

# nRF52840

High-end multiprotocol Bluetooth 5 SoC supporting:  
Bluetooth 5/Bluetooth mesh/Thread/Zigbee/802.15.4/ANT/2.4 GHz

## Ready for Bluetooth 5 and high grade IoT security

The nRF52840 is an advanced, highly flexible single chip solution for today's increasingly demanding ULP wireless applications for connected devices on our person, connected living environments and the IoT at large. It is designed ready for the major feature advancements of Bluetooth® 5 and takes advantage of Bluetooth 5's increased performance capabilities which include long range and high throughput modes. Inherent industry-grade security is essential in today's applications. The nRF52840 adds best-in-class security for Cortex™-M Series with on-chip ARM® CryptoCell cryptographic accelerator.

## Advanced performance, lowest power consumption

The nRF52840 employs the same hardware and software architecture as existing nRF52 Series SoCs. At its core is an Arm Cortex-M4 processor allowing quicker and more efficient computation of complex functions for DSP and those requiring floating point math. There is extensive memory availability in both flash and RAM, 1 MB/256 KB respectively. The combination of Cortex-M4 with floating point and memory availability offers unparalleled capabilities for true single chip applications. A full-speed (12 Mbps) USB 2.0 controller is included on-chip. An extensive range of peripherals are available with a number of high performance digital interfaces such as high speed SPI (32 MHz) and quad SPI (32 MHz) to allow direct interfacing to displays and external memory sources. The nRF52840 can operate from +5.5 V down to 1.7 V supply voltages allowing direct supply from rechargeable batteries and USB supplies.

## Bluetooth 5 – Bluetooth Low Energy further and faster

The nRF52840 is ready to take advantage of the considerable performance improvements for Bluetooth LE with the arrival of the Bluetooth 5 specification. Of greatest importance is the support for longer range (up to x4 compared to Bluetooth 4.x) and doubling of on-air data-rate, up to 2 Mbps from 1 Mbps in Bluetooth 4.x.

Bluetooth 5	nRF52810	nRF52811	nRF52832	nRF52840
2 Mbps	X	X	X	X
CSA #2	X	X	X	X
Advertising Extensions		(X)	X	X
Long Range		(X)		X

(X) Software support planned

## Thread certified and 802.15.4 support

The nRF52840 is a Thread certified component and as such is ideal for home networking products using the Thread mesh stack. The radio supports 802.15.4 PHY and MAC layers and makes it suitable for additional stacks using 802.15.4 such as Zigbee.

## High link budget for in-home applications

The nRF52840 is the ideal solution for smart connected home applications. It supports both Bluetooth 5's Long Range feature

## KEY FEATURES

- 64 MHz Arm® Cortex-M4 with FPU
- 1 MB Flash + 256 KB RAM
- Bluetooth 5 multiprotocol radio
  - 2 Mbps
  - CSA #2
  - Advertising Extensions
  - Long Range
  - +8 dBm TX power
  - -95 dBm sensitivity
  - 4.8 mA in TX (0 dBm)
  - 4.6 mA in RX (1 Mbps)
  - Integrated balun with 50 Ω single-ended output
- IEEE 802.15.4 radio support
  - Thread
  - Zigbee
- 1.7-5.5 V supply voltage range
- Full-speed 12 Mbps USB
- NFC-A tag
- Arm CryptoCell CC310 security subsystem
- QSPI/SPI/TWI/I<sup>2</sup>S/PDM/QDEC
- High speed 32 MHz SPI
- Quad SPI interface 32 MHz
- EasyDMA for all digital interfaces
- 12-bit 200 ksps ADC
- 128 bit AES/ECB/CCM/AAR co-processor
- On-chip DC-DC buck converter
- Regulated supply for external components up to 25 mA

## APPLICATIONS

- IoT
  - Smart Home products
  - Industrial mesh networks
  - Smart city infrastructure
- Advanced wearables
  - Connected watches
  - Advanced personal fitness devices
  - Wearables with wireless payment
  - Connected Health
  - Virtual/Augmented Reality applications
- Interactive entertainment devices
  - Advanced remote controls
  - Gaming controller

and also 802.15.4 which is already a popular technology for home networking protocols. With a maximum output power of 8 dBm a total link budget of >111 dBm is achievable for achieving robust communications through objects within the home.

### Arm CryptoCell 310

The nRF52840 features an on-chip Arm CryptoCell 310 cryptographic hardware accelerator. CryptoCell offers a wide range of ciphers and security features for building solid security into applications from the ground up. Use of CryptoCell also makes associated security operations run faster and uses less processing time and power than equivalent operation carried out in software by the CPU.

### OTA DFU

The nRF52840 is supported by Over-the-Air Device Firmware Upgrade (OTA-DFU). This allows for in the field updates of application and/or protocol stack.

### Nordic SoftDevices

Nordic protocol stacks are known as SoftDevices. SoftDevices are pre-compiled binaries without runtime dependencies. They reside in a separate memory location to your application and offer safer, easier, and more secure application development. The nRF52840 is supported by the SI40 SoftDevice which supports 20 links operating concurrently.

### SI40 SoftDevice

The SI40 SoftDevice supports 20 Bluetooth LE links in concurrent operation for all 4 roles (Central/Peripheral/Broadcaster/Observer). The SI40 is a Bluetooth 5 qualified stack and as such supports the latest long range and high throughput features introduced in Bluetooth 5.

### nRF52840 compatible SoftDevices

SI40	Feature complete Bluetooth 5 protocol stack for the nRF52840 SoC
S340	Combined Bluetooth 5 and ANT protocol stack for the nRF52840 SoC

## RELATED PRODUCTS

nRF52840 DK	Development kit for nRF52811 and nRF52840 SoCs
nRF5 SDK	Main software development kit for Bluetooth 5, ANT and 802.15.4
nRF5 SDK for HomeKit	Software development kit for Apple HomeKit
nRF5 SDK for Thread and Zigbee	Software development kit for Thread and Zigbee
nRF5 SDK for mesh	SDK for Bluetooth mesh applications

## SPECIFICATIONS

Protocol support	Bluetooth 5/802.15.4/ANT/2.4 GHz proprietary
Microprocessor	64 MHz 32-bit Arm Cortex-M4 with FPU
Memory	1 MB Flash + 256 KB RAM
On-air data rate	Bluetooth 5: 2 Mbps/1 Mbps/500 kbps/125 kbps 802.15.4: 250 kbps 2.4 GHz proprietary: 2 Mbps/ 1 Mbps
TX power	Programmable from +8 dBm to -20 dBm in 4 dB steps
Sensitivity	Bluetooth 5: -103 dBm at 125 kbps -99 dBm at 500 kbps -95 dBm at 1 Mbps -92 dBm at 2 Mbps 802.15.4: -100 dBm at 250 kbps ANT: -93 dBm at 1 Mbps 2.4 GHz: -93 dBm at 1 Mbps -89 dBm at 2 Mbps
Radio current consumption DC/DC at 3 V	14.8 mA at +8 dBm TX power, 9.6 mA at +4 dBm TX power, 4.8 mA at 0 dBm TX power, 4.6 mA in RX at 1 Mbps 5.2 mA in RX at 2 Mbps
Oscillators	64 MHz from 32 MHz external crystal or internal 32 kHz from crystal, RC or synthesized
System current consumption DC/DC at 3 V	0.4 µA in System OFF, no RAM retention 1.86 µA in System OFF, full RAM retention 0.97 µA in System ON, no RAM retention 2.35 µA in System ON, full RAM retention 3.16 µA in System ON, full RAM retention and RTC
Hardware security	128-bit AES CCM, ECB, AAR
Security subsystem	Arm TrustZone CryptoCell 310
Digital interfaces	USB 2.0, 4 × SPI master/slave, 2 × TWI master/slave, 2 × UART, 4 × PWM, QPSI, I <sup>2</sup> S, PDM, QDEC
Analog interfaces	12-bit 200 kps ADC, GP comparator, LP comparator
Peripherals	5 × 32 bit timer/counter, 3 × 24 real-time counter, 20 × PPI channels, 4 × GPIOTE, temperature sensor, watchdog timer, RNG
NFC	NFC-A tag
Voltage supply	1.7 to 5.5 V LDO or DC/DC
Package options	7×7 mm aQFN73 with 48 GPIOs 3.5×3.6 mm WLCSP93 with 48 GPIOs



7×7 mm



3.5×3.6 mm

## WORLD WIDE OFFICE LOCATIONS

Headquarters:  
Trondheim, Norway  
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### For more information

Visit [nordicsemi.com](http://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.

