

SUMMARY:

This document contains the operational description for the Bluetooth radio design implemented by Eyenovia, Inc. The guide specifically references the design for the nRF51x22 radio module.

OPERATIONAL DESCRIPTION:

The nRF51 series devices employ Nordic Semiconductor's 3rd generation 2.4 GHz radio architecture. This radio uses narrow-band GFSK modulation and is frequency adaptable across the 2.4 GHz ISM band. A 2450AT18B100E surface mount 2.4Ghz, 0.5dBi chip antenna, paired with a 2450BM14E0003T 2.45 GHz Impedance Matched Balun-Filter, provides and receives signal to the Nordic nRF51x22 MCU. Programmable gain control, modulation, and byte synchronization are performed digitally.

The nRF51 series ultra-low power 2.4 GHz GFSK RF transceiver is designed and optimized to operate in the worldwide ISM frequency band at 2.400 GHz to 2.4835 GHz. Configurable radio modulation modes and packet structure makes the transceiver interoperable with Bluetooth low energy (BLE) (Bluetooth 4.2), ANT™, Gazell, Enhanced Shockburst™, and a range of other 2.4 GHz protocol implementations. The RADIO implements EasyDMA (Direct Memory Access) for reading and writing of data packets from and to the RAM without CPU involvement. The radio implements a mechanism for measuring the power in the received radio signal. This feature is called Received Signal Strength Indicator (RSSI).

The final radio frequency amplifying devices for normal operation over the provided power range is comprised of the Nordic nRF51x22 MCU which is powered by 3V LDO from a single cell 3.7V Li-Po battery. The radio current consumption DC-DC at 3V for TX at +4dBm output power is 10.5mA, for TX at 0dBm output power is 8.06mA, and for RX at 1Mbps is 9.7mA.

For operation of the Nordic nRF chip, an external 16MHz 8pF crystal oscillator and external 32.768 kHz 12.5pF crystal oscillator were utilized to support the clock control and overall function. Transceiver consists of a small matching network that is used for impedance matching with the antenna and suppress the spurious radiation. Custom PCB is enclosed in device subshell and is inaccessible to user.