

Features

- Operating voltage: 2.4V~5.1V
- System frequency: 512KHz
- 15-key instrument
- Auto power off
- 6 programmable timbres (64 notes for each)
- 15 melodies (max)
- Mode selection by push-button or slide switch
- One-key-playing function
- 28 DIP enclosed
- 50K Ω /330K Ω pull-high resistance ($V_{DD}=5V$) can be set by mask option.
- Stop demo melody playing option of the chromatic scale keys
- 15 melodies code in a 512-note ROM

General Description

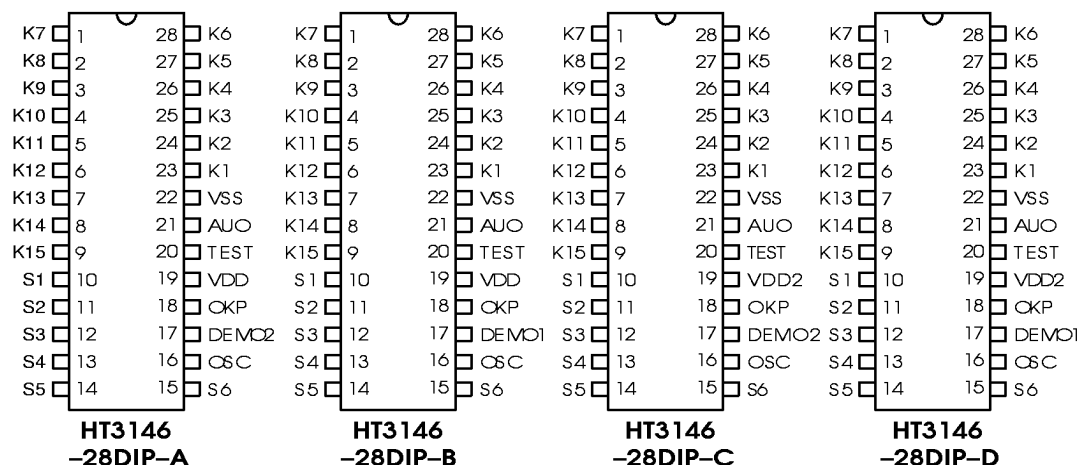
The HT3146 is a CMOS LSI designed for musical instruments. There are totally 15 melodies coded in a 512-note ROM for playing. The timbre of the demo song can be altered by S1~S6.

The HT3146 provides 15 retriggerable tone keys and 6 timbres for use. Each tone key represents a specific timbre scale. The device also offers an auto-power-off function. When there is no fur-

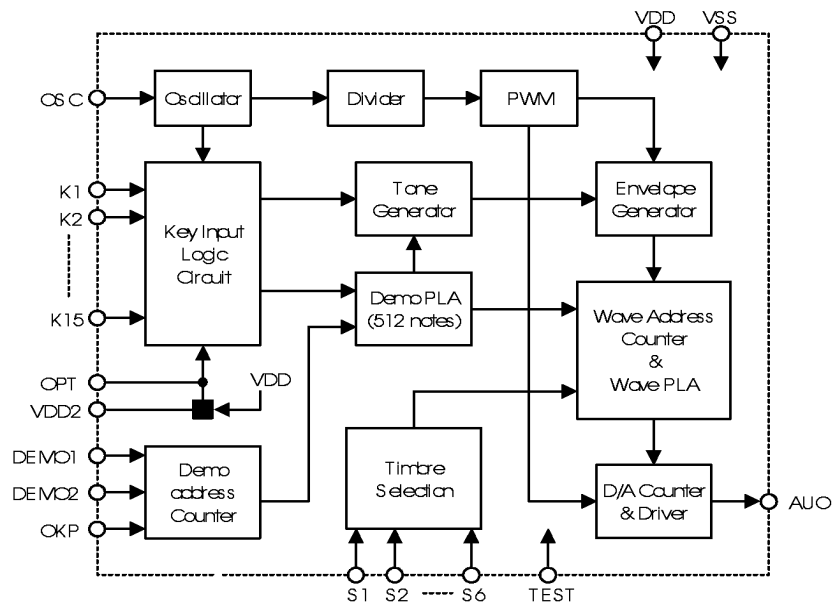
ther key entry or when the demo song ceases, the power is automatically turned off and the chip holds the pervious timbre.

There are two ways to enter the demo mode, namely toggle switch the on/off of DEMO1 and switch the high/low of DEMO2 so as to enter the demo mode or the play mode.

Pin Assignment

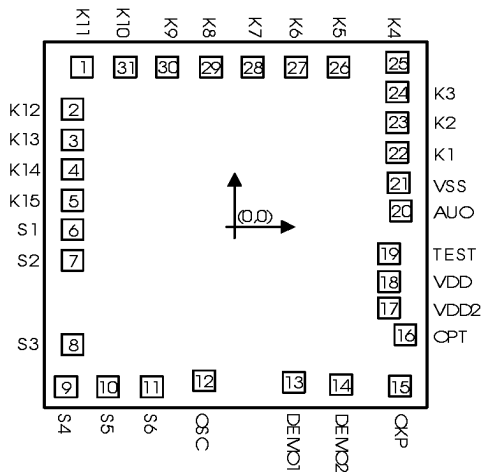


Block Diagram



Pad Coordinates

Unit: μm



Chip size: $1820 \times 2440 (\mu\text{m})^2$

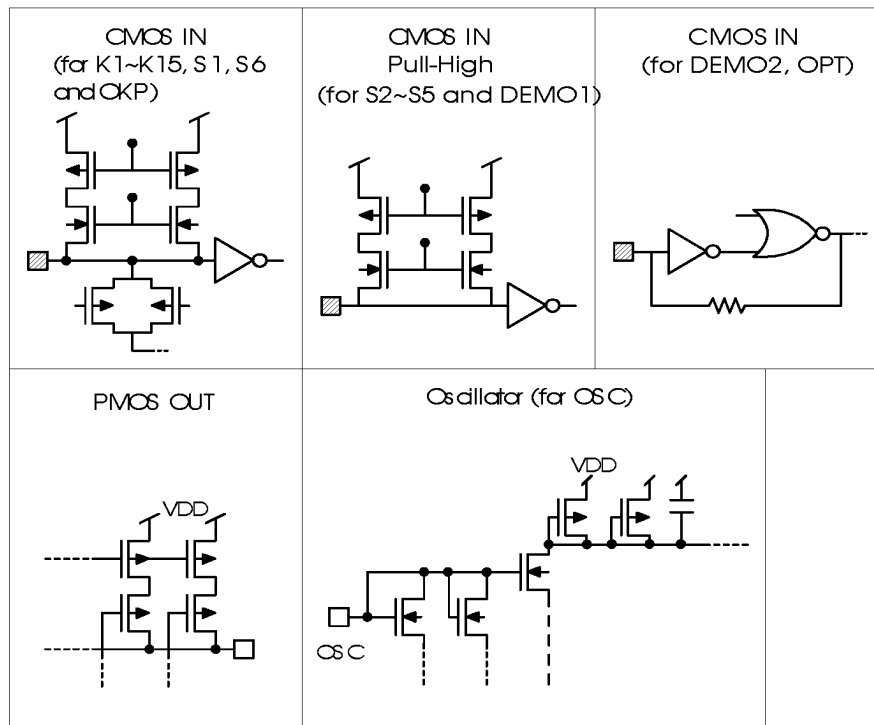
* The IC substrate should be connected to VSS in the PCB layout artwork.

Pad No.	X	Y	Pad No.	X	Y
1	-656.05	976.20	17	661.85	-495.30
2	-696.25	720.00	18	661.85	-335.30
3	-696.25	531.60	19	661.85	-165.30
4	-696.25	352.00	20	712.45	100.40
5	-696.25	163.60	21	703.45	270.40
6	-696.25	-16.00	22	696.35	456.70
7	-696.25	-204.40	23	696.35	636.30
8	-696.25	-717.20	24	696.35	824.70
9	-724.45	-976.20	25	696.35	1004.30
10	-544.85	-976.20	26	445.95	976.20
11	-356.45	-976.20	27	264.35	976.20
12	-131.45	-938.90	28	77.95	976.20
13	253.95	-948.70	29	-103.65	976.20
14	455.85	-963.70	30	-290.05	976.20
15	708.25	-972.50	31	-469.65	976.20
16	731.85	-657.10			

Pad Description

Pad No.	Pad Name	I/O	Internal Connection	Description
22~31 1~5	K1~K15	I	CMOS Pull-High	Key inputs for key tone and demo song selection.
6~11	S1~S6	I	CMOS Pull-High	Timbre selection inputs There are 6 timbres to change the demo timbre from S1~S6 or to play a simulative instrument from among 6 timbres.
12	OSC	I	—	Oscillator input Connect a resistor to VDD for an internal system clock
13	DEMO1	I	CMOS Pull-High	Demo melody trigger input DEMO1 is a toggle input to switch the on/off of the demo mode.
14	DEMO2	I	CMOS	Demo melody trigger input Connect DEMO2 to VDD to enter the demo mode or connect DEMO2 to VSS to play the keys
15	OKP	I	CMOS Pull-High	One-key-playing function play input Press OKP to repeat playing the built-in melody note by note.
16	OPT	I	CMOS	Demo stop mode selection input When OPT is connected to VDD, the playing melody can be stop by pressing the keys which is not be setting as melody selection from K1~K15. If OPT is open (without connecting to VDD), it fails to stop the playing melody.
17	VDD2	I	—	Finger structure pad If VDD2 is bonded to pin, it is equal to the OPT pad that is connected to VDD.
18	VDD	I	—	Power supply (positive)
19	TEST	I	CMOS Pull-High	For IC test only
20	AUO	O	PMOS	Audio signal output The output of AUO is of a current type D/A. An NPN transistor is driven for applications.
21	VSS	I	—	Power supply (negative)

Approximate internal connection



Absolute Maximum Ratings

Supply Voltage-0.3V to 6V

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

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

Operating Temperature.....0°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	—	5.2	V
I _{STB}	Stand-by Current	3V	—	—	0.1	2	μA
		4.5V		—	0.2	3	
I _{DD}	Operating Current	3V	No load, F _{OSC} =512KHz	—	280	600	μA
		4.5V		—	650	1200	
I _{AUO}	Max. AUO Output Current	3V	V _{OH} =0.6V	1.5	2.5	3.5	mA
		4.5V		2.2	3.7	5.1	
I _{IL}	Input Low Current	3V	V _{IL} =V _{SS}	3.4	5	8.5	μA
		4.5V		9.0	12.7	22.1	
V _{IL}	Input Low Voltage	—	—	V _{SS}	—	0.2V _{DD}	V
V _{IH}	Input High Voltage	—	—	0.8V _{DD}	—	V _{DD}	
F _{OSC}	System Frequency	3V	R _{OSC} =240KΩ	—	512K	—	V
		4.5V	R _{OSC} =240KΩ	—	512K	—	

Functional Description

Initial status

After power is initially supplied, the system is default to the normal playing mode, and the timbre is S1.

If there is no key input, the system always stays in the stand-by mode to minimize power consumption.

Key tone

There are totally 15 direct input keys to be played.

6 timbre

A timbre is played by pressing a key of S1~S6. Pressing a key of S1~S6 can also change the timbre of the playing melody while the demo song is playing.

OKP

In the normal playing mode, pressing the OKP key once enters the one-key-playing mode. Subsequently pressing the OKP key in series repeats playing the last demo melody note by note. To quit the one-key-playing mode and return to the normal playing mode, a key of K1~K15 has to be pressed.

When the system is in the demo mode, pressing the OKP once enters the one-key-playing mode. Subsequently pressing the OKP key in series, plays the current melody note by note. At this time, if OKP receives no input over 4 seconds, the system will return to the demo mode and play the remaining tones automatically. To quit the one-key-playing mode, a key of K1~K15 may be pressed to select a melody song, and then the system returns to the demo mode.

Demo mode

There are two ways to enter the demo mode, i.e., DEMO1 and DEMO2 options. The DEMO1 pad uses a toggle switch to enter/quit the demo mode. The DEMO2 pad, on the other hand, employs a slide switch to enter the demo mode.

Normally, there are 15 melodies maximum to be played and selected by 15 direct keys. If the 15 direct keys are not all used, the remaining undefined keys may be applied for other selection, such as stop. For example, if there are totally 14 melodies selected for playing by their corresponding 14 keys, the remaining undefined key may function as a stop key to terminate melody playing. This undefined key, however, cannot stop any demo song without the OPT pad being connected to the VDD. Once the demo song ends, the system will enter the halt mode.

Options

- VDD2

VDD2 is a finger structure pad. An undefined key of the 15 direct keys can be used to stop the playing of demo melodies only when the OPT and connects to VDD, as shown below.

OPT=VDD, the unselection keys=stop key

OPT=open, all keys functioning normally

- DEMO1 & DEMO2

The DEMO1 and DEMO2 pads select the way to enter the demo mode.

If the DEMO1 pad is selected, a button switch is used to toggle switch the on/off of the demo function. But if the DEMO2 pad is used, a slide switch is used to control the on/off of the demo function.

- Pull high resistance

The pull-high resistance of the input pads can be set to 50K Ω or 330K Ω by mask option.

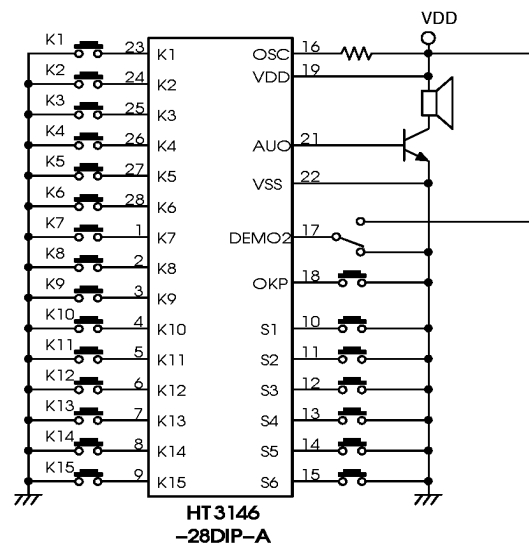
Test mode

In the test mode, the K1 is a input pad and the K2~K15, S1, S6 and OKP pads become output mode with the transmission gate.

Application Circuits

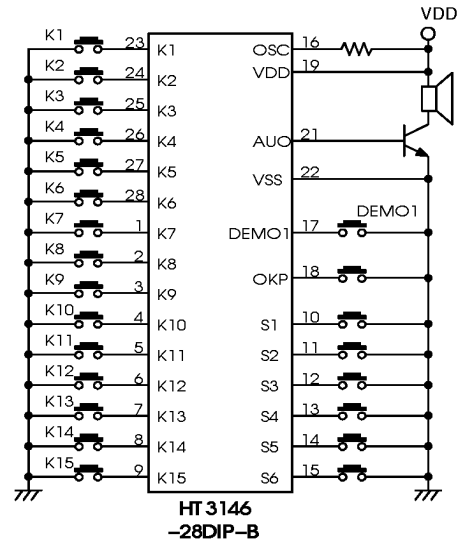
Package form

- HT3146-A application



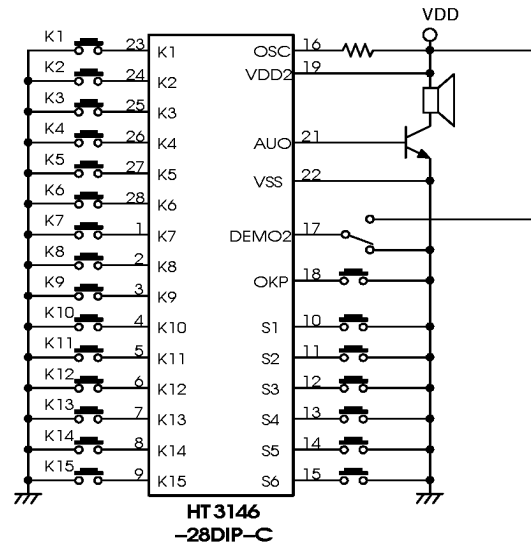
- *Note: 1) Switch the DEMO2 high to enter the demo mode or low to enter play mode.
 2) It can not terminate the playing demo melody by pressing the unselection keys.

• HT3146-B application



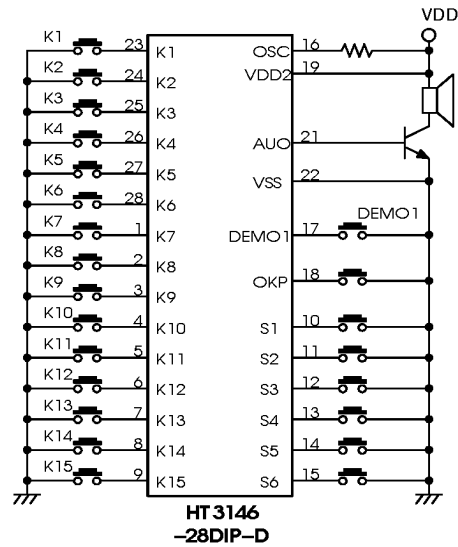
- *Note: 1) Press the DEMO1 to toggle enter the demo mode or play mode.
2) It can not terminate the playing demo melody by pressing the unselection keys.

• HT3146-C application



*Note: 1) Switch the DEM02 high to enter the demo mode or low to enter play mode.
2) It may terminate the playing demo melody by pressing the unselection keys.

• HT3146-D application



- *Note: 1) Press the DEMO1 to toggle enter the demo mode or play mode.
2) It may terminate the playing demo melody by pressing the unselection keys.