



RF-BT02 Test Board User Guide

Version 1.2

Shenzhen RF-star Technology Co., Ltd.

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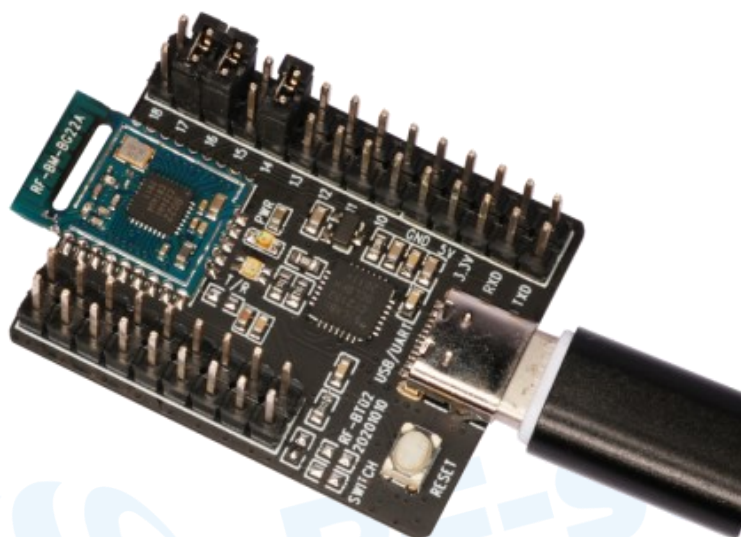
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1 Product Overview

RF-BT02 development board is a complete set of test products formed by a serial port module and a USB to UART baseboard for customer testing and development, which greatly reduces the difficulty of customers' testing and development. This user guide describes how to use the development board. For more information about our products, please visit the official website: www.szrfstar.com.



1.1 Functions and Resources

The function area distribution is shown in Figure 1 and Table 1.

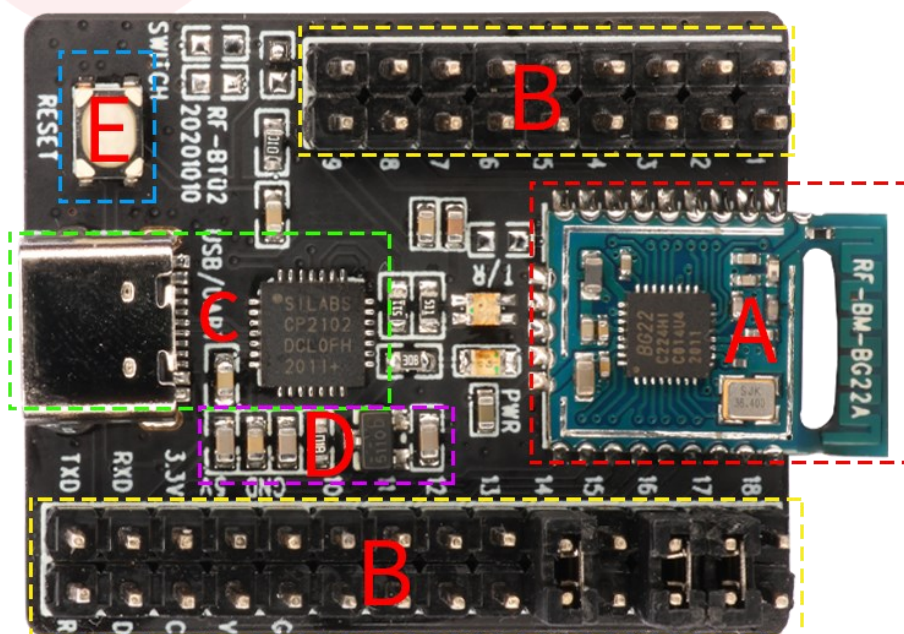


Figure 1. Function Area Distribution

Table 1. Function Area Description

Area	Name	Function
A	Module expansion area	The adapter modules are shown in Table 2.
B	Pin output area	All pins are pulled out, which is convenient for the test.
C	USB-to-UART area	USB-to-UART function can be used as a USB to TTL tool when there is no module.
D	3.3 V power supply area	Output voltage 3.3 V / 5 V
E	Button function area	Reset by pushing buttons

1.2 Adapter Modules

Table 2. Table of Adapter Modules

EFR32BG22Cx	nRF52832/10	nRF52805	CC2640R2F/L	CC2540/1	RS02A1-A/B
RF-BM-BG22A1	RF-BM-ND08	RF-BM-ND09	RF-BM-4044B2	RF-BM-S02	RSBRS02AA
RF-BM-BG22A2	RF-BM-ND08C	RF-BM-ND09A	RF-BM-4044B3	RF-BM-S02A	RSBRS02AI
RF-BM-BG22A3			RF-BM-4055B1L	RF-BM-S02I	RSBRS02ABR
					RSBRS02ABRI

1.3 Pin Description

◆ nRF52832/nRF52810 Series

Figure 2 is the pin diagram of RF-BT02 and RF-BM-ND08/RF-BM-ND08C, Table 3 shows the pin correspondence between the RF-BM-ND08/RF-BM-ND08C module and the development board, where A1 ~ A18 correspond to pin 2 ~ pin 19 of the module, Table 4 shows the detailed pin description of the RF-BM-ND08/RF-BM-ND08C. Please refer to the appendix for detailed pin descriptions of other modules.

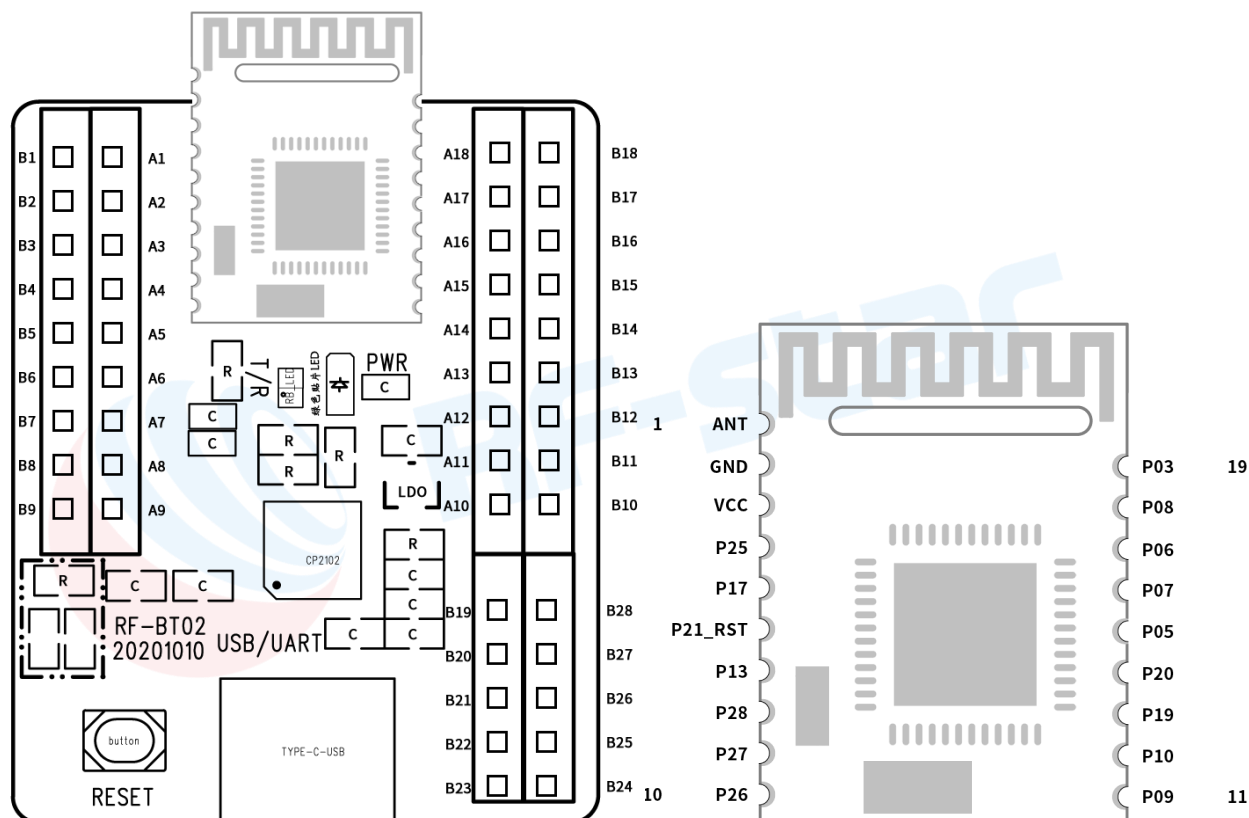


Figure 2. Pin Diagram RF-BT02 (Left) and RF-BM-ND08/RF-BM-ND08C (Right)

Table 3. Pin Correspondence between RF-BM-ND08 and RF-BT02

Outside Pins of RF-BT02	Description	Inside Pins of RF-BT02	Description
B1	GND	A1	GND. Need to short-circuit via the jumper.
B2	VCC	A2	VCC. Need to short-circuit via the jumper.
B3	GND	A3	P25
B4	GND	A4	Broadcast indicator (P17)
B5	Reset	A5	RESET (P21)

B6	GND	A6	Wake-up IO (P13)
B7	GND	A7	P28
B8	GND	A8	P27
B9	GND	A9	P26
B10	GND	A10	P09
B11	GND	A11	P10
B12	GND	A12	RESTORE (P19)
B13	GND	A13	P20
B14	GND	A14	RTS (P05)
B15	GND	A15	Module CTS. Need to short-circuit via the jumper. (P07)
B16	RXD (CP2102)	A16	Module TX. Need to short-circuit via the jumper. (P06)
B17	TXD (CP2102)	A17	Module RX. Need to short-circuit via the jumper. (P08)
B18	GND	A18	P03
B19	GND		
B20	VCC (5 V)		
B21	VCC (3.3 V)		
B22	RXD (CP2102)		
B23	TXD (CP2102)		
B24	RESET		
B25	SWD (J-Link)		
B26	SWC (J-Link)		
B27	VCC (3.3 V)		
B28	GND		

Table 4. Pin Functions of RF-BM-ND08/RF-BM-ND08C

Pin	Name	Chip Pin	I/O	Description
A1	GND	GND	-	Ground
A2	VCC	VCC	-	Power supply 1.7 V ~ 3.6 V, Recommend 3.3 V
A3	-	P25	I/O	
A4	Status indication	P17	-	Slave mode (including Beacon) connection status indicator: low when connected, LED always on under connection.

A5	RESET	P21	I/O	Reset pin, active low.
A6	Wake-up IO	P13	I	It can wake up the module when the module is in sleep state. Falling edge valid.
A7	-	P28	I/O	
A8	-	P27	I/O	
A9	-	P26	I/O	
A10	-	P09	I/O	
A11	-	P10	I/O	
A12	RESTORE	P19	-	Keep this pin at a low level for 3 s, all parameters are restored to factory settings.
A13	-	P20	I/O	
A14	RTS	P05	O	The module output signal (Standard hardware flow control: Require To Send). When it is at a high level, the module serial port is busy, and the MCU is not allowed to send data to the module serial port. When it is at a low level, the MCU is allowed to send data to the module serial port.
A15	CTS	P07	I	The module input signal (Standard hardware flow control: Clear To Send). When it is at a high level, the MCU serial port is busy, and the module will not send data to the MCU serial port. When it is at a low level, the module will send data to the MCU serial port.
A16	TX	P06	O	Serial port TX
A17	RX	P08	I	Serial port RX
A18	-	P03	I/O	

◆ nRF52805 Series

The following figure 3 is the pin diagram of RF-BT02 and RF-BM-ND09 (bottom view). Table 5 shows the pin correspondence between the module and the development board. Table 6 shows the module detailed pin description.

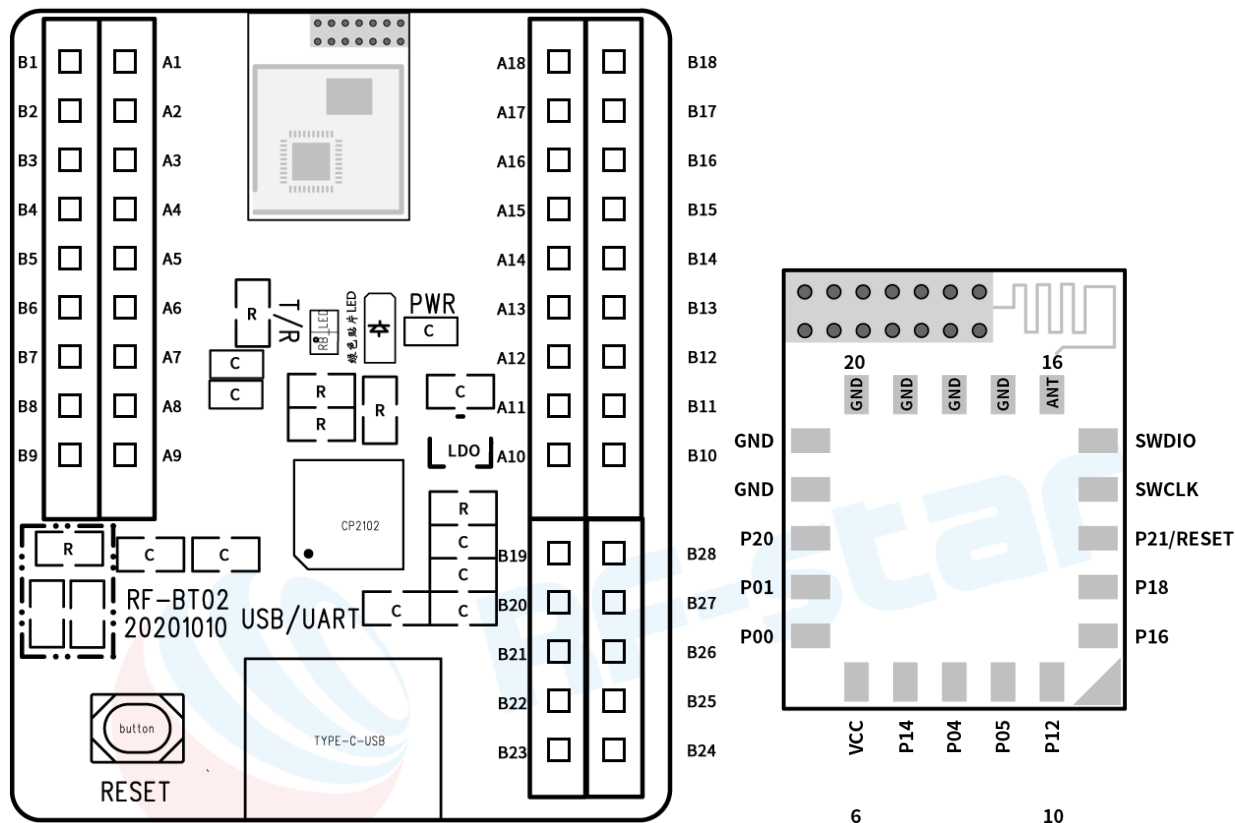


Figure 3. Pin Diagram RF-BT02 (Left) and RF-BM-ND09 (Right)

Table 5. Pin Correspondence between RF-BM-ND09 and RF-BT02

Outside Pins of RF-BT02	Description	Inside Pins of RF-BT02	Description
B1	GND	A1	
B2	VCC	A2	
B3	GND	A3	
B4	GND	A4	
B5	Reset	A5	RESET
B6	GND	A6	P18
B7	GND	A7	
B8	GND	A8	

B9	GND	A9	
B10	GND	A10	Status indicator (P16)
B11	GND	A11	Status control (P12)
B12	GND	A12	RESTORE (P05)
B13	GND	A13	P04
B14	GND	A14	Module CTS (P14)
B15	GND	A15	Module BRTS (P00)
B16	RXD (CP2102)	A16	Module TX. Need to short-circuit via the jumper (PC01).
B17	TXD (CP2102)	A17	Module RX. Need to short-circuit via the jumper (PC20)
B18	GND	A18	GND
B19	GND		
B20	VCC (5 V)		
B21	VCC (3.3 V)		
B22	RXD (CP2102)		
B23	TXD (CP2102)		
B24	RESET		
B25	SWD (J-Link)		
B26	SWC (J-Link)		
B27	VCC (3.3 V)		
B28	GND		

Table 6. Pin Functions of RF-BM-ND09(A)

Pin	Name	Chip Pin	Pin Type	Description
1	GND	GND	GND	Ground
2	GND	GND	GND	Ground
3	P20	P0_20	RX	Serial port RX
4	P01	P0_01/XL2	TX	Serial port TX
5	P00	P0_00/XL1	RTS	Module output signal (Standard hardware flow control: Require To Send). When it is at a high level, the module

				serial port is busy, and the MCU is not allowed to send data to the module serial port. When it is at a low level, the MCU is allowed to send data to the module serial port.
6	VCC	VDD	Positive input	Power supply 1.7 V ~ 3.6 V, Recommend 3.3 V
7	P14	P0_14	CTS	Module input signal (Standard hardware flow control: Clear To Send). When it is at a high level, the MCU serial port is busy, and the module will not send data to the MCU serial port. When it is at a low level, the module will send data to the MCU serial port.
8	P04	P0_04/AIN2	I/O	
9	P05	P0_05/AIN3	RESTORE	Keep this pin at a low level for 3 s, all parameters are restored to factory settings.
10	P12	P0_12	Status control	To control the switch of work and sleep mode. Active on falling edge
11	P16	P0_16	Status indicator	Connection status indicator: low when connected. (LED always on)
12	P18	P0_18	I/O	
13	P21/RESET	P0_21/RESET	I/O	Reset, active low.
14	SWCLK	SWCLK	Debug	Serial wire debug clock input for debugging and programming
15	SWDIO	SWDIO	Debug	Serial wire debug I/O for debugging and programming
16	ANT	ANT	ANT	External antenna interface
17	GND	GND	-	Ground
18	GND	GND	-	Ground
19	GND	GND	-	Ground
20	GND	GND	-	Ground

◆ EFR32BG22 Series

The following figure 4 is the pin diagram of RF-BT02 and RF-BM-BG22A1/RF-BM-BG22A2/RF-BM-BG22A3. Table 7 shows the pin correspondence between the module and the development board. A1 ~ A9 correspond to pin 2 to pin 10 of the module, and A10 ~ A18 correspond to pin 16 to pin 24 of the module. Table 8 shows the module detailed pin description.

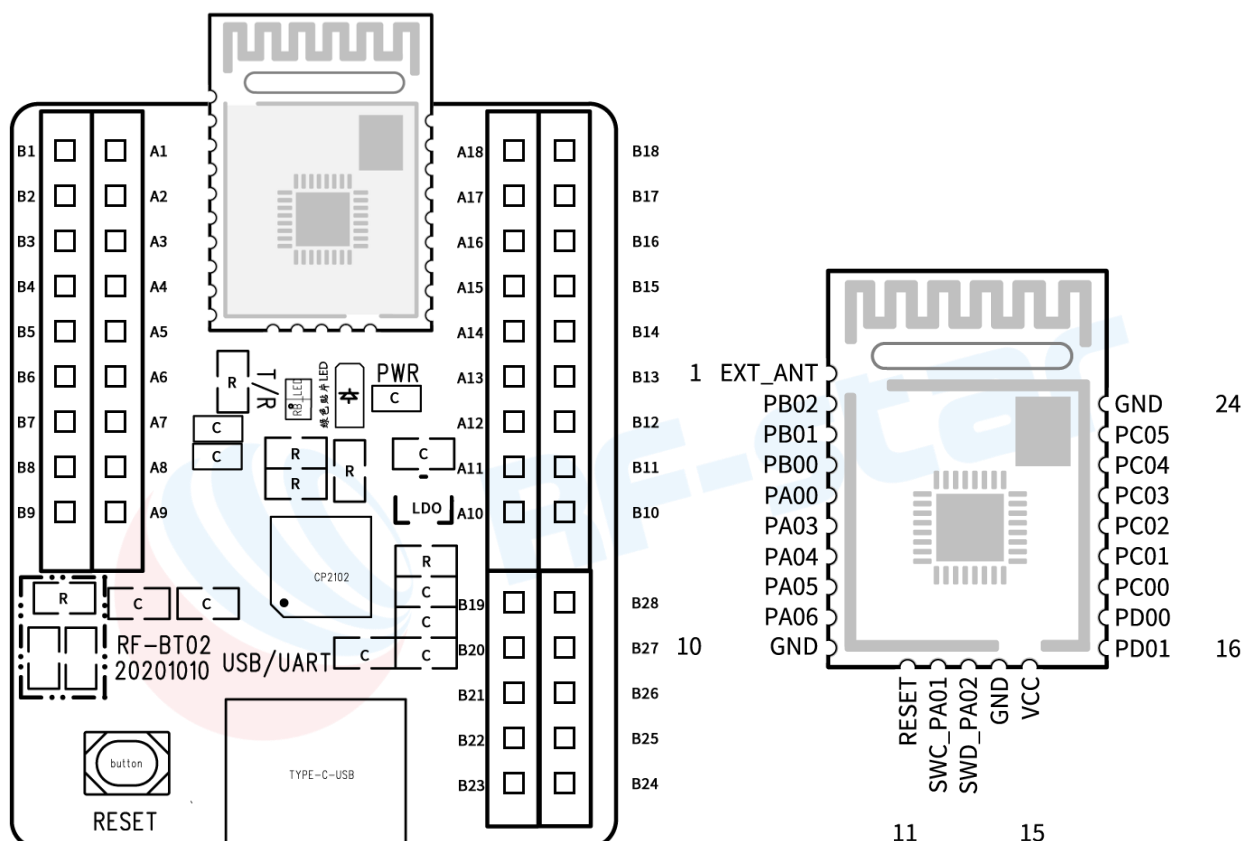


Figure 4. Pin Diagram RF-BT02 (Left) and RF-BM-BG22A1/A2/A3 (Right)

Table 7. Pin Correspondence between RF-BM-BG22A1/A2/A3 and RF-BT02

Outside Pins of RF-BT02	Description	Inside Pins of RF-BT02	Description
B1	GND	A1	PB02
B2	VCC	A2	PB01
B3	GND	A3	RESTORE(PB00)
B4	GND	A4	PA00
B5	Module CTS (PA03)	A5	RESET (development board)

B6	GND	A6	Module RTS (PA04)
B7	GND	A7	Module TX (PA05)
B8	GND	A8	Module RX (PA06)
B9	GND	A9	GND
B10	GND	A10	Slave mode connection status indicator (PD01)
B11	GND	A11	Master mode connection status indicator (PD00)
B12	GND	A12	PC00
B13	GND	A13	PC01
B14	GND	A14	PC02
B15	GND	A15	PC03
B16	RXD (CP2102)	A16	PC04
B17	TXD (CP2102)	A17	PC05
B18	GND	A18	GND
B19	GND		
B20	VCC (5 V)		
B21	VCC (3.3 V)		
B22	RXD (CP2102)		
B23	TXD (CP2102)		
B24	RESET		
B25	SWD (J-Link)		
B26	SWC (J-Link)		
B27	VCC (3.3 V)		
B28	GND		

Remark: B5 is the GPIO PA03 of the module, and A5 is the RESET pin of the development board.

Table 8. Pin Functions of RF-BM-BG22A1/A2/A3

Pin	Name	Chip Pin	Pin Type	Description
1	EXT_ANT	-	-	External antenna pin.
2	PB02	PB02	I/O	GPIO
3	PB01	PB01	I/O	GPIO
4	PB00	PB00	RESTORE	Keep this pin at a low level for 5 s, all parameters are restored to factory settings.
5	PA00	PA00	I/O	GPIO
6	PA03	PA03	CTS	The module input signal (Standard hardware flow control: Clear To Send). When it is at a high level, the MCU serial port is busy, and the module will not send data to the MCU serial port. When it is at a low level, the module will send data to the MCU serial port.
7	PA04	PA04	RTS	The module output signal (Standard hardware flow control: Require To Send). When it is at a high level, the module serial port is busy, and the MCU is not allowed to send data to the module serial port. When it is at a low level, the MCU is allowed to send data to the module serial port.
8	PA05	PA05	TX	Serial port TX
9	PA06	PA06	RX	Serial port RX
10	GND	GND	-	Ground
11	RESET	RESET	I	Reset, active low, internal pull-up.
12	PA01	PA01	I/O	GPIO / SWCLK (connect j-link)
13	PA02	PA02	I/O	GPIO / SWCDIO (connect j-link)
14	GND	GND	-	Ground
15	VCC	VCC	-	1.71 V ~ 3.8 V, recommended to 3.3 V
16	PD01	PD01	Status indicator	Slave mode (including Beacon) connection status indicator: low when connected. (LED always on)
17	PD00	PD00	Status	Master mode connection status indicator: low when

			indicator	connected. (LED always on)
18	PC00	PC00	I/O	GPIO
19	PC01	PC01	I/O	GPIO
20	PC02	PC02	I/O	GPIO
21	PC03	PC03	I/O	GPIO
22	PC04	PC04	TX	GPIO
23	PC05	PC05	RX	GPIO
24	GND	GND	-	Ground



◆ CC2540/CC2541 Series

Figure 5 is the pin diagram of RF-BT02 and RF-BM-S02/RF-BM-S02A/RF-BM-S02I. Table 9 shows the pin correspondence between the module and the development board. A1~A18 correspond to pin 1 to 18 pins of the module. Table 10 shows the module detailed pin description.

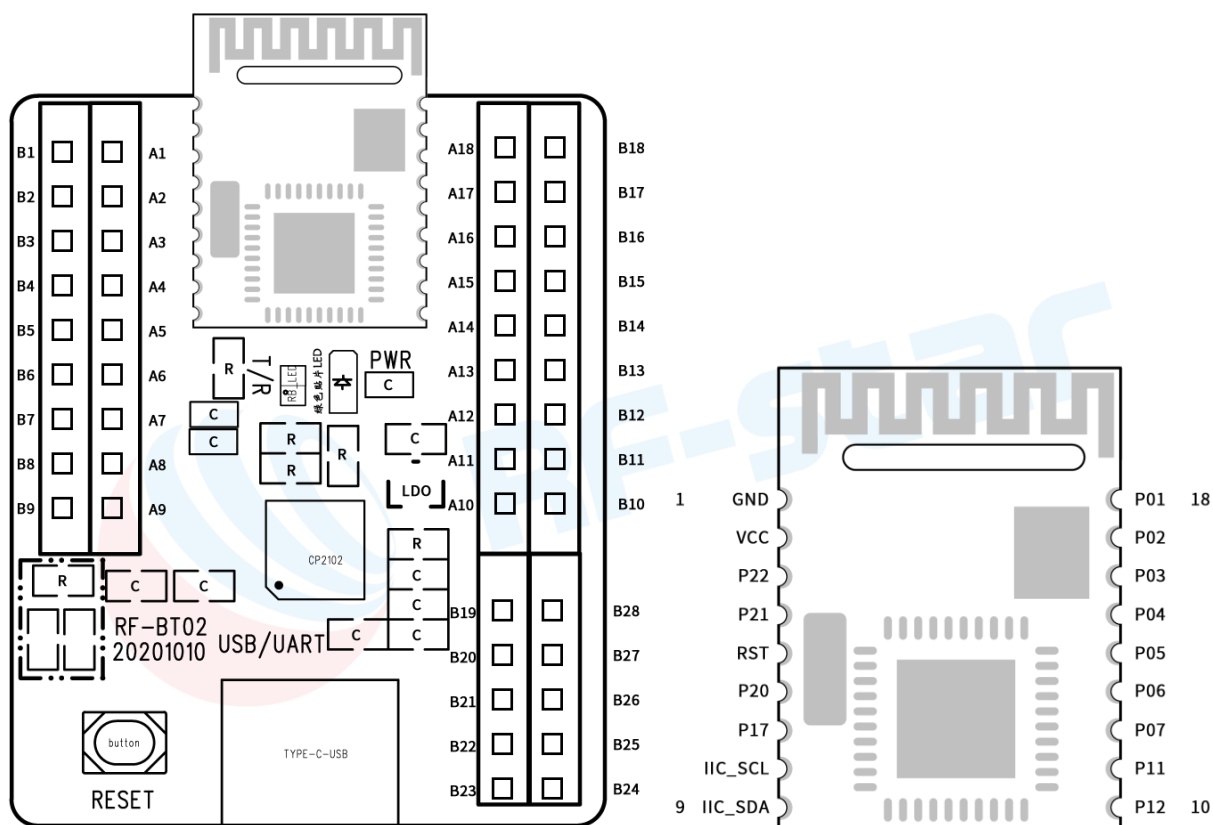


Figure 5. Pin Diagram RF-BT02 (Left) and RF-BM-S02/RF-BM-S02A/RF-BM-S02I (Right)

Table 9. Pin Correspondence between RF-BM-S02/RF-BM-S02A/RF-BM-S02I and RF-BT02

Outside Pins of RF-BT02	Description	Inside Pins of RF-BT02	Description
B1	GND	A1	GND. Need to short-circuit via the jumper.
B2	VCC	A2	VCC. Need to short-circuit via the jumper.
B3	GND	A3	Sleep status indicator (P22)
B4	GND	A4	Connection status indicator (P21)
B5	Reset	A5	RESET

B6	GND	A6	EN. Need to short-circuit via the jumper and pull low. (P20)
B7	GND	A7	P17
B8	GND	A8	IIC_SCL (CC2541) / USB+ (CC2540)
B9	GND	A9	IIC_SDA (CC2541) / USB- (CC2540)
B10	GND	A10	RESTORE (P12)
B11	GND	A11	P11
B12	GND	A12	P07
B13	GND	A13	P06
B14	GND	A14	BRTS. Need to short-circuit via the jumper and pull low. (P05)
B15	GND	A15	BCTS (P04)
B16	RXD (CP2102)	A16	Module TX. Need to short-circuit via the jumper (P03)
B17	TXD (CP2102)	A17	Module RX. Need to short-circuit via the jumper (P02)
B18	GND	A18	P01
B19	GND		
B20	VCC (5 V)		
B21	VCC (3.3 V)		
B22	RXD (CP2102)		
B23	TXD (CP2102)		
B24	RESET		
B25	DD (CC Debugger)		
B26	DC (CC Debugger)		
B27	VCC (3.3 V)		
B28	GND		

Table 10. Pin Functions of RF-BM-S02/RF-BM-S02A/RF-BM-S02I

Pin	Name	Chip Pin	I/O	Description
A1	GND	GND	-	Ground
A2	VCC	VCC	-	Power supply 2 V ~ 3.6 V

A3	-	P22	O	Output (timed flip) / sleep status indication
A4	-	P21	O	Output (timed flip) / connection status indication
A5	RST	RST	I	Reset, active low.
A6	EN	P20	I	Module-enabled control circuit (active low) 0: Module starts to broadcast, until it connects to the mobile device. 1: Enter sleep mode immediately (0.1 μ A), regardless of the current status.
A7	-	P17	I/O	
A8	-	-	I/O	
A9	-	-	I/O	
A10	RESTORE	P12	I/O	
A11	PWM1	P11	O	PWM output channel 1
A12	PWM3	P07	O	PWM output channel 3
A13	PWM4	P06	O	PWM output channel 4
A14	BRTS	P05	I	As the request of data sending (for module wake-up) 0: Master has data to send, and the module will wait for data transmission from the master, so the module will not sleep. 1. Master has no data to send, or data has been sent. So, the value of the signal line should be set at "1".
A15	BCTS	P04	O	Data input signal (for master wake-up, optional) 0: Module has data to send, and the master will receive the data from the module. 1: Module has no data to send, or data has been sent, and the value of the signal line should be set at "1".
A16	TX	P03	O	Serial port TX
A17	RX	P02	I	Serial port RX
A18	ADC1	P01	I	Analog acquisition, channel 1

◆ CC2640R2F/CC2640R2L Series

Figure 6 is the pin diagram of RF-BT02 and RF-BM-4044B2/RF-BM-4044B3/RF-BM-4055B1L. Table 11 shows the pin correspondence between the module and the development board. A1 ~ A18 correspond to pin 1 to 18 pins of the module. Table 12 shows the module detailed pin description.

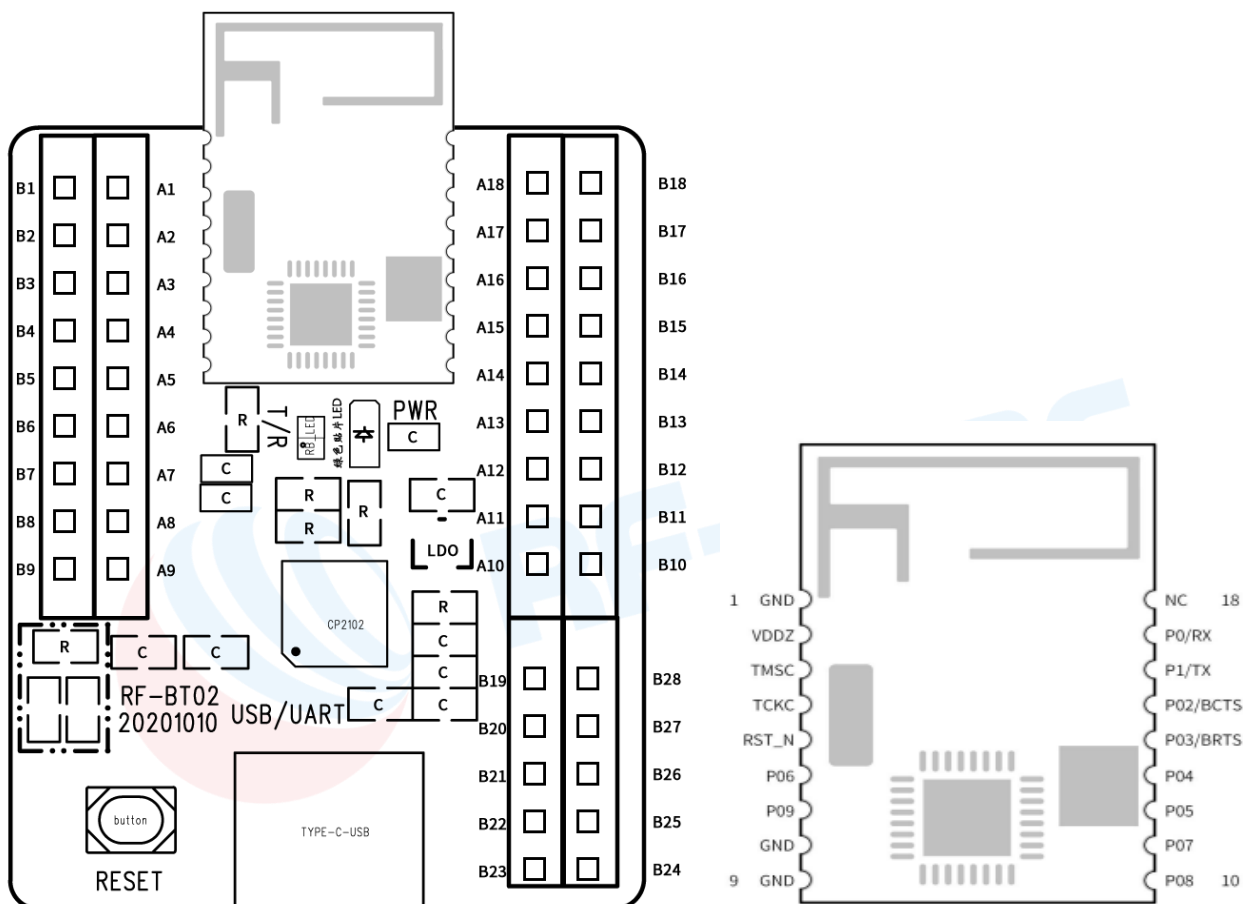


Figure 6. Pin Diagram RF-BT02 (Left) and RF-BM-4044B2/RF-BM-4044B3/RF-BM-4055B1L (Right)

Table 11. Pin Correspondence between RF-BM-4044B2/RF-BM-4044B3/RF-BM-4055B1L and RF-BT02

Outside Pins of RF-BT02	Description	Inside Pins of RF-BT02	Description
B1	GND	A1	GND. Need to short-circuit via the jumper.
B2	VCC	A2	VCC. Need to short-circuit via the jumper.
B3	GND	A3	TMS (XDS)
B4	GND	A4	TCK (XDS)
B5	Reset	A5	RST

B6	GND	A6	EN. Need to short-circuit via the jumper and pull low. (P06)
B7	GND	A7	P09
B8	GND	A8	GND
B9	GND	A9	GND
B10	GND	A10	P08
B11	GND	A11	P07
B12	GND	A12	Link indicator (P05)
B13	GND	A13	Broadcast indicator (P04)
B14	GND	A14	BRTS. Need to short-circuit via the jumper and pull low. (P03)
B15	GND	A15	BCTS (P02)
B16	RXD (CP2102)	A16	Module TX. Need to short-circuit via the jumper. (P01)
B17	TXD (CP2102)	A17	Module RX. Need to short-circuit via the jumper. (P00)
B18	GND	A18	NC
B19	GND		
B20	VCC (5 V)		
B21	VCC (3.3 V)		
B22	RXD (CP2102)		
B23	TXD (CP2102)		
B24	RESET		
B25	TCK (XDS)		
B26	TMS (XDS)		
B27	VCC (3.3 V)		
B28	GND		

Table 12. Pin Functions of RF-BM-4044B2

Pin	Name	Chip Pin	I/O	Description
A1	GND	GND	-	Ground
A2	VCC	VCC	-	Power supply 1.8 V~3.8 V. Recommend 3.3 V

A3	TMS	-	I/O	Connect to XDS TMS
A4	TCK	-	I/O	Connect to XDS TCK
A5	RESET	-	-	Reset, active low, and no internal pull-up
A6	EN	P06	I	Module-enabled control circuit (active low) 0: Module starts to broadcast, until it connects to the mobile device. 1: Enter sleep mode immediately (0.1 μ A), regardless of the current status.
A7	-	P09	I/O	
A8	GND	-	-	Ground
A9	GND	-	-	Ground
A10	RESTORE	P08	I/O	Factory reset trigger Keep this pin at a low level for 5 s, the system can be partially reset (light recovery). If keeping more than 20 s, the system can be completely reset (deep recovery).
A11	-	P07	I/O	
A12	Link indicator	P05	O	Link indicator 0: Bluetooth connected 1: Bluetooth disconnected
A13	Broadcast indicator	P04	O	Broadcast indicator 0: Turn-on broadcast 1: Turn-off broadcast
A14	BRTS	P03	-	As the request of data sending (for module wake-up) 0: Master has data to send, and the module will wait for data transmission from the master, so the module will not sleep. 1. Master has no data to send, or data has been sent. So, the value of the signal line should be set at "1".
A15	BCTS	P02	O	Data input signal (for master wake-up, optional) 0: Module has data to send, and the master will receive the data from the module. 1: Module has no data to send, or data has been sent, and the value of the signal line should be set at "1".
A16	TX	P01	O	Serial port TX

A17	RX	P00	I	Serial port RX
A18	NC	-	-	



◆ RS02A1-A Series

Figure 7 is the pin diagram of RF-BT02 and RSBRS02AA/RSBRS02AI. Table 13 shows the pin correspondence between the module and the development board. A1 ~ A18 correspond to pin 1 to pin 18 of the module. Table 14 shows the module detailed pin description.

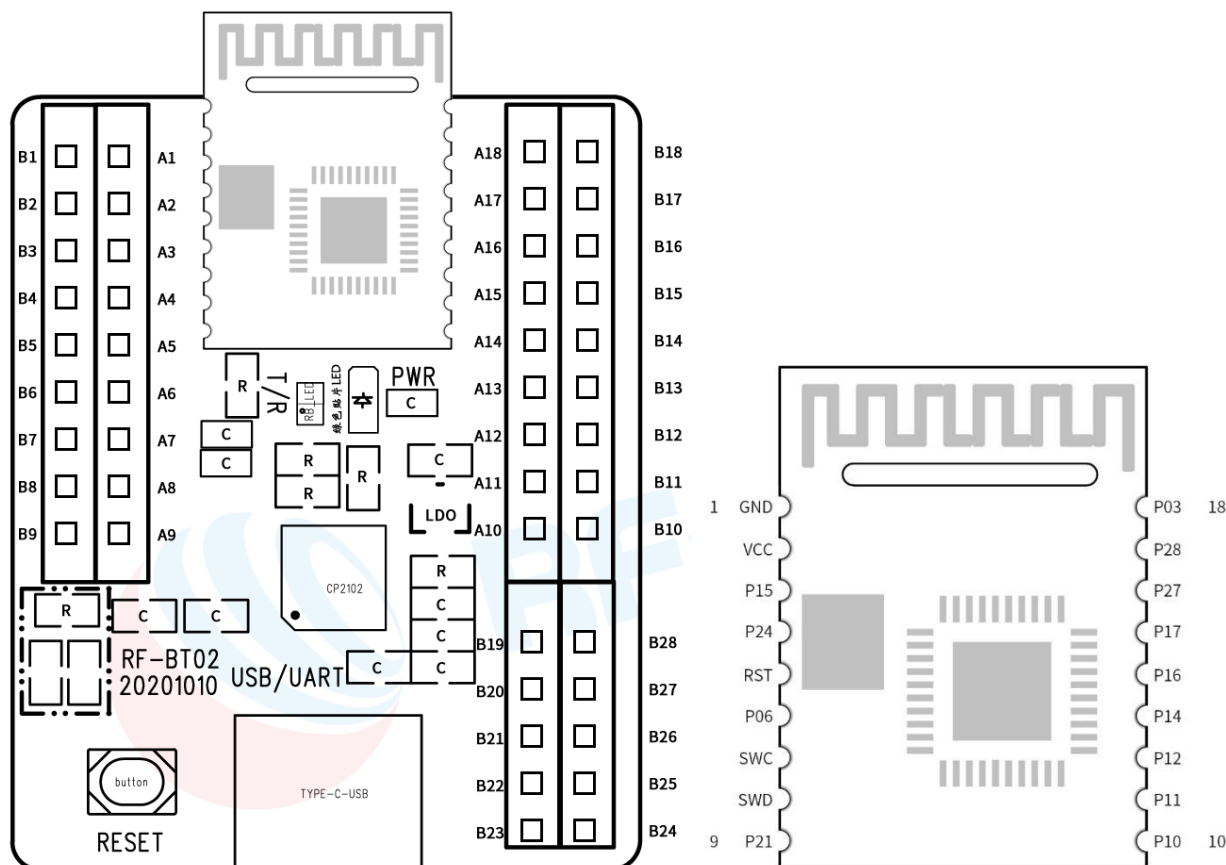


Figure 7. Pin Diagram RF-BT02 (Left) and RSBRS02AA/RSBRS02AI (Right)

Table 13. Pin Correspondence between RSBRS02AA/RSBRS02AI and RF-BT02

Outside Pins of RF-BT02	Description	Inside Pins of RF-BT02	Description
B1	GND	A1	GND. Need to short-circuit via the jumper.
B2	VCC	A2	VCC. Need to short-circuit via the jumper
B3	GND	A3	Sleep status indicator (P15)
B4	GND	A4	Connection status indicator (P24)
B5	Reset	A5	RESET
B6	GND	A6	EN. Need to short-circuit via the jumper and pull

			low. (P06)
B7	GND	A7	SWC
B8	GND	A8	SWD
B9	GND	A9	P21
B10	GND	A10	RESTORE (P10)
B11	GND	A11	P11
B12	GND	A12	P12
B13	GND	A13	P14
B14	GND	A14	BRTS. Need to short-circuit via the jumper and pull low. (P16)
B15	GND	A15	BCTS (P17)
B16	RXD (CP2102)	A16	TX. Need to short-circuit via the jumper (P27)
B17	TXD (CP2102)	A17	RX. Need to short-circuit via the jumper (P28)
B18	GND	A18	P03
B19	GND		
B20	VCC (5 V)		
B21	VCC (3.3 V)		
B22	RXD (CP2102)		
B23	TXD (CP2102)		
B24	RESET		
B25	SWD (J-Link)		
B26	SWC (J-Link)		
B27	VCC (3.3 V)		
B28	GND		

Table 14. Pin Functions of RSBRS02AA/RSBRS02AI

Pin	Name	Chip Pin	I/O	Description
A1	GND	GND	-	Ground
A2	VCC	VCC	-	Power supply 1.6 V ~ 3.6 V, Recommend 3.3 V
A3	-	P15	O	Output port (able to timed reversal) / Sleep mode indicator
A4	-	P24	O	Output port (able to timed reversal) / Connection status indicator
A5	RESET	RST	I	Reset, active low.

A6	EN	P06	I	Module-enabled control circuit (active low) 0: Module starts to broadcast, until it connects to the mobile device. 1: Enter sleep mode immediately (0.1 μA), regardless of the current status.
A7	SWC	SWC	-	JTAG clock pin
A8	SWD	SWD	-	JTAG data pin
A9	-	P21	I/O	
A10	RESTORE	P10	I/O	
A11	-	P11	I/O	
A12	-	P12	I/O	
A13	-	P14	I/O	
A14	BRTS	P16	I	As the request of data sending (for module wake-up) 0: Master has data to send, and the module will wait for data transmission from the master, so the module will not sleep. 1. Master has no data to send, or data has been sent. So, the value of the signal line should be set at "1".
A15	BCTS	P17	O	Data input signal (for master wake-up, optional) 0: Module has data to send, and the master will receive the data from the module. 1: Module has no data to send, or data has been sent, and the value of the signal line should be set at "1".
A16	TX	P27	O	Serial port TX
A17	RX	P28	I	Serial port RX
A18	-	P03	I/O	

◆ RS02A1-B Series

Figure 8 is the pin diagram of RF-BT02 and RSBRS02ABR/RSBRS02ABRI. Table 15 shows the pin correspondence between the module and the development board. A1 ~ A18 correspond to pin 1 to pin 18 of the module. Table 16 shows the module detailed pin description.

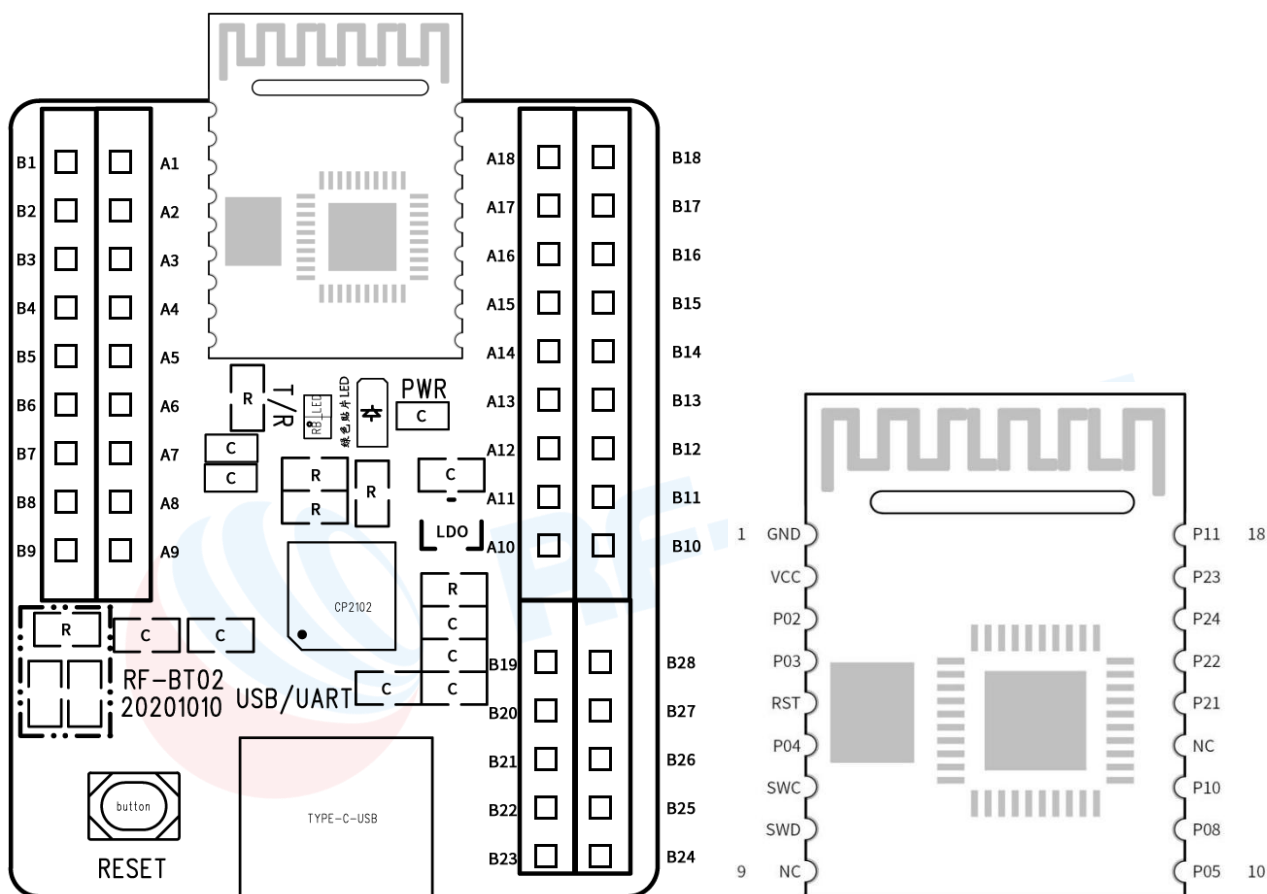


Figure 8. Pin Diagram RF-BT02 (Left) and RSBRS02ABR/RSBRS02ABRI (Right)

Table 15. Pin Correspondence between RSBRS02ABR/RSBRS02ABRI and RF-BT02

Outside Pins of RF-BT02	Description	Inside Pins of RF-BT02	Description
B1	GND	A1	GND. Need to short-circuit via the jumper
B2	VCC	A2	VCC. Need to short-circuit via the jumper
B3	GND	A3	Sleep status indicator(P02)
B4	GND	A4	Connection status indicator (P03)
B5	Reset	A5	RESET

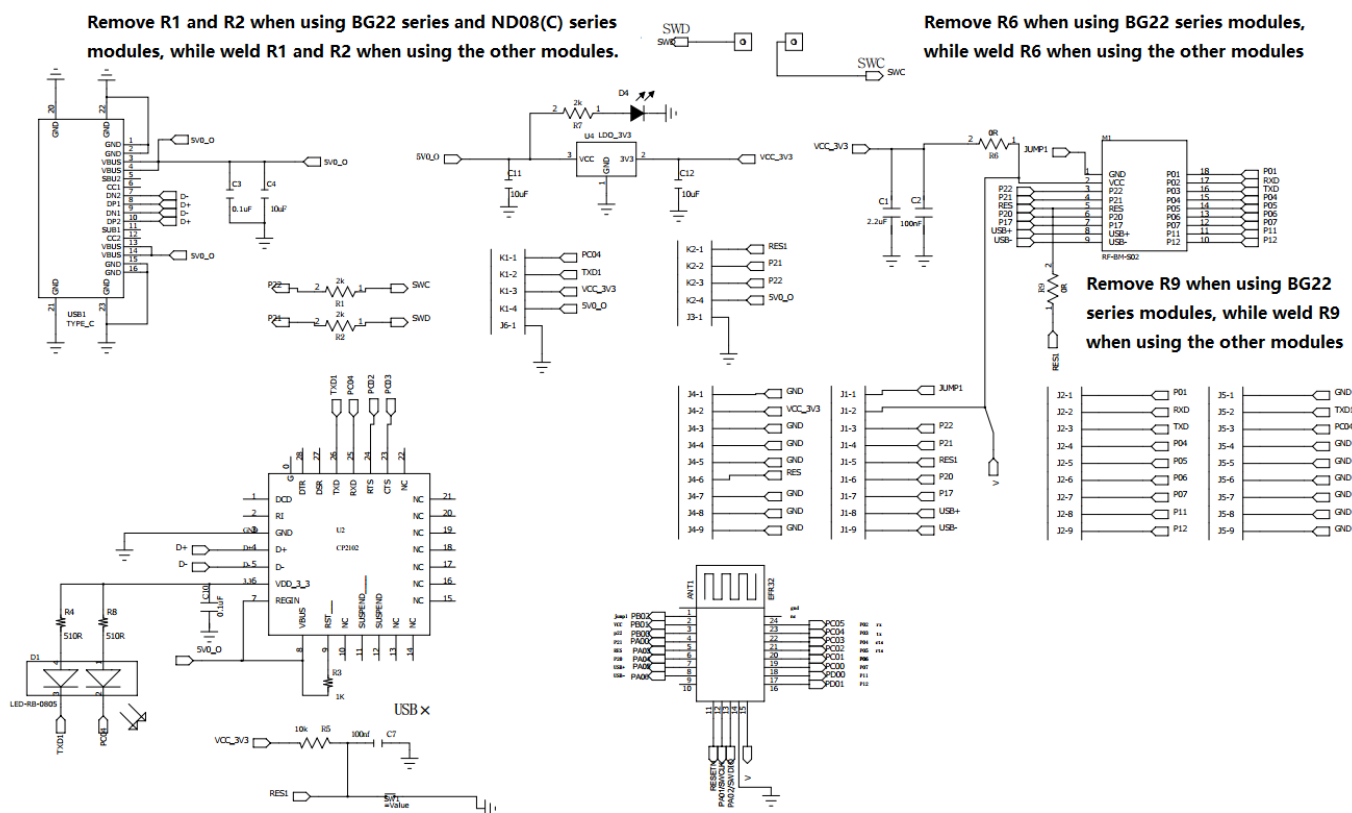
B6	GND	A6	EN. Need to short-circuit via the jumper and pull low. (P04)
B7	GND	A7	SWC
B8	GND	A8	SWD
B9	GND	A9	NC
B10	GND	A10	RESTORE (P05)
B11	GND	A11	P08
B12	GND	A12	P10
B13	GND	A13	NC
B14	GND	A14	BRTS. Need to short-circuit via the jumper and pull low. (P21)
B15	GND	A15	BCTS (P22)
B16	RXD (CP2102)	A16	TX. Need to short-circuit via the jumper. (P24)
B17	TXD (CP2102)	A17	RX. Need to short-circuit via the jumper. (P23)
B18	GND	A18	P11
B19	GND		
B20	VCC (5 V)		
B21	VCC (3.3 V)		
B22	RXD (CP2102)		
B23	TXD (CP2102)		
B24	RESET		
B25	SWD (J-Link)		
B26	SWC (J-Link)		
B27	VCC (3.3 V)		
B28	GND		

Table 16. Pin Functions of RSBRS02ABR/RSBRS02ABRI

Pin	Name	Chip Pin	I/O	Description
A1	GND	GND	-	Ground
A2	VCC	VCC	-	Power supply 2 V ~ 3.6 V
A3	-	P02	O	Output port (able to timed reversal) / Sleep mode indicator
A4	-	P03	O	Output port (able to timed reversal) / Connection status indicator

A5	RESET	RST	I	Reset, active low.
A6	EN	P04	I	Module-enabled control circuit (active low) 0: Module starts to broadcast, until it connects to the mobile device. 1: Enter sleep mode immediately (0.1 μ A), regardless of the current status.
A7	SWC	SWC	–	JTAG clock pin
A8	SWD	SWD	–	JTAG data pin
A9	NC	–	–	
A10	RESTORE	P05	I/O	
A11	PWM2	P08	I/O	Use FFB1 to control PWM output after Bluetooth connection
A12	PWM1	P10	I/O	Use FFB1 to control PWM output after Bluetooth connection
A13	NC	–	–	
A14	BRTS	P21	I	As the request of data sending (for module wake-up) 0: Master has data to send, and the module will wait for data transmission from the master, so the module will not sleep. 1: Master has no data to send, or data has been sent. So, the value of the signal line should be set at “1”.
A15	BCTS	P22	O	Data input signal (for master wake-up, optional) 0: Module has data to send, and the master will receive the data from the module. 1: Module has no data to send, or data has been sent, and the value of the signal line should be set at “1”.
A16	TX	P24	O	Serial port TX
A17	RX	P23	I	Serial port RX
A18	ADC	–	I	

1.4 Schematic Diagram of RF-BT02



2 Transparent Transmission Introduction for Use

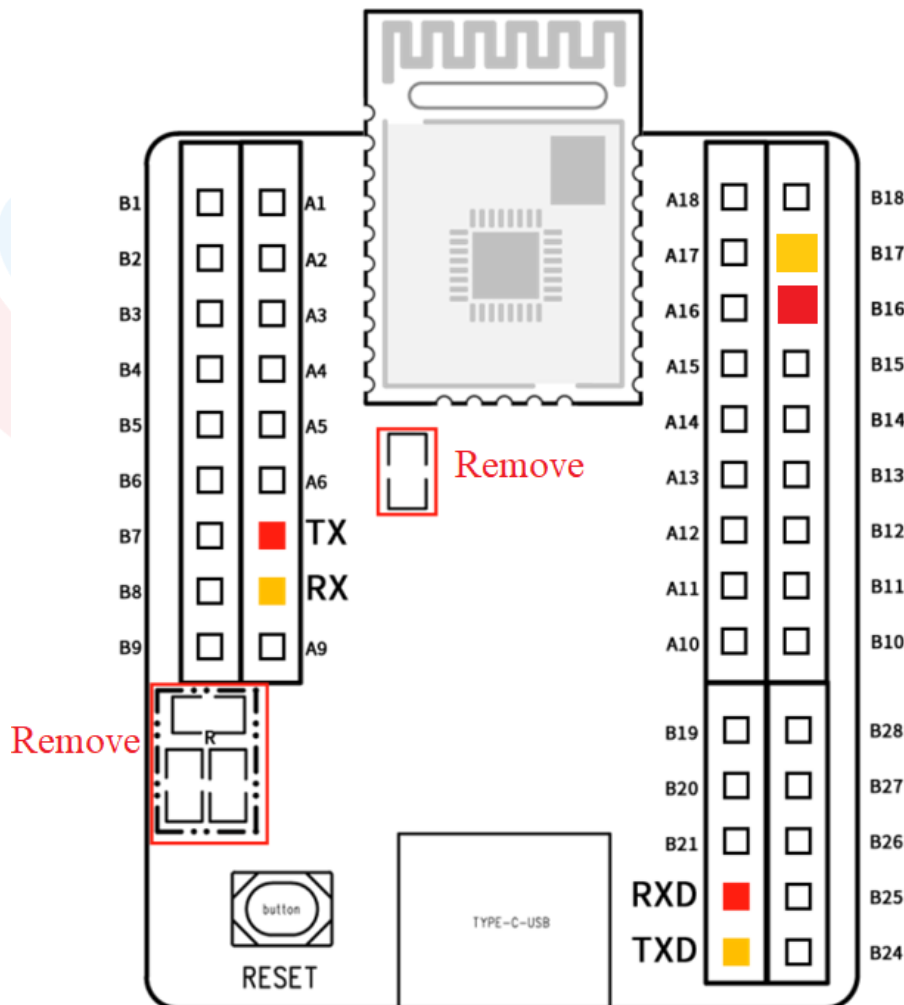
2.1 Preparation of Hardware and Software

1. Prepare RF-BT02 development board, USB to Type-C cable.

◆ EFR32BG22 Series

BG22Ax series: RF-BM-BG22A1, RF-BM-BG22A2, RF-BM-BG22A3.

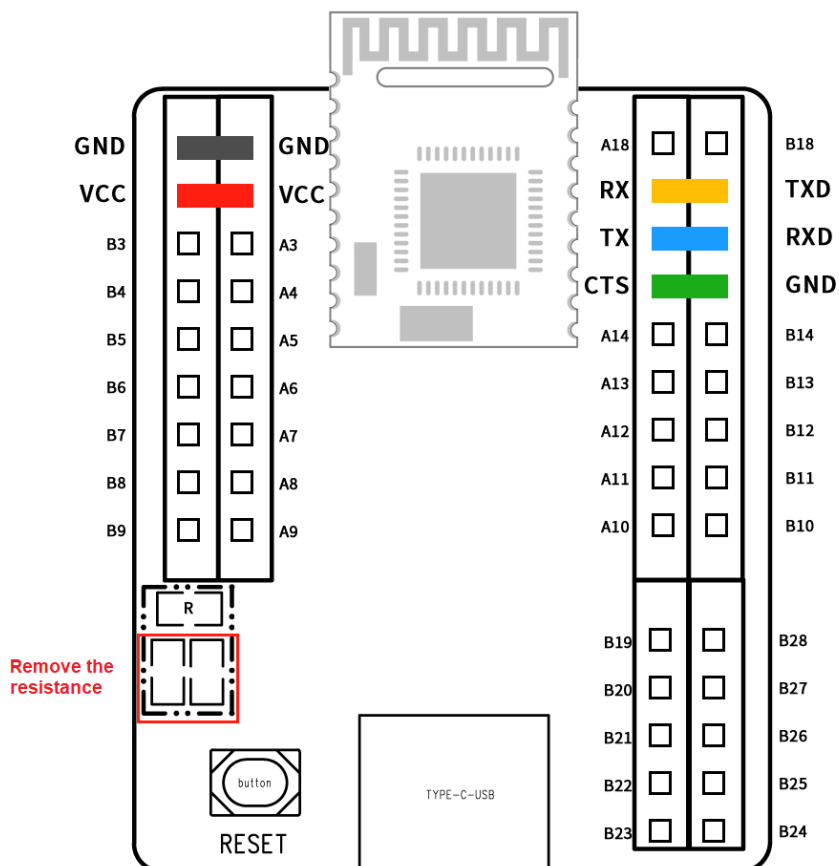
When using the BG22Ax series modules, the following pins need to be connected via DuPont cables: A7 and B22/B16 (TX → RXD), A8 and B23/B17 (RX → TXD). As shown in the figure below (Remove the 0 R resistance from the red box):



◆ nRF52832/nRF52810 Series

nRF52832/nRF52810 series: RF-BM-ND08, RF-BM-ND08C.

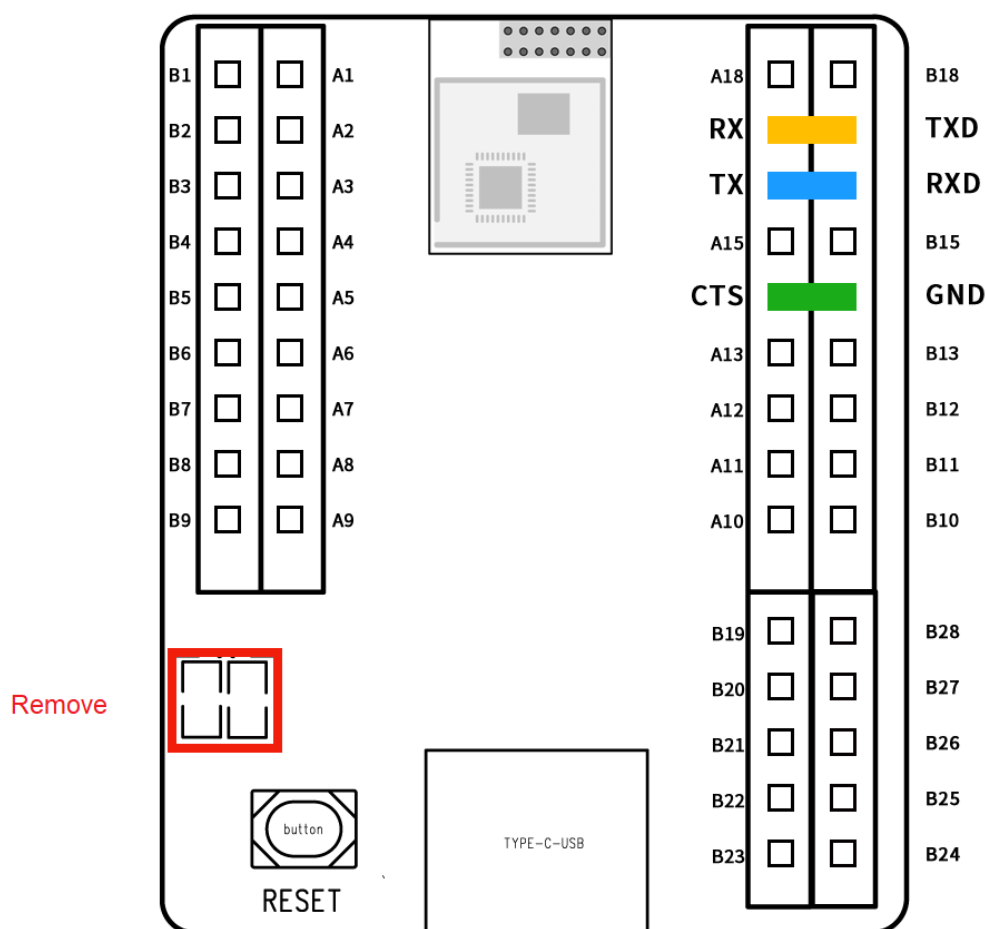
When using the nRF52832/nRF52810 series modules, the following pins need to be short-circuited via jumpers: A1 and B1 (GND), A2 and B2 (VCC), A15 and B15 (pull CTS low), A16 and B16 (TX → RXD), A17 and B17 (RX → TXD). As shown in the figure below (Remove the 0 R resistance from the red box):



◆ nRF52805 Series

nRF52805 series: RF-BM-ND09, RF-BM-ND09A.

When using the nRF52805 series modules, the following pins need to be short-circuited via jumpers: A14 and B14 (pull CTS low), A16 and B16 (TX → RXD), A17 and B17 (RX→TXD). As shown in the figure below (Remove the 0 R resistance from the red box):



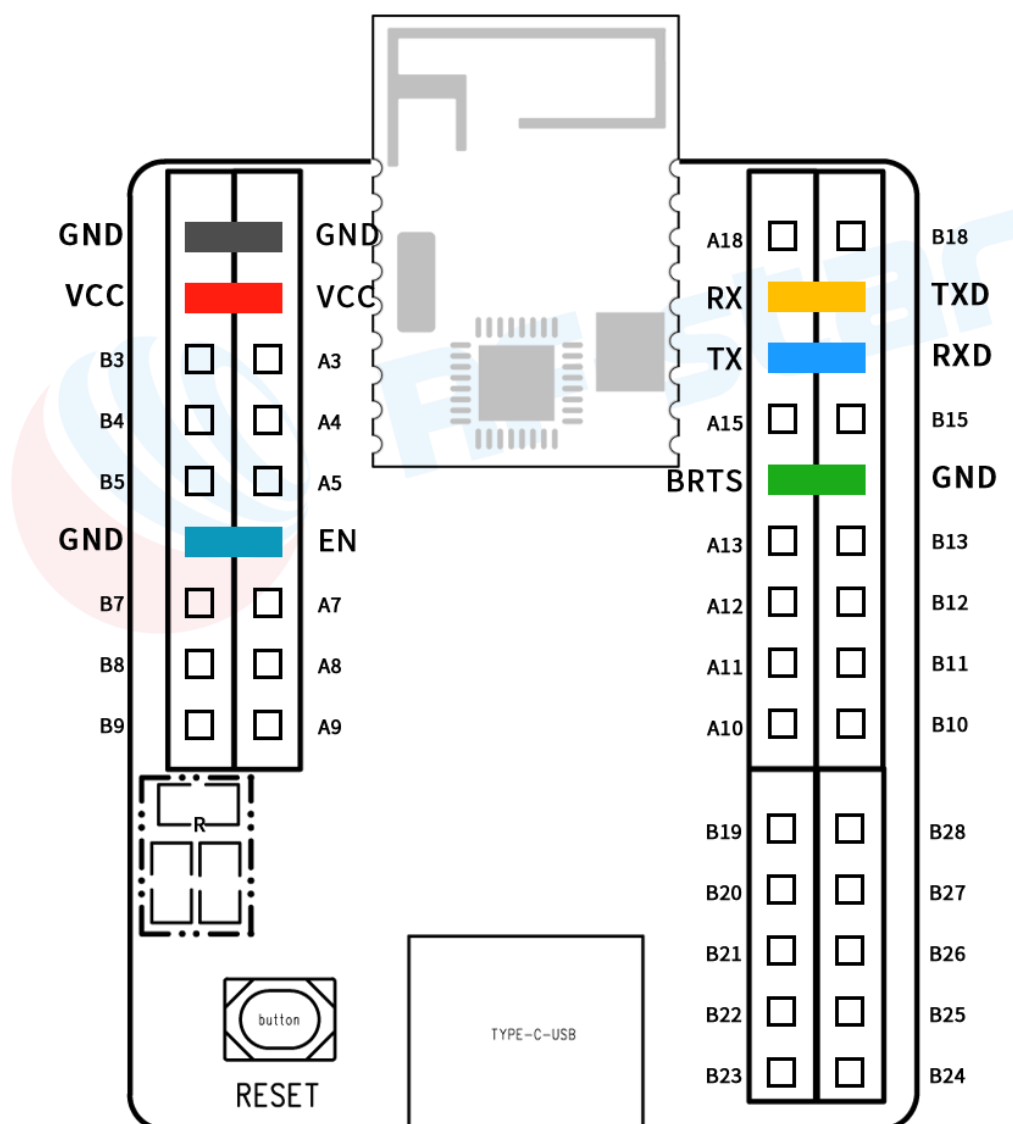
◆ CC254x, CC2640R2x and RS02A1-x Series

CC254x series: RF-BM-S02, RF-BM-NDS02A, RF-BM-NDS02I.

CC2640R2x series: RF-BM-4044B2, RF-BM-4044B3, RF-BM-4055B1L.

RS02A1-x series: RSBRS02AA, RSBRS02AI, RSBRS02ABR, RSBRS02ABRI.

When using the CC254X, CC2640, RS02A1-x series modules, the following pins need to be short-circuited via jumpers: A1 and B1 (GND), A2 and B2 (VCC), A6 and B6 (pull EN low to enable broadcast), A14 and B14 (pull BRTS low to enable the serial port), A16 and B16 (TX → RXD), A17 and B17 (RX → TXD). As shown in the figure below:



2. Install USB-to-UART driver, the driver file is as follows:



3. After unzipping the driver file, according to the type of computer operating system, click to install the corresponding program. Take the 32-bit computer operating system as an example, install the program shown in the following. (64-bit operating system installs the program suffixed with * 64).

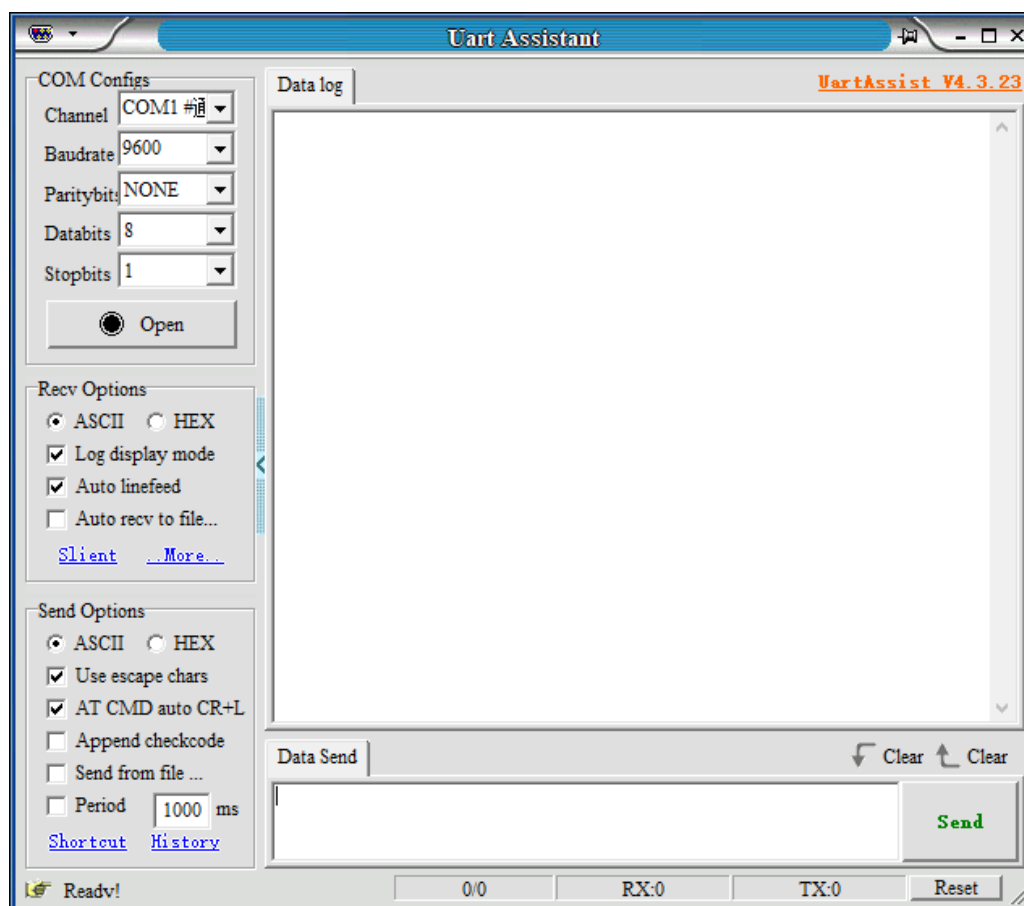
arm	2019/9/24 9:06	文件夹	
arm64	2019/9/24 9:06	文件夹	
x64	2019/9/24 9:06	文件夹	
x86	2019/9/24 9:06	文件夹	
CP210x_Universal_Windows_Driver_R...	2019/6/24 13:01	文本文档	24 KB
CP210xVCPInstaller x64.exe	2018/5/7 17:05	应用程序	1,026 KB
CP210xVCPInstaller_x86.exe	2018/5/7 17:05	应用程序	903 KB
dpinst.xml	2018/5/7 16:46	XML 文档	12 KB
silabser.cat	2019/6/24 9:21	安全目录	13 KB

4. After installation, connect to the RF-BT02, and right-click on "Computer - Management - Device Manager - Port" to see if the driver has been installed successfully. The successful installation is shown below (Repeat step 2 if it is shown as a yellow exclamation mark).



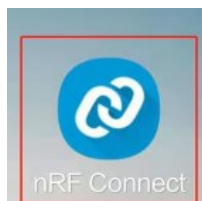
5. Open the UartAssist software, this software will automatically identify the USB-to-UART tool driver. The software configuration is shown below. After the settings are correct, click to open the serial port.

CP210x_Universal_Windows_Driver	2019/9/25 14:14	文件夹	
sniffer	2019/9/19 10:09	文件夹	
USB Dongle及Btool测试使用说明资料和...	2019/9/25 9:17	文件夹	
CP210x_Universal_Windows_Driver.zip	2019/9/24 9:06	WinRAR ZIP 压缩...	879 KB
nRF5SDK153059ac345_uart注释.zip	2019/9/25 11:13	WinRAR ZIP 压缩...	161,082 KB
sniffer.rar	2019/9/23 11:00	WinRAR 压缩文件	13,494 KB
UartAssist.exe	2019/9/25 9:18	应用程序	516 KB
USB Dongle及Btool测试使用说明资料和...	2019/9/23 11:00	WinRAR 压缩文件	24,097 KB

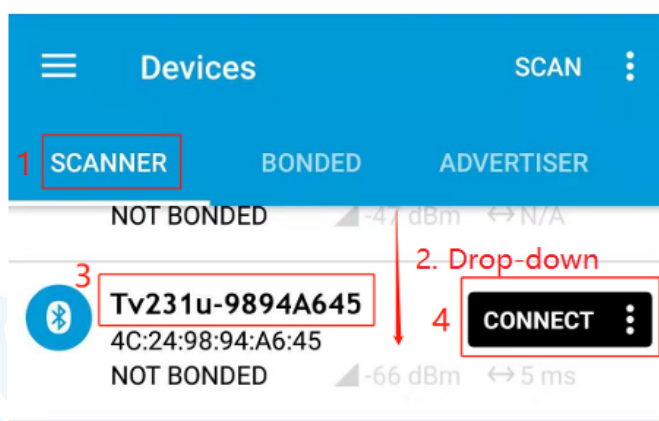


2.2 Transparent Transmission Test by APP (Android)

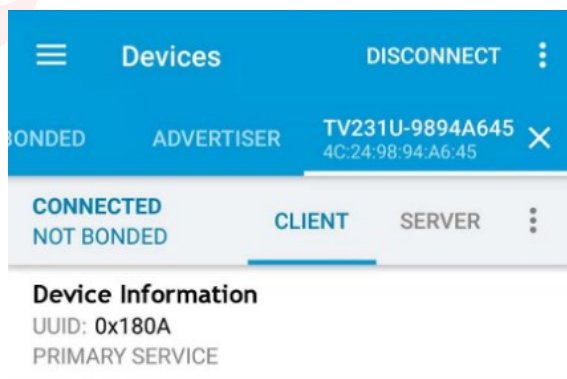
1. Turn on cellphone Bluetooth, and install APP “nRF Connect” (this APP can be found in the APP store):



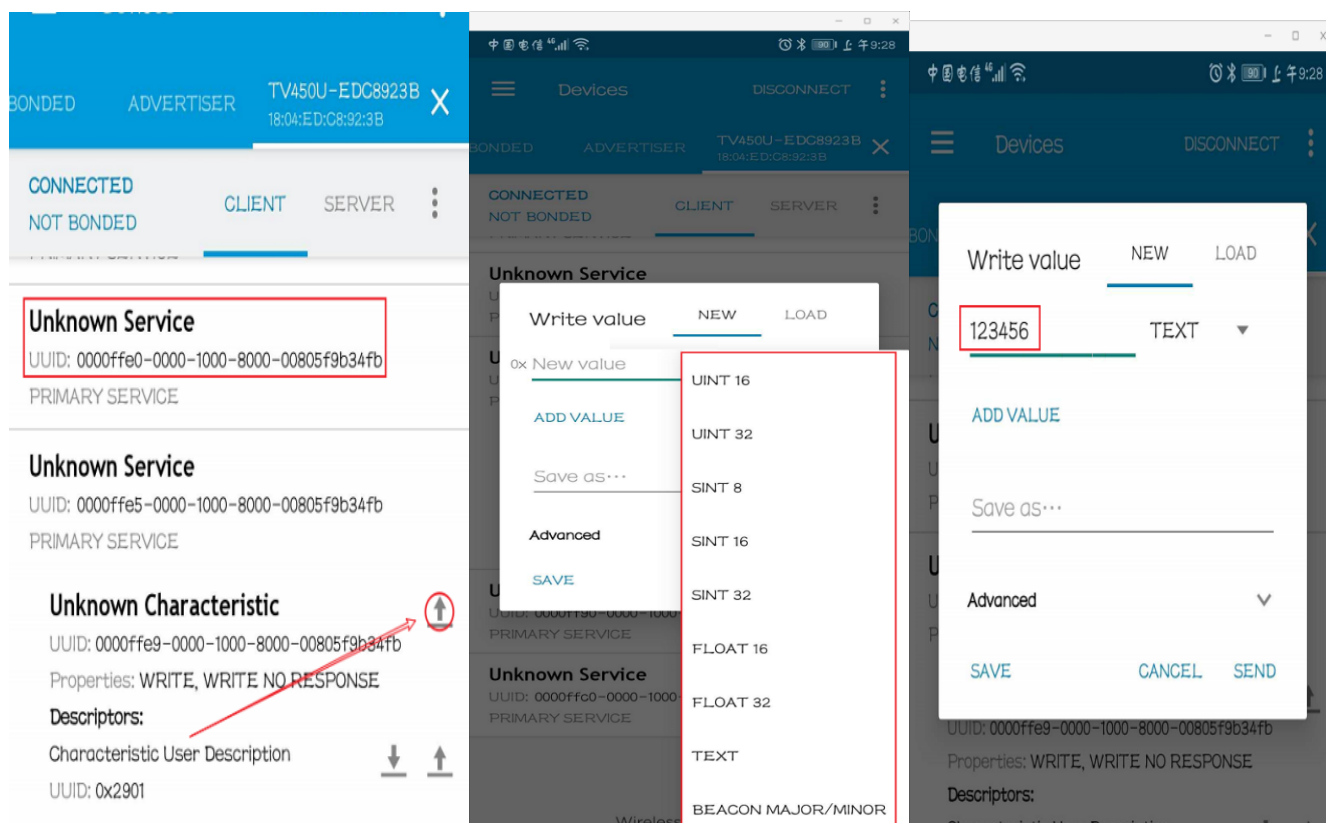
2. Open nRF Connect, press “scanner” and Press and hold the screen drop-down to search surrounding devices. As shown in following figure, there will be Bluetooth device list being broadcast nearby. After click on the BLE device you want to connect to, the connection process begins.



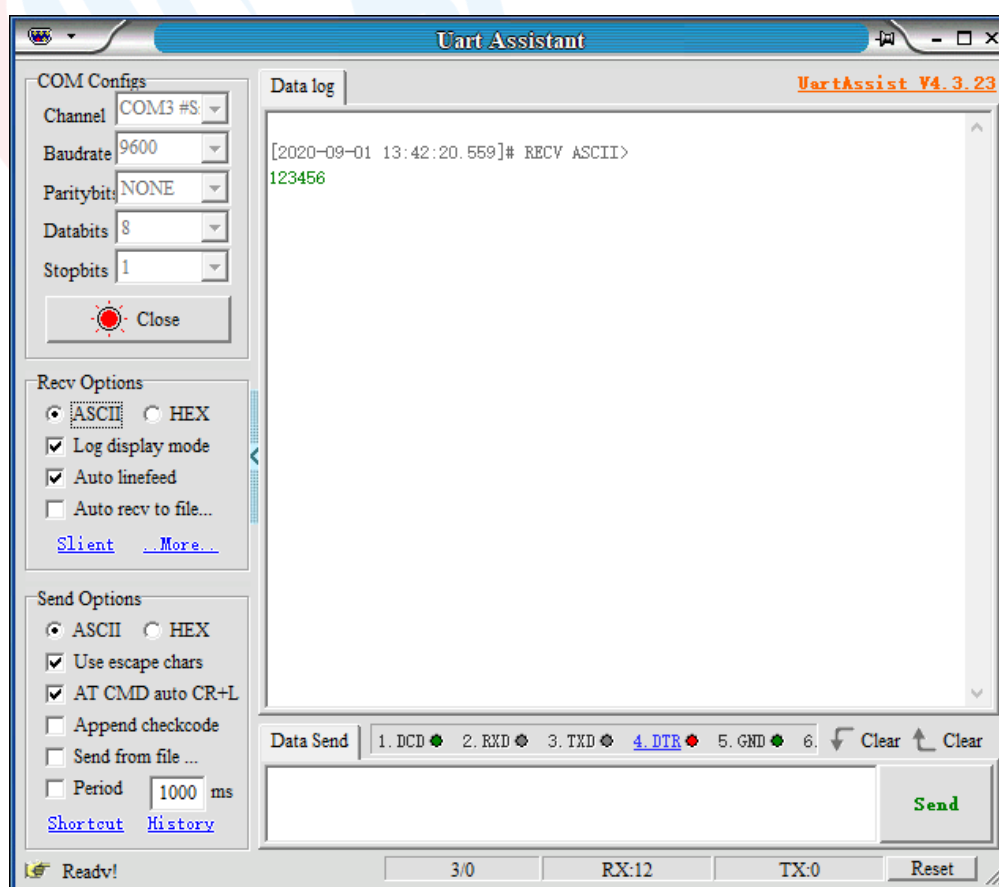
3. After successful connection, nRF Connect screen is shown as follows:



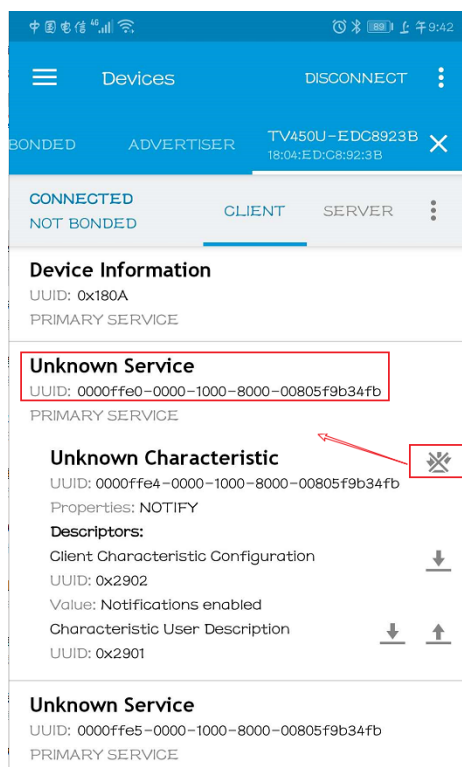
4. Click the FFE5 channel in nRF Connect to write. Text mode: Text. click SEND to send.



5. Then, UART Assistant will receive the data sent by APP:



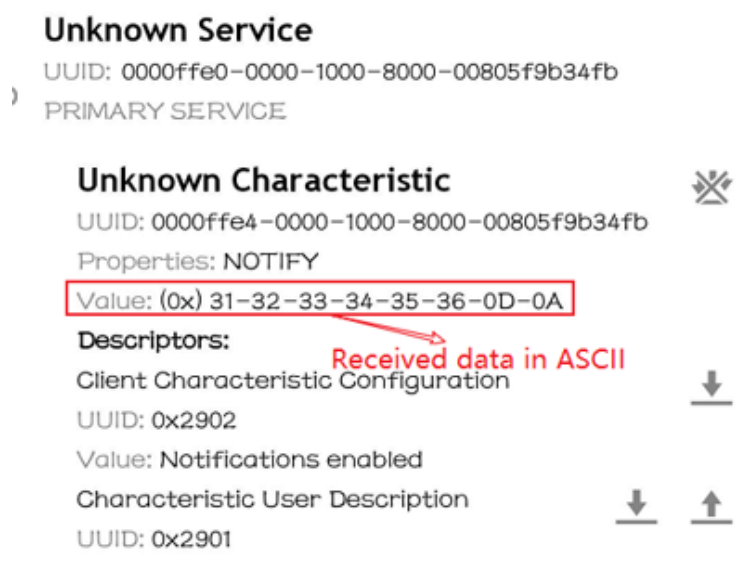
6. Click the serial port data channel in nRF Connect to turn on Notification.



7. Write the string in UartAssist and send.



8. nRF Connect will receive the data written in UartAssist:



The usage method of iOS version APP is similar to Android.

3. MCU Reference Code (Transparent Transmission)

3.1 Non-Flow Control Module

Logical relationship: CC254X, CC2640 and RS02A1-x series modules use two IO ports of BCTS, BRTS to send and receive notification and control. These two IOs are at a high level and will be triggered when put low in normal. If the module has data to send, BCTS will be set low to inform the microcontroller to receive it. If the microcontroller has data to send, BRTS will set low to notification module to receive. The schematic code is as follows:

```
void main(void)
{
    EN = 0;                                // EN, start to broadcast
    while(!BLEMoudleAck("TTM:OK"));        // Wait the mobile device to scan and connect
                                           // Wait for successful connection, can also join in the
                                           // time-limited waiting
                                           // Can also judge the level of the connection prompt
                                           // signal line
    BRTS = 0;                              // BRTS is set low, and notify CC2640R2F module to
                                           // ready for receiving
    halMcuWaitMs(50);                      // Delay for 50 ms
    UARTWrite( HAL_UART_PORT_0, "TTM:CIT-100ms", 14);
                                           // Modify the connection interval, and get confirmation
                                           // from the serial port
    halMcuWaitMs(50);                      // Delay for 50 ms, and ensure the data is transmitted
    BRTS = 1;                              // BRTS is set high, and transmission is finished
    while(!BLEMoudleAck("TTM:OK"));        // Wait for successful configuration, can also join in the
                                           // time-limited waiting
    while(1){                              // Cyclic test of transmission and receiving
        while(1){
            if(BCTS == 0){                 // Check, if BCTS is set low, the module will be ready
                                           // for receiving
                while(BCTS==0);            // Wait for transmission to be finished, can also do
                                           // time-limited waiting
                if(UARTRead(uartBuffer) == SUCCESS)
                                           // Read data from serial port
```

```
        {... ...}                                // Use data
    }
    BRTS = 0;                                     // RTS is set low, notify CC2640R2F module to ready
                                                // for receiving
    halMcuWaitMs(50);                             // Delay for 50 ms
    send_TX("1234567890");                         // Transmit any data (Whthin 200 byte)
    halMcuWaitMs(50);                             // Delay for 50 ms, and ensure the data is transmitted
    BRTS = 1;                                     // BRTS is set high, and transmission is finished
    halMcuWaitMs(20);                             // Delay to send the next packet, the delay depends
                                                // on the packet size.
}
}
}}
```



3.2 Standard Hardware Flow Control Module

The serial port between the BG22Ax, nRF52 series module and the MCU uses hardware flow control of two IO ports (CTS and RTS) to send and receive notification and control.

These two IOs are always at a high level and will be triggered when pull-low.

When the module can receive data, the module will pull RTS signal low (CTS for the MCU) to notify the MCU that it can send data.

When MCU can receive data, MCU should pull RTS signal low (CTS for the module) to inform the module that it can send data.

The demo code is as follows (for reference only):

```
void main(void)
{
    //Wait for the BLE module to start successfully
    while(!memcmp(rx_ble_mode_data(),"DEVICE_START\r\n",strlen("DEVICE_START\r\n")));

    //Enable RTS, that is, MCU can receive data from BLE module
    set_rts_enable();

    While(1){
        //Acquire whether the CTS status is in low level
        If(get_cts_state()==0){

            // Send test data to BLE module
            mcu_send_to_ble_string("Test data.\r\n");
        }

        // Processing the data obtained by MCU
        mcu_data_process(mcu_uart_read_data());
    }
}
```

4 Secondary Development

4.1 Downloads Address of Writer, DK and SDK

1. RF-BM-ND08 / RF-BM-ND08C, RF-BM-ND09 / RF-BM-ND09A and other nRF52832, nRF52810, Nrf52805 modules:
Burn tool is J-Link, and the development environment is Keil 5.

SDK download address: <http://www.nordicsemi.com/Software-and-Tools/Software/S132>

2. RF-BM-BG22A1 / RF-BM-BG22A2 / RF-BM-BG22A3 and other EFR32BG22Cx modules: Burn tool is J-Link, and the development environment is Simplicity IDE 4. Install the Bluetooth SDK package in simplicity ide 4 to obtain the SDK.

Development environment and SDK download address: <https://www.silabs.com/products/development-tools/software/simplicity-studio>

3. RF-BM-S02 / RF-BM-S02A / RF-BM-S02I and other CC254x modules: Burn tool is CC Debugger, and the development environment is IAR (8051) .

SDK download address: <https://www.ti.com/tool/BLE-STACK>

4. RF-BM-4044B2 / RF-BM-4044B3, RF-BM-4055B1L and CC2640R2F/L modules: Burn tool is XDS110 / J-Link, and the development environment is IAR、CCS、IDE.

SDK download address: <https://www.ti.com/tool/BLE-STACK>

5. RSBRS02AA / RSBRS02AI / RSBRS02ABR / RSBRS02ABRI and other RS02A1-A modules: Burn tool is J-Link, and the development environment is Keil 5.

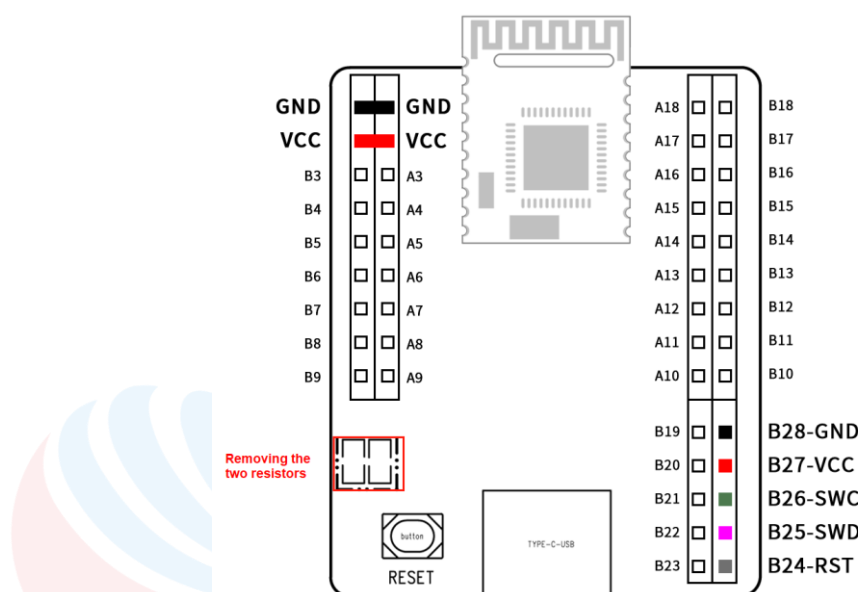
SDK download address: Contact the sales representative

4.2 Pin Description during Burning

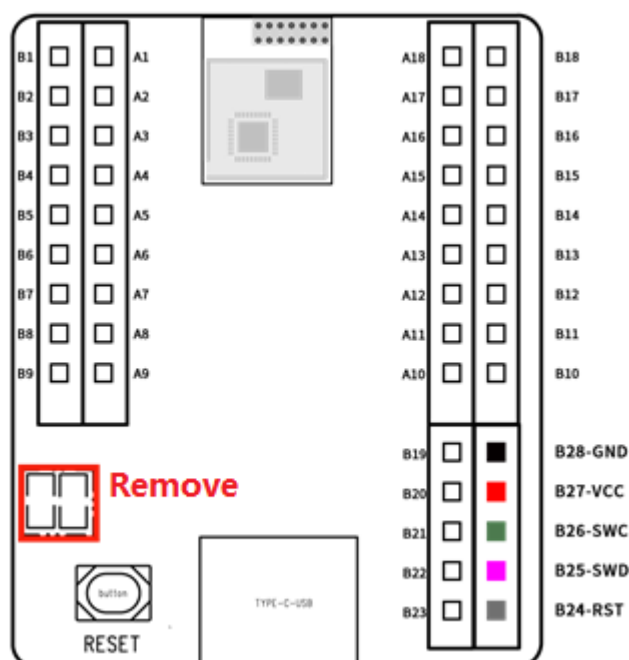
For different chip modules, pay attention to the corresponding firmware flash operation:

◆ nRF52832/nRF52810 and nRF52805 Series

RF-BM-ND08 / RF-BM-ND08C pin Diagram is shown in the figure. Remove the two 0 R resistors at the top left of the reset button. The chip can only be identified by the short-circuited via jumpers between A1 and B1, A2 and B2.

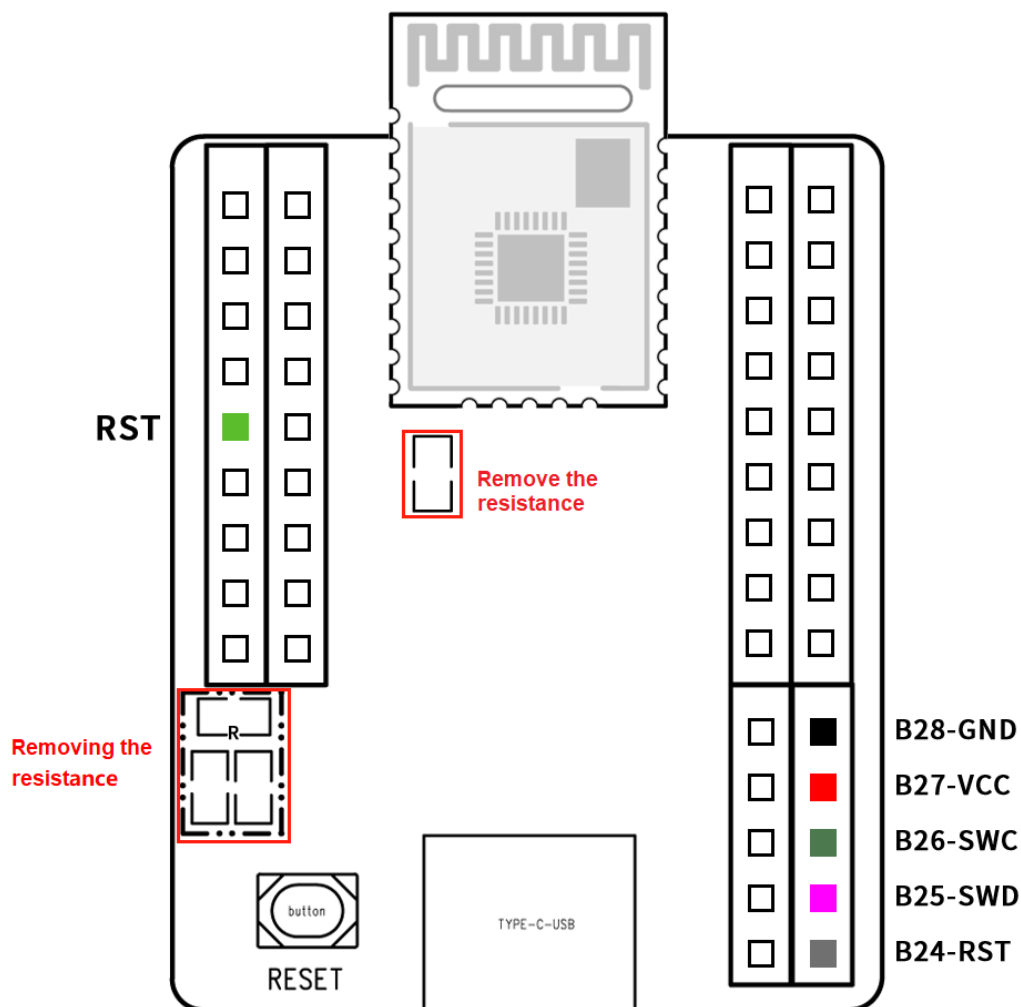


RF-BM-ND09 / RF-BM-ND09A pin Diagram is shown in the figure. Remove the two 0 R resistors at the top left of the reset button.



◆ EFR32BG22 Series

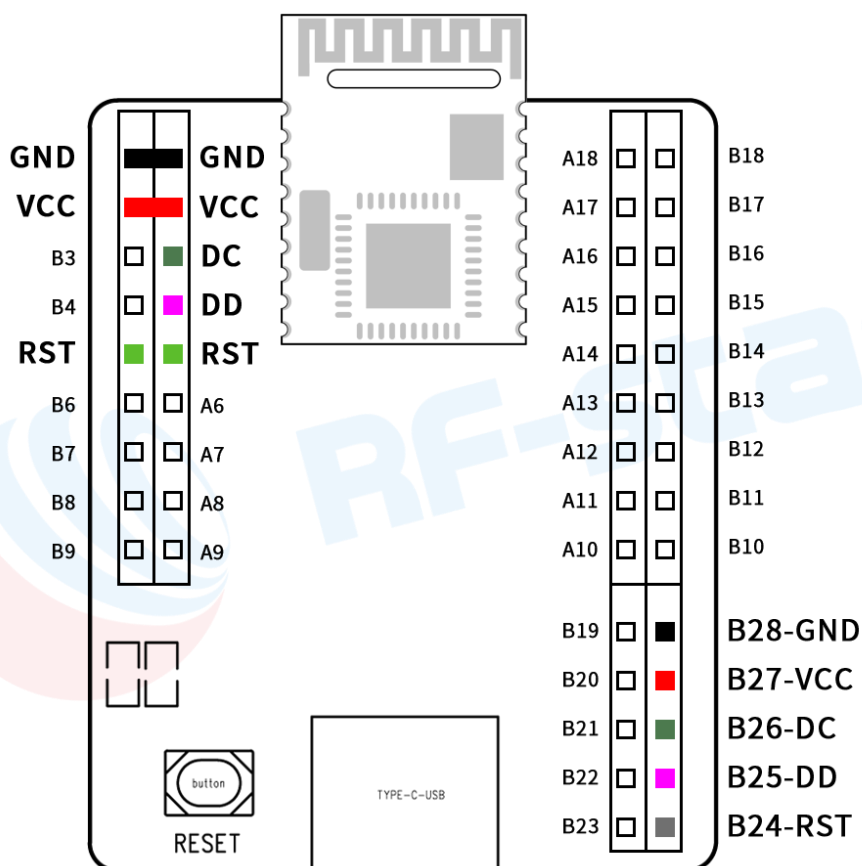
BG22Ax module pin Diagram is shown in the figure. Remove the four 0 R resistors in the figure, as shown below.



◆ CC254X, CC2640 and RS02A1-x Series

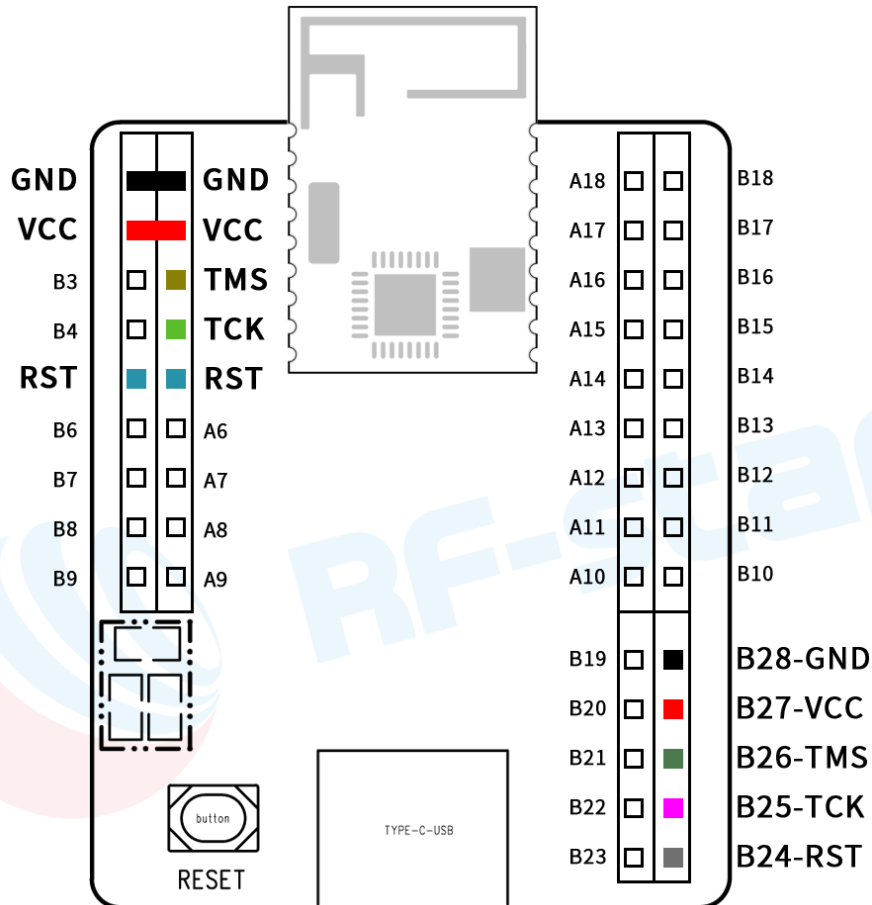
1. CC254X Series

A3 corresponds to B26(DC), and A4 corresponds to B25(DD), A5(B5) corresponds to B24(RST). Corresponding pins can be used universally during burning firmware. Only need to connect to any one of A3 and B26, and only need to connect to any one of A4 and B25, and only need to connect to any one of A5, B5 and B24. A1 and B1, A2 and B2 need to be short-circuited via jumpers.



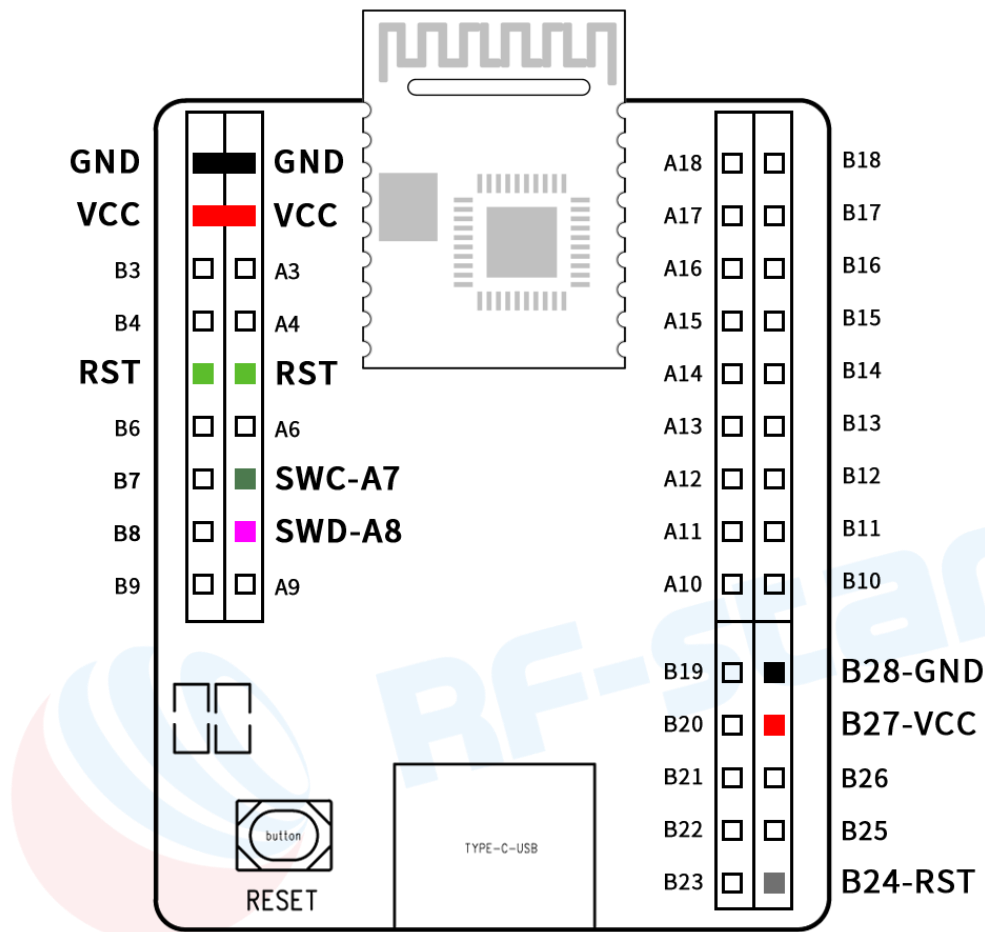
2. CC2640R2F Series

A3 corresponds to B26(TMS), and A4 corresponds to B25(TCK), A5(B5) corresponds to B24(RST). Corresponding pins can be used universally during burning firmware. Only need to connect to any one of A3, B3 and B26, and only need to connect to any one of A4, B4 and B25, and only need to connect to any one of A5, B5 and B24. A1 and B1, A2 and B2 need to be short-circuited with jumpers.



3. RF-star Series

A7 is SWC, and A8 is SWD. B25 and B26 cannot be used for burning firmware. Only one of A5, B5, B24 needs to connect RST. A1 and B1, A2 and B2 need to be short-circuited via jumpers



5 Trouble Shooting

5.1 Unsatisfactory Transmission Distance

1. When there is a linear communication obstacle, the communication distance will be correspondingly weakened. Temperature, humidity, and co-channel interference will lead to an increase in communication packet loss rate. The performances of ground absorption and reflection of radio waves will be poor, when the module is tested close to the ground.
2. Seawater has a strong ability to absorb radio waves, so the test results by seaside are poor.
3. The signal attenuation will be very obvious, if there is a metal near the antenna or the module is placed inside of the metal shell.
4. The incorrect power register set or the high data rate in an open air may shorten the communication distance. The higher the data rate, the closer the distance.
5. The low voltage of the power supply is lower than the recommended value at ambient temperature, and the lower the voltage, the smaller the power is.
6. The unmatchable antennas and module or the poor quality of antenna will affect the communication distance.

5.2 Vulnerable Module

1. Please ensure the supply voltage is between the recommended values. The module will be permanently damaged if the voltage exceeds the maximum value. Please ensure the stable power supply and no frequently fluctuated voltage.
2. Please ensure the anti-static installation and the electrostatic sensitivity of high-frequency devices.
3. Due to some humidity sensitive components, please ensure the suitable humidity during installation and application. If there is no special demand, it is not recommended to use at too high or too low temperature.

5.3 High Bit Error Rate

1. There are co-channel signal interferences nearby. It is recommended to be away from the interference sources or modify the frequency and channel to avoid interferences.
2. The unsatisfactory power supply may also cause garbled. It is necessary to ensure the power supply reliability.
3. If the extension wire or feeder wire is of poor quality or too long, the bit error rate will be high.

6 Revision History

Date	Version No.	Description
2020.11.17	V1.0	The initial version is released.
2020.1.21	V1.1	Add ND09(A) module instructions Update the use of BG22 transparent transmission
2021.3.25	V1.2	Modify the development environment supported by CC2640R2F
2023.05.25	V1.2	Update the Shenzhen office address.

Note:

1. The document will be optimized and updated from time to time. Before using this document, please make sure it is the latest version.
2. To obtain the latest document, please download it from the official website: www.rfstariot.com and www.szrfstar.com.



7 Contact Us

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