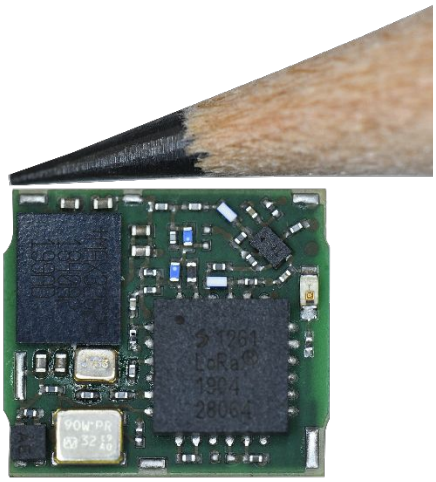
FMLR-6X-P-MA62X

WOLRD SMALLEST HIGH PERFORMANCE LORAWAN® IOT MODUL



Smallest FMLR subGHz low power wireless module with MAX32625/26 and Semtech SX1261

FMLR-6X-P-MA62X LoRa® and LoRaWAN® IoT module enables devices and sensors to communicate at low data rates or over long distance. The integrated SX1261 transceiver supports a frequency range from 902 - 928 MHz. Power consumption can be optimized to run on a small-sized battery. The integrated low power ARM Cortex- M4 microcontroller has sufficient resources available to run user applications.

The **FMLR-6X-P-MA62X** supports a vast number of modulation schemes such as LoRa®, (G)FSK, (G)MSK, ASK, and OOK.

KEY BENEFITS

- Semtech SX1261 based long range LoRaWAN® IoT module
- Line-of-sight range of up to 100km
- Maxim ARM Cortex-M4 MCU
- Secure MCU option with MAX32626
- Customer application on MCU
- Fully FCC and CE certified
- Tiny footprint: 8.5 x 9.3 mm

APPLICATIONS

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

Document Information

ABOUT

File name	FMLR-6X-P-MA62X datasheet
Document type	Datasheet
Date	03.02.2021
Revision	1.3.151

REVISION HISTORY

Date	Release	Changes
03.02.2021	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

TABLE OF CONTENT

Functional Description

The world's smallest **FMLR-6X-P-MA62X** LoRa® and LoRaWAN® IoT module provides wireless connectivity to devices, systems and sensors communicating with low data rates or over a long distance. The integrated Semtech transceiver supports a frequency range from 902 928 MHz. Power consumption can be optimized to run on a small-sized battery. The integrated ARM Cortex-M4 32-bit microcontroller runs entire RF stacks and has sufficient resources available to run user applications. The MAX32626 variant supports additional security features such as secure boot and state-of-the-art encryption.

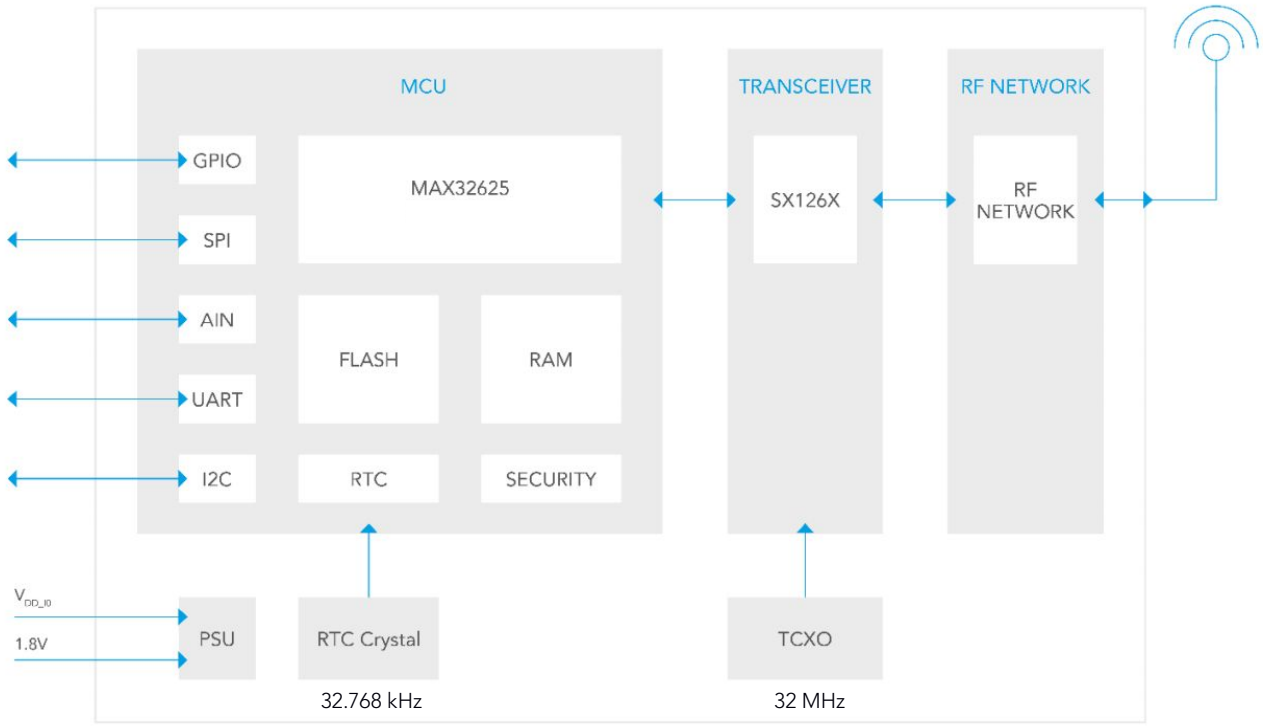


Figure 1: Block diagram FMLR-6X-P-MA62X

The modules offer plenty of data flash to support Over-the-Air (OTA) update and data storage. The **FMLR-6X-P-MA62X** 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 SX1261
Microcontroller	Maxim MAX32625IWYL+
Core	Cortex-M4, 96 MHz
Flash Memory	256 kB
RAM	128 kB

MECHANICAL SPECIFICATIONS

Weight	1.3 g
Dimensions	8.5 x 9.3 x 1.8 mm

OPERATING CONDITIONS

Temperature	-40 – 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	1.89	V
Digital IO pin input / output voltage	*see datasheet of MAX32625*			
Current consumption, TX mode (+10 dBm)		15		mA
Current consumption, TX mode (+14 dBm)		35		mA
Current consumption, RX mode	4.2	5.1	10.1	mA
Current consumption, sleep mode		2.5		µA
Highest receiver sensitivity			-135	dBm
RF output power			13.5	dBm

CERTIFICATIONS

CE	RED 2014/53/EU
FCC	FCC ID: 2AUQEF64CH

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 to disable LED.

Module Pinout

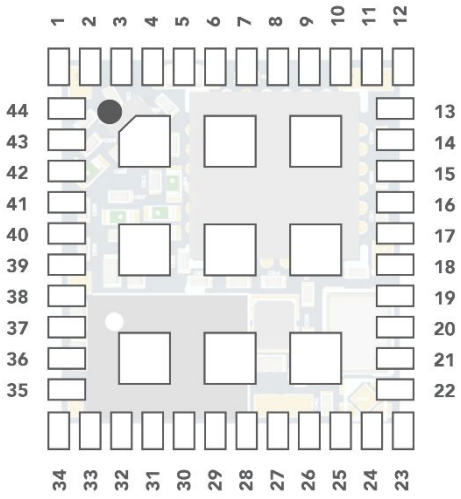


Figure 2: FMLR-6X-P-MA62X Pinout (Top View)

#	Pad name	MCU pad	Description
1	GND	GND	Ground (V_{SS})
2	ANT		RF Out (50 Ohms)
3	GND	GND	Ground (V_{SS})
4	GND	GND	Ground (V_{SS})
5	P0.2	P0.2	GPIO
6	AIN0	AIN0	Analog In 0
7	AIN1	AIN1	Analog In 1
8	AIN3	AIN3	Analog In 3
9	U2ATX	P3.1	UART 2A TX
10	U2ARX	P3.0	UART 2A RX
11	P3.3	P3.3	GPIO
12	MOSI	P2.5	SPI MOSI
13	MISO	P2.6	SPI MISO
14	P4.1	P4.1	GPIO
15	P4.3	P4.3	GPIO
16	P4.2	P4.2	GPIO
17	P3.7	P3.7	GPIO
18	P4.0	P4.0	GPIO
19	V_{DD_IO}	V_{DD_IO}	V_{DD} I/O
20	V_{DD_1V8}	V_{DD_1V8}	V_{DD} 1V8
21	P1.0	P1.0	GPIO
22	AIN2	AIN2	Analog In 2

#	Pad name	MCU pad	Description
23	P3.6	P3.6	GPIO
24	SDA	P3.4	I^2C M 1A SDA
25	SCL	P3.5	I^2C M 1A SCL
26	P3.2	P3.2	GPIO
27	P2.2	P2.2	GPIO
28	P2.3	P2.3	GPIO
29	P2.1	P2.1	GPIO
30	CS	P2.7	SPI CS
31	SCK	P2.4	SPI SCK
32	P2.0	P2.0	GPIO
33	P1.5	P1.5	GPIO
34	BOOT0	P1.3	GPIO
35	SDA	P1.6	I^2C M0A SDA
36	SCL	P1.7	I^2C M0A SCL
37	U0ATX	P0.1	UART 0A TX
38	U0ARX	P0.0	UART 0A RX
39	P1.4	P1.4	GPIO
40	SWDIO	SWDIO	MCU Debug
41	SWCLK	SWCLK	MCU Debug
42	P1.2	P1.2	GPIO
43	RSTN	RSTN	MCU Reset
44	SRSTN	SRSTN	MCU Soft Reset

Module Footprint

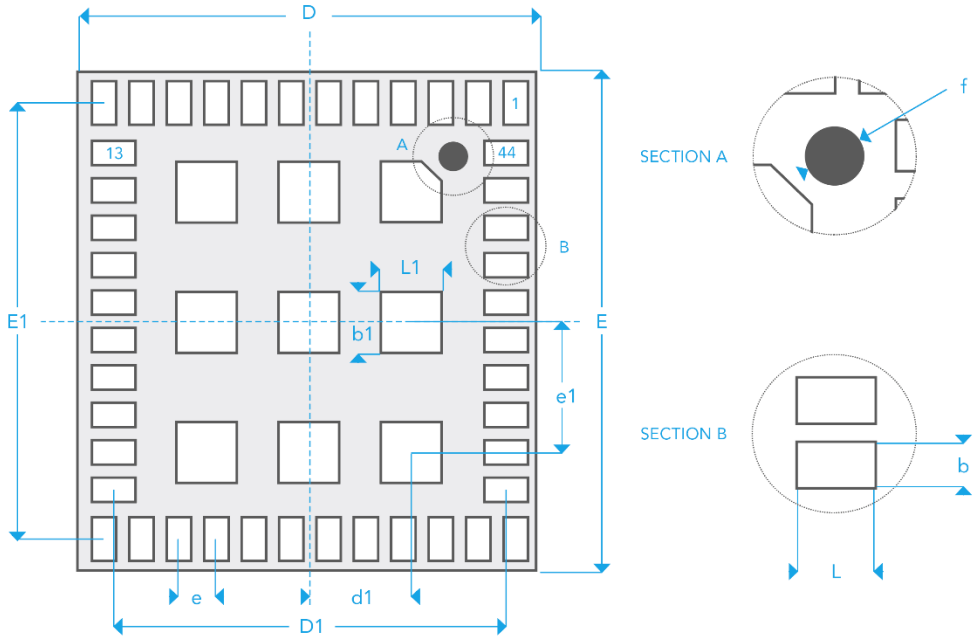


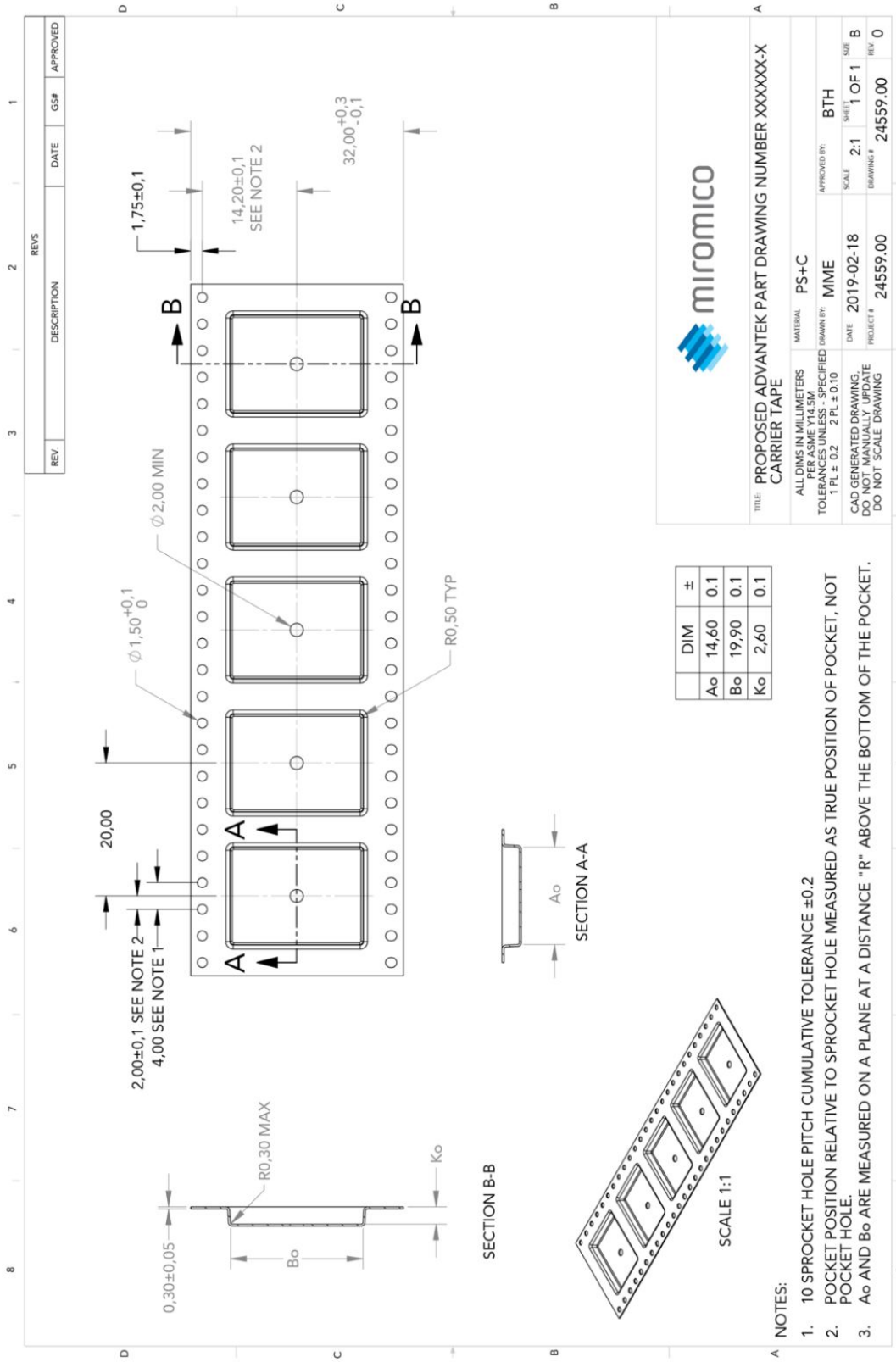
Figure 3: FMLR-6X-P-MA62X Footprint (Bottom View)

FMLR FOOTPRINT DIMENSIONS

Dimension *(see Figure 3: FMLR-6X-P-MA62X Footprint)*	Min	Typ	Max
D		8.5	
E		9.3	
D1		7.4	
E1		8.2	
e		0.7	
b		0.4	
L		0.7	
d1		2.05	
e1		2.45	
b1		1	
L1		1	
f (no GND plane or any other routing in this area)		1	

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 1 cycle.

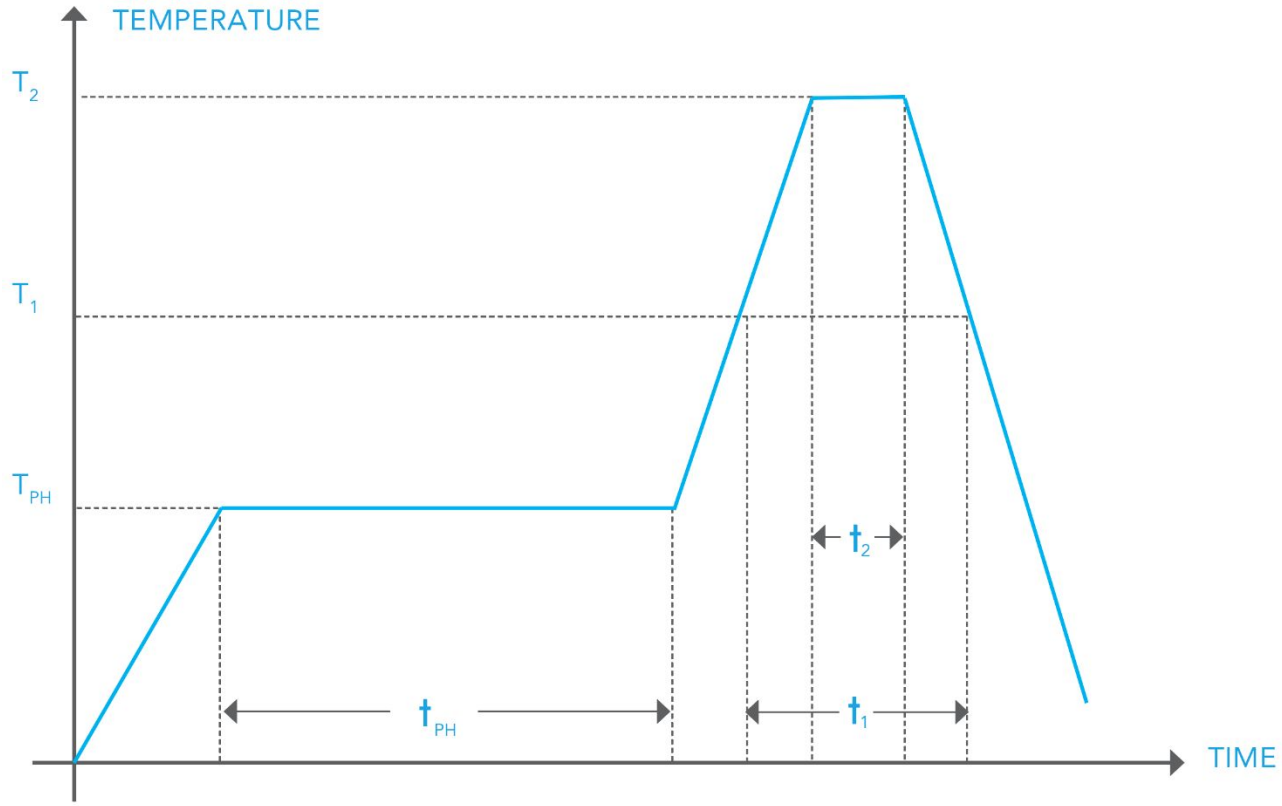


Figure 4: Soldering Profile

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-M4+	256 kB flash	20 kB RAM	4Mbit Flash	SX1261	SX1262
FMLR-61-P-MA625	■	■	■		■	
FMLR-61-P-MA626	■	■	■		■	
FMLR-62-P-MA625						■
FMLR-62-P-MA626						■

Options for other MAX3262x variants are available on request.

Additional Documentation

FCC CAUTION:

Antenna Manufacturer:	Molex
Antenna Model:	1052620001
Antenna type:	External
Antenna gain:	2 dBi

Host product manufacturers that they need to provide a physical or e-label stating, "Contains FCC ID: 2AUQEF64CH" with their finished product. Only those antennas with same type and lesser gain filed under this FCC ID can be used with this device. The host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed. The final host integrator must ensure there is no instruction provided in the user manual or customer documentation indicating how to install or remove the transmitter module except such device has implemented two-ways authentication between module and the host system. The final host manual shall include the following regulatory statement: This equipment has been tested and found to comply with the limits. 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. This module has been tested and found to comply with part 15.247 requirements for Modular Approval. This module is intended for OEM integrator. The OEM integrator is responsible for the compliance to all the rules that apply to the product into which this certified RF module is integrated. Additional testing and certification may be necessary when multiple modules are used.

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.

FCC RF RADIATION EXPOSURE STATEMENT:

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

2. This equipment complies with RF radiation exposure limits set forth for an uncontrolled environment.

3.This equipment should be installed and operated with minimum distance 20cm between the radiator& your body.

ADDITIONAL RESSOURCES

Product Information Page	Product Website
Technical Documentation	Technical Documentation Website

Keep in touch

Miromico AG
Gallusstrasse 4
CH-8006 Zürich
Switzerland

info@miromico.ch
www.miromico.ch
https://forum.miromico.ch

DISCLAIMER

We reserve the right to make technical changes, which serve to improve the product, without prior notification.

SAFETY-CRITICAL, MILITARY, AND AUTOMOTIVE APPLICATIONS DISCLAIMER: Miromico products are not designed for and will not be used in connection with any applications where the failure of such products would reasonably be expected to result in significant personal injury or death ("Safety-Critical Applications") without an Miromico officer's specific written consent. Safety-Critical applications include, without limitation, life support devices and systems, equipment, or systems for the operation of nuclear facilities and weapons systems. Miromico products are not designed nor intended for use in military or aerospace applications or environments. Miromico products are not designed nor intended for use in automotive applications unless specifically designated by Miromico as automotive grade.