

9325812 UNITED MICROELECTRONICS

92D 00588

D 7-77-13



## UM3511A

ADVANCED PRODUCT DESCRIPTION

### Melody Organ Generator

#### Features

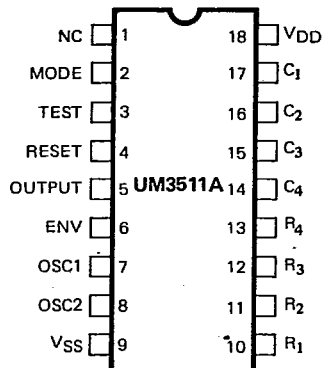
- Typical 3V operating voltage and low power consumption
- Can play a scale with 15 notes (G3-G5)
- Can replay a tune with real time (max. 47-note memory)
- First key priority
- Up to 15 songs can be selected (512-note memory)
- A magnetic buzzer can be driven by connecting an NPN transistor
- 8 kinds of tempo programming
- One key one song (auto-stop)

#### General Description

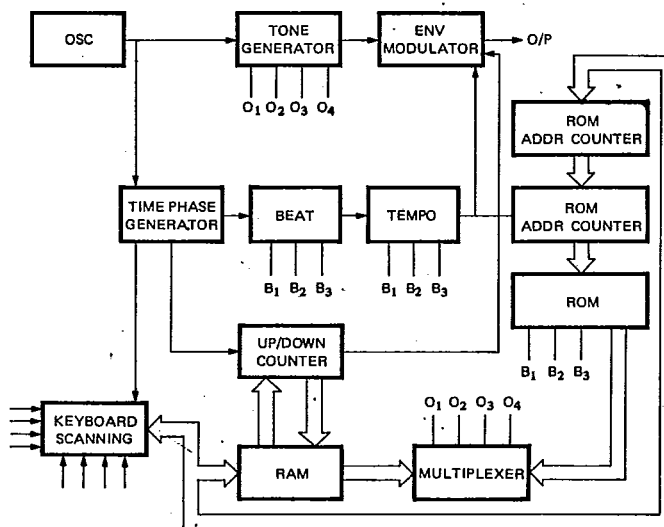
The UM3511A series is a low-cost, low-power CMOS LSI designed for use in electronic toy organs. The UM3511A has an on-chip ROM programmed for musical performance and a dynamic RAM used for the organ replay function.

The integrated circuit provides keyboard scanning with up to 16 keys and produces a piano effect. The UM3511A series is packaged in 18-pin DIPs.

#### Pin Configuration



#### Block Diagram



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**Absolute Maximum Ratings\***

Supply Voltage  $V_{DD}-V_{SS}$  ..... -0.3V to +5V  
 Input Voltage .....  $V_{SS}-0.2V$  to  $V_{DD}+0.2V$   
 Operation Temperature ..... -20°C to +65°C  
 Storage Temperature ..... -55°C to +125°C

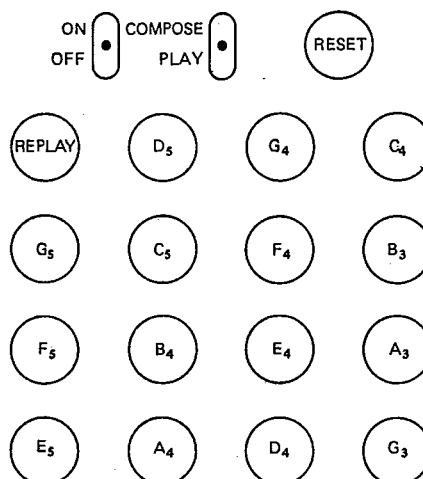
**\*Comments**

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**

( $V_{DD} = 3V$ ,  $V_{SS} = 0$ ,  $T_A = 25^\circ C$ , unless otherwise specified.)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Operation Voltage	$V_{DD}$		2.4	3	5	V
Stand-By Current	$I_{STB}$	OSC halting $V_2 = V_7 = V_{SS}$ $V_6 = V_{DD}$	—	—	10	$\mu A$
'H' Input Voltage	$V_{IH}$		$V_{DD}-0.2$	—	$V_{DD}$	V
'L' Input Voltage	$V_{IL}$		$V_{SS}$	—	$V_{SS}+0.2$	V
Frequency Deviation Per Lot	$\Delta F/F$	$V_{DD} = 3V$	-10%	—	+10%	
Frequency Stability	$\pm \Delta F/F$	$\frac{F_{OSC}(3.3V) - F_{OSC}(2.7V)}{F_{OSC}(2.7V)}$	—	—	20%	
Output Current	$I_O$	$V_O = 0.8V$	200	—	—	$\mu A$
ENV Drive Current	$I_{ED}$	$V_{DD} = 2.7V$ , $V_6 = 0.7V$	150	—	—	$\mu A$

**Keyboard Layout**

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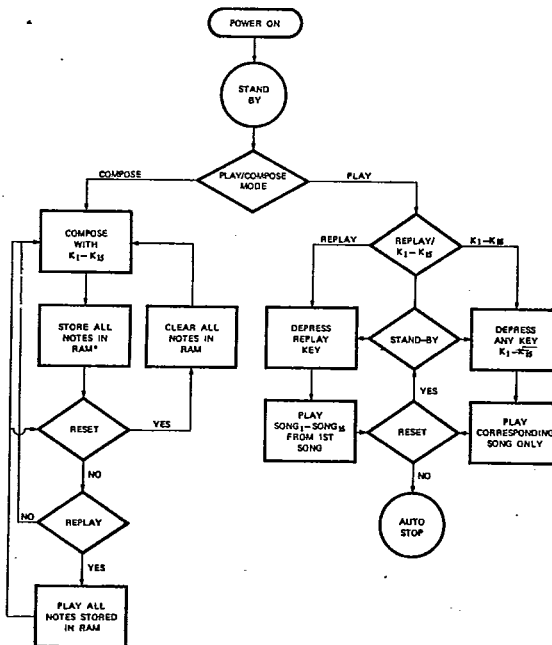


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## Pin Description

Pin No.	Designation	Description
1	NC	No connection
2	MODE	Plays a song if this pin is connected to $V_{DD}$ Composes a song if this pin is connected to $V_{SS}$
3	TEST	This pin is used for testing. In normal operation, this pin should be either open or grounded.
4	RESET	Clears all address data if connected to $V_{DD}$
5	OUTPUT	Organ output
6	ENV	Enveloping circuit terminal
7	OSC 1	A resistor is connected between P7 and P8 as an oscillator
8	OSC 2	
9	$V_{SS}$	Negative power supply
10	$R_1$	Keyboard row line 1
11	$R_2$	Keyboard row line 2
12	$R_3$	Keyboard row line 3
13	$R_4$	Keyboard row line 4
14	$C_4$	Keyboard column line 4
15	$C_3$	Keyboard column line 3
16	$C_2$	Keyboard column line 2
17	$C_1$	Keyboard column line 1
18	$V_{DD}$	Positive power supply

## Operation Chart



\* RAM max. 47 notes, additional notes will not be stored in RAM

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**UM3511A****Functional Description****Oscillating Circuit**

The resistor  $R_1$  is connected externally to set the frequency at 64 KHz. Since the oscillation frequency is used as a time base for the tone, rhythm and tempo generators, its accuracy will affect the quality of the organ.

**Keyboard Scanning**

These are 4-row and 4-column inputs from the keyboard contacts. Four stages of FLIP-FLOP constitutes the keyboard scanning circuit.

**Tone Generator**

The tone generator is a programmed divider. Within the organ, 15 scales can be selected. The range of scales is from "G3" to "G5".

**Beat Generator**

The rhythm includes eight notes, including the following, for example 4/4:

- (1) a sixteenth note (a semiquaver rest)
- (2) an eighth note (a quaver rest)
- (3) a dotted eighth note
- (4) a quarter note (a crotchet rest)
- (5) a dotted quarter note
- (6) a half note (a minimum rest)
- (7) a dotted half note
- (8) a whole note (a semi-breve rest)

**Tempo**

Tempo is the number of  $\text{♩}$  in one minute. In the play mode, the tempo generator contains 8 different tempos. One tempo can be selected from the 8 available tempos, including 63, 78, 85, 104, 134, 156, 187, 234  $\text{♩}/\text{minute}$ .

**Melody ROM**

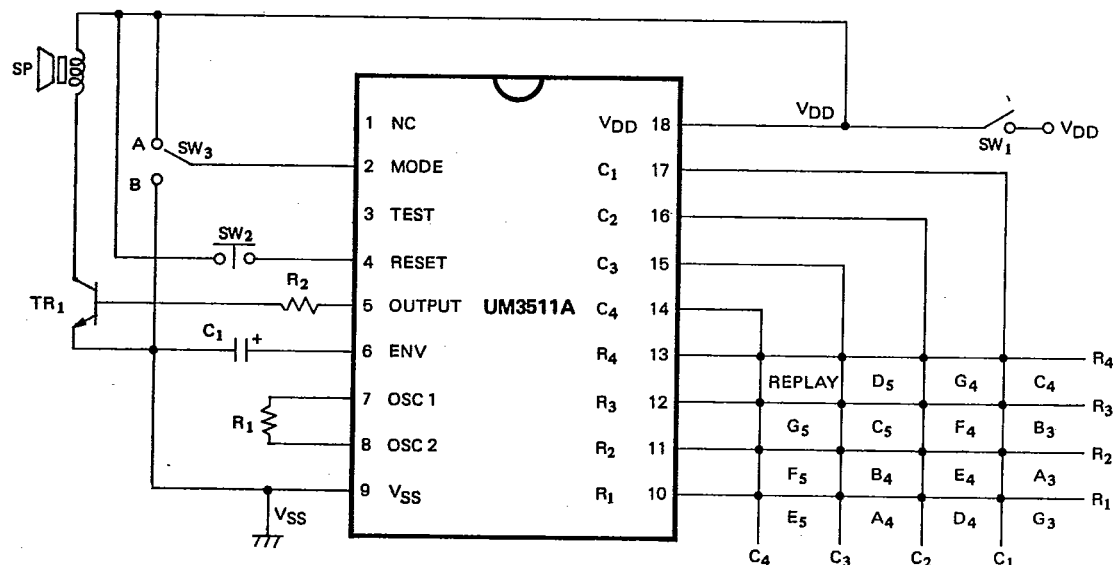
The mask ROM can memorize 512 words of 7 bits each. Of these, 4 bits are used for controlling the tone generator and 3 bits are used for controlling the beat generator and program tempo.

**Compose Mode Beat Generator**

A single tone is generated as long as the user presses any key in the composing mode. The interval between two keys is memorized in RAM. Maximum interval is 4 sec.

**Melody RAM**

The melody RAM can memorize 47 words. The melody is generated by pressing the keyboard, and memorizing in RAM. When pressing the replay button, the song composed will be played back from RAM.

**Application Circuit**

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**UM3511A****Recommended Value of External Components**

Components	Recommended Value	Unit
C <sub>1</sub>	47	μF
R <sub>1</sub>	750-800	KΩ
R <sub>2</sub>	1	KΩ
TR <sub>1</sub>	NPN: 9013	—
SW <sub>1</sub>	Toggle Switch	—
SW <sub>2</sub>	Push-button Switch	—
SW <sub>3</sub>	Toggle Switch	—
SP	8 ohm 0.2W Speaker	—

Note: Switch 3 has two positions: A Play mode B Compose mode. When SW<sub>3</sub> is set in the "A" position, one can listen to any of the 15 available songs.

When SW<sub>3</sub> is set in the "B" position, one can compose a song from "G3" to "G5". By pressing the replay button, the song composed will automatically play back.

**Songs Series List**

- |                                  |  |
|----------------------------------|--|
| 1. Hush Little Baby              | 9. Mary Had a Little Lamb              |
| 2. Twinkle Twinkle Little Star   | 10. Long Long Ago                      |
| 3. London Bridge Is Falling Down | 11. Santa Lucia                        |
| 4. Dream of Home And Mother      | 12. Little Brown Jug                   |
| 5. Christmas Carol               | 13. Butterfly                          |
| 6. Are You Sleeping              | 14. The Train Is Running Fast          |
| 7. The Farmer in the Dell        | 15. Close Encounters of the Third Kind |
| 8. In a Persian Market           |  |

**Bonding Diagram**