



BL-M8197FH1

802.11ac 1200Mbps WLAN

Repeater Module Specification

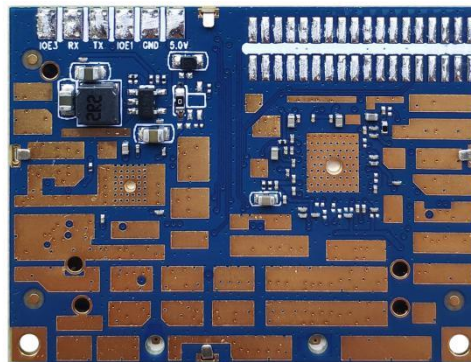
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(Top View)



(Bottom View)

Module Name: BL-M8197FH1	
Module Type: 802.11a/b/g/n/ac 1200Mbps WLAN Repeater Module	
Revision: V1.1	
Customer Approval:	
Company:	
Title:	
Signature:	Date:
BL-link Approval:	
Title:	
Signature:	Date:

Revision History

Revision	Summary		Release Date
1.0	Official release	2022-08-15	
1.1	Update the specification version	2023-04-12	Ch

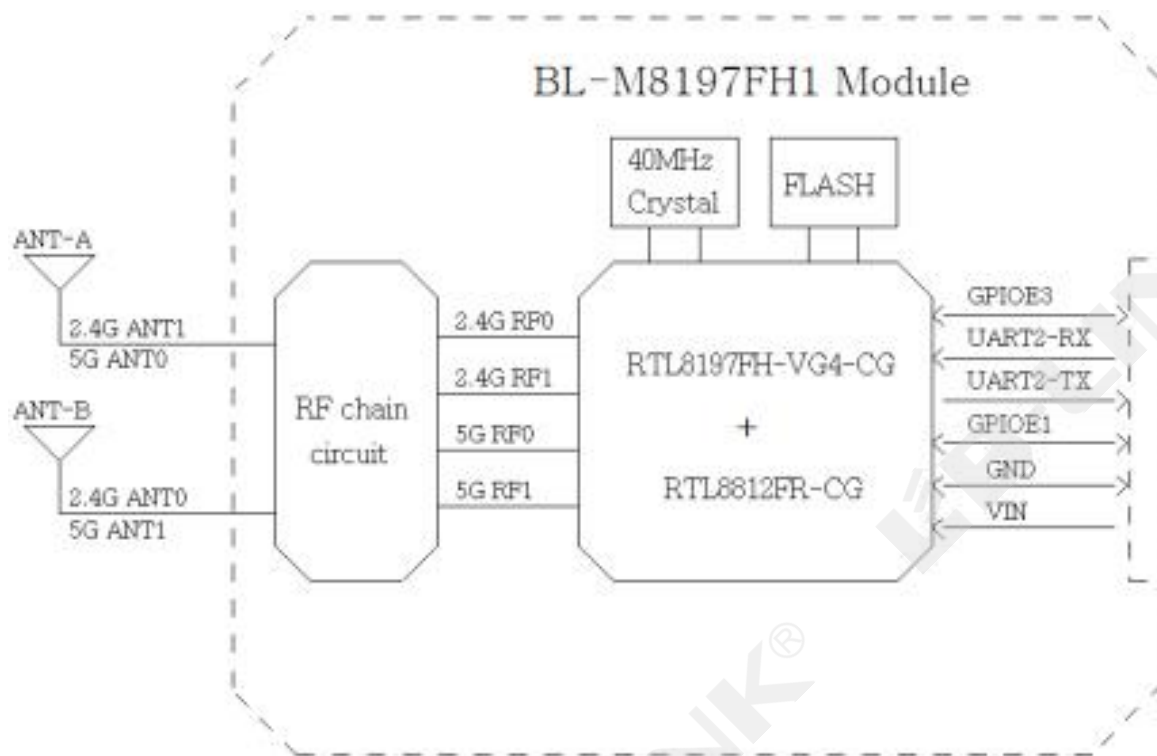
1. Introduction

BL-M8197FH1 is a highly integrated WLAN Repeater module, it combines a 2T2R dual-band concurrent WLAN system, a high performance CPU system and a memory system. The module compatible IEEE802.11 a/b/g/n/ac standard and provides the highest PHY rate up to 300Mbps +866.7Mbps, offering feature-rich wireless connectivity and delivering reliable throughput over extended distance.

1.1 Features

- Operating Frequencies: 2.4~2.4835GHz and 5.15~5.85GHz
- IEEE Standards: IEEE 802.11a/b/g/n/ac, PHY rate can reach up to 300Mbps+866.7Mbps
- Supports 5MHz/10MHz narrow channels and excellent RF performance for 5G WLAN communication over longer distances
- Customized low TX power and high-level RX capabilities are more suitable for 2.4G WLAN zero distance relay communication
- High performance MIPS 24Kc CPU Core up to 1000MHz speed
- 64Mb SPI NOR FLASH (Customization capacity up to 256 Mb) and 512Mb DDR2 Memory
- Provides variety of practical peripheral interfaces
- Connect to external dual band antenna through IPEX connectors
- 5.0V single Power Supply
- Optimized software and hardware design are more suitable for 2.4G and 5G dual-band WLAN relay transmission applications. For example, The UVA with BL-M8812CU2 or BL-M8822CS module can transmit 800Kbps video streams to a Smart Phone over long-distance of 3KM

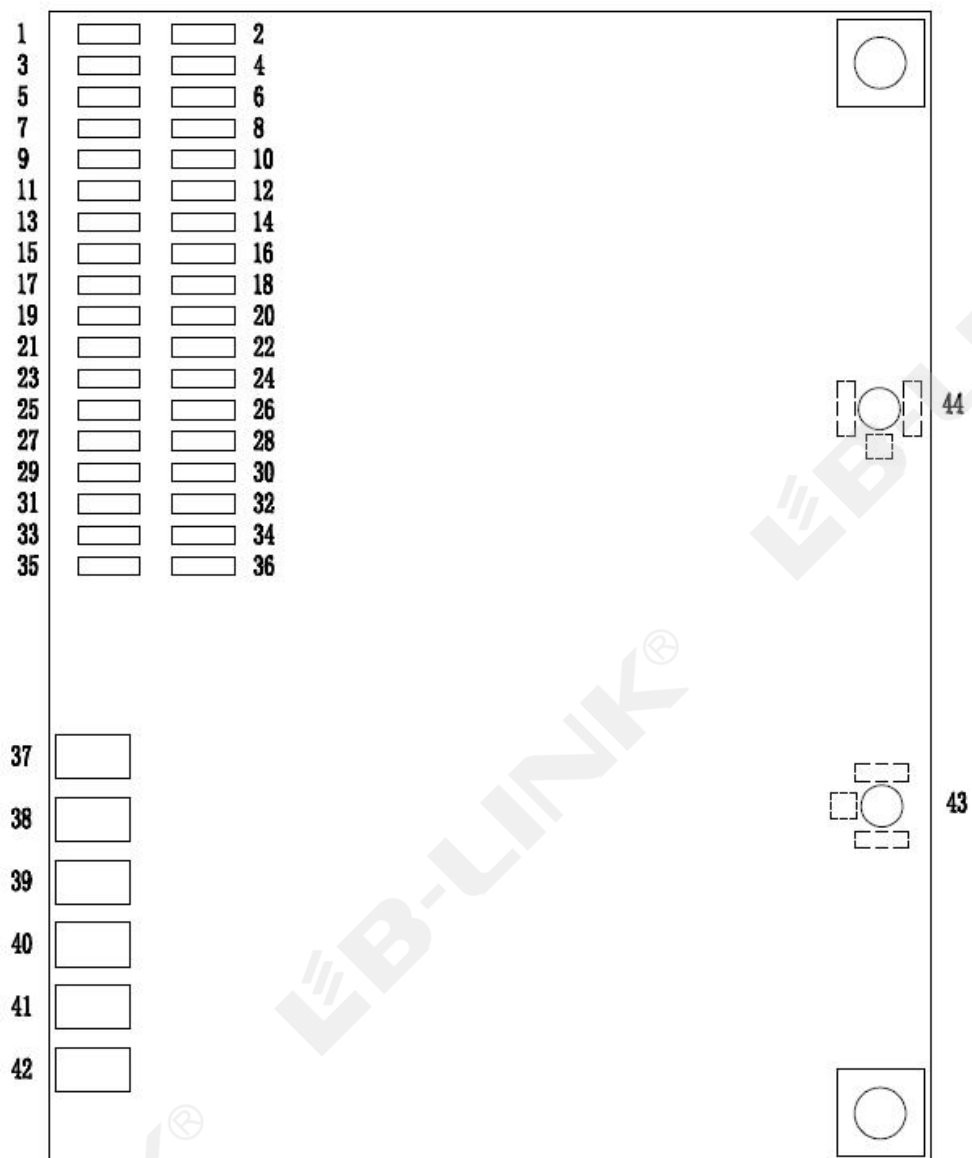
1.2 Block Diagram



1.3 General Specifications

Module Name	BL-M8197FH1
Chipset	RTL8197FH-VG4-CG + RTL8812FR-CG
RAM	512Mb DDR2
ROM	64Mb SPI NOR FLASH (Customization capacity up to 256 Mb)
WLAN Standards	IEEE802.11a/b/g/n/ac
Antenna	Connect to the external dual band antenna through IPEX connectors
Dimension	46.7*35.8*5.6mm (L*W*H)
Power Supply	DC 5.0V±0.25V@2.0A(Max)
Operation Temperature	-10°C to +50°C
Operation Humidity	10% to 95% RH (Non-Condensing)
Caution:	In order that the thermal conductive silicone pad between chipset and shield cover in the module is not damaged by the high temperature of reflow Soldering, the BL-M8197FH1 module must be manually soldering by the customer.

2. Pin Assignments



(Bottom View)

2.1 Pin Definition

No	Pin Name	Type	Description	Level
PIN of the Socket				
1	NC		NC	
2	NC		NC	
3	GND	P	Ground connections	
4	GND	P	Ground connections	

5	NC		NC (should keep floating)	
6	NC		NC (should keep floating)	
7	NC		NC	
8	NC		NC	
9	NC		NC	
10	NC		NC	
11	NC		NC	
12	NC		NC	
13	NC		NC	
14	NC		NC	
15	NC		NC	
16	NC		NC	
17	GND	P	Ground connections	
18	GND	P	Ground connections	
19	NC		NC	
20	NC		NC	
21	NC		NC	
22	NC		NC	
23	TXON_P3	AO	Ethernet Port3 10/100Mbps differential pair TX- MDI signal	
24	RXIN_P3	AI	Ethernet Port3 10/100Mbps differential pair RX- MDI signal	
25	NC		NC	
26	RXIP_P3	AI	Ethernet Port3 10/100Mbps differential pair RX+ MDI signal	
27	USB-HSDP1	AI/O	USB 2.0 Host Port1 differential pair Data+ signal	
28	TXOP_P3	AO	Ethernet Port3 10/100Mbps differential pair TX+ MDI signal	
29	USB-HSDM1	AI/O	USB 2.0 Host Port1 differential pair Data- signal	
30	NC		NC	
31	UART0-RX	I	UART0-RX for debug	3.3V
32	UART0-TX	O	UART0-TX for debug	3.3V
33	GND	P	Ground connections	
34	GND	P	Ground connections	
35	NC		NC (should keep floating)	
36	NC		NC	
Pad of Test Point				
37	VIN	P	DC 5.0V power input	
38	GND	P	Ground connections	

39	GPIOE1	I/O	Programmable General Purpose I/O_E1	3.3V
40	UART2-TX	O	UART2-TX for communication	3.3V
41	UART2-RX	I	UART2-RX for communication	3.3V
42	GPIOE3	I/O	Programmable General Purpose I/O_E3	3.3V
IPEX/MHF-1 Connector				
43	ANT-A	RF	ANT1 of 2.4G & ANT0 of 5G WLAN RF Signal	
44	ANT-B	RF	ANT0 of 2.4G & ANT1 of 5G WLAN RF Signal	

P: Power, I: Input, O: Output, I/O: Input/Output, RF: Analog RF Port, AI: Analog Input, AO: Analog Output, AI/O: Analog Input/Output

3. Electrical and Thermal Specifications

3.1 Recommended Operating Conditions

Parameters		Min	Typ	Max	Units
Ambient Operating Temperature		-10	25	50	°C
External Antenna VSWR			1.7	2.0	/
Supply Voltage	VIN	4.75	5.0	5.25	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 Current Consumption

Conditions : VIN=5.0V ; Ta:25°C ;			
Use Case	VIN Current		
	Typ(I _{RMS})	Max(I _{Peak})	Units
2.4G 11b 1Mbps TX @ 10dBm (1TX RF test)	446	670	mA
2.4G 11b 11Mbps TX @ 10dBm (1TX RF test)	405	670	mA

2.4G 11g 6Mbps TX @ 7dBm (1TX RF test)	429	690	mA
2.4G 11g 54Mbps TX @ 7dBm (1TX RF test)	340	690	mA
2.4G HT20 MCS8 TX @ 7dBm (2TX RF test)	544	990	mA
2.4G HT20 MCS15 TX @ 7dBm (2TX RF test)	377	990	mA
2.4G HT40 MCS8 TX @ 7dBm (2TX RF test)	471	970	mA
2.4G HT40 MCS15 TX @ 7dBm (2TX RF test)	363	970	mA
2.4G HT40 MCS8 RX (2RX RF test)	377	570	mA
2.4G HT40 MCS15 RX (2RX RF test)	389	570	mA
5G 11a BPSK (10MHz BW) TX @ 22dBm (2TX RF test)	756	1690	mA
5G 11a BPSK (10MHz BW) TX @ 22dBm (1TX RF test)	526	970	mA
5G 11a 6Mbps TX @ 22dBm (1TX RF test)	542	970	mA
5G 11a 54Mbps TX @ 17dBm (1TX RF test)	401	910	mA
5G HT20 MCS8 TX @ 21dBm (2TX RF test)	760	1690	mA
5G HT20 MCS15 TX @ 16dBm (2TX RF test)	473	1410	mA
5G HT40 MCS8 TX @ 21dBm (2TX RF test)	738	1610	mA
5G HT40 MCS15 TX @ 16dBm (2TX RF test)	420	1410	mA
5G VHT80 MCS0 TX @ 19dBm (2TX RF test)	637	1530	mA
5G VHT80 MCS9 TX @ 15dBm (2TX RF test)	420	1290	mA
5G VHT80 MCS0 RX (2RX RF test)	361	610	mA
5G VHT80 MCS9 RX (2RX RF test)	360	610	mA
1Mbps RX throughput test: UAV (BL-M8812CU2: 5G AP_Mode BPSK 10MHz BW 2TX@22dBm) --> Repeater (BL-M8197FH1: 5G Client_Mode BPSK 10MHz BW 2RX & 2.4G AP_Mode HT40 MCS15@7dBm TX) --> Smart Phone (2.4G Client_Mode RX)	543	1690	mA
200Kbps TX throughput test: Smart Phone (2.4G Client_Mode HT40 MCS15 TX) --> Repeater (BL-M8197FH1: 2.4G AP_Mode RX & 5G Client_Mode BPSK 10MHz BW 2TX@22dBm) --> UAV (BL-M8812CU2: AP_Mode BPSK 10MHz BW 2RX)	629	1770	mA

4. WLAN RF Specifications

4.1 2.4G WLAN RF Specification

Conditions : VIN=5.0V ; Ta:25°C			
Features	Description		
WLAN Standard	IEEE 802.11b/g/n		
Frequency Range	2.4~2.4835GHz (2.4GHz ISM Band)		
Channels	Ch1~Ch14 (For 20MHz Channels)		
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_SISO) 13.5~150Mbps 802.11n (HT40) : MCS8~MCS15(2T2R_MIMO) 27~300Mbps		
Frequency Tolerance	≤ ±20ppm		
2.4G Transmitter Specifications (ANT0 & ANT1)			
TX Rate	TX Power	TX Power Tolerance	EVM
802.11b@1Mbps	10dBm	±2.0dBm	≤-10dB
802.11b@11Mbps	10dBm	±2.0dBm	≤-10dB
802.11g@6Mbps	7dBm	±2.0dBm	≤-10dB
802.11g@54Mbps	7dBm	±2.0dBm	≤-25dB
802.11n@HT20_MCS0	7dBm	±2.0dBm	≤-10dB
802.11n@HT20_MCS7	7dBm	±2.0dBm	≤-28dB
802.11n@HT40_MCS0	7dBm	±2.0dBm	≤-10dB
802.11n@HT40_MCS7	7dBm	±2.0dBm	≤-28dB
2.4G Receiver Specifications (ANT0 & ANT1)			
RX Rate	Min Input Level(Typ)	Max Input Level(Typ)	PER
802.11b@1Mbps	-91dBm	-10dBm	< 8%
802.11b@11Mbps	-83dBm	-10dBm	< 8%
802.11g@6Mbps	-88dBm	-10dBm	< 10%

802.11g@54Mbps	-71dBm	-10dBm	< 10%
802.11n@HT20_MCS0	-87dBm	-10dBm	< 10%
802.11n@HT20_MCS7	-70dBm	-10dBm	< 10%
802.11n@HT40_MCS0	-86dBm	-10dBm	< 10%
802.11n@HT40_MCS7	-66dBm	-10dBm	< 10%

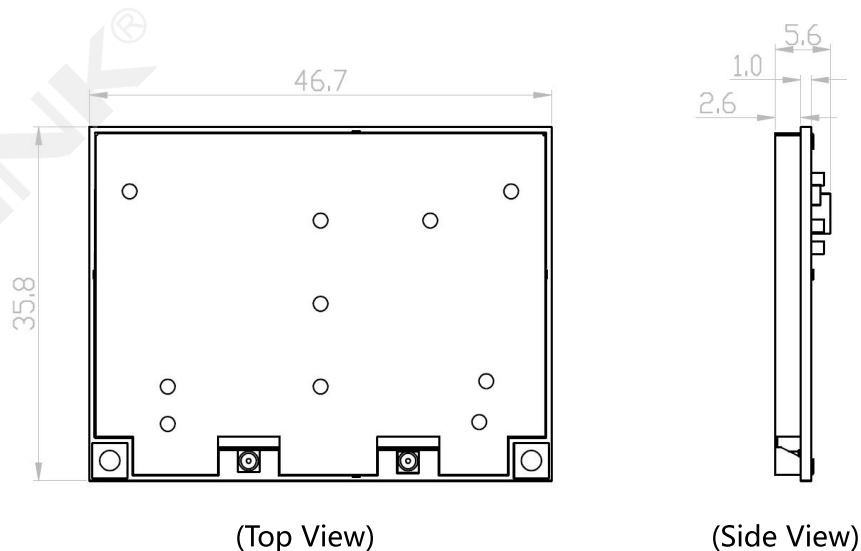
4.2 5G WLAN RF Specification

Conditions : VIN=5.0V ; Ta:25°C			
Features	Description		
WLAN Standard	IEEE 802.11a/n/ac		
Frequency Range	5.15~5.25GHz ; 5.25~5.35GHz ; 5.47~5.73GHz 5.735~5.835GHz (5GHz ISM Band)		
Channels	Ch36 , Ch40 , Ch44 , Ch48 ; Ch52~Ch64 Ch100~Ch144 ; Ch149~Ch165 (For 20/10MHz Channels)		
Modulation	802.11a OFDM : BPSK , QPSK , 16QAM , 64QAM 802.11n OFDM : BPSK , QPSK , 16QAM , 64QAM 802.11ac OFDM : BPSK , QPSK , 16QAM , 64QAM , 256QAM		
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_SISO) 13.5~150Mbps 802.11n (HT40) : MCS8~MCS15(2T2R_MIMO) 27~300Mbps 802.11ac (VHT20) : MCS0~MCS8(1T1R_SISO) 6.5~86.7Mbps 802.11ac (VHT20) : MCS0~MCS8(2T2R_MIMO) 13~173.3Mbps 802.11ac (VHT40) : MCS0~MCS9(1T1R_SISO) 13.5~200Mbps 802.11ac (VHT40) : MCS0~MCS9(2T2R_MIMO) 27~400Mbps 802.11ac (VHT80) : MCS0~MCS9(1T1R_SISO) 29.3~433.3Mbps 802.11ac (VHT80) : MCS0~MCS9(2T2R_MIMO) 58.5~866.7Mbps		
Frequency Tolerance	≤ ±20ppm		
5G Transmitter Specifications (ANT0 & ANT1)			
TX Rate	TX Power	TX Power Tolerance	EVM
802.11a@BPSK (10MHz BW)	21.5dBm	±2.0dBm	TBD
802.11a@6Mbps	21.5dBm	±2.0dBm	≤-10dB
802.11a@54Mbps	17dBm	±2.0dBm	≤-25dB

802.11n@HT20_MCS0	20.5dBm	±2.0dBm	≤-10dB
802.11n@HT20_MCS7	16dBm	±2.0dBm	≤-28dB
802.11n@HT40_MCS0	20.5dBm	±2.0dBm	≤-10dB
802.11n@HT40_MCS7	16dBm	±2.0dBm	≤-28dB
802.11ac@VHT80_MCS0	18.5dBm	±2.0dBm	≤-10dB
802.11ac@VHT80_MCS9	15dBm	±2.0dBm	≤-32dB
5G Receiver Specifications (ANT0 & ANT1)			
RX Rate	Min Input Level(Typ)	Max Input Level(Typ)	PER
802.11a@6Mbps	-92dBm	-10dBm	< 10%
802.11a@54Mbps	-74dBm	-10dBm	< 10%
802.11n@HT20_MCS0	-91dBm	-10dBm	< 10%
802.11n@HT20_MCS7	-72dBm	-10dBm	< 10%
802.11n@HT40_MCS0	-89dBm	-10dBm	< 10%
802.11n@HT40_MCS7	-68dBm	-10dBm	< 10%
802.11ac@VHT80_MCS0	-85dBm	-10dBm	< 10%
802.11ac@VHT80_MCS9	-60dBm	-10dBm	< 10%

5. Mechanical Specifications

5.1 Module Outline Drawing



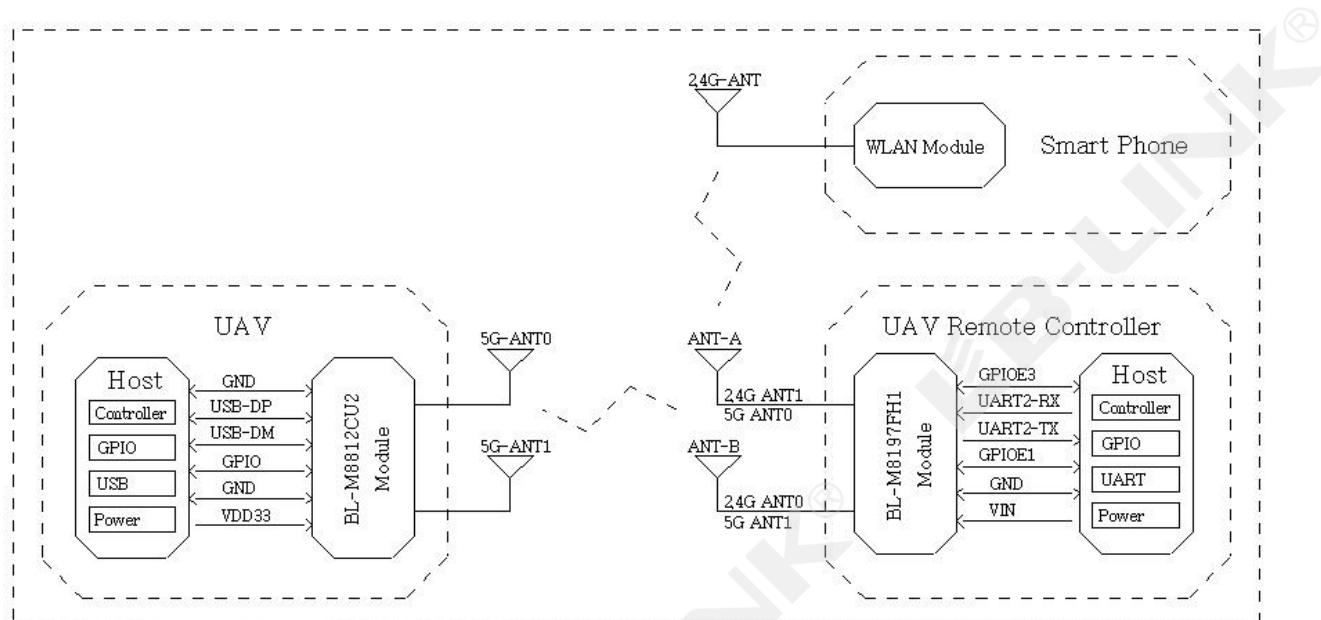
Module dimension: 46.7*35.8*5.6mm (L*W*H; Tolerance: ±0.15mm)

IPEX / MHF-1 connector dimension: 2.6*3.0*1.2mm (L*W*H, Ø2.0mm)



6. Application Information

6.1 Typical Application Circuit



6.2 HW Application Note

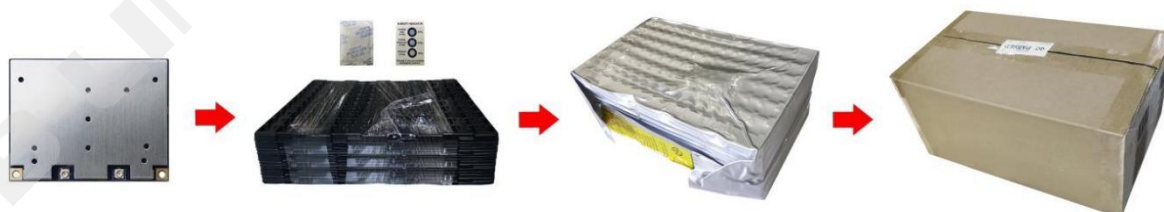
- Power supply voltage: DC 4.75 ~ 5.25V, ripple voltage < 100mV.
- Maximum RMS current $\geq 1.5A$ and maximum peak current $\geq 2A$.
- Current mode converter is recommended to meet fast transient response.
- It is recommended to add a 100 ~ 220uF low ESR Conductive polymer aluminum solid electrolytic capacitor at the power input of the module to improve the circuit stability.
- In order that the thermal conductive silicone pad between chipset and shield cover in the module is not damaged by the high temperature of reflow Soldering, the BL-M8197FH1 module must be manually soldering by the customer.
- The module's 5G WLAN will generate more heat when continuously transmitting with higher power. In order to maintain its good RF performance and stability, in addition to the shield cover, the customer need to add other heat dissipation devices.

7. Key Components Of Module

No.	Parts	Specification	Manufacturer	Note
1	Chipset	RTL8197FH-VG4-CG	Realtek Semiconductor Corp.	
2	Chipset	RTL8812FR-CG	Realtek Semiconductor Corp.	
3	PCB	BL-M8197FH1	SHEN ZHEN QILI ELECTRON CO.,LTD	
			MILLION SOURCE PRINTED CIRCUIT BOARD CO.,LTD	
			Quzhou Sunlord Electronics Co.,Ltd	
			ShenZhen Tie Fa Technology Limited	
4	Crystal	40MHz-3225	Chengde oscillator Electronic Technology CO.,LTD	
			HUBEI TKD CRYSTAL ELECTRONIC SCIENCE AND TECHNOLOGY CO.,LTD	
			JinHua East Crystal Electronic CO.,LTD	
			LUCKI CM ELECTRONICS CO.,LTD	
5	Diplexer	DIP1608	Advanced Ceramic X Corp.	
			Dongguan Hekang Electronics Co.,LTD	
			Walsin Technology Corporation	

8. Package and Storage Information

8.1 Package Dimensions



Package Specification:

1. 17 modules per tray and 320 modules per box.
2. The module trays are fixed with wrapping film and packaged into an anti-static vacuum bag.
3. Each anti-static vacuum bag is also filled with a bag (20g) of dry agent and a humidity card.
4. The outer box size is 35.2*21.5*15.5cm.

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