



Ai-M61-32S-Kit Specification

Version V1.1.1

Copyright ©2023

Document resume

Version	Date	Develop/revise content	Edition	Approve
V1.1.0	2023.03.23	First formulated	Huang Fang	Hong Xu
V1.1.1	2023.11.15	1、 Update the chip block diagram and the supported peripheral interfaces; 2、 Add important statements	Huang Fang	Hong Xu

Content

1. Product overview	4
1.1. Characteristics	4
2. Main parameters	6
2.1. Power selection	6
2.2. Electrostatic requirements	6
2.3. Electrical characteristics	7
2.4. Wi-Fi radio frequency performance	7
2.5. BLE RF performance	8
2.6. Power consumption	8
3. Appearance size	9
4. Indicator and key instructions	10
5. Pin definition	11
6. Schematic diagram	14
7. Product packaging information	15
8. Contact us	15
Disclaimer and copyright notice	16
Notice	16
Statement	17

1. Product overview

Ai-M61-32S-Kit is a development board designed for Ai-M61-32S modules. Ai-M61-32S is a Wi-Fi 6 + BLE5.3 module developed by Shenzhen Ai-Thinker Technology Co., Ltd. The module is equipped with BL618 chip as the core processor, supports Wi-Fi 802.11b/g/n/ax protocol and BLE protocol, and supports Thread protocol. The BL618 system includes a low-power 32-bit RISC-V CPU with floating-point unit, DSP unit, cache and memory, with a maximum dominant frequency of 320M.

The Ai-M61-32S module has rich peripheral interfaces, including Camera, MJPEG, Display, Audio Codec, USB2.0, SDU, Ethernet (EMAC), SD/MMC(SDH), SPI, UART, I2C, I2S, PWM, GPDAC, GPADC, ACOMP, GPIO, etc. It can be widely used in audio and video multimedia, Internet of Things (IoT), mobile devices, wearable electronic devices, smart homes and other fields.

The Ai-M61-32S module Sec Eng module supports AES/SHA/PKA/TRNG and other functions, supports image encryption and signature startup, and meets various security application requirements in the Internet of Things field.

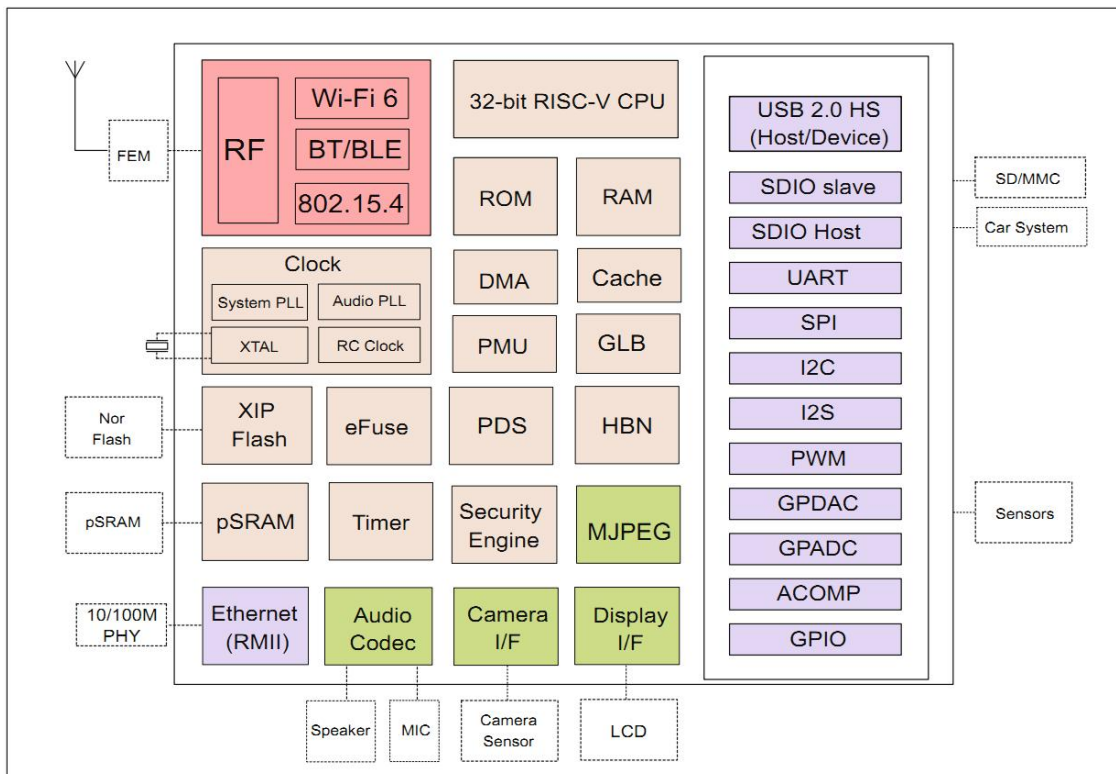


Figure 1 Main chip architecture diagram

1.1. Characteristics

- DIP-42 package

- Supports 2.4GHz operating frequency band
- Support IEEE 802.11 B/g/n/ax
- Support BLE5.3
- Support Thread
- Support Wi-Fi/BLE/Thread coexistence
- Wi-Fi security support WPS/WEP/WPA/WPA2/WPA3
- Supports 20/40MHz bandwidth, 1T1R, maximum rate 229.4 Mbps
- Support STA, SoftAP, STA + SoftAP and sniffer modes
- 32-bit RISC-V CPU with FPU and DSP, with a maximum dominant frequency of 320M
- 4MB pSRAM,532KB SRAM,128KB ROM,4Kb eFuse
- Supports Camera, MJPEG, Display, Audio Codec, USB2.0, SDU, Ethernet (EMAC), SD/MMC(SDH), SPI, UART, I2C, I2S, PWM, GPDAC, GPADC, ACOMP, GPIO, etc.
- Support Camera Sensor DVP interface
- Support Video Codec MJPEG encoding
- Support LCD display (QSPI,DBI and RGB)
- Integrated RF Balun, PA/LNA
- Support for safe startup and safe debugging
- Support XIP QSPI On-The-Fly AES decryption (OTFAD)
- Support TrustZone
- Support AES-CBC/CCM/GCM/XTS mode
- Support MD5, SHA-1/224/256/384/512
- TRNG (True Random Number Generator) is supported
- Support PKA (Public Key Accelerator) for RSA/ECC
- BLE-enabled Wi-Fi fast connection
- Universal AT command can be used quickly.
- Supports secondary development and integrates Windows and Linux development environments

2. Main parameters

Table 1 Description of Main Parameters

Model	Ai-M61-32S-Kit
Package	DIP-42
Size	59.83*25.4(±0.2)mm
Antenna	Onboard antenna
Frequency	2400~2483.5MHz
Operating temperature	-40 °C ~ 85 °C
Storage temperature	-40°C~125°C,<90%RH
Power supply	The power supply voltage is 3.3V or 5V, and the power supply current is ≥ 500mA
Interface	Supports Camera, MJPEG, Display, Audio Codec, USB2.0, SDU, Ethernet (EMAC), SD/MMC(SDH), SPI, UART, I2C, I2S, PWM, GPDAC, GPADC, ACOMP, GPIO, etc
IO	26
UART rate	Default 115200 bps
Security	WPS/WEP/WPA/WPA2/WPA3
Flash	8MByte,maximum support 16MByte

2.1. Power selection

The Ai-M61-32S-Kit supports three power supply modes:

- Type-C Interface Power Supply (Recommended)
- 5V and GND pin power supply
- 3V3 and GND Pin Power Supply

2.2. Electrostatic requirements

Ai-M61-32S-Kit are electrostatic sensitive equipment, special precautions need to be taken when handling.



Figure 2 ESD preventive measures

2.3. Electrical characteristics

Table 2 Table of Electrical Characteristics

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

2.4. Wi-Fi radio frequency performance

Table 3 Wi-Fi RF Performance Table

Description	Typical value			Unit
Spectrum range	2400~2483.5MHz			MHz
Output power				
Mode	Min.	Typical	Max.	Unit
11ax mode HE40,PA output power	-	16	-	dBm
11ax mode HE20,PA output power	-	17	-	dBm
11n mode HT40,PA output power	-	19	-	dBm
11n mode HT20,PA output power	-	19	-	dBm
In 11g mode, PA output power	-	19	-	dBm
In 11b mode, PA output power	-	22	-	dBm
Receiving sensitivity				
Mode	Min.	Typical	Max.	Unit
11b,1 Mbps	-	-98	-	dBm
11b,11 Mbps	-	-90	-	dBm
11g,6 Mbps	-	-93	-	dBm
11g,54 Mbps	-	-76	-	dBm
11n,HT20(MCS7)	-	-73	-	dBm
11ax,HE20(MCS9)	-	-70	-	dBm

11ax,HE40(MCS9)	-	-67	-	dBm
-----------------	---	-----	---	-----

2.5. BLE RF performance

Table 4 BLE RF Performance Table

Description	Typical value			Unit
Spectrum range	2400-2483.5			MHz
Output power				
Mode	Min.	Typical value	Max.	Unit
1Mbps	-	10	15	dBm
2Mbps	-	10	15	dBm
Receiving sensitivity				
Mode	Min.	Typical value	Max.	Unit
1Mbps sensitivity @ 30.8%PER	-	-99	-	dBm
2Mbps sensitivity @ 30.8%PER	-	-97	-	dBm

2.6. Power consumption

- The POUT power for all transmit modes is the measured value at the antenna interface.
- All transmission data are measured in the continuous transmission mode based on a duty cycle of 100%.

Table 5 Power consumption table

Mode	Min.	Average	Max.	Unit
Transmit 802.11B, 11Mbps,POUT = + 22dBm	-	374	-	mA
Transmit 802.11g,54Mbps,POUT = + 19dBm	-	331	-	mA
Emission 802.11n,MCS7,POUT = + 19dBm	-	328	-	mA
Launch 802.11ax,MCS7,POUT = + 19dBm	-	293	-	mA
Receive 802.11B, packet length 1024 bytes	-	64	-	mA
Receive 802.11g, packet length 1024 bytes	-	64	-	mA
Receive 802.11n, packet length 1024 bytes	-	64	-	mA
Receive 802.11ax, packet length 1024 bytes	-	64	-	mA

3. Appearance size

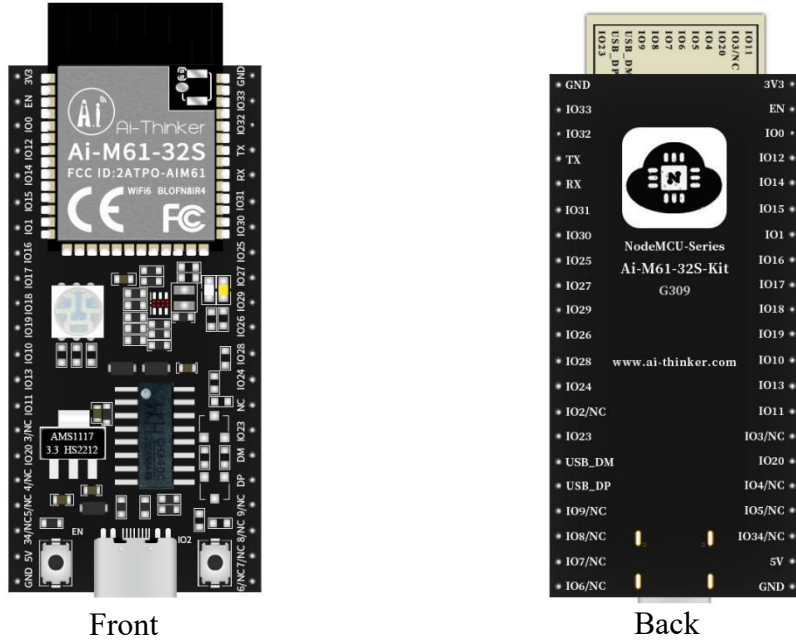


Figure 3 Appearance diagram (Rendering figure is for reference only,subject to physical objects)

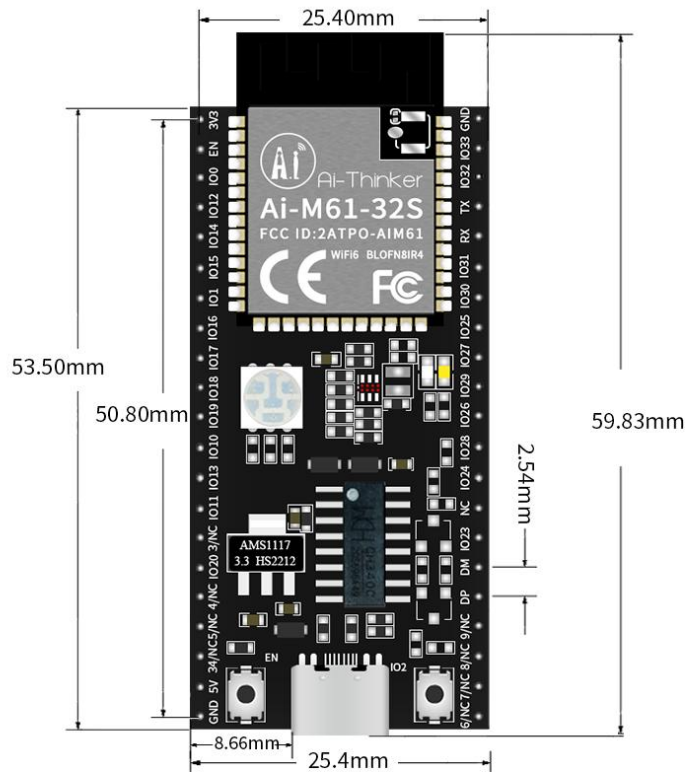


Figure 4 dimension diagram

4. Indicator and key instructions

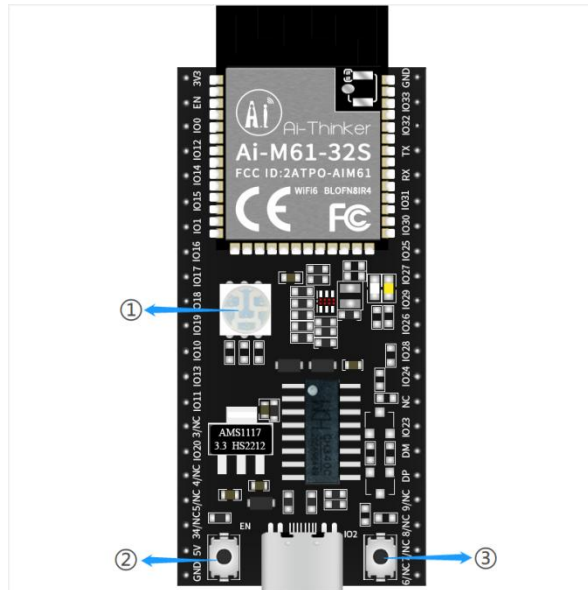


Fig. 5 Ai-M61-32S-Kit indicator light and key position

Table 6 Ai-M61-32S-Kit Indicator and Key Position

①	RGB lamp (red lamp is connected to IO12, green lamp is connected to IO14, blue lamp is connected to IO15, high level is valid)
②	Reset button
③	Burn button, burn firmware is to first press the burn button and then short press the reset button

5. Pin definition

A total of 42 interfaces were connected to the Ai-M61-32S-Kit, as shown in the pin diagram, the pin function definition table is an interface definition.

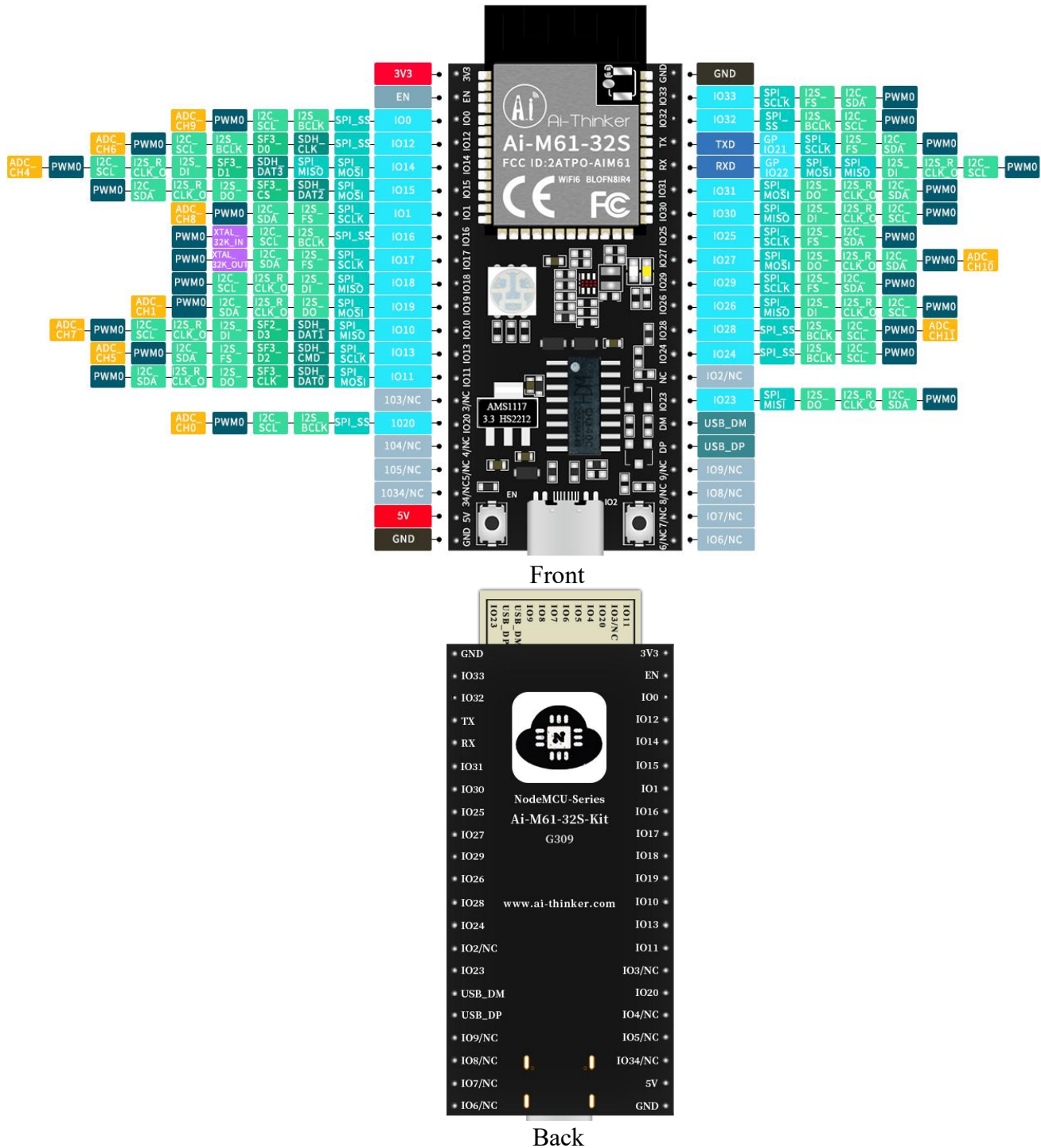


Figure 6 pin diagram

Table 7 Pin Function Definition Table

Foot	Name	Functional description
1	3V3	3.3V power supply; The output current of external power supply is recommended to be above 500mA.
2	EN	Default as chip enable, high level valid
3	IO0	GPIO0/SPI_SS/I2S_BCLK/I2C_SCL/PWM0/ADC_CH9
4	IO12	GPIO12/SPI_SS/SDH_CLK/SF3_D0/I2S_BCLK/I2C_SCL/PWM0/ADC_CH6
5	IO14	GPIO14/SPI_MOSI/SPI_MISO/SDH_DAT3/SF3_D1/I2S_DI/I2S_RCLK_O/I2C_SCL/PWM0/ADC_CH4
6	IO15	GPIO15/SPI_MOSI/SDH_DAT2/SF3_CS/I2S_DO/I2S_RCLK_O/I2C_SDA/PWM0
7	IO1	GPIO1/SPI_SCLK/I2S_FS/I2C_SDA/PWM0/ADC_CH8
8	IO16	Available by default, the IO port is shared with the PIN pin of the 32.768KHz crystal oscillator input inside the module. If the module of the internal patch 32.768KHz crystal oscillator is customized, the IO is in NC state. GPIO16/SPI_SS/I2S_BCLK/I2C_SCL/XTAL_32K_IN/PWM0
9	IO17	Available by default, the IO port is shared with the 32.768KHz crystal output PIN pin inside the module. If the module of the internal patch 32.768KHz crystal oscillator is customized, the IO is in NC state. GPIO17/SPI_SCLK/I2S_FS/I2C_SDA/XTAL_32K_OUT/PWM0
10	IO18	GPIO18/SPI_MISO/I2S_DI/I2S_RCLK_O/I2C_SCL/PWM0
11	IO19	GPIO19/SPI_MOSI/I2S_DO/I2S_RCLK_O/I2C_SDA/PWM0/ADC_CH
12	IO10	GPIO10/SPI_MISO/SDH_DAT1/SF2_D3/I2S_DI/I2S_RCLK_O/I2C_SCL/PWM0/ADC_CH7
13	IO13	GPIO13/SPI_SCLK/SDH_CMD/SF3_D2/I2S_FS/I2C_SDA/PWM0/ADC_CH5
14	IO11	GPIO11/SPI_MOSI/SDH_DAT0/SF3_CLK/I2S_DO/I2S_RCLK_O/I2C_SDA/PWM0
15	IO3/NC	Default NC, not available. For use, please contact Ai-Thinker. GPIO3/SPI_MOSI/I2S_DO/I2S_RCLK_O/I2C_SDA/PWM0/ADC_CH3
16	IO20	GPIO20/SPI_SS/I2S_BCLK/I2C_SCL/PWM0/ADC_CH0
17	IO4/NC	Default NC, not available. The IO port is shared with the module Flash pin and cannot be used in the external FLASH state.
18	IO5/NC	Default NC, not available. The IO port is shared with the module Flash pin and cannot be used in the external FLASH state.

19	IO34/NC	Default NC, not available. For use, please contact Ai-Thinker. GPIO34/SPI_MISO/I2S_DI/I2S_RCLK_O/I2C_SCL/PWM0
20	5V	5V power supply; The output current of external power supply is recommended to be above 500mA.
21	GND	Grounding
22	GND	Grounding
23	IO33	GPIO33/SPI_SCLK/I2S_FS/I2C_SDA/PWM0
24	IO32	GPIO32/SPI_SS/I2S_BCLK/I2C_SCL/PWM0
25	TX	TXD/GPIO21/SPI_SCLK/I2S_FS/I2C_SDA/PWM0
26	RX	RXD/GPIO22/SPI_MOSI/SPI_MISO/I2S_DI/I2S_RCLK_O/I2C_SCL/PWM0
27	IO31	GPIO31/SPI_MOSI/I2S_DO/I2S_RCLK_O/I2C_SDA/PWM0
28	IO30	GPIO30/SPI_MISO/I2S_DI/I2S_RCLK_O/I2C_SCL/PWM0
29	IO25	GPIO25/SPI_SCLK/I2S_FS/I2C_SDA/PWM0
30	IO27	GPIO27/SPI_MOSI/I2S_DO/I2S_RCLK_O/I2C_SDA/PWM0/ADC_CH10
31	IO29	GPIO29/SPI_SCLK/I2S_FS/I2C_SDA/PWM0
32	IO26	GPIO26/SPI_MISO/I2S_DI/I2S_RCLK_O/I2C_SCL/PWM0
33	IO28	GPIO28/SPI_SS/I2S_BCLK/I2C_SCL/PWM0/ADC_CH11
34	IO24	GPIO24/SPI_SS/I2S_BCLK/I2C_SCL/PWM0
35	IO2/NC	Default NC, not available. For use, please contact Anxin. GPIO2/SPI_MISO/I2S_DI/I2S_RCLK_O/I2C_SCL/PWM0/ADC_CH2
36	IO23	GPIO23/SPI_MOSI/I2S_DO/I2S_RCLK_O/I2C_SDA/PWM0
37	USB_DM	USB_DM
38	USB_DP	USB_DP
39	IO9/NC	Default NC, not available. The IO port is shared with the module Flash pin and cannot be used in the external FLASH state.
40	IO8/NC	Default NC, not available. The IO port is shared with the module Flash pin and cannot be used in the external FLASH state.
41	IO7/NC	Default NC, not available. The IO port is shared with the module Flash pin and cannot be used in the external FLASH state.
42	IO6/NC	Default NC, not available. The IO port is shared with the module Flash pin and cannot be used in the external FLASH state.

6. Schematic diagram

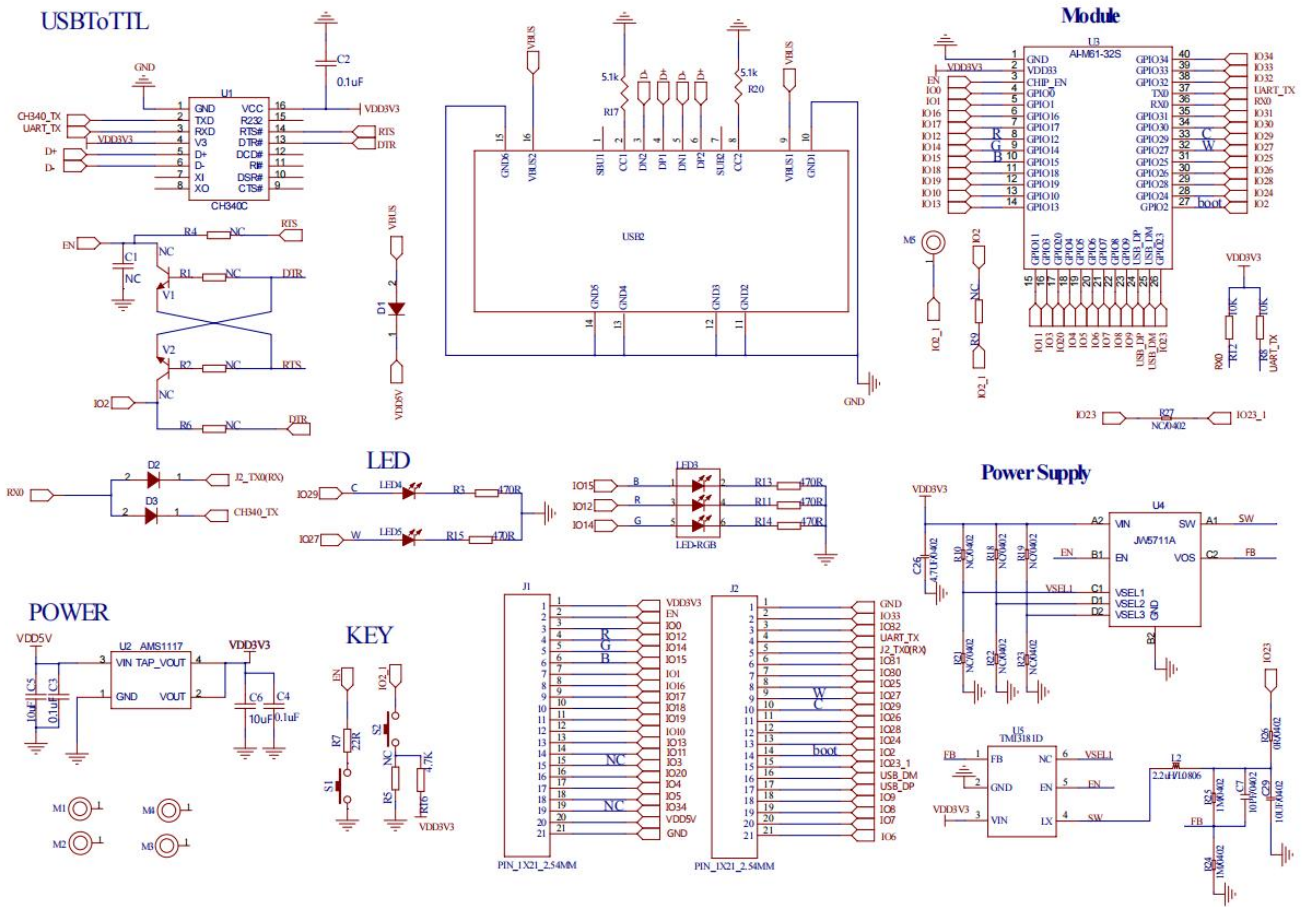


Figure 7 Schematic Diagram

7. Product packaging information

Table 8 Packing Information Table

Packing list	Packaging method	Quantity per pack	Quantity per pack (Sealed Bag)
Ai-M61-32S-Kit	Foam + Electrostatic Bag	1pcs	20pcs

8. 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

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.

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-Thinker or 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.