



# EH-MC33

Ultra Low Power Bluetooth BLE5.3 Module Datasheet

July 2024 Version2.0

Professional IoT Grid Module Programme Provider

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Description:

Click on the link or scan the two-dimensional scanner to check if it is the latest version of the file:

[http://api.ehlink.com.cn:9527/public/EH-MC33\\_规格书\\_V1.1.pdf](http://api.ehlink.com.cn:9527/public/EH-MC33_规格书_V1.1.pdf)

## 1. Module overview

### 1.1 characterisation

| element                 | (an official) standard                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| processing unit         | ARM Cortex M33 (64MHz) <ul style="list-style-type: none"><li>• 128kB RAM, 64kB ROM</li><li>• 512kB Flash</li></ul>                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| (an official) standard  | • Bluetooth BLE 5.3                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| BLE RF Parameters       | <ul style="list-style-type: none"><li>• Maximum transmit power: +3 dBm</li><li>• Receiving sensitivity: -95 dBm</li></ul>                                | <ul style="list-style-type: none"><li>• RF power consumption in 3V supply mode</li><li>Receiving Current (RX@-95dB): 0.85mA</li><li>Emission current (@0dB): 2.1mA</li><li>• Normal operation of PMU, power consumption under 3V supply condition: Receiving current (RX@-95dB): 1.4mA</li><li>Emission current (@0dB): 2.5mA</li><li>• Beacon broadcast power consumption: 7.15uA</li><li>(Intermit interval: 2s, data: 23Bytes, 0dBm)</li></ul> |
| Sleep power consumption | Deep sleep: 400nA                                                                                                                                        | Wakeable: 1.1uA                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| peripheral equipment    | <ul style="list-style-type: none"><li>• 21 x GPIO (maximum)</li><li>• 2 x SPI (master or slave)</li><li>• 2 x I2C (main)</li><li>• 1 x I2S/PCM</li></ul> | <ul style="list-style-type: none"><li>• 8 x PWM</li><li>• 2 x UART</li><li>• ADC (11-bit)</li></ul>                                                                                                                                                                                                                                                                                                                                               |
| input voltage           | Input Power: 1.1V~4.2V, 3V (typical)                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| matrix                  | Temperature: <ul style="list-style-type: none"><li>• Working temperature: -20°C ~ 85°C</li><li>• Storage Temperature: -55°C ~ 150°C</li></ul>            | Humidity: <ul style="list-style-type: none"><li>• Relative humidity: &lt; 90% without condensation</li><li>• Storage humidity: &lt; 90% no condensation</li></ul>                                                                                                                                                                                                                                                                                 |

|                    |                              |                                                              |
|--------------------|------------------------------|--------------------------------------------------------------|
| exterior condition | Size:<br>17.70x11.95x2.20mm  | Pin: 27 stamp holes<br>Antenna: PCB board mounted<br>antenna |
| accreditation      | BQB, FCC, CE, IC, SRRC, Rohs |                                                              |

## 1.2 descriptions

The EH-MC33 is an ultra-low-power module supporting Bluetooth 5.3. It is small in size, powerful in function, and has a rich set of interfaces that can be used in Apple FMN positioning, smart home, smart hardware, and other scenarios.

The modules use an Atomic 3325 chip with an ARM Cortex M33 processor at up to 64 MHz, 128 KB of Random Access Memory (RAM), 64 KB of Read-Only Memory (ROM), 512 KB of Non-Volatile Memory (NVM), and state-of-the-art power management to maximise the life of the battery used in the device.

The EH-MC33 has extremely low power consumption, with 0.85 mA radio receiver and 2.1 mA radio transmitter power consumption, which can greatly extend the battery life of Internet of Things (IoT) devices. Supports low duty cycle operation, allowing the system to run longer without battery replacement. Supports an innovative wake-up mechanism, providing an option to further reduce energy consumption.

The EH-MC33 also integrates a rich set of peripherals, including SPI, I2S, I2C, UART, PWM, and GPIO interfaces, along with a rich set of application software, and complete module certification, allowing customers to bring their products to market faster and at lower cost.

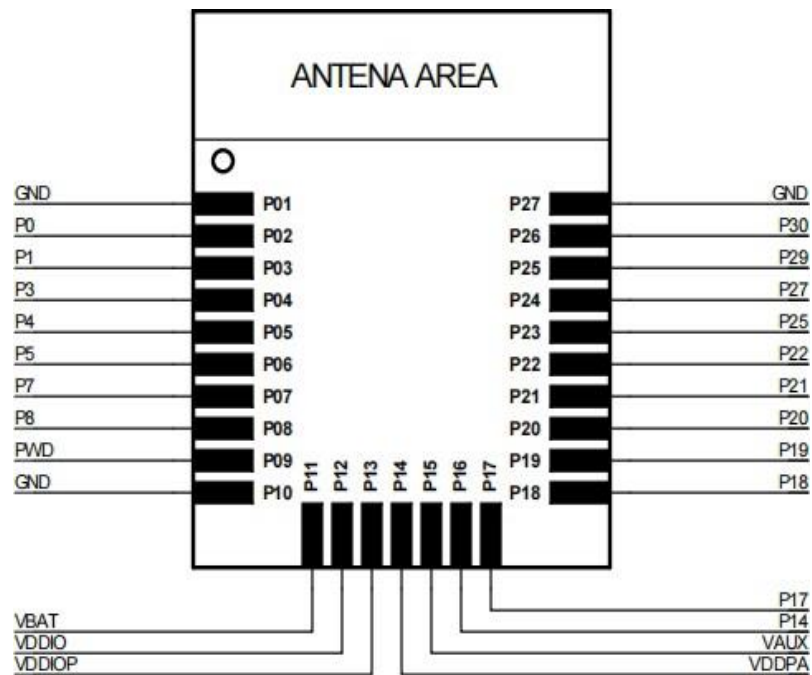
## 1.3 use

- Apple Positioning (FMN)
- smart home
- Beacon
- intelligent building
- Intelligent Hardware
- Electronic Label
- intelligent agriculture
- Workplace automation
- smart toy
- Mesh Grid

# Project Name

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## 2.Pin definition



Picture 2 : EH-MC33 Pin Layout (Top View)

| Pin<br>Sequence | IO     | typology | descriptions                    |
|-----------------|--------|----------|---------------------------------|
| 1               | GND    | GND      | earth (electric connection)     |
| 2               | P0     | GPIO     | Use GPIO, default SWCLK.        |
| 3               | P1     | GPIO     | Use GPIO, default SWDIO.        |
| 4               | P3     | GPIO     | Using GPIOs                     |
| 5               | P4     | GPIO     | Using GPIOs                     |
| 6               | P5     | GPIO     | Using GPIOs                     |
| 7               | P7     | GPIO     | Using GPIOs                     |
| 8               | P8     | GPIO     | Using GPIOs                     |
| 9               | PWD    | GPIO     | Use GPIO, burn PWD by default.  |
| 10              | GND    | GPIO     | Using GPIOs                     |
| 11              | VBAT   | VBAT     | Module power supply in VBAT     |
| 12              | VDDIO  | VDDIO    | VDDIO                           |
| 13              | VDDIOP | VDDIOP   | Module power supply in VDDIOP   |
| 14              | VDDPA  | VDDPA    | VDDPA                           |
| 15              | VAUX   | VAUX     | VAUX                            |
| 16              | P14    | GPIO     | Use GPIO, default UART0_RX.     |
| 17              | P17    | GPIO     | Use GPIO, default UART0_TX.     |
| 18              | P18    | GPIO     | Using GPIOs                     |
| 19              | P19    | GPIO     | Using GPIOs                     |
| 20              | P20    | GPIO     | Using GPIOs                     |
| 21              | P21    | GPIO     | Using GPIOs                     |
| 22              | P22    | GPIO     | Using GPIOs                     |
| 23              | P25    | GPIO     | Use GPIO, burn BOOT by default. |
| 24              | P27    | GPIO     | Use GPIO, default UART1_TX.     |
| 25              | P29    | GPIO     | Using GPIOs                     |
| 26              | P30    | GPIO     | Using GPIOs                     |
| 27              | GND    | GND      | earth (electric connection)     |

Table 2: Pin Descriptions

### 3. Electrohydraulic characteristics

#### 3.1 Absolute Maximum Ratings

Exceeding the absolute maximum ratings may result in permanent damage to the device. This is an emphasis on ratings only and does not address the functional operation of the device under these or other conditions beyond those indicated in this technical specification. Prolonged exposure to absolute maximum rated conditions may affect module reliability.

| notation      | parametric          | minimum value | Maximumvalue | unit (of measure) |
|---------------|---------------------|---------------|--------------|-------------------|
| VDD_BAT       | Power Pin Voltage   | 1.1           | 4.2          | V                 |
| <i>Tstore</i> | Storage temperature | -55           | 125          | °C                |

Table 3: Absolute Maximum Ratings

#### 3.2 Recommended Working Conditions

| notation                  | minimum value | typical value | Maximumvalue | unit (of measure) |
|---------------------------|---------------|---------------|--------------|-------------------|
| Working temperature range | -20           | -             | 85           | °C                |
| VDD_BAT                   | 1.1           | 3.0           | 4.2          | V                 |
| I/O power supply          | 1.8           | -             | VDD_BAT      | V                 |
| frequencyrange            | 2402          | -             | 2480         | MHz               |

Table 4: Recommended working conditions

#### 3.3 Power consumption characteristics

Working Current of EH-MC33 in Active Mode: Condition: VBAT = 3V, VDDIO = 3V, Ambient Temperature: 25°C.

| paradigm             | descriptions |                                            | peak value |
|----------------------|--------------|--------------------------------------------|------------|
| Radio Frequency Work | RX           | Sensitivity: -95dBm                        | 0.85mA     |
|                      | TX           | TX Power:0dBm                              | 2.1mA      |
|                      |              | TXPower:+ 3dBm                             | 4mA        |
|                      | Beacon       | Intermit interval: 1S, Data: 23Bytes, 0dBm | 7.15uA     |

Table 5: Power Consumption in RF Working Mode

Powerconsumption of EH-MC33 in sleep mode: VBAT/HVD = 3V, VDDIO = 3V, ambient temperature: 25°C.

| Power Mode | 32kHz RCOSC | SRAM hold | Wake-up mode               | Power consumption (typical) |
|------------|-------------|-----------|----------------------------|-----------------------------|
| Power Down | Off         | Off       | Wake-up via GPIO           | 400nA                       |
| Deep LPS   | on          | remain    | Wake-up via GPIO and clock | 1.6uA                       |

Table 6: Power Consumption in Low Power Mode

3.4 Bluetooth Radio Frequency (RF)

| parametric           | bandwidths | Modulation Method | rate  | typical value | unit (of measure) |
|----------------------|------------|-------------------|-------|---------------|-------------------|
| firing power         | 2MHz       | GFSK              | 1Mbps | +3            | dBm               |
|                      |            |                   | 2Mbps | +3            | dBm               |
| receiver sensitivity |            |                   | 1Mbps | -97           | dBm               |
|                      |            |                   | 2Mbps | -95           | dBm               |

Table 7: BLE RF characteristics

4. Module size and PCB package graphics

4.1 Module Size

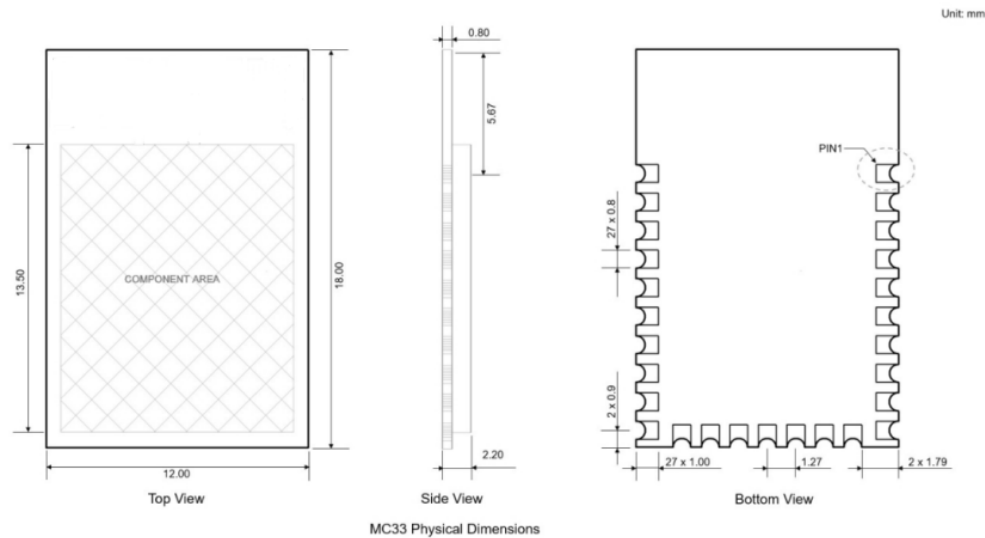
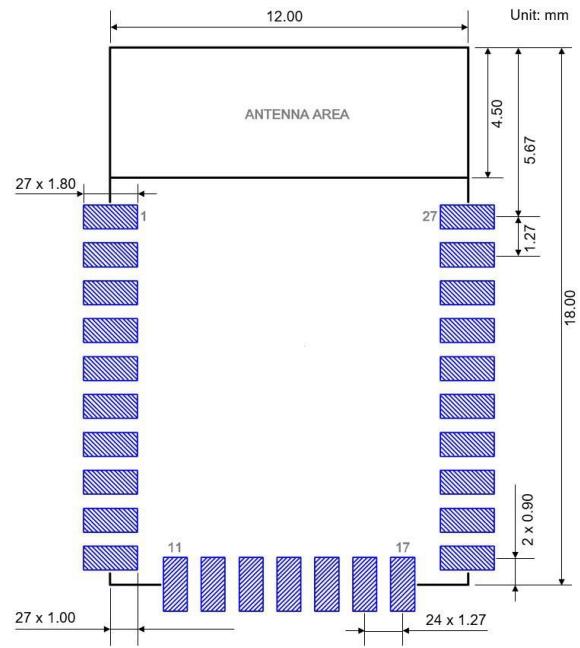


Figure 4: EH-MC33 Module Size

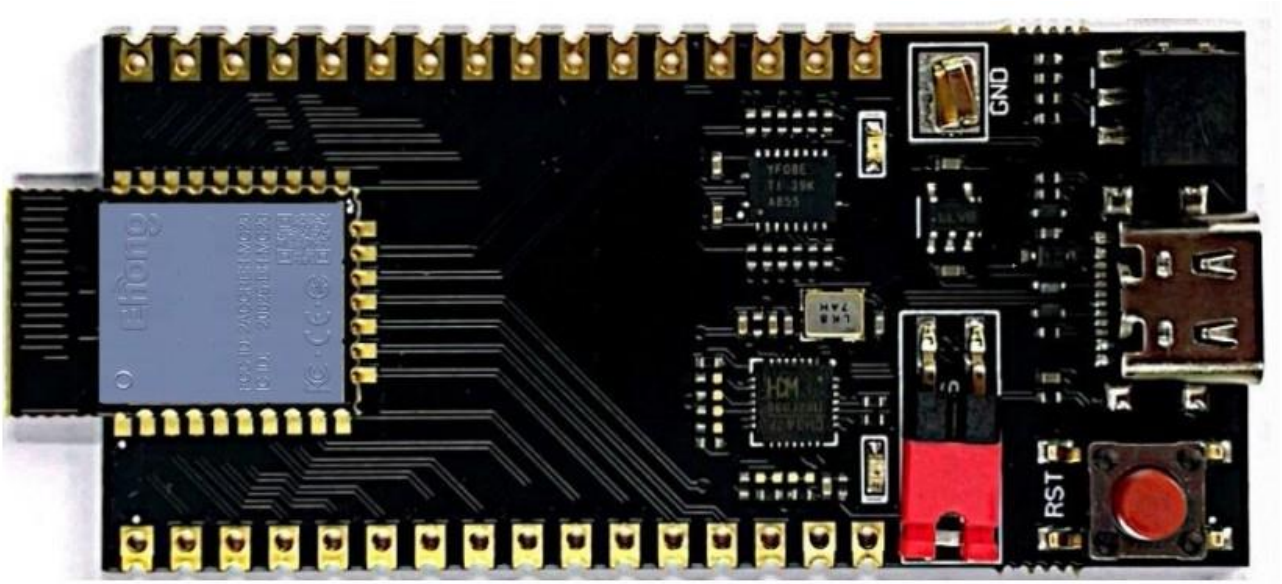
4.2 PCB Package Graphics



MC33 Recommended PCB Land Pattern

Figure 5: EH-MC33 PCB Package Graphics

## 5. Development board



The EH-MC33 development board supports pushbutton functionality and comes with an USB port, which can satisfy the basic development and verification needs of customers. The EH-MC33 supports keypad functions and a built-in serial port to meet customers' basic development and verification needs, and adopts the standard 2.54 pin header for the module's usability io, which facilitates customers' use and enhances the efficiency of two-stage development.

## 6. Product handling

### 6.1 storage condition

- 3.4.1 Products sealed in Moisture Barrier Bags (MBB) should be stored in a non-condensing atmosphere of  $< 40^{\circ}\text{C}/90\%\text{RH}$ .
- 3.4.2 The moisture sensitivity class MSL of the module is 3.
- 3.4.3 After unpacking the vacuum bag, it must be used within 168 hours at  $25\pm 5^{\circ}\text{C}$  and 60% RH, otherwise it will need to be baked before it can be used.

A second second source is online.

### 6.2 electrostatic discharge

- 3.4.4 My body discharge mode (HBM):  $\pm 2000\text{V}$
- 3.4.5 Charging Device Mode (CDM):  $\pm 500\text{V}$

### 6.3 Reflow temperature profile

It is recommended that the module be reflowed only once.

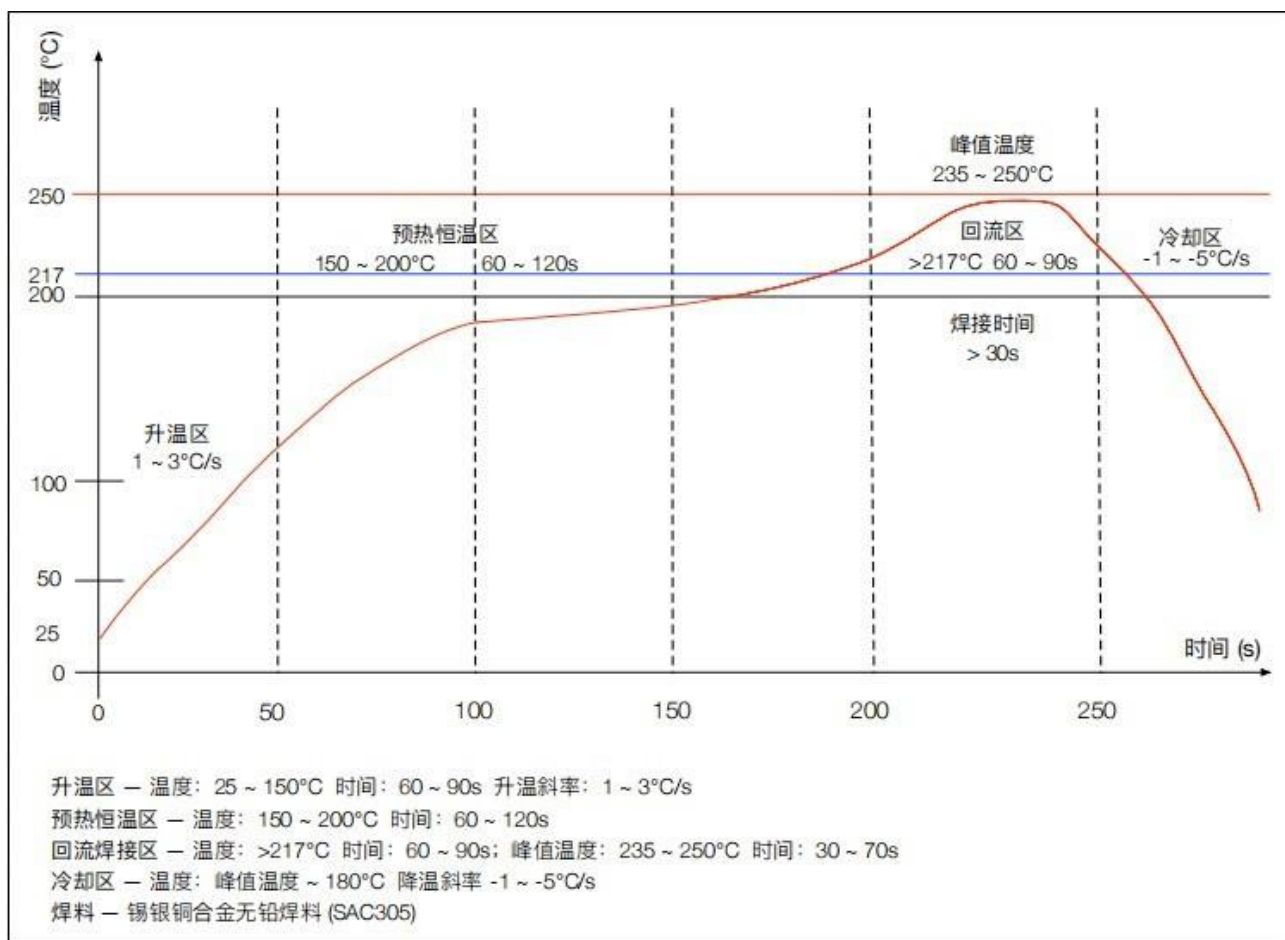


Figure 6: Reflow temperature profile

### 8.1 ultrasonic vibration

Avoid exposing the Next Sense module to vibration from ultrasonic equipment such as ultrasonic welders or ultrasonic cleaners. Vibration from ultrasonic equipment may resonate with the crystal inside the module, causing the crystal to malfunction or even fail, rendering the module inoperable or degrading its performance.

## 9. Relevant files and information

### 9.1 Related files of Next Rainbow Information

Please click the following web link to view or download more information:

[http://www.ehonglink.com/en/h-pd-35.html#\\_pp=118\\_1336](http://www.ehonglink.com/en/h-pd-35.html#_pp=118_1336)

Support Email: [support@ehonglink.com](mailto:support@ehonglink.com)

Sales Email: [sales@ehonglink.com](mailto:sales@ehonglink.com)

Contact: 021-64769993-201

### 9.2 revision history

| date       | releases | Updates         |
|------------|----------|-----------------|
| 2023-05-06 | V1.0     | Initial release |

|            |      |                                         |
|------------|------|-----------------------------------------|
| 2024-07-01 | V2.0 | Updated module size and pin definitions |
|------------|------|-----------------------------------------|

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01r01

List of applicable FCC rules:

FCC Part 15 Subpart C 15.247 & 15.207 & 15.209

Specific operational use conditions:

The module is a Bluetooth module with BLE function. Operation Frequency: 2402-2480MHz

Number of Channel: 40 Modulation: GFSK

Type: EH-MC33 Model PCB Antenna(1.20dBi)

The module can be used for mobile or portable applications with a maximum 1.20dBi 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 shown in this manual.

Limited module procedures

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

Trace antenna designs

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

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.

Antennas

Antenna Specification are as follows: Type: EH-MC33 (PCB Antenna: 1.20dBi)

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.)

Label and compliance information

Host product manufacturers need to provide a physical or e-label stating "Contains FCC ID: 2ACCRMC33" with their finished product.

Information on test modes and additional testing requirements

Operation Frequency: 2402-2480MHz Number of Channel: 40

Modulation: GFSK

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.

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

The modular transmitter is only FCC authorized for FCC Part 15 Subpart C 15.247 & 15.207 & 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: 2ACCRMC33" .

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.

### **ISED Statement**

English: This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) This device may not cause interference, and (2) This device must accept any interference, including interference that may cause undesired operation of the device. The digital apparatus complies with Canadian CAN ICES-3 (B)/NMB-3(B).

French: Le présent appareil est conforme aux CNR d'Industrie 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, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

### **Radiation Exposure Statement**

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

Déclaration d'exposition aux radiations

Cet équipement est conforme Canada limites d'exposition aux radiations dans un environnement non contrôlé. Cet équipement doit être installé et utilisé à distance minimum de 20cm entre le radiateur et votre corps.

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

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

As long as the condition above is 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.

Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes: Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les 1 condition ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

Important Note:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the Canada authorization is no longer considered valid and the IC cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

**Note Importante:**

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considérée comme valide et l'IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

**End Product Labeling**

The final end product must be labeled in a visible area with the following: Contains IC: 20625-MC33. Plaque signalétique du produit final

Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: Contient des IC: 20625-MC33

**Manual Information to the End User**

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual. Manuel d'information à l'utilisateur final

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module.

Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.

Mesh self-organizing network type communication equipment, can efficiently and quickly form a non-central wireless broadband network; BLE Wearable Devices, Fitness trackers and smartwatches that monitor heart rate, sleep patterns, steps taken, and other health metrics.