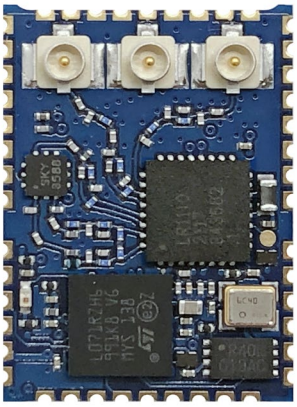
FMLR 1110-STL0Z

LoRa Edge™ LR1110 asset management platform



FMLR sub-GHz low power wireless LoRa® / LoRaWAN® integrating scanners for GPS/GNSS and Wi-Fi AP MAC addresses

Description

FMLR-1110-STL0Z is an ultra-low power IoT platform-on-a-module that integrates a long range LoRa® transceiver, wireless scanners for multiconstellation GPS/GNSS and passive Wi-Fi AP MAC addresses targeting asset management application.

The module offers a frequency range from 150 MHz up to 960 MHz. The module supports additional modulation schemes over LoRa®. These modulation schemes include (G)FSK and Long Range-Frequency Hopping Spread Spectrum (LR-FHSS) modulation for LPWAN use cases.

Due to its low power consumption, the module is ideal for applications running on small-sized batteries. The integrated low power 32-bit ARM Cortex®-M0+ microcontroller featuring 192 kB flash and 20 kB RAM offers sufficient resources to run advanced user applications.

Features

- Semtech LR1110 based
- LoRaWAN® IoT module
- GPS/GNSS scanner
- Wi-Fi AP MAC address scanner
- ARM Cortex®-M0+ MCU
- Optional ext. flash, U.FL connector
- STM32L0 MCU for stack and user application
- Tiny FMLR footprint: 14 × 19.5 mm

Applications

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

Document Information

About

File name	Document type	Date	Revision
DS-FMLR-1110-STL0Z	Datasheet	2023/03/03	2.0

Revision History

Date	Release	Changes
2022/06/13	1.0	Initial revision
2023/03/03	2.0	Fully revised

Table of Content

Functional Description

The **FMLR STM LR1110** LoRa® and LoRaWAN® IoT module provides wireless connectivity to devices, systems and sensors communicating with low data rates over a long distance. The module 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®-M0+ 32-bit microcontroller is capable of running entire RF stacks and has sufficient resources to run user applications.

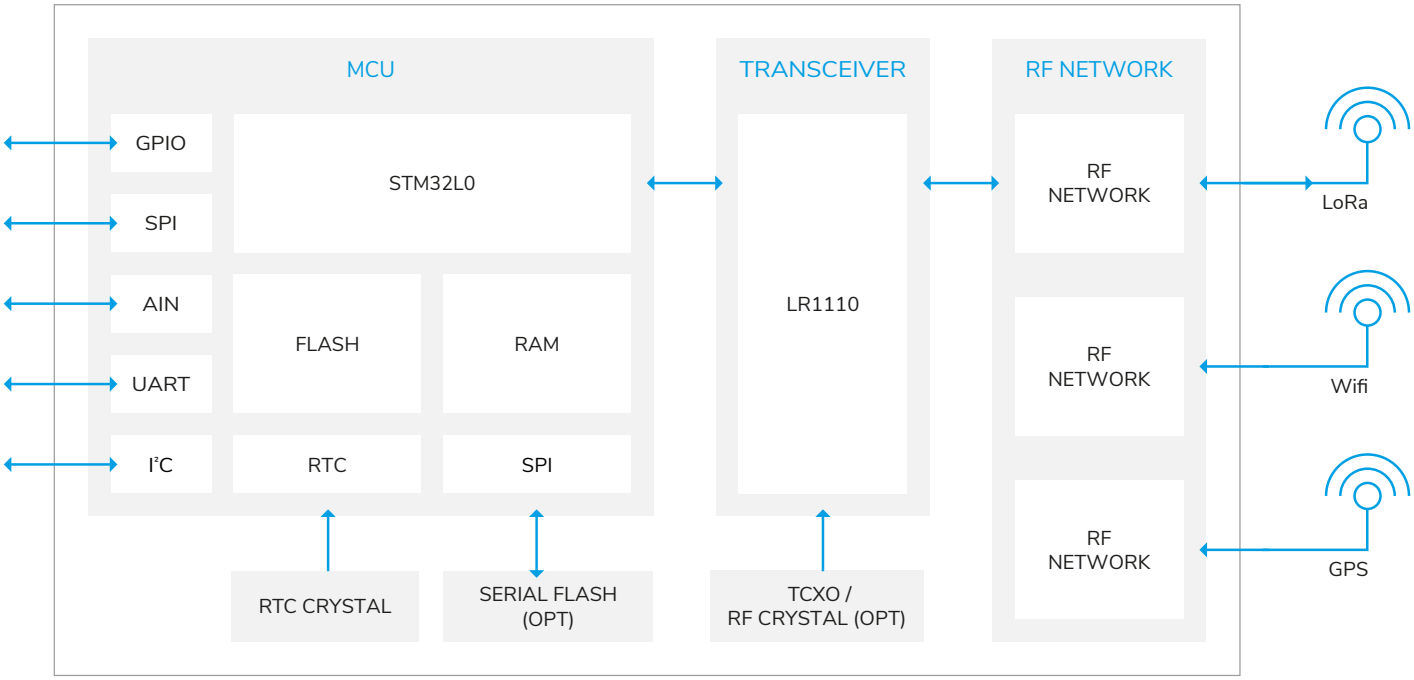


Figure 1: Block diagram FMLR STM LR1110

The module is available with additional on-board flash memory to support Over-the-Air (OTA) update and additional data storage. Additional modulation schemes over LoRa®, such as (G)FSK and Long Range-Frequency Hopping Spread Spectrum (LR-FHSS) modulation for LPWAN use cases are supported

As part of the LoRa Edge™ platform, this device integrates seamlessly with Semtech's LoRa Cloud™ Modem & Geolocalication services to implement asset localization at lowest power consumption.

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

Technical Specifications

Core Components

LoRa® transceiver	Semtech LR1110
Microcontroller	STM STM32L071RZH6
Core	Cortex®-M0+, 32 MHz
Flash memory	192 kB
RAM	20 kB
EEPROM	6 kB
Ext. flash, optional (-4M)	Macronix MX25R4035FZUIL0, 512 kB

Mechanical Specifications

Weight	2 g
Dimensions	14 × 19.5 × 2 mm

Operating Conditions

Temperature	-20 – 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.

Electrical Specifications

Parameter	Min	Typ	Max	Unit
Standard operating voltage (V)	2.5		3.6	V
Digital IO pin input low voltage	V_{SS}		$0.3 \cdot V_{DD}$	V
Digital IO pin input high voltage	$0.7 \cdot V_{DD}$		V_{DD}	V
Digital IO pin output low voltage	0		0.4	V
Digital IO pin output high voltage	$V_{DD} - 0.4$		V_{DD}	V
Current consumption, TX mode (15dBm)[1]			36	mA
Current consumption, TX mode (14dBm)[1]			28	mA
Current consumption, TX mode (10dBm)[1]			18.5	mA
Current consumption, deep sleep mode			1.5	µA
Current consumption, RX mode LoRa/FSK[1]	5.4		7.8	mA
Current consumption, Wi-Fi scan mode[1]	3		11	mA
Current consumption, GNSS scan mode[1]	5		10	mA
Highest receiver sensitivity LoRa (RxBoosted)[1]			-144	dBm
Highest receiver sensitivity Wi-Fi[1]	-75		-94	dBm
Highest receiver sensitivity GNSS[1]	-131		-141	dBm

[1]See transceiver datasheet for detailed specifications

Certifications

CE	
UKCA	
LoRaWAN® certification	EU863-870, US902-928
FCC	pending

On-Board LED

The on-board LED is connected to port PB12. Actively drive port to low (0V) to light up LED. Drive port high to disable LED.

Module Pinout

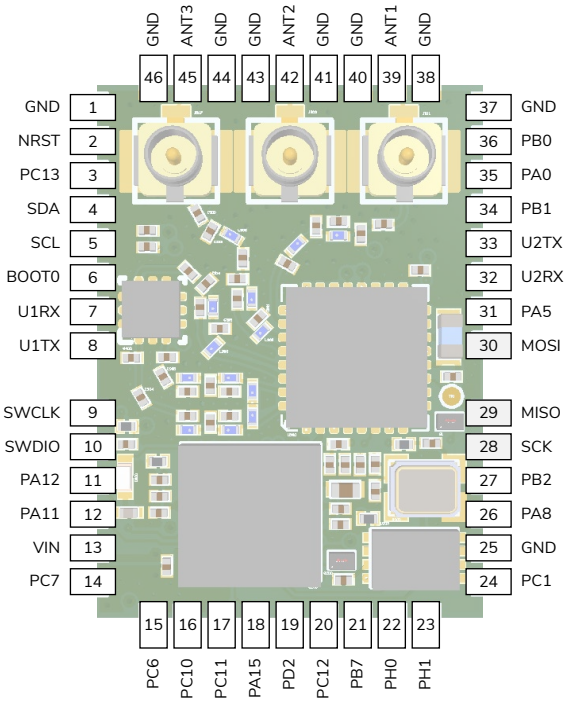


Figure 2: Module Pinout

#	Pad name	MCU pad	Description
1	GND		Ground (V_{SS})
2	NRST	NRST	MCU Reset
3	PC13	PC13	GPIO
4	SDA	PB9	I²C1, 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	PA12	PA12	USB P[2] / GPIO
12	PA11	PA11	USB N[2] / 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
21	PB7	PB7	GPIO
22	PH0	PH0	GPIO
23	PH1	PH1	GPIO

#	Pad name	MCU pad	Description
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})
38	GND		Ground (V_{SS})
39	ANT1		WiFi RF In (50 Ohm)
40	GND		Ground (V_{SS})
41	GND		Ground (V_{SS})
42	ANT2		SubG RF (50 Ω)
43	GND		Ground (V_{SS})
44	GND		Ground (V_{SS})
45	ANT3		GPS RF In (50 Ohm)
46	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!
[2] USB not available on all variants

FMLR Family Footprint

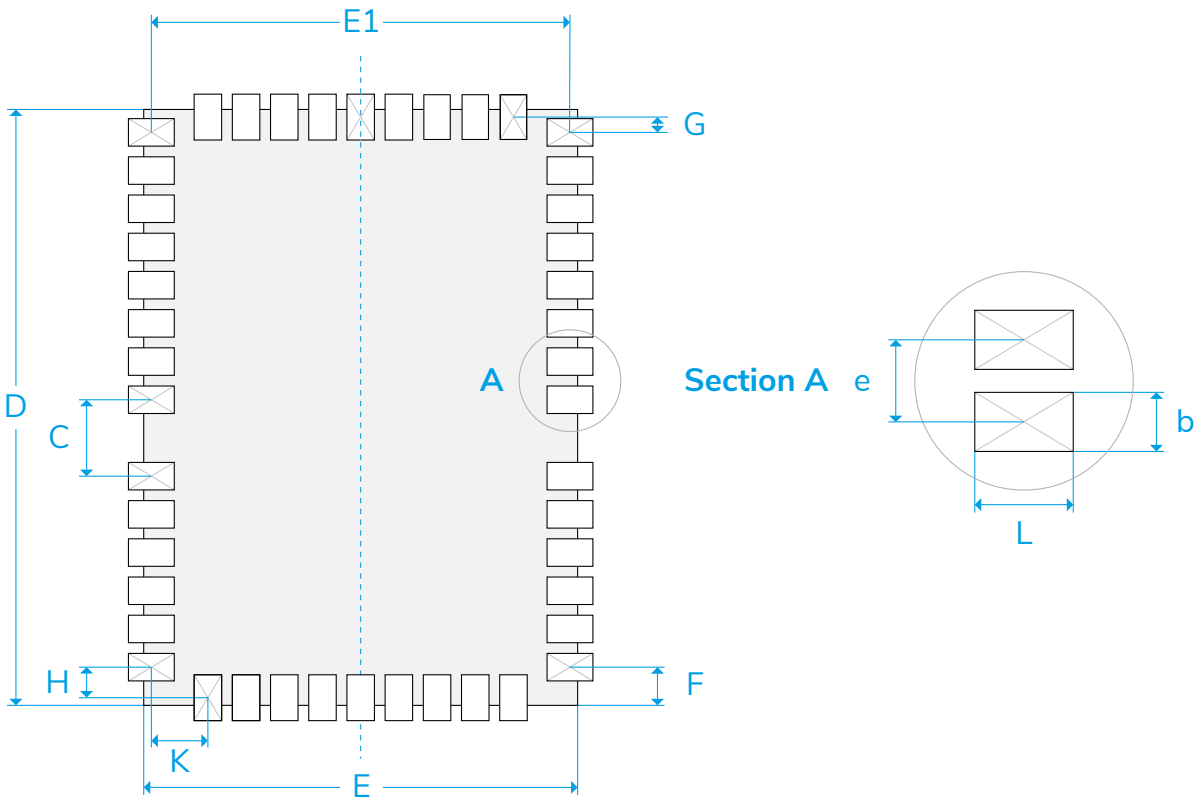


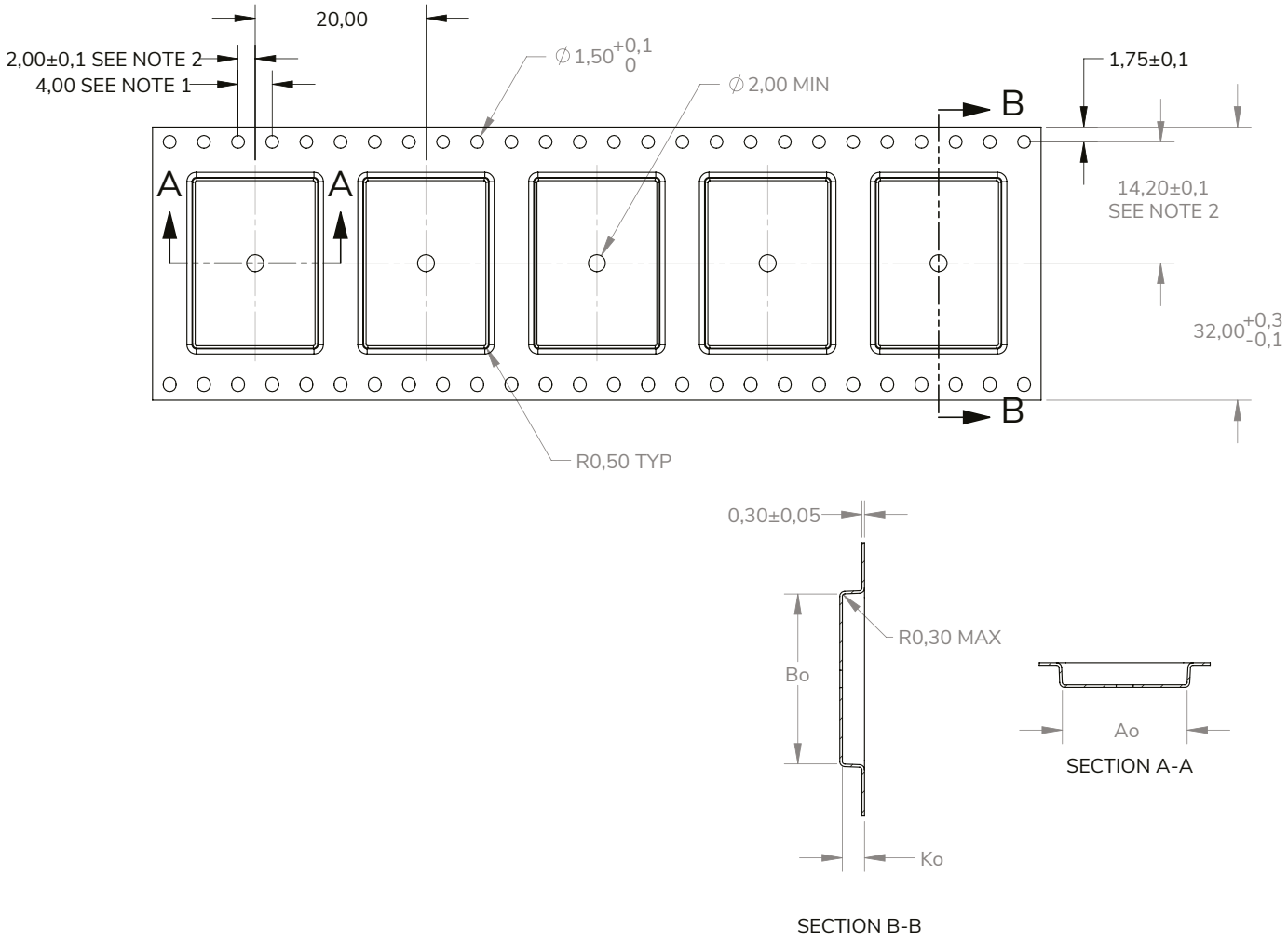
Figure 3: FMLR Module Footprint

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	
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.

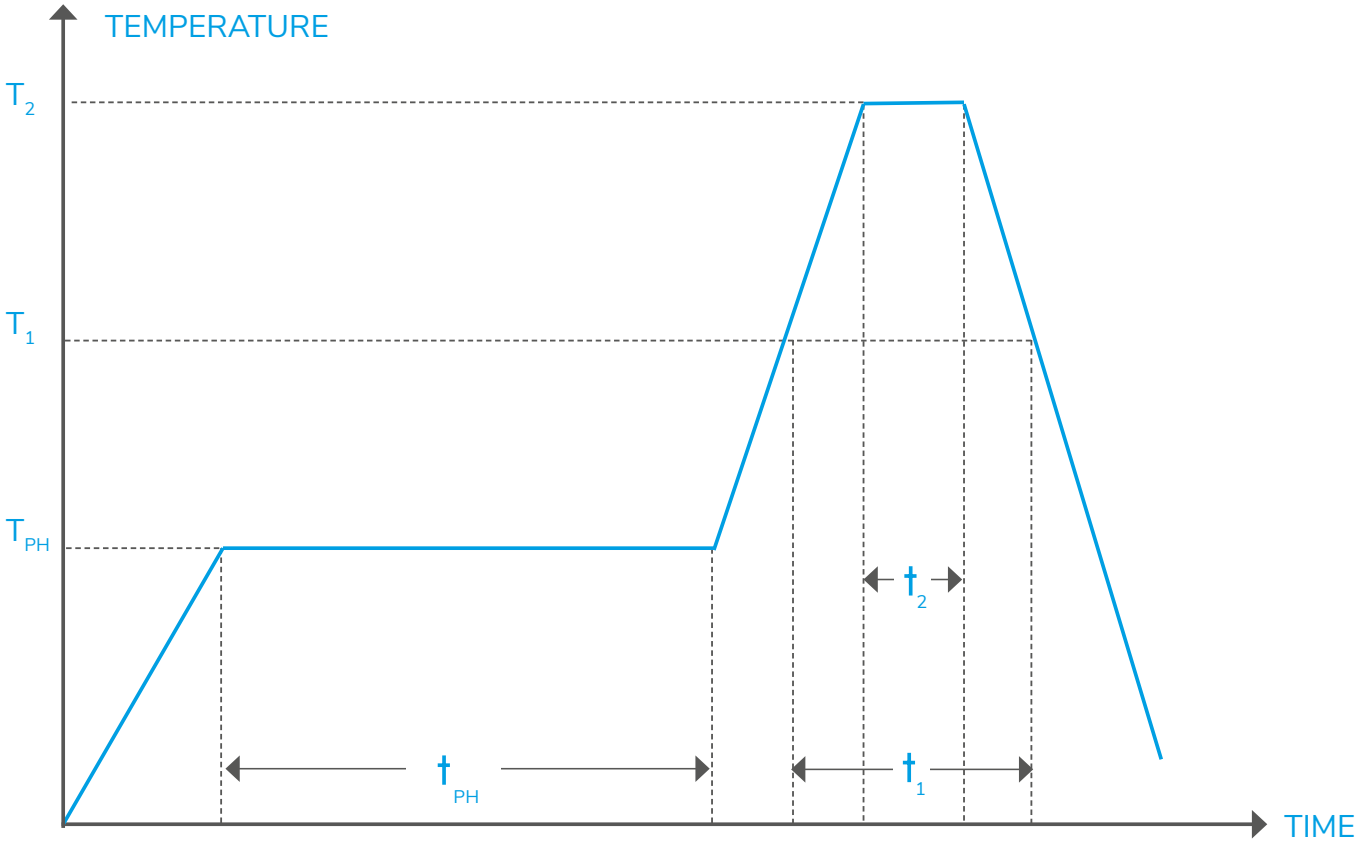


Figure 4: Soldering Profile

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	https://miromico.ch/fmlr-1110-stl0z
Technical documentation	https://docs.miromico.ch/datasheets/modules.html

Device Options

Product ID	MCU options				RF	
	Cortex®-M0+	192KB flash	20KB RAM	4Mbit Flash	U.FL connect.	Antenna pad
FMLR-1110-P-STL0Z	✓	✓	✓			✓
FMLR-1110-U-STL0Z	✓	✓	✓		✓	
FMLR-1110-P-STL0Z-4M	✓	✓	✓	✓		✓
FMLR-1110-U-STL0Z-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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