XJ-B1A Module Series

B1A BLEmesh Standard Module (PCB Antenna)

XJ-B1A series of low-power Bluetooth module is a high-performance Bluetooth module which is developed based on the Telink low-power Bluetooth SOC TLSR8250 chip. The module adopts the stamp-type and side plug-in interfaces, is exquisite and compact, is fully lead out via ports and convenient to use, and helps the users omit the complicated RF hardware design, development and production links. Therefore, the users can easily realize the development of Bluetooth application programs on that basis, shorten the R&D cycle, and seize the market opportunities. This model is a pure hardware module that excludes any software. If you need the edition with software, please notify in advance.

Product Characteristics

·Working Frequency Band

- Working frequency band: 2402-2480MHz

·Ultra-low Power Consumption

- Support 2.7V-3.6V power supply
- Emission current: ≤20mA (10dBm power configuration)
- Receiving current: ≤7.5mA (overall current)
- Sleep current: 400nA (SRAM not saving)

·High-link Budget

- Sensitivity-96dBm±1dBm (1Mbps, PER<30.8%)
- Emission power: Max.1.391dBm

·Memory Resources

- Internal 512kB Flash (the capacity that the client can actually use is less than 512kB)
- 48kB on-chip SRAM, wherein 32kB can sleep and save

·Compatibility

- Designed interface mode with side plug-in and stamp holes compatible

·Mesh Functions

- Support BLE
- Support the Bluetooth SIG Mesh
- Support the exclusive Mesh of Telink

·Communication Interface

- 2 PWM / 4 GPIO / 1 UART （Pin multiplexing）

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ORIGINAL EQUIPMENT MANUFACTURER (OEM) NOTES

- The OEM must certify the final end product to comply with unintentional radiators (FCC Sections 15.107 and 15.109) before declaring compliance of the final product to Part 15 of the FCC rules and regulations. Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change.

- The OEM must comply with the FCC labeling requirements. If the module's label is not visible when installed, then an additional permanent label must be applied on the outside of the finished product which states: "Contains transmitter module FCC ID: ZAXSOXJ-B1A ". Additionally, the following statement should be included on the label and in the final product's user manual: "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 interferences, and(2)this device must accept any interference received, including interference that may cause undesired operation."

- The module is limited to installation in mobile or fixed applications. Separate approval is required for all other operating configurations, including portable configuration with respect to Part 2.1093 and different antenna configurations.

- A module or modules can only be used without additional authorizations if they have been tested and granted under the same intended end-use operational conditions, including simultaneous transmission operations. When they have not been tested and granted in this manner, additional testing and/or FCC application filing may be required. The most straightforward approach to address additional testing conditions is to have the grantee responsible for the certification of at least one of the modules submit a permissive change application. When having a module grantee file a permissive change is not practical or feasible, the following guidance provides some additional options for host manufacturers. Integrations using modules where additional testing and/or FCC application filing(s) may be required are: (A) a module used in devices requiring additional RF exposure compliance information (e.g., MPE evaluation or SAR testing); (B) limited and/or split modules not meeting all of the module requirements; and (C) simultaneous transmissions for independent collocated transmitters not previously granted together.

This Module is full modular approval, it is limited to OEM installation ONLY.
Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change.
(OEM) Integrator has to assure compliance of the entire end product includ the integrated Module. Additional measurements (15B) and/or equipment authorizations (e.g Verification) may need to be addressed depending on co-location or simultaneous transmission issues if applicable.

(OEM) Integrator is reminded to assure that these installation instructions will not be made available to the end user of the final host device.

CONTENTS

1 Specifications & Parameters

Table 1-1 Limit Parameters of Module

Parameters	Performance		Remarks
	Min	Max	
Supply voltage （V）	-0.3	+3.6	All AVDD and DVDD with same voltages
Max voltage of input pins	-0.3	VDD+0.3	
Storage temperature（℃）	-65	150	

Table 1-2 Working Parameters[1] of Module

Parameters		Performance			Remarks
		Min	TYP	Max	
Supply voltage（V）		2.7	3.3	3.6	
Work temperature（℃）		-40	-	85	
Initial frequency tolerance (KHz)		-30	-	+30	Below 25℃
Work frequency (GHZ)		2.402	-	2.480	Support customized frequency setting
Power consumption	Transmit (mA)	17	18	20	Output power 10dBm，system timer 16MHz
		5.5	6.8	8	Output power 0dBm，system timer 16MHz
	Receive (mA)	5.5	6.5	7.5	Overall current
	Sleep (uA)	-	0.15	1	Deep sleep, not save SRAM
Transmit power (dBm)		-25	1.391	-	Transmit power can be configured through software
RSSI (dBm)		-95	-96	-	1Mbps，PER<30.8%
Communication protocol		BLE5/4.2/Mesh			
Interface type		stamp /side inserted			
Dimensional accuracy		GB/T1804-C level			Meet the dimensional tolerance class C

2 Dimensional Drawing and Pin Definitions

The physical diagram of XJ-B1A Module Series is as shown in Fig. 2-1. There will be a label on the shield cover, and it shall be subject to the physical product.

[1] The test is conducted at 25℃ in a shielded room environment.

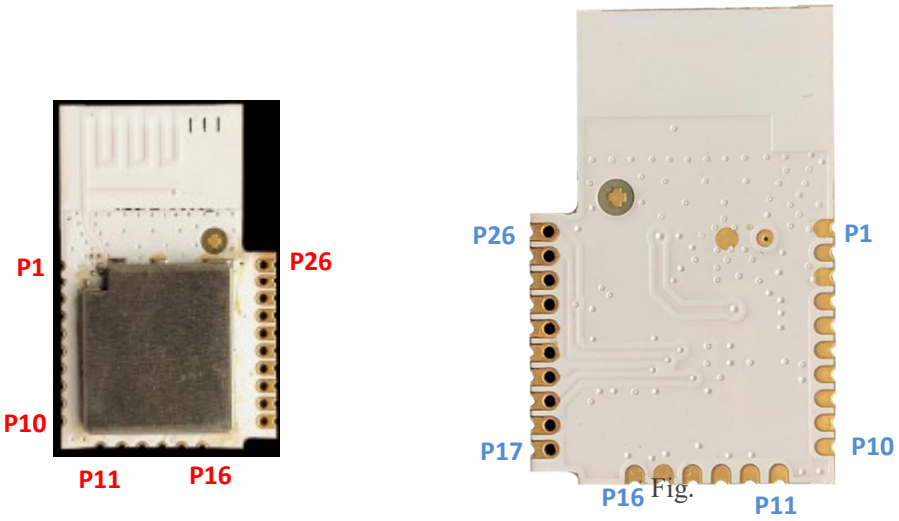

Fig. 2-1 Physical Diagram of XJ-B1A Module Series

* When this product is being designed, the resistance capacitor and PCB have optional material models, so their colors of appearance may be different on the premise that the performance requirements are met, and shall be subject to the physical products; please refer to Table 1-3 for the key materials BOM.

Table 1-3 Key Materials of BOM

Designator	Priority	Quantity	Manufacturer	Description	Package
U1	1	1	Telink Semiconductor	TLSR8250F512ES16	TSSOP16
X1	1	1	TXC	8pF/24MHz/10PPM	3225
X1	2	1	TST	8pF/24MHz/10PPM	3225

2.1 Dimensional Drawing

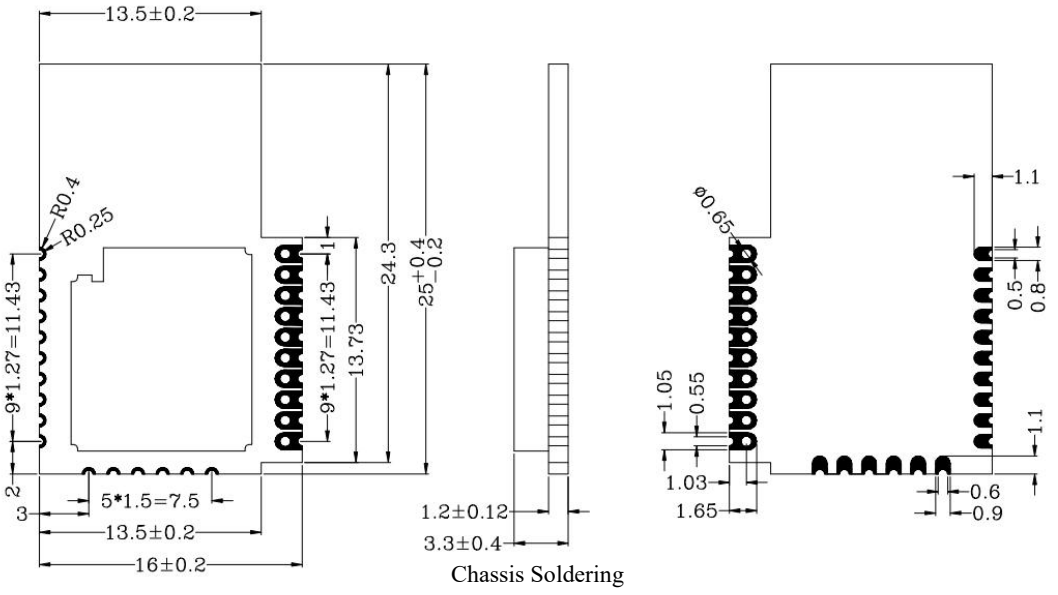

Fig. 2-2 Dimensional Drawing of XJ-B1A Module Series

2.2 Pin Definitions

Table 2-1 Pin Definitions[2]

PIN	Pin Name	Description
P1	GND	Ground
P2	ANT	RF signal/ANT
P3	GND	Ground
P4	RST	Power on reset ,active low
P5-P13	NC	
P14	SWS/UART_RTS/PA<7>	Single wire slave / UART_RTS / GPIO PA[7]
P15	GND	Ground
P16	VCC	3.3V power supply for module internal circuit
P17	VCC	3.3V power supply for module internal circuit
P18	GND	Ground
P19	SWS/UART_RTS/PA<7>	Single wire slave / UART_RTS / GPIO PA[7]
P20	PWM3_N/UART_RX/sar_aio<9>/ PC<5>	PWM3 inverting output / UART_RX / SAR ADC input / GPIO PC[5]
P21	PWM4[3]/UART_TX/sar_aio<1>/ PB<1>	PWM4 output / UART_TX / SAR ADC input / GPIO PB[1]
P22	The same as P21	The same as P21
P23	PWM3[4]/UART_RX/sar_aio<0>/ PB<0>	PWM3 output / UART_RX / SAR ADC input / GPIO PB[0]
P24	GND	Ground
P25	The same as P21	The same as P21
P26	The same as P23	The same as P23

Note: This module is pin-multiplexed.that is, P21, P22, and P25 are the same output port,P23 and P26 are the same output port. This module can output 2 PWM.

2 For the specific functions of the multiplex pin, please refer to the *Datasheet for TLSR8250F512*

3 pin-multiplexed, P21, P22, and P25 are the same output port,PWM4 output

4 pin-multiplexed, P23, and P26 are the same output port,PWM3 output

3 Basic Operations

3.1 Pins

When using the module, please choose the IO pin and carry out single-wire burning to the module according to the actual application. It is suggested leaving VCC, GND and SWS on the bottom plate for burning.

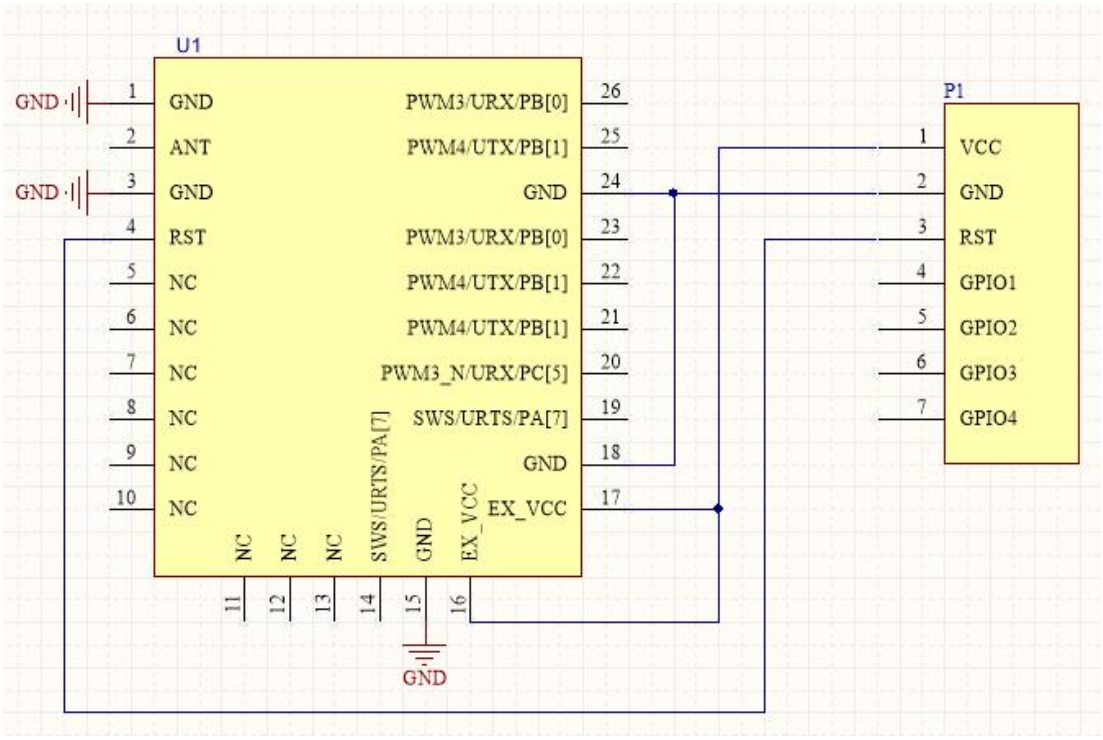

Fig. 3-1 Typical Application Circuits

3.2 Notices to Hardware Layout

1. Try to shorten the wire from the RF outlet to the antenna pad, lay the 50Ω impedance wire, surround the wire with copper foil which is grounded, and form as many as possible through holes around the wire.
2. If permitted, add the π circuit from the RF outlet to the antenna pad.
3. Make sure the surrounding environment of the antenna is clear, and at least leave a 5mm clearance area.
4. Pay attention to the grounding quality, and large-area pavement is recommended.
5. Keep off the high-voltage circuits, high-frequency switches and other circuits.

3.3 Antenna Clearance

When using the PCB antenna of our company's module, the following three schemes for the layout of the RF clearance area are recommended. Usually, the RF performance of the module under Scheme 1 (The PCB antenna is outside the board frame) is better than that of the module under Scheme 2 (The PCB antenna is placed along the board side and its lower part is hollowed), and the RF performance of the module under Scheme 2 is better than that under Scheme 3 (The PCB antenna is placed along the board side and is not clad with copper), i.e. Scheme 1 ≥ Scheme 2 ≥ Scheme 3.

Scheme 1: The PCB antenna is outside the board frame

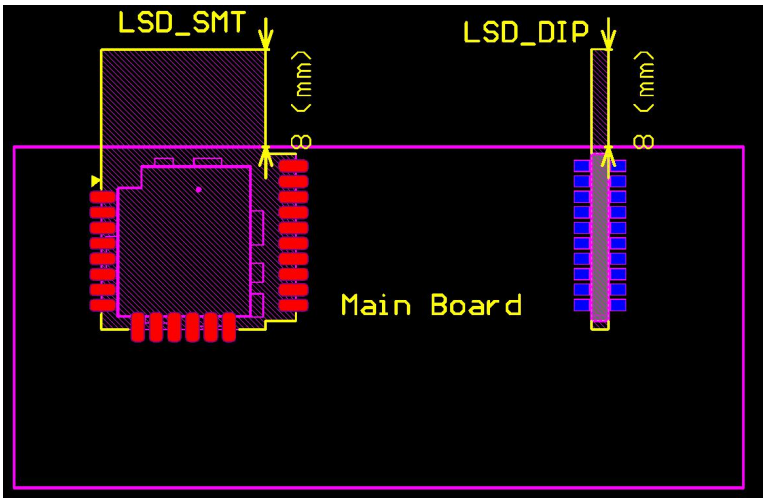

Fig. 3-2 The PCB antenna is outside the board frame

Scheme 2: The PCB antenna is placed along the board side and its lower part is hollowed

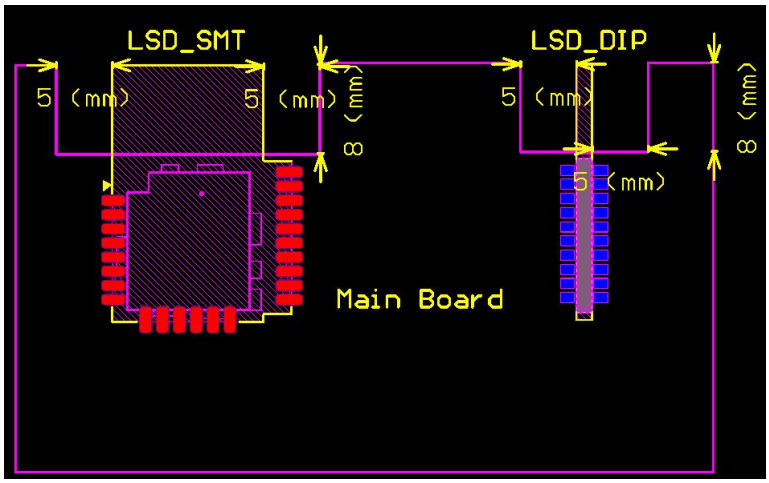

Fig. 3-3 The PCB antenna is placed along the board side and its lower part is hollowed

Scheme 3: The PCB antenna is placed along the board side and is not clad with copper

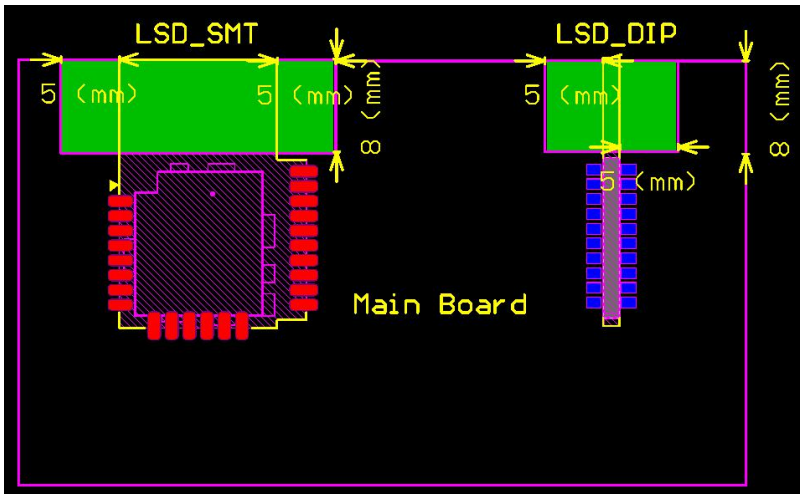

Fig. 3-4 The PCB antenna is placed along the board side and is not clad with copper

4 Common Problems

4.1 Communication Failure of Module in Near Distance

- Make sure the sending and receiving configuration is consistent, because inconsistent configuration will disenable normal communication.
- Abnormal voltage: Too low voltage will lead to abnormal sending.
- Low battery: when in low battery, the voltage will be reduced at the time of sending which will cause abnormal in sending.
- Abnormal antenna soldering, RF signal failed to reach the antenna or wrong soldering of π circuit.

4.2 Abnormal Power Consumption of Module

- The module is damaged due to such reasons as static electricity, resulting in abnormal power consumption.
- When in receiving at low power, the power consumption of the module does not achieve the expected effect due to the inaccuracy of timing configuration, etc.
- The power consumption of the module fluctuates when the working environment is adverse and in such extreme environments as high temperature and humidity, as well as low temperature.

4.3 Insufficient Communication Distance of Module

- The antenna impedance is not well matched, so the emission power is very low.
- Serious signal attenuation due to metal and other things around the antenna or because the module is in the metal.
- Near communication distance of the module due to other interference signals in the testing environment.
- Abnormal emission power due to not enough power supply.
- The testing environment is adverse, especially the humidity greatly attenuates the 2.4G signals.
- The module goes through the wall and other environments and then communicates with the other end, the wall greatly attenuates the signals; most signals go around the wall, so the signals are greatly attenuated.
- The module is too close to the ground, absorbed and reflected, and thus the communication effect is worse.

4.4 Module Authentication

This module has been certified by SRRC (China) and FCC (United States). CMIIT ID number is 2019DP1351, and FCC ID number is ZAXSOXJ-B1A.

Three display modes of CMIIT ID and FCC ID are provided. The first shield laser scheme is defaulted.

1.Shield shield laser: display module product serial number, CMIIT ID, FCC ID, RoHS logo, lierda registered trademark, CE certification logo, etc., with shield as the specific criterion;

2.Back label: display module product serial number, CMIIT ID, FCC ID, module P/N, lierda registered trademark, etc, specific to the manufactured product;

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.

NOTE: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

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

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
- 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
- This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

RF Exposure Information and Statement :

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body.

5 Production Guide

5.1 Production Guide

It is suggested processing SMT machine patch on the stamp tear sealing module, and finishing it within 24 hours after unpacking. Otherwise, please vacuumize and package again, so as to prevent the problem that the patch processing effect is poor due to damp. If there is a humidity indicator card in the package, it is suggested judging if the module needs to be baked according to the indication of the humidity card. The baking conditions are as follows:

Baking temperature: 125℃±5℃;

Alarm temperature: 130℃;

SMT patch processing can be carried out after the product is cooled to < 36℃ under natural conditions.

If the unpacking time exceeds 3 months, whether the product got damp shall be paid special attention to, because the gold immersion process of PCB may lead to the oxidation of the bonding pad when in excess of 3 months, and such problems as pseudo soldering and solder skips.

In order to ensure the pass rate of reflow soldering, sampling 10% of products to carry out visual inspection and take the AOI test in the first time of patch processing is suggested, so as to ensure the reasonableness of furnace temperature control, device absorption mode, and placement method.

During the whole production process, the operators at all stations must wear antistatic gloves.

5.2 Requirements on Module Position on Bottom Plate

It is suggested that the thickness of liquid photosensitive solder resist at the module position on the bottom plate be less than 0.02mm, to avoid excessive thickness causing the module unable to be effectively contacted with the solder paste after being blocked up, thus affecting soldering quality.

In addition, please make sure not to put other devices within 2mm around the module position on the interface board, so as to guarantee the maintenance of module.

5.3 Opening Design of Steel Mesh

If the thickness of steel mesh on the bottom plate is selected by comprehensively considering the sealing type of the devices in the board in principle, pay close attention to the following requirements:

The bonding pad of module can be locally thickened to 0.15~0.20mm, to avoid missing solder.