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UM1857
User manual

Stepper motor driver expansion board based on L6474 for STM32 Nucleo

Introduction

The X-NUCLEO-IHM01A1 is a stepper motor driving board based on the L6474.

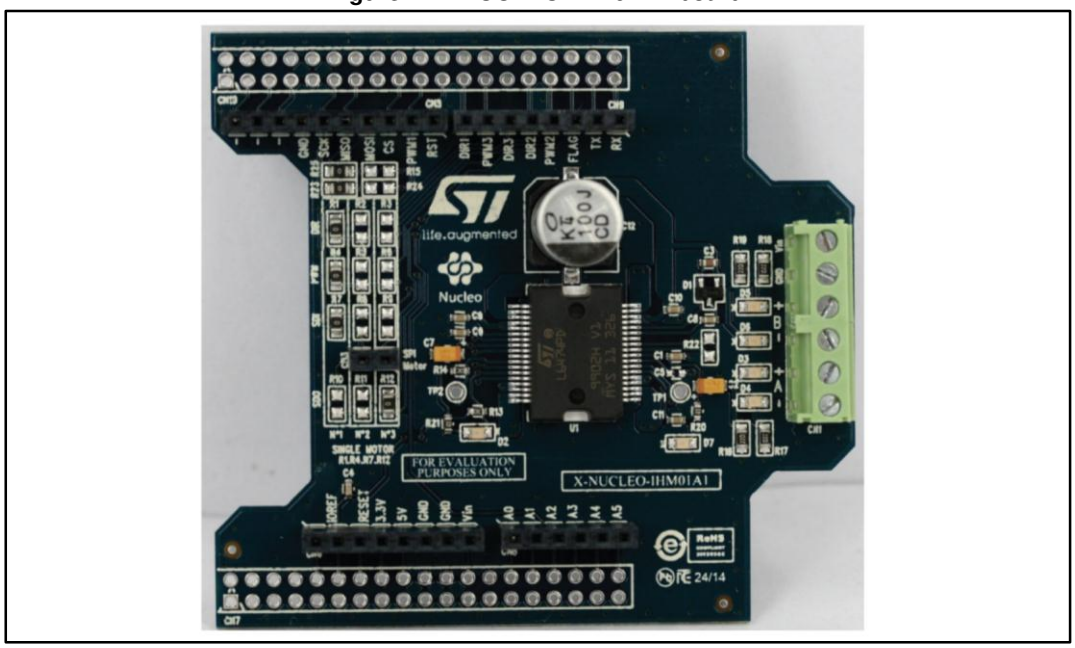
It provides an affordable and easy-to-use solution for driving stepper motors in your STM32 Nucleo project.

The advanced current control of the L6474 and the complete set of protections guarantee high performance and robustness.

The X-NUCLEO-IHM01A1 is compatible with the Arduino UNO R3 connector on the ST Morpho connector.

More boards of the same type can be stacked easily to drive up to three stepper motors with a single STM32 Nucleo board.

Figure 1: X-NUCLEO-IHM01A1 board



Contents

1 Getting started

The X-NUCLEO-IHM01A1 expansion board is a stepper motor driver covering a wide range of applications.

The maximum ratings are:

- Power stage supply voltage (VS) from 8 V to 45 V
- Motor phase current up to 3 A rms

To start your project with the board:

1. Check the jumper position in accordance with your configuration (see *Section 2: "Hardware description and configuration"*).
2. Connect the board to the STM32 Nucleo board with the connector:
   a. Arduino UNO R3 for the X-NUCLEO-IHM01A1.
   b. ST Morpho for the X-NUCLEO-IHM01A.

Up to three expansion boards can be stacked on the same STM32 Nucleo board, as described in *Section 2.2: "Multi motor configuration"*.

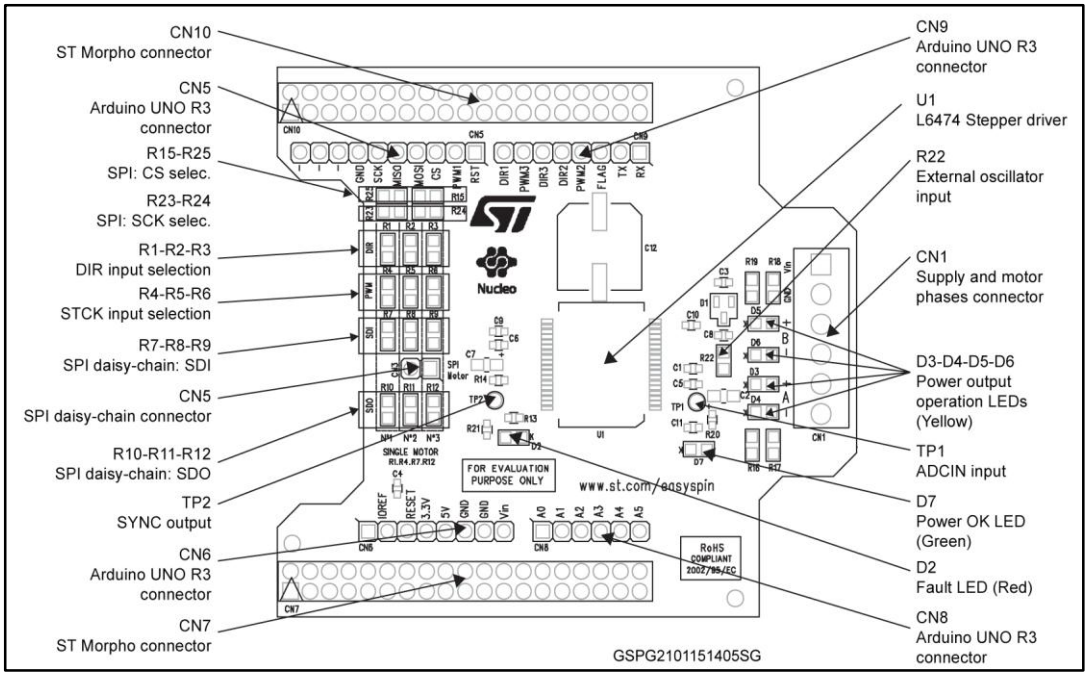
1. Supply the board through input 1 (VS) and 2 (ground) of the connector CN1.
2. The power OK (green) and fault (red) LEDs turn on.
3. Develop your application using the examples provided with the firmware library.

Further support material is available on the L6474 and STM32 Nucleo web pages (www.st.com/stm32nucleo).

2 Hardware description and configuration

The *Figure 2: "Jumpers and connectors position"* shows the position of the connectors and the configuration jumpers of the board.

Figure 2: Jumpers and connectors position



The following tables provide the connector details for the Arduino UNO R3 and ST Morpho, respectively.

Table 1: Arduino UNO R3 connector table

Connector	Pin(1)	Signal	Remarks
CN5	1	L6474 STBY\\RESET	
	2	PWM1	See *Section 2.1: "Selecting the chip select and clock lines of the SPI"*
	3	SPI CS	See *Section 2.2: "Multi motor configuration"*
	4	SPI MOSI	See *Section 2.1: "Selecting the chip select and clock lines of the SPI"*
	5	SPI MISO	
	6	SPI SCK	See *Section 2.2: "Multi motor configuration"*
	7	Ground	
CN9	3	L6474 FLAG output	
	4	PWM2\\SPI SCK	See *Section 2.2: "Multi motor configuration"* and *Section 2.1: "Selecting the chip select and clock lines of the SPI"*
	5	DIR2	See *Section 2.2: "Multi motor configuration"*
	6	DIR3	
	7	PWM3	

Connector	Pin(1)	Signal	Remarks
	8	DIR1	
CN6	2	VDD	
	6	Ground	
	7	Ground	
CN8	3	SPI CS	See *Section 2.1: "Selecting the chip select and clock lines of the SPI"*

Notes:

(1)All the non-listed pins are not connected.

Table 2: ST Morpho connector table

Connector	Pin(1)	Signal	Remarks
CN10	9	Ground	
	11	SPI SCK	See *Section 2.1: "Selecting the chip select and clock lines of the SPI"*
	13	SPI MISO	See *Section 2.2: "Multi motor configuration"*
	15	SPI MOSI	
	17	SPI CS	See *Section 2.1: "Selecting the chip select and clock lines of the SPI"*
	19	PWM1	See *Section 2.2: "Multi motor configuration"*
	21	L6474 STBY\\RESET	
	23	DIR1	See *Section 2.2: "Multi motor configuration"*
	25	PWM3	
	27	DIR3	
	29	DIR2	
	31	PWM2	See *Section 2.1: "Selecting the chip select and clock lines of the SPI"* and *Section 2.2: "Multi motor configuration"*
	33	L6474 FLAG output	
CN7	12	VDD	
	20	Ground	
	22	Ground	
	32	SPI CS	See *Section 2.1: "Selecting the chip select and clock lines of the SPI"*

Notes:

(1)All the non-listed pins are not connected.

2.1 Selecting the chip select and clock lines of the SPI

The chip select and the clock lines of the SPI interface can be selected through dedicated resistors as indicated in *Table 3: "Chip select line selection"* and *Table 4: "Chip select line selection"*.

Table 3: Chip select line selection

R15	R25	CS line
Not mounted	0R	CN5 pin 3, CN10 pin 17 (default)
0R	Not mounted	CN8 pin 3, CN7 pin 32

Table 4: Chip select line selection

R23	R24	CS line
0R	Not mounted	CN5 pin 6, CN10 pin 9 (default)
Not mounted	0R	CN9 pin 4, CN10 pin 31

When the alternative clock line is selected (CN9 pin 4, CN10 pin 31) the PWM2 signal is no longer available for multi-motor configurations (see *Section 2.2: "Multi motor configuration"*).

2.2 Multi motor configuration

The expansion boards can be stacked on a single STM32 Nucleo board in order to drive up to three stepper motors (one for each motor).

The configuration can be changed by mounting the necessary resistors from R1 to R12 as listed in the *Table 5*. The other resistors are not mounted.

By default, the stepper driver board is configured for a single motor setup, so board configurations for multi-motor setups must be changed before stacking the boards on the STM32 Nucleo.

Table 5: Multi-motor setup table

Number of motors	Board	STCK\\DIR	Mounted resistors (0R)
1	-	PWM1\\DIR1	R1, R4, R7, R12
2	1 (bottom)	PWM1\\DIR1	R1, R4, R7, R10
	2 (top)	PWM2\\DIR2	R2, R5, R8, R12
3	1 (bottom)	PWM1\\DIR1	R1, R4, R7, R10
	2	PWM2\\DIR2	R2, R5, R8, R11
	3 (top)	PWM3\\DIR3	R3, R6, R9, R12

If the alternative SPI clock line is selected (see *Section 2.1: "Selecting the chip select and clock lines of the SPI"*) the PWM2 step clock is no longer available and the multi-motor setup is limited to two motors maximum.

The *Table 6: "Multi-motor setup with alternative SPI clock line"* shows the proper configuration in this case.

Table 6: Multi-motor setup with alternative SPI clock line

Number of motors	Board	STCK\\DIR	Mounted resistors (0R)
2	1 (bottom)	PWM1\\DIR1	R1, R4, R7, R10
	2 (top)	PWM3\\DIR2	R2, R6, R8, R12

3 Revision history

Table 7: Document revision history

Date	Revision	Changes
16-Mar-2015	1	Initial release.
30-Mar-2015	2	Updated *Section 1: "Getting started"*.

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