nRF24AP1™

Ultra-low power 2.4GHz transceiver with embedded ANT protocol for wireless Personal Area Networks (PAN)

NORDIC SEMICONDUCTOR

5x5mm package **1Mbit/sec air datarate** **Designed for Coin Cell Battery operation**

2.4GHz operation **Star and peer-to-peer networks** **Adaptive channel communications**

1.9-3.6V voltage supply **2^32 addressable devices**

nRF24AP1 Features

- UART and synchronous serial interface
- 2.4GHz operation
- 125 RF channels
- 1.9 - 3.6V voltage supply
- 1Mbit/sec air datarate
- -20 dBm to 0 dBm output

High Hardware Integration

- Delivered in "Green" Pb (lead) free 24 pin QFN package, 5x5mm
- Few external components, Crystal, resistor and LC
- No trimming in production
- No need for external SAW filter
- Smallest available BOM & footprint

ANT Protocol Features

- Designed for Coin Cell Battery operation
- Uni-directional and bi-directional channel support
- Channel method: TDMA
- 2^32 addressable devices
- Data validity detection: 16 bit CRC
- Adaptive channel communications – automatically adjust and synchronize with each other to provide robust, non-destructive operation
- Broadcast, Acknowledged, Burst transmission modes available
- Data security and immunity from cross-talk
- Supports star and peer-to-peer networks
- Private and public networking capability

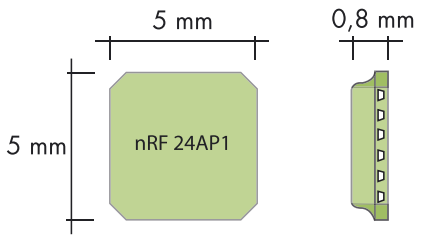
RF Performance and Quality

- GFSK modulation
- Efficient output spectrum
- Embedded ShockBurst™ engine
- -40°C to + 85°C operation
- 100% RF tested

Quick Reference Data

Message rate	0,5 – 200	Hz
Idle current consumption, no communications	2	µA
Peak current consumption RX mode	22	mA
Peak current consumption TX @ 0 dBm	16	mA
Average system current consumption per TX message [1]	39,4	µA
Average system current consumption per RX message [1]	43,1	µA
Max # of simultaneous connections [2]	>65000	connections
Maximum sustained transfer rate (all data – no overhead) [3]	20	kbps
CR2032 Battery life in typical sensor application [4]	15	years

Actual size 5 x 5 mm



[1] 8 bytes payload data – no additional overhead required. Message interval of 2s
[2] Using shared channel network
[3] Transfer rates refers to data rate of the end application's message payload
[4] Message interval of 2s, 1 hour/day usage (Unidirectional communication)

Introducing the ultra-low power 2.4GHz wireless nRF24AP1™ transceiver with embedded ANT networking protocol for wireless personal area networks (PAN)

Based on the market leading nRF24XX RF core, the nRF24AP1™ combines the best of 2 worlds, and integrates a unique ultra-low power 2.4GHz transceiver for wireless communication with Dynastream Innovation's production-proven low power network protocol, ANT, to create a true single chip solution. The nRF24AP1 is the ultimate solution for customers who are looking for a simple to use 2.4GHz transceiver for global operation, but do not want to spend months and years on integrating a networking standard protocol into their system. The nRF24AP1 is a drop-in wireless communications solution that provides private and public network connectivity and eliminates the need to purchase third party protocol stacks and acquire standards certification through expensive acceptance testing. The nRF24AP1 is the solution of choice for those customers whose main interest is offering the longest battery lifetime, lowest cost, and smallest size for their products.

The component from Nordic Semiconductor ASA, is manufactured in a modern 0.18µm process, and includes a multitude of features to make your product the lowest power, first-to-market and certainly the lowest cost system around. The ANT protocol is used in coin cell battery operated watches for heart rate monitoring, and other sports instruments, but is equally well suited for industrial as well as medical applications.

The entire radio, protocol, peripherals, inductors and filters, are integrated in a single chip that gives the lowest cost solution to the end user. The only external components needed to make a complete system are a crystal, some RC components, and a low cost MCU controlling the application. The application MCU is interfaced to the nRF24AP1™ via a asynchronous or synchronous serial port. The total solution fits into a 5x5mm QFN package.

Using the worldwide 2.4GHz frequency band the nRF24AP1™ eliminates the need for several hardware platforms to cover a global market, easing logistics and ensuring portability for the end customer.

ANT - the ultra-low power wireless performance protocol

ANT

The nRF24AP1 integrates Nordic's 2.4GHz ISM RF transceiver with Dynastream's 4th generation, production proven ANT wireless network protocol to enable product designers to create real-time, wireless connectivity in applications challenged by power, cost, and physical size constraints. ANT is a wireless personal area network (PAN) communications technology that delivers immediate device connectivity and data integrity to product applications in the sport/recreation, medical, industrial and other emerging wireless application marketplaces. ANT is a wireless network protocol focused on delivering ultra-low power, low-cost, and ease of implementation to your product design.

Cost

The ANT network protocol is a robust and flexible implementation that has been optimized to minimize the system cost associated with deploying a wireless connectivity solution for a product. The ANT embedded nRF24AP1 extends this low-cost philosophy by creating the first fully complete drop-in 2.4GHz transceiver + protocol solution for real-time wireless applications. The single chip, drop-in solution, results in much faster system developments and reduced system BOM, significantly lowering your overall costs and time to market.

Ultra-low Power Consumption

ANT is a 4th generation, production proven wireless networking protocol found in applications requiring aggressive low-power targets. Designed to be integrated into small form factor product environments - such as those powered by a coin cell battery - ANT's ultra-low power performance is significantly lower than other competing protocols such as Bluetooth® or ZigBee™.

Ease of Implementation

ANT has been engineered with ease-of-integration as a principle priority. ANT, embedded with the 2.4GHz radio in the nRF24AP1 creates an integrated, single-chip drop-in wireless solution. The nRF24AP1 allows customers to easily implement a complete, wireless communications solution for their real-time product application without the time-consuming burden of integrating a radio with a third party networking protocol. The drop-in nRF24AP1 accelerates your development cycle shortening your time-to-market and time-to-production for your product application.

Flexibility and Scalability

ANT's protocol support for different network topologies, device pairing and selectable transmission types make the nRF24AP1 the perfect solution for numerous product applications. Whether you need a private or a public network consisting of two or thousands of nodes, increasing or decreasing the number of nodes in the network can easily be achieved by the device pairing feature in the protocol. Depending on what is most important for your application, three different types of data transmissionare available:

- Broadcast data is the default transmission type. The broadcast data is never acknowledged and should be considered when extreme low power consumption is the most critical parameter in your application.
- Acknowledge data is used when 100% data integrity is required. Retransmission and acknowledge of success or failure are automatically handled by the protocol.
- Burst data enables sending of large amounts of data. All data is acknowledged in this mode.

The ANT protocol uses TDMA techniques for the basis of its communications channels. TDMA techniques combined with the ANT multiple access channel technology allows for two to thousands of nodes to be connected to an ANT network.

With the flexibility of ANT, wireless networking has never been easier.

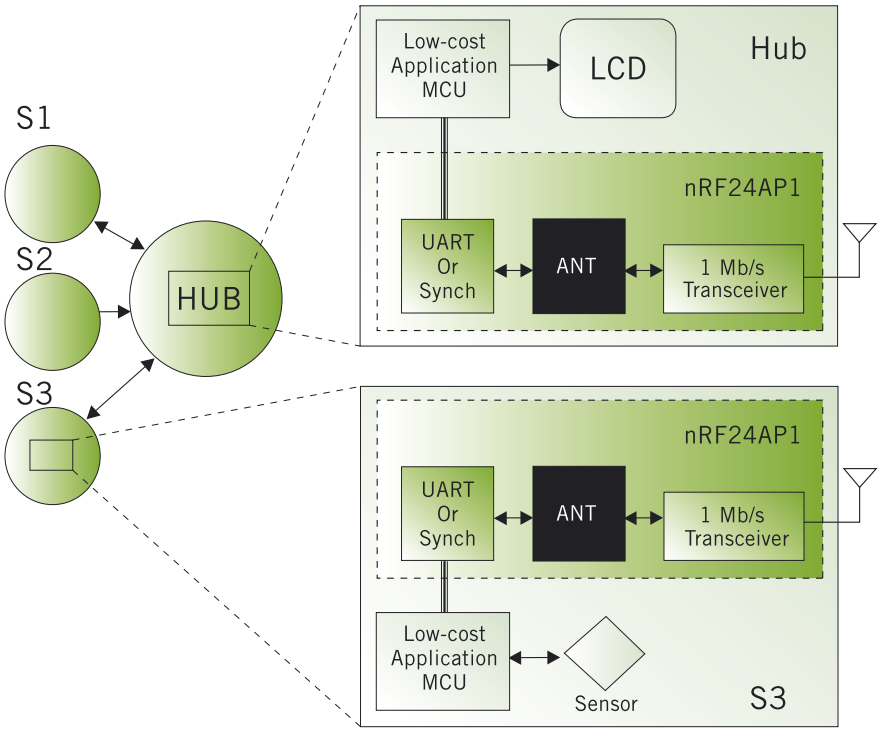
Compare

	ANT	Bluetooth	ZigBee Alliance
Frequency	2. 4 GHz	2. 4 GHz	2. 4 GHz
Modulation	GFSK	GFSK	QPSK
RF Raw Data Rate	1 Mbps	1 Mbps	250 Kbps
Frequency Channels	125	79	16
External System Resources	None	250k	28k
Supported Network Types	Star, Peer-to-Peer	Peer-to-Peer	Star, Peer-to-Peer
RF Node configuration (Minimum)	Transmitter or transceiver	Transceiver	Transceiver

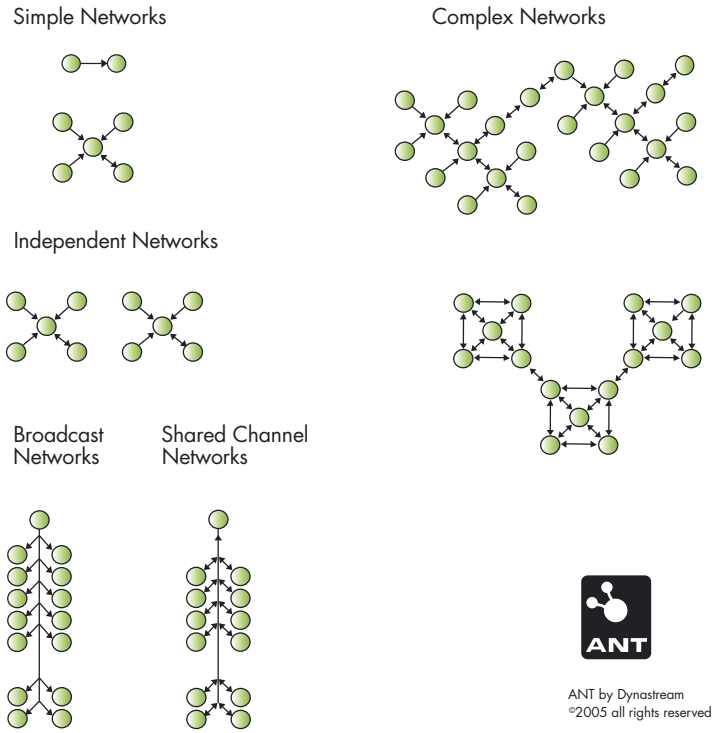
DYNASTREAM™ TECHNOLOGY PLATFORM

Implementation

The nRF24AP1, a 2.4GHz transceiver with a complete embedded ANT protocol stack, is an integrated single chip wireless solution. With the nRF24AP1 new and existing products can be quickly and easily implemented as real-time wireless product applications. The nRF24AP1 interfaces to a system through a serial interface enabling straight-forward system integration. A low-cost MCU for the software application, a sensor, display or other input/output device, a crystal and a few other passive components are all that is required to implement a wireless networked product.



ANT Network Configuration



Features and Benefits

- Single chip transceivers with embedded ANT Personal Area Network protocol
- Drop-in RF + embedded protocol solution resulting in lower development cost and shorter time-to-market
- Ultra-low power consumption
- Extremely low cost Bill of Material (BOM)
- Small size - 5x5mm
- Easy-to-use serial interface
- Performance, range, reliability and security.
- Designed for coin cell battery operation
- Made for volume production - surface mount & RF tested
- Raw RF data rate - up to 1Mbit/sec
- Layout and PCB antenna solution available for free
- Toolkits and technical support
- Compliance with ETSI, FCC and other local regulations
- Star and peer-to-peer network supported
- Adaptive channel communication
- "Green" Pb (lead) free package

nRF24AP1-EVKIT

A general purpose Evkit used to provide the resources necessary for application developers to:

- Evaluate the nRF24AP1 with Embedded ANT protocol solution
- Develop applications using the nRF24AP1 product

nRF24AP1-EVKIT contents

- Two USB/Battery powered ANT Development Boards, with two USB cables
- Two ANT Battery powered Boards
- Four ANT RF Transceiver Modules with embedded protocol
- Four Coin Cell batteries – CR2032
- CD with documentation, software and libraries
  - PC based demonstration application showing the channel set up and communication mode
  - Emulation demonstration of a simple Input/ Output sensor mode of operation
  - Documentation that provides descriptions of the Evkit, Serial Messaging interface, and ANT Transceiver modules
  - ANT PC library files

Wireless connect Wireless control Wireless transfer

NORDIC SEMICONDUCTOR

www.nordicsemi.no e-mail: nRF@nordicsemi.no

Trondheim:
Nordic Semiconductor ASA
Vestre Rosten 81 Phone: +47 72 89 89 00
N-7075 Tiller Fax: +47 72 89 89 89
Norway

Oslo:
Nordic Semiconductor ASA
Hoffsveien 23 Phone: +47 22 51 10 50
P.O. Box 436 Skøyen Fax: +47 22 51 10 99
N-0213 Oslo, Norway

Hong Kong:
Nordic Semiconductor ASA
16/F, Cheung Kong Centre Phone: +852 22 97 23 83
2 Queen's Road Central Fax: +852 22 97 23 40
Hong Kong