NORDIC SEMICONDUCTOR

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 CryptoCell-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 authenticated 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

nRF SERIES 53

For more information please visit: **nordicsemi.com/nRF5340**

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 transferred 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	128/64 MHz Arm Cortex-M33	
Memory	1 MB Flash + 512 KB RAM	
Cache	8 KB 2-way set associative cache	
Performance Efficiency	514/257 CoreMark 66/73 CoreMark/mA	
Network core		
CPU	64 MHz Arm Cortex-M33	
Memory	256 KB Flash + 64 KB RAM	
Cache	2 KB instruction cache	
Performance	244 CoreMark	
Efficiency	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: 802.15.4:	2 Mbps/1 Mbps/125 kbps 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 4×UART/SPI/TWI, I²S, PDM, 4×PWM, 2×QDEC UART/SPI/TWI	
Analog interfaces	12-bit, 200 ksps ADC, low-power comparator, general-purpose comparator	
Other peripherals	6 × 32 bit timer/counter, 4 × 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	7×7 mm aQFN™94 with 48 GPIOs 4.4×4.0 mm WLCSP95 with 48 GPIOs	

Related Products

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