

Product Specification

IEEE 802.11 a/b/g/n 2x2

Project Name	Wireless Module
Customer	Hon Hai Precision Industry Co., Ltd.
Customer Part No.	
Model #	WBU053-LGA

Approved:	Approved:	Prepared by:
Zeke Wu Manager	Ben Ho Supervisor	Kevin Engineer

Revision History

Date	Number	Approver	Comments
2020/01/08	1.0	Kevin Yao	Initial Draft
2020/02/21	1.1	Cathy Kuo	Updated TX Typical Power on page 7, 8
2020/02/26	1.2	Cathy Kuo	Updated FCC and IC warning statement page 13,14,15

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CHAPTER 1. MODULE OVERVIEW

The Foxconn WBU053-LGA is a highly integrated module which features a low power 2x2 dual-band Wi-Fi subsystem. The Wi-Fi 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-LGA 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
- Integrated BALUN and PA
- USB device fully compliant to USB v3.0 specification

1-2 Pin Definition

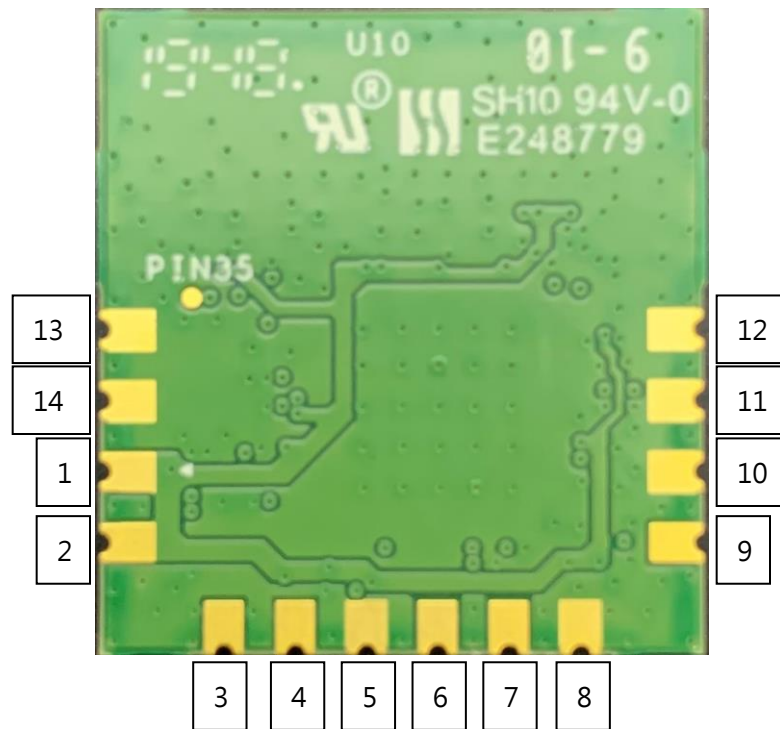


Figure 1 Pin Definitions (Module Top View)

Table 1 Pin Definitions

Pin number	Symbol name	Type	Pin description
1	VBUS	Power	DC 3.3V
2	VBUS	Power	DC 3.3V
3	U2D-	I/O	USB data -
4	U2D+	I/O	USB data +
5	GND	GND	Ground
6	PMU_EN	I/O	reset
7	WIFI_INT_B	I/O	Wi-Fi_wake on
8	GND	GND	Ground
9	BGF_INT_B	I/O	BT_wake on
10-14	GND	GND	Ground

CHAPTER 2. ELECTRICAL AND RF SPECIFICATION

2-1 Recommended Operation Rating Table 2 Operation Rating

Table 2 Operation Rating

	Condition	Min	Typ.	Max.	Unit
VDD	3	3.3	3	3.6	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 WiFi RF Specification – TX

Table 4 IEEE 802.11 b/g/n TX Average Output Power (WLAN0 / WLAN1)

Data Rate (Mbps)	Modulation	Tx Typical Power (dBm)	Data Rate (Mbps)	Modulation	Tx Typical Power (dBm)
1	DBPSK	12.5	HT20-MCS0	BPSK	11
2	DQPSK	12.5	HT20-MCS1	BPSK	11
5.5	CCK	12.5	HT20-MCS2	QPSK	11
11	CCK	12.5	HT20-MCS3	QPSK	11
6	OFDM	11.5	HT20-MCS4	16-QAM	11
9	OFDM	11.5	HT20-MCS5	16-QAM	11
12	OFDM	11.5	HT20-MCS6	64-QAM	11
18	OFDM	11.5	HT20-MCS7	64-QAM	11
24	OFDM	11.5	HT40-MCS0	BPSK	8
36	OFDM	11.5	HT40-MCS1	QPSK	8
48	OFDM	11.5	HT40-MCS2	QPSK	8
54	OFDM	11.5	HT40-MCS3	16-QAM	8
			HT40-MCS4	16-QAM	8
			HT40-MCS5	64-QAM	8
			HT40-MCS6	64-QAM	8
			HT40-MCS7	64-QAM	8

Tolerance: +/-2dBm

※Total Max. Power = WLAN0 Max. Power + WLAN1 Max. Power + 3dBm

Table 5 IEEE 802.11 a/n TX Average Output Power (WLAN0 / WLAN1)

Data Rate (Mbps)	Modulation	Tx Typical Power (dBm)	Data Rate (Mbps)	Modulation	Tx Typical Power (dBm)
6	OFDM	8	HT20-MCS0	BPSK	8
9	OFDM	8	HT20-MCS1	BPSK	8
12	OFDM	8	HT20-MCS2	QPSK	8
18	OFDM	8	HT20-MCS3	QPSK	8
24	OFDM	8	HT20-MCS4	16-QAM	8
36	OFDM	8	HT20-MCS5	16-QAM	8
48	OFDM	8	HT20-MCS6	64-QAM	8
54	OFDM	8	HT20-MCS7	64-QAM	8
			HT40-MCS0	BPSK	10
			HT40-MCS1	QPSK	10
			HT40-MCS2	QPSK	10
			HT40-MCS3	16-QAM	10
			HT40-MCS4	16-QAM	10
			HT40-MCS5	64-QAM	10
			HT40-MCS6	64-QAM	10
			HT40-MCS7	64-QAM	10

Tolerance: +/-2dBm

※Total Max. Power = WLAN0 Max. Power + WLAN1 Max. Power + 3dBm

2-4 WiFi RF Specification – RX

Table 6 IEEE 802.11 b/g/n RX Sensitivity (WLAN0&WLAN1)

Data Rate (Mbps)	Modulation	Rx Sensitivity (dBm)		Data Rate (Mbps)	Modulation	Rx Sensitivity (dBm)	
		Max.	Typ.			Max.	Typ.
1	DBPSK	-83	-92	HT20-MCS0	BPSK	-82	-89
2	DQPSK	-80	-89	HT20-MCS1	QPSK	-79	-86
5.5	CCK	-79	-87	HT20-MCS2	QPSK	-77	-83
11	CCK	-76	-84	HT20-MCS3	16-QAM	-74	-80
6	OFDM	-85	-89	HT20-MCS4	16-QAM	-70	-77
9	OFDM	-84	-87	HT20-MCS5	64-QAM	-66	-72
12	OFDM	-82	-86	HT20-MCS6	64-QAM	-65	-71
18	OFDM	-80	-84	HT20-MCS7	64-QAM	-64	-70
24	OFDM	-77	-80	HT40-MCS0	BPSK	-79	-86
36	OFDM	-73	-77	HT40-MCS1	QPSK	-76	-82
48	OFDM	-69	-73	HT40-MCS2	QPSK	-74	-80
54	OFDM	-68	-71	HT40-MCS3	16-QAM	-71	-77
				HT40-MCS4	16-QAM	-67	-73
				HT40-MCS5	64-QAM	-63	-69
				HT40-MCS6	64-QAM	-62	-68
				HT40-MCS7	64-QAM	-61	-67

Table 7 IEEE 802.11 a/n RX Sensitivity (WLAN0&WLAN1))

Data Rate (Mbps)	Modulation	Rx Sensitivity (dBm)		Data Rate (Mbps)	Modulation	Rx Sensitivity (dBm)	
		Max.	Typ.			Max.	Typ.
6	OFDM	-85	-90	HT20-MCS0	BPSK	-82	-90
9	OFDM	-84	-88	HT20-MCS1	QPSK	-79	-87
12	OFDM	-82	-87	HT20-MCS2	QPSK	-77	-85
18	OFDM	-80	-85	HT20-MCS3	16-QAM	-74	-81
24	OFDM	-77	-82	HT20-MCS4	16-QAM	-70	-78
36	OFDM	-73	-78	HT20-MCS5	64-QAM	-66	-74
48	OFDM	-69	-74	HT20-MCS6	64-QAM	-65	-72
54	OFDM	-68	-73	HT20-MCS7	64-QAM	-64	-71
				HT40-MCS0	BPSK	-79	-87
				HT40-MCS1	QPSK	-76	-84
				HT40-MCS2	QPSK	-74	-82
				HT40-MCS3	16-QAM	-71	-79
				HT40-MCS4	16-QAM	-67	-75
				HT40-MCS5	64-QAM	-63	-71
				HT40-MCS6	64-QAM	-62	-70
				HT40-MCS7	64-QAM	-61	-68

2-5 Environment Specifications

Operating Conditions (preliminary)

Operation Temperature : 0 ~ 60°C

Storage Conditions (preliminary)

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

CHAPTER 3. MECHANICAL SPECIFICATION

3-1 Module Assembly Dimension

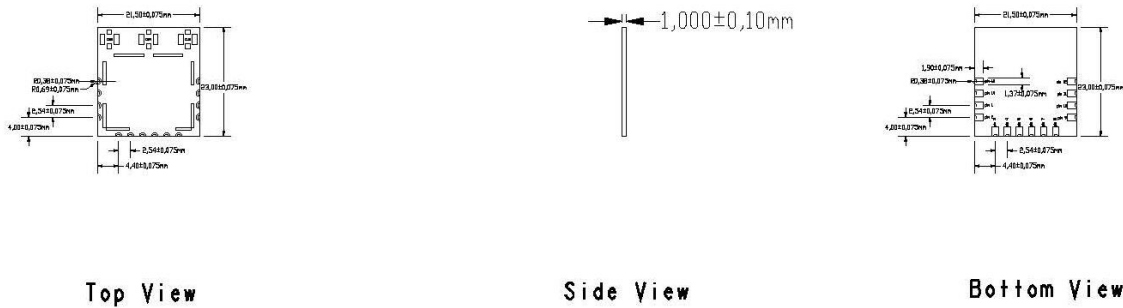


Figure 2 Mechanical Drawing

3-2 Module Photo

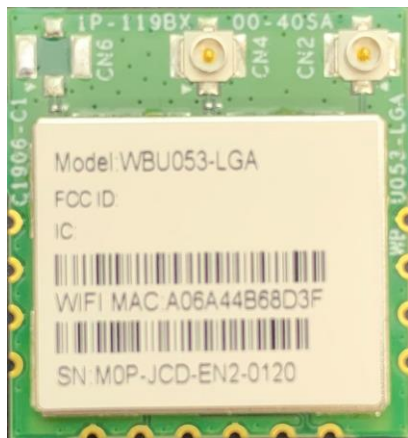


Figure 3 Top Side Photo

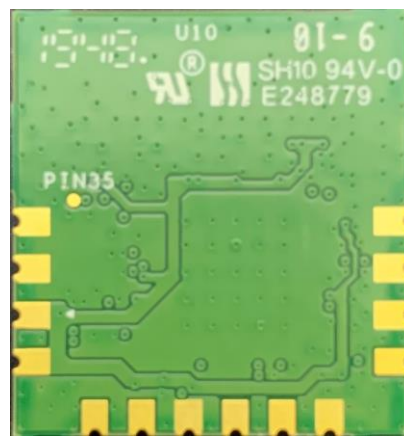
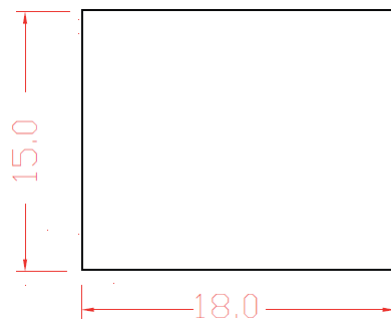


Figure 4 Bottom Side Photo

3-3 Label Drawing and location



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.

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 -1 :

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.

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-WBU053LGA". The grantee's FCC ID can be used only when all FCC compliance requirements are met.

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.

IMPORTANT NOTE -2 :

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.

Antenna Type: PIFA

Peak Gain:

Chain 0/1	2GHz	3.16 dBi
	5GHz	2.56 dBi

*those antenna gains measured at impedance 50ohm

Canada, Industry Canada (IC) Statement

This Class B digital apparatus complies with Canadian ICES-003.

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.

Required end product labeling:

Any device incorporating this module must include an external, visible, permanent marking or label which states: "Contains IC: 2878F-WBU053LGA"

This radio transmitter [2878F-WBU053LGA] 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.

Antenna Type: PIFA	Peak Gain:	Chain 0/1	2GHz	3.16 dBi
			5GHz	2.56 dBi

*those antenna gains measured at impedance 50ohm

IMPORTANT NOTE :

5G band I (5150-5350MHz) indoor use only.

Canada, Industrie Canada (IC) Déclaration

Cet appareil numérique de classe B est conforme à la norme NMB-003.

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.

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.

Obligation d'étiquetage du produit final:

Tout dispositif intégrant ce module doit comporter un externe, visible, marquage permanent ou une étiquette qui dit: "Contient IC : 2878F-WBU053LGA ".

Cet émetteur radio [2878F-WBU053LGA] a été approuvé par Innovation, Sciences et Développement économique Canada fonctionnera avec les types d'antennes énumérés ci-dessous, avec le gain maximum autorisé indiqué. Les types d'antennes non inclus dans cette liste qui ont un gain supérieur au gain maximum indiqué pour tout type répertorié sont strictement interdits pour une utilisation avec cet appareil.

Type d'antenne: PIFA

Pic Gain:

<u>Chaîne 0/1</u>	2GHz	<u>3.16 dBi</u>
	5GHz	<u>2.56 dBi</u>

* ces gains d'antenne mesurés à l'impédance 50ohm

NOTE IMPORTANTE :

5G bande I (5150-5350 MHz) pour usage intérieur uniquement.