J5
POWER
1
2
3
4
GND
TP2
VBAT
VBAT

File: power-supply.kicad_sch
5V PowerSupply
VBAT
5VOUT
TP4
+5V
R15
0R-1206
+5V

File: 3V3-3V0-power-supply.kicad_sch
3V-3.3V-PS
+5V
5VIN
3V3_PI
EN
3V0OUT
3V3OUT
TP1
+3.0V
R5
0R-1206
+3V0
TP3
+3.3V
R14
0R-1206
+3V3

TP5
GND
GND

+5V
R19
1.0k-1%-0603
D1
+5V
GND

GND
UART2_TXD
UART2_RXD
1
2
3
J2
UART

TP6 TP7 TP8
CAN_INT0
CAN_INT1
CAN_INT

File: can-fd.kicad_sch
CAN-FD
CAN_INT
CAN_INT0
CAN_INT1
SPI2_RXD
SPI2_TXD
SPI2_CS
SPI2_CLK
SDO
SDI
CAN_CS
SCK
CAN_L
CAN_H
1
2
J4
CAN

J1
PI Header
1 3V3_PI
2
3
4
5
6
7 SPI2_CLK
8 UART2_TXD
9
10 UART2_RXD
11 PWM0
12
13 PWM1
14
15
16
17 3V3_PI
18
19 SPI1_TXD
20
21 SPI1_RXD
22
23 SPI1_CLK
24 SPI1_CS
25
26
27
28
29 SPI2_TXD
30
31 SPI2_RXD
32 DR
33 SPI2_CS
34
35 CAN_INT
36 CAN_INT1
37 CAN_INT0
38
39
40
GND
+5V
+5V

File: IMUdriver.kicad_sch
IMU Driver
DR
SPI1_TXD
PWM0
R18
499R-1%-0603
SPI1_RXD
SPI1_CLK
SPI1_CS
DR
MOSI
MISO
SCK
CS
SCK_LD
SCK_HD
DR_LD
DR_HD
MOSI_LD
MOSI_HD
MISO_LD
MISO_HD
CS_LD
CS_HD

GND
+5V
1
2
3 SCK_L
4 SCK_H
5 DR_L
6 DR_H
7 MOSI_L
8 MOSI_H
9 MISO_L
10 MISO_H
11 CS_L
12 CS_H
J3
IMU SPI

H4
MTG Hole 2.5mm
H8
MTG Hole 2.5mm
H6
MTG Hole 2.5mm
H2
MTG Hole 2.5mm

H7
Paste Hole 2.5mm
H5
Paste Hole 2.5mm
H1
Paste Slot 5x2.5mm
H3
Paste Slot 5x2.5mm

Power Utilization

3V3:
- CAN-FD: 28 mA
- IMU Driver: 56 mA
TOTAL 84 mA
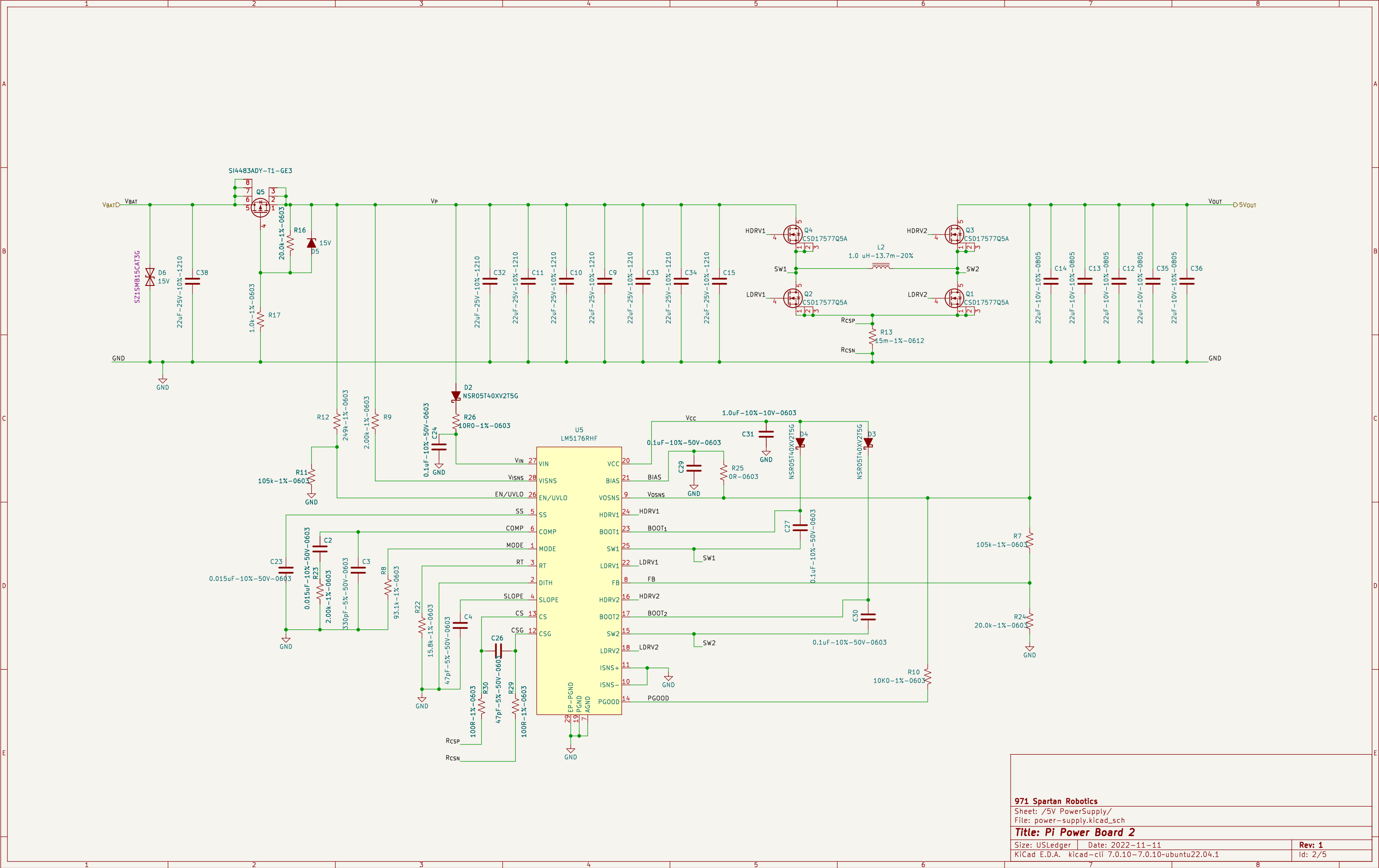
5V:
- CAN-FD: 70 mA
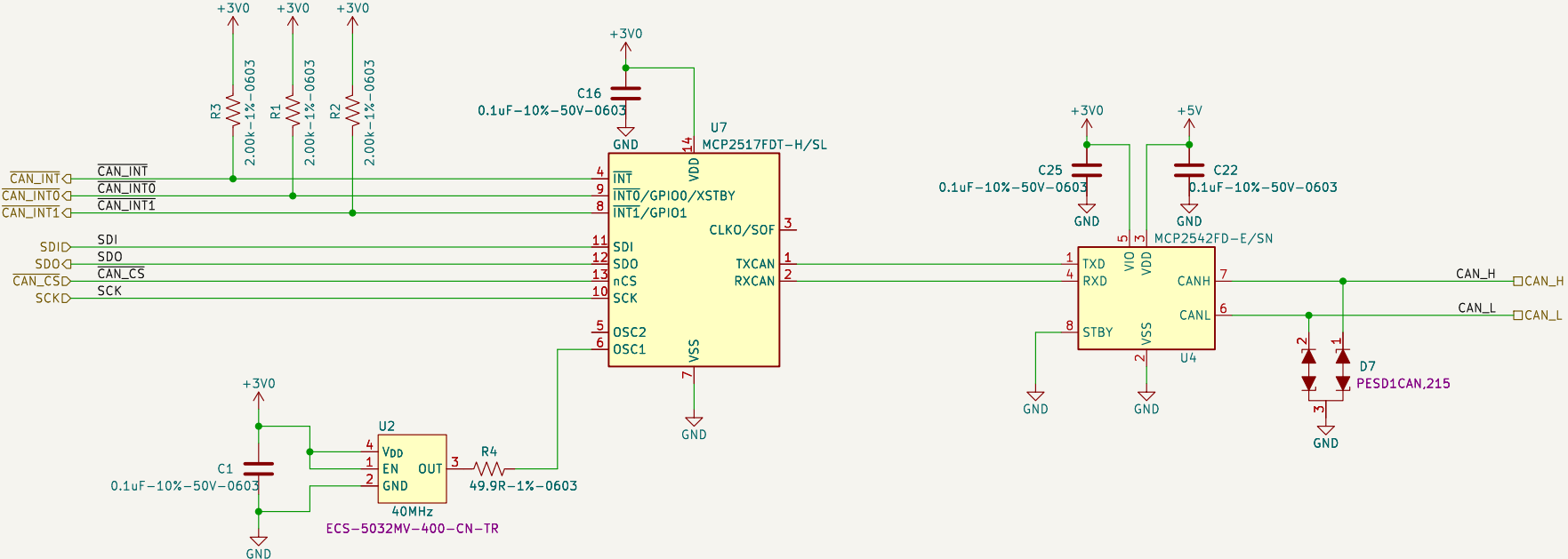TOTAL: 70 mA

971 Spartan Robotics
Sheet: /
File: PI-Power-Board.kicad_sch
Title: Pi Power Board 2
Size: USLedger   Date: 2022-11-11   Rev: 1
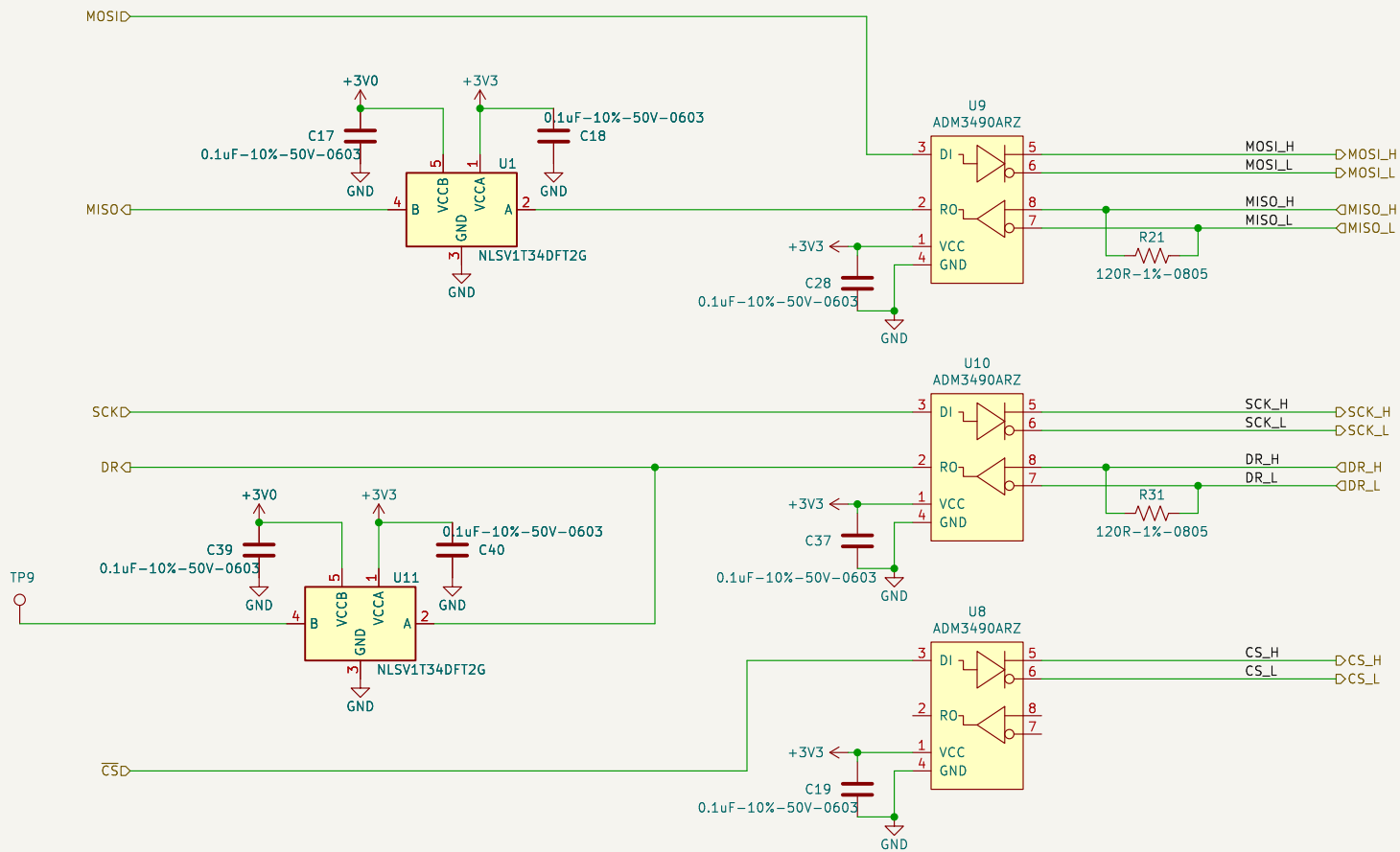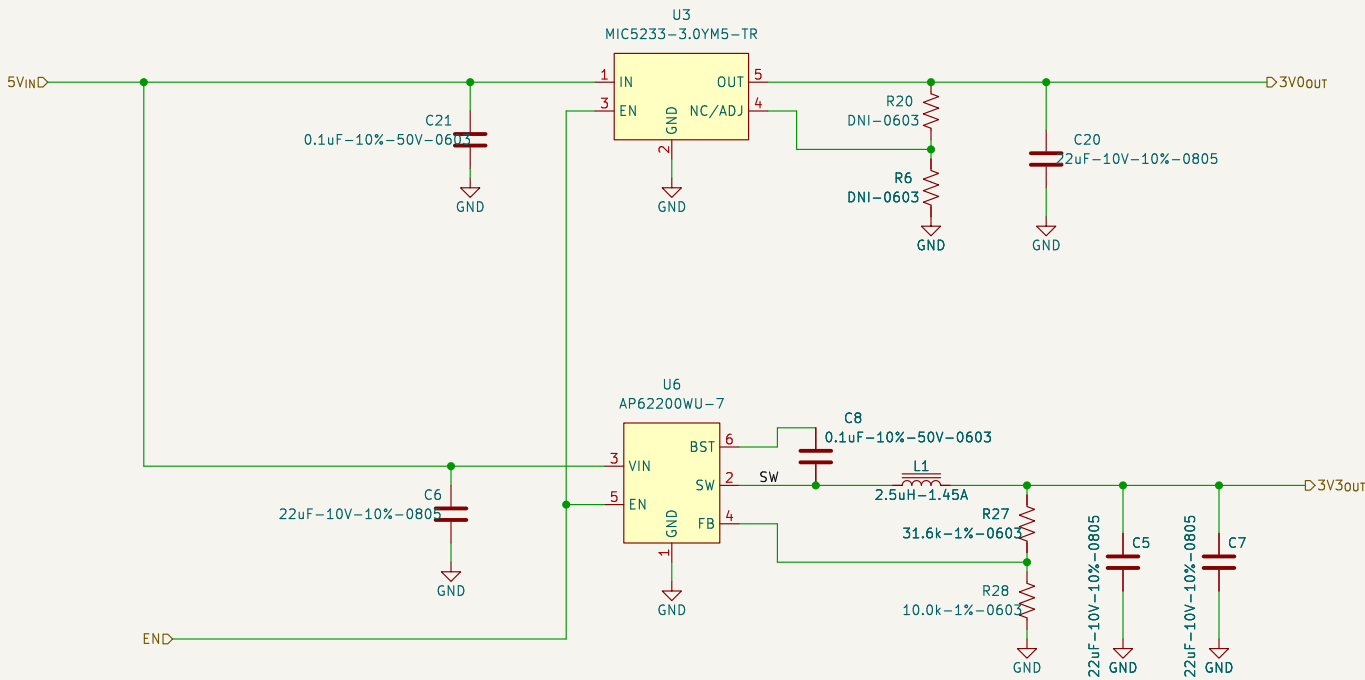KiCad E.D.A. kicad-cli 7.0.10-7.0.10-ubuntu22.04.1   Id: 1/5

SI4483ADY-T1-GE3
Q5

V_{BAT} VBAT

R16
20.0k-1%-0603

D5
15V

V_P

SZ1SMB15CAT3G
D6
15V

C38
22uF-25V-10%-1210

R17
1.0k-1%-0603

C32
22uF-25V-10%-1210

C11
22uF-25V-10%-1210

C10
22uF-25V-10%-1210

C9
22uF-25V-10%-1210

C33
22uF-25V-10%-1210

C34
22uF-25V-10%-1210

C15
22uF-25V-10%-1210

HDRV1 Q4
CSD17577Q5A

HDRV2 Q3
CSD17577Q5A

L2
1.0 uH-13.7m-20%

SW1   SW2

LDRV1 Q2
CSD17577Q5A

LDRV2 Q1
CSD17577Q5A

Rcsp
R13
15m-1%-0612
Rcsn

V_{OUT} 5V_{OUT}

C14 C13 C12 C35 C36
22uF-10V-10%-0805

GND

GND

R12
249k-1%-0603

R9
2.00k-1%-0603

D2
NSR05T40XV2T5G

R26
10R0-1%-0603

C24
0.1uF-10%-50V-0603

GND

R11
105k-1%-0603

GND

U5
LM5176RHF

V_{IN} 27 VIN   VCC 20

V_{ISNS} 28 VISNS   BIAS 21

EN/UVLO 26 EN/UVLO V_{OSNS} 9

SS 5 SS   HDRV1 24

COMP 6 COMP   BOOT1 23

MODE 1 MODE   SW1 25

RT 3 RT   LDRV1 22

DITH 2 DITH   FB 8

SLOPE 4 SLOPE   HDRV2 16

CS 13 CS   BOOT2 17

CSG 12 CSG   SW2 15

ISNS+ 11   LDRV2 18

ISNS- 10

PGOOD 14

29 EP-PGND
19 PGND
7   AGND

Vcc
1.0uF-10%-10V-0603
C31

GND

0.1uF-10%-50V-0603
C29

GND

R25
0R-0603

NSR05T40XV2T5G
D4

NSR05T40XV2T5G
D3

V_{OSNS}

HDRV1
BOOT1
C27
0.1uF-10%-50V-0603
SW1

HDRV2
BOOT2
C30
0.1uF-10%-50V-0603
SW2

R7
105k-1%-0603

R24
20.0k-1%-0603

GND

FB

R10
10K0-1%-0603

PGOOD

C23
0.015uF-10%-50V-0603

C2
0.015uF-10%-50V-0603

R23
2.00k-1%-0603

C3
330pF-5%-50V-0603

R8
93.1k-1%-0603

R22
15.8k-1%-0603

C4
47pF-5%-50V-0603

C26
47pF-5%-50V-060

R30
100R-1%-0603

R29
100R-1%-0603

GND

GND

GND

Rcsp
Rcsn

GND

GND

Power Utilization
3.0V:
    MCP2517: 20mA
    MCP2542: 400uA
    ECS-5032: 7mA

5V:
    MCP2542: 140mA (Fault), 70mA (Normal)

MOSI

+3V0   +3V3
C17   0.1uF-10%-50V-0603
0.1uF-10%-50V-0603   C18
GND   GND
        U1

MISO   B   A
        VCCB VCCA
        GND
        NLSV1T34DFT2G
        GND

U9
ADM3490ARZ
3 DI   5 MOSI_H   MOSI_H
               6 MOSI_L   MOSI_L
2 RO   8 MISO_H   MISO_H
               7 MISO_L   MISO_L
+3V3   1 VCC
        4 GND
C28   R21
0.1uF-10%-50V-0603   120R-1%-0805
GND

SCK

DR

TP9

+3V0   +3V3
C39   0.1uF-10%-50V-0603
0.1uF-10%-50V-0603   C40
GND   GND
        U11

        B   A
        VCCB VCCA
        GND
        NLSV1T34DFT2G
        GND

U10
ADM3490ARZ
3 DI   5 SCK_H   SCK_H
               6 SCK_L   SCK_L
2 RO   8 DR_H   DR_H
               7 DR_L   DR_L
+3V3   1 VCC
        4 GND
C37   R31
0.1uF-10%-50V-0603   120R-1%-0805
GND

U8
ADM3490ARZ
3 DI   5 CS_H   CS_H
               6 CS_L   CS_L
2 RO   8
               7
+3V3   1 VCC
        4 GND
C19
0.1uF-10%-50V-0603
GND

CS

Power Utilization
3.3V:
    3x ADM3490: 3 x (2.2mA+2V/120) = 56mA

971 Spartan Robotics
Sheet: /IMU Driver/
File: IMUdriver.kicad_sch
Title: Pi Power Board 2
Size: USLedger   Date: 2022-11-11   Rev: 1
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5V_IN

U3
MIC5233-3.0YM5-TR
1 IN OUT 5
3 EN NC/ADJ 4
2 GND
GND

C21
0.1uF-10%-50V-0603
GND

R20
DNI-0603

R6
DNI-0603
GND

C20
22uF-10V-10%-0805
GND

3V0_OUT

U6
AP62200WU-7
3 VIN BST 6
2 SW
5 EN
1 GND FB 4
GND

C6
22uF-10V-10%-0805
GND

EN

C8
0.1uF-10%-50V-0603

SW

L1
2.5uH-1.45A

R27
31.6k-1%-0603

R28
10.0k-1%-0603
GND

C5
22uF-10V-10%-0805
GND

C7
22uF-10V-10%-0805
GND

3V3_OUT

$t_{ON} = V_{OUT}/(V_{IN}*f_{SW})$
$t_{ON} = 3.3/(5*750E3) = 0.88us$

$I_{LOAD} = ((V_{IN} - V_{OUT})/(2*L)) * t_{ON}$
$L = 0.5*(V_{IN} - V_{OUT})*t_{ON}/I_{LOAD}$
$L = 0.5*(5 - 3.3)*0.88E-6/0.5$
$L = 1.5uH$
$L = V_{OUT}*(V_{IN} - V_{OUT})/(V_{IN}*dI_{L}*f_{SW})$
$dI_{L} = 0.3*2 = 0.6$
$L = 3.3*(5-3.3)/(5*.6*750E3)$
$L = 2.5uH$

Vin: 5V
Vout: 3.3V 500mA

971 Spartan Robotics
Sheet: /3V-3.3V-PS/
File: 3V3-3V0-power-supply.kicad_sch
Title: Pi Power Board 2
Size: USLedger | Date: 2022-11-11 | Rev: 1
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