

# nRF52 Series

Industry-leading series of wireless Bluetooth 5.3 SoCs for any product requiring Bluetooth Low Energy, Bluetooth mesh, Thread or Zigbee connectivity



## Overview

The nRF52 Series is a series of seven wireless multiprotocol System-on-Chips (SoCs) offering a broad selection for any product requiring Bluetooth® Low Energy, Bluetooth mesh, Thread or Zigbee connectivity. All SoCs 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 (Bluetooth 5.3) and are capable of high-throughput 2 Mbps. 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. NFC is available to wake up the devices from sleep or to securely pair out-of-band (OOB). The most advanced SoC, the nRF52840, also supports the new Matter application layer protocol.

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 I<sup>2</sup>S. 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 5.3               | •                                   | •                                   | •                                   | •                                 | •                                 | •                                 | •                                 |
| Direction Finding           |                                     |                                     | •                                   | •                                 |                                   | •                                 |                                   |
| 2 Mbps                      | •                                   | •                                   | •                                   | •                                 | •                                 | •                                 | •                                 |
| Long range                  |                                     |                                     | •                                   | •                                 |                                   | •                                 | •                                 |
| Bluetooth mesh              |                                     |                                     |                                     | •                                 | •                                 | •                                 | •                                 |
| Thread                      |                                     |                                     | •                                   | •                                 |                                   | •                                 | •                                 |
| Zigbee                      |                                     |                                     |                                     | •                                 |                                   | •                                 | •                                 |
| Matter                      |                                     |                                     |                                     |                                   |                                   |                                   | •                                 |
| NFC                         |                                     |                                     |                                     |                                   | •                                 | •                                 | •                                 |
| CPU                         | 64 MHz Arm Cortex-M4                |                                     |                                     |                                   |                                   |                                   |                                   |
| FPU                         |                                     |                                     |                                     |                                   | •                                 | •                                 | •                                 |
| Flash (KB)                  | 192                                 | 192                                 | 192                                 | 256                               | 512<br>256                        | 512                               | 1024                              |
| RAM (KB)                    | 24                                  | 24                                  | 24                                  | 32                                | 64<br>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                               | -96                               | -95                               |
| TWI/SPI/UART                | TWI, SPI,<br>UART                   | TWI, SPI,<br>UART                   | TWI/SPI,<br>SPI,<br>UART            | 2-TWI/SPI,<br>SPI,<br>UART        | 2-TWI/SPI,<br>SPI,<br>UART        | 2-TWI/SPI,<br>SPI,<br>2xUART      | 2-TWI/SPI,<br>SPI,<br>2xUART      |
| PWM units                   |                                     | 1                                   | 1                                   |                                   | 3                                 | 4                                 | 4                                 |
| ADC, Comparators            | ADC                                 | ADC,<br>COMP                        | ADC,<br>COMP                        | COMP                              | •                                 | •                                 | •                                 |
| USB, QSPI, High speed SPI   |                                     |                                     |                                     | USB                               |                                   | USB,<br>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<br>WLCSP28<br>10 GPIOs | 5x6 mm<br>QFN48<br>32 GPIOs         | 5x6 mm<br>QFN48<br>32 GPIOs         | 5x5 mm<br>QFN40<br>18 GPIOs       | 5x6 mm<br>QFN48<br>32 GPIOs       | 7x7 mm<br>oQFN73<br>42 GPIOs      | 7x7 mm<br>oQFN73<br>48 GPIOs      |
|                             |                                     | 5x5 mm<br>QFN32<br>16 GPIOs         | 5x5 mm<br>QFN33<br>17 GPIOs         | 2.5x2.5 mm<br>WLCSP44<br>18 GPIOs | 3.0x3.2 mm<br>WLCSP50<br>32 GPIOs | 5x5 mm<br>QFN40<br>18 GPIOs       | 6x6 mm<br>QFN48<br>30 GPIOs       |
|                             |                                     | 2.48x2.46 mm<br>WLCSP33<br>15 GPIOs | 2.48x2.46 mm<br>WLCSP33<br>15 GPIOs |                                   |                                   | 3.2x3.2 mm<br>WLCSP75<br>42 GPIOs | 3.5x3.6 mm<br>WLCSP94<br>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 kit

The nRF52 Series SoCs are supported the nRF Connect SDK. It is a new, open-source and scalable method for developing software on all of our wireless devices. This SDK is comprised of open-source elements from external projects and code developed by us. 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 is 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

We 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 and SoCs are available for purchase through our distribution network.

### Related software and tools

|                                       |  |
|---------------------------------------|--|
| <a href="#">nRF52_DK</a>              | Development kit for the nRF52805, nRF52810 and nRF52832 SoCs                                       |
| <a href="#">nRF52833_DK</a>           | Development kit for the nRF52820 and nRF52833 SoCs   |
| <a href="#">nRF52840_DK</a>           | Development kit for the nRF52811 and nRF52840 SoCs   |
| <a href="#">nRF_Connect_SDK</a>       | Software development kit for cellular IoT, Bluetooth Low Energy, Bluetooth mesh, Thread and Zigbee |
| <a href="#">Power Profiler Kit II</a> | Power profiling and optimization tool for embedded development                                     |

