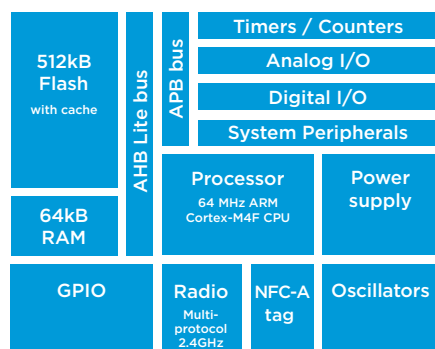# nRF52832

Multiprotocol Bluetooth low energy (Bluetooth 5), ANT/ANT+ and 2.4GHz proprietary System-on-Chip

ULP wireless System-on-Chip

The nRF52832 is a powerful multiprotocol single chip solutions for ULP wireless applications. It incorporates Nordic's best-in-class performance radio transceiver, an ARM® Cortex™ M4F CPU and 512kB flash and 64kB RAM memory. The nRF52832 supports *Bluetooth®* low energy (Bluetooth 5), ANT™ and 2.4GHz proprietary protocol stacks. The device also has a NFC-A tag interface for OOB pairing.

512kB Flash with cache	AHB Lite bus / APB bus	Timers / Counters
		Analog I/O
		Digital I/O
		System Peripherals
64kB RAM		Processor 64 MHz ARM Cortex-M4F CPU / Power supply
GPIO	Radio Multi-protocol 2.4GHz	NFC-A tag / Oscillators

Lower power and higher performance

The nRF52832 uses the 32-bit ARM Cortex M4F MCU, together with extensive flash availability, 512kB in total with 400kB available for application development. Code density and execution speed are considerably greater than for 8/16-bit platforms. Having HW support for DSP instructions as well as for Floating point operations positions the Cortex M4F above Cortex M0/M0+/M3 and M4 performance wise. The Programmable Peripheral Interconnect (PPI) system provides a 20-channel bus for direct and autonomous system peripheral communication without CPU intervention. This brings predictable latency times for peripheral to peripheral interaction and 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 is designed to support the Bluetooth 5 2Mbs mode. This means the nRF52832 can be qualified for Bluetooth 5 applications. It supports Bluetooth low energy (Bluetooth 5), ANT and proprietary 2.4GHz applications. It is on-air compatible with nRF5x and nRF24x devices. Output power is programmable between +4dBm and -20dBm and has receiver sensitivity of -96dBm for Bluetooth low energy 1Mbs).

KEY FEATURES

- Bluetooth 5 - 2Mbs mode
- 32-bit ARM Cortex M4F processor
- 512kB flash + 64kB RAM
- Software stacks available as downloads
- Application development independent from protocol stack
- Supports 1Mbit and 2Mbit Bluetooth low energy modes
- On-air compatible with nRF51, nRF24AP and nRF24L Series
- Sensitivity of -96 dbm for Bluetooth low energy
- Programmable output power from +4dBm to -20dBm
- RSSI
- RAM mapped FIFOs using EasyDMA
- Dynamic on air payload length up to 256 Bytes
- Flexible and configurable 32 pin GPIO
- Programmable Peripheral Interface – PPI
- Simple ON/OFF global power modes
- Full set of digital interfaces including: SPI/2-wire/UART/PDM/I2S, all with EasyDMA
- 12-bit/200KSPS ADC
- 128-bit AES ECB/CCM/AAR co-processor
- Quadrature demodulator
- Low cost external crystal 32MHz ± 40ppm for Bluetooth, ± 50ppm for ANT
- Single-ended antenna output (On-chip Balun)
- Low power 32MHz crystal and RC oscillators
- Ultra low-power 32kHz crystal and RC oscillators
- Wide supply voltage range (1.7 V to 3.6 V)
- On-chip DC/DC buck converter
- Individual power management for all peripherals
- Package options: 48-pin 6x6 QFN/WL-CSP

APPLICATIONS

- **IoT**
  - Home automation
  - Sensor networks
  - Building automation
- **Personal Area Networks**
  - Health/fitness sensor and monitor devices
  - Medical devices
  - Key-fobs + wrist watches
- **Interactive entertainment devices**
  - Remote control
  - Gaming controller
- **Beacons**
- **A4WP wireless chargers and devices**
- **Remote control toys**
- **Computer peripherals and I/O devices**
  - Mouse + Keyboard
  - Multi-touch trackpad

The NFC module supports NFC-A tags with proximity detection and Wake-on-field from low power mode. The NFC enables Out-Of-Band Bluetooth pairing of devices and thus greatly simplifying deployment.

Easy, fast and safe code development

The nRF52832 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 de-bugging challenges are removed. The Bluetooth low energy and ANT stack is a pre-compiled binary 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 nRF52832 is supported by an Over-The-Air Device Firmware Upgrade (OTA DFU) feature. This allows for in the field updates of application software and SoftDevice.

Maximum re-use and easy migration

The nRF52832 have binary compatible peripherals with the nRF51 Series for most functions enabling easy migration between older parts and the new nRF52 Series. The backwards compatibility of most interfaces and the common SW architecture of the nRF51 Series S130 and the nRF52 Series S132 SoftDevices ensures that existing codebase for the nRF51 Series can in very large parts be re-used effortlessly on the nRF52 Series.

SoftDevices

The Nordic protocol stacks are known as SoftDevices and complement the nRF52 Series SoCs. All nRF52 Series 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 nRF52 Series SoC.

Development tools

Nordic Semiconductor provides a complete range of hardware and software development tools for the nRF52 Series devices.

nRF52832 compatible SoftDevices

S132	Bluetooth low energy concurrent central/ peripheral/ observer/broadcaster stack
S212*	ANT stack
S332*	Bluetooth low energy concurrent central/ peripheral/ observer/broadcaster /ANT stack

*ANT related SoftDevices (s212,s332) for the nRF52 series are now obtained from ANT Wireless. This applies to both ANT only and ANT/Bluetooth low energy combo SoftDevices.
For more information on this please contact : ANTstacks@thisisant.com

SPECIFICATIONS

Frequency band	2.4GHz ISM (2.36000 – 2.4835GHz)
On-air data rate	1 Mbps and 2 Mbps for proprietary and Bluetooth low energy modes (Bluetooth 5 compatible)
Modulation	GFSK
Output power	Programmable: +4 to -20dBm in 4dB steps
Sensitivity	-96dBm Bluetooth, -92.5dBm at 1Mbs ANT, -89dBm at 2Mbs, -30dBm whisper mode
Radio current consumption DC-DC at 3V	7.5mA – TX at +4dBm output power, 5.3mA – TX at 0dBm output power, 5.4mA – RX at 1Mbs
Microcontroller	32-bit ARM Cortex M4F
Program Memory	512kB Flash with cache
RAM	64kB
Oscillators	32MHz crystal oscillator, 64MHz RC oscillator, 32kHz crystal oscillator, 32kHz RC oscillator (±250 ppm)
System current consumption	0.3µA – No RAM retention, 1.2uA – All peripherals in IDLE mode, 1.6uA – All peripherals in IDLE mode and 32KHz XO and RTC running, 30nA per 4KB - RAM retention
Hardware Security	128-bit AES ECB/CCM/AAR co-processor
GPIO	32 configurable
Digital I/O	3 x Hardware SPI master, 3 x Hardware SPI slave, 2 x 2-wire master, 2 x 2-wire slave, UART, Quadrature demodulator, 1x I2S, 1xPDM
Peripherals	12-bit/200KSPS ADC, RNG, Temperature sensor, general compararator, low power comparator
PPI	20-channel
Voltage regulator	LDO (1.7 to 3.6V), Buck DC/DC (1.7 to 3.6V)
Timers/counters	5 x 32bit, 3 x 24bit RTC
Package options	RoHS compliant 48-pin 6x6 QFN / 3.0x3.2 Ultra-compact Wafer Level Chip Scale Package (WLCSP)

RELATED PRODUCTS

nRF52 DK	Development kit for Bluetooth low energy, ANT and 2.4GHz applications

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 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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