

nRF52 Series

Industry-leading family of wireless SoCs for any product requiring Bluetooth Low Energy, Bluetooth mesh, Thread or Zigbee connectivity



Overview

The nRF52 Series is a family of wireless multiprotocol System-on-Chips (SoCs) offering a broad selection for any product requiring Bluetooth® Low Energy, Bluetooth mesh, Thread or Zigbee connectivity. All family members are extremely advanced and energy efficient, but have different feature sets and memory configurations.

All the SoCs integrate a powerful yet efficient 64 MHz Arm Cortex-M4 CPU, with a floating-point unit (FPU) and an instruction cache on the higher-end SoCs. Flash memory range from 192 KB to 1024 KB while RAM range from 24 KB to 256 KB.

The nRF52 Series SoCs support an extensive range of wireless protocols, offer excellent RX sensitivity and TX power up to 8 dBm. All SoCs support Bluetooth Low Energy and are capable of high-throughput 2 Mbps in addition to features introduced in Bluetooth 5.2. A selection of the devices also supports Bluetooth features such as Direction Finding and Long Range. Mesh protocols like Bluetooth mesh, Thread and Zigbee are supported, and can on the higher-end devices run concurrently with Bluetooth Low Energy. This enables smartphones to provision, commission, configure and control mesh nodes. NFC is available to wake up the devices from sleep or to securely pair out-of-band (OOB).

Digital interfaces such as UART, SPI and TWI are supported by all SoCs, but more instances are available on the higher-end SoCs. The more advanced SoCs also support digital interfaces such as high-speed SPI, QSPI, PWM, USB, PDM and I²S. Most also include a 12-bit ADC and one or two analog comparators.

All nRF52 Series SoCs are qualified to operate at temperatures as low as -40°C and as high as 85°C. nRF52820 and nRF52833 extend up to 105°C, making them suitable for commercial and industrial applications operating in higher temperatures, such as professional lighting. All SoCs can be supplied with a voltage between 1.7-3.6 V, and a selection extend up to 5.5 V, enabling supply from sources such as rechargeable batteries or USB.

| Hardware feature comparison | nRF52805 | nRF52810 | nRF52811 | nRF52820 | nRF52832 | nRF52833 | nRF52840 |
|-----------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| Bluetooth Low Energy | • | • | • | • | • | • | • |
| Bluetooth 5.2 | • | • | • | • | • | • | • |
| Direction Finding | | | • | • | | • | |
| 2 Mbps | • | • | | • | • | | • |
| Long range | | | • | • | | • | • |
| Bluetooth mesh | | | | • | • | • | • |
| Thread | | | • | • | | • | • |
| Zigbee | | | | • | | • | • |
| NFC | | | | | • | • | • |
| CPU | 64 MHz Arm Cortex-M4 | | | | | | |
| FPU | | | | | • | • | • |
| Flash (KB) | 192 | 192 | 192 | 256 | 512 256 | 512 | 1024 |
| RAM (KB) | 24 | 24 | 24 | 32 | 64 32 | 128 | 256 |
| AES encryption | • | • | • | • | • | • | • |
| Arm CryptoCell-310 | | | | | | | • |
| Max TX power (dBm) | 4 | 4 | 4 | 8 | 4 | 8 | 8 |
| RX sensitivity (dBm) | -97 | -96 | -97 | -95 | -96 | -95 | -95 |
| TWI/SPI/UART | TWI, SPI, UART | TWI, SPI, UART | TWI/SPI, SPI, UART | 2-TWI/SPI, UART | 2-TWI/SPI, SPI, UART | 2-TWI/SPI, SPI, 2-UART | 2-TWI/SPI, SPI, 2-UART |
| PWM units | | 1 | 1 | | 3 | 4 | 4 |
| ADC, Comparators | ADC | ADC, COMP | ADC, COMP | COMP | • | • | • |
| USB, QSPI, High speed SPI | | | | USB | | USB, HS-SPI | • |
| Max operating temp (°C) | -40 to 85 | -40 to 85 | -40 to 85 | -40 to 105 | -40 to 85 | -40 to 105 | -40 to 85 |
| Supply voltage range (V) | 1.7 to 3.6 V | 1.7 to 3.6 V | 1.7 to 3.6 V | 1.7 to 5.5 V | 1.7 to 3.6 V | 1.7 to 5.5 V | 1.7 to 5.5 V |
| Packages | 2.48x2.46 mm WLCSP28 10 GPIOs | 6x6 mm QFN48 32 GPIOs | 6x6 mm QFN48 32 GPIOs | 5x5 mm QFN40 18 GPIOs | 6x6 mm QFN48 32 GPIOs | 7x7 mm αQFN73 42 GPIOs | 7x7 mm αQFN73 48 GPIOs |
| | | 5x5 mm QFN32 16 GPIOs | 5x5 mm QFN33 17 GPIOs | 3.18x3.18 mm WLCSP44 18 GPIOs | 3.0x3.2 mm WLCSP50 32 GPIOs | 5x5 mm QFN40 18 GPIOs | 3.5x3.6 mm WLCSP94 42 GPIOs |
| | | 2.48x2.46 mm WLCSP33 15 GPIOs | 2.48x2.46 mm WLCSP33 15 GPIOs | | | 3.2x3.2 mm WLCSP75 42 GPIOs | |

Ideal platform for basing a product portfolio upon

The nRF52 Series is truly the ideal platform for basing a product portfolio upon. The common hardware and software architecture results in excellent software portability, increasing software reusability and lowering time-to-market and development cost.

All-flash based flexibility and upgradability

The nRF52 Series are all-flash based SoCs. Flash memory brings complete flexibility and upgradability to your designs and products. Devices can be re-programmed in the factory or in the field with over-the-air device firmware upgrades (OTA DFU). This enables product updates and feature additions any time, anywhere.

nRF52 Series software development kits

The nRF52 Series SoCs are supported by two main software development kits (SDKs): nRF5 SDK and nRF Connect SDK.

The nRF5 SDK is a very mature solution for developing Bluetooth Low Energy products and is in use in hundreds of millions of products in the market today. nRF5 SDK also has dedicated versions for Bluetooth mesh (nRF5 SDK for Mesh) and for Thread and Zigbee (nRF5 SDK for Thread and Zigbee). All nRF5 SDKs are complete and contains everything needed to develop nRF52 Series-based products with Bluetooth Low Energy, Bluetooth mesh, Thread and/or Zigbee connectivity.

The nRF Connect SDK represents a new, open-source and scalable long-term evolution for development on all of Nordic's short-range and cellular IoT devices. This SDK is comprised of open-source elements from external projects and code developed by Nordic. It incorporates a scalable and low power Zephyr real-time operating system (RTOS) and is designed for development of applications across all Nordic's wireless devices. The nRF Connect SDK represents the future direction for a single software platform for any design using wireless connectivity; from the resource constrained, to the ever more complex high-end solutions.

Power Profiler Kit II

The Power Profiler Kit II is an affordable development tool which can measure currents from 200 nA to 1 A on all Nordic development kits, in addition to custom designs. The quick sample rate of 100 ksps results in highly accurate representation of the current consumption, which can be analyzed in the nRF Connect for Desktop Power Profiler app. Data can also be exported for post processing.

nRF52 Series development kits

Nordic offer three development kits for the nRF52 Series SoCs: nRF52 DK, nRF52833 DK and nRF52840 DK. The affordable development kits have everything needed for development on a single board. All features and GPIOs of the SoCs are made available to the developer. All come with an on-board SEGGER J-Link debugger enabling both programming and debugging of the on-board SoC. The nRF52 DK is for developing with the nRF52805, nRF52810, and nRF52832 SoCs, the nRF52833 DK is for the nRF52820 and nRF52833 SoCs, while the nRF52840 DK is for the nRF52811 and nRF52840 SoCs.

All development kits are available for purchase through our distribution network.

Related software and tools

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|--------------------------------|--|
| nRF52 DK | Development kit for the nRF52805, nRF52810 and nRF52832 SoCs |
| nRF52833 DK | Development kit for the nRF52820 and nRF52833 SoCs |
| nRF52840 DK | Development kit for the nRF52811 and nRF52840 SoCs |
| nRF Connect SDK | Software development kit for cellular IoT, Bluetooth Low Energy, Bluetooth mesh, Thread and Zigbee |
| nRF5 SDK | Software development kit for Bluetooth Low Energy, ANT and 2.4 GHz proprietary |
| nRF5 SDK for Mesh | Software development kit for Bluetooth mesh |
| nRF5 SDK for Thread and Zigbee | Software development kit for Thread and Zigbee |
| Power Profiler Kit II | Current measurement tool for embedded development |

