

TPL3132 BLE 5.0 Module Datasheet

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1、Introduction

TPL3132 is a BLE 5 low power Bluetooth module, which can be widely used in short distance wireless Bluetooth communication. It has the characteristics of small size, low power consumption, strong anti-interference ability and long transmission distance.

The other main features of the module are as follows:

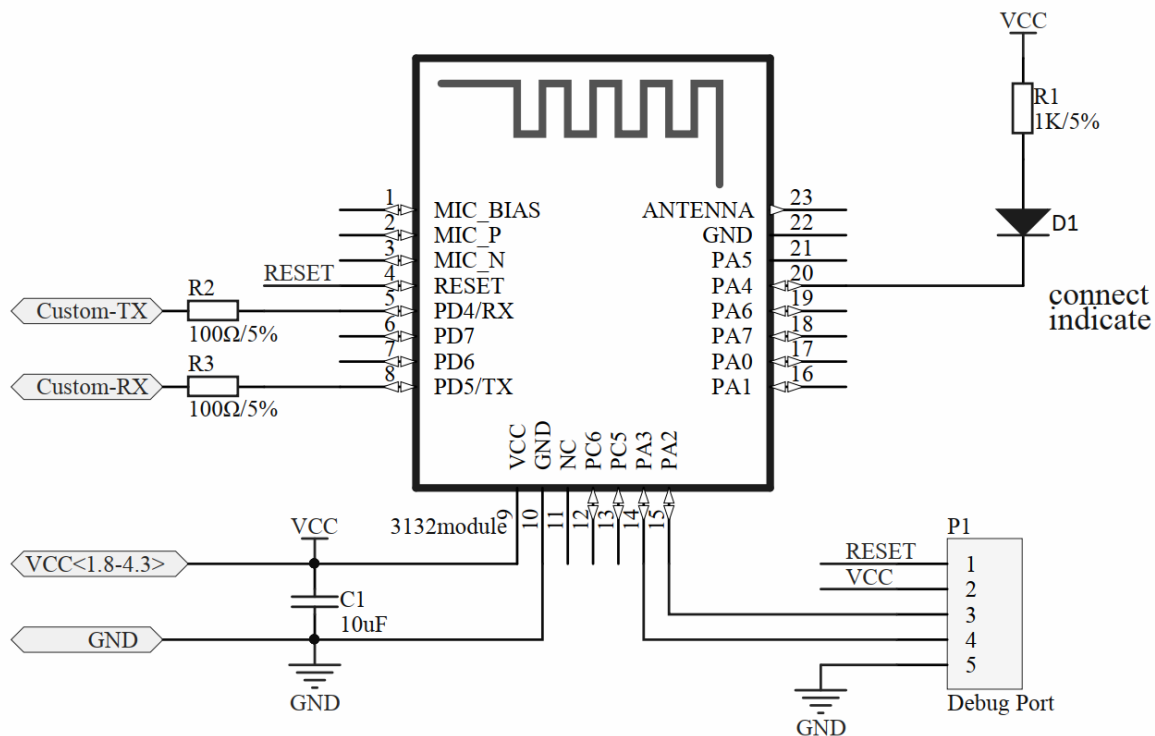
- Built in 512KB flash, 48KB SRAM
- compliant with Bluetooth 5 standard, which can support various Profile configurations.
- Support low power Bluetooth data transparent transmission
- Support AT command control
- Support ibeacon function
- Support ble mesh function
- Support online OTA upgrade module firmware
- Support PCB antenna and reserve external antenna interface
- Ultra small package
- Customer customizable development support

2、Module Parameters

Item	Parameters
Module Name	TPL3132
Package	SMT (Stamp Hole)
Size	11.20x15.06 (±0.2)MM
Voltage Range	1.8V~4.3V, Recommend 3.3V
Wireless Standard	Bluetooth 5.0
Frequency Range	2400~2483.5MHz
Output Power	10dBm
Sensitivity	-92dBm
Default Communication interface	UART
FLASH Size	512KB
RAM Size	48KB
GPIO Number	15
Work Temperature	-40°C~+85°C
Storage Temperature	-40°C~+125°C

Number	Name	PIN	Function	Remarks
1	MIC_BIAS	Analog output	Microphone bias output	
2	MIC_P	Analog input	Microphone input	
3	MIC_N	Analog input	Common mode voltage	
4	RESET	reset	Reset BT(High level reset)	
5	PD4/RX	Digital I/O	SCL0/I2SCLK/PWM4/SSPCLK/URXD0/URXD1/ANTCTL0 /PDMCLK/PWM5/ADC0	UART_RX
6	PD7	Digital I/O	SDA1/I2SDIN/PWM1/SSPDIN/UTXD0/UTXD1/ANTCTL1 /PDMDAT/PWM0/ADC3	
7	PD6	Digital I/O	SCL1/I2SDOUT/PWM0/SSPDOUT/URXD0/URXD1/CLKOUT/PDMCLK/PWM1/ADC2	
8	PD5/TX	Digital I/O	SDA0/I2SFRM/PWM5/SSPCSN/UTXD0/UTXD1/ANTCTL0/PDMDAT/PWM4/ADC1	UART_TX
9	VCC	Power	1.8V-4.3V, Recommend 3.3V	
10	GND	Power	Simulated GND	
11	NC	NC	NC	
12	PC6	Digital I/O	SCL1/I2SDOUT/PWM4/SSPDOUT/URXD0/URXD1/SWTCK/PDMCLK/PWM5	
13	PC5	Digital I/O	SDA0/I2SFRM/PWM5/SSPCSN/UTXD0/UTXD1/SWV/PDMDAT/PWM4	
14	PA3	Digital I/O	SDA1/I2SDIN/PWM3/SSPDIN/UTXD0/UTXD1/ANTCTL1/PD MDAT/PWM2	
15	PA2	Digital I/O	SCL1/I2SDOUT/PWM2/SSPDOUT/URXD0/URXD1/ANTCTL0 /PDMCLK/PWM3	
16	PA1	Digital I/O	SDA0/I2SFRM/PWM1/SSPCSN/UTXD0/UTXD1/ANTCTL0/PDMDAT/PWM0	
17	PA0	Digital I/O	SCL0/I2SCLK/PWM0/SSPCLK/URXD0/URXD1/CLKOUT/PDMCLK/PWM1	
18	PA7	Digital I/O	SDA1/I2SDIN/PWM1/SSPDIN/UTXD0/UTXD1/ANTCTL0/PDMDAT/PWM0	
19	PA6	Digital I/O	SCL1/I2SDOUT/PWM0/SSPDOUT/URXD0/URXD1/CLKOUT/PDMCLK/PWM1	
20	PA4	Digital I/O	SCL0/I2SCLK/PWM4/SSPCLK/URXD0/URXD1/CLKOUT/PDMCLK/PWM5	Connection status indicator pin
21	PA5	Digital I/O	SDA0/I2SFRM/PWM5/SSPCSN/UTXD0/UTXD1/ANTCTL1/PDMDAT/PWM4	
22	GND	Power	GND	
23	RFT	Analog	External RF antenna outlet pin	The default is the PCB antenna

5、Reference Design



Explanation:

- PA2 and PA3 are module downloads and debugger ports. It is recommended that they be pulled out to facilitate debugging and downloading programs.
- PA4 is connected to the status indicator pin. If the power consumption is not sensitive, it is recommended to pull out a lamp to facilitate the later debugging or maintenance to see if the Bluetooth module is connected.

6、Hardware Design Considerations

6.1、Module placement requirements on the bottom plate

(1) In order to meet the performance of the antenna on board, it is forbidden to place metal parts around the antenna, away from high frequency devices. Avoid using metal in the product housing and keep metal screw inside away from the RF part of the module.

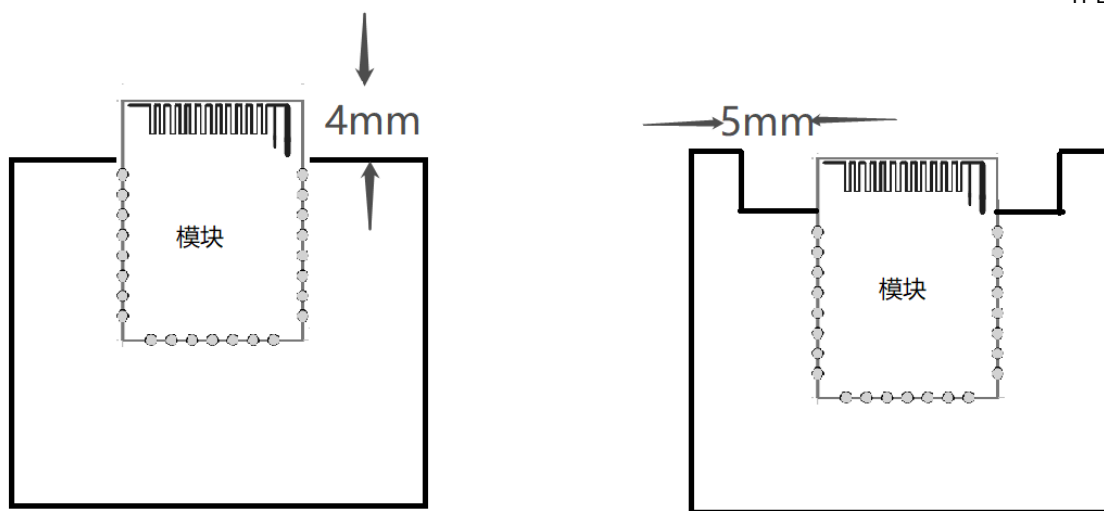
(2) Pay attention to the layout of the module on the soleplate, and minimize the impact of the soleplate on the performance of the module PCB antenna.

The following are suggested:

Option 1: Place the module at the edge of the motherboard and the antenna area extends beyond the edge of the motherboard.

Option 2: Place the module at the edge of the motherboard, which empties an area at the antenna position.

Option 3: If the above scheme is limited and cannot be implemented, make sure that the area of the module PCB antenna and the area of 5 mm extension need to be cleared (copper, wiring and placement of components are strictly prohibited).



6.2、 power supply requirements

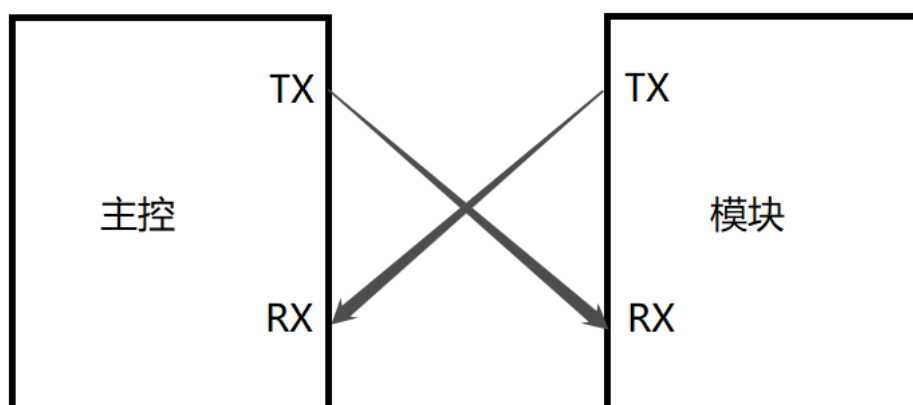
(1) It is recommended to use DC regulator power supply to supply power to the module. The power ripple factor is as small as possible and the module needs to be grounded reliably. Please note that the correct connection between the positive and negative poles of the power supply, such as reverse connection may cause permanent damage to the module.

(2) Check the power supply to ensure that between the recommended supply voltage, if the maximum value is exceeded, the module will be permanently damaged; check the power supply stability, the voltage should not fluctuate significantly and frequently;

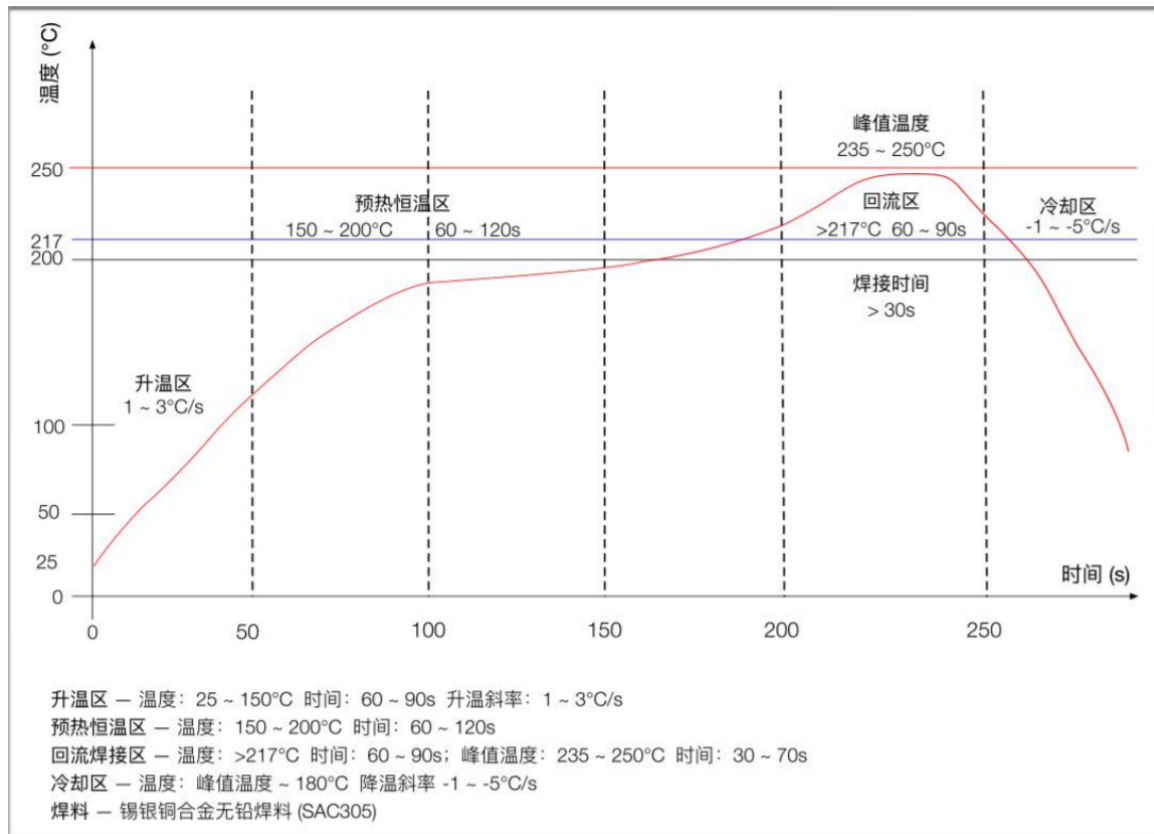
(3) Recommend 3.3V voltage, LDO power supply is recommended; if using DC-DC, ripple control is recommended within 30mV. The DC-DC power supply circuit suggests reserving the position of the dynamic response capacitance to optimize the output ripple when the load varies greatly.

6.3、 UART Communication

UART communication between module and master MCU through serial port supports full duplex transmission and reception of TX and RX.



7、Reflow Profile



8、Packaging

As shown below, the package is woven and sealed with an electrostatic bag.



List of applicable FCC rules

This device complies with part 15.247 of the FCC Rules.

Limited module procedures

Not applicable

Summarize the specific operational use conditions

This module can be applied in remote control toys, sports and fitness sensors , health sensors, mobile accessories as well as smart home. The input voltage to the module should be nominally 1.8-4.3 V DC , typical value 3.3V DC and the ambient temperature of the module should not exceed 85 °C.

Trace antenna designs

Not applicable

RF exposure considerations

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment .This equipment should be installed and operated with minimum distance 5mm between the radiator& your body. If the device built into a host as a portable usage, the additional RF exposure evaluation may be required as specified by 2.1093.

Antennas

This module using PCB antennas with maximum gain is 1.5 dB .

Label and compliance information

The outside of final products that contains this module device must display a label referring to the enclosed module. This exterior label can use wording such as:"Contains Transmitter Module FCC ID: xxxx-TPL3132 " , Any similar wording that expresses the same meaning may be used.

Information on test modes and additional testing requirements

a) The modular transmitter has been fully tested by the module grantee on the required number of channels, modulation types, and modes, it should not be necessary for the host installer to re-test all the available transmitter modes or settings. It is recommended that the host product manufacturer, installing the modular transmitter, perform some investigative measurements to confirm that the resulting composite system does not exceed the spurious emissions limits or band edge limits (e.g., where a different antenna may be causing additional emissions).

b) The testing should check for emissions that may occur due to the intermixing of emissions with the other transmitters, digital circuitry, or due to physical properties of the host product (enclosure). This

investigation is especially important when integrating multiple modular transmitters where the certification is based on testing each of them in a stand-alone configuration. It is important to note that host product manufacturers should not assume that because the modular transmitter is certified that they do not have any responsibility for final product compliance.

c) If the investigation indicates a compliance concern the host product manufacturer is obligated to mitigate the issue. Host products using a modular transmitter are subject to all the applicable individual technical rules as well as to the general conditions of operation in Sections 15.5, 15.15, and 15.29 to not cause interference. The operator of the host product will be obligated to stop operating the device until the interference has been corrected

The TPL3132 module is based on RF8016HA chip .support standard Bluetooth 5.0 commands. For the testing module on your product, user can refer to specification of the Bluetooth system on how to configure and evaluate the module. This specification can also be found on the official Bluetooth website:

<https://www.bluetooth.org/en-us/specification/adopted-specifications>.

Additional testing, Part 15 subpart B disclaimer

The final host / module combination need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device .

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

Frequency spectrum to be investigated

For host products with certified modular transmitter, the frequency range of investigation of the composite system is specified by rule in Sections 15.33(a)(1) through (a)(3), or the range applicable to the digital device, as shown in Section 15.33(b)(1), whichever is the higher frequency range of investigation.

Operating the host product

When testing the host product, all the transmitters must be operating. The transmitters can be enabled by using publicly-available drivers and turned on, so the transmitters are active. In certain conditions it might be appropriate to use a technology-specific call box (test set) where accessory devices or drivers are not available.

When testing for emissions from the unintentional radiator, the transmitter shall be placed in the receive mode or idle mode, if possible. If receive mode only is not possible then, the radio shall be passive (preferred) and/or active scanning. In these cases, this would need to enable activity on the communication BUS (i.e., PCIe, SDIO, USB) to ensure the unintentional radiator circuitry is enabled. Testing laboratories may need to add attenuation or filters depending on the signal strength of any active beacons (if applicable) from the enabled radio(s). See ANSI C63.4, ANSI C63.10 and ANSI C63.26 for further general testing details.

The product under test is placed into a normal ‘paired’ mode with another BLE device, as per the normal intended use of the product (for example, transferring data).

FCC Statement

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the

equipment. 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.

ISED RSS Warning/ISED RF Exposure Statement

ISED RSS Warning: This device complies with Innovation, Science and Economic Development Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'ISED applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement. ISED RF exposure statement:

This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 5mm between the radiator & your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Le rayonnement de la classe B respecte ISED fixaient un environnement non contrôlés. Installation et mise en œuvre de ce matériel devrait avec échangeur distance minimale entre 5 mm et son corps. Lanceurs ou ne

peuvent pas coexister cette antenne ou capteurs avec d'autres.

FCC Statement

FCC standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

PCB antenna , Antenna gain 1.5 dBi

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.

Any 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.

FCC Radiation Exposure Statement

This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: “Contains Transmitter Module FCC ID: 2AZYO-TPL3132 Or Contains FCC ID: 2AZYO-TPL3132 ”

When the module is installed inside another device, the user manual of the host must contain below warning statements;

1. 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.

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.

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

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

Any company of the host device which install this modular with modular approval should perform the test of radiated & conducted emission and spurious emission, etc. according to FCC part 15C : 15.247 and 15.209 & 15.207 ,15B Class B requirement, Only if the test result comply with FCC part 15C : 15.247 and 15.209 & 15.207 ,15B Class B requirement, then the host can be sold legally.