

PTC04-DB-HALL06

Daughter Board for Melexis PTC devices

Scope

Experimental tool for Lab and Prototyping.

Production Equipment for Serial Programming.

PTC04 interface board for testing the following devices:

Magnetic position sensors

- MLX90364⁽¹⁾
- MLX90365⁽¹⁾
- MLX90366⁽¹⁾
- MLX90367⁽¹⁾

- MLX90421
- MLX90422
- MLX90423
- MLX90425
- MLX90426

- MLX90371
- MLX90372
- MLX90373⁽²⁾
- MLX90374
- MLX90376
- MLX90377
- MLX91377
- MLX90378
- MLX90380

Latch & switch

- MLX92352⁽³⁾
- MLX92362⁽³⁾
- MLX92292⁽¹⁾

Inductive position sensors

- MLX90510⁽¹⁾
- MLX90513⁽¹⁾
- MLX90517⁽¹⁾

Pressure sensors

- MLX90822⁽²⁾
- MLX90823⁽²⁾
- MLX90824⁽²⁾
- MLX90825⁽²⁾
- MLX90829⁽²⁾

Ordering Information

Part No.

PTC04-DB-Hall06

Description

Daughter Board (PCB + rear panel PTC04)

Accessories

Part No.

DLL's for all supported products

User Interfaces for supported products

Description

¹ requires a PTC04-DB-HALL06 with a minimum revision of 3.

² requires a PTC04-DB-HALL06 with a minimum revision of 4.

³ requires a PTC04-DB-HALL06 with a minimum revision of 7.

1. Functional Diagram

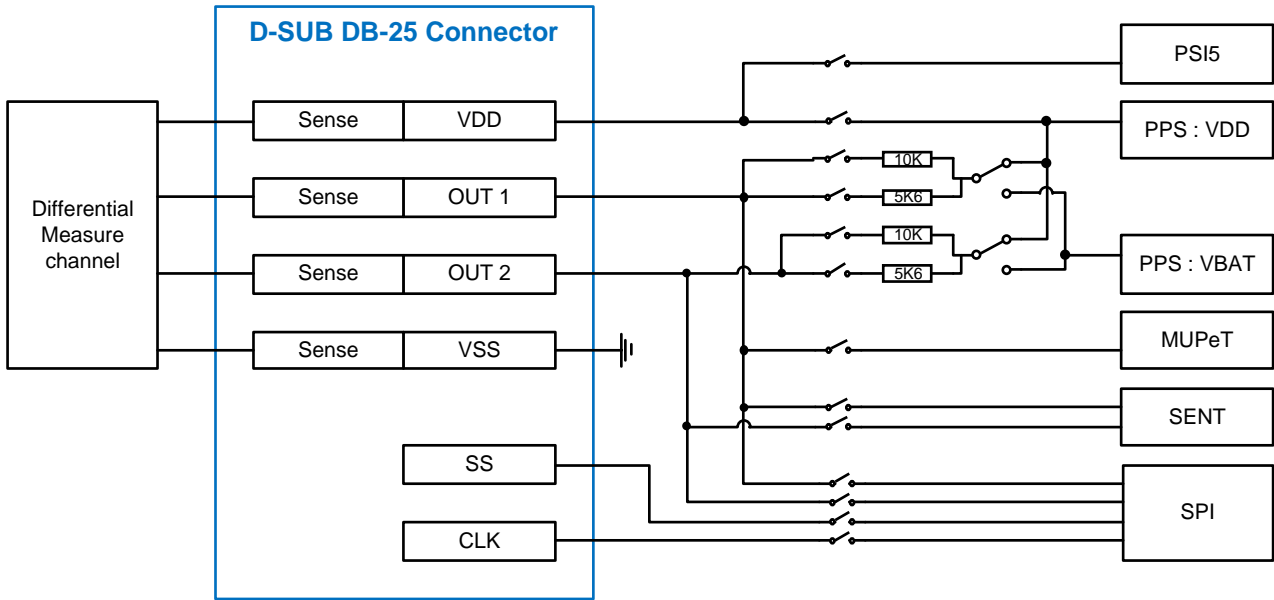


Figure 1: Functional diagram

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2. Board description

2.1. Board Layout

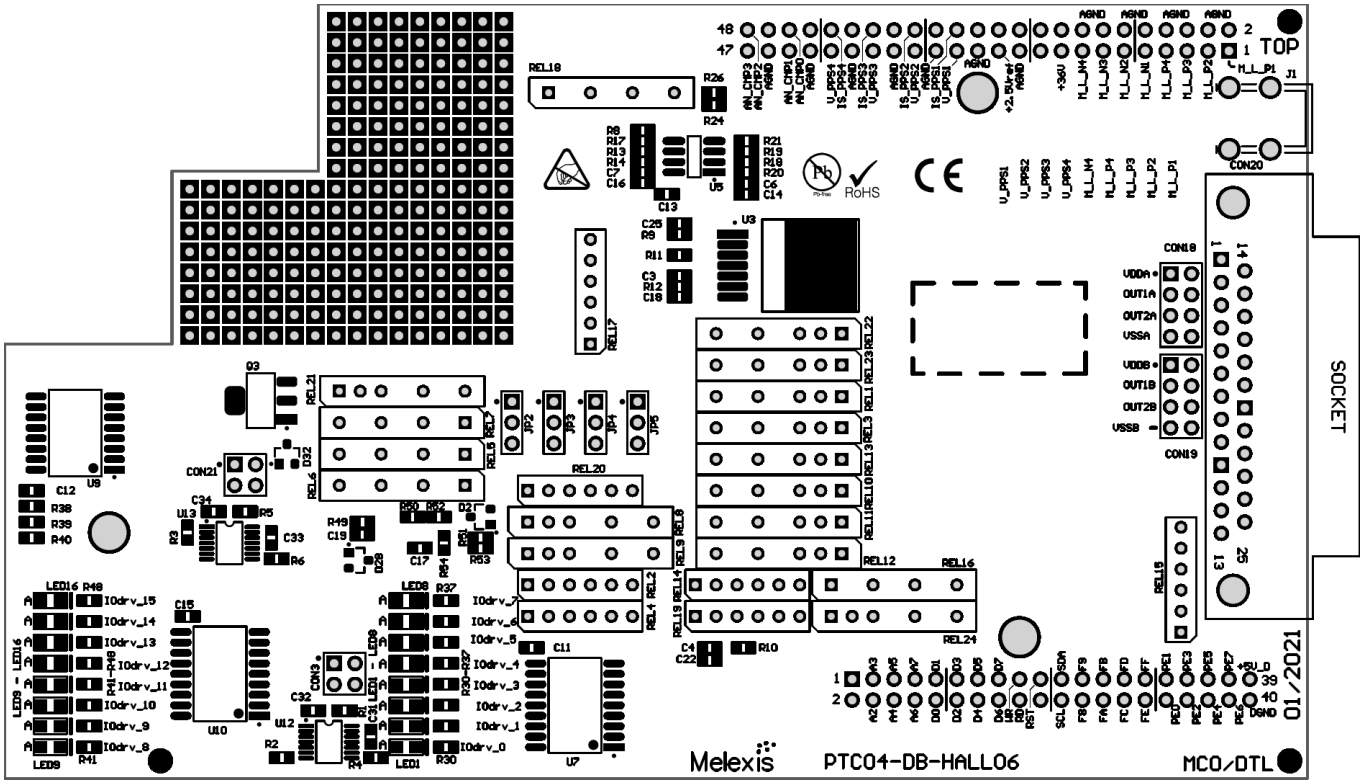


Figure 2: Top layer

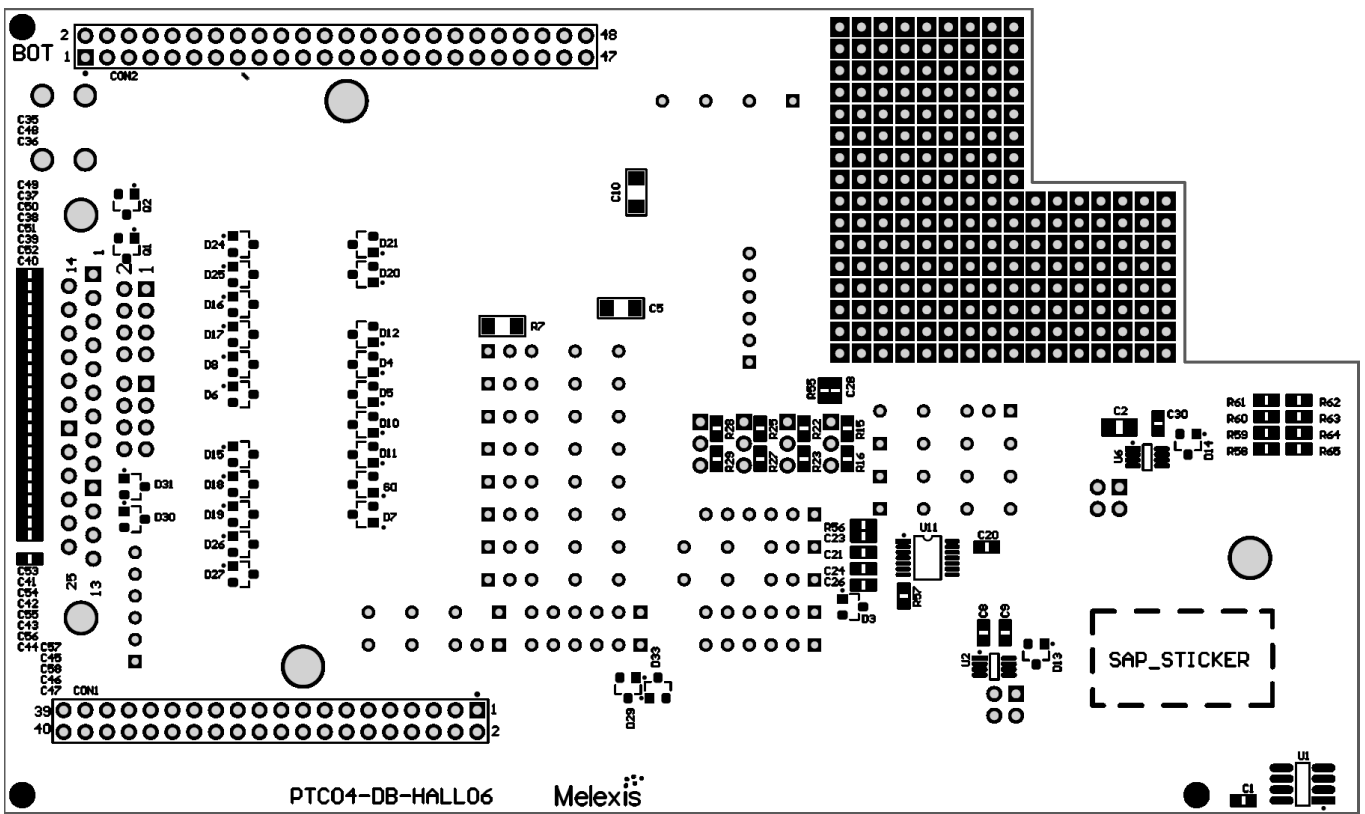


Figure 3: Bottom layer

- CON20: DB-25 Connector to the application.
- JP2, JP3, JP4, and JP5: Select 5K6 or 10 K for pull-up load to VDD or Vbat, resp. for OUT1A, OUT2A, OUT1B and OUT2B.
- CON3 and CON21: Jumpers to select a 100 Ohm resistor or the digital potentiometer for MUPET protocol.
- CON18 and CON19: Jumpers to short the sensing lines at the device connector.
- CON2: Analog connector.
- CON1: Digital connector.
- U1 This EEPROM memory keeps a few initial variables in mind. It allows for example to detect what DB is connected to the programmer and if the DB is not expired.
- J1: GND connection to back panel.

See below for a detailed description on the connectors and the jumper configurations.

2.2. Board Schematic

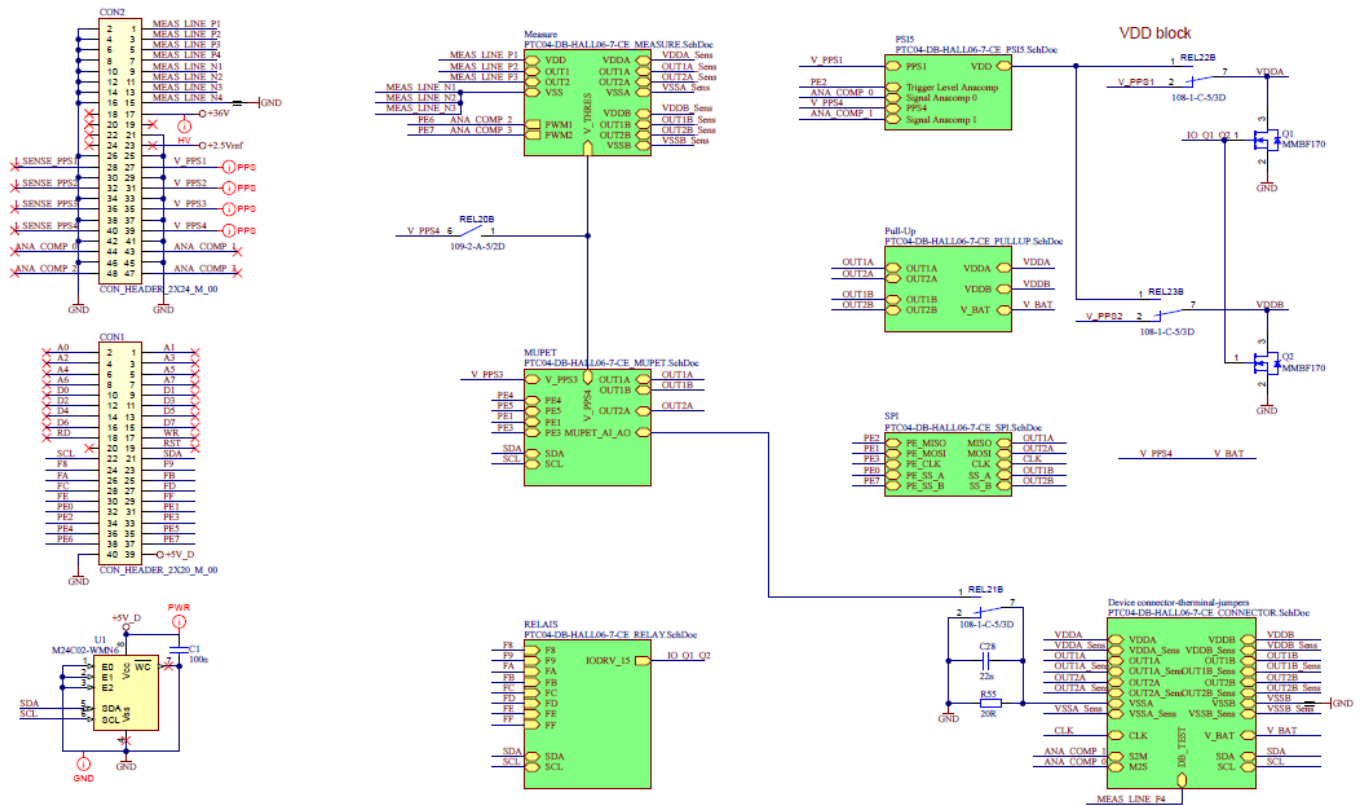


Figure 4: Main schematic

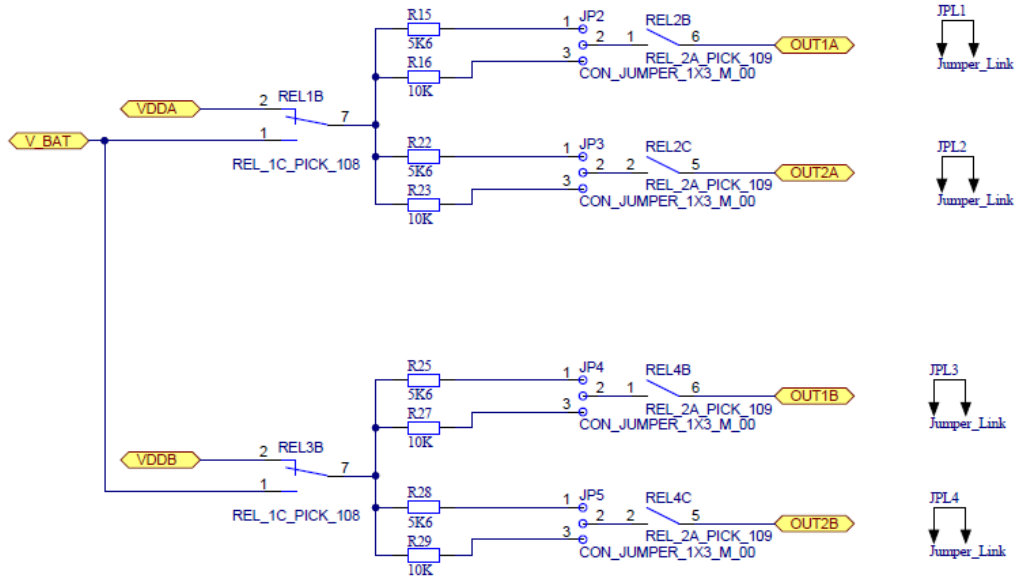


Figure 5: Pull-Up Block

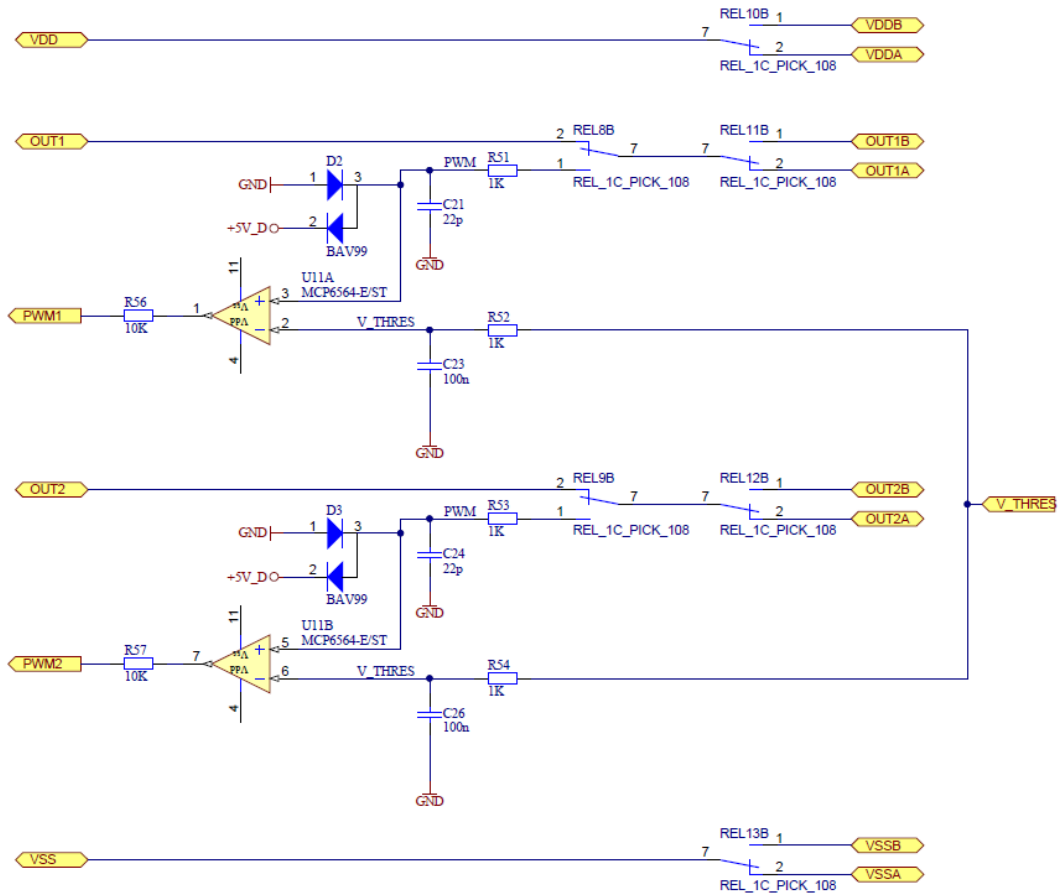


Figure 6: Measure Block

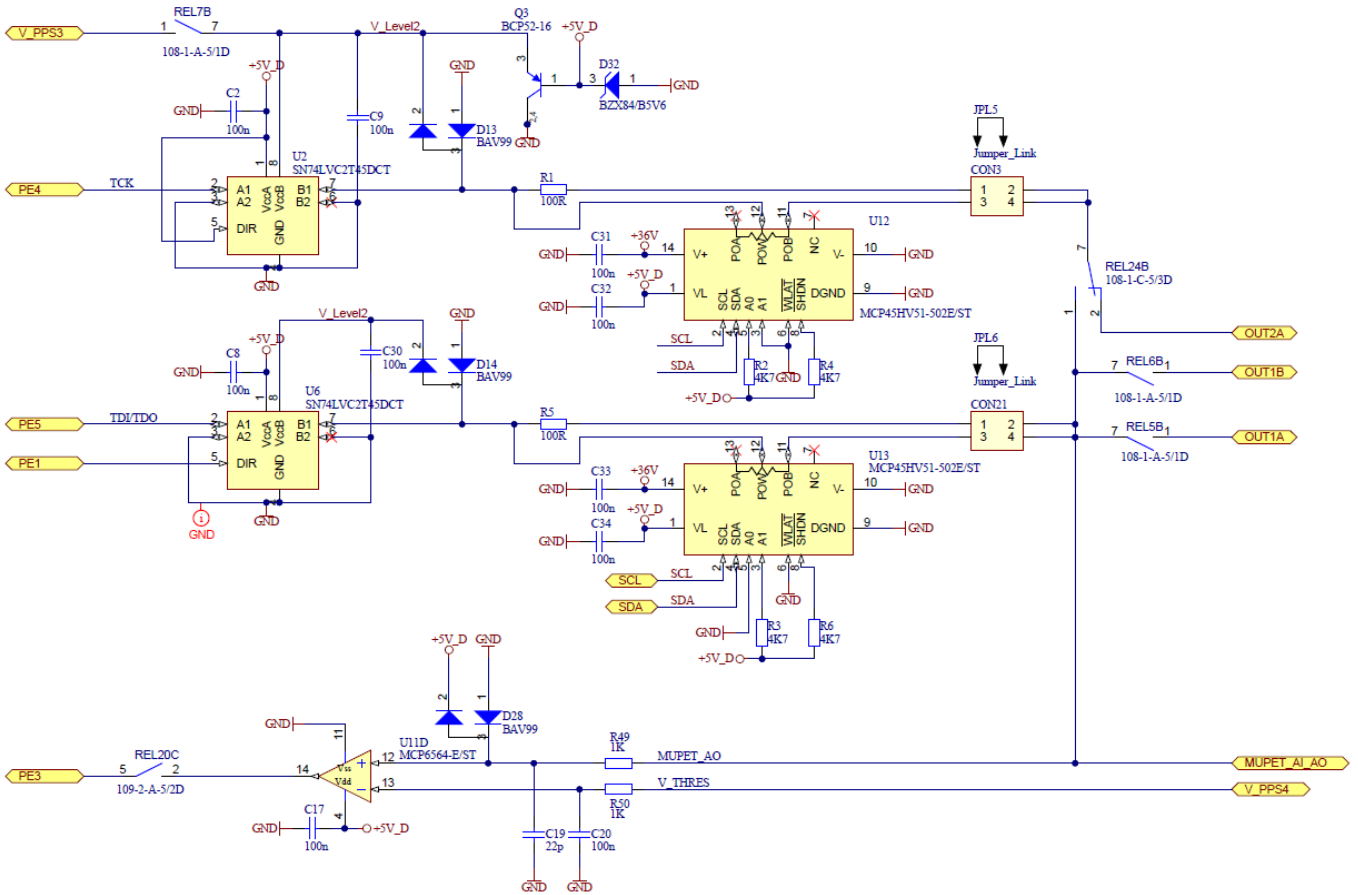


Figure 7: MUPET Block

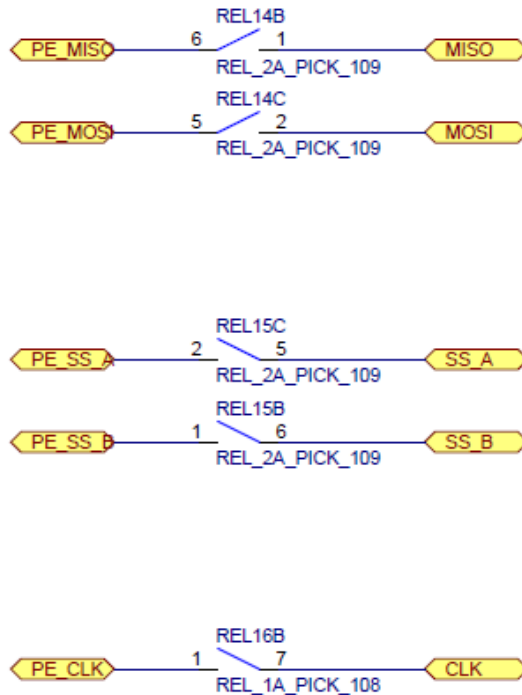


Figure 8: SPI Block

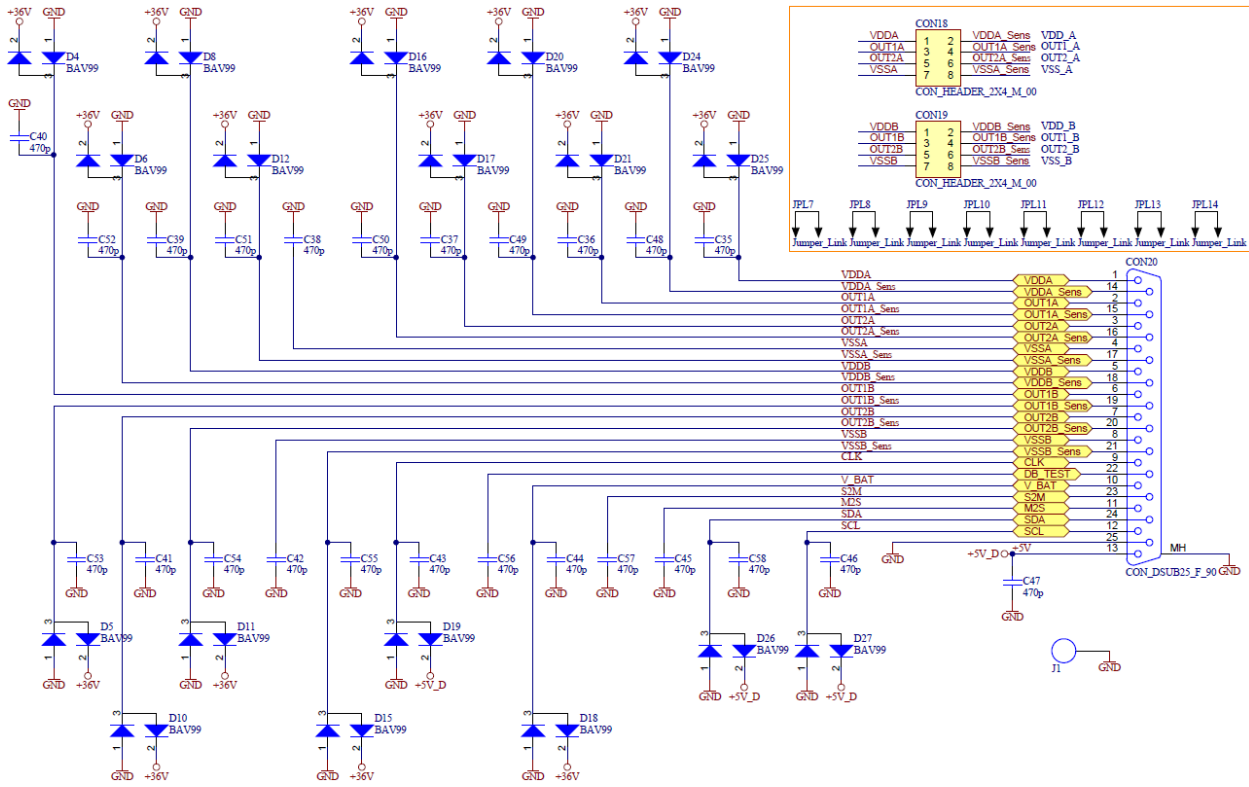


Figure 9: Device Connector Block

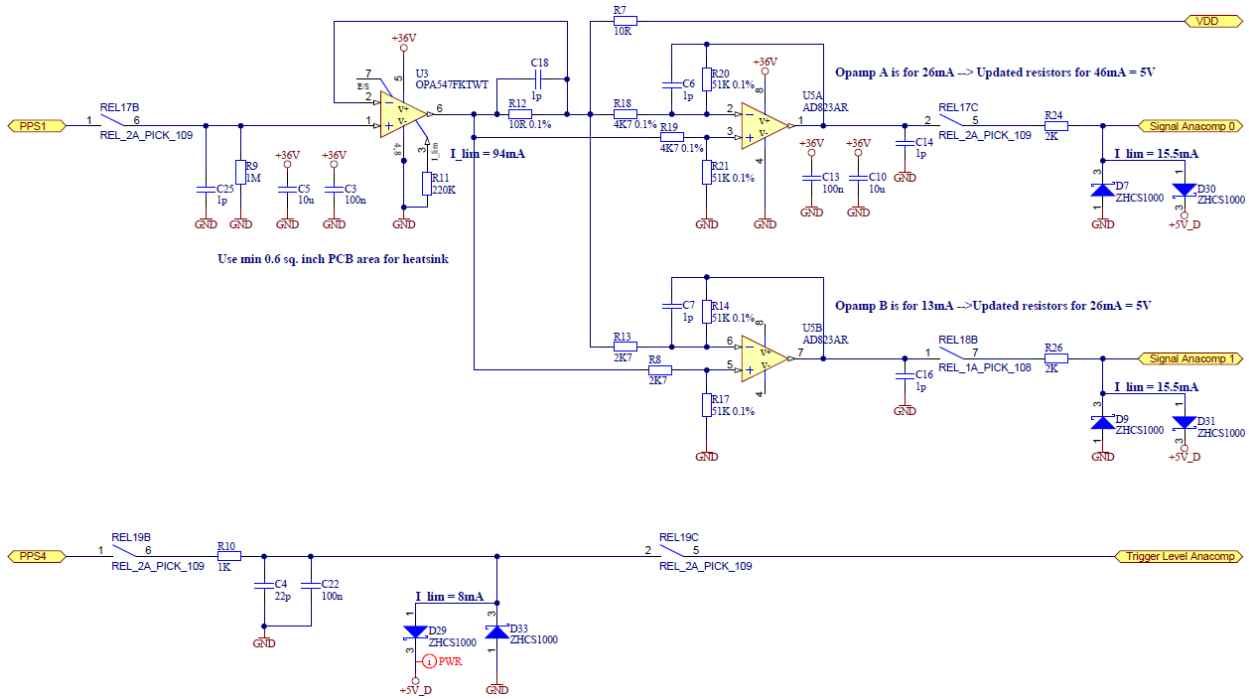


Figure 10: PS15 Block

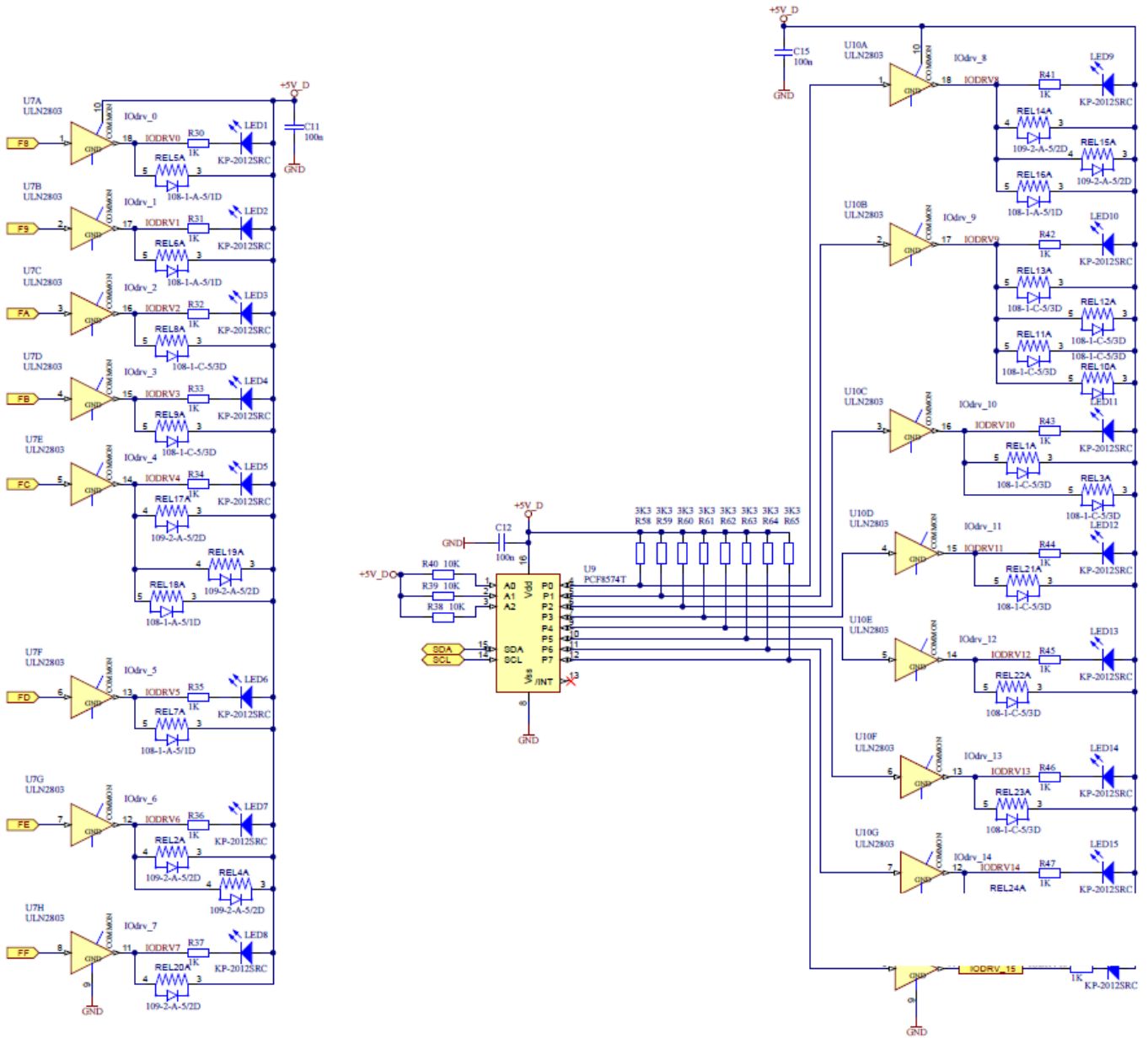


Figure 11: Relays Block

2.3. Daughter board Connectors

The main board has two connectors to the interface with the application. The PTC allows adding a full PCB in between. This daughter board can be mounted on the two connectors. In some exceptional cases, a daughter board contains only a few wires from the Analog connector to the application connector. The pins on of the connectors are described below.

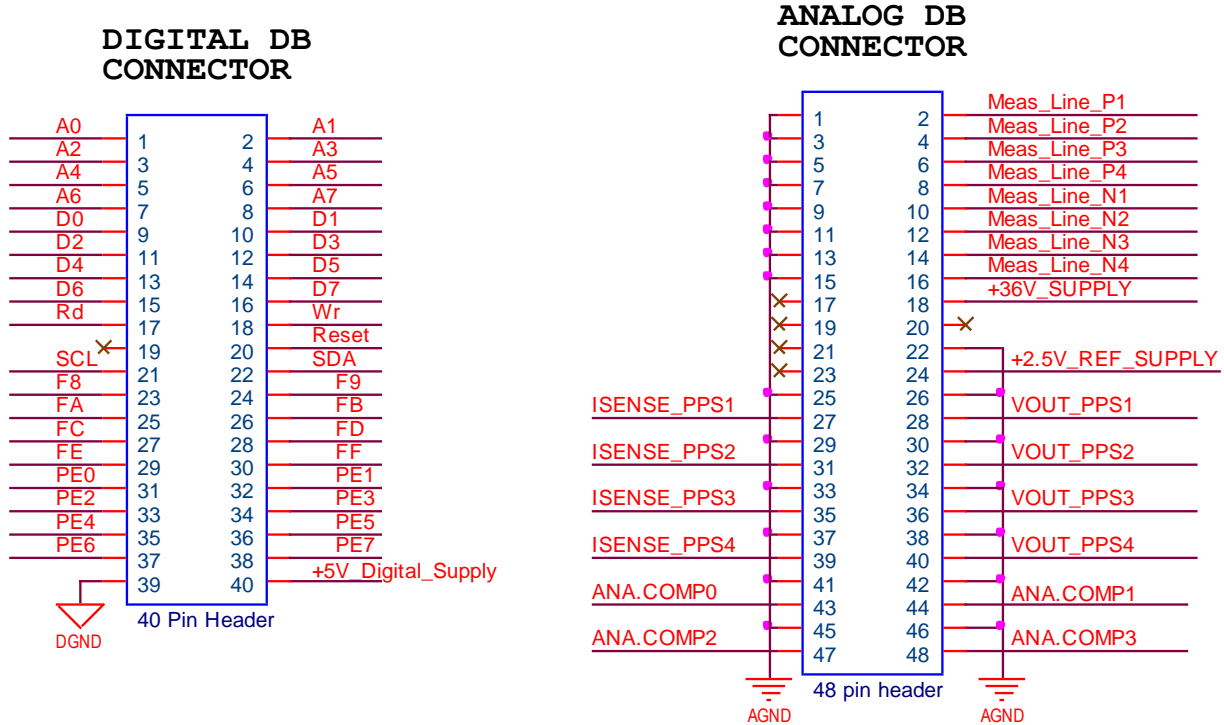


Figure 12: Daughter Board Connectors

2.3.1. Digital DB Connector (40 Pins)

Mainly, the digital connector is meant to expand the programmer to extra needs. Address lines A0-A7 together with the Map Select Lines F8-FF allows to direct access an area of 2 K. Examples would be adding a simple addressed I/O register by using the selection lines. If more complexity is needed, a full FPGA can be mounted on the DB board

Pins	Names	Description
1 – 8	A0 – A7	Address lines
9 – 16	D0 – D7	Data Lines active during Rd or Wr signals
17	Rd	Read: A negative pulse will indicate a sampling of the data on the Data Bus
18	Wr	Write: A Negative pulse will indicate when data is available on the Data Bus
20	Reset	This signal goes low by powering the PTC or by pressing the reset button. This line can be pulled low by application. Check firmware documentation for resetting by software.
21-22	SCL / SDA	I2c Bus
23-30	F8,F9,...,FF	CS lines when the address areas are accessed
31-38	Port E	Note: These pins are limited to 5 Volt input\output!!!! The full Port E of the Atmega core is mounted to these pins. This allows us to use advanced features like PWM, UARTS, Time Measurements, etc.... By using firmware that supports these, functions, application specific requirements can be fulfilled.
39	DGND	Digital Ground
40	+5V Digital	5 Volt Digital Supply. Maximum current to get out of this supply: 250mA

Note: All the pins are limited to 5 Volt input\output!!!! However, there are Protections, please take precautions in order to avoid damage of the main board.

2.3.2. Analog DB Connector (48 Pins)

Mainly, the analog connector provides all the analog signals and measure possibilities.

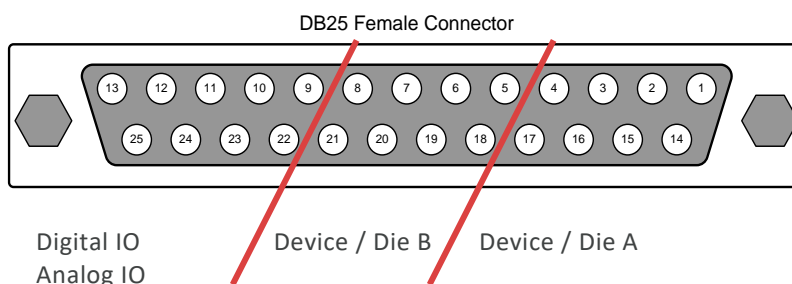
Pins	Names	Description
28,32,36	PPS 1-3	Output of the Programmable Supplies
40	PPS 4	Output of the Fast DAC Programmable Power Supply
27,31,35,39	Isense_PP1-4	Outputs (Driver outputs before Rsens) for current evaluations. These outputs could be used to connect to the analog comparators in order to create fast digital signals based on current.
2,4,6,8	ExtMeas1-4Pos	There are 4 differential inputs for making measurements
10,12,14,16	ExtMeas1_4Neg	The negative inputs of ExtMeas1-4Pos
17,19,21,23	Shtd_PPS1-4	Outputs that shows the status of the Drivers. Signals are meant to connect LED's to put the front panel
43,44,47,48	AnaComp0-3	Input (limited to 5V) See *Note. Fast Level comparators in order to remove time consuming measurement
18	+35V_Supply	Supply to extend the daughter board with some extra drivers
24	+2.5V Ref	Output of internal reference
All other	AGND	Analog Ground

Note: All the pins are limited to 35 Volt input\output!!!! However, there are Protections, please take precautions in order to avoid damage of the main board.

** Note: Some pins are protected and limited to 5 Volt!!!! However, there are Protections, please take precautions in order to avoid damage of the main board.*

2.4. Application Connector

The figure and table below shows the connections as provided by the daughterboard PTC04-DB-HALL06. The view of the connector is front view for the female connector of the PTC04-DB-HALL06 which corresponds to the solder side of the male connector. The right side of the connector is used for device / die A, the left side of the connector is used for device / die B.



PTC04			
D-SUB 25			
Pin	Names	SPI	Description
1	VDDA	VDD	Supply Device A (Minimum required single die connection)
2	OUT1A	MOSI	Output 1 Device A (Minimum required single die connection)
3	OUT2A	MISO	Output 2 Device A
4	VSSA	VSS	Analog Ground Device A (Minimum required single die connection)
5	VDDDB		Supply Device B (Minimum required dual die connection ⁴)
6	OUT1B	SS1	Output 1 Device B (Minimum required dual die connection)
7	OUT2B	SS2	Output 2 Device B
8	VSSB		Analog Ground Device B (Minimum required dual die connection)
9		CLK	SPI CLOCK
10	V_BAT		Programmable power supply (Max 30mA load)
11	M2S		Digital IO
12	SCL		I2C communication
13	+5Vdig		Digital supply used for I2C devices
14	VDDA_S		Sensing Supply Device A
15	OUT1A_S		Sensing Output 1 Device A
16	OUT2A_S		Sensing Output 2 Device A
17	VSSA_S		Sensing Analog Ground Device A
18	VDDDB_S		Sensing Supply Device B
19	OUT1B_S		Sensing Output 1 Device B
20	OUT2B_S		Sensing Output 2 Device B
21	VSSB_S		Sensing Analog Ground Device B
22	DB_TEST		Free measuring line
23	S2M		Digital IO
24	SDA		I2C communication
25	DGND		Digital ground for I2C communication
MH	AGND		Metal Housing (shielding of the connector)

⁴ In case of a dual die connection with a common supply in the application (common VDD), only the VDDA pin of the daughter board device connector needs to be connected.

PTC04			90371	90371
			90372	90372
			90377	90377
			91377	91377
			90365	90365
			90367	90367
			90421	90421
			90422	90422
			90423	90423
			90425	
			90426	
D-SUB 25			SO-8	TSSOP-16
Pin	Names	Description	Pin	Pin
1	VDDA	Supply Device A (Minimum required single die connection)	1	3
2	OUT1A	Output 1 Device A (Minimum required single die connection)	5	15
3				
4	VSSA	Analog Ground Device A (Minimum required single die connection)	8	2
5	VDDB	Supply Device B (Minimum required dual die connection ⁵)		11
6	OUT1B	Output 1 Device B (Minimum required dual die connection)		6
7				
8	VSSB	Analog Ground Device B (Minimum required dual die connection)		10
9				
10				
11				
12				
13				
14	VDDA_S	Sensing Supply Device A	1	3
15	OUT1A_S	Sensing Output 1 Device A	5	15
16				
17	VSSA_S	Sensing Analog Ground Device A	8	2
18	VDDB_S	Sensing Supply Device B		11
19	OUT1B_S	Sensing Output 1 Device B		6
20				
21	VSSB_S	Sensing Analog Ground Device B		10
22				
23				
24				
25				
MH	AGND	Metal Housing (shielding of the connector)		

⁵ In case of a dual die connection with a common supply in the application (common VDD), only the VDDA pin of the daughter board device connector needs to be connected.

PTC04			90371 90372 90364 90366 90421 90422	90372
D-SUB 25			DMP-4 #1	DMP-4 #2
Pin	Names	Description	Pin	PIN
1	VDDA	Supply Device A (Minimum required connection)	2	3
2	OUT1A	Output 1 Device A (Minimum required connection)	3	1
3				
4	VSSA	Analog Ground Device A (Minimum required connection)	4	2
5				
6				
7				
8				
9				
10				
11				
12				
13				
14	VDDA_S	Sensing Supply Device A	2	3
15	OUT1A_S	Sensing Output 1 Device A	3	1
16				
17	VSSA_S	Sensing Analog Ground Device A	4	2
18				
19				
20				
21				
22				
23				
24				
25				
MH	AGND	Metal Housing (shielding of the connector)		

PTC04			90377	90371
			90421	90376
			90422	90421
			90423	90422
			90425	90423
			90426	
D-SUB 25			SMP-3	SMP-4
Pin	Names	Description	Pin	PIN
1	VDDA	Supply Device A (Minimum required connection)	1	3
2	OUT1A	Output 1 Device A (Minimum required connection)	2	1
3				
4	VSSA	Analog Ground Device A (Minimum required connection)	3	2
5				
6	OUT1B	Output 1 Device B (Minimum required connection)		4
7				
8				
9				
10				
11				
12				
13				
14	VDDA_S	Sensing Supply Device A	1	3
15	OUT1A_S	Sensing Output 1 Device A	2	1
16				
17	VSSA_S	Sensing Analog Ground Device A	3	2
18				
19	OUT1B_S	Sensing Output 1 Device B		4
20				
21				
22				
23				
24				
25				
MH	AGND	Metal Housing (shielding of the connector)		

PTC04			90373	
D-SUB 25			DMP-4	TSSOP-16
Pin	Names	Description	Pin	Pin
1	VDDA	Supply Device A (Minimum required single die connection)	2	3
2				
3				
4	VSSA	Analog Ground Device A (Minimum required single die connection)	4	2
5	VDDDB	Supply Device B (Minimum required dual die connection)		11
6				
7				
8	VSSB	Analog Ground Device B (Minimum required dual die connection)		10
9				
10				
11				
12				
13				
14	VDDA_S	Sensing Supply Device A	2	3
15				
16				
17	VSSA_S	Sensing Analog Ground Device A	4	2
18	VDDDB_S	Sensing Supply Device B		11
19				
20				
21	VSSB_S	Sensing Analog Ground Device B		10
22				
23				
24				
25				
MH	AGND	Metal Housing (shielding of the connector)		

PTC04			90374		
D-SUB 25			DMP-4	90378	
Pin	Names	Description	Pin	Pin	Pin
1	VDDA	Supply Device A (Minimum required single die connection)	3	1	3
2	OUT1A	Output 1 Device A (Minimum required single die connection)	1	5	15
3	OUT2A	Output 2 Device A (Minimum required single die connection)	4	3	13
4	VSSA	Analog Ground Device A (Minimum required single die connection)	2	8	2
5	VDDDB	Supply Device B (Minimum required dual die connection ⁶)			11
6	OUT1B	Output 1 Device B (Minimum required dual die connection)			7
7	OUT2B	Output 2 Device B (Minimum required single die connection)			5
8	VSSB	Analog Ground Device B (Minimum required dual die connection)			10
9					
10					
11					
12					
13					
14	VDDA_S	Sensing Supply Device A	3	1	3
15	OUT1A_S	Sensing Output 1 Device A	1	5	15
16	OUT2A_S	Sensing Output 2 Device A	4	3	13
17	VSSA_S	Sensing Analog Ground Device A	2	8	2
18	VDDDB_S	Sensing Supply Device B			11
19	OUT1B_S	Sensing Output 1 Device B			7
20	OUT2B_S	Sensing Output 2 Device B			5
21	VSSB_S	Sensing Analog Ground Device B			10
22					
23					
24					
25					
MH	AGND	Metal Housing (shielding of the connector)			

⁶ In case of a dual die connection with a common supply in the application (common VDD), only the VDDA pin of the daughter board device connector needs to be connected.

PTC04			90380	
D-SUB 25			SO-8	TSSOP-16
Pin	Names	Description	Pin	Pin
1	VDDA	Supply Device A (Minimum required single die connection)	6/7	14/15
2	OUT1A	Output 1 Device A (Minimum required single die connection)	8	16
3	OUT2A	Output 2 Device A (Minimum required single die connection)	5	13
4	VSSA	Analog Ground Device A (Minimum required single die connection)	1	1
5	VDDDB	Supply Device B (Minimum required dual die connection ⁷)		6/7
6	OUT1B	Output 1 Device B (Minimum required dual die connection)		8
7	OUT2B	Output 2 Device B (Minimum required single die connection)		5
8	VSSB	Analog Ground Device B (Minimum required dual die connection)		9
9				
10				
11				
12				
13				
14	VDDA_S	Sensing Supply Device A	6/7	14/15
15	OUT1A_S	Sensing Output 1 Device A	8	16
16	OUT2A_S	Sensing Output 2 Device A	5	13
17	VSSA_S	Sensing Analog Ground Device A	1	1
18	VDDDB_S	Sensing Supply Device B		6/7
19	OUT1B_S	Sensing Output 1 Device B		8
20	OUT2B_S	Sensing Output 2 Device B		5
21	VSSB_S	Sensing Analog Ground Device B		9
22				
23				
24				
25				
MH	AGND	Metal Housing (shielding of the connector)		

⁷ In case of a dual die connection with a common supply in the application (common VDD), only the VDDA pin of the daughter board device connector needs to be connected.

PTC04			92352		MLX92362
D-SUB 25			TSOT-5L	SIP-VA-4	TSOT-6L
Pin	Names	Description	Pin	Pin	Pin
1	VDDA	Supply Device A (Minimum required connection)	3	2	6
2	OUT1A	Output 1 Device A (Minimum required connection ⁸)	2	1	3
3	OUT2A	Output 2 Device A (Minimum required connection ⁸)	1	4	1
4	VSSA	Analog Ground Device A (Minimum required connection)	4/5	3	2 + 4 or 5
5					
6	OUT1B	Output 1 Device B (Minimum required connection)			4 or 5
7					
8					
9					
10					
11					
12					
13					
14	VDDA_S	Sensing Supply Device A	3	2	6
15	OUT1A_S	Sensing Output 1 Device A	2	1	3
16	OUT2A_S	Sensing Output 2 Device A	1	4	1
17	VSSA_S	Sensing Analog Ground Device A	4/5	3	2 + 4 or 5
18					
19	OUT1B_S	Sensing Output 1 Device B			4 or 5
20					
21					
22					
23					
24					
25					
MH	AGND	Metal Housing (shielding of the connector)			

⁸ Jumper on JP2 + JP3 should be removed from the DB when MLX92362 is used.

PTC04			92292	
D-SUB 25			TSOT-3L	SO-8
Pin	Names	Description	Pin	Pin
1	VDDA	Supply Device A (Minimum required single die connection)	1	6
2	OUT1A	Output 1 Device A (Minimum required single die connection)	2	4
3	OUT2A	Output 2 Device A ⁹		2
4	VSSA	Analog Ground Device A (Minimum required single die connection)	3	5
5	VDDB	Supply Device B (Minimum required dual die connection)		8
6	OUT1B	Output 1 Device B (Minimum required dual die connection)		2
7				
8	VSSB	Analog Ground Device B (Minimum required dual die connection)		1
9				
10				
11				
12				
13				
14	VDDA_S	Sensing Supply Device A	1	6
15	OUT1A_S	Sensing Output 1 Device A	2	4
16	OUT2A_S	Sensing Output 2 Device A		2
17	VSSA_S	Sensing Analog Ground Device A	3	5
18	VDDB_S	Sensing Supply Device B		8
19	OUT1B_S	Sensing Output 1 Device B		2
20				
21	VSSB_S	Sensing Analog Ground Device B		1
22				
23				
24				
25				
MH	AGND	Metal Housing (shielding of the connector)		

⁹ Jumper on JP3 or JP4 should be removed from the DB when MLX92292 SO-8 is used.

PTC04			90376	
D-SUB 25			SO-8	TSSOP-16
Pin	Names	Description	Pin	Pin
1	VDDA	Supply Device A (Minimum required single die connection)	4	6
2	OUT1A	Output 1 Device A (Minimum required single die connection)	1	3
3				
4	VSSA	Analog Ground Device A (Minimum required single die connection)	3	5
5	VDDB	Supply Device B (Minimum required dual die connection ¹⁰)		14
6	OUT1B	Output 1 Device B (Minimum required dual die connection)		11
7				
8	VSSB	Analog Ground Device B (Minimum required dual die connection)		13
9				
10				
11				
12				
13				
14	VDDA_S	Sensing Supply Device A	4	6
15	OUT1A_S	Sensing Output 1 Device A	1	3
16				
17	VSSA_S	Sensing Analog Ground Device A	3	5
18	VDDB_S	Sensing Supply Device B		14
19	OUT1B_S	Sensing Output 1 Device B		11
20				
21	VSSB_S	Sensing Analog Ground Device B		13
22				
23				
24				
25				
MH	AGND	Metal Housing (shielding of the connector)		

¹⁰ In case of a dual die connection with a common supply in the application (common VDD), only the VDDA pin of the daughter board device connector needs to be connected.

PTC04			90510 90517	90513
D-SUB 25			TSSOP-16	TSSOP-16
Pin	Names	Description	Pin	Pin
1	VDDA	Supply Device A (Minimum required connection)	11	11
2	OUT1A	Output 1 Device A (Minimum required connection)	7 or 8 or 9 or 10	10
3				
4	VSSA	Analog Ground Device A (Minimum required connection)	5+12+16	7+9+12+16
5				
6				
7				
8				
9				
10				
11				
12				
13				
14	VDDA_S	Sensing Supply Device A	11	11
15	OUT1A_S	Sensing Output 1 Device A	7 or 8 or 9 or 10	10
16				
17	VSSA_S	Sensing Analog Ground Device A	5+12+16	7+9+12+16
18				
19				
20				
21				
22				
23				
24				
25				
MH	AGND	Metal Housing (shielding of the connector)		

PTC04			90824 90825	90822 90823	90829
D-SUB 25			SMP7	SMP7	SOIC16
Pin	Names	Description	Pin	Pin	Pin
1	VDDA	Supply Device A (Minimum required connection)	3	1 or 3	2
2	OUT1A	Output 1 Device A (Minimum required connection)	1	2	1
3					
4	VSSA	Analog Ground Device A (Minimum required connection)	2	4	3, 6, 11 or 14
5					
6					
7					
8					
9					
10					
11					
12					
13					
14	VDDA_S	Sensing Supply Device A	3	1 or 3	2
15	OUT1A_S	Sensing Output 1 Device A	1	2	1
16					
17	VSSA_S	Sensing Analog Ground Device A	2	4	3, 6, 11 or 14
18					
19					
20					
21					
22					
23					
24					
25					
MH	AGND	Metal Housing (shielding of the connector)			

2.5. Jumper Selection

2.5.1. CON18 and CON19 – short measuring lines

The D-SUB DB-25 connector of the daughter board is equipped with a sensing line for each analog device pin.

The top row is the force line of the device pins. The bottom row is the sensing line of the device pins.

Between each force and sense line there is a jumper to short the sense line at the DB-25 connector on the daughter board.

The jumper is placed when the external sensing is not required. For example: an application with a digital or PWM output.

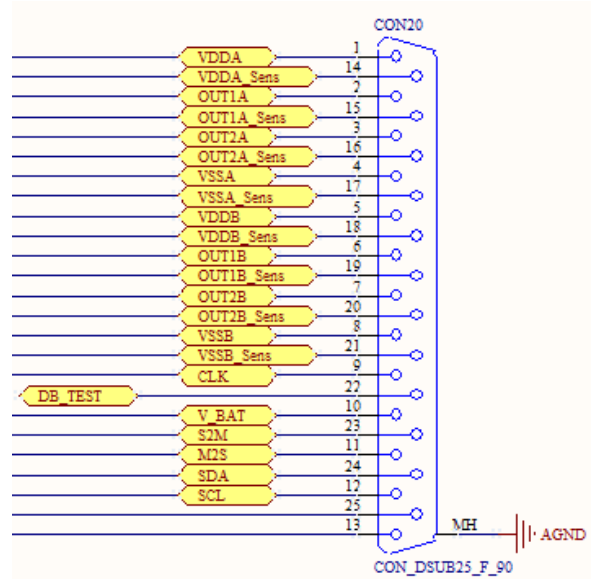


Figure 14: DB-25 device connector.

CON18 and CON19 are used to short the force and sense line of the analog device pins.

In other words, they are used to select single wire or double wire connection to the pin of the module / sensor.

- CON18 → Device / Die A
- CON19 → Device / Die B

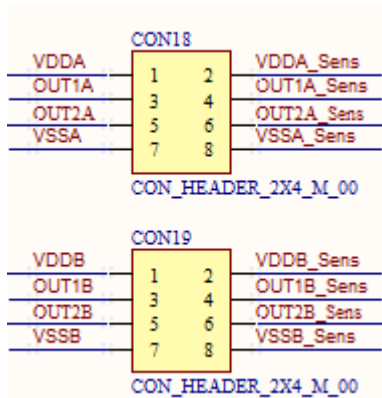
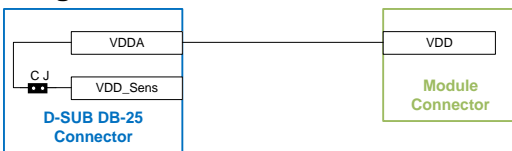


Figure 13: Jumper between force and sense line.

Single wire connection

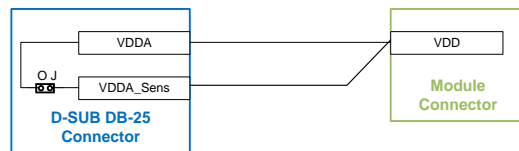


When the jumper is closed, only one wire is required **per pin** between the PTC-04 and the module or sensor.

In the table above these pins are marked as “Minimum required single/dual die connection”.

In this configuration the measurement of VDD, OUT1 or OUT2 is done at the D-SUB DB-25 connector of the PTC04-DB-HALL06.

Double wire connection



When the jumper is open, two wires are required **per pin** between the PTC-04 and the module or sensor.

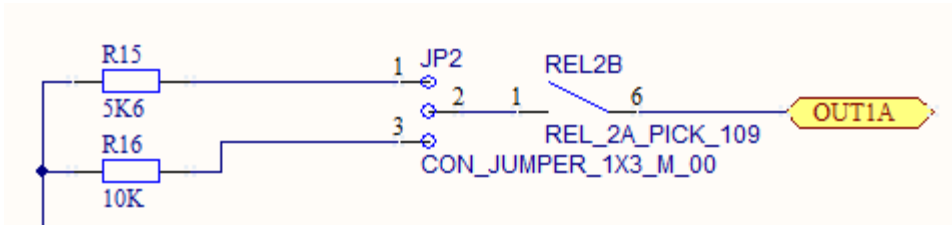
With two wires connected at the module side, the measurement of VDD, OUT1 or OUT2 is done on the module or sensor connector.

The external sensing line per pin is only required for applications with an analog sensor output and where a higher measuring accuracy is required.

2.5.2. J2, J3, J4 and J5 – select pull-up

These jumpers are used to select the pull-up resistor for the outputs of die A and B:

- JP2: Pull-up selection for OUT1 die A
- JP3: Pull-up selection for OUT2 die A
- JP4: Pull-up selection for OUT1 die B
- JP5: Pull-up selection for OUT2 die B



Place the jumper between:

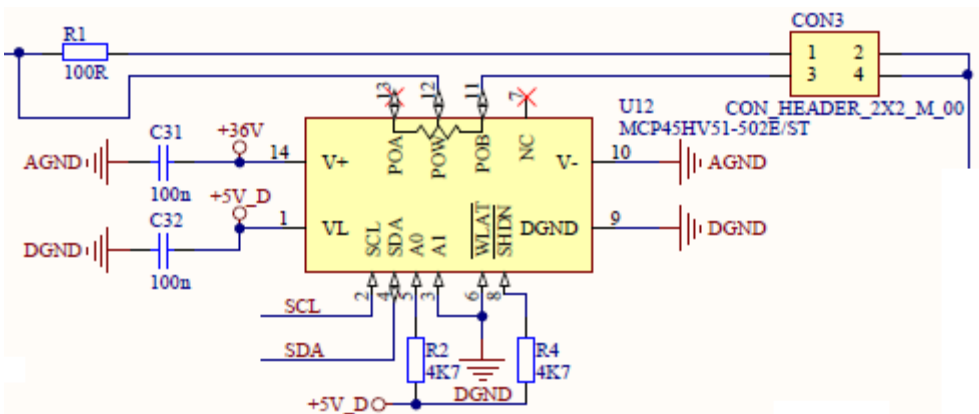
- Pin 1 and 2 → select 5K6 Pull-up
- Pin 3 and 2 → select 10K Pull-up

The selection between VDD and Vbat is done by a relay on software level. When Vbat is set to 0V one can select a pull-down

2.5.3. CON3 and CON21 – configure MUPET circuit

The MUPET circuit on the daughter board is used to convert the clock and data of the UART to a single wire protocol called MUPET.

CON3 and CON21 are used to configure the resistors of the MUPET circuit in function of the output resistance on the sensor/module.



- Pin 1 and 2 → select 100Ω
- Pin 3 and 4 → select digital potentiometer

3. History

Hardware Revision	Change	Supports
1.0		
2.0		MLX90371 MLX90372 MLX90374 MLX90377 MLX91377 MLX90378 MLX90380 MLX9036x MLX9042x MLX9082x
3.0	-Digital potentiometer added for MUPET protocol (Replacement for manual selection MUPET resistor bridge CON3/21). - PS15 compatibility added.	MLX90371 MLX90372 MLX90374 MLX90377 MLX91377 MLX90378 MLX90380 MLX9036x MLX9042x MLX9051x MLX9082x MLX92292
4.0	-Modify PS15 block to support MUPET protocol MLX90373.	MLX9037x MLX91377 MLX9036x MLX90380 MLX9042x MLX9051x MLX9082x MLX92292
5.0	-Modification for production PTC04-DB-HALL06.	MLX9037x MLX91377 MLX90380 MLX9036x MLX9042x MLX9051x MLX9082x MLX92292
6.0	-Modification for production PTC04-DB-HALL06.	MLX9037x MLX91377 MLX90380 MLX9036x MLX9042x MLX9051x MLX9082x MLX92292
7.0	-Modification for MLX92352/MLX92362.	MLX9037x MLX91377 MLX90380 MLX9036x MLX9042x MLX9051x MLX9082x MLX92352 MLX92362 MLX92292

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