Connectors

File: Connectors.kicad_sch

Avionics

File: Avionics.kicad_sch

Watchdog

File: watchdog.kicad_sch

GPS

File: GPS.kicad_sch

Photodiodes

File: photodiodes.kicad_sch

Power

File: Power.kicad_sch

IMU_and_Magnetometer

File: IMU_and_Magnetometer.kicad_sch

Magnetorquer Drivers

File: magnetorquer_driver.kicad_sch

ADCS Main

Sage Wu
Stanford Student Space Initiative

Sheet: /
File: ADCS_board.kicad_sch

Title: ADCS Main Board

Size: A4	Date: 2025-04-07	**Rev: 1.2**
KiCad E.D.A. 9.0.1		Id: 1/16

Link to this board's design document for future travellers

TODO:
- Check RF module for wakeup pins

capacitor for every power pin

C13 100nF, C14 100nF, C15 4.7uF, C16 100nF, C28 100nF, C37 100nF, C42 100nF, C43 100nF, C44 100nF, C45 100nF, C46 100nF, C47 100nF

PRIMARY PROCESSOR

U2 — Raspberry Pi RP2350B QFN-80

R26 33, C12 4.7uF, C11 4.7uF, C10 4.7uF, L1 3.3uH, PWR_FLAG

Y1 ABM8-272-T3, C1 15pF, C2 15pF, R20 1k

R27 27, R28 27, USB_IC_D+, USB_IC_D−, USB_D+, USB_D−

GPIO0 NEOPIXEL
GPIO1 EN_GPS
GPIO2 TX_TO_GPS
GPIO3 RX_FROM_GPS
GPIO4 X_MAGDRV_IN1
GPIO5 X_MAGDRV_IN2
GPIO6 Y_MAGDRV_IN1
GPIO7 Y_MAGDRV_IN2
GPIO8 Z_MAGDRV_IN1
GPIO9 Z_MAGDRV_IN2
GPIO10
GPIO11 EN_MAGDRV
GPIO12 I2C0_SDA
GPIO13 I2C0_SCL
GPIO14 IMU_INT1
GPIO15 IMU_INT2
GPIO16 EN_IMU
GPIO17 GPIO_17
GPIO18 SCLK_MAGMETER
GPIO19 MOSI_MAGMETER
GPIO20 MISO_MAGMETER
GPIO21 SCS_MAGMETER
GPIO22 EN_MAGNMETER
GPIO23 MOTOR_EN
GPIO24 TX_TO_MOTOR
GPIO25 RX_FROM_MOTOR
GPIO26 MOTOR_PGOOD
GPIO27 GPIO_27
GPIO28 UART_TO_DEBUG
GPIO29 UART_FROM_DEBUG
GPIO30 I2C1_SDA
GPIO31 I2C1_SCL
GPIO32 GPIO_32
GPIO33 GPIO_33
GPIO34 GPIO_34
GPIO35 ADCS_PGOOD
GPIO36 TX_TO_PICUBED
GPIO37 RX_FROM_PICUBED
GPIO38 WATCHDOG_FEED
GPIO39 EN_PD
GPIO40_ADC0 pd_y+_1
GPIO41_ADC1 pd_y+_2
GPIO42_ADC2 pd_z+_1
GPIO43_ADC3 pd_z+_2
GPIO44_ADC4 pd_y−_1
GPIO45_ADC5 pd_y−_2
GPIO46_ADC6 pd_z−_1
GPIO47_ADC7 pd_z−_2

FLASH_CS, FLASH_MOSI, FLASH_MISO, FLASH_IO2, FLASH_IO3, FLASH_SCK, QSPI_SS, QSPI_SD0, QSPI_SD1, QSPI_SD2, QSPI_SD3, QSPI_SCLK

XTAL1, XTAL2, XIN, XOUT, RUN, SWCLK, SWD, SWDIO

RP2350_80QFN

RESET

R3 1k, SW1 KMR231NG LFS, R23 1k, RESET, RUN

SWD RESET

BOOT SEL

R4 1k, SW2 KMR231NG LFS, FLASH_CS

To enter USB boot:
1. Press and hold BOOT_SEL button
2. Press release RESET button
3. Release BOOT_SEL button

Status LED

D1 1655, C5 100nF, NEOPIXEL

Wired OR Gate

Works because nFaults are open-drain

R29 10k, X_MAGDRV_nFAULT, Y_MAGDRV_nFAULT, Z_MAGDRV_nFAULT

MRAM — Nonvolatile Memory (4Mbit storage)

Using QSPI

U3 MR25H40MDF, R21 10k, C7 100nF

FLASH_CS, FLASH_MISO, FLASH_IO2, FLASH_IO3, FLASH_SCK, FLASH_MOSI

I2C buses

pull-up resistors here

Magdrv Current Monitor Mux

R45 10k, R46 10k, I2C0_SCL, I2C0_SDA

Ch0 X_MAGDRV_CM1
Ch1 X_MAGDRV_CM2
Ch2 Y_MAGDRV_CM1
Ch3 Y_MAGDRV_CM2
Ch4 Z_MAGDRV_CM1
Ch5 Z_MAGDRV_CM2
Ch6
Ch7

For functional check if desired

File: ADC_multiplexer.kicad_sch

IMU_SCL, IMU_SDA, QWIIC_SCL, QWIIC_SDA

Sun Pyramid Mux

R5 10k, R6 10k, I2C1_SCL, I2C1_SDA

Ch0 pyramid1_1
Ch1 pyramid1_2
Ch2 pyramid1_3
Ch3 pyramid1_4
Ch4 pyramid2_1
Ch5 pyramid2_2
Ch6 pyramid2_3
Ch7 pyramid2_4

File: ADC_multiplexer.kicad_sch

PWR_SCL, PWR_SDA

NOTE: Components labeled "do not install" (DNI) are not populated by default

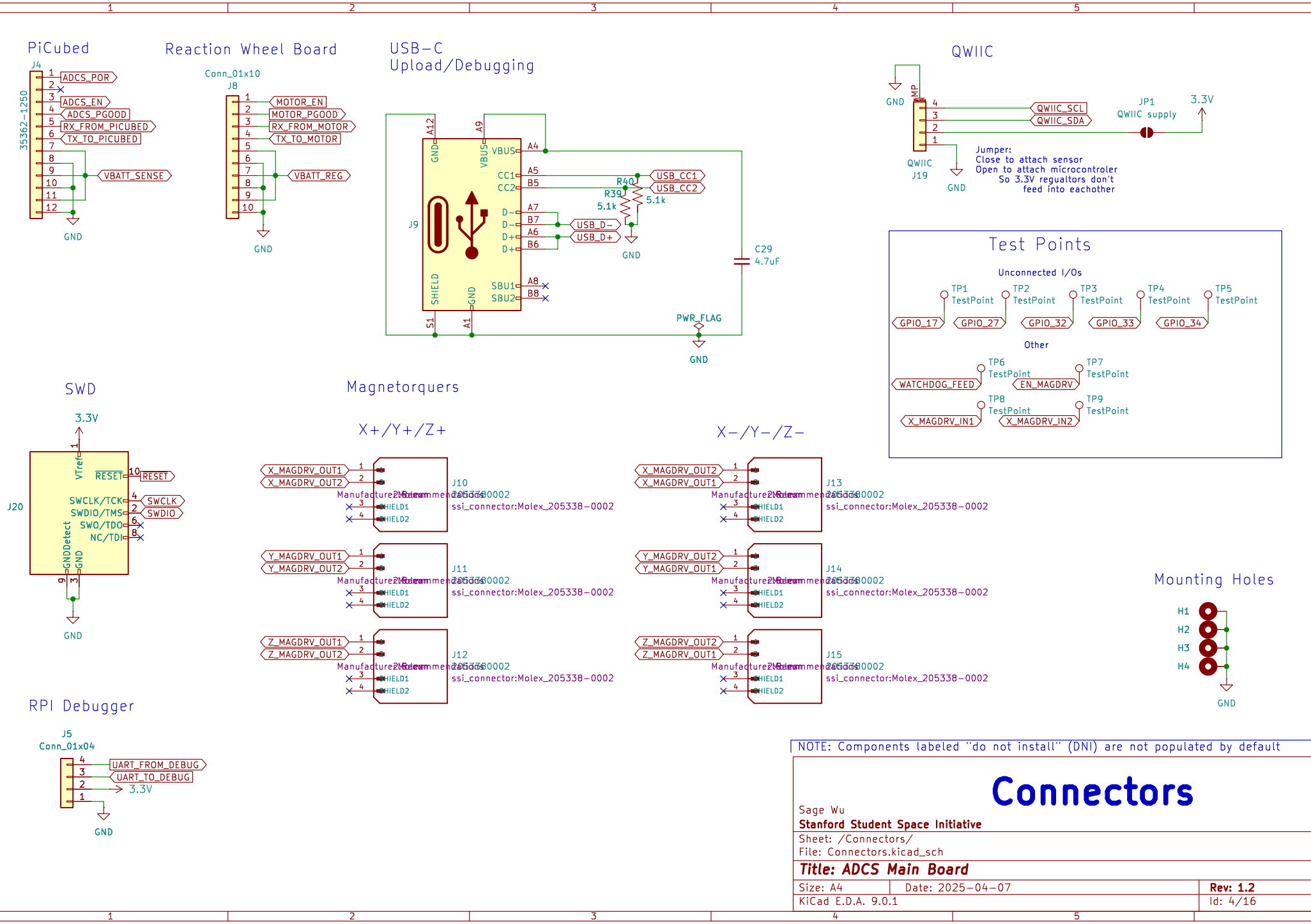
Avionics

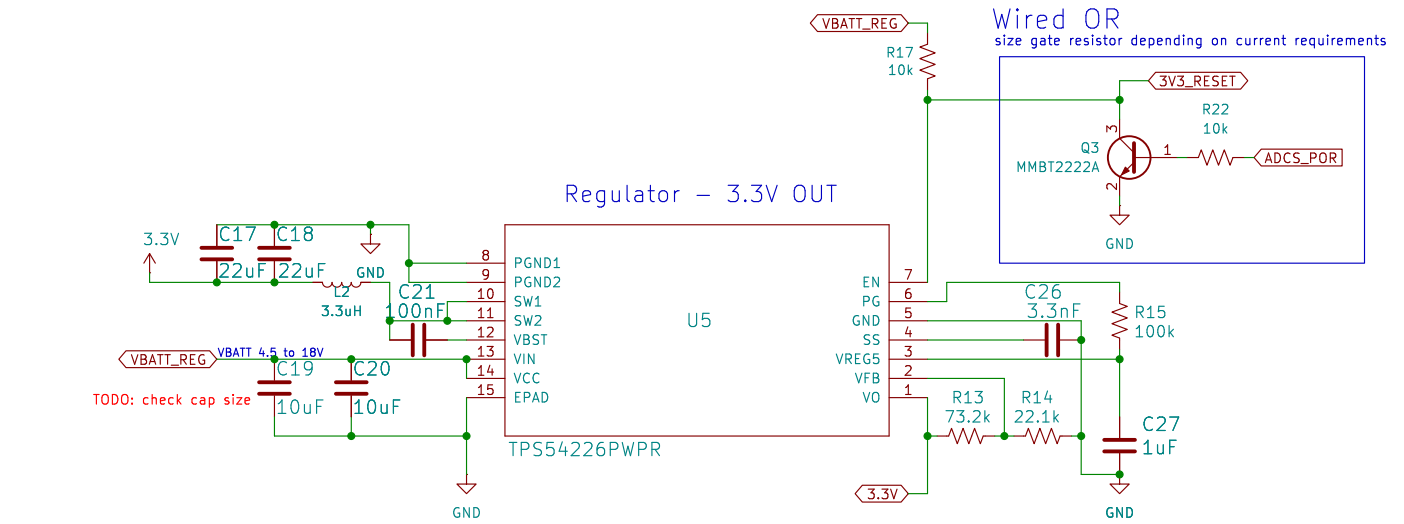
Sage Wu
Stanford Student Space Initiative

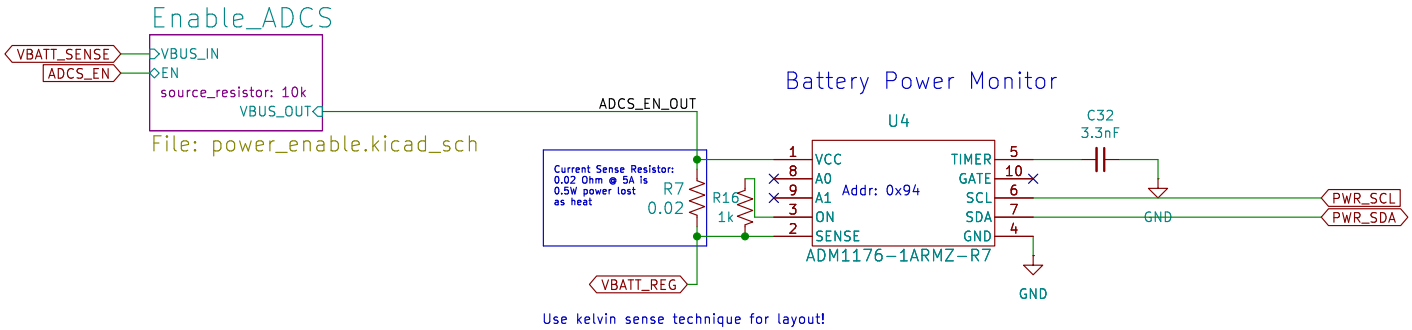
Sheet: /Avionics/
File: Avionics.kicad_sch

Title: ADCS Main Board

Size: USLedger	Date: 2025-04-07	**Rev: 1.2**
KiCad E.D.A. 9.0.1		Id: 2/16


PiCubed
J4
35362-1250
ADCS_POR
ADCS_EN
ADCS_PGOOD
RX_FROM_PICUBED
TX_TO_PICUBED
VBATT_SENSE
GND
Reaction Wheel Board
Conn_01x10
J8
MOTOR_EN
MOTOR_PGOOD
RX_FROM_MOTOR
TX_TO_MOTOR
VBATT_REG
GND
USB-C
Upload/Debugging
J9
VBUS
CC1
CC2
D-
D+
SBU1
SBU2
SHIELD
GND
USB_CC1
USB_CC2
USB_D-
USB_D+
R40
R39
5.1k
5.1k
C29
4.7uF
PWR_FLAG
GND
QWIIC
JMP
QWIIC_SCL
QWIIC_SDA
JP1
QWIIC supply
3.3V
QWIIC
J19
Jumper:
Close to attach sensor
Open to attach microcontroler
So 3.3V regualtors don't
feed into eachother
Test Points
Unconnected I/Os
TP1 TestPoint
TP2 TestPoint
TP3 TestPoint
TP4 TestPoint
TP5 TestPoint
GPIO_17
GPIO_27
GPIO_32
GPIO_33
GPIO_34
Other
TP6 TestPoint
TP7 TestPoint
WATCHDOG_FEED
EN_MAGDRV
TP8 TestPoint
TP9 TestPoint
X_MAGDRV_IN1
X_MAGDRV_IN2
SWD
3.3V
J20
VTref
RESET
SWCLK/TCK
SWDIO/TMS
SWO/TDO
NC/TDI
GNDDetect
SWCLK
SWDIO
Magnetorquers
X+/Y+/Z+
X_MAGDRV_OUT1
X_MAGDRV_OUT2
Y_MAGDRV_OUT1
Y_MAGDRV_OUT2
Z_MAGDRV_OUT1
Z_MAGDRV_OUT2
J10
J11
J12
ssi_connector:Molex_205338-0002
X-/Y-/Z-
J13
J14
J15
Mounting Holes
H1
H2
H3
H4
RPI Debugger
J5
Conn_01x04
UART_FROM_DEBUG
UART_TO_DEBUG
3.3V
GND
NOTE: Components labeled "do not install" (DNI) are not populated by default
Connectors
Sage Wu
Stanford Student Space Initiative
Sheet: /Connectors/
File: Connectors.kicad_sch
Title: ADCS Main Board
Size: A4
Date: 2025-04-07
Rev: 1.2
KiCad E.D.A. 9.0.1
Id: 4/16





NOTE: Components labeled "do not install" (DNI) are not populated by default

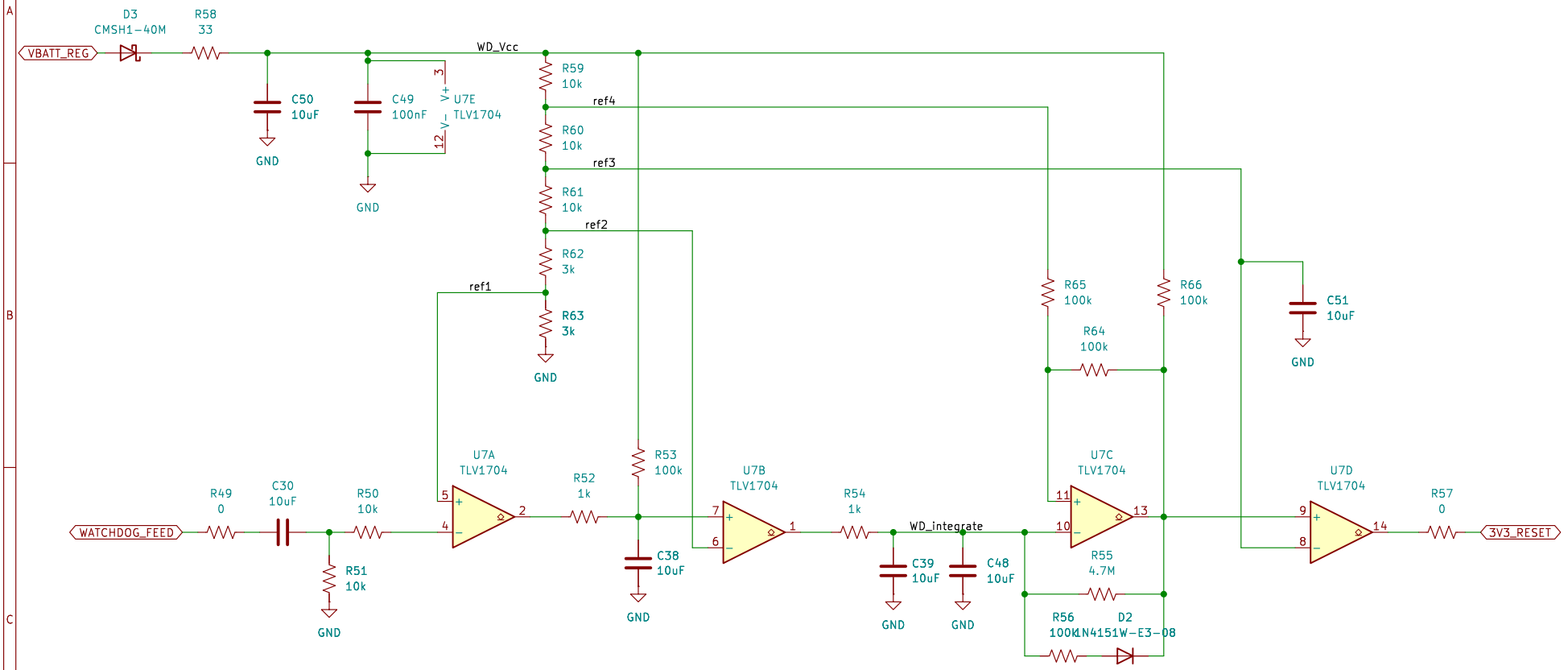
Power

From PiCubed
Sage Wu
Stanford Student Space Initiative

Sheet: /Power/
File: Power.kicad_sch

Title: ADCS Main Board

Size: A4	Date: 2025-04-07	**Rev: 1.2**
KiCad E.D.A. 9.0.1		Id: 5/16



Circuit based on Oresat's watchdog circuit:
https://github.com/oresat/oresat-c3-hardware/blob/master/kicad/oresat-c3-sch-watchdog.kicad_sch

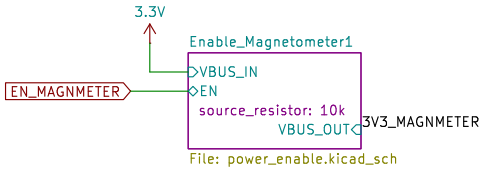
From PiCubed
Sage Wu
Stanford Student Space Initiative

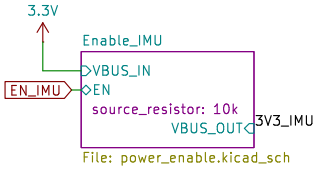
Sheet: /Watchdog/
File: watchdog.kicad_sch

Title: ADCS Main Board

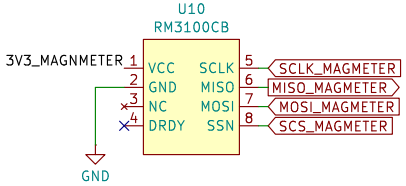
Size: USLetter	Date: 2025-04-07	**Rev: 1.2**
KiCad E.D.A. 9.0.1		Id: 7/16

Power Enable Circuitry





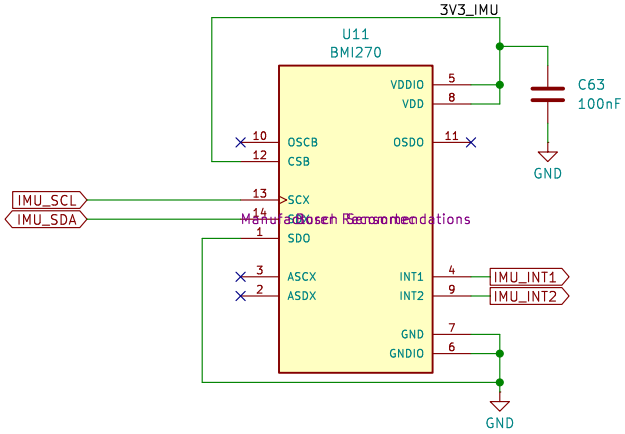
Magnetometers



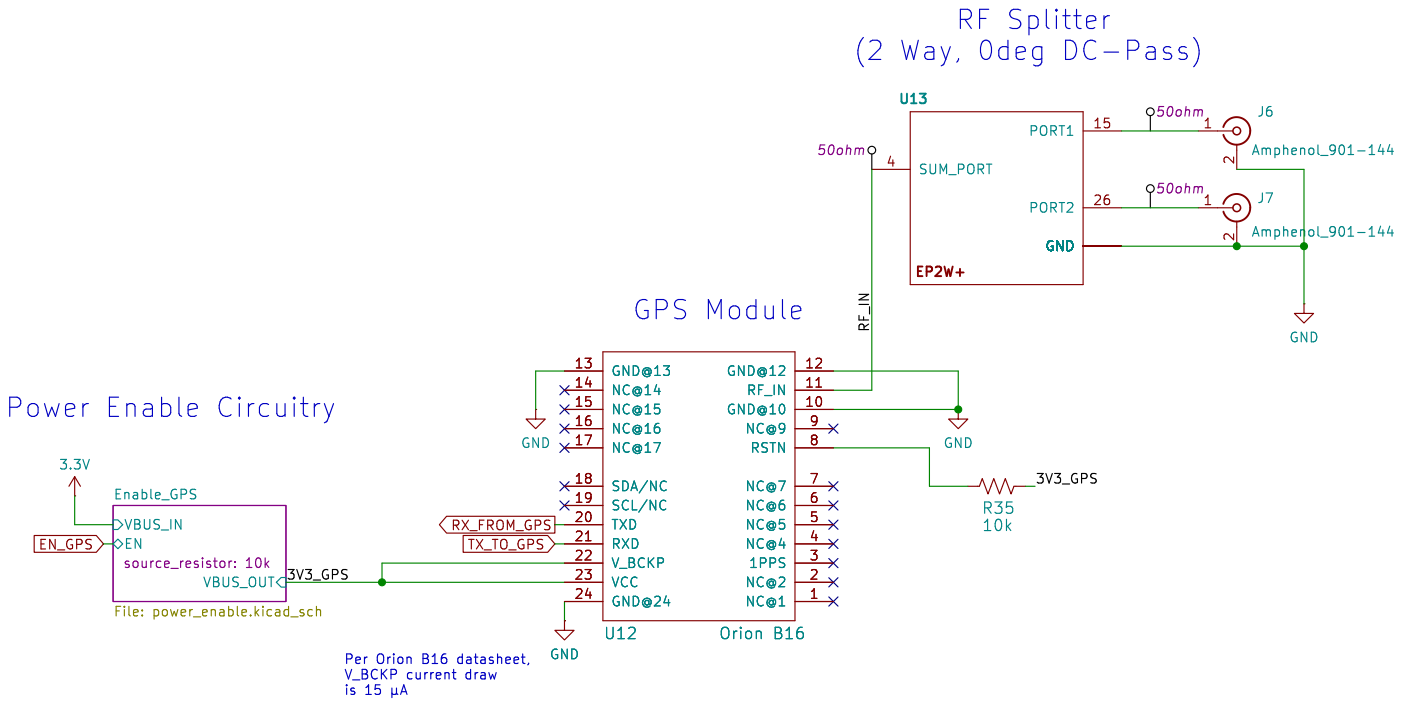
RM3100 datasheet
pg 27: I2C
pg 17: I2C ver configuration

IMU

R_pullup(min) = (3.3V−0.2*3.3v)/2mA = 1.32kΩ
R_pullup(max) = 300ns/(0.8473*400pF) = 88.5kΩ

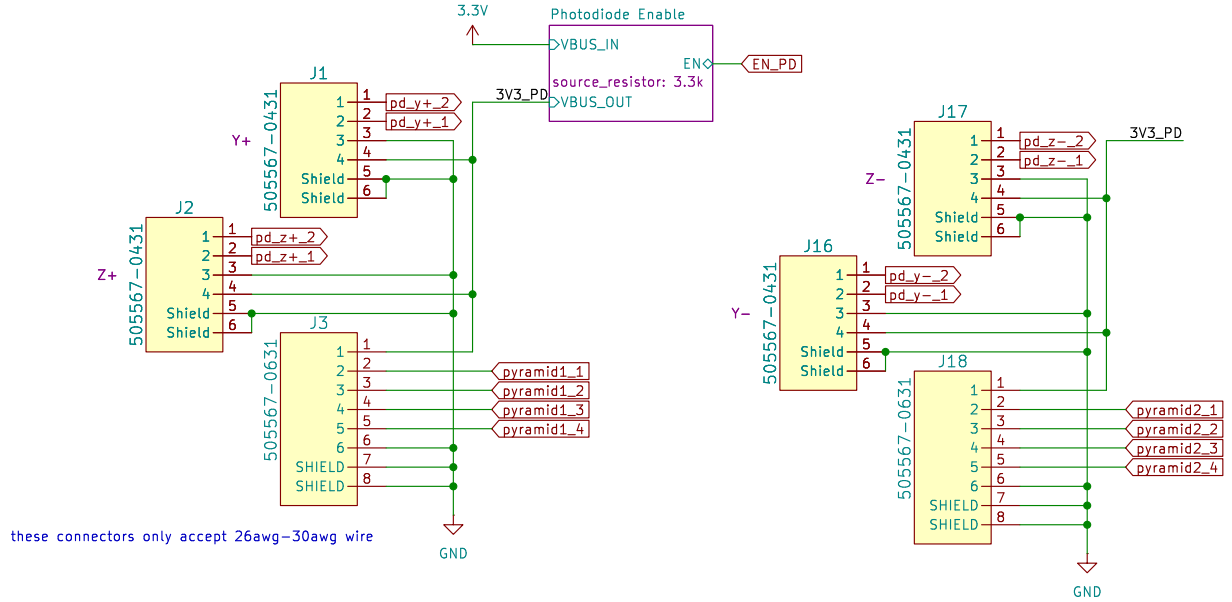


Sage Wu		
Stanford Student Space Initiative		
Sheet: /IMU_and_Magnetometer/		
File: IMU_and_Magnetometer.kicad_sch		
Title: ADCS Main Board		
Size: A	Date: 2025-04-07	**Rev: 1.2**
KiCad E.D.A. 9.0.1		Id: 10/16



Sage Wu **Stanford Student Space Initiative**		
Sheet: /GPS/ File: GPS.kicad_sch		
Title: ADCS Main Board		
Size: A4	Date: 2025-04-07	**Rev: 1.2**
KiCad E.D.A. 9.0.1		Id: 11/16

Photodiodes & Sun Pyramid

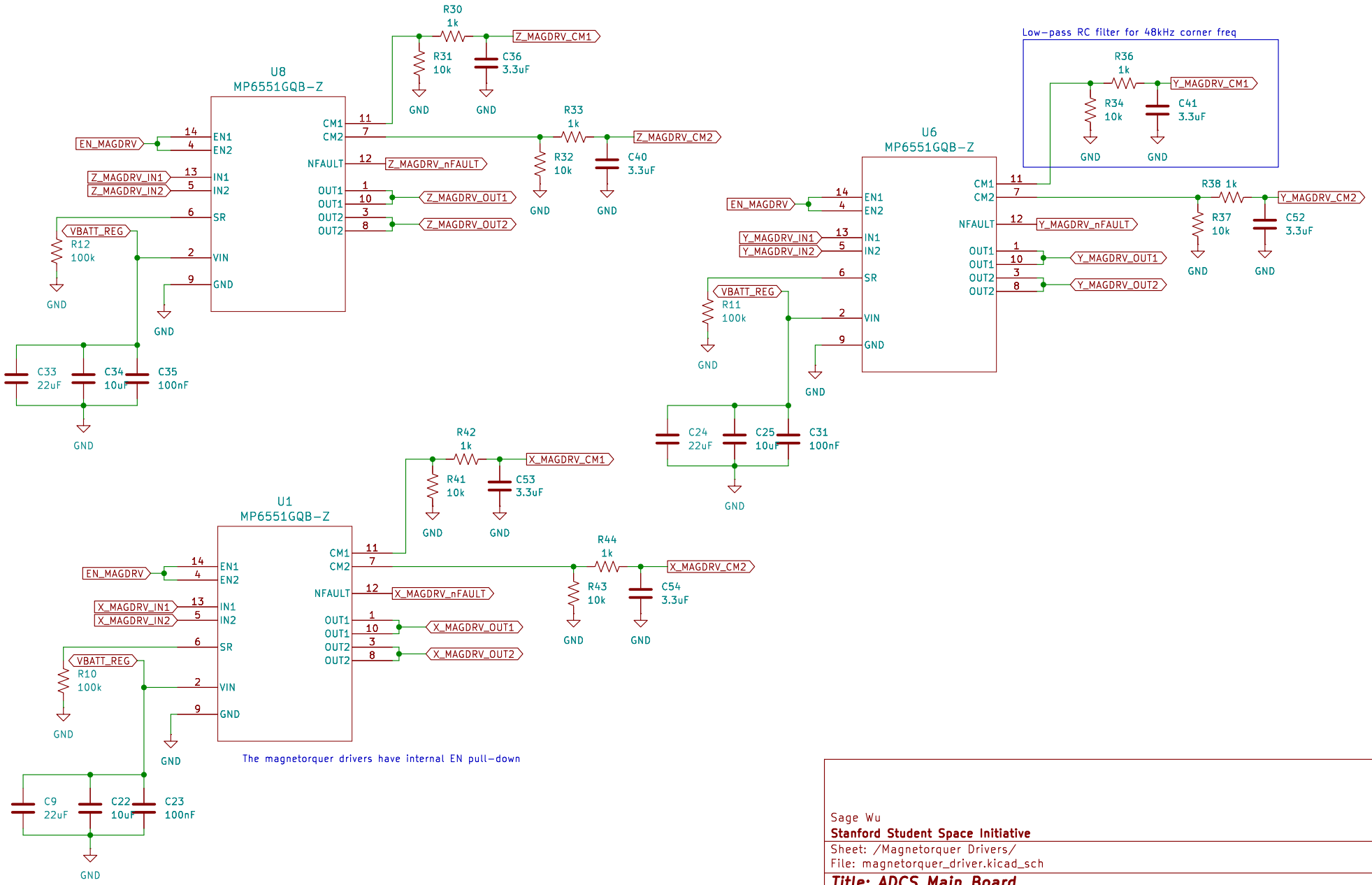


Sage Wu
Stanford Student Space Initiative

Sheet: /Photodiodes/
File: photodiodes.kicad_sch

Title: ADCS Main Board

Size: A4	Date: 2025-04-07	**Rev: 1.2**
KiCad E.D.A. 9.0.1		Id: 12/16



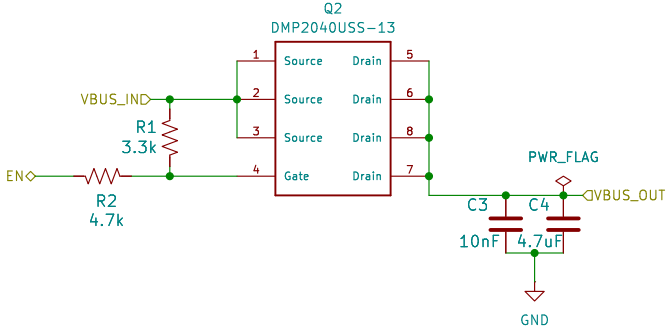
Sage Wu
Stanford Student Space Initiative
Sheet: /Magnetorquer Drivers/
File: magnetorquer_driver.kicad_sch

Title: ADCS Main Board

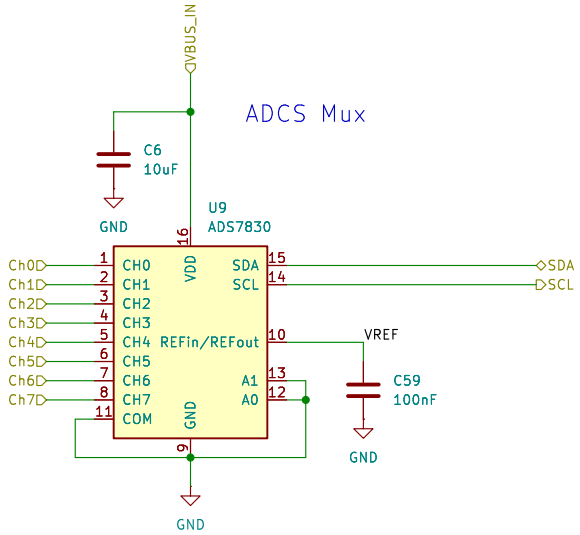
Size: A4	Date: 2025-04-07	**Rev: 1.2**
KiCad E.D.A. 9.0.1		Id: 15/16

Power Enable

check that the correct part is on the BOM: DMP2040USS-13



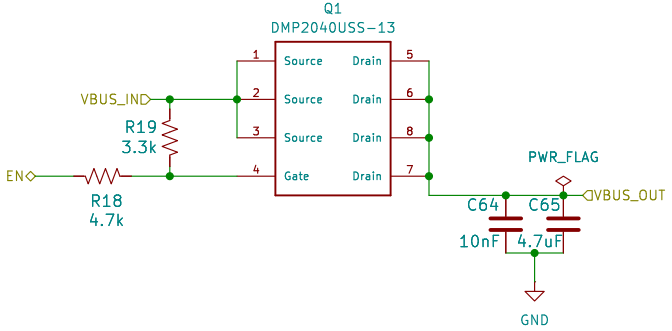
Sage Wu		
Stanford Student Space Initiative		
Sheet: /Photodiodes/Photodiode Enable/		
File: power_enable.kicad_sch		
Title: ADCS Main Board		
Size: A	Date: 2025-04-07	**Rev: 1.2**
KiCad E.D.A. 9.0.1		Id: 3/16



Sage Wu		
Stanford Student Space Initiative		
Sheet: /Avionics/Sun Pyramid Mux/		
File: ADC_multiplexer.kicad_sch		
Title: ADCS Main Board		
Size: A4	Date: 2025-04-07	**Rev: 1.2**
KiCad E.D.A. 9.0.1		Id: 8/16

Power Enable

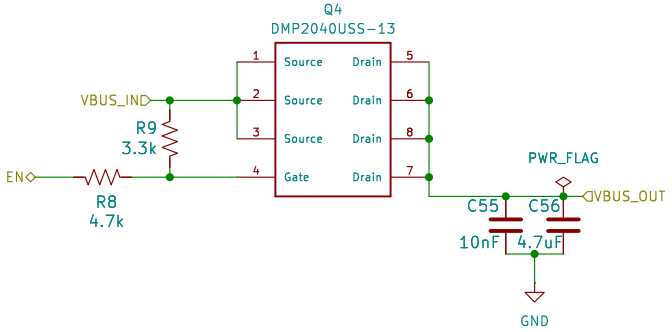
check that the correct part is on the BOM: DMP2040USS-13



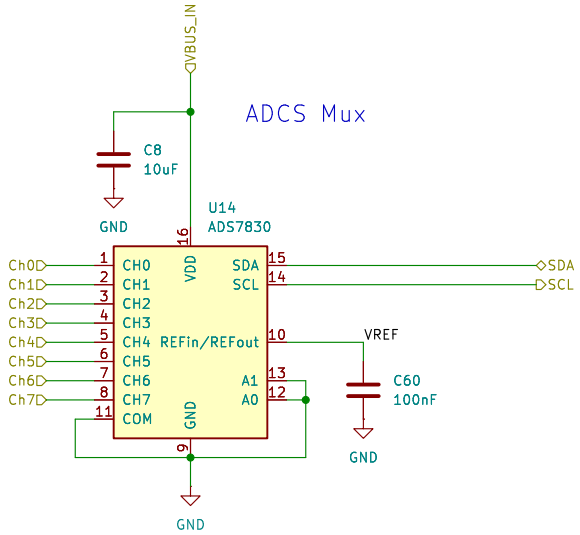
Sage Wu		
Stanford Student Space Initiative		
Sheet: /Power/Enable_ADCS/		
File: power_enable.kicad_sch		
Title: ADCS Main Board		
Size: A	Date: 2025-04-07	**Rev: 1.2**
KiCad E.D.A. 9.0.1		Id: 9/16

Power Enable

check that the correct part is on the BOM: DMP2040USS-13



Sage Wu		
Stanford Student Space Initiative		
Sheet: /GPS/Enable_GPS/		
File: power_enable.kicad_sch		
Title: ADCS Main Board		
Size: A	Date: 2025-04-07	**Rev: 1.2**
KiCad E.D.A. 9.0.1		Id: 12/16



Sage Wu
Stanford Student Space Initiative

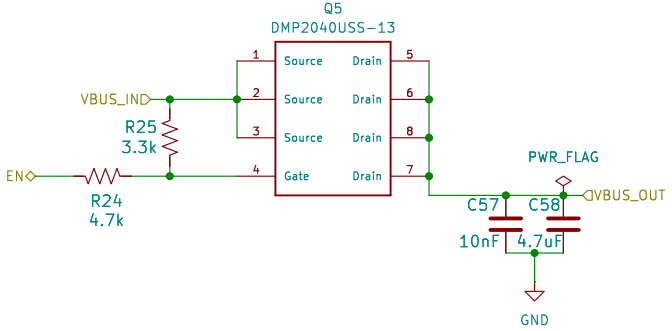
Sheet: /Avionics/Magdrv Current Monitor Mux/
File: ADC_multiplexer.kicad_sch

Title: ADCS Main Board

Size: A4	Date: 2025-04-07	**Rev: 1.2**
KiCad E.D.A. 9.0.1		Id: 16/16

Power Enable

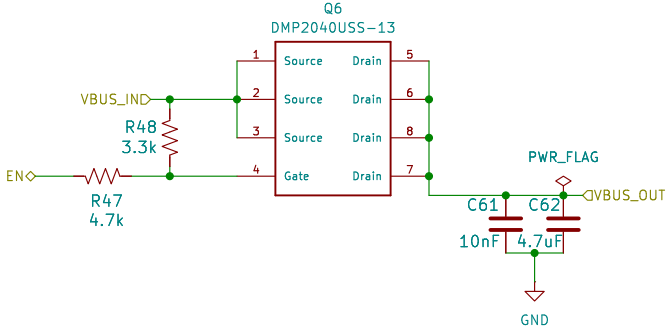
check that the correct part is on the BOM: DMP2040USS-13



Sage Wu		
Stanford Student Space Initiative		
Sheet: /IMU_and_Magnetometer/Enable_Magnetometer1/		
File: power_enable.kicad_sch		
Title: ADCS Main Board		
Size: A	Date: 2025-04-07	**Rev: 1.2**
KiCad E.D.A. 9.0.1		Id: 15/16

Power Enable

check that the correct part is on the BOM: DMP2040USS-13



Sage Wu		
Stanford Student Space Initiative		
Sheet: /IMU_and_Magnetometer/Enable_IMU/		
File: power_enable.kicad_sch		
Title: ADCS Main Board		
Size: A	Date: 2025-04-07	**Rev: 1.2**
KiCad E.D.A. 9.0.1		Id: 16/16