The nRF51822 is a powerful multi-protocol single chip solution for ULP wireless applications. It incorporates Nordic’s latest best-in-class performance radio transceiver, an ARM Cortex M0 CPU and 256/128kB flash + 16kB RAM memory. The nRF51822 supports Bluetooth® Smart and 2.4 GHz protocol stacks.

Lower power and higher performance
The nRF51822 uses the 32-bit ARM Cortex M0 MCU, together with extensive flash availability, 256/128kB in total with 40kB-180kB available for application development. 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 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 nRFS1822’s performance. The radio supports Bluetooth® Smart and is on air compatible with the nRF24L-series products from Nordic Semiconductor. Output power is now scalable from a maximum of +4dBm down to -20dBm in 4dB steps. Sensitivity is increased at every level and offers sensitivity ranges (dependent on data rate) from -96 to -85dBm, with -93dBm for Bluetooth® Smart.

ULP wireless system-on-chip
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**KEY FEATURES**

- Multi-protocol 2.4GHz radio
- 32-bit ARM Cortex M0 processor
- 256/128kB flash + 16kB RAM
- Software stacks available as downloads
- Pin compatible with other nRF51xxx series devices
- Application development independent from protocol stack
- Fully on-air compatible with nRF24L-series
- 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 31 pin GPIO
- Programmable Peripheral Interface – PPI
- Simple ON/OFF global power modes
- Full set of digital interfaces including: SPI/2-wire/UART
- 10-bit ADC
- 128-bit AES ECB/CCM/AAR co-processor
- Quadrature demodulator
- Low cost external crystal 16MHz ± 40ppm
- Low power 16MHz crystal and RC oscillators
- Ultra low-power 32kHz crystal and RC oscillators
- Wide supply voltage range (1.8 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**

- Bluetooth Smart applications
- Wearables
- Beacons
- Appcessories
- 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 for computers
- Toys and Electronic games
- Domestic/Industrial control and data-acquisition
- Intelligent domestic appliances
Easy, fast and safe code development
The nRF51822 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 Smart 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 nRF51822 is supported by a Over The Air Device Firmware Upgrade (OTA-DFU) feature. This allows for in the field updates of application software and SoftDevice with the S10 SoftDevice.

Maximum re-use and easy migration
The devices in the nRF51 series are pin compatible enabling migration between technologies such as Bluetooth Smart and ANT with no layout changes. The common HW architecture ensures that one codebase can be re-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 changes.

5-series protocol stacks
The S-series protocol stacks complement the nRF51 series SoCs. All nRF51 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 nRF51 series SoC.

nRF51822 compatible protocol stacks
S110 Bluetooth Smart peripheral stack
S120 Bluetooth Smart 8-link central stack
S130 Bluetooth Smart concurrent central/peripheral/observer/broadcaster stack

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

RELATED PRODUCTS
nRF6700 nRFgo Starter Kit
nRF51822-DK nRF51822 Development Kit
nRF51822-EK nRF51822 Evaluation Kit
nRF51422 ANT multi-protocol SoC

SPECIFICATIONS
Frequency band 2.4GHz ISM [2.40000 – 2.48350GHz]
On-air data rate 250 kbps, 1 Mbps or 2 Mbps
Modulation GFSK
Output power Programmable: +4 to -20dBm in 4dB steps
Sensitivity -91dBm Bluetooth low energy
-94dBm at 250kb
-90dBm at 1Mbs
-85dBm at 2Mbs
Radio current consumption LDO at 1.8V
16mA – TX at +4dBm output power
10.5mA – TX at 0dBm output power
9.5mA – RX at 1Mbs
Radio current consumption DC-DC at 3V
10.5mA – TX at +4dBm output power
8.1mA – TX at 0dBm output power
9.5mA – RX at 1Mbs
Microcontroller 32-bit ARM Cortex M0
Program Memory 256/128kB Flash
RAM 16kB
Oscillators 16MHz crystal oscillator
16MHz RC oscillator
32kHz crystal oscillator
32kHz RC oscillator (±250 ppm)
System current consumption 420nA – No RAM retention
530nA – 8kB RAM retention
2µA – All peripherals in IDLE mode
Hardware Security 128-bit AES ECB/CCM/AAR co-processor
GPIO 31 configurable
Digital I/O X2 Hardware SPI master
2X 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 [1.75 to 1.95V]
Buck DC/DC [2.1 to 3.6V]
Timers/counters 2 x 16 bit, 1 x 24bit, 2 x 24bit, RTC
Package options RoHS compliant 48-pin 6x6 QFN / 62-ball 3.5 x 3.8 WLCSP

WORLD WIDE OFFICE LOCATIONS
Headquarters: Trondheim, Norway
Tel: +47 72 89 89 00

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.