

Sensor and DSP algorithm software expansion for STM32Cube

Application	Applications
Middleware	FFT MotionSP
Hardware Abstraction	STM32Cube Hardware Abstraction Layer (HAL)
Hardware	STM32 Nucleo expansion boards X-NUCLEO-IKS01A1 (Sense) X-NUCLEO-IKS01A2 (Sense)
	STM32 Nucleo development board STEVAL evaluation board



Features

- Complete software to build applications using temperature and humidity sensors (HTS221 for both X-NUCLEO-IKS01A1 and X-NUCLEO-IKS01A2), pressure sensor (LPS25HB for X-NUCLEO-IKS01A1 and LPS22HB for X-NUCLEO-IKS01A2) and motion sensors (LIS3MDL and LSM6DS0 for X-NUCLEO-IKS01A1 and LSM303AGR and LSM6DSL for X-NUCLEO-IKS01A2), as per X-CUBE-MEMS1
- In addition, the following sensors available through the DIL24 adapter are supported: pressure sensor (LPS22HB for X-NUCLEO-IKS01A1; LPS22HH and LPS33HW for X-NUCLEO-IKS01A2) and motion sensors (LSM6DS3, LSM6DSL and LSM303AGR for X-NUCLEO-IKS01A1; H3LIS331DL, LIS2MDL, LIS2DH12 and LIS2DW12 for both X-NUCLEO-IKS01A1 and X-NUCLEO-IKS01A2; A3G4250D, AIS328DQ, AIS3624DQ, IIS2MDC, ISM303DAC, ISM330DLC, IIS2DLPC, LSM6DSO and LSM6DSR for X-NUCLEO-IKS01A2)
- Easy portability across different MCU families thanks to STM32Cube
- Free user-friendly license terms
- Three sample implementations to transmit real time sensor data to a PC including the **Unicleo-GUI** application and terminal application support
- Integrated Fast Fourier Transform (FFT) algorithm for vibration analysis
- Signal processing (MotionSP) middleware for vibration analysis in time and frequency domain
- Sample implementation of extended features like FIFO usage, detection of 6D orientation, free-fall, pedometer, single/double tap, tilt, wake-up, sensor hub and self-test

Product summary	
Motion MEMS and environmental sensor expansion board for STM32 Nucleo	X-NUCLEO-IKS01A1
Motion MEMS and environmental sensor expansion board for STM32 Nucleo	X-NUCLEO-IKS01A2
STM32 Nucleo development board	STM32 Nucleo

Description

As well as the on-board sensors supported by the X-CUBE-MEMS1 expansion software package for STM32Cube, the extended X-CUBE-MEMS-XT1 version also supports devices connected via the DIL24 socket.

X-CUBE-MEMS-XT1 runs on the STM32 and includes drivers that recognize the sensors and collect temperature, humidity, pressure and motion data from the A3G4250D, AIS328DQ, AIS3624DQ, H3LIS331DL, HTS221, IIS2DLPC, IIS2MDC, ISM303DAC, ISM330DLC, LIS2DH12, LIS2DW12, LIS2MDL, LIS3MDL, LPS22HB, LPS22HH, LPS25HB, LPS33HW, LSM303AGR, LSM6DS0, LSM6DS3, LSM6DSL, LSM6DSO, LSM6DSR and LSM6DSL devices.

The expansion is built on STM32Cube software technology to ease portability across different STM32 microcontrollers. The software comes with sample implementations of the drivers running on an X-NUCLEO-IKS01A1 or X-NUCLEO-IKS01A2 expansion board connected to a NUCLEO-F401RE or NUCLEO-L476RG development board.

1 Detailed description

1.1 What is STM32Cube?

STM32Cube™ is an STMicroelectronics initiative that helps you reduce development effort, time and cost. STM32Cube covers the STM32 portfolio.

STM32Cube version 1.x includes:

- STM32CubeMX, a graphical software configuration tool that allows the generation of C initialization code using graphical wizards.
- A comprehensive embedded software platform specific to each series (such as the STM32CubeF4 for the STM32F4 series), which includes:
 - the STM32Cube HAL embedded abstraction-layer software, ensuring maximized portability across the STM32 portfolio
 - a consistent set of middleware components such as RTOS, USB, TCP/IP and graphics
 - all embedded software utilities with a full set of examples

1.2 How does this software complement STM32Cube?

This software is based on the STM32CubeHAL hardware abstraction layer for the STM32 microcontroller. The package extends STM32Cube by providing a board support package (BSP) for the sensor expansion board. The drivers abstract low-level details of the hardware and allow the applications to access sensor data in a hardware-independent manner. The package includes a sample application that the developer can use to start experimenting with the code. As the sample application is designed to enable sensor data logging on a PC, the package includes a Windows PC utility which the developer can use to choose between various sensors available on the STM32 Nucleo expansion board and set delays or intervals between consecutive data points; the data can also be saved in log files.

Revision history

Table 1. Document revision history

Date	Version	Changes
26-Oct-2016	1	Initial release.
12-Jun-2017	2	Updated cover page image, features and description.
13-Nov-2017	3	Updated cover page image, title and features.
25-Jan-2018	4	Updated cover page features and description.
11-Sep-2018	5	Updated cover page features and description.

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