USER MANUAL

802.11 a/b/g/n 1x1 + BT5.0 + Zigbee(15.4) IoT Module

WCBN3516A

QCA4020

Version 1.0

Change History

Revision	Date	Author	Change List
Version 1.0	2018/11/12	Ben J Chen	Preliminary

DESCRIPTION

QCA4020 is an intelligent platform for the Internet of Things that contains a low-power Wi-Fi(802.11 a/b/g/n 1x1), BLE 5.0 and Zigbee(802.15.4) connectivity protocols along with SSL, enabling a low-cost, low-complexity system to obtain full-featured internet connectivity and reliable information exchange.

QCA4020 device contains three processors:

- The first processor, an ARM Cortex-M4F@ up to 128MHz is used as the application processor. It runs the Qualcomm network stack as well as OEM application code. Customer software runs under an RTOS such as ThreadX or FreeRTOS and so on.
- Second processor, an ARM Cortex-M0@64MHz, which is utilized as the connectivity processor for BLE and 802.15.4 subsystem
- Third processor, CPU which is a dedicated processor to run the Wi-Fi dual band function

PRODUCT FEATURES

The WCBN3516A module provides highly-integrated and flexible platform for developing and evaluating products and applications based on QCA4020 SoC. WCBN3516A module can be either used with development kit for software development or incorporated into OEM products to enable rapid deployment of Wi-Fi connected system.

Module feature includes:

- Operate at ISM frequency Band (2.4/5GHz)
- Dual-band IEEE802.11 a/b/g/n, single stream 1x1
- Support 20 MHz channel width in 2.4GHz and 5GHz
- Bluetooth Low Energy (BLE) compliant to the SIG v5.0 specification
- Zigbee 15.4
- Green TX power saving mode
- Low-power listen mode
- Rich set of GPIOs and interface: I2C, HSUART, UART, SPI, QSPI, SDIO2.0, I2S,JTAG, Sensor ADC(up to8 channels, 12bit, 1Mbps), up to 8 PWM optimized for LED lighting applications.
- advanced power management scheme to minimize power dissipation for each use case.
- 32Mb NOR flash memory
- On board Printed Antenna

PRODUCT SPECIFICATIONS

MAIN CHIPSET

Qualcomm QCA4020

FUNCTIONAL SPECIFICATIONS

Zigbee Function	
Standard	802.15.4
Modulation Scheme	O-QPSK
Transmit Output Power	Typical: 0 dBm
Receiver Sensitivity	-101dBm

BLE Function	
Standard	Bluetooth V5.0
Bus Interface	UART
Data Rate	1 Mbps, 2Mbps
Modulation Scheme	GFSK
Frequency Range	2.400~2.4835 GHz
Operating Channel	0~39
Transmit Output Power	-4 ≤ Output Power ≤ +2dBm; Class II Device
Receiver Sensitivity	< 0.1% BLE 1M at -93dBm

Wi-Fi Function	
Standard	IEEE802.11a; IEEE802.11b; IEEE 802.11g; IEEE 802.11n;
Bus Interface	UART
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 7 for HT20MHz
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	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

Transmit Output Power - single chain @ant;
Tolerance: ±2dBm@2.4GHz; ±2.5dBm@5GHz

2.4GHz

802.11b	***1Mbps***	***2Mbps***	***5.5Mbps***	***11Mbps***
Tgtpwr (dBm)	17	17	17	17

802.11g	***6~24Mbps***	***36Mbps***	***48Mbps***	***54Mbps***
Tgtpwr (dBm)	17	17	17	17

802.11n HT20	***MCS0***	***MCS1***	***MCS2***	***MCS3***	***MCS4***
Tgtpwr (dBm)	17	17	17	17	17
	MCS5	***MCS6***	***MCS7***		
	17	17	17		

5GHz

802.11a	***6~24Mbps***	***36Mbps***	***48Mbps***	***54Mbps***
Tgtpwr (dBm)	13	13	12	11

802.11n HT20	***MCS0***	***MCS1***	***MCS2***	***MCS3***	***MCS4***
Tgtpwr (dBm)	13	13	13	13	12
	MCS5	***MCS6***	***MCS7***		
	11	10	9		

Receiver Sensitivity

Frequency Band	***Rate***	***Condition***	***1x1(1SS) (dBm)***
2.4G	11b-1M	PER < 8%	-94
	11b-11M	PER < 8%	-87
	11g-6M	PER < 10%	-91

	11g-54M	PER < 10%	-75
	11n-HT20MCS0	PER < 10%	-92
	11n-HT20MCS7	PER < 10%	-71
5G	11a-6M	PER < 10%	-89
	11a-54M	PER < 10%	-72
	11n-HT20MCS0	PER < 10%	-89
	11n-HT20MCS7	PER < 10%	-69

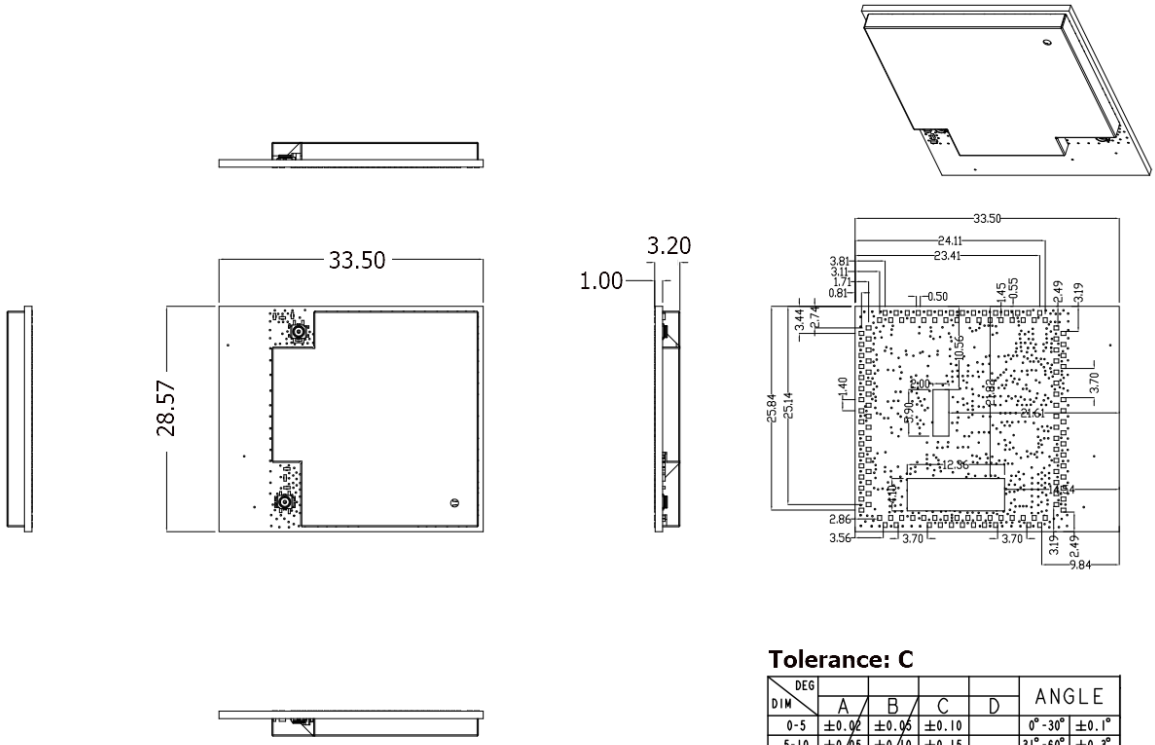
Security	WPA, WPA2, WEP 64bit & 128bit, IEEE 802.1X, IEEE 802.11i

Common Function					
Operating Voltage	3.3 V ±5% I/O supply voltage				
Power Consumption	***Mode***	***Average***		***Peak***	
		2.4G	***5G***	***2.4G***	***5G***
	TX	*TBDmA*	*TBDmA*	*TBDmA*	*TBDmA*
	RX	*TBDmA*	*TBDmA*		
	Disable	*TBDmA*			
	Sleep mode	*TBDmA*			
Antenna Type	Printed Antenna for WiFi/BT/15.4				

RECOMMENDED OPERATION CONDITIONS

Symbol	Parameter	Min	Typ	Max	Units
SWREG_IN_WL VDD33_WL	WL Internal SWREG supply	3.14	3.3	3.46	V
VDD33_ANT_WL VDD33_RF_WL VDD33_XTAL_WL VDD33_PLL_WL VDD33_SYNTH_WL VDD33_USB_WL	WL Analog High Voltage supply	3.14	3.3	3.46	V
DVDD12_WL	WL Core Digital supply	1.2	1.26	1.32	V
VDD12_BB_PLL_WL VDD12_RF_WL VDD12_SYNTH_WL	WL Core Analog supply	1.2	1.26	1.32	V
V_{IH}	High Level Input voltage	2.4	-	3.6	V
V_{IL}	Low Level Input voltage	-0.3	-	0.3	V
V_{OH}	High Level Output voltage	3.0	-	3.3	V
V_{OL}	Low Level Output voltage	-0.3	-	0.4	V

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

33	GND	G	Ground	YES
34				YES
35	32K_XTALI		Optional external 32KHz crystal	YES
36	32K_XTALO		Optional external 32KHz crystal	NC
37	CHIP_PWD_L_BE		BLE/15.4 Reset Pin	NC
38	GND	G	Ground	YES
39-41	VDD11_SWREG_OUT		Not used, NC	NC
42	GND	G	Ground	YES
43-44	VDDIO18_BE		Not used, NC	NC
45	GND	G	Ground	YES
46	GPIO28_BE		I2S_BCLK	YES
47	GPIO29_BE		I2S_RXD	YES
48	GPIO30_BE		I2S_TXD	YES
49	GPIO32_BE		I2S_MCLK	YES
50	GPIO31_BE		I2S_FSYNC	YES
51	GPIO17_BE		SPI0_CS1_N / I2C1_Master_SDA / HS_UART0_DM_RXD	YES
52	GPIO14_BE		HS_UART0_DM_CTS	YES
53	GPIO16_BE		SPI0_CS2_N / I2C1_Master_SCL / HS_UART0_DM_RFR / BT Active	YES
54	GPIO13_BE		PWM Out_7	YES
55	GPIO15_BE		HS_UART0_DM_TXD	YES
56	GPIO11_BE		I2C0_Master_SDA / JTAG1_BE_TDI	YES
57	GPIO48_BE		Ext_32K_IN	YES
58	GPIO9_BE		M0&M4_UART0_TX / JTAG1_BE_TDO	YES
59	GPIO10_BE		I2C0_Master_SDA / JTAG1_BE_TMS	YES
60	GPIO53_BE		JTAG3_BE_TDI	YES
61	GPIO8_BE		M0&M4_UART0_RX / JTAG1_BE_TCK	YES
62	GPIO52_BE		JTAG3_BE_TMS	YES
63	GPIO51_BE		JTAG3_BE_TDO	YES
64	GPIO49_BE	I/O	General-purpose input/output	YES
65-66	NC		Not Connected	NC
67-69	GND	G	Ground	
70	NC		Not Connected	NC
71	GND	G	Ground	
72-75	NC		Not Connected	NC
76	GND	G	Ground	
77	NC		Not Connected	NC
78	GPIO50_BE		JTAG3_BE_TCK	YES
79	GPIO7_BE		BT PRIORITY	YES
80	GPIO41_BE		PWR_STATUS	YES
81	GPIO6_BE		WLAN ACTIVE	YES
82	GPIO60_BE		HS UART2_DM_TXD(O) / BT PRIORITY	YES
83	GPIO5_BE		BT ACTIVE	YES

ENVIRONMENTAL

OPERATING

Operating Temperature: -20 to 80 °C
Relative Humidity: 5-90% (non-condensing)

STORAGE

Temperature: -40 to 80 °C (-40 to 176 °F)
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.
Refering to the multi-transmitter policy, multiple-transmitter(s) and module(s) can be operated simultaneously without C2P.

This device is restricted for indoor use.

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-WCBN3516A ". 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 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.

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-WCBN3516A) 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-WCBN3516A) 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.

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-WCBN3516A".

Japan Statement:
5GHz product for indoor use only.

CE Statement:
This equipment complies with EU 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.