3.3V

+3.3V

SLI Backplane Card Default Edge Connector

First 104 pins follow pumpkin CSK bus (Rev E) pins
Some user and IO pins have been assigned by SLI
(that are not used by any other functions)

P1
Card Edge for HSEC8-160-01-S-DV-A-K-TR

SEP1	1	2	SEP2
-Z_SOLAR_TLE	3	4	+X_SOLAR_TLE
-Z_SOLAR_RTN	5	6	+X_SOLAR_RTN
-Z_SOLAR_PWR	7	8	+X_SOLAR_PWR
H1-1	9	10	H1-2
H2-1	11	12	H2-2
H1-3	13	14	H1-4
H2-3	15	16	H2-4
H1-5	17	18	H1-6
H2-5	19	20	H2-6
H1-7	21	22	H1-8
H2-7	23	24	H2-8
H1-9	25	26	H1-10
H2-9	27	28	H2-10
H1-11	29	30	H1-12
H2-11	31	32	H2-12
H1-13	33	34	H1-14
H2-13	35	36	H2-14
RBF	37	38	H1-16
H2-15	39	40	H2-16
H1-17	41	42	H1-18
H2-17	43	44	H2-18
H1-19	45	46	H1-20
H2-19	47	48	H2-20
H1-21	49	50	H1-22
H2-21	51	52	H2-22
H1-23	53	54	H1-24
H2-23	55	56	H2-24
H1-25	57	58	H1-26
H2-25	59	60	H2-26
H1-27	61	62	H1-28
VCC_sys	63	64	VCC_sys
BUS_RESET	65	66	H1-30
GND	67	68	GND
H1-31	69	70	5V_USB
AGND	71	72	GND
H1-33	73	74	H1-34
H2-33	75	76	H2-34
H1-35	77	78	H1-36
H2-35	79	80	H2-36
H1-37	81	82	H1-38
H2-37	83	84	H2-38
H1-39	85	86	H1-40
H2-39	87	88	H2-40
SDA_SYS	89	90	H1-42
H2-41	91	92	H2-42
SCL_SYS	93	94	H1-44
H2-43	95	96	H2-44
H1-45	97	98	H1-46
H2-45	99	100	H2-46
SELF_TEST	101	102	USER_1
GND	103	104	GND
USER_2	105	106	H1-50
H2-49	107	108	H2-50
H1-51	109	110	H1-52
H2-51	111	112	H2-52
+Y_SOLAR_TLE	113	114	-X_SOLAR_TLE
+Y_SOLAR_RTN	115	116	-X_SOLAR_RTN
+Y_SOLAR_PWR	117	118	-X_SOLAR_PWR
SEP3	119	120	SEP4

End of CSK Bus Pins

GND

GND

5V_RF

H1-33

VCC_sys

+3.3V

+5V

H2-26

H2-25

SLI Backplane Card Default Circuitry

USB 2.0 microB

Blank-Card-Default

5V_USB
USB_VCC
USB_EN
USB_FLG
USB_D+
USB_D-
GND
CHS

LED_VCC
RED_LED
YEL_LED
ORG_LED
GRN_LED
SW_VCC
SW_NO
SW_COM

5V_USB
H1-5
H2-22
H1-7
H1-11
5V_USB
SW_NO
GND

File: Blank-Card-Default.kicad_sch

I2C PROTECTION

I2C-Protection-1

SCL_SYS
SDA_SYS
SCL_IN
SDA_IN
SCL_PROT
SDA_PROT
SCL_IMU
SDA_IMU

I2C-Protection-2

SCL_SYS
SDA_SYS
SCL_IN
SDA_IN
SCL_PROT
SDA_PROT
SCL_Magnetotorquers
SDA_Magnetotorquers

ROCKBLOCK LEVEL SHIFTERS & POWER SW

+3.3V
Level Shifter 6
5V_RF
UART_3_Rx
H1-39
Vlo
Vhi
io_lo
io_hi
R95 0
R96 0
DNP!!
R97 0
R98 0
RB_RxD
Level Shifter 5
UART_3_Tx
H1-40
RB_TxD
5V_RF
DNP!!
R94
100k
RB_OnOff
R89
10k
H1-8
mainboard PA19
R44
100k
Q17
MMBT4401-7-F
GND

PAYLOAD LEVEL SHIFTERS

+3.3V
Level Shifter 1
+5V
mainboard PC05 H1-5
SERVO_PWR_CTRL
Level Shifter 2
mainboard PC06 H1-6
P_RESET
openMV RST
Level Shifter 3
UART_2_Rx H1-19
P_TXD
openMV MOSI
Level Shifter 4
UART_2_Tx H1-20
P_RXD
openMV MISO

IMU

IMU

SCL_IMU
SDA_IMU
SCL
SDA

MAGNETORQUER DRIVERS TO MAGNETOTORQUERS

Magnetotorquer Drivers

SCL_Magnetotorquers
SDA_Magnetotorquers
SCL
SDA
X+
X-
Y+
Y-
Z+
Z-
Ball_Deploy
Ball_Deploy

X-
X+
Y-
Y+
Z-
Z+
J4
T1M-6-F-SV-L

TO ROCKBLOCK 9603

5V_RF
R101
3.3k
Q19
IRF7404TRPBF
R100
10k
H1-7
mainboard PC07
R99
100k
RB_PWR_SW_B
Q18
MMBT4401-7-F
GND
GND

RB_RxD
RB_CTS
RB_RTS
RB_NetAv
RB_RI
RB_TxD
RB_OnOff
RB_5V_IN
RB_Li-iON
J1
T1M-10-F-SV-L

MH
U24
RockBlock_9603
GND

RB has a low power sleep, but this is to disconnect in case of failure.

TO FORAS PROMINEO PAB

+5V
R107
3.3k
Q23
IRF7404TRPBF
R106
10k
H1-11
mainboard PC10
R105
100k
Q22
MMBT4401-7-F
PAYLOAD_PWR_SW
GND
GND
J5
T1M-10-F-SV-L
PAYLOAD_5V
P_TXD
SERVO_PWR_CTRL
P_RESET
P_RXD
GND
GND

PICO

Pico

H2-22
Pico_PWR_EN
SCL_IMU
SDA_IMU
I2C1_SCL
I2C1_SDA

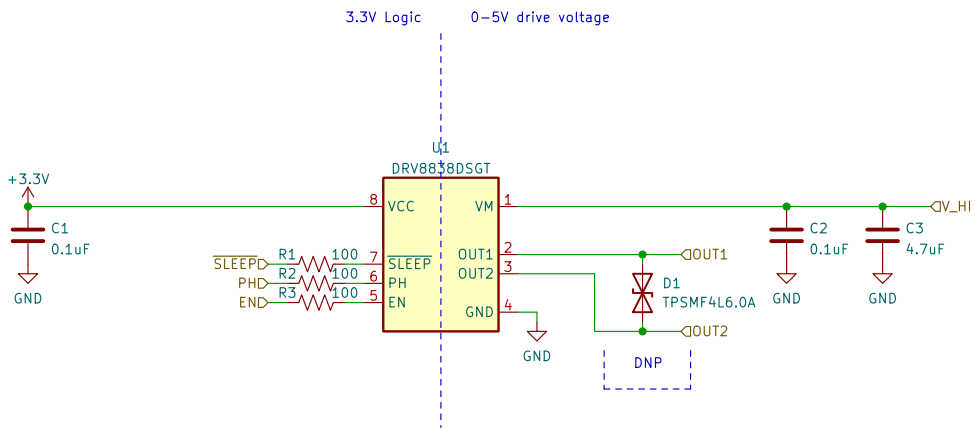
File: pico.kicad_sch

Sierra Lobo INC

Sheet: /
File: FP Interface Card.kicad_sch

Title: Blank Card for SLI Backplane

Size: B	Date: 2021-11-05	Rev: A
KiCad E.D.A. kicad (6.0.5)		Id: 1/22



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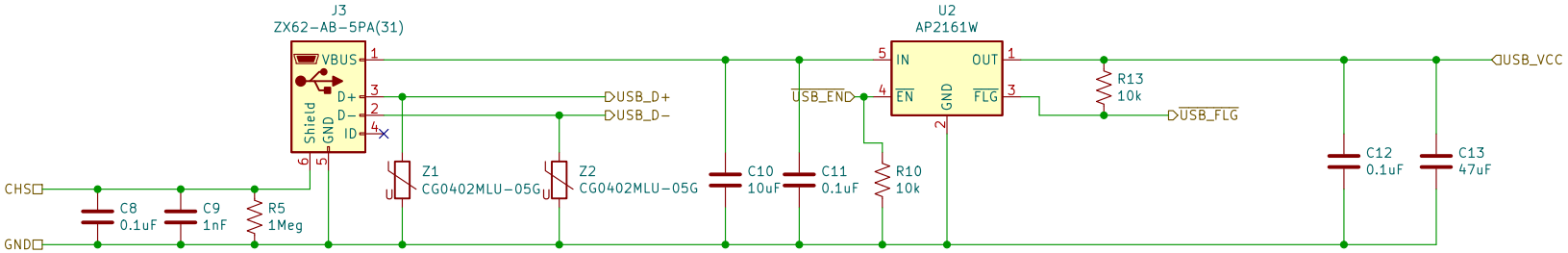
File: Full_Bridge.kicad_sch

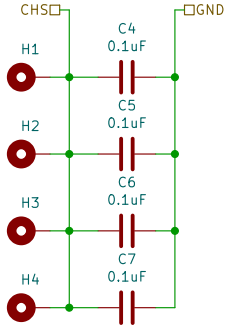
Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad (6.0.5)		Id: 2/22

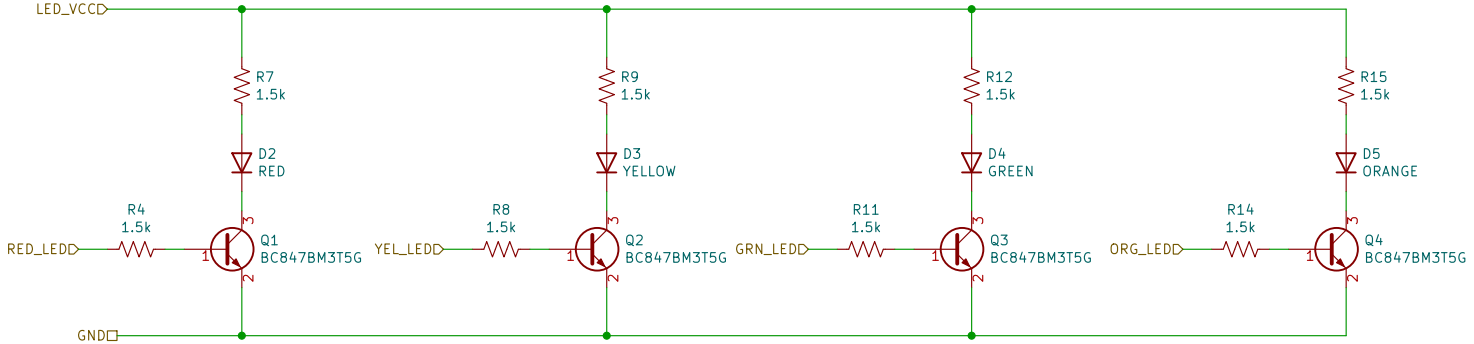
USB protection and power switch



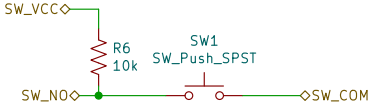
Mounting Holes



LEDs



Switch



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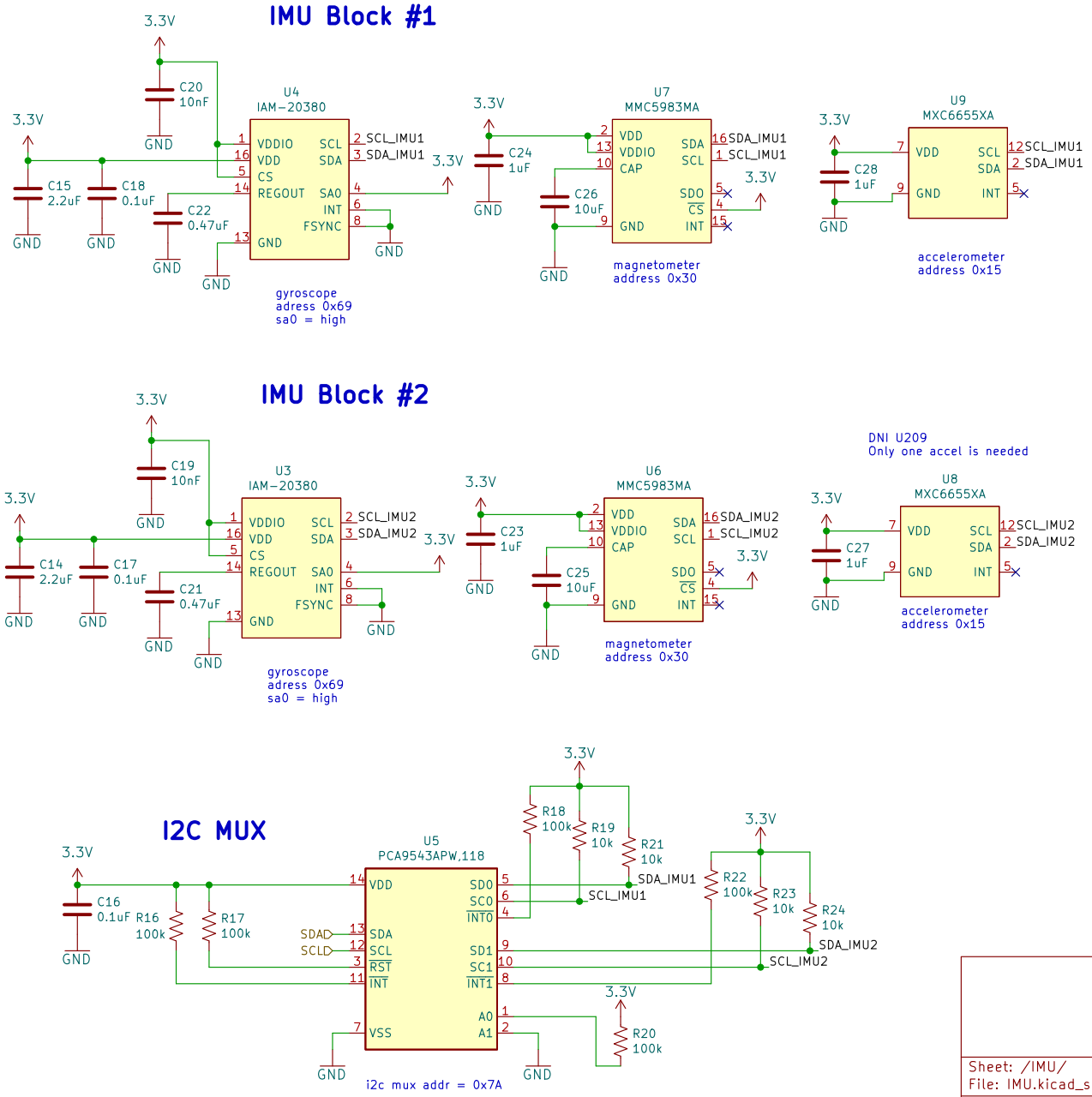
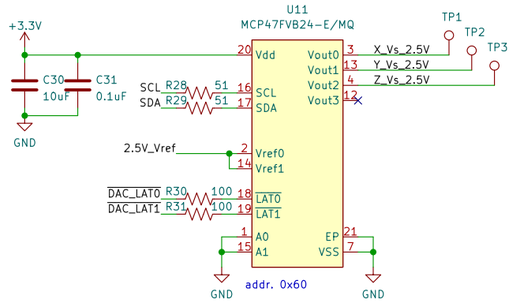
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad (6.0.5)		Id: 3/22


IMU Block #1
3.3V
C20
10nF
GND
U4
IAM-20380
VDDIO
VDD
CS
REGOUT
SCL
SDA
SA0
INT
FSYNC
GND
SCL_IMU1
SDA_IMU1
C15
2.2uF
C18
0.1uF
C22
0.47uF
gyroscope
adress 0x69
sa0 = high
U7
MMC5983MA
VDD
VDDIO
CAP
SDO
CS
C24
1uF
C26
10uF
magnetometer
address 0x30
U9
MXC6655XA
C28
1uF
accelerometer
address 0x15
IMU Block #2
U3
IAM-20380
SCL_IMU2
SDA_IMU2
C19
10nF
C14
2.2uF
C17
0.1uF
C21
0.47uF
U6
MMC5983MA
C23
1uF
C25
10uF
DNI U209
Only one accel is needed
U8
MXC6655XA
C27
1uF
I2C MUX
U5
PCA9543APW,118
VDD
SDA
SCL
RST
INT
VSS
SD0
SC0
INT0
SD1
SC1
INT1
A0
A1
SDAD
SCLD
C16
0.1uF
R16
100k
R17
100k
R18
100k
R19
10k
R21
10k
R22
100k
R23
10k
R24
10k
R20
100k
i2c mux addr = 0x7A
Sheet: /IMU/
File: IMU.kicad_sch
Title:
Size: A4
Date:
Rev:
KiCad E.D.A. kicad (6.0.5)
Id: 3/22

DAC STAGE

0–2.5Vout

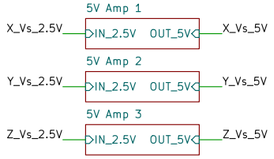
check for pulldowns on DAC lines



any way to get a super accurate 5V reference?
always a dropout voltage

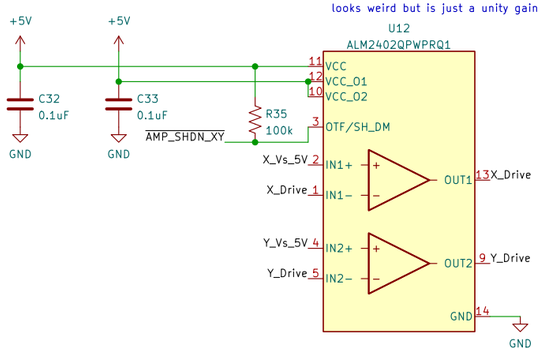
5V AMPLIFIER

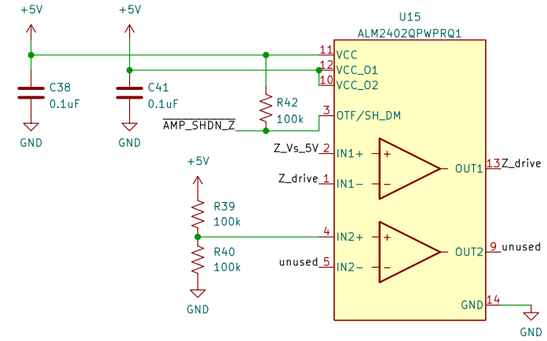
0–5Vout
take 0–2.5V DAC signal to 0–5V



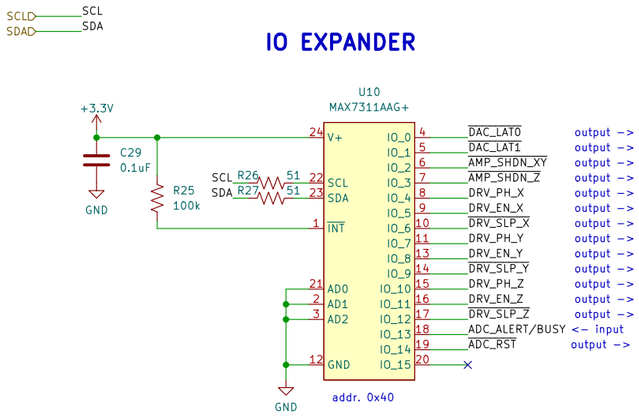
DRIVE AMPLIFIER

Magnetotorquer voltage source
just a high current op amp as a unity buffer
looks weird but is just a unity gain buffer





IO EXPANDER

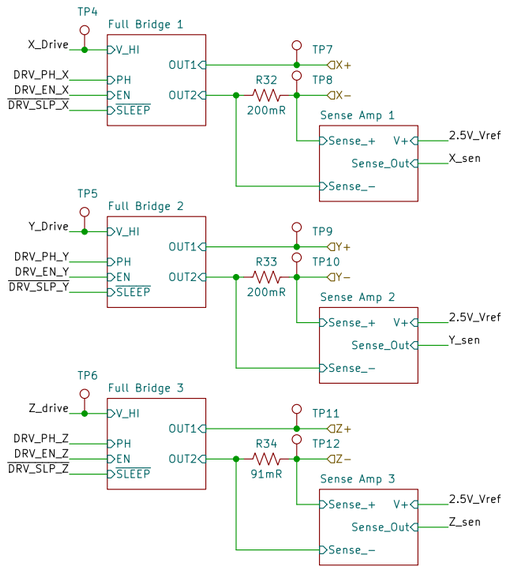


1.3.1 Technical specification

Parameter	Typical Value	Comments
Environmental Characteristics		
Qualified operational temperature range	-40 to +70°C	
Storage temperature range	-50 to +85°C (RH<60%)	
Electrical Characteristics		
Torquer supply voltage (design)	5V	
Nominal magnetic dipole (per actuator)	0.2 Am^2	
Actuation power (rods)	0.2 W	5V, 20 C, 0.2 Am^2
Actuation power (air core)	0.57 W	5V, 20 C, 0.2 Am^2
Temperature sensor current consumption	<150 uA	
Physical Characteristics		
Dimensions (Main)	95.9 x 90.1 mm	
External height	15 mm	
Weight	194 grams	

Table 1-2 iMTQ Overall Specification

HALF BRIDGE DRIVER & CURRENT SENSE

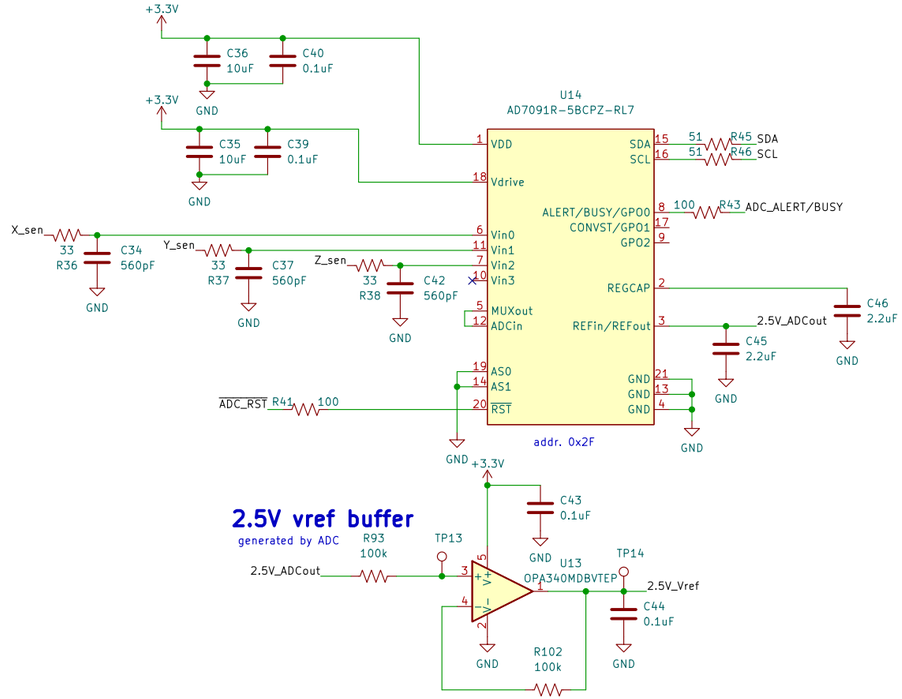


max rod current = 50mA
max air core current = 110mA
max current will be flowing both directions
biased at mid supply
lets say current will cause a +/– 1.0v defelection

r_rod = 1/(50mA)/100 = 200mR
r_air = 1/110mA/100 = 91mR

update me!

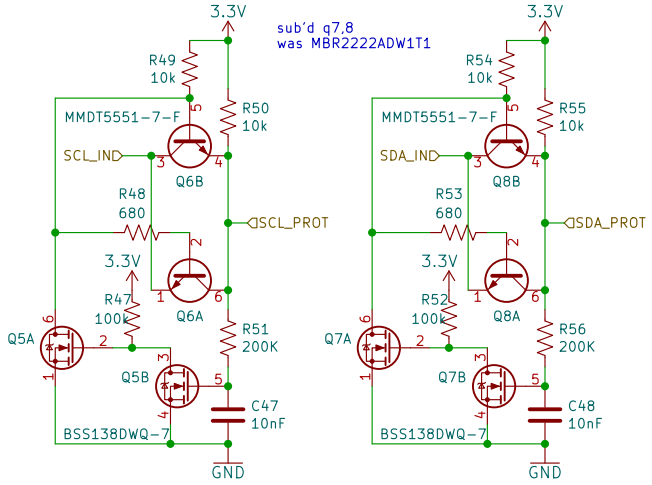
CURRENT SENSE ADC

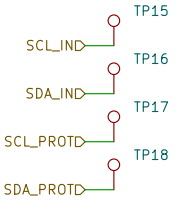


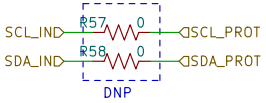
2.5V vref buffer

generated by ADC

I2C Bus Protection PIB







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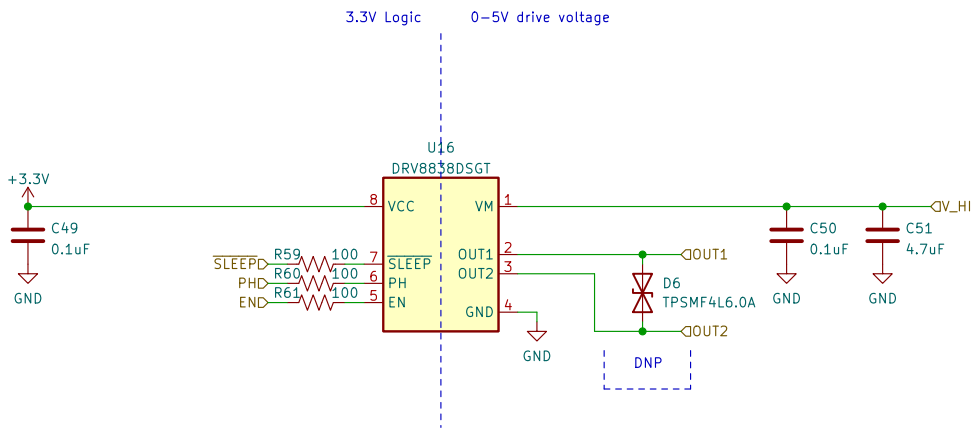
Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad (6.0.5)		Id: 5/22



Sheet: /Magnetotorquer Drivers/Full Bridge 1/
File: Full_Bridge.kicad_sch

Title:

Size: A4	Date:	**Rev:**
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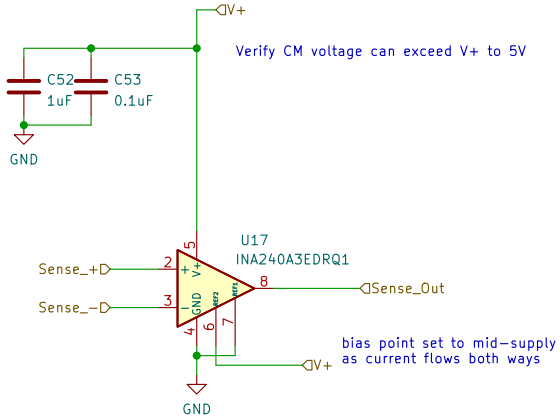
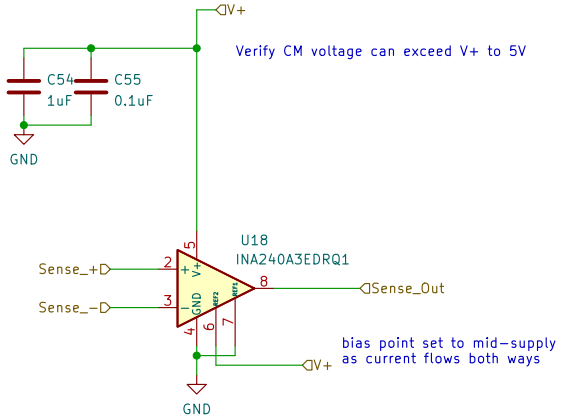


100v/v gain

current sense amplifier

Sheet: /Magnetotorquer Drivers/Sense Amp 1/		
File: Sense_Amp.kicad_sch		
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad (6.0.5)		Id: 7/22



100v/v gain

current sense amplifier

Sheet: /Magnetotorquer Drivers/Sense Amp 2/		
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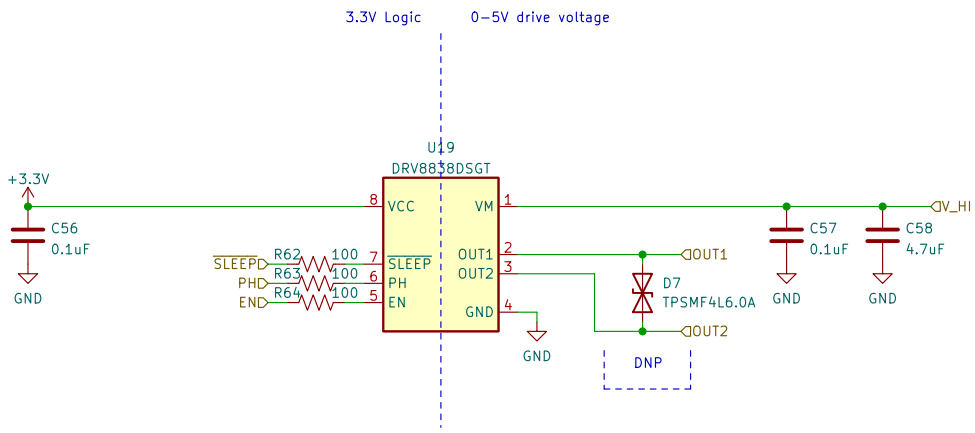
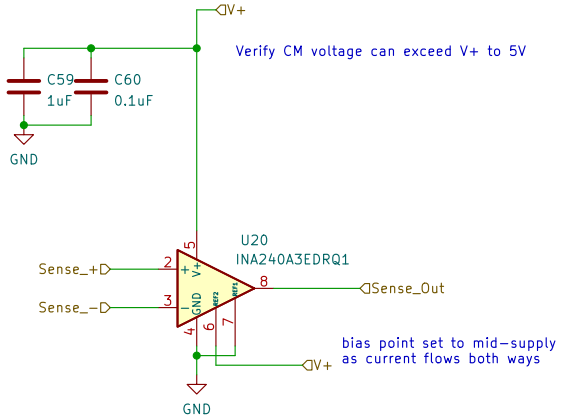
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad (6.0.5)		Id: 8/22



Sheet: /Magnetotorquer Drivers/Full Bridge 3/
File: Full_Bridge.kicad_sch

Title:

Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad (6.0.5)		Id: 9/22



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Size: A4	Date:	**Rev:**
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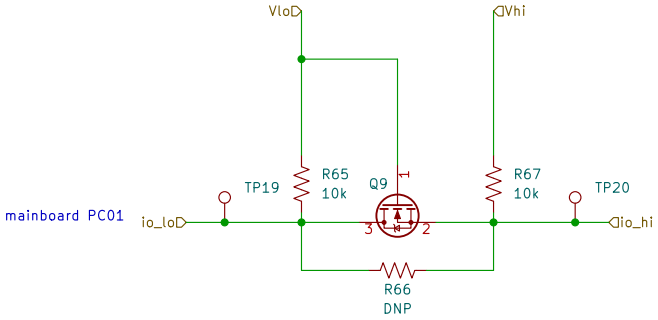

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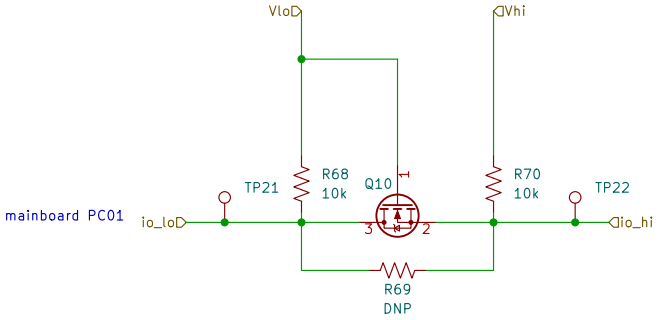

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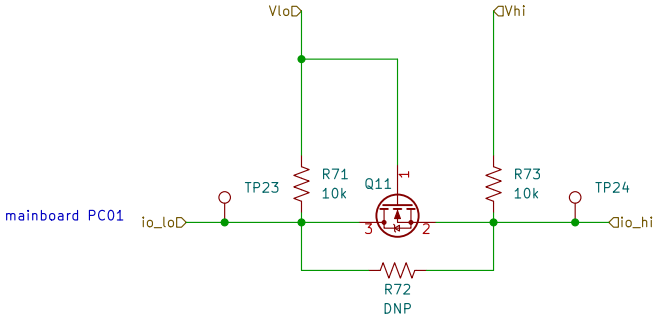

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Title:		
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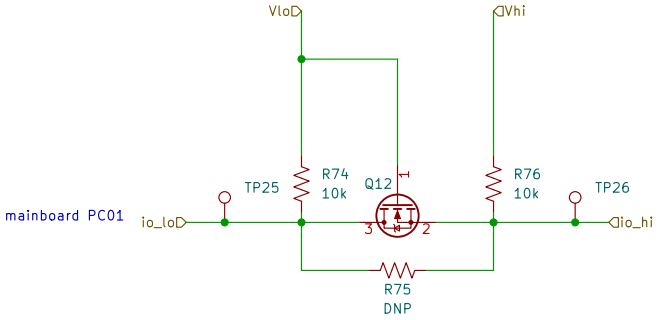

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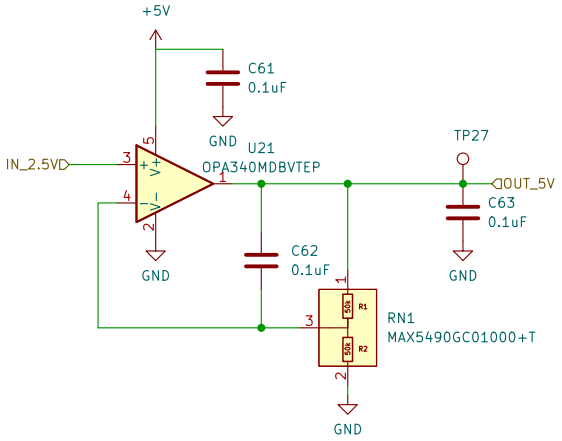

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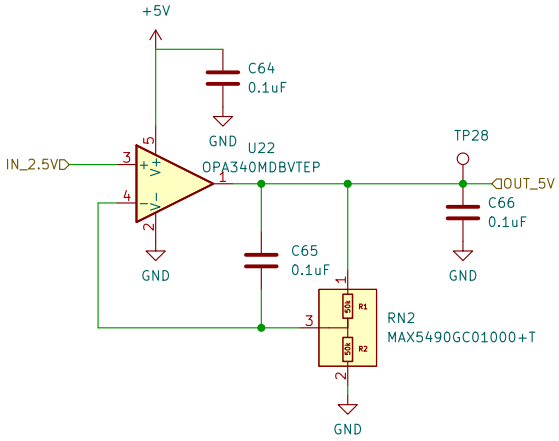

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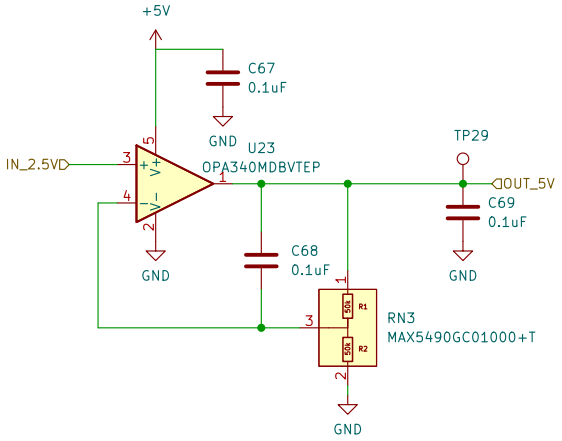

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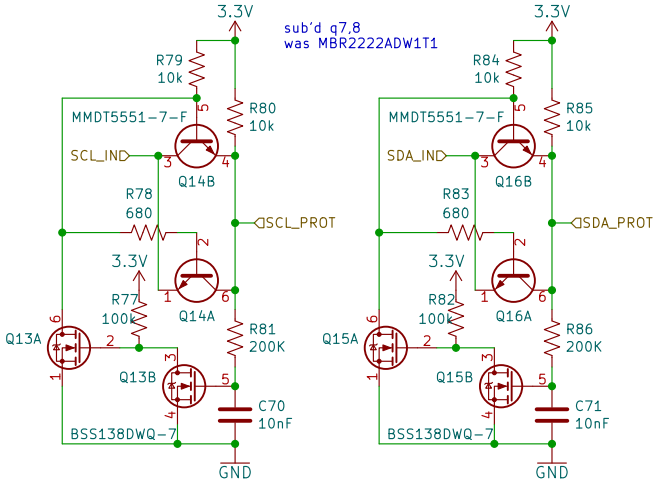
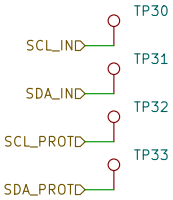
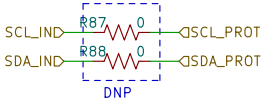
I2C Bus Protection PIB







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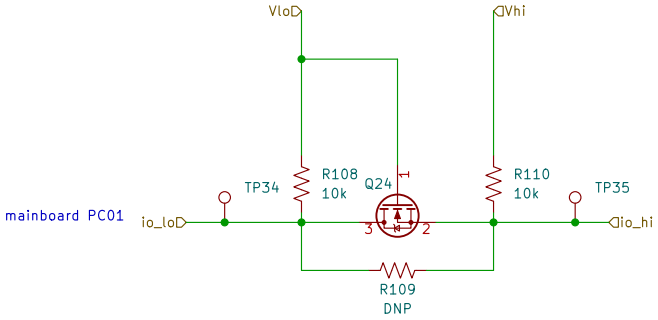

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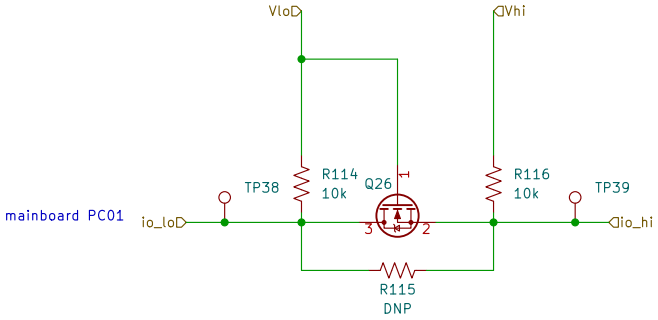
KiCad E.D.A. kicad (6.0.5) | Id: 19/22



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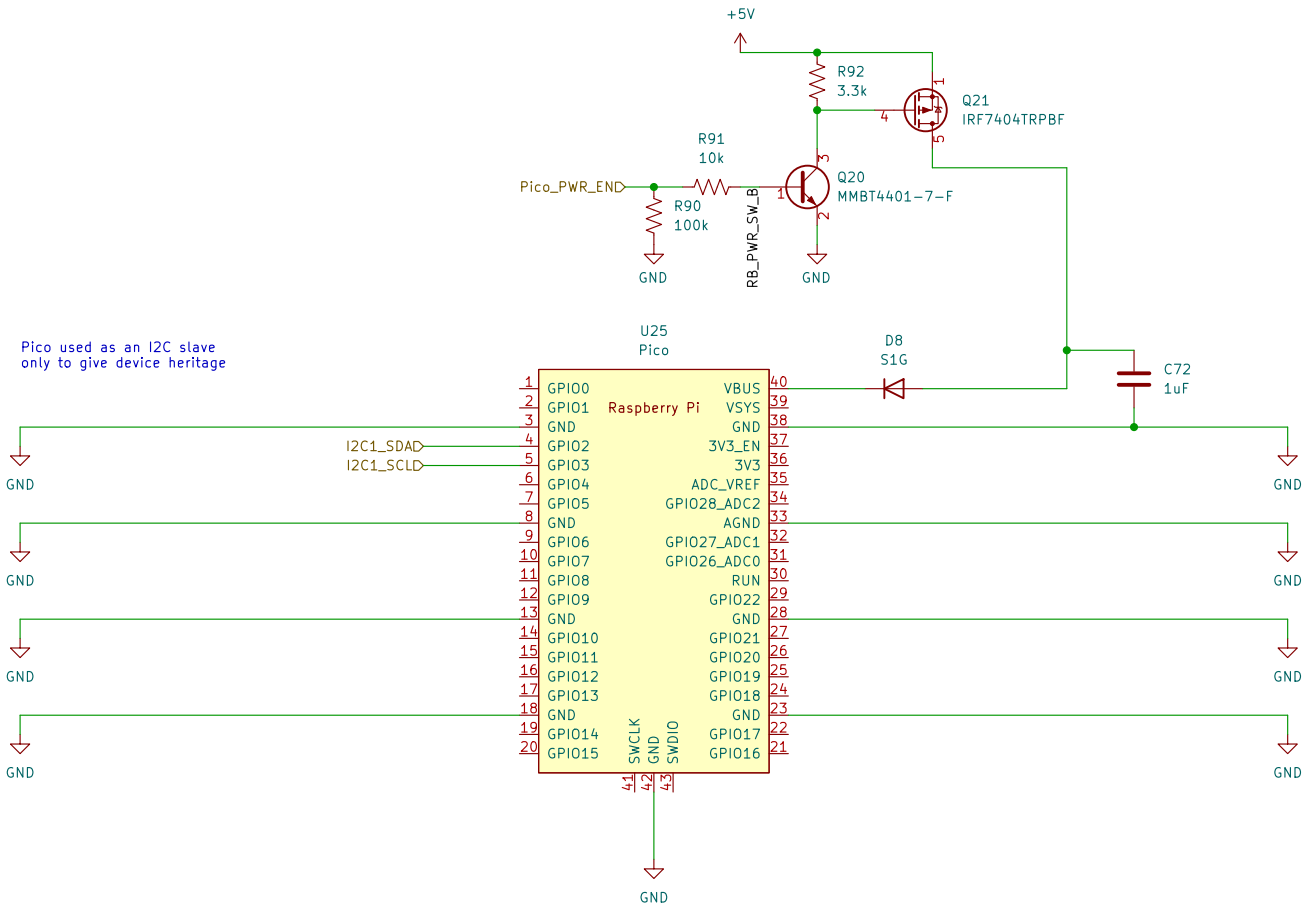

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