Features

- **STEVAL-BCN002V1B** evaluation kit with STEVAL-BCN002V1 sensor board and STEVAL-BCN002V1D programming board.
- **STEVAL-BCN002V1** sensor board:
  - BlueNRG-2: Bluetooth Low Energy single-mode system-on-chip
  - LSM6DSO: iNEMO 6DoF inertial module, ultra-low power and high accuracy
  - LIS2MDL: magnetic sensor, digital output, 50 gauss magnetic field dynamic range, ultra-low power, high performance, 3-axis magnetometer
  - VL53L1X: long range Time-of-Flight sensor based on ST FlightSense technology
  - MP34DT05TR-A: MEMS audio sensor omnidirectional digital microphone, 64 dB SNR, -26 dBFS sensitivity, top-port, 122.5 dBSPL AOP
  - LPS22HH: ultra-compact piezo-resistive absolute pressure sensor, 260-1260 hPa, digital output barometer, full-mold dust resistant, holed LGA package (HLGA)
  - HTS221: capacitive digital sensor for relative humidity and temperature
  - CR2032 battery powered (not included)
- **STEVAL-BCN002V1D** programming board:
  - program and debug firmware running on sensor board
  - supply power to the sensor board
- **ST BLE Sensor** app available on Android (Google Play) and iOS (iTunes)
- **Target Applications:**
  - Internet of Things, Smart Building, Home and City
  - Tracking System, Supply Chain/ Cold-Chain Management
  - Smart Agriculture (soil control, animal activity tracking, etc.)

Description

The **STEVAL-BCN002V1B** Bluetooth LE enabled sensor node development kit features the **STEVAL-BCN002V1** multi-sensor board based on BlueNRG-2 SoC Bluetooth Low Energy application processor. This sensor board has accelerometer, gyroscope, magnetometer, pressure, humidity, Time-of-Flight and microphone sensors, and is powered by a common CR2032 coin battery.

The sensor board communicates with a Bluetooth LE enabled smartphone running the **ST BLE Sensor** app, available on Google Play and iTunes stores.

The **STEVAL-BCN002V1D** adapter board is used to program and debug the sensor board. The adapter board is powered via USB.
1 Component layout

Figure 1. STEVAL-BCN002V1 sensor node front and rear components

1a. BlueNRG-2 Bluetooth 5.0 network and application processor
1b. BALF-NRG-02D3 integrated balun and matching network
2a. LPS22HH ambient pressure sensor
2b. LSM6DSO smart accelerometer and gyroscope
2c. LIS2MDL magnetometer
2d. VL53L1X proximity by time-of-flight
2e. HTS221 relative humidity and temperature
2f. MP34DT05-A top-port digital microphone
3a. User button
3b. RGB LED
4a. I2C SCL
4b. I2C SDA
4c. GND
4d. ADC
4e. TEST
4f. VDD
4g. GND
4h. RFTEST
5a. J-link (not mounted)
5b. SMD antenna
6a. Inductor to enable lowest power BLE active mode
6b. 32kHz crystal to enable lowest power BLE sleep mode
7a. Battery holder
7b. CR2032 battery (not included)
8. 10-pin connector
FCC ID: S9NSTEBCN2V1 IC ID: 8976C-STEBCN2V1
Figure 2. STEVAL-BCN002V1D host board for programming and debugging

Top side components:
1. ST-LINK V3 debugger
2. 20 pin JTAG/SWD for ext. ST-LINK V2

Bottom side components:
1. VCOM for STM32L151
2. 5 pin JTAG/SWD for Nucleo ST-LINK
2 Schematic diagrams
2.1 STEVAL-BCN002V1 sensor board schematics

Figure 3. STEVAL-BCN002V1 schematic (1 of 3)

Bluetooth low-energy chip
Figure 4. STEVAL-BCN002V1 schematic (2 of 3)

- **VL53L1CBV0FY**
- **BLM15GG471SN1D**
- **L4**
- **VDD**
- **GND**
- **LSM6DSO**
- **1**
- **SCL P2**
- **VDD P1**
- **I2C_SDA**
- **INT_COM**
- **INT_3X**
- **BOOT**
- **V+**
- **V+**
- **PDM_CLK**
- **U10**
- **P6**
- **VDD**
- **V+**
- **PDM_DATA**

- **Decoupling / Filtering**

- **Digital Microphone**

- **Magnetometer**

- **Proximity**

- **Pressure**

- **Accelerometer / Gyroscope**
Figure 5. STEVAL-BCN002V1 schematic (3 of 3)

Test points

- P1
- P1P2
- P2P3
- P3P4
- P4P5
- P5P6
- P6P7
- P7P8
- P8P9
- P9P10

Connectors:

- ARM10 debug connector

Components:

- ADC
- VDD
- TEST1
- I2C_CLK
- I2C_SDA
- GND

Pull-ups

- I2C_SDA
- I2C_CLK

Push button

- UART_RX
- UART_TX
- BOOT

I2C

- SCL
- SDA

Battery

- CR2032 3 V battery
2.2 STEVAL-BCN002V1D programming board schematics

Figure 6. STEVAL-BCN002V1D schematic (1 of 3)

Voltage Regulator
USB ESD Protection
Micro USB Connector
STM32L1 VCOM Interface
Crystal and Bypass capacitors

STM32L151CBT6
STM32L1 VCOM Interface

Voltage Regulator
Figure 7. STEVAL-BCN002V1D schematic (2 of 3)

- STM32L1 Debug Connector
- BlueTile Debug Connector
- JTAG Debug Connector
- Nucleo STLink SWD Connector
- Nucleo STLink UART connector
- Pogo pin
- GND
- Anchor Connectors
- Nucleo STLink UART connector
- Anchor Connector
- U4
- U5
- Reset Button
- JTAG Debug Connector
Default configuration allow user to:

1) If PLUGGED on a NUCLEO STLink:
   - Hardware modification: populate R6 and R8 with 0 ohm
   - Programming: using Nucleo STLink mini USB
   - Virtual COM: using Nucleo STLink mini USB; both SW3 and SW2 must be in (P1-P2) position

2) If using an EXTERNAL JTAG debugger:
   - Programming: using JTAG connector on top
   - Virtual COM: using micro USB connector on the bottom; both SW3 and SW2 must be in (P2-P3) position

3) If using the INTEGRATED USB to UART interface:
   - Programming: using micro USB connector on the bottom and only using BlueNRG-1 Flasher Utility
   - Virtual COM: using micro USB connector on the bottom; both SW3 and SW2 must be in (P2-P3) position

4) If using the INTEGRATED ST-LINK/V3:
   - Hardware modification: populate R4 and R14 with 0 ohm
   - Programming: using ST-LINK/V3 SWD
   - Virtual COM: using ST-LINK/V3 micro USB; both SW3 and SW2 must be in (P1-P2) position
3 How to set up the STEVAL-BCN002V1D board

Use the configurations below to set up the STEVAL-BCN002V1D board according to your requirements.

If plugged on a NUCLEO ST-LINK board:

Step 1. Place 0 Ω resistors (short) on R6 and R8.
Step 2. For programming: load the firmware via the NUCLEO ST-LINK mini USB connector.
Step 3. For virtual COM: use the NUCLEO ST-LINK mini USB connector. SW3 and SW2 can be in any position.

If using an external JTAG debugger:

Step 4. For programming: use the JTAG connector on the top side of the STEVAL-BCN002V1D board.
Step 5. For virtual COM: use the micro USB connector on the bottom side of the STEVAL-BCN002V1D board. SW3 and SW2 can be in any position.

If using the integrated USB to UART interface:

Step 6. For programming: use the micro USB connector on the bottom and use the BlueNRG-1 Flasher Utility only.
Step 7. For virtual COM: use the micro USB connector on the bottom side of the STEVAL-BCN002V1D board. Both SW3 and SW2 must be in (P2-P3) position.

If using the integrated ST-LINK/V3:

Step 8. Place 0 Ω resistors (short) on R4 and R14.
Step 9. For programming: use the ST-LINK/V3 SWD.
Step 10. For virtual COM: use the ST-LINK/V3 micro USB. Both SW3 and SW2 must be in (P1-P2) position.
4 Certification

4.1 Regulatory compliance

Table 1. RF certification summary

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<tr>
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<th>Comment</th>
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<td>S9NSTEBCN2V1 (PENDING)</td>
<td>On-board SMD antenna</td>
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<tr>
<td>IC</td>
<td>8976C-STEBCN2V1 (PENDING)</td>
<td>On-board SMD antenna</td>
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<td>ETSI</td>
<td>0051-RED-0010 REV.0 (PENDING)</td>
<td>On-board SMD antenna</td>
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4.2 FCC and IC

The STEVAL-BCN002V1B kit has been tested and complies with the FCC part 15 and IC RSS-210 regulations. These limits are designed to provide reasonable protection against harmful interference in approved installations. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:
1. The device must not cause harmful interference.
2. The device must accept any interference received, including interference that may cause undesired operation.

Modifications or changes to this equipment not expressly approved by the party responsible for compliance may render void the user's authority to operate this equipment.

4.3 CE

STEVAL-BCN002V1B kit complies with the following European EMI/EMC and safety directives and standards:
- EN 300 328 V 2.1.1 (2016-11) (a)
- ETSI EN 301 489-17 V3.1.1 (2017-02) (b)
- ETSI EN 301 489-1 V2.1.1 (2017-02) (c)
- EN 62479:2010

The module has the CE marking:

![CE marking]

The module has obtained the RED certificate: No. 0051-RED-0010 REV. 0

The certified module production firmware release is: 1.X

For additional information please refer to:
STMicroelectronics Via C. Olivetti, 2 Agrate Brianza 20864 (ITALY)
## Revision history

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<td>06-Aug-2018</td>
<td>1</td>
<td>Initial release.</td>
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<tr>
<td>07-Aug-2018</td>
<td>2</td>
<td>Minor text changes.</td>
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<tr>
<td>18-Oct-2018</td>
<td>3</td>
<td>Updated Section 2 Schematic diagrams.</td>
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<td>13-Nov-2018</td>
<td>4</td>
<td>Updated cover page image.</td>
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<td>Updated Figure 1 and Figure 2.</td>
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<tr>
<td>06-Feb-2019</td>
<td>5</td>
<td>Updated title.</td>
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<td>Added references to STABLESensor app.</td>
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<td>04-Mar-2019</td>
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<td>Minor text edits</td>
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<td>Added Section 2.2 STEVAL-BCN002V1D programming board schematics</td>
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