WFU033-LGA

IEEE 802.11 a/b/g/n/ac 2x2 WiFi Module

Product Specification 2.0

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

Date	Number	Approver	Comments
Jan.15 , 2018	1.0	Fred Kuo	Initial Draft
May 2, 2018	2.0	Kevin Yao	Updated

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CHAPTER 1. MODULE OVERVIEW

The Foxconn WFU033-LGA is a highly integrated module which has built in a 2x2 dual-band wireless LAN radio. It supports IEEE 802.11a/b/g/n/ac standard and provides the highest PHY rate up to 867Mbps, offering feature-rich wireless connectivity and reliable throughput from an extended distance.

Optimized RF architecture and baseband algorithms provide superb performance and low power consumption. WFU033-LGA integrates PA/LNA such that the number of the external components is reduced to minimum. Intelligent MAC design deploys a high efficient DMA engine and hardware data processing accelerators which offloads the host processor.

The WFU033-LGA supports the 802.11i security standard and implements hardware acceleration for TKIP, CCMP and WAPI. The device also supports 802.11e QoS for video, voice, and multimedia applications.

1-1 Key Characteristic

- IEEE 802.11 a/b/g/n and 802.11ac draft compliant
- Support 20MHz, 40MHz, 80MHz in 5GHz band, and 20MHz, 40MHz bandwidth in 2.4GHz band
- Dual-band 2T2R mode with data rate up to 867Mbps
- Integrated LNA, PA, and T/R switch
- Security support for WFA WPA/WPA2 personal, WPS2.0, WAPI
- A full-speed USB 2.0-compliant interface for WLAN

1-2 Certification

TBD

1-3 Block Diagram

The general HW architecture is shown below Figure:

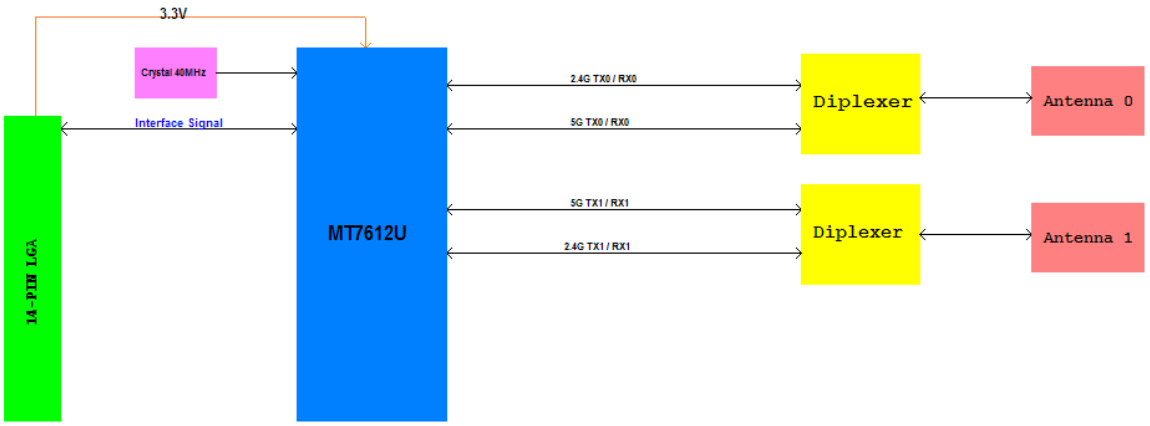

Figure 1 Module Block Diagram

1-4 Module Pin Definition

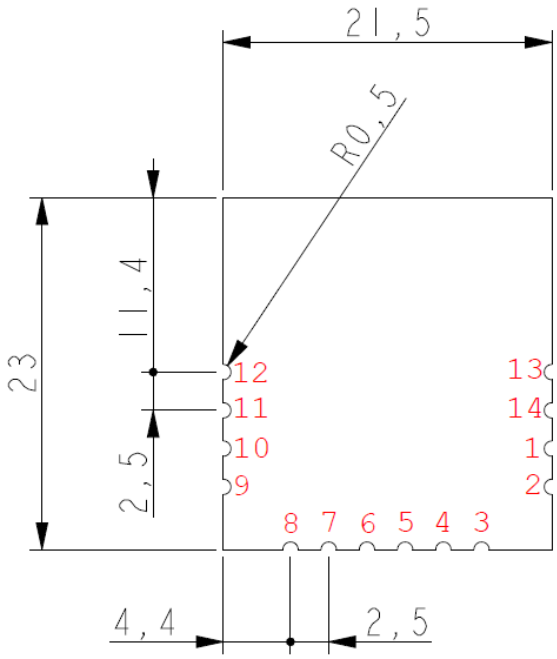

Figure 2 Pin Definitions (Module Top View)

Table 1 Pin Definitions

Pin Number	Name	Description
1	VCC	DC 3.3V
2	VCC	DC 3.3V
3	DM	USB Data -
4	DP	USB Data +
5	GND	Ground
6	RSL_L	Reset Signal, low active
7	WOW_L	Wake on WLAN Signal output
8	GND	Ground
9	NC	
10	GND	Ground
11	GND	Ground
12	GND	Ground
13	GND	Ground
14	GND	Ground

CHAPTER 2. ELECTRICAL AND RF SPECIFICAITON

2-1 Recommended Operation Rating

Table 2 Operation Rating

Parameter	Min	Typ.	Max.	Unit
Vcc	3.0	3.3	3.6	V
RF Interface		50		Ohm

2-2 Power Consumption

Power consumption is measured using current probe loop on the Power rails of the USB interface (Pins).

Table 3 Power Consumption(TBD)

Description	Typical	Unit
IDLE	70	mA
2G/2T- N mode HT 40MHz MCS 7 (14dBm)	176	mA
2G/2T- N mode HT 20MHz MCS 7 (14dBm)	210	mA
2G/2T- G mode OFDM54M (15dBm)	215	mA
2G/2T- B mode CCK11M (16dBm)	370	mA
5G/2T- AC mode HT 80MHz MCS 9 (12dBm)	210	mA
5G/2T- N mode HT 40MHz MCS 7 (13dBm)	210	mA
5G/2T- N mode HT 20MHz MCS 7 (13dBm)	240	mA
5G/2T- A mode OFDM54M (14dBm)	280	mA
2G/2R- N mode HT 40MHz MCS 7 (-60dBm)	160	mA
2G/2R- N mode HT 20MHz MCS 7 (-60dBm)	140	mA
2G/2R- G mode OFDM54M (-60dBm)	160	mA
2G/2R- B mode CCK11M (-60dBm)	160	mA
5G/2R- AC mode HT 80MHz MCS 9 (-60dBm)	190	mA
5G/2R- N mode HT 40MHz MCS 7 (-60dBm)	150	mA
5G/2R- N mode HT 20MHz MCS 7 (-60dBm)	140	mA
5G/2R- A mode OFDM54M (-60dBm)	140	mA

2-3 WiFi RF Specification – TX

Table 4 IEEE 802.11 b/g/n/ac TX Output Power (WLAN0&WLAN1) (TBD)

Tolerance : +/- 2dBm

Data Rate (Mbps)	Modulation	Tx Typical Power (dBm)	Data Rate (Mbps)	Modulation	Tx Typical Power (dBm)
1	DBPSK	15	HT20-MCS0	BPSK	14
2	DQPSK	15	HT20-MCS1	BPSK	14
5.5	CCK	15	HT20-MCS2	QPSK	14
11	CCK	15	HT20-MCS3	QPSK	14
6	OFDM	15	HT20-MCS4	16-QAM	14
9	OFDM	15	HT20-MCS5	16-QAM	14
12	OFDM	15	HT20-MCS6	64-QAM	14
18	OFDM	15	HT20-MCS7	64-QAM	14
24	OFDM	15	HT40-MCS0	BPSK	14
36	OFDM	15	HT40-MCS1	QPSK	14
48	OFDM	15	HT40-MCS2	QPSK	14
54	OFDM	15	HT40-MCS3	16-QAM	14
			HT40-MCS4	16-QAM	14
			HT40-MCS5	64-QAM	14
			HT40-MCS6	64-QAM	14
			HT40-MCS7	64-QAM	14

Table 5 IEEE 802.11 a/n/ac TX Output Power(WLAN0&WLAN1) (TBD)

Data Rate (Mbps)	Modulation	Tx Typical Power (dBm)	Data Rate (Mbps)	Modulation	Tx Typical Power (dBm)
6	OFDM	14	HT20-MCS0	BPSK	13
9	OFDM	14	HT20-MCS1	BPSK	13
12	OFDM	14	HT20-MCS2	QPSK	13
18	OFDM	14	HT20-MCS3	QPSK	13
24	OFDM	14	HT20-MCS4	16-QAM	13
36	OFDM	14	HT20-MCS5	16-QAM	13
48	OFDM	14	HT20-MCS6	64-QAM	13
54	OFDM	14	HT20-MCS7	64-QAM	13
			HT40-MCS0	BPSK	13
			HT40-MCS1	QPSK	13
			HT40-MCS2	QPSK	13
			HT40-MCS3	16-QAM	13
			HT40-MCS4	16-QAM	13
			HT40-MCS5	64-QAM	13
			HT40-MCS6	64-QAM	13
			HT40-MCS7	64-QAM	13
			HT80_MCS0	BPSK	12
			HT80_MCS1	QPSK	12
			HT80_MCS2	QPSK	12
			HT80_MCS3	16-QAM	12
			HT80_MCS4	16-QAM	12
			HT80_MCS5	64-QAM	12
			HT80_MCS6	64-QAM	12
			HT80_MCS7	64-QAM	12

2-4 WiFi RF Specification – RX

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

Data Rate (Mbps)	Modulation	Rx Sensitivity (dBm)		Data Rate (Mbps)	Modulation	Rx Sensitivity (dBm)	
		Max.	Typ.			Max.	Typ.
1	DBPSK	-83	-95	HT20-7.22	BPSK	-82	-89
2	DQPSK	-80	-91	HT20-14.44	QPSK	-79	-88
5.5	CCK	-79	-90	HT20-21.67	QPSK	-77	-86
11	CCK	-76	-86	HT20-28.89	16-QAM	-74	-82
6	OFDM	-85	-89	HT20-43.33	16-QAM	-70	-80
9	OFDM	-84	-89	HT20-57.78	64-QAM	-66	-75
12	OFDM	-82	-88	HT20-65	64-QAM	-65	-73
18	OFDM	-80	-86	HT20-72.22	64-QAM	-64	-72
24	OFDM	-77	-82	HT40-15	BPSK	-79	-86
36	OFDM	-73	-80	HT40-30	QPSK	-76	-85
48	OFDM	-69	-75	HT40-45	QPSK	-74	-83
54	OFDM	-68	-73	HT40-60	16-QAM	-71	-79
				HT40-90	16-QAM	-67	-77
				HT40-120	64-QAM	-63	-72
				HT40-135	64-QAM	-62	-70
				HT40-150	64-QAM	-61	-69

Table 5 IEEE 802.11 a/n/ac RX Sensitivity (WLAN0&WLAN1)) (TBD)

Data Rate (Mbps)	Modulation	Rx Sensitivity (dBm)		Data Rate (Mbps)	Modulation	Rx Sensitivity (dBm)	
		Max.	Typ.			Max.	Typ.
6	OFDM	-85	-89	HT20-7.22	BPSK	-82	-88
9	OFDM	-84	-88	HT20-14.44	QPSK	-79	-86
12	OFDM	-82	-87	HT20-21.67	QPSK	-77	-84
18	OFDM	-80	-85	HT20-28.89	16-QAM	-74	-81
24	OFDM	-77	-81	HT20-43.33	16-QAM	-70	-78
36	OFDM	-73	-80	HT20-57.78	64-QAM	-66	-73
48	OFDM	-69	-74	HT20-65	64-QAM	-65	-72
54	OFDM	-68	-73	HT20-72.22	64-QAM	-64	-70
				HT40-15	BPSK	-79	-85
				HT40-30	QPSK	-76	-84
				HT40-45	QPSK	-74	-82
				HT40-60	16-QAM	-71	-78
				HT40-90	16-QAM	-67	-75
				HT40-120	64-QAM	-63	-71
				HT40-135	64-QAM	-62	-69
				HT40-150	64-QAM	-61	-67
				HT80_MCS0	BPSK	-76	-80
				HT80_MCS1	QPSK	-73	-79
				HT80_MCS2	QPSK	-71	-78
				HT80_MCS3	16-QAM	-68	-75
				HT80_MCS4	16-QAM	-64	-72
				HT80_MCS5	64-QAM	-60	-67
				HT80_MCS6	64-QAM	-59	-66
				HT80_MCS7	64-QAM	-58	-63
				HT80_MCS8	256-QAM	-53	-59
				HT80_MCS9	256-QAM	-51	-57

2-7 Antenna Specification Requirements

TBD

CHAPTER 3. MECHANICAL SPECIFICATION

3-1 Module Assembly Dimension

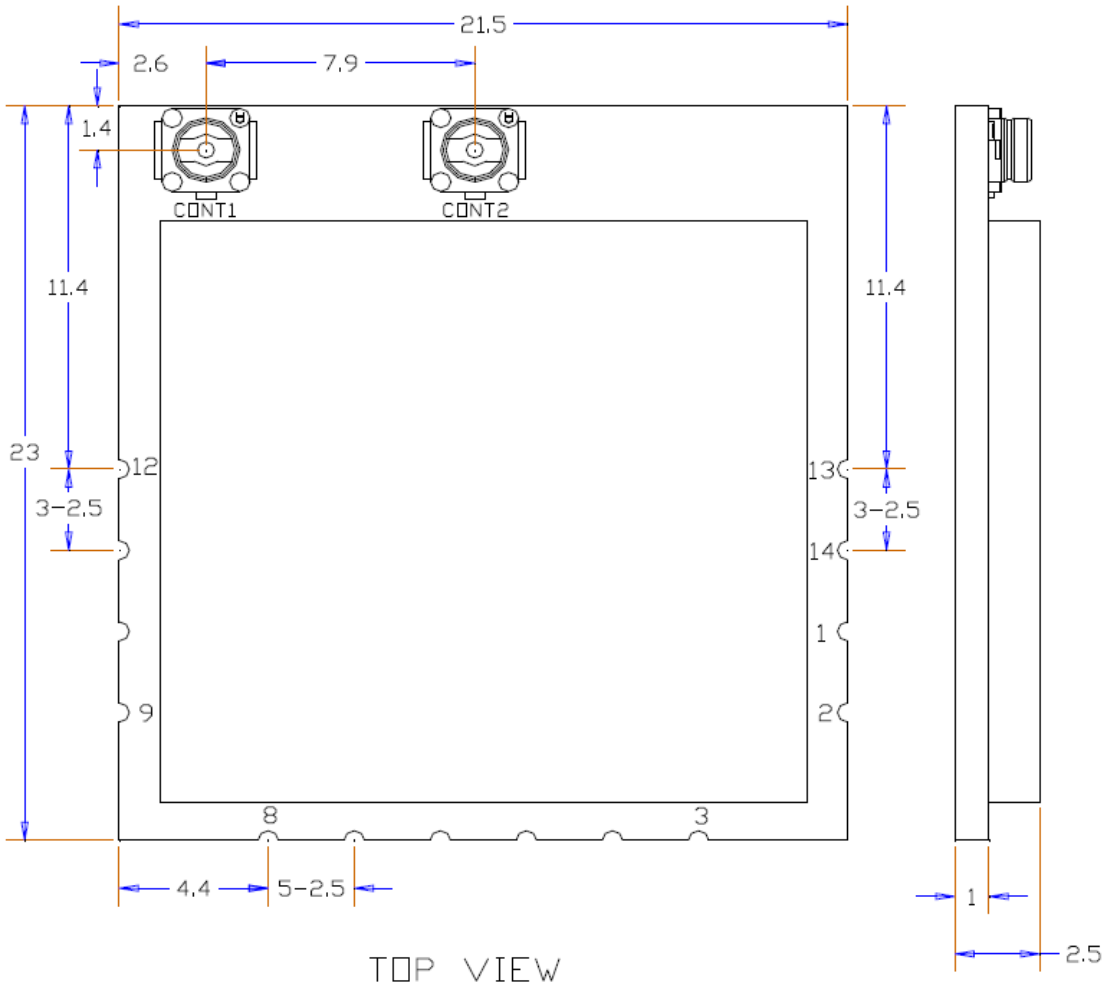

Figure 3 Mechanical Drawing

3-2 Label Specification

Figure 4 Label Drawing(TBD)

CHAPTER 4. ADDITIONAL INFORMATION

4-1 EEPROM Information

Table 8 USB PID/VID Setting (TBD)

WLAN Type	Mode	PID	VID
MT7612U WiFi (TBD)	AC	7612	0E8D

4-2 Module Photo

Figure 4 Top Side Photo

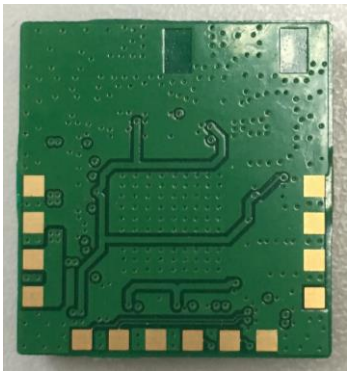

Figure5 Bottom Side Photo

4-3 Environment Specifications

Operating Conditions (preliminary)

Operation Temperature : 0~55 ℃
Relevant Humidity: 5 ~ 90% (non-condensing)

Storage Conditions (preliminary)

Operation Temperature : -20~105 ℃
Relevant Humidity: 5 ~ 90% (non-condensing)

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: 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-WFU033LGA”. 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.

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-WFU033LGA”

This radio transmitter (identify the device by certification number or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain 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.

Antenna Type: PIFA Peak Gain: 2,41 dBi(2,4GHz)/4,77 dBi(5GHz)

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 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.

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-WFU033LGA".

Cet émetteur radio (identifier le dispositif par numéro de certification ou le numéro de modèle , si la catégorie II) 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: PIFA Pic Gain: 2,41 dBi(2,4GHz)/4,77 dBi(5GHz)