Ai-BS21-32S Specification

Version V1.0.0

Copyright ©2024

Copyright □ 2024 Shenzhen Ai-Thinker Technology Co., Ltd All Rights Reserved

Document resume

Version	Date	Develop/revise content	Edition	Approve
V1.0.0	2024.02.22	First Edition	Nannan Yuan	NingGuan

Copyright © 2024 Shenzhen Ai-Thinker Technology Co., Ltd All Rights Reserved

Content

Copyright © 2024 Shenzhen Ai-Thinker Technology Co., Ltd All Rights Reserved

Copyright © 2024 Shenzhen Ai-Thinker Technology Co., Ltd All Rights Reserved

1. Product Overview

Ai-BS21-32S is a Bluetooth star flash module developed by Shenzhen Ai-Thinker Technology Co., Ltd. The core processor chip Hi2821 of this module is a highly integrated 2.4GHz SoC BLE & SLE chip, which supports BLE5.4/SLE1.0 and integrated RF circuits. RF includes power amplifier PA, low noise amplifier, TX/RX Switch, integrated power management and other modules, supports 3 Bandwidths of 1M/2M/4M, and supports a maximum speed of 12Mbit/s.

Hi2821 chip integrates high-performance 32-bit microprocessor (MCU), hardware security engine and rich peripheral interfaces. Peripheral interfaces include SPI, UART, I2S, PMW, GPIO, USB2.0, NFC Tag, PDM, I2S/PCM, QDEC, KEYSCAN keyboard scanning circuits, and supports 8 channels of 13-bit resolution ADC. ADC supports docking audio equipments, built-in SRAM and sealed Flash, and supports running.

Hi2821 supports LiteOS and provides an open and easy-to-use development and debugging environment.

Hi2821 is suitable for PC accessories, IoT and other IoT smart terminal fields.

1.1. Characteristic

- Dual-mode coexistence of BLE and SLE is supported
- BLE5.4
- Supports LE 1M,LE 2M, and Long Range
- RISC-V high-performance 32-bit CPU with a maximum clock frequency of 64MHz, floating point and SWD
- Supports SRAM 160kB and built-in 512KB Flash
- Supported Encryption methods: AES(Advanced Encryption Standard), SM4, and TRNG(True Random Number Generator)
- Supported peripheral interfaces include: SPI, UART, I2C, PMW, GPIO, USB2.0, NFC Tag, PDM, I2S/PCM, QDEC, KEYSCAN, etc
- Supports the BLE whitelist and can be resolved
- HID man-machine interface
- Supports the BLE service gap sweep function

Copyright © 2024 Shenzhen Ai-Thinker Technology Co., Ltd All Rights Reserved

- Support for BLEAFH frequency modulation
- Supports SLE1.0 protocol, wireless frame type 1(GFSK frame) and wireless frame type 2 (low latency frame),G frame and T frame, broadcast, discovery and access function, Unicast function, multicast function, high precision ranging
- Supports B/SLE and WLAN,3/4 lines of off-chip coexistence (high real-time)
- Supports B/SLE and WLAN, and coexists through UART (low real-time)

2. Main parameters

Table 1 Description of main parameters

Model	Ai-BS21-32S
Package	SMD-38
Size	25.5*18*3.1 (± 0. 2) mm
Antenna	On-board antenna/IPEX
Frequency	2400~2483.5MHz
Operating temperature	-40℃ ~ 85℃
Storage temperature	-40 ℃ ~ 125 ℃, <90% RH
Power supply	Power supply voltage 1.8V ~ 3.6V, power supply current> 500mA
Interface	SPI/UART/I2C/PMW/GPIO/USB2.0/NFCTag/PDM/I2S/PCM/ QDEC/KEYSCAN
IO	29
UART rate	Default 115200 bps
Bluetooth	BLE 5.4
Security	AES(Advanced Encryption Standard), SM4 and TRNG(True Random Number Generator).
SPI Flash	Built-in 512KB Flash

Copyright © 2024 Shenzhen Ai-Thinker Technology Co., Ltd All Rights Reserved

2.1. Electrostatic requirements

Ai-BS21-32S are electrostatic sensitive equipment, special preventive measures should be taken during handling.

Figure 2 ESD anti-static diagram

2.2. Electrical characteristics

Table 2 Electrical Characteristics Table

Parameter		Condition	Min.	Typical value	Max.	Unit
Supply voltage		VDD	1.8	3.3	3.6	V
I/O	V_{IL}/V_{IH}	-	-0.3/0.75VD	-	0.25VDD/VDD	V
	V_{OL}/V_{OH}	-	N/0.8VIO	-	0.1VIO/N	V
	I_{MAX}	-	-	-	12	mA

2.3. Bluetooth RF performance

Table 3 Bluetooth RF performance table

Description	Typical value			Unit
Operating frequency	2400~2483.5			MHz
Output power				
Mode	**Min.**	**Typical value**	**Max.**	**Unit**
BLE 2Mbps	-	6	-	dBm
BLE 1Mbps	-	6	-	dBm
Long Range	-	6	-	dBm
Receiving sensitivity				
Mode	**Min.**	**Typical value**	**Max.**	**Unit**
BLE 2Mbps	-	-94	-	dBm
BLE 1Mbps	-	-97	-	dBm
BLE 125Kbps	-	-103	-	dBm

Copyright © 2024 Shenzhen Ai-Thinker Technology Co., Ltd All Rights Reserved

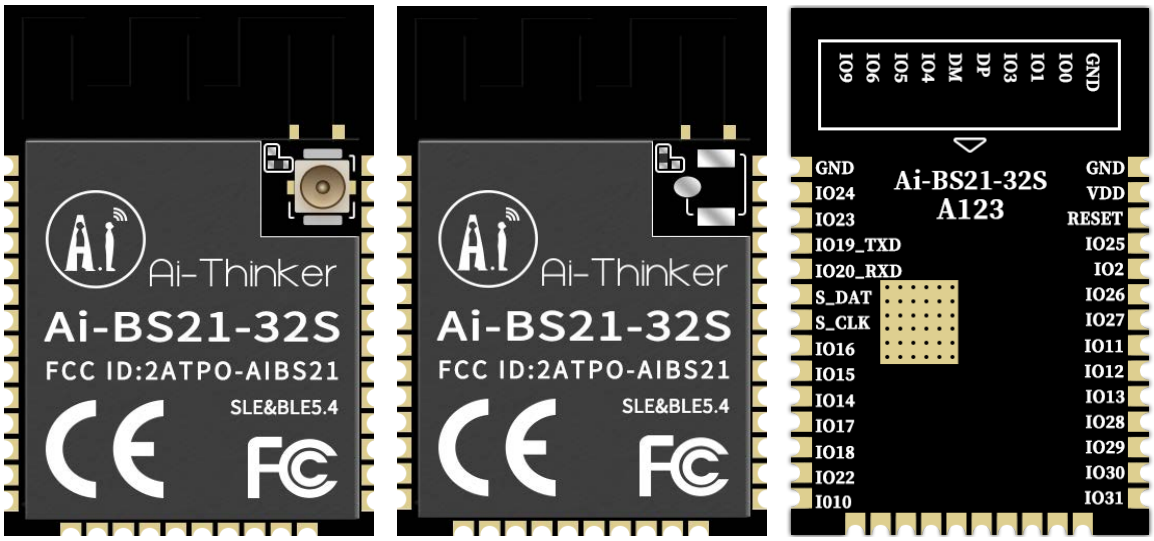
2.4. RF performance of SLE

Table 4 SLE RF performance table

Description	Typical value			Unit
Operating frequency	2400~2483.5			MHz
Output power				
Mode	**Min.**	**Typical value**	**Max.**	**Unit**
SLE Tx Power (wireless frame type 1) normal	-	6	-	dBm
SLE Tx Power (wireless frame type 2) normal	-	2	-	dBm
SLE Tx Power (wireless frame type 1) high power	-	8	-	dBm
SLE Tx Power (wireless frame type 2) high power	-	4	-	dBm
Receiving sensitivity				
Mode	**Min.**	**Typical value**	**Max.**	**Unit**
SLE 2MGFSK rate1	-	-93	-	dBm
SLE 2MQPSK rate3/4	-	-95	-	dBm
SLE 2M8PSK rate3/4	-	-90	-	dBm
SLE 4MGFSK rate1	-	-90	-	dBm
SLE 4MQPSK rate3/4	-	-92	-	dBm

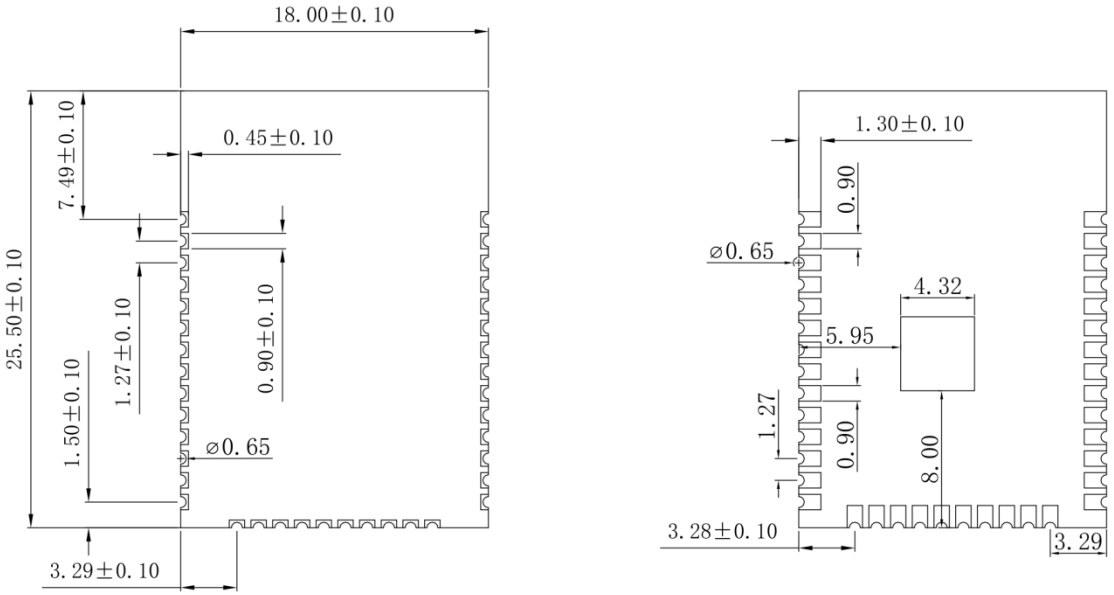
3. Appearance size

Copyright © 2024 Shenzhen Ai-Thinker Technology Co., Ltd All Rights Reserved



Front Front Back

Figure 3 External view of the module (for reference only, subject to the actual object)



Front Back

Figure 4 Module size diagram

Copyright © 2024 Shenzhen Ai-Thinker Technology Co., Ltd All Rights Reserved

4. Pin definition

Ai-BS21-32S module connects 38 pins, for example, the pin function definition table is the interface definition.

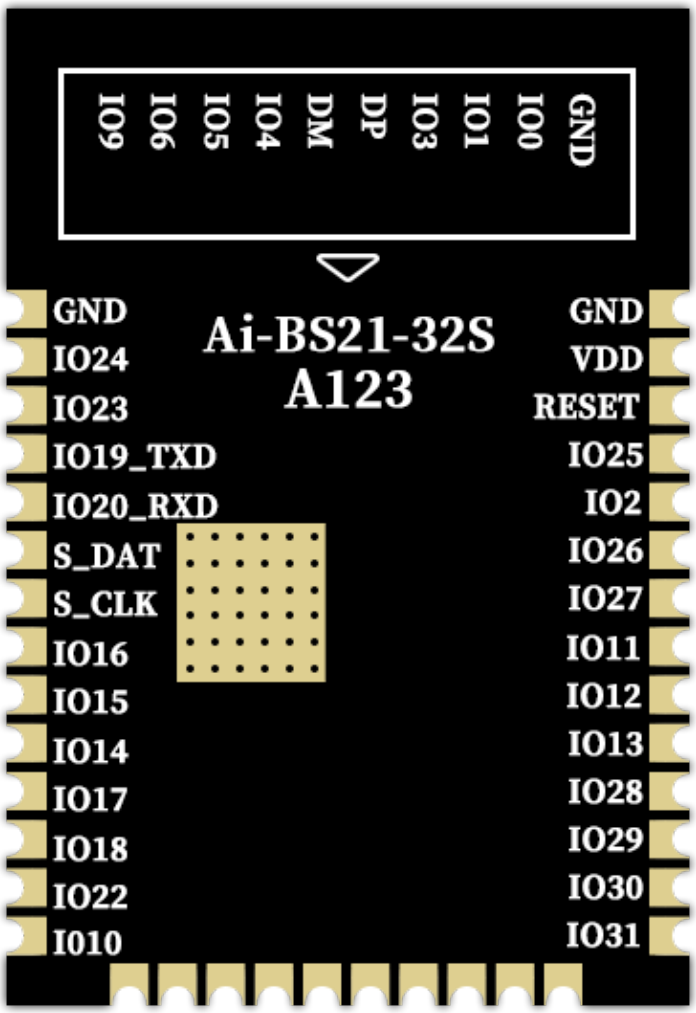


Figure 5 Schematic diagram of module pin (bottom view)

Table 5 Definition table of pin functions

No.	Name	Description
1,15,38	GND	Negative pole of grounding power supply
2	VDD	Power supply, positive pole of power supply
3	RESET	RESET/GPIO21/UART_H0_CTS/EXTLNA_RX_EN
4	IO25	GPIO25/O32M/I2C0_CLK/RESERVED
5	IO2	GPIO2/AIN0/SPI0_TXD/DMIC_CLK/RESERVED
6	IO26	GPIO26/I2C0_DATA/BT_WIFI_SW
7	IO27	GPIO27/I2C1_CLK/BT_WIFI_SW

Copyright © 2024 Shenzhen Ai-Thinker Technology Co., Ltd All Rights Reserved

8	IO11	GPIO11/high speed SPI_TXD/SPI2_TXD/PWM4
9	IO12	GPIO12/high speed SPI_RXD/SPI2_CS0/PWM5
10	IO13	GPIO13/high speed SPI_CS/SPI2_CS1/PWM6
11	IO28	GPIO28/AIN4/I2C1_DATA/RESERVED
12	IO29	GPIO29/AIN5/QDEC_A/BT_STATUS
13	IO30	GPIO30/AIN6/QDEC_ B /RESERVED
14	IO31	GPIO31/AIN7/LED_OUT/RESERVED
16	IO0	GPIO0/XL1/SPI0_RXD/DMIC_DIN/EXTLNA_CTRL
17	IO1	GPIO1/XL2/SPI0_TXD/DMIC_CLK/RESERVED
18	IO3	GPIO3/AIN1/SPI0_CS0/I2S_SCLK/RESERVED
19	DP	USB_DP
20	DM	USB_DM
21	IO4	GPIO4/AIN2/SPI0_CS1/I2S_DOUT/BT_FEM_TX_EN
22	IO5	GPIO5/AIN3/SPI1_RXD/I2S_DIN/RESERVED
23	IO6	GPIO6/SPI1_TXD/I2S_MCLK
24	IO9	GPIO9/NFC1/SPI1_CLK/PWM2
25	IO10	GPIO10/NFC2/SPI2_RXD/PWM3
26	IO22	GPIO22/UART_H0_RX_D/BT_FREQ
27	IO18	GPIO18/UART_L1_TXD/PWM11
28	IO17	GPIO17/UART_L1_RTS/PWM10
29	IO14	GPIO14/high speed SPI_CLK/SPI2_CLK/PWM7
30	IO15	GPIO15/UART_L0_RXD/PWM8
31	IO16	GPIO16/UART_L0_TXD/PWM9
32	S_CLK	SWD_CLK
33	S_DAT	SWD_DAT
34	RXD	GPIO20/UART_L1_RXD/PLUSE_CAPTURE
35	TXD	GPIO19/UART_L1_CTS/KEY_SCAN_BIR[0:31]
36	IO23	GPIO23/UART_H0_RXD/BT_FREQ
37	IO24	GPIO24/UART_H0_TXD/WLAN_ACTIVE

Copyright © 2024 Shenzhen Ai-Thinker Technology Co., Ltd All Rights Reserved

5. Antenna parameters

5.1. Antenna Test conditions

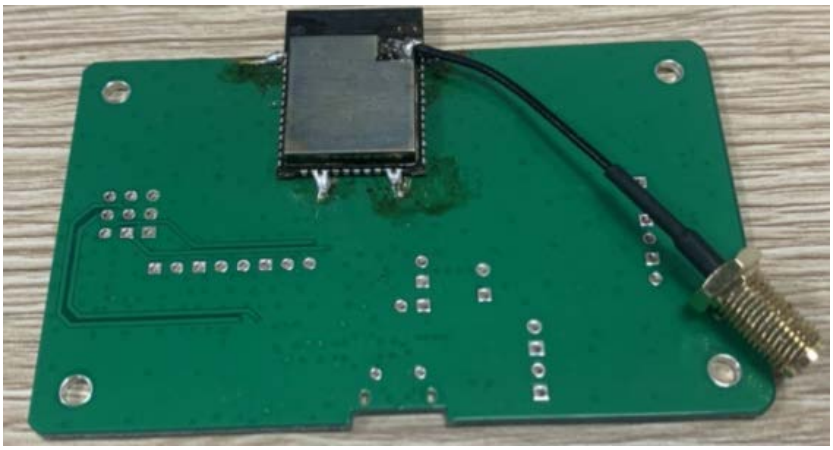


Figure 7 Antenna test conditions

Copyright © 2024 Shenzhen Ai-Thinker Technology Co., Ltd All Rights Reserved

5.2. Antenna S parameters

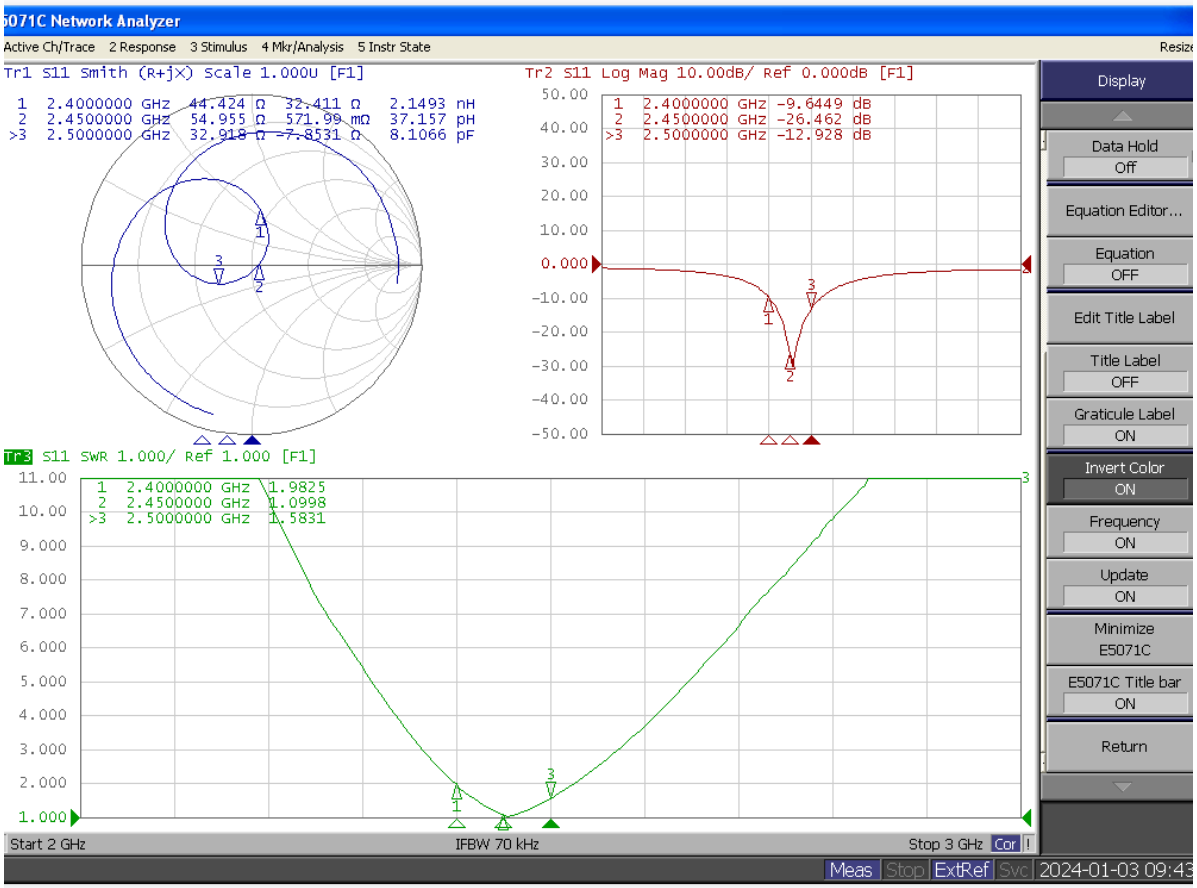


Figure 8 Antenna S parameters

5.3. Antenna gain and efficiency

Table 6 Antenna gain and efficiency

Frequency ID	1	2	3	4	5	6	7	8	9	10	11
Frequency (MHz)	2400.0	2410.0	2420.0	2430.0	2440.0	2450.0	2460.0	2470.0	2480.0	2490.0	2500.0
Gain (dBi)	0.64	0.60	0.71	0.85	1.04	1.15	1.21	1.29	1.38	1.22	1.10
Efficiency (%)	52.96	54.45	56.50	58.94	60.49	61.96	62.80	62.55	61.61	58.48	57.67

5.4. Antenna Field pattern diagram

Copyright © 2024 Shenzhen Ai-Thinker Technology Co., Ltd All Rights Reserved

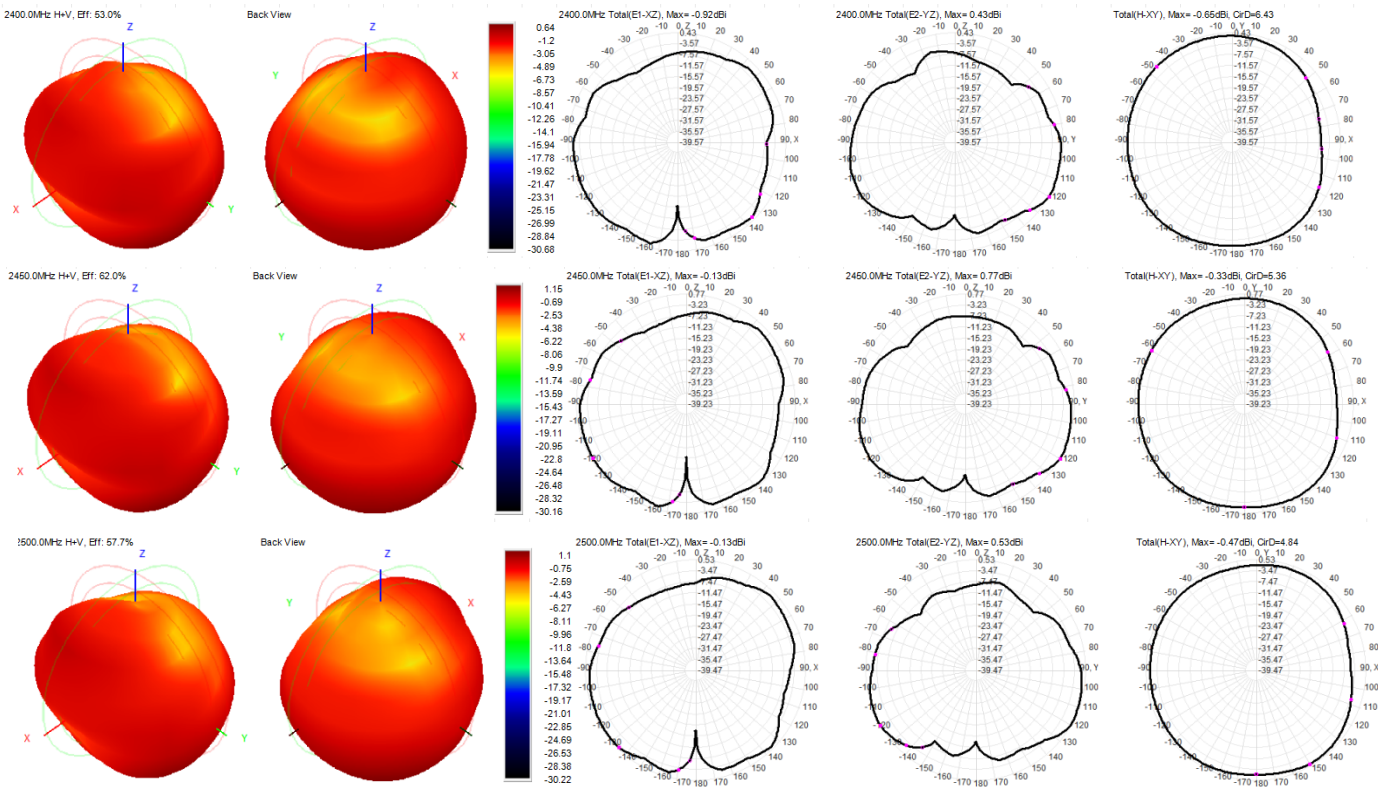


Figure 9 Antenna field type diagram

6. Design Guide

6.1. Module application guide circuit

(>= 200mA, it is recommended to use DC-DC or LDO for independent power supply)

- The Ai-BS21-32S can be reset through the RESET pin, and can also be reset by power-off. A PMOS can be used at the power input to realize the power-off action to reset the module.
- On the TX & RX serial line, two resistances are reserved and connected in series. It is used to prevent the 3.3V voltage of the serial port from affecting the reset of the module.

Copyright © 2024 Shenzhen Ai-Thinker Technology Co., Ltd All Rights Reserved

6.2. Recommend PCB package size

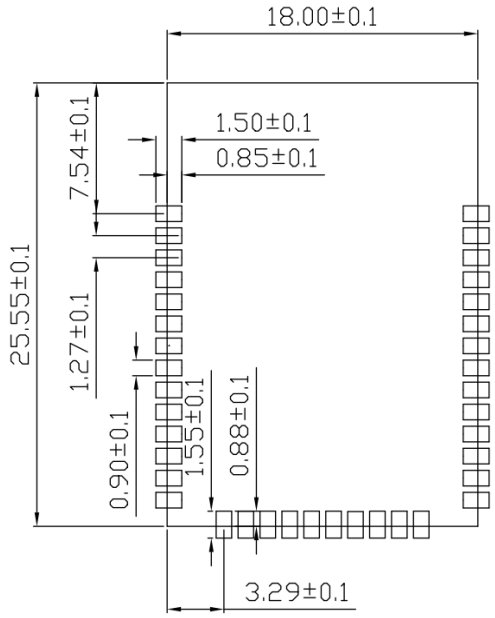


Figure 11 Recommend PCB package size

6.3. Antenna layout requirements

- The installation position on the motherboard is recommended in the following two ways:

Solution 1: place the module on the edge of the motherboard and extend the antenna area to the edge of the motherboard.

Solution 2: Place the module on the edge of the main board, and the edge of the main board will empty an area at the antenna position.

- In order to meet the performance of the on-board antenna, it is forbidden to place metal parts around the antenna and keep away from high-frequency devices.

6.4. Power supply

- Recommend a voltage of 3.3V with a peak current of over 500mA.
- We recommend that you use LDO for power supply. If you use DC-DC, we recommend that you control the ripple within 30mV.
- DC-DC power supply circuit is recommended to reserve the position of dynamic response capacitor, which can optimize the output ripple when the load changes greatly.
- We recommend that you add ESD devices to the 3.3V power interface.

Copyright © 2024 Shenzhen Ai-Thinker Technology Co., Ltd All Rights Reserved

6.5. GPIO

- Some IO ports are introduced outside the module. If you need to use them, we recommend that you connect 10-100 ohms of resistance to the IO ports in series. In this way, overshoot can be suppressed and the levels on both sides can be more stable. It is helpful for both EMI and ESD.
- For the pull-down of special I/O ports, please refer to the instructions in the specification, which will affect the startup configuration of the module.
- The I/O port of the module is 3.3V. If the main control does not match the I/O port level of the module, a level conversion circuit needs to be added.
- If the IO port is directly connected to the peripheral interface, or the terminal such as the pin, it is recommended to reserve ESD devices near the terminal of the IO port.

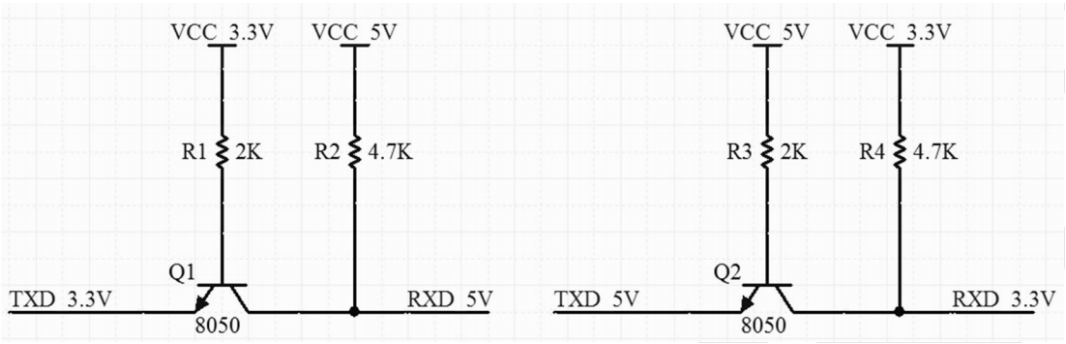


Figure 14 Level conversion circuit

7. Storage Conditions

Products sealed in moisture-proof bags shall be stored in a non-condensing atmospheric environment of <40℃/90% RH.

The humidity sensitivity level MSL of the module is Level 3.

After the vacuum bag is unpacked, it must be used up within 168 hours at 25±5℃/60% RH, otherwise it can be put on line again after baking.

Copyright © 2024 Shenzhen Ai-Thinker Technology Co., Ltd All Rights Reserved

8. Reflow soldering curve

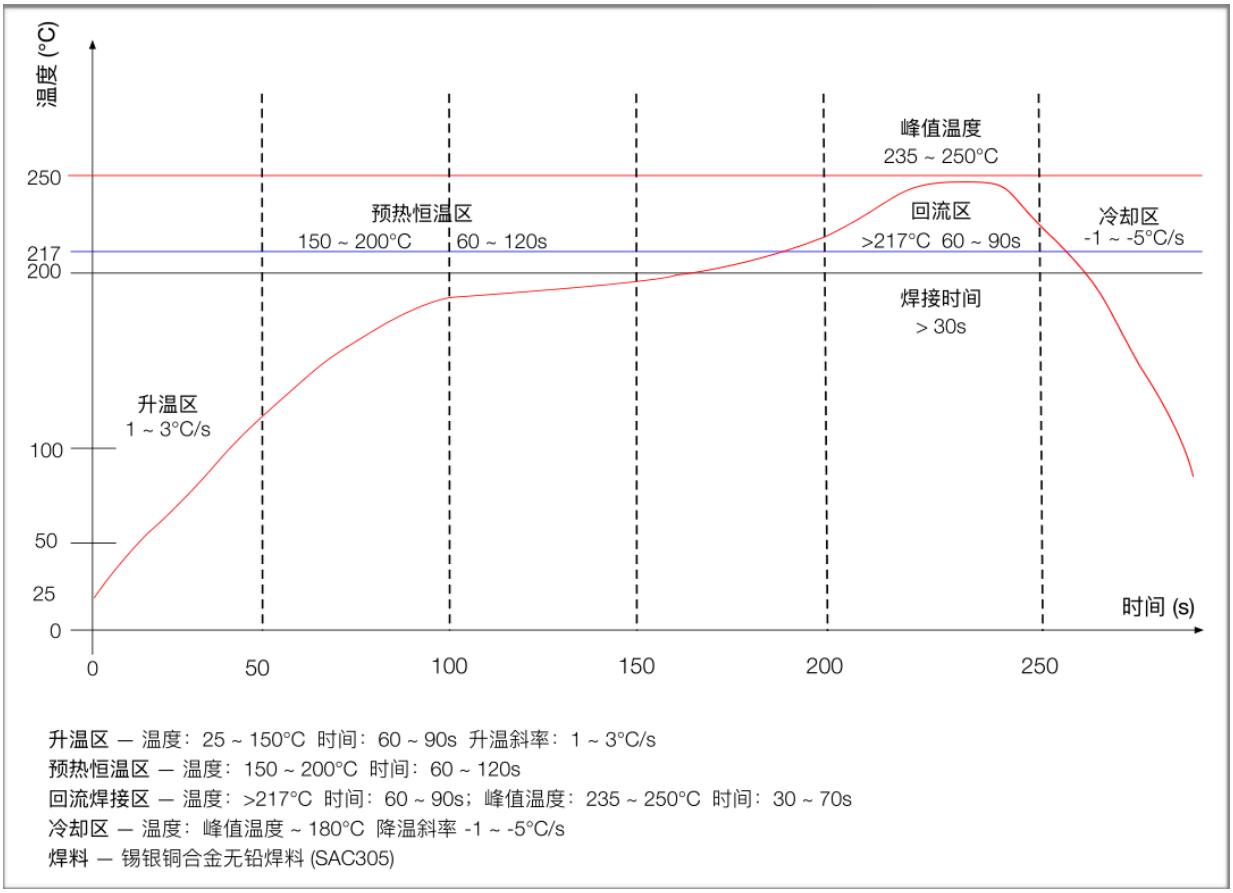


Figure 15 Reflow soldering curve

Copyright © 2024 Shenzhen Ai-Thinker Technology Co., Ltd All Rights Reserved

9. Product packaging information

Ai-BS21-32S module adopts braided packaging, 800pcs/disk. As shown in the following figure:

Figure 16 Packing ribbon diagram

10. Contact us

Ai-Thinker official website　Office forum　Develop DOCS

LinkedIn　Tmall shop　Taobao shop　Alibaba shop

Technical support email：support@aithinker.com

Domestic business cooperation：sales@aithinker.com

Overseas business cooperation：overseas@aithinker.com

Company Address：Room 403-405,408-410, Block C, Huafeng Smart Innovation Port, Gushu 2nd Road, Xixiang, Baoan District, Shenzhen.

Tel：+86-0755-29162996

WeChat mini program

WeChat official account

Copyright © 2024 Shenzhen Ai-Thinker Technology Co., Ltd All Rights Reserved

Disclaimer and copyright notice

The information in this article,including the URL address for reference,is subject to change without notice.

The document is provided"as is"without any guarantee responsibility,including any guarantee for merchantability,suitability for a specific purpose,or non-infringement,and any guarantee mentioned elsewhere in any proposal,specification or sample.This document does not bear any responsibility,including the responsibility for infringement of any patent rights arising from the use of the information in this document.This document does not grant any license for the use of intellectual property rights in estoppel or other ways,whether express or implied.

The test data obtained in the article are all obtained from Ai-Thinker's laboratory tests,and the actual results may vary slightly.

All brand names,trademarks and registered trademarks mentioned in this article are the property of their respective owners,and it is hereby declared.

The final interpretation right belongs to Shenzhen Ai-Thinker Technology Co.,Ltd.

Notice

Due to product version upgrades or other reasons,the contents of this manual may be changed.

Shenzhen Ai-Thinker Technology Co.,Ltd.reserves the right to modify the contents of this manual without any notice or prompt.

This manual is only used as a guide.Shenzhen Ai-Thinker Technology Co.,Ltd. makes every effort to provide accurate information in this manual.However, Shenzhen Ai-Thinker Technology Co.,Ltd. does not guarantee that the contents of the manual are completely free of errors.All statements and information in this manual And the suggestion does not constitute any express or implied guarantee.

Copyright © 2024 Shenzhen Ai-Thinker Technology Co., Ltd All Rights Reserved

Statement

Ai-Thinker may provide technical and reliability data (including data sheets), design resources (including reference designs), application or other design recommendations, network tools, safety information and other resources (the "Resources") "as is" without warranties of any kind, express or implied. Including, but not limited to, express or implied warranties of suitability, fitness for a particular use, or non-infringement of any third party's intellectual property rights.And specifically declares that it is not liable for any necessary or incidental losses, including but not limited to, arising from the application or the use of any of our products and circuits.

Ai-Thinker reserves the right to release information in this document (including but not limited to metrics and product descriptions) and any changes to our products without prior notice. This document automatically supersedes and replaces all information provided in previous versions of the same document number file.

These resources are available to skilled developers who design with Ai-Thinker products. You are solely responsible for: (1) Selecting the appropriate Ai-Thinker products for your application; (2) Design, validate, and run your application and product throughout its life cycle; (3) Ensure that your application meets all applicable standards, codes and laws, as well as any other functional security, information security, regulatory or other requirements.

Ai-Thinker may authorize you to use these resources only for the development of applications of Essence Products described in this Resource. Without the permission of Ai-Thinker, any unit or individual shall not extract or copy part or all of these resources, and shall not be transmitted in any form. You are not entitled to use any other Ai-Thinker intellectual property rights or any third party intellectual property rights. You shall indemnify you in full for any claims, damages, costs, losses and liabilities arising against Ai-Thinkeror its representatives in connection with the use of these resources, for which Ai-Thinker is not liable.

The products offered by Ai-Thinker are subject to the terms of sale of Ai-Thinker or other applicable terms attached to Essence's products. Essence's availability of these resources does not extend or otherwise change the warranties or warranties disclaimers applicable to product releases.

Copyright © 2024 Shenzhen Ai-Thinker Technology Co., Ltd All Rights Reserved

FCC WARNING

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this 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.

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

15.105 Information to the user.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

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.

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

Radiation Exposure Statement:

This equipment complies with FCC 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.
The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the intended destination.
The firmware setting is not accessible by the end user.
The final end product must be labelled in a visible area with the following:
“Contains Transmitter Module “FCC ID:2ATPO-AIBS21”

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 alsoSection 2.10 below concerning the need to notify host manufacturers that further testing is required.3

Explanation: This module meets the requirements of FCC part 15C (15.247).it Specifically identified AC Power Line Conducted Emission, Radiated Spurious emissions, Band edge and RF Conducted Spurious Emissions, Conducted Peak Output Power, Bandwidth, Power Spectral Density, Antenna Requirement.

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 product antenna uses an irreplaceable antenna with a gain of 2.61dBi

2.4 Single Modular

If a modular transmitter is approved as a "Single Modular ," then the module manufacturer isresponsible for approving the host environment that the Single Modular is used with. The manufacturer of a Single Modular must describe, both in the filing and in the installation instructions, the alternative means that the Single Modular manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions.

A Single Modular 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 Single Modular 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 a single 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 wavelength, 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; and 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

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 – xx 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 of the module through a change in FCC ID (new application).

Explanation: The module complies with FCC radiofrequency radiation exposure limits for uncontrolled environments. The device is installed and operated with a distance of more than 20 cm between the radiator and your body." This module follows FCC statement design, FCC ID :2ATPO-AIBS21

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 “omni-directional 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 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 product antenna uses an irreplaceable antenna with a gain of 2.61dBi

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: 2ATPO-AIBS21

2.9 Information on test modes and additional testing requirements5

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: Shenzhen Ai-Thinker Technology Co., Ltd can increase the utility of our modular transmitters by providing instructions that simulates or characterizes a connection by enabling a transmitter.

2.10 Additional testing, Part 15 Subpart B disclaimer

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product

as being Part 15
Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

Explanation: The module without unintentional-radiator digital circuity, so the module does not require an evaluation by FCC Part 15 Subpart B. The host shoule be evaluated by the FCC Subpart B.