UMC

Features

- 1.35V—5V operating voltage
- 64-note memory
- Volume control capability
- On-chip envelope modulator

- Low stand-by current
- Built-in oscillator and pre-amplifier circuit
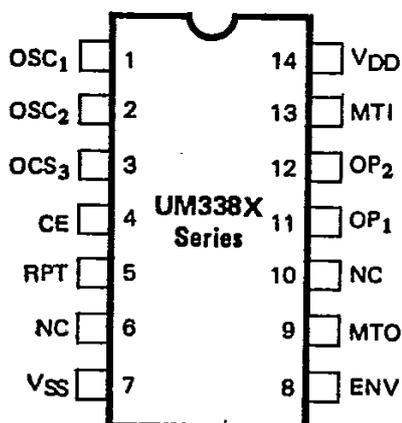- A piezo or magnetic buzzer can be driven by connecting an NPN transistor

General Description

The UM338X series is a mask programmed simple generator implemented in the CMOS technology. The melody signal is generated according to the previously programmed tone rhythm and tempo information. By properly modifying the envelope of the electric signal, sound effect of pia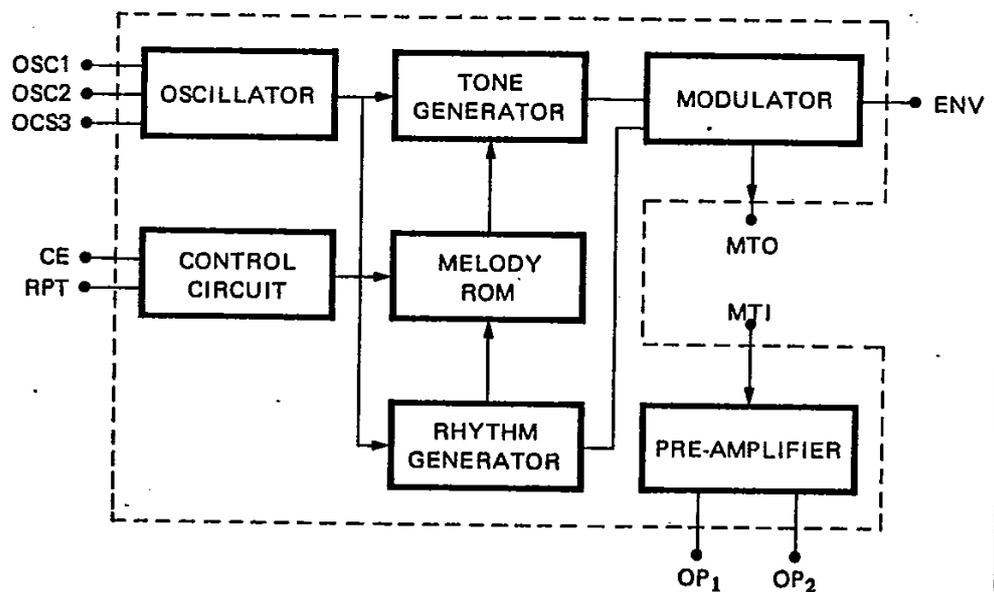no or organ may be generated. The device also includes a pre-amplifier which provides simple interface to the drive circuit.

The UM338X series is intended for application such as toys, music box, melody clock/timers and telephones.

Pin Configuration

OSC$_1$	1	14	V$_{DD}$
OSC$_2$	2	13	MTI
OCS$_3$	3	12	OP$_2$
CE	4	11	OP$_1$
RPT	5	10	NC
NC	6	9	MTO
V$_{SS}$	7	8	ENV

UM338X Series

Block Diagram

OSC1
OSC2
OCS3 → OSCILLATOR → TONE GENERATOR → MODULATOR → ENV

CE
RPT → CONTROL CIRCUIT → MELODY ROM

RHYTHM GENERATOR

MTO

MTI

PRE-AMPLIFIER

OP$_1$ OP$_2$

Absolute Maximum Ratings*

DC Supply Voltage . . . . —0.3V to 5V

Input/Output Voltage. . . . . V_{SS} —0.2V to V_{DD} +0.2V

Operating Ambient Temperature . . . . —20°C to +65°C

Storage Temperature . . . . —55°C to +125°C

*Comments

Stress above those listed under "Absolute Maximum Rating" 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	Condition	Min.	Typ.	Max.	Unit
Stand-by Current	I_{STB}	OSC HALTING	0.1	0.1	10	μA
High Level Input Voltage	V_{IH}	—	$V_{DD}-0.3$	—	V_{DD}	V
Low Level Input Voltage	V_{IL}	$V_{IH} = V_{DD}$	V_{SS}	—	$V_{SS}+0.3$	μA
High Level Input Current	I_{OH}	$V_{OH} = 0.8V$	1.5	3	6	μA
Output Current OP1 Terminal	I_{OL}	$V_{OL} = 0.8$	200	—	1200	μA
Output Current OP2 Terminal	I_{OH}	$V_{OH} = 0.7V$	200	—	1200	μA

Pin Description

Pin No.	Designation	Description
1	OSC1	PIN 1 to PIN 3 connected as an RC oscillator
2	OSC2	
3	OSC3	
4	CE	Chip enabled when CE = V_{IH} Chip disabled when CE = V_{IL}
5	RPT	Song repeated if RPT = V_{IH} Song stopped as melody ends if RPT = V_{IL}
6	NC	No connection
7	V_{SS}	Power supply negative
8	ENV	Envelope circuit terminal
9	MTO	Modulated tone signal output
10	NC	Same as pin 6
11	OP1	Pre-amplifier output
12	OP2	
13	MTI	Modulated tone signal input to the pre-amplifier
14	V_{DD}	Power supply positive

Bonding Diagram
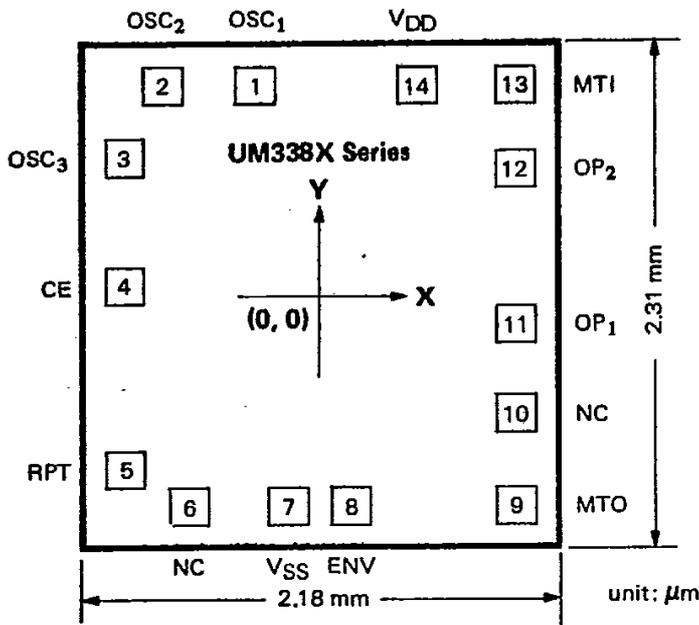
Pad No.	Designation	X	Y
1	OSC1	−320.04	980.44
2	OSC2	−624.84	980.44
3	OSC3	−929.64	855.98
4	CE	−929.64	63.50
5	RPT	−929.64	−850.90
6	NC	−685.80	−980.44
7	V_{SS}	−226.06	−980.44
8	ENV	48.26	−980.44
9	MTO	904.24	−980.44
10	NC	904.24	−670.56
11	OP1	904.24	−388.62
12	OP2	904.24	419.10
13	MT1	904.24	980.44
14	V_{DD}	441.96	980.44

Function Description

Oscillation and Control Circuit

The resistor R_1 and capacitor C_1 are connected externally for setting the frequency (typically 50KHZ). Addition of resistor R_S in series with input inverter is to make circuit insensitive to the variation of the supply voltage. Under stand-by condition (CE is low) the operation of the built-in oscillating circuit is inhibited. As soon as a high level signal enters into the CE input, the circuit starts oscillating. Since the oscillation frequency is used as a time base to the tone generator and the rhythm generator, its accuracy will affect the quality of the music.

Melody ROM

The mask ROM can memorize 64 words with 7 bits each. Of these, 4 bits are used for controlling the tone generator and 3 bits are used for controlling the rhythm generator.

Usually there are only 63 words available for the melody programming since 1 word is used for the control of automatic stop.

Tone Generator

The tone generator is a programmed divider. It divides the base frequency by 72 to 254 following the data stored in the melody ROM. The central "Do" is 263.16 Hz if the base frequency is 50KHz; the scale range is from 5 to 4.
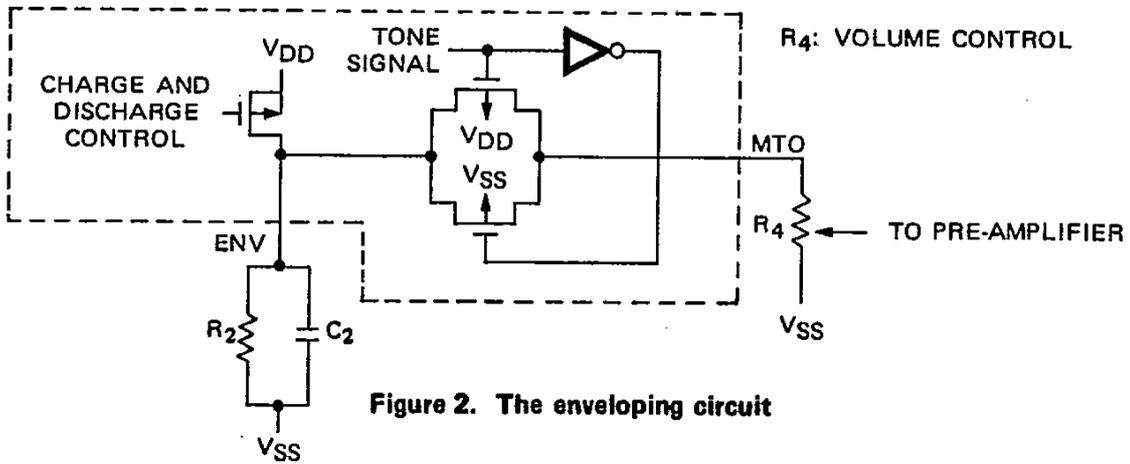
Enveloping Circuit and Modulator

The tone signal is put through an enveloping circuit and the output waveform shown in Figure 1 is produced.

PIANO EFFECT

ORGAN EFFECT
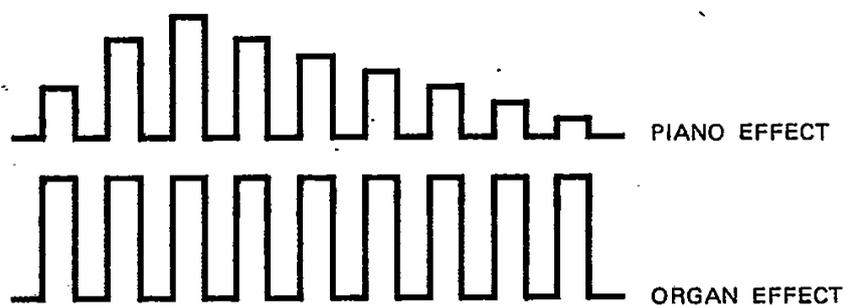
Figure 1. Waveform of modulated tone output (MTO)

The enveloping circuit is shown in Figure 2. Proper selection of C_2, R_2 & R_4 can produce envelops of desired charging and discharging time.
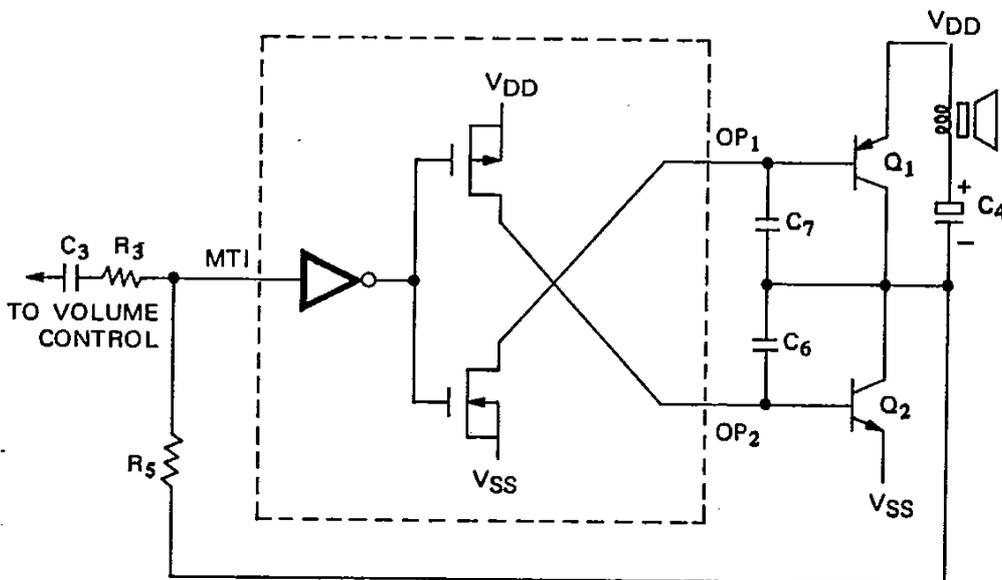

Figure 2. The enveloping circuit

Pre-amplifier

The equivalent circuit of the pre-amplifier is shown in Figure 3. Feedback resistor R_5 must be connected to obtain proper bias of the pre-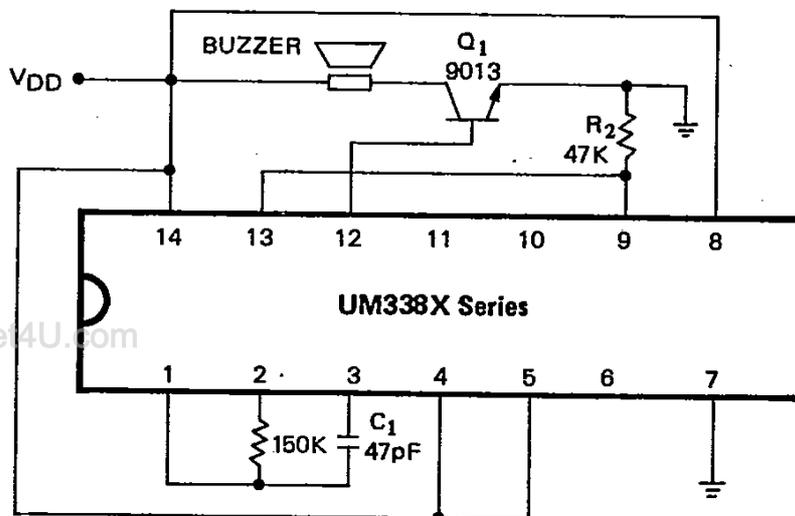amplifier stage. In the stand-by state the pre-amplifier is disabled, OP_1 is pulled up to V_{DD} and OP_2 is pulled down to V_{SS}.
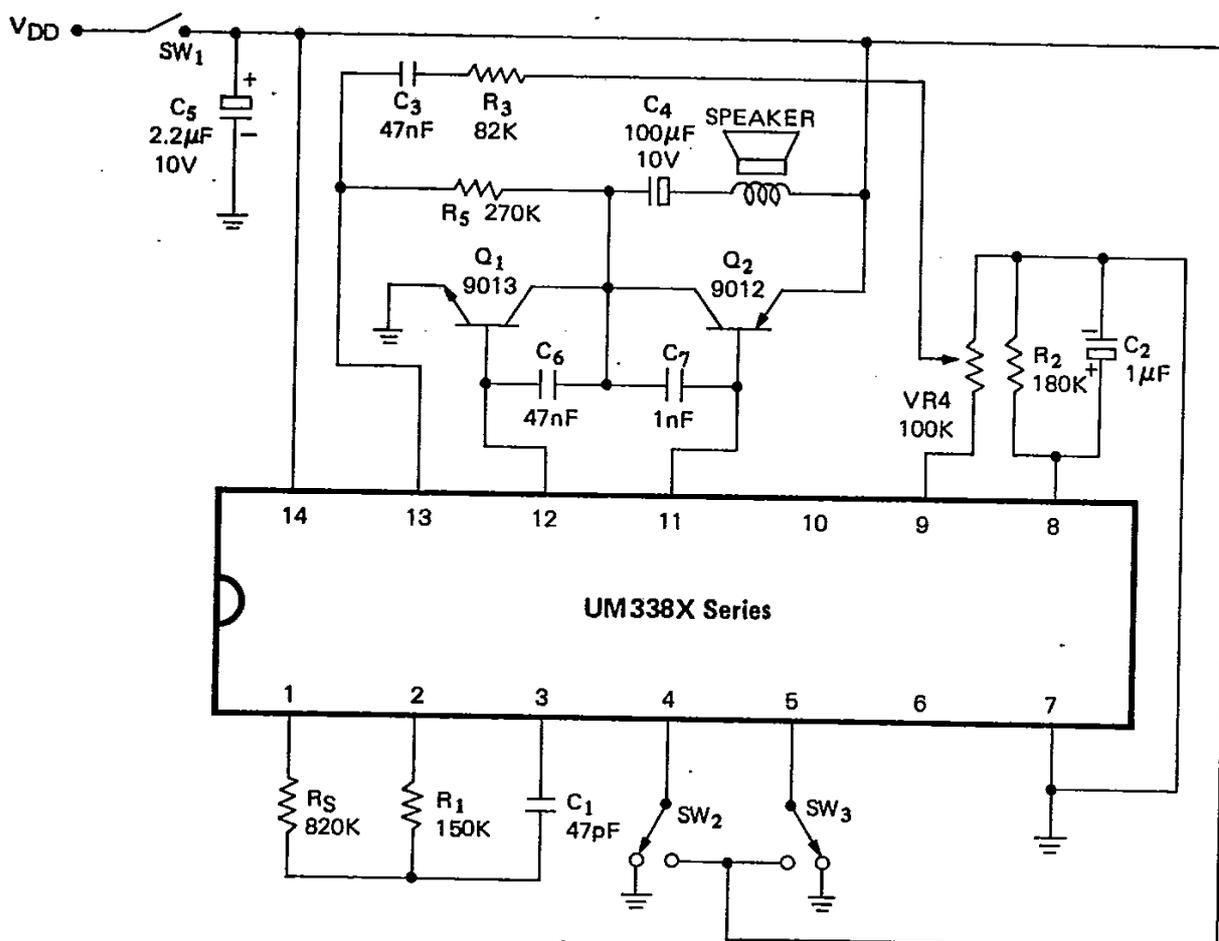

Figure 3. Pre-amplifier circuit

Typical Application

SIMPLE APPLICATION CIRCUIT USING MAGNETIC BUZZER

UMC

TYPICAL APPLICATION CIRCUIT USING SPEAKER

Song Series List

UM3381	Jingle Bells
UM3381-1	A Medley of Jingle Bells, Santa Claus is Coming to Town and We Wish You a Merry Christmas
UM3381-2	A Medley of Silent Night and The First Noel
UM3381-3	A Medley of Jingle Bells, Deck the Halls and Joy to the World
UM3382	A Medley of Three Blind Mice and Farmer in the Dell
UM3382-1	Lullaby (Brahams)
UM3382-2	Counting the Frogs; (Chinese children's song)
UM3382-3	A Medley of Happy Birthday and For He is a Jolly Good Fellow
UM3383	Blue Bells of Scotland
UM3383-1	Beethoven Symphony No. 9
UM3383-2	Home Sweet Home
UM3383-3	Camel Train