GreenPalm

GPMLx93x Datasheet

Hangzhou GreenPalm Technology Co.Ltd

- 1 个 125/250/500KHz LoRa Demodulator

1 Overview

Description

GPMLx93x series modules are developed based on digital baseband chip sx1302, adopt the mechanical definition of mini PCIe interface and provide SPI interface.

The module can be applied to LoRa/LoRaWAN Gateway and Lora autonomous network gateway, and can also be used to develop Lora network analysis tools and learn autonomous network. Compared with the previous generation products, sx1302 has lower power consumption, larger data throughput and better cost.

Features

- Supports CN470, EU868, US915、AS915、AS923
- Supports optional SPI interfaces
- Multiplex demodulator8 8-channel Lora packet detectors（BW125KHz）
- 8 个 SF5-SF12 LoRa Demodulator（BW125KHz）
- 8 个 SF5-SF10 LoRa Demodulator（BW125KHz）

- 1 个 (G)FSK Demodulator
- High precision TCXO clock source
- Overall dimension (mm)：30×50.95×3
- Mini PCI-e
- Operating Temperature：-40℃ -85℃
- Supply Voltage：3.0V-3.6V
- Antenna RF Interface：IPEX

Applications

- LoRa/LoRaWAN Gateway
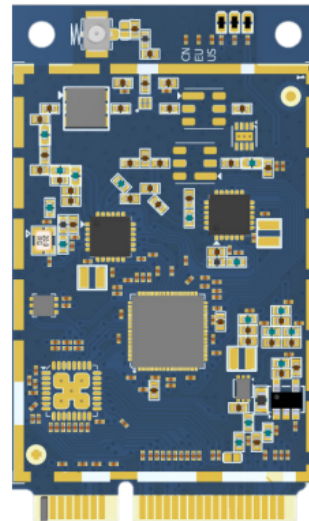- LoRa Network analysis tools
- Development Kit

Figure 1 GPMLx93x

Summary

GPMLx93x	GPML7931-PX
	GPML9931-PX
	GPML9932-PX
	GPML9932-PX-V2

	GPML9932-PX-V3

2 Specifications

2.1 Overview

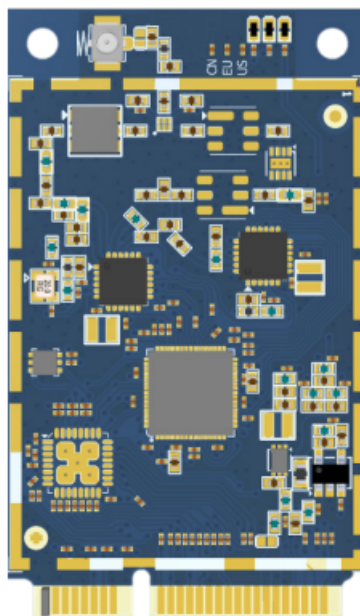| model	Send band	Maximum Tx Power	Receive band	LBT function
GPML7931-PX	490-510MHz	22dBm	4970-510MHz	N
GPML9931-PX	863-928MHz	27dBm	863-928MHz	Y
GPML9932-PX	863-928MHz	27dBm	863-928MHz	Y
GPML9932-PX-V2	863-928MHz	27dBm	863-928MHz	Y
GPML9932-PX-V3	902-928MHz	27dBm	902-928MHz	Y
	863-870MHz	27dBm	863-870MHz	Y

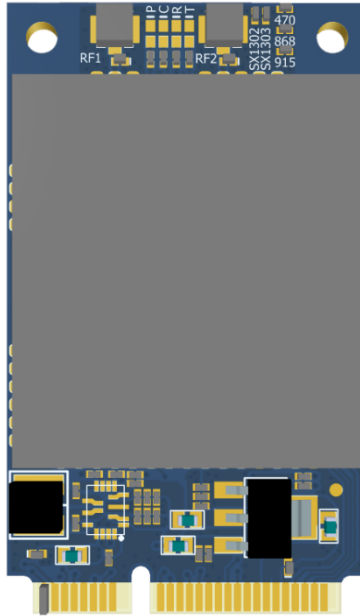## 2.2 Board Overview

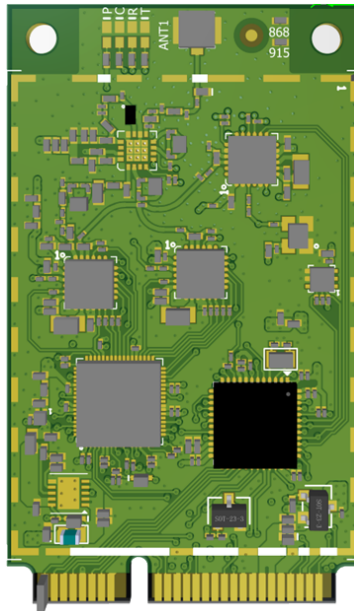Figure 2 GPML7931-PX

Figure 3 GPML9931-PX

Figure 4 GPML9932-PX / GPML9932-PX-V2/ GPML9932-PX-V3
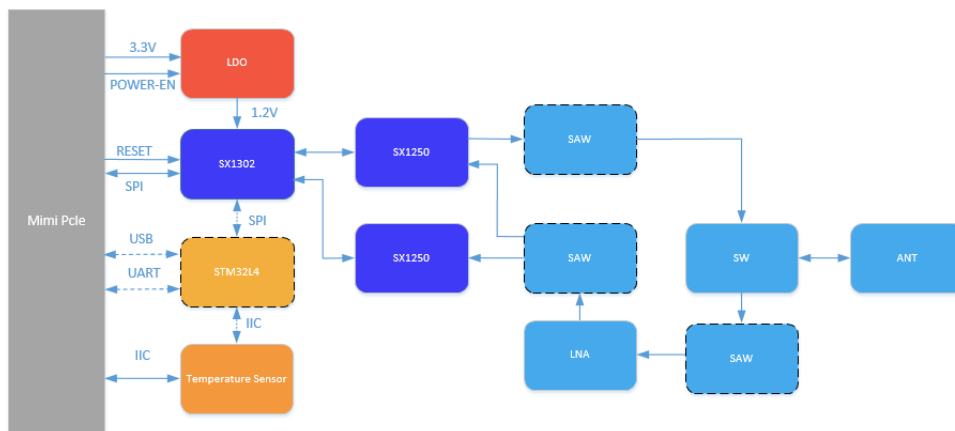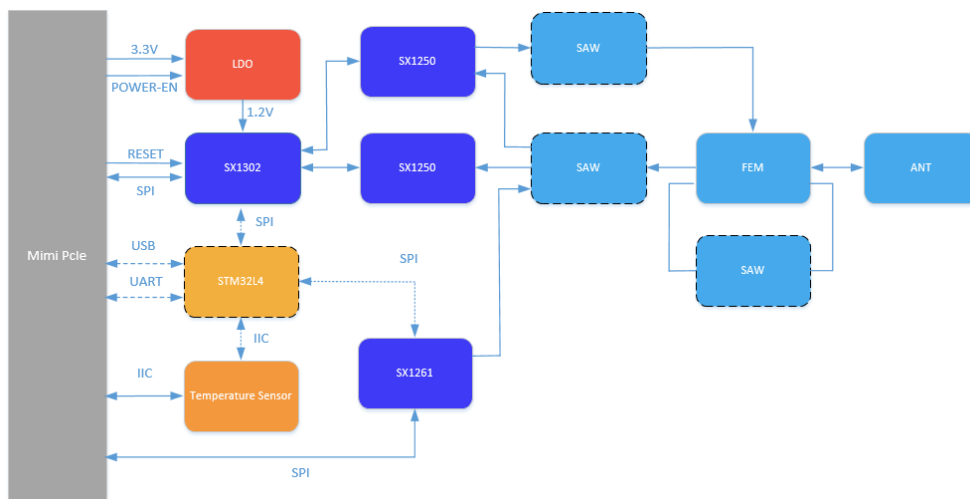
2.3 Block Diagram

Figure 5 GPML7931-PX

Figure 6 GPML9931-PX

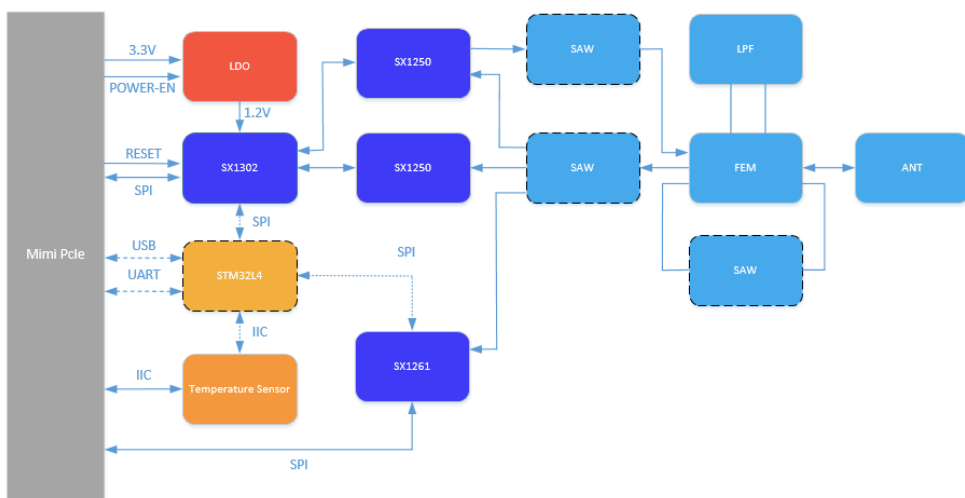Figure 7 GPML9932-PX / GPML9932-PX-V2/ GPML9932-PX-V3

Sx1261 and sx1302 use the same SPI bus.

model	STM32L4	SAW
GPML7931-PX	N	N
GPML9931-PX	N	N
GPML9932-PX	N	N
GPML9932-PX-V2	N	N
GPML9932-PX-V3	N	Y

2.4 Absolute Maximum Rating

parameter	minimum value	Maximum	unit	remarks
supply voltage	-0.5	+3.9	V	Exceeding this voltage may cause permanent module damage
Maximum input power of RF IPEX port	-	10	dBm	
Storage temperature	-40	+125	℃	
Peak Reflow Temperature	-	260	℃	

2.5 Recommended Operating Conditions

Parameter	Min	Typ	Max	Unitts	Remarks
Supply Voltage	3.0	3.3	3.6	V	Below 3.0V, the maximum transmission power will decrease
Operating Temperature	-40	-	85	℃	

Initial frequency offse		-0.5	-	+0.5	KHz	25℃	
Maximum Tx Power	GPML7931-	-	-	22	dBm	25℃	
	GPML9931-PX		-	27			
	GPML9932-PX	-	-	27			
	GPML9932-PX-V2	-	-	27			
	GPML9932-PX-V3	25	26	27		@863MHz~870MHz	
		25	26	27		@902MHz~928MHz	
Rx Sensitivity	GPML7931-PX	-	-127	-	dBm	BW125KHz、SF7、CR4/5、PL=32B，PER=10%、25℃	
	GPML9931-PX						
	GPML9932-PX						
	GPML9932-PX-V2						
	GPML9932-PX-V3		-125			@863MHz~870MHz	
			-126			@902MHz~928MHz	

2.6 Maximum ESD

ESD	Max	Remarks
	4KV	Air-Gap Discharge Method.
	8KV	Contact Discharge Method. The arc is about 10cm away from the module.

Although this module is designed to be as robust as possible, electrostatic discharge (ESD) can damage this module. This module must be protected at all times from ESD when handling or transporting. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD handling precautions should be used at all times.
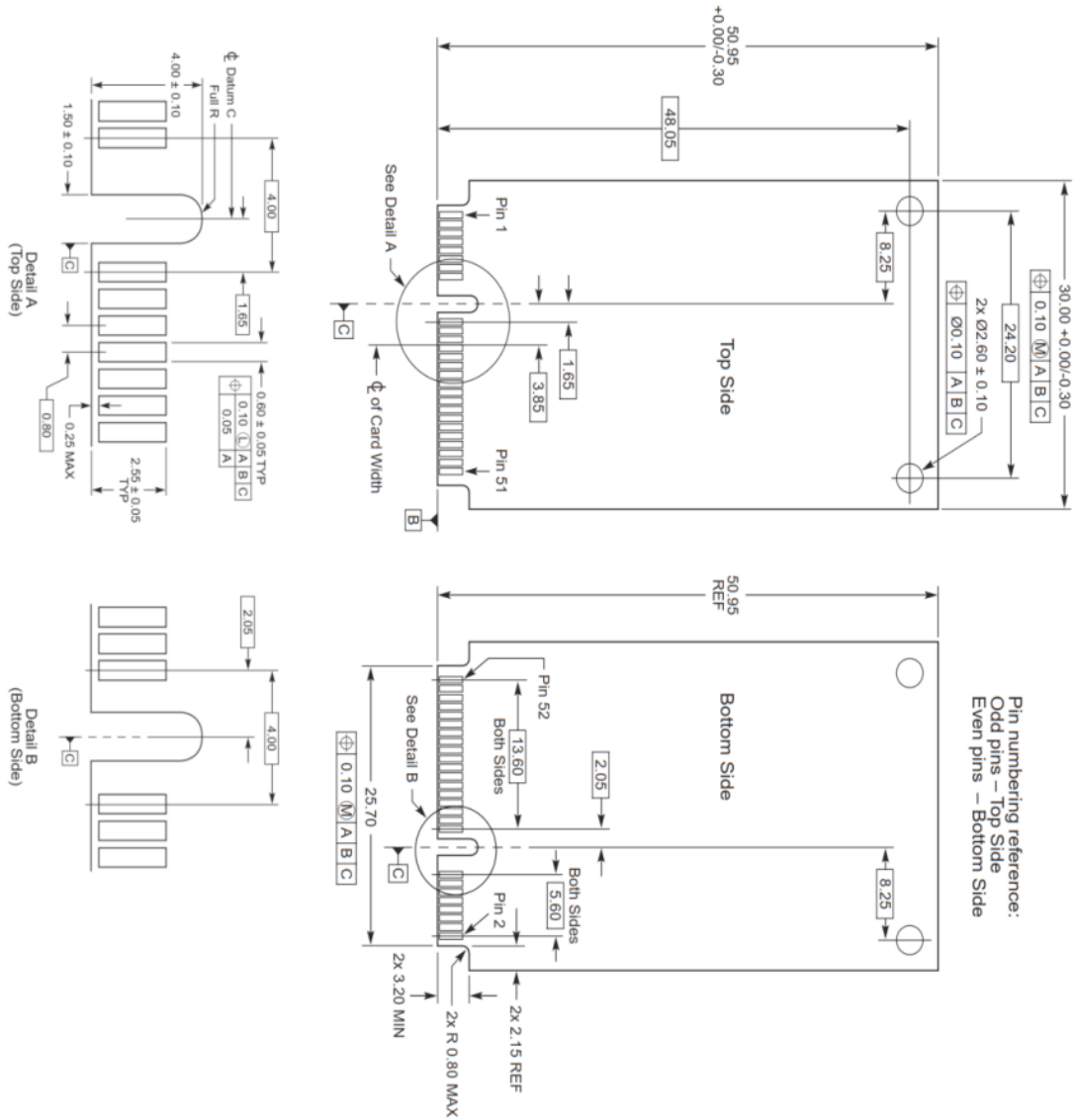
3 Package Characteristics

Figure 8 GPMLx93x Package Characteristics

4 Pin Definition
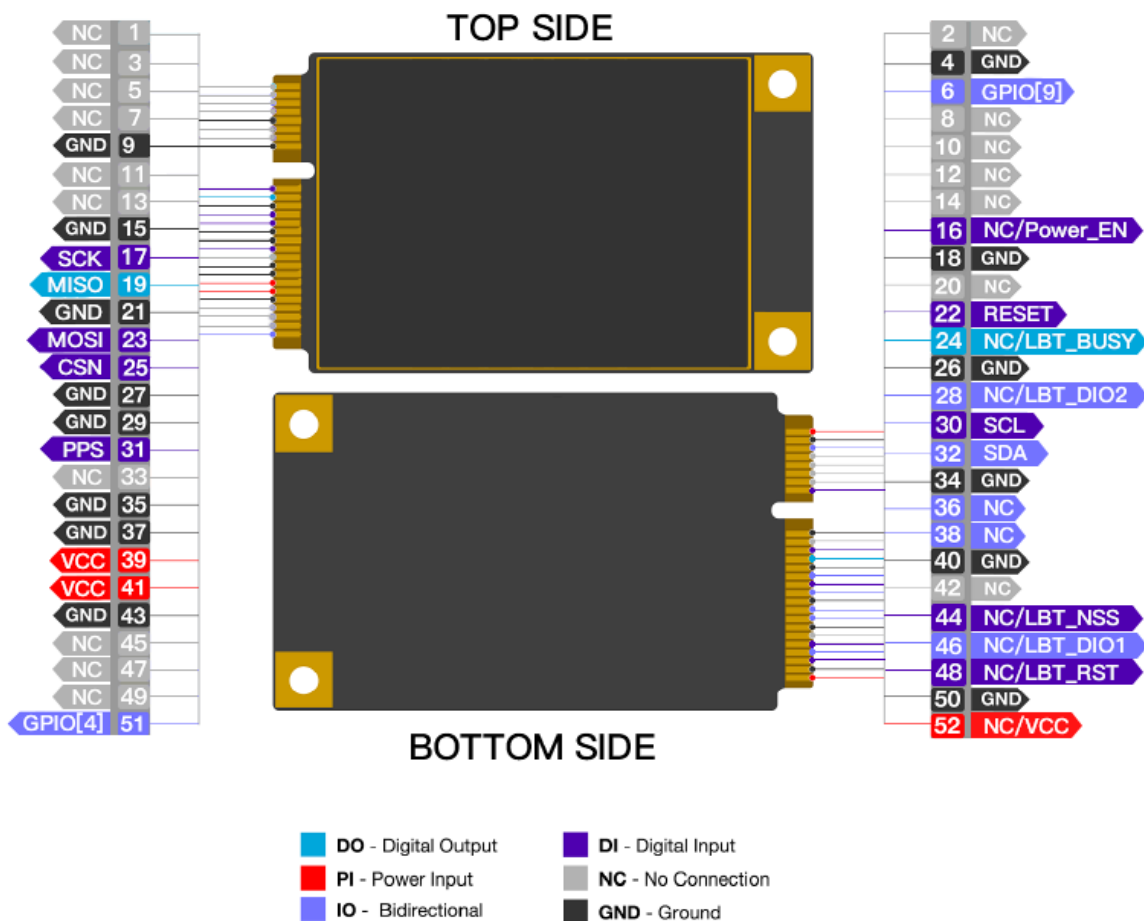
Figure 9 Pin Diagram

Pin No.	Pin	Description
1	NC	No Connection
2	NC	No Connection
3	NC	No Connection
4	GND	Ground
5	NC	No Connection
6	GPIO[9]	Connect to SX1302's GPIO[9]
7	NC	No Connection
8	NC	No Connection

9	GND		
10	NC	No Connection	
11	NC	No Connection	
12	NC	No Connection	
13	NC	No Connection	
14	NC	No Connection	
15	GND	Ground	
16	NC/Power_EN	GPML7931-PX	No Connection
		other	No Connection
17	SCK	Connect the SCK of the SX1302 Or SX126x	
18	GND	Ground	
19	MISO	Connect the MISO of the SX1302 Or SX126x	
20	NC	No Connection	
21	GND	Ground	
22	RESET	Connect the RESET of the SX1302, Reset at high level	
23	MOSI	Connect the MOSI of the SX1302 Or SX126x	
24	NC/LBT_BUSY	GPML7931-PX	NC
		other	Connect to SX126x's BUSY
25	CSN	Connect to SX1302's CSN	
26	GND	Ground	
27	GND	Ground	
28	NC/LBT_DIO2	GPML7931-PX	No Connection
		other	Connect to SX126x's DIO2
29	GND	Ground	
30	SCL	Connect the SCL of the Temperature Sensor	
31	PPS	Connect to SX1302's PPS	
32	SDA	Connect the SDA of the Temperature Sensor	
33	NC	No Connection	

34	GND	Ground		
35	GND	Ground		
36	NC	No Connection		
37	GND	Ground		
38	NC	No Connection		
39	VCC	3.3V DC supply		
40	GND	Ground		
41	VCC	3.3V DC supply		
42	NC	No Connection		
43	GND	Ground		
44	NC/LBT_NSS	GPML7931-PX	No Connection	
		other	Connect to SX126x's NSS	
45	NC	No Connection		
46	NC/LBT_DIO1	GPML7931-PX	No Connection	
		other	Connect to SX126x's DIO1	
47	NC	No Connection		
48	NC/LBT_RST	GPML7931-PX	No Connection	
		other	Connect to SX126x's RESET, Reset at low level	
49	NC	No Connection		
50	GND	Ground		
51	GPIO[4]	Connect to SX1302's GPIO[4]		
52	NC/VCC	GPML7931-PX	No Connection	
		other	3.3V DC supply	

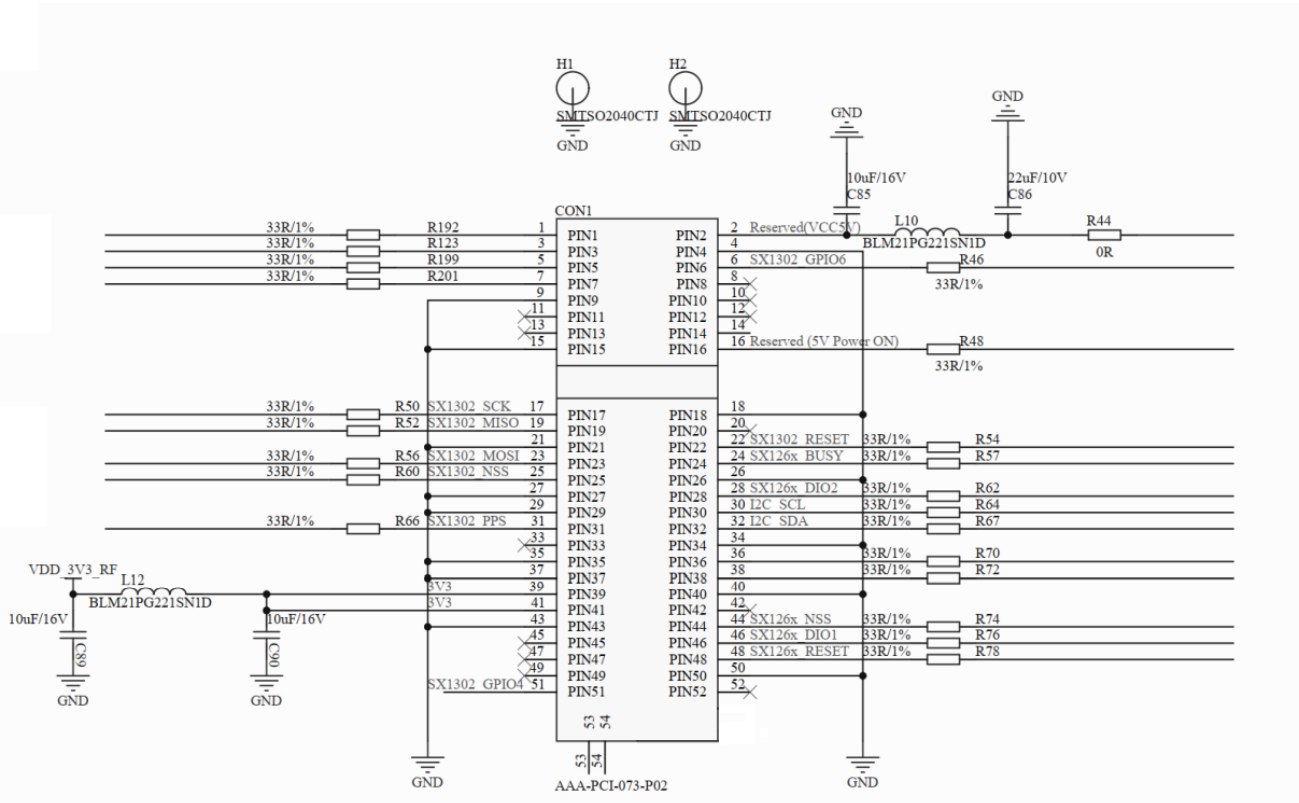# 5 Typical Application Circuits

5.1 Schematic Diagram

Figure 10 GPMLx93x Schematic Diagram

5.2 Hardware Layout Considerations

• Try to provide independent power supply for GPMLx93x module and ensure that the power ripple is as small as possible.

• If IPEX is used to connect to the external antenna, pay attention to the lightning protection design of the external antenna.

• If the on-board duplexer scheme is used, note that the wiring from the RF outlet to the antenna pad shall be as short as possible, 50 Ω impedance wire shall be used, and the ground shall be covered, and more holes shall be drilled around the wiring.

• Keep away from high-voltage circuits and high-frequency switching circuits.

6 Software Operating

SPI interface mainly provides for the Host_SCK, Host_MISO, Host_MOSI, Host_CSN pins of the system connector. The SPI interface gives access to the configuration register of SX1302. Only the slave side is implemented. (see SX1302 Datasheet)
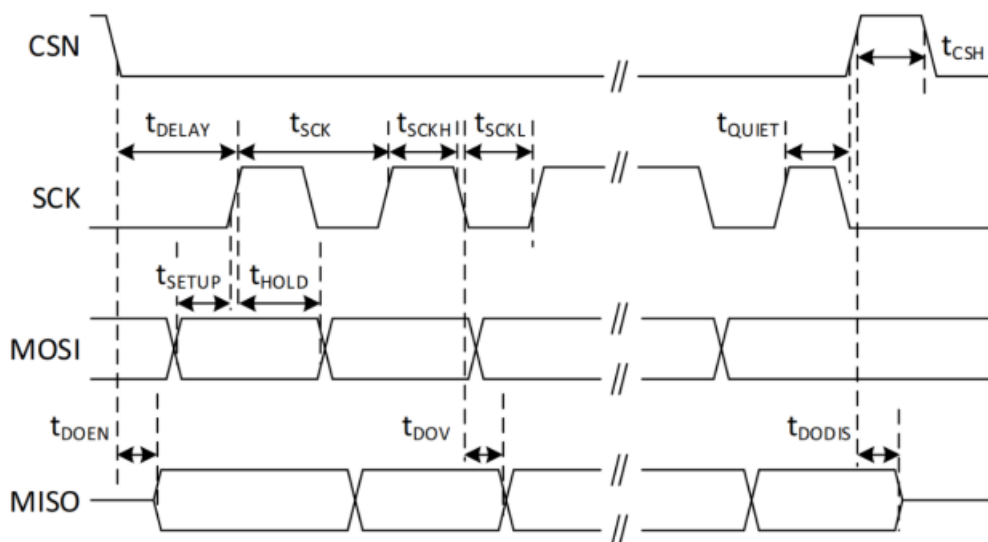

Figure 11 GPMLx93x Bus Timing

7 Certification

8 Additional Instructions

8.1 Power Supply

It is recommended to use DC regulated power supply to supply power to the module. The ripple coefficient of the power supply shall be as small as possible. The module shall be reliably grounded. Please pay attention to the correct connection of the positive and negative poles of the power supply. If it is reversed, the module may be permanently damaged.

8.2 Antenna RF Interface

Do not surround other metal objects near the module antenna, otherwise the communication distance will be seriously affected.

8.3 Avoid frequency point

Crystal oscillator multiple frequency point refers to the frequency point with extremely poor performance. It is recommended that users do not use it, and at least avoid the crystal oscillator multiple frequency point above 1MHz.