nRF9160 cellular IoT System-in-Package
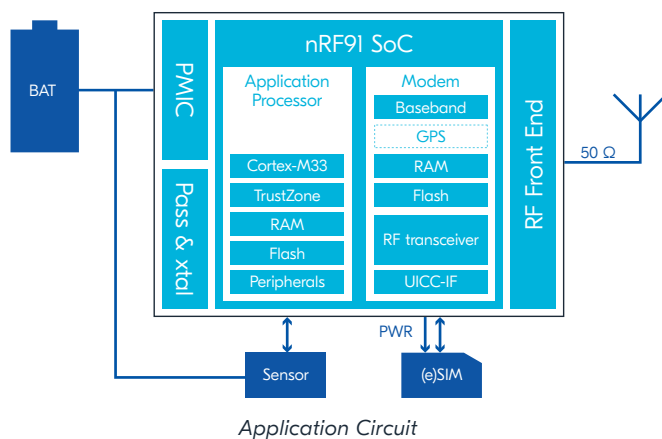
Low power SiP with integrated LTE-M and NB-IoT wireless modem

Overview

The nRF9160 SiP is making the latest LTE technology accessible for a wide range of applications and developers. Through the high integration and pre-certification for global operation, it solves the complex wireless design challenges as well as comprehensive set of qualifications needed to utilize cellular technology.

By integrating an application processor, multimode LTE-M and NB-IoT modem, RF Front End (RFFE) and power management in a 10×16×1 mm package, it offers the most compact solution for cellular IoT (cIoT) on the market.

Targeting asset tracking applications, the nRF9160 SiP has built-in assisted GPS. It combines location data from the cellular network with GPS satellite trilateration to allow remote monitoring of the device position.

Application Circuit

LTE-M and NB-IoT modem

The nRF9160 LTE modem integrates RFFE, radio and baseband. It supports operation worldwide, enabling cIoT products without regional specific variants.

The LTE modem supports half-duplex FDD operation and all power saving and coverage enhancement modes. A single pin antenna interface is available.

The LTE modem integrates IPv4/IPv6 stack layers up to transport and security (ex. TCP/TLS).

IP application layer protocols are located in the application processor, making it easy for a developer to select application protocols and device profiles supported by the chosen cloud service.

KEY FEATURES

LTE-M and NB-IoT modem
- Pre-certified for global operation
- 700 MHz - 2.2 GHz band support
- 23 dBm output power
- Assisted GPS
- eDRX and PSM power saving modes
- Coverage enhancement modes
- SMS, IPv4/IPv6
- TCP/UDP, TLS/DTLS
- 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 x SPI/UART/TWI
- PDM, I2S, PWM, ADC
- Automated power and clock management
- 32 GPIOs

Software Development kit
- LWM2M client
- CoAP, MQTT, HTTP
- Secure boot
- Secure FOTA for application and modem
- Peripheral driver libraries
- Application examples

APPLICATIONS
- Logistics and asset tracking
- Smart City
- Smart Agriculture
- Industrial & Predictive maintenance
- Wearables
- Medical

Application processor

The nRF9160 SiP offers a modern and powerful Arm Cortex-M33 CPU processor with on-chip flash and RAM exclusively for application use.

A range of analog and digital peripherals supports the powerful application processor and enables advanced single chip cellular IoT products.

The nRF9160 SiP uses standard Nordic development tools, making porting and development easy.

Low power

The nRF9160 SiP is made exclusively for the low power and low data rate LTE standards, introduced in 3GGP release 13. Due to this and the integration of application processor, modem and all memories, it can offer unparalleled low power performance.

It can maintain a connection with the cellular network with less than 15 uA average current and upload data every 20 seconds with 0.5 mA average current.
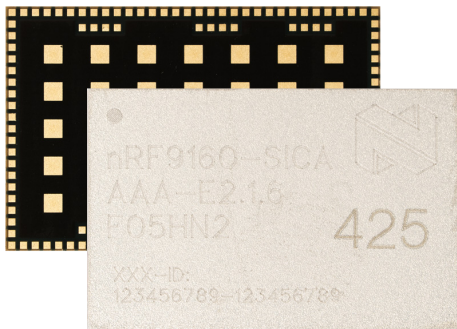
Security

The integrated cryptographic and security features enables the nRF9160 to meet the latest requirements on internet security and authentication. By including trusted execution capability on the application processor, it takes security a step further by securing the most critical processes and peripherals in the application.

The on-chip modem is its own security island.

SIM and eSIM support

The nRF9160 LTE modem supports both SIM and eSIM, plug-in or soldered. It provides power and handles all communication automatically.

For latest status on certifications go to: nordicsemi.com/9160cert

KEY DATA

LTE-M and NB-IoT modem	
Frequency range	700 MHz — 2.2 GHz
Throughput (UL/DL)	LTE-M: 300/375 kbps NB-IoT: 30/60 kbps
Output power	Up to 23 dBm
RX sensitivity	LTE-M: -108 dBm NB-IoT: -114 dBm
Mode	HD-FDD

Application Processor	
CPU	64 MHz Arm Cortex-M33 Arm TrustZone
Flash	1 MB
RAM	256 KB
Peripherals	Arm Cryptocell 310 3 × TIMER, 2 × RTC WDT
Interfaces	4 × SPI (M/S) / UARTE / TWI (M/S) 4 × PWM, PDM, I2S 12 bit/200 ksps ADC

Power consumption (LTE-M, 3.7 V supply)	
Connected with 10 min uplink latency/eDRX interval	15 uA
Sending tracking data uplink every 20s	0.5 mA
Full speed downlink	150 mA

Operating conditions and package	
Supply voltage	3.3 - 5.5 V
Temperature	-40 - 85 °C
Package	10×16×1 LGA

WORLD WIDE OFFICE LOCATIONS

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Trondheim, Norway
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For more information
Visit **nordicsemi.com** for the complete product specification about this and any other wireless ULP products.

About Nordic Semiconductor
Nordic Semiconductor is a fabless semiconductor company specializing in ULP short-range wireless communication. Nordic is a public company listed on the Norwegian stock exchange.

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