User Manual

for

IEEE 802.11 a/b/g/n , AR9382 SoC , 2T2R , FMC

Model Number : WMCND03TD

Revision: 1.0
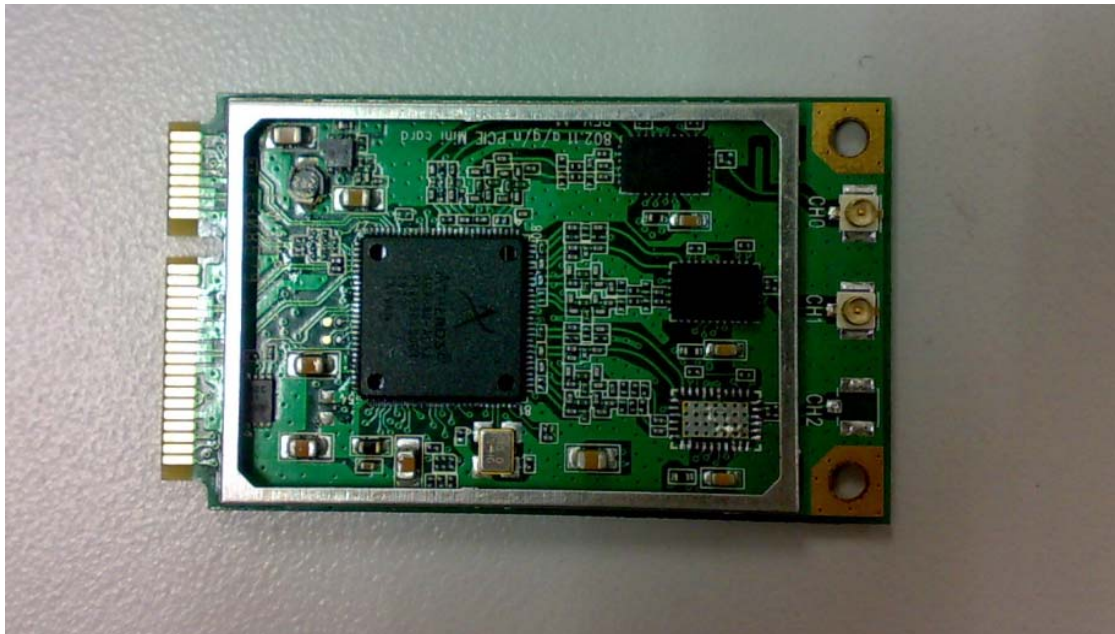
Rev.	Date	Author	Reason for Changes
1.0	2010/12/22	Amanda Wang	• New released – Tx Output Power & Rx Sensitivity update based on ES ver. 0A1

Contents

1.0 Scope

1.1 Document

This document is to specify the product requirements for **802.11a/b/g/n Draft 2.0 2x2 DB PCI Express Mini Card**. This Mini Card is based on **Atheros** chipset that complied with IEEE 802.11n Draft from 2.4/5GHz, and it is also backward compatible to comply with IEEE 802.11g and IEEE 802.11b standard to connect your exist 802.11 b/g wireless LAN device.

1.2 Product Features

- Compatible with IEEE 802.11a high rate standard to provide wireless 54Mbps data rate
- Compatible with IEEE 802.11g high rate standard to provide wireless 54Mbps data rate
- Compatible with IEEE 802.11b high rate standard to provide wireless 11Mbps data rate
- Compatible with IEEE 802.11n draft 2.0 standard to provide wireless 300Mbps data rate
- Operation at 2.4 ~ 2.5GHz and 5.15~5.85GHz frequency band to meet worldwide regulations
- Dynamic frequency selection (DFS) in required 5-GHz bands
- Dynamic date rate scaling at 6, 9, 12, 18, 24, 36, 48, 54Mbps for IEEE 802.11g
- Dynamic date rate scaling at 1, 2, 5.5, and 11Mbps for IEEE 802.11b
- Dynamic date rate scaling at 6, 6.5, 13, 13.5, 19.5, 26, 27, 39, 40.5, 53, 54, 58.5, 65, 78, 81, 104, 108, 117, 121.5, 130, 135, 162, 216, 243, 270, 300Mbps for IEEE 802.11n
- 2x2 MIMO Spatial steaming simultaneously to improve highest throughput performance and extended coverage
- Data rates up to 300Mbps @ 11n 40MHz channels operation
- Supports infrastructure networks via Access Point and ad-hoc network via peer-to-peer communication
- Supports WEP, 802.1x, WPA and WPA2 enhanced security
- Drivers support Windows 2K, XP and Vista
- Advanced Wireless multimedia QoS enhancement
- Full-size PCI-E Express 1.1 interface compliance
- RoHS compliant
- Tx Beamforming (Tx BF) support

2.0 Requirements

The following sections identify the detailed requirements of the **802.11a/b/g/n Draft 2.0 PCI Express Mini Card.**

2.1 General Requirements

2.1.1 IEEE 802.11a Section

#	Feature	Detailed Description
2.1.1.1	Standard	• IEEE 802.11a
2.1.1.2	Radio and Modulation Type	• BPSK, QPSK, 16QAM, 64QAM, OFDM
2.1.1.3	Operating Frequency	• 5.15 ~ 5.35GHz. , 5.47 ~ 5.725GHz and 5.725~5.850 GHz for US and Canada • 5.15 ~ 5.35GHz and 5.47~5.725GHz for Japan • 5.15 ~ 5.35GHz and 5.47 ~ 5.725GHz for Europe • 5.725~5.850GHz for China
2.1.1.4	Channel Numbers	• 24 non-overlapping channels for US and Canada • 19 non-overlapping channels for Japan • 19 non-overlapping channels for Europe • 5 non-overlapping channels for China
2.1.1.5	Data Rate	• 54, 48, 36, 24, 18, 12, 9, and 6Mbps
2.1.1.6	Media Access Protocol	• CSMA/CA with ACK
2.1.1.7	Transmitter Output Power	• Frequency 5150 ~5250MHz IEEE 802.11a: 16.78dBm • Frequency 5250 ~5350MHz IEEE 802.11a: 23.73dBm • Frequency 5470 ~5725MHz IEEE 802.11a: 23.73dBm • Frequency 5725 ~5850MHz IEEE 802.11a: 24.23dBm
2.1.1.8	Receiver Sensitivity	• Typical Sensitivity at Which Frame (1000-byte PDUs) Error Rate < 10% at room temperature 25 degree C. • –87dBm at 6Mbps • –87dBm at 9Mbps • –86dBm at 12Mbps • –84dBm at 18Mbps • –80dBm at 24Mbps • –77dBm at 36Mbps • –74dBm at 48Mbps • –72dBm at 54Mbps

2.1.2 IEEE 802.11b Section

#	Feature	Detailed Description
2.1.2.1	Standard	• IEEE 802.11b
2.1.2.2	Radio and Modulation Schemes	• DQPSK, DBPSK, DSSS, and CCK
2.1.2.3	Operating Frequency	• 2400 ~ 2497MHz ISM band
2.1.2.4	Channel Numbers	• 11 channels for United States 13 channels for Europe Countries 14 channels for Japan
2.1.2.5	Data Rate	• 11, 5.5, 2, and 1Mbps
2.1.2.6	Media Access Protocol	• CSMA/CA with ACK
2.1.2.7	Transmitter Output Power	• Frequency 2400~2483.5MHz IEEE 802.11b: 20.50dBm
2.1.2.8	Receiver Sensitivity	• Typical Sensitivity at Which Frame (1000-byte PDUs) Error Rate = 8% • –95dBm at 1Mbps • –93dBm at 2Mbps • –92dBm at 5.5Mbps • –88dBm for 11Mbps

2.1.3 IEEE 802.11g Section

#	Feature	Detailed Description
2.1.3.1	Standard	• IEEE 802.11g
2.1.3.2	Radio and Modulation Type	• BPSK, QPSK, 16QAM, 64QAM with OFDM
2.1.3.3	Operating Frequency	• 2400 ~ 2483.5MHz ISM band
2.1.3.4	Channel Numbers	• 11 channels for United States 13 channels for Europe Countries 13 channels for Japan
2.1.3.5	Data Rate	• 6,9,12,18,24,36,48,54Mbps
2.1.3.6	Media Access Protocol	• CSMA/CA with ACK
2.1.3.7	Transmitter Output Power	• Frequency 2400~2483.5MHz IEEE 802.11g: 19.47dBm
2.1.3.8	Receiver Sensitivity	• Typical Sensitivity at Which Frame (1000-byte PDUs) Error Rate = 10% • –88dBm at 6Mbps • –88dBm at 9Mbps • –88dBm at 12Mbps • –88dBm at 18Mbps • –87dBm at 24Mbps • –83dBm at 36Mbps • –76dBm at 48Mbps • –74dBm at 54Mbps

2.1.4 IEEE 802.11n Section for 2.4GHz band

#	Feature	Detailed Description
2.1.4.1	Standard	• IEEE 802.11n
2.1.4.2	Radio and Modulation Type	• BPSK, QPSK, 16QAM, 64QAM with OFDM
2.1.4.3	Operating Frequency	• 2.4 ~ 2.5GHz frequency
2.1.4.4	Channel Numbers	• 11 channels for United States 13 channels for Europe Countries 13 channels for Japan
2.1.4.5	Data Rate	• From MCS – 0 to MCS –15 as shown in Appendix I
2.1.4.6	Media Access Protocol	• CSMA/CA with ACK
2.1.4.7	Transmitter Output Power	• Frequency 2400~2483.5MHz IEEE 802.11n MCS0 20MHz: 18.73dBm IEEE 802.11n MCS0 40MHz: 18.73dBm
2.1.4.8	Receiver Sensitivity	• Typical Sensitivity at Which Frame (1000-byte PDUs) Error Rate = 10% HT20 • –88dBm at MCS0 • –88dBm at MCS1 • –87dBm at MCS2 • –82dBm at MCS3 • –80dBm at MCS4 • –75dBm at MCS5 • –73dBm at MCS6 • –71dBm at MCS7 HT40 • –85dBm at MCS0 • –85dBm at MCS1 • –85dBm at MCS2 • –81dBm at MCS3 • –78dBm at MCS4 • –73dBm at MCS5 • –70dBm at MCS6 • –68dBm at MCS7

2.1.5 IEEE 802.11n Section for 5GHz band

#	Feature	Detailed Description
2.1.5.1	Standard	• IEEE 802.11n draft 2.0
2.1.5.2	Radio and Modulation Type	• BPSK, QPSK, 16QAM, 64QAM , and OFDM
2.1.5.3	Operating Frequency	• 5.15 ~ 5.35GHz. , 5.47 ~ 5.725GHz and 5.725~5.850 GHz for US and Canada • 5.15 ~ 5.35GHz and 5.47~5.725GHz for Japan • 5.15 ~ 5.35GHz and 5.47 ~ 5.725GHz for Europe • 5.725~5.850GHz for China
2.1.5.4	Data Rate	• From MCS – 0 to MCS –15 as shown in Appendix I
2.1.5.5	Media Access Protocol	• CSMA/CA with ACK
2.1.5.6	Transmitter Output Power	• Frequency 5150-5250MHz IEEE 802.11n MCS0 20MHz: 16.87dBm IEEE 802.11n MCS0 40MHz: 16.41dBm • Frequency 5250-5350MHz IEEE 802.11n MCS0 20MHz: 23.92dBm IEEE 802.11n MCS0 40MHz: 23.66dBm • Frequency 5470-5725MHz IEEE 802.11n MCS0 20MHz: 23.75dBm IEEE 802.11n MCS0 40MHz: 23.85dBm • Frequency 5725-5850MHz IEEE 802.11n MCS0 20MHz: 23.98dBm IEEE 802.11n MCS0 40MHz: 24.08dBm Note: The maximum RF output power setting is different by channel and individual country regulations.
2.1.5.7	Receiver Sensitivity	• Typical Sensitivity at Which Frame (1000-byte PDUs) Error Rate = 10% HT20 • –88dBm at MCS0 • –87dBm at MCS1 • –85dBm at MCS2 • –82dBm at MCS3 • –79dBm at MCS4 • –76dBm at MCS5 • –73dBm at MCS6 • –71dBm at MCS7 HT40 • –85dBm at MCS0 • –85dBm at MCS1 • –81dBm at MCS2 • –78dBm at MCS3 • –74dBm at MCS4 • –71dBm at MCS5 • –68dBm at MCS6 • –66dBm at MCS7

2.1.6 General Section

#	Feature	Detailed Description
2.1.6.1	Antenna Connector	• UFL (i-pex)antenna connectors
2.1.6.2	Operating Voltage	• 3.3VDC +/- 10%
2.1.6.3	Current Consumption	• 470 mA at continuous transmit mode (2 Tx chains on) • 250 mA at continuous receive mode (2 Rx chains on)
2.1.6.4	Form Factor and Interface	• PCI Express 1.1 Mini Card add-in card Form factor

2.2 Software Requirements

The Configuration Software supports Microsoft Windows 2000, XP and Vista. This configuration software includes the following functions:

- **Information**
  Information allows you to monitor network status.

- **Configuration**
  Configuration allows you to configure parameters for wireless networking.

- **Security**
  Supports enhanced security WEP, 802.1x, WPA and WPA2.

2.2.1 Information

#	Feature	Detailed Description
2.2.1.1	General Information	• General Information shows the name of Wireless Adapter, Adapter MAC Address, Regulatory Domain, Firmware Version, and Utility Version.
2.2.1.2	Current Link Information	• Current Link Information shows the Current Setting ESSID, Channel Number, Associated BSSID, Network Type, Security Status, Link Status, Transmit Speed, Signal Strength, and Link Quality.
2.2.1.3	Site survey	• To search the neighboring access points and display the information of all access points.

2.2.2 Configuration

#	Feature	Detailed Description
2.2.2.1	ESS ID	• Input an SSID number if the roaming feature is enabled • Supports for ASCII printable characters.
2.2.2.2	Network Type	• Ad-hoc Mode and 802.11 Ad-hoc Mode for network configurations that do not have any access points • Infrastructure Mode for network configurations with access points
2.2.2.3	Power Save	• Extend the battery life of clients by allowing the client to sleep for short periods of time while the Access Point buffers the messages.
2.2.2.4	RTS Threshold	• Set the number of bytes used for fragmentation boundary for messages
2.2.2.5	Fragment Threshold	• Set the number of bytes used for RTS/CTS boundary
2.2.2.6	Transmission Speed	• This indicates the communication rates. Select appropriate transmission speed to match your wireless LAN settings
2.2.2.7	Roaming	• Support Automatic or Manual Rescan to associate with access point.

2.2.3 Security

#	Feature	Detailed Description
2.2.3.1	Encryption	• RC4 encryption algorithm • Support 64-bit and 128-bit WEP encryption • Support open system (OSA) and shared key authentication (SKA)
2.2.3.2	WEP Management	• Four WEP keys can be selected • STA with WEP off will never associate any AP with

#	Feature	Detailed Description
		WEP enabled • WEP Key Format: Option for Hex format
2.2.3.3	802.1x	• Support EAP-TLS, EAP-TTLS, and EAP-PEAP
2.2.3.4	WPA/WPA2	• Support WPA/WPA2-PSK and WPA/WPA2-EAP • Support Cipher Mode AES and TKIP

2.3 Mechanical Requirements

#	Feature	Detailed Description
2.3.1	Length	• 50.95mm
2.3.2	Width	• 30mm
2.3.3	Height	• 1.25mm

2.4 Compatibility Requirements

This device passes the following compatibility requirements.

#	Feature	Detailed Description
2.4.1	Wi-Fi	• Meet Wi-Fi certification for IEEE 802.11 product
2.4.2	WHQL	• Meet applicable WHQL certification requirements
2.4.3	Physical Layer and Functionality	• Meet ALPHA Engineering Test Plan and Test Report

2.5 Requirements of Reliability, Maintainability and Quality

#	Feature	Detailed Description
2.5.1	MTBF	• Mean Time Between Failure > 30,000 hours
2.5.2	Maintainability	• There is no scheduled preventive maintenance required
2.5.3	Quality	• The product quality is followed-up by ALPHA factory quality control system

2.6 Environmental Requirements

#	Feature	Detailed Description
2.6.1	Operating Temperature Conditions	• The product is capable of continuous reliable operation when operating in ambient temperature of 0 ℃ to +40℃.
2.6.2	Non-Operating Temperature Conditions	• Neither subassemblies is damaged nor the operational performance is degraded when restored to the operating temperature after exposing to storage temperature in the range of –20 ℃ to +75 ℃.
2.6.3	Operating Humidity conditions	• The product is capable of continuous reliable operation when subjected to relative humidity in the range of 10% and 90% non-condensing.
2.6.4	Non-Operating Humidity Conditions	• The product is not damaged nor the performance is degraded after exposure to relative humidity ranging from 5% to 95% non-condensing

FCC Statement:

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.

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 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.

For product available in the USA/Canada market, only channel 1~11 can be operated. Selection of other channels is not possible.

This device and its antenna(s) must not be co-located or operation in conjunction with any other antenna or transmitter.

IMPORTANT NOTE:
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 device is going to be operated in 5.15~5.25GHz frequency range, it is restricted in indoor environment only.

Devices will not permit operations on channels 120-132 for 11a and 11n/a which overlap the 5600 - 5650 MHz band.

IMPORTANT NOTE:
This module is intended for OEM integrator. The OEM integrator is still responsible for the FCC compliance requirement of the end product, which integrates this module.

20cm minimum distance has to be able to be maintained between the antenna and the users for the host this module is integrated into. Under such configuration, the FCC radiation exposure limits set forth for an population/uncontrolled environment can be satisfied.

Any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

USERS MANUAL OF THE END PRODUCT:
In the users manual of the end 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. The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users manual: 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 and (2) this device must accept any interference received, including interference that may cause undesired operation.

LABEL OF THE END PRODUCT:
The final end product must be labeled in a visible area with the following " Contains TX FCC ID: YUAWMCND03TD ". If the size of the end product is larger than 8x10cm, 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 and (2) this device must accept any interference received, including interference that may cause undesired operation.