Adapter board for STM32 ZeST motor-control boards

Introduction

The B-ZEST-ADAPT1 adapter board expands the abilities of control cards using a V2 motor-control connector (PCIe x16) by splitting the command signals into three connectors, enabling up to three power board management.

Figure 1. B-ZEST-ADAPT1 top view

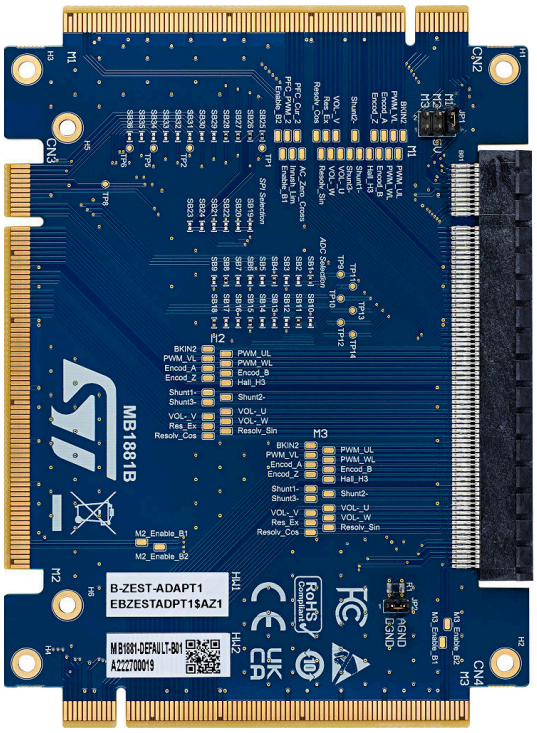
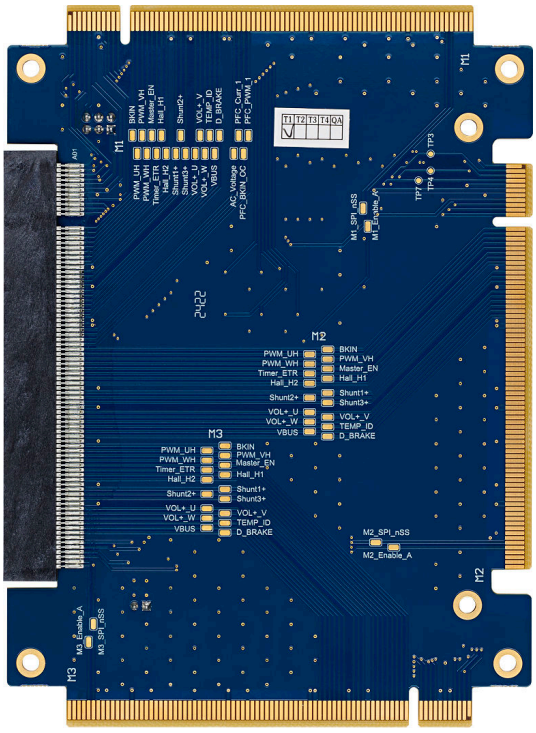


Figure 2. B-ZEST-ADAPT1 bottom view



Pictures are not contractual.

1 Features

- V2 motor-control connector splitter to three connectors allowing up to three motor board operation
- Signal configuration through solder bridges (SPI, ADC)
- Separate analog and digital ground planes for isolated operations with compatible boards

B-ZEST-ADAPT1 adapter board connects motor-control boards with embedded STM32 32-bit microcontrollers based on the Arm® Cortex®-M processor.

This board is compatible with the new generation of STM32 motor-control boards, to be used in association with B-G473E-ZEST1S and B-DRIVE-LVLP01. For further information, refer to the STM32 motor-control ecosystem webpage at *www.st.com*.

Note: Arm is a registered trademark of Arm Limited (or its subsidiaries) in the US and/or elsewhere.

2 Ordering information

To order the B-ZEST-ADAPT1 adapter board, refer to Table 1.

Table 1. List of available products

Order code	Board reference
B-ZEST-ADAPT1	MB1881

3 Conventions

Table 2 provides the conventions used for the ON and OFF settings in the present document.

Table 2. ON/OFF convention

Convention	Definition
Jumper JPx ON	Jumper fitted
Jumper JPx OFF	Jumper not fitted
Jumper JPx [1-2]	Jumper fitted between Pin 1 and Pin 2
Solder bridge SBx ON	SBx connections closed by 0 Ω resistor
Solder bridge SBx OFF	SBx connections left open
Resistor Rx ON	Resistor soldered
Resistor Rx OFF	Resistor not soldered
Capacitor Cx ON	Capacitor soldered
Capacitor Cx OFF	Capacitor not soldered

4 Hardware layout and configuration

The purpose of the B-ZEST-ADAPT1 adapter board is to extend the signals from a control board using the V2 motor-control connector to up to three motor boards.

Figure 3 illustrates how a complete system (one control board, one adapter board, and three motor boards) must be connected.

Figure 4 gives a picture of a complete system.

Figure 3. Hardware block diagram

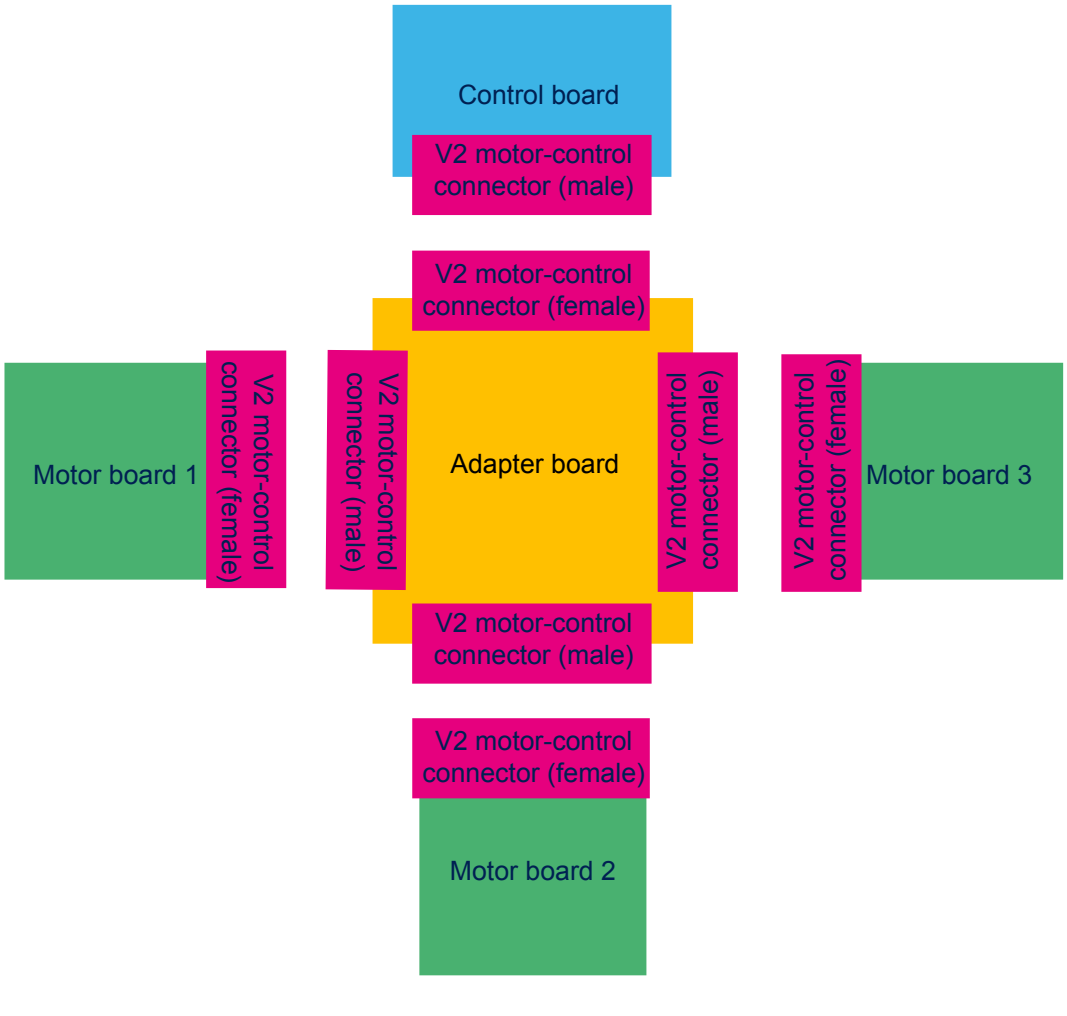
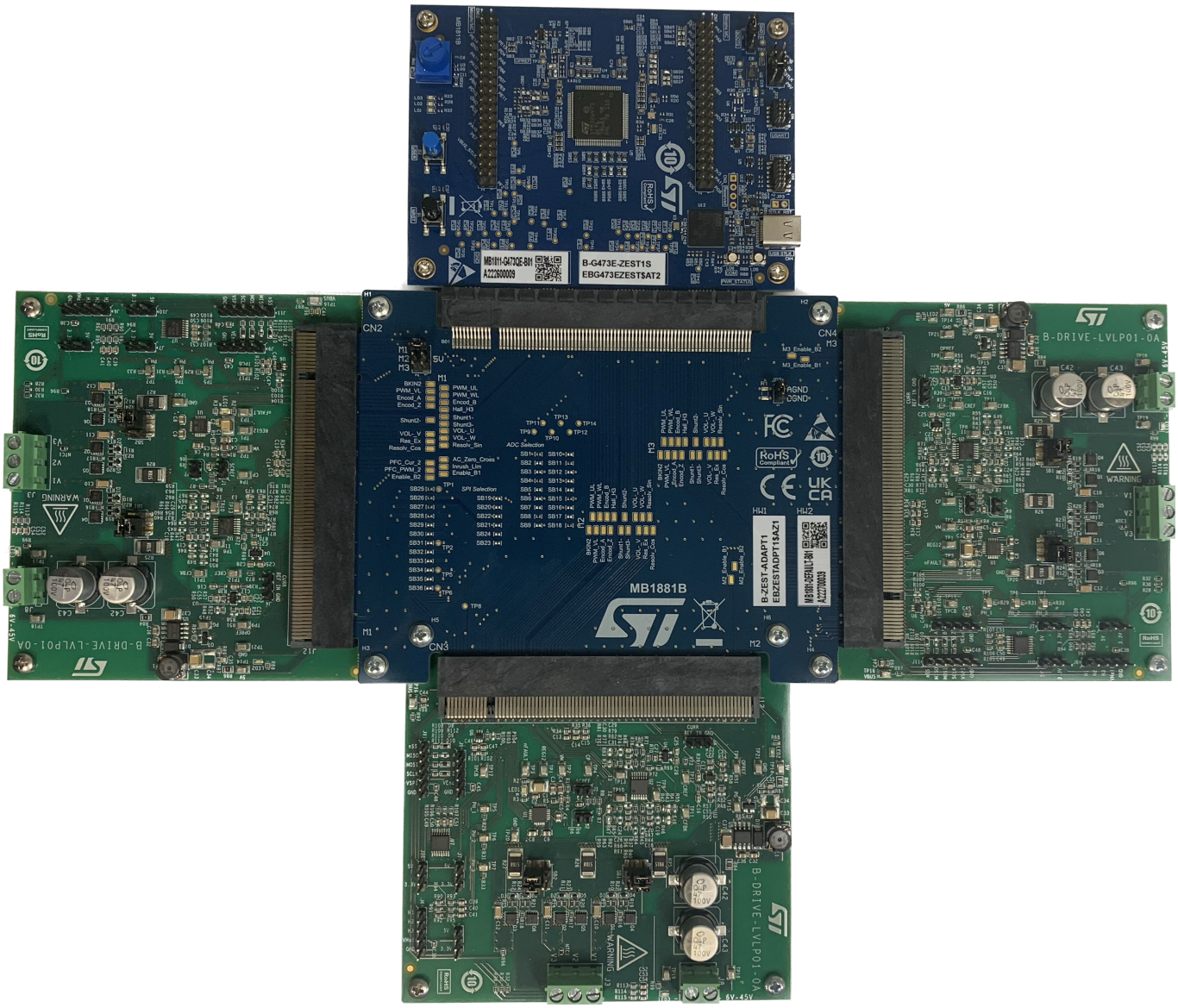


Figure 4. **Full system picture**



4.1 PCB layout

Figure 5. **Adapter board top view**

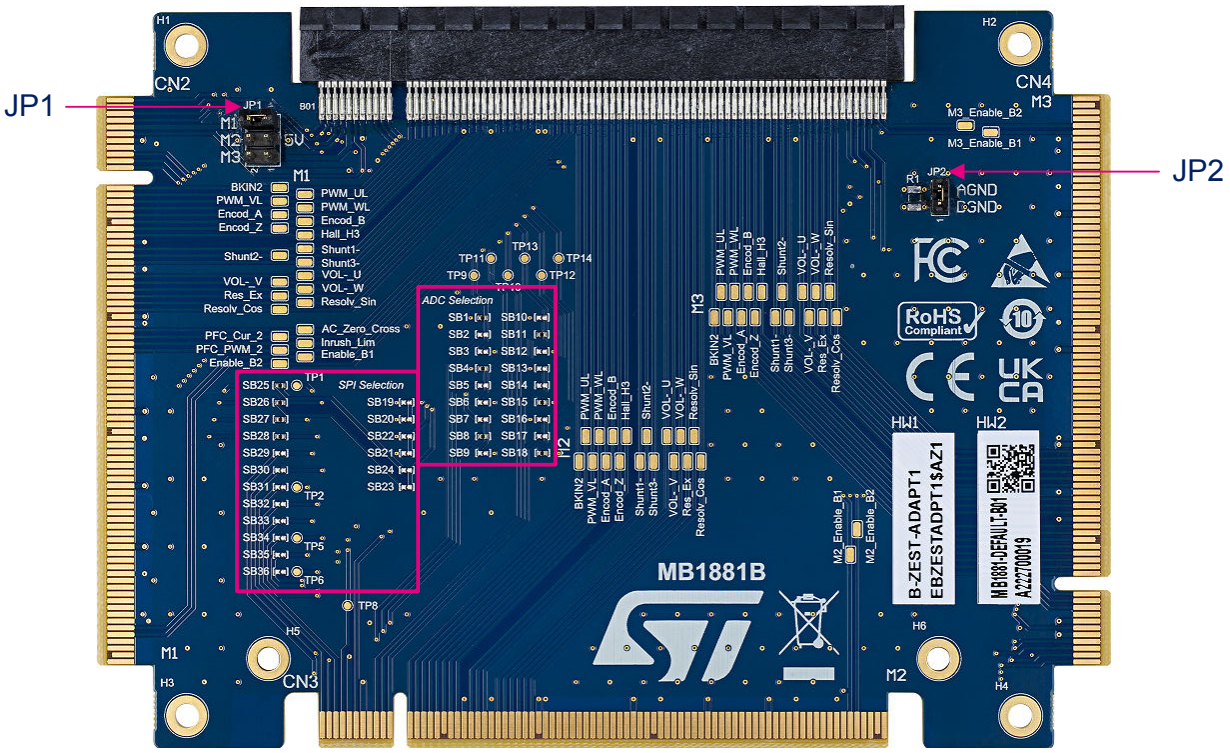
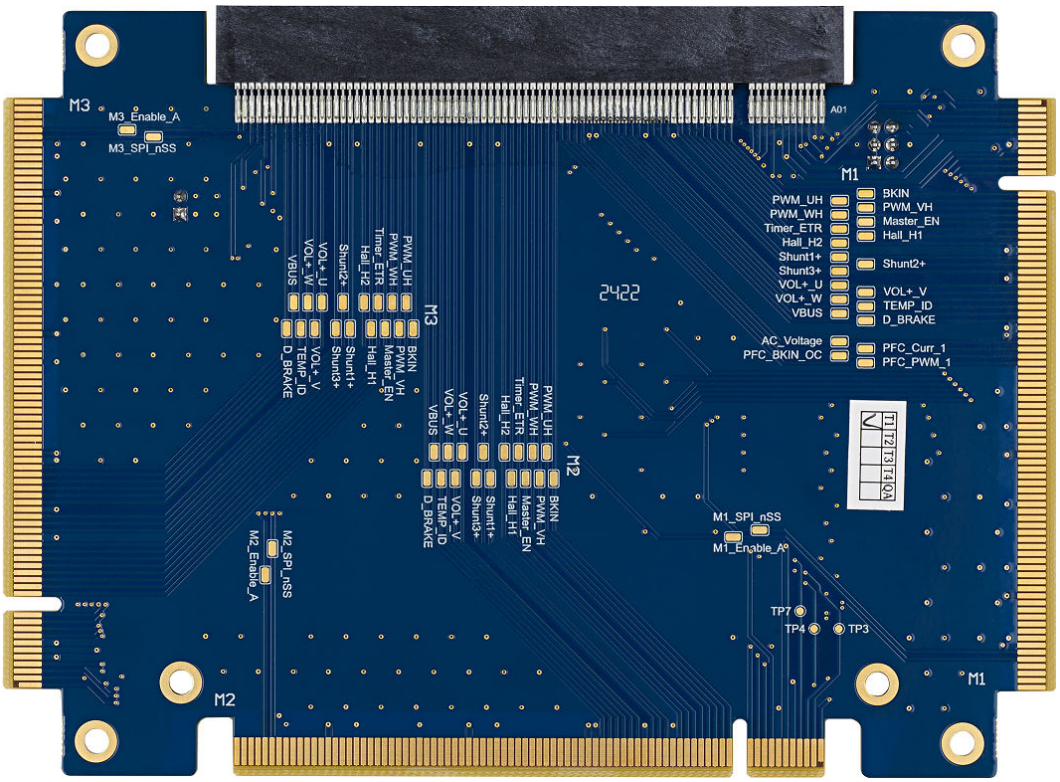


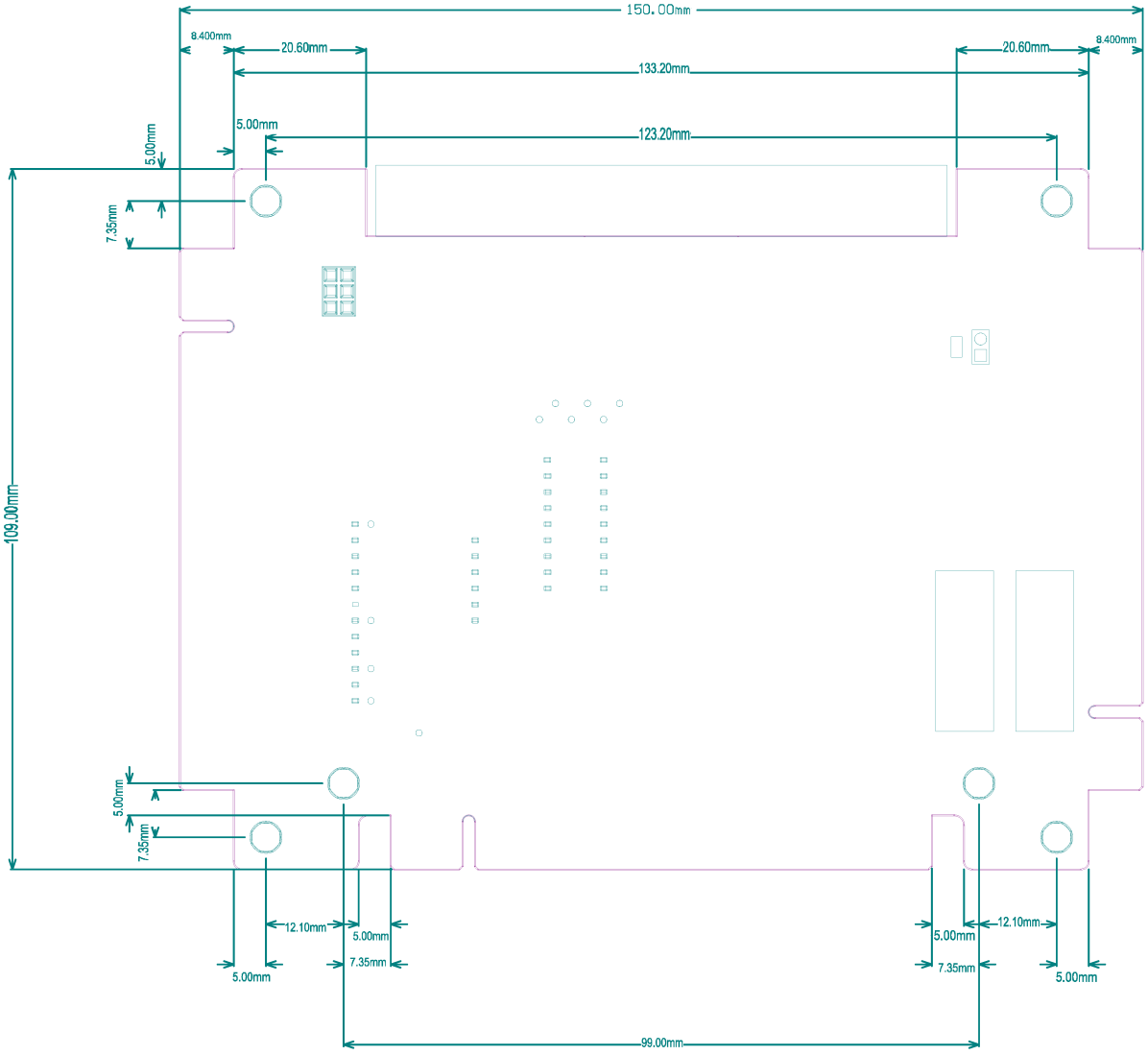
Figure 5 shows in pink the solder bridges setting the signal configuration according to Table 4 and Table 5.

Figure 6. **Adapter board bottom view**



4.2 Mechanical drawing

Figure 7. **B-ZEST-ADAPT1adapter board mechanical drawing (in millimeters)**



4.3 Default settings

Table 3. Jumpers default setting

Jumper	Default state	Comment
JP1	[5-6]	Control board powered from the M1 board
JP2	ON	Joined AGND/DGND

Table 4. Solder bridge default settings for ADC channel selection

Solder bridge	Default state	Comment
SB1, SB2, and SB3	SB1 ON SB2 and SB3 OFF	ADC1 is linked to board M1
SB4, SB5, and SB6	SB4 ON SB5 and SB6 OFF	ADC2 is linked to board M1
SB7, SB8, and SB9	SB8 ON SB7 and SB9 OFF	ADC3 is linked to board M2
SB10, SB11, and SB12	SB11 ON SB10 and SB12 OFF	ADC4 is linked to board M2
SB13, SB14, and SB15	SB15 ON SB13 and SB14 OFF	ADC5 is linked to board M3
SB16, SB17, and SB18	SB18 ON SB16 and SB17 OFF	ADC6 is linked to board M3

Table 5. Solder bridge default settings for SPI channel selection

Solder bridge	Default state	Comment
SB25 and SB27	Both ON	SPI1 linked to board M1
SB29 and SB31	Both OFF	Not connected
SB33 and SB35	Both OFF	Not connected
SB26 and SB28	Both ON	SPI2 linked to board M1
SB30 and SB32	Both OFF	Not connected
SB34 and SB36	Both OFF	Not connected
SB19 and SB20	Both OFF	Not connected
SB21 and SB22	Both OFF	Not connected
SB23 and SB24	Both OFF	Not connected

Warning: *Only one board must be enabled for an SPI connection to avoid conflict.*

4.4 Configuration

Table 6. **ADC selection configuration**

Channel	Solder bridge	State	Comment
ADC1	SB1	ON	Connected to board M1
		OFF	Not connected
	SB2	ON	Connected to board M2
		OFF	Not connected
	SB3	ON	Connected to board M3
		OFF	Not connected
ADC2	SB4	ON	Connected to board M1
		OFF	Not connected
	SB5	ON	Connected to board M2
		OFF	Not connected
	SB6	ON	Connected to board M3
		OFF	Not connected
ADC3	SB7	ON	Connected to board M1
		OFF	Not connected
	SB8	ON	Connected to board M2
		OFF	Not connected
	SB9	ON	Connected to board M3
		OFF	Not connected
ADC4	SB10	ON	Connected to board M1
		OFF	Not connected
	SB11	ON	Connected to board M2
		OFF	Not connected
	SB12	ON	Connected to board M3
		OFF	Not connected
ADC5	SB13	ON	Connected to board M1
		OFF	Not connected
	SB14	ON	Connected to board M2
		OFF	Not connected
	SB15	ON	Connected to board M3
		OFF	Not connected
ADC6	SB16	ON	Connected to board M1
		OFF	Not connected
	SB17	ON	Connected to board M2
		OFF	Not connected
	SB18	ON	Connected to board M3
		OFF	Not connected

Warning: *Only one solder bridge must be ON for each channel to avoid conflict.*

The JP1 jumper is used to select which power board powers the control board.

Table 7. Power configuration (JP1)

JP1[1]	Comment
[1-2]	Power from the M3 board
[3-4]	Power from the M2 board
[5-6]	**Power from the M1 board**

1. *The default configuration is in bold.*

5 Connectors

5.1 PCIe 16x control-board connector (CN1)

Figure 8. **PCIe 16x female connector**

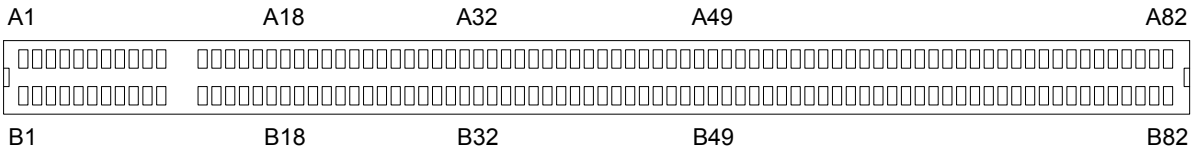


Table 8. **PCI-e 16x pinout for the control-board connector (CN1)**

-	Pin	A raw	B row
1x	1	SPI1_nSS	SPI1_MISO
	2	SPI1_SCK	SPI1_MOSI
	3	SPI2_nSS	SPI2_MISO
	4	SPI2_SCK	SPI2_MOSI
	5	5V_to_CTRLB	5V_to_CTRLB
	6	3V3_to_PWRB	VREF+
	7	DGND	DGND
	8	ID_Enable	AGND
	9	ADC1	ADC4
	10	ADC2	ADC5
	11	ADC3	ADC6
	Notch		
	12	M1_BKIN	M1_BKIN2
	13	M1_PWM_UH	M1_PWM_UL
	14	M1_PWM_VH	M1_PWM_VL
	15	M1_PWM_WH	M1_PWM_WL
	16	M1_Master_EN	M1_Encoder_A
	17	M1_Timer_ETR	M1_Encoder_B
	18	M1_Hall_H1	M1_Encoder_Z
4x	19	M1_Hall_H2	M1_Hall_H3
	20	DGND	DGND
	21	M1_SHUNT1+	M1_SHUNT1-
	22	M1_SHUNT2+	M1_SHUNT2-
	23	M1_SHUNT3+	M1_SHUNT3-
	24	AGND	AGND
	25	M1_VOL+_U	M1_VOL-_U
	26	M1_VOL+_V	M1_VOL-_V
	27	M1_VOL+_W	M1_VOL-_W
	28	M1_TEMP_ID	M1_Res.Ex
	29	M1_VBUS	M1_Resolver_Sin

-	Pin	A raw	B row
4x	30	M1_D_Brake	M1_Resolver_Cos
	31	DGND	DGND
	32	AGND	AGND
8x	33	AC_Voltage	AC_Zero_Crossing
	34	PFC_Current_1	PFC_Current_2
	35	PFC_BKIN_OC	Inrush_Lim
	36	PFC_PWM_1	PFC_PWM_2
	37	M2_BKIN	M2_BKIN2
	38	M2_PWM_UH	M2_PWM_UL
	39	M2_PWM_VH	M2_PWM_VL
	40	M2_PWM_WH	M2_PWM_WL
	41	M2_Master_EN	M2_Encoder_A
	42	M2_Timer_ETR	M2_Encoder_B
	43	M2_Hall_H1	M2_Encoder_Z
	44	M2_Hall_H2	M2_Hall_H3
	45	DGND	DGND
	46	M2_SHUNT1+	M2_SHUNT1-
	47	M2_SHUNT2+	M2_SHUNT2-
	48	M2_SHUNT3+	M2_SHUNT3-
	49	AGND	AGND
16x	50	M2_VOL+_U	M2_VOL-_U
	51	M2_VOL+_V	M2_VOL-_V
	52	M2_VOL+_W	M2_VOL-_W
	53	M2_TEMP_ID	M2_Res.Ex
	54	M2_VBUS	M2_Resolver_Sin
	55	M2_D_Brake	M2_Resolver_Cos
	56	DGND	DGND
	57	M3_BKIN	M3_BKIN2
	58	M3_PWM_UH	M3_PWM_UL
	59	M3_PWM_VH	M3_PWM_VL
	60	M3_PWM_WH	M3_PWM_WL
	61	M3_Master_EN	M3_Encoder_A
	62	M3_Timer_ETR	M3_Encoder_B
	63	M3_Hall_H1	M3_Encoder_Z
	64	M3_Hall_H2	M3_Hall_H3
	65	DGND	DGND
	66	M3_SHUNT1+	M3_SHUNT1-
	67	M3_SHUNT2+	M3_SHUNT2-
	68	M3_SHUNT3+	M3_SHUNT3-
	69	AGND	AGND
	70	M3_VOL+_U	M3_VOL-_U

-	Pin	A raw	B row
16x	71	M3_VOL+_V	M3_VOL-_V
	72	M3_VOL+_W	M3_VOL-_W
	73	M3_TEMP_ID	M3_Res.Ex
	74	M3_VBUS	M3_Resolver_Sin
	75	M3_D_Brake	M3_Resolver_Cos
	76	DGND	AGND
	77	M1_SPI_nSS	M1_Enable_B1
	78	M1_Enable_A	M1_Enable_B2
	79	M2_SPI_nSS	M2_Enable_B1
	80	M2_Enable_A	M2_Enable_B2
	81	M3_SPI_nSS	M3_Enable_B1
	82	M3_Enable_A	M3_Enable_B2

5.2 PCIe 16x motor-board connectors (CN2, CN3, and CN4)

Table 9. PCI-e 16x pin out for motor-board connectors (CN2, CN3, and CN4)

-	Pin	A raw	B raw
1x	1	Mx_SPI1_nSS	Mx_SPI1_MISO
	2	Mx_SPI1_SCK	Mx_SPI1_MOSI
	3	Mx_SPI2_nSS	Mx_SPI2_MISO
	4	Mx_SPI2_SCK	Mx_SPI2_MOSI
	5	Mx_5V	Mx_5V
	6	3V3_to_PWRB	VREF+
	7	DGND	DGND
	8	ID_Enable	AGND
	9	Mx_ADC1	Mx_ADC4
	10	Mx_ADC2	Mx_ADC5
	11	Mx_ADC3	Mx_ADC6
	Notch		
	12	Mx_BKIN	Mx_BKIN2
	13	Mx_PWM_UH	Mx_PWM_UL
	14	Mx_PWM_VH	Mx_PWM_VL
	15	Mx_PWM_WH	Mx_PWM_WL
	16	Mx_Master_EN	Mx_Encoder_A
	17	Mx_Timer_ETR	Mx_Encoder_B
	18	Mx_Hall_H1	Mx_Encoder_Z
4x	19	Mx_Hall_H2	Mx_Hall_H3
	20	DGND	DGND
	21	Mx_SHUNT1+	Mx_SHUNT1-
	22	Mx_SHUNT2+	Mx_SHUNT2-
	23	Mx_SHUNT3+	Mx_SHUNT3-

-	Pin	A raw	B raw
4x	24	AGND	AGND
	25	Mx_VOL+_U	Mx_VOL-_U
	26	Mx_VOL+_V	Mx_VOL-_V
	27	Mx_VOL+_W	Mx_VOL-_W
	28	Mx_TEMP_ID	Mx_Res.Ex
	29	Mx_VBUS	Mx_Resolver_Sin
	30	Mx_D_Brake	Mx_Resolver_Cos
	31	DGND	DGND
	32	AGND	AGND
8x	33	AC_Voltage (Only for M1)	AC_Zero_Crossing (Only for M1)
	34	PFC_Current_1 (Only for M1)	PFC_Current_2 (Only for M1)
	35	PFC_BKIN_OC (Only for M1)	Inrush_Lim (Only for M1)
	36	PFC_PWM_1 (Only for M1)	PFC_PWM_2 (Only for M1)
	37	NC	NC
	38	NC	NC
	39	NC	NC
	40	NC	NC
	41	NC	NC
	42	NC	NC
	43	NC	NC
	44	NC	NC
	45	DGND	DGND
	46	NC	NC
	47	NC	NC
	48	NC	NC
	49	AGND	AGND
16x	50	NC	NC
	51	NC	NC
	52	NC	NC
	53	NC	NC
	54	NC	NC
	55	NC	NC
	56	DGND	DGND
	57	NC	NC
	58	NC	NC
	59	NC	NC
	60	NC	NC
	61	NC	NC
	62	NC	NC
	63	NC	NC
	64	NC	NC

-	Pin	A raw	B raw
16x	65	DGND	DGND
	66	NC	NC
	67	NC	NC
	68	NC	NC
	69	AGND	AGND
	70	NC	NC
	71	NC	NC
	72	NC	NC
	73	NC	NC
	74	NC	NC
	75	NC	NC
	76	DGND	AGND
	77	Mx_SPI_nSS	Mx_Enable_B1
	78	Mx_Enable_A	Mx_Enable_B2
	79	NC	NC
	80	NC	NC
	81	NC	NC
	82	NC	NC

6 B-ZEST-ADAPT1 product information

6.1 Product marking

The stickers located on the top or bottom side of all PCBs provide product information:

- First sticker: product order code and product identification, generally placed on the main board featuring the target device.
  Example:

  Product order code
  Product identification

- Second sticker: board reference with revision and serial number, available on each PCB.
  Example:

  MBxxxx-Variant-yzz
  syywwxxxxx

On the first sticker, the first line provides the product order code, and the second line the product identification.

On the second sticker, the first line has the following format: *"MBxxxx-Variant-yzz"*, where *"MBxxxx"* is the board reference, *"Variant"* (optional) identifies the mounting variant when several exist, *"y"* is the PCB revision, and *"zz"* is the assembly revision, for example B01. The second line shows the board serial number used for traceability.

Parts marked as *"ES"* or *"E"* are not yet qualified and therefore not approved for use in production. ST is not responsible for any consequences resulting from such use. In no event will ST be liable for the customer using any of these engineering samples in production. ST's Quality department must be contacted prior to any decision to use these engineering samples to run a qualification activity.

"ES" or *"E"* marking examples of location:

- On the targeted STM32 that is soldered on the board (for an illustration of STM32 marking, refer to the STM32 datasheet *Package information* paragraph at the *www.st.com* website).
- Next to the evaluation tool ordering part number that is stuck, or silk-screen printed on the board.

Some boards feature a specific STM32 device version, which allows the operation of any bundled commercial stack/library available. This STM32 device shows a *"U"* marking option at the end of the standard part number and is not available for sales.

To use the same commercial stack in their applications, the developers might need to purchase a part number specific to this stack/library. The price of those part numbers includes the stack/library royalties.

6.2 B-ZEST-ADAPT1 product history

Table 10. Product history

Order code	Product identification	Product details	Product change description	Product limitations
B-ZEST-ADAPT1	BZESTADAPT1$AZ1	Board: • MB1881-DEFAULT-B01	Initial revision	No limitation

6.3 Board revision history

Table 11. Board revision history

Board reference	Board variant and revision	Board change description	Board limitations
MB1881	MB1881-DEFAULT-B01	Initial revision	No limitation

Revision history

Table 12. **Document revision history**

Date	Version	Changes
27-Jan-2023	1	Initial release.

Contents

List of tables

List of figures