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AMENDMENT HISTORY

| Version | Date | Description |
|----------------|-----------------|----------------------------|
| Ver 1.0 | Oct 30, 2007 | First issue |
| Ver 1.1 | May 28, 2008 | Update Application Circuit |
| Ver 1.2 | June 10, 2008 | Refine Application Circuit |
| Ver 1.3 | June 23, 2008 | Refine Application Circuit |
| Ver 1.4 | August 25 2008 | Refine Application Circuit |
| Ver1.5 | October 30,2008 | Refine Application Circuit |



1. INTRODUCTION

SNC15016 is a one-channel voice synthesizer IC with PWM direct drive circuit. It built in a 4-bit tiny controller with two 4-bit I/O ports. By programming through the tiny controller in SNC15016, user's varied applications including voice section combination, key trigger arrangement, output control, and other logic functions can be easily implemented.

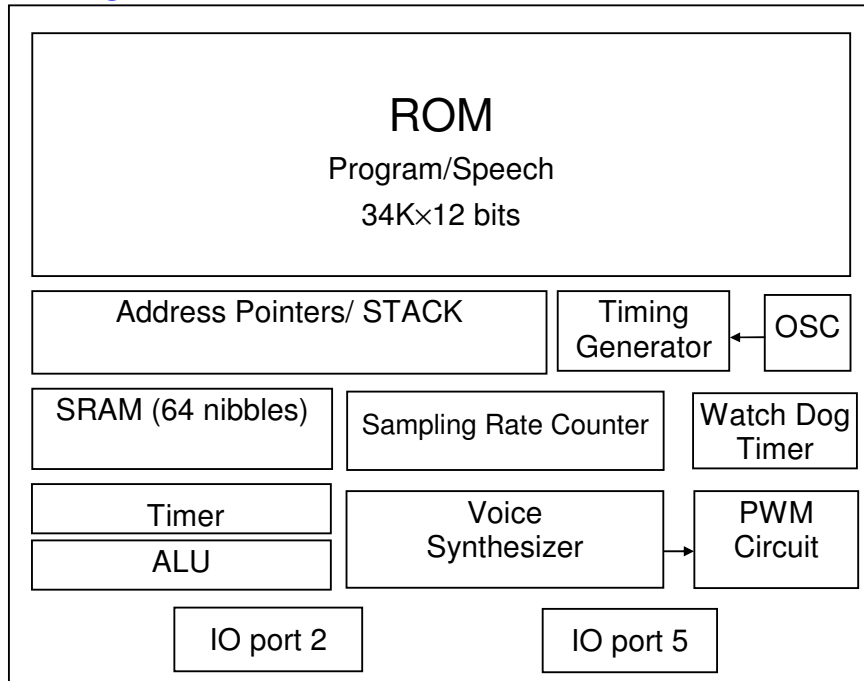
2. FEATURES

- ◆ Single power supply 2.4V – 5.5V
- ◆ 16 seconds voice capacity are provided (@6KHZ sample rate)
- ◆ Built in a 4-bit tiny controller
- ◆ I/O Port
 - Two 4-bit I/O ports P2 and P5 are provided.
 - The driving/sink current of P2 & P5 is up to 8mA/16mA
 - The IO pins P2.3 can be modulated with 38.5Khz carry signal to implement IR function.
- ◆ 64*4 bits RAM are provided
- ◆ Maximum 34k program ROM is provided
- ◆ 34K*12 shared ROM for voice data and program
- ◆ Readable ROM code data
- ◆ Built in one channel speech synthesizer
- ◆ Adaptive playing speed from 2.5k-20kHz is provided
- ◆ Built in an PWM circuit output, can directly connected to Speaker for sound output.
- ◆ System clock: 2MHz
- ◆ Event Mark function supported
- ◆ Low Power Detect.
- ◆ Watch Dog Timer Supported

3. PIN ASSIGNMENT

| Symbol | I/O | Function Description |
|---------|-----|---|
| P20~P23 | I/O | I/O port 2: IO |
| P50~P53 | I/O | I/O port 5: IO |
| Rosc | I | Oscillation component connection pin |
| BUO1 | O | PWM output 1 |
| BUO2 | O | PWM output 2 |
| RST | I | RST=1 → Reset Chip (Active H) |
| VDDIO | I | Positive power supply for I/O |
| GNDIO | I | Negative power supply for I/O |
| CVDD | I | Positive power supply for internal core |
| CGND | I | Negative power supply for internal core |
| Test | I | Test pin |

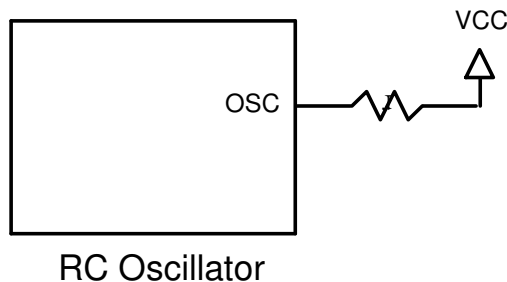
4. Block Diagram



5. FUNCTION DESCRIPTIONS

5.1 Oscillator

SNC15016 accepts RC type oscillator for system clock. The typical circuit diagram for oscillator is listed as follows.



5.2 ROM

SNC15016 contains a substantial 34K words (12-bit) internal ROM, which is shared by program and resource data. Program, voice and data are shared within this same 34K words ROM.

5.3 RAM

SNC15016 contains 64 nibble RAM (64 x 4-bits). The 64 nibble RAM is only one page (page 0, 64 nibble RAM on each page). In our programming structure, users can use the instructions, PAGE n (n=0) to switch and indicate the RAM page. Besides, users can use direct mode, M0 ~ M63 in the data transfer type instructions, to access all 64 nibbles of each page.

5.4 Power Down Mode

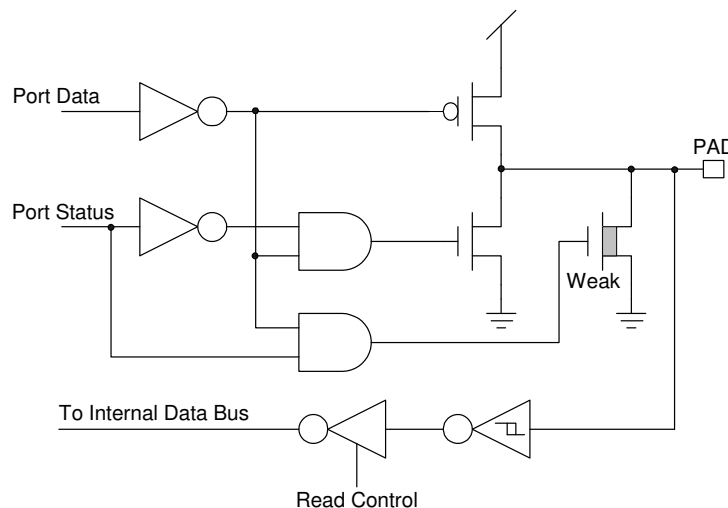
“End” instruction makes the IC entering into Stop Mode will stop the system clock for power savings (<3uA @VDD=3V and <6uA @VDD=4.5V.) Any valid data transition (L→H or H→L) occurring on any IO pin can be used to start the system clock and return to normal operating mode.

5.5 Sampling Rate Counter

The unique sampling rate counter is designed in voice channel to be able to play diverse voices at different sample playing rates. The playing rate can be adaptively set up among from the wide ranges of 2.5KHz to 20KHz. This architecture yields a high-quality voice synthesis that sounds very close to its original source when played through the same amplifier and speaker circuitry.

5.6 I/O Ports

There are two 4-bit I/O ports P2 and P5. Any I/O can be individually programmed as either input pull low or output. Any valid data transition (H→ L or L→H) of P2 and P5 can reactivate the chip when it is in power-down stage.



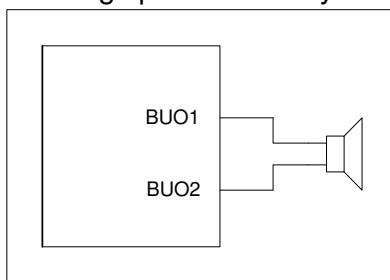
I/O Port Configuration

Note:

- (1) **Weak N-MOS can serve as pull-low resistor.**
- (2) **The driving/sink current of P2 & P5 is up to 8mA/16mA**

5.7 PWM Output

An PWM circuit is built-in SNC15016. The maximum resolution of PWM is 8 bits. Two huge output stage circuits are designed in SNC15016. With this advanced circuit, the chip is capable of driving speaker directly without external transistors.



PWM Output

5.8 Watch Dog Timer

SNC15016 built an internal WDT (Watch Dog Timer). This Watchdog timer would issue resets signal to this chip if it is not cleared before reaching terminal count (1sec). The watchdog timer is enabled at reset and cannot be disabled.

5.9 IR Function

P23 can be modulated with 38.5KHz square wave before sent out to P23 pin. The IR signal can be achieved by this modulated signal.

6. ABSOLUTE MAXIMUM RATING

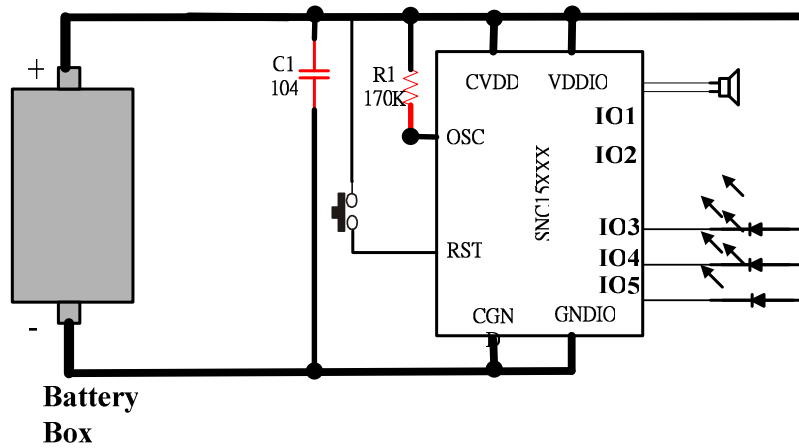
| Items | Symbol | Min | Max | Unit. |
|-----------------------|------------|--------------|--------------|-------|
| Supply Voltage | V_{DD-V} | -0.3 | 6.0 | V |
| Input Voltage | V_{IN} | $V_{SS}-0.3$ | $V_{DD}+0.3$ | V |
| Operating Temperature | T_{OP} | 0 | 55.0 | °C |
| Storage Temperature | T_{STG}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



7. ELECTRICAL CHARACTERISTICS

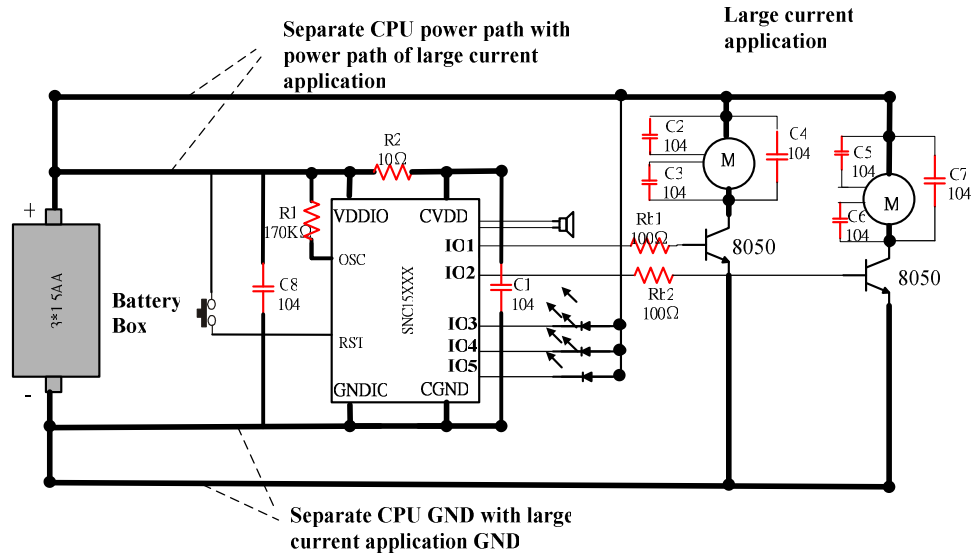
| Item | Sym. | Min. | Typ. | Max. | Unit | Condition |
|-------------------------|------------------|------|------|------------|------|--|
| Operating Voltage | V _{DD} | 2.4 | 3.0 | 5.5 | V | |
| Standby current | I _{SBY} | - | - | 3.0 6.0 | μA | V _{DD} =3V, no load V _{DD} =4.5V, no load |
| Operating Current | I _{OPR} | - | 300 | - | μA | V _{DD} =3V, no load |
| Input current of P2, P5 | I _{IH} | - | 3.0 | - | μA | V _{DD} =3V, V _{IN} =3V |
| Drive current of P2, P5 | I _{OD} | 6 | 8 | - | mA | V _{DD} =3V, V _O =2.4V |
| Sink current of P2, P5 | I _{OS} | 10 | 16 | - | mA | V _{DD} =3V, V _O =2.4V |
| PWM current | I _{PP} | - | 120 | - | mA | V _{DD} =3V, Output 1K Sin wave. |
| PWM current | I _{PP} | - | 150 | - | mA | V _{DD} =4.5V, Output 1K Sin wave. |
| Oscillation Freq. | F _{OSC} | - | 2.0 | - | MHz | V _{DD} =3V |

8. APPLICATION Circuit
8.1 General application



It is suggested to add a capacitor (C1), 104, between VDD with GND to keep power stable with general application. And this capacitor is strongly suggested to be as close to the chip as possible.

8.2 Motor application



There are some suggestions about PCB layout when user use SNC15000 series IC with motor applications.

- (1) The capacitor C1 、 C8 (104) is strongly suggested to be as close to the chip as possible.
- (2) It had better let OSC components (R) get close to IC chip.
- (3) OSC components had better get far away large current applications.
- (4) Separate IC power path with large current application power path to avoid affect IC working by power drop from large current application.
- (5) R2 (10Ω)separate VDDIO and CVDD.
- (6) Let power cable thicker, especially for large current application.
- (7) C2 、 C3 、 C4 and C5 、 C6 、 C7 (104) are connected at the shell of motor, positive point and negative point of the motor.



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