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WU3322-00A

WLAN Dual-Band 2x2 802.11ac + Bluetooth 5.0

M.2 2230 A-E Key Wireless Module

Qualcomm QCA6174A-5 Solution

Datasheet

Revision 0.1

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1. OVERVIEW

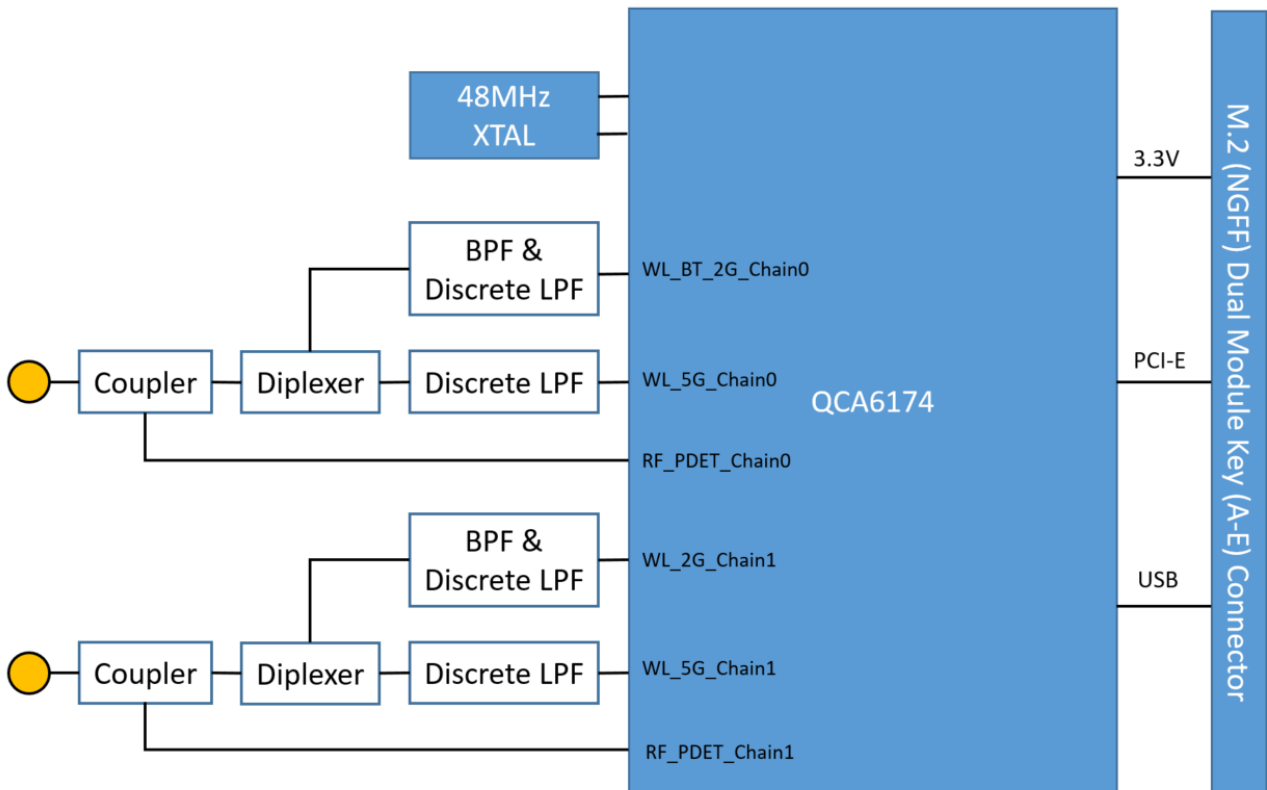
The WU3322-00 is a wireless local area network (WLAN), Bluetooth (BT) combination module to support 2 × 2 multiple input, multiple output (MIMO) with two spatial streams IEEE 802.11a/b/g/n/ac WLAN standards and Bluetooth 5.0 enabling seamless integration of WLAN/Bluetooth and low-energy technology. This module is M.2 2230-S3 A-E key slot type and based on Qualcomm QCA6174A-5 single-die chip.

1.1. General Features

- Support IEEE 802.11a, 802.11b, 802.11g, 802.11n, and 802.11ac WLAN standards.
- Supports 20/40 MHz at 2.4GHz and 20/40/80MHz at 5GHz (SW PL determines 2.4 GHz HT40/VHT40 support).
- Supports Class1 and Class 2 BT power level transmissions without requiring an external PA.
- Support Bluetooth 5.0, BLE, ANT+ and be backwards compatible with Bluetooth 1.2, 2.X + enhanced data rate.
- Support for Simple Pairing (SP) and Enhanced Inquiry Response (EIR) function
- Supports Bluetooth-WLAN coexistence and ISM-LTE coexistence.
- Dual-stream IEEE 802.11n support for 20 and 40MHz channels provide the PHY layer rates up to 300Mbps.
- Dual-stream IEEE 802.11ac support for 80MHz channels provide the PHY layer rates up to 867Mbps.
- Supports Wi-Fi Direct and MU-MIMO.
- Includes additional features such as:
 - Maximal Likelihood(ML) decoding
 - Low-Density Parity Check(LDPC)
 - Maximal Ratio Combining(MRC)
 - Space Time Block Code (STBC)
 - Transmit beamforming
 - 1.5 K bytes of on-chip one-time programmable (OTP) memory
- RoHS Compliance

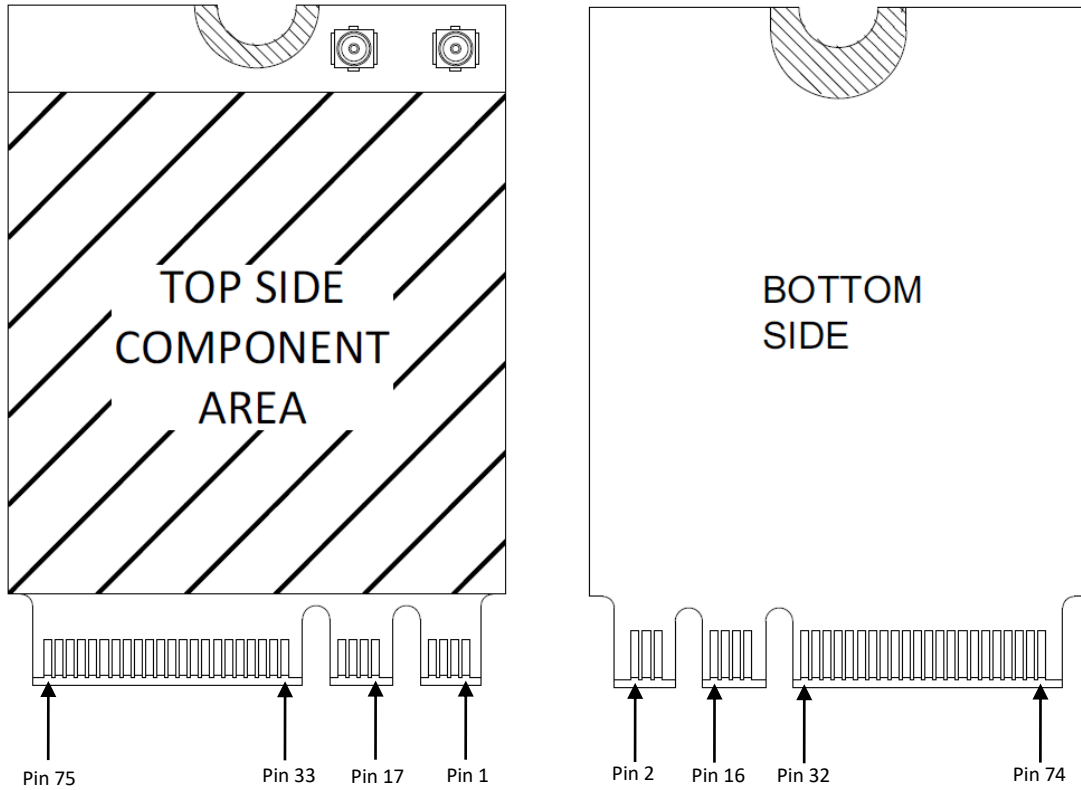
2. FUNCTIONAL FEATURES

2.1. Module Block Diagram



3. MODULE OUTLINE

3.1. Signal Layout



3.2. Pin Description

Table 3-1. Pin Description

Pin #	Pin Name	I/O	Description	Pin #	Pin Name	I/O	Description
1	GND	GND	Ground	2	+3.3V	Power	+3.3V Power
3	USB_D+	AIO	Bluetooth USB differential pair data +	4	+3.3V	Power	+3.3V Power
5	USB_D-	AIO	Bluetooth USB differential pair data -	6	LED_WLAN	OD	Open drain, active low signal. This signal is used to allow the card to provide WLAN status

							indicator via LED device that will be provided by the system.
7	GND	GND	Ground				
Mechanical key A							
17	N.C.	-	No connection	16	LED_BT	OD	Open drain, active low signal. This signal is used to allow the card to provide Bluetooth status indicator via LED device that will be provided by the system.
19	N.C.	-	No connection	18	GND	GND	Ground
21	N.C.	-	No connection	20	N.C.	-	No connection
23	N.C.	-	No connection	22	N.C.	-	No connection
Mechanical key E							
33	GND	GND	Ground	32	N.C.	-	No connection
35	PERp0	AI	PCIe RX Differential signal +	34	N.C.	-	No connection
37	PERn0	AI	PCIe RX Differential signal -	36	N.C.	-	No connection
39	GND	GND	Ground	38	Reserved	-	-
41	PETp0	AO	PCIe TX Differential signal +	40	Reserved	-	-
43	PETn0	AO	PCIe TX Differential signal -	42	Reserved	-	-
45	GND	GND	Ground	44	COEX3	PD	LTE coexistence signal.
47	REFCLKp0	AI	PCIe Reference Clock signals (100 MHz) +	46	COEX2	DO	LTE coexistence signal, LTE_PRI
49	REFCLKn0	AI	PCIe Reference Clock signals (100 MHz) -	48	COEX1	PD	LTE coexistence signal, LTE_SYNC
51	GND	GND	Ground	50	SUSCLK	PD	Suspend Clock is a 32.768 kHz clock

							supply input that is provided by platform to enable the card to enter reduce power consumption modes.
53	CLKREQ0#	OD	Reference to clock request	52	PERST0#	PD	PCI Express reset with weak pull-down
55	PEWAKE#	OD	PCIe PME Wake. Open Drain with pull up on platform; Active Low	54	W_DISABLE_2#	PU	Turn off Bluetooth RF analog and front-end. Active low.
57	GND	GND	Ground	56	W_DISABLE_1#	PU	Turn off WLAN RF analog and front-end. Active low.
59	Reserved	-	-	58	N.C.	-	No connection
61	Reserved	-	-	60	N.C.	-	No connection
63	GND	GND	Ground	62	N.C.	-	No connection
65	Reserved	-	-	64	Reserved	-	-
67	Reserved	-	-	66	Reserved	-	-
69	GND	GND	Ground	68	Reserved	-	-
71	Reserved	-	-	70	Reserved	-	-
73	Reserved	-	-	72	+3.3V	Power	+3.3V Power
75	GND	GND	Ground	74	+3.3V	Power	+3.3V Power

(1) I/O description parameters

Power: Voltage supply

GND: Ground

AI: Analog input

AO: Analog output

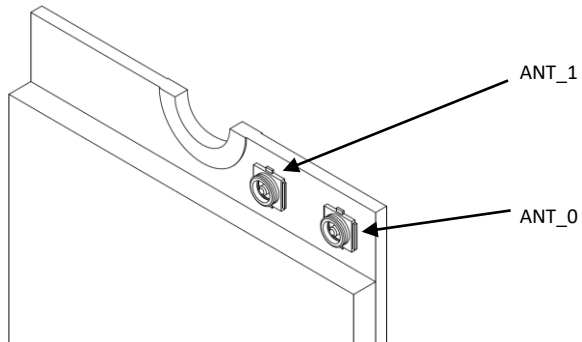
OD: A digital output signal with open drain

DO: Digital output signal

PU: Input signals with weak internal pull-up, to prevent signals from floating when left open

PD: Input signals with weak internal pull-down, to prevent signals from floating when left open

3.3. Antenna Port Description



Antenna #	Description
ANT_0	RF Antenna for WiFi 2.4GHz/5GHz chain 0 & Bluetooth
ANT_1	RF Antenna for WiFi 2.4GHz/5GHz chain 1

4. MODULE SPECIFICATIONS

We reserve the right to amend the design and/or specifications of our products without notice.

4.1. Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted)

Table 4-1. Absolute Maximum Ratings

Parameter	Conditions	MIN	MAX	Units
Supply voltage, VDD		-0.3	3.63	V
Supply voltage, VIO		-0.3	3.63	
3.3V I/O VIH	Maximum digital I/O input voltage for 3.3V I/O supply		VIO + 0.3	
1.8V I/O VIH	Maximum digital I/O input voltage for 1.8V I/O supply	-0.3	VIO + 0.2	
RF _{IN}	Maximum RF input (reference to 50 Ω input)	-	0	dBm
ESD	Electrostatic discharge tolerance	2000		V
Storage temperature		-40	+85	°C

4.2. Recommended Operating and Storage Conditions

Table 4-2. Recommended Operating Conditions

Parameter	Conditions	MIN	Typ.	MAX	Units
Operating supply voltage (VDD)	3.3V supply	3.135	3.3	3.465	V
Operating supply voltage (VIO)	1.8V or 3.3V supply	1.71 3.135	1.8 3.3	3.46	
Operating Temperature (Ta)	ambient	-40	25	85	°C
Storage Temperature		-40	25	85	°C
Operating Humidity		5	-	95	%
Storage Humidity		5	-	95	%

4.3. Digital Logic Characteristics

General DC electrical characteristics (for VDD=3.3V, I/O operation). Tc = 25°C

Table 4-3. Digital Logic Characteristics

Symbol	Parameter	Comments	Min	Typ.	Max	Units
VIH	High-level input voltage		0.7 x VIO	-	VIO + 0.3	V
VIL	Low-level input voltage		-0.3		0.3 x VIO	V
VSHYS	Schmitt hysteresis			1.8 V I/O: 375 3.3 V I/O: 645		
IIL	Input low leakage current	VIN = 0 V; Supply = VIO max	-5.0	-	5.0	μA
VOH	High-level output voltage		0.9 x VIO	-	VIO	V
VOL	Low-level output voltage		0	-	0.1 x VIO	V
IOH	High-level output current		3	-	-	mA
IOL	Low-level output current		-	-	-11	mA
CIN	Input capacitance		-	-	3	pF

Table 4-4. Digital pad internal pull resistor

Internal pull resistor	VDDIO = 1.8 V		VDDIO = 3.3 V	
	R (kΩ)		R (kΩ)	
	Min.	Max.	Min.	Max.
Pull down	23	72	24	60
Pull up	70	168	49	95

4.4. Specification

Standards	IEEE 802.11ac/a/b/g/n (2T2R), Bluetooth 5.0, LE, V3.0+HS, V2.1+EDR
Chip	Qualcomm Atheros QCA6174A-5

Data Rate	802.11b: 11Mbps 802.11a/g: 54Mbps 802.11n: MCS0~15 802.11ac: MCS0~9 Bluetooth: 1Mbps, 2Mbps and up to 3Mbps EDR
Operating Frequency	IEEE 802.11 ac/a/b/g/n ISM Band, 2.412GHz~2.484GHz, 5.150GHz~5.850GHz *Subject to local regulations
Interface	PCIe 2.1 (w/L1 substate) interface for WLAN USB 1.1 interface for Bluetooth
Form Factor	M.2 2230 A-E Key
RF connector	I-PEX MHF4 Receptacle, 20449-001E
WLAN Modulation	802.11b: DSSS (DBPSK, DQPSK, CCK) 802.11a/g: OFDM (BPSK, QPSK, 16-QAM, 64-QAM) 802.11n: OFDM (BPSK, QPSK, 16-QAM, 64-QAM) 802.11ac: OFDM (BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM)
Bluetooth Modulation	GFSK, $\pi/4$ -DQPSK and 8-DPSK
Wi-Fi VID/PID	168C / 003E
Wi-Fi SVID/SPID	1E2B / 3222
BT VID/PID	0CF3 / 3200
Dimensions	30mm(L) x 22mm(W) x 2.4mm(H)
Security	64/128-bits WEP, WPA, WPA2, 802.1x

4.5. WLAN RF Characteristics

Transmit power with IEEE 802.11 EVM and spectral mask compliance.

Table 4-5. Transmit power at 2.4 GHz per RF Chain (Tolerance: ± 2.5 dBm)

Standard	Modulation	Data rates	802.11b/g	802.11n/ac 20MHz	802.11n/ac 40MHz	Unit
802.11b (1)	BPSK	1 Mbps	19	-	-	dBm
	QPSK	2 Mbps	19	-	-	dBm
	CCK	5.5 Mbps	19	-	-	dBm
	CCK	11 Mbps	19	-	-	dBm
802.11g (1)	BPSK	6 Mbps	18	-	-	dBm
	BPSK	9 Mbps	18	-	-	dBm
	QPSK	12 Mbps	18	-	-	dBm
	QPSK	18 Mbps	18	-	-	dBm
	16 QAM	24 Mbps	18	-	-	dBm
	16 QAM	36 Mbps	17	-	-	dBm
	64 QAM	48 Mbps	16	-	-	dBm
	64 QAM	54 Mbps	16	-	-	dBm
802.11n (1)	BPSK	MCS0	-	18	17	dBm
	QPSK	MCS1	-	18	17	dBm
	QPSK	MCS2	-	18	17	dBm
	16 QAM	MCS3	-	17	16	dBm
	16 QAM	MCS4	-	17	16	dBm
	64 QAM	MCS5	-	16	16	dBm
	64 QAM	MCS6	-	16	16	dBm
	64 QAM	MCS7	-	16	16	dBm
802.11ac (1)	256 QAM	MCS8	-	15	13	dBm
	256 QAM	MCS9	-	-	13	dBm

(1) Regulatory constraints limit the module output power to the following:

- Channel 1, 11 @ 11B and 11G data rates is **15dBm** typical to comply with the FCC/IC/NCC.
- Channel 3, 9 @ MCS0 to MCS4 of 11N 40MHz is **14.5dBm** typical to comply with the FCC/IC/NCC.
- Channel 1, 13, 14 @ 11B and 11G data rates is **15dBm** typical to comply with the TELEC.
- Channel 3, 11 @ MCS0 to MCS4 of 11N 40MHz is **14.5dBm** typical to comply with the TELEC.
- Channel 1-13 @ 1Mbps to 36Mbps data rates is **15dBm** typical to comply with the ETSI EIRP.
- Channel 1-13 @ MCS0 to MCS4 of 11N 20MHz is **15dBm** typical to comply with the ETSI EIRP.
- Channel 3-11 @ MCS0 to MCS4 of 11N 40MHz is **14.5dBm** typical to comply with the ETSI EIRP.

Table 4-6. Transmit power at 5 GHz per RF Chain (Tolerance: ± 3 dBm)

Standard	Modulation	Data rates	802.11a		802.11n/ac		802.11ac		Unit
					20MHz	40MHz	80MHz		
802.11a (1)	BPSK	6 Mbps	13	-	-	-	-	-	dBm
	BPSK	9 Mbps	13	-	-	-	-	-	dBm
	QPSK	12 Mbps	13	-	-	-	-	-	dBm
	QPSK	18 Mbps	13	-	-	-	-	-	dBm
	16 QAM	24 Mbps	13	-	-	-	-	-	dBm
	16 QAM	36 Mbps	13	-	-	-	-	-	dBm
	64 QAM	48 Mbps	12	-	-	-	-	-	dBm
	64 QAM	54 Mbps	11	-	-	-	-	-	dBm
802.11n/ac (1)	BPSK	MCS0	-	13	12.5	12.5	12.5	12.5	dBm
	QPSK	MCS1	-	13	12.5	12.5	12.5	12.5	dBm
	QPSK	MCS2	-	13	12.5	12.5	12.5	12.5	dBm
	16 QAM	MCS3	-	13	12.5	12.5	12.5	12.5	dBm
	16 QAM	MCS4	-	13	12.5	12.5	12.5	12.5	dBm
	64 QAM	MCS5	-	13	12.5	12.5	12.5	12.5	dBm
	64 QAM	MCS6	-	11	11	11	11	11	dBm
	64 QAM	MCS7	-	10	10	9	9	9	dBm
802.11ac (1)	256 QAM	MCS8	-	9	8.5	9	9	9	dBm
	256 QAM	MCS9	-	-	8	8	8	8	dBm

(1) Regulatory constraints limit the module output power to the following:

- Channel 149-165 @ 11A and 11N data rate is 8.5dBm typical to comply with the ETSI EIRP.
- Channel 149-165 @ MCS0 to MCS8 of 11AC is 8.5dBm typical to comply with the ETSI EIRP.

Table 4-7. Receive minimum input level sensitivity at 2.4 GHz for 1 × 1 configuration

Standard	Modulation	Data rates	802.11b/g		802.11n/ac		802.11n/ac		Unit
					20MHz		40MHz		
			Typ.	Max	Typ.	Max	Typ.	Max	
802.11b	BPSK	1 Mbps	-95	-94	-	-	-	-	dBm
	CCK	11 Mbps	-88	-85	-	-	-	-	dBm
802.11g	BPSK	6 Mbps	-91	-87	-	-	-	-	dBm
	64 QAM	54 Mbps	-74	-70	-	-	-	-	dBm
802.11n	BPSK	MCS0	-	-	-90	-86	-87	-83	dBm

	64 QAM	MCS7	-	-	-71.5	-67	-67	-65	dBm
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Table 4-8. Receive minimum input level sensitivity at 5 GHz for 1 × 1 configuration

Standard	Modulation	Data rates	802.11a		802.11n/ac 20MHz		802.11n/ac 40MHz		802.11ac 80MHz		Unit
			Typ.	Max	Typ.	Max	Typ.	Max	Typ.	Max	
802.11a	BPSK	6 Mbps	-91	-90	-	-	-	-	-	-	dBm
	64 QAM	54 Mbps	-75	-74	-	-	-	-	-	-	dBm
802.11n/ac	BPSK	MCS0	-	-	-91	-89	-88	-86	-83	-82	dBm
	64 QAM	MCS7	-	-	-72	-70	-67	-64	-65	-61	dBm
802.11ac	256 QAM	MCS8	-	-	-67	-65	-62	-58	-59	-56	dBm
	256 QAM	MCS9	-	-	-	-	-60	-57	-58	-55	dBm

4.6. BT RF Characteristics

Table 4-9. Bluetooth basic rate transmitter performance at 25°C

Parameter	Comments	Min	Typ	Max	Unit
RF frequency range ¹		2402	-	2480	MHz
RF output power (GFSK)	Maximum power setting	-	6	-	dBm
Transmit power control range		40	-	-	dB
Transmit power control step size	Each control step of power change	2	-	8	dB
20 dB bandwidth	GFSK only	-	0.92	0.97	MHz
Adjacent channel power (±2 channels)	$F = F_0 \pm 2 \text{ MHz}$	-	-49	-20	dB
Adjacent channel power (±3 channels)	$F = F_0 \pm 3 \text{ MHz}$	-	-50	-40	dB
Frequency deviations	$\Delta f_{1\text{AVG}}$	140	-	175	kHz
	$\Delta f_{2\text{MAX}}$	115	-	-	kHz
	$\Delta f_{2\text{AVG}} / \Delta f_{1\text{AVG}}$	0.80	-	-	
	Packets exceeding 115 kHz ($\Delta f_{2\text{MAX}}$)	99.9	-	-	%
Frequency tolerance		-75	-	+75	kHz
Carrier frequency drift	Maximum drift rate within	-20	-	+20	kHz/50 μs

	50 μ s				
	Maximum length 1-slot packet	-25	-	+25	kHz
	Maximum length 3-slot Packet	-40		+40	kHz
	Maximum length 5-slot packet	-40	-	+40	kHz

(1) Center frequency $f = 2402 + k$, where k is the channel number (all values in MHz).

Table 4-10. Bluetooth EDR rate transmitter performance at 25°C

Parameter	Comments	Min	Typ	Max	Unit
RF frequency range		2402	-	2480	MHz
RF output power ¹	$\pi/4$ -DQPSK	-	4.5	-	dBm
	8-DPSK	-	4.5	-	dBm
Transmit power control range		40	-	-	dB
EDR transmit power control step size	Each control step of power change	2	-	8	dB
EDR differential phase encoding		-	100	-	%
DEVM for $\pi/4$ -DQPSK	>99% of measured blocks	-	-	30	%
	RMS for any measured block	-	-	13	%
	Peak	-	-	30	%
DEVM for 8-DPSK	>99% of measured blocks	-	-	20	%
	RMS for any measured block	-	-	13	%
	Peak	-	-	20	%
Maximum carrier frequency stability					
Block error (ω_o)	$\pi/4$ -DQPSK of error for RMS DEVM, all blocks	-10	-	+10	kHz
	8-DPSK of error for RMS DEVM, all blocks	-10	-	+10	kHz
Packet error (ω_j)	$\pi/4$ -DQPSK of initial error, all packets	-75	-	+75	kHz
	8-DPSK of initial error, all packets	-75	-	+75	kHz
Total error ($\omega_j + \omega_o$)	$\pi/4$ -DQPSK of total	-75	-	+75	kHz

	blocks				
	8-DPSK of total blocks	-75	-	+75	kHz
In-band spurious emissions					
1 MHz offset	$F = F_0 \pm 1 \text{ MHz}$	-	-	-26	dBc
2 MHz offset	$F = F_0 \pm 2 \text{ MHz}$	-	-	-20	dBm
$\geq 3 \text{ MHz}$ offset	$F \geq F_0 \pm 3 \text{ MHz}$	-	-	-40	dBm

(1) Center frequency $f = 2402 + k$, where k is the channel number (all values in MHz).

Table 4-11. Bluetooth low energy mode of transmitter performance

Parameter	Comments	Min	Typ	Max	Unit
RF frequency range		2402	-	2480	MHz
Average RF output power	Maximum output power setting	-	0	-	dBm
In-band emissions	$F = F_{TX} \pm 1 \text{ MHz}$	-	-	-26	dBc
	$F = F_{TX} \pm 2 \text{ MHz}$	-	-	-20	dBm
	$F \geq F_{TX} \pm 3 \text{ MHz}$	-	-	-30	dBm
Modulation characteristics					
Δf_{1AVG}	Recorded over 10 test packets	225	-	275	kHz
Frequency values exceeding 185 kHz Δf_{2MAX}		99.9	-	-	%
$\Delta f_{2AVG} / \Delta f_{1AVG}$		0.8	-	-	-
Carrier frequency offset and drift					
$f_n - f_{TX}, n = 0,1,2,\dots,k$	f_{TX} is the nominal Tx frequency	-150	-	+150	kHz
$ f_0 - f_n , n = 2,3,\dots,k$		-	-	50	kHz
$ f_1 - f_0 $		-	-	20	kHz
$ f_n - f_{n-5} , n = 6,7,\dots,k$		-	-	20	kHz

Table 4-12. Basic rate receiver performance

Parameter	Comments	Min	Typ	Max	Unit
RF frequency range ¹		2402	-	2480	MHz
Sensitivity	$BER \leq 0.1\%$	-	-95	-	dBm
Maximum usable input	$BER \leq 0.1\%$	0	-	-	dBm
Maximum level of intermodulation interference ^{2,3}		-39	-	-	dBm
Carrier to interference ratios (C/I), $BER \leq 0.1\%$					
Co-channel		-	-	11	dB

Adjacent channel	$F = F_{TX} \pm 1 \text{ MHz}$	-	-	0	dB
	$F = F_{TX} \pm 2 \text{ MHz}$	-	-	-30	dB
	$F \geq F_{TX} \pm 3 \text{ MHz}$	-	-	-40	dB

- (1) Center frequency $f = 2402 + k$, where k is the channel number (all values in MHz).
- (2) Maximum interference level to maintain 0.1% BER; interference signals at 3 MHz and 6 MHz offsets.
- (3) Intermodulation performance specification is valid with minimum BPF insertion loss of 1.5 dB.

Table 4-13. Enhanced data rate receiver performance

Parameter	Comments	Min	Typ	Max	Unit
RF frequency range ¹		2402	-	2480	MHz
Sensitivity (BER $\leq 0.01\%$)	$\pi/4$ -DQPSK	-	-93	-	dBm
	8-DPSK	-	-87	-	dBm
Maximum usable input (BER $\leq 0.1\%$)	$\pi/4$ -DQPSK	-10	-	-	dBm
	8-DPSK	-10	-	-	dBm
Carrier to interference ratios (C/I), BER $\leq 0.1\%$					
Co-channel	$\pi/4$ -DQPSK	-	-	12	dB
	8-DPSK	-	-	20	dB
Adjacent channel $F = F_c \pm 1 \text{ MHz}$	$\pi/4$ -DQPSK	-	-	0	dB
	8-DPSK	-	-	5	dB
Adjacent channel $F = F_c \pm 2 \text{ MHz}$	$\pi/4$ -DQPSK	-	-	-30	dB
	8-DPSK	-	-	-25	dB
Adjacent channel $F = F_c \pm 3 \text{ MHz}$	$\pi/4$ -DQPSK	-	-	-40	dB
	8-DPSK	-	-	-33	dB

- (1) Center frequency $f = 2402 + k$, where k is the channel number (all values in MHz).

Table 4-14. Low energy receiver performance

Parameter	Comments	Min	Typ	Max	Unit
RF frequency range ¹		2402	-	2480	MHz
Sensitivity	BER $\leq 0.1\%$	-	-98	-	dBm
Intermodulation		-50	-	-	dBm
Maximum input signal level		0	-	-	dBm
PER report integrity		50	-	-	%
Carrier to interference ratios (C/I)					
Carrier to interference ratios (C/I)	Co-channel	-	-	21	dB
	$F = F_c \pm 1 \text{ MHz}$	-	-	15	dB
	$F = F_c \pm 2 \text{ MHz}$	-	-	-17	dB

	$F = F_c \pm 3 \text{ MHz}$	-	-	-27	dB
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(1) Center frequency $f = 2402 + k$, where k is the channel number (all values in MHz)

4.7. Typical Power Consumption

Table 4-15. Typical power consumption¹ for low-power states at 3.3 V

Mode	State	single chain	dual chain	Unit
Standby	Deep sleep	0.37	0.37	mA
Power save 2.4 GHz	DTIM = 1	1.3	1.6	mA
	DTIM = 3	0.7	0.8	mA
	DTIM = 10	0.5	0.5	mA
Power save 5 GHz	DTIM = 1	1.4	1.6	mA
	DTIM = 3	0.7	0.8	mA
	DTIM = 10	0.5	0.5	mA

(1) Power consumption at chip at 25°C

Table 4-16. Power consumption¹ for continuous Rx (2.4 GHz) at 3.3 V

Rate	dual chain	Unit
11n MCS7 HT20	110	mA
11ac MCS8 VHT20	112	mA
11n MCS7 HT40	130	mA

(1) Power consumption at chip at 25°C

Table 4-17. Power consumption¹ for continuous Rx (5 GHz) at 3.3 V

Rate	dual chain	Unit
11n MCS7 HT20	135	mA
11n MCS7 HT40	152	mA
11ac MCS8 VHT20	143	mA
11ac MCS8 VHT40	159	mA
11ac MCS7 VHT80	195	mA
11ac MCS9 VHT80	205	mA

(1) Power consumption at chip at 25°C

Table 4-18. Power consumption¹ for continuous Tx (2.4 GHz) at 3.3 V

Rate	Power (dBm)	dual chain	Unit
11b 1 Mbps	19	708	mA
11b 11 Mbps	19	685	mA

11g 6 Mbps	18	646	mA
11g 54 Mbps	16	490	mA
11n MCS7 HT20	16	478	mA
11ac MCS8 VHT20	16	452	mA
11ac MCS9 VHT20	15.5	580	mA

(1) Power consumption at chip at 25°C

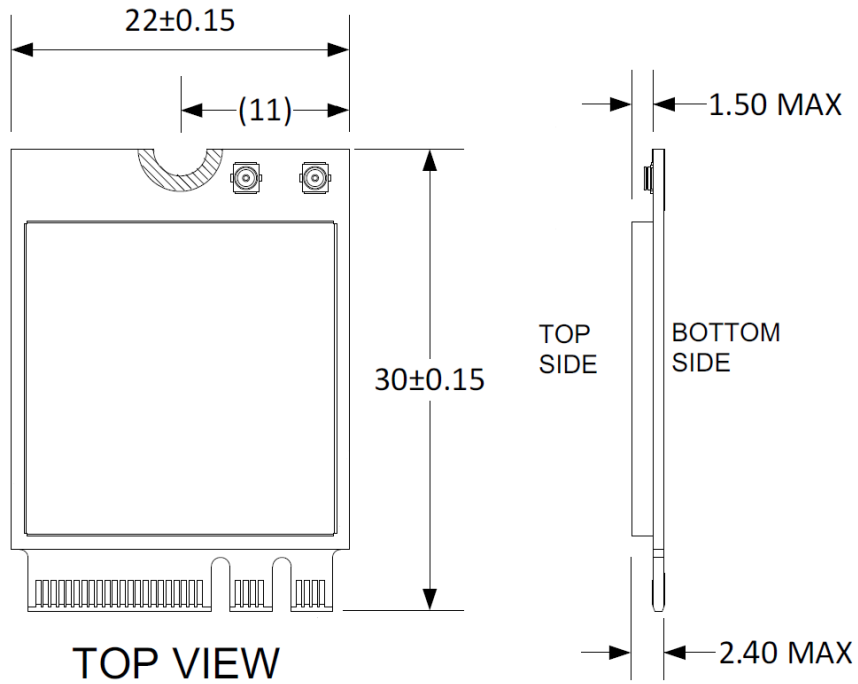
Table 4-19. Power consumption¹ for continuous Tx (5 GHz) at 3.3 V

Rate	Power (dBm)	dual chain	Unit
11a 6 Mbps	13	645	mA
11a 54 Mbps	11	488	mA
11ac MCS7 VHT20	10	484	mA
11ac MCS8 VHT20	9	465	mA
11ac MCS7 VHT40	10	430	mA
11ac MCS8 VHT40	9	407	mA
11ac MCS9 VHT40	8	394	mA
11ac MCS7 VHT80	9	396	mA
11ac MCS8 VHT80	9	382	mA
11ac MCS9 VHT80	8	369	mA

(1) Power consumption at chip at 25°C

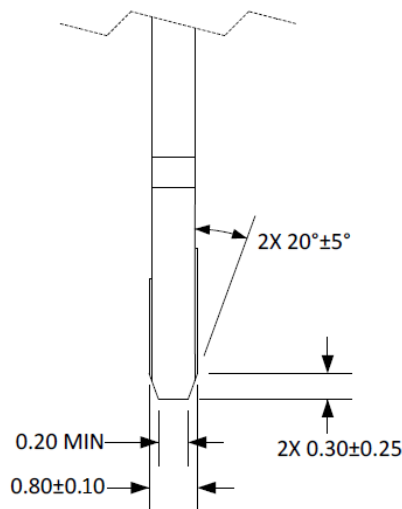
5. PACKAGE INFORMATION

5.1. Module Mechanical Outline



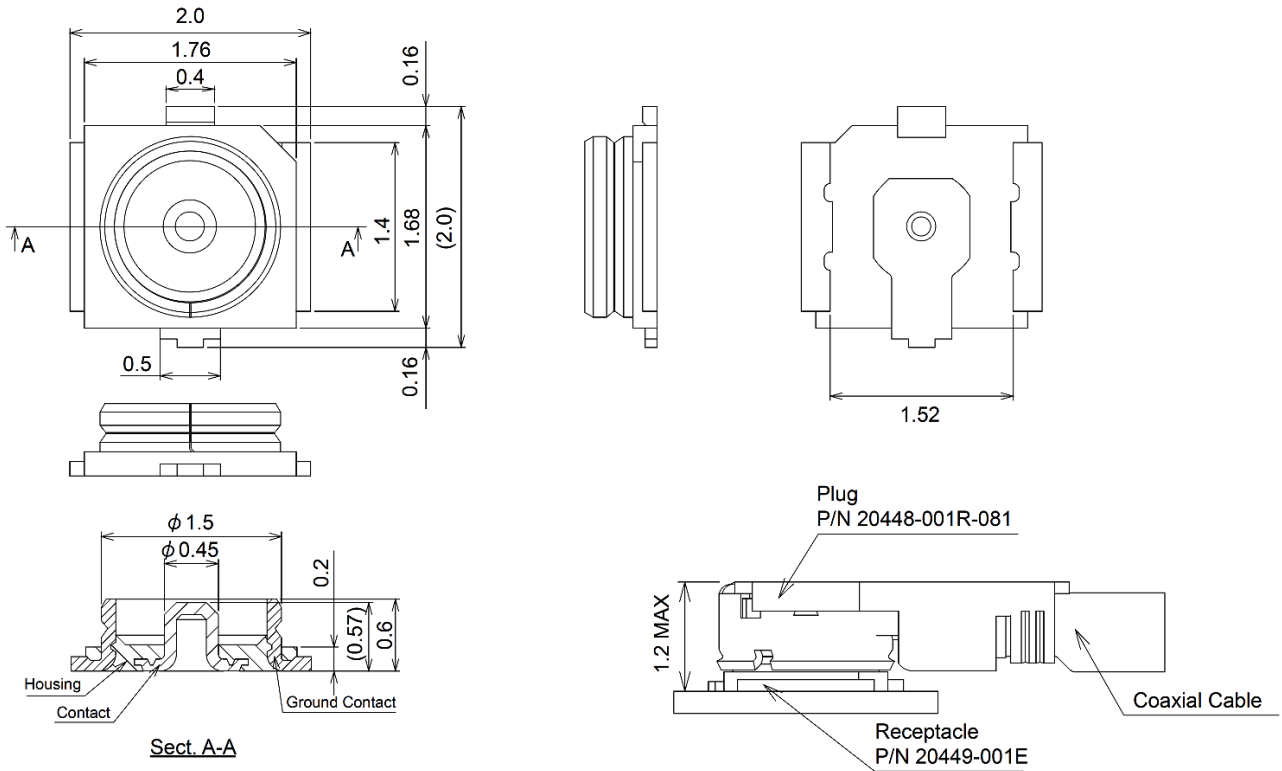
Unit: mm

5.2. Mechanical Outline of Card-Edge



5.3. RF Connector Information

Manufacturer: I-PEX



※P/N : 20449-001E (MHF4 series) from I-PEX

5.4. Ordering Information

Order Number	Package
WU3322-00	M.2(NGFF) 2230-S3 A-E

5.5. Package Marking



Marking	Description
JORJIN	Brand name
WU3322-00	Model name
YYWWSSFA	YY = Digit of the year, ex: 2019=19 WW = Week (01~52) SS = Serial number from 01 ~99 match to manufacture's lot number F = Reverse for internal use. A = Module version.
WS2-WU3322	FCC grant ID
10462A-WU3322	IC grant ID
CE	CE Logo
QR Code	Wi-Fi MAC ID Number

※BT MAC = Wi-Fi MAC+1 (Hexadecimal, hex)

6. REGULATORY INFORMATION

This section outlines the regulatory information for the following countries:

- United States
- Canada
- Europe

6.1. United States

FCC WARNING 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 or more 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.

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the 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.

FCC RF Radiation Exposure Statement:

1. This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
2. This equipment complies with FCC RF 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.

According to FCC 15.407(e), the device is intended to operate in the frequency band of 5.15GHz to

5.25GHz under all conditions of normal operation. Normal operation of this device is restricted to indoor used only to reduce any potential for harmful interference to co-channel MSS operations

Notice to OEM integrator

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 manual of the end product. The user manual which is provided by OEM integrators for end users must include the following information in a prominent location.

1. In the users manual of the end of product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated.
2. The antenna(s) used for this transmitter must not be collocated or operating in conjunction with any other antenna or transmitter within a host device, except in accordance with FCC multi-transmitter product procedures.
3. Only those antennas with same type and lesser gain filed under this FCC ID number can be used with this device.

Transmitter Circuit	Brand	Model	Ant. Type	2.4GHz Gain with cable loss (dBi)	5GHz Gain with cable loss (dBi)	2.4GHz Cable Loss (dBi)	5G Cable Loss (dBi)	Connector Type	Cable Length (mm)
Chain (0)	WNC	81-EBJ15.005	PIFA	3.00	Band 1&2: 2.56	1.15	Band 1&2: 1.70	IPEX	300
					Band 3: 4.76		Band 3: 1.74		
					Band 4: 4.76		Band 4: 1.79		
Chain (1)	WNC	81-EBJ15.005	PIFA	3.62	Band 1&2: 3.08	1.15	Band 1&2: 1.70	IPEX	300
					Band 3: 3.31		Band 3: 1.74		
					Band 4: 2.42		Band 4: 1.79		

4. The regulatory label on the final system must include the statement: “Contains **FCC ID: WS2-WU3322**”.
5. The final system integrator must ensure there is no instruction provided in the user manual or customer documentation indicating how to install or remove the transmitter module except such device has implemented two-ways authentication between module and the host system.
6. If the end product integrating this module is going to be operated in 5.15~5.25GHz frequency range, the warning statement in the user manual of the end product should include the restriction of operating this device in indoor could void the user’s authority to operate the equipment.
7. The final system integrator must ensure there is no instruction provided in the user manual or customer documentation indicating how to install or remove the transmitter module except such device has implemented two-ways authentication between module and the host system.
8. The final host manual shall include the following regulatory statement: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of 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. If not installed and

used in accordance with the instructions, it 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 tuning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the distance between the equipment and the receiver.
- Connect the equipment to outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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.

6.2. Canada

Industry Canada statement:

This device complies with ISED's licence-exempt RSSs. 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.

Le présent appareil est conforme aux CNR d'ISED applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

This radio transmitter **10462A-WU3322** 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.

FOR MOBILE DEVICE USAGE (>20cm/low power)

Radiation Exposure Statement:

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with greater than 20cm between the radiator & your body.

Déclaration d'exposition aux radiations:

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé à plus de 20 cm entre le radiateur et votre corps.

This device is intended only for OEM integrators under the following conditions: (For module device use)

- 1) The antenna must be installed and operated with greater than 20cm between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna.

Transmitter Circuit	Brand	Model	Ant. Type	2.4GHz Gain with cable loss (dBi)	5GHz Gain with cable loss (dBi)	2.4GHz Cable Loss (dBi)	5G Cable Loss (dBi)	Connector Type	Cable Length (mm)
Chain (0)	WNC	81-EBJ15.005	PIFA	3.00	Band 1&2: 2.56	1.15	Band 1&2: 1.70	IPEX	300
					Band 3: 4.76		Band 3: 1.74		
					Band 4: 4.76		Band 4: 1.79		
Chain (1)	WNC	81-EBJ15.005	PIFA	3.62	Band 1&2: 3.08	1.15	Band 1&2: 1.70	IPEX	300
					Band 3: 3.31		Band 3: 1.74		
					Band 4: 2.42		Band 4: 1.79		

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.

Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes: (Pour utilisation de dispositif module)

- 1) L'antenne doit être installée et exploitée avec plus de 20 cm entre l'antenne et les utilisateurs, et
- 2) Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les 2 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.

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.

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.

End Product Labeling FOR MOBILE DEVICE USAGE (>20cm/low power)

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: **10462A-WU3322**".

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: **10462A-WU3322**".

End Product Labeling FOR PORTABLE DEVICE USAGE (<20m from body/SAR needed)

The product can be kept as far as possible from the user body or set the device to lower output power if such function is available. The final end product must be labeled in a visible area with the following: "Contains IC: **10462A-WU3322**".

Plaque signalétique du produit final

L'appareil peut être conservé aussi loin que possible du corps de l'utilisateur ou que le dispositif est réglé sur la puissance de sortie la plus faible si une telle fonction est disponible. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: **10462A-WU3322**".

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.

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.

Caution :

- (i) 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;
- (ii) for devices with detachable antenna(s), 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; (detachable antenna only)
- (iii) for devices with detachable antenna(s), 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 as appropriate; (detachable antenna only)
- (iv) where applicable, antenna type(s), antenna models(s), and worst-case tilt angle(s) necessary to remain compliant with the e.i.r.p. elevation mask requirement set forth in section 6.2.2.3 shall be clearly indicated.

Avertissement:

Le guide d'utilisation des dispositifs pour réseaux locaux doit inclure des instructions précises sur les restrictions susmentionnées, notamment :

- (i) 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;
- (ii) pour les dispositifs munis d'antennes amovibles, le gain maximal d'antenne permis pour les dispositifs utilisant les bandes de 5250 à 5350 MHz et de 5475 à 5725 MHz doit être conforme à la limite de la p.i.r.e; (detachable antenna only)
- (iii) pour les dispositifs munis d'antennes amovibles, le gain maximal d'antenne permis (pour les dispositifs utilisant la bande de 5725 à 5850 MHz) doit être conforme à la limite de la p.i.r.e. spécifiée, selon le cas; (detachable antenna only)
- (iv) lorsqu'il y a lieu, les types d'antennes (s'il y en a plusieurs), les numéros de modèle de l'antenne et les pires angles d'inclinaison nécessaires pour rester conforme à l'exigence de la p.i.r.e. applicable au masque d'élévation, énoncée à la section 6.2.2.3, doivent être clairement indiqués

6.3. Europe

Jorjin Technologies Inc. declares that the radio equipment type RF module is in compliance with Directive 2014/53/EU.

The compliance has been verified in the operating frequency band of 2400 MHz to 2480 MHz 、 5180 MHz to 5320 MHz 、 5500 MHz to 5700MHz 、 5745 MHz to 5825 MHz. Developers and integrators

that incorporate the WU3322-00 Module in any end products are responsible for obtaining applicable regulatory approvals for such end product.

The WU3322-00 has been tested the frequency at 3.3 V across the temperature range -40°C to +85°C and tolerance as below :

1. 2.4GHz band with maximum peak power of 19.67 dBm EIRP.
2. 5GHz band with maximum peak power of 22.83 dBm EIRP.

Labeling and User Information Requirements

As a result of the conformity assessment procedure described in Annex III of the Directive 2014/53/EU, the end-customer equipment should be labeled as follows:



7. HISTORY CHANGE

Revision	Date	Description
D 0.1	2020/02/04	Initial Released.
D 0.2	2020/05/11	Modified Tx power and Rx sensitivity
D 0.3	2020/07/09	Modified the tolerance of Tx for BT
D 0.4	2021/03/11	<ol style="list-style-type: none">1. Modified WLAN RF Characteristics and BT RF Characteristics and Power Consumption2. Regulatory information
D 0.5	2021/05/26	<ol style="list-style-type: none">1. Add 5.4 Ordering Information2. Add 5.5 Package Marking3. Add VID/PID4. Change RF Connector Information
R 01	2021/07/13	To official version