



BW21-CBV-Kit Specification

Version V1.0.0

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Document resume

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1. Product overview

BW21-CBV-Kit is a dual-band Wi-Fi + BLE camera SoC module development board developed by Ai-Thinker Co., Ltd. based on RTL8735B series chips, supporting dual-band (2.4GHz or 5GHz) 802.11a/b/g/n WLAN protocol and BLE 5.1 protocol. The BW21-CBV-Kit integrates ARM v8M MCUS (500MHz and 2.23DMIPS /MHz), WLAN MAC, WLAN baseband with 1T1R support, Bluetooth MAC, RF, audio codec, ISP and H264/H265 encoders.

BW21-CBV-Kit module development board has rich peripheral interfaces, including the UART/GPIO/ADC/PWM/IIC/IIS / SPI/SDIO/SWD/EPHY/Audio/MIC/MIPI/USB, etc. It can be widely used in the Internet of Things (IoT), smart audio and video equipment, smart home and other fields.

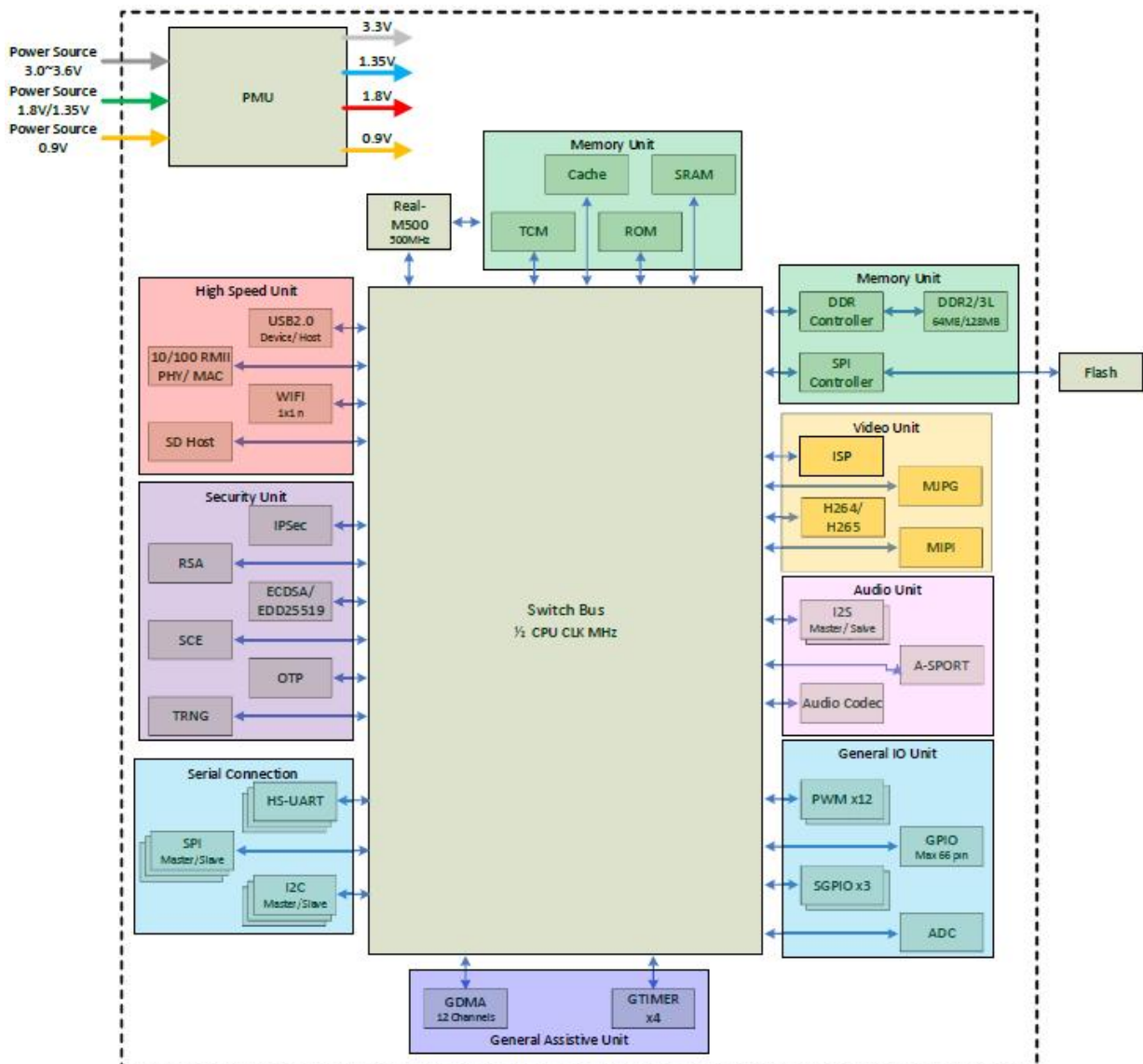


Figure 1 Chip Block Diagram

1.1. Characteristic

- Support 802.11a/b/g/n protocol
- Support 802.11e QoS strengthen (WMM)
- Support dual-band 2.4GHz or 5GHz
- Support the HT20 and HT40 modes
- Support BLE 5.1 protocol
- Support LE secure connection
- Support LE scattering network
- Support one master and one slave
- Support LE data length extension
- Supports link layer privacy
- Support hardware encryption engines
- Real-M500 (TM9) Clock frequency up to 500MHz
- 2 groups of 1x18 pins lead to 30 programmable IO
- Provide TF booth
- Supports 12-bit Bayer mode input and 8-bit YUY2 input for CMOS sensors
- Supports MIPI CSI-2 four data channels
- Provides MIPI camera interface
- Supports MCM embedded 64MB/128MB DDR2 memory
- Supports short-range and low-power Tx/Rx applications
- Wi-Fi and Bluetooth share the same antenna
- Support Arduino development

2. Main parameters

Table 1 Description of the main parameters

Model	BW21-CBV-Kit
Package	DIP-36
Size	37.50(±0.1)*62.0(±0.2)MM
Antenna	I-PEX (1generation)
Frequency	2400~2483.5MHz 或 5180~5825MHz
Operating	-40 °C~85 °C
Storage	-40 °C~125 °C, <90%RH
Power supply	The typical value is 5V, supply current > 1A
Support interface	UART/GPIO/ADC/PWM/IIC/IIS/SPI/SDIO/SWD/EPHY/Audio/MIC/MIPI/USB
IO	Default 30
UART rate	Default 115200bps
Bluetooth	BLE 5.1
SPI flash	Default 16MB Flash

2.1. Static electricity requirement

BW21-CBV-Kit development board is an electrostatic sensitive device that requires special ESD prevention measures, and ESD protection devices are usually added in use. Correct ESD handling and packaging must be used during transportation, operation and use of the BW21-CBV-Kit development board. Do not touch the module or weld with a non-antistatic soldering iron to avoid damaging the development board.



Figure 2 ESD Anti-static diagram

2.2. Electrical characteristics

Table 2 Electrical characteristics table

Parameters		Condition	Min.	Typical value	Max.	Unit
Power supply		VDD_DD R (DDR2)	1.71	1.8	1.89	V
		VDD3	3.135	3.3	3.465	V
		5VDD	4.75	5	5.25	V
I/O	VIL	-	-	-	0.8	V
	VIH	-	2.0	-	-	V
	VOL	-	2.4	-	-	V
	VOH	-	-	-	0.4	V

2.3. Wi-Fi RF performance

Table 3 WiFi RF performance

Description	Typical value			Unit
Frequency range	2400~2483.5 and 5180~5825			MHz
Output power				
Rate mode	Min.value	Typical	Max.value	Unit
11a mode, PA output power	-	17	-	dBm
11b mode, PA output power	-	19	-	dBm
11g mode, PA output power	-	18	-	dBm
11n mode, PA output power	-	17	-	dBm
Receiving sensitivity				
Rate mode	Min.value	Typical	Max.value	Unit
11b, 1Mbps	-	-98	-	dBm
11b, 11Mbps	-	-91	-	dBm
11a/g, 6Mbps	-	-97	-	dBm
11a/g, 54Mbps	-	-78	-	dBm
HT20（MCS0）	-	-96	-	dBm
HT20（MCS7）	-	-76	-	dBm
HT40（MCS0）	-	-93	-	dBm
HT40（MCS7）	-	-73	-	dBm

2.4. BLE RF performance

Table 4 BLE RF performance

Description	Typical value			Unit
Frequency range	2400~2483.5			MHz
Output power				
Rate mode	Min.value	Typical	Max.value	Unit
1Mbps	-	8	-	dBm
2Mbps	-	8	-	dBm
Receiving sensitivity				
Rate mode	Min.value	Typical	Max.value	Unit
1Mbps @30.8%PER	-	-98	-	dBm
2Mbps @30.8%PER	-	-96	-	dBm

2.5. Power Consumption

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

- The POUT power for all transmission modes is measured at the antenna interface.
- All emission data are measured in continuous emission mode.

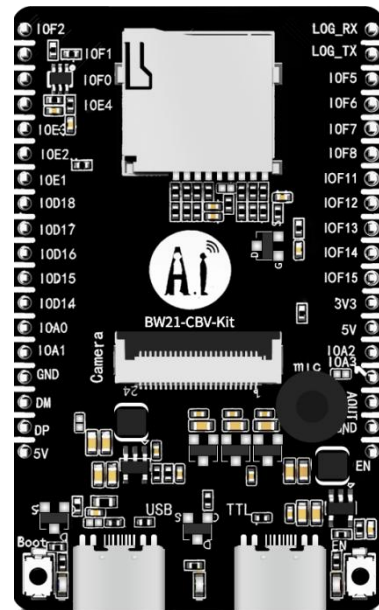
Table 5 Power consumption table

Mode	Min.value	Typical	Max.va	Unit
Transmitting 802.11b, 11Mbps,	-	615	-	mA
Transmitting 802.11g, 54Mbps, POUT	-	398	-	mA
Transmitting 802.11n, MCS7, POUT	-	369	-	mA
Receive 802.11b	-	50	-	mA
Receive 802.11g	-	50	-	mA
Receive 802.11n	-	50	-	mA

3. Appearance dimensions



Front



Back

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



Figure 4 Size diagram

4. Interface Indication

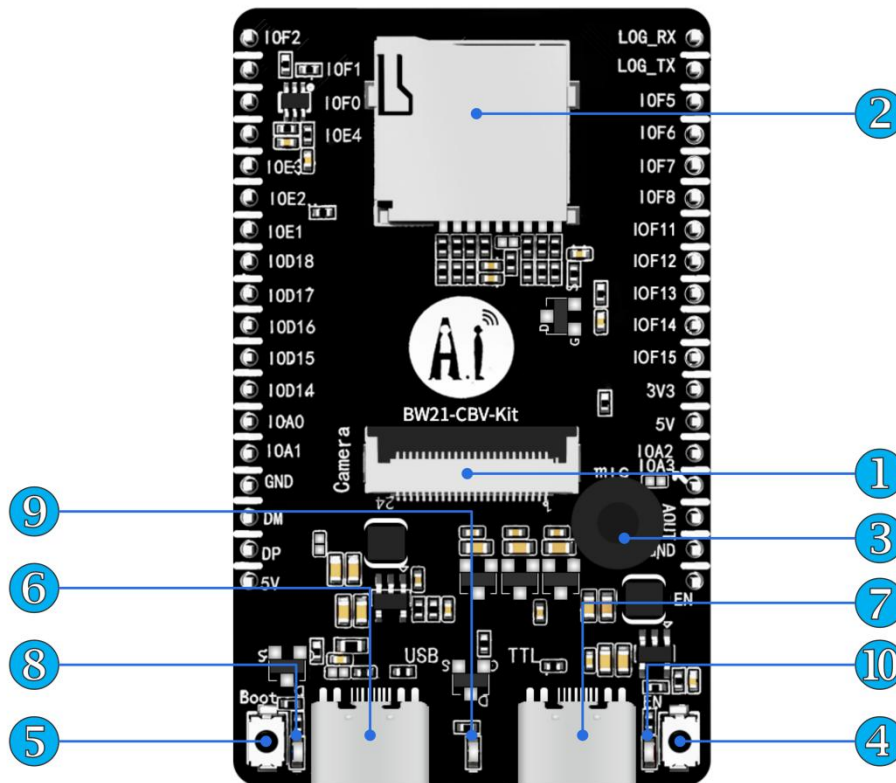


Figure 5 Interface indication diagram

Table 6 Interface indicator table

①	FPC-24-MIPI camera interface
②	TF booth
③	Audio microphone
④	Reset button
⑤	Download button
⑥	TypeC interface (USB2.0)
⑦	TypeC interface (TTL to USB)
⑧	Blue LED light (IOF9)
⑨	Green LED light (IOE6)
⑩	Red LED power light

5. Pin definition

BW21-CBV-Kit connects a total of 36 pins. For example, the pin diagram, the pin function definition table is the interface definition.



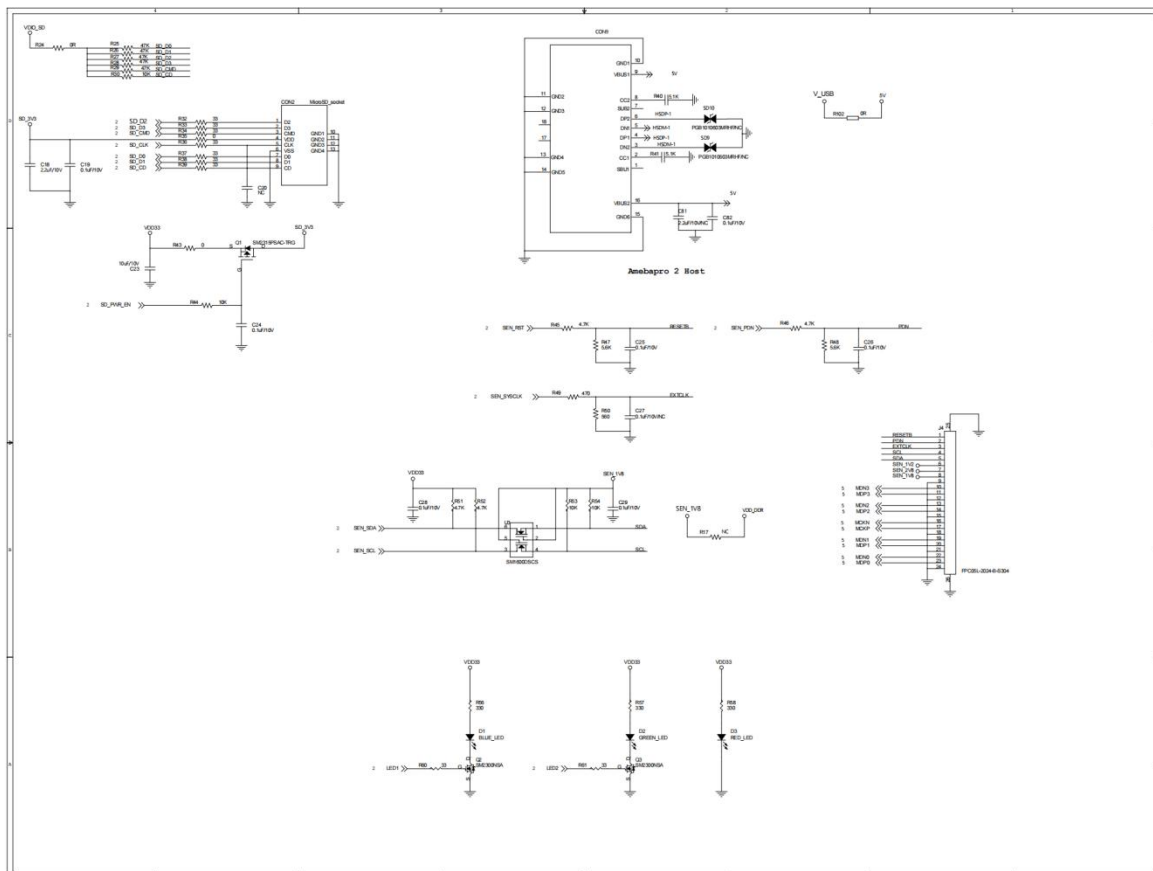
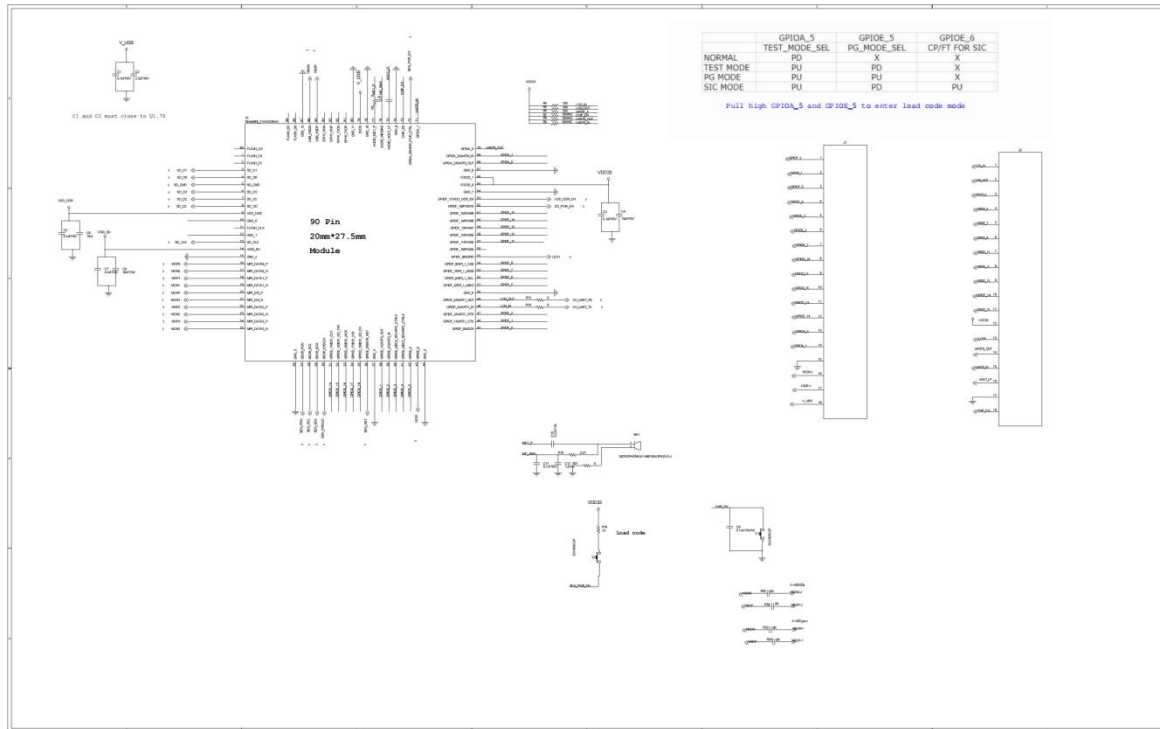
Figure 6 Pin diagram

Table 7 Pin function definition table

No.	Name	Function description
1	LOG_RX	GPIOF_3/ADC3/RFE_CTRL_2/UART1_IN/ArduinoPin_26
2	LOG_TX	GPIOF_4/UART1_OUT/ArduinoPin_25
3	IOF5	GPIOF_5/SPI_1_MISO/SPI_3_MISO/ArduinoPin_0
4	IOF6	GPIOF_6/PWM0/SPI_1_SCL/SPI_3_SC/ArduinoPin_1
5	IOF7	GPIOF_7/PWM1/SPI_1_MOSI/SPI_3_MOSI//ArduinoPin_2
6	IOF8	GPIOF_8/PWM2/SPI_1_CS0/SPI_3_CS/ArduinoPin_3
7	IOF11	GPIOF_11/PWM5/I2S0_MCK/ArduinoPin_4
8	IOF12	GPIOF_12/PWM6/I2S0_SD_RX/UART1_IN/ArduinoPin_5
9	IOF13	GPIOF_13/PWM7/I2S0_CLK/UART1_OUT/ArduinoPin_6
10	IOF14	GPIOF_14/SGPIO_RX/PWM8/I2S0_SD_TX0/ArduinoPin_7
11	IOF15	GPIOF_15/SGPIO_TX/PWM9/I2S_WS/ArduinoPin_8

12	3V3	3.3V power supply terminal, this pin can be used to power peripherals on the development board
13,36	5V	5V power supply terminal, the development board can be powered externally through this pin, and the power supply current is recommended to be above 1A
14	IOA2	GPIOA_2/ADC6/UART0_OUT/ArduinoPin_21
15	IOA3	GPIOA_3/ADC7/UART0_IN/ArduinoPin_22
16	AOUT	AOUT_LP: positive signal output from the speaker
17,33	GND	Ground
18	EN	CHIP_EN, chip Enable pin, pull up Enable; Pull down shutdown. By default, a 10K resistor is pulled up inside the module
19	IOF2	GPIOF_2/ADC2/I2C1_SDA/RFE_CTRL_1/UART1_RTS/ArduinoPin_9
20	IOF1	GPIOF_1/ADC1/I2C1_SCL/RFE_CTRL_0/UART1_CTS/ArduinoPin_10
21	IOF0	GPIOF_0/ADC0/ArduinoPin_11
22	IOE4	GPIOE_4/I2C_SDA/RFE_CTRL5/SPI_0_CS0/SPI_2_CS/UART3_CTS/ArduinoPin_12
23	IOE3	GPIOE_3/I2C_SCL/RFE_CTRL4/SPI_0_MOSI/SPI_2_MOSI/UART3_RTS/ArduinoPin_13
24	IOE2	GPIOE_2/SPI_0_MISO/SPI_2_MISO/UART3_IN/ArduinoPin_14
25	IOE1	GPIOE_1/SPI_0_SCL/SPI_2_SCL/UART3_OUT/ArduinoPin_15
26	IOD18	GPIOD_18/DMIC_DATA/RFE_CTRL_5/I2S1_SD_RX/UART2_RTS/BTCMD_IRQ/ArduinoPin_16
27	IOD17	GPIOD_17/RFE_CTRL_4/I2S1_WS/UART2_CTS/WL_ACT/ArduinoPin_17
28	IOD16	GPIOD_16/DMIC_CLK/I2S1_MCK/UART2_IN/BT_CK/ArduinoPin_18
29	IOD15	GPIOD_15/I2S1_SD_TX0/UART2_OUT/BT_STA/ArduinoPin_19
30	IOD14	GPIOD_14/DMIC_CLK/WIFI_LED/I2S1_CLK/BT_PRI/ArduinoPin_20
31	IOA0	GPIOA_0/ADC4/XTAL_XO_32/I2C2_SCL/ArduinoPin_28,32K crystal oscillator output pin
32	IOA1	GPIOA_1/ADC5/XTAL_XI_32/I2C2_SDA/ArduinoPin_27, 32K crystal oscillator output pin
34	DM	GPIOB_1/I2C0_SDA/HSDM, high-speed USB D- signal
35	DP	GPIOB_0/I2C0_SCL/HSDP, high-speed USB D+ signal

6. Schematic diagram



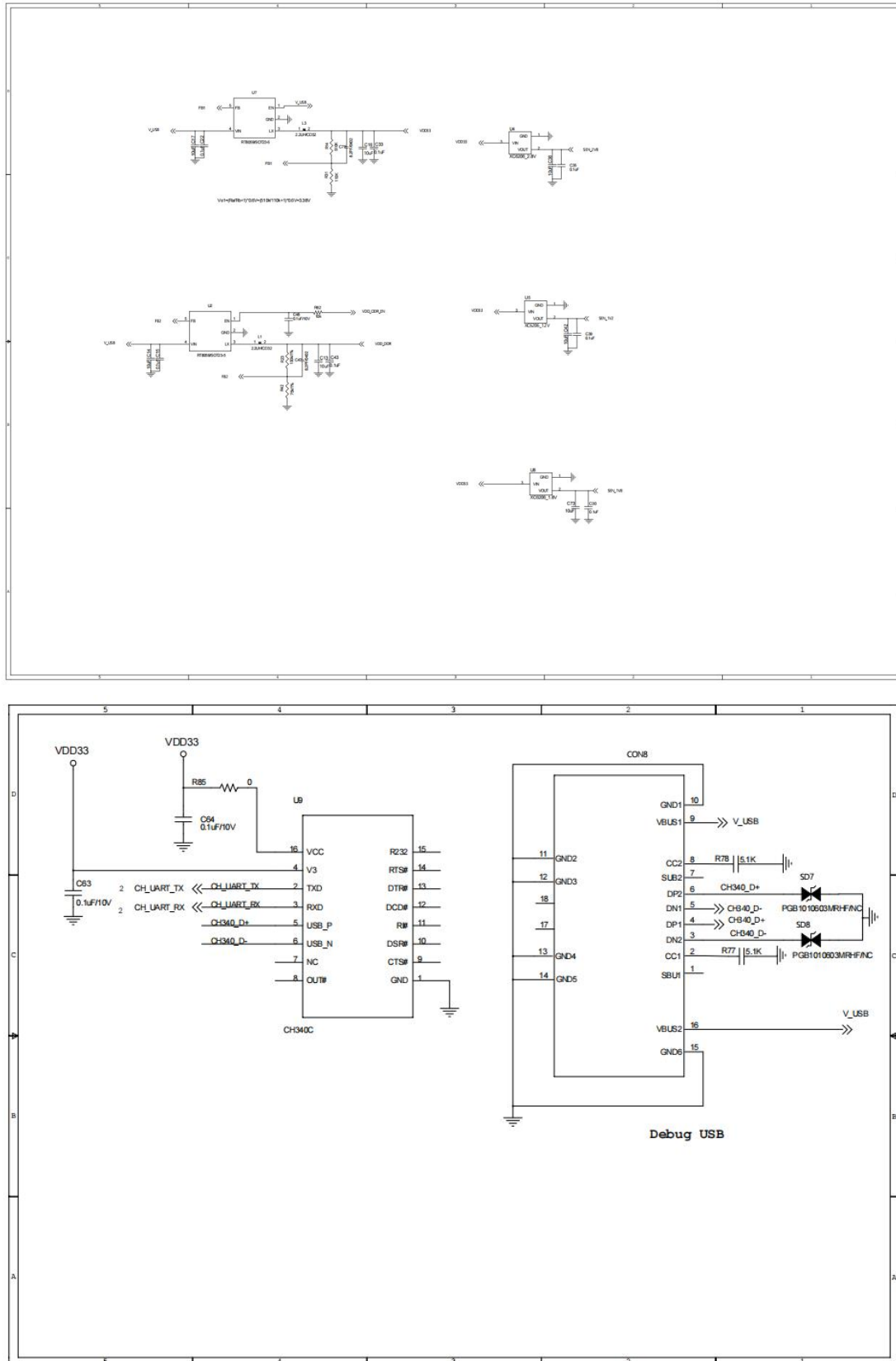


Figure 7 Schematic diagram of development board

7. Product Packaging Information

Table 8 Packaging information table

Packing List	Mode of packing	Quantity per packet	Quantity per packet
BW21-CBV-Kit	Foam + electrostatic bag	1pcs	20pcs

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