STM32 Nucleo starter pack with LoRa® LF band sensor and gateway

P-NUCLEO-LRWAN3

STM32 Nucleo pack
LoRa® LF band sensor and gateway

LoRa® sensor device

NUCLEO-L073RZ NUCLEO DEVELOPMENT BOARD (FROM STMicroelectronics)

- STM32L073RZT6 ultra-low-power MCU
- Arm® Cortex®-M0+ 32 MHz, 192-Kbyte Flash memory and 20-Kbyte SRAM
- Supports Arduino™ Uno V3 and ST morpho connectors
- Embedded ST-LINK/V2-1 debugger and programmer

LoRa® LF BAND (433/470 MHz) SENSOR EXPANSION BOARD (FROM RisingHF)

- RisingHF RHF0M003-LF20 low-power long-range LoRaWAN® module, based on STM32L071 and Semtech SX1278 transceiver.
- Sensors:
  - Temperature/humidity: ST HTS221
  - Pressure: ST LPS22HB
  - Accelerometer/gyroscope: ST LSM6DS3
  - Magnetometer: ST LIS3MDL

LoRa® gateway

NUCLEO-F746ZG NUCLEO DEVELOPMENT BOARD (FROM STMicroelectronics)

- STM32F746ZGT6 high-perfomance MCU
- Arm® Cortex®-M7 216 MHz, 1-Mbyte Flash memory and 320-Kbyte SRAM
- Supports ST Zio connector (includes Arduino™ Uno V3) and ST morpho connectors
- Ethernet 10/100 Mbps, USB OTG user connectivity
- Embedded ST-LINK/V2-1 debugger and programmer

LoRa® LF BAND (433/470 MHz) GATEWAY EXPANSION BOARD (FROM RisingHF)

- Semtech SX1301 LF baseband data concentrator

Part number: P-NUCLEO-LRWAN3

www.st.com/p-nucleo-lrwan3

Picture is not contractual.

Product status link
P-NUCLEO-LRWAN3

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For further information contact your local STMicroelectronics sales office.

www.st.com

Features

- NUCLEO-L073RZ development board (from STMicroelectronics)
  - STM32L073RZT6 Arm® Cortex®-M0+ ultra-low-power MCU at 32 MHz with 192-Kbyte Flash memory, 20-Kbyte SRAM and 6-Kbyte data EEPROM
  - 1 user LED
  - 1 user and 1 reset push-buttons
  - 32.768 kHz crystal oscillator
  - On-board ST-LINK/V2-1 debugger/programmer with USB re-enumeration capability: mass storage, Virtual COM port, and debug port
  - Board connectors
    - Mini-AB USB connector for the ST-LINK
    - ARDUINO® Uno V3 expansion connector
    - ST morpho extension pin headers for full access to all STM32 I/Os
- NUCLEO-F746ZG development board (from STMicroelectronics)
  - STM32F746ZGT6 Arm® Cortex®-M7 high-performance MCU at 216 MHz with 1-Mbyte Flash memory and 320-Kbyte SRAM
  - 3 user LEDs
  - 1 user and 1 reset push-buttons
  - Ethernet compliant with IEEE-802.3-2002
  - USB OTG full speed or device only
  - 32.768 kHz crystal oscillator
  - On-board ST-LINK/V2-1 debugger/programmer with USB re-enumeration capability: mass storage, Virtual COM port, and debug port
  - Board connectors
    - Micro-AB USB connector for the ST-LINK
    - ST Zio expansion connector including ARDUINO® Uno V3
    - ST morpho extension pin headers for full access to all STM32 I/Os
    - USB with Micro-AB
    - Ethernet RJ45
- LRWAN_NS1 LoRa® LF band (433/470 MHz) sensor expansion board (from RisingHF)
  - RisingHF RHF0M003-LF20 low-power long-range LoRaWAN® module, based on the STM32L071 MCU and Semtech SX1278 transceiver
    - High sensitivity down to -137 dBm
    - 14 dBm to 20 dBm output power
  - STMicroelectronics HTS221 temperature and humidity sensor
  - STMicroelectronics LPS22HB pressure sensor
  - STMicroelectronics LSM6DS3 accelerometer and gyroscope sensor
  - STMicroelectronics LIS3MDL magnetometer
- LRWAN_GS_LF1 LoRa® LF band (433/470 MHz) gateway expansion board (from RisingHF)
  - Semtech SX1301/SX1255 LF baseband data concentrator and transceiver
    - Automatically adaptive to spreading factor from SF12 to SF7 in each of 8 channels
    - High sensitivity down to -140 dBm at 300 bit/s
    - 6 dBm output power
    - Support LoRaWAN® protocol Class A and Class C
    - Support Semtech packet forwarder
    - Support DNS and NTP

Description

The P-NUCLEO-LRWAN3 STM32 Nucleo starter pack for LoRa® technology and high-performance (G)FSK/OOK/(G)MSK modulations is a development tool to learn and quickly develop low-power wide-area network (LPWAN) solutions. The pack contains both an LPWAN end-node and its related gateway. It is compatible with various LoRaWAN® network server providers. P-NUCLEO-LRWAN3 is intended for countries granting radio-communications access in frequency bands lower than 500 MHz.

On the gateway side, the NUCLEO-F746ZG board, based on a high-performance STM32F7 Arm® 32-bit microcontroller, controls a RisingHF ARDUINO® expansion board (LRWAN_GS_LF1) used as a basic LoRaWAN® packet forwarder. In that way, data coming from the development node can directly reach LoRaWAN® network servers.

On the sensor-node side, the NUCLEO-L073RZ, based on an ultra-low-power STM32L0 Arm® 32-bit microcontroller, controls a RisingHF LRWAN_NS1 ARDUINO® expansion board used as a sensor node.

The LRWAN_NS1 end-node is an ARDUINO® compatible expansion board. This board is designed by RisingHF around a LoRa® module powered by an STM32L07 device hosting a friendly AT command stack. This makes user development and access to the LoRa® technology easier. In addition, this expansion board features several sensors from STMicroelectronics: accelerometer and gyroscope (LSM6DS3), MEMS pressure (LPS22HB), humidity and temperature (HTS221), and magnetometer (LIS3MDL).

1 Ordering information

To order a P-NUCLEO-LRWAN3 LoRa® LF band sensor and gateway Nucleo starter pack, refer to Table 1. For a detailed description, refer to the user manual on the product web page. Additional information is available from the datasheet and reference manual of the target STM32.

Table 1. List of available products

Order code	Boards	User manual	Target STM32	Differentiating features
P-NUCLEO-LRWAN3	- MB1136 (STMicroelectronics) - MB1137 (STMicroelectronics) - LRWAN_GS_LF1 (RisingHF) - LRWAN_NS1 (RisingHF)	UM2587[1]	- STM32L073RZT6 - STM32F746ZGT6	LoRa® LF band (433/470 MHz) sensor and gateway

1. "Getting started" user manual.

1.1 Product marking

Evaluation tools marked as "ES" or "E" are not yet qualified and therefore not ready to be used as reference design or in production. Any consequences deriving from such usage will not be at ST charge. In no event, ST will be liable for any customer usage of these engineering sample tools as reference design or in production.

"E" or "ES" marking examples of location:

- On the targeted STM32 that is soldered on the board (for illustration of STM32 marking, refer to the STM32 datasheet "Package information" paragraph at the *www.st.com* website).
- Next to the evaluation tool ordering part number that is stuck or silk-screen printed on the board.

2 Development environment

The STM32 32-bit microcontrollers are based on the Arm® Cortex®-M processor.

Note: *Arm is a registered trademark of Arm Limited (or its subsidiaries) in the US and/or elsewhere.*

2.1 Demonstration software

The demonstration software, included in the I-CUBE-LRWAN STM32Cube Expansion Package, is preloaded in the STM32 Flash memory of each Nucleo board for easy demonstration. The latest versions of the demonstration source code and associated documentation can be downloaded from *www.st.com*.

2.2 Development toolchains

- Keil® MDK-ARM (see note)
- IAR™ EWARM (see note)
- GCC-based IDEs

Note: *On Windows® only.*

2.3 System requirements

- Windows® OS (7, 8 and 10), Linux® 64-bit, or macOS®
- USB Type-A to Micro-B (NUCLEO-F746ZG) or USB Type-A to Mini-B cable (NUCLEO-L073RZ)

Note: *macOS® is a trademark of Apple Inc. registered in the U.S. and other countries.*
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Revision history

Table 2. Document revision history

Date	Version	Changes
26-Sep-2019	1	Initial release.