



Model WF-R22E-UWD1 User Manual

IEEE 802.11 2x2 WiFi 5 Wireless LAN and Bluetooth 5.3 Combo Module

[SoC RTL8822EU]

for 802.11a/b/g/n/ac + Bluetooth 5.3

Version: 1.0

<Specification may be changed without prior notice>

Sichuan AI-Link Technology Co., Ltd

四川爱联科技股份有限公司

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Please sign and return this page and the front page to our company by email or fax, or by courier to the following address:

Address: Anzhou Industrial Park, Mianyang, Sichuan, P.R.C

Company: Sichuan AI-Link Technology Co., Ltd.

Module Name		WF-R22E-UWD1	
	Designed by	Reviewed by	Approved by
Signature	ZHANG, Jie	FAN, Xijun	DING, Shuangpeng
Date	03/04/2025	03/04/2025	12/30/2024

Model WF-R22E-UWD1

➤ Compatible WLAN Standards

IEEE Std. 802.11 a/b/g/n/ac
Bluetooth V2.1/5.3

➤ SoC

RTL8822EU

➤ Product Size

47.0mm×30.0mm×6.0mm

➤ Product Weight0

5.47mm



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Features

WLAN

- ✚ IEEE 802.11ab/g/n/ac compatible WLAN
- ✚ IEEE 802.11e QoS Enhancement (WMM)
- ✚ IEEE 802.11i(WPA,WPA2).Open, sharedkey, and pair-wise key authentication services
- ✚ IEEE 802.11h DFS, TPC, Spectrum Measurement
- ✚ IEEE 802.11k Radio Resource Measurement
- ✚ WAPI(Wireless Authentication PrivacyInfrastructure) certified

Bluetooth

- ✚ Support Bluetooth 5 system (BT 5.3 Logo Compliant)
- ✚ Compatible with Bluetooth v2.1 Systems
- ✚ Integrated MCU to execute Bluetooth protocol stack
- ✚ Supports all packet types in basic rate and enhanced data rate
- ✚ Supports Secure Simple Pairing
- ✚ Enhanced BT/Wi-Fi Coexistence Control to improve transmission quality in different profiles
- ✚ Supports multiple Low Energy states
- ✚ Dual Mode support: Simultaneous LE and BR/EDR

Revision Record

Revision	Date	Description	Edited by
V1.0	03/04/2025	Premier Release	ZHANG, Jie

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1 General Description

1.1 System Overview

Model WF-R22E-UWD1 is a highly integrated WiFi module by AI-Link, based on the MediaTek SoC RTL8822EU, featuring a 2x2 a/b/g/n/ac dual-band Wi-Fi, and a Bluetooth v5.3 subsystems.

The finely tuned hardware architecture and baseband algorithms provide superlative RF performance, as well as low power consumption. Intelligent MAC design powers a highly efficient offload engine; the hardware supports standard features of higher level of security, performance, and conforms most international regulations, offering the great performance at any time, in any circumstance.

1.2 System Properties

Dimension	Typically, 47mm×30mm×6.0mm
Chipset	RTL8822EU
Operating Frequency	2.4GHz: 2.400~2.483.5 GHz 5 GHz: 5.150~5.850GHz
Antenna	IPEX Connector and Internal Antenna
Operating Voltage	3.3V±5%
PCB Information	4-layers design (1.0+/-0.15mm)
Peripheral Interface	USB2.0
Rate	11b: 1, 2, 5.5 and 11Mbps 11a/g: 6, 9, 12, 18, 24, 36, 48 and 54 Mbps 11n: MCS0~15, up to 300Mbps 11ac: MCS0~9, Nss=2, BW=80MHz up to 866.7Mbps
Operating Temperature	-10°C to +70°C
Storage Temperature	-40°C to +85°C
ESD Protection	IEC:2000V

1.3 Diagram

The hardware architecture for the module is shown in Figure 1. The AI-Link' s WF-R22E-UWD1 module Complies with IEEE standards 802.11a/b/g/n/ac; it also supports 2x2 and could reach up to data rate of 866.7 Mbps. Meanwhile, it is also a module of Bluetooth v5.3 and Wi-Fi Dual-band.

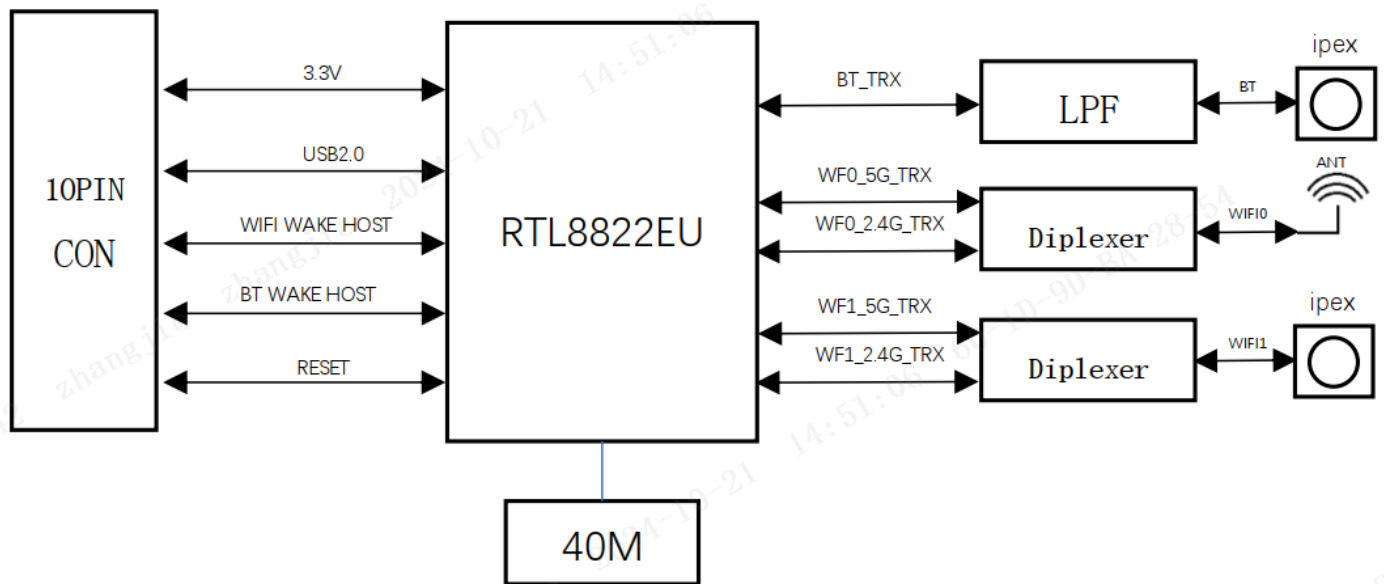


Figure 1: WF-R22E-UWD1 Block Diagram

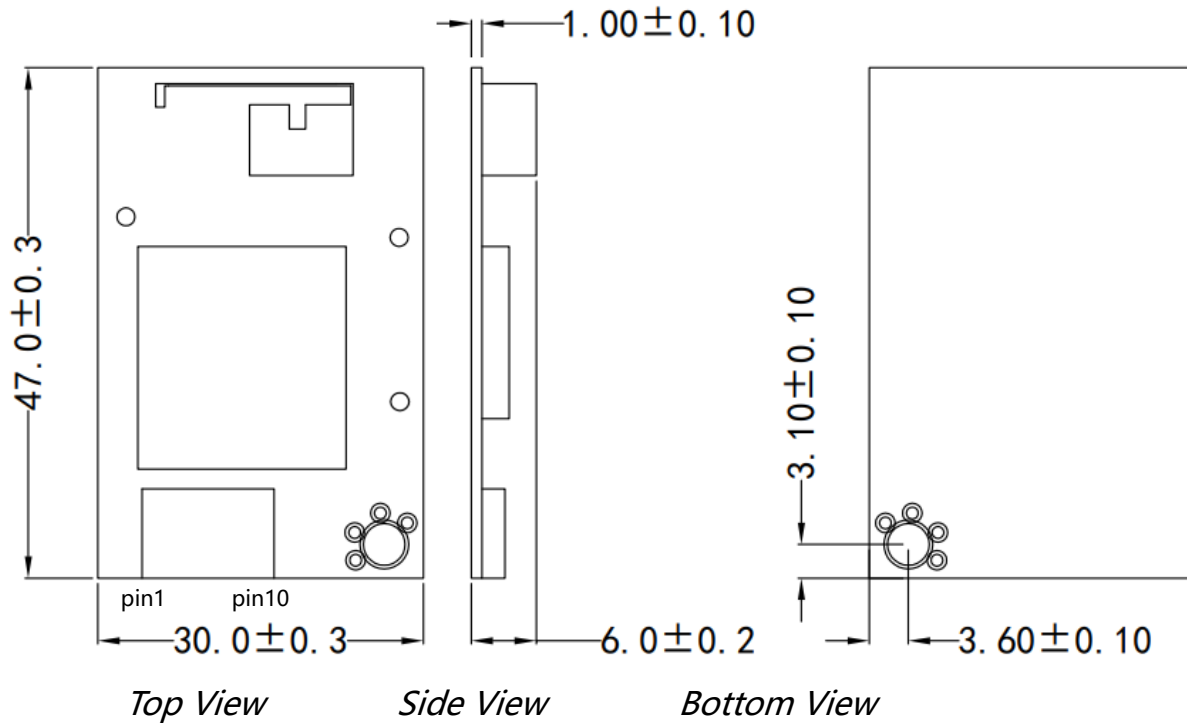
2 Mechanical Dimensions

2.1 Mechanical Outline Drawing

Typical Dimension (W x L x T): 47.0 mm x30.0mm x6.0mm

General tolerance: $\pm 0.2\text{mm}$

PCB Thickness: 1.0mm (+/-0.15mm)



2.2 Pin Definitions

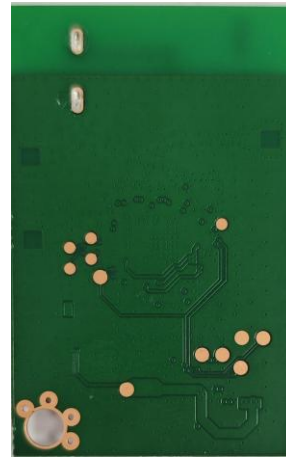


Pin	Define	Description
1	GND	GND
2	HSDP	HSDP
3	HSDM	HSDM
4	VIN	+3.3V
5	VIN	+3.3V
6	VIN	+3.3V
7	WL_WAKE_HOST	Wlan/BT WAKE Host
8	HOST_WAKE_WL	Host WAKE Wlan/BT
9	RESET	RESET
10	GND	GND

2.3 Product Photos



Top View



Bottom View

2.4 Label Information

Top Label



- WIFI MAC information DM code
- Model: WF-R22E-UWD1
- FCC ID: 2AOKI-AL8822E
- IC ID: 23460-AL8822E

3 RF Characteristics

NOTE:

The power specification is a performance control specification. Under normal circumstances, please refer to the Single SKU power table for driving.

3.1 Wi-Fi Subsystem

Items	Contents	
WLAN Standard	IEEE 802.11a/b/g/n/ac	
Frequency Range	2.400 GHz ~ 2.4835 GHz (2.4 GHz)	
	5.1 GHz~5.9 GHz (5 GHz)	
Channels	CH1 to CH11 @ 2.4G	
	CH36 to CH165 @ 5G	
Modulation Mode	802.11b: DBPSK,DQPSK,CCK	
	802.11 a/g/n: BPSK, QPSK, 16QAM, 64QAM	
	802.11 ac: BPSK, QPSK, 16QAM, 64QAM,256QAM	
Output Power & EVM	Power Value	EVM @max rate
	802.11b /11Mbps: 17 ± 2dBm	≤ -10dB
	802.11g /54Mbps: 15 ± 2dBm	≤ -25dB
	802.11a /54Mbps: 15 ± 2dBm	≤ -25dB
	802.11n HT20 /MCS7: @2.4G 15 ± 2dBm	≤ -28dB
	802.11n HT20 /MCS7: @5G 15 ± 2dBm	≤ -28dB
	802.11n HT40 / MCS7: @2.4G 15 ± 2dBm	≤ -28dB
	802.11n HT40 / MCS7: @5G 15 ± 2dBm	≤ -28dB
	802.11ac VHT20 /MCS8: @5G 14 ± 2dBm	≤ -32dB
	802.11ac VHT40 /MCS9: @5G 13 ± 2dBm	≤ -32dB
	802.11ac VHT80 /MCS9: @5G 13 ± 2dBm	≤ -32dB
Receiver Sensitivity @2.4G/5G PER≤ 10%	Rate Type	Max
	802.11b /11Mbps @2.4G PER≤8%	-85dBm
	802.11g /54Mbps @2.4G	-72dBm
	802.11a /54Mbps @5G	-71dBm
	802.11n HT20 /MCS7 @2.4G	-68dBm
	802.11n HT20 /MCS7 @5G	-68dBm
	802.11n HT40 /MCS7 @2.4G	-67dBm
	802.11n HT40 /MCS7 @5G	-67dBm

Items	Contents	
	802.11ac VHT20 /MCS8 @5G	-64dBm
	802.11ac VHT40 /MCS9 @5G	-58dBm
	802.11ac VHT80 /MCS9 @5G	-56dBm

3.2 Bluetooth Subsystem

Items	Contents			
Host Interface	USB			
TX Characteristics				
Channel	BR、 EDR:CH0 toCH78			
	LE:CH0 to CH39			
Modulation	GFSK、 $\pi/4$ -DQPSK 、 8PSK			
TX Power	Rate Type	Min(dBm)	Typ(dBm)	Max(dBm)
	1DH5			6.75
	2DH5			9.02
	3DH5			9.68
	1LE			7.20
	2LE			7.27
RX Characteristics				
RX	Rate Type	Min(dBm)	Typ(dBm)	Max(dBm)
	1DH5 (BER<0.1%)		-92	
	2DH5 (BER<0.01%)		-90	
	3DH5 (BER<0.01%)		-86	
	1LE (PER<30.8%)		-90	
	2LE (PER<30.8%)		-89	

* Note: [1] Typical RF Output Power are tested at room temp.25°C

4 Interface

4.1 USB Interface

The module supports the USB (USB v2.0 specification) device port, Use USB as the host interface for Bluetooth

5 Electrical Current Consumption

Description	Value	Unit
TX AC mode VHT20, MCS0	744	mA
RX AC modeVHT40, MCS0	290	mA

**Note:*

[1] Results are measured provided VDD33 is 3.3V. TX power is measured at the antenna port. The temperature is 25°C.

[2] The duty cycle for TX/RX measurement is 100%.

[3] The chip variation is +/- 25%.

6 Software Information

6.1 RF Driver

WINDOWS Driver: Win7_MP_Kit_RTL11ac_8822EU_USB_v2.51_20241029(176757) or later.

6.2 Normal Driver

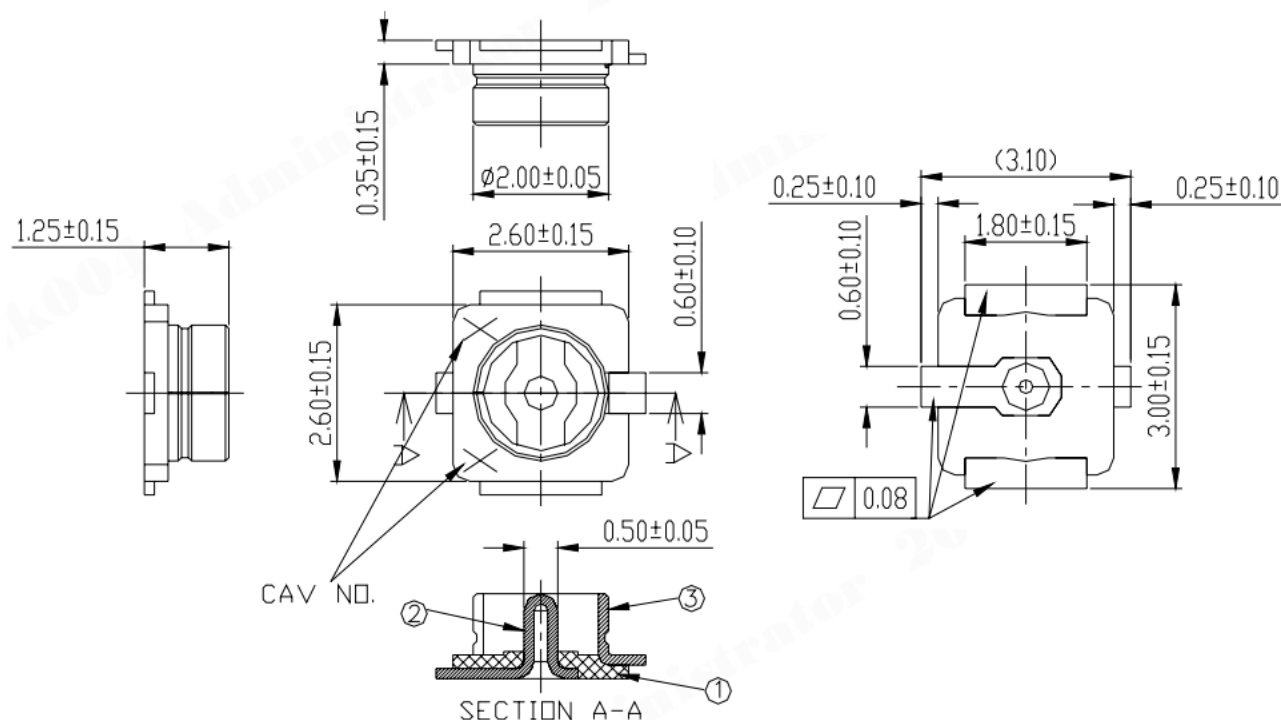
RTL88x2EU_RTL88x2CU-VE_WiFi_linux_v5.15.0.1-229-g8d59e1617.20240528_COEX20240327-340c

or later.

**Note:*

The software (driver) package version is subject to change without notice because it may encounter several updates. It is advised to consult with AI-Link for the best right driver package.

7 RF Connector Dimension

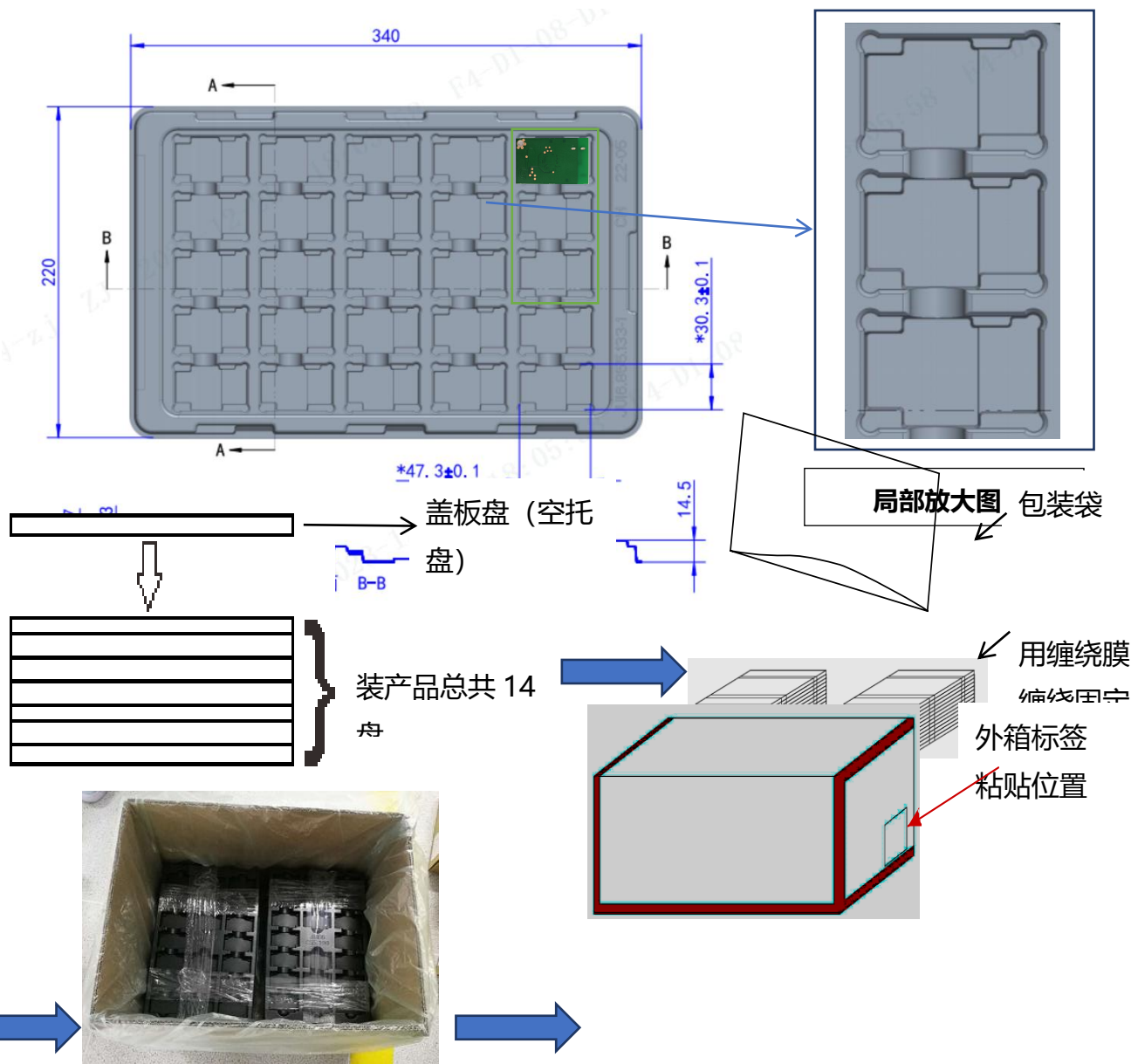


8 Antenna specification

NO.	Type	Antenna Project Code	Gain	Part No.
1	External	PIFA Antenna	3.93 dBi(@2.4 ~ 2.5 GHz) 5.19 dBi(@5.15 ~ 5.85 GHz)	TX-DM1xBD113Y63M
2	Onboard	PIFA Antenna	3.79 dBi(@2.4 ~ 2.5 GHz) 3.68 dBi(@5.15 ~ 5.85 GHz)	RFMTA170900NNLB003

9 Package, Storage & Disposal

9.1 Package



1. The product placement direction, label pasting position and packaging shall be carried out according to the schematic diagram;
2. The number of products is 25 in each layer, with an empty tray on the upper layer. Each box contains 2 boxes, totaling 700pcs, and each box contains 350pcs products;
3. Outer box size: 483mm*367mm*181mm;
4. Other matters not covered shall be implemented according to the customer's packaging requirements.

9.2 Storage

All electronic components must be stored in a clean, well-ventilated place free of corrosive gas. Unless otherwise specified, the temperature and humidity of the storage place must meet below requirements:

- ✚ Temperature: -40~85°C;
- ✚ Humidity: 20%~75%;
- ✚ Humidity sensitivity grade: MSL 3
- ✚ Container Requirement: products shall be placed in a container well-functioning as an electrostatic shielding.

8.3 Disposal

The waste disposal of this product and the package should comply with the applicable local/regional /state/ international regulations.

10 FCC Statement

FCC regulatory compliance 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.

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

This Module complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Labelling Instruction for Host Product Integrator

Please notice that if the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains **FCC ID: 2AOKI-AL8822E**" any similar wording that expresses the same meaning may be used.

Installation Notice to Host Product Manufacturer

The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.

The module is limited to installation in mobile application, a separate approval is required for all other operating configurations, including portable configurations with respect to §2.1093 and difference antenna configurations.

Antenna Change Notice to Host manufacturer

If you desire to increase antenna gain and either change antenna type or use same antenna type certified, a Class II permissive change application is required to be filed by us, or you (host manufacturer) can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

FCC other Parts, Part 15B Compliance Requirements for Host product manufacturer

This modular transmitter is only FCC authorized for the specific rule parts listed on our grant, 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.

Host manufacturer in any case shall ensure host product which is installed and operating with the module is in compliant with Part 15B requirements.

Note: 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 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 circuit different from that to which the receiver is connected.*
- Consult the dealer or an experienced radio/TV technician for help.*

11 ISED Regulatory Compliance

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 equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

Cet équipement est conforme aux limites d'exposition aux radiations IC CNR-102 établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec une distance minimale de 20cm entre le radiateur et votre corps.

Please notice that if the IC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains IC: **23460-AL8822E**" any similar wording that expresses the same meaning may be used.

L'étiquette d'homologation d'un module d'Innovation, Sciences et Développement économique Canada devra être posée sur le produit hôte à un endroit bien en vue, en tout temps. En l'absence d'étiquette, le produit hôte doit porter une étiquette sur laquelle figure le numéro d'homologation du module d'Innovation, Sciences et Développement économique Canada, précédé du mot « contient », ou d'une formulation similaire allant dans le même sens et qui va comme suit : Contient IC: **23460-AL8822E** est le numéro d'homologation du module.

- i. the device for operation in the band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;
- ii. for devices with detachable antenna(s), the maximum antenna gain permitted for devices in the bands 5250-5350 MHz and 5470-5725 MHz shall be such that the equipment still complies with the e.i.r.p. limit;

- iii. for devices with detachable antenna(s), the maximum antenna gain permitted for devices in the band 5725-5850 MHz shall be such that the equipment still complies with the e.i.r.p. limits as appropriate; and
- i. le dispositif utilisé dans la bande 5150-5250 MHz est réservé à une utilisation en intérieur afin de réduire le risque de brouillage préjudiciable aux systèmes mobiles par satellite dans le même canal;
- ii. pour les dispositifs à antenne (s) détachable (s), le gain d'antenne maximal autorisé pour les dispositifs dans les bandes 5250-5350 MHz et 5470-5725 MHz doit être tel que l'équipement soit toujours conforme à la norme e.i.r.p. limite;
- iii. pour les dispositifs à antenne (s) détachable (s), le gain d'antenne maximal autorisé pour les dispositifs de la bande 5725-5850 MHz doit être tel que l'équipement soit toujours conforme à la norme e.i.r.p. les limites, le cas échéant; et

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