FMLR
STM SX1272

HIGH PERFORMANCE LORAWAN®
IOT MODUL

FMLR subGHz low power wireless LoRa® / LoRaWAN® module with STM32L0 and optional flash memory

FMLR STM SX1272 LoRa® and LoRaWAN® IoT module enables devices and sensors to communicate at low data rates or over long distance in the worldwide available 868 and 915 MHz ISM spectrum. Power consumption can be optimized to run on a small-sized battery. The integrated low power ARM Cortex-M0+ or M4 microcontroller has sufficient resources available to run user applications.

The module offers a frequency range from 860 MHz up to 1020 MHz. The FMLR family supports a vast number of modulation schemes such as LoRa®, (G)FSK, (G)MSK, ASK, and OOK.

KEY BENEFITS

- Semtech SX1272 based long range LoRaWAN® IoT module
- Line-of-sight range of up to 100km
- ARM Cortex M0+ or M4 MCU
- Optional ext. flash, TCXO, U.FL connector
- Customer application on MCU
- Fully FCC and CE certified
- Tiny FMLR footprint: 14 x 19.5 mm

APPLICATIONS

- Long range, low data rate IoT sensors
- Asset Tracking and monitoring
- Smart agriculture, farming, and city

Document Information

ABOUT

File name	FMLR STM SX1272 datasheet
Document type	Datasheet
Date	25.02.2021
Revision	1.1.102

REVISION HISTORY

Date	Release	Changes
02/25/2021	1.0	Initial revision
05/26/2021	1.1	Changed solder profile

TABLE OF CONTENT

Functional Description

The **FMLR STM SX1272** LoRa® and LoRaWAN® IoT module provides wireless connectivity to devices, systems and sensors communicating with low data rates or over a long distance. The module supports a frequency range from 860 MHz up to 1020 MHz. Power consumption can be optimized to run on a small-sized battery. The integrated ARM Cortex-M0+ or M4 32-bit microcontroller runs entire RF stacks and has sufficient resources available to run user applications.

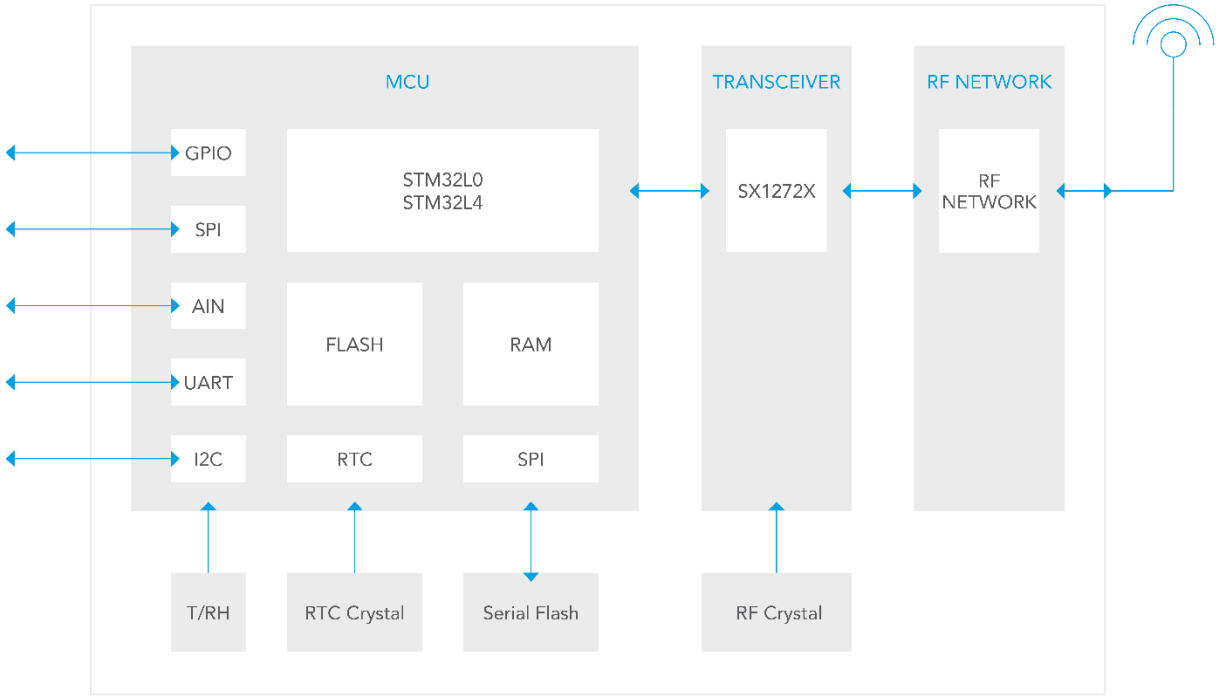


Figure 1: Block diagram FMLR STM SX1272

The modules are available with additional on-board flash memory to enable Over-the-Air (OTA) update and data storage. The **FMLR STM SX1272** supports many different modulation schemes such as LoRa®, (G)FSK, (G)MSK, ASK, and OOK. This enables communication with standards like Wireless M-Bus and IEEE802.15.4g. The module also allows the emulation of proprietary systems such as Nordic NRF905 or NRF9E5 with enhanced range coverage and additional flexibility.

To support fast prototyping and development, the module's firmware including wireless stack can be updated via SWD, UART-Bootloader or optional via OTA.

Technical Specifications

CORE COMPONENTS

LoRa® Transceiver	Semtech SX1272
Microcontroller	STM STM32L071CZH6
Core	Cortex-M0, 32 MHz
Flash Memory	192 kB
RAM	20 kB
EEPROM	6 kB
Ext. Flash, optional (-4M)	Macronix MX25R4035FZUIL0, 512 kB
Humidity/temperature sensor, optional	Sensirion SHTC3

MECHANICAL SPECIFICATIONS

Weight	2 g
Dimensions	14 x 19 x 2 mm

OPERATING CONDITIONS

Temperature	-40 – 85 °C
Humidity	0 – 95% RH, non-condensing

ABSOLUTE MAXIMUM RATINGS

Parameter	Min	Max	Unit
Ext. supply voltage on all power pins (V_{DD})	-0.3	3.6	V
Input voltage on any pin	V_{SS} – 0.3	V_{DD}	V
DC current on any pin		15	mA
Storage temperature	-40	+85	°C

WARNING!

Stressing the device beyond the «Absolute Maximum Ratings» may cause permanent damage.

OPERATING CONDITIONS

Parameter	Min	Typ	Max	Unit
Standard operating voltage (V_{DD})	1.9		3.6	V
Digital IO pin input low voltage	V_{SS}		$0.4 \cdot V_{DD}$	V
Digital IO pin input high voltage	$0.4 \cdot V_{DD}$		V_{DD}	V
Digital IO pin output low voltage	0		0.4	V
Digital IO pin input high voltage	$V_{DD} - 0.4$		V_{DD}	V
Current consumption, TX mode (+10dBm)		25.5		mA
Current consumption, TX mode (+14dBm)		52		mA
Current consumption, TX mode (+20dBm)		125		mA
Current consumption, RX mode		11.4		mA
Current consumption, sleep mode		1.5		µA
Highest receiver sensitivity			-137	dBm
RF output power ($V_{DD} < 2.4$ V)			17	dBm
RF output power ($V_{DD} \geq 2.4$ V)			19.5	dBm

ON-BOARD LED

The on-board LED is connected to port PB8. Actively drive port to low (0V) to light up LED. Drive port high to disable LED.

Module Pinout

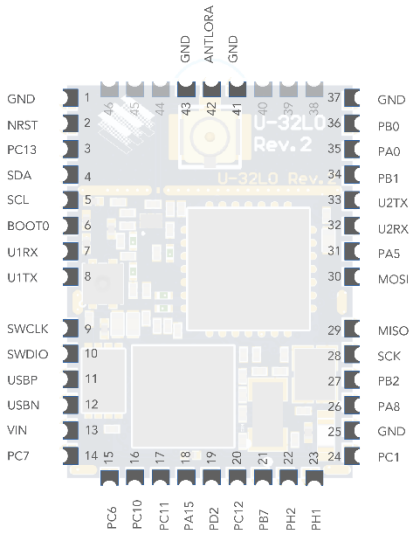


Figure 2: FMLR Pinout

#	Pad name	MCU pad	Description
1	GND		Ground (V_{SS})
2	NRST	NRST	MCU Reset
3	PC13	PC13	GPIO
4	SDA	PB9	I^2C1, GPIO
5	SCL	PB6	I2C1, GPIO
6	BOOT0	BOOT0	MCU BOOT0
7	U1RX	PA10	UART1 RX
8	U1TX	PA9	UART1 TX
9	SWCLK	PA14	DBG Clock / GPIO
10	SWDIO	PA13	DBG Data / GPIO
11	USBP	PA12	USB P / GPIO
12	USBN	PA11	USB N / GPIO
13	VIN		Supply Voltage V_{DD}
14	PC7	PC7	GPIO
15	PC6	PC6	GPIO
16	PC10	PC10	GPIO
17	PC11	PC11	GPIO
18	PA15	PA15	GPIO
19	PD2	PD2	GPIO
20	PC12	PC12	GPIO

#	Pad name	MCU pad	Description
21	PB7	PB7	GPIO
22	PH2	PH2	GPIO
23	PH1	PH1	GPIO
24	PC1	PC1	GPIO
25	GND		Ground (V_{SS})
26	PA8	PA8	GPIO
27	PB2	PB2	GPIO
28	SCK[1)]	PB3	SPI SCK
29	MISO[1)]	PB4	SPI MISO
30	MOSI[1)]	PB5	SPI MOSI
31	PA5	PA5	GPIO
32	U2RX	PA3	UART2 RX
33	U2TX	PA2	UART2 TX
34	PB1	PB1	GPIO
35	PA0	PA0	GPIO
36	PB0	PB0	GPIO
37	GND		Ground (V_{SS})
41	GND		Ground (V_{SS})
42	ANT		RF Out (50 Ω)
43	GND		Ground (V_{SS})

[1)] If the module variant contains an external flash, these pins are connected internally and should not be used as GPIO pins!

FMLR Family Footprint

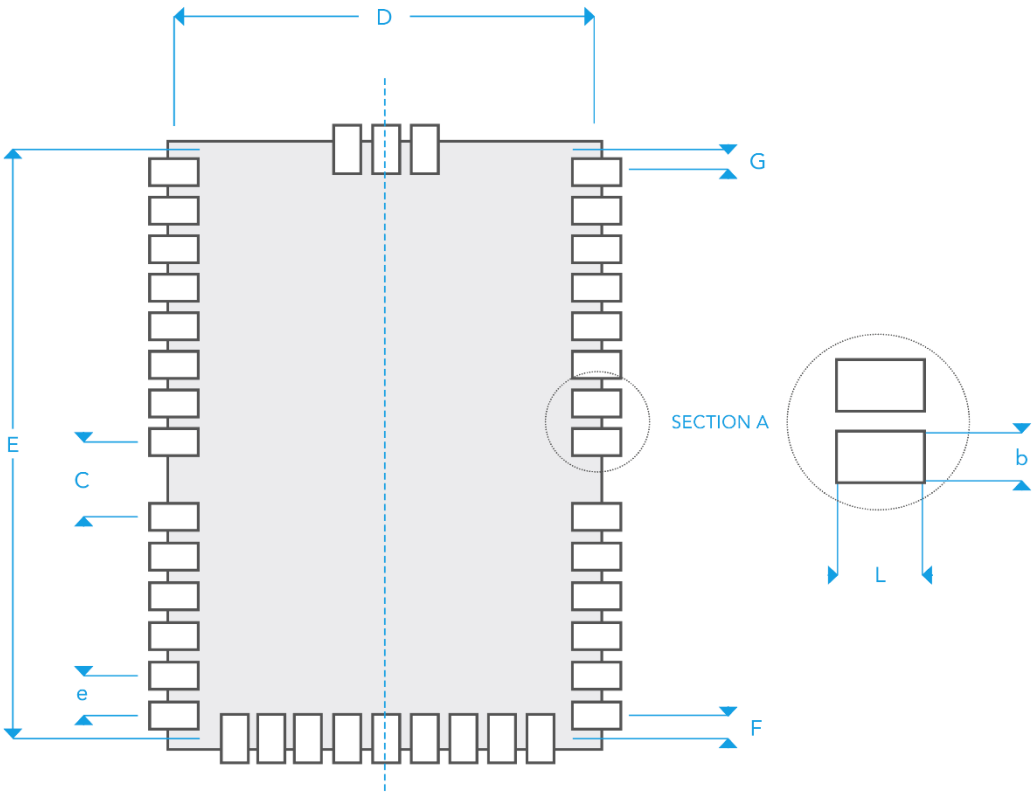


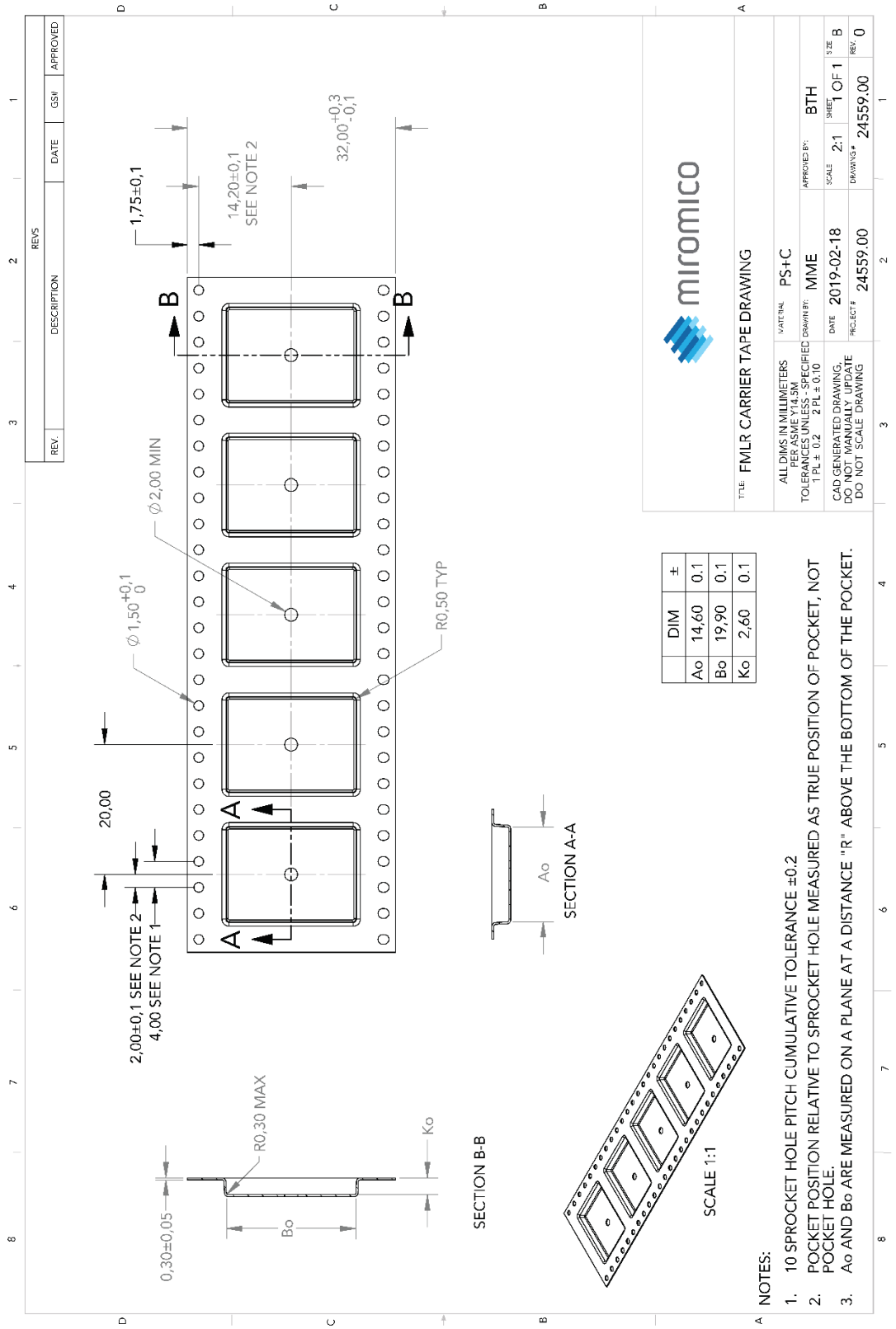
Figure 3: FMLR Footprint

FMLR FOOTPRINT DIMENSIONS

Dimension (*see* Figure 3: FMLR Footprint)	Min	Typ	Max
C		2.5	
D		13.7	
e		1.25	
b	0.85	0.9	0.95
L	1.45	1.5	1.55
F		1	
G		0.5	

All dimensions in mm

Tape Information



All dimensions in mm

Recommended Soldering Conditions

The following graph shows a typical temperature profile for the module soldering process. The exact values to be used in production is highly depending on other parameters of the soldering process, such as soldering paste, PCB design, soldering process, etc.

Reflow process should be finished within 2 cycle.

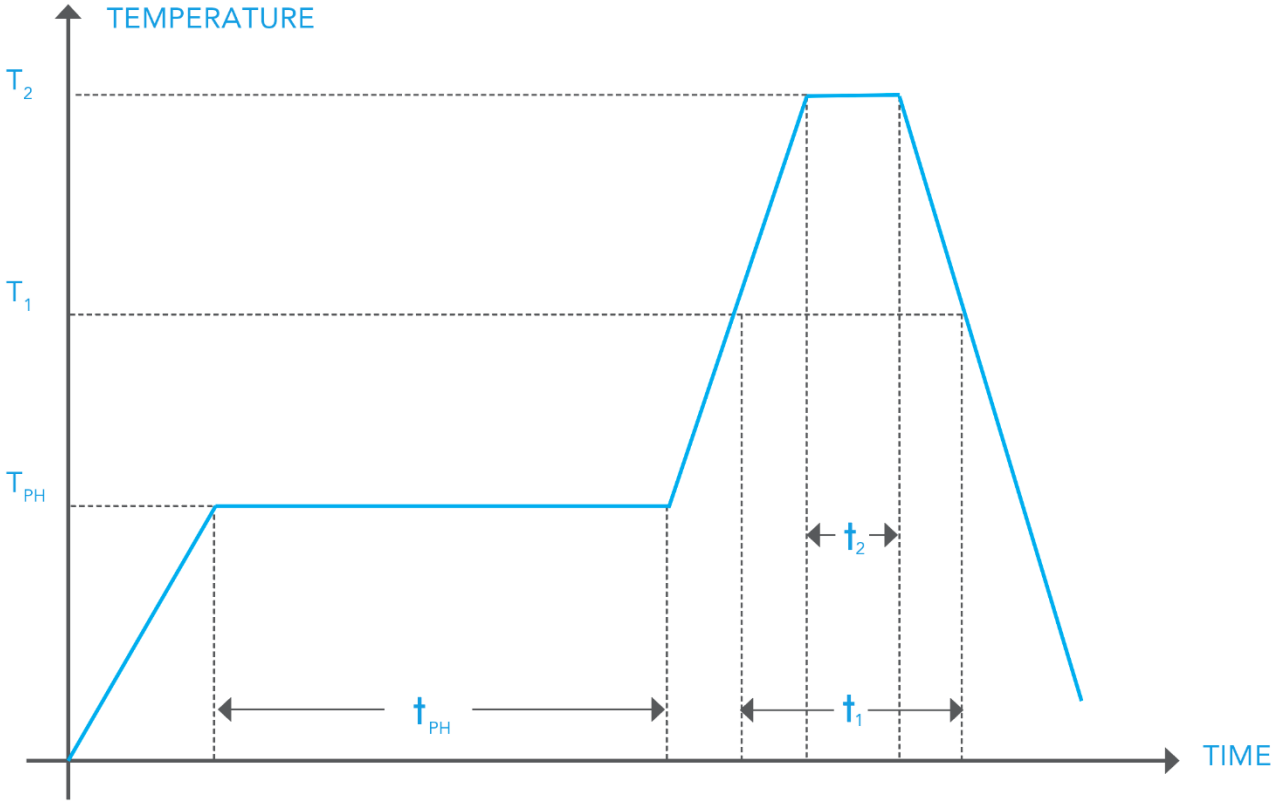


Figure 4: Soldering Profile

SOLDERING CONDITIONS

Step (see Figure 4: Soldering Profile)	Temperature	Time
Preheat (T_{PH}, t_{PH})	150 to 180 °C	120 s
Heating (T_1, t_1)	220 °C	60 s
Reflow (T_2, t_2)	255 °C	5 s

Device Options

PRODUCT ID	MCU OPTIONS				RF	
	Cortex-M0+	192KB flash	20KB RAM	4Mbit Flash	U.FL connect.	Antenna pad
FMLR-72-U-STL0Z	■	■	■		■	
FMLR-72-P-STL0Z	■	■	■			■
FMLR-72-U-STL0Z-4M	■	■	■	■	■	
FMLR-72-P-STL0Z-4M	■	■	■	■		■

Options for other STM32 variants (USB, Cortex-M0+/M4 with FPU, etc.) and external flash sizes are available on request.

Additional Documentation

ADDITIONAL RESSOURCES

Product Information Page	Product Website
Technical Documentation	Technical Documentation Website

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