

Integration Guide

Sona™ NX611 M.2 1218 With Chip Antenna Module

Application Note

v3.0

1 Introduction

This document describes key hardware aspects of Ezurio Connectivity's Sona™NX611 Wi-Fi6 / Bluetooth 5.4 modules, which are based on NXP's IW611 chipset. It serves as a preliminary supplement to the full module datasheet and is provided to assist in initial hardware integration.

Note: Data in this document is drawn from several sources and is subject to change.



Figure 1: Sona NX611 M.2 1218 Chip Antenna SMT Module

2 Sona™ NX611 M.2 1218 Module

This section describes the hardware footprint, mechanical drawing and hardware pinout of the Sona NX611 M.2 1218 Chip Antenna module. It provides details and pin assignments critical to hardware integration of the module.

Detail drawings are shown in [Figure 2](#) and [Figure 3](#).

2.1 SONA™ NX611 M.2 1218 Module PCB Footprint

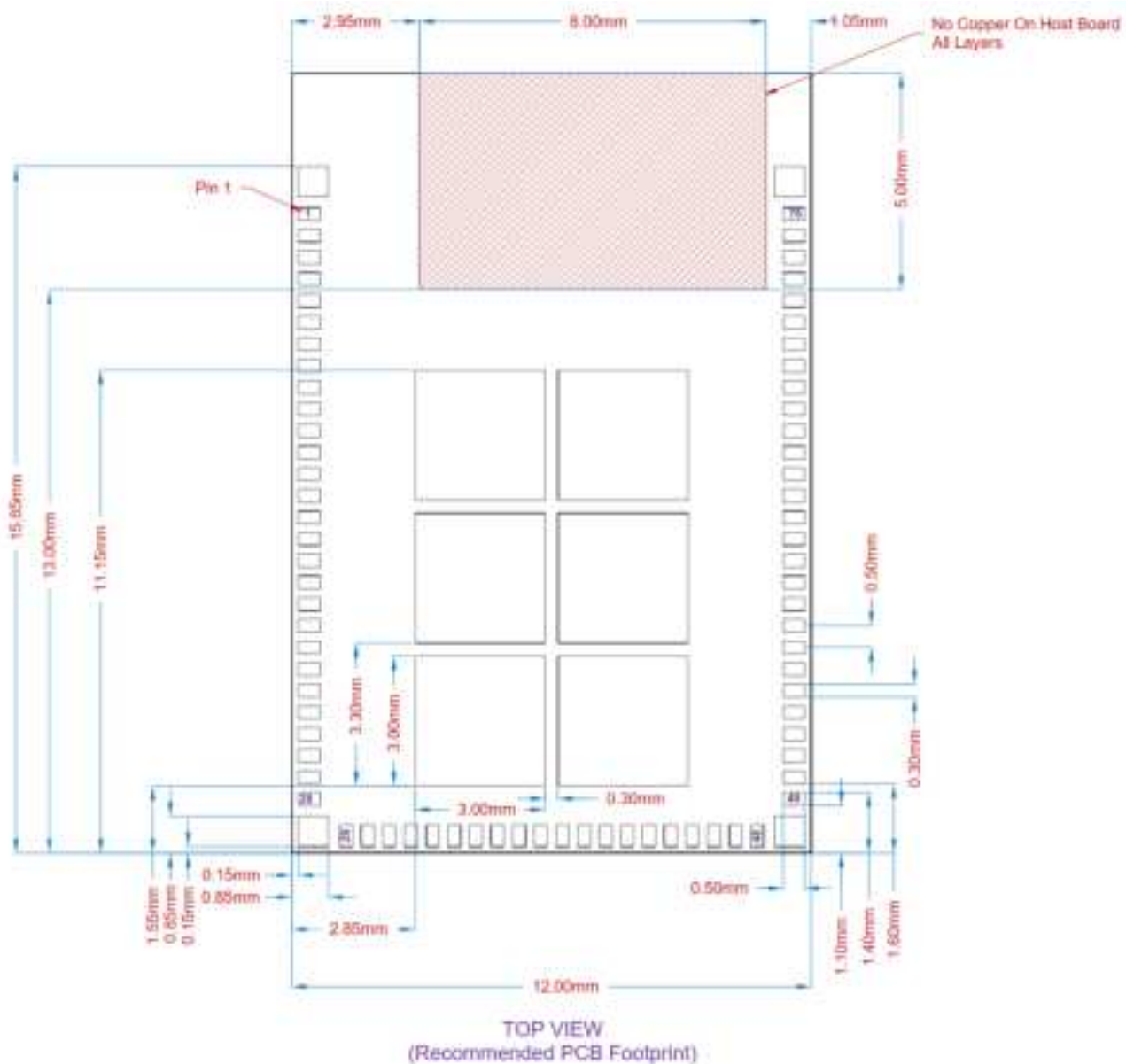


Figure 2: PCB Footprint (Top View) – NX611 M.2 1218 Module

2.2 SONA™ NX611 M.2 1218 Module Mechanical Drawing

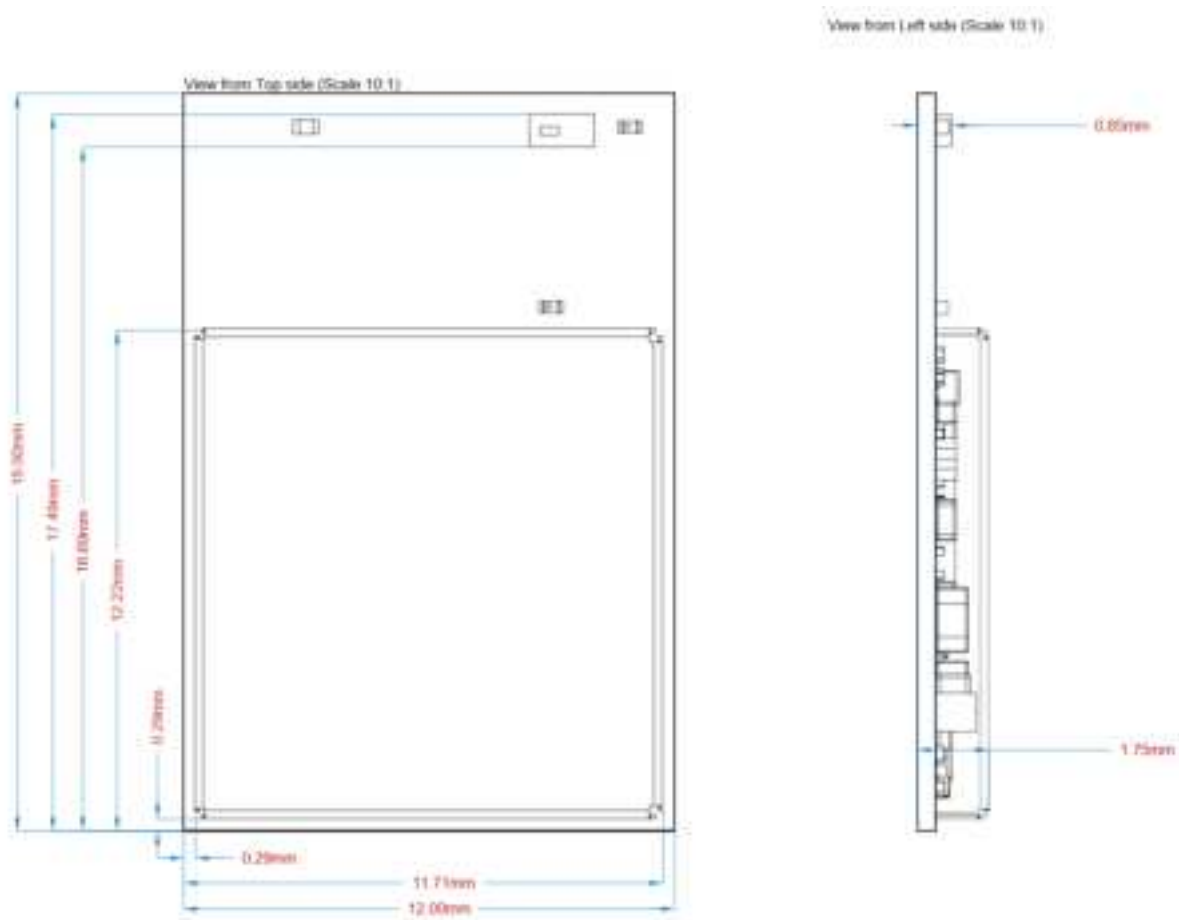


Figure 3: Mechanical Drawing – NX611 M.2 1218 Chip Antenna module.

2.3 SONA™ NX611 M.2 1218 Module Pinout

Table 1: Sona NX611 M.2 1218 Chip Antenna Module Pinout

Pin Number	PCIe M.2 Name	Pin Name NX611	Description
1	UIM_POWER_SRC/GPIO1	UNUSED	
2	UIM_POWER_SNK	UNUSED	
3	UIM_SWP	UNUSED	
4	3.3V	3.3V	
5	3.3V	3.3V	
6	GND	Ground	Ground
7	RESERVED	UNUSED	
8	ALERT#	NC	
9	I2C_CLK	NC	
10	I2C_DATA	NC	
11	COEX_RXD	COEX_RXD	
12	COEX_TXD	COEX_TXD	
13	COEX3	UNUSED	
14	SYSCLK/GNSS_0	UNUSED	
15	TX_BLANKING/GNSS_1	UNUSED	
16	RESERVED	UNUSED	
17	GND	Ground	Ground
18	RESERVED	UNUSED	
19	RESERVED	NC	
20	GND	Ground	Ground
21	PETn1	UNUSED	
22	PETp1	UNUSED	
23	GND	Ground	
24	PERn1	UNUSED	
25	PERp1	UNUSED	
26	GND	Ground	
27	SUSCLK(32kHz)	UNUSED	
28	W_DISABLE1#	PDn	
29	PEWAKE#	UNUSED	
30	CLKREQ#	UNUSED	
31	PERST#	UNUSED	
32	GND	Ground	Ground
33	REFCLKn0	UNUSED	
34	REFCLKp0	UNUSED	
35	GND	Ground	Ground
36	PETn0	UNUSED	
37	PETp0	UNUSED	

Pin Number	PCIe M.2 Name	Pin Name NX611	Description
38	GND	Ground	Ground
39	PERn0	UNUSED	
40	PERp0	UNUSED	
41	GND	Ground	Ground
42	VENDOR DEFINED	EXT_PRI	
43	VENDOR DEFINED	BT_WAKE_IN	
44	VENDOR DEFINED	WL_WAKE_IN	
45	SDIO RESET#	IND_RST_WL	
46	SDIO WAKE#	WL_WAKE_OUT	
47	SDIO DATA3	SDIO DATA3	
48	SDIO DATA2	SDIO DATA2	
49	SDIO DATA1	SDIO DATA1	
50	SDIO DATA0	SDIO DATA0	
51	SDIO CMD	SDIO CMD	
52	SDIO CLK	SDIO CLK	
53	UART WAKE#	BT_WAKE_OUT	
54	UART CTS	UART CTS	
55	UART Tx	UART Tx	
56	UART Rx	UART Rx	
57	UART RTS	UART RTS	
58	PCM_SYNC/I2S_WS	PCM_SYNC/I2S_WS	
59	PCM_IN/I2S_SD_IN	PCM_IN/I2S_SD_IN	
60	PCM_OUT/I2S_SD_OUT	PCM_OUT/I2S_SD_OUT	
61	PCM_CLK/I2S_SCK	PCM_CLK/I2S_SCK	
62	GND	Ground	Ground
63	W_DISABLE2#	IND_RST_BT	
64	LED_2#	UNUSED	
65	LED_1#	UNUSED	
66	RESERVED/VIO_1.8	VIO_1.8	
67	RESERVED	UNUSED	
68	GND	Ground	Ground
69	USB_D-	UNUSED	
70	USB_D+	UNUSED	
71	GND	Ground	Ground
72	3.3V	3.3V	
73	3.3V	3.3V	
74	GND	Ground	Ground
75	GND	Ground	Ground
76	GND/VIO_CFG	NC	

3 Host PCB Requirements

The Sona NX611 1218 Chip Antenna Module has been certified by the FCC and Industry Canada (IC) as a Modular Radio. The end user is authorized to integrate this module into an end-product and is solely responsible for the Unintentional Emissions levels produced by the end-product.

To uphold the Modular Radio certifications, the integrator of the module must abide by the PCB layout recommendations outlined in the following paragraphs. Any divergence from these recommendations will invalidate the modular radio certifications and require the integrator to re-certify the module and/or end-product.

Additionally, the size of the host PCB and positioning of the Module greatly affects tuning and performance of the module antenna. The Sona NX611 1218 Chip Antenna Module has been tuned and matched to the size and position on the Host Development board shown below. Because tuning for the antenna is integrated into the module, if the reference design board size is not followed, performance of the antenna will be degraded.

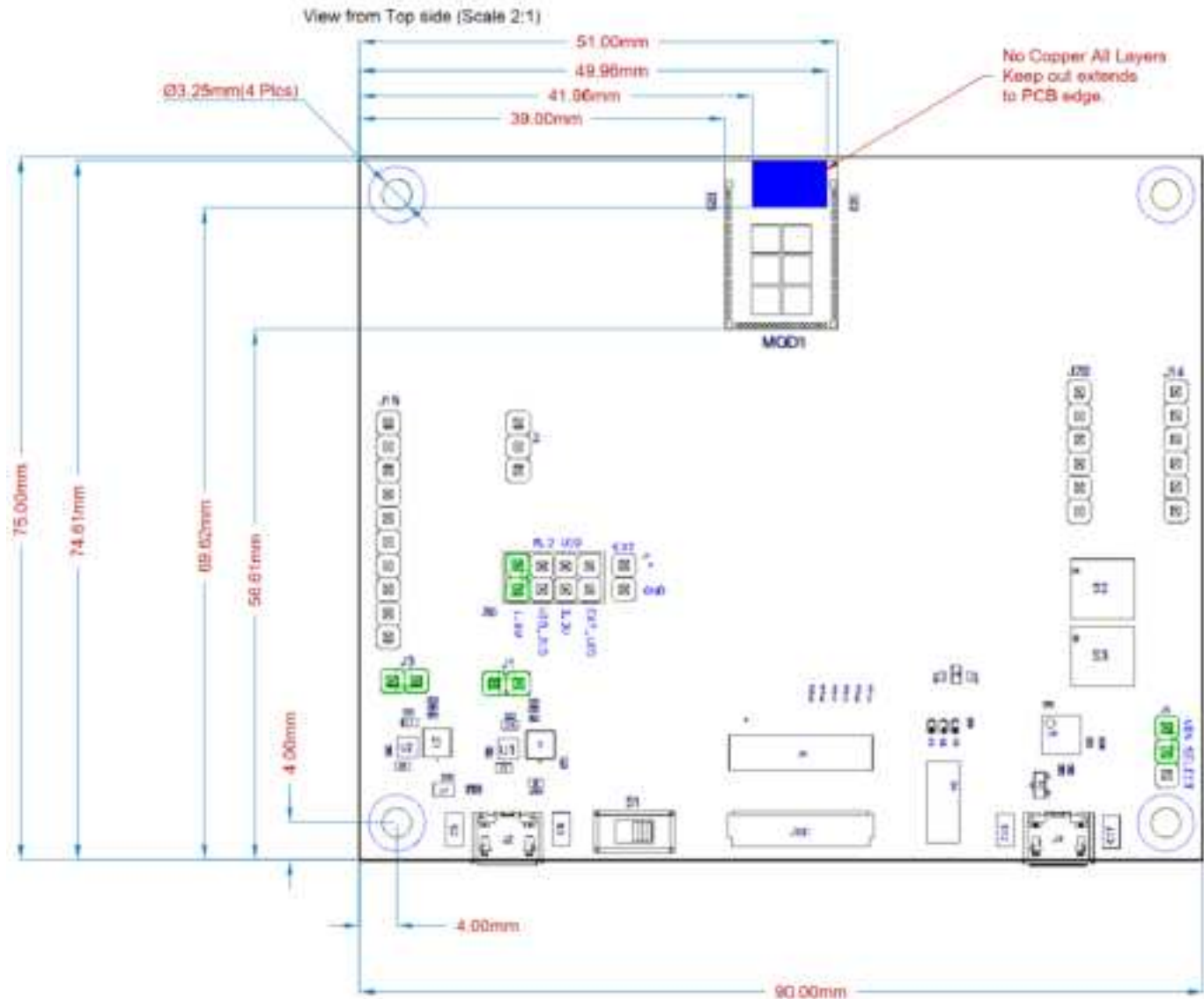


Figure 4: Sona NX611 M.2 1218 Chip Antenna Reference Board.

Note: Please use the latest CAD files from the Ezurio web site when incorporating the Sona™ 1218 module into a new design. CAD files are provided in native Altium as well as Gerber and PDF formats.

3.1 Sona NX611 Integrated Antenna module RF Layout Guidelines

The following is a list of RF layout design guidelines and recommendation when installing an Ezurio radio into your device.

- Do not run any cables directly above or directly below the radio.
- Do not place any parts or run any high-speed digital lines below the radio.
- Be sure to put a 10uF/16V/0603 capacitor on EACH 3.3V power pin. Also, place that capacitor as close as possible to the pin to make sure the internal PMU is working correctly.
- Use proper electro-static-discharge (ESD) procedures when installing the Ezurio radio module. To avoid negatively impacting Tx power and receiver sensitivity, do not cover the antennas with metallic objects or components.
- Ezurio's surface mount modules are designed to conform to all major manufacturing guidelines. This application note is intended to provide additional guidance beyond the information that is presented in the user manual. This application note is considered a living document and will be updated as new information is presented.
- The modules are designed to meet the needs of commercial and industrial applications. They are easy to manufacture and conform to current automated manufacturing processes.
- The Sona NX611 Integrated antenna variant should be located at the center of the Host PCB and surrounded by ground on three sides. The antenna keep out region as defined in [Figure 4](#) must be kept clear of copper on all layers of the host PCB.

4 FCC and ISED Modular Certification Requirements

Because these modules and their associated set of approved antennas has been certified by the FCC and Innovation, Science and Economic Development, Canada (ISED) as Modular Radios, the end user is authorized to integrate this module into an end-product and is solely responsible for the Unintentional Emissions levels produced by the end-product.

To uphold the Modular Radio certifications, the integrator of the module must abide by the PCB layout recommendations outlined in the following paragraphs. Any divergence from these recommendations will invalidate the modular radio certifications and require the integrator to re-certify the module and/or end-product.

The module must be used with its integral antenna with the following characteristics:

Table 2: Integral Antenna Characteristics (Peak Gain [dBi])

Manufacturer	Part Number	Type	2412 MHz	2442 MHz	2472 MHz	5180 MHz	5510 MHz	5835 MHz
TDK	ANT162442DT-2001A2	Chip	2.5	3.3	2.8	1.6	4.1	4.2

Note:

Please use the latest CAD files from the Ezurio web site when incorporating the Sona™ module into a new design. CAD files are provided in native Altium as well as Gerber and PDF formats.

4.1 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 radiofrequency 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.

Important Note:

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.

Integration Instructions for Host Product Manufacturers

Applicable FCC rules to module:

FCC Part 15.247, FCC Part 15.407

Summarize the specific operational use conditions:

This device is intended only for OEM integrators under the following condition:

- The transmitter module may not be co-located with any other transmitter or antenna

As long as 1 condition 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 cannot 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 cannot 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. The OEM integrator must 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 shown in this manual.

Limited module procedures

Not applicable.

Trace antenna designs

Not Applicable.

RF exposure considerations

Co-located issue shall be met as mentioned in Summarize the specific operational use conditions.

Product manufacturer shall provide the following text in the end-product manual:

FCC Radiation Exposure Statement

The product complies with the US portable RF exposure limit set forth for an uncontrolled environment and are safe for intended operation as described in this manual. The further RF exposure reduction can be achieved if the product can be kept as far as possible from the user body or set the device to lower output power if such function is available.

A 20-centimeter separation distance and co-located issue shall be met as mentioned in Summarize the specific operational use conditions.

Product manufacturer shall provide the following text in the end-product manual:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 64 millimeters between the radiator and your body.

Label and Compliance Information

Product manufacturers must provide, with the finished product, a physical or e-label that states the following:

Contains FCC ID: SQG-SONANX611C

Information on Test Modes and Additional Testing Requirements

Test tool: The NXP LabTool shall be used to set the module to transmit continuously. Please contact Ezurio for further information and usage conditions.

Additional Testing, Part 15 Subpart B Disclaimer

The module is only FCC authorized for the specific rule parts listed on the grant, and that 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

4.2 Innovation, Science and Economic Development, Canada (ISED) Statement

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.

This radio transmitter (IC: 3147A-SONANX611C) has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types

listed in Table 2 above, 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.

Le présent émetteur radio (IC: 3147A-SONANX611C) a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés ci-dessus dans le tableau 4 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.

Radiation Exposure Statement:

This equipment complies with Canada radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 64 mm between the radiator & your body.

Déclaration d'exposition aux radiations:

Cet équipement est conforme Canada limites d'exposition aux radiations dans un environnement non contrôlé. Cet équipement doit être installé et utilisé à distance minimum de 64 mm entre le radiateur et votre corps.

This device is intended only for OEM integrators under the following conditions:

- 1) The transmitter module may not be co-located with any other transmitter or antenna.

As long as the condition above is met, further transmitter testing is not 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:

- 1) Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les 1 condition 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 cannot 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 cannot 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

The final end product must be labeled in a visible area with the following: "Contains IC: 3147A-SONANX611C.

Plaque signalétique du produit final

Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: 3147A-SONANX611C.

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.

5 Revision History

Version	Date	Notes	Contributor(s)	Approver
0.1	11 June 2023	Preliminary release.	Peter Scharpf	Andy Ross
1.0	5 Feb 2025	Initial release	Dave Drogowski	Andy Ross
2.0	11 Feb 2025	Update Antenna and Certification Information	Brian Petted	
3.0	12 Feb 2035	Updated module rendered drawing	Peter Scharpf	

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