

# HaaS201 模块规格书

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## 版本历史记录

| 版本   | 时间         | 描述   |
|------|------------|------|
| V1.0 | 2021/02/20 | 初始版本 |

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# 1. 概述

HaaS201 是一款集成了双频 WiFi（2.4GHz 和 5GHz）和蓝牙 5.0 的模组。它包含了一个 KM4 内核的高性能 MCU 和一个低功耗 MCU KM0，集成 WLAN（802.11 a/b/g/n）MAC，和一个 1T1R 兼容的 WLAN 和蓝牙基带，模块具备也丰富的外设资源。

HaaS201 拥有高速 SDIO 和 USB 接口，并集成了音频编解码器，Key-Scan 和 touch keys。而且可以根据应用需求将 GPIO 灵活配置为各种功能。

高性能 MCU KM4 是 ARMv8-M 架构，主频高达 200MHz，兼容 Cortex-M33 指令集，支持浮点，DSP 功能，集成了 512KB SRAM，4MB PSRAM。

低功耗 MCU KM0 是 ARMv8-M 架构，主频高达 20MHz，兼容 Cortex-M23 指令集，集成了 64KB SRAM，同时提供 1KB retention SRAM 用于在低功耗模式下保存数据。

## 2. 功能特点

### WiFi 特点

- ✓ 802.11 a/b/g/n 1x1, 2.4GHz & 5GHz
- ✓ 支持 HT20/HT40 模式
- ✓ 支持低功耗 beacon 侦听模式，低功耗接收模式，极低功耗待机模式（DLPS）
- ✓ 支持 STA, AP 和 STA+AP 模式
- ✓ WiFi 和蓝牙共用同一天线

### 内存

- ✓ 高性能 MCU KM4，集成了 512KB SRAM，4MB PSRAM
- ✓ 低功耗 MCU KM0，集成了 64KB SRAM，同时提供 1KB retention SRAM 用于在低功耗模式下保存数据。
- ✓ 外部 4MB flash

### 蓝牙特点

- ✓ 支持蓝牙 5.0
- ✓ 全功耗模式（8dbm，和 WiFi 共用同一 PA）

### 安全

- ✓ AES/DES/SHA 硬件加密
- ✓ 支持 TrustZone-M
- ✓ 支持 Secure boot
- ✓ SWD 保护，支持调试端口保护和禁止模式
- ✓ 支持 Secure eFuse

## 系统外设

- ✓ 3 个 UART 接口, 1x 高速 UART, 波特率高达 6Mbps; 1x 低速 UART; 1x Debug UART
- ✓ 3 个 SPI 接口, 速度高达 50MHz
- ✓ 1 个 RTC
- ✓ 1 个红外接口, 载波频率 25kHz-500kHz
- ✓ 1 个 I2C 接口, 速度可达 400Kbps
- ✓ 17 路 PWM
- ✓ 1 个 I2S 接口
- ✓ 1 个 DMIC 接口
- ✓ 1 个 Q-Decoder 接口
- ✓ 1 个 SGPIO (单线通信) 接口
- ✓ 7x3/5x5 Key-Scan
- ✓ 10 个 Wake Pin
- ✓ 2 个高速定时器
- ✓ 1 个 USB 接口
- ✓ 7 路 ADC
- ✓ 1 路电池电压监测接口
- ✓ 4 路电容触摸按键
- ✓ 2 路音频输出 (Single-ended)
- ✓ 2 路音频输入 (Single-ended)

## 软件特点

- ✓ 多环境开发支持：支持 windows, linux 开发, Alios Things studio 一键编译烧录
- ✓ 完善的 BSP 支持：UART, FLASH, GPIO, I2C, PWM, SPI, ADC
- ✓ 网络功能强大：wifi STA/AP, BLE MESH, BT5.0
- ✓ 多文件系统支持：KV (键值对存储), Littlefs, FAT32
- ✓ 云联动组件：阿里云链接套件 (LinkKit)
- ✓ 丰富应用层协议：MQTT, CoAP, HTTP, TLS, DHCP
- ✓ 完备测试手段：uLog (日志), backtrace, shell, 数据断点, 内存监控, 系统监控
- ✓ 工业协议支持：Modbus RTU, CANOpen
- ✓ 支持 IOT 轻应用：JavaScript 编写嵌入式应用, 免编译, 免烧录, 一键热更新

### 3. 应用场景

HaaS200 应用场景

- a. 数据网关
- b. 智能家居
- c. 智慧商业
- d. 边缘计算网关

### 4. 基本参数

|                           |                            |
|---------------------------|----------------------------|
| Wi-Fi Operating Frequency | 2.4GHz/5GHz                |
| Buletooth Standard        | BLE 5.0 core specification |
| Dimension                 | 28.0mm*18.6mm              |
| Operation Temperature     | -40℃ to +125 °C            |
| Storage Temperature       | -55℃ to +125 °C            |
| Operation Voltage         | 3.3V (3.0V~3.6V)           |

## 5. 硬件概述

### 5.1. 尺寸信息

Typical Housing Dimension (L x W x H ): 28.0mm x 18.6mm x 3.15mm.

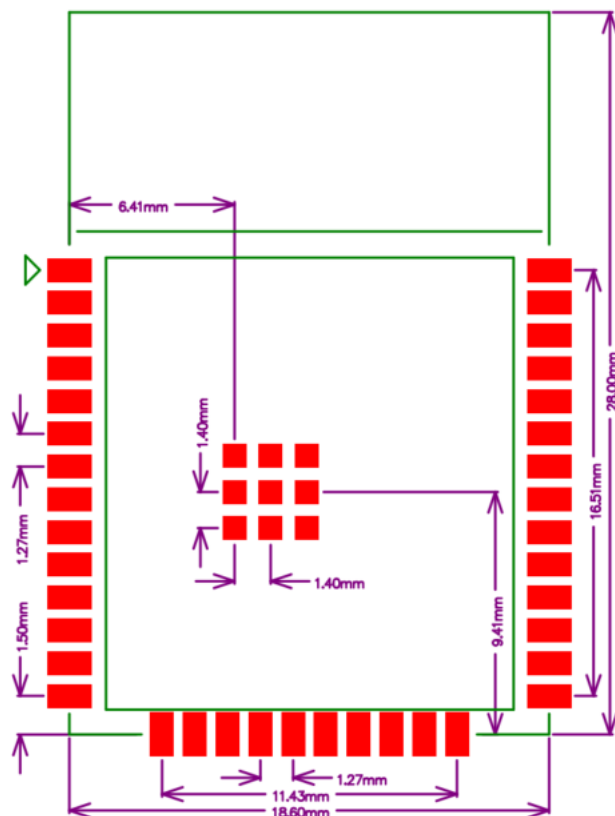


图 5-1-1 模块尺寸 (mm)

## 5.2. 引脚定义

| Pin number    | Nume         | Type        | Description                          |
|---------------|--------------|-------------|--------------------------------------|
| 1, 15, 38, 39 | GND          | Analog      | GND                                  |
| 2             | VDD          | Analog      | VDD input                            |
| 3             | EN           | Digital I/O | Chip reset pin. High level is active |
| 4             | PA30         | Digital I/O | GPIO                                 |
| 5             | PA17         | Digital I/O | GPIO                                 |
| 6             | PA16         | Digital I/O | GPIO                                 |
| 7             | PA15         | Digital I/O | GPIO                                 |
| 8             | PA13         | Digital I/O | GPIO                                 |
| 9             | PA12         | Digital I/O | GPIO                                 |
| 10            | PA25         | Digital I/O | GPIO                                 |
| 11            | PB4          | Digital I/O | GPIO                                 |
| 12            | VBAT_MEAS    | Analog      |                                      |
| 13            | PA18         | Digital I/O | GPIO                                 |
| 14            | PA27         | Digital I/O | GPIO                                 |
| 16            | PA19         | Digital I/O | GPIO                                 |
| 17            | PB6          | Digital I/O | GPIO                                 |
| 18            | PB7          | Digital I/O | GPIO                                 |
| 19            | PB5          | Digital I/O | GPIO                                 |
| 20            | PB3          | Digital I/O | GPIO                                 |
| 21            | PB2          | Digital I/O | GPIO                                 |
| 22            | PB1          | Digital I/O | GPIO                                 |
| 23            | PB22         | Digital I/O | GPIO                                 |
| 24            | PB29         | Digital I/O | GPIO                                 |
| 25            | PB23         | Digital I/O | GPIO                                 |
| 26            | PB26         | Digital I/O | GPIO                                 |
| 27            | PB31         | Digital I/O | GPIO                                 |
| 28            | PA4          | Digital I/O | GPIO                                 |
| 29            | PA2          | Digital I/O | GPIO                                 |
| 30            | PA0          | Digital I/O | GPIO                                 |
| 31            | PA26         | Digital I/O | GPIO                                 |
| 32, 37        | NC           | NC          | NC                                   |
| 33            | PA28         | Digital I/O | GPIO                                 |
| 34            | UART_LOG_RXD | Digital I/O | GPIO                                 |
| 35            | UART_LOG_TXD | Digital I/O | GPIO                                 |
| 36            | PA14         | Digital I/O | GPIO                                 |

注意:

PA27, 上电不能下拉, 输出低时内部 50K 电阻下拉。

### 5.3. GPIO 功能介绍

| type | Function 0  | Function 1     | Function 2      | Function 3 | Function 4 | Function 5 | Function 6   | Function 7   | Function 8 | Function 9 |
|------|-------------|----------------|-----------------|------------|------------|------------|--------------|--------------|------------|------------|
| GPIO | CHIP_EN     |                |                 |            |            |            |              |              |            |            |
|      | UART-LOG-RX |                |                 |            |            |            |              |              |            |            |
|      | UART-LOG-TX |                |                 |            |            |            |              |              |            |            |
|      | PA0         | I2S_SD_RX      | QDEC_IDX        | SGPIO      | MIC_BIAS   |            |              |              |            |            |
|      | PA2         | I2S_CLK        | QDEC_PHB        | SGPIO_OUT  | MIC2_P     |            |              |              |            |            |
|      | PA4         | I2S_WS         | QDEC_PHA        |            | MIC1_P     |            |              |              |            |            |
|      | PA12        | LP_UART_TXD    | SPI1_MOSI       | HS_PWM0    | LP_PWM0    | I2S_MCLK   |              |              |            |            |
|      | PA13        | LP_UART_RXD    | SPI1_MISO       | HS_PWM1    | LP_PWM1    | I2S_SD_TX1 |              |              |            |            |
|      | PA14        | LP_UART_RTS    | SPI1_CLK        |            |            | I2S_SD_TX2 |              |              |            |            |
|      | PA15        | LP_UART_CTS    | SPI1_CS         |            |            |            |              |              |            |            |
|      | PA16        | HS_UART0_RTS   | SPI0_MOSI       |            |            |            |              |              |            |            |
|      | PA17        | HS_UART0_CTS   | SPI0_MISO       |            |            |            |              |              |            |            |
|      | PA18        | HS_UART0_TXD   | SPI0_CLK        |            |            |            |              |              |            |            |
|      | PA19        | HS_UART0_RXD   | SPI0_CS         |            |            |            |              |              |            |            |
|      | PA25        | LP_UART_RXD    | HS_USI_SPI_MOSI | IR_TX      | LP_I2C_SCL | HS_PWM4    | LP_PWM4      |              |            |            |
|      | PA26        | LP_UART_TXD    | HS_USI_SPI_MISO | IR_RX      | LP_I2C_SDA | HS_PWM5    | LP_PWM5      |              |            |            |
|      | PA27        | LP_UART_RTS    |                 |            |            |            |              |              |            |            |
|      | PA28        | LP_UART_CTS    | HS_USI_SPI_CS   | HS_PWM6    | LP_PWM0    |            |              |              |            |            |
|      | PA30        | HS_USI_SPI_CLK | HS_PWM7         | LP_PWM1    |            |            |              |              |            |            |
|      | PB1         | LP_UART_TXD    | ADC             |            |            |            |              |              |            |            |
|      | PB2         | LP_UART_RXD    | ADC             |            |            |            |              |              |            |            |
|      | PB3         |                | ADC             |            |            |            |              |              |            |            |
|      | PB4         | SPI1_MOSI      | RTC_EXT_32K     | HS_PWM8    | LP_PWM2    | I2S_SD_TX1 | HS_TIM4_TRIG | ADC          | touch key  |            |
|      | PB5         | SPI1_MISO      | RTC_OUT         | LP_I2C_SCL | HS_PWM9    | LP_PWM3    | I2S_SD_TX2   | HS_TIM5_TRIG | ADC        | touch key  |
|      | PB6         | SPI1_CLK       | LP_TIM4_TRIG    | LP_I2C_SDA |            |            |              | ADC          | touch key  |            |
|      | PB7         | SPI1_CS        | LP_TIM5_TRIG    | HS_PWM17   | LP_PWM5    |            |              | ADC          | touch key  |            |
|      | PB22        | LP_TIM4_TRIG   | IR_RX           | SPI_DATA3  | HS_PWM14   | LP_PWM2    | I2S_SD_RX    | QDEC_PHB     | SGPIO_OUT  |            |
|      | PB23        | LP_TIM5_TRIG   | IR_TX           | SPI_DATA2  | HS_PWM15   | LP_PWM3    | I2S_MCLK     | QDEC_PHA     | SGPIO_OUT  |            |
|      | PB26        | I2S_SD_TX0     | SGPIO           |            |            |            |              |              |            |            |
|      | PB29        | IR_RX          | I2S_CLK         | SGPIO      |            | AOUTP_R    |              |              |            |            |
|      | PB31        | IR_TX          | I2S_WS          | QDEC_PHA   | SGPIO      | AOUTP_L    |              |              |            |            |
|      | VBAT_MEAS   |                |                 |            |            |            |              |              |            |            |

## 6. 电气特性

### 6.1. 2.4G wifi Performance

| WiFi 2.4G Spec  |      |     |      |      |                                                                                |
|-----------------|------|-----|------|------|--------------------------------------------------------------------------------|
| Item            | Min  | Typ | Max  | Unit | Condition                                                                      |
| Frequency range | 2412 |     | 2484 | MHz  |                                                                                |
| Rx Sensitivity  |      | -98 |      | dBm  | 1Mbps CCK                                                                      |
| RX Sensitivity  |      | -95 |      | dBm  | BPSK rate 1/2, 6Mbps OFDM                                                      |
| RX Sensitivity  |      | -95 |      | dBm  | BW = 20MHz Mixed Mode<br>800ns Guard Interval Non-STBC<br>MCS 0, BPSK rate 1/2 |
| RX Sensitivity  |      | -93 |      | dBm  | BW = 40MHz Mixed Mode<br>800ns Guard Interval Non-STBC<br>MCS 0, BPSK rate 1/2 |
| Output power    |      | 20  | 21   | dBm  | With spectral mask and EVM compliance                                          |
| Tx EVM          |      |     | -5   | dB   | BPSK rate 1/2, 6Mbps OFDM                                                      |

### 6.2. 5G wifi Performance

| WiFi 5G Spec    |      |     |      |      |                                                                                   |
|-----------------|------|-----|------|------|-----------------------------------------------------------------------------------|
| Item            | Min  | Typ | Max  | Unit | Condition                                                                         |
| Frequency range | 5180 |     | 5825 | MHz  |                                                                                   |
| Rx Sensitivity  |      | -93 |      | dBm  | BPSK rate 1/2, 6Mbps OFDM                                                         |
| RX Sensitivity  |      | -93 |      | dBm  | BW = 20MHz HT Mixed Mode<br>800ns Guard Interval Non-STBC<br>MCS 0, BPSK rate 1/2 |
| RX Sensitivity  |      | -91 |      | dBm  | BW = 40MHz HT Mixed Mode<br>800ns Guard Interval Non-STBC<br>MCS 0, BPSK rate 1/2 |
| Output power    |      | 18  | 19   | dBm  | BPSK rate 1/2, 6Mbps OFDM                                                         |
| Tx EVM          |      |     | -5   | dB   | BPSK rate 1/2, 6Mbps OFDM                                                         |

### 6.3. Bluetooth Performance

| BT RF Specifications |        |     |      |      |           |
|----------------------|--------|-----|------|------|-----------|
| Item                 | Min    | Typ | Max  | Unit | Condition |
| Frequency Range      | 2402   |     | 2480 | MHz  |           |
| Tx Output Power      | -10    | 4.5 |      | dBm  |           |
| Rx Sensitivity       | -100.9 |     |      | dBm  |           |

### 6.4. ADC Characteristics

| ADC characteristics |     |     |     |      |             |
|---------------------|-----|-----|-----|------|-------------|
| Item                | Min | Typ | Max | Unit | Condition   |
| Temperature         | -40 | 25  | 125 | °C   |             |
| Resolution          |     | 12  |     | Bits |             |
| Input Voltage Range |     |     | 3.6 | V    |             |
| Sampling Rate       |     |     | 1   | MHz  |             |
| Power Consumption   |     | 190 |     | uA   | 1M sample/s |

### 6.5. Power Characteristics

| DCDC characteristics      |     |     |     |      |           |
|---------------------------|-----|-----|-----|------|-----------|
| Item                      | Min | Typ | Max | Unit | Condition |
| Power supply              | 3.0 | 3.3 | 3.6 | V    |           |
| Current in sleep mode     |     | 38  | 105 | uA   |           |
| Current in deepsleep mode |     | 10  | 25  | uA   |           |

## 7. 订购信息

### 7.1. 订购型号

| 产品        | 天线     | MOQ (PCS) | 备注     |
|-----------|--------|-----------|--------|
| HaaS201-P | IPX 天线 |           | IPX 输出 |
| HaaS201-A | 外置天线   |           | 板载天线   |

## 8. 联系我们

翼数（上海）信息科技有限公司

官网: [www.beancomm.com](http://www.beancomm.com)

手机: 17326012517

邮箱: [info@beancomm.com](mailto:info@beancomm.com)

QQ: 2875211099