

Midea IoT Module User Manual

Manufacturer name: Guangdong Midea Refrigeration Equipment co. LTD

Module name: MT7697D Small Size Wi-Fi & Bluetooth Module

Model specification: MM3SB1150Z

Material code: XXXXXXXXXXXXXXXX

Preparation:

Sign:

Review:

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Midea IoT

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1、 Product Overview

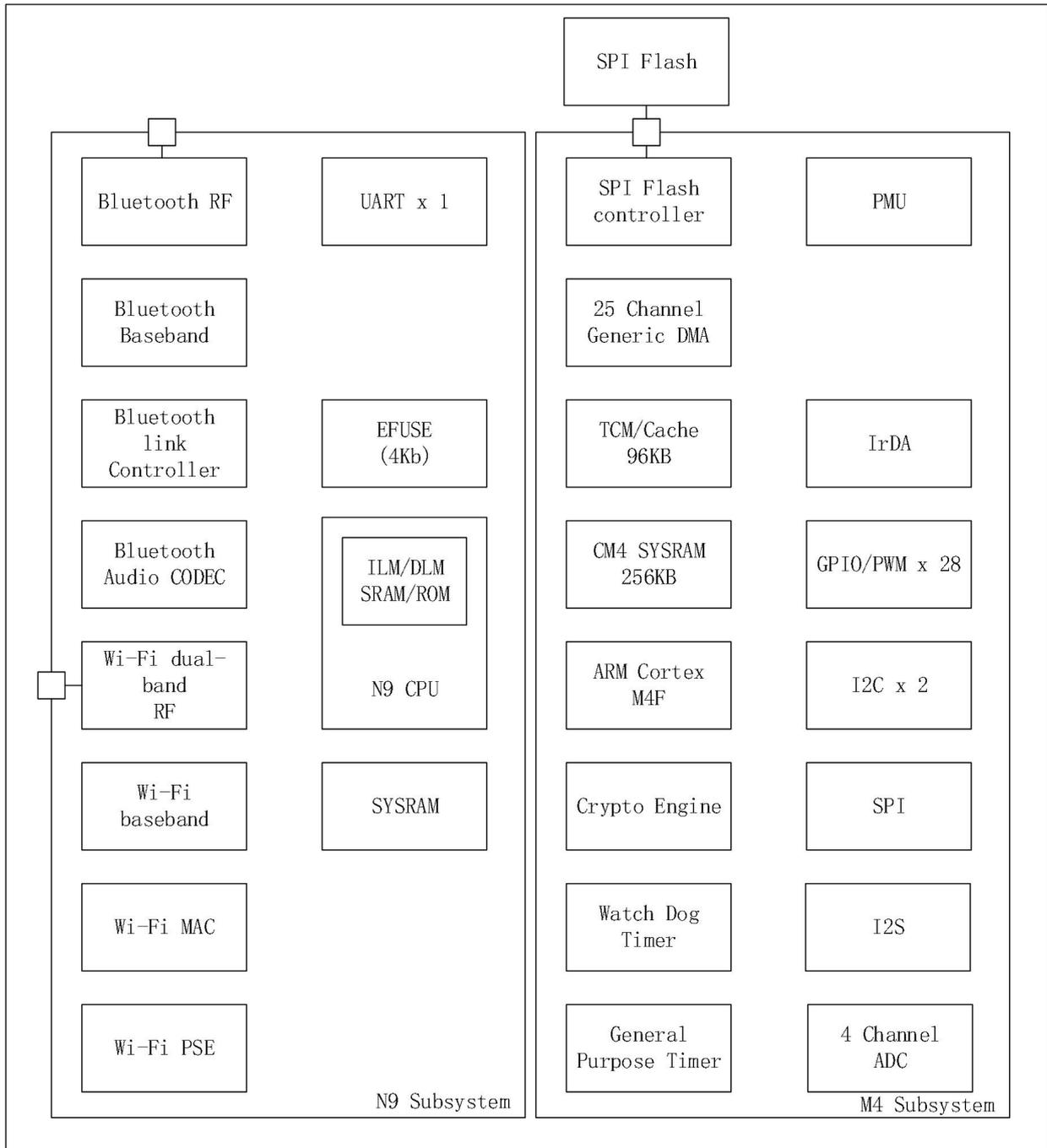
MM3SB1150Z wireless module is a fully functional, highly integrated, low power consumption dedicated Wi-Fi & bluetooth module for the Internet of things. It supports IEEE802.11a/b/g/n protocol, also embedded IPV4, TCP, UDP, DNS, HTTP and other complete network protocol, so that the terminal in the Internet of things applications more reliable, convenient and easy to use.

MM3SB1150Z core chip adopts the MT7697D single chip scheme of Media corp. The chip is highly integrated with CPU, PMU, RAM, T/R SW, LNA, PA and other major parts, thus greatly reducing the power consumption of the whole machine. The module adopts the integrated three-dimensional metal antenna design, which can not only reduce the cost of the antenna for customers, but also save the assembly space of the antenna, greatly reduce the area of the board, and make the product more competitive. At present, the module provides a complete serial port interface function to communicate with the device, and can connect the cloud and the device through the serial port and the mobile client.

The module has the following characteristics:

- Support IEEE 802.11a/b/g/n protocol
- Supports 20MHz and 40MHz bandwidth in the 2.4ghz band and 5GHz band
- Support bluetooth BLE 4.2
- The module has a built-in dual-mode metal antenna
- Low power listening mode
- Both up and down theoretically support a connection rate of 150Mbps
- Support encryption protocols: WFA, WPA, WPA2, WPS2.0
- Support IPV4, TCP, UDP, DNS, HTTP and other network protocols

The block diagram of the module is as follows:



2、Top view

Positive figure



On the back of the figure



3、Radio frequency characteristics

3.1 transmission and reception characteristics

Support IEEE 802.11a/b/g/n standard; For parameters such as transmitting power, receiving sensitivity, EVM and distribution, a more stringent standard than the IEEE specification is sought. Please refer to the attached table for the specifications.

Table 1: Wi-Fi 2.4ghz Band RF Specifications

TX Characteristics	Min.	Typ.	Max.	The Unit	
1. The Frequency range	2400	-	2483.5	MHz	
2. The Output power					
1 Mbps CCK	16			dBm	
11 Mbps CCK	16			dBm	
6 Mbps OFDM	15			dBm	
54 Mbps OFDM	13			dBm	
HT20, MCS0	15			dBm	
HT20, MCS7	13			dBm	
HT40, MCS0	15			dBm	
HT40, MCS7	13			dBm	
3. The TX EVM entry					
6 Mbps OFDM			- 5	The dB	
54 Mbps OFDM			- 25	The dB	
HT20, MCS 0			- 5	The dB	
HT20, MCS 7			27 -	The dB	
HT40, MCS 0			- 5	The dB	
HT40, MCS 7			27 -	The dB	
RX Characteristics	Min.	Typ.	Max.	The Unit	

1. The Frequency range	2400	-	2483.5	MHz	
2. Minimum Input Level Sensitivity					
1) 1 MBPS (FER) \cong 8% CCK		- 82.		dBm	
2) 2 MBPS (FER) \cong 8% CCK		- 80.		dBm	
3) 5.5 Mbps (FER) \cong 8% CCK		- 78.		dBm	
4) 11 MBPS (FER) \cong 8% CCK		- 76.		dBm	
5) BPSK rate 1/2, 6 Mbps OFDM		- 82.		dBm	
6) BPSK rate 3/4, 9 Mbps OFDM		- 81.		dBm	
7) QPSK rate 1/2, 12 Mbps OFDM		- 79.		dBm	
8) QPSK rate 3/4, 18mbps OFDM		- 77.		dBm	
9) 16QAM rate 1/2, 24mbps OFDM		- 74.		dBm	
10) 16QAM rate 3/4, 36 Mbps OFDM		- 70.		dBm	
11) 64QAM rate 1/2,48mbps OFDM		- 66.		dBm	
12) 64QAM rate 3/4, 54mbps OFDM		- 65.		dBm	
3. RX Sensitivity BW=20MHz Mixed mode 800ns Guard Interval non-stbc					
1)MCS 0, BPSK rate 1/2		- 82.		dBm	
2)MCS 1, QPSK rate 1/2		- 79.		dBm	
3)MCS 2, QPSK rate 3/4		- 77.		dBm	
4)MCS 3, 16QAM rate 1/2		- 74.		dBm	
5)MCS 4, 16QAM rate 3/4		- 70.		dBm	
6)MCS 5, 64QAM rate 2/3		- 66.		dBm	
7)MCS 6, 64QAM rate 3/4		- 65.		dBm	
8)MCS 7, 64QAM rate 5/6		- 64.		dBm	
4. RX Sensitivity BW=40MHz Mixed mode 800ns Guard Interval					
1)MCS 0, BPSK rate 1/2		- 79.		dBm	
2)MCS 1, QPSK rate 1/2		- 76.		dBm	
3)MCS 2, QPSK rate 3/4		- 74.		dBm	
4)MCS 3, 16QAM rate 1/2		- 71.		dBm	

5)MCS 4, 16QAM rate 3/4		- 67.		dBm	
6)MCS 5, 64QAM rate 2/3		- 63.		dBm	
7)MCS 6, 64QAM rate 3/4		- 62.		dBm	
8)MCS 7, 64QAM rate 5/6		- 61.		dBm	
5. Maximum Input Level (FER = 10%)					
6 Mbps OFDM		- 20		dBm	
54 Mbps OFDM		- 20		dBm	
The MCS 0		- 20		dBm	
The MCS 7		- 20		dBm	

Table 2: Wi-Fi 5GHz Band RF Specifications

TX Characteristics	Min.	Typ.	Max.	The Unit	
1. The Frequency range	5150	-	5850	MHz	
2. The Output power					
6 Mbps OFDM		16		dBm	
54 Mbps OFDM		15		dBm	
HT20, MCS0		16		dBm	
HT20, MCS7		15		dBm	
HT40, MCS0		16		dBm	
HT40, MCS7		15		dBm	
3. The TX EVM entry					
6 Mbps OFDM			- 5	The dB	
54 Mbps OFDM			- 25	The dB	
HT20, MCS 0			- 5	The dB	
HT20, MCS 7			27 -	The dB	
HT40, MCS 0			- 5	The dB	
HT40, MCS 7			27 -	The dB	
RX Characteristics	Min.	Typ.	Max.	The Unit	

1. The Frequency range	5150	-	5850	MHz	
2. Minimum Input Level Sensitivity					
1) BPSK rate 1/2, 6 Mbps OFDM		- 82.		dBm	
2) BPSK rate 3/4, 9 Mbps OFDM		- 81.		dBm	
3) QPSK rate 1/2, 12 Mbps OFDM		- 79.		dBm	
4) QPSK rate 3/4, 18Mbps OFDM		- 77.		dBm	
5) 16QAM rate 1/2, 24Mbps OFDM		- 74.		dBm	
6) 16QAM rate 3/4, 36 Mbps OFDM		- 70.		dBm	
7) 64QAM rate 1/2, 48Mbps OFDM		- 66.		dBm	
8) 64QAM rate 3/4, 54Mbps OFDM		- 65.		dBm	
3. RX Sensitivity BW=20MHz Mixed mode 800ns Guard Interval non-stbc					
1) MCS 0, BPSK rate 1/2		- 82.		dBm	
2) MCS 1, QPSK rate 1/2		- 79.		dBm	
3) MCS 2, QPSK rate 3/4		- 77.		dBm	
4) MCS 3, 16QAM rate 1/2		- 74.		dBm	
5) MCS 4, 16QAM rate 3/4		- 70.		dBm	
6) MCS 5, 64QAM rate 2/3		- 66.		dBm	
7) MCS 6, 64QAM rate 3/4		- 65.		dBm	
8) MCS 7, 64QAM rate 5/6		- 64.		dBm	
4. RX Sensitivity BW=40MHz Mixed mode 800ns Guard Interval					
1) MCS 0, BPSK rate 1/2		- 79.		dBm	
2) MCS 1, QPSK rate 1/2		- 76.		dBm	
3) MCS 2, QPSK rate 3/4		- 74.		dBm	
4) MCS 3, 16QAM rate 1/2		- 71.		dBm	
5) MCS 4, 16QAM rate 3/4		- 67.		dBm	
6) MCS 5, 64QAM rate 2/3		- 63.		dBm	
7) MCS 6, 64QAM rate 3/4		- 62.		dBm	
8) MCS 7, 64QAM rate 5/6		- 61.		dBm	

5. Maximum Input Level (FER = 10%)				
6 Mbps OFDM		- 20		dBm
54 Mbps OFDM		- 20		dBm
The MCS 0		- 20		dBm
The MCS 7		- 20		dBm

Table 3: Bluetooth LE RF Specifications

TX Characteristic	Min.	Typ.	Max.	The Unit
1. The Frequency range	2400	-	2483.5	MHz
2. The Output power	0		10	dBm
3. Carrier Frequency Offset and Drift				
1) the Frequency Offset	- 150.		150	KHz
2) Frequency Drift	- 50		50	KHz
3) Max Drift Rate	- 20		20	Hz/us
4. The Modulation Characteristic				
Delta f1avg	225		275	KHz
Delta f2max	185			KHz
Delta f1avg/delta f2avg	0.8	0.94		Hz/Hz
5. The In - band Spurious Emission				
Plus or minus 2 m Offset			- 20	dBm
> plus or minus 3 MHZ offset			- 30	dBm

RX Characteristic	Min.	Typ.	Max.	The Unit
1. The Frequency range	2400	-	2483.5	MHz
2. The Receiver Sensitivity		- 95.		dBm
3. The C/I Co - channel		6	21	The dB
4. The C/I 1 MHZ		7 -	15	The dB
5. C/I 2 MHZ		- 30	- 17	The dB

6. The C/I 3 MHz or higher		- 33	27 -	The dB	
7. C/I Image channel		- 20	9 -	The dB	
8 C/I Image 1 MHz		- 30	- 15	The dB	
9. Intel - modulation	- 50	- 35		dBm	
10. Out-of-band blocking					
30 MHz to 2000 MHz	- 30			dBm	
2001 MHz to 2339 MHz	- 35			dBm	
2501 MHz to 3000 MHz	- 35			dBm	
3001 MHz to 12.75 GHz	- 30			dBm	

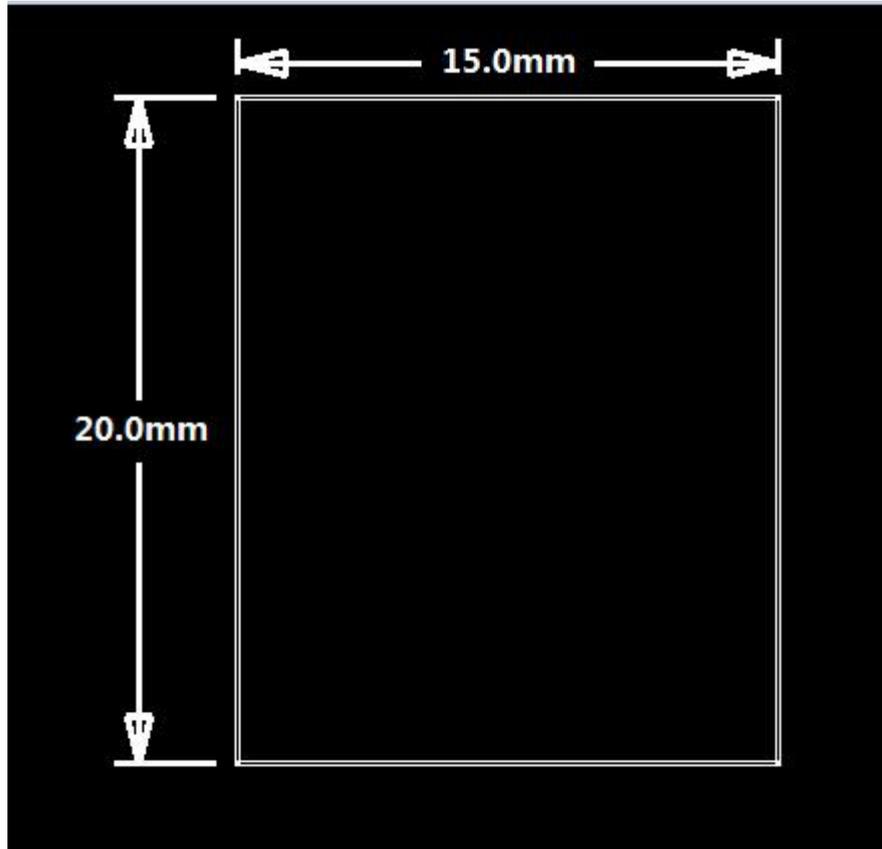
3.2 characteristics of the module antenna

The passive performance of the antenna of the Wi-Fi & Bluetooth module should meet the following requirements (passive performance can only be used as a reference, and the antenna performance test is mainly based on the active throughput test) :

parameter	In 2.4g frequency band: 2400MHz~ 2483.5mhz And 5G frequency band: 5150MHz~5850MHz in the requirements
Return loss	< - 10 db
Efficiency	> 40%

4. Product structure diagram

4.1 PCB size



Thickness of module plate: 1.0mm

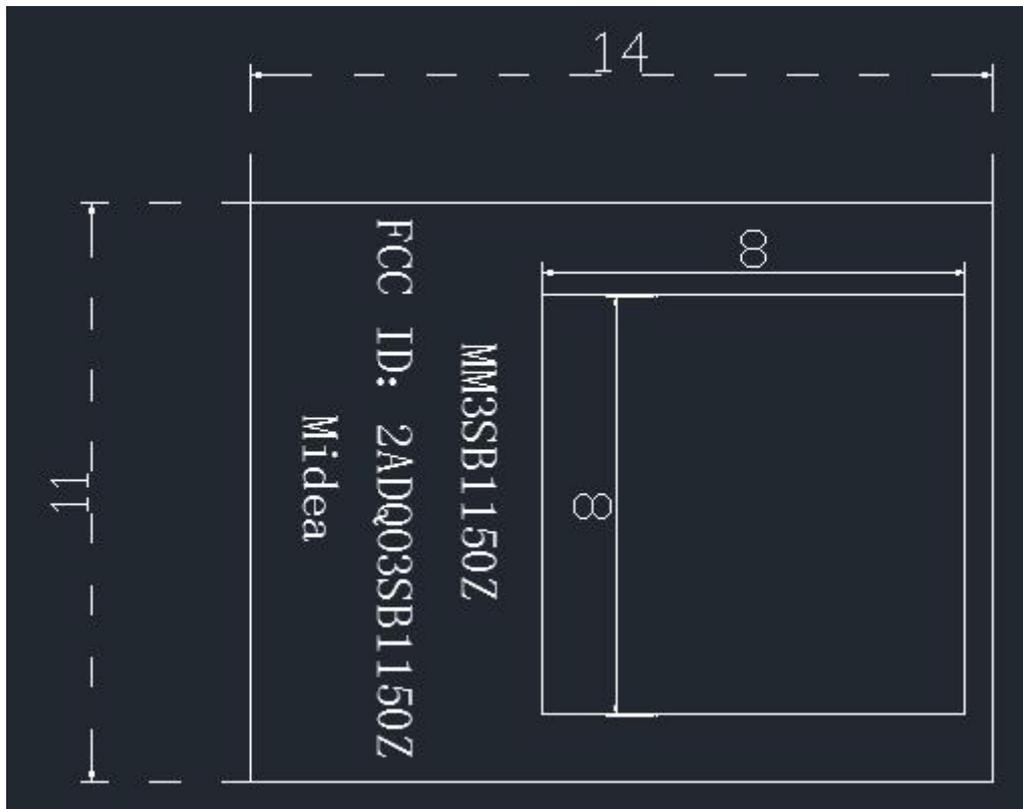
Tolerance: + / - 0.2 mm

4.2 line drawings



The serial number	tag	Wi-Fi module end pin description	Home appliance end pin description
1	V	The VCC power supply	The VCC power supply
2	R	RXD module receives	TXD appliance delivery
3	T	TXD module send	Reception of RXD appliances
4	GND symbol	GND to	GND to

4.3 label requirements



Label printing requirements:

Label size is 14*11mm, label material is white, Song typeface; The dimension of the QR code is 8*8mm.

QR code content:

The content of the QR code is shown in the following table.

QR code content		
Field	Characters in length	note
The initial code	4	Fixed content as "MAC:"

The MAC address	12	Fixed as "XXXXXXXXXXXX"
Production information	26	If the content is less than 26 characters, fill in the front with the character "X" Factory code (2 a) + job number (8) + production date (6th) + small software version number (6) + enterprise code (4 digits) : "01xxxxxxxx1608020001090000"
Software version number	12	Fixed as "XXXXXXXXXXXX"
The power supply	4	Fixed content as "3.3v" or "5.0v"
current	5	Fixed content as "500mA"

Note:

Starting code (4 bits) : MAC:

MCA address (12 bits) : XXXXXXXXXXX

Production information (bit 26) : 01 XXXXXXXX 160919 000109 0000

Position 1 and 2: represent the manufacturing plant

Position 3-10: represents the job number of the manufacturing plant

Bit 11~16: production date, such as September 19, 2016 marked 160919

Bits 17 to 22: software minor version Numbers

No. 23-26: enterprise code, midea's internal business department is "0000"

Non-american enterprise code according to the software code.

Software version (12 bits) : XXXXXXXXXXXXXXX

Power supply (4-bit) : working voltage of the module

Current (5 bits) : 500mA

5. Power consumption description

The State	The Average current in 2 min (mA)	Peak current (mA) in	Max current in 2 min (mA)	Min current in 2 Min (mA)
Idle	80 or less	100 or less	100 or less	80 or less
The STA	80 or less	800 or less	800 or less	80 or less
AP	80 or less	800 or less	800 or less	80 or less

6. Electrical parameters

Power supply parameters:

Under 5V working power supply:

Symbol	parameter	The minimum value	Typical values	The maximum	unit
VDD	The power input	4.5	5	5.5	V

(ripple control within 100mv)

3.3v Operating Power:

Symbol	parameter	The minimum value	Typical values	The maximum	unit
VDD	The power input	3.135	3.3	3.465	V

(ripple control within 100mv)

Communication serial port level parameters:

Under 5V working power supply:

Symbol	parameter	The minimum value	Typical values	The maximum	unit
VIH	High Level Input Voltage	4.5	5	VDD	V
VIL	Low Level Input Voltage	0.3	-	0.3	V
VOH	High Level Output Voltage	4.5	5.0	VDD	V
VOL	Low Level Output Voltage	0	-	0.4	V

3.3v Operating Power:

Symbol	parameter	The minimum value	Typical values	The maximum	unit
VIH	High Level Input Voltage	3.135	3.3	VDD	V
VIL	Low Level Input Voltage	0.3	-	0.3	V
VOH	High Level Output Voltage	3.135	3.3	VDD	V
VOL	Low Level Output Voltage	0	-	0.4	V

7. Compliance with standards and certification

The Wi-Fi & Bluetooth module shall be certified by the state radio administration of the ministry of industry and information technology of the People's Republic of China.

8. Precautions for use

The Wi-Fi & Bluetooth module exposed in the air (the core board inside the module or the whole composed of the core board and the base board) shall at least meet the service environmental conditions of general consumer electronic products, including but not limited to:

- Working temperature: - 20 ~ 85 °C
- Storage temperature: - 20 ~ 85 °C
- Working humidity: 0~95 %RH
- Storage humidity: 0~98 %RH
- Tolerance - 20 / + 85 °C, every 2h a cycle, thermal shock, under the impact of the cycle of at least 20 don't appear dysfunction or performance degradation, no significant tin crack phenomenon.
- When working for a long time, the temperature rise of the circuit components should meet the requirements of their own specifications.
- To simulate the transportation process and home application scenarios, the module should be able to withstand a certain degree of mechanical impact and drop.

Through certain protective means, Wi-Fi & Bluetooth module can have higher environmental adaptability. When designing a Wi-Fi & Bluetooth module, the performance, size and process margin required for the implementation of protection measures should be reserved.

FCC Certification Requirements.

According to the definition of mobile and fixed device is described in Part 2.1091(b), this device is a mobile device.

And the following conditions must be met:

1. 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.
2. The EUT is a mobile device; maintain at least a 20 cm separation between the EUT and the user's body and must not transmit simultaneously with any other antenna or transmitter.
3. A label with the following statements must be attached to the host end product: This device contains FCC ID: 2ADQO3SB1150Z
4. To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, maximum antenna gain (including cable loss) must not exceed:

BT/WIFI: <1dBi
5. This module must not transmit simultaneously with any other antenna or transmitter
6. The host end product must include a user manual that clearly defines operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.

For portable devices, in addition to the conditions 3 through 6 described above, a separate approval is required to satisfy the SAR requirements of FCC Part 2.1093

If the device is used for other equipment that separate approval is required for all other operating configurations, including portable configurations with respect to 2.1093 and different antenna configurations.

For this device, OEM integrator must be provided with labeling instructions of finished products. Please refer to KDB784748 D01 v07, section 8. Page 6/7 last two paragraphs:

A certified modular has the option to use a permanently affixed label, or an electronic label. For a permanently affixed label, the module must be labelled withan FCC ID - Section 2.926 (see 2.2 Certification (labelling requirements) above). The OEM manual must provide clear instructions explaining to the OEM the labelling requirements,options and OEM user manual instructions that are required (see next paragraph).

For a host using a certified modular with a standard fixed label, if (1) the module's FCC ID is notvisible when installed in the host, or (2) if the host is marketed so that end users do not havestraightforward commonly used methods for access to remove the module so that the FCC ID ofthe module is visible; then an additional permanent label referring to the enclosed module:“Contains Transmitter Module FCC ID:2ADQO3SB1150Z” or “Contains FCC ID: 2ADQO3SB1150Z” must be used. The host OEM user manual must also contain clear instructions on how end users can find and/or access the module and the FCC ID.

The final host / module combination may also need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.

The user's manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

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 manufacturer could void the user's authority to operate the equipment.

To ensure compliance with all non-transmitter functions the host manufacturer is responsible for ensuring compliance with the module(s) installed and fully operational. For example, if a host was previously authorized as an unintentional radiator under the Declaration of Conformity procedure without a transmitter certified module and a module is added, the host manufacturer is responsible for ensuring that the after the module is installed and operational

the host continues to be compliant with the Part 15B unintentional radiator requirements.