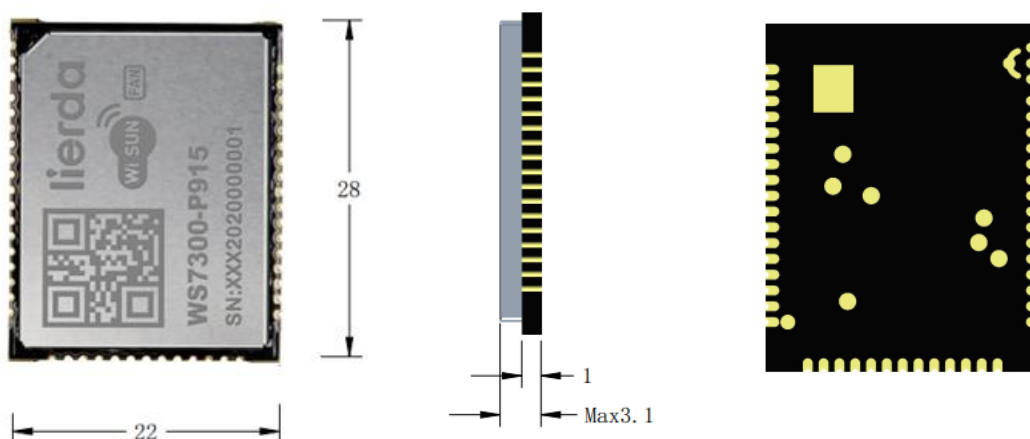


# WS7300 series modules

The WS7300 series modules are Wi-SUN wireless communication modules based on the VC7300BU chip. They are interoperable, reliable, high speed and have advanced wireless mesh communication technology to meet Wi-SUN standards and are widely used in wireless intelligent public networks and related applications.

## Products Features

- Operating Frequency Bands
    - Operating bands 902~928MHz, 470~510MHz, 863~870MHz
  - Modulation method
    - Support GFSK modulation method
  - High link budget
  - Sensitivity up to -110dBm@PER10%/50kbps/h=1
  - Maximum transmit power typical values.
    - High power version 29.5dBm
    - Medium power version 20dBm
  - Protocol Standards
    - Wi-SUN
  - High Speed
- Communication rate of 50 to 300 Kbps
  - Communication interface
    - Serial port
  - OTA support
  - Security
    - IEEE 802.1x enterprise security level
  - Applicable scenarios
    - Smart Meters
    - Smart Home
    - Sensor Networks
    - Smart Street Lighting
    - ....
  - Module size (mm)



This document is provided by the Company to support its customers in the design of their products. Customers must design their products in accordance with the specifications and parameters provided in this document. The Company shall not be liable for any personal injury or property damage caused by improper handling by the customer. Lilda reserves the right to update this document without prior notice.

The copyright for this document belongs to us and any person who reproduces this document without our permission will be held liable.

## Document revision history

Version	Date	Authors	Description of change
Rev01	2020-08-05	Youxc	Initial Version
Rev02	2020-09-10	Youxc	MODE pin description change
Rev03	2020-09-21	Youxc	functional block diagram update
Rev04	2020-11-18	Youxc	Upper and lower current limits added
Rev05	2020-11-23	Youxc	Modified 20dBm module power, added detailed pin descriptions, added test point coordinates
Rev06	2020-11-30	Youxc	Add new test point behind the mark
Rev07	2020-12-17	Youxc	1. Update section 5.2.8 of reference design, add decoupling capacitor to pin recommendation, modify reset time to pull down reset pin; 2. Modify power consumption of medium power version
Rev08	2021-05-11	Youxc、Lxy	Modify operating voltage range, add 470-510MHz module parameters, modify module pinout, modify maximum power consumption of 915 medium power version
Rev09	2021-09-06	Youxc	1.add 868M module parameters 2.add notes 3.add selection table

## 目录

1 Introduction.....	5
2 Product information .....	5
2.1 Functional block diagram.....	5
2.2 Product Selection Guide .....	5
2.3 Product size description.....	6
3 Product performance description.....	6
3.1 Product specifications.....	6
3.2 Power description .....	8
4 Product pinout.....	9
4.1 Module Pinout Electrical Characteristics .....	9
4.2 Module pinout indication .....	10
4.3 Module Pin Function Classification.....	10
4.3.1 Power supply.....	10
4.3.2 Serial port.....	10
4.3.3 SWD interface.....	11
4.3.4 Functional interfaces.....	11
4.3.5 Antenna interface .....	12
4.3.6 Other interfaces.....	12

# 1 Introduction

The purpose of this document is to introduce the hardware features of our WS7300 series modules. You can use this document to quickly understand the electrical features, interface specifications and design references of the WS7300 series modules. The combination of interface protocols and command sets will help you to build Wi-SUN networks faster.

- 《WS7300 Series Module BorderRouter Side Interface Protocols》
- 《WS7300 Series Module Node Side Interface Protocol》
- 《WS7300 Series Module Shell Command Set》

# 2 Product information

## 2.1 Functional block diagram

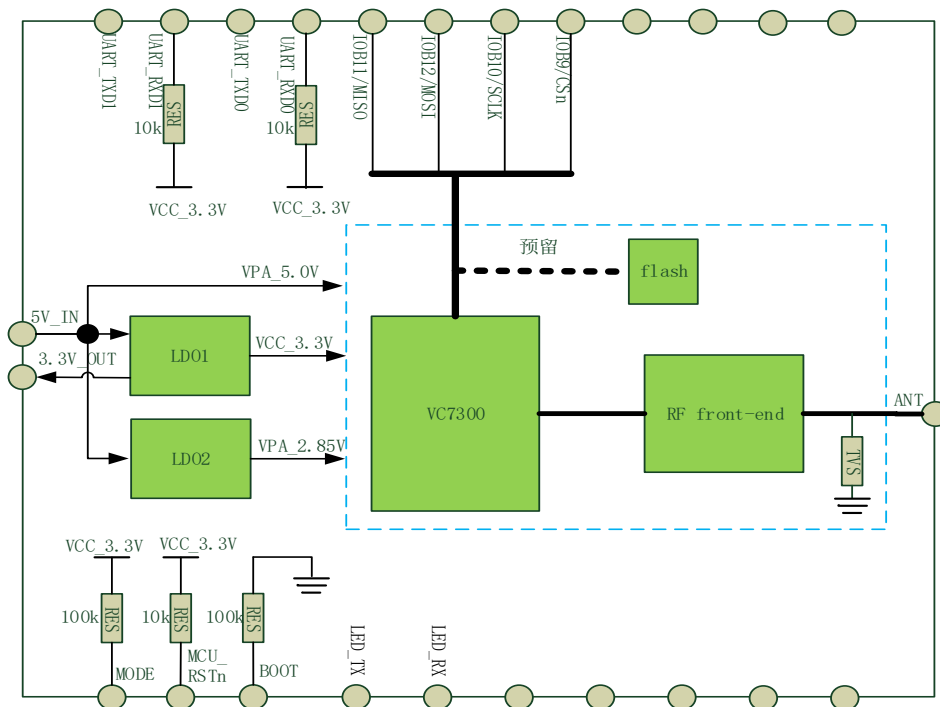


Figure 1 Internal block diagram of WS7300 series modules

Note: The above block diagram is only used to indicate the internal architecture of the modules.

## 2.2 Product Selection Guide

Users can follow the table below to understand the characteristics of specific products and choose a more suitable product.

Table 1 WS7300 Series Module Selection Guide

Model No.	Shield silkscreen	Product Features	Support band MHz	Transmit power dBm	Receive sensitivity dBm	Supply voltage V	Hardware
LSD4RF-3V930RN0	WS7300-P915	High power, high sensitivity	902~928	30	-110	5	Node



Turn-off voltage (V)		-		0.3	It takes 100ms for the voltage to fall below 0.3V before it drops completely
Operating frequency band (MHz)	WS7300-P915	902	915	928	Customer-defined operating frequency
	WS7300-915				
	WS7300-470	470	490	510	
	WS7300-868	863	868	870	
Frequency bias(KHz) <sup>1</sup>		-3	-	3	Factory frequency bias
Launch power consumption (mA)	LSD4RFC-2V9DRND01				
		120	130	155	Factory power value transmit, tested with 50 Ohm load
	LSD4RF-3V930RN0/ LSD4RF-3V930R50				
		600	750	800	Factory power value transmit, tested with 50 Ohm load
	LSD4RFC-4V7DRND02				
		120	140	160	Factory power value transmit, tested with 50 Ohm load
	L-WSMVB10-86PN4				
		50	70	85	Factory power value transmit, tested with 50 Ohm load
Receiving power consumption (mA)		32	38	45	Continuous reception status
Transmitting power (dBm)	LSD4RFC-2V9DRND01				
		18.5	19.5	20.5	Customer-defined transmitting power
	LSD4RF-3V930RN0/ LSD4RF-3V930R50				
		28.5	29.5	30.5	Customer-defined transmitting power <sup>2</sup>
	LSD4RFC-4V7DRND02				

If the module is in transmitting mode for a long time, the frequency deviation will change due to temperature effects

The table shows the power values when transmitting at 50kbps/h = 1/GFSK modulated waveform at maximum power, the user can set the required transmitting power according to their needs, see chapter 3.2.

	18.5	19.5	21	Customer-defined transmitting power
--	------	------	----	-------------------------------------

Table 4 WS7300 Series Module Operating Parameters (continued)

Main parameters	Performance			Remarks
	Minimum	Typical values	Maximum	
	L-WSMVB10-86PN4			
Transmitting power (dBm)	12.5	13	14	Factory calibrated to 14dBm, customer definable transmit power up to 20dBm
Transmitted power flatness (dB)	-	±0.5	-	Individual module power vs. frequency
Reception sensitivity (dBm)	-	-110	-108	PER10%/50kbps/h=1/GFSK
Communication rate (bps)	-	50k	300k	-
Modulation method	GFSK			
Interface type	Stamp hole			1.27mm Spacing
Communication protocols	UART			
Interface level	3.3V			
Dimensions (mm)	28*22*3.1			
Standard	Wi-SUN			
RF port characteristic impedance (Ω)	50			

### 3.2 Power description

If you want to change the output power, you can refer to the document "WS7300 Series Module Node Side Interface Protocol" or contact us to provide the API for power modification.

The current corresponding to the different transmitting power of the high power module is shown in the figure below. Note: This diagram shows the correspondence between typical values of power and power consumption.



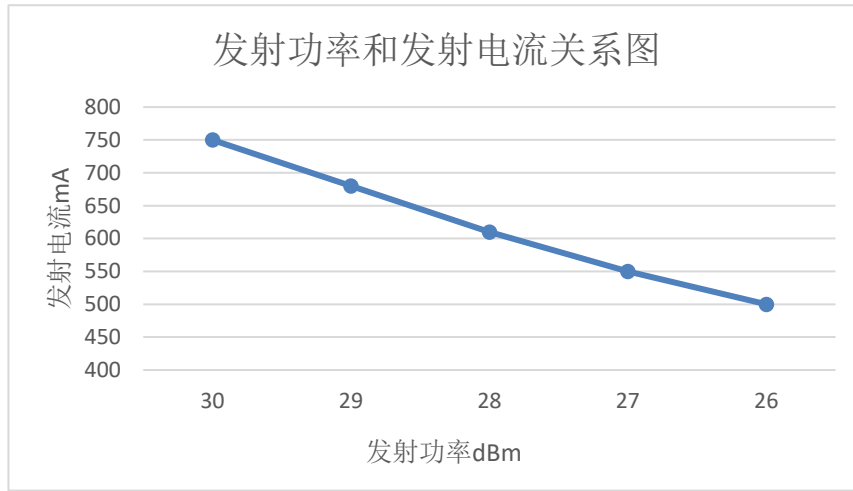


Fig. 3 High power module transmit power-current relationship

## 4 Product pinout

### 4.1 Module Pinout Electrical Characteristics

Table 5 WS7300 Series Module Pinout Electrical Characteristics

Main parameters	Performance			V <sub>DDIO</sub>	Remark
	Minimum	Typical values	Maximum		
V <sub>IH</sub> (V)	2.0	-	-	3.3V	-
V <sub>IL</sub> (V)	-	-	0.3 V <sub>DDIO</sub>	3.3V	-
V <sub>OH</sub> (V)	2.4	-	-	3.3V	-
V <sub>OL</sub> (V)	-	-	0.8	3.3V	-
IO pull current (mA)	-	4	-	3.3V	-
IO filling current (mA)		4	-	3.3V	-

## 4.2 Module pinout indication

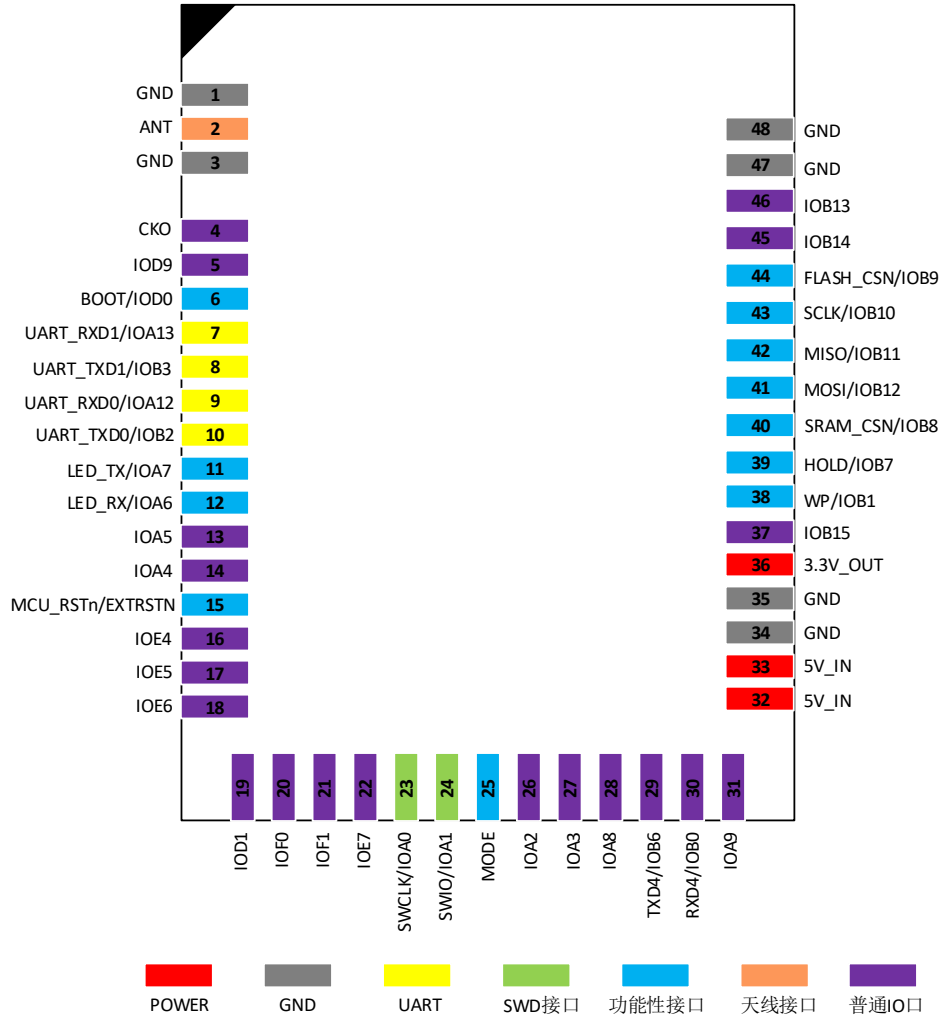


Fig. 4 WS7300 series module pinout indication

## 4.3 Module Pin Function Classification

### 4.3.1 Power supply

Table 6 WS7300 Series Module Power Supply Pinout

LSD4RF-3V930RN0 LSD4RFC-2V9DRND01 LSD4RFC-4V7DRND02					
Pin Name	Pin No.	Instructions	Pin Type <sup>3</sup>	DC characteristics	Remark
5V_IN	32	Module power input	PI	V <sub>max</sub> = 5.25V V <sub>type</sub> = 5V V <sub>min</sub> = 4V	Performance can be affected when not powered by 5V
	33				
3.3V_OUT	36	Module provides power output	PO	V <sub>type</sub> = 3.3V I <sub>omax</sub> = 50mA	Customers are advised to use this pin for level shifting or low current applications
GND	1,3,34,35,47,48	Ground	G	-	-

### 4.3.2 Serial port

<sup>3</sup> (Pin type: "O"=Output, "I"= Input, "P"=Power, "G"=Ground)

Table 7 WS7300 series module serial port pin descriptions

LSD4RF-3V930RN0 LSD4RFC-2V9DRND01 LSD4RFC-4V7DRND02					
Pin Name	Pin NO.	Instructions	Pin type	DC characteristics	Remark
UART_RXD1	7	Debugging the serial port	I/O	$R_{pu} = 10k$	RX internal pull-up, debug serial port, baud rate 115200, parity bit NONE data bit 8 stop bit 1
UART_TXD1	8	Debugging the serial port	I/O	-	
UART_RXD0	9	Data serial port	I/O	$R_{pu} = 10k$	RX internal pull-up, main serial port, baud rate 115200, parity bit NONE data bit 8 stop bit 1
UART_TXD0	10	Data serial port	I/O	-	

### 4.3.3 SWD interface

Table 8 WS7300 series module SWD interface description

LSD4RF-3V930RN0 LSD4RFC-2V9DRND01 LSD4RFC-4V7DRND02					
Pin Name	Pin No.	Instructions	Pin type	DC characteristics	Remark
SWCLK	23	SWD Clock signals	I/O	-	MODE = 0 This pin is for SWCLK function MODE = 1 This pin is for general purpose IO,IOA1
SWIO	24	SWD Data signals	I/O	-	MODE = 0 This pin is for SWIO function MODE = 1 This pin is for general purpose IO,IOA0

### 4.3.4 Functional interfaces

Table 9 WS7300 series module functional interface descriptions

LSD4RF-3V930RN0 LSD4RFC-2V9DRND01 LSD4RFC-4V7DRND02					
Pin Name	Pin No.	Instructions	Pin type	DC characteristics	Remark
MCU_RSTn	15	Reset pins	I	$R_{pu} = 10k$	Internal pull-up, active low
BOOT	6	Start-up method selection	I	$R_{pd} = 100k$	Internal drop down, BOOT = 0: Embedded flash boot. BOOT = 1: Internal ROM boot
MODE	25	Mode selection	I	$R_{pu} = 100k$	Internal pull-up, MODE = 0: Debug mode MODE = 1: Normal mode
LED_TX	11	Communication instructions	O	-	This pin is pulled low when data is sent from the data serial port
LED_RX	12	Communication	O	-	This pin is pulled low

		instructions			when data is received on the data serial port
SRAM_CSN	40	SRAM chip selection	O	-	Chip select signal for SRAM
MOSI	41	SPI MOSI	O	-	SPI MOSI
MISO	42	SPI MISO	I	-	SPI MISO
SCLK	43	SPI CLK	O	-	SPI CLK
FLASH_CSN	44	Flash chip selection	I	-	Chip select signal for Flash
HOLD	39	-	O		FLASH write protect pin
WP	38	-	O		FLASH HOLD Pins

#### 4.3.5 Antenna interface

Table 10 WS7300 series module antenna interface description

LSD4RF-3V930RN0 LSD4RFC-2V9DRND01 LSD4RFC-4V7DRND02					
Pin Name	Pin No.	Instructions	Pin type	DC characteristics	Remark
ANT	2	Antenna pins	I/O	50Ω 阻抗	Maximum module input power should not exceed 10dBm, otherwise there is a risk of module damage

#### 4.3.6 Other interfaces

Table 11 Other interface descriptions for WS7300 series modules

LSD4RF-3V930RN0 LSD4RFC-2V9DRND01 LSD4RFC-4V7DRND02					
Pin Name	Pin No.	Instructions	Pin type	DC characteristics	Remark
CKO	4	Clock signal output	O	-	Overhang
IOD9	5	GPIO	I/O	-	Overhang
IOA5	13	GPIO/ External interrupts 5	I/O	-	Overhang
IOA4	14	GPIO/ External interrupts 4	I/O	-	Overhang
IOE4	16	GPIO/ADC channel 4	I/O	-	Overhang
IOE5	17	GPIO/ADC channel 5	I/O	-	Overhang
IOE6	18	GPIO/ADC channel 6	I/O	-	Overhang
IOD1	19	GPIO	I/O	-	Overhang
IOF0	20	GPIO	I/O	-	Overhang
IOF1	21	GPIO	I/O	-	Overhang
IOE7	22	GPIO/ADC 通道 7	I/O	-	Overhang
IOA2	26	GPIO/ External interrupts 2	I/O	-	Overhang
IOA3	27	GPIO/ External interrupts 3	I/O	-	Overhang
IOA8	28	GPIO/ External interrupts 8	I/O	-	Overhang
TXD4	29	GPIO/ Serial port 4	I/O	-	Overhang
RDX4	30	GPIO/ Serial port 4	I/O	-	Overhang

IOA9	31	GPIO/ External interrupts 9	I/O	-	Overhang
IOB15	37	GPIO	I/O	-	Overhang
IOB14	45	GPIO/IIC SDA	I/O	-	Overhang
IOB13	46	GPIO/IIC SCL	I/O	-	Overhang

Specific multiplexing functions can be found in the VC7300BU datasheet, which can be used by users according to their needs.

# Conformity

## **FCC regulatory conformance :**

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.
- (2) This device must accept any interference received, including interference that may cause undesired operation.

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

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.

## **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.

---

## ORIGINAL EQUIPMENT MANUFACTURER (OEM) NOTES

The OEM must certify the final end product to comply with unintentional radiators (FCC Sections 15.107 and 15.109) before declaring compliance of the final product to Part 15 of the FCC rules and regulations. Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change.

The OEM must comply with the FCC labeling requirements. If the module's label is not visible when installed, then an additional permanent label must be applied on the outside of the finished product which states: "Contains transmitter module FCC ID: **2AOFDWS7300-P915**". Additionally, the following statement should be included on the label and in the final product's user manual: "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 interferences, and
- (2) this device must accept any interference received, including interference that may cause undesired operation."

The module is limited to installation in mobile or fixed applications. Separate approval is required for all other operating configurations, including portable configuration with respect to Part 2.1093 and different antenna configurations.

A module or modules can only be used without additional authorizations if they have been tested and granted under the same intended end - use operational conditions, including simultaneous transmission operations. When they have not been tested and granted in this manner, additional testing and/or FCC application filing may be required. The most straightforward approach to address additional testing conditions is to have the grantee responsible for the certification of at least one of the modules submit a permissive change application. When having a module grantee file a permissive change is not practical or feasible, the following guidance provides some additional options for host manufacturers. Integrations using modules where additional testing and/or FCC application filing(s) may be required are: (A) a module used in devices requiring additional RF exposure compliance information (e.g., MPE evaluation or SAR testing); (B) limited and/or split modules not meeting all of the module requirements; and (C) simultaneous transmissions for independent collocated transmitters not previously granted together.

This Module is full modular approval, it is limited to OEM installation ONLY.

Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change. (OEM) Integrator has to assure compliance of the entire end product include the integrated Module. Additional measurements (15B) and/or equipment authorizations (e.g. Verification) may need to be addressed depending on co-location or simultaneous transmission issues if applicable. (OEM) Integrator is reminded to assure that these installation instructions will not be made available to the end user