HOLTEK

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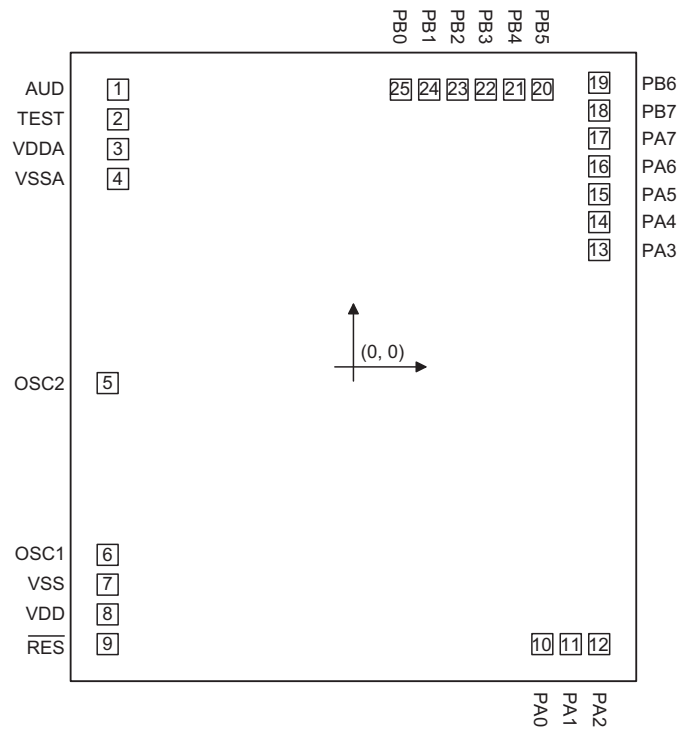
The HT3834 has applications in areas such as phone ringtones, high function toys, musical boxes, doorbells etc.

Block Diagram

Pin Assignment

HT3834
—16 SOP-A

HT3834
—28 SOP-A
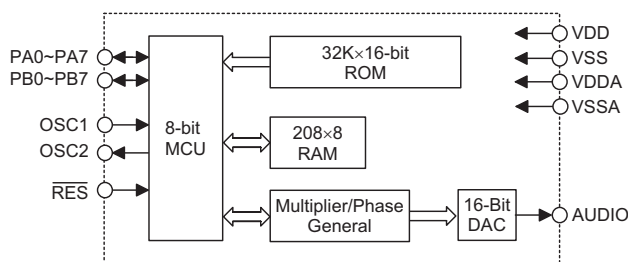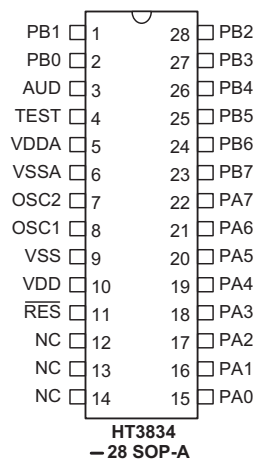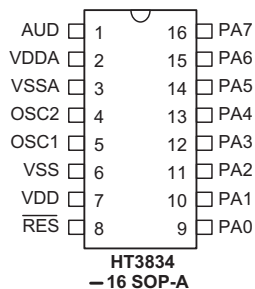
Pad Assignment

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
$\overline{RESET}$	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

Input Voltage .... V_{SS}–0.3V to V_{DD}+0.3V

Storage Temperature .... –50°C to 125°C

Operating Temperature .... –25°C to 70°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

Ta=25°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
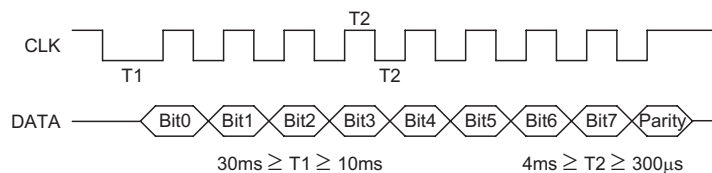
Note: 50ms after power up, the device will be ready to communicate with the external CPU using the CLK and DATA lines.

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**
	PA0	Ring Detect	Clock
	PA1	Hook	Data
	PA2	Select	No function
″VDD″ Phone Ring	PA3	Hold	No function
	PA4	Volume	No function
	PA5	LVR	LVR
	PA6	BusyB	BusyB

	PA6	BusyB		BusyB	
		Mode 1	**Mode 2**	**Mode 3**	—
	PA0	VDD	VDD	VSS	VSS
	PA1	VDD	VSS	VDD	VSS
	PA2	Re-trigger	Toggle	Level Hold	—
″VSS″ (See Manual Selection Mode)	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

HT3834

Key Control Mode

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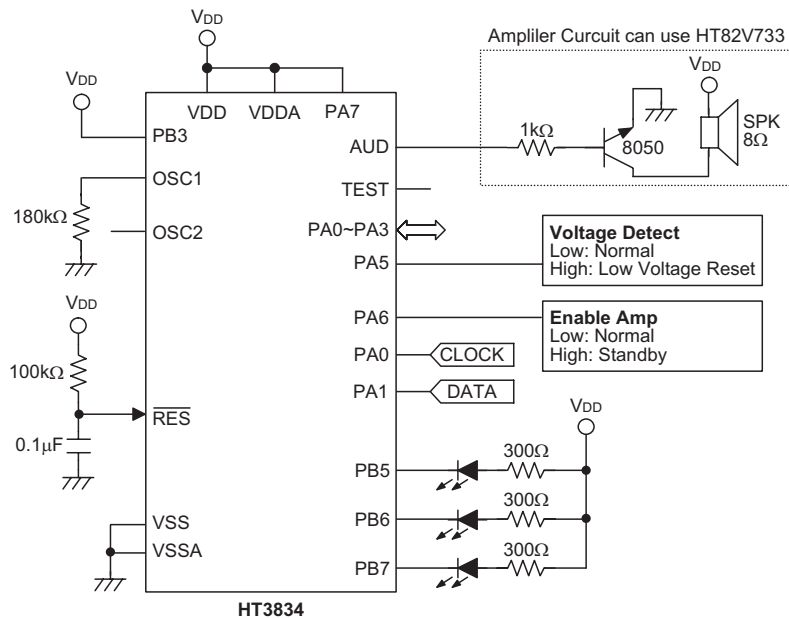
Manual Selection Mode: Mode 1

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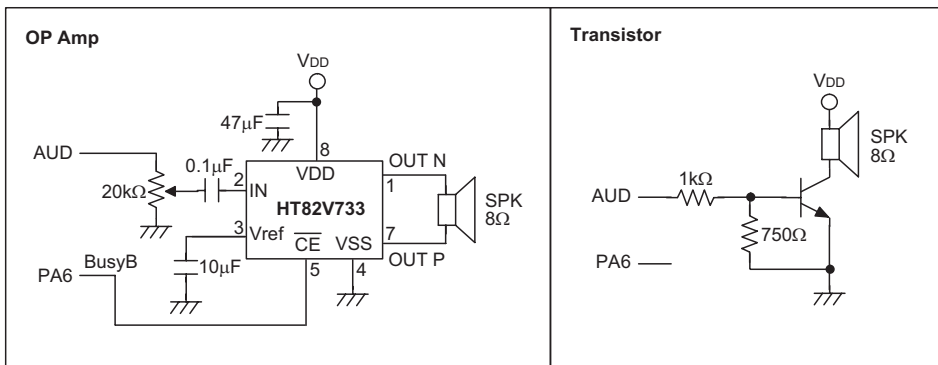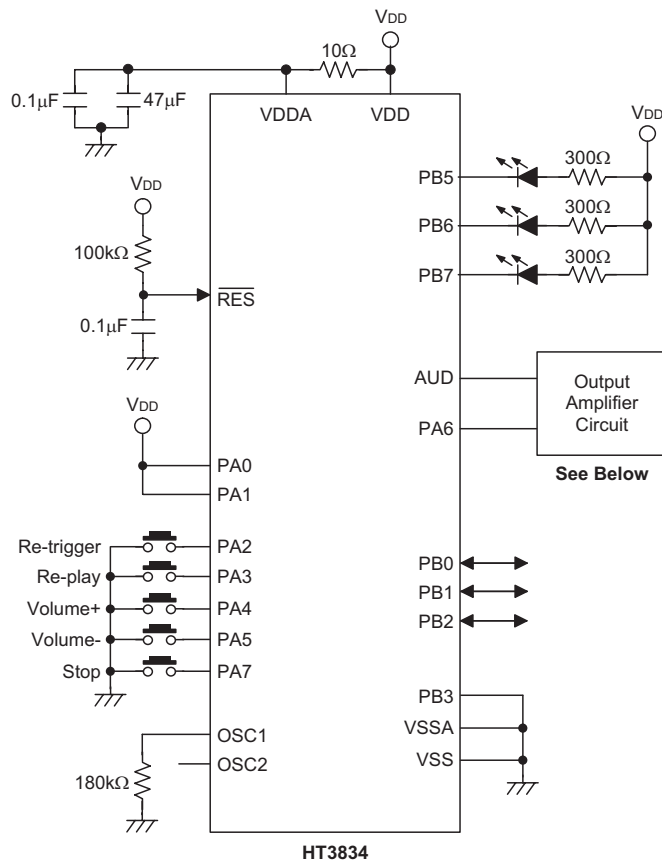
Manual Selection Mode: Mode 2

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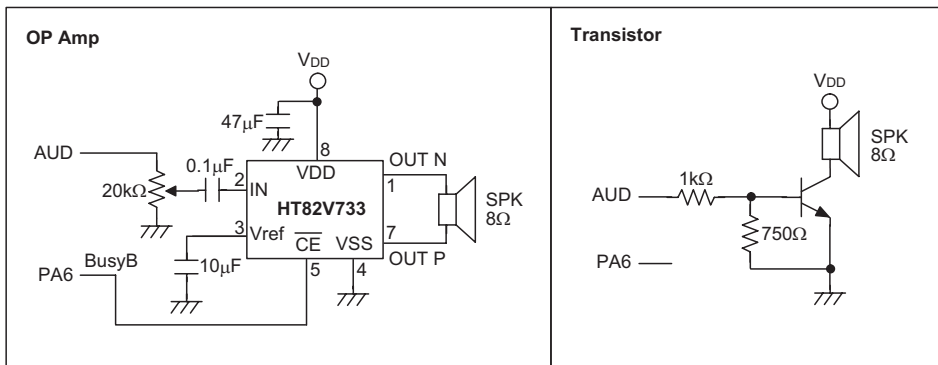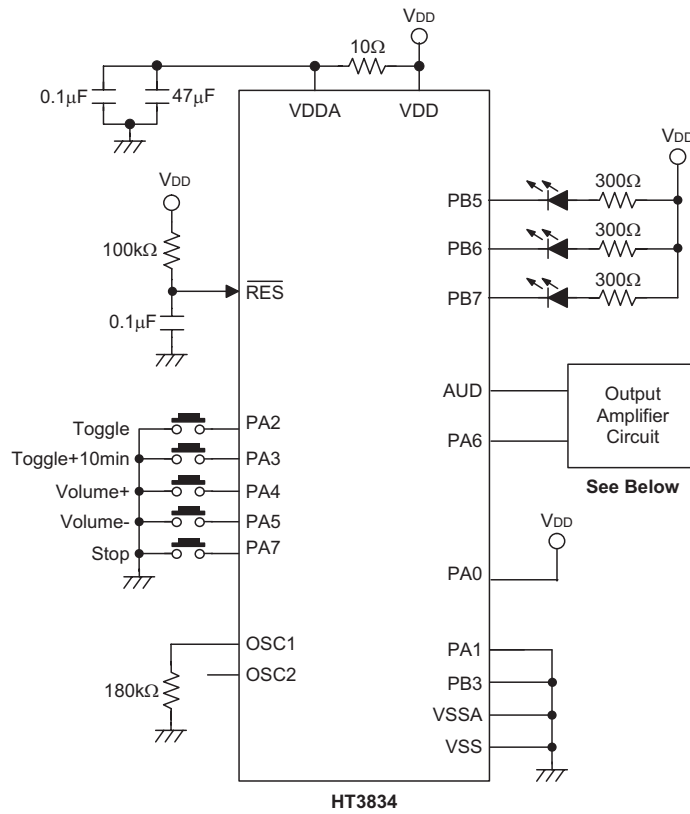
Manual Selection Mode: Mode 3

HT3834
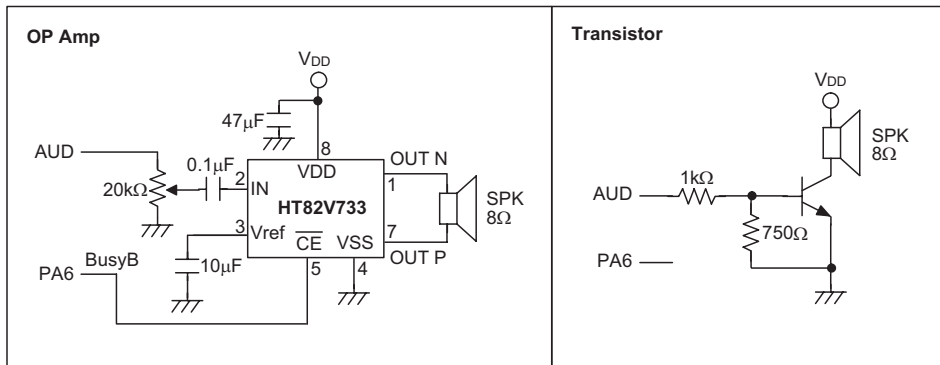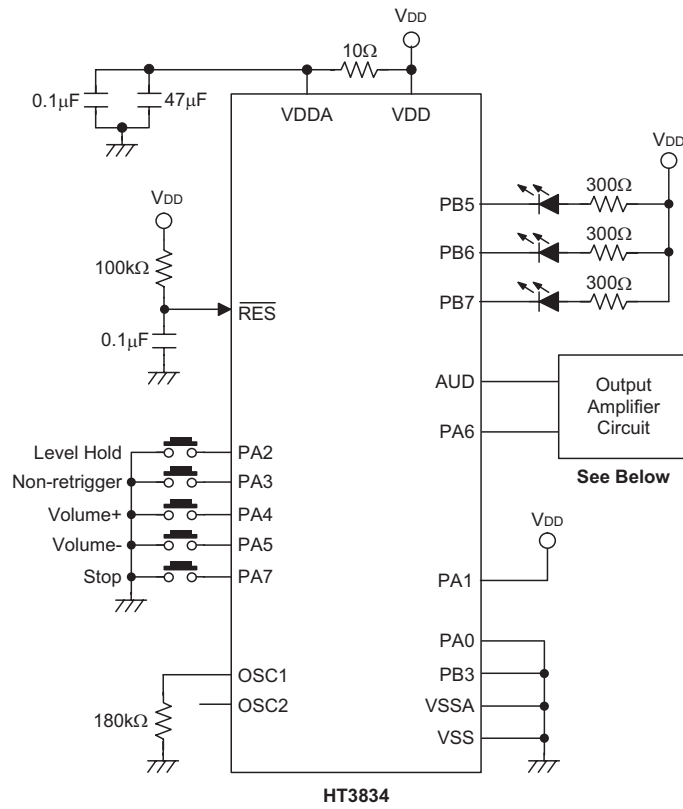
Package Information

16-pin SOP (300mil) Outline Dimensions
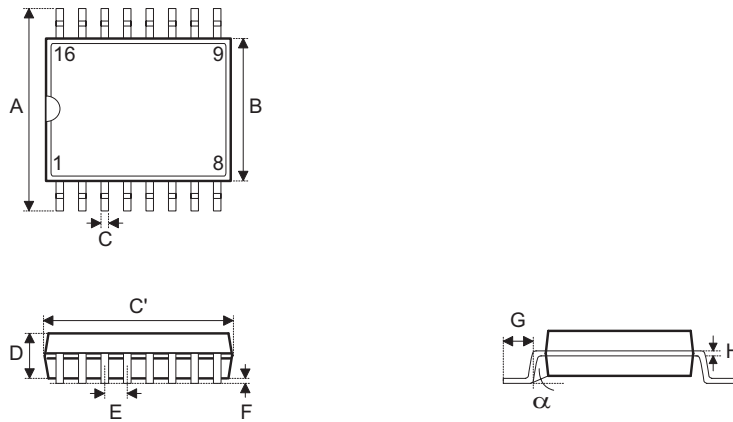
Symbol	Dimensions in mil		
	Min.	**Nom.**	**Max.**
A	394	—	419
B	290	—	300
C	14	—	20
C′	390	—	413
D	92	—	104
E	—	50	—
F	4	—	—
G	32	—	38
H	4	—	12
α	0°	—	10°

28-pin SOP (300mil) Outline Dimensions
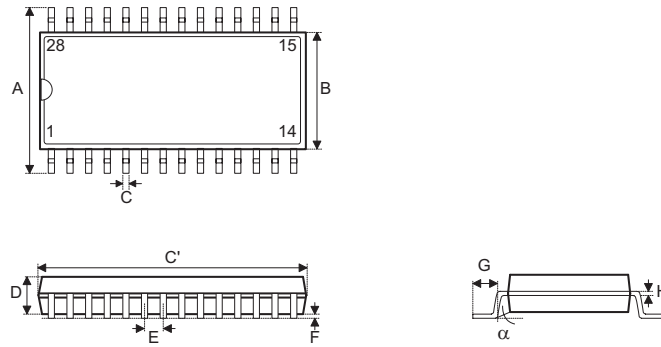
Symbol	Dimensions in mil		
	Min.	**Nom.**	**Max.**
A	394	—	419
B	290	—	300
C	14	—	20
C′	697	—	713
D	92	—	104
E	—	50	—
F	4	—	—
G	32	—	38
H	4	—	12
α	0°	—	10°

Product Tape and Reel Specifications

Reel Dimensions
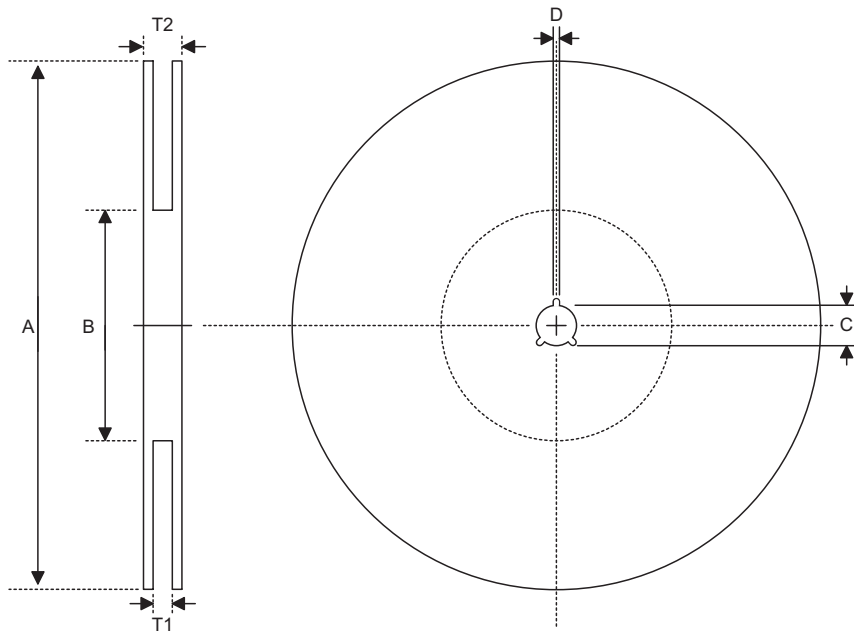
SOP 16W (300mil)

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
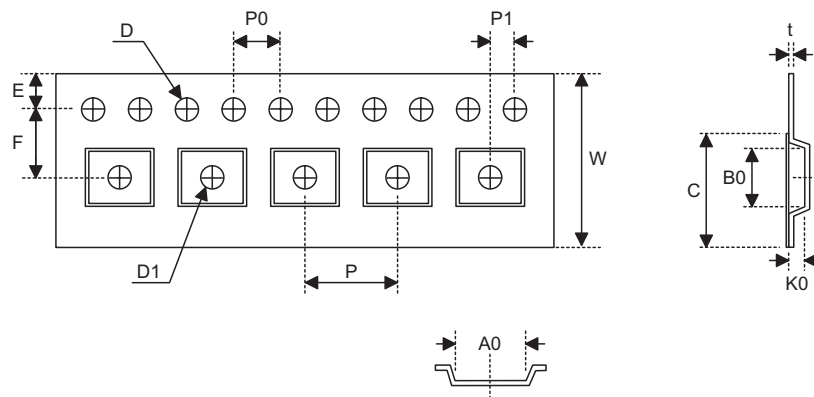
SOP 16W (300mil)

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