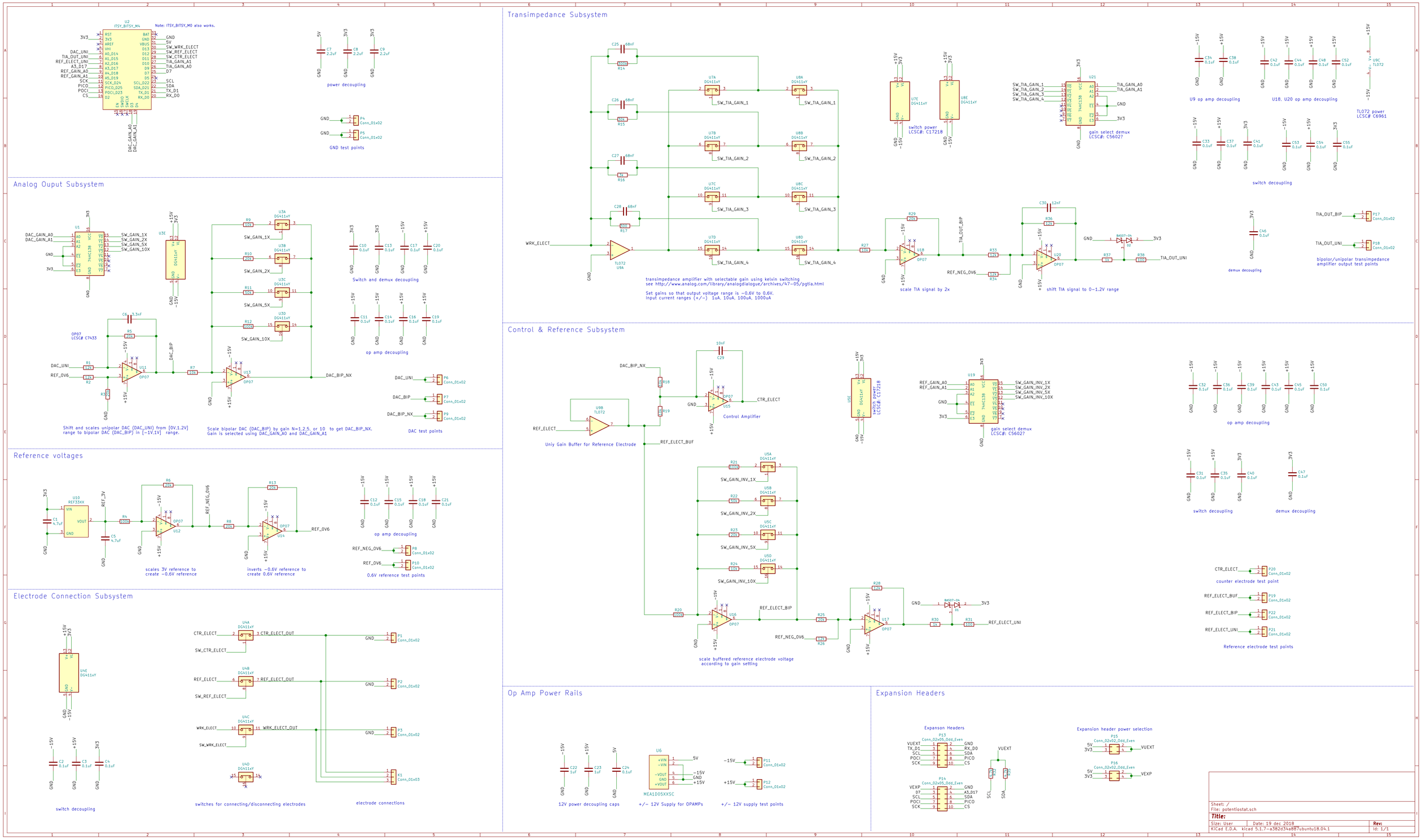
Note: ITSY_BITSY_M0 also works.
U2 ITSY_BITSY_M4
3V3
DAC_UNI
TIA_OUT_UNI
REF_ELECT_UNI
A3_D17
REF_GAIN_A0
REF_GAIN_A1
SCK
PICO
POCI
CS
GND
5V
SW_WRK_ELECT
SW_REF_ELECT
SW_CTR_ELECT
TIA_GAIN_A1
TIA_GAIN_A0
D7
SCL
SDA
TX_D1
RX_D0
DAC_GAIN_A0
DAC_GAIN_A1
C7 2.2uF
C8 2.2uF
C9 2.2uF
power decoupling
P4 Conn_01x02
P5 Conn_01x02
GND test points
Analog Ouput Subsystem
U1 74HC138
U3E DG411xY
SW_GAIN_1X
SW_GAIN_2X
SW_GAIN_5X
SW_GAIN_10X
U3A DG411xY
U3B DG411xY
U3C DG411xY
U3D DG411xY
R9 10k
R10 20k
R11 50k
R12 100k
C6 3.3nF
R5 20k
OP07
LCSC# C7433
R1 124
R2 124
R3 20k
U11
DAC_BIP
R7 10k
U13
DAC_BIP_NX
C10 0.1uF
C13 0.1uF
C17 0.1uF
C20 0.1uF
Switch and demux decoupling
C11 0.1uF
C14 0.1uF
C16 0.1uF
C19 0.1uF
op amp decoupling
P6 Conn_01x02
P7 Conn_01x02
P9 Conn_01x02
DAC test points
Shift and scales unipolar DAC (DAC_UNI) from [0V,1.2V] range to bipolar DAC (DAC_BIP) in [−1V,1V] range.
Scale bipolar DAC (DAC_BIP) by gain N=1,2,5, or 10 to get DAC_BIP_NX. Gain is selected using DAC_GAIN_A0 and DAC_GAIN_A1
Reference voltages
U10 REF33XX
C1 4.7uF
C5 4.7uF
R4 100k
REF_3V
R6 20k
U12
REF_NEG_0V6
R8 20k
R13 20k
U14
REF_0V6
C12 0.1uF
C15 0.1uF
C18 0.1uF
C21 0.1uF
op amp decoupling
P8 Conn_01x02
P10 Conn_01x02
0.6V reference test points
scales 3V reference to create −0.6V reference
inverts −0.6V reference to create 0.6V reference
Electrode Connection Subsystem
U4E DG411xY
U4A DG411xY
U4B DG411xY
U4C DG411xY
U4D DG411xY
CTR_ELECT
SW_CTR_ELECT
CTR_ELECT_OUT
REF_ELECT
SW_REF_ELECT
REF_ELECT_OUT
WRK_ELECT
SW_WRK_ELECT
WRK_ELECT_OUT
P1 Conn_01x02
P2 Conn_01x02
P3 Conn_01x02
K1 Conn_01x03
C2 0.1uF
C3 0.1uF
C4 0.1uF
switch decoupling
switches for connecting/disconnecting electrodes
electrode connections
Transimpedance Subsystem
C25 68nF
R14 100k
C26 68nF
R15 10k
C27 68nF
R16 1k
C28 68nF
R17 100k
TL072 U9A
WRK_ELECT
U7A DG411xY
U7B DG411xY
U7C DG411xY
U7D DG411xY
U8A DG411xY
U8B DG411xY
U8C DG411xY
U8D DG411xY
SW_TIA_GAIN_1
SW_TIA_GAIN_2
SW_TIA_GAIN_3
SW_TIA_GAIN_4
R27 100k
R29 20k
U18 OP07
TIA_OUT_BIP
transimpedance amplifier with selectable gain using keivin switching
see http://www.analog.com/library/analogdialogue/archives/47-05/pgtia.html
Set gains so that output voltage range is −0.6V to 0.6V.
Input current ranges (+/−) 1uA, 10uA, 100uA, 1000uA
scale TIA signal by 2x
U7E DG411xY
U8E DG411xY
switch power
LCSC#: C17218
U21 74HC138
TIA_GAIN_A0
TIA_GAIN_A1
gain select demux
LCSC#: C5602?
C30 12nF
R36 124
U20 OP07
R33 124
REF_NEG_0V6
R34 124
D1 BAS07-04
R37 16
R38 100
TIA_OUT_UNI
shift TIA signal to 0−1.2V range
C34 0.1uF
C38 0.1uF
U9 op amp decoupling
C42 0.1uF
C44 0.1uF
C48 0.1uF
C52 0.1uF
U18, U20 op amp decoupling
U9C TL072
TL072 power
LCSC# C6961
C33 0.1uF
C37 0.1uF
C41 0.1uF
C53 0.1uF
C54 0.1uF
C55 0.1uF
switch decoupling
C46 0.1uF
demux decoupling
P17 Conn_01x02
P18 Conn_01x02
bipolor/unipolar transimpedance amplifier output test points
Control & Reference Subsystem
C29 10nF
DAC_BIP_NX
R18 100k
R19 100k
U15 OP07
CTR_ELECT
Control Amplifier
U9B TL072
REF_ELECT
Uniy Gain Buffer for Reference Electrode
REF_ELECT_BUF
U5E DG411xY
switch power
LCSC#: C17218
U19 74HC138
REF_GAIN_A0
REF_GAIN_A1
SW_GAIN_INV_1X
SW_GAIN_INV_2X
SW_GAIN_INV_5X
SW_GAIN_INV_10X
gain select demux
LCSC#: C5602?
C32 0.1uF
C36 0.1uF
C39 0.1uF
C43 0.1uF
C45 0.1uF
C50 0.1uF
op amp decoupling
U5A DG411xY
U5B DG411xY
U5C DG411xY
U5D DG411xY
R21 20k
R22 50k
R23 20k
R24 10k
R20 100k
U16 OP07
REF_ELECT_BIP
R25 20k
R26 124
REF_NEG_0V6
R28 124
U17 OP07
D2 BAS07-04
R30 16
R31 100
REF_ELECT_UNI
scale buffered reference electrode voltage according to gain setting
C31 0.1uF
C35 0.1uF
C40 0.1uF
C47 0.1uF
switch decoupling
demux decoupling
P20 Conn_01x02
CTR_ELECT
counter electrode test point
P19 Conn_01x02
REF_ELECT_BUF
P22 Conn_01x02
REF_ELECT_BIP
P21 Conn_01x02
REF_ELECT_UNI
Reference electrode test points
Op Amp Power Rails
C22 1uF
C23 1uF
C24 0.1uF
12V power decoupling caps
U6 MEA1D05XXSC
+VIN
−VIN
−VOUT
GND
+VOUT
5V
−15V
+15V
+/− 12V Supply for OPAMPs
P11 Conn_01x02
P12 Conn_01x02
+/− 12V supply test points
Expansion Headers
Expanson Headers
P13 Conn_02x05_Odd_Even
VUEXT
TX_D1
SCL
POCI
SCK
RX_D0
SDA
PICO
CS
P14 Conn_02x05_Odd_Even
VEXP
D7
A3_D17
R32 100k
R33 100k
Expansion header power selection
P15 Conn_02x02_Odd_Even
P16 Conn_02x02_Odd_Even
Sheet: /
File: potentiostat.sch
Title:
Size: User
Date: 19 dec 2018
Rev:
KiCad E.D.A. kicad 5.1.7-a382d34a887ubuntu18.04.1
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