



Fihonest Communication Co.,Ltd.

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# JS-BTMA1R19

## Fihonest Bluetooth Module User Manual

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## Revision History

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| 2016-04-26 | V1.0    | n First Release |        |
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## CONTENT

|                                            |           |
|--------------------------------------------|-----------|
| <b>1. INTRODUCTION.....</b>                | <b>4</b>  |
| 1.1 BLOCK DIAGRAM.....                     | 4         |
| 1.2 FEATURES .....                         | 5         |
| 1.3 APPLICATIONS .....                     | 6         |
| <b>2. GENERAL SPECIFICATION .....</b>      | <b>7</b>  |
| <b>3. PHYSICAL CHARACTERISTIC.....</b>     | <b>8</b>  |
| 3.1 Pin Description.....                   | 10        |
| <b>5. Function Description.....</b>        | <b>12</b> |
| 4.1 Radio Transceiver .....                | 12        |
| 4.2 Baseband Processing Unit.....          | 12        |
| 4.3 Serial Interfaces.....                 | 12        |
| 4.3.1 SPI.....                             | 12        |
| 4.3.2 UART.....                            | 12        |
| 4.4 Power Management/Regulation.....       | 13        |
| 4.4.1 Li-ion Battery Charger.....          | 13        |
| 4.5 Audio.....                             | 13        |
| 4.5.1 Analog Audio Input.....              | 13        |
| 4.5.2 Analog Audio Output.....             | 13        |
| 4.5.3 Line Input.....                      | 14        |
| 4.5.4 PCM.....                             | 14        |
| <b>5. ELECTRICAL CHARACTERISTIC .....</b>  | <b>15</b> |
| 5.1 Absolute maximum ratings .....         | 15        |
| 5.2 Recommended Operating Conditions ..... | 15        |
| 5.3 Battery chargers.....                  | 15        |
| 5.4 RF characteristics.....                | 16        |
| 5.5 Power consumptions.....                | 16        |
| <b>6. REFLOW PROFILE.....</b>              | <b>17</b> |
| <b>7. PACKAGING INFORMATION .....</b>      | <b>18</b> |



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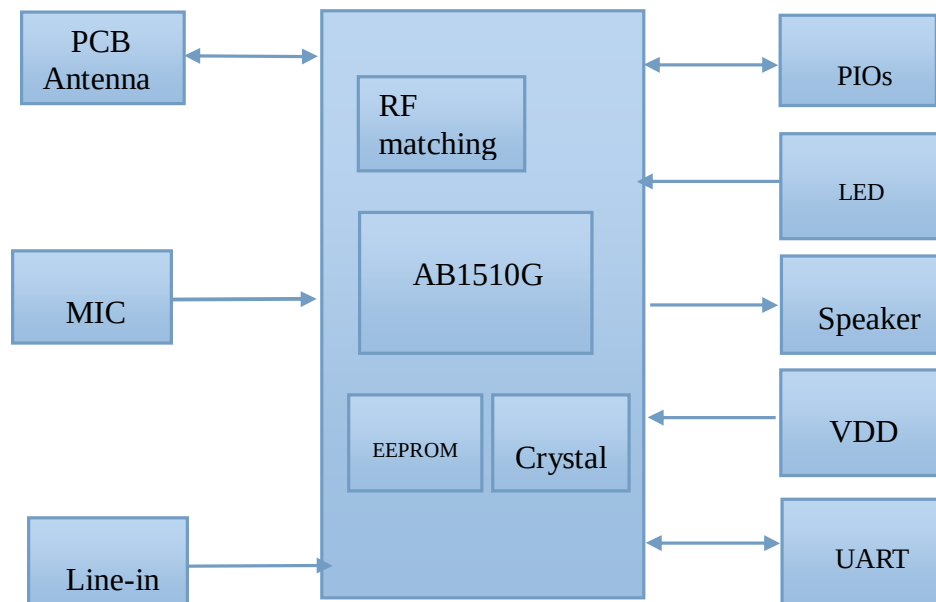
## 1. INTRODUCTION

The JS-BTMA1R19 Bluetooth® module is a perfect solution for enhanced audio applications, such as stereo headset and speaker. It can be connected with any Bluetooth® devices in an operating range. It is slim and light so the designers can have better flexibilities for the product shapes.

The JS-BTMA1R19 Bluetooth® module complies with Bluetooth® specification version 4.1 with EDR. It contains a powerful 48MIPS dual-MAC DSP coprocessor for enhanced audio applications. The built-in noise reduction and echo cancellation functions enhance the voice quality. It supports HSP, HFP, A2DP, AVRCP, SPP, HID profiles. It integrates RF baseband and radio, antenna, ... etc. and provide UART interface, programmable I/O, stereo speaker output, microphone input, ... etc.

The detail information of JS-BTMA1R19 Bluetooth® module is presented in this document below.

### 1.1 Block Diagram





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## 1.2 Features

- ü Small overall dimension ( 25 \* 14.5 \* 2.2 mm )
- ü Bluetooth® V4.1
- ü Support EDR function
- ü Physical connection as SMD type
- ü High quality stereo audio
- ü Embedded 48MIPS dual-MAC DSP coprocessor
- ü Support for noise reduction and echo cancellation
- ü Multi-band configurable EQ
- ü Support for voice prompt
- ü Multipoint for HFP and A2DP
- ü Support HSP(v1.2), HFP(v1.6), A2DP(v1.3), AVRCP(v1.5),SPP(1.2),HID profiles
- ü Based on Airoha chip set AB1510G
- ü Integrated Li-ion battery charger supports 400mA fast charging and over-discharging protection
- ü Integrated 1.35V Buck and 3V/1.8V LDO regulator
- ü RoHS Compliant
- ü No radio signal interference, support for 802.11 co-existence
- ※ *Some features are optional for customization on demand.*



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### 1.3 Application

- ü High Quality Stereo Bluetooth Headset
- ü Bluetooth Speaker



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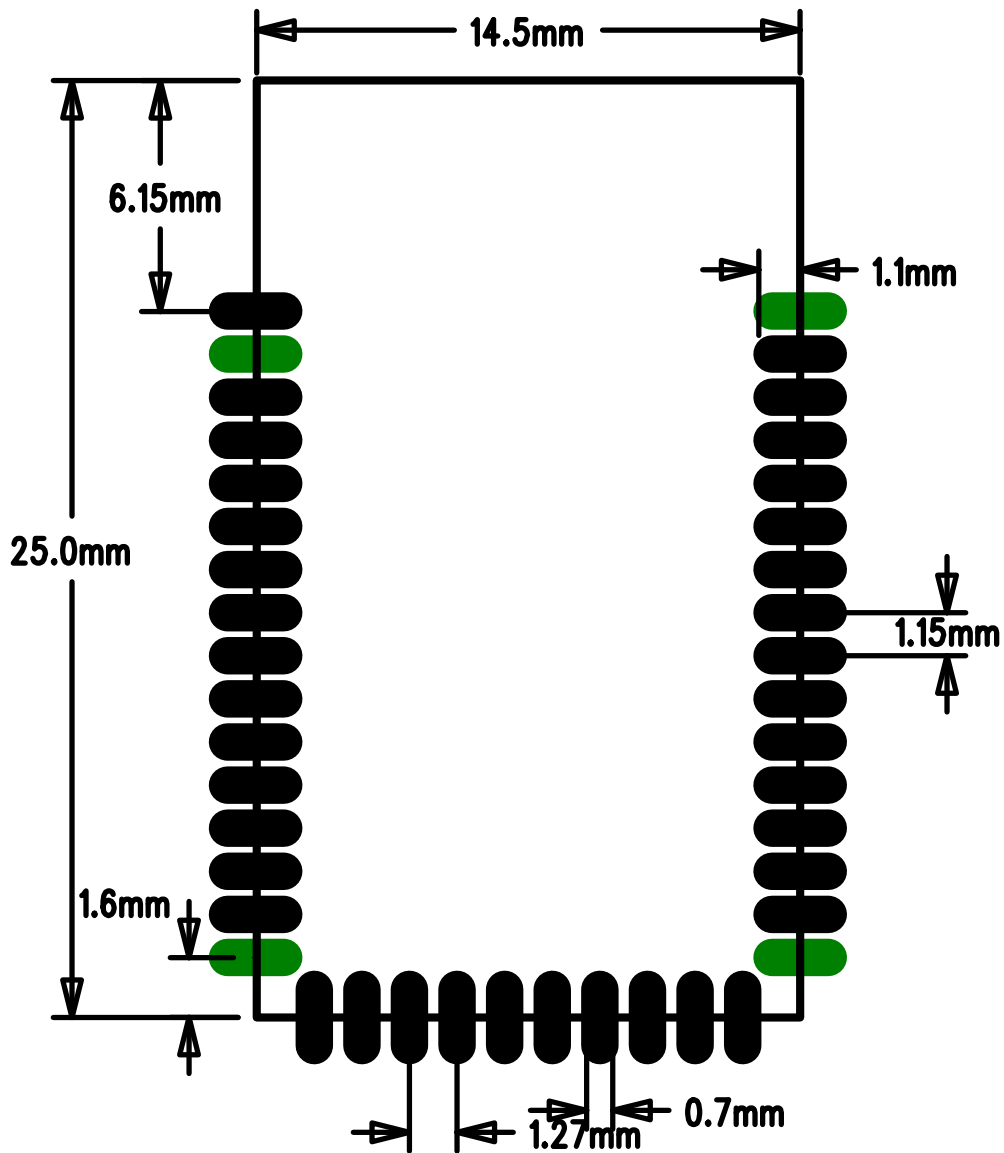
## 2. GENERAL SPECIFICATION

| Bluetooth Specification |                                  |
|-------------------------|----------------------------------|
| Chip Set                | Airoha AB1510G                   |
| Module ID               | JS-BTMA1R19                      |
| BT Standard             | Bluetooth® V4.1                  |
| RF TX Output Power      | 4dBm (Class II)(max)             |
| Sensitivity             | -86dBm@0.1%BER                   |
| Frequency Band          | 2.402GHz~2.480GHz ISM Band       |
| Modulation Type         | GFSK, $\pi/4$ DQPSK, 8DPSK       |
| Channel No.             | 79(for Classic)                  |
| Baseband Crystal OSC    | 26MHz                            |
| Hopping                 | 1600hops/sec, 1MHz channel space |
| RF Input Impedance      | 50 ohms                          |
| Environmental           | RoHS Compliant                   |



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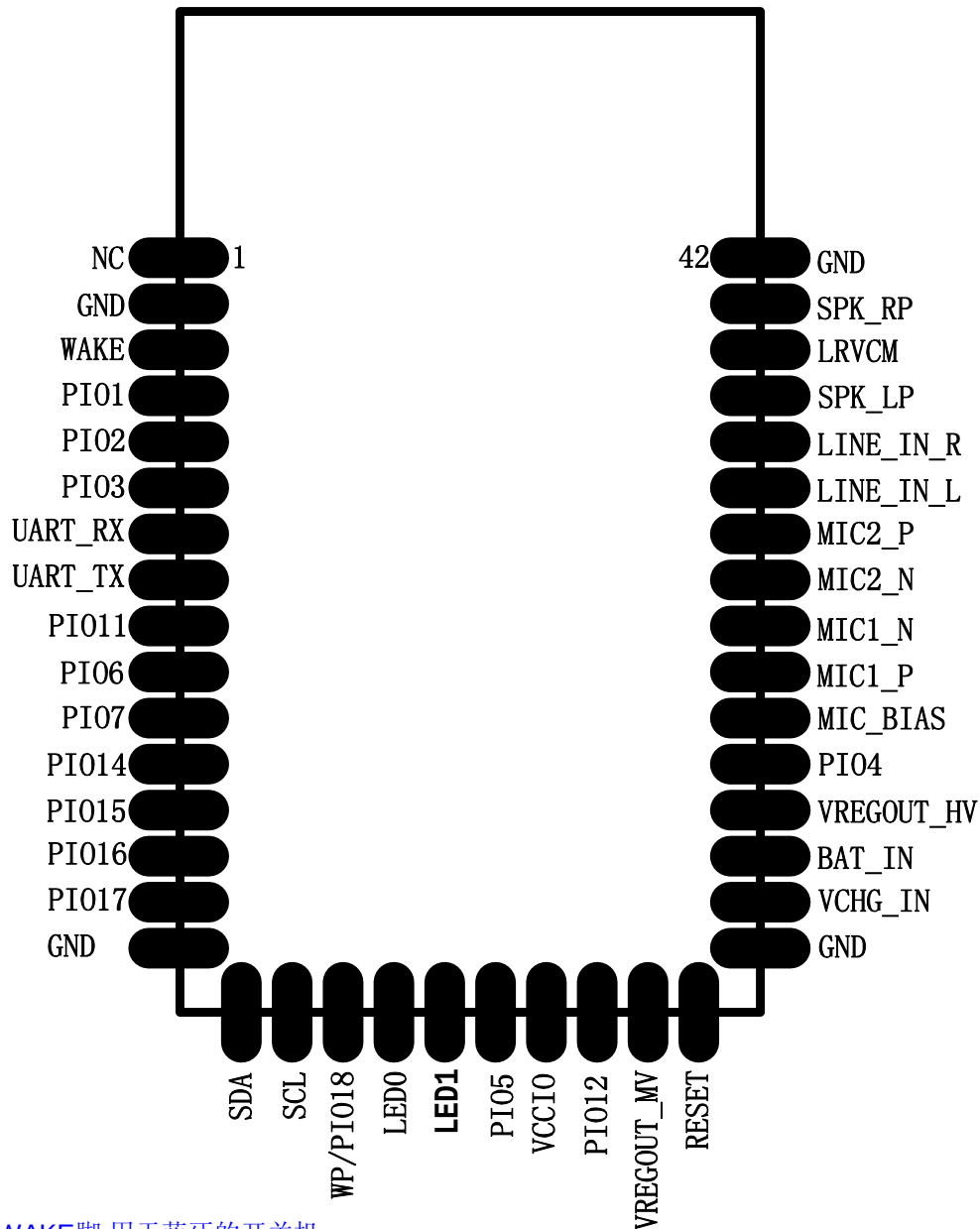
### 3. PHYSICAL CHARACTERISTIC



Drill size:0.4mm  
Ring+Drill size:0.4mm  
Pad size:0.4mm



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**Note:**

PIO0作为WAKE脚,用于蓝牙的开关机;  
PIO1/PIO2/PIO3只能作为输入PIO口;  
PIO7作为升级软件的CLK口, 因此PIO7不能用于其他功能;  
PIO4一般作为AMP的控制脚;  
PIO5是UART\_RTS;  
PIO6/ PIO12/PIO14/PIO15/PIO16/PIO17作为I/O口使用;  
PIO11一般作为AUX IN检测脚;  
PIO13和PIO12可以作为LED3和LED2;  
PIO14, PIO15, PIO16, PIO17作为I2S输出是分别为LRCLK,DATE,MCLK,BCLK。LRCLK支持48K/44.1,BCLK支持32\*LRCLK,MCLK是12.288M, 只能支持MASTE, A2DP和AUX IN



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### 3.1 Pin Description

| Pin# | Pin Name | Pad Type              | Description                                 |
|------|----------|-----------------------|---------------------------------------------|
| 1    | NC       | NC                    | NC                                          |
| 2    | GND      | Ground                | Ground                                      |
| 3    | WAKE     | Input, Digital        | Input Pin<br>用于蓝牙的开关机                       |
| 4    | PIO1     | Input, Digital        | Input Pin<br>只能作为输入PIO口                     |
| 5    | PIO2     | Input, Digital        | Input Pin<br>只能作为输入PIO口                     |
| 6    | PIO3     | Input, Digital        | Input Pin with 750K pull up<br>只能作为输入PIO口   |
| 7    | UART_RX  | Input, Digital        | UART RX                                     |
| 8    | UART_TX  | Output, Digital       | UART TX                                     |
| 9    | PIO11    | Input/Output, Digital | Programmable IO<br>I2S输入脚                   |
| 10   | PIO6     | Input/Output, Digital | Programmable IO<br>作为I/O口使用                 |
| 11   | PIO7     | Input/Output, Digital | Programmable IO<br>升级软件的CLK口,不能用于其他功能       |
| 12   | PIO14    | Input/Output, Digital | Programmable IO<br>作为I/O口使用<br>可以作为PCM和SPI脚 |
| 13   | PIO15    | Input/Output, Digital | Programmable IO<br>作为I/O口使用<br>可以作为SPDIF输出口 |
| 14   | PIO16    | Input/Output, Digital | Programmable IO<br>作为I/O口使用<br>可以作为PCM和SPI脚 |
| 15   | PIO17    | Input/Output, Digital | Programmable IO<br>作为I/O口使用<br>可以作为PCM和SPI脚 |
| 16   | GND      | Ground                | Ground                                      |
| 17   | SDA      | Input/Output, Digital | I2C data line                               |
| 18   | SCL      | Input/Output, Digital | I2C clock line                              |
| 19   | WP/PIO18 | Output, Digital       | Write Protect Control for EEPROM            |
| 20   | LED0     | Open Drain            | LED 0 for Red Light                         |
| 21   | LED1     | Open Drain            | LED 1 for Blue Light                        |



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|    |            |                                      |                                                                  |
|----|------------|--------------------------------------|------------------------------------------------------------------|
| 22 | PIO5       | Input/Output, Digital<br>AIO, Analog | Programmable IO<br>作为UART_RTS                                    |
| 23 | VCCIO      | Supply, 1.8V~3.3V                    | VCC for IO                                                       |
| 24 | PIO12      | Input/Output, Digital                | Programmable IO<br>作为I/O口使用<br>可以作为LED2, 作为LED2使用时, 上拉电压需要接VCCIO |
| 25 | VREGOUT_MV | Analog                               | LDO output<br>输出1.8V                                             |
| 26 | RESET      | Input, Digital                       | Global reset<br>拉高25MS以上复位                                       |
| 27 | GND        | Ground                               | Ground                                                           |
| 28 | VCHG_IN    | Supply, 5V                           | VCC for Charger                                                  |
| 29 | BAT_IN     | Supply                               | Battery input P, as Switching/Linear regulator input             |
| 30 | VREGOUT_HV | Analog                               | LDO output<br>输出3.3V                                             |
| 31 | PIO4       | Input/Output, Digital AIO, Analog    | Programmable IO<br>作为AMP的控制脚                                     |
| 32 | MIC_BIAS   | Analog                               | Microphone bias                                                  |
| 33 | MIC1_P     | Analog                               | Microphone 1 P-path                                              |
| 34 | MIC1_N     | Analog                               | Microphone 1 N-path                                              |
| 35 | MIC2_N     | Analog                               | Microphone 2 N-path<br>暂时没有作用, 只能使用MIC1                          |
| 36 | MIC2_P     | Analog                               | Microphone 2 P-path<br>暂时没有作用, 只能使用MIC1                          |
| 37 | LINE_IN_L  | Analog                               | Line in L-path                                                   |
| 38 | LINE_IN_R  | Analog                               | Line in P-path                                                   |
| 39 | SPK_LP     | Analog                               | Speaker output LP                                                |
| 40 | LRVCM      | NC                                   | NC                                                               |
| 41 | SPK_RP     | Analog                               | Speaker output RP                                                |
| 42 | GND        | Ground                               | Ground                                                           |



## 4.Function Description

### 4.1 Radio Transceiver

- n The RF transceiver is a 2.4GHz-band transceiver for the Bluetooth Headset applications. There are three main functions – transmitter, receiver, and synthesizer. The enable control signals of these functions are given by the Baseband Processing Unit.

### 4.2 Baseband Processing Unit

- n The baseband processing unit contains a MCU subsystem, a Link Manager and a Modem.

### 4.3 Serial Interfaces

#### 4.3.1 SPI

- n The SPI is capable of communicating with external devices. Both 3-wire and 4-wire mode SPI interfaces are supported. When 3-wire mode is selected, SPI\_MOSI would be data I/O pin of the SPI interface. Only master mode is supported.

|       | Four-wire Mode |      | Three-wire Mode |         |
|-------|----------------|------|-----------------|---------|
| PIO14 | O              | NCS  | O               | NCS     |
| PIO15 | O              | MOSI | I/O             | DATA_IO |
| PIO16 | I              | MISO | NA              |         |
| PIO17 | O              | SCK  | O               | SCK     |

#### 4.3.2 UART

- n The UART interface supports flexible configurations as listed below. There are local FIFOs and DMA which can achieve high throughputs serial communications.

| Configuration Parameters | Supported Values         |
|--------------------------|--------------------------|
| Data Length              | 8 bits                   |
| Flow control             | Hardware RTS/CTS<br>None |
| Parity                   | Even<br>Odd<br>None      |
| Number of stop bits      | 1 or 2                   |

|           |                                                                                                                     |
|-----------|---------------------------------------------------------------------------------------------------------------------|
| Baud rate | 1200<br>2400<br>4800<br>9600<br>19200<br>38400<br>57600<br>76800<br>115200<br>230400<br>460800<br>921600<br>1843200 |
|-----------|---------------------------------------------------------------------------------------------------------------------|



## 4.4 Power Management/Regulation

- n** AB1510 integrates a Power Management Unit (PMU), one Bulk regulator, one LDO regulator, and a Li-ion

### 4.4.1 Li-ion Battery Charger

- n** The Li-mode battery charger of AB1510 provides five modes:
  - l** Trickle mode
  - l** Constant current mode (CC mode)
  - l** Constant voltage mode (CV mode)
  - l** Standby mode
  - l** Error mode

## 4.5 Audio

- n** The Audio Interface consists of:
  - l** Dual Analog audio input
  - l** Single Analog audio output
  - l** Dual Line-in inputs
  - l** Digital Audio interfaces (PCM)

The Audio Processor (APU) includes dual acoustic band ADC and DAC, variable gain amplifiers for external earphone and microphone. The line-input path can switch to processed by DSP or not. There are three digital audio interfaces to transmit or receive audio data. A low-noise microphone bias supply and a ring-tone generator are also embedded in the module.

### 4.5.1 Analog Audio Input

- n** There are dual analog audio input ports . The analog audio signal from microphone is first amplified by the microphone amplifier, and converts to digitized data by the ADC. The microphone amplifier is differential end and has programmable gain setting from 42dB to 0dB. The voice codec converts the digitized audio data to associated audio format (A-law/u-law/CVSD) and loads into data Memory through the Audio interface. Either BPU or DSP can access the audio data from data Memory. It also provide Microphone Bias voltage to Microphone to reduce BOM cost.

### 4.5.2 Analog Audio Output

- n** There is single analog audio output ports. The DAC loads the audio data from data Memory that is stored by the BPU or DSP. The audio data is decoded by the voice codec or after DSP unit processed then fed into DAC to convert to analog signal format, and amplified by the Ear amplify, and sent to the external speaker. The ear amplifier has programmable gain setting from 9dB to -12dB. The ear amplifier out provide LR voltage common DC to reduce external capacitor in application. The ring tone generator can generate five octave audio tones and play out by the speaker. The whole functions within APU are controlled by MCU



### 4.5.3 Line Input

**n** AB1510 provides dual line-input for stereo line-input source such as MP3 or Mobile phone. There are two paths that we can route. One is the line-input source route to the microphone amplifier input after the ADC digitized and DSP processed then send to DAC and Ear amplify. So Line in source can process by the DSP such as equalizer function. The other path is without DSP process. The line in source route to the ear amplifier input directly. All that we can control Line in source level by ear amplifier.

### 4.5.4 PCM

**n** The PCM interface support Master mode . In the EEPROM setting select wanted interface and transmit or receive audio data from data memory. The interface shares with the GPIO pin as below.

| GPIO pins | PCM interface |
|-----------|---------------|
| GPIO14    | PCM_SYNC      |
| GPIO15    | PCM_OUT       |
| GPIO16    | PCM_IN        |
| GPIO17    | PCM_CLK       |

The PCM interface is a four wire serial interface for transmitting and receiving voice data via digital channel. The PCM\_CLK can be programmed to 128 KHz, 256 KHz, 512 KHz or 1536 KHz. The PCM\_SYNC supports both short and long frame synchronization schemes. The PCM\_SYNC is always fixed at 8 KHz.



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## 5.ELECTRICAL CHARACTERISTIC

### 5.1 Absolute Maximum Ratings

| Item                       | Min  | Typ | Max | Unit |
|----------------------------|------|-----|-----|------|
| I/O supply voltage (VCCIO) | -0.3 |     | 3.6 | V    |
| Switching Regulator supply | -0.3 |     | 4.4 | V    |
| Charger supply voltage     | -0.3 |     | 6.5 | V    |
| Operating temperature      | -20  |     | 70  | °C   |
| Storage temperature        | -65  |     | 150 | °C   |

### 5.2 Recommended Operating Conditions

| Item                       | Min | Typ  | Max | Unit |
|----------------------------|-----|------|-----|------|
| Core supply voltage        |     | 1.25 |     | V    |
| I/O supply voltage         | 1.7 |      | 3.6 | V    |
| Switching Regulator supply | 2.7 |      | 4.2 | V    |
| Audio Speaker voltage      | 2.7 | 3    | 3.3 | V    |
| Charger supply voltage     | 4.5 | 5    | 6.5 | V    |

### 5.3 Battery charger

| Item                             | Min | Typ  | Max | Unit |
|----------------------------------|-----|------|-----|------|
| Input Voltage                    | 4.5 | 5    | 6.5 | V    |
| Charge Current (CC Mode)         | 25  |      | 400 | mA   |
| Trickle Charge Current           |     | 8    |     | mA   |
| Trickle Charge Threshold Voltage |     | 2.92 |     | V    |
| Regulated Output (Float) Voltage |     | 4.2  |     | V    |



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## 5.4 RF characteristics

| Receiver                |         | Average | Spec  | Transmitter  |         | Average | Spec | Unit |
|-------------------------|---------|---------|-------|--------------|---------|---------|------|------|
| Sensitivity at 0.1% Ber | 2402MHz | -86     | <=-83 | Output Power | 2402MHz | 2.3     | 0~4  | dBm  |
|                         | 2441MHz | -86     |       |              | 2441MHz | 2.3     |      | dBm  |
|                         | 2480MHz | -85     |       |              | 2480MHz | 2.4     |      | dBm  |

| Crystal Trim     |         | Average | Spec  | Unit |
|------------------|---------|---------|-------|------|
| Frequency Offset | 2402MHz | 9.5     | +/-10 | KHz  |
|                  | 2441MHz | 9.2     |       | KHz  |
|                  | 2480MHz | 9.3     |       | KHz  |

## 5.5 Power consumption

| Item           | Condition      | Min | Typ    | Max | Unit |
|----------------|----------------|-----|--------|-----|------|
| Sniff mode*1   | Interval=500ms |     | 0.335  |     | mA   |
| SCO mode*2     | HV3 packet     |     | 11.4   |     | mA   |
| eSCO mode*3    | 2EV3 packet    |     | 9.8    |     | mA   |
| A2DP mode*1    | 1kHz tone      |     | 10.436 |     | mA   |
| Power off mode |                |     | 0.6    |     | uA   |

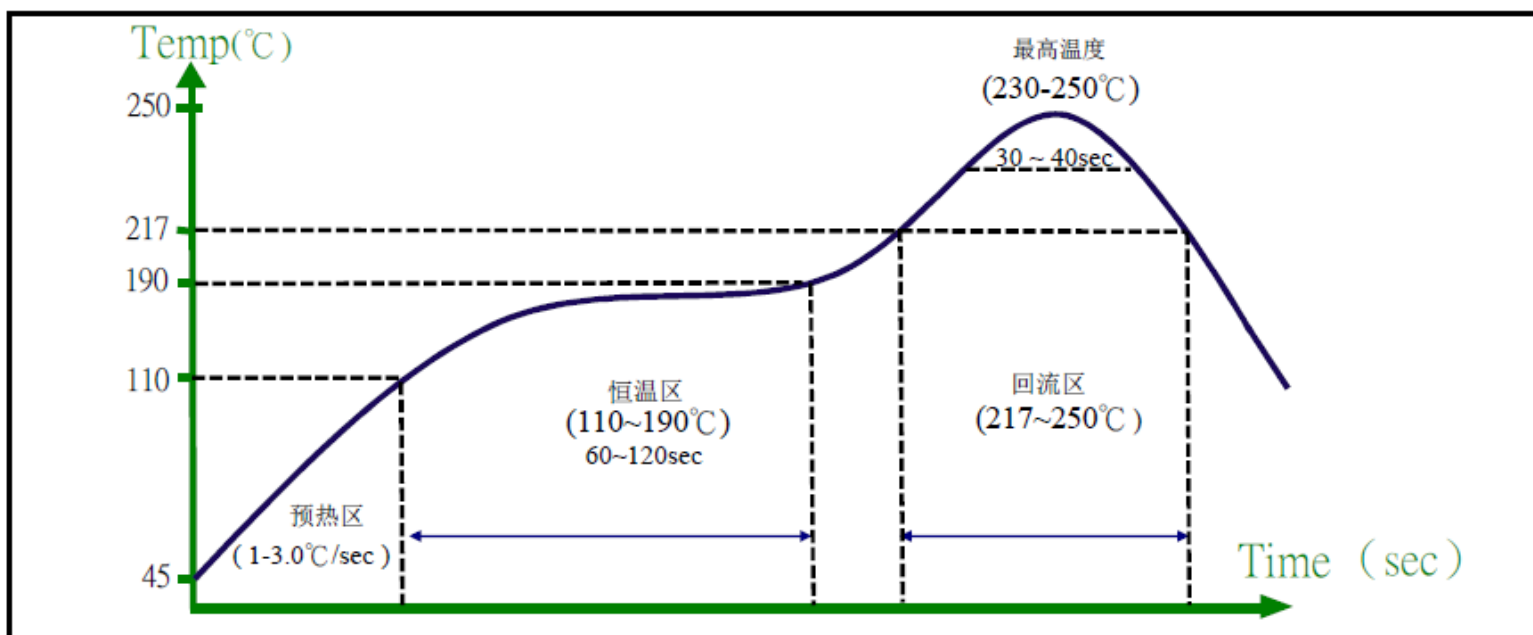


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## 6. REFLOW PROFILE

Reflow number of times:  $\leq 2$ times



### 温度范围与要求

1. 预热区: 60-90°C 以下, 升温率 1 - 3.0°C/sec
2. 恒温区: 110-190°C 时间为 60 - 120sec
3. 217°C 以上: 30 - 90sec
4. 230°C - 250°C 时间为 30 - 40sec
5. 最高温度: 230°C - 250°C.

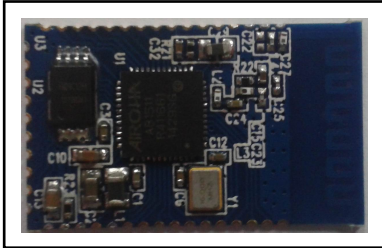


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## 7. PACKAGING INFORMATION

### 1. BLUETOOTH® Module: JS-BTMA1R19



#### Note: Warning

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Please notice that if the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains FCC ID:2AHS5-1510G" any similar wording that expresses the same meaning may be used.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator & your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

The module is limited to OEM installation ONLY.

The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.

The module is limited to installation in mobile application;

A separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and difference antenna configurations.

There is requirement that the grantee provide guidance to the host manufacturer for compliance with Part 15B requirements.

#### Note:

The installer must to perform tests inside of each host for the host manufactures product(s) are compliant to all the applicable FCC rules.