

Dual brush DC motor and stepper motor evaluation kit

Introduction

The L62xx family evaluation environment is a fast, robust, and easy-to-use solution that allows to evaluate all the brush DC and stepper motor drivers of the L62xx family in combination with a NUCLEO-F401RE control board and the STSPIN Studio software.

The kit includes:

- a compact main board (EVL62XX-MAIN) compatible with the Arduino UNO R3 connector
- one plug-in board (EVL62XX-PLUG) based on the DMOS dual full-bridge driver for motor control of the STMicroelectronics L62xx family. In particular:

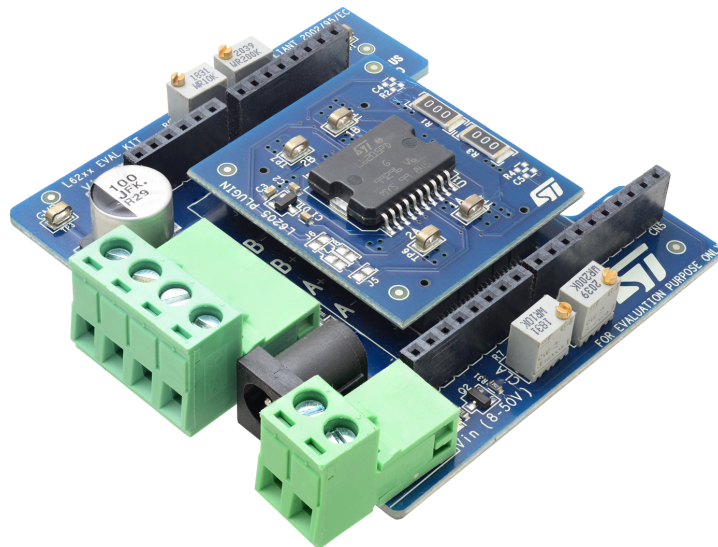
L6205, L6225, L6206, L6226, L6207 and L6227 to drive from one to four DC motors

L6208 and L6228 DMOS to drive one bipolar stepper motor.

The maximum ratings of the plug-in boards are:

- power stage supply voltage (VS) from 8 V to 50 V
- motor phase current up to 1.4 A r.m.s. (L6225, L6226, L6227 and L6228)
- motor phase current up to 2.8 A r.m.s. (L6205, L6206, L6207 and L6208)

Figure 1. L62XX evaluation environment mounting L6205 driver board



1 Getting started

The EVL62XX evaluation environment covers a wide range of applications and it is ready to be used in a few steps.

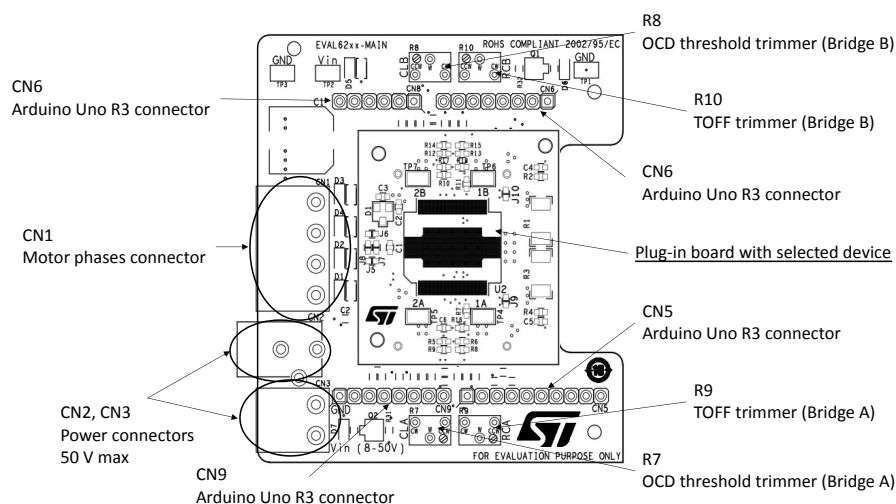
Follow this procedure to start your evaluation:

1. Check the setting of the jumpers based on your configuration as described in Section 2: "Hardware description and configuration".
2. Connect the plug-in board onto the main board.
3. Connect the main board with the STM32 Nucleo board through Arduino UNO R3.
4. Supply the board through the input 1 (VS) and 2 (ground) of the connector CN3.

Further support material is available on the respective product pages on www.st.com.

2 Hardware description and configuration

Figure 2. EVL62XX-MAIN main board overview



The following tables provide the detailed pinout of the Arduino UNO R3 and ST Morpho connectors.

Table 1. Arduino UNO R3 connector table (L62x5, L62x6 and L62x7 devices)

Connector	Pin ⁽¹⁾	Signal	Remarks
CN5	3	Fault B	
	4	Enable B	
	5	ADC-6	
	7	Ground	
CN9	3	Enable A	
	4	Fault A	
	5	IN2B	
	6	IN1B	
	7	VREFA	L6207/L6227 only
CN8	1	IN1A	
	2	IN2A	
	3	ADC-4	
	4	VREFB	L6207/L6227 only
CN6	2	VDD	
	6	Ground	
	7	Ground	

1. All non-listed pins are not connected.

Table 2. Arduino UNO R3 connector table (L62x8 devices)

Connector	Pin ⁽¹⁾	Signal	Remarks
CN5	1	Reset	
	3	Fault	
	4	Enable	
	5	ADC-6	
	7	Ground	
CN9	5	HALF/FULL	
	6	CONTROL	
	7	VREFA	
CN8	1	CLOCK	
	2	CW/CCW	
	3	ADC-4	
	4	VREFB	
CN6	2	VDD	
	6	Ground	
	7	Ground	

1. All non-listed pins are not connected.

2.1 Overcurrent (OCD) threshold setting (L6206 and L6226)

The plug-in boards based on L6206 and L6226 devices integrate two overcurrent protection circuits with adjustable threshold, one for each full-bridge.

The overcurrent threshold is set by means of R7 (bridge A) and R8 (bridge B) resistors of the main board, according to Figure 3.

Below the value of $R_{CL} = 5 \text{ k}\Omega$ the overcurrent threshold converges non-linearly to the maximum value of the selected device, $5.6 \text{ A} \pm 30\%$ for L6206 and $2.8 \text{ A} \pm 30\%$ for L6226.

Figure 3. L6206: Overcurrent threshold vs. resistor value (no paralleling)

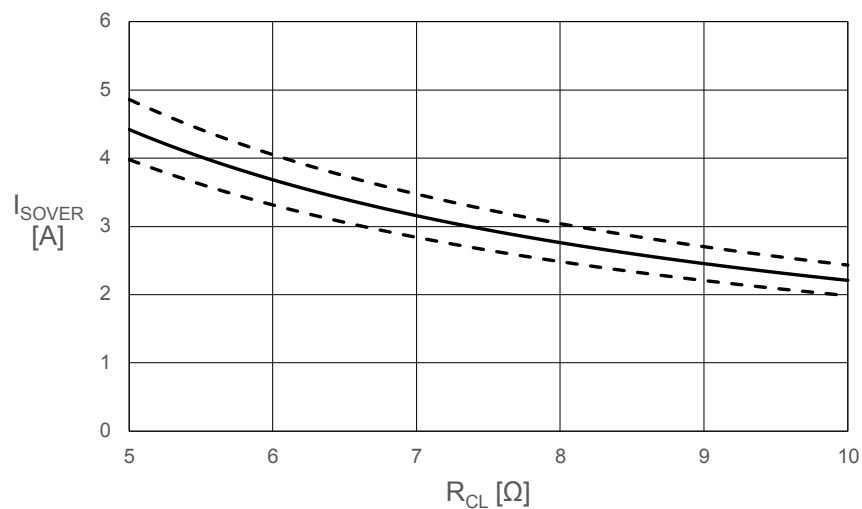
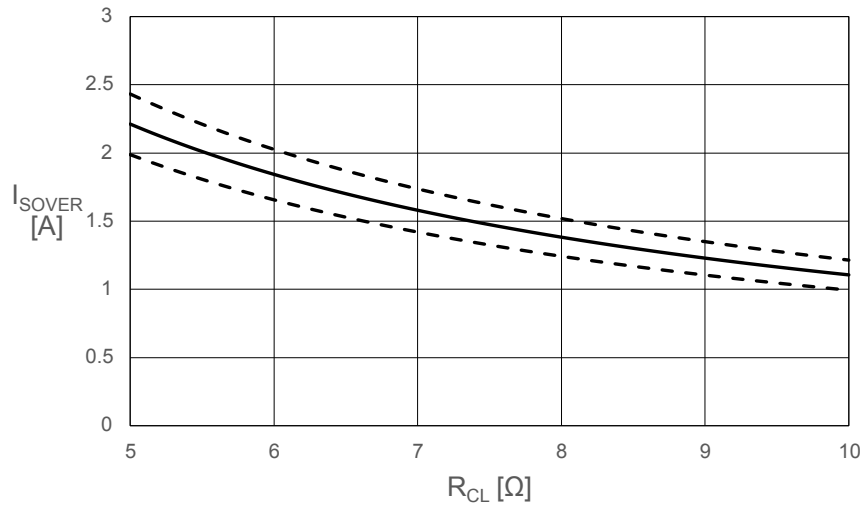


Figure 4. L6226: Overcurrent threshold vs. resistor value (no paralleling)



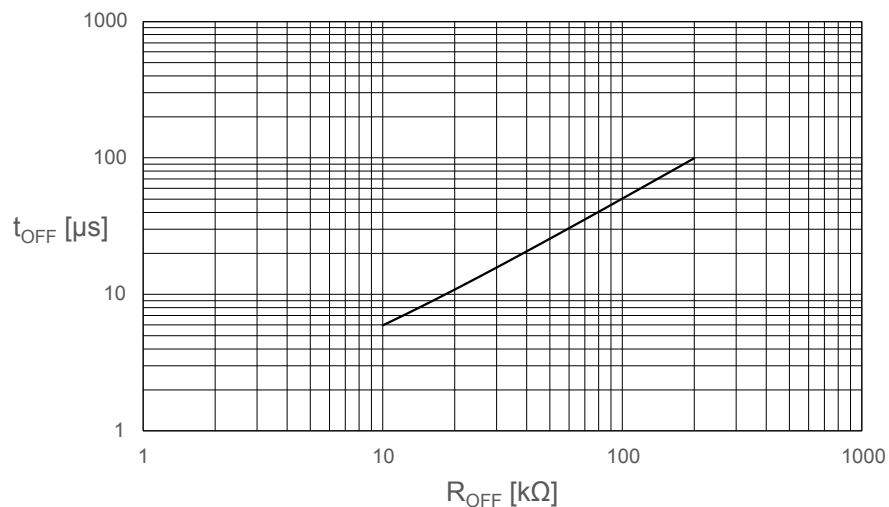
When one of the paralleling modes is used, the actual OCD threshold value is scaled as indicated in Table 3. Further details are available in the application note AN1762, “L6205, L6206, L6207 DUAL FULL-BRIDGE DRIVERS”, on the st.com website.

2.2 TOFF setting (L6207, L6208, L227 and L6228)

The plug-in boards based on L6207, L6227, L6208 and L6228 devices integrate a variable TOFF time, one for each full-bridge, that can be set by means of ROFF, R9 (bridge A) and R10 (bridge B) resistors of the main board, according to Figure 5.

Further details are available in the application note AN1762, “L6205, L6206, L6207 DUAL FULL-BRIDGE DRIVERS”, on the st.com website.

Figure 5. tOFF vs. ROFF



2.3 Driving mode selection (L6205, L6225, L6206 and L6226)

Plug-in boards mounting the L62x5 or L62x6 devices can drive from 1 to 4 DC motors at the same time.

The driving mode selection is done by properly setting J5, J6, J7 and J8 solder jumpers on the top of the boards. By default, all solder jumpers are open (two bidirectional DC motor driving configuration).

The table below briefly summarizes the possible configurations:

Table 3. Hardware configurations

Mode	Max. output current	Output RDS(ON)	OCD threshold scaling	J5	J6	J7	J8
2-bidirectional - default (Figure 6)	L6205, L6206 2.8 Arms	0.3Ω	x1				
	L6225, L6226 1.4 Arms						
4-unidirectional (Figure 7)	L6205, L6206 2.8 Arms	0.3Ω	x1 ⁽¹⁾				
	L6225, L6226 1.4 Arms						
1-bidirectional High current parallel (Figure 8)	L6205, L6206 5.6 Arms	0.15Ω	x2			X	X
	L6225, L6226 2.8 Arms						
2-unidirectional High current parallel (Figure 9)	L6205, L6206 5.6 Arms	0.15Ω	x2			X	X
	L6225, L6226 2.8 Arms						
1-bidirectional Low overcurrent parallel (Figure 10)	L6205, L6206 2.8 Arms	0.15Ω	x1	X	X		
	L6225, L6226 1.4 Arms						
2-bidirectional Low overcurrent parallel (Figure 11)	L6205, L6206 2.8 Arms	0.15Ω	x1	X	X		
	L6225, L6226 1.4 Arms						
1-unidirection All bridges parallel (Figure 12)	L6205, L6206 11.2 Arms	0.075Ω	x4	X	X	X	X
	L6225, L6226 5.6 Arms						

1. The current limit is shared between the two motors connected on the same full-bridge (A or B).

Figure 6. Two bidirectional DC motors

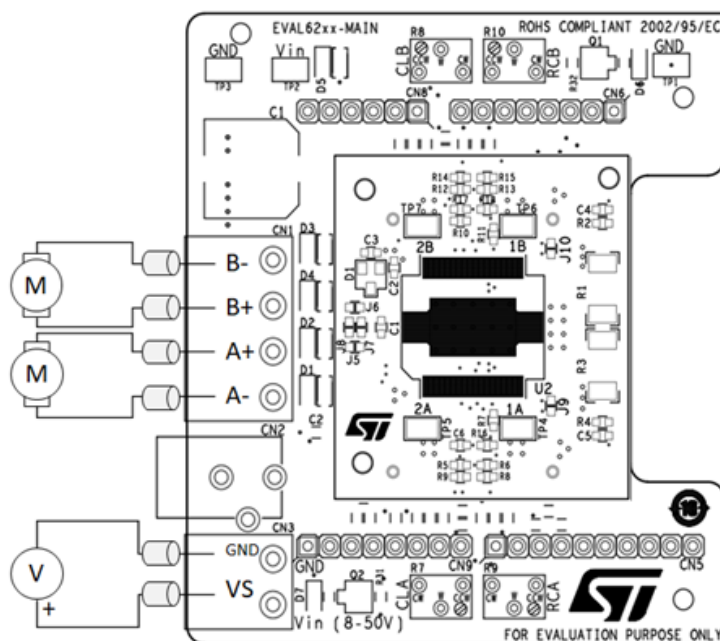


Figure 7. Four unidirectional DC motors

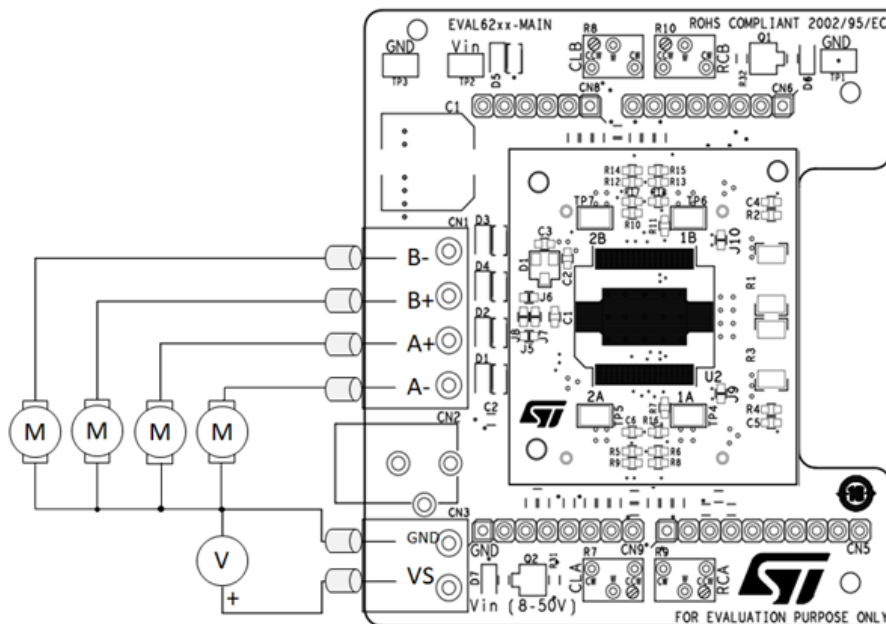


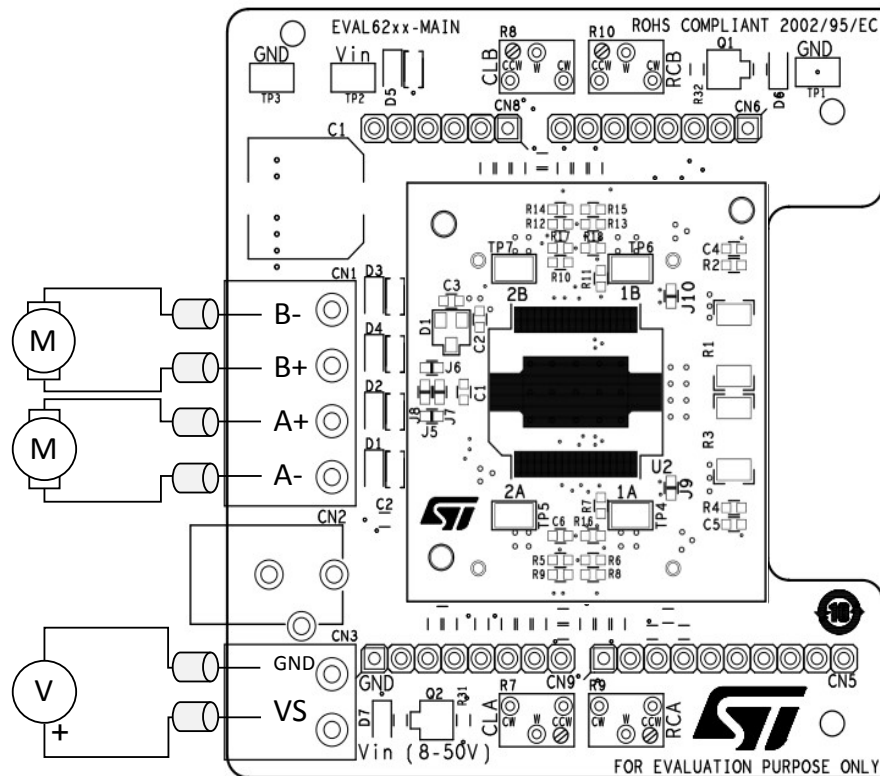
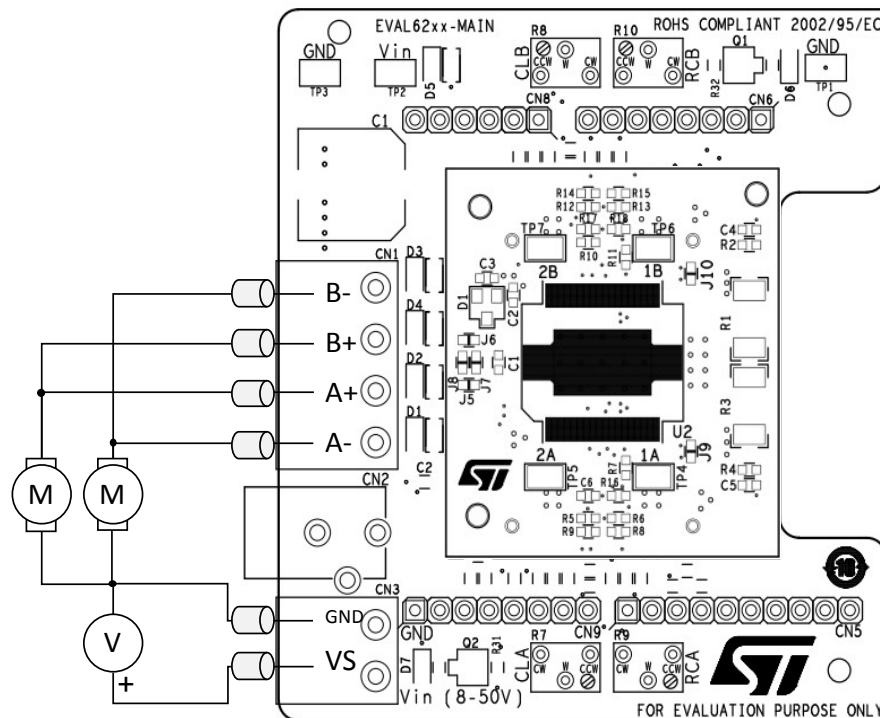
Figure 8. One bidirectional DC motor – higher current

Figure 9. Two unidirectional DC motors – higher current


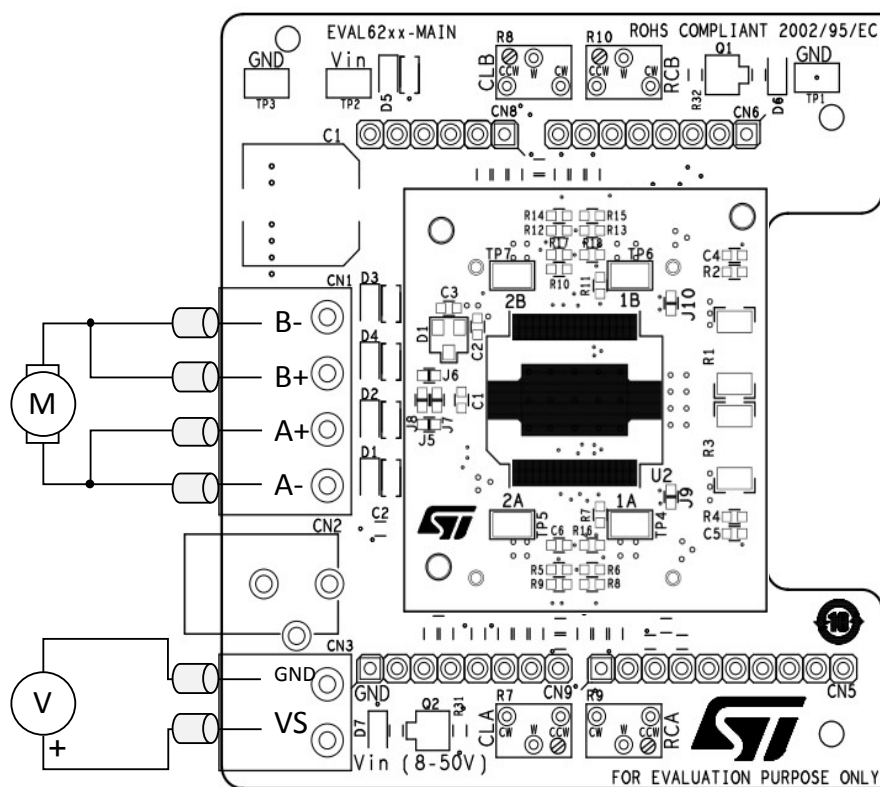
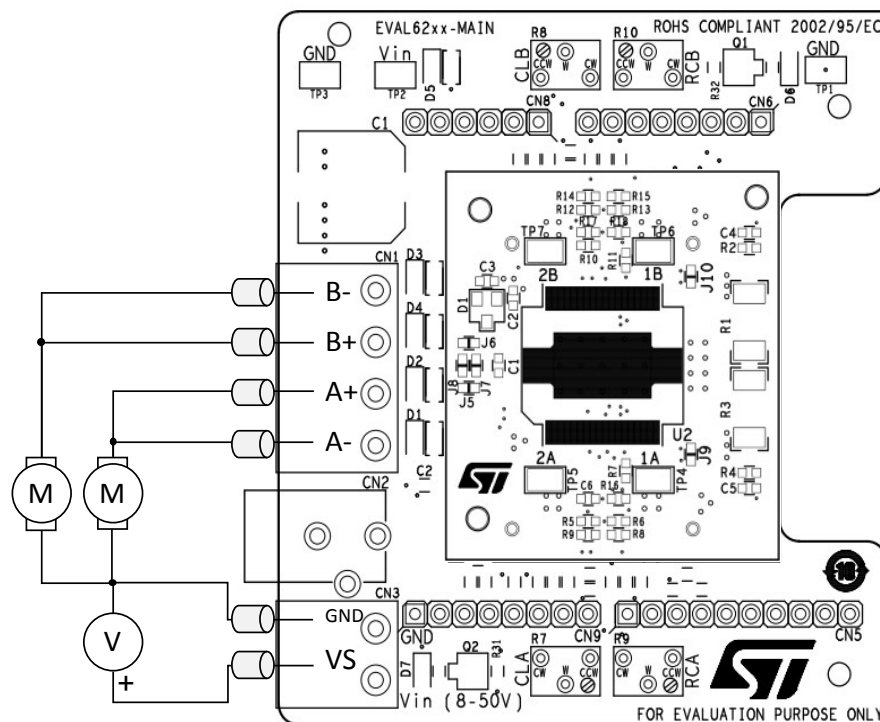
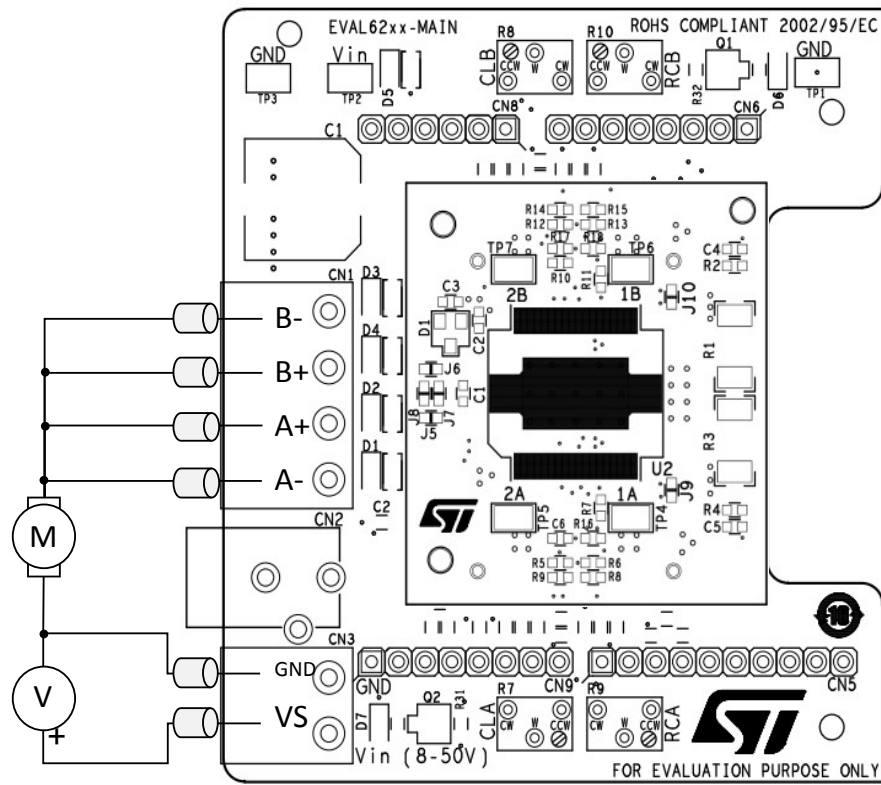
Figure 10. One bidirectional DC motor – lower overcurrent

Figure 11. Two unidirectional DC motors – lower overcurrent


Figure 12. One unidirectional DC motor – all bridges parallel


3 Safety precautions

Warning:

Some of the components mounted on the board could reach hazardous temperature during operation.

While using the board, please follow the precautions below:

- *Do not touch the components or the heatsink.*
 - *Do not cover the board.*
 - *Do not put the board in contact with flammable materials or with materials releasing smoke when heated.*
 - *After operation, allow the board to cool down before touching it.*
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4 Bills of material

Table 4. EVL62XX-MAIN bill of material

Item	Q.ty	Ref.	Description	Part/Value	Manufact.	Order code
1	1	CN1	Connector 5.08 mm close vertical	CON-1x4	Würth Elektronik	691312510004 or equivalent
2	1	CN2	Jack connector, 2,1 mm, 2,5 mm, female, PCB mounting	Jack connector		RS 805-1699 or equivalent
3	1	CN3	Connector 5.08 mm close vertical	CON-1x2	Würth Elektronik	691312510002 or equivalent
4	1	CN5	Connector through-hole-pitch 2.54	CON-1x10	Samtec	SSQ-110-04-F-S or equivalent
5	2	CN6,CN9	Connector through-hole-pitch 2.54	CON-1x8	Samtec	SSQ-108-04-F-S or equivalent
6	1	CN8	Connector through-hole-pitch 2.54	CON-1x6	Samtec	SSQ-106-04-F-S or equivalent
7	1	C1	SMT aluminum elect. capacitor	100uF/63V	Panasonic	EEEFK1J101P or equivalent
8	1	C2	SMT ceramic capacitor	100nF/50V		
9	2	C3,C4	SMT ceramic capacitor	5.6nF/50V		
10	2	C5,C11	SMT ceramic capacitor	68nF/50V		
11	2	C7,C8	SMT ceramic capacitor	820pF/50V		
12	2	C9,C10	SMT ceramic capacitor	N.M.		
13	4	D1,D2, D3,D4	Yellow LED	Yellow		
14	1	D5	Green LED	Green		
15	2	D6,D7	Red LED	Red		
16	2	J1,J2	Basic blade & beam header & socket	BSE-020-01-F-D-A-TR	Samtec	BSE-020-01-F-D-A-TR or equivalent
17	2	Q1,Q2	Digital FET, P-Channel	FDV302P		
18	2	R1,R2	SMT resistor	100k		
19	2	R3,R5	SMT resistor	4.7k		
20	2	R4,R6	SMT resistor	2.2k		
21	2	R7,R8	1/4" square trimpot trimming potentiometer, top adjust	10k	Bourns	3266W-1-103 LF or equivalent
22	2	R9,R10	1/4" square trimpot trimming potentiometer, top adjust	200k	Bourns	3266W-1-204 LF or equivalent
23	5	R11, R12, R13,R14, R17	SMT resistor	10K-1/2W		
24	2	R15,R16	SMT resistor	330R		
25	13	R18, R19,R20, R21,R22, R23, R24, R25, R26, R27, R28,R29, R30	SMT resistor	0R		
26	2	R31,R32	SMT resistor	N.M.		

Item	Q.ty	Ref.	Description	Part/Value	Manufact.	Order code
27	5	TP1,TP2,TP3	SMT test point	TESTPOINT	Harwin	S1751-46R or equivalent
28	1		Connector 5.08 mm horizontal with hook on wire side	CON-1x4	Würth Elektronik	691351500004 or equivalent
29	1		Connector 5.08 mm horizontal with hook on wire side	CON-1x2	Würth Elektronik	691351500002 or equivalent

Table 5. EVL6205-PLUG bill of materials

Item	Q.ty	Ref.	Description	Part/Value	Manufact.	Order code
1	1	C1	SMT ceramic capacitor	10nF/50V		
2	1	C2	SMT ceramic capacitor	100nF/50V		
3	1	C3	SMT ceramic capacitor	220nF/35V		
4	2	C4,C5	SMT ceramic capacitor	N.M.		
5	1	D1	High speed double switching diode	BAR43	STMicroelectronics	BAR43SFILM
6	2	J1,J2	Terminal strip	BTE-020-01-F-D-A-TR	Samtec	BTE-020-01-F-D-A-TR or equivalent
7	2	R1,R3	SMT resistor	0R		
8	2	R2,R4	SMT resistor	N.M.		
9	1	R5	SMT resistor	100R		
10	4	TP4,TP5,TP6,TP7	SMT test point	TESTPOINT	Harwin	S1751-46R or equivalent
11	1	U1	DMOS dual full-bridge driver	L6205PD	STMicroelectronics	L6205PD

Table 6. EVL6206-PLUG bill of materials

Item	Q.ty	Ref.	Description	Part/Value	Manufact.	Order code
1	1	C1	SMT ceramic capacitor	10nF/50V		
2	1	C2	SMT ceramic capacitor	100nF/50V		
3	1	C3	SMT ceramic capacitor	220nF/35V		
4	3	C4,C5,C6	SMT ceramic capacitor	N.M.		
5	1	D1	High speed double switching diode	BAR43	STMicroelectronics	BAR43SFILM
6	2	J1,J2	Terminal strip	BTE-020-01-F-D-A-TR	Samtec	BTE-020-01-F-D-A-TR or equivalent
7	4	J5,J6,J7,J8	Solder jumper	OPEN		
8	2	J9,J10	Solder jumper	CLOSED		
9	2	R1,R3	SMT resistor	0R		
10	12	R2,R4,R7,R8,R9,R11,R12,R14,R15,R16,R17,R18	SMT resistor	N.M.		
11	4	R5,R6,R10,R13	SMT resistor	0R		

Item	Q.ty	Ref.	Description	Part/Value	Manufact.	Order code
12	1	R19	SMT resistor	100R		
13	4	TP4,TP5, TP6,TP7	SMT test point	TESTPOINT	Harwin	S1751-46R or equivalent
14	1	U1	DMOS dual full-bridge driver	L6206PD	STMicroelectronics	L6206PD

Table 7. EVL6207-PLUG bill of materials

Item	Q.ty	Ref.	Description	Part/Value	Manufact.	Order code
1	1	C1	SMT ceramic capacitor	10nF/50V		
2	1	C2	SMT ceramic capacitor	100nF/50V		
3	1	C3	SMT ceramic capacitor	220nF/35V		
4	3	C4,C5,C6	SMT ceramic capacitor	N.M.		
5	1	D1	High speed double switching diode	BAR43	STMicroelectronics	BAR43SFILM
6	2	J1,J2	Terminal strip	BTE-020-01-F-D-A-TR	Samtec	BTE-020-01-F-D-A-TR or equivalent
7	6	J5,J6,J7, J8,J9,J10	Solder jumper	OPEN		
8	2	R1,R3	SMT resistor	0R2-3W		
9	8	R2,R4,R5, R7,R8, R11,R13, R14	SMT resistor	0R		
10	8	R6,R9, R10,R12, R15,R16, R17,R18	SMT resistor	N.M.		
11	1	R19	SMT resistor	100R		
12	4	TP4,TP5, TP6,TP7	SMT test point	TESTPOINT	Harwin	S1751-46R or equivalent
13	1	U1	DMOS dual full-bridge driver	L6207PD	STMicroelectronics	L6207PD

Table 8. EVL6208-PLUG bill of materials

Item	Q.ty	Ref.	Description	Part/Value	Manufact.	Order code
1	1	C1	SMT ceramic capacitor	10nF/50V		
2	2	C2,C6	SMT ceramic capacitor	100nF/50V		
3	1	C3	SMT ceramic capacitor	220nF/35V		
4	2	C4,C5	SMT ceramic capacitor	N.M.		
5	1	D1	High speed double switching diode	BAR43	STMicroelectronics	BAR43SFILM
6	2	J1,J2	Terminal strip	BTE-020-01-F-D-A-TR	Samtec	BTE-020-01-F-D-A-TR or equivalent

Item	Q.ty	Ref.	Description	Part/Value	Manufact.	Order code
7	6	J5,J6,J7, J8,J9,J10	Solder jumper	OPEN		
8	2	R1,R3	SMT resistor	0R2-3W		
9	8	R2,R4,R7, R8,R9,R11, R12,R15	SMT resistor	0R		
10	8	R5,R6, R10,R13, R14,R16, R17,R18	SMT resistor	N.M.		
11	1	R19	SMT resistor	100R		
12	4	TP4,TP5, TP6,TP7	SMT test point	TESTPOINT	Harwin	S1751-46R or equivalent
13	1	U1	DMOS driver for bipolar stepper motor	L6208PD	STMicroelectronics	L6208PD

Table 9. EVL6225-PLUG bill of materials

Item	Q.ty	Ref.	Description	Part/Value	Manufact.	Order code
1	1	C1	SMT ceramic capacitor	10nF/50V		
2	1	C2	SMT ceramic capacitor	100nF/50V		
3	1	C3	SMT ceramic capacitor	220nF/35V		
4	2	C4,C5	SMT ceramic capacitor	N.M.		
5	1	D1	High speed double switching diode	BAR43	STMicroelectronics	BAR43SFILM
6	2	J1,J2	Terminal strip	BTE-020-01-F-D-A-TR	Samtec	BTE-020-01-F-D-A-TR or equivalent
7	2	R1,R3	SMT resistor	0R		
8	2	R2,R4	SMT resistor	N.M.		
9	1	R5	SMT resistor	0R		
10	4	TP4,TP5, TP6,TP7	SMT test point	TESTPOINT	Harwin	S1751-46R or equivalent
11	1	U1	DMOS dual full-bridge driver	L6225PD	STMicroelectronics	L6225PD

Table 10. EVL6226-PLUG bill of materials

Item	Q.ty	Ref.	Description	Part/Value	Manufact.	Order code
1	1	C1	SMT ceramic capacitor	10 nF/50 V		
2	1	C2	SMT ceramic capacitor	100 nF/50 V		
3	1	C3	SMT ceramic capacitor	220 nF/35 V		
4	3	C4,C5,C6	SMT ceramic capacitor	N.M.		
5	1	D1	High speed double switching diode	BAR43	STMicroelectronics	BAR43SFILM

Item	Q.ty	Ref.	Description	Part/Value	Manufact.	Order code
6	2	J1,J2	Terminal strip	BTE-020-01-F-D-A-TR	Samtec	BTE-020-01-F-D-A-TR or equivalent
7	4	J5,J6,J7,J8	Solder jumper	OPEN		
8	2	J9,J10	Solder jumper	CLOSED		
9	2	R1,R3	SMT resistor	0R		
10	12	R2,R4,R7, R8,R9, R11,R12, R14,R15, R16,R17, R18	SMT resistor	N.M.		
11	5	R5,R6, R10,R13, R19	SMT resistor	0R		
12	4	TP4,TP5, TP6,TP7	SMT test point	TESTPOINT	Harwin	S1751-46R or equivalent
13	1	U1	DMOS dual full-bridge driver	L6226PD	STMicroelectronics	L6226PD

Table 11. EVL6227-PLUG bill of materials

Item	Q.ty	Ref.	Description	Part/Value	Manufact.	Order code
1	1	C1	SMT ceramic capacitor	10nF/50V		
2	1	C2	SMT ceramic capacitor	100nF/50V		
3	1	C3	SMT ceramic capacitor	220nF/35V		
4	3	C4,C5,C6	SMT ceramic capacitor	N.M.		
5	1	D1	High speed double switching diode	BAR43	STMicroelectronics	BAR43SFILM
6	2	J1,J2	Terminal strip	BTE-020-01-F-D-A-TR	Samtec	BTE-020-01-F-D-A-TR or equivalent
7	6	J5,J6,J7, J8,J9,J10	Solder jumper	OPEN		
8	2	R1,R3	SMT resistor	0R2-3W		
9	9	R2,R4,R5, R7,R8,R11, R13,R14, R19	SMT resistor	0R		
10	6	R6,R9, R10,R12, R15,R18	SMT resistor	N.M.		
11	2	R16,R17	SMT resistor	2.2K		
12	4	TP4,TP5, TP6,TP7	SMT test point	TESTPOINT	Harwin	S1751-46R or equivalent

Item	Q.ty	Ref.	Description	Part/Value	Manufact.	Order code
13	1	U1	DMOS dual full-bridge driver	L6227PD	STMicroelectronics	L6227PD

Table 12. EVL6228-PLUG bill of materials

Item	Q.ty	Ref.	Description	Part/Value	Manufact.	Order code
1	1	C1	SMT ceramic capacitor	10nF/50V		
2	2	C2,C6	SMT ceramic capacitor	100nF/50V		
3	1	C3	SMT ceramic capacitor	220nF/35V		
4	2	C4,C5	SMT ceramic capacitor	N.M.		
5	1	D1	High speed double switching diode	BAR43	STMicroelectronics	BAR43SFILM
6	2	J1,J2	Terminal strip	BTE-020-01-F-D-A-TR	Samtec	BTE-020-01-F-D-A-TR or equivalent
7	6	J5,J6,J7, J8,J9,J10	Solder jumper	OPEN		
8	2	R1,R3	SMT resistor	0R2-3W		
9	9	R2,R4,R7, R8,R9,R11, R12,R15, R19	SMT resistor	0R		
10	6	R5,R6,R10, R13, R14,R17	SMT resistor	N.M.		
11	2	R16,R18	SMT resistor	2.2K		
12	4	TP4,TP5, TP6,TP7	SMT test point	TESTPOINT	Harwin	S1751-46R or equivalent
13	1	U1	DMOS driver for bipolar stepper motor	L6228PD	STMicroelectronics	L6228PD

Figure 13. EVL62XX-MAIN schematic diagram

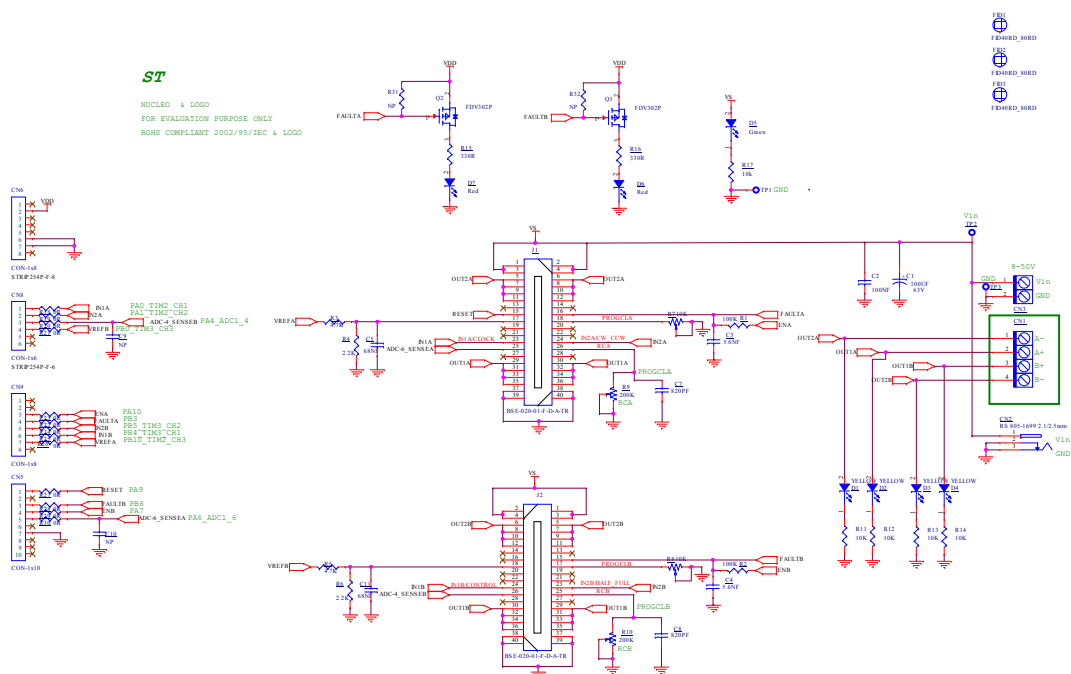


Figure 14. EVL6205-PLUG schematic diagram

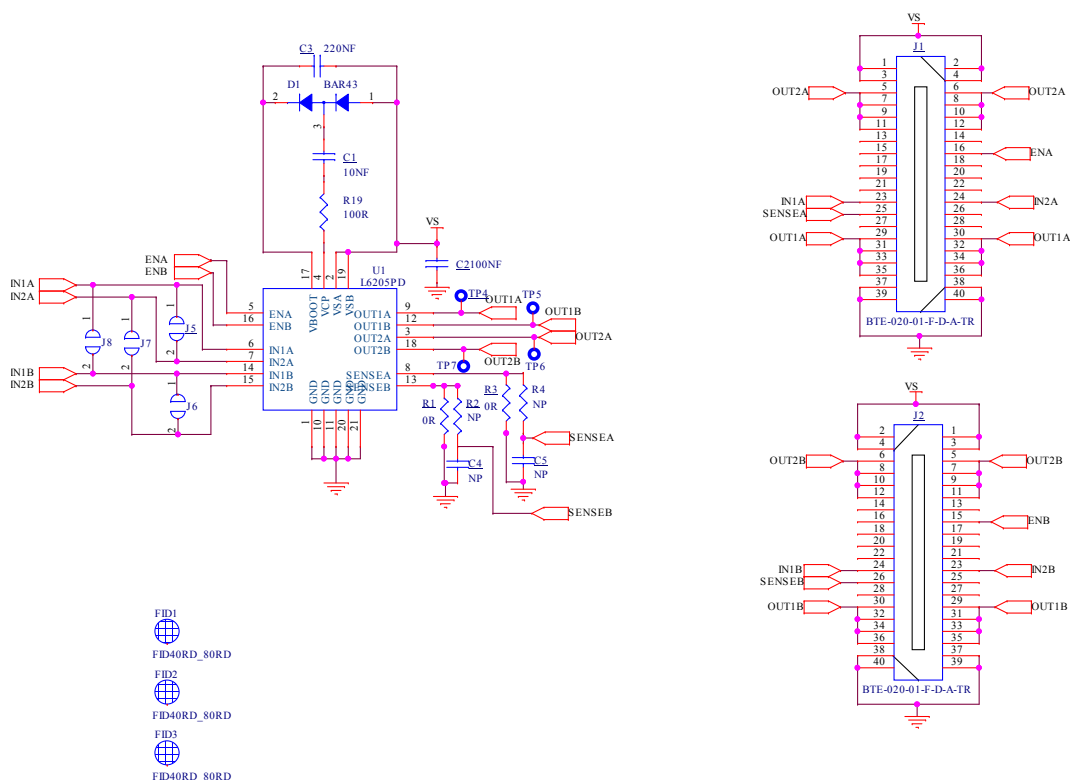


Figure 15. EVL6206-PLUG schematic diagram

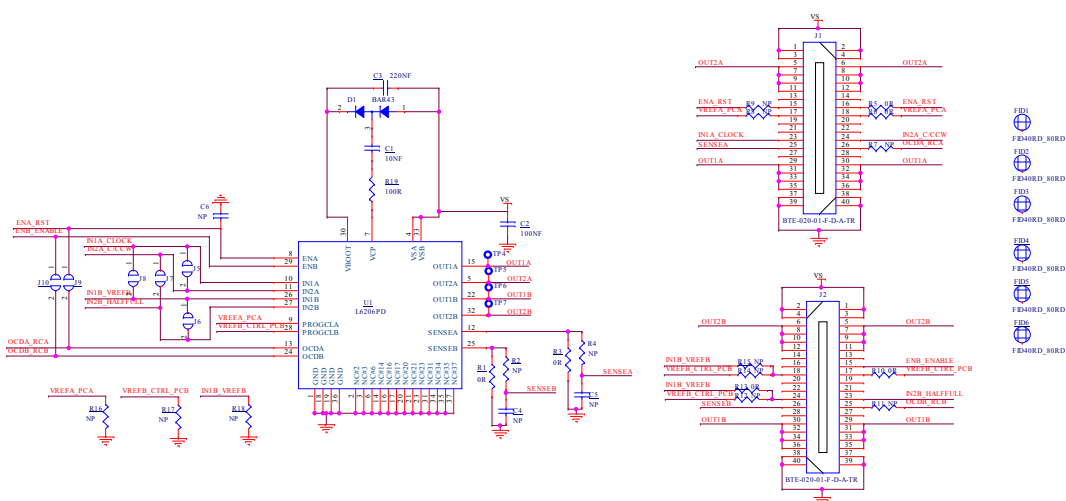


Figure 16. EVL6207-PLUG schematic diagram

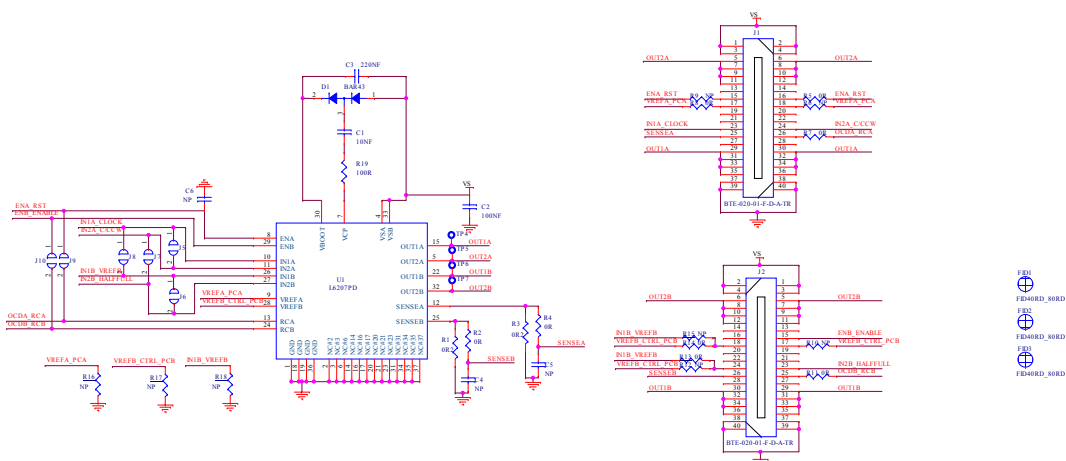


Figure 17. EVL6208-PLUG schematic diagram

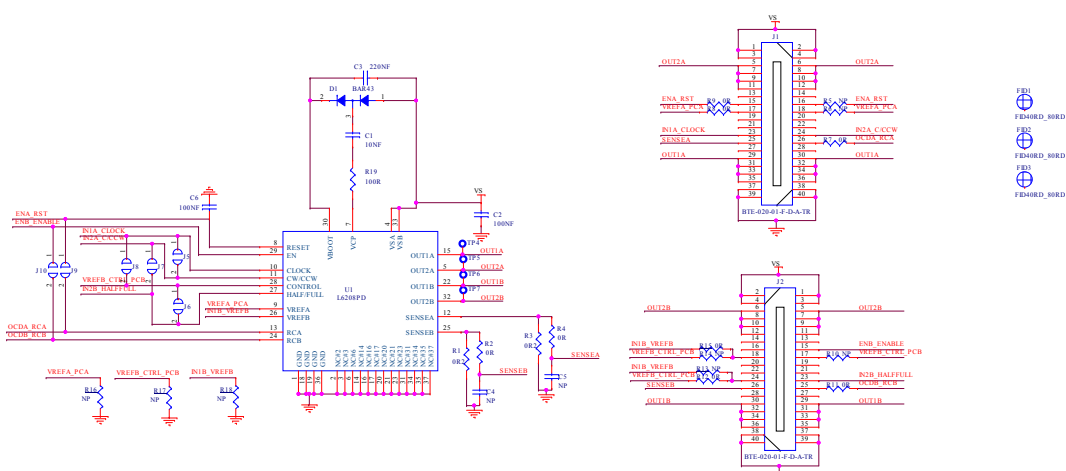


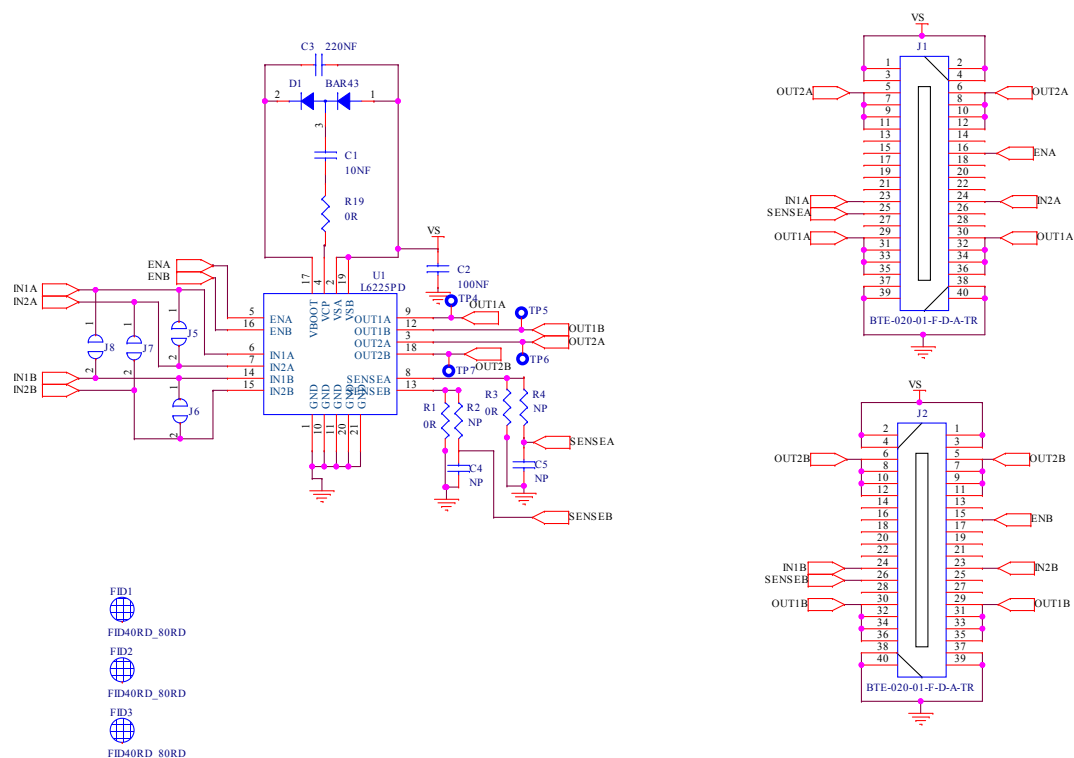
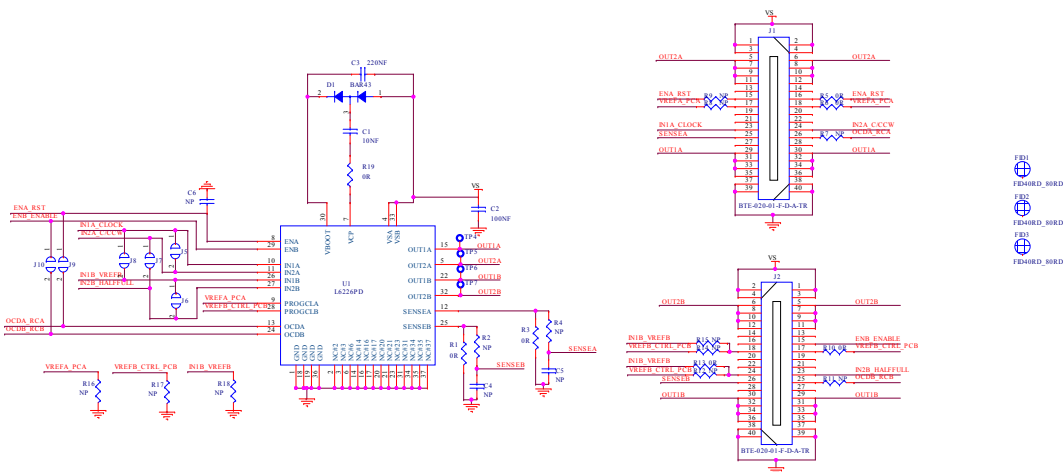
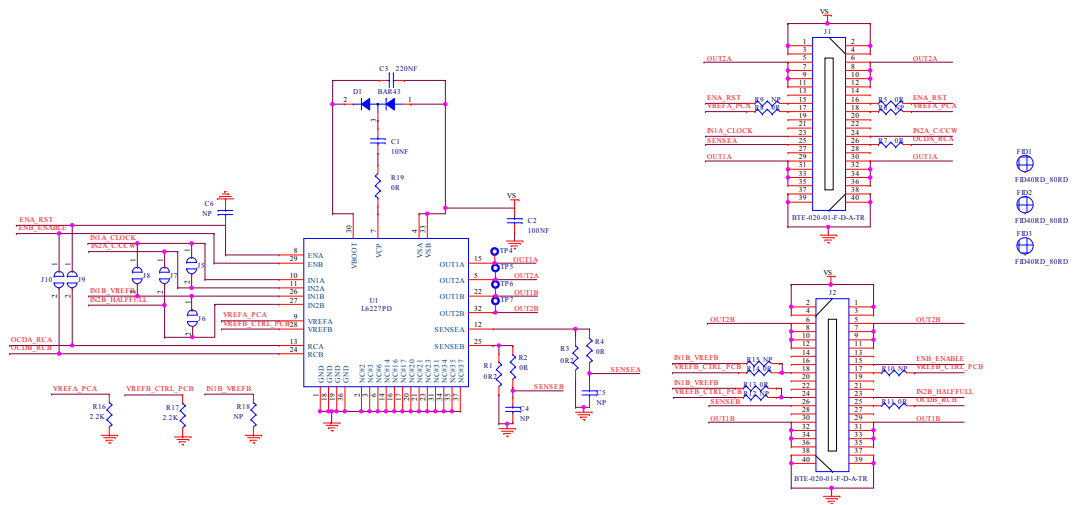
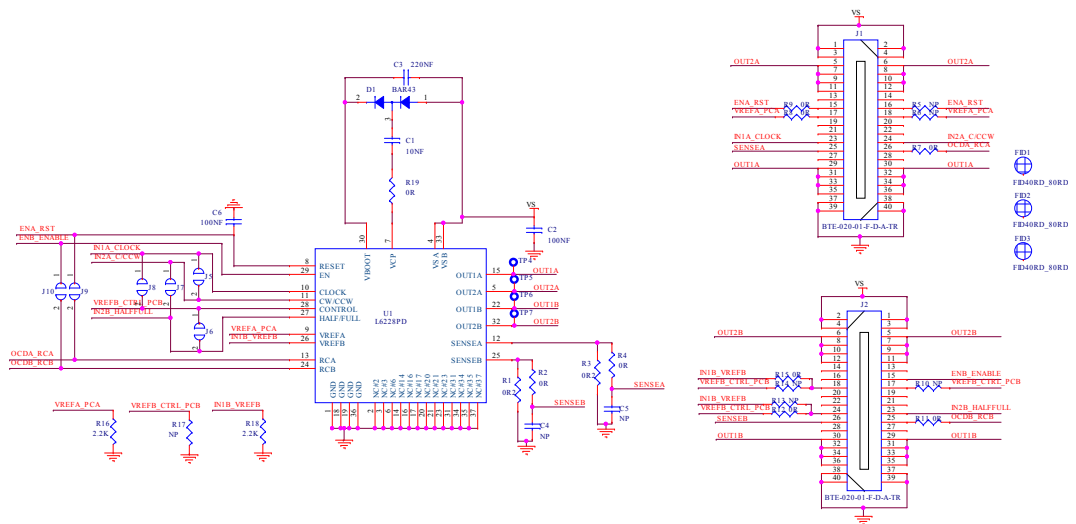
Figure 18. EVL6225-PLUG schematic diagram

Figure 19. EVL6226-PLUG schematic diagram


Figure 20. EVL6227-PLUG schematic diagram

Figure 21. EVL6228-PLUG schematic diagram


Revision history

Table 13. Document revision history

Date	Version	Changes
08-Jul-2021	1	Initial release.

Contents

1	Getting started	2
2	Hardware description and configuration	3
2.1	Overcurrent (OCD) threshold setting (L6206 and L6226)	4
2.2	TOFF setting (L6207, L6208, L227 and L6228)	5
2.3	Driving mode selection (L6205, L6225, L6206 and L6226)	5
3	Safety precautions.....	11
4	Bills of material.....	12
5	Schematic diagrams and layouts.....	18
	Revision history	22
	Contents	23
	List of tables	24
	List of figures.....	25

List of tables

Table 1.	Arduino UNO R3 connector table (L62x5, L62x6 and L62x7 devices)	3
Table 2.	Arduino UNO R3 connector table (L62x8 devices)	4
Table 3.	Hardware configurations	6
Table 4.	EVL62XX-MAIN bill of material	12
Table 5.	EVL6205-PLUG bill of materials	13
Table 6.	EVL6206-PLUG bill of materials	13
Table 7.	EVL6207-PLUG bill of materials	14
Table 8.	EVL6208-PLUG bill of materials	14
Table 9.	EVL6225-PLUG bill of materials	15
Table 10.	EVL6226-PLUG bill of materials	15
Table 11.	EVL6227-PLUG bill of materials	16
Table 12.	EVL6228-PLUG bill of materials	17
Table 13.	Document revision history	22

List of figures

Figure 1.	L62XX evaluation environment mounting L6205 driver board	1
Figure 2.	EVL62XX-MAIN main board overview	3
Figure 3.	L6206: Overcurrent threshold vs. resistor value (no paralleling).	4
Figure 4.	L6226: Overcurrent threshold vs. resistor value (no paralleling).	5
Figure 5.	tOFF vs. ROFF.	5
Figure 6.	Two bidirectional DC motors.	7
Figure 7.	Four unidirectional DC motors	7
Figure 8.	One bidirectional DC motor – higher current.	8
Figure 9.	Two unidirectional DC motors – higher current	8
Figure 10.	One bidirectional DC motor – lower overcurrent	9
Figure 11.	Two unidirectional DC motors – lower overcurrent.	9
Figure 12.	One unidirectional DC motor – all bridges parallel	10
Figure 13.	EVL62XX-MAIN schematic diagram	18
Figure 14.	EVL6205-PLUG schematic diagram	18
Figure 15.	EVL6206-PLUG schematic diagram	19
Figure 16.	EVL6207-PLUG schematic diagram	19
Figure 17.	EVL6208-PLUG schematic diagram	19
Figure 18.	EVL6225-PLUG schematic diagram	20
Figure 19.	EVL6226-PLUG schematic diagram	20
Figure 20.	EVL6227-PLUG schematic diagram	21
Figure 21.	EVL6228-PLUG schematic diagram	21

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