SX-SDCAG 802.11a/b/g SDIO Module

User Manual

140-00197-100 Rev A

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About This User Manual

This user manual provides detailed specifications, diagrams and additional information required to install the SX-SDCAG 802.11a/b/g SDIO module into a product. The intended audiences are the developers and engineers responsible for the integration of the module in another product.

Safety Precautions

- To prevent damage to the SX-SDCAG module's electronic circuit components, follow established ESD practices and procedures for handling static-sensitive devices. All ESD-sensitive components must be stored and shipped in ESD-conductive bags or bubble-wrap and labeled as such using the standardized ESD adhesive warning label.
- Ethernet electrical wiring must be at least 6 feet from bare power wiring or lightning rods and associated wires, and at least 6 inches from other types of wire (antenna wires, doorbell wires, wires from transformers to neon signs), steam or hot water pipes, and heating devices.
- Protectors and grounding wire placed by the service provider must not be connected to, removed, or modified by the customer.

Emissions Disclaimer

Final emission certification per FCC, IC, CE and other agency requirements are the responsibility of the OEM (refer to chapter 2 for additional information).

Chapter 1: Introduction

The SX-SDCAG is an 802.11a/b/g radio/baseband module in a standard SDIO form factor. Designed for wireless local area network (WLAN) applications that require low power consumption, the SX-SDCAG is ideal for battery-operated portable devices in the medical, weights and measures, transportation and other industries.

SX-SDCAG features include:

- Highly Integrated System for 802.11a/b/g WLAN
- U.FL antenna connectors with diversity support
- Wide operating temperature range
- Integrated Atheros AR6002XZ Single Chip
- Integrated high performance Dual-Band Front End Module (FEM), Band Pass Filter, 26MHz Crystal
- 16Kbit EEPROM
- Advanced power management to minimize standby and active power
- WEP 64/128, WPA (TKIP), WPA2 (802.11i) security
- Linux, Windows CE, and Windows Mobile drivers available from Silex (porting will be required in most cases)
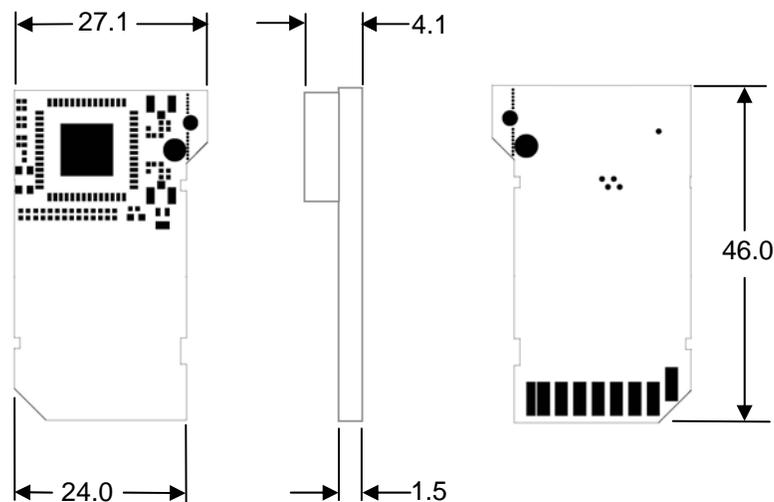
Figure 1 SX-SDCAG Dimensions (mm)

Chapter 2
Hardware Specifications/Compliance

FCC Information

FCC ID: N6C-SXSDCAG

NOTICE

In accordance with FCC Part 15, the SX-SDCAG is listed as a Modular Transmitter device. End products that include the SX-SDCAG shall have the words "Contains Transmitter module FCC ID: N6C-SXSDCAG" on an exterior label.

This equipment 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 within 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 different circuit from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help.

The transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

In accordance with 15.407(e), within the 5.15 – 5.25 GHz band, this device must be restricted to indoor use to reduce any potential for harmful interference to co-channel Mobile Satellite Systems.

The available scientific evidence does not show that any health problems are associated with using low power wireless devices. There is no proof, however, that these low power wireless devices are absolutely safe. Low power wireless devices emit low levels of radio frequency energy (RF) in the microwave range while being used. Whereas high levels of RF can produce health effects (by heating tissue), exposure to low-level RF that does not produce heating effects causes no known adverse health effects. Many studies of low-level RF exposures have not found any biological effects. Some studies have suggested that some biological effects might occur, but such findings have not been confirmed by additional research.

To satisfy RF exposure requirements, this device and its antenna(s) must operate with a separation distance of at least 20 centimeters from all persons and must not be co-located or operated in conjunction with any other antenna or transmitter. End-users must be provided with specific operating instructions for satisfying RF exposure.

FCC WARNING:

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Information for Canadian Users (IC Notice)

The term "IC" before the radio certification number only signifies that Industry Canada technical specifications were met. 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.

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Regulations.
>   I. The device for the band 5150-5250MHz is for indoor usage to reduce potential for harmful interference to co-channel Mobile Satellite systems.
>   II. The maximum antenna gain permitted (for devices in the bands 5250-5350 MHz and 5470-5725 MHz) to comply with the e.i.r.p. limit
>   III. The maximum antenna gain permitted (for devices in the band 5725-5825 MHz) to comply with the e.i.r.p. limits specified for point-to-point and non point-to-point operation as appropriate, as stated in section A9.2(3).

Users should be cautioned to take note that high-power radars are allocated as primary users (meaning they have priority) of the bands 5250-5350 MHz and 5650-5850 MHz and these radars could cause interference and/or damage to LE-LAN devices.

To prevent radio interference to the licensed service, this device is intended to be operated indoors and away from windows to provide maximum shielding. Equipment that is installed outdoors is subject to licensing.

This device has been designed to operate with the antennas listed below, and having a maximum gain of 3.2dB @ 2.4 GHz and 4.2 dB @ 5 GHz. Antennas not included in this list or having a higher gain are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.
- Ethertronics Prestta WLAN Embedded Antenna, Part No. 1000418
- Pulse Engineering Dualband WLAN Ceramic Chip Antenna, Part No. W3006

To reduce potential radio interference to others, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (EIRP) is not more than required for successful communication.

The available scientific evidence does not show that any health problems are associated with using low power wireless devices. There is no proof, however, that these low power wireless devices are absolutely

safe. Low power wireless devices emit low levels of radio frequency energy (RF) in the microwave range while being used. Whereas high levels of RF can produce health effects (by heating tissue), exposure to low-level RF that does not produce heating effects causes no known adverse health effects. Many studies of low-level RF exposures have not found any biological effects. Some studies have suggested that some biological effects might occur, but such findings have not been confirmed by additional research.

Specifications

Operating environment:	Temperature: -20º to +70ºC (-4º to +158ºF)
	Humidity: 20% to 80%
Storage environment:	Temperature: -30º to +85ºC (-22º to +185ºF)
	Humidity: 20% to 85%
Supply voltage:	3.3V ± 5%
Host interface:	SDIO
IEEE 802.11b	Frequency: 2412MHz-2462MHz
	Transmission system: DSSS
	Transmission speed: 1/2/5/11Mbps
	Automatic detection
	Channel: 1-11
IEEE 802.11g	Frequency: 2412MHz-2462MHz
	Transmission system: OFDM
	Transmission speed: 6/9/12/18/24/36/48/54Mbps
	Automatic detection
	Channel: 1-11
IEEE 802.11a	Frequency: 5180MHz-5240MHz, 5745-5825MHz
	Transmission system: OFDM
	Transmission speed: 6/9/12/18/24/36/48/54Mbps
	Automatic detection
	Channel: 36-48, 149-165

Chapter 3
Installation

Installation Requirements

The SX-SDCAG must be installed in a device that contains a 9-pin SDIO slot.

The SX-SDCAG has FCC limited single modular approval, which can eliminate the need for you to obtain FCC Part 15 Subpart C and E (intentional radiation) approvals for your device. In order to use this FCC/IC limited single modular approval for the SX-SDCAG, OEM integrators must:

1. include "Contains FCC ID: N6C-SXSDCAG, IC: 4908B-SXSDCAG" on the exterior label of your device.
2. ensure for use in the United States and Canada that the driver for the SX-SDCAG in your product disables scanning on channels 12-14, 50-70 and 80-144 by loading a table with disabled channels into the SX-SDCAG during initialization.
3. ensure the driver does not permit use of channels 12-14, 50-70 and 80-144 in ad-hoc mode in the United States and Canada by using the same disabling method.
4. use an antenna referred to in appendix A or an equivalent type antenna with equal or lower gain.
5. include all required statements in your final product user's manual (per 15.21, 15.27, 15.105, 15.407(e), etc) and final product labeling (per 15.19). Refer to FCC/IC Information in previous chapter.
6. include following statement "In accordance with 15.407(e), within the 5.15 – 5.25 GHz band, this device must be restricted to indoor use to reduce any potential for harmful interference to co-channel Mobile Satellite Systems."
7. not provide Instructions on how to remove or install the SX-SDCAG to your end users.
8. provide regulated +3.3 VDC +/- 5% power to the SX-SDCAG.

If you do not follow the above instructions, then it is your responsibility to obtain the necessary FCC approvals.

Installation Procedure

To install the SX-SDCAG:

1. Be sure to use the proper antistatic handling techniques.

2. Connect one end of the antenna cable to the main antenna connector on the SX-SDCAG (see figure 2). If you are using a diversity antenna configuration, connect one end of the second antenna cable to the secondary antenna on the SX-SDCAG.
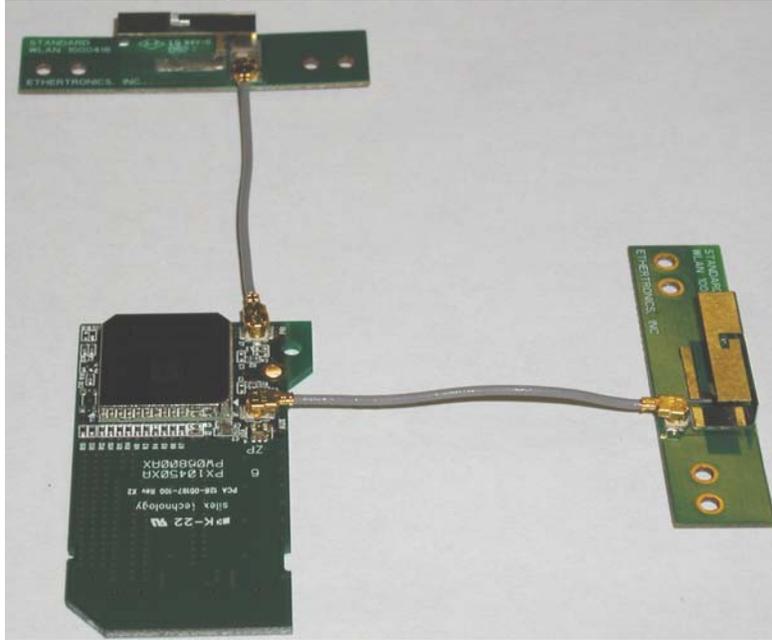
Figure 2. Connecting the Antenna(s) and cable(s) to the SX-SDCAG

3. Insert the SX-SDCAG into an available SDIO slot in your device. Make sure that it is securely seated.

4. If your device is subject to significant vibration or other forces, Silex recommends securing the SX-SDCAG using the corner mounting hole with a screw to prevent the accidental ejection of the card.

M2 Screw
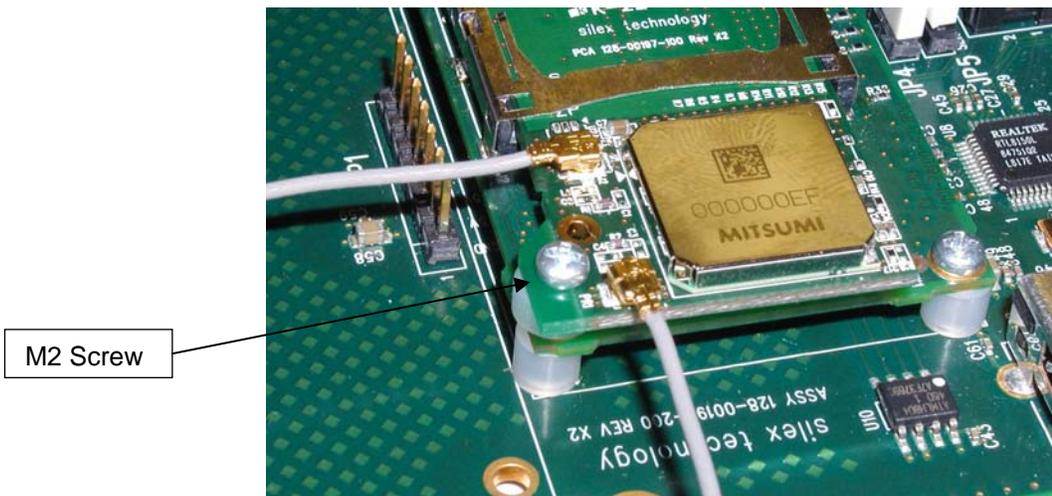
Figure 3. Securing the SX-SDCAG

Appendix A
Antenna Information

Antenna Specifications

Please refer to the Ethertronics website @ www.ethertronics.com for more detailed information for the Prestta WLAN Embedded Antenna, Part No. 1000418.

Table 1 Electrical Specifications

Parameter	Value
Antenna Type	Isolated Magnetic Dipole
Frequency Range	2.4 to 5.8 GHz
Impedance	50 Ohms
Gain (peak)	2.4 GHz = 2.5 dBi 5.8 GHz = 3.5 dBi
VSWR	≤ 2.0
Standard Connector	U.FL Micro Coaxial

Please refer to the Pulse website @ www.pulseeng.com/antennas for more detailed information for the Pulse Dualband WLAN Ceramic Antenna, Part No. W3006.

Table 2 Electrical Specifications

Parameter	Value
Antenna Type	High-Dielectric Monopole
Frequency Range	2.4 to 5.8 GHz
Impedance	50 Ohms
Gain (peak)	2.4 GHz = 3.2 dBi 5.8 GHz = 4.2 dBi
VSWR	≤ 2.0
Standard Connector	U.FL Micro Coaxial

Appendix B
Silex Contact Information

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