



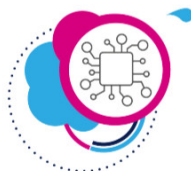
STEVAL-MKSBOX1V1 Wireless Multi Sensor User Manual

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STEVAL-MKSBOX1V1

SensorTile.box wireless multi-sensor development kit with a user-friendly app for IoT and wearable sensor applications



Product summary	
Low-voltage local digital temperature sensor	<u>STTS751 – 2.25 V low-voltage local digital temperature sensor – STMicroelectronics</u>
iNEMO 6DoF inertial module	<u>LSM6DSOX – iNEMO inertial module with Machine Learning Core, Finite State Machine and advanced Digital Functions. Ultra-low-power for battery-operated IoT, Gaming, Wearable and Personal Electronics. – STMicroelectronics</u>
3-axis MEMS accelerometer	<u>LIS2DW12 – 3-axis MEMS accelerometer, ultra low power, configurable single/double-tap recognition, free-fall, wakeup, portrait/landscape, 6D/4D orientation detections – STMicroelectronics</u>
Three-axis digital output accelerometer	<u>LIS3DHH – 3-axis accelerometer, ultra high resolution, low-noise, SPI 4-wire digital output, $\pm 2.5g$ full-scale – STMicroelectronics</u>
Digital 3-axis magnetometer	<u>LIS2MDL – Magnetic sensor, digital output, 50 gauss magnetic field dynamic range, ultra-low power high performance 3-axis magnetometer – STMicroelectronics</u>
Digital nano pressure sensor	<u>LPS22HH – High-performance MEMS nano pressure sensor: 260-1260 hPa absolute digital output barometer – STMicroelectronics</u>
MEMS analog bottom port microphone	<u>MP23ABS1 – High performance MEMS audio sensor single ended analog bottom-port microphone – STMicroelectronics</u>
Capacitive digital sensor for relative humidity and temperature	<u>HTS221 – Capacitive digital sensor for relative humidity and temperature – STMicroelectronics</u>
Applications	<u>Cloud Connectivity – STMicroelectronics</u>

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Features

- Easy-to-use app with immediate functionality for the following motion and environmental sensor applications:
 - Pedometer optimized for belt positioning
 - Baby crying detection with Cloud AI learning
 - Barometer / environmental monitoring
 - Vehicle/goods tracking
 - Vibration monitoring
 - Compass and inclinometer
 - Sensor data logger

- Expert Mode with additional sensor app parameter settings
- Compact board with the following high precision sensors:
 - Digital temperature sensor ([STTS751 – 2.25 V low-voltage local digital temperature sensor – STMicroelectronics](#))
 - 6-axis inertial measurement unit ([LSM6DSOX – iNEMO inertial module with Machine Learning Core, Finite State Machine and advanced Digital Functions. Ultra-low power for battery operated IoT, Gaming, Wearable and Personal Electronics. – STMicroelectronics](#))
 - 3-axis accelerometers ([LIS2DW12 – 3-axis MEMS accelerometer, ultra low power, configurable single/double-tap recognition, free-fall, wakeup, portrait/landscape, 6D/4D orientation detections – STMicroelectronics](#) and [LIS3DHH – 3-axis accelerometer, ultra high resolution, low-noise, SPI 4-wire digital output, ±2.5g full-scale – STMicroelectronics](#))
 - 3-axis magnetometer ([LIS2MDL – Magnetic sensor, digital output, 50 gauss magnetic field dynamic range, ultra-low power high performance 3-axis magnetometer – STMicroelectronics](#))
 - Altimeter/pressure sensor ([LPS22HH – High-performance MEMS nano pressure sensor: 260-1260 hPa absolute digital output barometer – STMicroelectronics](#))
 - Microphone / audio sensor ([MP23ABS1 – High performance MEMS audio sensor single ended analog bottom-port microphone – STMicroelectronics](#))
 - Humidity sensor ([HTS221 – Capacitive digital sensor for relative humidity and temperature – STMicroelectronics](#))
 - Ultra-low-power ARM Cortex-M4 microcontroller with DSP and FPU ([STM32L4R9ZI – Ultra-low-power with FPU Arm Cortex-M4 MCU 120 MHz with 2048 kbytes of Flash memory, USB OTG, DFSDM, LCD-TFT, MIPI DSI – STMicroelectronics](#))
- Bluetooth application processor v5.2 ([BlueNRG-M2 – Very low power application processor module for Bluetooth® low energy v5.2 – STMicroelectronics](#)) which replaces the SPBTLE-1S Bluetooth Smart connectivity v4.2 module of the board previous batches
- Programming and debugging interface for professional firmware development

Description

The [STEVAL-MKSBOX1V1 – SensorTile.box wireless multi sensor development kit with user friendly app for IoT and wearable sensor applications – STMicroelectronics](#) (SensorTile.box) is a ready-to-use box kit with wireless IoT and a wearable sensor platform to help you use and develop apps based on remote motion and environmental sensor data, regardless of your level of expertise.

The SensorTile.box board fits into a small plastic box with a long-life rechargeable battery, and the [STBLESensor – BLE sensor application for Android and iOS – STMicroelectronics](#) app on your smartphone connects via Bluetooth to the board and allows you to immediately begin using the wide range of default IoT and wearable sensor applications.

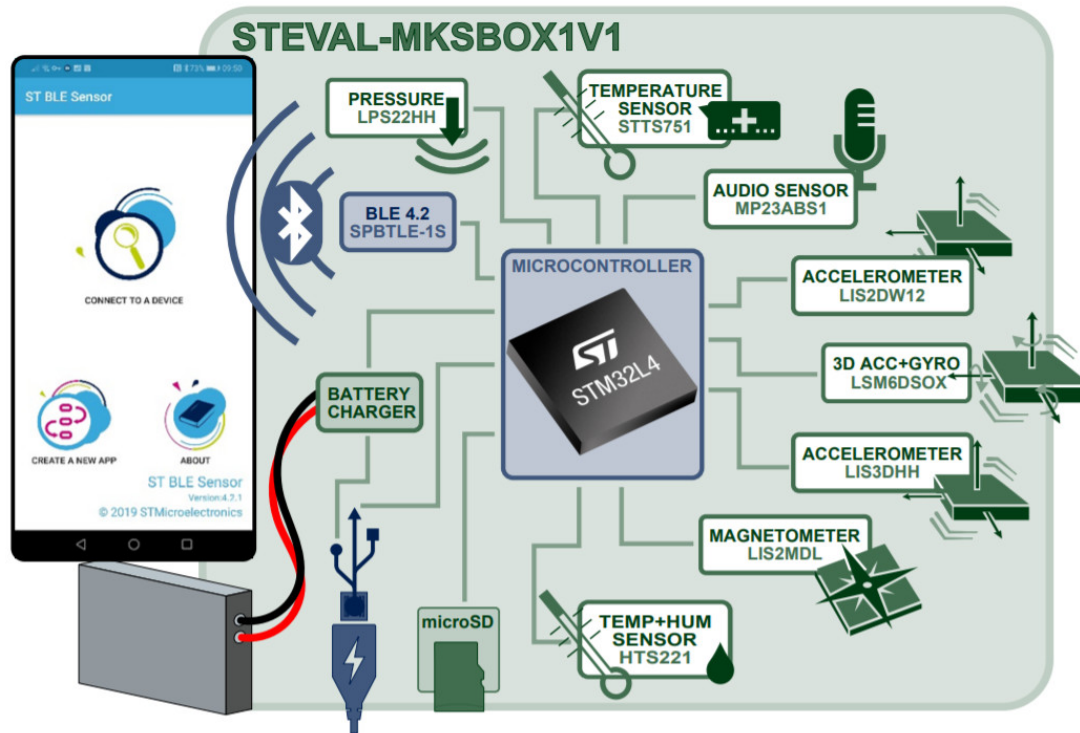
In Expert Mode, you can build custom apps from your selection of SensorTile.box sensors, operating parameters, data and output types, and special functions and algorithms available. This multi-sensor kit, therefore, allows you to design wireless

IoT and wearable sensor applications quickly and easily, without performing any programming.

SensorTile.box includes a firmware programming and debugging interface that allows professional developers to engage in more complex firmware code development using the STM32 Open Development Environment ([STM32 Open Development Environment – STMicroelectronics](#)), which includes a sensing AI function pack with neural network libraries.

Solution overview

Figure 1. SensorTile.box block diagram



Note:

The SPBTLE-1S module has been replaced by the [BlueNRG-M2 – Very low power application processor module for Bluetooth® low energy v5.2 – STMicroelectronics](#) Bluetooth application processor v5.2 in the latest production batches.

The STEVAL-MKSBOX1V1 solution features a board with a wide range of intelligent, low power MEMS sensors recently released by ST, three interface buttons and three LEDs, an STM32L4 microcontroller to manage sensor configuration and process sensor output data, a micro-USB battery charging interface, and an ST Bluetooth Low Energy module for wireless communication with a BLE-enabled smartphone. The kit's small protective shroud and long-life battery render it suitable for testing wearable and remote monitoring and tracking IoT applications.

You can download the free ST BLE Sensor app on your smartphone and almost immediately begin commanding the board with any of the following applications that have been specifically designed to work with the board sensors:

- **Barometer app:** allows you to configure the STTS751 temperature, LPS22HH pressure, and HTS221 humidity sensors to monitor environmental information in real-time on your smartphone, or collect and graph the data against time on a plot screen.
- **Compass and level app:** This allows you to configure the LSM6DSOX accelerometer and gyroscope and LIS2MDL magnetometer sensors to monitor real-time bearing and inclination sensor feedback data and plot the information over time.
- **Step counter app:** allows you to configure the LSM6DSOX accelerometer to monitor your walking and running speeds and plot the information over time.
- **Baby crying app:** This allows you to configure the MP23ABS1 microphone sensor to detect human voice events such as a baby crying and send an alert to your smartphone as well as activate a LED on the sensor board.
- **Vibration monitoring app:** allows you to configure the LSM6DSOX accelerometer and set up your board to "learn" the normal operation of motorized domestic or industrial equipment, and then monitor the same equipment for anomalous vibration for predictive maintenance purposes.
- **Data recorder and vehicle/goods tracking app:** This allows you to select and configure appropriate environmental and motion sensors to log the transportation and storage conditions that selected merchandise

is subject to over time.

- **Compensated magnetometer app:** allows you to build additional apps from the magnetometer output and a sensor fusion algorithm to compensate for disturbances from external magnetic fields

The app and the board support extended functionality in Export Mode, where you can build custom applications by selecting and configuring certain sensors, defining outputs and event triggers, and applying further data processing algorithms.

Revision history

Table 1. Document revision history

Date	Version	Changes
24-Apr-2019	1	Initial release.
03-May-2019	2	Updated cover page features.
06-Apr-2021	3	Added BlueNRG-M2 module compatibility information.

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