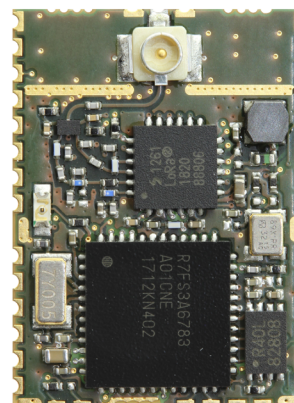


FMLR 61-REN

High performance LoRaWAN®
IoT module

FMLR sub-GHz low power wireless LoRa® / LoRaWAN® module with Renesas S3 MCU and optional flash memory.



Description

FMLR-61-REN LoRa®/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. Due to its low power consumption, the module is ideal for devices running on small-sized batteries. The integrated Renesas S3A6 low power ARM Cortex®-M4 microcontroller has sufficient resources available to run user applications.

The module offers a frequency range from 150 MHz up to 960 MHz. The FMLR family supports a vast number of modulation schemes such as LoRa®, (G)FSK, (G)MSK, ASK, and OOK.

Features

- ▶ Semtech SX1261 based
- ▶ LoRaWAN® IoT module
- ▶ Line-of-sight range of up to 100km
- ▶ ARM Cortex®-M4 MCU, M0+ (optional)
- ▶ Optional ext. flash, TXCO, U.FL connector or integrated antenna
- ▶ Customer application on MCU
- ▶ Tiny FMLR footprint: 14 × 19.5 mm

Applications

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

Document Information

About

File name	Document type	Date	Revision
DS-FMLR-61-REN	Datasheet	2023/06/30	2.1

Revision History

Date	Release	Changes
2021/02/25	1.0	Initial revision
2021/05/26	1.1	Changed solder profile
2022/04/04	1.2	New design
2023/04/11	2	Fully revised
2023/06/30	2.1	Module is EOL

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Functional Description

The **FMLR-61-REN** 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 SX1261 transceiver from Semtech 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 Renesas S3A6 ARM Cortex®-M4 32-bit microcontroller is capable of running entire RF stacks and has sufficient resources available to run user applications. For cost optimization the MCU can be downsized to a Renesas S128 ARM Cortex®-M0+.

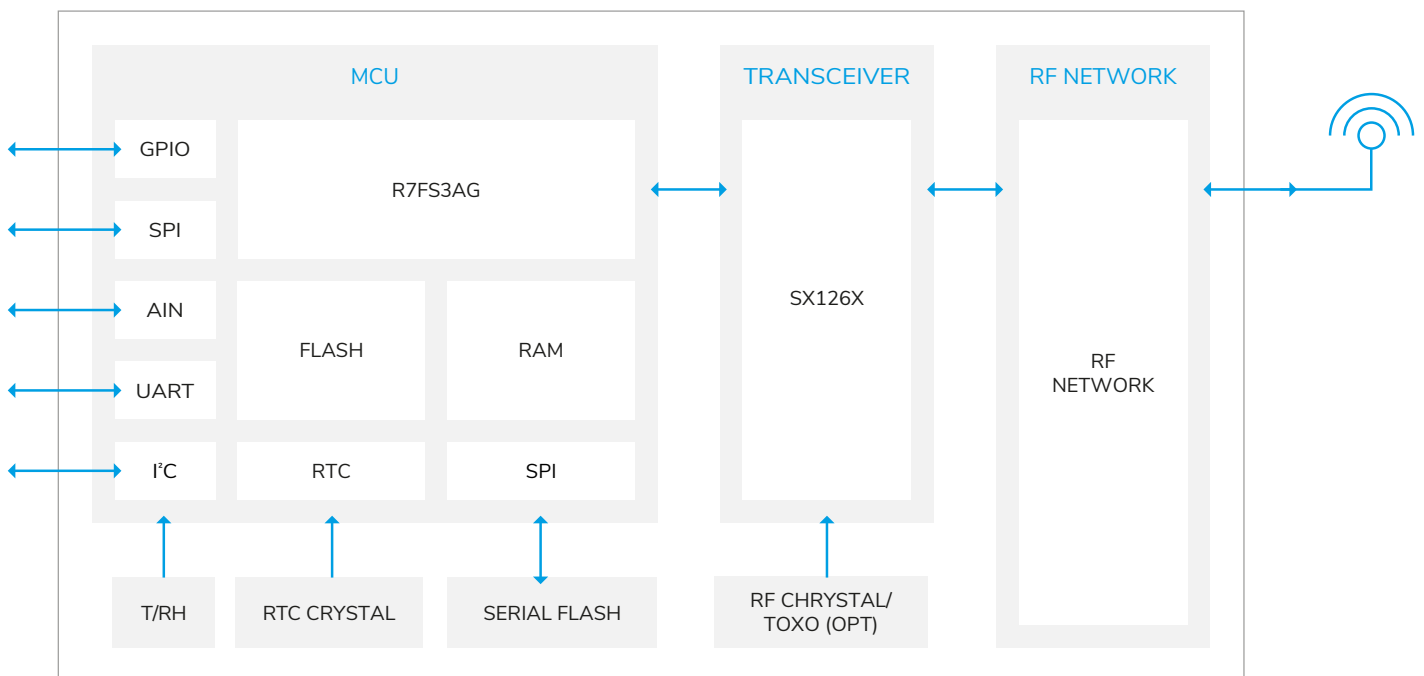


Figure 1: Block diagram FMLR-61-REN

The modules are available with additional on-board flash memory to enable Over-the-Air (OTA) update and data storage. The **FMLR-61-REN** supports up to +14 dBm output power and 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. Optionally, a SX1262 variant with output power up to +22 dBm is available. The module also allows the emulation of proprietary systems such as Nordic NRF905 or NRF9E5 with enhanced range coverage and additional flexibility.

Technical Specifications

Core Components

LoRa® transceiver	Semtech SX1261
Microcontroller	Renesas R7FS3A6783A01CNE#AC0
Core	Cortex®-M4, 48 MHz
Flash memory	256 kB
RAM	32 kB
EEPROM	8 kB
Ext. flash, optional (-4M)	Macronix MX25R4035FZUIL0, 512 kB

Mechanical Specifications

Weight	2 g
Dimensions	14 × 19.5 × 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})	2.2		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 (+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		1.4		μ A
Highest receiver sensitivity			-135	dBm
RF output power			13.5	dBm

Certifications

CE	RED 2014/53/EU
UKCA	Radio Equipment Regulations 2017
FCC	Pending

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.

On-Board LED

The on-board LED is connected to port P011. Actively drive port to low (0V) to light up LED. Drive port high to disable LED.

Module Pinout

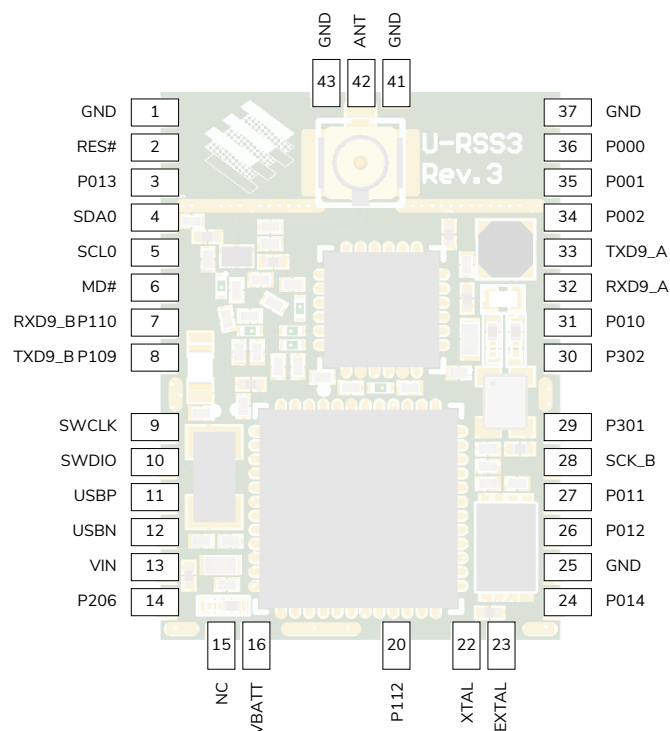


Figure 2: Module Pinout

#	Pad name	MCU pad	Description
1	GND		Ground (V_{SS})
2	RES#	RES	MCU Reset
3	P013	P013	GPIO
4	SDA0	P407	I ² C1 SDA0, GPIO
5	SCL0	P400	I ² C1 SCL0, GPIO
6	MD#	P201	MCU Boot Mode
7	RXD9_B	P110	SPI MISO_B/RXD9_B
8	TXD9_B	P109	SPI MOSI_B/TXD9_B
9	SWCLK	P300	DBG Clock, GPIO
10	SWDIO	P108	DBG Data, GPIO
11	USBP	P914	USB P, GPIO
12	USBN	P915	USB N, GPIO
13	VIN		Supply Voltage V_{DD}
14	P206	P206	GPIO
15	NC		NC ¹
16	VBATT	VBATT ²	MCU VBATT ²
20	P112	P112	GPIO
22	XTAL	P213	GPIO

#	Pad name	MCU pad	Description
23	EXTAL	P212	GPIO
24	P014	P014	GPIO
25	GND		Ground (V_{SS})
26	P012	P012	GPIO
27	P011	P011	GPIO
28	SCK_B	P111	SPI SCK_B, GPIO
29	P301	P301	GPIO
30	P302	P302	GPIO
31	P010	P010	GPIO
32	RXD9_A	P408	RXD9_A
33	TXD9_A	P409	TXD9_A
34	P002	P002	GPIO
35	P001	P001	GPIO
36	P000	P000	GPIO
37	GND		Ground (V_{SS})
41	GND		Ground (V_{SS})
42	ANT		RF Out (50 Ω)
43	GND		Ground (V_{SS})

¹ Not connected (NC) for -RSS3 variant; connected to P401 for -RSS1 variant

² Not connected (NC) for -RSS1 variant

FMLR Family Footprint

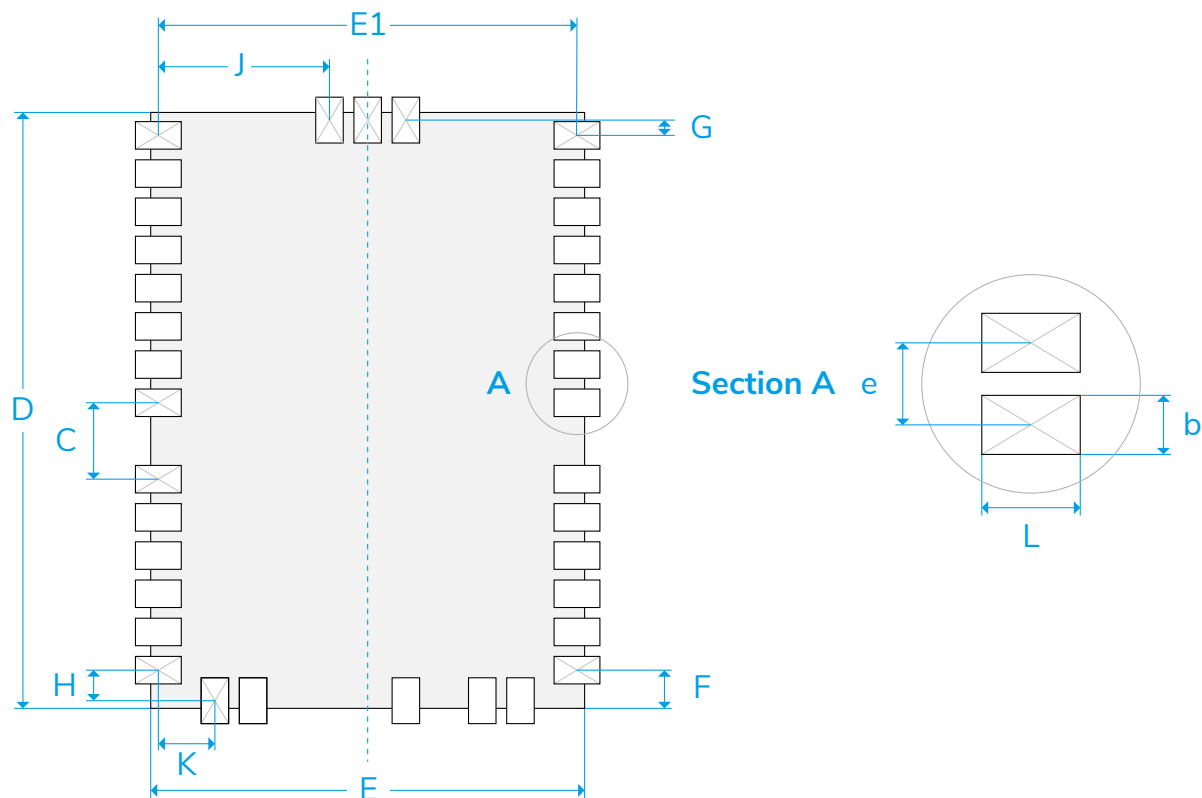


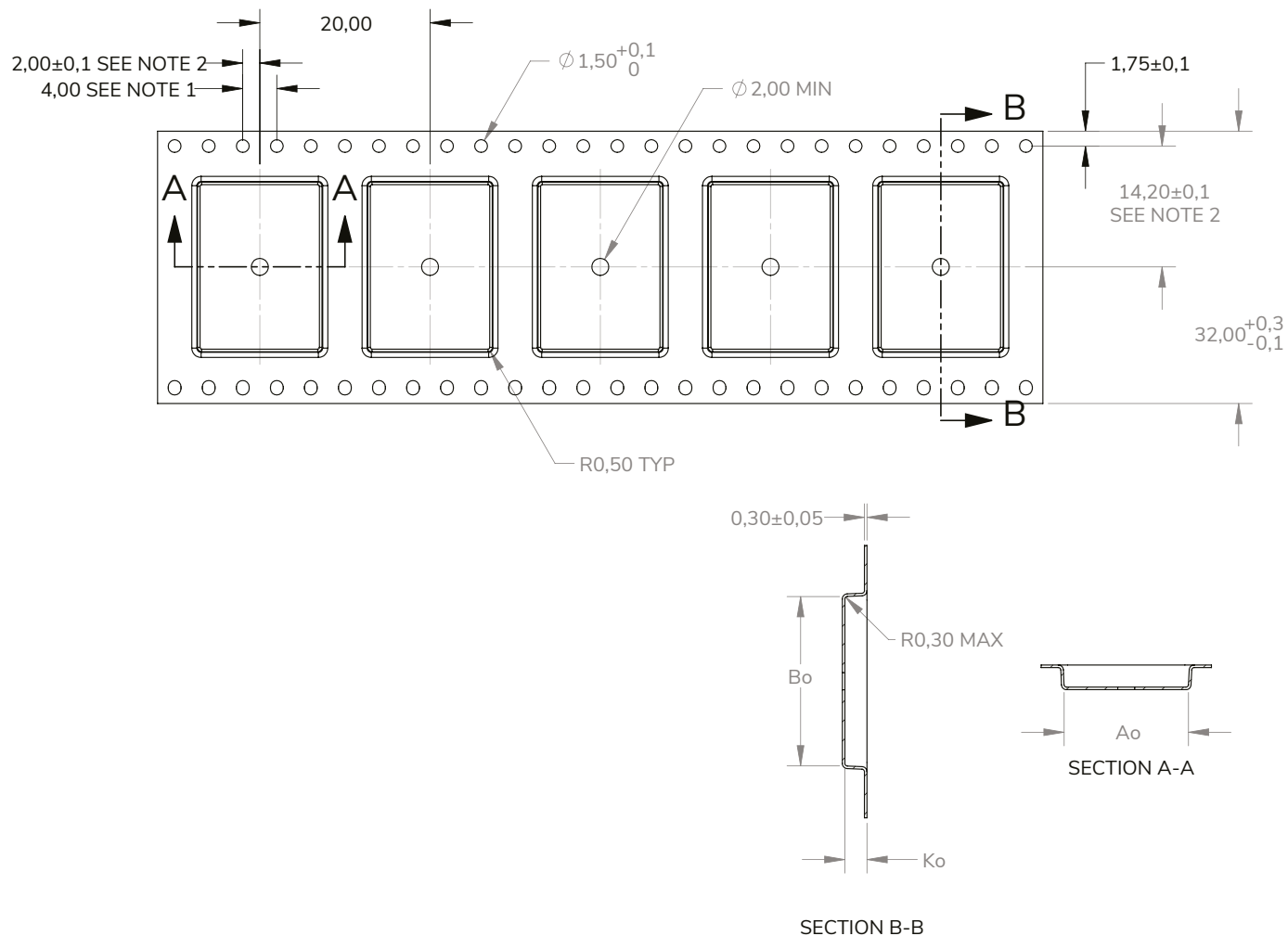
Figure 3: FMLR Module Footprint

FMLR Footprint Dimensions*

Dimension (see Figure 3: FMLR Module Footprint)	Min	Typ	Max
b	0.85	0.9	0.95
C		2.5	
D		19.5	
E		14.2	
E1		13.7	
e		1.25	
F		1.25	
G		0.5	
H		1	
J		5.6	
K		1.85	
L	1.45	1.5	1.55

*All dimensions in mm

Tape Information



	DIM	±
Ao ³	14,60	0.1
Bo ³	19,90	0.1
Ko	2,60	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 Ao And Bo 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 2 cycles.

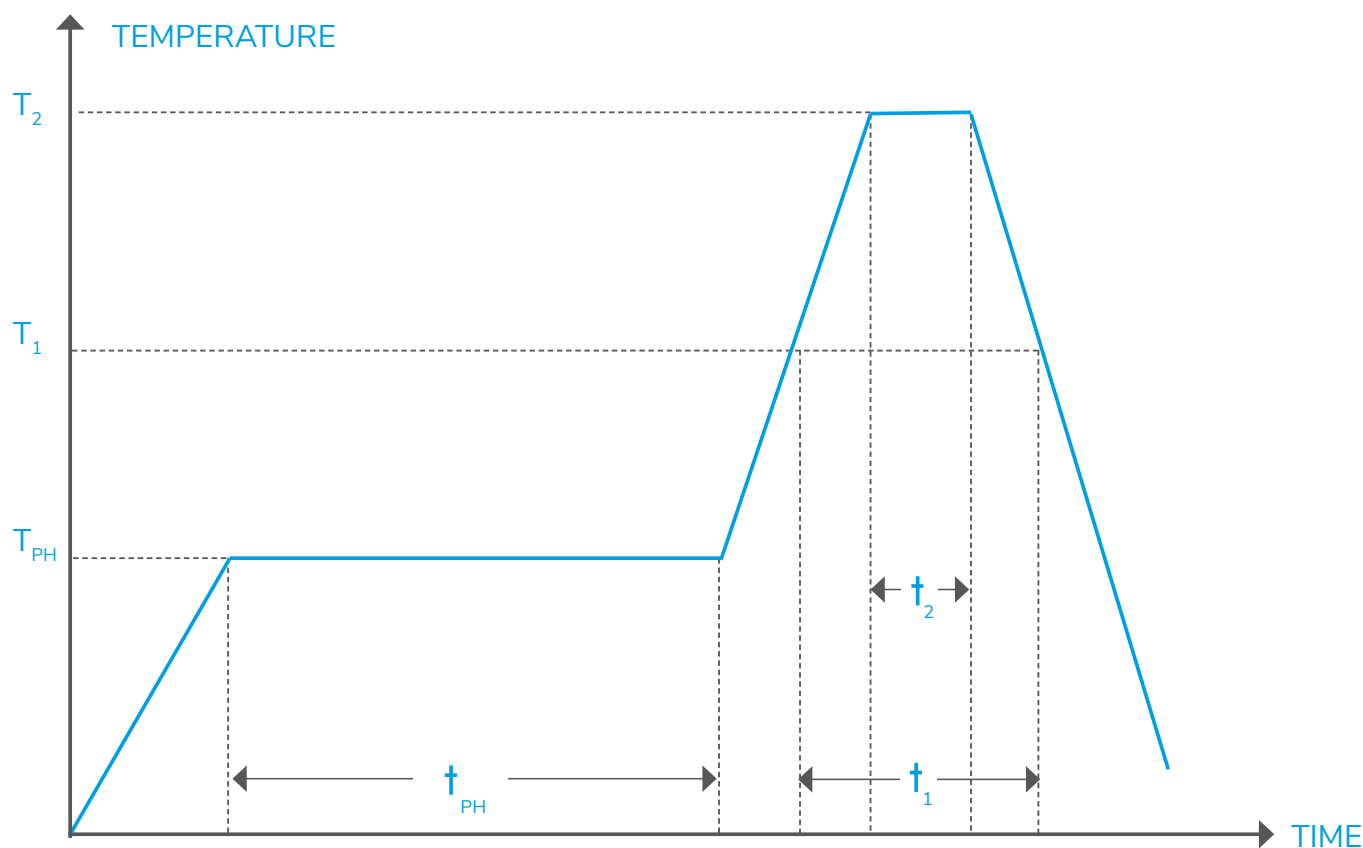


Figure 4: Soldering Profile

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-ren
Technical documentation	docs.miromico.ch/modules

Device Options

Module is end-of-life (EOL) and no longer produced.

Product ID	MCU options				RF	
	Cortex®-M0+	256KB flash	32KB RAM	4Mbit Flash	U.FL connect.	Antenna pad
FMLR-61-U-RSS3	✓	✓	✓		✓	
FMLR-61-P-RSS3	✓	✓	✓			✓
FMLR-61-U-RSS3-4M	✓	✓	✓	✓	✓	
FMLR-61-P-RSS3-4M	✓	✓	✓	✓		✓

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

Keep in Touch

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