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AMENDENT HISTORY

Version	Date	Description
Ver 1.0	April 30, 2008	First issue

1 INTRODUCTION

The SNC82169A is a single chip 12-channel MIDI compatible wave-table/voice synthesizer. Equipped with a powerful 8-bit controller and 24 I/O pins, it provides a low-cost MIDI sound system solution. It's low power consumption and operating range makes it ideal for all battery operated devices using MIDI or voice synthesis.

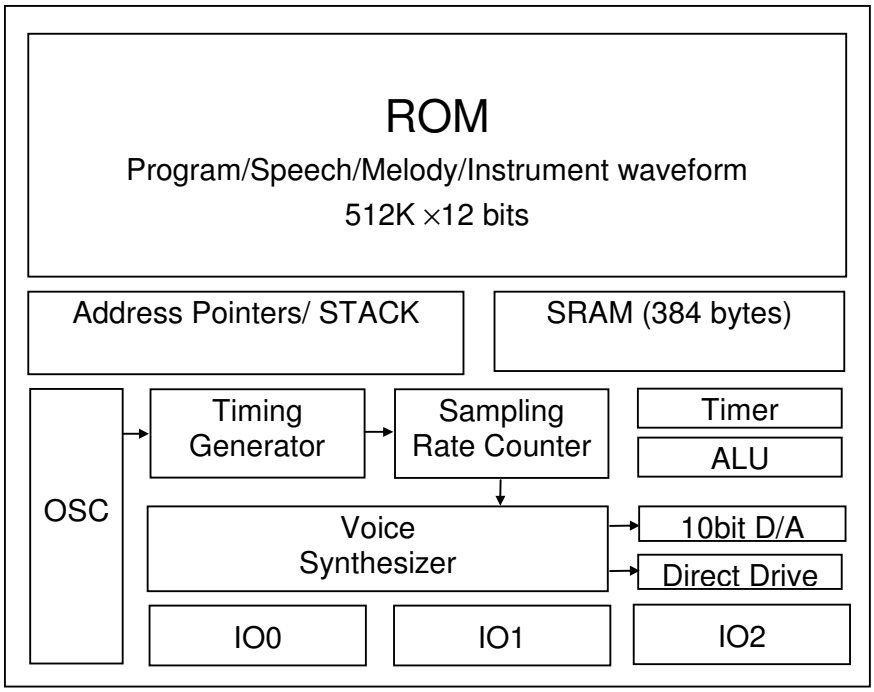
2 FEATURES

- Single Power Supply 2.4V – 5.5V
- Powerful Built-in 8-bit Controller
- Three 8-bit I/O ports
- 384*8 bits RAM
- Maximum 64k program ROM
- 512K*12 shared ROM for program and voice data
- Readable ROM code data
- 12-voice Polyphony through a high-quality speech synthesizer
- Mark Event Supported in both Wave and Melody.
- Individual adaptive playing speed from 4k-64kHz for all 12 channels
- Automatic repetition for each channel
- Volume modulation controlled by embedded multiplier
- One digital mixers with saturation control
- One built-in 10-bit current mode DA converters
- **Analog** Direct Drive speaker circuit.
- System clock: 16.384M Hz (RC-type or Crystal Option)
- 2 MIPS CPU power free to user
- Low Voltage Reset
- ESD improve

3 PIN ASSIGNMENT

Symbol	I/O	Function Description
P00 ~ P07	I/O	Bit7 ~ Bit0 of I/O port 0
P10 ~ P17	I/O	Bit7 ~ Bit0 of I/O port 1
P20 ~ P27	I/O	Bit7 ~ Bit0 of I/O port 2
VDDVR	P	Positive power supply for ROSC
GNDVR	P	Negative power supply for ROSC
VDDPP	P	Positive power supply for Direct Drive
GNDPP	P	Negative power supply for Direct Drive
CVDD	P	Positive power supply for internal circuit
VDD	P	Positive power supply for I/O
GND	P	Negative power supply
REGOUT	P	3V regulator output
RST	I	Chip Reset (Active low)
XIN	I	High clock Crystal In
XOUT	O	High clock Crystal Out
LXIN	I	Low clock Crystal In
LXOUT	O	Low clock Crystal Out
CKSEL	I	Clock type select 'VDD' → RC oscillator 'GND' →Crystal
TestM	I	Test Pin
VO	O	DA output
BN0	O	Direct Drive negative output
BP0	O	Direct Drive positive output

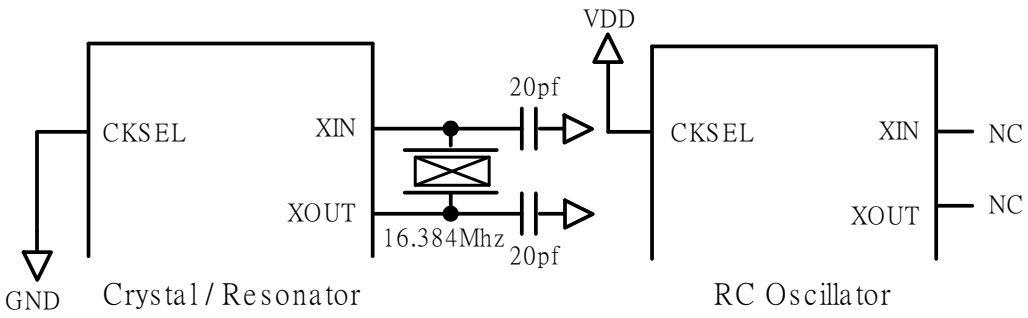
4 Block Diagram



5 FUNCTION DESCRIPTION

5.1. Oscillator

CKSEL (Clock Select) input pin of the SNC82169A selects between crystal oscillator/ceramic resonator or RC type oscillators as system clock.



Notice: For RC Oscillator, Keep XOUT and XIN as "No Connect".

5.2. ROM

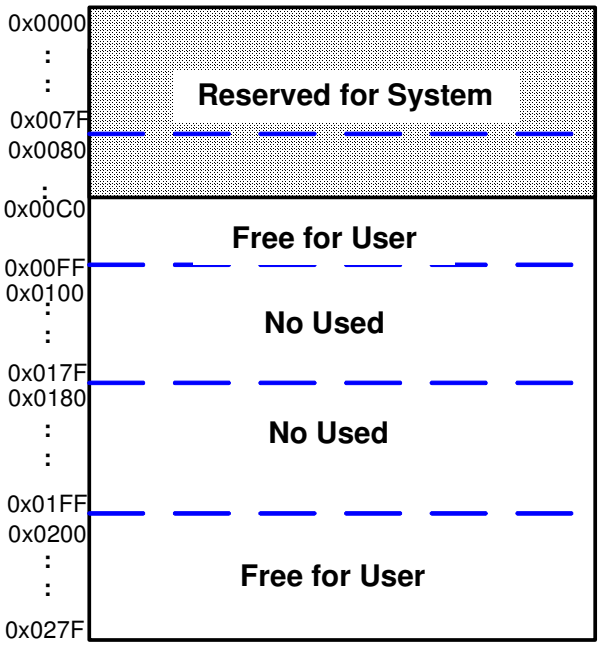
SNC82169A contains a substantial 512K x 12-bit word internal ROM which is shared by program and resource data. Program, voice, melodies, data, and instrument waveforms are shared within this same 512K words ROM.

5.3. RAM

SNC82169A contains 384 bytes RAM (384 x 8-bits). The 384 byte RAM is divided into five pages (page0, 1and 4, 128 bytes RAM for each page). The RAMBK register is used to switch to a specific RAM page. For example, declaring

```
Org       0x250
UseMem  ds  1
```

would locate one byte memory for “UseMem” at BANK 4. Setting ‘RAMbk = 4’ in a program would switch to bank 4 of RAM.



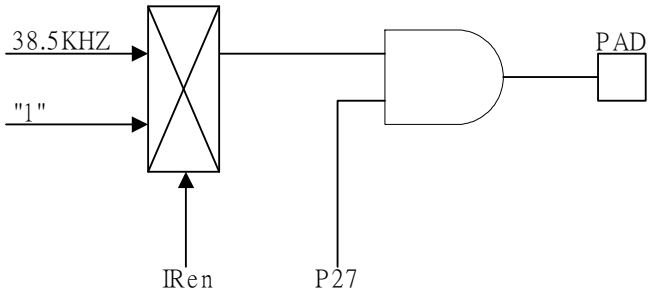
Notice: (C0~FFh) and (200~27Fh) Bank4 is free for user.

5.4. Power Down Mode

Entering the IC into Stop Mode will stop the system clock for power savings (<3uA @VDD=3V and <6uA @VDD=4.5V). Any transition (L→H or H→L) on any I/O pin or RTC (Real-time clock) can be used to start the system clock and return to normal operating mode.

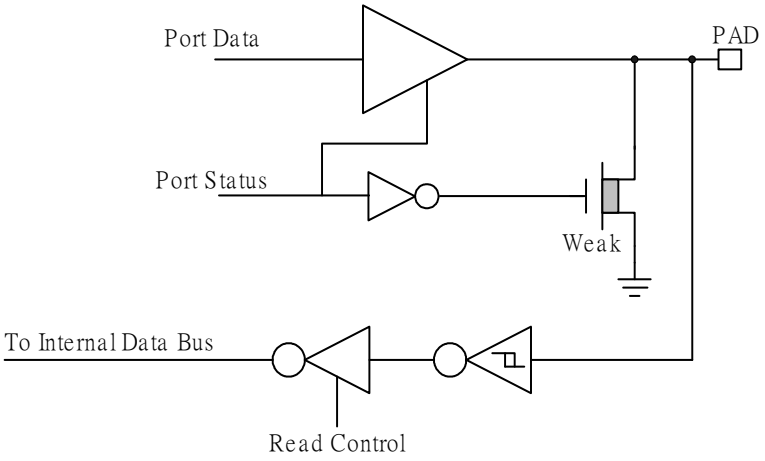
5.5. IR Function

When IR is enabled, a 38.5KHz square wave is gated with P27. The 38.5KHz IR signal is present at the pin when P27 is set to “1”.



5.6. I/O Ports

There are three 8-bit I/O ports P0, P1, and P2. Any I/O can be individually programmed as either input or output. When I/O is set to input, any valid data transition (H→ L or L→H) of each I/O port can wake-up the chip from power-down mode.



I/O Port Configuration

Note: weak N-MOS’s can serve as pull-low resistors.

5.7. Sampling Rate Counters

Each voice channel of 12 is equipped with an independent sampling rate counter to allow individual sample rate play back per channel. Channel sample rate play back can be dynamically set from 4KHz to 64KHz. Each sampling rate counter is updated on a period of 0.125uS. This architecture yields a high-quality music/voice synthesis that sounds very close to its original source when played through the same amplifier and speaker circuitry.

5.8. Auto Repetition

Each voice channel of 12 is equipped with a hardware auto repeat function. Auto repeat functions are normally used to implement sustain in instrument synthesis but can even be used to repeat any voice data of arbitrary length.

5.9. Voice Synthesizer

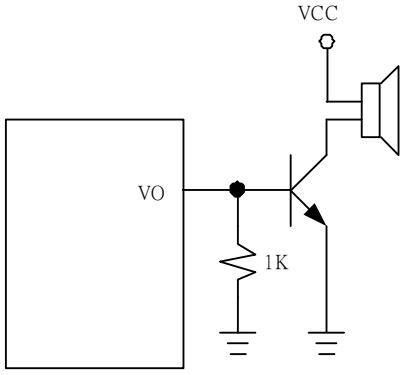
The Major function of Voice Synthesizer is to fetch Wave data from ROM and synthesize into voice. Each voice channel of 12 is equipped with an individual volume setting.

5.10. DAC

One10-bit current type digital-to-analog converters are built-in SNC82169A. The relationship between input digital data and output analog current signal is listed in the following table.

Input data	Typical value of output current (mA)
0	0
1	3/1023
…	
N	n*(3/1023)
…	
1023	3

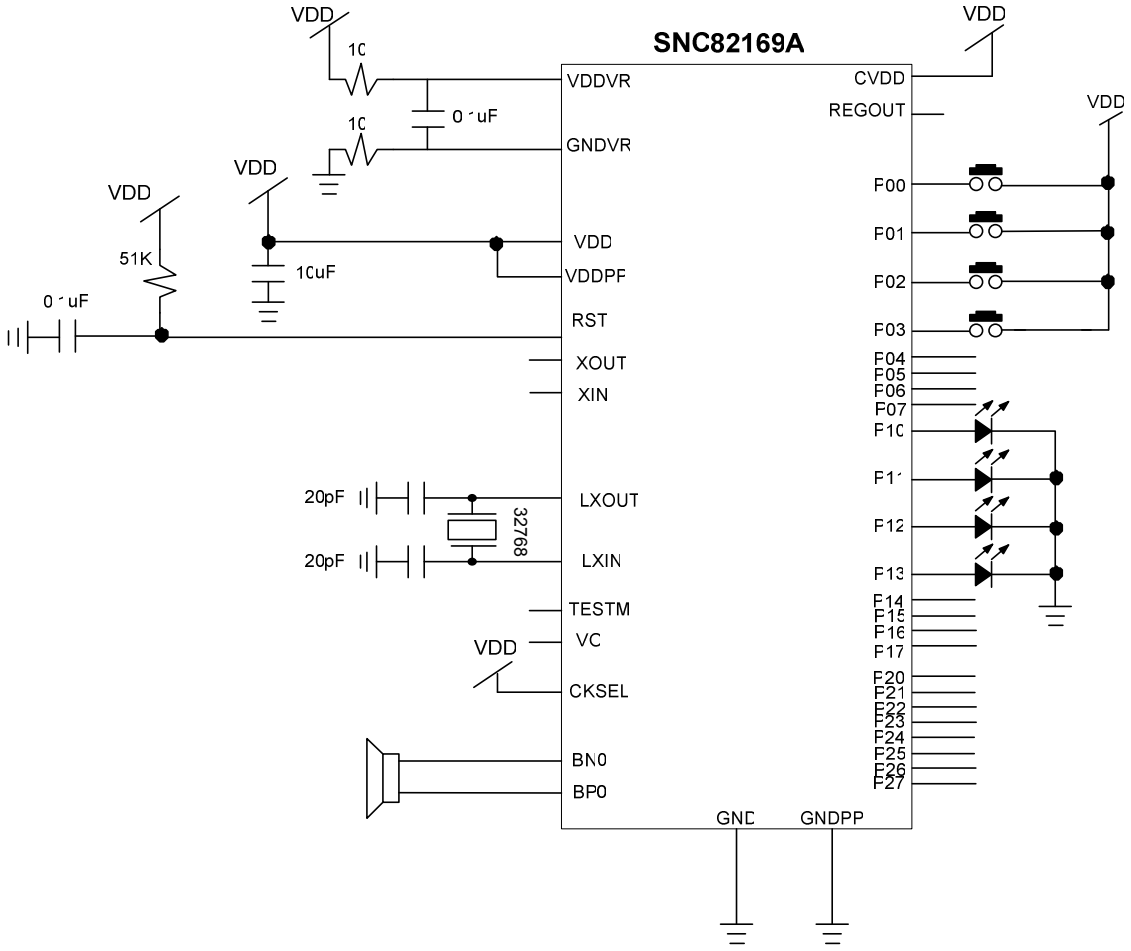
Recommended application circuits are illustrated below.



Single Speaker Application

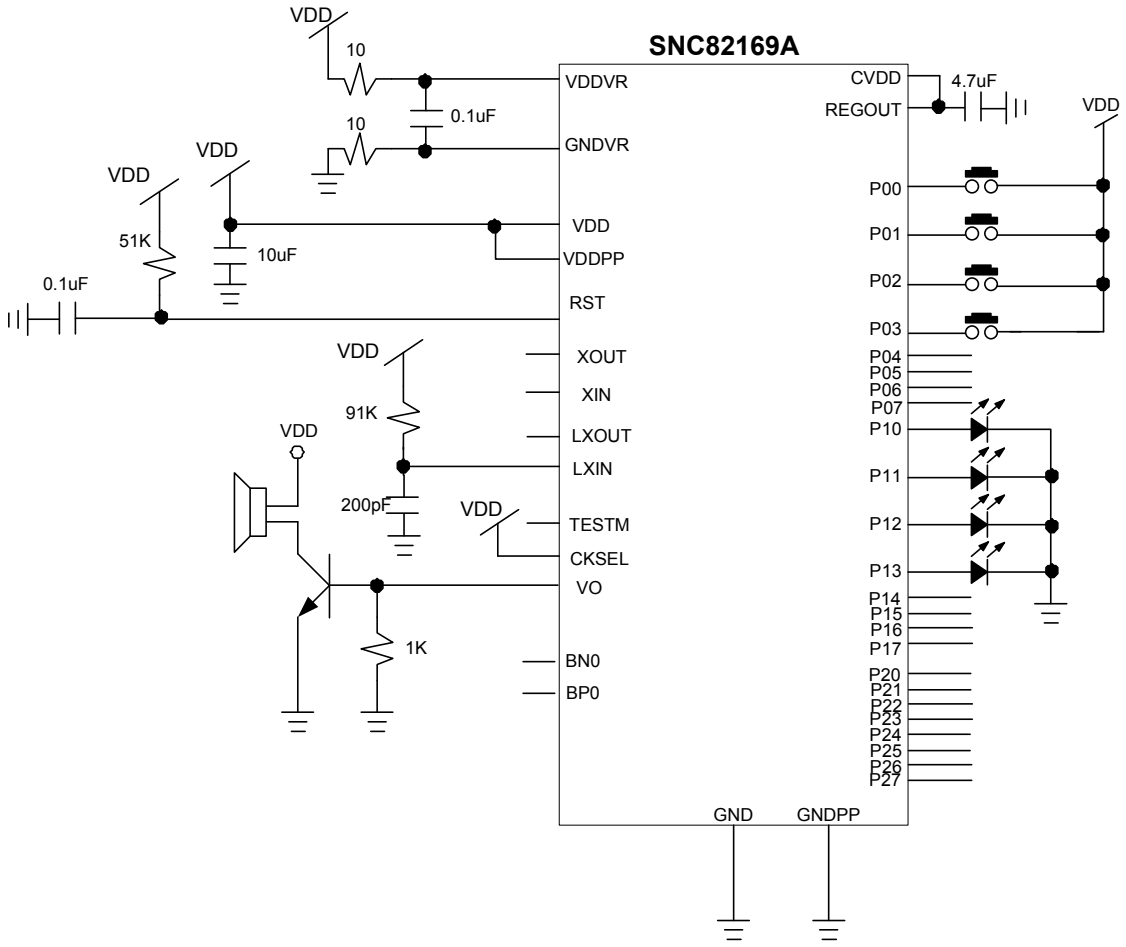
6 APPLICATION CIRCUIT

- Power Supply: 3.0V
- System Clock: Rosc with calibration or RTC function
- Low Clock: 32768
- Voice output: Direct Drive Output



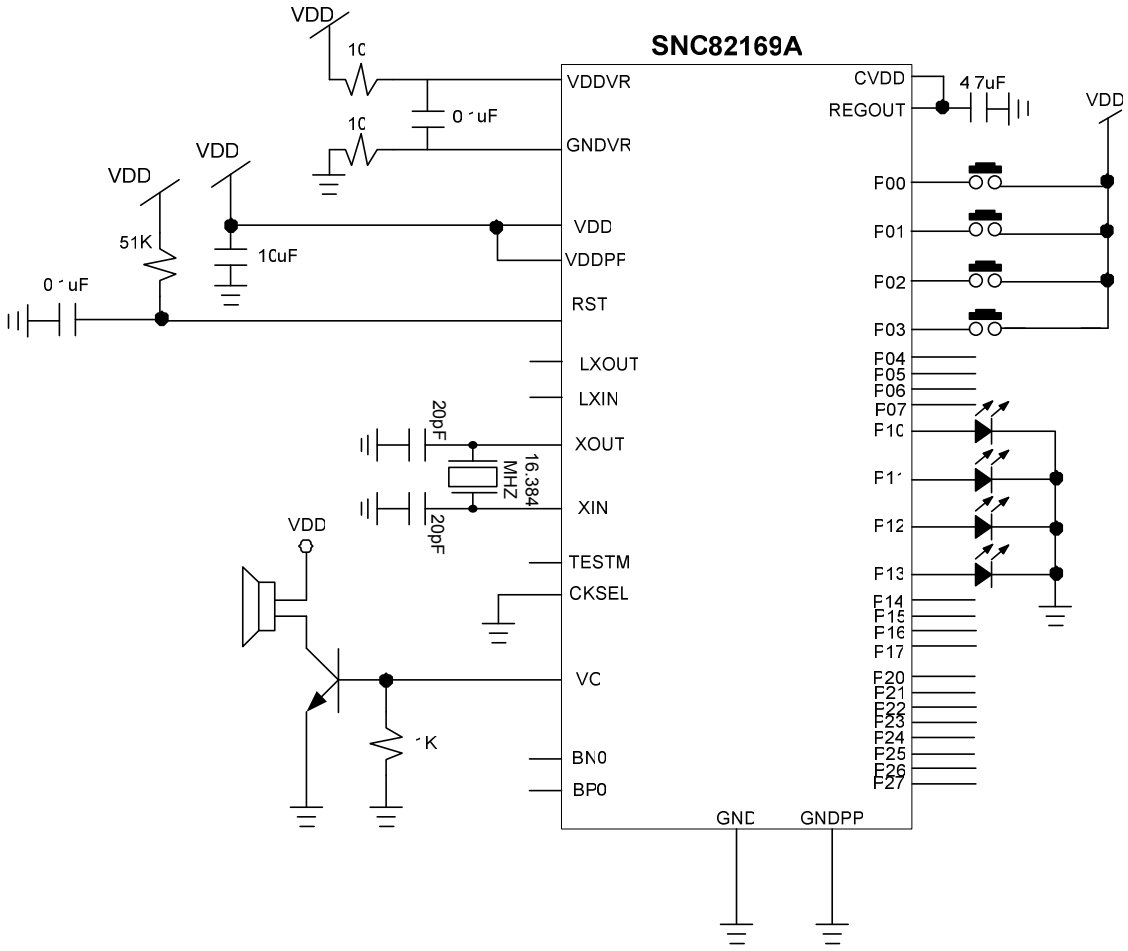
Notice: If system clock is ROSC, please leave Xout and Xin as "no connect".

- **Power Supply: 4.5V**
- **System Clock: Rosc with calibration or RTC function**
- **Low Clock: R-Type**
- **Voice output: DA output**



Notice: If system clock is ROSC, please leave Xout and Xin as "no connect".

- **Power Supply: 4.5**
- **System Clock: 16.384M Crystal**
- **Voice output: DA output**



7 ABSOLUTE MAXIMUM RATING

Items	Symbol	Min	Max	Unit.
Supply Voltage	V_{DD}-V	-0.3	6.0	V
Input Voltage	V_{IN}	V_{SS}-0.3	V_{DD}+0.3	V
Operating Temperature	T_{OP}	0	55.0	°C
Storage Temperature	T_{STG}	-55.0	125.0	°C

8 ELECTRICAL CHARACTERISTICS

Item	Sym.	Min.	Typ.	Max.	Unit	Condition
Operating Voltage	V_{DD}	2.4	-	5.5	V	
Standby Current	I_{SBY}	-	3 5	-	*u*A	V_{DD}=3V V_{DD}=4.5V
Operating Current (Push-Pull Turn On)	I_{OPR}	-	6 12	-	mA	V_{DD}=3V, no load V_{DD}=4.5V, no load
Operating Current (Push-Pull Turn OFF)	I_{OPR}	-	4 5	-	mA	V_{DD}=3V, no load V_{DD}=4.5V, no load
Input pull low impedance of P0~P2	Ri	-	0.8M	-	Ω	V_{DD}=3V
I/O port Drive Current	I_{OD}	- -	4 8	- -	*m*A	V_{DD}=3V, V_O=2.6V V_{DD}=5V, V_O=4.2V
I/O port Sink Current	I_{OS}	- -	6 10	- -	*m*A	V_{DD}=3V, V_O=0.4V V_{DD}=5V, V_O=0.8V
D/A Output Current	I_{VO}	2 2	3 3	4 4	*m*A	V_{DD}=3V, V_O=0.7V V_{DD}=5V, V_O=0.7V
Push-Pull current	I_{PP}	-	70	-	*m*A	VDD=3V, Output 1Khz Sin wave.
Push-Pull current	I_{PP}	-	100	-	*m*A	VDD=4.5V, Ouput 1Khz Sin wave.
Oscillation Freq.	F_{OSC}	-	16.384	-	MHz	V_{DD}=3V
IR Carrier Frequency	Fir	-	38.5	-	KHz	

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