PRODUCT SPECIFICATION

802.11a/b/g/n/ac 2Tx2R+BT V4.1LE USB Combo Module

WCBN3509A

User Manual

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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:

-ġReorient or relocate the receiving antenna.

-ġIncrease the separation between the equipment and receiver.

-ġConnect the equipment into an outlet on a circuit different from that to which the receiver is

connected.

-ġConsult 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.

Refering to the multi•transmitter policy, multiple•transmitter(s) and module(s) can be operated simultaneously without C2PC.

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.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains TX FCC ID: PPQ- WCBN3509ANB ". 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.

OEM Integrator Checklist

The party below will implement the LITE-ON Module in host systems in accordance with the instructions specified in this document and the documents referenced herein.

1. The OEM integrator will ensure the Module is integrated in a host systems using only the approved antenna model(s) described in this document.
2. The OEM integrator will ensure the antenna placement inside the host system will maintain the required spacing to end user for RF Exposure compliance, as specified in this document.
3. If other radios are integrated inside the host with the LITE-ON Module, the OEM integrator will contact its test lab, TCB or LITE-ON to determine if additional FCC compliance evaluation is required to meet FCC collocation rules.
4. The OEM integrator will ensure end user documentation will contain the specified regulatory wording and ensure the host system and the Module itself are labeled as specified in this document.

5. The OEM integrator will ensure the Module is programmed in the factory with compliant transmit power not exceeding the levels specified in this document.

LITE-ON requests that the OEM integrator acknowledge its receipt of this document and the above instructions. You may contact LITE-ON with any questions concerning this document or the responsibilities of the OEM integrator.

IC Statement:

This device complies with Industry Canada license•exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie 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, et (2) l'utilisateur de 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.

Refering 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.

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 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.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains TX IC: 4491A-WCBN3509ANB ".

DESCRIPTION

QCA9378 is a single-die wireless local area network(WLAN) and Bluetooth(BT) combo solution to support 2x2 MIMO with two spatial streams IEEE802.11 a/b/g/n/ac WLAN standards and BT 4.1+HS enabling seamless integration of WLAN/BT and Low Energy technology.

PRODUCT FEATURES

- Bluetooth V4.1 LE system
  Backwards compatible with BT version of 1.1, 1.2, 2.0, 2.1, 3.0+HS and V4.0LE
- Bluetooth Class I transmission power
- Support for Adaptive Frequency Hopping(AFH), Secure Simple Pairing (SSP) and Extended Inquiry Response (EIR) function
- Scatternet operation with up to four active piconets with background scan and support for scatter mode
- Low power consumption for meeting worldwide energy standards
- Operate at ISM frequency Band (2.4/5GHz)
- IEEE Standards Support, 802.11a ,802.11b, 802.11g 802.11n and 802.11ac
- Support for both 20 MHz/40 MHz channel width in 2.4GHz and 20 MHz/40 MHz/80MHz channel width in 5GHz
- Enterprise level security supporting: WPS2.0,WAPI, WPA, WPA2
- Dual-stream IEEE 802.11n support for 20MHz and 40MHz channels provides PHY layer rates up to 300Mbps
- Dual-stream IEEE 802.11ac support for 80MHz channels provides PHY layer rates up to 867Mbps
- Support for WI-Fi Direct
- Support MU-MIMO
- Fully compliance with USB v2.0 specification
- Support OS: Linux based
- RoHS compliance
- Low Halogen compliance

PRODUCT SPECIFICATIONS

MAIN CHIPSET

Qualcomm Atheros QCA9378-7

FUNCTIONAL SPECIFICATIONS

BT Function	
Standard	Bluetooth V4.1LE
Bus Interface	USB2.0
Data Rate	1 Mbps, 2Mbps and Up to 3Mbps
Modulation Scheme	GFSK, π/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 -80dBm

Wi-Fi Function	
Standard	IEEE802.11a; IEEE802.11b; IEEE 802.11g; IEEE 802.11n; IEEE802.11ac
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 ***802.11ac:*** MCS 0 to 8 for HT20MHz MCS 0 to 9 for HT40MHz MCS 0 to 9 for HT80MHz
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 ***802.11ac***: 256QAM, 64QAM, 16QAM, QPSK, BPSK

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
Receiver Sensitivity	***802.11a:*** -86 dBm@6Mbps -70 dBm@54Mbps ***802.11b:*** -88 dBm@1Mbps -82 dBm@11Mbps ***802.11g:*** -86 dBm@6Mbps -70 dBm@54Mbps ***802.11n(2.4GHz):*** **20MHz** -86 dBm@MCS0 -69 dBm@MCS7 **40MHz** -83 dBm@MCS0 -66 dBm@MCS7 ***802.11n(5GHz):*** **20MHz** -84 dBm@MCS0 -67 dBm@MCS7

	40MHz -81 dBm@MCS0 -64 dBm@MCS7 ***802.11ac:*** **20MHz** -64 dBm@MCS8 **40MHz** -62 dBm@MCS8 -59 dBm@MCS9 **80MHz** -59 dBm@MCS8 -56 dBm@MCS9
Security	WPS, WPA, WPA2, WEP 64bit & 128bit, IEEE 802.1X, IEEE 802.11i

Common Function					
Operating Voltage	3.3 V ±5% I/O supply voltage				
Power Consumption	***Mode***	***Average***		***Peak***	
		2.4G	***5G***	***2.4G***	***5G***
	TX	*630mA*	*715mA*	*900mA*	*1150mA*
	RX	*335mA*	*375mA*		
	Disable	*81mA*			
	WiFi+BT @Wake up mode	*30mA*			
Antenna Type	Dual U.FL Antenna for WiFi/BT				

RECOMMENDED OPERATION CONDITIONS

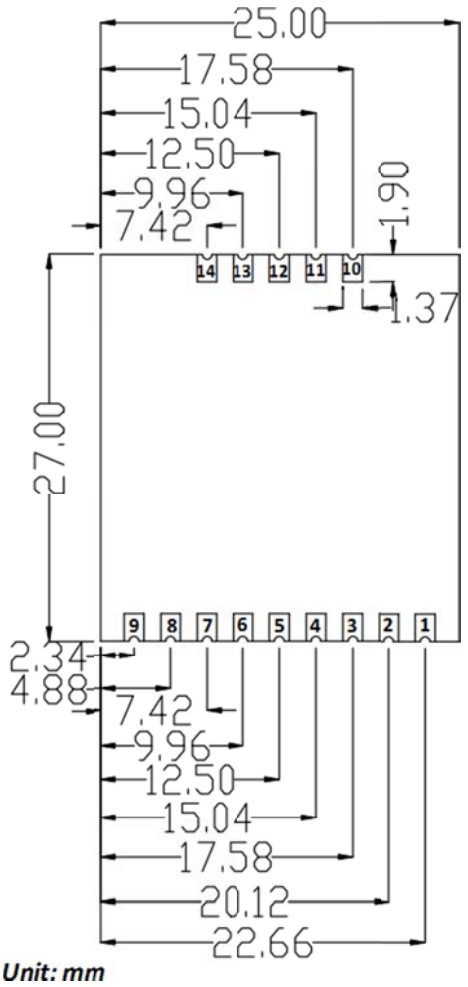
Symbol	Parameter	Min	Typ	Max	Units
VDD33	3.3V Supply Voltage	3.14	3.3	3.46	V

PIN ASSIGMENT

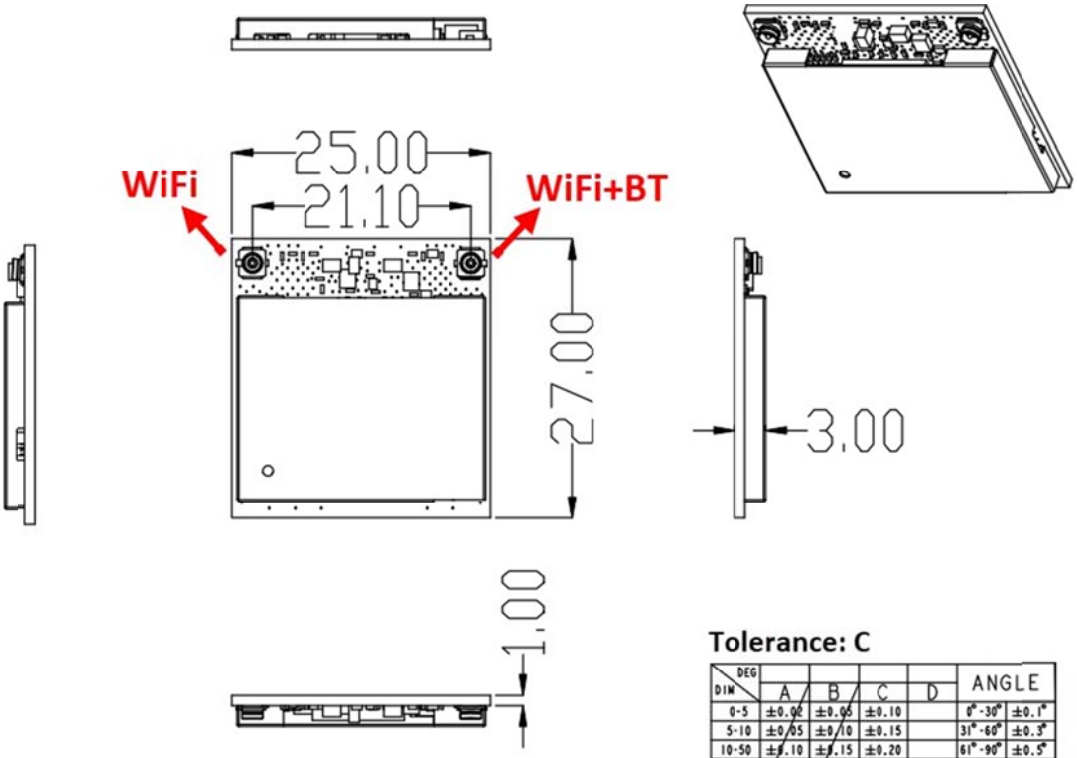
Pin.	Pin Define	Description	Status
1	+3.3V	3.3V source	YES
2	+3.3V	3.3V source	YES
3	USB_D-	USB Data-	YES
4	USB_D+	USB Data+	YES
5	GND	Ground	YES
6	RESET#	System reset QCA9378, low active	YES
7	WoWLAN#	Wake up system via wifi, low active	YES
8	GND	Ground	YES
9	WoBT	Wake up system via BT, high active	YES
10	GND	Ground	YES
11	GND	Ground	YES
12	GND	Ground	YES
13	GND	Ground	YES
14	GND	Ground	YES

FOOTPRINT

Top View



MECHANICAL

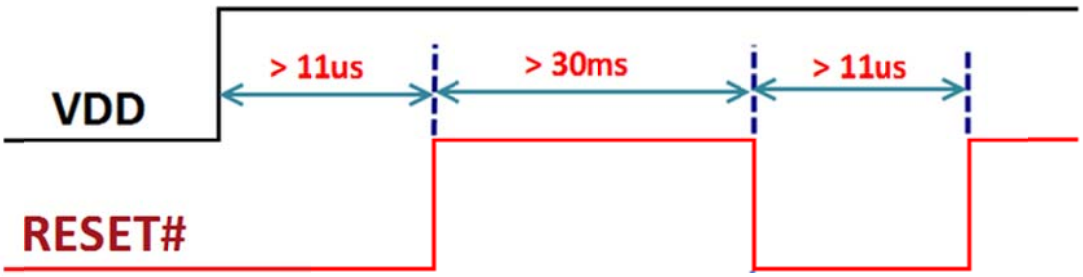


Tolerance: C

DIM \ DEG	A	B	C	D	ANGLE	
0-5	±0.02	±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

POWER-UP SEQUENCE TIMING



**Notes:*

1. There should be at least 30ms delay between two consecutive toggles.

EEPROM INFORMATION

BT

Vendor ID	0x0CF3
Product ID	0x9378

WI-FI

Reg Domain	
Vendor ID	0x00CF3
Device ID	0x9378

ENVIRONMENTAL

OPERATING

Operating Temperature: 0 to 70 °C (32 to 158 °F)
Relative Humidity: 5-90% (non-condensing)

STORAGE

Temperature: -40 to 80 °C (-40 to 176 °F)
Relative Humidity: 5-95% (non-condensing)