Lierda UB64 Series Hardware Design Manual

Version: Rev1.0

Date: 23/07/25

Address：Lierda Internet of Things Technology Park, No.1326 Wenyi West Road, Hangzhou Tel：0571-88800000

Legal Notices

By receiving this document from Lierda Technology Group Corporation (hereinafter referred to as "Lierda"), you agree to the following terms. If you do not agree to the following terms, please stop using this document.

This product complies with the design requirements regarding environmental protection and personal safety. The storage, use and disposal of the product should be carried out in accordance with the requirements of the product manual, the relevant contract or the relevant laws and regulations.

The Company reserves the right to make changes and improvements to the products described in this manual without prior notice; it also reserves the right to revise or withdraw this manual at any time.

Document revision history

Document version	Date of change	proposer	auditor	Changes
Rev1.0	23-07-25	WZJ	YB	initial version

Safety Instructions

It is the user's responsibility to follow the relevant regulations of other countries and the specific environmental regulations for the use of wireless communication modules and equipment. By observing the following safety principles, you can ensure your personal safety and help to protect the product and the working environment from potential damage. We are not liable for damages related to the customer's failure to comply with these regulations.

	Safety on the road comes first! When you are driving, do not use hand-held mobile terminal devices unless they have a hands-free function. Please stop the car before making a call!
	Please turn off your mobile devices before boarding the airplane. The wireless function of mobile devices is prohibited on board to prevent interference with the aircraft's communication system. Ignoring this reminder may lead to flight safety or even violate the law.
	When in a hospital or health care setting, note if there are restrictions on the use of mobile devices.RF interference can cause medical equipment to malfunction, so it may be necessary to turn off the mobile device.
	The mobile device does not guarantee a valid connection in all circumstances, for example if the mobile device is out of credit or the SIM is invalid. When you are in an emergency situation, please remember to use the emergency call and make sure that your device is switched on and in an area with sufficient signal strength.
	Your mobile device receives and transmits RF signals when it is switched on, which can cause RF interference when in close proximity to TVs, radios computers or other electronic devices.
	Keep the mobile terminal unit away from flammable gases. Turn off the mobile device when you are near gas stations, oil depots, chemical plants, or explosive workplaces. It is a safety hazard to operate electronic devices in any place where there is a potential explosion hazard.

Applicable modules Options

serial number	Module Model	Supported Frequency Bands	sizes	Module Introduction
1	L-WFMUB64-D5NN4	2.4 GHz ISM Band / 5GHz Band	13x12.2x2.6 mm	

Catalogs

1 Introduction

UB64 series is a low-cost Wi-Fi 6 module with USB interface supporting 802.11a/b/g/n/ac/ax 2.4GHz&5GHz and BR/EDR/BLE5.4, its WLAN function supports USB 2.0 interface, and its Bluetooth function supports UART interface. The module supports 20MHz/40MHz bandwidth to ensure backward and network compatibility, and can be widely used in HD webcam, OTT/IPTV/DVB/Set-top box, Smart TV and other fields.

Figure 1-1 Product Appearance

2 Product Overview

2.1 Key Features

connector	Stamp Interface
wireless standard	IEEE 802.11 b/a/g/n/ac/ax+BR/EDR/ BLE5.4
Module Packaging	13 mm × 12.2 mm × 2.6 mm
operating voltage	3.0V~3.6V, 3.3V typical
operating frequency	2400~2483.5MHZ (2.4 GHz ISM Band) 5180~5825MHz (5GHz Band)
operating temperature	-20 ~ +80°C
Storage temperature	-40 ~ +85°C
communication interface	USB 2.0/UART
bandwidths	Support 5/10MHz narrow bandwidth & standard 20/40MHz bandwidth
MAC	IEEE802.11 d/e/i/k/v/w

2.2 Product Advantages

1) Supports IEEE 802.11 b/a/g/n/ac/ax@2.4GHz&5GHz

2) Built-in BR/EDR/BLE5.4

3) Supports STA, AP, and Wi-Fi Direct modes

4) Supports WEP/WPA/WPA2/WPA3-SAE Personal, MFP bands

5) Supports Wi-Fi/BLE time-sharing multiplexing

6) Supports USB 2.0 interface

7) Support MU-MIMO, OFDMA

8) Supports Wi-Fi 6 TWT

9) Wi-Fi 5G AUX support

2.3 Application scenario

- HD Webcam, Surveillance Head
- OTT/IPTV/DVB/Set-top box
- Smart Home, Smart Home Appliances

2.4 Functional block diagram

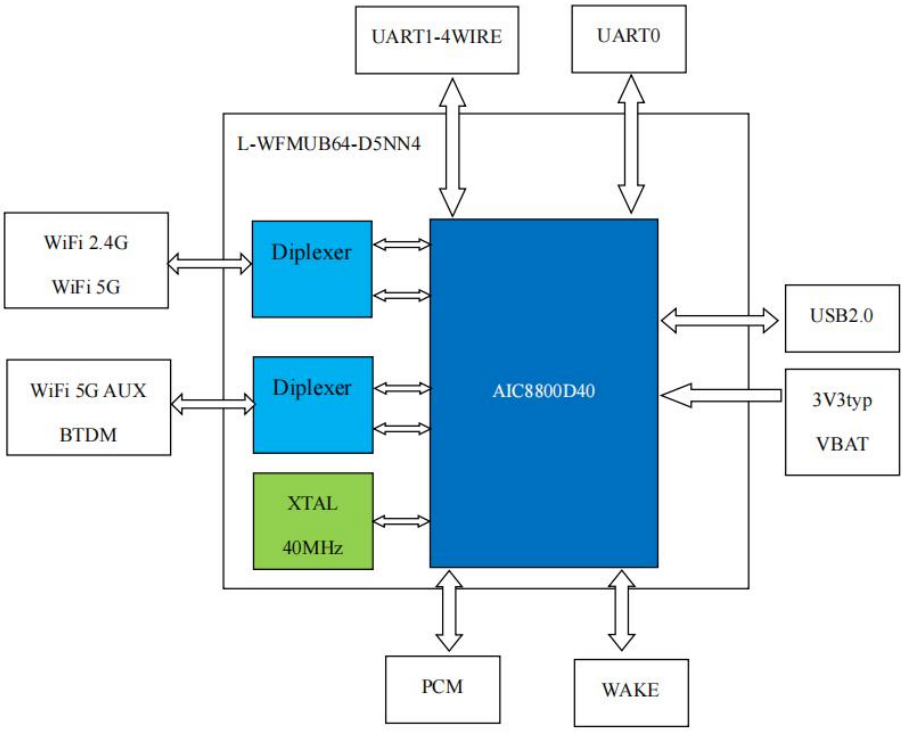


Figure 2.1 Functional Block Diagram

2.5 Pinouts

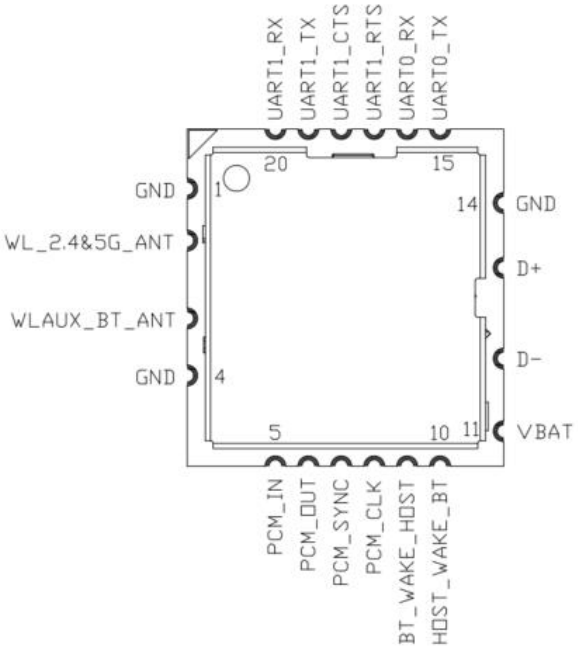


Figure 2.2 Pinouts

2.6 Pin Description Table

pin	Pin Definitions	I/O Type	Functional Description
1	GND	G	Ground pin
2	WL_2.4&5G_ANT	RF	Wi-Fi 2.4G & 5G Antenna Pin
3	WLAUX_BT_ANT	RF	WIFI AUX&BT Antenna Pin
4	GND	G	Ground pin
5	PCM_IN	I/O	PCM Input Pins
6	PCM_OUT	I/O	PCM Output Pins
7	PCM_SYNC	I/O	PCM frame synchronization signal pin
8	PCM_CLK	I/O	PCM Clock Pins
9	BT_WAKE_HOST	I/O	Bluetooth wake-up host pin (active high, default low)
10	HOST_WAKE_BT	I/O	Host wake-up Bluetooth pin (active high)
11	VBAT	P	Power supply pin (3.3V typical)
12	D-	I/O	USB DATA-Pin
13	D+	I/O	USB DATA+ pin
14	GND	G	Ground pin
15	UART0_TX	I/O	Debugging the serial port TX pin
16	UART0_RX	I/O	Debugging the serial port RX pin
17	UART1_RTS	I/O	Bluetooth flow control pins
18	UART1_CTS	I/O	Bluetooth flow control pins
19	UART1_TX	I/O	Bluetooth serial port TX pin
20	UART1_RX	I/O	Bluetooth serial port RX pin

"P":POWER "I":INPUT "O":OUTPUT "G". GND

3 Working Characteristics

3.1 Power Supply Design

3.1.1 Power connector

The VDD pin is used to connect to an external power supply, and the interface is described in the following table:

Table 3-1 Power Supply Pin Definitions

pin number	Pin Definitions	Description	Minimum Value V	Typical Value V	Maximum value V
3	VDD	Module Power Supply	3.0	3.3	3.6

The power supply range of the module is 3.0~3.6V to ensure that the voltage is not lower than 3.0V during operation, and the power supply current requirement is preferably not lower than 700mA.

3.1.2 Power Supply Design

A 22uF with 0.1uF decoupling capacitor is recommended for the UB64 module power pins. The capacitors should be as close as possible to the VDD power supply pin. The power supply voltage range is 3.0~3.6V, and when using 3.3V power supply, we need to make sure that the power supply voltage is not lower than 3.0V. The VDD pin needs to meet the power supply capacity of 500mA peak current, and the power supply ripple is recommended to be less than 10mV, so as to avoid the degradation of RF performance caused by the excessive ripple. The recommended circuits for power supply are as follows:

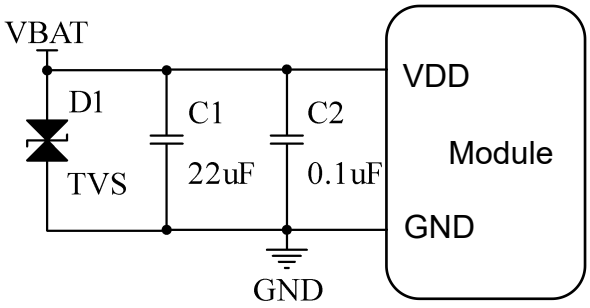


Figure 3.1 Power Supply Recommended Design

Note: D1 TVS static protection is used and it is recommended to place a TVS tube for static protection.

4 Application interface

4.1 USB interface

The UB64 module supports USB2.0 interface, which is used for communication data transfer and firmware upgrade, and the interface is described as follows:

Table 4-1 USB Interface Pin Definitions

pin number	Pin Definitions	descriptive	note
4	D-	USB Differential Data (-)	Differential impedance needs to be controlled at design time
5	D+	USB Differential Data (+)	

4.2 USB Circuit Reference Design

USB signals are differential high-speed signals, the design needs to pay attention to control the differential impedance and equal length, the reference design is as follows:

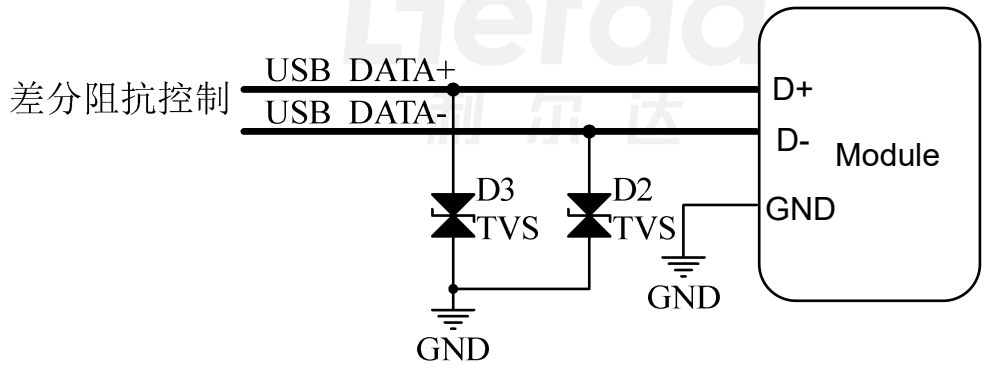


Figure 4.1 USB Reference Design

D2 and D3 are TVS tubes, which are used to prevent the interference generated by the USB interface during hot plugging and unplugging, thus causing the internal circuit to work abnormally. When connected to the external USB connector, it is necessary to add TVS tubes and place them close to the USB interface. It is recommended that the junction capacitance of less than 0.6pF protection device.

USB Differential Cable Alignment Notes:

- Differential impedance is controlled at 90Ohm ±15%;
- Common mode impedance is controlled at 30Ohm±30% and equal length is guaranteed;
- Cable Skew is less than 100ps and Cable Delay is less than 26ns;
- Ground wrapping is required around the alignment, away from areas such as crystals, crystals, magnetic devices or devices, and RF signals.

5 RF Characterization

5.1 Antenna Interface

Table 5-1 Antenna Interface Definitions

pin number	Pin Definitions	I/O Type	descriptive	note
2	WL_2.4&5G_ANT	RF	2.4G Wi-Fi & BT Antenna Interface	50Ω Characteristic Impedance
3	WLAUX_BT_ANT	RF	WIFI AUX&BT Antenna Pinout	50Ω Characteristic Impedance

5.2 Wi-Fi Performance

Table 5-2 Wi-Fi Performance Parameters

performances	descriptive	
wireless standard	IEEE 802.11b/a/g/n/ac/ax(@2.4GHz&5GHz), Wi-Fi compliant	
operating frequency	2.400 GHz ~ 2.4835 GHz (2.4 GHz ISM Band) 5180 ~ 5825MHz (5GHz Band)	
signal path	2.4GHz: CH1 ~ CH13 5GHz: CH36 ~ CH165	
modulation method	802.11b	DQPSK,DBPSK,CCK
	802.11 a/g/n/ac: OFDM	64-QAM,16-QAM,QPSK,BPSK

	802.11ax: OFDMA	1024-QAM,256-QAM,64-QAM, 16-QAM,QPSK,BPSK
发射功率@2.4G	802.11b/1Mbps	18dBm ± 2dB@EVM ≤ -10.5dB
	802.11b/11Mbps	18dBm ± 2dB@EVM ≤ -15.5dB
	802.11g/6Mbps	18dBm ± 2dB@EVM ≤ -5dB
	802.11g/54Mbps	15dBm ± 2dB@EVM ≤ -25dB
	802.11n/MCS0 (20/40M)	18dBm ± 2dB@EVM ≤ -5dB
	802.11n/MCS7 (20/40M)	15dBm ± 2dB@EVM ≤ -27dB
	802.11ax/MCS0 (20/40M)	18dBm ± 2dB@EVM ≤ -5dB
	802.11ax/MCS9 (20/40M)	14dBm ± 2dB@EVM ≤ -32dB
	802.11ax/MCS11 (20/40M)	13dBm ± 2dB@EVM ≤ -35dB
Transmit power @ 5G	802.11a / 6Mbps	18dBm ± 3dB@EVM ≤ -5dB
	802.11a /54Mbps	15dBm ± 3dB@EVM ≤ -25dB
	802.11n /MCS0 (20/40M)	18dBm ± 3dB@EVM ≤ -5dB
	802.11n /MCS7 (20/40M)	15dBm ± 3dB@EVM ≤ -27dB
	802.11ac /MCS0 (20/40M)	18dBm ± 3dB@EVM ≤ -5dB
	802.11ac /MCS9 (20/40M)	14dBm ± 3dB@EVM ≤ -32dB
	802.11ax /MCS0 (20/40M)	18dBm ± 3dB@EVM ≤ -5dB
	802.11ax /MCS9 (20/40M)	13dBm ± 3dB@EVM ≤ -32dB
	802.11ax MCS11 (20/40M)	12dBm ± 3dB@EVM ≤ -35dB
frequency tolerance	±20ppm	
Receive Sensitivity (11b,20MHz) @8% PER	1Mbps	-97.5dBm@2.4G,Typical
	11Mbps	-89.5dBm@2.4G,Typical
Receive Sensitivity (11g, 20MHz) @10% PER	6Mbps	-94dBm@2.4G,Typical
	54Mbps	-78dBm@2.4G,Typical
Receive Sensitivity (11n,20MHz)	MCS=0	-94dBm@2.4G,Typical
	MCS=7	-75dBm@2.4G,Typical

@10% PER		
Receive Sensitivity (11n,40MHz) @10% PER	MCS=0	-91dBm@2.4G,Typical
	MCS=7	-73dBm@2.4G,Typical
Receive Sensitivity (11ax,20MHz) @10% PER	MCS=0	-93.5dBm@2.4G,Typical
	MCS=7	-74dBm@2.4G,Typical
	MCS=9	-68dBm@2.4G,Typical
	MCS=11	-67dBm@2.4G,Typical
Receive Sensitivity (11ax,40MHz) @10% PER	MCS=0	-90dBm@2.4G,Typical
	MCS=7	-72dBm@2.4G,Typical
	MCS=9	-67dBm@2.4G,Typical
	MCS=11	-64dBm@2.4G,Typical
Receive Sensitivity (11a, 20MHz) @10% PER	6Mbps	-94dBm@5G,Typical
	54Mbps	-77.5dBm@5G,Typical
Receive Sensitivity (11n,20MHz) @10% PER	MCS=0	-94dBm@5G,Typical
	MCS=7	-75dBm@5G,Typical
Receive Sensitivity (11n,40MHz) @10% PER	MCS=0	-91dBm@5G,Typical
	MCS=7	-72dBm@5G,Typical
Receive Sensitivity (11ac,20MHz) @10% PER	MCS=0	-94dBm@5G,Typical
	MCS=8	-71dBm@5G,Typical
Receive Sensitivity (11ac,40MHz) @10% PER	MCS=0	-91dBm@5G,Typical
	MCS=7	-72dBm@5G,Typical
	MCS=9	-66dBm@5G,Typical
Receive	MCS=0	-92dBm@5G,Typical

Sensitivity (11ax,20MHz) @10% PER	MCS=7	-73dBm@5G,Typical
	MCS=9	-70dBm@5G,Typical
	MCS=11	-65dBm@5G,Typical
Receive Sensitivity (11ax,40MHz) @10% PER	MCS=0	-89.5dBm@5G,Typical
	MCS=7	-72.5dBm@5G,Typical
	MCS=9	-67dBm@5G,Typical
	MCS=11	-62dBm@5G,Typical

AUX Sensitivity (11a, 20 MHz) @10% PER	6Mbps	-94dBm@5G,Typical
	54Mbps	-77.5dBm@5G,Typical
AUX Sensitivity (11n, 20MHz) @10% PER	MCS=0	-94dBm@5G,Typical
	MCS=7	-75dBm@5G,Typical
AUX Sensitivity (11n, 40MHz) @10% PER	MCS=0	-91dBm@5G,Typical
	MCS=7	-72dBm@5G,Typical
AUX Sensitivity (11ac, 20MHz) @10% PER	MCS=0	-94dBm@5G,Typical
	MCS=8	-71dBm@5G,Typical
AUX Sensitivity (11ac, 40MHz) @10% PER	MCS=0	-90.5dBm@5G,Typical
	MCS=9	-65.5dBm@5G,Typical
AUX Sensitivity (11ax, 20MHz) @10% PER	MCS=0	-93dBm@5G,Typical
	MCS=11	-64.5dBm@5G,Typical
AUX Sensitivity (11ax, 40MHz) @10% PER	MCS=0	-89.5dBm@5G,Typical
	MCS=11	-61.5dBm@5G,Typical

5.3 BT Performance

The UB64 module has BR/EDR/BLE modes.

5.3.1 LE mode

Table 5-3 BLE performance parameters

performances	descriptive
Bluetooth standard	BLE5.4
operating frequency	2.402GHz ~ 2.480GHz
signal path	LE: Ch0 ~ Ch39
modulation method	GFSK
carrier transmitting power	9dBm, Typical
Modulating Wave Power (DTM)	10dBm, Typical
Sensitivity @ PER=30.8% for LE(1Mbps)	-95dBm, Typical
Sensitivity @ PER=30.8% for LE(2Mbps)	-92dBm,Typical
Sensitivity, @ PER=30.8% for LE Coded (S=2)	-100dBm, Typical
Sensitivity, @ PER=30.8% for LE Coded (S=8)	-102dBm,Typical
Maximum Input Level	0dBm,Typical

5.3.2 BR+EDR mode

Table 5-4 BR+EDR Performance Parameters

performances	descriptive
Bluetooth standard	BR+EDR
operating frequency	2.402GHz ~ 2.480GHz
signal path	BR/EDR: Ch0 ~ Ch78

modulation method	BR (1M)	GFSK
	EDR (2M)	π/4-DQPSK
	EDR (3M)	8DPSK
firing power	BR (1M)	9dBm, Typical
	EDR (2M)	6dBm, Typical
	EDR (3M)	6dBm, Typical
Sensitivity @BER=0.1% for GFSK(1Mbps)	-94dBm, Typical	
Sensitivity @BER=0.01% for π/4-DQPSK (2Mbps)	-92dBm, Typical	
Sensitivity @ BER=0.01% for 8DPSK(3Mbps)	-86dBm, Typical	
Maximum Input Level	GFSK (1Mbps)	0dBm
	π/4-DQPSK (2Mbps)	0dBm
	8DPSK (3Mbps)	0dBm

5.4 Reference design

The UB64 module has two RF interfaces, WL_2.4&5G_ANT and WLAUX_BT_ANT, where the WL_2.4&5G_ANT interface is the main antenna interface for Wi-Fi for 2.4G and 5G, and the WLAUX_BT_ANT interface is the auxiliary reception for Wi-Fi 5G + antenna interface for Bluetooth 2.4G, and both interfaces use two Diplexers inside the module so that 2.4G and 5G share a common antenna.

The π-matching circuit needs to be reserved between the antenna interface of the module and the antenna interface of the baseboard, and the following circuits are reserved for both RF ports, and the recommended antenna matching circuit and initial parameters are shown in the following figure:

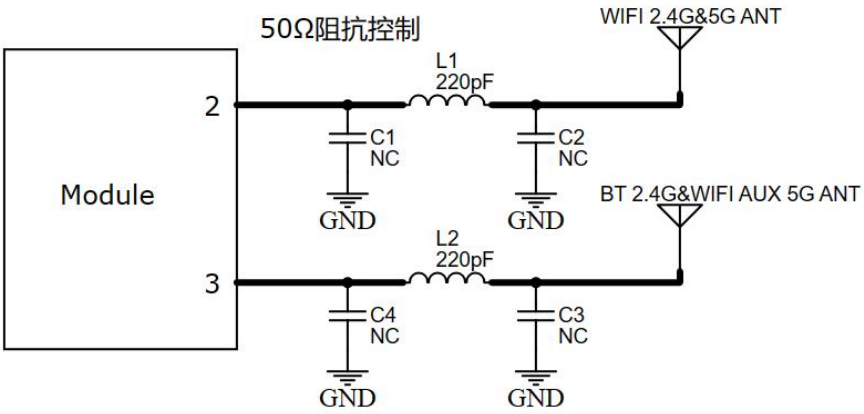


Figure 5.1 Antenna reference design circuit

L2 default use 220pF capacitor or 0R resistor, C5, C6 default, do match reserved, its final value according to the actual debugging results to determine.

Antenna interface to the bottom of the board antenna alignment to ensure that the impedance control of 50Ω, the alignment should be as short as possible, do not hit the hole, do not go to the sharp line. RF alignment around more GND holes. As shown in Figure 5.2 below:

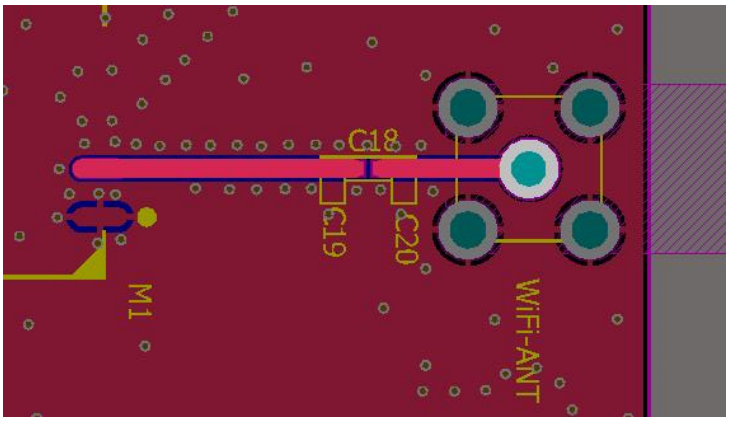


Figure 5.2 Impedance lines of the base plate

The relationship between plate thickness and line width and line spacing can be referenced:

Recommended values for FR4 double-sided boards (H=board thickness, W=wire width, D=spacing between alignment and copper placement)

- h=1.0mm, w=0.8mm, d=0.2mm
- H=1.0mm, W=1.0mm, D=0.254mm (recommended)
- H=1.2mm, W=1.0mm, D=0.2mm (recommended)
- H=1.6mm, W=1.0mm, D=0.2mm (recommended)

For π-matching circuits, to avoid introducing additional parasitic parameters that affect debugging difficulty, the recommended placement is shown in the figure below:

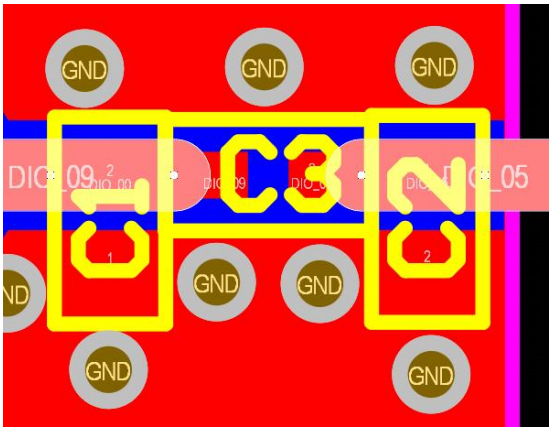


Figure 5.3 Matching circuit LC placement method

6 Electrical performance and reliability

6.1 Power supply ratings

Parameters	Descriptive	minimum value	typical value	maximum values	unit (of measure)
V_{DD}	Power Supply	3.0	3.3	3.6	V

6.2 Power wastage

Descriptive	Test condition	Current (mA)		
		I_{Ave} @TX	I_{Peak} @TX	I_{Ave} @RX
Wi-Fi data transmission	802.11b,11Mbps@20dBm	190(Duty 50%)	360	65
	802.11ax,HE20,MCS11@13dBm	85(Duty 20%)	300	65
	802.11ax,HE40,MCS11@12dBm	80(Duty 20%)	300	65
BT data transmission	BLE @1M default power	90	110	58
	BR@DH5 default power	78	125	58
	EDR@3DH5 default power	68	100	58

6.3 Digital Logic Level Characterization

parameters	descriptive	minimum value	typical value	maximum values	unit
V_{IL}	CMOS Low Level Input Voltage	0	/	0.3*VDD	V
V_{IH}	CMOS High Level Input Voltage	0.7*VDD	/	VDD	V
V_{TH}	CMOS Threshold Voltage	/	0.5*VDD	/	V

6.4 Electrostatic protection

parameters	descriptive	minimum value	typical value	maximum values	unit
V_{ESD} VDD&ANT PIN ESD performance	HBM:JS-001-2017	/	3	/	KV
	CDM:JS-001-2018	/	0.8	/	KV
	IEC61000-4-2 Contact Discharge	/	2	/	KV

6.5 Operating and storage temperature

parameters	descriptive	minimum value	typical value	maximum values	unit
T_A	operating temperature	-20	/	+80	℃
$T_{Storage}$	Storage temperature	-40	/	+85	℃

7 Reference design

7.1 Schematic

The UB64 series module interface consists of three parts: power supply, USB interface and RF antenna port. The specific detailed design content of each part is detailed in sections 3, 4 and 5.

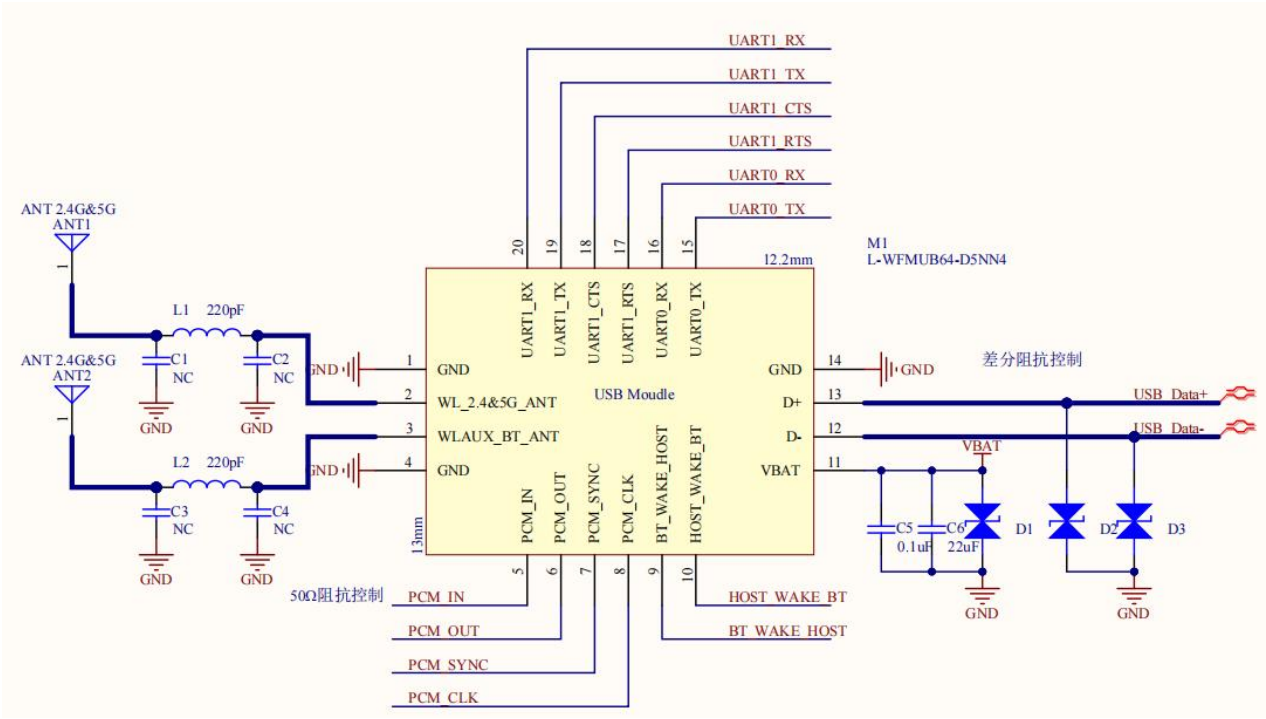


Figure 7.1 Reference Design Schematic

7.2 Baseboard Layout Considerations

UB64 module BOTTOM layer no high-speed signal or sensitive signal alignment, but it is still recommended that the bottom of the TOP layer design alignment to avoid the module, so as not to bring unexpected factors of influence.

There is no excessive skeletonization processing requirements in the base plate

design, in addition to the previously mentioned general requirements for avoiding interference sources, the base plate can be almost a whole plate to lay copper.There are two GND pads at the bottom. Do not open the window wiring below to avoid short circuit.

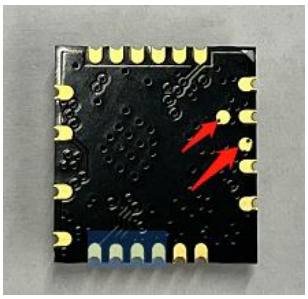


Figure 7.2 Actual picture of the bottom of the module

8 Mechanical dimensions

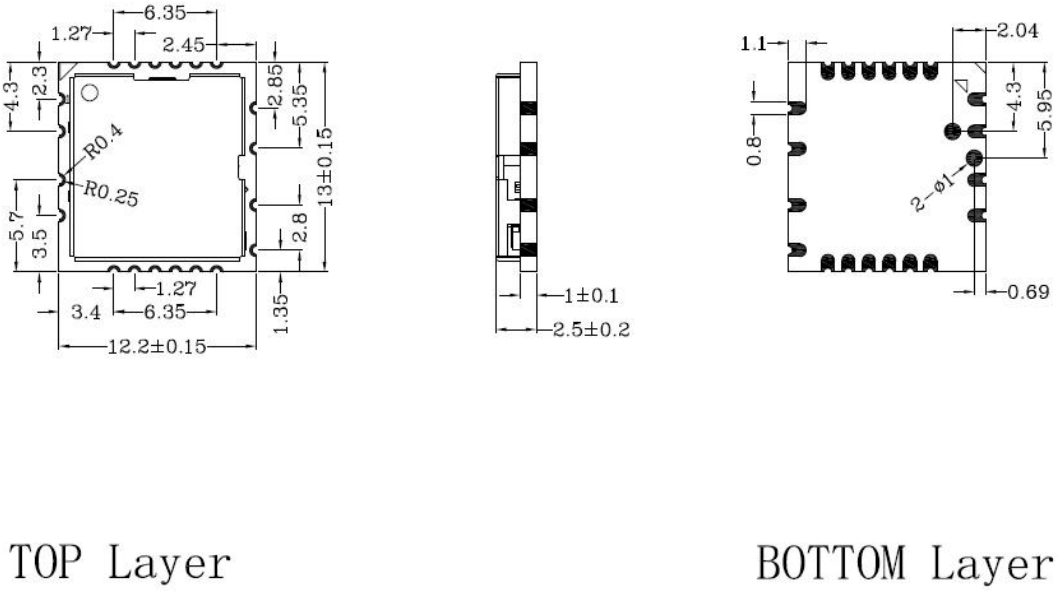


Figure 8.1 Module external dimensions

9 Production and Packaging Information

9.1 Production Welding

9.1.1 Production Guidelines

It is recommended that the stamp port encapsulated module be mounted using SMT machine and the mounting should be completed within 24 hours after unpacking, otherwise it should be re-vacuum-packed to avoid moisture leading to poor mounting.

If the package contains a humidity indication card, it is recommended to judge whether the module needs to be baked according to the humidity card indication, and the conditions during baking are as follows:

Baking temperature: 125℃±5℃;

The alarm temperature is set to 130°C;

After cooling <36℃ under natural conditions, it is ready for SMT placement;

If the unpacking time is more than 3 months, you need to pay special attention to whether the product is affected by moisture, because the PCB immersed gold process, more than 3 months may lead to oxidation of the pads, the patch may lead to false soldering, leakage of soldering and other problems.

In order to ensure that the reflow soldering pass rate, the first patch is recommended to take 10% of the products for visual inspection, AOI testing to ensure that the furnace temperature control, device adsorption method, placement of the rationality of the way;

Operators at each station must wear electrostatic gloves during the entire production process.

9.1.2 Module location requirements at the base plate

It is recommended that the base plate module location of the green oil thickness of less than 0.02mm, to avoid excessive thickness, padding module can not effectively contact with the solder paste affects the welding quality. Also need to consider the interface board

module location within 2mm around the layout of other devices, in order to protect the maintenance of the module.

9.1.3 Stencil opening design

The thickness of the stencil on the base plate is selected in principle according to the type of packaging of the device on the board to be selected, need to focus on the following requirements:

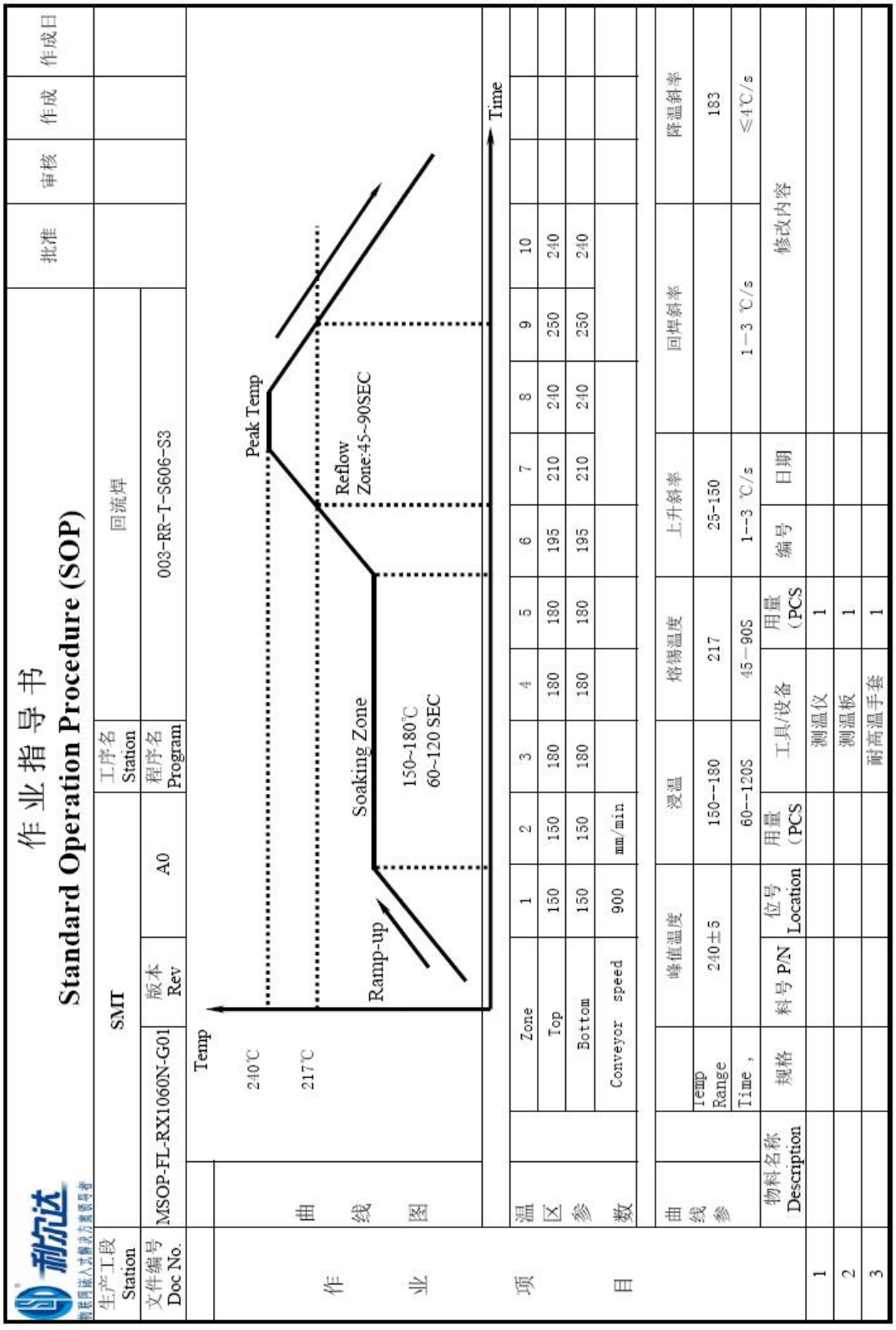
Module pad locations can be locally thickened to 0.15~0.20mm to avoid void soldering.

9.1.4 Production Precautions

- During the production process, each operator must wear electrostatic gloves;
- Baking should not exceed the specified baking time;
- It is strictly prohibited to add explosive, flammable and corrosive substances during baking;
- During baking, modules should be placed in high temperature trays to maintain air circulation between modules;
- The door of the baking box needs to be closed during baking to ensure that the baking box is closed and to prevent the temperature from leaking out;
- Try not to open the door when the oven is running, if you have to open it, try to shorten the time you can open the door;
- After baking, wait until the module cools down naturally to below 36℃ before taking it out with electrostatic gloves to avoid burns;
- When operating, do not allow the bottom surface of the module to get wet or dirty;

9.1.5 Reflow soldering work instructions

Note: This work instruction is suitable for lead-free work only and is for reference only.



作业指导书
Standard Operation Procedure (SOP)

生产工段 Station	SMT		工序名 Station	回流焊		批准	审核	作成	作成日
文件编号 Doc No.	MSOP-FL-RX1060N-G01	版本 Rev	A0	程序名 Program	003-RR-T-S606-S3				

Temp
240℃
217℃
Peak Temp
Reflow Zone:45~90SEC
Soaking Zone
150~180℃ 60~120 SEC
Ramp-up
Time

项目																
温区参数	Zone		1	2	3	4	5	6	7	8	9	10				
	Top		150	150	180	180	180	195	210	240	250	240				
	Bottom		150	150	180	180	180	195	210	240	250	240				
	Conveyor speed		900	mm/min												
曲线参数		峰值温度		浸温		熔锡温度		上升斜率		回焊斜率			降温斜率			
	Temp Range	240±5		150--180		217		25-150					183			
	Time ,			60--120S		45--90S		1--3 ℃/s		1--3 ℃/s			≤4℃/s			
	物料名称 Description	规格	料号 P/N	位号 Location	用量（PCS	工具/设备	用量（PCS	编号	日期	修改内容						
1						测温仪	1									
2						测温板	1									
3						耐高温手套	1									

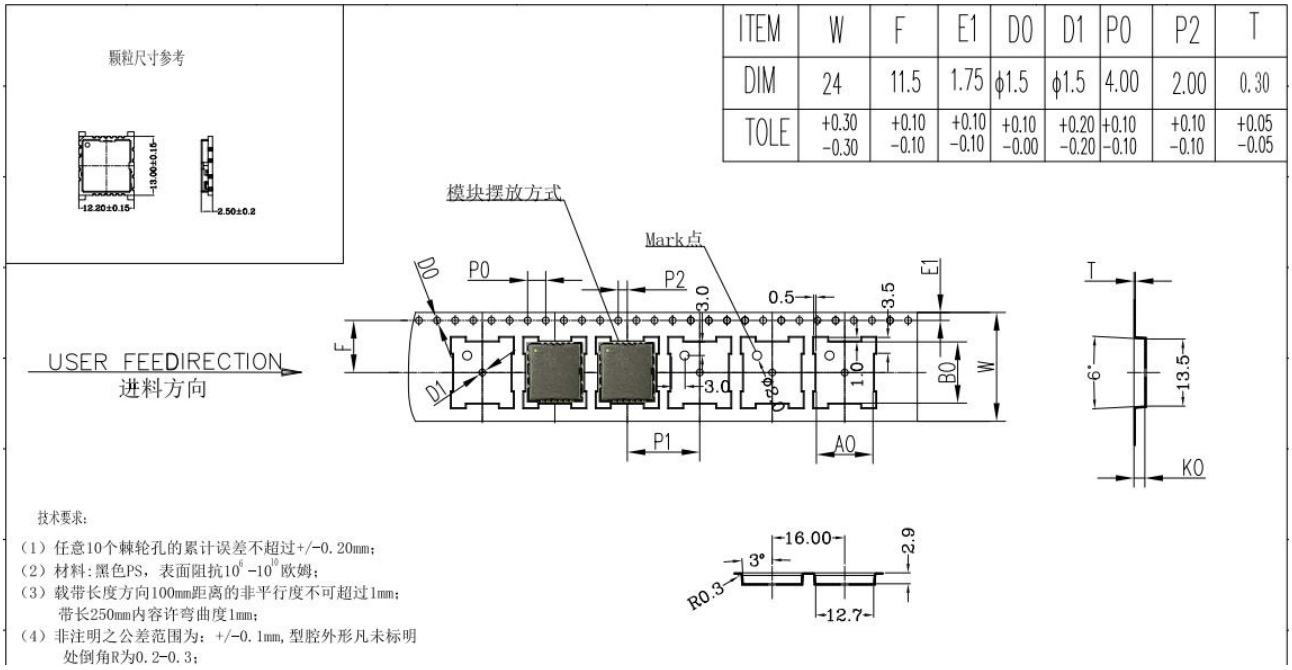
Figure 9.1 Reflow Soldering Operating Instructions

9.2 Packaging specification

9.2.1 Packaging

model number	Packaging	Full Carton(PCS)	Minimum Packing Quantity (PCS)	Number of reels per case
L-WFMUB64-D5NN4	reel	6500	1300	5

9.2.2 Belt size and product orientation



ITEM	W	F	E1	D0	D1	P0	P2	T
DIM	24	11.5	1.75	φ1.5	φ1.5	4.00	2.00	0.30
TOLE	+0.30 −0.30	+0.10 −0.10	+0.10 −0.10	+0.10 −0.00	+0.20 −0.20	+0.10 −0.10	+0.10 −0.10	+0.05 −0.05

Figure 9.2 Strip Size and Product Orientation

Conformity

FCC regulatory conformance：
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.
(2) This device must accept any interference received, including interference that may cause undesired operation.

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

NOTE: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

FCC Radiation Exposure Statement:
This equipment 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.

ORIGINAL EQUIPMENT MANUFACTURER (OEM) NOTES

The OEM must certify the final end product to comply with unintentional radiators (FCC Sections 15.107 and 15.109) before declaring compliance of the final product to Part 15 of the FCC rules and regulations. Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change.

The OEM must comply with the FCC labeling requirements. If the module's label is not visible when installed, then an additional permanent label must be applied on the outside of the finished product which states: "Contains transmitter module FCC ID: **2AOFDL-WFMUB64**". Additionally, the following statement should be included on the label and in the final product's user manual: "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 interferences, and
(2) this device must accept any interference received, including interference that may cause undesired operation."

The module is limited to installation in mobile or fixed applications. Separate approval is required for all other operating configurations, including portable configuration with respect to Part 2.1093 and different antenna configurations.

A module or modules can only be used without additional authorizations if they have been tested and granted under the same intended end‐use operational conditions, including simultaneous transmission operations. When they have not been tested and granted in this manner, additional testing and/or FCC application filing may be required. The most straightforward approach to address additional testing conditions is to have the grantee responsible for the certification of at least one of the modules submit a permissive change application. When having a module grantee file a permissive change is not practical or feasible, the following guidance provides some additional options for host manufacturers. Integrations using modules where additional testing and/or FCC application filing(s) may be required are: (A) a module used in devices requiring additional RF exposure compliance information (e.g., MPE evaluation or SAR testing); (B) limited and/or split modules not meeting all of the module requirements; and (C) simultaneous transmissions for independent collocated transmitters not previously granted together.

This Module is full modular approval, it is limited to OEM installation ONLY.
Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change. (OEM) Integrator has to assure compliance of the entire end product include the integrated Module. Additional measurements (15B) and/or equipment authorizations (e.g. Verification) may need to be addressed depending on co-location or simultaneous transmission issues if applicable. (OEM) Integrator is reminded to assure that these installation instructions will not be made available to the end user

Requirement per KDB996369 D03

2.2 List of applicable FCC rules

List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power, spurious emissions, and operating fundamental frequencies. DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See also Section 2.10 below concerning the need to notify host manufacturers that further testing is required.3

Explanation: This module meets the requirements of FCC part 15C(15.247).

2.3 Summarize the specific operational use conditions

Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to-point antennas are used that require reduction in power or compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer’s instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain, specifically for master devices in 5 GHz DFS bands.

Explanation: The EUT has a Dipole Antenna, and the antenna use a permanently attached antenna which is not replaceable.

2.4 Limited module procedures

If a modular transmitter is approved as a “limited module,” then the module manufacturer is responsible for approving the host environment that the limited module is used with. The manufacturer of a limited module must describe, both in the filing and in the installation instructions, the alternative means that the limited module manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions.

A limited module manufacturer has the flexibility to define its alternative method to address the conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited module manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval.

This limited module procedure is also applicable for RF exposure evaluation when it is necessary to demonstrate compliance in a specific host. The module manufacturer must state how control of the product into which the modular transmitter will be installed will be maintained such that full compliance of the product is always ensured. For additional hosts other than the specific host originally granted with a limited module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module.

Explanation: The module is not a limited module.

2.5 Trace antenna designs

For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ – Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects:
layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements.
a) Information that includes permitted variances (e.g., trace boundary limits, thickness, length, width, shape(s), dielectric constant, and impedance as applicable for each type of antenna);
b) Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency, the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered);
c) The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout;
d) Appropriate parts by manufacturer and specifications;
e) Test procedures for design verification; and
f) Production test procedures for ensuring compliance.
The module grantee shall provide a notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.
Explanation: Yes, The module with trace antenna designs, and This manual has been shown the layout of trace design, antenna, connectors, and isolation requirements.

2.6 RF exposure considerations

It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information: (1) to the host product manufacturer, to define the application conditions (mobile, portable – xx cm from a person’s body); and (2) additional text needed for the host product manufacturer to provide to end users in their end-product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).
Explanation: This module complies with FCC RF radiation exposure limits set forth for an uncontrolled environment, This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body." This module is designed to comply with the FCC statement, FCC ID is: 2AOFDL-WFMUB64.

2.7 Antennas

A list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an “omni-directional antenna” is not considered to be a specific “antenna type”)).

For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on the Part 15 authorized transmitters used in the host product. The module manufacturers shall provide a list of acceptable unique connectors.

Explanation: The EUT has a Dipole Antenna, and the antenna use a permanently attached antenna which is unique.

2.8 Label and compliance information

Grantees are responsible for the continued compliance of their modules to the FCC rules. This includes advising host product manufacturers that they need to provide a physical or e-label stating “Contains FCC ID” with their finished product. See Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748.

Explanation: The host system using this module, should have label in a visible area indicated the following texts: “Contains FCC ID: 2AOFDL-WFMUB64”

2.9 Information on test modes and additional testing requirements5

Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

The grantee should provide information on how to configure test modes for host product evaluation for different operational conditions for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host.

Grantees can increase the utility of their modular transmitters by providing special means, modes, or instructions that simulates or characterizes a connection by enabling a transmitter. This can greatly simplify a host manufacturer’s determination that a module as installed in a host complies with FCC requirements.

Explanation: Top band can increase the utility of our modular transmitters by providing instructions that simulates or characterizes a connection by enabling a transmitter.

2.10 Additional testing, Part 15 Subpart B disclaimer

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) 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.

Explanation: The module without unintentional-radiator digital circuity, so the module does not require an evaluation by FCC Part 15 Subpart B. The host shoule be evaluated by the FCC Subpart B.