Quick Start Guide
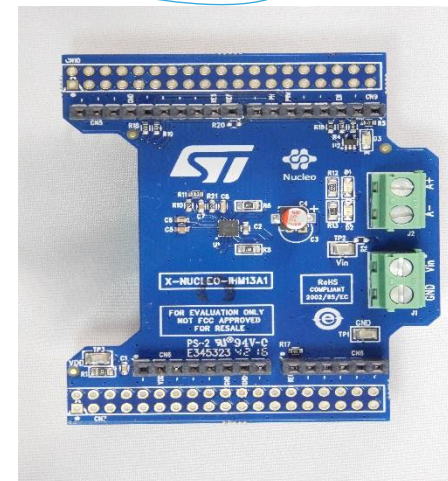
Low voltage brush DC motor driver expansion board based on STSPIN250 for STM32 Nucleo
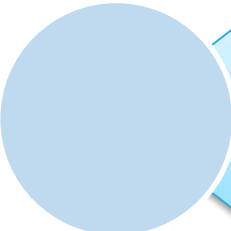
(X-NUCLEO-IHM13A1)

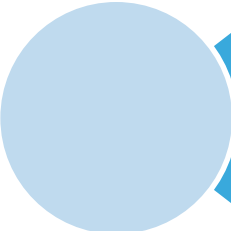

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Version 1.0.0 (Jan 11, 2016)

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X-NUCLEO-IHM13A1: Low voltage brush DC motor driver expansion board Hardware and Software overview

Setup & Demo Examples
Documents & Related Resources

STM32 Open Development Environment: Overview

Low voltage brush DC motor driver expansion board

X-NUCLEO-IHM13A1 hardware description

- The X-NUCLEO-IHM13A1 is a low voltage brush DC motor driver expansion board based on the STSPIN250 for STM32 Nucleo. It provides an affordable and easy-to-use solution for the implementation of portable motor driving applications such as thermal printers, robotics and toys. Thanks to its programmable current limiter and its complete set of protection features, it offers high levels of performance and robustness.

- The X-NUCLEO-IHM13A1 is compatible with the Arduino UNO R3 connector and most STM32 Nucleo boards.

Key features

- Low voltage range from 1.8 V to 10 V
- Current up to 1.3 A_{RMS}
- Current control with adjustable off-time
- Full protection overcurrent and short-circuit protection
- Low RDS(ON) power stage (HS + LS = 0.4 Ω typ.)
- Thermal shutdown
- Compatible with Arduino UNO R3 connector
- Compatible with STM32 Nucleo boards
- Connection for one DC motor
- RoHS compliant

Key product on board

STSPIN250: low voltage brush DC motor driver
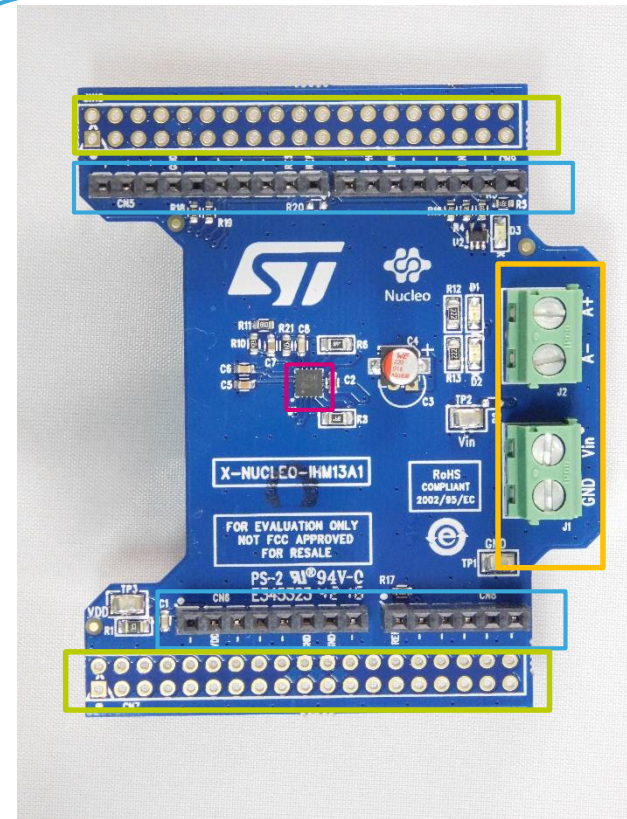
- STSPIN250
- Arduino UNO R3 connector
- Supply and motor connector
- ST morpho connector*

(*) Not mounted

Latest info available at www.st.com
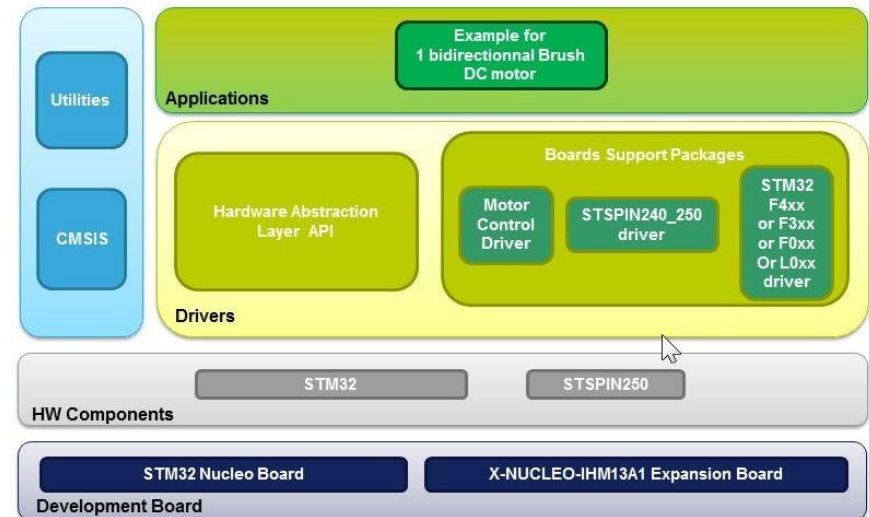**X-NUCLEO-IHM13A1**

X-CUBE-SPN13 software description

- The X-CUBE-SPN13 is an expansion software package for STM32Cube. The software runs on the STM32 Nucleo providing management of STSPIN250 to control a low voltage brush DC motor. The expansion is built on STM32Cube software technology to ease portability across different STM32 microcontrollers. It is compatible with the NUCLEO-F401RE, NUCLEO-F334R8, NUCLEO-F030R8 or NUCLEO-L053R8 boards connected to an X-NUCLEO-IHM13A1 expansion board. The software comes with a sample implementation driving a bidirectional low voltage brush DC motor.

Key features

- Driver layer for complete management of the STSPIN250 low voltage brush DC motor driver

- Example implementation to control one bidirectional brush DC motor, available on NUCLEO-F401RE, NUCLEO-F334R8, NUCLEO-F030R8 or NUCLEO-L053R8 when connected to one X-NUCLEO-IHM13A1 expansion board

- Easy portability across different MCU families, thanks to STM32Cube

- Free, user-friendly license terms

Overall Software Architecture

Utilities

CMSIS

Example for 1 bidirectionnal Brush DC motor

Applications

Boards Support Packages

Hardware Abstraction Layer API

Motor Control Driver

STSPIN240_250 driver

STM32 F4xx or F3xx or F0xx Or L0xx driver

Drivers

STM32

STSPIN250

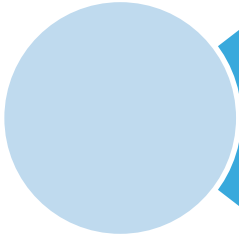HW Components

STM32 Nucleo Board

X-NUCLEO-IHM13A1 Expansion Board

Development Board
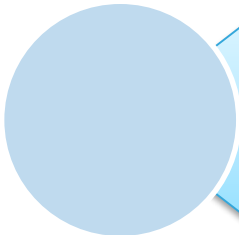
Latest info available at www.st.com
X-CUBE-SPN13

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HW prerequisites

- 1x Low voltage brush DC motor driver expansion board (**X-NUCLEO-IHM13A1**)

- 1x STM32 Nucleo development board (**NUCLEO-F401RE** or **NUCLEO-F334R8** or **NUCLEO-F030R8** or **NUCLEO-L053R8**)

- 1 low voltage brush DC motor

- An external DC power supply with two electric cables (*)

- Laptop/PC with Microsoft Windows™ 7 and above

- 1x USB type A to mini-B USB cable

NUCLEO-F401RE
NUCLEO-L053R8
NUCLEO-F334R8
NUCLEO-F030R8

Mini USB Cable

Low voltage brush DC motor

X-NUCLEO-IHM13A1

(*) Power stage supply voltage from 1.8 V to 10 V

SW prerequisites

- **STSW-LINK009:** ST-LINK/V2-1 USB driver

- **STSW-LINK007:** ST-LINK/V2-1 firmware upgrade

- A Windows PC with one of the supported development toolchains:
    - KEIL: MDK-ARM
    - IAR: EWARM
    - GCC-based IDE: System Workbench for STM32

- **X-CUBE-SPN13:** expansion software for STM32Cube

Low voltage brush DC motor driver expansion board
Start coding in just a few minutes with X-CUBE-SPN13

Driving one bidirectional brush DC motor with X-NUCLEO-IHM13A1 and X-CUBE-SPN13

1 Stack the X-NUCLEO-IHM13A1 on the STM32 Nucleo board using the Arduino UNO R3 connector and connect the power supply (VIN\GND) to the CN1 connector.

2 Connect one brush DC motor to A+/-.

3 Connect the STM32 Nucleo board to the PC through the USB cable.
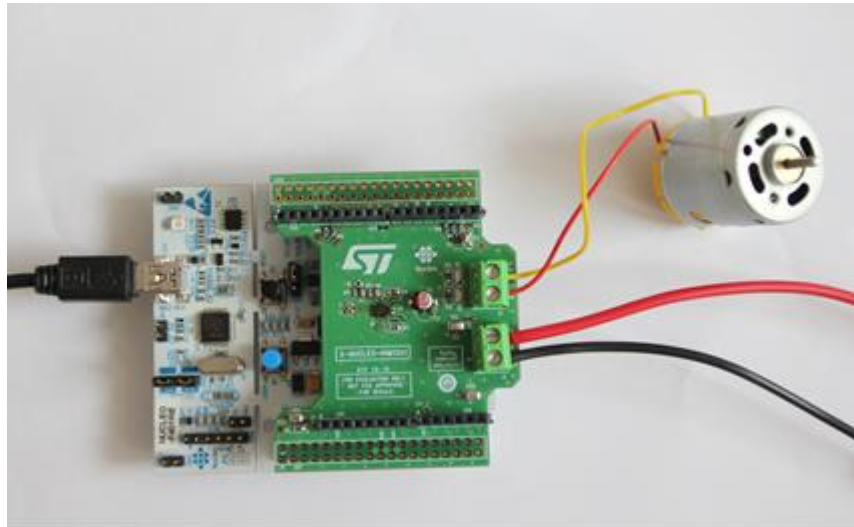
Low voltage brush DC motor driver expansion board
Start coding in just a few minutes with X-CUBE-SPN13

4 Depending on your STM32 Nucleo board, from the examples folder (**\stm32_cube\Projects\Multi\Examples\MotionControl\IHM13A1_ExampleFor1BiDirMotor**) open the software project from:
- **\YourToolChainName\STM32F401RE-Nucleo** for Nucleo based on **STM32F401**
- **\YourToolChainName\STM32F334R8-Nucleo** for Nucleo based on **STM32F334**
- **\YourToolChainName\STM32F030R8-Nucleo** for Nucleo based on **STM32F030**
- **\YourToolChainName\STM32L053R8-Nucleo** for Nucleo based on **STM32L053**

5 Open the file:
stm32_cube\Drivers\BSP\Components\stspin240_250\stspin240_250_target_config.h.
and modify the according to your target configuration.

6 Build the project and download it into the STM32 memory.

7 Run the example. Press the user button to start the demo and to switch from one sequence to the following one (see main.c for a detailed demo sequence).

Documents & related resources

All documents are available in the DESIGN tab of the related products webpage

X-NUCLEO-IHM13A1:
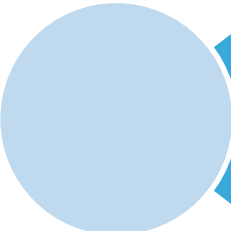
- Gerber files, BOM, and schematics

- **DB3131:** Low voltage brush DC motor driver expansion board for STM32 Nucleo based on the STSPIN250 – **Data brief**

- **UM2148:** Getting started with the X-NUCLEO-IHM13A1 low voltage dual brush DC motor driver expansion based on STSPIN250 for STM32 Nucleo– **User manual**

X-CUBE-SPN13:

- **DB3141:** STSPIN250 low voltage brush DC motor driver software expansion for STM32Cube – **Data brief**

- **UM2161:** Getting started with the X-CUBE-SPN13, low voltage brush DC motor driver software expansion for STM32Cube – **User manual**

- Software setup file
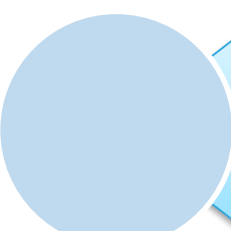
Consult www.st.com for the complete list

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X-NUCLEO-IHM13A1: Low voltage brush DC motor driver expansion board

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STM32 Open Development Environment: Overview

- The STM32 Open Development Environment (ODE) consists of a set of stackable boards and a modular open SW environment designed around the STM32 microcontroller family.

STM32Cube development software	STM32 Nucleo expansion boards (X-NUCLEO)
STM32 Nucleo development boards	STM32Cube expansion software (X-CUBE)

STM32 Open Development Environment

Function Packs (FP)
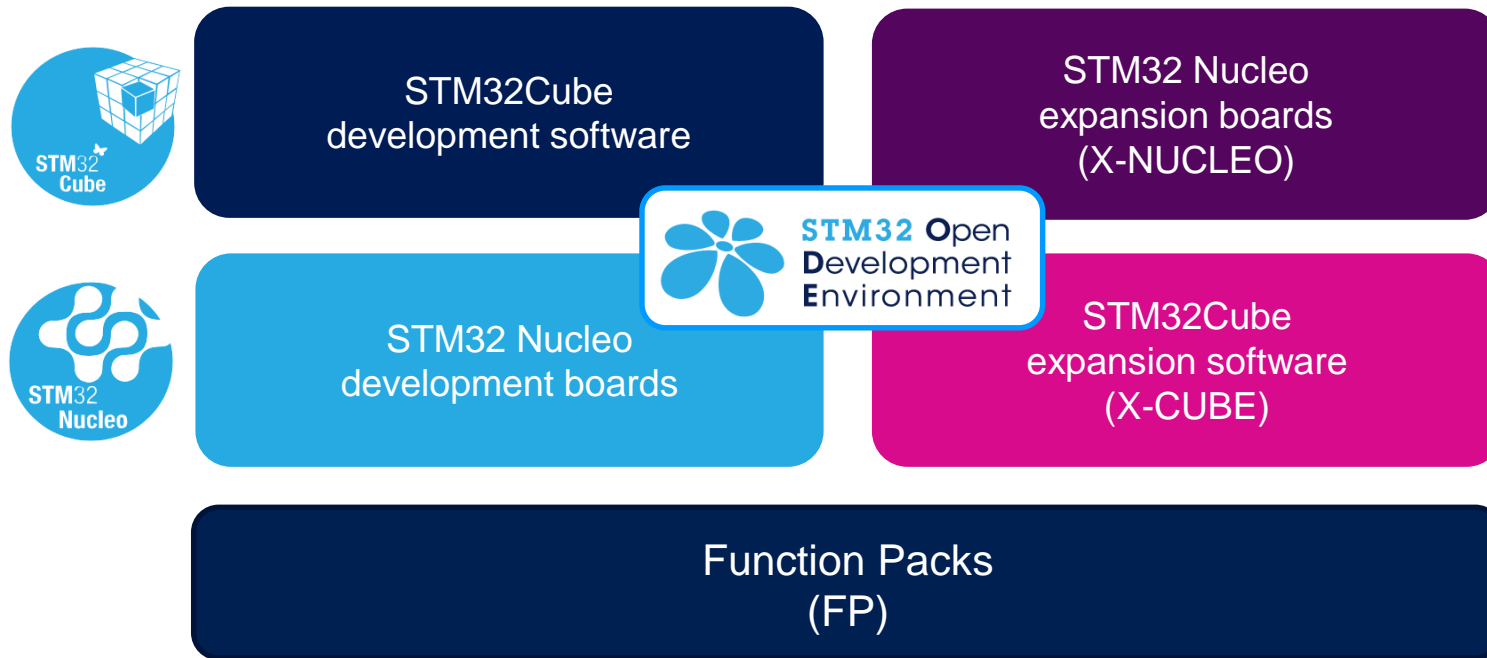
www.st.com/stm32ode

STM32 Nucleo
Development Boards (NUCLEO)

- A comprehensive range of affordable development boards for all the STM32 microcontroller series, with unlimited unified expansion capabilities and integrated debugger/programmer functionality.

Power supply through USB or external source

Integrated debugging and programming ST-LINK probe

STM32 microcontroller

STM32 F0　STM32 F1　STM32 F2　STM32 F3　STM32 F4　STM32 F7

STM32 L0　STM32 L1

Complete product range
from ultra-low power to high-performance

ST morpho extension header

Arduino™ UNO R3 extension headers
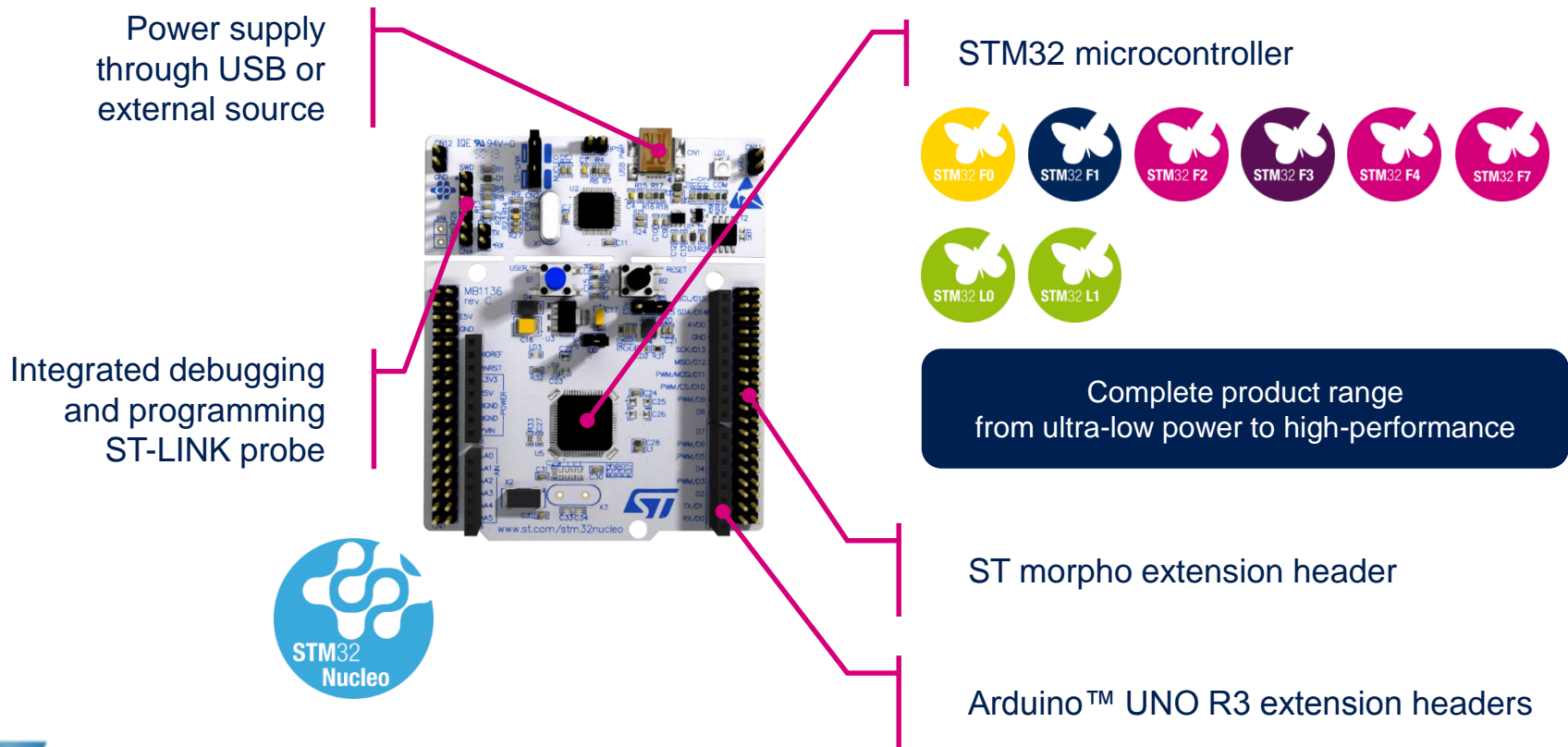
STM32 Nucleo
Expansion Boards (X-NUCLEO)

- Boards with additional functionality that can be plugged directly on top of the STM32 Nucleo development board directly or stacked on another expansion board.

Sense

Connect

Power

Move/Actuate

Interact

Motion MEMS sensors

Environmental sensors

DIL24 support for new devices
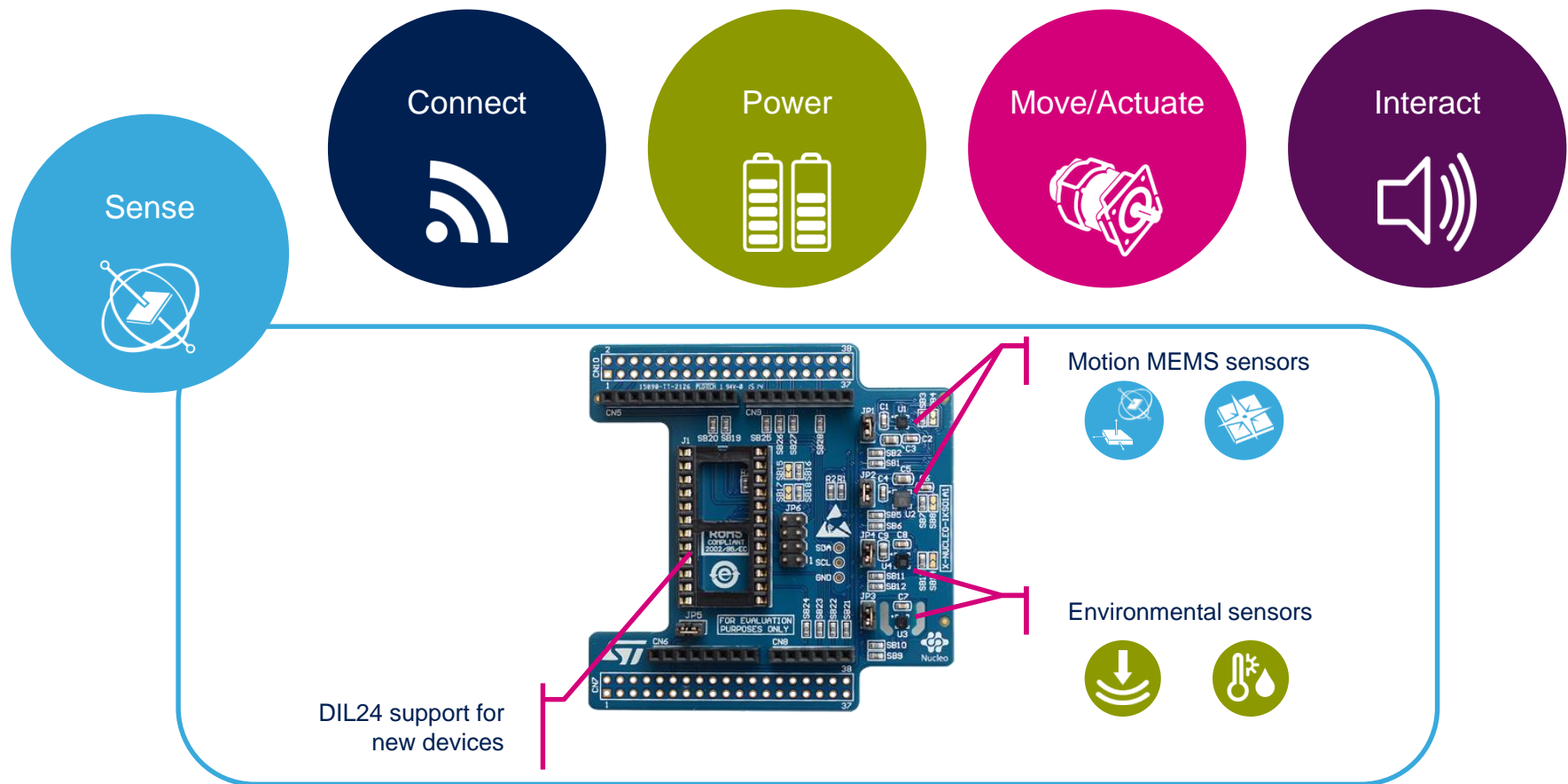
Example of STM32 expansion board (X-NUCLEO-IKS01A1)

www.st.com/x-nucleo

STM32 Open Development Environment
Software components

- **STM32Cube software (CUBE)** - A set of free tools and embedded software bricks to enable fast and easy development on the STM32, including a Hardware Abstraction Layer and middleware bricks.

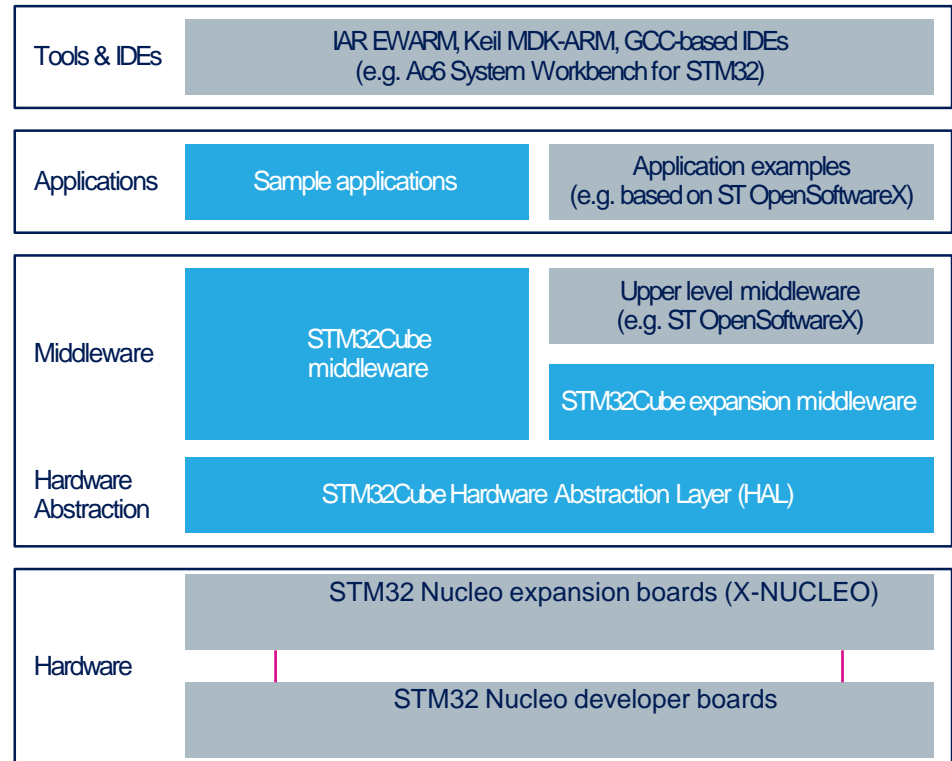- **STM32Cube expansion software (X-CUBE)** - Expansion software provided free for use with the STM32 Nucleo expansion board and fully compatible with the STM32Cube software framework. It provides abstracted access to expansion board functionality through high-level APIs and sample applications.

Tools & IDEs	IAR EWARM, Keil MDK-ARM, GCC-based IDEs (e.g. Ac6 System Workbench for STM32)	
Applications	Sample applications	Application examples (e.g. based on ST OpenSoftwareX)
Middleware	STM32Cube middleware	Upper level middleware (e.g. ST OpenSoftwareX)
		STM32Cube expansion middleware
Hardware Abstraction	STM32Cube Hardware Abstraction Layer (HAL)	
Hardware	STM32 Nucleo expansion boards (X-NUCLEO)	
	STM32 Nucleo developer boards	

- **Compatibility with multiple Development Environments -** The STM32 Open Development Environment is compatible with a number of IDEs including IAR EWARM, Keil MDK, and GCC-based environments. Users can choose from three IDEs from leading vendors, which are free of charge and deployed in close cooperation with ST. These include Eclipse-based IDEs such as Ac6 System Workbench for STM32 and the MDK-ARM environment.

OPEN LICENSE MODELS: STM32Cube software and sample applications are covered by a mix of fully open source BSD license and ST licenses with very permissive terms.

www.st.com/stm32cube

www.st.com/x-cube

STM32 Open Development Environment
Building block approach

The building blocks → **Your need** → **Our answer**

Sense
- Accelerometer, gyroscope
- Inertial modules, magnetometer
- Pressure, temperature, humidity
- Proximity, microphone

COLLECT

Connect
- Bluetooth LE, Sub-GHz radio
- NFC, Wi-Fi, GNSS

TRANSMIT

Translate
- Audio amplifier
- Touch controller
- Operation Amplifier

ACCESS

Move / Actuate
- Stepper motor driver
- DC & BLDC motor driver
- Industrial input / output

CREATE

Power
- Energy management & battery

POWER

Process
- General-purpose microcontrollers
- Secure microcontrollers

PROCESS

Software

STM32 Cube

STM32 Open Development Environment

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