

# 四川爱联

## WF-U21DS-SSA1 User Manual

### Features:

- **Supported WLAN Standard**
  - IEEE Std. 802.11a
  - IEEE Std. 802.11b
  - IEEE Std. 802.11g
  - IEEE Std. 802.11n
  - IEEE Std. 802.11ac
  - Bluetooth 2.1+EDR/4.2/5.1
- **Chip Solution**
  - UWE5621DS
- **Size**
  - 13.0mm x 15.0mm x 1.90mm



Interface	Assemble	Band	Antenna	Power supply
SDIO	SMD	2.4G/5G	--	3.3V

## 四川爱联科技股份有限公司

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ADD: Anzhou,Industrial park,Mianyang,Sichuan

公司：四川爱联科技股份有限公司

Factory: Sichuan AI-Link Technology Co.,Ltd.

Approved	Checked	Designed	Product	WiFi Module
陈进	范西君	覃达开	Model	WF-U21DS-SSA1
			Date	2022-04-29



### 1. Introduction

WF-U21DS-SSA1 module design is based on UWE5621DS solution. UWE5621DS is a highly integrated 2-in-1 connectivity single chip for PC, STB, OTT, industrial control and automotive applications. This chip includes 2.4 GHz and 5 GHz WLAN IEEE 802.11 a/b/g/n/ac 2x2 MU-MIMO 20/40/80 MHz VHT R2 MAC/PHY/Radio, Bluetooth 5.1 Smart Ready compliant with supporting high power mode, Mesh, Direction Finding and Long Range. Additionally, this radio-on-a-chip integrates power amplifiers, receive low noise amplifiers and RF TR switch. It supports high-speed 4-wire UART and SDIO 3.0 for Wi-Fi and Bluetooth.

#### 1.1 RF module Overview

The general HW architecture for the module is shown in Figure 1.

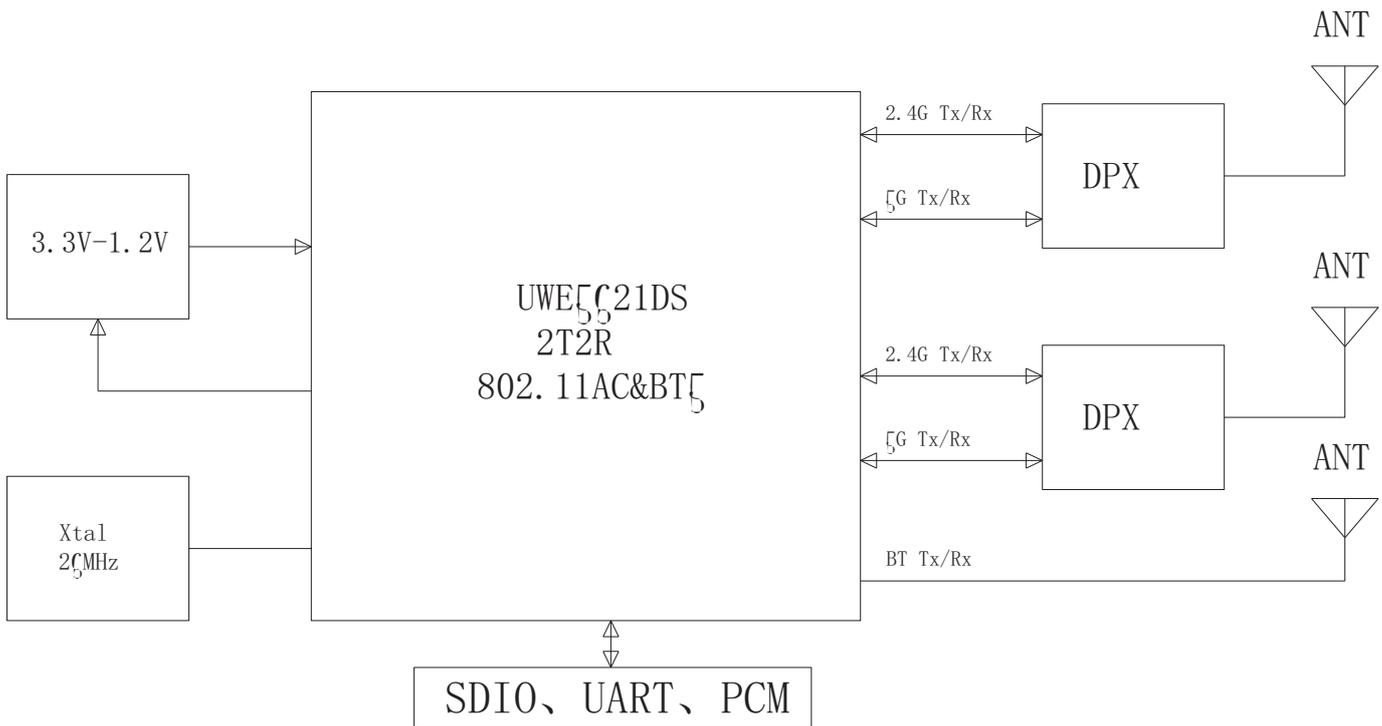


Figure 1 WF-U21DS-SSA1 Block Diagram

#### 1.2 Specification reference

This specification is based on additional references listed below.

- \_ IEEE Std. 802.11a
- \_ IEEE Std. 802.11b
- \_ IEEE Std. 802.11g
- \_ IEEE Std. 802.11n
- \_ IEEE Std. 802.11ac
- \_ Bluetooth 2.1+EDR/4.2/5.1

#### 1.3 System Functions

Table1: General Specification as below:

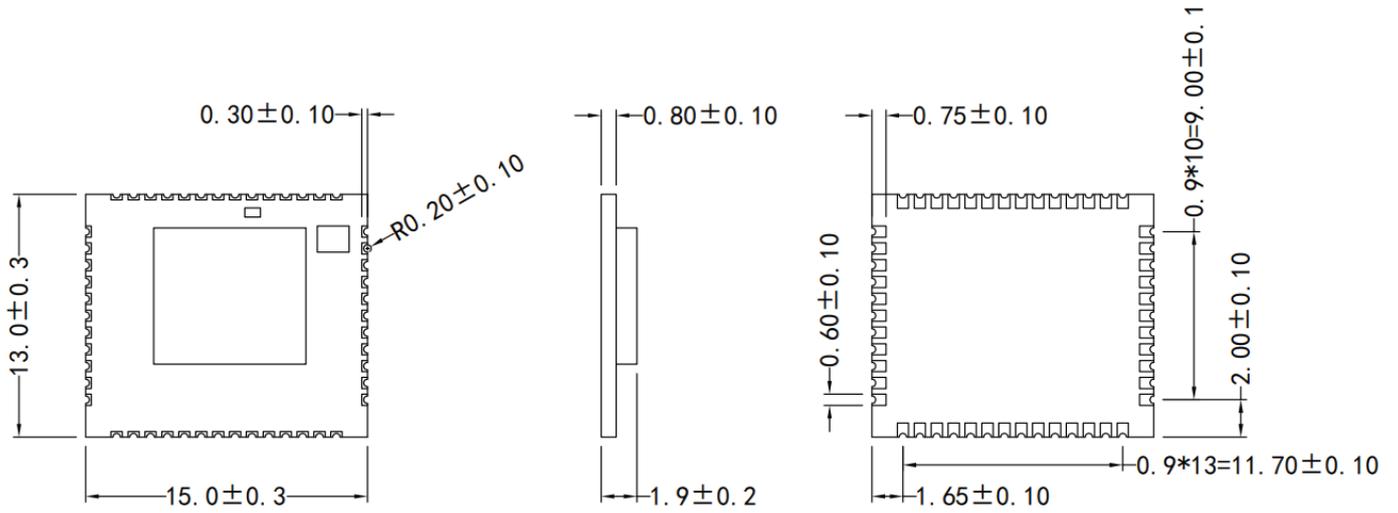
Main Chipset	UWE5621DS
Operating Frequency	2.4G/5G
WiFi Standard	802.11a/b/g/n/ac (2x2)
Bluetooth	2.1+EDR/4.2/5.1

Modulation	WIFI:11b: DBPSK, DQPSK and CCK and DSSS 11a/g: BPSK, QPSK, 16QAM, 64QAM and OFDM 11n: BPSK, QPSK, 16QAM, 64QAM and OFDM 11ac: BPSK, QPSK, 16QAM, 64QAM,256QAM and OFDM BT: FHSS,GFSK,DPSK,DQPSK
Data rates	11b: 1, 2, 5.5 and 11Mbps 11a/g: 6, 9, 12, 18, 24, 36, 48 and 54 Mbps 11n: MCS0~15, up to 300Mbps 11ac: MCS0~9, Nss=2, up to 866.7Mbps
Form factor	50pins
Host Interface	SDIO
PCB Stack	4-layers design
Dimension	Typical, 13.0mmx 15.0mm x 1.90mm
Antenna	External Antennas Design
Operation Temperature	-10℃ to +70℃
Storage Temperature	-40℃ to +125℃
Operation Voltage	3.3V +/-10%

## 2. Mechanical Specification

### 2.1 Mechanical Outline Drawing

Typical Dimension (W x L): 13.0mmx 15.0mm x 1.90mm



## 2.2 Pin define:



Pin	Define	Description	Pin	Define	Description
1	GND	GND	25	GPI030	General Purpose Input/Output Pin;ESMD1
2	ANT0	ANT 0	27	IISLRCK	Left-Right channel clock
3	GND	GND	28	IISDI	IIS interface data input
4	GND	GND	29	IISDO	IIS interface data output
5	GND	GND	30	IISCLK	IIS clock
6	GND	GND	31	GND	GND
7	GND	GND	32	GND	GND
8	GND	GND	33	GPI029	General Purpose Input/Output Pin;ESMD2
9	ANT1	ANT 1	34	VDD1V8	1.8V Supply for GPIO
10	GND	GND	35	GPI038	General Purpose Input/Output Pin;RFCTL4
11	GND	GND	36	VDD33	VDD INPUT(3.3V)
12	RF_BT	BT ANT	37	GPI039	General Purpose Input/Output Pin;RFCTL5
13	GPI033	General Purpose Input/Output Pin;ESMCLK	38	RST_N	External reset input, active low
14	GPI032	General Purpose Input/Output Pin;ESMCSN	39	GND	GND
15	CHIP_EN	PMU-Enable	40	U0TXD	UART port0 TX
16	WL_WAKE_HOST	WLAN to wake-up the host;ESMD3	41	U0RXD	UART port0 RX
17	SD_CMD	SDIO Command Input	42	U0RTS	UART port0 RTS
18	SD_CLK	SDIO Clock Input	43	U0CTS	UART port0 CTS
19	SD_D3	SDIO Data Line 3	44	SD_RESET	SDIO interface reset
20	SD_D2	SDIO Data Line 2	45	GPI02	General Purpose Input/Output Pin
21	SD_D0	SDIO Data Line 0	46	U1TXD	UART port1 TX
22	SD_D1	SDIO Data Line 1	47	U1RXD	UART port1 RX
23	GND	GND	48	GND	GND
24	GPI01	General Purpose Input/Output Pin	49	HOST_WAKE_B T	Host wake-up Bluetooth
25	GPI031	General Purpose Input/Output Pin;ESMD0	50	BT_WAKE_HOS T	Bluetooth to wake-up the host

### 2.3 Product Picture



TOP VIEW



BOTTOM VIEW

### 3. Electrical Specification

This Specification is based-on conductive DVT testing result. The extreme condition include overall temperature (0°C,+25°C,+40°C) and overall voltage (3.0V,3.3V,3.6V).

#### 3.1 IEEE 802.11g/a Section:

Items	Contents					
Specification	IEEE802.11g&IEEE802.11a					
Mode	BPSK, QPSK, 16QAM, 64QAM and OFDM					
Channel	CH1 to CH13 @ 11g CH36 to CH165 @ 11a					
Data rate	6, 9, 12, 18, 24, 36, 48, 54Mbps					
TX Characteristics		Min.	Typ.	Max.	Unit	Remark
1. Power Levels						
1) 15dBm Target (For Each antenna port) @ 11g 54Mbps		13	15	18	dBm	
2) 15dBm Target (For Each antenna port) @ 11a 54Mbps		13	15	18	dBm	
2. Spectrum Mask @ Target Power						
1) at fc +/-11MHz		-	-	-20	dBr	
2) at fc +/-20MHz		-	-	-28	dBr	
3) at fc > +/-30MHz		-	-	-40	dBr	
3. Constellation Error(EVM) @ Target Power						
1) 6Mbps		-	-	-5	dB	
2) 9Mbps		-	-	-8	dB	
3) 12Mbps		-	-	-10	dB	
4) 18Mbps		-	-	-13	dB	
5) 24Mbps		-	-	-16	dB	
6) 36Mbps		-	-	-19	dB	
7) 48Mbps		-	-	-22	dB	
8) 54Mbps		-	-27	-25	dB	
4. Frequency Error						
1) IEEE802.11g/a		-10		10	ppm	
RX Characteristics		Min.	Typ.	Max.	Unit	
5. Minimum Input Level Sensitivity(each chain)						
1) 6Mbps (PER $\leq$ 10%)		-		-82	dBm	
2) 9Mbps (PER $\leq$ 10%)		-		-81	dBm	
3) 12Mbps (PER $\leq$ 10%)		-		-79	dBm	
4) 18Mbps (PER $\leq$ 10%)		-		-77	dBm	
5) 24Mbps (PER $\leq$ 10%)		-		-74	dBm	
6) 36Mbps (PER $\leq$ 10%)		-		-70	dBm	
7) 48Mbps (PER $\leq$ 10%)		-		-66	dBm	
8) 54Mbps (PER $\leq$ 10%)		-		-65	dBm	
6. Maximum Input Level (PER $\leq$ 10%)						
1) IEEE802.11g/a		-20	-5	-	dBm	

## 3.2 IEEE 802.11b Section:

Items	Contents				
Specification	IEEE802.11b				
Mode	DBPSK, DQPSK and CCK and DSSS				
Channel	CH1 to CH13				
Data rate	1, 2, 5.5, 11Mbps				
TX Characteristics	Min.	Typ.	Max.	Unit	Remark
1. Power Levels(Calibrated)					
1) 17dBm Target (For Each antenna port) @1Mbps~11Mbps	14	17	20	dBm	
2. Spectrum Mask @ Target Power					
1) fc +/-11MHz to +/-22MHz	-	-	-30	dBr	
2) fc > +/-22MHz	-	-	-50	dBr	
3. Constellation Error(EVM) @ Target Power					
1) 1Mbps	-		-10	dB	
2) 2Mbps	-		-10	dB	
3) 5.5Mbps	-		-10	dB	
4) 11Mbps	-	-20	-10	dB	
4. Frequency Error	-10	-	10	ppm	
RX Characteristics	Min.	Typ.	Max.	Unit	
5. Minimum Input Level Sensitivity(each chain)					
1) 1Mbps (FER $\leq$ 8%)	-		-76	dBm	
2) 2Mbps (FER $\leq$ 8%)	-		-76	dBm	
3) 5.5Mbps (FER $\leq$ 8%)	-		-76	dBm	
4) 11Mbps (FER $\leq$ 8%)	-		-76	dBm	
6. Maximum Input Level (FER $\leq$ 8%)	-10	-5	-	dBm	

## 3.3 IEEE 802.11n HT20 Section:

Items	Contents				
Specification	IEEE802.11n HT20 @ 2.4G/5G				
Mode	BPSK, QPSK, 16QAM, 64QAM and OFDM				
Channel	CH1 to CH13 @ 2.4G CH36 to CH165 @ 5G				
Data rate (MCS index)	MCS0/1/2/3/4/5/6/7/8/9/10/11/12/13/14/15				
TX Characteristics	Min.	Typ.	Max.	Unit	Remark
1. Power Levels					
1) 14dBm Target (For Each antenna port) @ 2.4G MCS7	12	14	18	dBm	
2) 14dBm Target (For Each antenna port) @ 5G MCS7	12	14	18	dBm	
2. Spectrum Mask @ Target Power					
1) at fc +/-11MHz	-	-	-20	dBr	
2) at fc +/-20MHz	-	-	-28	dBr	
3) at fc > +/-30MHz	-	-	-45	dBr	
3. Constellation Error(EVM) @ Target Power					
1) MCS0	-	-	-5	dB	
2) MCS1	-	-	-10	dB	
3) MCS2	-	-	-13	dB	
4) MCS3	-	-	-16	dB	
5) MCS4	-	-	-19	dB	
6) MCS5	-	-	-22	dB	
7) MCS6	-	-	-25	dB	
8) MCS7	-	-28	-27	dB	
4. Frequency Error					
1) IEEE802.11n HT20 @ 2.4G/5G	-10	-	10	ppm	
RX Characteristics	Min.	Typ.	Max.	Unit	
5. Minimum Input Level Sensitivity(each chain)					
1) MCS0 (PER $\leq$ 10%)	-	-	-82	dBm	
2) MCS1 (PER $\leq$ 10%)	-	-	-79	dBm	
3) MCS2 (PER $\leq$ 10%)	-	-	-77	dBm	
4) MCS3 (PER $\leq$ 10%)	-	-	-74	dBm	
5) MCS4 (PER $\leq$ 10%)	-	-	-70	dBm	
6) MCS5 (PER $\leq$ 10%)	-	-	-66	dBm	
7) MCS6 (PER $\leq$ 10%)	-	-	-65	dBm	
8) MCS7 (PER $\leq$ 10%)	-	-	-64	dBm	
6. Maximum Input Level (PER $\leq$ 10%)					
1) IEEE802.11n HT20 @ 2.4G/5G	-20	-6	-	dBm	

## 3.4 IEEE 802.11n HT40 Section:

Items	Contents				
Specification	IEEE802.11n HT40 @ 2.4G/5G				
Mode	BPSK, QPSK, 16QAM, 64QAM and OFDM				
Channel	CH3 to CH11 @ 2.4G CH38 to CH159 @ 5G				
Data rate (MCS index)	MCS0/1/2/3/4/5/6/7/8/9/10/11/12/13/14/15				
TX Characteristics	Min.	Typ.	Max.	Unit	Remark
1. Power Levels					
1) 14dBm Target (For Each antenna port) @ 2.4G MCS7	12	14	18	dBm	
2) 14dBm Target (For Each antenna port) @ 5G MCS7	12	14	18	dBm	
2. Spectrum Mask @ Target Power					
1) at fc +/-11MHz	-	-	-20	dBr	
2) at fc +/-20MHz	-	-	-28	dBr	
3) at fc > +/-30MHz	-	-	-45	dBr	
3. Constellation Error(EVM) @ Target Power					
1) MCS0	-		-5	dB	
2) MCS1	-		-10	dB	
3) MCS2	-		-13	dB	
4) MCS3	-		-16	dB	
5) MCS4	-		-19	dB	
6) MCS5	-	-	-22	dB	
7) MCS6	-	-	-25	dB	
8) MCS7	-	-30	-28	dB	
4. Frequency Error					
1) IEEE802.11n HT40 @ 2.4G	-10	-	10	ppm	
RX Characteristics	Min.	Typ.	Max.	Unit	
5. Minimum Input Level Sensitivity(each chain)					
1) MCS0 (PER $\leq$ 10%)	-		-79	dBm	
2) MCS1 (PER $\leq$ 10%)	-		-76	dBm	
3) MCS2 (PER $\leq$ 10%)	-		-74	dBm	
4) MCS3 (PER $\leq$ 10%)	-		-71	dBm	
5) MCS4 (PER $\leq$ 10%)	-		-67	dBm	
6) MCS5 (PER $\leq$ 10%)	-		-63	dBm	
7) MCS6 (PER $\leq$ 10%)	-		-62	dBm	
8) MCS7 (PER $\leq$ 10%)	-		-61	dBm	
6. Maximum Input Level (PER $\leq$ 10%)					
1) IEEE802.11n HT40 @ 2.4G/5G	-20	-6	-	dBm	

## 3.5 IEEE 802.11 ac Section:

Items	Contents				
Specification	IEEE802.11ac @ 5G				
Mode	BPSK, QPSK, 16QAM, 64QAM, 256QAM and OFDM				
Channel	CH36 to CH165 @ VHT-20 CH38 to CH159 @ VHT-40 CH42 to CH155 @ VHT-80				
Data rate (MCS index)	MCS0/1/2/3/4/5/6/7/8/9/10/11/12/13/14/15				
TX Characteristics	Min.	Typ.	Max.	Unit	Remark
1. Power Levels					
1) 13dBm Target (For Each antenna port) @ MCS9	10	12	18	dBm	
2. Spectrum Mask @ Target Power					
1) at fc +/-11MHz			-20	dBr	
2) at fc +/-20MHz			-28	dBr	
3) at fc > +/-30MHz			-45	dBr	
3. Constellation Error(EVM) @ Target Power					
1) MCS0			-5	dB	
2) MCS1			-10	dB	
3) MCS2			-13	dB	
4) MCS3			-16	dB	
5) MCS4			-19	dB	
6) MCS5			-22	dB	
7) MCS6			-25	dB	
8) MCS7			-27	dB	
9) MCS8			-30		
10) MCS9		-32	-32		
4. Frequency Error					
1) IEEE802.11ac	-10		10	ppm	
RX Characteristics	Max.			Unit	
5. Minimum Input Level Sensitivity(each chain)	VHT20	VHT40	VHT80		
1) MCS0 (PER $\leq$ 10%)	-82	-79	-76	dBm	
2) MCS1 (PER $\leq$ 10%)	-79	-76	-73	dBm	
3) MCS2 (PER $\leq$ 10%)	-77	-74	-71	dBm	
4) MCS3 (PER $\leq$ 10%)	-74	-71	-68	dBm	
5) MCS4 (PER $\leq$ 10%)	-70	-67	-64	dBm	
6) MCS5 (PER $\leq$ 10%)	-66	-63	-60	dBm	
7) MCS6 (PER $\leq$ 10%)	-65	-62	-59	dBm	
8) MCS7 (PER $\leq$ 10%)	-64	-61	-58	dBm	
9) MCS8 (PER $\leq$ 10%)	-59	-56	-53		
10) MCS9 (PER $\leq$ 10%)		-54	-51		
6. Maximum Input Level (PER $\leq$ 10%)					
1) IEEE802.11ac	-30		-	dBm	

### 3.6 Bluetooth Section:

#### 3.6.1 BR Specification

Items	Contents				
Host Interface	SDIO				
Antenna Reference	Small antennas with 0~2 dBi peak gain				
Channel	CH0 to CH78				
Modulation	GFSK				
	Min.	Typ.	Max.	Unit	
TX Characteristics					
1.Output Average Power	-6	10	20	dBm	
2.Modulation Characteristics					
1)Delta f1(Avg)		157		kHz	
2)Delta f2max(For at least 99.9% of all Delta f2max)		121		kHz	
3)Delta f2/ Delta f1		0.85		kHz	
3.Initial Carrier Frequency Tolerance		+/-20	-	kHz	
4. Carrier Frequency Drift					
1) One Slot packet drift (DH1)		+/-15		kHz	
2) Three Slot packet drift (DH3)		+/-15		kHz	
3) Five Slot packet drift (DH5)		+/-15		kHz	
4) Max Drift Rate		+/-15		kHz/50us	
RX Characteristics					
1. Receiver Sensitivity (BER<0.1%)		-91		dBm	
2. Maximum usable signal (BER<0.1%)		-5		dBm	

## 3.6.2 EDR Specification

Items	Contents				
Host Interface	SDIO				
Antenna Reference	Small antennas with 0~2 dBi peak gain				
Channel	CH0 to CH78				
Modulation	$\pi/4$ -DQPSK 、 8PSK				
	Min.	Typ.	Max.	Unit	
TX Characteristics					
1. Relative Transmit Power					
1) $\pi/4$ -DQPSK		-1.5		dBm	
2) 8PSK		-1.5		dBm	
2. Frequency Stability					
1) Omega-i		+/-4		kHz	
2) Omega-0		+/-4	-	kHz	
3) Omega-0 + Omega-i		+/-4			
3. Modulation Accuracy					
1) RMS DEVM					
$\pi/4$ -DQPSK		+/-9		%	
8PSK		+/-9		%	
2) Peak DEVM					
$\pi/4$ -DQPSK		+/-28		%	
8PSK		+/-21		%	
3) 99% DEVM					
$\pi/4$ -DQPSK		+/-15		%	
8PSK		+/-12		%	
RX Characteristics					
1. Receiver Sensitivity (BER<0.01%)					
1) $\pi/4$ -DQPSK		-91		dBm	
2) 8PSK		-85		dBm	
2. Maximum usable signal (BER<0.1%)					
1) $\pi/4$ -DQPSK		-5		dBm	
2) 8PSK		-5		dBm	

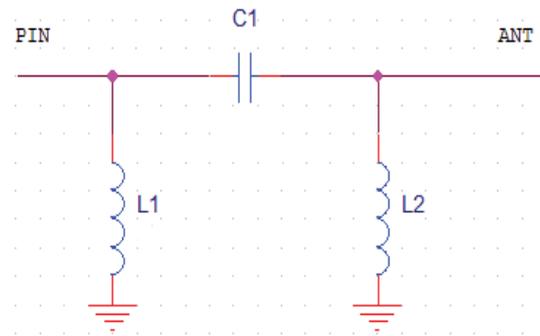
### 3.6.3 LE Specification

Items	Contents				
Host Interface	SDIO				
Antenna Reference	Small antennas with 0~2 dBi peak gain				
Channel	CH0 to CH39				
	Min.	Typ.	Max.	Unit	
TX Characteristics					
1. Output power at NOC		4		dBm	
2. Modulation Characteristics					
1)Delta f1(Avg)	225		275	kHz	
2)Delta f2max(For at least 99.9% of all Delta f2max)	185			kHz	
3)Delta f2/ Delta f1	0.8	0.94		Hz/Hz	
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. In-band Spurious Emissions					
1) +/-2M offset			20	dBm	
2) > +/-3MHz offset			30	dBm	
RX Characteristics					
1. Receiver Sensitivity (BER<30.8%)		-91		dBm	
2. Maximum usable signal (BER<30.8%)		-5		dBm	

## 4. Conditions of use

4.1 Please keep the antenna away from metal and horn interference sources.

4.2 The BT RF, ANT0 and ANT1 Pin connect to antenna, please refer to design demand



a). The module and antenna shall be far away from the interference source, and the module ground and antenna ground shall be integrated.

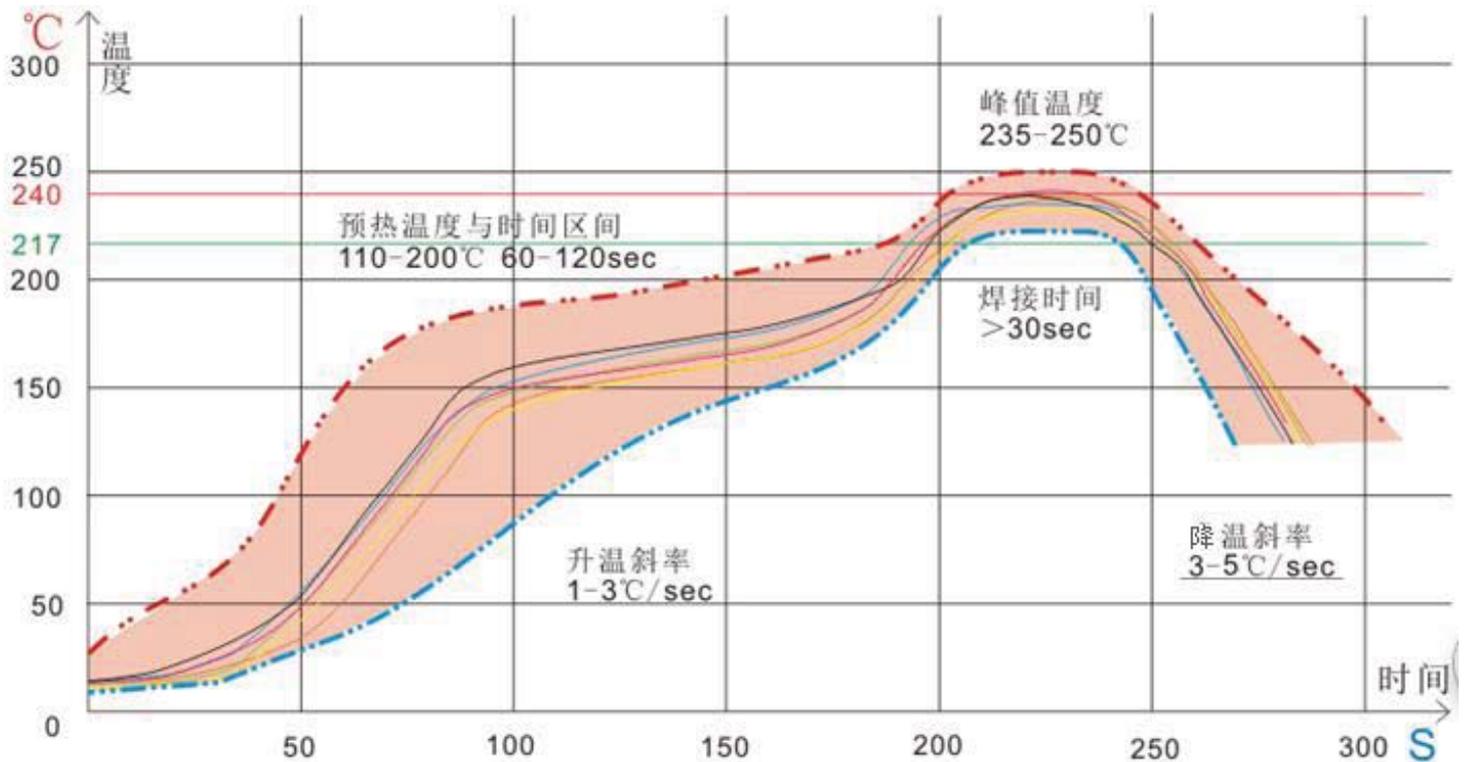
b). Pin2 is the RF interface of WiFi module. The coplanar impedance between Pin2 and antenna is required to be 50Ω. It is recommended to use arc and straight line with the length as short as possible.

c). L1, L2 and C1 form a π type matching network and are close to the antenna interface design, which is adjusted according to the actual measurement effect of antenna recommendation and typesetting design.

## 5. Software Requirements

The driver supports the following operating systems: Android.  
Mfg. software tool is Pandora and Simba.

## 6. Reflow Standard Condition



Heating zone: temperature:  $< 150\text{ }^{\circ}\text{C}$ , time: between 60 and 90 seconds, the slope is controlled between  $1 \sim 3\text{ }^{\circ}\text{C} / \text{S}$ .

Preheating constant temperature zone: temperature:  $150\text{ }^{\circ}\text{C} \sim 200\text{ }^{\circ}\text{C}$ , time: between 60-120 seconds, slope between 0.3-0.8.

Reflow soldering area: peak temperature  $235\text{ }^{\circ}\text{C} \sim 250\text{ }^{\circ}\text{C}$  (recommended peak temperature  $< 245\text{ }^{\circ}\text{C}$ ), time 30-70 seconds.

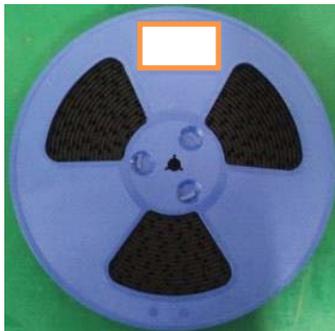
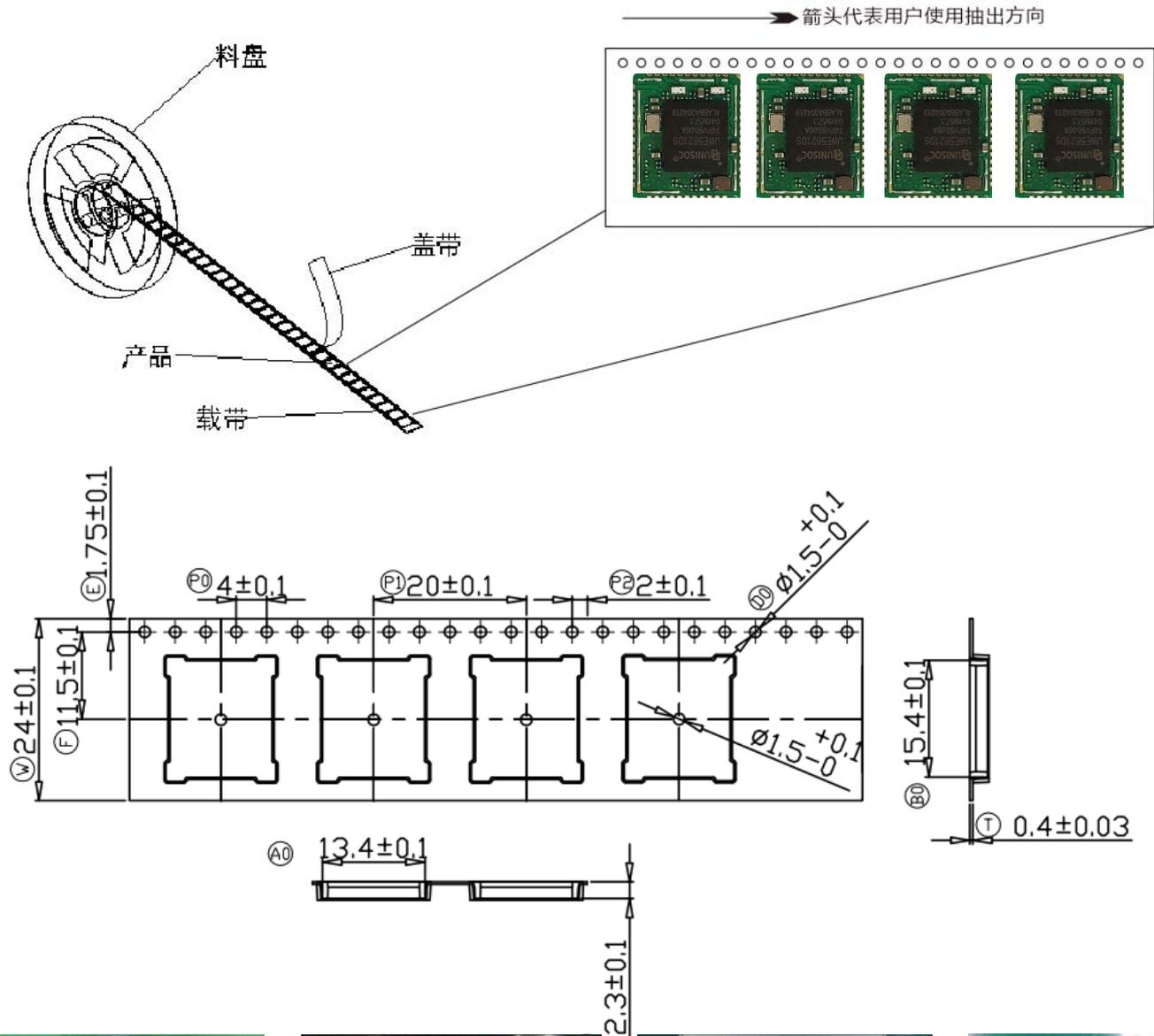
Cold area: temperature:  $217\text{ }^{\circ}\text{C} \sim 170\text{ }^{\circ}\text{C}$ , slope between  $3 \sim 5\text{ }^{\circ}\text{C} / \text{S}$ .

The solder is lead-free solder in tin-silver copper alloys/Sn&Ag&Cu Lead-free solder (SAC305).

## 7. Waste disposal

The disposal of our products shall comply with local/superior region/national/international applicable laws and regulations.

### 8. Package



## 9. FCC Statement

### FCC regulatory compliance 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.

Warning: changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This Module complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

#### Labelling Instruction for Host Product Integrator

Please notice that if the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains FCC ID: **2AOKI-O** )" any similar wording that expresses the same meaning may be used.

#### Installation Notice to Host Product Manufacturer

The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module. The module is limited to installation in mobile application, a separate approval is required for all other operating configurations, including portable configurations with respect to §2.1093 and difference antenna configurations.

#### Antenna Change Notice to Host manufacturer

If you desire to increase antenna gain and either change antenna type or use same antenna type certified, a Class II permissive change application is required to be filed by us, or you (host manufacturer) can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

#### FCC other Parts, Part 15B Compliance Requirements for Host product manufacturer

This modular transmitter is only FCC authorized for the specific rule parts listed on our grant, 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.

Host manufacturer in any case shall ensure host product which is installed and operating with the module is in compliant with Part 15B requirements.

*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.

## 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.

**Explanation:** this module meets all the requirements of FCC part 15 -247&FCC Part 15, Subpart E (15.407)

## 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 no have permanently attached antenna , The test antenna gain is 2.4G: 3.46 dBi, 5G: 3.37dBi. The use condition of the prototype is mobile . Use conditions mainly for advertising machines and HDTV colar .

## 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:** this module is 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.

**Explanation:** NO. this module without trace antenna designs.

## 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 module is designed to comply with the FCC statement, fcc id is:2AOKI-5621D

## 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 “omnidirectional 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:** This module use External rubber antenna.

External Antenna:3.46dBi Gain for 2400MHz ~ 2500MHz

External Antenna,3.37dBi Gain for 5180MHz ~ 5240MHz

External Antenna,3.37dBi Gain for 5260MHz ~ 5320MHz

External Antenna, 3.37dBi Gain for 5500MHz ~ 5700MHz

## 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:**compliance (FCC ID lable in the manual ) .

## 2.9 Information on test modes and additional testing requirements<sup>5</sup>

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:** Data transfer module demo board can control the EUT work in RF test mode at specified test channel.

## 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 circuitry), 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 circuitry, so the module do not require an evaluation by FCC part15 subpart B. The host should be evaluated by the FCC subpart B.