

USER'S MANUAL

802.11a/b/g/n 2Tx2R + BT5.0 USB WLAN Module

WCBN3509R(38BT)



PRODUCT FEATURES

BT FEATURE:

- Bluetooth V5.0 system
Backwards compatible with BT version of 1.1, 1.2, 2.0, 2.1, 3.0+HS and 4.0LE
- Bluetooth Class I transmission power
- Support for Simple Pairing (SP) and Enhanced Inquiry Response (EIR) function
- Support for SCATTERNET and up to 7 piconets simultaneously with background inquiry/page scan
- Up to 7 BT link + 32BLE link
- Support wide-band speech and hardware accelerated SBC codec for A2DP streaming
- Packet loss concealment
- Channel quality driven data rate adaptation
- Support Wake On Bluetooth

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 and Bluetooth 5.0 with a single USB interface
- PA, LNA, and T/R switch integration for Wi-Fi and Bluetooth
- 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

BT Function	
Standard	Bluetooth V5.0LE
Bus Interface	USB2.0
Data Rate	1 Mbps, 2Mbps and Up to 3Mbps
Modulation Scheme	GFSK, $\pi/4$ -DQPSK and 8-DPSK
Frequency Range	2.402~2.480 GHz
Transmit Output Power	+4 ≤ Output Power ≤ +10dBm; Class I Device
Receiver Sensitivity	< 0.1% BER at -88dBm
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
	MCS0(VHT20/40/80MHz) < -5dB
	MCS7(VHT 20/40/80MHz) < -27dB
	MCS8(VHT 20/40/80MHz) < -30dB
	MCS9(VHT 20/40/80MHz) < -32dB
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 ±10% I/O supply voltage

Power Consumption	Mode	Average		Peak	
		2.4G	5G	2.4G	5G
	TX	TBDmA	TBDmA	TBDmA	TBDmA
	RX	TBDmA	TBDmA		
	Unassociated Idle	TBDmA			

Antenna Type

Triple U.FL connectors for WiFi&BT

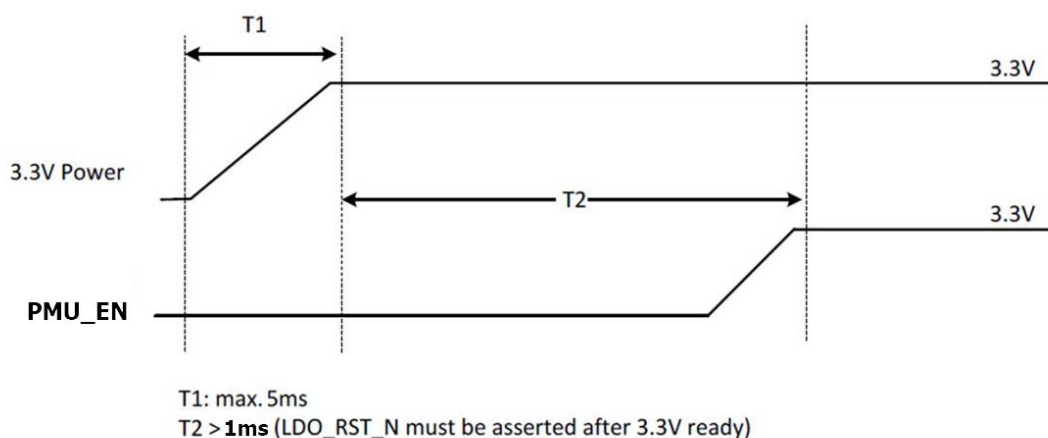
RECOMMENDED OPERATION CONDITIONS

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 _{OH}	Output High Voltage	2.4	-	3.63	V

POWER ON SEQUENCE TIMING

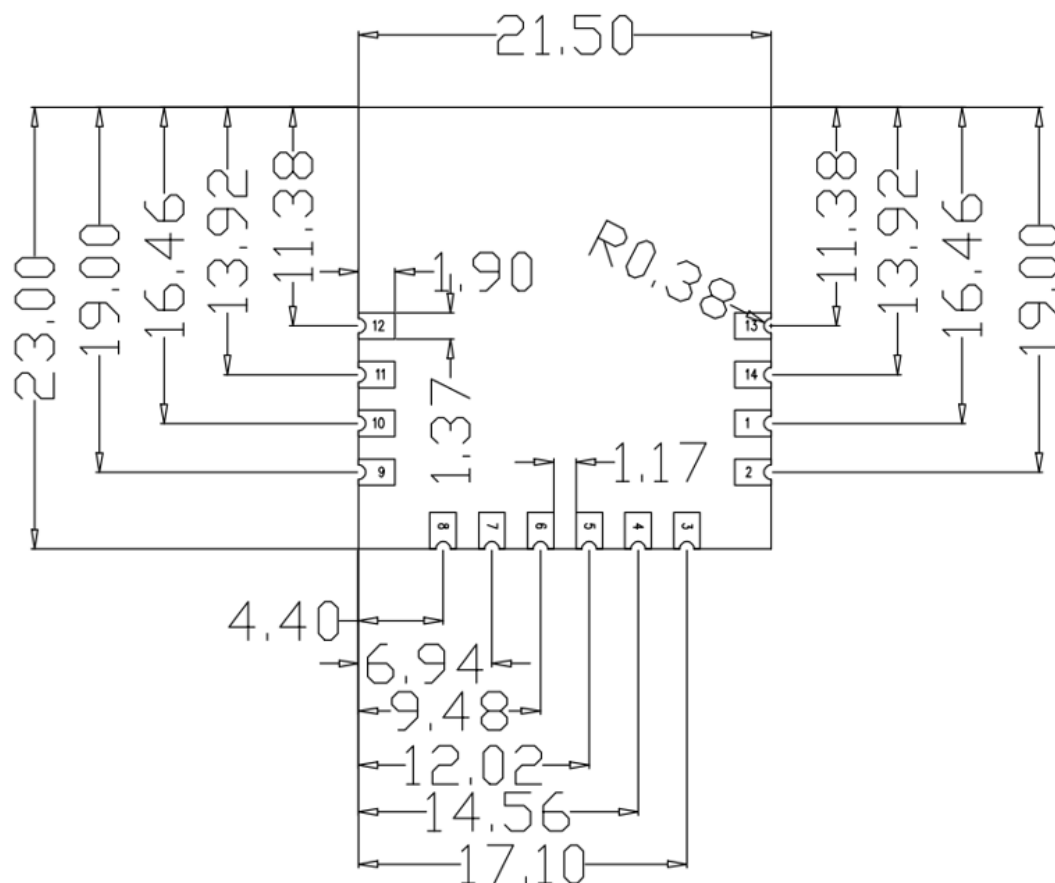


PIN ASSIGNMENT

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	Wake up system via BT, low active	YES
10	GND	Ground	YES
11	GND	Ground	YES
12	GND	Ground	YES
13	GND	Ground	YES
14	GND	Ground	YES

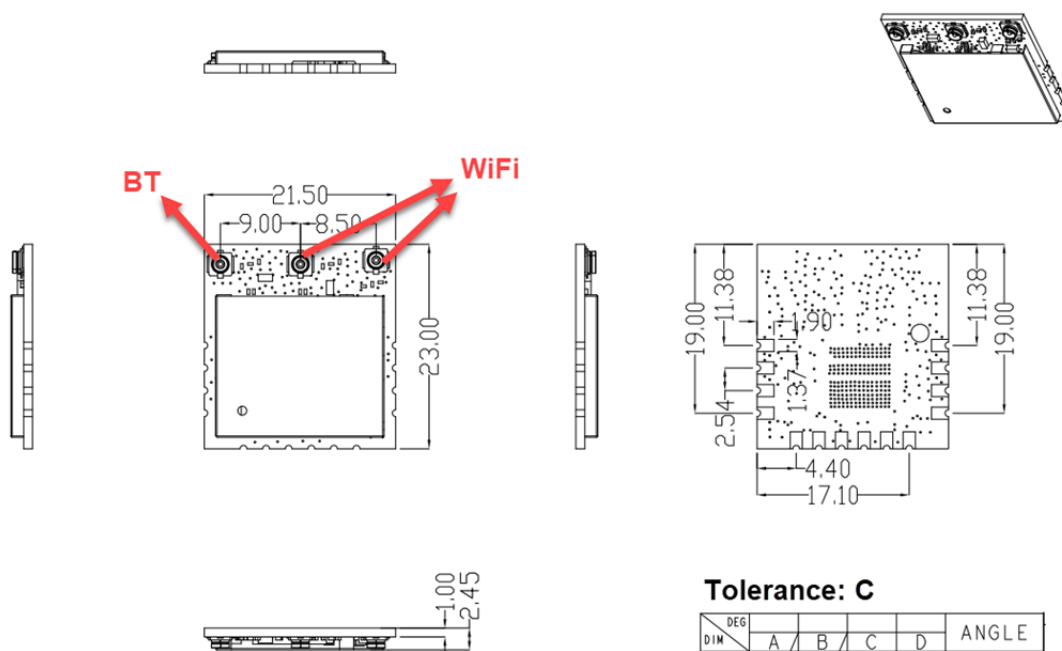
FOOTPRINT

Top View



Unit:mm

MECHANICAL



Tolerance: C

DIM	DEG	A	B	C	D	ANGLE
0-5		±0.06	±0.06	±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)

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.

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.

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.

This module is intended for OEM integrators under the following conditions:

This module is certified pursuant to two Part 15 rules sections (15.407, 15.247).

This module is restricted to installation in products for use only in mobile and fixed applications.

This module is restricted to integration into hosts for indoor use only.

Appropriate measurements (e.g. 15 B compliance) and if applicable additional equipment authorizations (e.g. SDoC) of the host product to be addressed by the integrator/manufacture.

This module is only FCC authorized for the specific rule parts 15.247, 15.407 listed on the grant, and the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host product as being Part 15 Subpart B compliant.

This module has been approved to operate with the antenna types listed below, with the maximum permissible gain indicated.

Ant.	Brand	Model Name	Antenna Type	Gain (dBi)		
				2.4G	5G	BT
1	HONGBO	290-10569	PIFA	3.74	3.8	-
2	HONGBO	290-10569	PIFA	3.74	3.8	-
3	HONGBO	290-10569	PIFA	-	-	3.74
4	PSA	RFMTA401030IMLB702	PIFA	3.74	3.8	-
5	PSA	RFMTA401030IMLB702	PIFA	3.74	3.8	-
6	PSA	RFMTA401030IMLB702	PIFA	-	-	3.74
7	HONGBO	290-10843	PIFA	3.05	1.59	-
8	HONGBO	290-10843	PIFA	3.05	1.59	-
9	HONGBO	290-10843	PIFA	-	-	3.05
10	PSA	RFMTA401050IMLB706	PIFA	3.05	1.59	-
11	PSA	RFMTA401050IMLB706	PIFA	3.05	1.59	-
12	PSA	RFMTA401050IMLB706	PIFA	-	-	3.05
13	HONGBO	290-10844	PIFA	2.38	1.49	-
14	HONGBO	290-10844	PIFA	2.38	1.49	-
15	HONGBO	290-10844	PIFA	-	-	2.38
16	PSA	RFMTA401080IMLB704	PIFA	1.72	1.25	-
17	PSA	RFMTA401080IMLB704	PIFA	1.72	1.25	-
18	PSA	RFMTA401080IMLB704	PIFA	-	-	1.72
19	PSA	RFMTA340730IMLB305	PIFA	-0.5	3.28	-
20	PSA	RFMTA340715IMLB302	PIFA	-1.68	3.08	-
21	PSA	RFMTA340715IMLB305	PIFA	-	-	-0.5

The host product manufacturer must provide following statement in end-product manuals.

- 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.
- 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.
- This device is restricted to indoor use.

Label of the end product:

The host product must be labeled in a visible area with the following " Contains FCC ID:

PPQ-3509R38BT "

The end product shall bear the following 15.19 statement: This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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 radio transmitter [IC: 4491A-3509R38BT] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Le présent émetteur radio [IC: 4491A-3509R38BT] a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

Ant.	Brand	Model Name	Antenna Type	Gain (dBi)		
				2.4G	5G	BT
1	HONGBO	290-10569	PIFA	3.74	3.8	-
2	HONGBO	290-10569	PIFA	3.74	3.8	-
3	HONGBO	290-10569	PIFA	-	-	3.74
4	PSA	RFMTA401030IMLB702	PIFA	3.74	3.8	-
5	PSA	RFMTA401030IMLB702	PIFA	3.74	3.8	-
6	PSA	RFMTA401030IMLB702	PIFA	-	-	3.74
7	HONGBO	290-10843	PIFA	3.05	1.59	-
8	HONGBO	290-10843	PIFA	3.05	1.59	-
9	HONGBO	290-10843	PIFA	-	-	3.05
10	PSA	RFMTA401050IMLB706	PIFA	3.05	1.59	-
11	PSA	RFMTA401050IMLB706	PIFA	3.05	1.59	-
12	PSA	RFMTA401050IMLB706	PIFA	-	-	3.05
13	HONGBO	290-10844	PIFA	2.38	1.49	-
14	HONGBO	290-10844	PIFA	2.38	1.49	-
15	HONGBO	290-10844	PIFA	-	-	2.38
16	PSA	RFMTA401080IMLB704	PIFA	1.72	1.25	-
17	PSA	RFMTA401080IMLB704	PIFA	1.72	1.25	-
18	PSA	RFMTA401080IMLB704	PIFA	-	-	1.72
19	PSA	RFMTA340730IMLB305	PIFA	-0.5	3.28	-
20	PSA	RFMTA340715IMLB302	PIFA	-1.68	3.08	-
21	PSA	RFMTA340715IMLB305	PIFA	-	-	-0.5

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;

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 20cm 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 20cm de distance entre la source de rayonnement et votre corps

IMPORTANT NOTE for OEM integrator:

This module is intended for OEM integrator.

The OEM integrator is still responsible for

1. ensuring that the end-user has no manual instructions to remove or install module
2. the ISED compliance requirement of the end product, which integrates this module.
3. Appropriate measurements and if applicable additional equipment authorizations of the host device to be addressed by the integrator/manufacturer.
4. The separate approval is required for all other operating configurations, including portable configurations and different antenna configurations

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains transmitter module IC: IC: 4491A-3509R38BT.

Contient le module d'émission IC: 4491A-3509R38BT

The Host Model Number (HMN) must be indicated at any location on the exterior of the end product or product packaging or product literature which shall be available with the end product or online.