

Delta-robot vision pick-and-place controller

11 sheets: this overview, then one sheet per function. Nets between sheets are global labels; power rails are power symbols.

5 V buck converter and more

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- 5 V buck converter
 - 5 V buck converter: support parts
 - OV5640 FPC 24 (J2)

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STM32H743VIT6 (U1, 2 of 2)

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CAN FD transceiver

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- CAN FD transceiver

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3.3 V buck converter and more

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- 3.3 V buck converter
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 - +1V5 supply: TLV75515P (U8)

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24 V input protection and more

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AMPSEAL 23 connector and more

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BOOT0 (J5) and more

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Stepper driver motor 2 and more

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STM32H743VIT6 (U1, 1 of 2)

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- STM32H743VIT6 (U1, 1 of 2): support parts
 - STM32H743VIT6 (U1, 1 of 2): decoupling

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E-stop switch for motor power

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- E-stop switch for motor power

File: board-e-stop-switch-for-motor-power.kicad_sch

Power tree
VIN_P
-> U5 TP54560B -> +5V
-> U6 TLV62569 -> +3V3
-> U8 TLV75515P -> +1V5
-> U7 ME6211C28 -> +2V8
-> FB1 600R@100MHz -> 2V8_A
-> FB2 600R@100MHz -> VDDA

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Sheet: Overview

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Sheet: /

File: board.kicad_sch

Title: Delta-robot vision pick-and-place controller

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Turns the 24 V supply into 5 V for the logic, the CAN transceiver and the next converter. TP554560B with the component values of TI's 5 V reference design (400 kHz, 15 μ H, 2 x 47 μ F); the 15 μ H inductor and compensation differ slightly from the 5 A example because this rail only carries about 0.5 A. Under-voltage lock-out divider R2/R3 starts the converter at about 6.5 V.



Plugs in the OV5640 camera module on the underside and makes its 2.8 V and 1.5 V supplies.
Pinout is the common 24-pin OV5640 DVP one (see README) – check it against your module.
The camera data D9..D2 go to the processor's DCMI D7..D0.
D9..D2 and the analog AVDD (through a ferrite bead) are 2.8 V. DVDD is 1.5 V.
The module sits flat under the board; keep the underside around it free (about 25 x 24 mm).



Sheet: /5 V buck converter and more/

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Title: Delta-robot vision pick-and-place controller

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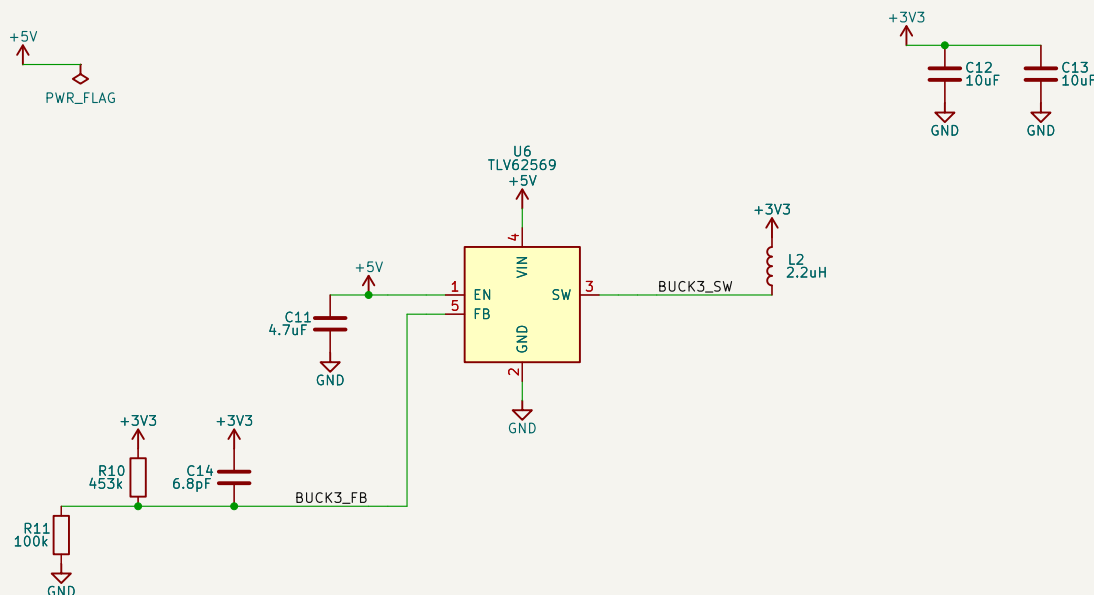
SIZE: A4	
KiCad E.D.A. 10.0.6	

Rev: 1

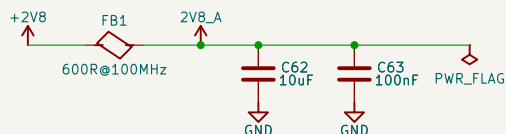
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3.3 V buck converter

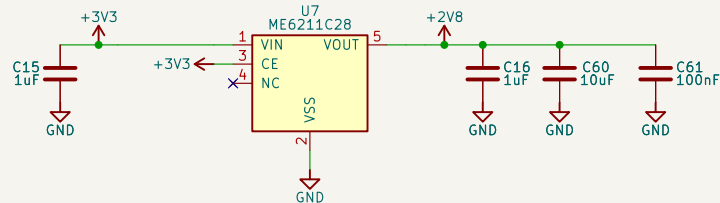
Makes the 3.3 V supply for the processor, the motor-driver logic and the camera regulators from the 5 V rail. TLV62569 with 2.2 uH and 2 x 10 uF; output 0.6 V x (1 + 453 k / 100 k) = 3.32 V.



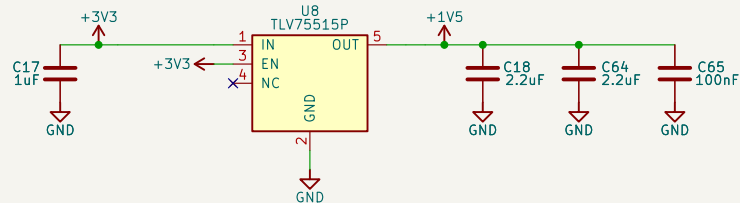
OV5640 FPC 24 (J2): decoupling



+2V8 supply: ME6211C28 (U7)



+1V5 supply: TLV75515P (U8)



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Sheet: 3.3 V buck converter and more

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Sheet: /3.3 V buck converter and more/

File: board-3-3-v-buck-converter-and-more.kicad_sch

Title: Delta-robot vision pick-and-place controller

Size: A4

Date: 2026-10-15

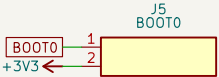
Rev: 1

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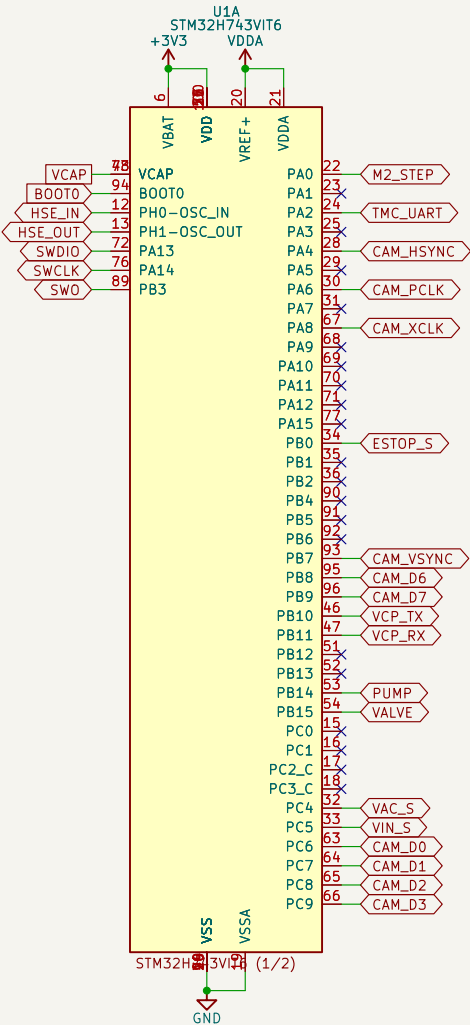
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BOOT0 (J5)

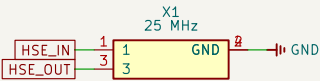
The brain. It reads the camera, finds the parts, steps the three motors and talks CAN.
25 MHz crystal (HSE); the same clock also leaves PA8 (MC01) as the camera clock CAM_XCLK.
BOOT0 has a 10 kOhm pull-down; fit the J5 jumper to start the ST ROM bootloader.
The 32.768 kHz crystal (LSE) is left out – it is optional.



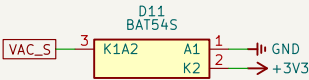
STM32H743VIT6 (U1, 1 of 2)



25 MHz (X1)



BAT54S (D11)



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Sheet: BOOT0 (J5) and more

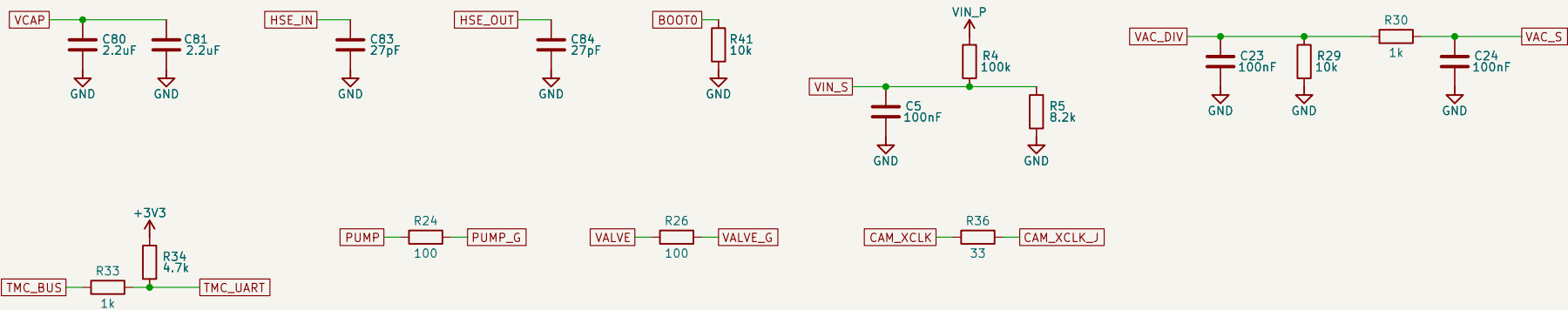
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Sheet: /BOOT0 (J5) and more/
File: board-boot0-j5-and-more.kicad_sch

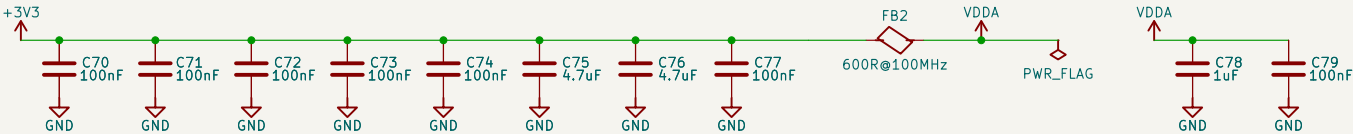
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STM32H743VIT6 (U1, 1 of 2): support parts



STM32H743VIT6 (U1, 1 of 2): decoupling



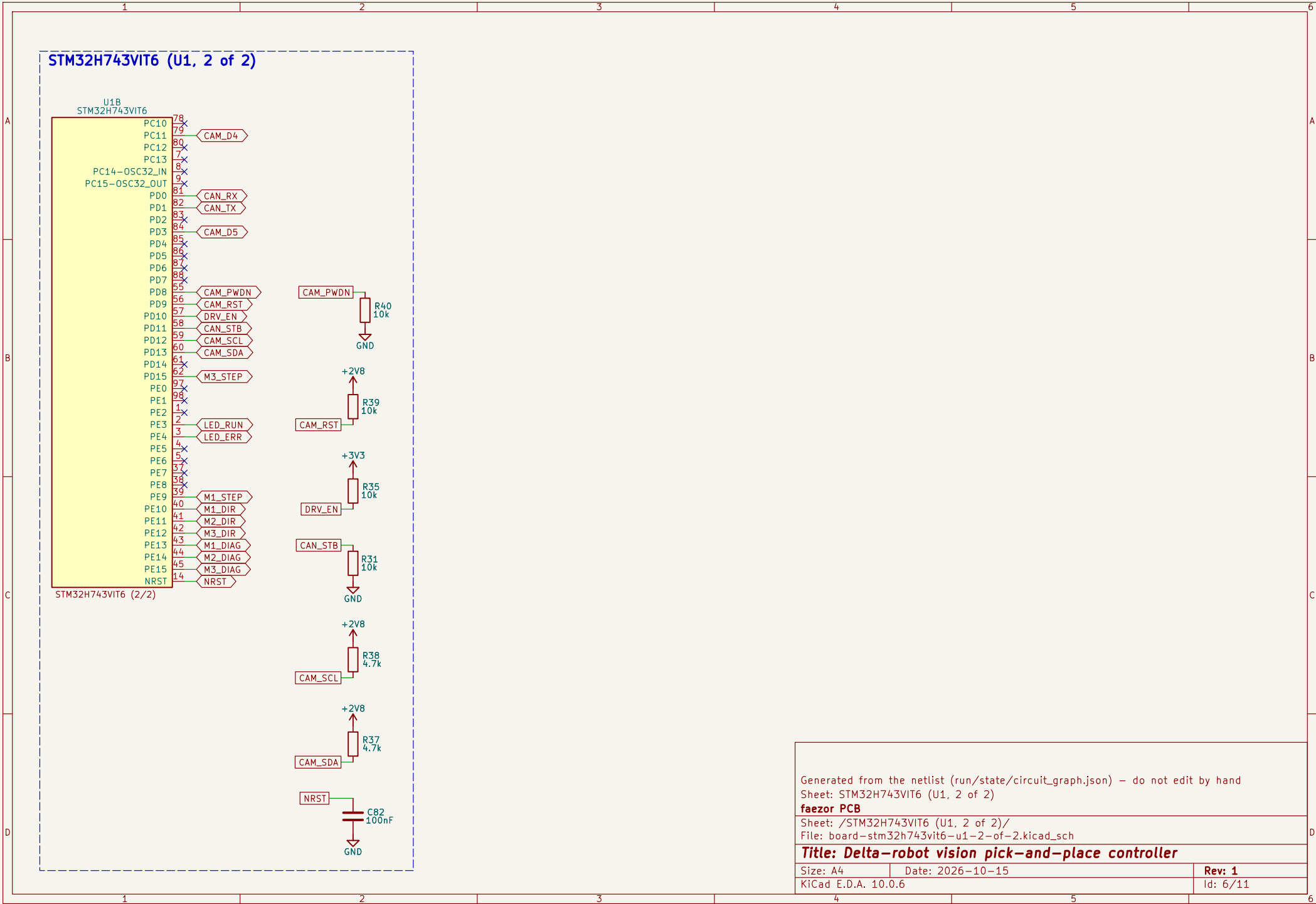
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Sheet: /STM32H743VIT6 (U1, 1 of 2)/
File: board-stm32h743vit6-u1-1-of-2.kicad_sch

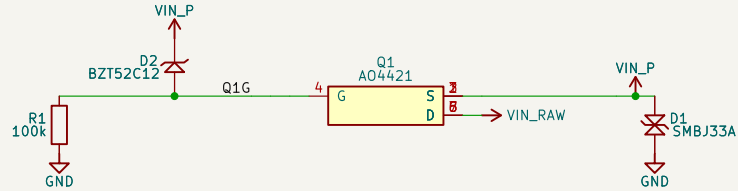
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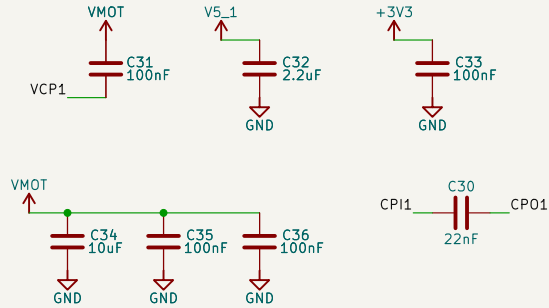


24 V input protection

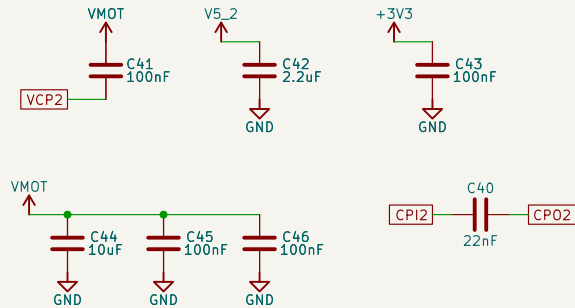
Stops a reversed supply from damaging the board and clamps voltage spikes from the 24 V line.
Q1 (AO4421, 60 V P-FET) blocks reverse polarity; its gate is held within 12 V by D2.
D1 (SMBJ33A TVS) clamps transients at about 53 V; everything behind it is rated 60 V or more.



Stepper driver motor 1: support parts

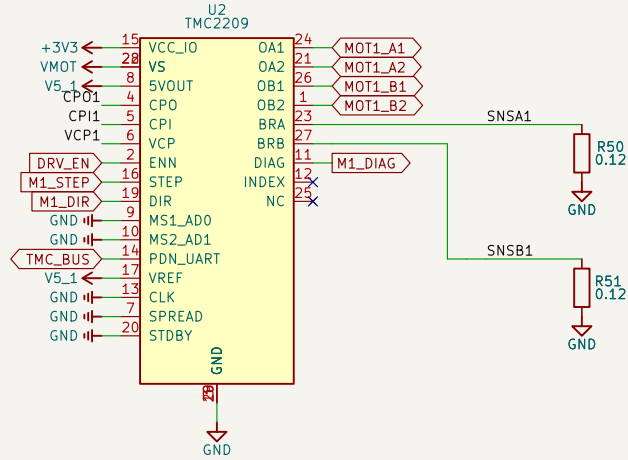


Stepper driver motor 2: support parts

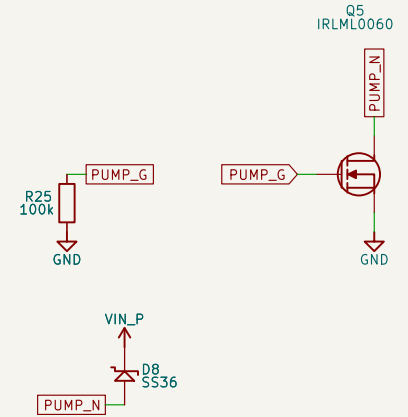


Stepper driver motor 1

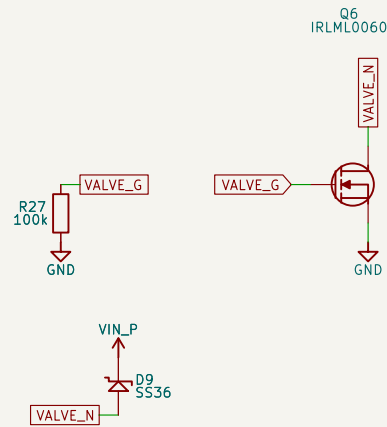
TMC2209 driver for motor 1. The processor sends step and direction pulses; settings go over the shared one-wire serial bus.
UART address 0 (MS1, MS2 low). Sense resistors 0.12 ohm give up to 1.64 A RMS at full scale; set IRUN in software (1.4 A RMS is the datasheet's continuous guideline).
DIAG (M1_DIAG) is the StallGuard output for sensorless homing.



IRLML0060 (Q5)



IRLML0060 (Q6)



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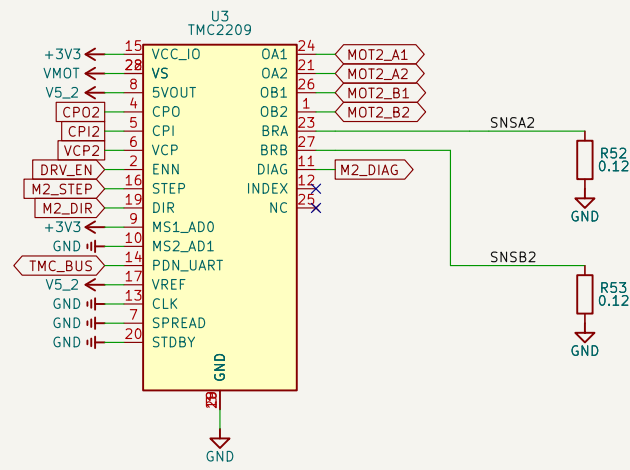
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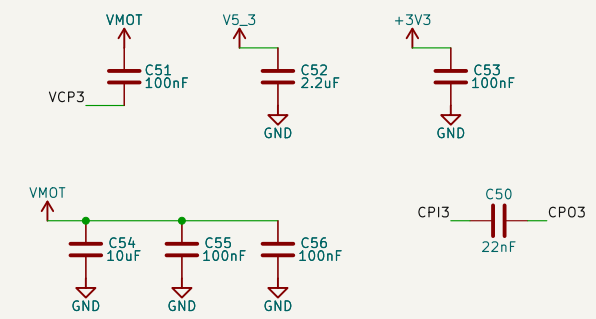
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Stepper driver motor 2

TMC2209 driver for motor 2, same circuit as motor 1.
UART address 1 (MS1 high, MS2 low).

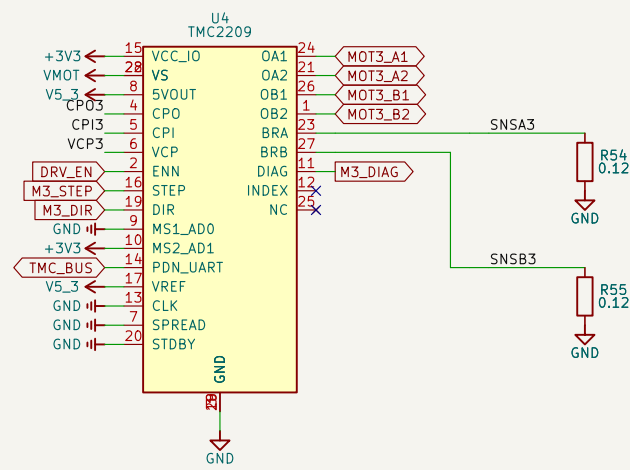


Stepper driver motor 3: support parts



Stepper driver motor 3

TMC2209 driver for motor 3, same circuit as motor 1.
UART address 2 (MS1 low, MS2 high). The three drivers share TMC_UART through a 1 kOhm resistor.



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Sheet: Stepper driver motor 2 and more

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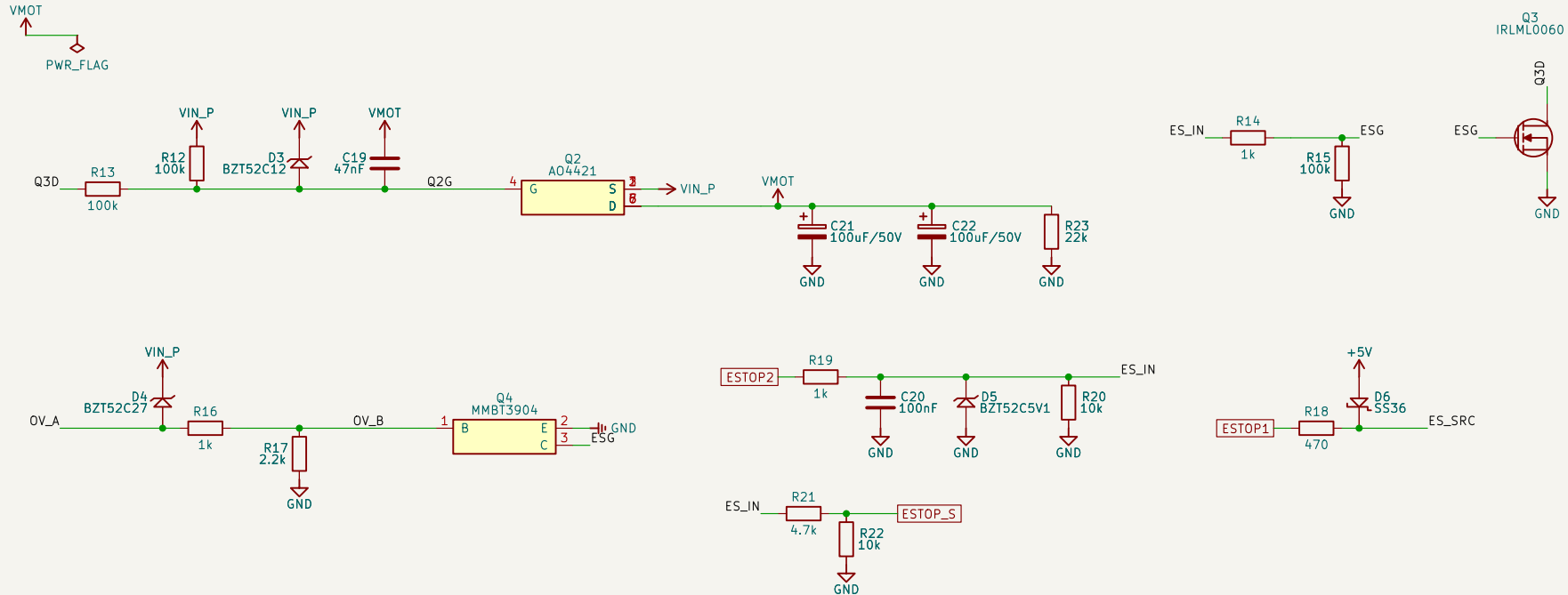
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File: board-stepper-driver-motor-2-and-more.kicad_sch

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E-stop switch for motor power

A switch in the motor power line that opens by itself, with no processor involved, when the E-stop loop is broken.
 The loop is 5 V through D6 and 470 ohm out of ESTOP1, back in on ESTOP2. When it closes, Q3 turns on Q2 (P-FET) slowly (about 10 ms, limits inrush into the two 100 uF capacitors).
 Over-voltage cut-off – D4 (27 V zener) and Q4 also open the switch when the supply is above about 26–29 V, because the TMC2209 is rated 29 V. Motors need 18 to about 26 V.
 The processor reads the loop on ESTOP_S.



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 Sheet: E-stop switch for motor power

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Sheet: /E-stop switch for motor power/
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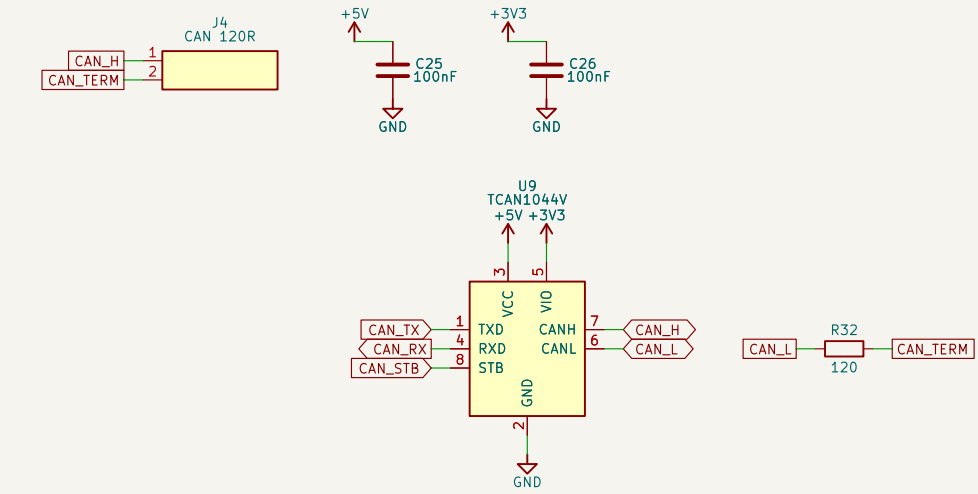
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CAN FD transceiver

Connects the controller to the cell's CAN bus with the PLC.
TCAN1044V on 5 V with 3.3 V logic. The 120 ohm bus termination (R32) is switched in by fitting the J4 jumper. D10 (PESD2CAN) protects the bus pins against static.



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Sheet: CAN FD transceiver

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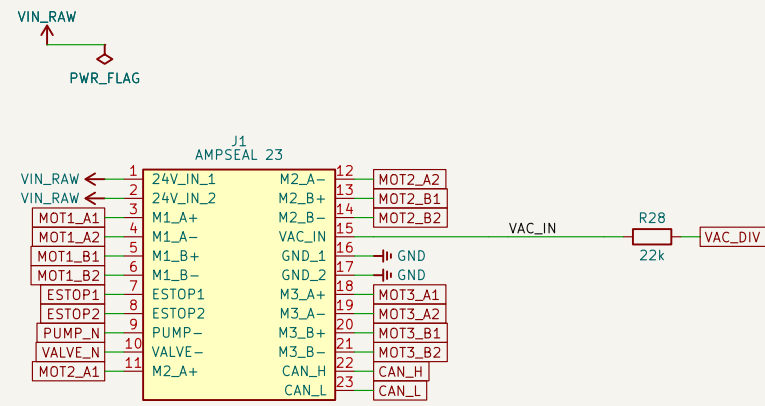
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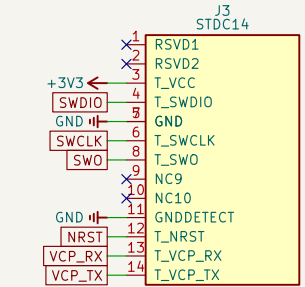
AMPSEAL 23 connector

The one sealed plug-in connector of the controller. Power, the three motors, pump, valve, E-stop, CAN and the vacuum sensor all go through it.
Pins (face view of the header): 1–2 24 V IN, 3–6 motor 1 (A+ A– B+ B–), 7 ESTOP1, 8 ESTOP2, 9 PUMP–, 10 VALVE–, 11–14 motor 2, 15 VAC_IN (0–10 V), 16–17 GND, 18–21 motor 3, 22 CAN_H, 23 CAN_L.
TE 776087–1 right-angle header; its body covers the top side up to about 19 mm from the edge, so nothing tall sits there.

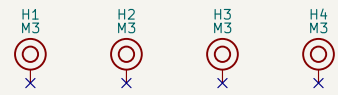


Debug connector STDC14

Plug for an ST-LINK probe inside the housing – programming, debugging trace and a serial console.
Pins: 4 SWDIO, 6 SWCLK, 8 SWO, 12 NRST, 13 VCP_RX (to PB11), 14 VCP_TX (from PB10, USART3), 3 target voltage, 5/7/11 GND.



Mounting holes



Status lights

Green RUN and red ERROR lights driven by the processor.
About 1.4 mA (green) and 4 mA (red) from the 3.3 V pins through 330 ohm.



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