

## Datasheet

## EMB1016 BLE Module

Built-in ultra-low MX1510 MCU, 64KB SRAM, 512KB Flash  
BT 5.1 core specification, Security Algorithm  
ultra-high integration, rich peripherals

version: 1.0

Date: 2022-03-04

NO.: DS0194CN

## Abstract

- **Input Voltage:** 1.8V~3.6V
- **Operating Temperature:** -40°C to +85°C
- **Processor: MX1510**
  - Main Frequency up to 20MHz
  - Cortex-M0 core
- **Memory**
  - 64KB SRAM
  - 512KB XIP Flash
- **Bluetooth**
  - Support BT 5.0/5.1 core specification, BLE Mesh
  - Support 125Kbps/500Kbps/1Mbps/2Mbps
  - RX Sensitivity: -96dBm @1Mbps, 94dBm@2Mbps, 105dBm@125kbps
  - TX power: +7dBm
  - Support Single-Ended Antenna Output
- **Rich Peripherals**
  - Support Up to 18 interface
  - 2 I2C interface(support bus arbitration)
  - 2 SPI interface
  - 3 UART (support ISO7816, LIN, IrDA)
  - 2 PDM interface, support Digital MIC,
  - 1 I2S interface
  - 12-bit high precision SAR ADC, 5 channels
  - 6 timers, 14 sets of PWM signal output, 4 sets of complementary support
  - RTC: supports high precision hardware temperature repair
  - Watchdog timers: IWDG and WWDG



- **Security and Arithmetic acceleration unit**
  - ECC Elliptic Curve encryption (256)
  - AES Advanced encryption (256/192/128)
  - T/DES Advanced Encryption (192/128/64)
  - True Random number generator (TRNG)
  - Computing Accelerator (CALC)
- **Interface and Dimension**
  - Onboard PCB Antenna
  - 3 x 7 pin, 1.3mm pitch, stamp hole
  - 11 mm x 15.2 mm
- **Rich supporting software**
  - Support MXOS
  - Support xBT Bluetooth stack, broadcast, scan, Peripheral and Central modes, extended broadcast, long-range and other 5.0 new features
  - Support Bluetooth Sig Mesh
  - Support the MXCHIP xMesh stack
  - Support Controller and Host modes
  - Bluetooth AT firmware, supporting transparent transmission
- **Ordering Code**

| Ordering Code | Note        |
|---------------|-------------|
| EMB1016-PZG6  | PCB Antenna |

## Ordering Code

|                                                |            |          |           |          |           |          |          |          |             |
|------------------------------------------------|------------|----------|-----------|----------|-----------|----------|----------|----------|-------------|
| <b>For example,</b>                            | <b>EMB</b> | <b>1</b> | <b>01</b> | <b>6</b> | <b>-P</b> | <b>Z</b> | <b>G</b> | <b>6</b> | <b>-XXX</b> |
| Product Series                                 |            |          |           |          |           |          |          |          |             |
| EMB = IoT BLE Module                           |            |          |           |          |           |          |          |          |             |
| Product Type                                   |            |          |           |          |           |          |          |          |             |
| 1=Welding type wireless module                 |            |          |           |          |           |          |          |          |             |
| Typical target applications and features       |            |          |           |          |           |          |          |          |             |
| 01=IOT Application 1 Series                    |            |          |           |          |           |          |          |          |             |
| Dimensions, enhancements                       |            |          |           |          |           |          |          |          |             |
| 11mm x 15.2mm, 3 x 7pin 1.3 Spacing stamp hole |            |          |           |          |           |          |          |          |             |
| RF Interface                                   |            |          |           |          |           |          |          |          |             |
| P=2.4GHz On-Board PCB Antenna                  |            |          |           |          |           |          |          |          |             |
| SRAM Capacity(optional)                        |            |          |           |          |           |          |          |          |             |
| Z = No SRAM                                    |            |          |           |          |           |          |          |          |             |
| Flash capacity (omit)                          |            |          |           |          |           |          |          |          |             |
| G = 512KB Flash                                |            |          |           |          |           |          |          |          |             |
| Operation temperature(omit)                    |            |          |           |          |           |          |          |          |             |
| 7 = Industrial temperature range, -40°C~85°C   |            |          |           |          |           |          |          |          |             |
| Option                                         |            |          |           |          |           |          |          |          |             |
| TR = tape and reel (default package is tray)   |            |          |           |          |           |          |          |          |             |

For a list of all relevant features (such as packaging, minimum order quantity, etc.) and other information, please contact the nearest MXCHIP sales point and agent.

## Accessories

| Order Code      | Description                                                                          |
|-----------------|--------------------------------------------------------------------------------------|
| MXKIT-Base      | Development board for all EMB1016 modules                                            |
| MXKIT-Core-1016 | The development board core board for the EMB1016, used with MXKIT-Base               |
| FX-1016         | EMB1016 production fixture with accompanying test board: MXKIT-Base, MXKIT-Core-1016 |

## Version Update Instructions

| Date       | Version | Update Contents |
|------------|---------|-----------------|
| 2022-03-04 | 1.0     | Initial Version |

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# Catalog

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# 1. Introduction

Based on MX1510 Bluetooth microcontroller, EMB1016 series modules can realize data acquisition and control with rich peripheral interfaces, and communicate with other Bluetooth devices through the built-in Bluetooth subsystem. They can not only interact directly with mobile phones, but also connect data to Internet of Things cloud service platform through Mesh network. This series of modules through a variety of different dimensions, interface forms, antenna interface, applied to a wide range of Internet of things products.

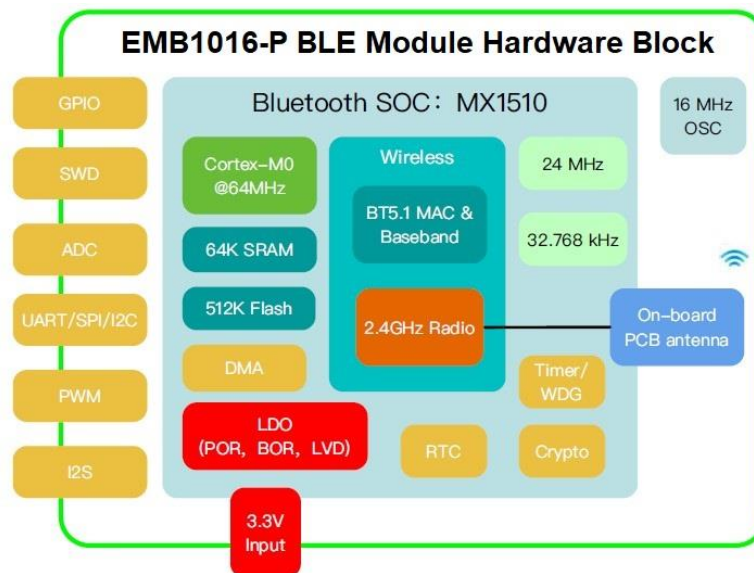
EMB1016 module is built with an ultra-high integration Bluetooth microcontroller, MX1510, which integrates 64KB bytes of SRAM, 512K bytes of Flash storage, and a Bluetooth controller that supports the Bluetooth 5.0 core specification. The processor supports multiple low power modes for Bluetooth beacon, tag, sensor, button and other applications. The module provides stamp hole interface for flexible installation. The module uses high temperature resistant components and white PCB ink, suitable for application in high temperature lighting scenarios.

MXCHIP provides MXOS software platform to support the development of EMB1016 series modules, providing an efficient development environment. MXOS includes xBT Bluetooth protocol stack, xMesh SDK, and various Bluetooth sample programs and typical applications.

The following is a hardware block diagram of the EMB1016 module. It mainly includes:

- Bluetooth MCU MX1510
- PCB Antenna
- Power supply and Communication interface

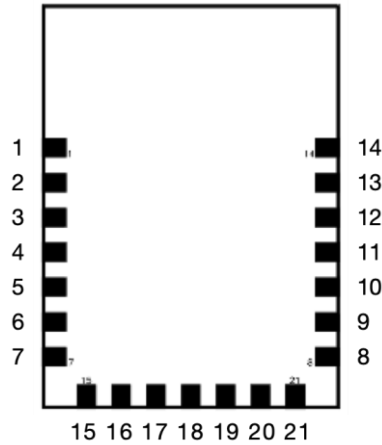
Figure 1 Hardware Block Diagram



## 2. Pin Definition

### 2.1. Pin Arrangement

Figure 2 Pin Arrangement



### 2.2. Pin Definition

Table 1 Module operating mode selection

| No. | Name  | Type       | Despition                                                      | Setting <sup>(2)</sup>        |
|-----|-------|------------|----------------------------------------------------------------|-------------------------------|
| 1   | PB08  | I/O        | GPIO                                                           | PWM, Cold LED <sup>(3)</sup>  |
| 2   | PB09  | I/O        | GPIO                                                           | PWM, Warm LED <sup>(3)</sup>  |
| 3   | PB12  | I/O/Analog | GPIO/ADC_CH0                                                   |                               |
| 4   | PB13  | I/O/Analog | GPIO/ADC_CH1                                                   |                               |
| 5   | PB06  | I/O        | GPIO/SWCLK                                                     | SWCLK                         |
| 6   | PB05  | I/O        | GPIO/SWDIO                                                     | SWDIO                         |
| 7   | PB01  | I/O        | GPIO/UART1_RXD, debug serial port <sup>(1)</sup> ,<br>ISP burn | DEBUG_UART_RX                 |
| 8   | PA00  | I/O/Analog | GPIO/ADC_CH4/Wakeup                                            |                               |
| 9   | PA01  | I/O/Analog | GPIO/ADC_CH5                                                   | PWM, Red LED <sup>(3)</sup>   |
| 10  | NRST  | I          | Reset signal, active at low level                              | Reset                         |
| 11  | PA02  | I/O/Analog | GPIO/ADC_CH6                                                   | PWM, Green LED <sup>(3)</sup> |
| 12  | PA08  | I/O        | GPIO                                                           | PWM, Blue LED <sup>(3)</sup>  |
| 13  | PA13  | I/O        | GPIO                                                           |                               |
| 14  | PA14  | I/O        | GPIO                                                           |                               |
| 15  | PB00  | I/O        | GPIO/UART1_TXD, debug serial <sup>(1)</sup> , ISP<br>burn      | DEBUG_UART_TX                 |
| 16  | PB11  | I/O        | GPIO/Wakeup:                                                   | USER_UART_TX                  |
| 17  | PB10  | I/O        | GPIO                                                           | USER_UART_RX                  |
| 18  | GND   | Power      |                                                                |                               |
| 19  | VDD33 | Power      | 3.3V Power Input                                               |                               |
| 20  | PB14  | I/O        | GPIO/BOOT <sup>(1)</sup>                                       | BOOT <sup>(1)</sup>           |
| 21  | PB15  | I/O        | GPIO/Wakeup                                                    | STATUS <sup>(1)</sup>         |

#### Special notes:

1. At startup, the hardware detects PB14 to decide whether to enter ISP mode. This is a hardware-

solidified function, so it cannot be modified. When using the SDK or firmware provided by MXCHIP, the firmware will also detect the PB15 pin to determine whether to enter QC mode.

All specific working modes and entry modes of the module are shown in Table 2.

- ISP mode: UART connects the module's PB00 (UART1\_TXD) and PB01 (UART1\_RXD), allowing to program the on-chip Flash using a burn-in tool.
- This mode is mainly used for production. During development, firmware can be downloaded directly through the SWD debugging interface using an emulator.
- QC mode: Run an internal test program, which processes data via PB11 (USER\_UART\_TX) and PB10 (USER\_UART\_RX).
- Serial port parameters: 115200/8/n/1.
- Normal mode: The application executes automatically.

Table 2 Module operating mode selection

| Operation Mode | PB14             | PB15             |
|----------------|------------------|------------------|
|                | Default state: 0 | Default state: 1 |
| ISP            | 1                | x                |
| Normal         | 0                | 1                |
| QC             | 0                | 0                |

2. The processor can be configured to attach GPIO to any digital peripheral. In the module SDK provided by MXCHIP, some IO port functions have been preset.
3. Default Settings in the PWM lighting example scenario.

### 3. Electrical Parameters

#### 3.1. Electrical characteristics

| Parameter             | Description                     | Min.      | Typ.  | Max.      | Unit |
|-----------------------|---------------------------------|-----------|-------|-----------|------|
| Operating Temperature |                                 | -40       |       | 85        | °C   |
| Supply Voltage        | Regulator supply input          | 1.8       | 3.3   | 3.6       | V    |
| V <sub>IH</sub>       | High Level Input Voltage        | 0.9*VDD33 |       | VDD33     | V    |
| V <sub>IL</sub>       | Low Level Input Voltage         | 0         |       | 0.1*VDD33 | V    |
| V <sub>OH</sub>       | High Level Output Voltage       | VDD33-0.4 |       | VDD33     | V    |
| V <sub>OL</sub>       | Low Level Output Voltage        |           |       | 0.4       | V    |
| Source Current        |                                 |           | 60    |           | mA   |
| Sink Current          |                                 |           | 30    |           | mA   |
| V <sub>ESD</sub>      | Electrostatic discharge voltage |           | ±8000 |           | V    |

#### 3.2. Typical Parameters

| Mode                            | Average | Max. | Unit |
|---------------------------------|---------|------|------|
| TX Mode @ 0dBm 1Mbps, CPU 64MHz | 15.8    | 31.9 | mA   |
| TX Mode @ 7dBm 1Mbps, CPU 64MHz | 27.3    | 35.2 | mA   |
| RX Mode @ 1Mbps, CPU 64MHz      | 16.2    | 22   | mA   |
| RF Idle @ CPU 64MHz             | 6.8     | 10   | mA   |
| Standby Mode                    | 2       |      | mA   |
| Low Power Mode2                 | 1.1     |      | mA   |
| Low Power Mode3                 | 0.7     |      | mA   |

#### 3.3. RF parameter

Table 3 RF received parameter

| Symbol                             | Description                               | Min. | Typ.  | Max.   | Unit |
|------------------------------------|-------------------------------------------|------|-------|--------|------|
| <b>Receiver operation</b>          |                                           |      |       |        |      |
| PRX <sub>MAX</sub>                 | Maximum received signal strength at <0.1% |      | -1.5  |        | dBm  |
| PRX <sub>SENS,2M</sub>             | Sensitivity (0.1% BER) at 2 Mbps          |      | -94   | -97    | dBm  |
| PRX <sub>SENS,1M</sub>             | Sensitivity (0.1% BER) at 1 Mbps          |      | -96   | -100.7 | dBm  |
| PRX <sub>SENS,500k</sub>           | Sensitivity (0.1% BER) at 500 kbps        |      | -98   | -99    | dBm  |
| PRX <sub>SENS,250k</sub>           | Sensitivity (0.1% BER) at 125 kbps        |      | -104  | -105   | dBm  |
| P <sub>SENS IT</sub><br>1 Mbps BLE | Receiver sensitivity: Ideal transmitter   |      | -99   | -100   | dBm  |
| P <sub>SENS DT</sub><br>1 Mbps BLE | Receiver sensitivity: Dirty transmitter   |      | -98.5 | -99.5  | dBm  |

Table 4 RF transmitted parameter

| Symbol        | Description                           | Min | Typ  | Max | Unit |
|---------------|---------------------------------------|-----|------|-----|------|
| $P_{RF\_PA}$  | Maximum output power                  |     | 8    |     | dBm  |
| $P_{RFC\_PA}$ | RF power control range                |     | 40   |     | dB   |
| $P_{BW1\_PA}$ | 20 dB bandwidth for modulated carrier |     | 1000 |     | KHz  |
| $F_{DR}$      | Frequency Drift Error                 |     |      |     | KHz  |

The parameters of the module meet the requirements of FCC Part 15.247

## 4. Antenna Information

EMB1016 designs a PCB antenna.

### 4.1. PCB antenna parameters

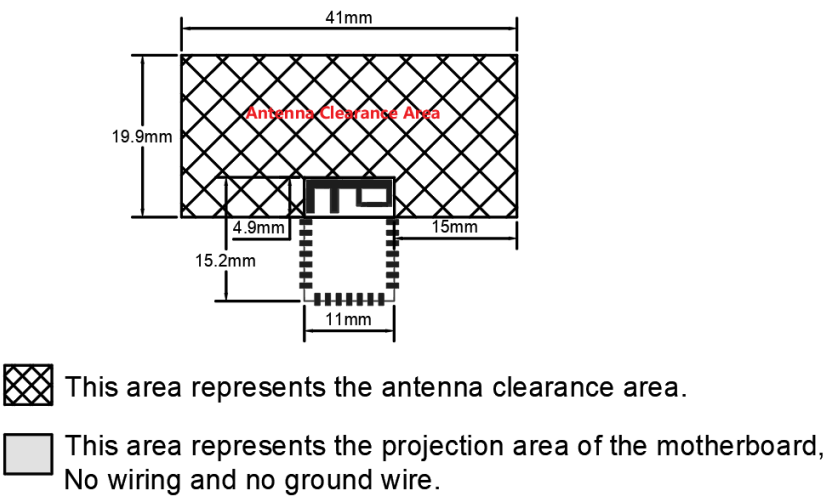
Table 5 On-board PCB parameter

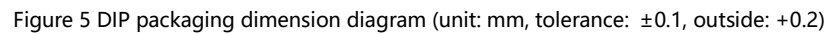
| Item       | Min.                           | Typical | Max. | Unit     |
|------------|--------------------------------|---------|------|----------|
| Frequency  | 2400                           |         | 2500 | MHz      |
| Impedance  |                                | 50      |      | $\Omega$ |
| VSWR       |                                |         | 2    |          |
| Gain       | $\leq 2\text{dBi}$             |         |      |          |
| Efficiency | $> 54\%$ or $> -2.68\text{dB}$ |         |      |          |

### 4.2. PCB Antenna Clearance

When using PCB antenna in BLE module, it is necessary to ensure that PCB and other metal devices are at least 15 mm away from the motherboard. The shaded areas in the figure below need to be far away from metal devices, sensors, interference sources and other materials that may cause signal interference.

Figure 3 Antenna minimum clearance area (unit: mm)





## 6. Production Guidelines

MXCHIP stamp port packaging module must be SMT machine patches, module humidity sensitivity grade MSL3, after unpacking more than a fixed time patches to bake module.

- SMT patches require instruments
  - Reflow bonding machine
  - AOI detector
  - 6-8mm suction nozzle
- Baking requires equipment:
  - Cabinet oven
  - Anti-static, high temperature tray
  - Antistatic and heat resistant gloves

The storage conditions of MXCHIP module are as follows:

- Moisture-proof bags must be stored in an environment with temperature < 30 degree C and humidity < 85% RH.
- A humidity indicator card is installed in the sealed package.

Figure 6 Humidity Card



After the module is split, if the humidity card shows pink, it needs to be baked.

The baking parameters are as follows:

- The baking temperature is  $120^{\circ}\text{C} \pm 5^{\circ}\text{C}$  and the baking time is 4 hours.
- The alarm temperature is set to  $130^{\circ}\text{C}$ .
- SMT patches can be made after cooling <  $36^{\circ}\text{C}$  under natural conditions.
- Drying times: 1 time.
- If there is no welding after baking for more than 12 hours, please bake again.

If the disassembly time exceeds 3 months, SMT process is forbidden to weld this batch of modules, because PCB gold deposition process, over 3 months, pad oxidation is serious, SMT patch is likely to lead to virtual welding, leak welding, resulting in various problems, our company does not assume the corresponding responsibility.

Before SMT patch, ESD (Electrostatic Discharge, Electrostatic Release) protection should be applied to the module.

SMT patches should be made according to the reflow curve. The peak temperature is 250°C.

In order to ensure the qualified rate of reflow soldering, 10% of the first patches should be taken for visual inspection and AOI testing to ensure the rationality of furnace temperature control, device adsorption mode and placement mode, and 5-10 patches per hour are recommended for visual inspection and AOI testing in subsequent batch production.

## 6.1. Precautions

- Operators of each station must wear static gloves during the entire production process.
- Do not exceed the baking time when baking.
- It is strictly forbidden to add explosive, flammable, or corrosive substances during baking.
- When baking, the module uses a high temperature tray to be placed in the oven to keep the air circulation between each module while avoiding direct contact between the module and the inner wall of the oven.
- When baking, please close the oven door to ensure that the oven is closed to prevent temperature leakage and affect the baking effect.
- Try not to open the door when the oven is running. If it must be opened, try to shorten the time for opening the door.
- After baking, the module should be naturally cooled to <36°C before wearing the static gloves to avoid burns.
- When operating, strictly guard against water or dirt on the bottom of the module.

The temperature and humidity control level of MXCHIP factory module is Level3, and the storage and baking conditions are based on IPC/JEDEC J-STD-020.

## 6.2. Storage Condition

Figure 7 Storage Conditions Diagram

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                          |                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>CAUTION</b><br>This bag contains<br><b>MOISTURE-SENSITIVE DEVICES</b> | <b>LEVEL</b><br><b>3</b><br><small>If Blank, see adjacent bar code label</small> |
| <p>1. Calculated shelf life in sealed bag: 12 months at &lt;40°C and &lt;90% relative humidity (RH)</p> <p>2. Peak package body temperature: <u>260</u> °C<br/><small>If Blank, see adjacent bar code label</small></p> <p>3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must<br/>a) Mounted within: <u>168</u> hrs. of factory conditions<br/><small>If Blank, see adjacent bar code label</small><br/>≤30°C/60%RH, OR<br/>b) Stored at &lt;10% RH</p> <p>4. Devices require bake, before mounting, if:<br/>a) Humidity Indicator Card is &gt; 10% when read at 23 ± 5°C<br/>b) 3a or 3b not met.</p> <p>5. If baking is required, devices may be baked for 48 hrs. at 125±5°C</p> <p>Note: If device containers cannot be subjected to high temperature or shorter bake times are desired, reference IPC/JEDEC J-STD-033 for bake procedure</p> <p>Bag Seal Date: _____<br/><small>If Blank, see adjacent bar code label</small></p> <p>Note: Level and body temperature defined by IPC/JEDEC J-STD-020</p> |                                                                          |                                                                                  |

## 7. Label Information

Figure 8 Module Label Schematic Diagram



1. MXCHIP: Company Logo.
2. FCC ID: FCC Authorization ID
3. Product Module: EMB1016-P
4. ZG6: Product extended code
5. W2145: Production serial number
6. B0F89300A528: MAC address.
7. QR code: MAC Address.

Note: Due to production batches and versions, etc., the above label schematics are for reference only, please refer to the actual product.

## 8. FCC Declaration

### 8.1. Trace antenna designs

For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ – Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects: layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements.

- a) Information that includes permitted variances (e.g., trace boundary limits, thickness, length, width, shape(s), dielectric constant, and impedance as applicable for each type of antenna);
- b) Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency, the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered);
- c) The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout;
- d) Appropriate parts by manufacturer and specifications;
- e) Test procedures for design verification; and
- f) Production test procedures for ensuring compliance.

The module grantee shall provide a notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

**Explanation:** Yes, This module has a permanently connected PCB antenna

### 8.2. RF exposure considerations

It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information: (1) to the host product manufacturer, to define the application conditions (mobile, portable – xx cm from a person's body); and (2) additional text needed for the host product manufacturer to provide to end users in their end-product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).

**Explanation:** This module complies with FCC RF radiation exposure limits set forth for an uncontrolled environment, This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body." This module is designed to comply with the FCC statement, FCC ID is: P53-EMB1016.

### 8.3. Antennas

A list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an “omni-directional antenna” is not considered to be a specific “antenna type”)).

For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on the Part 15 authorized transmitters used in the host product. The module manufacturers shall provide a list of acceptable unique connectors.

**Explanation:** The EUT has a PCB Antenna, and the antenna use a permanently attached antenna which is unique.

### 8.4. Label and compliance information

Grantees are responsible for the continued compliance of their modules to the FCC rules. This includes advising host product manufacturers that they need to provide a physical or e-label stating “Contains FCC ID” with their finished product. See [Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748](#).

**Explanation:** The host system using this module, should have label in a visible area indicated the following texts: "Contains FCC ID: P53-EMB1016.

### 8.5. Information on test modes and additional testing requirements

Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

The grantee should provide information on how to configure test modes for host product evaluation for different operational conditions for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host.

Grantees can increase the utility of their modular transmitters by providing special means, modes, or instructions that simulates or characterizes a connection by enabling a transmitter. This can greatly simplify a host manufacturer’s determination that a module as installed in a host complies with FCC requirements.

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

The grantee should include a statement that the modular transmitter is **only** FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital 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.

**Explanation:** The module without unintentional-radiator digital circuitry, so the module does not require an evaluation by FCC Part 15 Subpart B. The host should be evaluated by the FCC Subpart B.

- The module is limited to OEM installation ONLY.
- The OEM integrator is responsible for ensuring that the end-user has no manual instructions to remove or install module.
- The module is limited to installation in mobile or fixed applications

(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 warning:

Any 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 equipment complies with FCC 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.

## **Appendix: Sales and Technical support Information**

If you need to consult or purchase this product, please call Shanghai MXCHIP Information Technology Co., Ltd. during office hours.

Office hours: Monday to Friday morning: 9:00-12:00, afternoon: 13:00-18:00

Contact Tel: +86-21-52655026

Address: 9th Floor, Lane 5, 2145 Jinshajiang Road, Putuo District, Shanghai

Zip code: 200333

Email: [sales@mxchip.com](mailto:sales@mxchip.com)