BU04-Kit Specification

Version   V1.1.0

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Document resume

Version	Date	Develop/revise content	Edition	Approve
V1.1.0	2024.08.14	First Edition	XiaoCheng Li	Hong Xu

Content

1. Product Overview

BU04-Kit is a dual-antenna ultra-wideband development board designed by Ai-Thinker Co., Ltd based on BU04 module. The BU04 module on the board integrates the DW3000+STM32F103 MCU and supports dual onboard antennas or dual IPEX external antennas. BU04 can be used in bidirectional ranging, TDOA or PDOA positioning system, positioning accuracy up to 10 cm, and support up to 6.8 Mbps data rate, can be widely used in precision positioning, coal mine positioning, hospital personnel positioning, storage positioning, a variety of indoor positioning and other fields.
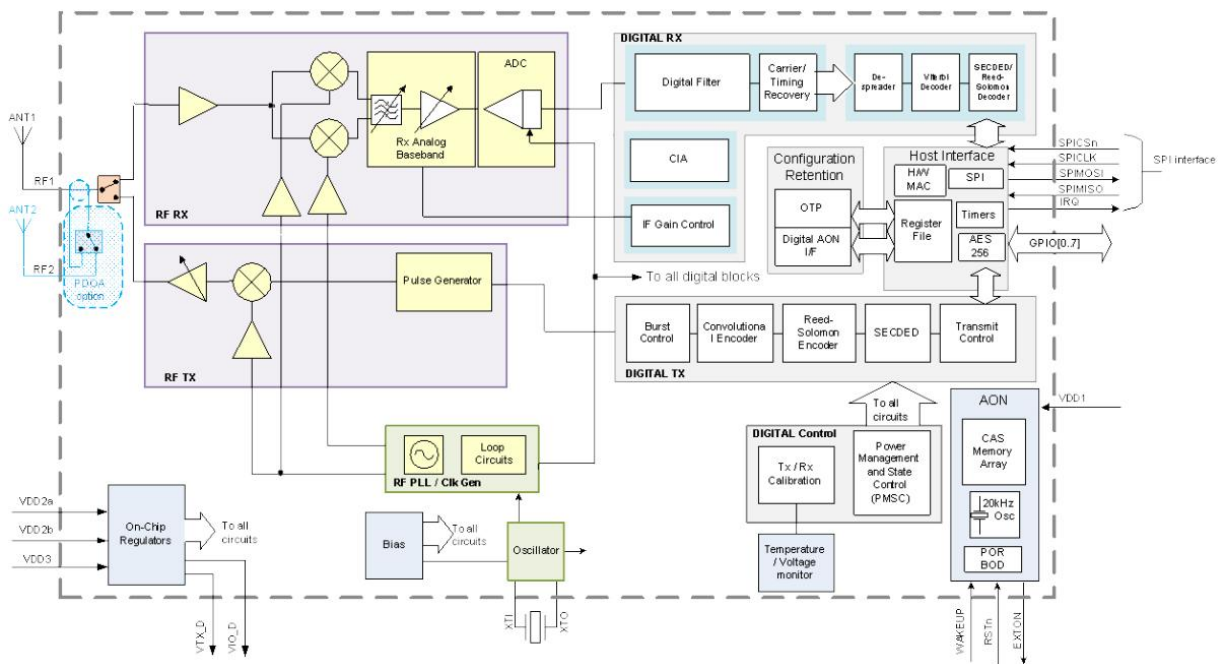

Figure 1 Main chip architecture diagram

1.1. Characteristic

- DIP-40 package

- Complies with the IEEE 802.15.4-2015 UWB standard

- Conforms to IEEE802.15.4z (BPRF mode)

- Supports dual antenna channels

- Channel 5 and channel 9 are supported

- Easy integration without RF secondary design

- Support for onboard antenna, compatible with IPEX external antenna

- Integrated MAC function

- The use of RTLS infrastructure extends the range of communication

- Data rate supports 850 Kbps and 6.8 Mbps

- Supports two-way ranging and TDOA and PDOA positioning schemes

- Provides accurate positioning and data transfer

- Positioning accuracy 10 cm

- Supports high label density

- Integrated HW AES 256

- Supports the SPI interface

- 20 GPIO available

- Integrated STM32F103 MCU

- Programmable adjustment of the transmit power

- Power supply can be external Type-C, and pin 3.3 or 5V power supply

2. Main parameters

Table 1 Description of the main parameters

Model	BU04-Kit
Package	SMD-40
Size	46.00*52.00(±0.2)mm
Antenna	On-board PCB antenna, compatible with IPEX
Center frequency	CH5(6489.5MHz)、CH9(7987.2MHz)
Operating temperature	-40℃~85℃
Storage temperature	-40℃~125℃,＜90%RH
Power supply	Power supply voltage USB Type-C or pin 3.3 or 5V power supply. Power supply current ≥500mA
Interface	SPI/UART/I2C
IO	20
Built-in MCU	STM32F103

2.1. Static electricity requirements

BU04-Kit is an electrostatic sensitive device, and special precautions must be taken when handling it.

Figure 2 ESD anti-static diagram

2.2. Electrical characteristics

Table 2 Electrical characteristics table

Parameter		Name	Min.	Typical value	Max.	Unit
Supply voltage		VDD1	1.7	3.3	3.6	V
Supply voltage		3V3	2.5	3.3	3.6	V
I/O	VIL	-	-	-	0.3*3V3	V
	VIH	-	0.7*3V3	-	-	V
	VOL	-	-	0.1*3V3	-	V
	VOH	-	-	0.9*3V3	-	V
	IMAX	-	-	-	10	mA

2.3. RF Parameter

Table 3 UWB RF parameters

Description	Typical value	Unit
CH5 center frequency	6489.6	MHz
CH9 center frequency	7987.2	MHz
Channel bandwidth	499.2	MHz

2.4. Power Consumption

The following power consumption data is based on a 3.3V power supply and an ambient temperature of 25°C.

Table 4 Power consumption table

Mode	Min.	Typical	Max.	Unit
CH5 transmitting at 0.85Mbps	-	45.39	-	mA
CH5 transmitting at 6.81Mbps	-	43.19	-	mA
CH9 transmitting at 0.85Mbps	-	53.18	-	mA
CH9 transmitting at 6.81Mbps	-	51.16	-	mA
CH5 receives at 0.85Mbps	-	50.83	-	mA
CH5 receives at 6.81Mbps	-	51.19	-	mA
CH9 receives at 0.85Mbps	-	79.28	-	mA
CH9 receives at 6.81Mbps	-	79	-	mA

3. Appearance dimensions

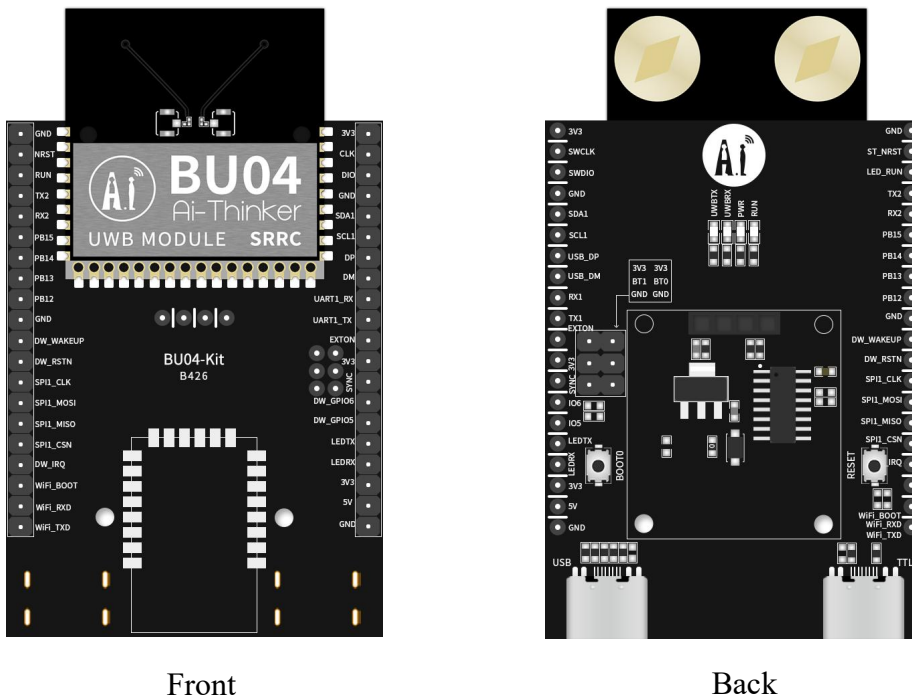Front   Back

Figure 3 Appearance of the module(the rendering is for reference only, the actual object shall prevail)
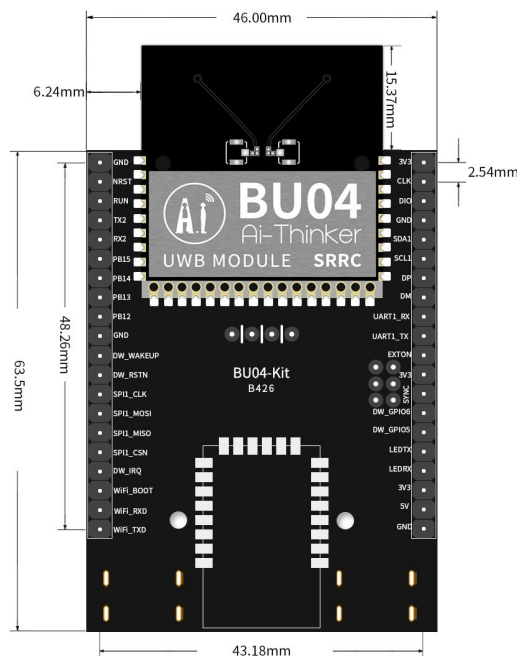

Figure 4 Module size diagram

4. Button and indicator description

A total of 40 pin pins are connected to the BU04-Kit development board. As shown in the diagram, the pin function definition table is the interface definition.
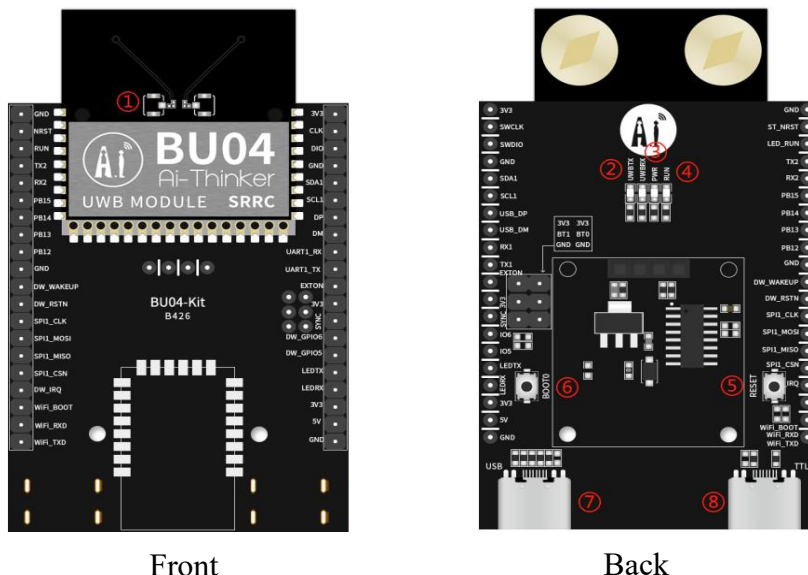

Front   Back

Figure 5 Position of indicators and buttons on BU04-Kit

Table 5 BU04-Kit indicators\key positions, and pins

①	External antenna seat
②	Communication light
③	Power light
④	Running indicator light
⑤	Reset key
⑥	Burning control key, press B00T0 pin pull high, serial port burning
⑦	USB communication host computer ranging data interface
⑧	AT command + program burning port

Note: The development board comes with a jump cap, BOOT1 and BOOT0 are pulled down by default, and the effect of pressing the key is the same as that of jumping to the high level of the jump cap, which controls the serial port burning.

Boot mode select pin		Start-up model	Description
BOOT1	**BOOT0**		
X	0	Main flash memory	The main flash memory is selected to locate the boot area
0	1	System memory	The system memory is selected as the boot area
1	1	Built-in SRAM	The built-in SRAM is selected as the boot area

5. Pin definition

A total of 40 interfaces are connected to BU04-Kit, such as the pin diagram, and the pin function definition table is the interface definition.

Front

Back

Figure 6 Schematic diagram of the pin

Table 6 Pin function definition table

No.	Name	Function
1	GND	GND
2	ST_NRST	NRST
3	LED_RUN	PA1_LED_RUN，ADC_IN1 / USART2_RTS / TIM2_CH2
4	UART2_TX	ADC_IN2 / USART2_TX / TIM2_CH3
5	UART2_RX	ADC_IN3 / USART2_RX / TIM2_CH4
6	PB15	PB15,SPI2_MOSI/TIM1_CH3N
7	PB14	PB14,SPI2_MISO/USART3_RTSTIM1_CH2N
8	PB13	PB13,SPI2_SCK/USART3_CTS/TIM1_CH1N
9	PB12	PB12,SPI2_NSS/I2C2_SMBAl/USART3_CK/TIM1_BKIN
10	GND	GND
11	DW_WAKEUP	PA0WKUP,PA0,WKUP/USART2_CTS(9)/ADC12_IN0/TIM2_CH1_ETR
12	DW_RXTN	DW_RXTN
13	SPI1_CLK	ADC_IN5 / SPI1_SCK
14	SPI1_MOSI	ADC_IN7 / SPI1_MOSI / TIM3_CH2
15	SP1_MISO	ADC_IN6 / SPI1_MISO / TIM3_CH1
16	SPI1_CSN	ADC_IN4 / SPI1_NSS / USART2_CK
17	DW_IRQIO	DW_IRQ/GPIO8
18	WIFI_BOOT	WIFI_BOOT
19	WIFI_RXD	WIFI_RXD
20	WIFI_TXD	WIFI_TXD
21	GND	GND
22	5V	5V
23	3V3	3V3
24	LEDRX	LEDRX
25	LEDTX	LEDTX
26	DW_GPIO5	IO5/EXTTXE/SPIPOL
27	DW_GPIO6	IO6/EXTRXE/SPIPHA
28	DW_SYNC	DW_SYNC
29	3V3	3V3

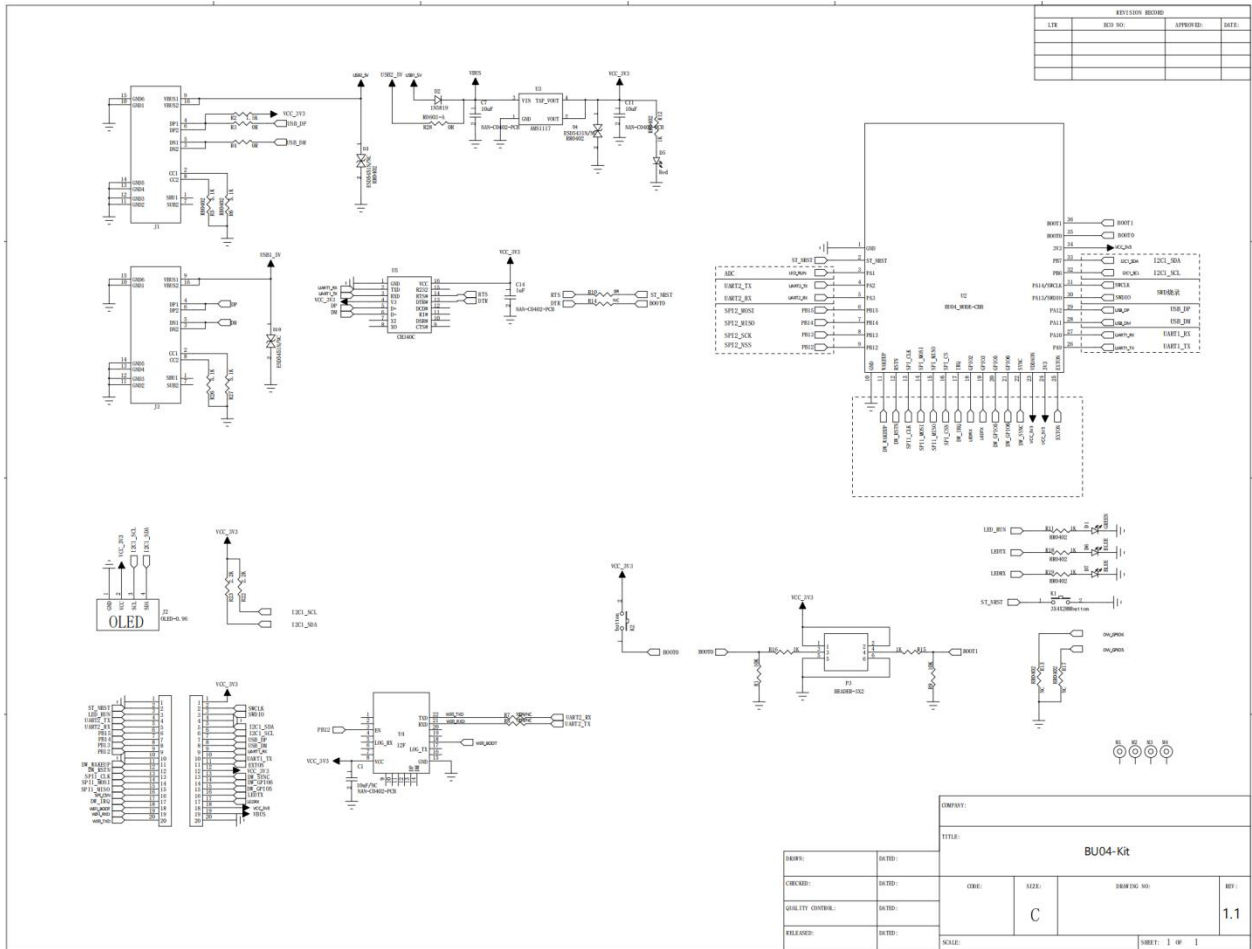| 30	EXTON	EXTON_PA8
31	UART1_TX	UART1_TX
32	UART1_RX	UART1_RX
33	USB_DM	USB_DM
34	USB_DP	USB_DP
35	I2C1_SCL	I2C1_SDA / TIM4_CH2 / USART1_RX
36	I2C1_SDA	I2C1_SCL / TIM4_CH1 / USART1_TX
37	GND	GND
38	SWDIO	SWDIO
39	SWCLK	SWCLK
40	3V3	3V3

6. Schematic

Figure 7 Schematic

7. Product packaging information

Table 7 Packaging information table

Packing List	Package	Pack Quantity Units (electrostatic bag)	Pack Quantity Units(Sealed bag)
BU04-Kit	Foam + electrostatic bag	1pcs	10pcs

8. Contact us

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