Midea IoT Division MDA6K21-2 Single Bluetooth Module Specification

Manufacturer Name: Midea IoT Division

Module Name: 2.4G Bluetooth Communication Module

Model: MDA6K21-2

Material code: XXXXXXXXXXXXXXXXX

Prepared by:

Countersigned by:

Reviewed by:

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1. Product Overview

MDA6K21-2 is a single Bluetooth solution designed by using BK3431Q_QFN32, and supports BLE 5.0, built-in ARM968E-S core, and 64K RAM. It can support the Bluetooth long-distance transmission and mesh network.

- The features are as follows:
- Supports BLE5.0;
- Supports 512KB Flash and 64KB RAM;
- Support; 16MHz reference clock;
- Supports the mesh networking;

The application scenarios are as follows:

- Smart Home;
- Smart wearable devices;
- Instruments and meters
- Intelligent transportation
- Smart medical
- Security devices
- Automotive devices
- Remote control

2. Top view

Front view

Rear view

3. Radio Frequency (RF) Characteristics

3.1 Transmit (Tx) and Receive (Rx) Characteristics

Table 1: Tx characteristics

TX Characteristic	Min.	Typ.	Max.	Unit	
1. Frequency range	2402	-	2480	MHz	
2. Output power	-20	5.5	7	dBm	
3. Carrier Frequency Offset and Drift					
1)Frequency Offset	-150		150	KHz	
2)Frequency Drift	-50		50	KHz	
3)Max Drift Rate	-20		20	Hz/us	
4. Modulation Characteristic					
△f1avg	225		275	KHz	
△f2max	185			KHz	
△f1avg/△f2avg	0.8	1		Hz/Hz	
5. In-band Spurious Emission					
±2M Offset			-20	dBm	
＞±3MHz offset			-30	dBm	

Table 2: Rx characteristics

RX Characteristic	Min.	Typ.	Max.	Unit	
1. Frequency range	2402	-	2480	MHz	
2. Receiver Sensitivity		-94	-97	dBm	
3.Max Input		-10		dBm	
4. C/I Co-channel		7		dB	
5. C/I 1MHz	-9		6	dB	
6. C/I 2MHz		-44		dB	
7. C/I ≥3MHz		-50		dB	
8. C/I Image channel		-25	-	dB	

9. C/I Image 1MHz		-35		dB	
10.Out-of-band blocking					
@2399 and 2484MHz		-15		dBm	
2000MHz to 3000MHz		-15		dBm	

3.2 Module Antenna Characteristics

The passive performance of the antenna of the Bluetooth module should meet the following requirements (because the passive performance can only be used as a reference, the antenna performance test is based on the active throughput test).

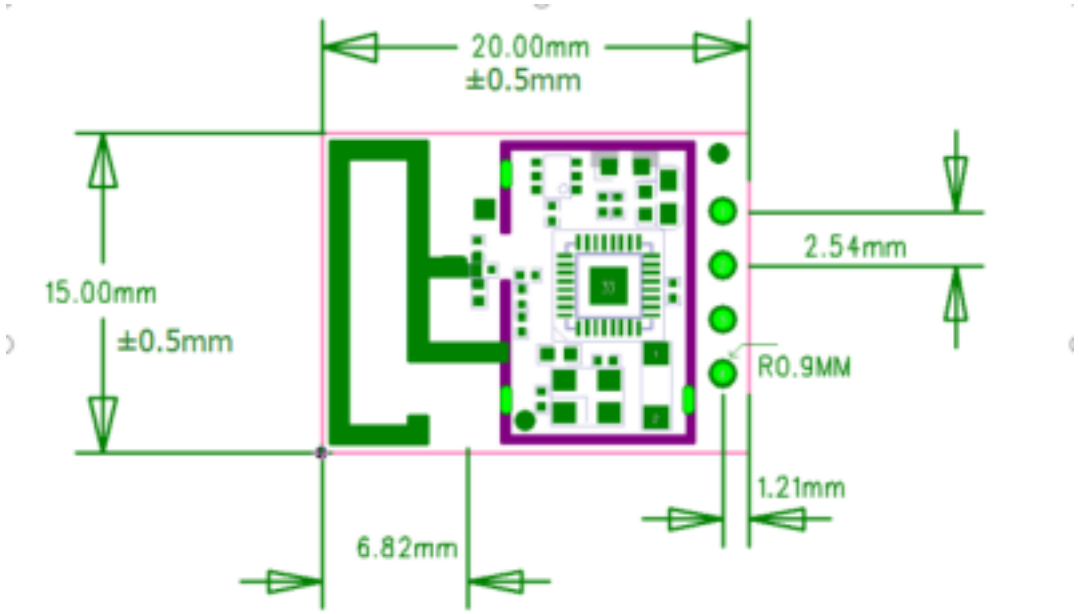
Parameter	2400MHz-2484MHz (in the 2.4G band)
Return loss	<-10dB
Efficiency	>40%

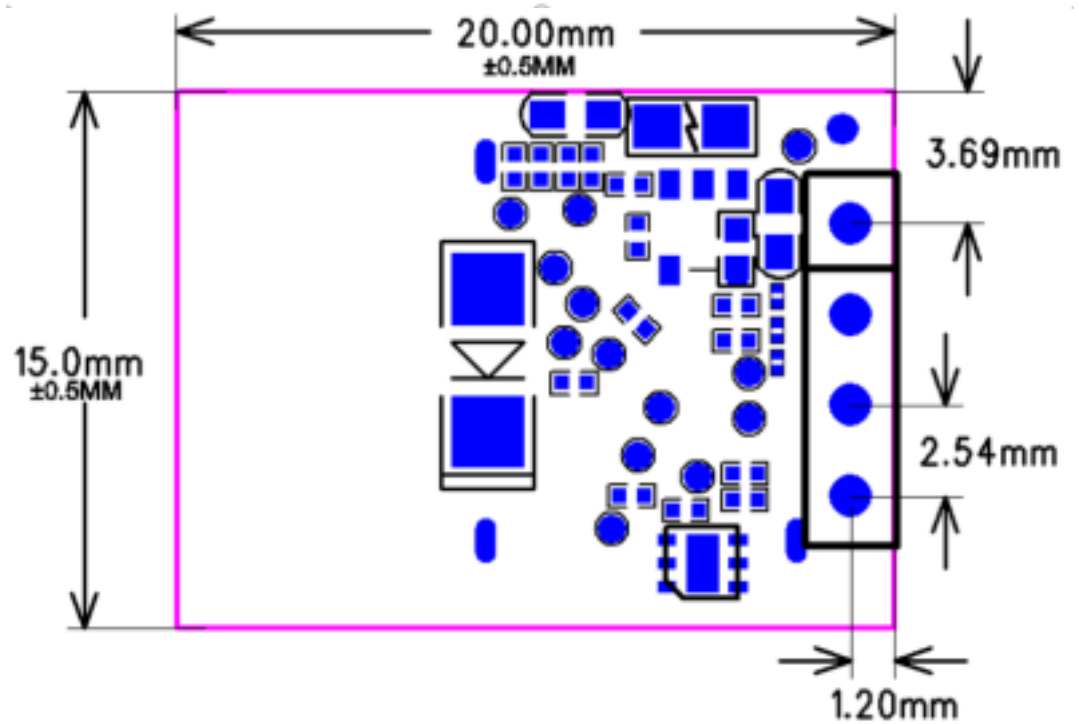
Frequency	2400MHz	2450MHz	2480MHz
VSWR	1.26	1.44	1.89
Frequency	2400MHz	2450MHz	2480MHz
S11	-18.58	-14.75	-10.22

Frequency	Efficiency	Peak Gain(dBi)
2400MHz	41.72%	-0.3
2450MHz	48.1%	0.79
2480MHz	41.77%	0.25

4. Product Structure Diagram

4.1 PCB size





PCB thickness: 1.0mm

Tolerance: ±0.2mm

Material: FR-4

4.2 Interface

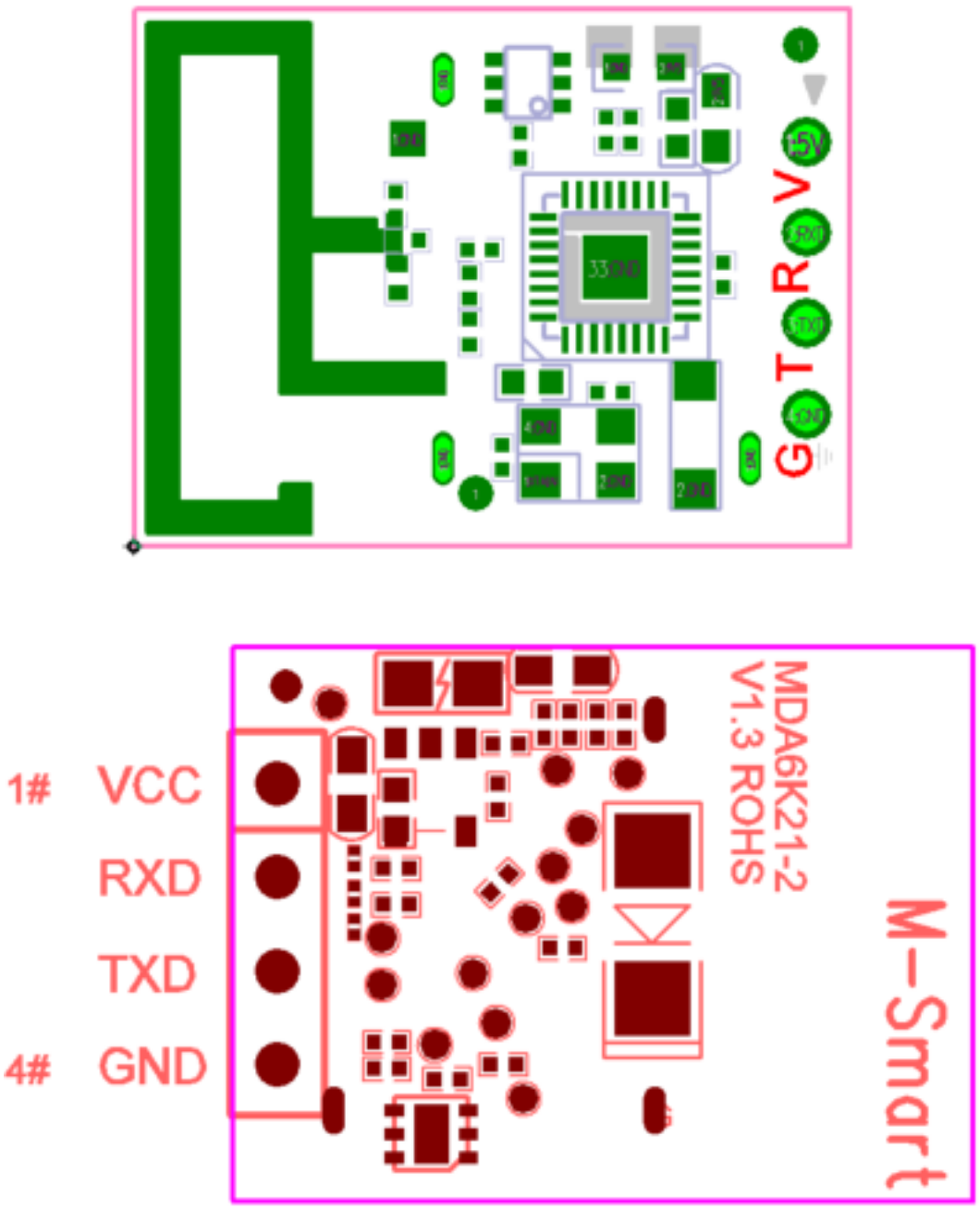


Figure 2.1 Terminal Interface

Table 2.1 Description of Terminal Interface

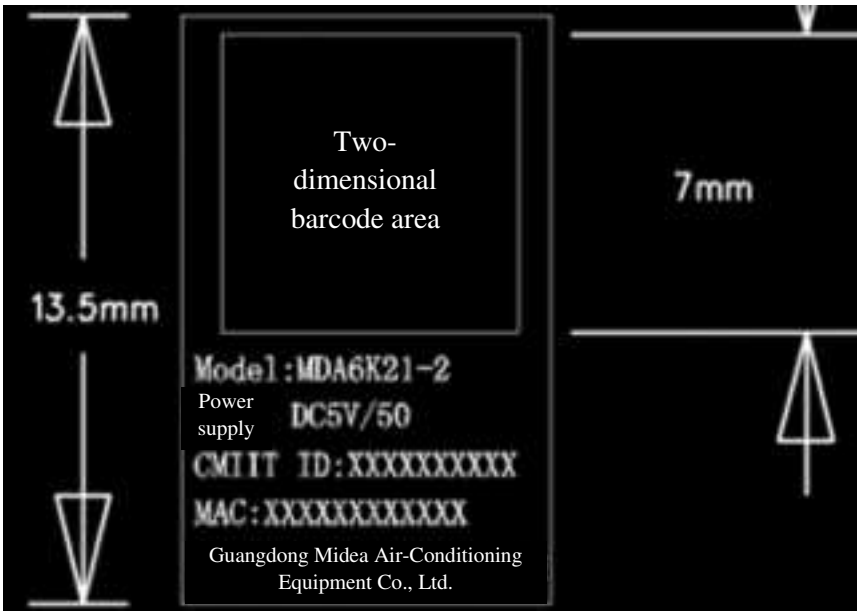
No.	Symbol	**Description of Wi-Fi module terminal pin**
1	V	VCC (Power supply)
2	R	RXD (Module receive)

3	T	TXD (Module transmit)
4	GND symbol	GND (Ground)

Wiring instructions:

The RXD and TXD pins of the Wi-Fi Bluetooth module are connected to the TXD and RXD pins at the communication end. The VCC is connected to 5V level. GND refers to the grounding. After the module is powered on, it implements the receiving via RXD and transmitting via TXD.

4.3. Label Requirements



Label printing requirements:

Label size is 13.5 * 8.5 mm. Label is white in Song font.

Two-dimensional barcode:

The content of the two-dimensional barcode is described in the following table.

Content of the two-dimensional code		
Field	**Character length**	**Remarks**
CMIITID	10	The content is fixed as "2019DP0665"
MAC address	16	Format is fixed as "MAC:XXXXXXXXXXXXXXX"

Production information	26	If there are less than 26 characters, it shall be supplemented with the character "X" in front. Factory code (2 digits) + operation number (8 digits) + production date (6 digits) + software minor version number (6 digits) + enterprise code (4 digits). Example: “08 XXXXXXXX1706080000010000”
Software version number	12	The format is fixed as "150010012002".
Power supply	4	The content is fixed as "5.0V".
Current	5	The content is fixed as "50mA".

Label statement:

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 ID: 2ADQOMDA6K21-2”

Note:

Production information (26 digits): 02 XXXXXXXX 170608 000003 0000

Digits 1 and 2: represent the production factory, and 08 represents Core-in-Core.

Digits 3-10: represent the operation number of the factory.

Digits 11-16: represent production date. For example, June 8, 2017 is marked as 170608.

Digits 17- 22: reserved.

Digits 23-26: Enterprise code. The internal division in Midea is "0000".

Non-Midea enterprise code is based on the software code.

Software version (12 digits): XXXXXXXXXXXXXXX

Power supply (4 digits): module working voltage

Current (5 digits): 50mA

Others: fill-in as required.

CMIIT ID: fill-in as required.

Code: It is the code prepared for the module by the centralized purchasing department of Midea.

Digit segments are separated by ",".

4.5. Physical Photos

5. Power Consumption

Test state	Average current	Maximum current	Minimum current	Average power consumption
Judgment criteria	15mA	20mA	-	75mW
BLE broadcast state	5.675	12.90	5.515	64.5
BLE connection transmission	6.322	12.399	5.145	61.99
Mesh broadcast state	10.45	12.90	5.518	64.5

Mesh connection	6.324	11.75	5.145	58.77
Mesh transmission	10.53	13.98	4.86	69.9
Mesh+BLE transmission	6.68	13.81	4.76	69.08

6. Electrical Parameters

Power parameters: (ripple control within 100mV)

Symbol	**Parameter**	**Minimum value**	**Typical value**	**Maximum value**	**Unit**
VDD	Power input	3.1	5	5.25	V

DC Electrical Characteristics for Digital I/Os

Symbol	**Parameter**	**Minimum value**	**Typical value**	**Maximum value**	**Unit**
VIH	High Level Input Voltage	VCC-0.3	-	VCC+0.3	V
VIL	Low Level Input Voltage	VSS	-	VSS+0.3	V
VOH	High Level Output Voltage	VCC-0.3	-	VCC	V
VOL	Low Level Output Voltage	VSS	-	VSS+0.3	V

7 Compliance Standards and Certifications

The Bluetooth module shall comply with ROHS environmental assessment certification.

8. Precautions

8.1 Environmental temperature

The Bluetooth module exposed in the air (The core board inside the module or the core board with the

substrate constitutes as a whole) should at least meet the environmental conditions for ordinary consumer electronics, including but not limited to:

- Operating temperature: -20~85℃
- Storage temperature: -40 ~ 85 ℃
- Operating humidity: 0 ~ 95 % RH
- Storage humidity: 0 ~ 98 % RH
- The module can withstand the thermal shocks every 2h a cycle in the range of -20℃ to +85℃. There should be no function failure or performance degradation in at least 20 cycles of shocks, without significant tin crack.
- The temperature rise of the circuit components should meet the requirements of their own specifications when working for long periods of time.
- In the simulation of the transportation process and home application scenarios, the module should be resistant to a certain degree of mechanical shock and drops.

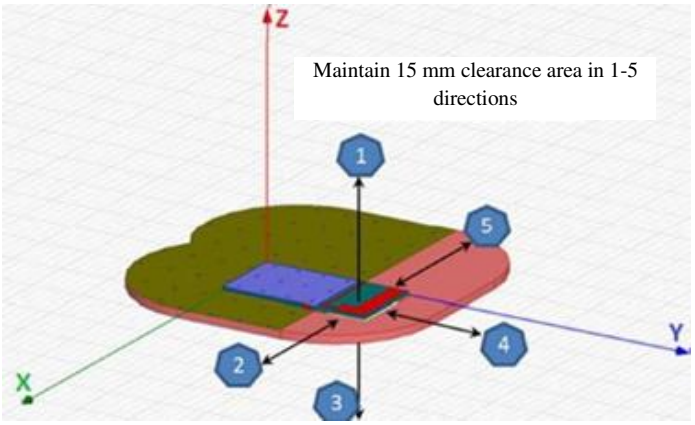
Through certain protection means, the Bluetooth module can be provided with higher environmental adaptability. In the design of the Bluetooth module, the redundancy is reserved in terms of performance, size and process for implementing the protection.

8.2 Antenna Layout

A. For the wireless Bluetooth environment, wireless signals are greatly affected by the surroundings, such as trees, metal and other obstacles, that is, a certain absorption of wireless signals. As a result, data transmission distance is affected in the actual applications.

B. The Bluetooth module needs to support the existing system with housed in a metal shell. The metal shell can shield wireless RF signals. Therefore, it is recommended not to install the module in the metal shell.

C. PCB: The antenna of the Bluetooth module adopts the PCB antenna. The metal may weaken the function of the antenna; therefore, it is not allowed to arrange the grounding or wiring under the module antenna area during PCB layout. It is recommended that the area should be hollow.



D. If the module antenna is close to the battery, metal objects, LCD, speakers, etc., the distance from

the antenna is at least 15 mm (as shown in the figure).

E. In the layout, the power supply line should adopt the star, with the excellent performance. The BT ground must be separated from the op-amp, power amplifier, MCU, etc. The lower side of LE should not have other interferences.

F. Around the antenna, there should be no control lines, power lines, audio lines, MIC lines, and other interference lines. If there is a socket near the module antenna, the metal wire mesh of the shell may have an impact on signals. A professional high-gain antenna is recommended.

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

MODIFICATION: Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the device.