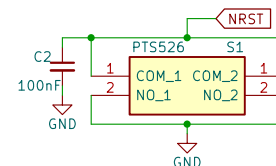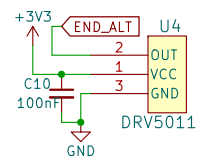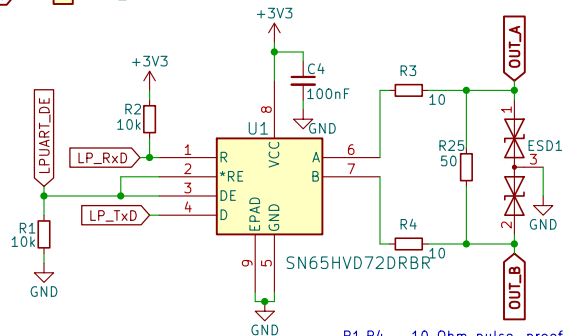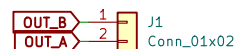# Post-debugging notes:

– Hall effect latches are used, which means the HIGH signal holds until the sensor senses a source of magnetic flux with the opposite direction. Find a "switch" instead (Texas Instruments have those too).
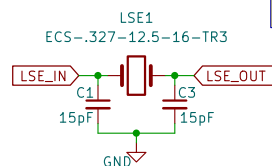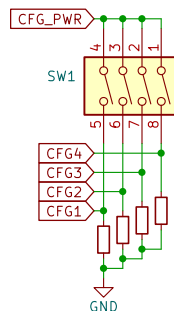
– The encoders are open-drain output and the MCU's internal pull-up resistors might be too large for higher speeds, add external circuitry to accomodate this if needed.

– All connection pads and header pins should be replaced with JST connectors for assembly convenience and reliability.

– Encoder input pins on the MCU are selected incorrectly. Either rewire the encoders accordingly, or fix the circuit and reroute the pins. Consult STM32CubeIDE's setup GUI to configure proper pinout.
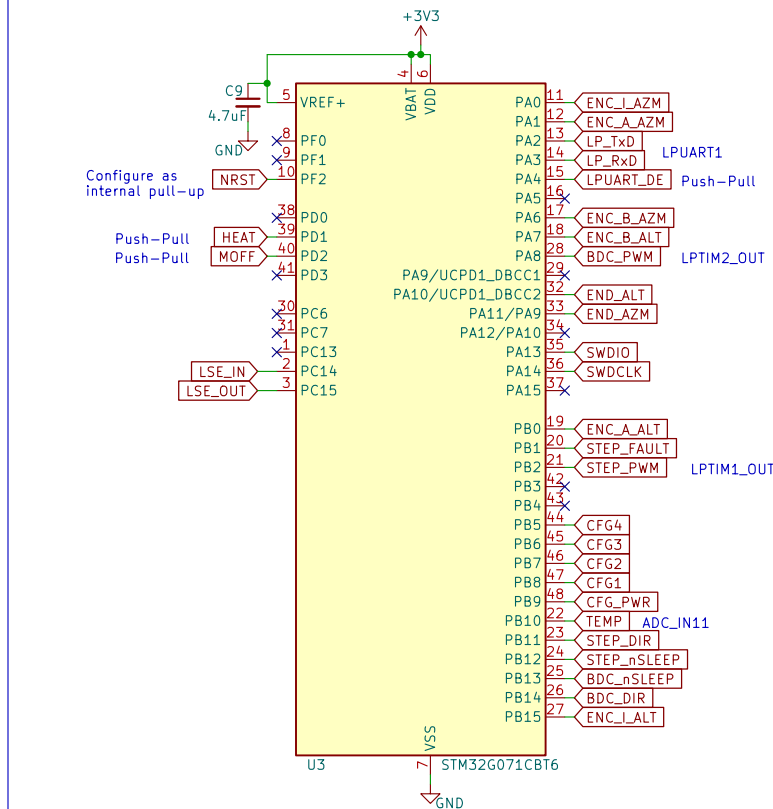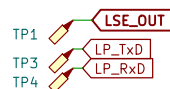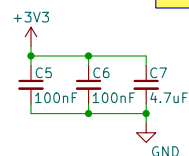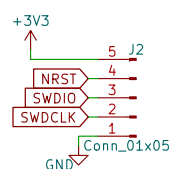
Homing

+3V3 END_AZM U2
C8 100nF OUT / VCC / GND
DRV5011
GND

+3V3 END_ALT U4
C10 100nF OUT / VCC / GND
DRV5011
GND

MCU reset

NRST
C2 100nF PTS526 S1
COM_1 COM_2
NO_1 NO_2
GND
GND

POWER & MOTORS

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OUT_B OUT_A J1 2 1 Conn_01x02

Communication protocol: RS-485 with ESD protection.

+3V3 C4 100nF GND
R3 10 OUT_A
R25 50 ESD1
R4 10 OUT_B GND
LPUART_DE
+3V3
R2 10k
U1 R / *RE / DE / D VCC / A / B / EPAD / GND
SN65HVD72DRBR
LP_RxD
LP_TxD
R1 10k GND
GND
R1,R4 – 10 Ohm pulse-proof thickfilm resistors w low error

Configuration switch

CFG_PWR
SW1
CFG4 / CFG3 / CFG2 / CFG1
GND

+3V3 C9 4.7uF GND NRST
VREF+ VBAT VDD +3V3
PA0 11 ENC_I_AZM
PA1 12 ENC_A_AZM
PA2 13 LP_TxD
PA3 14 LP_RxD LPUART1
PA4 15 LPUART_DE Push-Pull
PA5 16
PF0 8
PF1 9
PF2 10
PA6 17 ENC_B_AZM
PA7 18 ENC_B_ALT
PA8 28 BDC_PWM LPTIM2_OUT
PD0 38
PD1 39 HEAT
PD2 40 MOFF
PD3 41
PA9/UCPD1_DBCC1 29
PA10/UCPD1_DBCC2 32 END_ALT
PA11/PA9 33 END_AZM
PA12/PA10 34
PC6 30
PC7 31
PA13 35 SWDIO
PA14 36 SWDCLK
PC13 1
PC14 2 LSE_IN
PC15 3 LSE_OUT
PA15
PB0 19 ENC_A_ALT
PB1 20 STEP_FAULT
PB2 21 STEP_PWM LPTIM1_OUT
PB3 42
PB4 43
PB5 44 CFG4
PB6 45 CFG3
PB7 46 CFG2
PB8 47 CFG1
PB9 48 CFG_PWR
PB10 22 TEMP ADC_IN11
PB11 23 STEP_DIR
PB12 24 STEP_nSLEEP
PB13 25 BDC_nSLEEP
PB14 26 BDC_DIR
PB15 27 ENC_I_ALT
VSS 7
U3 STM32G071CBT6
GND

Configure as internal pull-up

Push-Pull
Push-Pull

LSE only needed for low speed USART comm.

LSE1 ECS-.327-12.5-16-TR3
LSE_IN C1 15pF C3 15pF LSE_OUT
GND

Encoders

+3V3 ENC_B_ALT
0705430109 ENC_A_ALT
ENC_I_ALT
J4 GND

+3V3 ENC_B_AZM
0705430109 ENC_A_AZM
ENC_I_AZM
J3 GND

Single Wire Debug pins

+3V3 5 J2
NRST 4
SWDIO 3
SWDCLK 2
1
Conn_01x05
GND

Decoupling

+3V3
C5 100nF C6 100nF C7 4.7uF
GND

TESTPADS

TP1 LSE_OUT
TP3 LP_TxD
TP4 LP_RxD
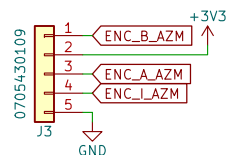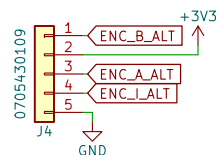
Sheet: /
File: PEEKbot_APS.kicad_sch
Title:
Size: USLetter   Date: Rev:
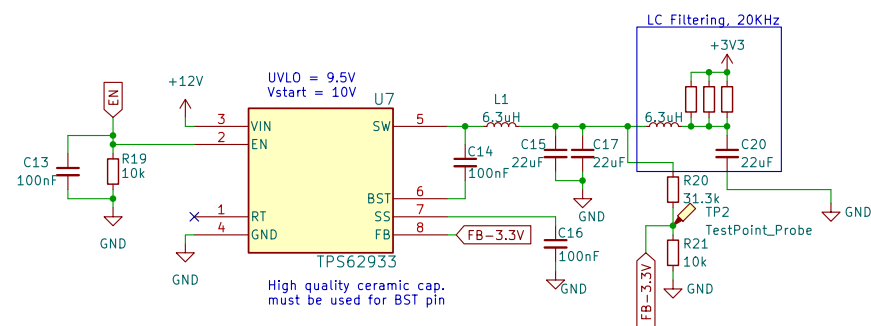KiCad E.D.A. 8.0.1-rc1   Id: 1/2

Temp. Switch disables the MCU below −40C and activates the internal PCB heating element. Resettable fuse maxes out at 0.5A (6W @ 12V)
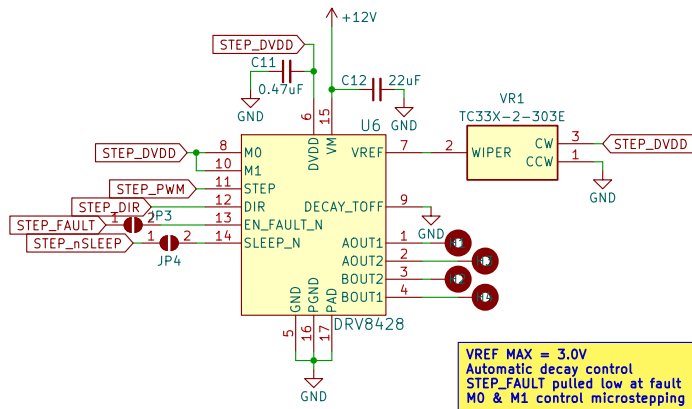
When VTEMP outputs high at temperature threshold, set MOFF to low. This stops shorting the OUT signal to ground and sends a high signal to Q7 which inverts the signal to a low for EN thereby shutting down all 3V3 lines.

LC Filtering, 20KHz

+12V

U5
VTEMP
TSET
HYSTSET
V+
*OUT
GND
TMP300

30k
R9
10k
R10
GND
GND
TEMP
R11
31.3k
GND
GND

+12V
R12
10k
GND

+12V
R16
10k
EN
Q3
2N7002LT3G
GND

MOFF
R14
10k
R15
10k
Q2
2N7002LT3G
GND

HEAT
R17
10k
R18
10k
Q4
2N7002LT3G
GND

+12V
Heating trace
R13
Q1
2N7002LT3G
GND

VCC F1
Fuse
+12V
J5
Conn_01x02
GND
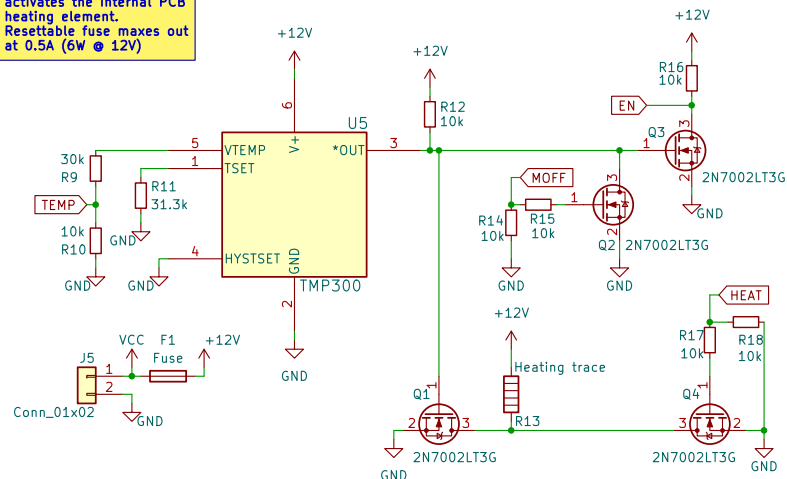
Power converted and filtered: 12V −> 3.3V Undervoltage protection set below 9.5V

UVLO = 9.5V
Vstart = 10V
U7
+12V
EN
C13
100nF
R19
10k
GND
VIN
EN
RT
GND
SW
BST
SS
FB
TPS62933

High quality ceramic cap. must be used for BST pin

L1
6.3µH
C14
100nF
C15
22uF
C17
22uF
GND
C16
100nF
GND
FB−3.3V
R20
31.3k
R21
10k
FB−3.3V
GND
TP2
TestPoint_Probe
+3V3
6.3µH
C20
22uF
GND

Stepper driver

+12V
STEP_DVDD
C11
0.47uF
GND
C12
22uF
GND
U6
M0
M1
STEP
DIR
EN_FAULT_N
SLEEP_N
DVDD
VM
VREF
DECAY_TOFF
AOUT1
AOUT2
BOUT2
BOUT1
PGND
GND
PAD
DRV8428
STEP_DVDD
STEP_PWM
JP3
STEP_DIR
STEP_FAULT
STEP_nSLEEP
JP4
GND
GND
VR1
TC33X−2−303E
WIPER
CW
CCW
STEP_DVDD
GND
GND
AOUT1
AOUT2
BOUT2
BOUT1

VREF MAX = 3.0V Automatic decay control STEP_FAULT pulled low at fault M0 & M1 control microstepping

Table 7-2. Microstepping Settings
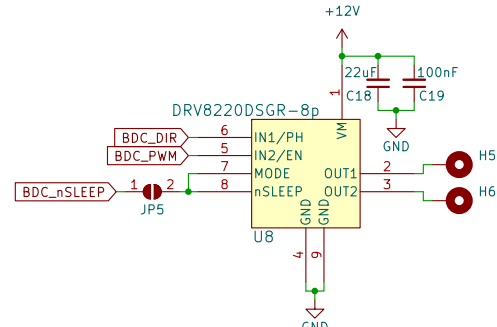
M0	M1	STEP MODE
0	0	Full step (2-phase excitation) with 100% current
0	330 kΩ to GND	Full step (2-phase excitation) with 71% current
1	0	Non-circular 1/2 step
Hi-Z	0	1/2 step
0	1	1/4 step
1	1	1/8 step

Table 7-2. Microstepping Settings (continued)

M0	M1	STEP MODE
Hi-Z	1	1/16 step
0	Hi-Z	1/32 step
Hi-Z	330 kΩ to GND	1/64 step
Hi-Z	Hi-Z	1/128 step
1	Hi-Z	1/256 step

Configured for 1/8 microstepping mode

BDC driver

+12V
C18
22uF
C19
100nF
GND
DRV8220DSGR−8p
BDC_DIR
BDC_PWM
BDC_nSLEEP
JP5
IN1/PH
IN2/EN
MODE
nSLEEP
VM
OUT1
OUT2
GND
GND
U8
H5
H6
GND

POWER & MOTOR DRIVERS

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KiCad E.D.A. 8.0.1−rc1

Rev:
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