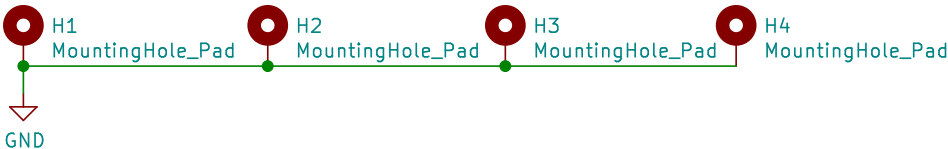
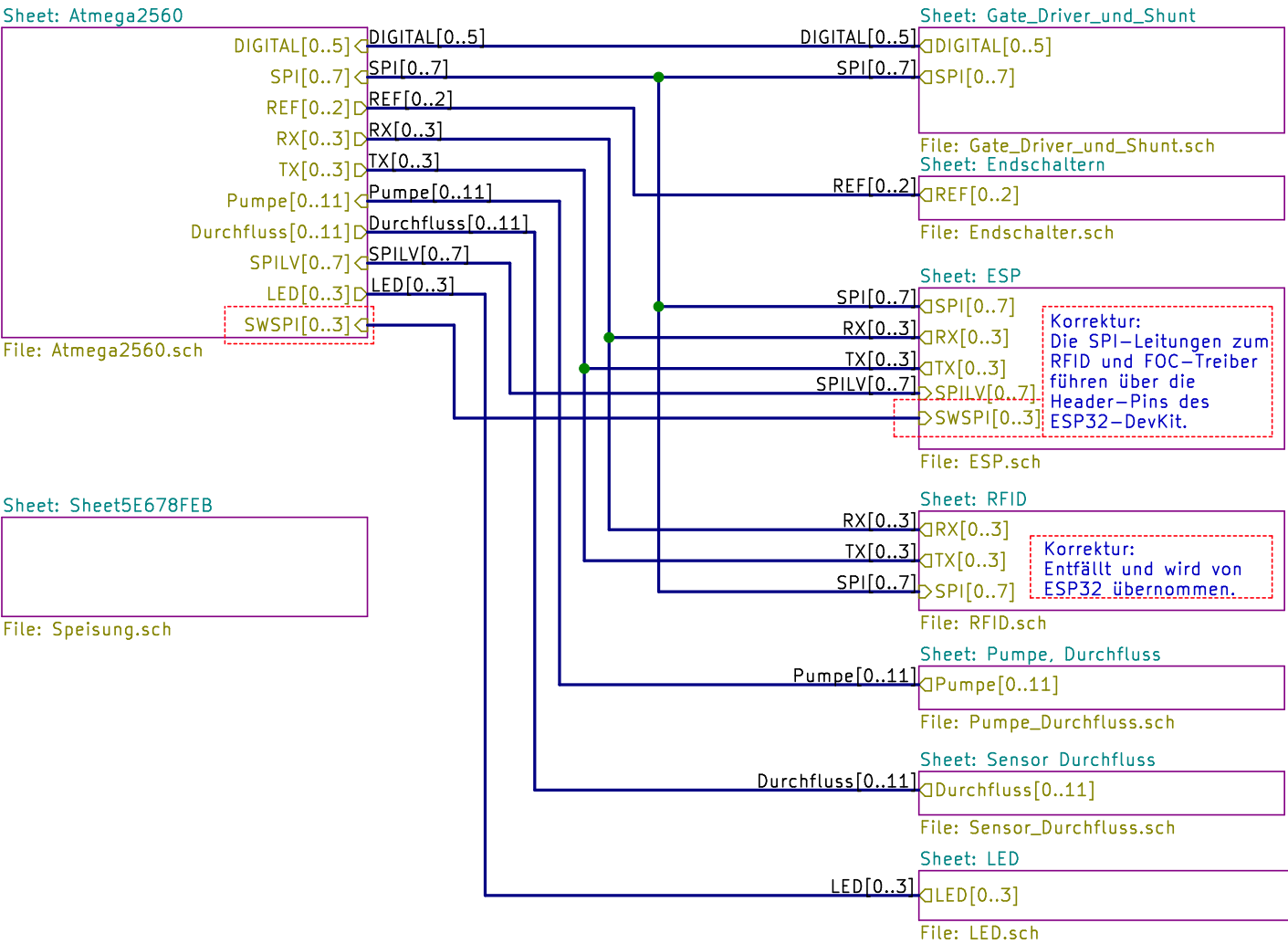


Mikrocontroller

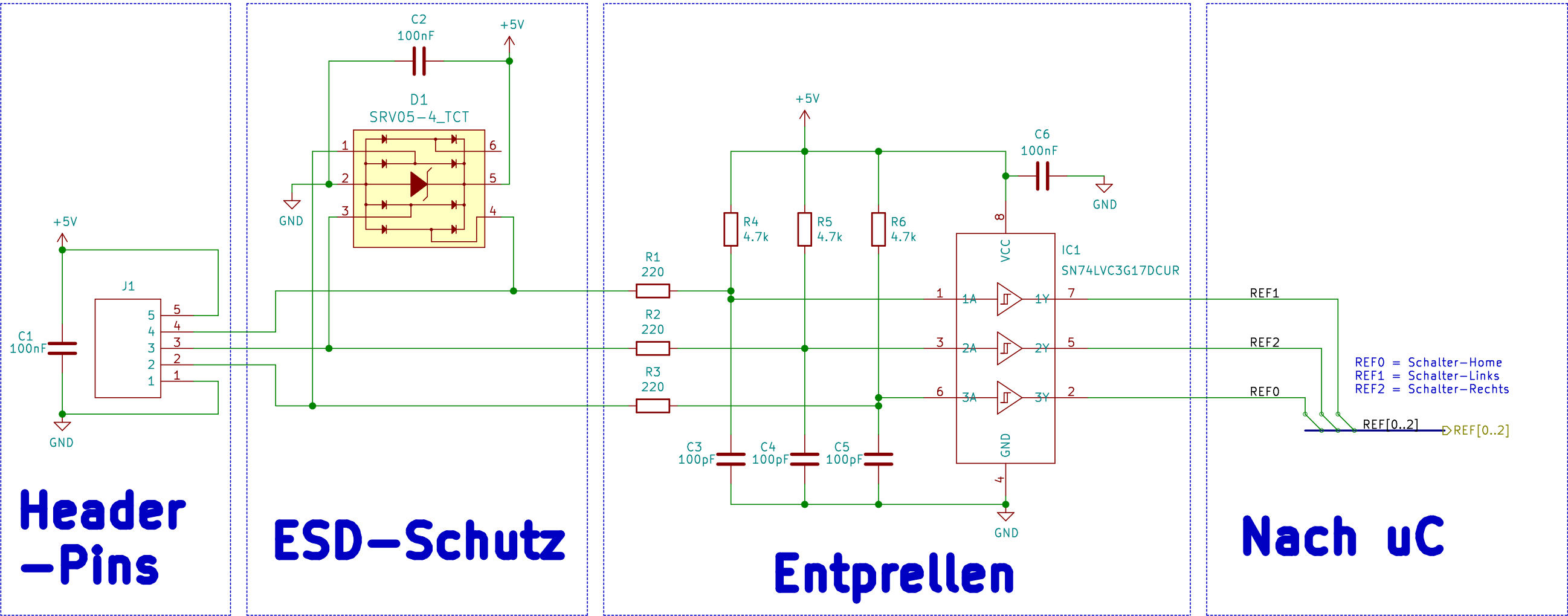
Speisungen

- Motor etc
- Endschalter
- ESP32
- RFID
- Pumpen
- Durchflusssensoren
- LED

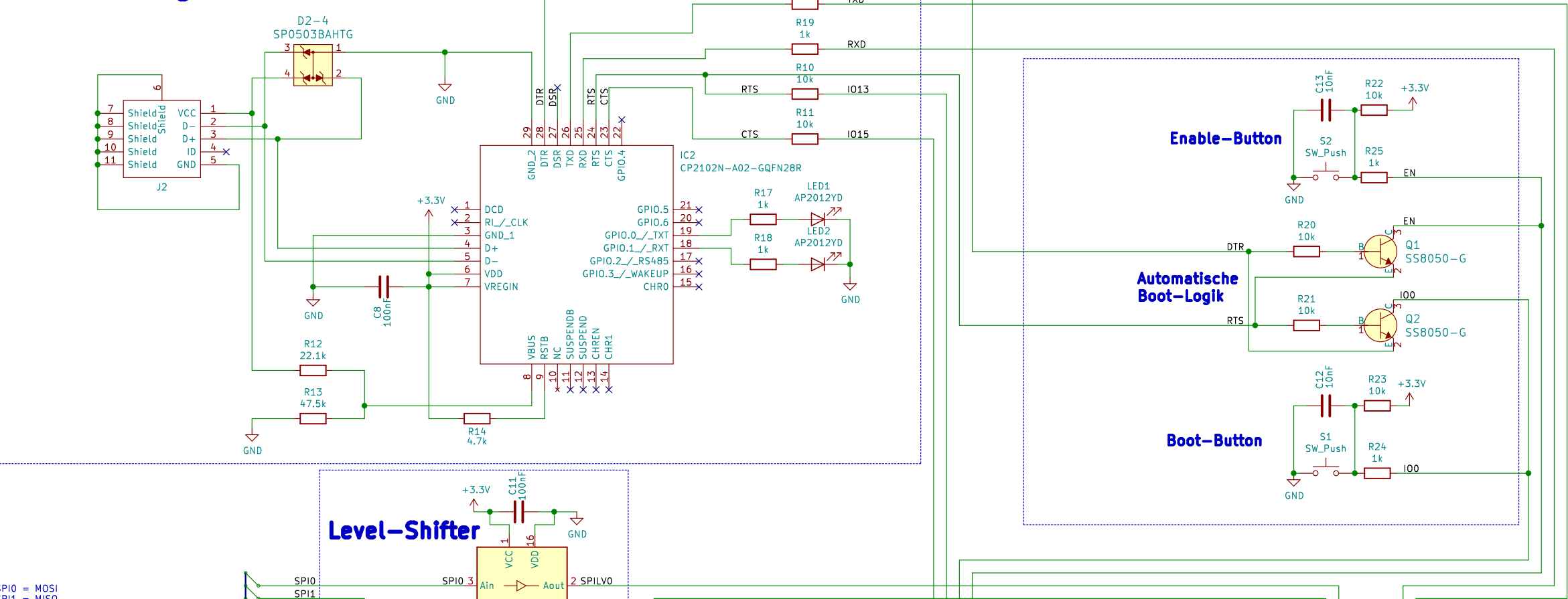


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| File: Pro6_Print.sch         |       |  |          |
| Title:                       |       |  |          |
| Size: A4                     | Date: |  | Rev:     |
| KiCad E.D.A. kicad (5.1.6)-1 |       |  | Id: 1/10 |

# Endschalter



# USB-Programmierschnittstelle



SPI0 = MOSI  
SPI1 = MISO  
SPI2 = SCK  
SPI3 = CS Trinamic TMC4671  
SPI4 = CS Trinamic TMC6200  
SPI5 = CS Espressif ESP32 (Wroom&DevKit)  
SPI6 = CD Mifare MC522  
SPI7 = SD-Karte

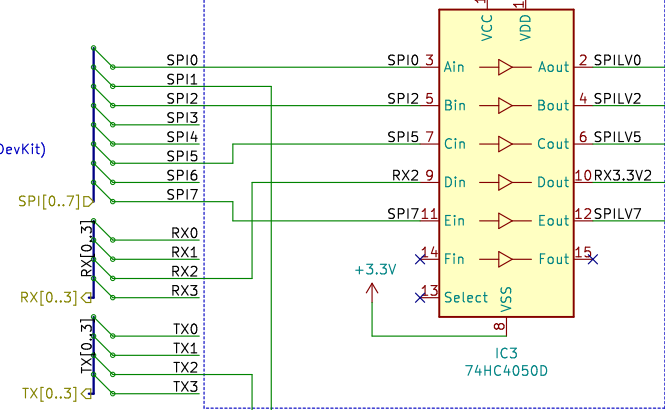
RX0 = Recieve PC  
RX1 = Recieve Nextion Display  
RX2 = Recieve Espressif ESP32  
RX3 = Recieve Mifare MC522  
TX/RX jeweils vor uC verdreht

TX0 = Trancieve PC  
TX1 = Trancieve Nextion Display  
TX2 = Trancieve Espressif ESP32  
TX3 = Trancieve Mifare MC522  
TX/RX jeweils vor uC verdreht

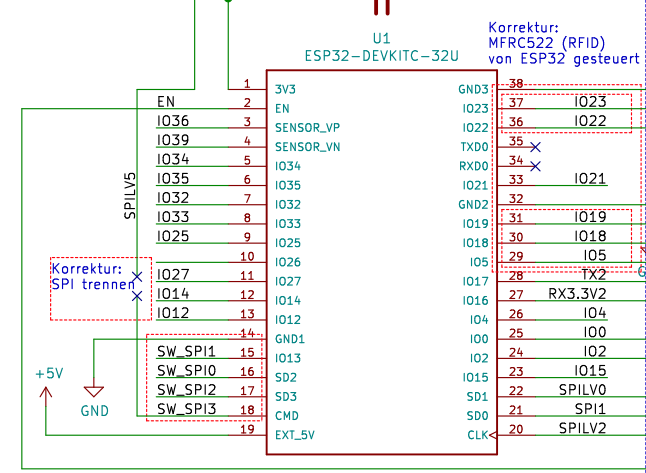
SPI0 = MOSI  
SPI1 = MISO  
SPI2 = SCK  
SPI3 = CS Trinamic TMC4671  
SPI4 = CS Trinamic TMC6200  
SPI5 = CS Espressif ESP32 (Wroom&DevKit)  
SPI6 = CD Mifare MC522  
SPI7 = SD-Karte

Korrektur:  
Software-SPI für TMC4671  
über header-Pins

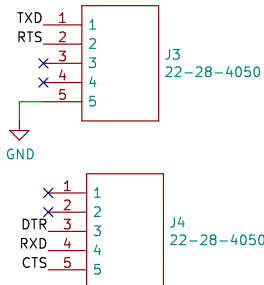
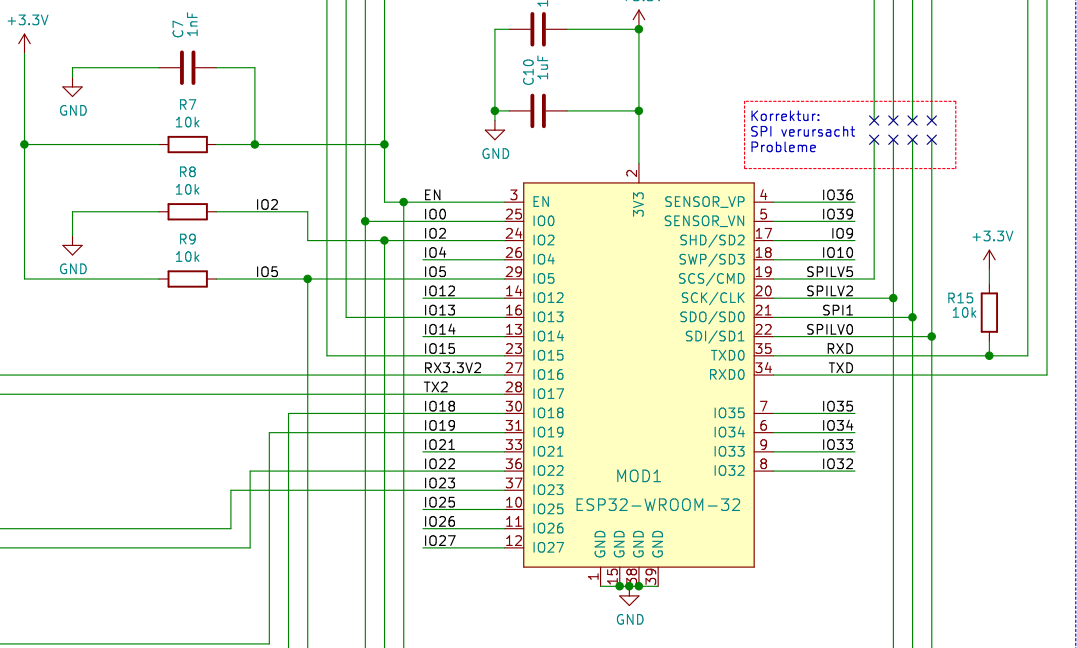
## Level-Shifter



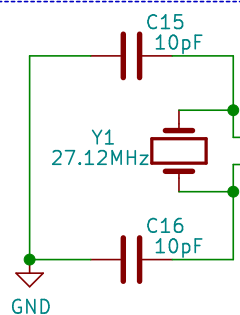
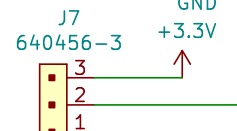
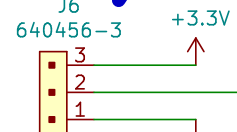
## DevKit



## ESP32-Wroom-32U



## UART/SPI



## Oszillator

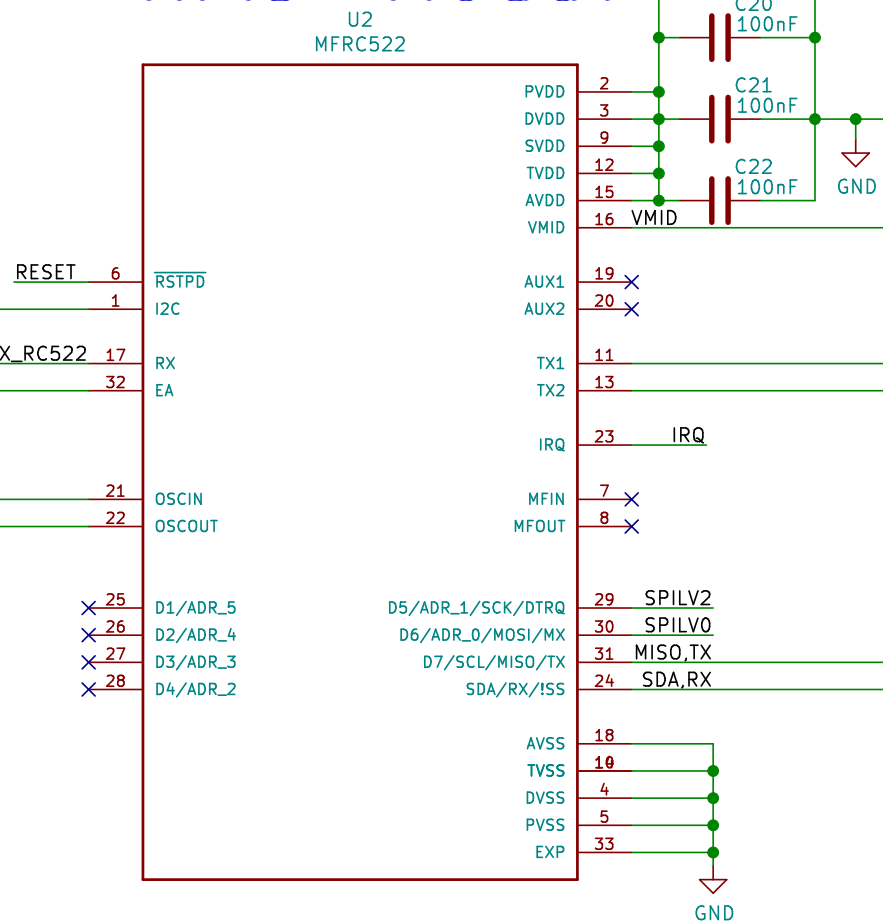
**Korrektur:**  
Der gesamte RFID-Teil entfällt und wird vom ESP32 übernommen. Statt über die vorgesehene Verbindung zum DevKit führen die Leitungen über die Header-Pins des ESP32-DevKit (welche eine Verbindung haben zum ESP32-Wroom)

RX0 = Recieve PC  
RX1 = Recieve Nextion Display  
RX2 = Recieve Espressif ESP32  
RX3 = Recieve Mifare MC522  
TX/RX jeweils vor uC verdreht

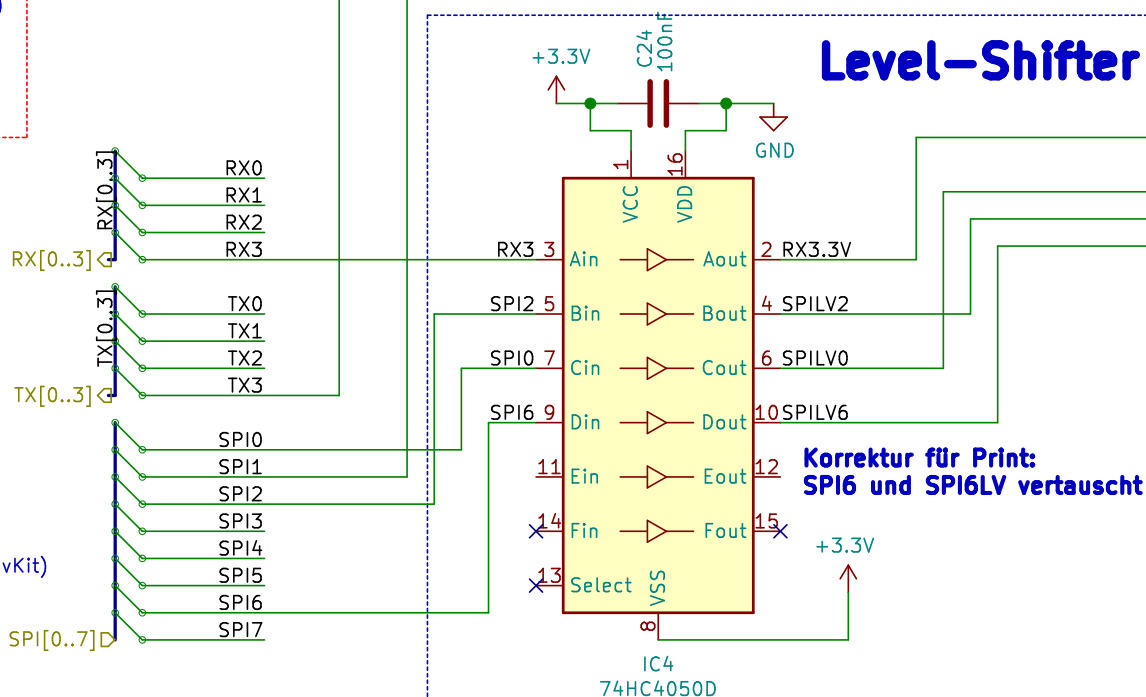
TX0 = Trancieve PC  
TX1 = Trancieve Nextion Display  
TX2 = Trancieve Espressif ESP32  
TX3 = Trancieve Mifare MC522  
TX/RX jeweils vor uC verdreht

SPI0 = MOSI  
SPI1 = MISO  
SPI2 = SCK  
SPI3 = CS Trinamic TMC4671  
SPI4 = CS Trinamic TMC6200  
SPI5 = CS Espressif ESP32 (Wroom&DevKit)  
SPI6 = CD Mifare MC522  
SPI7 = SD-Karte

## RFID-Modul

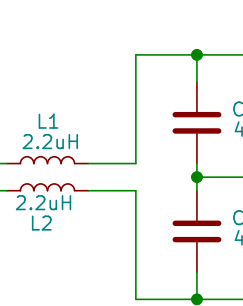


## Level-Shifter

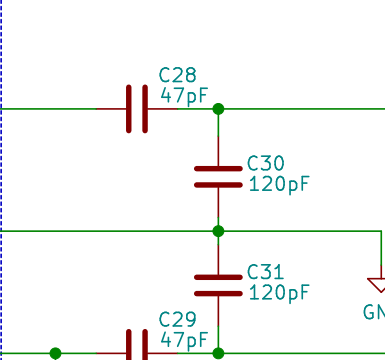


**Korrektur für Print:**  
SPI6 und SPI6LV vertauscht

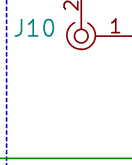
## EMC-Filter



## Anpass-Netzwerk



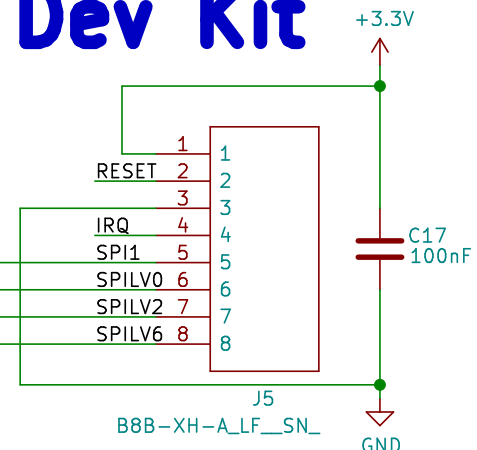
## Externe Antenne



## UART/SPI



## Verbindung Dev Kit



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File: RFID.sch

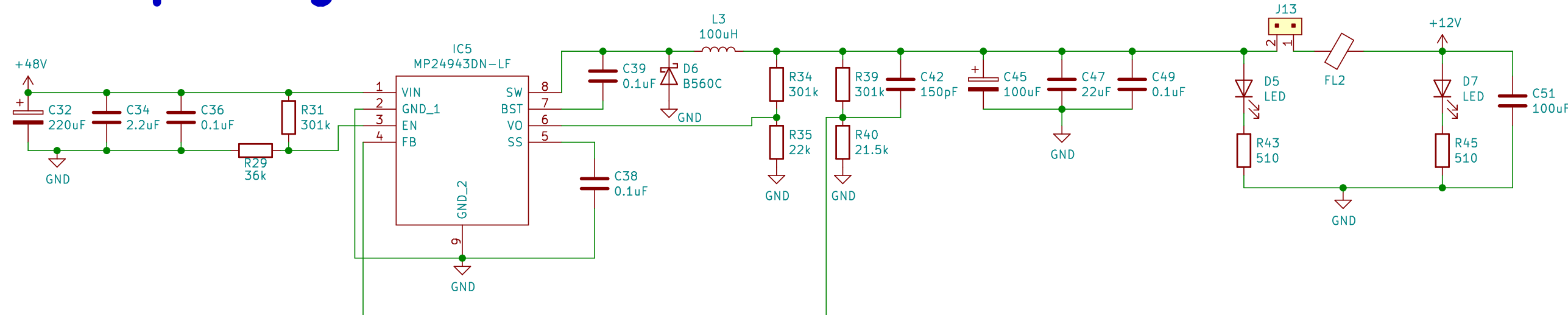
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Size: A4 Date:  
KiCad E.D.A. kicad (5.1.6)-1

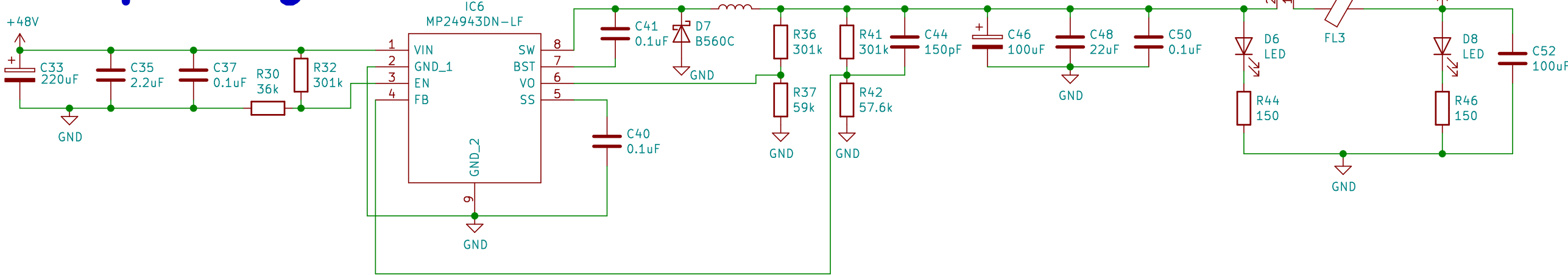
**Rev:**

Id: 4/10

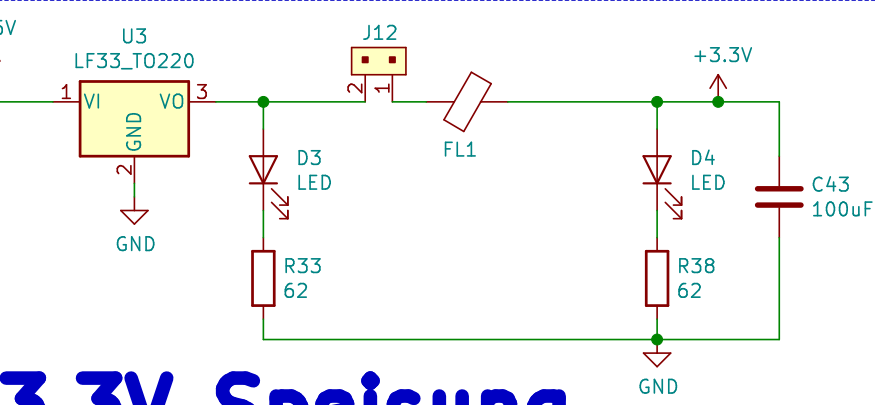
# 12V Speisung



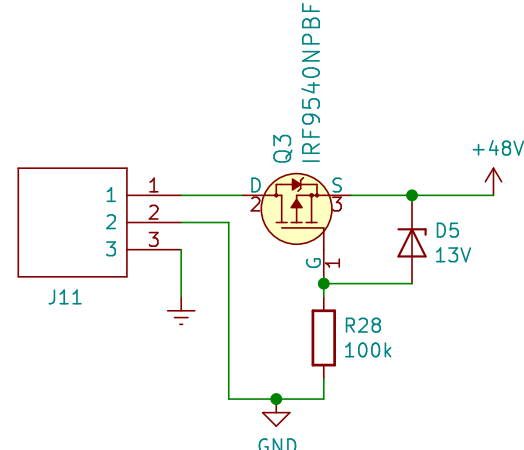
# 5V Speisung

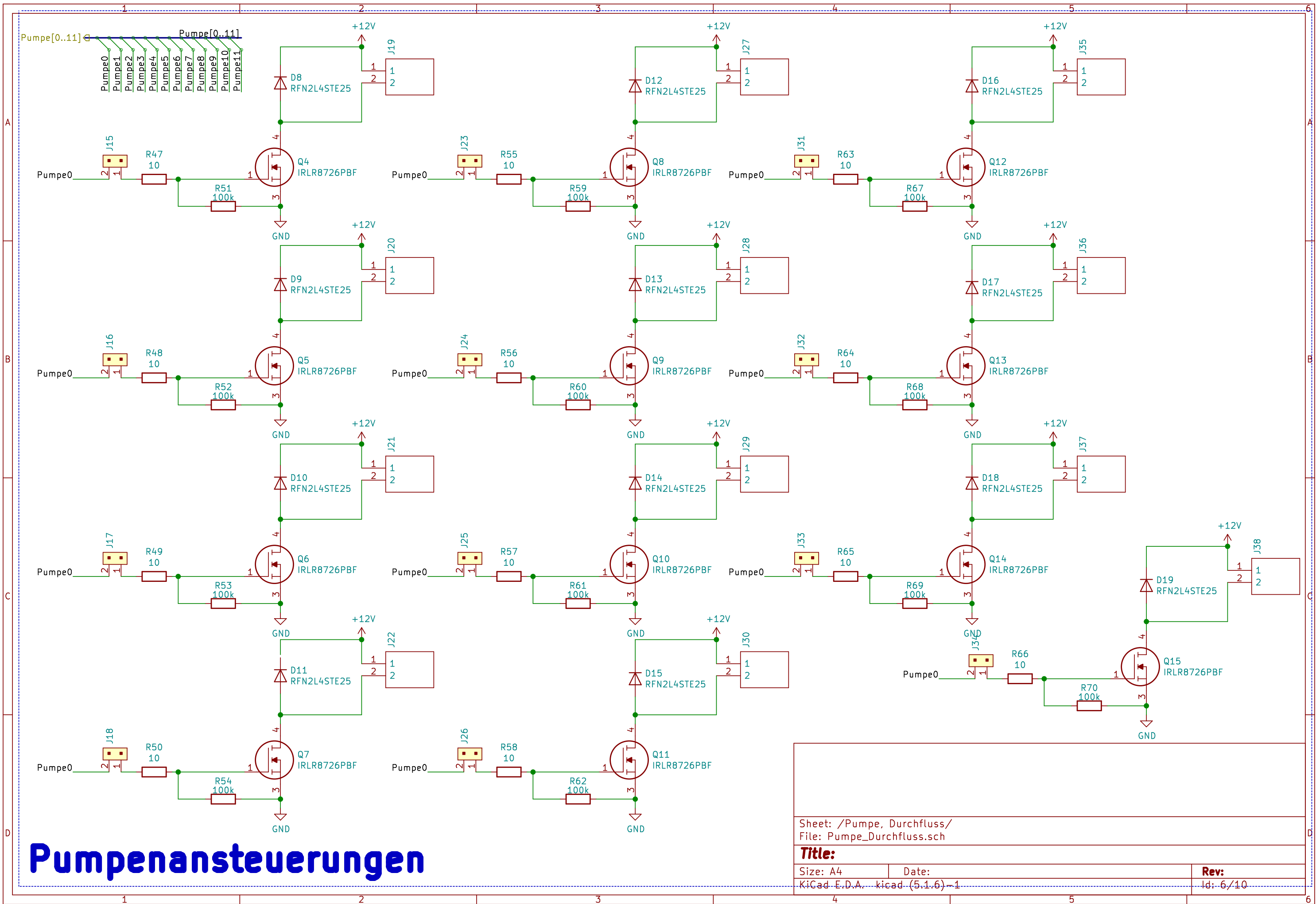


# 3.3V Speisung



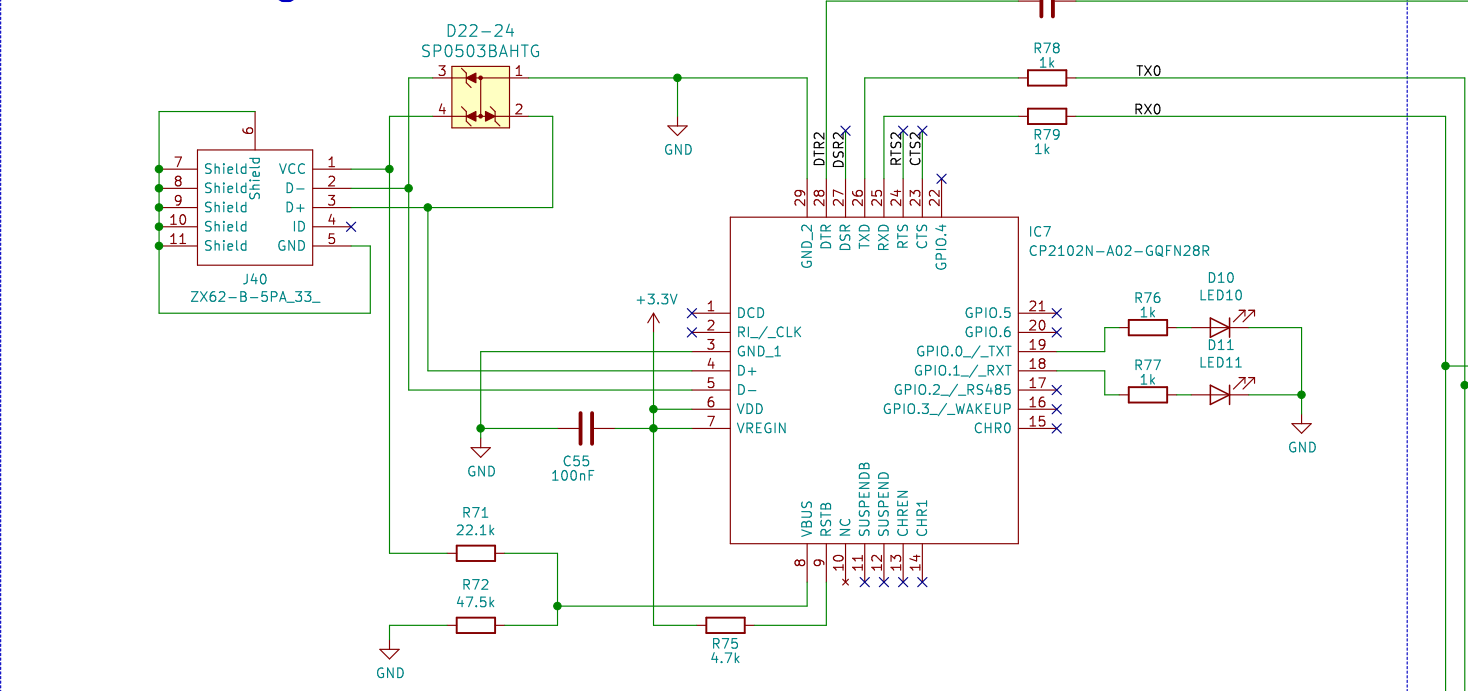
# Verpolungsschutz



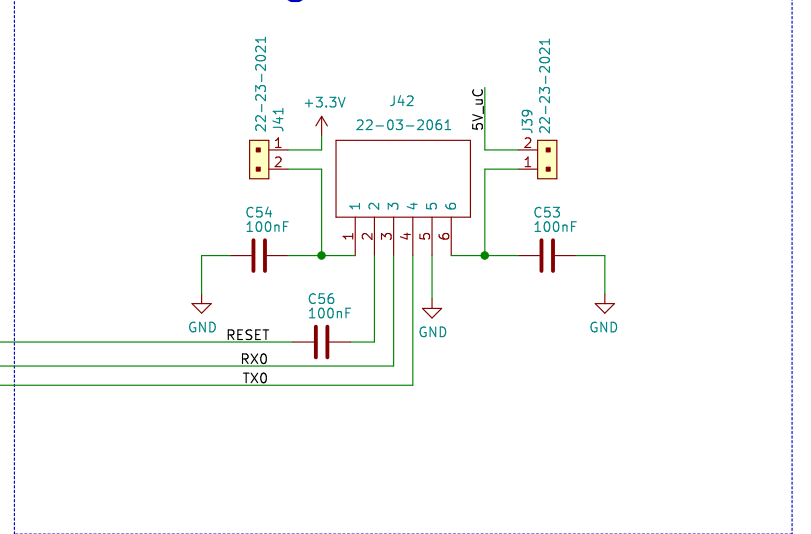




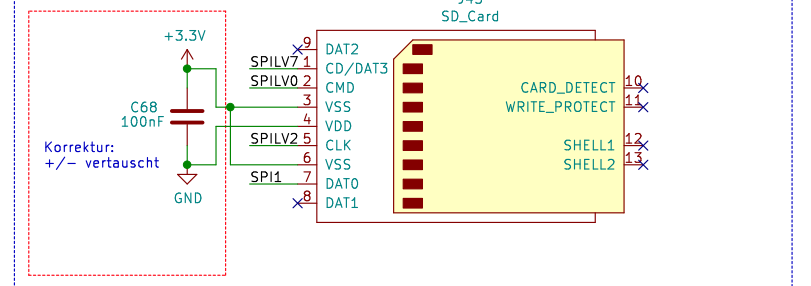
## USB-Programmierschnittstelle



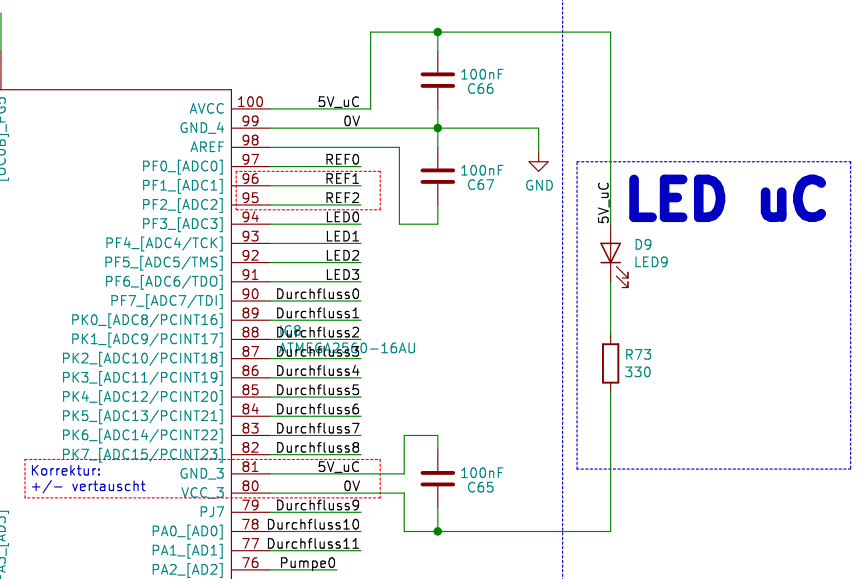
## USB-Program.-BOB



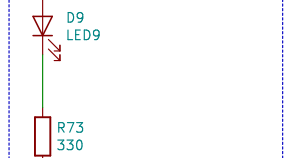
## SD-Karte



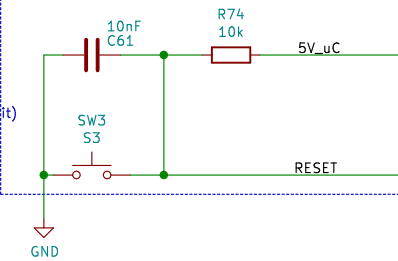
# Mikrocontroller



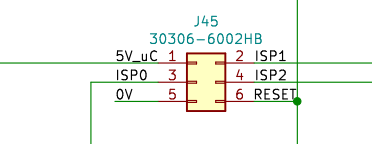
## LED uC



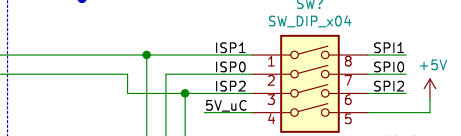
## Reset-Button



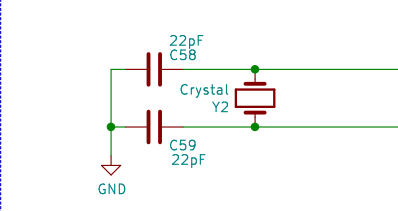
**ISP**



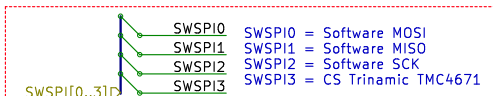
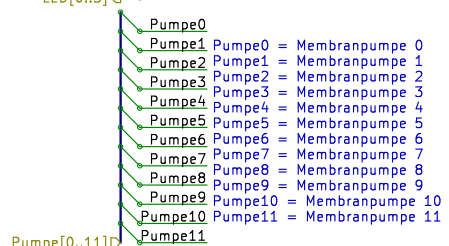
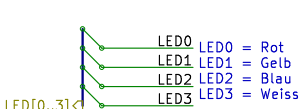
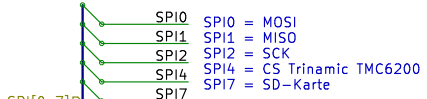
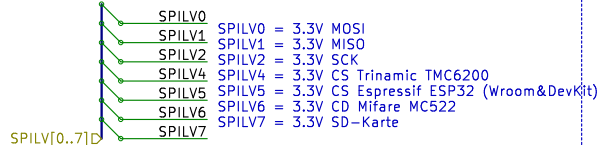
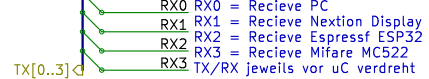
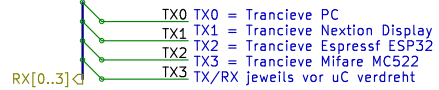
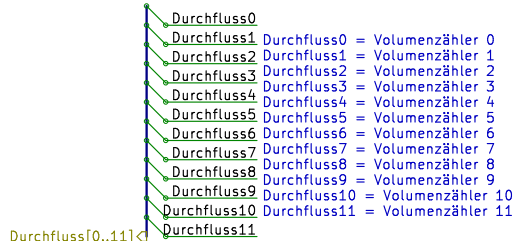
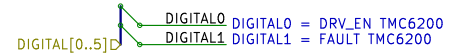
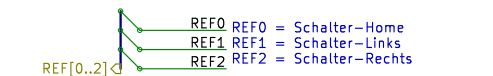
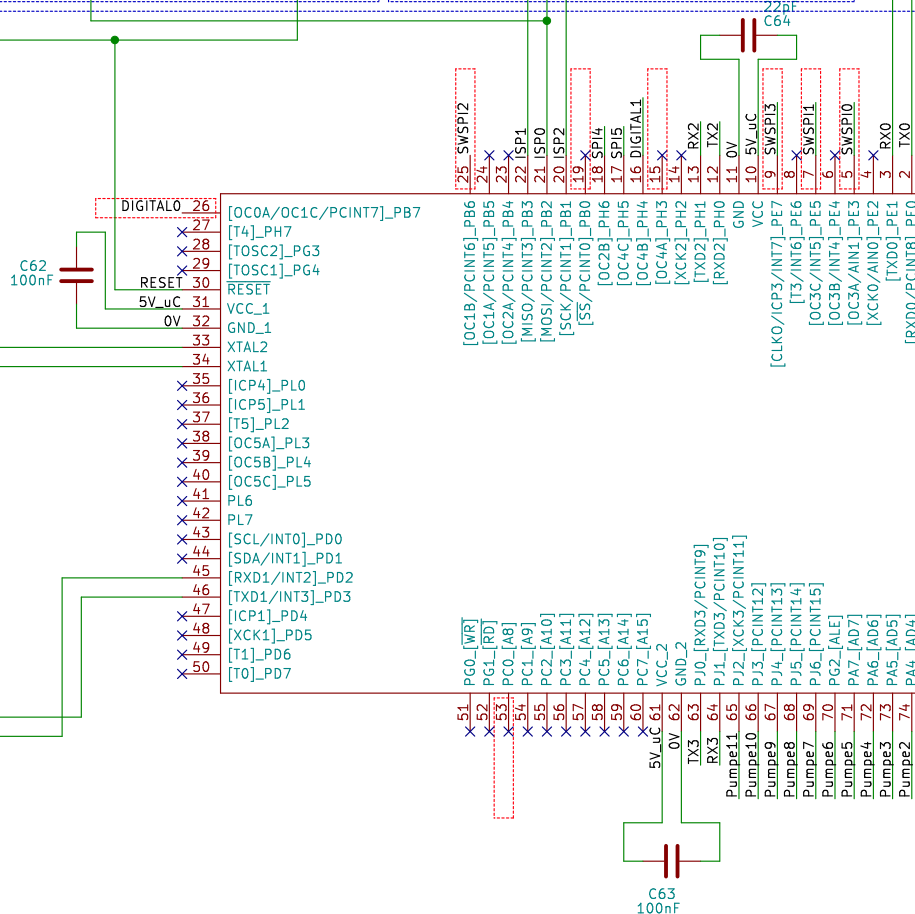
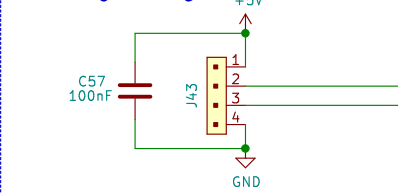
## Dip-Switch SPI



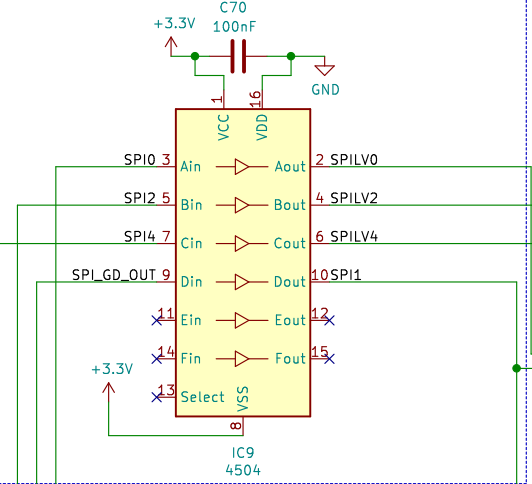
# Quarz 16MHz



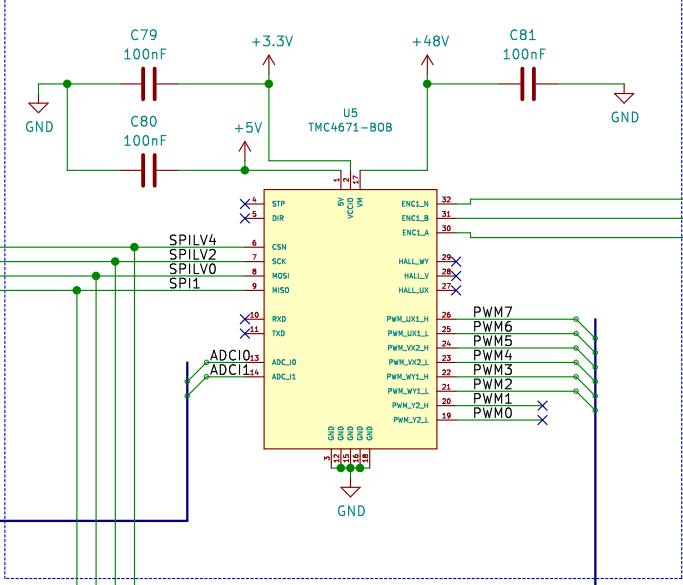
## Display



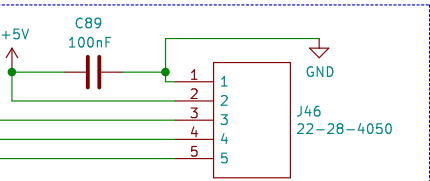
Level-Shifter



FOC-Treiber



Encoder-Pins

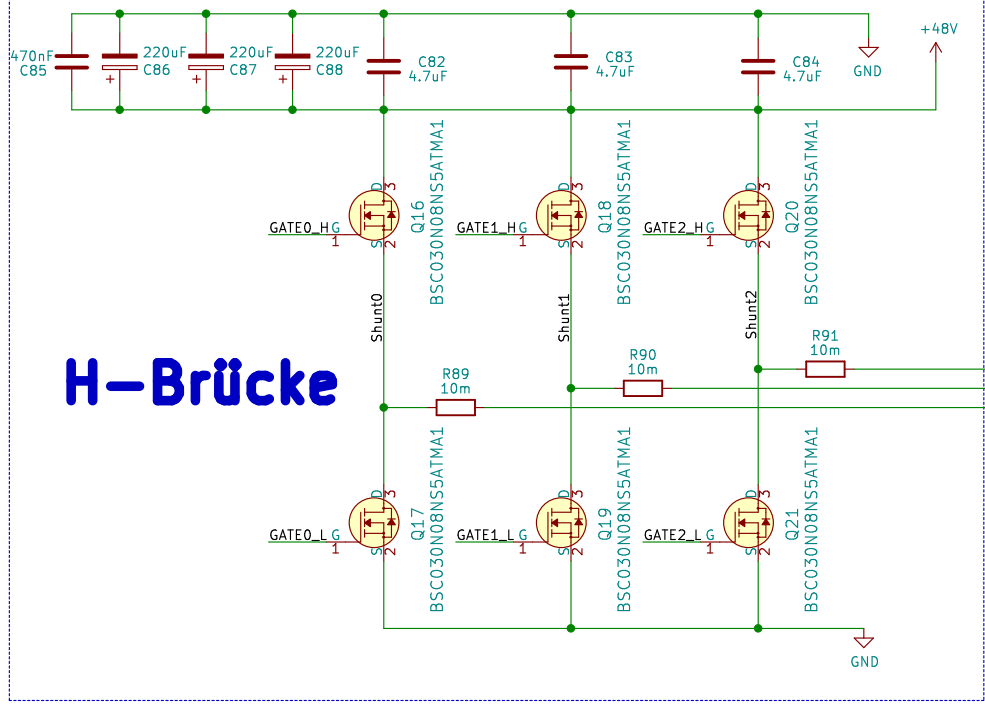


Korrektur:  
Da Probleme mit dem Layout bestehen, kann die Motorengruppe nicht auf dem Print in Betrieb genommen werden. Es werden deshalb zwei externe Boards verwendet, welche über die Header-Pins des TMC4671 und die Header-Pins des ESP32 angesteuert werden.

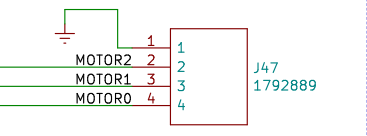
SPI0 = MOSI  
SPI1 = MISO  
SPI2 = SCK  
SPI3 = CS Trinamic TMC4671  
SPI4 = CS Trinamic TMC6200  
SPI5 = CS Espressif ESP32 (Wroom&DevKit)  
SPI6 = CS Mifare MC522  
SPI7 = SD-Karte  
DIGITAL0 = DRV\_EN TMC6200  
DIGITAL1 = FAULT TMC6200

SPILV4 Korrektur:  
SPILV2 Die geschifteten SPI-Leitungen führen zum SPILV0 externen Gate-Treiber-Board  
SPI1 TMC6200-EVAL.

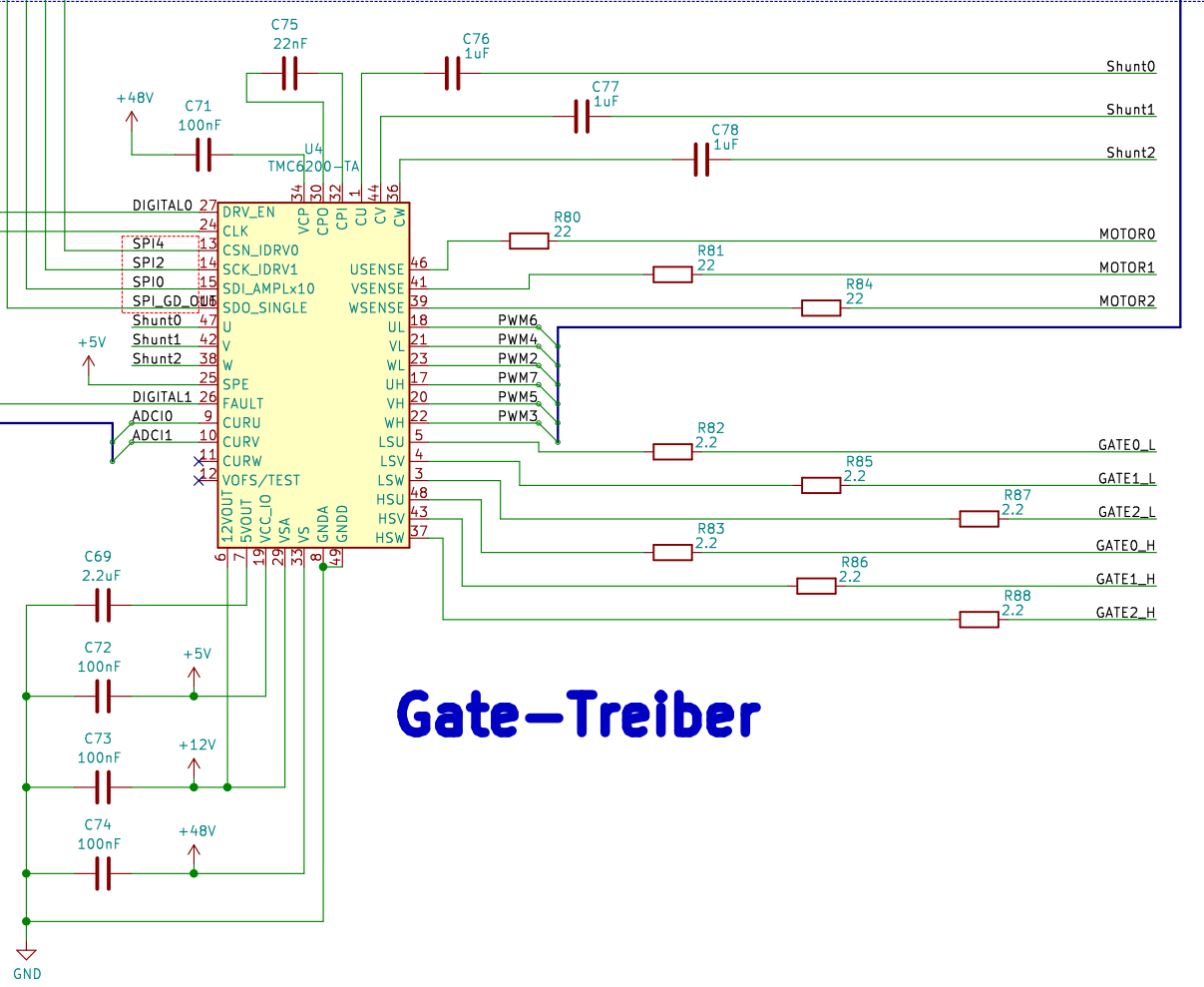
H-Brücke



Motor-Pins



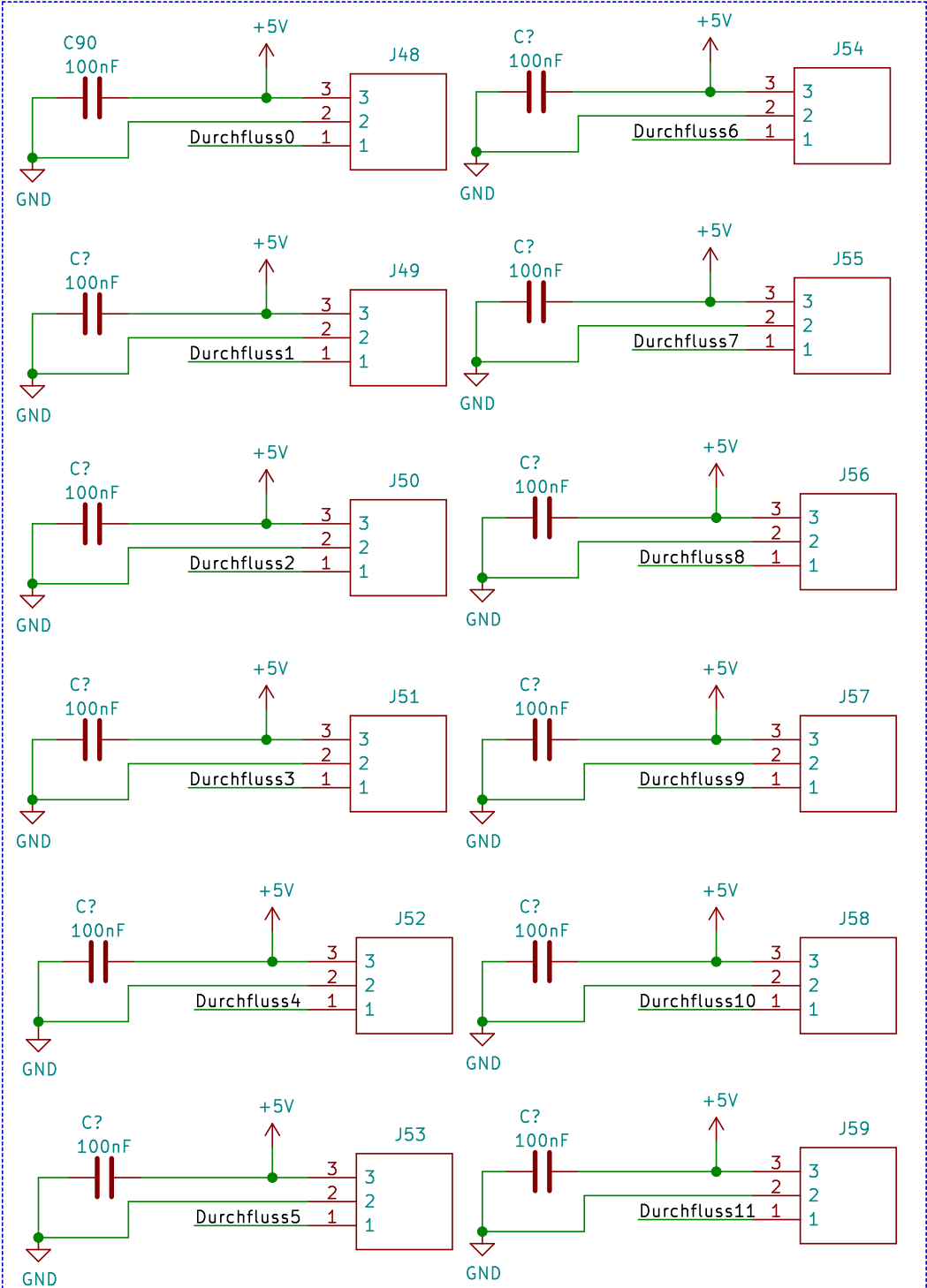
Gate-Treiber





Durchfluss[0..11] < Durchfluss[0..11]

- Durchfluss0
- Durchfluss1
- Durchfluss2
- Durchfluss3
- Durchfluss4
- Durchfluss5
- Durchfluss6
- Durchfluss7
- Durchfluss8
- Durchfluss9
- Durchfluss10
- Durchfluss11



# Anschlüsse der Durchflussmessgeräte

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File: Sensor\_Durchfluss.sch

**Title:**

Size: A4

Date:

KiCad E.D.A. kicad (5.1.6)–1

**Rev:**

Id: 9/10

