

# **MCR-WMDBE-CWP User Manual**

## ■ Revision History

| Version | Date       | Description | Author |
|---------|------------|-------------|--------|
| Rev1.0  | 2021.09.28 | Initial     |        |
|         |            |             |        |
|         |            |             |        |

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# 1. System Overview

## 1.1 General Description

MCR-WMDBE-CWP is a highly integrated single Module which features an application processor, a low power 1x1 11n single-band Wi-Fi subsystem, a Bluetooth subsystem, and a Power Management Unit.

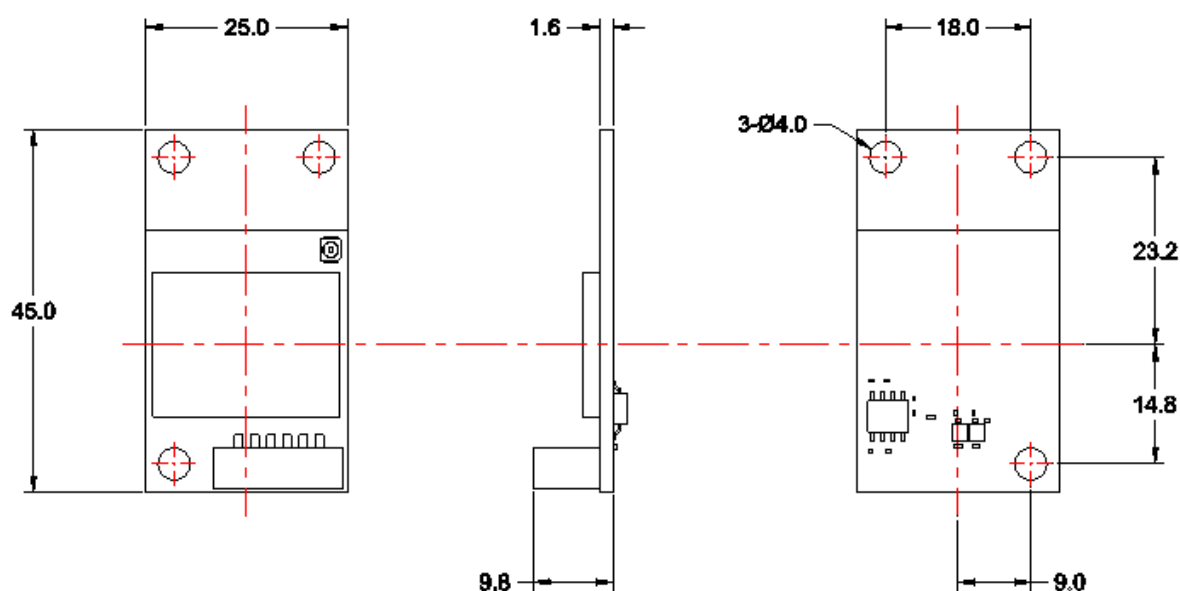
The Wi-Fi subsystem contains the 802.11a/b/g/n radio, baseband, and MAC that are designed to meet both the low power and high throughput application. It also contains a 32-bit RISC CPU that could fully offload the application processor.

The Bluetooth subsystem contains the Bluetooth radio, baseband, link controller. It also uses the same 32-bit RISC CPU for the Bluetooth protocols.

## 1.2 Features

### 1.2.1 Physical Dimension

| ITEM                       | Specification                             |
|----------------------------|-------------------------------------------|
| Dimension                  | 45.0 x 25.0 x 12.0 mm                     |
| Weight                     | Typ. 6.0 gram                             |
| Modem Interface            | SMW200-H06G ( Yeonho Electronics )        |
| External Antenna Connector | RF 2.5H REC CONNECTOR ( 7.005A5-000-1R0 ) |
| Mounting Hole              | 3 Hole                                    |



[Fig.1] Physical dimension

### **1.2.2 WLAN**

- IEEE 802.11 a/b/g/n Complicant
- Supports 20MHz bandwidth in 2.4GHz and 5GHz band
- Single-band 1T1R mode with data rate up to 75Mbps
- Greenfield, mixed mode, legacy modes support
- When the module is operated with the AP mode, 2.4GHz is only activated

### **1.2.3 Bluetooth**

- Bluetooth 4.2 Low Energy ( LE )
- Integrated Balun and PA
- Supports SCO AND Esco link with re-transmission
- Channel assessment for AFH

### **1.2.4 Applications**

- MCR-WMDBE-CWP is designed for Internet-of-Things that is Wi-Fi and Bluetooth design.

## 2. Electrical Characteristics

### 2.1 Absolute Maximum Raing

| Item                       | Min. | Max.  | Unit |
|----------------------------|------|-------|------|
| VCC_5V                     | -0.3 | +20   | V    |
| Storage Temperature        | -40  | +85   | °C   |
| ESD ( ESD HBM Protection ) |      | +2000 | V    |

### 2.2 Recommended Operating Range

| Item                  | Min. | Max. | Unit |
|-----------------------|------|------|------|
| VCC_5V                | +4.5 | +5.5 | V    |
| Operating Temperature | -30  | +85  | °C   |

### 2.3 Current Consumption

The listed current consumption is tested at 5V power supply.

| Mode |         |    |                      | Average ( mA ) | Peak ( mA ) |
|------|---------|----|----------------------|----------------|-------------|
| WiFi | Standby |    |                      |                |             |
|      | Tx mode | 2G | 802.11b CCK, 11Mbps  |                |             |
|      |         |    | 802.11g OFDM, 54Mbps |                |             |
|      |         |    | 802.11n OFDM, MCS7   |                |             |
|      |         | 5G | 802.11a OFDM, 6Mbps  |                |             |
|      |         |    | 802.11a OFDM, 54Mbps |                |             |
|      |         |    | 802.11n OFDM, MCS7   |                |             |
|      | RX Mode | 2G | 802.11b/g/n          |                |             |
|      |         | 5G | 802.11b/g/n          |                |             |
| BLE  | Tx mode |    |                      |                |             |
|      | RX Mode |    |                      |                |             |

### 3. Radio Characteristics

#### 3.1 Wi-Fi 2.4GHz Band RF transmitter Specifications

| Parameters          | Description                                   | Spec. |      |       |      |
|---------------------|-----------------------------------------------|-------|------|-------|------|
|                     |                                               | Min.  | Typ. | Max.  | Unit |
| Frequency Range     | Center channel Frequency                      | 2412  |      | 2462  | MHz  |
| Output Power        | 1 Mbps CCK                                    | 18    |      |       | dBm  |
|                     | 11 Mbps CCK                                   | 18    |      |       |      |
|                     | 6 Mbps OFDM                                   | 18    |      |       |      |
|                     | 54 Mbps OFDM                                  | 15    |      |       |      |
|                     | HT20, MCS0                                    | 16.5  |      |       |      |
|                     | HT20, MCS7                                    | 15    |      |       |      |
| Tx EVM              | 1 Mbps CCK                                    |       |      | 35    | %    |
|                     | 11 Mbps CCK                                   |       |      | 35    |      |
|                     | 6 Mbps OFDM                                   |       |      | -5    | dB   |
|                     | 54 Mbps OFDM                                  |       |      | -25   |      |
|                     | HT20, MCS0                                    |       |      | -5    |      |
|                     | HT20, MCS7                                    |       |      | -28   |      |
| frequency Tolerance | 802.11b<br>Chip Clock Frequency Tolerance     |       |      | +/-25 | ppm  |
|                     | 802.11g/n<br>Symbol Clock Frequency Tolerance |       |      | +/-20 |      |

### 3.2 Wi-Fi 2.4GHz Band RF Receiver Specifications

| Parameters             | Description                  | Spec. |      |      |      |
|------------------------|------------------------------|-------|------|------|------|
|                        |                              | Min.  | Typ. | Max. | Unit |
| Frequency Range        | Center channel Frequency     | 2412  |      | 2462 | MHz  |
| RX Sensitivity         | 1 Mbps CCK                   |       | -97  | -94  | dBm  |
|                        | 2 Mbps CCK                   |       | -93  | -90  |      |
|                        | 5.5 Mbps CCK                 |       | -91  | -88  |      |
|                        | 11 Mbps CCK                  |       | -89  | -86  |      |
|                        | BPSK rate 1/2, 6 Mbps OFDM   |       | -94  | -91  |      |
|                        | BPSK rate 3/4, 9 Mbps OFDM   |       | -91  | -88  |      |
|                        | QPSK rate 1/2, 12 Mbps OFDM  |       | -89  | -86  |      |
|                        | QPSK rate 3/4, 18 Mbps OFDM  |       | -87  | -84  |      |
|                        | 16QAM rate 1/2, 24 Mbps OFDM |       | -83  | -80  |      |
|                        | 16QAM rate 3/4, 36 Mbps OFDM |       | -80  | -77  |      |
|                        | 64QAM rate 1/2, 48 Mbps OFDM |       | -78  | -75  |      |
|                        | 64QAM rate 3/4, 54 Mbps OFDM |       | -76  | -73  |      |
|                        | HT20, MCS0                   |       | -93  | -90  |      |
|                        | HT20, MCS1                   |       | -90  | -87  |      |
|                        | HT20, MCS2                   |       | -87  | -84  |      |
|                        | HT20, MCS3                   |       | -84  | -81  |      |
|                        | HT20, MCS4                   |       | -81  | -78  |      |
|                        | HT20, MCS5                   |       | -76  | -73  |      |
|                        | HT20, MCS6                   |       | -75  | -72  |      |
|                        | HT20, MCS7                   |       | -73  | -70  |      |
| Maximum Receiver Level | 802.11b                      | -10   |      |      | dBm  |
|                        | 802.11g                      | -20   |      |      |      |
|                        | 802.11n                      | -20   |      |      |      |

### 3.3 Wi-Fi 5GHz Band RF transmitter Specifications

| Parameters          | Description                                   | Spec. |      |       |      |
|---------------------|-----------------------------------------------|-------|------|-------|------|
|                     |                                               | Min.  | Typ. | Max.  | Unit |
| Frequency Range     | Center channel Frequency                      | 5180  |      | 5825  | MHz  |
| Output Power        | 6 Mbps OFDM                                   | 16    |      |       |      |
|                     | 54 Mbps OFDM                                  | 14    |      |       |      |
|                     | HT20, MCS0                                    | 16    |      |       |      |
|                     | HT20, MCS7                                    | 14    |      |       |      |
| Tx EVM              | 6 Mbps OFDM                                   |       |      | -5    | dB   |
|                     | 54 Mbps OFDM                                  |       |      | -25   |      |
|                     | HT20, MCS0                                    |       |      | -5    |      |
|                     | HT20, MCS7                                    |       |      | -28   |      |
| Frequency Tolerance | 802.11g/n<br>Symbol Clock Frequency Tolerance |       |      | +/-20 | ppm  |

### 3.4 Wi-Fi 5GHz Band RF Receiver Specifications

| Parameters             | Description                  | Spec. |      |      |      |
|------------------------|------------------------------|-------|------|------|------|
|                        |                              | Min.  | Typ. | Max. | Unit |
| Frequency Range        | Center channel Frequency     | 5180  |      | 5825 | MHz  |
| RX Sensitivity         | BPSK rate 1/2, 6 Mbps OFDM   |       | -92  | -89  | dBm  |
|                        | BPSK rate 3/4, 9 Mbps OFDM   |       | -90  | -87  |      |
|                        | QPSK rate 1/2, 12 Mbps OFDM  |       | -90  | -86  |      |
|                        | QPSK rate 3/4, 18 Mbps OFDM  |       | -88  | -85  |      |
|                        | 16QAM rate 1/2, 24 Mbps OFDM |       | -85  | -82  |      |
|                        | 16QAM rate 3/4, 36 Mbps OFDM |       | -81  | -78  |      |
|                        | 64QAM rate 1/2, 48 Mbps OFDM |       | -77  | -74  |      |
|                        | 64QAM rate 3/4, 54 Mbps OFDM |       | -75  | -72  |      |
|                        | HT20, MCS0                   |       | -92  | -89  |      |
|                        | HT20, MCS1                   |       | -90  | -87  |      |
|                        | HT20, MCS2                   |       | -87  | -84  |      |
|                        | HT20, MCS3                   |       | -84  | -81  |      |
|                        | HT20, MCS4                   |       | -81  | -78  |      |
|                        | HT20, MCS5                   |       | -76  | -73  |      |
|                        | HT20, MCS6                   |       | -74  | -71  |      |
|                        | HT20, MCS7                   |       | -73  | -70  |      |
| Maximum Receiver Level | 802.11g                      | -20   |      |      | dBm  |
|                        | 802.11n                      | -20   |      |      |      |

### 3.5 Bluetooth LE transmitter Specifications

| Parameters                         | Description                               | Spec. |      |      |       |
|------------------------------------|-------------------------------------------|-------|------|------|-------|
|                                    |                                           | Min.  | Typ. | Max. | Unit  |
| Frequency Range                    | Center channel Frequency                  | 2402  |      | 2480 | MHz   |
| Output Power                       | At max power out level                    | -20   | 7    | 10   | dBm   |
| Carrier Frequency offset and Drift | Frequency offset                          | -150  |      | 150  | kHz   |
|                                    | Frequency drift                           | -50   |      | 50   | kHz   |
|                                    | Max. drift rate                           | -20   |      | 20   | Hz/us |
| Modulation characteristic          | $\Delta f_{1_{avg}}$                      | 225   |      | 275  | kHz   |
|                                    | $\Delta f_{1_{max}}$                      | 185   |      |      | kHz   |
|                                    | $\Delta f_{2_{avg}} / \Delta f_{1_{avg}}$ | 0.8   | 0.94 |      | Hz/us |
| In-band Spurious Emission          | $\pm 2M$ offset                           |       |      | -20  | dBm   |
|                                    | $> \pm 3M$ offset                         |       |      | -30  | dBm   |

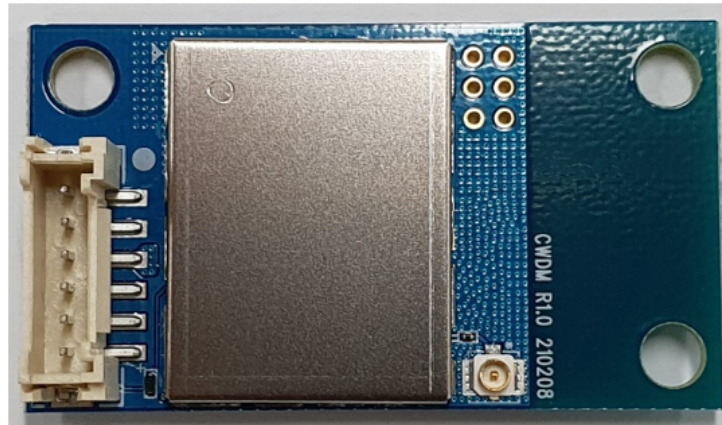
### 3.6 Bluetooth LE Receiver Specifications

| Parameters      | Description              | Spec. |      |      |      |
|-----------------|--------------------------|-------|------|------|------|
|                 |                          | Min.  | Typ. | Max. | Unit |
| Frequency Range | Center channel Frequency | 2402  |      | 2480 | MHz  |
| Min Sensitivity | PER < 30.8%              |       | -95  | -92  | dBm  |
| Max input Level | PER < 30.8%              | -10   | -5   |      | dBm  |

## 4. Module Interface Description

### 4.1 I/O Interface Connector ( power / Reset / UART )

1. GND
2. GND
3. VCC\_5V
4. TX
5. RX
6. RSTN

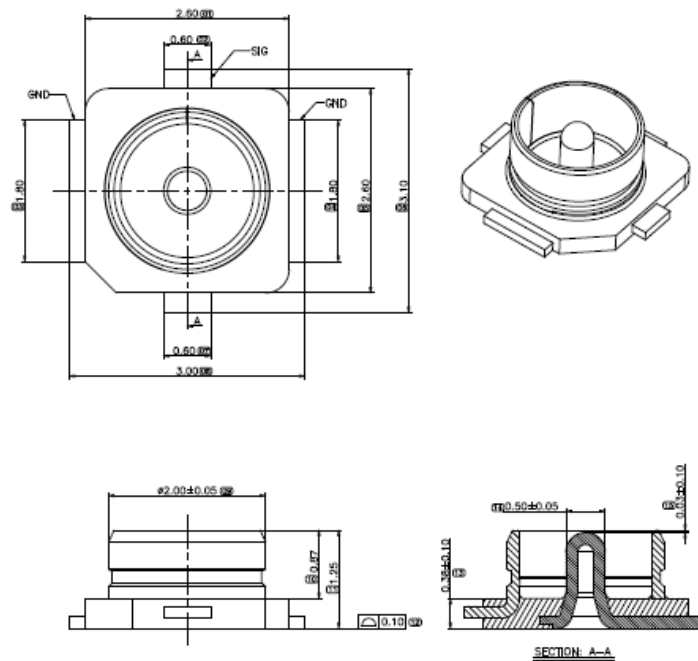


**[Fig.3] I/O Interface Connector**

| ITEM                      | PIN No. | PIN Name | Description                     |
|---------------------------|---------|----------|---------------------------------|
| SMW200-H06G<br>( Yeonho ) | 1       | GND      | System Ground                   |
|                           | 2       | GND      | System Ground                   |
|                           | 3       | VCC_5V   | Power Supply ( 5V )             |
|                           | 4       | TX       | UART TXD ( 5V level )           |
|                           | 5       | RX       | UART RXD ( 5V level )           |
|                           | 6       | RSTN     | 5V Level active low Reset input |

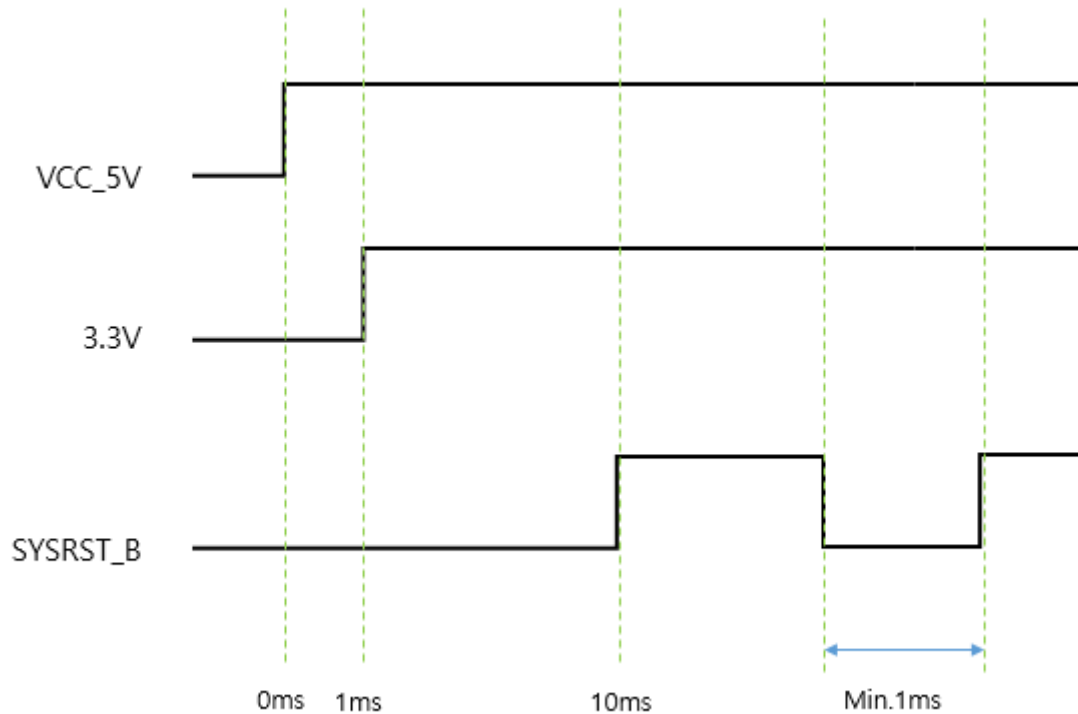
## 4.2 Coaxial RF Connector

| Item         | Description                         |
|--------------|-------------------------------------|
| Manufacturer | Kunshan Jiahua Electronics Co., Ltd |
| Part Number  | 7.005A5-000-1R0                     |



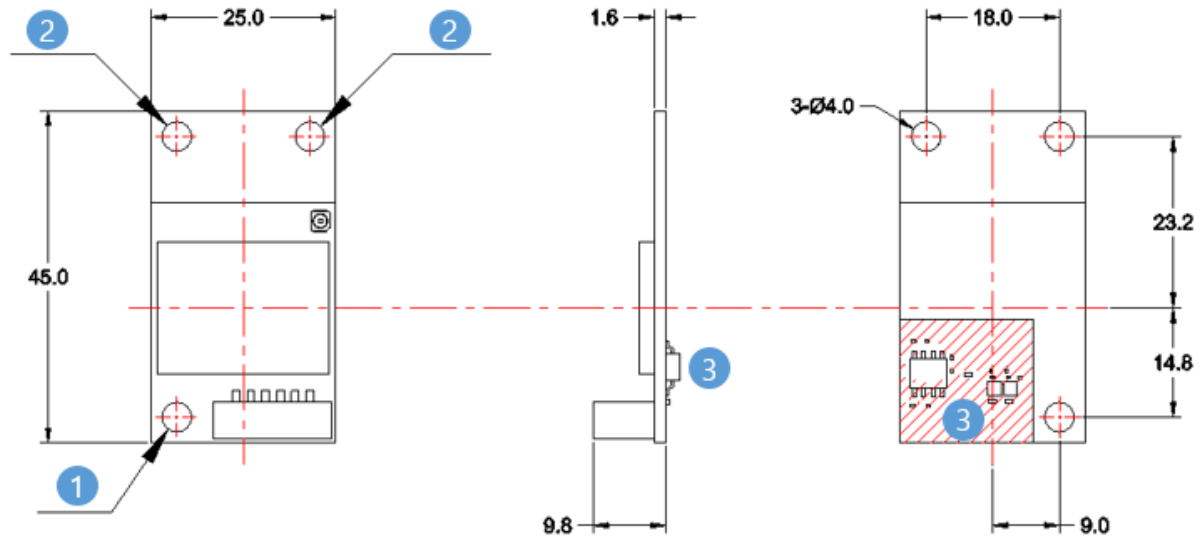
[Fig.4] Coaxial RF Connector Dimension

## 5. Power on Sequence & HW reset



**[Fig.5] I/O Interface Connector**

## 6. Mechanical Guide & Assembly



|   |                                                                                                                                                                                                                                                         |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ① | This is a Screw hole for fixing the Module. You can use screws of M4 or less.                                                                                                                                                                           |
| ② | 1. In case of using the external antenna<br>This is a Screw hole for fixing the Module. You can use screws of M4 or less.<br>2. in case of using the internal antenna<br>This is just an module hole for fixing the module.<br>Do not insert the screw. |
| ③ | Be careful not to interfere with module's parts on bottom and Injection equipment                                                                                                                                                                       |
| ④ | We recommend to place the antenna as free of metallic materials as possible                                                                                                                                                                             |

## 7. FCC Statement

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

This device should be installed and operated with minimum 20 cm between the radiator and your body.

### INTEGRATION INSTRUCTIONS

#### List of applicable FCC rules

Complies with part 15.247, Part 15.407

#### Summarize the specific operational use conditions

This device should be installed and operated with minimum 20 cm between the radiator and your body. The module must not be co-located or operating in conjunction with any other antenna or transmitter.

#### Limited module procedures

Not applicable

#### Trace antenna designs

Not applicable

#### RF exposure considerations

This module complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. The module is limited to installation in mobile or fixed applications. At least 20 Cm of separation distance between the transmitting antenna and the user's body must be maintained at all times.

The host manual shall include the RF exposure statements.

#### Antennas

This device is designed to operate with antennas listed in table below.

| Manufacture | Model          | Antenna type |
|-------------|----------------|--------------|
| K-MARU      | MW25DEC130PT-V | PCB Antenna  |
| INNO-LINK   | INNO-APC-0321  | PCB Antenna  |
| COWAY       | CWA-01         | PCB Antenna  |
| WINIZEN     | W5I-BO-07      | PCB Antenna  |

**Label and compliance information**

The module is labeled with its own FCC. If the FCC ID 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. In that case, the final end product must be labeled in a visible area with the following:

"Contains FCC ID: 2AVW5MCRWMDBECWP"

The host manual shall include the following regulatory statement:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

This device should be installed and operated with minimum 20 cm between the radiator and your body.

**Information on test modes and additional testing requirements**

This module is tested in a standalone. Co-location of this module with other transmitters that operate simultaneously are required to be evaluated using the FCC multi-transmitter procedures.

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

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.

The host product may need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.