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AMENDENT HISTORY

Version	Date	Description
Ver 1.1	December 3, 2002	V1.1 first issue
Ver 1.2	March 20, 2003	Add application circuit
Ver 1.3	April 2, 2003	Page4, 15: Wording modification Update application circuit

1. INTRODUCTION

The SNC710 is a powerful voice engine, which is based on16-bit fixed-point DSP architecture. This chip embedded 32K words hi-performance ROM and 2K words RAM. This internal ROM is used to implement software synthesizer in order to provide various flexible sound effects for users, such as 2kbps~24kbps voice compression, 4-CH wave-table melody etc…. Furthermore, the SNC710 also built-in a SONiX's mask ROM interface, all the user's program and voice data should be stored in external mask ROM. And SNC710 can execute user's program from this external mask ROM.

2. FEATURES

- Power supply: 2.4V ~ 3.6V (for 2 battery application)
  3.6V ~ 5.1V (for 3 battery application)
- Built-in a 16-bit DSP (Very Light Structure)
- Software-based voice/melody processing
- Rich Function Instruction Set
- 16MHz crystal or R-C type oscillator for system clock
- 8 MIPS CPU performance
- I/O Ports:
  - 16 I/O pins (P0.0~P0.15) and 8 input pins (P1.0~P1.7)
  - P0.15 with IR carrier signal
- RAM size: 2K*16 bits
- High performance program ROM: 32K*16
- Watch-Mode for real time clock (32768HZ clock source)
- 9 Interrupt Sources
  - 4 for Internal Timer (timer0, 1, 2 and RTC)
  - 4 for External interrupt(P0.0~P0.3)
  - 1 for DA or PWM
- Three 8-bit timer with auto-reload function
- Built in a 10-bit PWM Direct Drive circuit and a fixed current D/A output
- Sampling Rate: 4KHz ~16KHz
- Built-in software voice synthesizer (multiple bit-rate solution from 2Kbps ~ 24Kbps @8K sampling rate)
- Low Voltage Reset

3. PIN ASSIGNMENTS

Symbol	I/O	Function Description
P0.0~P0.15	I/O	I/O Port 0
P1.0~P1.7	I	Input Port 1
VDD	I	Positive power supply for digital I/O pad
GND	I	Negative power supply for digital I/O pad &core
CVDD	I	Positive power supply for DSP core & AD bus interface
BP0	O	PWM output 1
BN0	O	PWM output 2
VO0	O	DA0 converter output
XIN/VR1	I	High clock crystal input /RC oscillator input
XOUT/VR2	I/O	High clock crystal output/RC oscillator input
LXIN	I	Low clock oscillator input
LXOUT	O	Low clock oscillator output
CKSEL	I	Crystal/RC oscillator system clock select
ALECLK	O	System Clock output
CEB	O	External ROM Enable , active low
READY	I/O	Data Ready(I)/ Reset(O)
CLKIN	I	Bus system clock in
CEIN	I	External ROM enable in
AD[0..7]	I/O	ROM Address/Data Bus (AD Bus)
RST	I	Chip reset (active low)
TestM	I	TEST pin
EXTM	I	External ROM Share Mode

4. SYSTEM DESCRIPTIONS

4.1 Connection

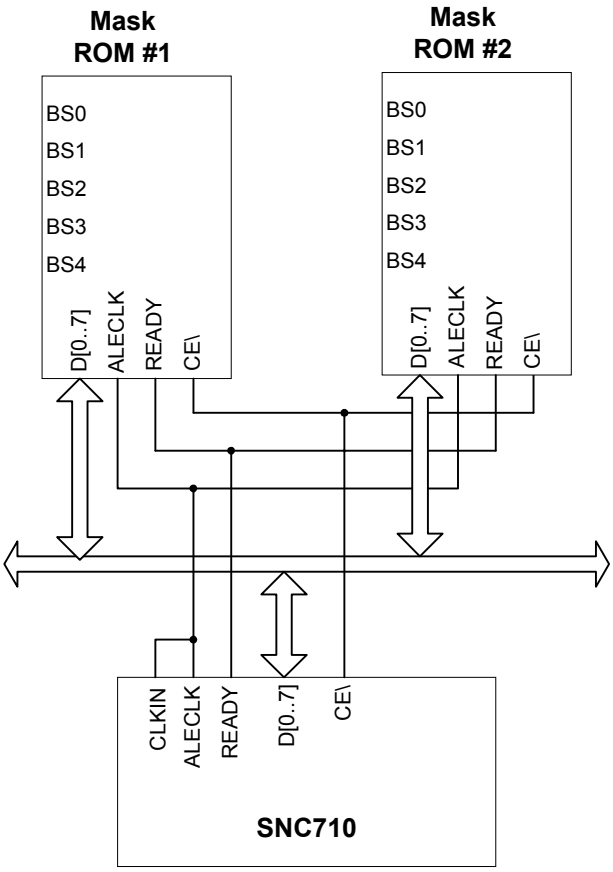


Figure-1

The SNC710 is a ROM-less DSP architecture, but it still built-in 32K hi-speed ROM for software voice synthesizer. All the user's program and voice data are stored in external mask ROM that provided by SONiX. In **Figure-1**, show out the system connection between SNC710 and external mask ROM. Each mask ROM both has several bank select pins (BSn) to specify the memory region, and SNC710 allows user to connect totally 4 external mask ROMs.

The SNC710 built-in an 8-bit AD (address/data) bus, which connect to SONiX's mask ROM. And SONiX's mask ROM provides encryption code function to protect user's program to avoid illegal copy. In SONiX's compiler system, user can assign his own ID-Code to protect his program and data.

4.2 Memory Mapping

The SNC710 provides totally 24-bit address for mask ROM addressing. The whole ROM area is divided into 8 pages, each page's addressing ability is 32M bits (2M words). The first ROM page is reserved for system. We built-in 32K words high speed ROM internally for Voice decompressed algorithm. The actual addressing capability free for user is 224M bits (14M words). The memory mapping of external mask ROM is shown as bellow:

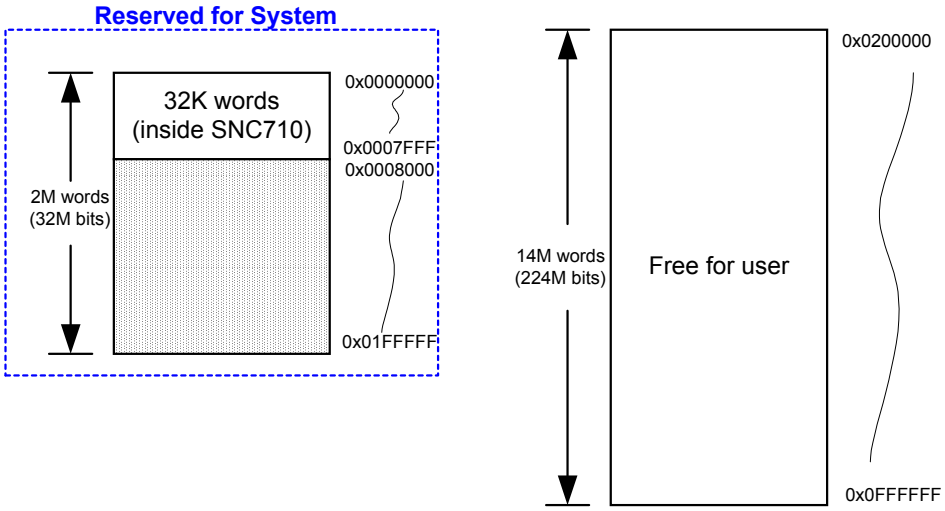
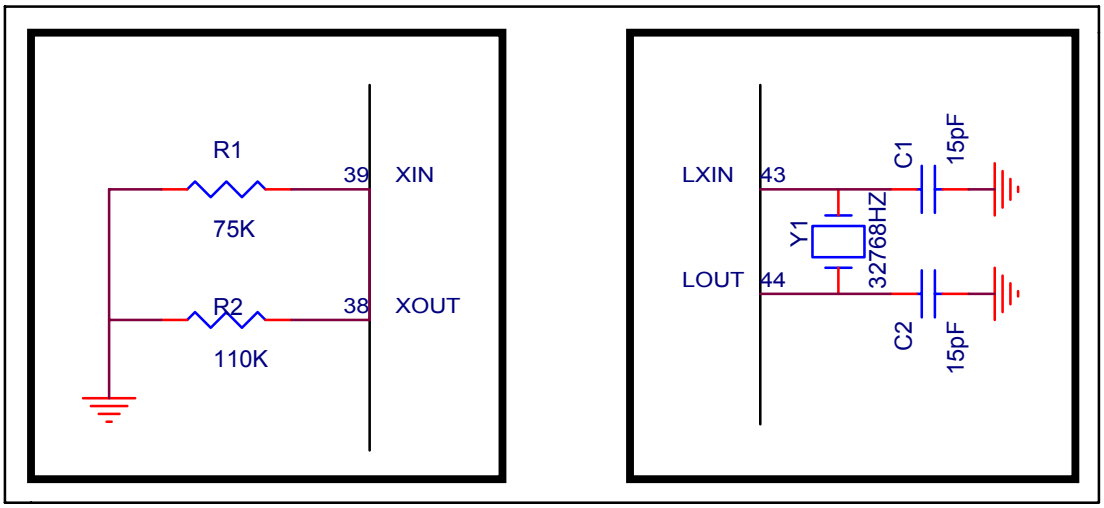


Table-1

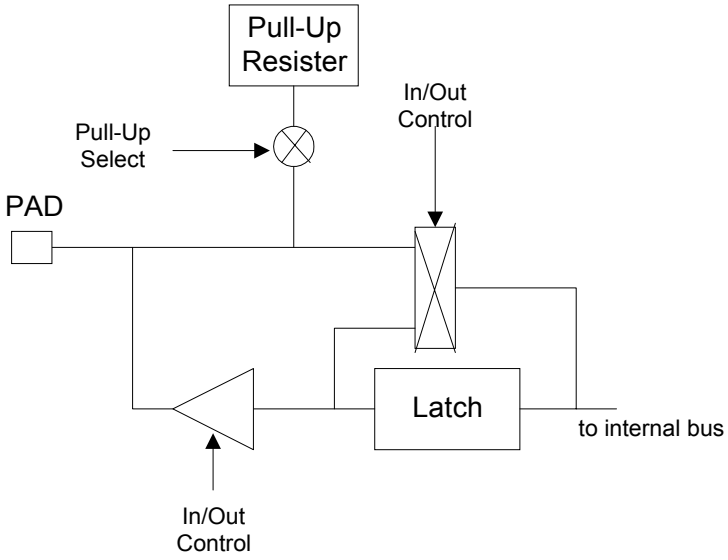
4.3 System Clock

The system clock source also can be selected from 16MHZ Rosc. For the ROSC, user should connect two resistors in the pin "XIN" and "XOUT" instead of 16MHZ crystal. Beside, the clock source select pin "CKSEL" also should be connected to VDD for ROSC. ***In order to get an accurate system clock by ROSC, the real time clock source is recommended to connect a 32768HZ crystal for system clock calibration***.

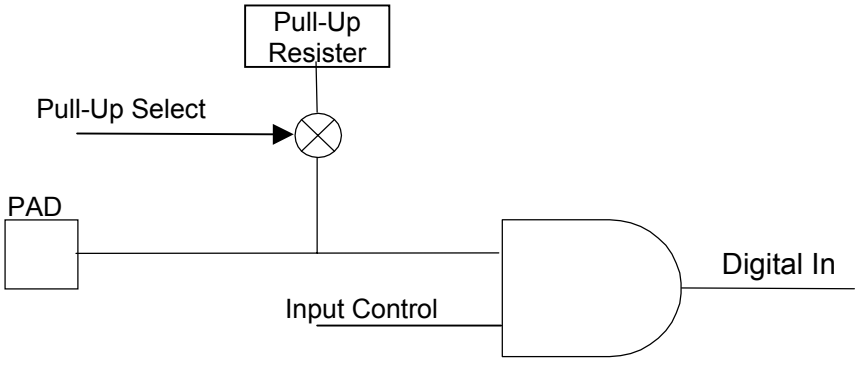


4.4 I/O Port

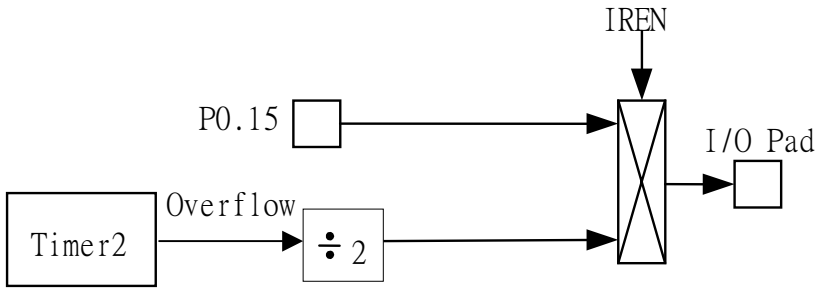
SNC710 provides one a 16-bit I/O port and an 8-bit input port for user application (P0.0~P0.15, P1.0~P1.7). The input pull high resistor of each pin can be programmed by Port Pull-High register. The direction of I/O port is selected by Port Direction register. The Port0 (P0.0~P0.15) and Port1 (P1.0~P1.7) can wake the chip up from the stop mode and watch mode. And P0.15 Modulated with a carry signal



I/O Configuration of P0.0~P0.15



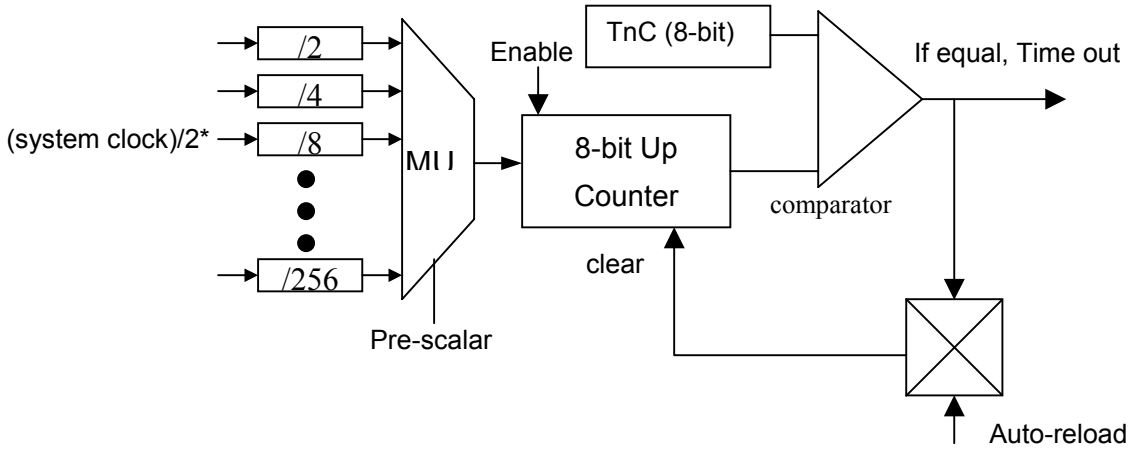
Input Port Configuration of Port 1 (P1.0~P1.7)



P0.15 Modulated with a carry signal

4.5 Timer/Counter

SNC710 provides three 8-bit timer/event counters (T0/T1/T2). Each timer is 8-bit binary up-count timer with pre-scalar and auto-reload function. Timer 0 (T0) is used when voice playing, so user should avoid to use T0.



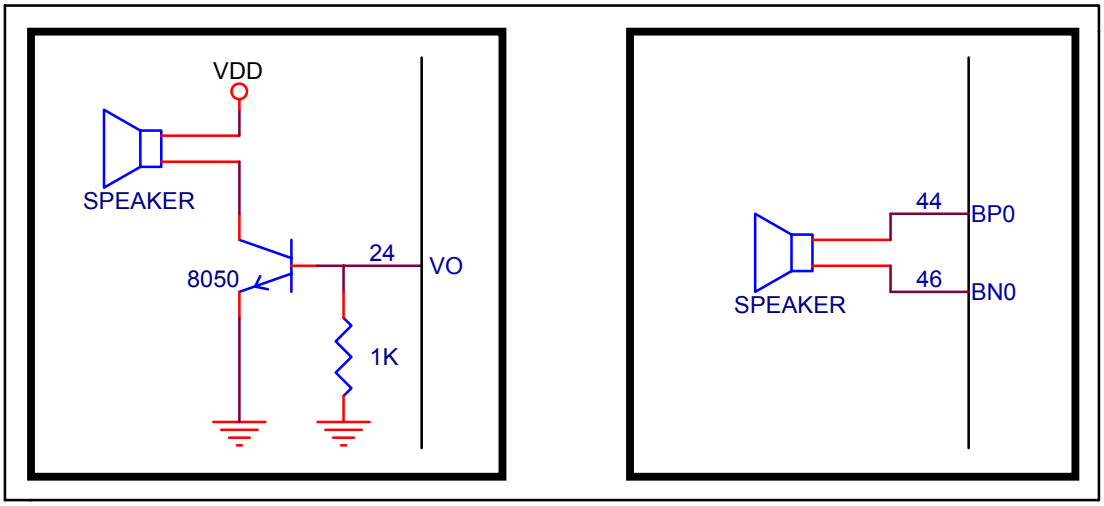
4.6 DAC & PWM

To play out voices, SNC710 contains two different solutions, DAC and PWM, for the users' applications. The user can choose one of these two solutions in his design. Only one function can be activated at one time.

DAC: A 10-bit current type digital-to-analog converter is built-in SNC710. The relationship between of input digital data and output analog current signal is listed in the following table. Also, the recommended application circuit is illustrated as follows.

Input data	Typical value of output current (mA)
0	0
1	3/1024
…	
N	n*(3/1024)
…	
1024	3

PWM: A PWM (pulse width modulation) circuit is built-in SNC710. PWM can convert input digital data into pulse trains with suitable different pulse width. The maximum resolution of PWM is 10 bits. Two huge output stage circuits are included in SNC710. Both of them are capable of driving speaker directly. The recommended application circuit is as follows.



DAC output PWM output

5. ABSOLUTE MAXIMUM RATINGS

Items	Symbol	Min	Max	Unit.
Supply Voltage	V_{DD}-V	-0.3	6.0	V
Input Voltage	V_{IN}	GND-0.3	V_{DD}+0.3	V
Operating Temperature	T_{OP}	-20.0	70.0	°C
Storage Temperature	T_{STG}	-55.0	125.0	°C

6. ELECTRICAL CHARACTERISTICS

Item	Sym.	Min.	Typ.	Max.	Unit	Condition
Operating Voltage	V_{DD}	2.4	-	3.6	V	*1.
	V_{DD}	3.6	-	5.1	V	*2.
Standby current	I_{SBY}	-	-	2.0	*u*A	V_{DD}=3V, no load
Operating Current	I_{OPR}	-	-	5	mA	V_{DD}=3V, no load
Input current of P0, P1	I_{IH}	-	-	10.0	*u*A	V_{DD}=3V,V_{IN}=3V
Drive current of P0	I_{OD}	-	10	-	*m*A	V_{DD}=3V,V_O=2.4V
Sink Current of P0	I_{OS}	-	12	-	*m*A	V_{DD}=3V,V_O=0.4V
Drive current of Buo1	I_{OD}	100	120	-	*m*A	V_{DD}=3V,Buo1=1.5V
Sink Current of Buo1	I_{OS}	100	120	-	*m*A	V_{DD}=3V,Buo1=1.5V
Drive Current of Buo2	I_{OD}	100	120	-	*m*A	V_{DD}=3V,Buo2=1.5V
Sink Current of Buo2	I_{OS}	100	120	-	*m*A	V_{DD}=3V,Buo2=1.5V
Oscillation Freq. (crystal)	F_{OSC}	-	16.0	-	MHz	V_{DD}=3V

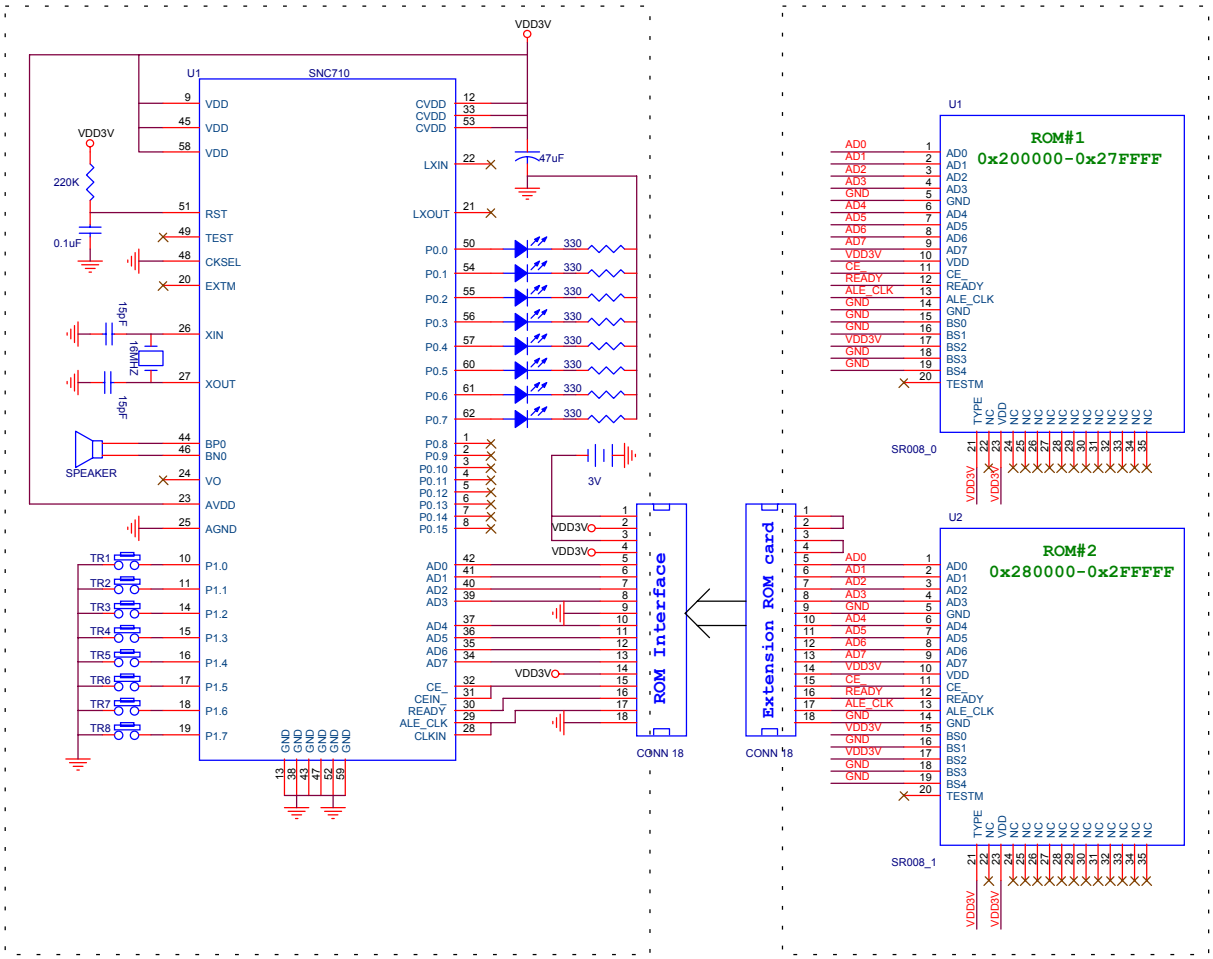
Note:

1. ***For 2 batteries application.***
2. ***For 3 batteries application, user should add 1 resister between power and CVDD pin of chip.***

7. APPLICATION CIRCUIT

7.1 3V/16M Crystal

3V power supply with 16M crystal input and PWM output

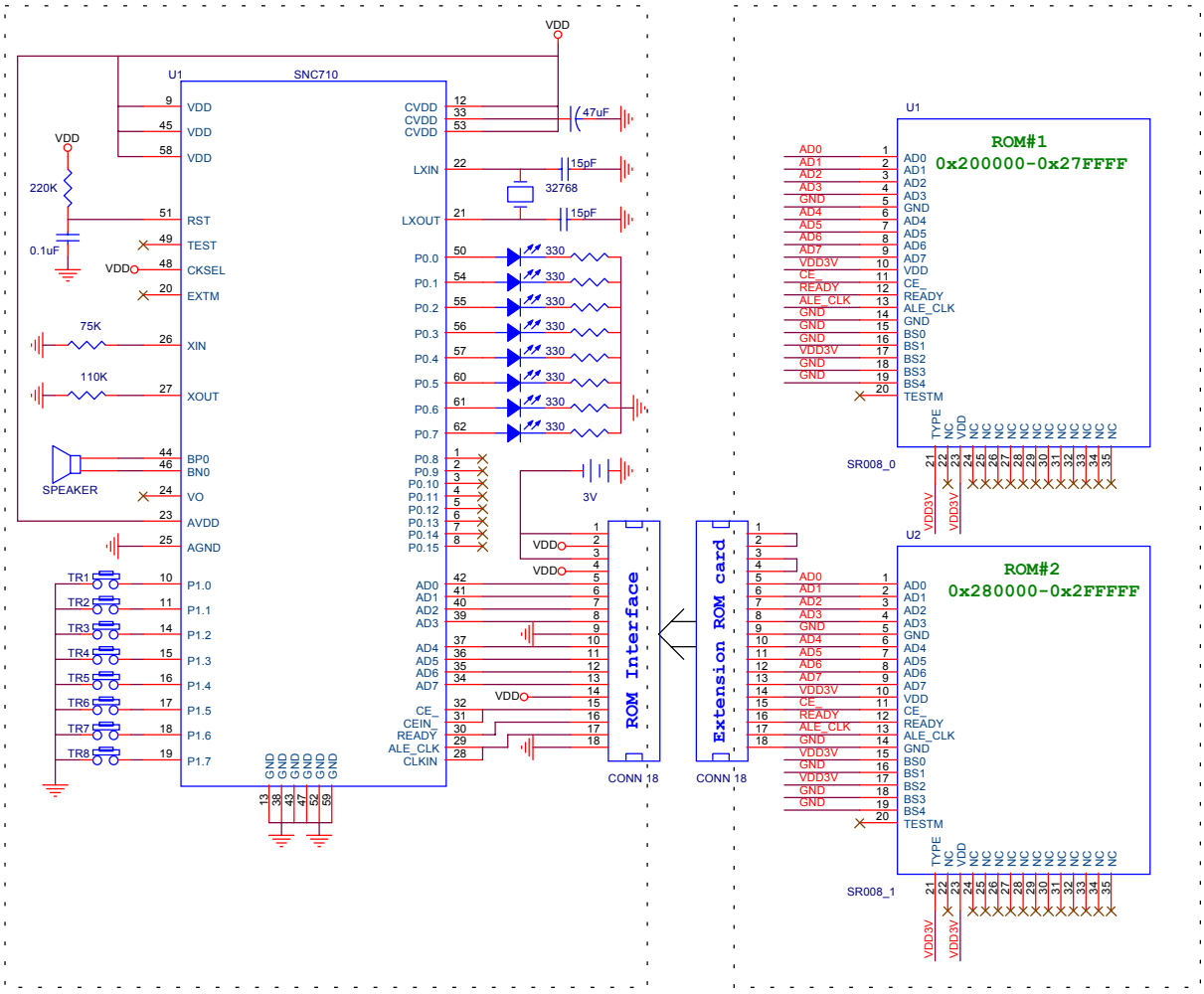


SNC710 Main Board

Extension ROM board

7.2 3V/16M ROSC

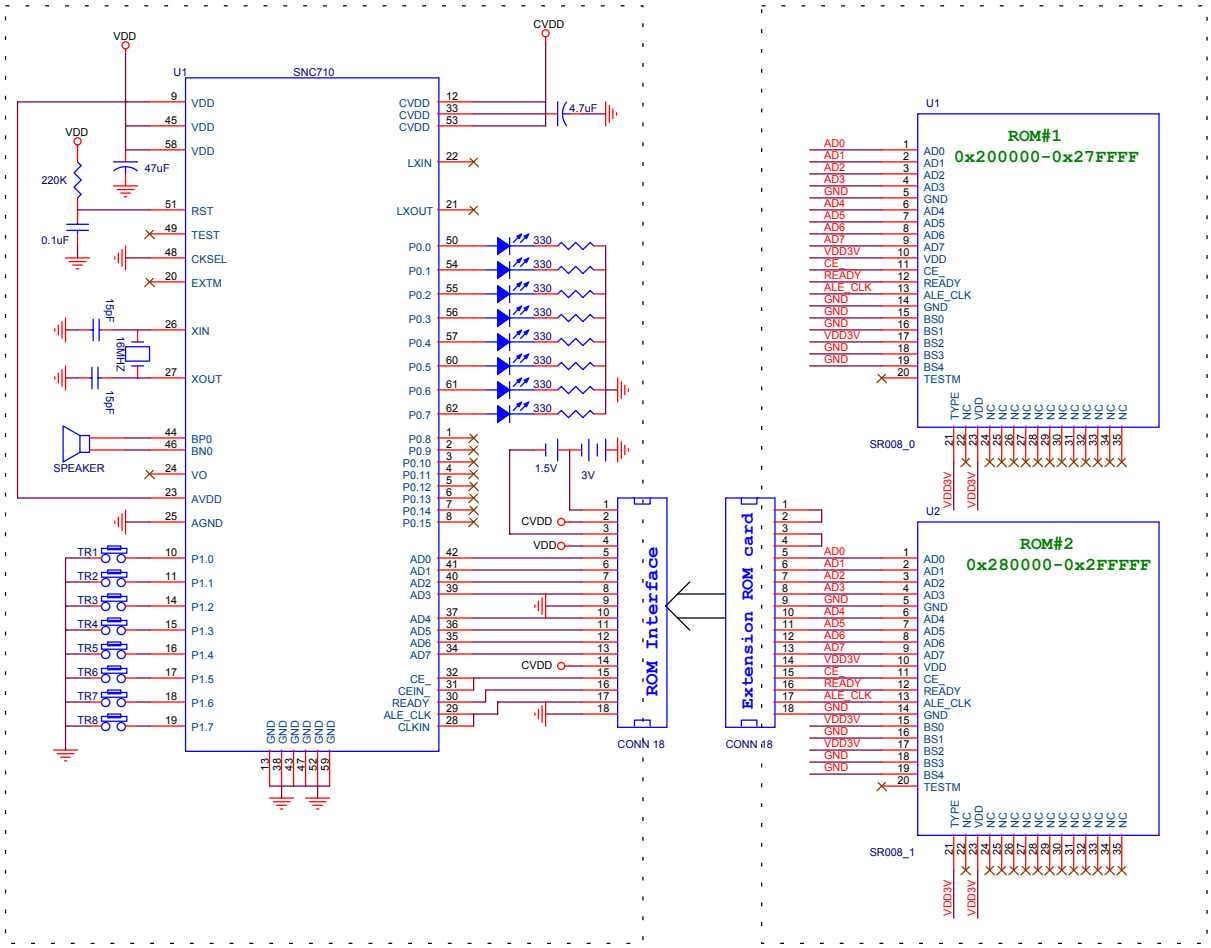
3V power supply with 16Mhz ROSC and PWM output



SNC710 Main Board Extension ROM board

7.3 4.5V/16M Crystal

4.5V power supply with 16M crystal input and PWM output

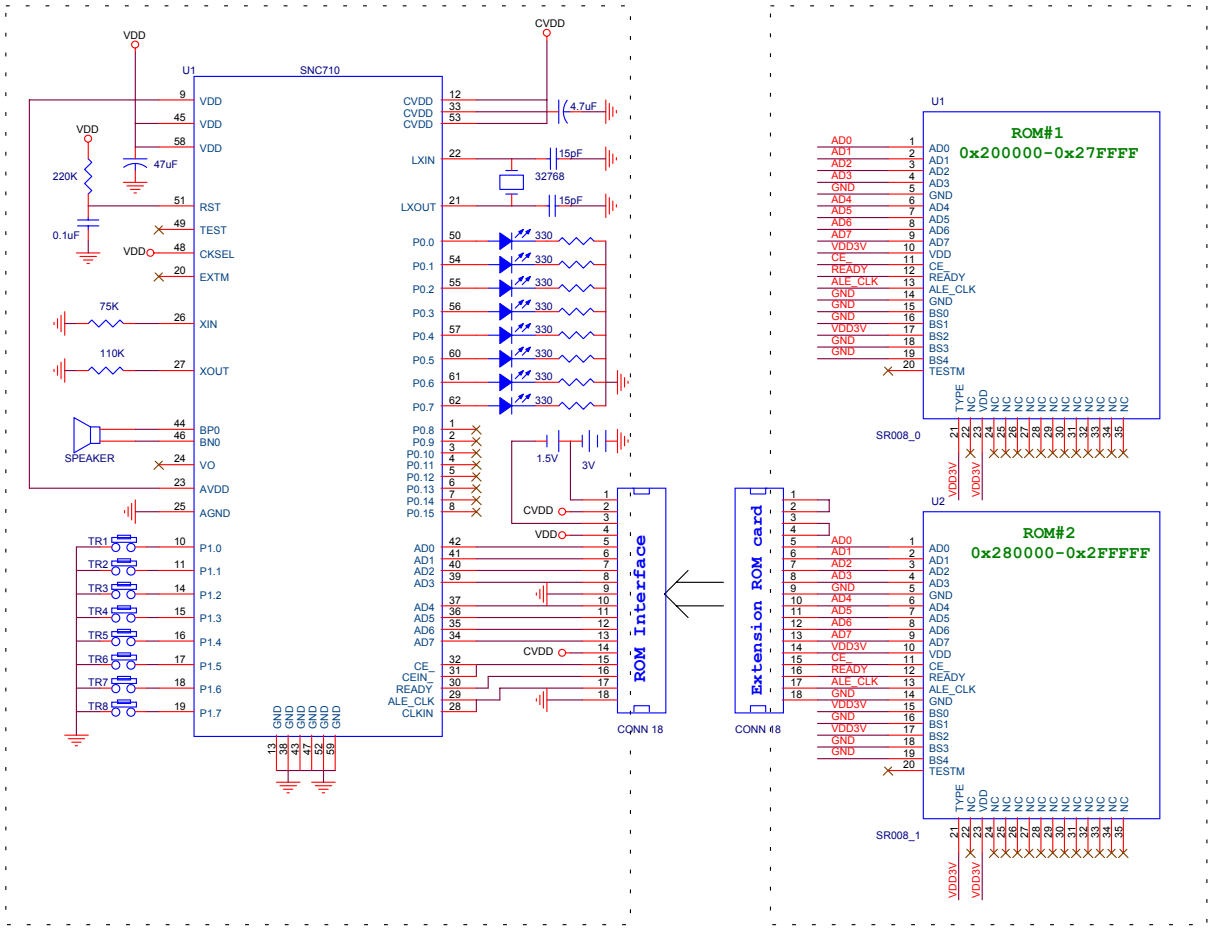


SNC710 Main Board

Extension ROM board

7.4 4.5V/16M ROSC

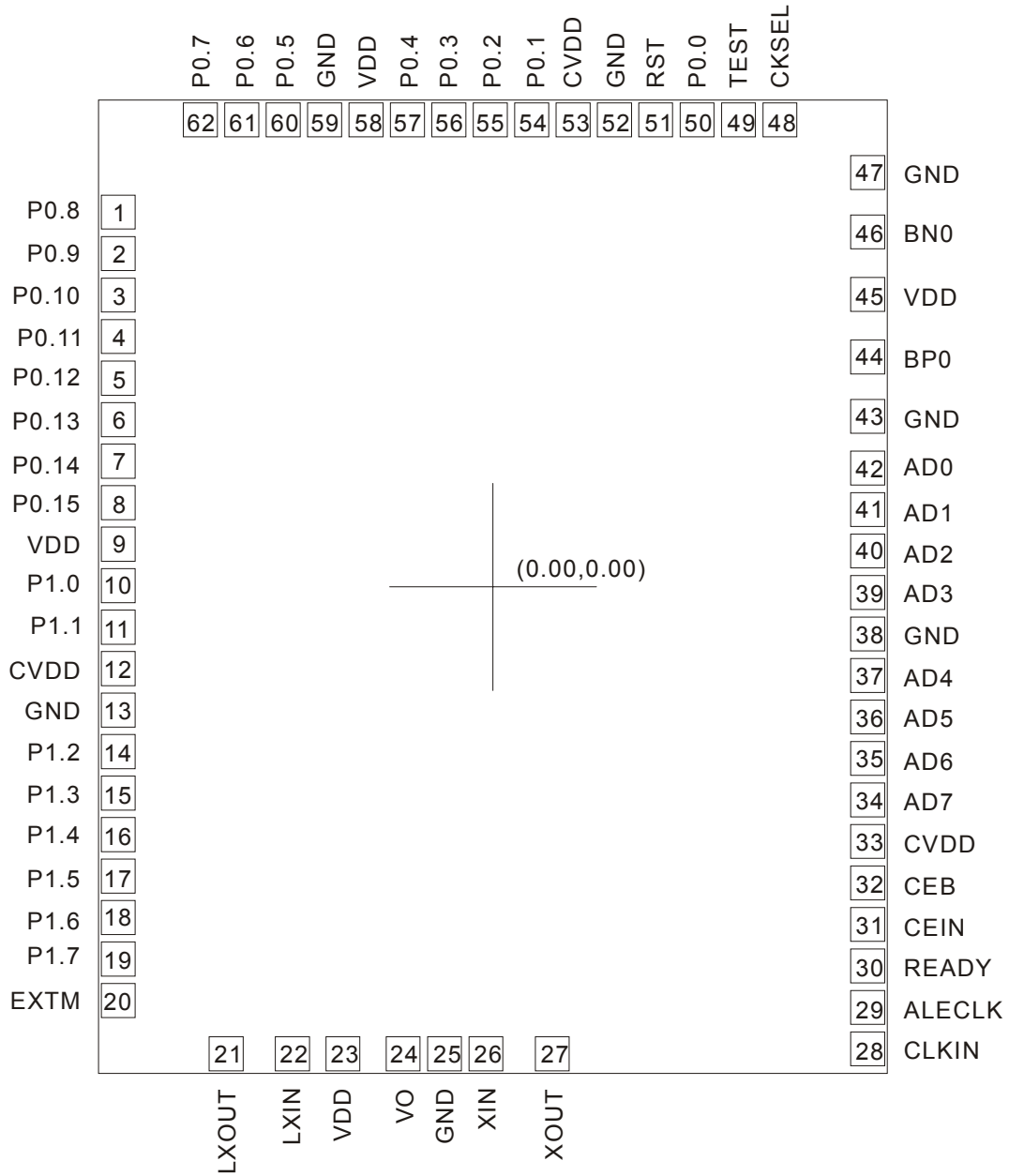
4.5V power supply with 16Mhz ROSC and PWM output



SNC710 Main Board

Extension ROM board

8. Bonding Pad



Note: The substrate MUST be connected to Vss in PCB layout.

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