Quick start guide

Dual-brush DC motor driver expansion board based on L6206 for STM32 Nucleo (X-NUCLEO-IHM04A1)
Quick Start Guide Contents

- X-NUCLEO-IHM04A1: dual-brush DC motor driver expansion board
  Hardware and Software overview

- Setup & Demo Examples
- Documents & Related Resources

- STM32 Open Development Environment: Overview
Dual-brush DC motor driver expansion board

Hardware overview

X-NUCLEO-IHM04A1 Hardware Description

- The X-NUCLEO-IHM04A1 is a dual full-bridge for a dual-bipolar DC or quad-unipolar DC motor driver expansion board based on the L6206 for STM32 Nucleo.

- It provides an affordable and easy-to-use solution for driving dual-brush DC motors in your STM32 Nucleo project.

- The X-NUCLEO-IHM04A1 is compatible with the Arduino UNO R3 connector, and supports the addition of other expansion boards with a single STM32 Nucleo board.

Key Products on board

L6206
DMOS dual full-bridge driver

Latest info available at www.st.com
X-NUCLEO-IHM04A1

(*) Not mounted
X-CUBE-SPN4 Software Description

• This software running on the STM32 completely manages the L6206 for the control of dual-brush DC motors. It is built on top of the STM32Cube software technology that eases portability across different STM32 microcontrollers.

Key features

• Driver layer for complete management of the L6206 (DMOS dual full bridge driver) which is integrated on the X-NUCLEO-IHM04A1 expansion board

• Examples to control one bidirectional brush DC motor or 4 unidirectional brush DC motors

• Easy portability across different MCU families thanks to STM32Cube

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Hardware prerequisites

- 1 x STM32 Nucleo development board (NUCLEO-F401RE or NUCLEO-F334R8 or NUCLEO-L053R8)
- 1 x Dual-brush DC motor driver expansion board (X-NUCLEO-IHM04A1)
- 1 x One or four dual-brush DC motors according to the target setup
- 1 x Laptop/PC with MS Windows 7 or 8
- 1 x external DC power supply with two electric cables (*)
- 1 x USB type A to mini-B USB cable

(*) Power stage supply voltage from 8 V to 50 V
Setup & demo examples
Software prerequisites

- **STSW-LINK008**: ST-LINK/V2-1 USB driver
- **STSW-LINK007**: ST-LINK/V2-1 firmware upgrade

A Windows PC with one of the supported development tool chains:
  - KEIL: MDK-ARM
  - IAR: EWARM
  - AC6 System Workbench for STM32: SW4STM32

A Linux or Mac OSX computer with the supported development tool chains:
  - AC6 System Workbench for STM32: SW4STM32

- **X-CUBE-SPN4**: firmware
Dual-brush DC motor driver expansion board
Start coding in just a few minutes with X-CUBE-SPN4

Driving a four-brush DC motor with X-NUCLEO-IHM04A1 and X-CUBE-SPN4

1. Set the X-NUCLEO-IHM04A1 configuration jumpers as follows:
   - J1, J2, J3 and J4 → Open

2. Plug the X-NUCLEO-IHM04A1 on the STM32 Nucleo board through the Arduino UNO R3 connector and connect the each brush DC motor between one of the power outputs (A+/− and B+/−) and ground. Connect the power supply (Vin\Gnd) to the CN1 connector.

3. Connect the STM32 Nucleo board to the PC through the USB cable.
Dual-brush DC motor driver expansion board
Start coding in just a few minutes with X-CUBE-SPN4

4. Depending on the STM32 Nucleo board, from the examples folder
   (\stm32_cube\Projects\Multi\Examples\MotionControl\IHM04A1_ExampleFor4UniDirMotors) open the software project from:
   • \YourToolChainName\STM32F401RE-Nucleo for Nucleo based on STM32F401RE
   • \YourToolChainName\STM32F334R8-Nucleo for Nucleo based on STM32F334R8
   • \YourToolChainName\STM32L053R8-Nucleo for Nucleo based on STM32L053R8

5. Open the file: stm32_cube\Drivers\BSP\Components\l6206\l6206_target_config.h.
   and modify the parameters according to your target configuration.

6. Build the project and download it into the STM32 memory.

7. Run the example. The motor automatically starts. (See main.c file for the detailed demo sequence.)
Driving a one-brush DC motor in Parallel mode with X-NUCLEO-IHM04A1 and X-CUBE-SPN4

1. Set the X-NUCLEO-IHM04A1 configuration jumpers as following:
   - J1 → Closed (1A and 2A in parallel)
   - J2 → Closed (1B and 2B in parallel)
   - J3 and J4 → Open

2. Plug the X-NUCLEO-IHM04A1 on the STM32 Nucleo board through the Arduino UNO R3 connector and connect the brush DC motor between one of the A+/- and B+/- power outputs. Connect the power supply (Vin\Gnd) to the CN1 connector.

3. Connect the STM32 Nucleo board to the PC through the USB cable.
Dual-brush DC motor driver expansion board
Start coding in just a few minutes with X-CUBE-SPN4

4. Depending on the STM32 Nucleo board, from the examples folder
   (`\stm32_cube\Projects\Multi\Examples\MotionControl\IHM04A1_ExampleFor1BiDirMotor`) open the software project from:
   - `\YourToolChainName\STM32F401RE-Nucleo` for Nucleo based on STM32F401RE
   - `\YourToolChainName\STM32F334R8-Nucleo` for Nucleo based on STM32F334R8
   - `\YourToolChainName\STM32L053R8-Nucleo` for Nucleo based on STM32L053R8

5. Open the file: `stm32_cube\Drivers\BSP\Components\l6206\l6206_target_config.h`.
   and modify the parameters according your target configuration.

6. Build the project and download it into the STM32 memory.

7. Run the example. The motor automatically starts. (See main.c file for the detailed demo sequence.)
Documents & related design resources

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

X-NUCLEO-IHM04A1:

• Gerber files, BOM, and schematics

• **DB2633**: Dual-brush DC motor driver expansion board based on L6206 for STM32 Nucleo – Data brief

• **UM1925**: Getting started with the X-NUCLEO-IHM04A1 dual-brush DC motor driver expansion board for STM32 Nucleo – User manual

X-CUBE-SPN4:

• **DB2636**: Dual-brush DC motor driver software expansion for STM32Cube – Data brief

• **UM1929**: Getting started with the X-CUBE-SPN4 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
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 development boards
- STM32Cube expansion software (X-CUBE)
- STM32 Nucleo expansion boards (X-NUCLEO)
- 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
- Complete product range from ultra-low power to high-performance
- ST morpho extension header
- Arduino™ UNO R3 extension headers

www.st.com/stm32nucleo
STM32 Nucleo 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)

- Sense
- Connect
- Power
- Move/Actuate
- Interact

Motion MEMS sensors
Environmental sensors
DIL24 support for new devices

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.

• **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.

**Tools & IDEs**
- IAR EWARM, Keil MDK-ARM, GCC-based IDEs (e.g. Ac6 System Workbench for STM32)

**Applications**
- Sample applications (e.g. based on ST OpenSoftwareX)

**Middleware**
- STM32Cube middleware
- STM32Cube expansion middleware

**Hardware Abstraction**
- STM32Cube Hardware Abstraction Layer (HAL)

**Hardware**
- STM32 Nucleo expansion boards (X-NUCLEO)

**Compatibility with multiple Development Environments**

**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

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

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

- Translate
  - Audio amplifier
  - Touch controller
  - Operation Amplifier

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

- Power
  - Energy management & battery

- Process
  - General-purpose microcontrollers
  - Secure microcontrollers

- Software

Your need

Your need

Our answer

COLLECT

TRANSMIT

ACCESS

CREATE

POWER

PROCESS