

# USER MANUAL

**Wi-Fi (11a/b/g/n/ac 2Tx2R) + BT (V4.1 LE) SDIO Combo Module**

**WCBN4503M**

**Marvell 88w8897**

Version 1.3

## Change History

Revision	Date	Author	Change List
Version 1.0	2015/05/17	Ben J. Chen	Preliminary
Version 1.1	2015/07/01	Ben J. Chen	Update Transmit Output Power Update Pin Assignment - Change Pin13 to NC, using internal 1.8V Update Connector SPEC
Version 1.2	2015/07/09	Ben J. Chen	Update Power Consumption
Version 1.3	2015/07/22	Ben J. Chen	Update Antenna SPEC - Remove Sponge and Heat Shrink tubing

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**WCBN4503M**

**Marvell 88w8897**

Version 1.3

**Networking B.U.  
Lite-on Technology Corporation  
4F, No. 90, Chien I Rd.,  
Chung Ho, New Taipei City 235, Taiwan, R.O.C.**

**Customer Approval:** \_\_\_\_\_ (Signature)  
\_\_\_\_\_ (Title)  
\_\_\_\_\_ (Company)  
\_\_\_\_\_ (Date)

(Please Sign Back by FAX. For Confirming the Spec Only, not an Official Agreement for OEM/ODM Business)

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## PRODUCT FEATURES

### BT FEATURE:

- Bluetooth V4.1 LE system  
Backwards compatible with BT version of 1.1, 1.2, 2.0, 2.1 and 3.0+HS
- Support Dual-mode Bluetooth
- BT using SDIO interface
- BT transmission speed including 1M (GFSK), 2M ( $\pi/4$ -DQPSK) and 3Mbps (8DPSK) EDR and up to 54Mbps (Physical Rate) High Speed operations
- Support for Simple Pairing (SP) and Enhanced Inquiry Response (EIR) function
- Support master and slave piconet and scatternet
- Adaptive Frequency Hopping (AFH) using Packet Loss Rate (PLR)
- Enhanced low power scan mode

### WI-FI FEATURE:

- 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
- Support SDIO 3.0 interface, 4-bit SDIO transfer modes at full clock range up to 208MHz
- Enterprise level security supporting: WEP, WPA, WPA2, WAPI
- 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 Wi-Fi Direct
- Support Wake On WLAN

### COMMON FEATURE

- Support for BT & WLAN Co-existence
- Support Linux OS based
- RoHS compliance
- Low Halogen compliance

## PRODUCT SPECIFICATIONS

### MAIN CHIPSET

Marvell 88w8897

### FUNCTIONAL SPECIFICATIONS

BT Function	
Standard	Bluetooth V4.1 LE
Bus Interface	
Bus Interface	SDIO
Data Rate	1 Mbps, 2Mbps and Up to 3Mbps
Modulation Scheme	
Modulation Scheme	GFSK, $\pi/4$ -DQPSK and 8-DPSK
Frequency Range	2.402~2.480 GHz
Transmit Output Power	+4 ≤ Output Power ≤ +10 ; Class I Device
Receiver Sensitivity	< 0.1% BER at -80dBm
Wi-Fi Function	
Standard	IEEE802.11a; IEEE802.11b; IEEE 802.11g; IEEE 802.11n, IEEE 802.11ac
Bus Interface	
Bus Interface	SDIO 3.0
Data Rate	<p><b>802.11b:</b> 11, 5.5, 2, 1 Mbps</p> <p><b>802.11a/g:</b> 54, 48, 36, 24, 18, 12, 9, 6 Mbps</p> <p><b>802.11n:</b> MCS 0 to 15 for HT20MHz MCS 0 to 15 for HT40MHz</p> <p><b>802.11ac:</b> MCS 0 to 8 for HT20MHz MCS 0 to 9 for HT40MHz MCS 0 to 9 for HT80MHz</p>
Media Access Control	
Media Access Control	CSMA/CA with ACK
Modulation Techniques	<p><b>802.11b:</b> CCK, DQPSK, DBPSK</p> <p><b>802.11a/g:</b> 64QAM, 16QAM, QPSK, BPSK</p> <p><b>802.11n:</b> 64QAM, 16QAM, QPSK, BPSK</p> <p><b>802.11ac:</b> 256QAM, 64QAM, 16QAM, QPSK, BPSK</p>

<b>Network Architecture</b>	Ad-hoc mode (Peer-to-Peer) Infrastructure mode
<b>Operation Channel</b>	<p><b>2.4GHz</b> 11: (Ch. 1-11) – United States 13: (Ch. 1-13) – Europe 14: (Ch. 1-14) – Japan</p> <p><b>5GHz</b> 12: United States 19: Europe 8: Japan</p>
<b>Frequency Range</b>	<p><b>802.11bg</b> 2.412 ~ 2.462 GHz</p> <p><b>802.11a</b> 5.15 ~ 5.825 GHz</p>
<b>Transmit Output Power – 2x2 (Tolerance: ±1.5dBm)</b>	<p><b>802.11a:</b> 14 dBm@6Mbps 14 dBm@54Mbps</p> <p><b>802.11b:</b> 15 dBm@1Mbps 15 dBm@11Mbps</p> <p><b>802.11g:</b> 14 dBm@6Mbps 14 dBm@54Mbps</p> <p><b>802.11n(2.4GHz):</b> <b>20MHz:</b> 13 dBm@MCS0 13 dBm@MCS7 <b>40MHz:</b> 13 dBm@MCS0 13 dBm@MCS7</p> <p><b>802.11n(5GHz):</b> <b>20MHz:</b> 11 dBm@MCS0 11 dBm@MCS7 <b>40MHz:</b> 10 dBm@MCS0 10 dBm@MCS7</p> <p><b>802.11ac:</b> <b>20MHz:</b> 11 dBm@MCS0 11 dBm@MCS8 <b>40MHz:</b> 10 dBm@MCS0 10 dBm@MCS8 10 dBm@MCS9 <b>80MHz:</b> 8 dBm@MCS0 8 dBm@MCS8 8 dBm@MCS9</p>
<b>Receiver Sensitivity</b>	<p><b>802.11a:</b> -86 dBm@6Mbps -70 dBm@54Mbps</p> <p><b>802.11b:</b> -88 dBm@1Mbps -82 dBm@11Mbps</p> <p><b>802.11g:</b></p>

	-86 dBm@6Mbps -70 dBm@54Mbps
	<b>802.11n(2.4GHz):</b>
	<b>20MHz</b>
	-86 dBm@MCS0 -69 dBm@MCS7
	<b>40MHz</b>
	-83 dBm@MCS0 -66 dBm@MCS7
	<b>802.11n(5GHz):</b>
	<b>20MHz</b>
	-84 dBm@MCS0 -67 dBm@MCS7
	<b>40MHz</b>
	-81 dBm@MCS0 -64 dBm@MCS7
	<b>802.11ac:</b>
	<b>20MHz</b>
	-64 dBm@MCS8
	<b>40MHz</b>
	-62 dBm@MCS8 -59 dBm@MCS9
	<b>80MHz</b>
	-59 dBm@MCS8 -54 dBm@MCS9
<b>Security</b>	WPA, WPA2, WEP 64bit & 128bit, IEEE 802.1X, IEEE 802.11i

<b>Common Function</b>					
<b>Operating Voltage</b>	3.3 V ±10% I/O supply voltage				
<b>OS Supported</b>	Linux Based				
<b>Power Consumption</b>	<b>Mode</b>	<b>Average</b>		<b>Peak</b>	
		<b>2.4G</b>	<b>5G</b>	<b>2.4G</b>	<b>5G</b>
	<b>TX</b>	550mA	750mA	800mA	900mA
	<b>RX</b>	110mA	180mA		
	<b>Idle</b>	90mA			
<b>Deep Sleep</b>	1mA				
<b>Antenna Type</b>	Triple U.FL connectors for plugging external antenna				

**RECOMMENDED OPERATION CONDITIONS**

Symbol	Parameter	Min	Typ	Max	Units
AVDD33	3.3V analog power supply	2.97	3.3	3.63	V
AVDD18	1.8V analog power supply	1.71	1.8	1.98	V
VIO	1.8V power supply for host interface	1.62	1.8	1.98	V
	3.3V power supply for host interface	2.97	3.3	3.63	V

## PIN ASSIGNMENT

Pin.	Pin Define	Description	Status
1	GND	Ground	YES
2	GND	Ground	YES
3	SDIO_Data1	SDIO Data Line1	YES
4	SDIO_Data2	SDIO Data Line2	YES
5	SDIO_Data0	SDIO Data Line0	YES
6	SDIO_Data3	SDIO Data Line3	YES
7	SDIO_CMD	SDIO Command Input	YES
8	WL/BT_HOST_WAKE#	Device wake up Host, Low Active	YES
9	SDIO_CLK	SDIO Clock Input	YES
10	GND	Ground	YES
11	PDn#	Active Low to Power-Down WLAN	YES
12	GND	Ground	YES
13	+1.8V	1.8V power supply for VIO_SD	NC
14	+3.3V	3.3V power supply	YES

## CONNECTOR SPEC

Material:

- \* Insulator: Nylon 6T With 30% GF. Color Black
- \* S.Q PIN: Brass

Ordering Code:

CH74 \*\* 2 M 1 0\*-J -NH

① ② ③ ④ ⑤ ⑥ ⑦

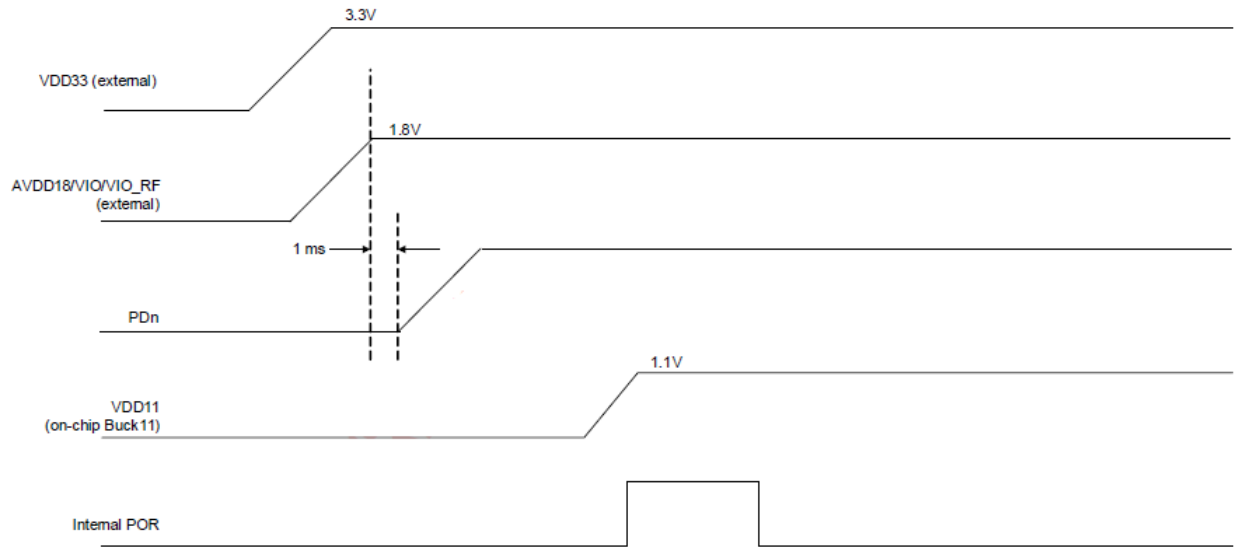
- Series No.
- No. of Contacts
- Plating option:  
2= Gold flash plated over 1.27μm(50μ") Nickel
- Tail style: M= Straight SMT Type
- Color: 1= Black
- Option: 00-J= Without Pegs  
0P-J= With Pegs
- NH= For Lead Free IR Processes and Halogen-Free

Recommended P.C. Board Layout

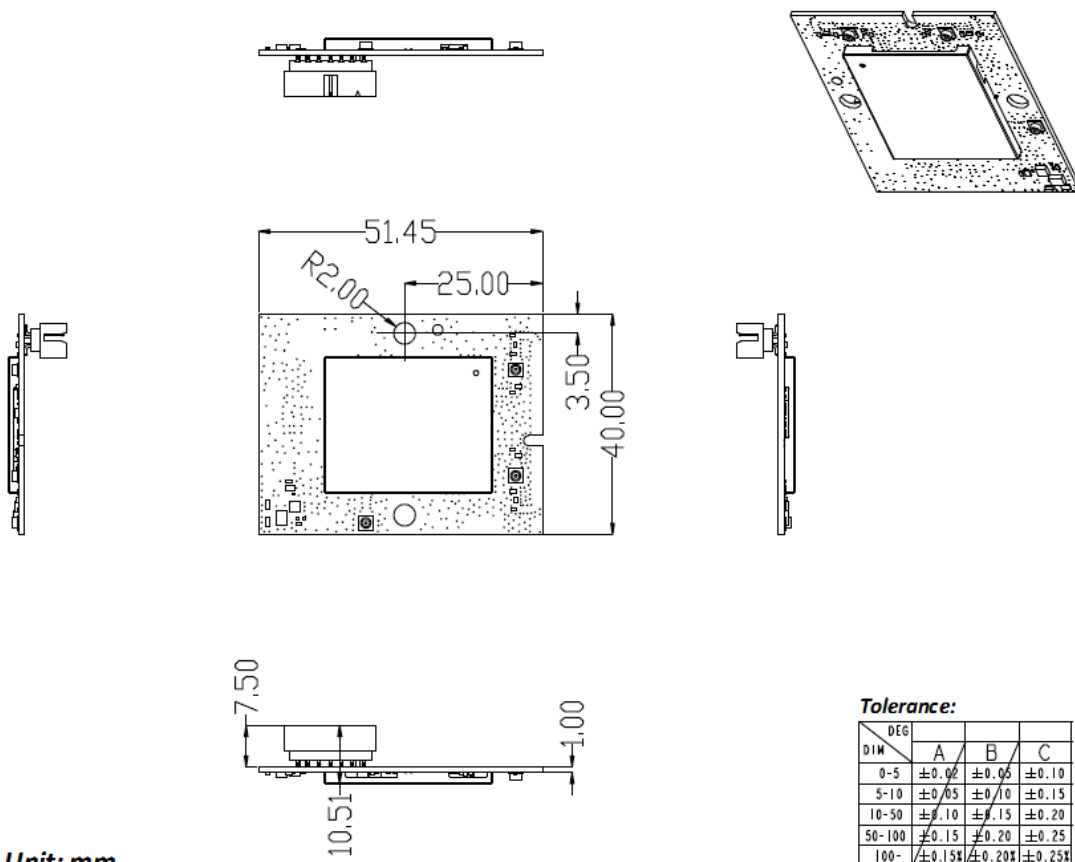
	Halogen-Free	Lead Free Process	RoHS compliant
		瀚荃股份有限公司 CvILux Corporation	
		TITLE: 2.00mm(.079") STRAIGHT DUAL ROW BORAO MOUNT PIN HEADER MATERIAL: FINISH:	
		DRAWING NO. CH7429S1 PART NO. CH74**2M10*-J-NH SCALE 3 / 1 SHEET 1 OF 1	
		DATE: _____ UNIT: mm / inch TOLERANCE UNLESS OTHERWISE SPECIFIED X ± 0.30/.012 X' ± 1" XX ± 0.20/.008 X' ± XXX ± 0.10/.004 XX ±	
		DRAWN BY: _____ ENGINEER: _____ CHECKED BY: _____ APPROVED BY: _____	
		SYM NAME DATE REVISIONS	



## POWER-UP SEQUENCE TIMING



## MECHANICAL



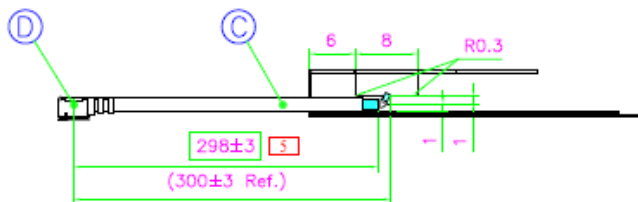
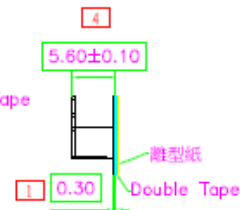
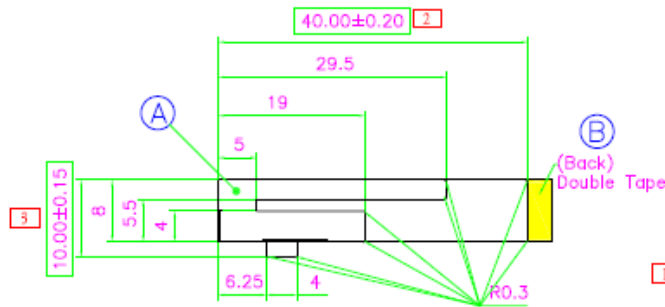
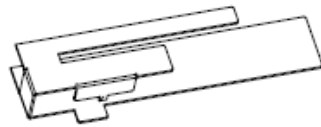
Unit: mm

**ANTENNA SPEC**

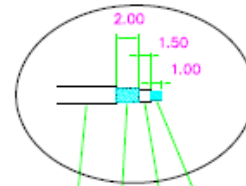
**Wi-Fi Antenna (Q'ty: 2pcs)**

NO	DESCRIPTION	QTY	REMARK
<b>ELECTRICAL</b>			
Frequency: 2.4/5. x GHZ			
A	Antenna	SUS430(鍍鍍) T=0.3mm	1
B	Double Tape	3M 9448	1
C	Coaxial cable	Φ1.37 Cable(Black)	1
D	Connector	IPEX	1

注意：  
CABLE+IPEX拉力需≥1.5kg



注意接頭方向



D C B A  
A - center conductor  
B - Dielectric  
C - Outer conductor  
D - Jacket

※標記□記號者，為重點檢驗尺寸

				設計 DR. HWCHAN	2015.07.08	品名	版本 REV.
				核准 MARCO		ARTICLE	A
				容許公差 TOLERANCE			
				6以下.....±0.2			
				6以上~30.....±0.5			
				30以上~120.....±0.8			
				120以上~315.....±1.2			
				315以上~1000.....±2.0			
				1000以上~2000.....±3.0			
LTR	DESCRIPTION	DATE	REQ. BY	RFMTA401029IMLB702			
<b>華新科技股份有限公司</b> Walsin Technology Corporation				單位 UNIT	比例 SCALE	張數 SHEET	
				mm	****	1	

**ELECTRICAL CHARACTERISTICS**

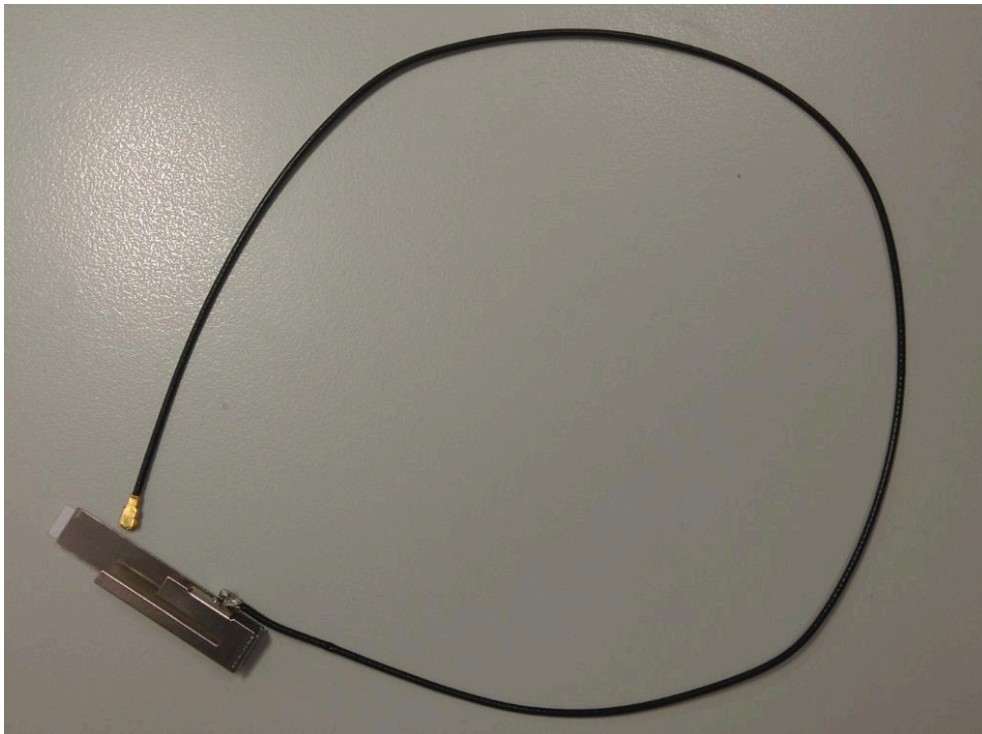
Item	Specification
Working Frequency Range	2.4 ~ 2.5 / 5.15 ~ 5.85 GHz
Return Loss	-10dB(Max)
VSWR	2 max.
Polarization	Linear Vertical
Radiation Pattern	Directional
Impedance	50Ω

\*Note 1. Central Frequency should be defined after customers' application approval.

**MATERIAL TABLE**

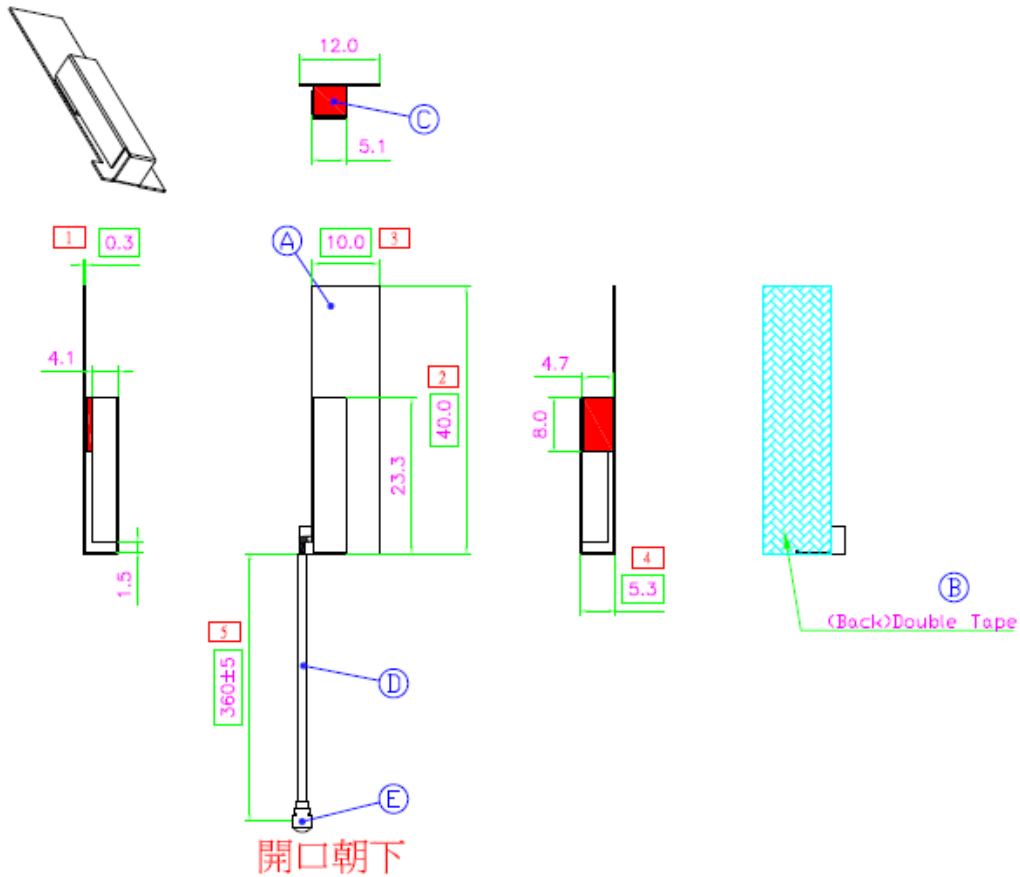
Items	Description
Antenna Material	SUS430 鍍線 T=0.3mm
Cable	φ 1.37 Cable (Black)
Sponge(EVA)+Double Tape(G9000)	含背膠總厚度1.20mm
Connector	IPEX

**WI-FI ANTENNA PHOTO**



**BT Antenna(Q'ty: 1pcs)**

ELECTRICAL Frequency : 2.4~2.5 GHz	NO	DESCRIPTION	QTY	REMARK
	注意： CABLE+IPEX拉力需≥1.0kg	A	Antenna	SUS430(鍍鍍) T=0.3mm
B		Double Tape	3M 9448(L40*W10mm)	1
C		Sponge(EPDM L8*W4.8 Black)+Double Tape(G9000) : T4.7mm		1
D		Coaxial cable	φ1.13 Cable(Gray)	1
E		Connector	IPEX	1



IPEX方向:  
 100mm±90°  
 200mm±135°  
 200mm以上不管控

※標記□記號者, 為重點檢驗尺寸

		設計 DR.	HWCHAN	2014.08.13	品名	版本 REV.
		核准			ARTICLE	A
LTR	DESCRIPTION	DATE	REQ. BY	容許公差 TOLERANCE	RFMTA400536IMAB301	單位 UNIT
 華新科技股份有限公司 Walsin Technology Corporation				0-5	±0.05	比例 SCALE
				5-10	±0.10	****
				10-50	±0.15	張數 SHEET
				50-100	±0.20	1
						

**ELECTRICAL CHARACTERISTICS**

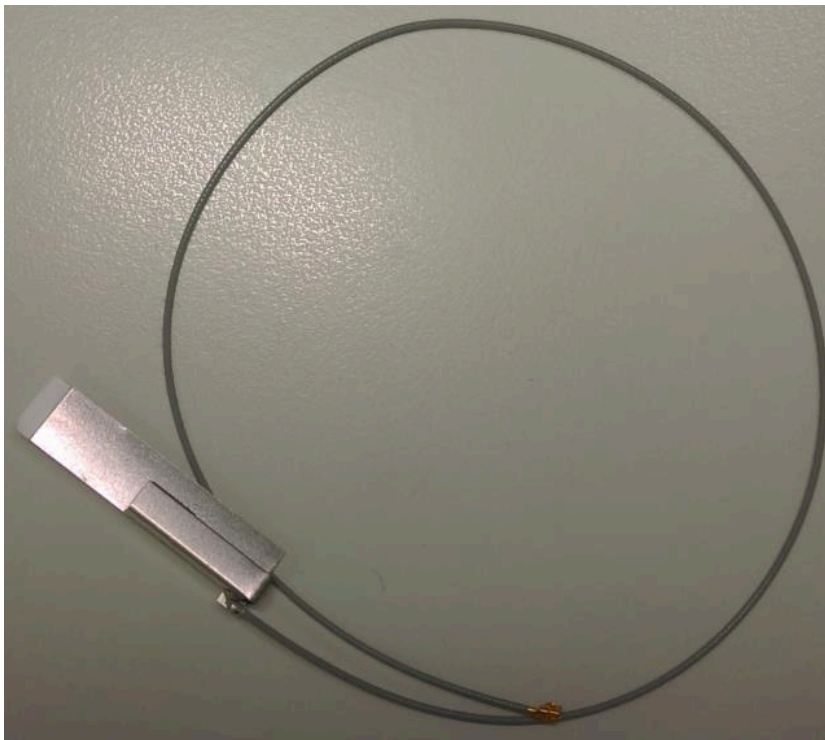
Item	Specification
Working Frequency Range	2.4 ~2.5 GHz
Return Loss	-10dB(Max)
VSWR	2 max.
Peak Gain	3.79 dBi
Polarization	Linear Vertical
Radiation Pattern	Directional
Impedance	50Ω

\*Note 1. Central Frequency should be defined after customers' application approval.

**MATERIAL TABLE**

Items	Description
Antenna Material	SUS430 鍍銀 T=0.3mm
Cable	φ 1.37 Cable(Gray)
Double Tape	3M 9448
Sponge+Double Tape	EPDM L8*W4.8(Black)+G9000 : 總厚度T=4.7mm
Connector	IPEX

**BT ANTENNA PHOTO**



## EEPROM INFORMATION

### BT

<b>Vendor ID</b>	0xTBD
<b>Product ID</b>	0xTBD

### Wi-Fi

<b>Region Code</b>	FCC SKU <b>2.4G:</b> CH1-11 <b>5G:</b> U-NII-1, U-NII-3
	CC=0x10
<b>Vendor ID</b>	0xTBD
<b>Device ID</b>	0xTBD

## 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)

**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 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-WCBN4503M ". 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.

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.

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-WCBN4503M ".