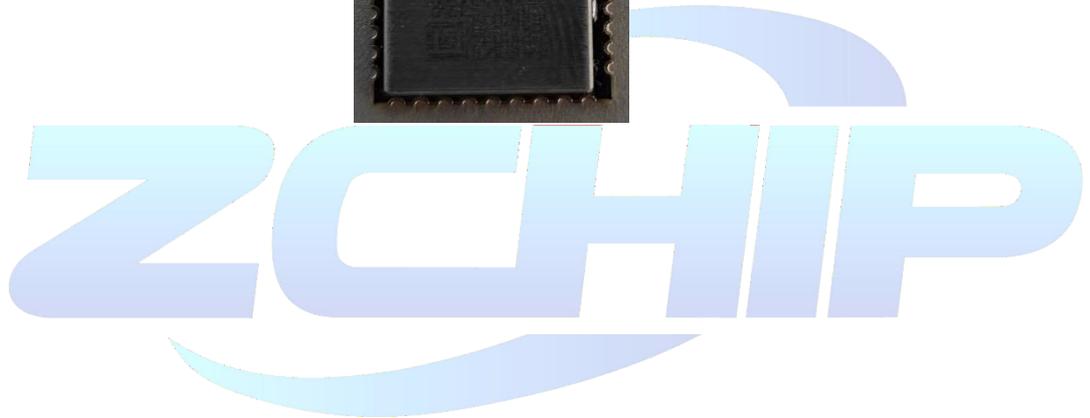


# USER MANUAL



Latest version V 1. 7

Hangzhou Zhexin Communication Technology Co., Ltd. Copyright  
2023-2024

# About this manual

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The Specification of ZX5005 Transparent Transmission Module provides an introduction to the basic functions of ZX5005 Transparent Transmission Module.

## Revise history

Version information management

version number	time	update record	Editor
V1.0	2023.12.30	Initial version	Ziheng_Yuan
V1.4	2024.01.25	Added pin note function.	Ziheng_Yuan
V1.7	2024.01.30	Fixed an error in pin function.	Ziheng_Yuan



# 1. summary

ZX5005 series is a low-power Bluetooth transparent transmission module launched by Hangzhou Zhexin Communication Technology Co., Ltd., It conforms to the low-power Bluetooth 5.3 specification and can also be used for 2.4G development. It is compact and can greatly reduce the development time and difficulty of customers, and is mainly used for data communication in the Internet of Things. Provide basic firmware, users can realize multiple functions with simple configuration, and support customers' secondary development.

The ZX5005 series has built-in 512K Flash, which supports upgrading of BLE (Up to Bluetooth 5.3), BLE MESH, Zigbee3.0, 2.4G Proprietary and OTA, and is flexible to use.

Our company has been deeply involved in the Bluetooth field for many years, and has a strong R&D strength. We can realize various application functions on ZX5005 series modules according to customers' needs, provide software and hardware R&D support, and assist customers in the smooth transition from R&D to mass production. For details, please visit our company in official website. [www.zchip.net.cn](http://www.zchip.net.cn)

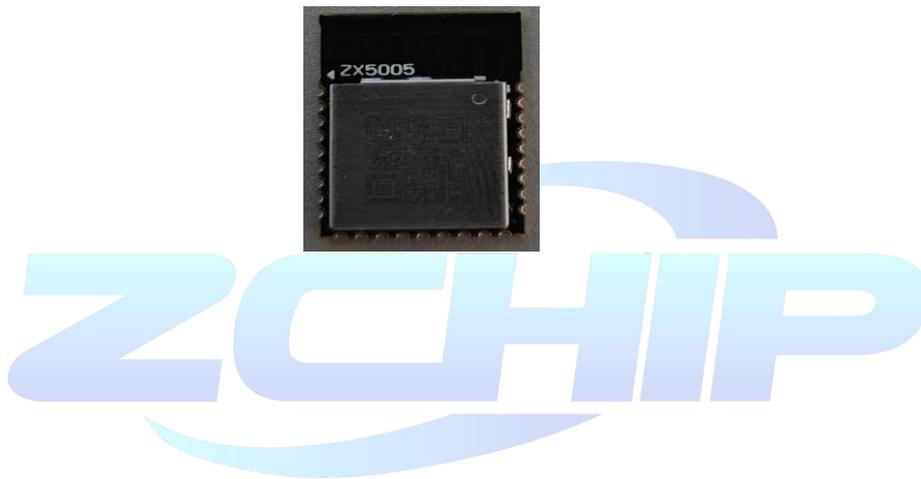


Figure 1-1-1: ZX5005 Transparent Transmission Module

## 1.1. Main features

Built-in high-performance 32-bit MCU, 512KB Flash, 32/48/64KB SRAM.

Meet the Bluetooth 5.3 standard. It has twice the data transmission rate, four times the transmission distance (LR) and eight times the broadcast packet expansion (AE) transmission

receiving sensitivity

- -96dBm@BLE 1Mbps
- -93dBm@ BLE 2Mbps mode
- -99dBm@ BLE 500kbps mode
- -101dBm@ BLE 125kbps mode

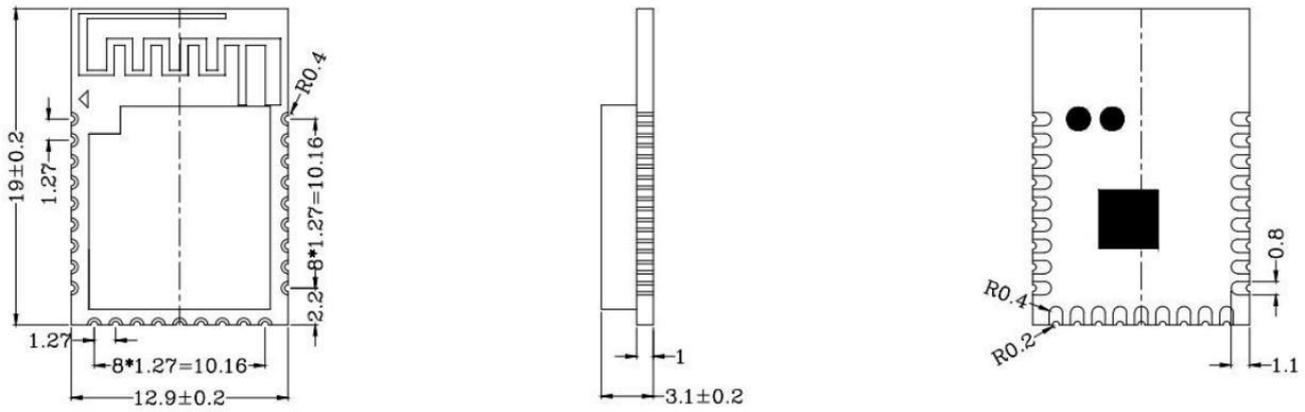
supports UART interface and AT instruction.

On-board high-performance PCB antenna, and support external antenna stamp hole pin, welding is easy and reliable.

Ultra small package: 12.9x19mm

Working temperature: -40°C~+85°C

## 2. Module size and reference package



ZCHIP

### 3. Pin description



<i>serial number</i>	<i>pin</i>	<i>function</i>	<i>direction</i>	<i>Remarks</i>
1	NC	-	-	-
2	GND	GND	-	<i>landing</i>
3	PC4	GPIO	-	-
4	PC3	GPIO/PWM	-	-
5	PC1	OTA_EN	Input	<i>Input port P_OTA_EN is used for OTA function switch; When P_OTA_EN is low, the module prohibits OTA, and when P_OTA_EN is high or suspended, OTA is allowed.</i>
6	PC2	GPIO	-	Multiplexing function: PWM0/7816_TRX/I2C_SDA
7	PB4	SLEEP	Input	<i>Input port P_SLEEP is used for low power control; When P_SLEEP is low, the module enters SLEEP mode. If low power control is not required, this pin can be left floating.</i>
8	PB5	GPIO	-	Multiplexing function: ADC/PWM5/SDM_N0/COMP_IN5.
9	PD7	GPIO	-	Multiplexing function: SPI_CK/I2C_SCK/I2S_BCK/7816_TRX
10	VCC	Power	-	<i>Rated 3.3v</i>
11	GND	Ground	-	<i>landing</i>
12	RST	Reset	Input	<b>Module reset pin</b> <i>High level: the module runs normally; low level: the module remains reset.</i> <i>Note: This pin is internally pulled up, so it can be suspended when not in use.</i>
13	PA7	SWS	-	<i>Burning port</i>

14	NC	-	-	-
15	PA1	GPIO	-	Multiplexing function: I2S_CLK/7816_CLK/DMIC_CLK
16	PB7	GPIO	-	Multiplexing function: ADC/SPI_do/SDM_n1/comp_in7/UART_rx.
17	PB1	UART TX	Output	<i>Serial data output pin</i>
18	PA0	UART RX	Input	<i>Serial data input pin</i>
19	NC	-	-	-
20	NC	-	-	-
21	PB6	P_CONN_ST	Output	<b>Connection status indication pin</b> <i>High level: indicates that the module is connected; low level: indicates that the module is not connected.</i>
22	PD3	GPIO	-	Multiplexing function: PWM1N/I2S_SDI/7816_TRX
23	PD4	GPIO	-	Multiplexing function: PWM2N/I2S_SDO
24	PD2	GPIO	-	Multiplexing function: PWM3/SPI_CN/I2S_LR
25	PC0	DISCONNECT	Input	<i>Input port P_DISCONN is used to disconnect Bluetooth connection; Disconnect the current Bluetooth connection at the falling edge of P_DISCONN.</i> <i>If the Bluetooth connection does not need to be actively disconnected, this pin can be suspended.</i>
26	GND	Ground	-	All GND should be connected
27	ANT	External antenna interface	-	<i>The default is PCB antenna, and internal jump is required to connect external antenna.</i> <i>Selected device, item number: C20</i>

## 4. Electrical performance of module

### 1. PMU Characteristics

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
VDD	Voltage output	1.8	3.3	3.6	V	
I <sub>VDDIO</sub>	Loading current	--	--	--	mA	

### 2. IO Input/Out Electrical Logical Characteristics

IO Input Characteristics						
Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
V <sub>IL</sub>	Low-Level Input Voltage	VSS	--	0.3* VDDIO	V	VDDIO = 3.3V

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$V_{IH}$	High-Level Input Voltage	0.7* VDDIO	--	VDDIO	V	VDDIO = 3.3V
IO output characteristics						
$V_{OL}$	Low-Level Output Voltage	VSS	--	0.1* VDD	V	VDDIO = 3.3V

VOH	High-Level Output Voltage	0.9* VDD	--	VDD	V	VDDIO=3.3V
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### 3. Internal Resistor Characteristics

Port	General Output	High Drive	Internal Pull-Up Resistor	Internal Pull-Down Resistor	Comment
PA [0,4:7], PC [0:7], PD [0:7]	2mA	4mA	18K 1M	160K	1. DP[PA2] pin also supports 1.5K Pull-up resistor for USB use.
PA [1:3], PB [0:7]	4mA	8mA	18K 1M	160K	

### 4. BT

#### Characteristics

#### 4.1 Transmitter

#### BLE 1Mbps RF\_TX Performance

Parameter	Min	Typ	Max	Unit	Test Conditions
RF Transmit Power	--	--	--	dBm	
RF Power Control Range		55		dB	
20dB Bandwidth		1.4		MHz	

### BLE 2Mbps RF TX Performance

Parameter	Min	Typ	Max	Unit	Test Conditions
RF Transmit Power	--	--	--	dBm	
RF Power Control Range		55		dB	
20dB Bandwidth		2.5		MHz	

### 4.2Receive

#### BLE 1Mbps RF RX Performance

Parameter	Min	Typ	Max	Unit	Test Conditions
Sensitivity		-97		dB	
Co-channel Interference Rejection		eight		dB	
In-band blocking rejection (equal modulation interference)	+1MHz	-4		dB	
	+1MHz	-2		dB	
	+2MHz	-41		dB	
	-2MHz	-32		dB	
	≥3MHz	-42		dB	

#### BLE 2Mbps RF RX Performance

Parameter	Min	Typ	Max	Unit	Test Conditions
Sensitivity		-93		dBm	
Co-channel Interference Rejection		eight		dB	
In-band blocking rejection(equal modulation interference)	+2MHz	-9		dB	
	-2MHz	-7		dB	
	+4MHz	-38		dB	
	-4MHz	-33		dB	
	>4MHz	-42		dB	

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# 5.matters need attention

Bluetooth works at the frequency of 2.4GHz, so we should try to avoid the influence of various factors on wireless transceiver. Pay attention to the following points: avoid using

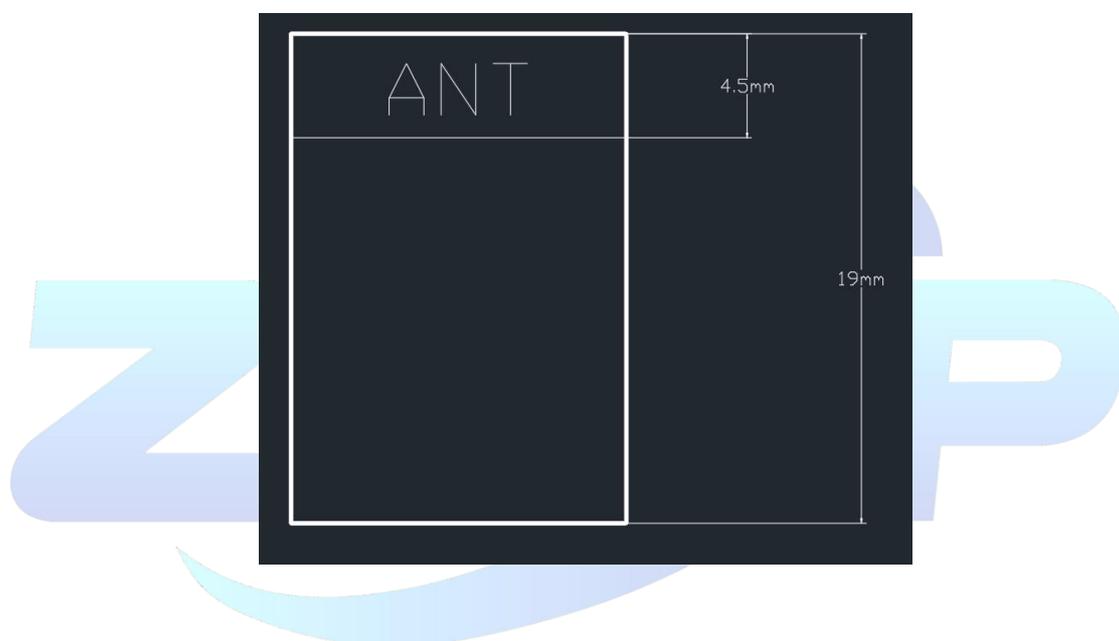
- metal in the product shell surrounding the module, and consider using an external antenna if the shell is metal. Metal screws inside the product should be far away from the RF part of the module.

- In order to maximize RF performance, the user motherboard layout should follow the following recommendations:

Antenna clearance area: The user motherboard located directly below the module antenna area cannot have any copper foil traces (including power, ground and signal layers).

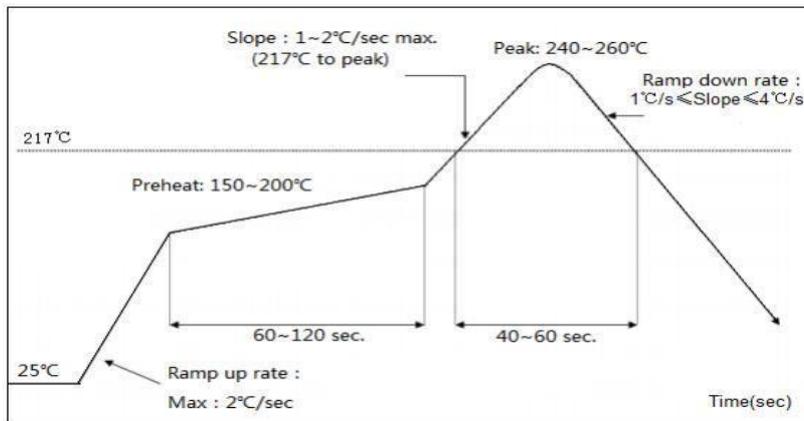
Module location: Ideally, the module should be arranged in a corner of the user's motherboard, and the PCB antenna is located at the far end of the motherboard. This position can minimize the clearance area of the antenna.

(Refer to the following figure for the definition of antenna clearance area)



# 6.Reflux parameter recommendation

Reflux parameters can refer to the following settings:



Temperature Range	Time	Key parameters
Preheat zone (<150°C)	60-120S	Ramp up rate: ≤2S
Uniform temperature zone(150-200°C)	60-120S	Ramp up rate:<1S
Recirculation zone(>217°C)	40-60S	Peak:240-260°C
Cooling zone	Ramp down rate:1°C/s≤Slope≤4°C/s	

Reflux  
recommended  
parameters

# 7.FCC Statement

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

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

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

## Radiation Exposure Statement

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

## 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 has been investigated. It is applicable to the modular transmitter

### 2.3 Specific operational use conditions

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

### 2.4 Limited module procedures

Not applicable

### 2.5 Trace antenna designs

Not applicable

### 2.6 RF exposure considerations

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

### 2.7 Antennas

This radio transmitter **FCC ID: 2BMOC-ZX5005** has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Antenna No.	Model No. of antenna:	Type of antenna:	Gain of the antenna (Max.)	Frequency range:
Bluetooth	/	PCB Antenna	0dBi	2402-2480MHz

### 2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains **FCC ID: 2BMOC-ZX5005**".

### 2.9 Information on test modes and additional testing requirements

Host manufacturer is strongly recommended to confirm compliance with FCC requirements for the transmitter when the module is installed in the host.

### 2.10 Additional testing, Part 15 Subpart B disclaimer

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.

### 2.11 Note EMI Considerations

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Host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties.

### **2.12 How to make changes**

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system. According to the KDB 996369 D02 Q&A Q12, that a host manufacture only needs to do an evaluation (i.e., no C2PC required when no emission exceeds the limit of any individual device (including unintentional radiators) as a composite. The host manufacturer must fix any failure.