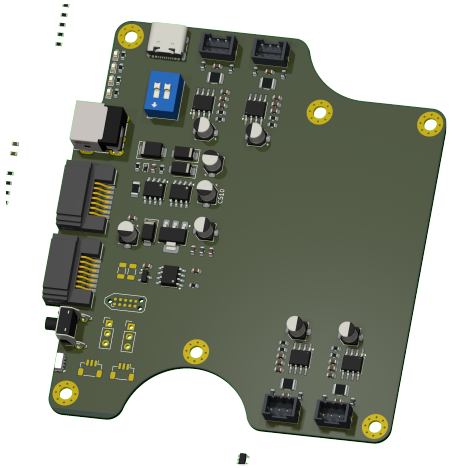
SMPBR / Pump_board

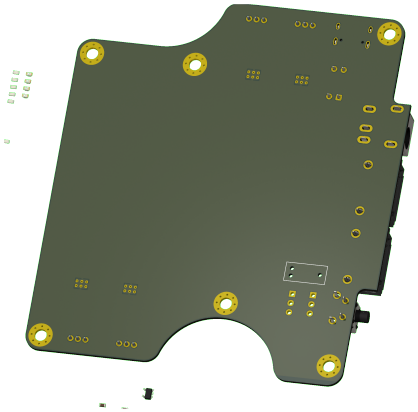
Rev 1.0

2025-07-31

TOP VIEW



BOTTOM VIEW



NOTES

Not fitted components are marked as X

DESIGN CONSIDERATIONS

INFO NOTE:	DESIGN NOTE:	LAYOUT NOTE:
Example text for informational design notes.	Example text for critical design notes.	Example text for critical layout notes.

Designed for: TrendBit
Designed by: Petr_Malaník

Sheet: / File: pump_board.kicad_sch	**Project: SMPBR**
Title:	**Board: Pump_board**

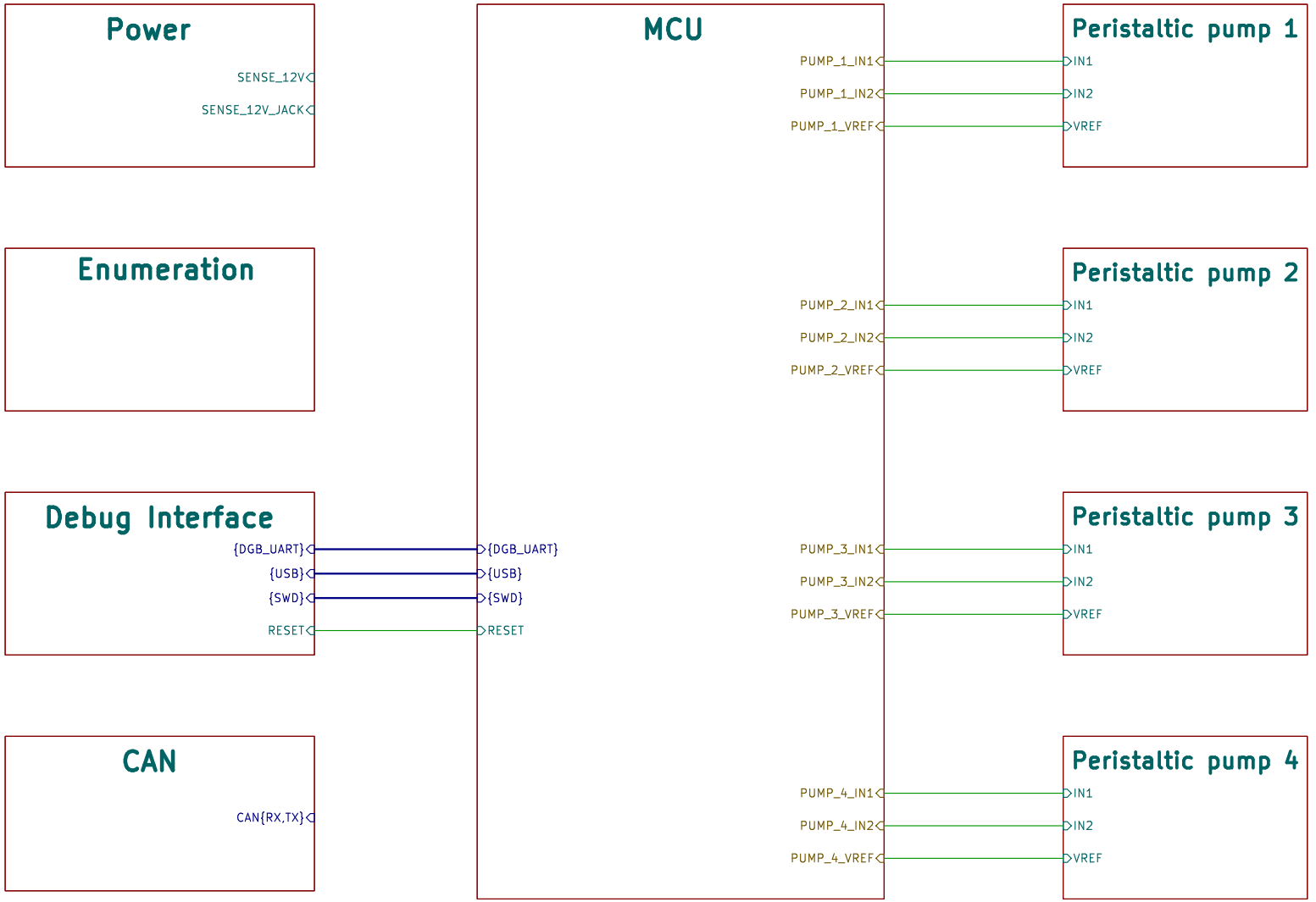
Size: A4	Date: 2024-12-03	GIT hash: a985fdb	**Rev: 1.0**
KiCad E.D.A. 9.0.1			Id: 1/12

Revision History

Designed for: TrendBit
Designed by: Petr_Malaník

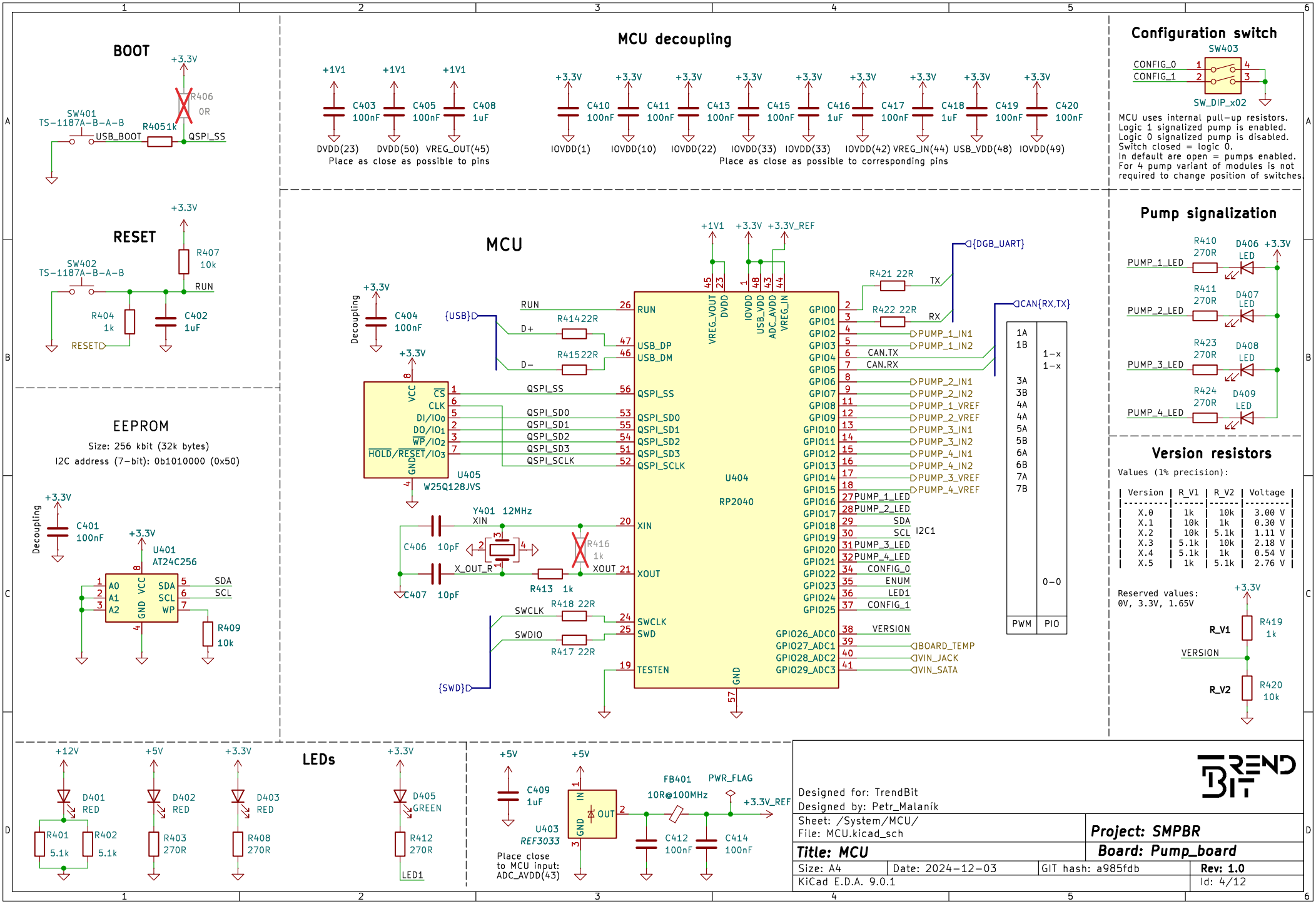
Sheet: /Revision History/ File: revision_history.kicad_sch	**Project: SMPBR**
Title: Revision History	**Board: Pump_board**

Size: A4	Date: 2024-12-03	GIT hash: a985fdb	**Rev: 1.0**
KiCad E.D.A. 9.0.1			Id: 2/12



Designed for: TrendBit
Designed by: Petr_Malaník

Sheet: /System/ File: system.kicad_sch	**Project: SMPBR**
Title: System	**Board: Pump_board**
Size: A4 | Date: 2024-12-03 | GIT hash: a985fdb	**Rev: 1.0**
KiCad E.D.A. 9.0.1	Id: 3/12

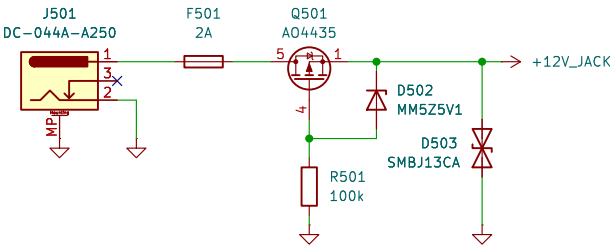

BOOT
SW401
TS-1187A-B-A-B
USB_BOOT
R4051k
R406
0R
QSPI_SS
RESET
SW402
TS-1187A-B-A-B
R407
10k
RUN
R404
1k
C402
1uF
RESET
EEPROM
Size: 256 kbit (32k bytes)
I2C address (7-bit): 0b1010000 (0x50)
C401
100nF
U401
AT24C256
A0
A1
A2
GND
VCC
SDA
SCL
WP
R409
10k
MCU decoupling
C403 100nF
C405 100nF
C408 1uF
DVDD(23)
DVDD(50)
VREG_OUT(45)
Place as close as possible to pins
C410 100nF
C411 100nF
C413 100nF
C415 100nF
C416 1uF
C417 100nF
C418 1uF
C419 100nF
C420 100nF
IOVDD(1)
IOVDD(10)
IOVDD(22)
IOVDD(33)
IOVDD(33)
IOVDD(42)
VREG_IN(44)
USB_VDD(48)
IOVDD(49)
Place as close as possible to corresponding pins
MCU
C404 100nF
{USB}
D+
D-
R41422R
R41522R
U405
W25Q128JVS
CS
CLK
DI/IO0
DO/IO1
WP/IO2
HOLD/RESET/IO3
QSPI_SS
QSPI_SD0
QSPI_SD1
QSPI_SD2
QSPI_SD3
QSPI_SCLK
Y401 12MHz
C406 10pF
C407 10pF
X_OUT_R
R413 1k
R416 1k
U404
RP2040
RUN
USB_DP
USB_DM
XIN
XOUT
SWCLK
SWD
TESTEN
R418 22R
R417 22R
{SWD}
R421 22R
R422 22R
TX
RX
{DGB_UART}
CAN{RX,TX}
CAN.TX
CAN.RX
PUMP_1_IN1
PUMP_1_IN2
PUMP_2_IN1
PUMP_2_IN2
PUMP_1_VREF
PUMP_2_VREF
PUMP_3_IN1
PUMP_3_IN2
PUMP_4_IN1
PUMP_4_IN2
PUMP_3_VREF
PUMP_4_VREF
PUMP_1_LED
PUMP_2_LED
SDA
SCL
I2C1
PUMP_3_LED
PUMP_4_LED
CONFIG_0
ENUM
LED1
CONFIG_1
VERSION
BOARD_TEMP
VIN_JACK
VIN_SATA
1A
1B
1-x
1-x
3A
3B
4A
4A
5A
5B
6A
6B
7A
7B
0-0
PWM
PIO
Configuration switch
SW403
CONFIG_0
CONFIG_1
SW_DIP_x02
MCU uses internal pull-up resistors.
Logic 1 signalized pump is enabled.
Logic 0 signalized pump is disabled.
Switch closed = logic 0.
In default are open = pumps enabled.
For 4 pump variant of modules is not required to change position of switches.
Pump signalization
PUMP_1_LED
PUMP_2_LED
PUMP_3_LED
PUMP_4_LED
R410 270R
R411 270R
R423 270R
R424 270R
D406 LED
D407 LED
D408 LED
D409 LED
Version resistors
Values (1% precision):
Version | R_V1 | R_V2 | Voltage
X.0 | 1k | 10k | 3.00 V
X.1 | 10k | 1k | 0.30 V
X.2 | 10k | 5.1k | 1.11 V
X.3 | 5.1k | 10k | 2.18 V
X.4 | 5.1k | 1k | 0.54 V
X.5 | 1k | 5.1k | 2.76 V
Reserved values:
0V, 3.3V, 1.65V
R_V1
R_V2
R419 1k
R420 10k
VERSION
LEDs
D401 RED
D402 RED
D403 RED
D405 GREEN
R401 5.1k
R402 5.1k
R403 270R
R408 270R
R412 270R
LED1
C409 1uF
U403
REF3033
Place close to MCU input: ADC_AVDD(43)
FB401 10R@100MHz
PWR_FLAG
+3.3V_REF
C412 100nF
C414 100nF
Designed for: TrendBit
Designed by: Petr_Malaník
Sheet: /System/MCU/
File: MCU.kicad_sch
Project: SMPBR
Board: Pump_board
Title: MCU
Size: A4
Date: 2024-12-03
GIT hash: a985fdb
Rev: 1.0
KiCad E.D.A. 9.0.1
Id: 4/12

Polarity protection

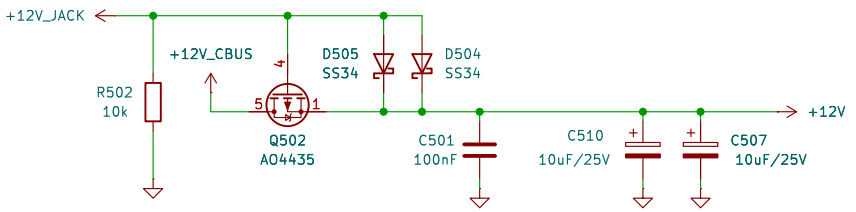
Input merging 12V from barrel Jack vs SATA

12V Enable by 5V ?

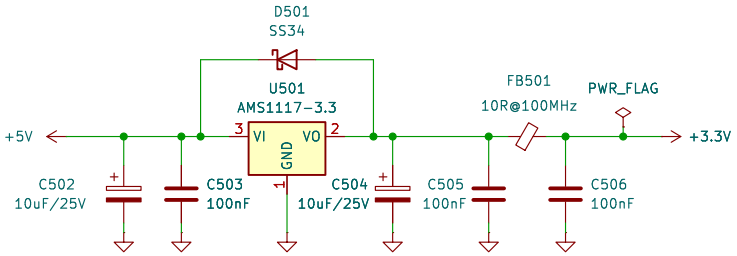
Input protection



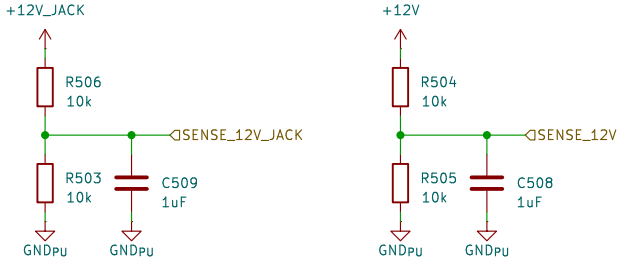
Supply switching



Supply – 3.3V



12V reading



Designed for:
Designed by: Petr_Malaník

Sheet: /System/Power/
File: power.kicad_sch

Project: SMPBR

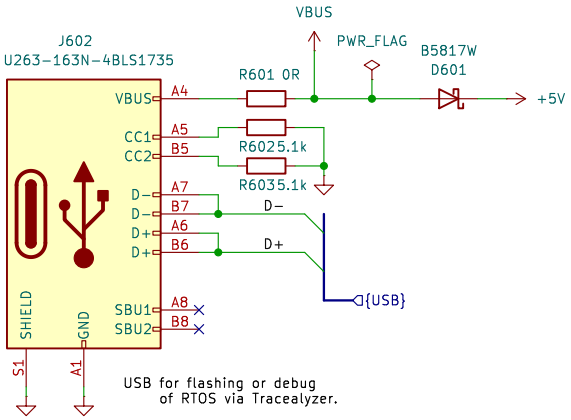
Board: Pump_board

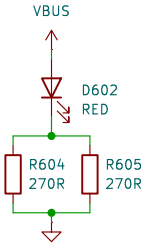
Title: Power

Size: A4 | Date: | GIT hash: a985fdb | **Rev:**

KiCad E.D.A. 9.0.1 | Id: 5/12

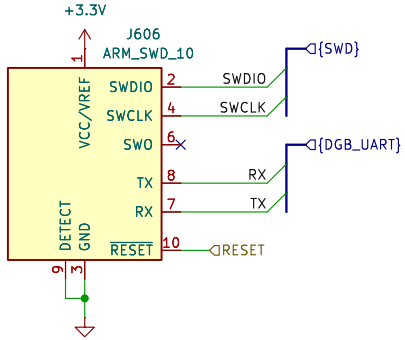
USB – Update & Debug



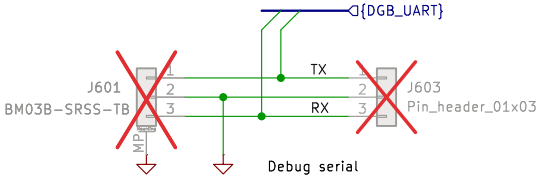


CONFIG 2 vs 4 pumps

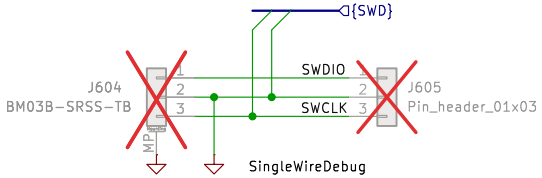
Tag-connector



Serial Debug

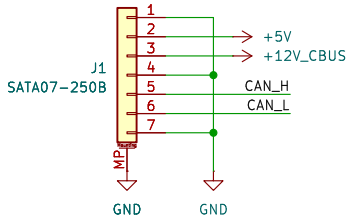


SWD Debug

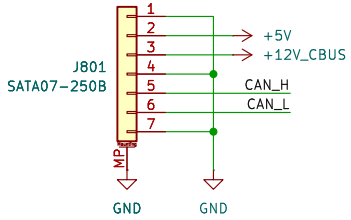


Pinout of these connectors is intended to be used with RPi debug Probe

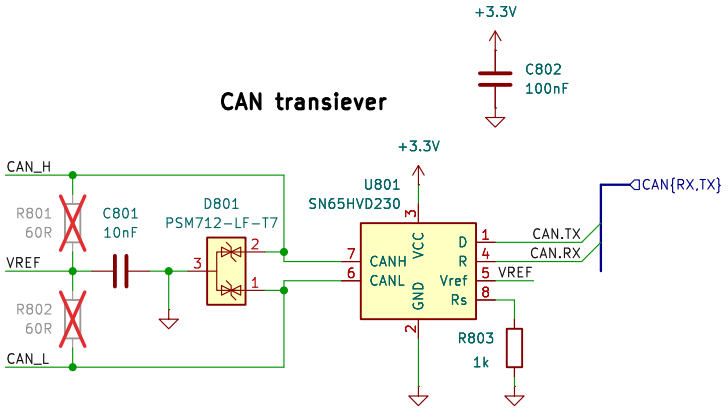
Designed for:			
Designed by: Petr_Malaník			
Sheet: /System/Debug Interface/ File: debug.kicad_sch			**Project: SMPBR**
Title: Debug Interface			**Board: Pump_board**
Size: A4	Date:	GIT hash: a985fdb	**Rev:**
KiCad E.D.A. 9.0.1			Id: 6/12



Dual SATA ports passthrough

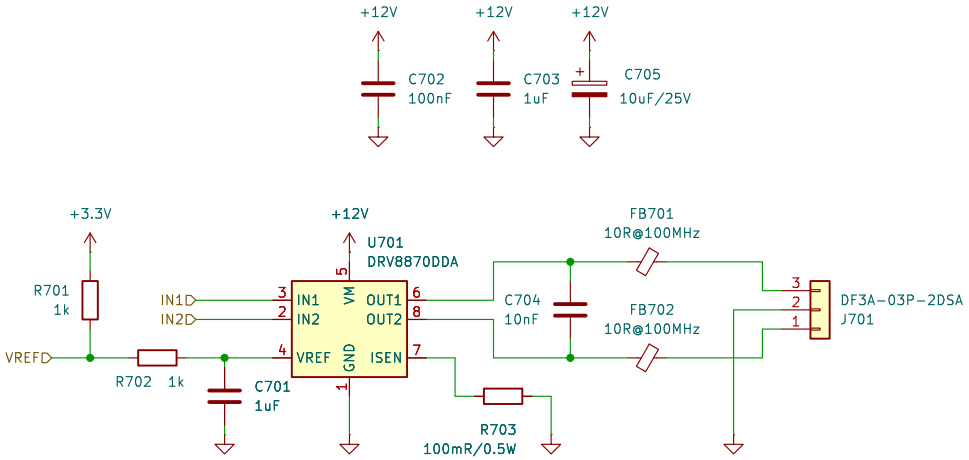


CAN transiever



Designed for:
Designed by: Petr_Malaník

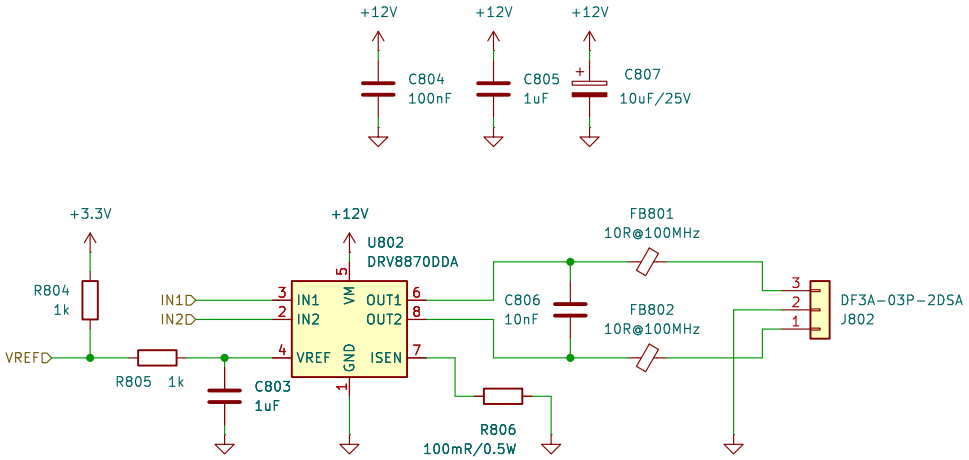
Sheet: /System/CAN/ File: can_interface.kicad_sch	**Project: SMPBR**
Title: CAN	**Board: Pump_board**
Size: A4 | Date: | GIT hash: a985fdb	**Rev:**
KiCad E.D.A. 9.0.1	Id: 7/12



Input filter:
CTRL PWM frequency = 10 kHz
Settling time (10->90%) = ~4 ms
Peak to peak (Duty = 50%) = 0.07 V
Default max current = 3.3 A (with 0.1R Sense resistor)

$R_{SEN} = V_{REF}/(10 \times I_{TRIP})$
Current limit = 3.30 A

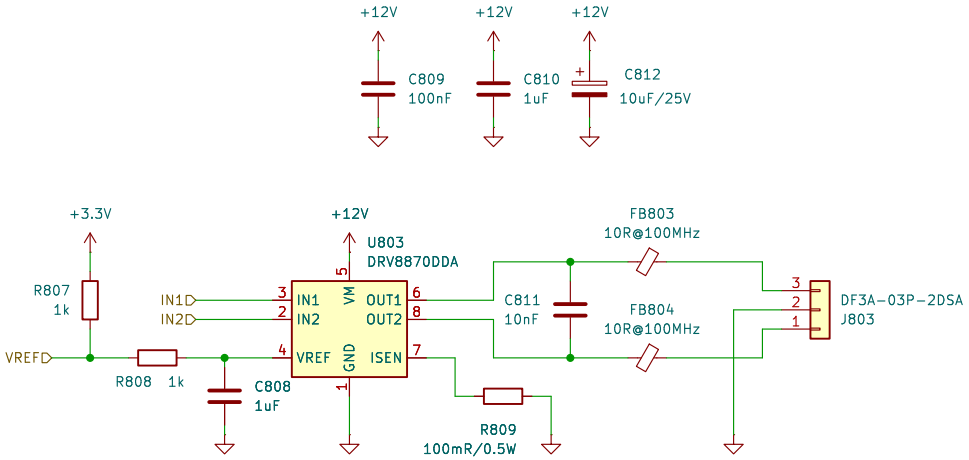
Designed for:			
Designed by: Petr_Malaník			
Sheet: /System/Peristaltic pump 1/ File: motor.kicad_sch			**Project: SMPBR**
Title: Peristaltic pump 1			**Board: Pump_board**
Size: A4	Date:	GIT hash: a985fdb	**Rev:**
KiCad E.D.A. 9.0.1			Id: 8/12



Input filter:
CTRL PWM frequency = 10 kHz
Settling time (10->90%) = ~4 ms
Peak to peak (Duty = 50%) = 0.07 V
Default max current = 3.3 A (with 0.1R Sense resistor)

$R_{SEN} = V_{REF}/(10 \times I_{TRIP})$
Current limit = 3.30 A

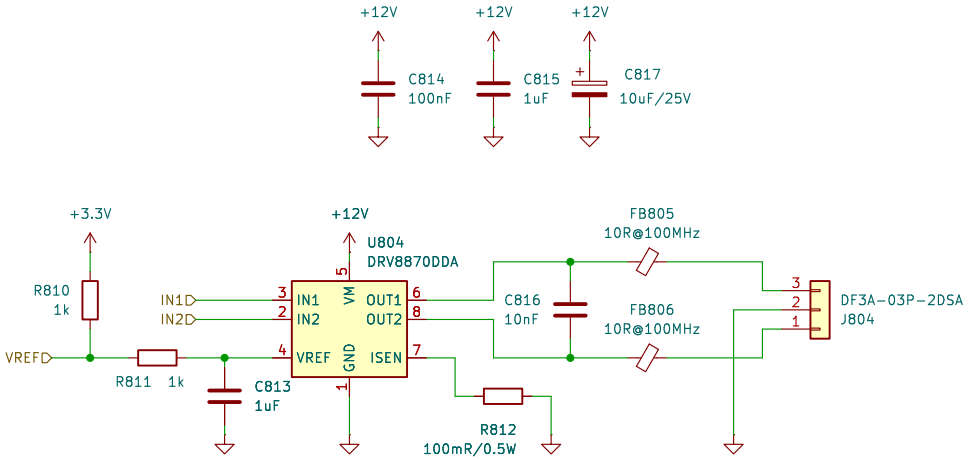
Designed for:
Designed by: Petr_Malaník
Sheet: /System/Peristaltic pump 2/
File: motor.kicad_sch
Project: SMPBR
Title: Peristaltic pump 2
Board: Pump_board
Size: A4 | Date: | GIT hash: a985fdb | **Rev:**
KiCad E.D.A. 9.0.1 | Id: 9/12



Input filter:
CTRL PWM frequency = 10 kHz
Settling time (10->90%) = ~4 ms
Peak to peak (Duty = 50%) = 0.07 V
Default max current = 3.3 A (with 0.1R Sense resistor)

$R_{SEN} = V_{REF}/(10 \times I_{TRIP})$
Current limit = 3.30 A

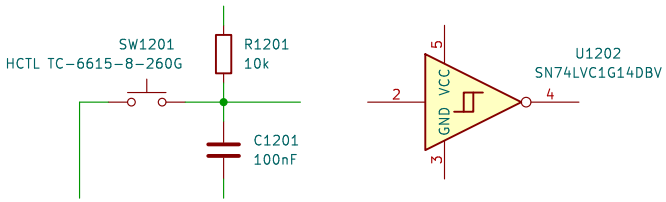
Designed for:
Designed by: Petr_Malaník
Sheet: /System/Peristaltic pump 3/
File: motor.kicad_sch
Project: SMPBR
Title: Peristaltic pump 3
Board: Pump_board
Size: A4 | Date: | GIT hash: a985fdb | **Rev:**
KiCad E.D.A. 9.0.1 | Id: 10/12

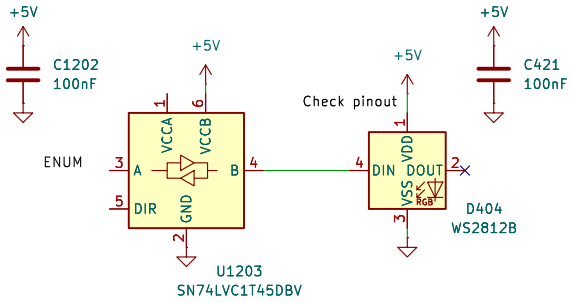


Input filter:
CTRL PWM frequency = 10 kHz
Settling time (10->90%) = ~4 ms
Peak to peak (Duty = 50%) = 0.07 V
Default max current = 3.3 A (with 0.1R Sense resistor)

$R_{SEN} = V_{REF}/(10 \times I_{TRIP})$
Current limit = 3.30 A

Designed for:			
Designed by: Petr_Malaník			
Sheet: /System/Peristaltic pump 4/ File: motor.kicad_sch			**Project: SMPBR**
Title: Peristaltic pump 4			**Board: Pump_board**
Size: A4	Date:	GIT hash: a985fdb	**Rev:**
KiCad E.D.A. 9.0.1			Id: 11/12





Designed for: TrendBit
Designed by: Petr_Malaník

Sheet: /System/Enumeration/ File: enumeration.kicad_sch	**Project: SMPBR**
Title: Enumeration	**Board: Pump_board**
Size: A4 | Date: 2024-12-03 | GIT hash: a985fdb	**Rev: 1.0**
KiCad E.D.A. 9.0.1	Id: 12/12