

Quick Start Guide

Three-phase brushless DC motor driver expansion board based on L6230 for STM32 Nucleo (X-NUCLEO-IHM07M1)



Version 1.0 (September 18, 2015)

1

Introduction to the STM32 Open Development Environment

2

STM32 Nucleo Three-phase brushless DC motor driver expansion board

- Hardware overview
- Software overview

3

Documents & Related Resources

4

Setup & Demo Examples

1

Introduction to the STM32 Open Development Environment

2

STM32 Nucleo Three-phase brushless DC motor driver expansion board

- Hardware overview
- Software overview

3

Documents & Related Resources

4

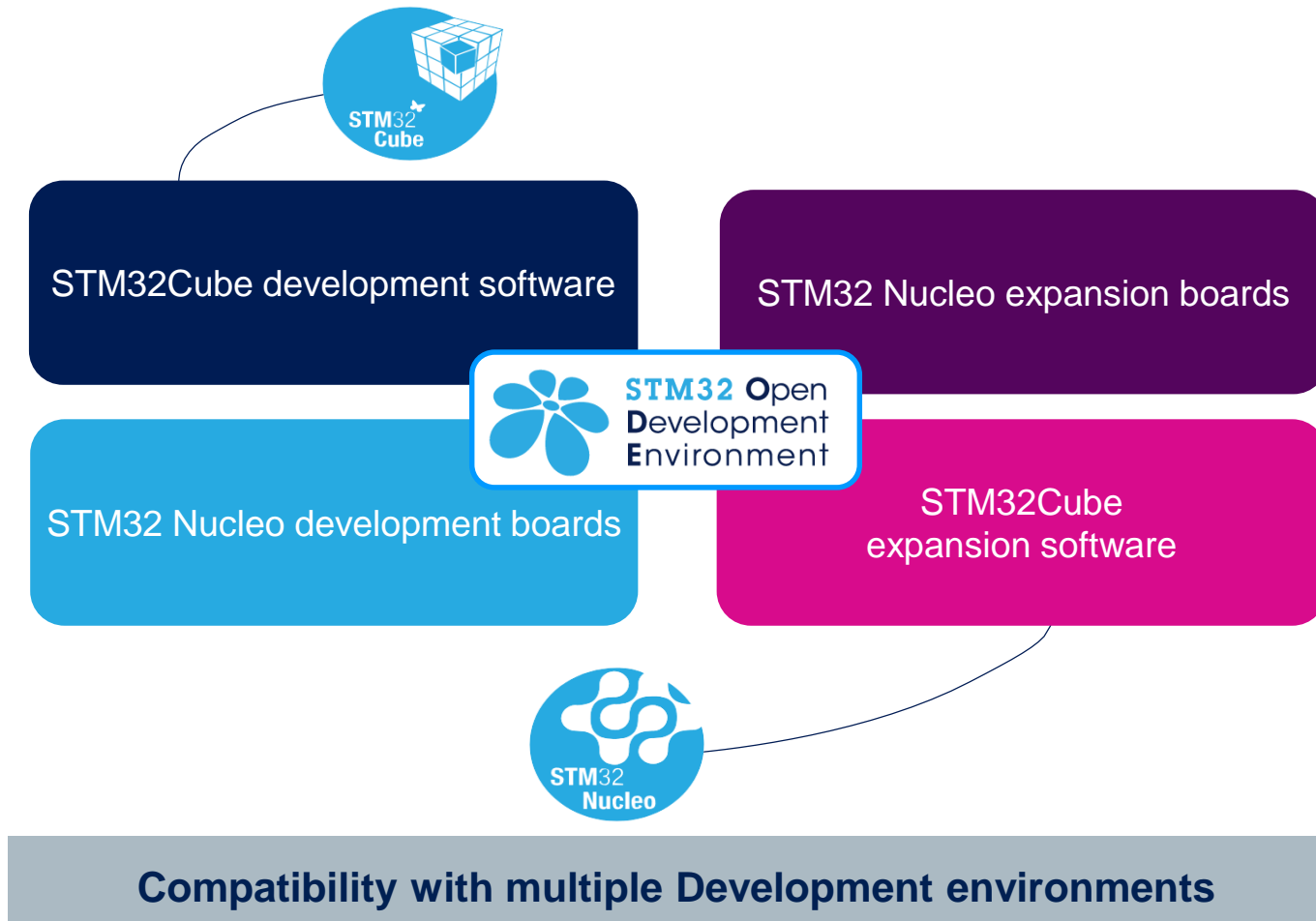
Setup & Demo Examples

STM32 Open Development Environment

Fast, affordable Prototyping and Development

4

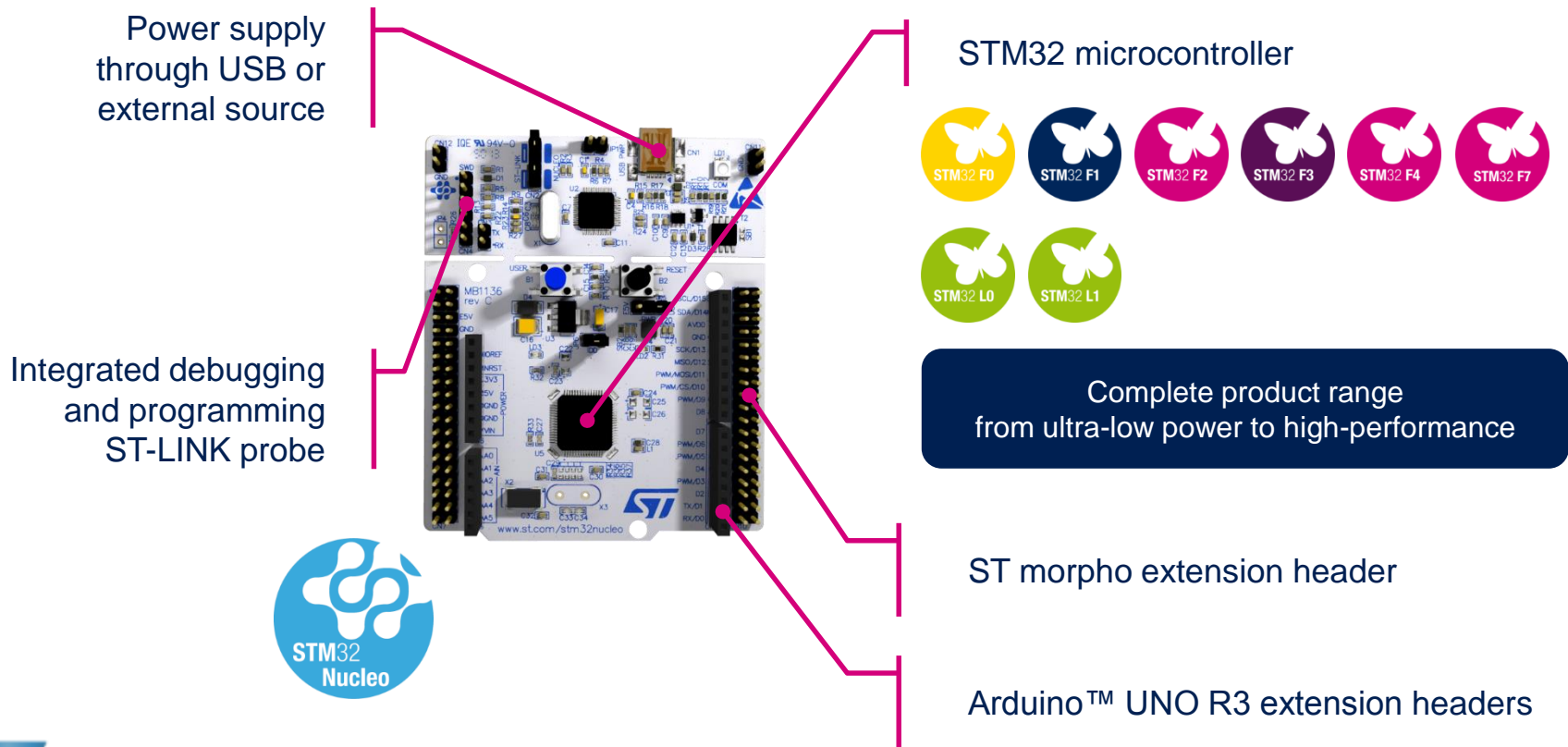
- The STM32 Open Development Environment (ODE) consists of a set of stackable boards and a modular open SW environment designed around the STM32 microcontroller family.



STM32 Nucleo Development Boards (NUCLEO)

5

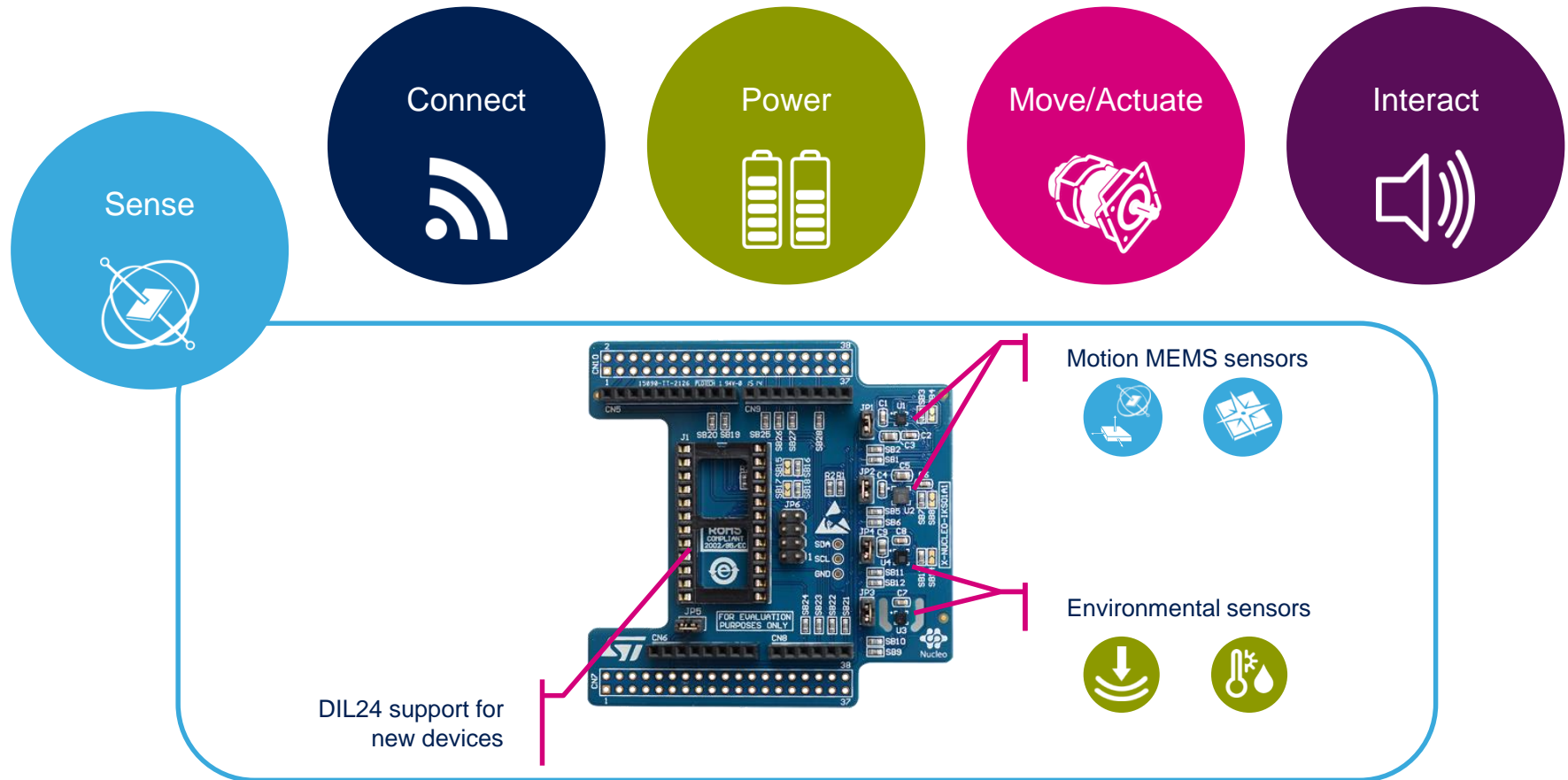
- A comprehensive range of affordable development boards for all the STM32 microcontroller series, with unlimited unified expansion capabilities and integrated debugger/programmer functionality.



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.



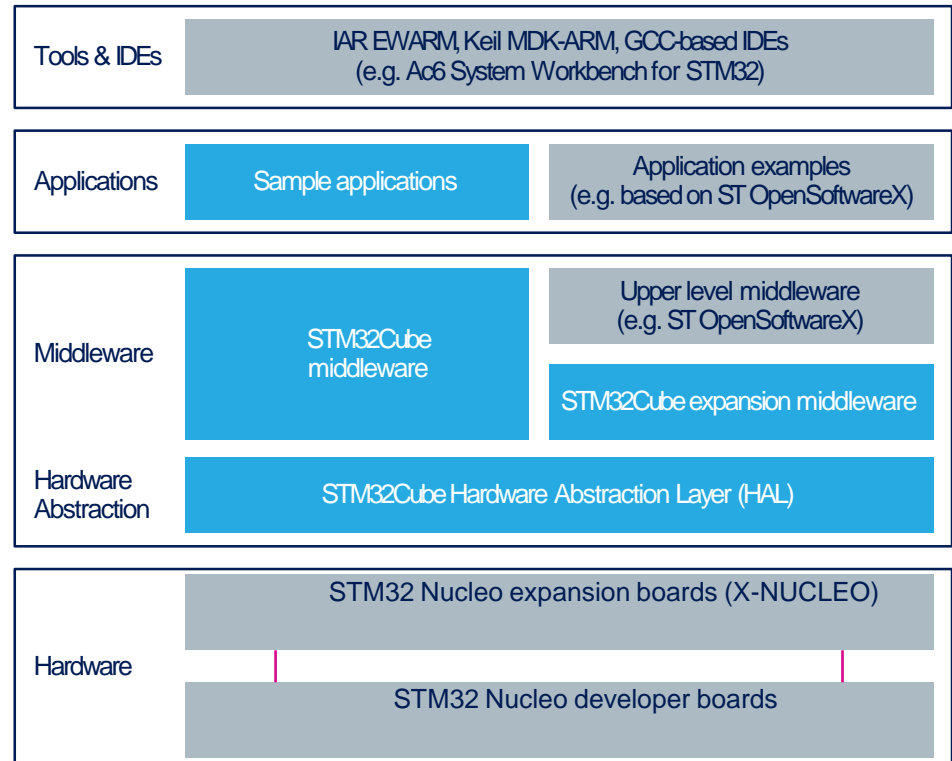
Example of STM32 expansion board (X-NUCLEO-1KS01A1)

STM32 Open Development Environment

Software components

7

- **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

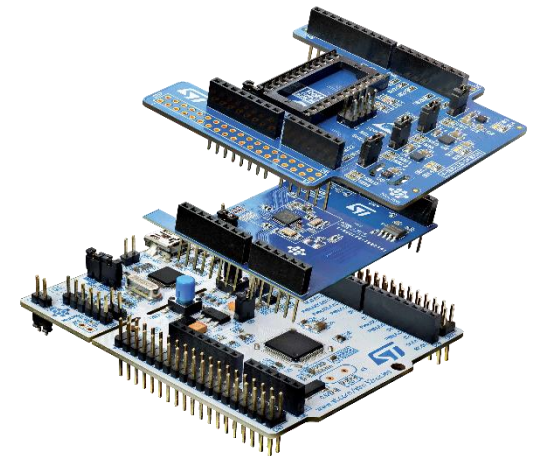
The building blocks

Your need

Our answer



 **STM32 Open Development Environment**



1

Introduction to the STM32 Open Development Environment

2

STM32 Nucleo Three-phase brushless DC motor driver expansion board

- Hardware overview
- Software overview

3

Documents & Related Resources

4

Setup & Demo Examples

Three-phase brushless DC motor driver expansion board

Hardware Overview

10

X-NUCLEO-IHM07M1 Hardware description

- The X-NUCLEO-IHM07M1 is a three-phase brushless DC motor driver expansion board based on L6230 for STM32 Nucleo. It provides an affordable and easy-to-use solution for driving three-phase brushless DC motor in your STM32 Nucleo project. It is compatible with the ST morpho connector and supports the addition of other boards which can be stacked with a single STM32 Nucleo board. The user can also mount the Arduino UNO R3 connector
- Main features**
 - Nominal operating voltage range: 8 V - 48 V DC
 - Maximum output peak current: 2.8 A
 - Thermal measuring and overheating protection
 - 3-Shunt and 1-Shunt configurable jumpers for motor current sensing
 - Hall / Encoder motor sensor connector and circuit

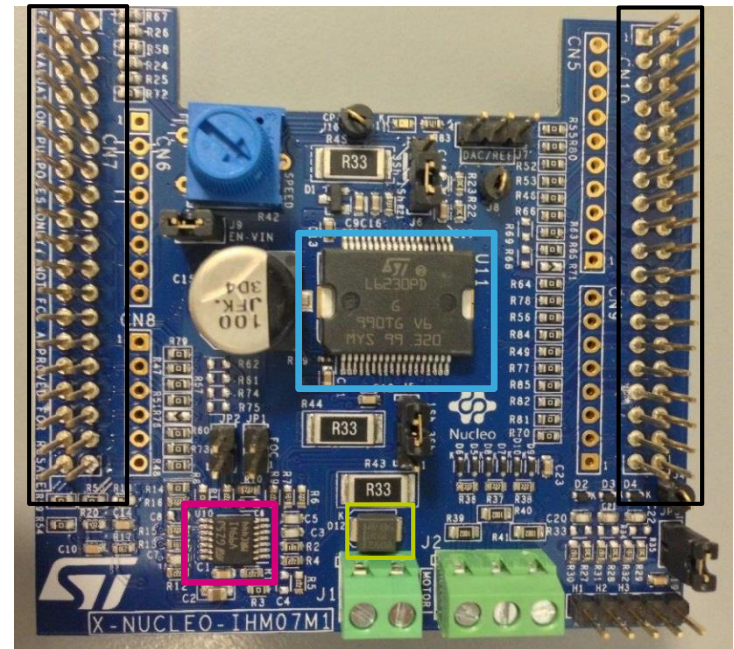
Key Products on board

L6230: DMOS driver for three-phase brushless DC motor

TSV994: Rail to rail input / output high merit factor op-amps

BAT30: Small signal Schotky diodes, 30V, 0.3A

Latest info available at
X-NUCLEO-IHM07M1



- ☐ L6230PD
- ☐ TSV994IPT
- ☐ BAT30KFILM
- ☐ ST morpho connectors

Order Code: X-NUCLEO-IHM07M1

Three-phase brushless DC motor driver expansion board

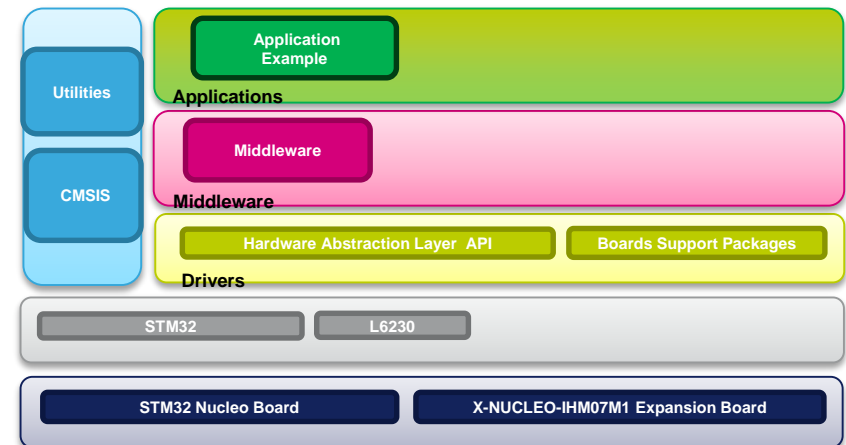
Software Overview

11

X-CUBE-SPN7 Software description

- The X-CUBE-SPN7 is an expansion software package for STM32Cube. The software runs on the STM32 and includes drivers that recognize, initialize and send application commands to L6230 device.
- It is compatible with the NUCLEO-F030R8, the NUCLEO-F103RB, the NUCLEO-F302R8 or the NUCLEO-F401RE when connected to one or more X-NUCLEO-IHM07M1 expansion boards.
- **Key features**
 - Complete middleware to build Motor Control applications based on three-phase BLDC motor.
 - Easy portability across different MCU families, thanks to STM32Cube
 - Free, user-friendly license terms

Overall System Architecture



Latest SW available at
X-CUBE-SPN7

1

Introduction to the STM32 Open Development Environment

2

STM32 Nucleo Three-phase brushless DC motor driver expansion board

- Hardware overview
- Software overview

3

Documents & Related Resources

4

Setup & Demo Examples

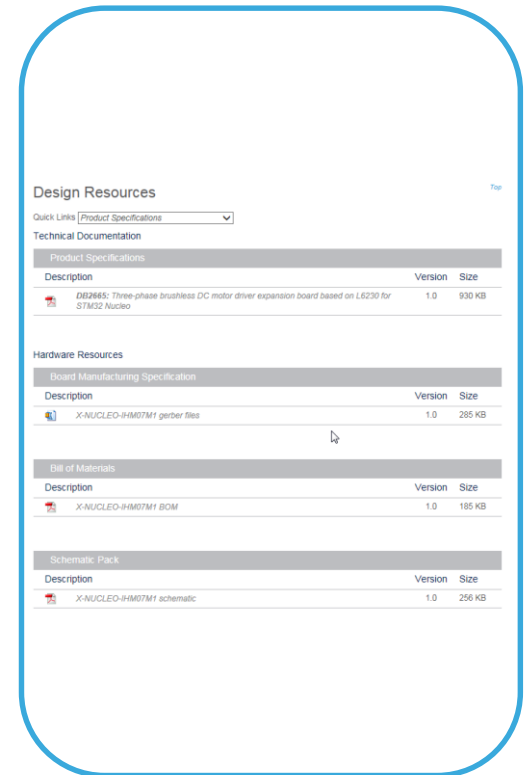
All documents are available in the Design Resources tab of the three-phase brushless motor driver expansion board webpage

X-NUCLEO-IHM07M1: Product webpage ([Link](#))

- **Gerber files, BOM, Schematic**
- **DB2665:** Three-phase brushless DC motor driver expansion board based on L6230 for STM32 Nucleo – **Data Brief**
- **UM1943:** Getting started with the X-NUCLEO-IHM07M1; three-phase brushless DC motor driver expansion board based on L6230 for STM32 Nucleo – **User Manual**

X-CUBE-SPN7: Product webpage ([Link](#))

- **DB2667:** Three-phase brushless DC motor driver software expansion for STM32Cube – **Data Brief**
- **UM1946:** Getting started with the X-CUBE-SPN7; three-phase DC motor Driver software expansion for STM32Cube – **User Manual**
- Software setup file



1

Introduction to the STM32 Open Development Environment

2

STM32 Nucleo Three-phase brushless DC motor driver expansion board

- Hardware overview
- Software overview

3

Documents & Related Resources

4

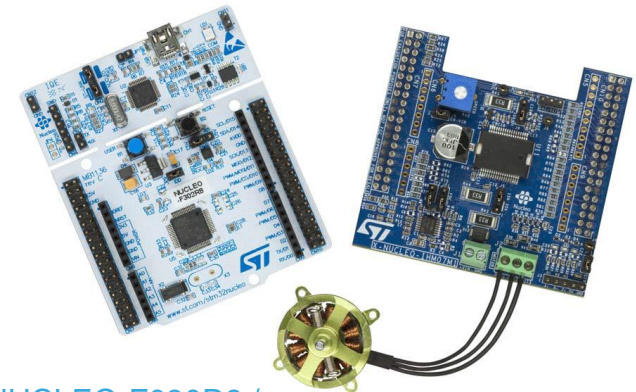
Setup & Demo Examples

Setup & Demo Examples

HW prerequisites

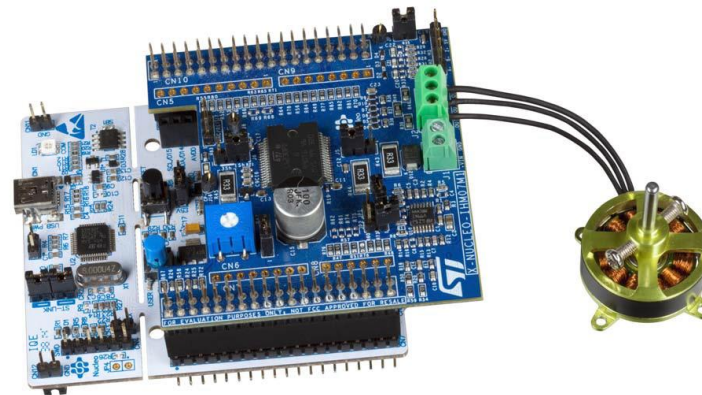
15

- 1 x X-NUCLEO-IHM07M1 (Three-phase Motor driver expansion board based on L6230)
- 1 x STM32 Nucleo development board (NUCLEO-F030R8, NUCLEO-F103RB, NUCLEO-F302R8 or NUCLEO-F401RE)
- 1 x external DC power supply with two electric cables (*)
- 1 x low voltage three-phase BLDC motor
- 1 x Laptop/PC with MS Windows 7 or 8
- 1 x mini USB cable



NUCLEO-F030R8 /
NUCLEO-F103RB /
NUCLEO-F302R8 /
NUCLEO-F401RE

X-NUCLEO-IHM07M1



Complete evaluation platform: NUCLEO +
X-NUCLEO-IHM07M1 + LV Motor

Low voltage motor:
Three-phase BLDC
motor, BR2804-1700
kV or equivalent

Setup & Demo Examples

SW prerequisites

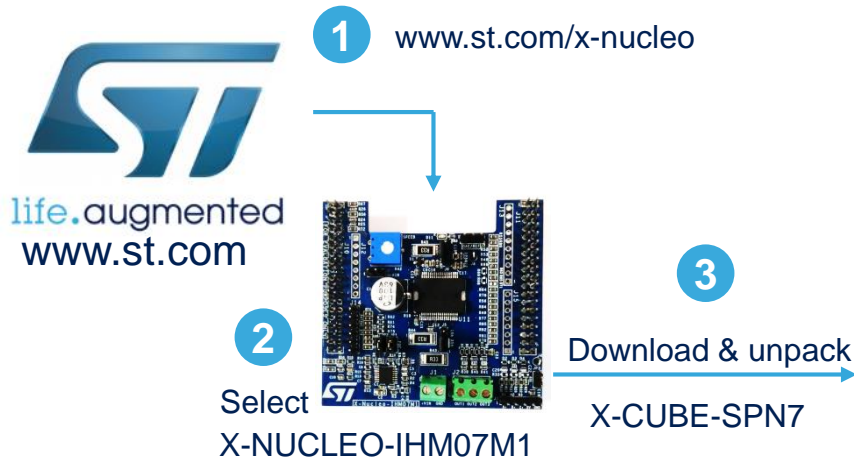
16

- STSW-LINK008: ST-LINK/V2-1 USB driver ([Link](#))
- STSW-LINK007: ST-LINK/V2-1 firmware upgrade ([Link](#))
- X-CUBE-SPN7 ([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-F030R8](#), [NUCLEO-F103RB](#), [NUCLEO-F302R8](#) or [NUCLEO-F401RE](#).

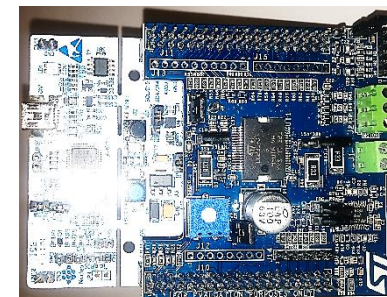
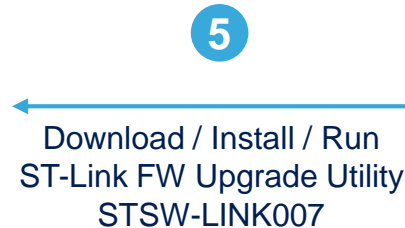
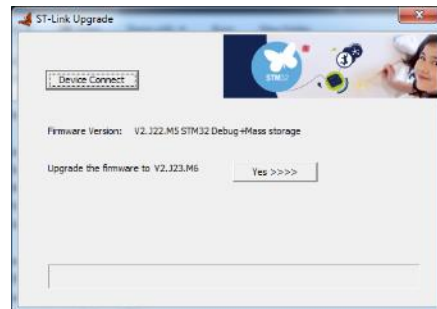
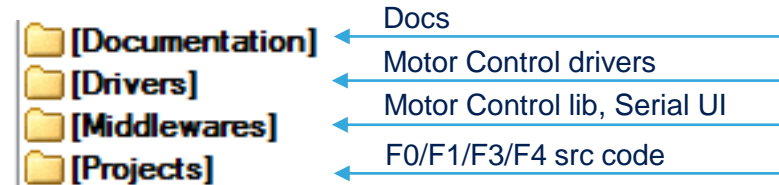
X-CUBE-SPN7 in 8 steps

Use of X-CUBE-SPN7 with pre-compiled .BIN FW file

17



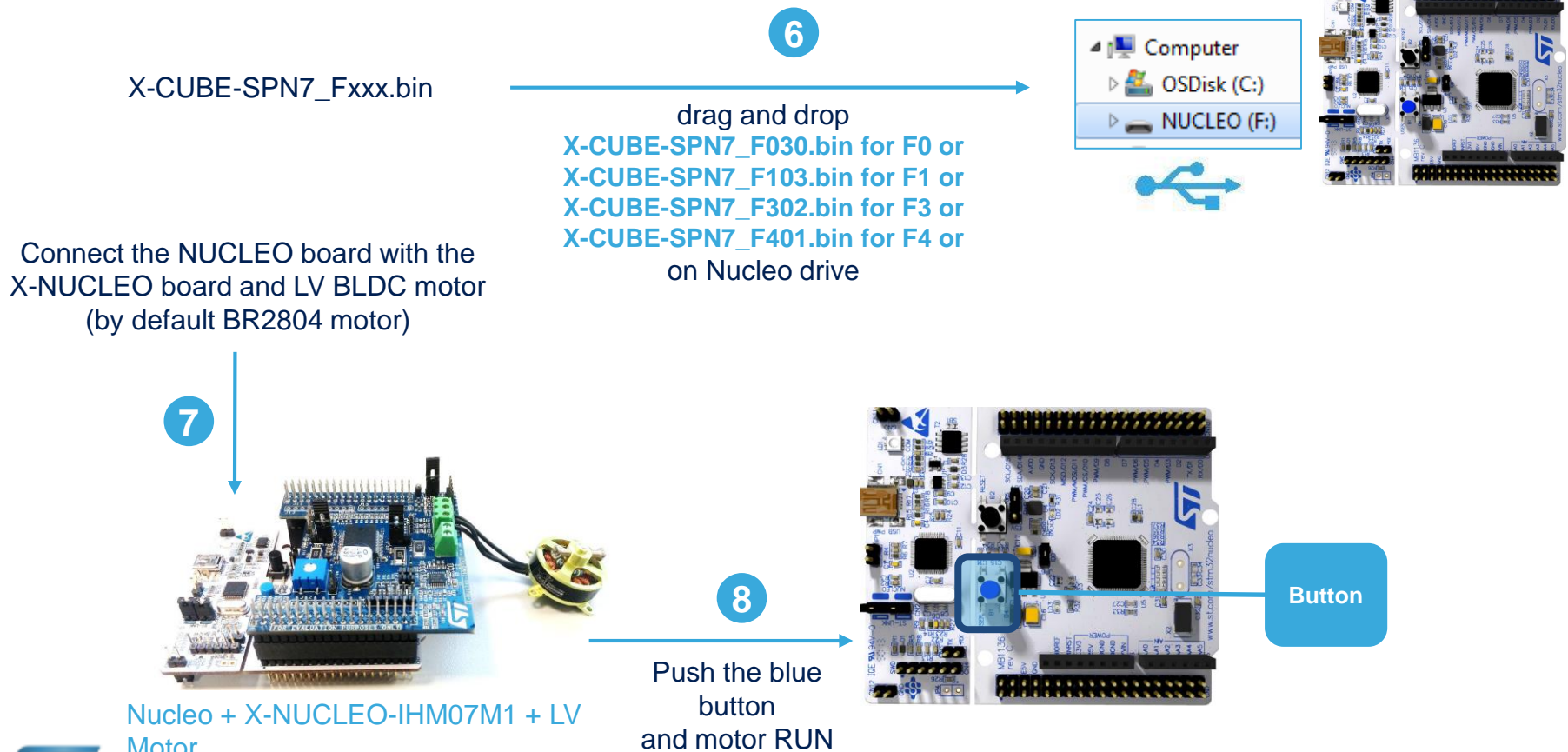
X-CUBE-SPN7 package main structure



Use of X-CUBE-SPN7 with pre-compiled .BIN FW file

X-CUBE-SPN7 for NUCLEO-F030 or NUCLEO-F103, NUCLEO-F302 or NUCLEO-F401

\\STM32CubeExpansion_SPN7_V1.0.0\Projects\Multi\Examples\MotorControl\Binary\STM32F030R8-Nucleo
\\STM32CubeExpansion_SPN7_V1.0.0\Projects\Multi\Examples\MotorControl\Binary\STM32F103RB-Nucleo
\\STM32CubeExpansion_SPN7_V1.0.0\Projects\Multi\Examples\MotorControl\Binary\STM32F302R8-Nucleo
\\STM32CubeExpansion_SPN7_V1.0.0\Projects\Multi\Examples\MotorControl\Binary\STM32F401RE-Nucleo



X-CUBE-SPN7 for code developers

Compile the FW using one of supported IDE

19

X-CUBE-SPN7 for NUCLEO-F030 or NUCLEO-F103, NUCLEO-F302 or NUCLEO-F401



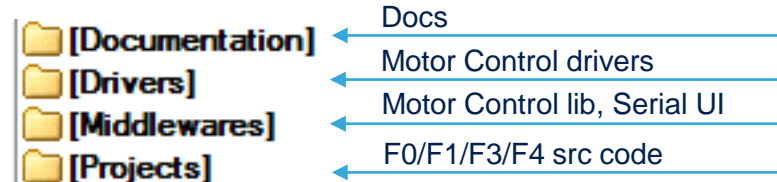
1 www.st.com/x-nucleo

2 Select
X-NUCLEO-IHM07M1



3 Download & unpack
X-CUBE-SPN7

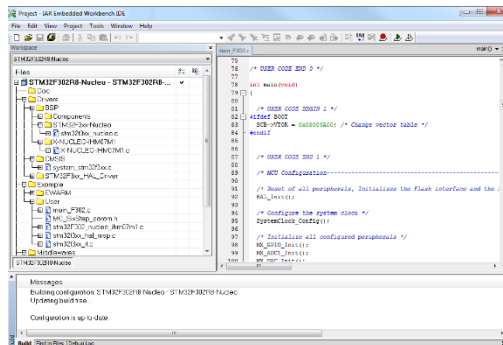
X-CUBE-SPN7 package main structure



Open the IDE workspace for
Nucleo board selected

4

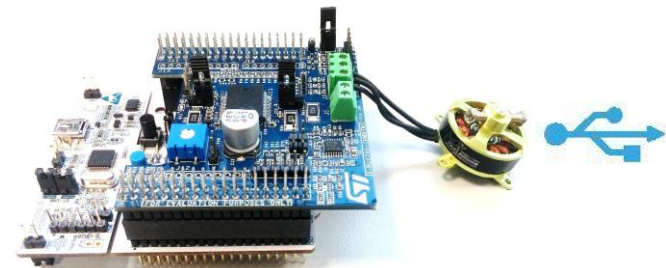
\\STM32CubeExpansion_SPN7_V1.0.0\\Projects\\Multi\\Examples\\MotorControl\\EWARM\\STM32FXXXRX-Nucleo

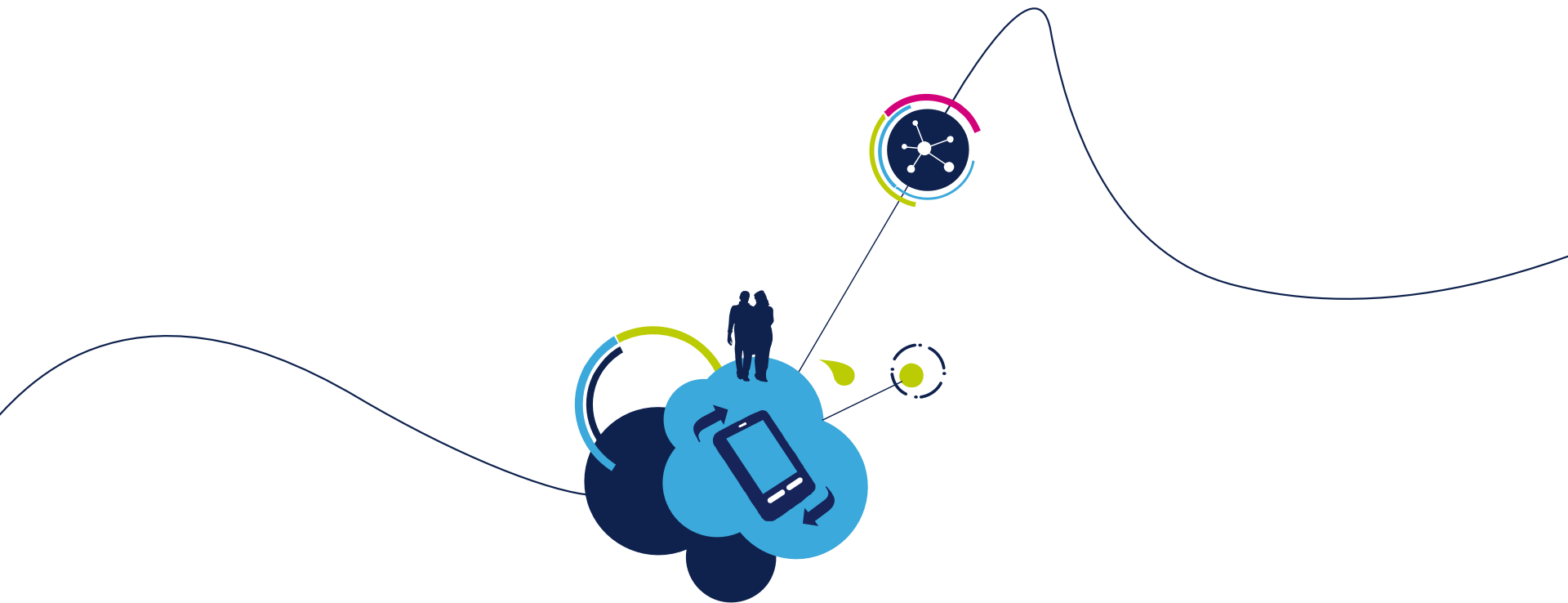


IAR IDE vers. 7.20



Flash and Run the project





www.st.com/stm32code