UM348X Series

Multi-Instrument Melody Generator

Features

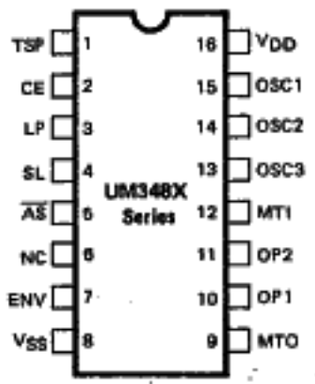
- Powered by a 1.5V battery
- Low stand-by current
- 512-note memory, up to 16 songs
- Play all the songs repeatedly or auto stop
- Play one song only, repeatedly or auto stop
- Every song starts from the first note
- Any song can be present
- 3 timbres — piano, organ and mandolin
- 5 tempos available through mask setting
- On-chip envelope modulator and pre-amplifier

General Description

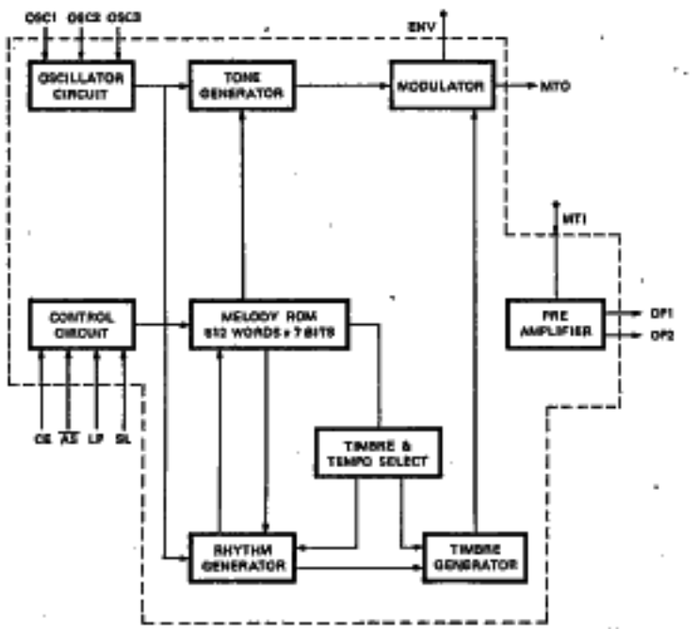
The UM348X series is a mask-ROM-programmed multi-instrument melody generator, implemented in the CMOS technology. They are designed to play the melody according to the previously programmed information and capable of generating 16 songs with 3 instrument sounds, the piano, the organ and the mandolin.

The devices also include a pre-amplifier which provide simple interface to the driver circuit. The UM348X series is intended for applications such as toys, door bells, music boxes, melody clock/timers and telephones.

Pin Configuration



Block Diagram



Absolute Maximum Ratings*

DC Supply Voltage . . . . . −0.3V to 5.0V
Input/Output Voltage . . . . . V_{SS} −0.3 to V_{DD} +0.3V
Operating Ambient Temperature . . . . . −10°C to 60°C
Storage Temperature . . . . . −55°C to 125°C

*Comments

Stress above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of this device at these or any other conditions above those indicated in the operational sections of this specification is not implied and exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Electrical Characteristics

(V_{DD} = 1.5V, V_{SS} = 0V, T_A = 25°C, unless otherwise specified.)

Parameter	Symbol	Min.	Typ.	Max.	Conditions
Operating Voltage	V_{DD}	1.35V	1.5V	3V	
Stand-By Current	I_{STB}	0.1μA	–	12μA	OSC halting
Input Voltage-High	V_{IH}	V_{DD} − 0.3V	–	V_{DD}	
Input Voltage-Low	V_{IL}	V_{SS}	–	V_{SS} + 0.3V	
Input Current High	I_{IH}	1.5μA	3μA	6μA	$V_{IH} = V_{DD}$
Input Current Low	I_{IL}	–	–	0.1μA	$V_{IL} = V_{SS}$
ENV Pin Drive Current	I_{ENV}	500μA	–	–	V_{ENV} = 0.8V
Output Current (OP1)	I_{OL}	200μA	–	1200μA	V_{OL} = 0.8V
Output Current (OP2)	I_{OH}	200μA	–	1200μA	V_{OH} = 0.7V

Pin Description

Pin No.	Designation	Description
1	TSP	Output flag of melody auto stop In normal operation, this pin should be open
2	CE	Chip enabled if connected to V_{DD} Chip disabled if connected to V_{SS}
3	LP	The melody plays only one song if this pin is connected to V_{DD} The melody plays all songs if this pin is connected to V_{SS}
4	SL	A positive going edge applied to this pin will make the melody change to the next song
5	$\overline{AS}$	The melody will be repeated if this pin is connected to V_{DD} The melody will stop automatically if this pin is connected to V_{SS}
6	NC	No connection
7	ENV	Envelope circuit terminal
8	V_{SS}	Negative supply power
9	MTO	Modulated tone signal output
10	OP1	Pre-amplifier output 1
11	OP2	Pre-amplifier output 2
12	MTI	Modulated tone signal input to the pre-amplifier
13	OSC3	Pin 13-15 can be connected as an RC oscillator External oscillating signal can be input to Pin 15
14	OSC2	
15	OSC1	
16	V_{DD}	Positive power supply

Functional Description

Oscillator & Control Circuit

The resistor R_1 & capacitor C_1 are connected externally to set the frequency at 100 KHz. Addition of R_S (shown is application CKT) in series with input inverter is to make the circuit insensitive to the variation of supply voltage. Under the stand-by condition (CE is Low) the operation of the OSC is inhibited. As soon as a high level signal is applied to the CE terminal, the circuit starts oscillating. Since the OSC frequency is used as a time base of the tone, rhythm and tempo generators, its accuracy will affect the quality of the melody.

Modulator Circuit

The tone signal and the timbre signal are put through the modulator circuit. The output wavefrom is shown in Fig. 1 and the modulator circuit shown in Fig. 2. Proper selection of C_2, R_2 can produce envelops of desired charging and discharging time.

Pre-amplifier

The pre-amplifier circuit is shown in Fig. 3. Feedback resistor R_f must be connected to obtain proper bias of pre-amp stage. In the stand-by state the pre-amp is disabled, and OP1 is pulled up to V_{DD}, OP2 is pulled down to V_{SS}.

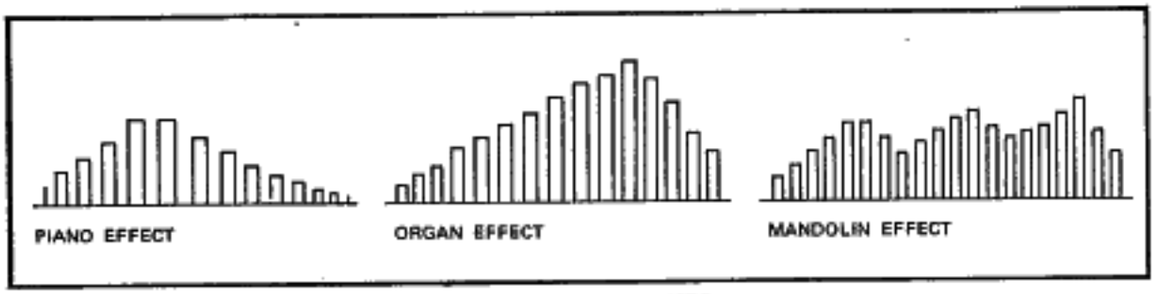


Figure 1. Waveform at MTO

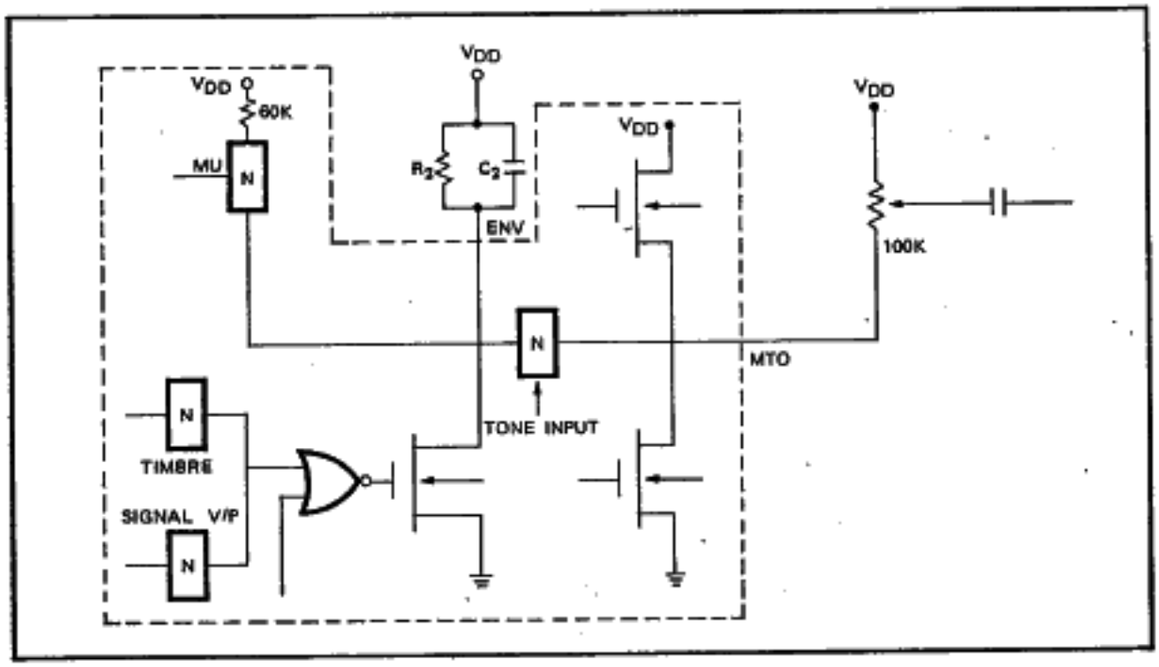


Figure 2. Modulator Circuit

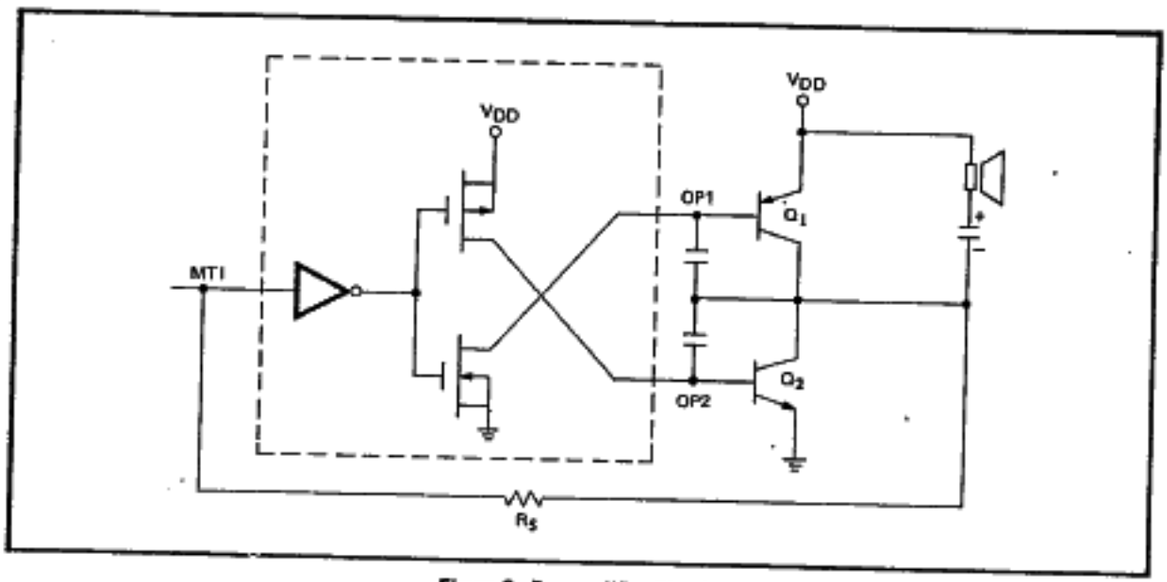


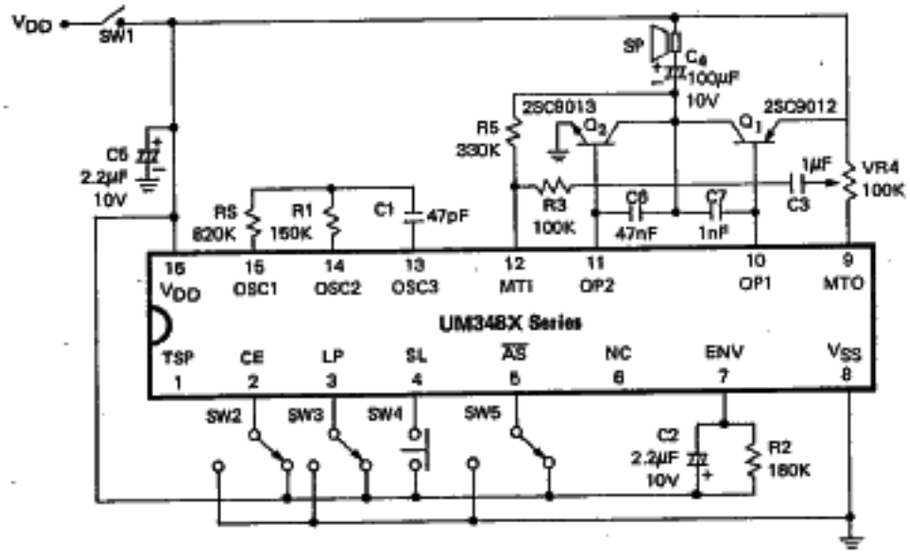
Figure 3. Pre-amplifier Circuit

Program Truth Table

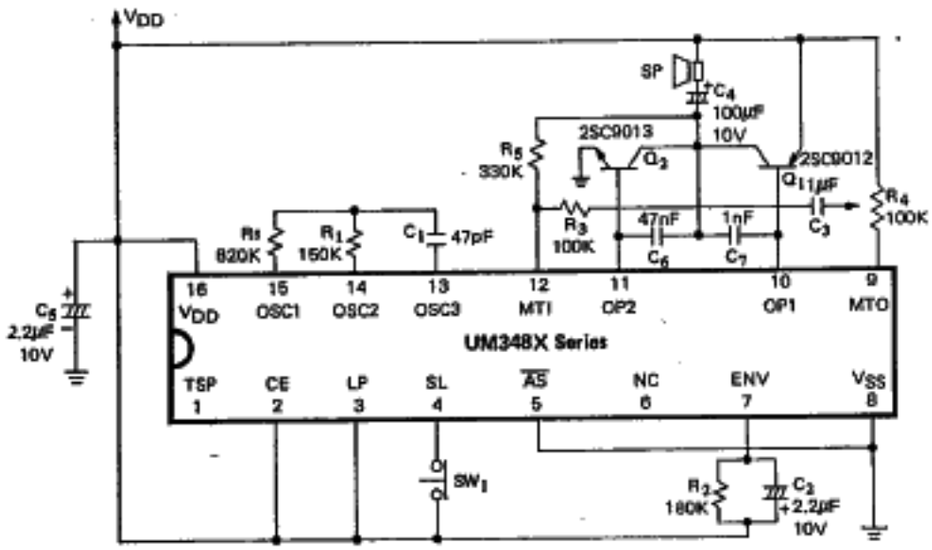
Items	CE	SL	LP	AS	Program
1	0	X	X	X	Stand-by
2	1	0	0	0	Start from first melody → last melody → stop
3	⌐	0	0	1	Start from first melody → last melody → repeat from first melody
4	⌐	0	1	0	Start from the present melody → stop
5	1	0	1	1	Repeat the present melody
6	1	⌐⌐	0	0	Change to the next melody → last melody → stop
7	1	⌐⌐	0	1	Change to the next melody → last melody → repeat from first melody
8	1	⌐⌐	1	0	Change to the next melody → stop
9	1	⌐⌐	1	1	Change to the next melody → repeat the same melody

Typical Application

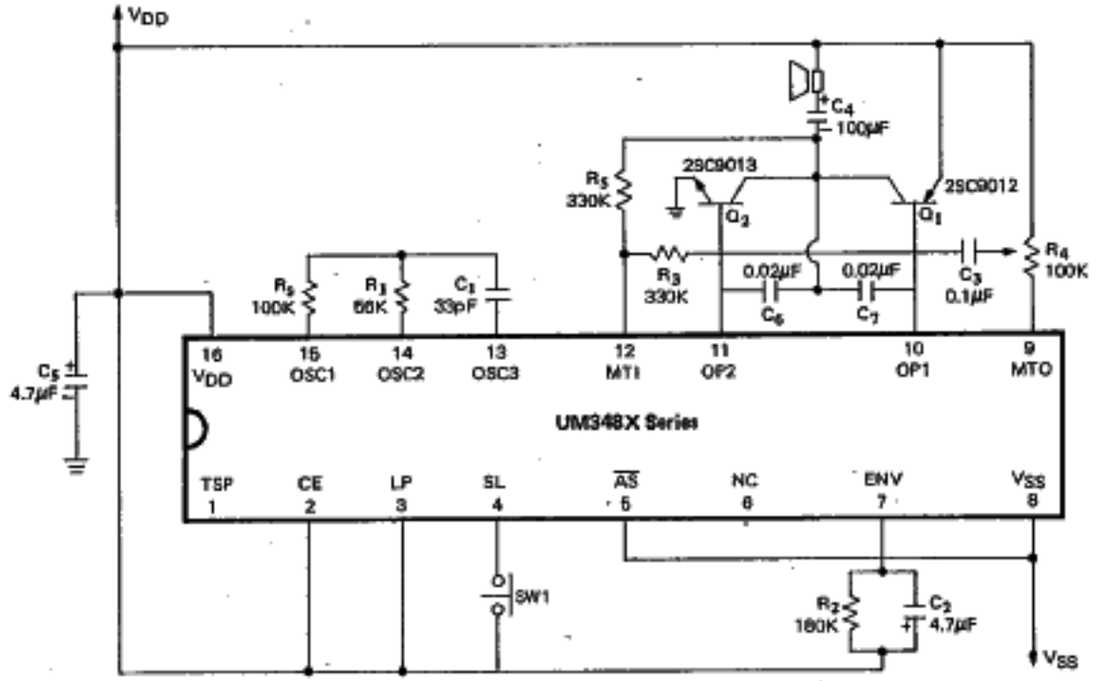
A. GENERAL APPLICATION



B. CHIME FUNCTION APPLICATION

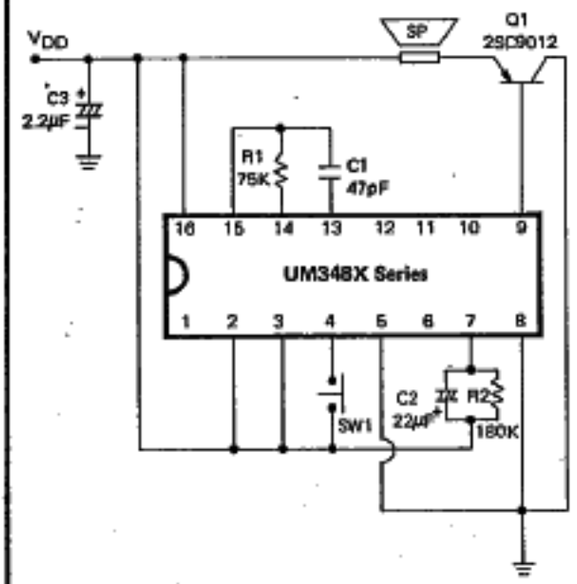


C. MELODY DOOR BELL

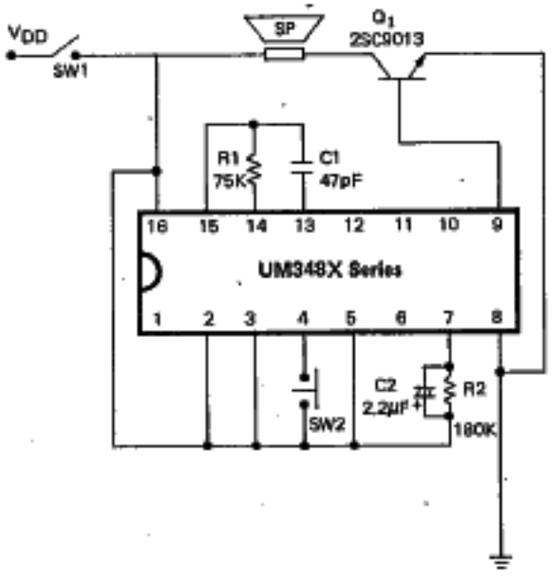


D. LOW COST APPLICATION

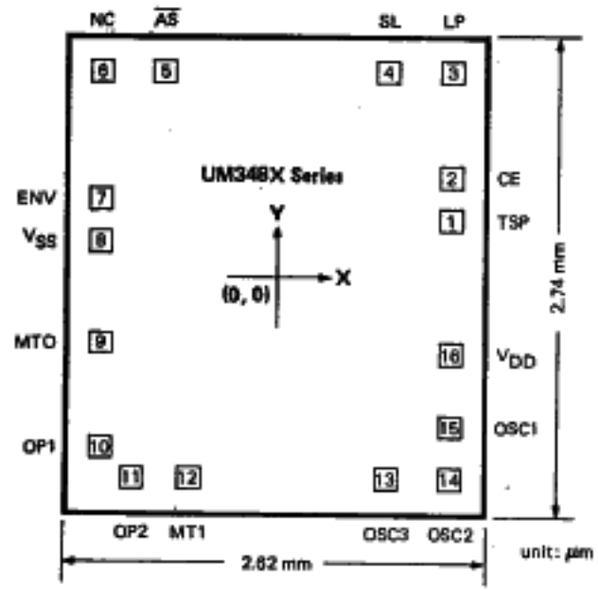
(1) One-shot



(2) Level-hold



Bonding Diagram



Pad No.	Designation	X	Y
1	TSP	1163.57	640.08
2	CE	1163.57	836.68
3	LP	1163.57	1220.72
4	SL	662.94	1209.29
5	$\overline{AS}$	− 913.38	1220.72
6	NC	−1097.28	1220.72
7	ENV	−1159.00	496.06
8	V_{SS}	−1159.00	299.47
9	MTO	−1149.86	− 491.49
10	OP1	−1149.86	−1028.70
11	OP2	−1044.70	−1216.15
12	MT1	− 861.82	−1216.15
13	OSC3	745.24	−1216.15
14	OSC2	1163.57	−1217.42
15	OSC1	1154.43	−1032.26
16	V_{DD}	1154.43	− 619.51

Ordering Information

UM3481A

Jingle Bells
Santa Claus Is Coming to Town
Silent Night, Holy Night
Joy to the World
Rudolph the Red-nosed Reindeer
We Wish You a Merry Christmas
O Come, All Ye Faithful
Hark, The Herald Angels Sing
Wedding March
Happy Birthday
Humoresque
Lorelei
The Last Rose of Summer
Love Song from Sikang

UM3482A

American Patrol
Rabbits
Oh My Darling, Clementine
Butterfly
London Bridge Is Falling Down
Row, Row, Row Your Boat
Are You Sleeping
Happy Birthday
Joy Symphony
Home Sweet Home
Wiegenlied
Melody on Purple Bamboo

UM3483

L'eau Vive (Living Water)
Home on the Range
Romance de Amor
Comin' Thro' the Rye

UM3484

Westminster
Chime Function

UM34811A

Twinkle Twinkle Little Star
Coo Coo Waltz (1)
Eency Weency Spider
Lullaby
Santa Lucia
Oh My Darling, Clementine
Are You Sleeping
Rock-a-bye Baby
London Bridge is Falling Down
Little Brown Jug
Butterfly
Long Long Ago
Coo Coo Waltz (2)
Mary Had a Little Lamb
The Train is Running Fast
Dream of Home and Mother