

BM45 BLE Module Specification

Version: V1.2

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amendant record

Documen t Version	Author	assessor	conner	date of issue	Edit
V1.0	Yyt	ZZL	Lxl	2025/4/15	first draft
V1.1	Yyt	Zzl	Lxl	2025/9/8	1、 Increase power consumption 2、 Add authentication data 3、 Add product specifications page 4、 Edit document error description
V1.2	Yyt	Zzl	Lxl	2025/11/25	1、 Add CE/FCC/IC caution statement

catalogue

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1. summary

1.1. Product Overview

The BM45 module, developed by Shenzhen ElinkThings Co., Ltd, is specifically designed for intelligent wireless data transmission. It utilizes the HBS3526 chip and complies with Bluetooth Low Energy (BLE) 5.3 specifications. The module supports serial port transparent transmission mode and the AiLink protocol, offering advantages such as low cost, compact size, low power consumption, and high transmission sensitivity. With minimal peripheral components, it delivers robust functionality. Customizable protocols can be implemented to meet diverse application scenarios. Measuring 10.9*15.8*2.2mm, the module features pin compatibility with BM series universal modules. It has obtained certifications including ROHS, REACH, BQB, FCC, CE, Japan's TELEC, South Korea's KC, Canada's IESD, and UCKC CA. The module includes Bluetooth 5.3 protocol test reports and Bluetooth RF test reports (see appendix for details).

1.2. characteristic

- Bluetooth V5.3
- Supports PCB RF antenna
- The low-power BLE Bluetooth solution achieves a sleep power consumption as low as 4.43μA.
- Support customer-customized development agreements
- Compatible with BM series PIN pins
- Quickly develop products by integrating with ready-made Ailink APP and cloud platforms
- Certified under ROHS, REACH, BQB, FCC, CE, Japan's TELEC, Korea's KC, Canada's IESD, and UCKC CA standards

1.3. application area

This module is primarily designed for short-range wireless data transmission. It can easily connect with Bluetooth devices on PCs and mobile phones, and also enables data exchange between two modules.

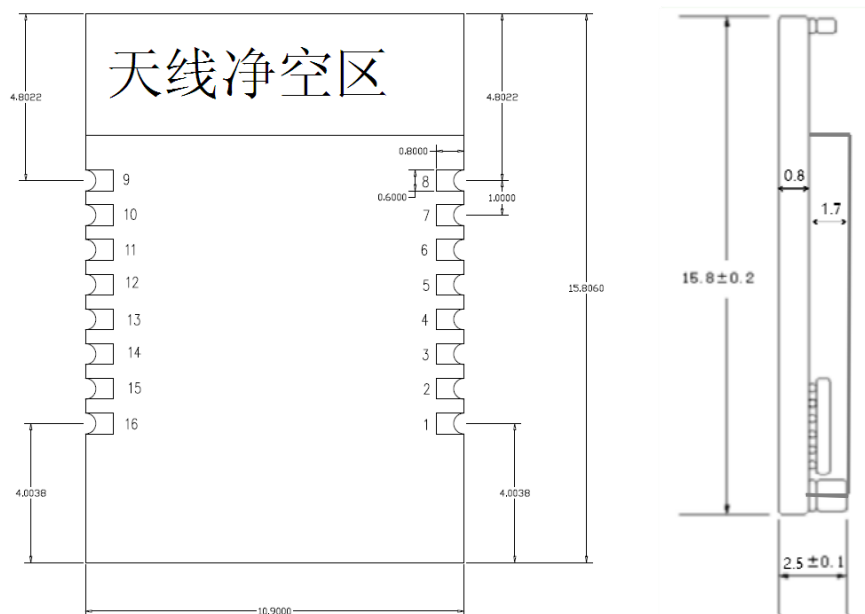
- ◆ Smart scales (including body weight scales, body fat scales, nutrition scales, etc.);
- ◆ Sports and health (smart jump rope, pedometer, electric toothbrush, etc.);
- ◆ intelligent instrument ;
- ◆ Intelligent medical devices (blood glucose meter, blood pressure meter, thermometer, ear thermometer, etc.);
- ◆ Sensor Internet of Things, etc.; Vernier caliper;

2. size of product

Software Parameters	
Main chip	HBS3526
protocol	AiLink Protocol Customer customization agreement
Certification support	ROHS,REACH,BQB; FCC, CE, Japan's TELEC, South Korea's KC, Canada's IESD, UCKC CA
Hardware	
working voltage	2.35~3.3V
Package size	EasyLink 1116 package, 10.9*15.8*1.6mm
working current	Deep sleep: / Low-power sleep: 4.43μA Low-power sleep mode + 1000ms broadcast: 29.12μA Peak power on: 16.74mA RF_TX: 10.50mA RF_RX: 8.12mA Work + 100ms broadcast interval: 3.08mA Work + 50ms connection interval: 2.96mA
Wireless Parameters	
transmitting power	0~4dBm
receiving sensitivity	-93dBm
Wireless standard	2.4GHz MIFA onboard antenna
Antenna type	Default built-in antenna, supports external antenna
Other parameters	
working temperature	-40~85°C
Storage stable	-50~150°C

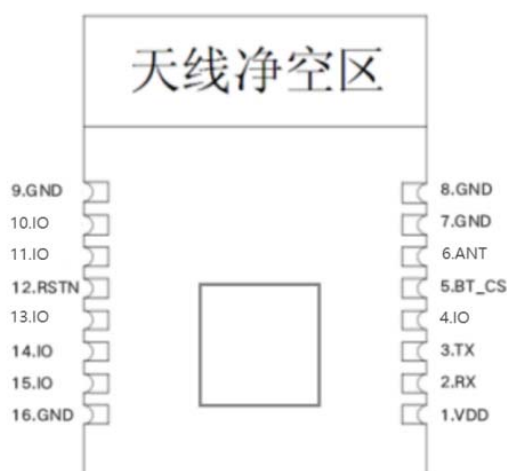
3. Module Packaging Interface

3.1. Mechanical dimensions



Encapsulation size (mm, side view)

3.2. Pin interface



3. 3. Pin definition (UART):

Seat number	name	type	Feature Description
1	VDD 【A】	power input	+3.0V power supply
2	RX 【B】	CMOS import	Serial input
3	TX 【B】	CMOS output	Serial output
4	IO	Bidirectional IO port	IO
5	BT_CS	delivery outlet	Output high level: Bluetooth not connected. Output low level: Bluetooth is connected.
6	ANT	ANT	External antenna foot;
7	GND	the earth	the earth
8	GND	the earth	the earth
9	GND	the earth	the earth
10	IO	Bidirectional IO port	IO
11	IO	Bidirectional IO port	IO
12	RSTN	hardware reset	Enter low level: module reset. High input level: Module is operating normally.
13	IO	Bidirectional IO port	IO
14	IO	Bidirectional IO port	IO
15	IO	Bidirectional IO port	IO
16	GND	the earth	the earth

pour :

[A]. Power supply operating range: 2.3V~3.3V;

[B]. The baud rate can be configured flexibly, with a default value of 9600;

3.4. picture of real products



4. Electrical Parameters

4.1. Absolute electrical parameters

parameter	description	least value	representative value	crest value	unit
Ts	Storage Temperature	-50		+150	°C
VDD	service voltage	-0.4		3.3	V

4.2. Going

paramet er	description	least value	represe ntative value	crest value	unit
Ta	working temperature	-40	-	85	°C
VDD	input voltage	2.35	3.0	3.3	V

parameter	description	least value	representative value	crest value	unit
VIL	IO low-level input	-0.3	-	VDD+0.3	V
VIH	IO high-level input	VDD-0.3	-	VDD	V
VOL	IO low-level output	VSS	-	VDD+0.3	V
VOH	IO High-Level Output	VDD-0.3	-	VDD	V

4.3. power dissipation

state		parameter		application scenarios	
pattern	state	average value	peak value	explain	remarks
dormancy	Deep sleep	/	/	The module does not retain RAM and RC, and can only be awakened by IO. After waking up, it resets.	UART does not operate in sleep mode
	Low-power sleep	4.43μA	/	The module retains RAM and RC, supporting RC wake-up and IO wake-up.	
	Low power consumption + 200ms connection	56.42μA	10.54mA	The module is in low-power mode and connected to the app.	
	Low power consumption + 1000ms broadcast	29.12μA	11.12mA	The module is in low-power mode and broadcasting simultaneously, which can be detected and connected by the APP.	
	Low power consumption + 2000ms broadcast	16.83μA	11.80mA	/	

work	Peak power on	/	16.74mA	Pulse current during module power-on startup	UART operates in working mode
	RF_Tx	/	10.50mA	The current when RF transmits data	
	RF_Rx	/	8.12mA	The RF receives data as current	
	Work +50ms connection interval	2.96mA	12.30mA	Work mode while staying connected to the app	
	Work +100ms broadcast interval	3.08mA	10.56mA	The work mode enables simultaneous broadcasting, which can be detected and connected by the APP.	
	Work +200ms broadcast interval	3.01mA	10.60mA	/	
	Work +300ms broadcast interval	2.99mA	10.56mA	/	

The above data was tested at 0 dBm with PHY=1M.

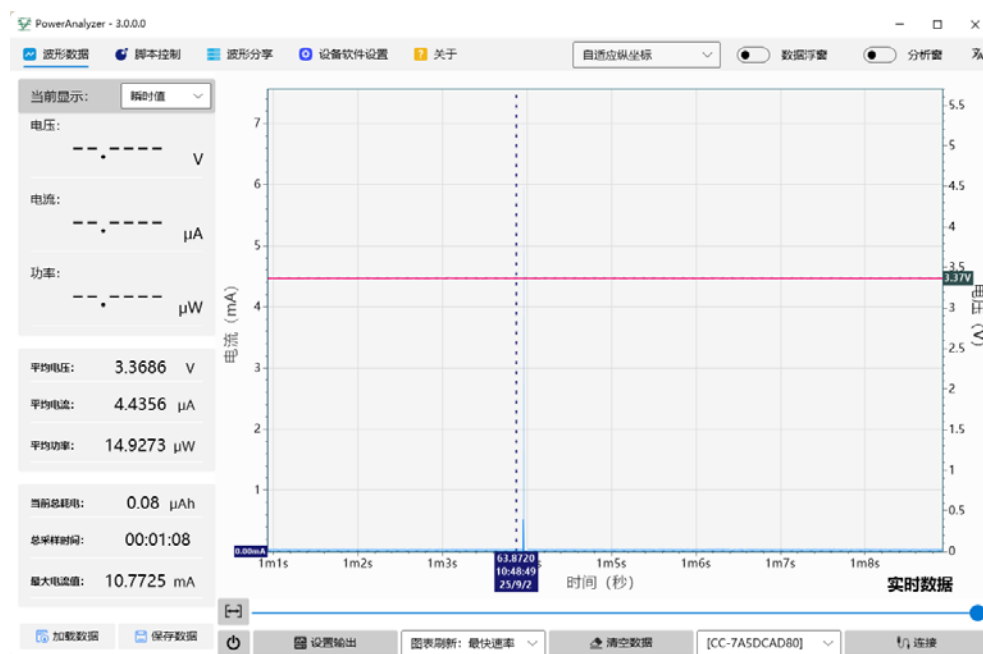


Figure 1 Low-power sleep

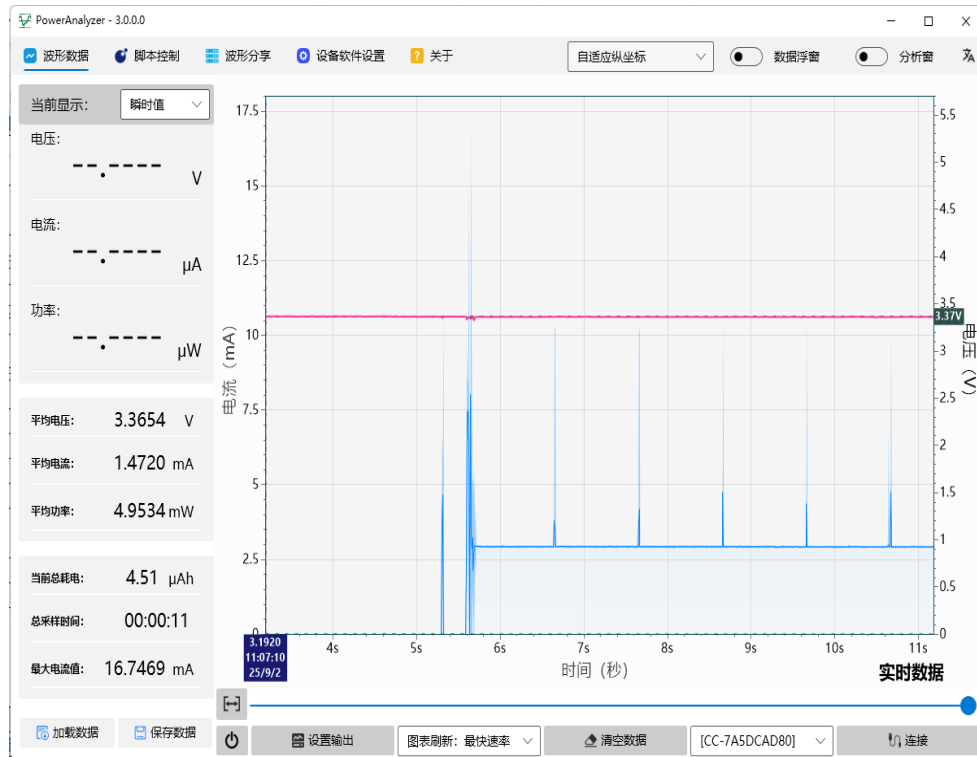


Figure 2 Power-on peak

5. RF characteristics

5.1. Basic RF characteristics

Parameter	define
service frequency	2.4GHz ISM band
Wireless standard	BLE 5.3
rate of data signalling	1Mbps
Antenna type	Board PCB antenna (default)

5.2. RF output power

Parameter	least value	representative value	crest value	unit
Average RF output power		0	4	dBm
occupied bandwidth		1		MHz

5.3. RF receiving sensitivity

main parameter	remarks	least value	representative value	crest value	unit
RX receiving sensitivity			-93		dBm

6. Antenna information

6.1. Antenna type

The PCBA antenna used is a 2.4GHz MIFA board antenna.

6.2. Reduce antenna interference

1. 1. 1. LAYOUT Note: No traces or copper layers should be placed beneath the antenna clearance area of the module.
1. 1. 2. Assembly note: Ensure the clearance height and distance around the module are greater than 5mm to avoid interference from other metal materials.

6.3. Module Placement Guide

1) The module antenna should be positioned either outside the MCU base plate frame or along the edge with a hollowed-out area underneath. The PCB antenna must maintain a minimum distance of 5.0mm from both sides of the base plate. As shown in the schematic diagram below:

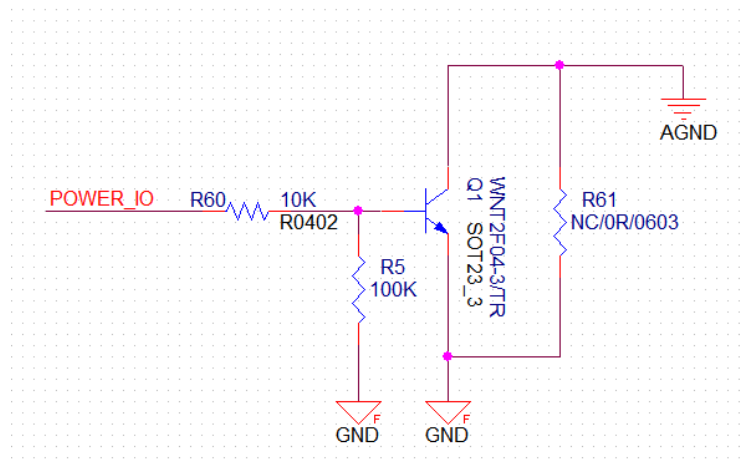
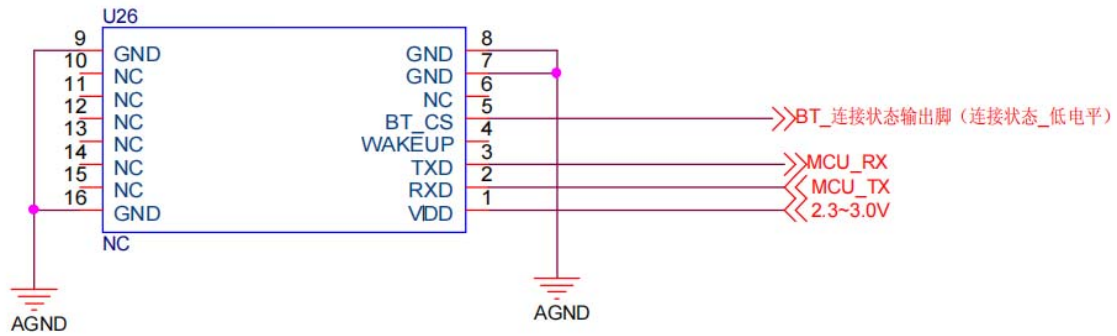


2) The module antennas are positioned along the board edge without copper plating underneath. For PCB antennas, copper plating is prohibited in the main board-facing area with a clearance of more than 5.0mm. As shown in the schematic diagram below:



7. Hardware Reference Design

7.1. Typical Application Diagram



Module power control circuit (control module AGND)

(1. Connect R61 for normal power mode; 2. Connect R5/R60/Q1 for power-off mode)

7.2. design notes

7. 2. 1. The BM45 supports power-off mode:

Power-off mode-Bluetooth will be powered off directly and the power consumption is 0.

Power it on again when you need to use it.

7. 2. 2. Power-on requirements: When powering on the module, first supply it with normal power voltage, then delay for 1000ms before sending data to RX/TX. Note that the power voltage and ripple must not exceed the specified limits to avoid module damage. The ripple must not exceed

50mV.

7. 2. 3. Mainboard PCB LAYOUT module packaging design recommendations:

Length and width of the foot position: 1.8mm*0.7mm;

The vertical center-to-center distance of the foot position is 1.0mm.

The lateral distance between the foot positions is: 10.9mm;

Use PCB package files: http://doc.elinkthings.com/web/#/40?page_id=358

8. protocol

8.1. Universal Through

The default setting enables universal pass-through, and users can customize module parameters. For details, refer to the BM series application manual corresponding to this module.

8.2. V4.0.0 AiLink Protocol

To facilitate customer development of AiLink series products, this module supports the AiLink protocol, AiLink APP, and platform. For detailed information, refer to the corresponding AiLink product application manuals, such as the ailink forehead thermometer application manual: <http://www.elinkthings.com/cn/help-detail-171.html>.

8.3. Other custom protocols

To meet diverse customer needs, this module offers extensive customization options for client agreements. Each customized module will have a unique firmware version number. Please contact our sales team for details.

9. operation instruction

9.1. Shipping packaging

1. Customized pallet: 85-100 packages per pallet (product size and maximum load may vary slightly), each 10 pallets as a stack, each stack not more than 1000.
2. Storage: If the product is stored for more than 7 days, baking for 4-8 hours before production can improve the welding yield. The transparent tray can withstand 60 degrees Celsius, and the white tray can withstand 80 degrees Celsius.
3. Product packaging: Each pallet stack has a label affixed to the upper right corner, containing details such as customer name, quantity, model, PCBA code, and customer part number.
4. Photo of the identification card and tray:

客户名称	普思智能装备-广州
产品型号	PCBA-1000000
PCBA编码	00000000000000000000000000000000
客户料号	0000000000
订单号	0000000000
数量	1000000
生产日期	2020-01-20
送货日期	2020-01-20

(Shipping label) (Packaging tray)



(Shipping label) (Packaging tray)

9.2. Process details

1. Steel mesh: The holes of the module's solder pads are proportionally enlarged by 0.5mm from the original 1:1 ratio, with the mesh thickness maintained at 0.1mm.
2. Hold the necessary contact module (soldering iron) properly. Take protective measures such as gloves and static wrist straps.
3. Storage-Recommended storage conditions: temperature $\leq 30^{\circ}\text{C}$, humidity $\leq 60\%\text{R.H}$;
4. Baking: 60°C for 8 hours.
5. Passing through the furnace: The temperature curve varies slightly depending on the product.

The maximum temperature range is N, where $239^{\circ}\text{C} < N < 250^{\circ}\text{C}$.

9.3. Production Guide

9.4. production test

To enhance product quality and maximize customer production efficiency, we provide mature and efficient testing tools. For usage instructions, please refer to the "BM Series Test Kit Manual".



10. contact us

Shenzhen ElinkThings Co., Ltd

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Marketing Department email: marketing@elinkthings.com

FAE email: hw@elinkthings.com

[Official website: www.elinkthings.com](http://www.elinkthings.com)

11. Appendix (Certification)

BQB



Qualification Workspace

Qualified Product Details

The details below should reflect how the Products are advertised, packaged, and distributed commercially.

Product List

Product Name	Product Description	Model Number	Product Website
HB5352X series	HB5352X series is a power-optimized system-on-chip (SOC) solution for Bluetooth low power and proprietary 2.4GHz applications. It integrates a high-performance, low-power RF transceiver with Bluetooth baseband and rich peripheral IO extensions. It can be used in 2.4GHz Bluetooth low power systems, proprietary 2.4GHz systems, human-machine interface devices (keyboards, mice, and remote controls), sports and leisure devices, mobile phone accessories, and consumer electronics.	HB53526	
HB5352X series	HB5352X series is a power-optimized system-on-chip (SOC) solution for Bluetooth low power and proprietary 2.4GHz applications. It integrates a high-performance, low-power RF transceiver with Bluetooth baseband and rich peripheral IO extensions. It can be used in 2.4GHz Bluetooth low power systems, proprietary 2.4GHz systems, human-machine interface devices (keyboards, mice, and remote controls), sports and leisure devices, mobile phone accessories, and consumer electronics.	ZZ3526	

2 Product(s) found
Note: Only Products that have completed the Bluetooth Qualification Process will appear in the Qualified Product database search results on the specified Product Publication Date

Member Details

Member Company	Guangzhou Honor Microelectronic Co.,Ltd.
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Guangzhou Honor Microelectronic Co.,Ltd.	0x0ECE
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Bluetooth RF Test Report

Bluetooth RF-PHY Test Report	
Bluetooth® Qualification Test Facility recognized by the Bluetooth SIG.  Bluetooth® Test Report issued under the responsibility of:  Test Report Number: 4935214.00Rev01	
Project Name	HBS352X series
Model Number	HBS3526
Applicant.....	广州鸿博微电子科技有限公司
Address.....	广东省广州市黄埔区科学大道 18 号芯大厦 A 栋 402
Issued by	DEKRA Testing and Certification (Shanghai) Ltd. Guangzhou Branch
Address.....	Block 5, No.3, Qiyun Road, Huangpu District, Guangzhou, People's Republic of China
Core version	5.3
TCRL version.....	TCRL 2025-1
Standard	RFPHY.TS.p23
Test Spec Errata(s).....	NA
PICS	RFPHY.ICS.p11
IXIT	Core.IXIT.p22
Date of Receipt	2025-03-21
Date of Report	2025-04-29
Date of Issue.....	2025-04-29
Report Reversion	Rev01
Prepared by	Ryan Zhang/ Project Engineer (Responsible for the Test Report)
Approved by	Mike Lu / Director (Verification of the Test Report)

Ryan Zhang

Mike Lu

Bluetooth 5.3 protocol test report

Test Report issued under the responsibility of:

Bluetooth® Qualification Test Facility
recognized by the Bluetooth SIG.



Test Report Number:
4935214.01Rev01

Bluetooth Protocol Test Report

Project Name	HBS352X series
Model Number.....	HBS3526
Applicant.....	广州鸿博微电子科技有限公司
Address	广东省广州市黄埔区科学大道 18 号芯大厦 A 栋 402
Issued by	DEKRA Testing and Certification (Shanghai) Ltd. Guangzhou Branch
Address	Block 5, No.3, Qiyun Road, Huangpu District, Guangzhou, People's Republic of China
Core version	5.3
TCRL version	TCRL 2025-1
Standard.....	See Standard List
PICS.....	See Standard List
IXIT	See Standard List
Test Spec Errata(s)	NA
Date of Receipt	2025-03-21
Date of Report	2025-04-29
Date of Issue	2025-04-29
Report Reversion.....	Rev01
Prepared by.....	Ryan Zhang / Project Engineer (Responsible for the Test Report)
Approved by	Mike Lu / Director (Verification of the Test Report)

Ryan Zhang
Mike Lu

12. CE/FCC/IC caution statement

12.1. 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.

NOTE: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications or changes to this equipment. Such modifications or changes could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The device has been evaluated to meet general RF exposure requirement, The device can be used in portable exposure condition without restriction.

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

1. The antenna must be installed such that 20 cm is maintained between the antenna and users.
2. The transmitter module may not be co-located with any other transmitter or antenna. As long as the two conditions above are met, additional transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required for the installed module.

Important Note:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the Federal Communications Commission of the U.S. Government (FCC) and the Canadian Government authorizations are no longer considered valid and the FCC ID and IC ID cannot be used on the final product. In these circumstances, the OEM integrator shall be responsible for re-evaluating the end-product (including the transmitter) and obtaining a separate FCC and IC authorization in the U.S. and Canada.

OEM Integrators - End Product Labeling Considerations:

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: 2BDNC-BM452025 or IC: 34716-BM452025. The grantee's FCC ID can be used only when all FCC compliance requirements are met.

OEM Integrators - End Product Manual Provided to the End User:

The OEM integrator shall not provide information to the end user regarding how to install or remove this RF module in end product user manual. The end user manual must include all required regulatory information and warnings as outlined in this document.

The module only includes RF shielding cover, OEM integrators shall evaluate the RSE when installing this module to ensure that the module still meets regulatory requirements when installed into their system.

12.2. IC Statement:

This device complies with Industry Canada licence-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.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Radiation Exposure Statement:

The product comply with the Canada portable RF exposure limit set forth for an uncontrolled environment and are safe for intended operation as described in this manual. The further RF exposure reduction can be achieved if the product can be kept as far as possible from the user body or set the device to lower output power if such function is available.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radioexempts 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.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Déclaration d'exposition aux radiations:

Le produit est conforme aux limites d'exposition pour les appareils portables RF pour les Etats-Unis et le Canada établies pour un environnement non contrôlé. Le produit est sûr pour un fonctionnement tel que décrit dans ce manuel. La réduction aux expositions RF peut être augmentée si l'appareil peut être conservé aussi loin que possible du corps de l'utilisateur ou que le dispositif est réglé sur la puissance de sortie la plus faible si une telle fonction est disponible.

12.3. CE Statement:

This device is a low-power radio transmitter and receiver. As recommended by international guidelines, the device meets applicable national SAR limits of 2.0W/kg (10g). 10g SAR: meets low-power exclusion level, SAR test is not required.

Do not use the device in the environment at too high or too low temperature,
never expose the device under strong sunshine or too wet environment.
The suitable temperature for the product and accessories is -40°C-85°C.

Operating Frequency Range, Max Output Power

Bluetooth: 2402MHz ~ 2480MHz, -0.31dBm

This product can be used across EU member states.

EU Regulatory Conformance

Hereby, Shenzhen ElinkThings Co., Ltd. declares that this device is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.

For the declaration of conformity, visit the Web site [https:// www.elinkthings.com](https://www.elinkthings.com)

