OVERVIEW

The SM1131 is a high sound-quality melody CMOS-IC capable of performing sixteen pieces (in the sequential play mode) or twelve pieces (in the directly selected play mode) of music at the maximum. In addition to the two chordal melodies which differ in sound quality or have an identical melody, this melody CMOS-IC permits such rhythmic sounds (percussion) as a drum and a cymbal to be performed, too. Furthermore, it allows for a selection of play modes, such as Directly Selected, Sequential, One-Shot and Level-Hold.

FEATURES

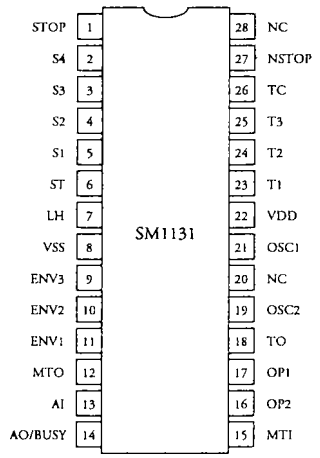
- –Maximum number of pieces performed
  16 pcs. in the sequential play mode
  12 pcs. in the direct selected play mode
- –Maximum number of notes programmable
  512 notes in Melody 1 and 512 notes in Melody 2
- –A tempo may be specified on a piece by piece basis.
- –A CR oscillator or ceramic oscillator circuit is available on a mask-option basis.
- –To indicate that a piece of music is being performed, a busy signal can be outputted on a mask-option basis.
- –A play may be forced to stop by means of a stop key.
- –A drum-cymbal percussion feature is available.
- –A dynamic loudspeaker has a push-pull drive feature built in.
- –A power-saver feature [out-of-play mode oscillation shutdown and pull-down resistance cut (S1 to S4) built in]
- –An extensible sound quality has the triple higher harmonics added.
- –A tremolo feature allows the triple higher harmonic to turn on and off.
- –28 pin SDIP(SM1131×××N)
- –28pin SOP(SM1131×××S)
- -The series is composed of four models.

(note) ××× is version name.

VERSION

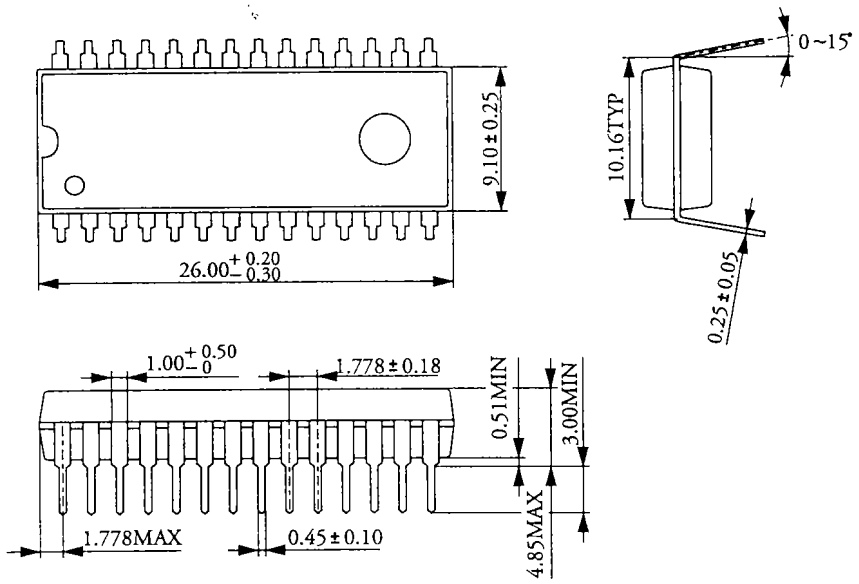
Mask options		Type name
Power supply	Oscilation	
standrad voltage(3.0V)	CR Oscilation	1 1 3 1 A ××
Low voltage (1.5V)	CR Oscilation	1 1 3 1 B ××
standrad voltage(3.0V)	Ceramic Oscilation	1 1 3 1 C ××
Low voltage (1.5V)	Ceramic Oscilation	1 1 3 1 D ××

PINOUT

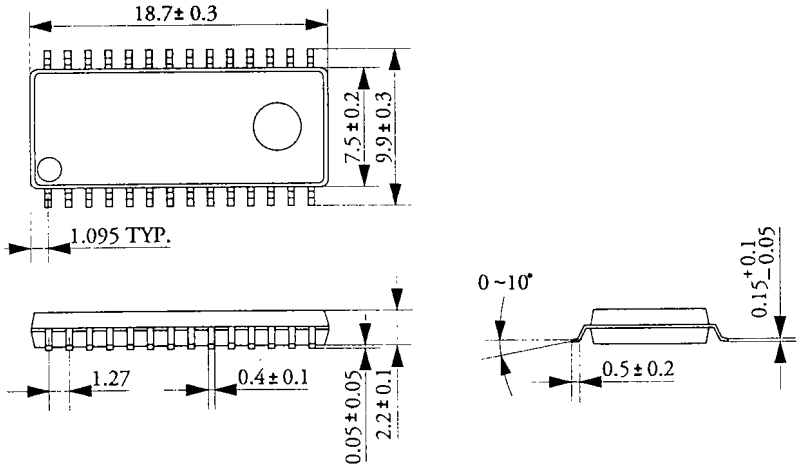


PACKAGE DIMENSIONS(unit : mm)

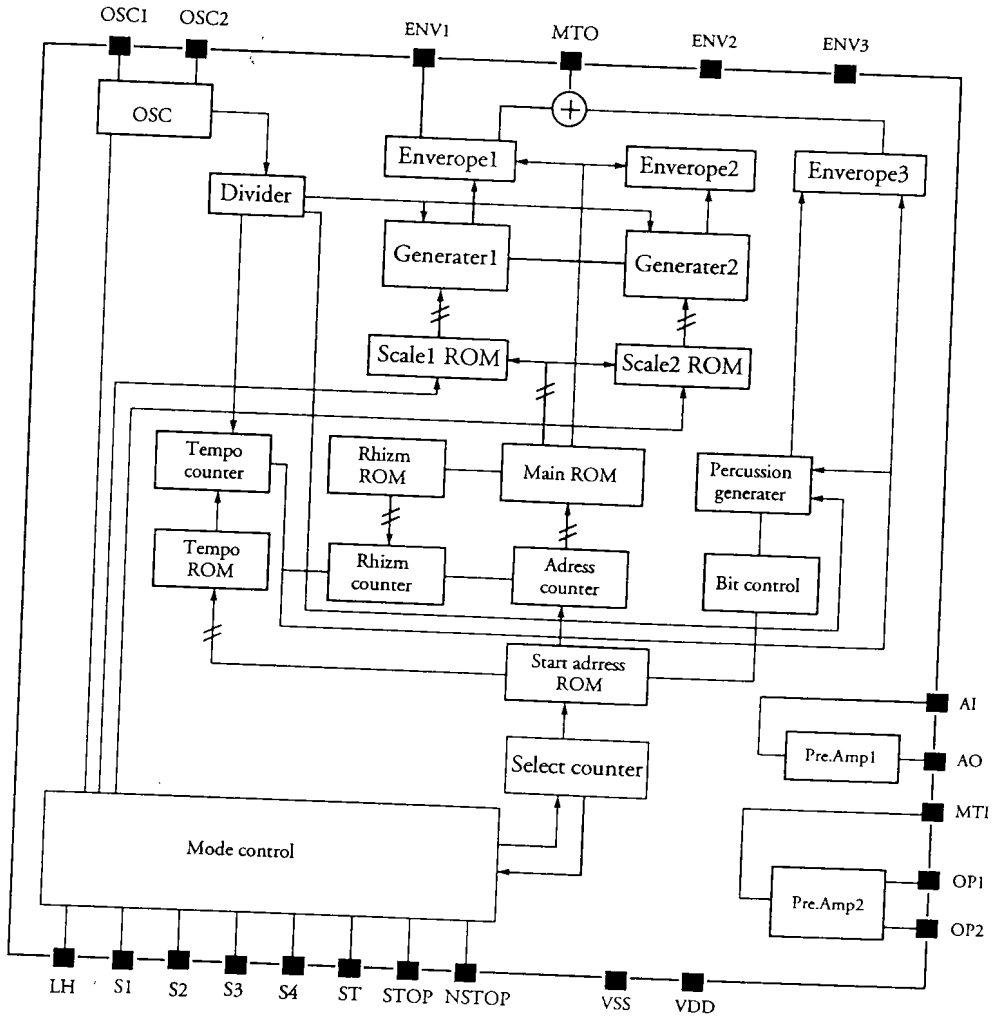
28pin SDIP



28pin SOP



BLOCK DIAGRAM



PIN DESCRIPTION

Pin no.	Pin name	i/o	description
1	STOP	i	Play stop pin; in the serial music mode, however, a subsequent pieceof music may be performed every time when one input to this pin is made. It has a pull-down resistor built in.
2 to 5	S4 to S1	i	Play mode setting pin; a pull-down resistor built in.
6	ST	i	Play control pin; a pull-down resistor is built in.
7	LH	i	Play operation selector pin; An input of Level "H" or "L" will set the LEVE -HOLD or ONE-SHOT play mode, respectively.
8	VSS	-	ground pin
9	ENV3	-	Pin to connect a percussion envelope resistor and a capacitor
10	ENV2	-	Pin to connect a resistor and a capacitor for Melody 2 Envelope
11	ENV1	-	Pin to connect a resistor and a capacitor for Melody 1 Envelope
12	MTO	o	Play signal output
13	AI	i	Single-transistor drive type input pin; Level "H" in the out-of-play mode
14	AO/BUSY	o	To indicate Either single transistor drive type output pin or in-operation indicator busy signal pin is selected on a mask-option basis; Level "L" in the out-of-play mode
15	MTI	i	Low-frequency amplifier circuit input pin; Level "L" in the out-of-play mode
16 17	OP2 OP1	o o	Bipolar transistor push-pull drive type output pin; with Pin OP2 at Level "L" in the out-of-play mode while Pin OP1 has a high impedance level.
18	TO	o	The frequency obtained with the oscillating frequency divided by 8192 is outputted, which signifies an output of 48.82Hz. at an oscillating output frequency of 400KHz.
19	OSC2	o	Either CR or ceramic oscillation is selectable on a mask-option basis. With CR oscillation, the oscillating resistor is connected to this pin. A resistor with a typical resistance of 33 kilo-ohms is to be connected between both resistors. With ceramic oscillation, a ceramic oscillator and an external capacitance should be connected between both pins.
21	OSC1	i	
22	VDD	-	Power supply pin
23 to 25	T1 to T3	i	Test pin; a pull-down resistor is built in.
26	TC	i	Test pin; a pull-down resistor is built in.
27	NSTOP	i	Sound stop input pin; Play had left stopped even if an ST input is available. The music selection counter, however, is to have readings incremented.

SPECIFICATIONS

Absolute Maximum Ratings

V_{SS}= 0V unless otherwise noted

Parameter	Symbol	condition	Rating	Unit
Supply voltage	V_{DD}		−0.3 to 7.0	V
Input voltage range	V_{IN}		VSS−0.2 to VDD+0.2	V
Operating temperature	T_{OPR}		−20 to +80	℃
Strage temperature	T_{STG}		−40 to +125	℃
Soldering temperature	T_{SLD}		255	℃
Soldering time	t_{SLD}		10	sec

Electrical Characteristics

Standard voltage

Ta= 25℃, V_{SS}= 0Vunless otherwise noted

Parameter	Symbol	Condition	Rating			Unit
			MIN	TYP	MAX	
Supply voltage	V_{DD}		1.2	3.0	5.5	V
Curent consunpution 1	I_{DD1}	Out of PLay			1.0	μA
Curent consunpution 2	I_{DD2}	In play, MTI=Vss, ENV1, ENV2, ENV3 , OP1, and OP2 are open		2.0	4.0	mA
Input voltage*1	V_{IH}		V_{DD}-0.2V		V_{DD}	V
	V_{IL}		Vss		Vss+0.2	V
Input current 1 *2	I_{IH1}	V_{IH1}=3.0V	4.0	9.0	18.0	μA
	I_{IL1}	V_{IL1}=0.0V			0.1	μA
AI Input current 2 (when AO)	I_{IH2}	AI=3.0V	2.5	5.0	10.0	μA
	I_{IL2}	AI=0.0V	2.5	5.0	10.0	μA
AI Input current 3 (when BUSY)	I_{IH3}	AI=3.0V			0.1	μA
	I_{IL3}	AI=0.0V			0.1	μA
LH,NSTOP Input current 4	I_{IH4}	V_{IH2}=3.0V			0.1	μA
	I_{IL4}	V_{IL2}=0.0V			0.1	μA
OP1OP2 Output current 1	I_{OH1}	V_{OH1}=0.7V	0.4	1.0	2.0	mA
	I_{OL1}	V_{OL1}=2.3V	0.4	1.0	2.0	mA
AO/BUSY Output current 2	I_{OH2}	V_{OH2}=1.5V, AI=0.0V	2.5			mA
	I_{OL2}	V_{OL2}=1.5V, AI=3.0V	1.8			mA
ENV1,2,3Outputcurrent 3	I_{OL3}	V_{OL3}=3.0V	10			mA
TO Oscilator frequency 1	f_{OSC1}	External R=35.3kΩ(*3)	320	400	480	kHz
TO Oscilator frequency 2	f_{OSC2}	Ceramic oscilation	-1.0		+1.0	%
TO Oscilator stability	Δf /f	CR oscilation		1		%/0.1V

*1) S1 to S4,ST,STOP,NSTOP,LH

*2) ST,STOP,ST,S1 to S4 (condition is power-saver function)

*3) Extenal resister for CR oscilation change by supply-voltage

note

OP1,OP2 Current 1 = 1 mA (typical) while working at V_{DD} = 3.0 volts

The AI Input Currents 2 and 3 are dependent upon the mask-option conditions at the AO/BUSY pins.

Low voltage

Ta= 25℃, V_{SS}= 0V,V_{DD}=1.5Vunless otherwise noted

Parameter	Symbol	Condition	Rating			Unit
			MIN	TYP	MAX	
Supply voltage	V_{DD}		1.2	1.5	5.5	V
curent consunpution 1	I_{DD1}	Out of PLay			1.0	μA
curent consunpution 2	I_{DD2}	In play, MTI=V_{SS}, ENV1, ENV2, ENV3 , OP1, and OP2 are open		1.5	1.0	mA
Input voltage*1	V_{IH}		V_{DD}-0.2V		V_{DD}	V
	V_{IL}		V_{SS}		V_{SS}+0.2	V
Input current 1 *2	I_{IH1}	V_{IH1}=1.5V	0.7	1.5	3.0	μA
	I_{IL1}	V_{IL1}=0.0V			0.1	μA
AI Input current 2 (when AO)	I_{IH2}	AI=1.5V	1.2	2.5	5.0	μA
	I_{IL2}	AI=0.0V	1.2	2.5	5.0	μA
AI Input current 3 (when BUSY)	I_{IH3}	AI=1.5V			0.1	μA
	I_{IL3}	AI=0.0V			0.1	μA
LH,NSTOP Input current 4	I_{IH4}	V_{IH2}=1.5V			0.1	μA
	I_{IL4}	V_{IL2}=0.0V			0.1	μA
OP1OP2 Output current 1	I_{OH1}	V_{OH1}=0.7V	0.4	1.0	2.0	mA
	I_{OL1}	V_{OL1}=0.8V	0.4	1.0	2.0	mA
AO/BUSY Output current 2	I_{OH2}	V_{OH2}=0.75V, AI=0.0V	0.4			mA
	I_{OL2}	V_{OL2}=0.75V, AI=3.0V	0.4			mA
ENV1,2,3Outputcurrent 3	I_{OL3}	V_{OL3}=1.5V	2.0			mA
TO Oscilator frequency 1	f_{OSC1}	External R=31.4kW(*3)	320	400	480	kHz
TO Oscilator frequency 2	f_{OSC2}	Ceramic oscilation	-1.0		+1.0	%
TO Oscilator stability	Δf /f	CR oscilation		1		%/0.1V

*1) S1 to S4,ST,STOP,NSTOP,LH

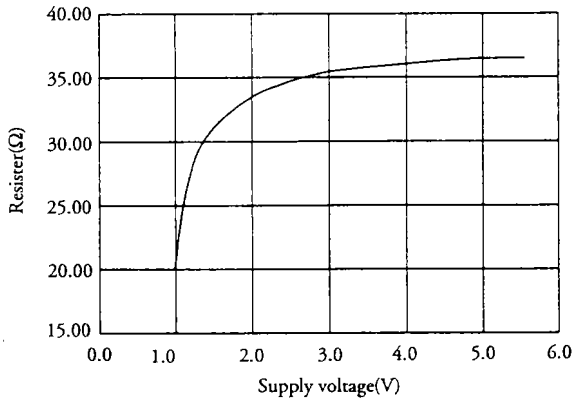
*2) ST,STOP,ST,S1 to S4 (condition is power-saver function)

*3) Extenal resister for CR oscilation change by supply-voltage

note

OP1,OP2 Current 1 = 1 mA (typical) while working at V_{DD} = 1.5 volts.

The AI Input Currents 2 and 3 are dependent upon the mask-option conditions at the AO/BUSY pins.



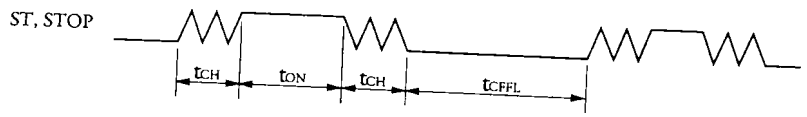
FUNCTIONAL DESCRIPTION

Chattering Prevention Feature

ST and STOP pins have a chattering prevention circuit built in. Chattering should fall within tS. The chattering time is as illustrated below.

$t_{CH} < t_S$, $t_{ONH} \geq t_S$

$t_{OFFL} > 65536 / f_{OSC}$ (f_{OSC} is oscillating frequency)



Envelope Feature

An envelope may be attached to each of Melody 1, Melody 2 and Percussion according to the time constant based on those resistors and capacitors which are connected to Pins ENV 1 thru 3. With the EVN pins fixed at Level "L", a play is played without an envelope.

ENV1 Melody 1 Envelope Control Pin
ENV2 Melody 2 Envelope Control Pin
ENV3 Percussion Envelope Control Pin

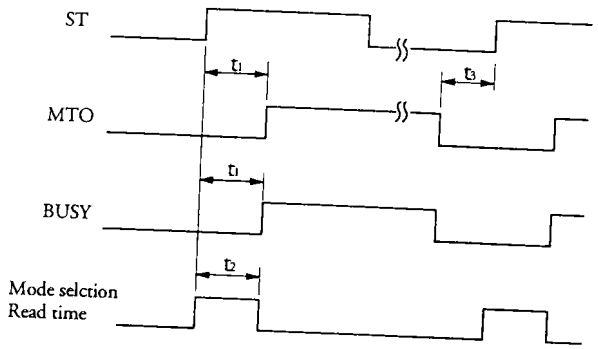
Play Starting Time

Play Mode Control Pins S1 to S4 validate the mode which has been set in Timing t2.

(d) To replay after completion of play, 15ms or more is required for t3 following the turn-off of the busy signal.

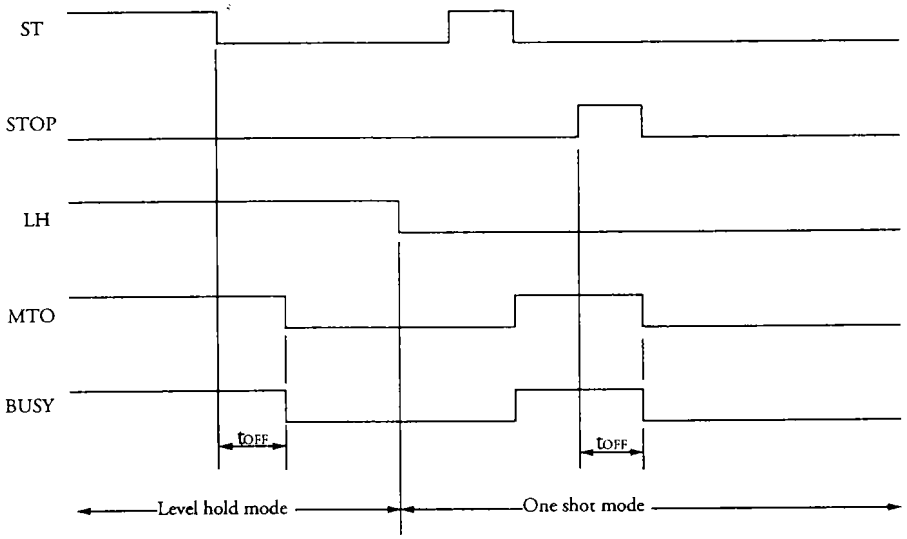
$t_1 = t_S + (4096/f_{OSC}) + (256/f_{OSC})$

$t_2 = t_1$, $t_3 \geq 15ms$



Play Stop Time

Play stop time (tOFF)is between 0 and (16384/fosc)+(256/fosc).

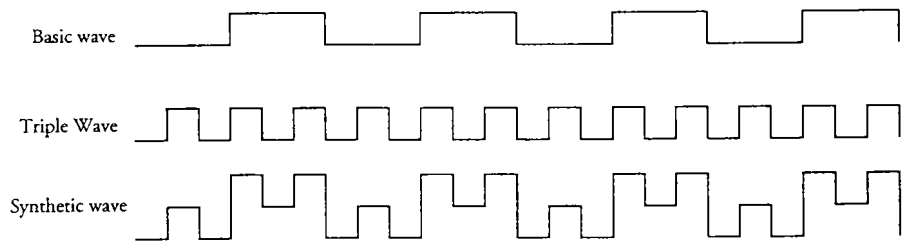


Wave form

The mask-option feature may be used to select whether or not a triple wave of Melody 1 and Melody 2 be available on a piece by piece basis.

Melody 1, moreover, has a tremolo feature, which turns on and off a triple wave at approximately 8Hz. The availability of tremolo may be set on a sound by sound basis. The tremolo feature, moreover, may be set irrespective of whether the triple wave is set.

The illustration indicates the case where a triple wave is synthesized in Melody 1 or Melody 2. In reality, however, this wave-form has another melody and percussion wave-forms synthesized and outputted.



Wave-form with a Triple Wave Set

Play control

Pins S1 to S4 are used to select either DIRECTLY SELECTED or SEQUENTIAL play mode. And the ST pin should be used to start a play. In the demonstration mode, moreover, the STOP pin allows for a transfer to the subsequent piece of music.

One-shot mode

	S4	S3	S2	S1	ST	STOP	LH	Operation
1	L	L	L	L	↑	-	L	First piece of music start ⇒ stop
2	L	L	L	H	↑	-	L	Second piece of music start ⇒ stop
3	L	L	H	L	↑	-	L	Third piece of music start ⇒ stop
4	L	L	H	H	↑	-	L	Fouth piece sof music tart ⇒ stop
5	L	H	L	L	↑	-	L	Fifth piece of music start ⇒ stop
6	L	H	L	H	↑	-	L	Sixth piece of music start ⇒ stop
7	L	H	H	L	↑	-	L	Seventh piece of music start ⇒ stop
8	L	H	H	H	↑	-	L	Eighth piece of music start ⇒ stop
9	H	L	L	L	↑	-	L	Nineth piece of music start ⇒ stop
10	H	L	L	H	↑	-	L	Tenth piece of music start ⇒ stop
11	H	L	H	L	↑	-	L	Elevrnth piece of music start ⇒ stop
12	H	L	H	H	↑	-	L	Twelveth piece of music start ⇒ stop
13	H	H	L	L	L	↑	L	Select counter increment ⇒ Play ⇒ Stop
14	H	H	L	L	↑	-	L	A piece of music setted select counter start ⇒ Stop ⇒ Select counter increment
15	H	H	H	×	↑	-	L	A piece of music setted select counter start ⇒ Last piece of music stop ⇒ Select counter increment
16	H	H	×	↑	L	-	L	Select counter set first piece.not play

Level-hold mode

	S4	S3	S2	S1	ST	STOP	LH	Operation
1	L	L	L	L	H	-	H	1st piece of music start ⇒ ST go "L" and music stop
2	L	L	L	H	H	-	H	2nd piece of music start ⇒ ST go "L" and music stop
3	L	L	H	L	H	-	H	3rd piece of music start ⇒ ST go "L" and music stop
4	L	L	H	H	H	-	H	4th piece of music start ⇒ ST go "L" and music stop
5	L	H	L	L	H	-	H	5th piece of music start ⇒ ST go "L" and music stop
6	L	H	L	H	H	-	H	6th piece of music start ⇒ ST go "L" and music stop
7	L	H	H	L	H	-	H	7th piece of music start ⇒ ST go "L" and music stop
8	L	H	H	H	H	-	H	8th piece of music start ⇒ ST go "L" and music stop
9	H	L	L	L	H	-	H	9th piece of music start ⇒ ST go "L" and music stop
10	H	L	L	H	H	-	H	10th piece of music start ⇒ ST go "L" and music stop
11	H	L	H	L	H	-	H	11th piece of music start ⇒ ST go "L" and music stop
12	H	L	H	H	H	-	H	12th piece of music start ⇒ ST go "L" and music stop
13	H	H	L	L	H	H	H	Select counter increment ⇒ Music start ⇒ ST go "L" and music stop
14	H	H	L	L	H	-	H	A piece of music setted select counter start ⇒ ST go "L" and music stop ⇒ Select counter increment
15	H	H	H	×	L	-	H	A piece of music setted select counter start ⇒ Continiously play ⇒ ST go "L" and music stop ⇒ Select counter increment
16	H	H	×	↑	L	-	H	Select counter set first piece.not play

* To set any mode, S1 to S4 should be read in upon startup of ST.

1 to 12: DIRECTLY SELECTED Play Mode: The piece of music which has been selected by means of S1 thru S4 is performed.

13 and 14: SEQUENTIAL play (demonstration) Mode: Pieces of music are performed subsequently one by one.

15: SEQUENTIAL ALL-PIECE PLAY Mode

16: Clear the music selection counter. (Even if the ST should try to be started up during the play, however, it will not be accepted.)

* In Music Selection Code 13, a STOP input would make a play with a retrigger available.

* The ONE-SHOT or LEVEL-HOLD play is selected by means of the L/H pin.

Power-Saving Type Pull-down Resistor

Pull-down Resistors S1 to S4 are connected immediately after an input has entered Pin ST, and for a duration of 4096/fosc (sec) with the circuit powered on. In any other mode, they are not connected. Pin S1, however, has the pull-down resistor normally connected whenever the preceding play may have done in the sequential play mode.

Music Selection Counter

To set a piece of music to be performed, the piece number selected in each mode should be set in the music selection counter in the interior. If the play mode has changed (e.g. from the sequential individual piece play mode to the sequential all-piece play mode) after setting a piece of music, the play will start from the music which has been set immediately before. A maximum of up to 16 pieces, meanwhile, may be set in the music selection counter on a mask-option basis.

Immediately after powered on, the SM1131XXXN has the power-on clearance feature functioned so that the first piece will be set in the music selection counter.

Mask Option Chart

The features selectable on a mask-option basis are as summarized in a table below.

Oscillator Circuit: Select CR or ceramic oscillation according to the application.

A0/BUSY Pin: Either AO pin, preamplifier output, or BUSY pin, in-operation indicator, is selected at the AO/BUSY output pins.

Power Supply Voltage: Push-pull Driver Output Pins OP1 and OP2 have a power supply voltage of either 1.5 or 3.0 volts selected at an output current of 1 ma.

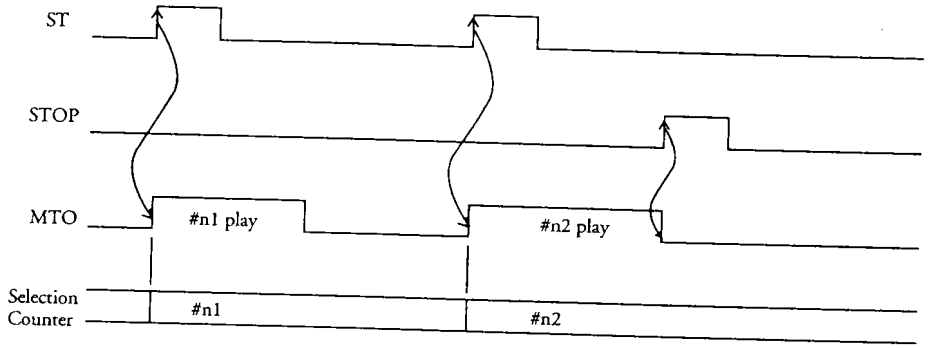
* Any other mask-option feature is dependent upon the music-oriented specification.

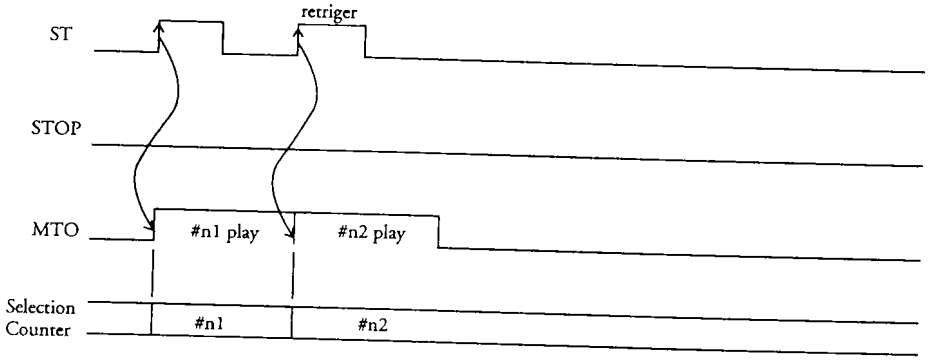
Function	Seletion condition	
OScilation Circuit	CR oscilation	Ceramic oscilation
AO/BUSY pin	AO output	BUSY output
Supply voltage	1.5V(low voltage)	3.0V(satandard voltage)
Trigger (ST pin)	Available	Unavailable
number in Sequential mode	1 to 16 pieces of music	

Play Timing Chart

Directly Selected Play Mode (in the ONE-SHOT play mode)

S4	S3	S2	S1	LH
L	×	×	×	H
H	L	×	×	H



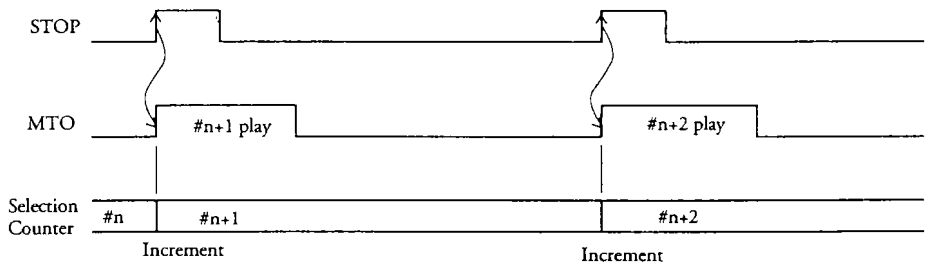


** (ignored with RETRIGGER-FREE selected on a mask-option basis)

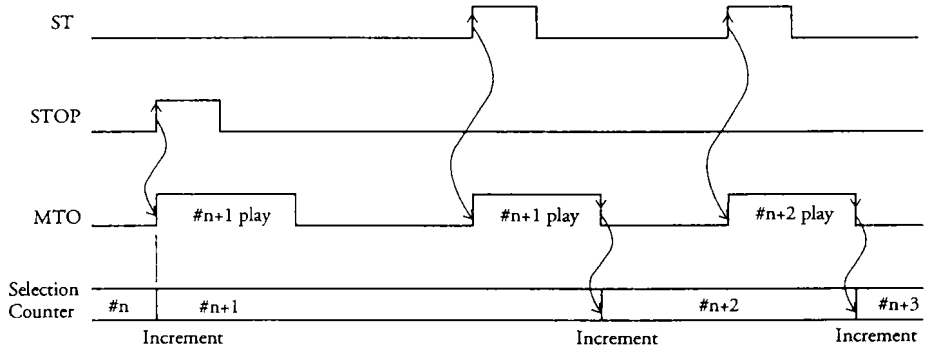
* #n1 and #n2 represent the piece number which will be set in the music selection counter with S1 thru S4 upon startup of ST.

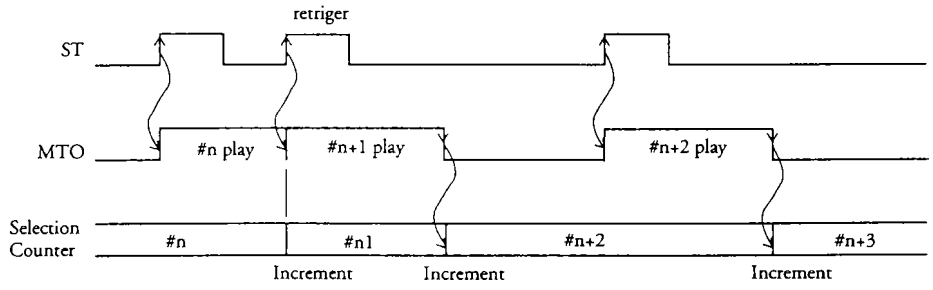
Sequential Play Mode (in the ONE-SHOT play mode)

S4	S3	S2	S1	LH
H	H	L	L	L



* In the sequential play mode, the STOP pin has the function of starting a play after incrementing the music selection counter.

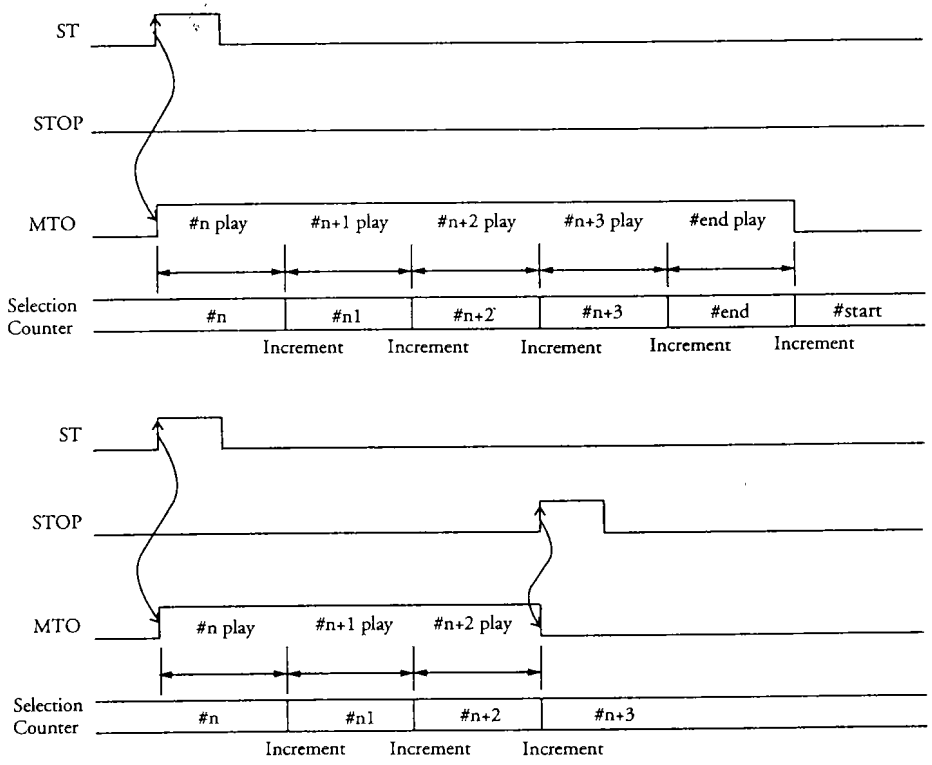




* #n represents the piece number which has been set in the music selection counter prior to the startup of a play.
* In the sequential play mode, the ST pin allows for the play of a piece selected in the music selection counter. After completion of the play, it increments the music selection counter.

Sequential All-Piece Play Mode (in case of a one-shot play)

S4	S3	S2	S1	LH
H	H	H	L	L

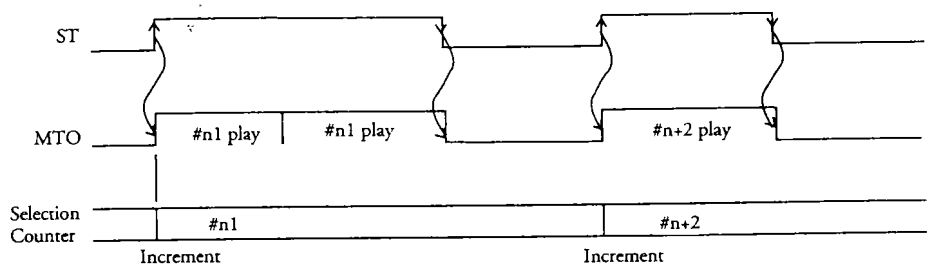


**#n represents the piece number which has been set in the music selection counter prior to the startup of a

play.

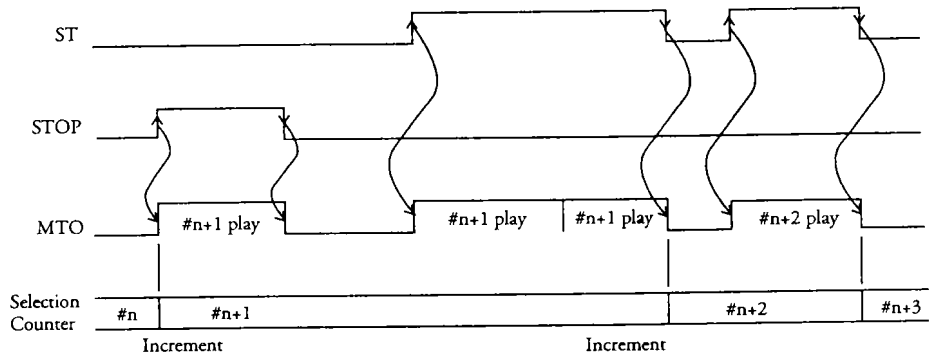
Directly Selected Play Mode (in the LEVEL-HOLD play mode)

S4	S3	S2	S1	LH
L	×	×	×	H
H	L	×	×	H



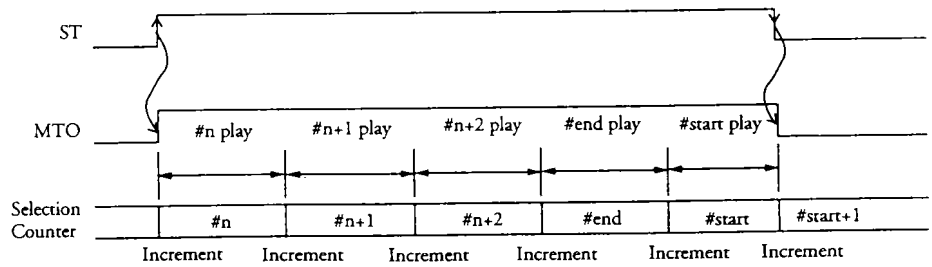
* #n1 and #n2 represent the piece number which will be set in the music selection counter with S1 thru S4 upon startup of ST.

S4	S3	S2	S1	LH
H	H	L	L	H



Sequential Play Mode (in the LEVEL-HOLD play mode)

S4	S3	S2	S1	LH
H	H	H	L	H



Sequential All-Piece Play Mode (in the LEVEL-HOLD play mode)

* #n represents the piece number which has been set in the music selection counter prior to the startup of a play.

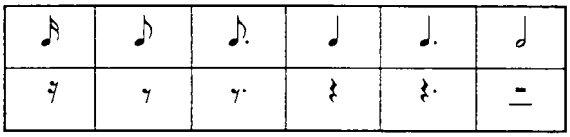
Music-Oriented Specification

Maximum Number of Program Steps

A maximum of up to 512 steps are programmable on a mask-option basis in a built-in ROM. One step allows for such settings as interval, availability of tremolo, sound length, tie and pause for Melody 1, and interval, sound length, tie and pause for Melody 2. On a piece by piece basis, moreover, it is possible to set a tempo, availability of triple sound for Melody 1/2, availability of percussion and rhythm.

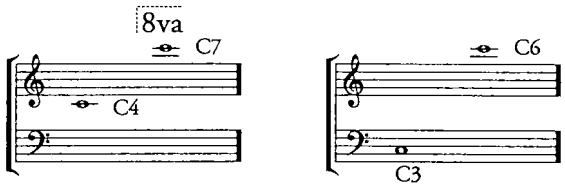
Sound Length

A total of 12 sound lengths are available by the use of six note plus tie.



Compass and Scale

It is possible to select either C4 thru C7 or C3 thru C6 on a mask-option basis and to use 32 intervals as a scale in three octaves for Melodies 1 and 2. Melody 1 and Melody 2, moreover, are allowed to have different scale ranges.



Percussion Function

An alteration of the mask program will make the percussion feature selectively available on a piece by piece basis. For rhythms, moreover, it is possible to select a time of simple duple, simple triple or quadruple.

Tempo

Fosc=400.000kHz

♩=	Tempo
732	
366	
244	Prestissimo
183	Prest
146	Allegro
122	Moderato
105	
91.6	Adante
81.4	
73.2	Adgio
66.6	Larghetto
61.0	
56.3	
52.3	Largo
48.8	
45.8	

Scale Chart 1

CLK=fosc=400.000kHz

Name	Output Frequency (Hz)	Absolute Frequency (Hz)	Error (cent)	DATA
C4	261.44	261.63	−1.27	FF
C#4	277.78	277.18	+3.73	F0
D4	293.69	293.67	+0.09	E3
D#4	311.53	311.13	+2.20	D6
E4	330.03	329.63	+2.12	CA
F4	349.04	349.23	−0.94	BF
F#4	370.37	369.99	+1.78	B4
G4	392.16	392.00	+0.69	AA
G#4	414.08	415.31	+5.14	A1
A4	438.60	440.00	−5.53	98
A#4	466.20	466.16	+0.15	8F
B4	493.83	493.88	−0.19	87
C5	524.93	523.25	+5.56	7F
C#5	555.56	554.37	+3.70	78
D5	584.80	587.33	−7.49	72
D#5	623.05	622.25	+2.23	6B
E5	660.07	659.26	+2.12	65
F5	701.75	698.46	+8.15	5F
F#5	740.74	739.99	+1.76	5A
G5	784.31	783.92	+0.87	55
G#5	833.33	830.61	+5.67	4C
A5	877.19	880.00	−5.53	4C
A#5	925.93	932.33	−11.93	48
B5	995.03	987.77	+12.67	43
C6	1041.67	1046.50	−8.01	40
C#6	1111.11	1108.73	+3.71	3C
D6	1169.59	1174.66	−7.49	39
D#6	1234.57	1244.50	−13.87	36
E6	1307.19	1318.51	−14.97	33
F6	1388.89	1396.91	−9.97	30
F#6	1481.48	1479.97	+1.77	2D
G6	1550.39	1567.98	−19.53	2B
G#6	1666.67	1661.22	+5.67	28
A6	1754.39	1760.00	−5.53	26
A#6	1851.85	1864.65	−11.93	24
B6	1960.78	1975.53	−12.97	22
C7	2083.33	2093.01	−8.02	20

* Three octaves are available in C4 to C7.

Scale Chart 2

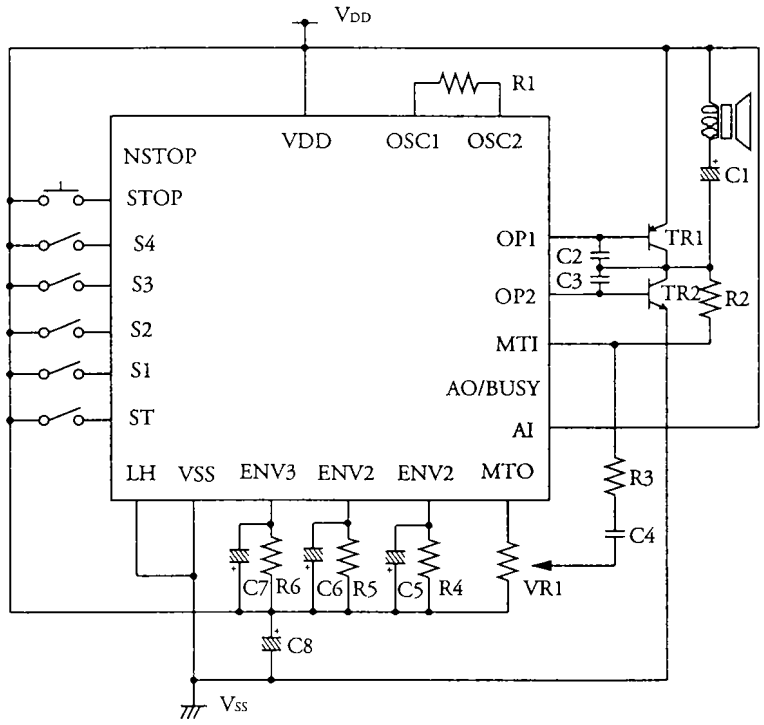
CLK=fosc=400.000kHz

Name	Output Frequency (Hz)	Absolute Frequency (Hz)	Error (cent)	DATA
C3	130.72	130.81	−1.27	FF
C#3	138.89	138.59	+3.73	F0
D3	146.85	146.83	+0.09	E3
D#3	155.77	155.56	+2.20	D6
E3	165.02	164.81	+2.12	CA
F3	174.52	174.61	−0.94	BF
F#3	185.19	185.00	+1.78	B4
G3	196.08	196.00	+0.69	AA
G#3	207.04	207.65	−5.14	A1
A3	219.30	220.00	−5.53	98
A#3	233.10	233.08	+0.15	8F
B3	246.92	246.94	−0.19	87
C4	262.47	261.63	+5.56	7F
C#4	277.78	277.18	+3.70	78
D4	292.40	293.67	−7.49	72
D#4	311.53	311.13	+2.23	6B
E4	330.04	329.63	+2.12	65
F4	350.88	349.23	+8.15	5F
F#4	370.37	369.99	+1.76	5A
G4	392.16	392.00	+0.87	55
G#4	416.67	415.31	+5.67	4C
A4	438.60	440.00	−5.53	4C
A#4	462.97	466.16	−11.93	48
B4	497.52	493.88	+12.67	43
C5	520.84	523.25	−8.01	40
C#5	555.56	554.37	+3.71	3C
D5	584.80	587.33	−7.49	39
D#5	617.29	622.25	−13.87	36
E5	653.60	659.26	−14.97	33
F5	694.45	698.46	−9.97	30
F#5	740.74	739.99	+1.77	2D
G5	775.20	783.92	−19.53	2B
G#5	833.34	830.61	+5.67	28
A5	877.20	880.00	−5.53	26
A#5	925.93	932.33	−11.93	24
B5	980.39	987.77	−12.97	22
C6	1041.67	1046.50	−8.02	20

* Three octaves are available in C4 to C7.

Application Circuits

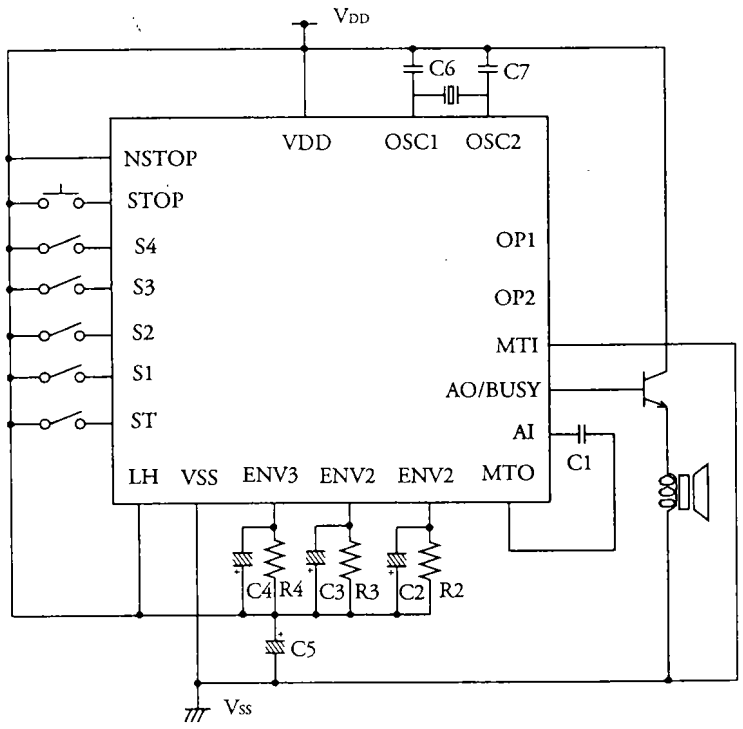
push-pull drive circuit(One-shot mode : LH="L")



Oscilation type is CR oscilation

C1	100μF	C6	4.7μF	R2	330kΩ	VR1	100kΩ
C2	0.02μF	C7	1.0μF	R3	100～470kΩ		
C3	0.02μF	(C8)	100μF	R 4	100～470kΩ	TR1	2SA683 2SA684
C4	0.1μF			R5	100～470kΩ		
C5	4.7μF	R1	33kΩ	R6	100～470kΩ	TR2	2SC1383 2SC1384

1 Tr drive circuit(Level-hold mode : LH="H")



Oscilation type is Ceramic oscilation

C1	0.1μF	R2	100~470kΩ	TR1	2SC1383
C2	4.7μF	R3	100~470kΩ		2SC1384
C3	4.7μF	R4	100~470kΩ	Ceramic oscillator	
C4	1.0μF			CSB400P	
C5	100μF				
C6	220pF				
C7	220pF				