

WF-R710-RTU1

IEEE 802.11b/g/n 1T1R UART SoC Module

Features:

➤ **Reserving System**

IEEE Std. 802.11b/g/n Wi-Fi

1T1R System-on-Chip UART module

➤ **Chip Solution**

RTL8710B

➤ **I/O Interface & Size**

Standard two UART/GPIO I/O Interface

Support RF Testing and OTP/Flash Programming

18.0mm x20.0mm x2.9mm

Model Overview:

| Model | Interface | RF Standard | Data rate | Frequency | I/O | Voltage Input |
|--------------|-----------|------------------|-----------|-----------|------|---------------|
| WF-R710-RTU1 | UART | IEEE 802.11b/g/n | 72.2Mbps | 2.4G | GPIO | 3.3V |

1. Introduction

WF-R710-RTU1 SoC module designed base on RTL8710B chip solution, The SOC module is a highly intelligent platform for the Internet of Everything that contains a low-power Wi-Fi connectivity solution on one package. It includes a number of TCP/IP based connectivity protocols along with SSL, enabling a low-cost, low-complexity system to obtain full-featured internet connectivity and reliable information exchange.

Realtek RTL8710B is a highly integrated single-chip low power 802.11n Wireless LAN (WLAN) network controller. It combines an ARM-CM4F MCU, WLAN MAC, a 1T1R capable WLAN baseband, and RF in a single chip. It also provides a bunch of configurable GPIOs which are configured as digital peripherals for different applications and control usage.

RTL8710BN integrates internal memories for complete WIFI protocol functions. The embedded memory configuration also provides simple application developments.

1.1 RF module Overview

The general HW architecture for the module is shown in Figure-1, The WF-R710-RTU1 module is a alone chipset solution, system-on-chip-module, 1x1 802.11 b/g/n device optimized for low-power embedded applications with single-stream capability for both transmit and receive. It has an integrated network processor with a large set of TCP/IP with IPv4/IPv6 based services.

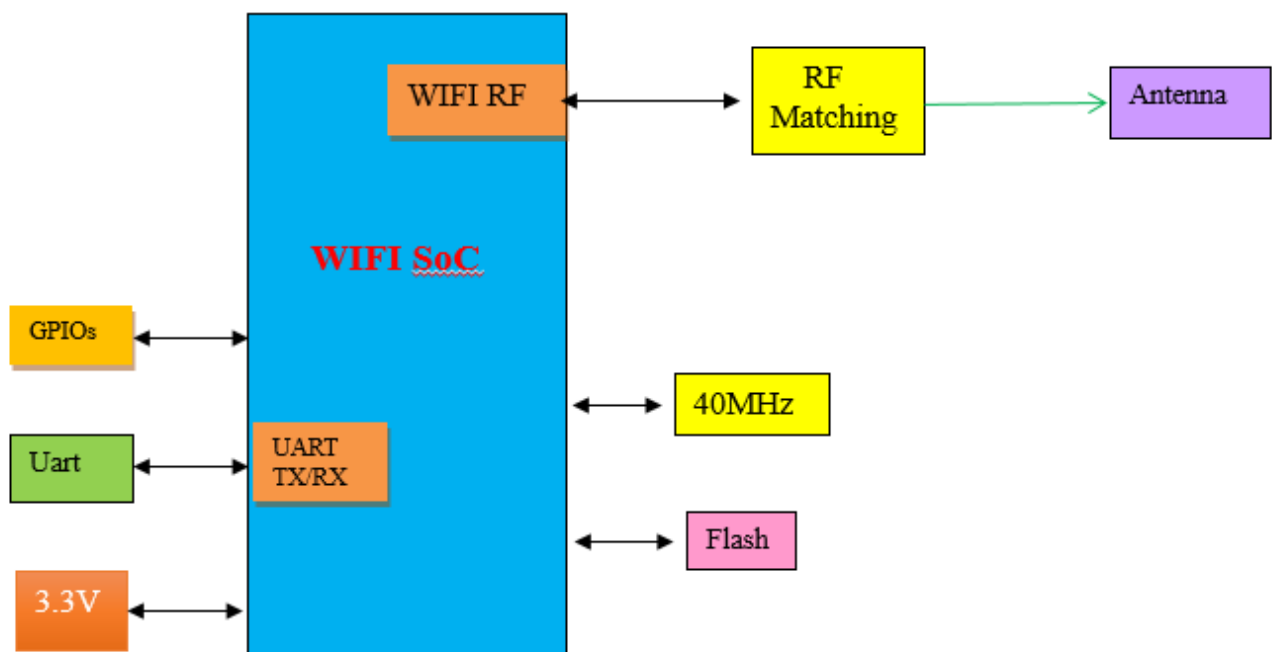


Figure 1 WF-R710-RTU1 Block Diagram

1.2. RF Specification Reference

SoC RF specification refer to below list.

| | |
|------------------------|---|
| Main Chipset | RTL8710B |
| SoC RF standard | IEEE 802.11 b/g/n |
| Operating Frequency | 2.412~2.462 GHz |
| UART Interface | For testing and OTP programming (Calibration data) |
| Antenna Design Options | PCB printed |
| RF Modulation | WiFi: 11b: DBPSK, DQPSK and CCK and DSSS 11g: BPSK, QPSK, 16QAM, 64QAM and OFDM 11n: BPSK, QPSK, 16QAM, 64QAM and OFDM |
| Data rates | 11b: 1, 2, 5.5 and 11Mbps 11g: 6, 9, 12, 18, 24, 36, 48 and 54 Mbps 11n: 6.5, 13, 19.5, 26, 39, 52, 58.5, 65, up to 72.2 Mbps |
| Operation Voltage | 3.3V +/-10% input |

1.3. System Functions

SoC S/W & system general specification refer to below list:

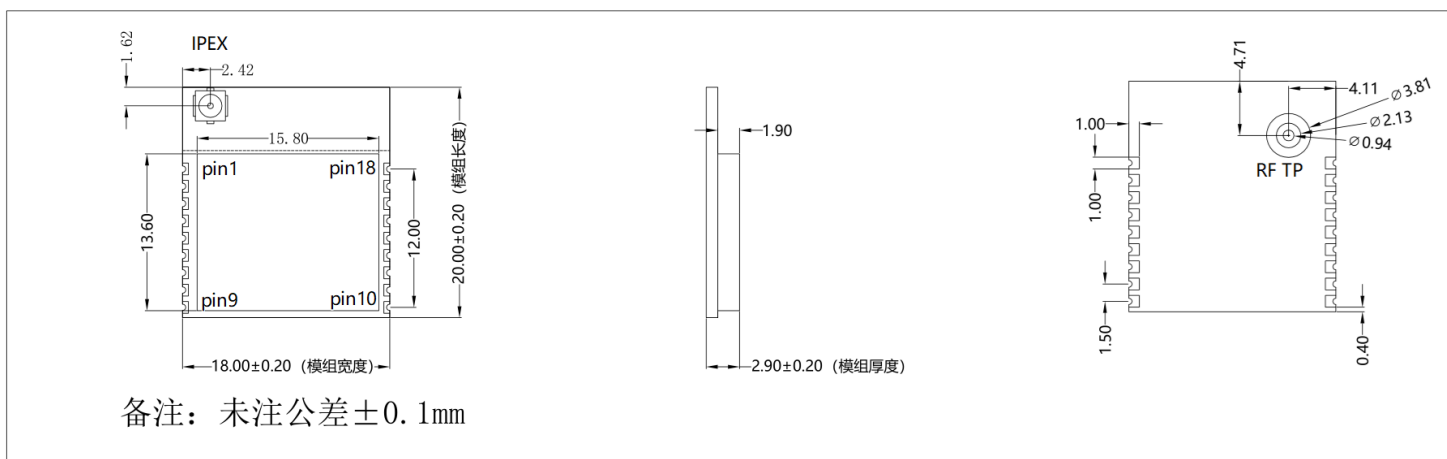
| | |
|-----------------------|--------------------------------|
| Main Chipset | RTL8710B |
| WLAN PHY Features | 1T1R |
| Connective | WiFi Direct support |
| Package | QFN32 (5x5mm) |
| Bandwidth | 20MHz bandwidth transmission |
| HW acceleration | WPA,WPA2, WPS2.0 |
| Form factor | Maximum 9 GPIO pins |
| PCB Stack | 2-layers design (1+/-0.15mm) |
| Module Dimension | Typical, 18.0mm x20.0mm x2.9mm |
| Operation Temperature | -20℃ to +85℃ |
| Storage Temperature | -40℃ to +125℃ |

2. Mechanical Specification

2.1 PCBA Mechanical Outline Drawing

Typical Dimension (W x L x T): 18.0 mm x 20.0mm x 2.9mm (+/-0.2 mm)

PCB Thickness: 1mm (+/-0.15mm)



2.2 Pin Distribution Definition

Pins sequence and distribution list as follows

| Pin | Define | Description |
|-----|--------|--|
| 1 | 3V3 | 3.3V 供电 |
| 2 | EN | EN |
| 3 | IO14 | PWM0 |
| 4 | IO15 | PWM1 |
| 5 | IO0 | PWM2 |
| 6 | IO12 | PWM3 |
| 7 | NC | NC |
| 8 | IO5 | PWM4 |
| 9 | GND | GND |
| 10 | NC | NC |
| 11 | IO18 | UART0_RXD,SPI1_CLK,SPI0_SCL,I2C1_SCL,TIMER4_TRIG |
| 12 | IO23 | UART0_TXD,SPI1_MOSI,SPI0_MOSI,I2C1_SDA, PWM0 |
| 13 | GND | GND |
| 14 | IO19 | UART0_CTS,SPI1_CS,SPI0_CS,I2C0_SDA, TIMER5_TRIG |
| 15 | IO22 | UART0_RTS,SPI1_MISO,SPI0_MISO,I2C0_SCL,PWM5 |
| 16 | IO30 | UART1_LOG_TXD |
| 17 | IO29 | UART1_LOG_RXD |
| 18 | GND | GND |

3. Electrical Specification

This Specification is based-on conductive DVT testing result. The extreme condition include overall temperature +25°C and overall voltage 3.3V.

3.1 IEEE 802.11b Section:

| Items | Contents | | | | |
|--|-------------------------------|------|------|------|--------|
| Specification | IEEE802.11b | | | | |
| Mode | DBPSK, DQPSK and CCK and DSSS | | | | |
| Channel | CH1 to CH13 | | | | |
| Data rate | 1, 2, 5.5, 11Mbps | | | | |
| TX Characteristics | Min. | Typ. | Max. | Unit | Remark |
| 1. Power Levels(Calibrated) | | | | | |
| 1) 16dBm Target (For Each antenna port) | - | 16 | 19 | dBm | |
| 2. Spectrum Mask @ Target Power | | | | | |
| 1) fc +/-11MHz to +/-22MHz | - | - | -30 | dBr | |
| 2) fc > +/-22MHz | - | - | -50 | dBr | |
| 3. Constellation Error(EVM) @ Target Power | | | | | |
| 1) 1Mbps | - | - | -10 | dB | |
| 2) 2Mbps | - | - | -10 | dB | |
| 3) 5.5Mbps | - | - | -10 | dB | |
| 4) 11Mbps | - | - | -10 | dB | |
| 4. Frequency Error | -15 | - | 15 | ppm | |
| RX Characteristics | Min. | Typ. | Max. | Unit | |
| 5. Minimum Input Level Sensitivity(each chain) | | | | | |
| 1) 1Mbps (FER \leq 8%) | - | - | -88 | dBm | |
| 2) 2Mbps (FER \leq 8%) | - | - | -86 | dBm | |
| 3) 5.5Mbps (FER \leq 8%) | - | - | -83 | dBm | |
| 4) 11Mbps (FER \leq 8%) | - | - | -79 | dBm | |
| 6. Maximum Input Level (FER \leq 8%) | -10 | - | - | dBm | |

3.2 IEEE 802.11g Section:

| Items | Contents | | | | |
|--|-----------------------------------|------|------|------|--------|
| Specification | IEEE802.11g | | | | |
| Mode | BPSK, QPSK, 16QAM, 64QAM and OFDM | | | | |
| Channel | CH1 to CH13 @ 11g | | | | |
| Data rate | 6, 9, 12, 18, 24, 36, 48, 54Mbps | | | | |
| TX Characteristics | Min. | Typ. | Max. | Unit | Remark |
| 1. Power Levels | | | | | |
| 1) 14dBm Target (For Each antenna port) @ 11g | - | 14 | 17 | dBm | |
| 2. Spectrum Mask @ Target Power | | | | | |
| 1) at fc +/-11MHz | - | - | -20 | dBr | |
| 2) at fc +/-20MHz | - | - | -28 | dBr | |
| 3) at fc > +/-30MHz | - | - | -40 | dBr | |
| 3. Constellation Error(EVM) @ Target Power | | | | | |
| 1) 6Mbps | - | - | -10 | dB | |
| 2) 9Mbps | - | - | -11 | dB | |
| 3) 12Mbps | - | - | -12 | dB | |
| 4) 18Mbps | - | - | -13 | dB | |
| 5) 24Mbps | - | - | -16 | dB | |
| 6) 36Mbps | - | - | -19 | dB | |
| 7) 48Mbps | - | - | -22 | dB | |
| 8) 54Mbps | - | - | -25 | dB | |
| 4. Frequency Error | | | | | |
| 1) IEEE802.11g | -15 | - | 15 | ppm | |
| RX Characteristics | Min. | Typ. | Max. | Unit | |
| 5. Minimum Input Level Sensitivity(each chain) | | | | | |
| 1) 6Mbps (PER \leq 10%) | - | - | -82 | dBm | |
| 2) 9Mbps (PER \leq 10%) | - | - | -81 | dBm | |
| 3) 12Mbps (PER \leq 10%) | - | - | -79 | dBm | |
| 4) 18Mbps (PER \leq 10%) | - | - | -77 | dBm | |
| 5) 24Mbps (PER \leq 10%) | - | - | -74 | dBm | |
| 6) 36Mbps (PER \leq 10%) | - | - | -70 | dBm | |
| 7) 48Mbps (PER \leq 10%) | - | - | -66 | dBm | |
| 8) 54Mbps (PER \leq 10%) | - | - | -65 | dBm | |
| 6. Maximum Input Level (PER \leq 10%) | | | | | |
| 1) IEEE802.11g | -20 | - | - | dBm | |

3.3 IEEE 802.11n HT20 Section:

| Items | Contents | | | | |
|--|-----------------------------------|------|------|------|--------|
| Specification | IEEE802.11n HT20 | | | | |
| Mode | BPSK, QPSK, 16QAM, 64QAM and OFDM | | | | |
| Channel | CH1 to CH13 | | | | |
| Data rate (MCS index) | MCS0/1/2/3/4/5/6/7 | | | | |
| TX Characteristics | Min. | Typ. | Max. | Unit | Remark |
| 1. Power Levels | | | | | |
| 1) 13dBm Target (For Each antenna port) @ 2.4G | - | 13 | 17 | dBm | |
| 2. Spectrum Mask @ Target Power | | | | | |
| 1) at fc +/-11MHz | - | - | -20 | dBr | |
| 2) at fc +/-20MHz | - | - | -28 | dBr | |
| 3) at fc > +/-30MHz | - | - | -45 | dBr | |
| 3. Constellation Error(EVM) @ Target Power | | | | | |
| 1) MCS0 | - | - | -5 | dB | |
| 2) MCS1 | - | - | -10 | dB | |
| 3) MCS2 | - | - | -13 | dB | |
| 4) MCS3 | - | - | -16 | dB | |
| 5) MCS4 | - | - | -19 | dB | |
| 6) MCS5 | - | - | -22 | dB | |
| 7) MCS6 | - | - | -25 | dB | |
| 8) MCS7 | - | - | -28 | dB | |
| 4. Frequency Error | | | | | |
| 1) IEEE802.11n HT20 @ 2.4G | -15 | - | 15 | ppm | |
| RX Characteristics | Min. | Typ. | Max. | Unit | |
| 5. Minimum Input Level Sensitivity(each chain) | | | | | |
| 1) MCS0 (PER \leq 10%) | - | - | -82 | dBm | |
| 2) MCS1 (PER \leq 10%) | - | - | -79 | dBm | |
| 3) MCS2 (PER \leq 10%) | - | - | -77 | dBm | |
| 4) MCS3 (PER \leq 10%) | - | - | -74 | dBm | |
| 5) MCS4 (PER \leq 10%) | - | - | -70 | dBm | |
| 6) MCS5 (PER \leq 10%) | - | - | -66 | dBm | |
| 7) MCS6 (PER \leq 10%) | - | - | -65 | dBm | |
| 8) MCS7 (PER \leq 10%) | - | - | -64 | dBm | |
| 6. Maximum Input Level (PER \leq 10%) | | | | | |
| 1) IEEE802.11n HT20 @ 2.4G | -20 | - | - | dBm | |

4 Warning:

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

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.

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.

RF Exposure:

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.

Module statement:

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-WFR710RTU1" 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.

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01**1) List of applicable FCC rules**

FCC Part 15 Subpart C 15.247 & 15.209

2) Specific operational use conditions

The module is a WIFI module. Operation Frequency: 2412-2462MHz

Number of Channel: 11

Modulation:

11b: DBPSK, DQPSK and CCK and DSSS

11g: BPSK, QPSK, 16QAM, 64QAM and OFDM

11n: BPSK, QPSK, 16QAM, 64QAM and OFDM

Type: FPC Antenna

Gain: 1 dBi Max.

The module can be used for mobile or portable applications with a maximum 1dBi antenna. The host manufacturer installing this module into their product must ensure that the final composite product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation. The host manufacturer 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.

3) Limited module procedures

Not applicable. The module is a Single module and complies with the requirement of FCC Part 15.212.

4) Trace antenna designs

Not applicable. The module has its own antenna, and doesn't need a host's printed board microstrip trace antenna etc.

5) RF exposure considerations

The module must be installed in the host equipment such that at least 20cm is maintained between the antenna and users' body; and if RF exposure statement or module layout is changed, then the host product manufacturer required to take responsibility of the module through a change in FCC ID or new application. The FCC ID of the module cannot be used on the final product. In these circumstances, the host manufacturer will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

6) Antennas

Antenna Specification are as

follows: Type: FPC Antenna

Gain: 1 dBi

This device is intended only for host manufacturers under the following conditions:

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

The module shall be only used with the internal antenna(s) that has been originally tested and certified with this module. The antenna must be either permanently attached or employ a 'unique' antenna coupler.

As long as the conditions above are met, further transmitter test will not be required. However, the host manufacturer is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

7) Label and compliance information

Host product manufacturers need to provide a physical or e-label stating "Contains FCC ID: 2AOKI-WFR710RTU1" with their finished product.

8) Information on test modes and additional testing requirements

Operation Frequency: 2412-2462MHz

Number of Channel: 11

Modulation:

11b: DBPSK, DQPSK and CCK and DSSS

11g: BPSK, QPSK, 16QAM, 64QAM and OFDM

11n: BPSK, QPSK, 16QAM, 64QAM and OFDM

Host manufacturer must perform test of radiated & conducted emission and spurious emission, etc according to the actual test modes for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

Only when all the test results of test modes comply with FCC requirements, then the end product can be sold legally.

9) Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for FCC Part 15 Subpart C 15.247 & 15.209 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 circuitry), 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.

Federal Communication Commission Statement (FCC, U.S.)

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 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.

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.

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.

IMPORTANT NOTES

Co-location warning:

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

OEM integration instructions:

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

The transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the external antenna(s) that has been originally tested and certified with this module.

As long as the conditions 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 (for example, digital device emissions, PC peripheral requirements, etc.).

Validity of using the module certification:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module 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.

End product labeling:

The final end product must be labeled in a visible area with the following: "Contains Transmitter Module FCC ID: 2AOKI-WFR710RTU1".

Information that must be placed in the end user manual:

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.