

密级状态: 绝密() 秘密() 内部资料() 公开()

文档编号: (芯片型号) - ASR6500S (英文、数字)

ASR6500S Datasheet

文件状态:	当前版本:	V0.3
<input checked="" type="checkbox"/> 正在修改	作者:	ASR6500S Design Team
<input type="checkbox"/> 正式发布	启动日期:	2019-10-10
	审核:	
	完成日期:	2019-12-19



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版本历史

版本号	修改日期	作者	修改说明
V0.1	2019.10.10	ASR6500S Design Team	Initial version Created
V0.2	2019.12.16	ASR6500S Design Team	1.Update ASR6500S Package information 2.Update ASR6500S Pin definition
V0.2	2019.12.19	ASR6500S Design Team	Update ASR6500S Dimension

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General Description

The ASR6500S is a LoRa SIP module integrated with RF front end and LoRa radio transceiver SX1262 which supports LoRa® and FSK modulation. LoRa technology is a spread spectrum protocol optimized for low data-rate, ultra-long range and ultra-low power communication for LPWAN application.

The ASR6500S is designed for long battery life with just 4.2 mA of active receive current consumption, and the maximum transmit power is up to +22dBm. A high sensitivity down to -148 dBm is achieved which provides a high interference immunity.

The ASR6500S package is LGA, with a very small size of 8mm x 8mm x 1.3mm.

Applications

The ASR6500S SIP module integrated with SX1262 enable a new generation of IOT applications.

- ◆ Smart meters
- ◆ Supply chain and logistics
- ◆ Building automation
- ◆ Agricultural sensors
- ◆ Smart cities
- ◆ Retail store sensors
- ◆ Asset tracking
- ◆ Streetlights
- ◆ Parking sensors
- ◆ Environmental sensors
- ◆ Healthcare
- ◆ Safety and security sensors
- ◆ Remote control applications

1. System Introduction

1.1 Key Feature

- ◆ Small footprint: 8 x 8 x 1.3mm.
- ◆ RF front end integrated.
- ◆ LoRa Radio Transceiver SX1262.
- ◆ Frequency Range: 150 ~ 960MHz.
- ◆ Maximum Power: up to 22dBm@LoRa CW.
- ◆ LoRa High sensitivity:
-148dBm@BW=10.4 kHz, SF12.
- ◆ Maximum Link Budget:
170 dB @ BW=10.4 kHz, SF12.
- ◆ Programmable Bit rate LoRa:
Max 62.5Kbps @ BW=500 kHz, SF5.
Min 0.018Kbps @ BW=7.8 kHz, SF12.
- ◆ Programmable bit rate GFSK up to 300kbps.
- ◆ Preamble detection.
- ◆ 135 dB Dynamic Range RSSI
- ◆ Excellent Blocking Immunity
- ◆ Automatic RF Sense and CAD with Ultra-Fast AFC.

1.2 Block Diagram

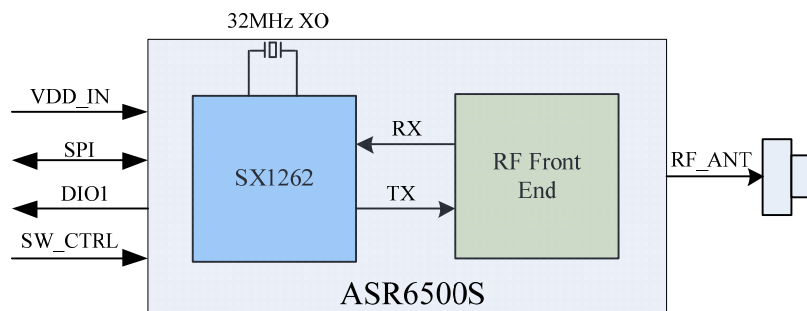


Figure 1-2: The block diagram of ASR6500S module

1.3 Specification

The following table is the general specifications of ASR6500S SIP module

Module Name	ASR6500S
Product description	LoRa Wireless Communication Module
Host Interface	SPI
Operation Conditions	
Temperature	<ul style="list-style-type: none"> ● Storage: -55C ~ +125C ● Operating: -40C ~ +85C
Humidity	<ul style="list-style-type: none"> ● Storage: 5 ~ 95% (Non-Condensing) ● Operating: 10 ~ 95% (Non-Condensing)
Dimension	8mm x 8mm x 1.3mm
Package	LGA Type

Table 1-3 General specifications of ASR6500S module

2. Electrical Characteristics

Electrical Characteristics include Absolute Maximum Ratings for the Module, Recommended Operating Range and Power Consumption Characteristics.

2.1 Absolute Maximum Rating

Symbol	Parameter	Min.	Typ.	Max.	Unit
VDD_IN	RF Supply Voltage	-0.3		3.9	V
Pin	RF Input level			+10	dBm

2.2 Power Consumption Characteristics

Symbol	Mode	Conditions	Min.	Typ.	Max.	Unit
IDD_OFF	OFF mode	All blocks off	-	160	-	nA
	(SLEEP mode with code start)					
IDD_SL	SLEEP mode	RF Config Retained;	-	600	-	nA
	(SLEEP mode with warm start)	Config retained + RC64k	-	1.2	-	uA
IDD_SBR	STDBY_RC mode	RC13M,XOSC OFF	-	0.6	-	mA
IDD_SBX	STDBY_XOSC mode	XOSC ON	-	0.8	-	mA
IDD_FS	Synthesizer mode	DC-DC mode used	-	2.1	-	mA
		LDO mode used		3.55	-	mA
IDD_RX	Receive mode (DC-DC mode used)	FSK 4.8Kbps	-	4.2	-	mA
		LoRa 125KHz	-	4.6	-	mA
		Rx Boosted, FSK 4.8Kbps	-	4.8	-	mA
		Rx Boosted, 125KHz	-	5.3	-	mA
	Receive mode (LDO mode used)	FSK 4.8Kbps	-	8	-	mA
		LoRa 125KHz	-	8.8	-	mA
		Rx Boosted, FSK 4.8Kbps	-	9.3	-	mA
		Rx Boosted, 125KHz	-	10.1	-	mA

IDD_TX	Transmit mode (434/490MHz)	Pout=+22dBm	-	108	-	mA
		Pout=+20dBm	-	90	-	mA
		Pout=+17dBm	-	75	-	mA
		Pout=+14dBm	-	63	-	mA
		Pout=+20dBm(TX OPT)	-	65	-	mA
	Transmit mode (868/915MHz)	Pout=+22dBm	-	118	-	mA
		Pout=+20dBm	-	102	-	mA
		Pout=+17dBm	-	95	-	mA
		Pout=+14dBm	-	90	-	mA
		Pout=+20dBm(TX OPT)	-	84	-	mA

2.3 Recommended Operating Range

Symbol	Parameter	Min.	Typ.	Max.	Unit
VDD	Supply Voltage	1.8	3.3	3.7	V
Pin	RF Input Power			+10	dBm

2.4 RF Characteristics

The table 2-4 gives the electrical specifications for the LoRa RF transceiver operating with LoRa modulation. Following conditions apply unless otherwise specified:

- ◆ Supply Voltage = 3.3V.
- ◆ Temperature = 25C.
- ◆ Frequency bands: 470MHz.
- ◆ Bandwidth (BW) = 10.4/125/250/500kHz.
- ◆ Spreading Factor (SF) = 12.
- ◆ Coding Rate (CR) = 4/6.
- ◆ Package Error Rate (PER) = 1%.
- ◆ CRC on payload enabled.
- ◆ Payload length = 10bytes.
- ◆ Preamble Length = 12 symbols.
- ◆ With matched impedances.

LoRa Transmitter RF Characteristics					
Items	Condition	Min.	Typ.	Max.	Unit
Frequency Range		150	470	960	MHz
Tx Power	RFO Pin	18	20	22	dBm
LoRa Receiver RF Characteristics					
Items	Condition	Min.	Typ.	Max.	Unit
Frequency Range		150	470	960	MHz
Sensitivity	BW = 10.4 kHz, SF = 12	-	-148	-	dBm
	BW = 10.4 kHz, SF = 7	-	-134	-	dBm
	BW = 125 kHz, SF = 12	-	-138	-	dBm
	BW = 125 kHz, SF = 7	-	-124	-	dBm
	BW = 250 kHz, SF = 12	-	-134	-	dBm
	BW = 250 kHz, SF = 7	-	-121	-	dBm
	BW = 500 kHz, SF = 12	-	-129	-	dBm
	BW = 500 kHz, SF = 7	-	-117	-	dBm
2nd order harmonic	Tx Power = 22dBm	-	-41	-	dBm

Table 2-4: LoRa RF Transceiver Characteristics

2.5 Digital Characteristics

2.5.1 DC Characteristics

Symbol	Description	Conditions	Min.	Typ.	Max.	Unit
V _{IH}	I/O input high level		0.7xVDD			V
V _{IL}	I/O input low level				0.3xVDD	V
RPU	Weak pull up resistor	V _{in} =GND	30	45	60	K Ω
RPD	Weak pull down resistor	V _{in} =VDD	30	45	60	K Ω

2.5.2 RST Characteristics

Figure 2-5 shows the recommended XRES pin connection. An external RESET button is used to generate reset pulse of the whole chip. The 0.1uF capacitor is to filter out the parasitic reset glitch.

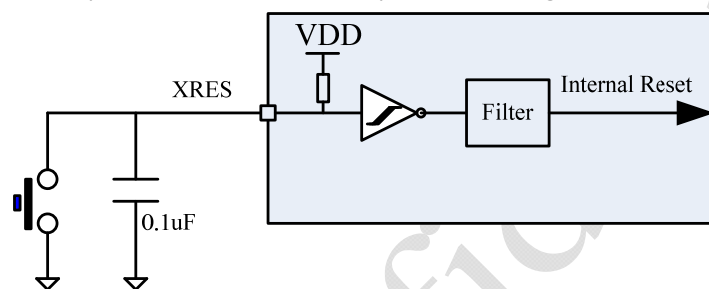


Figure 2-5: XRES Pin Connection

3. Pin Connection

3.1 I/O Description

Pin NO.	Pin Name	P/G/I/O	Description
1	DIO1	I/O	General purpose I/O
2	SPI_BUSY	I/O	SPI busy indicator
3	SPI_NRESET	I/O	SPI reset, active low
4	GND	P	GND
5	RF_ANT	I/O	Antenna connector
6	SW_CTRL	I/O	RFSW control
7	SPI_MISO	I/O	SPI slave output
8	SPI_MOSI	I/O	SPI slave input
9	SPI_SCK	I/O	SPI clock
10	SPI_NSS	I/O	SPI slave select
11	VDD_IN	P	Input voltage
12	PGND	P	DC-DC GND, Connect to GND external
13	GND	P	GND

Table 3-1: ASR6500S pinout in LGA 8x8 13L

3.2 Pin Assignment

Pin assignment of ASR6500S SIP module is shown in the following diagram (top view)

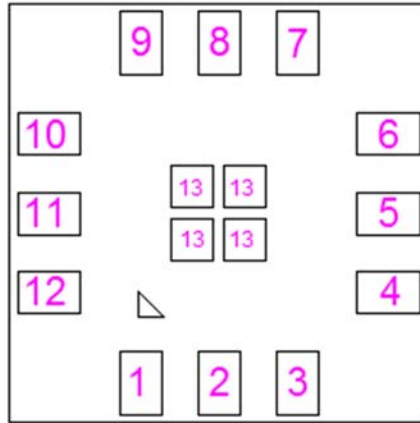
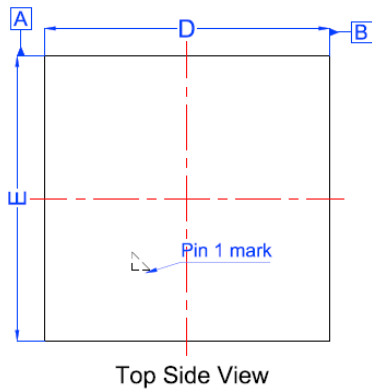


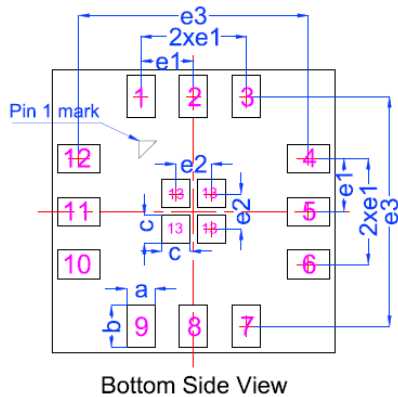
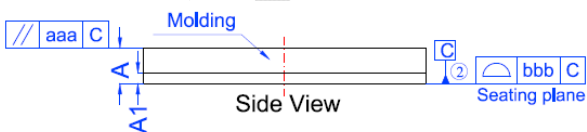
Figure 3-2 Pin Assignment of ASR6500S

4. Package Information



DIMENSIONAL REFERENCES Units:mm

SYMBOL	DIMENSIONAL REOMTS			SYMBOL	Tolerance of Form & Position
	MIN	NOM	MAX		
A	1.26	1.30	1.34	aaa	0.10
A1	0.27	0.30	0.33	bbb	0.10
D	7.90	8.00	8.10		
E	7.90	8.00	8.10		
a	0.75	0.80	0.85		
b	1.15	1.20	1.25		
c	0.75	0.80	0.85		
e1	1.50 REF				
e2	1.00 REF				
e3	6.50 REF				



Note:

1. All dimensions are in mm
- ② Datum 'C' is the mounting surface, with which the package is in contact

PIN	Value	PIN	Value
1	DIO1	8	SPI_MOSI
2	SPI_BUSY	9	SPI_SCK
3	SPI_NRST	10	SPI_NSS
4	GND	11	VDD_IN
5	RF_ANT	12	PGND
6	SW_CTRL	13	GND
7	SPI_MISO		