



HAC-UBee

2.4G Ultra Low Power Data Radio Module

(Based on ZigBee protocol)

V1.3



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1. Features of HAC-UBee

HAC-UBee is a ultra low power data radio module which based on ZigBee protocol. Its features are as follow:

1. Ultra low power transmission within 1mW (0dBm) , and receiving sensitivity is -92dBm.
2. ISM frequency band with no require of applying frequency

The carrier frequency is 2.4GHz.

3. High anti-interference and Low BER (Bit error Rate)

Based on the Quadrature Phase Shift Keying (QPSK) modulation, the high-efficiency forward error correction channel encoding technology is used to enhance data's resistance to both transient interference and random interference. Narrowband interference of the same frequency can be suppressed by Direct Sequence Spread Spectrum. The 16 CRC verify bits can be used to check mistake.

4. The transmitting speed in the air can reach up to 250kbps.

5. Transmission Distance

Within the visible range, when the height of antenna is higher than 2m and The Bit Error Rate (BER) is 10^{-3} , the reliable transmission distance is 100m.

6. Multi-channels

HAC-UBee offers 16 channels. The communication channel can be adjusted automatically based on the user's environment.

7. UART interface

HAC-UBee provides a UART interface of TTL level. The interface baud rate is 38400bps, and the parity is no-parity (8N1).

8. Low power consumption

The receive current is less than or equal to 33mA, and the transmit current is less than or equal to 33mA.

9. Small size and light weight

10. By using monolithic radio-frequency integrated circuit and single-chip MCU, the transceivers have less peripheral circuits, higher reliability, and lower failure rate.

11. HAC-UBee (V1.3) provides external antenna.

12. It can meet for the protocol of IEEE 802.15.4 for 2.4GHz and the application of ZigBee , it can make network automatically.



II. Applications of HAC-UBee

HAC-UBee ultra low power data radio module is suitable for:

- * Home appliances intelligent control.
- * Auto Meter Reading system.
- * Industry telemetry and automatic data collection system.
- * Security and alarm.
- * Wireless monitor for hotel and equipment of computer room, door's security, personnel orientation.
- * Traffic and the control for street lamp.
- * Logistics, active RFID, POS system and wireless handheld terminal.

III. How to use HAC-UBee

1. Power supply

HAC-UBee power supply is +3.3~6.0V DC. By using better ripple factor, HAC-UBee can also share power supply with other equipment. If possible, a voltage-stabilizing chip with +3.3~6.0V DC voltage is recommended as the only power supply.

If lower power and lower power consumption are needed, we can specially design to lower the power as +3V or much lower.

2. Connection Definition with terminal

HAC-UBee supply one 20-pin connector (JP1), their definitions and connection methods with terminals are shown in Table 1.

The range of interface level: the low level is 0-0.5V, the high level is 2.5-3.3V.

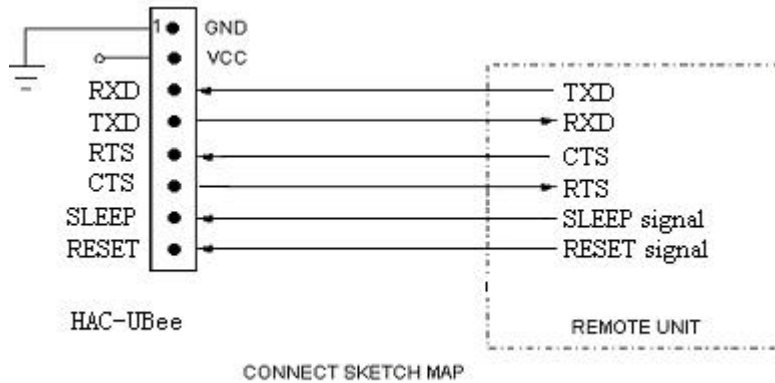


Pin	Definition	Instruction	Function	Connect with CC2430's pin
1	GND	Power ground		
3	VCC	Power supply DC	+3.3~6.0V	
5	RxD	Serial data receiver	Data input	4(P1_4)
7	TxD	Serial data transmitter	Data output	3(P1_5)
9	RTS	Request to send	Signal output	5(P1_3)
11	CTS	Clear to send	Signal input	6(P1_2)
13	SLEEP	Sleep signal	Signal input (1=sleep , 0=communicate)	11(P0_0)
15	RESET	Reset signal	Signal input (1=communicate , 0=reset)	10(RESET)
17	NC	I/O or ADC	Suspending	15(P0_4)
19	NC	I/O or ADC	Note 1*	16(P0_5)
2	NC	I/O	Suspending	45(P2_2)
4	NC	I/O	Suspending	46(P2_1)
6	3.0V	Power output	Maximum output current is 50mA	
8	NC	I/O	Suspending	1(P1_7)
10	NC	I/O	Suspending	2(P1_6)
12	NC	I/O	Suspending	8(P1_1)
14	NC	I/O	Suspending	9(P1_0)
16	NC	I/O or ADC	Suspending	18(P0_7)
18	NC	I/O or ADC	Suspending	13(P0_2)
20	NC	I/O or ADC	Note 1*	14(P0_3)

Table 1: JP1 Pin Definitions and connection methods

Note: When 19th and 20th pin are shorted by connector, the protocol for data transmitting is transparent protocol; when 19th and 20th pin are suspending, the protocol for data transmitting is formatted protocol. The details can be seen in the “HAC-UBee data interface protocol”.

3. The connection sketch between HAC-UBee and terminal equipment.



Picture 1: Connection sketch between HAC-UBee and terminal equipment

4. Channels of HAC-UBee.

a. **Channel frequency:** Corresponding frequency points of 1~16 channels

Channel No.	Frequency	Channel No.	Frequency
1	2.405 GHz	9	2.445GHz
2	2.410 GHz	10	2.450GHz
3	2.415GHz	11	2.455GHz
4	2.420GHz	12	2.460GHz
5	2.425GHz	13	2.465GHz
6	2.430GHz	14	2.470GHz
7	2.435GHz	15	2.475GHz
8	2.440GHz	16	2.480GHz

Table2: channel and frequency

Note: The frequency points corresponding to each channel can be adjusted automatically based on the environment of user.

5. Interface format:

Data interface: Universal Asynchronous Receiver Transmitter (UART)

Level of interface: TTL level

Interface baud rate: 38400bps

Data format: 8N1 (eight data bits, no-parity and one stop bit)

6. LED function indicator

D1: networking indicator

D2: data input

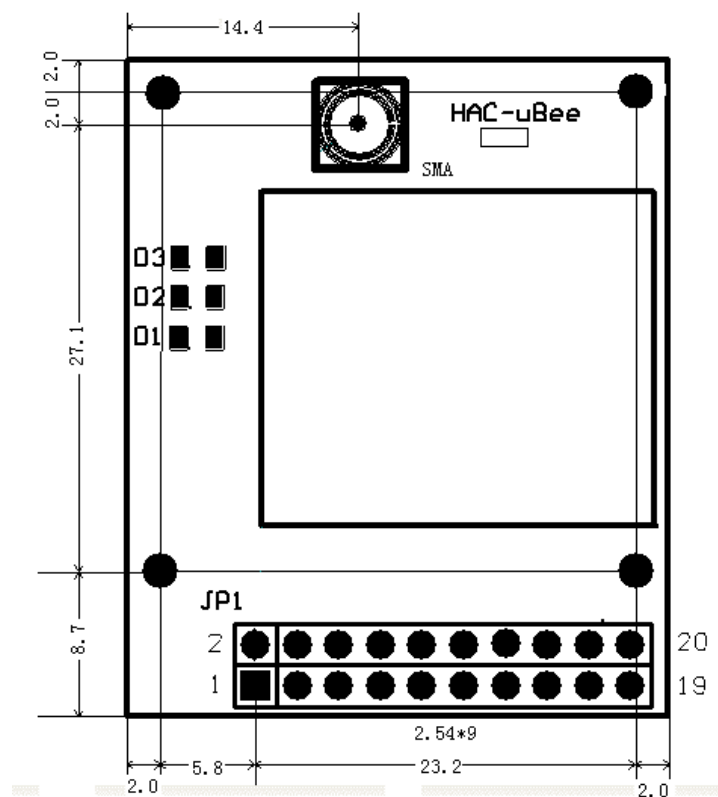
D3: data output

7. Antenna configuration:

HAC-UBee (V1.3) uses with external antenna. When you use antenna, pay attention to the position of antenna, it doesn't allow metal shield layer nearby. There is more than 20mm all around the antenna. If you need a shell, you only can use plastic shell, you can't use metal shell, you'd better put the antenna near the edge of the shell. When you use external antenna, you need to use external antenna of 2.4GHz.

8. Dimension diagram (Unit: mm):

Picture 3 is structure dimension of HAC-UBee V1.3 (with external antenna).



Picture 3 Structure dimension of HAC-UBee V1.3

IV. Technical specification of HAC-UBee

- Modulation mode: QPSK
- Method of spread spectrum: DSSS
- Working frequency: 2.4~2.5GHz
- Transmission power: <0dBm (1mW)
- Receiving sensitivity -92dBm
- Interface: UART, TTL, 38400bps, 8N1



- Working temperature: -40 ~80 (Industrial)
- Power supply: +3.3 ~ 6.0VDC
- Dimension: 40 × 33 × 3.5mm
- Transmit current: 33mA
- Receive current: 33mA
- Working humidity: 10%~90% relative humidity without condensation
- Transmission Distance: Within the visible range, when the height of antenna is higher than 2m , the reliable transmission distance is 100m.

V. Configuration of HAC-UBee

1. Development kit of ZigBee

- One Coordinator UBee with external antenna
- One Router UBee with external antenna
- Pin header is plug in the back side and welded in the face side, assort with testing board.
- Reverse Polarity SMA antenna with 2.4GHz
- Four sets testing board (including AC100V~240V/DC9V adaptor)
- Three standard serial wires
- One USB-to-RS232 serial wire
- One CD (USB driver , ZIGBEE-DEMO demo software , Specification)

2. HAC-UBee

- Reverse Polarity SMA antenna with 2.4GHz
- Sample with CD



3. Choose and buy

- Testing board (including AC100V~240V/DC9V adaptor)
- Standard serial wire
- USB-to-RS232 serial wire
- Reverse Polarity SMA antenna





NOTE: THE MANUFACTURER IS NOT RESPONSIBLE FOR ANY RADIO OR TV INTERFERENCE CAUSED BY UNAUTHORIZED MODIFICATIONS TO THIS EQUIPMENT. SUCH MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

**This device complies with Part 15 of the FCC Rules.
Operation is subject to the following two conditions:
(1) this device may not cause harmful interference, and
(2) this device must accept any interference received,
including interference that may cause undesired operation.**