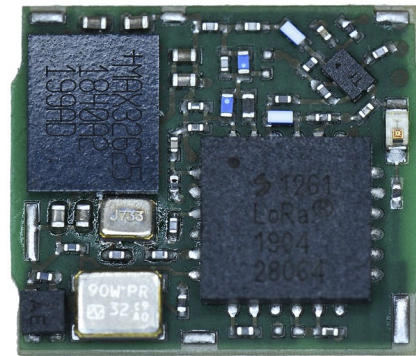


FMLR 61-MA625

World's smallest high performance
LoRaWAN® IoT module

Smallest FMLR sub-GHz low power
wireless module with MAX32625 and
Semtech SX1261



Description

FMLR-61-MA625 LoRa® and LoRaWAN® IoT module enables devices and sensors to communicate at low data rates or over a long distance. The integrated SX1261 transceiver supports a frequency range from 150 MHz up to 960 MHz covering all major sub-GHz ISM bands around the world. In addition to LoRa® and long range FHSS for LPWAN use cases, the module supports (G)FSK modulation.

Due to its low power consumption, the module is ideal for devices running on small-sized batteries. The integrated low power ARM Cortex®-M4 microcontroller with FPU featuring up to 512 kB flash and 160 kB RAM has sufficient resources to run user applications.

Features

- ▶ Semtech SX1261 based
- ▶ LoRaWAN® IoT module
- ▶ Line-of-sight range of up to 100 km
- ▶ Maxim ARM Cortex®-M4F MCU
- ▶ Secure MCU option with MAX32626
- ▶ Customer application on MCU
- ▶ World smallest footprint: 8.5 × 9.3 mm

Applications

- ▶ Asset tracking
- ▶ Health care
- ▶ Industry 4.0
- ▶ Smart agriculture
- ▶ Smart building
- ▶ Smart city
- ▶ Smart metering
- ▶ Smart retail
- ▶ Supply chain and logistics

Document Information

About

File name	Document type	Date	Revision
DS-FMLR-61-MA625	Datasheet	2022/08/12	2

Revision History

Date	Release	Changes
2021/02/03	1.0	Initial revision
2021/03/03	1.1	New template
2021/08/09	1.2	Updated FCC info
2021/11/09	1.3	Pin-out correction
2022/10/12	2	Fully revised

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Functional Description

The world's smallest **FMLR-61-MA625** LoRa® and LoRaWAN® IoT module provides wireless connectivity to devices, systems and sensors communicating with low data rates over a long distance. The integrated Semtech transceiver supports a frequency range from 150 MHz up to 960 MHz. Due to its low power consumption, the module is ideal for devices running on small-sized batteries. The integrated ARM Cortex®-M4 with FPU 32-bit microcontroller is capable of running entire RF stacks and has sufficient resources available to run user applications.

The MAX32626 variant (on request) supports additional security features such as secure boot and state-of-the-art encryption.

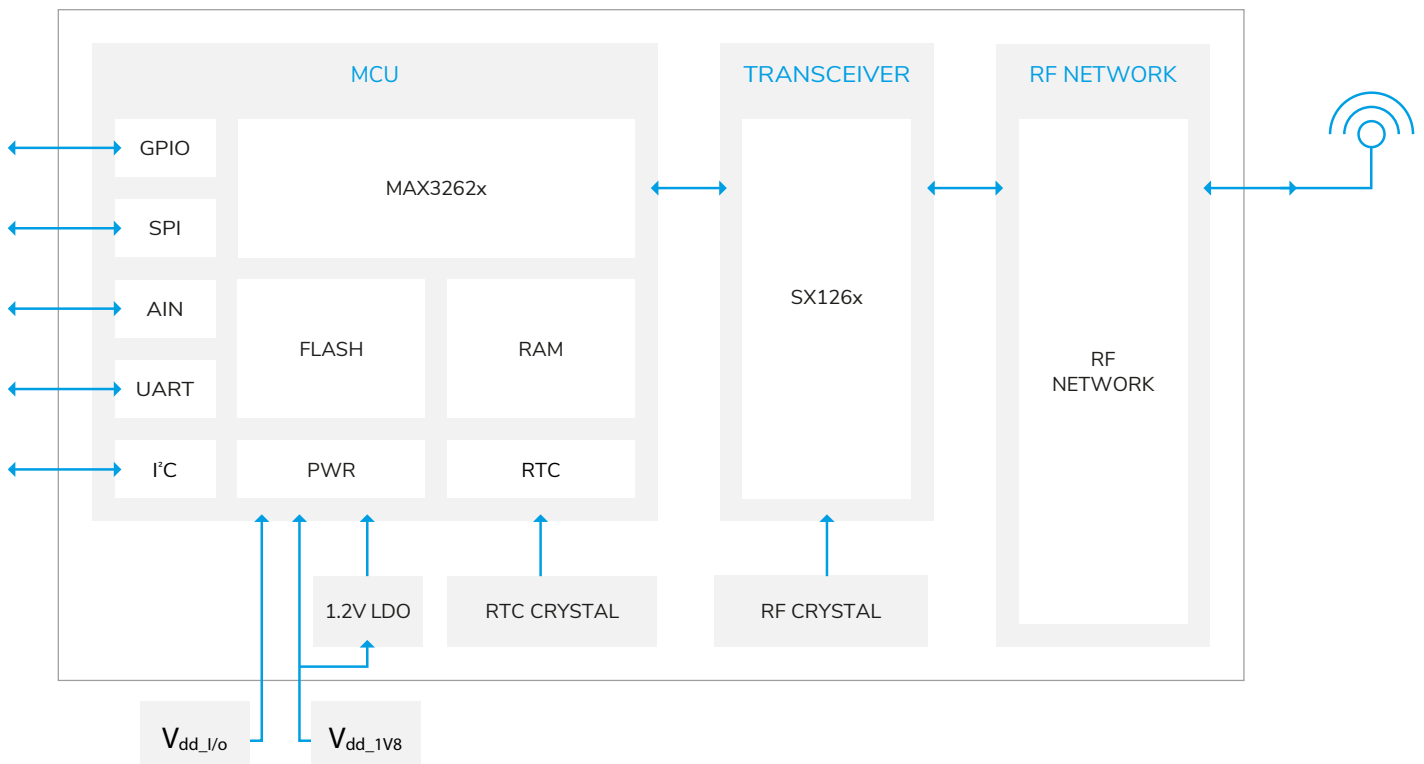


Figure 1: Block diagram FMLR-61-MA625

The modules offer sufficient data flash to support Over-the-Air (OTA) update and data storage. The **FMLR-61-MA625** supports many different modulation schemes such as LoRa®, long range FHSS and (G)FSK. This enables communication with standards like Wireless M-Bus and IEEE802.15.4g.

To support fast prototyping and development, the firmware, including the wireless stack, can be updated via SWD.

Technical Specifications

Core Components

LoRa® transceiver	Semtech SX1261
Microcontroller	Maxim MAX32625IWYL+
Core	Cortex®-M4 with FPU, 96 MHz
Flash memory	256 kB
RAM	128 kB

Mechanical Specifications

Weight	1.3 g
Dimensions	8.5 × 9.3 × 1.8 mm

Operating Conditions

Temperature	-20 – 85 °C
Humidity	0 – 95 % RH, non-condensing

Absolute Maximum Ratings

Parameter	Min	Max	Unit
Ext. main supply voltage (V_{DD_1V8})	-0.3	1.89	V
Ext. I/O supply voltage (V_{DD_IO})	-0.3	3.6	V
Input voltage on I/O pins (GPIO, RSTN, SRSTN, JTAG)	-0.3	3.6	V
DC current on I/O pins (GPIO, RSTN, SRSTN, JTAG)		25	mA
Analog input A[0:1]	-0.3	5.5	V
Analog input A[2:3]	-0.3	3.6	V
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 main supply ($V_{DD_{1V8}}$)	1.8	1.8	1.89	V
Standard operating voltage for I/O ($V_{DD_{IO}}$)	1.8	1.8	3.6	V
Digital IO pin input /output voltage	see datasheet of MAX32625			
Current consumption, TX mode (+10dBm, 3.3V) ¹		15		mA
Current consumption, TX mode (+14dBm, 3.3V) ¹		35		mA
Current consumption, RX mode ¹	4.2	5.1	8.2	mA
Current consumption, sleep mode		2.5		μ A
Highest receiver sensitivity ¹			-148	dBm
RF output power ¹			14	dBm

¹See transceiver datasheet for detailed specifications

Certifications

CE

UKCA

FCC

FCC ID: 2AUQEF64CH

▲ FCC Caution:

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 unde-sired operation.

The module is FCC compliant by using antenna 1052620001 by Molex, 1.4 dBi gain.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

On-Board LED

The on-board LED is connected to port P4.4. Actively drive port to low (0V) to light up LED. Drive port high or high Z to disable LED. LED anode is internally connected to $V_{DD_{1V8}}$.

Module Pinout

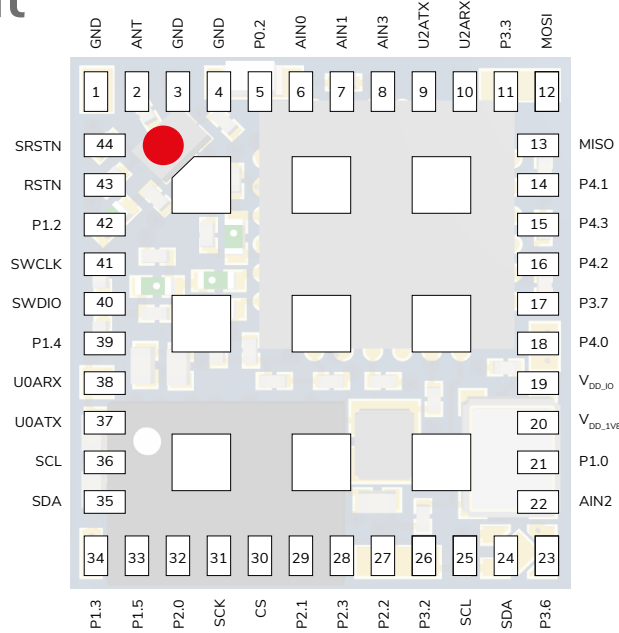


Figure 2: FMLR Pinout (top view)

#	Pad name	MCU pad	Description	#	Pad name	MCU pad	Description
1	GND	GND	Ground (V_{SS})	23	P3.6	P3.6	GPIO
2	ANT		RF Out (50 Ohms)	24	SDA	P3.4	I ² C M 1A SDA
3	GND	GND	Ground (V_{SS})	25	SCL	P3.5	I ² C M 1A SCL
4	GND	GND	Ground (V_{SS})	26	P3.2	P3.2	GPIO
5	P0.2	P0.2	GPIO	27	P2.2	P2.2	GPIO
6	AIN0	AIN0	Analog In 0	28	P2.3	P2.3	GPIO
7	AIN1	AIN1	Analog In 1	29	P2.1	P2.1	GPIO
8	AIN3	AIN3	Analog In 3	30	CS	P2.7	SPI CS
9	U2ATX	P3.1	UART 2A TX	31	SCK	P2.4	SPI SCK
10	U2ARX	P3.0	UART 2A RX	32	P2.0	P2.0	GPIO
11	P3.3	P3.3	GPIO	33	P1.5	P1.5	GPIO
12	MOSI	P2.5	SPI MOSI	34	P1.3	P1.3	GPIO
13	MISO	P2.6	SPI MISO	35	SDA	P1.6	I ² C M0A SDA
14	P4.1	P4.1	GPIO	36	SCL	P1.7	I ² C M0A SCL
15	P4.3	P4.3	GPIO	37	U0ATX	P0.1	UART 0A TX
16	P4.2	P4.2	GPIO	38	U0ARX	P0.0	UART 0A RX
17	P3.7	P3.7	GPIO	39	P1.4	P1.4	GPIO
18	P4.0	P4.0	GPIO	40	SWDIO	SWDIO	MCU Debug
19	VDD_IO	VDD_IO	VDD I/O	41	SWCLK	SWCLK	MCU Debug
20	VDD_1V8	VDD_1V8	VDD 1V8	42	P1.2	P1.2	GPIO
21	P1.0	P1.0	GPIO	43	RSTN	RSTN	POR Reset
22	AIN2	AIN2	Analog In 2	44	SRSTN	SRSTN	MCU Soft Reset

FMLR Family Footprint

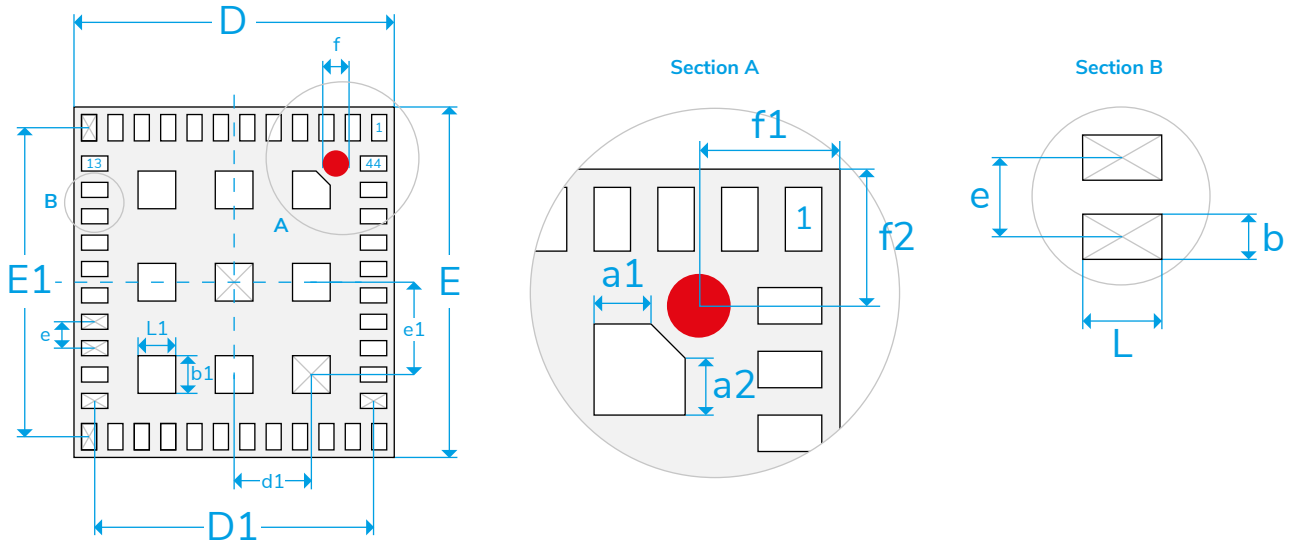


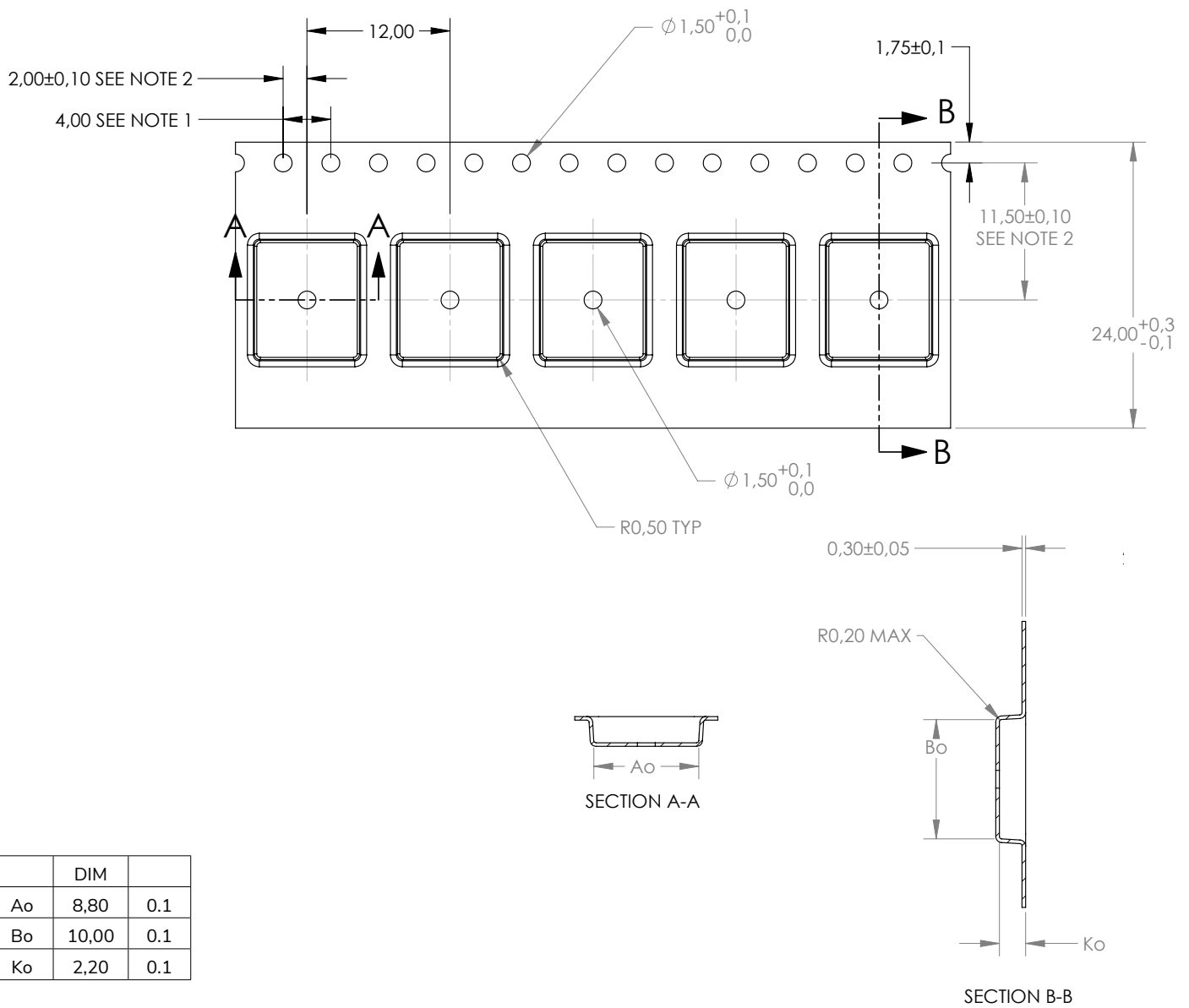
Figure 3: FMLR Module Footprint (bottom view)

FMLR Footprint Dimensions*

Dimension (see Figure 3: FMLR Module Footprint)	Min	Typ	Max
a1		0.625	
a2		0.625	
f1		1.5	
f2		1.55	
D		8.5	
E		9.3	
D1		7.4	
E1		8.2	
e		0.7	
b		0.4	
L		0.7	
b1		1	
L1		1	
d1		2.05	
e1		2.45	
f (GND plane allowed. No bare copper in this region)		0.7	

*All dimensions in mm

Tape Information



	DIM	
A _o	8,80	0.1
B _o	10,00	0.1
K _o	2,20	0.1

1. 10 Sprocket hole pitch cumulative tolerance ± 0.2
2. Pocket position relative to sprocket hole measured as true position of pocket, not Pocket hole.
3. A_o and b_o are measured on a plane at a distance „r“ above the bottom of the pocket.

All dimensions in mm

Tolerances unless - specified

1 PL ± 0.2

2 PL ± 0.10

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 1 cycle.

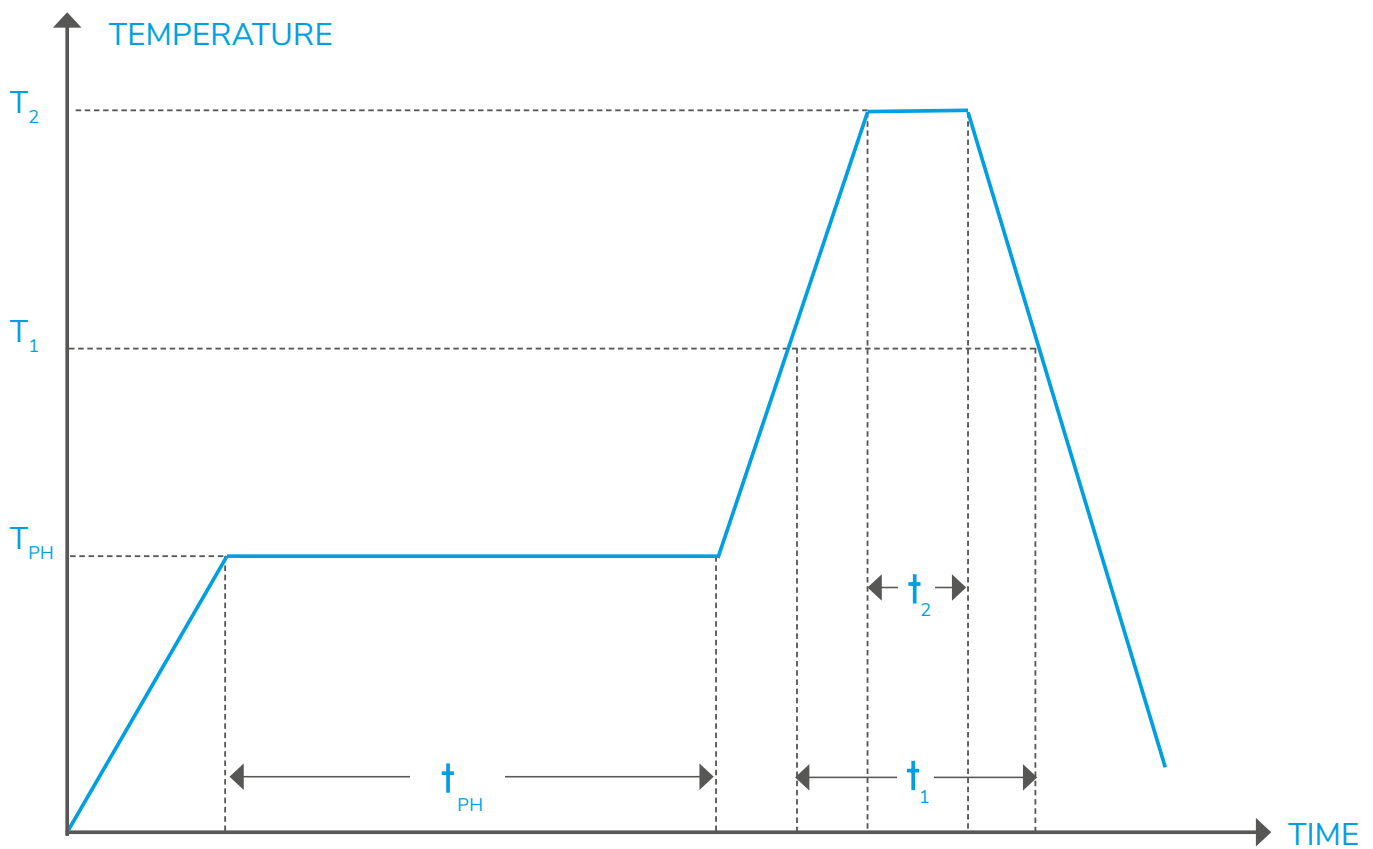


Figure 4: Soldering Profile

Soldering Conditions

Step (see Figure: 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

Additional Documentation

Additional Resources

Product information page miromico.ch/fmlr-61-ma625

Technical documentation docs.miromico.ch/datasheets/modules.html

Device Options

Product ID	MCU options					RF	
	Cortex®-M4+	512 kB flash	256 kB flash	160 kB RAM	128 kB RAM	SX1261	SX1262
FMLR-61-P-MA625	✓		✓		✓	✓	

Options for other MAX3262x or SX126x variants are available on request.

Keep in Touch

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