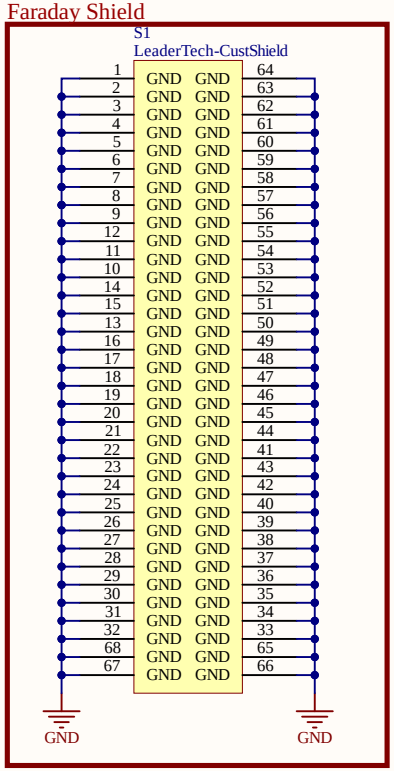
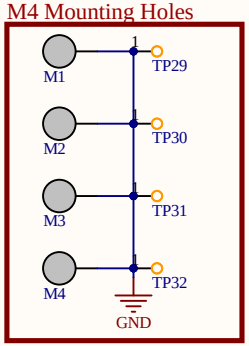
Faraday Shield

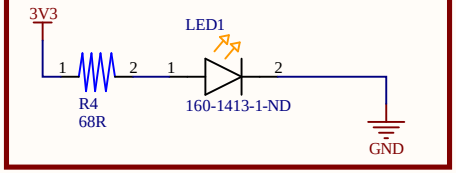


M4 Mounting Holes

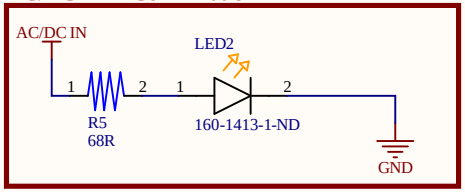


Title: Connectors & Shield		
Size: A4	Number:	Revision: V1
Date: 2-05-2024	Sheet 1 of 9	
File: C:\Users\..\RoBeast_Mounting_Shield.SchDoc	Drawn By: VM & IG	

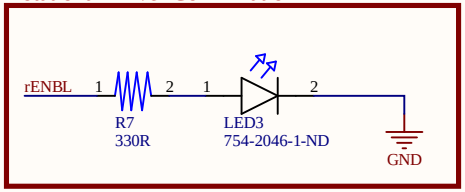
3V3 LED Confirmation



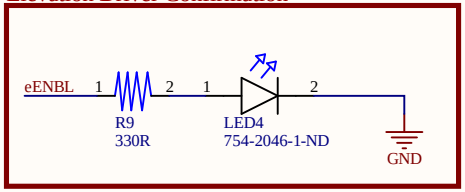
AC/DC LED Confirmation



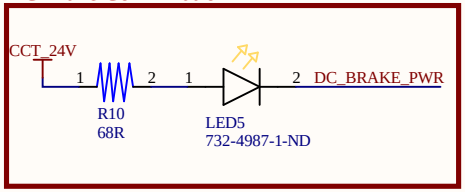
Rotational Driver Confirmation



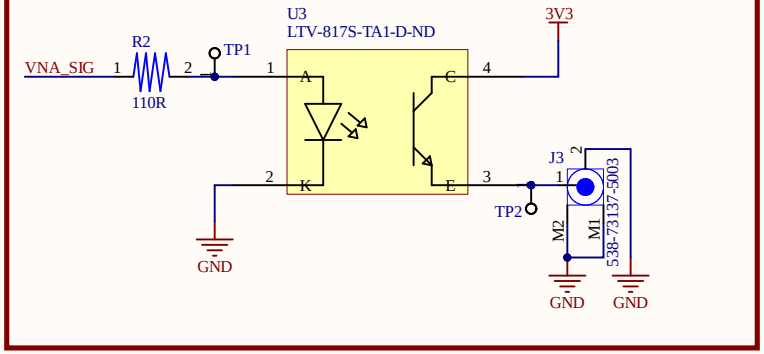
Elevation Driver Confirmation



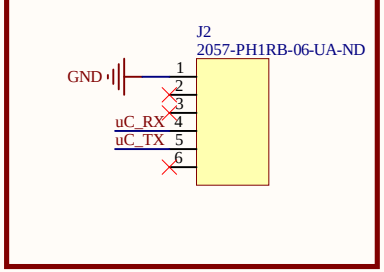
DC Brake Confirmation



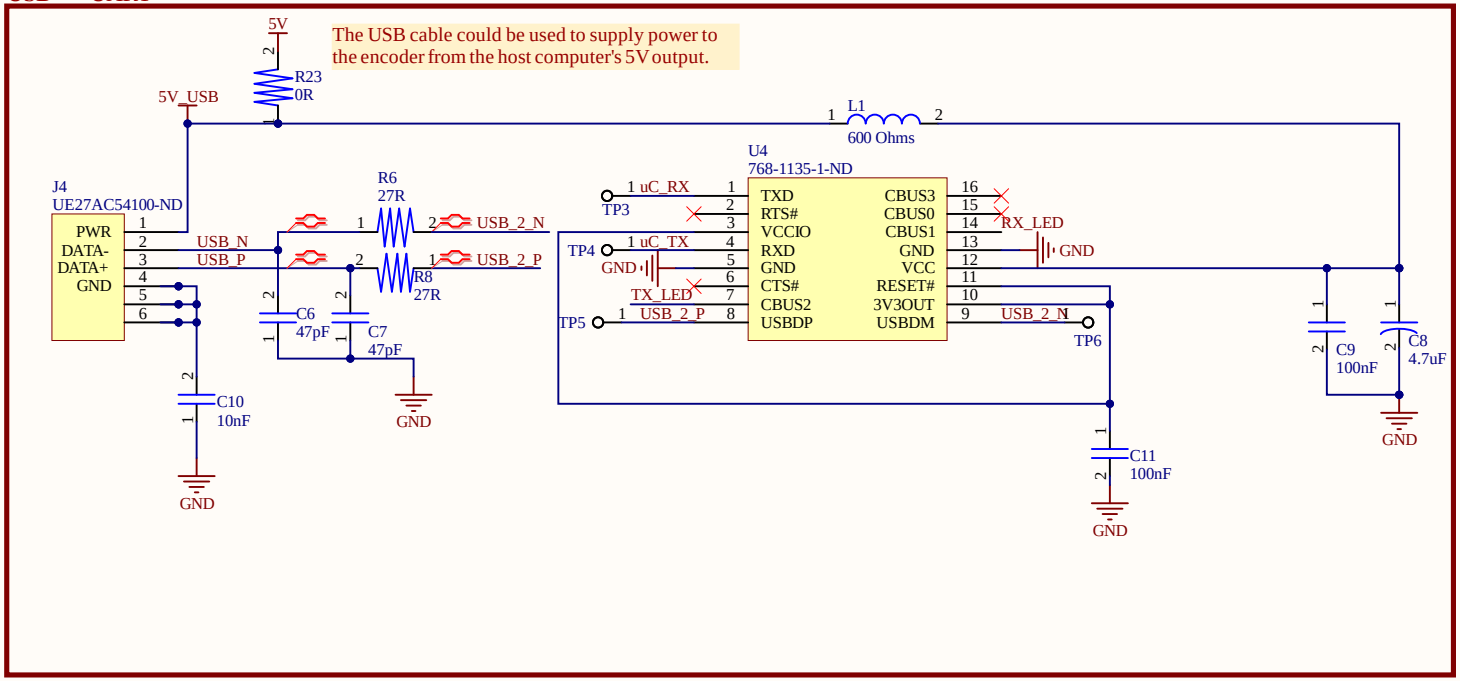
VNA Connector



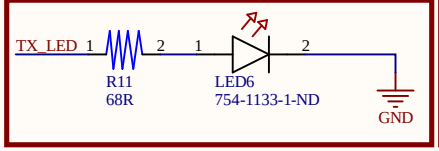
USB/UART Cable Header (Backup)



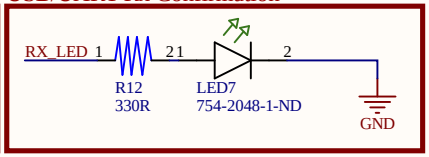
USB --> UART



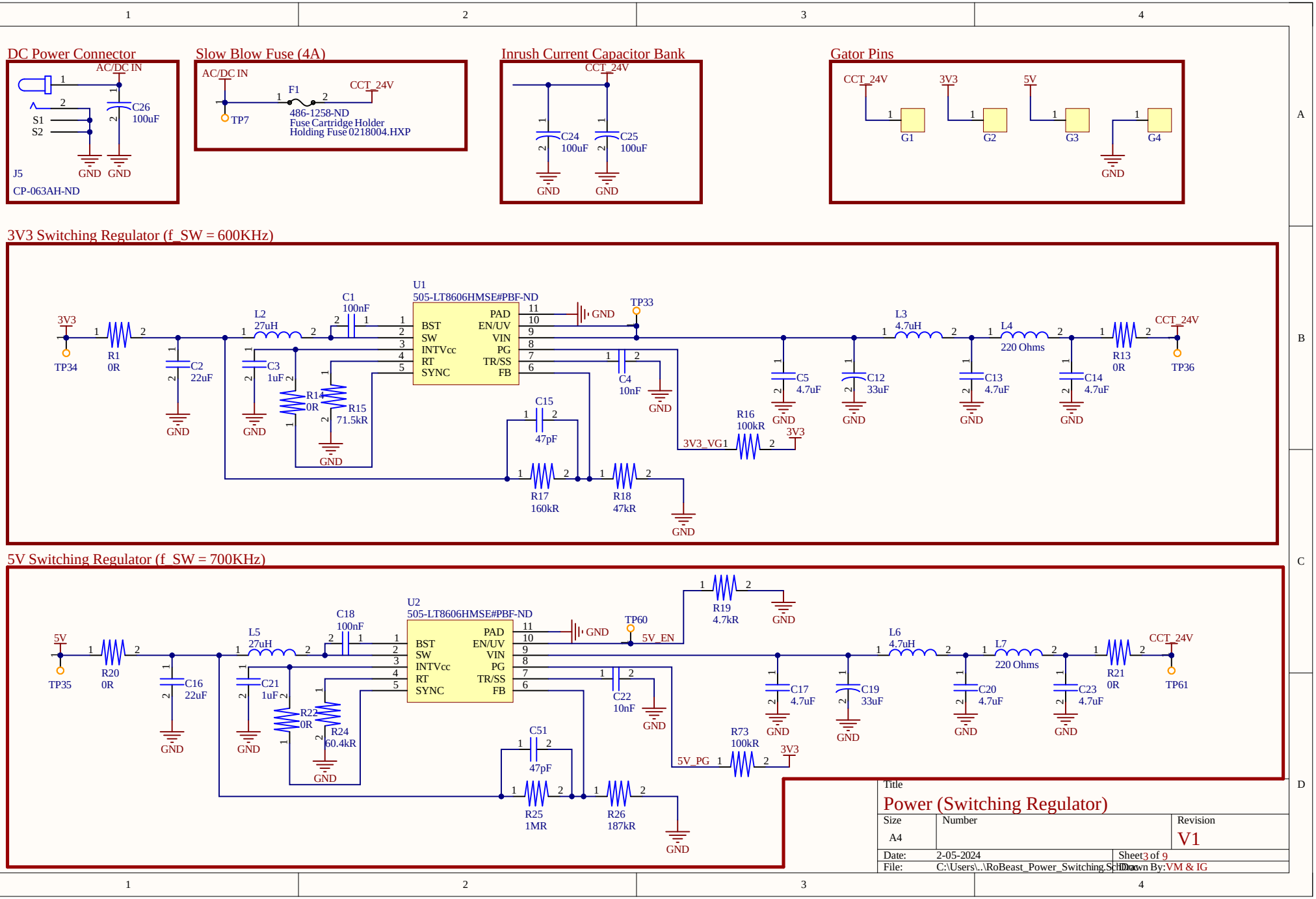
USB/UART Tx Confirmation

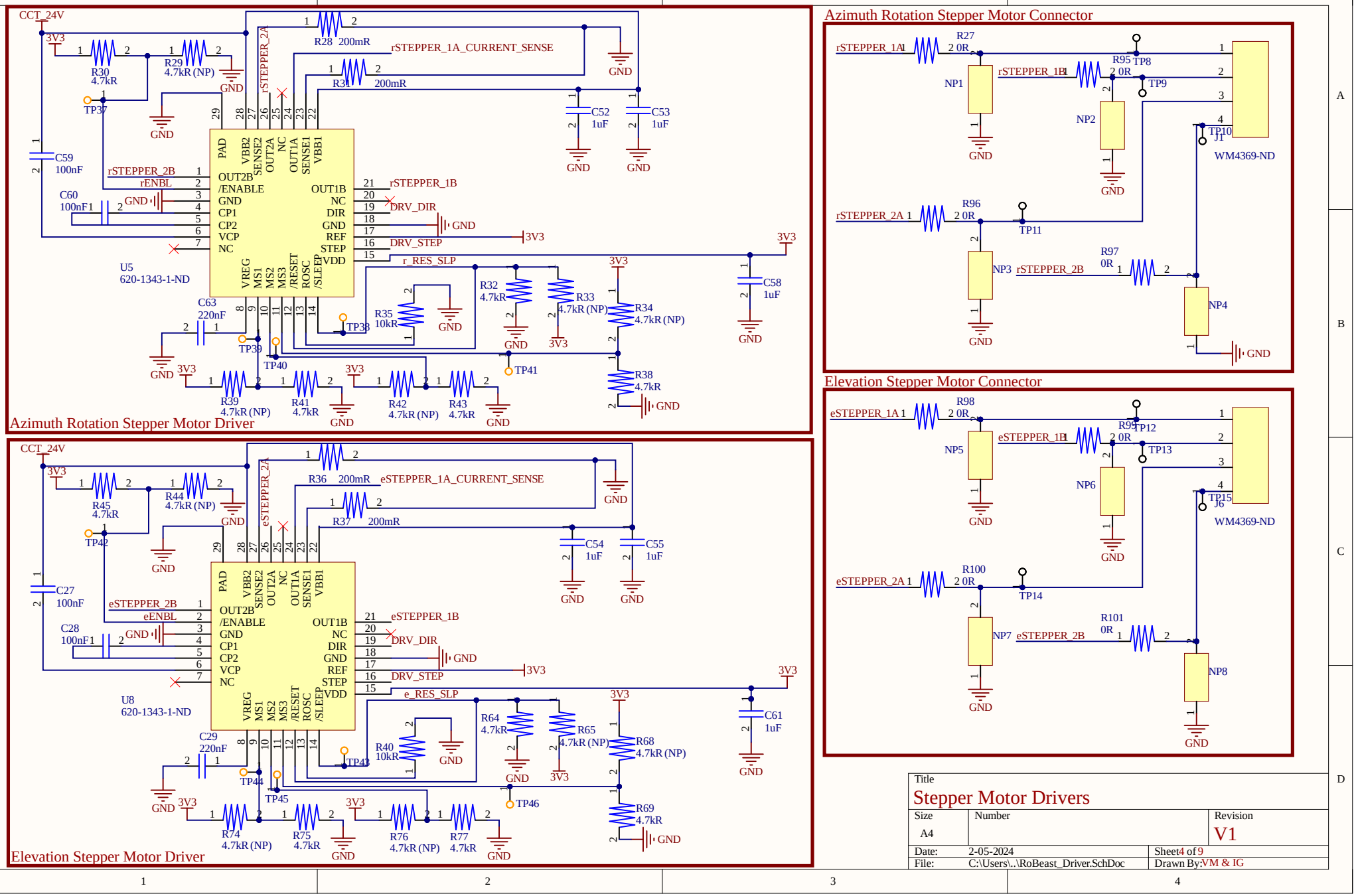


USB/UART Rx Confirmation

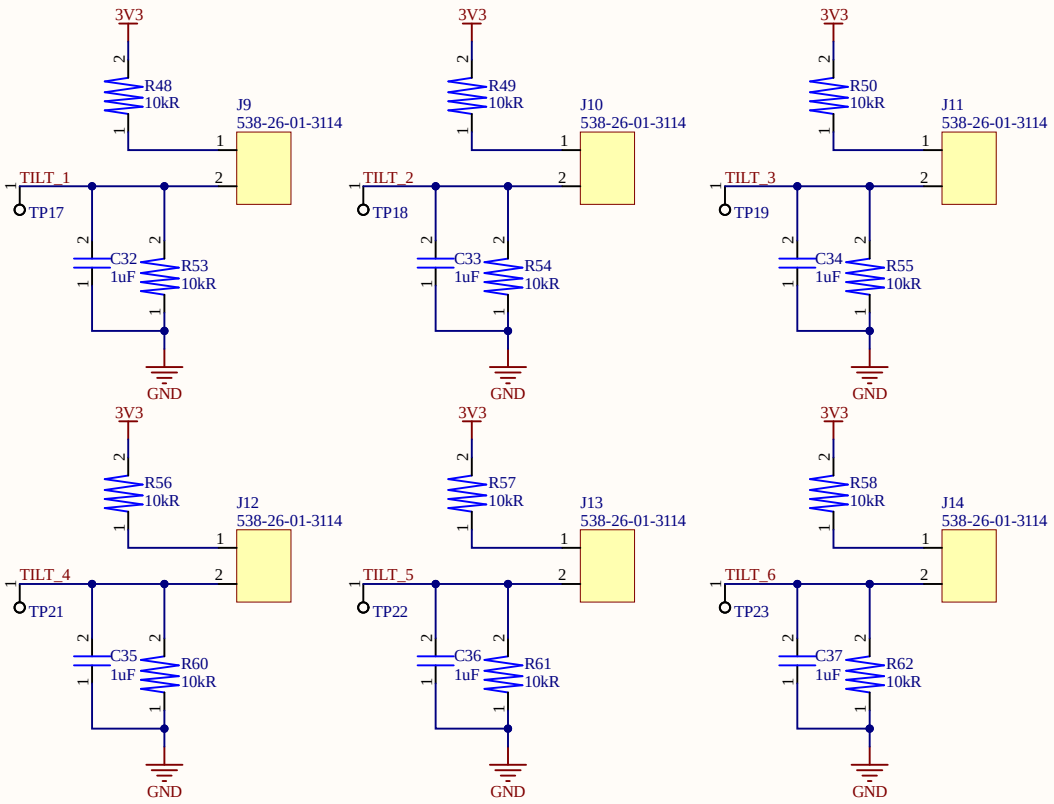


Title: **User Interface**		
Size: A4	Number:	Revision: V1
Date: 2-05-2024		Sheet 2 of 9
File: C:\Users\..\RoBeast_UI.SchDoc		Drawn By: VM & IG

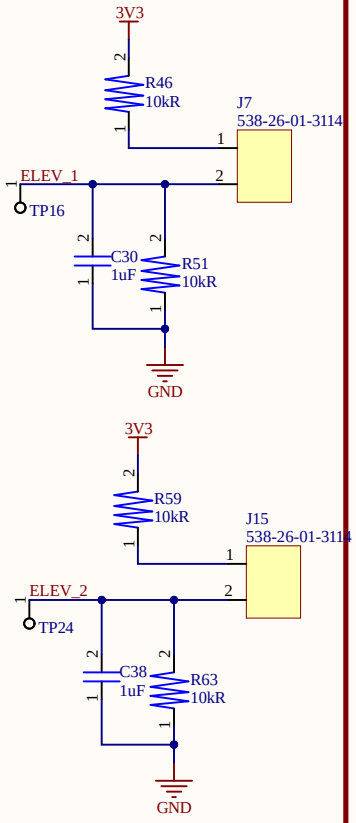

DC Power Connector
AC/DC IN
S1
S2
C26
100uF
J5
CP-063AH-ND
Slow Blow Fuse (4A)
AC/DC IN
F1
CCT_24V
TP7
486-1258-ND
Fuse Cartridge Holder
Holding Fuse 0218004.HXP
Inrush Current Capacitor Bank
CCT_24V
C24
100uF
C25
100uF
Gator Pins
CCT_24V
3V3
5V
G1
G2
G3
G4
3V3 Switching Regulator (f_SW = 600KHz)
U1
505-LT8606HMSE#PBF-ND
BST
SW
INTVcc
RT
SYNC
PAD
EN/UV
VIN
PG
TR/SS
FB
3V3
TP34
R1
0R
C2
22uF
L2
27uH
C1
100nF
C3
1uF
R14
0R
R15
71.5kR
C15
47pF
R17
160kR
R18
47kR
TP33
C4
10nF
3V3_VG1
R16
100kR
C5
4.7uF
C12
33uF
L3
4.7uH
L4
220 Ohms
C13
4.7uF
C14
4.7uF
R13
0R
CCT_24V
TP36
5V Switching Regulator (f_SW = 700KHz)
U2
505-LT8606HMSE#PBF-ND
5V
TP35
R20
0R
C16
22uF
L5
27uH
C18
100nF
C21
1uF
R22
0R
R24
60.4kR
C51
47pF
R25
1MR
R26
187kR
TP60
5V_EN
R19
4.7kR
C22
10nF
5V_PG
R73
100kR
C17
4.7uF
C19
33uF
L6
4.7uH
L7
220 Ohms
C20
4.7uF
C23
4.7uF
R21
0R
CCT_24V
TP61
GND
Title
Power (Switching Regulator)
Size
A4
Number
Revision
V1
Date:
2-05-2024
Sheet 3 of 9
File:
C:\Users\..\RoBeast_Power_Switching.SchDoc
Drawn By:VM & IG


Azimuth Rotation Stepper Motor Driver
Azimuth Rotation Stepper Motor Connector
Elevation Stepper Motor Driver
Elevation Stepper Motor Connector
U5
620-1343-1-ND
U8
620-1343-1-ND
WM4369-ND
WM4369-ND
Title
Stepper Motor Drivers
Size
A4
Number
Revision
V1
Date: 2-05-2024
Sheet4 of 9
File: C:\Users\..\RoBeast_Driver.SchDoc
Drawn By:VM & IG

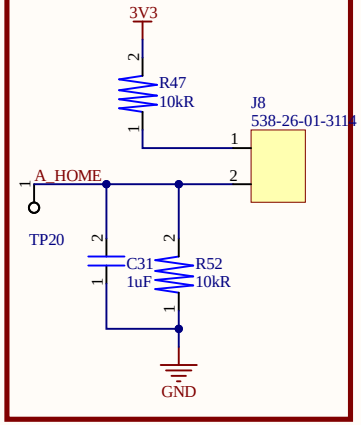
Tilt Limit Switches (x6)



Elevation Limit Switches



Azimuth Rotation Home Switch



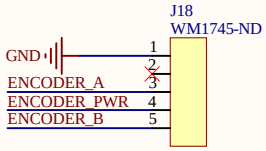
The common (COM) and normally open (NO) pins will be used for all limit switches

Molex Connector - 26013114: https://www.mouser.ca/ProductDetail/Molex/26-01-3114?qs=ZhwKFWhxrSEC8%252Bv2mQsO9A%3D%3D

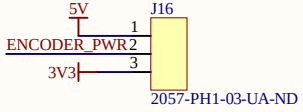
Receptacle Housing Connection - 39013025: https://www.digikey.com/en/products/detail/molex/0039013025/3160115

Pre-crimped AWG 18 Wire: 797580009 - https://www.digikey.com/en/products/detail/molex/0797580009/5806729

Encoder



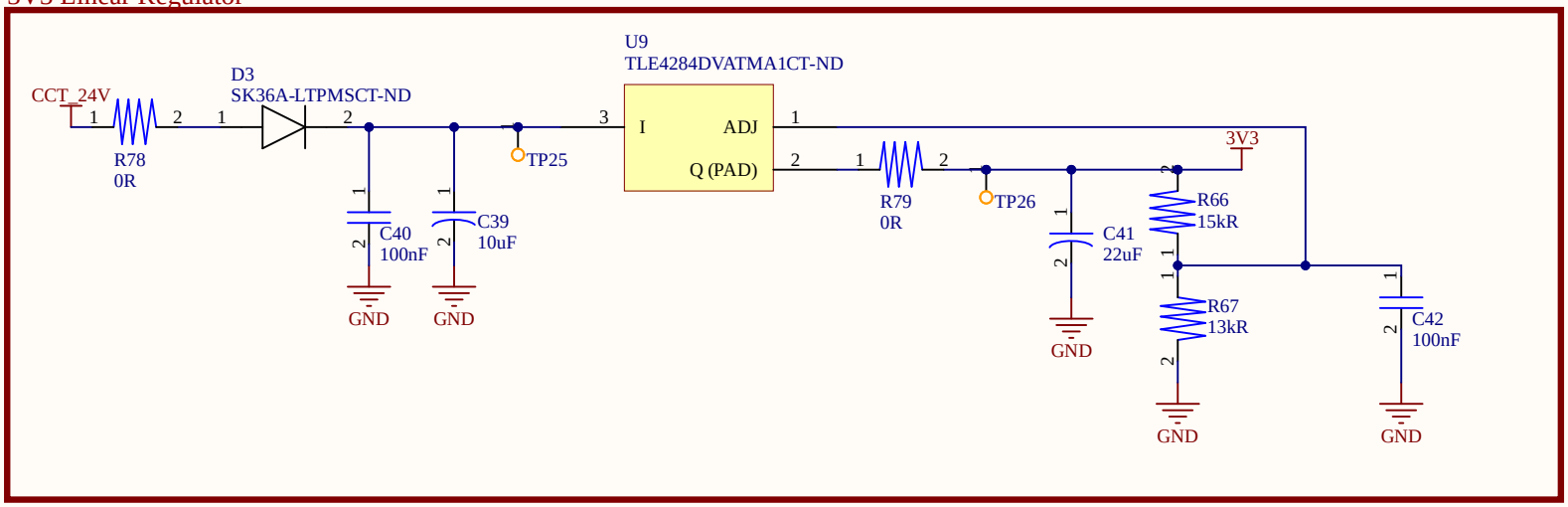
Encoder Power Control



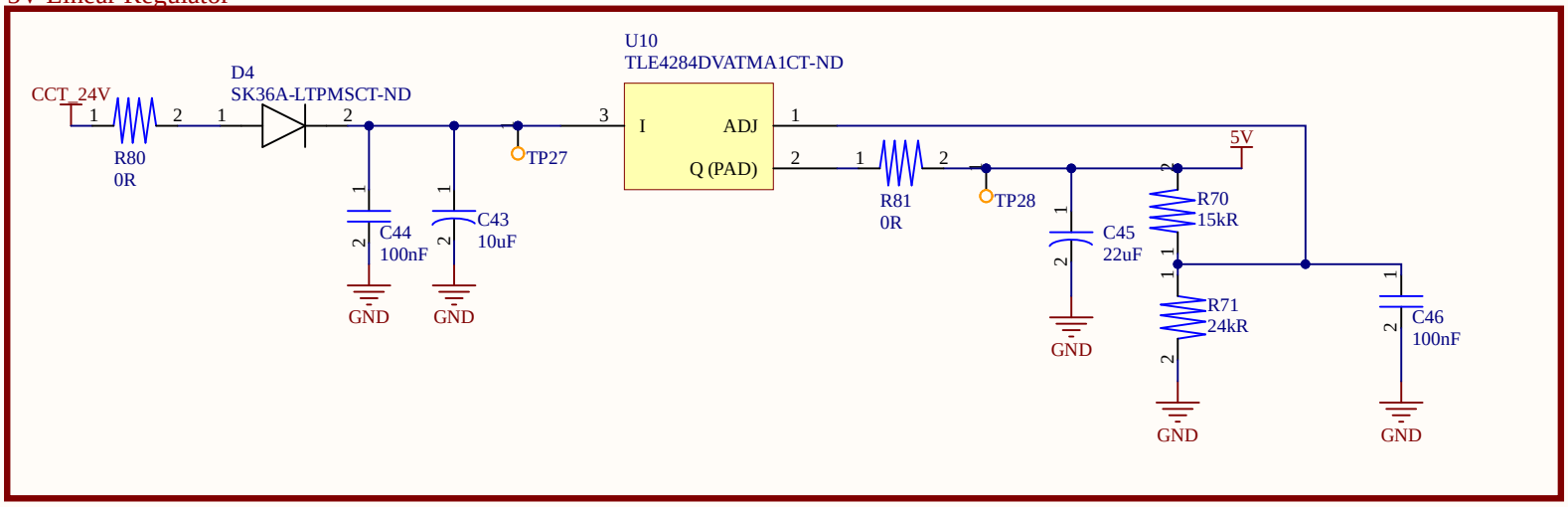
Uses jumper: 60900213421

Title: Positional Feedback		
Size: A4	Number:	Revision: V1
Date: 2-05-2024	Sheet 5 of 9	
File: C:\Users\..\RoBeast_Positional_Feedback.SchDoc	Drawn By: VM & IG	

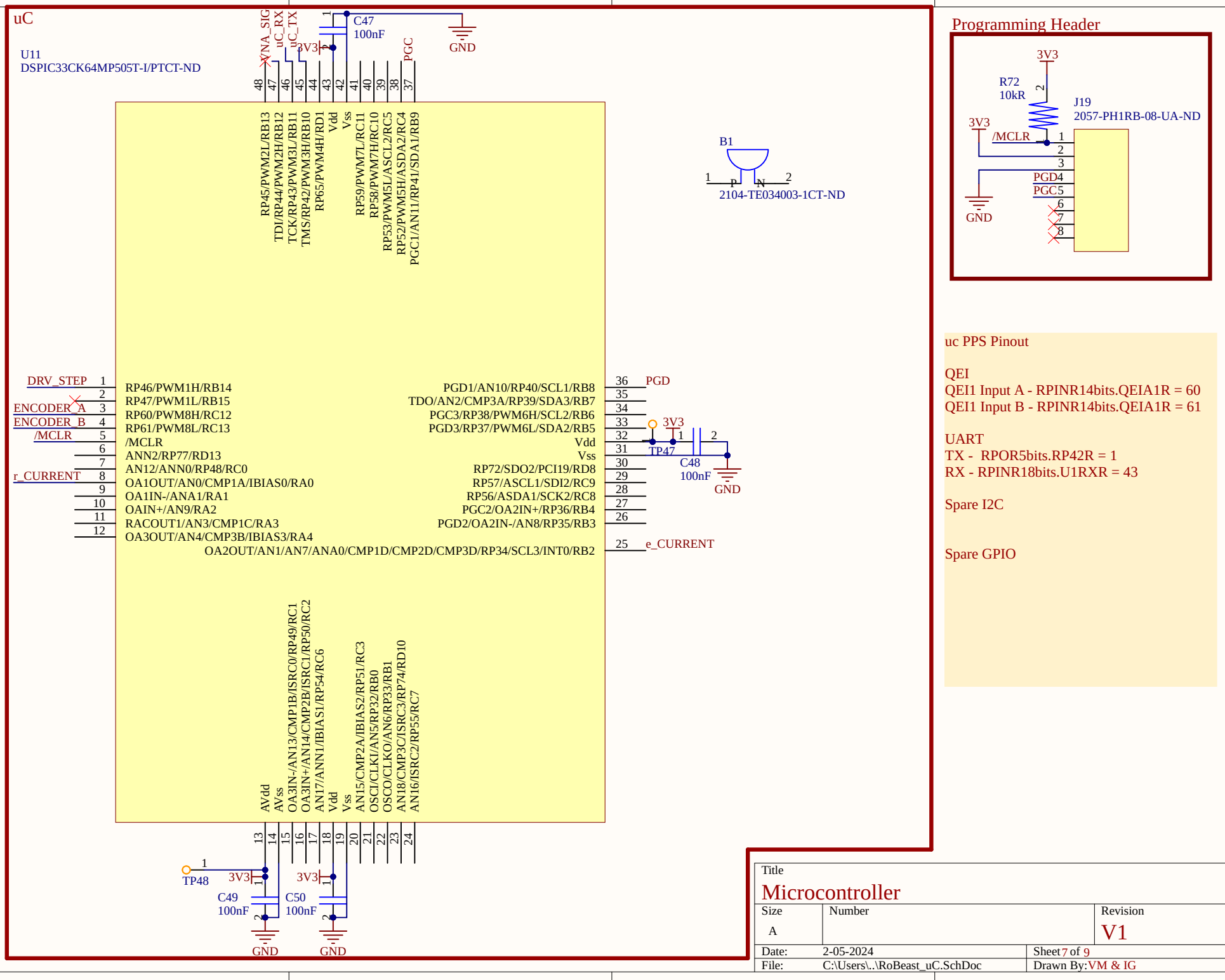
3V3 Linear Regulator



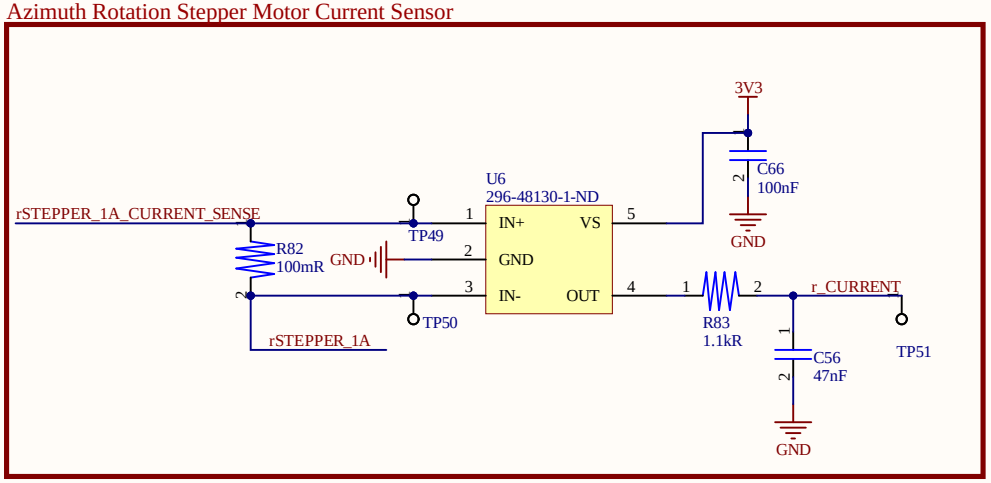
5V Linear Regulator



Title: Power (Linear Regulator)		
Size: A	Number:	Revision: V1
Date: 2-05-2024	Sheet 6 of 9	
File: C:\Users\..\RoBeast_Power_Linear.SchDoc	Drawn By: VM & IG	


uC
U11
DSPIC33CK64MP505T-I/PTCT-ND
VNA_SIG
uC_RX
uC_TX
3V3
C47
100nF
GND
PGC
RP45/PWM2L/RB13
TDI/RP44/PWM2H/RB12
TCK/RP43/PWM3L/RB11
TMS/RP42/PWM3H/RB10
RP65/PWM4H/RD1
Vdd
Vss
RP59/PWM7L/RC11
RP58/PWM7H/RC10
RP53/PWM5L/ASCL2/RC5
RP52/PWM5H/ASDA2/RC4
PGC1/AN11/RP41/SDA1/RB9
B1
2104-TE034003-1CT-ND
DRV_STEP
ENCODER_A
ENCODER_B
/MCLR
r_CURRENT
RP46/PWM1H/RB14
RP47/PWM1L/RB15
RP60/PWM8H/RC12
RP61/PWM8L/RC13
/MCLR
ANN2/RP77/RD13
AN12/ANN0/RP48/RC0
OA1OUT/AN0/CMP1A/IBIAS0/RA0
OA1IN-/ANA1/RA1
OAIN+/AN9/RA2
RACOUT1/AN3/CMP1C/RA3
OA3OUT/AN4/CMP3B/IBIAS3/RA4
OA2OUT/AN1/AN7/ANA0/CMP1D/CMP2D/CMP3D/RP34/SCL3/INT0/RB2
PGD1/AN10/RP40/SCL1/RB8
TDO/AN2/CMP3A/RP39/SDA3/RB7
PGC3/RP38/PWM6H/SCL2/RB6
PGD3/RP37/PWM6L/SDA2/RB5
Vdd
Vss
RP72/SDO2/PCI19/RD8
RP57/ASCL1/SDI2/RC9
RP56/ASDA1/SCK2/RC8
PGC2/OA2IN+/RP36/RB4
PGD2/OA2IN-/AN8/RP35/RB3
PGD
3V3
TP47
C48
100nF
GND
e_CURRENT
AVdd
AVss
OA3IN-/AN13/CMP1B/ISRC0/RP49/RC1
OA3IN+/AN14/CMP2B/ISRC1/RP50/RC2
AN17/ANN1/IBIAS1/RP54/RC6
Vdd
Vss
AN15/CMP2A/IBIAS2/RP51/RC3
OSCI/CLKI/AN5/RP32/RB0
OSCO/CLKO/AN6/RP33/RB1
AN18/CMP3C/ISRC3/RP74/RD10
AN16/ISRC2/RP55/RC7
TP48
3V3
C49
100nF
C50
100nF
GND
GND
Programming Header
3V3
R72
10kR
J19
2057-PH1RB-08-UA-ND
/MCLR
PGD
PGC
GND
uc PPS Pinout
QEI
QEI1 Input A - RPINR14bits.QEIA1R = 60
QEI1 Input B - RPINR14bits.QEIA1R = 61
UART
TX - RPOR5bits.RP42R = 1
RX - RPINR18bits.U1RXR = 43
Spare I2C
Spare GPIO
Title
Microcontroller
Size
A
Number
Revision
V1
Date: 2-05-2024
Sheet 7 of 9
File: C:\Users\..\RoBeast_uC.SchDoc
Drawn By: VM & IG

Azimuth Rotation Stepper Motor Current Sensor



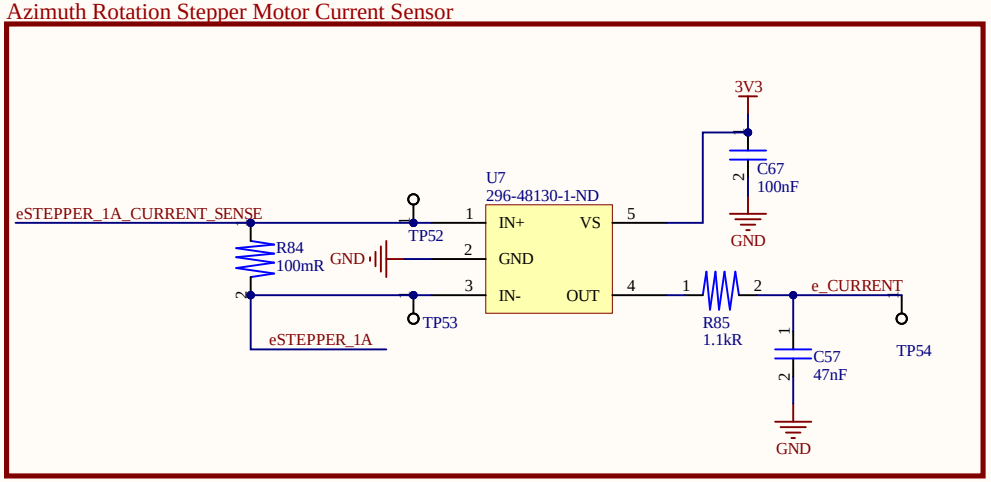
OUT:
V_sense*Gain = V_sense*20V/V

V_sense = I_1A * R_sense
V_sense = I_1A * 0.1

Error in measurement: 1.05%

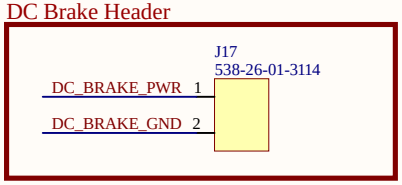
Maximum sampling rate due to anti aliasing filter at the output: 3kHz

Azimuth Rotation Stepper Motor Current Sensor

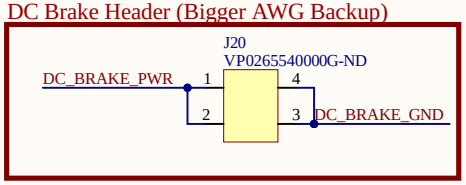


Title: Current Sense		
Size: A4	Number:	Revision: V1
Date: 2-05-2024	Sheet 8 of 9	
File: C:\Users\..\RoBeast_Current_Sense.SchDoc	Drawn By: VM & IG	

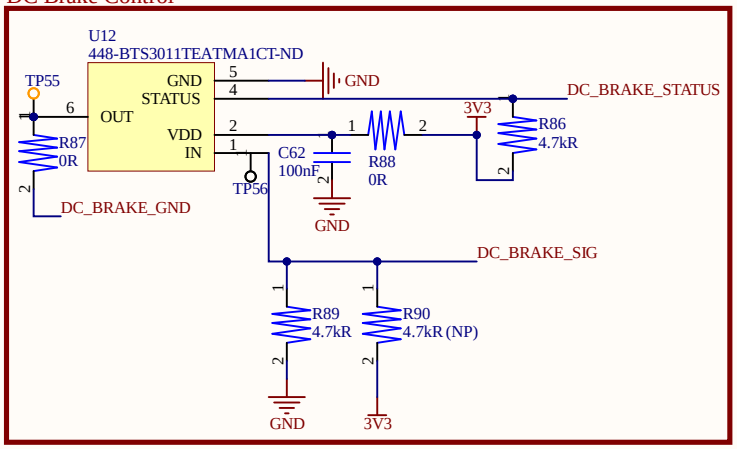
DC Brake Header



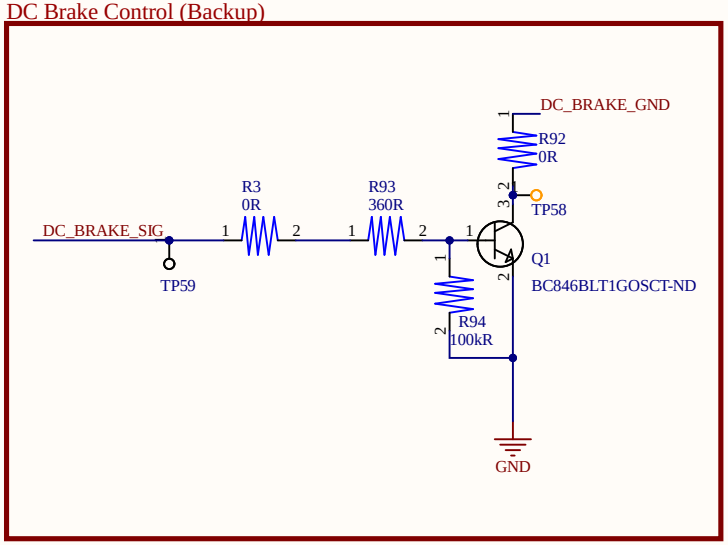
DC Brake Header (Bigger AWG Backup)



DC Brake Control



DC Brake Control (Backup)



As the inductance of the chosen DC brake is unknwon, a backup high side control has been implemented in the even that the power rail switch is not able to withstand the flyback voltage/current from the inductive DC brake.

DC Electromagnetic Brake:
https://www.omc-stepperonline.com/dc-electromagnetic-brake-24v-0-25nm-35-4oz-in-for-nema-17-stepper-motor-swb-01

After elevation changes, the elevation stepper motor will have to be disabled by disabling its stepper motor driver, and then the DC brake must be enabled.

The DC brake also serves the purpose of preventing the elevating rails from falling down in the event of an emergency stop that may occur during the elevation change/sweep.

Regarding Power Rail Switch:
In case of a thermal shutdown (fault), an internal MOSFET connected to the STATUS pin, pulls its voltage down
to GND, providing a “low” level signal to the microcontroller. To reset the latch fault signal of the BTS3011TE, the STATUS pin has to be pulled up to 5 V (recommended VDD).
Resetting the fault signal will not reset the current limitation trigger signal. To do so, the INPUT pin has to be
set in logic “low” at the same time the STATUS pin is set “high”. I

Molex Connector - 26013114:
https://www.mouser.ca/ProductDetail/Molex/26-01-3114?qs=ZhwKFWhxrSEC8%252Bv2mQsO9A%3D%3D

Receptacle Housing Connection - 39013025:
https://www.digikey.com/en/products/detail/molex/0039013025/3160115

Pre-crimped AWG 18 Wire: 797580009 -
https://www.digikey.com/en/products/detail/molex/0797580009/5806729

Title: DC Brake		
Size: A4	Number:	Revision: V1
Date: 2-05-2024		Sheet 9 of 9
File: C:\Users\..\RoBeast_DC_Brake.SchDoc		Drawn By: VM & IG