LCM001 Datasheet

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CONTENT

Chapter 1: Overview

The SX1301 is targeted at smart metering fixed networks and Internet of Things. The LCM001 is a LoRa / LoRaWan packet forwarder module which is used to build Lora gateway. The LCM001 is built upon SX1301® from Semtech®. The control firmware for SX1301® is from Semtech® and the source code is in https://github.com/Lora-net. LCM001 has been successfully ported to both PC with Ubuntu and Raspberry PI. It can collect and forward the packets collected from the LoRaWan® sensor nodes. Our driver, codes and programs are also based on Semtech' ® code in https://github.com/Lora-net. There are USB and SPI driver for this board, so the board can collect the packet from the node and forward the packet to another host (PC or ...). User can use their own network server (host) to decrypt the received packet and manage the sensor nodes.
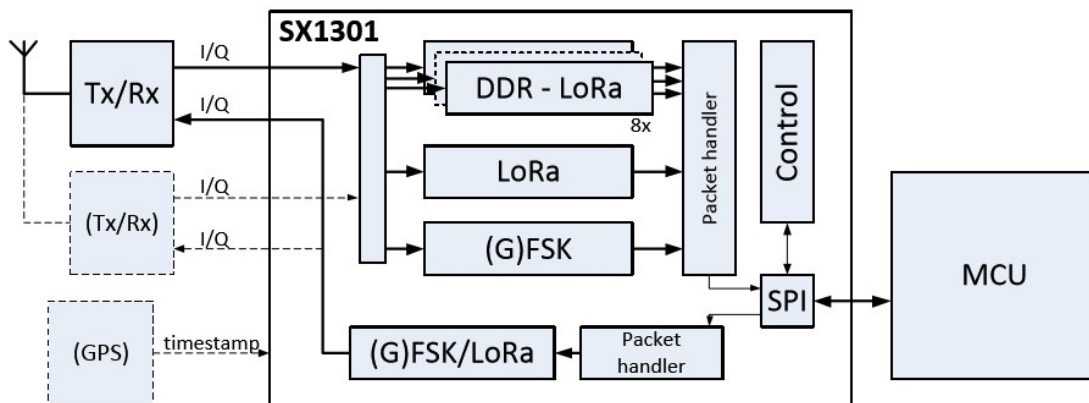

Figure : SX1301 Block Diagram , source : Semtech® SX1301

The LCM001 is a multi-channel high performance transmitter/receiver designed to receive and send packet over long distance with encrypted data. Its goal is to enable robust connection between a central wireless data concentrator and a massive amount of wireless end-points. SX1301 connection to RF front-end, SX1257 for TX operation, in TX mode , the SX1301 digital baseband are connected to two SX1257. The LoRa are to be transmitted on any of the two radios. Only a single packet may be transmitted at any given time. Transmit operation interrupts all current reception operations.

The SX1301 is a smart baseband processor for long range ISM communication. In the receiver part, it receives I and Q digitized bit stream from one or two receivers (SX1257 as an example), demodulates these signals using several demodulators, adapting the demodulators' settings to the received signal and stores the received demodulated packets in a FIFO to be retrieved from a MCU. In the transmitter part, the packets are modulated using a programmable (G) FSK/LoRa modulator and sent to one transmitter (SX1257 as an example).

The SX1257 is a highly integrated RF front-end to digital I and Q modulator/demodulator Multi-PHY mode transceiver capable of supporting multiple constant and non-constant envelope modulation schemes. It is designed to operate over the 862 to 960 MHz European, North American and Japanese ISM (Industrial, Scientific and Medical) license-exempt frequency bands. Its highly integrated architecture allows for a minimum of external components whilst maintaining maximum design flexibility. All major RF communication parameters are programmable and most of them can be dynamically set. The SX1257 offers support for both narrow-band and wide-band communication modes without the need to modify external components. The SX1257 is optimized for low power consumption while offering the provision for high RF output power and channelized operation.
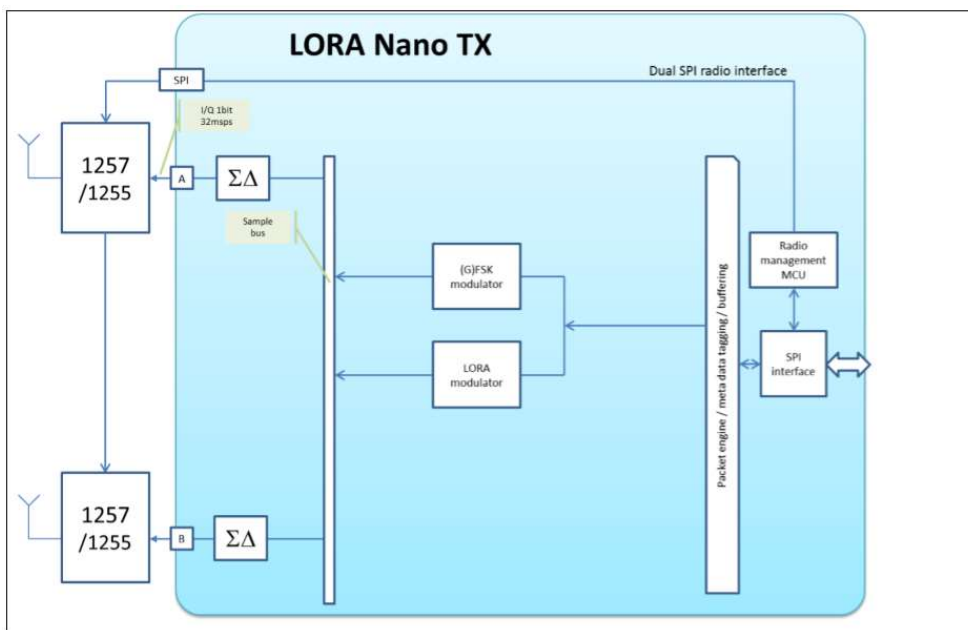
Chapter 2: Features

. Semtech® SX1301

. Semtech® SX1257

. FTDI® 232H

. USB interface

. Frequency 915MHz

. u.FL connector to antennas

. 8 parallel RF channels

. RF distance around 0.9km

. Receiver sensitivity: -130 dbm

. Dimension: 50 x 29 x 9 mm

. Voltage: 3.3V

. Operating temperature -20 ^{o} ~ 70°C

Chapter 3: Hardware

The table below provides the power requirement of the circuit for SX1301 and LCM001 board.
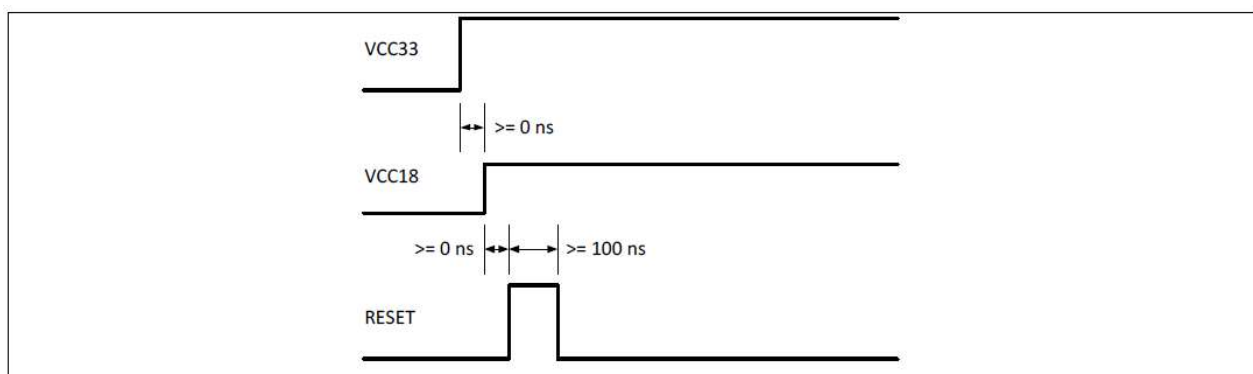
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Current Consumption						
Current in idle mode	$I_{VDDCORE,IDLE}$	1.8V supply current in Idle mode[1]		120	3000	uA
	$I_{VDDIO,IDLE}$	3.3V supply current in idle mode		1	2	uA
Current in medium active	$I_{VDDCORE,MED}$	1.8V supply current with 4 active paths		330	550	mA
	$I_{VDDIO,MED}$	3.3V supply current with 4 active paths – no load		5	10	mA
Current in full active	$I_{VDDCORE,FULL}$	1.8V supply current with 8 active paths		550	750	mA
	$I_{VDDIO,FULL}$	3.3V supply current with 8 active paths – no load		5	10	mA

For the LCM001 operation :

IDLE mode: 550 mA

Transmit mode: 750 mA

Chapter 4: Connection

The LCM001 is 100% compliant with the mini PCIe requirement. It use partial of the 52 pins. The used pins are marked in yellow.

47	Reserved	48	+1.5V
45	Reserved	46	LED_WPAN#
43	GND	44	LED_WLAN#
41	+3.3Vaux	42	LED_WWAN#
39	+3.3Vaux	40	GND
37	GND	38	USB_D+
35	GND	36	USB_D-
33	PETp0	34	GND
31	PETn0	32	SMB_DATA
29	GND	30	SMB_CLK
27	GND	28	+1.5V
25	PERp0	26	GND
23	PERn0	24	+3.3Vaux
21	GND	22	PERST#

19	Reserved* (UIM_C4)	20	W_DISABLE#
17	Reserved* (UIM_C8)	18	GND
Mechanical Key			
15	GND	16	UIM_VPP
13	REFCLK+	14	UIM_RESET
11	REFCLK-	12	UIM_CLK
9	GND	10	UIM_DATA
7	CLKREQ#	8	UIM_PWR
5	COEX2	6	1.5V
3	COEX1	4	GND
1	WAKE#	2	3.3Vaux

Figure : LCM001 mini PCIe pin out
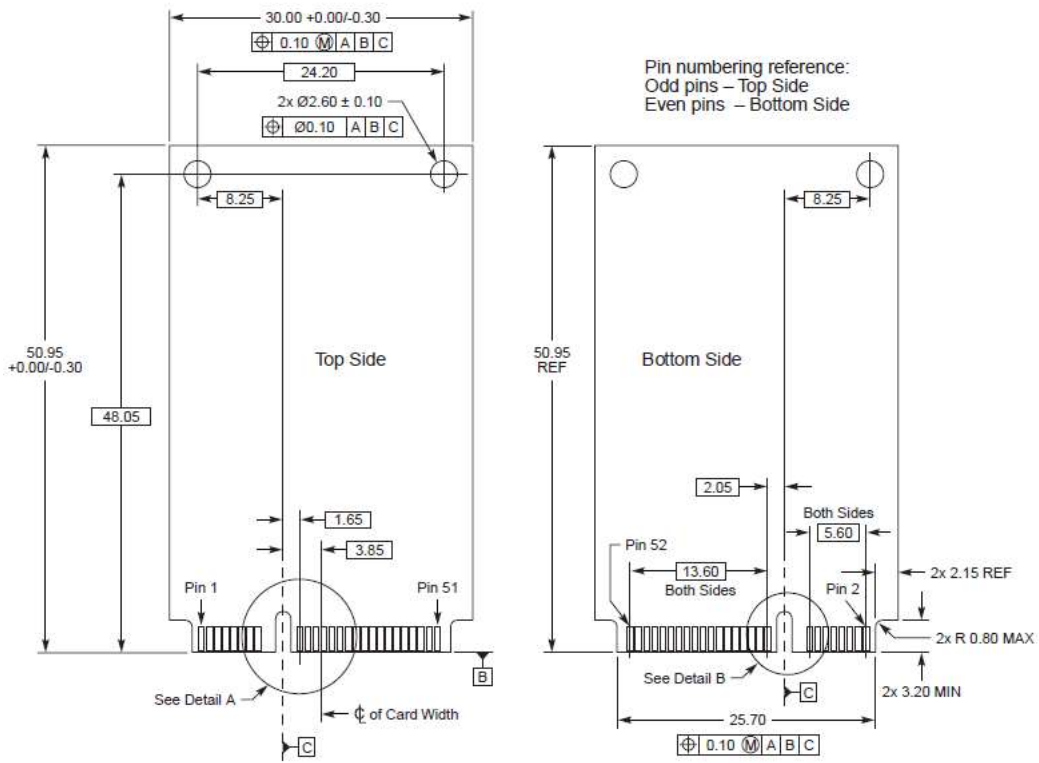
Chapter 5: Mechanical

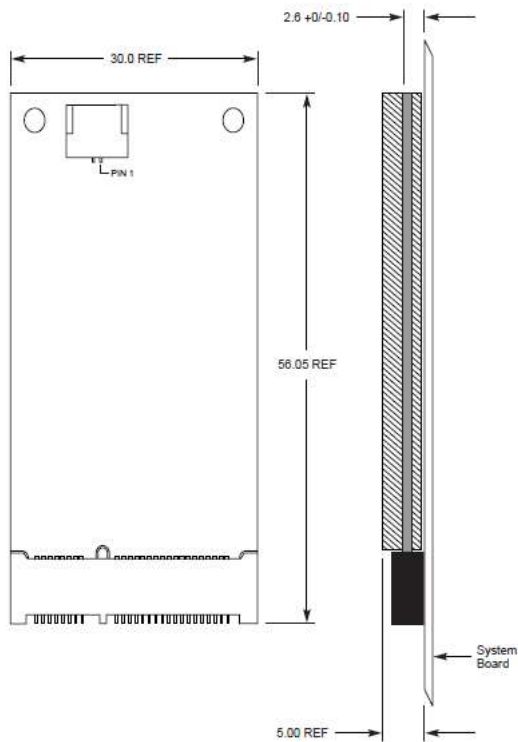Figure : Mechanic Guidance – top view

Figure: Mechanic Guidance – Side View

Chapter 6: Reference models

In addition to the LCM001-915. Liyatech also provide 433MHz and 868MHz LoRaWan gateway module which is listed below.

Model Name	Mini PCIe	USB	FCC compliant
LCM001-915	Yes	Yes	Yes
LCM001-868	Yes	Yes	No
LCM001-433	Yes	Yes	No

Thanks for your patience in using our products. If you had any question, please contact the distributor or info@liyatech.com .

Appendix : FCC Statement

Federal Communication Commission Interference Statement

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 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.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this 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.

IMPORTANT NOTE:

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.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Country Code selection feature to be disabled for products marketed to the US/CANADA

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This device is intended only for OEM integrators under the following conditions:

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2) The transmitter module may not be co-located with any other transmitter or antenna,
3) For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band by supplied firmware programming tool. OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change.

As long as 3 conditions above are met, further <u>transmitter</u> test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

IMPORTANT NOTE

In the event that these conditions <u>can not be met</u> (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID <u>can not</u> be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.