HT3010
Rhythm Generator

Features

- Operating voltage: 2.4V~5.0V
- Directly driving an external transistor
- Low standby current (1μA for VDD=3V)
- Minimal external components required
- Programmable playing function
  - Manual
  - Auto
- Demo function
- Output pin options:
  - End-pulse output for external driving
  - 4Hz flash of LED
  - LED sound level indication
- Selectable 1 rhythm and 4 fill-ins or 1 fill-in and 4 rhythms
- 4 key inputs
- Key options:
  - Retriggerable
  - Non-retriggerable
- 18 pin dual-in-line package

Applications

- Toys
- Rhythm generators
- Sound effect generators

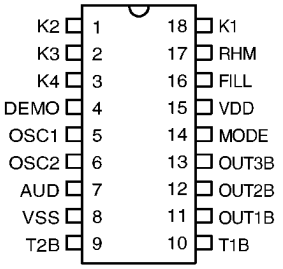
General Description

The HT3010 is a single chip rhythm generator. It can generate 4 kinds of drum sounds in addition to 4 types of rhythms. The IC provides 4 key inputs (K1~K4) and a FILL key. The FILL key is used to add fill-ins to rhythm playing.

The HT3010 can operate in 2 different modes, namely manual and auto rhythm operation, controlled by the RHM pin. In manual operation, K1~K4 can generate 4 kinds of drum sounds. In auto rhythm operation, they can derive either 4 fill-ins or rhythms, decided by the MODE pin. The former output of auto operation is called Mode 1, and the latter Mode 0. Mode 1 contains 1 rhythm and 4 fill-ins (the same as the HT821A7 series) whereas Mode 0 consists of 4 rhythms and 1 fill-in (the same as the HT821A8 series).

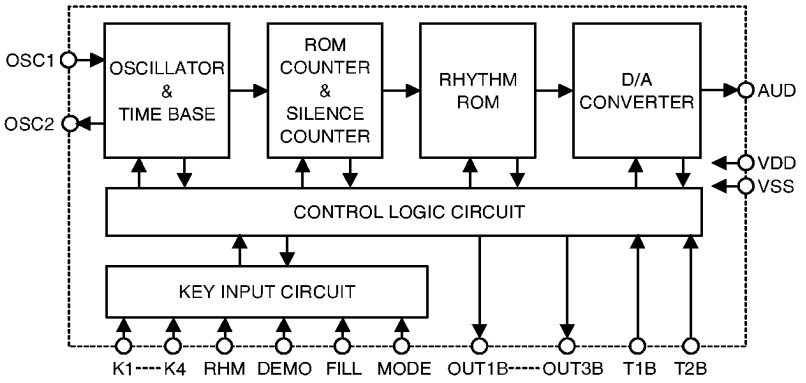
The HT3010 provides 3 programmable output pins, i.e., end-pulse output, LED flash, and sound level indicator, decided by mask option. The IC is offered in either a dice form or 18-pin dual-in-line package.

Pin Assignment



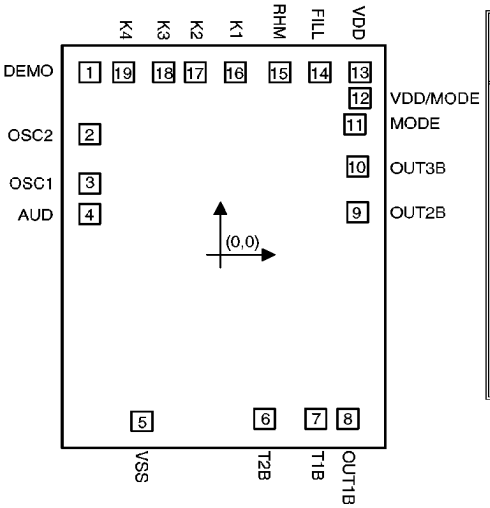
HT3010
– 18 DIP

Block Diagram



Pad Assignment

Unit: μm



Pad No.	X	Y	Pad No.	X	Y
1	–764.25	1073.75	11	764.25	758.75
2	–764.25	697.25	12	784.25	916.25
3	–764.25	400.25	13	784.25	1073.75
4	–764.25	215.25	14	568.75	1073.75
5	–461.25	–1039.75	15	337.25	1073.75
6	248.75	–1023.75	16	78.75	1073.75
7	545.75	–1023.75	17	–152.75	1073.75
8	730.75	–1023.75	18	–337.75	1073.75
9	787.25	227.50	19	–569.25	1073.75
10	787.25	504.75			

Chip size: 1940×2480 $(\mu m)^2$

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

Pad Description

Pad No.	Pad Name	I/O	Internal Connection	Description
1	DEMO	I	Pull-High	Trigger key, low active A demo rhythm plays 7 times continuously (refer to the functional description for details).
2	OSC2	O	—	Oscillator output pin
3	OSC1	I	—	Oscillator input pin
4	AUD	O	PMOS Output	Sound output for driving an external transistor
5	VSS	—	—	Negative power supply (GND)
6	T2B	I	Pull-High	For IC test only
7	T1B	I	Pull-High	For IC test only
8	OUT1B	O	NMOS Open Drain	Low active, 4Hz flash output
9	OUT2B	O	NMOS Open Drain	Open drain, low active, and busy/sound level output
10	OUT3B	O	NMOS Open Drain	Low active, and end-pulse/4HzB flash (complement of OUT1B) output
11	MODE	I	—	Selection of 4 rhythms and 1 fill-in or 1 rhythm and 4 fill-ins: Mode 1 (VDD): 1 rhythm and 4 fill-ins Mode 0 (VSS): 4 rhythms and 1 fill-in
12	VDD/MODE	I	—	PAD bound out selection: Mode 0: Pad 11 and pad 13 are bound but pad 12 is left open. Mode 1: Pad 12 is bound to VDD, but pad 11 and 13 are both left open.
13	VDD	I	—	Positive power supply
14	FILL	I	Pull-High	Fill-in trigger key, 2 fill-in selections
15	RHM	I	Pull-High	Manual or auto rhythm selection input (toggle)
16	K1	I	Pull-High	Trigger key input, low active
17	K2	I	Pull-High	Trigger key input, low active
18	K3	I	Pull-High	Trigger key input, low active
19	K4	I	Pull-High	Trigger key input, low active

Absolute Maximum Ratings

Supply Voltage ..... –0.3V to 5.5V
Input Voltage ..... V_{SS}–0.3V to V_{DD}+0.3V
Storage Temperature ..... –50°C to 125°C
Operating Temperature ..... –20°C to 70°C

Electrical Characteristics

(Ta=25°C)

Symbol	Parameter	Test Condition		Min.	Typ.	Max.	Unit
		V_{DD}	Condition				
V_{DD}	Operating Voltage	—	—	2.4	3	5	V
I_{DD}	Operating Current	3V	No load, Fosc=180KHz	—	150	300	μA
I_{STB}	Stand-by Current	3V	—	—	1	3	μA
I_{AUD}	Max. AUD Output Current	3V	V_{OH}=0.6V	–1.0	–1.5	—	mA
I_{OL}	Output Sink Current (for OUT1B, OUT2B and OUT3B)	3V	V_{OL}=0.3V	3	5	—	mA
T_{END}	ENDB Pulse Width	—	F_{OSC}=180KHz	—	160	—	μs
V_{IL}	"L" Input Voltage	—	—	—	—	0.2V_{DD}	V
V_{IH}	"H" Input Voltage	—	—	0.7V_{DD}	—	—	V
T_{KEY}	Key Debounce Time	—	F_{OSC}=180KHz	—	7.5	—	ms

Functional Description

HT3010 is a single chip rhythm generator. It can generate 4 kinds of drum sounds in addition to 4 types of rhythms. The IC provides 4 key inputs (K1~K4) and a FILL key input. The FILL key is used to add fill-ins to rhythm playing.

The HT3010 can operate in 2 different modes, namely manual or auto playing operation, decided by the RHM pin toggle action. In manual operation, K1~K4 generate four kinds of drum sounds. In auto rhythm operation, they produce 4 different fill-ins or rhythms. The former output of auto operation is called Mode 1, and the latter Mode 0. Mode 1 includes 1 rhythm and 4 fill-ins. Mode 0, on the other hand, contains 4 rhythms and 1 fill-in as shown in Table 1.

Trigger Key	Manual	Auto Rhythm	
	MODE 1 or 0	MODE 1 (VDD)	MODE 0 (VSS)
K1	Drum 1	Fill-in 1	Rhythm 1
K2	Drum 2	Fill-in 2	Rhythm 2
K3	Drum 3	Fill-in 3	Rhythm 3
K4	Drum 4	Fill-in 4	Rhythm 4
FILL	Inapplicable	Inapplicable	Fill-in 0

Table 1

Notes: *Selection of manual or auto rhythm playing is controlled by the toggle action of the RHM pin.

*FILL is inapplicable in either the manual or auto rhythm mode in Mode 1.

K1~K4

The HT3010 provides 4 trigger keys, namely K1~K4. All of these keys can be optioned as retriggerable or non-retriggerable.

MODE

The IC has 2 kinds of outputs, i.e., Mode1 and Mode 0, decided by the status of the MODE pin. The MODE pin is connected to VDD and generates 4 rhythms along with 1 fill-in in Mode 1. It, on the other hand, connects to VSS and produces 1 rhythm and 4 fill-ins in Mode 0.

RHM

The IC can operate in 2 modes, i.e., manual and auto rhythm playing modes, controlled by the RHM pin toggle action. In manual operation, 4 different drum sounds can be generated by pressing K1~K4. In auto operation, pressing K1~K4 generates 4 kinds of fill-ins in Mode 1 but 4 kinds of rhythms in Mode 0. What's more, songs in auto operation plays continuously till the system switches to the manual operation or power is turned off.

FILL

The FILL pin adds fill-ins to rhythm playing in the operation of auto rhythm and Mode 0. It, on the other hand, is inactive in the operation of manual or auto rhythm and Mode 1.

DEMO

Pressing the DEMO key plays an internal rhythm 7 times continuously. While the demo rhythm is playing and the RHM key is pressed as well, the system will first switch to the auto rhythm operation and then continue playing the demo rhythm.

During the playing of the demo rhythm, pressing one of K1~K4 not only stops demo rhythm playing, but plays the corresponding rhythm twice continuously in manual operation. After the playing is completed, the system will return to the demo mode and then resume playing the demo rhythm. The playing number of the demo rhythm depends on which Mode (Mode1 or Mode 0) the system is in. The playing number is the remaining times of playing demo rhythm (before being interrupted by K1~K4 triggers) which are deducted by 2 in Mode 0. The playing times of the demo rhythm turn out to be 5 in Mode 1.

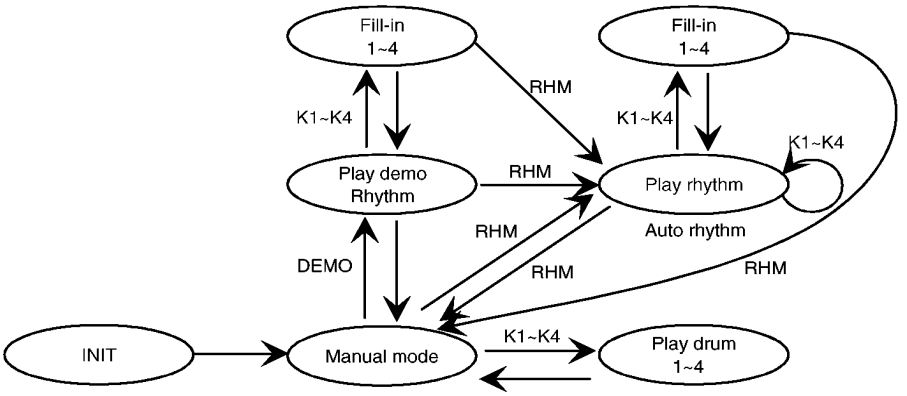
OUT pin options

OUT1B, OUT2B, and OUT3B are all output pins used for various output indication.

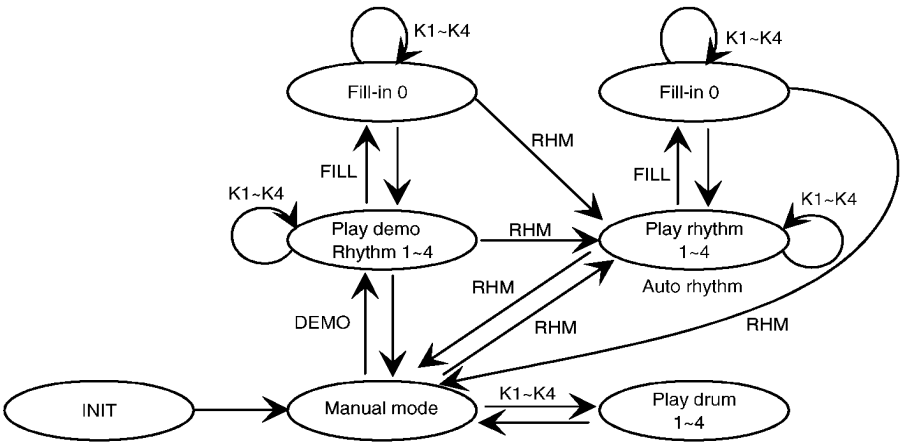
OUT1B is an output with a 4Hz flash, OUT2B is a busy output or a sound level output by mask option, and OUT3B is an END pulse output or a complement of the OUT1B output also by mask option.

Operation flowchart

• Mode 1 (MODE=VDD): 1 rhythm and 4 fill-ins

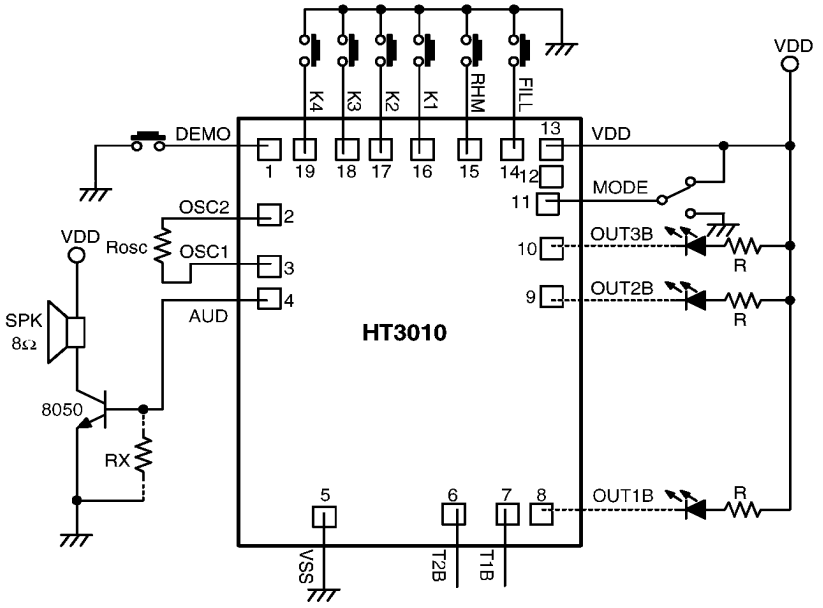


• Mode 0 (MODE=VSS): 4 rhythms and 1 fill-in



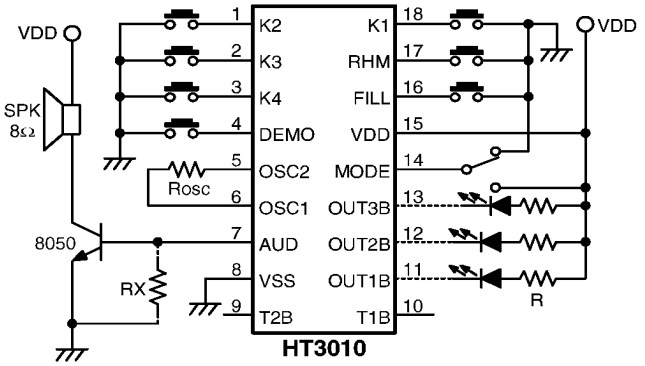
Application Circuits

Chip form



* The IC substrate should be connected to VSS in the PCB layout artwork.
In Mode 1, bond pad12 to VDD,and leave pad11 & pad13 open.

Package form



R=100Ω~330Ω
RX ≅1KΩ for VDD=4V~5V

Standard Item List

HT3010A/C ride cymbal

Rhythm	Manual	Auto Rhythm	
MODE	—	1 (VDD)	0 (VSS)
K1	Ride Cymbal	Fill-in 1	Rhumba
K2	Bass Drum	Fill-in 2	Tango
K3	Low Conga	Fill-in 3	Big Band
K4	Snare Drum	Fill-in 4	Rock
FILL	—	—	Fill-in 0
OUT1B	4Hz flash		
OUT2B	Flash follows sounds		
OUT3B	End pulse of all sections		
K1~K4	Retriggerable		

HT3010B/D crash cymbal

Rhythm	Manual	Auto Rhythm	
MODE	—	1 (VDD)	0 (VSS)
K1	Crash Cymbal	Fill-in 1	Rhumba
K2	Low Tom Tom	Fill-in 2	Tango
K3	Timbal	Fill-in 3	Big Band
K4	High Hat	Fill-in 4	Rock
FILL	—	—	Fill-in 0
OUT1B	4Hz flash		
OUT2B	Flash follows sounds		
OUT3B	End pulse of all sections		
K1~K4	Retriggerable		

HT3010E

Rhythm	Manual	Auto Rhythm	
MODE	—	1 (VDD)	0 (VSS)
K1	Whistle	Fill-in 1	Rock
K2	Carhorn	Fill-in 2	Disco
K3	Boing	Fill-in 3	March
K4	Clap	Fill-in 4	Rhumba
FILL	—	—	Fill-in 0
OUT1B	4Hz flash		
OUT2B	Flash follows sounds		
OUT3B	End pulse of all sections		
K1~K4	Retriggerable		

HT3010F

Rhythm	Manual	Auto Rhythm	
MODE	—	1 (VDD)	0 (VSS)
K1	High Hat	Fill-in 1	RAP 1
K2	Esnare	Fill-in 2	RAP 2
K3	Gesnare	Fill-in 3	RAP 3
K4	Ekick	Fill-in 4	RAP 4
FILL	—	—	Fill-in 0
OUT1B	4Hz flash		
OUT2B	Flash follows sounds		
OUT3B	End pulse of all sections		
K1~K4	Retriggerable		