

PRELIMINARY SPECIFICATIONS



RCL Semiconductors Ltd.

16 Songs Melody Chip with Multi-Instrument Effects

C5481

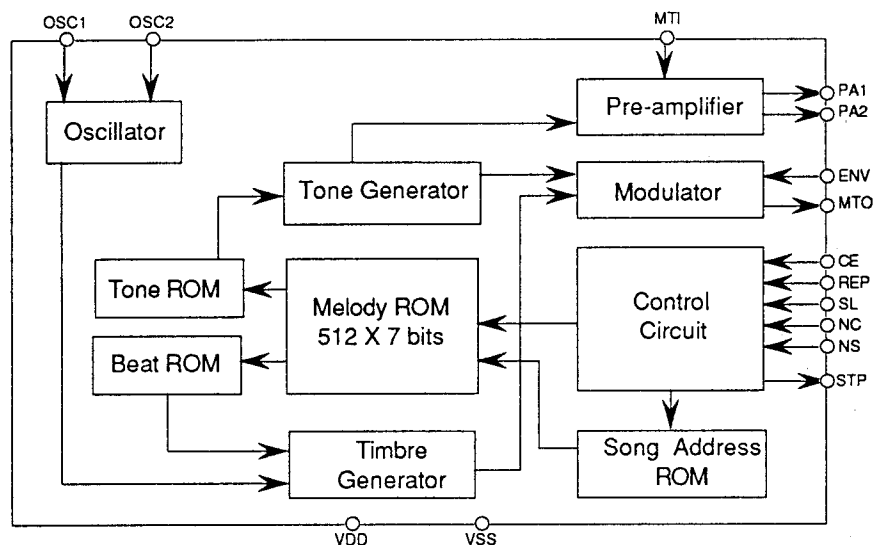
GENERAL DESCRIPTION

The C5481 is a silicon gate CMOS LSI which is designed to generate multi-instrument melody, customized by a ROM mask, through an external speaker or a piezo-buzzer. The chip is capable of generating a maximum of 16 songs with 3 instrument effects: piano, organ and mandolin, which provides more variety for listening than an ordinary melody chip. The device also includes a pre-amplifier circuit for external driver. A few external components are required for applications such as toys, door bells, telephones, etc.

FEATURES

- Wide power supply range(1.3- 5V).
- Built in RC oscillator, frequency adjustable by an external resistor.
- Built in envelope modulator and pre-amplifier.
- Low standby power dissipation.
- 3 timbres: piano, organ and mandolin
- 5 mask programmable tempos.
- 8 mask programmable beats
- 14 tones selectable.
- 512 note ROM, available up to 16 songs.
- 8 operation modes selected through user interface.
- Wide frequency range: (394 - 25KHz).
- Drives external speaker or piezo- buzzer through different transistor configurations.

BLOCK DIAGRAM



PIN DESCRIPTION

Symbol	Description
ENV	Enveloped song effect can be adjusted by connecting external RC circuit to this pin.
OSC1 OSC2	A resistor is connected across these pins to adjust the oscillator frequency.
VDD	Positive power supply.
VSS	Negative power supply.
STP	Output will be high at the end of play.
NS	Plays one for input high and all songs for input low.
NC	For testing only, left open for normal operation.
SL	Change to the next song when a rising edge is applied to this pin.
REP	The melody will repeat or stop automatically if this pin is connected to VDD or VSS respectively.
CE	Chip enable, high for enable and low for disable.
PA2	Preamplifier output #2.
PA1	Preamplifier output #1.
MTI	Modulated tone signal input to the preamplifier.
MTO	Modulated tone signal output.

ABSOLUTE MAXIMUM RATINGS

Parameter	Limits
Power supply voltage range	-0.3V to +5V
Input voltage range	VSS -0.3V to VDD +0.3V
Operating temperature range	0 to +70°C
Storage temperature range	-10 to +125°C

DC ELECTRICAL CHARACTERISTICS

Unless otherwise specified, Ta = 25°C, VDD = 1.5V, VSS = 0V.

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Conditions
Oscillating Frequency	f _{osc}	300	400	500	KHz	-
Operating Voltage Range	VDD	1.3	1.5	5	V	-
Standby Current	I _{STB}	-	-	12	μA	no load
Input Voltage Low	V _{IL}	V _{SS}	-	V _{SS} +0.3	V	-
Input Voltage High	V _{IH}	VDD-0.3	-	VDD	V	-
Input Current High	I _{IH}	1.5	-	6	μA	V _{IH} = VDD
Input Current Low	I _{IL}	-	-	0.1	μA	V _{IL} = VSS
ENV Pin Drive Current	I _{ENV}	500	-	-	μA	V _{ENV} = 0.8V
Preamplifier Output Current(PA1)	I _{OL}	200	-	1200	μA	V _{OL} = 0.8V
Preamplifier Output Current(PA2)	I _{OH}	200	-	1200	μA	V _{OH} = 0.7V

OPERATION MODES

	CE	SL	NS	REP	STATUS
1	0	X	X	X	Standby
2	1	0	0	0	First melody → Last melody → Stop
3		0	0	1	→ First melody ← Last melody
4		0	1	0	(P)th melody → Stop
5	1	0	1	1	→ (P)th melody
6	1		0	0	(P+1)th melody → Last melody → Stop
7	1		0	1	(P+1)th melody → Last melody ← First melody ←
8	1		1	0	(P+1)th melody → Stop
9	1		1	1	(P+1)th melody ←

*Note: (Pth) represents the present melody.

FUNCTIONAL DESCRIPTION**Oscillator and Control Circuit**

The frequency of the built in RC oscillator circuit can be adjusted by an external resistor to be set at about 400KHz. During standby condition, when CE is low, the oscillator is disabled. When CE goes high, the oscillator starts to oscillate. Since the oscillating frequency acts as the time base of the entire device, its accuracy will affect its functionality as well as the quality of the melody.

Pre-amplifier

During the standby condition, the pre-amp is disabled and PA1 is pulled up to VDD while PA2 is pulled down to VSS.

Modulator Circuit

Three selectable timbre effects (piano, organ or mandolin) are generated by the modulator circuit. Proper selection of R_{ENV} and C_{ENV} will affect the waveform at MTO (Fig.2).

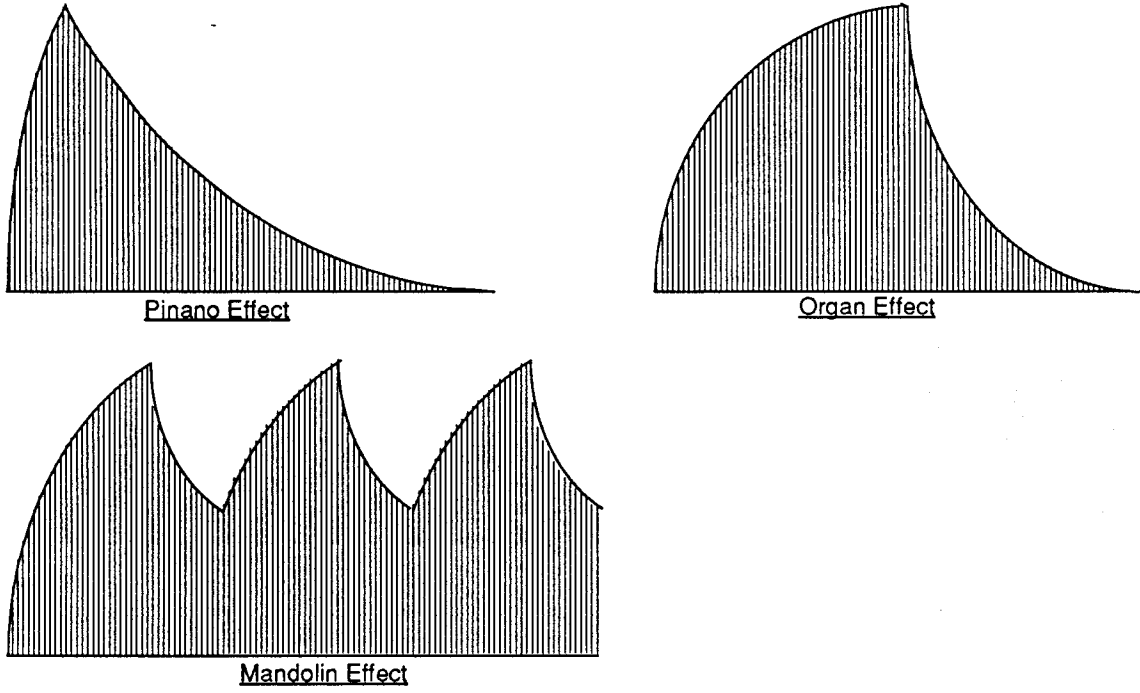


Fig2.Waveform at MTO

APPLICATION CIRCUITS

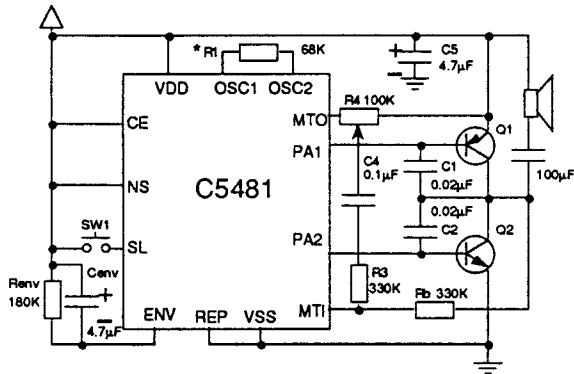


Fig 3a. Enveloped output

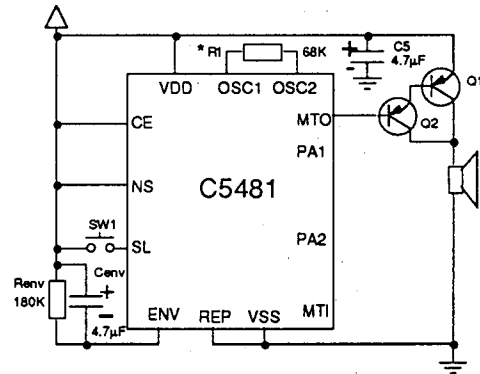


Fig 3b. One shot output through loudspeaker

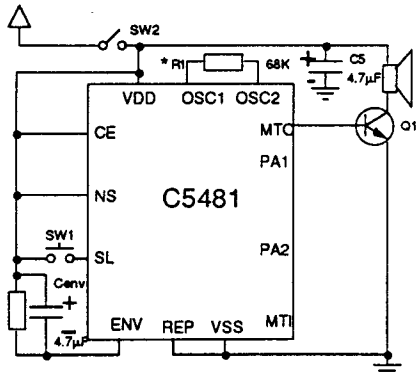


Fig 3c. Level hold output through loudspeaker

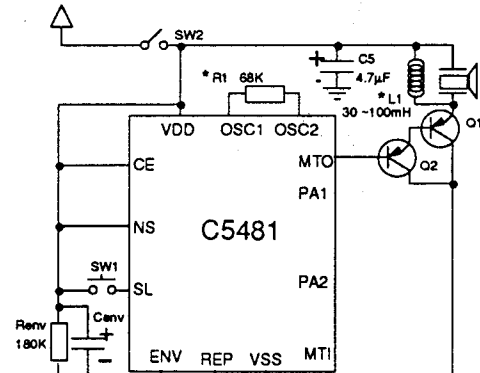


Fig 3d. One shot output through loudspeaker

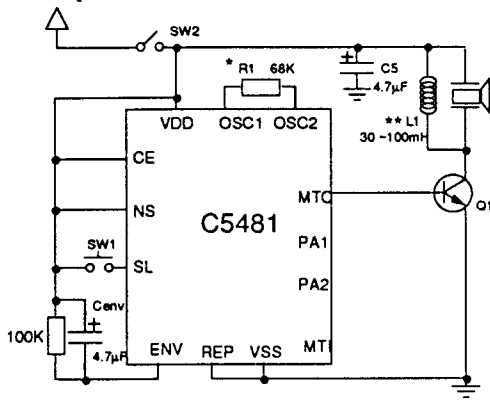
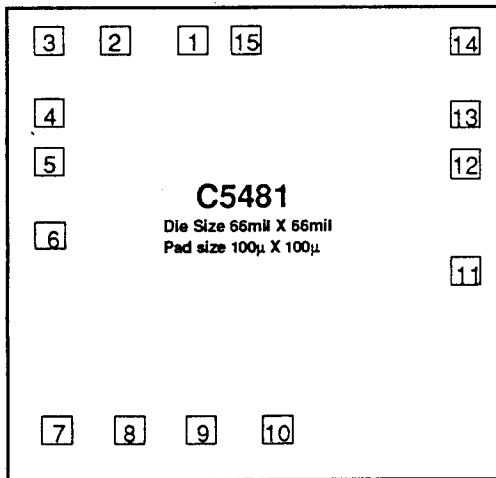


Fig 3e. Level hold output through piezo-buzzer

**The sound will become smaller if the inductor paralleled with piezo can be replaced by a 100K resistor.

PAD DIAGRAM



PAD Assignment	Coordinate (X, Y) [µm]
1. STP	(-266.8 , 648.1)
2. CE	(-527.2 , 648.1)
3. NC	(-747.4 , 648.1)
4. NS	(-747.4 , 389.7)
5. SL	(-747.4 , 209.7)
6. REP	(-747.4 , -49.7)
7. ENV	(-725.5 , -748.1)
8. VSS	(-481.7 , -748.1)
9. MTO	(-244 , -748.1)
10. PA1	(14.3 , -748.1)
11. PA2	(647.4 , -184.8)
12. MTI	(647.4 , 199.1)
13. OSC2	(647.4 , 379.1)
14. OSC1	(647.4 , 638.1)
15. VDD	(-88.8 , 648.1)

NOTE : Substrate should be connected to VSS or left floating.

C5481 Song Option List

Option I.D.	Content
1	Song 1 - Jing Bells Song 2 - Santa Claus is Coming to Town Song 3 - Silent Night, Holy Night Song 4 - Joy to the World Song 5 - Rudolph, the Red-nosed Reindeer Song 6 - We Wish You a Merry Christmas Song 7 - O Come, All Ye Faithful Song 8 - Hark, the Herald Angels Sing
2	Song 1 - The Hawaiian Wedding Song Song 2 - Try To Remember Song 3 - Aloha Oe Song 4 - Love Story Song 5 - Yesterday
3	Song 1 - American Patrol Song 2 - Rabbits Song 3 - Oh, My Darling, Clemenine Song 4 - Butterfly Song 5 - London Bridge Is Falling Down Song 6 - Row, Row, Row Your Boat Song 7 - Are You Sleeping Song 8 - Happy Birthday Song 9 - Joy Symphony Song 10 - Home, Sweet Home Song 11 - Wiegenlied Song 12 - Melody On Purple Bamboo

May 2, 1998.