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Abstract

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 Products described in this Guide have US patents and patents pending.

SRU233 Module

01.01.02 Operational Guide

**This document contains Confidential Information regarding Operational characteristics for:**

**In US FCC ID: 2AEHJSRU232**

**In Canada IC: 20053-SRU232**

**This document is supplementing:**

1. **Block Diagram Flow Guide (confidential)**
2. **User’s Manual**
3. **Schematics (confidential)**

**The Information contained here within is considered confidential subject to terms and conditions of confidentiality statement.**

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# Scope

The purpose of this document is to detail the specific specialized information regarding construction means of the Model SRU233 module:

* In US FCC:
* In Canada IC:

# Key Features of the Nordic Semiconductor nRF51422

* Industry leading wireless range from integrated chip antenna

• Built in nRF51422 single-chip 2.4GHz Bluetooth Low Energy system on a chip

• Full supports with Bluetooth 4.0, Bluetooth Smart, BLE, ANT and soft devices

• Bluetooth Compliant Transmit Power: +4 dBm

• Maximum Transmit Power: +4 dBm

• Maximum range: 175meters LOS

* RF Receive Sensitivity (BLE): -93 dBm RF Receive Sensitivity (ANT): -90dBm

• Miniature Size: 13mm x 18mm x 2.5mm

• Operating Voltage: 2.0V to 3.6V

• Operating temperature: -40 C to +85o C

• Integrated ARM® Cortex® M0 32-bit micro-controller

• Memory: 256KB Flash, 16/32 KB RAM

• 8 Configurable ADC Channels

• 16 bit and 32 bit timers

• SPI Master/Slave, I2C, UART

• Low power comparator

• Temperature Sensor

• CPU Independent Programmable Peripheral Interconnect (PPI)

• Quadrature Decoder (QDEC)

• AES hardware encryption

• Real Time Counter (RTC)

• RoHS compliant

• Supports maximum Bluetooth data rates over HCI UART interface

# Application for the module:

Below is the example for Embedded Wireless applications.

Note: All applications must adhere to the minimum 20 cm separation details as defined by the RF exposure statement enclosed in the User Guide document.

• High security remote controls

• Home and Building Automation

• iBeacon

• Industrial Control Application

• Medical (Ex. Heart Rate Monitor, Blood Pressure Sensor, Blood Glucose Meter)

• Thermometer

• Flood Alarm

• Heating Control

• Automatic Key Control

• Industrial Sensors

• Toys

• Entertainment Devices

• Mobile Accessories

• All Bluetooth Low Energy Wireless Applications

• Breaks down connectivity barriers imposed by Zigbee promoting the Internet of Things

• Get to market fast with industry leading disruptive long range Bluetooth Low Energy Technology

# Description for the module

* SRU233 is a single mode Bluetooth Low Energy (Bluetooth Smart) module.
* It has +4 dBm Tx Power and -93 dBm for RF Rx (BLE) and -90 dBm for RF Rx (ANT) sensitivity, which has best in-class Radio Frequency performance and provides long-range connectivity up to 175 meters with iOS device under Line of Sights.
* SRU233 can integrates all the require features for Bluetooth Smart applications e.g. Bluetooth Radio, Software Stack and GATT based profiles.
* It contains ARM® Cortex M0 ® processor with 256KB flash memory therefore no external micro-controller is required for size, price and power constrained devices.

# Operation of module including part numbers

SRU233 module contains following: (confidential)

## 5.1 Nordic nRF51422 :

The SRU233 module is a power-optimized true system-on-chip (SoC) solution for Bluetooth Low Energy, ANT or proprietary 2.4-GHz applications. The processor combines the excellent performance of a leading RF transceiver with an industry-standard a 32 bit ARM® CortexTM-M0 CPU, with 256K Flash, 16KB/32KB RAM and many other powerful supporting features and peripherals.

## 5.2 Crystal 16MHz:

16MHz crystal is source of Main Clock freq. of system. It is Ultra Miniature size low profile SMD crystal. This crystal is shielded by metal shield so that it will not export any high frequency from the module. During RF transceiver this clock is enabled.

Specification: (confidential)

|  |  |
| --- | --- |
| Part | **16 MHz Crystal** |
| Frequency Stability | +/-30ppm |
| Frequency Tolerance | +/-20ppm |
| Load Capacitance | 10pF |
| Motional Resistance(ESR) | 80 Ohm |

## 5.3 SLOW CLOCK (32 KHZ) SOURCE REQUIREMENTS

Two 32-kHz oscillators are available in the device as clock sources for the 32-kHz clock:

• 32-kHz XOSC – External Crystal Oscillator

• 32-kHz RCOSC – Internal RC Oscillator

By default, after a reset, the 32-kHz RCOSC is enabled and selected as the 32-kHz clock source. The RCOSC consumes less power, but is less accurate compared to the 32-kHz XOSC. The chosen 32-kHz clock source drives the Sleep Timer, generates the tick for the Watchdog Timer, and is used as a strobe in Timer 2 to calculate the Sleep Timer sleep time. The crystal is required for accurate sleep timing, so it is only needed to for the module be BLE certified when using low power modes.

User can connect external 32 KHz crystal on Pin# 20 and 21 of SRU233 for accurate clock, if required. This clock is not used for Radio frequency generation

This clock is not used for radio frequency generation.

Specification of External 32 KHz Crystal

|  |  |
| --- | --- |
| **Part** | **32 KHz Crystal** |
| Frequency Stability | +/‐30ppm |
| Frequency Tolerance | +/‐20ppm |
| Load Capacitance | 10pF |
| Motional Resistance(ESR) | 70 kOhm |

## 5.4 Impedance Matching Network:

Capacitor and Inductor are used for impedance matching between the Antenna and the RF front end.

## 5.5 Chip Antenna (ACA-102-T):

Chip Antenna constructed from solid dielectric ceramic material

Suitable for RoHS compliant reflow

Gain 3D 0.60 (Peak), -3.48 (Average) [dBi]

VSWR 1.0 ~ 2.6 : 1

Non Ground Mounting type

Linear Polarization

Matched to 50 Ohm

## 5.6 Power Supply:

Pin#24, 25 are VCC pins and it supply range is between 2.0V-3.6V and Pin #13, 14, 15, 16, 19 and Pin #43 are GND pins of Module.

Vcc is given to supply power through pin #24 and 25 via LC Filter that is reduced high frequency noise and give stable and noise free power.

Ferrite bead and Ceramic capacitors are used in the LC filter. This filter is connected between the power supply pin and the power supply feed point of module. This filter will block high freq. noise in power supply and provide stability against EMI noise.

## 5.7 Metal Shield:

A Nickel Silver metal cover is used for shielding of processor and crystals. Shield is directly connected to GND plane which will restrict emission of any high freq. that may be generated from the module. Its specification is below:

Specification:

|  |  |
| --- | --- |
| Maximum Overall Dimension | 11.7 mm X 13.85 mm |
| Maximum Overall Height | 1.50 mm |
| Material Thickness | 0.20 mm |
| Material | Nickel silver C77000 ½ hard |

# Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| **Revision** | **Date** | **Author** | **Modification/Remarks** |
| 01.01.01 | 04/08/2015 | Kinjal | Initial release for module SRU233 |
| 01.01.02 | 14/08/2015 | Mitesh | Change VCC and Ground pin detail and Crystal detail |