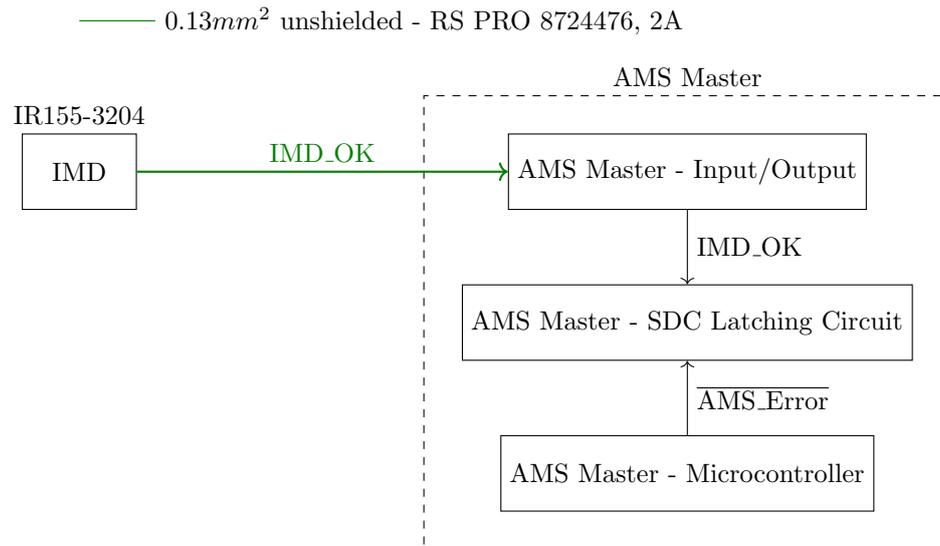
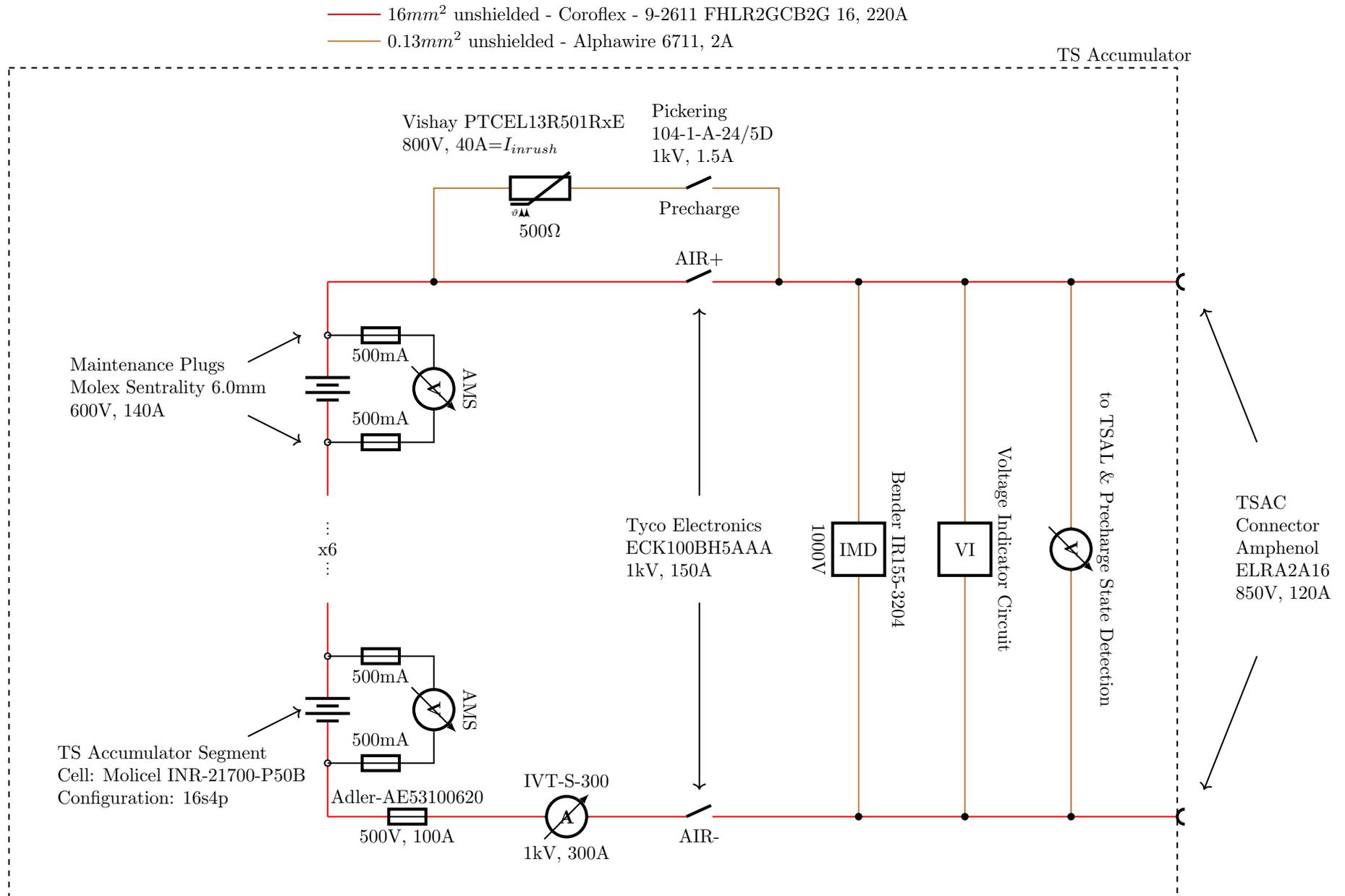
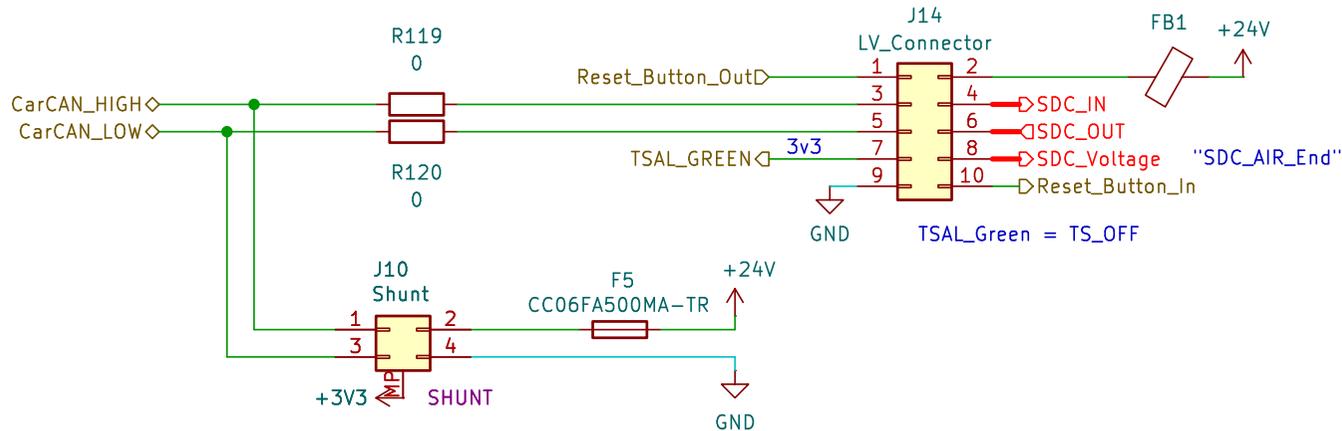


1 AMS und IMD Error Latching



2 SCS signal implementation



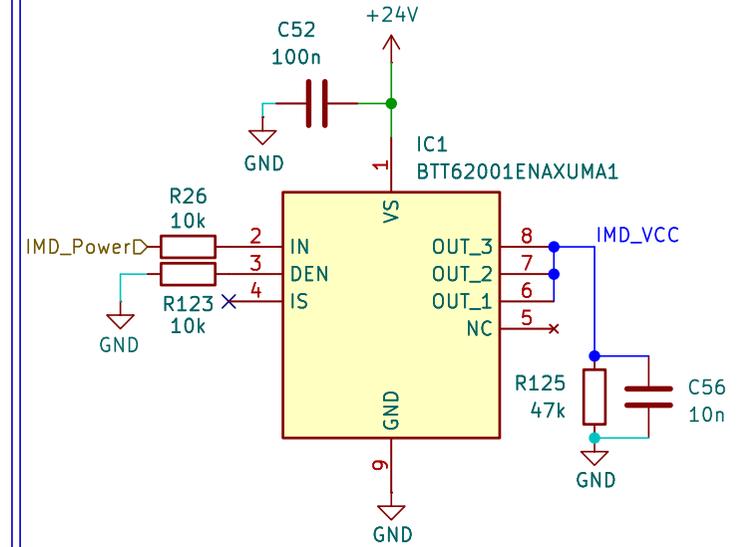


SHUNT:
IVT-S-300-U3-I-CAN1-12/24
max. 80mA

Datasheet
<https://www.isabellenhuetteusa.com/wp-content/uploads/2022/07/Datasheet-IVT-S-V1.03.pdf>

Main Connector

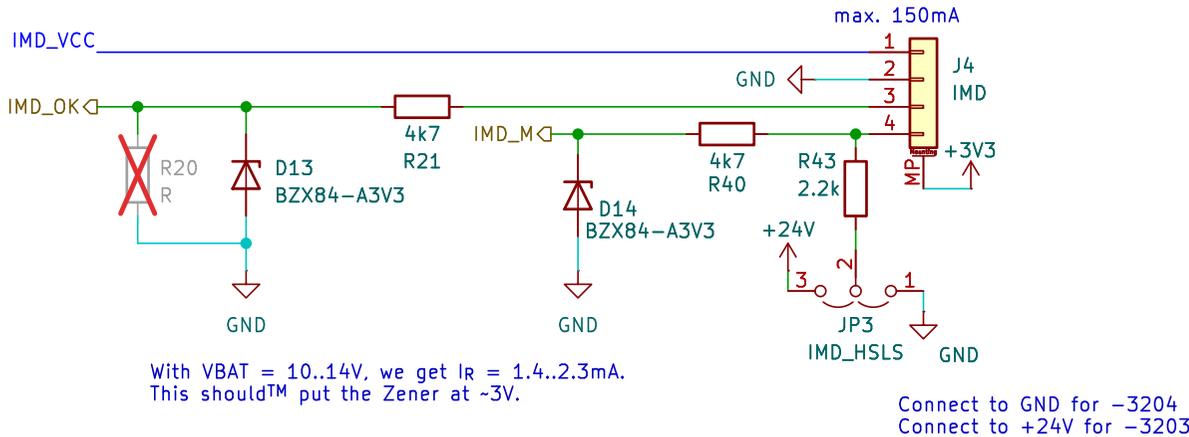
IMD Supply



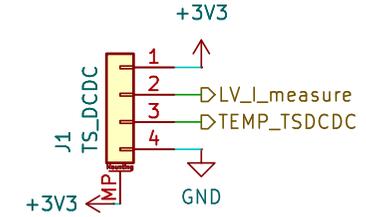
IMD Connector

IMD - Datasheet

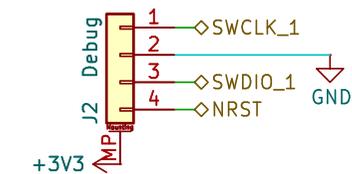
https://www.bender.de/fileadmin/content/Products/d/e/IR155-32xx-V004_D00115_D_XXEN.pdf



TSDCDC Connector



Debug Connector



FASTTUBE

Title: Input/Output

Rev: V1

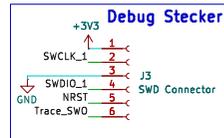
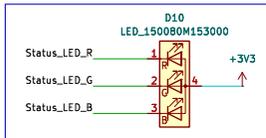
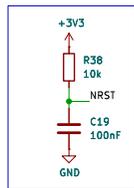
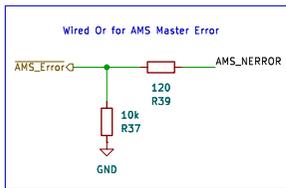
Date: 2025-03-09

Project: Master_FT25

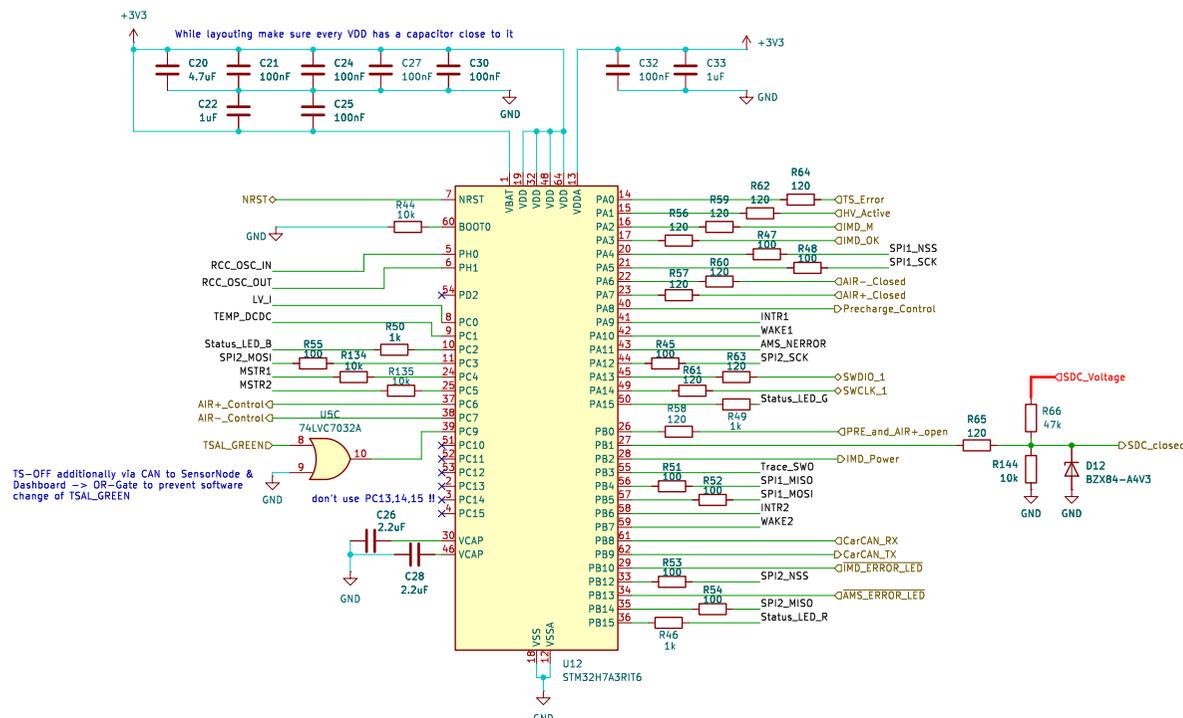
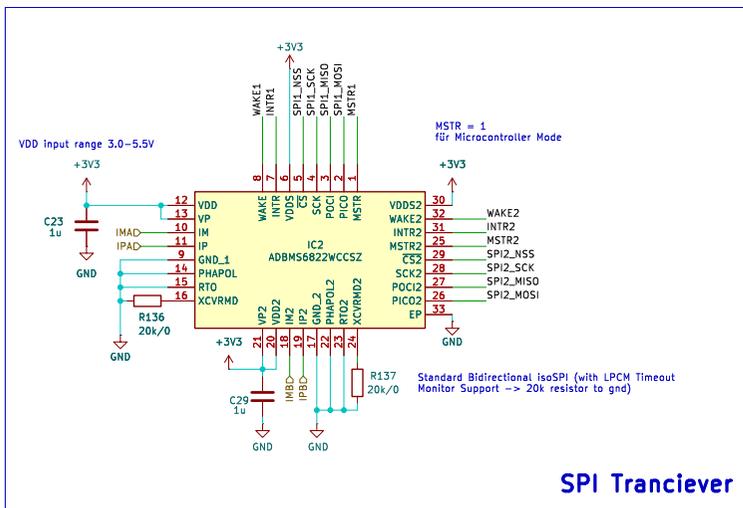
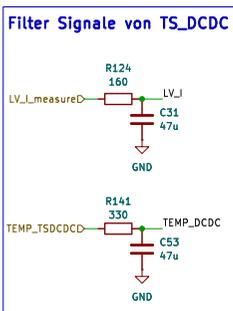
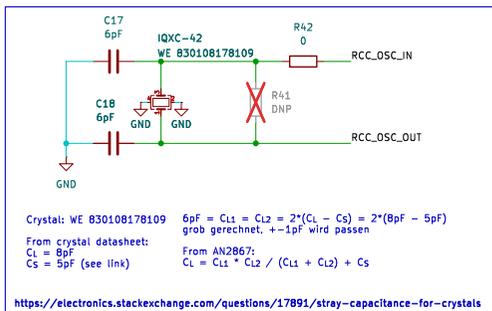
Exp. Date: 2025-04-27

Author: Lene Marquardt

Size: A5 | Page: 13/15



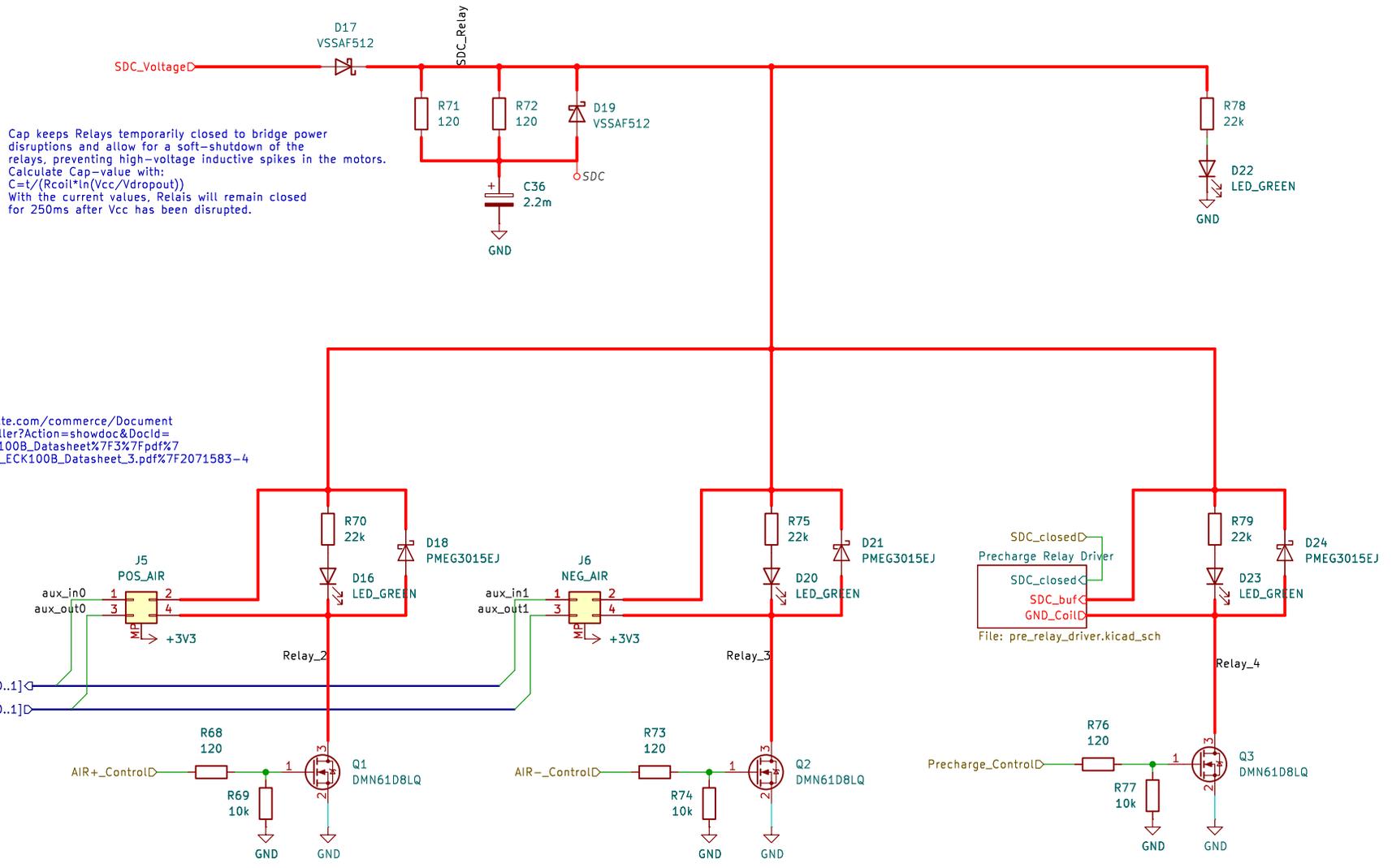
add esd siehe slide 24



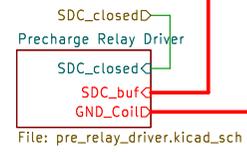
Cap keeps Relays temporarily closed to bridge power disruptions and allow for a soft-shutdown of the relays, preventing high-voltage inductive spikes in the motors.
 Calculate Cap-value with:
 $C = t / (R_{coil} * \ln(V_{cc} / V_{dropout}))$
 With the current values, Relays will remain closed for 250ms after Vcc has been disrupted.

max 500mA to AIR

siehe: https://www.te.com/commerce/DocumentDelivery/DDEController?Action=showdoc&DocId=Data+Sheet%7FECK100B_Datasheet%7F3%7Fpdf%7FEnglish%7FENG_DS_ECK100B_Datasheet_3.pdf%7F2071583-4



The MOSFETs act as a low-side switch for the Power-relays used. The diodes protect the MOSFETs from inductive voltage spikes caused by the Relays-coils when powered off.

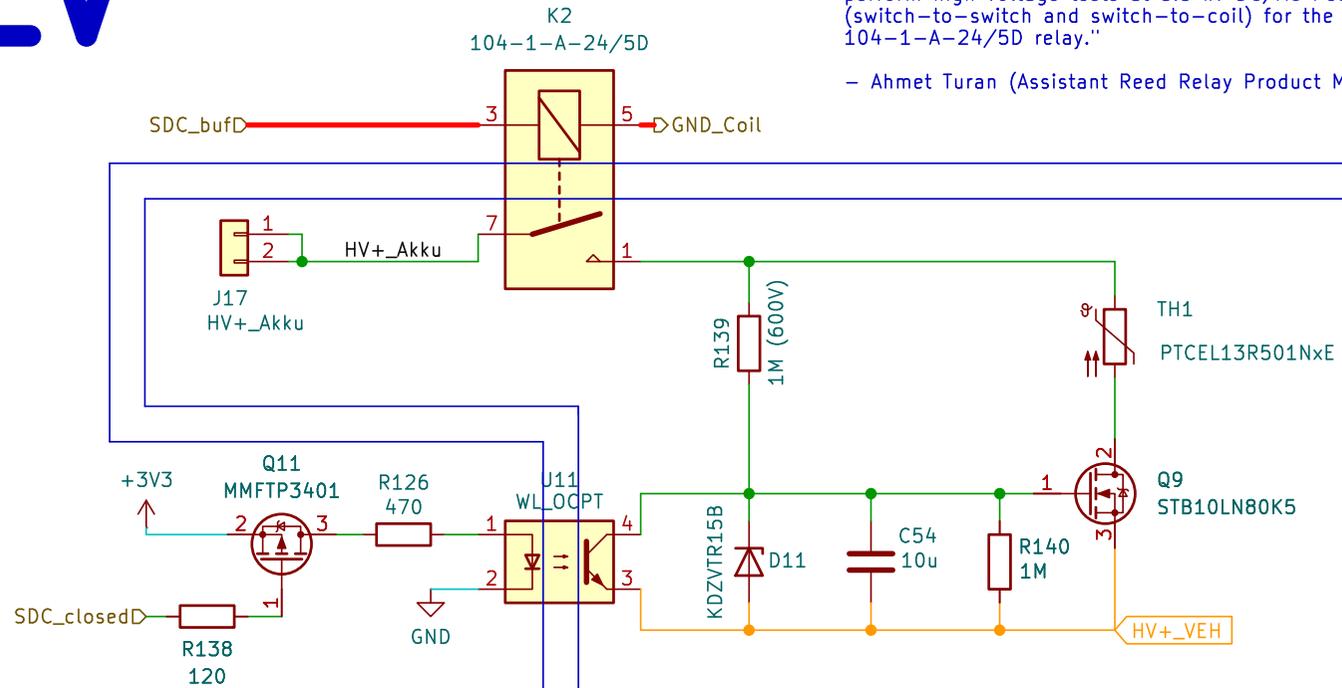


LV

TS-LV isolation via relay pn distance (10.16mm)

"Regarding your questions about our testing process, we perform high voltage tests at 5.5 kV DC/AC Peak (switch-to-switch and switch-to-coil) for the 104-1-A-24/5D relay."

- Ahmet Turan (Assistant Reed Relay Product Manager)



TS

FASTTUBE

Title: Precharge Relay Driver

Rev: V1

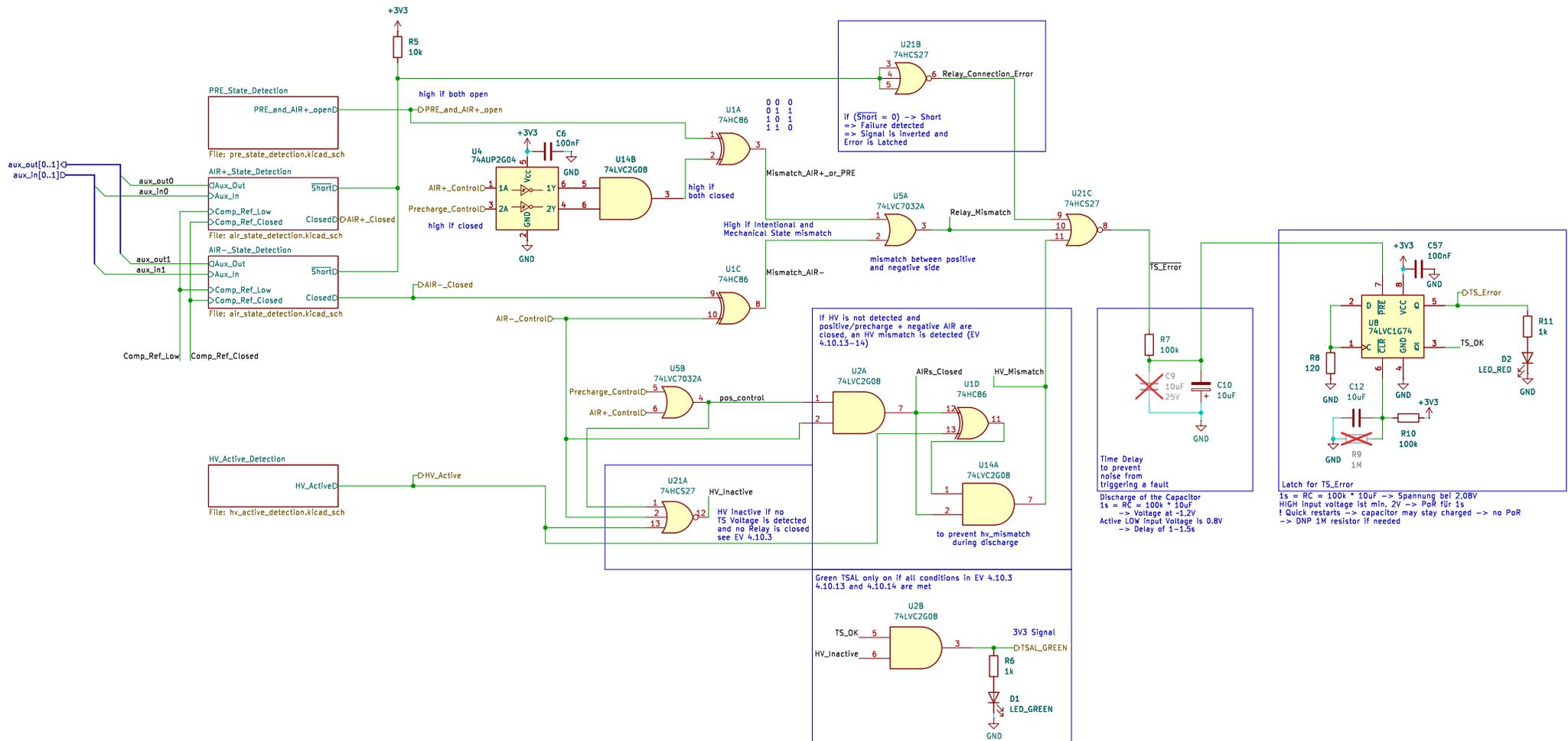
Date: 2025-03-09

Project: Master_FT25

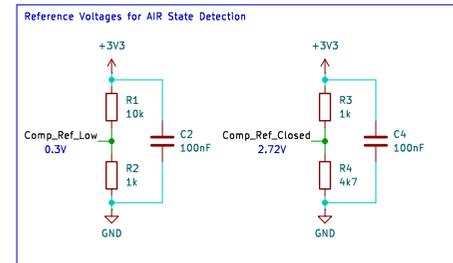
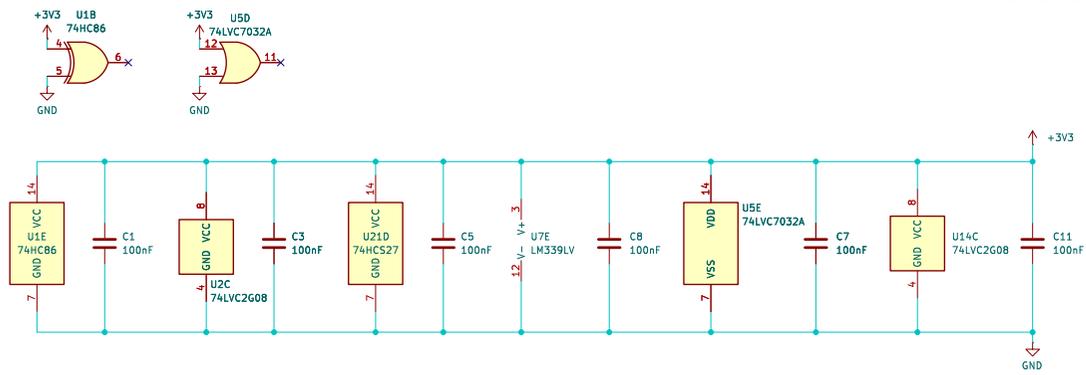
Exp. Date: 2025-04-27

Author: Lene Marquardt

Size: A5 | Page: 10/15

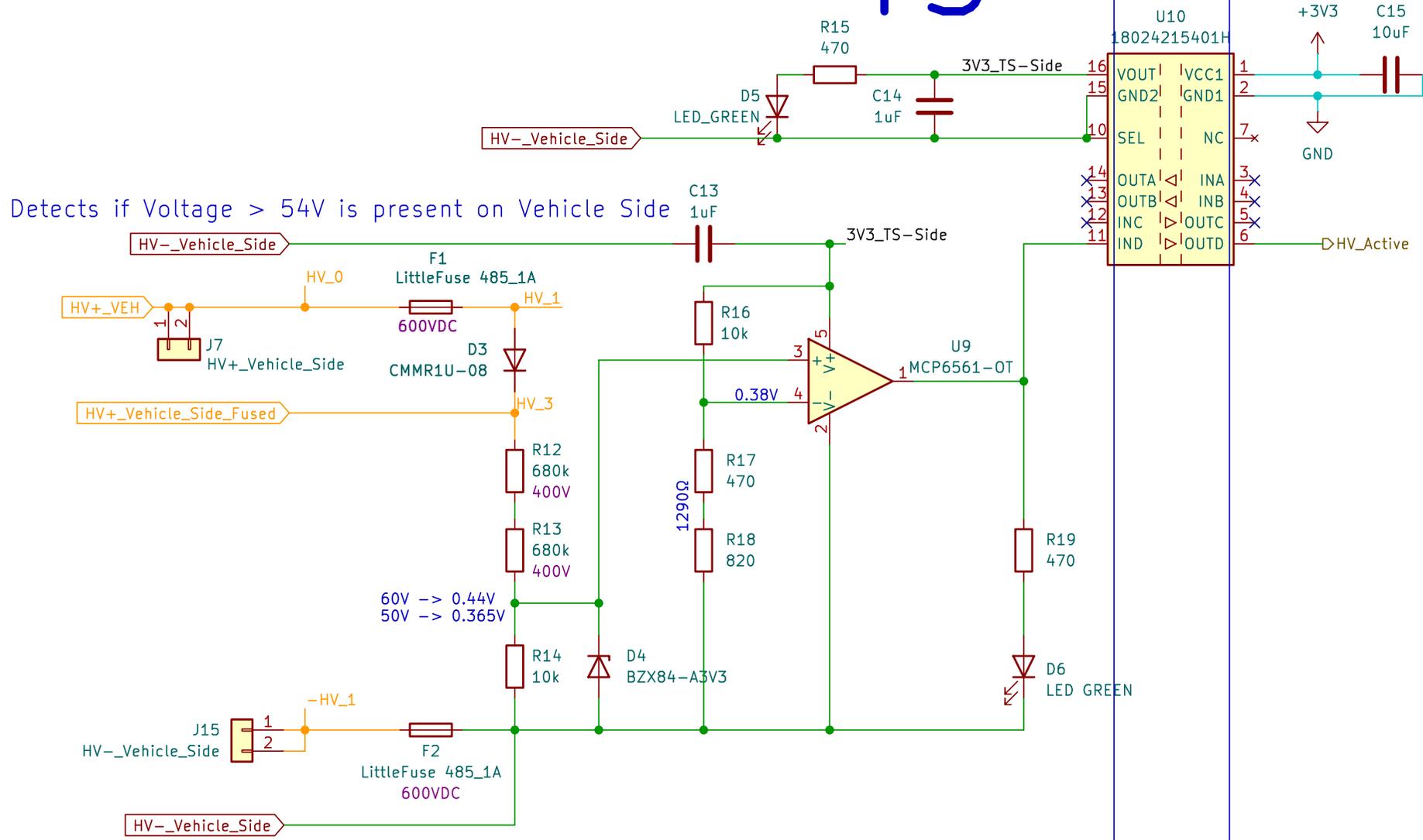


TSAL_GREEN signal leads dashboard and to the TSAL driver board



TS

LV

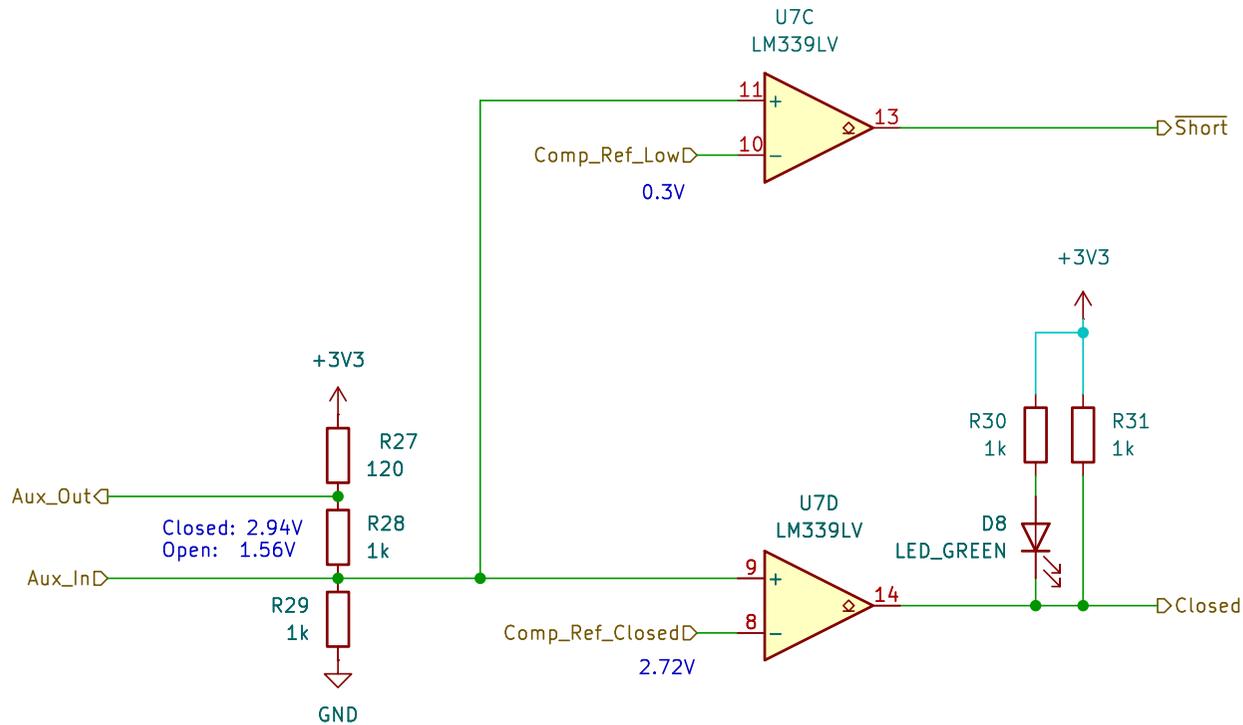


Detects if Voltage > 54V is present on Vehicle Side

FASTTUBE

Title: TSAL HV Detection	Rev: V1
Project: Master_FT25	Date: 2025-03-09
Author: Lene Marquardt	Exp. Date: 2025-04-27
	Size: A5 Page: 3/15

Accumulator TSAL – Relay state detection



FASTTUBE

Title: AIR Relay State Detection

Rev: V1

Date: 2025-03-09

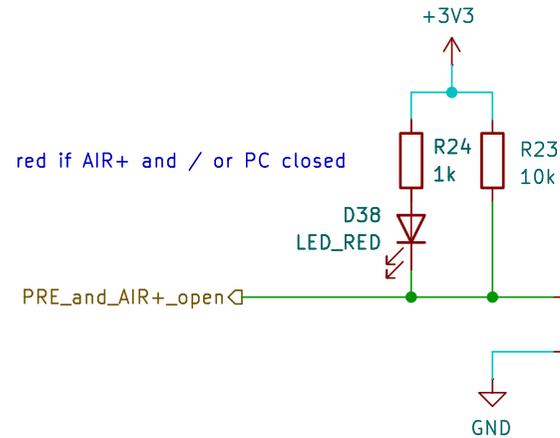
Project: Master_FT25

Exp. Date: 2025-04-27

Author: Lene Marquardt

Size: A5 | Page: 4/15

LV

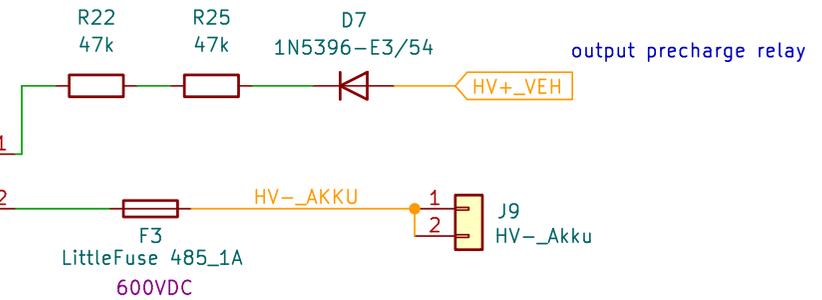


red if AIR+ and / or PC closed

Detects if Precharge or Positive AIR are closed:
PRE_AIR+_open = 3V3 if both Relays are Open
PRE_AIR+_open = 0V if one or both are Closed

opto diode current:
@ maximum TS Voltage 403V = 4,27 mA
@ minimum TS Voltage 240V = 2,55 mA

TS



output precharge relay

FASTTUBE

Title: Precharge State Detection

Rev: V1

Date: 2025-03-09

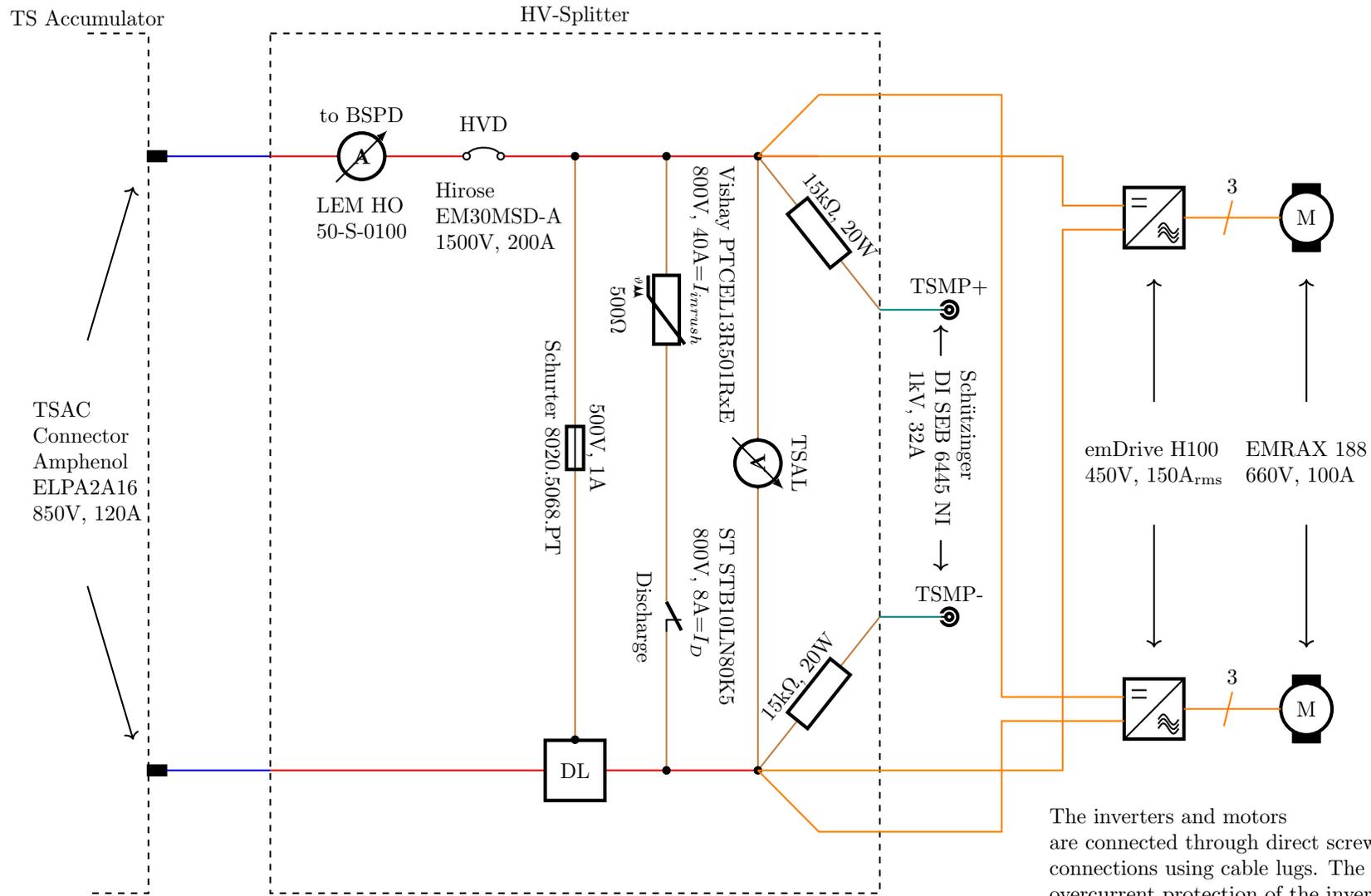
Project: Master_FT25

Exp. Date: 2025-04-27

Author: Lene Marquardt

Size: A5 | Page: 6/15

- 16mm² shielded - Coroflex - 9-2611 FHLR2GCB2G 16, 220A
- 16mm² unshielded - Coroflex - 9-2611 FHLR2GCB2G 16, 220A
- 6mm² shielded - Coroflex - 9-2611 FHLR2GCB2G 6, 150A
- 0.5mm² shielded - TE SPEC55, 6A
- 0.13mm² unshielded - Alphawire 6711, 2A

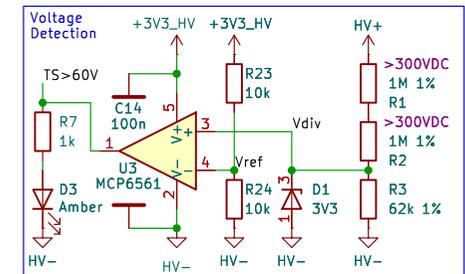
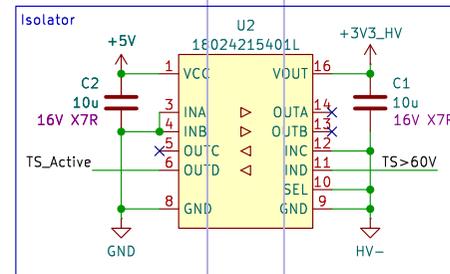
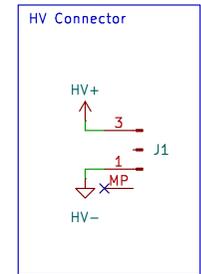
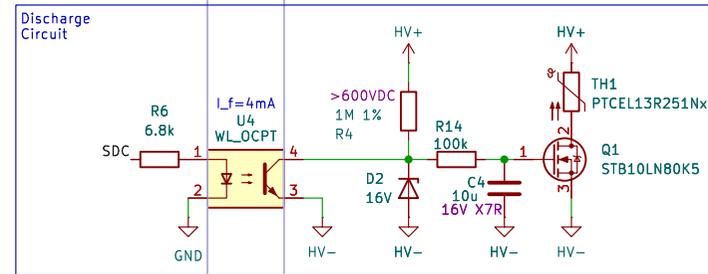
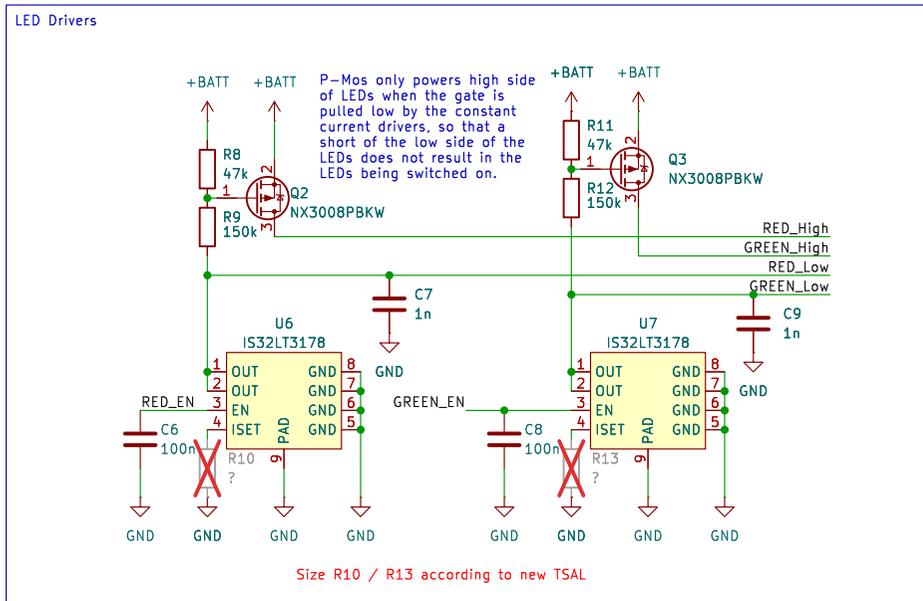
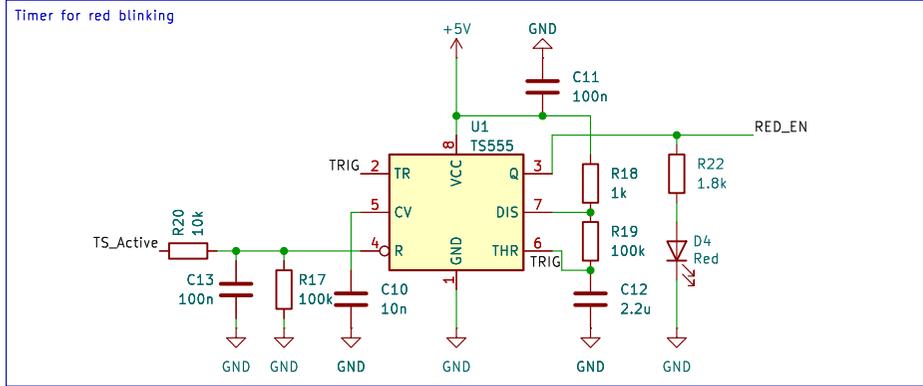


The cables are routed through cable glands if not specified

The inverters and motors are connected through direct screwed connections using cable lugs. The built-in overcurrent protection of the inverters (150A_{rms}) is used to protect the wires, which can handle a continuous current of 170A

TSAL driver board and DC-link voltage detection

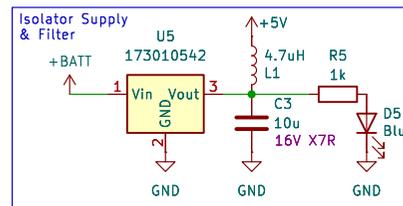
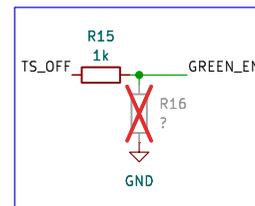
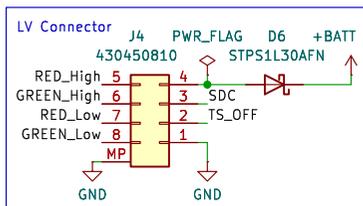
LV TS



$$Vref_max = 3.47V * 10.1k\Omega / (10.1k\Omega + 9.9k\Omega) = 1.76V$$

$$Vdiv@60V_min = 60V * 61.38\Omega / (2 * 990k\Omega + 61.38k\Omega) = 1.8V$$

$$Vhyst_max@75deg = 6mV < 40mV (1.80V - 1.76V)$$



FASTTUBE	
Title: Discharge Circuit	Rev: V1
Project: DC	Date: 2024-11-10
Author: Karlsson Winkels	Exp. Date: 2025-04-27
	Size: A4 Page: 1/1