JetWave WIFI Module

Industrial 2.4G 802.11n 2.4G/ 5G 802.11ac mPCIe WIFI module

User Manual

V1.0 Aug. 2016

Copyright

About This Manual

This user manual provides the following notes:

1. The Declaration of Conformity policy and manufacturer information.
2. The Safety Precaution and important notification.
3. The technical specification of the product.
4. The instruction on how to install and configure your product.

Please read this document carefully and only trained and qualified personnel should be allowed to install, replace, or service this equipment.

Conventions

For your attention on important parts, special characters and patterns are used in this manual:

Note:

This indicates an important note that you must pay attention to.

The Blue Wording is important note that you must pay attention to.

The Blue Wording with Big Case is very important note you must pay more attention to.

Warning:

This indicates a warning or caution that you have to abide.

The Red wording is very important you must avoid.

Bold: Indicates the function, important words, and so on.

Declaration of Conformity

R&TTE Directive 1999/5/EC

The product may be operated in all European Union countries. The R&TTE (1995/5/EC) Directive requires that apparatus bears the CE mark as an attestation of compliance with the R&TTE Directive. While you see the CE Marking print in our product, it indicates the product comfort to the requirement of the R&TTE Directive.

We provides formal declaration of R&TTE for Wireless product in our web site, different product may comfort to different standards of Health & Safety, EMC, Radio and other specific standard. You can download the formal document of the product in our Web site or apply from our Sales/Technical people.

The declaration of R&TTE is authorized at the following company and address.

Korenix Technology Co., Ltd.

14F., No.213, Beixin Rd., Xindian Dist., New Taipei City 23143, Taiwan (R.O.C.)

TEL: +886-2-8911-1000

Safety Precautions – JetWave Wireless Module Product

General Notification
● Only operate the device according to the technical specification. You can find the information from the product datasheet, user manual…etc. ● Read the installation instructions before connecting the system to the power source. ● If you don't get exact info you need, you can contact Korenix technical people, korecare@korenix.com. Only trained and qualified personnel should be allowed to install, replace, or service this equipment.
● The devices are designed for operation with extra-low voltage (SELV). Connect the module only to the power source pin that complies with the safety extra-low voltage (SELV) requirements in IEC/EN 60950 based safety standards.
Environment & Housing
● **Hot surface.** Avoid touching the device while it is operating. ● Only operate the device at the specified ambient temperature and humidity. ● While installing multiple devices within the cabinet, remains suitable width between the devices is MUST for better heat dispersing. ● Install the device in a cabinet or in an operating site with limited access. ● Without the manufacturer permitted, open the shielding cover means the product is not warrantied and no responsible for any unexpected risk. ● You are responsible for undertaking suitable lightning protection for the module on your main board and IPEX RF cable. **Note that Field EMD (Lightning) DAMAGE IS NOT COVERED UNDER WARRANTY.**

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.

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 Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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 20cm between the radiator & your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the intended destination. The firmware setting is not accessible by the end user.

Content

Chapter 1

Introduction

Chapter 1 Introduction

Introduction

JetWave 1223-ac1 is an industrial grade 802.11ac wave1 Wi-Fi mPCIe module to deliver up to 1.3 Gbps data rate, and backward compatible with 802.11a/b/g/n. The maximum transmission power is 21 dBm in 2.4 GHz and 19 dBm in 5 GHz.

JetWave 1223-ac1 is powered by Qualcomm Atheros QCA 9890 which enables high performance 3x3 MIMO for wireless applications demanding the highest robust link quality and maximum throughput and range.

Typical applications including high definition video surveillance for point-to-point high bandwidth connectivity, and indoor AP with smart antenna diversity.

Operating voltage is 3.3 VDC and maximum power consumption is 4W. Wide temperature design ranging from -40℃ to 70℃ and strengthened ESD protection allow users to install JetWave 1223-ac1 WIFI module under harsh environmental conditions.

For detail product specification, please download the latest datasheet from Korenix web site.

Product Package

The product package you have received should contain the following items.

Package:

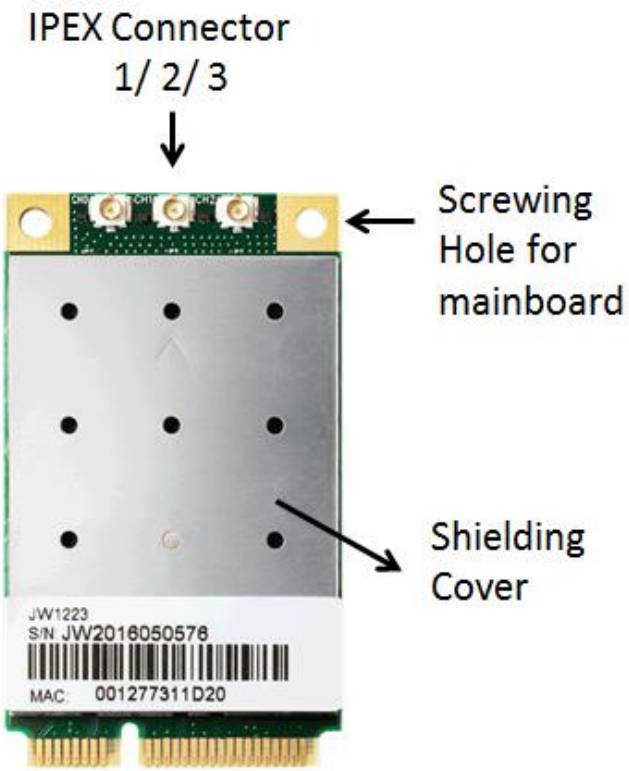
Product Unit within the antistatic bag

The product unit may be packed per multiple pcs in a box while shipment.

Note : Please contact Korenix Sales to download the Utility, Driver and User Manual.

Note 2: Korenix can offer Heat Sink, SMA connector to IPEX RF Cable as optional accessories

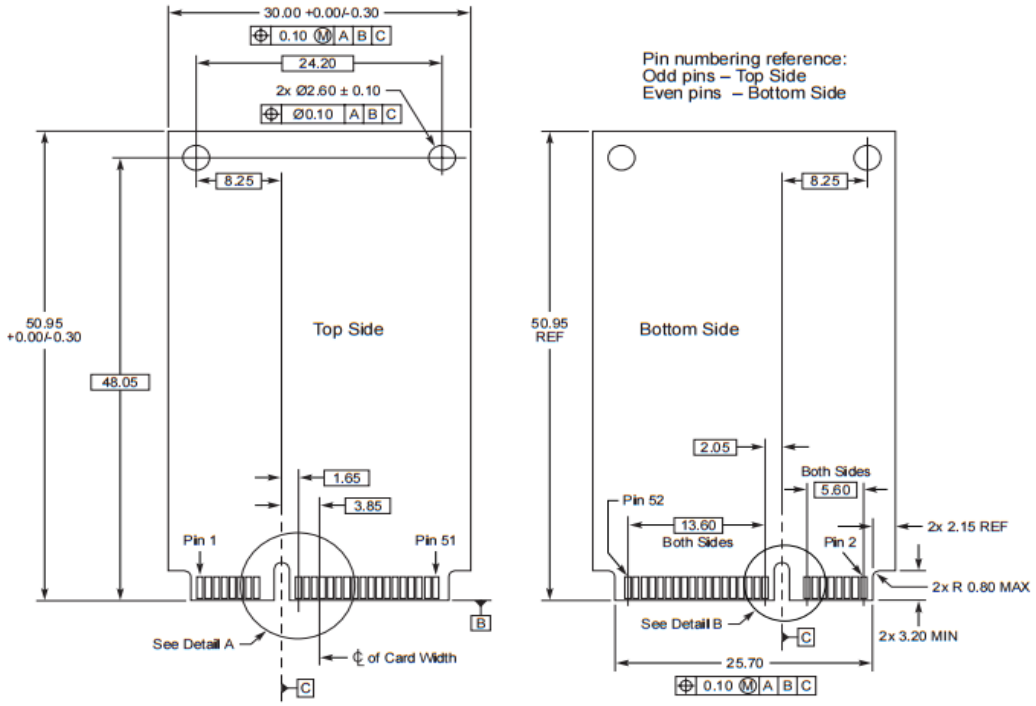
Appearance

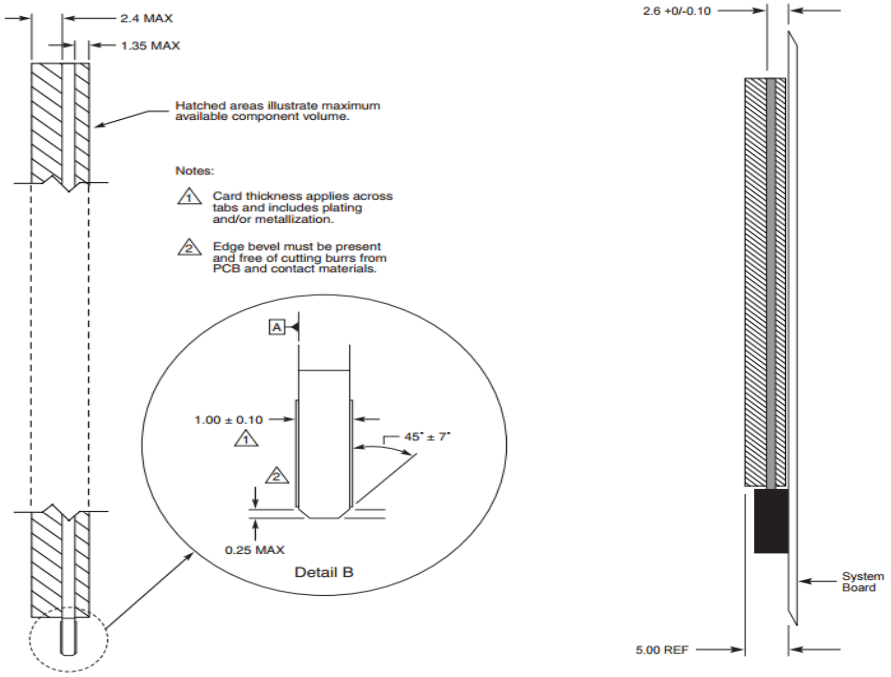


Major Features

- Qualcomm Atheros QCA9890 reference design
- 20/40/80MHz channel bandwidth and 256 QAM
- 3T3R MIMO technology, data rate up to 1.3 Gbps
- Dual band 2.4 GHz/ 5GHz
- IEEE 802.11ac compliant & backward compatible with 802.11a/b/g/n
- 2.4 GHz max 21 dBm & 5GHz max 19 dBm output power per chain
- Strengthened ESD protection
- MiniPCI Express 1.1 interface
- Wide temperature, -40~70℃ (Temperature outside the Cabinet)

Dimension


30.00 +0.00/-0.30
0.10 M A B C
24.20
2x Ø2.60 ± 0.10
Ø0.10 A B C
8.25
50.95
+0.00/-0.30
48.05
Top Side
1.65
3.85
Pin 1
Pin 51
See Detail A
B
C
℄ of Card Width
Pin numbering reference:
Odd pins – Top Side
Even pins – Bottom Side
8.25
50.95
REF
Bottom Side
2.05
Both Sides
5.60
Pin 52
13.60
Both Sides
Pin 2
2x 2.15 REF
2x R 0.80 MAX
See Detail B
C
2x 3.20 MIN
25.70
0.10 M A B C


2.4 MAX
1.35 MAX
Hatched areas illustrate maximum available component volume.
Notes:
1 Card thickness applies across tabs and includes plating and/or metallization.
2 Edge bevel must be present and free of cutting burrs from PCB and contact materials.
A
1.00 ± 0.10
1
2
45° ± 7°
0.25 MAX
Detail B
2.6 +0/-0.10
System Board
5.00 REF

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains TX FCC ID: SSA-JW1223 ". If the size of the end product is larger than the palm of the hand, 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

(2) This device must accept any interference received, including interference that may cause undesired operation.

Chapter 2

Hardware Installation

Chapter 2 Hardware

This chapter describes safety precautions and hardware information of the module.

2.1 Professional Installation Required

1. Please seek assistance from a professional hardware engineer or manufacture for design and installation. These hardware design engineers must be well knowledgeable of the mPCIe bus and system.
2. The product is distributed through distributors, system integrator and OEM/ODM customers with professional technicians and will not be sold directly through retail stores.

2.2 Safety Precautions

To keep you safe and install the hardware properly, please refer to the safety precautions in the front pages of this manual. **The Safety Precautions described in the front pages include General Notification, Environment & Housing Notification and Installation Notification.**

Additional Notification for the product:

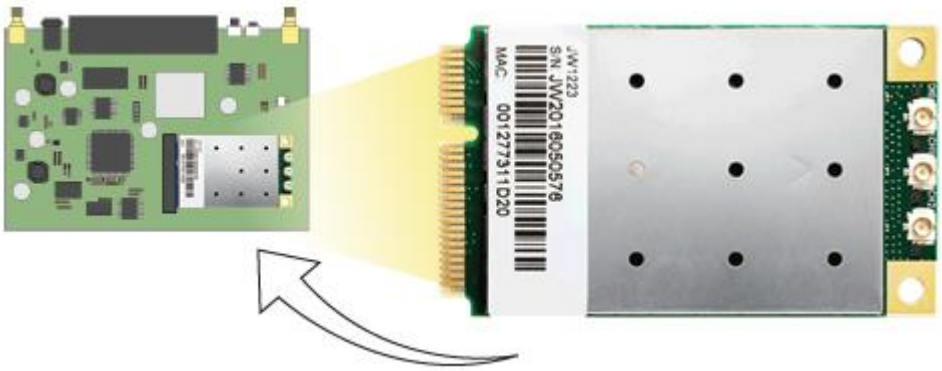
- The module is standard full size mPCIe type module. Please check the pin definition before using the module and design the main board.
- The power input voltage is +3.3 VDC±5% power input.
- Please use 50 Ω RF 1.13Ø cable and U.FL connectors for the Antenna connetors.
- Please use M2 screw.
- Do not touch the module by hand with anti-static protection. The anti-static measures in the factory/lab is Must to prevent damage from the human body and environmental static electricity.

Note that Field Electricity Static, EMD (Lightning) DAMAGE IS NOT COVERED UNDER WARRANTY.

2.3 Installation

Put the module to the mPCIe socket and lock the module by M2 screw. The module will generate high heat within any kind of mechanical box, it is MUST to have heat dispersing design for the module, for example, airflow or high efficiency aluminum heat sink.

Reference photo:



2.4 Ground

To ensure the module will not be damaged by noise or any electrical shock, your product must make exact design for grouding.

Note: Well Ground is MUST for your product, it can avoid our module to be damaged in the field. Normally, connect the Ethernet cable, Antenna, extended antenna cable and Ground before power on your system. Grounding is important and MUST in field.

2.5 Pinout

The pinout definition of the PCIe bus.

Pin #	Name	Pin #	Name
1	WAKE#	2	3.3Vaux
3	NC	4	GND
5	NC	6	NC
7	CLKREQ#	8	NC
9	GND	10	NC
11	REFCLK-	12	NC
13	REFCLK+	14	NC
15	GND	16	NC
17	NC	18	GND
19	NC	20	W_DISABLE#
21	GND	22	PERST#
23	PERn0	24	3.3Vaux
25	PERp0	26	GND
27	GND	28	NC
29	GND	30	NC
31	PETn0	32	NC
33	PETp0	34	GND
35	GND	36	NC
37	GND	38	NC
39	3.3Vaux	40	GND
41	3.3Vaux	42	NC
43	GND	44	LED_WLAN#
45	NC	46	NC
47	NC	48	NC
49	NC	50	GND
51	NC	52	3.3Vaux

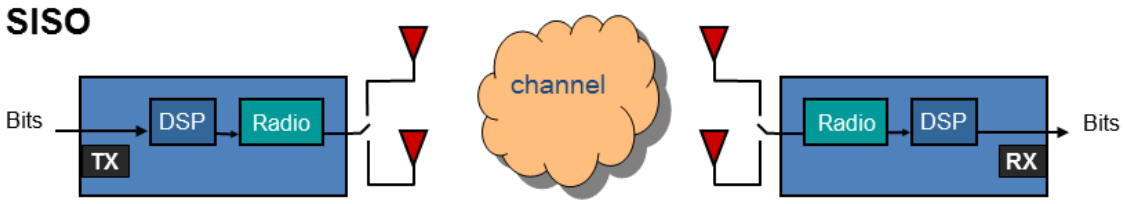
2.6 WIFI MIMO Introduction

The WIFI module supports Multiple-input Multiple-output (short of MIMO) technology. The module supports up to 3T3R MIMO, which means 3 Transmit and 3 Receive, it can reach up to 450Mbps for 802.11n or 1,299Mbps for 802.11ac, three times communication performance than traditional 1T1R SISO (Single-in Single-out).

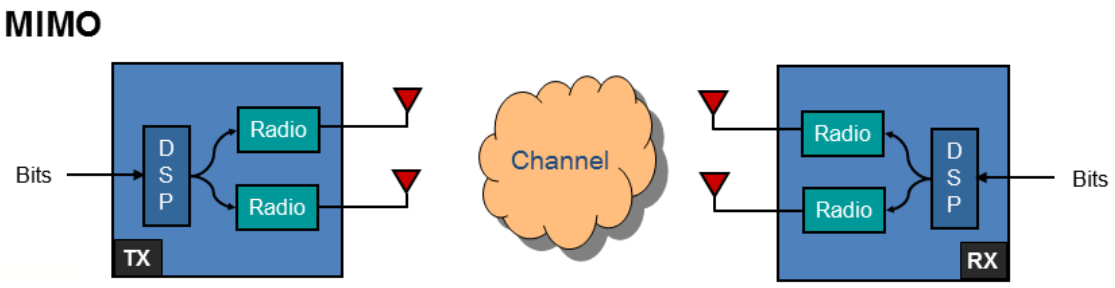
What is MIMO:

With the rising data rates and signal congestion, the MIMO is the proposed radio technology in IEEE 802.11n and accepted popularly. MIMO is short of the Multiple-Input and Multiple-Output, is the use of multiple antennas at both the transmitter and receiver to increase the wireless communication bandwidth, for example the 2T2R means 2 Transmitter and 2 receiver, then the bandwidth is double than SISO, and the 3T3R means 3 Transmitter and 3 receiver, then the bandwidth is triple than SISO. The MIMO technology offers significant increases in data throughput without additional bandwidth or increased transmit radio power.

The below figure shows the SISO technology, each transmitter and receiver has single radio:



The below figure shows the MIMO technology, the transmitter and receiver spread the total transmit power to 2 (or more) different radio antenna for communication.



2.7 RF Performance Table

The below table shows the RF performance of the 2.4G frequency.

Note: The table is measured in lab by 3rd party EMC company. Difference environment, air, RF cable and test equipment may measure different performance.

IEEE Standard	Modulation / MCS	Data rate (Mbps)	1 TX Power ±2 dBm tolerance	1 RX Sensitivity ±2 dBm tolerance
2.4GHz 802.11b	DSSS- BPSK	1	21.0	-94
	DSSS- QPSK	2	21.0	-93
	DSSS- CCK	5.5	21.0	-92
	DSSS- CCK	11	21.0	-90
2.4GHz 802.11g	OFDM - BPSK	6	21.0	-92
	OFDM - BPSK	9	21.0	-91
	OFDM - QPSK	12	21.0	-89
	OFDM - QPSK	18	21.0	-87
	OFDM - 16 QAM	24	21.0	-84
	OFDM - 16 QAM	36	19.0	-80
	OFDM - 64 QAM	48	18.0	-76
	OFDM - 64 QAM	54	18.0	-75
2.4GHz 11n 20MHz	MCS0 - OFDM - BPSK	6.5	21.0	-91
	MCS1 - OFDM - QPSK	13	20.0	-89
	MCS2 - OFDM - QPSK	19.5	20.0	-87
	MCS3 - OFDM - 16QAM	26	19.0	-83
	MCS4 - OFDM - 16QAM	39	19.0	-79
	MCS5 - OFDM - 64QAM	52	19.0	-75
	MCS6 - OFDM - 64QAM	58.5	18.0	-74
	MCS7 - OFDM - 64QAM	65	17.0	-72
2.4GHz 11n 40MHz	MCS0 - OFDM - BPSK	13.5	21.0	-88
	MCS1 - OFDM - QPSK	27	20.0	-85
	MCS2 - OFDM - QPSK	40.5	20.0	-83
	MCS3 - OFDM - 16QAM	54	19.0	-80
	MCS4 - OFDM - 16QAM	81	19.0	-76
	MCS5 - OFDM - 64QAM	108	19.0	-72
	MCS6 - OFDM - 64QAM	121.5	18.0	-71
	MCS7 - OFDM - 64QAM	135	17.0	-70

The below table shows the RF performance of the 5G frequency.

IEEE Standard	Modulation / MCS	Data rate (Mbps)	1 TX Power ±2 dBm tolerance	1 RX Sensitivity ±2 dBm tolerance
5GHz 802.11a	OFDM - BPSK	6	19.0	-90
	OFDM - BPSK	9	19.0	-90
	OFDM - QPSK	12	19.0	-89
	OFDM - QPSK	18	19.0	-87
	OFDM - 16 QAM	24	19.0	-83
	OFDM - 16 QAM	36	17.0	-81
	OFDM - 64 QAM	48	16.0	-76
	OFDM - 64 QAM	54	15.0	-75
5GHz 11n/ac 20MHz	MCS0 - OFDM - BPSK	6.5	19.0	-90
	MCS1 - OFDM - QPSK	13	18.0	-89
	MCS2 - OFDM - QPSK	19.5	18.0	-87
	MCS3 - OFDM - 16QAM	26	17.0	-82
	MCS4 - OFDM - 16QAM	39	17.0	-79
	MCS5 - OFDM - 64QAM	52	16.0	-74
	MCS6 - OFDM - 64QAM	58.5	15.0	-73
	MCS7 - OFDM - 64QAM	65	14.0	-71
	VHT MCS8 - OFDM - 256 - QAM	78	13.0	-67
5GHz 11n/ac 40MHz	MCS0 - OFDM - BPSK	13.5	19.0	-87
	MCS1 - OFDM - QPSK	27	18.0	-86
	MCS2 - OFDM - QPSK	40.5	18.0	-83
	MCS3 - OFDM - 16QAM	54	17.0	-80
	MCS4 - OFDM - 16QAM	81	17.0	-77
	MCS5 - OFDM - 64QAM	108	16.0	-73
	MCS6 - OFDM - 64QAM	121.5	15.0	-72
	MCS7 - OFDM - 64QAM	135	14.0	-70
	VHT MCS8 - OFDM - 256 - QAM	162	13.0	-66
	VHT MCS9 - OFDM - 256 - QAM	180	12.0	-64
5GHz 11n/ac 80MHz	VHT MCS0 - OFDM - BPSK	29.3	19.0	-84
	VHT MCS1 - OFDM - QPSK	58.5	18.0	-83
	VHT MCS2 - OFDM - QPSK	87.8	18.0	-81
	VHT MCS3 - OFDM - 16 - QAM	117	17.0	-77
	VHT MCS4 - OFDM - 16 - QAM	175.5	17.0	-74
	VHT MCS5 - OFDM - 64 - QAM	234	16.0	-70
	VHT MCS6 - OFDM - 64 - QAM	263.3	15.0	-69
	VHT MCS7 - OFDM - 64 - QAM	292.5	14.0	-67
	VHT MCS8 - OFDM - 256 - QAM	351	13.0	-62
	VHT MCS9 - OFDM - 256 - QAM	390	12.0	-60

Chapter 3

Prepare for Software Development

Chapter 3 Prepare for Software Development

The JetWave Wi-Fi mPCIe module software supported by either Korenix Firmware with Atheros Reference Wireless Driver OR OpenWRT with ath10k Wireless Driver.

Please note that the product is not sold in reatail market and doesn't support Window based OS. Please contact our Sale to get the approval of downloading the driver and development document.

Revision History

Version	Description	Date	Editor
V1.0	1st release	Aug, 2016	Orwell Hsieh