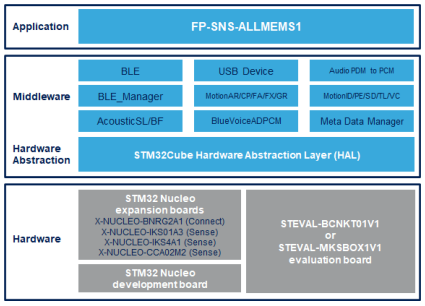
FP-SNS-ALLMEMS1

Data brief

STM32Cube function pack for IoT node with Bluetooth® Low Energy connectivity, digital microphone, environmental, and motion sensors



STM32 Open Development Environment

Product summary	
STM32Cube function pack for IoT node with Bluetooth® Low Energy connectivity, digital microphone, environmental, and motion sensors	FP-SNS-ALLMEMS1
Motion MEMS and environmental sensor expansion board for STM32 Nucleo	X-NUCLEO-IKS4A1/ X-NUCLEO-IKS01A3
Bluetooth® Low Energy expansion board based on the BLUENRG-M2SP module for STM32 Nucleo	X-NUCLEO-BNRG2A1
Digital MEMS microphone expansion board based on MP34DT06J for STM32 Nucleo	X-NUCLEO-CCA02M2
BlueCoin starter kit	STEVAL-BCNKT01V1
Multisensor kit with portable	STEVAL-MKSBOX1V1

Features

- Complete firmware to develop an IoT node with Bluetooth® Low Energy connectivity, digital microphone, environmental, and motion sensors
- Middleware libraries for sensor data fusion, accelerometer-based real-time activity recognition, carry position, gesture recognition, motion intensity recognition, user current pose recognition, working mode recognition, tilt angles evaluation, vertical movement detection, fitness activities quantity repetition, acoustic source localization and beam forming, audio processing and streaming over Bluetooth® Low Energy communication profile, SD card data logging
- Compatible with STBLESensor or STBLESensClassic application for Android/ iOS, to perform sensor data reading, audio and motion algorithm feature demo, and firmware update over the air (FOTA)
- Sample implementation available for STEVAL-BCNKT01V1 and STEVAL-MKSBOX1V1 boards and for X-NUCLEO-CCA02M2, X-NUCLEO-IKS4A1 (or X-NUCLEO-IKS01A3) and X-NUCLEO-BNRG2A1 connected to a NUCLEO-F446RE or NUCLEO-L476RG boards
- Easy portability across different MCU families, thanks to STM32Cube
- Free, user-friendly license terms

Description

FP-SNS-ALLMEMS1 is an STM32Cube function pack, which lets you connect your IoT node to a smartphone via Bluetooth® Low Energy and use a suitable Android™ or iOS™ application, like the STBLESensor or STBLESensClassic app, to view real-time environmental sensor data, motion sensor data, digital microphone levels, and battery level.

The package also enables advanced functions such as voice communication over Bluetooth® Low Energy, sound source localization, and acoustic beam forming using inputs from multiple microphones, as well as sensor data fusion and accelerometer-based real-time activity recognition, carry position, gesture recognition, motion intensity recognition and audio data logging.

Moreover, it provides real-time information about the user current pose based on data from a device, working mode (sitting/standing desk position), the device tilt angles, the repetitions of various fitness activities performed and the vertical movement.

This package, together with the suggested combination of STM32 and ST devices, can be used to develop specific wearable applications, or smart things applications in general.

The software runs on the STM32 microcontroller and includes all the necessary drivers to recognize the devices on the STM32 Nucleo development board and expansion boards, as well as on the STEVAL-BCNKT01V1 and STEVAL-MKSBOX1V1.

The software is also available on GitHub, where the users can signal bugs and propose new ideas through [Issues] and [Pull Requests] tabs.

Product summary	
sensor box and smart sensor app	
BLE sensor application for Android and iOS	STBLESensor
BLE Sensor Classic application for Android and iOS	STBLESensClassic
Applications	Factory Automation Cloud Connectivity Smart Farming Tracking

1 Detailed description

1.1 What can you do with STM32Cube function packs?

STM32Cube function packs leverage the modularity and interoperability of STM32 Nucleo and X-NUCLEO boards together with STM32Cube and X-CUBE software to create function examples for some of the most common use cases of different application technologies.

These software function packs are designed to exploit the underlying STM32 ODE hardware and software components as much as possible to best satisfy the requirements of final user applications.

Moreover, function packs may include additional libraries and frameworks that are not present in the original X-CUBE packages, thus enabling new functionalities allowing real and usable system for developers.

1.2 What is STM32Cube?

STM32Cube is a combination of a full set of PC software tools and embedded software blocks running on STM32 microcontrollers and microprocessors:

- STM32CubeMX configuration tool for any STM32 device; it generates initialization C code for Cortex-M cores and the Linux device tree source for Cortex-A cores
- STM32CubeIDE integrated development environment based on open-source solutions like Eclipse or the GNU C/C++ toolchain, including compilation reporting features and advanced debug features
- STM32CubeProgrammer programming tool that provides an easy-to-use and efficient environment for reading, writing and verifying devices and external memories via a wide variety of available communication media (JTAG, SWD, UART, USB DFU, I2C, SPI, CAN, etc.)
- STM32CubeMonitor family of tools (STM32CubeMonRF, STM32CubeMonUCPD, STM32CubeMonPwr) to help developers customize their applications in real-time
- STM32Cube MCU and MPU packages specific to each STM32 series with drivers (HAL, low-layer, etc.), middleware, and lots of example code used in a wide variety of real-world use cases
- STM32Cube expansion packages for application-oriented solutions.

1.3 How does this software complement STM32Cube?

This software is based on the STM32CubeHAL. It extends STM32Cube by providing a board support package (BSP) for the BlueNRG-MS and BlueNRG-2, sensor expansion board, and middleware components for communication with other Bluetooth® Low Energy devices, for sensor data fusion, real-time audio library and voice communication over Bluetooth® Low Energy.

The package contains audio libraries (AcousticBF, AcousticSL, and BlueVoiceADPCM) and motion sensor libraries (MotionAR, MotionCP, MotionFA, FusionFX, MotionGR, MotionID, MotionPE, MotionSD, MotionTL, MotionVC) useful for sensing applications based on Bluetooth® Low Energy communication.

The motion algorithms are managed through special software designed for mobile and wearable applications and are strictly limited to work with accelerometer and pressure data only, to facilitate low power consumption strategies commonly required in these applications, in compliance with Bluetooth specifications.

The provided drivers abstract low-level hardware details, so middleware components and applications can access the sensors in a hardware-independent manner.

The package includes a sample application to transmit the values read from all the sensors to a Bluetooth low energy-enabled device such as an Android™ or iOS™.

The STBLESensor or STBLESensClassic Android/iOS application, available on the respective application stores, displays the values read from the sensors. The application also allows firmware update over the air as well as displaying battery information.

The STEVAL-MKSBOX1V1 board goes in shutdown mode if it is not connected to an Android/iOS device for a period longer than a fixed range time.

Related links

Visit the X-CUBE-MEMS1 web page on www.st.com for further information on the motion sensor libraries

Visit the X-CUBE-MEMSMIC1 web page on www.st.com for further information on AcousticBF and AcousticSL audio libraries

Visit the FP-AUD-BVLINK1 web page on www.st.com for further information on BlueVoiceADPCM audio library

Revision history

Table 1. **Document revision history**

Date	Version	Changes
12-Apr-2016	1	Initial release.
13-Jun-2016	2	Updated cover page image. Updated cover page features and description.
12-Oct-2016	3	Added reference to Gas Gauge for STEVAL-STLKT01V1
15-Dec-2016	4	Added X-NUCLEO-IKS01A2 expansion board support information
08-May-2017	5	Updated cover page image, features and description. Updated How does this software complement STM32Cube?
03-July-2017	6	Minor text and formatting changes. Updated cover page image, features and description.
19-Oct-2017	7	Updated cover page image, features, description and How does this software complement STM32Cube?
29-Jan-2018	8	Updated cover page image and How does this software complement STM32Cube?
01-Oct-2019	9	Updated cover page image. Added STEVAL-MKSBOX1V1, X-NUCLEO-IKS01A3 and STBLESensor compatibility information.
28-May-2020	10	Updated cover page image, features, product summary table and Section 1.3 How does this software complement STM32Cube?. Added X-NUCLEO-BNRG2A1 and X-NUCLEO-CCA02M2 compatibility information.
07-Mar-2022	11	Updated cover page description and How does this software complement STM32Cube?. Minor text changes.
22-Sep-2023	12	Added references to GitHub and to X-NUCLEO-IKS4A1. Updated Cover image, Features, Description, Product summary and Section 1.3 How does this software complement STM32Cube?.