

VOICE OTP IC

aP58M1 – 42sec

APLUS INTEGRATED CIRCUITS INC.

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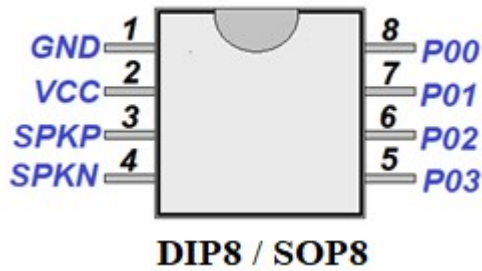
Feature :

- 8 bit DSP
- System speed 48MHz.
- Built-in 1M bit (128 K Bytes) OTP memory
- Built-in 1K bit(128 Bytes)SRAM
- Built-in 12/13 bit PWM
- Built-in 2 x 8bit Timer
- Built-in 8 I/O
- Built-in 2.0V 80mA LDO
- Built-in 4 channel MIDI.
- Built-in Watch-Dog Timer circuit
- Built-in PWM 8Ω/0.18W to drive speaker
- Operation voltage : 2.2V~5.0V

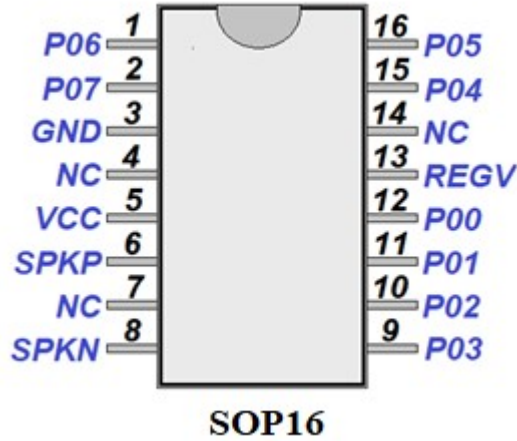
Duration :

| <i>aP58M1 body --- sample rate 4688 Hz</i> | | | | | |
|--|--------------|--------------|--------------|----------------|----------------|
| <i>Coding</i> | <i>AD5</i> | <i>AD6</i> | <i>AD8</i> | <i>PCM10</i> | <i>PCM16</i> |
| <i>durations</i> | <i>42sec</i> | <i>35sec</i> | <i>26sec</i> | <i>20.9sec</i> | <i>17.5sec</i> |

Pin Assignment :



| <i>Pin No.</i> | <i>Designation</i> | <i>I/O</i> | <i>Description</i> |
|----------------|------------------------|------------|--|
| 1 | GND | P | System Ground |
| 2 | VCC | P | Chip Power |
| 3 | SPKP | O | Speaker Output |
| 4 | SPKN | O | Speaker Output |
| 5 | P0 [3] / VPP / Reset | I/O | Port-0 I/O Bit3. or VPP or EXT Reset pin |
| 6 | P0 [2] | I/O | Port-0 I/O Bit2. |
| 7 | P0 [1] | I/O | Port-0 I/O Bit1. |
| 8 | P0 [0] | I/O | Port-0 I/O Bit0 |



| Pin No. | Designation | I/O | Description |
|---------|------------------------|-----|---|
| 1 | P0 [6] | I/O | Port-0 I/O Bit6. |
| 2 | P0 [7] | I/O | Port-0 I/O Bit7. |
| 3 | GND | P | System Ground. |
| 4 | NC | | |
| 5 | VCC | P | Chip Power. |
| 6 | SPKP | O | Speaker Output. |
| 7 | NC | | |
| 8 | SPKN | O | Speaker Output |
| 9 | P0 [3] / VPP / Reset | I/O | Port-0 I/O Bit3. Or VPP or EXT Reset pin |
| 10 | P0 [2] | I/O | Port-0 I/O Bit2. |
| 11 | P0 [1] | I/O | Port-0 I/O Bit1. |
| 12 | P0 [0] | I/O | Port-0 I/O Bit0. |
| 13 | REGV | P | Digital Power. (LDO voltage output). |
| 14 | NC | | |
| 15 | P0 [4] | I/O | Port-0 I/O Bit4. |
| 16 | P0 [5] | I/O | Port-0 I/O Bit5. |

Group Options :

Selectable options that affect each individual group are called Group Options. They are:

Edge or Level trigger.

Unholdable or Holdableoption.

Re-triggerable or Non-retriggerable option.

Stop pulse disable or enable.

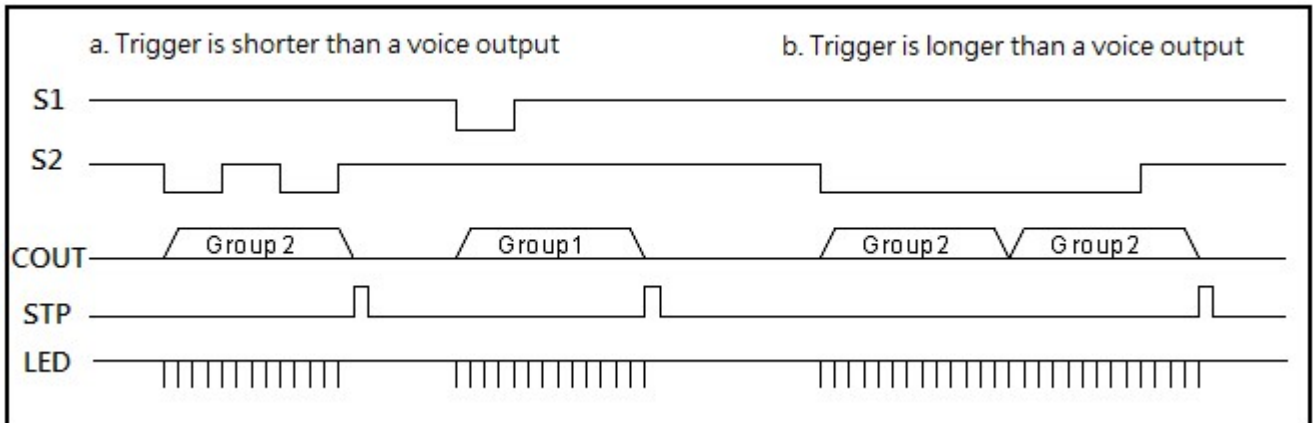


Fig. 1 Level, Unholdable, Non-retriggerable

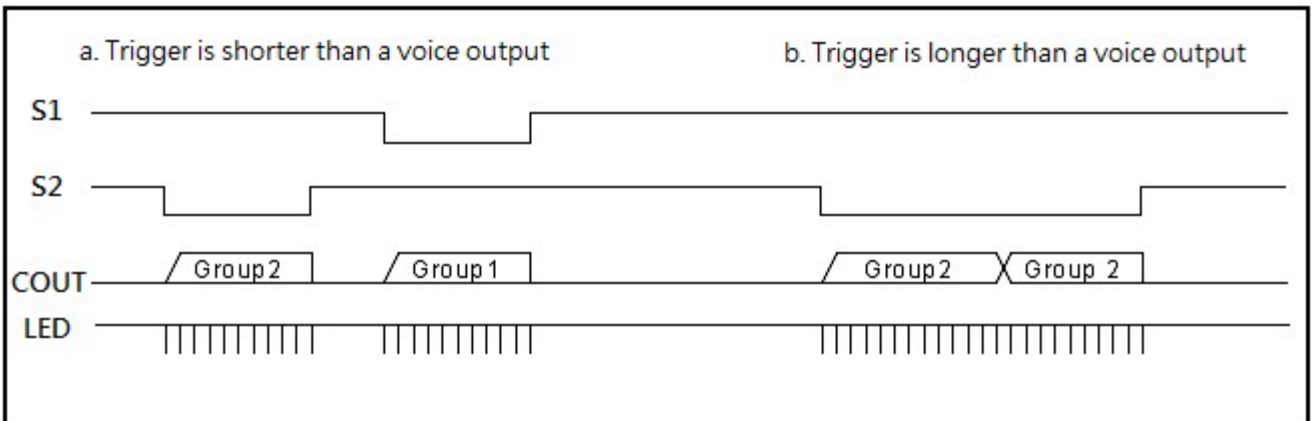


Fig. 2 Level Holdable

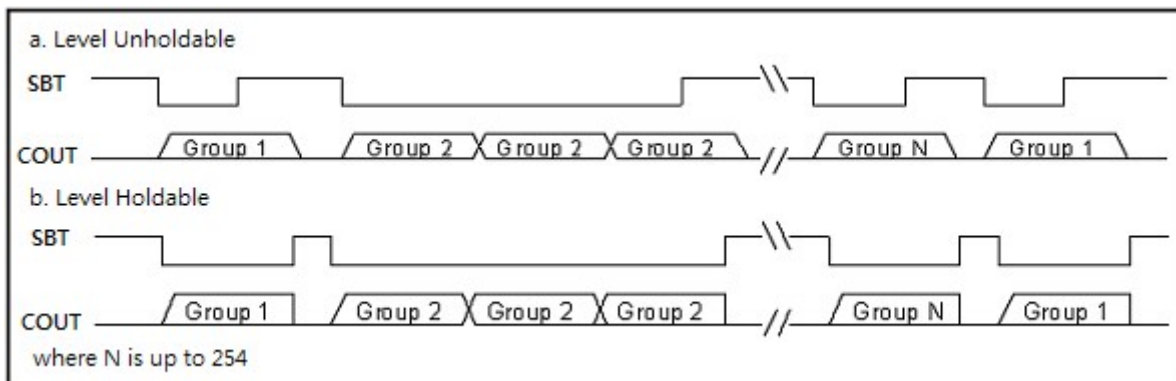


Fig. 3 SBT sequential trigger with Level Holdable and Unholdable

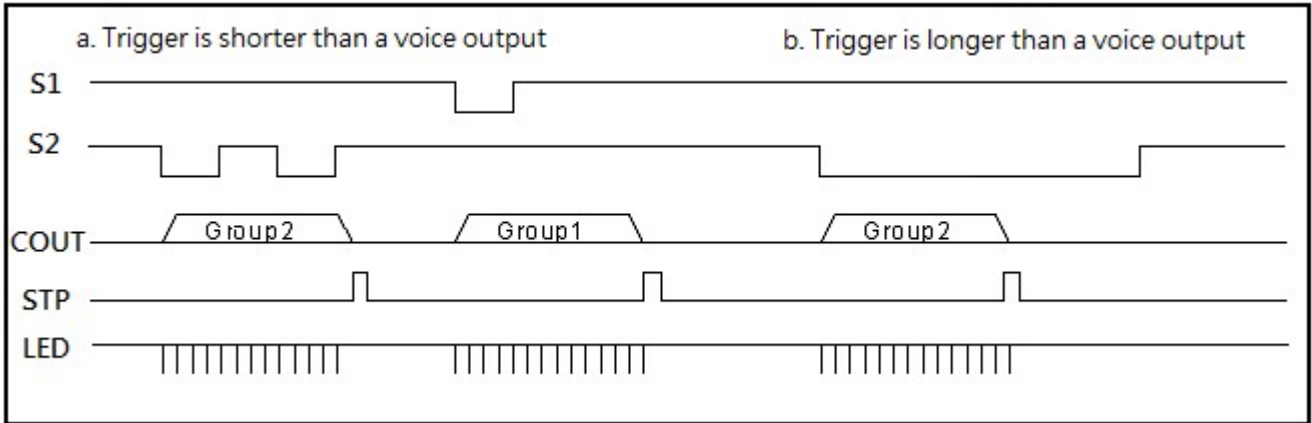


Fig. 4 Edge, Unholdable, Non-retrigger

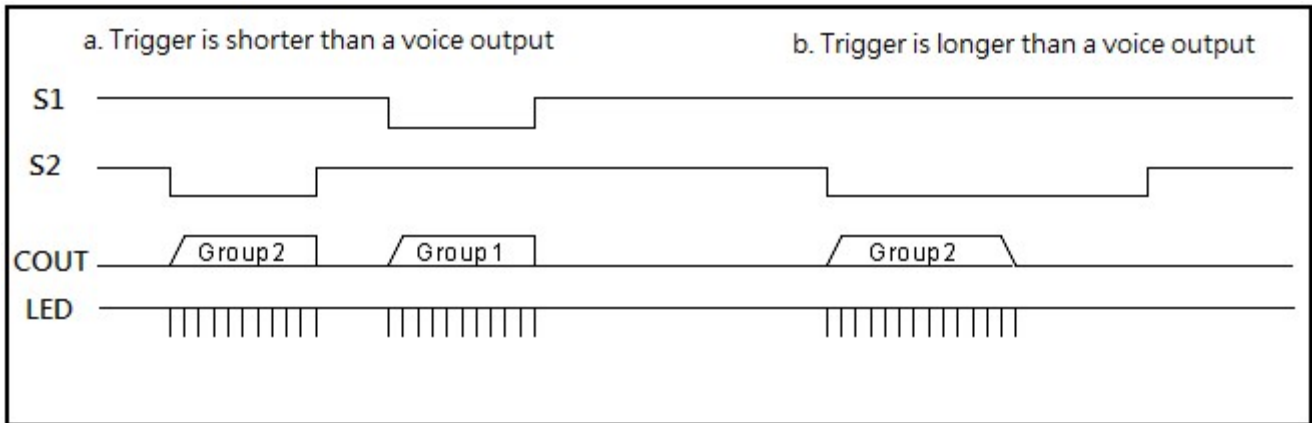


Fig. 5 Edge, Holdable

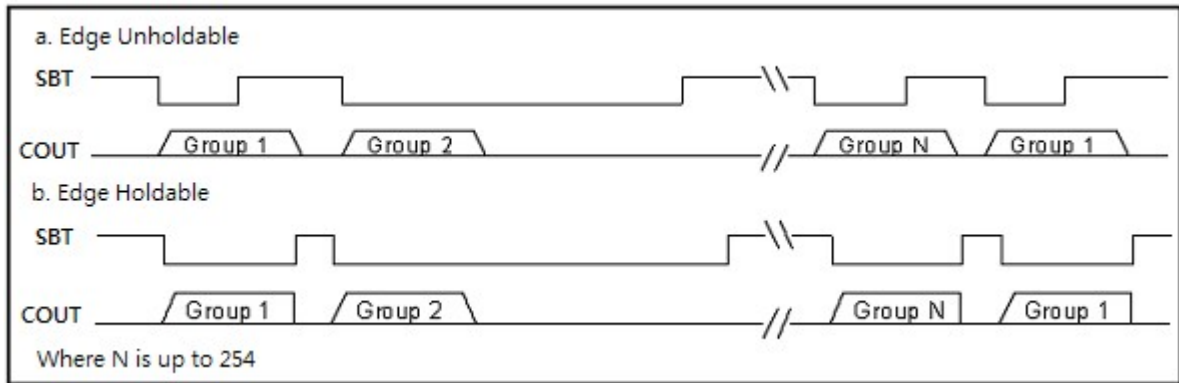


Fig. 6 SBT sequential trigger with Edge Holdable and Unholdable

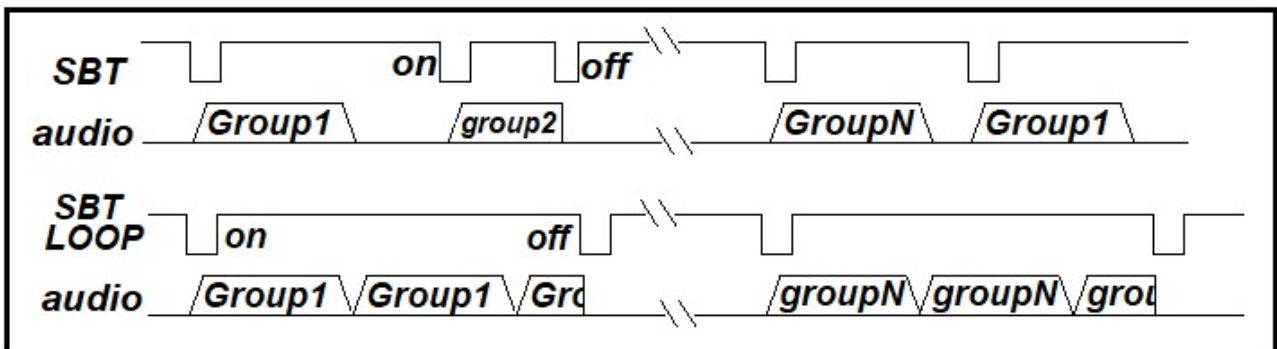


Fig. 7 SBT sequential trigger with On/Off

Trigger Mode

There are 7 trigger modes

- SBT Mode.
- Key Mode.
- Key(Matrix) Mode.
- MP3 Mode.
- 1-Wire Mode.
- 2-Wire Mode.
- 3-Wire Mode.

- **SBT Mode :**

Maximum Voice Groups : 254 for each I/O. All I/O can be chosen input or output. Each Voice Group can have its independent trigger options (See Fig. 1,2,4 and 5). SBT mode has an additional on/off function. (See Fig. 7).

| P00 | P01 | P02 | P03 | P04 ~ P07 |
|-------------|-------------|-------------|-------------------|-------------|
| SEQ/VOL/OUT | SEQ/VOL/OUT | SEQ/VOL/OUT | SEQ/VOL/Reset/OUT | SEQ/VOL/OUT |

SEQ : Sequential Play (See Fig. 3 and 6).

VOL : Volume Control

Output :BusyH , BusyL , 3Hz , 6Hz , LED-dyna , StopH , StopL

- **Key Mode :**

All I/O can be chosen input or output .Each Voice Group can have its independent trigger options (See Fig. 1,2,4 and 5).

| | P00 | P01 | P02 | P03 | P04 ~ P07 |
|---------------|--------|--------|--------|-----------|-----------|
| 1 key | Key in | Out | Out | Out/Reset | Out |
| 3 key | Key in | Key in | Out | Out/Reset | Out |
| 7 key | Key in | Key in | Key in | Out/Reset | Out |
| 15 key | Key in | Key in | Key in | Key in | Out |

Output :BusyH , BusyL , 3Hz , 6Hz , LED-dyna , StopH , StopL

1 key setting :

| Voice Group | P00 |
|-------------|-----|
| SW1 | 0 |

3 keys setting :

| Voice Group | P00 | P01 |
|-------------|-----|-----|
| SW1 | 0 | 1 |
| SW2 | 1 | 0 |
| SW3 | 0 | 0 |

7 keys setting :

| Voice Group | P00 | P01 | P02 |
|-------------|-----|-----|-----|
| SW1 | 0 | 1 | 1 |
| SW2 | 1 | 0 | 1 |
| SW3 | 1 | 1 | 0 |
| SW4 | 0 | 0 | 1 |
| SW5 | 1 | 0 | 0 |
| SW6 | 0 | 1 | 0 |
| SW7 | 0 | 0 | 0 |

15 keys setting :

| Voice Group | P00 | P01 | P02 | P03 |
|-------------|-----|-----|-----|-----|
| SW1 | 0 | 1 | 1 | 1 |
| SW2 | 1 | 0 | 1 | 1 |
| SW3 | 1 | 1 | 0 | 1 |
| SW4 | 1 | 1 | 1 | 0 |
| SW5 | 0 | 0 | 1 | 1 |
| SW6 | 1 | 0 | 0 | 1 |
| SW7 | 1 | 1 | 0 | 0 |
| SW8 | 0 | 1 | 1 | 0 |
| SW9 | 0 | 1 | 0 | 1 |
| SW10 | 1 | 0 | 1 | 0 |
| SW11 | 0 | 0 | 0 | 1 |
| SW12 | 0 | 0 | 1 | 0 |
| SW13 | 0 | 1 | 0 | 0 |
| SW14 | 1 | 0 | 0 | 0 |
| SW15 | 0 | 0 | 0 | 0 |

- **Key(Matrix) Mode :**

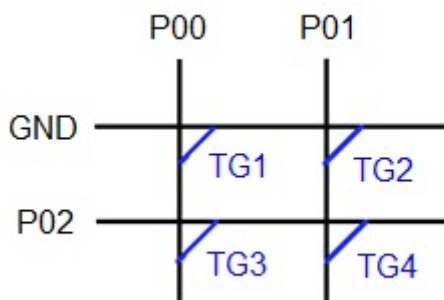
The sound group is triggered by combining P00 to P07 and GND in a matrix. All I/O scan be chosen input or output. Each Voice Group can have its independent trigger option (see Figures 1, 2, 4 and 5).

| | P00 | P01 | P02 | P03 | P04 | P05 | P06 | P07 |
|---------------|---------|---------|----------|---------------|----------|----------|----------|----------|
| 4MKey | Scan in | Scan in | Scan Out | Vol/Reset/Out | -- | -- | -- | -- |
| 6MKey | Scan in | Scan in | Scan in | Scan out | -- | -- | -- | -- |
| 9MKey | Scan in | Scan in | Scan in | Vol/Reset/Out | Scan out | Scan out | -- | -- |
| 12MKey | Scan in | Scan in | Scan in | Vol/Reset/Out | Scan out | Scan out | Scan out | -- |
| 16MKey | Scan in | Scan in | Scan in | Vol/Reset/Out | Scan in | Scan out | Scan out | Scan out |
| 20MKey | Scan in | Scan in | Scan in | Scan in | Scan out | Scan out | Scan out | Scan out |

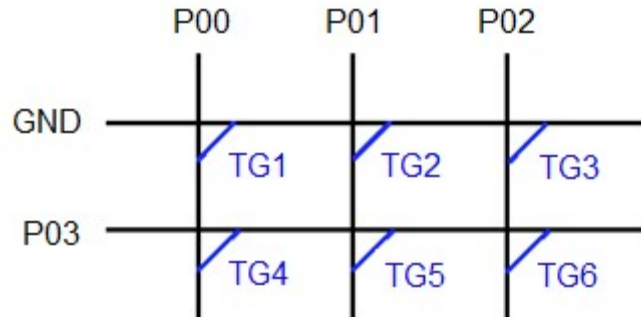
Output : BusyH , BusyL , 3Hz , 6Hz , LED-dyna , StopH , StopL

VOL : Volume Control

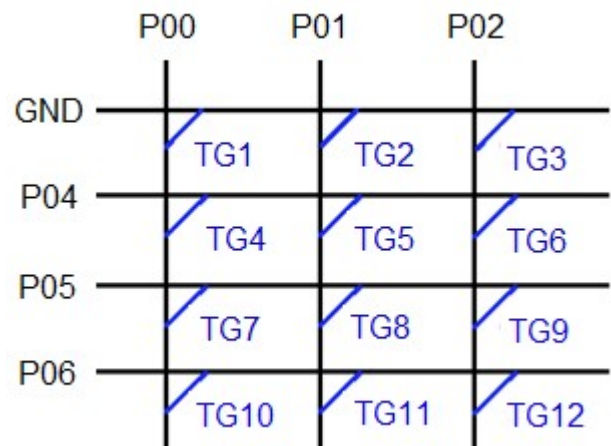
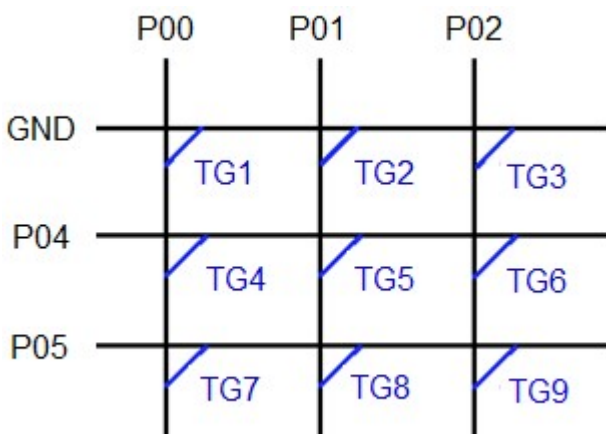
4MKeys : In(P00 , P01)xOut (GND,P02)



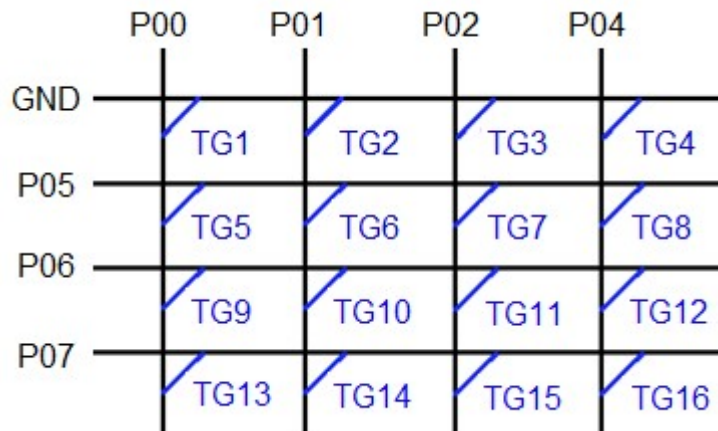
6MKeys : In(P00 , P01 , P02)xOut (GND , P03)



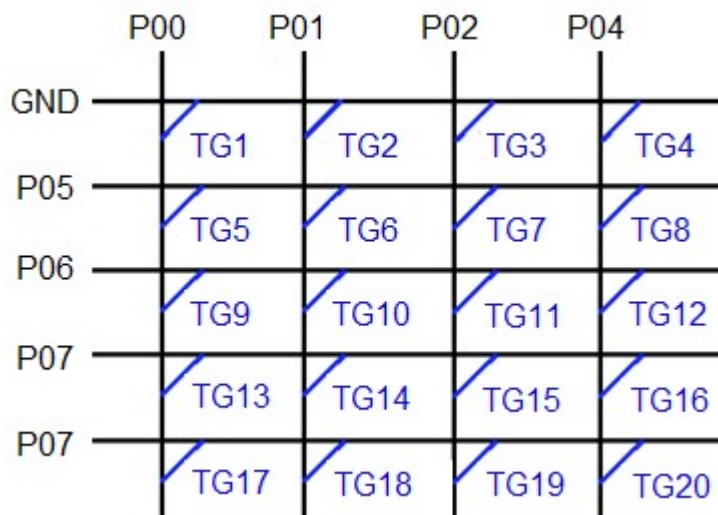
9MKeys: In(P00,P01,P02)xOut (GND,P04,P05) **12MKeys:** In(P00,P01,P02)xOut (GND,P04,P05,P06)



16MKeys: In(P00 , P01 , P02 , P04) x Out (GND , P05 , P06 , P07)



20MKeys: In(P00 , P01 , P02 , P03) x Out (GND , P04 , P05 , P06 , P07)



• **MP3 Mode**

User can start to Play or Pause the voice by P00 pin, and Backward or Forward play by P01 pin or P02 pin, up to 254 Voice Sections.

| P00 | P01 | P02 | P03 | P04 ~ P07 |
|------------|----------|---------|-------------------|-----------|
| Play/pause | backward | forward | Reset / Vol / Out | Vol / Out |

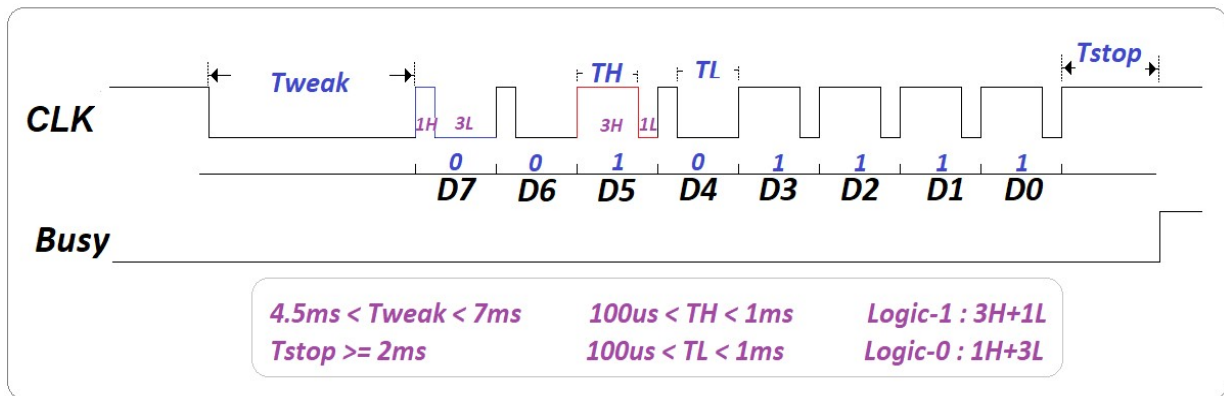
VOL : Volume Control

Output :BusyH , BusyL , 3Hz , 6Hz , LED-dyna , StopH , StopL

• 1-wire mode :

| P00 | P01 | P02 | P03 | P04 ~ P07 |
|-----|-----|-----|-----------|-----------|
| Rx | Out | Out | Out/Reset | Out |

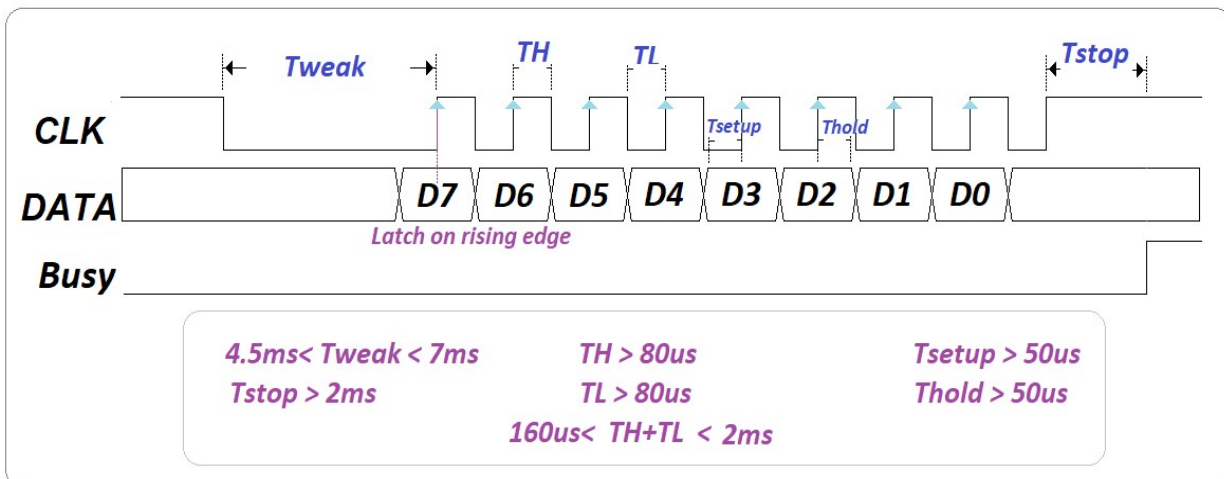
Output :BusyH , BusyL , 3Hz , 6Hz , LED-dyna , StopH , StopL



• 2-wire mode :

| P00 | P01 | P02 | P03 | P04 ~ P07 |
|-------|------|-----|-----------|-----------|
| Sdata | Sclk | Out | Out/Reset | Out |

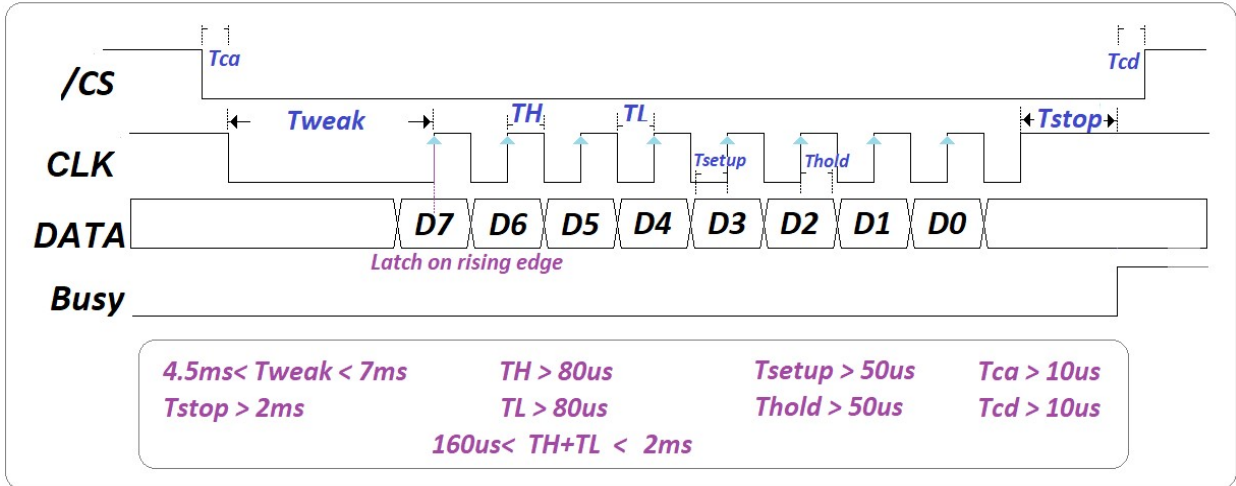
Output :BusyH , BusyL , 3Hz , 6Hz , LED-dyna , StopH , StopL



• 3-wire mode :

| | | | | |
|------------|------------|------------|------------|------------------|
| P00 | P01 | P02 | P03 | P04 ~ P07 |
| Sdata | Sclk | Cs | Out/Reset | Out |

Output :BusyH , BusyL , 3Hz , 6Hz , LED-dyna , StopH , StopL



Command :

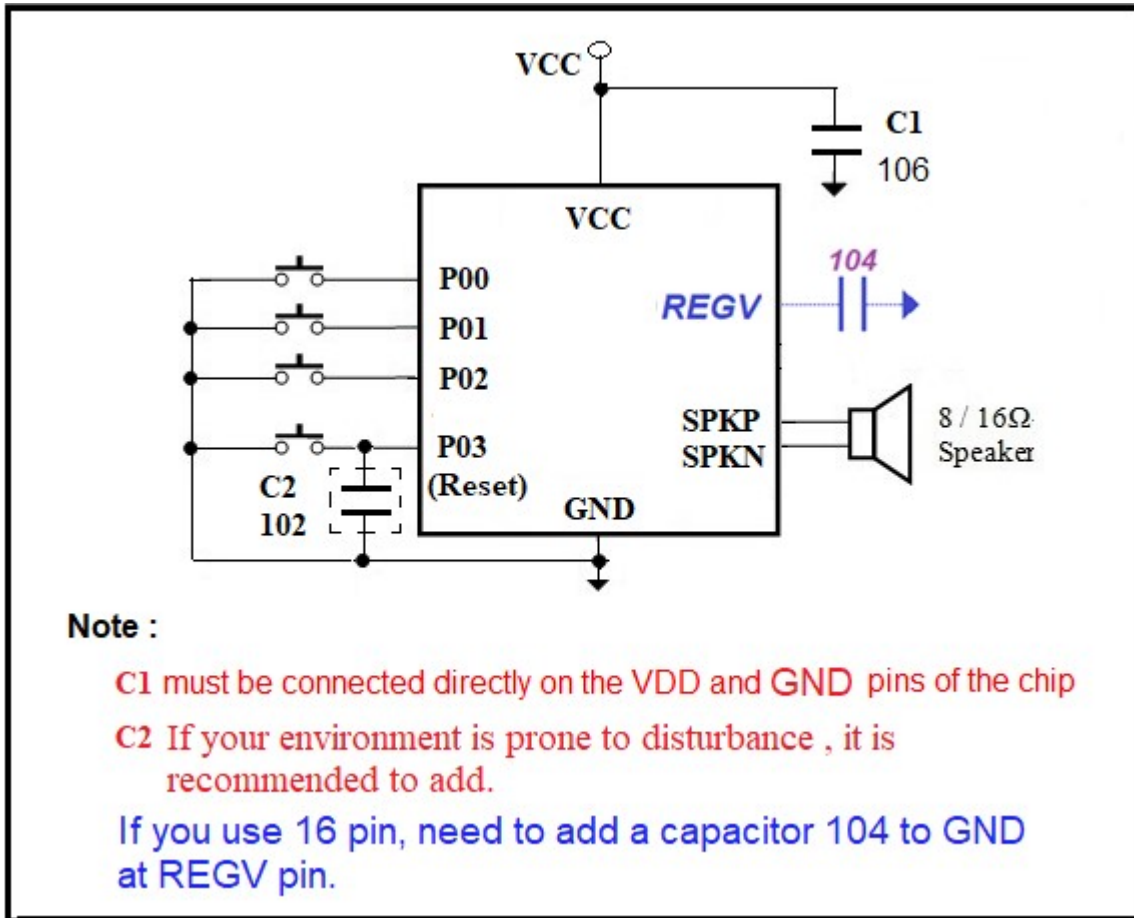
| command | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|------------------|---------|----|----|----|----|----|----|----|
| play sentence(n) | 01 ~ DF | | | | | | | |
| set volume (n) | E | | | | n | | | |
| reserved | F0 ~ F7 | | | | | | | |
| repeat off | F8 | | | | | | | |
| repeat on | F9 | | | | | | | |
| Vol- | FA | | | | | | | |
| Vol+ | FB | | | | | | | |
| Play Next | FC | | | | | | | |
| Play Previous | FD | | | | | | | |
| Pause / Resume | FE | | | | | | | |
| Stop | FF | | | | | | | |

DC Characteristics (VCC = 3.0V , VDD = 2.0V , GND = 0V , TA = 25°C)

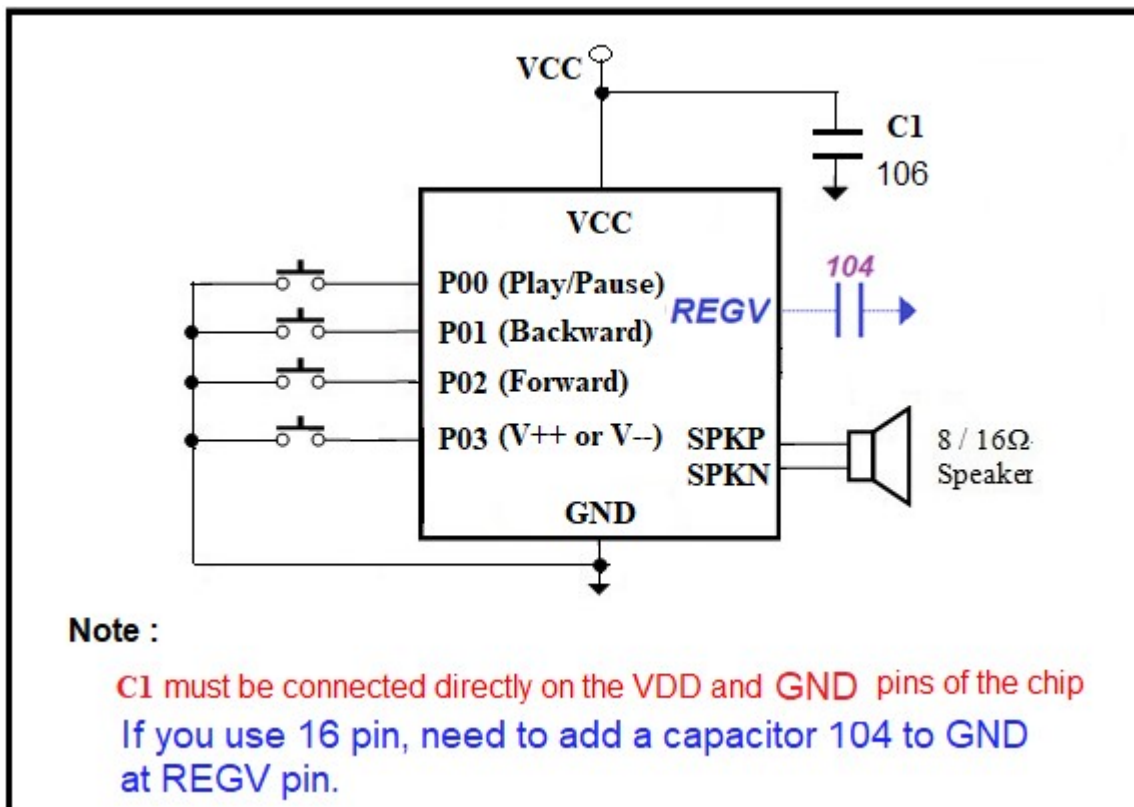
| Symbol | Parameter | Min. | Typ. | Max. | Unit | Condition |
|------------|-----------------|------|------|------|------|-------------------------------|
| PORT0[2:0] | Driving Current | 2 | | 12 | mA | VOH=2.7 |
| PORT0[3] | Driving Current | | 2 | | mA | VOH=2.7 |
| SPKP/SPKN | Driving Current | | | 200 | mA | RL = 8Ω @3.0V |
| SPKP/SPKN | Driving Current | | | 320 | mA | RL = 8Ω @4.5V |
| PORT0[2:0] | Sink Current | 2 | | 12 | mA | VOL=0.3 |
| PORT0[3] | Sink Current | | 2 | | mA | VOL=0.3 |
| SPKP/SPKN | Sink Current | | | 200 | mA | RL = 8Ω @3.0V |
| SPKP/SPKN | Sink Current | | | 320 | mA | RL = 8Ω @4.5V |
| I_STD | Standby Current | 0.5 | 1 | 2 | uA | <2uA @<4.5V <3uA @4.5~5.1V |

■ TYPICAL APPLICATIONS :

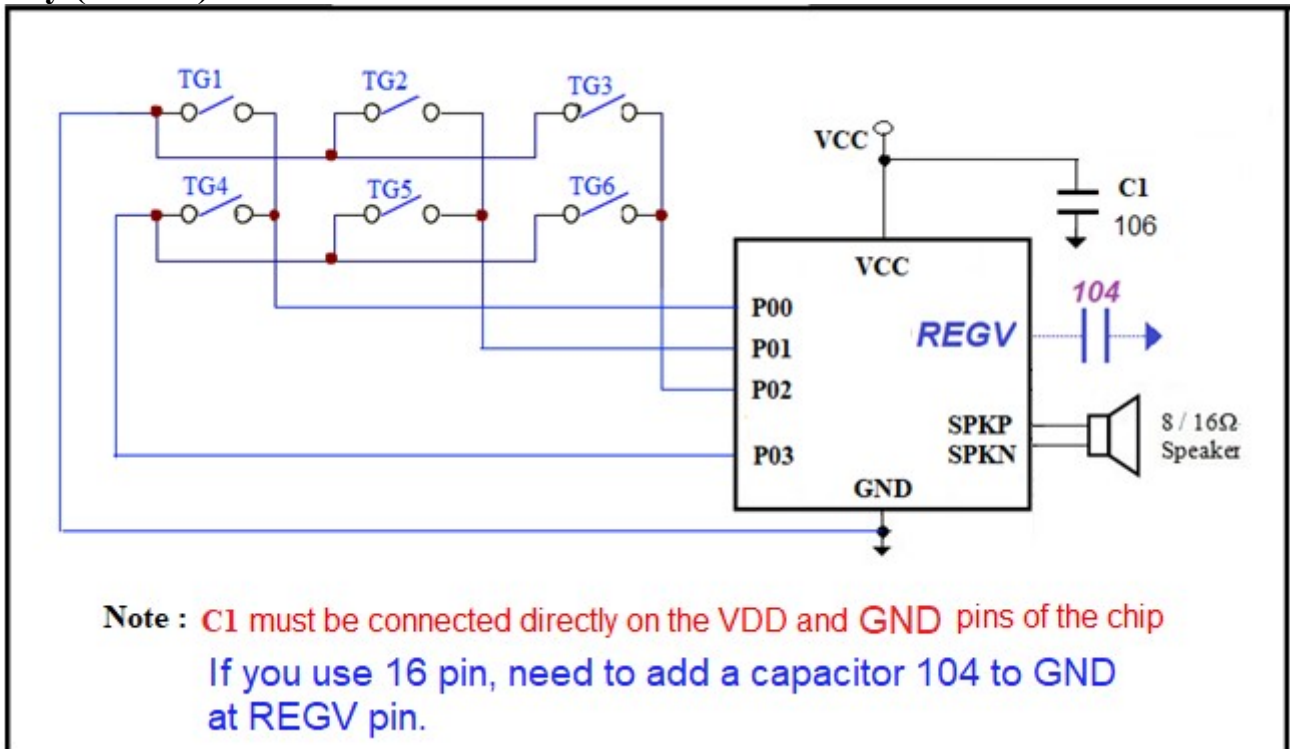
KEY Mode and SBT Mode



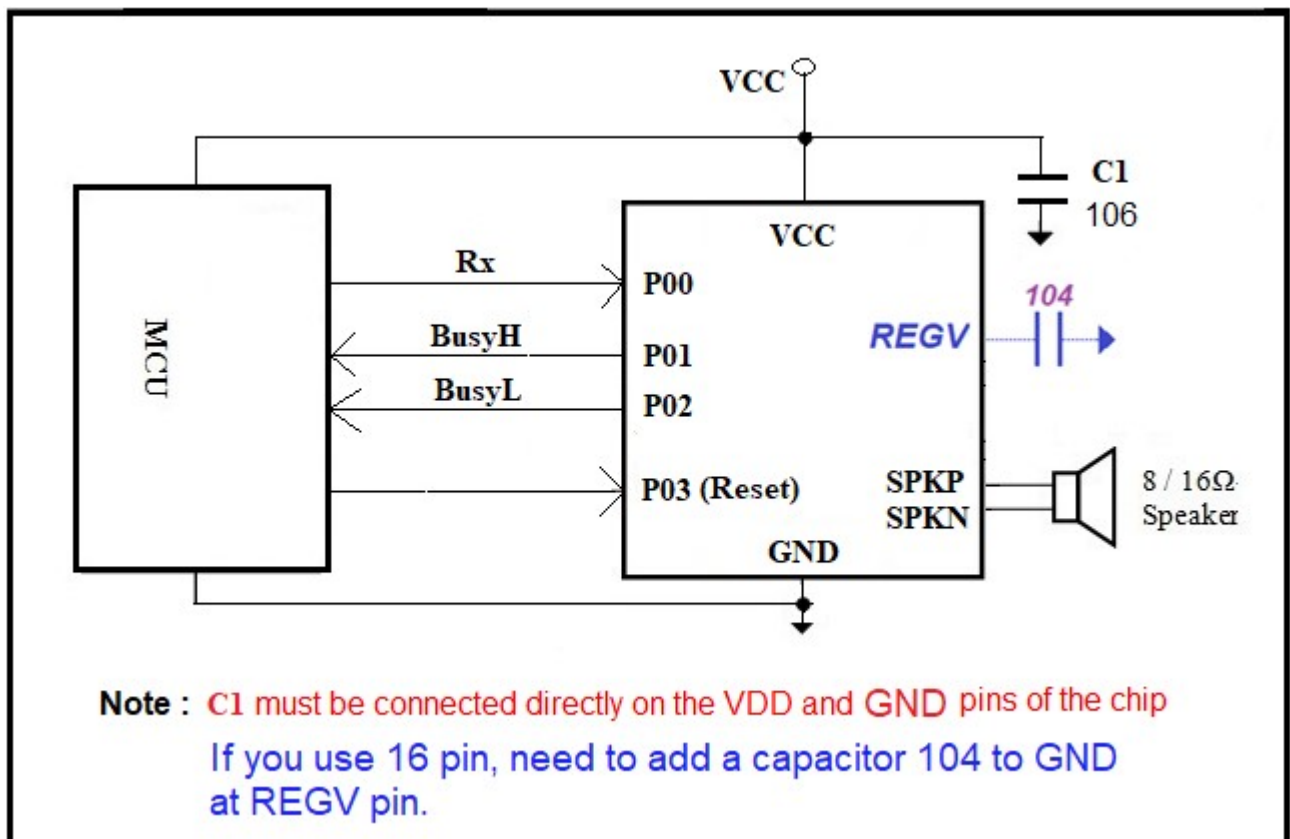
MP3 Mode



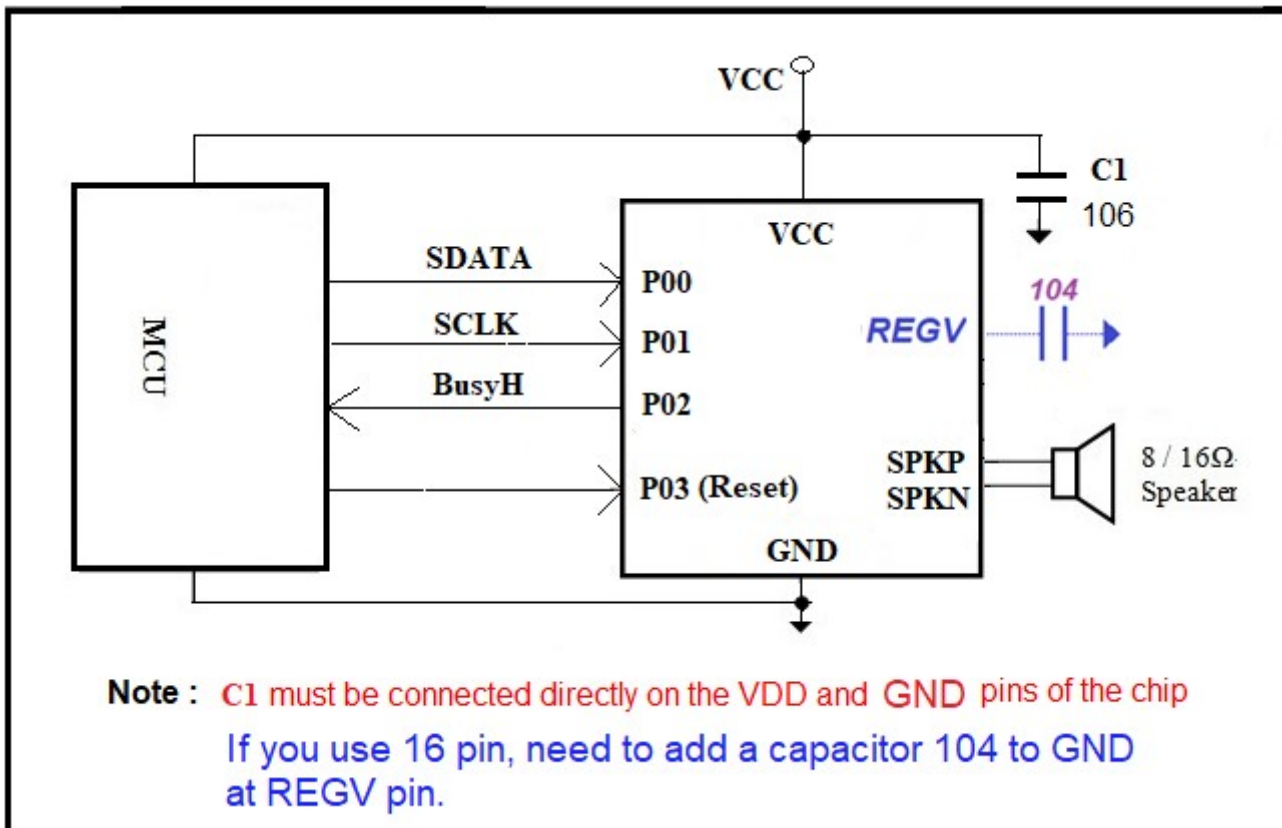
Key (Matrix) Mode



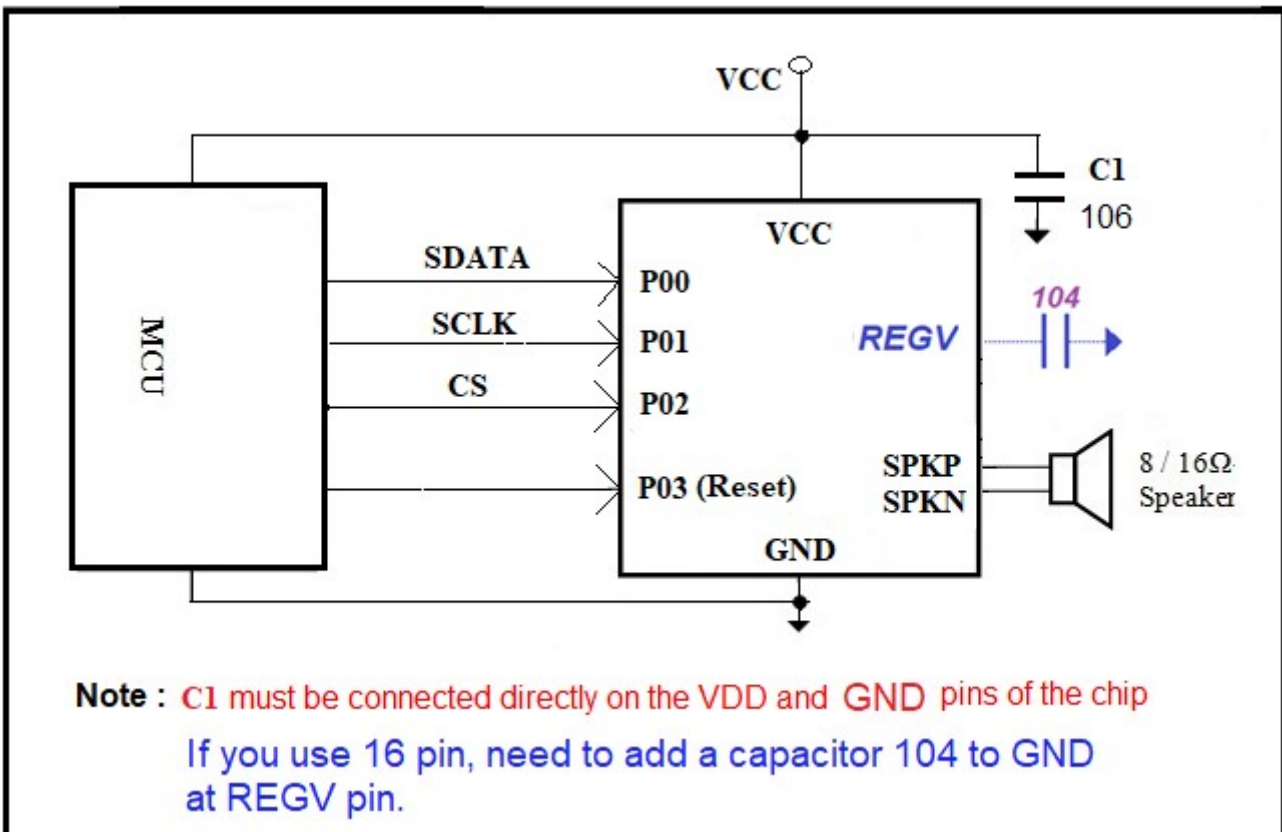
1-Wire



2-Wire

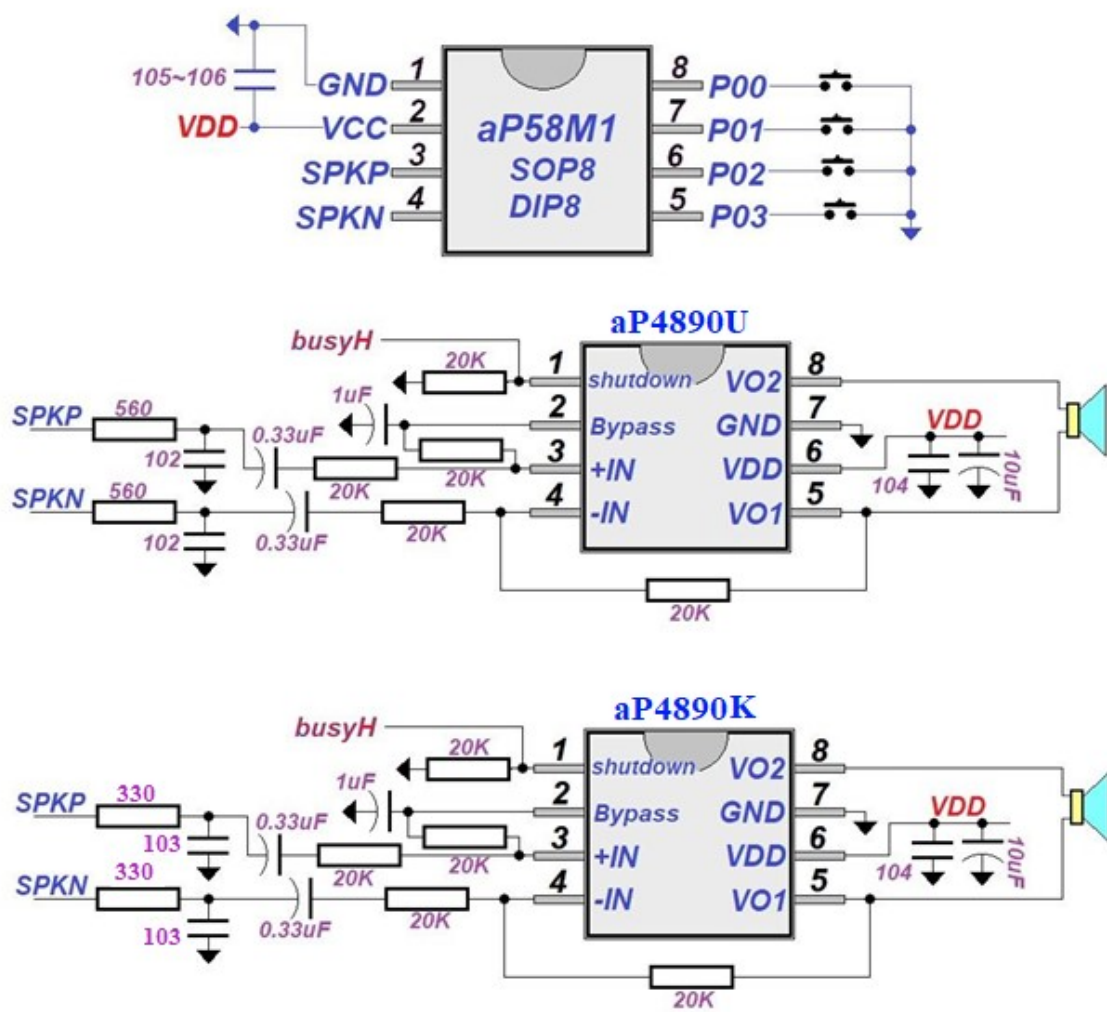


3-Wire



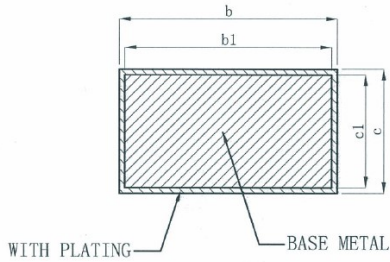
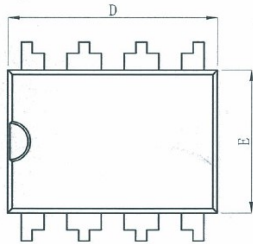
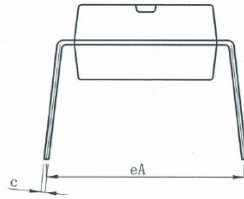
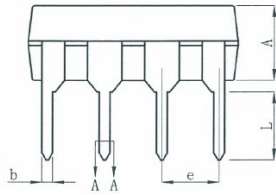
Amplify Application Circuit : aP4890K(1.4W X 8Ω) and aP4890U(1.7W X 8Ω)

PWM AMP. circuit :



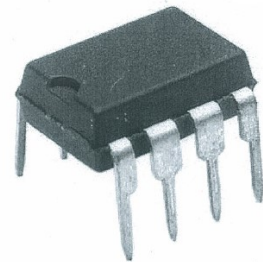
PACKAGES DIMENSION OUTLINES

DIP8



SECTION A-A

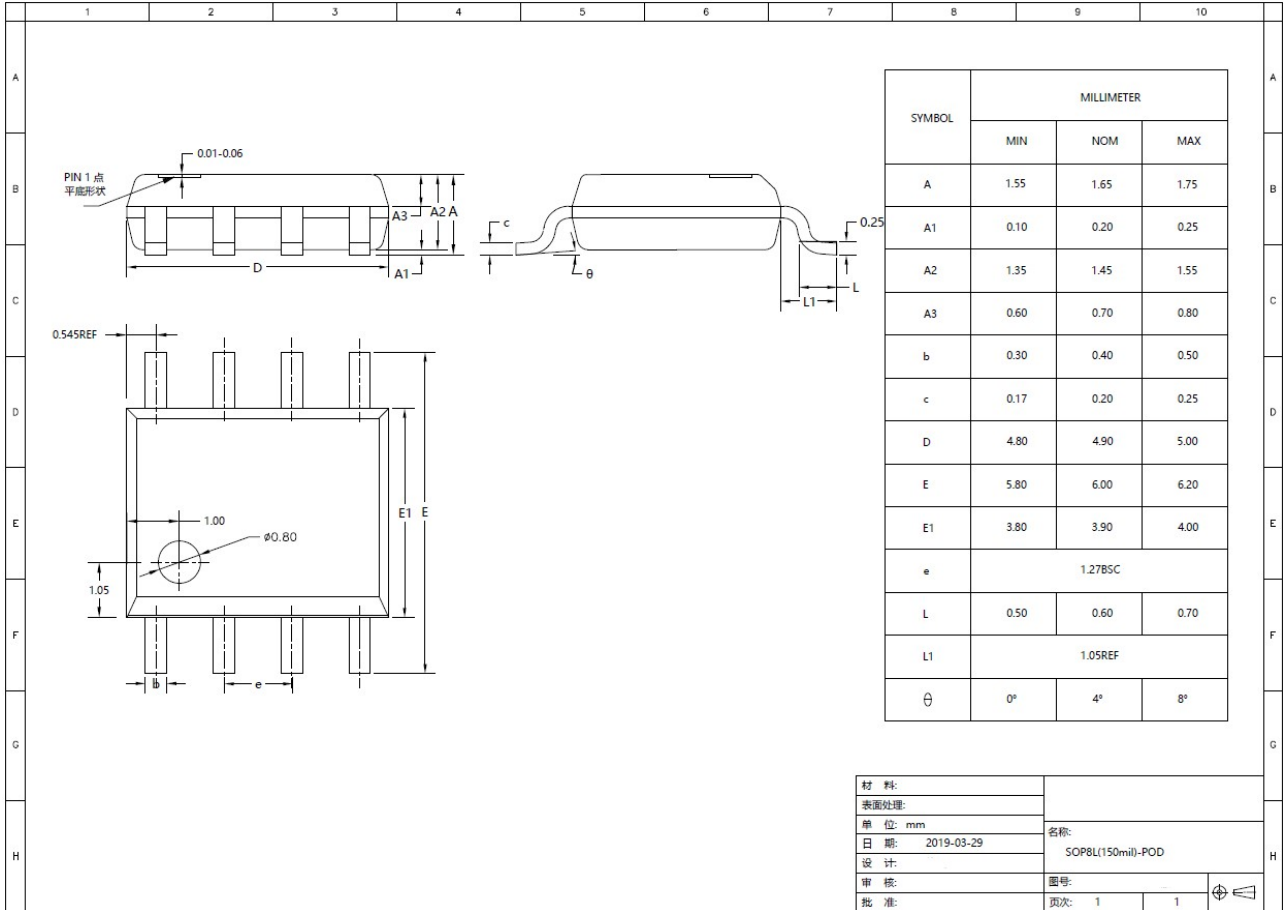
| symbol | millimeter | | |
|--------|------------|------|------|
| | Min | Nom | Max |
| A | 3.20 | 3.30 | 3.40 |
| b | 0.44 | --- | 0.53 |
| b1 | 0.43 | 0.46 | 0.49 |
| c | 0.25 | --- | 0.30 |
| c1 | 0.24 | 0.25 | 0.26 |
| D | 9.20 | 9.30 | 9.40 |
| E | 6.30 | 6.40 | 6.50 |
| e | 2.54BSC | | |
| eA | 8.30 | 8.80 | 9.30 |
| L | 3.00 | --- | --- |



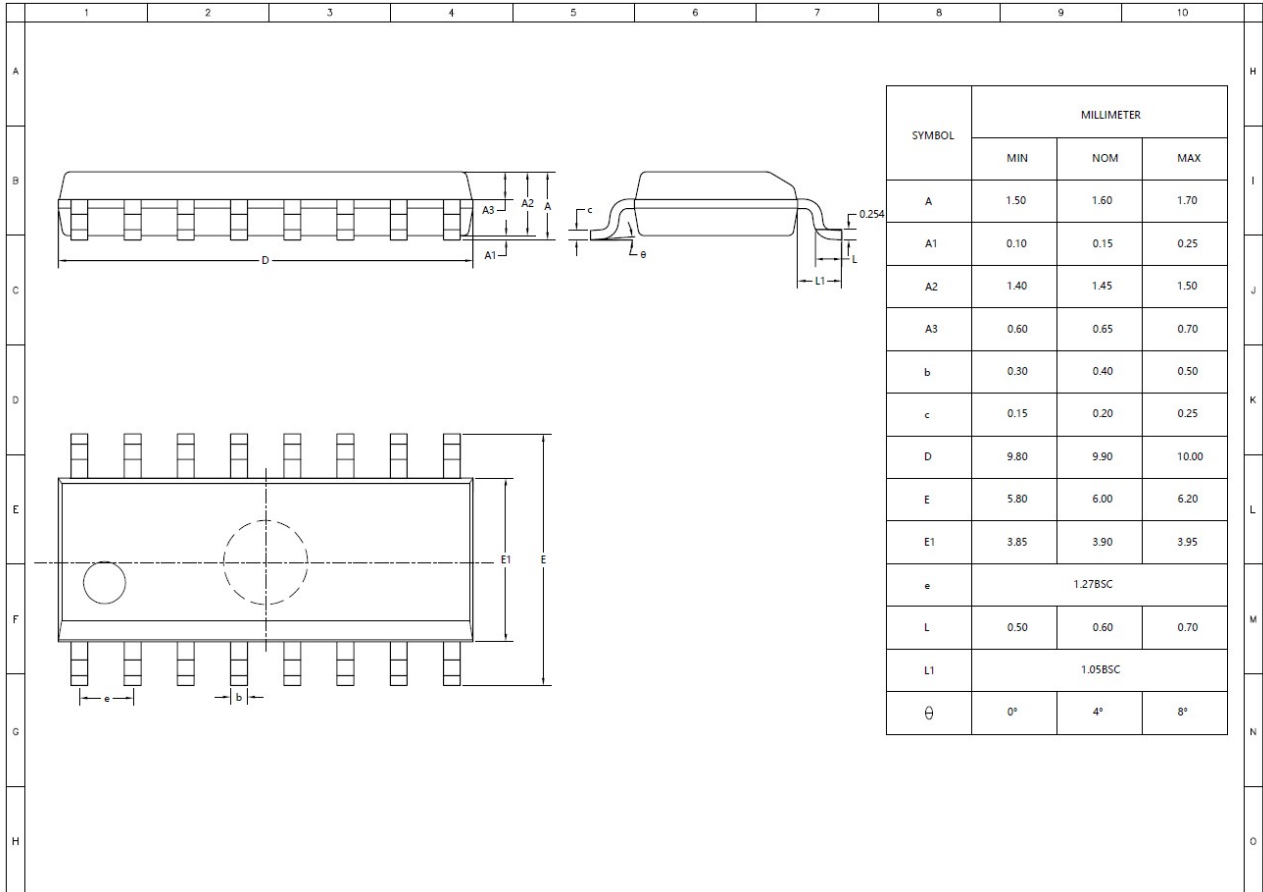
Note:

1. All dimension are in mm;
2. Dim D & E does not include plastic flash;
Flash: Plastic residual around body edge after dejunk/singulation.
3. Dim b does not include dambar protrusion/intrusion.
4. Plating thickness 0.007-0.020 mm.

SOP8



SOP16



History

| Version no. | Date | Description |
|--------------------|-------------------|--|
| <i>0.1</i> | <i>12/12/2022</i> | <i>Internal Initial APLUS Release.</i> |