Quick Start Guide
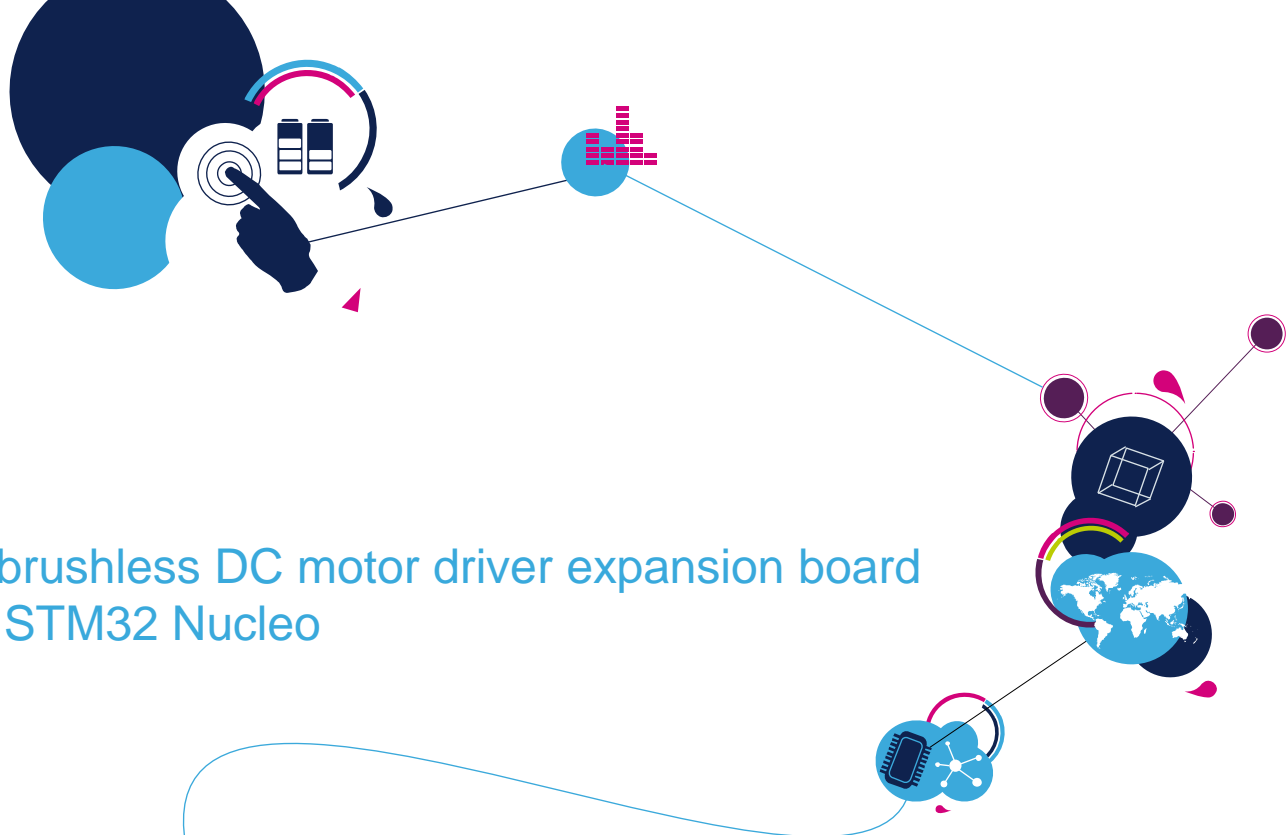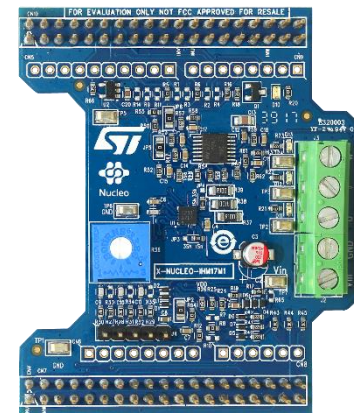
Low voltage three-phase brushless DC motor driver expansion board based on STSPIN233 for STM32 Nucleo

(X-NUCLEO-IHM17M1)
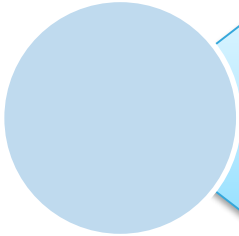

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Version 1.0 (Feb 28, 2018)

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X-NUCLEO-IHM17M1: 3 phase brushless DC motor driver expansion board

Hardware and Software overview

Setup & Demo Examples

Documents & Related Resources

STM32 Open Development Environment: Overview

Low voltage 3-ph brushless motor driver expansion board

Hardware overview

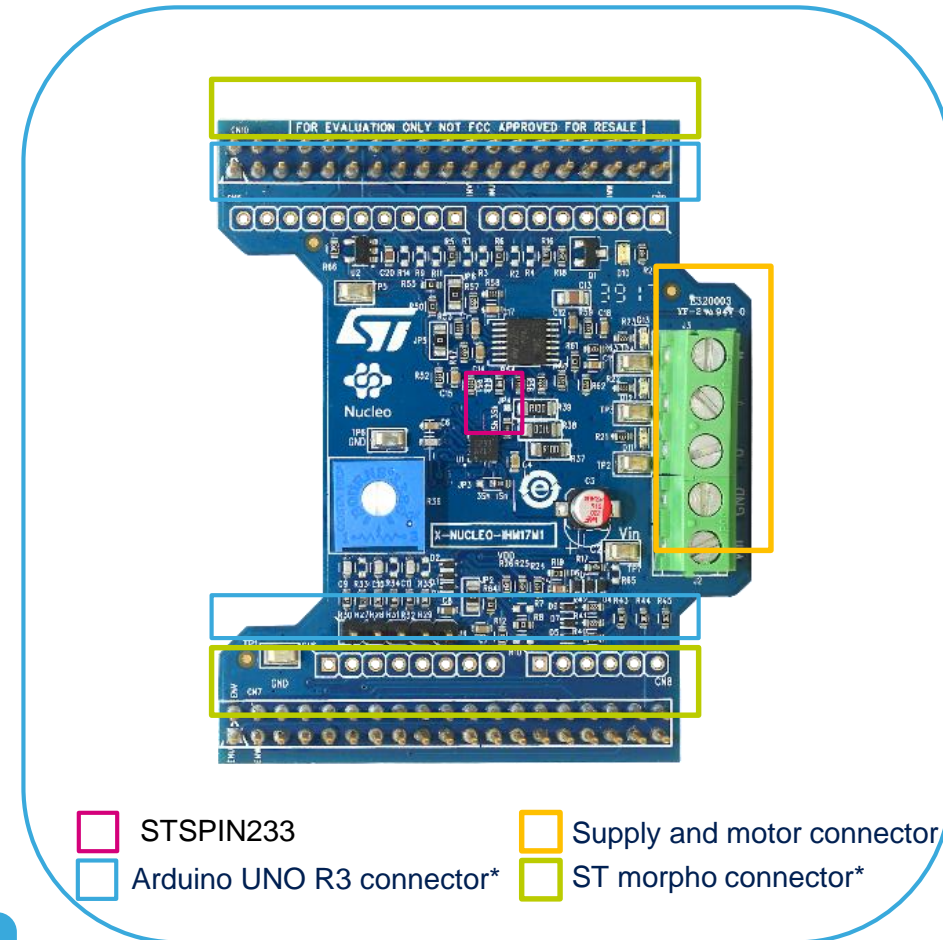### X-NUCLEO-IHM17M1 hardware description

- The X-NUCLEO-IHM17M1 is a low voltage 3 phase brushless motor driver expansion board based on STSPIN233. This driver is designed to operate in battery powered scenarios. With its low current consumption standby and its complete set of protection features, it offer high levels of performance and robustness.

- The X-NUCLEO-IHM17M1 is compatible with the ST morpho connector and supports the addition of other expansions boards.

Key Features

- Low voltage range from 1.8 V to 10 V
- Current up to 1.3 Arms
- Full overcurrent protection and short-circuit protection
- Thermal shutdown
- Compatible with STM32 Nucleo boards
- Equipped with ST morpho connectors
- Hall/Encoder motor sensor connector and circuit
- Potentiometer available for speed regulation
- RoHS compliant

☐ STSPIN233　　　　　　☐ Supply and motor connector
☐ Arduino UNO R3 connector*　　☐ ST morpho connector*

Key products on board

STSPIN233: Low voltage three phase and three sense motor driver

Latest info available at www.st.com
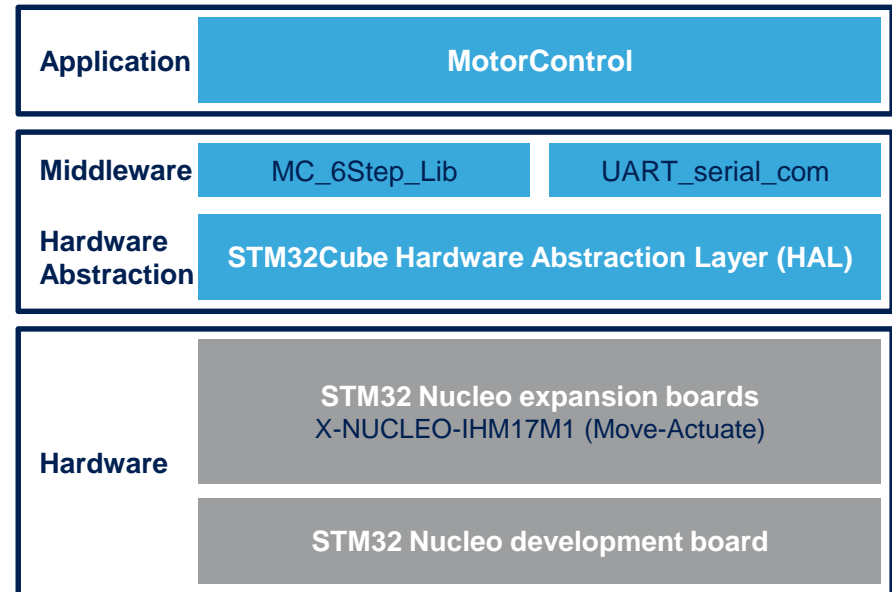**X-NUCLEO-IHM17M1**

(*) Not mounted

X-CUBE-SPN17 software description

- This X-CUBE-SPN17 is a software expansion for STM32Cube used to develop applications based on STSPIN233. The package includes an application example to drive a low voltage three phase brushless motor, managing a X-NUCLEO-IHM17M1 board plugged on top of a NUCLEO-F401RE board
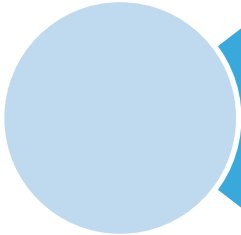
Key features

- Sample application to drive a low voltage three phase brushless motor,
- Timer to generate step clock and voltage reference
- Management of parameters like minimum and maximum speed, direction etc.
- GPIO, PWM and IRQ configuration
- API function available to send any application command to the motor driver
- User interface utility based on PC terminal to control the motor
- Speed control through potentiometer
- Motor control by user button
- Easy portability across different MCU families,

Overall system architecture

Application	MotorControl	
Middleware	MC_6Step_Lib	UART_serial_com
Hardware Abstraction	STM32Cube Hardware Abstraction Layer (HAL)	
Hardware	STM32 Nucleo expansion boards X-NUCLEO-IHM17M1 (Move-Actuate)	
	STM32 Nucleo development board	
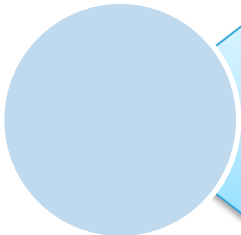
Latest info available at www.st.com
X-CUBE-SPN17

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STM32 Open Development Environment: Overview

- 1x Low voltage 3 phase brushless DC motor driver expansion board expansion board **(X-NUCLEO-IHM17M1)**

- 1x STM32 Nucleo development board **(NUCLEO-F401RE)**

- 1x 3 phase low voltage brushless motor

- 1x external DC power supply with two electric cables (*)

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

NUCLEO-F401RE

3 phase low voltage brushless motor
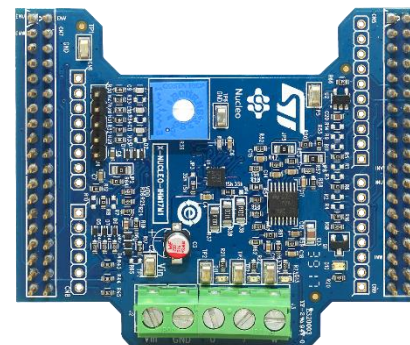
X-NUCLEO-IHM17M1

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

- **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-SPN17**: software expansion for STM32Cube

Low voltage 3-ph brushless motor driver expansion board
Start coding in just a few minutes with X-CUBE-SPN17

Driving one 3 phase brushless motor with
X-NUCLEO-IHM17M1 and X-CUBE-SPN17

1 On the X-NUCLEO-IHM17M1
- Tune R12 potentiometer.
- JP6 and P5 open
- JP3 and JP4 closed on "1Sh" position

2 On the NUCLEO-F401RE
- JP1 off
- JP5 (PWR) on UV5 side
- JP6 (IDD) on

3 Stack the X-NUCLEO-IHM17M1 on the STM32 Nucleo board using the ST morpho connector and connect the 3 phase brushless motor (U,V,W) to the J3 connector.
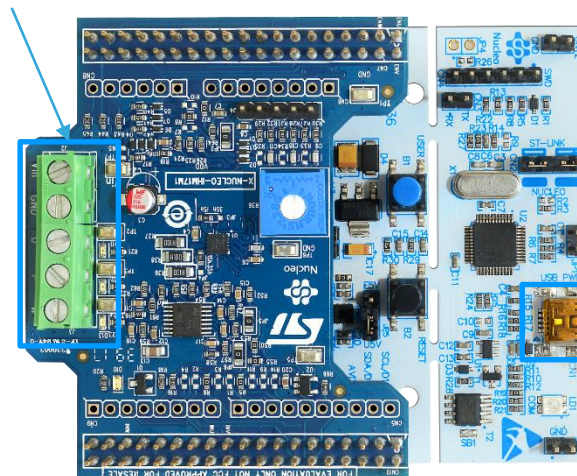
4 Connect the STM32 Nucleo board to the PC through the USB cable.

Low voltage 3-ph brushless motor driver expansion board
Start coding in just a few minutes with X-CUBE-SPN17

5 Open your preferred toolchain (MDK-ARM from Keil, EWARM from IAR, or SW4STM32 from www.openstm32.org)

6 open the software project from **Projects\Multi\Applications\MotionControl \YourToolChainName\STM32F401RE-Nucleo** for Nucleo based on **STM32F401**

7 Open the file **Projects\Multi\Applications\MotorControl\Inc\MC_SixStep_param.h** and modify the parameters according to your target configuration.

8 Build the project and download .bin file into the STM32 memory.

9 Connect the power supply (VIN\GND) and power-up the board

10 Run the example and push the blue button to start and the black button to stop the motor

11 You can also use a User interface utility based on PC terminal to run the motor (for details please refer to the User Manual)
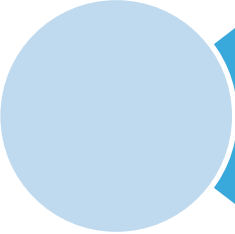
Documents & related resources

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

X-NUCLEO-IHM17M1:

- Gerber files, BOM, and schematics

- **DB3516:** Low voltage three-phase brushless DC motor driver expansion board based on STSPIN233 for STM32 Nucleo – **Data brief**

- **UM2360:** Getting started with the X-NUCLEO-IHM17M1 low voltage 3-phase brushless DC motor driver expansion board based on STSPIN233 – **User manual**

X-CUBE-SPN17:

- **DB3517:** Low voltage three-phase brushless DC motor driver software expansion for STM32Cube – **Data brief**

- **UM2362:** Getting started with the X-CUBE-SPN17 low voltage three-phase brushless DC motor driver software expansion for STM32Cube – **User manual**

- Software setup file

Consult www.st.com for the complete list
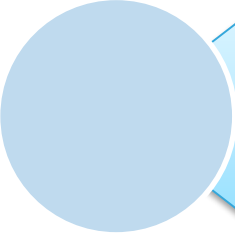
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X-NUCLEO-IHM17M1: 3 phase brushless DC motor driver expansion board

Hardware and Software overview

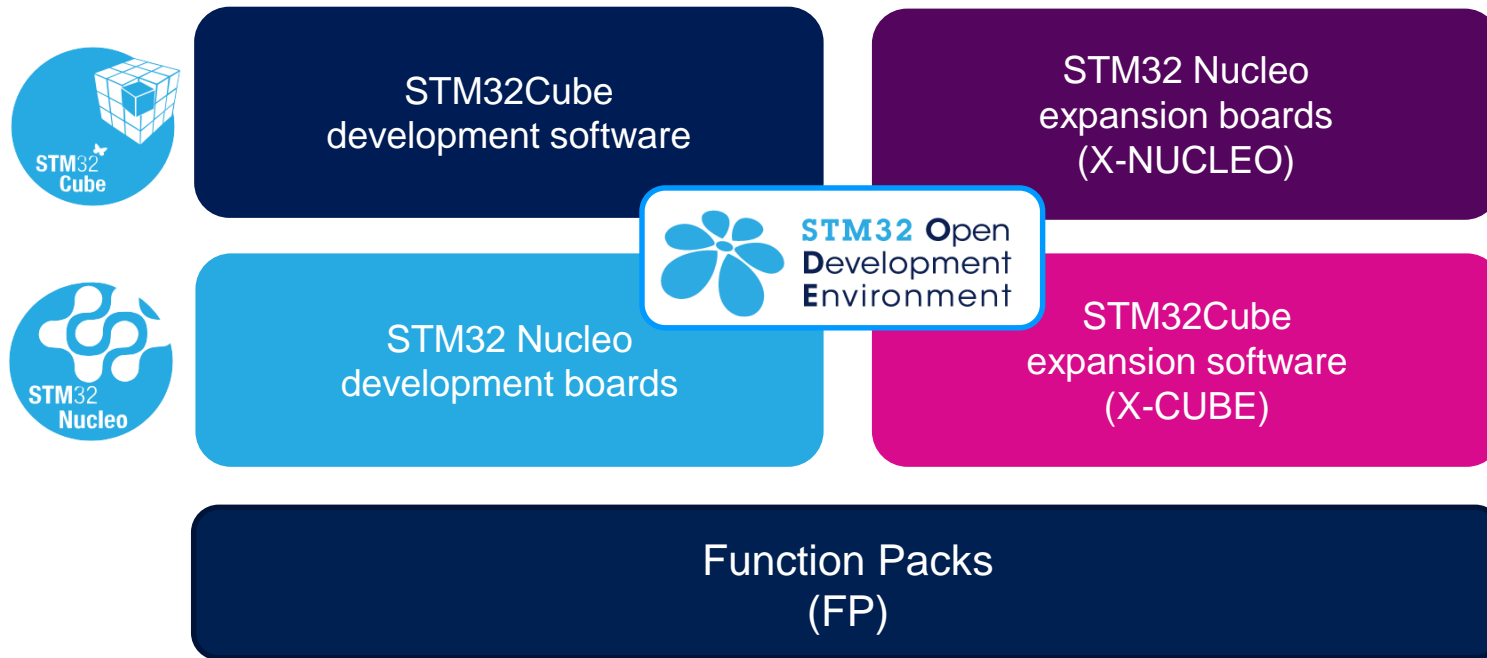Setup & Demo Examples

Documents & Related Resources

STM32 Open Development Environment: Overview

STM32 Open Development Environment
Fast, affordable Prototyping and Development

- 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
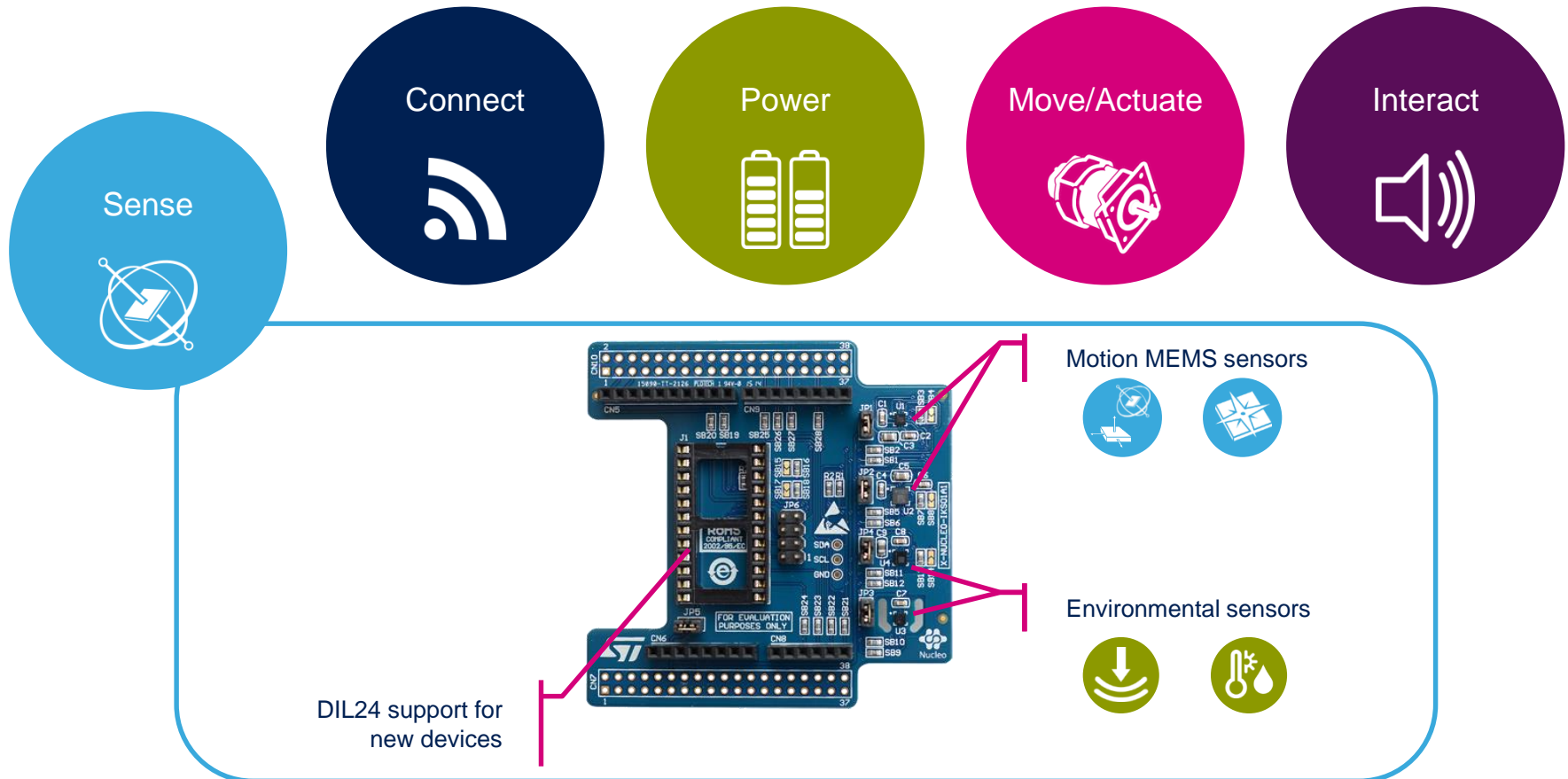
STM32 microcontroller

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

STM32 L0 STM32 L1
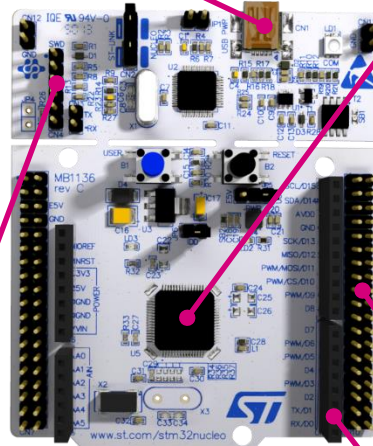
Complete product range from ultra-low power to high-performance

ST morpho extension header

Arduino™ UNO R3 extension headers

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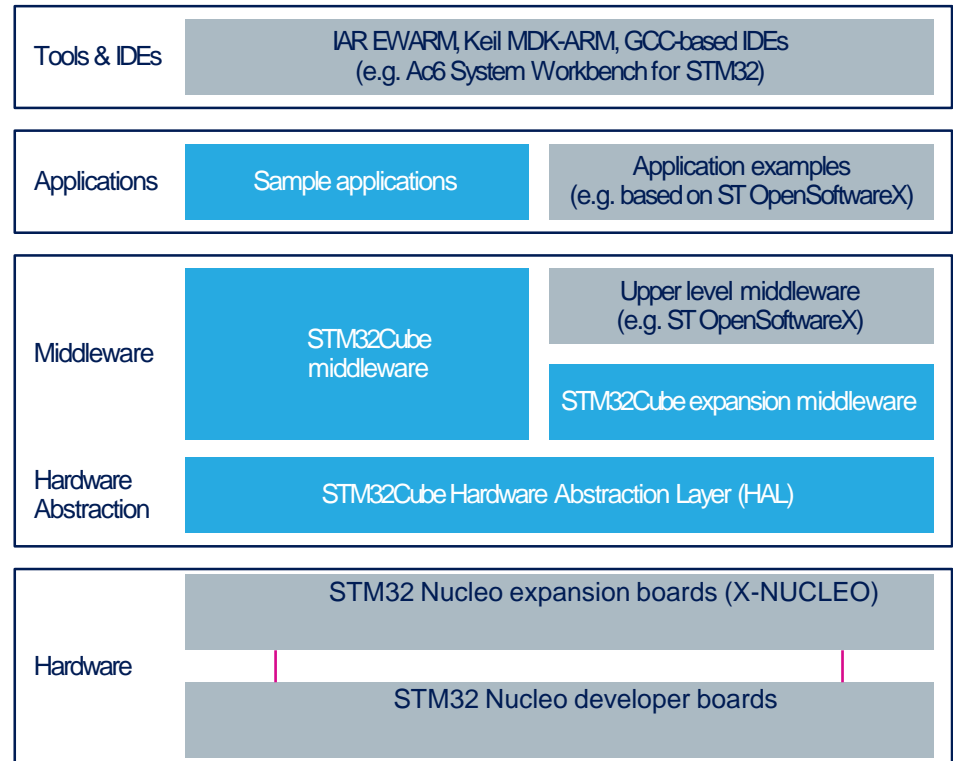
Connect

Power

Move/Actuate

Interact

Sense

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

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

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

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

Translate — ACCESS
- Audio amplifier
- Touch controller
- Operation Amplifier

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

Power — POWER
- Energy management & battery

Process — PROCESS
- General-purpose microcontrollers
- Secure microcontrollers

Software

STM32 **O**pen **D**evelopment **E**nvironment

STM32Cube

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