Product Specification

Wireless Module

Project Name	**WBU053-VZ**
Customer	**FOXCONN**
Customer Part No.	**6M01B0000R000**
Foxconn Part No.	**WBU053-VZ**

Approved:	Approved:	Prepared by:
_____	_____	_____
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Revision History

Date	Number	Approver	Comments
2019/09/20	1.0	Kevin Yao	Initial Draft
2019/10/28	2.0	Kevin Yao	Update module photo

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CHAPTER 1. MODULE OVERVIEW

The Foxconn WBU053-VZ is a highly integrated module which features a low power 2x2 dual-band WLAN subsystem. The WLAN subsystem contains the 802.11a/b/g/n radio, baseband, and MAC that are designed to meet both the low power and high throughput application.

WBU053-VZ has a 32-bit RISC MCU that handles Wi-Fi, and an ARM Cortex-R4 MCU that could offload data frame processing in Wi-Fi host driver.

1-1 Key Characteristic

- 32-bits RISC MCU for Wi-Fi protocols
- IEEE 802.11 a/b/g/n compliant
- Support 20MHz, 40MHz in 2.4GHz band 5GHz band
- Dual-band 2T2R mode with data rate up to 240Mbps
- Integrated LNA, PA, and T/R switch
- Security support for WFA WPA/WPA2 personal, WPS2.0, WAPI
- Compliance to Bluetooth v5.0
- Integrated BALUN and PA
- USB device fully compliant to USB v3.0 specification

1-2 Pin Definition

Figure 1 Pin Definitions (Module Top View)

Table 1 Pin Definitions

Pin number	Symbol name	Type	Pin description
1	VBUS	Power	DC 5V
2	VBUS	Power	DC 5V
3	BGF_INT_B	I/O	BT_wake on
4	GND	GND	Ground
5	GND	GND	Ground
6	U2D-	I/O	USB data -
7	U2D+	I/O	USB data +
8	GND	GND	Ground
9	WIFI_INT_B	I/O	Wi-Fi_wake on
10	PMU_EN	I/O	reset

CHAPTER 2. ELECTRICAL AND RF SPECIFICAITON

2-1 Recommended Operation Rating Table 2 Operation Rating

Table 2 Operation Rating

	Condition	Min	Typ.	Max.	Unit
VDD	5	4.5	5	5.5	V
RF Interface	Zo		50		Ohm

2-2 Power Consumption

Table 3 Power Consumption

Description	Typical	Unit
IDLE	65	mA
2G/2T- N mode HT 40MHz MCS 7	128	mA
2G/2T- N mode HT 20MHz MCS 7	147	mA
2G/2T- G mode OFDM54M	158	mA
2G/2T- B mode CCK11M	237	mA
5G/2T- N mode HT 40MHz MCS 7	160	mA
5G/2T- N mode HT 20MHz MCS 7	180	mA
5G/2T- A mode OFDM54M	205	mA
2G/2R- N mode HT 40MHz MCS 7	78	mA
2G/2R- N mode HT 20MHz MCS 7	75	mA
2G/2R- G mode OFDM54M	76	mA
2G/2R- B mode CCK11M	75	mA
5G/2R- N mode HT 40MHz MCS 7	83	mA
5G/2R- N mode HT 20MHz MCS 7	79	mA
5G/2R- A mode OFDM54M	79	mA

2-3 WLAN RF Specification – TX

Table 4 IEEE 802.11 b/g/n TX Output Power (Chain 0 or Chain 1)

Data Rate (Mbps)	Modulation	Tx Typical Power (dBm)	Data Rate (Mbps)	Modulation	Tx Typical Power (dBm)
1	DBPSK	13	HT20-MCS0	BPSK	11
2	DQPSK	13	HT20-MCS1	BPSK	11
5.5	CCK	13	HT20-MCS2	QPSK	11
11	CCK	13	HT20-MCS3	QPSK	11
6	OFDM	12	HT20-MCS4	16-QAM	11
9	OFDM	12	HT20-MCS5	16-QAM	11
12	OFDM	12	HT20-MCS6	64-QAM	11
18	OFDM	12	HT20-MCS7	64-QAM	11
24	OFDM	12	HT40-MCS0	BPSK	7
36	OFDM	12	HT40-MCS1	QPSK	7
48	OFDM	12	HT40-MCS2	QPSK	7
54	OFDM	12	HT40-MCS3	16-QAM	7
			HT40-MCS4	16-QAM	7
			HT40-MCS5	64-QAM	7
			HT40-MCS6	64-QAM	7
			HT40-MCS7	64-QAM	7

※ Tolerance +/-2dBm

Table 5 IEEE 802.11 a/n TX Output Power(Chain 0 or Chain 1)

Data Rate (Mbps)	Modulation	Tx Typical Power (dBm)	Data Rate (Mbps)	Modulation	Tx Typical Power (dBm)
6	OFDM	12	HT20-MCS0	BPSK	11
9	OFDM	12	HT20-MCS1	BPSK	11
12	OFDM	12	HT20-MCS2	QPSK	11
18	OFDM	12	HT20-MCS3	QPSK	11
24	OFDM	12	HT20-MCS4	16-QAM	11
36	OFDM	12	HT20-MCS5	16-QAM	11
48	OFDM	12	HT20-MCS6	64-QAM	11
54	OFDM	12	HT20-MCS7	64-QAM	11
			HT40-MCS0	BPSK	9
			HT40-MCS1	QPSK	9
			HT40-MCS2	QPSK	9
			HT40-MCS3	16-QAM	9
			HT40-MCS4	16-QAM	9
			HT40-MCS5	64-QAM	9
			HT40-MCS6	64-QAM	9
			HT40-MCS7	64-QAM	9

※ Tolerance +/-2dBm

2-4 WLAN RF Specification – RX

Table 6 IEEE 802.11 b/g/n RX Sensitivity (Chain 0 & Chain 1)

Data Rate (Mbps)	Modulation	Rx Sensitivity (dBm)		Data Rate (Mbps)	Modulation	Rx Sensitivity (dBm)	
		Max.	Typ.			Max.	Typ.
1	DBPSK	-83	-91	HT20-MCS0	BPSK	-82	-87
2	DQPSK	-80	-88	HT20-MCS1	QPSK	-79	-84
5.5	CCK	-79	-85	HT20-MCS2	QPSK	-77	-82
11	CCK	-76	-82	HT20-MCS3	16-QAM	-74	-79
6	OFDM	-85	-87	HT20-MCS4	16-QAM	-70	-75
9	OFDM	-84	-85	HT20-MCS5	64-QAM	-66	-71
12	OFDM	-82	-85	HT20-MCS6	64-QAM	-65	-69
18	OFDM	-80	-83	HT20-MCS7	64-QAM	-64	-68
24	OFDM	-77	-79	HT40-MCS0	BPSK	-79	-83
36	OFDM	-73	-76	HT40-MCS1	QPSK	-76	-81
48	OFDM	-69	-71	HT40-MCS2	QPSK	-74	-79
54	OFDM	-68	-70	HT40-MCS3	16-QAM	-71	-75
				HT40-MCS4	16-QAM	-67	-72
				HT40-MCS5	64-QAM	-63	-68
				HT40-MCS6	64-QAM	-62	-66
				HT40-MCS7	64-QAM	-61	-65

Table 7 IEEE 802.11 a/n RX Sensitivity (Chain 0 & Chain 1)

Data Rate (Mbps)	Modulation	Rx Sensitivity (dBm)		Data Rate (Mbps)	Modulation	Rx Sensitivity (dBm)	
		Max.	Typ.			Max.	Typ.
6	OFDM	-85	-87	HT20-MCS0	BPSK	-82	-87
9	OFDM	-84	-85	HT20-MCS1	QPSK	-79	-84
12	OFDM	-82	-84	HT20-MCS2	QPSK	-77	-81
18	OFDM	-80	-82	HT20-MCS3	16-QAM	-74	-78
24	OFDM	-77	-79	HT20-MCS4	16-QAM	-70	-75
36	OFDM	-73	-75	HT20-MCS5	64-QAM	-66	-71
48	OFDM	-69	-71	HT20-MCS6	64-QAM	-65	-69
54	OFDM	-68	-70	HT20-MCS7	64-QAM	-64	-68
				HT40-MCS0	BPSK	-79	-85
				HT40-MCS1	QPSK	-76	-81
				HT40-MCS2	QPSK	-74	-79
				HT40-MCS3	16-QAM	-71	-76
				HT40-MCS4	16-QAM	-67	-72
				HT40-MCS5	64-QAM	-63	-68
				HT40-MCS6	64-QAM	-62	-67
				HT40-MCS7	64-QAM	-61	-65

2-5 Environment Specifications

Operating Conditions (preliminary)

Operation Temperature : 0 ~ 60℃

Storage Conditions (preliminary)

Non-Operation Temperature : -10 ~ 60℃ (Typ. 25℃)

CHAPTER 3. MECHANICAL SPECIFICATION

3-1 Module Assembly Dimension

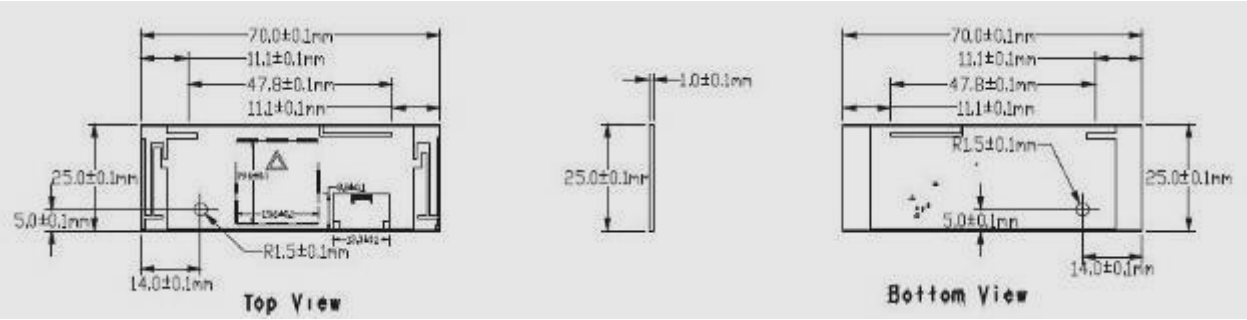

Figure 2 Mechanical Drawing

3-2 Module Photo

Figure 3 Top Side Photo

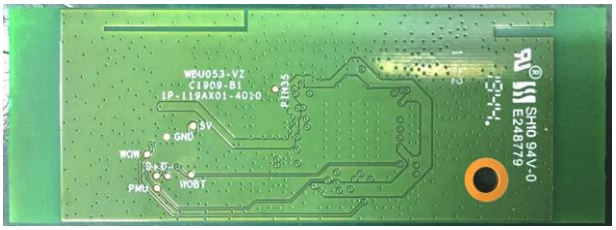

Figure 4 Bottom Side Photo

Federal Communication Commission Interference 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 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 transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
Operations in the 5.15-5.25GHz band are restricted to indoor usage only.
This device meets all the other requirements specified in Part 15E, Section 15.407 of the FCC Rules.

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 20cm between the radiator & your body.

This device is intended only for OEM integrators under the following conditions:
1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and 2) The transmitter module may not be co-located with any other transmitter or antenna.
As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

IMPORTANT NOTE: In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for reevaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

The module is tested for standalone mobile RF exposure use condition. Any other usage conditions such as co-location with other transmitter(s) or being used in a portable condition will need a separate reassessment through a class II permissive change application or new certification.

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 FCC ID: RX3-WBU053VZ". The grantee's FCC ID can be used only when all FCC compliance requirements are met.

Antennas

The following antennas have been certified for use with this module; antennas of the same type with equal or lower gain may also be used with this module. The antenna must be installed such that 20 cm can be maintained between the antenna and users.

WLAN 2.4GHz Antenna Type : PCB Antenna
2412-2462MHz Gain ➔ Chain 0 : 0.95dBi ; Chain 1 : 0.62dBi

WLAN 5GHz Antenna Type : PCB Antenna
5150 - 5250 MHz Gain ➔ Chain 0 : -0.22dBi ; Chain 1 : 1.86dBi
5250 - 5350 MHz Gain ➔ Chain 0 : -0.22dBi ; Chain 1 : 1.86dBi
5470 - 5725 MHz Gain ➔ Chain 0 : 2.89dBi ; Chain 1 : 3.07dBi
5725 - 5850 MHz Gain ➔ Chain 0 : 1.86dBi ; Chain 1 : 2.44dBi

Part 15 Subpart B disclaimer

This transmitter module is tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B rule requirement applicable to the final host. The final host will still need to be reassessed for compliance to this portion of rule requirements if applicable.

As long as all conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

OEM/Host manufacturer responsibilities

OEM/Host manufacturers are ultimately responsible for the compliance of the Host and Module. The final product must be reassessed against all the essential requirements of the FCC rule such as FCC Part 15 Subpart B before it can be placed on the US market. This includes reassessing the transmitter module for compliance with the Radio and EMF essential requirements of the FCC rules. This module must not be incorporated into any other device or system without retesting for compliance as multi-radio and combined equipment

Canada, Industry Canada (IC) Statement

This device complies with Industry Canada licence-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.

RF Radiation Exposure Statement:
This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.
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.

This device is intended only for OEM integrators under the following conditions:
The transmitter module may not be co-located with any other transmitter or antenna.
As long as above conditions is met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

IMPORTANT NOTE:
In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the Canada authorization is no longer considered valid and the IC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

Required end product labeling:
This transmitter module is authorized only for use in device where the antenna may be installed and operated with greater than 20cm between the antenna and users. The final end product must be labeled in a visible area with the following: “Contains IC: 2878F-WBU053VZ”.

Manual Information To the End User
The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user’s manual of the end product which integrates this module.
The end user manual shall include all required regulatory information/warning as show in this manual.

Antennas

The following antennas have been certified for use with this module; antennas of the same type with equal or lower gain may also be used with this module. The antenna must be installed such that 20 cm can be maintained between the antenna and users.

WLAN 2.4GHz Antenna Type : PCB Antenna
2412-2462MHz Gain Chain 0 : 0.95dBi ; Chain 1 : 0.62dBi

WLAN 5GHz Antenna Type : PCB Antenna
5150 - 5250 MHz Gain Chain 0 : -0.22dBi ; Chain 1 : 1.86dBi
5250 - 5350 MHz Gain Chain 0 : -0.22dBi ; Chain 1 : 1.86dBi
5470 - 5725 MHz Gain Chain 0 : 2.89dBi ; Chain 1 : 3.07dBi
5725 - 5850 MHz Gain Chain 0 : 1.86dBi ; Chain 1 : 2.44dBi

Canada, Industrie Canada (IC) Déclaration

Le présent appareil est conforme aux CNR d'Industrie Canada applicables auxappareils 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 adioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Déclaration d'exposition aux radiations:
Cet appareil est conforme aux limites d'exposition aux rayonnements définies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé à une distance minimale de 20 centimètres entre le radiateur et votre corps.
La bande 5 150-5 250 MHz est réservé uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux.

Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes:
Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.
Tant que les 1 conditions ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

NOTE IMPORTANTE:
Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considéré comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

Plaque signalétique du produit final
Ce module émetteur est autorisé uniquement pour une utilisation dans un appareil où l'antenne peut être installée et utilisée à plus de 20 cm entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: 2878F-WBU053VZ ".

Manuel d'information à l'utilisateur final
L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module.
Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.

ANTENNE

Cet émetteur radio (IC: 2878F-WBU053VZ, HVIN: WBU053-VZ) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous avec le gain maximal admissible indiqué . types d'antennes non inclus dans cette liste , ayant un gain supérieur au gain maximum indiqué pour ce type , sont strictement interdits pour une utilisation avec cet appareil.

Type d'antenne WLAN 2,4 GHz: : PCB Antenna
2412-2462MHz Gain Chain 0 : 0.95dBi ; Chain 1 : 0.62dBi

Type d'antenne WLAN 5 GHz: : PCB Antenna
5150 - 5250 MHz Gain Chain 0 : -0.22dBi ; Chain 1 : 1.86dBi
5250 - 5350 MHz Gain Chain 0 : -0.22dBi ; Chain 1 : 1.86dBi
5470 - 5725 MHz Gain Chain 0 : 2.89dBi ; Chain 1 : 3.07dBi
5725 - 5850 MHz Gain Chain 0 : 1.86dBi ; Chain 1 : 2.44dBi