

# Module Specification Document

Manufacturer Name: GD Midea Air-Conditioning Equipment Co., Ltd.

Module Name: 2.4GHz WLAN/Bluetooth Module

Module Number: MWB-S-F13

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## 1. Product Overview

The MWB-S-F13 is a fully-featured, highly integrated, low-power consumption IoT dedicated WIFI+BLE module developed by Midea. The module adopts an integrated PCB antenna design, and the main chip highly integrates memory, flash, WIFI baseband, and Bluetooth baseband, etc. It supports the IEEE802.11 b/g/n protocol, and provides a UART communication interface to communicate with the main device, which can be widely used in the field of smart home devices.

The module has the following features:

- Supports a main frequency of 160MHz, 288KB of RAM, and 2M Flash
- The UART communication interface supports negotiated baud rates with TX error  $\leq \pm 2\%$ , and RX tolerance  $\geq \pm 2\%$
- Supports IEEE 802.11b/g/n protocols
- Supports 20MHz bandwidth within the 2.4GHz frequency band
- Supports Bluetooth BLE 5.2
- Supports encryption protocols: WPA, WPA2
- PCB onboard antenna
- Operating temperature:  $-20^{\circ} \text{ C}$  to  $85^{\circ} \text{ C}$
- The module comply with FCC part 15 subpart C.

The module's block diagram is as follows:

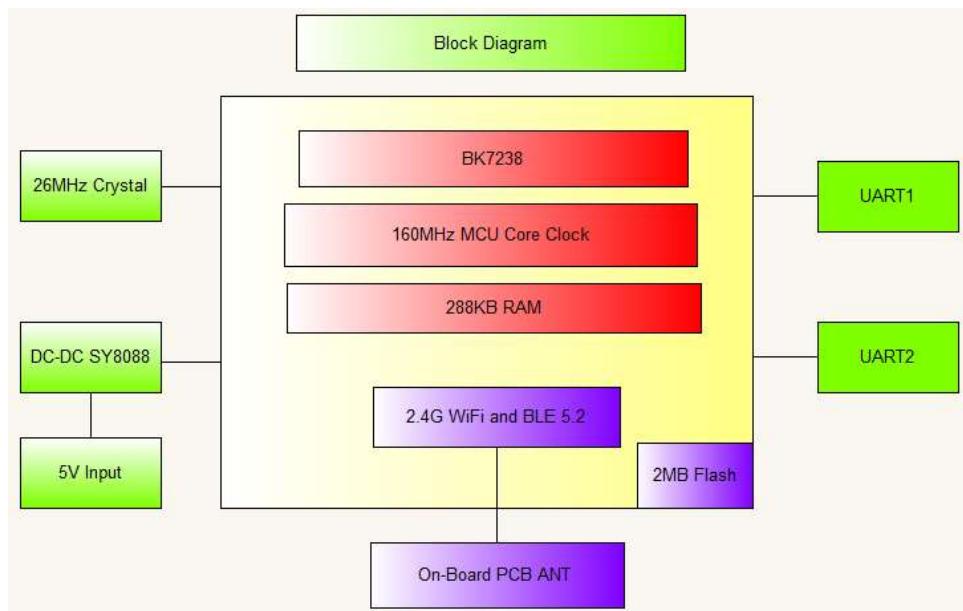
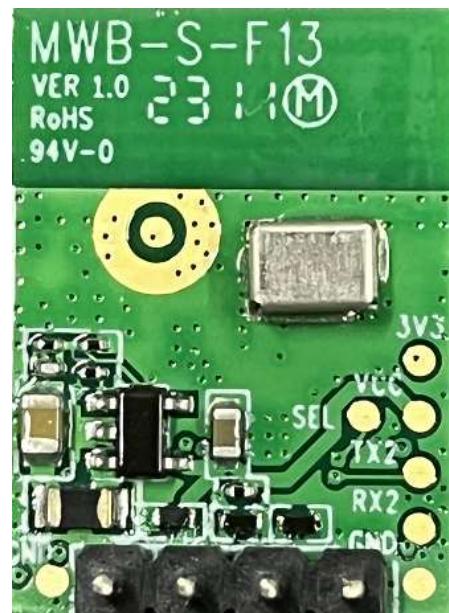


Figure 1.1 Block diagram of the MWB-S-F13 module

## 2. Module prototype reference top view



Back view



### 3. RF characteristics

#### 3.1 Basic RF parameters

Frequency range	WIFI: 2.4GHz~2.4835GHz    Bluetooth: 2.4GHz~2.4835GHz
Wireless standards	WIFI: 802.11b/g/n, Bluetooth: BLE 5.2
Antenna	PCB antenna
Data rate	11b: 1Mbps, 2Mbps, 5.5Mbps, 11Mbps  11g: 6Mbps, 9Mbps, 12Mbps, 18Mbps, 24Mbps, 36Mbps, 48Mbps, 54Mbps  11n: MCS0, MCS1, MCS2, MCS3, MCS4, MCS5, MCS6, MCS7  Bluetooth: 1Mbps

#### 3.2 RF output power

WIFI target power table:

Rate	1~11 channels	12 channel	13 channel	Unit
1Mbps	17±2	17±2	14±2	dBm
11Mbps	17±2	17±2	14±2	dBm

6Mbps	16±2	15±2	11±2	dBm
54Mbps	14±2	14±2	11±2	dBm
HT20-MCS0	16±2	15±2	10±2	dBm
HT20-MCS7	13±2	13±2	10±2	dBm
Frequency Error	±10	±10	±10	ppm

Bluetooth Target Power Table:

Rate	Minimum	Typical Value	Maximum	Unit
Bluetooth 1Mbps	4	6	8	dBm
Frequency Error	-150	0	150	KHz

### 3.3 RF receive sensitivity

Rate	Maximum	Typical	Minimum	Unit
1Mbps	-84		-100	dBm
11Mbps	-78		-91	dBm
6Mbps	-84		-92	dBm
54Mbps	-67		-77	dBm
HT20-MCS0	-84		-92	dBm
HT20-MCS7	-66		-75	dBm
Bluetooth 1Mbps	-90		-98	dBm

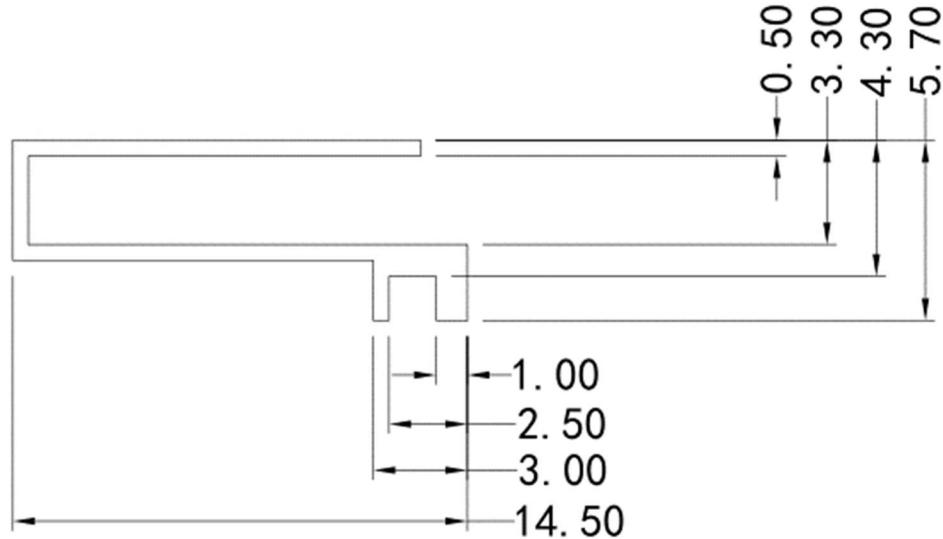
### 3.4 Module antenna characteristics

- The passive performance of the module's antenna should refer to the following requirements:

Parameters	Operating frequency range 2.4GHz~2.4835GHz
S11	≤-9.5dB
Efficiency	>40%

Gain	$\geq 0\text{dBi}$
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➤ The module antenna drawing is as follows:

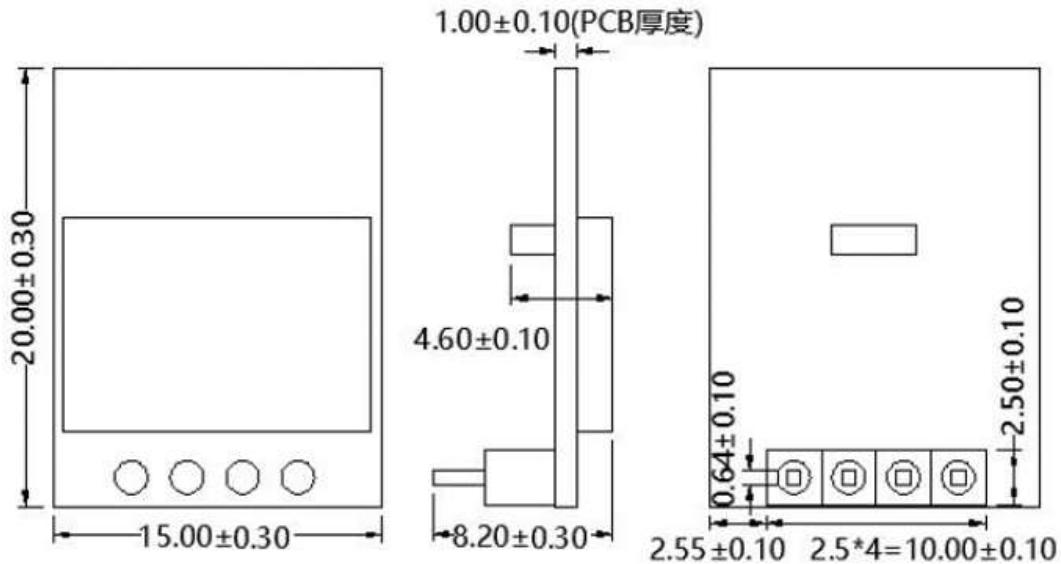


➤ When placing the module antenna, the following points should be noted:

1. It is recommended to place the module at the edge of the control board, and the antenna should face outward, away from metal parts and high-frequency signal traces.
2. No traces are allowed under the PCB antenna, and clearance should be provided, high-speed signals should be avoided around and below the module. If routing cannot be avoided, it is recommended to strictly follow the high-frequency signal routing rules, and ground the high-speed signals.
3. During installation, the front of the antenna should avoid metal enclosures or components to prevent signal shielding. Plastic shielding is allowed, interference from any object with the antenna is prohibited.

## 4. Product structure diagram

### 4.1 PCB dimensions



- Board thickness: 1.0mm
- Module thickness (with shielding cover):  $15*20*4.6$  mm
- Tolerance:  $\pm 0.3$ mm
- Material: FR-4

### 4.2 Interface diagram

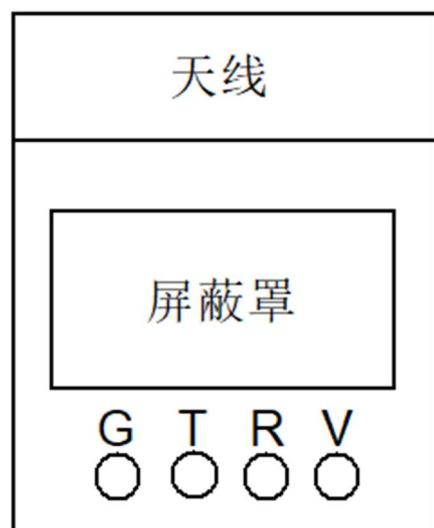


Figure 2.1 Terminal interface diagram

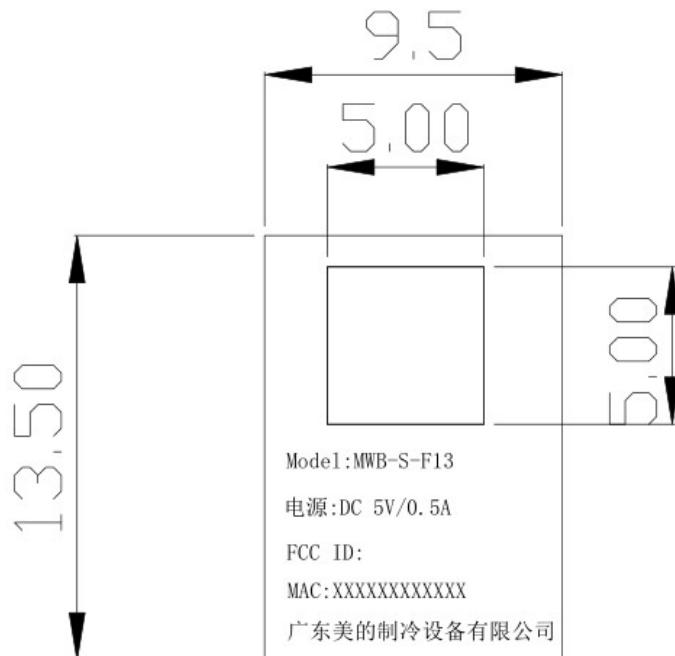
Table 2.1 Terminal interface description

Serial number	Mark	Wi-Fi module terminal pin description
1	V	VCC Power
2	R	RX Module Receive
3	T	TX Module Transmit
4	G	GND Ground

#### Wiring Instructions:

The Wi-Fi Bluetooth module's RXD and TXD pins are connected to the communication end's TXD and RXD pins of the module, VCC is connected to 5V level, GND is grounded. After the module is powered on, it receives through the RX end and transmits through the TX end.

#### 4.3 Label Requirements

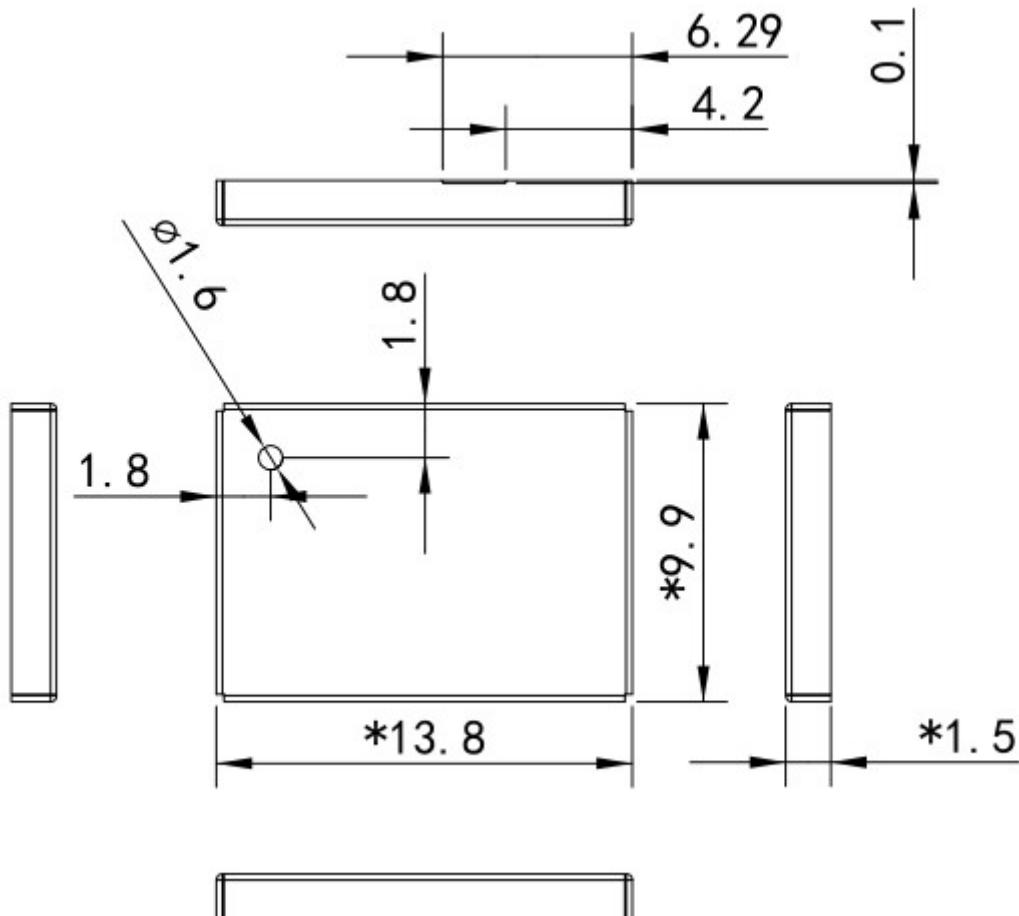


#### Label Printing Requirements:

The label size is 13.5\*9.5mm, the label material is a polyimide with an acrylic pressure-sensitive adhesive, Song style; the QR code size is 5.5\*5.5mm.

FCC ID: 2ADQOMWB-S-F13;

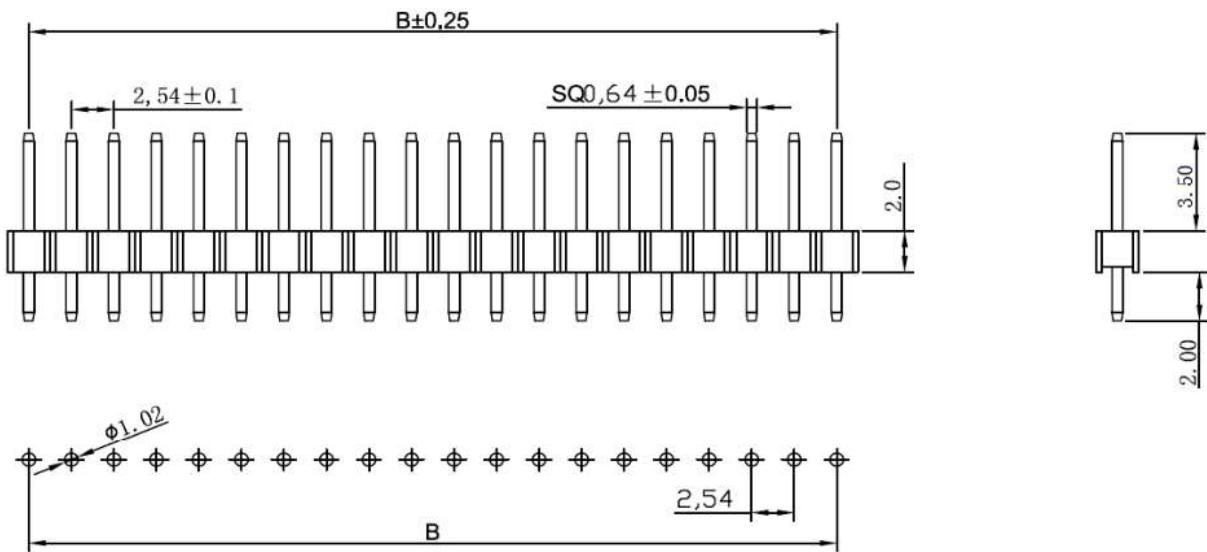
#### 4.4 Shield cover dimensions



Technical requirements:

- Material: Nickel silver C7701, material thickness  $T=0.2\text{mm}$ ,  $H=1.5\text{mm}$
- Surface clean, no burrs, no flash and other defects,
- Unspecified dimensional tolerances are  $\pm 0.1\text{mm}$

#### 4.5 Connector pin drawing



Technical requirements:

- Operating temperature:  $-40^{\circ}\text{C} \sim +105^{\circ}\text{C}$
- Insulating material: Black PA6T
- Material: Brass
- Plating: G/F Plated Over Nickel

#### 5. Power Consumption Description

Power consumption in operation mode (current based on 5V test data for reference only) :

Mode	Average Current (mA)	Minimum Current (mA)	Maximum Current (mA)	Average Power Consumption (mW)
Idle	8.83	7.94	63.77	44.15
AP	33.8	24.66	299.58	169
Station idle	30.62	28.28	298.56	153.12

## 6. Electrical parameters

### 6.1 Absolute electrical parameters

Power parameters:

Parameters	Description	Minimum	Maximum	Unit
Ts	Storage temperature	-40	85	° C
VCC	Supply voltage	4.5	5.5	V
Electrostatic Discharge Voltage (Human Body Model)	TAMB-25°C	-2	2	KV
Electrostatic Discharge Voltage (Machine Model)	TAMB-25°C	-0.5	0.5	KV
Contact Discharge	Communication UART Interface	-4	4	KV
Air Discharge	Communication UART Interface	-8	8	KV

### 6.2 Operating Conditions

Parameters	Description	Minimum	Typical Value	Maximum	Unit
Ta	Operating Temperature	-20		85	° C
VCC	Operating voltage	4.5	5	5.5	V

## 7. Usage precautions

The Wi-Fi Bluetooth module exposed in the air (the module's internal core board or the assembly of the core board and the baseboard) should meet the usage environmental conditions of ordinary consumer electronics, including but not limited to:

- Operating temperature: -20~85°C

- Storage temperature: -40~85°C
- Operating humidity: 0~95 %RH
- Storage humidity: 0~98 %RH
- Withstand -20/+85°C thermal shock, one cycle every 2h, without functional abnormalities or performance degradation, and no significant solder cracking after at least 20 cycles.
- When operating for extended periods, the temperature rise of circuit components should meet the requirements specified in the component specifications.
- To simulate transportation processes and home application scenarios, the module should withstand a certain degree of mechanical shock and drop.

With appropriate protective measures, the Wi-Fi Bluetooth module can achieve higher environmental adaptability. When designing the Wi-Fi Bluetooth module, allowances should be made for the implementation of protective measures in terms of performance, size, and process.

## 8. Statement

### 8.1 FCC Statements.

This device complies with FCC PART 15 subpart C. 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.

### 8.2 FCC Radiation Exposure Statement.

The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device, for example, USB dongle like transmitters is forbidden.

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

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 Transmitter Module FCC ID: 2ADQOMWB-S-F13 Or Contains FCC ID: 2ADQOMWB-S-F13"

When the module is installed inside another device, the user manual of this device must contain below warning statements:

1. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

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- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

The host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

The end user manual shall include all required regulatory information/warning as shown in this manual, include:

This product must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

**NOTE:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.