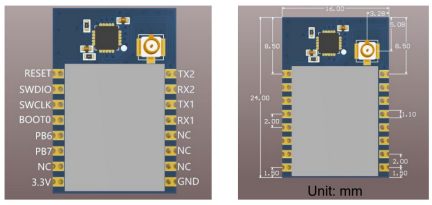
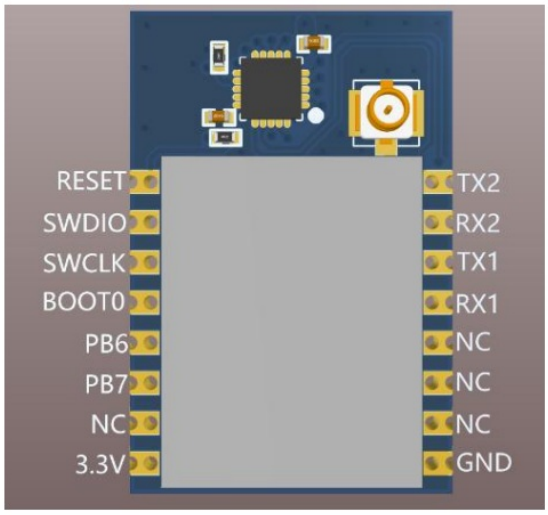
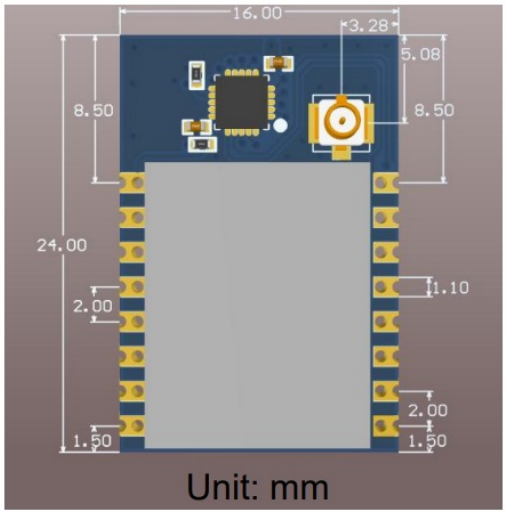


Hi-Link HLK-L06-915 LoRa Module User Manual

Hi-Link HLK-L06-915 LoRa Module





Contents

Product Introduction

Overview

HLK-L06-915 uses Lora chip as wireless communication to realize data transparent transmission from serial port to Lora wireless radio frequency. It has the characteristics of long transmission distance, low power consumption, strong anti interference ability, and easy to use.

Product Features

- Support serial port to Lora RF data conversion
- The main frequency supports 32MHz
- The main control uses PY32F003 as the main control
- Lora uses LLCC68 for communication, 903-927Mhz communication frequency, long transmission distance
- Working voltage 3.0-3.6V, typical value 3.3v
- Compatible with B36 module package, external antenna
- Support the configuration transmission rate and power of at command
- Maximum transmit power14.29dBm
- Support LoRa modulation mode
- Supports one-to-one and one-to-many communication

Technical Specifications

Table 1 Product Specification

			Remark
Module	**Model**	HLK-L06-915	
	encapsulation	DIP/SMD	
Wireless parameters	**Modulation**	LoRa	
	Frequency Range	903-927Mhz	
	transmit power	Maximum14.29dBm	Programmable adjustment
	Receiver sensitivity	-129dBm	
	Antenna form	External: I-PEX connector	
Hardware parameters	**hardware interface**	UART	
	Operating Voltage	3.3V (3.0-3.6v)	
	Communication rate	LoRa modulation method: 1.11 ~ 18.23 Kbps	
	Working current	Under continuous transmission : ~ 12 0mA, the maximum transmission power In receive mode : 5 mA	
	Operating temperature	-40 °C ~ 85 °C	
Serial transparent transmission	**Transmission rate**	9600 – 115200 bps	
	user configuration	AT+ command set	

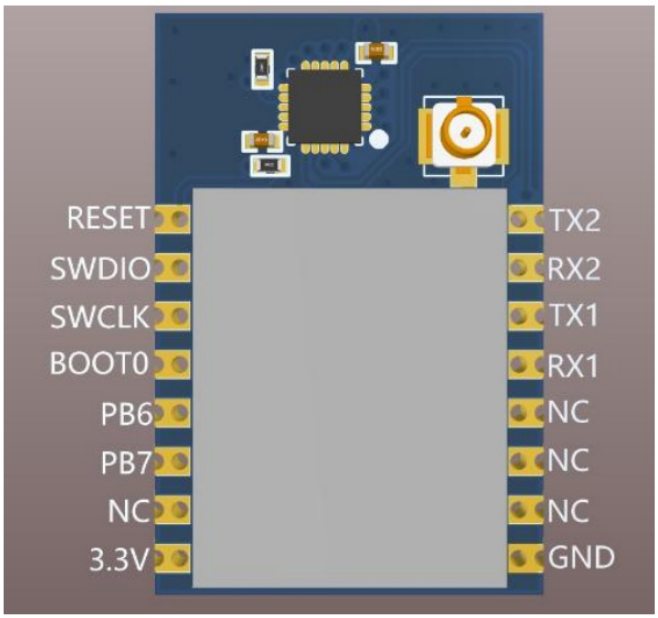
Pin Introduction

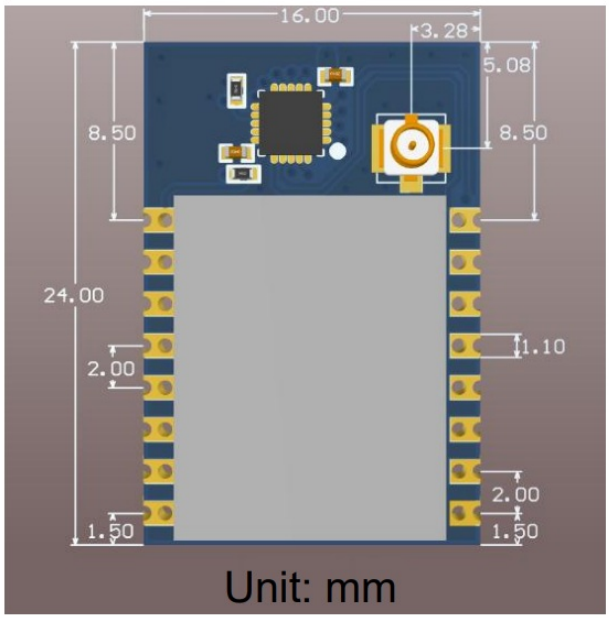
Table 2 Module pin interface

Pin	Network name	Type	Illustrate
1	**RESET**	I	Chip reset pin, low level reset
2	**SWDIO**	I/O	SWDIO
3	**SWCLK**		SWCLK
4	**BOOT0**	I	BOOT0 (keep Hanging)
5	**PB6**	I/O	ES0, enter at command mode/restore fact ory settings, please pull up if not in use
6	**PB7**	I/O	PB7 (keep Hanging)
7	**NC**	I/O	NC
8	**3.3V**	P	3.3V power supply
9	**GND**	P	GND
1 0	**NC**	I/O	NC
1 1	**NC**	I/O	NC
1 2	**NC**	I/O	NC
1 3	**RX1**	I/O	RX0
14	**TX1**	I/O	TX0, log print
15	**RX2**	I/O	UART1, command setting and transparent transmission
16	**TX2**	I/O	UART1, command setting and transparent transmission

Product Packaging

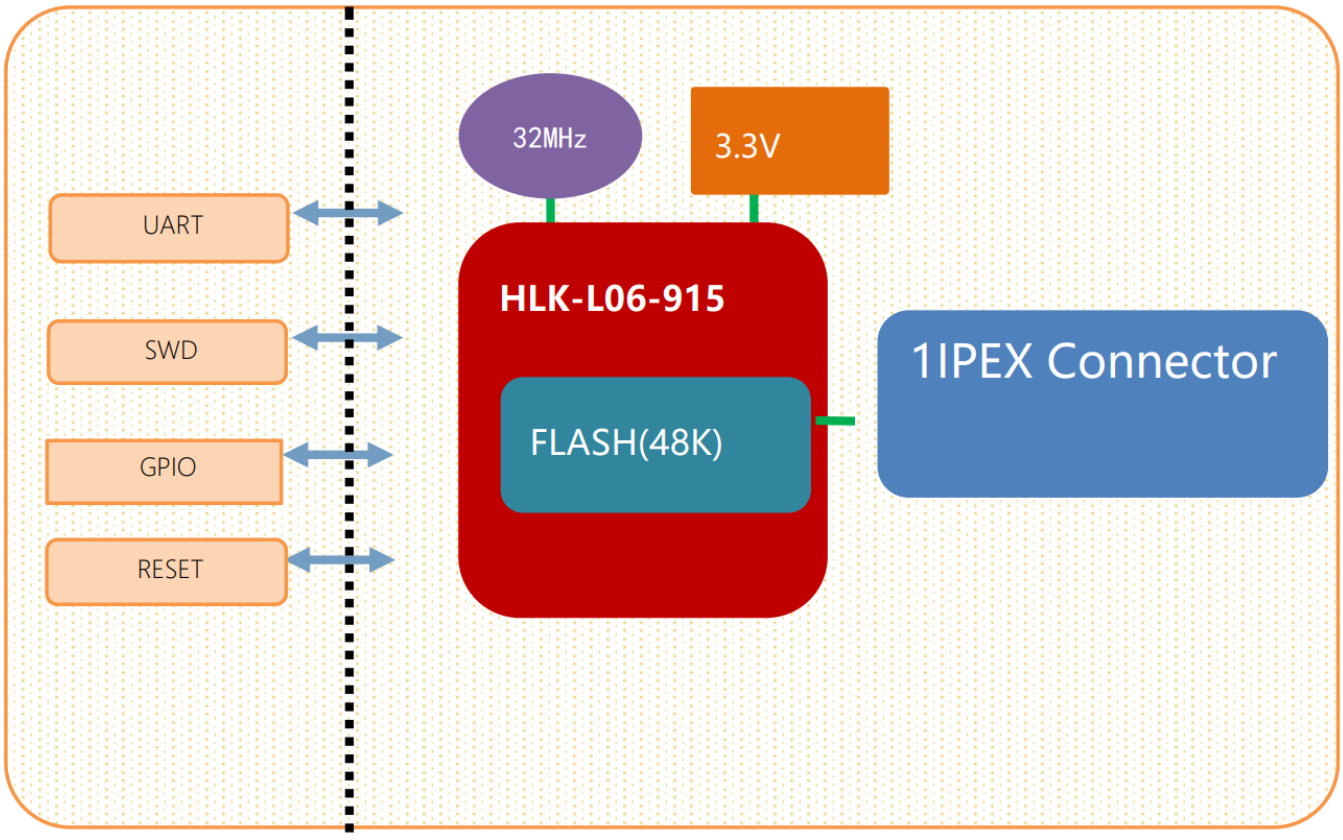
Figure 1 HLK-L06-915 package size





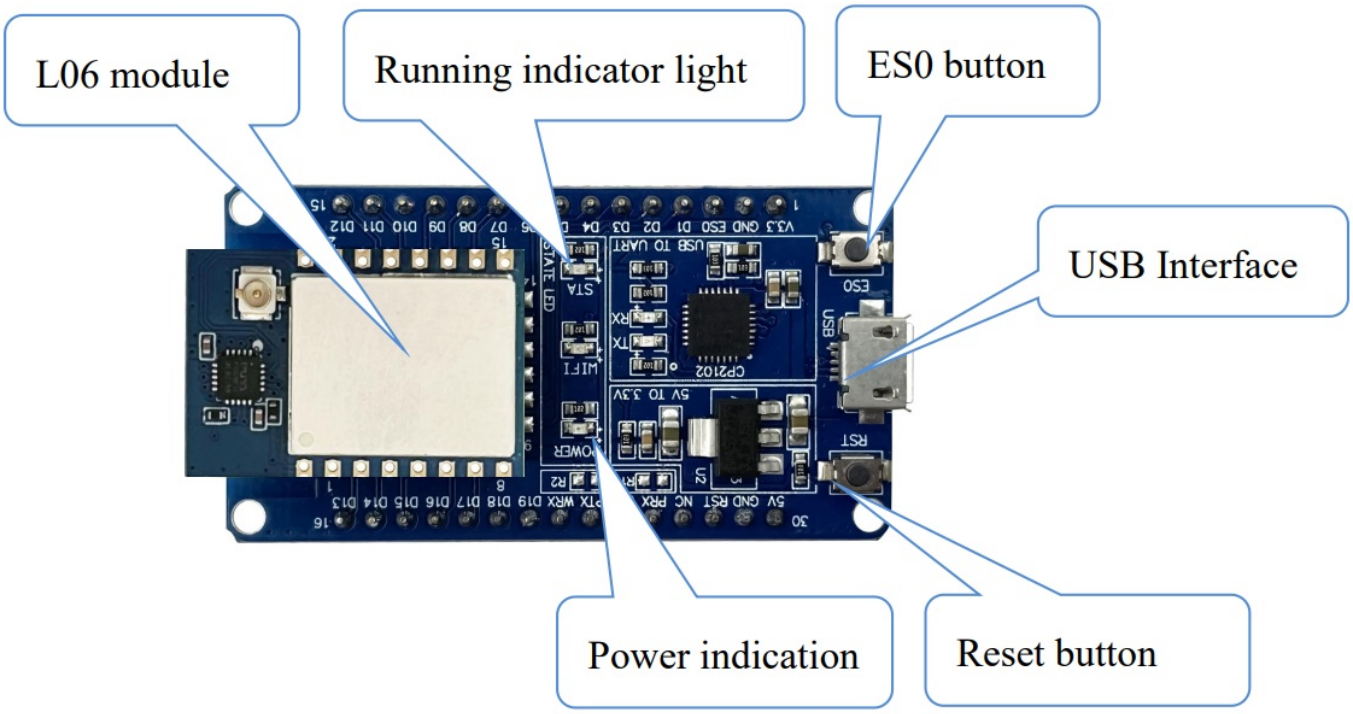
Block Diagram

Figure 2 HLK-L06-915 module architecture diagram



Bottom Plate Description

Figure 3 Bottom plate illustration



Reset button: reset and restart the module
ES0 button: Short press to enter command mode, long press for more than 6 seconds will automatically restore to the default configuration

Indicator Light Description

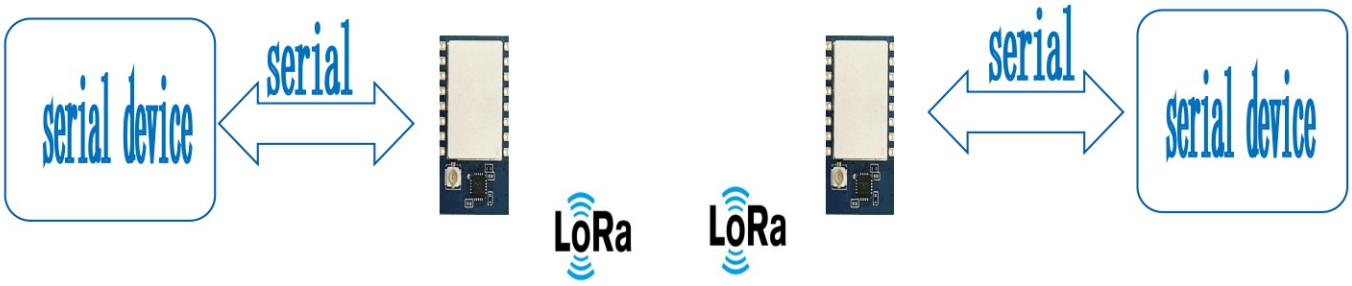
Description of the running indicator light: The LED light flashes at intervals of three flashes and one off, indicating that the program is running Power indicator light: always on after power on When the module is tested on the test board, there is an LED indicator light, and the module itself has no LED light.

Functional Description

HLK-L06-915 supports serial port to radio frequency, one-to-one communication and one-to-many communication.
If the two modules need to communicate, it is necessary to set the air baud rate level, module working channel and working ID to be the same before data transmission can be carried out.

One-to-one Communication

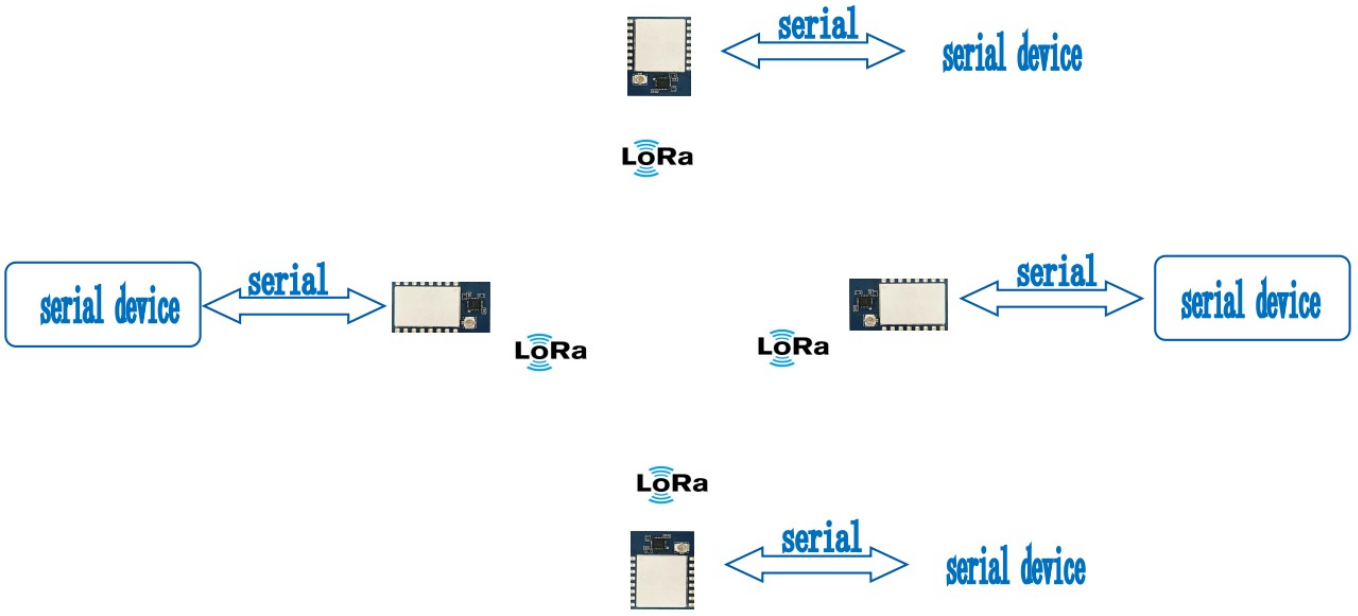
Figure 4 one-to-one communication



The module converts the serial port data of the device into a LoRa modulated signal, which spreads in the air, and another module prints out the data from the serial port after receiving the data. Two modules with the same working ID can perform one-to-one communication, and other modules with different working IDs will directly discard the received data.

One-to-many Communication

Figure 5 One-to-many communication

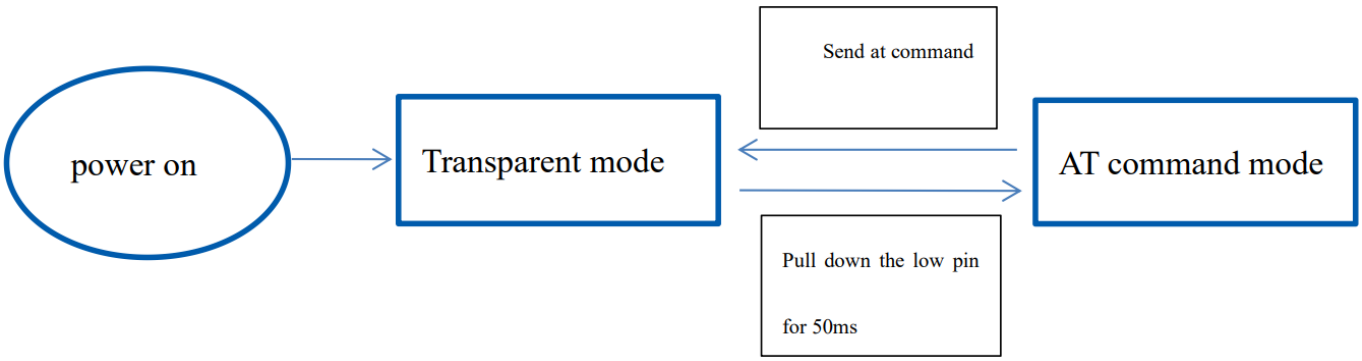


When multiple modules communicate at the same time, all modules need to be set to the same work ID, and when one module sends data, all modules can receive data.

AT Command Description

After HLK-L06-915 is powered on, the default is the transparent transmission mode. By pulling down the pin ES0 (PIN5) for more than 50ms to enter the at command mode, the module will process the received data as an at command, and send the at command to let The module enters the transparent transmission mode. Before the ES0 pin is pulled low, the data received by the serial port will be transmitted as transparent transmission data.

Figure 6 Serial working mode conversion



Version Query: at+ ver

Command type	**Grammar**	**Return and instructions**
query command	at+ ver = ?	at+ver=? HLK-L06-915(a.3.10.120230111221438) Description: Return the current software version

Set the Serial Port Mode: at+mode

Command type	Grammar	Return and instructions
execute order	at+ mode = 1	at+ mode = 1 ok Description: Jump from at command mode to transparent transmission mode
query command	at+ mode =?	at+ mode =? 0 Description: Query the current mode 0: at command mode 1: Transparent transmission mode

Set Serial Port Parameters: at+uart

Command type	Grammar	Return and instructions
Excuting an order	at+uart=115200,8,n,1	at+uart=115200,8,n,1 Ok Description: Set the serial port parameters to 115200 baud rate, 8 data bits, no parity, and 1 data stop bit Baud rate range: 9600 ~ 115200
query command	at+uart=?	at+uart=? 115200,8,n,1 Description: Query serial port parameters

Restore Factory Settings: at+default

Command type	Grammar	Return and instructions
execute order	at+ default = 1	at+ default = 1 ok **Note**: Restore factory settings, after executing this command, the module will restart

Reboot Command: at+reboot

Command type	Grammar	Return and instructions
execute order	at+ reboot = 1	at+ reboot = 1 ok **Note**: Restart the module, before starting, the module will save the data

Set the Module Transmit Power Level: at+power

Command type	Grammar	Return and instructions
execute order	at + power = 1	at + power = 1 ok Description: Set the power level to 0 Description of power level: 0: -3dBm 1: 0dBm 2: 5dBm 3: 10dBm 4: 14.29dBm
query command	at+ power =?	at+ power =? 4 Description: query the current power level is 5, that is 14.29dBm

Set the Air Baud Rate Level of the Module: at+rf_baud

Command type	Grammar	Return and instructions
execute order	at+ rf_baud = 2	at+ rf_baud = 2 ok Description: Set the air baud rate level to 2 Description of air baud rate level: 0: 1.11kbps 1: 1.46kbps 2: 2.60kbps 3: 4.56kbps 4: 9.11kbps 5: 18.75kbps For data transmission, the slower the speed, the greater the delay in the air
query command	at + rf_baud = ?	at+rf_baud=? 1 Description: Query the current air baud rate level is 1, that is, 1.46kbps

Set the Working Channel of the Module: at+rf_channel

Command type	Grammar	Return and instructions
execute order	at+ rf_channel = 0	at+ rf_channel = 0 ok Description: Set the working channel of the module to 0 Description of power level: 0: 903Mhz 1: 904Mhz 2: 905Mhz … 25: 927Mhz
query command	at+ rf_channel =?	at+ rf_channel =? 0 **Description**: Query the working channel of the current module is 0, that is, 915Mhz

Set the Module Work ID: at+pid

Command type	Grammar	Return and instructions
execute order	at + pid = 1	at + pid = 1 ok **Description**: Set the module work ID to 1 ID range: 0~255, the working id is used to distinguish each module, only modules with the same id can communicate with each other
query command	at+ pid =?	at+ pid =? 1

Test Demo

Power on the two modules, connect the transparent serial ports of the modules respectively, send data from one module, and receive data from the other module. The maximum packet transmitted by the module in the air is 64 bytes, and the maximum packet sent by the serial port at one time is 1000words. Section, after the module serial port receives the data, if it is less than 64 bytes, it will be sent directly, if it is larger than 64 bytes, it will be split into 64 bytes and transmitted in the air.

Appendix A Document Revision Record

Version number	Scope of revision	Date
V1.00	first edition	2022-12-30
V1.01	Add AT command description	2023-3-1
V1.02	Add led instructions and demonstration instructions	2023-3-8
V1.03	Add job ID function description	2023-3-18

FCC Caution

Any Changes or modifications not expressly approved by the party responsible for compliance 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.

IMPORTANT NOTE:

NOTE: This equipment 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 equipment 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 equipment 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.

FCC Radiation Exposure Statement:
This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment .This equipment should be installed and operated with minimum distance 20cm between the radiator& your body

OEM/Integrators Installation Manual

List of applicable FCC rules This module has been tested and found to comply with part 15.247 requirements for Modular Approval.
Summarize the specific operational use conditions This module can be applied in Smart home, Instrumentation; Wi-Fi Remote monitoring/control; Toy field; Color LED control;
Intelligent integrated management of fire protection and security; Smart card terminals, wireless POS machines, handheld devices.
The input voltage to the module should be nominally 3.3 VDC, typical value 3.3VDC and the
ambient temperature of the module should not exceed 80℃.
Limited module procedures N/A
Trace antenna designs N/A
Antennas The module of HLK-L06 has one Antenna port and the antenna gain as below:
Lora, DTS 500kHz mode: 3.85dBi;

Label and compliance information When the module is installed in the host device, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily removed. If not, a second label must be placed on the outside of the final device that contains the following text: Contains Transmitter Module FCC ID: 2AD56HLK-L06-915, the FCC ID can be used only when all FCC ID compliance requirements are met.

Information on test modes and additional testing requirements

a) The modular transmitter has been fully tested by the module grantee on the required number of channels, modulation types, and modes, it should not be necessary for the host installer to re-test all the available transmitter modes or settings. It is recommended that the host product manufacturer, installing the modular transmitter, perform some investigative measurements to confirm that the resulting composite system does not exceed the spurious emissions limits or band edge limits (e.g., where a different antenna may be causing additional emissions).
b) The testing should check for emissions that may occur due to the intermixing of emissions with the other transmitters, digital circuitry, or due to physical properties of the host product (enclosure). This investigation is especially important when integrating multiple modular transmitters where the certification is based on testing each of them in a stand-alone configuration. It is important to note that host product manufacturers should not assume that because the modular transmitter is certified that they do not have any responsibility for final product compliance.
c) If the investigation indicates a compliance concern the host product manufacturer is obligated to mitigate the issue. Host products using a modular transmitter are subject to all the applicable individual technical rules as well as to the general conditions of operation in Sections 15.5, 15.15, and 15.29 to not cause interference. The operator of the host product will be obligated to stop operating the device until the interference has been corrected.

Additional testing, Part 15 Subpart B disclaimer
The final host / module combination need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part15 digital device. The host integrator installing this module into their product must ensure that the final composite product complies with the FCC requirements by

a technical assessment or evaluation to the FCC rules, including the transmitter operation and should refer to guidance in KDB 996369. For host products with certified modular transmitter, the frequency range of investigation of the composite system is specified by rule in Sections 15.33(a)(1) through (a)(3), or the range applicable to the digital device, as shown in Section 15.33(b)(1), whichever is the higher frequency range of investigation. When testing the host product, all the transmitters must be operating. The transmitters can be enabled by using publicly available drivers and turned on, so the transmitters are active. In certain conditions it might be appropriate to use a technology-specific call box (test set) where accessory devices or drivers are not available. When testing for emissions from the unintentional radiator, the transmitter shall be placed in the receive mode or idle mode, if possible. If receive mode only is not possible then, the radio shall be passive (preferred) and/or active scanning. In these cases, this would need to enable activity on the communication BUS (i.e., PCIe, SDIO, USB) to ensure the unintentional radiator circuitry is enabled. Testing laboratories may need to add attenuation or filters depending on the signal strength of any active beacons (if applicable) from the enabled radio(s). See ANSI C63.4, ANSI C63.10 and ANSI C63.26 for further general testing details.

Documents / Resources

	Hi-Link HLK-L06-915 LoRa Module [pdf] User Manual 2AD56HLK-L06-915, 2AD56HLKL06915, HLK-L06-915 LoRa Module, HLK-L06-915, HLK-L06-915 Module, LoRa Module, Module