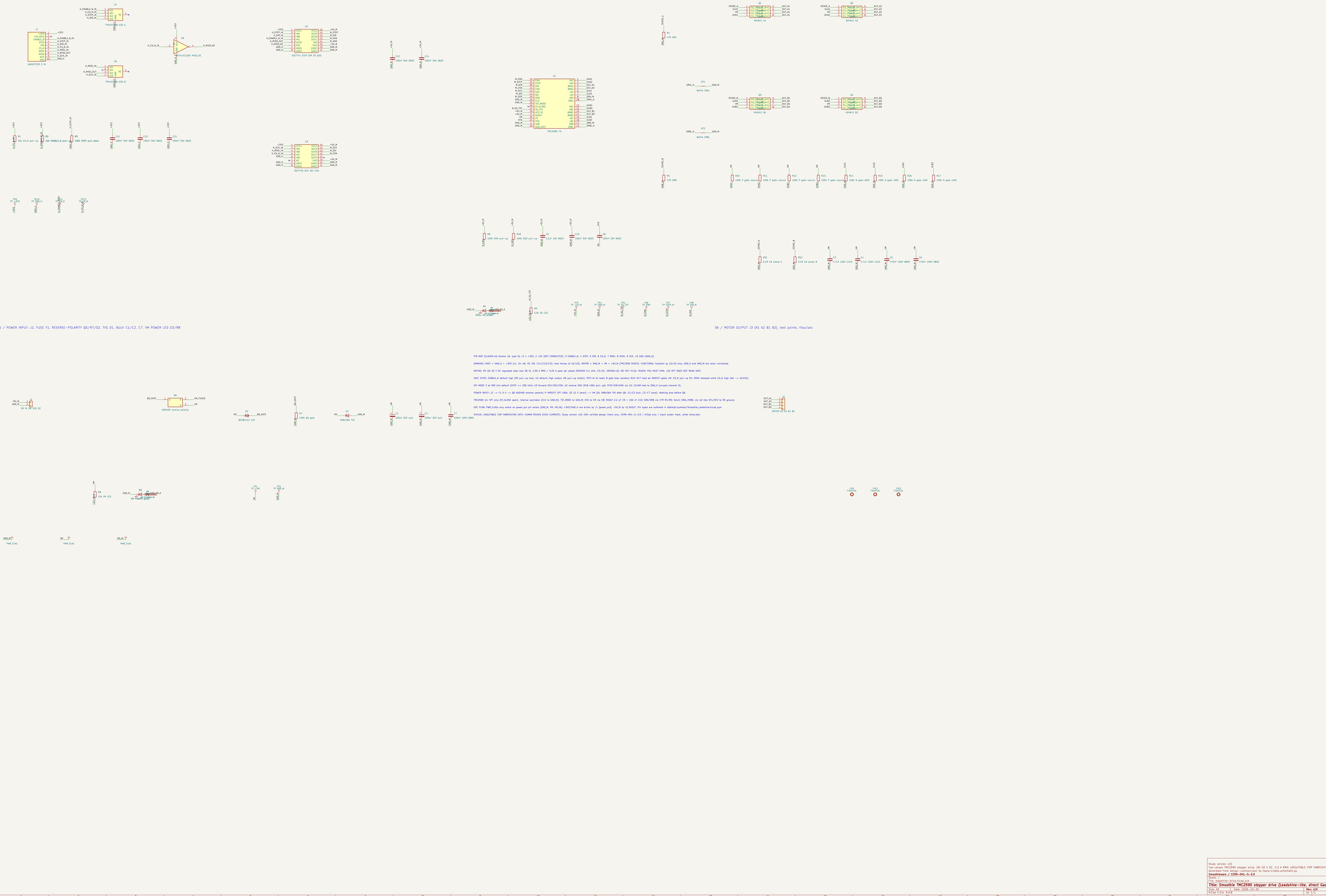
01 / HOST DOMAIN (GND_H, +3V3): GADGETEER S SOCKET J1, ESD CLAMPS U4/U5, MISO ENABLE INVERTER U6, PULL-UPS R1–R3, DECOUPLING C11/C13/C1502 / ISOLATION BARRIER: U2 ISO7741 (STEP, DIR, ENABLE_N forward; SDO reverse) and U3 ISO7740 (SCK, SDI, CSN) + C12/C14

03 / TMC2590 DRIVER U1 AND SUPPORT (R4/R5 sense filter, NT1/NT2 Kelvin ties, SVOUT/VHS caps, ENN/SDO pulls, SG LED)

04 / BRIDGES A AND B: AO4611 Q1–Q4, SENSE RESISTORS RS1/RS2, GATE BIAS R10–R17, BRIDGE SUPPLY CAPS C3–C6

05 / POWER INPUT: J2, FUSE F1, REVERSE-POLARITY Q5/R7/D2, TVS D1, BULK C1/C2, C7, VM POWER LED D3/R8

06 / MOTOR OUTPUT J3 (A1 A2 B1 B2), test points, fiducials



PIN MAP (CLAUDE.md Version 16, type S): J1 1 +3V3, 2 +5V (NOT CONNECTED), 3 ENABLE_N, 4 STEP, 5 DIR, 6 CS_N, 7 MOSI, 8 MISO, 9 SCK, 10 GND (GND_H).

DOMAINS: HOST = GND_H + +3V3 (J1, U4–U6, R1–R3, C11/C13/C15, host halves of U2/U3). MOTOR = GND_M + VM + +5V_M (TMC2590 SVOUT). FUNCTIONAL isolation by U2/U3 only; GND_H and GND_M are never connected.

RATING: VM 18–32 V DC regulated (abs max 36 V), 2.30 A RMS / 3.25 A peak per phase (RSENSE 0.1 ohm, CS=31, VSENSE=0). NO HOT-PLUG. REGEN: PSU MUST SINK, LED OFF DOES NOT MEAN SAFE.

SAFE STATE: ENABLE_N default high (R2 pull-up host, U2 default-high output, R6 pull-up motor): TOFF=0 at reset: B gate bias resistors R10–R17 hold all MOSFET gates off; CS_N pull-up R1; MISO released while CS_N high (U6 --> U2.EN1).

SPI MODE 3 at 500 kHz default (STEP <= 200 kHz): U3 forward SCK/SDI/CSN, U2 reverse SDO (R1B 100k pull-up); STEP/DIR/ENN via U2: U3.IN3 tied to GND_H (unused channel 3).

POWER INPUT: J2 --> F1 5 A --> Q5 AO3409 reverse-polarity P-MOSFET (RT 100k, D2 12 V zener) --> VM (D1 SMBJ36A TVS after Q5, C1/C2 bulk, C3–C7 local). Nothing else before Q5.

TMC2590 U1: SPI only (ST_ALONE open). Internal oscillator (CLK to GND_M). TST_MODE to GND_M. VHS to VM via CB: SVOUT 2.2 uF C9 + 100 nF C10: SPA/SPB via 47R R4/R5: Kelvin SRAL/SRBL via net ties NT1/NT2 to RS ground.

ERC PLAN: PWR_FLAGs only where no power_out pin exists (GND_M, VM, VM_IN): +3V3/GND_H are driven by J1 (power_out). +5V_M by U1.SVOUT. Pin types are authored in attempt/symbols/Smoothie_Leadshine.kicad_sym.

STATUS: UNSUITABLE FOR FABRICATION UNTIL HUMAN REVIEW (HIGH CURRENT). Study version v10: CAD-verified design intent only. CERN-OHL-S-2.0 | KiCad only | black solder mask, white silkscreen.

Study version v10
Two-phase TMC2590 stepper drive, 18–32 V DC, 2.3 A RMS: UNSUITABLE FOR FABRICATION UNTIL HUM
Generated from design-control.json by tools/create_schematic.py
Smoothieware / CERN-OHL-S-2.0
Sheet: /
File: leadshine-drive.kicad_sch

Title: Smoothie TMC2590 stepper drive (Leadshine-like, direct Gadgeteer S)

Size: A0	Date: 2026-10-01	Rev: v10
KiCad 8.0.4, 9.0.8		Id: 1/1