

HR-1020 Low Power RF Module

User Manual



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Before using HR-1020 Module, please carefully read the user manual of HR-1020 Module, any question in technical, you can contact us, Tel:86 755 81782516 Cell: 86 15813856667

I 、 HR-1020 Main Application Range

HR-1020, the low-power wireless transceiver data module is used as the wireless data transceiver in short-ranges, with the small size, weight and power consumption and good stability and reliability. Narrowband low power UHF wireless data transmitters

and receivers with channel spacings as low as 50KHz:

- * AMR Automatic Meter Reading
- * Wireless alarm and security systems
- * Home automation
- * Low power telemetry
- * 433 / 868 and 915 MHz ISM/SRD band systems
- * Data radio can be used for Wireless conference voting system;
- * Mapping;
- * Radio modem can be used for Sports training & competition;
- * Wireless dishes ordering;
- * Wireless POS, PDA wireless smart terminal;
- * RF modem can be used for Electronic bus station and intelligent traffic;
- * RF transmitter Wireless electronic display screen and queuing machine;
- * Wireless telemetry Charging for parking, parking lot;
- * Wireless modem Automobile inspection and four-wheel orientation;
- * Wireless sensor Industrial wireless remote control and air conditioning remote controller;
- * Observation and predication of oil well and hydrological information;
- * Point to multi-point wireless network, wireless on-the-spot bus and automatic data collection system;

II 、 Feature of HR-1020 Low Power Data RF Module:

1. low power transmission with the transmission power of 10dbm/10mW

2. ISM frequency band , requiring on application of frequency point.

Carrier frequency of 433MHz(HR-1020 F433), 915MHZ(HR-1020 F915), 868MHz(HR-1020 F868).

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

Based on the GFSK modulation mode, the high- efficiency forward error correction channel encoding technology is used to enhance data's resistance to both burst interference and random interference and the actual bit error rate of $10^{-5} \sim 10^{-6}$ can be achieved when channel bit error rate is 10^{-2} .

4. Long transmission distance

Within the range of visibility, the reliable transmission distance is >400 m when the height is greater than 2m (BER= 10^{-3} @9600bps).

Within the range of visibility, the reliable transmission distance is >700 m when the height is greater than 2m (BER= 10^{-3} @1200bps).

Within the range of visibility, the reliable transmission distance is >500 m when the height is greater than 3m (BER= 10^{-3} @9600bps).

Within the range of visibility, the reliable transmission distance is >800 m when the height is greater than 3m (BER= 10^{-3} @1200bps).

5. Transparent data transmission

Transparent data interface is offered to suit any standard or nonstandard user protocol. Any false data generated in the air can be filtrated automatically (What has been received is exactly what has been transmitted).

6. Multi- channel

The standard HR-1020 configuration provides 8 channels. If the user needs, it can be extended to 16/32 channels, meeting the multiple communication combination mode of the user.

7. Dual serial port, 3 interface modes

HR-1020 provides 2 serial ports and 3 interfaces, with COM1 as the TTL level UART interface and COM2 as user defined standard RS - 232/RS - 485 interface (user only needs to plug/pull 1 bit short circuiter and energize it to make the definition).

8. Large data buffer zone

Interface baud rate is 9600bps with format of 8N1/8E1 and user self- definition, allowing the transmission of long data frames at one time for more flexible programming by users. (If the user needs, it can also transmit the data in unlimited length at one time).

9. Intelligent data control and the user doesn't need to prepare excessive programs

Even for semi duplex communication, the user doesn't need to prepare excessive programs, only receiving/transmitting the data from the interface. HR-1020 will automatically, complete the other operations, such as transmission/receiving conversion in the air, control, etc.

10. Low power consumption and sleeping function

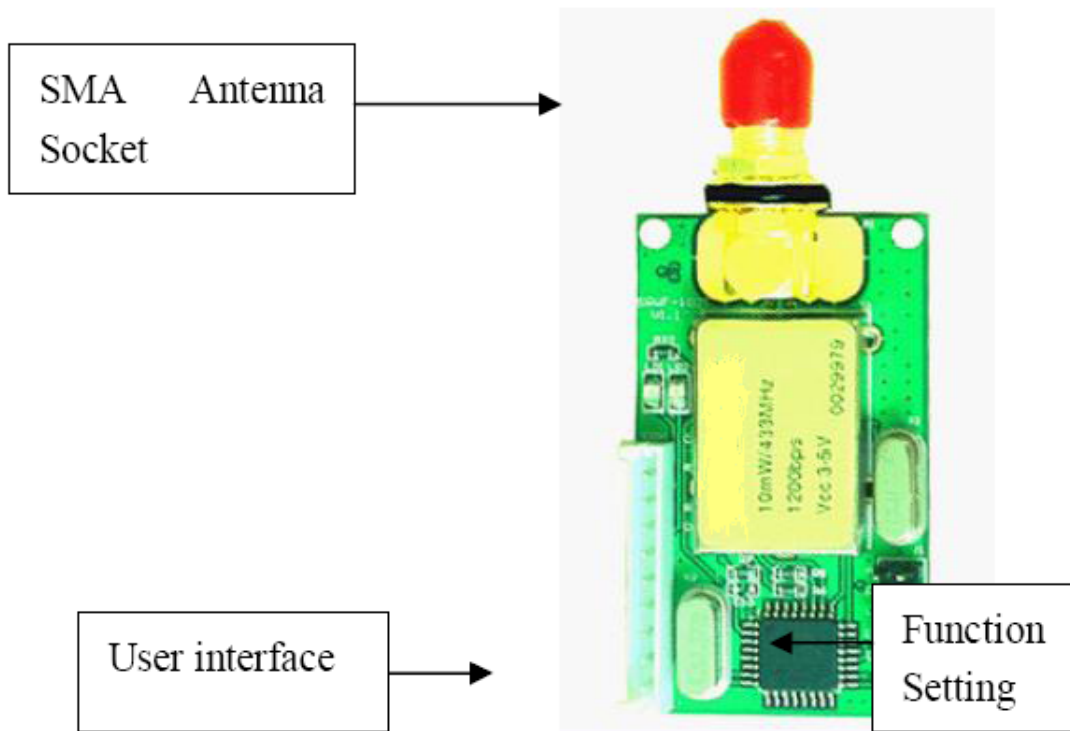
For receiving, current is <20mA, transmitting current is <40mA, and sleep current is <3uA.

11. High reliability, small and light

Single chip radio - frequency integrated circuit and single chip MCU are used for lessened peripheral circuit s, high reliability, and low failure rate.

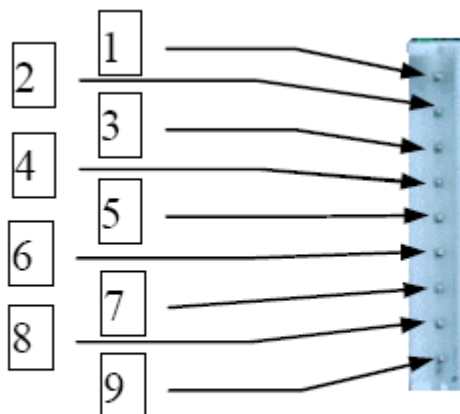
III、 Use HR-1020 Wireless data transceiver module

1. Appearance chart



2. Interface definition

HR-1020 supply 9-pin connector, and its definitions as well as below.



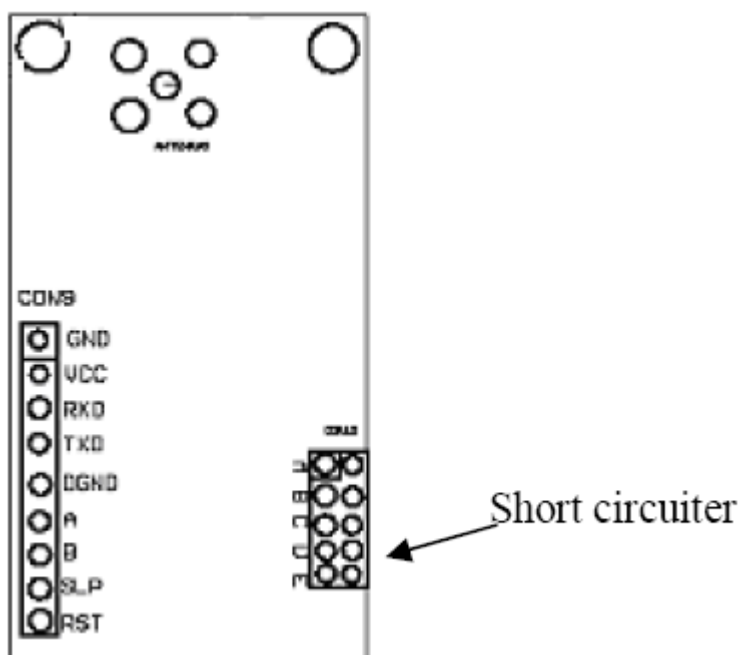
User interface

Connection method for terminals are shown in Table 1.

| No. | Pin name | Description | Level | Connected to the terminal | Remarks |
|-----|-------------------|-------------------------------|------------|---------------------------|------------------------------------|
| 1 | GND | Power to | | Power to | |
| 2 | VCC | DC power | 3.3 ~ 5.0V | | |
| 3 | RXD/TTL RXD / TTL | Serial data receiver | TTL | TXD | |
| 4 | TXD/TTL TXD / TTL | Serial data transmitter | TTL | RXD | |
| 5 | SGND | Signal to | | Simulation and | Can be connected with the power to |
| 6 | A(TX) A (TX) | The RS-485 A The RS-232 TX | | A(RX) A (RX) | |
| 7 | B(RX) B (RX) | The RS-485 B The RS-232 RX | | B(TX) B (TX) | |
| 8 | SLEEP | Dormancy control (input) | TTL | Dormancy signal | Low effective t> 15ms |
| 9 | RESET | Reduction and control (input) | TTL | Reset signal | Negative Pulse 1 ms |

IV、 Setting of the channel, interface, data rate and data format:

1. Before using HR-1020, you have to make simple configuration of your system parameter such as interface and data format.



There is one group of 5-bit short-circuit wire(JP2) on the bottom right corner of HR-1020 defined as A, B, C, D, E respectively, assuming the open circuit of jumper wire (without short circuit) is mode 1 and short circuit of jumper wire (with short circuit) is mode 0.

A: Channel configuration

ABC jumper wires of JP2 provide 8 options and you can choose to use 0-7 channels if the work wireless module is work at the same channel (ABC jumper wire

mode is same), you can transmit data between each module but keep in mind, at the same time only one module is in TX mode, more detail is Table 3

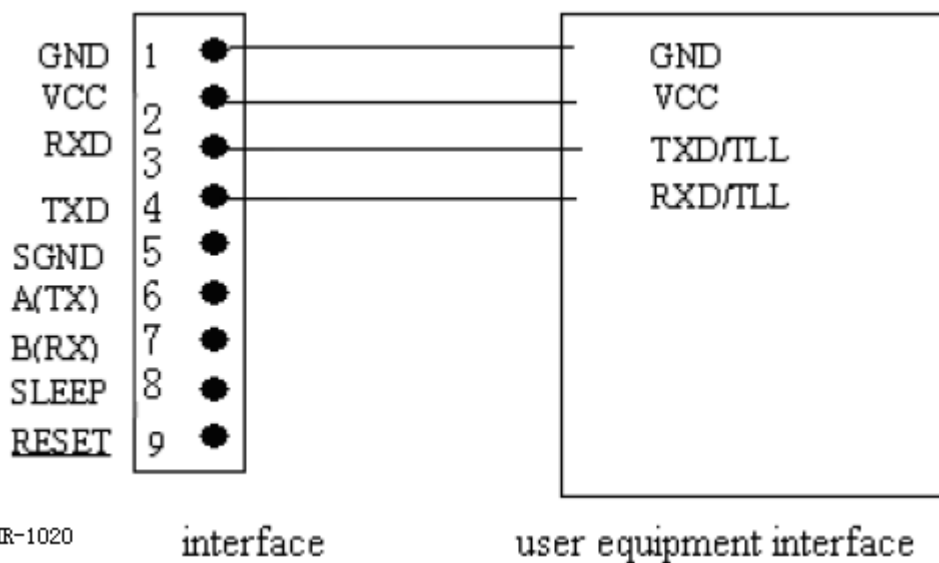
Table3

| JUMPER ABC | CHANNEL NUMBER | PROGRAM -FREQUENCY (433MHz) | PROGRAM -FREQUENCY (470MHz) | PROGRAM -FREQUENCY (868MHz) |
|---------------|--------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| | 0(ABC NO SHORT) | 433.85 MHz | 470.25 MHz | 869.43 MHz |
| | 1 | 432.10 MHz | 470.36 MHz | 869.49 MHz |
| | 2 | 433.20 MHz | 470.49 MHz | 869.56 MHz |
| | 3 | 433.25 MHz | 470.10 MHz | 869.62 MHz |
| | 4 | 434.00 MHz | 470.652 MHz | 867.8 MHz |
| | 5 | 432.65 MHz | 470.842 MHz | 868.0 MHz |
| | 6 | 433.40 MHz | 470.90 MHz | 868.2 MHz |
| | 7 | 432.60 MHz | 470.72 MHz | 868.4 MHz |

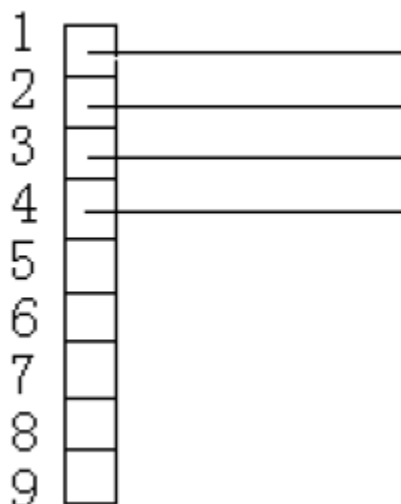
B: Selection of interface mode

HR-1020 provides 2 serial ports, COM (Pin3 and Pin4 of JP1) is fixed as UART serial port of TTL level, COM2 (Pin6 and Pin7 of JP1) can choose interface mode through D of JP2.

1. TTL interface connection application circuit

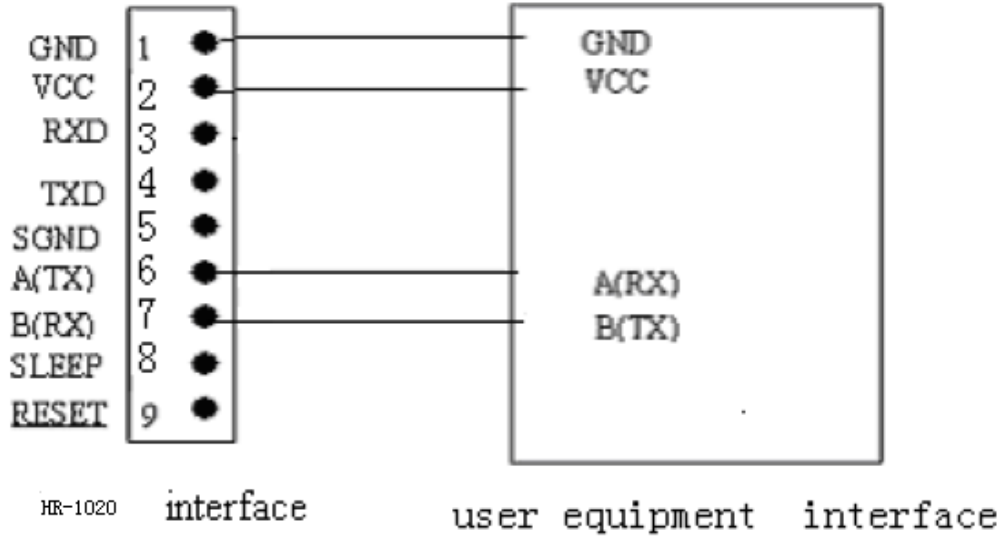


Note: Please do not connect any wire on Pin7 and Pin8 if COM2 is no use
 If you use the TTL only please make sure the D jumper of JP2 without jumper wire.
 The connection wire as well as below:

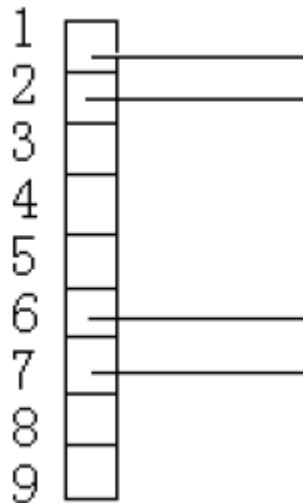


2. RS232 interface connection application circuit

D=1(with short jumper as: $\frac{D}{\text{---}}$)

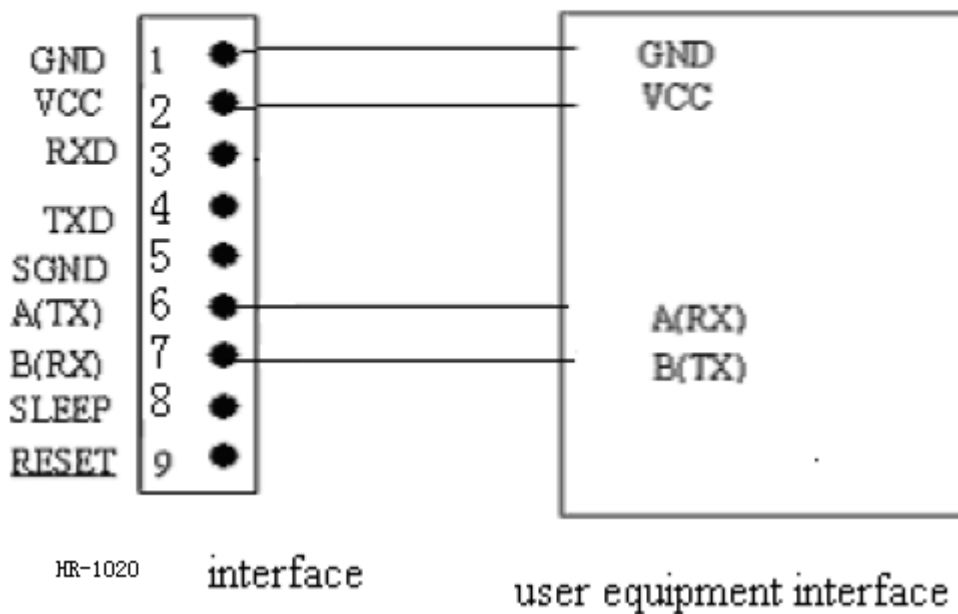


The connection wire as well as below:



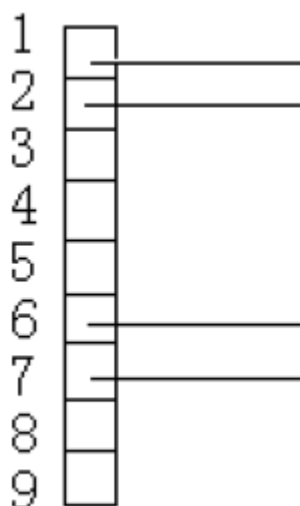
3. RS-485 Interface connection application circuit

D=0(without short jumper as: $\frac{D}{\text{---}}$)



Note: Please do not connect any wire on Pin3 and Pin4 if COM1 is no use, if the two use different Power supply, please make sure the two use the same GND (join the two`s GND together).

The connection wire as well as below:



C: Interface rate setting

The rate of HR-1020 is determined by hardware to make sure the module rate is suitable to your system, we have to tell your system`s rate.

D: HR-1020 can support no parity and even parity mode of the serial

communication UART, it can choose parity mode through E of JP2

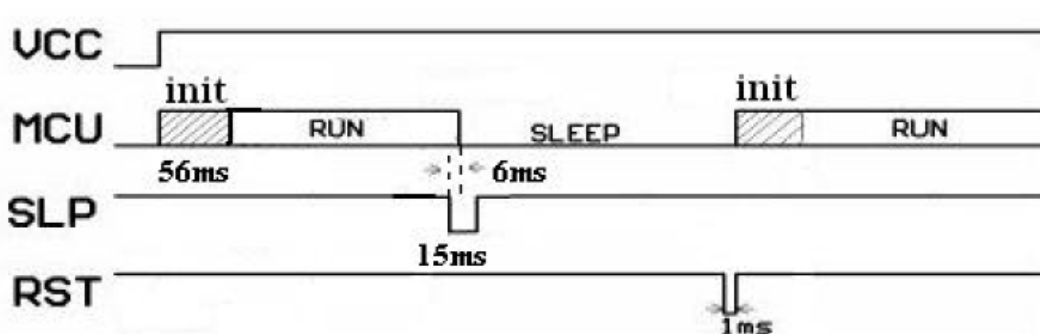
E=0 (without short circuit) parity 8E1/8O1/8N1

E=1 (with short circuit) parity 8N1

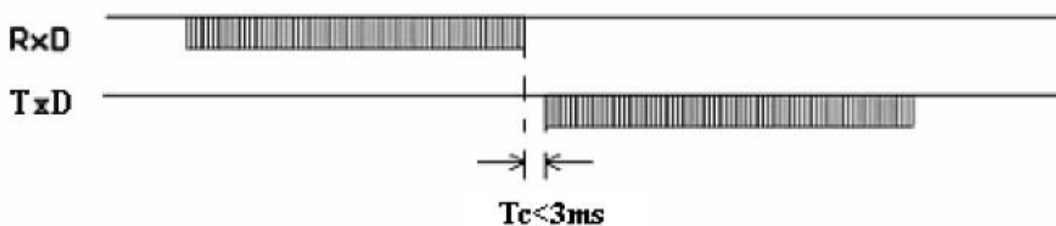
Note: Channel setting, COM2's interface mode and parity mode is fixed after the power is on, if you want to change the setting, you must reset the module or power on again.

E: Timing diagram

(1) The Pin8 "SLP" in JP1 is the signal of sleep control in low power level, when the transceiver stays in sleep mode, the conversion from idle mode to sleep will be finished in 6ms, if the sleep signal arrives when the transceiver is transmitting data, the module will enter sleep mode after finishing transmission, from sleep mode to transceiver mode, it takes when the RST signal comes

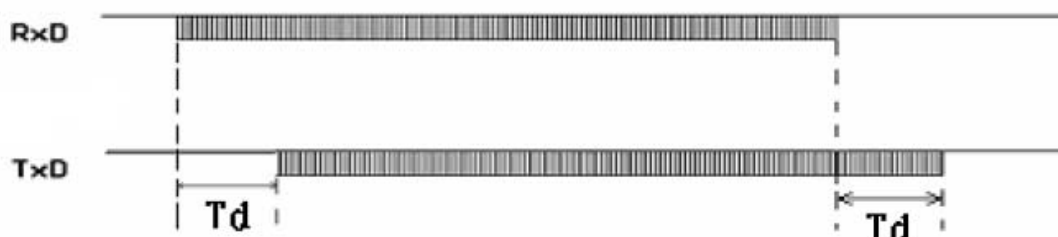


(2) The delay time(T_c) of conversion between transmitting and receiving is less than 3ms



The delay time of transceivers between the first bit sent by TXD to the first bit received by RXD, due to a data processing will be made on user's data by HR-1020 transceiver using FEC(Forward Error Correction) or other correction algorithm, when RXD of a HR-1020 transceiver "A" receives the data, then transmits it, the other one transceiver "B" will have a delay(T_d) to receive and transmit by TXD, different RF data rate causes different delay time, please see the specific delay time below:

| Baudrate (bps) | Delay Time (Td/ms) |
|----------------|--------------------|
| 1200 | 122 |
| 2400 | 58 |
| 4800 | 31 |
| 9600 | 16 |
| 19200 | 8 |



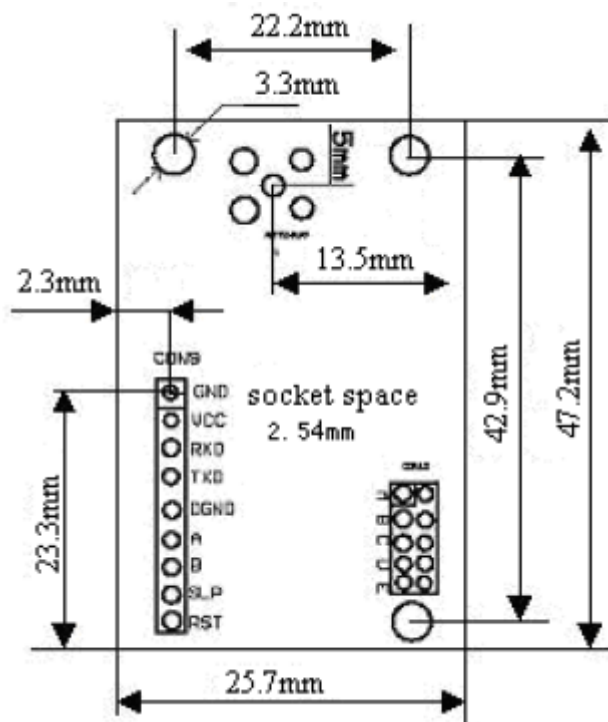
F: Indicator function

When transmitting mode, the red indicator light will twinkle (only UART TTL)
 When in receiving mode, the green indicator light will twinkle (only UART TTL)

V、 Technical specification of HR-1020:

| Serial number | Item | Parameter | Note |
|---------------|----------------------------|---|-------------------------------------|
| 1 | Modulation mode | GFSK/FSK | |
| 2 | Work frequency | 433/470/868/915MHz | |
| 3 | Transmission power | 10dBm(433/470MHz),5dBm(868/915dBm) | |
| 4 | Receiving sensitivity | -118dBm | 1200bps |
| 5 | Channel amount | 8channel | 16/32 channel custom-made |
| 6 | Transmitting current | 38±2mA | |
| 7 | Receiving current | 28±2mA | |
| 8 | Sleeping current | 5±2uA | |
| 9 | Interface velocity | 1200/2400/4800/9600/19200bps | |
| 10 | Interface mode | UART TTL/RS-232/RS-485 | User setting, and 19200bps TTL only |
| 11 | Power supply | +3.3~5VDC | |
| 12 | Working temperature | -25℃~75℃ | -40℃~85℃ custom-made |
| 13 | Working humidity | 10%~90%(relative humidity without condensation) | |
| 14 | Dimension | 47mm×26mm×10mm | |
| 15 | Reliable transmit distance | 800 Meter | AT-9/1200bps |

VI、 Sketch map of structural size (see below):



VII、 Technology support and after service:

We offer sufficient technology support for user use the module and further development for free, mending broken module one year for free, always offer after service

To adapt different user structure, we can develop smaller module or various size modules