

FRX-M8822CU5

802.11ac 867Mbps WLAN + BT v5.0

USB2.0 Module Specification



Module Name: FRX-M8822CU5	
Module Type: 802.11a/b/g/n/ac 867Mbps WLAN +Bluetooth v5.0 Combo USB2.0 Module	
Revision: V1.0	
Customer Approval:	
Company:	
Title:	
Signature:	Date:
FRX Approval:	
Title:	
Signature:	Date:

Revision History

Revision	Summary	Release Date	Revised By
V0.1	Initial release	2024-01-20	Xhg
V1.0	Official release	2024-04-15	Xhg

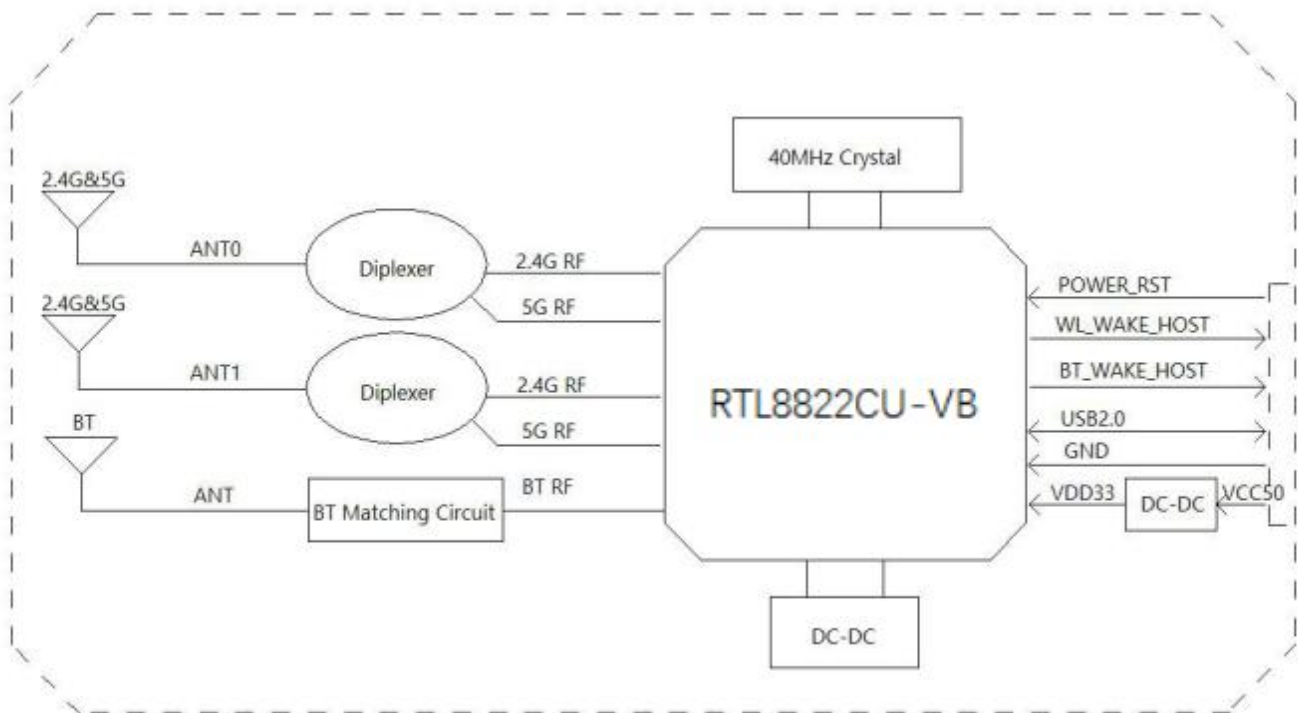
1. Introduction

FRX-M8822CU5-5V is a highly integrated Dual-band WLAN + Bluetooth v5.0 Combo module. It combines a 2T2R Dual-band WLAN subsystem and a Bluetooth v5.0 subsystem with USB interface controller. This module compatible IEEE 802.11 a/b/g/n/ac standard and provides the maximum PHY rate up to 867Mbps, it supports BT/BLE dual mode with BT v5.0/v4.2/v2.1 compliant, offering feature-rich wireless connectivity at high standards, and delivering reliable, cost-effective throughput from an extended distance.

1.1 Features

- Operating Frequencies: 2.4~2.4835GHz
- Support Dual-band 2T2R mode with 20/40/80MHz bandwidth
- Support BT Classic / BT Low Energy dual mode
- Power Supply: $5.0 \pm 0.5V$ main power supply
- Support IPEX with external antenna

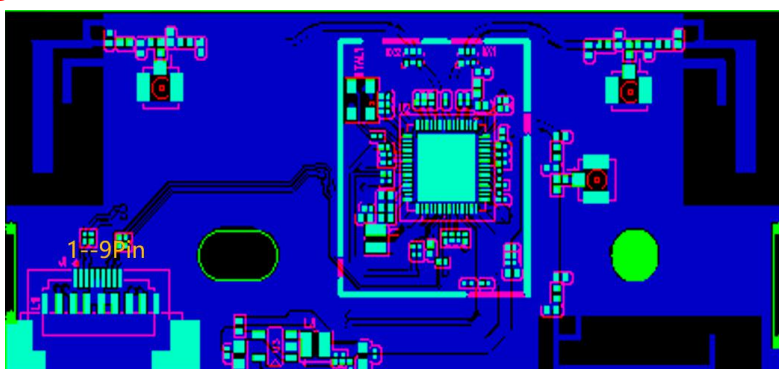
1.2 Block Diagram



1.3 General Specifications

Module Name	FRX-M8822CU5
Chipset	RTL8822CU
WiFi Standard	IEEE802.11a/b/g/n/ac
Bluetooth Standard	Bluetooth Core Specification v5.0/v4.2/v2.1
Host Interface	USB2.0 for WLAN & Bluetooth
Antenna	2 on-board WLAN antennas and 1 on-board BT antenna
Dimension	70.0mm*30.0mm*5.4mm (L*W*H)
Power Supply	DC 5.0V±0.5V@ 1A (Max)
Operation Temperature	-20°C to +70°C
Operation Humidity	10% to 95% RH (Non-Condensing)

2. Pin Assignments



2.1 Pin Definition

No.	Pin Name	Type	I/O Level	Module Pin Description
1	GND	P	/	Ground for Power and I/O
2	D+	I/O	/	USB Communication signal USB-DP
3	D-	I/O	/	USB Communication signal USB-DM

4	VCC	I	3.3V	VCC3.3V
5	VCC	I	3.3V	VCC3.3V
6	VCC	I	3.3V	VCC3.3V
7	WL_HOST_WAKE	O	/	WL WAKEUP
8	RESET	I	/	Reset Controlled by main SOC
9	GND	P	/	Ground for Power and I/O

P: Power, I: Input, O: Output, I/O: In/Output, RF: Analog RF Port, A I/O: Analog In/Output

3. Electrical and Thermal Specifications

3.1 Recommended Operating Conditions

Parameters		Min	Typ	Max	Units
Ambient Operating Temperature		-20	25	70	°C
Supply Voltage	VCC50	4.5	5.0	5.5	V

3.2 Digital I/O DC Specifications

Symbol	Parameter	Min	Typ	Max	Units
VIH	Input High Voltage	2.0	3.3	3.6	V
VIL	Input Low Voltage	--	0	0.9	V
VOH	Output High Voltage	2.97	--	3.3	V
VOL	Output Low Voltage	0	--	0.33	V

3.3 Antenna Specifications

Items	Frequency Range	Gain(max)	VSWR	polarization
2.4G WLAN /5G WLAN ANT0	2.4~2.4835GHz(2.4GHz ISM Band) 5.15~5.835GHz(5GHz ISM Band)	3.0dBi	<2	Linear polarization
2.4G WLAN /5G WLAN ANT1	2.4~2.4835GHz(2.4GHz ISM Band) 5.15~5.835GHz(5GHz ISM Band)	3.0dBi	<2	Linear polarization
2.4G BT ANT	2.4~2.4835GHz(2.4GHz ISM Band)	3.0dBi	<2	Linear polarization

3.4 Current Consumption

Conditions : VCC50=5.0V ; Ta:25°C			
Use Case	VCC50 Current		
	Typ(I _{RMS})	Max(I _{Peak})	Units
WLAN Radio Off (Linux Driver)	20	38	mA
WLAN Unassociated (Linux Driver)	92	128	mA
2.4G WLAN throughput TX 270Mbps(Linux Driver)	310	640	mA
2.4G WLAN throughput RX 270Mbps(Linux Driver)	115	132	mA
5G WLAN throughput TX 300Mbps(Linux Driver)	160	370	mA
5G WLAN throughput RX 300Mbps(Linux Driver)	120	140	mA
2.4G 11b_1Mbps TX@17dBm (1TX RF Test)	230	278	mA
2.4G 11g_6Mbps TX@16dBm(1TX RF Test)	245	340	mA
2.4G 11n_HT20_MCS0 TX@16dBm (1TX RF test)	163	308	mA
2.4G 11n_HT20_MCS7 TX@14dBm (1TX RF test)	162	310	mA
2.4G 11n_HT20_MCS7 RX (1RF test)	119	130	mA
2.4G 11n_HT40 MCS8 TX@16dBm (2TX RF test)	326	652	mA
2.4G 11n_HT40_MCS15 TX@14dBm(2TX RF Test)	196	584	mA
2.4G 11n_HT40_MCS15 RX (2RX RF Test)	144	169	mA
5G 11a_6Mbps TX @16dBm (1TX RF Test)	317	448	mA
5G 11n_HT20_MCS0 TX @16dBm (1TX RF test)	312	444	mA

5G 11n_HT20_MCS7 TX @14dBm (1TX RF test)	191	404	mA
5G 11n_HT20_MCS7 RX (1RF test)	135	144	mA
5G 11n_HT40_MCS8 TX@16dBm(2TX RF Test)	435	912	mA
5G 11n_HT40_MCS15 TX@14dBm (2TX RF Test)	239	800	mA
5G 11n_HT40_MCS15 RX (2RX RF Test)	165	191	mA
5G 11ac_VHT80_MCS0 TX@15dBm(2TX RF Test)	235	416	mA
5G 11ac_VHT80_MCS9 TX@13dBm(2TX RF Test)	170	388	mA
5G 11ac_VHT80_MCS9 RX (1RF test)	127	150	mA
BT BR_1M TX@6dBm (BT RF test)	205	242	mA
BT EDR_3M TX@6dBm (BT RF test)	208	230	mA
BT LE_1M TX@6dBm (BT RF test)	201	232	mA
BT LE_1M RX Active (BT RF test)	172	178	mA

4. WLAN & Bluetooth RF Specifications

4.1 2.4G WLAN RF Specification

Conditions: VCC50=5.0V; Ta:25°C	
Features	Description
WLAN Standard	IEEE 802.11b/g/n
Frequency Range	2.4~2.4835GHz (2.4GHz ISM Band)
Modulation	802.11b (DSSS): DBPSK, DQPSK, CCK; 802.11g (OFDM): BPSK, QPSK, 16QAM, 64QAM; 802.11n (OFDM): BPSK, QPSK, 16QAM, 64QAM;
Data Rate	802.11b: 1, 2, 5.5, 11Mbps; 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps; 802.11n (HT20): MCS0~MCS7(1T1R_SISO) 6.5~72.2Mbps; 802.11n (HT20): MCS8~MCS15(2T2R_MIMO) 13~144.4Mbps; 802.11n (HT40): MCS0~MCS7(1T1R) 13.5~150Mbps; 802.11n (HT40): MCS8~MCS15(2T2R) 27~300Mbps;
Frequency Tolerance	$\leq \pm 20\text{ppm}$
2.4G Transmitter Specifications (TX power of some rates is calibrated, customers can define the target TX power of other rates by modifying configuration file of the driver software. Customers must define the TX power same or lower than recommended Target TX Power as below)	

TX Rate	TX Power (dBm)	TX Power Tolerance (dBm)	EVM (dB)
802.11b@1Mbps	Recommended Target TX Power : 17	±2	≤-10
802.11b@11Mbps	Calibrated TX Power: 15	±2	≤-10
802.11g@6Mbps	Recommended Target TX Power : 16	±2	≤-10
802.11g@54Mbps	Calibrated TX Power: 14	±2	≤-25
802.11n@HT20_MCS0	Recommended Target TX Power : 16	±2	≤-10
802.11n@HT20_MCS7	Calibrated TX Power: 14	±2	≤-28
802.11n@HT40_MCS0	Recommended Target TX Power : 16	±2	≤-10
802.11n@HT40_MCS7	Calibrated TX Power: 14	±2	≤-28
2.4G Receiver Specifications			
RX Rate	Min Input Level (Typ. dBm)	Max Input Level (Typ. dBm)	PER
802.11b@1Mbps	-96	-10	< 8%
802.11b@11Mbps	-88	-10	< 8%
802.11g@6Mbps	-93	-10	< 10%
802.11g@54Mbps	-75	-10	< 10%
802.11n@HT20_MCS0	-92	-10	< 10%
802.11n@HT20_MCS7	-72	-10	< 10%
802.11n@HT40_MCS0	-89	-10	< 10%
802.11n@HT40_MCS7	-70	-10	< 10%

4.2 5G WLAN RF Specification

Conditions: VCC50=5.0V; Ta:25°C	
Features	Description
WLAN Standard	IEEE 802.11a/n/ac
Frequency Range	5.15~5.25GHz; 5.725~5.850GHz (5GHz ISM Band)
Channels	Ch36, Ch40, Ch44, Ch48; Ch52~Ch64; Ch100~Ch140; Ch149~Ch165 (For 20MHz Channels)

Modulation	802.11a (OFDM): BPSK, QPSK, QAM16, QAM64; 802.11n (OFDM): BPSK, QPSK, QAM16, QAM64; 802.11ac (OFDM): BPSK, QPSK, QAM16, QAM64, QAM256;
Data Rate	802.11a: 6, 9, 12, 18, 24, 36, 48, 54Mbps; 802.11n (HT20): MCS0~MCS7(1T1R_SISO) 6.5~72.2Mbps; 802.11n (HT20): MCS8~MCS15(2T2R_MIMO) 13~144.4Mbps; 802.11n (HT40): MCS0~MCS7(1T1R) 13.5~150Mbps; 802.11n (HT40): MCS8~MCS15(2T2R) 27~300Mbps; 802.11ac (VHT20): MCS0~MCS8(1T1R) 6.5~86.7Mbps; 802.11ac (VHT20): MCS0~MCS8(2T2R) 13~173.3Mbps; 802.11ac (VHT40): MCS0~MCS9(1T1R)13.5~200Mbps; 802.11ac (VHT40): MCS0~MCS9(2T2R)27~400Mbps; 802.11ac (VHT80): MCS0~MCS9(1T1R)29.3~433.3Mbps; 802.11ac (VHT80): MCS0~MCS9(2T2R)58.5~866.7Mbps;
Frequency Tolerance	≤ ±20ppm

5G Transmitter Specifications (TX power of some rates is calibrated, customers can define the target TX power of other rates by modifying configuration file of the driver software. Customers must define the TX power same or lower than recommended Target TX Power as below)			
TX Rate	TX Power (dBm)	TX Power Tolerance (dBm)	EVM (dB)
802.11a@6Mbps	Recommended Target TX Power : 16	±2.0	≤-10
802.11a@54Mbps	Calibrated TX Power: 14	±2.0	≤-25
802.11n@HT20_MCS0	Recommended Target TX Power : 16	±2.0	≤-10
802.11n@HT20_MCS7	Calibrated TX Power: 14	±2.0	≤-28
802.11n@HT40_MCS0	Recommended Target TX Power : 16	±2.0	≤-10
802.11n@HT40_MCS7	Calibrated TX Power: 14	±2.0	≤-28
802.11ac@VHT80_MCS0	Recommended Target TX Power : 15	±2.0	≤-10
802.11ac@VHT80_MCS9	Calibrated TX Power: 13	±2.0	≤-32

5G Receiver Specifications			
RX Rate	Min Input Level (Typ. dBm)	Max Input Level (Typ. dBm)	PER
802.11a@6Mbps	-91	-10	< 10%
802.11a@54Mbps	-74	-10	< 10%
802.11n@HT20_MCS0	-90	-10	< 10%
802.11n@HT20_MCS7	-70	-10	< 10%
802.11n@HT40_MCS0	-88	-10	< 10%
802.11n@HT40_MCS7	-68	-10	< 10%
802.11ac@VHT80_MCS0	-84	-10	< 10%
802.11ac@VHT80_MCS9	-58	-10	< 10%

4.3 Bluetooth RF Specifications

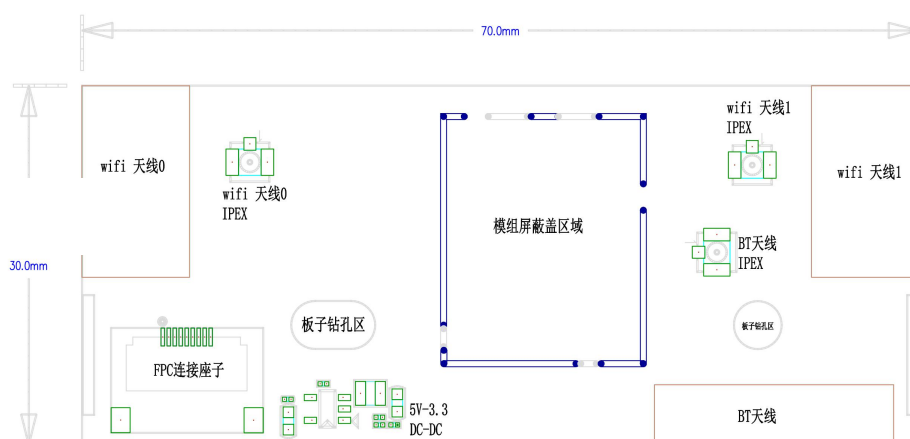
Conditions: VCC50=5.0V; Ta:25℃			
Features	Description		
Bluetooth Specification	Bluetooth Core Specification v5.0/v4.2/v2.1		
Frequency Range	2.4~2.4835GHz(2.4GHz ISM Band)		
Channels	Bluetooth Classic: Ch0~Ch78 (For 1MHz Channels); Bluetooth Low Energy: Ch0~Ch39 (For 2MHz Channels);		
Power Classes	Bluetooth Classic: Class1; Bluetooth Low Energy: Class1.5;		
Data Rate & Modulation	BR_1Mbps: GFSK; EDR_2Mbps: π/4-DQPSK; EDR_3Mbps: 8DPSK; – – LE_1Mbps: GFSK (Uncoded); LE_2Mbps: GFSK (Uncoded);		
Bluetooth Transmitter Specifications			
Items	Min (dBm)	Typ (dBm)	Max (dBm)
TX Power			

BR_1M	2	6	10
EDR_2/3M	2	6	10
LE_1M	2	6	10
LE_2M	2	6	10
BR_1M (DH1) Modulation Characteristics			
Δf_{1avg}	140KHz	153.5KHz	175KHz
Δf_{2avg}	115KHz	153.2KHz	175KHz
Δf_{2max}	115KHz	165.5KHz	/
$\Delta f_{2avg}/\Delta f_{1avg}$	0.8	1	/
BR_1M (DH1) Initial Carrier Frequency Tolerance			
Init Freq Error	-75kHz	-4.3kHz	+75kHz
EDR_3M(3DH5) EDR Carrier Frequency Stability and Modulation Accuracy			
ω_i	-75KHz	-5.3KHz	+75KHz
$\omega_i + \omega_o$	-75KHz	-5.4KHz	+75KHz
ω_o	-10KHz	0.8KHz	+10KHz
8DPSK RMS DEVM	/	0.06	0.13
8DPSK Peak DEVM	/	0.12	0.25
LE_1M Modulation Characteristics			
Δf_{1avg}	225KHz	250.7KHz	275KHz
Δf_{2avg}	185KHz	252.9KHz	275KHz
Δf_{2max}	185KHz	245.5KHz	/
$\Delta f_{2avg}/\Delta f_{1avg}$	0.8	0.98	/
LE_2M Modulation Characteristics			
Δf_{1avg}	450KHz	494KHz	550KHz
Δf_{2avg}	370KHz	504KHz	550KHz
Δf_{2max}	370KHz	529KHz	/
$\Delta f_{2avg}/\Delta f_{1avg}$	0.8	1.1	/
Bluetooth Receiver Specifications			

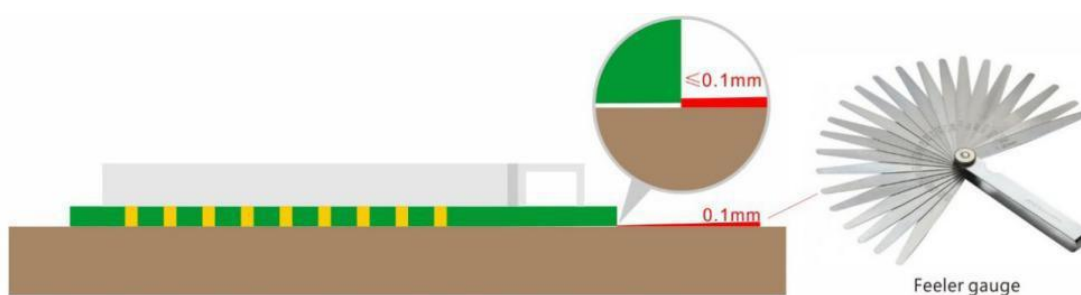
Items	Sensitivity		Maximum Input Level	
	Input Level (Typ. dBm)	BER	Input Level (Typ. dBm)	BER
BR_1M	-90	$\leq 0.1\%$	-10	$\leq 0.1\%$
EDR_3M	-82	$\leq 0.01\%$	-10	$\leq 0.1\%$
	Input Level (Typ. dBm)	PER	Input Level (Typ. dBm)	PER
LE_1M	-90	$\leq 5\%$	-10	$\leq 5\%$
LE_2M	-84	$\leq 5\%$	-10	$\leq 5\%$

5. Mechanical Specifications

5.1 Module Outline Drawing



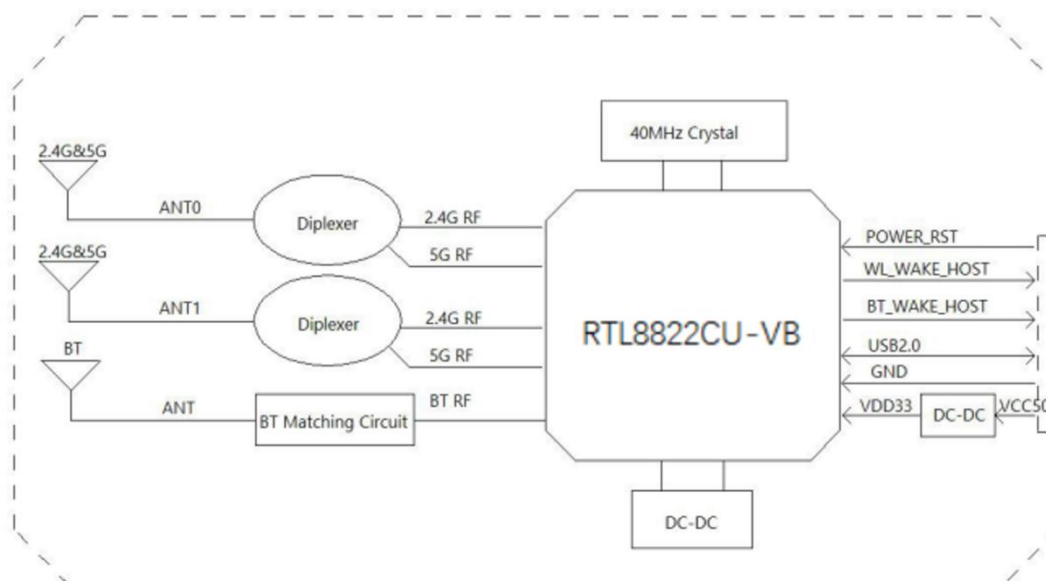
Module dimension: 70.0mm*30.0mm*5.4mm (L*W*H; Tolerance: $\pm 0.3\text{mm}_L/W$, $\pm 0.2\text{mm}_H$)



Module Bow and Twist : $\leq 0.1\text{mm}$

6. Information

6.1 Typical Application Circuit

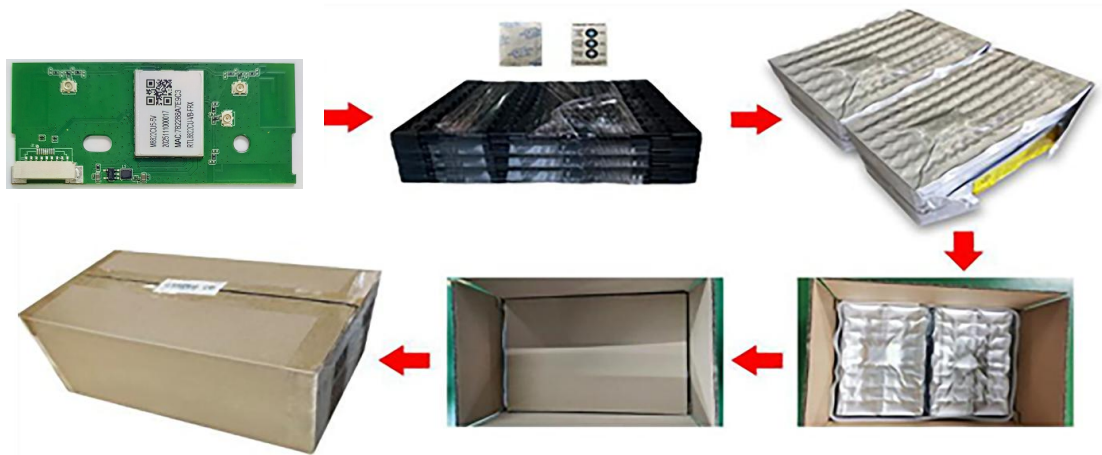


7. Key Components Of Module

No.	Parts	Specification	Manufacturer	Note
1	Chipset	RTL8822CU	Realtek Semiconductor Corp.	
2	PCB	FRX-M8822CU5-5V	SHEN ZHEN QILI ELECTRON CO.,LTD	
			Quzhou Sunlord Electronics Co.,Ltd	
			ShenZhen Tie Fa Technology Limited	
3	Crystal	40MHz-3225	LUCKI CM ELECTRONICS CO.,LTD	
			Chengde oscillator Electronic Technology CO.,LTD	
			JinHua East Crystal Electronic CO.,LTD	
4	Diplexer	DP1608	JIA XING GLEAD ELECTRONICS CO., LTD	
			Shenzhen FTR Technologies CO., LTD	
			Dongguan Hekang Electronics Co.,LTD	
			Advanced Ceramic X Corp.	
5	DC-DC	SOT23-5	Hangzhou Toll Microelectronic Co., LTD	
			Shenzhen Lowpower Semiconductor Co., LTD	
			ETA Semiconductor Co., LTD	

8. Package and Storage Information

8.1 Package Dimensions



Package specification:

1. 12 modules per blister plate and 312modules per box.
2. The blister is bound with wire membrane and put into anti-static vacuum bag.
3. Put 1 bag of dry beads (20g) and 1 humidity card in each anti-static vacuum bag.
4. The outer box size is 43*35.5*16cm.

8.2 Storage Conditions

Absolute Maximum Ratings:

Storage temperature: -40°C to +85°C

Storage humidity: 10% to 95% RH (Non-Condensing)

Recommended Storage Conditions:

Storage temperature: 5°C to +40°C

Storage humidity: 20% to 90% RH

Please use this Module within 12month after vacuum-packaged.

The Module shall be stored without opening the packing.

After the packing opened, the Module shall be used within 72hours.

When the color of the humidity indicator in the packing changed,
the Module shall be baked before use.

Baking condition : 60°C, 24hours, 1time.

ESD Sensitivity:

ESD Protection: 2KV(HBM, Maximum rating)

The Module is a static-sensitive electronic device.

Do not operate or store near strong electrostatic fields.

Take proper ESD precautions!



ESD CAUTION

FCC 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.

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.

This modular has been tested and found to comply with part 15 requirements for Modular Approval.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01r01

2.2 List of applicable FCC rules

47 CFR FCC Part 15 Subpart C, §15.247 and §15.407 have been fully investigated. These requirements are applicable to this modular transmitter.

2.3 Specific Operational Use Conditions - Antenna Placement Within the Host Platform

The module is tested for standalone mobile RF exposure use condition.

- The antenna must be installed such that 20cm is maintained between the antenna and users,
 - The transmitter module may not be co-located with any other transmitter or antenna.
- In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

2.4 Limited Module Procedures

Not applicable

2.5 Trace Antenna Designs

Not applicable

2.6 RF Exposure Considerations

This device complies with FCC 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.

2.7 Antenna Type and Gain

The following antennas have been certified for use with this module.

Only antennas of the same type with equal or lower gain may also be used with this module.

Other types of antennas and/or higher gain antennas may require the additional authorization for operation.

Antenna Specification list below:

Model	Type	Connector	Peak gain (dBi)				
			2400-2483.5 MHz	5150-5250 MHz	5250-5350 MHz	5470-5725 MHz	5725-5850 MHz
/	Internal Antenna	SMA	3.00dBi	3.00dBi	/	/	3.00dBi
/	Internal Antenna	SMA	3.00dBi	3.00dBi	/	/	3.00dBi
/	Internal Antenna	SMA	3.00dBi	/	/	/	/

2.8 End Product Labelling Compliance Information

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: **2AVEDFRX-M8822CU5**”. The FCC ID can be used only when all FCC compliance requirements are met.

2.9 Information on Test Modes and Additional Testing Requirements

This transmitter is tested in a standalone mobile RF exposure condition and any co-located or simultaneous transmission with other transmitter(s) class II permissive change re-evaluation or new FCC authorization.

Host manufacturer installed this modular with single modular approval should perform the test of radiated emission and spurious emission according to FCC part 15C, Part 15E, 15.209, 15.207 requirement, only if the test result comply with FCC part 15C, Part 15E, 15.209, 15.207 requirement, then the host can be sold legally.

2.10 Additional testing, Part 15 Subpart B Disclaimer

This transmitter modular is tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B rules requirement applicable to the final host. The final host will still need to be reassessed for compliance to this portion of rules requirements if applicable.

As long as all conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this modular installed.

2.11 Manual Information to The End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The host integrator must follow the integration instructions provided in this document and ensure that the composite system end product complies with the requirements by a technical assessment or evaluation to the rules and to KDB Publication 996369.

The host integrator installing this module into their product must ensure that the final composite product complies with the requirements by a technical assessment or evaluation to the rules, including the transmitter operation and should refer to guidance in KDB Publication 996369.

OEM/Host Manufacturer Responsibilities

OEM/Host manufacturers are ultimately responsible for the compliance of the Host and Module. The final product must be reassessed against all the essential requirements of the FCC rule such as FCC Part 15 Subpart B before it can be placed on the US market.

This includes reassessing the transmitter module for compliance with the Radio and RF Exposure essential requirements of the FCC rules.

2.12 How to Make Changes - Important Note

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.