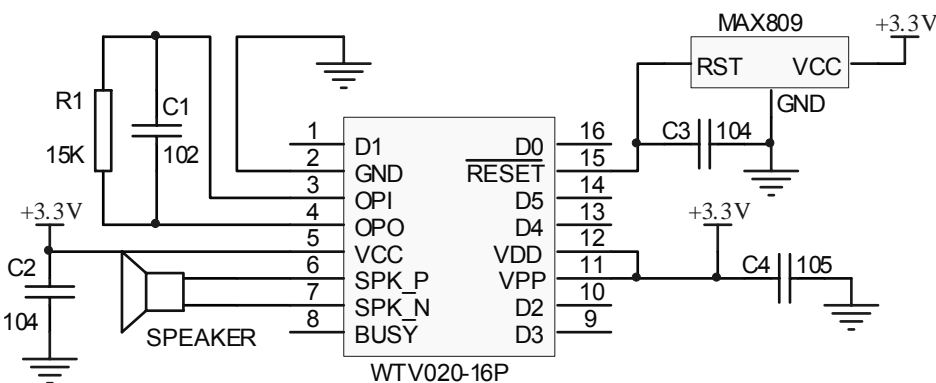


D0～D5 keep 10ms low level or give negative pulse , can trigger voice . BUSY will be low level during playing , other time will be high level. Reset should keep low level 5ms . R1 and C1 are for reactive circuit, change R1 value and change the volume output, 0～50K is ok , use 15K in circuit. Bigger volue ,higher sound volume. SPK can direct drive 0.5W/8Ω speaker in PWM output. VCC can be 2.5V～3.6V . If battery power this chip, it can be use capacitor connect GND to reset.   If use DC power, it have to use reset circuit or MCU to reset.

**9.2. Keyboard mode DAC output (External amplifier )**
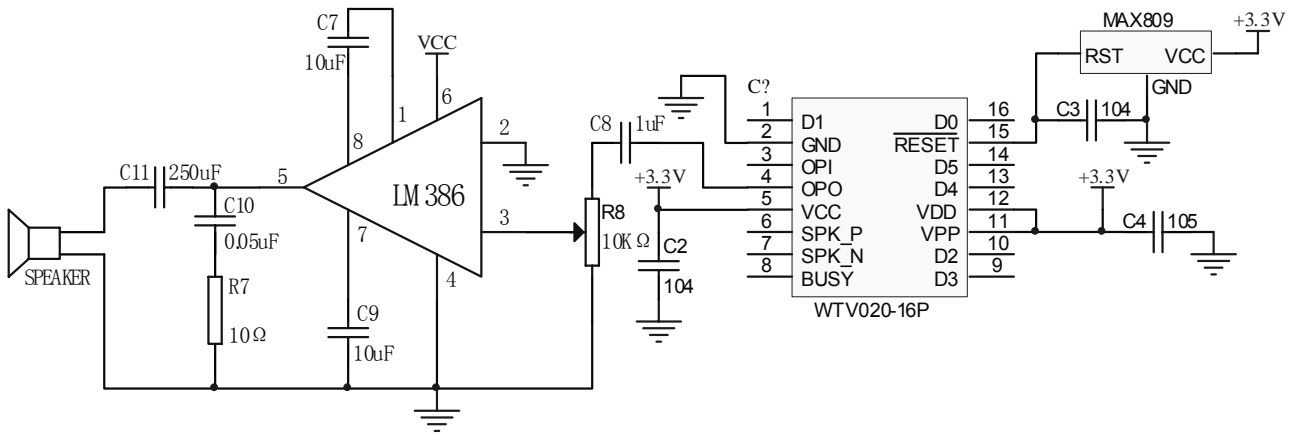


D0~D5 keep 10ms low level or give negative pulse , can trigger voice . BUSY will be low level during playing , other time will be high level. Reset should keep low level 5ms . Connect amplifer from OPO pin ,Change R8 value can change the sound volume.
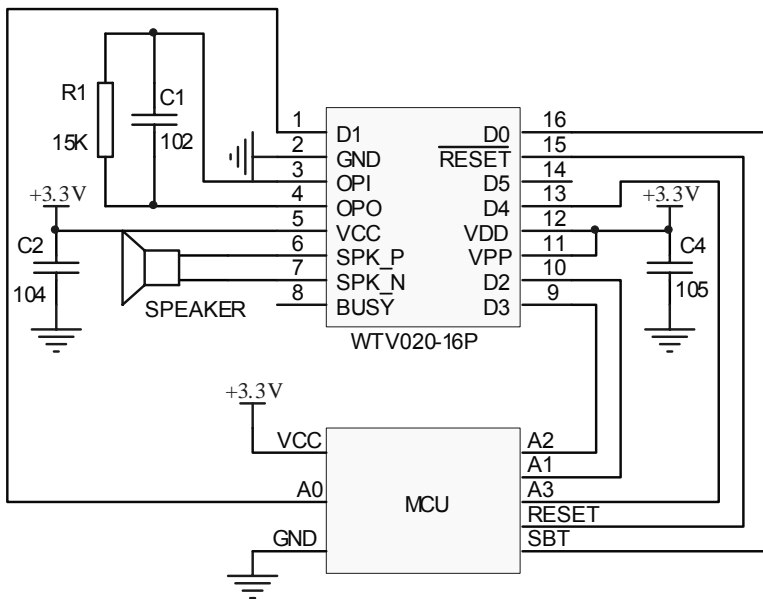
**9.3. WTV010/WTV020 DIP16/SOP16/TSSOP16 ,parallel interface(COM+SBT) mode PWM output.**



Use A0~A3 pins to control voice addresses in WTV010/WTV020 DIP16/SOP16/TSSOP16 , then use SBT to trigger the selected address voice . Reset should keep low level 5ms . If MCU is 5V powered , you have to connect 470Ω resistors between MCU and WTV chips cables , because it is 3.3V power the WTV chip.

R1 and C1 are for reactive circuit, change R1 value and change the volume output, 0~50K is ok , use 15K in circuit. Bigger volue ,higher sound volume. SPK can direct drive 0.5W/8Ω speaker in PWM output.

## 9.4. WTV010/WTV020 DIP16/SOP16/TSSOP16 , one line serial interface PWM output
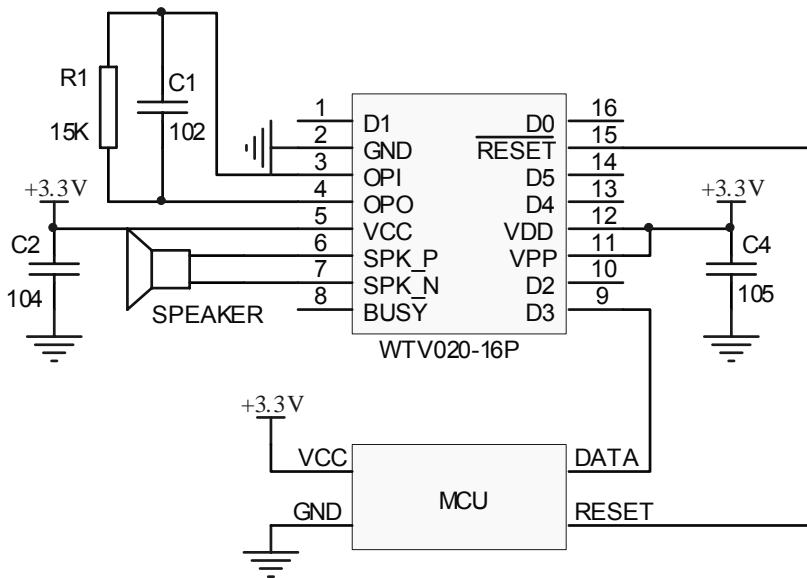


Mcu control WTV chip via DATA cable, Reset should keep low level 5ms . If MCU is 5V powered , you have to connect 470Ω resistors between MCU and WTV chips cables , because it is 3.3V power the WTV chip.

R1 and C1 are for reactive circuit, change R1 value and change the volume output, 0～50K is ok , use 15K in circuit. Bigger value ,higher sound volume. SPK can direct drive 0.5W/8Ω speaker in PWM output.

## 9.5. WTV010/WTV020 DIP16/SOP16/TSSOP16 , three lines serial interface PWM output



Mcu control WTV chip via CS,CLK and DATA cable, Reset should keep low level 5ms . If MCU is 5V powered , you have to connect 470Ω resistors between MCU and WTV chips cables , because it is 3.3V power the WTV chip.

R1 and C1 are for reactive circuit, change R1 value and change the volume output, 0～50K is ok , use 15K in circuit. Bigger value ,higher sound volume. SPK can direct drive 0.5W/8Ω speaker in PWM output.

## 9.6. WTV020-20S , Parallel (COM+SBT) interface PWM output



Mcu control WTV chip via A0～A6,then trigger the sound by SBT . Reset should keep low level 5ms . If MCU is 5V powered , you have to connect 470Ω resistors between MCU and WTV chips cables , because it is 3.3V power the WTV chip.

R1 and C1 are for reactive circuit, change R1 value and change the volume output, 0～50K is ok , use 15K in circuit. Bigger value ,higher sound volume. SPK can direct drive 0.5W/8Ω speaker in PWM output.
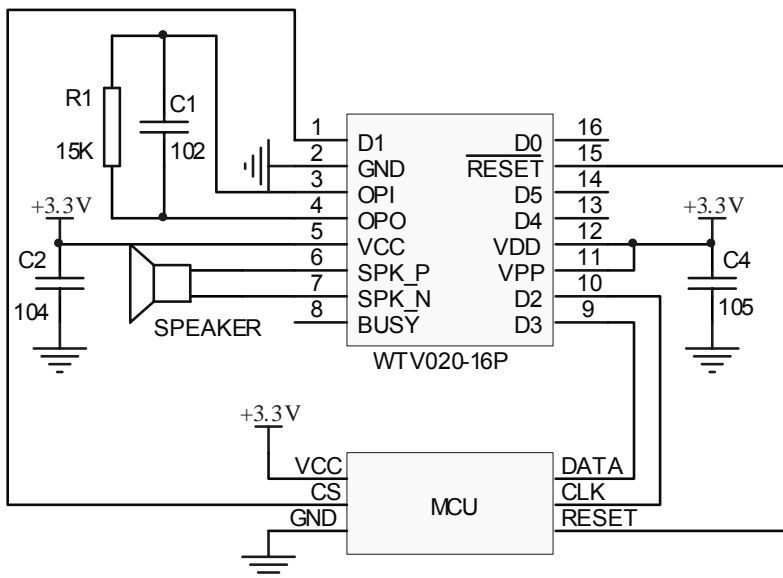
## 9.7.WTV020-20S , one line serial interface PWM output
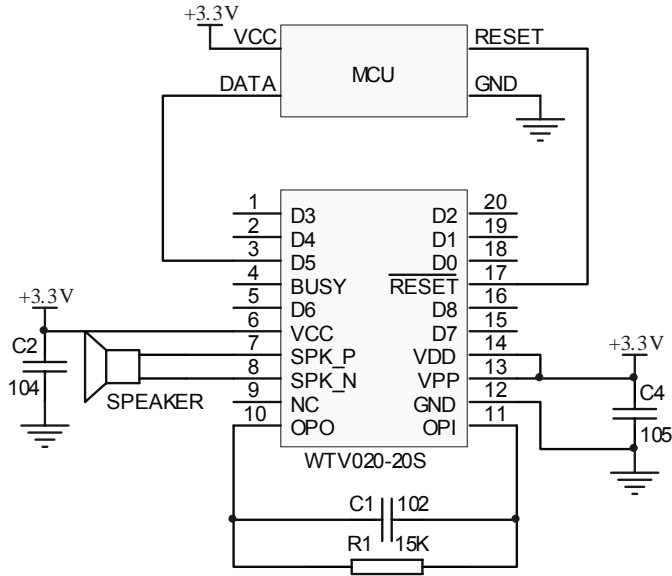
Mcu control WTV chip via DATA cable, Reset should keep low level 5ms . If MCU is 5V powered , you have to connect 470Ω resistors between MCU and WTV chips cables , because it is 3.3V power the WTV chip.

R1 and C1 are for reactive circuit, change R1 value and change the volume output, 0~50K is ok , use 15K in circuit. Bigger value ,higher sound volume. SPK can direct drive 0.5W/8Ω speaker in PWM output.
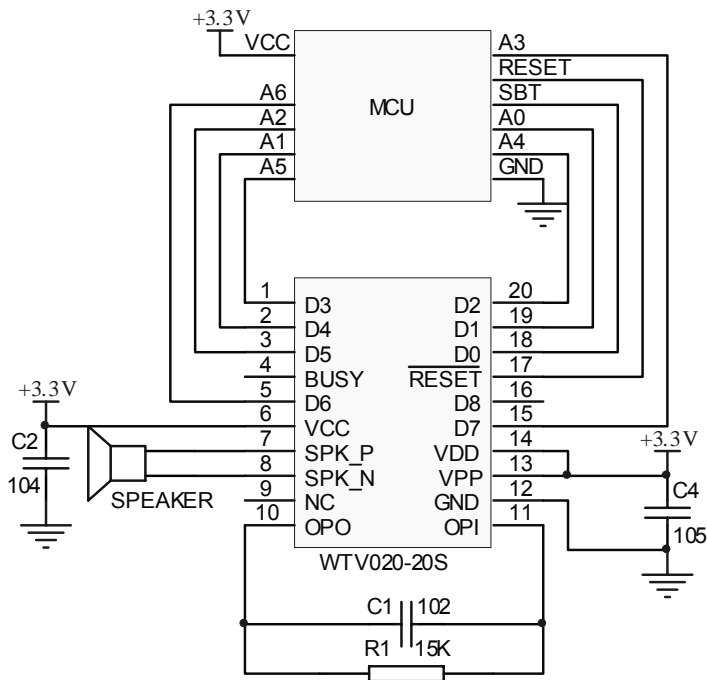
### 9.8. WTV020-20S two lines serial interface PWM output

Ignore

9.9. WTV020-20S , three lines serial interface PWM output
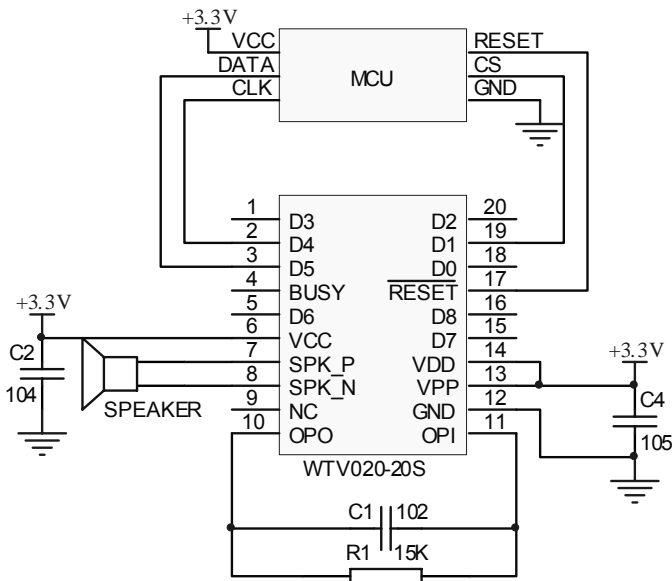


Mcu control WTV chip via CS,CLK and DATA cable, Reset should keep low level 5ms . If MCU is 5V powered , you have to connect 470Ω resistors between MCU and WTV chips cables , because it is 3.3V power the WTV chip.

R1 and C1 are for reactive circuit, change R1 value and change the volume output, 0~50K is ok , use 15K in

circuit. Bigger value ,higher sound volume. SPK can direct drive 0.5W/8Ω speaker in PWM output.

## 10. Packages and Pins

### 10.1. DIP 16 dimension
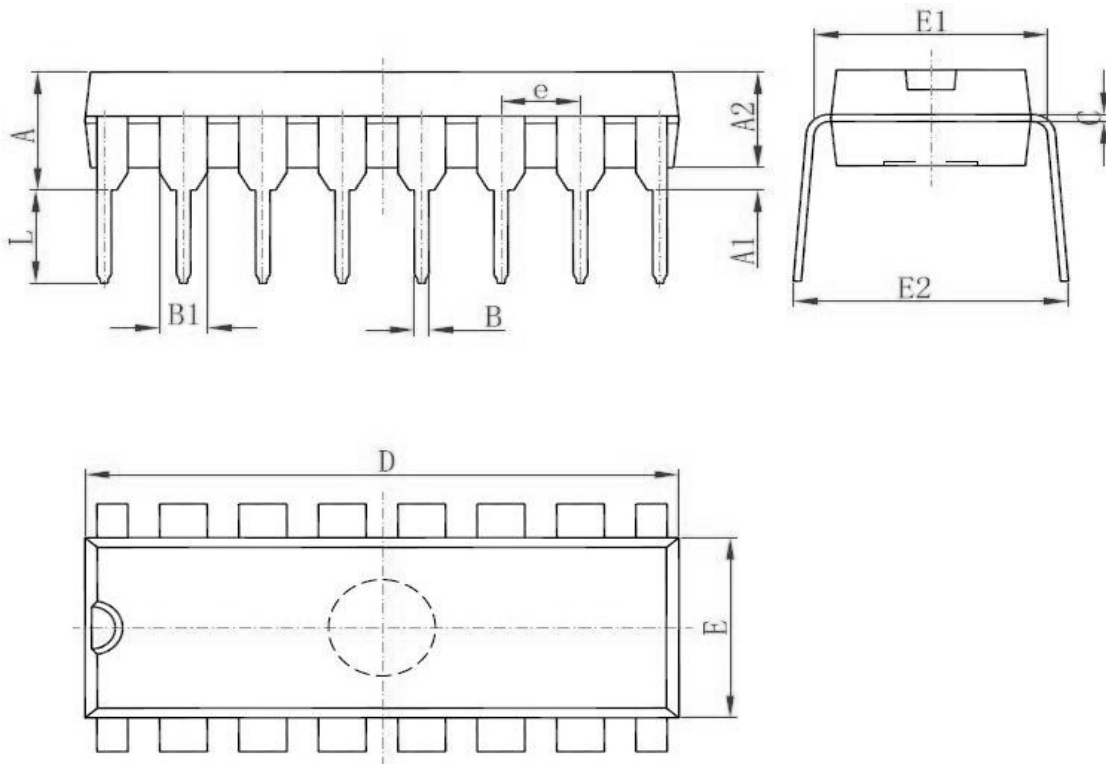


| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 3.710 | 4.310 | 0.146 | 0.170 |
| A1 | 0.510 | | 0.020 | |
| A2 | 3.200 | 3.600 | 0.126 | 0.142 |
| B | 0.380 | 0.570 | 0.015 | 0.022 |
| B1 | 1.524 (BSC) | | 0.060 (BSC) | |
| C | 0.204 | 0.360 | 0.008 | 0.014 |
| D | 18.800 | 19.200 | 0.740 | 0.756 |
| E | 6.200 | 6.600 | 0.244 | 0.260 |
| E1 | 7.320 | 7.920 | 0.288 | 0.312 |
| e | 2.540 (BSC) | | 0.100 (BSC) | |
| L | 3.000 | 3.600 | 0.118 | 0.142 |
| E2 | 8.400 | 9.000 | 0.331 | 0.354 |

## 10.2. SOP16 dimension
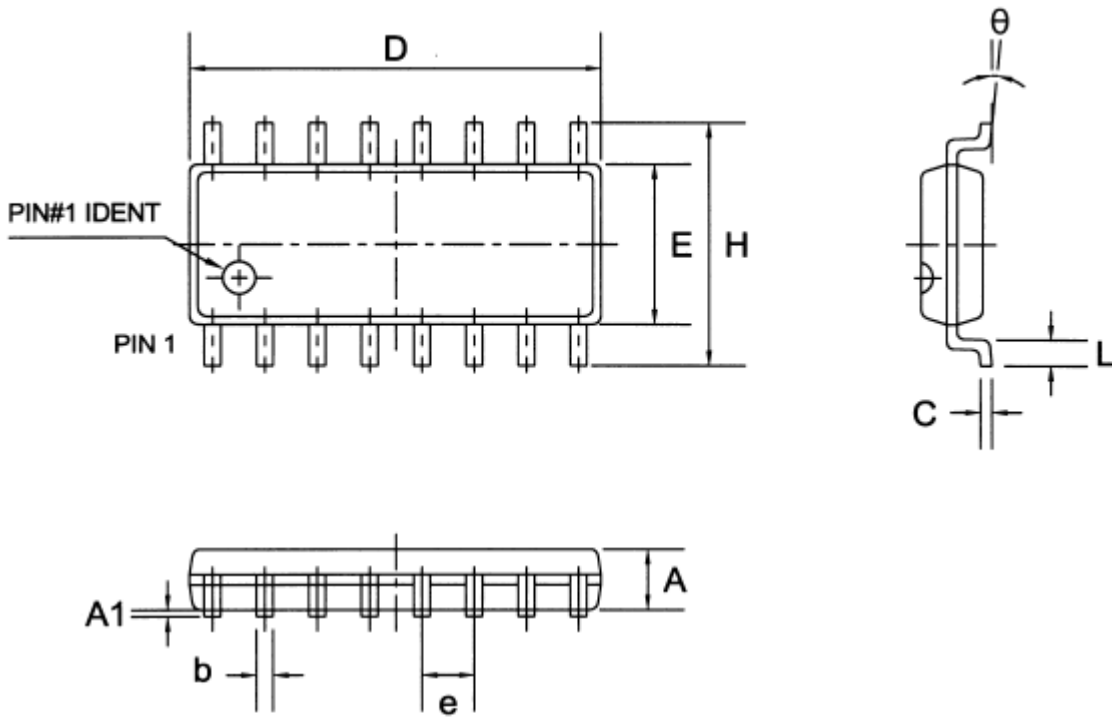


| Symbol | Dimensions In Millmeters | | | Dimensions In Inches | | |
|--------|------|------|------|------|------|------|
|        | Min  | Nom  | Max  | Min  | Nom  | Max  |
| A      | 1.30 | 1.50 | 1.70 | 0.051 | 0.059 | 0.067 |
| A1     | 0.06 | 0.16 | 0.26 | 0.002 | 0.006 | 0.010 |
| b      | 0.30 | 0.40 | 0.55 | 0.012 | 0.016 | 0.022 |
| C      | 0.15 | 0.25 | 0.35 | 0.006 | 0.010 | 0.014 |
| D      | 9.70 | 10.00 | 10.30 | 0.382 | 0.394 | 0.406 |
| E      | 3.75 | 3.95 | 4.15 | 0.148 | 0.156 | 0.163 |
| e      | —    | 1.27 | —    | —    | 0.050 | —    |
| H      | 5.70 | 6.00 | 6.30 | 0.224 | 0.236 | 0.248 |
| L      | 0.45 | 0.65 | 0.85 | 0.018 | 0.026 | 0.033 |
| θ      | 0°   | —    | 8°   | 0°   | —    | 8°   |

## 10.3. SOP20 dimension
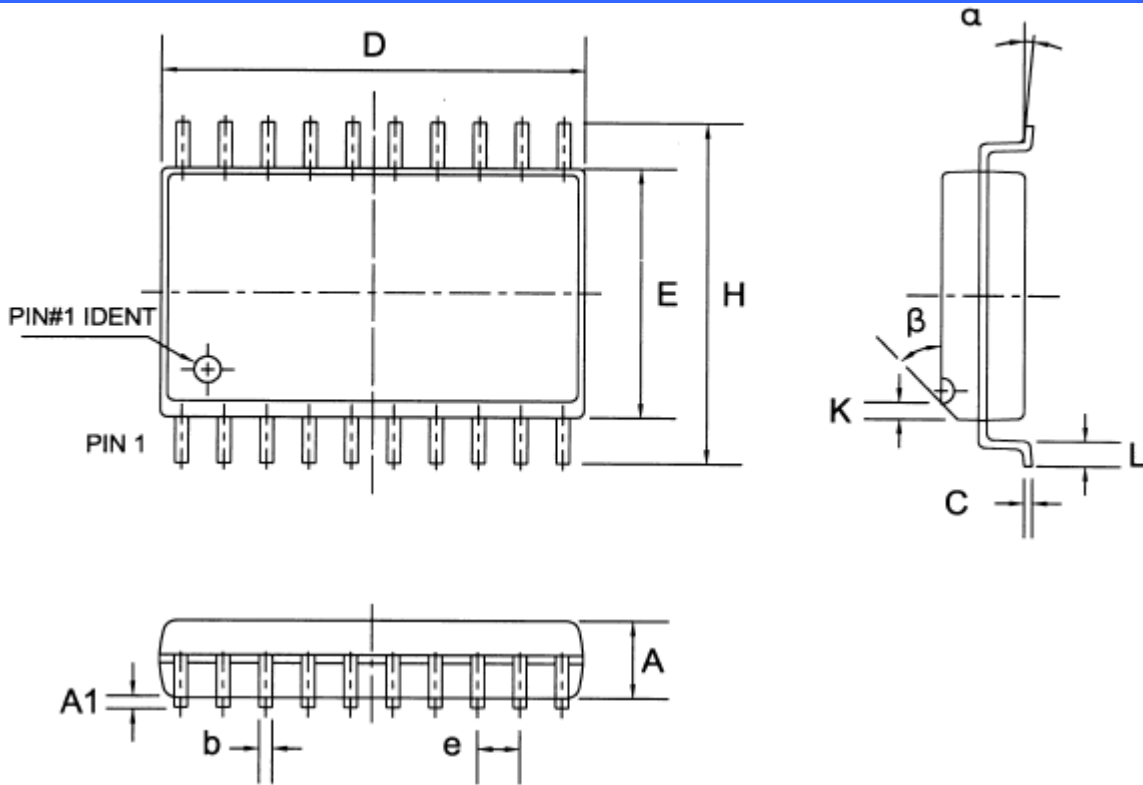
| Symbol | Dimensions In Millmeters | | | Dimensions In Inches | | |
|--------|-----|-----|-----|-----|-----|-----|
| | Min | Nom | Max | Min | Nom | Max |
| A | 2.15 | 2.35 | 2.55 | 0.085 | 0.093 | 0.100 |
| A1 | 0.05 | 0.15 | 0.25 | 0.002 | 0.006 | 0.010 |
| b | — | 0.40 | — | — | 0.016 | — |
| C | — | 0.25 | — | — | 0.010 | — |
| D | 12.40 | 12.70 | 13.00 | 0.488 | 0.500 | 0.512 |
| E | 7.40 | 7.65 | 7.90 | 0.291 | 0.301 | 0.311 |
| e | — | 1.27 | — | — | 0.050 | — |
| H | 10.15 | 10.45 | 10.75 | 0.400 | 0.411 | 0.423 |
| K | — | 0.50 | — | — | 0.020 | — |
| L | 0.60 | 0.80 | 1.00 | 0.024 | 0.031 | 0.039 |
| α | 0° | — | 8° | 0° | — | 8° |
| β | — | 45° | — | — | 45° | — |

**10.4. TSSOP16 dimension**
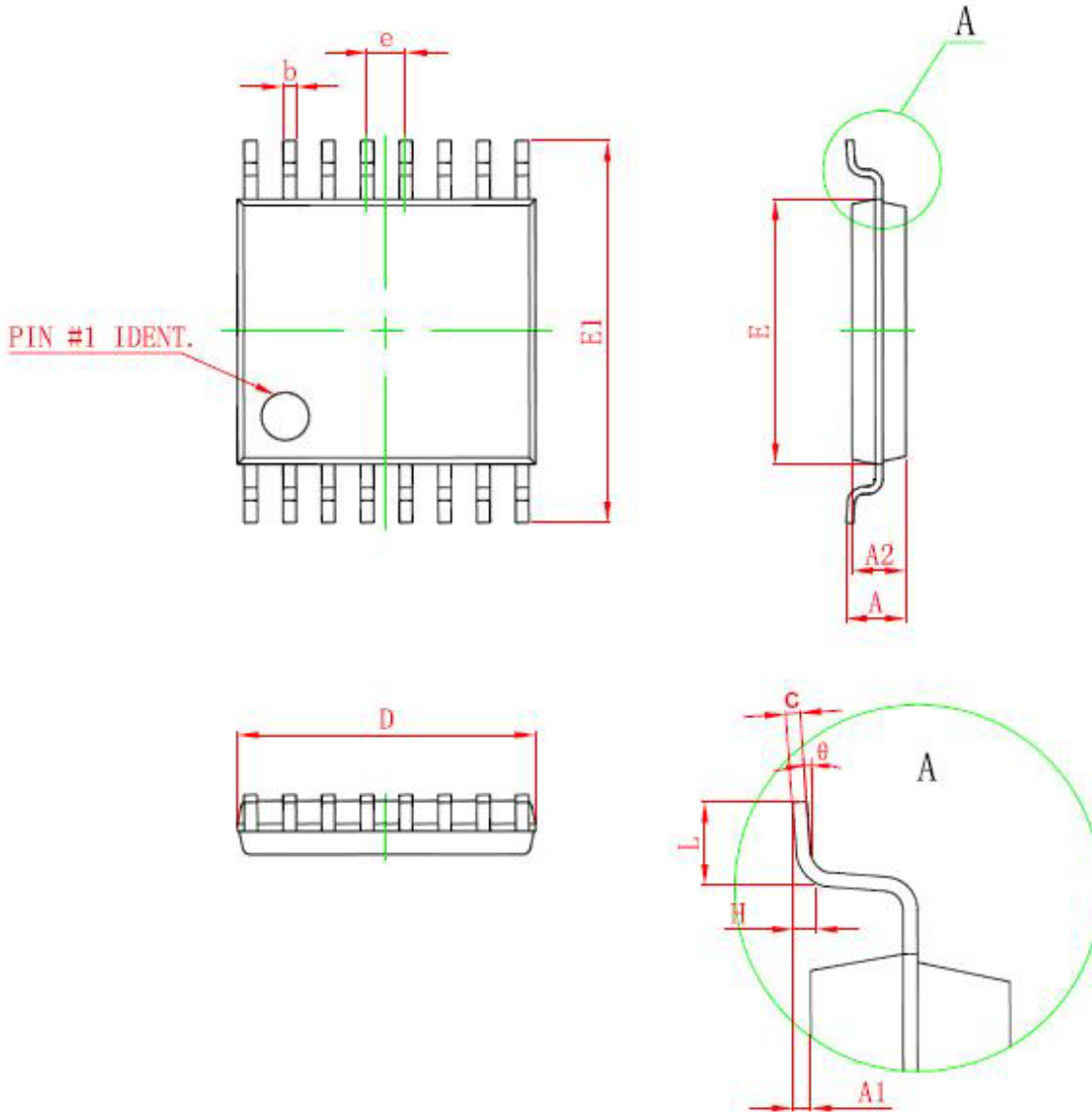
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| D | 4.900 | 5.100 | 0.193 | 0.201 |
| E | 4.300 | 4.500 | 0.169 | 0.177 |
| b | 0.190 | 0.300 | 0.007 | 0.012 |
| c | 0.090 | 0.200 | 0.004 | 0.008 |
| E1 | 6.250 | 6.550 | 0.246 | 0.258 |
| A | | 1.100 | | 0.043 |
| A2 | 0.800 | 1.000 | 0.031 | 0.039 |
| A1 | 0.020 | 0.150 | 0.001 | 0.006 |
| e | 0.65 (BSC) | | 0.026 (BSC) | |
| L | 0.500 | 0.700 | 0.020 | 0.028 |
| H | 0.25 (TYP) | | 0.01 (TYP) | |
| θ | 1° | 7° | 1° | 7° |

## 11.Timing control

### 11.1.Timing control waveform

Keyboard
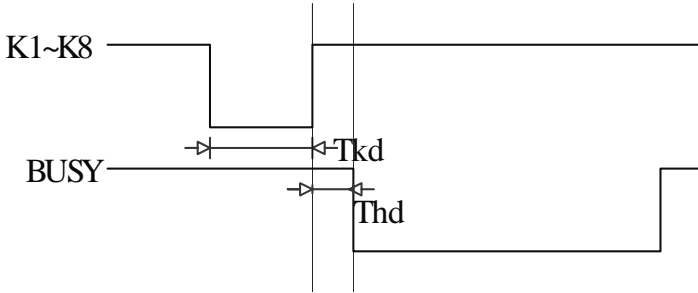


Parallel (COM+SBT)
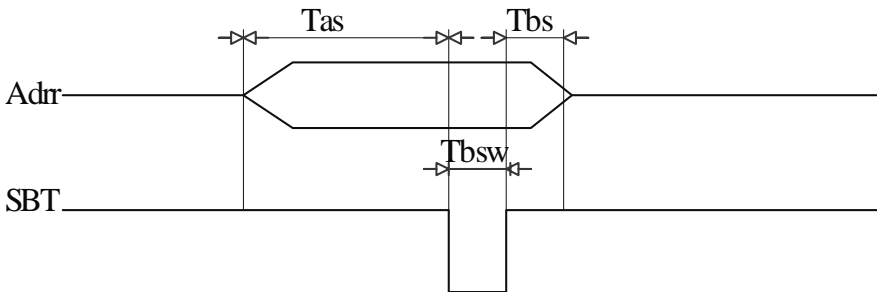


Three lines serial interface
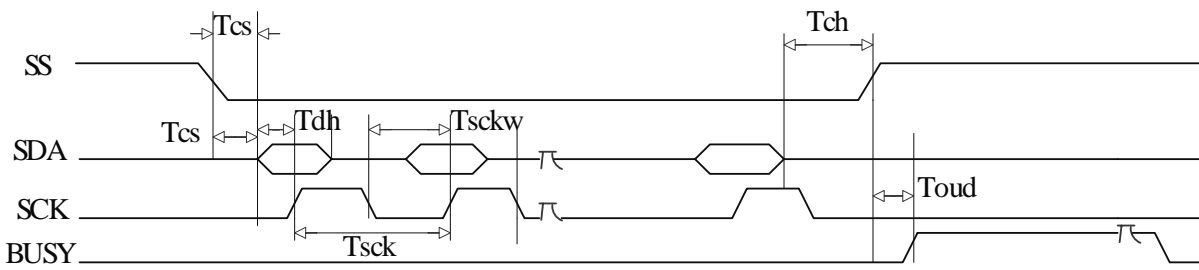


One line serial interface
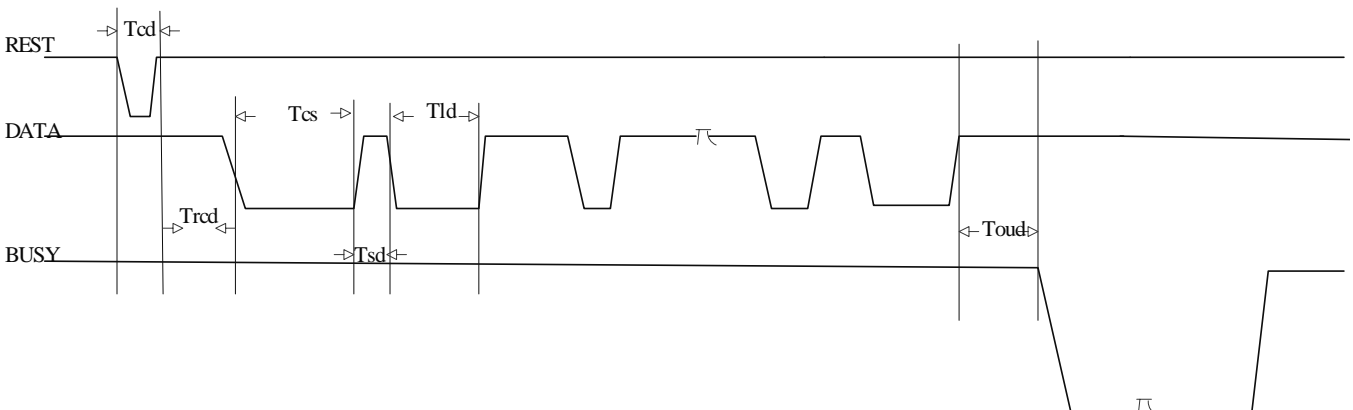
**11.2.Timing value**

| Symbol | Description | Min. | Typical | Max. | Unit |
|--------|-------------|------|---------|------|------|
| Tkd | Keyboard delay time | 10 | 20 | 25 | MS |
| Thd | Busy delay time | 400 | | 2000 | US |
| Tas | Address startup time | 1 | 2 | 5 | MS |
| Tbs | Address holding time | 1 | 3 | 5 | MS |
| Tbsw | SBT trigger time | 2 | | | MS |
| Tcs | CS startup time | 2 | 5 | 10 | MS |
| Tdh | Data input holding time | 40 | 200 | 2000 | US |
| Tsck | Serial Clock cycle | 200 | 400 | 1000 | US |
| Tsckw | Serial Clock pulse width | 30 | 100 | 4000 | US |
| Tch | CS holding time | 20 | | | US |
| Toutd | Busy output delay time | 400 | | 2000 | US |
| Tcd | Reset holding time | 3 | 5 | | MS |
| Tcs | Data wake up time | 3 | 5 | 10 | MS |
| Trd | CS startup time | 20 | | | US |
| Trcd | Waiting time after chip reset | 5 | | | MS |
| Tsd | DATA low level holding time | 100 | 200 | 1000 | US |
| Tld | DATA high level holding time | 200 | 400 | 2000 | MS |

**12. One line , three line serial interface control flow**
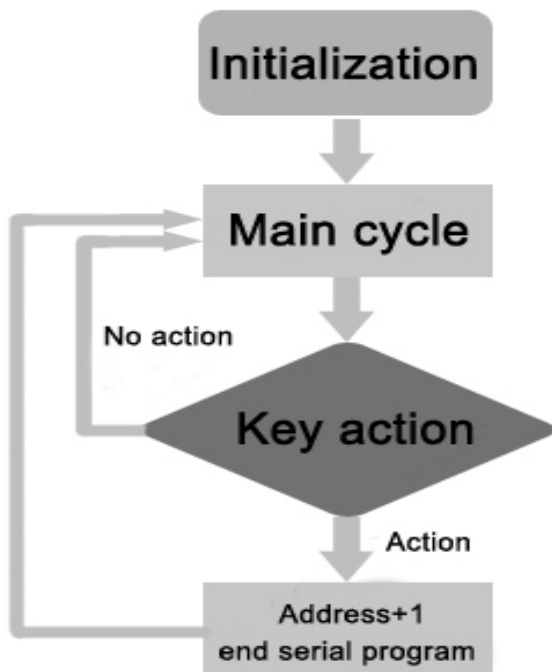
**13. One serial interface program**

**13.1.One line serial finterface Assembly**

```
 ORG 0000H
        KEY EQU P1.1      ;
        RST EQU P3.2      ;
        SDA EQU P3.3      ;
DAIFAZHI EQU 50H          ;
        MOV DAIFAZHI,#0H;
        MOV R5,#8         ;


MAIN:
        JB KEY,MAIN
        MOV R6,#10        ;
        LCALL DELAY1MS
        JB KEY,MAIN       ;
        JNB KEY,$         ;
        LCALL one_line    ;
        INC DAIFAZHI      ;
        MOV A,DAIFAZHI
        CJNE A,#128,XX2 ;
XX2: JC XX3
        MOV DAIFAZHI,#0H
XX3: LJMP MAIN

one_line:                ;////
             CLR RST
          MOV R6,#2       ;
             LCALL DELAY1MS
        SETB RST
        MOV R6,#6         ;
        LCALL DELAY1MS
        CLR SDA
        MOV R6,#5         ;
        LCALL DELAY1MS
             MOV A,DAIFAZHI
      LOOP:     SETB SDA
             RRC A
             JNC DIDIANPIN   ;
        LCALL DELAY300US
        LCALL DELAY300US
        LCALL DELAY300US
```

```
              CLR   SDA
          LCALL DELAY300US
          LJMP LOOP1
    DIDIANPIN:                  ;
             LCALL DELAY300US
              CLR   SDA
          LCALL DELAY300US
          LCALL DELAY300US
          LCALL DELAY300US
       LOOP1:   DJNZ R5,LOOP
              MOV R5,#08H
          SETB SDA
              RET
 DELAY300US:   MOV R6,#150          ;
              DJNZ R6,$
           RET
    DELAY1MS:                  ;
        L1:   MOV R7,#248
          DJNZ R7,$
          DJNZ R6,L1
          RET
END
```

## 13.2.One line serial interface C program

```c
#include <at89x51.H>
sbit KEY=P1^1;
 sbit RST=P3^2;
sbit SDA=P3^3;
void delay1ms(unsigned char count)
{
     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)
{ 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(2);
      RST=1;
      delay1ms(6);
      SDA=0;
      delay1ms(5);
      for(i=0;i<8;i++)
          {SDA=1;
        if(addr & 1)
            {delay100us(6);
            SDA=0;
            delay100us(2);
            }
        else {
             delay100us(2);
            SDA=0;
            delay100us(6);
            }
        addr>>=1; }
        SDA=1;
}

main()
{unsigned char FD=0;
      P3=0XFF;
      while(1)
          {
        if(KEY==0)
            {
            delay1ms(10);
            if(KEY==0)
            {
                Send_oneline(FD);
            FD++;
                if(FD==208)
                {
                    FD=0;
                }
                while(KEY==0);
             }
            }
        }
```

}

## 14. Three lines serial interface progarm

### 14.1. Three lines serial interface Assembly

```
        ORG 0000H
        KEY EQU P1.1    ;
        RST EQU P3.2    ;
        CS   EQU P3.3   ;
        SCL EQU P3.4    ;
        SDA EQU P3.5    ;
DAIFAZHI EQU 50H        ;
         MOV DAIFAZHI,#0H;
        MOV R5,#8        ;

MAIN:
        JB KEY,MAIN
        MOV R6,#10       ;
        LCALL DELAY1MS
        JB KEY,MAIN      ;
        JNB KEY,$        ;
        LCALL THREE_LINE;
        INC DAIFAZHI     ;
        MOV A,DAIFAZHI
        CJNE A,#128,XX2 ;
XX2: JC XX3
        MOV DAIFAZHI,#0H
XX3: LJMP MAIN

THREE_LINE:            ;
              CLR RST
          MOV R6,#2      ;
            LCALL DELAY1MS
          SETB RST
          MOV R6,#5      ;
          LCALL DELAY1MS
          CLR CS
          MOV R6,#2      ;
          LCALL DELAY1MS
              MOV A,DAIFAZHI
        LOOP:
```

```
                    CLR SCL
                    RRC A
                    MOV SDA,C
                    LCALL DELAY50US
                    SETB SCL
                LCALL DELAY50US
                    DJNZ R5,LOOP
                    MOV R5,#08H
                    SETB CS
                    RET
DELAY50US:      MOV R6,#25          ;
                    DJNZ R6,$
            RET
DELAY1MS:                   ;
L1:         MOV R7,#248
                DJNZ R7,$
            DJNZ R6,L1
            RET
                END
```

## 14.2. Three lines serial interface C program

```c
#include <at89x51.H>
sbit KEY=P1^1;
sbit RST=P3^2;
sbit   CS=P3^3;
sbit SCL=P3^4;
sbit SDA=P3^5;
//sbit DENG=P3^7;
void delay1ms(unsigned char count)
{
     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(void)
{
     unsigned char j;
         for(j=50;j>0;j--);
}
```

```
Send_threelines(unsigned char addr)
        {unsigned char i;
            RST=0;
            delay1ms(2);
            RST=1;
            delay1ms(5);
            CS=0;
            delay1ms(2);
        for(i=0;i<8;i++)
            {SCL=0;
            if(addr & 1)SDA=1;
            else SDA=0;
            addr>>=1;
            delay100us();
            SCL=1;
            delay100us();
            }
            CS=1;
        }


main()
{unsigned char FD=0;
        P3=0XFF;
        while(1)
        {
        if(KEY==0)
         {
             delay1ms(10);
             if(KEY==0)
             {
                 Send_threelines(FD);
            FD++;
                if(FD==208
                 {
                     FD=0;
                 }
                 while(KEY==0);
             }
            }
        }
}
```

## 15. Supply information

| Package | Model | Duration （at 6KHz） |
|---|---|---|
| DIP16 | WTV020-16P | 20s |
| SOP16 | WTV020-16S | 20s |
| TSSOP16 | WTV020-TSSOP16 | 20s |
| SOP20 | WTV020-20S | 20s |
| DIP16 | WTV010-16P | 10s |
| SOP16 | WTV010-16S | 10s |

## 16. Versions

| Version | Date | Description |
|---|---|---|
| V1.8 | 2009-4-17 | Origin |