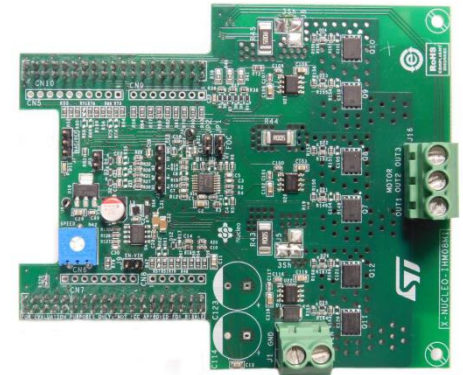


Quick Start Guide

Low-Voltage BLDC motor driver expansion board based
on STL220N6F7 for STM32 Nucleo
(X-NUCLEO-IHM08M1)



Version 1.0 (January 27, 2016)

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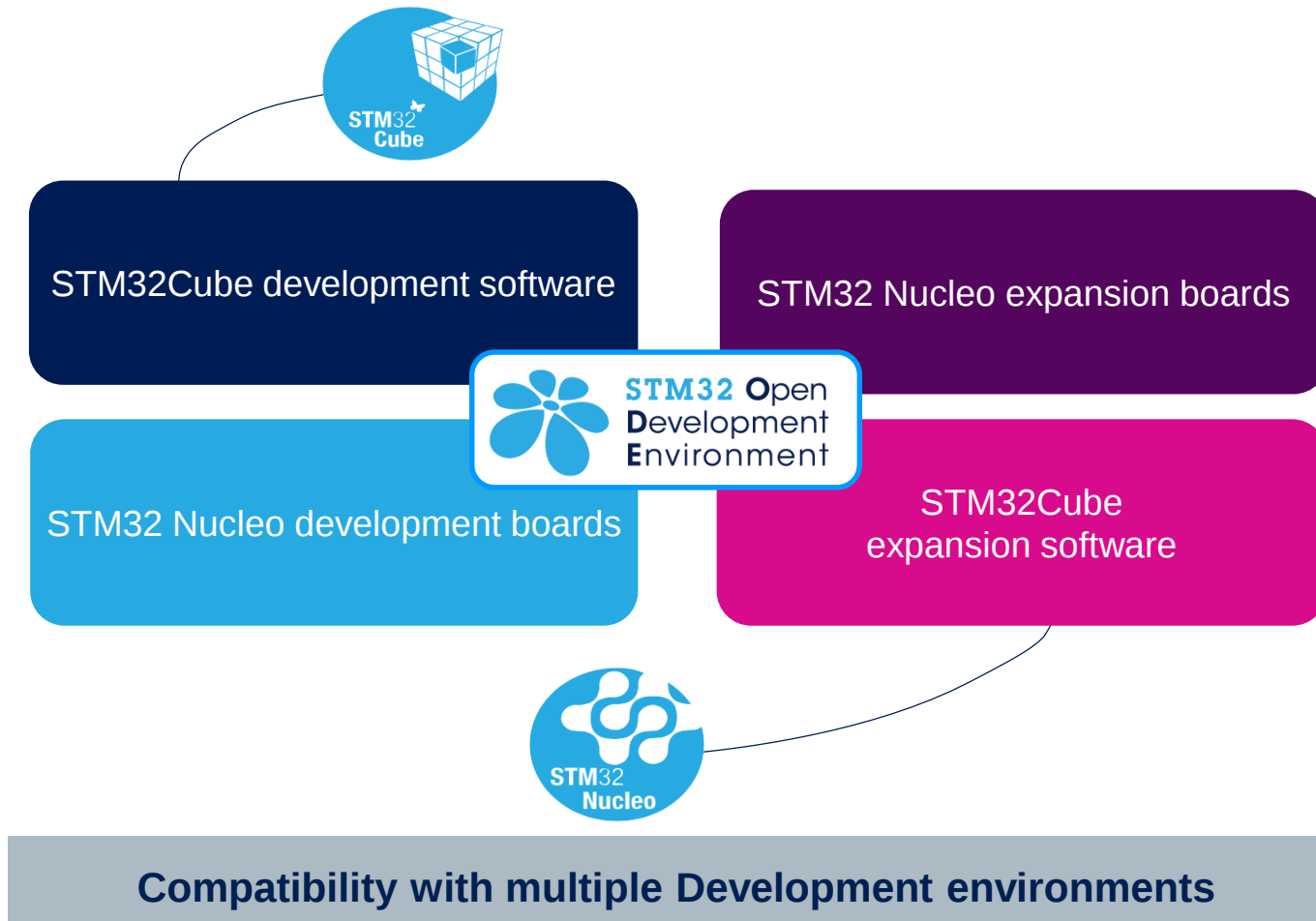
Setup & Demo Examples

STM32 Open Development Environment

Fast, affordable Prototyping and Development

4

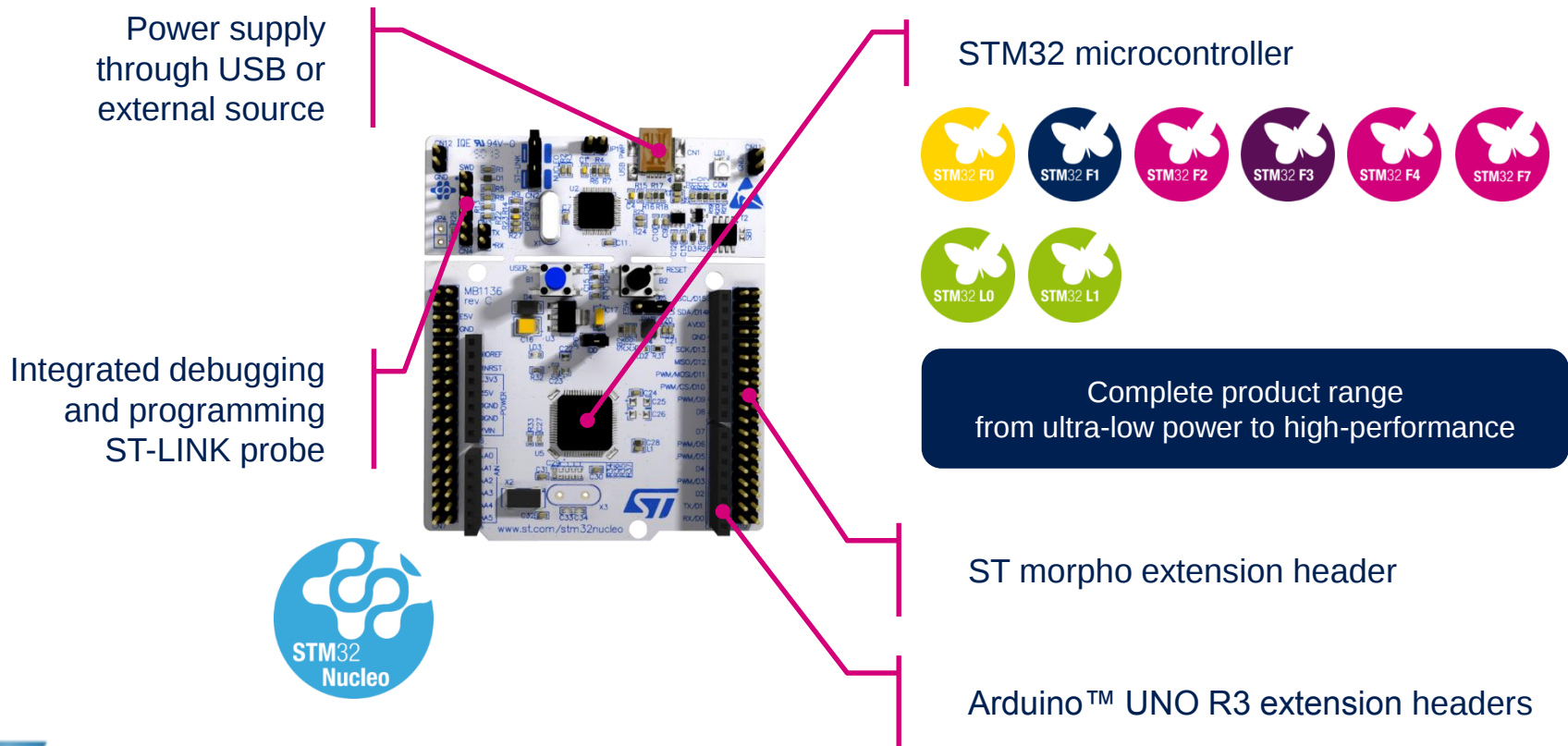
- The STM32 Open Development Environment (ODE) consists of a set of stackable boards and a modular open SW environment designed around the STM32 microcontroller family.



STM32 Nucleo Development Boards (NUCLEO)

5

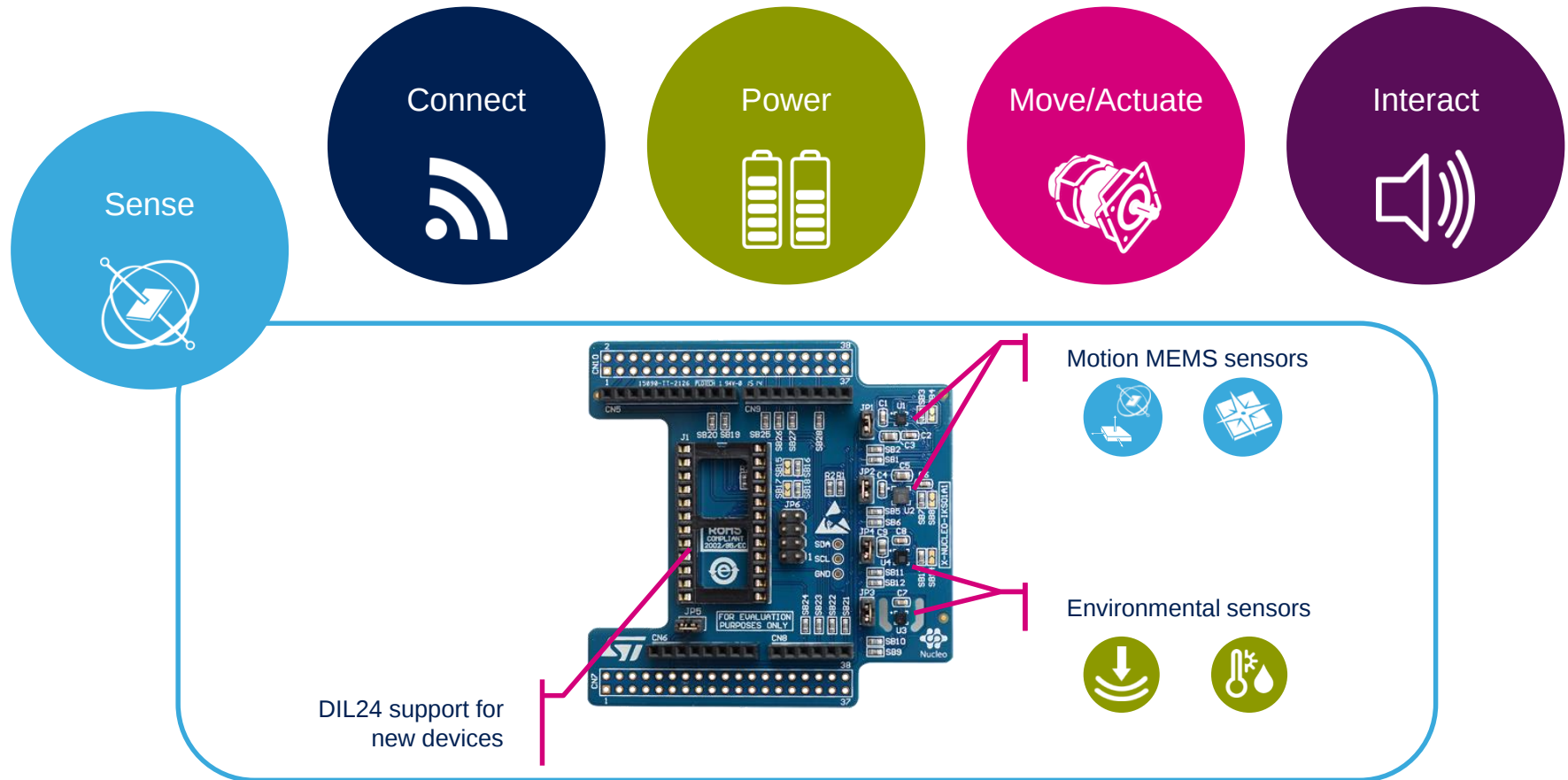
- A comprehensive range of affordable development boards for all the STM32 microcontroller series, with unlimited unified expansion capabilities and integrated debugger/programmer functionality.



STM32 Nucleo Expansion Boards (X-NUCLEO)

6

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



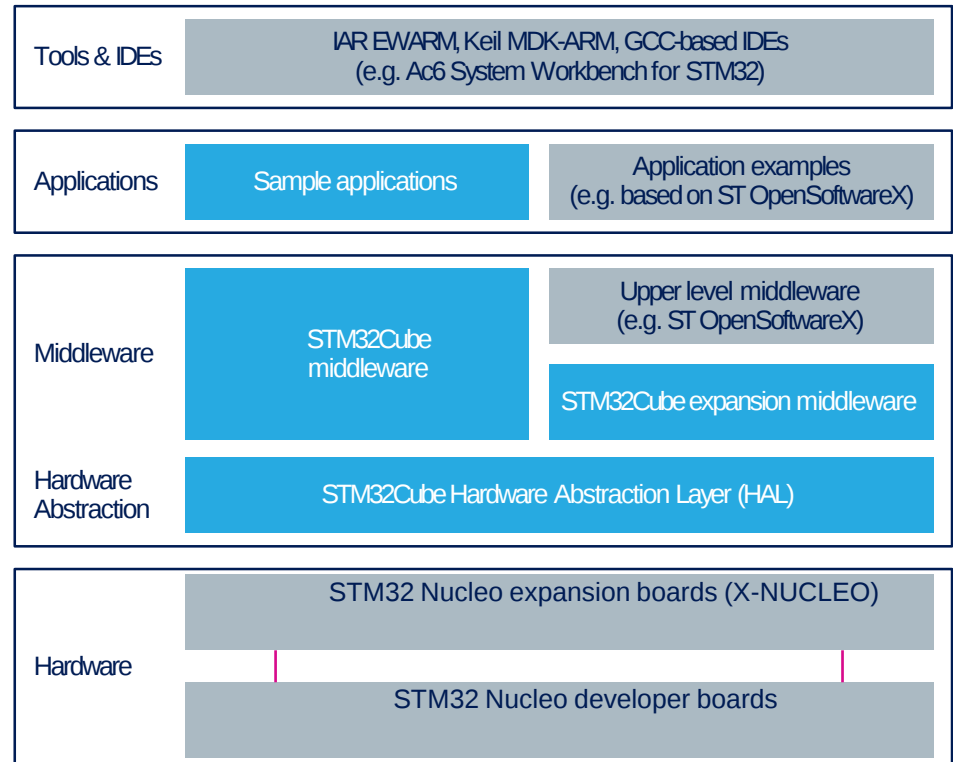
Example of STM32 expansion board (X-NUCLEO-1KS01A1)

STM32 Open Development Environment

Software components

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- **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.

STM32 Open Development Environment

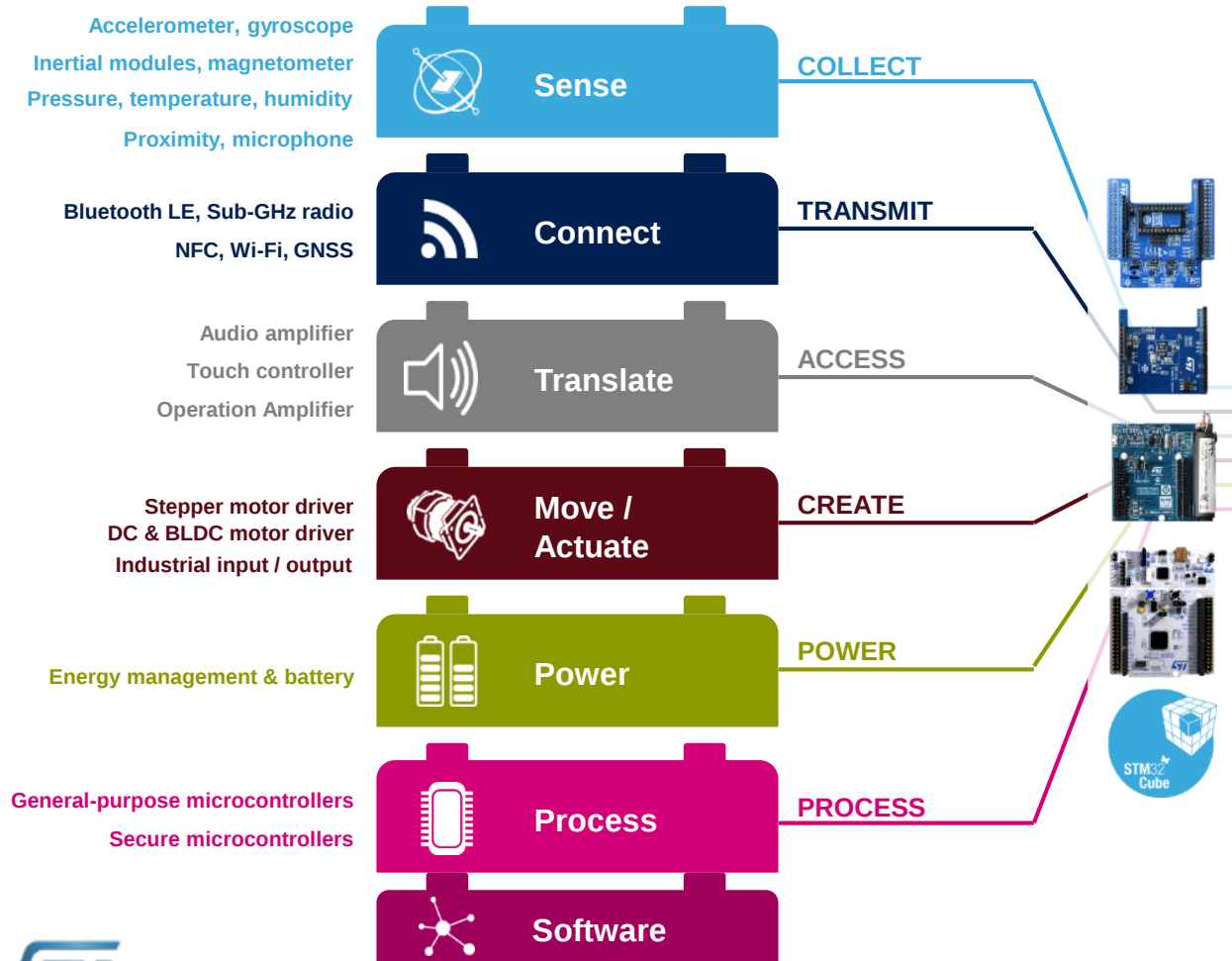
Building block approach

8

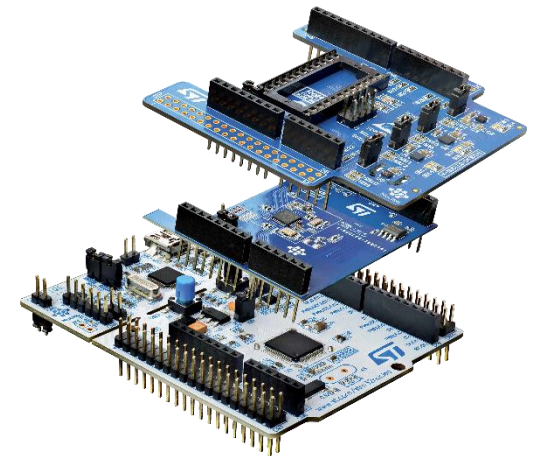
The building blocks

Your need

Our answer



 **STM32 Open Development Environment**



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Hardware Overview

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X-NUCLEO-IHM08M1 Hardware Description

The X-NUCLEO-IHM08M1 is a three-phase brushless DC motor driver expansion board based on the STL220N6F7 (STripFET™ F7 Power MOSFET) for STM32 Nucleo. The combination of STL220N6F7 and L6398 (IC driver) forms the high current power platform for the BLDC motor and the digital section based on the STM32 Nucleo board offers 6-step or FOC algorithm control solutions. It is compatible with the ST morpho connector and supports the addition of other boards which can be connected with a single STM32 Nucleo board. The user can also mount the Arduino™ UNO R3 connector.

Main features

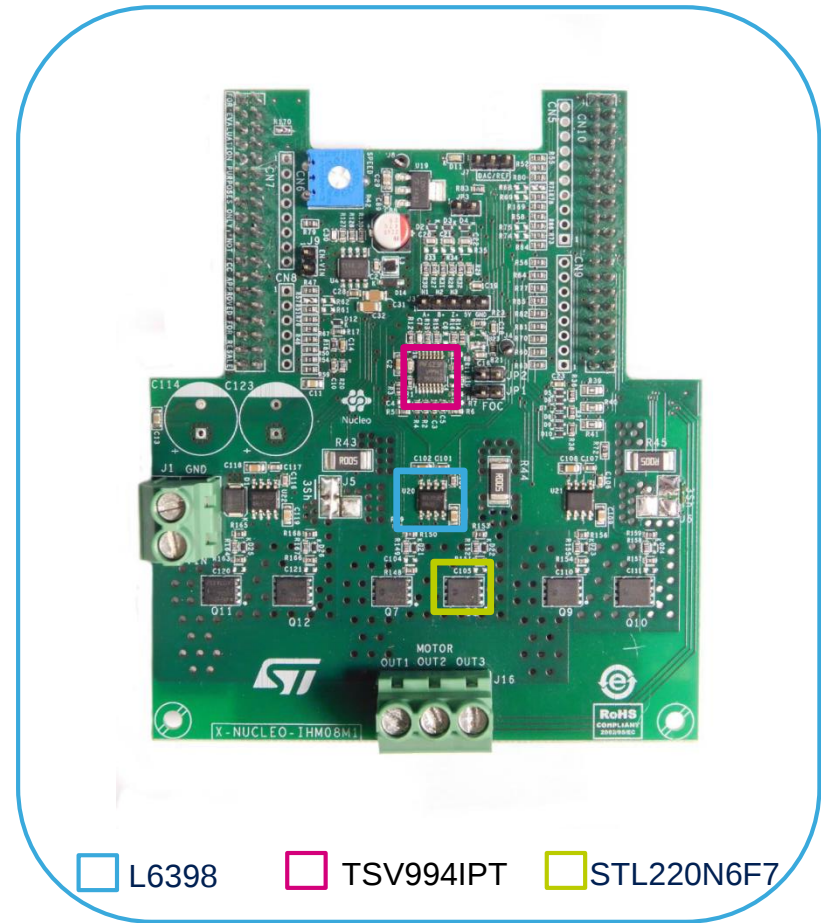
- 3-phase driver board for BLDC/PMSM motors.
- Nominal operating voltage range: 8 V - 48 V DC.
- Maximum output peak current: 30 A.
- Nominal RMS output current: 15A
- Thermal monitoring and overheating protection.
- 3-Shunt and 1-Shunt configurable jumpers for motor current sensing.
- Hall / Encoder motor sensor connector and circuit.
- Potentiometer available for speed regulation.
- User LED
- RoHS compliant.

Key Products on board

STL220N6F7: STripFET™ F7 Power MOSFET 260A, 60V

L6398: High voltage high and low-side driver

TSV994IPT: Rail to rail input/output high merit factor op-amps



Order Code: X-NUCLEO-IHM08M1

Low-Voltage BLDC motor driver expansion board

Software Overview

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X-CUBE-SPN8 Software description

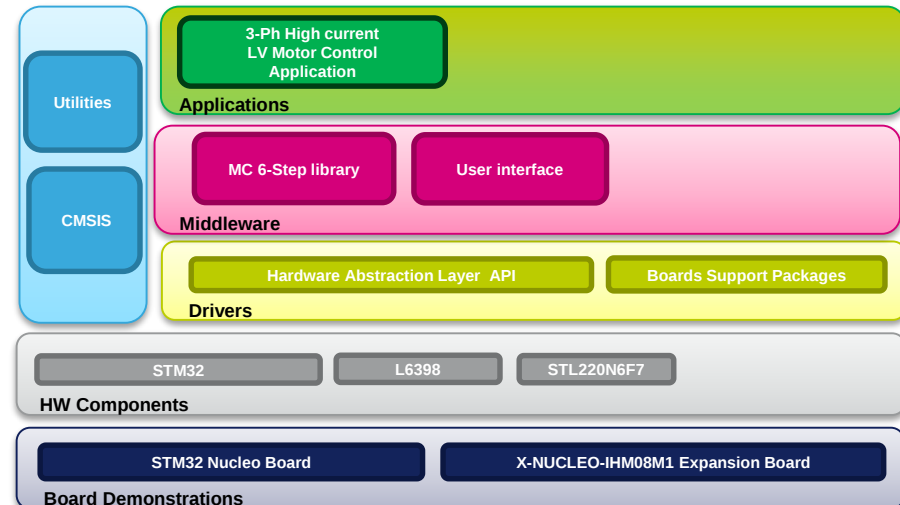
The X-CUBE-SPN8 is an expansion software package for STM32Cube. The software runs on the STM32 and includes drivers that recognize, initialize and send application commands to the L6398 device.

It is compatible with the NUCLEO-F302R8 or the NUCLEO-F401RE when connected to one or more X-NUCLEO-IHM08M1 expansion boards.

Key features

- Complete firmware package to build motor control applications based on L6398 gate drivers and STL220N6F7 Power MOSFETs (X-NUCLEO-IHM08M1).
- API function available to send any application command to motor driver
- Example implementation to control one low voltage three phase BLDC/PMSM motor, available on board X-NUCLEO-IHM08M1 expansion board when plugged to NUCLEO-F302R8 or NUCLEO-F01RE
- Easy portability across different MCU families, thanks to STM32Cube
- Free, user-friendly license terms

Overall System Architecture



Latest SW available at
X-CUBE-SPN8

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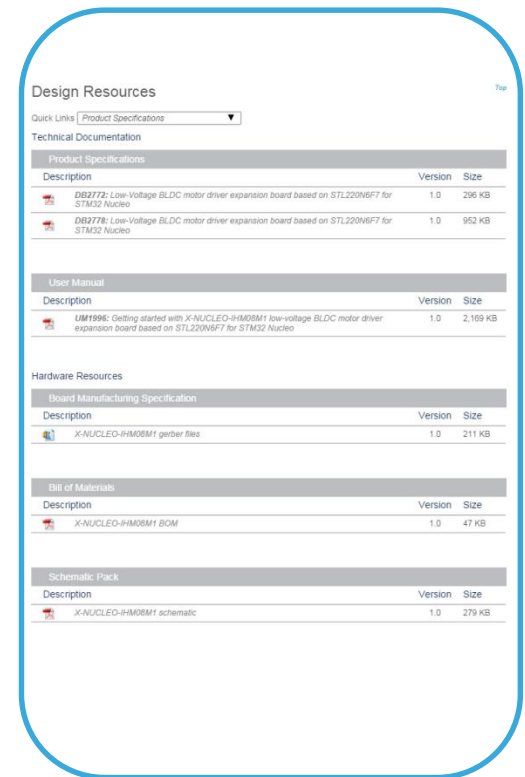
All documents are available in the Design Resources tab of the Low-Voltage BLDC motor driver expansion board webpage

X-NUCLEO-IHM08M1: Product Folder ([Link](#))

- **Gerber files, BOM, Schematic**
- **DB2778:** Low-Voltage BLDC motor driver expansion board based on STL220N6F7 for STM32 Nucleo – **data brief**
- **UM1996:** Getting started with X-NUCLEO-IHM08M1 low-voltage BLDC motor driver expansion board based on STL220N6F7 for STM32 Nucleo – **user manual**

X-CUBE-SPN8 : Product Folder ([Link](#))

- **DB2771:** Low-Voltage BLDC motor driver software expansion for STM32Cube – **data brief**
- **UM1992:** Getting started with X-CUBE-SPN8, low-voltage BLDC motor driver software expansion for STM32Cube – **user manual**
- **Software setup file**



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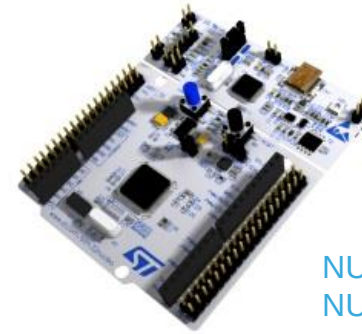
Setup & Demo Examples

Setup & Demo Examples

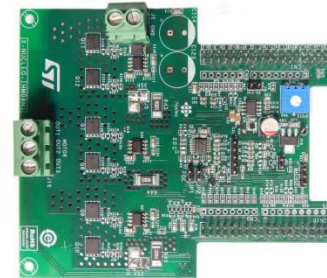
HW prerequisites

15

- 1 x X-NUCLEO-IHM08M1 (Low-Voltage BLDC motor driver expansion board based on STL220N6F7)
- 1 x STM32 Nucleo development board ([NUCLEO-F302R8](#) or [NUCLEO-F401RE](#))
- 1 x Low voltage 3-phase BLDC motor
- 1 x Laptop/PC equipped with Windows 7 or 8
- 1 x USB type A to Mini-B cable
- 1 x external power supply (according with the motor characteristics)



NUCLEO-F302R8 /
NUCLEO-F401RE



X-NUCLEO-IHM08M1



Low-Voltage 3-phase BLDC
motor

STM32 Nucleo + X-NUCLEO-IHM08M1 + LV motor

Setup & Demo Examples

SW prerequisites

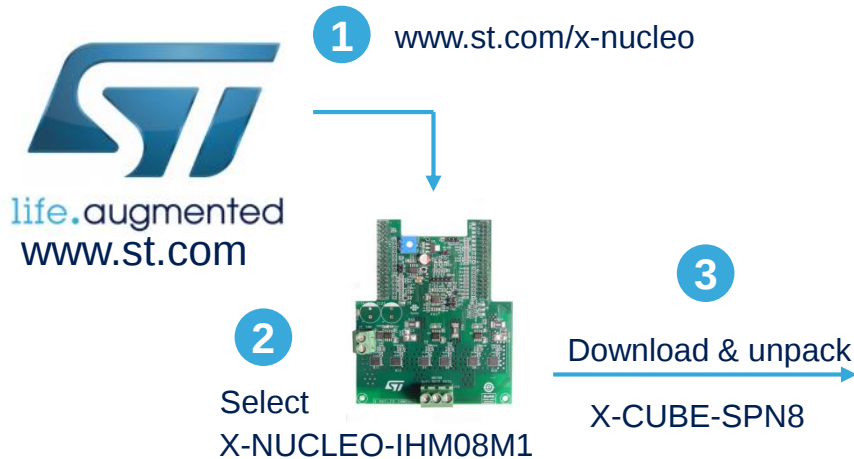
16

- STSW-LINK008: ST-LINK/V2-1 USB driver ([Link](#))
- STSW-LINK007: ST-LINK/V2-1 firmware upgrade ([Link](#))
- X-CUBE-SPN8 ([Link](#))
 - copy the .zip file content into a folder on your PC. The package will contain source code example (Keil, IAR, System Workbench) based on [NUCLEO-F302R8](#) or [NUCLEO-F401RE](#).

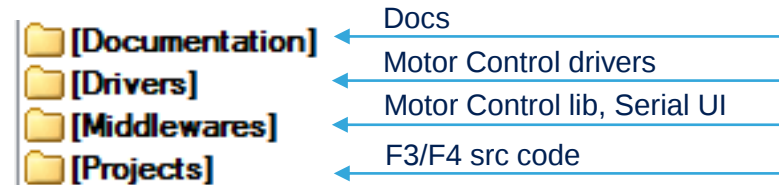
X-CUBE-SPN8 in 8 steps

Use of X-CUBE-SPN8 with pre-compiled .BIN FW file

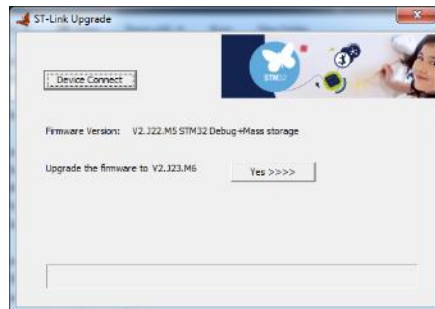
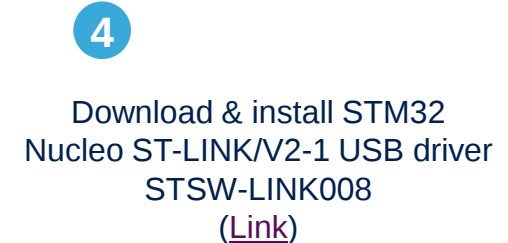
17



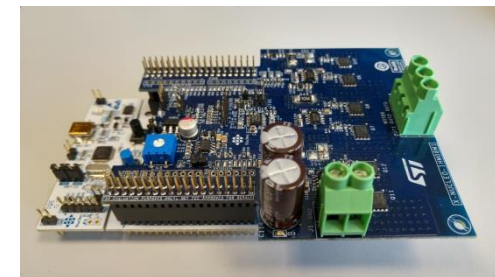
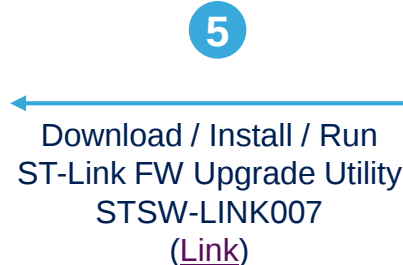
X-CUBE-SPN8 package main structure



4 Download & install STM32 Nucleo ST-LINK/V2-1 USB driver STSW-LINK008 ([Link](#))



5 Download / Install / Run ST-Link FW Upgrade Utility STSW-LINK007 ([Link](#))



Use of X-CUBE-SPN8 with pre-compiled .BIN FW file

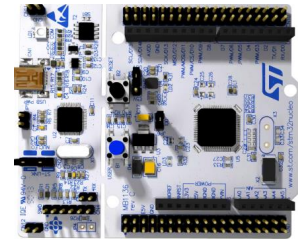
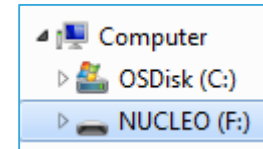
X-CUBE-SPN8 for NUCLEO-F302R8 or NUCLEO-F401RE

\\STM32CubeExpansion_SPN8_V1.0.0\\Projects\\Multi\\Examples\\MotorControl\\Binary\\STM32F302R8-Nucleo
\\STM32CubeExpansion_SPN8_V1.0.0\\Projects\\Multi\\Examples\\MotorControl\\Binary\\STM32F401RE-Nucleo

X-CUBE-SPN8_Fxxx.bin

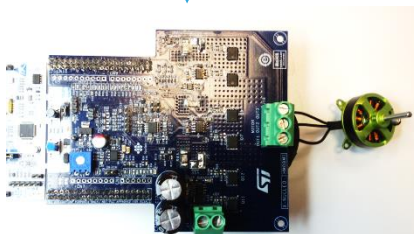
6

drag and drop
X-CUBE-SPN8_F302.bin for F3 or
X-CUBE-SPN8_F401.bin for F4 or
on Nucleo drive



Connect the STM32 NUCLEO board
with the X-NUCLEO-IHM08M1 board
and LV BLDC motor

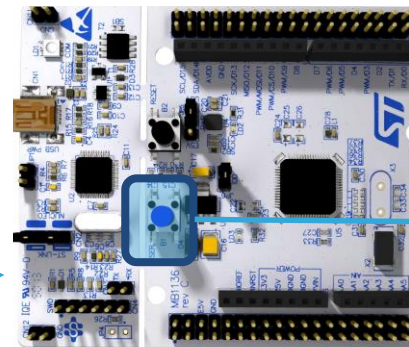
7



STM32 Nucleo + X-NUCLEO-IHM08M1 + LV motor

8

Push the blue
button
and motor RUN



Button

X-CUBE-SPN8 for code developers

Compile the FW using one of supported IDE

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X-CUBE-SPN8 for NUCLEO-F302R8 or NUCLEO-F401RE



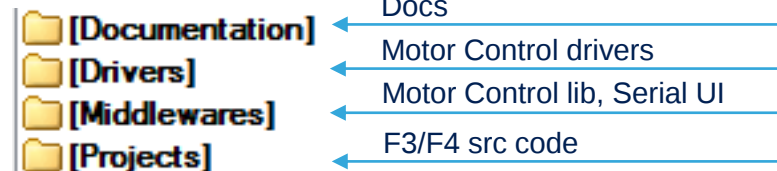
1 www.st.com/x-nucleo

2 Select
X-NUCLEO-IHM08M1



3 Download & unpack
X-CUBE-SPN8

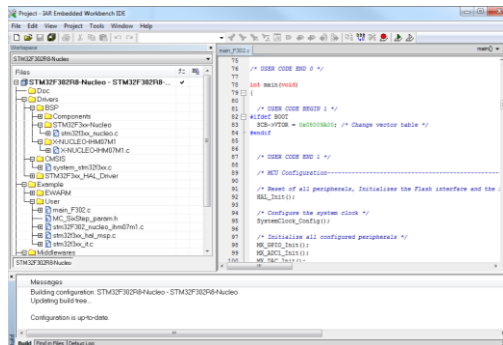
X-CUBE-SPN8 package main structure



Open the IDE workspace for
Nucleo board selected

4

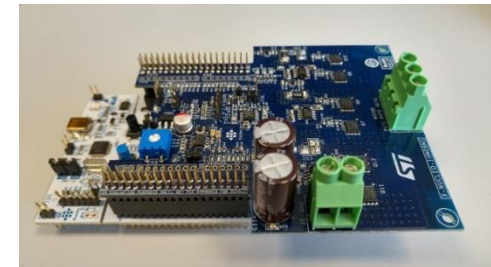
`\\STM32CubeExpansion_SPN8_V1.0.0\\Projects\\Multi\\Examples\\MotorControl\\EWARM\\STM32FXXXRX-Nucleo`

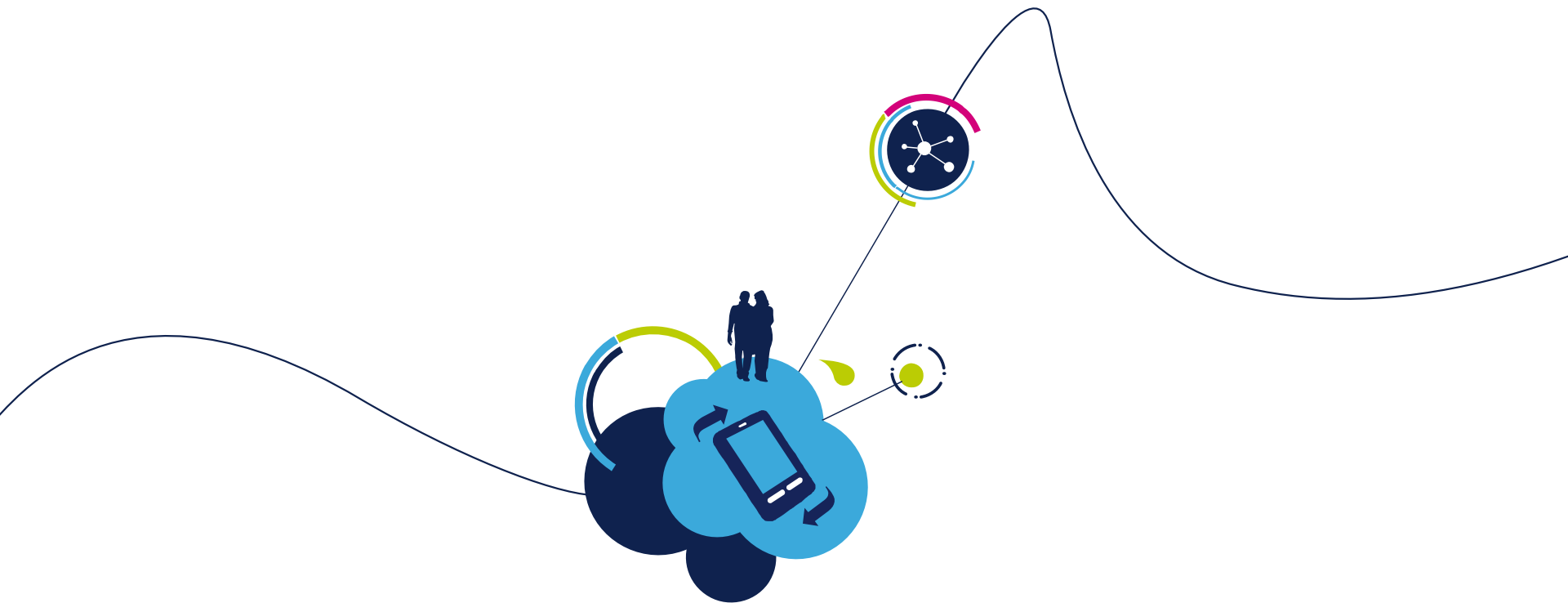


IAR IDE vers. 7.40



Flash and Run the project





www.st.com/stm32code