Nordic Thingy:91 X

Cellular IoT prototyping platform for nRF9151 SiP

LTE-M NB-IoT GNSS nr+

Overview

The Nordic Thingy:91 X is a battery-operated prototyping platform for cellular IoT based on the nRF9151 System-in-Package (SiP) supporting LTE-M, NB-IoT, GNSS and NR+, and certified for global operation. It is the ideal platform for rapidly developing a prototype for any cellular IoT concept, and is especially suited for asset-tracking applications. Nordic Thingy:91 X enables location tracking using cellular (MCELL and SCELL), Wi-Fi, or GNSS, in combination with nRF Cloud Location Services.

An exhaustive set of sensors is included to gather data about the environment, and the movement of the Nordic Thingy:91 X. Temperature, humidity, air quality, air pressure, magnetic field, acceleration and movement can easily be extracted for local or remote analysis. Additional functionality can be easily added through the debug board connector or the expansion board connector, which is compatible with Qwiic, STEMMA QT, and Grove.

For user input, Nordic Thingy:91 X offers two user-programmable buttons. Visual output is achieved with user-programmable RGB LEDs. USB connectivity is done via nRF5340 System-on-Chip (SoC), which serves as the board controller, and also supports Bluetooth Low Energy (LE) for selected use cases. The nRF7002 Wi-Fi companion IC enables Wi-Fi locationing.

It has two antennas connected to the nRF9151 SiP: one for LTE-M, NB-IoT, and NR+, supporting a global range of LTE bands, and one for GNSS. One dual-band 2.4/5GHz antenna is shared between the nRF5340 and nRF7002.

The Nordic Thingy:91 X has a Nano/4FF SIM card slot, supporting (e)SIM. It is bundled with SIM cards from Onomondo and Wireless Logic, preloaded with data, to get connected to nRF Cloud out-of-the-box.

The package also includes a 1350 mAh rechargeable Li-Po battery, which will facilitate the transition into prototype field testing. The power supply is managed by the nPM6001 and nPM1300 PMICs, with the latter also offering battery charging and accurate fuel gauging functionality.

LTE bands B1-B5, B8, B12-B13, B17-B20, B25-B26, B28, B65-B66 and B85 are enabled out of the box.

Key features

- Battery-operated prototyping platform for the nRF9151 SiP
- Certifications: FCC (USA), CE (EUR)
- LTE-M/NB-IoT/NR+, GNSS and Bluetooth LE/Wi-Fi antennas
- Wi-Fi locationing enabled by nRF7002
- User-programmable buttons and LEDs
- Environmental sensor for temperature, humidity, air quality, and air pressure, plus magnetometer
- Low-power 3-axis accelerometer
- 6-axis IMU with gyroscope
- Rechargeable Li-Po battery with 1350 mAh capacity - nPM1300 PMIC for battery charging and fuel gauging
- Board controller: nRF5340 for connectivity between USB interface and nRF9151

nRF9151 SiP

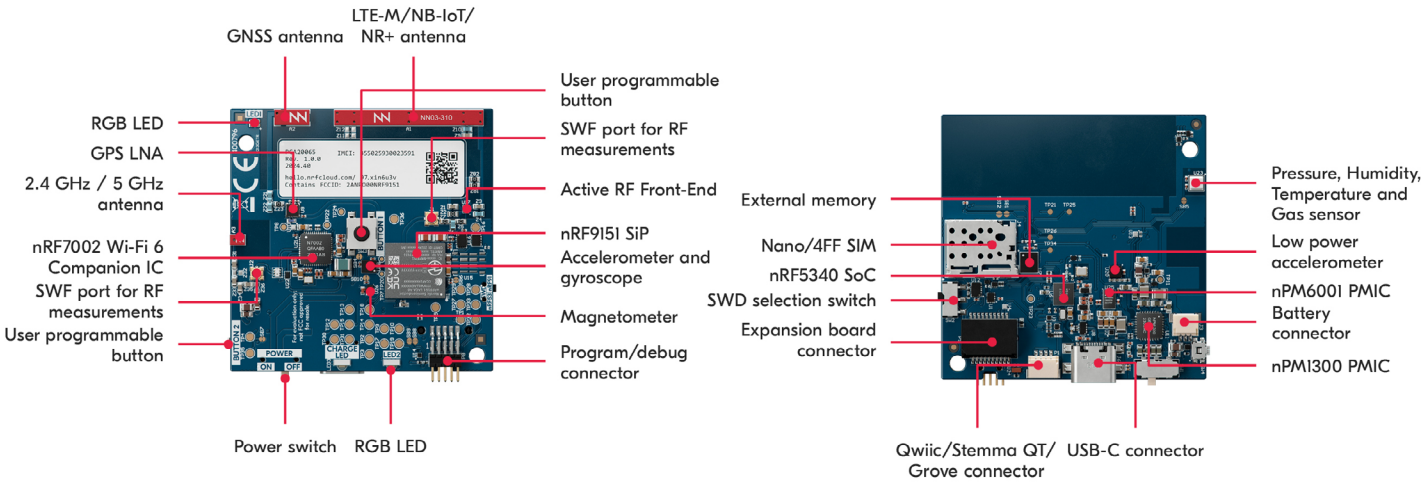
- Certified for global operation
  - Updated list: nordicsemi.com/nRF91certs
- Multimode LTE-M/NB-IoT modem with DECT NR+ support
  - 700-2200 MHz LTE band support
  - Power class 5 20 dBm
  - Power class 3 23 dBm
  - GNSS (GPS, QZSS)
  - eDRX and PSM power saving features
  - Single pin 50 Ω antenna interface
  - UICC interface
- Application processor
  - 64 MHz Arm® Cortex®-M33 CPU
  - Arm TrustZone® for trusted execution
  - Arm CryptoCell 310 for application layer security
  - 1 MB Flash & 256 KB RAM
  - 4 × SPI/UART/TWI, PDM, I2S, PWM, ADC

Applications

- Logistics and asset tracking
- Smart city & smart agriculture
- Predictive maintenance & industrial
- Wearables & medical

nRF 9 SERIES

For more information please visit: **nordicsemi.com/Thingy91X**



Internal layout of the Thingy:91 X.

Software and tools

nRF Cloud is our IoT optimized cloud that works seamlessly with the Thingy:91 X. It enables the use of nRF Cloud Location Services, which provide different ways of computing location data with a lower power consumption compared with regular GNSS.

The standard application firmware on the Nordic Thingy:91 X extracts the data from the different sensors and relays it securely up to nRF Cloud, where it is displayed in a clear interface that can be easily accessed out-of-the-box by reading the QR code inside the casing or manually inputting the device ID. The LEDs can be controlled remotely through this same interface. The firmware supports concurrent operation with Cellular Monitor, a tool providing an AT command interface enabling link and network testing.

The firmware has been developed using the nRF Connect SDK. It is open source, and can be leveraged and modified to suit your specific needs. The firmware can be updated and debugged by using an external programmer/debugger, for example the one on the nRF9151 DK.

nRF9151 SiP

The nRF9151 SiP is a low power SiP integrating a dedicated application processor and a multimode LTE-M and NB-IoT modem with integrated GNSS. It is the most compact cellular IoT solution on the market, measuring just 12.1×11.1×1.2 mm.

The application processor includes a 64 MHz Arm Cortex-M33 CPU with 1 MB of flash and 256 KB of RAM dedicated for the application. It has Arm TrustZone for trusted execution and Arm CryptoCell for application layer security. It has a wide range of interfaces to communicate with sensors and actuators.

The multimode modem supports the eDRX and PSM power saving features and the coverage enhancement features of LTE-M and NB-IoT, and has GNSS integrated. The global RF front end supports bands from 700 MHz to 2.2 GHz, has +23 dBm output power and offers a single pin 50 Ω antenna interface.

nRF Connect SDK

nRF Connect SDK is our software development kit for Nordic Semiconductor devices. It integrates the Zephyr RTOS, and a wide range of examples, application protocols, libraries and hardware drivers. Everything needed to get started with cellular IoT development.

It is publicly hosted on GitHub and offers version control management with Git. It is supported by the nRF Connect for VS Code extension for a full-fledged IDE experience.

Related Products

nRF9151 DK	Development kit for the nRF9150 SiP
nRF9151 SiP	LTE-M/NB-IoT/NR+/GNSS SiP
nRF5340 SoC	SoC supporting Bluetooth LE, Bluetooth mesh, Thread and Zigbee
nRF7002	Wi-Fi 6 companion IC
nPM1300 PMIC	Power Management IC (PMIC) with unique system management features
nRF Connect SDK	Software Development Kit for cellular IoT/ Bluetooth LE/Bluetooth mesh/Wi-Fi/ Thread/ Zigbee/Matter development
nRF Cloud	IoT cloud optimized for ultra-low power Nordic devices
Cellular Monitor	AT command user interface to test cellular link and get network info application
Programmer	Programming user interface application
Quick Start	Guided path to evaluation and development

Order Information

THINGY91X	Nordic Thingy:91 X cellular IoT prototyping platform