Ai-BS21-32S-Kit Specification

Version V1.0.0

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Document resume

Version	Date	Develop/Revise content	Formulate	Approve
V1.0.0	2024. 03. 21	First edition	Zekai Qian	Hong Xu

Content

1. Product Overview

Ai-BS21-32S -Kit is a development board designed by Shenzhen Ai-Thinker Technology Co., Ltd. for the Bluetooth SparkLink module Ai-BS21-32S . Ai-BS21-32S core processor chip Hi2821is a highly integrated 2.4GHz SoC BLE&SLE chip that supports BLE5.4/SLE1.0 and integrates RF circuits. RF includes power amplifier PA , low noise amplifier , TX/RX Switch , integrated power management and other modules support 3 bandwidths of 1M/2M/4M, with a maximum rate of 12Mbit/s .

The Hi2821chip integrates a high-performance 32bit microprocessor (MCU), hardware security engine and rich peripheral interfaces. The peripheral interfaces include SPI , UART , I2C , PMW , GPIO , USB2.0 , NFC Tag , PDM , I2S /PCM , QDEC , KEYSCAN keyboard scanning circuit, supports 8-channel 13bit resolution ADC, ADC supports docking audio AMIC, built-in SRAM and sealed Flash, and supports running programs on Flash .

Hi2821supports LiteOS and provides an open and easy-to-use development and debugging operating environment .

Hi2821is suitable for PC accessories, IoT and other Internet of Things intelligent terminal fields .

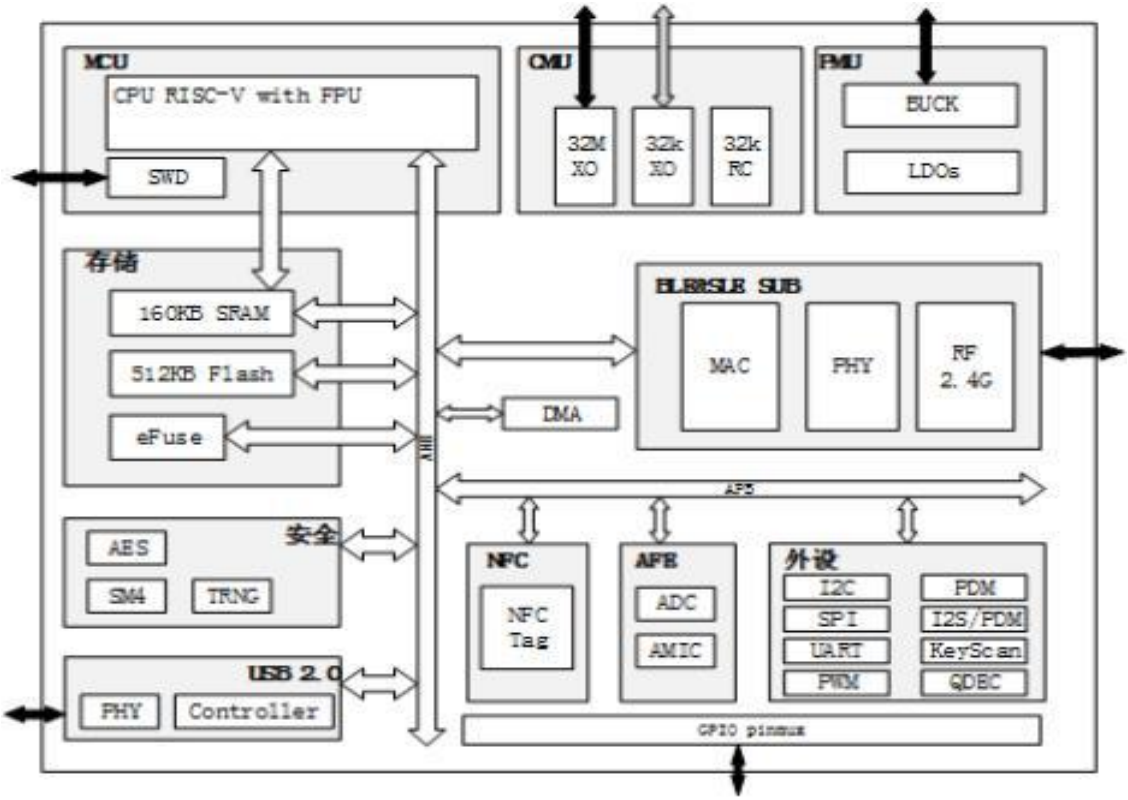


Figure 1 Main chip architecture diagram

1.1. Characteristic

- Supports BLE and SLE dual-mode coexistence
- Support BLE 5.4
- Support LE 1M, LE 2M, Long Range
- RISC-V high-performance 32bit CPU, maximum frequency supports 64MHz, supports floating point, supports SWD
- Support SRAM 160KB , 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 BLE whitelist and can be parsed
- Support HID human-machine interface device
- Support BLE service gap frequency sweep function
- Support BLEAFH FM
- Support 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 functions , unicast function , multicast function , high accuracy Ranging
- Support B/SLE and WLAN , 3/4 line off-chip coexistence (high real-time performance)
- Support B/SLE and WLAN , coexist through UART (low real-time performance)
- Get started quickly with AT commands

2. Main parameters

Table 1 Description of main parameters

Development board model	Ai-BS21-32S-Kit
Development board packaging	DIP-42
Size	69.24*25.40(±0.2)mm
Antenna	Onboard antenna
Frequency	2400 ~ 2483.5 MHz
Operating temperature	- 40 ℃ ~ 8 5 ℃
Storage environment	- 40 ℃ ~ 125 ℃ , < 90%RH
Power supply range	Supply voltage 3.3 V or 5 V, supply current > 500mA
Support interface	SPI/UART/I2C/PMW/GPIO/USB2.0/NFCTag/PDM/I2S/PCM/QDEC/KEYSCAN
IO	29
UART rate	Default 115200 bps
Bluetooth/SLE flash	BLE 5.4/SLE1.0
Safety	AES(Advanced Encryption Standard), SM4 and TRNG (True Random Number Generator)
SPI Flash	Built-in 512KB Flash

2.1. Power supply selection

Ai-BS21-32S-Kit supports three power supply methods:

- Type-C (USB1 and USB2) interface power supply
- 5V and GND pin header power supply
- 3V3 and GND pin header power supply

2.2. Static electricity requirements

Ai-BS21-32S-Kit is an electrostatically sensitive device and requires special precautions when handling .

Figure 2 ESD anti-static diagram

2.3. Electrical characteristics

Table 2 Electrical Characteristics Table

Parameters		Condition	Min.	Typical value	Max.	Unit
Interface power supply (Type-C)		VDD	4.5	5	5.3	V
Supply voltage (pin header)		VDD	2.97	3.3	3.6	V
I/O	VIL	-	-	-	0.3*VDDIO	V
	VIH	-	0.7*VDDI	-	-	V
	VOL	-	-	0.1*VDDIO	-	V
	VOH	-	-	0.9*VDDIO	-	V
	IMAX	-	-	-	15	mA

2.4. Bluetooth RF performance

Table 3 Bluetooth RF performance table

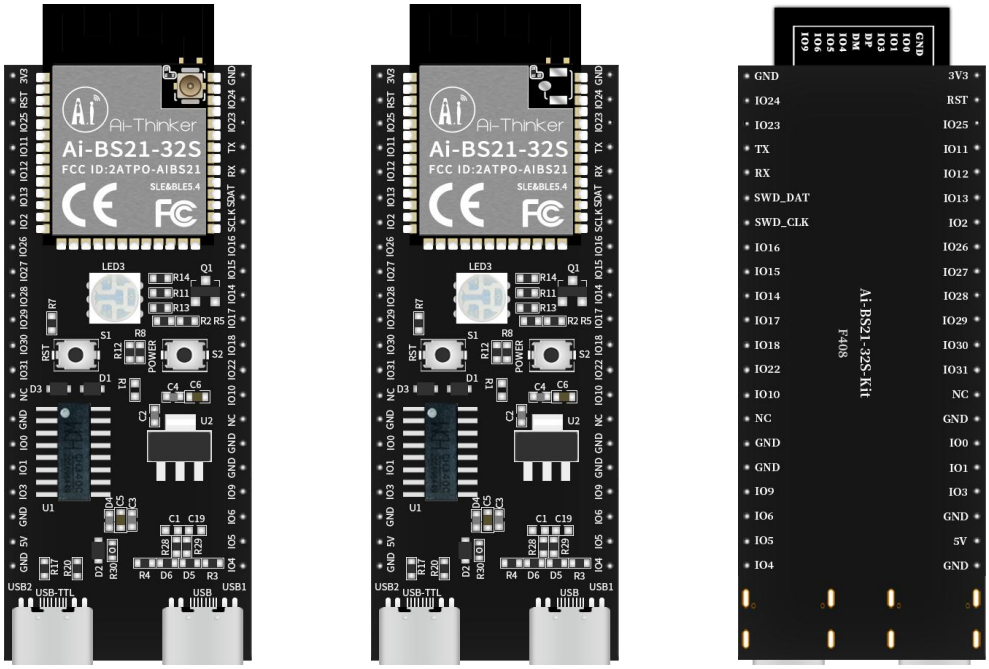
Description	Typical value			Unit
Working frequency	2400 ~ 248 3.5			MHz
Output Power				
Mode	**Min.**	**Typical value**	**Max.**	**unit**
BLE 2Mbps	-	6	-	dBm
BLE 1Mbps	-	6	-	dBm
Long Range	-	6	-	dBm
Receive sensitivity				
Mode	**Min.**	**Typical value**	**Max.**	**unit**
BLE 2Mbps	-	-94	-	dBm
BLE 1Mbps	-	-97	-	dBm
BLE 125Kbps	-	-103	-	dBm

2.5. SLE RF performance

Table 4 SLE RF performance table

Description	Typical value			Unit
Frequency range	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
Receive 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 Dimension



Front Front Back

Figure 3 Module appearance (rendering is for reference only, the actual object shall prevail)

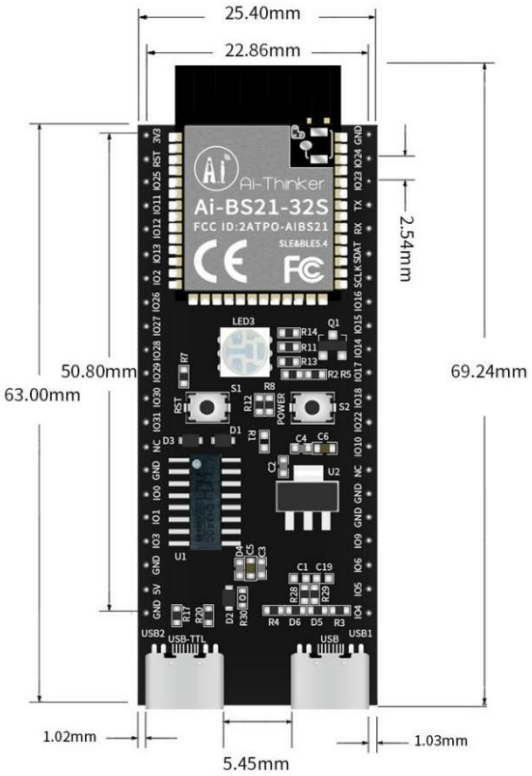


Figure 4 Dimension diagram

4. Indicator Lights and Button Descriptions

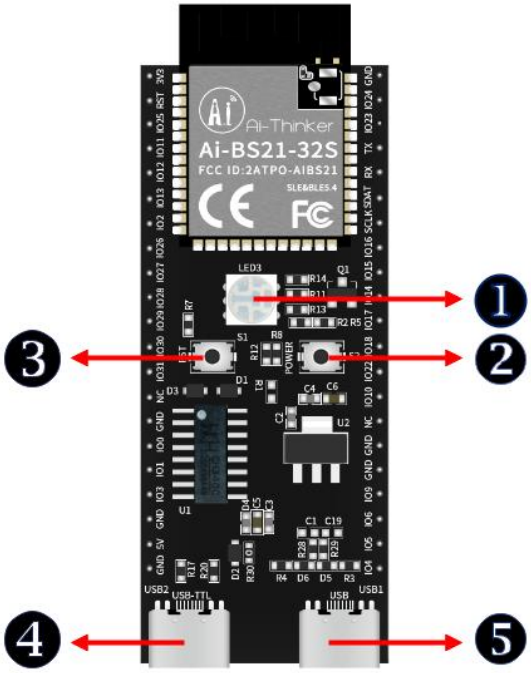


Figure 5 Ai-BS21-32S-Kit indicator light and button location

Table 5 Ai-BS21-32S-Kit indicator lights and button locations

①	RGB light (IO11 red light, IO12 green light, IO13 blue light)
②	Power button
③	RST button (reset)
④	Type-C port (USB2 to CH340)
⑤	Type-C port (USB1)

5. Pin definition

The Ai-BS21-32S - Kit module has a total of 42 pins . As shown in the pin diagram, the pin function definition table is the interface definition.

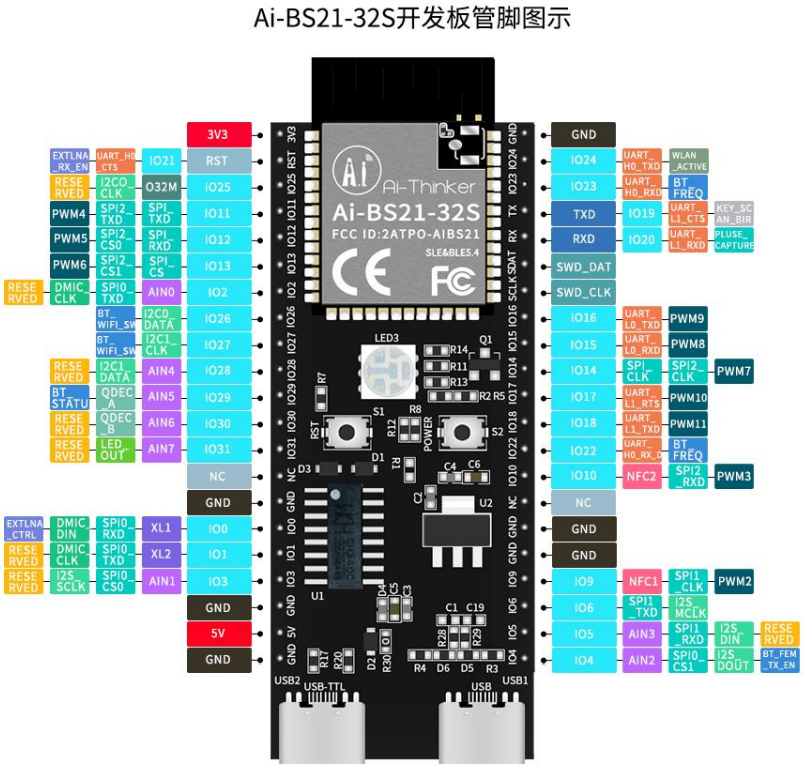


Figure 6 Module pin diagram (bottom view)

Table 6 Pin function definition table

Pin no.	Name	Function Description
1 5 ,1 9 , 21,26,27,42	GND	Ground power supply negative pole
14,28	NC	Not exported, not available by default
1	3V3	Positive power supply
2	RST	RESET/GPIO21/UART_H0_CTS/EXTLNA_RX_EN
3	IO25	GPIO25/O32M/I2C0_CLK/RESERVED
4	IO11	GPIO11/High-speed SPI_TXD/SPI2_TXD/PWM4
5	IO12	GPIO12/High-speed SPI_RXD/SPI2_CS0/PWM5
6	IO13	GPIO13/High-speed SPI_CS/SPI2_CS1/PWM6
7	IO2	GPIO2/AIN0/SPI0_TXD/DMIC_CLK/RESERVED
8	IO26	GPIO26/I2C0_DATA/BT_WIFI_SW

9	IO27	GPIO27/I2C1_CLK/BT_WIFI_SW
10	IO28	GPIO28/AIN4/I2C1_DATA/RESERVED
11	IO29	GPIO29/AIN5/QDEC_A/BT_STATUS
12	IO30	GPIO30/AIN6/QDEC_B/RESERVED
13	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
20	5V	5V power supply
22	IO4	GPIO4/AIN2/SPI0_CS1/I2S_DOUT/BT_FEM_TX_EN
23	IO5	GPIO5/AIN3/SPI1_RXD/I2S_DIN/RESERVED
24	IO6	GPIO6/SPI1_TXD/I2S_MCLK
25	IO9	GPIO9/NFC1/SPI1_CLK/PWM2
29	IO10	GPIO10/NFC2/SPI2_RXD/PWM3
30	IO22	GPIO22/UART_H0_RX_D/BT_FREQ
31	IO18	GPIO18/UART_L1_TXD/PWM11
32	IO17	GPIO17/UART_L1_RTS/PWM10
33	IO14	GPIO14/High speed SPI_CLK/SPI2_CLK/PWM7
34	IO15	GPIO15/UART_L0_RXD/PWM8
35	IO16	GPIO16/UART_L0_TXD/PWM9
36	S_CLK	SWD_CLK
37	S_DAT	SWD_DAT
38	RXD	GPIO20/UART_L1_RXD/PLUSE_CAPTURE
39	TXD	GPIO19/UART_L1_CTS/KEY_SCAN_BIR[0:31]
40	IO23	GPIO23/UART_H0_RXD/BT_FREQ
41	IO24	GPIO24/UART_H0_TXD/WLAN_ACTIVE

6. Schematic Diagram

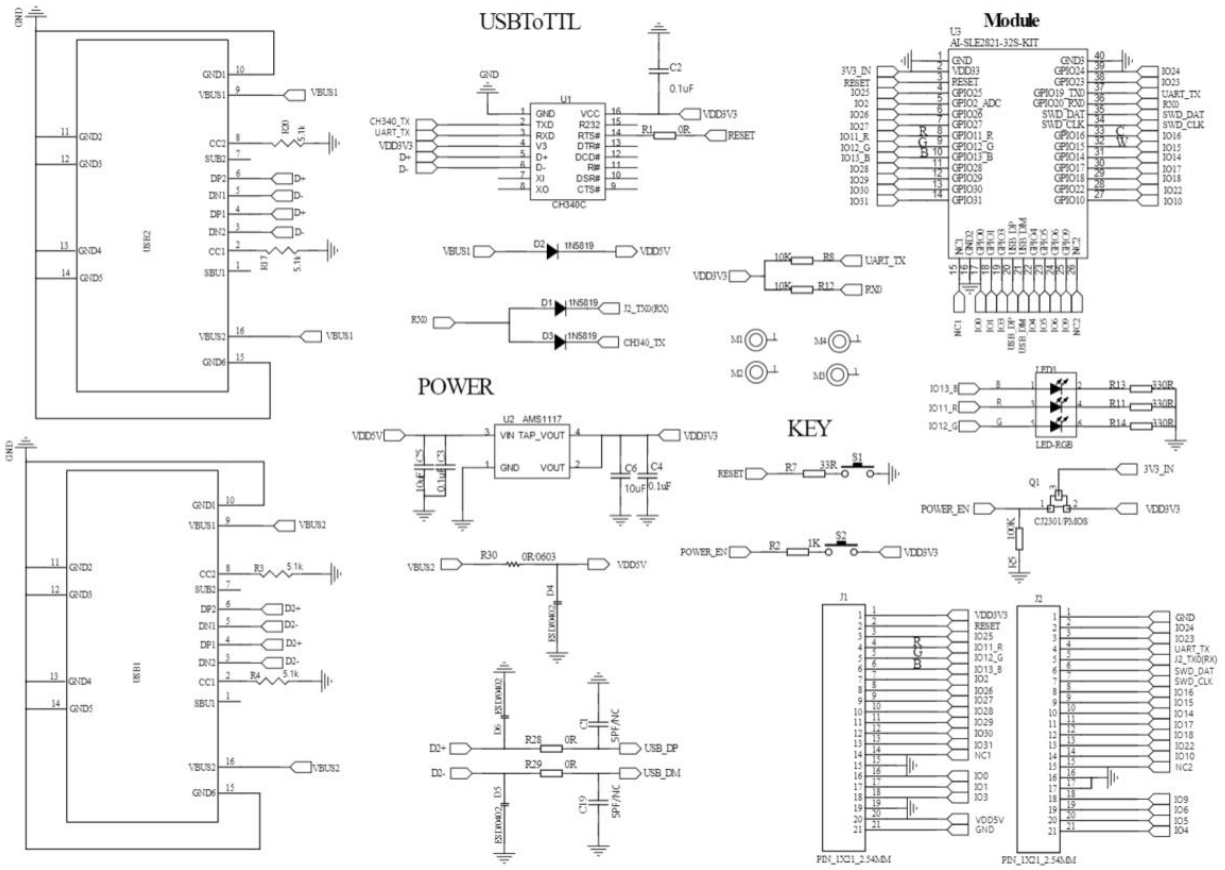


Figure 7 Module schematic diagram

7. Product Packaging Information

Table 7 Packaging information table

Packing list	Packing	Quantity per package (static bag)	Quantity per box (color box)
Ai-BS21-32S-Kit	Foam+static bag+color box	1pcs	1pcs

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