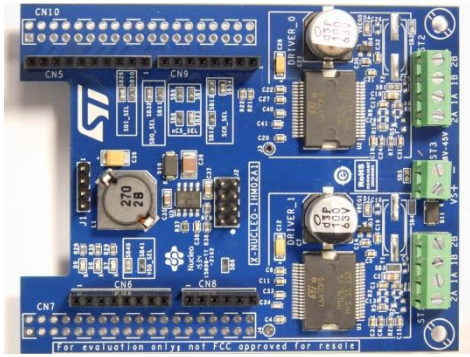
Quick Start Guide

Two axis stepper motor driver expansion board based on the L6470 for STM32 Nucleo (X-NUCLEO-IHM02A1)



Version 1.0 (November 18, 2015)

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Overview

1. Introduction to the STM32 Open Development Environment
2. STM32 Nucleo two axis stepper motor driver expansion board
   - Hardware overview
   - Software overview
3. Documents & Related Resources
4. Setup & Demo Examples

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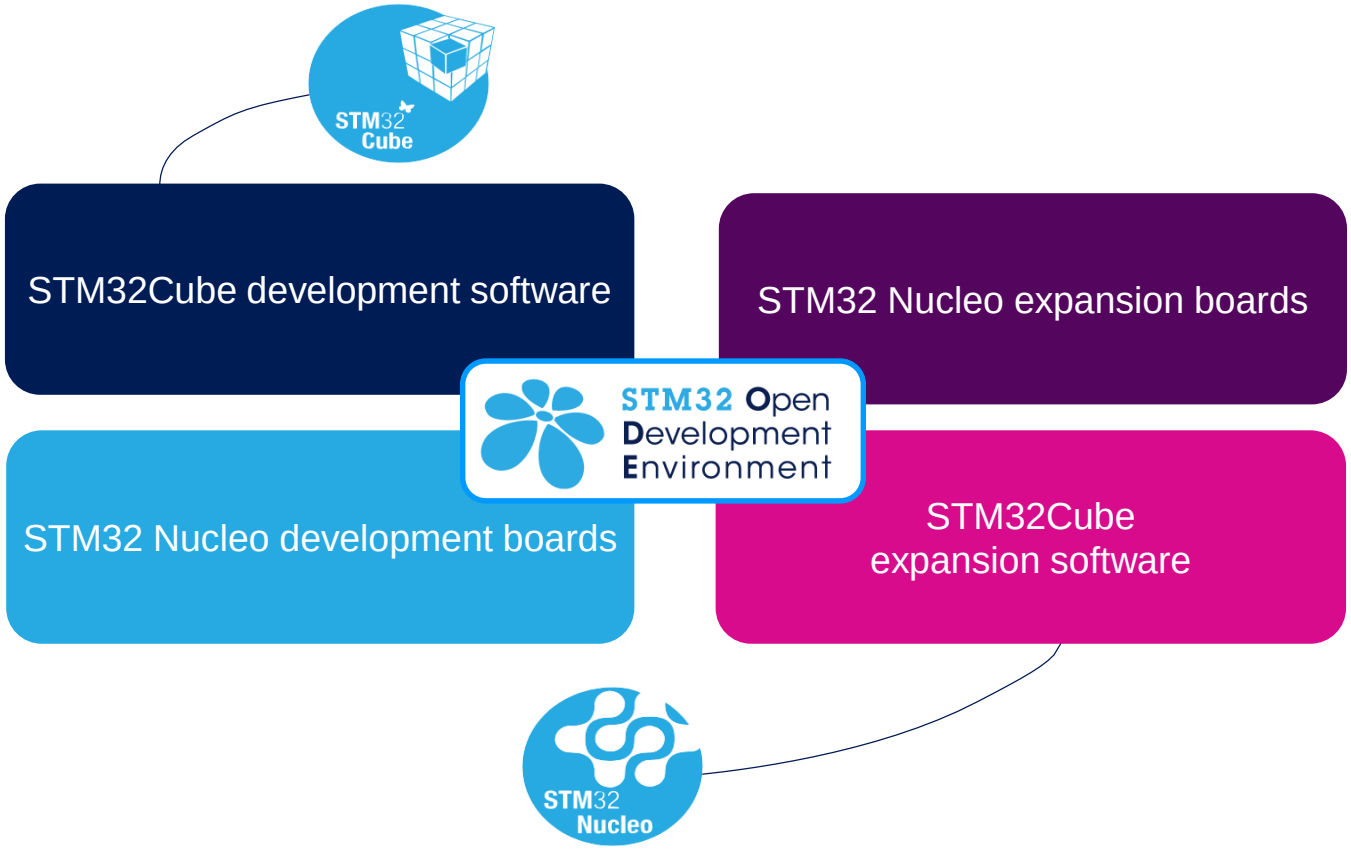
STM32 Open Development Environment
Fast, affordable Prototyping and Development

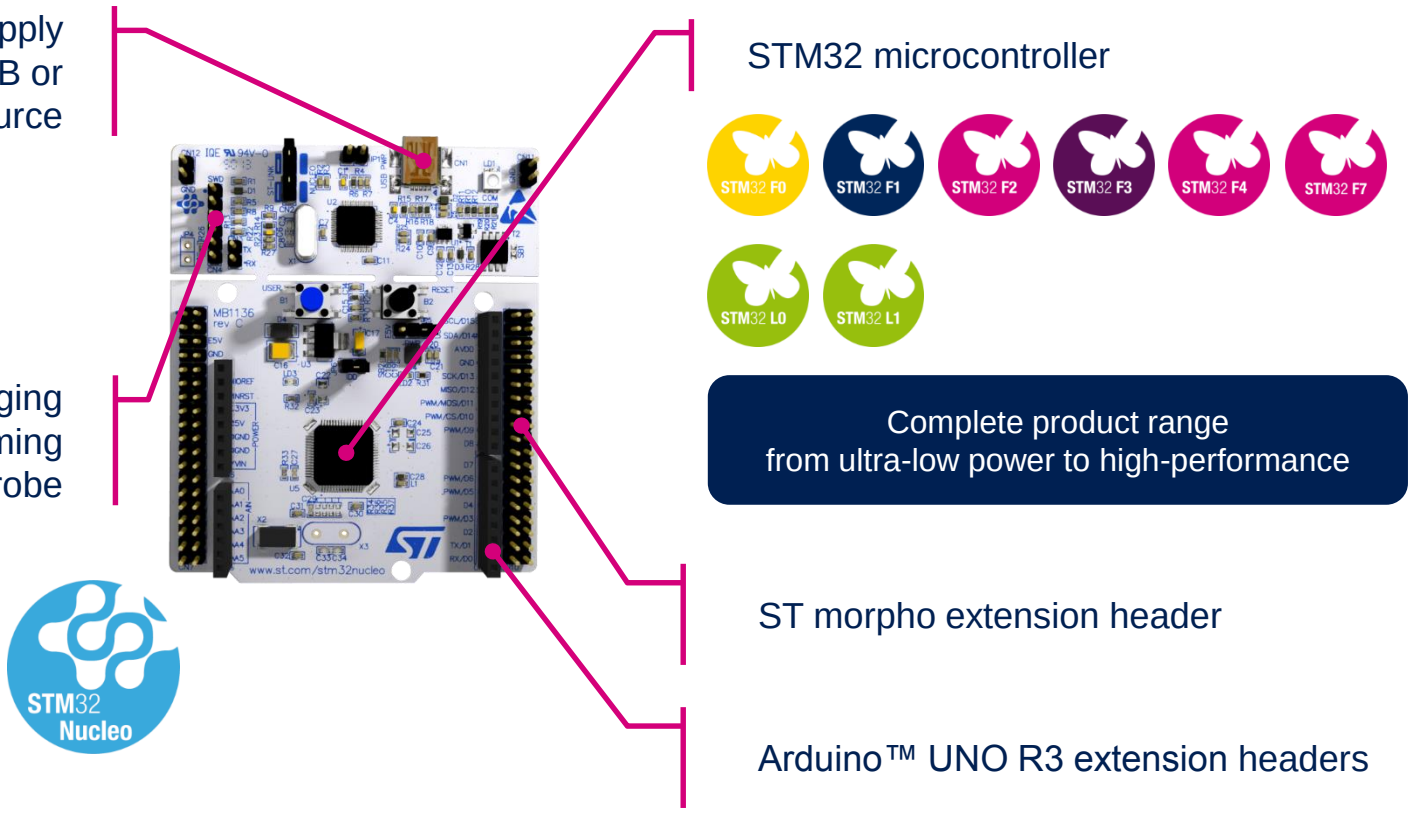
- The STM32 Open Development Environment (ODE) consists of a set of stackable boards and a modular open SW environment designed around the STM32 microcontroller family.



Compatibility with multiple Development environments

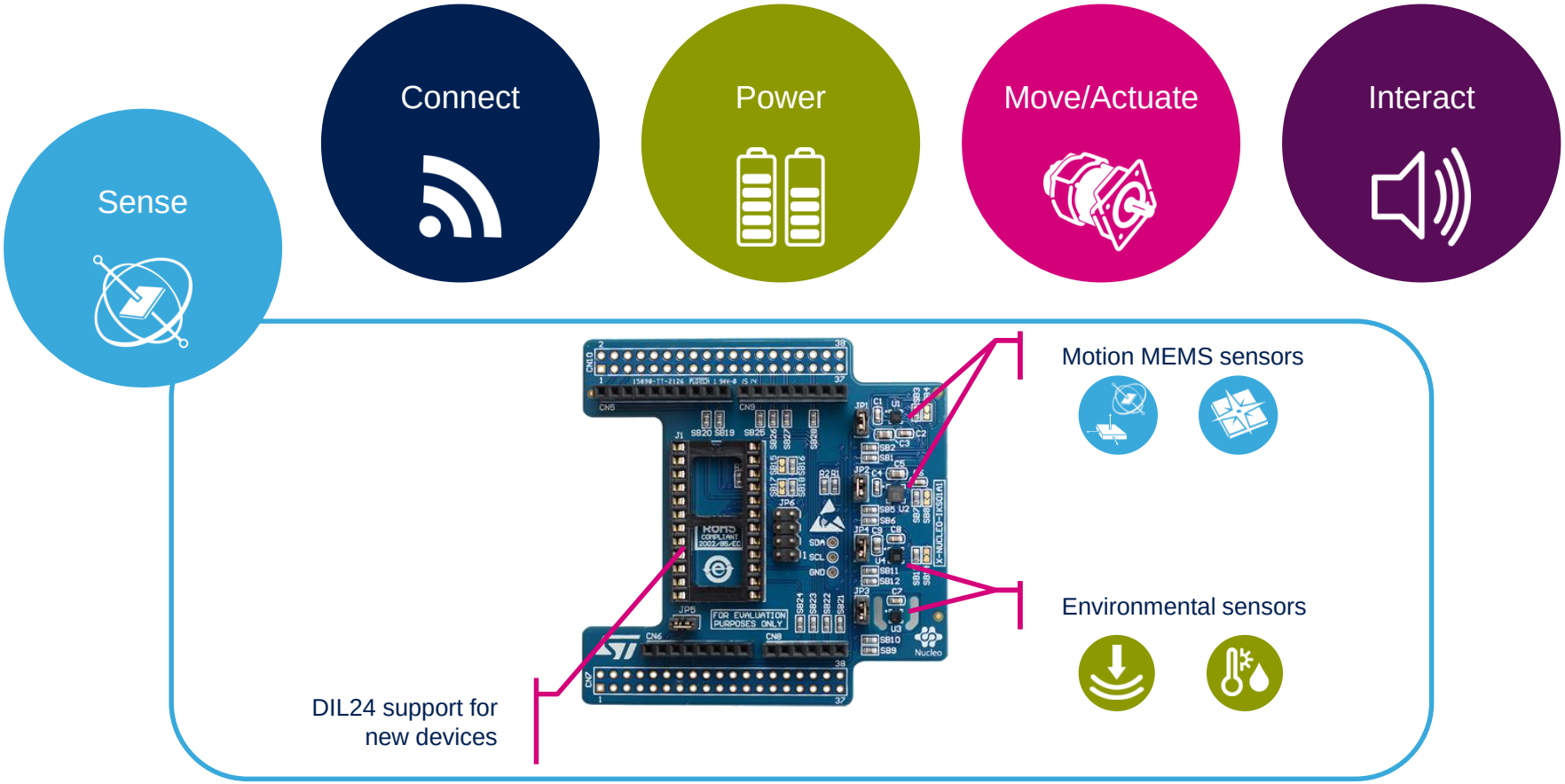
Development Boards (NUCLEO)

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



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.

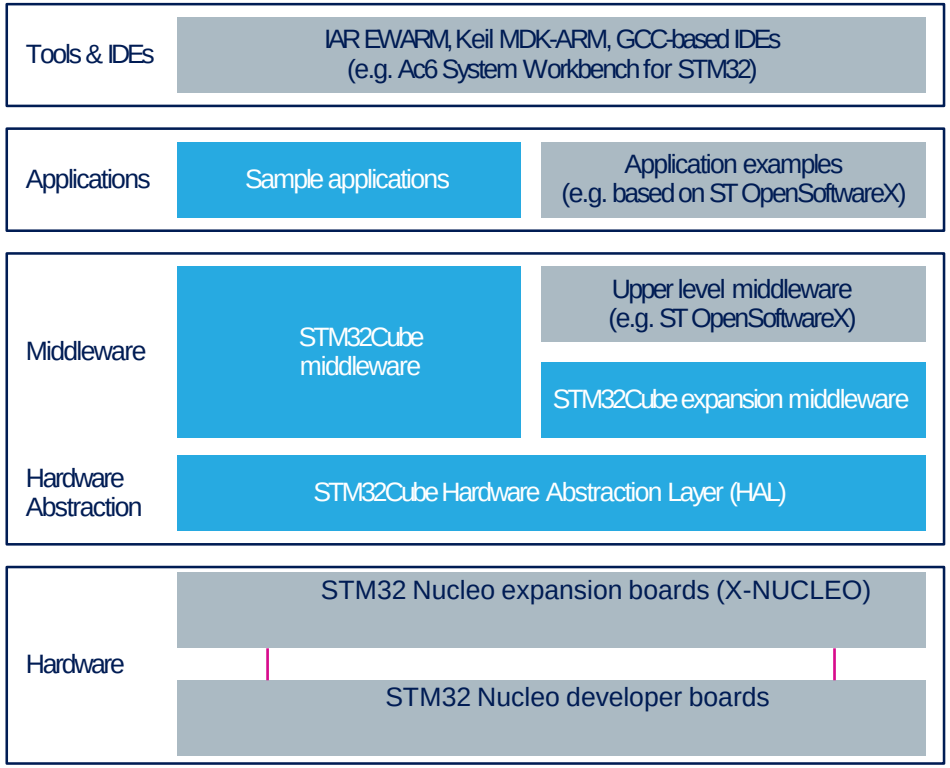


Example of STM32 expansion board (X-NUCLEO-IKS01A1)

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.

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

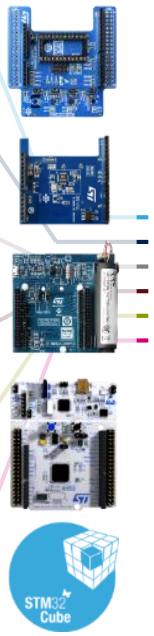
Energy management & battery

Power — POWER

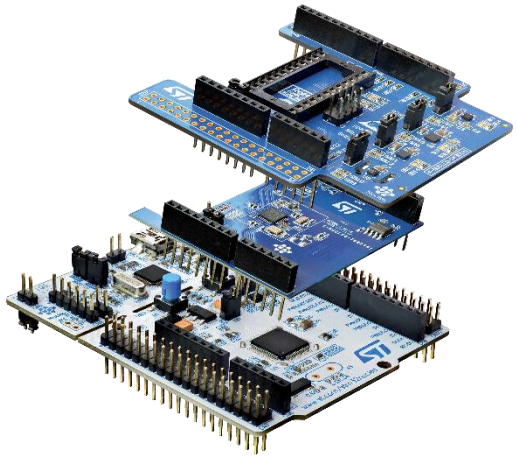
General-purpose microcontrollers
Secure microcontrollers

Process — PROCESS

Software



STM32 Open Development Environment



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Two axis stepper motor driver expansion board

Hardware Overview

X-NUCLEO-IHM02A1 Hardware description

The X-NUCLEO-IHM02A1 is a two axis stepper motor driver expansion board based on L6470. It provides an affordable and easy-to-use solution for driving low voltage motor control for Stepper Motor in your STM32 Nucleo project. The expansion board includes two L6470s, a fully-integrated micro stepping motor driver used to control stepper motors by means of high-end motion control commands received through SPI. It is capable of driving one or two stepper motors when plugged into an STM32 Nucleo board.

Main features:

- Nominal operating voltage range: 8 V - 45 V DC
- Maximum output peak current: 7.0 A (3.0 A rms) for each motor driver
- Digital voltage supply is selectable (3.3 V or 5.0 V)
- USART communication
- SPI interface (may be connected in a daisy chain configuration)
- Equipped with Arduino UNO R3 connectors
- Layout compatible with ST morpho connectors

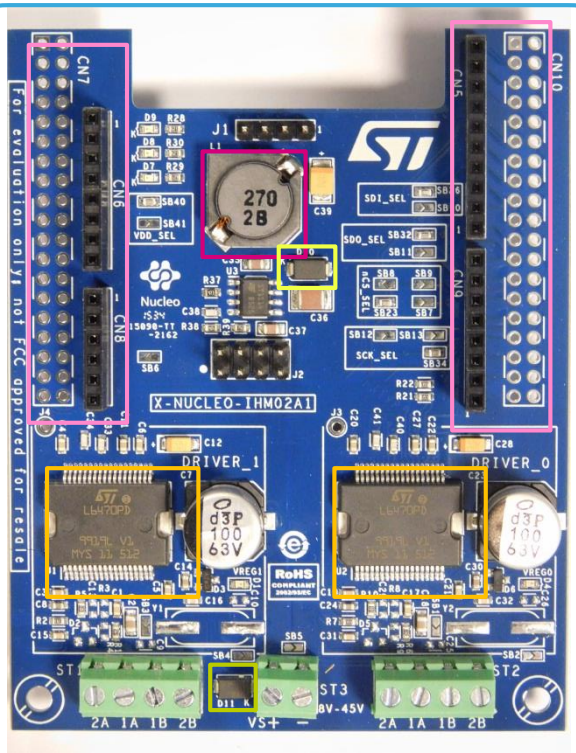
Key Products on board:

L6470: Fully integrated microstepping motor driver with motion engine and SPI

ST1S14: Up to 3 A step down switching regulator

SMAJ48A: Transil

STPS1L60: Low Drop Power Schottky Rectifier



L6470 ST1S14 SMAJ48A

STPS1L60 Connectors (Arduino UNO R3 and ST morpho) (*)

Order Code: X-NUCLEO-IHM02A1

Latest info available at
X-NUCLEO-IHM02A1

(*) only Arduino is mounted by default

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Two axis stepper motor driver software expansion

Software Overview

X-CUBE-SPN2 Software description

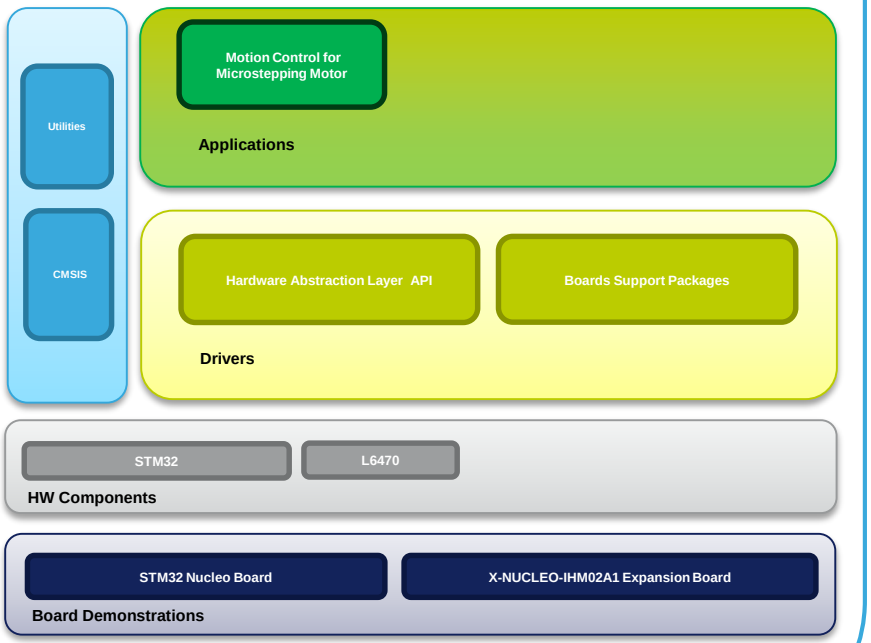
- The X-CUBE-SPN2 is an expansion software package for STM32Cube. The software runs on the STM32 and includes drivers that initialize and send application commands to all stepper motor drivers (L6470) mounted on one or more dedicated STM32 expansion board (X-NUCLEO-IHM02A1) stacked on a STM32 Nucleo Board.

- It is compatible with the NUCLEO-F401RE, the NUCLEO-F302R8 or the NUCLEO-F072RB when connected to X-NUCLEO-IHM02A1 expansion board for STM32.

Key features:

- Complete middleware to build applications using stepper motor driver (L6470) for STM32 expansion board (X-NUCLEO-IHM02A1)
- Addresses more than one STM32 expansion board
- Addresses more than two stepper motor drivers in the same daisy chain
- Simply functions to send application commands from one to all stepper motor drivers in a daisy chain simultaneously
- Sample application to send commands through a PC via USART
- Easy portability across different MCU families, thanks to STM32Cube
- Free, user-friendly license terms
- Sample implementation available on board X-NUCLEO-IHM02A1 when plugged into NUCLEO-F401RE, NUCLEO-F302R8 or NUCLEO-F072RB

Overall System Architecture



Latest SW available at
X-CUBE-SPN2

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Documents & Related Resources

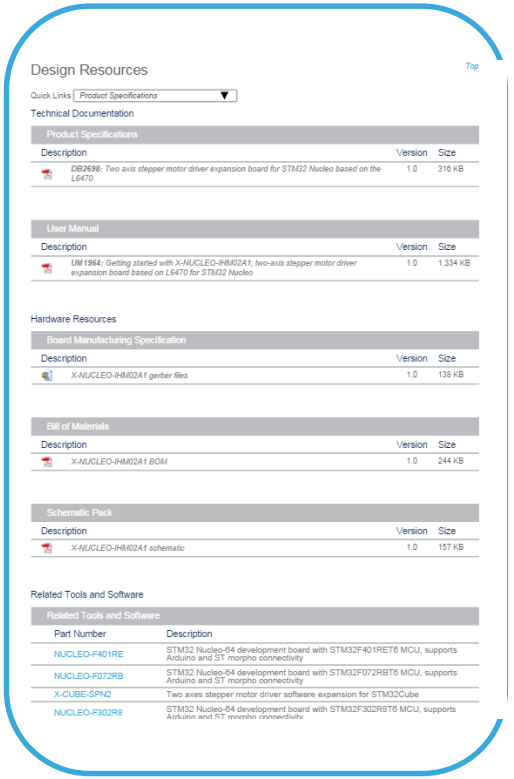
All documents are available in the Design Resources tab of the two axis stepper motor driver expansion board webpage

X-NUCLEO-IHM02A1: Product webpage (Link)

- **Gerber files, BOM, Schematic**
- **DB2698:** Two axis stepper motor driver expansion board for STM32 Nucleo based on L6470 – **Data Brief**
- **UM1964:** Getting started with X-NUCLEO-IHM02A1; two-axis stepper motor driver expansion board based on L6470 for STM32 Nucleo – **User Manual**

X-CUBE-SPN2: Product webpage (Link)

- **DB2699:** Two axis stepper motor driver software expansion for STM32Cube – **Data Brief**
- **UM1963:** Getting started with the X-CUBE-SPN2; two-axis stepper motor driver software expansion for STM32Cube – **User Manual**
- **Software setup file**



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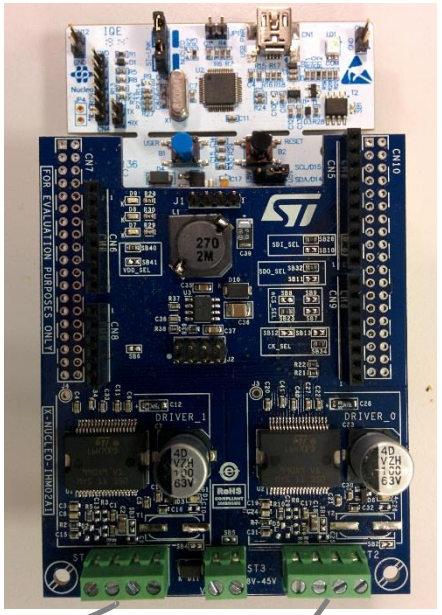
Setup & Demo Examples
HW prerequisites

- 1 x X-NUCLEO-IHM02A1 (Two axis stepper motor driver expansion board based on L6470)
- 1 x STM32 Nucleo board (NUCLEO-F401RE, NUCLEO-F302R8, or NUCLEO-F072RB)
- 1 x external DC power supply with two electric cables (*)
- 2 x stepper motors whose voltage and current compatible with the L6470 (**)
- 1 x Laptop/PC with MS Windows 7 or 8
- 1 x USB type A to Mini-B USB cable

Complete evaluation platform

STM32 NUCLEO
+
X-NUCLEO-IHM02A
+
2 stepper motors

NUCLEO-F401RE or
NUCLEO-F302R8 or
NUCLEO-F072RB



X-NUCLEO-IHM02A1

Stepper motor

Stepper motor

(*) Power stage supply voltage from 8 V to 45 VDC

(**) The example provided is set to use motors as the Hybrid Stepping Motor 42BYGHM809 by Wantai Motor.

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SW prerequisites

- STSW-LINK008: ST-LINK/V2-1 USB driver (Link)
- STSW-LINK007: ST-LINK/V2-1 firmware upgrade (Link)
- X-CUBE-SPN2 (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-F401RE, NUCLEO-F302R8, or NUCLEO-F072RB.

Use of X-CUBE-SPN2 with pre-compiled .BIN FW file

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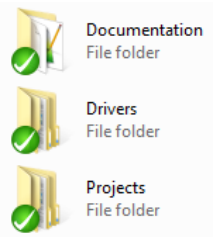
1 www.st.com/x-nucleo

2 Select
X-NUCLEO-IHM02A1

3 Download & unpack
X-CUBE-SPN2

X-CUBE-SPN2 package main structure

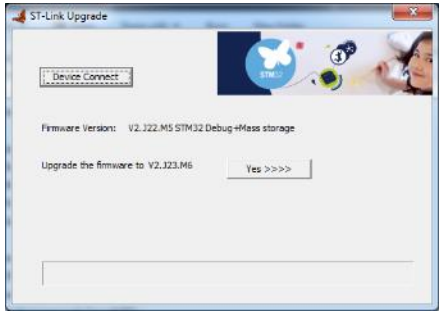


Docs

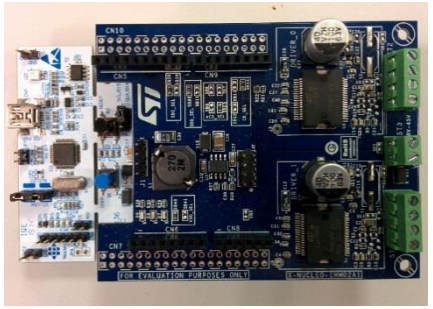
HAL and BSP drivers

F4/F3/F0 src code

4 Download & install STM32
Nucleo ST-LINK/V2-1 USB driver
STSW-LINK008



5 Download / Install / Run
ST-Link FW Upgrade Utility
STSW-LINK007



Use of X-CUBE-SPN2 with pre-compiled .BIN FW file

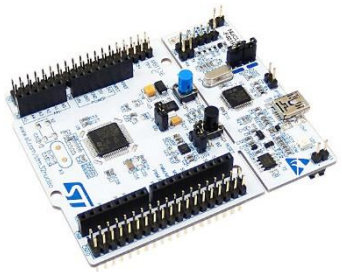
X-CUBE-SPN2 for NUCLEO-F401RE or NUCLEO-F302R8 or NUCLEO-F072RB

\STM32CubeExpansion_SPN2_V1.0.0\Projects\Multi\Examples\MotionControl\MicrosteppingMotor\Binary\NUCLEO-F401RE
\STM32CubeExpansion_SPN2_V1.0.0\Projects\Multi\Examples\MotionControl\MicrosteppingMotor\Binary\NUCLEO-F302R8
\STM32CubeExpansion_SPN2_V1.0.0\Projects\Multi\Examples\MotionControl\MicrosteppingMotor\Binary\NUCLEO-F072RB

X-CUBE-SPN2_Fxxx.bin

6

drag and drop
X-CUBE-SPN2_F401.bin for F4 or
X-CUBE-SPN2_F302.bin for F3 or
X-CUBE-SPN2_F072.bin for F0
on Nucleo drive



Connect the STM32 NUCLEO board with the X-NUCLEO board and two stepper motors

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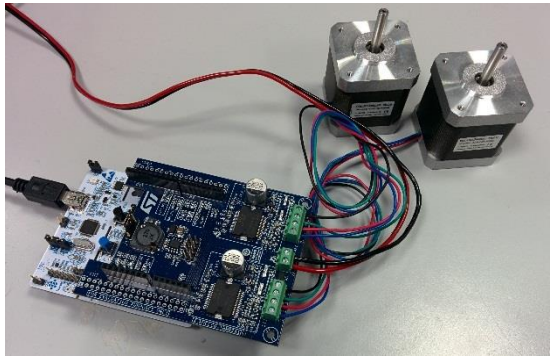
Nucleo + X-NUCLEO-IHM02A1 + two stepper motors



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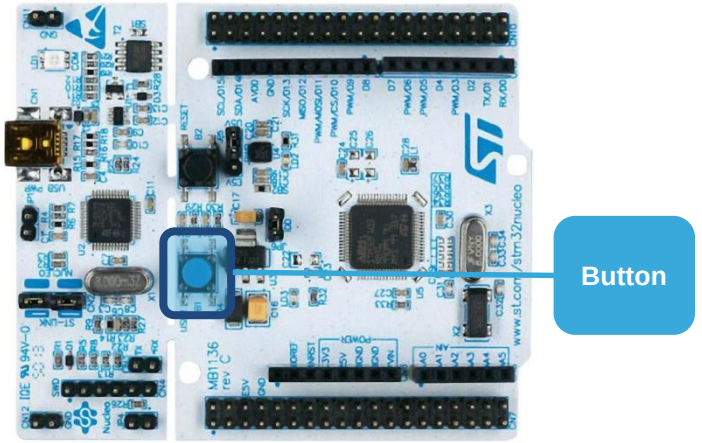
Push the blue button and motor RUN



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X-CUBE-SPN2 for code developers

Compile the FW using one of supported IDE

X-CUBE-SPN2 for NUCLEO-F401RE or NUCLEO-F302R8, NUCLEO-F072RB

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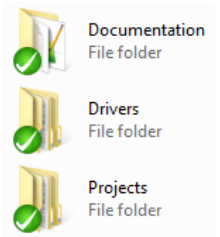
1 www.st.com/x-nucleo

2 Select X-NUCLEO-IHM02A1

3 Download & unpack X-CUBE-SPN2

X-CUBE-SPN2 package main structure



Docs

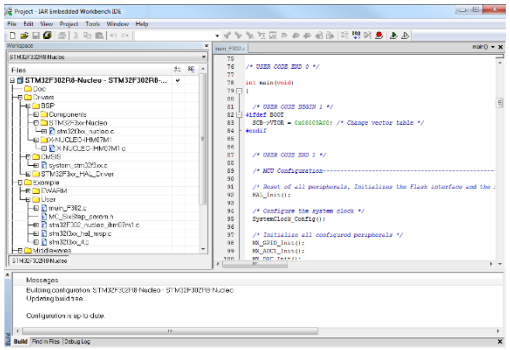
HAL and BSP drivers

F4/F3/F0 src code

Open the IDE workspace for Nucleo board selected

4

\STM32CubeExpansion_SPN2_V1.0.0\Projects\Multi\Examples\MotionControl\MicrosteppingMotor\EWARM\
\STM32CubeExpansion_SPN2_V1.0.0\Projects\Multi\Examples\MotionControl\MicrosteppingMotor\MDK-ARM\
\STM32CubeExpansion_SPN2_V1.0.0\Projects\Multi\Examples\MotionControl\MicrosteppingMotor\SW4STM32\



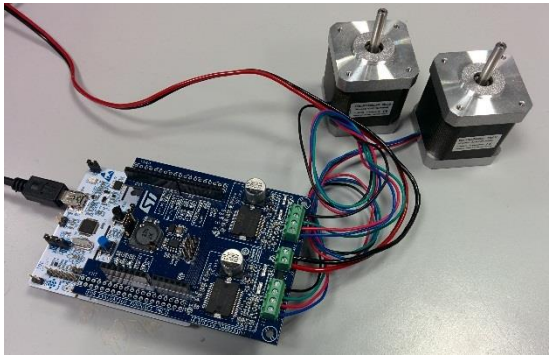
IAR IDE vers. 7.20

KEIL Tools by ARM

IAR SYSTEMS

Open STM32 Tools

Flash and Run the project



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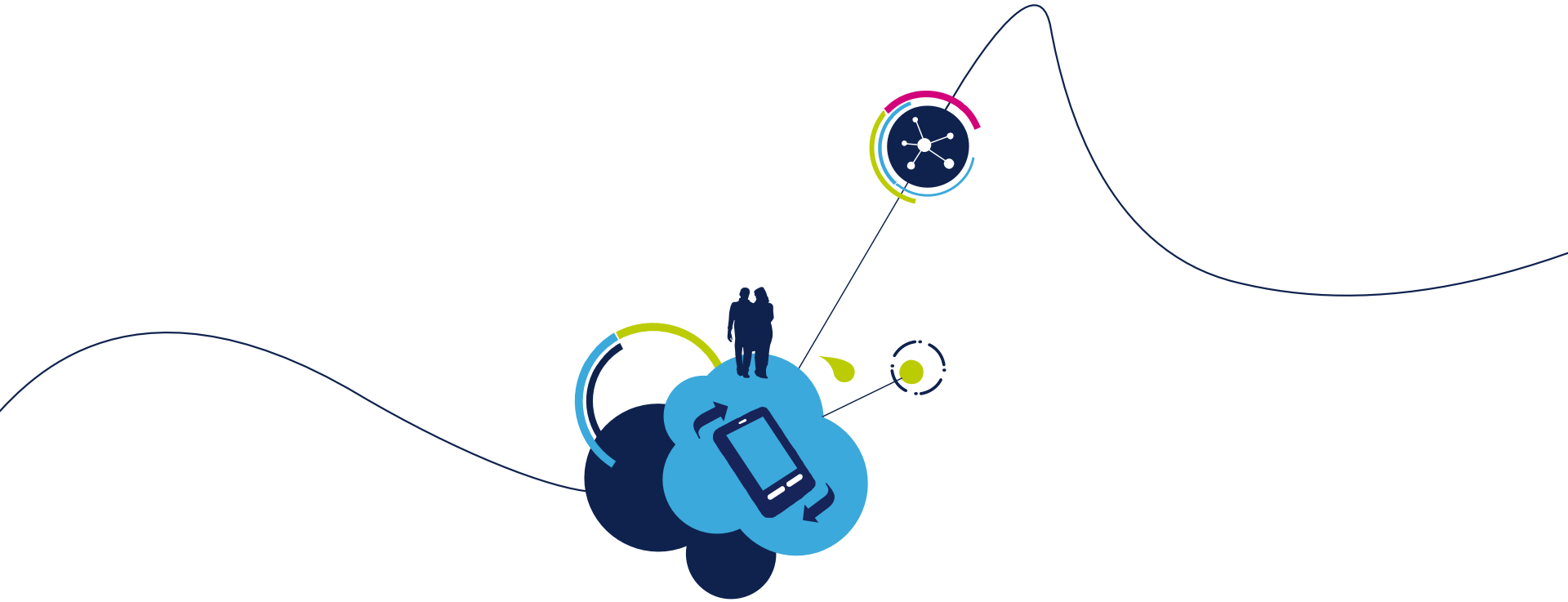

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