# PRODUCT SPECIFICATION

# V200A-S

## Wi-Fi Dual-band 1x1 + BT5.3

## Combo Module

**Version:v1.1**

# V200A-S Module Datasheet

| | Part NO. | Description |
|---|---|---|
| **Ordering Information** | FGV200ASRX-00 | BES2600iWA2,802.11b/g/n/a+BLE5.3,1T1R+BT ANT, 12*12 ,SDIO3.0/Uart,single-ANT |
| | | |

**Customer:** _____

**Customer P/N:**_____

**Signature:**_____

**Date:**_____

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# CONTENTS

# Revision History

| Version | Date | Contents of Revision Change | Preparde | Checked | Approved |
|---|---|---|---|---|---|
| V1.0 | 2022/09/02 | New version | LTK | LXY | QJP |
| V1.1 | 2022/09/26 | Add VDDIO VIO voltage | LTK | LXY | QJP |
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# 1. General Description

## 1.1 Introduction

V200A-S is a small size and low profile of Wi-Fi + BT Combo module with LGA module, board size is 12*12mm. It can be easily manufactured on SMT process and highly suitable for tablet PC, mobile device and consumer products. It provides SDIO 3.0 interface for Wi-Fi to connect with host processor and high speed UART interface for BT5.3. It also has a PCM interface for audio data transmission with direct link to external audio codec via BT controller.

The Wi-Fi throughput up to 150Mbps in theory by using 802.11n technology.

## 1.2 Description

| | |
|---|---|
| Model Name | V200A-S |
| Product Description | Support Wi-Fi/Bluetooth functionalities |
| Dimension | L x W x H: 12 x 12 x1.6 (typical) mm |
| Wi-Fi Interface | Support SDIO V3.0 |
| BT Interface | UART / PCM |
| OS supported | Android /Linux/ Win CE /iOS /XP/WIN7/WIN10 |
| Operating temperature | 0°C to 70°C |
| Storage temperature | -40°C to 85°C |

# 2. Features

## General

- Operate at 2.4G&5GHz frequency bands
- IEEE standards support: IEEE 802.11a,IEEE 802.11b, IEEE 802.11g, IEEE 802.11n
- Enterprise level security which can apply WPA2/PSK
- Wi-Fi 1T1R allow data rates supporting up to 150 Mbps PHY rates

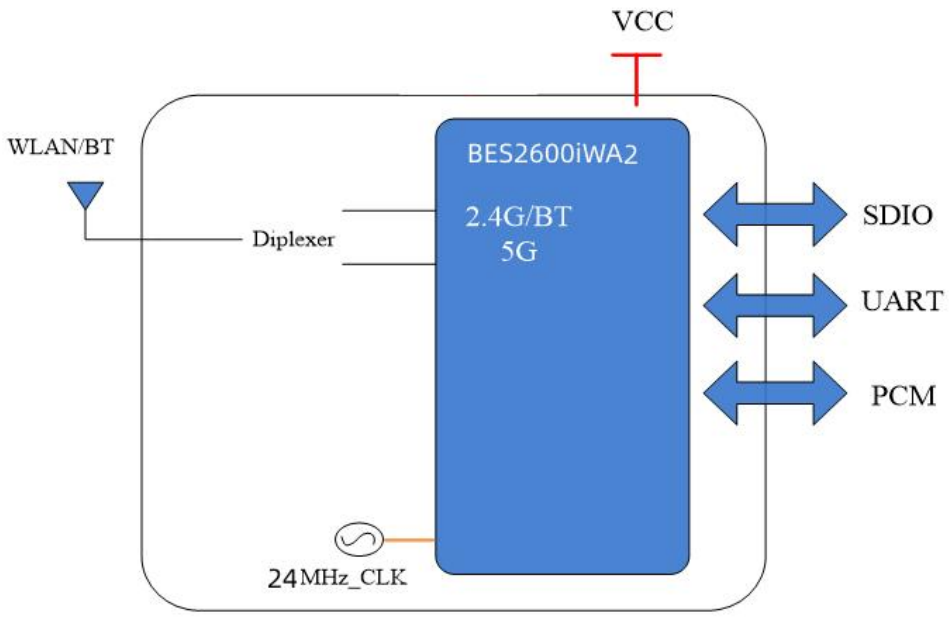
## Host Interface

- SDIO3.0 for Wi-Fi and UART for BT5.3
- PCM interface for audio data transmission via BT controller

## Bluetooth Features

- Compatible with Bluetooth v2.1+EDR v5.2 system
- Support BLE4.0, BT5.3 dual mode

# 3. Block Diagram



# 4. General Specification

## 4.1 2.4GHz WI-FI Specification

| Feature | Description | |
|---|---|---|
| WLAN Standard | IEEE 802.11 b/g/n Wi-Fi compliant | |
| Frequency Range | 2.400 GHz ~ 2.4835 GHz (2.4 GHz ISM Band) | |
| Number of Channels | 2.4GHz：Ch1 ~ Ch14 | |
| **Test Items** | **Typical Value** | **EVM** |
| Output Power[1] | 802.11b /11Mbps : 17dBm ± 2 dB | EVM ≤ -9dB |
| | 802.11g /54Mbps : 15dBm ± 2 dB | EVM ≤ -25dB |
| | 802.11n /MCS7 : 14dBm ± 2 dB | EVM ≤ -28dB |
| Spectrum Mask | Meet with IEEE standard | |
| Freq. Tolerance | ±20ppm | |
| SISO Receive Sensitivity (11b,20MHz) @8% PER | - 1Mbps PER @ -92 dBm | ≤-83 |
| | - 2Mbps PER @ -90 dBm | ≤-80 |
| | - 5.5Mbps PER @ -87 dBm | ≤-79 |
| | - 11Mbps PER @ -85 dBm | ≤-76 |
| SISO Receive Sensitivity (11g,20MHz) @10% PER | - 6Mbps PER @ -89 dBm | ≤-85 |
| | - 9Mbps PER @ -88 dBm | ≤-84 |
| | - 12Mbps PER @ -87 dBm | ≤-82 |
| | - 18Mbps PER @ -84 dBm | ≤-80 |
| | - 24Mbps PER @ -81 dBm | ≤-77 |
| | - 36Mbps PER @ -78 dBm | ≤-73 |
| | - 48Mbps PER @ -73 dBm | ≤-69 |
| | - 54Mbps PER @ -71 dBm | ≤-68 |
| SISO Receive Sensitivity (11n,20MHz) @10% PER | - MCS=0 PER @ -89 dBm | ≤-85 |
| | - MCS=1 PER @ -86 dBm | ≤-82 |
| | - MCS=2 PER @ -84 dBm | ≤-80 |
| | - MCS=3 PER @ -80 dBm | ≤-77 |
| | - MCS=4 PER @ -77 dBm | ≤-73 |
| | - MCS=5 PER @ -72 dBm | ≤-69 |
| | - MCS=6 PER @ -71 dBm | ≤-68 |
| | - MCS=7 PER @ -69 dBm | ≤-67 |
| SISO Receive Sensitivity (11n,40MHz) @10% PER | - MCS=0, PER @ -88 dBm | ≤-82 |
| | - MCS=1, PER @ -85 dBm | ≤-79 |
| | - MCS=2, PER @ -83 dBm | ≤-77 |

| | | |
|---|---|---|
| | - MCS=3, PER @ -79 dBm | ≤-74 |
| | - MCS=4, PER @ -76 dBm | ≤-70 |
| | - MCS=5, PER @ -71 dBm | ≤-66 |
| | - MCS=6, PER @ -70 dBm | ≤-65 |
| | - MCS=7, PER @ -68 dBm | ≤-64 |
| Maximum Input Level | 802.11b : -10 dBm | |
| | 802.11g/n : -20 dBm | |
| Antenna Reference | Small antennas with 0~2 dBi peak gain | |

1.TX power can control by driver side to increase or decrease the output value;

## 4.2 5GHz WI-FI Specification

| **Feature** | **Description** | |
|---|---|---|
| WLAN Standard | IEEE 802.11a/n Wi-Fi compliant | |
| Frequency Range[1] | 5.150 GHz ~ 5.850 GHz (5.0 GHz Band) | |
| Number of Channels | 5.0GHz：Please see the table1 | |
| **Test Items** | **Typical Value** | **EVM** |
| Output Power[2] | 802.11a/54Mbps : 13dBm ± 2 dB | EVM ≤ -25dB |
| | 802.11n /MCS7 : 12dBm ± 2 dB | EVM ≤ -28dB |
| **Test Items** | **Test Value** | **Standard Value** |
| SISO Receive Sensitivity (11a,20MHz) @10% PER | - 6Mbps PER @ -88 dBm | ≤-85 |
| | - 9Mbps PER @ -86.5 dBm | ≤-84 |
| | - 12Mbps PER @ -85.5 dBm | ≤-82 |
| | - 18Mbps PER @ -83 dBm | ≤-80 |
| | - 24Mbps PER @ -80 dBm | ≤-77 |
| | - 36Mbps PER @ -77 dBm | ≤-73 |
| | - 48Mbps PER @ -72 dBm | ≤-69 |
| | - 54Mbps PER @ -70 dBm | ≤-68 |
| SISO Receive Sensitivity (11n,20MHz) @10% PER | - MCS=0 PER @ -88 dBm | ≤-85 |
| | - MCS=1 PER @ -85 dBm | ≤-82 |
| | - MCS=2 PER @ -83 dBm | ≤-80 |
| | - MCS=3 PER @ -80 dBm | ≤-77 |

| | | |
|---|---|---|
| | - MCS=4 PER @ -76 dBm | ≤-73 |
| | - MCS=5 PER @ -71 dBm | ≤-69 |
| | - MCS=6 PER @ -70 dBm | ≤-68 |
| | - MCS=7 PER @ -69 dBm | ≤-67 |
| SISO Receive Sensitivity (11n,40MHz) @10% PER | - MCS=0 PER @ -85 dBm | ≤-82 |
| | - MCS=1 PER @ -82 dBm | ≤-79 |
| | - MCS=2 PER @ -80 dBm | ≤-77 |
| | - MCS=3 PER @ -77 dBm | ≤-74 |
| | - MCS=4 PER @ -73 dBm | ≤-70 |
| | - MCS=5 PER @ -69 dBm | ≤-66 |
| | - MCS=6 PER @ -68 dBm | ≤-65 |
| | - MCS=7 PER @ -67 dBm | ≤-64 |
| Maximum Input Level | 802.11a/n : -30 dBm | |
| Antenna Reference | Small antennas with 0~2 dBi peak gain | |

2.TX power can control by driver side to increase or decrease the output value;

**[1]5GHz(20MHz) Channel table**

| Band range | Operating Channel Numbers | Channel center frequencies(MHz) |
|---|---|---|
| 5180MHz~5240MHz | 36 | 5180 |
| | 40 | 5200 |
| | 44 | 5220 |
| | 48 | 5240 |
| 5260MHz~5320MHz | 52 | 5260 |
| | 56 | 5280 |
| | 60 | 5300 |
| | 64 | 5320 |
| 5550MHz~5700MHz | 100 | 5500 |
| | 104 | 5520 |
| | 108 | 5540 |
| | 112 | 5560 |
| | 116 | 5580 |
| | 120 | 5600 |
| | 124 | 5620 |
| | 128 | 5640 |
| | 132 | 5660 |

| | | |
|---|---|---|
| | 136 | 5680 |
| | 140 | 5700 |
| 5745MHz~5825MHz | 149 | 5745 |
| | 153 | 5765 |
| | 157 | 5785 |
| | 161 | 5805 |
| | 165 | 5825 |

## 4.3 Bluetooth Specification

| **Feature** | **Description** | | |
|---|---|---|---|
| **General Specification** | | | |
| Bluetooth Standard | Bluetooth V5.3/2.1 | | |
| Host Interface | UART | | |
| Antenna Reference | Small antennas with 0~2 dBi peak gain | | |
| Frequency Band | 2402 MHz ~ 2480 MHz | | |
| Number of Channels | 79 channels | | |
| Modulation | GFSK, π/4-DQPSK, 8-DPSK | | |
| **RF Specification** | | | |
| | **Min**(dBm) | **Typical**(dBm) | **Max**(dBm) |
| Output Power (Class 1) | 2 | 4 | 8 |
| Sensitivity @ BER=0.1% for GFSK (1Mbps) | | -92 | |
| Sensitivity @ BER=0.01% for π/4-DQPSK (2Mbps) | | -86 | |
| Sensitivity @ BER=0.01% for 8DPSK (3Mbps) | | -85 | |
| Maximum Input Level | GFSK (1Mbps):-20dBm | | |
| | π/4-DQPSK (2Mbps) :-20dBm | | |
| | 8DPSK (3Mbps) :-20dBm | | |

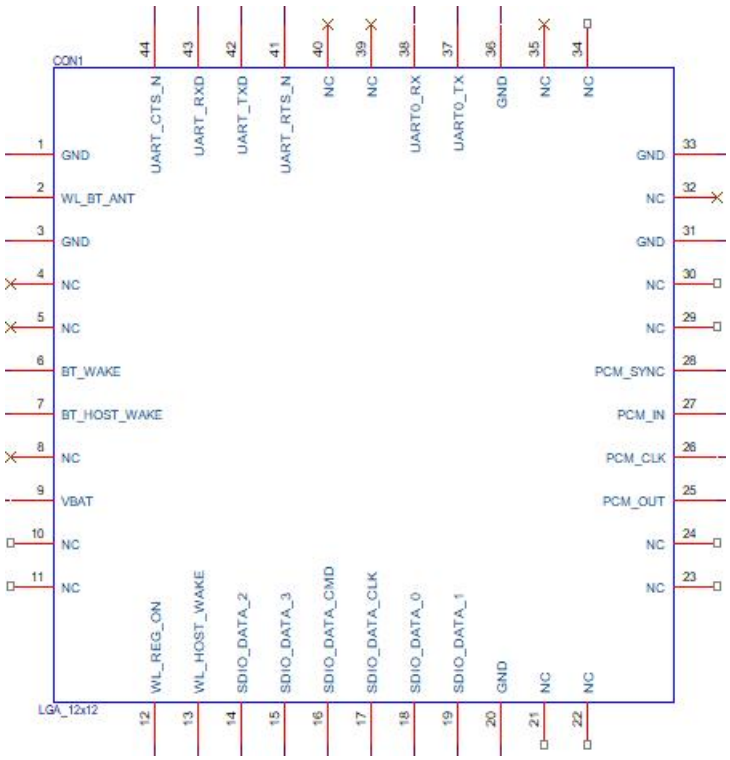
# 5. ID setting information

WI-FI

| | |
|---|---|
| Vendor ID | |
| Product ID | |

# 6. Pin Definition

## 6.1 Pin Outline



## 6.2 Pin Definition details

| NO. | Name | Type | Description | Voltage |
|---|---|---|---|---|
| 1 | GND | — | Ground connections | |
| 2 | WL_BT_ANT | I/O | WL/BT port | |
| 3 | GND | — | Ground connections | |
| 4 | NC | | Floating (NC) | |
| 5 | NC | | Floating (NC) | |
| 6 | BT_WAKE | I | Host to wake up Bluetooth device | VIO |
| 7 | BT_HOST_HOST | O | Bluetooth device to wake up host | VIO |
| 8 | NC | | Floating (NC) | |
| 9 | VBAT_IN | P | 3.3V±10% Main power voltage source input | 3.3V |
| 10 | NC | | Floating (NC) | |
| 11 | NC | | Floating (NC) | |
| 12 | WL_REG_ON | I | Chip power on, internal pull high | 3.3V |
| 13 | WL_HOST_WAKE | O | WLAN to wake up HOST | VIO |
| 14 | SD_D2 | I/O | SDIO data line 2 | VDDIO |
| 15 | SD_D3 | I/O | SDIO data line 3 | VDDIO |
| 16 | SD_CMD | I/O | SDIO command line | VDDIO |
| 17 | SD_CLK | I | SDIO clock line | VDDIO |
| 18 | SD_D0 | I/O | SDIO data line 0 | VDDIO |
| 19 | SD_D1 | I/O | SDIO data line 1 | VDDIO |
| 20 | GND | | Ground connections | |
| 21 | NC | | Floating(NC) | |
| 22 | NC | | Floating(NC) | |
| 23 | NC | | Floating (NC) | |
| 24 | NC | | Floating (NC) | |
| 25 | PCM_OUT | O | PCM Output | VIO |
| 26 | PCM_CLK | I/O | PCM Clock | VIO |
| 27 | PCM_IN | I | PCM Input | VIO |
| 28 | PCM_SYNC | O | PCM Sync | VIO |
| 29 | NC | | Floating (NC) | |
| 30 | NC | | Floating (NC) | |
| 31 | GND | | Ground connections | |
| 32 | NC | | Floating (NC) | |
| 33 | GND | | Ground connections | |
| 34 | NC | | Floating (NC) | |
| 35 | NC | | Floating (NC) | |

| | | | | |
|---|---|---|---|---|
| 36 | GND | | Ground connections | |
| 37 | UART0_TX | O | Debug_TX | VIO |
| 38 | UART0_RX | I | Debug_RX | VIO |
| 39 | NC | | Floating (NC) | |
| 40 | NC | | Floating (NC) | |
| 41 | UART_RTS | | UART RTS | VIO |
| 42 | UART_OUT | O | UART Output | VIO |
| 43 | UART_IN | I | UART Input | VIO |
| 44 | UART_CTS | I | UART CTS | VIO |

P:POWER I:INPUT O:OUTPUT

# 7. Electrical Specifications

## 7.1 Power Supply DC Characteristics

| | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|
| Operating Temperature | 0 | 25 | 70 | deg.C |
| VBAT | 3.15 | 3.3 | 3.45 | V |
| VDDIO | - | 3.3/1.8 | - | V |
| VIO | - | 1.8 | - | V |

## 7.2 Power Consumption

| | | |
|---|---|---|
| Power Consumption | MCS7 Pout=16dbm | 270mA |
| | OFDM 54Mbps Pout=17dbm | 273mA |
| | CCK 11Mbps Pout=18dbm | 280mA |
| | RX Mode | 42mA |

## 7.3 Interface Circuit time series

### 7.3.1 SDIO Pin Description

The module supports SDIO version 3.0 for 3.3V .

SDIO Pin Description

| SD 4-Bit Mode | |
|---|---|
| DATA0 | Data Line 0 |
| DATA1 | Data Line 1 or Interrupt |
| DATA2 | Data Line 2 or Read Wait |
| DATA3 | Data Line 3 |
| CLK | Clock |
| CMD | Command Line |

### 7.3.2 SDIO Default Mode Timing Diagram

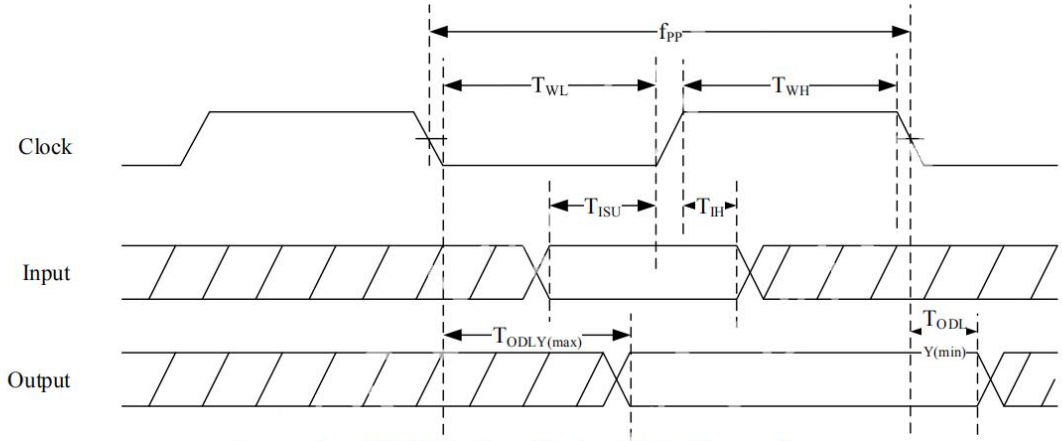



Figure 4. SDIO Interface Timing (default speed)

**Table 13. SDIO Interface Timing Parameters (default speed)**

| NO | Parameter | MIN | MAX | Unit |
|---|---|---|---|---|
| $f_{PP}$ | Clock Frequency | 0 | 25 | MHz |
| $T_{WL}$ | Clock Low Time | 10 | - | ns |
| $T_{WH}$ | Clock High Time | 10 | - | ns |
| $T_{ISU}$ | Input Setup Time | 5 | - | ns |
| $T_{IH}$ | Input Hold Time | 5 | - | ns |
| $T_{ODLY}$ | Output Delay Time During Data Transfer Mode | 0 | 14 | ns |
| $T_{ODLY}$ | Output Delay Time During Identification Mode | 0 | 50 | ns |

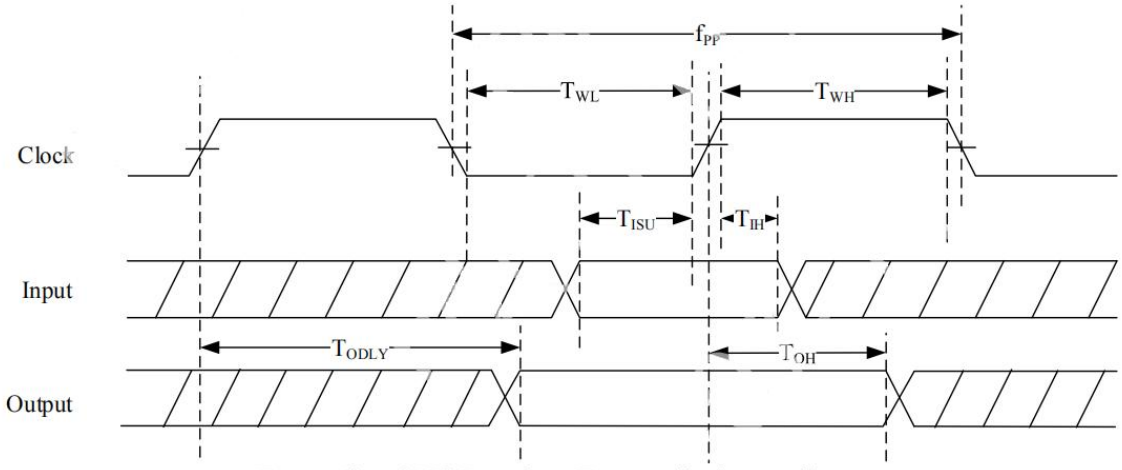



Figure 5. SDIO Interface Timing (high speed)

| NO | Parameter | MIN | MAX | Unit |
|---|---|---|---|---|
| $f_{PP}$ | Clock Frequency | 0 | 50 | MHz |
| $T_{WL}$ | Clock Low Time | 7 | - | ns |
| $T_{WH}$ | Clock High Time | 7 | - | ns |
| $T_{ISU}$ | Input Setup Time | 6 | - | ns |
| $T_{IH}$ | Input Hold Time | 2 | - | ns |
| $T_{ODLY}$ | Output Delay Time During Data Transfer Mode | - | 14 | ns |
| $T_{OH}$ | Output Hold Time | 2.5 | - | ns |

### 7.3.3 SDIO Power-on sequence

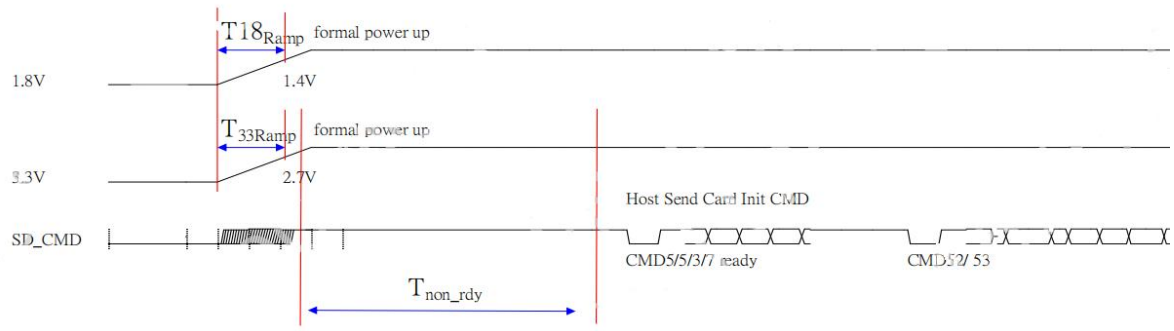



Figure 6. SDIO Interface Power-On Sequence

**Table 15. SDIO Interface Power-On Sequence**

| Symbol | Description |
|---|---|
| $T_{33ramp}$ | The 3.3V main power ramp up duration. |
| $T_{18ramp}$ | The 1.8V main power ramp up duration. |
| $T_{non\_rdy}$ | SDIO Not Ready Duration.<br>In this state, the RTL8723FS may respond to commands without the ready bit being set. After the ready bit is set, the host will initiate complete card detection procedure. |

We recommend that the card detection procedures are divided into two phases: A 3.3V power pre-charge phase and a formal power-up phase.

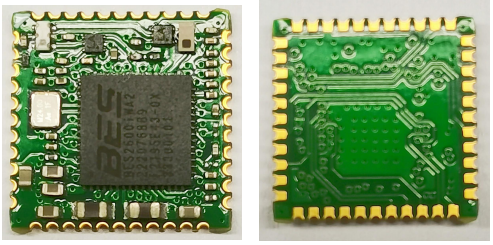
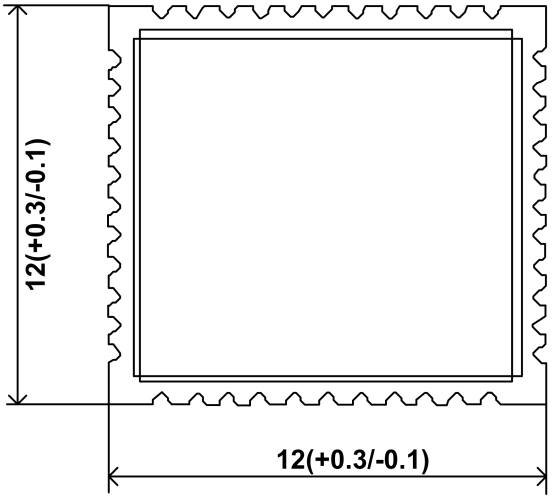
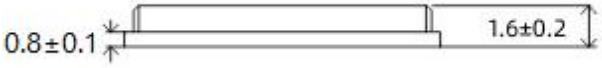
After main 3.3V ramp up and 1.8V ramp up, the power management unit is enabled by the power ready detection circuit. The power management unit enables the SDIO block. eFUSE is then autoloaded to SDIO circuits during the $T_{non\_rdy}$ duration. After CMD5/5/3/7 procedures, card detection is executed. When the driver has loaded, normal CMD52 and CMD53 are used.

**Table 16. SDIO Interface Power-On Timing Parameters**

| | Min | Typical | Max | Unit |
|---|---|---|---|---|
| T33ramp | 0.2 | 0.5 | 2.5 | ms |
| T18ramp | 0.2 | 0.5 | 2.5 | ms |
| Tnon-rdy | 1 | 2 | 10 | ms |

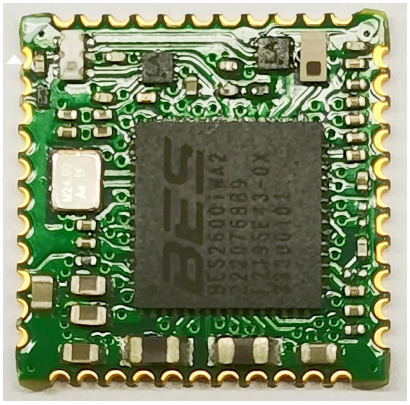
# 8. Size reference

## 8.1 Module Picture

| | |
|---|---|
| **L x W : 12 x 12 (+0.3/-0.1) mm**<br>  |  |
| H: 1.6 (±0.2) mm |  |
| **Weight** | 0.59g |

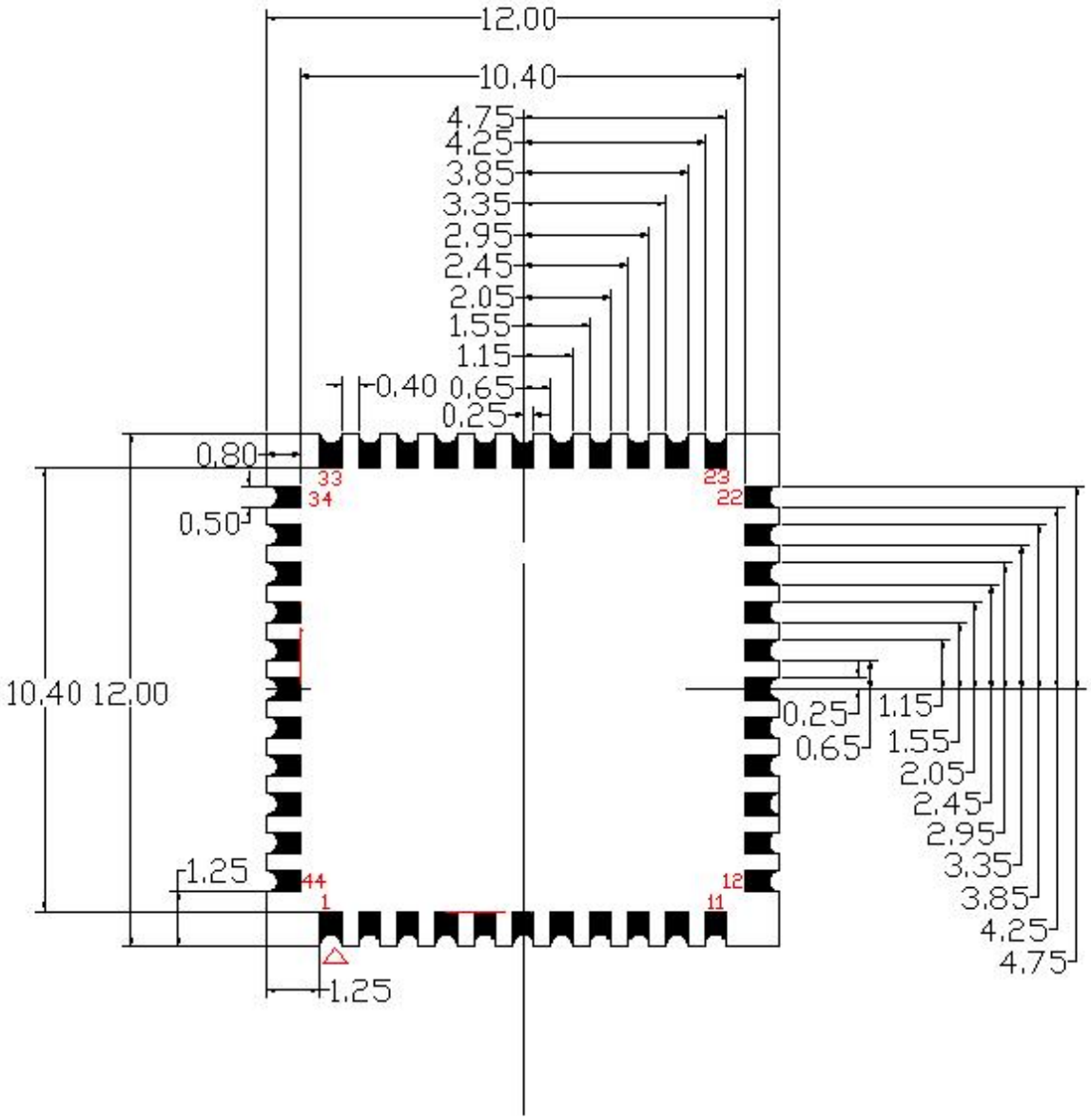
## 8.2 Marking Description

< TOP VIEW >

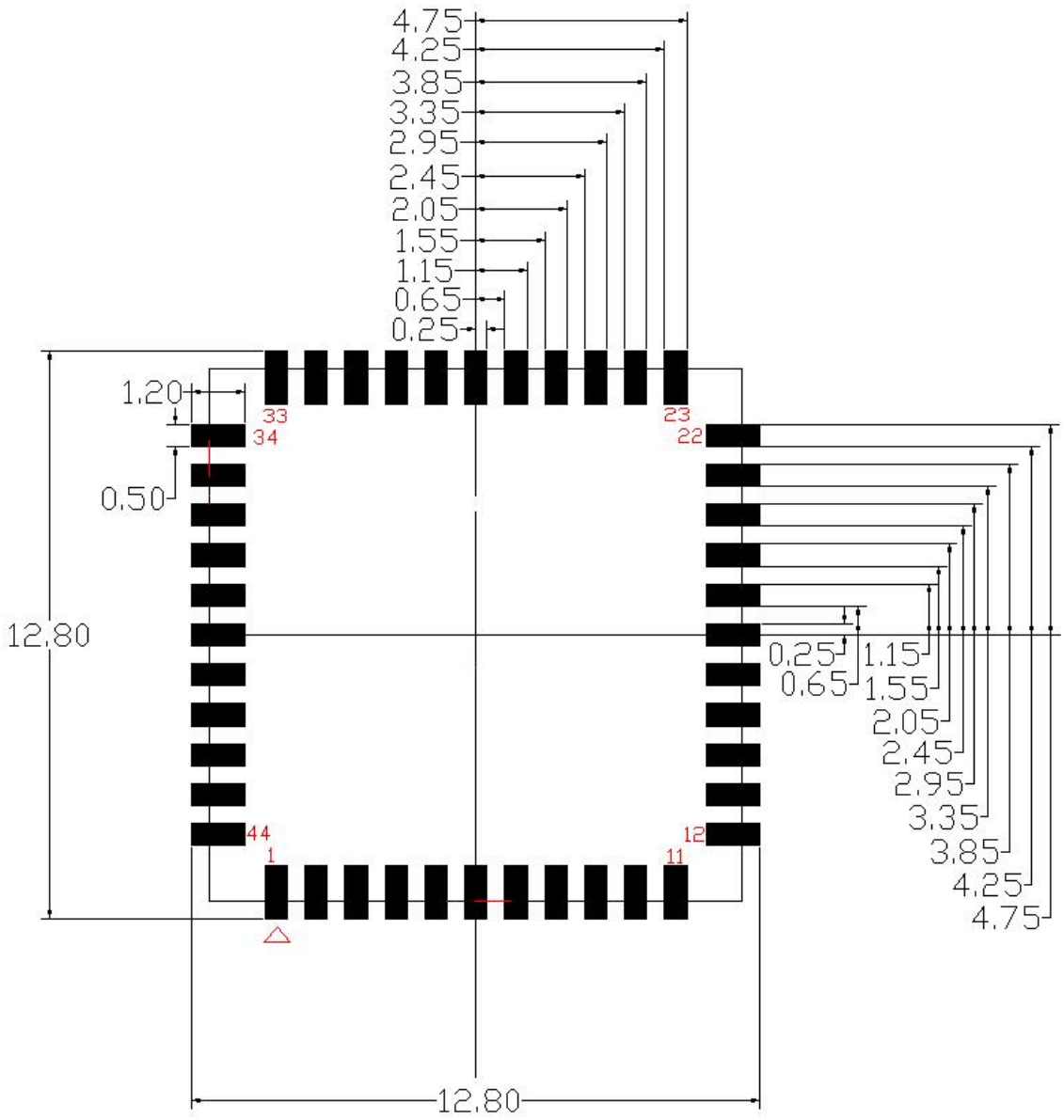


## 8.3 Physical Dimensions

<TOP View>



## 8.4 Layout Recommendation

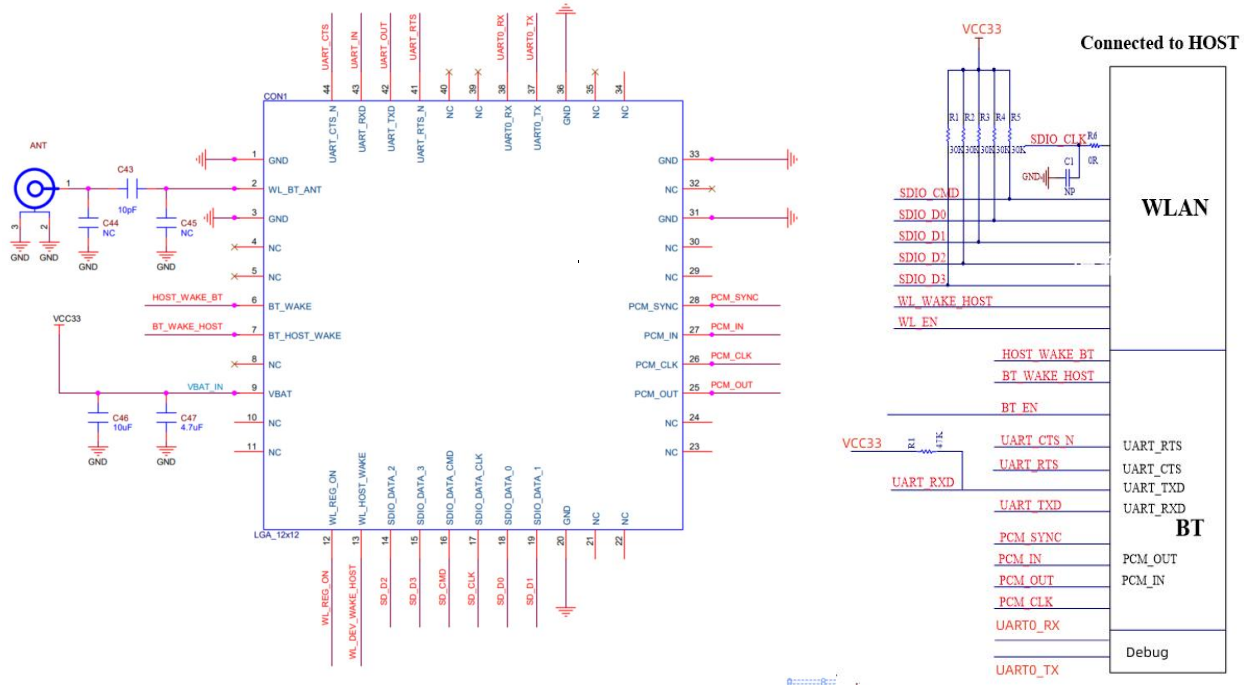



# 9. The Key Material List

| | | |
|---|---|---|
| Chipset | BES2600iWA2 | 恒玄 |
| PCB | V200A-S PCB green,6layer,FR4,12X12X0.8mm | XY-PCB,KX-PCB,SL-PCB,Sunlord, SL-PCB,XL PCB |
| Crystal | 2016 24MHz 10ppm 8PF -20-85° C | ECEC,TKD,JWT,Hosonic |
| Diplexer | 1608 Dual-band, dual-mode 2.4GHz/5GHz WLAN | Glead, Walsin, ACX, Murata, MAG.LAYERS,TDK |

| | | |
|---|---|---|
| TVS | 0201 5V 0.15pF 12KV TVS | Murata,sunlord,way-on |

# 10. Reference Design

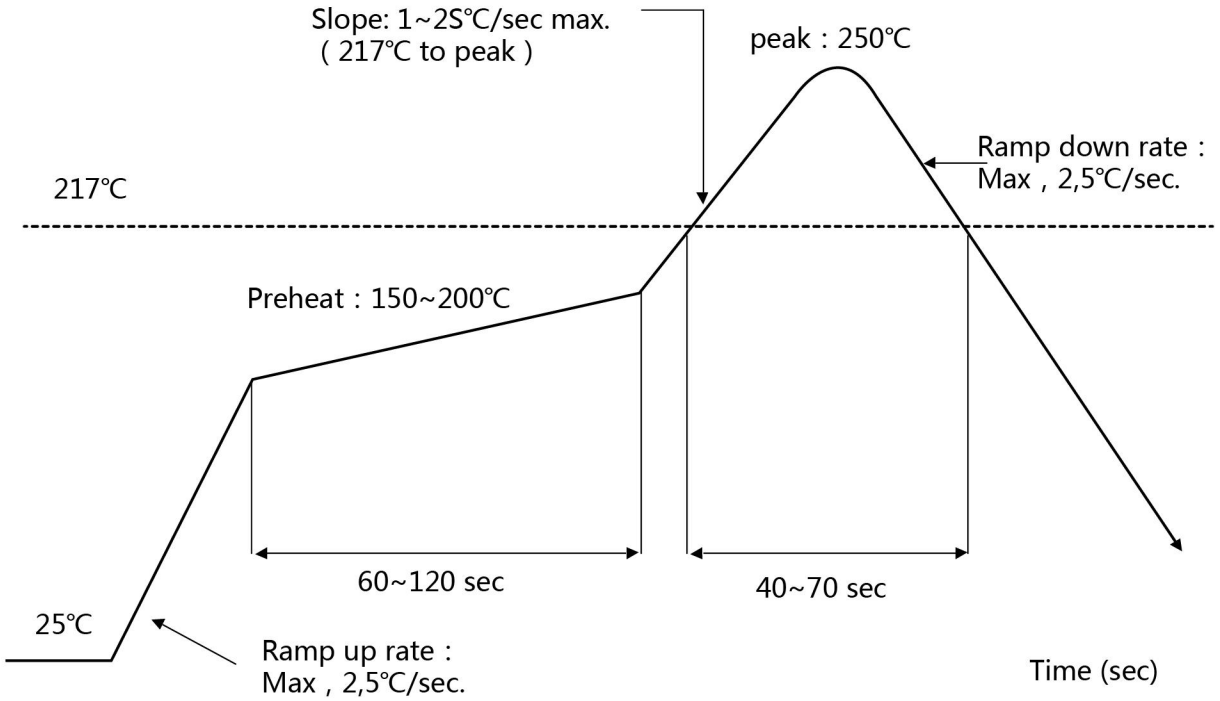



# 11. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : <250°C

Number of Times : ≤2 times



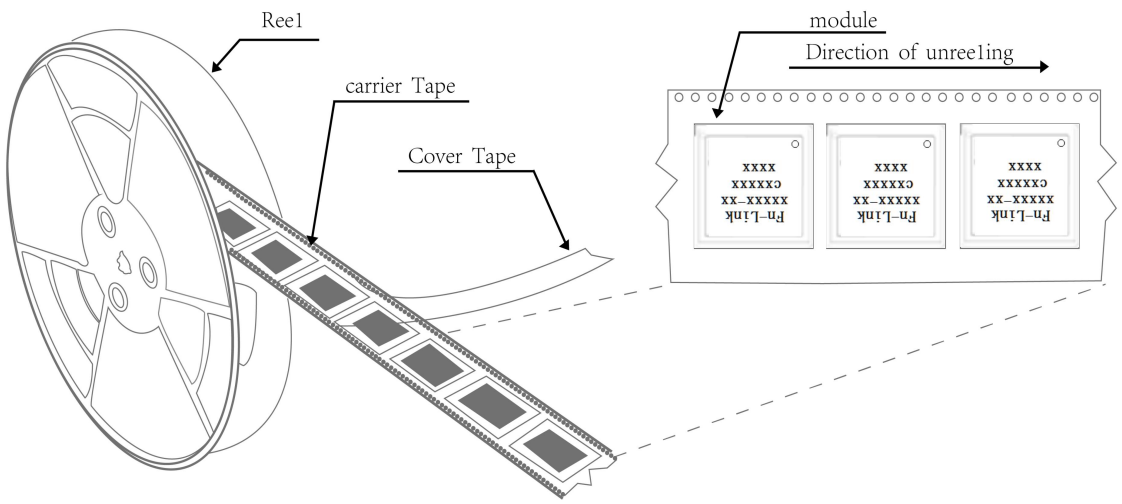

# 12. RoHS compliance

All hardware components are fully compliant with EU RoHS directive

# 13. Package

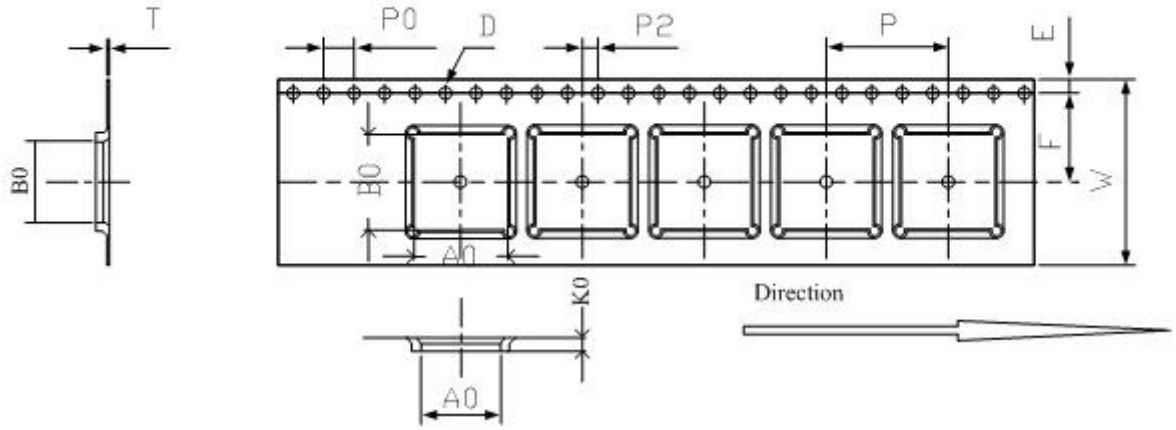
## 13.1 Reel

A roll of 1500pcs




## 13.2 Carrier Tape Detail

| ITEM | W | A0 | B0 | D | F | E | K0 | P0 | P2 | P | T |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DIM | 24 | 12.40 | 12.40 | 1.50 | 11.5 | 1.75 | 2.6 | 4.0 | 2.0 | 16.0 | 0.30 |
| TOLE | +0.3 -0.3 | ±0.10 | ±0.10 | +0.1 -0.0 | +0.1 -0.1 | ±0.1 | ±0.10 | ±0.1 | ±0.1 | ±0.1 | ±0.05 |




## 13.3 Packaging Detail

the take-up package

Using self-adhesive tape

Size of black tape: 24mm*32.6m  the cover tape  :21.33mm*32.6m

Color of plastic disc: black

NY bag size:450mm*415mm

size ： 350*350*35mm


The packing case size:350*210*370mmg

# 14. Moisture sensitivity

The Modules is a Moisture Sensitive Device level 3, in according with standard IPC/JEDEC J-STD-020, take care
all the relatives requirements for using this kind of components.
Moreover, the customer has to take care of the following conditions:

a) Calculated shelf life in sealed bag: 12 months at <40°C and <90% relative humidity (RH)

b) Environmental condition during the production: 30°C / 60% RH according to IPC/JEDEC J-STD-033A paragraph 5

c) The maximum time between the opening of the sealed bag and the reflow process must be 168 hours if condition

b) "IPC/JEDEC J-STD-033A paragraph 5.2" is respected

d) Baking is required if conditions b) or c) are not respected

e) Baking is required if the humidity indicator inside the bag indicates 10% RH or more