Product External Specifications

For

Silex

802.11b/g/n Draft 2.0 USB module

(Atheros AR9271)

Model Number: SX-USBGN

Revision: 1.0

Revision History

Rev.	Date	Author	Reason for Changes
1.0	2012/08/23	Amanda Wang	• Initial

Contents

1.0 Scope

1.1 Document

This document is to specify the product requirements for **802.11 b/g/n USB Module**. This Card is based on Atheros chipset that complied with IEEE 802.11g, IEEE 802.11b, IEEE 802.11n standard from 2.4~2.5GHz, and it can be used to provide up to 54Mbps for 802.11g, 11Mbps for 802.11b and 150Mbps for 802.11n to connect your wireless LAN.

With seamless roaming, fully interoperability and advanced security with WEP standard, **802.11b/g/n USB Module** offers absolute interoperability with different vendors' 802.11g, 802.11b and 802.11n Access Points through the wireless LAN.

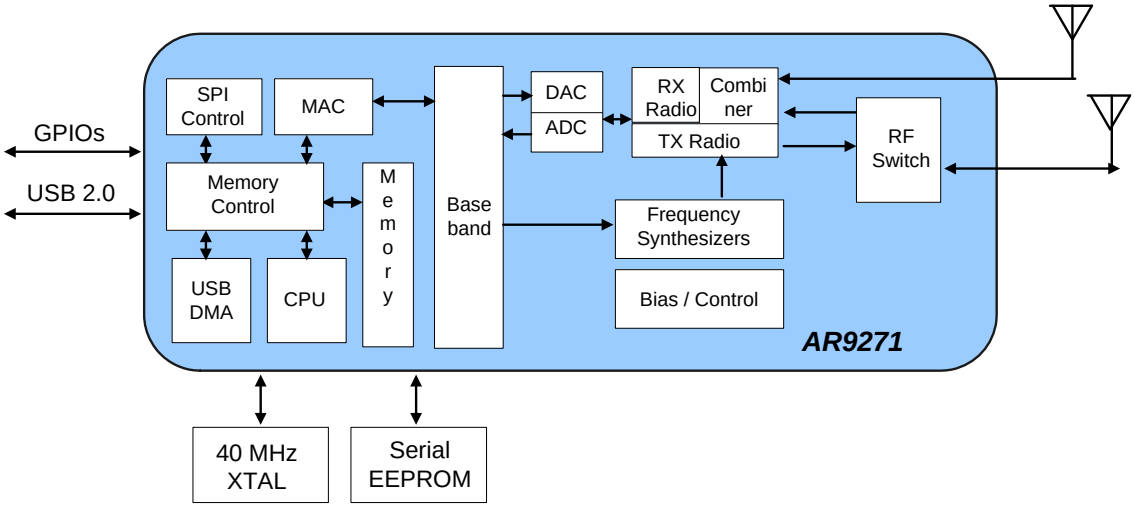
1.2 Product Features

- Compatible with IEEE 802.11n draft 2.0 standard to provide wireless 150Mbps data rate.
- Compatible with IEEE 802.11g standard to provide wireless 54Mbps data rate
- Compatible with IEEE 802.11b standard to provide wireless 11Mbps data rate
- Operation at 2.4 ~ 2.5GHz frequency band to meet worldwide regulations
- Dynamic date rate scaling at 6, 9, 12, 18, 24, 36, 48, 54 for IEEE 802.11g.
- Dynamic date rate scaling at 1, 2, 5.5, and 11Mbps for IEEE 802.11b
- Maximum reliability, throughput and connectivity with automatic data rate switching
- Support wireless data encryption with 64/128-bit WEP for security
- Support infrastructure networks via Access Point and ad-hoc network via peer-to-peer communication
- Support WEP, 802.1x, WPA and WPA2 enhanced security
- Friendly user configuration and utilities
- Drivers support Windows 2K, XP 32/64-bit, Vista 32/ 64-bit
- High speed USB 2.0 interface
- RoHS compliant
- Integrated antenna

2.0 Requirements

The following sections identify the detailed requirements of the **802.11n USB2.0 Module.**

2.1 Functional Block Diagram



2.2 General Requirements

2.2.1 IEEE 802.11b Section

#	Feature	Detailed Description
2.2.1.1	Standard	• IEEE 802.11b
2.2.1.2	Radio and Modulation Schemes	• DQPSK, DBPSK, DSSS, and CCK
2.2.1.3	Operating Frequency	• 2400 ~ 2497MHz ISM band
2.2.1.4	Channel Numbers	• 11 channels for United States 13 channels for Europe Countries 14 channels for Japan
2.2.1.5	Data Rate	• 11, 5.5, 2, and 1Mbps
2.2.1.6	Media Access Protocol	• CSMA/CA with ACK
2.2.1.7	Transmitter Output Power at Antenna Connector	• Typical RF Output Power at each RF chain, Data Rate and at room Temp. 25degree C • 17dBm(± 2dB) at 1,2,5.5,11Mbps
2.2.1.8	Receiver Sensitivity at Antenna Connector	• Typical Sensitivity at Which Frame (1000-byte PDUs) Error Rate = 8% • –90dBm at 1Mbps • –88dBm at 2Mbps • –86dBm at 5.5Mbps • –84dBm for 11Mbps

2.2.2 IEEE 802.11g Section

#	Feature	Detailed Description
2.2.2.1	Standard	• IEEE 802.11g

#	Feature	Detailed Description
2.2.2.2	Radio and Modulation Type	• BPSK, QPSK, 16QAM, 64QAM with OFDM
2.2.2.3	Operating Frequency	• 2400 ~ 2483.5MHz ISM band
2.2.2.4	Channel Numbers	• 11 channels for United States 13 channels for Europe Countries 13 channels for Japan
2.2.2.5	Data Rate	• 6,9,12,18,24,36,48,54Mbps
2.2.2.6	Media Access Protocol	• CSMA/CA with ACK
2.2.2.7	Transmitter Output Power at Antenna Connector	• Typical RF Output Power (tolerance +-2dB) at each RF chain, Data Rate and at room Temp. 25degree C • 17± 2dBm at 6~24 Mbps • 17± 2dBm at 36 Mbps • 16± 2dBm at 48 Mbps • 15± 2dBm at 54 Mbps
2.2.2.8	Receiver Sensitivity at Antenna Connector	• Typical Sensitivity at Which Frame (1000-byte PDUs) Error Rate = 10% • –87dBm at 6Mbps • –87dBm at 9Mbps • –84dBm at 12Mbps • –82dBm at 18Mbps • –79dBm at 24Mbps • –75dBm at 36Mbps • –71dBm at 48Mbps • –70dBm at 54Mbps

2.2.3 IEEE 802.11n draft 2.0 Section

<table>
<tr><th>#</th><th>Feature</th><th colspan="5">Detailed Description</th></tr>
<tr><td>2.2.3.1</td><td>Standard</td><td colspan="5">• IEEE 802.11n</td></tr>
<tr><td>2.2.3.2</td><td>Radio and Modulation Type</td><td colspan="5">• BPSK, QPSK, 16QAM, 64QAM with OFDM</td></tr>
<tr><td>2.2.3.3</td><td>Operating Frequency</td><td colspan="5">• 2400 ~ 2483.5MHz ISM band
• Channel Frequency for HT20: 2412~2472MHz
• Channel Frequency for HT40: 2422~2462MHz</td></tr>
<tr><td rowspan="10">2.2.3.4</td><td rowspan="10">Data Rate (Mbps)</td><td colspan="5">• TX/RX: MCS0 ~ MCS7</td></tr>
<tr><td>MCS</td><td colspan="2">GI=800ns</td><td colspan="2">GI=400ns</td></tr>
<tr><td></td><td>20MHz</td><td>40MHz</td><td>20MHz</td><td>40MHz</td></tr>
<tr><td>0</td><td>6.5</td><td>13.5</td><td>7.2</td><td>15</td></tr>
<tr><td>1</td><td>13</td><td>27</td><td>14.4</td><td>30</td></tr>
<tr><td>2</td><td>19.5</td><td>40.5</td><td>21.7</td><td>45</td></tr>
<tr><td>3</td><td>26</td><td>54</td><td>28.9</td><td>60</td></tr>
<tr><td>4</td><td>39</td><td>81</td><td>43.3</td><td>90</td></tr>
<tr><td>5</td><td>52</td><td>108</td><td>57.8</td><td>120</td></tr>
<tr><td>6</td><td>58.5</td><td>121.5</td><td>65.0</td><td>135</td></tr>
<tr><td>7</td><td>65</td><td>135</td><td>72.2</td><td>150</td></tr>
<tr><td>2.2.3.5</td><td>Media Access Protocol</td><td colspan="5">• CSMA/CA with ACK</td></tr>
<tr><td>2.2.3.6</td><td>Transmitter Output Power at Antenna Connector</td><td colspan="5">• Typical RF Output Power(tolerance +-2dB) at each RF chain, Data Rate and at room Temp. 25degree C
HT20</td></tr>
</table>

#	Feature	Detailed Description
		• 17± 2dBm at MCS0~4 • 17± 2dBm at MCS5 • 16± 2dBm at MCS6 • 15± 2dBm at MCS7 HT40 • 15± 2dBm at MCS0~4 • 15± 2dBm at MCS5 • 15± 2dBm at MCS6 • 14± 2dBm at MCS7
2.2.3.7	Receiver Sensitivity	• Typical Sensitivity at Which Frame (1000-byte PDUs) Error Rate = 10% HT20 • –86dBm at MCS0 • –83dBm at MCS1 • –82dBm at MCS2 • –77dBm at MCS3 • –74dBm at MCS4 • –69dBm at MCS5 • –68dBm at MCS6 • –67dBm at MCS7 HT40 • –83dBm at MCS0 • –81dBm at MCS1 • –78dBm at MCS2 • –74dBm at MCS3 • –71dBm at MCS4 • –66dBm at MCS5 • –65dBm at MCS6 • –64dBm at MCS7

2.2.4 General Section

#	Feature	Detailed Description
2.2.4.1	Antenna Type	• Integrated antenna
2.2.4.2	Operating Voltage	• 5VDC +/- 5%
2.2.4.3	Current Consumption	• 400mA at continuous transmit mode • 200mA at receive mode w/o receiving packet
2.2.4.4	USB	• High Speed USB2.0 Interface

2.3 Software Requirements

The Configuration Software supports Microsoft Windows 2000, XP 32/64-bit and Vista 32/64-bit. 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.
- **Encryption**
  Encryption provides WEP, WPA, WPA2, and 802.1X security control

- **Diagnosis**
  Diagnosis allows you to display all channel status and search neighboring access points

2.3.1 Information

#	Feature	Detailed Description
2.3.1.1	General Information	• General Information shows the name of Wireless Adapter, Adapter MAC Address, Regulatory Domain, Firmware Version, and Utility Version.
2.3.1.2	Current Link Information	• Current Link Information shows the Current Setting ESSID, Channel Number, Associated BSSID, Network Type (infrastructure or Ad-hoc network), WEP Status (enable or disable), Link Status (Connect or Dis-connect), 802.11g Transmit Speed (6, 9, 12, 18, 24, 36, 48, 54Mbps), 802.11b Transmit Speed (1, 2, 5.5, 11Mbps), Signal Strength, and Link Quality.
2.3.1.3	Site survey	• To search the neighboring access points and display the information of all access points.

2.3.2 Configuration

#	Feature	Detailed Description
2.3.2.1	ESS ID	• Input an SSID number if the roaming feature is enabled • Supports for ASCII printable characters.
2.3.2.2	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
2.3.2.3	Transmission Speed	• This indicates the communication rates. Select appropriate transmission speed to match your wireless LAN settings
2.3.2.4	Roaming	• Support Automatic or Manual Rescan to associate with access point.

2.3.3 Encryption

#	Feature	Detailed Description
2.3.3.1	Encryption	• RC4 encryption algorithm • Support 64/128 bit WEP encryption • Support open system and shared key authentication
2.3.3.2	WEP Management	• Four WEP keys can be selected • STA with WEP off will never associate any AP with WEP enabled • WEP Key Format: Option for Hex format
2.3.3.3	802.1x	• Support EAP-TLS, EAP-TTLS, and EAP-PEAP
2.3.3.4	WPA/WPA2	• Support WPA/WPA2-PSK and WPA/WPA2-EAP • Support Cipher Mode AES and TKIP

2.4 Mechanical Requirements

#	Feature	Detailed Description
2.4.1	Length	• 57.5mm(PCBA)
2.4.2	Width	• 22.6mm(PCBA)
2.4.3	Height	• 5.8mm(PCBA)

2.5 Compatibility Requirements

This device passes the following compatibility requirements.

#	Feature	Detailed Description
2.5.1	Wi-Fi	• Meet Wi-Fi certification for IEEE 802.11b/g product

#	Feature	Detailed Description
2.5.2	WHQL	• Meet applicable WHQL certification requirements
2.5.3	Physical Layer and Functionality	• Meet Alpha Networks Engineering Test Plan and Test Report

2.6 Requirements of Reliability, Maintainability and Quality

#	Feature	Detailed Description
2.7.1	MTBF	• Mean Time Between Failure > 30,000 hours
2.7.2	Maintainability	• There is no scheduled preventive maintenance required
2.7.3	Quality	• The product quality is followed-up by Alpha Networks factory quality control system

2.7 Environmental Requirements

#	Feature	Detailed Description
2.7.1	Operating Temperature Conditions	• The product is capable of continuous reliable operation when operating in ambient temperature of 0 ℃ to +45 ℃.
2.7.2	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 ℃.
2.7.3	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.
2.7.4	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

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 re-evaluating 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: N6C-USBGN”. 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.

Industry Canada statement:

This device complies with RSS-210 of the Industry Canada 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.
Ce dispositif est conforme à la norme CNR-210 d'Industrie Canada applicable aux appareils radio exempts de licence. Son fonctionnement est sujet 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.

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 minimum distance 20cm between the radiator & your body.

Déclaration d'exposition aux radiations:
Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement 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 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.

Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes: (Pour utilisation de dispositif module)
1) L'antenne doit être installée de telle sorte qu'une distance de 20 cm est respectée 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
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 IC: 4908A-USBGN".

Plaque signalétique du produit final

Ce module émetteur est autorisé uniquement pour une utilisation dans un dispositif où l'antenne peut être installée de telle sorte qu'une distance de 20cm peut être maintenue entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: 4908A-USBGN".

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.