

Ultra-Low Power

Ultra-Short Latency

Precise Ranging

Low EMI

High Data Rate

## About us

SPARK Microsystems offers a unique & innovative wireless transceiver technology that achieves **40x better energy efficiency, 60x lower latency, and 10x more data throughput** as compared to BLE.

The SPARK ultra-wideband (UWB) transceiver has low EMI and does not interfere with other radios such as WiFi, BLE, Zigbee, Z-Wave, or cellular. It also provides very high quality of service connectivity.

## About the SR1000 UWB Transceiver Family

The SR1000 UWB transceiver family operates in the license-free UWB spectrum.

The family consists of two transceivers: the SR1010 spanning the 3.1 – 5.75 GHz band and the SR1020 spanning the 6 – 9.25 GHz band. Both chips have identical pinouts and functionalities.

The transceiver can stream data wirelessly from a few kbps to 20 Mbps with ultra-short latency while maintaining an order of magnitude better energy efficiency than other radios such as BLE.

In addition to data transfer, the SPARK transceiver can make accurate distance measurements (i.e., ranging) between two SPARK chips using a robust low power time of flight measurement feature.

## Evaluation Kit Overview

The SPARK SR1000 Series Evaluation Kit demonstrates the capabilities of the SR1000 family of low power, low latency, high data rate radio transceivers through audio streaming, gaming hub functionality, data transfers with predefined patterns, and ranging.

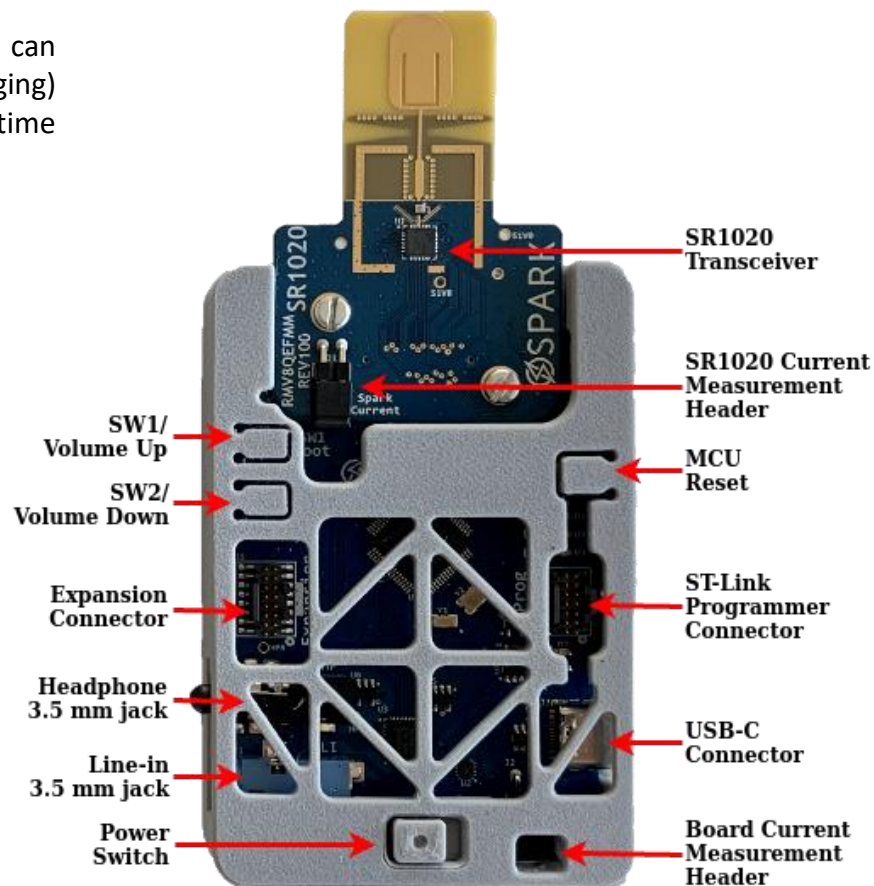
The evaluation board leverages an ARM-based STM32G4 microcontroller to communicate with the SR1010 or SR1020 transceiver and the provided software application.

The intended purpose is to demonstrate the unique qualities of the SR1000 transceiver family in terms of data rate, power consumption, and latency according to different configurable presets.

The kit can also be used for development with an available API.

## Specifications

- ARM Cortex-M4 MCU
- Detachable SPARK RF module
- Capable of multi-Mbps data streaming
- Link quality monitor to plot link statistics
- Built in audio input / output for uncompressed high-fidelity audio streaming demo
- Stats mode: evaluate link quality of typical profiles
- Advanced mode: test all configurations of the wireless link
- Ranging mode: test the time of flight ranging capability
- Gaming hub mode: mimic controllers and audio headset in a unified star network
- USB interface
- Expansion header for custom application testing
- API support for application development



## SR1000 Application Programming Interface

### Overview

The SR1000 Application Programming Interface (API) can be used to develop various applications that need ultra-low-power, low-latency, and high-performance wireless communications. The API has everything a user needs to establish a communication link between two SR1000 UWB transceivers for robust data exchange or time-of-flight ranging. Typical applications are wireless sensor nodes, data streaming and ranging measurements.

Even the most basic of microcontrollers can be used to drive a SR1000 Series transceiver, if it has a SPI bus, some spare GPIOs, a timer and an external interrupt pins.

If a complex network topology is needed for a given application, one can use their own network stack on top of this API, as the API's primary focus is the control of the transceiver.

### Binary

A standard API package includes source code of an example application and a binary for the SR1000 API for use with any ARM Cortex M4 processor. Should you need a binary for another processor type please contact SPARK Microsystems.

### Quick Start Guide

The API comes with a Quick Start guide and example code to help setup basic application functions like a pair of sensor nodes.

### Examples Included

#### Blinky Example

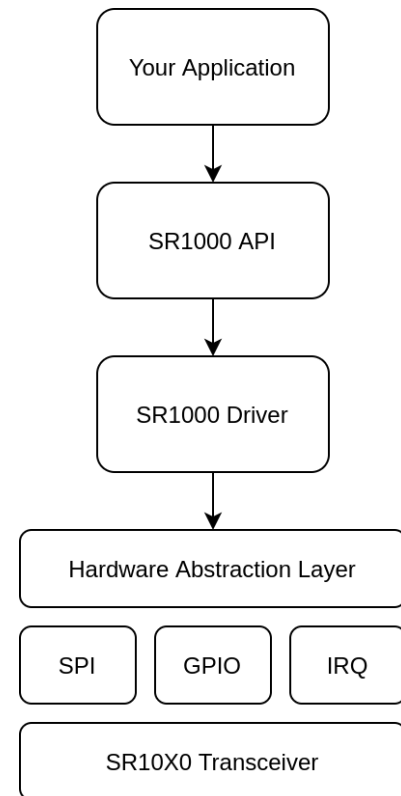
Each board transmits a frame every 500 ms and then puts itself in receiver mode for a maximum of 500 ms. When a board receives a frame, it toggles its LED and puts the radio to sleep until the next transmission.

#### Ranging Example

Every 10 ms, the master sends a frame and waits for the slave's auto reply. After data exchanges, the master calculates the distance between itself and the slave.

### Structure

The below block diagram shows the different layers of a project using the SR1000 API. On top, there is the user's application (examples included). The application makes calls to the API. The SR10X0 Driver takes care of the low-level control of the transceiver. The API wraps the user's application needs into convenient functions. The SR10X0 Driver then makes use of the Hardware Abstraction Layer to access the MCU's peripherals, such as the SPI bus, to access the transceiver's registers.



### SPARK Wireless Protocol Stack API

(Coming soon) This API will allow developers to readily create time-synchronized point-to-point and star networks using the SR1000 Series transceiver with high-performance ACK-based communications for high-reliability connectivity, leveraging the unique low-power and low-latency properties of the SR1000 Series transceiver, and its robust high payload connectivity capabilities.

## SPARK Transceiver Specifications

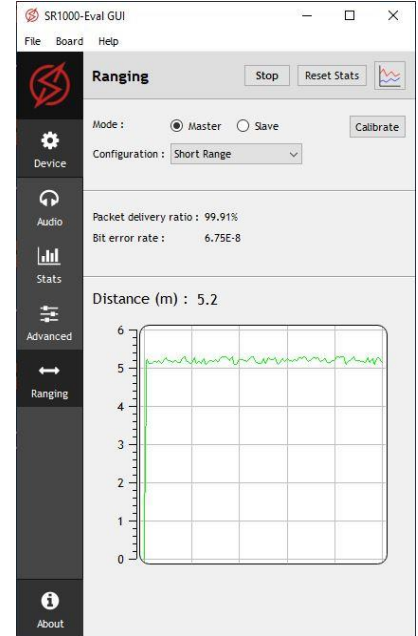
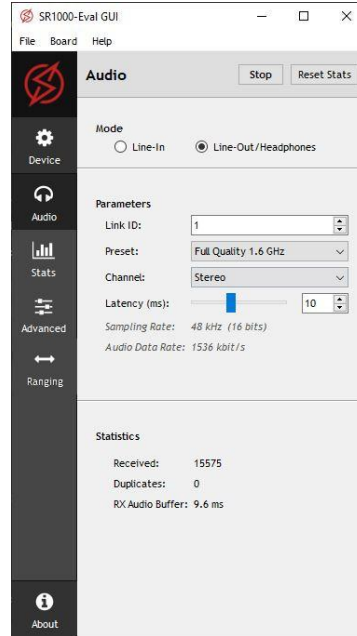
- Dynamically reconfigurable UWB spectrum with up to 3 GHz of bandwidth
  - SR1010: 3.1 – 5.75 GHz band
  - SR1020: 6 – 9.25 GHz band
  - Up to 10 dBm peak TX power
- Ultra-short latency: 50  $\mu$ s airtime for 1 kb
- High quality of service
  - Capable of 3 ms audio latency for uncompressed 48 kSps 16-bit stereo audio streaming (1.54 Mbps payload)
- Scalable data rate up to 20.48 Mbps
- Time of flight-based distance measurement capability
  - 30 cm line of sight accuracy from 0.5 to 100 m
- Ultra-low power consumption
- Down to 0.25 nJ/bit TX energy efficiency and 1.15 nJ/bit RX energy efficiency
  - Sub-mW TX at 2.83 Mbps and sub-mW RX at 0.85 Mbps
  - Energy efficient operation down to a few kbps
  - 55 nA hibernate, 750 nA deep sleep (w/ synch)
  - 1.7 to 3.6 V supply
- Coexistence and non-interference with BLE / WiFi (2.4 & 5 GHz) and cellular
- 50 m range @ 5.5 Mbps; 100 m range @ 600 Kbps
- Low power/cost timing using a 32.768 kHz XTAL
- Industrial operating range: -40 to +85 °C
- Compact 4 x 4 mm 28 pin QFN
- SPI Interface



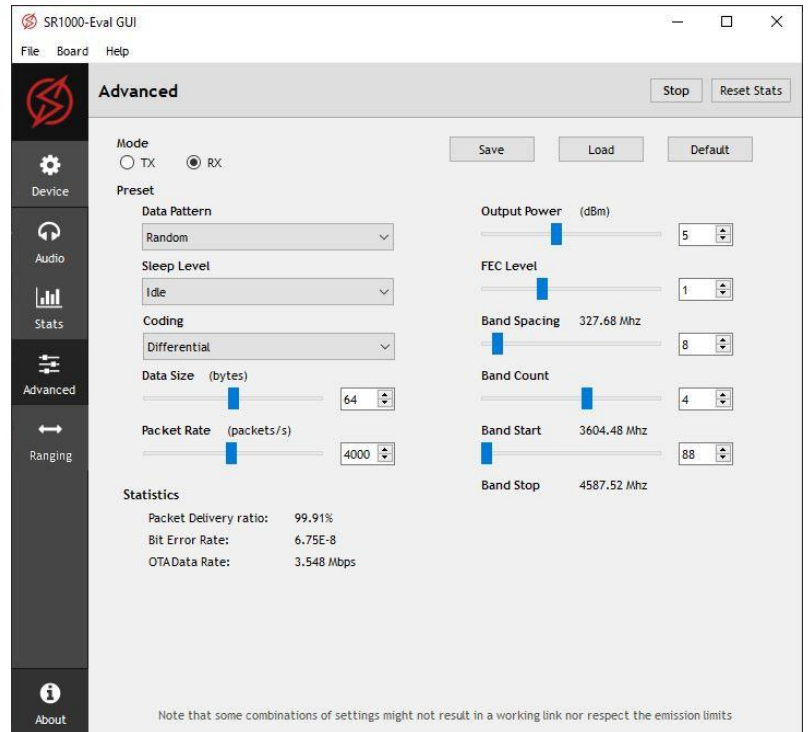
4 x 4 mm SR1020 chip



SR1020 module with monopole antenna



Evaluation kit interface in audio mode (left) and ranging mode (right)



## About SPARK Microsystems

SPARK Microsystems is a fabless semiconductor company that is leading the way towards ultra-low power wireless communications for the Internet of Things revolution. With its patented technologies, SPARK Microsystems is bringing to market a high performance wireless transceiver that allows for orders of magnitude improved power consumption and latency while providing higher data rates than competing technologies. For more information, please visit [www.sparkmicro.com](http://www.sparkmicro.com).

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