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**ThinkFIT
MR_BLE001 BLE
Bluetooth Module**

ThinkFIT MR_BLE001 BLE Bluetooth Module Owner's Manual

Contents

ThinkFIT MR_BLE001 BLE Bluetooth Module

Specifications

- **Product Name:** MR_BLE001 Bluetooth Module
- **Bluetooth Version:** Up to Bluetooth 5.0
- **Flash Memory:** 512kB
- **MCU:** 32-bit RSIC @48M
- **RAM:** 32KB SRAM
- **RF Data Link Speed:** Up to 2Mbps
- **RF Sensitivity:** -96dBm@BLE 1Mbps, -93dBm@BLE 2Mbps, -99dBm@BLE 500kbps, -101dBm@BLE 125kbps

Product Usage Instructions

1. Connect the MR_BLE001 Bluetooth Module to your device following the provided pin description.
2. Power on your device and ensure Bluetooth functionality is enabled.
3. Pair your device with the MR_BLE001 module using the appropriate pairing method.
4. Start using the Bluetooth capabilities of the module for data transmission or communication.

FAQ

1. **Q: Where can I find more information about the MR_BLE001 module?**

   A: You can visit the official website at **http://www.thinkfiter.com/** for detailed documentation, technical support, and contact information

2. **Q: What is the RF sensitivity of the MR_BLE001 module?**

   A: The RF sensitivity varies based on the data link speed, ranging from -96dBm to -101dBm in different modes.

Information Technology Co., LTD

This specification provides a basic introduction to the MR_BLE001 module, including its electrical specifications, RF performance, pin dimensions, and reference schematic design. Readers can refer to this document for a detailed understanding of the module's overall functional parameters and applications. If you have any questions, please log in to **http://www.thinkfiter.com/** to contact our company or customer service.

Revision History

Version	Date	Revision History	Reviser	Auditor
V1.0	2020.12.17	OV		

Product Overview

Features
MR_BLE001 is a small-sized, low-cost Bluetooth Low Energy (BLE) standardized transparent transmission module developed by ThinkFIT. The module supports BLE (up to Bluetooth 5.0) and features a built-in 512kB FLASH memory, which supports dynamic stack and protocol profile configurations. The product functionality can be configured through software, providing ultimate flexibility. Additionally, it supports hardware OTA upgrades and multiple boot switching, allowing for convenient product feature releases and upgrades.
The module features include:

- 32-bit MCU RSIC @48M 512KB lash F32KB SRAM

- High Performance 32-bit MCU RSIC @48M 512KB Flash 32KB SR

- RFMbps

- Bluetooth 5.0 Standard,RF Data link up to 2Mbps

- -96dBm@BLE 1Mbps -93dBm@ BLE 2Mbps mode

- -99dBm@ BLE 500kbps mode -101dBm@ BLE 125kbps mode

- Support UART Interface, I/O Port that has exte

- APP

- Support APP Parameter Configure

- +4pin

- Snap off hole Pin + 4 PIN Terminal interface: Easy for Welding

- 23×12.6mm

- Compact Encapsulation:23×12.6mm Board Thickness 1.0mm

- -40℃~+85℃

- Working Temperature -40℃~+85℃

http://www.thinkfiter.com/
The MR_BLE001 module only requires the connection of four wires (VCC, GND, TX, RX) to achieve data transparent transmission functionality. It can also be applied to various small-sized accessories or fitness products through the use of Snap off holes. ThinkFIT has strong research and development capabilities, enabling seamless interconnection, data transmission, and various other applications for users' Bluetooth devices. Our company can customize Bluetooth modules that meet the customer's usage specifications based on the TFB0B02 standard version module and provide corresponding software and hardware support according to customer requirements. For more details, please contact our company at **http://www.thinkfiter.com/** or reach out to customer service.

(Application Areas)

- Smart Jump Robes\ Ab Rollers etc.
- Fitness Equipment like Treadmills\Exercise Bikes etc.
- Smart Home Products
- Industrial Control Equipment

Electrical Specifications

Item	Symbol	Min	Typical	Max	Unit
Input Voltage (4pin terminal)	VCC1	3.1	3.3	12.5	V
Input Voltage (Snap off Hole)	VCC2	2.8	3.0	3.6	V
Serial Voltage	TX/RX		3.0	3.3	V

Storage Temperature	T-STR	-65	25	150	°C	
Welding Temperature	T-SLD			260	°C	

Cautions

The data listed about is only for reference purpose.Some of the data listed above may be updated based on new testing carried out.
The showed voltage listed above is subject to the GND in the module.Voltage that surpass the "Maximum Rated Value"will cause permanent damage to the device

Working Current

| Item	Symbol	Min	Typical	Max	Unit
RX RX Current	Irx		5.3		mA
TX TX Current	Itx		4.8		mA
Sleep	Istandby		1.2		uA

Whole Module Working @0dBm With DCDC enable
Note:Power consumption test conditions:Whole Module Working @0dBm With DCDC enable

(RF Parameter

Item	Symbol	Min	Typical	Max	Unit
(Frequency Range)	Freq.	2380	–	2500	MHz
(Data Rate)	BLE/2.4G Proprietary 1Mbps, ±250kHz deviation BLE/2.4G Proprietary 2Mbps, ±500kHz deviation BLE 125kbps, ±250kHz deviation BLE 500kbps, ±250kHz deviation				

Pin Description
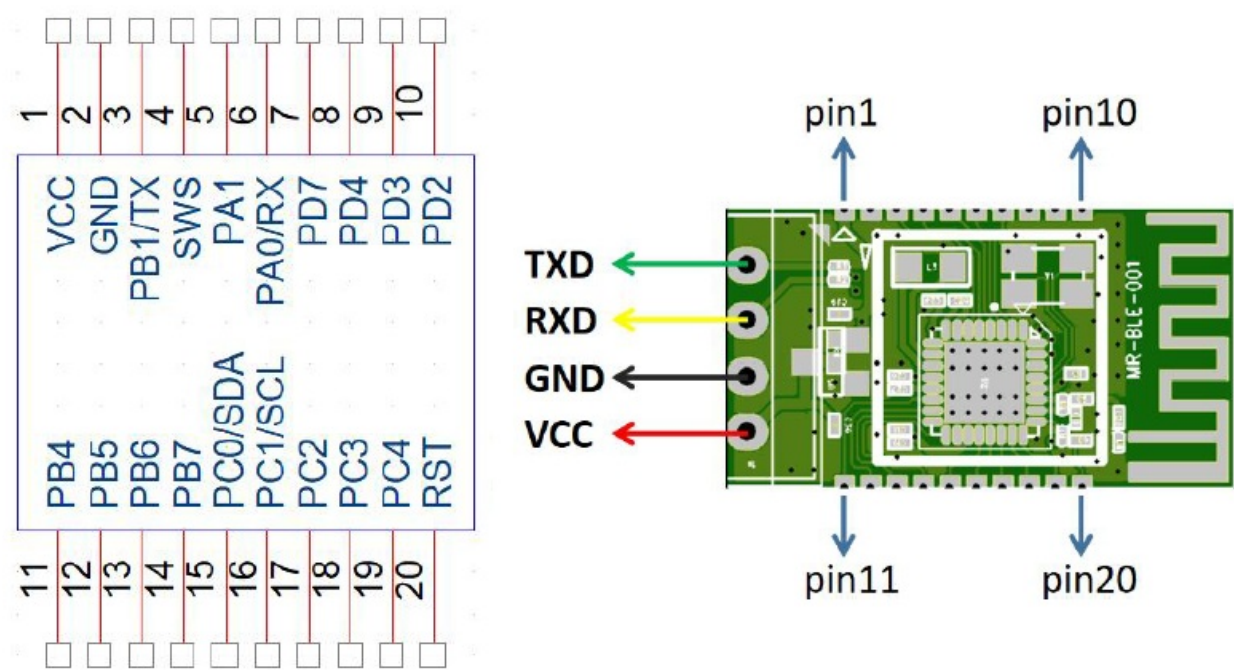
Port Description

| Pin #	Name	Type	Description
1	VCC2	PWR	3.0V
2	GND	PWR	
3	PB1_UTX	I/O	PWM4 output / UART_TX / Antenna select pin 2 / Low power comparator input / SAR ADC input / GPIO PB[1]
4	SWS	I/O	Single wire slave/ UART_RTS / GPIO PA[7]
5	PA1	I/O	DMIC clock / UART 7816 clock / I2S clock / GPIO PA[1]
6	PA0_URX	I/O	DMIC data input / PWM0 inverting output / UART_RX / GPIO PA[0]
7	PD7	I/O	SPI clock (I2C_SCK) / I2S bit clock / UART 7816 TRX (UART _TX) / GPIO PD[7]

| 8	PD4	I/O	Single wire master / I2S serial data output / PWM2 inverting output / GPIO PD[4]
9	PD3	I/O	PWM1 inverting output / I2S serial data input / UART 7816 TRX (UART_TX) / GPIO PD[3]
10	PD2	I/O	SPI chip select (Active low) / I2S left right channel select / PWM3 output / GPIO PD[2]
11	PB4	I/O	SDM positive output 0 / PWM4 output / Low power comparator input / SAR ADC input / GPIO PB[4]
12	PB5	I/O	SDM negative output 0 / PWM5 output / Low power comparator input / SAR ADC input / GPIO PB[5]
13	PB6	I/O	SDM positive output 1 / SPI data input (I2C_SDA) / UART_RTS / Low power comparator input / SAR ADC input / GPIO PB[6]
14	PB7	I/O	SDM negative output 1 / SPI data output / UART_RX / Low power comparator input / SAR ADC input / GPIO PB[7]
15	PC0_SDA	I/O	I2C serial data / PWM4 inverting output / UART_RTS / PGA left channel positive input / GPIO PC[0]
16	PC1_SCL	I/O	I2C serial clock / PWM1 inverting output / PWM0 output / PGA left channel negative input / GPIO PC[1]
17	PC2	I/O	PWM0 output / UART 7816 TRX (UART_TX) / I2C serial data / (optional) 32kHz crystal output / PGA right channel positive input / GPIO PC[2]
18	PC3	I/O	PWM1 output / UART_RX / I2C serial clock / (optional)32kHz crystal input / PGA right channel negative input / GPIO PC[3]
19	PC4	I/O	PWM2 output / UART_CTS / PWM0 inverting output / SAR ADC input / GPIO PC[4]
20	RST	RESET	Power on reset, active low

Design Reference

(Schematic Diagram
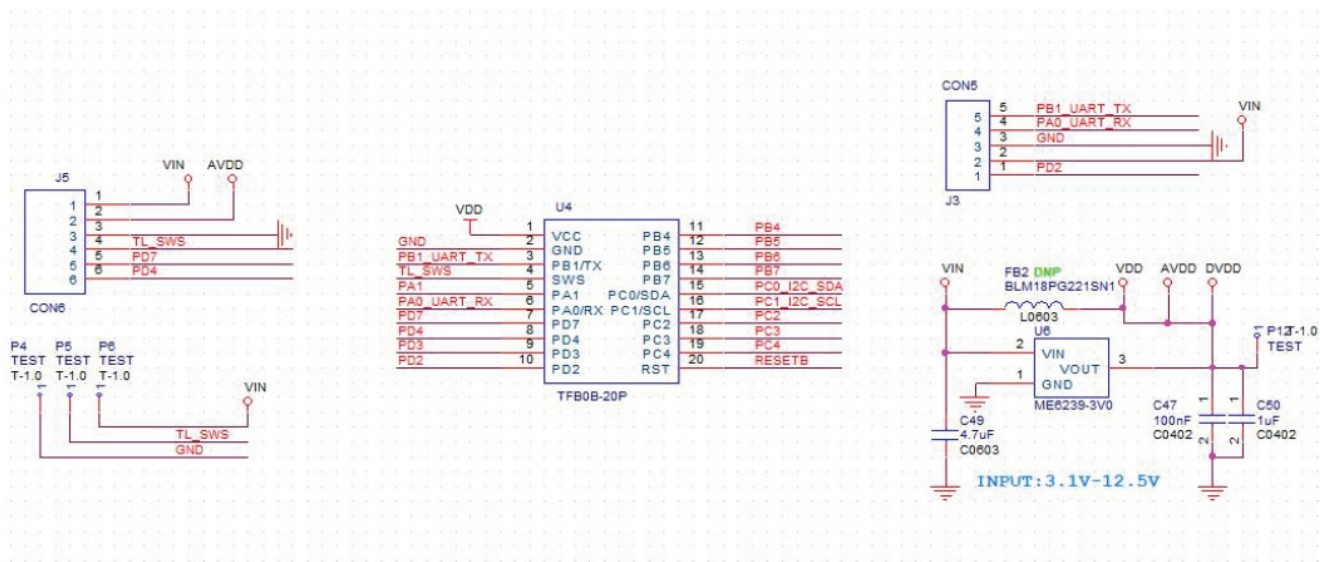
Module Dimensions
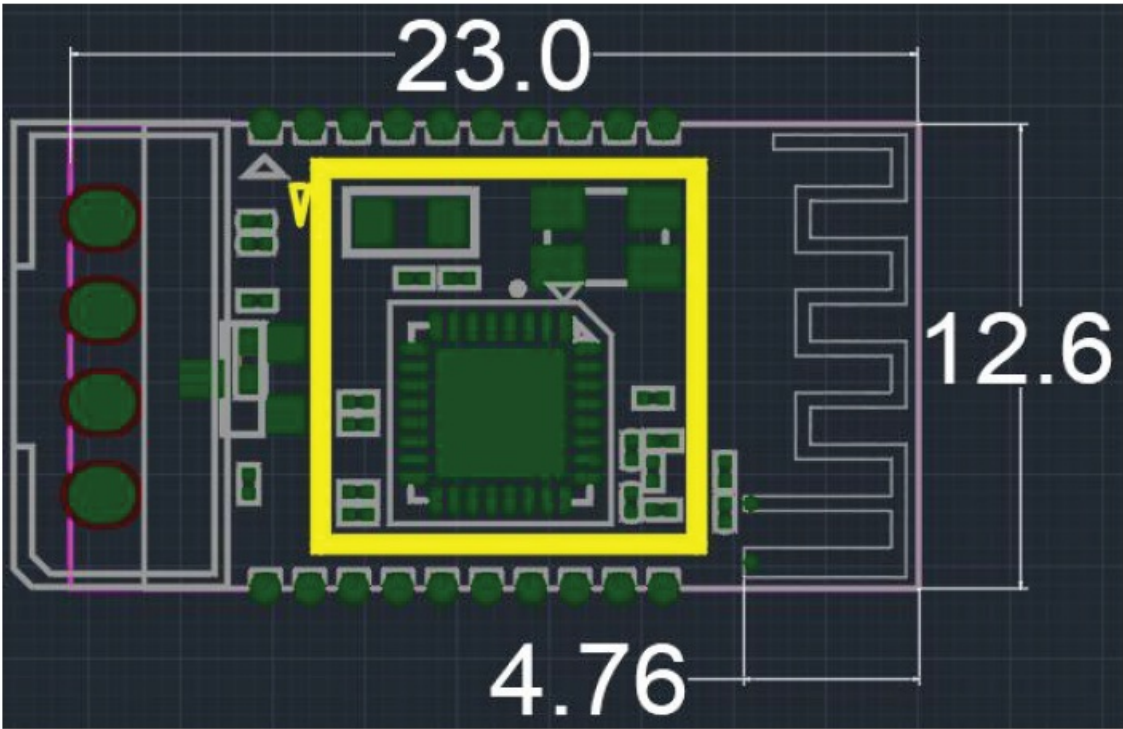
PCB Encapsulation
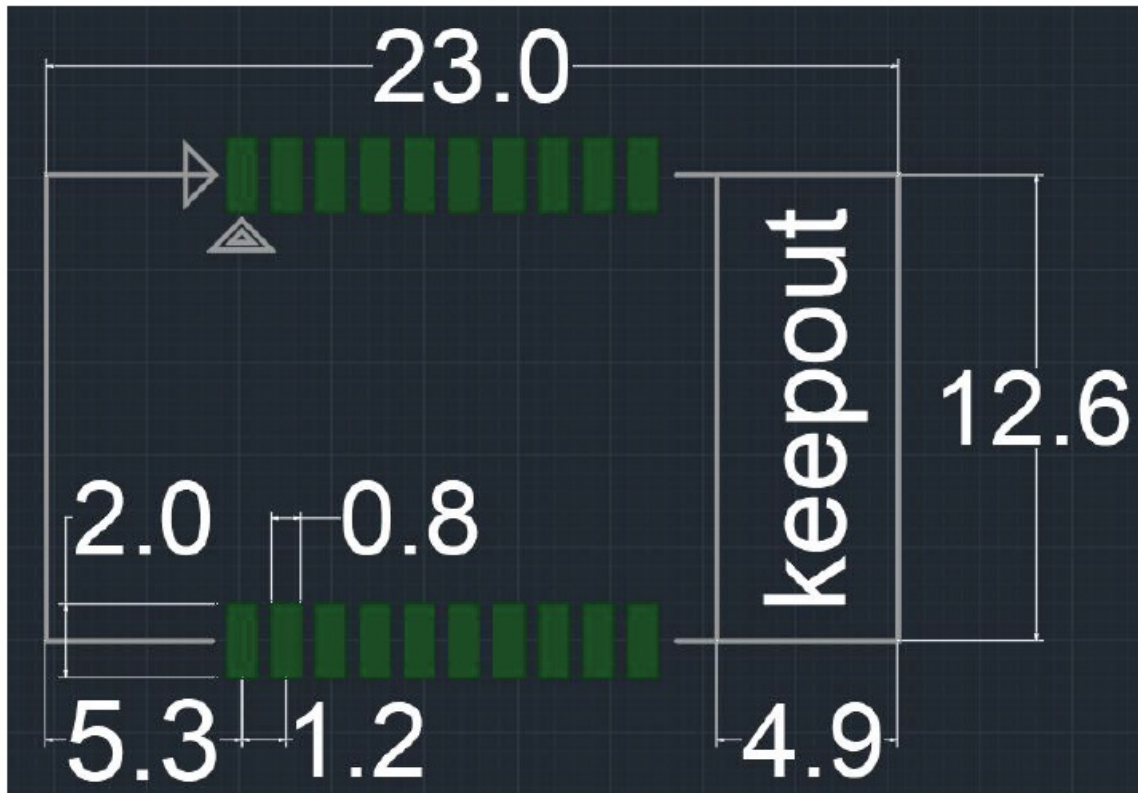
Cautions

The blue-tooth working frequency should be 2.4GHZ and It is suggested to use the device in an environment where the interference factor can be minimized.

(Cautions)

- Avoid using metal materials in the shell of the knob.
- Avoid placing metal screws and other parts too close to the radio frequency part
- To maximize RF performance, users should follow the following recommendations for PCB layout:

(Antenna Clearance Area:) The user's main board, located directly below the antenna area of the module, should not have any copper foil (including power, ground, and signal layers).
Module placement: Ideally, the module should be placed in one corner of the user's main board, with the PCB antenna positioned at the far end of the board. This placement helps minimize the antenna clearance area to the lowest possible extent.

Furnace Parameter)

(Refer to the following parameter)
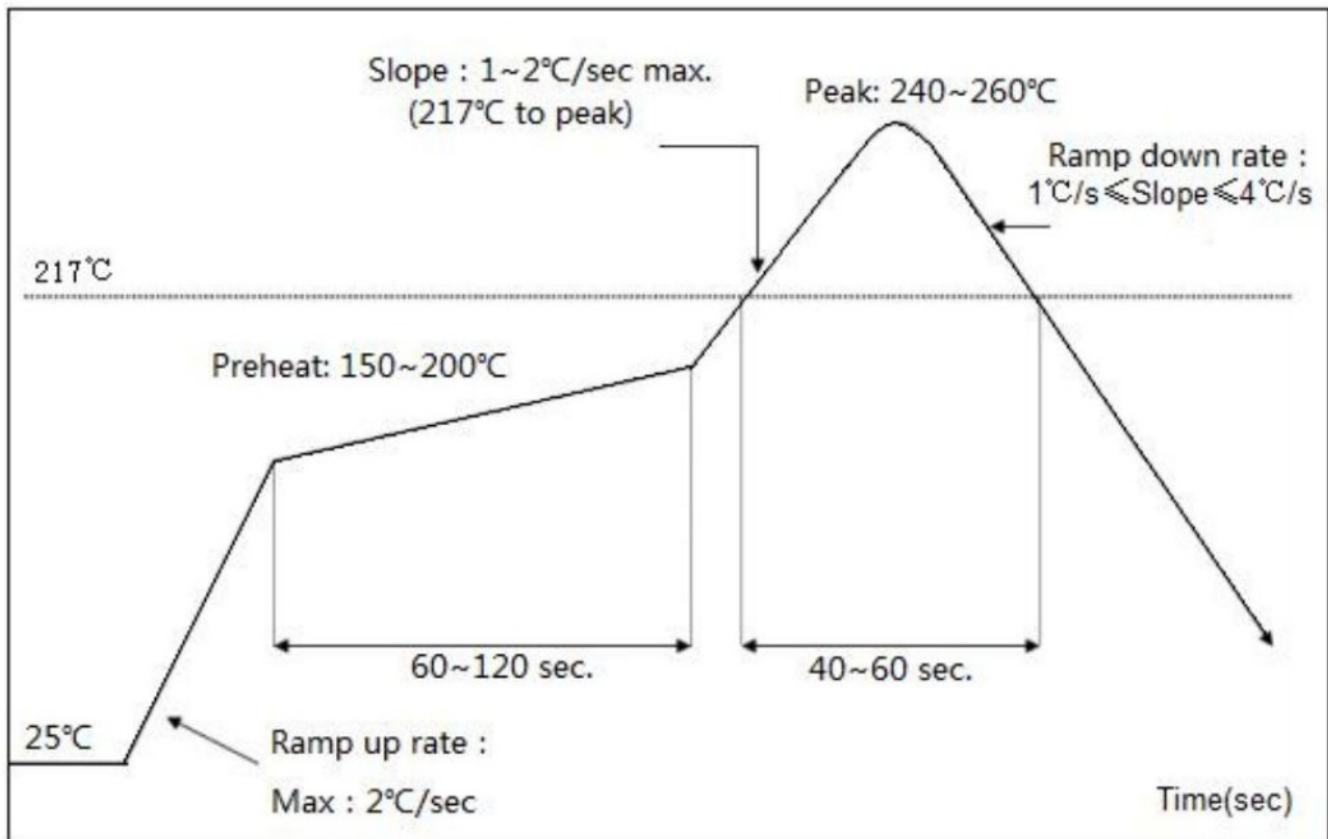
Temperature range	Time	Key parameters
Preheat zone(<150℃)	60-120S	Ramp up rate:≤2S
Uniform temperature zone(150-200℃)	60-120S	Ramp up rate:<1S
Recirculation zone(>217℃)	40-60S	Peak:240-260℃
Cooling zone	Ramp down rate:1℃/s≤Slope≤4℃/s	

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.

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 modular has been tested and found to comply with part 15 requirements for Modular Approval.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01r01

List of applicable FCC rules
CFR 47 FCC Part 15 Subpart C and Subpart F has been investigated. It is applicable to the modular transmitter

Specific Operational Use Conditions – Antenna Placement Within the Host Platform
The module is tested for standalone mobile RF exposure use condition.

- The antenna must be installed such that 20cm is maintained between the antenna and users,
- The transmitter module may not be co-located with any other transmitter or antenna.

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

Limited Module Procedures
Not applicable

Trace Antenna Designs
Not applicable

RF Exposure Considerations
This device 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.

Antenna Type and Gain
The following antennas have been certified for use with this module.
Only antennas of the same type with equal or lower gain may also be used with this module.
Other types of antennas and/or higher gain antennas may require the additional authorization for operation.

Antenna Specification list below

Antenna Type	Antenna Model No.	Maximum Antenna Gain (dBi)	Frequency Range
PCB Antenna	MR_BLE001	3.65	2400 – 2500 MHz

End Product Labelling Compliance Information
When the module is installed in the host device, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily removed. If not, a second label must be placed on the outside of the final device that contains the following text: "Contains FCC ID: 2BGXU-MR-BLE001". The FCC ID can be used only when all FCC compliance requirements are met.

Information on Test Modes and Additional Testing Requirements
This transmitter is tested in a standalone mobile RF exposure condition and any co-located or simultaneous transmission with another transmitter (s) class II permissive change re-evaluation or new FCC authorization. Host manufacturer installed this modular with single modular approval should perform the test of radiated emission and spurious emission according to FCC part 15C, 15.209, 15.207 requirement, only if the test result comply with FCC part 15C, 15.209, 15.207 requirement, then the host can be sold legally.

Additional testing, Part 15 Subpart B Disclaimer

This transmitter modular us tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B rules requirement applicable to the final host. The final host will still need to be reassessed for compliance to this portion of rules requirements if applicable.

As long as all 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 modular installed.

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 host integrator must follow the integration instructions provided in this document and ensure that the composite system end product complies with the requirements by a technical assessment or evaluation to the rules and to KDB Publication 996369.

The host integrator installing this module into their product must ensure that the final composite product complies with the requirements by a technical assessment or evaluation to the rules, including the transmitter operation and should refer to guidance in KDB Publication 996369.

OEM/Host Manufacturer Responsibilities

OEM/Host manufacturers are ultimately responsible for the compliance of the Host and Module. The final product must be reassessed against all the essential requirements of the FCC rule such as FCC Part 15 Subpart B before it can be placed on the US market. This includes reassessing the transmitter module for compliance with the Radio and RF Exposure essential requirements of the FCC rules.

How to Make Changes – Important Note

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

WWW.THINKFITER.COM

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Documents / Resources

ThinkFIT MR_BLE001 BLE Bluetooth Module [pdf] Owner's Manual
MR-BLE001, 2BGXU-MR-BLE001, 2BGXUMRBLE001, MR_BLE001 BLE Bluetooth Module, MR_BLE001 BLE, Bluetooth Module, Module

References

- WiFi PCBA IoT+ |
- WiFi PCBA IoT+ |
- **User Manual**