

WF-M63B-USD1

IEEE 802.11a/b/g/n/ac 2T2R USB WiFi Module
Integrated Bluetooth 2.1+EDR/4.2/5.1



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

21.5mmx23mmx2.5mm

Model	Standard	rate	band	Power
WF-M63B-USD1	IEEE 802.11a/b/g/n/ac	866.7Mbps	2.4G/5G	3.3V
	Bluetooth2.1+EDR/4.2/5.1	3Mbps	2.4G	

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1. Introduction

WF-M63B-USD1 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.

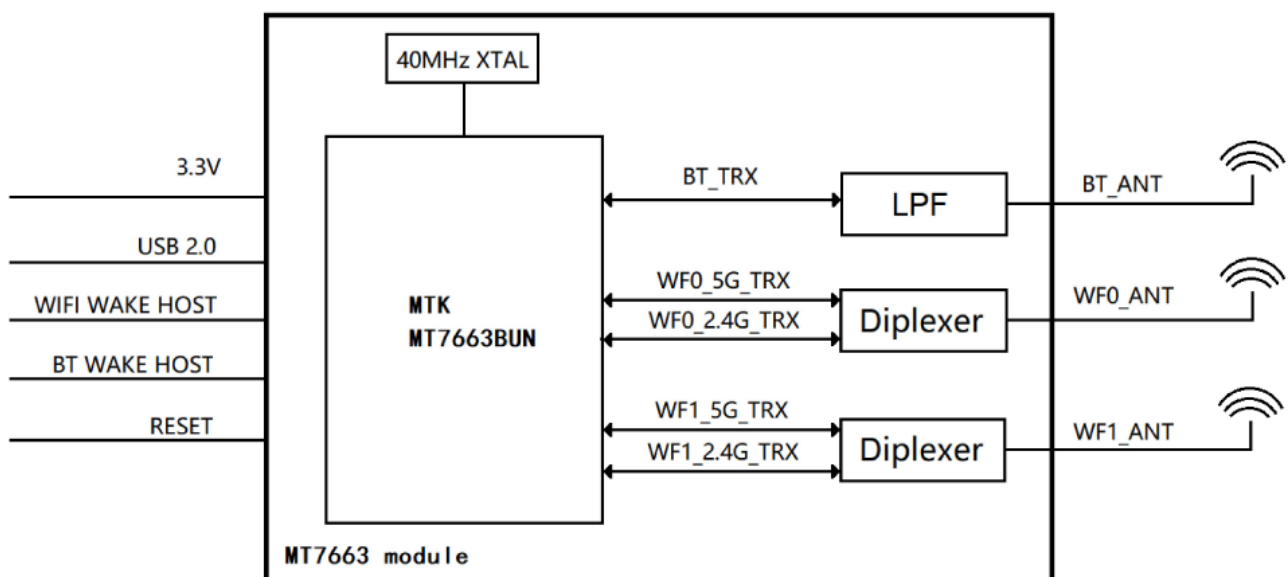


Figure 1 WF-M63B-USJ1 Block Diagram

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:

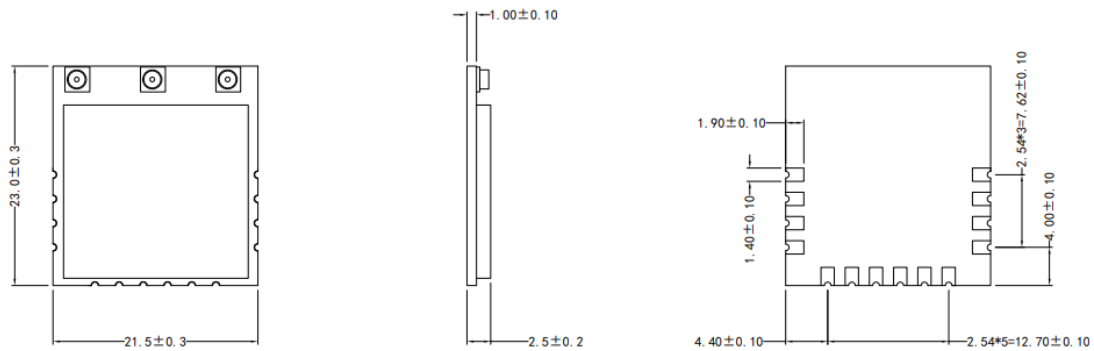
Main Chipset	Mediatek MT7663BUN
Operating Frequency	2.4G/5G
WiFi Standard	802.11a/b/g/n/ac (2x2)
Bluetooth	2.1+EDR/4.2/5.1
Modulation	WIFI: 11b: DBPSK, DQPSK and CCK and DSSS 11a/g: BPSK, QPSK, 16QAM, 64QAM and OFDM 11n: BPSK, QPSK, 16QAM, 64QAM and OFDM 11ac: BPSK, QPSK, 16QAM, 64QAM, 256QAM and OFDM Bluetooth: 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	14pins
Host Interface	USB 2.0
PCB Stack	4-layers design
Dimension	Typical: 21.5mmx23mmx2.5mm
Antenna	external Antennas Design
Operation Temperature	-10℃ to +70℃
Storage Temperature	-40℃ to +85℃
Operation Voltage	3.3V +/-5%
Power Consumption (WIFI TX)	813mA@3.3V 5G TX NSS=2 HT20 MCS0
Power Consumption (WIFI RX)	165mA@3.3V 5G RX NSS=2 VHT80 MCS9
Power Consumption (BT TX)	82mA@3.3V
Power Consumption (BT RX)	29mA@3.3V

2. Mechanical Specification

2.1 Mechanical Outline Drawing

Typical Dimension (W x L x H): 21.5mmx23mmx2.5mm

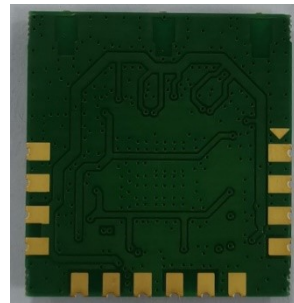
General tolerance: $\pm 0.2\text{mm}$



2.2 Product Picture

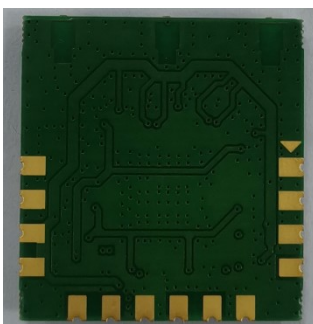


Top view



Bot view

2.3 Pin define



NO	Definition	Descriptions
1	GND	Ground
2	GND	Ground
3	GND	Ground
4	BT_HOST_WAKE	BT WAKE
5	GND	Ground
6	WL_HOST_WAKE	WIFI WAKE
7	RESET	RESET
8	GND	Ground
9	USB D+	DP
10	USB D-	DM
11	VDD3.3	3.3V

12	VDD3.3	3.3V
13	GND	Ground
14	GND	Ground

3. Electrical Specification

This Specification is based-on conductive DVT testing result. The extreme condition include overall temperature (0℃,+25℃,+40℃) and overall voltage (2.97V,3.3V,3.63V).

3.1 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	16	18	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	-	-23	-13	dB	
2) 2Mbps	-	-	-13	dB	
3) 5.5Mbps	-	-	-13	dB	
4) 11Mbps	-	-23	-13	dB	
4. Frequency Error	-10	-	10	ppm	
RX Characteristics	Min.	Typ.	Max.	Unit	
5. Minimum Input Level Sensitivity(each chain)					
1) 1Mbps (FER ≤8%)	-	-95	-85	dBm	
2) 2Mbps (FER ≤8%)	-	-	-83	dBm	
3) 5.5Mbps (FER ≤8%)	-	-	-83	dBm	
4) 11Mbps (FER ≤8%)	-	-89	-83	dBm	
6. Maximum Input Level (FER ≤8%)	-10	10	-	dBm	

3. 2 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) 16dBm Target (For Each antenna port) @ 11g 54Mbps	13	15	17	dBm	
3) 17dBm Target (For Each antenna port) @ 11a 6Mbps~48Mbps	15	17	19	dBm	
4) 15dBm Target (For Each antenna port) @ 11a 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	-	-30	-8	dB	
2) 9Mbps	-	-	-11	dB	
3) 12Mbps	-	-	-13	dB	
4) 18Mbps	-	-	-16	dB	
5) 24Mbps	-	-	-19	dB	
6) 36Mbps	-	-	-23	dB	
7) 48Mbps	-	-	-25	dB	
8) 54Mbps	-	-37	-28	dB	
4. Frequency Error					
1) IEEE802.11g	-10	-	10	ppm	
2) IEEE802.11a	-10		10	ppm	
RX Characteristics	Min.	Typ.	Max.	Unit	
5. Minimum Input Level Sensitivity(each chain)					
1) 6Mbps (PER $\leq$ 10%)	-	-94	-85	dBm	
2) 9Mbps (PER $\leq$ 10%)	-	-	-84	dBm	
3) 12Mbps (PER $\leq$ 10%)	-	-	-82	dBm	
4) 18Mbps (PER $\leq$ 10%)	-	-	-80	dBm	
5) 24Mbps (PER $\leq$ 10%)	-	-	-77	dBm	
6) 36Mbps (PER $\leq$ 10%)	-	-	-73	dBm	
7) 48Mbps (PER $\leq$ 10%)	-	-	-71	dBm	
8) 54Mbps (PER $\leq$ 10%)	-	-76	-71	dBm	

6. Maximum Input Level (PER $\leq$ 10%)					
1) IEEE802.11g	-20	-2	-	dBm	
2) IEEE802.11a	-30	-2		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) 16dBm Target (For Each antenna port) @ 2.4G/MCS7	12	14	16	dBm	
3) 17dBm Target (For Each antenna port) @ 5G/MCS0~MCS6	15	17	19	dBm	
4) 15dBm Target (For Each antenna port) @ 5G/MCS7	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	-	-	-45	dBr	
3. Constellation Error(EVM) @ Target Power					
1) MCS0	-	-30	-8	dB	
2) MCS1	-	-	-13	dB	
3) MCS2	-	-	-16	dB	
4) MCS3	-	-	-19	dB	
5) MCS4	-	-	-22	dB	
6) MCS5	-	-	-25	dB	
7) MCS6	-	-	-28	dB	
8) MCS7	-	-38	-30	dB	
4. Frequency Error					
1) IEEE802.11n HT20 @ 2.4G	-10	-	10	ppm	
2) IEEE802.11n HT20 @ 5G	-10	-	10	ppm	
RX Characteristics	Min.	Typ.	Max.	Unit	
5. Minimum Input Level Sensitivity(each chain)					
1) MCS0 (PER $\leq$ 10%)	-	-94	-85	dBm	
2) MCS1 (PER $\leq$ 10%)	-	-	-82	dBm	
3) MCS2 (PER $\leq$ 10%)	-	-	-80	dBm	
4) MCS3 (PER $\leq$ 10%)	-	-	-77	dBm	
5) MCS4 (PER $\leq$ 10%)	-	-	-73	dBm	
6) MCS5 (PER $\leq$ 10%)	-	-	-69	dBm	
7) MCS6 (PER $\leq$ 10%)	-	-	-68	dBm	

8) MCS7 (PER $\leq 10\%$)	-	-74	-68	dBm	
6. Maximum Input Level (PER $\leq 10\%$)					
1) IEEE802.11n HT20 @ 2.4G	-20	-2	-	dBm	
2) IEEE802.11n HT20 @ 5G	-30	-2	-	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)					
1) 17dBm Target (For Each antenna port) @ 2.4G/MCS0~MCS6	15	17	19	dBm	
2) 16dBm Target (For Each antenna port) @ 2.4G/MCS7	12	14	16	dBm	
3) 17dBm Target (For Each antenna port) @ 5G/MCS0~MCS6	15	17	19	dBm	
4) 15dBm Target (For Each antenna port) @ 5G/MCS7	12	14	16	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	-	-30	-8	dB	
2) MCS1	-	-	-13	dB	
3) MCS2	-	-	-16	dB	
4) MCS3	-	-	-19	dB	
5) MCS4	-	-	-22	dB	
6) MCS5	-	-	-25	dB	
7) MCS6	-	-	-28	dB	
8) MCS7	-	-38	-30	dB	
4. Frequency Error					
1) IEEE802.11n HT20 @ 2.4G	-10	-	10	ppm	
2) IEEE802.11n HT20 @ 5G	-10	-	10	ppm	
RX Characteristics	Min.	Typ.	Max.	Unit	
5. Minimum Input Level Sensitivity(each chain)					
1) MCS0 (PER $\leq 10\%$)	-	-90	-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 $\leq 10\%$)	-	-	-66	dBm	

8) MCS7 (PER $\leq 10\%$)	-	-71	-66	dBm	
6. Maximum Input Level(PER $\leq 10\%$)					
1) IEEE802.11n HT20 @ 2.4G	-20	-2	-	dBm	
2) IEEE802.11n HT20 @ 5G	-30	-2	-	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	11	13			15		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	-	-			-8		dB	
2) MCS1	-	-			-13		dB	
3) MCS2	-	-			-16		dB	
4) MCS3	-	-			-19		dB	
5) MCS4	-	-			-22		dB	
6) MCS5	-	-			-25		dB	
7) MCS6	-	-			-28		dB	
8) MCS7	-	-			-30		dB	
9) MCS8					-32		dB	
10) MCS9		-36			-33		dB	
4. Frequency Error	-10	-			10		ppm	
RX Characteristics	Min.	Typ.			Max.		Unit	
5. Minimum Input Level Sensitivity(each chain)		VHT 20	VHT 40	VHT 80	VHT 20	VHT 40	VHT 80	
1) MCS0 (PER ≦ 10%)	-	-94	-90	-87	-85	-82	-79	dBm
2) MCS1 (PER ≦ 10%)	-	-	-	-	-82	-79	-76	dBm
3) MCS2 (PER ≦ 10%)	-	-	-	-	-80	-77	-74	dBm
4) MCS3 (PER ≦ 10%)	-	-	-	-	-77	-74	-71	dBm
5) MCS4 (PER ≦ 10%)	-	-	-	-	-73	-70	-67	dBm
6) MCS5 (PER ≦ 10%)	-	-	-	-	-69	-67	-63	dBm

7) MCS6 (PER $\leq 10\%$)	-	-	-	-	-68	-65	-62	dBm	
8) MCS7 (PER $\leq 10\%$)	-	-	-	-	-67	-64	-61	dBm	
9) MCS8 (PER $\leq 10\%$)	-	-	-	-	-64	-59	-56	dBm	
10) MCS9 (PER $\leq 10\%$)	-	-70	-65	-63	-60	-58	-55	dBm	
6. Maximum Input Level(PER $\leq 10\%$)	-30	-2	-2	-2	-			dBm	

3.6 Bluetooth Section:

3.6.1 BR Specification

Items	Contents				
Host Interface	USB				
Channel	CH0 to CH78				
Modulation	GFSK				
	Min.	Typ.	Max.	Unit	
TX Characteristics					
1.Output Average Power	9	7	17	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%)		-94		dBm	
2. Maximum usable signal (BER<0.1%)		-5		dBm	

3.6.2 EDR Specification

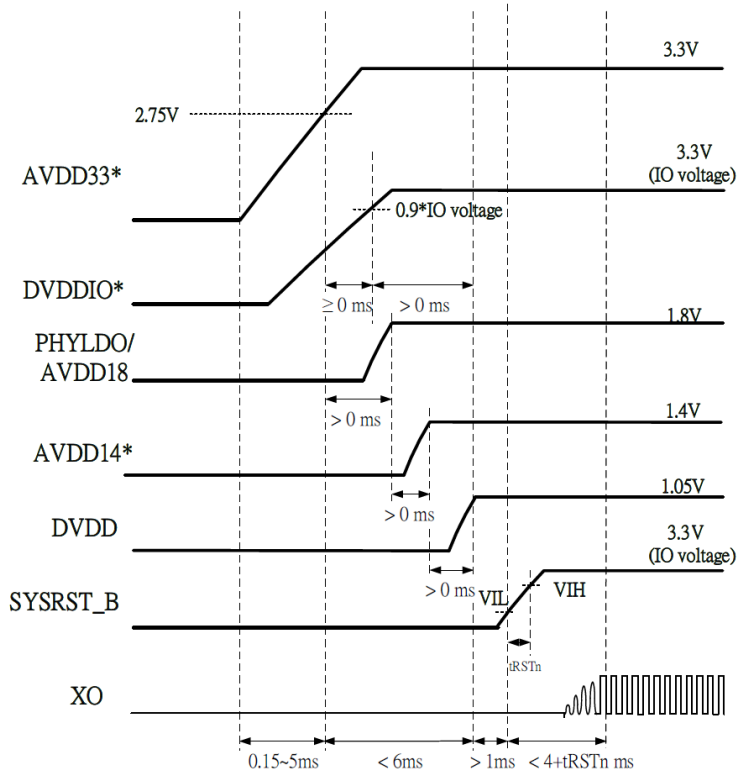
Items	Contents				
Host Interface	USB				
Channel	CH0 to CH78				
Modulation	$\pi/4$ -DQPSK 、 8PSK				
	Min.	Typ.	Max.	Unit	
TX Characteristics	6	7	14		
1.Relative Transmit Power					
1) $\pi/4$ -DQPSK		-1.5		dBm	
2) 8PSK		-1.5		dBm	
2. Frequency Stability				kHz	
1) Omega-i		+/-4		kHz	
2) Omega-0		+/-4	-	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		-89		dBm	
2. Maximum usable signal (BER<0.1%)					
1) $\pi/4$ -DQPSK		-5		dBm	
2) 8PSK		-5		dBm	

3.6.3 LE Specification

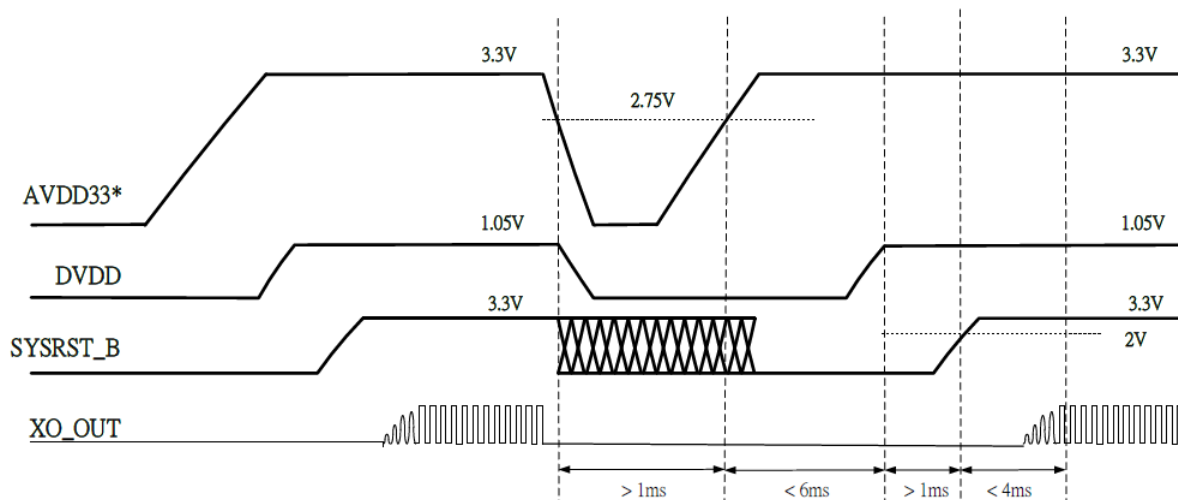
Items	Contents				
Host Interface	UART				
Channel	CH0 to CH39				
	Min.	Typ.	Max.	Unit	
TX Characteristics					
1. Output power at NOC	9	7	17	dBm	
2. Modulation Characteristics					
1)Delta f1(Avg)	225		275	kHz	
2)Delta f2max(For at least 99.9% of all Delta f2max)	185			kHz	
3)Delta f2/ Delta f1	0.8	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. Host Interface Timing Diagram

4.1 Chip power on sequence



4.2 reset sequence



5. Software Requirements

The driver supports the following operating systems: Linux, Microsoft Windows XP, Vista and Win7.
Mfg. software tool is MT7663BUN_QA_Tool.

6. DC Characteristics

Symbol	Parameter	Min	Type	Max	Unit
DVDDIO	3.3V IO Voltage	2.97	3.3	3.63	V
V _{IL}	Input Low Voltage	-0.3	-	VDD33*0.25	V
V _{IH}	Input High Voltage	VDD33*0.625	-	VDD33+0.3	V
V _{OL}	Output Low Voltage	-0.3	-	0.4	V
V _{OH}	Output High Voltage	VDD33-0.4		VDD33+0.3	V

7. Statement

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-WFM63BUSD1" 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.

FCC Part 15

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.