# WF-M63B-USX2
# WF-M63B-USX3

**IEEE 802.11a/b/g/n/ac2T2R 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**
  MediatekMT7663BUN
- **Size**
  13.0mm x15.0mm x 2.3mm

| Module | Standard | Rate | Band |
|---|---|---|---|
| WF-M63B-USX2 WF-M63B-USX3 | IEEE 802.11a/b/g/n/ac | 866.7Mbps | 2.4G/5G |
| | Bluetooth2.1+EDR/4.2/5.1 | 3Mbps | 2.4G |

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RoHS

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**We accept the specification after Confirmed**

| Customer name | Customer signature | Confirmation Date |
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ADD：Anzhou,Industrial park,Mianyang,Sichuan
Factory：Sichuan AI-Link Technology Co.,Ltd.

| Approved | Checked | Designed | Product | WiFi Module |
|---|---|---|---|---|
| **Fengyi** | **Fanxijun** | **Huanghua** | **Model** | **WF-M63B-USX2** |
|  |  |  | **Date** | **20210813** |

## Record of Modification

| Version | Date of modification | Main content of modification | Reason of modification | Serial number of modification | Confirm |
|---------|---------------------|------------------------------|------------------------|-------------------------------|---------|
| V0.1 | 2021/04/26 | Firstrelease | | | Huangwei |
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# 1. Introduction

WF-M63B-USX3 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

This WLAN Moduledesign is based on Mediatek MT7663BUN. It is a highly integrated single-chip MIMO(Multiple In Multiple Out) Wireless LAN (WLAN) network interface controllercomplying with the 802.11 specification and Bluetooth over USB interface. It combines a MAC, a2T2R 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.

## 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<br>    11a/g: BPSK, QPSK, 16QAM, 64QAM and OFDM<br>    11n: BPSK, QPSK, 16QAM, 64QAM and OFDM<br>    11ac: BPSK, QPSK, 16QAM, 64QAM,256QAM and OFDM<br>Bluetooth:GFSK, π/4-DQPSK and 8-DPSK |
| Data rates | 11b:1, 2, 5.5 and 11Mbps<br>11a/g:6, 9, 12, 18, 24, 36, 48 and 54 Mbps<br>11n: MCS0~15, up to 300Mbps<br>11ac: MCS0~9, Nss=2, up to 866.7Mbps |
| Form factor | 50pins , |
| Host Interface | USB 2.0/3.0/PCM |
| PCB Stack | 4-layers design |
| Dimension | Typical:13.0mmx 15.0mmx 2.3mm |
| Antenna | external Antennas Design |
| Operation Temperature | -10℃to +70℃ |
| Storage Temperature | -40℃to +125℃ |
| 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
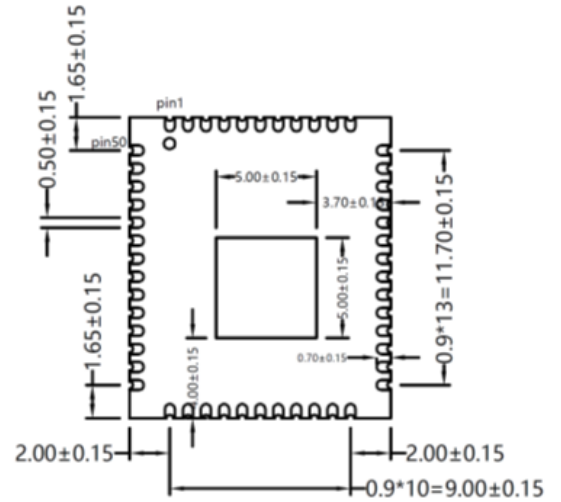
Typical Dimension (W x L ): 13.0mmx15.00mm x 2.3mm

General tolerance: ±0.2mm
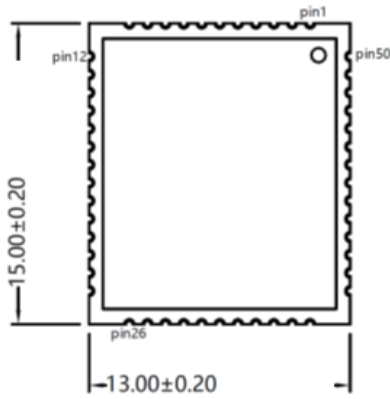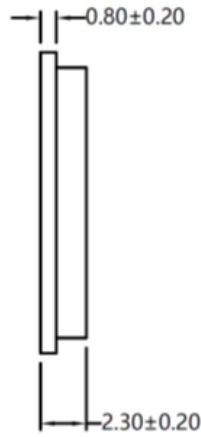


TOP VIEW          SIDE VIEW          BOT VIEW

## 2.2   Product Picture



Topview



Botview

## 2.3　Pin define

| Pin | Define | Pin | Define |
|---|---|---|---|
| 1 | GND | 29 | USB_RXN |
| 2 | ANT1 | 30 | USB_RXP |
| 3、4、5、6、7、8 | GND | 31 | GND |
| 9 | ANT2 | 32 | USB_DP |
| 10、11 | GND | 33 | USB_DM |
| 12 | NC | 34 | GND |
| 13 | GND | 35 | NC |
| 14 | NC | 36 | 3.3V |
| 15 | NC | 37 | GND |
| 16 | WIFI_WAKE | 38 | NC |
| 17 | NC | 39 | GND |
| 18 | PCM_SYNC | 40 | NC |
| 19 | PCM_CLK | 41 | NC |
| 20 | PCM_IN | 42 | NC |
| 21 | PCM_OUT | 43 | NC |
| 22 | NC | 44 | NC |
| 23 | GND | 45 | GPIO3 |
| 24 | RESET | 46 | GND |
| 25 | GND | 47 | NC |
| 26 | USB_TXN | 48 | GND |
| 27 | USB_TXP | 49 | NC |
| 28 | GND | 50 | BT_WAKE |

# 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 | 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 | - | -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%) | - | - | -81 | dBm | |
| 4) 11Mbps (FER≦8%) | - | -89 | -79 | 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<br>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 | - | -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 ≦10%) | - | -94 | -85 | dBm | |
| 2) 9Mbps (PER ≦10%) | - | - | -84 | dBm | |
| 3) 12Mbps (PER ≦10%) | - | - | -82 | dBm | |
| 4) 18Mbps (PER ≦10%) | - | - | -80 | dBm | |
| 5) 24Mbps (PER≦10%) | - | - | -77 | dBm | |
| 6) 36Mbps (PER ≦10%) | - | - | -73 | dBm | |
| 7) 48Mbps (PER≦10%) | - | - | -69 | dBm | |
| 8) 54Mbps (PER≦10%) | - | -76 | -68 | dBm | |
| 6. Maximum Input Level (PER≦10%) | | | | | |
| 1) IEEE802.11g | -20 | -2 | - | dBm | |
| 2) IEEE802.11a | -30 | -2 | | dBm | |

## 3.3 IEEE 802.11nHT20 Section:

| Items | Contents | | | | |
|---|---|---|---|---|---|
| Specification | IEEE802.11n HT20 @ 2.4G<br>IEEE802.11n HT20@ 5G | | | | |
| Mode | BPSK, QPSK, 16QAM, 64QAM and OFDM | | | | |
| Channel | CH1 to CH13 @ 2.4G<br>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 | - | -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≦10%) | - | -94 | -85 | dBm | |
| 2) MCS1 (PER ≦10%) | - | - | -82 | dBm | |
| 3) MCS2 (PER≦10%) | - | - | -80 | dBm | |
| 4) MCS3 (PER≦10%) | - | - | -77 | dBm | |
| 5) MCS4 (PER≦10%) | - | - | -73 | dBm | |
| 6) MCS5 (PER ≦10%) | - | - | -69 | dBm | |
| 7) MCS6 (PER ≦10%) | - | - | -68 | dBm | |
| 8) MCS7 (PER ≦10%) | - | -74 | -67 | dBm | |
| 6. Maximum Input Level (PER ≦10%) | | | | | |
| 1) IEEE802.11n HT20 @ 2.4G | -20 | -2 | - | dBm | |
| 2)IEEE802.11n HT20@ 5G | -30 | -2 | - | dBm | |

## 3.4 IEEE 802.11nHT40 Section:

| Items | Contents | | | | |
|---|---|---|---|---|---|
| Specification | IEEE802.11n HT40 @ 2.4G<br>IEEE802.11n HT40@ 5G | | | | |
| Mode | BPSK, QPSK, 16QAM, 64QAM and OFDM | | | | |
| Channel | CH3 to CH11 @ 2.4G<br>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) 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 +/-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≦10%) | - | -90 | -82 | dBm | |
| 2) MCS1 (PER≦10%) | - | - | -79 | dBm | |
| 3) MCS2 (PER≦10%) | - | - | -77 | dBm | |
| 4) MCS3 (PER≦10%) | - | - | -74 | dBm | |
| 5) MCS4 (PER≦10%) | - | - | -70 | dBm | |
| 6) MCS5 (PER≦10%) | - | - | -66 | dBm | |
| 7) MCS6 (PER≦10%) | - | - | -65 | dBm | |
| 8) MCS7 (PER≦10%) | - | -71 | -64 | dBm | |
| 6. Maximum Input Level(PER≦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<br>CH38 to CH163    VHT40<br>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 |

| 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 | - | - | -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≦10%) | - | - | - | - | -68 | -65 | -62 | dBm |
| 8) MCS7 (PER≦10%) | - | - | - | - | -67 | -64 | -61 | dBm |
| 9) MCS8 (PER≦10%) | - | - | - | - | -62 | -59 | -56 | dBm |
| 10) MCS9 (PER≦10%) | - | -70 | -65 | -63 | -60 | -57 | -54 | dBm |
| 6. Maximum Input Level(PER≦10%) | -30 | -2 | -2 | -2 | - | | | dBm |

## 3.6 BluetoothSection:

### 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 | 13 | 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. ReceiverSensitivity (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 | π/4-DQPSK、8PSK | | | | |
| | Min. | Typ. | Max. | Unit | |
| TX Characteristics | 6 | 10 | 14 | | |
| 1.Relative Transmit Power | | | | | |
| 1) π/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 | | | | | |
|   π/4-DQPSK | | +/-9 | | % | |
|   8PSK | | +/-9 | | % | |
| 2) Peak DEVM | | | | | |
|   π/4-DQPSK | | +/-28 | | % | |
|   8PSK | | +/-21 | | % | |
| 3) 99% DEVM | | | | | |
|   π/4-DQPSK | | +/-15 | | % | |
|   8PSK | | +/-12 | | % | |
| RX Characteristics | | | | | |
| 1. ReceiverSensitivity (BER<0.01%) | | | | | |
| 1) π/4-DQPSK | | -91 | | dBm | |
| 2) 8PSK | | -89 | | dBm | |
| 2. Maximum usable signal (BER<0.1%) | | | | | |
| 1) π/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 | 13 | 17 | dBm | |
| 2. ModulationCharacteristics | | | | | |
| 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 offsetand 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. ReceiverSensitivity (BER<30.8%) | | -95 | | dBm | |
| 2. Maximum usable signal (BER<30.8%) | | -5 | | dBm | |

# 4. Reference Design
## 4.1 SCH
## 4.2Recommend PCB Layout Decal
# 5. Host Interface Timing Diagram
## 5.1Chip power on sequence
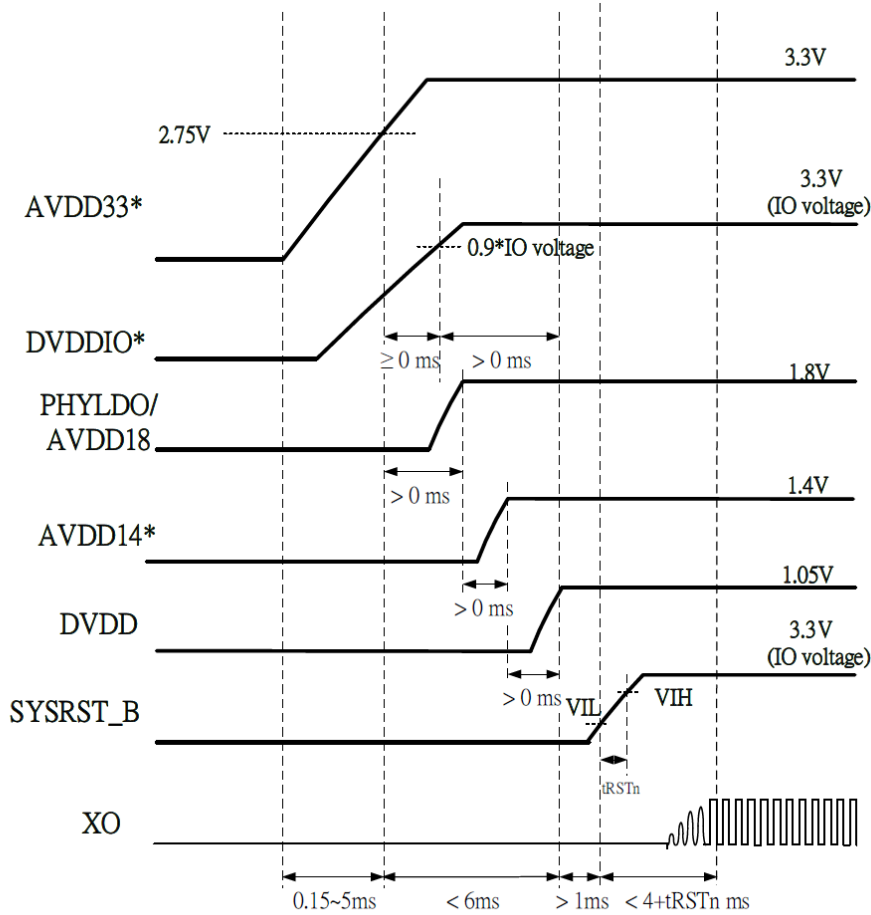


## 5.1reset sequence
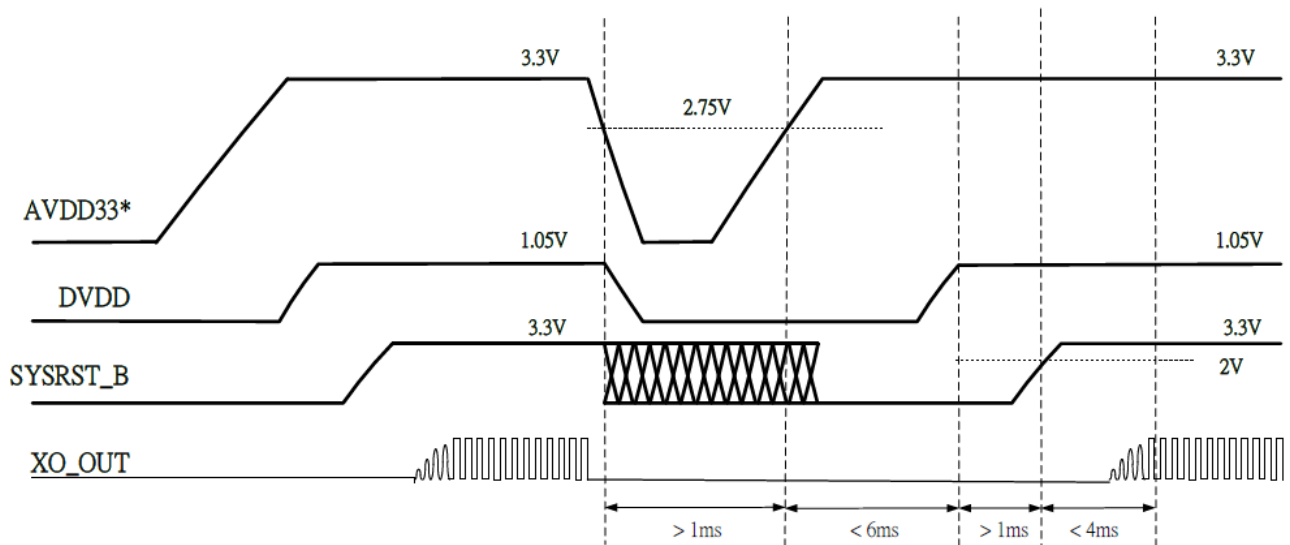


# 6. Software Requirements

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

# 7. DC Characteristics

| Symbol | Parameter | Min | Type | Max | Unit |
|---|---|---|---|---|---|
| DVDDIO | 3.3V IOVoltage | 2.97 | 3.3V | 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 |

# 8. Antenna matching
## The 2th,9thand12thPin connect to antenna, please refer to design demand
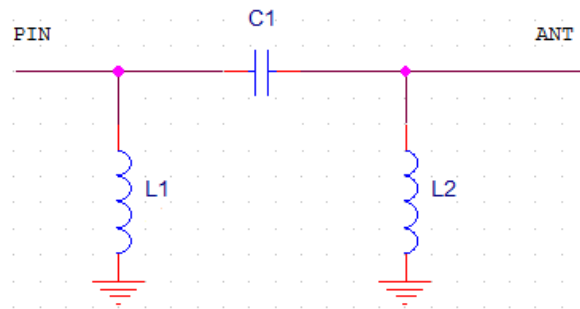
# 8.Packaging Information:
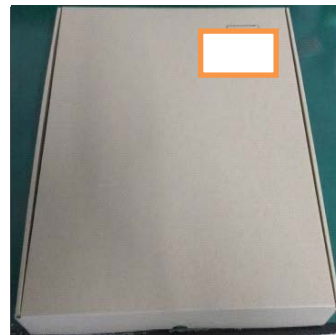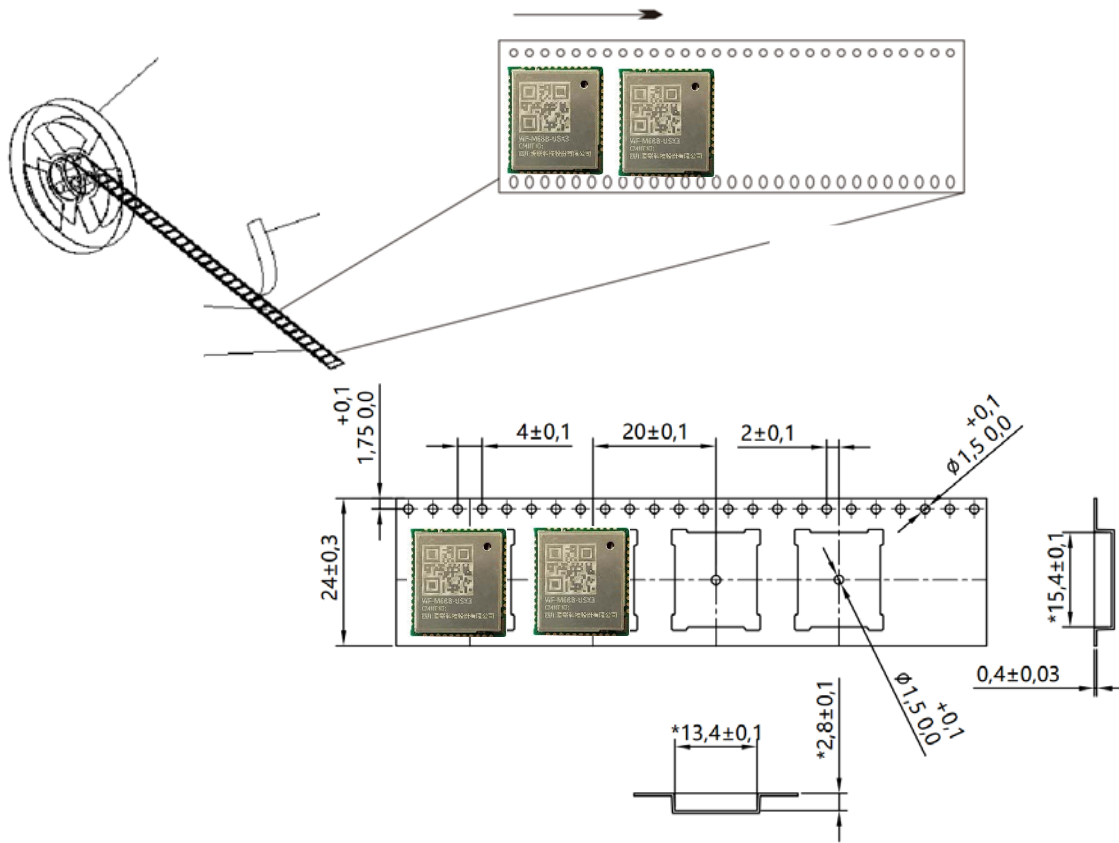




1. Product placement direction, label sticking position and packaging shall be carried out according to the schematic diagram;

2. Put 1000 pieces of products in each roll, 1 roll in each small box, 8 small boxes in total in the big box, 8000 pieces in total in quantity/box;

3, outer box size: 370mm*300mm*370mm, small box size: 360mm*360mm*37mm;

4. Two bags of 2G desiccant and one 6-color humidity card are placed in the vacuum bag;

5. Other unmentioned matters shall be carried out according to customer's packaging requirements.

## 9. Product Label&Label Location:



WF-M63B-USX2
CMIIT ID:2021AP8821(M)
四川爱联科技股份有限公司
Sichuan AI-Link Technology Co.,Ltd.
FCC ID:2AOKI-WFM63BUSX3
IC:23460-WFM63BUSX3



WF-M63B-USX3
CMIIT ID:2021AP9710(M)
四川爱联科技股份有限公司
Sichuan AI-Link Technology Co.,Ltd.
FCC ID:2AOKI-WFM63BUSX3
IC:23460-WFM63BUSX3

## CE Radiation Exposure Statement

Herby, Sichuan AI-Link Technology Co., Ltd. Declares that this RF 2.4G&5G Wireless and BT Module，WF-M63B-USX2, WF-M63B-USX3 are in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.

Operation Temperature：Use the WF-M63B-USX2, WF-M63B-USX3 in the environment with the temperature between -10℃ and 70℃

Operation Frequency range:2.400 ~ 2.4835 GHz,5.150~5.350 GHz,5.470~5.725 GHz,5.725~5.850 GHz,5.850~5.925 GHz

RF Output Power: Max 20dBm

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

Address：Anzhou, Industrial Park, Mianyang, Sichuan

Tel: +86-0816-2438701

Fax: +86-0816-2416943

E-mail: ai-link@ailinkiot.com

## FCC warning:

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.

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

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.

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.

The separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and different antenna configurations.

The OEM may operate only with the following antenna or antennas of the same type with maximum gain as shown:FPC antenna with 2 dBi linear far field gain

• RF I/O interface to the antenna connector on the Printed Circuit Board shall be accomplished via amicrostrip or stripline transmission line with characteristic impedance of 50 ohms +/- 10%. A custom coaxial pigtail may also be utilized to connect to the antenna in lieu of a connector.

• The connector on the OEM's Printed Circuit Board which interfaces to the antenna must be of a unique type to disable connection to a non-permissible antenna in compliance with FCC section 15.203.

• The minimum safe distance for people from the WF-M63B-USX2, WF-M63B-USX3 been determined by conservative calculation to be less than 20 cm for the allowable antenna types. The end product User's Guide must include the following statement in a prominent location: To comply with FCC's RF radiation exposure requirements, the antenna(s) used for this transmitter must be installed such that a minimum separation distance of 20 cm is maintained between the radiator (antenna) & user's/nearby people's body at all times and must not be co-located or operating in conjunction with any other antenna or transmitter.

## Warning:
The module is limited to installation in mobile or fixed application. The OEM integrator is responsible for ensuring the end-user has no manual instruction to remove or install module; Modular approval allows installation in different end-use products by an original equipment manufacturer (OEM) with limited or no additional testing or equipment authorization for the transmitter function provided by the WF-M63B-USX2, WF-M63B-USX3.

Specifically: 1.No additional transmitter compliance testing is required if the module is operated with the antenna listed in the document below.2.No additional transmitter-compliance testing is required if the module is operated with the same general type of antenna (i.e. near-field segmented loop, circularly polarized patches) as those listed in this User's Guide and in the FCC filing for the WF-M63B-USX2, WF-M63B-USX3. Acceptable antennas must be of equal or less far field gain than the antenna previously authorized under the same FCC ID, and must have similar in band and out of band characteristics. In addition, the end product must comply with all applicable FCC equipment authorizations, regulations, requirements and equipment functions not associated with the WF-M63B-USX2, WF-M63B-USX3. For example, compliance must be demonstrated to regulations for other transmitter components within the host product, to requirements for unintentional radiators (Part 15B), and to additional authorization requirements for the non-transmitter functions.

The OEM applying the WF-M63B-USX2, WF-M63B-USX3 is required to include all FCC and/or IC statements and warnings detailed in the following sections to the end product labeling (where specified) and in the finished product manual.

The OEM must also strictly adhere to antenna and installation guidelines and MPE restrictions stated in this document. The finished product manual must contain the following statement: The host product shall use physical label stating "contains module FCC ID: 2AOKI-WFM63BUSX3" or "contains FCC ID: 2AOKI-WFM63BUSX3"

## IC warning:

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-WFM63BUSX3**" 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-WFM63BUSX3** 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; 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

## Requirement per KDB996369 D03
### 1.1 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).

### 1.2 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 FPC Antenna, , and the antenna use a permanently attached antenna which is not replaceable.

### 1.3 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.

## 1.4 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: **2AOKI-WFM63BUSX3**

## 1.5 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 FPC Antenna, , and the antenna use a permanently attached antenna which is unique.

## 1.6 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: **2AOKI-WFM63BUSX3**

## 1.7 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:** Topband can increase the utility of our modular transmitters by providing instructions that simulates or characterizes a connection by enabling a transmitter.

**1.8 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 should be evaluated by the FCC Subpart B.