Shenzhen Hi-Link Electronic Co., Ltd.

HLK-B20 User Manual

BLE 4.2 wireless module

Contents

1. Product description

HLK-B20 is an new low-consumption Bluetooth BLE 4.2 control module made by Hi-Link. This product is a Bluetooth-compliant module based on universal serial interface. It has built-in BLE 4.2 protocol stack, which can realize data conversion between user serial port and Bluetooth interface.

1.1. Basic parameters

- High-speed ARM9E core MCU
- 2.4G/1T1R, BLE 4.2
- 160k programming space, 20KB RAM
- Power supply voltage 0.9-3.6v
- Ultra low supply voltage, low power consumption
- Built-in crystal, high stability
- Small chip package 4x4
- Rich peripheral interface, SPI, I2C, ADC, UART, PWM, GPIO
- Widely used in the Internet of Things
- High-speed 10-bit multi-channel ADC with internal filtering
- Easy to connect, fast speed

2. Product Overview

2.1. Technical specifications

Table 2-1 Product Specifications

Transfer Protocol	Bluetooth standard : BLE 4.2
Supply voltage	0.9-3.6V
Air speed	1Mbps
Number of channels	40
Frequency Range	2400-2480MHZ
Transmit power	4DB
Receiving sensitivity	-96dbm
Received power	5.1ma
Transmit power	4.5ma
Antenna type	External /internal antenna
Other parameters	
Status indicator	Status indication
Environmental standard	Operating temperature: -40-125℃
	Working humidity: 10%-90%RH (Non-condensing)
	Storage temp.: -40-90℃
	Storage humidity: 5%-90%RH (Non-condensing)
Other performance	Band bandwidth optional: 1MHz

2.2. Hardware description

HLK-B20 dimension as below:(L*W)=16mm*25mm

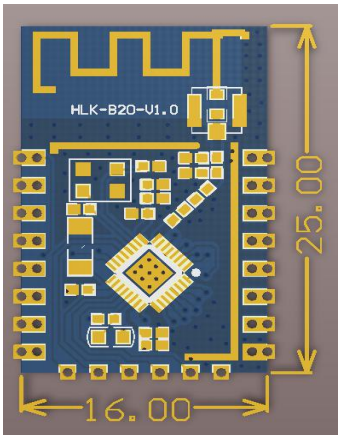


Figure 1 HLK-B20 Dimension

2.3. Block diagram

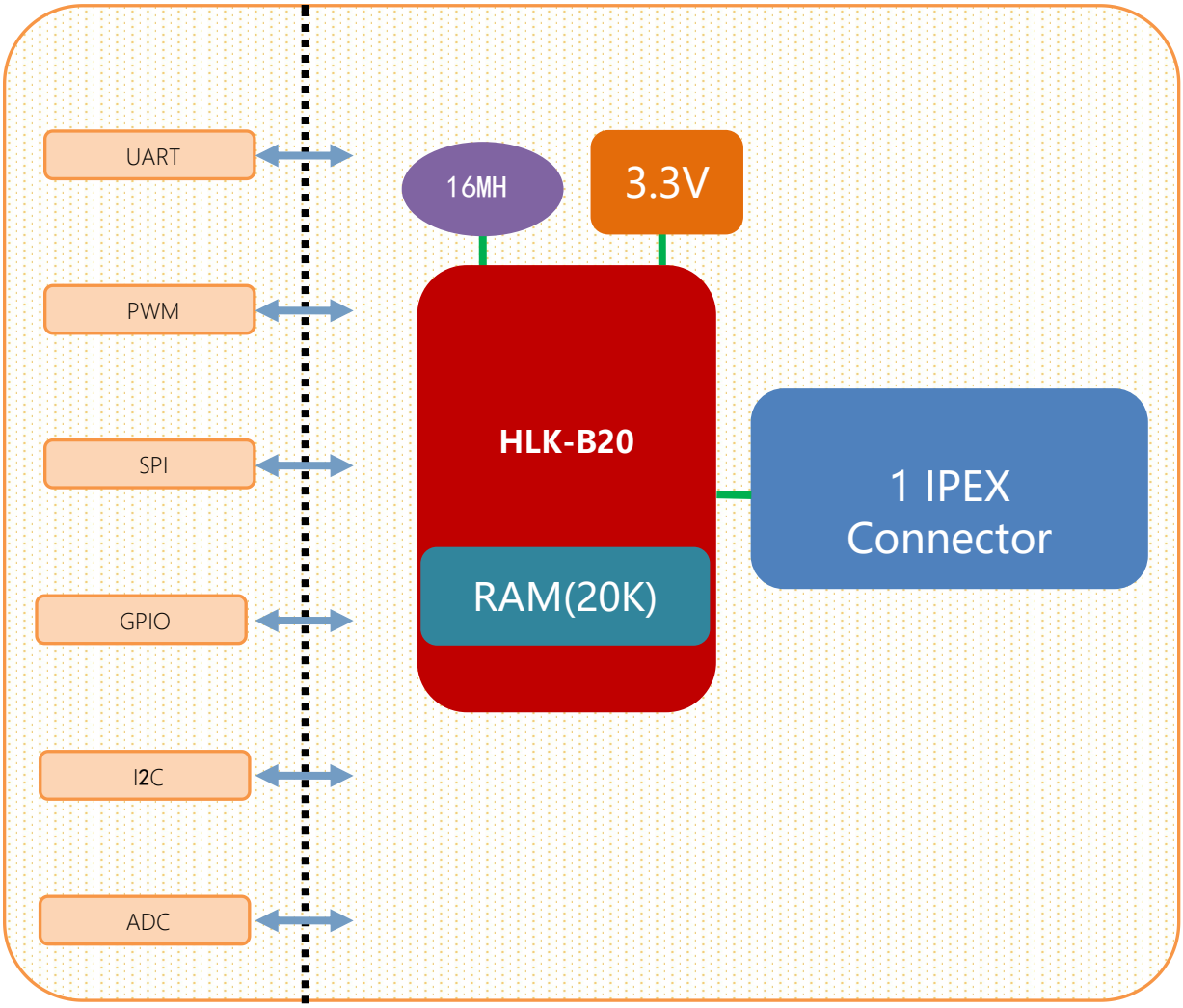


Figure 2 HLK-B20 Module architecture diagram

2.4. Default pin function

No.	Network name	Type	Function description	Default features
1	RSTN	I	Chip enable, high efficiency	CPU reset
2	P07	I/O	P07,SPI_NSS,PWM5	GPIO,SPI,PWM
3	P14	I/O	P14,PWM4	GPIO,PWM
4	P10	I/O	P10,PWM0	GPIO,PWM
5	P11	I/O	P11,PWM1	GPIO,PWM
6	P12	I/O	P12,PWM2	GPIO,PWM
7	P13	I/O	P13,PWM3	GPIO,PWM
8	3V3	P	3.3V power supply	Power
9	P31	I/O	P31	GPIO
10	P32	I/O	P32	GPIO
11	P17	I/O	P17,uart2_rxd	GPIO,uart2
12	P16	I/O	P16, uart2_txd	GPIO,uart2
13	P34	I/O	P32	GPIO

14	P33	I/O	P33	GPIO
15	GND	P	GND	GND
16	P02	I/O	P02,SCL	GPIO,I2C
17	P03	I/O	P03,SDA	GPIO,I2C
18	P04	I/O	P04,SPI_CLK	GPIO,SPI
19	P05	I/O	P05,SPI_MOSI	GPIO,SPI
20	P06	I/O	P06,SPI_MISO	GPIO,SPI
21	P01	I/O	Uart1_rxd	Uart1, Transparent transmission serial port
22	P00	I/O	Uart1_txd	Uart1, Transparent transmission serial port

3. Test board description

The test board is mainly used to test the data transmission function of the HLK-B20's Bluetooth and serial ports.

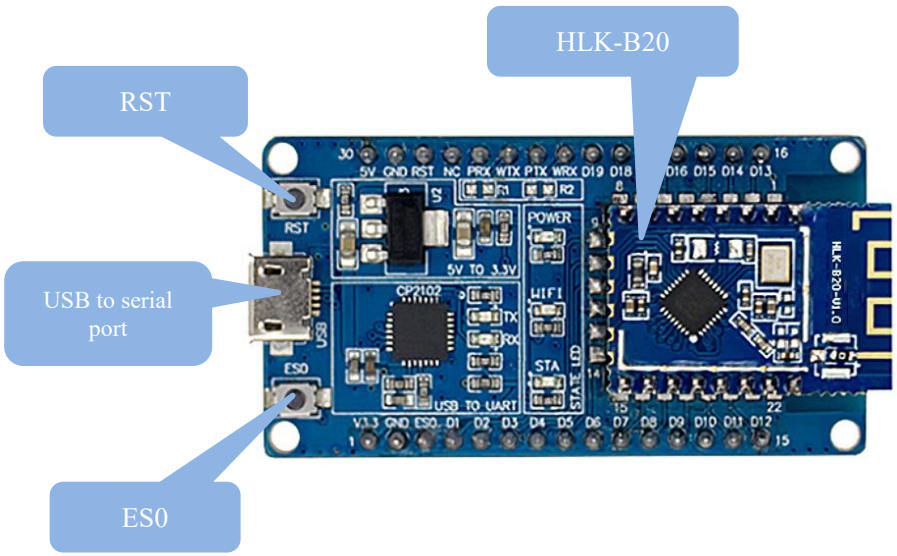


Figure 3 HLK-B20 module test board

3.1. Restore factory settings

To ensure that all configuration procedures are correct, first reset the module to factory settings. Modules that are already in factory mode can skip this step. Provide 5V (1000mA) power supply to power on the module, wait for about 1 second, let the module start up. After the startup is completed, pull down the ES0 (PIN5) pin for more than 6S. When the LED corresponding to the STA is always on, it means that the module is restored the factory settings successfully, then release the ES0 pin, the system will automatically restart. The system is already in factory mode after rebooting.

4. Function description

The module function is mainly to realize the mutual conversion of Bluetooth data and serial data.

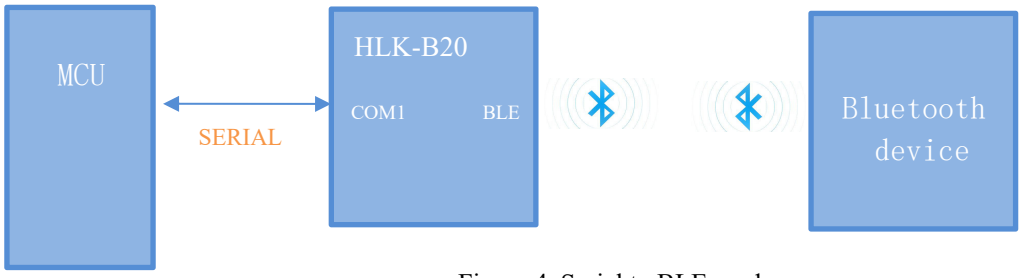


Figure 4 Serial to BLE mode

In this mode, the BLE Bluetooth device transmits the data to the HLK-B20 module via Bluetooth, and the HLK-B20 module sends the received data from the serial port. When the serial port gets data, the HLK-B20 sends the serial port data from the Bluetooth terminal to realize the conversion of serial data and Bluetooth data. When the HLK-B20 has a Bluetooth device connected, the HLK-B20 will turn off the broadcast of the Bluetooth name, and other Bluetooth devices will no longer be able to connect to the HLK-B20.

5. Serial port working state conversion

The module defines the working state of the serial port as two modes: transparent transmission mode and AT command mode.

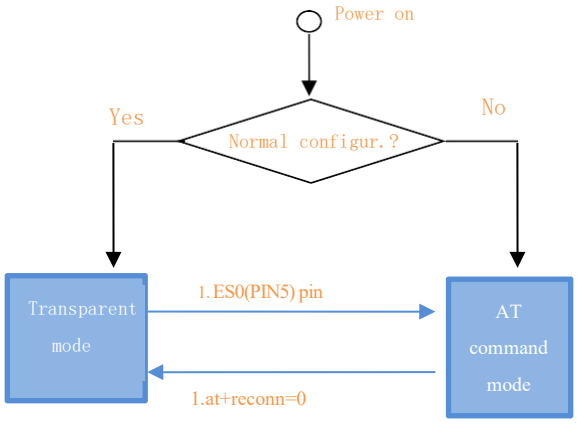


Figure 5 . Serial port working state transition

After normal power-on, the module directly enters the transparent mode. If Bluetooth is not connected, the data will not be sent out from Bluetooth. If Bluetooth is connected, the data will be sent out from Bluetooth. In any state, keeping the ES0 pin low for longer than Tes and less than Trst will immediately enter the AT command mode.

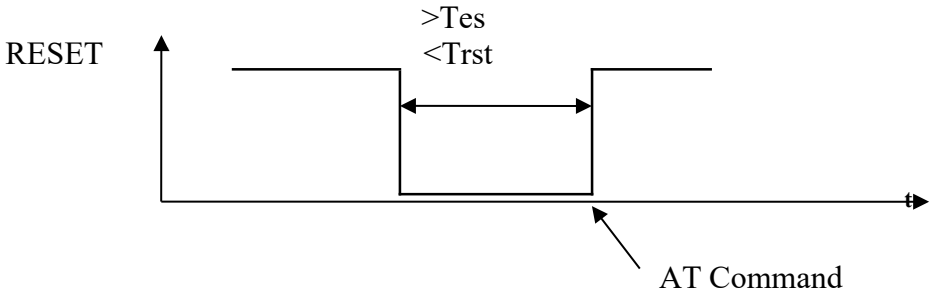


Figure 6. RST Exit transparent mode

Notes: Tes=100ms, Trst=6s

6. Led light indication meaning

The status of the led connection module's P02 pin, corresponding to the sta led on the test board:

* Double flash: Bluetooth is not connected, and is in transparent mode
* Triple flash: AT command mode
* Long extinction or fast flash: Bluetooth is connected, it will flash quickly when there is transparent data transmission

7. Parameter configuration method

The module configuration is mainly configured through the serial port AT command.To configure parameters through the serial AT command, you need to let the module enter the AT command mode first.The serial port configuration tool HLK-B20_CONFIG, that configures the module through the AT command mode, through the parameters of each configuration combinations, provides a simple and convenient configuration process.

8. Serial port AT command configuration

8.1. AT instruction format

In AT mode, system parameters can be configured through the AT command of the serial port. The format of the instruction is as follows: at+[command]=[value]\r

Different return values of the module will be returned depending on the different command.

Example: "at+ble_name=blename\r" sets the module broadcast address to blename.

Example: "at+ver=?\r" queries the module program version number.

Command list as below:

ver	Module Version
uart	Serial port configuration
default	Restore factory setting
ble_name	Bluetooth name
net_commit	Submit configuration parameters
reconn	Restart the serial port service
ble_status	Bluetooth connection status
Reboot	Restart the system

8.1.1. Ver

Function	Firmware version query
Format	at+ver=? \r
Parameter	No

8.1.2. Uart

Function	Serial port configuration settings
Format	at+uart=<baud>, <data>, <parity>, <stop>\r
Parameter	Baud: Baud rate Data: Data bit Parity: Check Digit Stop: Stop bit length

8.1.3. net_commit

Function	Submit network settings
Format	at+net_commit=< Net_commit >\r
Parameter	0: invalid 1: Submit

8.1.4. Reconn

Function	Restart the serial port conversion service
Format	at+ reconn =< reconn >\r
Parameter	0: invalid 1: Restart the serial port conversion service

8.1.5. ble_status

Function	Query Bluetooth connection status
Format	at+ ble_status =?\r
Parameter	0: Not connected 1: Connected

8.1.6. ble_name

Function	Query Bluetooth connection status
Format	at+ ble_name =<blename>\r
Parameter	blename: Bluetooth name

8.1.7. default

Function	Restore factory setting
Format	at+ default =1\r
Parameter	No

8.1.8. Reboot

Function	Restart the system
Format	at+ reboot =1\r
Parameter	No

9. Configuration Tool Description

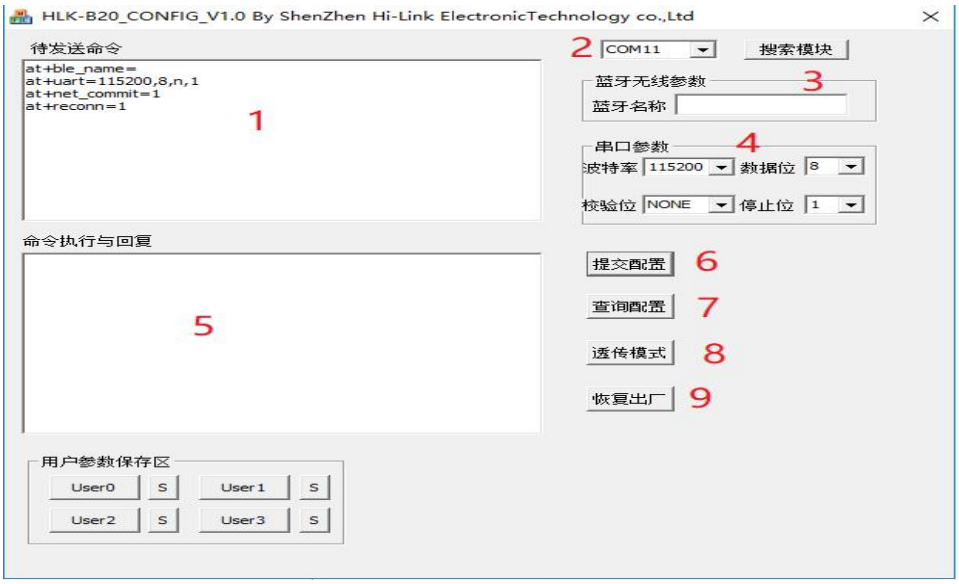


Figure 7 Configuration tool

1: Command window to be sent
2: Serial port number selection
3: Bluetooth name setting
4: Serial port parameters
5: Serial port return command
6: Submit configuration
7: Query configuration
8: Enter transparent mode
9: Restore factory settings

10. Transparent transmission minimum system

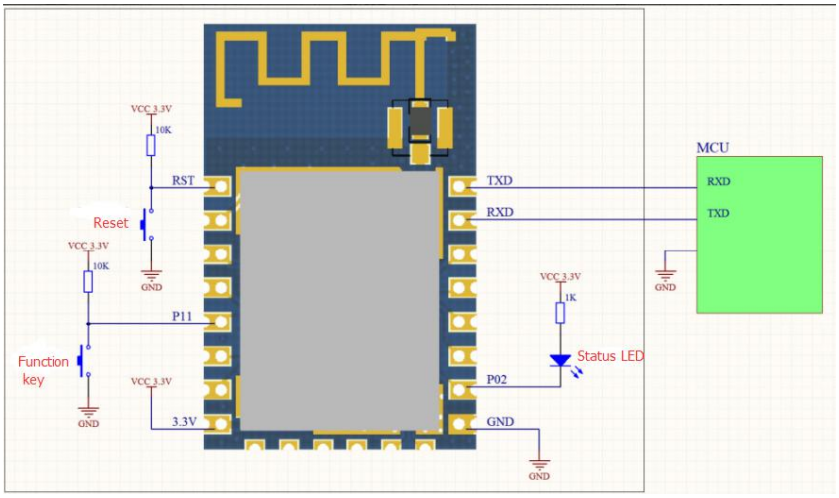


Figure 8 Minimum system

11. Bluetooth data transmission

Bluetooth data transmission is that after the Bluetooth connection is successful, the module will send the data received from the Bluetooth by the serial port, and the data received from the module serial port will be sent out by the Bluetooth.

The module Bluetooth function only supports Bluetooth 4.2.

Install the Bluetooth mobile phone test software HLK-BLE.apk, open the Bluetooth function of the mobile phone, and then open the app, it will search for the Bluetooth name at the beginning of HLK-BLE_ on the app.

Figure 9 Bluetooth search list

Then select the last item

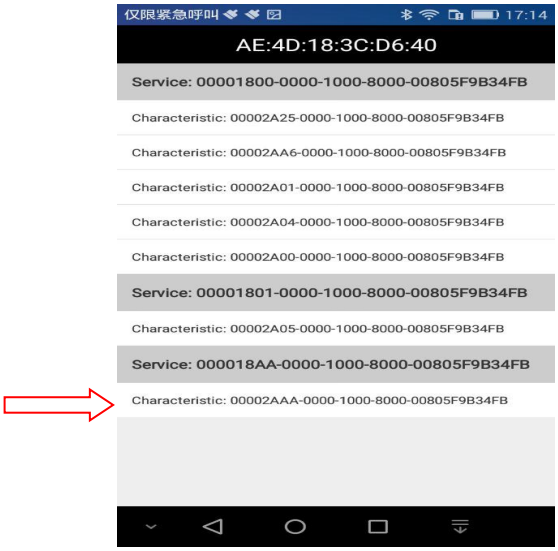


Figure 10 Bluetooth attribute list

Then input the sent data in the send box, click Send, the data will be received on the serial port, and the data sent by the serial port will be received on the app.

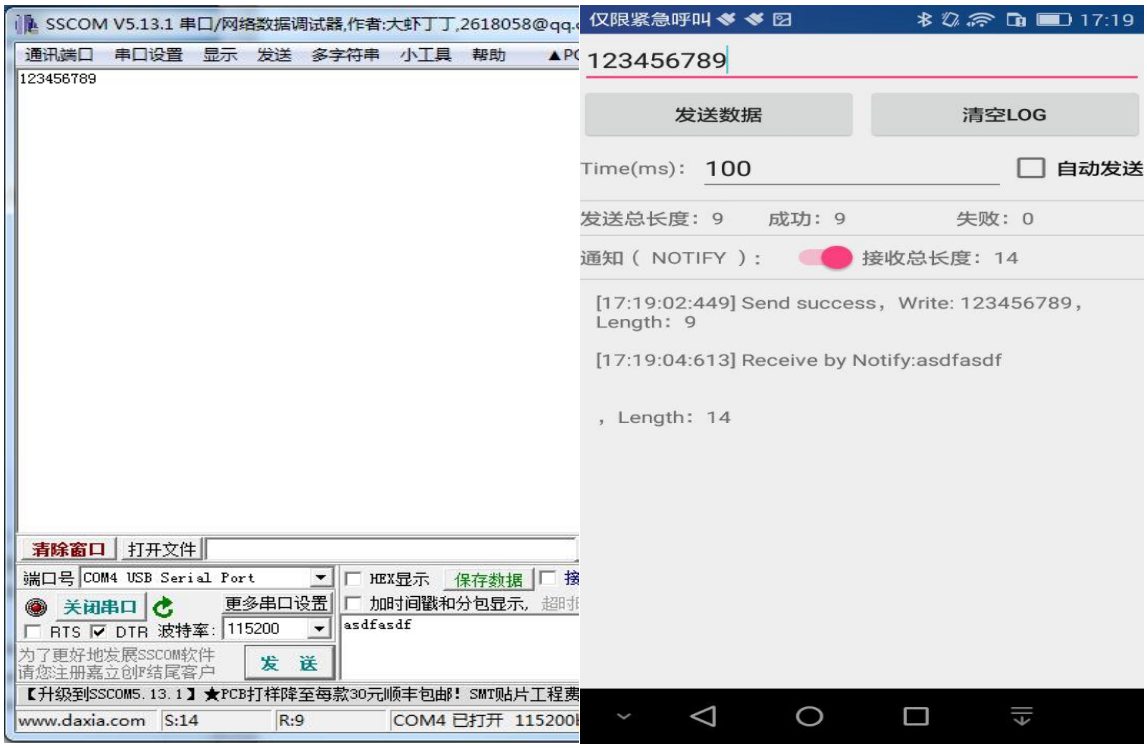
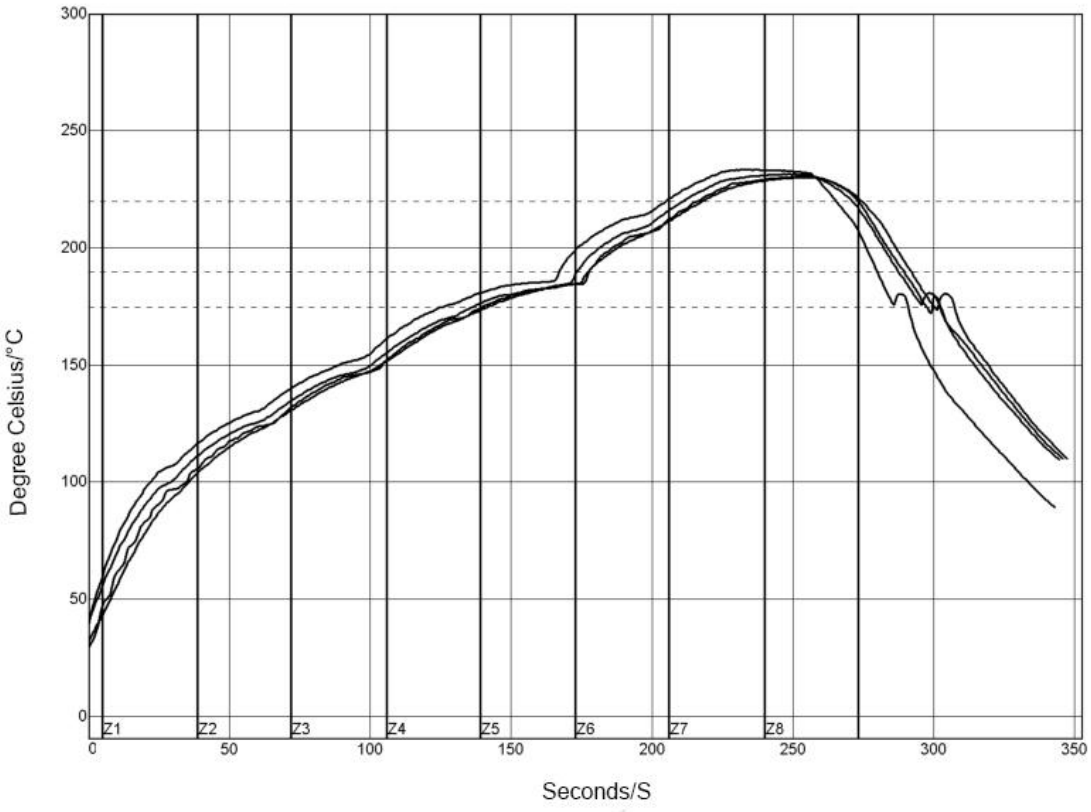


Figure 11 Bluetooth transmission test

12. Reflow soldering temperature curve

When the module is over-fired, please strictly follow this temperature curve. If the temperature deviation of the reflow soldering is too large, the module will be damaged!

Temperature setting (degrees Celsius)									
Warm zone	1	2	3	4	5	6	7	8	
Upper temperature zone	125	135	155	185	195	225	240	230	
Lower temperature zone	125	135	155	185	195	225	240	230	
Conveyor speed: 70.0 cm/min									



PWI= 94%	Constant temperature time 175~190°C			Reflux time/220° C		Max temp.
<TC2>	35.53	-82%	55.58	-72%	230.28	-94%
<TC3>	37.66	-74%	58.66	-57%	230.56	-89%
<TC4>	41.52	-62%	60.63	-47%	233.62	-28%
<TC5>	37.07	-76%	60.44	-48%	231.67	-67%
Temp. difference	5.99		5.05		3.34	

Process boundary

Solder paste: System Default for Reflow

Statistic name	Minimum limit	Maximum limit	Unit
Constant temperature time 175~190 °C	30	90	S
Reflow time -220°C	50	90	S
Maximum temp.	230	240	°C

Appendix A Document Revision History

Version number	Revision Scope	Date
1.00		2019-4-15

2.2 List of applicable FCC rules

FCC Part 15.247

2.6 RF exposure considerations

This module certified that complies with RF exposure requirement under 5mm RF distance.

2.8 Label and compliance information

FCC ID label on the final system must be labeled with “Contains FCC ID: 2AD56HLK-B20” or “Contains transmitter module FCC ID: 2AD56HLK-B20”.

2.9 Information on test modes and additional testing requirements

Contact ShenZhen HaiLingKe Electronic co.,Ltd will provide stand-alone modular transmitter test mode. Additional testing and certification may be necessary when multiple modules are used in a host.

2.10 Additional testing, Part 15 Subpart B disclaimer

To ensure compliance with all non-transmitter functions the host manufacturer is responsible for ensuring compliance with the module(s) installed and fully operational. For example, if a host was previously authorized as an unintentional radiator under the Supplier’s Declaration of Conformity procedure without a transmitter certified module and a module is added, the host manufacturer is responsible for ensuring that the after the module is installed and operational the host continues to be compliant with the Part 15B unintentional radiator requirements. Since this may depend on the details of how the module is integrated with the host, ShenZhen HaiLingKe Electronic co.,Ltd shall provide guidance to the host manufacturer for compliance with the Part 15B requirements.

FCC Warning

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.

NOTE 1: This product has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This product generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this product does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
—Reorient or relocate the receiving antenna.
—Increase the separation between the equipment and receiver.
—Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
—Consult the dealer or an experienced radio/TV technician for help.

NOTE 2: Any changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance.

Note 1: This module certified that complies with RF exposure requirement under 5mm RF distance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Note 2: Any modifications made to the module will void the Grant of Certification, this module is limited to OEM installation only and must not be sold to end-users, end-user has no manual instructions to remove or install the device, only software or operating procedure shall be placed in the end-user operating manual of final products.

Note 3: The module may be operated only with the antenna with which it is authorized. Any antenna that is of the same type and of equal or less directional gain as an antenna that is authorized with the intentional radiator may be marketed with, and used with, that intentional radiator.