

Bluetooth LE Module **ME54BS12**



Datasheet

V 1.0.0



Version Note

Version	Details	Contributor(s)	Date	Notes
1.0.0	First edit	Michelle	2025.09.26	

Part Number

Model	Hardware Code
ME54BS12	1Y15TI

Click the icon to view and download the latest product documents electronically.
https://en.minewsemi.com/file/ME54BS12-nRF54L15_Datasheet_M_EN.pdf



ME54BS12-nRF54L15

Bluetooth master-slave pass-through module that supports master-slave switching, UART AT command configuration

The ME54BS12 is a master-slave module that can switch between master and slave modes through commands. The master and slave modes cannot work simultaneously and only support one-to-one connections. By default, the device operates in master mode. In master mode, it can scan and connect to devices through commands. The scan can be configured to filter by broadcast name or MAC address to locate relevant devices. Connections can only be initiated by specifying the MAC address. The device communicates with an MCU via a UART interface. In command mode, the UART can be used to send commands to modify parameters such as scan interval, scan timeout, connection interval, broadcast interval, custom broadcast data, and baud rate. The MCU can send a command through UART to switch to slave mode. In slave mode, the device can be in broadcast or connection state, allowing the master device to connect and serve as a bridge for transparent data transmission between the master and the MCU.

FEATURES



Bluetooth 6.0



Supports master-slave switching



One-to-one connection



Supports AT command configuration via UART

KEY PARAMETERS

ME54BS12-nRF54L15			
Chip Model	Nordic nRF54L15	Antenna	PCB
Module Size	15.8×12×2mm	GPIO	29
Flash	1.5MB	RAM	256KB
Receiving Sensitivity	-96dBm	Transmitting Power	-40~ +8dBm
Emission Current	0dBm-5mA	Receiving Current	3.2mA
Firmware	Master-slave UART firmware		

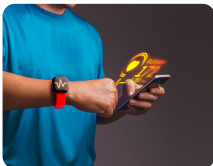
APPLICATION



Smart Home



Computer Accessories



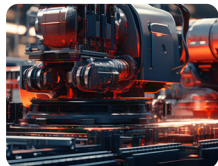
Virtual reality and Augmented reality



Game controllers and Remotes



Medical Devices



Industrial IoT

CERTIFICATION



INDEX

1.Electrical Specification	05
2.Current Consumption Characteristics	05
3.Pin Description	06
4.Pin Definition	06
5.Module Operation Instructions	08
5.1 Tool	08
5.2 Wiring	08
5.2.1 Power Supply	09
5.2.2 SLP(Sleep/Wake)	09
5.2.3 BTDATA(UART Control)	09
5.2.4 UART interface:TX and RX	09
5.2.5 CON_IND	09
5.2.6 FIFO_FULL	09
5.2.7 Command Instructions	09
5.3 Operation Examples	15
5.3.1 Factory Default Parameters	15
5.3.2 Parameter Modification Example	15
5.3.3 Scanning and Connecting to Devices	15
5.3.4 Master Pass-Through	16
5.3.5 Slave Broadcasting	17
5.3.6 Slave Pass-Through	19
6.Mechanical Drawing	20
7.PCB Layout	20
8.Reflow and Soldering	21
9.Package Information	22
10.FCC warning	23
11.Storage Conditions	26
12.Handling Conditions	26
13.Quality	26
14.Copyright Statement	27
15.Related Documents	27



1 ELECTRICAL SPECIFICATION

Parameters	Value	Notes
Working Voltage	1.71V-3.6V	To ensure RF work, it is recommended that the supply voltage should not be lower than 2.3V.
Working Temperature	-40℃~+105℃	Work for -40℃~+105℃
Transmission Power	-40 ~ +8dBm	Configurable
Receiving Current	3.2mA	RF reception current in 1Mbps mode
Emission Current	5mA	RF emission current in 0dBm mode
Module Dimension	15.8*12*2mm	
Quantity of IO Port	29	

2 CURRENT CONSUMPTION CHARACTERISTICS

The following power consumption tests were conducted with a supply voltage of 3.3V and at room temperature.

The power consumption is not the same in master mode and slave mode.

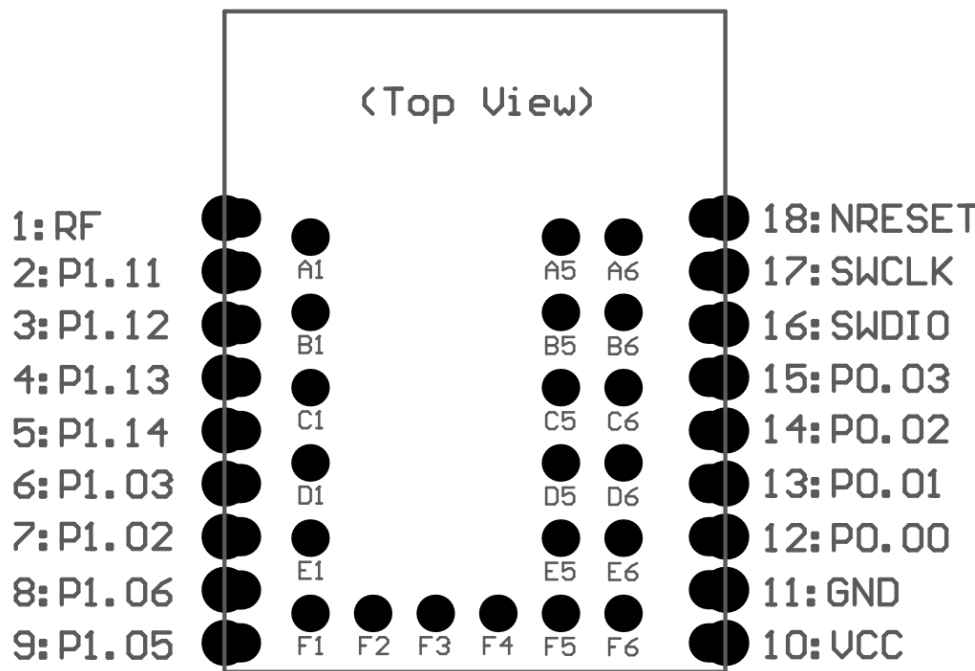
In slave mode, the power consumption is as follows: (broadcast interval is 1s, maximum and minimum connection interval is 20-40ms, and transmit power is 0dBm).

Status	Consumption	Peak(mA)	Avg(μA)
Sleep mode average current (SLP pulled high, BTDATA pulled high)		1.69	4.76
Broadcast average current (SLP pin connected to GND, BTDATA pulled high)		7.17	13.69
Broadcast average current (SLP and BTDATA pin connected to GND)		7.24	146.18
Transmission average current (SLP, BTDATA pin pulled low, baud rate 115200, 200 bytes, 20ms/time)		7.68	378.80
Broadcast average current in Longrange operating mode (SLP pulled low, BTDATA pin pulled high)		7.62	65.89
Longrange operating mode connection state average current (connected to VDD, GND, SLP pulled low, BTDATA pin pulled high)		7.47	287.10

In master mode, the power consumption is as follows: (maximum minimum connection interval of 20-40ms, transmit power 0dBm)

Status	Consumption	Peak(mA)	Avg(μA)
Transmission average current (SLP, BTDATA pin pull-down)		7.77	846.64
Transmission average current in Longrange operating mode (SLP, BTDATA pin pulled low)		7.59	3.58 (mA)

3PIN DESCRIPTION



4PIN DEFINITION

Pin Number	Symbol	Type	Definition
1	RF	External Antenna Pin	If you use the antenna with the module, this pin is directly suspended. If you don't use the module antenna, you can connect an external antenna through this pin. When connecting an external antenna, you need to solder the resistor connected to the antenna horizontally to this pin
2	P1.11	GPIO	Firmware not used, NC
3	P1.12	GPIO	Firmware not used, NC
4	P1.13	GPIO	Firmware not used, NC
5	P1.14	GPIO	Firmware not used, NC



Pin Number	Symbol	Type	Definition
6	P1.03	GPIO	Firmware not used, NC
7	P1.02	GPIO	Firmware not used, NC
8	P1.06	GPIO	Firmware not used, NC
9	P1.05	GPIO	Firmware not used, NC
10	VCC	VCC	
11	GND	GND	
12	P0.00	Connection Indication Pin	Unconnected state: low Connected state: high
13	P0.01	Transmission Space Indication Pin	Judge whether the transmission space is available or not 0: Bluetooth module has available space, can transmit 1: The host stops transmission and waits for the available space to be released.
14	P0.02	Sleep Pin	Active low to wake up, high level for sleep. Must not be left floating.
15	P0.03	UART control Pin	UART enable/disable control pin. Must not be left floating. UART Off: High level UART On: Low level
16	SWDIO	Programming Data Pin	Programming firmware
17	SWCLK	Programming Clock Pin	Programming firmware
18	NRESET	Reset	Low level reset, high level operation
A1	GND	GND	
A5	GND	GND	
A6	P0.04	GPIO	Firmware not used, NC
B1	P1.09	GPIO	Firmware not used, NC
B5	GND	GND	
B6	P2.09	GPIO	Firmware not used, NC
C1	P1.10	GPIO	Firmware not used, NC
C5	GND	GND	
C6	P2.10	GPIO	Firmware not used, NC



Pin Number	Symbol	Type	Definition
D1	P2.00	GPIO	Firmware not used, NC
D5	P2.08	GPIO	Firmware not used, NC
D6	P2.07	GPIO	Firmware not used, NC
E1	P1.08	GPIO	Firmware not used, NC
E5	P2.05	GPIO	Firmware not used, NC
E6	P2.06	GPIO	Firmware not used, NC
F1	P1.07	GPIO	Firmware not used, NC
F2	P1.04	GPIO	Firmware not used, NC
F3	P2.01	GPIO	Firmware not used, NC
F4	P2.03	GPIO	Firmware not used, NC
F5	P2.02	GPIO	Firmware not used, NC
F6	P2.04	GPIO	Firmware not used, NC



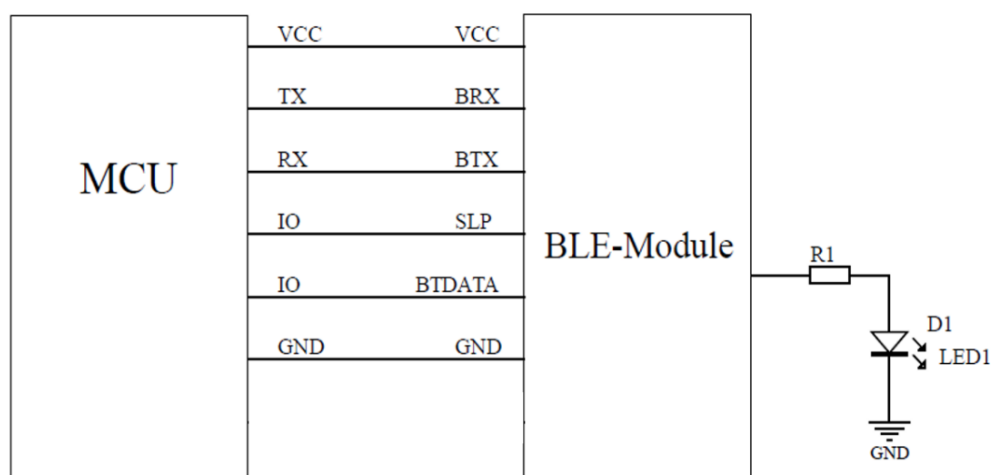
Note: In slave pass-through mode, when connection password is enabled, P0.00 outputs a high level only after a successful connection and correct password entry.
In master pass-through mode, P0.00 outputs a high level only after a successful connection and notification (notify) is enabled.

5 MODULE OPERATION INSTRUCTION

5.1 Tool

PC serial port assistant: Search and download "Serialport Utility" in your browser. The PC serial port assistant is used to debug the UART interface of the module.

5.2 Wiring



5.2.1 Power Supply

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

5.2.2 SLP(Sleep/Wake)

When pull SLP low, the module in broadcast mode. BLE device can be found by smartphone APP, Device name: Minew_Vxxxxx (default), 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.

5.2.3 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.

5.2.4 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.

During module testing, the TX and RX pins can be connected to a USB-to-UART module. This allows sending and receiving UART data through a PC serial port assistant.



Note: If a USB-to-UART module is not available, you can connect the TX and RX pins of two Bluetooth modules in reverse. Then, connect each module to a separate phone, and you can test data pass-through between the two devices.

5.2.5 CON_IND

CON_IND is used to indicate the connection status. It outputs a high level when connected and a low level in other states. This pin can be used to wake up the connected MCU, helping to save power.

5.2.6 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 used for status checking. If it is high, then the FIFO is full, and UART data should not be transmitted further to avoid packet loss.

5.2.7 Command Instructions

After connecting VCC and GND, grounding the SLP and BTDATA pins places the module in an unconnected state, meaning the module is in command mode with the UART enabled. Commands can be sent to set and query parameters.

For all device commands, the return messages are consistent:

A successful command returns: 54544D3A4F4B0D0A00 (TTM\r\n\0)

A failed command returns: 54544D3A4552500D0A00 (TTM\r\n\0)

After sending a valid setting command, parameters are applied immediately (note: baud rate settings only apply after a reset command is issued). However, these parameters are not retained on power down unless the reset command is sent, which saves them to flash memory.

Below is the list of setting commands:



Note: The first and second lines of the command correspond to the HEX format and ASCII format, respectively. When querying parameters, all returned values are in hexadecimal, so commands need to be parsed using hexadecimal numbers.

The master-related parameters include scan timeout, scan interval, and connection interval. The connection interval setting applies to both master and slave modes. However, scan timeout and scan interval are only effective in master mode.

Function	Command (hex/ASCII)	Description
Set scan Timeout	54544D3A5343542D<Para> TTM:SCT-<Para>	Length: 1 Byte, Values: 0-36, Para*5S, 0 means scanning all the time and output scanning result in real time.
Set Scan Timeout	54544D3A5343543F TTM:SCT?	Return TTM:SCT-<Para>\r\n0, Para: Hexadecimal
Set Scan Interval	54544D3A5349572D<Para> TTM:SIW-<Para>	Length: 1 Byte, Value: 0-100, Para*10mS; Try not to modify the scanning parameters during the scanning process
Query Scan Interval	54544D3A5349573F TTM:SIW?	Return TTM:SIW-<Para>\r\n0, Para: Hexadecimal
Set RSSI Filtering	54544D3A5253492D<Para> TTM:RSI-<Para>	Para is expressed in hexadecimal or ASCII code. Value: -120 ~ -30dBm, if less than -100dbm, then disable RSSI filtering.
Query RSSI Filtering	54544D3A5253493F TTM:RSI?	Return TTM:RSI-<Para>\r\n0, Para: Hexadecimal
Set Broadcast Name Filtering	54544D3A404E462D<Para> TTM:AVF-<Para>	Length: 16 Byte, Value: ASCII code
Query Broadcast Name Filtering	54544D3A404E463F TTM:ANF?	Return TTM:ANF-<Para>\r\n0, Para: Hexadecimal. Para is empty if not switched on
Cancel Broadcast Name Filtering	54544D3A404E462D TTM:ANF-	Cancel broadcast name filtering
Setting MAC Address Filtering	54544D3A4D41462D<Para> TTM:MAF-<Para>	Length: 6 Byte, value: hexadecimal number When MAC address filtering is enabled, the scanning results are output in real time, and the output format is. 0xAA+MAC+RSSI+adv_data+0x0D0A. If no filtering device is scanned it will output: TTM:NO-DEVICE\r\n0
Query MAC Address Filtering	54544D3A4D41463F TTM:MAF?	Return TTM:MAF-<Para>\r\n0, Para: Hexadecimal
Cancel MAC address filtering	54544D3A4D41462D TTM:MAF-	Cancel MAC address filtering



Note: To make it easier to find the device, RSSI, broadcast name, and MAC address filtering features have been added. Only one of MAC address filtering or broadcast name filtering can be active at a time. Enabling MAC address filtering will automatically disable broadcast name filtering, and enabling broadcast name filtering will automatically disable MAC address filtering.

When functioning as a master, the device needs to send specific commands to enable Bluetooth operations, such as scanning and initiating a connection to a particular device. Once connected, during data transmission, all data packets are checked to determine if they contain a disconnect command.

Function	Command (hex/ASCII)	Description
Turn On Scanning	54544d3a5343414e TTM:SCAN	Command correctly return: TTM:SCAN-NING\r\n\r\n0, error return TTM:ERP\r\n\r\n0, after scanning to the device serial port output 10 RSSI value of the strongest device, scanning timeout is 0 or MAC address filtering scanning output results format 0xAA + MAC + RSSI + adv_data + 0x0D0A, the rest of the output for MAC + broadcast name
Stop Scanning	54544d3a5343414e2d53544f50 TTM:SCAN-STOP	The command returns correctly: TTM:SCAN-STOP\r\n\r\n0, incorrectly returns TTM:ERP\r\n\r\n0
Connect to the Specified MAC	54544D3A434F4E4E2D <MAC> TTM:CONN-<MAC>	Command return: TTM:CONNING\r\n\r\n0, indicating connection in progress TTM:CONN-TOUT\r\n\r\n0, connection timeout TTM:NO-DEVICE\r\n\r\n0, device not found TTM:CONN-MAC-XXXXXXXXXXXX\r\n\r\n0, connected TTM:MAC-DCON-XXXXXXXXXXXX\r\n\r\n0, Disconnect TTM:ERP\r\n\r\n0, Command Error
Disconnect All Connections	54544D3A444953432D414C4C TTM:DISC-ALL	Correctly return TTM:DISC-XXXXXXXXXXXX\r\n\r\n0, incorrectly return TTM:ERP\r\n\r\n0



Note: The above commands are only effective in master mode. If the device is not in master mode, sending these commands will return TTM:ERP\r\n\r\n0.

For all other device commands, regardless of whether in master or slave mode, as long as the parameter requirements are met, the response will be TTM:OK\r\n\r\n0, and the parameters will take effect in the corresponding role.

In master mode, the device can initiate a connection to a specified slave device using its MAC address, entering connection mode directly. When the MAC address of the target device is known, scanning is not necessary; you can simply send the connection command.

When switching from master mode to slave mode, the device must first ensure it is in an unconnected state. You should invoke the command to set the role, followed by the reset command to successfully switch to the slave role, and vice versa.

Function	Command (hex/ASCII)	Description
Set Role	54544D3A524F4C2D <Para> TTM:ROL-<Para>	Length: 1 Byte, Values: 0-1, 0 for slave mode, 1 for master mode
Query Role	54544d3a524f4c3f TTM:ROL?	Return to TTM:ROL-<Para>\r\n\r\n0, Para: Hexadecimal

When in slave mode, you can set and query many parameters of the broadcast process and connection process as follows:

Function	Command (hex/ASCII)	Description
Set Broadcast Name	54544D3A52454E2D <Para> TTM:REN-<Para>	Length: 1-16 Byte, Value: ASCII
Query Broadcast Name	54544d3a52454e3f TTM:REN?	Return TTM:REN-<Para>\r\n\0, Para is ASCII
Set Broadcast Interval	54544D3A4144502D <Para> TTM:ADP-<Para>	Length: 1 Byte, value: 1-20, corresponding to broadcast interval 1*100ms.
Query Broadcast Interval	54544D3A4144503F TTM:ADP?	Return TTM:ADP-<Para>\r\n\0, Para: Hexadecimal
Set Transmitting Power	54544D3A54504C2D <Para> TTM:TPL-<Para>	Length: 1 Byte, Values: 0-8, corresponding to -40, -20, -16, -12, -8, -4, 0, +4, +7 (unit: dBm)
Query Transmitting Power	54544D3A54504C3F TTM:TPL?	Return TTM:TPL-<Para>\r\n\0, Para: Hexadecimal
Set Broadcast Data	54544D3A4144442D <Para> TTM:ADD-<Para>	Length: 1-16 Byte, value: any hexadecimal number
Query Broadcast Data	54544D3A4144443F TTM:ADD?	Return TTM:ADD-<Para>\r\n\0, Para: Hexadecimal
Set Factory ID	54544D3A5049442D <Para> TTM:PID-<Para>	Length: 2 Byte, value: any hexadecimal number
Query Factory ID	54544D3A5049443F TTM:PID?	Return TTM:PID-<Para>\r\n\0, Para: Hexadecimal
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.
Query Service UUID	54544D3A5549443F TTM:UID?	Return TTM:UID-<Para>\r\n\0, Para: Hexadecimal. After modification, it does not take effect immediately—a reset command must be sent for the change to apply. The queried UUID reflects the UUID currently in use.



Function	Command (hex/ASCII)	Description
Set 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
Query Broadcast Mode	54544d3a4d4f443f TTM:MOD?	Return TTM:MOD-<Para>\r\n\0, Para: Hexadecimal
Setting the UUID	54544D3A4149442D <Para> TTM:AID-<Para>	Length: 16 bytes, value: any hexadecimal number
Query UUID	54544D3A4149443F TTM:AID?	Return TTM:AID-<Para>\r\n\0, Para: Hexadecimal
Set Major	54544D3A4D414A2D <Para> TTM:MAJ-<Para>	Length: 2 bytes, value: any hexadecimal number
Query Major	54544D3A4D414A3F TTM:MAJ?	Return to TTM:MAJ-<Para>\r\n\0, Para: Hexadecimal
Set Minor	54544D3A4D494E2D <Para> TTM:MIN-<Para>	Length: 2 bytes, value: any hexadecimal number
Query Minor	54544d3a4d494e3f TTM:MIN?	Return TTM:MIN-<Para>\r\n\0, Para: Hexadecimal
Set 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
Query Connection Mode	54544D3A5057453F TTM:PWE?	Return TTM:PWE-<Para>\r\n\0, Para: Hexadecimal
Set 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
Query Connection Password	54544D3A5057443F TTM:PWD?	Return to TTM:PWD-<Para>\r\n\0, Para:ASCII

Regardless of whether in master mode or slave mode, all configuration commands require a reset command to take effect. Query commands will return the relevant parameters, while erroneous commands will return TTM:ERP\r\n\0.

For the device as a whole, commands for baud rate and connection interval are effective in both master and slave modes.



Function	Command (hex/ASCII)	Description
Set Baud Rate	54544D3A4250532D <Para> TTM:BPS-<Para>	Length: 1 Byte, Values: 0-4, corresponding to 9600/ 19200/38400/57600/115200 (unit: bps) respectively.
Query baud	54544D3A4250533F TTM:BPS?	Return TTM:BPS-<Para>\r\n0, Para: Hexadecimal
Set Connection Interval	54544D3A4349542D <Para> TTM:CIT-<Para>	Length: 1 Byte, value: 1-100, corresponding to the minimum connection interval 1*10ms, maximum connection interval = minimum connection interval + 20ms.
Query connection interval	54544D3A4349543F TTM:CIT?	Return to TTM:CIT-<Para>\r\n0, Para: Hexadecimal
Read MAC Address	54544D3A4D4143(2D)3F TTM:MAC-? or TTM:MAC?	Return TTM:MAC-<Para>\r\n0, Para: Hexadecimal
Read Version Information	54544D3A564552(2D)3F TTM:VER-? or TTM:VER?	Return to TTM:VER-<Para>\r\n0, Para:ASCII
Restore Factory Settings	54544D3A5253542D464143 TTM:RST-FAC	Consistent with the return of the setup command
Reset	54544D3A5253542D535953 TTM:RST-SYS	Success will return TTM:OK\r\n0
Set UART Parity	54544D3A5041522D <Para> TTM:PAR-<Para>	Set whether UART parity is enabled. <Para> can be represented as a hexadecimal value (0x00~0x02) or as a string ("0"~"2"), with a length of 1 byte: 0: Disabled, 1: Odd parity, 2: Even parity Note: After a successful setting and reset, the host (e.g., serial assistant) must also be configured with the corresponding parity setting.
Query UART Parity	54544D3A5041523F TTM:PAR?	Query whether UART parity is enabled. Return: TTM:PAR-<Para>\r\n0 The returned <Para> is represented in hexadecimal format.
Set Operating PHY	54544D3A5750592D <Para> TTM:WPY-<Para>	Set the device operating PHY. <Para> can be represented as a hexadecimal value (0x01~0x02) or as a string ("1"~"2"), with a length of 1 byte: 1: Standard mode, 2: Long Range mode Note: Long Range mode increases communication distance but reduces data transmission speed.
Query Operating PHY	54544D3A5750593F TTM:WPY?	Query device operating PHY. Return: TTM:WPY-<Para>\r\n0, the returned <Para> is represented in hexadecimal format.



5.3 Operation Examples

5.3.1 Factory Default Parameters

Broadcast Name: Minew_Vxxxxx
Serial port baud rate: 9600bps,8N1
Transmit power: 0dBm
Minimum and maximum connection interval: 20ms - 40ms
Device Role: Master
Scanning RSSI filter value: -120dBm
Scanning broadcast name filtering: not enabled
Scanning MAC address filtering: not enabled
Serial port parity bit: not enabled

Default parameters related to master mode:

Scanning timeout: 10s
Scanning interval: 100ms

Default parameters related to slave mode:

Broadcast interval: 1s
Broadcast mode: transparent broadcast package
Custom data: MinewTech
Connection password enable: not enabled
Connection password: minew123
Major: 0x1234
minor: 0x1235
UUID: 74278BDA-B644-4520-8F0C-720EAF059935

5.3.2 Parameter Modification Example

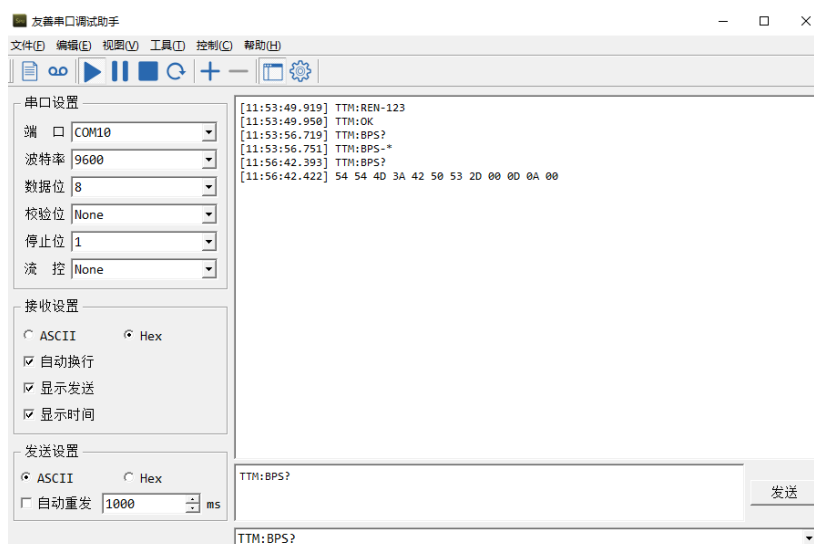
Connect all pins according to the wiring diagram, grounding SLP and BTDATA to put the device in an unconnected state. At this point, parameters can be set, and regardless of whether in master mode or slave mode, all parameters can be configured, taking effect immediately.

However, the effective parameters will only be reflected in the corresponding role. For example, if the broadcast name is modified while in master mode, the change will take effect, but it will only be visible when the device switches to slave mode. After sending the reset command, all parameters will be saved during power off.



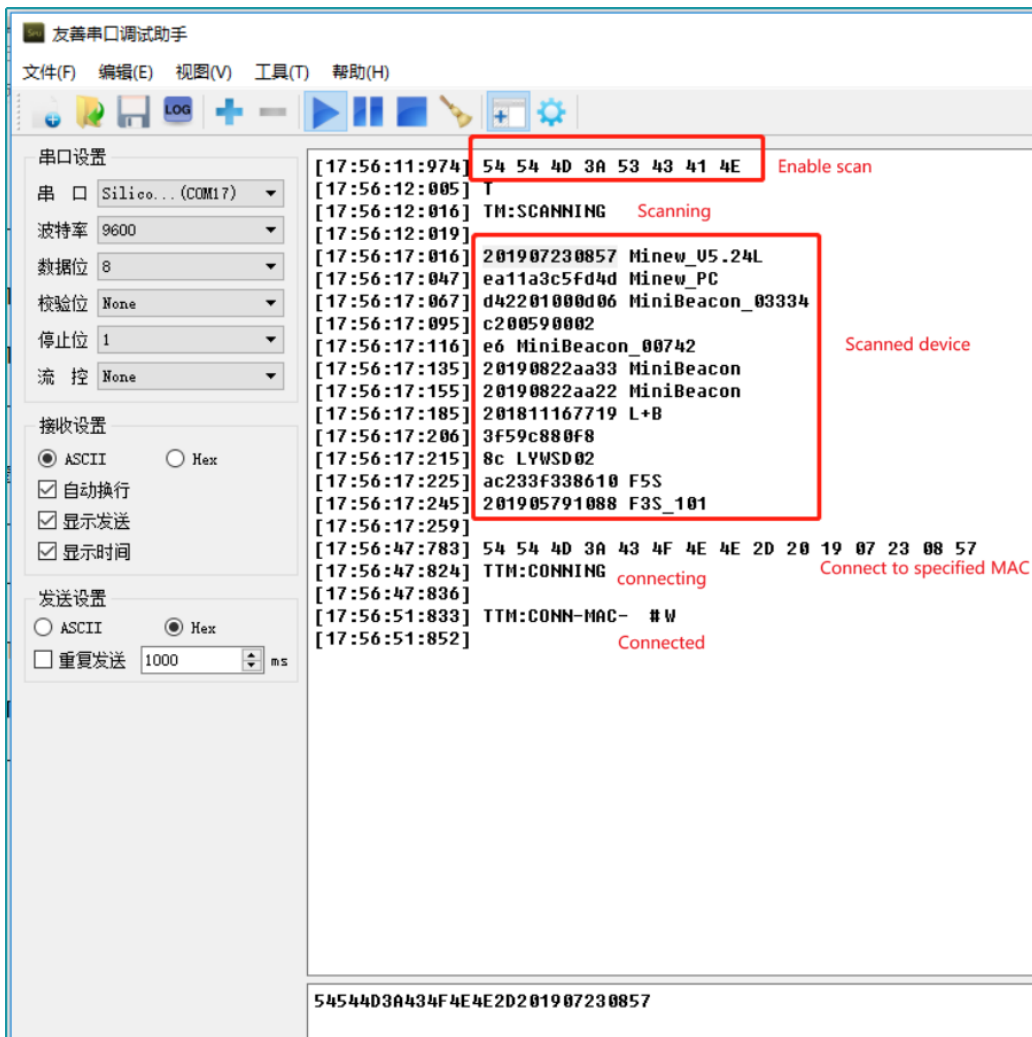
Note: When you need to modify multiple parameters, you can send all the setting commands first and then send the reset command.

When querying device parameters, the values are in hexadecimal format. If ASCII display is selected, the parameter positions may appear as garbled text. In this case, you should set it to HEX display. The parameters will correspond to the positions after "2D" in the output. To check the baud rate, make sure to use HEX display to view the specific parameters.



5.3.3 Scanning and Connecting to Devices

Send the 54544D3A5343414E (TTM:SCAN) command to scan for a device and obtain its MAC address. The scanned device returns MAC + broadcast name information. Send the 54544D3A434F4E4E2D201907230857 command and the module will connect the device with MAC address 20:19:07:23:08:57. The device connected will return TTM:CONN-MAC-XXXXXXXXXXXX\r\n0. Since MAC is a hexadecimal number, the entire command is sent as a hexadecimal number. Once connected you can perform data passthrough.



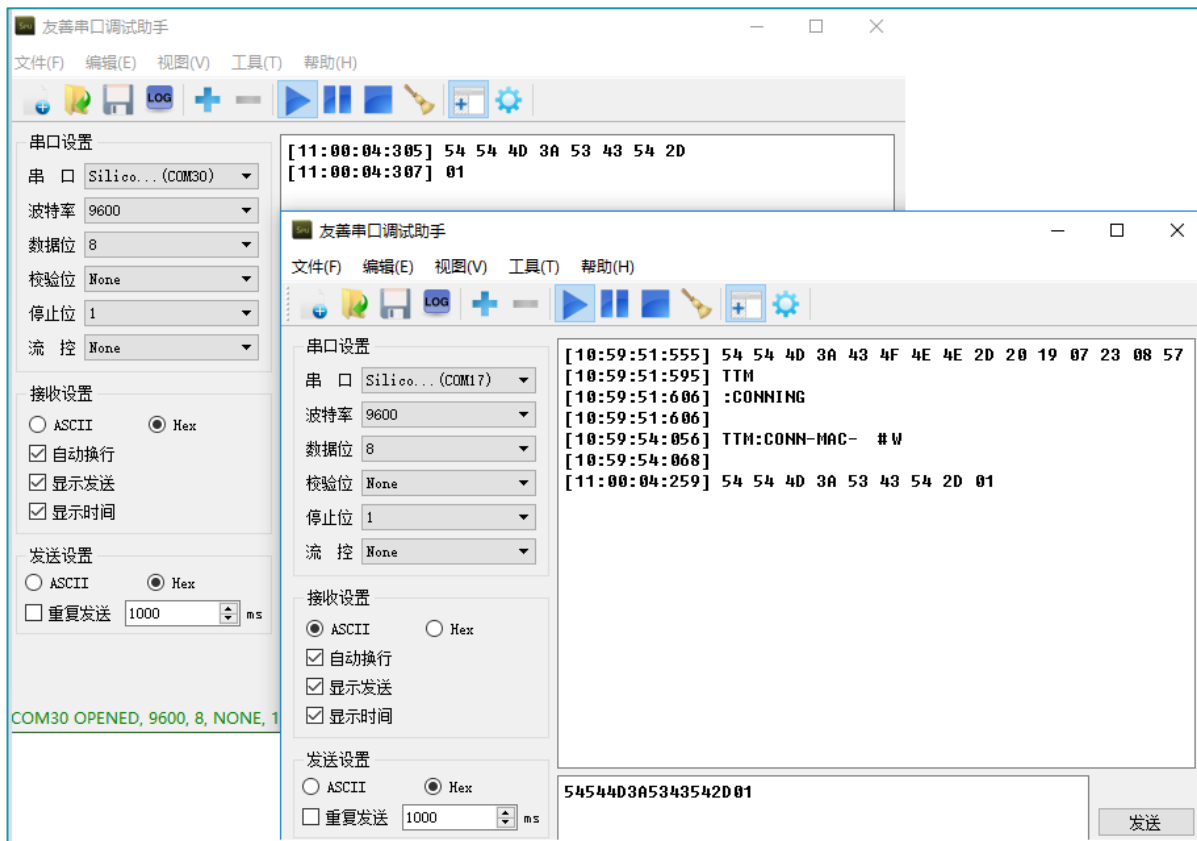
5.3.4 Master Pass-Through

Data passthrough is possible after the connected command is returned in step 6.3.3 The prerequisite for correct communication between the module and the slave device is that the slave device must have the same services, features, and their UUIDs and attributes as the module.

Relevant information is provided below:

Eigenvalue UUID	Executable Operation	Packet Length	Notes
FFF1	notify	244	Module data reception, the data sent from the device to the module shall not exceed 244 Byte per packet.
FFF2	write	244	Module data sending, the module has to do automatic packetization, data more than 244 Byte will be automatically divided into 244 packets sent to the slave device.

As an example, the master module connects to the passthrough slave module, and then sends the data after connecting.



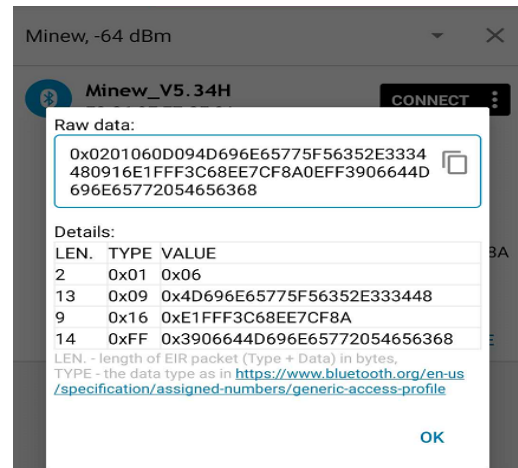
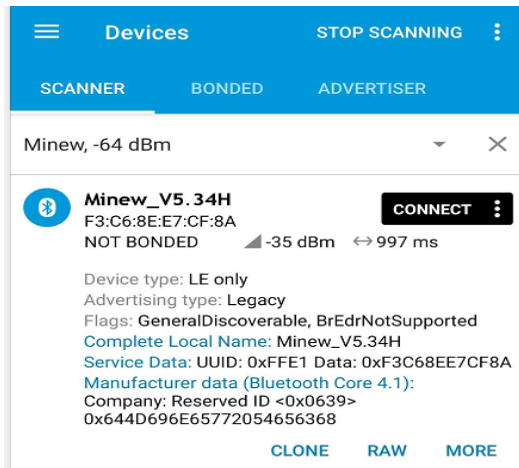
5.3.5 Slave Broadcasting

After setting the device role to slave mode using the command TTM:ROL-0, data pass-through can occur with a mobile phone. When the SLP pin is low, the device is in broadcast mode.

Using the nRF Connect app, you can scan for devices. Once the device is detected, click on "Raw" to view the raw data, which is the unparsed data from the scan. After parsing according to BLE data types, you can refer to the Details section.

BLE broadcast data follows a specific format: Length + Type + Content. The content can vary, while the type is fixed, and the length is determined by the content. The device has two broadcast formats: pass-through broadcast packets and iBeacon broadcast packets. Both formats include four types: Flag (0x01), Broadcast Name (0x09), Service Data (0x16), and Manufacturer Data (0xFF).

The diagram below shows the pass-through broadcast packet: Flag, Broadcast Name, and Service Data are included in the broadcast data packet, while Manufacturer Data is found in the response data packet. The content of the Service Data includes the Service Data UUID (E1FF) and MAC Address. The Manufacturer Data consists of the Company ID (3906), Battery Level Information (1 byte), and Custom Data.



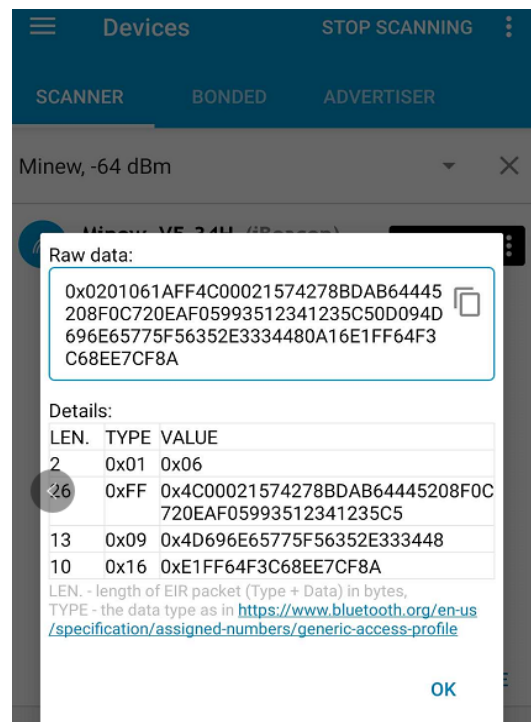
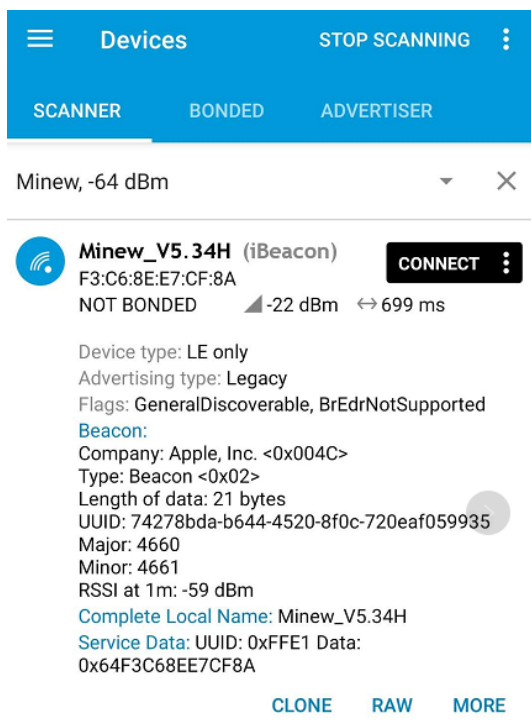
Note: The iOS side cannot access the MAC address field, so the MAC address is placed back into the broadcast packet to ensure that the iOS app can retrieve the device's MAC address. Additionally, WeChat Mini Programs cannot access the response data packet, so the MAC address is included in the service data of the broadcast packet to ensure that iOS devices using WeChat Mini Programs can also obtain the device's MAC address.

The diagram below shows the iBeacon broadcast packet: Flag and Manufacturer Data are included in the broadcast data packet, while Service Data and Broadcast Name are found in the response data packet. The broadcast data packet must follow this fixed format to comply with the iBeacon protocol definition.

In the Manufacturer Data, 4C 00 represents Apple's Company ID, and 02 15 is the fixed format for iBeacon, followed by the Proximity UUID (16 bytes), Major (2 bytes), Minor (2 bytes), and Measured Power (1 byte).

In iBeacon broadcast mode, the Manufacturer Data can only have the Proximity UUID, Major, and Minor values modified.

The Service Data consists of the Service Data UUID (FFE1), Battery Level Information, and MAC Address.



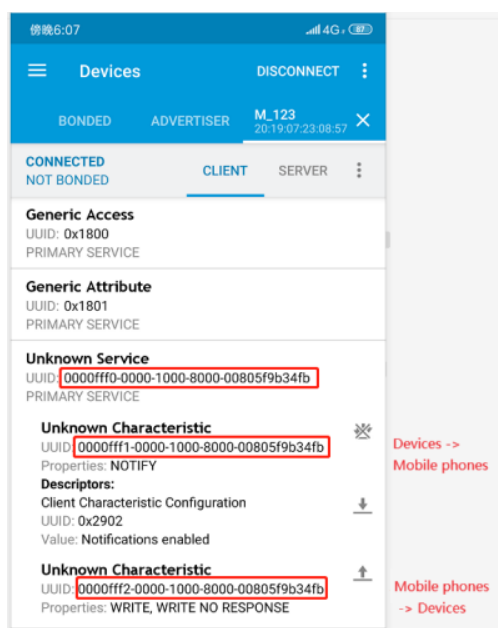


5.3.6 Slave Pass-Through

Based on 6.3.5, when connecting the device using a mobile app, keep the BTDATA pin low to enable data pass-through. If BTDATA is not low, it does not affect the device's broadcasting and connection capabilities; it simply prevents pass-through functionality.

Using nRF Connect, you can view the specific Service, Characteristic, and their corresponding Properties.

The UUID consists of an Alias UUID (2 bytes, located at the 3rd and 4th bytes in the figure) combined with a Base UUID (the remaining 14 bytes). In the pass-through program, the services and characteristics utilize a standard base UUID, and the following explanation will use the Alias UUID for clarification.



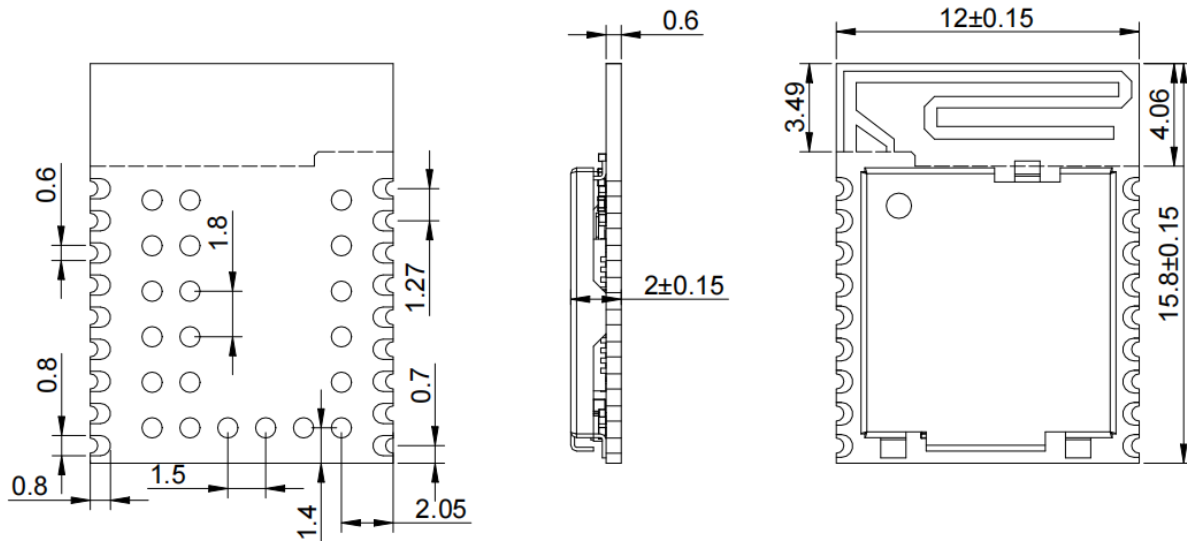
FFF0 is the Service UUID.

FFF1 is for data received by the phone, with the module sending data.

FFF2 is for data sent by the phone, with the module receiving data

Eigenvalue UUID	Executable Operation	Maximum Packet Length	Notes
FFF1	notify	244	When sending data to the module via the serial interface, the module will forward it to the phone. The phone must enable notifications to receive the data. The maximum packet size that the module can send in one transmission is 244 bytes. Note: The firmware automatically handles packet fragmentation, so there is no need to manually divide the data into packets based on the maximum length. However, each packet must not exceed 10 kB, and you should consider the transmission rate to avoid issues such as packet loss or disconnection.
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

6 MECHANICAL DRAWING



Default unit: mm Default tolerance: ±0.15

7 PCB LAYOUT

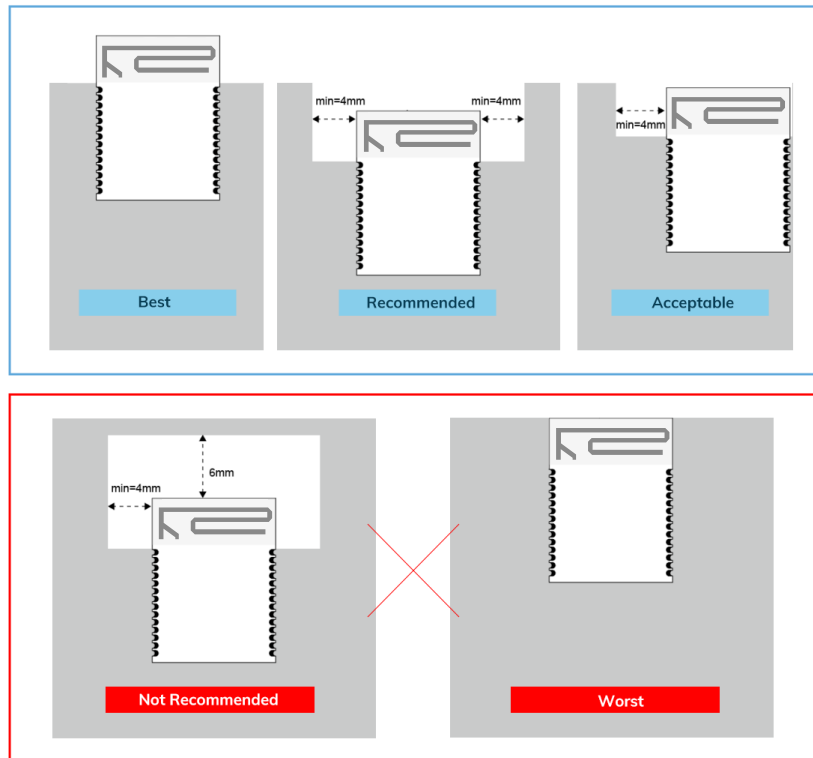
There should be no GND plane or metal cross wiring in the module antenna area, and no components should be placed nearby. It is best to make a hollow or clear area, or place it on the edge of the PCB board. The reference example is as follows:



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

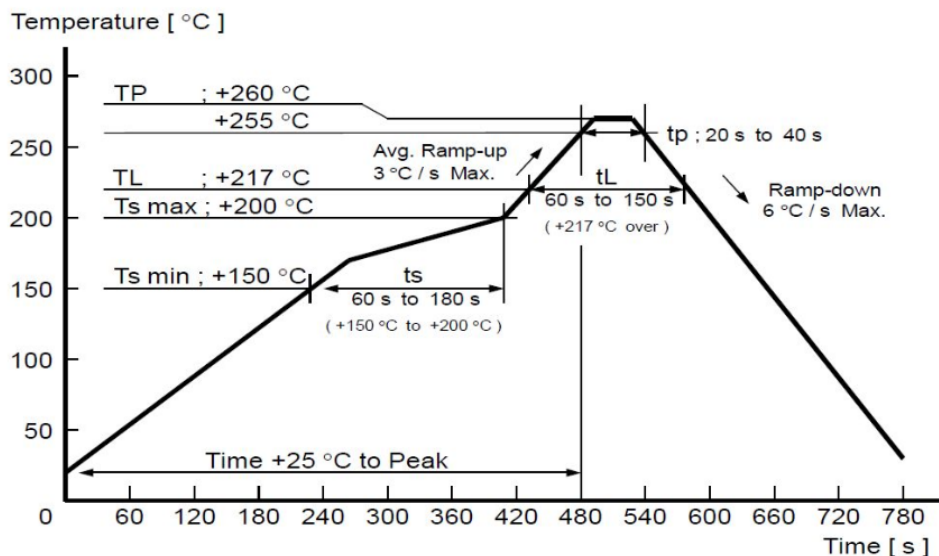
Layout Notes:

- 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.

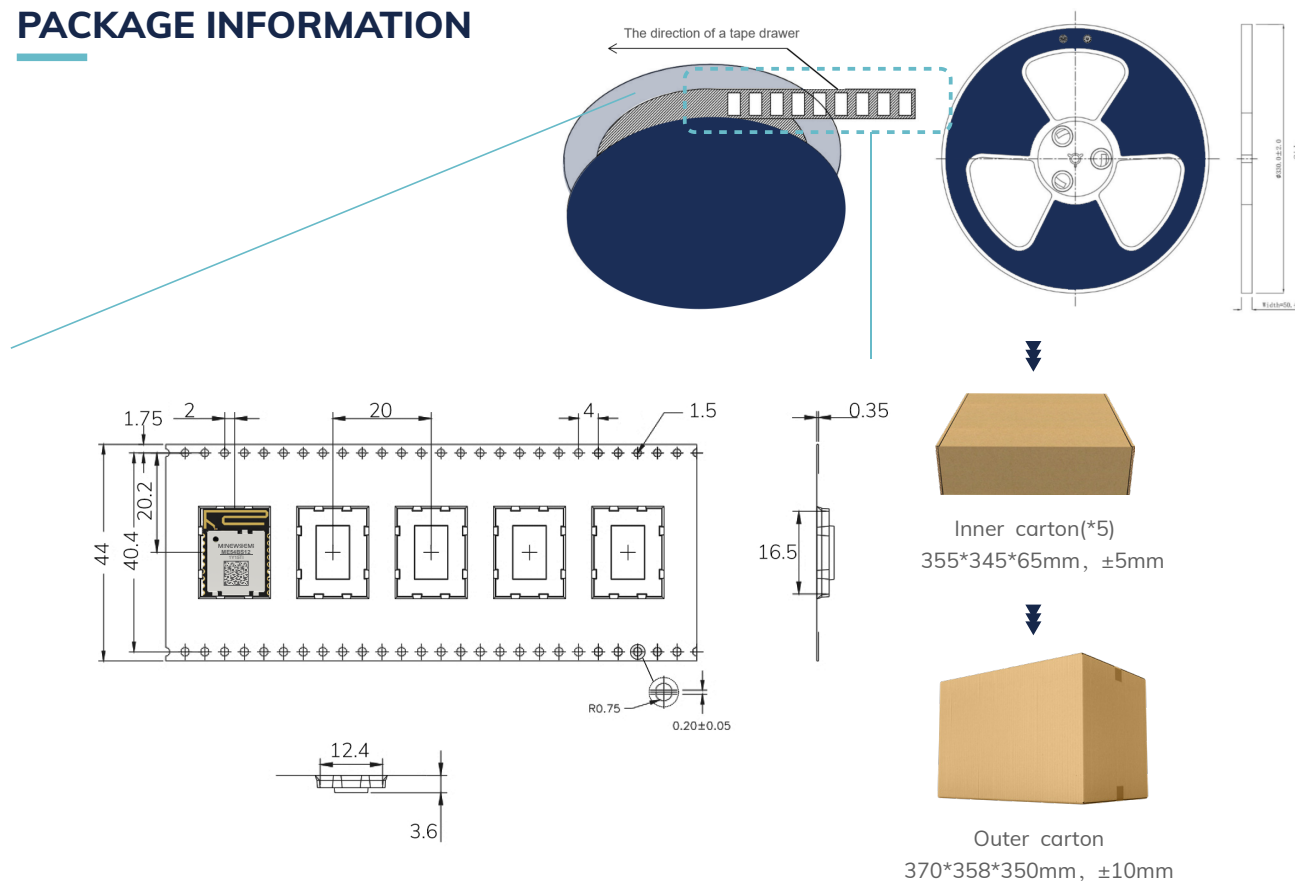


8 REFLOW AND SOLDERING

- 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) It is recommended that the thickness of the steel mesh for the module SMT be 0.13-0.15mm, the length of the two rows of pins be expanded outward by 1-1.3mm, and the internal pins have an opening of 1:0.9 without expansion.
- 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.

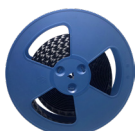


9 PACKAGE INFORMATION

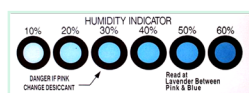


Remarks

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

ME54BS12

850PCS

484.5g

1061g

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.

10 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.

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.

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 – 20 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 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: 2BDJ6-ME54BS12

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: 2BDJ6-ME54BS12

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.

11 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.

12 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 solderability and destroy by static electrical charge.

13 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.

14 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.

15 RELATED DOCUMENTS

- [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