Model WF-R92F-USH1 Datasheet

IEEE 802.11 2x2 WiFi 4 Wireless LAN WIFI Module

[SoC RTL8192FC]

for 802.11b/g/n

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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Typed Name	Signature	Date

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-R92F-USH1**	
	Designed by	Reviewed by	Approved by
Signature	Qin, Dakai	Fan, Xijun	Ding, ShuangPeng
Date	5/20/2023	5/20/2023	5/20/2023

Model WF-R92F-USH1

- **Compatible WLAN Standards**

  IEEE Std. 802.11 b/g/n

- **SoC**

  RTL8192FC

- **Product Size**

  15.0mm×13.0mm×2.35mm

- **Product Weight**

  0.89 g

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RoHS

Features

WLAN

- IEEE 802.11 b/g/n compliant
- Support 20MHz, 40MHz bandwidth in 2.4GHz band
- 2T2R mode
- data rate up to 300Mbps with USB2.0

Revision Record

Revision	Date	Description	Edited by
V1.0	5/20/2023	Premier Release	Qin, Dakai

Contents

1 General Description

1.1 System Overview

Model WF-R92F-USH1 is a highly integrated WiFi module by AI-Link, based on the Realtek SoC RTL8192FC, featuring a 2x2 b/g/n 2.4G band Wi-Fi.

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, 15.0mm×13.0mm×2.35mm
Chipset	RTL8192FC
Operating Frequency	2.4GHz: 2.412~2.462 GHz
Antenna	External antenna
Operating Voltage	3.3V±10%
PCB Information	4-layers design (0.8+/-0.15mm)
Peripheral Interface	WIFI@USB
Rate	11b: 1, 2, 5.5 and 11Mbps 11g: 6, 9, 12, 18, 24, 36, 48 and 54 Mbps 11n: MCS0~15, up to 300Mbps
Operating Temperature	-10℃ to +70℃
Storage Temperature	-40℃ to +125℃
ESD Protection	IEC(Contact discharge)：±2000V

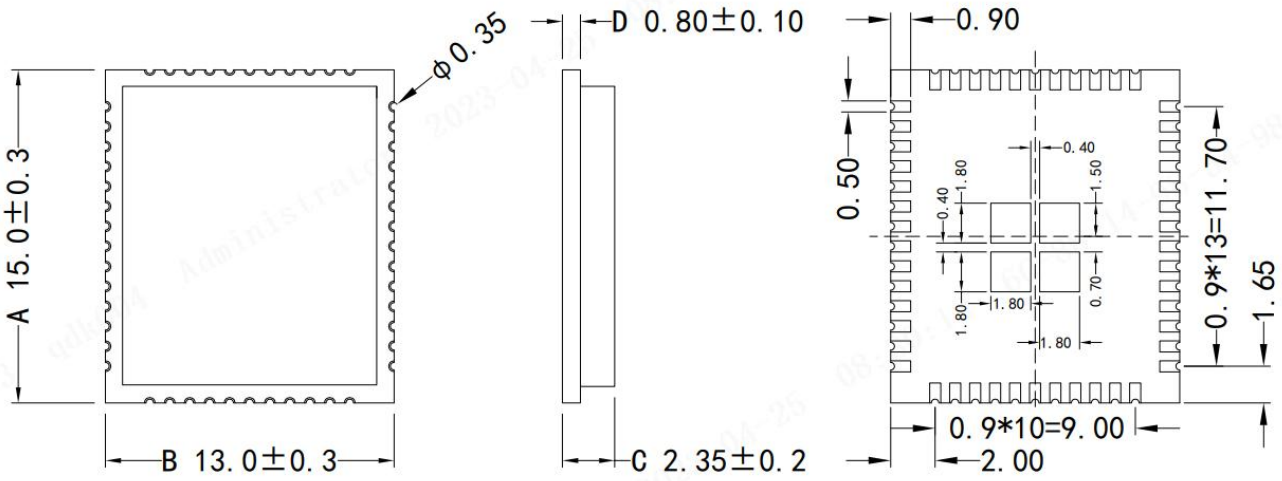
1.3 Diagram

The hardware architecture for the module is shown in Figure 1. The AI-Link' s WF-R92F-USH1 module Complies with IEEE standards 802.11 b/g/n; it also supports 2x2 Multi-User Multiple-Input Multiple-Output (known as MU-MIMO) and could reach up to data rate of 300Mbps.

2 Mechanical Dimensions

2.1 Mechanical Outline Drawing

- Typical Dimension (W x L x T): 15.0mmx 13.0mm x 2.35mm
- General tolerance: ±0.2mm
- PCB Thickness: 0.8mm (+/-0.15mm)

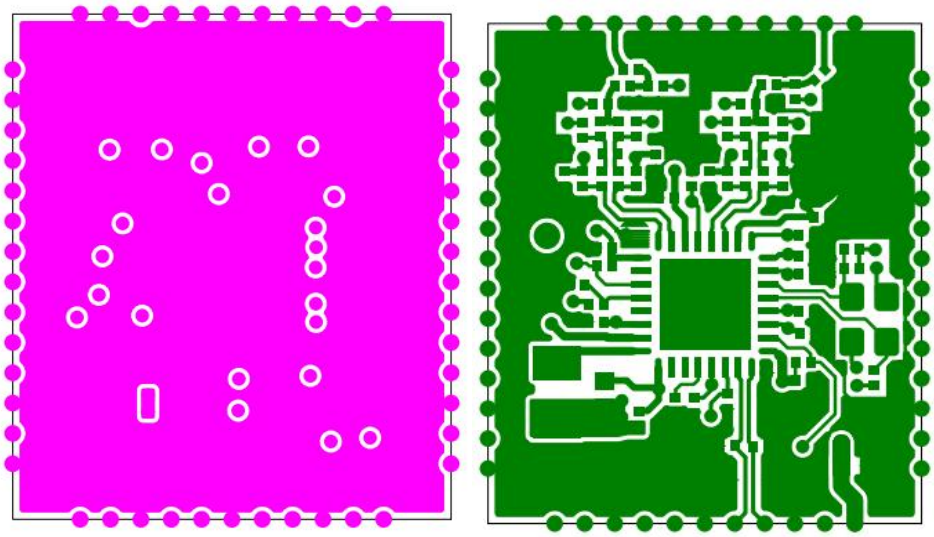


Top View *Bottom View*

2.2 Pin definitions

Pin	Symbol	Description	Pin	Symbol	Description
1	GND	Ground	26	NC	Not connected
2	RF0	RF0 for WIFI	27	NC	Not connected
3	GND	Ground	28	GND	Ground
4	GND	Ground	29	NC	Not connected
5	GND	Ground	30	NC	Not connected
6	GND	Ground	31	GND	Ground
7	GND	Ground	32	USB_DP	USB DP+
8	GND	Ground	33	USB_DM	USB DP-
9	RF1	RF1 for WIFI	34	GND	Ground
10	GND	Ground	35	NC	Not connected
11	GND	Ground	36	VD33	Power Supply for 3.3v
12	NC	Not connected	37	NC	Not connected
13	GND	Ground	38	NC	Not connected
14	NC	Not connected	39	GND	Ground
15	NC	Not connected	40	NC	Not connected
16	WL_WAKE_HOST	WLAN CHIP Wakes up HOST	41	NC	Not connected
17	NC	Not connected	42	NC	Not connected
18	NC	Not connected	43	NC	Not connected
19	NC	Not connected	44	NC	Not connected
20	NC	Not connected	45	NC	Not connected
21	NC	Not connected	46	GND	Ground
22	NC	Not connected	47	NC	Not connected
23	GND	Ground	48	GND	Ground
24	Reset	Reset module	49	NC	Not connected
25	GND	Ground	50	NC	Not connected

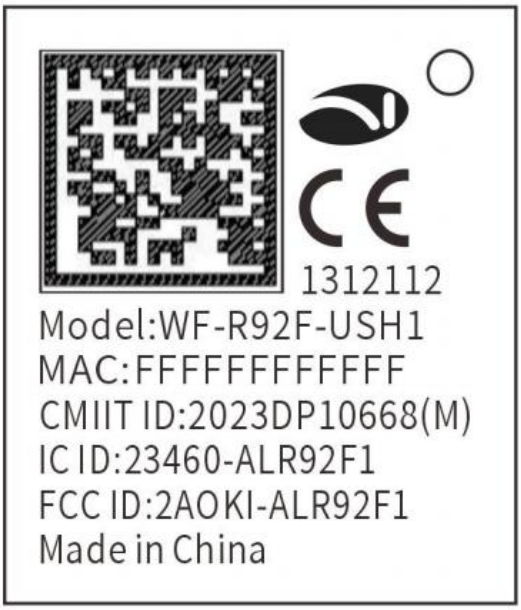
2.4 Product Photos（Example）



Bottom View *Top View*

2.5 Label Information

- Top Label



- WIFI MAC information QR code
- Model: WF-R92F-USH1
- MAC: 4C312D1A2A85（Example）
- CMIIT ID: 2023DP10668(M)
- IC ID: 23460-ALR92F1
- FCC ID: 2AOKI-ALR92F1
- Made in China

3 RF Characteristics

3.1 Wi-Fi Subsystem

Items	Contents	
WLAN Standard	IEEE 802.11b/g/n	
Frequency Range	2.400 GHz ~ 2.4835GHz (2.4 GHz)	
Channels	CH1 to CH13 @ 2.4G	
Modulation Mode	802.11b: DBPSK, DQPSK ,CCK	
	802.11 g/n: BPSK, QPSK, 16QAM, 64QAM	
Output Power & EVM	Power Value	EVM
	802.11b 1Mbps: 17.0 ± 1.5dBm	/
	802.11b 11Mbps: 17.0 ± 1.5dBm	≤ -10dB
	802.11g 6Mbps: 15.0 ± 1.5dBm	/
	802.11g 54Mbps: 15.0 ± 1.5dBm	≤ -25dB
	802.11n HT20 MCS0: 14.0 ± 1.5dBm	/
	802.11n HT20 MCS7: 14.0 ± 1.5dBm	≤ -28dB
	802.11n HT40 MCS0: 14.0 ± 1.5dBm	/
	802.11n HT40 MCS7: 14.0 ± 1.5dBm	≤ -28dB
Receiver Sensitivity @2.4G PER≤ 10%	Rate Type	Max
	802.11b /11Mbps @2.4G PER≤8%	-85dBm
	802.11g /54Mbps @2.4G	-72dBm
	802.11n HT20 /MCS7 @2.4G	-68dBm
	802.11n HT40 /MCS7 @2.4G	-64dBm

4 Interface

4.1 USB Interface

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

5 Software Information

5.1 RF Driver

Win7_MP_Kit_RTL11n_8192FU_USB_v4.03 or later

5.2 Normal Driver

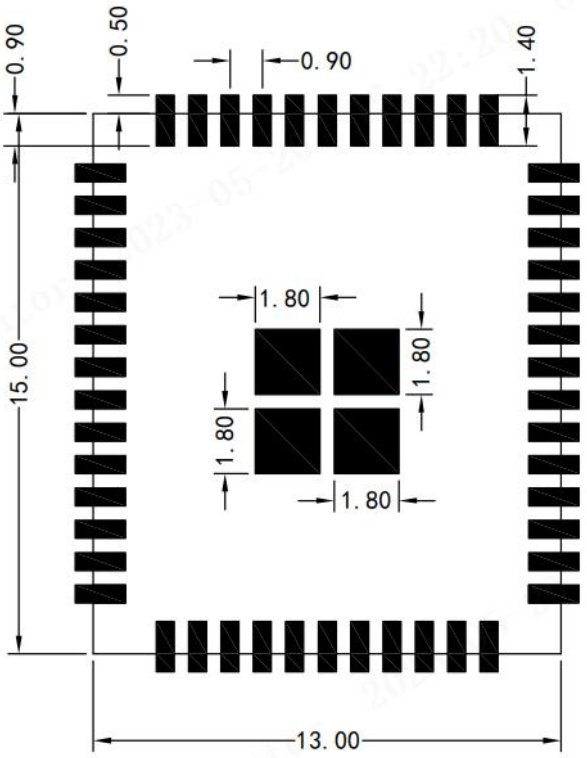
RTLWlanU_WindowsDriver_1030.40.0128.2019_Drv_3.00.0034

**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.

6 Reference Design

7.1 Recommend PCB Layout Decal

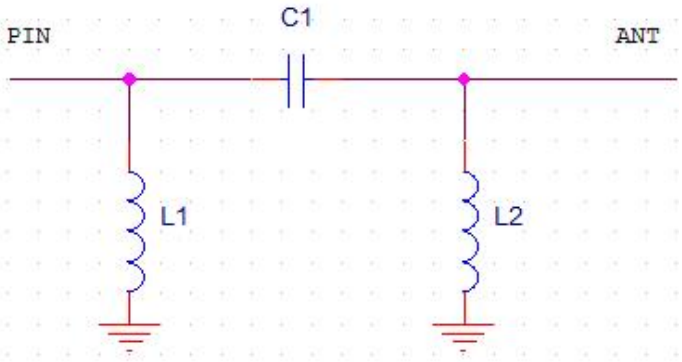


**Note:*

Mainboard PIN3 (WiFi ant) shall be designed in strict accordance with the reference design dimensions, and a clearance of 0.3mm (only top surface) shall be made around the pad to ensure the isolation of RF and GND parts.

7.2 Antenna matching

The 2th and 9th Pin connect to antenna, please refer to design demand



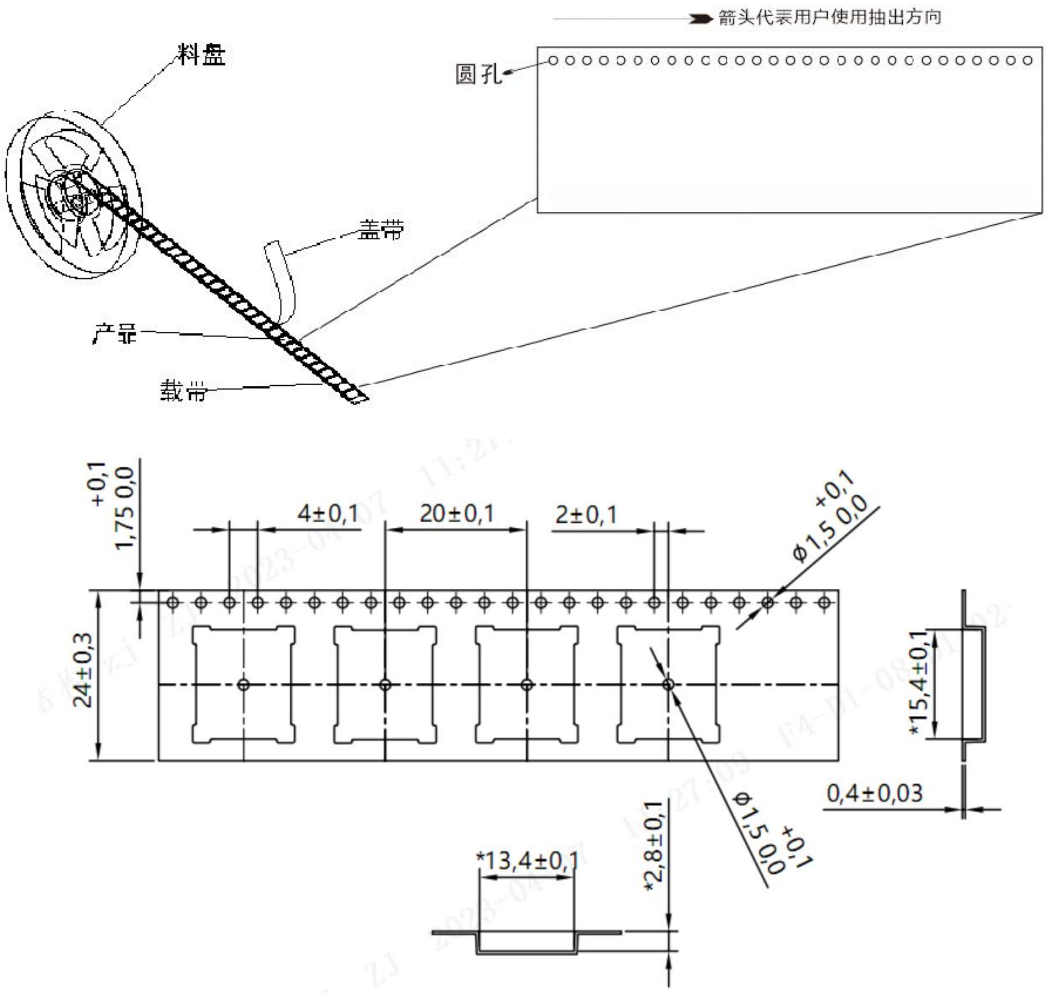
a). The module and antenna shall be far away from the interference source, and the module ground and antenna ground shall be integrated.

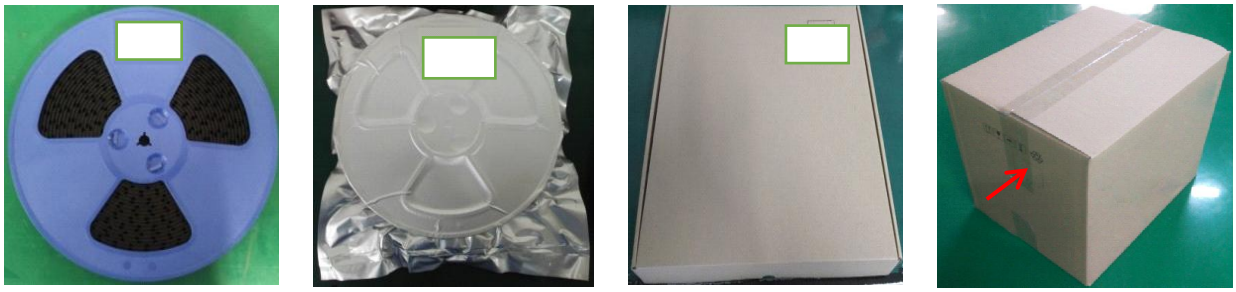
b). Pin2 is the RF interface of WiFi module. The coplanar impedance between Pin2 and antenna is required to be 50Ω. It is recommended to use arc and straight line with the length as short as possible.

c). L1, L2 and C1 form a π type matching network and are close to the antenna interface design, which is adjusted according to the actual measurement effect of antenna recommendation and typesetting design.

7 Package, Storage & Disposal

8.1 Package





1. The product placement direction, label pasting position, and packaging shall be carried out according to the schematic diagram;

2. 1000 products per roll, 1 roll per small box, 8 small boxes in a large box, with a total of 8000 products per box;

3. Outer box size: 370mm * 300mm * 370mm, small box size: 355mm * 355mm * 55mm;

4. Place 2 bags of 2g desiccant and 1 6-color humidity card in the vacuum bag;

5. Other matters not covered shall be executed according to the customer's packaging requirements.

8.2 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：-40~125℃;
- 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

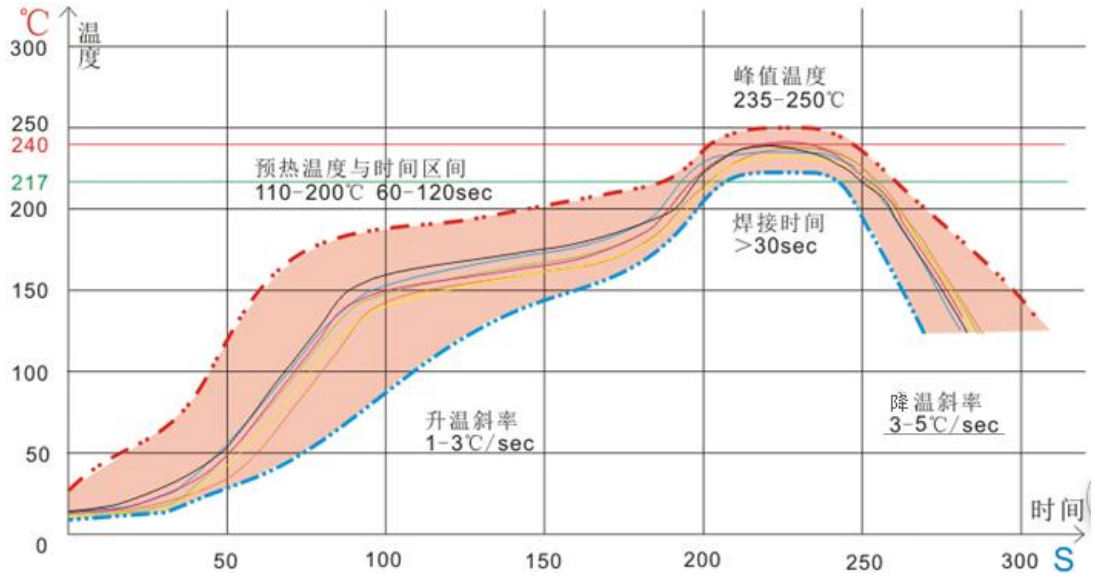
The waste disposal of this product and the package should comply with the applicable local/regional /state/ international regulations.

8 Appendix

Key Components List

NO.	Name	Model	Specification	Manufacturer
1	IC	RTL8192FC		Realtek
2	PCB	JUI7.820.1436-1	FR-4, 4-lay, 0.8mm	Rui Jiexing Kexiang Benchuang
3	Crystal	CN4040M00012T4057024 9S4001S003 SX20Y040000BC1T-Z Y40000E023	2016 40MHz	JWT Huilun Taijing ECEC

9 Refelow Standard Condition



Heating zone: temperature: < 150 °C, time: between 60 and 90 seconds, the slope is controlled between 1 ~ 3 °C / S.
Preheating constant temperature zone: temperature: 150 °C ~ 200 °C, time: between 60-120 seconds, slope between 0.3-0.8.
Reflow soldering area: peak temperature 235 °C ~ 250 °C (recommended peak temperature < 245 °C), time 30-70 seconds.
Cold area: temperature: 217 °C ~ 170 °C, slope between 3 ~ 5 °C / S.
The solder is lead-free solder in tin-silver copper alloys/Sn&Ag&Cu Lead-free solder (SAC305).

10 Certification Information:

This product is a radio transmitter module for restricted non-standalone operation.

The module bearing CMIIT ID: 2023AP****(M) approval does not mean that the final equipment in which the module is embedded or used complies with relevant radio management technical regulations or standards. The final equipment of the specific manufacturer is responsible for the technical compliance with the relative local or nationwide radio management technical regulations or standards.

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CE DOC

Hereby, Sichuan AI-Link Technology Co., Ltd. declares that the radio equipment type WF-R92F-USH1 is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address: http://www.ailinkiot.com

CE warning

RF exposure information: The Maximum Permissible Exposure (MPE) level has been calculated based on a distance of 20cm between the device and the human body. To maintain compliance with RF exposure requirement, use product that maintain a 20cm distance between the device and human body.

FCC regulatory conformance

FCC ID: 2AOKI-ALR92F1

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.

(2) This device must accept any interference received, including interference that may cause undesired operation.

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

NOTE: Unauthorized changes will result in loss of device operating privileges.

RF Exposure

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

The module is limited to installation in mobile or fixed applications. Separate approval is required for all other operating configurations, including portable configuration with respect to Part 2.1093 and different antenna configurations.

IC regulatory conformance

IC: 23460-ALR92F1

This device complies with CAN ICES-003 (B)/NMB-003(B).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.

Cet appareil est conforme à la norme CAN ICES-003 (B)/NMB-003 (B).

Cet appareil contient des émetteurs / récepteurs exempt (s) de licence qui sont conformes aux RSS exemptes de licence d'Innovation, Sciences et Développement économique Canada. Son fonctionnement est soumis aux deux conditions suivantes:

(1) Cet appareil ne doit pas provoquer d'interférences.

(2) Cet appareil doit accepter toute interférence, y compris les interférences susceptibles de provoquer un fonctionnement indésirable de l'appareil.

RF Exposure

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance

of 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. Cet équipement est conforme aux limites d’exposition aux rayonnements de la IC établies pour unenvironnement non contrôé. Cet équipement doit être installé et fonctionner à au moins 20cm de distance d’un radiateur ou de votre corps.

The module is limited to installation in mobile or fixed applications. Separate approval is required for all other operating configurations, including portable configuration with respect to Part 2.1093 and different antenna configurations.

ORIGINAL EQUIPMENT MANUFACTURER (OEM) NOTES

OEM must certify the final end product to comply with unintentional radiators (FCC Sections 07 and 15.109) before declaring compliance of the final product to Part 15 of the FCC rules and regulations. Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change.

The OEM must comply with the FCC labeling requirements. If the module's label is not visible when installed, then an additional permanent label must be applied on the outside of the finished product which states: "Contains transmitter module FCC ID: 2AOKI-ALR92F1". Additionally, the following statement should be included on the label and in the final product's user manual: "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 interferences, and

(2) this device must accept any interference received, including interference that may cause undesired operation."

The module is limited to installation in mobile or fixed applications. Separate approval is required for all other operating configurations, including portable configuration with respect to Part 2.1093 and different antenna configurations. A module or modules can only be used without additional authorizations if they have been tested and granted under the same intended end-use operational conditions, including simultaneous transmission operations. When they have not been tested and granted in this manner, additional testing and/or FCC application filing may be required. The most straightforward approach to address additional testing conditions is to have the grantee responsible for the certification of at least one of the modules submit a permissive change application. When having a module grantee file a permissive change is not practical or feasible, the following guidance provides some additional options for host manufacturers. Integrations using modules where additional testing and/or FCC application filing(s) may be required are: (A) a module used in devices requiring additional RF exposure compliance information (e.g., MPE evaluation or SAR testing); (B) limited and/or split modules not meeting all of the module requirements; and (C) simultaneous transmissions for independent collocated transmitters not previously granted together.

This Module is full modular approval, it is limited to OEM installation ONLY. Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change. (OEM) Integrator has to assure compliance of the entire end product include the integrated Module. Additional measurements (15B) and/or equipment authorizations (e.g. Verification) may need to be addressed depending on co-location or simultaneous transmission issues if applicable. (OEM) Integrator is reminded to assure that these installation instructions will not be made available to the end user.

IC labeling requirement for the final end product:
The final end product must be labeled in a visible area with the following "Contains IC: 23460-ALR92F1"
The Host Marketing Name (HMN) must be indicated at any location on the exterior of the host product or product packaging or product literature, which shall be available with the host product or online.

Unauthorized modifications could void the user's authority to operate the equipment.

This radio transmitter [IC: 23460-ALR92F1] 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.

Frequency range	Manufacturer	Peak gain	Impedance	Antenna type
2400-2483.5MHz	ZHONGSHAN B&T TECHNOLOGY Co,.Ltd	2.32dBi	50Ω	PIFA Antenna

Requirement per KDB996369 D03

2.2 List of applicable FCC rules

List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power, spurious emissions, and operating fundamental frequencies. DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See also Section 2.10 below concerning the need to notify host manufacturers that further testing is required.3
Explanation: This module meets the requirements of FCC part 15C(15.247).

2.3 Summarize the specific operational use conditions

Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to-point antennas are used that require reduction in power or compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer's instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain, specifically for master devices in 5 GHz DFS bands.
Explanation: The module has the trace antenna designs, and the antenna use a permanently attached antenna which is unique, The designed antenna meets the hardware module's requirements via the connection between ipex connector and module.

2.4 Limited module procedures

If a modular transmitter is approved as a "limited module," then the module manufacturer is responsible for approving the host environment that the limited module is used with. The manufacturer of a limited module must describe, both in the filing and in the installation instructions, the alternative means that the limited module manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions.
A limited module manufacturer has the flexibility to define its alternative method to address the conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited

module manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval.
This limited module procedure is also applicable for RF exposure evaluation when it is necessary to
demonstrate compliance in a specific host. The module manufacturer must state how control of the product into which the modular transmitter will be installed will be maintained such that full compliance of the product is always ensured. For additional hosts other than the specific host originally granted with a limited module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module.
Explanation: The module is not a limited module.

2.5 Trace antenna designs

For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ – Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects:
layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements.
a) Information that includes permitted variances (e.g., trace boundary limits, thickness, length, width, shape(s),
dielectric constant, and impedance as applicable for each type of antenna);
b) Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency,
the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered);
c) The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout;
d) Appropriate parts by manufacturer and specifications;
e) Test procedures for design verification; and
f) Production test procedures for ensuring compliance.
The module grantee shall provide a notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.
Explanation: Yes, The module with trace antenna designs, and this manual has been shown the layout of trace design, antenna, connectors, and isolation requirements.

2.6 RF exposure considerations

It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information: (1) to the host product manufacturer, to define the application conditions (mobile, portable – xx cm from a person's body); and (2) additional text needed for the host product manufacturer to provide to end users in their end-product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).
Explanation: This module complies with FCC RF radiation exposure limits set forth for an uncontrolled environment, This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body." This module is designed to comply with the FCC statement, FCC ID is: 2AOKI-ALR92F1.

2.7 Antennas

A list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an "omni-directional antenna" is not considered to be a specific "antenna type")).
For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on the Part 15 authorized transmitters used in the host product. The module manufacturers shall provide a list of acceptable unique connectors.
Explanation: The module has the trace antenna designs, and the antenna use a permanently attached antenna which is unique, The designed antenna meets the hardware module's requirements via the connection between ipex connector and module.

2.8 Label and compliance information

Grantees are responsible for the continued compliance of their modules to the

FCC rules. This includes advising host product manufacturers that they need to provide a physical or e-label stating “Contains FCC ID” with their finished product. See Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748.
Explanation: The host system using this module, should have label in a visible area indicated the following texts: “Contains FCC ID: 2AOKI-ALR92F1, Contains IC: 23460-ALR92F1 ”

2.9 Information on test modes and additional testing requirements5

Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.
The grantee should provide information on how to configure test modes for host product evaluation for different operational conditions for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host.
Grantees can increase the utility of their modular transmitters by providing special means, modes, or
instructions that simulates or characterizes a connection by enabling a transmitter. This can greatly simplify a host manufacturer’s determination that a module as installed in a host complies with FCC requirements.
Explanation: Top band can increase the utility of our modular transmitters by providing instructions that simulates or characterizes a connection by enabling a transmitter.

2.10 Additional testing, Part 15 Subpart B disclaimer

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) 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. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.
Explanation: The module without unintentional-radiator digital circuity, so the module does not require an evaluation by FCC Part 15 Subpart B. The host should be evaluated by the FCC Subpart B.