nRF52805

Bluetooth 5.2 SoC in a WLCSP optimized for small two-layer PCB designs

Overview

The nRF52805 System-on-Chip (SoC) is the 7th addition to the industry-leading nRF52® Series. It augments the already extensive collection of wireless SoCs with an SoC in a WLCSP optimized for small two-layer PCB designs, ideal for cost-constrained applications. It is the perfect choice for applications such as beacons, disposable medical devices, sensors, styluses and presenters. It can also be applied as a network processor, allowing another MCU to leverage its connectivity.

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

The nRF52805 features an Arm® Cortex®-M4 processor, clocked at 64 MHz (144 CoreMark), with excellent efficiency (65 CoreMark/mA). It has 192 KB Flash and 24 KB RAM and integrates a range of analog and digital interfaces such as a 2-channel 12-bit ADC, SPI, UART, and TWI. The SoC's current draw is as little as 0.3 µA in System OFF and 1.1 µA in System ON with 24 KB RAM retained and RTC running.

The nRF52805 is a Bluetooth 5.2 SoC supporting Bluetooth Low Energy and 2.4 GHz proprietary protocols. It is capable of Bluetooth high-throughput 2 Mbps, transferring data faster and more efficient, and Bluetooth channel selection algorithm #2 (CSA #2), improving coexistence and reducing interference. It also supports 2.4 GHz proprietary protocols. The radio has up to 4 dBm TX power and -97 dBm sensitivity (1 Mbps Bluetooth LE). The radio draws only 4.6 mA in both TX (0 dBm) and RX.
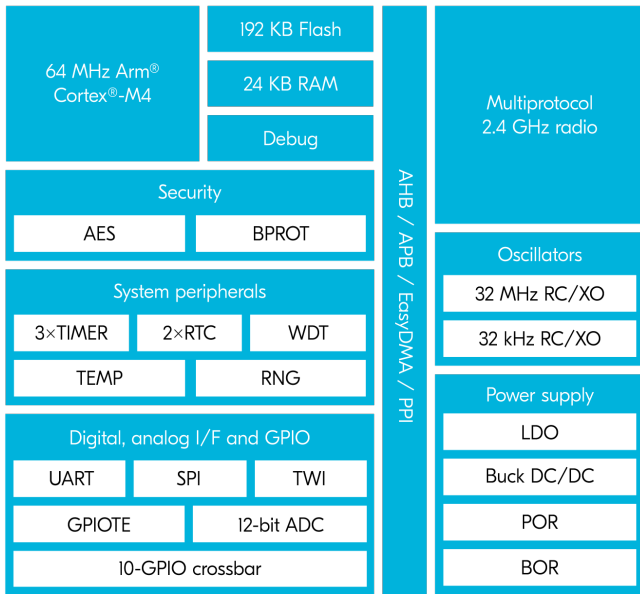
KEY FEATURES

- 64 MHz Arm Cortex-M4
- 192 KB Flash + 24 KB RAM
- Bluetooth Low Energy
  - Bluetooth 5.2
  - High-throughput 2 Mbps
  - Channel selection algorithm #2
- 2.4 GHz proprietary protocol support
- Ultra-low-power 2.4 GHz multiprotocol radio
  - +4 dBm TX power
  - -97 dBm RX sensitivity
  - 7 mA in TX (4 dBm)
  - 4.6 mA in TX (0 dBm)
  - 4.6 mA in RX (1 Mbps)
  - Integrated balun with single-ended output
- SPI, TWI, UART
- 2-channel 12-bit ADC
- Integrated DC/DC regulator
- 0.3 µA in System OFF
- 1.1 µA in System ON with 24 KB RAM retained and RTC running
- Optimized for small two-layer PCB designs
  - 2.48×2.46 mm WLCSP package
  - Significantly lower cost than four-layer PCB designs
  - Only 10 external passive components
  - 9.5×8.8 mm reference layout is available, giving access to all 10 GPIOs

APPLICATIONS

- Beacons
- Disposable medical devices
- Simple network processor
- Sensors
- Styluses and presenters

Hardware feature comparison	nRF52805	nRF52810	nRF52811	nRF52820	nRF52832	nRF52833	nRF52840	nRF5340
Bluetooth 5.2	X	X	X	X	X	X	X	X
Bluetooth Direction Finding			X	X		X		X
Bluetooth 2 Mbps	X	X	X	X	X	X	X	X
Bluetooth Long Range			X	X		X	X	X
802.15.4			X	X		X	X	X
USB				X		X	X	X
Max supply voltage (V)	3.6	3.6	3.6	5.5	3.6	5.5	5.5	5.5
Max temperature (°C)	+85	+85	+85	+105	+85	+105	+85	+105

Block diagram (left)

64 MHz Arm® Cortex®-M4	192 KB Flash
	24 KB RAM
	Debug

Security
AES | BPROT

System peripherals
3×TIMER | 2×RTC | WDT
TEMP | RNG

Digital, analog I/F and GPIO
UART | SPI | TWI
GPIOTE | 12-bit ADC
10-GPIO crossbar

AHB / APB / EasyDMA / PPI

Multiprotocol 2.4 GHz radio

Oscillators
32 MHz RC/XO
32 kHz RC/XO

Power supply
LDO
Buck DC/DC
POR
BOR

SPECIFICATIONS

Core	
CPU	64 MHz Arm Cortex-M4
Memory	192 KB Flash + 24 KB RAM
Performance	144 CoreMark
Efficiency	65 CoreMark/mA
Wireless protocol support	Bluetooth Low Energy/2.4 GHz proprietary
On-air data rate	Bluetooth LE: 2 Mbps/1 Mbps 2.4 GHz proprietary: 2 Mbps/1 Mbps
TX power	Programmable from +4 dBm to -20 dBm in 4 dB steps
RX sensitivity	Bluetooth LE: -97 dBm at 1 Mbps
Radio current consumption DC/DC at 3 V	+4 dBm TX power: 7 mA 0 dBm TX power: 4.6 mA RX at 1 Mbps: 4.6 mA
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	0.3 µA in System OFF 0.6 µA in System ON 1.1 µA in System ON with 32 KB RAM retained and RTC running
Security features	128-bit AES
Digital interfaces	UART, SPI, TWI
Analog interfaces	12-bit ADC
Other peripherals	3 × 32 bit timer/counter, 2 × 24 real-time counter, PPI, GPIOTE, temp sensor, WDT, RNG
Temperature range	-40°C to +85°C
Voltage supply	1.7 to 3.6 V LDO and DC/DC
Package options	2.48×2.46 mm WLCSP28 with 10 GPIOs

WLCSP optimized for small two-layer PCB designs

The nRF52805 is available in our smallest package, a 2.48×2.46 mm WLCSP, optimized for two-layer PCB designs. This enables designs that are small and low cost, attributes that are typically a design trade-off, since small designs typically require four-layer PCBs, which have significantly higher cost. We provide a 9.5×8.8 mm reference layout with all ten GPIOs available, requiring only 10 external passive components (inc. two crystal load capacitors).

Get started today

The nRF52805 is supported by SoftDevice S112, and will be supported by SoftDevice S113. S112 and S113 are memory-optimized Peripheral-only Bluetooth Low Energy protocol stacks supporting up to 4 connections as a Peripheral concurrently with a Broadcaster. They are Bluetooth 5.1 qualified and support the high-throughput 2 Mbps and CSA #2 Bluetooth features.

The nRF52 DK is the recommended development kit, it emulates the nRF52805, and can be used as a starting point for development before moving over to a custom board. A guide on how to use nRF52805 with nRF5 SDK is available.

The nRF52805 SoC is in mass production now, in a 2.48×2.46 WLCSP28 package with 10 GPIOs.

For more information please visit:
www.nordicsemi.com/nRF52805

RELATED PRODUCTS

nRF52 DK	Development kit for nRF52805, nRF52810 and nRF52832 SoCs
nRF5 SDK	Software development kit for Bluetooth Low Energy, ANT and 802.15.4

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For more information
Visit **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.

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