nRF9161 Product Specification

NORDIC SEMICONDUCTOR

Contents

1. nRF9161 Product Specification

This Product Specification contains functional descriptions, register tables, and electrical specifications, and is organized into chapters based on the modules and peripherals that are available in this IC.

Note: The HTML rendition of the Product Specification corresponds to the latest version only. All versions are available as PDF files.

Features:

Microcontroller:

- Arm® Cortex®-M33
  - 247 EEMBC CoreMark score running from flash memory
  - Data watchpoint and trace (DWT), embedded trace macrocell (ETM), and instrumentation trace macrocell (ITM)
  - Serial wire debug (SWD)
  - Trace port
- 1 MB flash
- 256 kB low leakage RAM
- Arm TrustZone®
- Arm CryptoCell™ 310
- Up to 4x SPI master/slave with EasyDMA
- Up to 4x I2C compatible two-wire master/slave with EasyDMA
- Up to 4x UART (CTS/RTS) with EasyDMA
- I2S with EasyDMA
- Digital microphone interface (PDM) with EasyDMA
- 4x pulse width modulator (PWM) unit with EasyDMA
- 12-bit, 200 ksps ADC with EasyDMA - eight configurable channels with programmable gain
- 3x 32-bit timer with counter mode
- 2x real-time counter (RTC)
- Programmable peripheral interconnect (PPI)
- 32 general purpose I/O pins

- Single supply voltage: 3.0 – 5.5 V
- All necessary clock sources integrated
- Package: 10 × 16 × 1.04 mm LGA

LTE modem:

- Transceiver and baseband
- 3GPP LTE release 14 Cat-M1 compliant
- 3GPP LTE release 14 Cat-NB1 and Cat-NB2 compliant
- GPS receiver
  - GPS L1 C/A supported
  - QZSS L1 C/A supported
- RF transceiver for global coverage
  - Up to 23 dBm output power
  - -108 dBm sensitivity (Cat-M1) for low band, -107 dBm for mid band
  - Single 50 Ω antenna interface
- LTE band support in hardware:
  - Cat-M1: B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B26, B28, B66, B85
  - Cat-NB1/NB2: B1, B2, B3, B4, B5, B8, B12, B13, B17, B19, B20, B25, B26, B28, B65, B66, B85
- Supports SIM and eSIM with an ETSI TS 102 221 compatible UICC interface
- Power saving features: DRX, eDRX, PSM
- IP v4/v6 stack
- Secure socket (TLS/DTLS) API

DECT NR+:

- NR+ band: 1, 2, 9

Current consumption @ 3.7 V:

- LTE power saving mode (PSM) floor current: 2.7 µA

Features:	
	• eDRX @ 81.92s: 19 µA in Cat-M1, 33 µA in Cat-NB1 (UICC included)

Applications:	
• Sensor networks • Logistics and asset tracking • Smart energy • Smart building automation • Smart agriculture	• Industrial • Retail and monitor devices • Medical devices • Wearables

Revision history

About this document This document is organized into chapters that are based on the modules and peripherals available in the IC.

Product overview The nRF9161 System-in-Package (SiP) is a low-power IoT (Internet of Things) solution integrating an Arm Cortex-M33 processor with advanced security features, a range of peripherals and a Low-Power Wide-Area (LPWA) network processor. The LPWA network processor can operate as a 5G DECT NR+ (NR+) device, independent of cellular network provider or as an LTE modem compliant with 3GPP LTE release 14 Cat-M1 and Cat-NB1/NB2 standards.

Application core The nRF9161 application core has a modern and powerful Arm Cortex-M33 with on-chip flash and RAM exclusively for application use.

Power and clock management The power and clock management system automatically ensures maximum power efficiency.

PeripheralsThe nRF9161 application core peripherals are found in Instantiation.

LTE modem The nRF9161 SiP contains a Low-Power Wide-Area (LPWA) network processor with dedicated flash/RAM, which controls the radio and baseband hardware components. LTE capabilities are provided by installing Nordic Semiconductor firmware, which complies with 3GPP LTE release 14 Cat-M1 and Cat-NB1/NB2 standards.

DECT NR+ The nRF9161 SiP contains a Low-Power Wide-Area (LPWA) network processor with dedicated flash/RAM, which controls the radio and baseband hardware components. DECT NR+ (NR+) capabilities are provided by installing Nordic Semiconductor firmware, that implements the physical layer (PHY) level operation of the NR+ radio protocol stack according to ETSI specifications (TS 103 636-2 and TS 103 636-3).

GPS receiver The LPWA network processor supports GPS reception, if the onboard network protocol firmware supports it.

Debug and trace The debug and trace system offers a flexible and powerful mechanism for non-intrusive debugging.

Hardware and layout The following sections describe nRF9161 hardware and layout specifications.

Operating conditions The operating conditions are the physical parameters that the chip can operate within.

Absolute maximum ratings Maximum ratings are the extreme limits to which the chip can be exposed for a limited amount of time without permanently damaging it. Exposure to absolute maximum ratings for prolonged periods of time may affect the reliability of the device.

Ordering information This chapter contains information on IC marking, ordering codes, and container sizes.

Regulatory information The nRF9161 undergoes regulatory certifications, ensuring both regional compliances and compatibility with the LTE 3GPP specification.

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