Xiaomi Smart WIFI Module

Rev 1.1

CMIIT ID: XXXXXXXXXXXXX

Xiaomi Communications Co., Ltd.
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1 Product description

1.1 Solution overview

MHCWB4P-B is an embedded high-performance WIFI + BLE module, using Realtek XMC1R chip platform solution. MHCWB4P-B is an integrated PCB on-board antenna, The module is mainly applicable to many IoT applications such as smart home appliances, home automation, and industrial Internet.

1.2 System hardware advantages

The module supports a variety of interfaces, and integrates 2MB Flash internally, which is suitable for connecting sensors, starters and other connections, reducing external component requirements and PCB size. Multiple GPIO interfaces are pulled out of the module for users to connect to the motherboard.

We support module function customization service, as well as factory parameter preset settings, and have a comprehensive software development platform and testing tools; The module has passed various related certification tests.

table 1-1. **MHCWB4P-B basic parameters**

module	MHCWB4P-B
IC	XMC1R
Antenna	PCB antenna
Mechanical Dimensions (unit: mm)	18*25*3.1

table 1-2. MHCWB4P-B arameters Table		
category	parameter	Description
Wireless parameter	Standard certification	
	Wi-Fi protocol	802.11 b/g/n
	Frequency Range	2.412 GHz ~ 2.462GHz
Hardware parameter	Data interface	UART/HSPI/I2C/I2S
		GPIO/PWM
	Operating Voltage	2.7V ~ 3.6V
	Operating current	average: 80 mA
	Supply current	min: 500 mA
	Operating temperature	-40°C ~ 85°C
	Storage temperature	-40°C ~ 85°C
	External interface	-
Software parameter	Wireless network mode	Station/SoftAP/SoftAP+Station
	Security Mechanism	WPA/WPA2
	Encryption type	WEP/TKIP/AES
	Firmware upgrade	Local serial programming / OTA upgrade / host download & programming
	Software development	Support for custom’ s server Provide SDK required for secondary development
	Network protocol	IPv4，TCP/UDP/HTTP/FTP
	User configuration	AT+Instruction Set, Cloud server, Android/iOS app

2 Pin descriptions

The pin distribution of the chip module MHCWB4P-B is shown in Figure 2-1

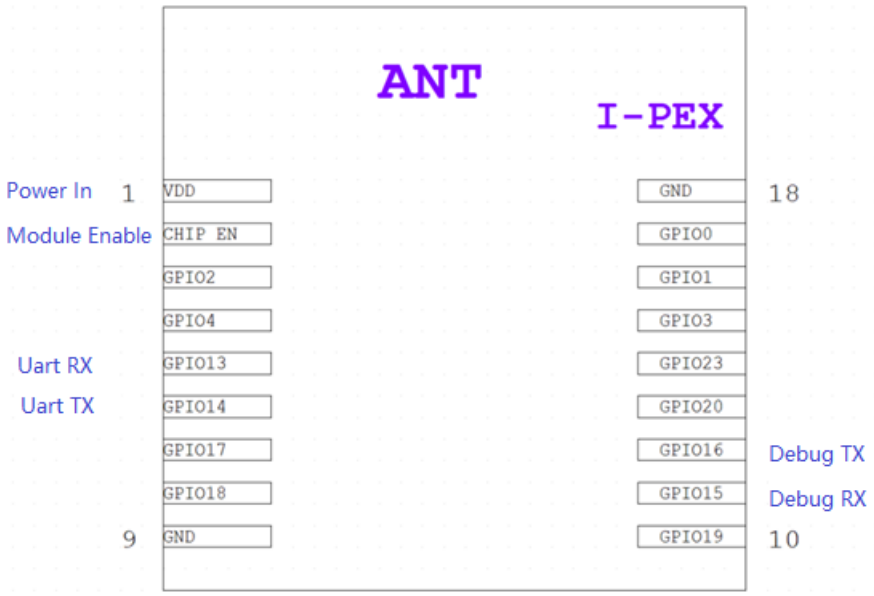


figure 2-1. MHCWB4P-B pin distribution

MHCWB4P-B has a total of 18 pins. See Table 2-1 for pin definitions.

table 2-1. MHCWB4P-B in definition

Number	Pin name	Description
1	VDD	Power The maximum output current of the external power supply is recommended to be 500 mA and above.
2	CHIP-EN	Module enable
3	GPIO2	I/O
4	GPIO4	I/O
5	GPIO13	I/O Communication RX
6	GPIO14	I/O Communication TX
7	GIPO17	I/O
8	GPIO18	I/O
9	GND	Ground
10	GPIO19	I/O

11	GPIO15	I/O Debug RX
12	GPIO16	I/O Debug TX
13	GPIO20	I/O
14	GPIO23	I/O
15	GPIO3	I/O
16	GPIO1	I/O
17	GPIO0	I/O
18	GND	Ground

Note:

When GPIO0 is powered on, do not pull it high, otherwise it will enter download mode.

Module startup configuration table:

	CHIP_EN	GPIOA_0	GPIOA_13
Normal operation mode	1	0	0 OR 1
UART download mode	0->1	1	1

3 Electrical parameters

Note: Unless otherwise specified, the test conditions are: VDD = 3.3V, temperature is 25 ℃.

3.1 Electrical characteristics

table 3-1. Electrical parameters					
Parameter	Symbol	Minimum	Typical	Maximum	Units

Storage temperature	-	-40	Normal temperature	85	℃
Operating temperature	-	-40	20	85	℃
	-	-40	20	105	℃
Welding temperature (welding condition: IPC / JEDEC J-STD-020)	-	-	-	260	℃
Supply voltage	VDD	2.7	3.3	3.6	V
Input-Low Voltage	V_{IL}	-0.3	-	0.25 VDD	V
Input-High Voltage	V_{IH}	0.75 VDD	-	VDD + 0.3	V
Output-Low Voltage	V_{OL}	-	-	0.1 VDD	V
Output-High Voltage	V_{OH}	0.8 VDD	-	-	V

3.2 Reflow temperature curve

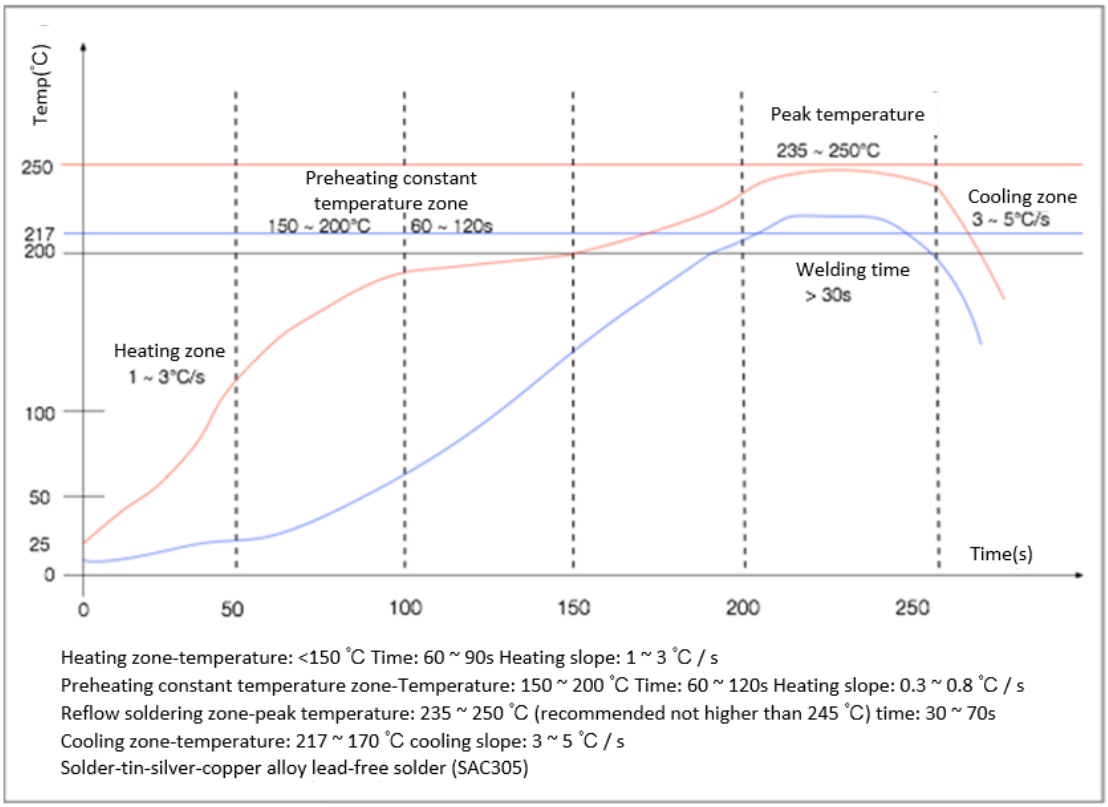
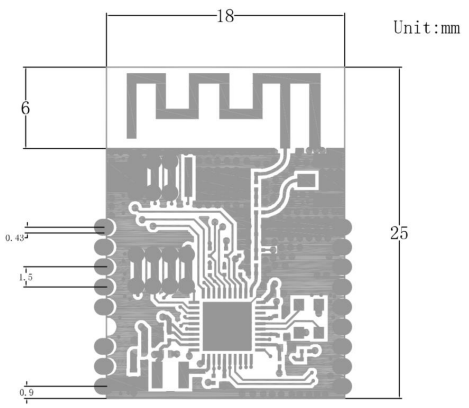


Figure 3-1. MHCWB4P-B Reflow temperature curve

Soldering instructions: In double-sided SMT, after the T-side (top side) components are reflowed for the first time, the circuit board needs to be flipped and reflow soldered on the other side. In the second reflow, the already soldered T-side components will be fixed by the surface tension of the solder paste to prevent the components from dropping under the effect of gravity.

The design of the mother board and the yin and yang board are over-furnaceed (furnace temperature 240-260℃) and verified that there is no defect. To ensure its stability, it is recommended to dispense.

4 Mechanical Dimension Chart



5 MSL level / Storage conditions

- MSL level: Level 3-less than or equal to 30℃/ 60% RH 168 hours workshop life.
- Storage conditions: The products should be handled carefully during transportation, and they should not be squeezed against each other to avoid being impacted and strongly vibrated. The storage environment should be kept dry and ventilated. The ambient temperature should be between 5℃ and 35℃. It should not be stored with items that can generate corrosive gases.

6 Delivery Checklist

- Complete packaging
- Evaluation tool (SPI / UART / JTAG interface)
- The software supports customer integration and performance test certification.
- Unit test / Qualification report
- Product specifications
- Complete and clear identification, such as production serial number, MAC, etc.
- Agency certification report

7 INTEGRATION INSTRUCTIONS

1. This module has been tested and found to comply with the FCC Part15.247 for Modular Approval.

2. This Modular Approval is limited to OEM installation for mobile and fixed applications only. The antenna installation and operating configurations of this transmitter, including any applicable source-based time- averaging duty factor, antenna gain and cable loss must satisfy MPE categorical Exclusion Requirements of 2.1091. This modular should be installed and operated with minimum distance 20 cm between the radiator& your body.

3. The PCB antenna has been approved for the modular. The maximum antenna gain is 3.33dBi. For situations where the host manufacturer is responsible for an external connector, the integration instructions shall inform the installer that a unique antenna connector must be used on the Part 15 authorized transmitters used in the host product.

4. When the module is installed in the host device, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily removed. If not, a second label must be placed on the outside of the final device that contains the following text: —Contains FCC ID: 2AFZZMHCWB4P-B.

5. The Xiaomi Communications Co., Ltd.uses various test mode programs for test set up which operate separate from production firmware. Host integrators should contact SXiaomi Communications Co., Ltd.for assistance with test modes needed for module/host compliance test requirements.

6. The Xiaomi Communications Co., Ltd. modular transmitter is only FCC authorized for the FCC Part15.247 listed on the grant, and that 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. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

Module design considerations

- The module is recommended to be placed at the corner of the plate, and the antenna is facing outwards. Keep a clearance of at least 15mm around the antenna. Keep it away from metal devices, sensors, high-frequency signal transmission devices, and high-frequency signal traces. Increase the distance from the location to the interference. The source energy is attenuated with increasing distance, which reduces the coupling of noise and improves the overall performance of the antenna.
- The recommended output current of the power chip selected for the module power supply is at least 500mA.
- It is recommended that the module should be powered by an independent power supply.
- Do not allow any object to interfere with the antenna.
- It is forbidden to route under the PCB antenna and do clearance processing. It is recommended that the width of the slot under the antenna with the mother board is at least 5mm from the edge of the antenna board.
- All the power supply interfaces and pull-up power supply of the module, please use the same power network to ensure that the power on sequence of the module is consistent.
- Power supply ripple requirements for the module: When sending 11n MCS7 packets, the power ripple must be less than 100mV; when sending 11b / 11g packets, the power ripple must be less than 120mV.
- When communicating between the module and the CPU through SDIO and UART, it is best to connect a 200 ohm resistor in series on the signal line (resistance value can be adjusted according to actual needs) to reduce the driving current and interference, and also eliminate Timing problems caused by inconsistent line lengths.
- Avoid high-speed signals around and below the module. If you cannot avoid them, it is recommended to strictly follow the high-frequency signal processing rules to try to cover the high-speed signals with ground as much as possible. When data or addr lines are involved, packaged in groups to cover with grounds.
- If high-power devices such as motors are involved in the system design, the circuit return path (GND) of the module must be separated from the return paths (GND) of other high-power devices, and finally connect the two return paths (GND) with a wire.
- When selecting the module, try not to use the PCB on-board antenna, because the PCB on-board antenna is interfaced more interferences, and it is easy to couple interference sources to affect the performance of the antenna. It is best to use an external antenna, which can be led out of the PCB through the cable Board, so the influence of high frequency interference signals on the antenna performance of the module will be reduced.
- After the product design is completed, it is recommended to test the antenna performance of the whole machine according to the product definition to confirm whether the antenna performance meets the requirements of the whole machine.
- Module reference design circuit, please refer to the module schematic diagram.

FCC Statement：

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

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.

FCC Radiation Exposure Statement:

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

FCC Label Instructions: The outside of final products that contains this module device must display a label referring to the enclosed module. This exterior label can use wording such as: "Contains Transmitter Module FCC ID:2AFZZMHCWB4P-B",or "Contains FCC ID: 2AFZZMHCWB4P-B".

Any similar wording that expresses the same meaning may be used.

IC RSS warning

This device complies with Industry Canada licence-exempt RSS standard (s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference,including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes:

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

IC Radiation Exposure Statement:

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment.

This equipment should be installed and operated with minimum distance 20cm between the radiator& your body.This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. Le rayonnement de la classe b repecte ISED fixaient un environnement non contrôlés.Installation et mise en œuvre de ce matériel devrait avec échangeur distance minimale entre 20 cm ton corps.Lanceurs ou ne peuvent pas coexister cette antenne ou capteurs avec d'autres.

Revision History

Date	Version	Release notes
2020.02	V0.1	Preliminary release for certification CE.

Conformity Assessment of the Radio Module to the RED

This radio module is for professional installation only. When installing this radio module permanently into a host product to a create new radio equipment device; the manufacturer responsible for placing the final radio product on the market in the EU must assess if the combination of this radio module and the host product complies with the essential requirements of the RE Directive 2014/53/EU.
Software version： V150
Test Antenna: Antenna type External fixed rubber antenna, WIFI 2.4GHz band Peak Gain 2.33(dBi), BT/BLE Peak Gain 2.33(dBi).

The final radio product will need to be fully assessed to Article 3.1a of the RED, for product safety
With regard to RF exposure for Article 3.1a of the RED, the manufacturer of the final radio product will need to assess if the compliance assessment of the original radio equipment/module remains relevant to the final radio product, or if further action is necessary.
This equipment should be installed and operated with minimum distance 20cm between the radiator& your body.
If the final radio equipment is used at the same distance from a person or domesticated animal as the radio module was assessed, (for example: >20cm), then the final radio product assessment could conclude that the final radio product is compliant with the RF exposure requirements without additional actions.
If the final radio equipment is used at a closer distance from a person or domesticated animal than the radio module was assessed, then the final radio product assessment could not automatically conclude that the final radio product is compliant with the RF exposure requirements without additional actions; and further assessment is necessary.
The final radio product will need to be fully assessed to Article 3.1b of the RED, for EMC.
EMC testing of the radio module will have been performed on some sort of temporary host or test jig; but now the module is in a new host product and the EMC performance of the final radio product must be assessed.
Most likely the host product will have its own EMC assessment for other functions, which should be performed with the radio module installed; and inclusion of the radio module into the host product will also require an assessment, such as to the relevant applicable part of EN 301 489, on the final radio product.
In theory, radio transmitter or receiver measurements made as conducted measurements at a radio module antenna port may be considered applicable to the radio performance of the final radio product. However, in this example, the radio module does not have an antenna port. The radio module has a pin which leads through a PCB trace to an antenna on the host product. If the manufacturer of the final radio product wishes to use conducted power, conducted emissions or receiver performance measurements from the radio module to show compliance of the final radio product, then they will need to exactly follow the detailed instructions from the radio module manufacturer; including input voltage, driver software, environmental conditions, antenna trace layout design construction and material, circuit board layout design construction and material, nearby circuitry, etc. In reality, it is expected that manufacturers of final radio products will need to test the output power, conducted spurious emissions and receiver performance requirements on the final radio product; and not take the results of those test cases from the radio module test reports.
Radiated test cases will also need to be performed on the final radio product.