

**PRODUCT SPECIFICATION & Manual**

# **6233E-UUB**

**WiFi/bt module**

**Version:v2.1**



## 6233E-UUB Module Datasheet

| Ordering Information | Part NO.      | Description                                                 |
|----------------------|---------------|-------------------------------------------------------------|
|                      | FG6233EUUB-01 | RTL8733BU-CG/802.11a/b/g/n/ WiFi+BT, 1T1R, USB, 12.2X12.9mm |

Customer: \_\_\_\_\_

Customer P/N: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

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## Revision History

[illegible]

## 1. General Description

### 1.1 Introduction

6233E-UUB is a highly integrated module with Realtek 8733BU-CG single-chip 802.11a/b/g/n 1T1R WLAN, and an integrated Bluetooth combo chip with USB 2.0 multi-function. The highly integrated module makes the possibilities of web browsing, VoIP, video stream applications. With seamless roaming capabilities and advanced security, also could interact with different vendors' 802.11a/b/g/n 1x1 Access Points in the wireless LAN.

The wireless module complies with IEEE 802.11 a/b/g/n standard and it can achieve up to a speed of 150Mbps when using 40MHz bandwidth. The integrated module provides USB2.0 interface for Wi-Fi.

### 1.2 Description

|                       |                                         |
|-----------------------|-----------------------------------------|
| Model Name            | 6233E-UUB                               |
| Product Description   | Support Wi-Fi/Bluetooth functionalities |
| Dimension             | L x W x H: 12.2 x 12.9 x 2.37 mm        |
| Wi-Fi Interface       | Support USB 2.0                         |
| BT Interface          | USB                                     |
| Operating temperature | -20°C to 70°C                           |
| Storage temperature   | -40°C to 85°C                           |

## 2. Features

### General Features

- 802.11a/b/g/n 1T1R WLAN and Bluetooth combo chip
- Complete 802.11n solution for both 2.4GHz and 5GHz band
- 72.2Mbps receive PHY rate and 72.2Mbps transmit PHY rate using 20MHz bandwidth
- 150Mbps receive PHY rate and 150Mbps transmit PHY rate using 40MHz bandwidth
- Maximum data rate 54Mbps in 802.11g; and 150Mbps in 802.11n

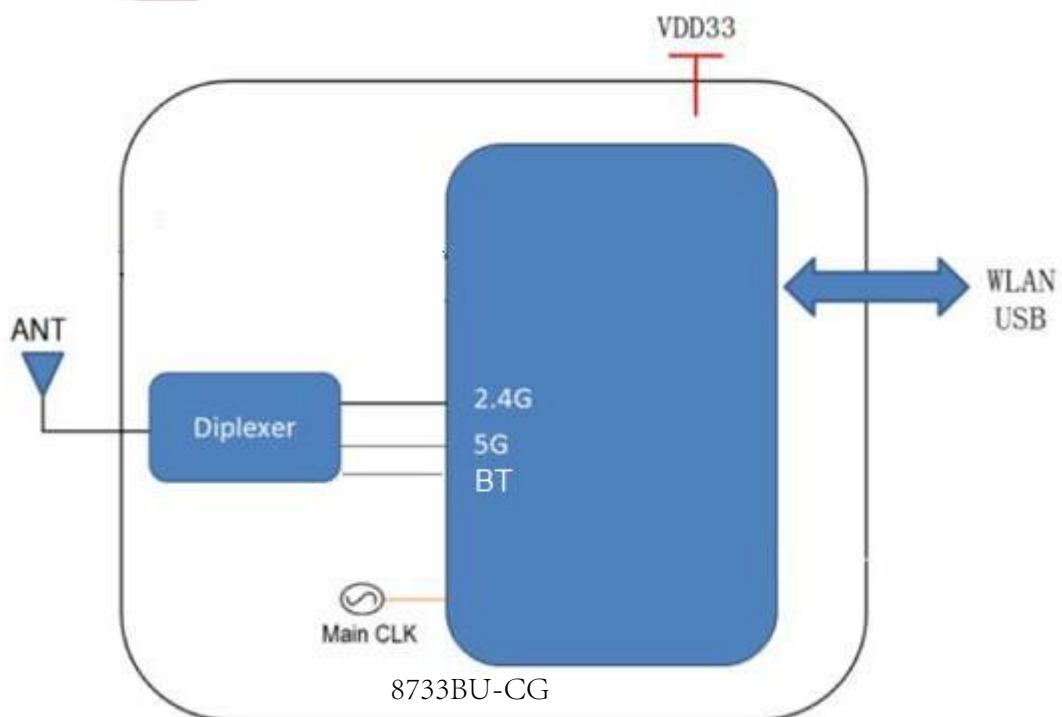
### WLAN Interface

- USB Multi-Function for both BT (USB function 0) and WLAN (USB function 1)

### Bluetooth Features

- Supports Bluetooth multiple Low Energy states
- Bluetooth Dual Mode support: Simultaneous LE and BR/EDR
- Small SMT package

## 3. Block Diagram



## 4. General Specification

### 4.1 WI-FI 2.4GHz RF Specification

| Feature                                          | Description                        |                  |
|--------------------------------------------------|------------------------------------|------------------|
| WLAN Standard                                    | IEEE 802.11 b/g/n Wi-Fi compliant  |                  |
| Frequency Range                                  | 2412-2462 MHz(2.4 GHz ISM Band)    |                  |
| Number of Channels                               | 2.4GHz: Ch1 ~ Ch11                 |                  |
| Test Items                                       | Typical Value                      | EVM              |
| Output Power                                     | 802.11b /11Mbps : 17dBm $\pm$ 2 dB | EVM $\leq$ -9dB  |
|                                                  | 802.11g /54Mbps : 15dBm $\pm$ 2 dB | EVM $\leq$ -25dB |
|                                                  | 802.11n /MCS7 : 14dBm $\pm$ 2 dB   | EVM $\leq$ -28dB |
| Spectrum Mask                                    | Meet with IEEE standard            |                  |
| Freq. Tolerance                                  | $\pm$ 20ppm                        |                  |
| Test Items                                       | TYP Test Value                     | Standard Value   |
| SISO Receive Sensitivity<br>(11b,20MHz) @8% PER  | - 11Mbps PER @ -85 dBm             | $\leq$ -81       |
| SISO Receive Sensitivity<br>(11g,20MHz) @10% PER | - 54Mbps PER @ -71 dBm             | $\leq$ -67       |
| SISO Receive Sensitivity<br>(11n,20MHz) @10% PER | - MCS=7 PER @ -68 dBm              | $\leq$ -65       |
| SISO Receive Sensitivity<br>(11n,40MHz) @10% PER | - MCS=7, PER @ -65 dBm             | $\leq$ -62       |
| Maximum Input Level                              | 802.11b : -10 dBm                  |                  |
|                                                  | 802.11g/n : -20 dBm                |                  |

Note: Other data rates transmit power are controlled by Power-by-Rate function of the driver.

### 4.2 WI-FI 5GHz RF Specification

| Feature            | Description                             |                  |
|--------------------|-----------------------------------------|------------------|
| WLAN Standard      | IEEE 802.11 a/n Wi-Fi compliant         |                  |
| Frequency Range    | 5150-5850 MHz(5.0 GHz Band)             |                  |
| Number of Channels | 5.0GHz: Please see the following table1 |                  |
| Test Items         | Typical Value                           | EVM              |
| Output Power       | 802.11a /54Mbps : 20dBm $\pm$ 2 dB      | EVM $\leq$ -25dB |
|                    | 802.11n /MCS7 : 20dBm $\pm$ 2 dB        | EVM $\leq$ -28dB |

|                                                  |                                       |                       |
|--------------------------------------------------|---------------------------------------|-----------------------|
| Spectrum Mask                                    | Meet with IEEE standard               |                       |
| Freq. Tolerance                                  | $\pm 20\text{ppm}$                    |                       |
| <b>Test Items</b>                                | <b>TYP Test Value</b>                 | <b>Standard Value</b> |
| SISO Receive Sensitivity<br>(11a,20MHz) @10% PER | - 54Mbps PER @ -71 dBm                | $\leq -68$            |
| SISO Receive Sensitivity<br>(11n,20MHz) @10% PER | - MCS=7 PER @ -68 dBm                 | $\leq -65$            |
| SISO Receive Sensitivity<br>(11n,40MHz) @10% PER | - MCS=7, PER @ -65 dBm                | $\leq -62$            |
| Maximum Input Level                              | 802.11a/n : -10 dBm                   |                       |
| Antenna Reference                                | Small antennas with 0~2 dBi peak gain |                       |

Note: Other data rates transmit power are controlled by Power-by-Rate function of the driver.

**15GHz(20MHz) Channel table**

| Band range      | Operating Channel Numbers | Channel center frequencies(MHz) |
|-----------------|---------------------------|---------------------------------|
| 5180MHz~5240MHz | 36                        | 5180                            |
|                 | 40                        | 5200                            |
|                 | 44                        | 5220                            |
|                 | 48                        | 5240                            |
| 5260MHz~5320MHz | 52                        | 5260                            |
|                 | 56                        | 5280                            |
|                 | 60                        | 5300                            |
|                 | 64                        | 5320                            |
| 5550MHz~5700MHz | 100                       | 5500                            |
|                 | 104                       | 5520                            |
|                 | 108                       | 5540                            |
|                 | 112                       | 5560                            |
|                 | 116                       | 5580                            |
|                 | 120                       | 5600                            |
|                 | 124                       | 5620                            |
|                 | 128                       | 5640                            |
|                 | 132                       | 5660                            |
|                 | 136                       | 5680                            |
|                 | 140                       | 5700                            |
| 5745MHz~5825MHz | 149                       | 5745                            |
|                 | 153                       | 5765                            |

|  |     |      |
|--|-----|------|
|  | 157 | 5785 |
|  | 161 | 5805 |
|  | 165 | 5825 |

### 4.3 Bluetooth Specification

| Feature                                               | Description                           |              |          |
|-------------------------------------------------------|---------------------------------------|--------------|----------|
| General Specification                                 |                                       |              |          |
| Bluetooth Standard                                    | Bluetooth                             |              |          |
| Host Interface                                        | USB                                   |              |          |
| Antenna Reference                                     | Small antennas with 0~2 dBi peak gain |              |          |
| Frequency Band                                        | 2402 MHz ~ 2480 MHz                   |              |          |
| Number of Channels                                    | 79 channels                           |              |          |
| Modulation                                            | GFSK, $\pi/4$ -DQPSK, 8-DPSK          |              |          |
| RF Specification                                      |                                       |              |          |
|                                                       | Min(dBm)                              | Typical(dBm) | Max(dBm) |
| Output Power (Class 1)                                | 2                                     | 4            | 5        |
| Sensitivity @ BER=0.1%<br>for GFSK (1Mbps)            |                                       |              | -70      |
| Sensitivity @ BER=0.01%<br>for $\pi/4$ -DQPSK (2Mbps) |                                       |              | -70      |
| Sensitivity @ BER=0.01%<br>for 8DPSK (3Mbps)          |                                       |              | -70      |
| Maximum Input Level                                   | GFSK (1Mbps):-20dBm                   |              |          |
|                                                       | $\pi/4$ -DQPSK (2Mbps) :-20dBm        |              |          |
|                                                       | 8DPSK (3Mbps) :-20dBm                 |              |          |

## 5. ID setting information

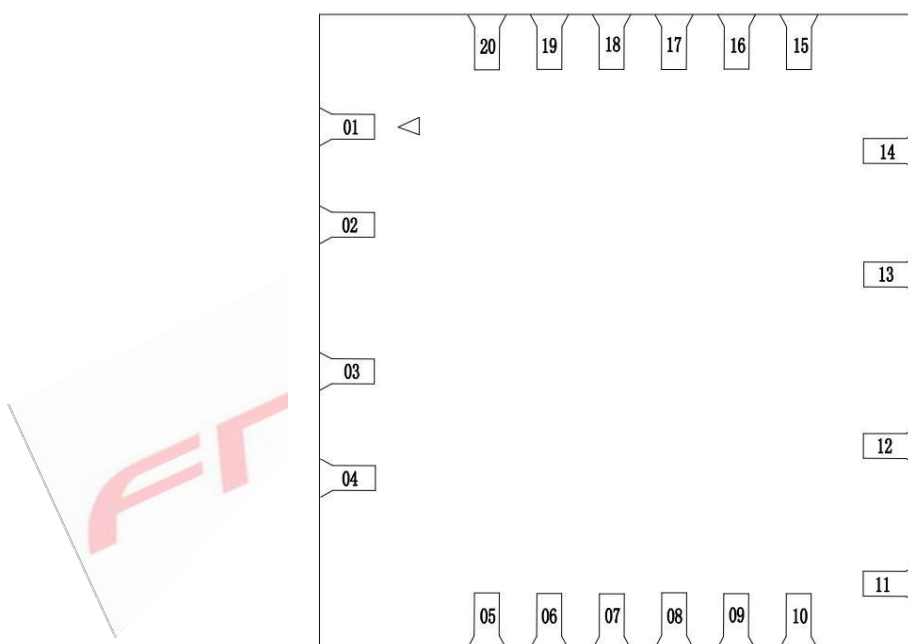
WI-FI

|            |   |
|------------|---|
| Vendor ID  | - |
| Product ID | - |

## 6. Pin Definition

### 6.1 Pin Outline

< TOP VIEW >



### 6.2 Pin Definition details

| NO. | Name | Type | Description              | Voltage |
|-----|------|------|--------------------------|---------|
| 1   | GND  |      | Ground connections       |         |
| 2   | RF_0 | I/O  | RF I/O, Wi-Fi 2.4G/5G/BT |         |
| 3   | NC   |      | Floating(NC)             |         |

|    |             |     |                                                                               |      |
|----|-------------|-----|-------------------------------------------------------------------------------|------|
| 4  | GND         |     | Ground connections                                                            |      |
| 5  | BT_PCM_IN   | I   | PCM data input                                                                | 3.3V |
| 6  | BT_PCM_OUT  | O   | PCM Data output                                                               | 3.3V |
| 7  | BT_PCM_SYNC | I/O | PCM sync signal                                                               | 3.3V |
| 8  | BT_PCM_CLK  | I/O | PCM clock                                                                     | 3.3V |
| 9  | BT_WAKE_HST | O   | Bluetooth device wake-up HOST                                                 | 3.3V |
| 10 | HST_WAKE_BT | I   | HOST wake-up Bluetooth device                                                 | 3.3V |
| 11 | VD33        | P   | Main power source input                                                       | 3.3V |
| 12 | DM          | I/O | USB2.0 differential pair D-                                                   |      |
| 13 | DP          | I/O | USB2.0 differential pair D+                                                   |      |
| 14 | GND         |     | Ground connections                                                            |      |
| 15 | NC          |     | Floating(NC)                                                                  |      |
| 16 | NC          |     | Floating(NC)                                                                  |      |
| 17 | NC          |     | Floating(NC)                                                                  |      |
| 18 | CHIP_EN     | I   | Enable pin for module<br>ON: pull high ; OFF: pull low<br>(Default:pull high) | 3.3V |
| 19 | HST_WAKE_WL | I   | HOST wake-up WL device                                                        | 3.3V |
| 20 | WL_WAKE_HST | O   | WL device wake-up HOST                                                        | 3.3V |

P:POWER I:INPUT O:OUTPUT

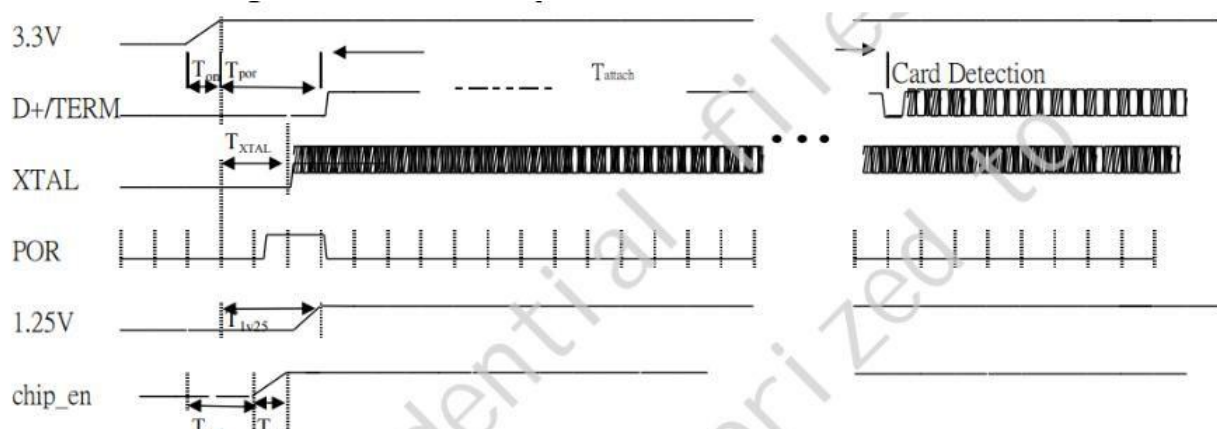
## 7. Electrical Specifications

### 7.1 Power Supply DC Characteristics

|                       | MIN | TYP | MAX | Unit  |
|-----------------------|-----|-----|-----|-------|
| Operating Temperature | -20 | 25  | 70  | deg.C |
| VDD33                 | 3.0 | 3.3 | 3.6 | V     |

## 7.2 Interface Circuit time series

### 7.2.1 USB Bus Timing during Power On Sequence



**T<sub>on</sub>:** The main power ramp up duration

**T<sub>en</sub>:** Interval between the rising point of 3.3V and chip\_en

**T<sub>gate</sub>:** Interval of 3.3V to be gated when chip\_en voltage level < 2V

**T<sub>attach</sub>:** USB attach state. The duration from resistor attached to USB host starting card detection procedure

**T<sub>xtal</sub>:** XTAL starts

#### The power on flow Description:

The power on flow description : After main 3.3V ramp up, the internal power on reset is released by power ready detection circuit and the power management unit will be enabled. The power management unit enables the internal regulator and clock circuits.

The power management unit also enables the USB circuits.

USB analog circuits attach resistors to indicate the insertion of the USB device.

|                           | Unit | Min | Typical | Max |
|---------------------------|------|-----|---------|-----|
| <b>T<sub>on</sub></b>     | ms   | 0.2 | 1.5     | 5   |
| <b>T<sub>por</sub></b>    | ms   | --  | 2       | 10  |
| <b>T<sub>xtal</sub></b>   | ms   | --  | 1.5     | 8   |
| <b>T<sub>attach</sub></b> | ms   | 100 | 250     | -   |
| <b>T<sub>1v25</sub></b>   | ms   | 0   | 0       | 5   |

7.2.2 Power off by 3.3V power sequence

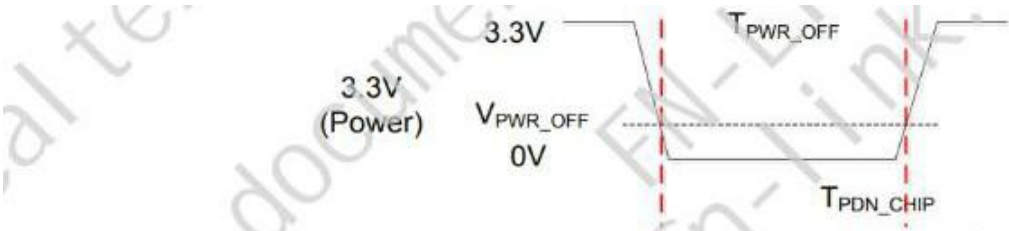


Figure 6. RTL8731BU-CG Power Off by 3.3V power Sequence

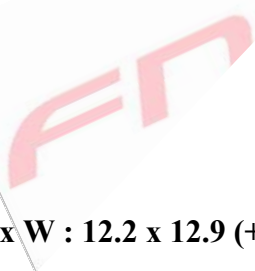
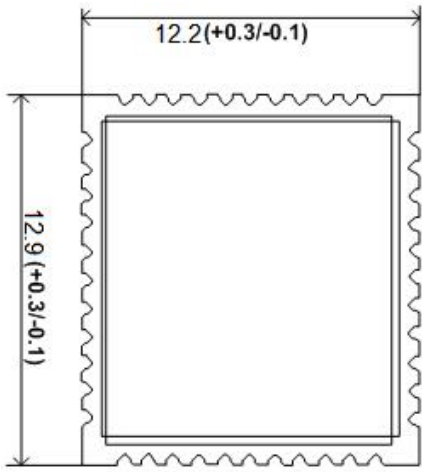
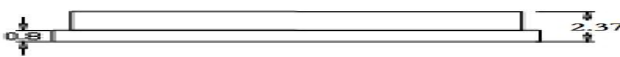
Table 14. RTL8731BU-CG Power Off by 3.3V power Timing Parameters

|          | Min | Typical | Max | Unit | Description            |
|----------|-----|---------|-----|------|------------------------|
| TPWR_OFF | 100 | 200     | --  | ms   | 3.3V power off time    |
| VPWR_OFF | --  | --      | 0.7 | V    | 3.3V power off voltage |

When 3.3V power off and on afterward, the voltage of 3.3V power must keep lower than VPWR\_OFF , and the 3.3V power keeping off duration must be more than TPWR\_OFF

8. Size reference

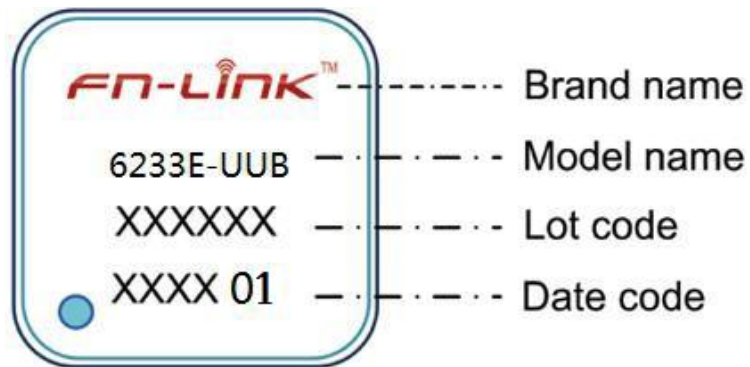
8.1 Module Picture

|                                                                                                                                  |                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <br><b>L x W : 12.2 x 12.9 (+0.3/-0.1) mm</b> |  |
| <b>H: 2.37 (±0.2) mm</b>                                                                                                         |  |
| <b>Weight</b>                                                                                                                    | <b>0.65g</b>                                                                         |

Note:The module diagram will be updated in a future version

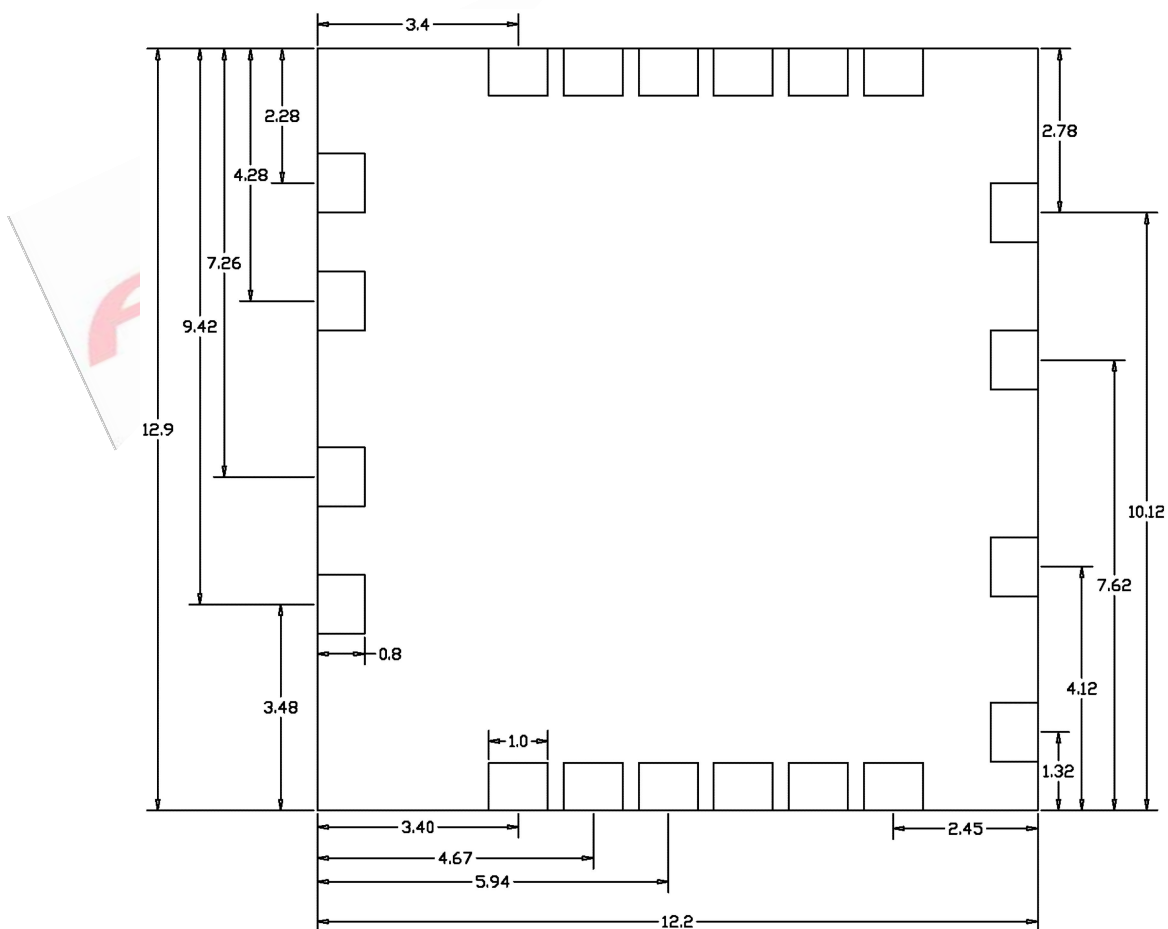
## 8.2 Marking Description

< TOP VIEW >

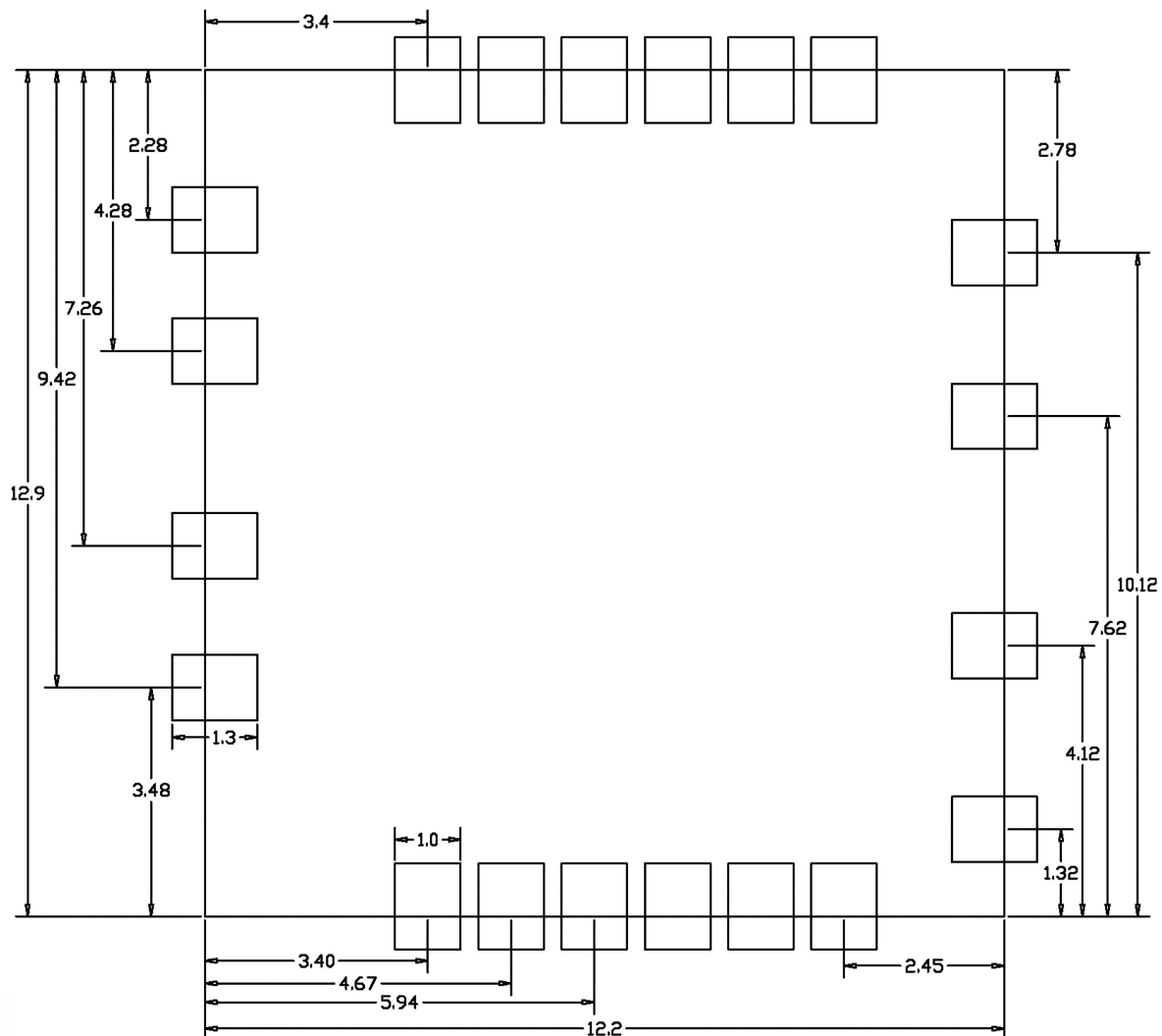


## 8.3 Physical Dimensions

<TOPView>



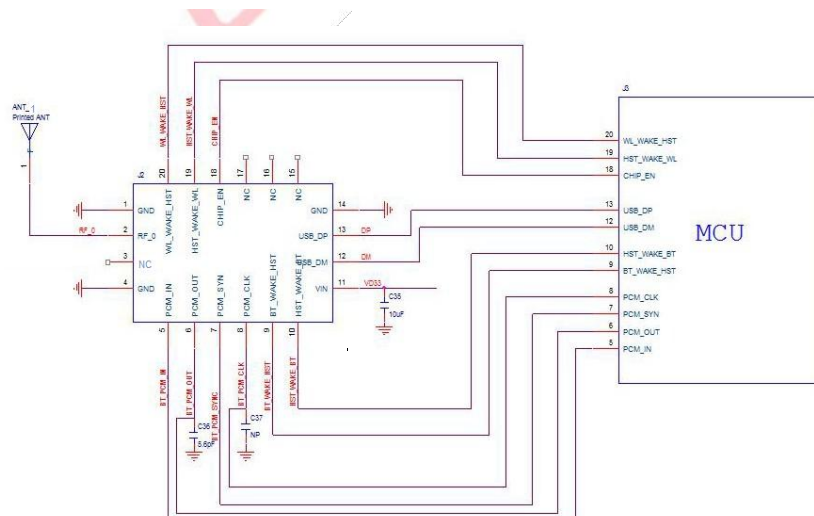
## 8.4 Layout Recommendation



## 9. The Key Material List

| Item | Part Name | Description                      | Manufacturer                                     |
|------|-----------|----------------------------------|--------------------------------------------------|
| 1    | PCB       | 6233E-UUB,4L,FR4,12.2X12.9X0.8mm | XY-PCB, GDKX, Sunlord, SLPCB                     |
| 2    | Crystal   | 2520 40MHz 10ppm 12PF            | ECEC, Hosonic, TKD, JWT                          |
| 3    | Chipset   | RTL8733BU-CG,QFN40               | Realtek                                          |
| 4    | Shielding | 6233E-UUB Shielding              | 信太, 精力通                                          |
| 5    | Diplexer  | RFDIP1607L898D1T                 | Glead, Walsin, ACX, Murata, MAG.LAYERS, ftrgroup |
| 6    | Inductor  | 2016 2.2UH, ±20%                 | MURATA, microgate, cenke, ceaiya                 |

## 10. Reference Design



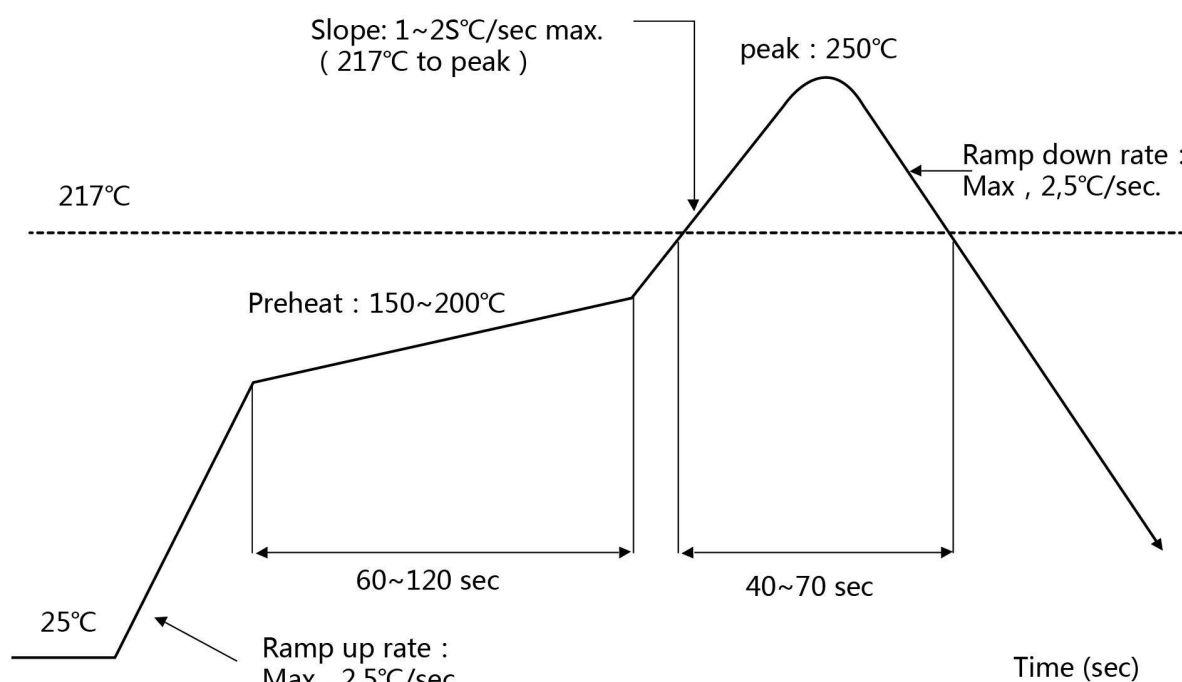
Note: Module requires independent power supply , supply capacity  $\geq 1200\text{mA}$  and ripple less than  $100\text{mV}$ ; Do not share power with amplifier, infrared device, camera, etc. USB differential trace, please keep  $90\text{ ohm}$ .

## 11. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : <250°C

Number of Times :  $\leq 2$  times



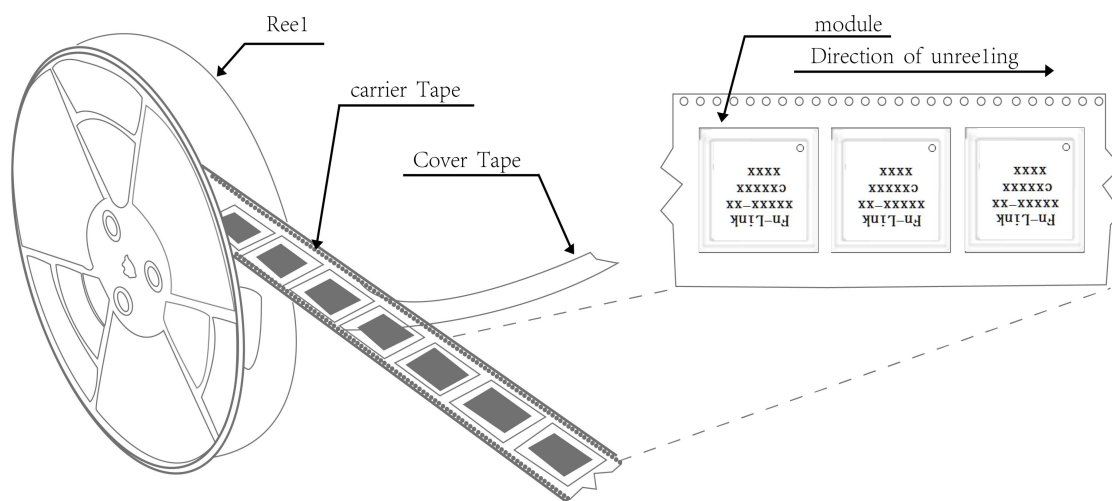
## 12. RoHS compliance

All hardware components are fully compliant with EU RoHS directive

## 13. Package

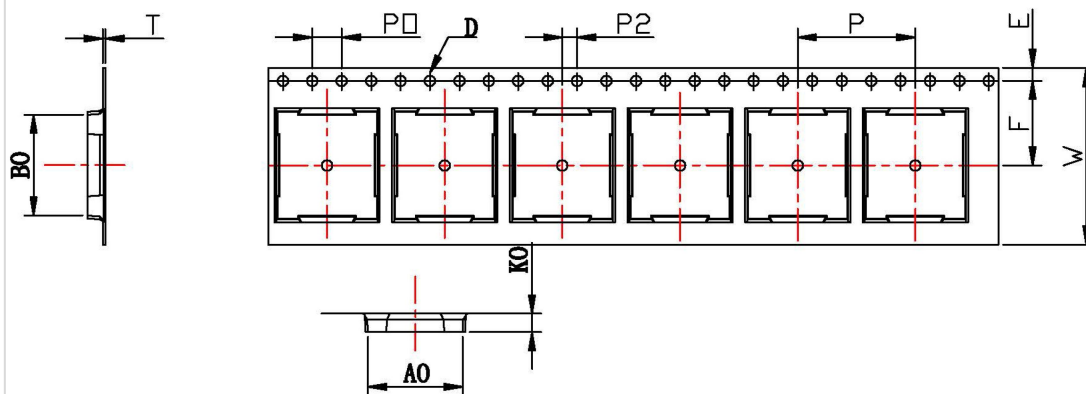
### 13.1 Reel

A roll of 1500pcs



### 13.2 Carrier Tape Detail

| ITEM | W                                                    | A0         | B0         | D                                                    | F                                                    | E         | K0         | P0        | P2        | P         | T          |
|------|------------------------------------------------------|------------|------------|------------------------------------------------------|------------------------------------------------------|-----------|------------|-----------|-----------|-----------|------------|
| DIM  | 24                                                   | 12.50      | 13.35      | 1.50                                                 | 11.5                                                 | 1.75      | 2.5        | 4.0       | 2.0       | 16.0      | 0.30       |
| TOLE | $\begin{smallmatrix} +0.3 \\ -0.3 \end{smallmatrix}$ | $\pm 0.15$ | $\pm 0.15$ | $\begin{smallmatrix} +0.1 \\ -0.0 \end{smallmatrix}$ | $\begin{smallmatrix} +0.1 \\ -0.1 \end{smallmatrix}$ | $\pm 0.1$ | $\pm 0.10$ | $\pm 0.1$ | $\pm 0.1$ | $\pm 0.1$ | $\pm 0.05$ |



### 13.3 Packaging Detail

the take-up package



Using self-adhesive tape

Size of black tape: 24mm\*24.4m the cover tape :21.3mm\*32.6m

Color of plastic disc: blue



NY bag size:450mm\*415mm



size : 350\*350\*35mm



The packing case size:360\*210\*370mmg

#### 14. Moisture sensitivity

The Modules is a Moisture Sensitive Device level 3, in according with standard IPC/JEDEC J-STD-020, take care all the relatives requirements for using this kind of components.

Moreover, the customer has to take care of the following conditions:

- a) Calculated shelf life in sealed bag: 12 months at <40°C and <90% relative humidity (RH)
- b) Environmental condition during the production: 30°C / 60% RH according to IPC/JEDEC J-STD-033A paragraph 5
- c) The maximum time between the opening of the sealed bag and the reflow process must be 168 hours if condition
- d) "IPC/JEDEC J-STD-033A paragraph 5.2" is respected
- e) Baking is required if conditions b) or c) are not respected
- f) Baking is required if the humidity indicator inside the bag indicates 10% RH or more

取得審驗證明之低功率射頻器材，非經核准，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

低功率射頻器材之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。

前述合法通信，指依電信管理法規定作業之無線電通信。

低功率射頻器材須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

應避免影響附近雷達系統之操作

##### 1.1 List of applicable FCC rules:

The module complies with FCC Part 15.247.and FCC Part 15.407

##### 1.2 Summarize the specific operational use conditions:

The module has been certified for Fix, Mobile applications.

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

##### 1.3 Module procedures:

The module has its own RF shielding, which belong to signal module Standard requires:

Clear and specific instructions describing the conditions, limitations and procedures for third - parties to use and/or integrate the module into a host device (see Comprehensive integration instructions below).

Resolve: Supply example as follows:

Installation Notes:

- 1) 6233E-UUB Module Power supply range is DC 3.3V~3.6V, when you use 6233E-UUB Module design product, the power supply cannot exceed this range.
- 2) When connect 6233E-UUB Module to the host device, the host device must be power off.
- 3) Make sure the module pins correctly installed.
- 4) Make sure that the module does not allow users to replace or demolition.

##### 1.4 Trace antenna designs:

Not applicable.

##### 1.5 RF exposure considerations:

This equipment complies with FCC RF radiation exposure limits set forth for an

uncontrolled environment. The antenna(s) used for this transmitter must not be collocated or operating in conjunction with any other antenna or transmitter.

Note: the host product manuals must include a statement in order to alert the users of FCC RF exposure compliance.

| Antenna information | Brand     | Model              | Type        | Max. Gain (dBi) |      |
|---------------------|-----------|--------------------|-------------|-----------------|------|
|                     | ABRACON   | AFB4714A           | FPC Antenna | U-NII Band 1    | 3.16 |
|                     |           |                    |             | U-NII Band 2-A  | 3.07 |
|                     |           |                    |             | U-NII Band 2-C  | 2.30 |
|                     |           |                    |             | U-NII Band 3    | 2.30 |
|                     | PSA       | RFPCA381425IMLB301 | PCB Antenna | U-NII Band 1    | 3.94 |
|                     |           |                    |             | U-NII Band 2-A  | 3.94 |
|                     |           |                    |             | U-NII Band 2-C  | 3.94 |
|                     |           |                    |             | U-NII Band 3    | 3.94 |
|                     | Laird     | EMN2449A2S-25UFL   | PCB Antenna | U-NII Band 1    | 5.75 |
|                     |           |                    |             | U-NII Band 2-A  | 6.26 |
|                     |           |                    |             | U-NII Band 2-C  | 6.34 |
|                     |           |                    |             | U-NII Band 3    | 5.18 |
|                     | iRobot    | 4802062            | PCB Antenna | U-NII Band 1    | 3.71 |
|                     |           |                    |             | U-NII Band 2-A  | 4.12 |
|                     |           |                    |             | U-NII Band 2-C  | 3.36 |
|                     |           |                    |             | U-NII Band 3    | 2.49 |
|                     | Cicent(*) | 450L               | FPC Antenna | U-NII Band 1    | -0.3 |
|                     |           |                    |             | U-NII Band 2-A  | 1.6  |
|                     |           |                    |             | U-NII Band 2-C  | 1.9  |
|                     |           |                    |             | U-NII Band 3    | 1.9  |

| MODEL              | ANTENNA TYPE | MAX GAIN           |
|--------------------|--------------|--------------------|
| 4802062            | PCB antenna  | 3.44dBi for 2.4GHz |
| AFB4714A           | FPC antenna  | 2.76dBi for 2.4GHz |
| RFPCA381425IMLB301 | PCB antenna  | 2.21dBi for 2.4GHz |
| EMN2449A2S-25UFL   | PCB antenna  | 3.50dBi for 2.4GHz |
| 450L               | FPC antenna  | 1.70dBi for 2.4GHz |

### 1.7 Label and compliance information

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 to this unit 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.

The system integrator must place an exterior label on the outside of the final product housing the Modules. Below is the content that must be included on this label.

The host product Labeling Requirements:

NOTICE: The host product must make sure that FCC labeling requirements are met. This includes clearly visible exterior label on the outside of the final product housing that displays the contents shown in below:

Contains FCC ID: 2AATL-6233E-UUB

Contains IC:12425A-6233EUUB

### 1.8 Information on test modes and additional testing requirements:

When testing host product, the host manufacture should follow FCC KDB Publication 996369 D04 Module Integration Guide for testing the host products. The host manufacturer may operate their product during the measurements. In setting up the configurations, if the pairing and call box options

for testing does not work, then the host product manufacturer should coordinate with the module manufacturer for access to test mode software.

### 1.9 Additional testing, Part 15 Subpart B disclaimer:

The modular transmitter is only FCC authorized for the specific rule parts (FCC Part 15.247) list 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 when contains digital circuitry.

### 1.10 Information on test modes and additional testing requirements:

When testing host product, the host manufacture should follow FCC KDB Publication 996369 D04 Module Integration Guide for testing the host products. The host manufacturer may operate their product during the measurements.

## FCC warning:

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.

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

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.

The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter, End-Users must be provided with transmitter operation conditions for satisfying RF exposure compliance.

## Canada warning:

### - English:

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:

This device may not cause interference.

This device must accept any interference, including interference that may cause undesired operation of the device.

### - French:

Cet appareil contient des émetteurs/récepteurs exemptés de licence qui sont conformes aux flux RSS exemptés de licence de Innovation, Science et développement économique Canada. L'exploitation est soumise aux deux conditions suivantes:

Cet appareil ne doit pas causer d'interférences.

Ce dispositif doit accepter toute interférence, y compris toute interférence pouvant causer un fonctionnement indésirable du dispositif

Les antennes utilisées pour cet émetteur doivent être installées pour assurer une distance de séparation d'au moins 20 cm par rapport à toutes les personnes et ne doivent pas être localisées ou fonctionner conjointement avec d'autres antennes ou émetteurs. Les utilisateurs doivent avoir des conditions de fonctionnement de l'émetteur pour satisfaire à la conformité à l'exposition RF.

When using IEEE 802.11a, n, or ac wireless LAN, this product is restricted to indoor use, due to its operation in the 5.15 GHz to 5.25 GHz frequency range. Industry Canada requires this product to be used indoors for the frequency range of 5.15 GHz to 5.25 GHz to reduce the potential for harmful interference to co-channel mobile satellite systems. High-power radar is allocated as the primary user of the 5.25 GHz to 5.35 GHz and 5.65 GHz to 5.85 GHz bands. These radar stations can cause interference with and/or damage to this device. The antennas for this device are not replaceable. Any attempt at user access will damage your computer.

Lorsque vous utilisez un réseau sans fil IEEE 802.11a, n ou ac, ce produit est limité à une utilisation en intérieur, en raison de son fonctionnement dans la gamme de fréquences de 5,15 GHz à 5,25 GHz. Industrie Canada exige que ce produit soit utilisé à l'intérieur pour la plage de fréquences de 5,15 GHz à 5,25 GHz afin de réduire le risque d'interférence nuisible avec les systèmes de satellites mobiles co-canaux. Le radar de haute puissance est attribué comme utilisateur principal des bandes de 5,25 GHz à 5,35 GHz et de 5,65 GHz à 5,85 GHz. Ces stations radar peuvent causer des interférences et/ou des dommages à cet appareil. Les antennes de cet appareil ne sont pas remplaçables. Toute tentative d'accès de l'utilisateur endommagera votre ordinateur.

The host product shall be properly labelled to identify the modules within the host product.

The Innovation, Science and Economic Development Canada certification label of a module shall be clearly visible at all times when installed in the host product; otherwise, the host product must be labelled to display the Innovation, Science and Economic Development Canada certification number for the module, preceded by the word “Contains” or similar wording expressing the same meaning, as follows:

“Contains IC:12425A-6233EUUB”

or “where: 12425A-6233EUUB is the module’s certification number” .

A label with the following statements must be attached to the host end product: This device contains IC: 12425A-6233EUUB.

The manual provides guidance to the host manufacturer will be included in the documentation that will be provided to the OEM.

The module is limited to installation in mobile or fixed applications.

The separate approval is required for all other operating configurations, including portable configurations and different antenna configurations.

The OEM integrators are responsible for ensuring that the end-user has no manual or instructions to remove or install module.

The module is limited to OEM installation ONLY.

Une étiquette avec les instructions suivantes doit être attachée au produit final hôte:

Cet appareil contient IC: 12425A-6233EUUB

Le manuel fournit des conseils au fabricant hôte sera inclus dans la documentation qui sera fournie à l’OEM.

Le module est limité à l’installation dans des applications mobiles ou fixes.

L’approbation distincte est requise pour toutes les autres configurations de fonctionnement, y compris les configurations portables et différentes configurations d’antenne.

Les intégrateurs OEM sont responsables de s’assurer que l’utilisateur n’a pas de manuel ou d’instructions pour retirer ou installer le module.

Le module est limité à l’installation OEM SEULEMENT.