



WF-M63B-UWP1

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**
 - Mediatek MT7663BUN
- **Size**
 - 33mm x 70mm x 6.0mm



Model	Insertion type	support	rate	band	ANT	Input voltage
WF-M63B-UWP1	external	IEEE 802.11a/b/g/n/ac	866.7Mbps	2.4G/5G	Metal	5V
		Bluetooth2.1+EDR/4.2/5.1	3Mbps	2.4G		

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Feedback of customer's Confirmation

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Customer name		Customer signature		Confirmation Date
Please feed back this paper and first paper after your signature by the address,thanks!				
ADD: Anzhou,Industrial park,Mianyang,Sichuan				
Factory: Sichuan AI-Link Technology Co.,Ltd.				
Approved	Checked	Designed	Product	WiFi Module
Shuangpeng Ding	Xijun Fan	Jingshuang Liu	Model	WF-M63B-UWP1
			Date	2021-06-16

Record of Modification

No	Date of modification	Main content of modification	Reason of modification	Serial number of modification	Confirm
0.1	2021/05/14	formal release			Jingshuang Liu

1. Introduction

WF-M63B-UWP1 module design is based on Mediatek MT7663BUN solution, The MT7663BUN 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 v5.1. The Module is a highly integrated MAC/BBP and 2.4/5GHz PA/LNA single chip which supports a 866.7Mbps 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 MT7663BUN. 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.

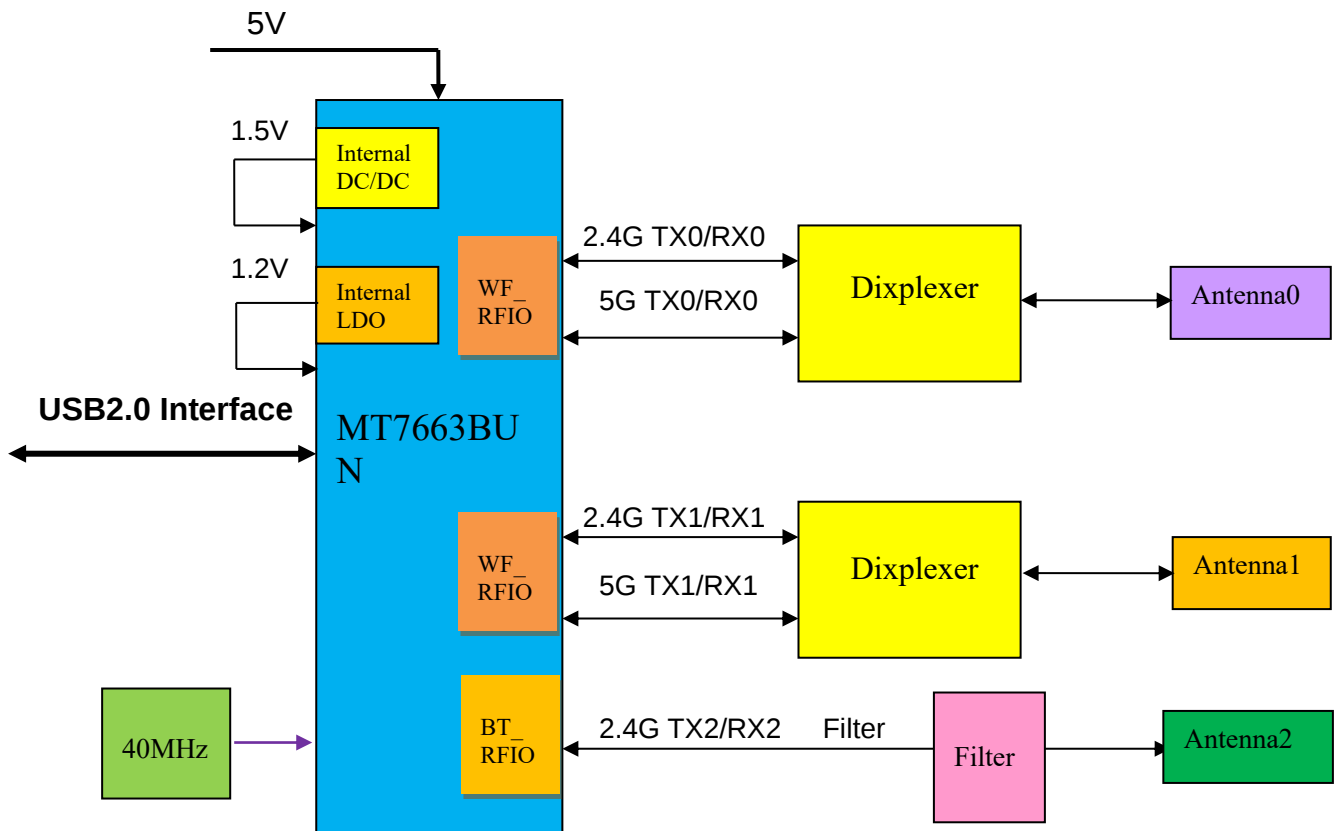


Figure 1 WB7663B-LP1 Block Diagram

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:

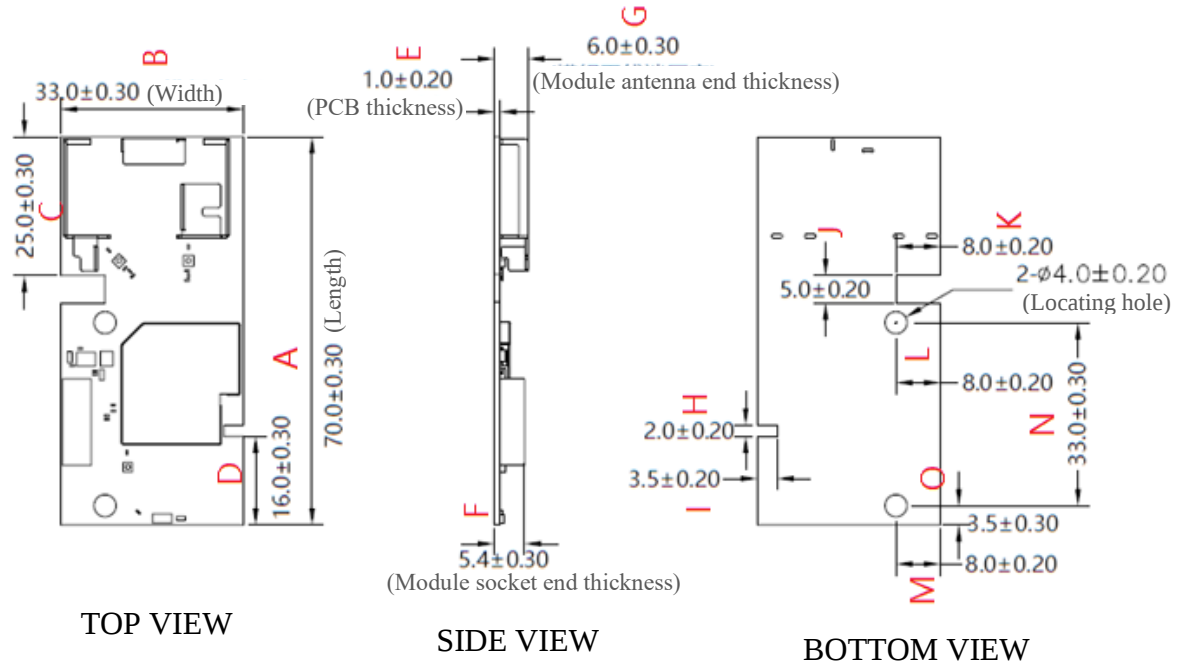
Main Chipset	Mediatek MT7663BUN
Operating Frequency	2.4G/5G
WiFi Standard	802.11a/b/g/n/ac (2x2)
Bluetooth	2.1+EDR/4.2/5.1
Modulation	WIFI:11b: DBPSK, DQPSK and CCK and DSSS 11a/g: BPSK, QPSK, 16QAM, 64QAM and OFDM 11n: BPSK, QPSK, 16QAM, 64QAM and OFDM 11ac: BPSK, QPSK, 16QAM, 64QAM,256QAM and OFDM BT: GFSK, $\pi/4$ -DQPSK and 8-DPSK
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	10pins
Host Interface	USB 2.0
PCB Stack	4-layers design
Dimension	Typical, 33mm x 70mm x 6.0mm
Antenna	External Antennas Design
Operation Temperature	-10℃ to +70℃
Storage Temperature	-40℃ to +125℃
Operation Voltage	5V +/-10%
Power Consumption (TX)	775mA
Power Consumption (RX)	236mA
Power Consumption (Disable)	1.5mA
Power Consumption (BT)	1.7mA

2. Mechanical Specification

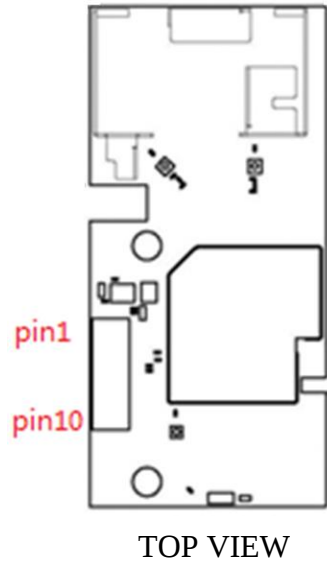
2.1 Mechanical Outline Drawing

Typical Dimension (W x L x H): 33.0mmx 70.0mm x 6.0mm

General tolerance: $\pm 0.2\text{mm}$



2.2 Pin Description

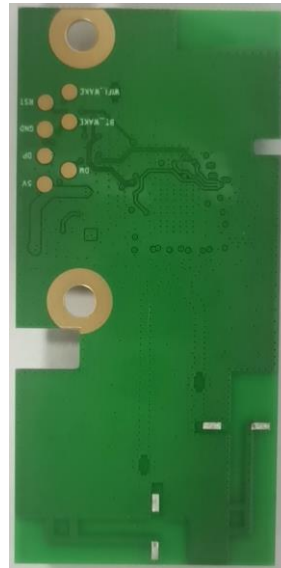


Num.	Name	Pin Description
1	DC_EN	Reset the module by controlling the DC / DC enable pin, internal 100K pull-up to 5V, low-level active
2	BT_WAKE_HOST	Bluetooth wakes up host, internal 10K pull-up to 3.3V, low-level active
3	VCC	The module power supply pin requires a load capacity of more than 1A
4	BTDN	USB D-
5	BTDP	USB D+
6、7	GND	Module grounding
8	3D_SYNC	3D synchronization function, internal 10K pull-up to 3.3V, low-level active
9	REG_ON	Module reset pin, internal 10K pull-up to 3.3V, low-level active
10	WLAN_DEV_WAKE	WIFI wakes up Host, internal 10K pull-up to 3.3V, low-level active

2.2 Product Picture



TOP VIEW



BOTTOM VIEW

PCB silk screen Description:

The marked red outline on the BOT surface is PCB diagram and PCB manufacturer control characters;

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) 17dBm Target (For Each antenna port) @ 11g 6Mbps~48Mbps	15	17	19	dBm	
2) 15dBm Target (For Each antenna port) @ 11g 54Mbps	14	16	18	dBm	
3) 17dBm Target (For Each antenna port) @ 11a 6Mbps~48Mbps	15	17	19	dBm	
4) 15dBm Target (For Each antenna port) @ 11a 54Mbps	13	15	17	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	-15	-	15	ppm	
2) IEEE802.11a	-15	-	15	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	
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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	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	-15	-	15	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	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) 17dBm Target (For Each antenna port) @ 2.4G/MCS0~MCS6	15	17	19	dBm	
2) 15dBm Target (For Each antenna port) @ 2.4G/MCS7	14	16	18	dBm	
3) 17dBm Target (For Each antenna port) @ 5G/MCS0~MCS6	15	17	19	dBm	
4) 15dBm Target (For Each antenna port) @ 5G/MCS7	13	15	17	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	-15	-	15	ppm	
2) IEEE802.11n HT20 @ 5G	-15	-	15	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	CH3 to CH11 @ 2.4G CH38 to CH163 @ 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)					
5) 17dBm Target (For Each antenna port) @ 2.4G/MCS0~MCS6	15	17	19	dBm	
6) 15dBm Target (For Each antenna port) @ 2.4G/MCS7	14	16	18	dBm	
7) 17dBm Target (For Each antenna port) @ 5G/MCS0~MCS6	15	17	19	dBm	
8) 15dBm Target (For Each antenna port) @ 5G/MCS7	13	15	17	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	-15	-	15	ppm	
2) IEEE802.11n HT20 @ 5G	-15	-	15	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	

3.5 IEEE 802.11ac Section:

Items	Contents					
Specification	IEEE802.11ac					
Mode	BPSK, QPSK, 16QAM, 64QAM ,256QAM and OFDM					
Channel	CH36 to CH165 VHT20 CH38 to CH163 VHT40 CH42 to CH157 VHT80					
Data rate (MCS index)	MCS0/1/2/3/4/5/6/7/8/9					
TX Characteristics	Min.	Typ.	Max.		Unit	Remark
1. Power Levels (Calibrated)						
1) 17dBm Target (For Each antenna port) @VHT20/VHT40/VHT80 MCS0~MCS6	15	17	19		dBm	
2) 15dBm Target (For Each antenna port) @VHT20/VHT40/VHT80 MCS7	13	15	17		dBm	
3) 14dBm Target (For Each antenna port) @VHT20/VHT40/VHT80 MCS8~MCS9	12	14	16		dBm	
2. Spectrum Mask @ Target Power						
1) at fc +/-11MHz /20MHz/30MHz	-	-	-20		dBr	
2) at fc +/-21MHz /40MHz/60MHz	-	-	-28		dBr	
3) at fc +/-41MHz /80MHz/120MHz	-	-	-40		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		dB	
10) MCS9			-32		dB	
4. Frequency Error	-15	-	15		ppm	
RX Characteristics	Min.	Typ.	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	dBm
10) MCS9 (PER $\leq$ 10%)	-	-	-57	-54	-51	dBm
6. Maximum Input Level(PER $\leq$ 10%)	-30	-	-		dBm	

3.6 Bluetooth Section:

3.6.1BR Specification

Items	Contents				
Host Interface	USB				
Antenna Reference	3dBi Peak Gain				
Channel	CH0 to CH78				
Modulation	GFSK				
	Min.	Typ.	Max.	Unit	
TX Characteristics					
1.Output Average Power	10	13	16	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%)		-92		dBm	
2. Maximum usable signal (BER<0.1%)		-5		dBm	

3.6.2 EDR Specification

Items	Contents				
Host Interface	USB				
Antenna Reference	3 dBi peak gain				
Channel	CH0 to CH78				
Modulation	$\pi/4$ -DQPSK 、 8PSK				
	Min.	Typ.	Max.	Unit	
TX Characteristics	7	10	13		
1.Relative Transmit Power					
1) $\pi/4$ -DQPSK		-1.5		dBm	
2) 8PSK		-1.5		dBm	
2. Frequency Stability				kHz	
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	USB				
Antenna Reference	3 dBi peak gain				
Channel	CH0 to CH39				
	Min.	Typ.	Max.	Unit	
TX Characteristics					
1. Output power at NOC	10	13	16	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%)		-95		dBm	
2. Maximum usable signal (BER<30.8%)		-5		dBm	

4. Software Requirements

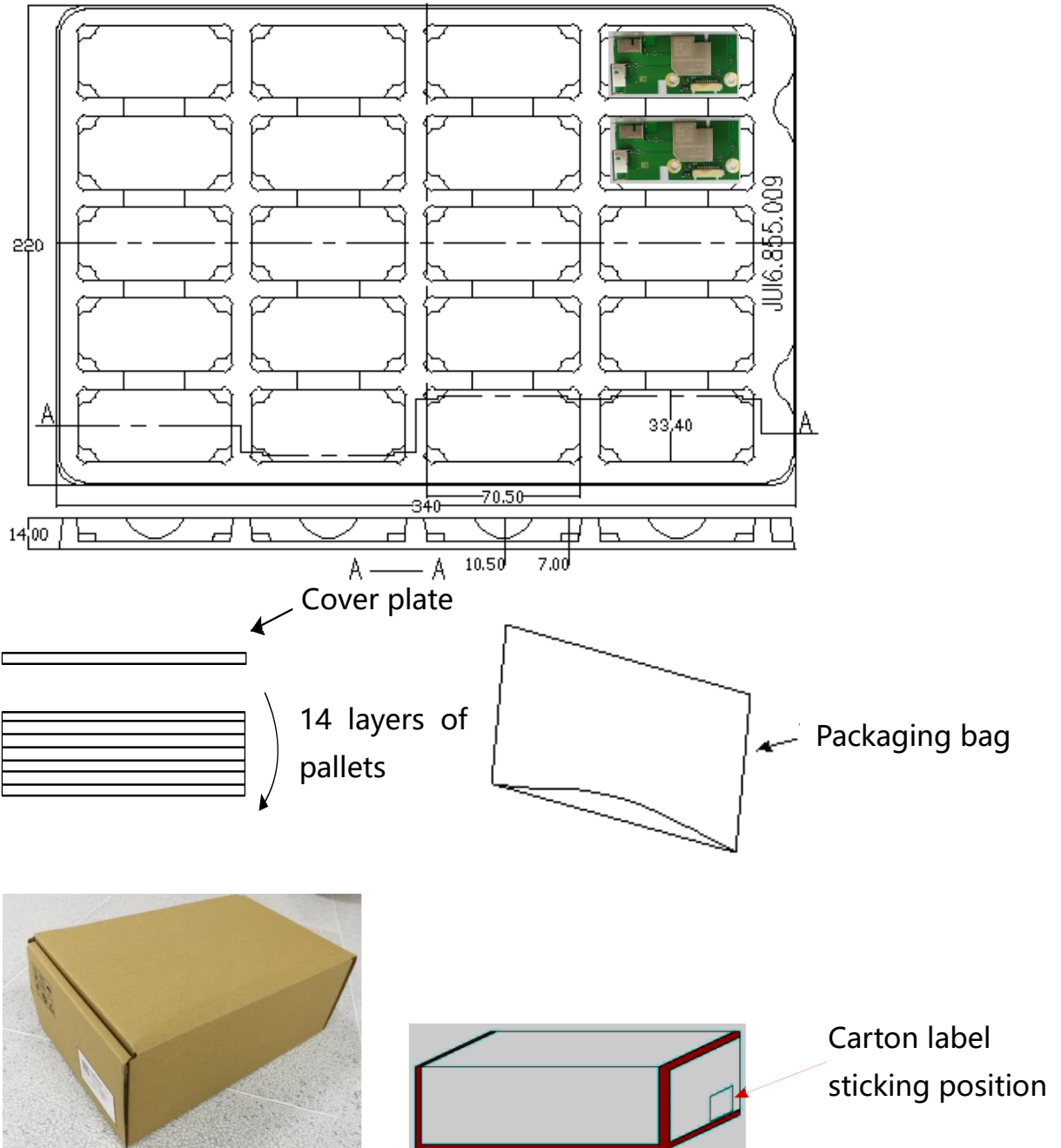
The driver supports the following operating systems: Linux, Microsoft Windows XP, Vista and Win7.
Mfg. software tool is MT7668AUN_QA_Tool.

5. Key component List

Num.	Key parts	Model	Specification	Manufacturer	Remarks
1	Integrated circuit	MT7663bUN	QFN	MTK	
2	PCB	JUI7.820.0922 series	FR-4,4LAY	Sunlord IQE Shenzhen prosperity billion Long Electronics Co.,Ltd. TRULY Guangdong Kingshine Electronic Technology Co.ltd Victory Giant Technology	

3	crystal	SMD3225-40M	40M	JWT Hosonic HELE TXC ECEC TKD	
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6.Packaging Information:



1. The product placement direction, label sticking position, and packaging are carried out according to the schematic diagram;
2. Put 2 packs of 2g desiccant and a humidity card into the vacuum package;
3. The product quantity is 20 pieces per layer, 14 layers of pallets, a total of 260

pieces per carton per carton;

4. Outer box size: 385mm*240mm*140mm;

5. Other unfinished matters shall be implemented in accordance with the customer's packaging requirements.

7、Certification Information

Description	ID	Remarks
SRRC	2021AP13141	\

8、Waste Disposal

The disposal of the company's products should comply with local/superior regional/national/international applicable regulations.

9、FCC Warning

According to the definition of mobile and fixed device is described in Part 2.1091(b), this device is a mobile device.

This Modular Approval is limited to OEM installation for mobile and fixed applications only. The antenna installation and operating configurations of this transmitter, including any applicable source-based time-averaging duty factor, antenna gain and cable loss must satisfy MPE categorical Exclusion Requirements of 2.1091. It maintained at least a 20 cm separation between the EUT and the user's body and must not transmit simultaneously with any other antenna or transmitter.

For a host using this modular with a standard fixed label, if (1) the module's FCC ID is not visible when installed in the host, or (2) if the host is marketed so that end users do not have straight forward commonly used methods for access to remove the module so that the FCC identifier of the module is visible; then an additional permanent label referring to the enclosed module: "Contains FCC ID: 2AOKI-WFM63BUWP1" must be used. The host OEM user manual must also contain clear instructions on how end users can find and/or access the module and the FCC identifier.

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 Federal Communications Commission (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.

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

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. Privacy of communications may not be ensured when using this device.