Quick Start Guide

Low voltage dual brush DC motor driver expansion board based on STSPIN240 for STM32 Nucleo

(X-NUCLEO-IHM12A1)

Version 1.0.0 (Oct 6, 2016)

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X-NUCLEO-IHM12A1 hardware description

- The X-NUCLEO-IHM12A1 is a low voltage dual brush DC motor driver expansion board based on the STSPIN240 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-IHM12A1 is compatible with the Arduino UNO R3 connector and most STM32 Nucleo boards.

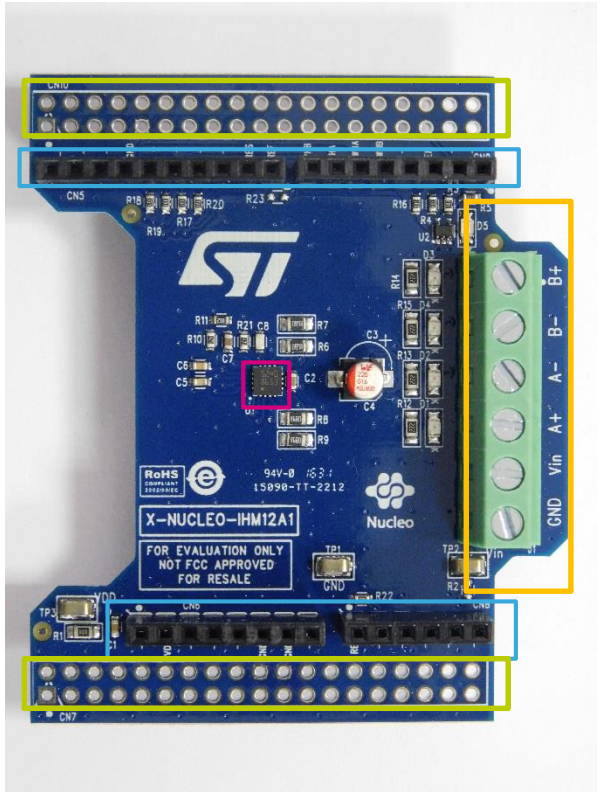
Key features

- 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 two independent DC motors
- RoHS compliant

Key product on board

STSPIN240: low voltage dual brush DC motor driver

Hardware overview



STSPIN240

Arduino UNO R3 connector

Supply and motor connector

ST morpho connector*

(*) Not mounted

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X-NUCLEO-IHM12A1

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Low voltage dual brush DC motor driver expansion board

Software overview

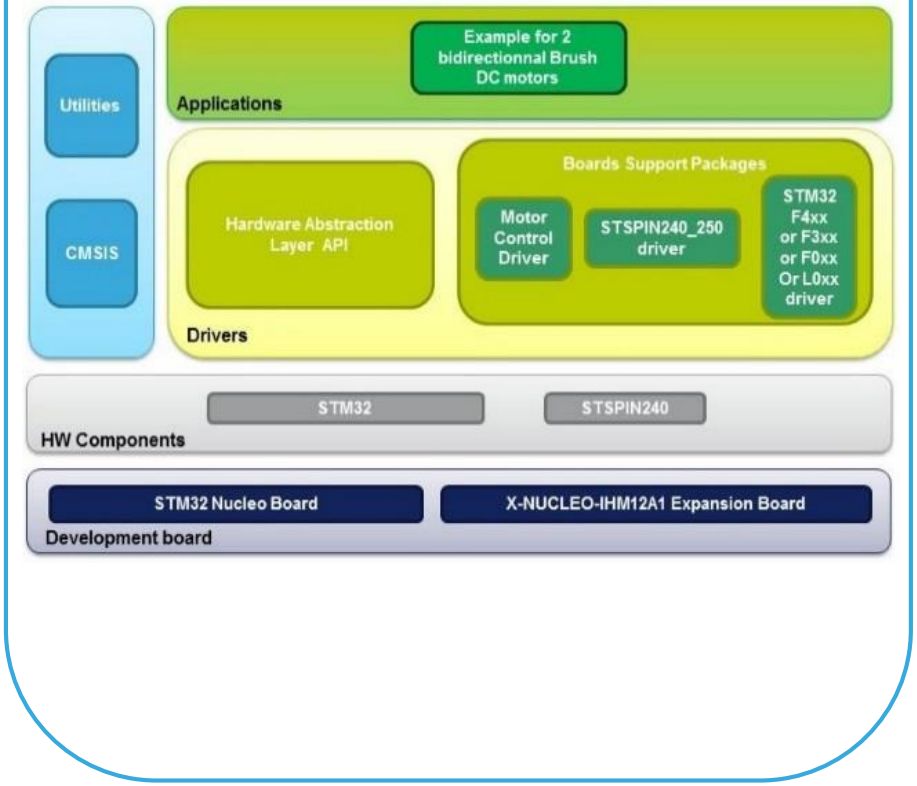
X-CUBE-SPN12 software description

- The X-CUBE-SPN12 is an expansion software package for STM32Cube. The software runs on the STM32 Nucleo providing management of STSPIN240 to control low voltage dual brush DC motors. 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-IHM12A1 expansion board. The software comes with a sample implementation driving two bidirectional low voltage dual brush DC motors.

Key features

- Driver layer for complete management of the STSPIN240 low voltage dual brush DC motor driver
- Example implementation to control up to two bidirectional brush DC motors, available on NUCLEO-F401RE, NUCLEO-F334R8, NUCLEO-F030R8 or NUCLEO-L053R8 when connected to one X-NUCLEO-IHM12A1 expansion board
- Easy portability across different MCU families, thanks to STM32Cube
- Free, user-friendly license terms

Overall Software Architecture



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Setup & Demo Examples
HW prerequisites

- 1x Low voltage dual brush DC motor driver expansion board (**X-NUCLEO-IHM12A1**)
- 1x STM32 Nucleo development board (**NUCLEO-F401RE** or **NUCLEO-F334R8** or **NUCLEO-F030R8** or **NUCLEO-L053R8**)
- 1 to 2 low voltage dual brush DC motors
- 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 dual brush DC motor

X-NUCLEO-IHM12A1

(*) 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-SPN12:** expansion software for STM32Cube

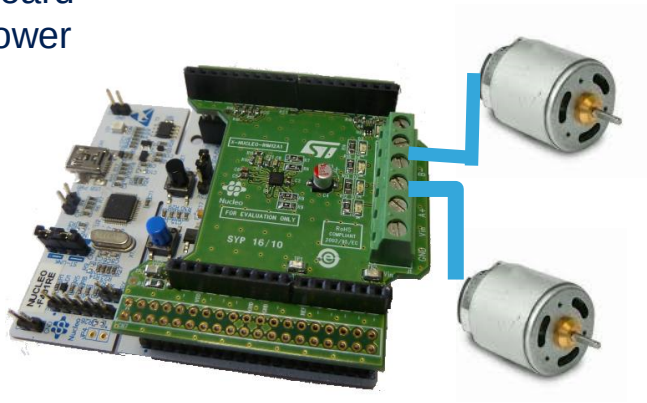
Low voltage dual brush DC motor driver expansion board

Start coding in just a few minutes with X-CUBE-SPN12

Driving two bidirectional brush DC motors with X-NUCLEO-IHM12A1 and X-CUBE-SPN12

1. Stack the X-NUCLEO-IHM12A1 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+/- and the second one to B+/-.



3. Connect the STM32 Nucleo board to the PC through the USB cable.

Low voltage dual brush DC motor driver expansion board

Start coding in just a few minutes with X-CUBE-SPN12

4. Depending on your STM32 Nucleo board, from the examples folder (**\stm32_cube\Projects\Multi\Examples\MotionControl\IHM12A1_ExampleFor2BiDirMotors**) 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-IHM12A1:

- Gerber files, BOM, and schematics
- **DB3037:** Low voltage dual brush DC motor driver expansion board based on STSPIN240 for STM32 Nucleo – **Data brief**
- **UM2112:** Getting started with the X-NUCLEO-IHM12A1, low voltage dual brush DC motor driver expansion board based on STSPIN240 for STM32 Nucleo – **User manual**

X-CUBE-SPN12:

- **DB3036:** Low voltage dual brush DC motor driver software expansion for STM32Cube – **Data brief**
- **UM2110:** Getting started with the X-CUBE-SPN12, low voltage dual 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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STM32 Open Development Environment: Overview

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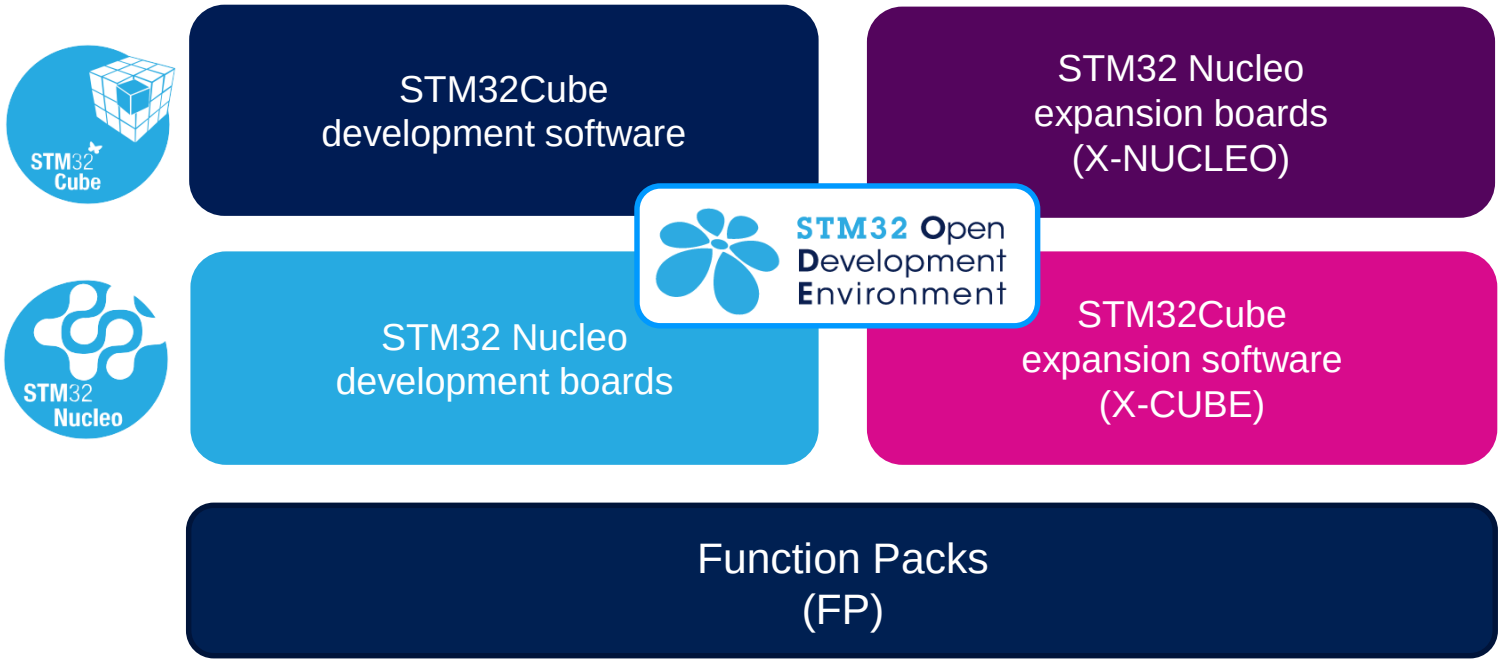
STM32 Open Development Environment
Fast, affordable Prototyping and Development

- 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.



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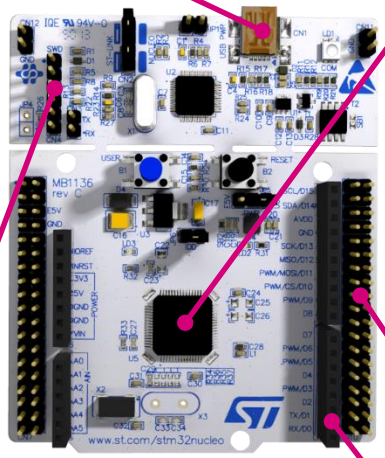
Development Boards (NUCLEO)

- 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

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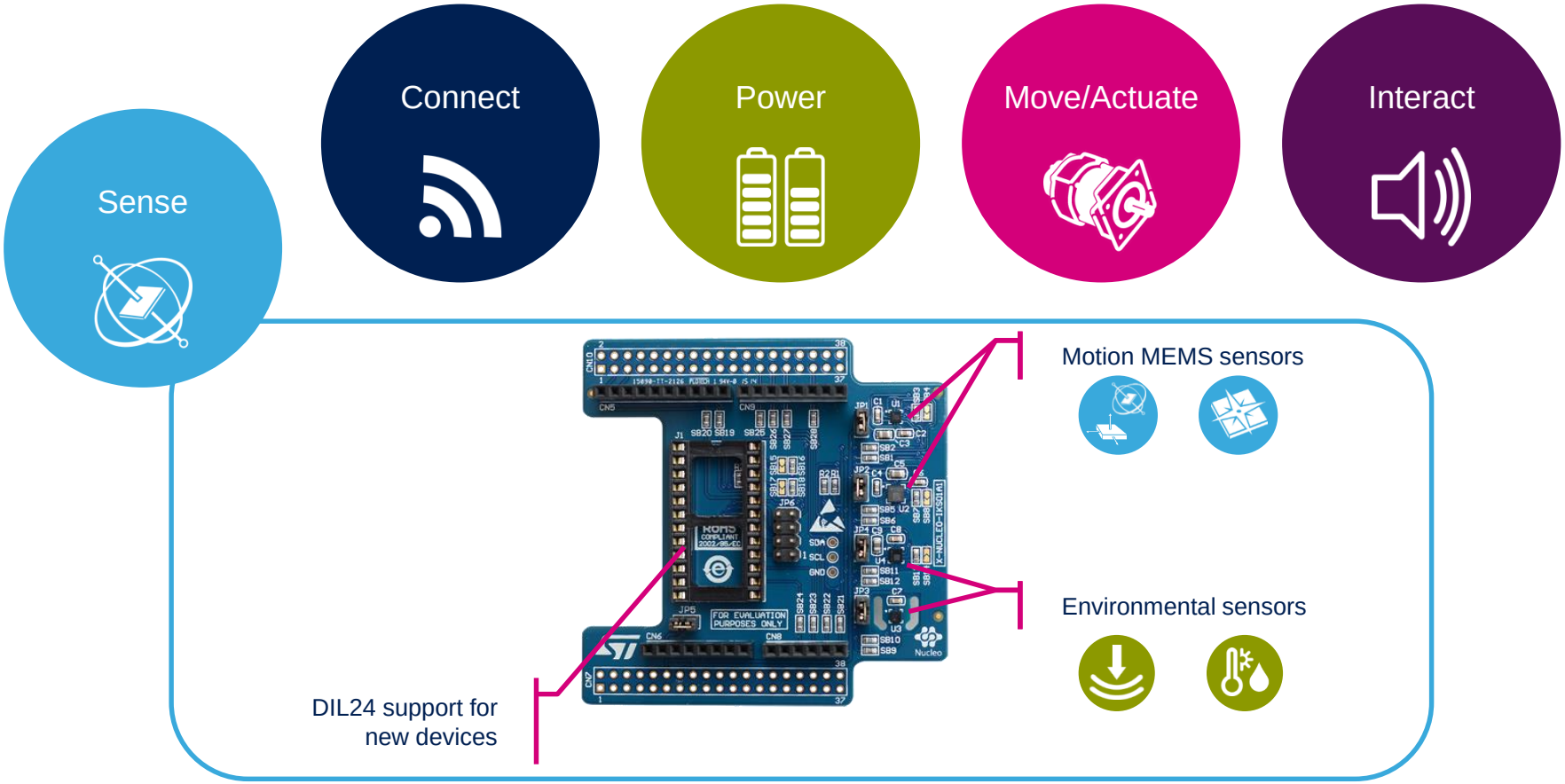
Expansion Boards (X-NUCLEO)

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



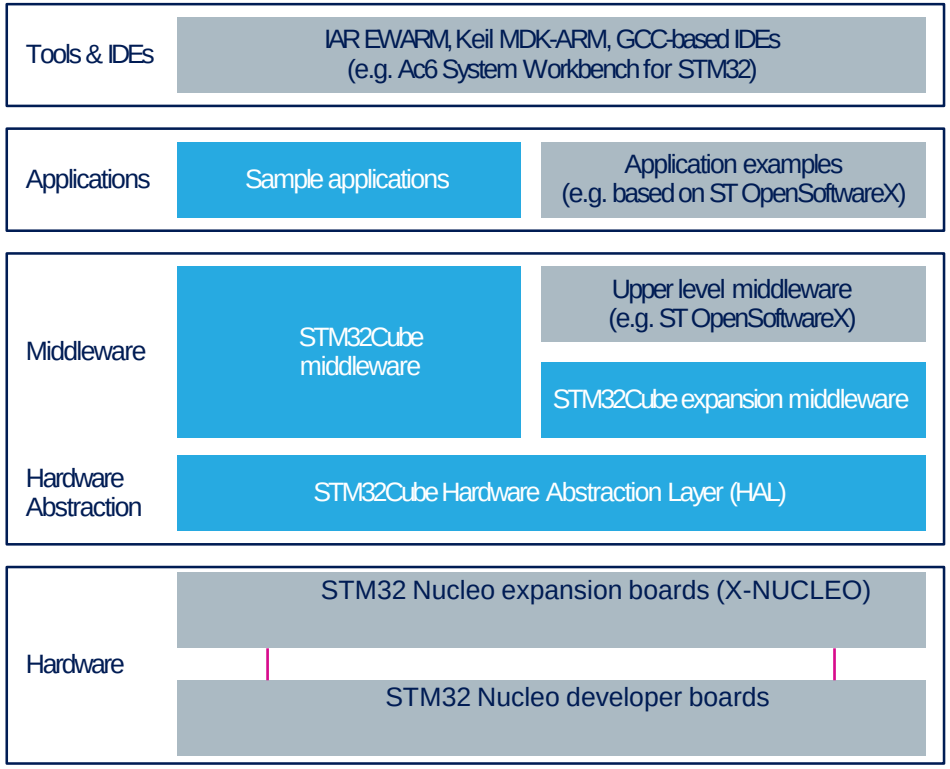
Example of STM32 expansion board (X-NUCLEO-IKS01A1)

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.



- **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.

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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

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

Sense — COLLECT

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

Connect — TRANSMIT

Audio amplifier
Touch controller
Operation Amplifier

Translate — ACCESS

Stepper motor driver
DC & BLDC motor driver
Industrial input / output

Move / Actuate — CREATE

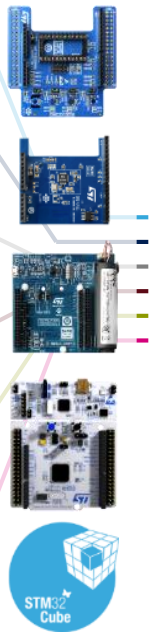
Energy management & battery

Power — POWER

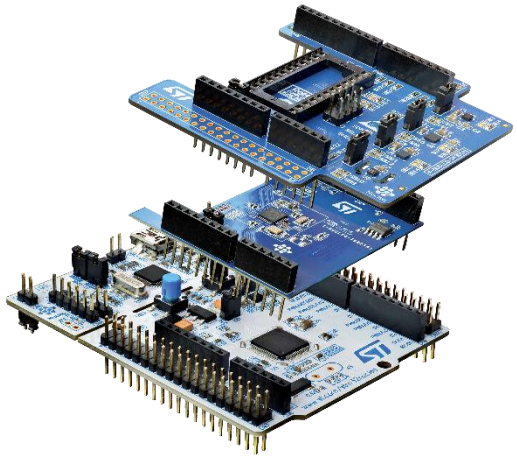
General-purpose microcontrollers
Secure microcontrollers

Process — PROCESS

Software



STM32 Open Development Environment



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