UMC

T-77-13

UM3481A Series

Multi-Instrument Melody Generator

Features

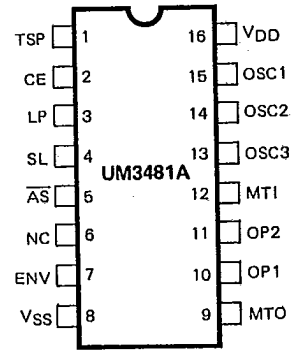
- Powered by a 1.5V battery
- Low standby current
- 512-note memory, up to 16 songs
- Plays all the songs repeatedly or auto stop
- Plays one song only, repeatedly or auto stop
- 14 tones selectable
- 8 beats selectable
- Any song can be selected sequentially
- 3 timbres — piano, organ and mandolin
- 5 tempos available through mask setting
- On-chip envelope modulator and pre-amplifier

General Description

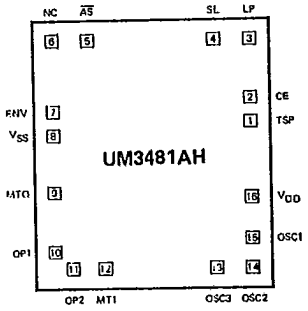
The UM3481A is a mask-ROM-programmed multi-instrument melody generator, implemented in CMOS technology. It is designed to play the melody according to the previously programmed information and is capable of generating 16 songs with 3 instrument effects: piano, organ and mandolin.

The device also includes a pre-amplifier which provides a simple interface to the driver circuit. The UM3481A series is intended for applications such as toys, door bells, music boxes, melody clock/timers and telephones.

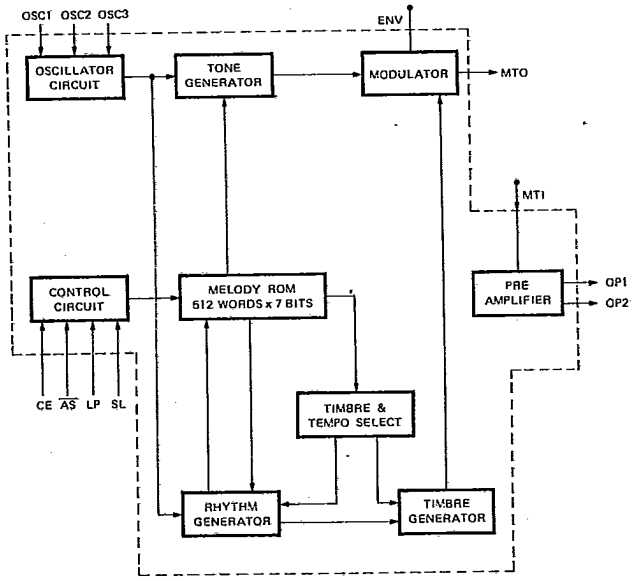
Pin Configuration



Pad Configuration



Block Diagram



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Absolute Maximum Ratings*

DC Supply Voltage . . . . . −0.3V to 3.0V
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

Stresses 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.

D.C. 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	V_{DD} = 1.5V unloaded
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

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Pin Description

Pin No.	Designation	Description
1	TSP	Output flag signal 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	Plays only one song if this pin is connected to V_{DD} Plays all songs if this pin is connected to V_{SS}
4	SL	A positive going edge applied to this pin will change to the next song
5	$\overline{AS}$	The melody will repeat 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	Pins 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

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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 in application CKT) in series with input inverter is to make the circuit insensitive to the variation of supply voltage. In standby 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 waveforms are shown in Fig. 1 and the modulator circuit shown in Fig. 2. Proper selection of C_2, R_2 can produce envelopes of desired charging and discharging time.

Pre-amplifier

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

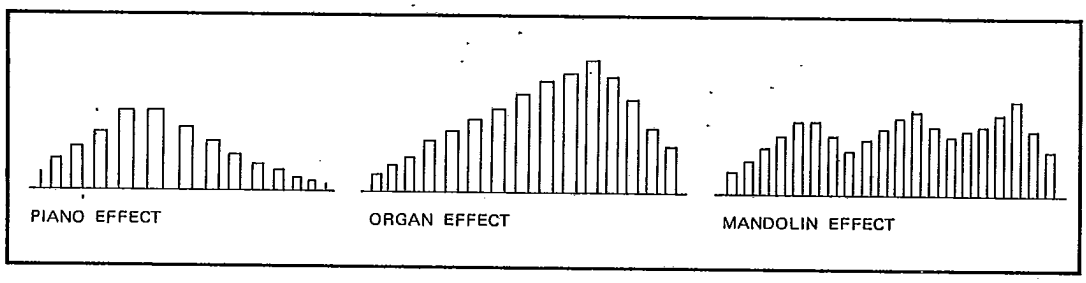

Figure 1. Waveforms at MTO

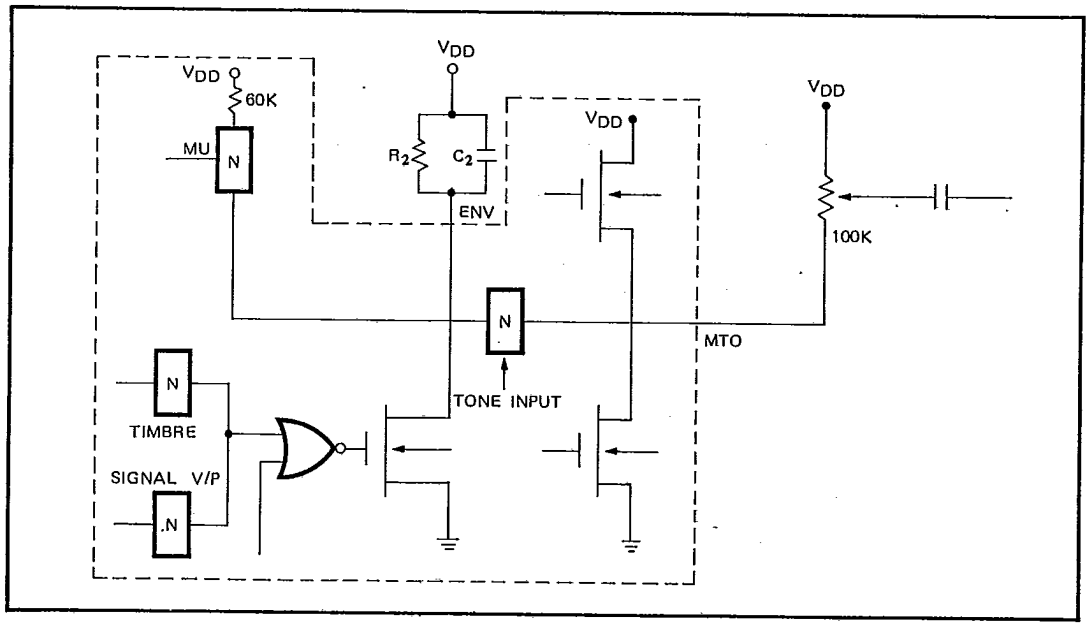

Figure 2. Modulator Circuit

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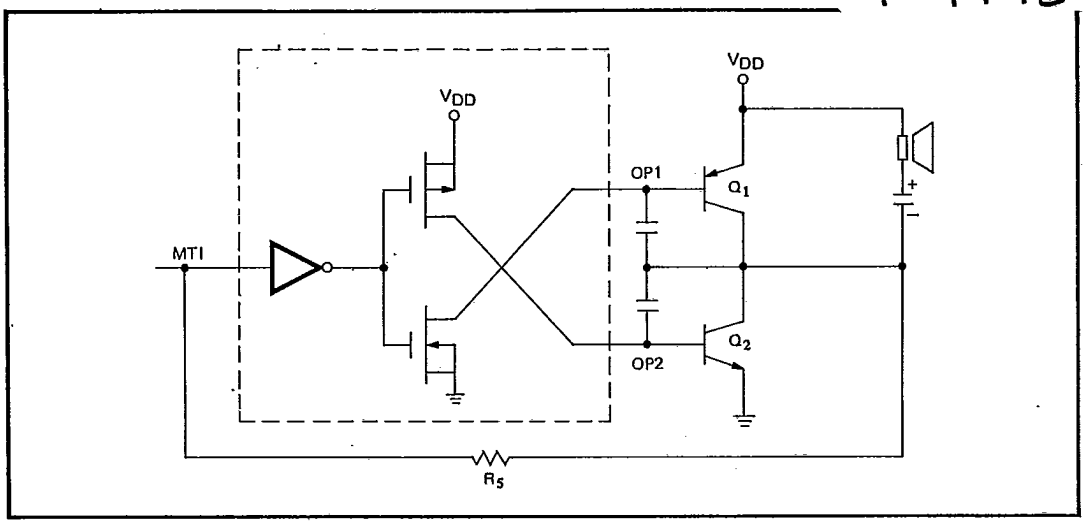

Figure 3. Pre-amplifier Circuit

Program Truth Table

Items	CE	SL	LP	$\overline{AS}$	Program
1	0	X	X	X	Standby
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

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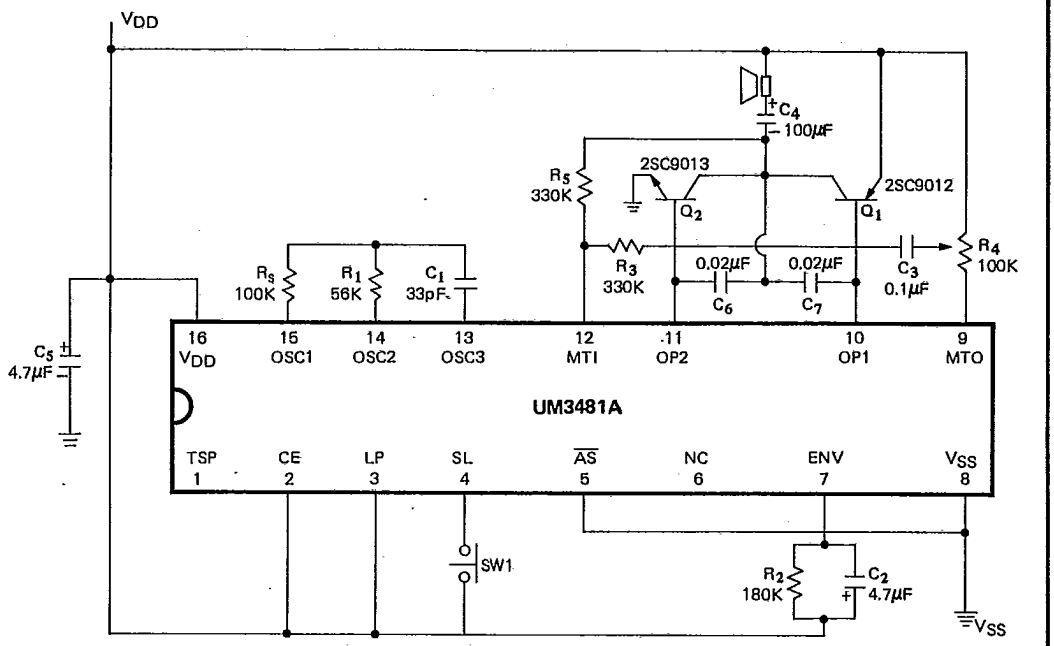
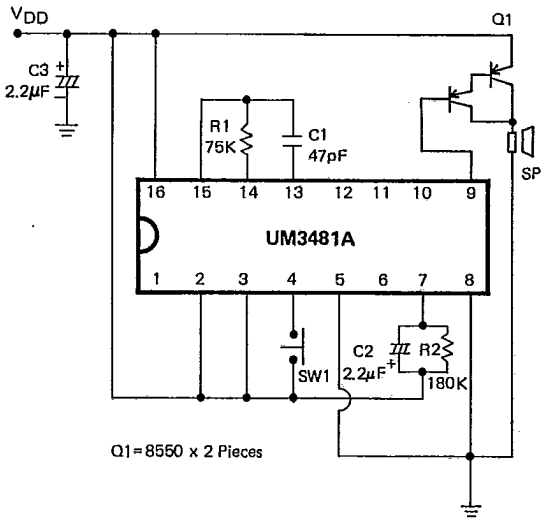
Typical Applications

A. MELODY DOOR BELL

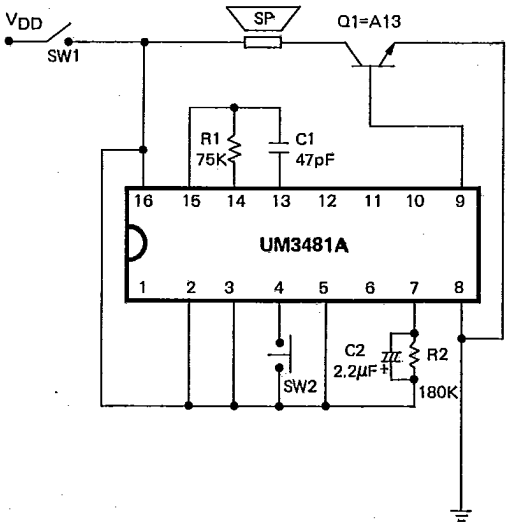


B. LOW COST APPLICATIONS USING SPEAKER

(1) One-shot



(2) Level-hold



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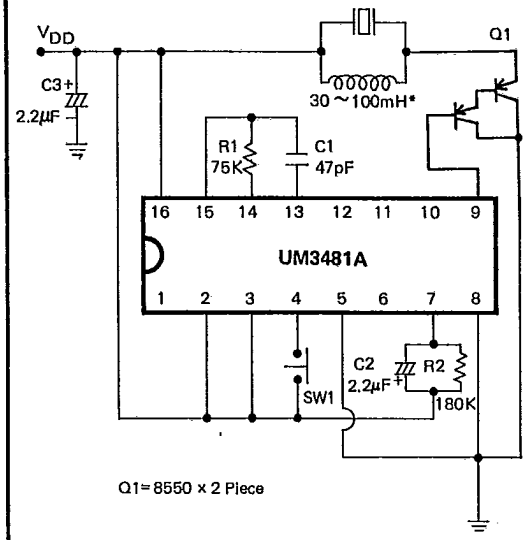
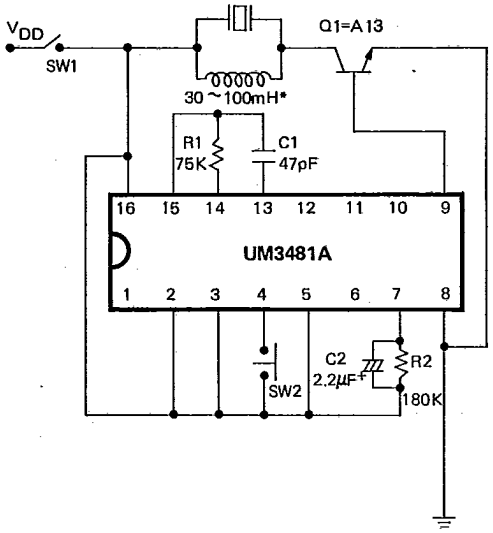
C. LOW COST APPLICATIONS USING PIEZO BUZZER

(1) One-shot



Q1= 8550 x 2 Piece

(2) Level-hold



*The inductor paralleled with piezo can be replaced by a 100 KΩ resistor but the sound will be smaller.

Melody

Song List

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

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

UM3483A
L'eau Vive (Living Water)
Home on the Range
Romance de Amor
Comin' Thro' the Ryel
Wedding March
Happy Birthday
Humoresque
Lorelei
The Last Rose of Summer
Love Song from Sikang

UM3484
Westminster
Chime Function

UM34810A
Jingle Bells
Rudolph, the Red-nosed Reindeer
Santa Claus is Coming to Town
Little Drummer Boy
Silent Night
White Christmas
Oh! My Lord
The Peace Carol
When a Child is Born
Eion's Daughter
Away in A Manger
We Wish You a Merry Christmas
O! Come All Ye Faithful
Hark, the Herald Angels Sing
Angels We Have Heard On High
O! Tannenbaum

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

UM34813A (With Chime)
1. Chim Chim Cher-ee
2. Buttons and Bows
3. Dream of Home and Mother
4. Popeye the Sailor Man
5. London Bridge is Falling Down
6. March of Toy Soldiers
7. Lullaby (Schubert)
8. Congratulations
9. Cuckoo Waltz
10. Song of Joy
11. March of New World
12. Yellow Rose of Texas

UM34814A
Hound Dog
Love Me Tender, Love Me True
My Way
Are You Lonesome Tonight
You'll Never Walk Alone
Surrender

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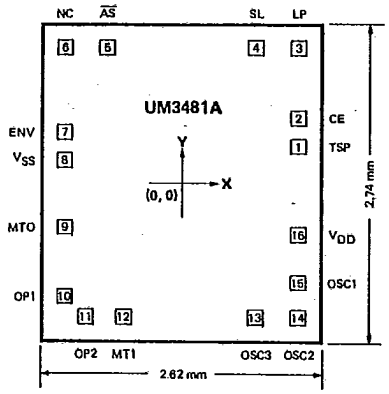
Bonding Diagram

unit: μm



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	MTI	− 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

Part Number	Package
UM3481AH	Chip
UM3481A	16L DIP

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