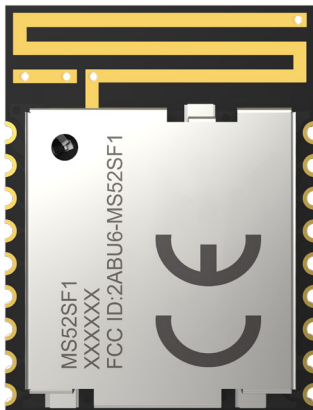


Bluetooth LE Module

MS52SF1



Datasheet

V 1.2.0



Version Note

Version	Details	Contributor(s)	Date	Notes
1.2.0	First edit	Michelle	2025.05.21	

Part Number

Model	Hardware Code
MS52SF11	1N08AI

Click the icon to view and download the latest product documents electronically.
https://en.minewsemi.com/file/MS52SF1-TLSR8208G_Datasheet_C_EN.pdf



MS52SF1-TLSR8208G

Bluetooth transparent slave module that supports serial port instruction configuration and iBeacon broadcast mode

MS52SF1 is a module with Bluetooth slave device firmware designed using Tailing Micro TLSR8208G chip. It has broadcast and connection status, and uses UART interface to transparently transmit data between main devices such as mobile phones/tablets and MCU. Bluetooth functionality can be added to the product without the need for Bluetooth development, providing convenience for product development. The device broadcast communicates with the MCU through the UART interface. In broadcast mode, the MCU can set and view the module's broadcast name in command format, set custom data, modify parameters such as broadcast interval and connection interval through the UART interface. When a host connects to a device through Bluetooth, the device will act as a bridge between the host and the MCU for transparent data transmission.

FEATURES



The fastest transmission rate can reach 5kB/s



The maximum transmission power can be configured as+10dB



Support serial port instruction configuration



Support iBeacon broadcast mode

KEY PARAMETER

MS52SF1-TLSR8208G			
Chip Model	Telink TLSR8208G	Antenna	PCB
Module Size	15.8×12×2mm	GPIO	14
Flash	512kB	RAM	20KB
Receiver sensitivity	-97dBm	Transmitting power	-45~ +10dBm
Current(TX)	0dBm-9.5mA	Current(RX)	9.1mA
Firmware	Transparent Slave Firmware		

APPLICATION



Smart Home



Consumer Electronics



Intelligent Medical care



Security Equipment



Automotive Equipment

CERTIFICATION

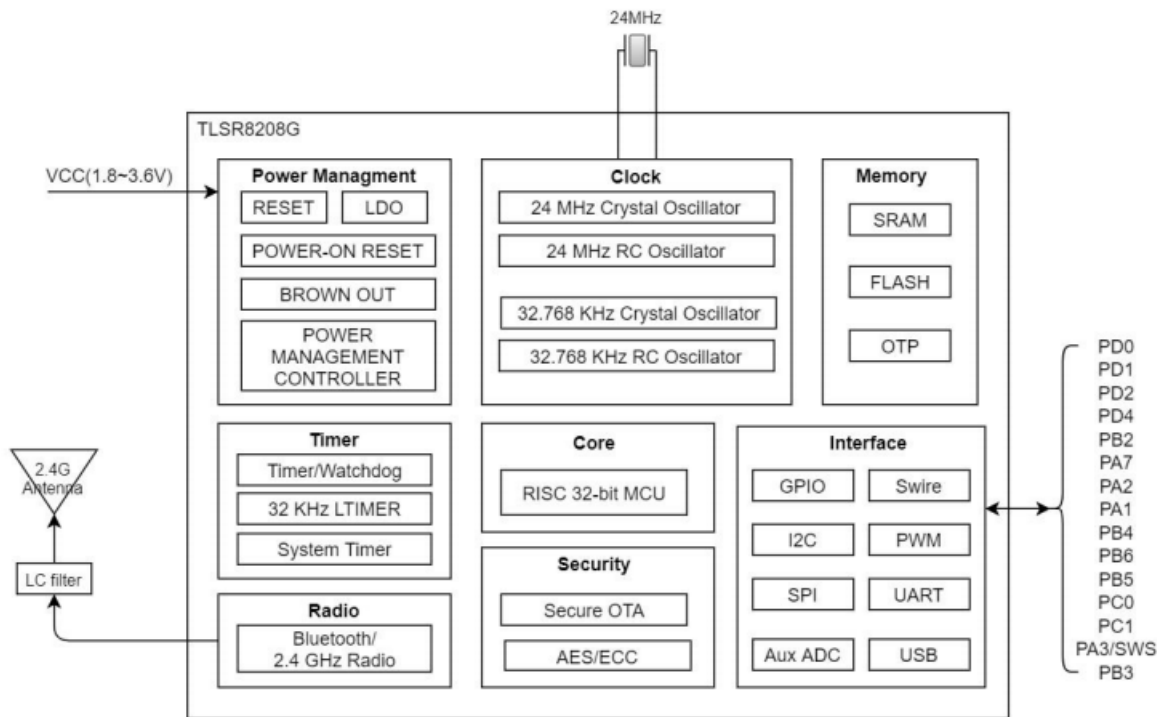




INDEX

1.Block Diagram	05
2.Electrical Specification	05
3.Current Consumption Characteristics	06
4.Pin Description	06
5.Pin Definition	07
6 Module Operation Instruction	08
6.1 Tool	08
6.2 Demonstration of module application	08
6.2.1 Power supply	08
6.2.2 SLP(Sleep/Awake)	08
6.2.3 BTDATA(UART control)	08
6.2.4 UART interface:TX and RX	09
6.2.5 CON_IND	09
6.2.6 FIFO_FULL	09
6.2.7 Command instruction	09
6.3 Example of operation	12
6.3.1 Factory Default Parameters	12
6.3.2 Broadcast packet (broadcast packet+reply packet)	13
6.3.3 Example of modifying parameters	14
6.3.4 Transparent transmission	15
7.Mechanical Drawing	16
8.Electrical Schematic	16
9.PCB Layout	17
10.Reflow and Soldering	17
10.1 ESD Static Protection Recommendations	18
11.Package Information	19
12.FCC warning	20
13.Storage Conditions	23
14.Handling Conditions	23
15.Quality	23
16.Copyright Statement	24
17.Related Documents	24

1 BLOCK DIAGRAM



2 ELECTRICAL SPECIFICATION

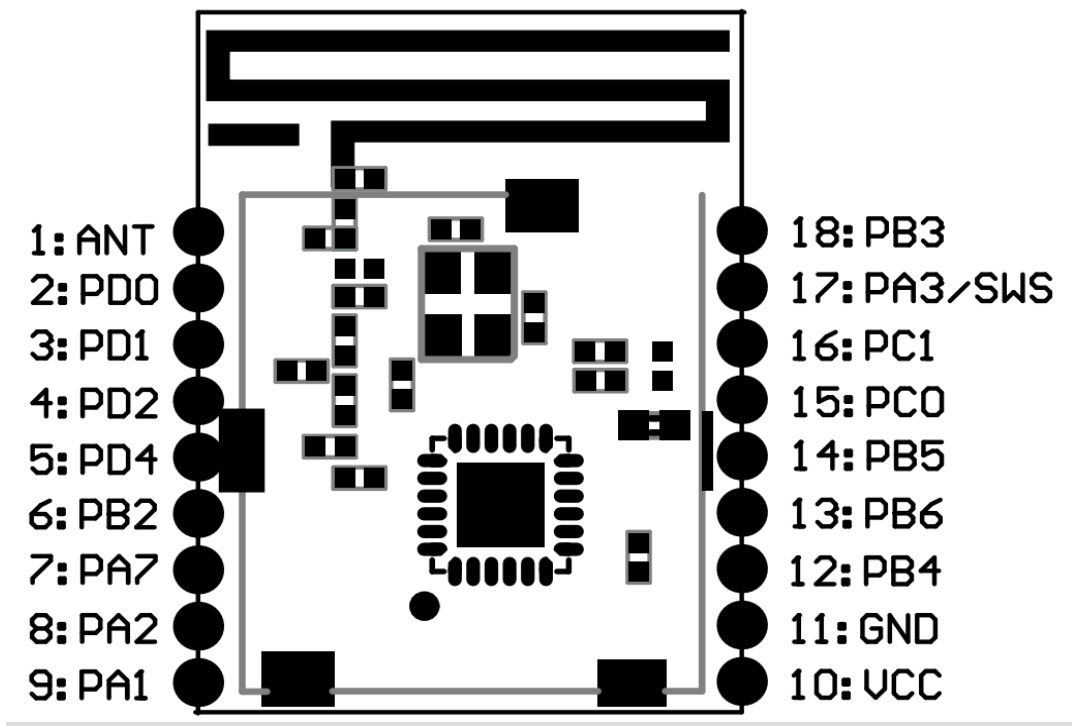
Parameters	Value	Notes
Working Voltage	1.8V-3.6V	To ensure RF work, supply voltage suggest not lower than 2.3V
Working Temperature	-40℃~+85℃	Storage temperature is -40℃~+125℃
Transmission Power	-45 ~ +10dBm	Configurable
Current(RX)	9.1mA	RF reception current in 1Mbps mode
Current(TX)	9.5mA	RF emission current in 0dBm mode
Module Dimension	15.8*12*2mm	
Quantity of IO Port	14	

3 CURRENT CONSUMPTION CHARACTERISTICS

The following power consumption test is conducted at room temperature with a power supply voltage of 3.3V. The broadcast interval is 1s, and the maximum and minimum connection interval is 20-40ms. The calculation of service life is generally based on the average power consumption (Avg).

Status	Consumption	Peak(mA)	Avg(mA)
	Average current in sleep state (SLP pulled high、BTDATA pulled low)	0.0014	0.00069
	Broadcast average current (SLP pin is connected to GND, BTDATA is pulled high)	11.09	0.0423
	Connection state average current (SLP pin is connected to GND, BTDATA is pulled high)	10.60	0.385
	Transparent transmission average current (SLP, BTDATA pins are connected to GND, connected to mobile phones)	10.86	3.20

4 PIN DESCRIPTION



5 PIN DEFINITION

Pin Number	Symbol	Type	Definition	Notes
1	ANT		External antenna pins	Using the module's built-in antenna, this pin is directly suspended in the air. If the module's built-in antenna is not used, the antenna can be externally connected through this pin. When connecting the antenna, the resistor connected to the antenna needs to be horizontally welded to this pin
2~7	PD0 to PA7		GPIO	Not used in UART, floating
8	PA2	BTX	UART TX	TX of Bluetooth Module
9	PA1	BRX	UART RX	RX of Bluetooth Module
10	VCC	VCC	Power Supply	3.3V power supply interface, need to be connected with VDDH
11	GND	GND	Ground	
12	PB4	CON_IND	Connection indication	Sleep state: low level Broadcast status: Low level Connection status: High level
13	PB6		GPIO	Not used in UART, floating
14	PB5	SLP	Sleep/Awake	Low level to wake-up, high level to sleep, no floating
15	PC0	BTDATA	Serial port control	Serial port on / off to control pin, no floating 0: serial port open, can send and receive serial port data 1: Serial port off
16	PC1		GPIO	Not used in UART, floating
17	PA3/SWS		Burn pin	For 5V power supply, connect this pin only. For 3.3V supply, connect with VDD.
18	PB3		GPIO	Not used in UART, floating



6 MODULE OPERATION INSTRUCTION

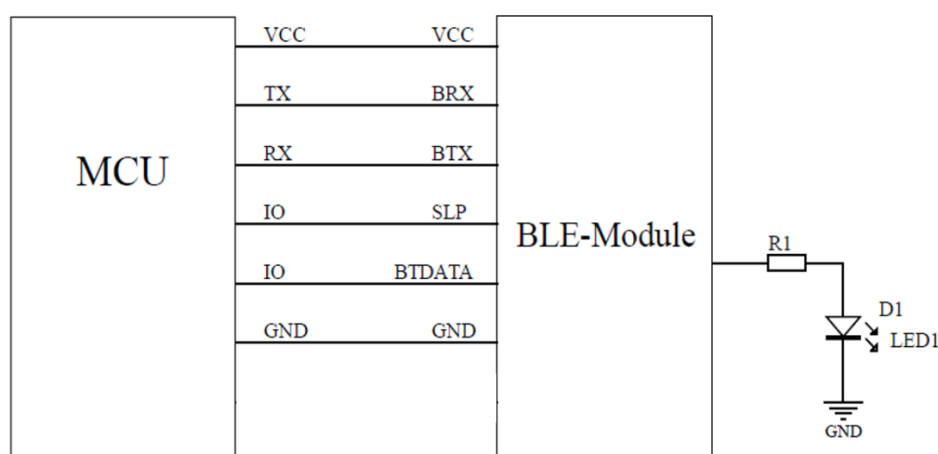
6.1 Tool

Mobile app: Minew serial port assistant, nRF connect (also known as nRF Master Control Panel). When testing BLE products, it is not possible to use the built-in Bluetooth directly when using the system settings, especially on the IOS end. The Bluetooth settings inside will not display BLE devices.

Download the IOS directly from the APP store.

PC serial port assistant: Baidu "Friendly Serial Port Assistant" can be downloaded. The PC serial port assistant is used to debug the UART interface of the module.

6.2 Demonstration of module application



6.2.1 Power supply

The SoC working voltage is 1.7V-3.6V, to ensure a stable function, supply voltage should be 3.0V-3.6V.

6.2.2 SLP(Sleep/Awake)

When pull SLP low, the module in broadcast mode. BLE device can be found by smartphone APP, Device name: Minew_Vxxxxx(default) name, module can be connected with smartphone and enters connection mode. When pull SLP high, device will enter sleep mode.



Note: This pin cannot be left floating to avoid unpredictable errors.

6.2.3 BTDATA(UART control)

The BTDATA pin is only valid when SLP is low. SLP is low, BTDATA is low, and when the module is in a broadcast state, all UART data will be considered as instructions. When the module is connected, all data is considered transparent.



Note: This pin cannot be left floating to avoid unpredictable errors.

6.2.4 UART interface:TX and RX

When both SLP and BTDATA in low level,UART port will be activated,the module TX and RX should be connected to MCU RX and TX,then start to communicate through UART.

In the test,module TX and RX can be connected with an UART to USB module's RX and TX pin, then send command through Serial Port Utility App from PC.



Note: The TX and RX of 2 modules can be connected reversed, each module connect with a smart phone, then transfer data over BLE between each smart phone.

6.2.5 CON_IND

CON_IND is used to indicate module status,high level in connection mode, low level in sleep or broadcast mode to wake up MCU and save power.

6.2.6 FIFO_FULL

FIFO_FULL is used to indicate whether the cache is full or not. When sending large amount of data from MCU to module, this pin can be added to judge. If it is high, then the FIFO is full, and you can not continue to send UART data at this time to avoid packet loss.

6.2.7 Command instruction

After connecting VCC and GND, the SLP and BTDATA pins are directly grounded. At this time, the module is in an unconnected state, that is, the module is in command mode and the serial port is turned on. Instructions can be sent to set and query parameters.

For all device instructions, the returning result is the same:

54544D3A4F4B0D0A00(TTM:OK\r\n\0) is returned after command sent successfully

54544D3A4552500D0A00 (TTM:ERP\r\n\0) is returned after command failed

After sending the correct setting command, the parameters take effect immediately (the baud rate only takes effect after sending the reset command), and the power outage will not be saved at this time. Only after sending the reset command will it be saved to flash.

Below is the list of setup instructions:



Note: The first line in the command list should be sent by Hex format, the second line should be sent by ASCII format. When checking the parameter, the returned result are all hexadecimal numbers, so you need to use hexadecimal numbers to parse the command.phone.



Function	Command (hex/ASCII)	Description
Setting the broadcast name	54544D3A52454E2D<Para> TTM:REN-<Para>	Length: 1-16 Byte, Value: ASCII
Setting the broadcast interval	54544D3A4144502D <Para> TTM:ADP-<Para>	Length: 1 Byte, value: 1-20, corresponding to broadcast interval 1*100ms.
Setting the Connection Interval	54544D3A4349542D<Para> TTM:CIT-<Para>	Length: 1 Byte, <Para> can only be represented in hexadecimal as 0x01~0x64; The actual connection interval is (<Para>*10~<Para>*10+20)ms
Setting the baud rate	54544D3A4250532D<Para> TTM:BPS-<Para>	Length: 1 Byte, values: 0-4, corresponding to 9600/19200/38400/57600/115200 (unit: bps)
Setting the transmit power	54544D3A54504C2D <Para> TTM:TPL-<Para>	Length: 1 Byte, Values: 0-8, corresponding to -40, -20, -16, -12, -8, -4, 0, +4, +8 (unit: dB)
Setting the broadcast data	54544D3A4144442D <Para> TTM:ADD-<Para>	Length: 1-16 Byte, value: any hexadecimal number
Setting the factory ID	54544D3A5049442D <Para> TTM:PID-<Para>	Length: 2 Byte, value: any hexadecimal number
Setting the Service UUID	54544D3A5549442D <Para> TTM:UID-<Para>	Length: 6Byte, (2 Byte service uuid+2 Byte rx UUID+2 Byte tx UUID) Values: Any hexadecimal number, service, rx, tx UUID can't be the same.
Setting the broadcast mode	54544D3A4D4F442D <Para> TTM:MOD-<Para>	Set device broadcast packet format: 0: pass-through broadcast packet 1: iBeacon broadcast packet, you can see the specific broadcast packet format instructions
Setting the UUID of iBeacon	54544D3A4149442D <Para> TTM:AID-<Para>	Length: 16 bytes, value: any hexadecimal number
Set Major	54544D3A4D414A2D<Para> TTM:MAJ-<Para>	Length: 2 bytes, value: any hexadecimal number
Set Minor	54544D3A4D494E2D <Para> TTM:MIN-<Para>	Length: 2 bytes, value: any hexadecimal number
Setting the connection mode	54544D3A5057452D <Para> TTM:PWE-<Para>	Whether the device requires a password to connect, 0: no password required to connect 1: Connection password required
Setting the connection password	54544D3A5057442D <Para> TTM:PWD-<Para>	Length: 1-8 bytes, value: ASCII, the correct password must be entered within 5s on the connection, otherwise the connection will be disconnected



Function	Command (hex/ASCII)	Description
Restore factory equipment	54544D3A5253542D464143 TTM:RST-FAC	Consistent with setting instruction return
Reset	54544D3A525342D535953 TTM:RST-SYS	Modify the confirmation command, the command is correct and there is no return

To ensure successful parameter setting, a parameter reading instruction has been added, which reads the current effective parameters of the device. When the instruction is incorrect, it returns 54544D3A455250D0A00(TTM:ERP\r\n0)

Function	Command (hex/ASCII)	Description
Read broadcast name	54544D3A52454E3F TTM:REN?	Return TTM: REN xxx r\ n \0, return parameter is ASCII
Read broadcast interval	54544D3A4144503F TTM:ADP?	Return TTM: ADP-xxx r\ n \0, return parameter is hexadecimal
Read Connection Interval	54544D3A4349543F TTM:CIT?	Return TTM: CIT-xxx r\ n \0, return parameter is hexadecimal
Read Baud Rate	54544D3A4250533F TTM:BPS?	Return TTM: BPS-xxx r\ n \0, return parameter is hexadecimal
Read transmit power	54544D3A54504C3F TTM:TPL?	Return TTM: TPL-xxx r\ n \0, return parameter is hexadecimal
Read broadcast data	54544D3A4144443F TTM:ADD?	Return TTM: ADD-xxx r\ n \0, return parameter is hexadecimal
Read factory ID	54544D3A5049443F TTM:PID?	Return TTM: PID-xxx r\ n \0, return parameter is hexadecimal
Read Service UUID	54544D3A5549443F TTM:UID?	Return TTM: UID-xxx r\ n \0, return parameter is hexadecimal
Read broadcast mode	54544D3A4D4F443F TTM:MOD?	Return TTM: MOD-xxx r\ n \0, return parameter is hexadecimal
Read UUID	54544D3A4149443F TTM:AID?	Return TTM: AID-xxx r\ n \0, return parameter is hexadecimal

Function	Command (hex/ASCII)	Description
Read Major	54544D3A4D414A3F TTM:MAJ?	Return TTM: MAJ-xxx r\n \0, return parameter is hexadecimal
Reading the Minor of iBeacon	54544D3A4D494E3F TTM:MIN?	Return TTM:MIN-xxx r\n \0, return parameter is hexadecimal
Read Connection Mode	54544D3A5057453F TTM:PWE?	Return TTM: PWE-xxx r\n \0, return parameter is hexadecimal
Read Connection Password	54544D3A5057443F TTM:PWD?	Return TTM: PWD-xxx r\n \0, return parameter is ASCII
Read MAC address	54544D3A4D4143(2D)3F TTM:MAC-? or TTM:MAC?	Return TTM: MAC-xxx r\n \0, return parameter is hexadecimal
Read version information	54544D3A564552(2D)3F TTM:VER-? or TTM:VER?	Return TTM: VER xxx r\n \0, return parameter is ASCII

6.3 Example of operation

6.3.1 Factory Default Parameters

Broadcast Name: Minew_Vxxxxx
 Serial port baud rate: 9600bps,8N1
 Transmit power: 0dBm
 Broadcast interval: 1s
 Broadcast mode: transparent broadcast package
 Custom data: Minew Tech
 Minimum and maximum connection interval: 20ms - 40ms
 Connection password enable: not enabled
 Connection password: minew123
 Major: 0x1234
 minor: 0x1235
 UUID: 74278BDA-B644-4520-8F0C-720EAF059935

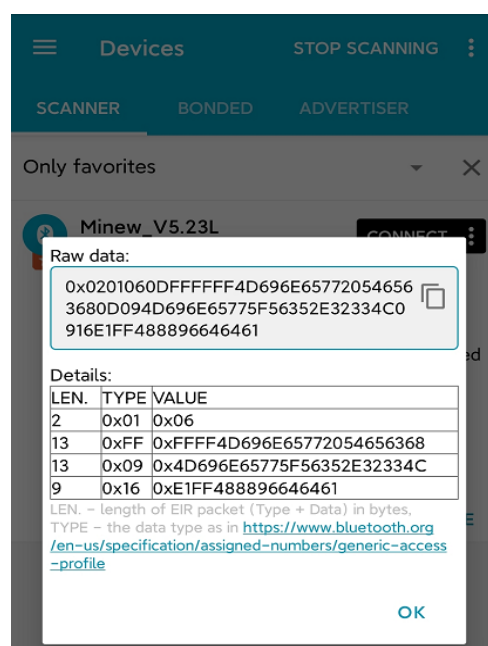
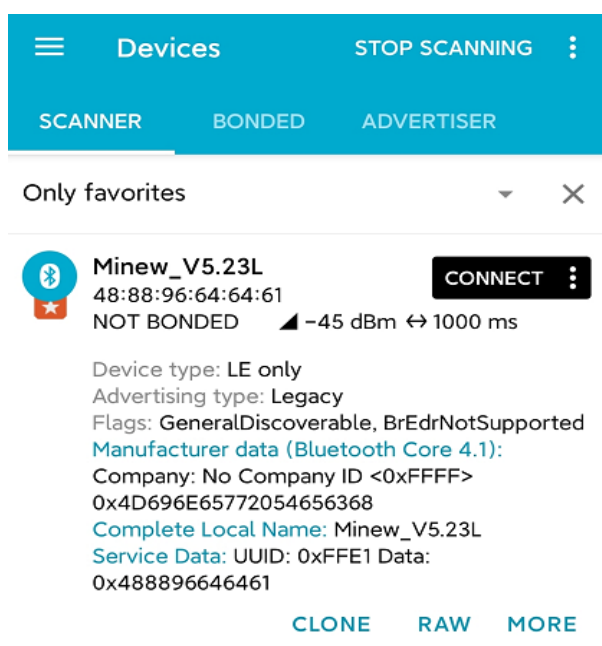


6.3.2 Broadcast packet (broadcast packet+reply packet)

Use nrf connect to scan the device, click Raw after scanning to the device, Raw data is the unparsed data of the scanned device. After parsing the data according to BLE data type, see Detail section, BLE broadcast data has a certain format: length + type + content.

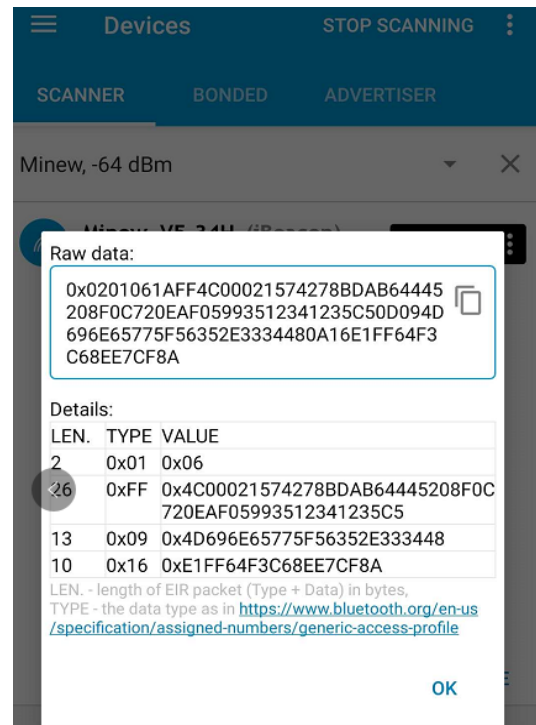
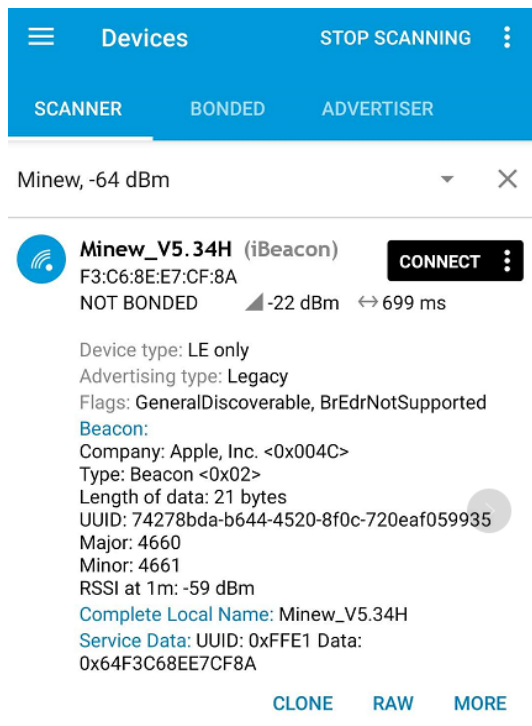
The content is changeable, the type is fixed and the length is determined by the content. There are two broadcast formats for the device, the pass-through broadcast packet and the iBeacon broadcast packet. Both formats contain four types: flag(0x01), broadcast name(0x09), service data(0x16), and manufacturer data(0xFF).

The following figure shows the transmitting broadcast packet: flag, broadcast name, service data is put in the broadcast packet, manufacturer data is put in the reply packet. The service data content is: service data UUID(E1FF) + MAC address. manufacturer data content consists of company id(3906) + battery level information(1 byte) + custom data.



Note: The IOS side can not get the content of the MAC address field, so the MAC address is put back into the broadcast packet to ensure that the IOS side can get the device MAC address. In addition, the WeChat applet can't get the reply packet, so the MAC is put into the service data of the broadcast packet to ensure that the IOS side can also get the device MAC address using the WeChat applet connection.

The following figure shows the iBeacon broadcast packet: flag, manufacturer data is put in the broadcast packet, service data and broadcast name are put in the reply packet. The broadcast packet must follow this fixed format to fulfill the iBeacon protocol definition. In manufacturer data data, 4C 00 is Apple's company id, 02 15 is iBeacon's fixed format, Proximity uuid(16 bytes)+Major(2 bytes)+Minor(2 bytes)+Measured power(1 byte). In iBeacon broadcast mode, manufacturer data can only change the value of Proximity uuid, Major, Minor.
service data= service data UUID(FFE1) + battery level information + MAC address.

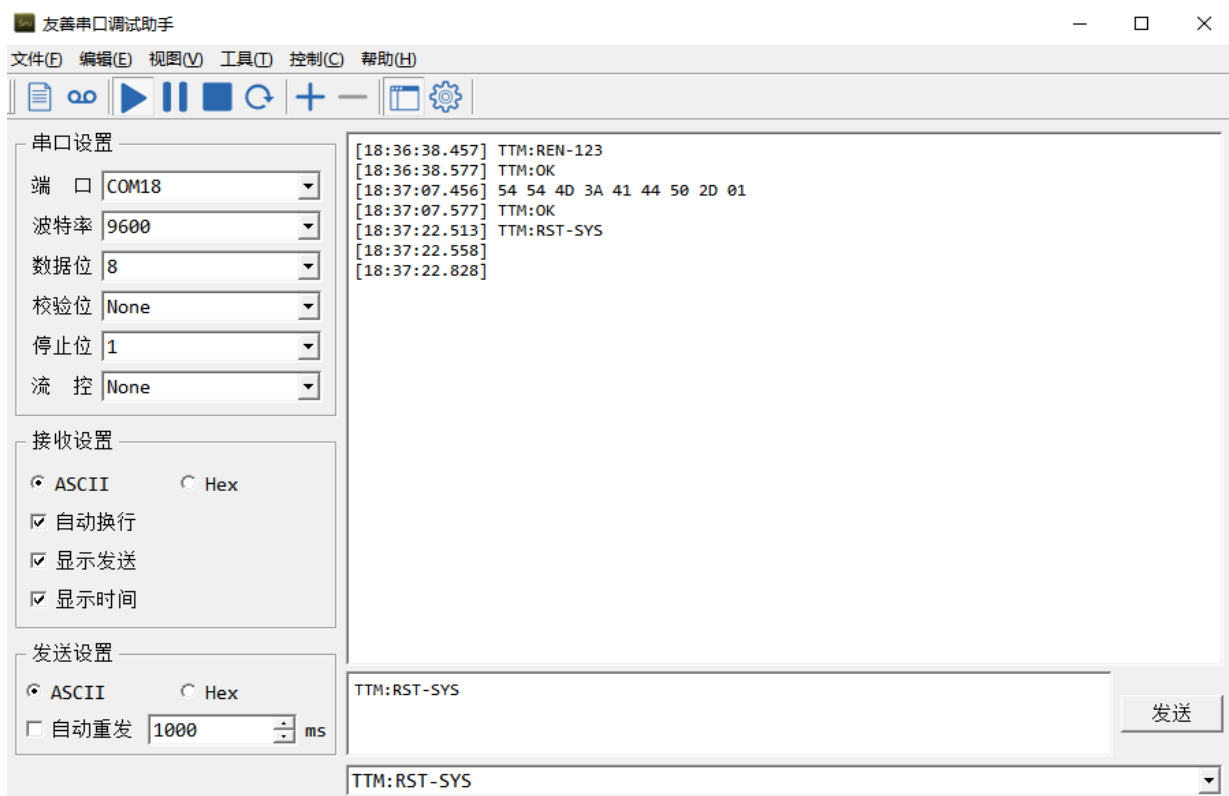


6.3.3 Example of Modifying Parameters

Connect all pins according to the wiring method, with SLP and BTDATA grounded. At this time, the broadcast name can be viewed through the mobile app (Minew serial assistant or nRF connect) as Minew_Vxxxxx device. In this state, if the serial port sends TTM: REN-123, it will return TTM: OK r n 0. The parameters will not take effect until the reset command is sent, and power down saving will be achieved.



Note: When multiple parameters need to be modified, all setting commands can be sent first, and then reset commands can be sent.





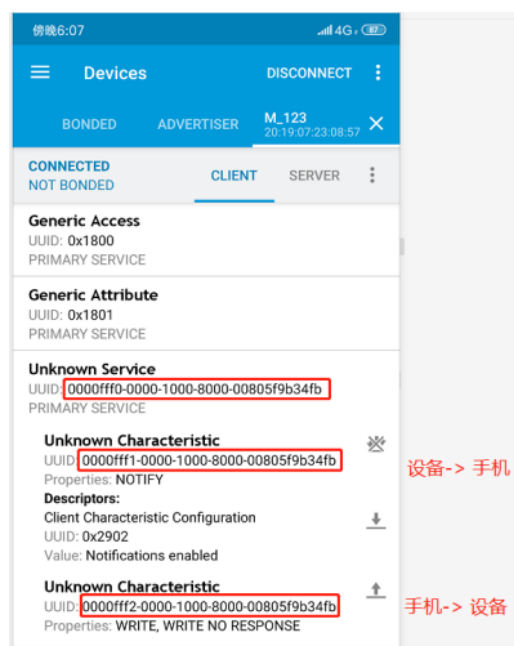
When querying device parameters, due to the fact that the parameters are hexadecimal numbers, when selecting ASCII display, the parameter position may be garbled. In this case, it is necessary to set it to HEX display. The parameters correspond to the position after 2D, as shown in the above figure. To query the baud rate, it is necessary to use HEX display to view the specific parameters.

6.3.4 Transparent transmission

Based on 7.3, connect to the device using the mobile app and keep the BTDATA pin low to perform data passthrough. when BTDATA is not low, it does not affect the broadcasting and connecting of the device, just that passthrough is not possible. Using nRF connect, you can see the specific service, characteristic and corresponding properties.

The UUID consists of the alias UUID (2 byte, 3.4 byte on the left in the figure) + the base UUID (the remaining 14 byte).

The base UUID used for services, features in the passthrough program is standard and is illustrated below with the alias UUID.

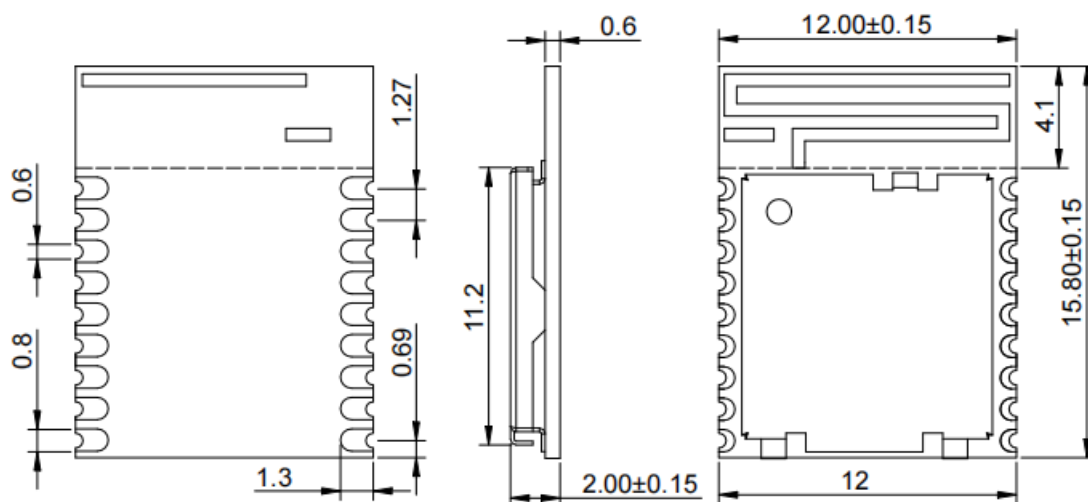


FFF0 is the service UUID, FFF1 is the cell phone receives data and the module sends data; FFF2 is the cell phone sends data and the module receives data.

Eigenvalue UUID	Executable operation	Maximum Packet Length	Note
FFF1	notify	244	The serial port sends data to the module and forwards it to the phone. Data can only be obtained after the phone is enabled to notify. The maximum number of bytes emitted by a module packet is 244 bytes
FFF2	write	244	The phone sends data to the module and forwards it to the serial port. When using the API interface function to write data, the maximum length of data written at one time is 244 bytes



7 MECHANICAL DRAWING

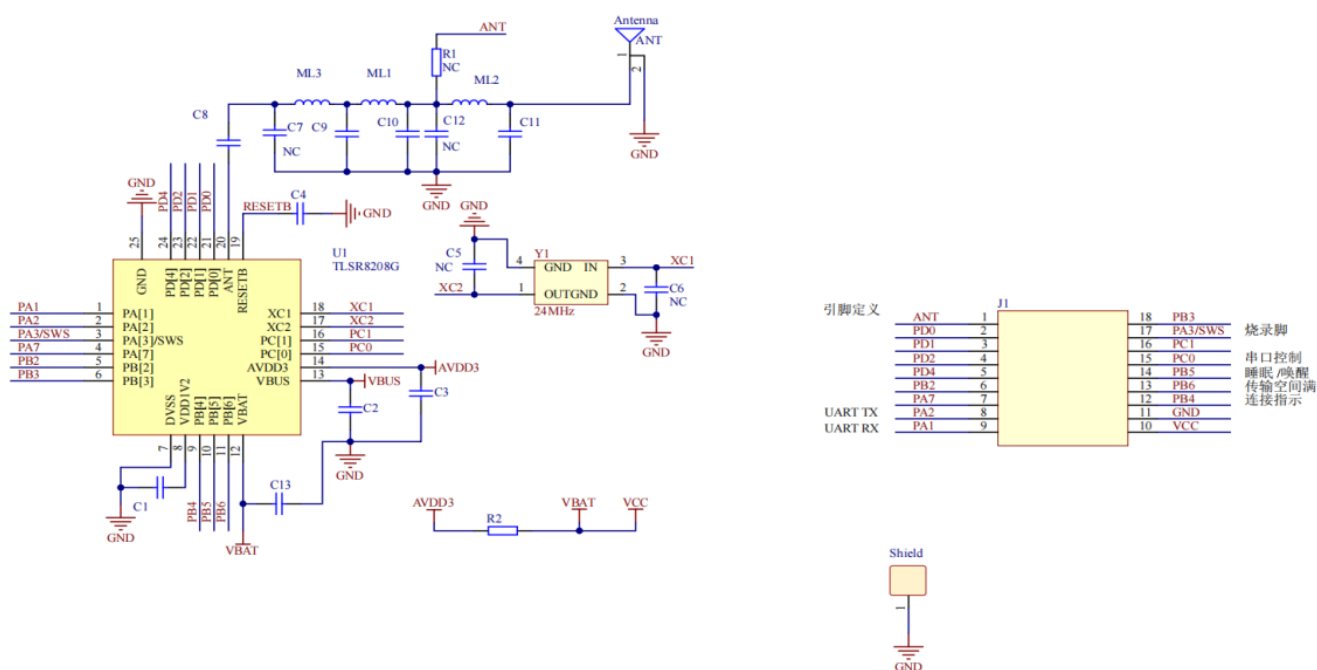


Default unit: mm Default tolerance: ±0.15



Note: Recommended pad size 1.8*0.8mm, pad extends outward 0.5mm

8 ELECTRICAL SCHEMATIC



Notice: Before placing an order, please confirm the specific configuration required with the salesperson.



9 PCB LAYOUT

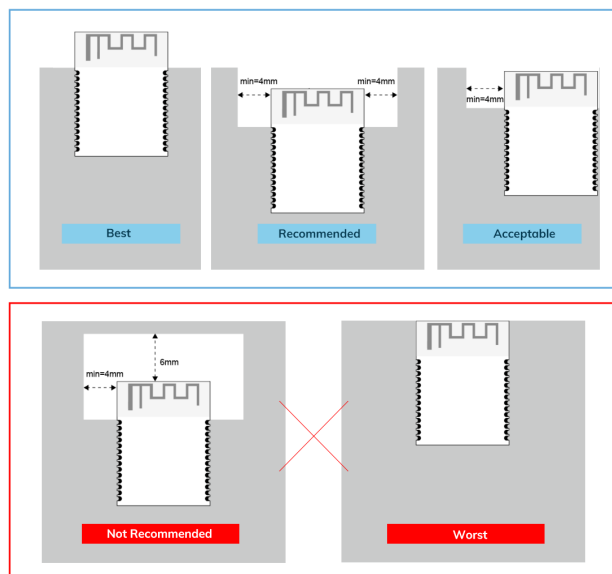
There should be no GND plane or metal cross wiring in the module antenna area, and no components should be placed nearby. It is best to make a hollow or clear area, or place it on the edge of the PCB board. The reference example is as follows:



Notice: It is strongly recommended to use the first design method. The module antenna design is debugged according to the first wiring.

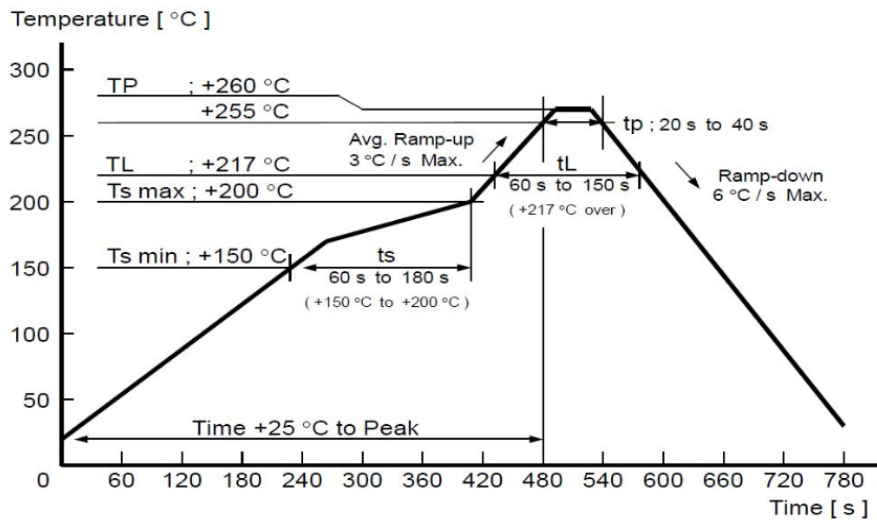
Layout Notes:

- 1) The module's antenna area should be completely clear of any metal obstructions to avoid affecting antenna performance (as shown in the diagram).
- 2) Outside the module's antenna area, try to maintain a solid copper pour to minimize interference from the mainboard signal lines or other sources.
- 3) A clear area of at least 4mm should surround the module's antenna (including its casing) to reduce interference with the antenna.
- 4) Ensure good grounding for components to minimize parasitic inductance.
- 5) Do not place copper under the module's antenna to prevent interference with signal radiation, which could affect transmission distance.
- 6) The antenna should be kept away from other circuits to maintain radiation efficiency and avoid impacting the normal operation of other circuits.
- 7) Position the module as close to the edge of the circuit board as possible, away from other circuitry.
- 8) It is recommended to use a ferrite bead for isolation when connecting the module to the power supply.



10 REFLOW AND SOLDERING

- 1) Perform SMT according to the reflow oven temperature profile provided below, with a maximum temperature of 260°C;
- 2) Follow IPC/JEDEC standards; Peak temperature: < 260°C; Number of reflows: ≤2 times; For SMT involving double-sided placement, it is recommended that the module side undergoes reflow soldering only once. For any special processes, please contact our company.
- 3) Module SMT is recommended to do stencil thickness of 0.13-0.15mm, and then the length of the pin external expansion 1-1.3mm.
- 4) After opening, if the entire package is not used at once, it should be stored in a vacuum to prevent long-term exposure to air, which can cause moisture absorption and pad oxidation. If there is a gap of 7 to 30 days before reuse, it is recommended to bake the tape at 65-70°C for 24 hours without unrolling it before returning to SMT.
- 5) ESD protection measures should be implemented before using SMT.



10.1 ESD Static Protection Recommendations

Categorization	Step	Note
Personnel related	1、 Anti-static ring (grounding)	All need to use anti-static material 1.Anti-static material: resistance $10^4 \sim 10^{11} \Omega$ 2.Insulator: resistance $> 10^{11} \Omega$
	2、 Anti-static clothing	
	3、 Anti-static gloves	
	4、 Anti-static hat	
	5、 Anti-static chair grounding	
	6、 Anti-static shoes	
	7、 Anti-static flooring	
Machines, equipment, tables, trolleys, lockers	1. Use anti-static materials for parts in contact with products (e.g. anti-static tablecloths, anti-static table mats) 2. Grounding of machines, equipment, tables, trolleys and lockers	Grounding instructions are as follows: 1. Auxiliary grounding wire (earth), resistance value $< 25 \Omega$ 2. Discreet: ground of the distribution box, resistance value $< 1 \Omega$
Environments	1. Workshop humidity control 40%~60%, temperature $20^\circ\text{C} \sim 30^\circ\text{C}$;	Ion blower: 1. Confirm whether the point check is effective; 2. Installation in the workstation that is easy to generate static electricity, such as: testing, assembly and other links.
	2. Ion fan dissipation;	

The statistics show that:

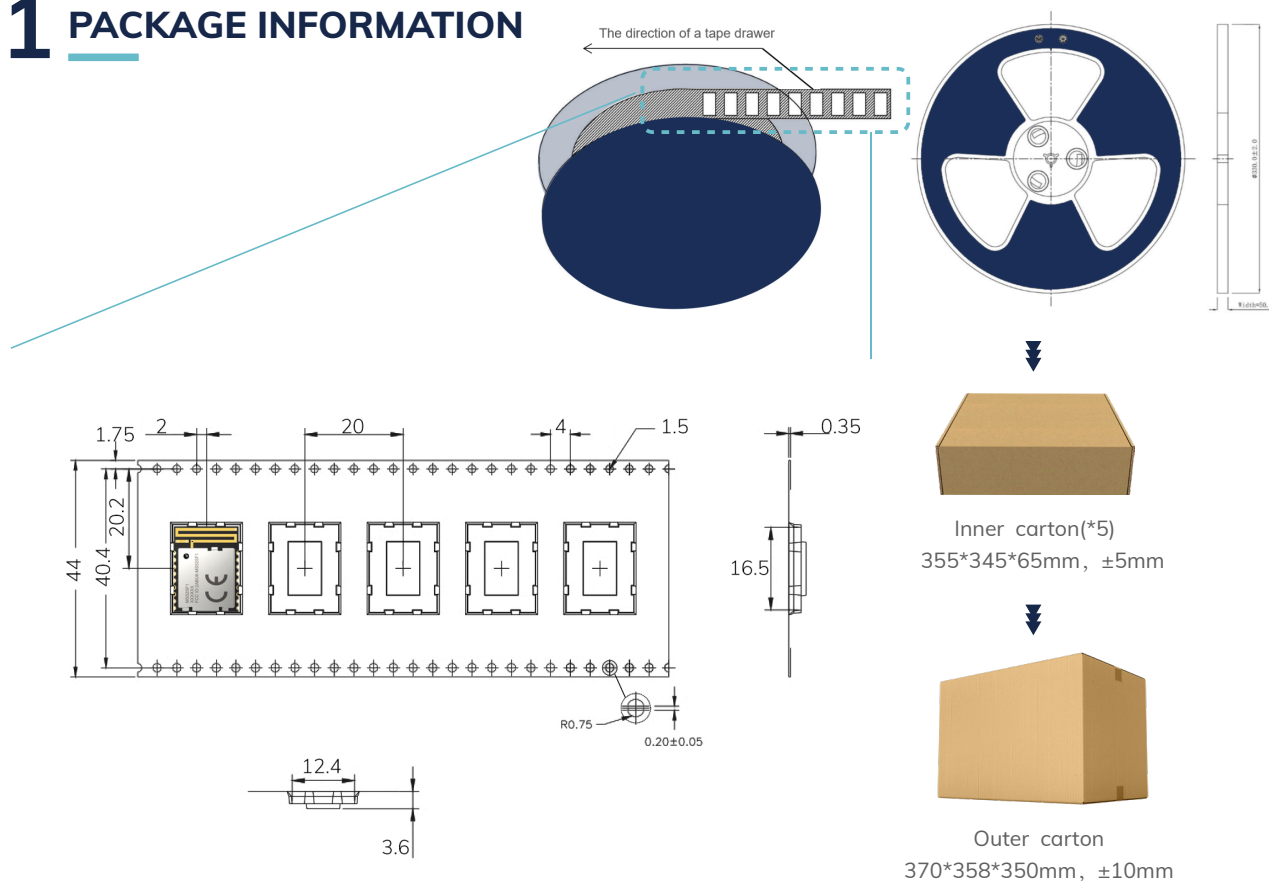
In the Action mode, which has been well protected against ESD, ESD electrostatic damage still occurs in the module:

HBM mode (external discharge to the chip), accounting for about 20%

CDM mode (the chip is connected to the external discharge), accounting for about 80%.

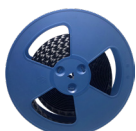


11 PACKAGE INFORMATION

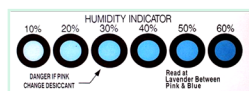


Remarks

General material list for FCL packaging:



Carrier tape packaging tray



Humidity Indicator
(1 pcs/bag)



Desiccant
(placed in a vacuum bag)



Vacuum bag



Inner carton(*5)
355*345*65mm, ±5mm



Outer carton
370*358*350mm, ±10mm

Other:

Moisture-proof label (attached to the vacuum bag)

Certification label (attached to the vacuum bag)

Outer box label



Default unit: mm Default tolerance: ±0.1

Packing detail	Specification	Net weight	Gross weight	Dimension
MS52SF1	850PCS	425g	1290g	W=44mm, T=0.35mm



Note: Default weight tolerance all are within 10g (except the special notes)

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
- (2) This device must accept any interference received, including interference that may cause undesired operation.

12 FCC WARNING

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

Note: This device 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 device 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 device does cause harmful interference to radio or television reception, which can be determined by turning the device 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 device and receiver.
- Connect the device 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. It can be used in portable exposure condition without restriction.

Requirement per KDB996369 D03

2.2 List of applicable FCC rules

List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power, spurious emissions, and operating fundamental frequencies. DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See also Section 2.10 below concerning the need to notify host manufacturers that further testing is required.3Explanation: This module meets the requirements of FCC part 15C(15.247).

2.3 Summarize the specific operational use conditions

Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to-point antennas are used that require reduction in power or compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer's instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain, specifically for master devices in 5 GHz DFS bands.

Explanation: The EUT has a PCB Antenna, , and the antenna use a permanently attached Antenna which is not replaceable.

2.4 Limited module procedures

If a modular transmitter is approved as a "limited module", then the module manufacturer is responsible for approving the host environment that the limited module is used with. The manufacturer of a limited module must describe, both in the filing and in the installation instructions, the alternative means that the limited module manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions.

A limited module manufacturer has the flexibility to define its alternative method to address the conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited module manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval.

This limited module procedure is also applicable for RF exposure evaluation when it is necessary to demonstrate compliance in a specific host. The module manufacturer must state how control of the product into which the modular transmitter will be installed will be maintained such that full compliance of the product is always ensured. For additional hosts other than the specific host originally granted with a limited module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module.

Explanation: The module is not a limited module.

2.5 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;
- 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, The module with trace antenna designs, and This manual has been shown the layout of trace design,, antenna, connectors, and isolation requirements.

2.6 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 for 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 device 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: 2ABU6G-MS52SF1

2.7 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 “omnidirectional 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 a 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 uses a permanently attached antenna, which is unique.

2.8 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: 2ABU6G-MS52SF1

2.9 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.

Explanation: Topband can increase the utility of our modular transmitters by providing instructions that simulates or characterizes a connection by enabling a transmitter.

13 STORAGE CONDITIONS

- Please use this product within 6 months after signing the receipt.
 - This product should be stored without opening the package at an ambient temperature of 5~35°C and a humidity of 20~70%RH.
 - This product should be left for more than 6 months after receipt and should be confirmed before use.
 - The product must be stored in a non-corrosive gas (Cl₂, NH₃, SO₂, NO_x, etc.).
 - To avoid damaging the packaging material, do not apply any excessive mechanical shocks, including but not limited to sharp objects adhering to the packaging material and product dropping.
- This product is suitable for MSL2 (based on JEDEC standard J-STD-020).
 - After opening the package, the product must be stored at ≤30°C/<60%RH. It is recommended to use the product within 3-6 months after opening the package.
 - When the color of the indicator in the package changes, the product should be baked before welding.
- Baking is not required for one year if exposure is limited to <30°C and 60%RH. Refer to MSL2 for exposure criteria for moisture sensitivity level. If exposed to (≥168h@85°C/60%RH) conditions or stored for more than one year, recommended baking conditions.
 1. 120 ±5/-5°C, 8 hours, 1 time
Products must be baked individually on heat-resistant trays because the materials (base tape, reel tape, and cover tape) are not heat-resistant, and the packaging material may be deformed at temperatures of 120°C;
 2. 90°C ±8/-0°C, 24hours, 1times
The base tape can be baked together with the product at this temperature. Please pay attention to the uniformity of heat.

14 HANDLING CONDITIONS

- Be careful in handling or transporting products because excessive stress or mechanical shock may break products.
- Handle with care if products may have cracks or damages on their terminals. If there is any such damage, the characteristics of products may change. Do not touch products with bare hands that may result in poor solder ability and destroy by static electrical charge.

15 QUALITY

Cognizant of our commitment to quality, we operate our own factory equipped with state-of-the-art production facilities and a meticulous quality management system. We hold certifications for ISO9001, ISO14001, ISO27001, OHSAS18001, BSCI.

Every product undergoes stringent testing, including transmit power, sensitivity, power consumption, stability, and aging tests. Our fully automated module production line is now in full operation, boasting a production capacity in the millions, capable of meeting high-volume production demands.

16 COPYRIGHT STATEMENT

This manual and all the contents contained in it are owned by Shenzhen Minewsemi Co., Ltd. and are protected by Chinese laws and applicable international conventions related to copyright laws.

The certified trademarks included in this product and related documents have been licensed for use by MinewSemi. This includes but is not limited to certifications such as BQB, RoHS, REACH, CE, FCC, BQB, IC, SRRC, TELEC, WPC, RCM, WEEE, etc. The respective textual trademarks and logos belong to their respective owners. For example, the Bluetooth® textual trademark and logo are owned by Bluetooth SIG, Inc. Other trademarks and trade names are those of their respective owners. Due to the small size of the module product, the "®" symbol is omitted from the Bluetooth Primary Trademarks information in compliance with regulations.

The company has the right to change the content of this manual according to the technological development, and the revised version will not be notified otherwise. Without the written permission and authorization of the company, any individual, company, or organization shall not modify the contents of this manual or use part or all of the contents of this manual in other ways. Violators will be held accountable in accordance with the law.

17 RELATED DOCUMENTS

- [Telink TLSR8208G_Chip_Datasheet](https://en.minewsemi.com/file/Telink_TLSR8208G_Chip_Datasheet_EN.pdf)
https://en.minewsemi.com/file/Telink_TLSR8208G_Chip_Datasheet_EN.pdf
- [MinewSemi_Product_Naming_Reference_Manual](https://en.minewsemi.com/file/MinewSemi_Product_Naming_Reference_Manual_EN.pdf)
https://en.minewsemi.com/file/MinewSemi_Product_Naming_Reference_Manual_EN.pdf
- [MinewSemi_Connectivity_Module_Catalogue](https://en.minewsemi.com/file/MinewSemi_Connectivity_Module_Catalogue_EN.pdf)
https://en.minewsemi.com/file/MinewSemi_Connectivity_Module_Catalogue_EN.pdf



For product change notifications and regular updates of Minewsemi documentation, please register on our website: www.minewsemi.com

MINESEMI
Innovative IoT Module Expert



SHENZHEN MINEWSEMI CO., LTD.



0086-755-2801 0353



<https://minewsemi.com>



minewsemi@minew.com



<https://store.minewsemi.com>



Gangzhilong Technology Park, Qinglong Road, Longhua District, Shenzhen