

32bits DSP Digital Audio Signal Process Module

Specification Sheet

Part Number：SNC8600BMT02

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修订历史

|  |  |  |
| --- | --- | --- |
| 修订版本 | 修改日期 | 内容概要 |
| V0.1 | 2021/06/10 | 初版 |
| V1.0 | 2021/07/22 | 增加PIN脚定义说明 |
| V1.1 | 2021/8/19 | 修改通用版本 |
|  |  |  |

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# 1 产品概述

九音科技SNC8600BMT02模组是一款支持多麦克风阵列的语音前端解决方案。可以搭载九音科技的麦克多阵列算法,通过对讲话人的角度定位，形成定向拾音波束，并对波束以外的噪声进行抑制，以保证较高的拾音质量。

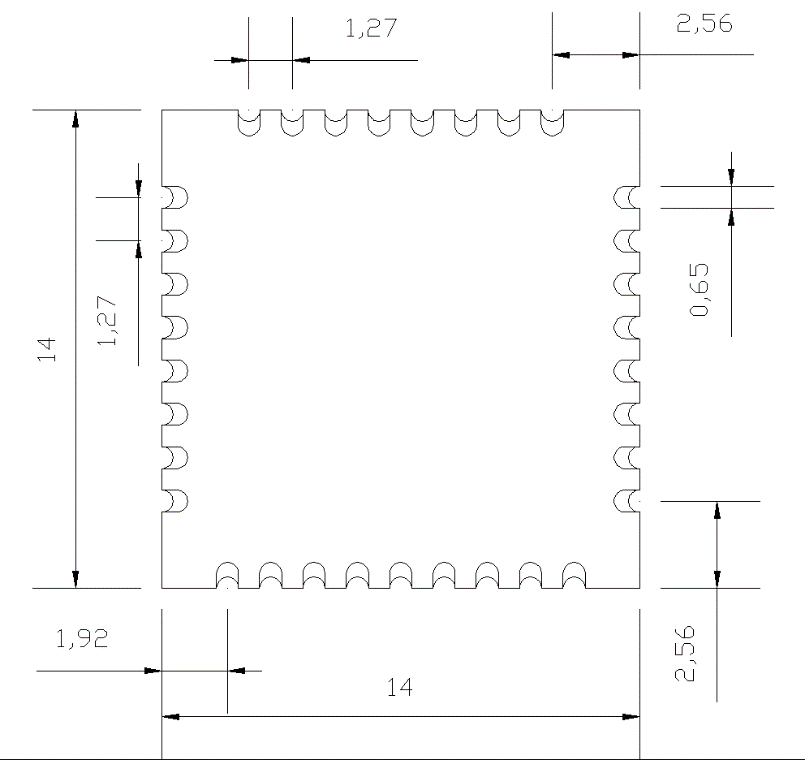
本模块主要有以下特性:

|  |  |
| --- | --- |
| System | * 200MHz 32bit HiFi DSP 处理器 * 集成512KB内存 * 集成ROM固件 * 集成 8M bits Flash * 支持24MHz无源晶振 * 工作电压: I/O 3.3V 或 1.8V * 支持PEQ,最大支持8段 |
| Audio | * 支持24位ADC和DAC的立体声,动态范围分别是106dB和110dB * 支持采样率: 8k, 16k, 32k, 44.1k, 48k, 88.2k, 96k, 176.4k, 192k * 2路模拟麦克风的输入 * 最多4路数字麦克风的输入 * 支持: 自动增益控制, 动态范围控制, 混音 |
| Power | * 3.3V到5.5V的单电源输入 * 支持3.3V单DC-DC调节CODEC模拟部分电压 * 支持3.3V单LDO为模拟部分提供电源 * 支持3.3V单LDO数字接口提供电源 * 支持2.5V的两路麦克风单独供电 * 功耗:   - 播放音乐 14mA@Vbat = 3.3V  - 通话 [16mA@Vbat=3.3](mailto:16mA@Vbat=3.3) |
| Interface | * 支持9 GPIO * 支持 1路Auxiliary ADC输入 * 支持4路硬件PWM * 支持Type-C接口,符合音频规范Rev1.0\Rev2.0版本 * 串行接口: I2S\*2, UART\*1, I2C\*1 |
| Application | * USB声卡 * 会议音箱 * USB麦克风 * 其他音频产品 |

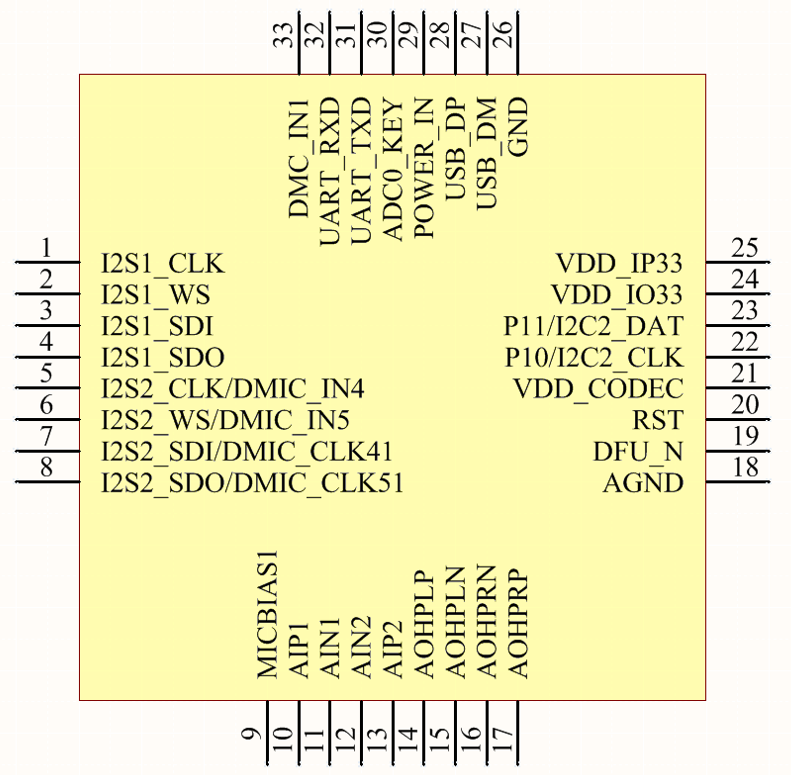
# 2模组介绍

## 2.1 尺寸

整板尺寸为14x14（mm），孔径为0.65mm。



## 2.2 Pin脚定义



|  |  |  |  |
| --- | --- | --- | --- |
| Pin Number | Type | Pin Name | Description |
| 1 | I/O | I2S1\_CLK/GPIO0 |  |
| 2 | I/O | I2S1\_WS/GPIO1 |  |
| 3 | I/O | I2S1\_SDI/GPIO2 |  |
| 4 | I/O | I2S1\_SDO/GPIO3 |  |
| 5 | I/O | I2S2\_CLK/DMIC\_IN4/GPIO4 |  |
| 6 | I/O | I2S2\_WS/DMIC\_IN5/GPIO5 |  |
| 7 | I/O | I2S2\_SDI/DMIC\_CLK41/GPIO6 |  |
| 8 | I/O | I2S2\_SDO/DMIC\_CLK51/GPIO7 |  |
| 9 | Power | MICBIAS1 | Micbias 1 |
| 10 | Analog | AIP1 | MIC1 input P port |
| 11 | Analog | AIN1 | MIC1 input N port |
| 12 | Analog | AIN2 | MIC2 input N port |
| 13 | Analog | AIP2 | MIC2 input P port |
| 14 | Analog | AOHPLP | Left DAC P port |
| 15 | Analog | AOHPLN | Left DAC N port |
| 16 | Analog | AOHPRN | Right DAC N port |
| 17 | Analog | AOHPRP | Right DAC P port |
| 18 | Analog GND | AGND |  |
| 19 | I/O | DFU\_N | Firmware update enable |
| 20 | I | RST | Chip reset |
| 21 | Power | VDD\_CODEC | 3.3V for Codec |
| 22 | I/O | P10/I2C2\_CLK |  |
| 23 | I/O | P11/I2C2\_DAT |  |
| 24 | Power | VDD\_IO33 | 3.3V for IO |
| 25 | Power | VDD\_IP33 | 3.3V for analog block |
| 26 | GND | GND |  |
| 27 |  | USB\_DM |  |
| 28 |  | USB\_DP |  |
| 29 | Power | POWER\_IN | External power supply |
| 30 | I | ADC0\_KEY |  |
| 31 | O | UART\_TXD | UART TX data |
| 32 | I | UART\_RXD | UART RX data |
| 33 | I/O | DMC\_IN1/GPIO9 |  |

# 3 音频接口

## 3.1 ADC 特性

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Condition: - 40°C to +100°C, AVDD=3.3Vm DVDD=1.1V. Input sine wave with a frequency of 1 kHz, measurement bandwidth 20 Hz - Fs/2 for Fs < 48 kHz, measurement bandwidth 20 Hz - 20 kHz for Fs = 48 kHz to 192 kHz, normal mode, capacitor-less input conﬁguration, unless otherwise speciﬁed. | | | | | |
| Parameter | Test condition | Min. | Typ. | Max. | Unit |
| Input level | Full Scale,Gain GID\* = 0 dB, boost gain GIM\* = 0 dB |  | 2.12 |  | Vpp |
| Full Scale, Gain GID\* = 0 dB, boost gain GIM\* = 20 dB |  | 0.212 |  | Vpp |
| THD+N | 1 kHz sine wave @ Full Scale -3 dB and gain GID\* = 0 dB, boost gain GIM\* = 0 dB, normal mode and low power mode |  | 88 |  | dB |
| Dynamic Range | A-weighted, 1 kHz sine wave, normal mode |  | 106.5 |  | dB |
| A-weighted, 1 kHz sine wave, low power mode |  | 103.5 |  | dB |
| SNR | A-weighted, 1 kHz sine wave, with activation of the SNR optimizer feature |  | 106 |  | dB |
| A-weighted, 1 kHz sine wave, gain GID\* = 0 dB, boost gain GIM\* = 0 dB, normal mode |  | 94.5 |  | dB |
| A-weighted, 1 kHz sine wave, gain GID\* = 0 dB, boost gain GIM\* = 0 dB, low power mode |  | 90.5 |  | dB |
| PSRR | 100 mVpp 1 kHz sinewave is applied to AVD, input data is 0 and gain GID\* = 0 dB, boost gain GIM\* = 0 dB |  | 90 |  | dB |

## 3.2 DAC 特性

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Condition: - 40°C to +100°C, AVDD=3.3Vm DVDD=1.1V. Input sinewave with a frequency of 1kHz, measurement bandwidth 20Hz-20kHz, unless otherwise speciﬁed. | | | | | |
| Parameter | Test condition | Min. | Typ. | Max. | Unit |
| Output level | Full Scale, gain GOL/R = +6 dB, GODL/R = 0 dB, 10 kOhms load |  | 5.6 |  | Vpp |
| Full Scale, gain GOL/R = +6 dB, GODL/R = 0 dB, 200 Ohms load |  | 5.6 |  | Vpp |
| Full Scale, gain GOL/R = +6 dB, GODL/R = 0 dB, 32 Ohms load |  |  | 3.96 | Vpp |
| Output power | 200 Ohms load |  | 19.6 |  | mW |
| 32 Ohms load |  |  | 61.3 | mW |
| SNR | A-weighted, 1 kHz sine wave @Full Scale, gain GOL/R = +6 dB, GODL/R = 0 dB, 10 kOhms load |  | 101 |  | dB |
| Dynamic Range | A-weighted, 1 kHz sine wave @ Full Scale, gain GOL/R = [-10 +6] dB, GODL/R = 0 dB, 10 kOhms load |  | 110 |  | dB |
| Idle Noise | A-weighted with no signal, gain GOL/R=-10dB, GODL/R = 0 dB, 10k Ohms load |  | -104.9 |  | dBV |
| THD+N | 1 kHz sine wave @ Full Scale -1 dB, gain GOL/R = +6 dB, GODL/R = 0 dB, 10 kOhms load |  | 87 |  | dB |
| 1 kHz sine wave @ Full Scale -1 dB, gain GOL/R = +6 dB, GODL/R = 0 dB, 200 Ohms load |  | 85 |  | dB |
| 1 kHz sine wave @ Full Scale -1 dB, gain GOL/R = -3 dB, GODL/R = 0 dB, 32 Ohms load |  | 79 |  | dB |

## 3.3 Digital microphone interface 特性

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Condition: Input sine wave with a frequency of 1 kHz, MCLK = 12 MHz or 13 MHz, DMIC\_CLK = Fmclk/4, measurement bandwidth 20 Hz - Fs/2 for Fs = 8 to 32 kHz, measurement bandwidth 20 Hz - 20 kHz for Fs = 44.1 kHz to 192 kHz, unless otherwise speciﬁed. | | | | | |
| **Parameter** | **Test condition** | **Min.** | **Typ.** | **Max.** | **Unit** |
| Input level | Full Scale max value, Gain GID\* = 0 dB |  | 85.6 |  | % |
| Full Scale min value, Gain GID\* = 0 dB |  | 14.4 |  | % |
| SNR | A-weighted,1kHz sinewave @Full Scale and gain GIDL, GIDR = 0 dB |  | 100 |  | dB |
| Dynamic Range | A-weighted, 1 kHz sine wave @ Full Scale -60 dB and gain GID\* = 0 dB |  | 100 |  | dB |
| THD+N | 1kHz sinewave @Full Scale-1dB and gain GIDL, GIDR = 0 dB |  | 90 |  | dB |
| Digital gain | Gain GID\* when activated | -64 |  | 63 | dB |
| Gain step | GID\* @1 kHz |  | 1 |  | dB |
| Gain accuracy | GID\* @1 kHz | -0.25 | 1 | +0.25 | dB |

# 4 外围接口说明

## 4.1 I2C 特性

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item | Quantity | Unit | Specification | Comment |
| I2C | 2 | kbps | Up to 400 |  |

## 4.2 UART 特性

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item | Quantity | Unit | Specification | Comment |
| UART | 1 | bps | Up to 3M | TX and RX |

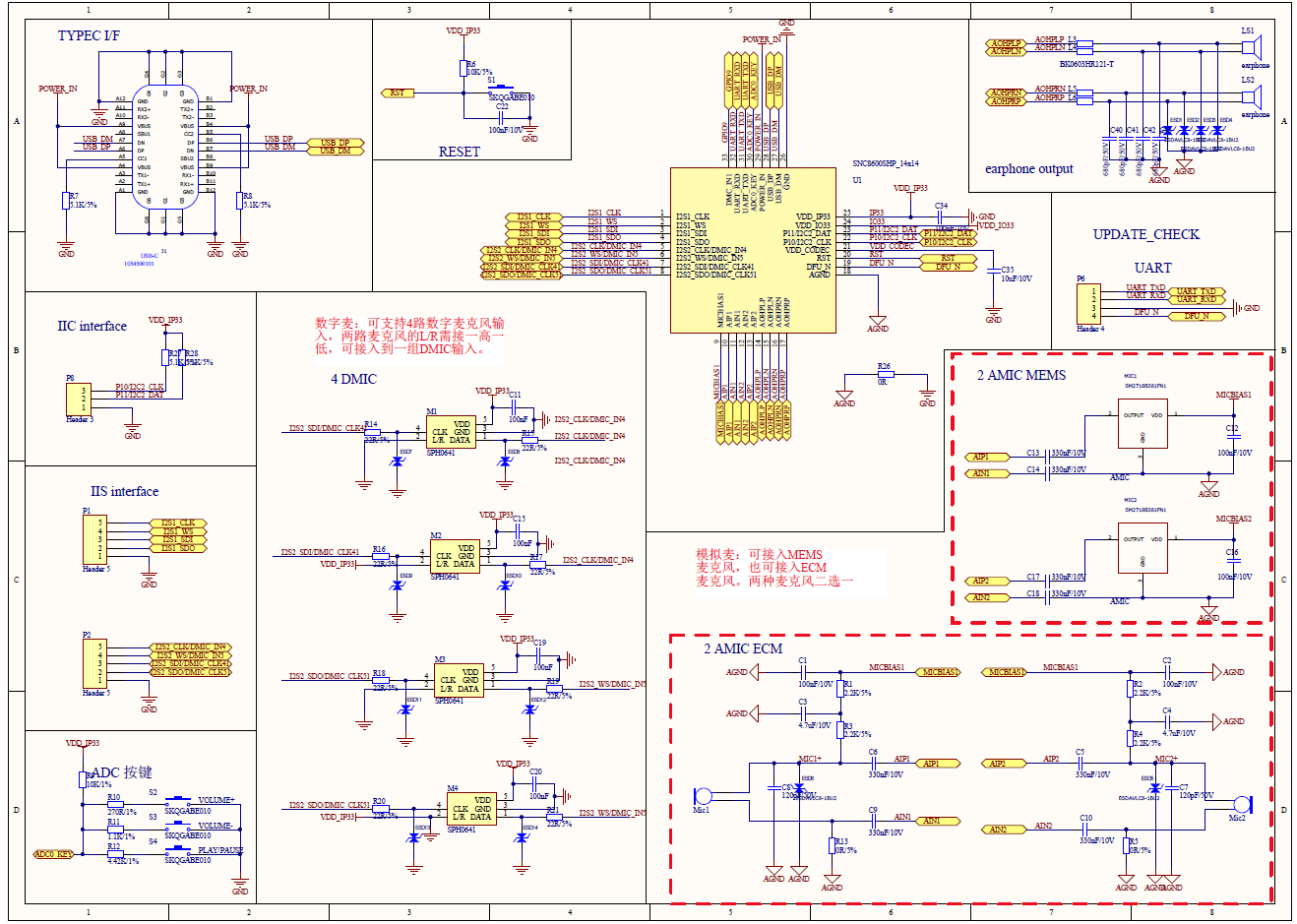
## 4.3 I2S 特性

|  |  |  |  |
| --- | --- | --- | --- |
| Item | Unit | Specification | Comment |
| Interface number |  | 3 I2S interface, with word clock, bit clock, data-in, data-out |  |
| Word clock | kHz | Up to 192 | 8, 16, 32, 44.1, 48, 88.2, 96, 176.4, 192 |
| Data width | bits | 16/20/24 |  |
| Format |  | Standard, left-justified, right-justified |  |

## 4.4 Auxiliary ADC 特性

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameters | Min | Typ | Max | Unit |
| Resolution |  | 12 |  | Bits |
| ENOB |  | 11 |  | Bits |
| Sampling rate |  | 5.0 |  | Msps |
| Channel |  | TBD |  |  |
| AVDD-aux-ADC |  | 3.3 |  | V |
| DVDD-aux-ADC |  | 1.1 |  | V |
| Input voltage range | 0 |  | 3.3 | V |
| INL accuracy | -2 |  | +2 | LSB |
| DNL accuracy | -1 |  | +1 | LSB |
| Offset | -2 |  | +2 | LSB |
| Gain error | -1 |  | 1 | % |
| Hardware conversion time |  | 1.0 |  | Us |

# 5 参考电路设计



# 6 PCB Layout设计注意事项

1. 模拟麦克风输入需要做包地处理，减小外接干扰。
2. 数字麦克风输入CLK和DAT信号线需要走差分线,并包地处理。



1. DAC输出LP/LN和RP/RN 需要走差分线并包地处理。

