

HK17XX

VOICE/SPEECH IC

40-360 SECOND MASK IC BODY

Features

- * Single power supply can operate from 2.4v through 5v.
- * The total voice duration is about 40,60,120,180,240,300,360 seconds could be partitioned up to 128 voice sections. Voice+mute length could up to 22 seconds (6k sampling rate) for each voice section.
- * One 1024 steps table, could be partitioned up to 128 sub_tables of step. For each table_step, could be an conventional voice step or voice - melody step.
- * 25 play back speed (4 . 0 Hz—16 . 0 Hz),8 levels current output, 7 tempos, 26 melody tones, 14 melody rhythm.
- * 4 mask option trigger mode: MATRIX(M1- M64), A LONE(A1 - A16), MODE change trigger (mode), CPU_trigger.

one mode control input 'MODE', could be used as mode selection or STS3 (mask_option).

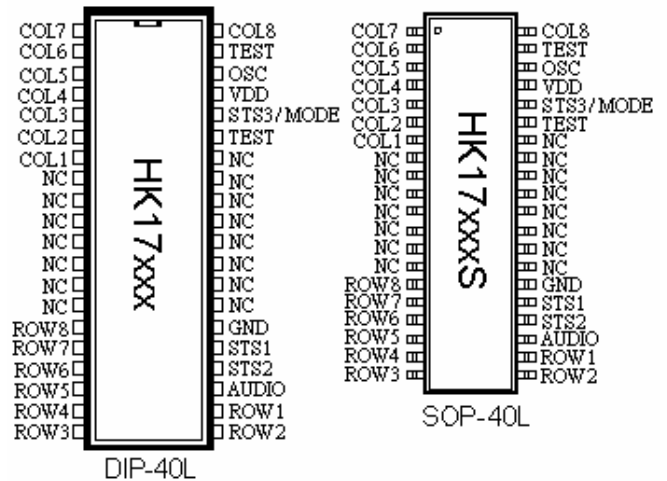
- * A 16/M64 could be mask selected as ONE-KEY; in ONE-KEY mode could be selected as SEQUENTIAL or RANDOM. Two mask options RESET/UNRESET could be selected in SEQUENTIAL
- * 3 mask option trigger type: EDGE/LEVEL, HOLD/UNHOLD, RETRIGGER/IRRETRIGGER
- * 3 STATUS output (when MODE/STS3) was in STS3 option).
- * Two mask option of debounce time (long, shout).

General Description

HK1740, HK1760, HK17120, HK17180, HK17240, HK17300, HK17360 is a single-chip synthesizing CMOS VLSI that can synthesize voice up to 40, 60, 120, 180, 240, 300, 360 seconds, or voice melody up to 1024 steps, using HONSITAK qualified coding algorithm (LOGPCM). Customer speech data will be edited and programmed into ROM by changing one mask during one mask during the device fabrication.

- HK1740 for 40 SEC. Voice IC Body
- HK1760 for 60 SEC. Voice IC Body
- HK17120 for 120 SEC. Voice IC Body
- HK17180 for 180 SEC. Voice IC Body
- HK17240 for 240 SEC. Voice IC Body
- HK17300 for 300 SEC. Voice IC Body
- HK17360 for 360 SEC. Voice IC Body

PinOut Diagram

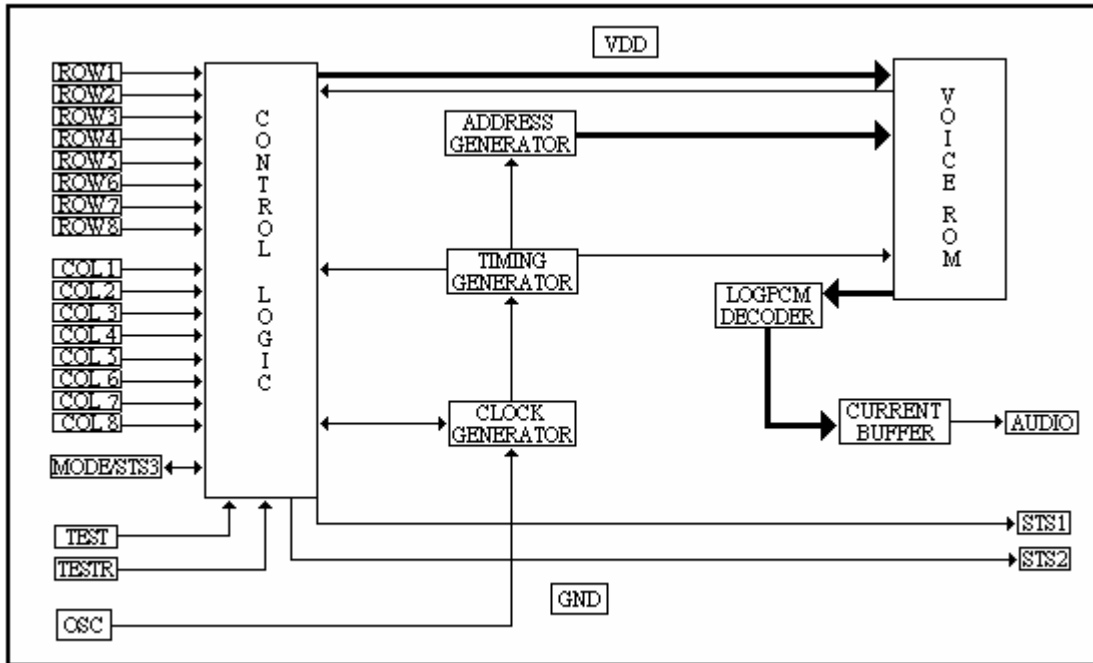


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Block Diagram



Pin Description

PAN NAME	FUNCTION
VDD	Positive power supply.
OSC	Oscillator input (300K ohm connect to VDD)
TEST	Test pad, for production testing (test high for testing)
MODE/STS3	I/O pad, mode: mode selection, sts3: status output.
ROW 1-8	Output for MATRIX mode; input for ALONE mode.
COL 1-7	Trigger input, internal pull low (high active)
COL 8	Trigger input, high active in ALONE/MATRIX; low active enable in CPU mode.
AUDIO	Current output, for driving speaker.
STS1, STS2	Status output, for busy LED signal or stop pulse.
VSS	Negative power supply.
TESTR	Test pad, for production testing

Absolute Maximum Rating:

SYMBOL	RATING	UNIT
VDD-VSS	-0.5~+7.0	V
VIN (for all input)	VSS-0.3<VIN<VDD+0.3	V
VOUT (for all output)	GND<VOUT<VDD	V
T (operating)	-1.0~+60	°C
T (storage)	-25~+75	°C

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Dc Characteristics:

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT	CONDITION
VDD	Operating Voltage	2.4	3	6	V	
Isb	Supply Current		Standby		uA	VDD=3V, I/O open (with Rosc)
Iop			Operating			
Iih	Input Current Row 1-8; Col 1-8 In ALONE Mode			5	uA	VDD=3V
Iil			0			
Iih	Input Current Col 1-8 In CPU_ Interface			0	uA	VDD=3V
Iil			-3.3			
Iaudio	Current Out (Audio) (Full Scale)	-2.4	-3	-3.6	mA	VDD=3V, V O/P=0.7V current level=6
Iih	Input Current Mode			1	uA	VDD=3V
Iil			0			
Ioh	MATRIX Mode Output Current Row 1-8			-5	mA	VDD=3V , V O/P=0V
Iol			5	VDD=3V , V O/P=3V		
Ioh	Output Current Sts1, Sts2, Sts3			min:-0.8 max:-1.2	mA	VDD=3V, V O/P=0V
Iol			10	VDD=3V, V O/P=3V		
dF/F	Frequency Stability				%	$\frac{Fosc(3v)-Fosc(2.4v)}{Fosc(3v)}$
dF/F	Fosc Variation	-10		10	%	VDD=3V , Rosc=300K

FUNCTION DESCRIPTION

* For voice section 0--31:there are 4 playing_lengths, the longest one is the original voice + length.
32--127:only have one playing length (the original).

* For each table_step, could specify one voice step or voice-melody step.
conventional voice step: could specify one voice section, 1 of 4 playing length or only one playing

level: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
play back speed (kHz): 4.00 4.24 4.49 4.76 5.05 5.35 5.66 6.00 6.36 6.73 7.13 7.56 8.00 8.49 8.99 9.52 10.09 10.69 11.33 12.00 12.71 13.47 4.27 15.12 16.00 6.00
melody tone: -4 -4# -5 -5# -6 -6# -7 1 1# 2 2# 3 4 4# 5 5# 6 6# 7 +1 +1# +2 +2# +3 +4 rest note

level: 0 1 2 3 4 5 6 7 8 9 10 11 12 13
melody rhythm: 1/8 1/4 3/8 1/2 5/8 3/4 1 1_1/4 1_1/2 2 2_1/2 3 3_1/2 4 (with one continued node)
tempo: 0>183 1>153 2>131 3>114 4>102 5>92 6>83 (beata/minute) (at VDD=3v, Rosc=300k ohm, Fosc=4KHz)
melody current level: 1>0.38 2>0.75 3>1.13 4>1.5 5>2.25 6>3.0 7>3.75 8>4.5 (mA, full scall, 3V)
voice current level: 1>0.38 2>0.75 3>1.13 4>1.5 5>2.25 6>3.0 7>3.75 8>4.5 (mA, full scall, 3V)
For rest note in melody, it must have one mute voice section, and select this section when playing this rest step.

* 4 mask option trigger type : MATRIX, alone (with mode selection, priority and debounce), MODE change trigger, CPU trigger: MATRIX: 8 x 8 matrix inputs; M1—M64 (MODE=0—>sub_table 65-128).
priority: M n+1>M n+2>M n+3> M n+4>M n+5>M n+6> M n+7> M n+8(n=0>8>16>24>32>40>48>56)

length. 1 of 25 play back speed, 1 of 8 levels audio current output.
voice-melody step: could specify 1 of 7 tempo, one voice section, 1 of 14 melody rhythm, one continued node. For all of the melody steps, could only have one level of current output (mask option).

debounce time: depend on current playing speed or last trigger's final playing speed (4kHz to 16kHz).
short---0.6ms to 2.1ms
long---5ms to 20ms.
ALONE: 16 alone inputs; A1—A16 (MODE=0-->sub_table 1-16), (MODE=1-->sub_table 17-32)

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with resistive type schmitt input (270K --- 1M) for CDS interface.
priority:

A1>A2>A3>A4>A5>A6>A7>A8>A9>A10>A11>A12>A13>A14>A15>A16.

debounce time: depend on current playing speed or last trigger's final playing speed (4kHz to 16kHz).

Long --- 4ms to 16ms. Short --- 20ms to 65us

In both mode, all the trigger input could be assign as different playing_type with following options:

EDGE/LEVEL, HOLD/UNHOLD, RETIGGER/IRRETRIGGER
MODE change trigger: when MODE/STS3 were in MODE, the MODE input could also used as trigger input (mask option)

if external state change. MODE 0-->1: trigger sub_table 128
MODE 1-->0: trigger sub_table 127, the playing type will depend on trigger input 127,128; must set as EDGE, UNHOLD, RETRIGGER. debounce time is the same in ALONE/MATRIX mode. sub_table 127,128 must have voice data, if don't have data, must fill mute.

CPU_trigger: in this mode, could access sub_table 1-128, some mask_option must set as follow options:

MATRIX/ALONE--.ALONE, SEQUENTIAL/NORMAL-->NORMAL, RESET/UNRESET-->RESET
DEBOUNCE-->short

for all the playing type: EDGE/LEVEL-->EDGE, HOLD/UNHOLD-->UNHOLD, RETRIGGER/IRRETRIGGER-->RETRIGGER

In this mode, COL--7 were used as (subtable binary address-1)input (sub_table 1---128),COL 8 were used as low active enable input.

STS1, STS2, STS3 must have one selected as busy low or busy high for CPU_interface strobe.

* A16 or M64 could be mask__selected as MORMAL or SEQUENTIAL:

NORMAL: normal trigger mode as ALONE or MATRIX.

ONE-KEY: could be mask_selected as RANDOM or SEQUENTIAL.

RANDOM: if the input (A16/M64) was trigger, the device will response from subtable m (m:1 - 128), to sub_table n (n:1 - 128) at random

SEQUENTIAL : if the input (A16/M64) was triggered sequentially the device will response by one sub_table of steps,

sequentially and cyclically, from sub_table m (m:1 - 128) to user defined sub_table_n (n: 1--128)

The relationship between SEQUENTIAL (A16/M64) and other inputs (A1-A15/M1-M63) could be mask_selected as RESET or UNRESET.

RESET: once the other inputs were triggered, the SEQUENTIAL sequence will reset to sub_table1.

UNRESET: sequential sequence and other inputs are independent.

* 3 status output (STS1,STS2, MODE/STS3), have following mask option:

STS1:

a> stop high_pulse	b> stop low_pulse
c> busy high_active	d> busy low_active
e> led 6hz (flash at mute)	f> led 3hz (flash at mute)
g> led 1.5hz (flash at mute)	h> led 0.75hz (flash at mute)
i> led 6hz (off at mute)	j> led 3hz (off at mute)
k> led 1.5hz (off at mute)	l> led 0.75hz (off at mute)
m> led dynamic 1/4	n> led dynamic 2/4

STS2:

a> stop high_pulse	b> stop low_pulse
c> busy high_active	d> busy low_active
e> led 6hz (flash at mute)	f> led 3hz (flash at mute)
g> led 1.5hz (flash at mute)	h> led 3hz (off at mute)
i> led dynamic 1/4	j> led 3hz (off at mute)
k> led dynamic 3/4	l> led dynamic2/4
m> Busy low, except mute	

STS3:

a> stop high_pulse	b> stop low_pulse
c> busy high_active	d> busy low_active
e> busy_high, except mute	f> busy_low, except mute

If both STS1 and STS2 are in 6hz mode, they will flash alternatively.

Dynamic means led will flash depending on voice signal.

For each voice step the STS1, STS2, STS3 could be mask selected as active or inactive.

STS3 was enabled only when the MODE/STS3 was in STS3 option.

The time of stop puls: 15ms -->60ms;

(40ms at playing speed=6kHz).

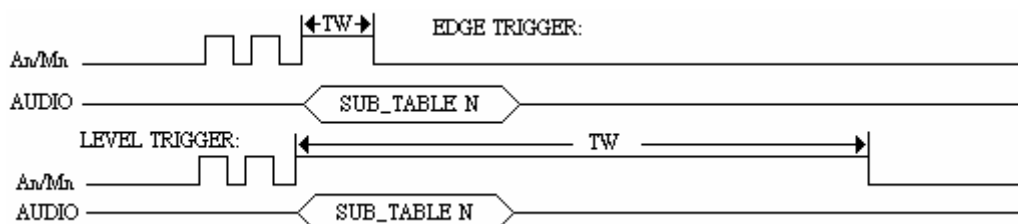
Note: the 3hz and 6hz are depend on the ratio of current playing speed (4kHz to 16kHz).

the stop pulse width is depend on the ratio of final playing speed.

TIMING DIAGRAM

1.>EDGE/LEVEL

EDGE MODE

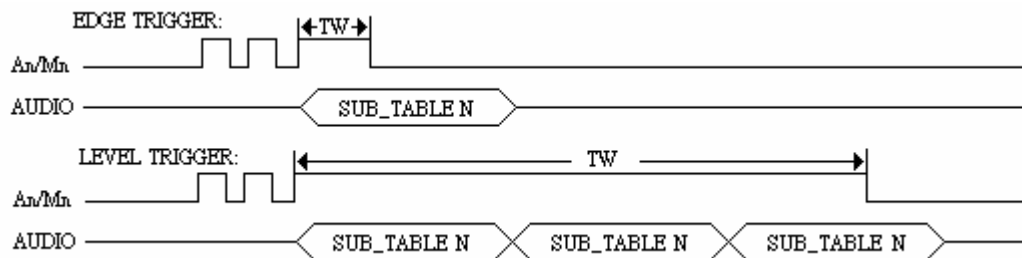


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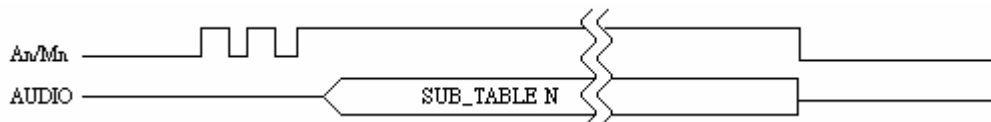
LEVEL MODE:



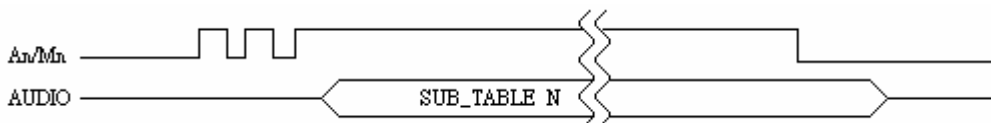
* NOTE: TW IS THE MINIMUM INPUT PULSE WIDTH > DEBOUNCE TIME

2.>HOLD/UNHOLD

HOLD:



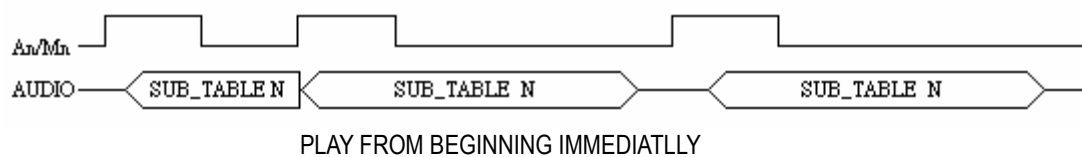
UNHOLD:



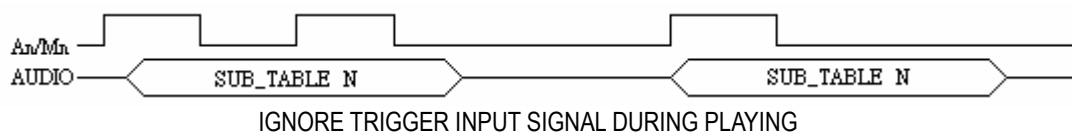
* NOTE: BOTH EDGE AND LEVEL HAVE HOLD AND UNHOLD OPTION.

3.>RETRIGGERABLE/IRRETRIGGERABLE

RETRIGGER:



IRRETRIGGER:

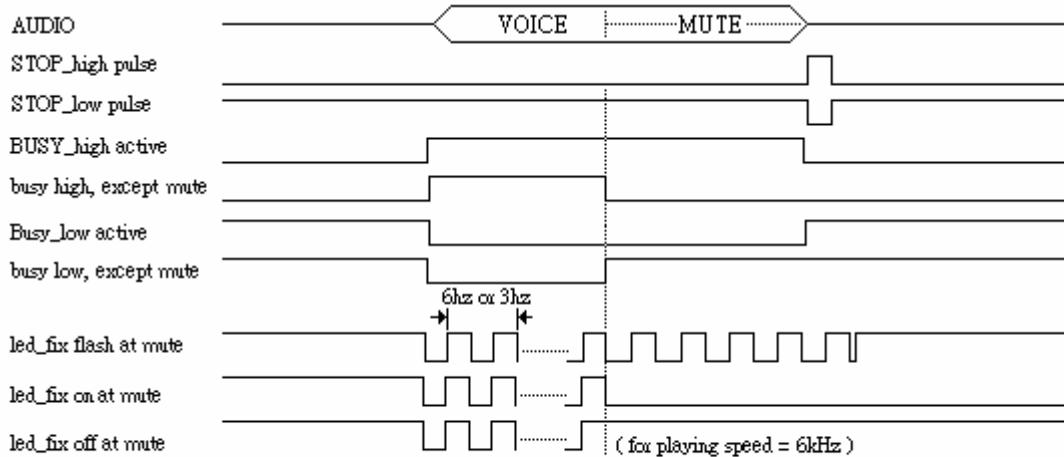


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4.>STATUS OUTPUT (STS1, STS2, STS3)



DYNAMIC: Partition the voice amplitude 8 steps (01234567);

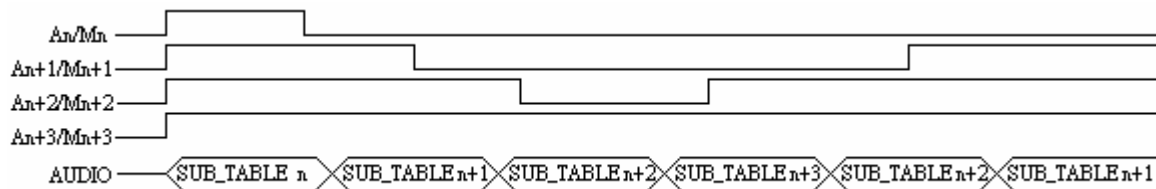
1/4:0,7 LED on. 2/4:0.1.6.7 LED on. 3/4:0.1.2.5.6.7 LED on.

LED on means status output low. ; every beginning of voice step will reset status signal..

NOTE : the 6hz and 3hz in above are depend on the ratio of current playing speed (4khz to 16khz).
the 40ms in above is depend on ratio of final playing speed.

NOTE : every new beginning of voice section will reset status signal.

5.>PRIORITY



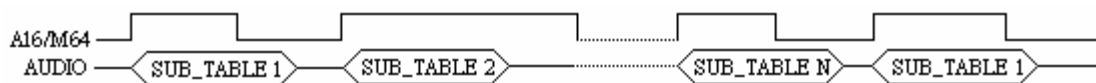
NOTE: PRIORITY A1>A2>A3>A4>A5>A6>A7>A8>A9>A10>A11>A12>A13>A14>A15>A16

Mn+1>Mn+2>Mn+3>Mn+4 >Mn+5>Mn+6>Mn+7>Mn+8

(n=0,8,16,24,32,40,48,56 ; 0>8>16>24>32>40>48>56)

The device will detect the input priority at start playing or level repeat.

6.>SEQUENTIAL EDGE-UNHOLD:

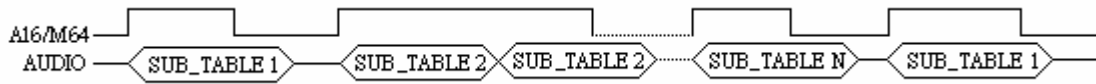


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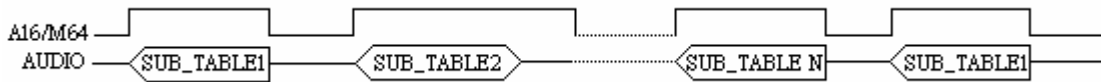
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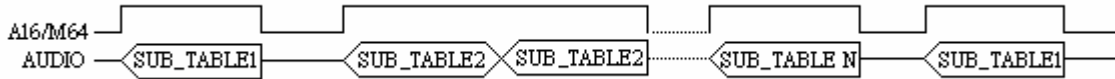
LEVEL-UNHOLD:



EDGE-HOLD:



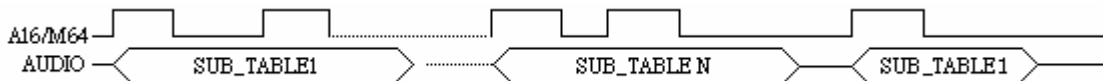
LEVEL-HOLD:



RETRIGGER:



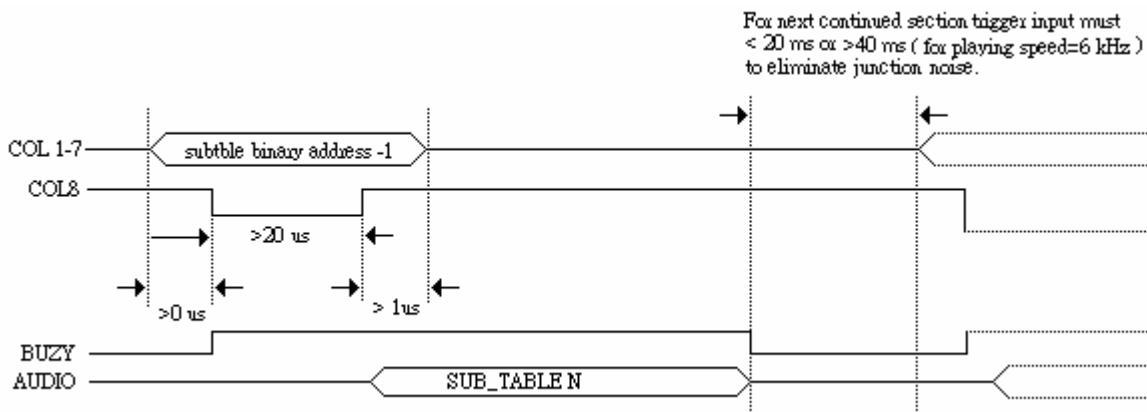
IRRETRIGGER:



7.>CPU_trigger

In this mode, COL 1-7 were used as (subtable binary address -1) input, COL 8 used as low active enable input. some of mask_option must set as follow :
MATRIX/ALONE --> ALONE, SEQUENTIAL/NORMAL -->

NORMAL, RESET/UNRESET --> RESET, DEBOUNCE --> short.
EDGE/LEVEL --> EDGE, HOLD/UNHOLD --> UNHOLD,
RETRIGGER/IRRETRIGGER --> RETRIGGER.



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NOTE : the 20 ms ; 40 ms in above is depend on the ratio of final current playing speed (4k Hz to 16K Hz). In this mode, COL 1-7 in low state ;

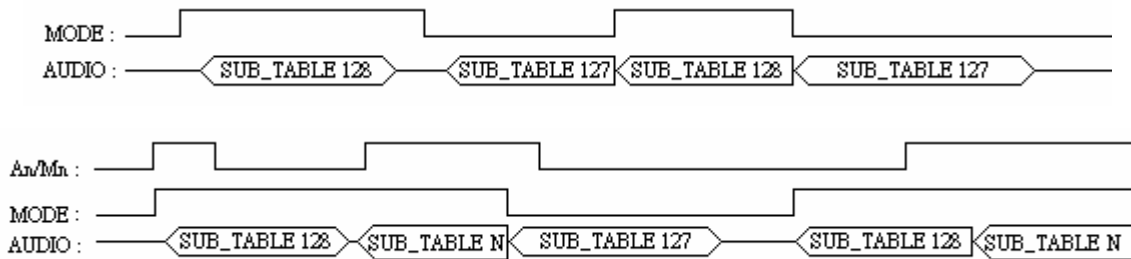
COL 8 in high state during standby. The corresponding interface from CPU must in the same state, for avoid D.C. current between the interface junction.

8.>MODE change trigger

For this mode, the playing type of trigger input 127, 128 must set as --> EDGE, UNHOLD, RETRIGGER.

RETRIGGER

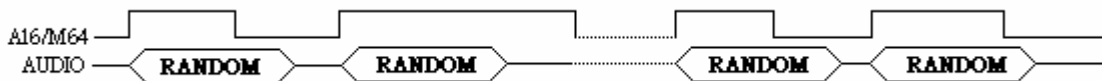
PRIORITY



NOTE : PRIORITY MODE > An/Mn
Debounce time is the same in ALONE/MATRIX mode

9.>ONEKEY-RANDOM

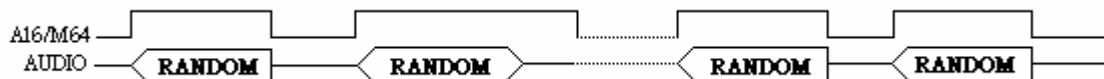
EDGE-UNHOLD



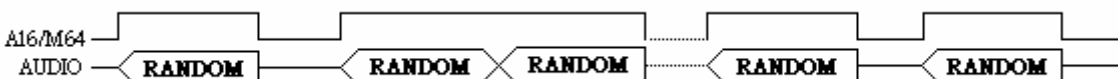
LEVEL-UNHOLD



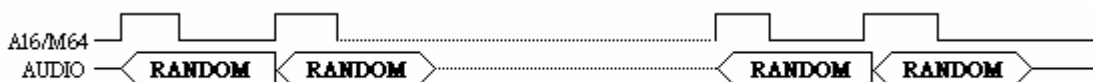
EDGE-HOLD



LEVEL-HOLD



RETRIGGER



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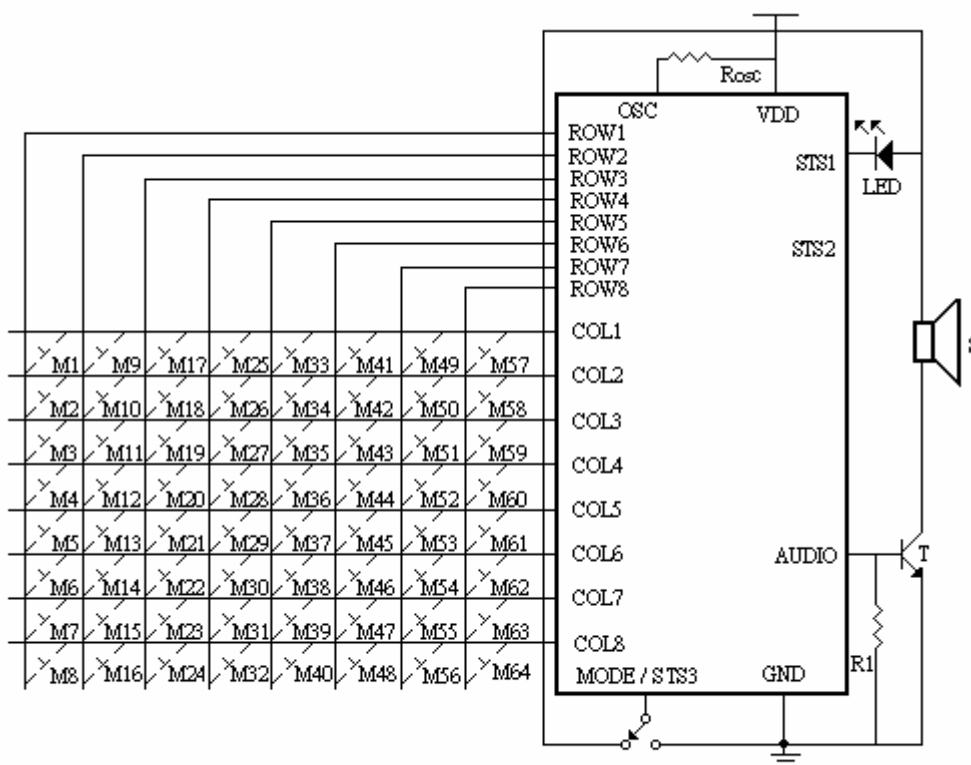
IRRETRIGGER



*NOTE : In ONEKEY-RANDOM mode must select UNRESET in RESET/UNRESET ; random end sub_table.

Application Circuit

A> MATRIX, LED DRIVING



NOTE : R_{osc}=300K ohm, T= bata 100 TRANSISTOR, R₁=1K NEEDED ONLY WHEN WISH TO LOWER THE POWER CONSUMPTION. S=8 ohm SPEAKER (ALL ARE TYPICAL).

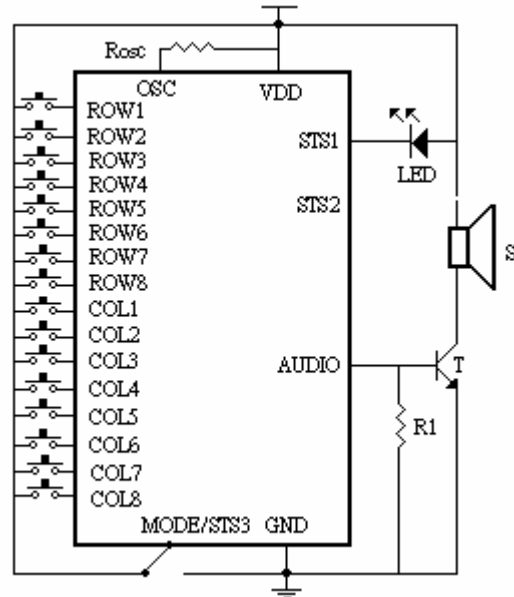
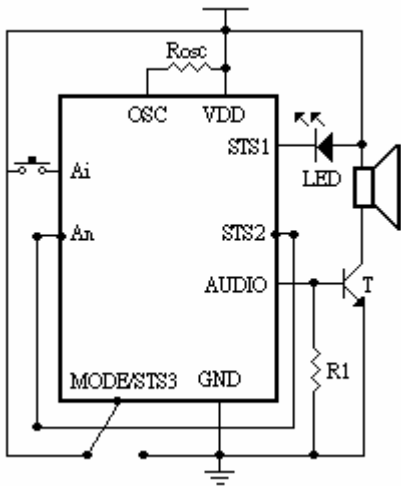
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B> USE STOP HIGH PULSE TO TRIGGER
OTHER TRIGGER INPUT N.

C> ALONE, LED DRIVER



The trigger input must set as ALONE mode.
STS2 must set as stop high pulse output.

Bonding Diagram

