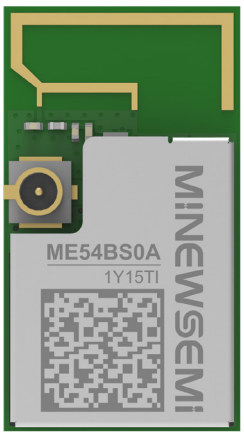
MINEWSEMI

Bluetooth LE Module

ME54BS0A



Datasheet

V 1.1.0

Version Note

Version	Details	Contributor(s)	Date	Notes
1.0.0	First edit	Michelle	2026.04.10	
1.1.0	Updated PCB Design	Michelle	2026.05.13	

Part Number

Model	Hardware Code
ME54BS0A	1Y15TI

Click the icon to view and download the latest product documents electronically.
https://en.minewsemi.com/file/ME54BS0A-nRF54L15_Datasheet_M_EN.pdf

ME54BS0A

High Sensitivity, PCB/U.FL Optional, Multi-protocol Bluetooth 6.0 PA Module

The ME54BS0A is a master-slave module that can switch between master and slave modes via commands. The master and slave modes cannot operate simultaneously, and only one-to-one connections are supported. The device defaults to master mode.

In master mode, the module can scan for and connect to devices via commands. Scanning supports filtering by advertising name and MAC address to identify target devices. Connections can be initiated by specifying a MAC address.

The module communicates with an MCU through a UART interface. In command mode, the MCU can send UART commands to configure parameters such as scan interval, scan timeout, connection interval, advertising interval, custom advertising data, and baud rate.

The MCU can also send a command via UART to switch the module to slave mode. In slave mode, the module supports both advertising and connection states, allowing it to be connected by a master device. It acts as a bridge between the master device and the MCU, enabling transparent data transmission.

FEATURES

- Bluetooth 6.0
- Maximum transmission speed up to 11kB/s
- Supports serial command configuration
- Built-in PA/LNA
- Supporting iBeacon broadcast mode
- OTA — Support OTA

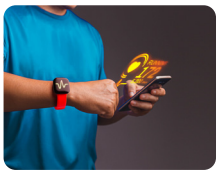
KEY PARAMETERS

ME54BS0A			
Chip Model	nRF54L15	**Antenna**	PCB/U.FL (MHF 1)
Module Size	18×10×1.7mm	**GPIO**	30
Flash	1524KB NVM	**RAM**	256KB
Receiving Sensitivity	-96dBm	**Transmitting Power**	+20dBm
Emission Current	20dBm-150mA	**Receiving Current**	7mA
Firmware	Master-slave firmware	**Transmission Distance**	800m

APPLICATION

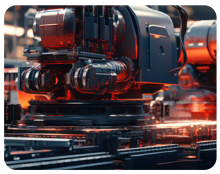

Smart Home


Computer Accessories


Virtual reality and Augmented reality


Game controllers and Remotes


Medical Devices

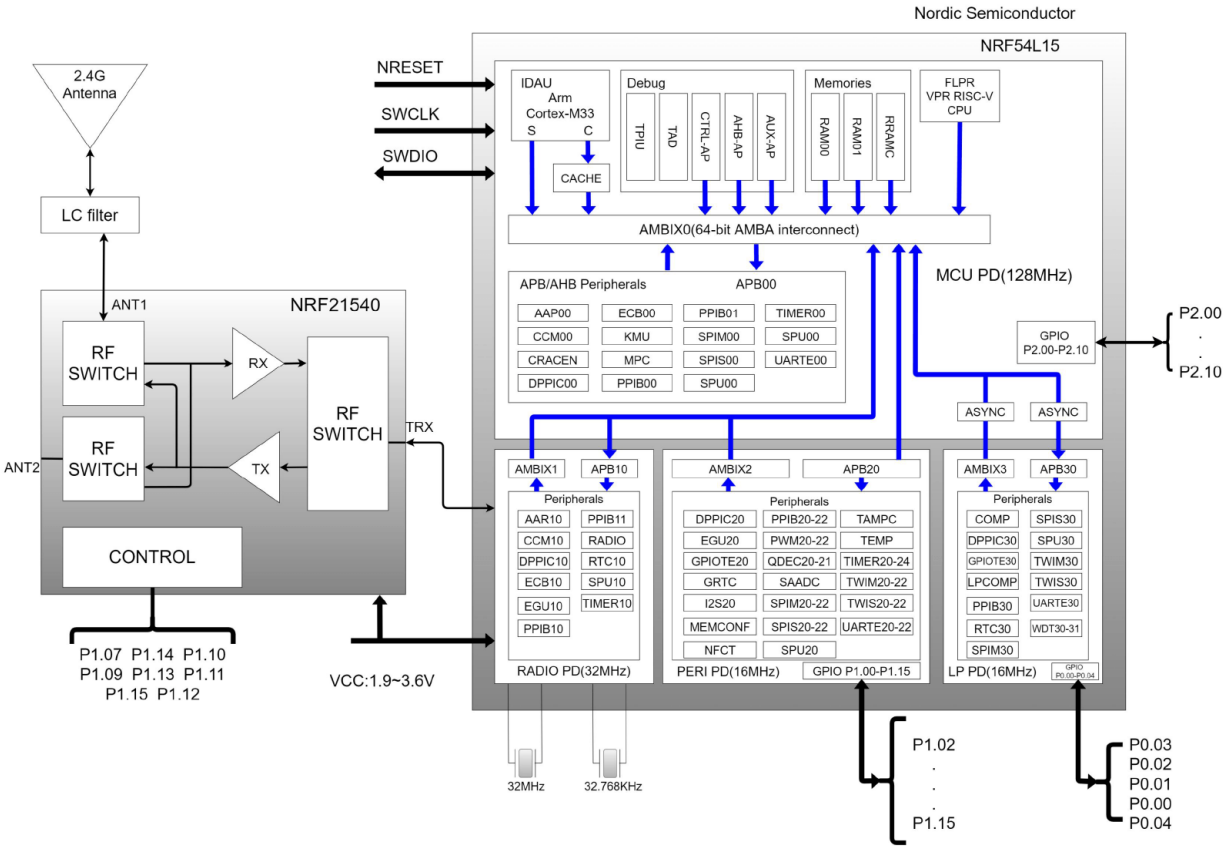

Industrial IoT

CERTIFICATION

CE FC

INDEX

1 BLOCK DIAGRAM



2 ELECTRICAL SPECIFICATION

Parameters	Value	Notes
Working Voltage	1.9V-3.6V	To ensure RF work, it is recommended that the supply voltage should not be lower than 2.3V.
Working Temperature	-30℃~+80℃	Operating temperature from -40°C to 85°C
Transmission Power	~ +20dBm	Cannot be set
Receiving Current	7mA	RF receiving current under 1Mbps pattern
Emission Current	150mA	RF transmission current under 20dBm pattern
Module Dimensions	18x10x1.7mm	
Quantity of IO Port	30	

3 CURRENT CONSUMPTION CHARACTERISTICS

The following power consumption tests were conducted at a supply voltage of 3.3V and at room temperature. Power consumption differs between master and slave modes.

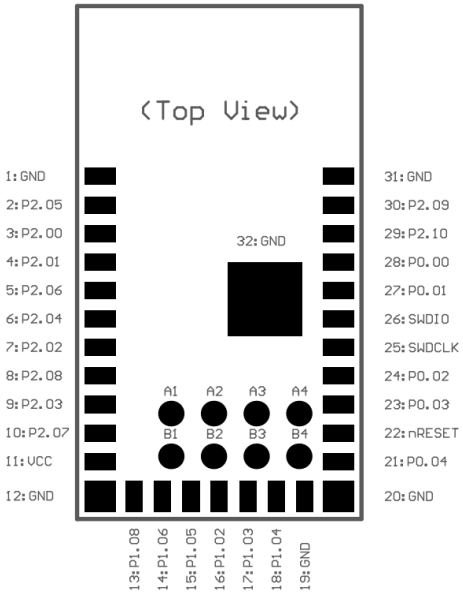
In slave mode, power consumption is as follows: (broadcast interval is 1 s, connection interval is 20 ms, transmission power is 20 dBm).

Status \ Consumption	Peak	Avg
Sleep mode average current (SLP pulled high, BTDATA pulled high)	2.64mA	7.34μA
Broadcast average current (SLP pin connected to GND, BTDATA pulled high)	149.60mA	289.96μA
Broadcast average current (SLP and BTDATA pin connected to GND)	139.41mA	427.64μA
Transmission average current (SLP, BTDATA pin pulled low, baud rate 115200,200 bytes, 20ms/time)	204.25mA	9.35mA
Broadcast average current in Longrange operating mode (SLP pulled low, BTDATA pin pulled high)	202.80mA	1.14mA
Longrange operating mode connection state average current (connected to VDD, GND, SLP pulled low, BTDATA pin pulled high)	204.60mA	3.03mA

In master mode, power consumption is as follows: (connection interval: 20 ms; transmission power: 20 dBm)

Status \ Consumption	Peak	Avg
Average current during scanning (with all pins connected) Send the command "TTM:SCT-0" to successfully set the module into a continuous (infinite) scanning mode	120.63mA	8.20mA
Transparent average current (SLP, BTDATA pin pulled low)	113.71mA	4.16mA
Average current in pass-through mode in Long-range mode (SLP, BTDATA pin pulled low)	201.74mA	32.32mA

4 PIN DESCRIPTION



5 PIN DEFINITION

Pin Number	Symbol	Type	Definition
1	GND	GND	
2	P2.05	GPIO	General-purpose I/O port
3	P2.00	GPIO	General-purpose I/O port
4	P2.01	GPIO/CK	General-purpose I/O port
5	P2.06	GPIO/CK	General-purpose I/O port
6	P2.04	GPIO	General-purpose I/O port
7	P2.02	GPIO	General-purpose I/O port
8	P2.08	GPIO	General-purpose I/O port
9	P2.03	GPIO	General-purpose I/O port
10	P2.07	GPIO/SWO	General-purpose I/O port
11	VCC	VCC	
12	GND	GND	
13	P1.08	GPIO	General-purpose I/O port
14	P1.06	TX	Bluetooth TX
15	P1.05	RX	Bluetooth RX
16	P1.02	GPIO/NFC1	General-purpose I/O port
17	P1.03	GPIO/NFC2/CK	General-purpose I/O port
18	P1.04	GPIO/AIN0/CK	General-purpose I/O port
19	GND	GND	
20	GND	GND	
21	P0.04	GPIO/CK	General-purpose I/O port
22	NRESET	Reset	Low-level reset, high-level operation
23	P0.03	BTDATA	High level: Disable UART Low level: Enable UART
24	P0.02	SLP	High level: Sleep Low level: Wake
25	SWCLK	Programming clock pin	For firmware programming
26	SWDIO	Programming data pin	For firmware programming

Pin Number	Symbol	Type	Definition
27	P0.01	FIFO_FULL	Is there space in the UART receive buffer? 0: The module has available space; transmission is possible 1: The module will have no available space
28	P0.00	LED	Not connected: Low level Connection status: High level
29	P2.10	GPIO	General-purpose I/O port
30	P2.09	GPIO	General-purpose I/O port
31	GND	GND	
32	GND	GND	
A1	P1.07	GPIO/AN3	General-purpose I/O port
A2	P1.14	GPIO/AN7	General-purpose I/O port
A3	P1.10	GPIO	General-purpose I/O port
A4	P1.09	GPIO	General-purpose I/O port
B1	P1.13	GPIO/AIN6	General-purpose I/O port

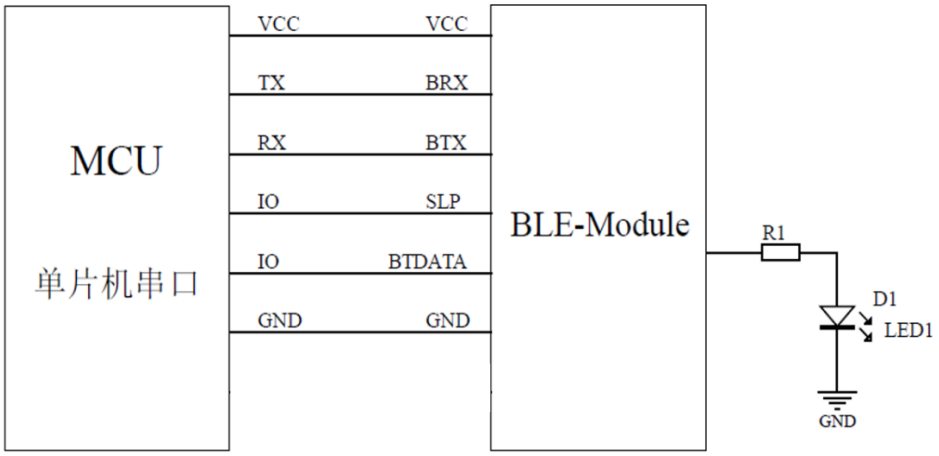
Note:
The ME54BSOA controls the power amplifier using 8 general-purpose input/output pins A1 to B4, namely nRF21540. These 8 pins can also be used for external connections. If they are used for other input/output functions, please avoid possible signal conflicts.

6 MODULE OPERATION INSTRUCTION

6.1 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.

6.2 Wiring



6.2.1 Power Supply

The SoC working voltage is 1.71V-3.6V, to ensure a stable function, supply voltage should be 2.3V-3.6V.

6.2.2 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.

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.
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.

6.2.5 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.

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 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.

6.2.7 Operating Mode

Command Mode
When not connected, all data input via the UART is treated as commands. Please refer to the command reference for details.
Pass-through Mode
After connection:

In master pass-through mode, sending a disconnect command via UART will terminate the current connection. All other UART and BLE data are transmitted in pass-through mode.

In slave pass-through mode, except for the authentication password sent by the master, all other UART and BLE data are transmitted in pass-through mode.

6.2.8 Command Instructions

After connecting VCC and GND, grounding the SLP and BTDATA pins, the module is in an unconnected state this time, which means 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:OK\r\n\0)
A failed command returns: 54544D3A4552500D0A00 (TTM:ERP\r\n\0)

After sending a valid configuration command, the parameters take effect immediately
(Except for baud rate and service/characteristic UUID, which only take effect after a reset command is issued).
These settings will not be saved after power-off at this stage.
Parameters are saved to flash only after a reset command is sent.

The following is the list of configuration commands:
Note:
In the command descriptions, the first and second lines represent the HEX format and ASCII string format, respectively.
The command parsing format is determined by:
- TTM:CMM-0 (string mode), or
- TTM:CMM-1 (HEX mode).

The returned parameters will be displayed according to the current command format. It is recommended to send commands using the corresponding format as well.
By default, the module operates in string mode.
If string mode is selected, parameters are set in string format. For example, if the advertising interval is set to 10 units:
- Command: TTM:ADP-10

If HEX mode is selected, parameters are set in HEX format. For example, if the advertising interval is set to 10 units:
- Command: TTM:ADP-0A

Other parameters follow the same rule.

Function	Command（hex/ASCII）	Description
Command Parsing Format	54544D3A434D4D2D<Para> TTM:CMM-<Para>	In hexadecimal mode, Para represents 0x00 to 0x01; in string mode, it represents '0' to '1'. Its length is 1 byte. 0: String mode 1: HEX mode
Query the current status of command parsing format	54544D3A434D4D3F TTM:CMM?	Return TTM:CMM-<Para>\r\n\0, with the returned parameters displayed according to the current instruction format.

Master-related parameters include scan timeout, scan interval and connection interval; the connection interval setting applies to both master and slave modes. Scan timeout and scan interval are only valid under the master module:

Note:
1. If scan parameters (such as scan interval and scan timeout) are modified after scanning has commenced, the current scan parameters will not be updated immediately, however, the query results will be updated. Therefore, please avoid modifying scan parameters when a scan is in progress.
2. To facilitate device discovery, RSSI, broadcast name and MAC address filtering functions have been added. Only one of MAC address filtering and broadcast name filtering can be active at a time; when MAC address filtering is enabled, broadcast name filtering is automatically disabled, and vice versa.

Function	Command（hex/ASCII）	Description
Set Scan Timeout	54544D3A5343542D<Para> TTM:SCT-<Para>	Para is represented in hexadecimal as 0x00 to 0x24 or as a string from 0 to 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\n\0, The returned parameters are displayed according to the current command format.
Set Scan Interval	54544D3A5349572D<Para> TTM:SIW-<Para>	Actual scanning interval: <Para> * 10ms <Para> May be represented in hexadecimal as 0x01 to 0x64, or as a string from 1 to 100, with a length of 1 byte.
Query Scan Interval	54544D3A5349573F TTM:SIW?	Return TTM:SIW-<Para>\r\n\0, Para: Hexadecimal The returned parameters are displayed according to the current command format.
Set RSSI Filtering	54544D3A5253492D<Para> TTM:RSI-<Para>	Representing values from 0xE2 to 0x88 in hexadecimal or -120 to -30 dBm in string format, with a length of 1 byte. RSSI filtering is disabled when values fall below -100 dBm.
Query RSSI Filtering	54544D3A5253493F TTM:RSI?	Return TTM:RSI-<Para>\r\n\0
Set Broadcast Name Filtering	54544D3A404E462D<Para> TTM:AVF-<Para>	Only when scanning detects a device broadcast name containing the configured name will the corresponding device information be output. Configured broadcast name filter value string length: 1-16 bytes Hexadecimal length: 1-16 bytes
Query Broadcast Name Filtering	54544D3A404E463F TTM:ANF?	Return TTM:ANF-<Para>\r\n\0,Para: Filter value for previously configured broadcast names.If not enabled, <Para> is empty.
Cancel Broadcast Name Filtering	54544D3A404E462D TTM:ANF-	Cancel broadcast name filtering
Setting MAC Address Filtering	54544D3A4D41462D<Para> TTM:MAF-<Para>	When MAC address filtering is enabled, scan results are output in real time in the format: 0xAA+MAC+RSSI+adv_data+0x0D0A. If no filtered devices are detected, the following is output: TTM:NO-DEVICE\r\n\0 X denotes hexadecimal, with string length being 12 bytes and hex length 6 bytes.
Query MAC Address Filtering	54544D3A4D41463F TTM:MAF?	Return TTM:MAF-<Para>\r\n\0,The returned parameters are displayed according to the current command format. If not enabled, <Para> is empty.
Cancel MAC Address Filtering	54544D3A4D41462D TTM:MAF-	Cancel MAC address filtering

Function	Command（hex/ASCII）	Description
Configure iBeacon UUID Filtering for Scanning	54544D3A4955462D<Para> TTM:IUF-<Para>	When iBeacon UUID filtering is enabled, scan results are output in real time in the format: 0xAA+MAC+RSSI+adv_data+0x0D0A. If no filtered devices are detected, the following is output: TTM:NO-DEVICE\r\n\0 <Para> denotes a string length of 32 bytes, corresponding to a hexadecimal length of 16 bytes.
Query and Scan iBeacon UUIDs with Filtering	54544D3A4955463F TTM:IUF?	Return: TTM:IUF-<Para>\r\n\0 Returned parameters are displayed according to the current command format. If not enabled, <Para> is empty.
Cancel iBeacon UUID Filtering	54544D3A4955462D TTM:IUF-	Cancel iBeacon UUID filtering
Set Broadcast Data Filter Value	54544D3A4D44462D<Para> TTM:MDF-	Configure vendor data filter values; device information will only be output when scanned vendor data contains the specified name. <Para> Character string length: 1-16 bytes; hexadecimal length: 1-16 bytes.
Query Broadcast Data Filter Values	54544D3A4D44463F TTM:MDF?	Query vendor data filter value, Returns: TTM:MDF-<Para>\r\n\0 <Para> denotes the previously configured vendor data filter value If not enabled, <Para> remains empty
Cancel broadcast data filtering	54544D3A4D44462D TTM:MDF-	Cancel manufacturer data filtering

During the connection setup process, relevant commands must be sent to put the device into Bluetooth mode, such as scanning for devices and initiating a connection with a specific device. Once connected, when transmitting data, the system checks all data to determine whether it constitutes a disconnection command.

Function	Command（hex/ASCII）	Description
Turn On Scanning	54544D3A5343414E TTM:SCAN	This command is only supported in master mode Command correctly return: TTM:SCAN-NING\r\n\0, error return Upon scan timeout, output device information for discoverable devices with broadcast names in the following format: XXXXXXXXXXXX Minew_V5.44H\r\n XXXXXXXXXXXX Minew_V5.43H\r\n XXXXXXXXXXXX Minew_V5.42H\r\n TTM:ERP\r\n\0, 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	This command is only supported in master mode The command returns correctly: TTM:SCAN-STOP\r\n\0, Indicates that scanning has stopped on the master;incorrectly returns TTM:ERP\r\n\0

Function	Command（hex/ASCII）	Description
Connect to the Specified MAC	54544D3A434F4E4E2D<MAC> TTM:CONN-<MAC>	This command is only supported in master mode MAC address, which may be represented either in hexadecimal or as a string: String: TTM:CONN-XXXXXXXXXXXX Hex: 54544D3A434F4E4E2DXXXXXXXXXXXX Command return: TTM:CONNING\r\n\0, indicating connection in progress TTM:CONN-TOUT\r\n\0, connection timeout TTM:NO-DEVICE\r\n\0, device not found TTM:CONN-MAC-XXXXXXXXXXXX\r\n\0, connected TTM:MAC-DCON-XXXXXXXXXXXX\r\n\0, Disconnect TTM:ERP\r\n\0, Command Error The command must be configured according to the current command format.
Master Disconnects All Connections From Slave	54544D3A444953432D414C4C TTM:DISC-ALL	This command is only supported in master mode and takes effect only after connection Response: TTM:C-MAC-DCON-XXXXXXXXXXXX\r\n\0 indicates disconnection from slave, error returns TTM:ERP\r\n\0 Commands must be configured according to the current command format.

⚠ Note: The above commands are only valid in master mode; if the device is not in master mode, sending these commands will return TTM:ERP\r\n\0.

Apart from the four commands mentioned above, all other device commands will return TTM:OK\r\n\0 in both master and slave modes, provided that the parameter range requirements are met; the parameters will take effect in the corresponding role.

A master device may initiate a connection with a slave device with a specified MAC address and enter connection mode. When the MAC address of the target device is known, there is no need to perform a scan; instead, a connection command may be sent directly.

When switching from master mode to slave mode, the device must first ensure it is in an unconnected state, call the 'Set Role' command, and then call the 'Reset' command to successfully switch to the slave role; the reverse process applies.

Function	Command（hex/ASCII）	Description
Set Role	54544D3A524F4C2D <Para> TTM:ROL-<Para>	<Para>Can be represented in hexadecimal as 0x00–0x01, or as the characters "0"–"1"; length: 1 byte, 0: Slave mode, 1: Master mode; other values are invalid
Query Role	54544D3A524F4C3F TTM:ROL?	Return TTM:ROL-<Para>\r\n\0; the parameters returned by <Para> are displayed in accordance with the current command format

In slave mode, various parameters for broadcast and connection processes can be configured and queried, as follows:

Function	Command（hex/ASCII）	Description
Set Broadcast Name	54544D3A52454E2D <Para> TTM:REN-<Para>	Para: Hexadecimal length 1–16 bytes, string length 1–16 bytes
Query Broadcast Name	54544d3a52454e3f TTM:REN?	Return TTM:REN-<Para>\r\n\0,The returned name conforms to the current command format.
Set Broadcast Interval	54544D3A4144502D <Para> TTM:ADP-<Para>	Set the broadcast interval; <Para> can be expressed in hexadecimal as 0x01 to 0x14, or as a string from “1” to “28”. Please note that when using a string, do not prefix valid digits with a zero. For values between 1 and 20, the actual broadcast interval is <Para> × 100 ms For values between 21 and 28, starting from 20 ms, the actual broadcast interval is 20 + (<Para> - 21) * 10 ms, increasing in increments of 10 ms Note: The larger the broadcast interval, the lower the power consumption, maximum broadcast interval 2s
Query Broadcast Interval	54544D3A4144503F TTM:ADP?	Return TTM:ADP-<Para>\r\n\0,The returned parameters are displayed according to the current command format.
Set Broadcast Data	54544D3A4144442D <Para> TTM:ADD-<Para>	<Para>May be represented either in hexadecimal or as a string, with hex lengths ranging from 1 to 16 bytes and string lengths from 1 to 16 characters.
Query Broadcast Data	54544D3A4144443F TTM:ADD?	If the broadcast data is "Minew Tech" Return: TTM:ADD-[Minew Tech]\r\n\0, The returned parameters are displayed according to the current command format.
Set Factory ID	54544D3A5049442D <Para> TTM:PID-<Para>	The string is 4 bytes; the hexadecimal representation is 2 bytes.
Query Factory ID	54544D3A5049443F TTM:PID?	If the product identification code is 0x0639 Return: TTM:PID-[0639]\r\n\0 The returned parameter display follows the current command format
Set Service UUID	54544D3A5549442D <Para> TTM:UID-<Para>	<Para>May be represented either in hexadecimal or as a string. The string length is 12 bytes, while the hex length is 6 bytes. Service_UUID + Rx_UUID + Tx_UUID. Each UUID occupies 2 bytes and cannot be set to zero. The UUIDs for service, rx, and tx must not be identical. Changes do not take effect immediately; a reset command must be sent for them to become active. The queried UUID represents the currently active UUID.
Query Service UUID	54544D3A5549443F TTM:UID?	If the UUIDs are 0xFFF0, 0xFFF1, 0xFFF2 respectively Return: TTM:UID-[FFF0FFF1FFF2]\r\n\0 The returned parameters are displayed according to the current command format

Function	Command（hex/ASCII）	Description
Set Broadcast Mode	54544D3A4D4F442D <Para> TTM:MOD-<Para>	Can be represented in hexadecimal as 0x00 to 0x01, or as the string "0" to "1", with a length of 1 byte. 0: Broadcast transparent transmission of broadcast packets 1: Broadcast IBeacon broadcast packets
Query Broadcast Mode	54544d3a4d4f443f TTM:MOD?	Return TTM:MOD-<Para>\r\n\0, The returned parameters are displayed according to the current command format.
Set IBeacon Broadcasting's UUID	54544D3A4149442D <Para> TTM:AID-<Para>	It may be represented either in hexadecimal notation or as a string, with the string length being 32 bytes and the hexadecimal length being 16 bytes.
Query IBeacon Broadcasting's UUID	54544D3A4149443F TTM:AID?	If the UUID is 0x11223344556677889900AABBCCDDEEFF, the response shall be: TTM:AID-[11223344556677889900AABBC-CDDEEFF]\r\n\0 The returned parameters shall be displayed in accordance with the current command format.
Set Major	54544D3A4D414A2D<Para> TTM:MAJ-<Para>	It may be represented in hexadecimal notation or as a string, with the string length being 4 bytes and the hexadecimal length being 2 bytes.
Query Major	54544D3A4D414A3F TTM:MAJ?	If major is 0x1234 Returns: TTM:MAJ-[1234]\r\n\0 Returned parameters are displayed according to the current command format
Set Minor	54544D3A4D494E2D <Para> TTM:MIN-<Para>	It may be represented in hexadecimal notation or as a string, with the string length being 4 bytes and the hexadecimal length being 2 bytes.
Query Minor	54544D3A4D494E3F TTM:MIN?	If Minor is 0x1235 Return: TTM:MIN-[1235]\r\n\0 The returned parameters are displayed according to the current command format.
Set Connection Mode	54544D3A5057452D <Para> TTM:PWE-<Para>	Whether the device requires a password for connection: <Para> may be represented in hexadecimal as 0x00 to 0x01, or as a string from "0" to "1", with a length of 1 byte. 0: Disabled 1: Enabled (effective only from the slave end; when enabled, a correct password must be entered within 6 seconds after connection, otherwise the connection will be terminated)
Query Connection Mode	54544D3A5057453F TTM:PWE?	Query whether connection password is enabled Return: TTM:PWE-<Parameter>\r\n\0 Returned parameter display follows current command format
Set Connection Password	54544D3A5057442D <Para> TTM:PWD-<Para>	May be represented in hexadecimal or as a string, with string lengths ranging from 1 to 8 bytes and hexadecimal lengths from 1 to 8 bytes.
Query Connection Password	54544D3A5057443F TTM:PWD?	If the connection password is minew123 Returns: TTM:PWD-[minew123]\r\n\0 The returned parameters are displayed according to the current command format.

Whether in master or slave mode, all configuration commands require a reset command to take effect, while query commands return the relevant parameters; if a command error occurs, the response is TTM:ERP\r\n\0. For the device as a whole, the baud rate and connection interval commands take effect regardless of whether the device is in master or slave mode.

Function	Command（hex/ASCII）	Description
Set Baud Rrate	54544D3A4250532D <Para> TTM:BPS-<Para>	Length: 1 Byte, It may be represented in hexadecimal as 0x00 to 0x08; alternatively, it may be expressed as the characters "0" to "7", corresponding to 9600/ 19200/38400/57600/115200/256000/460800/921600 (unit: bps) respectively. Modifications will not take effect immediately; a reset command must be issued for them to become active.
Query Baud Rate	54544D3A4250533F TTM:BPS?	Return TTM:BPS-<Para>\r\n\0, The returned parameters are displayed according to the current command format.
Set Connection Interval	54544D3A4349542D <Para> TTM:CIT-<Para>	Length: 1 byte, <Para> may be assigned hexadecimal values from 0x01 to 0x64, or string values from 1 to 100, corresponding to a minimum connection interval of <Para> * 10 ms. The maximum connection interval equals the minimum connection interval plus 20 ms.
Query Connection Interval	54544D3A4349543F TTM:CIT?	Return to TTM:CIT-<Para>\r\n\0, The returned parameters are displayed according to the current command format
Set UART Parity	54544D3A5041522D<Para> TTM:PAR-<Para>	Configure whether UART parity is enabled. <Para> can be in HEX format 0x00–0x02 or string format "0"–"2", length: 1 byte 0: Disabled 1: Odd parity 2: Even parity After setting successfully and resetting the module, the host (e.g., serial assistant tool) must also be configured to the corresponding parity setting.
Query UART Parity	54544D3A5041523F TTM:PAR?	Check whether UART parity is enabled. Return: TTM:PAR-<Para>\r\n\0 The returned parameter is displayed according to the current command format.
Set Working PHY	54544D3A5750592D<Para> TTM:WPY-<Para>	<Para> can be in HEX format 0x01–0x02 or string format "1"–"2", length: 1 byte 1: Standard mode 2: Long Range mode In Long Range mode, the transmission distance is longer, but the data rate is reduced.
Query Working PHY	54544D3A5750593F TTM:WPY?	Check the current working PHY of the device. Return: TTM:WPY-<Para>\r\n\0 The returned parameter is displayed according to the current command format.

Function	Command（hex/ASCII）	Description
Set PHY Update (1M / 2M)	54544D3A5550592D<Para> TTM:UPY-<Para>	<Para> can be in HEX format 0x00–0x01 or string format "0"–"1", length: 1 byte 0: Enable 1M PHY update 1: Enable 2M PHY update The 2M PHY update only takes effect in standard mode (non-coded PHY). The 2M PHY provides higher data rates but shorter transmission distance.
Query PHY Update Setting	54544D3A5550593F TTM:UPY?	Return: TTM:UPY-<Para>\r\n\0 The returned parameter is displayed according to the current command format.
Read MAC Address	54544d3a4d4143(2d)3f TTM:MAC-? or TTM:MAC?	Return TTM:MAC-<Para>\r\n\0,If the module's MAC address is 11:22:33:44:55:66, Return: TTM:MAC-[112233445566]\r\n\0, MAC displayed according to current command format.
Read Version Information	54544d3a564552(2d)3f TTM:VER-? or TTM:VER?	If the module's firmware version is "V1.0.0", return: TTM:VER-[V1.0.0]\r\n\0, where the version is represented as a string.
Restore Factory Settings	54544d3a5253542d464143 TTM:RST-FAC	Reset module parameters to factory defaults without parameters.
Reset	54544d3a5253542d535953 TTM:RST-SYS	Success will return TTM:OK\r\n\0

Note: During normal transparent transmission, the baud rate parameter is recommended to be set to a maximum of 115200. At 115200 baud with a 40ms connection interval, transparent transmission remains relatively stable. At baud rates exceeding 115200, or when using shorter connection intervals, packet loss or disconnection may occur.

6.3 Operation Examples

6.3.1 Factory Default Parameters

Broadcast Name: Minew_Vxxxxx
Serial port baud rate: 9600bps,8N1
Transmit power: 20dBm
Minimum and maximum connection interval: 20ms - 40ms
Device Role: Master Slave Simultaneous
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
DC_RC: DC-DC enabled, external 32K

6.3.2 Parameter Modification Example

Connect all pins according to the wiring, ground SLP and BTDATA, the device enters the unconnected state, at this time you can set the parameters, regardless of whether the device is in the state of the master or the slave, all the parameters can be set, and some of the parameters take effect immediately. After sending the reset command, all parameters are powered down and saved.

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

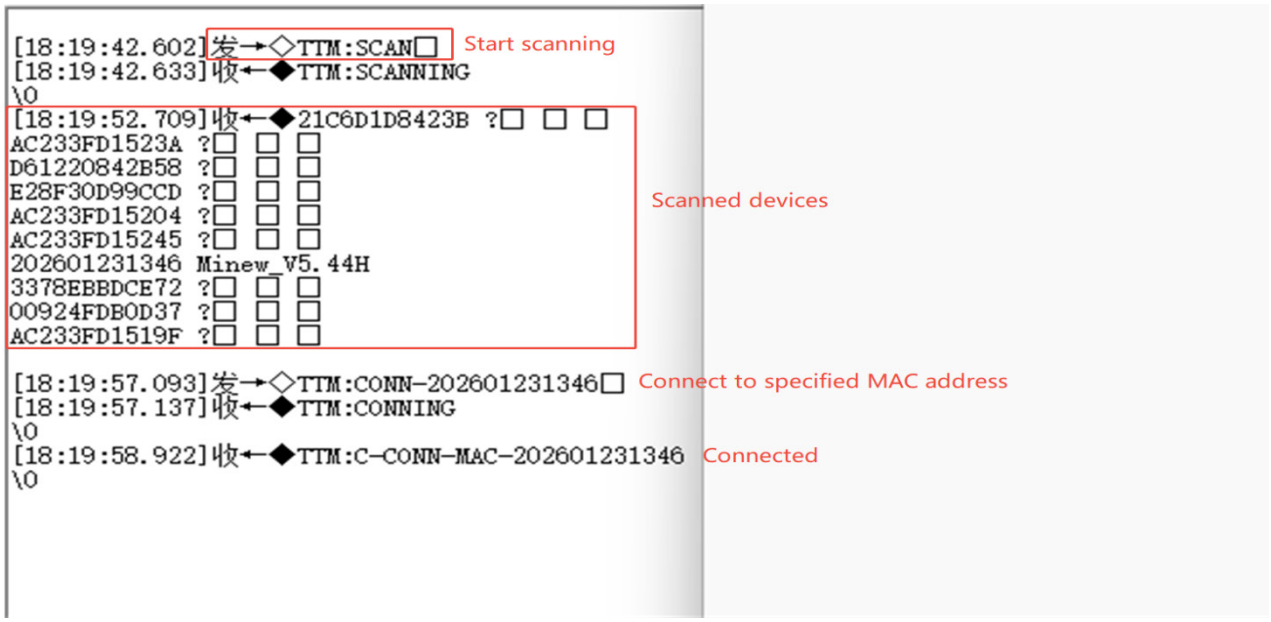
```
[14:44:20.451]发→◇TTM:REN?□
[14:44:20.475]收←◆TTM:REN-123
\0
[14:44:59.772]发→◇TTM:REN-ABC□
[14:44:59.803]收←◆TTM:OK
\0
[14:45:06.816]发→◇TTM:REN?□
[14:45:06.847]收←◆TTM:REN-ABC
\0
[14:45:30.933]发→◇TTM:BPS?□
[14:45:30.964]收←◆TTM:BPS-0
\0
[14:46:04.548]发→◇TTM:BPS-5□
[14:46:04.580]收←◆TTM:OK
\0
[14:46:11.644]发→◇TTM:RST-SYS□
[14:46:11.676]收←◆TTM:OK
\0

[14:47:14.828]发→◇TTM:BPS?□
[14:47:14.845]收←◆TTM:BPS-5
\0
```

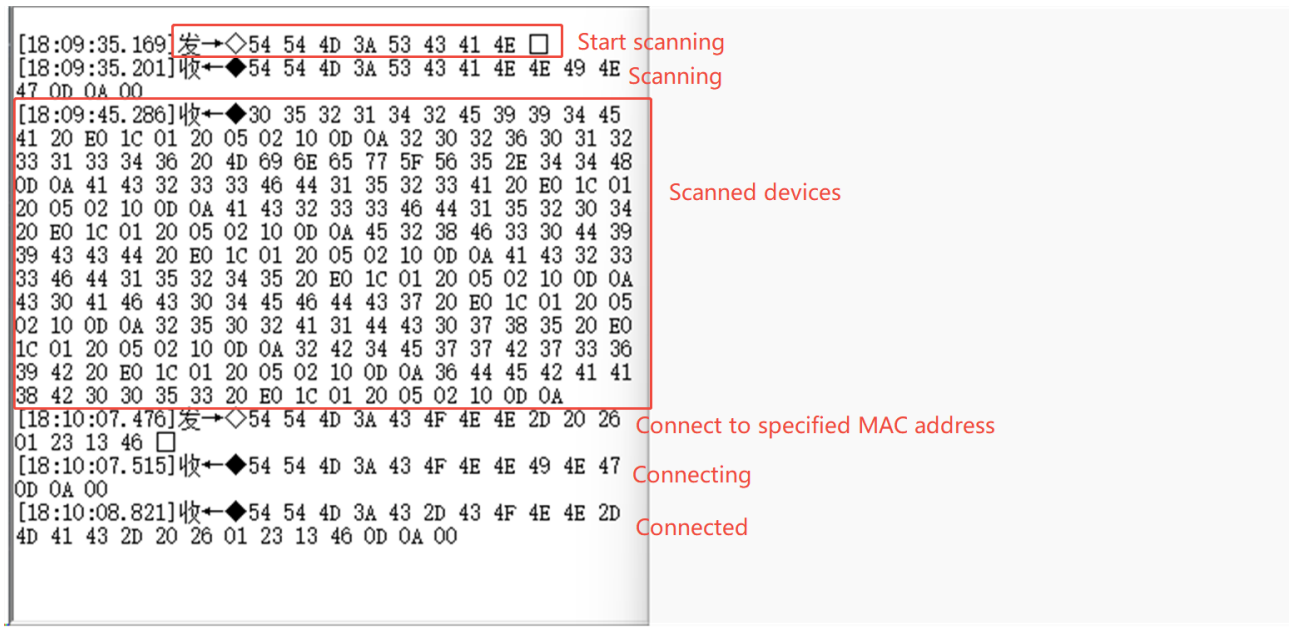
When querying device parameters, as parameters are displayed according to the currently configured format, for instance, if the command parsing format is set to HEX, selecting ASCII display may result in parameter positions appearing as garbled characters. In such instances, it is necessary to set the display to HEX. The parameters correspond to positions following the 2D designation, as illustrated in the figure below.

```
[14:50:16.409]发→◇54 54 4D 3A 52 45 4E 3F □
[14:50:16.425]收←◆54 54 4D 3A 52 45 4E 2D 41 42 43 0D 0A 00
[14:50:29.769]发→◇54 54 4D 3A 42 50 53 3F □
[14:50:29.785]收←◆54 54 4D 3A 42 50 53 2D 05 0D 0A 00
```

6.3.3 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 54544D3A434F4E4E2D323032363031323331333436（TTM:CONN-202601231346） command and the module will connect the device with MAC address 202601231346. The device connected will return 54544D3A432D434F4E4E2D4D41432D2026012313460D0A00（TTM:CONN-MAC-202601231346\r\n\0）.Once connected you can perform data passthrough.





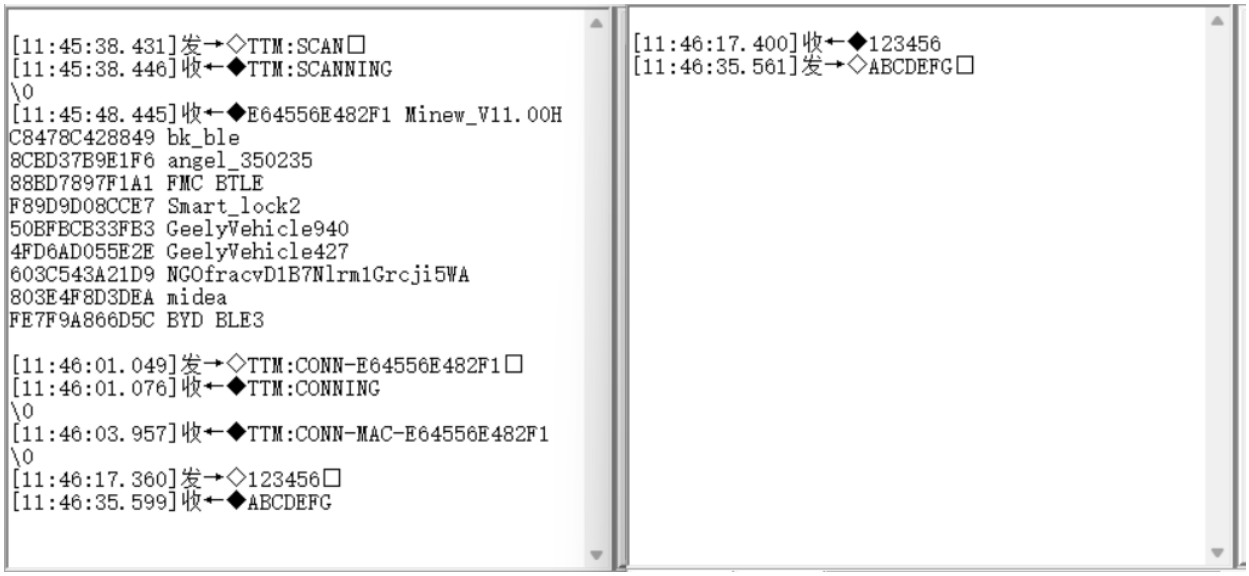
6.3.4 Transparent Transmission Test Procedure

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.

Taking the connection of a master module to a pass-through slave module as an example, data can be transmitted immediately after connection.
Wiring: Follow the pin configuration instructions in Section 6.2: Set SLP and BTDATA to low, and connect TX, RX, GND and VCC.

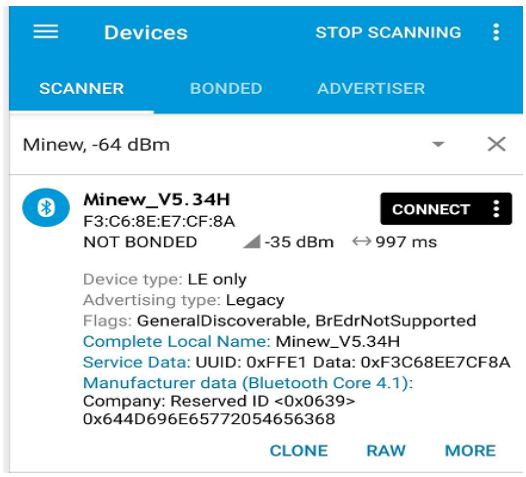


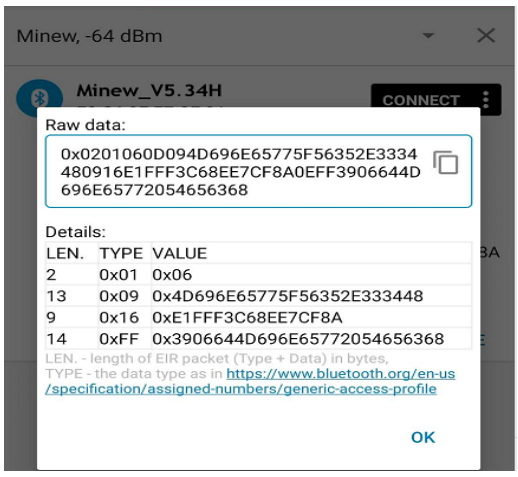
6.3.5 Slave Broadcasting

When the device acts as a slave, 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.





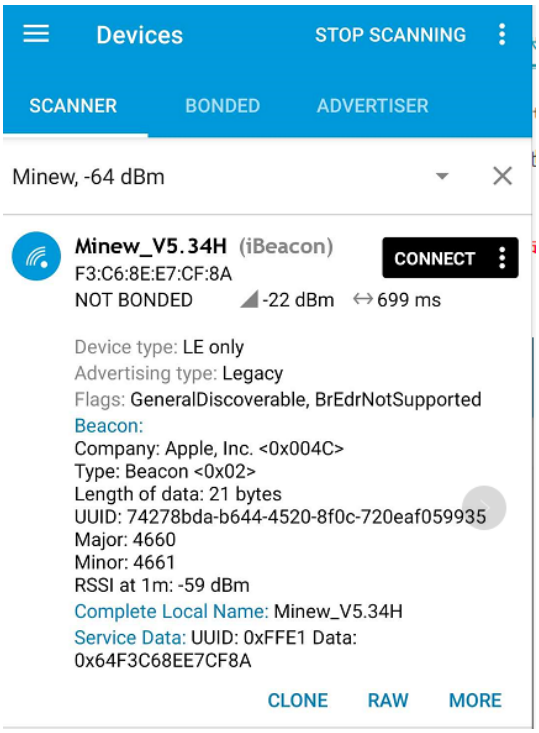
Note: The iOS side cannot access the MAC address field, so the MAC address is placed back into the broadcast packet to ensure that the iOS app can retrieve the device's MAC address. Additionally, WeChat Mini Programs cannot access the response data packet, so the MAC address is included in the service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

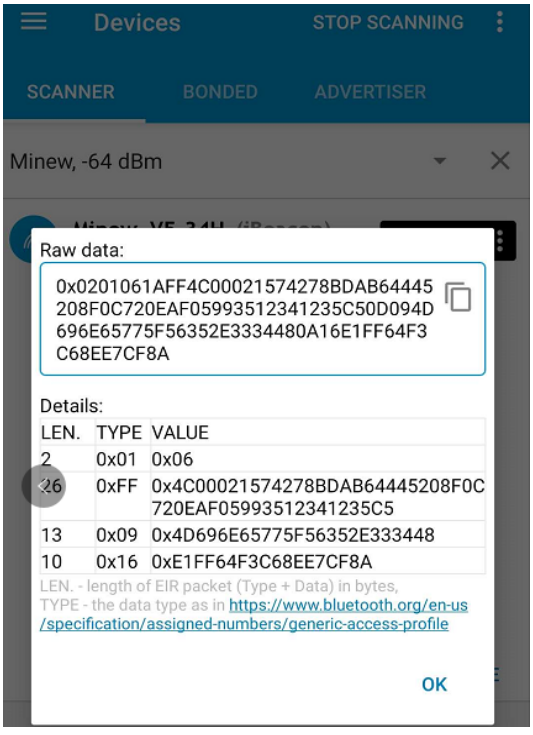
The diagram below shows the iBeacon broadcast packet: Flag and Manufacturer Data are included in the broadcast data packet, while Service Data and Broadcast Name are found in the response data packet. The broadcast data packet must follow this fixed format to comply with the iBeacon protocol definition.

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.



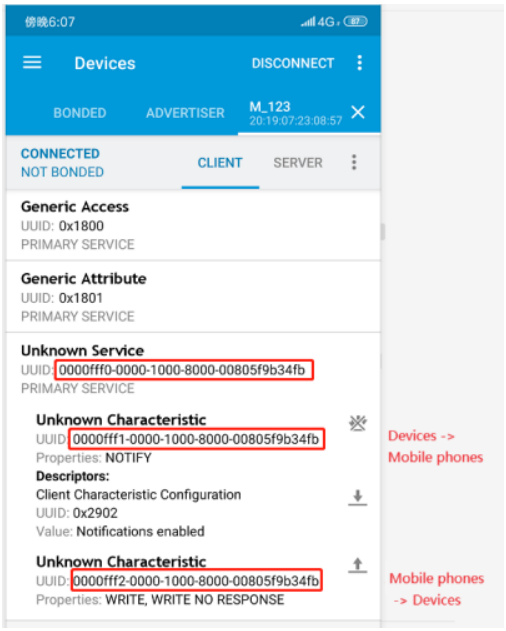


6.3.6 Slave Pass-Through

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.

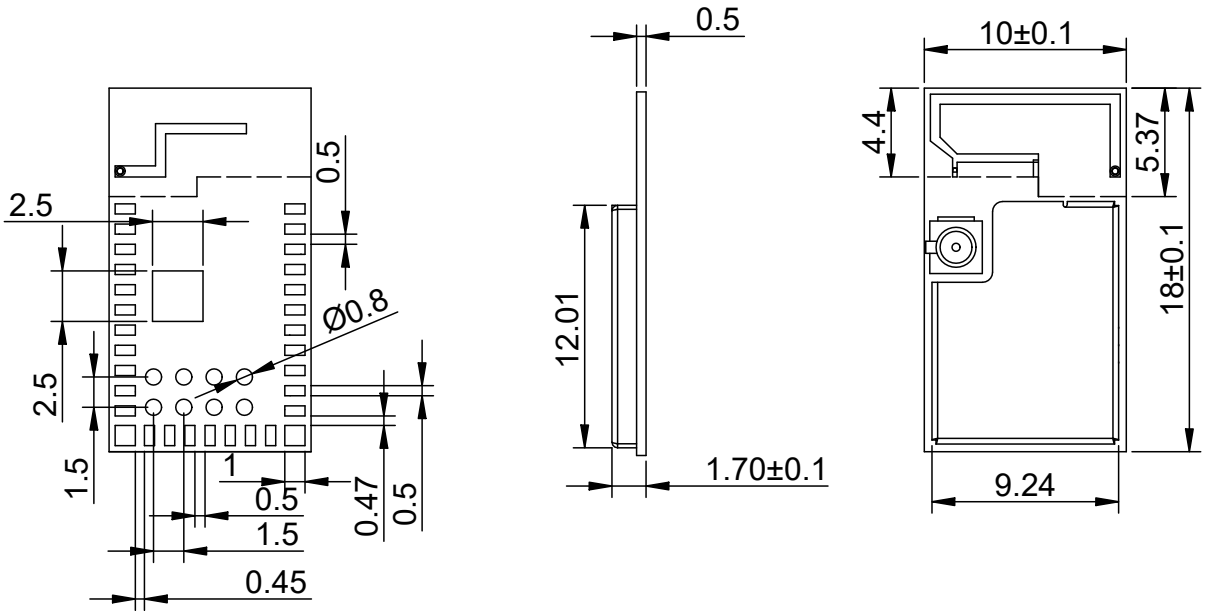
The UUID consists of an Alias UUID (2 bytes, located at the 3rd and 4th bytes in the figure) combined with a Base UUID (the remaining 14 bytes). In the pass-through program, the services and characteristics utilize a standard base UUID, and the following explanation will use the Alias UUID for clarification.



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

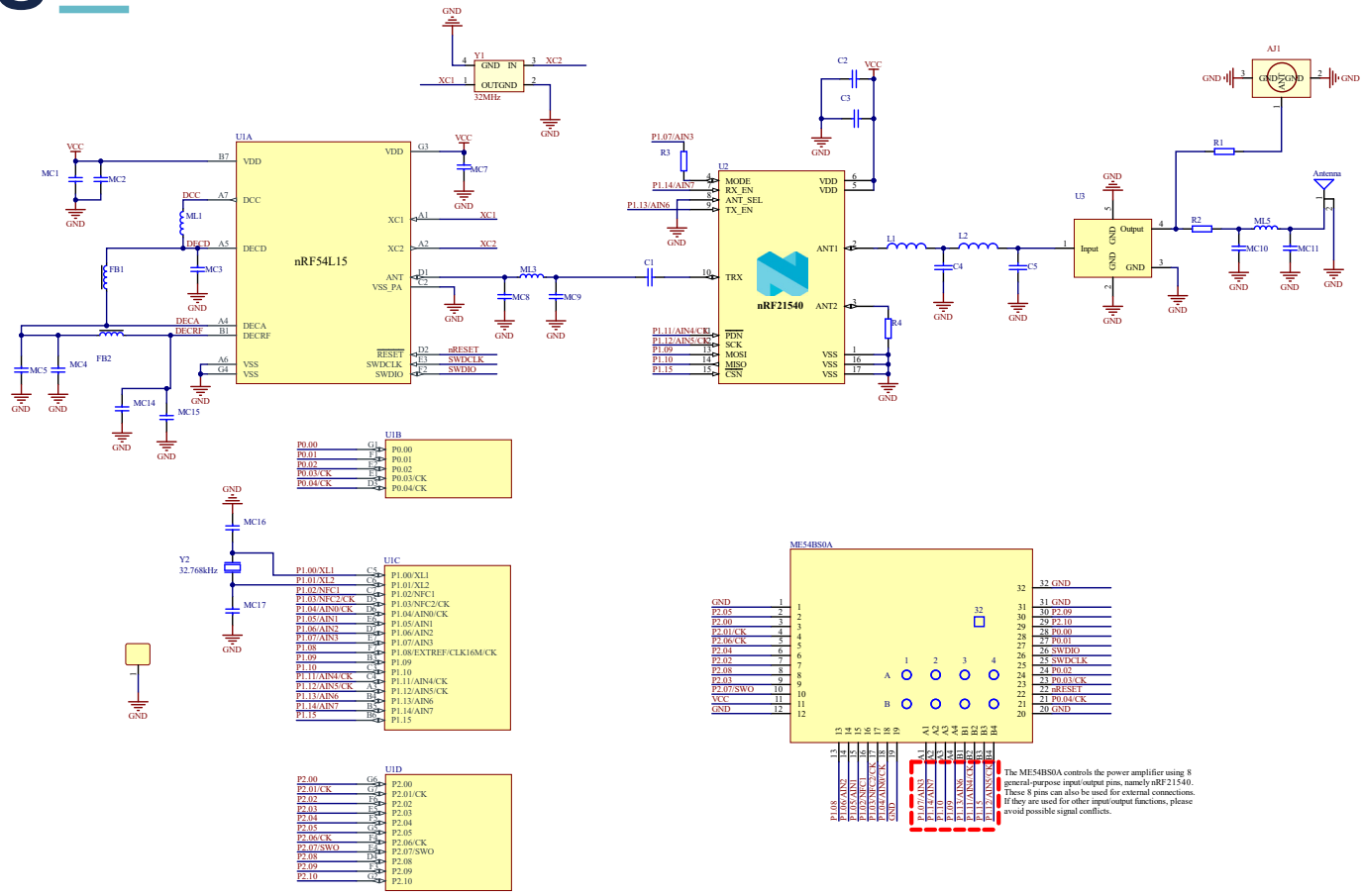
Eigenvalue UUID	Executable Operation	Maximum Packet Length	Notes
FFF1	notify	244	When sending data to the module via the serial interface, the module will forward it to the phone. The phone must enable notifications to receive the data. The maximum packet size that the module can send in one transmission 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

7 MECHANICAL DRAWING



Default unit: mm Default tolerance: ±0.15

8 ELECTRICAL SCHEMATIC



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

9 PCB DESIGN

9.1 Disclaimer

This document is provided as a recommended design reference for wireless modules and does not constitute any explicit or implied guarantee of performance or compliance. Due to differences in PCB layout, enclosure structure, antenna selection, and application environments of the end product, this document cannot guarantee RF performance in all scenarios. Users must conduct sufficient RF performance and compliance verification after completing the final product design and shall bear full responsibility for design and application outcomes. Our company reserves the right to modify the contents of this document without prior notice.

9.2 Core Rules for Module Placement

Board Edge Priority Rule

The RF output/antenna side of the module must face the edge of the main PCB to ensure that antenna radiation is directed outward from the board without obstruction. Placing the module in a closed central area of the PCB is strictly prohibited.

Keep-Out Area Rule

A 0.5 mm area around the module body must be kept clear. Non-ground components and non-ground signal traces are prohibited within this area. Within 4 mm around the RF side of the module, copper pours, unrelated components, and non-RF signal traces are strictly prohibited.

Interference Isolation Rule

The module must maintain a minimum safe distance from strong interference sources. Adjacent placement on the same layer is prohibited. Isolation using different PCB layers and shielding covers is recommended. General isolation requirements are as follows:

Interference Source Type	Minimum Recommended Isolation Distance
DC-DC switching power supplies, power inductors, power transformers	20mm
USB 3.0 / HDMI 2.0 / DDR / High-speed SDIO interfaces	20mm
MCU high-frequency clock circuits, Ethernet PHY chips	15mm
Displays, cameras, FPC cables with wiring	25mm

Structural Clearance Rule

The minimum distance between the module and metal screws, clips, standoffs, and other structural parts must be ≥5 mm. At least 4 mm of SMT soldering and rework clearance must be reserved around the module. The RF side of the module must not be enclosed inside a fully metal cavity.

Multiple Modules on the Same PCB

When placing multiple wireless modules of the same or different types on the same PCB, the minimum spacing between modules must be ≥50 mm to avoid mutual interference.

9.3 GENERAL PCB DESIGN REQUIREMENTS

Grounding Design

The main PCB must maintain a complete and continuous ground plane. Splitting the ground plane within the module projection area or RF surrounding area is strictly prohibited. All module ground pins must be soldered. At least one grounding via should be placed near each ground pad and connected to the main ground plane. A complete ground plane with dense grounding vias may be placed under the non-RF area of the module to improve shielding performance.

Power Supply Design

Decoupling capacitor combinations must be placed close to the module power input pins. The trace length between capacitor pads and power pins should be ≤0.5 mm, and at least two grounding vias should be placed near the ground terminal. For switching power supply applications, a π-type filter circuit footprint must be reserved near the module power input pins.

RF Trace Design

The entire RF path must maintain a strict 50 Ω characteristic impedance (tolerance ±10%). RF traces should be as short as possible and routed preferably in straight lines. Sharp or right-angle corners are prohibited; curved routing with a radius ≥3 times the trace width is recommended. Branch traces and stub traces are prohibited. A continuous reference ground plane must exist beneath the RF traces, and no other signal traces should be routed within 3 times the trace width on either side. Ground shielding should be applied throughout the RF routing.

Control Interface Design

Control signal traces such as UART, SPI, and I2C should be routed away from RF areas with short and simple routing paths and continuous ground shielding. Parallel routing adjacent to RF traces is prohibited. ESD protection devices must be placed close to external PCB connectors and must not be placed near module pins.

Footprint Design

Strictly use the standard PCB footprint provided by our company. Unauthorized modification of pad size or spacing is prohibited to ensure soldering reliability.

9.4 DESIGN RESTRICTIONS

Do not place the RF side of the module facing the inside of the PCB or away from the board edge.

Do not place copper pours, components, or fully enclosed metal housings without openings over the antenna area.

Do not route RF traces across split ground planes, without a complete reference ground, or with right-angle corners.

Do not place modules adjacent to strong interference sources or split the ground plane in the module area.

Do not leave module ground pins unconnected or inadequately grounded.

9.5 MODULE PLACEMENT EXAMPLE

For end products, antenna position significantly affects overall system performance. The module should preferably be placed at the edge or corner of the PCB to maximize the clearance area and reduce interference from surrounding components. The PCB area directly beneath the module antenna should be hollowed out to keep the antenna region suspended, while no signal traces, metal objects, or other interference sources should exist within 3–5 mm around the antenna area. The figure below demonstrates an example of proper module placement on the main PCB for optimal RF performance. The first recommended layout method should be used whenever possible, as the module antenna design has been tuned and optimized based on this configuration.

Correct Example

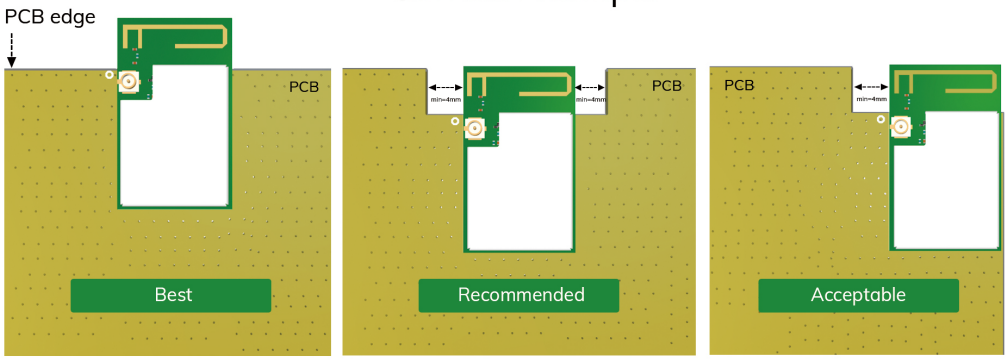


Figure 1 Figure 2 Figure 3

Incorrect Example

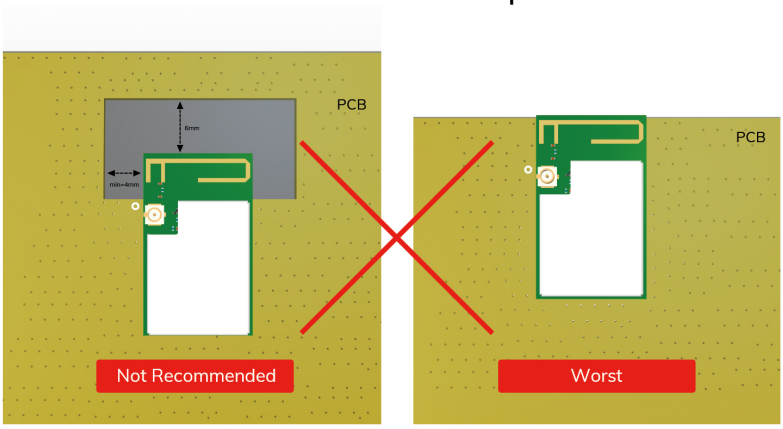
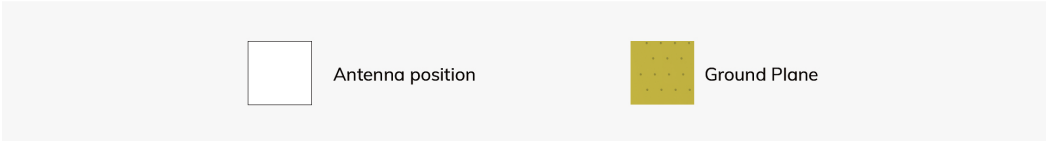


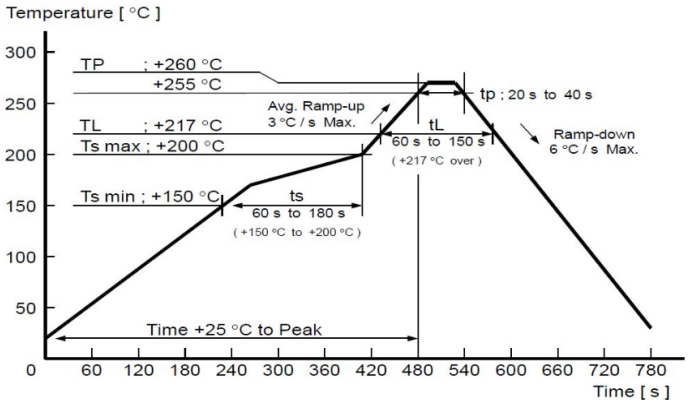
Figure 4 Figure 5



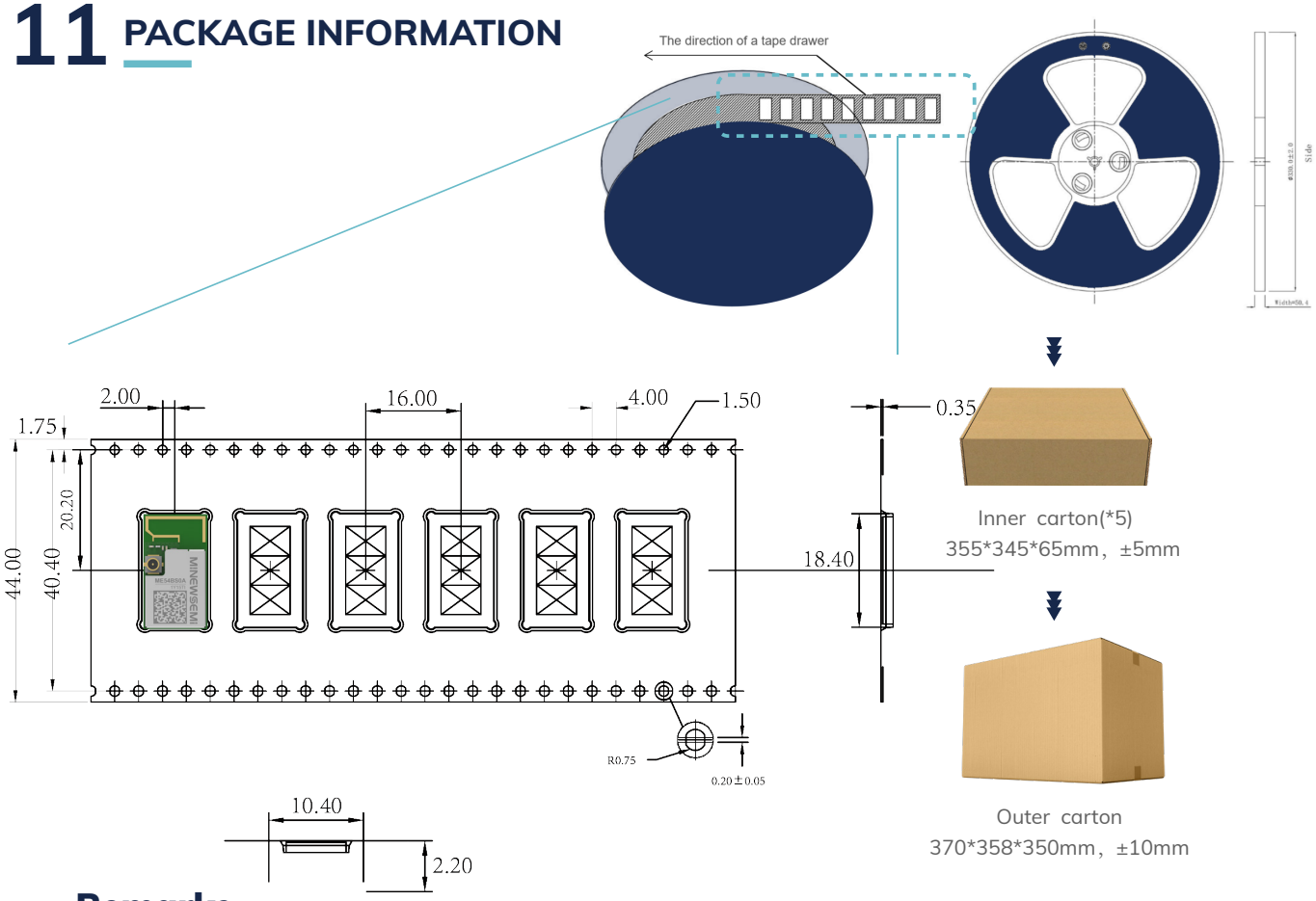
10 REFLOW AND SOLDERING

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) For SMT modules, a stencil thickness of 0.1–0.12 mm is recommended, with a 1:0.9 aperture ratio for the pins and no flare.
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.



11 PACKAGE INFORMATION



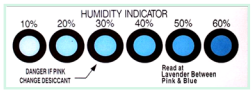
Inner carton(*5)
355*345*65mm，±5mm

Outer carton
370*358*350mm，±10mm

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
ME54BS0A	850PCS	484.5 g	1280.5 g	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.
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 wave-length, 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-ME54BS0A

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-ME54BS0A

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, NOx, 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℃;
  2、90℃ +8/-0℃, 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, OHSA18001, 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

- MinewSemi_Product_Naming_Reference_Manual
  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

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

MINEWSEMI
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