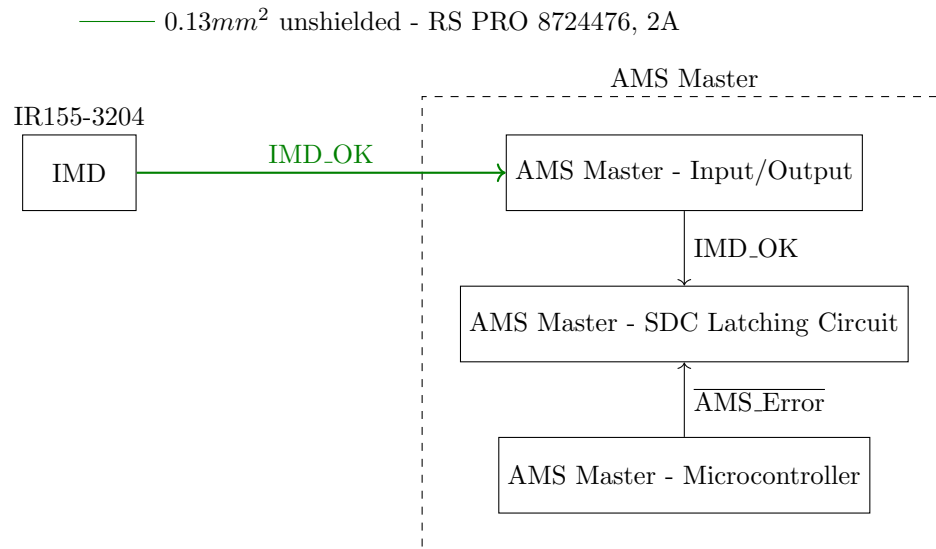
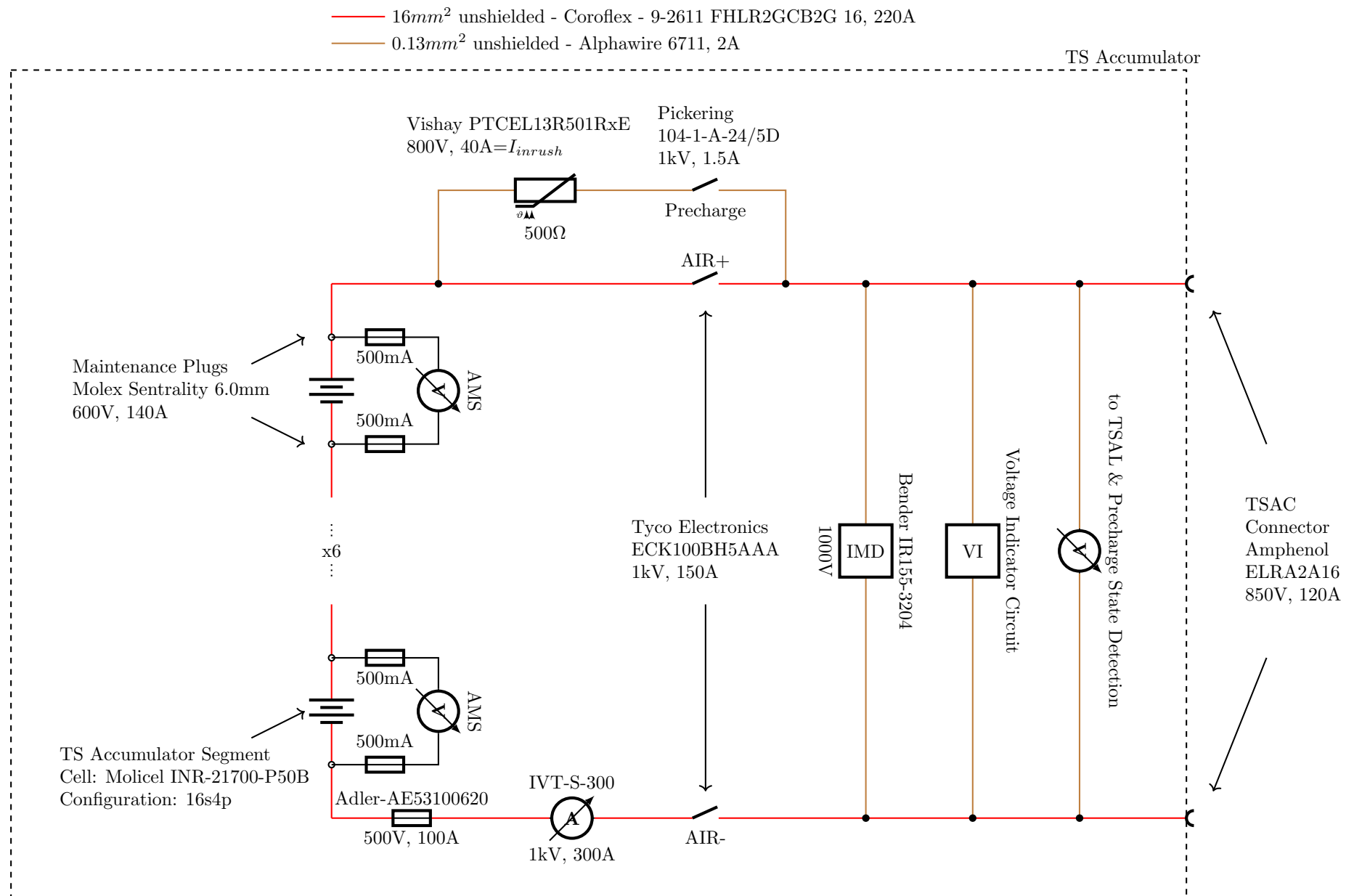
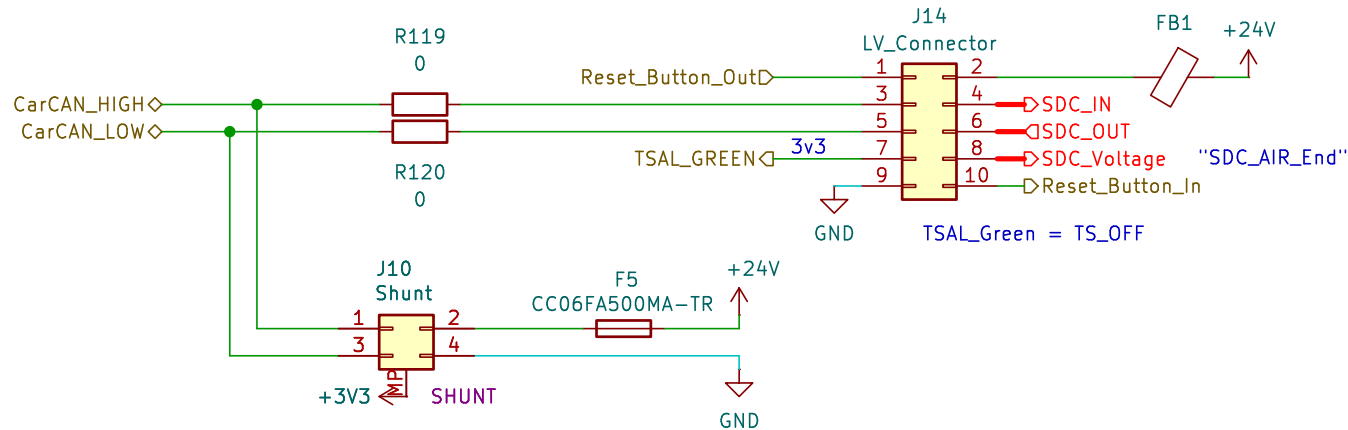


1 AMS und IMD Error Latching



2 SCS signal implementation



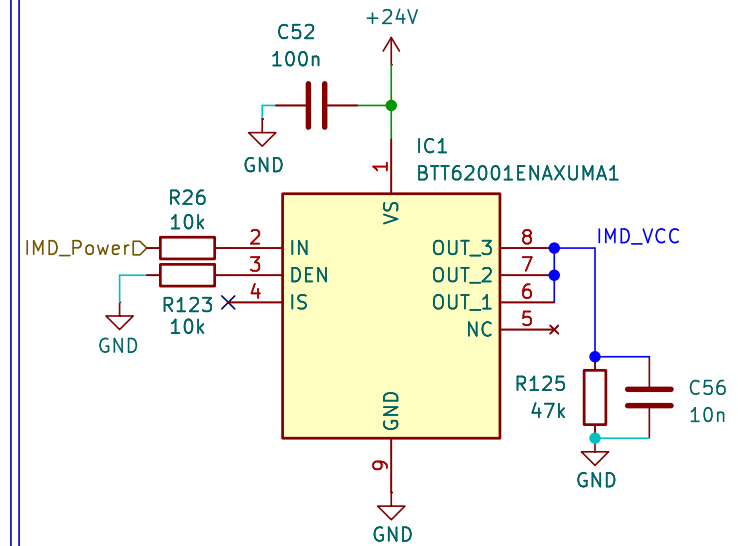


SHUNT:
IVT-S-300-U3-I-CAN1-12/24
max. 80mA

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

Main Connector

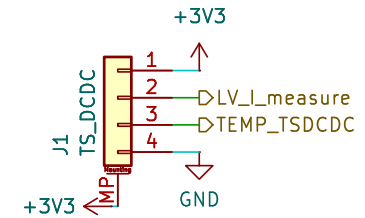
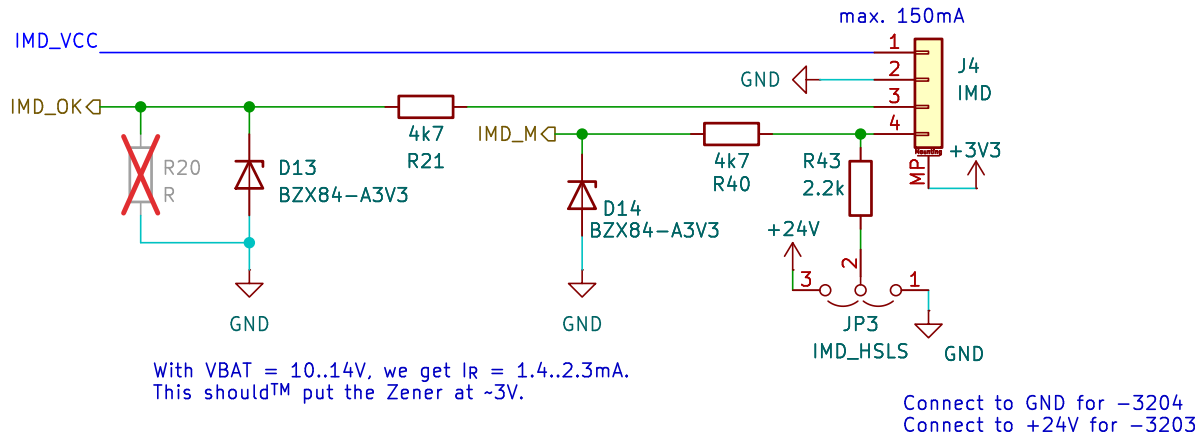
IMD Supply



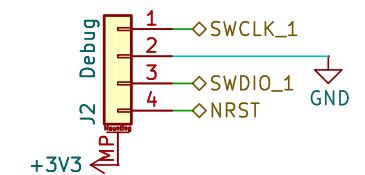
IMD - Datasheet

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

IMD Connector



TSDCDC Connector



Debug Connector

FASTTUBE

Title: Input/Output

Project: Master_FT25

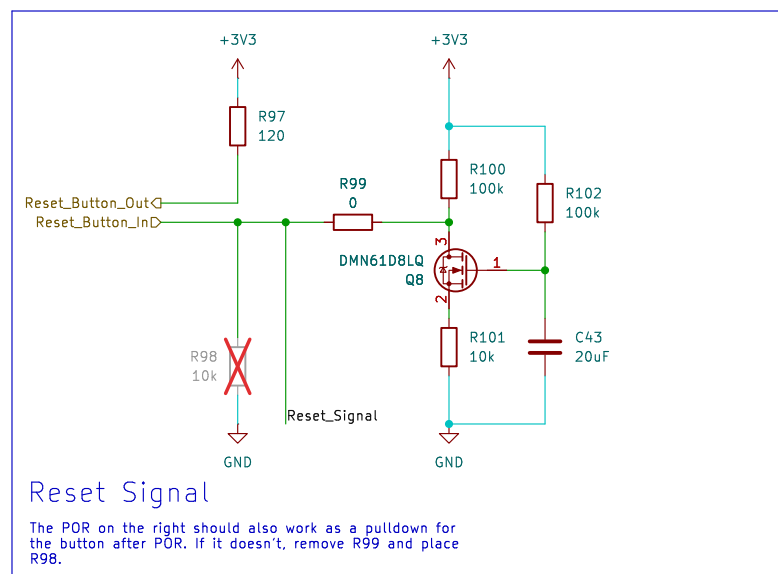
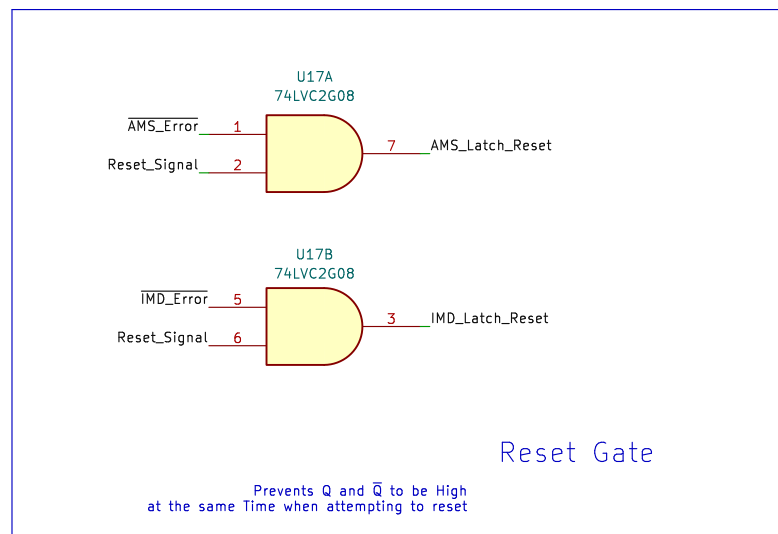
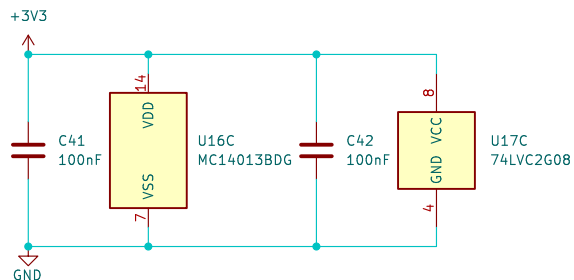
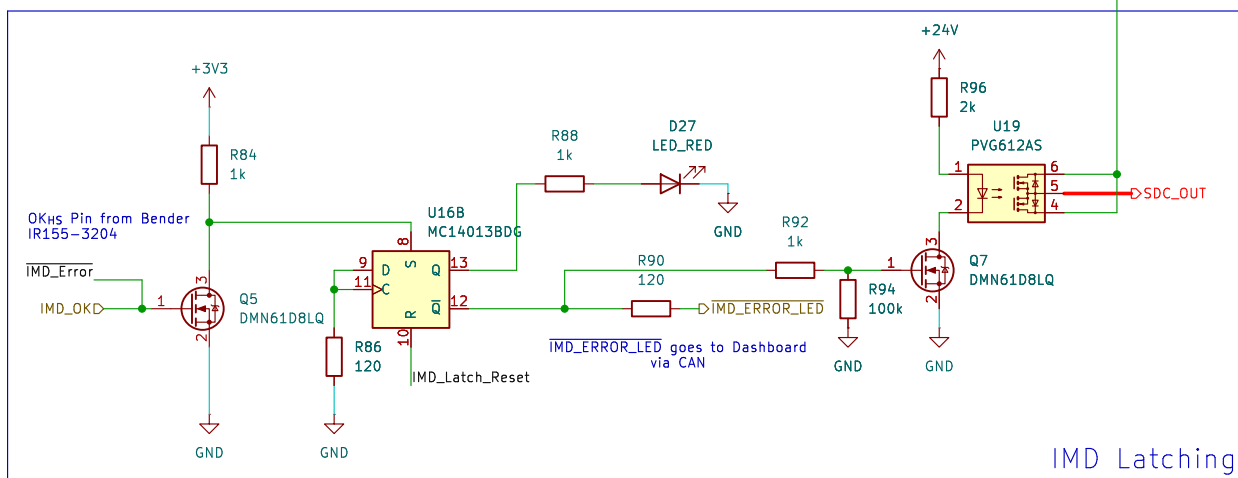
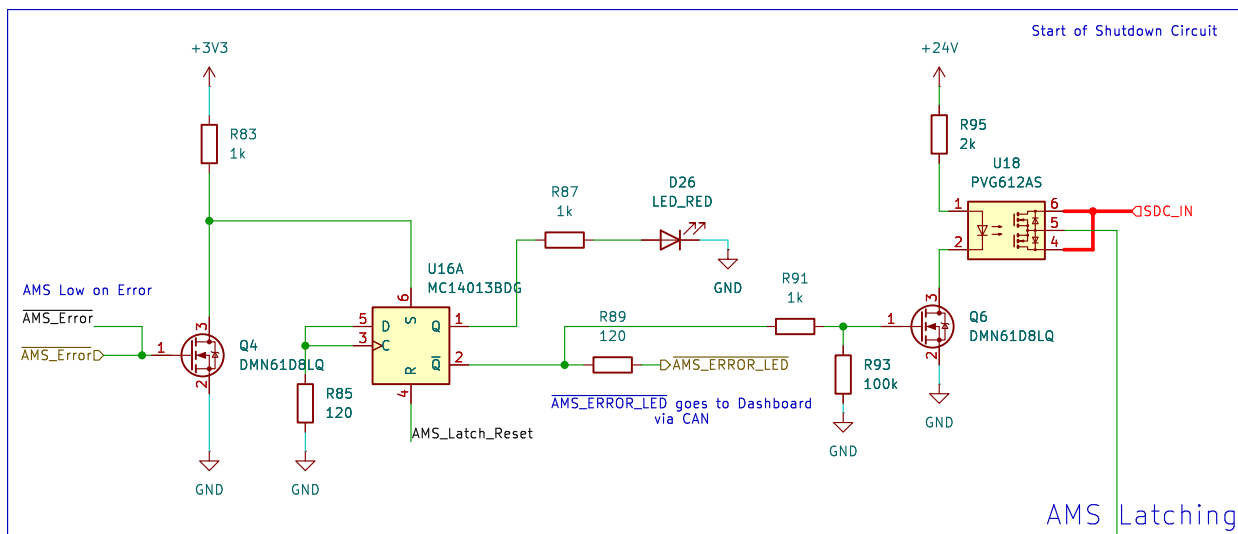
Author: Lene Marquardt

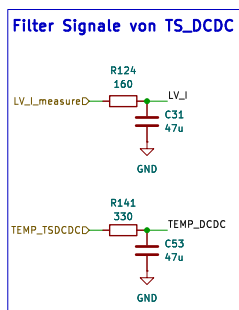
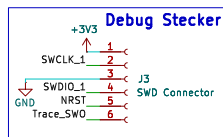
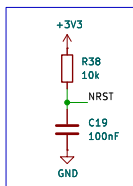
Rev: V1

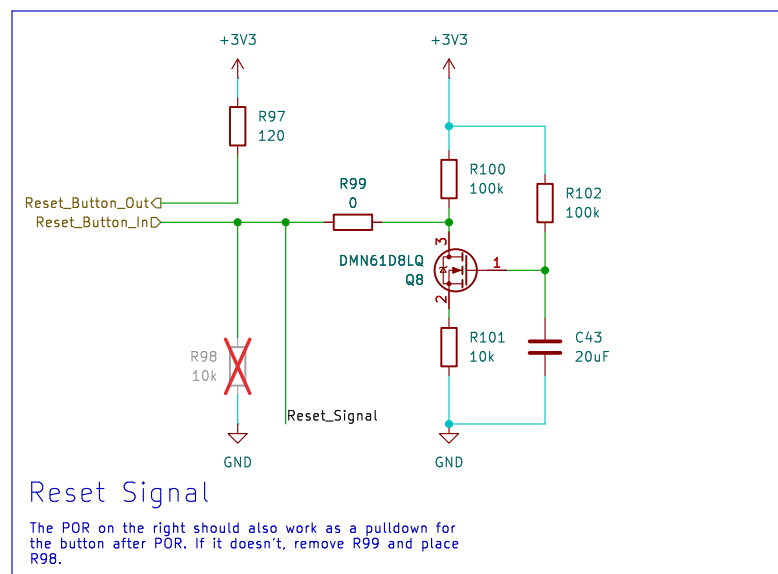
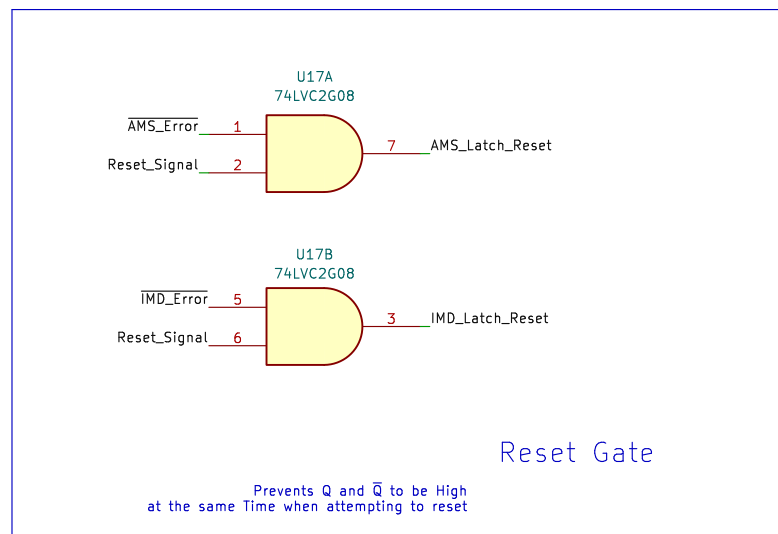
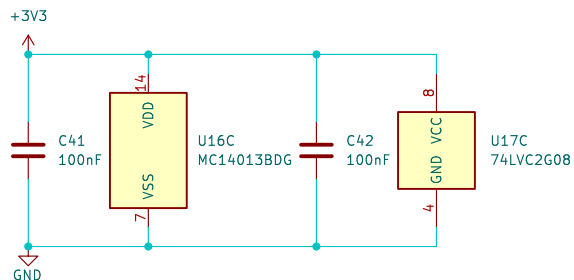
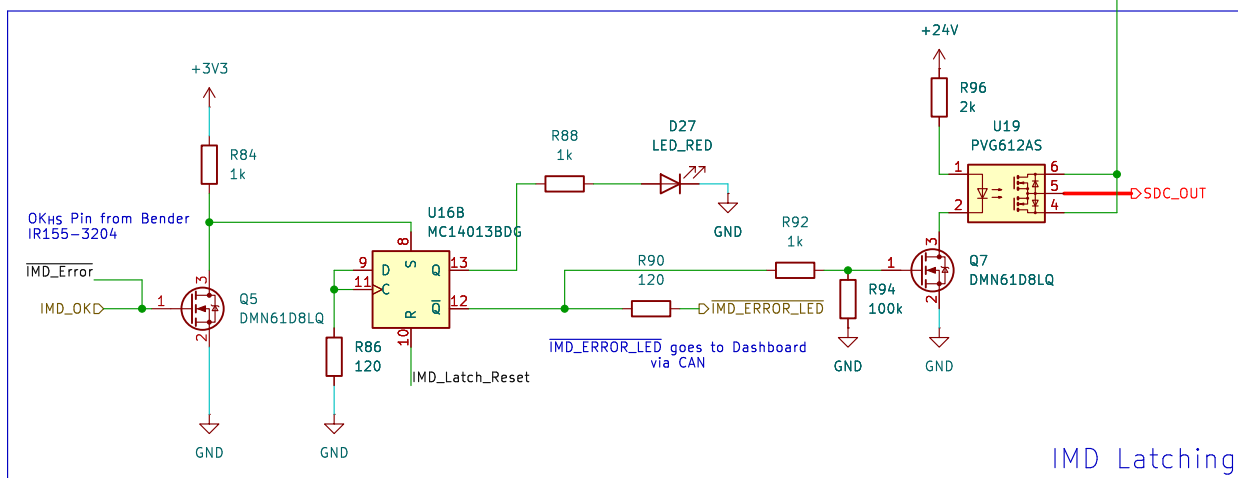
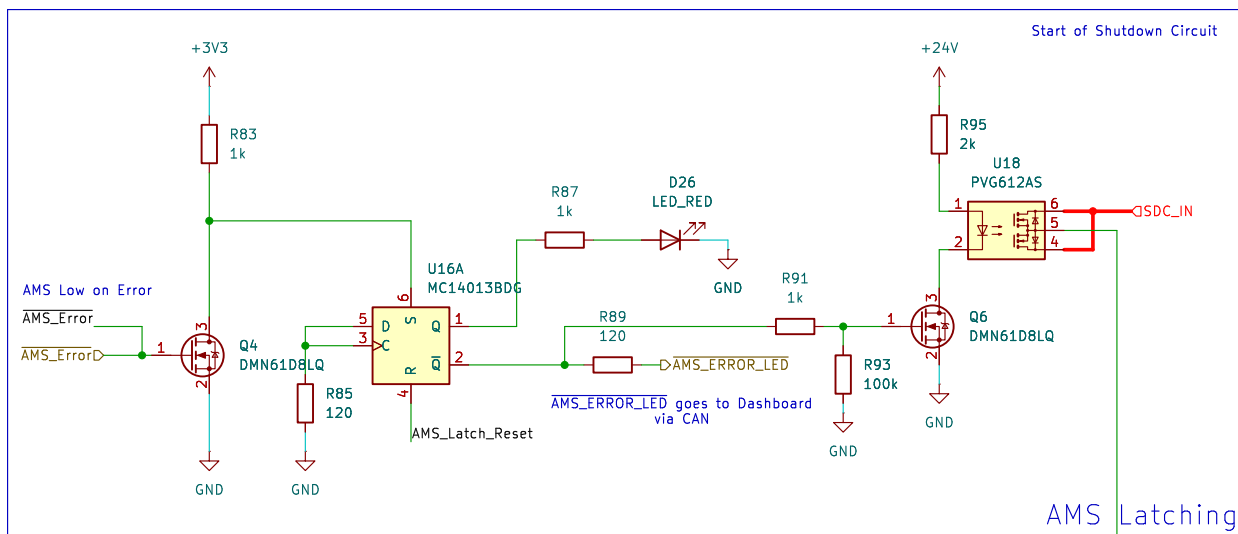
Date: 2025-03-09

Exp. Date: 2025-04-27

Size: A5 Page: 13/15



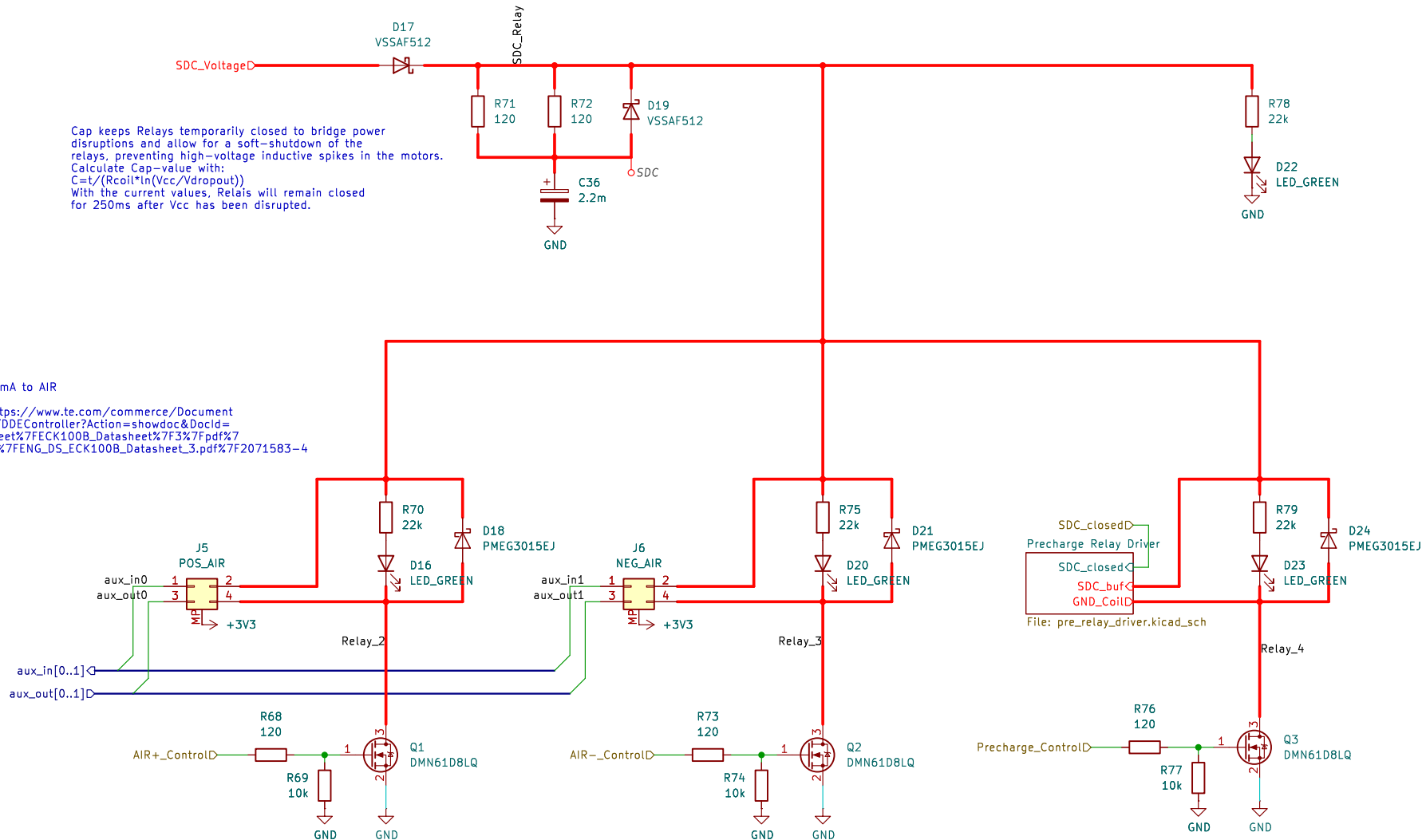




Cap keeps Relays temporarily closed to bridge power disruptions and allow for a soft-shutdown of the relays, preventing high-voltage inductive spikes in the motors.
Calculate Cap-value with:
 $C = t / (R_{coil} * \ln(V_{cc} / V_{dropout}))$
With the current values, Relais will remain closed for 250ms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



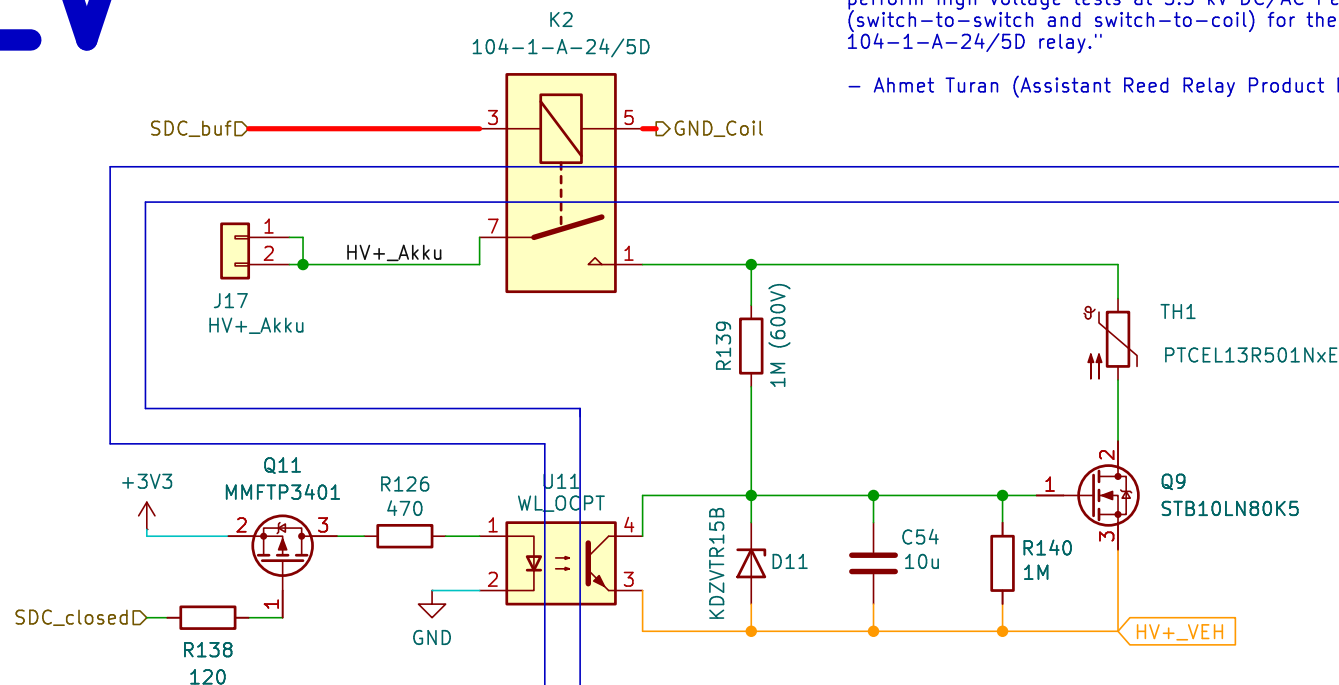
The MOSFETs act as a low-side switch for the Power-relais used. The diodes protect the MOSFETs from inductive voltage spikes caused by the Relais-coils when powered off.

LV

TS-LV isolation via relay pin 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

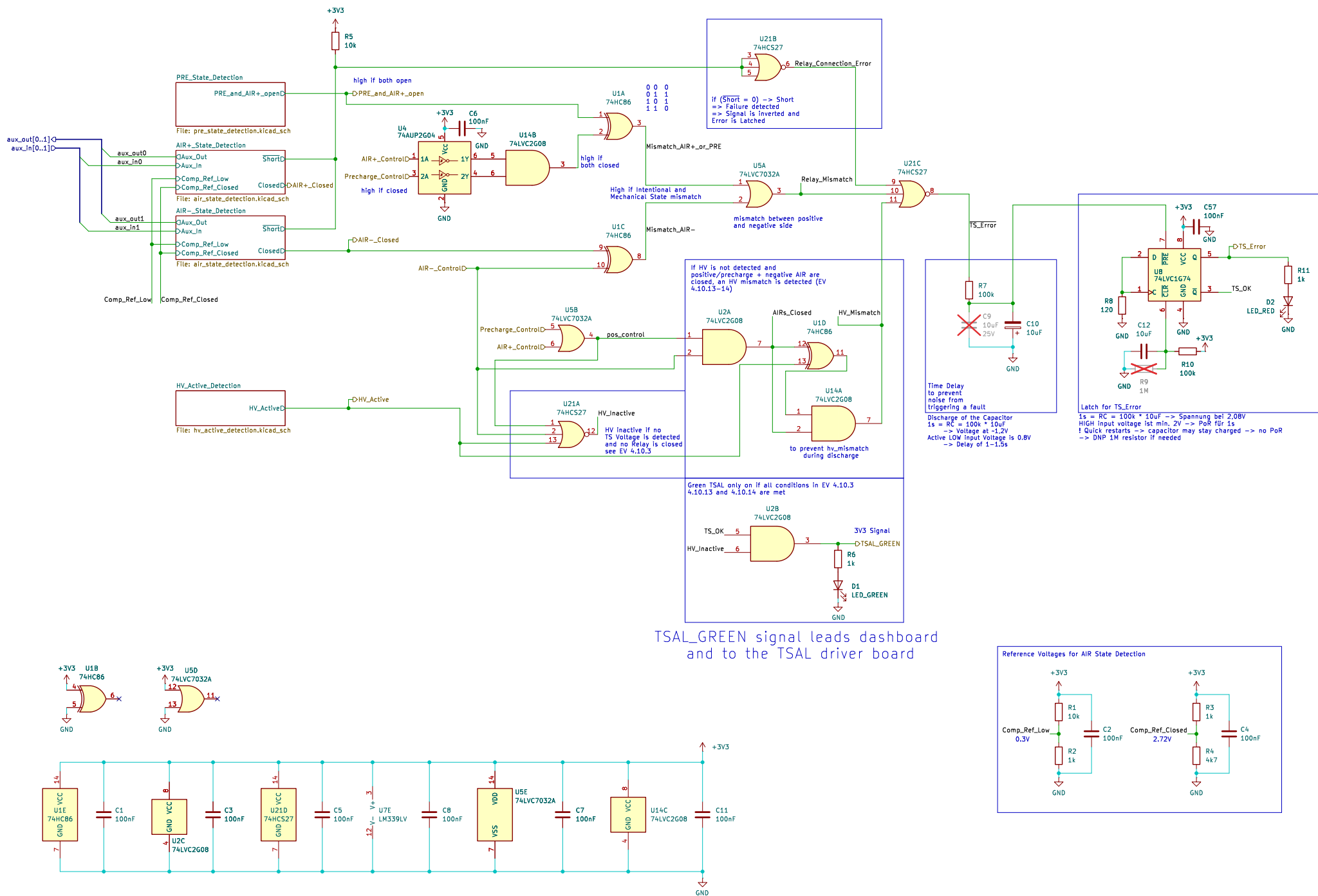
Date: 2025-03-09

Project: Master_FT25

Exp. Date: 2025-04-27

Author: Lene Marquardt

Size: A5 | Page: 10/15



FASTTUBE

Title: TSAL Logic

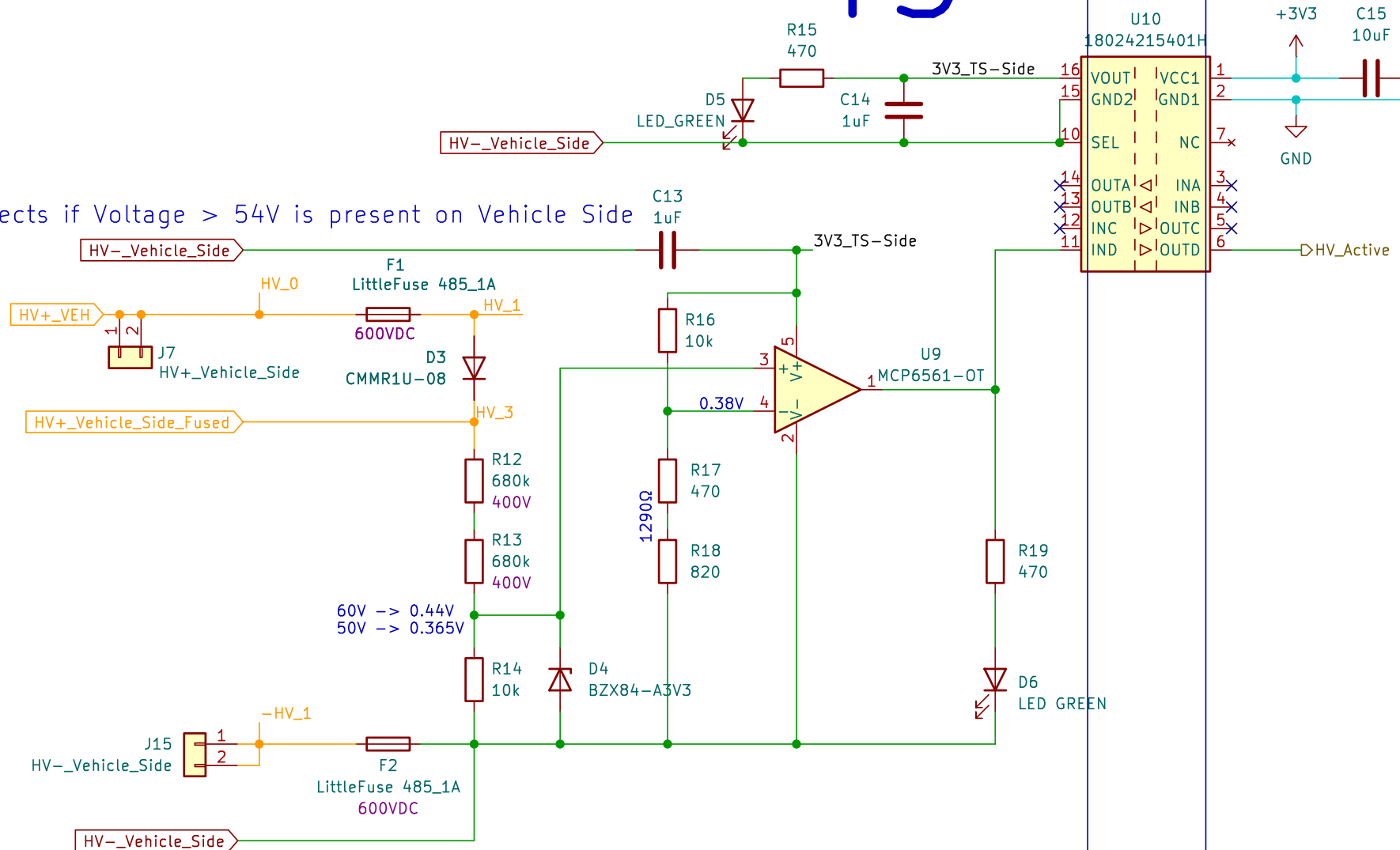
Project: Master_FT25
 Author: Lene Marquardt

Rev: V1
 Date: 2025-03-09
 Exp. Date: 2025-04-27
 Size: A3 | Page: 2/15

TS

LV

Detects if Voltage > 54V is present on Vehicle Side



FASTTUBE

Title: TSAL HV Detection

Rev: V1

Date: 2025-03-09

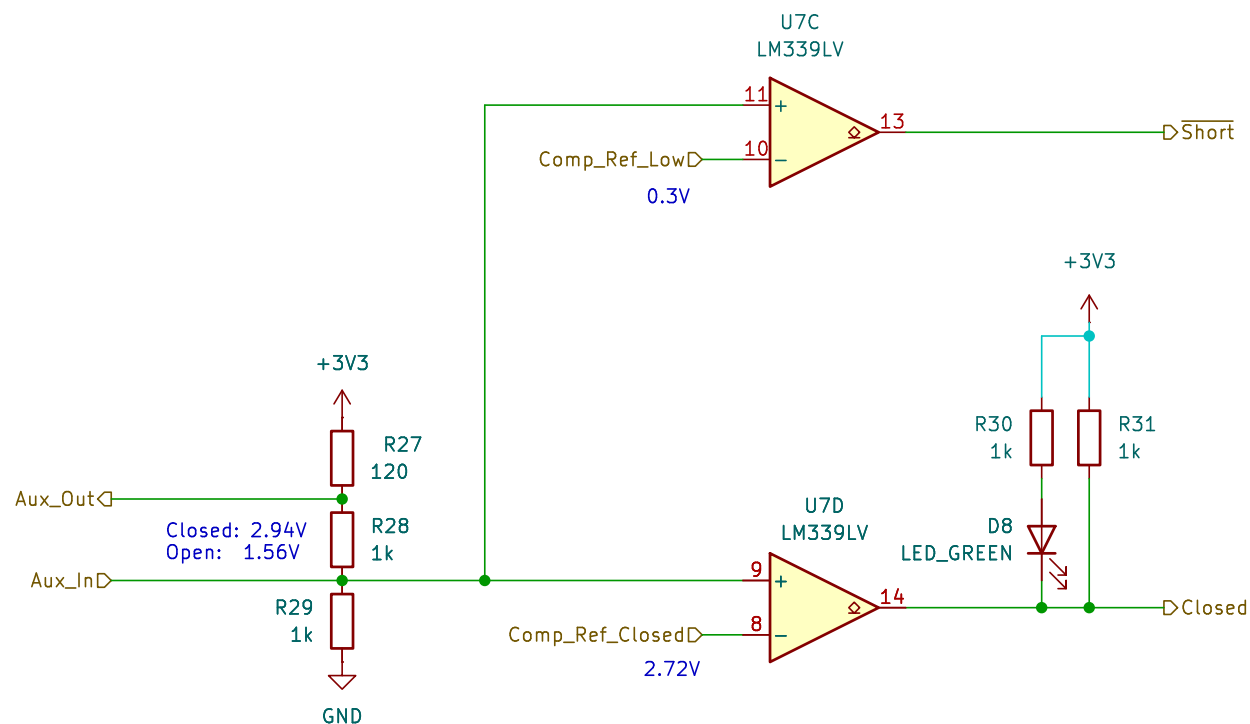
Project: Master_FT25

Exp. Date: 2025-04-27

Author: Lene Marquardt

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

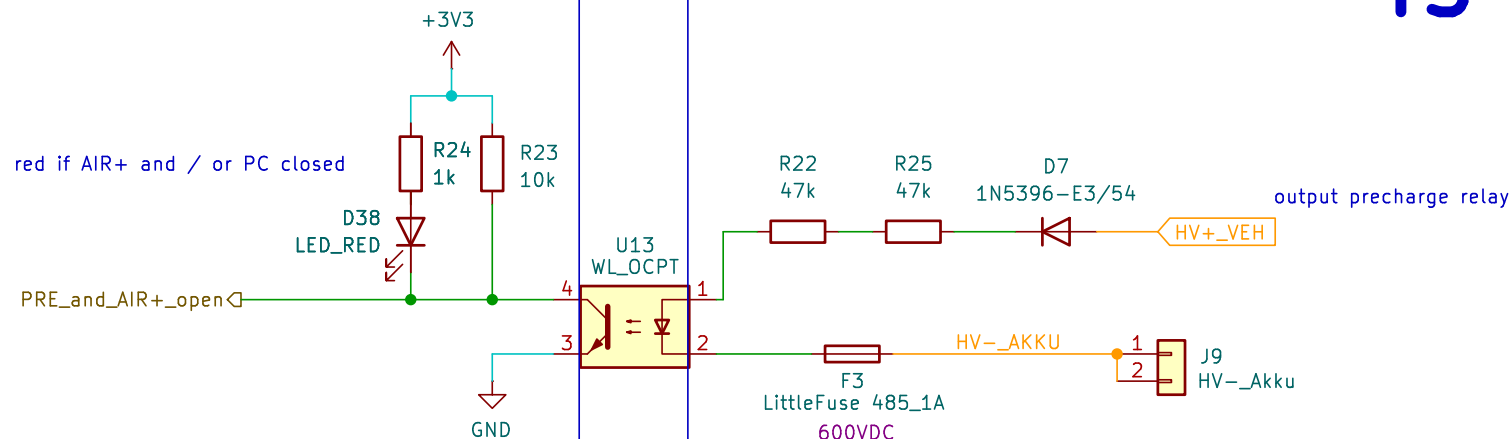
Exp. Date: 2025-04-27

Author: Lene Marquardt

Size: A5 **Page:** 4/15

LV

TS



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

FASTTUBE

Title: Precharge State Detection

Rev: V1

Date: 2025-03-09

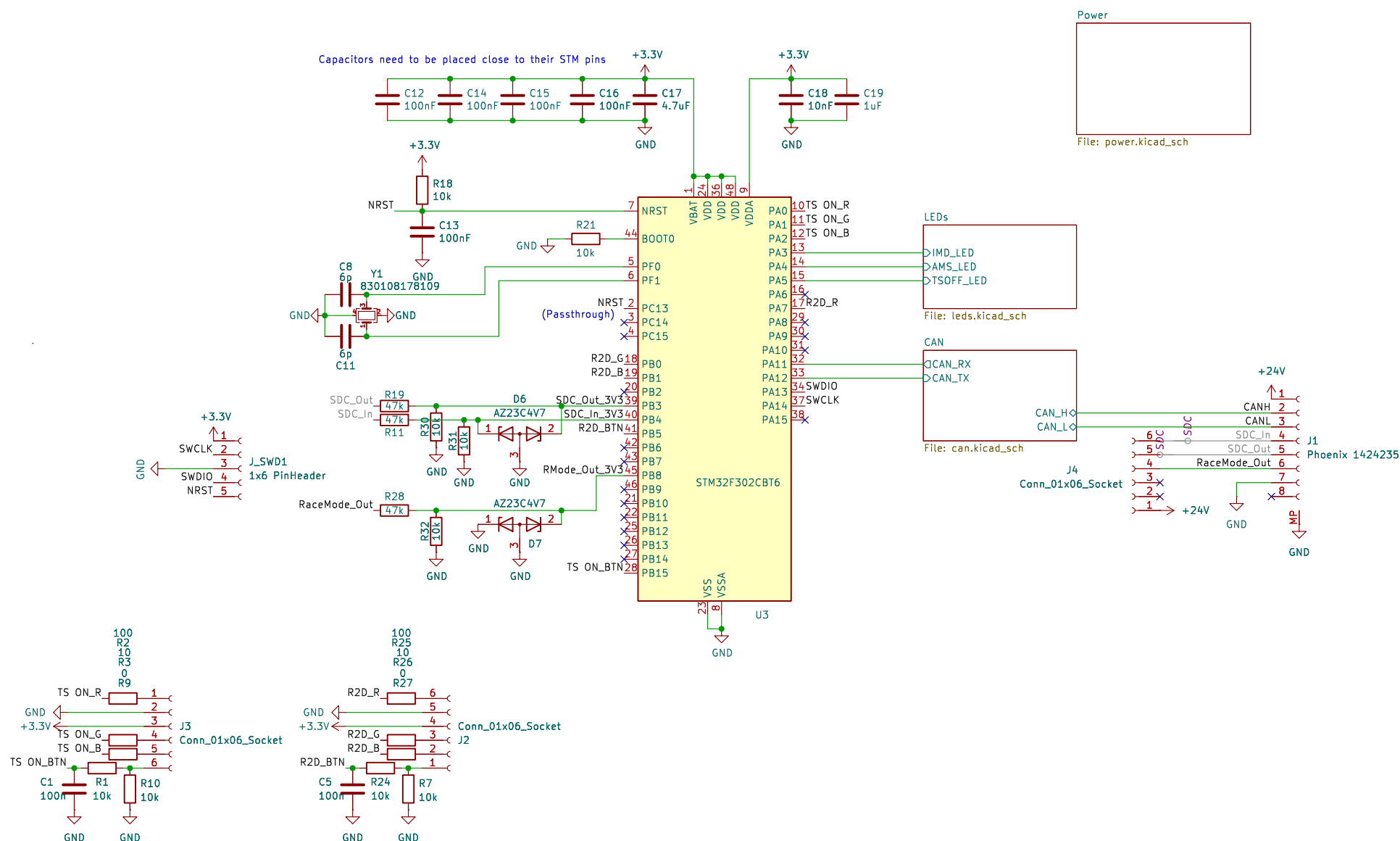
Project: Master_FT25

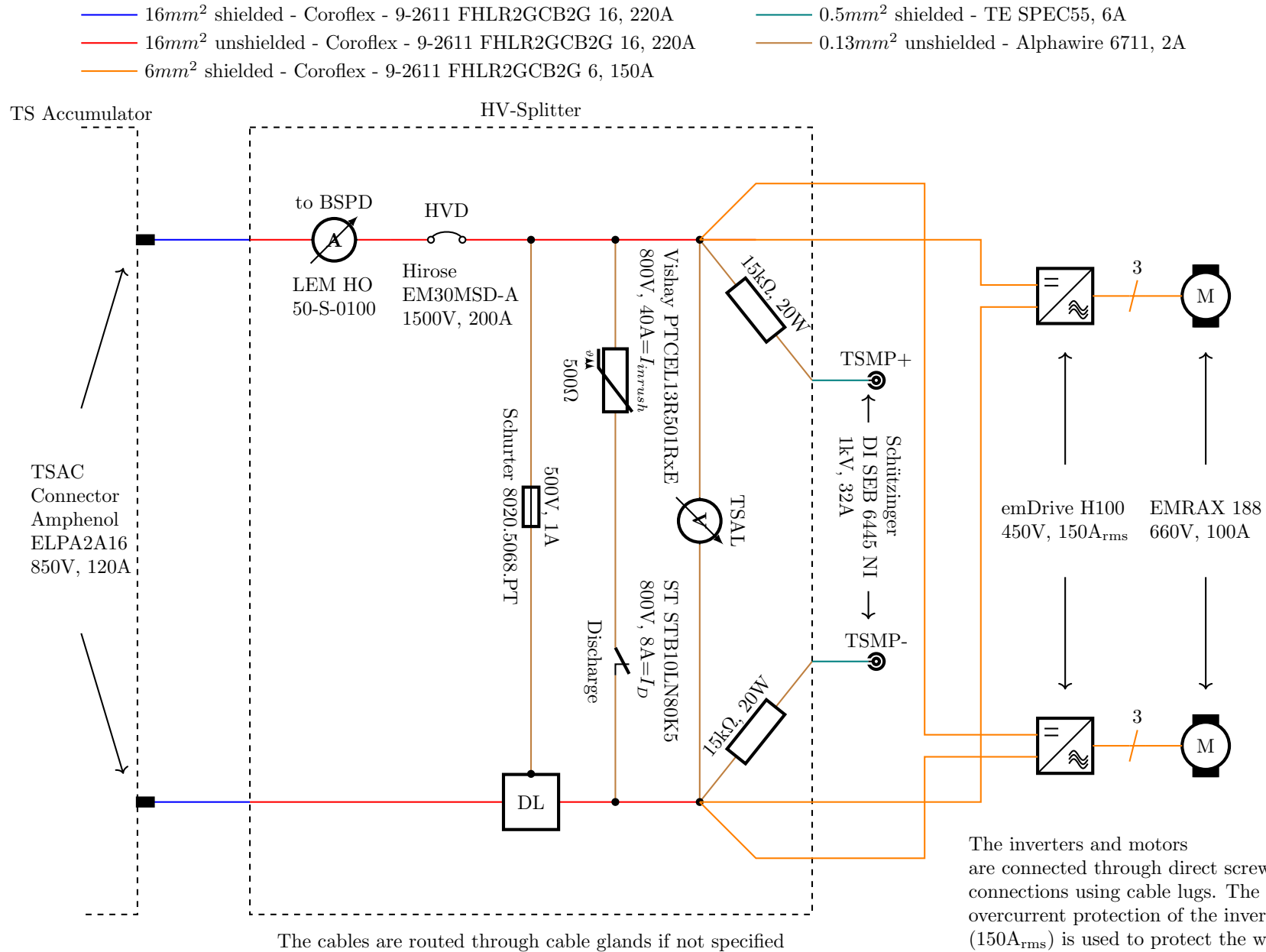
Exp. Date: 2025-04-27

Author: Lene Marquardt

Size: A5 | Page: 6/15

Dashboard





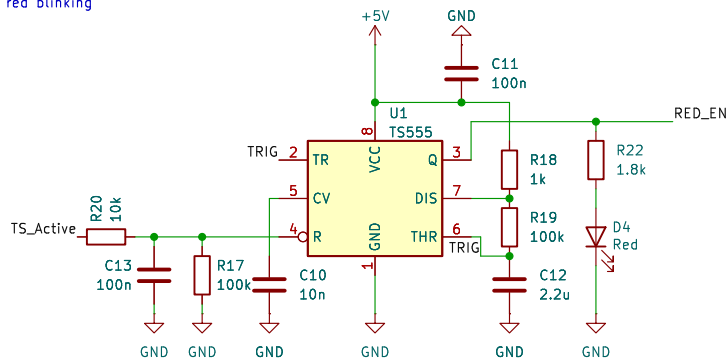
The inverters and motors are connected through direct screwed connections using cable lugs. The built-in overcurrent protection of the inverters (150A_{rms}) is used to protect the wires, which can handle a continuous current of 170A

TSAL driver board and DC-link voltage detection

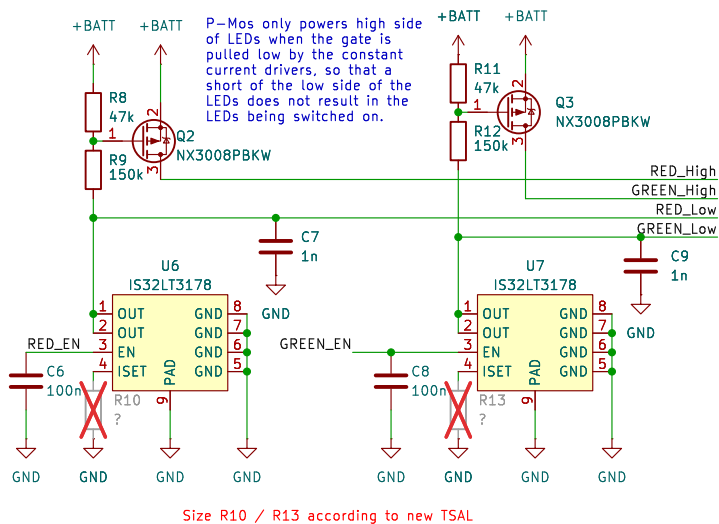
LV

TS

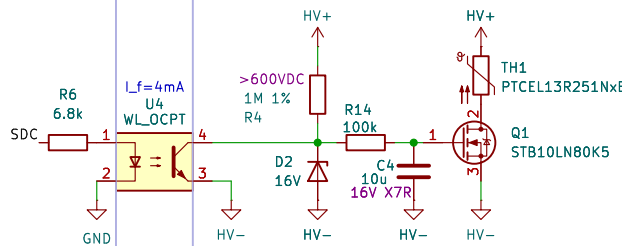
Timer for red blinking



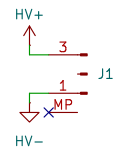
LED Drivers



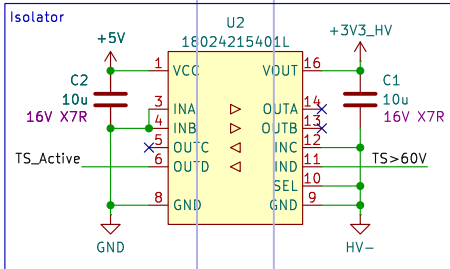
Discharge Circuit



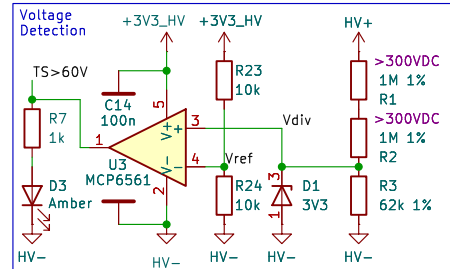
HV Connector



Isolator

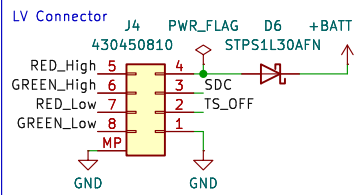


Voltage Detection

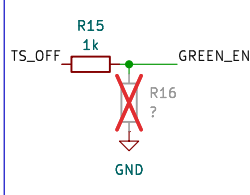


$$\begin{aligned} V_{ref_max} &= 3.47V \cdot 10.1k\Omega / (10.1k\Omega + 9.9k\Omega) = 1.76V \\ V_{div@60V_min} &= 60V \cdot 61.38\Omega / (2 \cdot 990k\Omega + 61.38k\Omega) = 1.8V \\ V_{hyst_max@75deg} &= 6mV < 40mV (1.80V - 1.76V) \end{aligned}$$

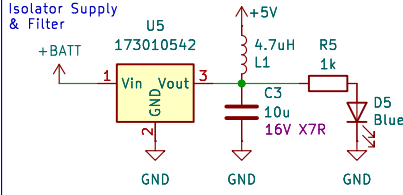
LV Connector



TS Off



Isolator Supply & Filter



FASTTUBE

Title: Discharge Circuit

Project: DC

Author: Karlsson Winkels

Rev: V1

Date: 2024-11-10

Exp. Date: 2025-04-27

Size: A4 Page: 1/1