HYLINTECH HLM5934 Series Gateway Module User Manual

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Contents

Overview

HLMx93x series modules are developed based on the digital baseband chip SX1302 with a mechanical definition of the Mini PCIe interface and provide SPI interface.

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Key Features

- Supportsmultiplebands
- SPI Interface
- (G)FSK demodulator
- High precision TCXO clock source

Typical Specification

- operating range from -40 to +85° C
- Power supply voltage range: 3.0V-3.6V
- Antenna interface: IPEX-1

Usage

- LoRa/LoRaWAN Gateway
- LoRa Network Analysis Tool

Model Information

*Model	Tx Band	Max Power	Rx Band	LBT	MOQ
HLM7931	490-510MHz	22dBm	470-510MHz	Not Support	3000
HLM7932	470-510MHz	22dBm	470-510MHz	Support	1000
HLM9931	863-928MHz	27dBm	863-928MHz	Support	EOL
HLM9932	863-928MHz	27dBm	863-928MHz	Support	1000
HLM9933	902-928MHz	28dBm	902-928MHz	Support	1000
HLM8934	863-870MHz	27dBm	863-870MHz	Support	1000
HLM5934	902-928MHz	27dBm	902-928MHz	Support	1000
HLM9934	TBD	27dBm	TBD	Support	–
HLM8834	TBD	21dBm	TBD	Support	–
HLM5834	TBD	21dBm	TBD	Support	–
HLM9834	TBD	21dBm	TBD	Support	–
HLM9953	TBD	27dBm	TBD	Support	–

*The full model number will contain the “-xxx” suffix to distinguish the packaging method, screen printing information, etc., such as HLM5934-P01.

Specifications

Table 2-1 Absolute Minimum and Maximum Ratings

Name	Value			Description
	Min	Max	Unit	
Power Supply	-0.5	+3.9	V	
Storage temperature	-40	+125	℃	
Peak reflow temperature	–	260	℃	

Table 2-2 Electrical Specifications

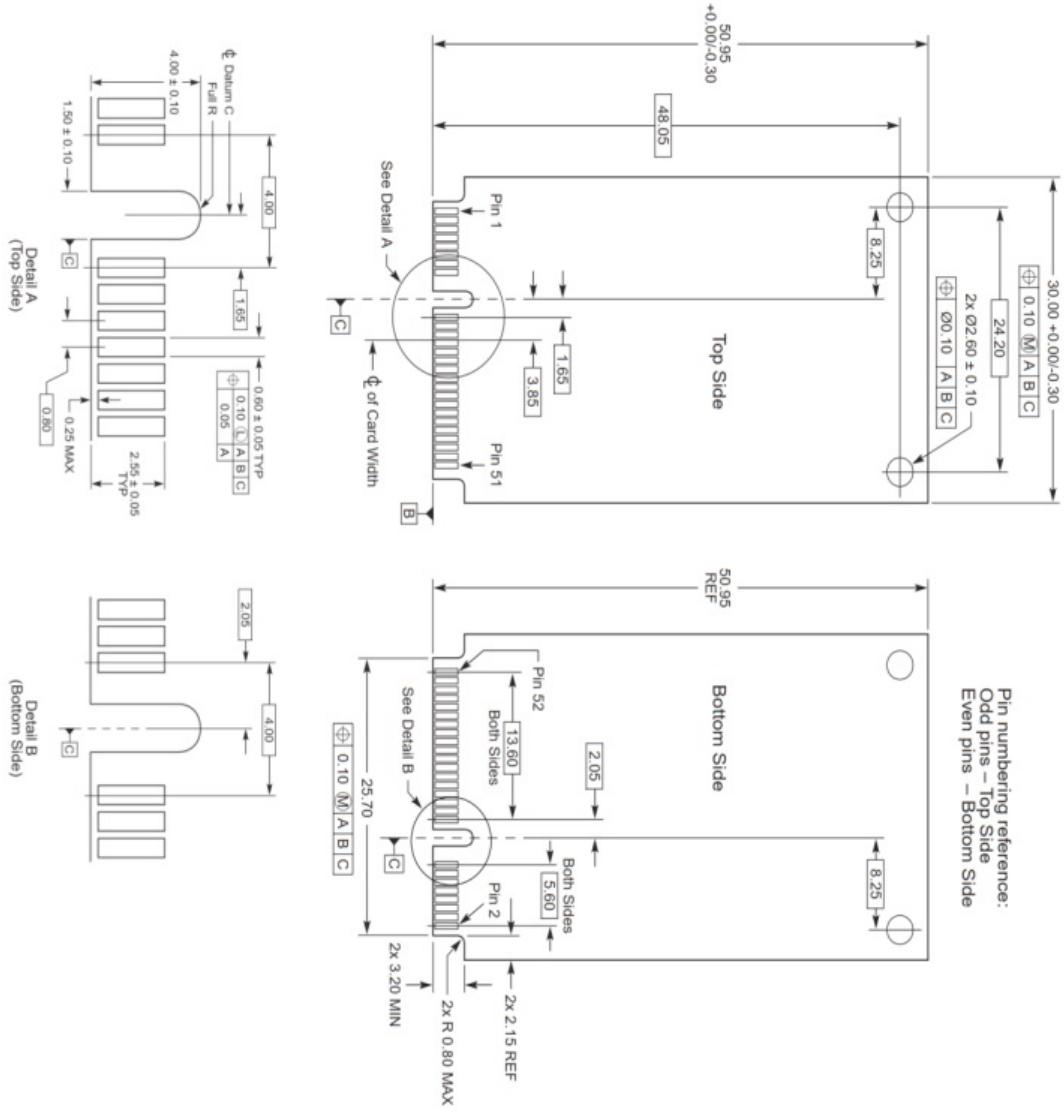
Name		Value				Description
		Min	Typ	Max	Unit	
Power Supply		3.0	3.3	3.6	V	The transmitting power decreases when the supply voltage is below 3.0V
Operating temperature		-40	–	85	℃	
Frequency Stability			2		ppm	25℃
Tx Power*	HLM7931	20	21	22	dBm	@490MHz~510MHz
	HLM7932	20	21	22	dBm	@470MHz~510MHz
	HLM9932	25	26	27	dBm	@863MHz~928MHz
	HLM9933	20	24	28	dBm	@902MHz~928MHz
	HLM8934	25	26	27	dBm	@863MHz~870MHz
	HLM5934	23	25	27	dBm	@902MHz~928MHz

	HLM9934				dBm	TBD
	HLM8834				dBm	TBD
	HLM5834				dBm	TBD
	HLM9834				dBm	TBD
	HLM9953				dBm	TBD
Rx Sensitivity**	HLM7931		-127		dBm	SF7BW125CR4/5@470MHz~510MHz
	HLM7932		-127		dBm	SF7BW125CR4/5@470MHz~510MHz
	HLM9932		-127		dBm	SF7BW125CR4/5@863MHz~928MHz
	HLM9933		-127		dBm	SF7BW125CR4/5@863MHz~928MHz
	HLM8934		-125		dBm	SF7BW125CR4/5@863MHz~870MHz
	HLM5934		-126		dBm	SF7BW125CR4/5@902MHz~928MHz
	HLM9934				dBm	TBD
	HLM8834				dBm	TBD
	HLM5834				dBm	TBD
	HLM9834				dBm	TBD

	HLM9953				dBm	TBD
Interface Packaging		Mini PCIe				
Digital Interface		SPI				–
Dimension (mm)		30×50.95×3				
CDimensional accuracy l W Test under nomina		temperatureGB/T1804-C conditions. and voltage				

Package and Pin Connections

Package



Pin Connections

Pin Number	Pin Name	Description
1	NC	NC
2	NC/5V	NC
3	NC	NC
4	GND	
5	NC	NC
6	GPIO[9]	SX1302’s GPIO[9] Pin
7	NC	NC
8	NC	NC
9	GND	
10	NC	NC
11	NC	NC
12	NC	NC
13	NC	NC

14	NC	NC	
15	GND		
16	NC/Power_EN	HLM7931	NC
		Others	Power Enable Pin
17	SCK	SX1302 and SX126x's SCK Pin	
18	GND		
19	MISO	SX1302 and SX126x's MISO Pin	
20	NC	NC	
21	GND		
22	RESET	SX1302's RESET Pin, High level reset	
23	MOSI	HLM7931 SX1302 and SX126x's MOSI Pin	
24	NC/LBT_BUSY		NC
		Others	SX126x 's BUSY Pin
25	CSN	SX1302's CSN Pin	

26	GND		
27	GND		
28	NC/LBT_DIO2	HLM7931	NC
		Others	SX126x’s DIO2 Pin
29	GND		
30	SCL	Temperature Sensor ,SSTS751	
31	PPS	SX1302’s PPS Pin	
32	SDA	Temperature Sensor ,SSTS751	
33	NC	NC	
34	GND		
35	GND		
36	NC	NC	
37	GND		
38	NC	NC	

39	VCC	3.3V Power	
40	GND		
41	VCC	3.3V Power	
42	NC	NC	
43	GND		
44	NC/LBT_NSS	HLM7931	NC
		Others	SX126x’s NSS Pin
45	NC	HLM7931 NC NC	
46	NC/LBT_DIO1		
		Others	SX126x’s DIO1 Pin
47	NC	HLM7931 NC NC	
48	NC/LBT_RST		
		Others	SX126x’s NRESET Pin, Low level reset
49	NC	NC	
50	GND		

51	GPIO[4]	HLM7931	SX1302’s GPIO[4] Pin
52	NC/VCC		NC
		Others	3.3V Power

Basic Usage

Application Circuit

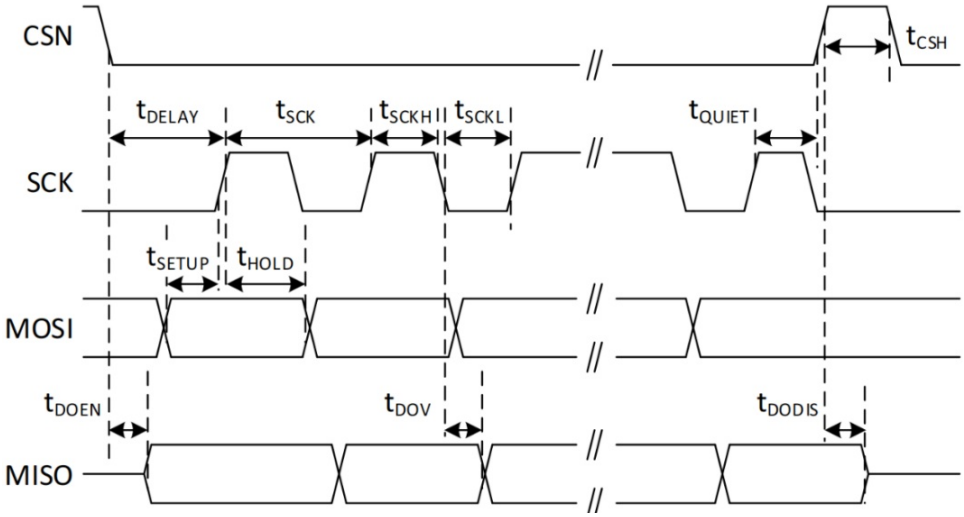
When using this module, the main attention is paid to the handling of power ripple.HLM7 932,HLM9931, HLM9932, HLM9933, HLM5934, HLM8934’s Pin2 is NC.

Layout

- Try to give this module a separate power supply and ensure that the power ripple is as small as possible.
- If you use IPEX to connect to an external antenna, take care to consider the lightning protection design of the external antenna.
- Stay away from high voltage circuits, high frequency switching circuits.

SPI Timings

Users communicate with SX1302, the main chip of this module, through SPI interface, and achieve control and access to SX1302 by accessing SX1302 registers. For specific usage, you can refer to the SX1302 information released by SEMTECH official website



Revisions

Version	Date	Author	Description
1.0	2021-06-18	Hylintech	Initial Version
1.01	2021-07-13	Hylintech	Modify interface
1.11	2021-09-08	Hylintech	Modify interface
1.2	2021-10-24	Hylintech	Modify interface
1.21	2021-11-03	Hylintech	Add reset Pin description
1.22	2021-11-16	Hylintech	HLM9931 EOL
1.3	2022-01-06	Hylintech	Adding new models

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

RF 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 and your body.

FCC Label Instructions

If using a permanently affixed label, the modular transmitter must be labeled with its own FCC identification number, and, if the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following:

“Contains FCC ID: 2A4G5-HLM5934”.
Any similar wording that expresses the same meaning may be used. The Grantee may either provide such a label, an example of which must be included in the application for equipment authorization, or, must provide adequate instructions along with the module which explain this requirement.

OEM Guidance

1. Applicable FCC rules
   OEM Guidance 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 monopole 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: Monopole antenna; Peak antenna gain: 2 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 HLM5934” or “Contains FCC ID: 2A4G5-HLM5934”
8. Information on test modes and additional testing requirements
   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).
   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 standalone 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.
   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 orderto 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.

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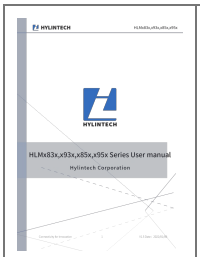
Documents / Resources

	HYLINTECH HLM5934 Series Gateway Module [pdf] User Manual HLM5934, 2A4G5-HLM5934, 2A4G5HLM5934, HLM5934 Series Gateway Module, HLM5934 Series, Gateway Module