

36 Melody Music Generator

Features

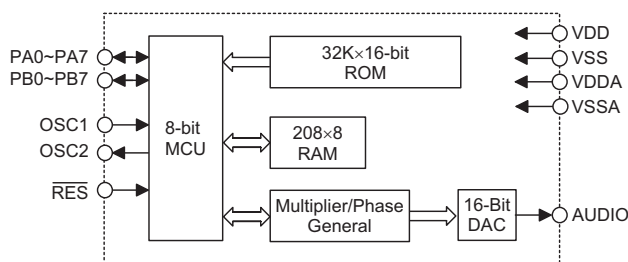
- Operating voltage: 2.4V~5.0V
- R_{osc} Operating frequency: 6MHz
- Three operating modes for 28-pin package, MCU control mode, key control mode and manual mode
- Dual operating mode for 16-pin package, key control mode and MCU mode
- Low voltage detect
- Volume control
- Hold key
- Ring detect
- Hook detect
- Mono output
- High D/A converter resolution: 16 bits
- Polyphonic 4 notes
- 16/28-pin SOP package

General Description

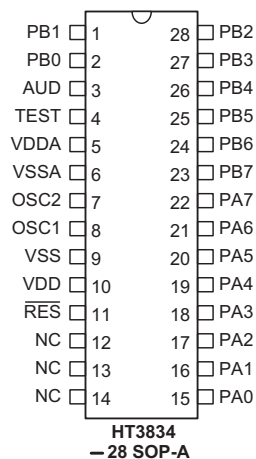
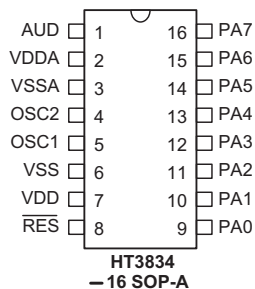
The HT3834 is a CMOS VLSI designed for musical instruments, especially 36 melody songs. The HT3834 has an integrated controller and a WTS (Wave Table Synthesizer).

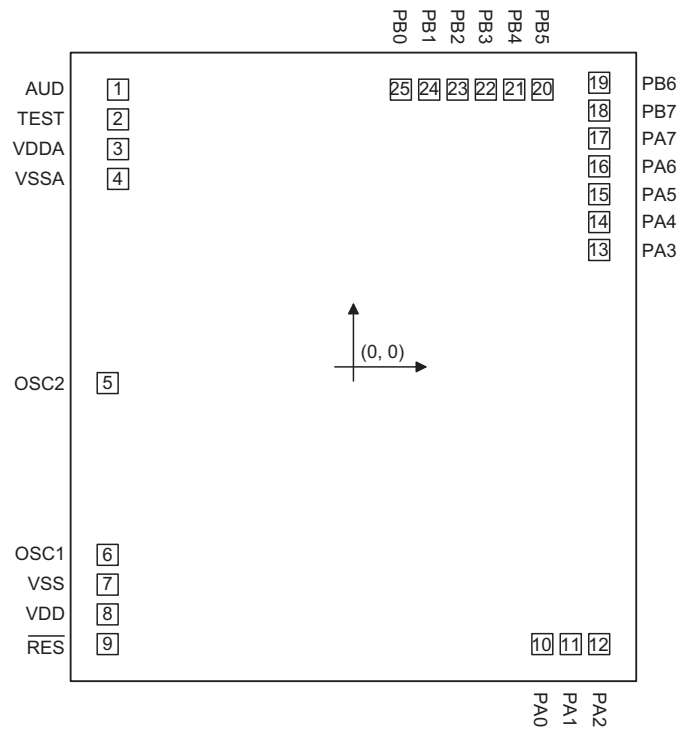
The HT3834 has applications in areas such as phone ringtones, high function toys, musical boxes, doorbells etc.

Block Diagram



Pin Assignment



Pad Assignment


Chip size: 2135×2385 (μm)²

* The IC substrate should be connected to VSS in the PCB layout artwork.

Pad Coordinates

Unit: μm

| Pad No. | X | Y | Pad No. | X | Y |
|---------|----------|-----------|---------|---------|----------|
| 1 | -876.150 | 1043.000 | 14 | 916.350 | 514.500 |
| 2 | -876.150 | 931.200 | 15 | 916.350 | 625.100 |
| 3 | -876.150 | 817.560 | 16 | 916.350 | 725.100 |
| 4 | -876.150 | 715.600 | 17 | 916.350 | 835.700 |
| 5 | -916.350 | -63.124 | 18 | 916.350 | 935.700 |
| 6 | -916.350 | -740.976 | 19 | 916.350 | 1046.300 |
| 7 | -916.350 | -842.650 | 20 | 704.250 | 1041.550 |
| 8 | -916.350 | -942.650 | 21 | 593.650 | 1041.550 |
| 9 | -916.350 | -1044.324 | 22 | 493.650 | 1041.550 |
| 10 | 710.500 | -1041.350 | 23 | 383.050 | 1041.550 |
| 11 | 810.500 | -1041.350 | 24 | 283.050 | 1041.550 |
| 12 | 921.100 | -1041.350 | 25 | 172.450 | 1041.550 |
| 13 | 916.350 | 414.500 | | | |

Pad Description

| Pad Name | I/O | Internal Connection | Function |
|----------|-----|----------------------------|--|
| VDD | — | — | Positive power supply |
| VDDA | — | — | DAC power supply |
| VSS | — | — | Negative power supply, ground |
| VSSA | — | — | DAC negative supply, ground |
| PA0~PA7 | I/O | Wake-up, Pull-high or None | Bidirectional 8-bit I/O port, wake-up by mask option |
| PB0~PB7 | I/O | Pull-high or None | Bidirectional 8-bit I/O port |
| RESET | I | — | Reset input, active low |
| OSC1 | I | X'tal/Resistor | XIN for X'tal or ROSCIN for resistor by mask option |
| OSC2 | O | — | XOUT or T1 |
| AUD | O | — | DAC output interface |

Absolute Maximum Ratings

Supply Voltage $V_{SS}-0.3V$ to $V_{SS}+5.5V$ Storage Temperature $-50^{\circ}C$ to $125^{\circ}C$
 Input Voltage $V_{SS}-0.3V$ to $V_{DD}+0.3V$ Operating Temperature $-25^{\circ}C$ to $70^{\circ}C$

Note: These are stress ratings only. Stresses exceeding the range specified under "Absolute Maximum Ratings" may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

Electrical Characteristics
 $T_a=25^{\circ}C$

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|-----------|----------------------------------|-----------------|---------------------|-------------|------|-------------|---------|
| | | V_{DD} | Conditions | | | | |
| V_{DD} | Operating Voltage | — | — | 2.4 | 4.5 | 5 | V |
| I_{DD} | Operating Current | 3V | No load (OSC= 6MHz) | — | 2 | 8 | mA |
| | | 4.5V | | — | 8 | 10 | |
| I_{STB} | Standby Current | 3V | — | — | 1 | — | μA |
| | | 4.5V | | — | 1 | 3 | |
| I_{OH} | Flag Source Current | 3V | — | 5 | — | — | mA |
| | | 4.5V | | | | | |
| I_{OL} | Flag Sink Current | 3V | — | 5 | — | — | mA |
| | | 4.5V | | | | | |
| V_{IH} | Input High Voltage for I/O Ports | — | — | $0.8V_{DD}$ | — | V_{DD} | V |
| V_{IL} | Input Low Voltage for I/O Ports | — | — | 0 | — | $0.2V_{DD}$ | V |

Function Description

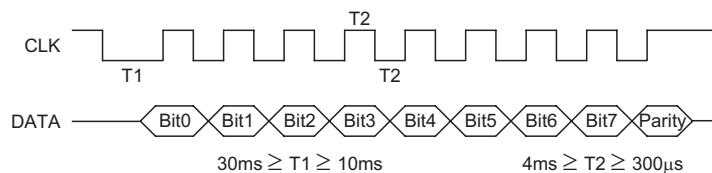
| | |
|--------------------|--|
| Mode selection | PB3=1, PA7=0: Key control mode PB3=1, PA7=1: MCU control mode PB3=0: Manual control mode |
| Low voltage detect | PA5=0 (normal); PA5=1 (low voltage active, program stop) |

Key Control Mode

| | |
|-------------------------|---|
| PA0: Ring Detect | When an incoming 13Hz~90Hz ring signal is detected after a period of 200ms, the music will automatically start playing. When the incoming ring signal stops, after a period of 6 seconds the music will stop playing. |
| PA1: Hook Detect | This line detects the on/off hook condition of the telephone. Only when the telephone is in an on-hook condition, can the music be chosen and played. If the handset is lifted to talk, the music will stop playing and the HOLD key will be effective. |
| PA2: Melody select key | This key chooses and plays one of the 36 stored musical melodies. When the key is pressed the next melody in the list will be selected and played. When the HOLD key is pressed, the telephone hold function will be activated and when an incoming ring signal is detected the music will be played. |
| PA3: Telephone Hold key | If this key is pressed during a phone conversation the phone will be put on hold and the caller can listen to the music while waiting. If, when the music is playing, the handset is lifted, the music will immediately stop playing. After this happens the HOLD function will have no effect for a period of 2 seconds. |
| PA4: Volume key | Controls the music volume in 8 discrete steps. Each time the key is pressed the volume will reduce one step at a time until the lowest volume is reached. When the lowest volume is reached, the next key press will return the volume to its maximum level. |

MCU Mode

| | |
|----------------|-------------------------|
| PA0: clock pin | Clock from external CPU |
| PA1: data pin | Data from external CPU |

Timing Chart


Note: 50ms after power up, the device will be ready to communicate with the external CPU using the CLK and DATA lines.

Communication via the CLK and DATA lines is conducted in a simple manner. The device will obtain its data on the high going edge of the CLK line. If the device does not receive a complete byte within 50ms then the present byte will be discarded and the next byte will then be received.

Even-parity is used for data checking. For the previous 8-bits, if the total number of "1s" is odd then the parity bit is set to "1", otherwise it is set to "0". If the parity is incorrect then the byte will be discarded.

Data Type (Command)

| | |
|---------|--|
| 00H~23H | This command will select and play one of the 36 stored musical melodies (play once). |
| 30H~53H | This command will select and play one of the 36 stored musical melodies (repeatedly once). |
| 5FH | Stop play |
| 60H~6FH | 16 level volume control, 60H refers to highest volume (power on default 60H) |

Song Selection (Manual Selection Mode Only)

| Mid Name | PB2 | PB1 | PB0 | English Song Name |
|-----------|-----|-----|-----|---|
| All | 1 | 1 | 1 | Play all songs, classical → xmas → children |
| Child | 1 | 1 | 0 | Play children songs, CHxx.mid |
| Classical | 1 | 0 | 1 | Play classical songs, CLxx.mid |
| Xmas | 1 | 0 | 0 | Play xmas songs, XMasxx.mid |
| Shuffle | 0 | 1 | 1 | Random play |

Trigger Mode

| PB3 | | PA7 | |
|---------------------|-----|-------------|-------------|
| | | VSS | VDD |
| "VDD" Phone Ring | PA0 | Ring Detect | Clock |
| | PA1 | Hook | Data |
| | PA2 | Select | No function |
| | PA3 | Hold | No function |
| | PA4 | Volume | No function |
| | PA5 | LVR | LVR |
| | PA6 | BusyB | BusyB |

| | PA6 | BusyB | | BusyB | |
|---|-----|------------|--------------|---------------|-----|
| | | Mode 1 | Mode 2 | Mode 3 | — |
| "VSS" (See Manual Selection Mode) | PA0 | VDD | VDD | VSS | VSS |
| | PA1 | VDD | VSS | VDD | VSS |
| | PA2 | Re-trigger | Toggle | Level Hold | — |
| | PA3 | Re-play | Toggle+10min | Non-retrigger | — |
| | PA4 | Volume + | | | |
| | PA5 | Volume - | | | |
| | PA6 | BusyB | | | |
| | PA7 | STOP | | | |

| PB4 | PB5/PB6/PB7 Mode |
|-----|------------------|
| VDD | PWM |
| VSS | On-Off |

Manual Selection Mode (28-pin Package only)

- Re-trigger play Songx.mid (for chosen songs)
- Replay the song that has been chosen by re-trigger mode, non-retriggerable (for doorbell)
- Toggle: Pressing the key once will play songs sequentially. Song1, Song2, SongN, Song1, Song2,
(There is 2sec of silence between every two songs)
Pressing the key again and the song will stop.
Pressing the key again will play the next song sequentially.
Pressing the key again and the song will stop.
- Toggle + 10 min timer
- Level Hold: Hold key, songs will play sequentially and repeatedly
(There is 2sec of silence between every two songs).
Songs will stop when the key is released.
Pressing the key again, will play sequentially from the next song.
- Non-retrigger: for bound trigger switch, in order not to be triggered during song playing.
- Volume+ / Volume -: volume up / down, power on default max volume=7. Min volume=0 (silence). 8 levels volume control.
- STOP: stop play

Output

- PA6: BusyB (Op amp control)
- PB5: PWM/On-Off control red LED, when stop play is high
- PB6: PWM/On-Off control blue LED, when stop play is high
- PB7: PWM/On-Off control green LED, when stop play is high

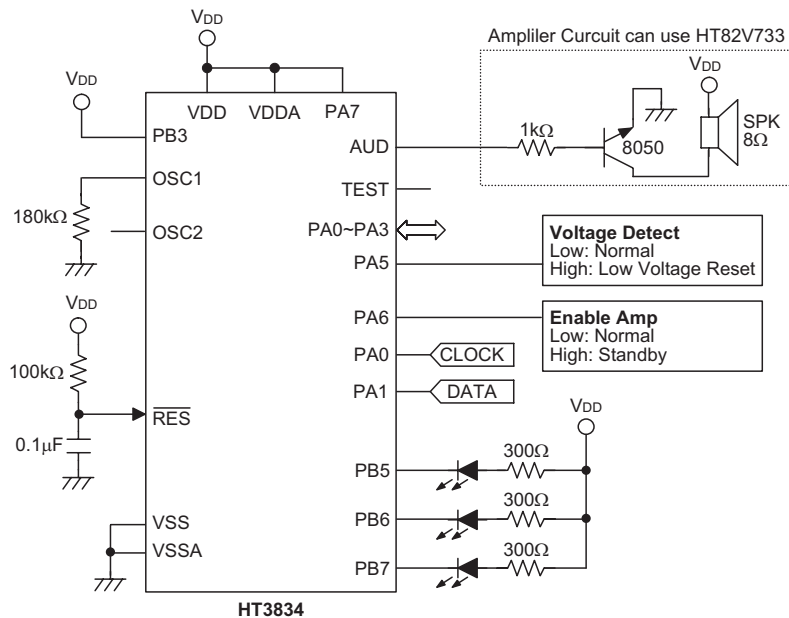
Song List Data

| No. | Mid Name | English Song Name |
|------------------|----------|--|
| Child | | |
| 1 | CH1.mid | Lullaby |
| 2 | CH2.mid | My Bonnie |
| 3 | CH3.mid | Little Boy Blue |
| 4 | CH4.mid | Clementine |
| 5 | CH5.mid | Mary Had a Little Lamb |
| 6 | CH6.mid | Old Black Joe |
| 7 | CH7.mid | Twinkle Twinkle Little Star |
| 8 | CH8.mid | Where, Oh Where Has My Little Dog Gone ? |
| 9 | CH9.mid | Rain, Rain |
| 10 | CH10.mid | London Bridge |
| 11 | CH11.mid | Lavender's Blue |
| 12 | CH12.mid | Rock-a-bye, Baby |
| Classical | | |
| 1 | CL1.mid | Canon |
| 2 | CL2.mid | Spring Song |
| 3 | CL3.mid | Jeanie With The Light Brown Hair |
| 4 | CL4.mid | To a Wild Rose |
| 5 | CL5.mid | ROMANCE de Amor |

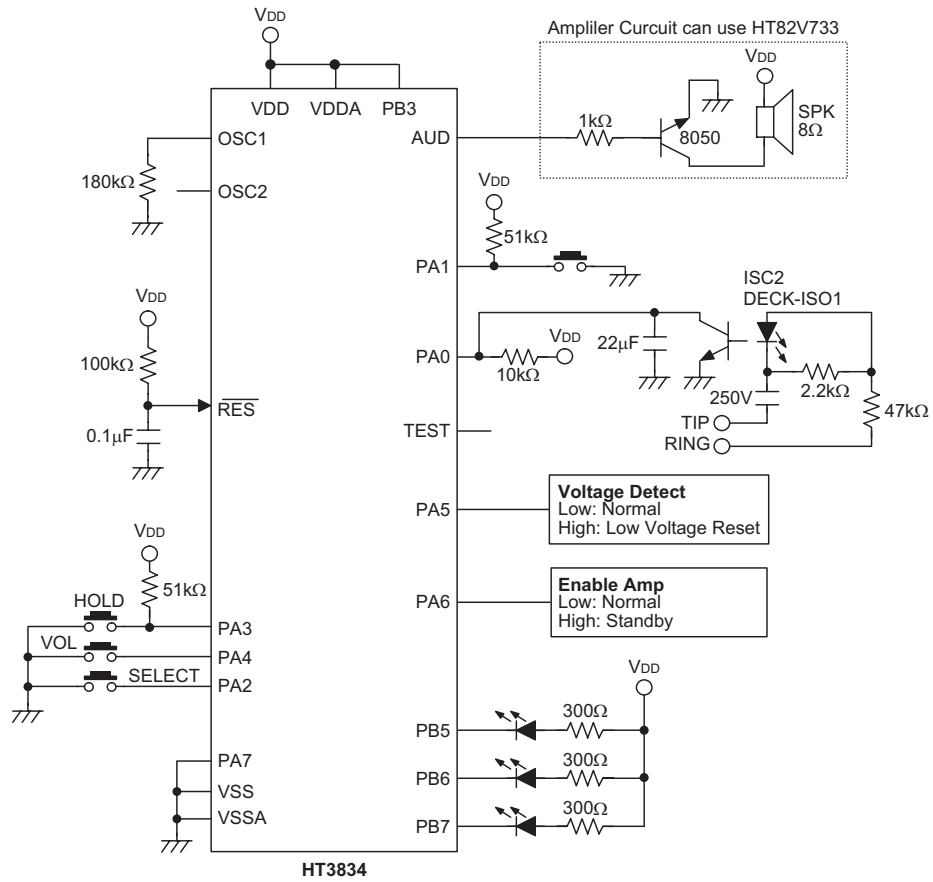
| No. | Mid Name | English Song Name |
|-------------|------------|--------------------------------------|
| 6 | CL6.mid | Green Sleeves |
| 7 | CL7.mid | Swan Lake |
| 8 | CL8.mid | About Strange Lands and People |
| 9 | CL9.mid | Old French Song |
| 10 | CL10.mid | Impromptu |
| 11 | CL11.mid | Solveig's Song |
| 12 | CL12.mid | Berceuse |
| Xmas | | |
| 1 | Xmas1.mid | Jingle Bells |
| 2 | Xmas2.mid | Silent Night |
| 3 | Xmas3.mid | The Twelve Days of Christmas |
| 4 | Xmas4.mid | Away in a Manger |
| 5 | Xmas5.mid | The First Noel |
| 6 | Xmas6.mid | Santa Claus Is Coming to Town |
| 7 | Xmas7.mid | We Wish You a Merry Christmas |
| 8 | Xmas8.mid | Toy Solder's March |
| 9 | Xmas9.mid | God Rest Ye Merry, Gentlemen |
| 10 | Xmas10.mid | Over the River and Through the Woods |
| 11 | Xmas11.mid | Go Tell it on the Mountain |
| 12 | Xmas12.mid | Angels We Have Heard On High |

Application Circuits

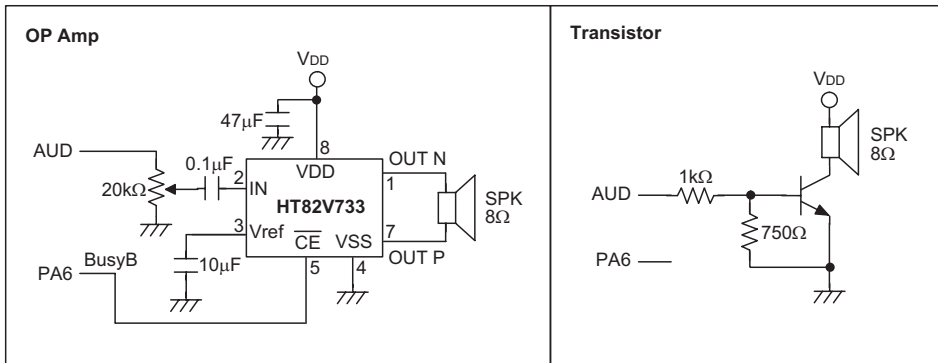
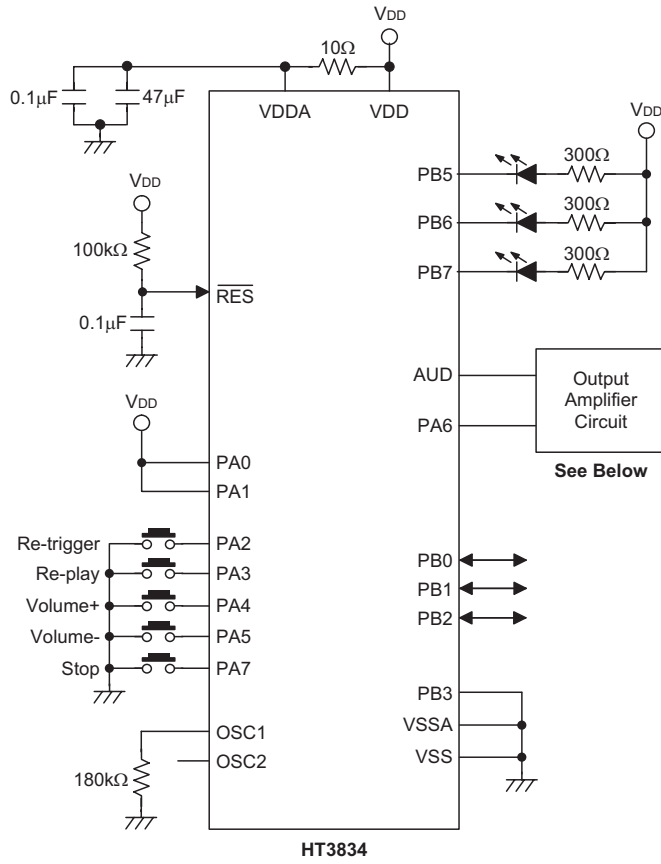
MCU Mode



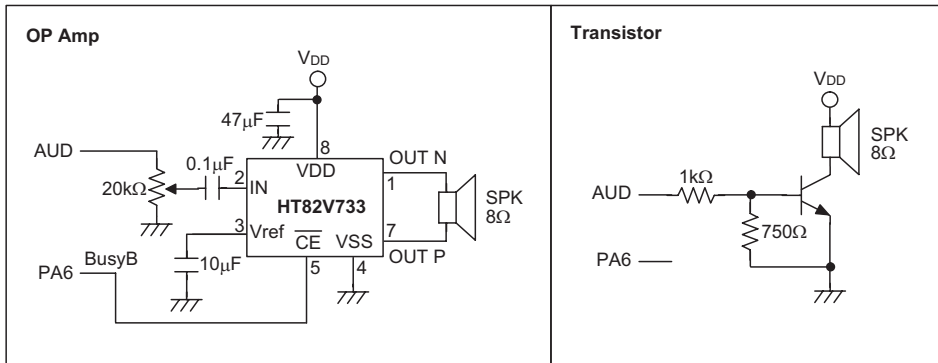
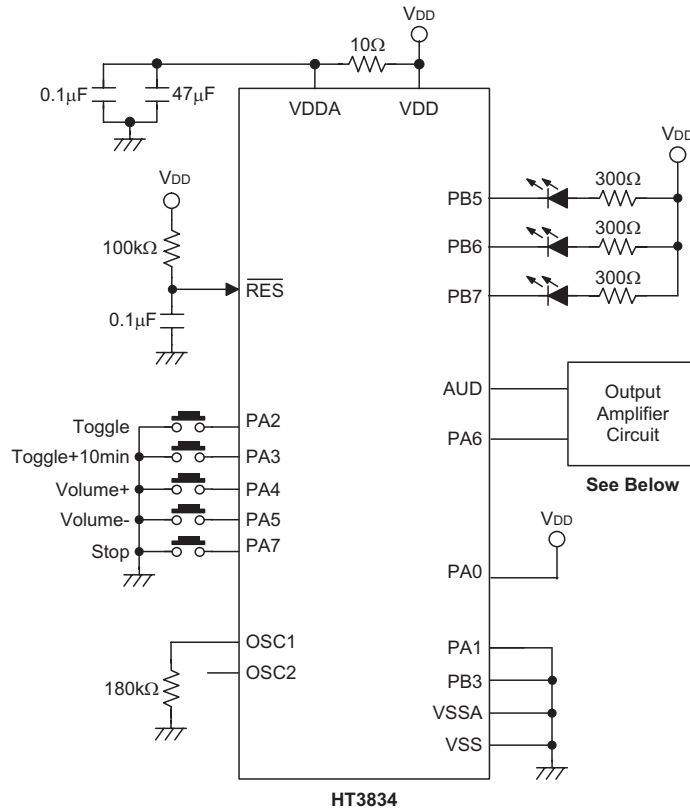
Key Control Mode



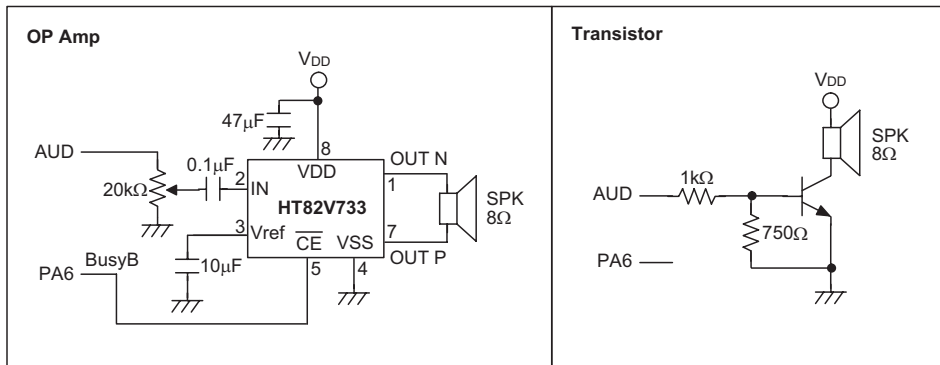
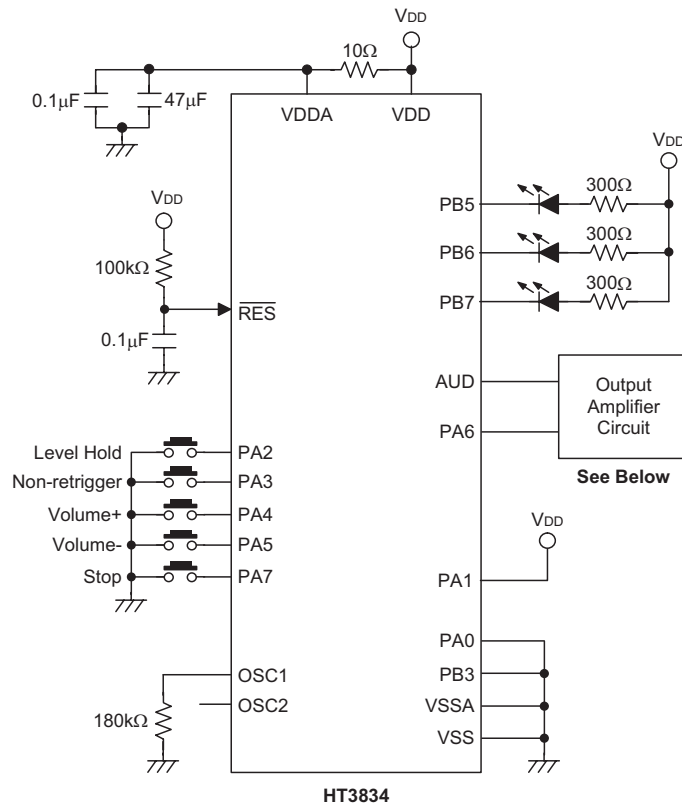
Manual Selection Mode: Mode 1



Manual Selection Mode: Mode 2

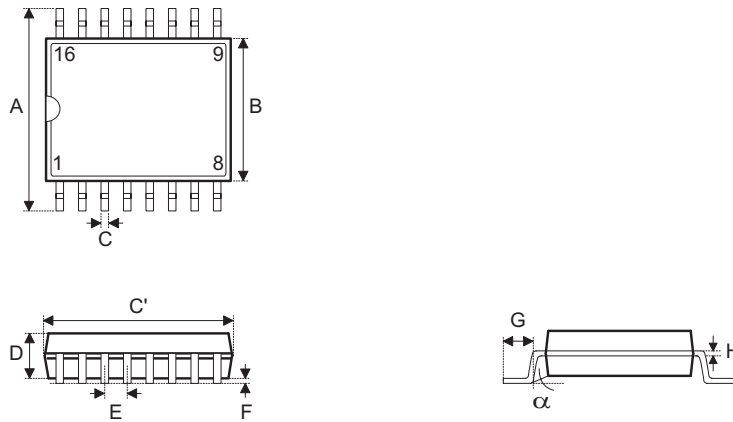


Manual Selection Mode: Mode 3



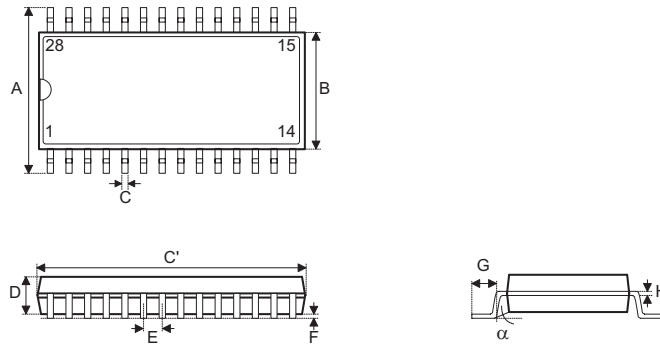
Package Information

16-pin SOP (300mil) Outline Dimensions



| Symbol | Dimensions in mil | | |
|--------|-------------------|------|------|
| | Min. | Nom. | Max. |
| A | 394 | — | 419 |
| B | 290 | — | 300 |
| C | 14 | — | 20 |
| C' | 390 | — | 413 |
| D | 92 | — | 104 |
| E | — | 50 | — |
| F | 4 | — | — |
| G | 32 | — | 38 |
| H | 4 | — | 12 |
| α | 0° | — | 10° |

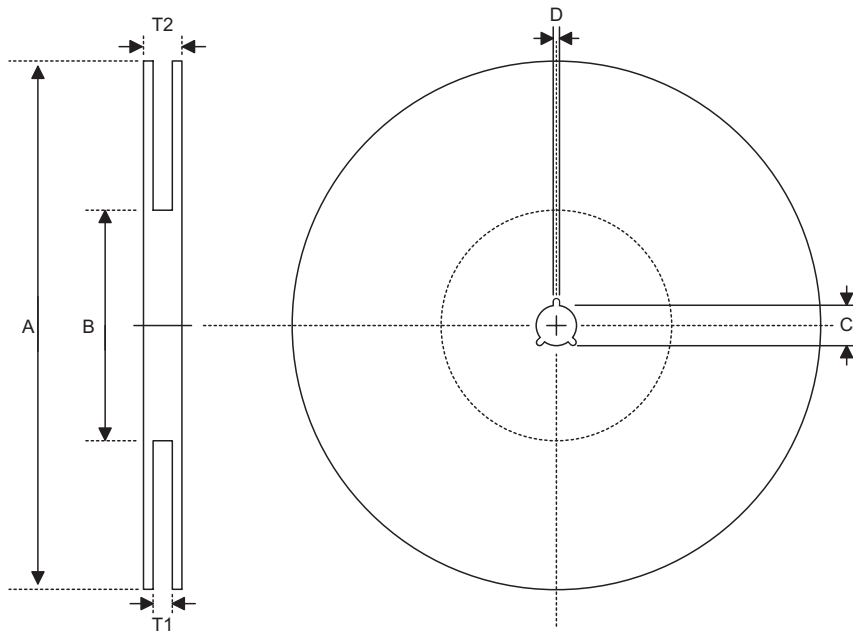
28-pin SOP (300mil) Outline Dimensions



| Symbol | Dimensions in mil | | |
|----------|-------------------|------|------|
| | Min. | Nom. | Max. |
| A | 394 | — | 419 |
| B | 290 | — | 300 |
| C | 14 | — | 20 |
| C' | 697 | — | 713 |
| D | 92 | — | 104 |
| E | — | 50 | — |
| F | 4 | — | — |
| G | 32 | — | 38 |
| H | 4 | — | 12 |
| α | 0° | — | 10° |

Product Tape and Reel Specifications

Reel Dimensions

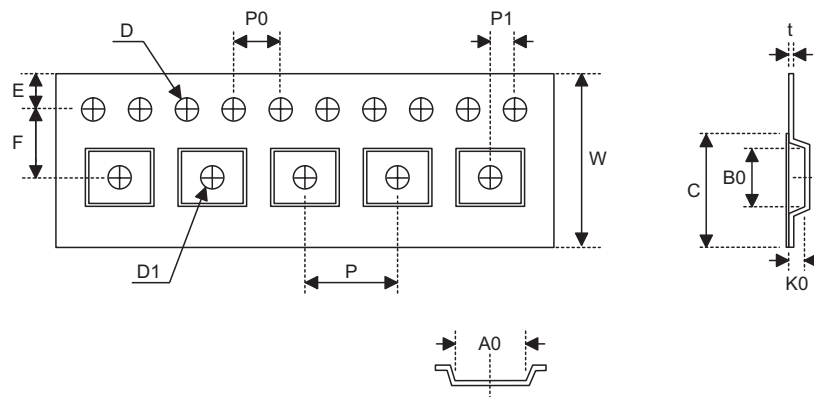


SOP 16W (300mil)

| Symbol | Description | Dimensions in mm |
|--------|-----------------------|------------------|
| A | Reel Outer Diameter | 330±1 |
| B | Reel Inner Diameter | 62±1.5 |
| C | Spindle Hole Diameter | 13±0.5 -0.2 |
| D | Key Slit Width | 2±0.5 |
| T1 | Space Between Flange | 16.8+0.3 -0.2 |
| T2 | Reel Thickness | 22.2±0.2 |

SOP 28W (300mil)

| Symbol | Description | Dimensions in mm |
|--------|-----------------------|------------------|
| A | Reel Outer Diameter | 330±1 |
| B | Reel Inner Diameter | 62±1.5 |
| C | Spindle Hole Diameter | 13+0.5 -0.2 |
| D | Key Slit Width | 2±0.5 |
| T1 | Space Between Flange | 24.8+0.3 -0.2 |
| T2 | Reel Thickness | 30.2±0.2 |

Carrier Tape Dimensions

SOP 16W (300mil)

| Symbol | Description | Dimensions in mm |
|--------|--|------------------|
| W | Carrier Tape Width | 16±0.2 |
| P | Cavity Pitch | 12±0.1 |
| E | Perforation Position | 1.75±0.1 |
| F | Cavity to Perforation (Width Direction) | 7.5±0.1 |
| D | Perforation Diameter | 1.5+0.1 |
| D1 | Cavity Hole Diameter | 1.5+0.25 |
| P0 | Perforation Pitch | 4±0.1 |
| P1 | Cavity to Perforation (Length Direction) | 2±0.1 |
| A0 | Cavity Length | 10.9±0.1 |
| B0 | Cavity Width | 10.8±0.1 |
| K0 | Cavity Depth | 3±0.1 |
| t | Carrier Tape Thickness | 0.3±0.05 |
| C | Cover Tape Width | 13.3 |

SOP 28W (300mil)

| Symbol | Description | Dimensions in mm |
|--------|--|------------------|
| W | Carrier Tape Width | 24±0.3 |
| P | Cavity Pitch | 12±0.1 |
| E | Perforation Position | 1.75±0.1 |
| F | Cavity to Perforation (Width Direction) | 11.5±0.1 |
| D | Perforation Diameter | 1.5+0.1 |
| D1 | Cavity Hole Diameter | 1.5+0.25 |
| P0 | Perforation Pitch | 4±0.1 |
| P1 | Cavity to Perforation (Length Direction) | 2±0.1 |
| A0 | Cavity Length | 10.85±0.1 |
| B0 | Cavity Width | 18.34±0.1 |
| K0 | Cavity Depth | 2.97±0.1 |
| t | Carrier Tape Thickness | 0.35±0.01 |
| C | Cover Tape Width | 21.3 |

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