nRF5340

Dual-core Bluetooth 5.3 SoC supporting Bluetooth Low Energy,
Bluetooth mesh, NFC, Thread and Zigbee

Overview

The nRF5340 is the world's first wireless System-on-Chip (SoC) with two Arm®
Cortex®-M33 processors. The combination of two flexible processors, the
advanced feature set, and an operating temperature up to 105 °C, makes it
the ideal choice for LE Audio, professional lighting, advanced wearables, and
other complex IoT applications.

All-in-one

The nRF5340 is an all-in-one SoC, including a superset of the most prominent
nRF52® Series features. Features like USB, Bluetooth 5.3, up to 105 °C operating
temperature, and more, are combined with more performance, memory, while
minimizing current consumption.

High-performance application processor

The application processor is optimized for performance and can be clocked at
either 128 or 64 MHz, using voltage-frequency scaling. The highest performance
(514 CoreMark at 66 CoreMark/mA) is achieved with 128 MHz, while running at
64 MHz offers a more efficient option (257 CoreMark at 73 CoreMark/mA).
The application processor has 1 MB Flash, 512 KB RAM, a floating-point unit
(FPU), an 8 KB 2-way associative cache and DSP instruction capabilities.

Fully-programmable network processor

The network processor is clocked at 64 MHz and is optimized for low power
and efficiency (101 CoreMark/mA). It has 256 KB Flash and 64 KB RAM. It is
fully programmable, enabling the developer to select which parts of the code
to run with the highest efficiency, in addition to the wireless protocol stack.

Next level security

The nRF5340 takes security to the next level by incorporating Arm Crypto-
Cell-312, Arm TrustZone®, and Secure Key Storage. Arm TrustZone efficiently
provides system-wide hardware isolation for trusted software by separating
between secure and non-secure regions on a single core. The security
attributes of the Flash, RAM, and peripherals are easily configured through
the nRF Connect SDK. The Arm CryptoCell-312 hardware accelerates the strong
ciphers and encryption standards required in the most security-conscious IoT
products.

Secure Key Storage is enabled by the Key Management Unit (KMU) peripheral,
where the keys are physically isolated from processor access, and only the
Arm CryptoCell-312 can access the secure keys. The secure bootloader in the
nRF Connect SDK establishes a root-of-trust and extends this to a chain-of-trust
by only booting software that has a verified signature. The bootloader also
verifies that all incoming device firmware updates originate from an authen-
ticated source.

Key features

- High-performance application processor
  - 128/64 MHz Arm Cortex-M33 with
    FPU and DSP instructions
  - 1 MB Flash + 512 KB RAM
  - 8 KB 2-way set associative cache
- Fully-programmable network processor
  - 64 MHz Arm Cortex-M33 with
    2 KB instruction cache
  - 256 KB Flash + 64 KB RAM
- Next level security
  - Trusted execution with Arm TrustZone
  - Hardware accelerated cryptography
    with Arm CryptoCell-312
  - Secure Key Storage
  - Secure bootloader with root-of-trust
    and DFU
- Bluetooth Low Energy
  - Bluetooth 5.3
  - LE Audio
  - Direction Finding
  - 2 Mbps, Advertising Extensions and
    Long Range
- Bluetooth mesh
- Thread, Zigbee and 802.15.4
- NFC
- Full range of digital interfaces with
  EasyDMA
  - Full-speed USB
  - 96 MHz encrypted QSPI
  - 32 MHz high-speed SPI
- 105 °C extended operating temperature
- 1.7-5.5 V supply voltage range

Applications

- LE Audio
- Professional lighting
- Industrial
- Advanced wearables
- Medical
- Smart home
- Asset tracking and RTLS

Extensive wireless protocol support

The nRF5340 SoC supports an extensive range of wireless protocols. It supports Bluetooth Low Energy and is capable of all angle-of-arrival and angle-of-departure roles in Direction Finding, in addition to LE Audio, Long Range, high-through-put 2 Mbps and Advertising Extensions features. Mesh protocols like Bluetooth mesh, Thread and Zigbee can be run concurrently with Bluetooth LE, enabling applications using Matter or HomeKit. NFC, ANT, 802.15.4 and 2.4 GHz proprietary protocols are also supported.

Designed for LE Audio

The SoC has been designed to meet the requirements of LE Audio, enabling audio streaming over Bluetooth Low Energy. LE Audio supports multi-stream synchronized audio for applications such as earbuds, and Audio Sharing, whereby a single audio source can broadcast to multiple recipients. The nRF5340 radio supports Isochronous Channels, the feature required by LE Audio for streaming. LE Audio also introduces the Low Complexity Communications Codec (LC3), a high-quality, low-power audio compression codec that can run efficiently on the nRF5340. The audio data can be trans-ferred to other parts of the system (AD/DA converters, speakers, microphones) using the I²S and PDM audio interfaces, which employ the nRF5340's low-jitter audio PLL clock source.

Ultra-low-power radio with great sensitivity

The nRF5340 SoC radio sets a new standard when it comes to combining advanced features and minimizing current. The 0 dBm TX current is 3.4 mA, while the RX current is only 2.7 mA, resulting in a reduction of 29% and 41% when comparing to the nRF52840 SoC. The RX sensitivity is -98 dBm, 3 dB better than nRF52840, meaning that the nRF5340 provides 3 dB better sensitivity, while using 41% less current.

nRF Connect SDK

The nRF Connect SDK is the software development kit for the nRF5340 SoC. It supports development of Bluetooth Low Energy, Thread and Zigbee applications. It integrates the Zephyr RTOS, protocol stacks, samples, hardware drivers and much more.

nRF Connect SDK also supports the nRF9160, our LTE-M/NB-IoT/GPS SiP, and the nRF52 Series. It is a common platform for both cellular IoT and short-range development.

nRF5340 DK

The nRF5340 DK is the development kit for the nRF5340 SoC. It is affordable, and has everything needed for development on a single board. All features and GPIOs of the nRF5340 SoC are made available to the developer, and it comes with an on-board SEGGER J-Link debugger enabling both programming and debugging of the nRF5340 SoC.

The nRF5340 SoC and the nRF5340 DK are available for purchase through our distribution network.

Specification

Application core CPU Memory Cache Performance Efficiency	128/64 MHz Arm Cortex-M33 1 MB Flash + 512 KB RAM 8 KB 2-way set associative cache 514/257 CoreMark 66/73 CoreMark/mA
Network core CPU Memory Cache Performance Efficiency	64 MHz Arm Cortex-M33 256 KB Flash + 64 KB RAM 2 KB instruction cache 244 CoreMark 101 CoreMark/mA
Security features	Trusted execution, root-of-trust, secure key storage, 128-bit AES
Security hardware	Arm TrustZone, Arm CryptoCell-312, SPU, KMU, ACL
Wireless protocol support	Bluetooth Low Energy/Bluetooth mesh/NFC/Thread/Zigbee/802.15.4/ANT/2.4 GHz proprietary
On-air data rate	Bluetooth LE: 2 Mbps/1 Mbps/125 kbps 802.15.4: 250 kbps
TX power	Programmable from +3 to -20 dBm in 1 dB steps
RX sensitivity	Bluetooth LE: -98 dBm at 1 Mbps -95 dBm at 2 Mbps
Radio current consumption DC/DC at 3 V	5.1 mA at +3 dBm TX power, 3.4 mA at 0 dBm TX power, 2.7 mA in RX at 1 Mbps 3.1 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	0.9 µA in System OFF 1.3 µA in System ON 1.5 µA in System ON with network core RTC running 1.7 µA in System ON with 64 KB network core RAM retained and network core RTC running
Digital interfaces	12 Mbps full-speed USB 96 MHz encrypted QSPI 32 MHz high-speed SPI 4xUART/SPI/TWI, I²S, PDM, 4xPWM, 2xQDEC UART/SPI/TWI
Analog interfaces	12-bit, 200 ksps ADC, low-power comparator, general-purpose comparator
Other peripherals	6 x 32 bit timer/counter, 4 x 24 bit real-time counter, DPPI, GPIOTE, Temp sensor, WDT, RNG
Temperature range	-40°C to 105°C
Supply voltage	1.7 to 5.5 V
Package options	7x7 mm aQFN™94 with 48 GPIOs 4.4x4.0 mm WLCSP95 with 48 GPIOs

Related Products

nRF5340_DK	Development kit for the nRF5340 SoC
nRF Connect SDK	Software development kit for the nRF5340