



===== **CONTENTS** =====

|          |  |           |
|----------|--|-----------|
| <b>1</b> | <b>INTRODUCTION .....</b>              | <b>3</b>  |
| <b>2</b> | <b>FEATURES.....</b>                   | <b>3</b>  |
| <b>3</b> | <b>PIN ASSIGNMENT .....</b>            | <b>4</b>  |
| <b>4</b> | <b>BLOCK DIAGRAM.....</b>              | <b>5</b>  |
| <b>5</b> | <b>FUNCTION DESCRIPTION .....</b>      | <b>6</b>  |
| 5.1.     | ROM .....                              | 6         |
| 5.2.     | RAM .....                              | 6         |
| 5.3.     | POWER DOWN MODE .....                  | 7         |
| 5.4.     | IR FUNCTION .....                      | 7         |
| 5.5.     | I/O PORTS .....                        | 7         |
| 5.6.     | SAMPLING RATE COUNTERS.....            | 8         |
| 5.7.     | WAVE PROCESSING UNIT (WPU).....        | 8         |
| 5.8.     | AUTO REPETITION .....                  | 8         |
| 5.9.     | SYSTEM CLOCK.....                      | 9         |
| 5.10.    | VOLUME CONTROL.....                    | 10        |
| <b>6</b> | <b>APPLICATION CIRCUIT.....</b>        | <b>11</b> |
| <b>7</b> | <b>ABSOLUTE MAXIMUM RATING.....</b>    | <b>13</b> |
| <b>8</b> | <b>ELECTRICAL CHARACTERISTICS.....</b> | <b>13</b> |



**AMENDMENT HISTORY**

| <b>Version</b> | <b>Date</b>  | <b>Description</b>  |
|----------------|--------------|---|
| Ver 1.0        | Dec 15, 2009 | First issue   |
| Ver 1.1        | Jan 11, 2010 | Update the relationship between the high-clock frequency and temperature. |

## 1 INTRODUCTION

The SNC82060B is a single chip 12-channel MIDI compatible wave-table/voice synthesizer. Equipped with a powerful 8-bit controller and 16 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.

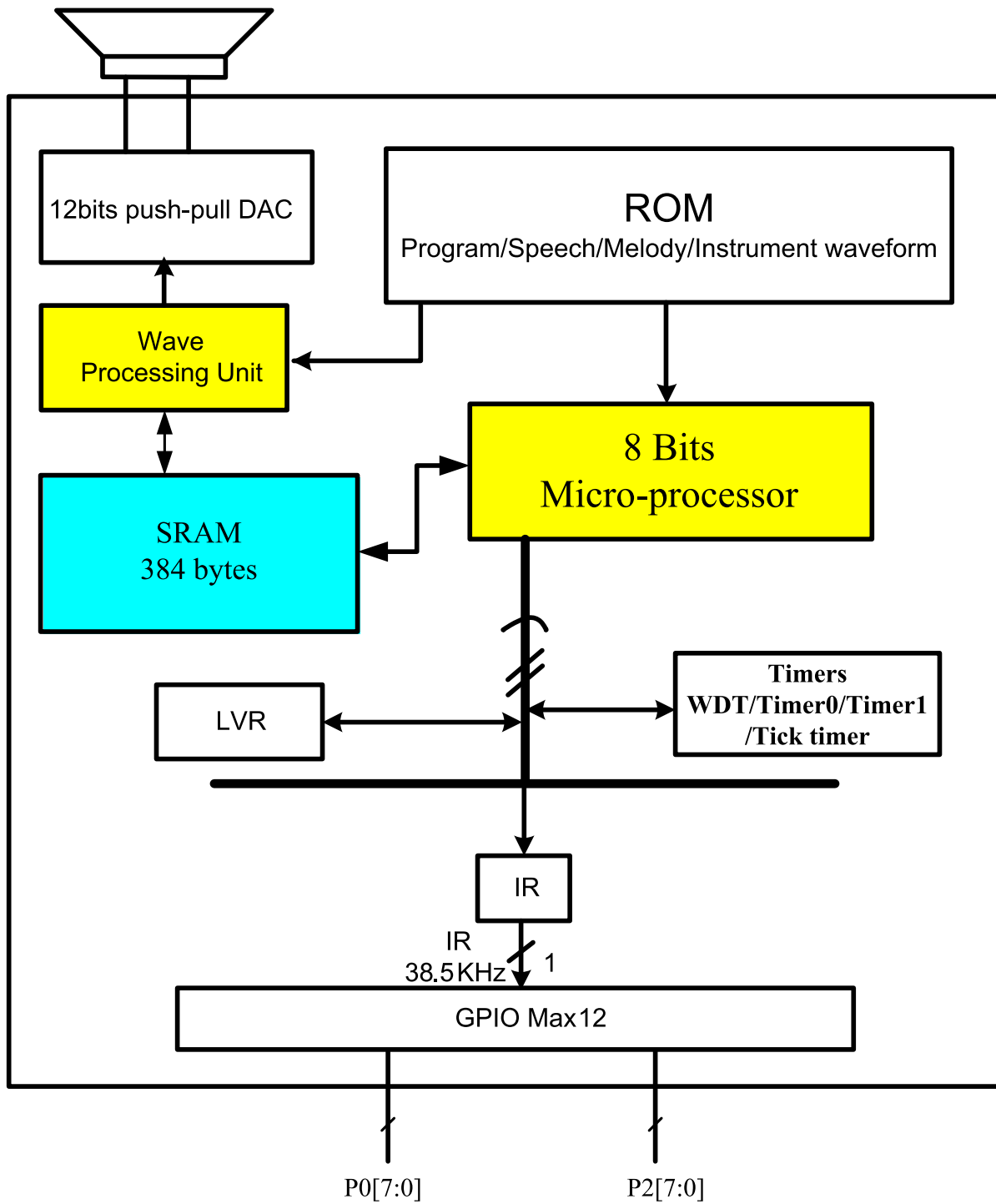
## 2 FEATURES

- ◆ Single Power Supply 2.4V – 5.1V
- ◆ Powerful Built-in 8-bit Controller
- ◆ Two 8-bit I/O ports
- ◆ 384\*8 bits RAM
- ◆ Maximum 128K program ROM
- ◆ 128K\*15 bits shared ROM for program and voice data
- ◆ One 12-bits Push-pull DAC with 64-levels global (analog) volume control
- ◆ Support 5-bits ASDPCM & 12-bits PCM
- ◆ System clock: internal OSC 16.384Mhz  $\pm 3\%$
- ◆ ESD improved
- ◆ Support SF2 ADSR envelope control
- ◆ 12-voice Polyphony through a high-quality speech synthesizer
- ◆ Mark Event Supported in both Wave and Melody
- ◆ Support wave mark interrupt
- ◆ Maximum 4096 wave mark
- ◆ 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
- ◆ Analog Direct Drive speaker circuit
- ◆ 2 MIPS CPU power free to user
- ◆ Low Voltage Reset
- ◆ Built-in a 8\*8 Multiplex for CPU
- ◆ 2 Timers, WDT and Tick timer
  - Timers 0 with Individual pre-scaler and auto-reload function, Timer 0 with Interrupt Function
  - Timers 1 with selectable time out (1ms, 4ms, 8ms, 16ms)
  - Watch Dog timer function is provided
  - Built-in a tick timer for software melody decodes

### 3 PIN ASSIGNMENT

| Symbol    | I/O | Function Description                       |
|-----------|-----|--|
| P00 ~ P07 | I/O | Bit7 ~ Bit0 of I/O port 0                  |
| P20 ~ P27 | I/O | Bit7 ~ Bit0 of I/O port 2                  |
| 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)                    |
| TestM     | I   | Test Pin                                   |
| BN0       | O   | Direct Drive negative output               |
| BP0       | O   | Direct Drive positive output               |

## 4 Block Diagram



## 5 FUNCTION DESCRIPTION

### 5.1. ROM

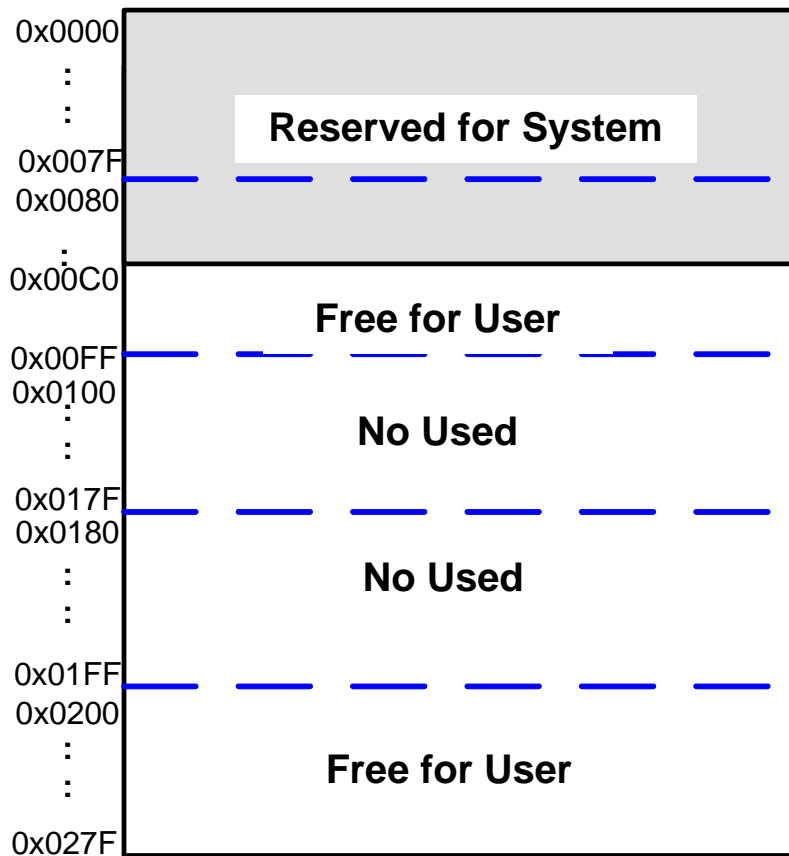
SNC82060B contains a substantial 128K\*15 bits internal ROM which is shared by program and resource data. Program, voice, melodies, data, and instrument waveforms are shared within this same 128K\*15 bits ROM.

### 5.2. RAM

SNC82060B contains 384 bytes RAM (384 x 8-bits). The 384 byte RAM is divided into five pages (page0, 1 and 4, 128 bytes RAM for each page).

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

**Need not select RAMBK in directly addressing mode**



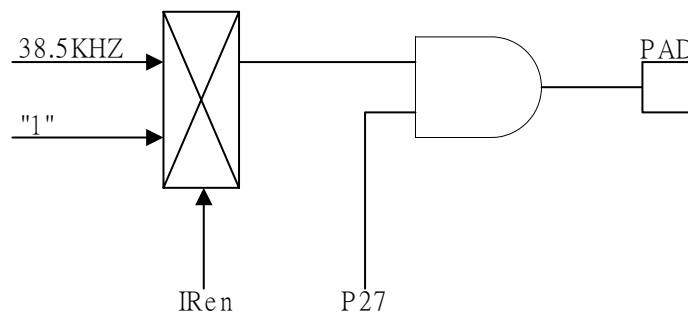
**Notice: (C0~FFh) and (200~27Fh) Bank4 is free for user.**

### 5.3. 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 can be used to start the system clock and return to normal operating mode.

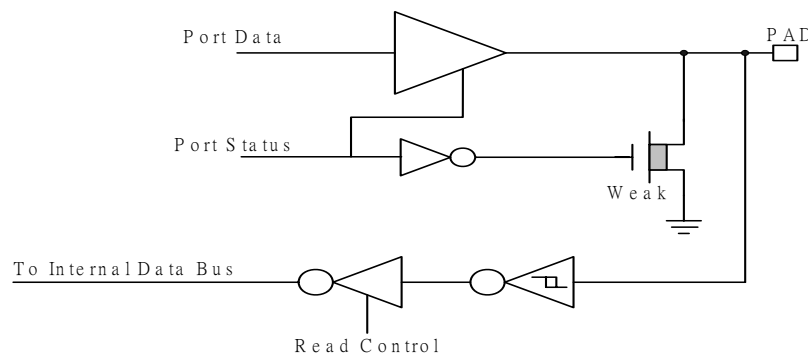
### 5.4. IR Function

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".



### 5.5. I/O Ports

There are two 8-bit I/O ports P0 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.**



### **5.6. 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.

### **5.7. Wave Processing Unit (WPU)**

The Wave Processing Unit (WPU) in SNC82060B provides up to 12 voice/music channels. A high-performance multi-channel music synthesizer is built-in to provide high-quality wave-table melody playback. Most of standard MIDI format can be accessed through the MIDI to Melody convert software. The voice playing can support 12-bits PCM and 5-bits ASDPCM compression format. Each channel has its own volume control and has a main volume control as well.

### **5.8. Auto Repetition**

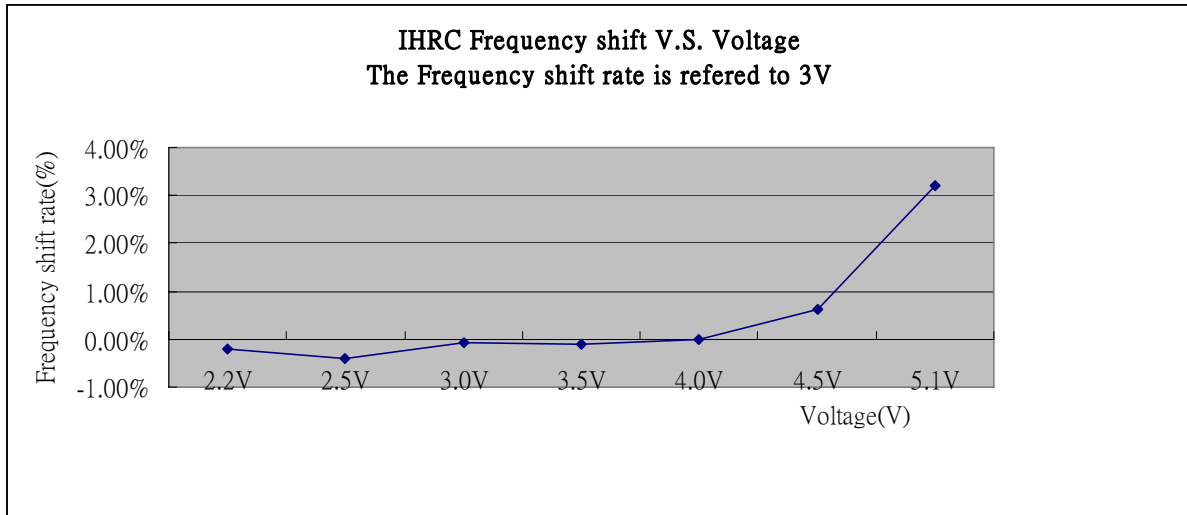
Each voice channel of 12 is equipped with a hardware auto repeat function. Auto repeat functions are normally used to implement sustain in instrument synthesis but can even be used to repeat any voice data of arbitrary length.



### 5.9. System clock

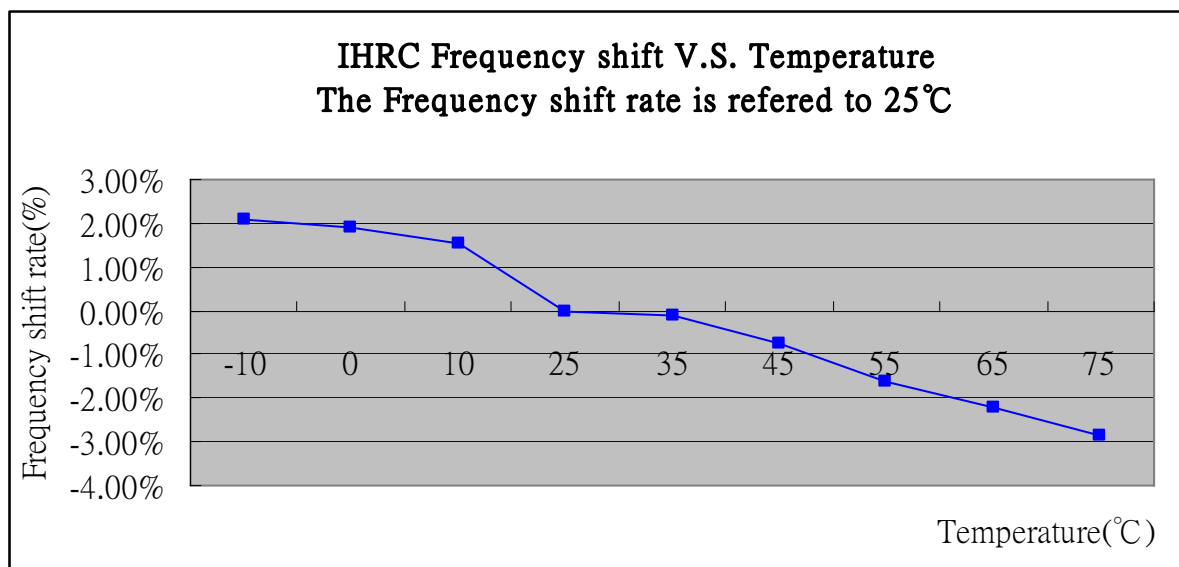
The system clock source is from the internal high-speed oscillator built in the SNC82060B chip. The high-speed oscillator uses RC type oscillator circuit. The frequency is affected by the voltage and temperature of the system and the following two diagrams is shown up the relation.

The figure <5-1> shows up the relationship between the high-clock frequency and Voltage.



**Figure <5-1>**

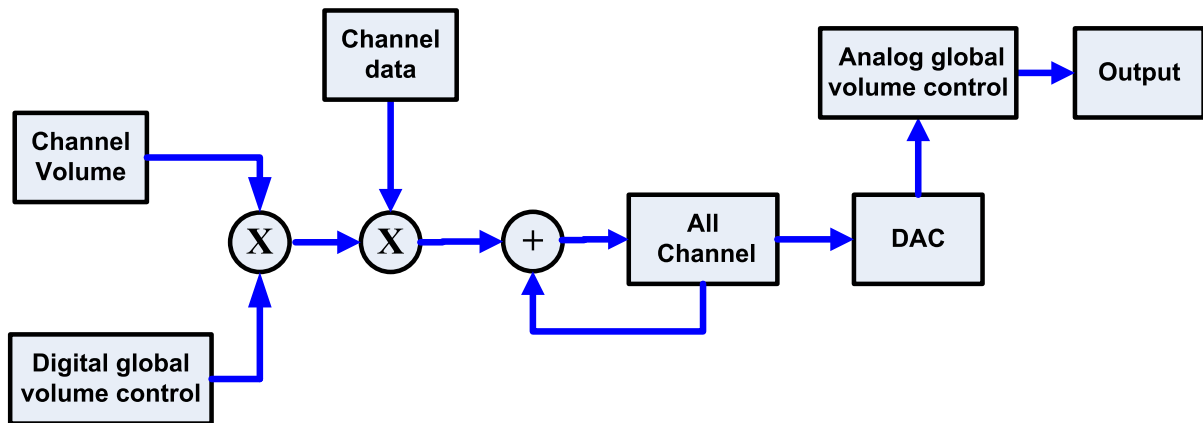
The Figure <5-2> shows up the relationship between the high-clock frequency and temperature at VDD=3V.



**Figure <5-2>**

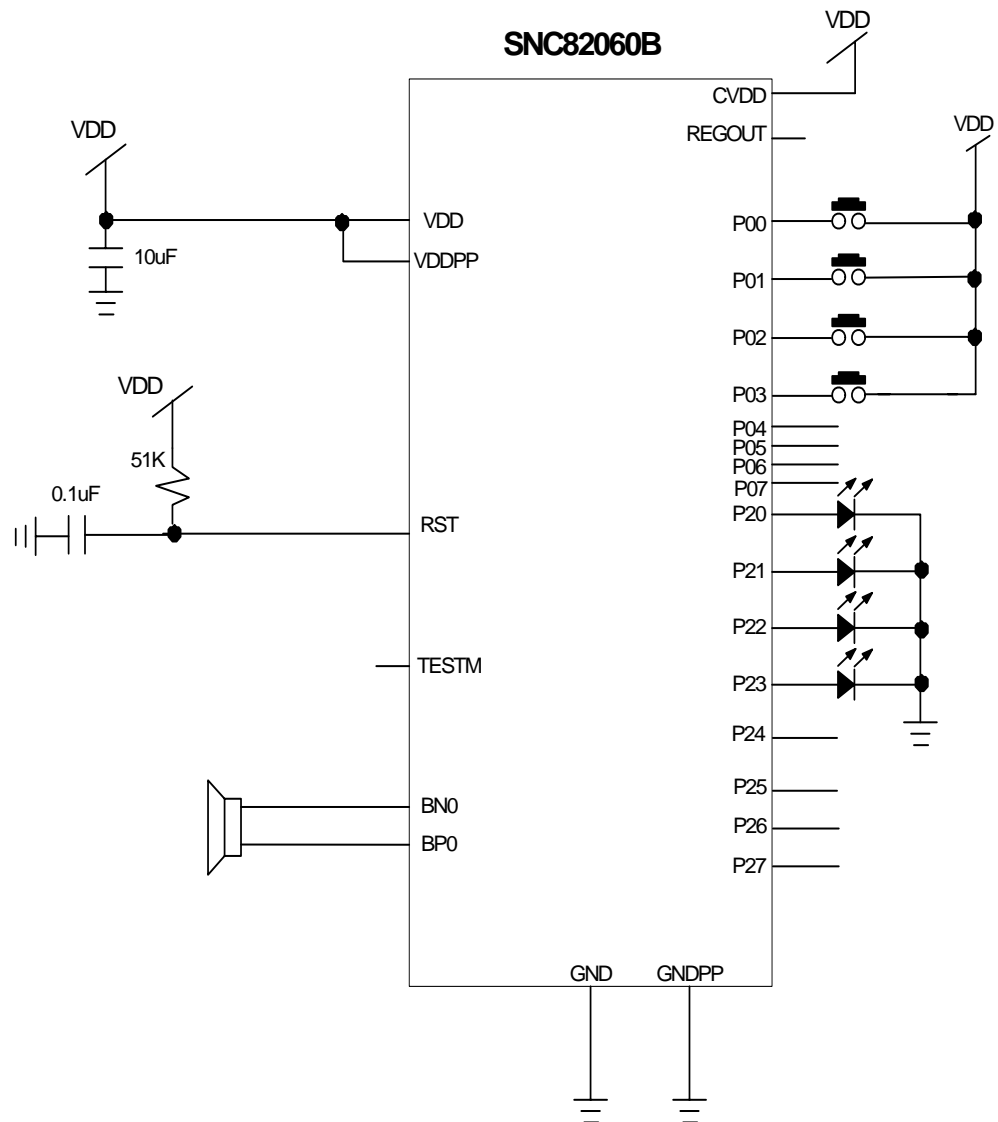
### 5.10. Volume Control

There are three ways to control volume of SNC80000B which is **channel volume control (8bits)**, **Analog global volume control** and **Digital global volume control**.

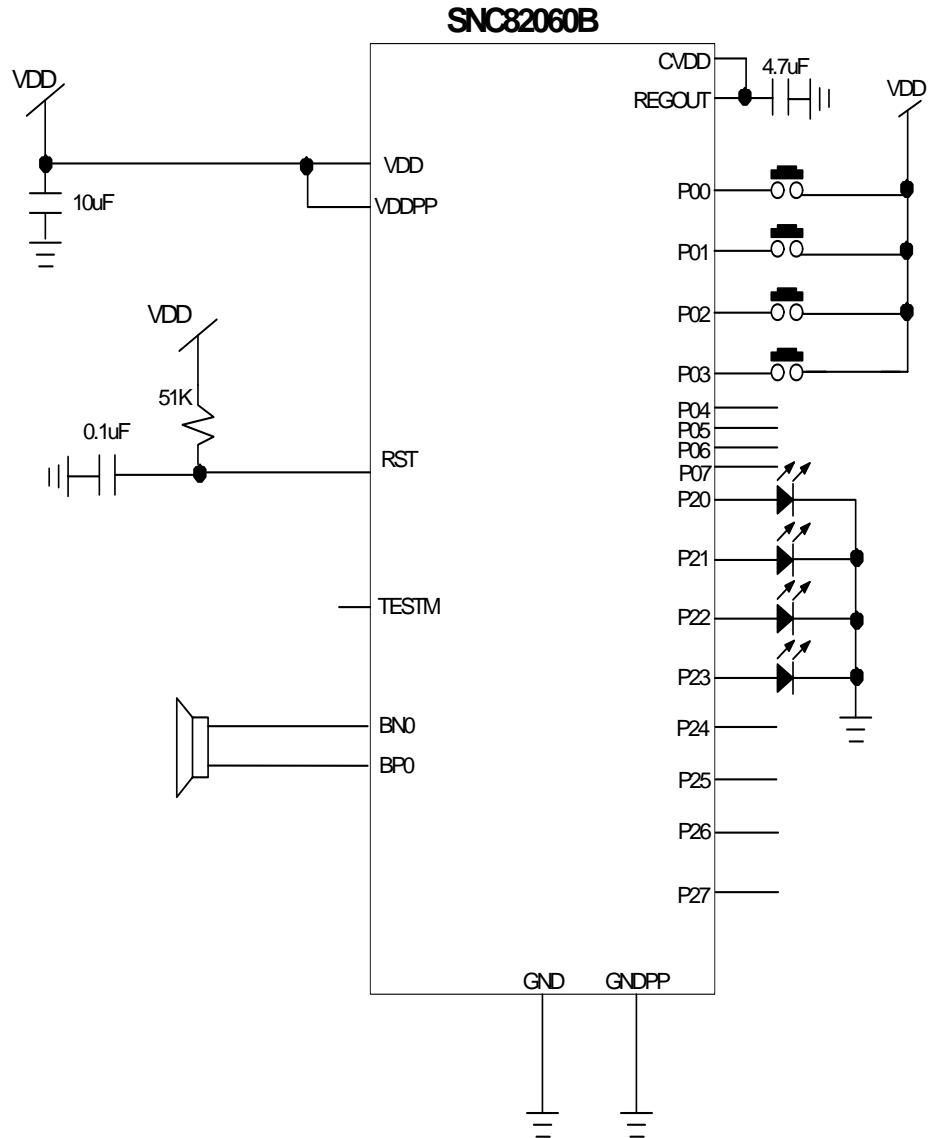


## 6 APPLICATION CIRCUIT

- ◆ Power Supply: 3.0V
- ◆ System Clock: Rosc 16.384Mhz ( $\pm 3\%$ )
- ◆ Voice output: Direct Drive Output



- ◆ Power Supply: 4.5V
- ◆ System Clock: Rosc 16.384Mhz ( $\pm 3\%$ )
- ◆ Voice output: Direct Drive 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    | -       | 5.1    | V        |  |
| Standby Current                           | $I_{SBY}$ | -      | 3<br>5  | -      | $\mu A$  | $V_{DD}=3V$<br>$V_{DD}=4.5V$                         |
| Operating Current<br>(Push-Pull Turn On)  | $I_{OPR}$ | -      | 6<br>12 | -      | mA       | $V_{DD}=3V$ , no load<br>$V_{DD}=4.5V$ , no load     |
| Operating Current<br>(Push-Pull Turn OFF) | $I_{OPR}$ | -      | 4<br>5  | -      | mA       | $V_{DD}=3V$ , no load<br>$V_{DD}=4.5V$ , no load     |
| Input pull low impedance of<br>P0,P2      | $R_i$     | -      | 0.8M    | -      | $\Omega$ | $V_{DD}=3V$  |
| I/O port Drive Current                    | $I_{OD}$  | -      | 4<br>8  | -      | mA       | $V_{DD}=3V$ , $V_O=2.6V$<br>$V_{DD}=5V$ , $V_O=4.2V$ |
| I/O port Sink Current                     | $I_{OS}$  | -      | 6<br>10 | -      | mA       | $V_{DD}=3V$ , $V_O=0.4V$<br>$V_{DD}=5V$ , $V_O=0.8V$ |
| Push-Pull current                         | $I_{PP}$  | -      | 70      | -      | mA       | $V_{DD}=3V$ , Output<br>1Khz Sin wave.               |
| Push-Pull current                         | $I_{PP}$  | -      | 100     | -      | mA       | $V_{DD}=4.5V$ , Ouput<br>1Khz Sin wave.              |
| IR Carrier Frequency                      | $F_{IR}$  | -      | 38.5    | -      | KHz      |  |
| Internal ROSC Frequency                   | $F_{OSC}$ | 15.892 | 16.384  | 16.876 | Mhz      | $V_{DD}=3V(\pm 3\%)$                                 |

## **DISCLAIMER**

The information appearing in SONiX web pages (“this publication”) is believed to be accurate.

However, this publication could contain technical inaccuracies or typographical errors. The reader should not assume that this publication is error-free or that it will be suitable for any particular purpose. SONiX makes no warranty, express, statutory implied or by description in this publication or other documents which are referenced by or linked to this publication. In no event shall SONiX be liable for any special, incidental, indirect or consequential damages of any kind, or any damages whatsoever, including, without limitation, those resulting from loss of use, data or profits, whether or not advised of the possibility of damage, and on any theory of liability, arising out of or in connection with the use or performance of this publication or other documents which are referenced by or linked to this publication.

This publication was developed for products offered in Taiwan. SONiX may not offer the products discussed in this document in other countries. Information is subject to change without notice. Please contact SONiX or its local representative for information on offerings available. Integrated circuits sold by SONiX are covered by the warranty and patent indemnification provisions stipulated in the terms of sale only. The application circuits illustrated in this document are for reference purposes only. SONIX DISCLAIMS ALL WARRANTIES, INCLUDING THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PURPOSE. SONIX reserves the right to halt production or alter the specifications and prices, and discontinue marketing the Products listed at any time without notice. Accordingly, the reader is cautioned to verify that the data sheets and other information in this publication are current before placing orders.

Products described herein are intended for use in normal commercial applications. Applications involving unusual environmental or reliability requirements, e.g. military equipment or medical life support equipment, are specifically not recommended without additional processing by SONIX for such application.