HYLINTECH HLM9S82 LoRa Wireless Module Owner's Manual

Contents

HYLINTECH HLM9S82 LoRa Wireless Module

Product Information

- Product Name: HYLINTECH HLM9S82
- Product Type: LoRa Module

Description:
The HLM9S82 wireless module is a high-performance IoT wireless transceiver based on LoRa modulation. It utilizes SEMTECH's LLCC68 series RF integrated chip, which offers small size, low power consumption, long transmission distance, and strong anti-interference capability. The module provides a user-friendly SPI interface, making it suitable for various IoT wireless communication applications.

FCC ID: 2A4G5-HLM9S82

Features:

- Frequency Range: 902.3-927.7MHz
- LoRa Modulation
- Low Power Consumption
- Supply Voltage: 1.8V~3.6V
- Rx Mode Current: 5.3mA
- Sleep Mode Current: 1.2uA
- High Link Budget
- Tx Power: Up to 22.10dBm

- Rx Sensitivity: -129dBm at SF9BW125
- SPI Interface
- Module Size: 18.6*18.5*3.0mm

Product Usage Instructions

The HYLINTECH HLM9S82 LoRa module can be used in the following applications:

- Metering
- Smart Home
- Remote Control
- Security

Specifications

Absolute Maximum Ratings:

Item	Range
Supply Voltage (VDDV)	-0.5V to +3.8V
RF Input Level (PmrdBm)	-55dBm to +125dBm
Temperature (Tmr)	-40°C to +85°C

General Specifications:

Item	Range
Supply Voltage (VDDV)	1.8V to 3.6V
Operating Temperature (Top)	-40°C to +85°C
Frequency Accuracy (Fa)	120kHz
Operating Frequency Band (Fop)	902.3MHz to 927.7MHz
Power Consumption	Tx: 5.3mA, Rx: 1.2mA, Sleep: 1.2uA
Tx Power	Up to 22.10dBm
Rx Sensitivity	-129dBm at SF9BW125
Modem	LoRa
Size	18.6mm x 18.5mm x 3.0mm

Pin Connection

Pin Num	Pin Name	Type	Description
P1	GND	I/O	Ground
P2	RF	I/O	RF in and out
P3	GND	I/O	Ground
P4	SW_TX	I/O	Switch Control, Tx mode: High Level, Other mode: Low Level
P5	SW_RX	I/O	Switch Control, Rx mode: High Level, Other mode: Low Level
P6	DIO1	I/O	LLCC68's DIO1
P7	DIO2	I/O	LLCC68's DIO2
P8	DIO3	I/O	LLCC68's DIO3
P9	NRST	I	LLCC68's NRESET
P10	BUSY	O	LLCC68's BUSY
P11	NSS	I	LLCC68's NSS
P12	MISO	O	LLCC68's MISO
P13	SCLK	I	LLCC68's SCLK
P14	MOSI	I	LLCC68's MOSI
P15	VDD	–	Power supply
P16	GND	–	Ground

Basic Operation

Typical Application Circuits:

When using the HLM9S82 module, it is recommended to include a matching circuit between the module's antenna interface and the antenna interface. Two typical application circuits are shown below:

Optimum Cost Solution

Fig4-1: Optimum Cost Solution

Minimum IO Ports Solution

Fig4-2: Minimum IO Ports Solution

PCB Layout Notes

1. The DIO port should be connected to the MCU's IO port with external interrupt.
2. The trace between the RF port and the antenna should be as short as possible. The RF trace should be impedance matched (50Ω).
3. Add a matching circuit between the RF port and the antenna if possible.
4. Keep the antenna away from other devices.
5. Avoid proximity to high-voltage circuits and high-frequency circuits.

6. Ensure proper grounding, preferably with a large area of paving.

Discription

HLM9S82 wireless module is a LoRa modulation based high performance IoT wireless transceiver. The module is developed based on SEMTECH's LLCC68 series RF integrated chip, which features small size, low power consumption, long transmission distance and strong anti-interference capability. HLM9S82 provides SPI interface, which is user-friendly and can be applied to various IoT wireless communication fields.

18.6*18.5*3.0 mm

Usage

- Metering
- Smart Home
- Remote control
- Security

Features

- 902.3-927.7MHz
- LoRa
- Low power
  - 1.8V~3.6V Supply voltage
  - 5.3mA Rx mode
  - 1.2uA Sleep Mode
- High link budget
  - Up to 22.10dBm Tx power
  - Rx sensitivity-129dBm@SF9BW125
- SPI Interface

Order

PN	Range	Size
HLM9S82	-40℃~+85℃	18.6×18.5×3mm

Specifications

Table1-1 Absolute Maximum Ratings

Item	Range		Description
	Min	**Max**	
VDD V	-0.5	+3.8	Supply voltage
Pmr dBm	–	+10	RF Input level
Tmr ℃	-55	+125	Temperature

Table1-2 General Specifications

Item		Range			Description
		Min	**Typ**	**MAX**	
VDD V		1.8	3.3	3.6	Supply voltage below 3.3V causes a drop in maximum transmit power. The module does not operate when the supply voltage is below 1.8V.
Top ℃		-40	–	85	Operating temperature range
Fa (kHz)		-10	–	+10	Frequency accuracy
Fop (MHz)		902.3	–	927.7	Operating frequency band
Power Consumption	Tx (mA)		120	–	Max power Tx
	Rx (mA)	–	5.3	–	DC_DC mode
	Sleep (uA)	–	1.2	–	SLEEP mode
Tx Power (dBm)		–	–	22.10	Supply voltage = 3.3V
Rx Sensitivity (dBm)		–	-129	–	BW_L=125kHz , SF=9
Modem		LoRa			
Size (mm)		18.6*18.6*3.0 Fig-2-1			GB/T1804-C

Package Outline

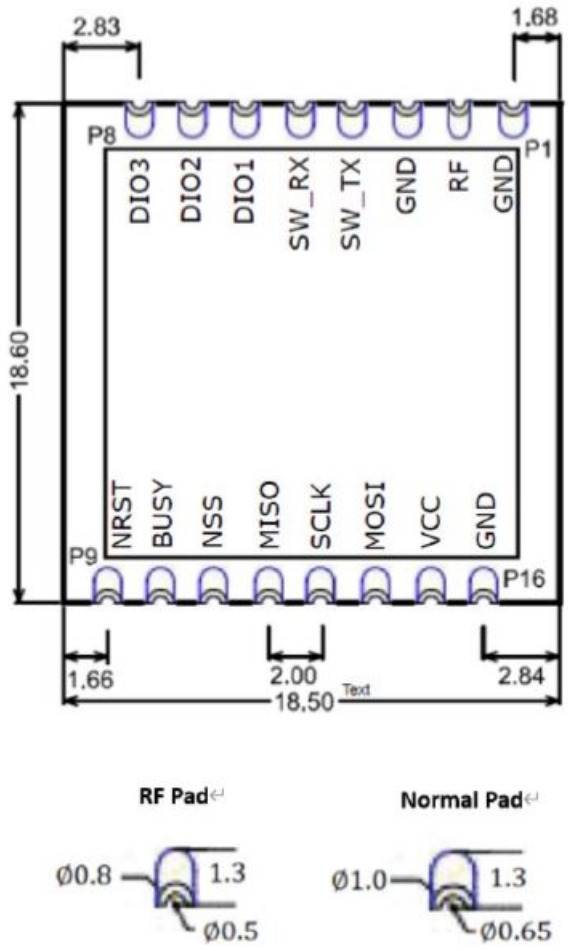

Fig 2-1 HLM9582 package outline

Pin Connection

Table 3-1 Pin Description

Pin Num	Pin Name	Type (I = input O = Output)	Description
P1	GND	–	Ground
P2	RF	I/O	RF in and out
P3	GND	–	Ground
P4	SW_TX	I	Switch Control , Tx mode : High Level Other mode : Low Level
P5	SW_RX	I	Switch Control , Rx mode : High Level Other mode : Low Level
P6	DIO1	I/O	LLCC68’s DIO1
P7	DIO2	I/O	LLCC68’s DIO2
P8	DIO3	I/O	LLCC68’s DIO3
P9	NRST	I	LLCC68’s NRESET
P10	BUSY	O	LLCC68’s BUSY
P11	NSS	I	LLCC68’s NSS
P12	MISO	O	LLCC68’s MISO
P13	SCLK	I	LLCC68’s SCLK
P14	MOSI	I	LLCC68’s MOSI
P15	VDD	–	Power supply
P16	GND	–	Ground

Basic Operation

Typical application circuits

When using the HLM9S82, users are advised to include a π-matching circuit between the module’s antenna interface and the antenna interface, with the reference circuit structure shown in the diagram below. Fig4-1 is the optimum cost solution, requiring 11 IO ports; Fig4-2 is the minimum IO ports solution, requiring 8 IO ports.

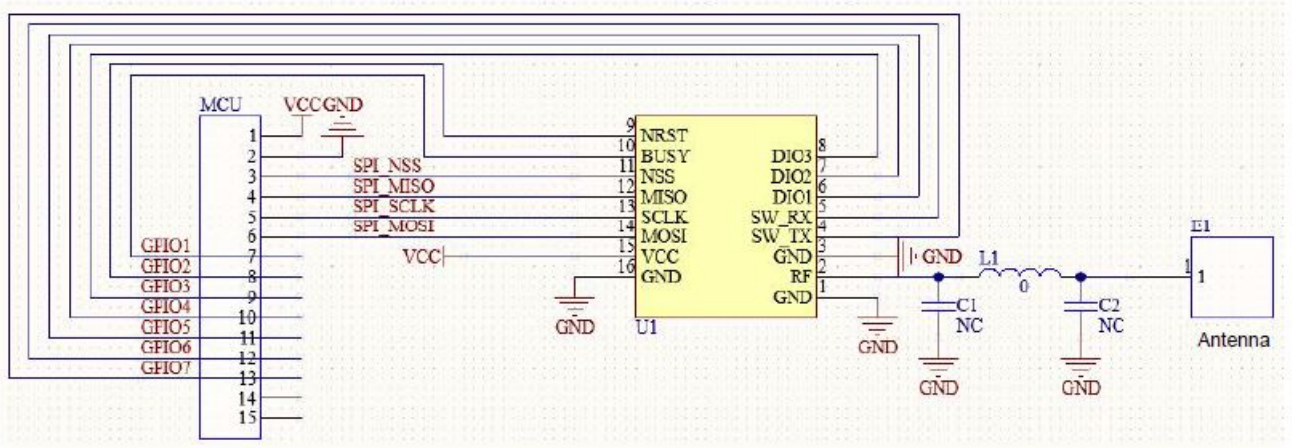

Fig4-1 optimum cost solution

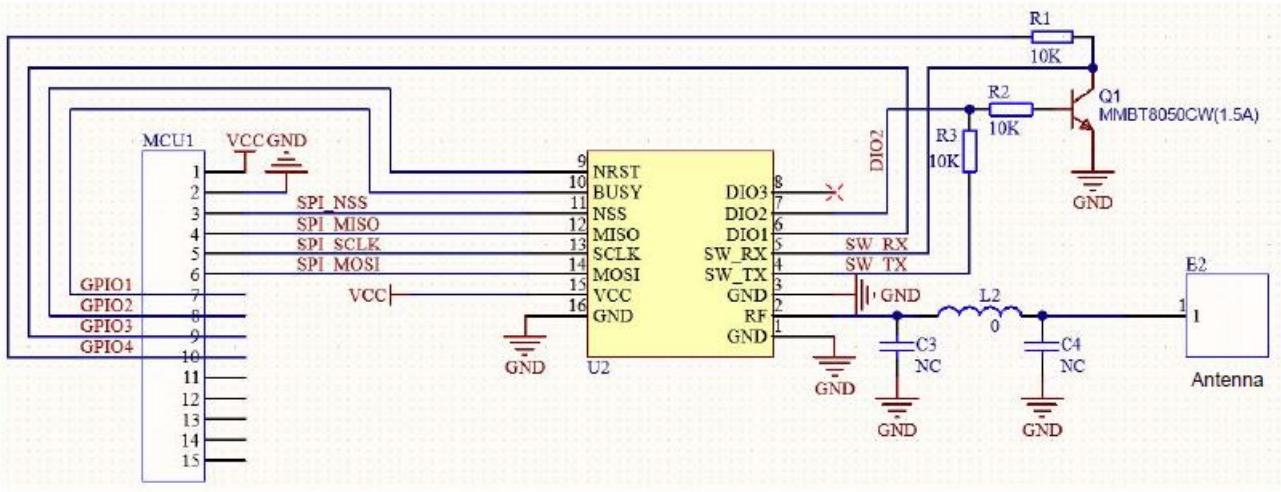

Fig4-2 minimum IO ports solution

PCB Layout Notes

1. The DIO port is connected to the MCU's IO port with external interrupt.
2. The Trace between the RF port and the antenna is as short as possible. the RF Trac should be impedance matched (50Ω).
3. Add π-matching circuit between RF port and antenna if possible.
4. Keep the antenna away from other devices.
5. Keep away from high voltage circuits and high-frequency circuits.
6. Ensure the quality of grounding, it is best to ensure a large area of paving.

SPI Interface

The SPI interface gives access to the configuration register via a synchronous full-duplex protocol corresponding to CPOL = 0 and CPHA = 0 in Motorola/Freescale nomenclature. Only the slave side is implemented.
An address byte followed by a data byte is sent for a write access whereas an address byte is sent and a read byte is received for the read access. The NSS pin goes low at the beginning of the frame and goes high after the data byte.
MOSI is generated by the master on the falling edge of SCK and is sampled by the slave (i.e. this SPI interface) on the rising edge of SCK. MISO is generated by the slave on the falling edge of SCK.
A transfer is always started by the NSS pin going low. MISO is high impedance when NSS is high.

The SPI runs on the external SCK clock to allow high speed up to 16MHz. For detailed information, please refer to the LLCC68 chip instruction manual.

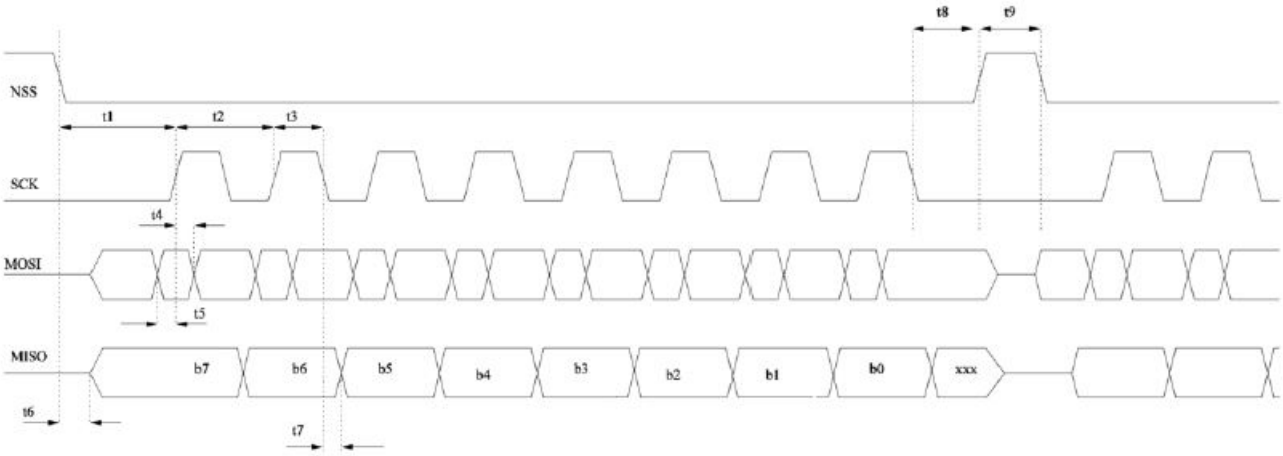

Fig4-3 SPI Timing Diagram

Additional Notes

Power Supply

It is recommended to use a DC-regulated power supply to power the HLM9S82 while keeping the power ripple as low as possible. HLM9S82 should be reliably grounded and the positive and negative terminals of the power supply should be properly connected, as reversing the connection may cause permanent damage to the module.

ESD

The module can pass the electrostatic test of contact discharge 4KV and air discharge 8KV. During air discharge, the arc is approximately 10cm from the module.
To avoid permanent damage to the device, all necessary ESD precautions should be taken.

Avoid using some frequencies

Since the HLM9S82 uses a 32MHz crystal, crystal'frequency is 902.3-927.7MHz. Users should avoid these frequencies (>1MHz) when using the HLM9S82.

FCC Statement

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.

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.

OEM Guidance

1. Applicable FCC rules
   This device complies with part 15.247 of the FCC Rules.
2. The specific operational use conditions
   This module can be used in IoT devices. The input voltage to the module is nominally 3.3 V DC. The operational ambient temperature of the module is -40 °C ~ 85 °C. the external antenna is allowed, such as dipole antenna.
3. Limited module procedures
   N/A
4. Trace antenna design
   N/A
5. RF exposure considerations
   The 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 and your body. If the equipment built into a host as a portable usage, the additional RF exposure evaluation may be required as specified by 2.1093.
   6. Antenna
   Antenna type: Dipole antenna; Peak antenna gain : 1.03 dBi
   7. Label and compliance information
   An exterior label on OEM's end product can use wording such as the
   following: "Contains Transmitter Module FCC ID: 2A4G5-HLM9S82" or "Contains FCC ID: 2A4G5-HLM9S82"
   8. Information on test modes and additional testing requirements
6. 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).
7. 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.
8. 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 have been

corrected .

9. Additional testing, Part 15 Sub part 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 Part 15 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 50 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.
The product under test is set into a link/association with a partnering device, as per the normal intended use of the product. To ease testing, the product under test is set to transmit at a high duty cycle, such as by sending a file or streaming some media content.

Documents / Resources

	HYLINTECH HLM9S82 LoRa Wireless Module [pdf] Owner's Manual 2A4G5-HLM9S82, 2A4G5HLM9S82, HLM9S82, HLM9S82 LoRa Wireless Module, LoRa Wireless Module, Wireless Module