

**User Manual**

**SX-USBAC**

silex technology, Inc.

## 1. Notifications

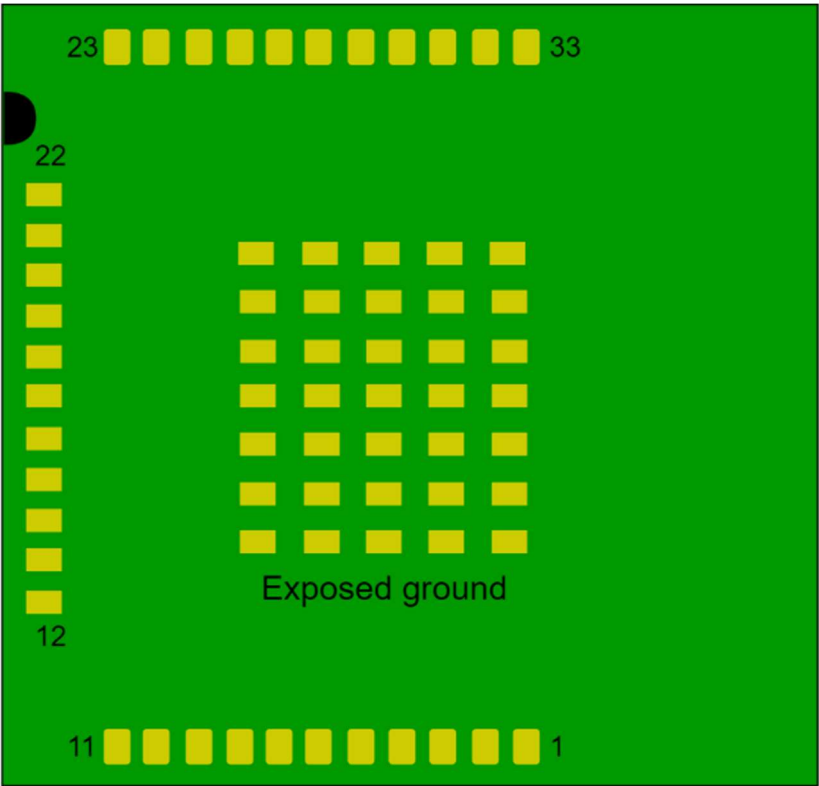
- ✧ This module is the wireless device using 2.4GHz / 5GHz band. You have to disable 5.15-5.35GHz band (W52, W53) before use at outdoor in Japan because these band are prohibited to use at outdoor by low restriction.
- ✧ This module is designed for embedded purpose into the general electric devices, and is not designed for high reliability demands like aircraft instruments, nuclear control instruments, high reliability medical instruments (Class III, IV), and high reliability security instruments or any other devices required extremely high reliability and quality. **In the case embedded into the medical instrument, please ask to silex despite the medical class.**
- ✧ As this module communicates by radio wave, it is strongly recommended to use some security system to prevent unexpected information leakage to others.
- ✧ This module is a radio module for embedded purpose. Please understand functions and features of this module, and evaluate as the final product which has this module embedded. Also, as evaluation of EMC conformity of this module has not been performed, EMC conformity evaluation and application must be performed with the final product which this module is embedded.
- ✧ This module will effect to some other device or be affected by the some other device using the same frequency band. Please investigate the environment to use this module beforehand.
- ✧ Disassembling or modifying the radio module leads to punishment based on radio law.
- ✧ This module is the embedded module that has the exposed connectors or some devices. Please be careful for electro static, condensing, and other dusts.
- ✧ In the case using the other wireless devices using same frequency band around this product, please take care below. (See IEEE802.11-2012 and IEEE802.11ac-2013)
  1. +/-25MHz (+/-25MHz) or more frequency separation from the center frequency of this module is recommended in 2.4GHz.
  2. Appropriate environment to avoid interference from the adjacent channels or the non-adjacent channels is necessary.
    - 2.4GHz: Center frequency +/-25MHz (5Ch), Non Adjacent channel: Further than Center frequency +/-30MHz (6Ch)
    - 5GHz HT20: Center frequency +/-20MHz (4Ch), Non Adjacent channel: Further than Center frequency +/-40MHz (8Ch)
    - 5GHz HT40 Adjacent channel: Center frequency +/-40MHz (8Ch), Non Adjacent channel: Further than Center frequency +/-80MHz (16Ch)
    - 5GHz HT80 Adjacent channel: Center frequency +/-80MHz (16Ch), Non Adjacent channel: Further than Center frequency +/-160MHz (32Ch)

Even if these conditions is satisfied, the module is possibly interfered when strong signal is input.  
The other wireless system should be enough far from this module

- ✧ The input level from the opponent device must be -20dBm or less at 2.4GHz, -30dBm or less at GHz with including antenna gain.

2. Signal pin specifications

2.1. Pin locations



Bottom view

## 2.2. Signal specifications

#	Signal name	Type	I/O Domain	Descriptions
1	GND	GND	GND	Ground
2	RESERVED	OD	VDDIO_GPIO1	Un-used signal. Keep Open.
3	GND	GND	GND	Ground
4	WOW	OD	OD	Wake on wireless signal. Low: wake up trigger. Open drain output. Need external pull-up to IO power rail of the host system.
5	GND	GND	GND	Ground
6	RESERVED	DI	VDDIO_GPIO1	Un-used signal. Keep Open.
7	GND	GND	GND	Ground
8	GND	GND	GND	Ground
9	VDD	P	P	Main power supply. +3.14~+3.46V
10	VDD	P	P	Main power supply. +3.14~+3.46V
11	VDD	P	P	Main power supply. +3.14~+3.46V
12	WLAN_PWD_L	PD	VDDIO_GPIO_1	WLAN reset. (0=Enable, 1=Disable) Internal Pull-down.
13	GND	GND	GND	Ground
14	GND	GND	GND	Ground
15	BT_USB_D+	AI,AO	VDD	Bluetooth USB 1.1 differential pair
16	BT_USB_D-	AI,AO	VDD	
17	GND	GND	GND	Ground
18	WL_USB_D-	AI,AO	VDD	Wireless LAN USB2.0 differential pair
19	WL_USB_D+	AI,AO	VDD	
20	GND	GND	GND	Ground
21	VDDIO_GPIO1	P	P	IO power supply. +1.71 ~ +3.46V
22	GND	GND	GND	Ground
23	BT_PWD_L	PD	VDDIO_GPIO1	Bluetooth reset. (0=Enable, 1=Disable) Internal Pull-down.
24	GND	GND	GND	Ground
25	GND	GND	GND	Ground
26	NC	NA	NA	NC pin
27	NC	NA	NA	NC pin

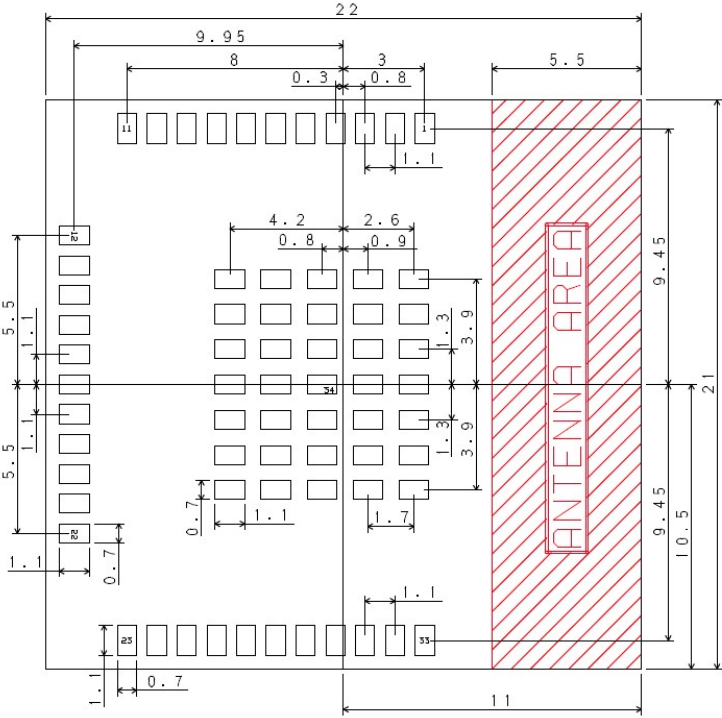
#	Signal name	Type	I/O Domain	Descriptions
28	GND	GND	GND	Ground
29	VDDIO_GPIO1	P	P	IO power supply. +1.71 ~ +3.46V
30	GND	GND	GND	Ground
31	GND	GND	GND	Ground
32	RESERVED	DI	DI	Un-used signal. Keep Open.
33	RESERVED	OD	OD	Un-used signal (Debug port). Connected to a test pad. Keep Open if the debug function is not used.
EXPGND	Exposed Ground	GND	GND	Exposed Ground pads

NOTE1	The Type DI signals which are directed "Keep Open" in case unused, these signals can be Open because the software in the chip does not concern about these signals.
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### 2.3. Signal definitions

Symbols	Descriptions
AI	Analog input
AO	Analog output
B	CMOS bidirectional digital signal
DI	CMOS digital input
OD	Open drain digital output
P	Voltage supply
GND	Ground
NA	Not applicable

3. Reference land design



TOP VIEW

## FCC Notice

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.

### List of applicable FCC rules

This device complies with below part 15 of the FCC Rules.

Part 15 Subpart C

Part 15 Subpart E

### Test Modes

silex technology, Inc. uses various test mode programs for test set up which operate separate from production firmware. Host integrators should contact silex technology, Inc. for assistance with test modes needed for module/host compliance test requirements.

### Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification.

The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

### Summarize the specific operational use conditions

This module designed for mounting inside of the end product by end product manufacturer professionally. Therefore, it complies with the antenna and transmission system requirements of § 15.203.

### Compliance with FCC requirement 15.407(c)

Data transmission is always initiated by software, which is the passed down through the MAC, through the digital and analog baseband, and finally to the RF chip. Several special packets are initiated by the MAC. These are the only ways the digital baseband portion will turn on the RF transmitter, which it then turns off at the end of the packet. Therefore, the transmitter will be on only while one of the aforementioned packets is being transmitted. In other words, this device automatically discontinue transmission in case of either absence of information to transmit or operational failure.

### RF exposure considerations

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines. This equipment should be installed and operated keeping the radiator at least 20cm or more away from person's body.

## Co-Location Rule

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

## Label and compliance information

Following information must be indicated on the host device of this module.

**Contains Transmitter Module FCC ID : N6C-USBAC**

Or

**Contains FCC ID : N6C-USBAC**

## FCC CAUTION

The following statements must be described on the user manual of the host device of this module;

### **FCC CAUTION**

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

## Antennas

Recommended Antenna List

Antennas	Vendors	Antenna Type	2.4GHz Gain		5GHz Gain	
			peak	Min.	peak	Min.
SXANTFDB24A55-02	Silex	Patern	+2.0dBi	0dBi	+3.0dBi	0dBi
H2B1PC1A1C(AA258)	Unictron	PCB	+2.9dBi	0dBi	+4.4dBi	0dBi
H2B1PD1A1C(AA222)	Unictron	PCB	+2.8dBi	0dBi	+4.2dBi	0dBi
146153	Molex	PCB	+3.25dBi	0dBi	+5.0dBi	0dBi

## WLAN Channel 12 & 13

Product hardware has the capability to operate on channel 12 & 13.

However, these 2 channels will be disabled via software and user will not able to enable these 2 channels.



## ISED Notice

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

## Label and compliance information

The following information must be indicated on the host device of this module.

Les informations suivantes doivent être indiquées sur le périphérique hôte de ce module.

**Contains Transmitter Module IC: 4908A-USBAC**

Or

**Contains IC: 4908A-USBAC**

## Operation in the band 5150-5350 MHz

Operation in the band 5150-5350 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems.

La bande 5150-5350 MHz est 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.

## Data transmission

Data transmission is always initiated by software, which is the passed down through the MAC, through the digital and analog baseband, and finally to the RF chip. Several special packets are initiated by the MAC. These are the only ways the digital baseband portion will turn on the RF transmitter, which it then turns off at the end of the packet. Therefore, the transmitter will be on only while one of the aforementioned packets is being transmitted. In other words, this device automatically discontinues transmission in case of either absence of information to transmit or operational failure.

La transmission des données est toujours initiée par le logiciel, puis les données sont transmises par l'intermédiaire du MAC, par la bande de base numérique et analogique et, enfin, à la puce RF. Plusieurs paquets spéciaux sont

initiés par le MAC. Ce sont les seuls moyens pour qu'une partie de la bande de base numérique active l'émetteur RF, puis désactive celui-ci à la fin du paquet. En conséquence, l'émetteur reste uniquement activé lors de la transmission d'un des paquets susmentionnés. En d'autres termes, ce dispositif interrompt automatiquement toute transmission en cas d'absence d'information à transmettre ou de défaillance.

## RF exposure considerations

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment and meets RSS-102 of the ISED radio frequency (RF) Exposure rules. This equipment should be installed and operated keeping the radiator at least 20cm or more away from person's body.

Cet équipement est conforme aux limites d'exposition aux rayonnements énoncées pour un environnement non contrôlé et respecte les règles d'exposition aux fréquences radioélectriques (RF) CNR-102 de l'ISDE. Cet équipement doit être installé et utilisé en gardant une distance de 20 cm ou plus entre le radiateur et le corps humain.

## Antenna Type

This radio transmitter (4908A- USBAC) 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.

Antenna Type	Gain		Impedance
	2.4GHz	5GHz	
PCB Antenna	3.25dBi	5dBi	50ohms

Le présent émetteur radio (4908A- USBAC) a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

Type d'antenne	Gain		Impedance
	2.4GHz	5GHz	
Antenne PCB	3.25dBi	5dBi	50ohms