

USER'S MANUAL

802.11a/b/g/n 2Tx2R USB WLAN Module

WCBN3509R(38)

PRODUCT FEATURES

Wi-Fi FEATURE:

- Operate at ISM frequency Band (2.4/5GHz)
- IEEE Standards Support, 802.11a ,802.11b, 802.11g, 802.11n
- Support for both 20 MHz, 40MHz channel width in 2.4GHz and 5GHz band
- Enterprise level security supporting: WPS2.0,WAPI, WPA, WPA2
- Support 2 transmission and 2 receiving, transmission rate can up to 300Mbps (Physical Rate) in downstream and upstream
- QoS support of WFA WMM, WMMPS
- Support MU-MIMO RX
- Support STBC, LDPC, TX&RX beamforming
- Support Wake On WLAN

COMMON FEATURE:

- MT7638BU is a single chip integrated IEEE 802.11 a/b/g/n with a single USB interface
- PA, LNA, and T/R switch integration for Wi-Fi
- Advanced FDD/TDD mode Wi-Fi/Bluetooth coexistence scheme
- Fully compliance with USB v2.0 specification
- RoHS compliance
- Low Halogen compliance

PRODUCT SPECIFICATIONS

MAIN CHIPSET

MediaTek MT7638BU

FUNCTIONAL SPECIFICATIONS

Wi-Fi Function	
Standard	IEEE802.11a; IEEE802.11b; IEEE 802.11g; IEEE 802.11n
Bus Interface	USB2.0
Data Rate	802.11a: 54, 48, 36, 24, 18, 12, 9, 6 Mbps
	802.11b: 11, 5.5, 2, 1 Mbps
	802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps
	802.11n: MCS 0 to 15 for HT20MHz MCS 0 to 15 for HT40MHz
Media Access Control	CSMA/CA with ACK
Modulation Technique	802.11a: 64QAM, 16QAM, QPSK, BPSK
	802.11b: CCK, DQPSK, DBPSK
	802.11g: 64QAM, 16QAM, QPSK, BPSK
	802.11n: 64QAM, 16QAM, QPSK, BPSK
Network Architecture	Ad-hoc mode (Peer-to-Peer) Infrastructure mode
Operation Channel	2.4GHz 11: (Ch. 1-11) – United States 13: (Ch. 1-13) – Europe 14: (Ch. 1-14) – Japan
	5GHz 21: USA 19: EU 8: Japan
Frequency Range	802.11bg 2.400 ~ 2.4835 GHz
	802.11a 5.15 ~ 5.85 GHz
EVM	CCK < 35% OFDM < -25dB MCS0(HT20/40MHz) < -5dB MCS7(HT20/40MHz) < -28dB
Frequency Offset	2.4&5GHz -20ppm < Center Frequency < +20ppm

Transmit Output Power - single chain @ant;
Tolerance: $\pm 1.5\text{dBm}@2.4\text{GHz}$; $\pm 2\text{dBm}@5\text{GHz}$

2.4GHz

802.11b	1Mbps	2Mbps	5.5Mbps	11Mbps
Tgtpwr (dBm)	16	16	16	16

802.11g	6~24Mbps	36Mbps	48Mbps	54Mbps
Tgtpwr (dBm)	15	15	15	15

802.11n HT20	MCS0	MCS1	MCS2	MCS3	MCS4
Tgtpwr (dBm)	15	15	15	15	15
	MCS5	MCS6	MCS7	MCS8	MCS9
	15	15	15		

802.11n HT40	MCS0	MCS1	MCS2	MCS3	MCS4
Tgtpwr (dBm)	15	15	15	15	15
	MCS5	MCS6	MCS7	MCS8	MCS9
	15	15	15		

5GHz

802.11a	6~24Mbps	36Mbps	48Mbps	54Mbps
Tgtpwr (dBm)	14	14	14	14

802.11n HT20	MCS0	MCS1	MCS2	MCS3	MCS4
Tgtpwr (dBm)	14	14	14	14	14
	MCS5	MCS6	MCS7	MCS8	MCS9
	14	14	14		

802.11n HT40	MCS0	MCS1	MCS2	MCS3	MCS4
Tgtpwr (dBm)	13	13	13	13	13
	MCS5	MCS6	MCS7	MCS8	MCS9
	13	13	13		

Receiver Sensitivity

Frequency Band	Rate	Condition	Typical (1SS) (dBm)
2.4G	11b-1M	PER < 8%	-94
	11b-11M	PER < 8%	-86
	11g-6M	PER < 10%	-90
	11g-54M	PER < 10%	-73
	11n-HT20MCS0	PER < 10%	-87
	11n-HT20MCS7	PER < 10%	-70
	11n-HT40MCS0	PER < 10%	-84
	11n-HT40MCS7	PER < 10%	-67
5G	11a-6M	PER < 10%	-88
	11a-54M	PER < 10%	-71

	11ac-VHT20MCS0	PER < 10%	-85
	11ac-VHT20MCS7	PER < 10%	-68
	11ac-VHT20MCS8	PER < 10%	-65
	11ac-VHT40MCS0	PER < 10%	-82
	11ac-VHT40MCS7	PER < 10%	-65
	11ac-VHT40MCS9	PER < 10%	-61
	11ac-VHT80MCS0	PER < 10%	-80
	11ac-VHT80MCS7	PER < 10%	-63
	11ac-VHT80MCS9	PER < 10%	-57

Security

WPS, WPA, WPA2, WEP 64bit & 128bit, IEEE 802.1X, IEEE 802.11i

Common Function
Operating Voltage

3.3 V $\pm$ 10% I/O supply voltage

Power Consumption	Mode	Average		Peak	
		2.4G	5G	2.4G	5G
	<i>TX</i>	TBDmA	TBDmA	TBDmA	TBDmA
	<i>RX</i>	TBDmA	TBDmA		
	<i>Unassociated Idle</i>	TBDmA			

Antenna Type

Dual U.FL connectors for WiFi

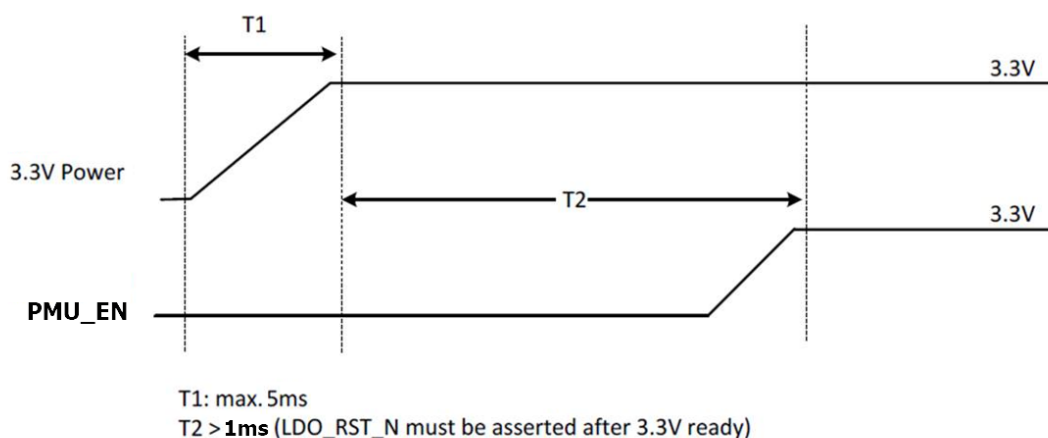
RECOMMENDED OPERATION CONDITIONS

Symbol	Rating	Min	Typ	Max	Units
VDD33	3.3V Supply Voltage	2.97	3.3	3.63	V
VDD12	1.2V Supply Voltage	1.14	1.2	1.26	V
VDD15	1.5V Supply Voltage	1.425	1.5	1.575	V

DC CHARACTERISTICS

Symbol	Parameter	Min	Typ	Max	Units
V _{IL}	Input Low Voltage	-0.28	-	0.6	V
V _{IH}	Input High Voltage	2.0	-	3.63	V
V _{OL}	Output Low Voltage	-0.28	-	0.4	V
V _{OH}	Output High Voltage	2.4	-	3.63	V

POWER ON SEQUENCE TIMING



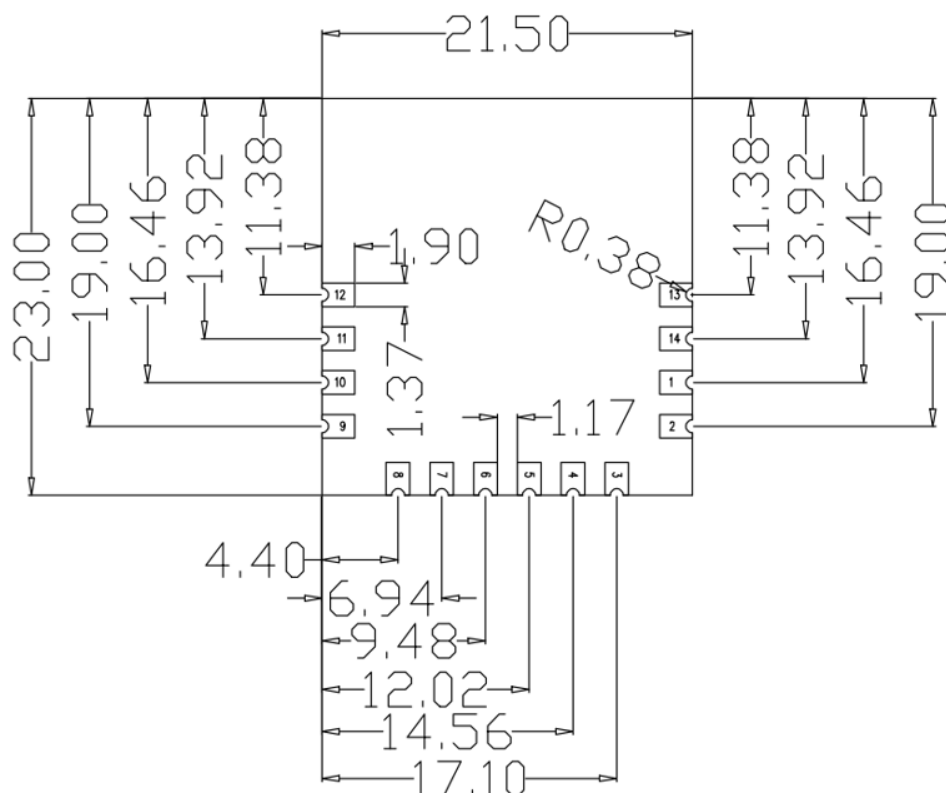
PIN ASSIGNMENT

Pin.	Pin Define	Description	Status
1	+3.3V	3.3V source	YES
2	+3.3V	3.3V source	YES
3	USB_D-	USB Data-	YES
4	USB_D+	USB Data+	YES
5	GND	Ground	YES
6	RESET#	System reset MT7668BU, low active	YES
7	WoWLAN#	Wake up system via wifi, low active	YES
8	GND	Ground	YES
9	WoBT* ¹	Wake up system via BT, low active	NC
10	GND	Ground	YES
11	GND	Ground	YES
12	GND	Ground	YES
13	GND	Ground	YES
14	GND	Ground	YES

**¹ The Pin9 of module is connected to MT7638BU but no need to connect this pin for TV platform since BT function is no use.*

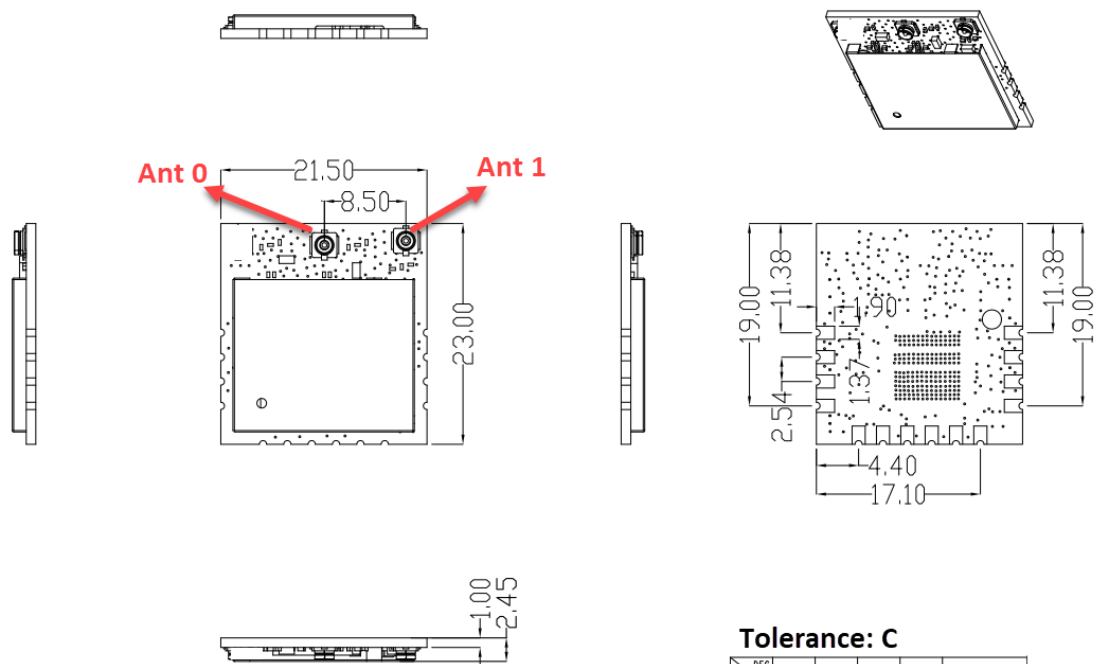
FOOTPRINT

Top View



Unit:mm

MECHANICAL



Tolerance: C

DIM	DEG	A	B	C	D	ANGLE
0-5	±0.06	±0.05	±0.10			0°-30° ±0.1°
5-10	±0.05	±0.10	±0.15			31°-60° ±0.3°
10-50	±0.10	±0.15	±0.20			61°-90° ±0.5°
50-100	±0.15	±0.20	±0.25			
100+	±0.15	±0.20	±0.25			

Unit: mm

EEPROM INFORMATION

Wi-Fi

Reg Domain	World Wide 2.4G/5G Read from registry; Control by driver
	Offset 0x38 for 5G: 0xFF Offset 0x39 for 2.4G: 0xFF
Vendor ID	0x0E8D
Device ID	0x7638

ENVIRONMENTAL

OPERATING

Ambient Operating Temperature: 0 to 70 °C (32 to 158 °F)

Ambient Relative Humidity: 5-90% (non-condensing)

STORAGE

Ambient Temperature: -40 to 80 °C (-40 to 176 °F)

Ambient Relative Humidity: 5-95% (non-condensing)

WARNINGS**FCC Statement:****Federal Communication Commission Interference Statement**

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 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.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for

compliance could void the user's authority to operate this 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.

For product available in the USA/Canada market, only channel 1~11 can be operated.

Selection of other channels is not possible.

This device and its antenna(s) must not be co-located with any other transmitters except in accordance with FCC multi-transmitter product procedures.

Referring to the multi-transmitter policy, multiple-transmitter(s) and module(s) can be operated simultaneously without C2P.

This device is restricted for indoor use.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter

IMPORTANT NOTE:**FCC Radiation Exposure Statement:**

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

IMPORTANT NOTE:

This module is intended for OEM integrator. The OEM integrator is responsible for the compliance to all the rules that apply to the product into which this certified RF module is integrated.

Additional testing and certification may be necessary when multiple modules are used. 20 cm minimum distance has to be able to be maintained between the antenna and the users for the host this module is integrated into. Under such configuration, the FCC radiation exposure limits set forth for an population/uncontrolled environment can be satisfied. Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

USERS MANUAL OF THE END PRODUCT:

In the users manual of the end product, the end user has to be informed to keep at least 20 cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies with Part 15 of 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.

This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

This device is restricted to indoor use.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains TX FCC ID: PPQ-WCBN3509R38 ". If the size of the end product is larger than 8x10cm, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of 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.

IC Statement:

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;

L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

For product available in the USA/Canada market, only channel 1~11 can be operated.

Selection of other channels is not possible.

Pour les produits disponibles aux États-Unis / Canada du marché, seul le canal 1 à 11 peuvent être exploités. Sélection d'autres canaux n'est pas possible.

This device and its antenna(s) must not be co-located with any other transmitters except in accordance with IC multi-transmitter product procedures.

Referring to the multi-transmitter policy, multiple-transmitter(s) and module(s) can be operated simultaneously without reassessment permissive change.

Cet appareil et son antenne (s) ne doit pas être co-localisés ou fonctionnement en association avec une autre antenne ou transmetteur.

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.

les dispositifs fonctionnant dans la bande 5150-5250 MHz sont réservés uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux.

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 specified for point-to-point and non-point-to-point operation as appropriate.

le gain maximal d'antenne permis (pour les dispositifs utilisant la bande 5725-5850 MHz) doit se conformer à la limite de p.i.r.e. spécifiée pour l'exploitation point à point et non point à point, selon le cas.

Dynamic Frequency Selection (DFS) for devices operating in the bands 5250- 5350 MHz, 5470-5600 MHz and 5650-5725 MHz.

Sélection dynamique de fréquences (DFS) pour les dispositifs fonctionnant dans les bandes 5250-5350 MHz, 5470-5600 MHz et 5650-5725 MHz.

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.

le gain maximal d'antenne permis pour les dispositifs utilisant les bandes 5250-5350 MHz et

5470-5725 MHz doit se conformer à la limite de p.i.r.e.

Users should also be advised that high-power radars are allocated as primary users (i.e. priority users) of the bands 5250-5350 MHz and 5650-5850 MHz and that these radars could cause interference and/or damage to LE-LAN devices.

De plus, les utilisateurs devraient aussi être avisés que les utilisateurs de radars de haute puissance sont désignés utilisateurs principaux (c.-à-d., qu'ils ont la priorité) pour les bandes 5250-5350 MHz et 5650-5850 MHz et que ces radars pourraient causer du brouillage et/ou des dommages aux dispositifs LAN-EL.

For indoor use only.

Pour une utilisation en intérieur uniquement.

IMPORTANT NOTE:

IC Radiation Exposure Statement:

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 20 cm between the radiator & your body.

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

This radio transmitter (IC: 4491A-WCBN3509R38) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio (IC: 4491A-WCBN3509R38BT) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

The transmitter module may not be co-located with any other transmitter or antenna.

Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

This module is intended for OEM integrator. The OEM integrator is still responsible for the IC compliance requirement of the end product, which integrates this module.

Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

USERS MANUAL OF THE END PRODUCT:

In the users manual of the end product, the end user has to be informed to keep at least 20 cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the IC radio-frequency exposure guidelines for an uncontrolled

environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. 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.

The transmitter module may not be co-located with any other transmitter or antenna.

Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains TX IC : 4491A-WCBN3509R38".