

四川爱联

秘密级别：公 开
生效时间：2021 年 08 月 24 日
保密期限：10 年

WF-M38B-UWG1

IEEE 802.11a/b/g/n 2T2R USB WiFi Module
Integrated Bluetooth 2.1+EDR/4.2/5.0



特性 Features:

- 接收制式 Reserving System
IEEE Std. 802.11a
IEEE Std. 802.11b
IEEE Std. 802.11g
IEEE Std. 802.11n
Bluetooth 2.1+EDR/4.2/5.0
- 芯片方案 Chip Solution
Mediatek MT7638BUN
- 结构大小 Size
40.0mmx 35mm x 3.2mm

型号预览 Model Overview:

型号	安装方式	支持标准	速率	频段	天线接口	备注
WF-M38B-UWG1	螺钉	IEEE 802.11a/b/g/n	300Mbps	2.4G/5G	内置天线+IPEX	5V 供电
		Bluetooth2.1+EDR/4.2/5.0	3Mbps	2.4G		

四川爱联科技股份有限公司

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经确认，我方承认该规格书

We accept the specification after Confirmed

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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.

批准 Approved	审核 Checked	拟制 Designed	产品 Product	无线模块 WiFi Module
陈进	范西君	刘婧爽	型号 Model	WF-M38B-UWG1
			日期 Date	2021-08-25

更改记录 Record of Modification

序号 No	更改日期 Date of modification	主要更改内容 Main content of modification	更改原因 Reason of modification	更改通知编号 Serial number of modification	确认 Confirm
1	2020/9/21	首次承认			刘婧爽
2	2020/12/03	1、变更产品尺寸 2、更新公司名称 3、添加环保标识，废弃处置			刘婧爽
3	2021/01/12	更新产品镭雕图			刘婧爽
4	2021/06/18	添加包装信息			刘婧爽
5	2021/08/24	正式存档			刘婧爽

1. Introduction

WF-M38B-UWG1 module design is based on Mediatek MT7638BUN solution, The MT7638BUN is a highly integrated single chip which has built in a 2x2 dual-band wireless LAN radio and Bluetooth radio. It includes Bluetooth EDR and LE radio which complies with Bluetooth v2.1+EDR, v4.2, and v5.0. The Module is a highly integrated MAC/BBP and 2.4/5GHz PA/LNA single chip which supports a 300Mbps PHY rate. The Module is designed to support standard-based features in the areas of security, quality of service, and international regulations, giving end users the greatest performance anytime and in any circumstance. This documentation describes the engineering requirements specification.

1.1 RF module Overview

The general HW architecture for the module is shown in Figure 1. This WLAN Module design is based on Mediatek MT7638BUN. It is a highly integrated single-chip MIMO(Multiple In Multiple Out) Wireless LAN (WLAN) network interface controller complying with the 802.11 specification and Bluetooth over USB interface. It combines a MAC, a 2T2R capable baseband, and RF in a single chip. An intelligent Wi-Fi/Bluetooth coexistence algorithm is implemented to provide the best harmonized Wi-Fi and Bluetooth radio performance.

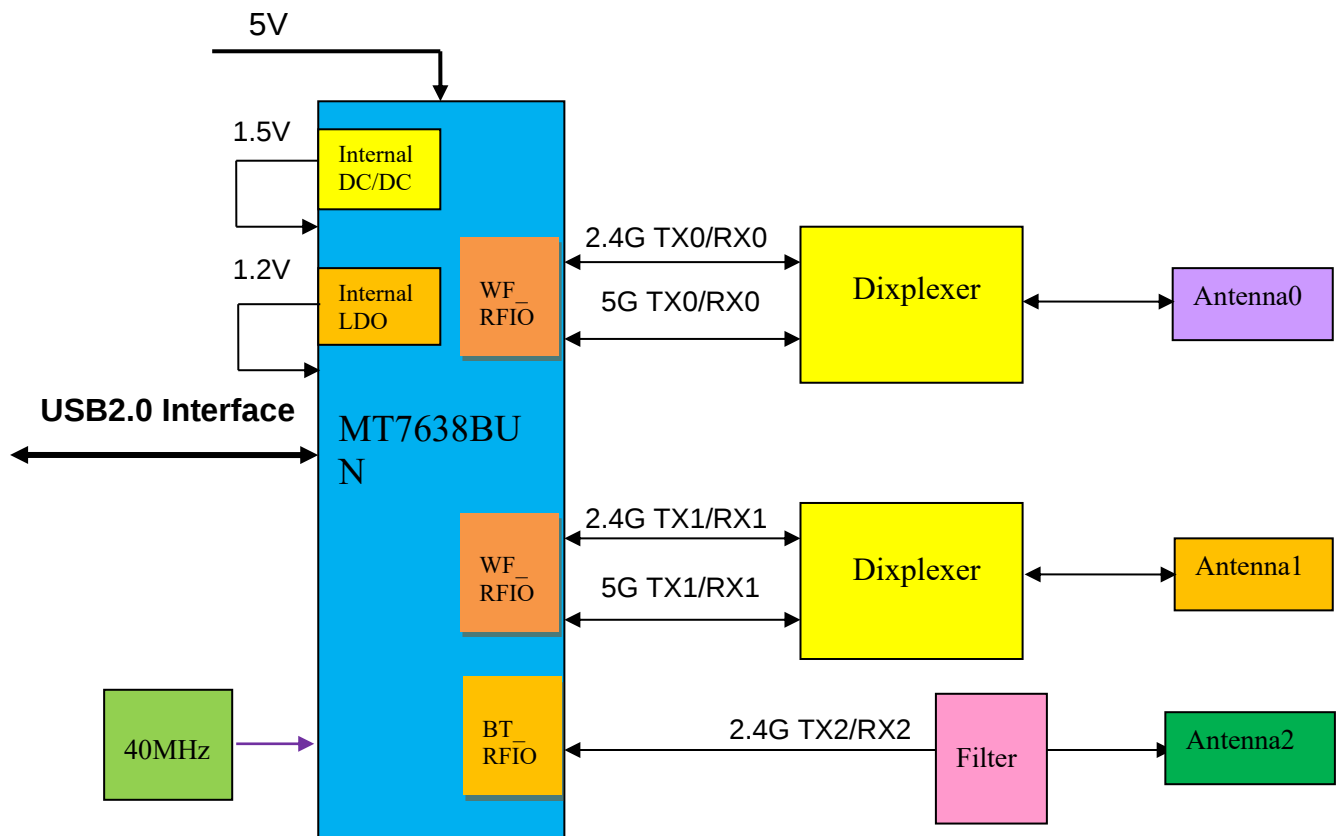


Figure 1 WF-M38B-UWG1 Block Diagram

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
- _ Bluetooth 2.1+EDR/4.2/5.0

1.3 System Functions

Table1: General Specification as below:

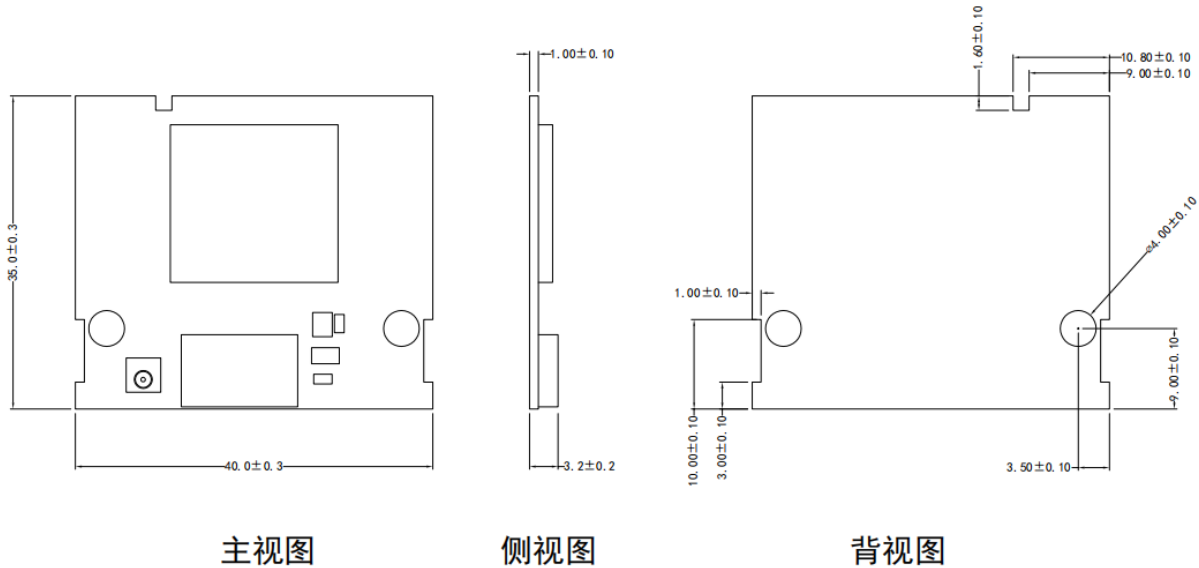
Main Chipset	Mediatek MT7638BUN
Operating Frequency	2.4G/5G
WiFi Standard	802.11a/b/g/n (2x2)
Bluetooth	2.1+EDR/4.2/5.0
Modulation	WIFI:11b: DBPSK, DQPSK and CCK and DSSS 11a/g: BPSK, QPSK, 16QAM, 64QAM and OFDM 11n: BPSK, QPSK, 16QAM, 64QAM and OFDM BT: FHSS,GFSK,DPSK,DQPSK
Data rates	11b: 1, 2, 5.5 and 11Mbps 11a/g: 6, 9, 12, 18, 24, 36, 48 and 54 Mbps 11n: MCS0~15, up to 300Mbps
Form factor	9pins ,
Host Interface	USB 2.0
PCB Stack	4-layers design
Dimension	Typical 40.0mmx 35mm x 3.2mm
Antenna	WIFI Internal/BT external Antennas Design
Operation Temperature	0℃ to +70℃
Storage Temperature	-15℃ to +45℃
Operation Voltage	5V +/-10%

2. Mechanical Specification

2.1 Mechanical Outline Drawing

Typical Dimension (W x L): 40.0mmx 35mm x 3.2mm

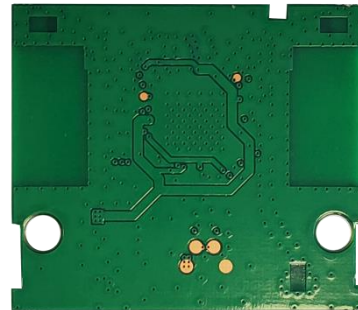
General tolerance: $\pm 0.3\text{mm}$



2.2 Product Picture



TOP VIEW

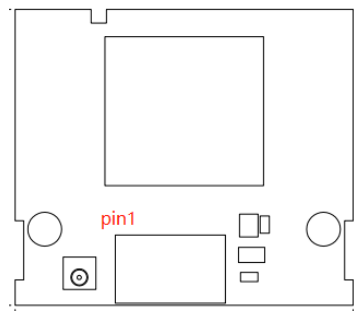


BOTTOM VIEW

PCB 丝印说明:

BOT 丝印为 PCB 厂家管控字符;

2.3 Pin define



Pin	定义	描述
1	RST	Reset
2	WIFI_WAKE	WIFI Wake up
3	GND	Ground connections
4	DP	USB positive differential data lines
5	DM	USB negative differential data lines
6	GND	Ground connections
7	BT_WAKE	BT Wake up
8	+5V	Power supply 5.0V is required
9	+5V	Power supply 5.0V is required

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 CH11 @ 11g CH36,CH40,CH44,CH48 CH52,CH56,CH60,CH64,CH100,CH104,CH108,CH112, CH116,CH120,CH124,CH128,CH132,CH136,CH140, CH149,CH153.CH157,CH161,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/6Mbps~54Mbps	13	15	17	dBm	
2) 14dBm Target (For Each antenna port) @ 11a/6Mbps~54Mbps	12	14	16	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	-	-	-25	dB	
4. Frequency Error					
1) IEEE802.11g	-25	-	25	ppm	
2) IEEE802.11a	-30		30	ppm	
RX Characteristics	Min.	Typ.	Max.	Unit	
5. Minimum Input Level Sensitivity(each chain)					
1) 6Mbps (PER ≤ 10%)	-	-	-82	dBm	
2) 9Mbps (PER ≤ 10%)	-	-	-81	dBm	
3) 12Mbps (PER ≤ 10%)	-	-	-79	dBm	
4) 18Mbps (PER ≤ 10%)	-	-	-77	dBm	
5) 24Mbps (PER ≤ 10%)	-	-	-74	dBm	
6) 36Mbps (PER ≤ 10%)	-	-	-70	dBm	
7) 48Mbps (PER ≤ 10%)	-	-	-66	dBm	
8) 54Mbps (PER ≤ 10%)	-	-	-65	dBm	
6. Maximum Input Level (PER ≤ 10%)					
1) IEEE802.11g	-20	-	-	dBm	
2) IEEE802.11a	-30			dBm	

3.2 IEEE 802.11b Section:

Items	Contents				
Specification	IEEE802.11b				
Mode	DBPSK, DQPSK and CCK and DSSS				
Channel	CH1 to CH11				
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	15	17	19	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	-25	-	25	ppm	
RX Characteristics	Min.	Typ.	Max.	Unit	
5. Minimum Input Level Sensitivity(each chain)					
1) 1Mbps (FER $\leq$ 8%)	-	-83	-76	dBm	
2) 2Mbps (FER $\leq$ 8%)	-	-80	-76	dBm	
3) 5.5Mbps (FER $\leq$ 8%)	-	-79	-76	dBm	
4) 11Mbps (FER $\leq$ 8%)	-	-76	-76	dBm	
6. Maximum Input Level (FER $\leq$ 8%)	-10	-	-	dBm	

3.3 IEEE 802.11n HT20 Section:

Items	Contents				
Specification	IEEE802.11n HT20 @ 2.4G IEEE802.11n HT20 @ 5G				
Mode	BPSK, QPSK, 16QAM, 64QAM and OFDM				
Channel	CH1to CH11 @ 2.4G CH36,CH40,CH44,CH48 CH52,CH56,CH60,CH64,CH100,CH104,CH108,CH112, CH116,CH120,CH124,CH128,CH132,CH136,CH140, CH149,CH153,CH157,CH161,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/MCS0~MCS7	12	14	16	dBm	
2) 13dBm Target (For Each antenna port) @ 5G/MCS0~MCS7	11	13	15	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	dB	
4. Frequency Error					
1) IEEE802.11n HT20 @ 2.4G	-25	-	25	ppm	
2) IEEE802.11n HT20 @ 5G	-20	-	20	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	-20	-	-	dBm	
2) IEEE802.11n HT20 @ 5G	-30	-	-	dBm	

3.4 IEEE 802.11n HT40 Section:

Items	Contents				
Specification	IEEE802.11n HT40 @ 2.4G IEEE802.11n HT40 @ 5G				
Mode	BPSK, QPSK, 16QAM, 64QAM and OFDM				
Channel	CH3to CH9 @ 2.4G CH38,CH46,CH54,CH62,CH102,CH110,CH118,CH126, CH134,CH151,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 (Calibrated)					
1) 14dBm Target (For Each antenna port) @ 2.4G/MCS0~MCS7	12	14	16	dBm	
2) 13dBm Target (For Each antenna port) @ 5G/MCS0~MCS7	11	13	15	dBm	
2. Spectrum Mask @ Target Power					
1) at fc +/-21MHz	-	-	-20	dBr	
2) at fc +/-40MHz	-	-	-28	dBr	
3) at fc > +/-60MHz	-	-	-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	dB	
4. Frequency Error					
1) IEEE802.11n HT20 @ 2.4G	-25	-	25	ppm	
2) IEEE802.11n HT20 @ 5G	-20	-	20	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 HT20 @ 2.4G	-20	-	-	dBm	
2) IEEE802.11n HT20 @ 5G	-30	-	-	dBm	

3.6 Bluetooth Section:

Items	Contents				
Specification	BT2.1+EDR/4.2/5.0				
Mode	FHSS,GFSK,DPSK,DQPSK				
Number of Channel	79 Channels				
Frequency Band	2.402 GHz ~2.480GHz				
	Min.	Typ.	Max.	Unit	Remark
1. Output Power	4	7	10	dBm	
2. Gain step	2	4	8	dB	
3. Receiver sensitivity (BER $\leq$ 0.1%)	-	-93.5	-80	dBm	
4. Maximum usable signal (BER $\leq$ 0.1%)	-	-5	-		
5. C/I co-channel (BER<0.1%)	-	4	11	dB	
6. C/I 1MHz (BER<0.1%)	-	-14	0	dB	
7. C/I 2MHz (BER<0.1%)	-	-42	-30	dB	
8. C/I $\geq$ 3MHz (BER<0.1%)	-	-49	-40	dB	
9. C/I Image channel (BER<0.1%)	-	-25	-9	dB	
10. C/I Image 1MHz (BER<0.1%)	-	-50	-20	dB	
11. Inter-modulation	-	-13	-	dB	
12. Out-of-band blocking					
1). 30MHz to 2000MHz	-10	-	-	dBm	
2). 2000MHz to 2399MHz	-27	-	-	dBm	
3). 2498MHz to 3000MHz	-27	-	-	dBm	
4). 3000MHz to 12.75GHz	-10	-	-	dBm	
13. Modulation characteristics					
1). Δf_{1avg}	140	157	175	KHz	
2). Δf_{2max} (For at least 99.9% of all Δf_{2max})	115	140	-	KHz	
3). $\Delta f_{1avg} / \Delta f_{2avg}$	0.8	0.98	-	KHz	
14. ICFT	-75	± 20	+75	KHz	
15. Carrier frequency drift					
1). One slot packet (DH1)	-25	± 15	+25	KHz	
2). Two slot packet (DH3)	-40	± 15	+40	KHz	
3). Five slot packet (DH5)	-40	± 15	+40	KHz	
4). Max drift rate	-	6	20	KHz/50us	
16. TX output spectrum(20dB bandwidth)	-	922	1000	KHz	
17. In-Band spurious emission					
1). ± 2 MHz offset	-	-45	-20	dBm	
2). ± 3 MHz offset	-	-48	-40	dBm	
3). $> \pm 3$ MHz offset	-	-48	-40	dBm	

4. Current consumption

4.1 WLAN current consumption

Description	Average current (mA)
Sleep mode, radio off	1.5
2.4GHz RX power saving, DTIM=1	3.3
2.4GHz RX active, HT20, MCS15	144
2.4GHz TX CCK, 11Mbps@21dBm	403
2.4GHz TX HT20, MCS15 @17.5dBm	496
2.4GHz TX HT20, MCS8 @18dBm	520
5GHz VHT80 RX listen, 2RX	152
5GHz RX active, HT40, MCS15	191
5GHz TX HT40, MCS15 @ 15.5dBm	698
5GHz TX HT40, MCS0@ 16.5dBm,2TX	723

4.2 Bluetooth current consumption

Description	Average current (mA)
Sleep mode, radio off	1.5
Bluetooth TX@9dBm	42
Bluetooth RX	21
Bluetooth SCO connection, HV3 packets + sniff mode + scan (page scan interval=1.28sec, inquiry scan interval=2.56s, sniff interval=500ms)	21
Bluetooth page scan + inquiry scan (page scan interval=1.28sec, inquiry scan interval=2.56s)	1.7
Bluetooth page scan (page scan interval=1.28sec)	1.6

Note:

- 1、 All result is measured provided VDD33 is 3.3V. Tx power is measured at antenna port. Temperature is 25℃.
- 2、 Host interface is USB2.0
- 3、 Duty cycle for TX/RX measurement is 100%
- 4、 The chip variation is +/-15%

5. Software Requirements

The driver supports the following operating systems: Linux, Microsoft Windows XP, Vista and Win7.
Mfg. software tool is MT7638BUN_QA_Tool.

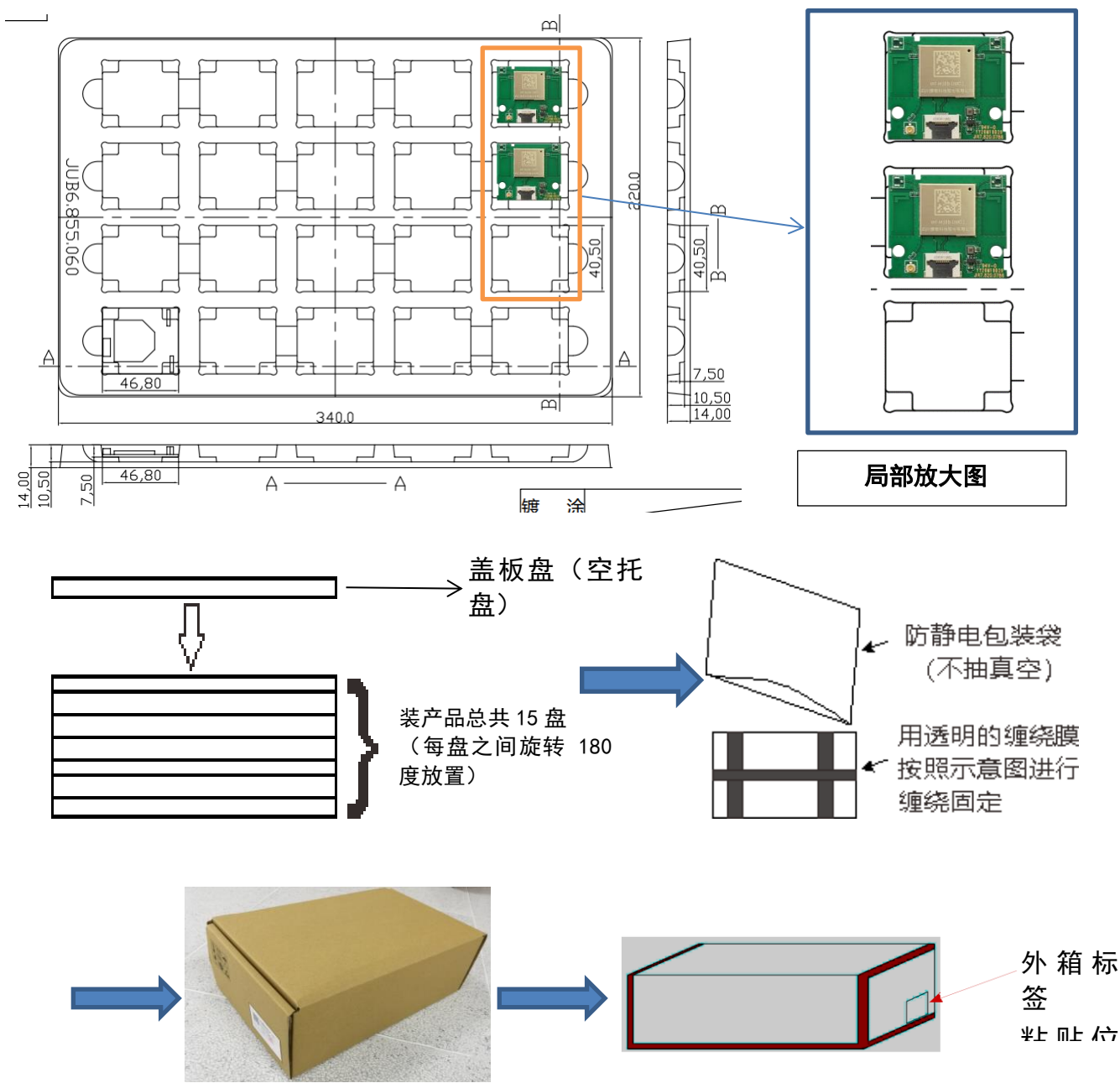
6. Key component List

序号	关键件名称	型号	规格/材料	生产者	备注
1	集成电路	MT7638BUN	QFN	MTK	
2	PCB	JUI7.820.0786系列	FR-4,4LAY	顺络 英创力 科翔	
3	晶体振荡器	SMD3225-40M	40M	晶威特 Hosonic 加高 TXC 东晶 泰晶	

7. Antenna specification

NO.	Type	Antenna Project Code	Gain	Part No.
1	External	PIFA Antenna	2.32 dBi(@2.4 ~ 2.5 GHz) 4.13 dBi(@5.15 ~ 5.85 GHz)	TX-DM50@1000BD113B63M
2	External	PIFA Antenna	1.72 dBi(@2.4 ~ 2.5 GHz) 2.57 dBi(@5.15 ~ 5.85 GHz)	SLK-T3010-L-XI-B

8. Packaging Information:



- a) 产品放置方向、标签粘贴位置、包装按示意图进行；
- b) 包装内放入2包2g干燥剂和一张湿度卡；
- c) 产品数量每层20只，上层放一个空托盘，每箱300只/箱；
- d) 外箱尺寸：240mm*385mm*140mm；
- e) 其它未尽事宜按照客户包装要求执行。

废弃处置

本公司产品的废弃处置应该遵从当地/上级区域/国家/国际适用的法规

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- WFM38BUWG1**" 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.*

10. ISED Regulatory Compliance

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions: (1) This device may not cause interference. (2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) L'appareil ne doit pas produire de brouillage; (2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

Cet équipement est conforme aux limites d'exposition aux radiations IC CNR-102 établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec une distance minimale de 20cm entre le radiateur et votre corps.

Please notice that if the IC 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 IC: **23460- WFM38BUWG1**" any similar wording that expresses the same meaning may be used.

L'étiquette d'homologation d'un module d'Innovation, Sciences et Développement économique Canada devra être posée sur le produit hôte à un endroit bien en vue, en tout temps. En l'absence d'étiquette, le produit hôte doit porter une étiquette sur laquelle figure le numéro d'homologation du module d'Innovation, Sciences et Développement économique Canada, précédé du mot « contient », ou d'une formulation similaire allant dans le même sens et qui va comme suit : Contient IC: **23460- WFM38BUWG1** est le numéro d'homologation du module.

- i. the device for operation in the band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;
 - ii. for devices with detachable antenna(s), the maximum antenna gain permitted for devices in the bands 5250-5350 MHz and 5470-5725 MHz shall be such that the equipment still complies with the e.i.r.p. limit;
 - iii. for devices with detachable antenna(s), the maximum antenna gain permitted for devices in the band 5725-5850 MHz shall be such that the equipment still complies with the e.i.r.p. limits as appropriate; and
- i. le dispositif utilisé dans la bande 5150-5250 MHz est réservé à une utilisation en intérieur afin de réduire le risque de brouillage préjudiciable aux systèmes mobiles par satellite dans le même canal;
 - ii. pour les dispositifs à antenne (s) détachable (s), le gain d'antenne maximal autorisé pour les dispositifs dans les bandes 5250-5350 MHz et 5470-5725 MHz doit être tel que l'équipement soit toujours conforme à la norme e.i.r.p. limite;
 - iii. pour les dispositifs à antenne (s) détachable (s), le gain d'antenne maximal autorisé pour les dispositifs de la bande 5725-5850 MHz doit être tel que l'équipement soit toujours conforme à la norme e.i.r.p. les limites, le cas échéant; et