

XW37-BLE 5.2Module

User Manual

Version V1.0

DATE 2023.12.13

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Version History

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1. Product Overview

XW37-BLE is a low-power Bluetooth 5.2 module. This module integrates a

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high-performance 2.4GHz RF transceiver, a feature-rich baseband processor, a 32-bit MCU operating at 32 MHz, and multiple peripheral interfaces. It features built-in 2 Mbit SiP Flash, 32 KB RAM, and 32 KB ROM, supporting programmable protocols to meet customer-specific application requirements.

We provide customers with complete hardware and software reference solutions to help shorten your product development cycle and reduce your cost investment.

1.1 Product Features

- Ultra-compact, low-power Bluetooth 5.2 module
- Built-in 12-bit high-precision ADC
- Supports UART/GPIO/I2C/PWM/ADC/SPI/JTAG interfaces, etc.
- Deep sleep current: 0.8uA
- Serial port can be enabled via pins to switch between working and sleep states.
- Supports command switching between AT command mode and transparent mode.
- Supports AT command parameter configuration.
- At 0 dBm transmit power, communication range in open areas can reach up to 40 meters.
- Supports up to 20 bytes per data frame.
- Operating voltage range: 1.7–3.3 V, recommended supply voltage: 3.0 V.
- Dimensions: 18 mm × 12 mm × 1.7 mm

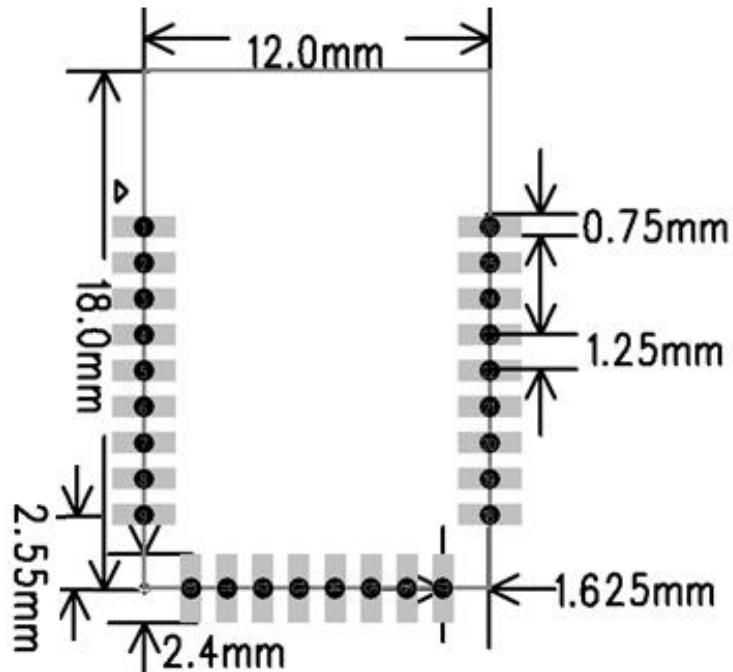
1.2 Application Solutions

- Home appliances ■ Industrial wireless control ■ Wearable electronics
- Smart sockets and lights ■ Wireless remote control ■ Health products
- Bluetooth to serial port products

2. Product Module Interface

2.1 Product Outline Drawing

2.2 Product Package Dimension Drawing

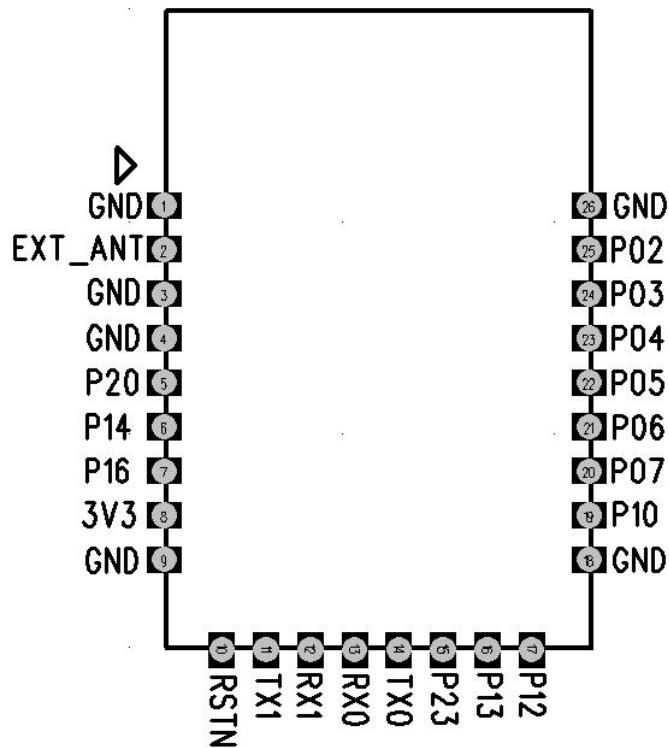


Package Dimension Drawing©

Module mode	Long (mm)	Wide (mm)	High (mm)	PADsize (mm)	Pin spacing (mm)	thickness (mm)
XW37-BLE	18	12	1.7±0.2	-	1.25	0.8

2.3 Pin Definition

The XW37-BLE module connects a total of 26 interfaces, of which GPIO has 17.



XW37-BLE pin schematic

Table 2.3 Pin function definitions

Number	Pin	Function description
1、3、4、 9、18、26	GND	grounding
2	EXT_ANT	External antenna can be connected when needed
5	P20	General IO
6	P14	General IO, I2C_SDA
7	P16	General IO
8	3V3	3.0V VCC; The external power supply output current should be above 60mA.
10	RSTN	Reset pin, low level active
11	P21/TXD1	General IO, UART1_TXD (Communicate with MCU)
12	P22/RXD1	General IO, UART1_RXD (Communicate with MCU)
13	P01/TXD0	General IO, Download_UART_TX0
14	P00/RXD0	General IO, Download_UART_RX0, ADC0
15	P23	General IO, PWM3
16	P13	General IO, I2C_SCL

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17	P12	General IO, PWM4
19	P10	General IO, PWM3
20	P07	General IO, PWM2, SPI_NSS, JTAG_TMS
21	P06	General IO, SPI_MISO, ADC5, PWM1, JTAG_TCK
22	P05	General IO, SPI_MOSI, ADC4, JTAG_TDO
23	P04	General IO, SPI_SCK, ADC3, JTAG_TDI
24	P03	General IO, I2C_SDA, ADC2
25	P02	General IO, I2C_SCL, ADC1

3. Product Functions and Test Operation Instructions

- Supports Bluetooth 5.2 host mode and slave mode.
- Supports WeChat AirSync protocol.
- Default configuration:

Working mode: Default transparent mode; if using AT commands, switch to command mode;

UART parameters: 9600, 8-bit data bits, no parity bit, 1 stop bit;

Bluetooth name: BleSerialPort;

Broadcast interval: "80,80", i.e., max=50ms, min=50ms;

Connection interval: "36,24,2,100", i.e., max=36, min=24, latency=2, timeout=300 (max=45ms, min=30ms, latency=2, timeout=1000ms).

4. UUID

Endpoint service UUID: 0xFFB0

Characteristic UUID: 0xFFB1 Attribute: Write no response

Characteristic UUID: 0xFFB2 Attribute: Read notification

5. Module and MCU Communication Interface

5.1 Asynchronous Serial Communication

The BLE module communicates with the MCU via a serial port (UART). Default port characteristics: baud rate 9600, data bits 8, stop bits 1, parity bit None.

5.2 Data Packet Format

Transparent mode: The BLE module is responsible for forwarding the data sent by the MCU to the app without any changes. Data sent by the app to the BLE

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module is also forwarded directly to the MCU.

Command mode: The module can be configured using AT commands. AT commands can be sent from the app or from the serial port assistant on the computer to configure the module.

5.3 Operating Mode Settings

5.3.1 Switching between command mode and transparent mode

When powered on, the default mode is transparent transmission mode. In this mode, sending “+++” returns “AT+ok Mode=AT Mode\r\n” to enter command mode, at which point AT commands can be used for settings and read operations.

In command mode, entering “AT+exit\r\n” returns “AT+ok Mode=Normal\r\n” to enter transparent transmission mode, at which point any data sent will be directly transmitted transparently.

Note: When sending “+++” to switch modes, only send three “+” characters. Do not include any other characters, including “\r\n” .

5.3.2 Serial Port Switch

24-pin (P03): High level enters serial port transparent mode; low level enters low-power mode; floating indicates serial port transparent mode. Enabling the switch requires a level change. (Note: Serial port transparent mode is not available in low-power mode.)

5.3.3 Status Indicator Light

13-pin (P01): High level when not connected; low level when connected.

5.3.4 MCU Interrupt Wake-up

14-pin (P00), default is low level; goes high when receiving data from the app, and returns to low after reception is complete.

5.3.5 Power On/Off Control

15-pin (P23), low level enters DEEP SLEEP mode, high level for normal operation, and floating for normal operation.

6. AT Commands

Note: The default mode upon power-up is transparent mode. To switch from transparent mode to command mode, send “+++” . In command mode, AT commands must be terminated with “\r\n” . When using a serial port assistant, you need to check the “Send new line” option.

6.1 AT Command Reference Table

command	Explanation
---------	-------------

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"AT+setBR 9600\r\n"	Set baud rate
"AT+getName\r\n"	Read Bluetooth name
"AT+setName=bleName\r\n"	Set Bluetooth name
"AT+getAddr\r\n"	Read Bluetooth address
"AT+setAddr=112233445566\r\n"	Set Bluetooth address
"AT+getStatus\r\n"	Read Bluetooth status
"AT+setAdvInt 80 100\r\n"	Set broadcast interval
"AT+setConnInt 36242300 \r\n "	Set connection interval
"AT+disConnect\r\n"	Disconnect
"AT+reStart\r\n"	Restart module
"AT+getPara\r\n"	Get configuration parameters
"AT+exit\r\n"	Exit command mode (switch to transparent mode);
"AT+shutDown\r\n"	In transparent mode, send "+++" to switch to command mode.
"AT+reStore\r\n"	Turn off module
"AT+getInfo\r\n"	Restore factory settings
"AT+help\r\n"	Query version information

6.2 Baud Rate Modification

Command description: Requires a manual restart to take effect.

Example: "AT+setBR 9600\r\n" ("\r\n" is an end-of-line character and is not entered, but each command must be followed by a line feed character with a value of 0D 0A, same below)

Hexadecimal: 41 54 2B 73 65 74 42 52 20 39 36 30 30 0D 0A (no spaces between numbers; some software may automatically ignore spaces, so you can add spaces if needed; same applies below)

Response: "AT+ok\r\n" (operation successful)

"AT+err_code\r\n" (operation failed; err_code details refer to "Command Error Return Parameter Description")

Baud rate setting range: (If the parameter does not match, an error message will be displayed.)

2400, 4800, 9600, 19200, 38400, 57600, 115200

6.3 Reading the Bluetooth Device Name

Example: "AT+getName\r\n"

Hexadecimal: 41 54 2B 67 65 74 4E 61 6D 65 0D 0A

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Response: "AT+ok=bleName\r\n" (Operation successful)

"AT+err_code\r\n" (Operation failed, err_code details refer to "Command Error Return Parameter Description")

6.4 Setting the Bluetooth Device Name

Command description: Requires a manual restart to take effect.

Example: "AT+setName=bleName\r\n" (e.g., set to SENSSUN FAT)

Hexadecimal: 41 54 2B 73 65 74 4E 61 6D 65 3D 62 6C 65 4E 61 6D 65 0D 0A

Response: "AT+okrestart effect!\r\n" (Operation successful, restart command required, takes effect after restart)

"AT+err_code\r\n" (Operation failed, err_code details refer to "Command Error Return Parameter Description")

6.5 Reading the Bluetooth MAC Address

Example: "AT+getAddr\r\n"

Hexadecimal: 41 54 2B 67 65 74 41 64 64 72 0D 0A

Response: "AT+okFF:11:22:33:66:FF\r\n" (Operation successful)

"AT+err_code\r\n" (Operation failed; err_code details refer to "Command Error Return Parameter Description")

6.6 Setting the Bluetooth MAC Address

Example: "AT+setAddr=112233445566\r\n"

Hexadecimal: 41 54 2B 73 65 74 41 64 64 72 3D 31 31 32 32 33 33 34 34 35 35 36 36 0D 0A

Response: "AT+okrestart effect!\r\n" (Operation successful, restart command required, takes effect after restart)

"AT+err_code\r\n" (Operation failed, err_code details refer to "Command Error Return Parameter Description")

6.7 Read Bluetooth Module Status: Broadcast/Connected

Example: "AT+getStatus\r\n"

Hexadecimal: 41 54 2B 67 65 74 53 74 61 74 75 73 0D 0A

Response: "AT+ok status_code\r\n" (operation successful), status_code is as follows:

00	Module is idle
01	Module is broadcasting
02	Module is connected
03	With response scan
04	Without response scan

"AT+err_code\r\n" (Operation failed, err_code See "Command Error Return Parameter Description" for details.)

6.8 Change Bluetooth Broadcast Interval

Command description: Requires a manual restart to take effect.

Example: "AT+setAdvInt 80 100\r\n" (minimum interval 80*0.625ms, maximum interval 100*0.625ms)

Hexadecimal: 41 54 2B 73 65 74 41 64 76 49 6E 74 20 38 30 20 31 30 30 0D 0A

(Broadcast interval maximum and minimum values, "min <= max" , 80~16000, i.e., 50ms~10000ms)

Response: "AT+okrestart effect!\r\n" (Operation successful; a restart command must be sent for the change to take effect after restart)

"AT+err_code\r\n" (Operation failed; err_code details refer to "Command Error Return Parameter Description")

6.9 Change Bluetooth Connection Interval

Command description: Effective immediately. Do not set frequently, otherwise you may lose connection.

Example: "AT+setConnInt 36 24 23 00\r\n" (parameters are max, min, latency, timeout)

Hexadecimal: 41 54 2B 73 65 74 43 6F 6E 6E 49 6E 74 20 33 36 32 34 32 33 30 30 0D 0A

In the example, the maximum interval is 36*1.25ms, the minimum interval is 24*1.25ms, the latency is 2, and the connection timeout is 300*10ms.

Minimum connection interval and maximum connection interval: The value range for both is 0x0006~0x0C80 (7.5ms~4000ms), with min <= max.

Latency: The valid range is 0x0000 to 0x01F3 (0 to 499).

Connection timeout: The valid range is 0x000A to 0x0C80. The connection interval must be less than the connection timeout, i.e., [max × 1.25 × (1 + latency)] < 10 × timeout.

Response: "AT+ok\r\n" (Operation successful, no need to restart, takes effect immediately)

"AT+err_code\r\n" (Operation failed, err_code details refer to "Command Error Return Parameter Description")

6.10 Disconnect Bluetooth Module

Example: "AT+disConnect\r\n"

Hexadecimal: 41 54 2B 64 69 73 43 6F 6E 6E 65 63 74 0D 0A

Response: "AT+ok\r\n" (Operation successful)

"AT+err_code\r\n" (Operation failed; err_code details refer to "Command Error Return Parameter Description")

6.11 Reset/Reboot

Example: "AT+reStart\r\n"

Hexadecimal: 41 54 2B 64 69 73 43 6F 6E 6E 65 63 74 0D 0A

Response: "AT+ok restart now \r\n" (Operation successful, automatic

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immediate restart)

6.12 Retrieve Configuration Parameters

Example: "AT+getPara\r\n"

Hexadecimal: 41 54 2B 67 65 74 50 61 72 61 0D 0A

Response: "AT+ok uart 9600,8,N,1; adv 120 160; con 36,24,2,300.\r\n"

(Operation successful), the returned parameters include the serial port, broadcast interval, and connection interval.

6.13 Exit Command Mode

Example: "AT+exit\r\n"

Hexadecimal: 41 54 2B 65 78 69 74 0D 0A

Response: "AT+ok Mode=Normal\r\n" (Operation successful, switched to transparent mode)

6.14 Shutdown

Example: "AT+shutDown\r\n"

Hexadecimal: 41 54 2B 73 68 75 74 44 6F 77 6E 0D 0A

Response: "AT+ok power off now!\r\n" (Operation successful)

6.15 Restore factory settings

Example: "AT+reStore\r\n"

Hexadecimal: 41 54 2B 72 65 53 74 6F 72 65 0D 0A

Response: "AT+ok restart now\r\n" (operation successful)

6.16 Query version information

Example: "AT+getInfo\r\n"

Hexadecimal: 41 54 2B 67 65 74 49 6E 66 6f 0D 0A

Response: "AT+ok HW=288-BLE-JXKJ,SW=V0.2"

6.17 Help command

Example: "AT+help\r\n"

Hexadecimal: 41 54 2B 68 65 6C 70 0D 0A

Response AT+ok Help:system_shutdown

setBR

getName

setName

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getAddr
setAddr
getStatus
setAdvInt
setConnInt
disConnect
reStore
reStart
getPara
getInfo
exit
help

6.18 Command error return parameter description

err_code	Meaning
"06"	The previous operation has not been completed.
"07"	The command parameters are invalid.
"08"	The module is in an unconnected state.
"09"	The module is in a connected state.
"10"	The module is broadcasting.
"11"	The operation failed.

7. Power consumption

Broadcast interval 100ms: 450uA

Broadcast interval 500ms: 110ua

Broadcast interval 1000ms: 59ua

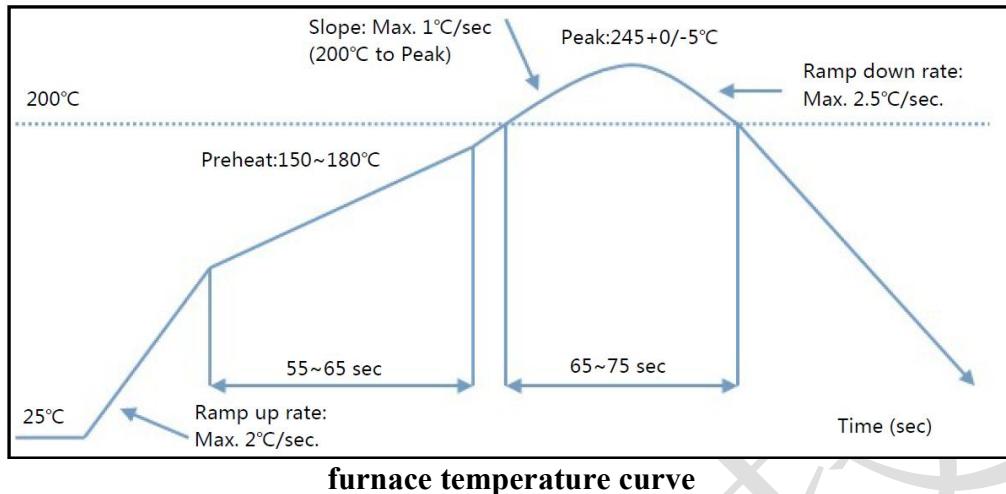
Deep sleep current (no broadcast): 0.8uA

8.Furnace temperature curve

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Maximum temperature: <250°C

Number of passes through the furnace: ≤2 times



9. Appendix: Reference specifications

《BLUETOOTH SPECIFICATION Version 4.2》

《IEEE 802.15.1》

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01r01

2.2 List of applicable FCC rules

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

2.3 Specific Operational Use Conditions

Antenna Placement Within the Host Platform

The module is tested for standalone mixed portable and mobile RF exposure use condition.

● The transmitter module may not be co-located with any other transmitter or antenna. In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

2.4 Limited Module Procedures

Not applicable

2.5 Trace Antenna Designs

Not applicable

2.6 RF Exposure Considerations

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated at mixed portable and mobile

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RF exposure use condition.

2.7 Antenna Type and Gain

The following antennas have been certified for use with this module.

Only antennas of the same type with equal or lower gain may also be used with this module. Other types of antennas and/or higher gain antennas may require the additional authorization for operation.

2.8 End Product Labelling Compliance Information

When the module is installed in the host device, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily removed. If not, a second label must be placed on the outside of the final device that contains the following text: "Contains FCC ID: **2AW97-XW37**". The FCC ID can be used only when all FCC compliance requirements are met.

2.9 Information on Test Modes and Additional Testing Requirements

This transmitter is tested in a standalone mixed portable and mobile RF exposure condition and any co-located or simultaneous transmission with other transmitter(s) class II permissive change re-evaluation or new FCC authorization.

Host manufacturer installed this modular with single modular approval should perform the test of radiated emission and spurious emission according to FCC part 15C, 15.209, 15.207 requirement, only if the test result comply with FCC part 15C, 15.209, 15.207 requirement, then the host can be sold legally.

2.10 Additional testing, Part 15 Subpart B Disclaimer

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

As long as all conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this modular installed.

2.11 Manual Information to The End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

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

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

OEM/Host Manufacturer Responsibilities

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

2.12 How to Make Changes - Important Note

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

10. Contact us

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