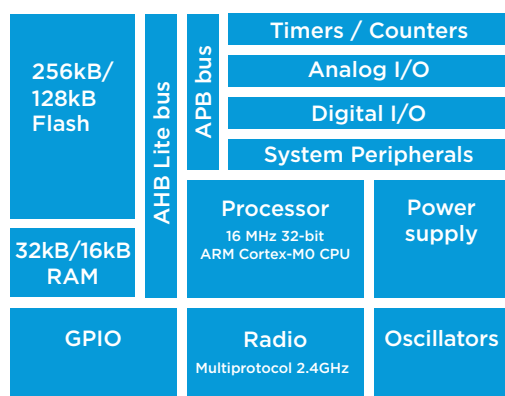# nRF51422

Multiprotocol Bluetooth low energy and ANT/ANT+ and 2.4GHz proprietary System-on-Chip

Multiprotocol wireless System-on-Chip

The nRF51422 is a powerful multiprotocol single chip solution for ANT/*Bluetooth*® low energy applications. It incorporates Nordic's latest best-in-class performance radio transceiver, an ARM® Cortex™ M0 CPU and 256kB/128kB flash and 32kB/16kB RAM memory. The nRF51422 supports Bluetooth Smart (formerly known as Bluetooth low energy), ANT and 2.4GHz proprietary protocol stacks.

256kB/128kB Flash	AHB Lite bus	APB bus	Timers / Counters	
			Analog I/O	
			Digital I/O	
			System Peripherals	
			Processor 16 MHz 32-bit ARM Cortex-M0 CPU	**Power supply**
32kB/16kB RAM				
GPIO		Radio Multiprotocol 2.4GHz		Oscillators

Lower power and higher performance

The nRF51422 uses the 32-bit ARM Cortex M0 MCU, together with extensive flash availability. Code density and execution speed are considerably greater than for 8/16-bit platforms. The Programmable Peripheral Interconnect (PPI) system provides a 16-channel bus for direct and autonomous system peripheral communication without CPU intervention. This brings predictable latency times for peripheral to peripheral interaction and associated power saving benefits associated with leaving the CPU idle. The device has 2 global power modes ON/OFF, but all system blocks and peripherals have individual power management control which allows for an automatic switching RUN/IDLE for system blocks based only on those required/not required to achieve particular tasks.

The new radio forms the basis of the nRF51422's performance. The radio supports Bluetooth Smart and ANT and is on-air compatible with nRF24AP- and nRF24L Series products from Nordic Semiconductor. Output power is now scalable from a maximum of +4dBm down to -20dBm in 4dB steps with a -36dBm whisper mode. Sensitivity is increased at every level and offers sensitivity ranges (dependent on data rate) from -96dBm to -85dBm, with -93dBm for Bluetooth Smart, and -90dBm for ANT.

KEY FEATURES

- Multiprotocol 2.4GHz radio
- 32-bit ARM Cortex-M0 processor
- 256kB/128kB flash and 32kB/16kB RAM
- Software stacks available as downloads
- Pin compatible with other nRF51 Series devices
- Application development independent from protocol stack
- Fully on-air compatible with nRF24AP- and nRF24L Series devices
- Programmable output power from +4dBm to -20dBm
- RSSI
- RAM mapped FIFOs using EasyDMA
- Flexible and configurable GPIO
- Programmable Peripheral Interconnect – PPI
- Full set of digital interfaces: SPI/2-wire/UART
- Dynamic on-air payload length up to 256 bytes
- 10-bit ADC
- 128-bit AES/ECB/CCM/AAR co-processor
- Quadrature demodulator
- Low cost external 16MHz ± 60ppm
- Low power 16MHz crystal and RC oscillators
- Ultra low power 32kHz crystal and RC oscillators
- Wide supply voltage range (1.8V to 3.6V)
- Simple ON/OFF global power power modes
- Flexible power management for all peripherals
- On-chip DC-DC converter
- Package options: 48-pin 6x6 QFN, 64-ball WLCSP

APPLICATIONS

- Bluetooth low energy applications
- Wearables
- Beacons
- Appcessories
- Smart Home
- ANT/ANT+ Sensor networks
- Wearable sensors
- Computer peripherals
- CE remote controls for TV, STB and media systems
- Proximity and security alert tags
- Sports and fitness sensors
- Healthcare and lifestyle sensors
- Game controllers and computers
- Toys and electronic games
- Domestic/industrial control and data-acquisition
- Intelligent domestic appliances
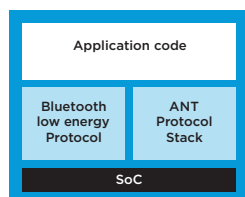
Easy, fast and safe code development

The nRF51422 offers developers a clean separation between application code development and embedded protocol stacks. This means compile, link and run-time dependencies with the embedded stack and associated debugging challenges are removed. The Bluetooth low energy and ANT stacks are pre-compiled binaries available from Nordic Semiconductor, leaving application code to be compiled stand-alone. The embedded stack interface uses an asynchronous and event-driven model removing the need for RTOS frameworks.

OTA DFU

The nRF51422 is supported by an Over The Air Device Firmware Upgrade (OTA-DFU) feature. This allows for in the field updates of application software and new SoftDevices when using the S110 SoftDevice.

Maximum re-use and easy migration

The devices in the nRF51 Series are pin-compatible enabling migration between technologies such as Bluetooth low energy and ANT with no layout changes. The common HW architecture ensures that one codebase can be used effortlessly between nRF51 Series devices. Variants in the nRF51 Series enable simple choices tailoring device selection to desired wireless protocol and feature requirements with little or no change.

Application code	
Bluetooth low energy Protocol	ANT Protocol Stack
SoC	

SoftDevices

The Nordic protocol stacks are known as SoftDevices, and complement the nRF51 Series SoCs. All nRF51 Series devices are programmable with software stacks available from Nordic Semiconductor. This brings maximum flexibility to application development and allows the latest stack version to be programmed into the nRF51 Series SoC.

nRF51422 compatible SoftDevices

S130	Bluetooth low energy concurrent central/peripheral/observer/broadcaster stack
S210	ANT/ANT+ 8-link
S310	Bluetooth low energy peripheral/ANT 8-link (concurrent)

Development tools

Nordic Semiconductor provides a complete range of hardware and software development tools for the nRF51 Series devices.

SPECIFICATIONS

Frequency band	2.4GHz ISM (2.400 – 2.483GHz)
On-air data rate	250 kbps, 1 Mbps, 2 Mbps
Modulation	GFSK
Output power	Programmable: +4 to -20dBm in 4dB steps
Sensitivity	-93dBm Bluetooth low energy -90dBm ANT -85dBm at 2Mbs -30dBm whisper mode
Radio current consumption LDO at 1.8V	16mA – TX at +4dBM 8.06mA – TX at 0dBm 9.7mA – RX at 1Mbs
Microcontroller	32-bit ARM Cortex-M0
Program Memory	256kB/128kB Flash
RAM	32kB/16kB
Oscillators	16MHz crystal oscillator 16MHz RC oscillator 32kHz crystal oscillator 32kHz RC oscillator (±250ppm)
System current consumption	0.6µA – No RAM retention 1.2µA - 8k RAM retention 2.6µA all peripherals in IDLE mode
Hardware Security	128-bit AES/ECB/CCM/AAR co-processor
GPIO	31 configurable
Digital I/O	X2 HW Master/Slave X2 2-wire Master UART Quadrature demodulator
Peripherals	10-bit ADC RNG Temperature sensor RTC
PPI	16-channel
Voltage regulator	LDO (1.8 to 3.6V), LDO bypass (1.75V to 1.95V) Buck DC/DC (2.1V to 3.6V)
Timers/counters	X2 16 bit, X1 24bit, X2 24bitRTC
Package options	RoHS compliant 48-pin 6x6 QFN / 3 Ultra-compact Wafer Level Chip Scale Package options (WLCSP)

RELATED PRODUCTS

nRF51 DK	Development kit for Bluetooth low energy, ANT and 2.4GHz applications
nRF51 Dongle	Bluetooth low energy/ANT/2.4GHz development dongle
nRF51822	Bluetooth low energy multiprotocol SoC

WORLD WIDE OFFICE LOCATIONS

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For more information
Visit www.nordicsemi.com for the complete product specification about this and any other wireless ultra-low power products.

About Nordic Semiconductor
Nordic Semiconductor is a fabless semiconductor company specializing in ultra-low power short-range wireless communication. Nordic is a public company listed on the Norwegian stock exchange.

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