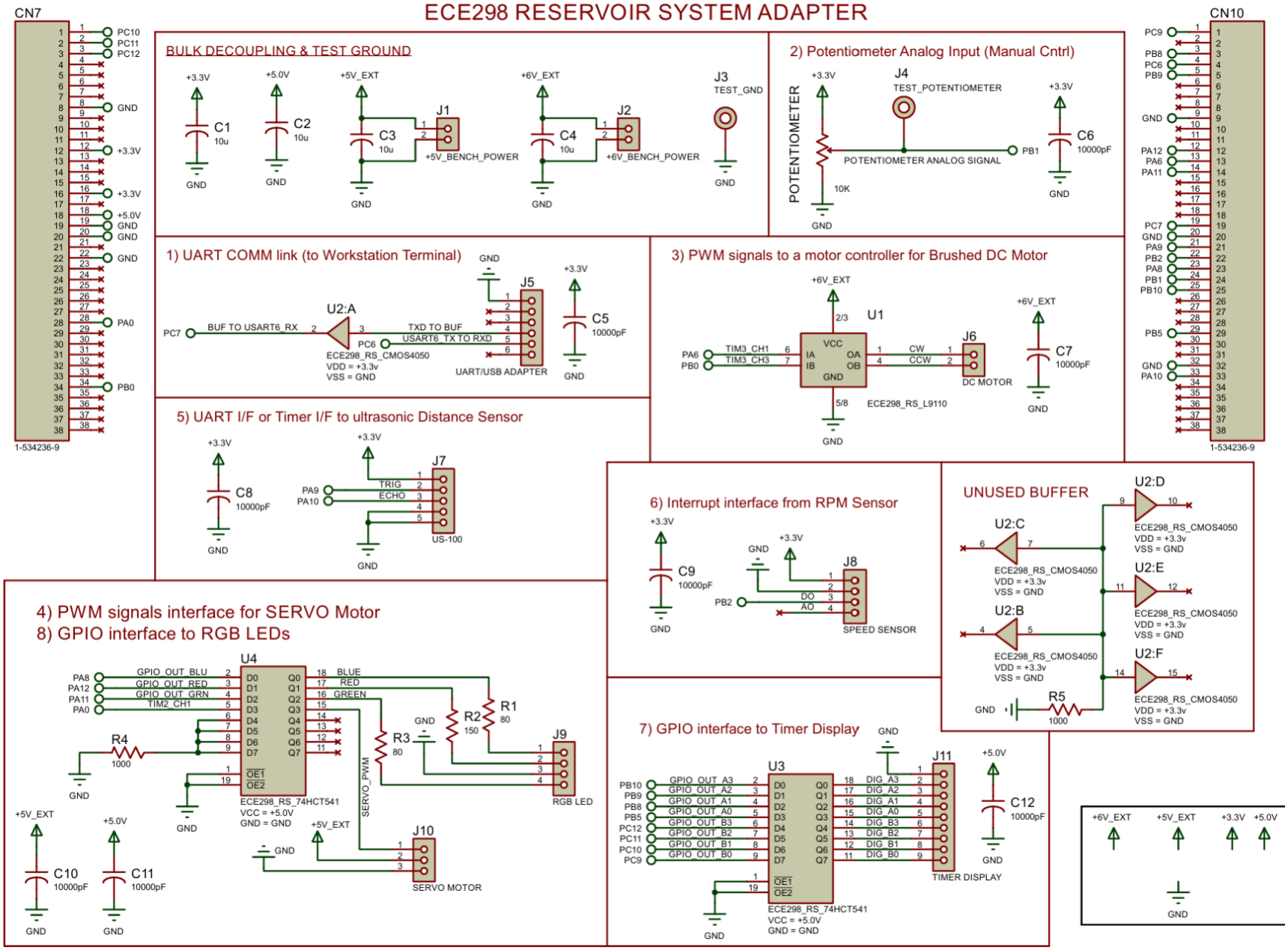
ECE 298

Prototype Model Report

LS007 Group 8: Sarah Son & Lucy Sun

Prototype Schematic



Schematic Net List (in txt file)

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ISIS SCHEMATIC DESCRIPTION FORMAT 8.0
=====================================
Design:  ECE298_RS_ADAPTER
Doc. no.: <NONE>
Revision: <NONE>
Author:  <NONE>
Created:  2023-07-07
Modified: 2024-12-02

*PROPERTIES,0

*MODELDEFS,0

*PARTLIST,36
C1,ECE298_RS_CAP_10U,10u,CODE="Digikey PCC2182TR-ND",EID=13,PACKAGE=CAPC2012X100
C3,ECE298_RS_CAP_10U,10u,CODE="Digikey PCC2182TR-ND",EID=12,PACKAGE=CAPC2012X100
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C6,ECE298_RS_CAP_10U,10u,CODE="Digikey PCC2182TR-ND",EID=1B,PACKAGE=CAPC2012X100
C7,ECE298_RS_CAP_10U,10u,CODE="Digikey PCC2182TR-ND",EID=1C,PACKAGE=CAPC2012X100
C8,ECE298_RS_CAP_0U1,10000pF,CODE="Digikey PCC103BQDKR-ND",EID=23,PACKAGE=CAPC1005X55
C9,ECE298_RS_CAP_0U1,10000pF,CODE="Digikey PCC103BQDKR-ND",EID=28,PACKAGE=CAPC1005X55
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C11,ECE298_RS_CAP_0U1,10000pF,CODE="Digikey PCC103BQDKR-ND",EID=2A,PACKAGE=CAPC1005X55
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C13,ECE298_RS_CAP_0U1,10000pF,CODE="Digikey PCC103BQDKR-ND",EID=2E,PACKAGE=CAPC1005X55
C14,ECE298_RS_CAP_0U1,10000pF,CODE="Digikey PCC103BQDKR-ND",EID=2F,PACKAGE=CAPC1005X55
CN7,1-534236-9,1-534236-9,CODE=1-534236-9,EID=1,PACKAGE=ECE298_REVTRANS38DIL-1,SUPPLIER=TE_CONNECTIVITY
CN10,1-534236-9,1-534236-9,CODE=1-534236-9,EID=2,PACKAGE=ECE298_REVTRANS38DIL-1,SUPPLIER=TE_CONNECTIVITY
J6,ECE298_RS_BENCH_POWER,+6V_BENCH_POWER,EID=1D,PACKAGE=SIL-100-02R
J7,ECE298_RS_2PINHDR,"DC MOTOR",EID=11,PACKAGE=SIL-100-02
J8,ECE298_RS_BENCH_POWER,+5V_BENCH_POWER,EID=1E,PACKAGE=SIL-100-02R
J9,ECE298_TERMINAL_VIA,TEST_GND,EID=1F,PACKAGE=PIN
J10,CONN-SIL5,US-100,EID=20,PACKAGE=CONN-SIL5
J11,CONN-SIL6,"UART/USB ADAPTER",EID=21,PACKAGE=CONN-SIL6
J12,ECE298_TERMINAL_VIA,TEST_POTENTIOMETER,EID=22,PACKAGE=PIN
J13,ECE298_RS_4PINREC,"RGB LED",EID=25,PACKAGE=CONN-SIL4
J14,ECE298_RS_3PINHDR,"SERVO MOTOR",EID=27,PACKAGE=SIL-100-03
J15,ECE298_RS_4PINREC,"SPEED SENSOR",EID=2B,PACKAGE=CONN-SIL4
J16,CONN-SIL9,"TIMER DISPLAY",EID=2D,PACKAGE=CONN-SIL9
POTENTIOMETER,ECE298_RS_POT10K,10K,CODE="Digikey 3361P-103GLFDKR-ND",EID=E,PACKAGE=TRIM_3361P,STATE=5
R1,9C04021A1500JLHF3,150,CODE="Digikey 311-150JDKR-ND",EID=15,PACKAGE=RESC1005X40,PRIMTYPE=RESISTOR
R2,9C04021A1800JLHF3,80,CODE="Digikey 311-180JCT-ND",EID=16,PACKAGE=RESC1005X40,PRIMTYPE=RESISTOR
R3,9C04021A2000JLHF3,1000,CODE="Digikey 311-200JCT-ND",EID=17,PACKAGE=RESC1005X40,PRIMTYPE=RESISTOR
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R4,9C04021A2400JLHF3,1000,CODE="Digikey 311-240JCT-ND",EID=18,PACKAGE=RESC1005X40,PRIMTYPE=RESISTOR
R5,9C04021A1800JLHF3,80,CODE="Digikey 311-180JCT-ND",EID=26,PACKAGE=RESC1005X40,PRIMTYPE=RESISTOR
U1,ECE298_RS_74HCT541,ECE298_RS_74HCT541,EID=6,GND=GND,PACKAGE=SO20W,PINSWAP="1,19",VCC=+5.0V
U2,ECE298_RS_CMOS4050,ECE298_RS_CMOS4050,EID_A=7,EID_B=8,EID_C=9,EID_D=A,EID_E=B,EID_F=C,ITFMOD=CMOS,MODFILE=40BUF,PACKAGE=SO16,VDD=+3.3v,VSS=GND
U3,ECE298_RS_L9110,ECE298_RS_L9110,EID=D,ITFMOD=TTL,PACKAGE=SO8
U4,ECE298_RS_74HCT541,ECE298_RS_74HCT541,EID=24,GND=GND,PACKAGE=SO20W,PINSWAP="1,19",VCC=+5.0V

*NETLIST,46
#00082,2
R1,PS,1
J13,PS,2

#00084,2
R2,PS,1
J13,PS,4

#00087,6
R3,PS,2
U2,IP,14
U2,IP,5
U2,IP,11
U2,IP,7
U2,IP,9

#00088,5
R4,PS,1
U4,IP,9
U4,IP,6
U4,IP,7
U4,IP,8

#00120,2
J13,PS,1
R5,PS,1

PB10,4,CLASS=SIGNAL
GPIO_OUT_A3,LBL
PB10,GT
U1,IP,2
CN10,PS,25

PB9,4,CLASS=SIGNAL
GPIO_OUT_A2,LBL
PB9,GT
U1,IP,3
CN10,PS,5

PB8,4,CLASS=SIGNAL
GPIO_OUT_A1,LBL
PB8,GT
U1,IP,4
CN10,PS,3

PB5,4,CLASS=SIGNAL
GPIO_OUT_A0,LBL
PB5,GT
U1,IP,5
CN10,PS,29

PC12,4,CLASS=SIGNAL
GPIO_OUT_B3,LBL
PC12,GT
U1,IP,6
CN7,PS,3

PC11,4,CLASS=SIGNAL
GPIO_OUT_B2,LBL
PC11,GT
U1,IP,7
CN7,PS,2

PC10,4,CLASS=SIGNAL
GPIO_OUT_B1,LBL
PC10,GT
U1,IP,8
CN7,PS,1

PC9,4,CLASS=SIGNAL
GPIO_OUT_B0,LBL
PC9,GT
U1,IP,9
CN10,PS,1

DIG_A3,3,CLASS=SIGNAL
DIG_A3,LBL
U1,TS,18
J16,PS,2
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```
DIG_A2,3,CLASS=SIGNAL
DIG_A2,LBL
U1,TS,17
J16,PS,3

DIG_A1,3,CLASS=SIGNAL
DIG_A1,LBL
U1,TS,16
J16,PS,4

DIG_A0,3,CLASS=SIGNAL
DIG_A0,LBL
U1,TS,15
J16,PS,5

DIG_B3,3,CLASS=SIGNAL
DIG_B3,LBL
U1,TS,14
J16,PS,6

DIG_B2,3,CLASS=SIGNAL
DIG_B2,LBL
U1,TS,13
J16,PS,7

DIG_B1,3,CLASS=SIGNAL
DIG_B1,LBL
U1,TS,12
J16,PS,8

DIG_B0,3,CLASS=SIGNAL
DIG_B0,LBL
U1,TS,11
J16,PS,9

TXD TO BUF,3,CLASS=SIGNAL
TXD TO BUF,LBL
U2,IP,3
J11,PS,4

PC7,4,CLASS=SIGNAL
BUF TO USART6_RX,LBL
PC7,GT
U2,OP,2
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CN10,PS,19

PB1,5,CLASS=SIGNAL
POTENTIOMETER ANALOG SIGNAL,LBL
PB1,GT
POTENTIOMETER,PS,3
J12,PS,1
CN10,PS,24

RED,3,CLASS=SIGNAL
RED,LBL
R1,PS,2
U4,TS,17

GREEN,3,CLASS=SIGNAL
GREEN,LBL
R2,PS,2
U4,TS,16

CW,3,CLASS=SIGNAL
CW,LBL
J7,PS,1
U3,OP,1

CCW,3,CLASS=SIGNAL
CCW,LBL
J7,PS,2
U3,OP,4

PA9,4,CLASS=SIGNAL
TRIG,LBL
PA9,GT
J10,PS,2
CN10,PS,21

PA10,4,CLASS=SIGNAL
ECHO,LBL
PA10,GT
J10,PS,3
CN10,PS,33

PC6,4,CLASS=SIGNAL
USART6_TX TO RXD,LBL
PC6,GT
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J11,PS,5
CN10,PS,4

PB0,4,CLASS=SIGNAL
PB0,GT
TIM3_CH3,LBL
U3,IP,7
CN7,PS,34

PA6,4,CLASS=SIGNAL
PA6,GT
TIM3_CH1,LBL
U3,IP,6
CN10,PS,13

BLUE,3,CLASS=SIGNAL
BLUE,LBL
R5,PS,2
U4,TS,18

PA12,4,CLASS=SIGNAL
PA12,GT
GPIO_OUT_RED,LBL
U4,IP,3
CN10,PS,12

PA11,4,CLASS=SIGNAL
PA11,GT
GPIO_OUT_GRN,LBL
U4,IP,4
CN10,PS,14

PA8,4,CLASS=SIGNAL
PA8,GT
GPIO_OUT_BLU,LBL
U4,IP,2
CN10,PS,23

SERVO_PWM,3,CLASS=SIGNAL
SERVO_PWM,LBL
J14,PS,1
U4,TS,15

PA0,4,CLASS=SIGNAL
PA0,GT
TIM2_CH1,LBL
U4,IP,5
CN7,PS,28

PB2,4,CLASS=SIGNAL
PB2,GT
DO,LBL
J15,PS,3
CN10,PS,22

{NC},62
AO,LBL
CN10,PS,37
CN10,PS,35
CN10,PS,31
CN10,PS,18
CN10,PS,11
CN7,PS,23
CN10,PS,2
CN10,PS,6
CN10,PS,34
CN10,PS,26
CN10,PS,28
CN10,PS,30
CN10,PS,16
CN10,PS,17
CN10,PS,27
CN10,PS,15
CN7,PS,37
CN7,PS,36
CN7,PS,35
CN7,PS,38
CN7,PS,21
CN7,PS,32
CN7,PS,30
CN7,PS,17
CN7,PS,15
CN7,PS,13
U2,PS,13
U2,PS,16
U2,OP,15
U2,OP,12
U2,OP,6
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U2,OP,4
U2,OP,10
J15,PS,4
U4,TS,11
U4,TS,12
U4,TS,13
U4,TS,14
J11,PS,6
J11,PS,3
J11,PS,2
CN7,PS,14
CN10,PS,8
CN10,PS,7
CN10,PS,38
CN10,PS,36
CN10,PS,10
CN7,PS,9
CN7,PS,7
CN7,PS,6
CN7,PS,5
CN7,PS,4
CN7,PS,33
CN7,PS,31
CN7,PS,29
CN7,PS,27
CN7,PS,26
CN7,PS,25
CN7,PS,24
CN7,PS,11
CN7,PS,10

+3.3V,13,CLASS=POWER
+3.3V,PR
U2,PP,1
C14,PS,1
C12,PS,1
J15,PS,1
C11,PS,1
J10,PS,1
C5,PS,1
C3,PS,1
C1,PS,1
POTENTIOMETER,PS,2
CN7,PS,16

CN7,PS,12

+5.0V,7,CLASS=POWER
+5.0V,PR
C13,PS,1
U4,PP,20
C9,PS,1
C4,PS,1
U1,PP,20
CN7,PS,18

+5V_EXT,5,CLASS=POWER
+5V_EXT,PR
C10,PS,1
J14,PS,2
C6,PS,1
J8,PS,1

+6V_EXT,6,CLASS=POWER
+6V_EXT,PR
C8,PS,1
U3,PP,2
U3,PP,3
C7,PS,1
J6,PS,1

GND,43,CLASS=POWER
GND,PR
U2,PP,8
C14,PS,2
C13,PS,2
J16,PS,1
C12,PS,2
J15,PS,2
U4,PP,10
C11,PS,2
C10,PS,2
C9,PS,2
J14,PS,3
U4,IP,19
U4,IP,1
J13,PS,3
C8,PS,2
U3,PP,5

U3,PP,8
J11,PS,1
J10,PS,4
J10,PS,5
J9,PS,1
J8,PS,2
C6,PS,2
J6,PS,2
C7,PS,2
C5,PS,2
C4,PS,2
C3,PS,2
R4,PS,2
R3,PS,1
C1,PS,2
POTENTIOMETER,PS,1
U1,PP,10
U1,IP,1
U1,IP,19
CN10,PS,9
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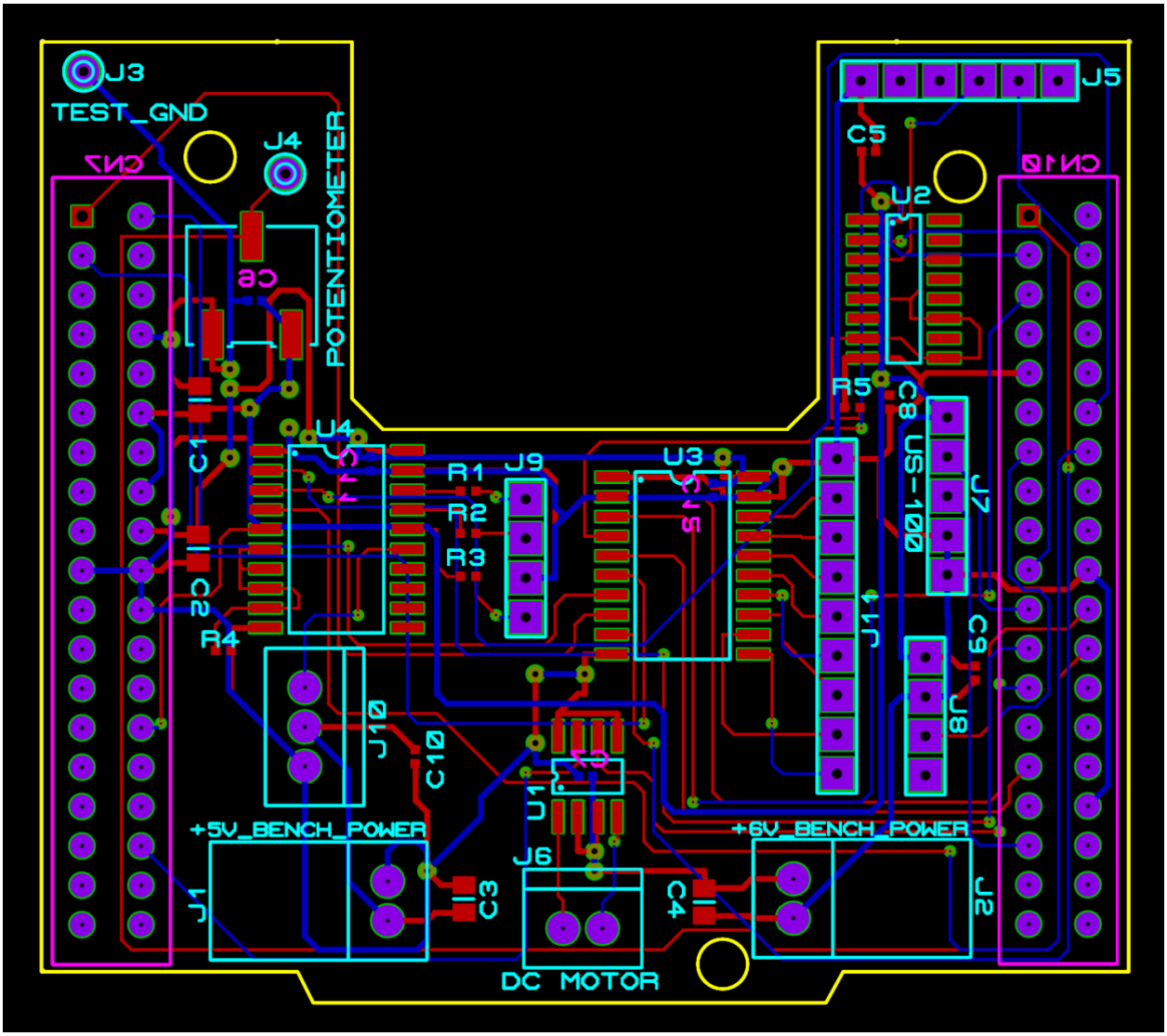
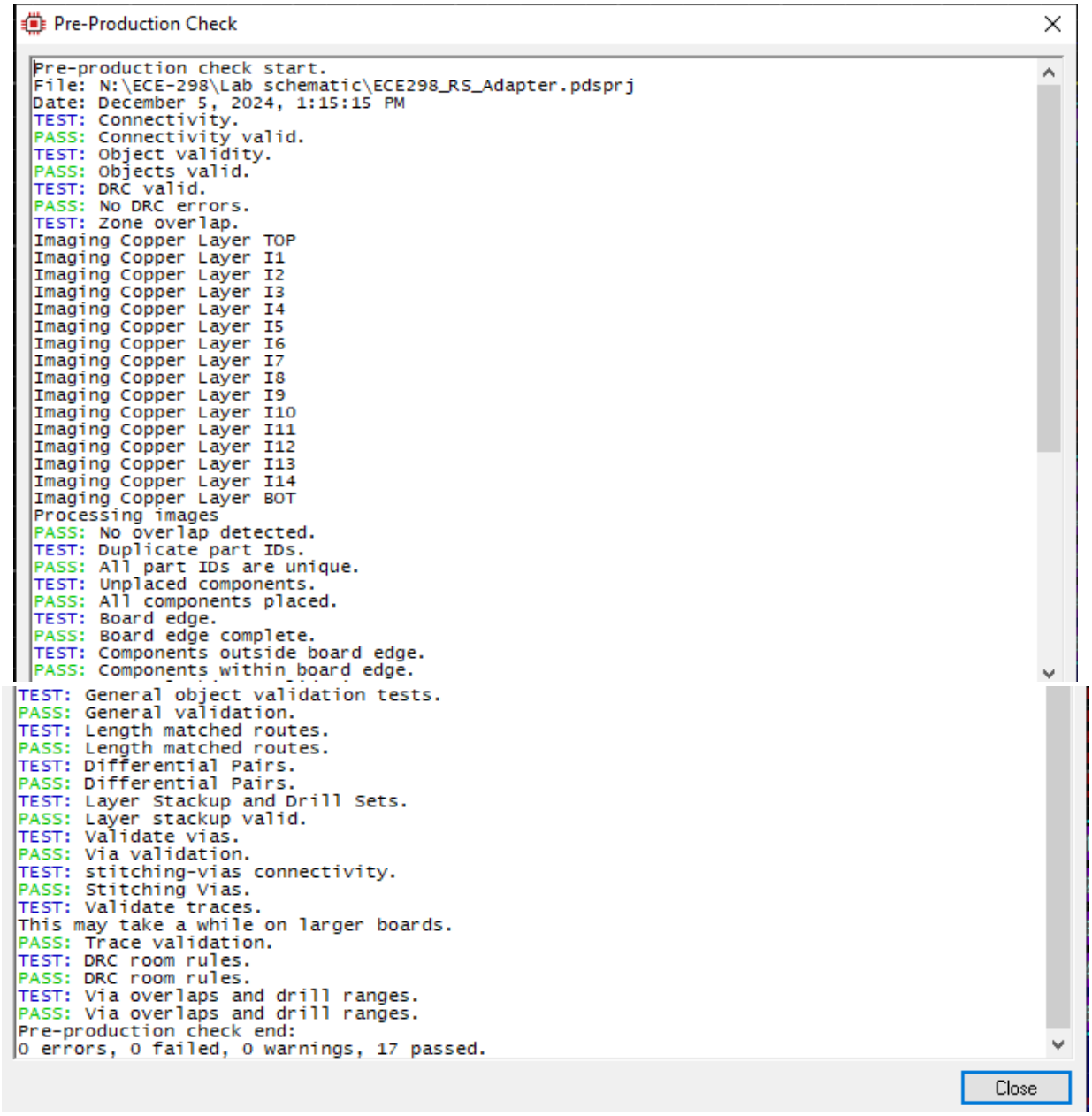
CN10,PS,20
CN7,PS,8
CN7,PS,22
CN7,PS,20
CN7,PS,19

Prototype Proteus PCB

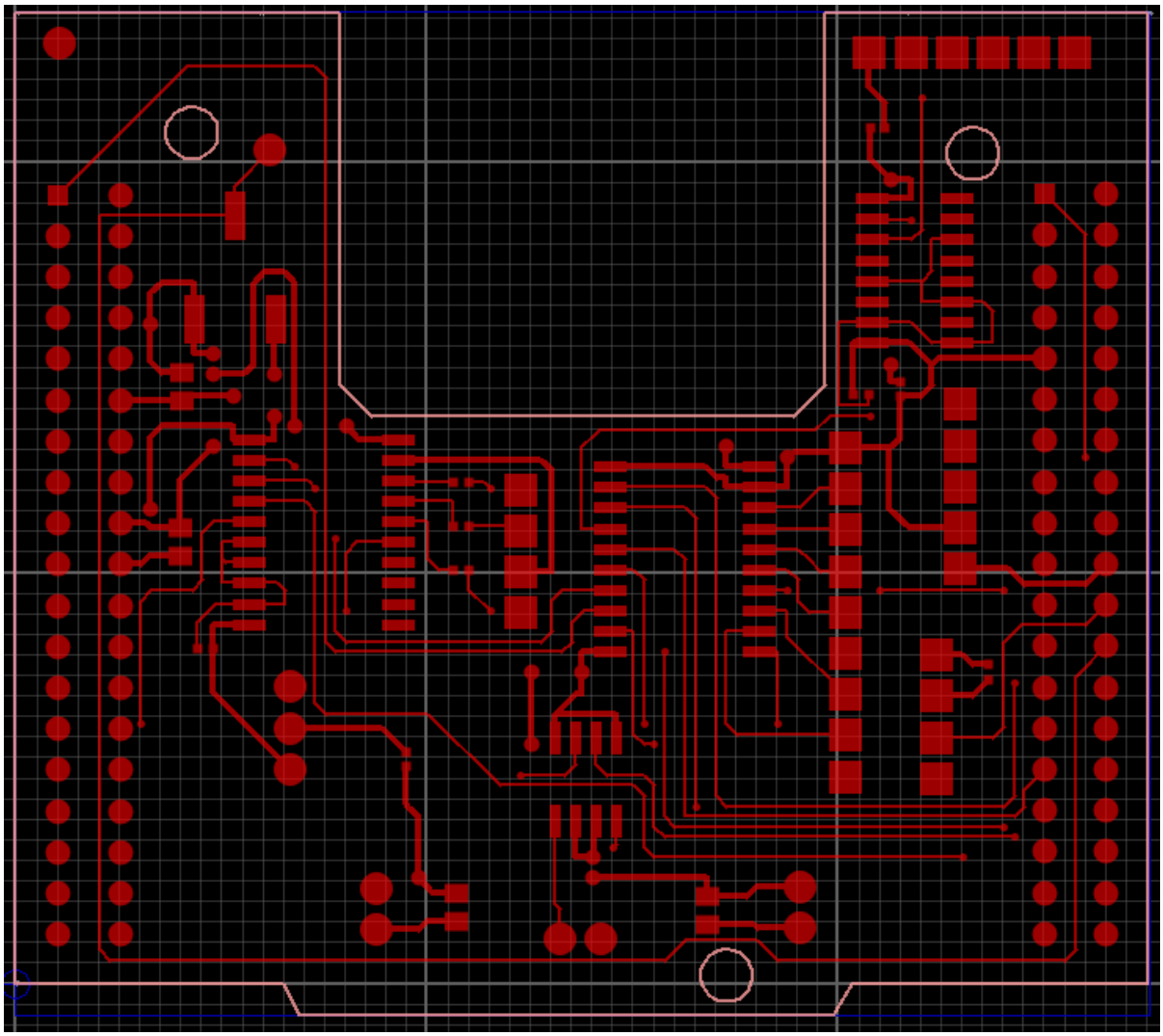


Pre-Production Check (PPC) Report

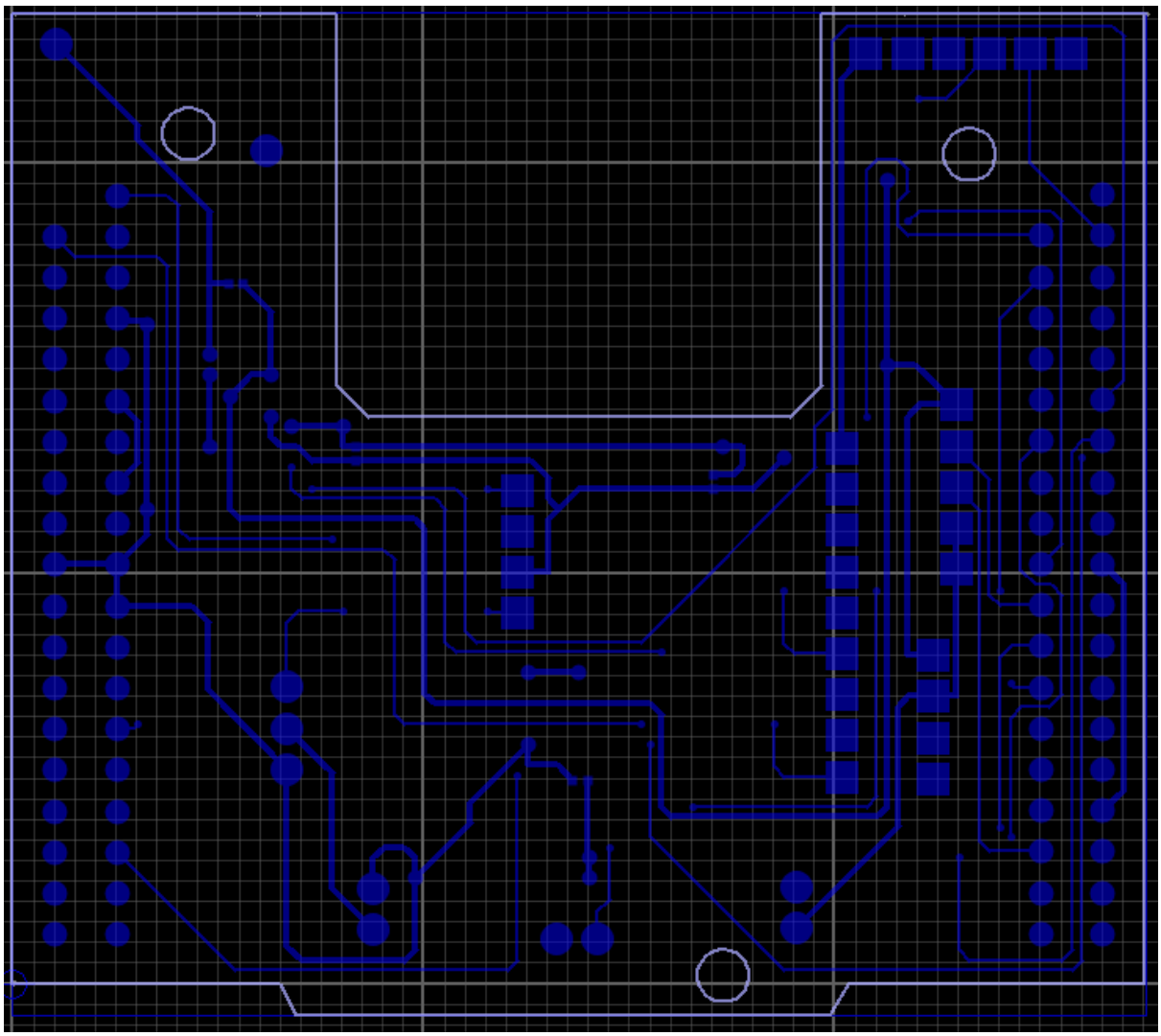


Gerber Layers

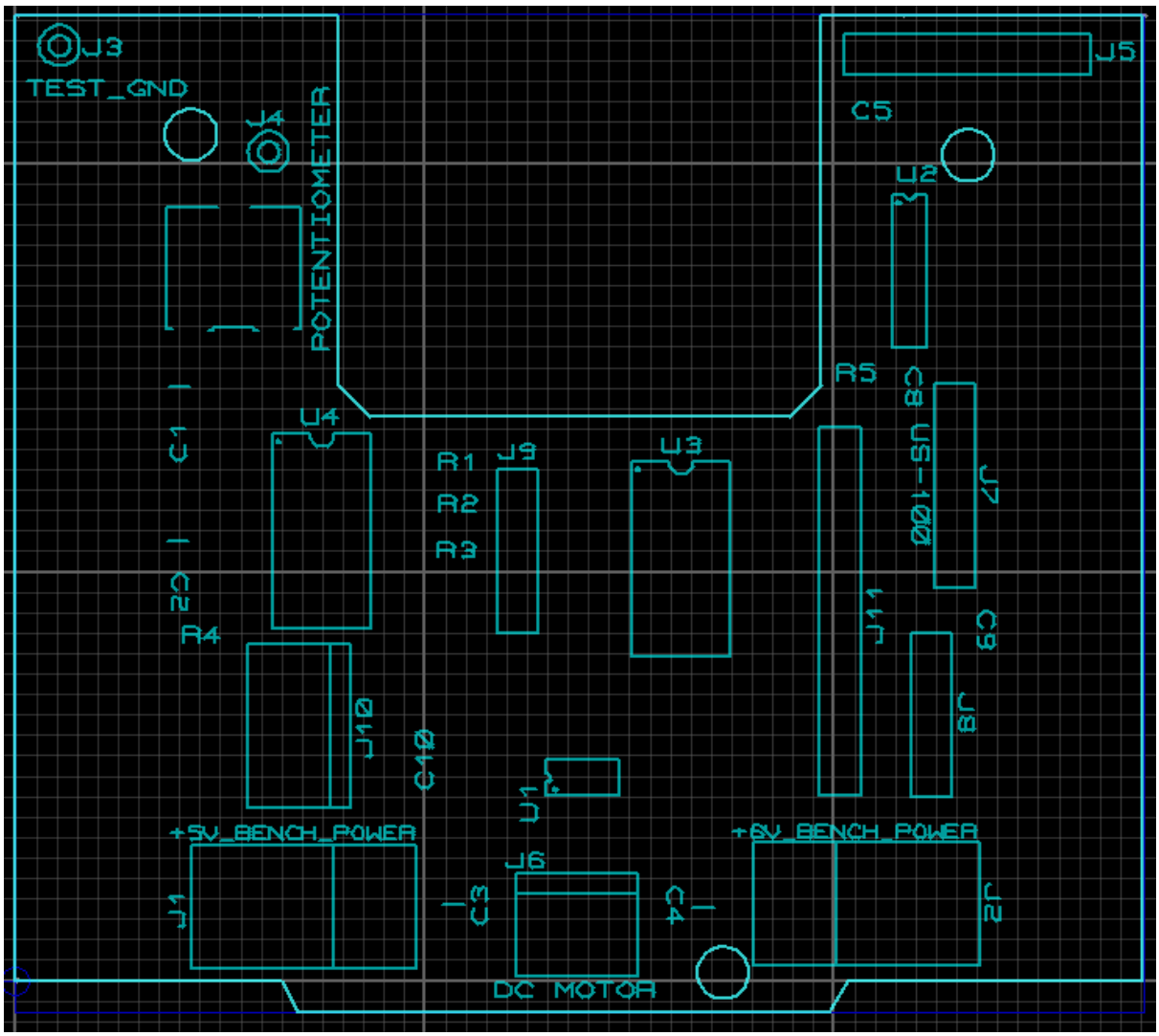
Top Copper:



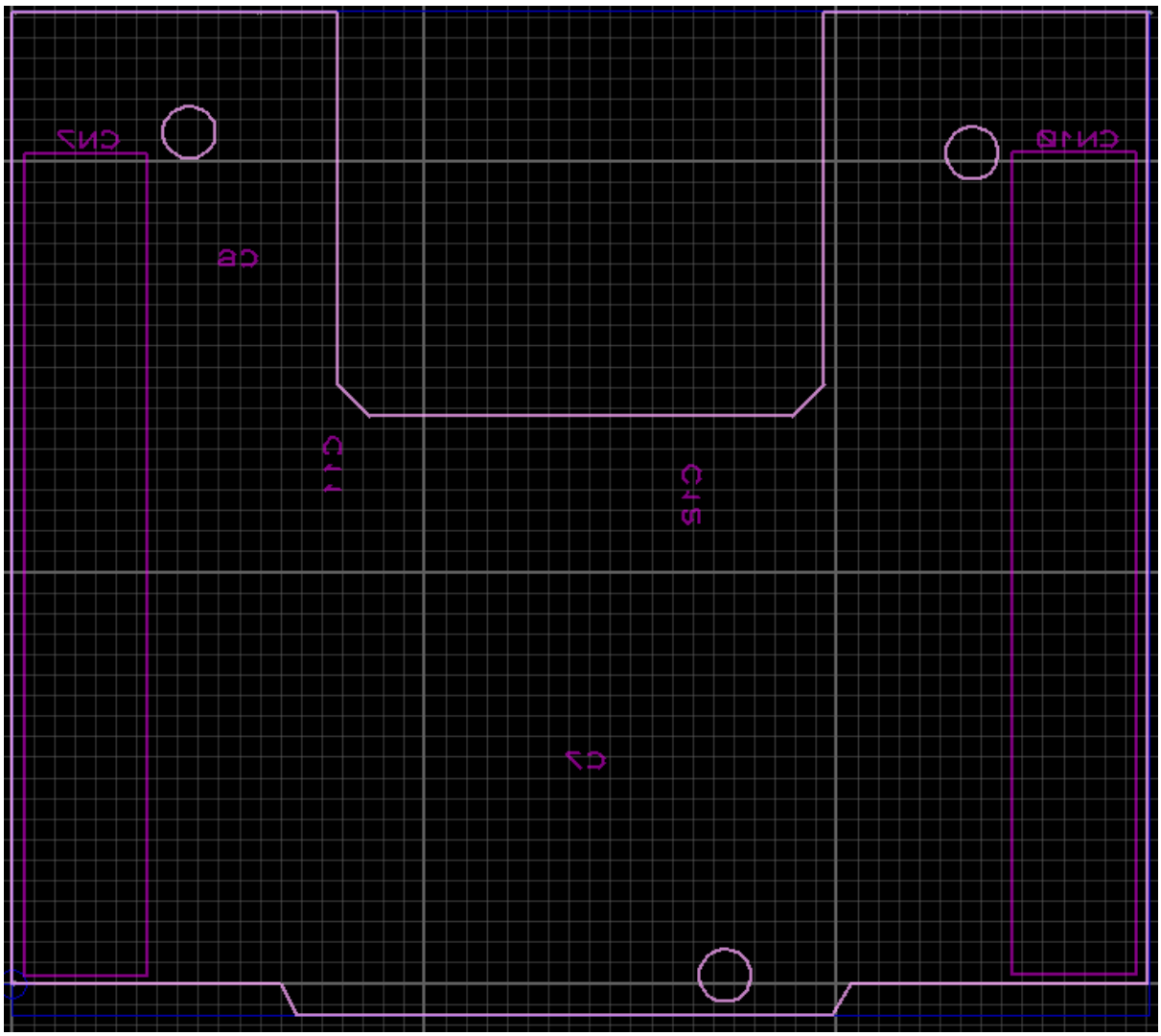
Bottom Copper:



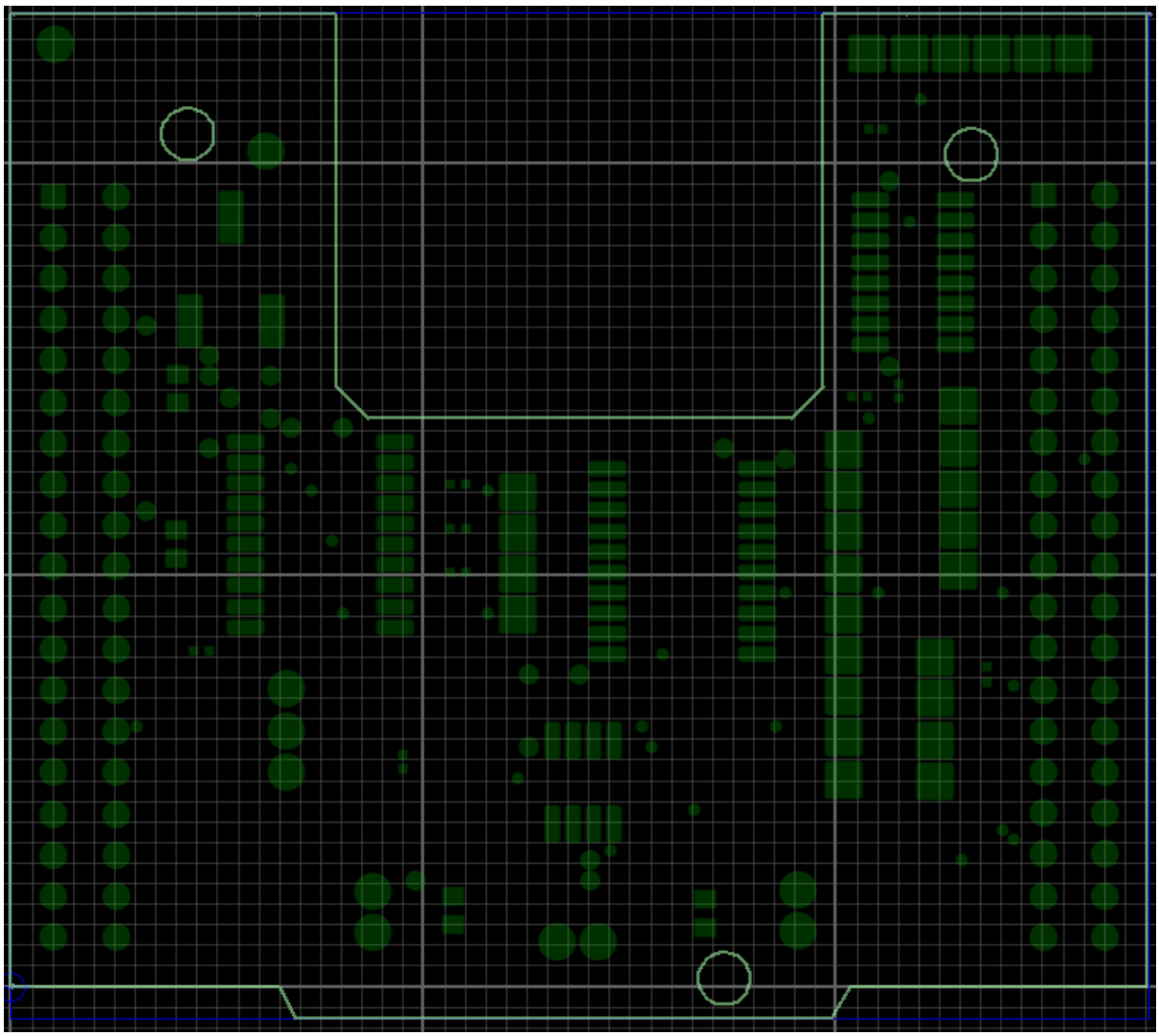
Top Silk:


J3
TEST_GND
J4
POTENTIOMETER
J5
C5
U2
R5
C8
US-100
J7
C1
U4
R1
R2
R3
J9
U3
C2
R4
J11
C9
J10
J8
C10
U1
+5V_BENCH_POWER
+6V_BENCH_POWER
J1
J6
C3
C4
J2
DC MOTOR

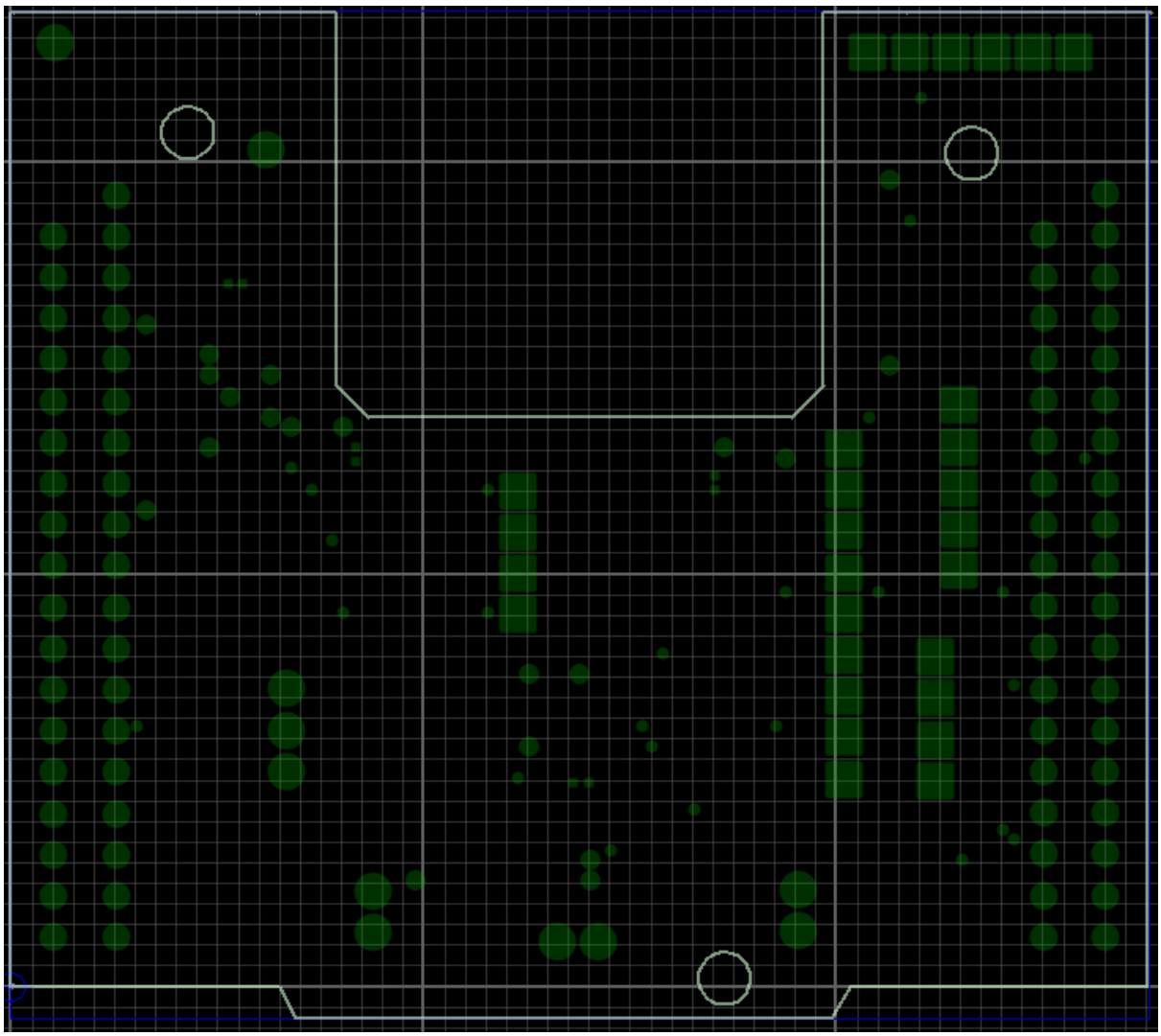
Bottom Silk:



Top Resist:



Bottom Resist:



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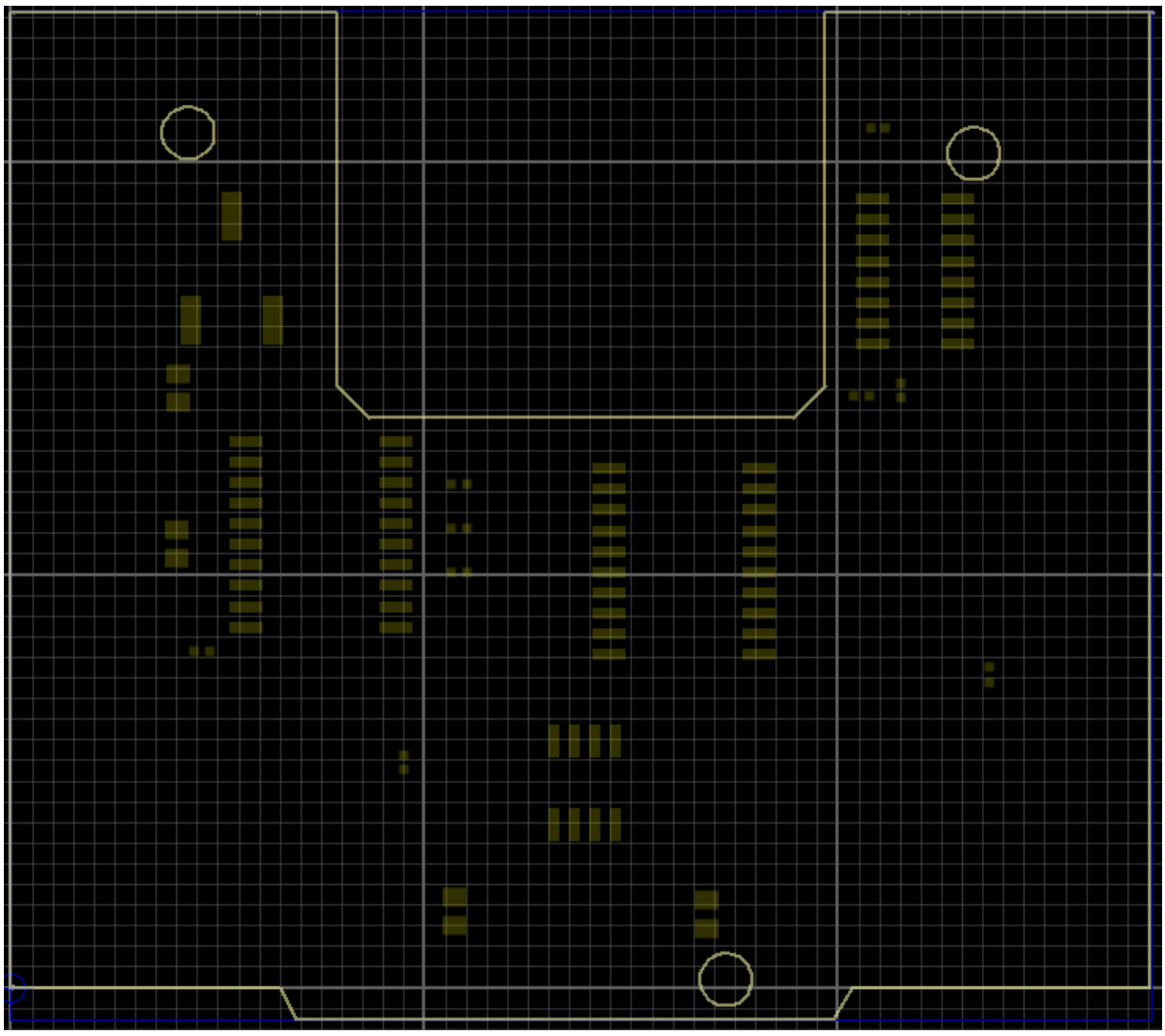
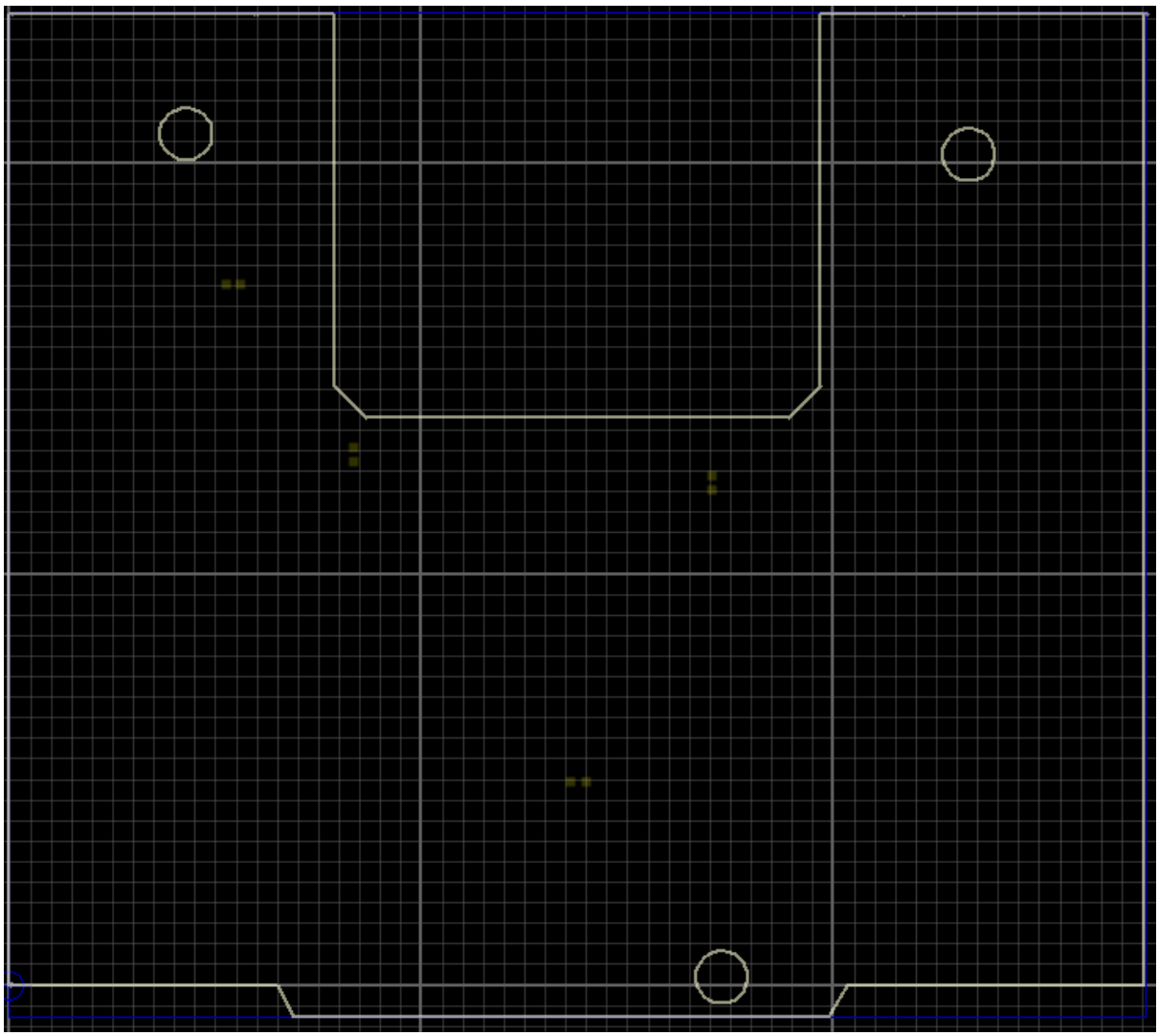
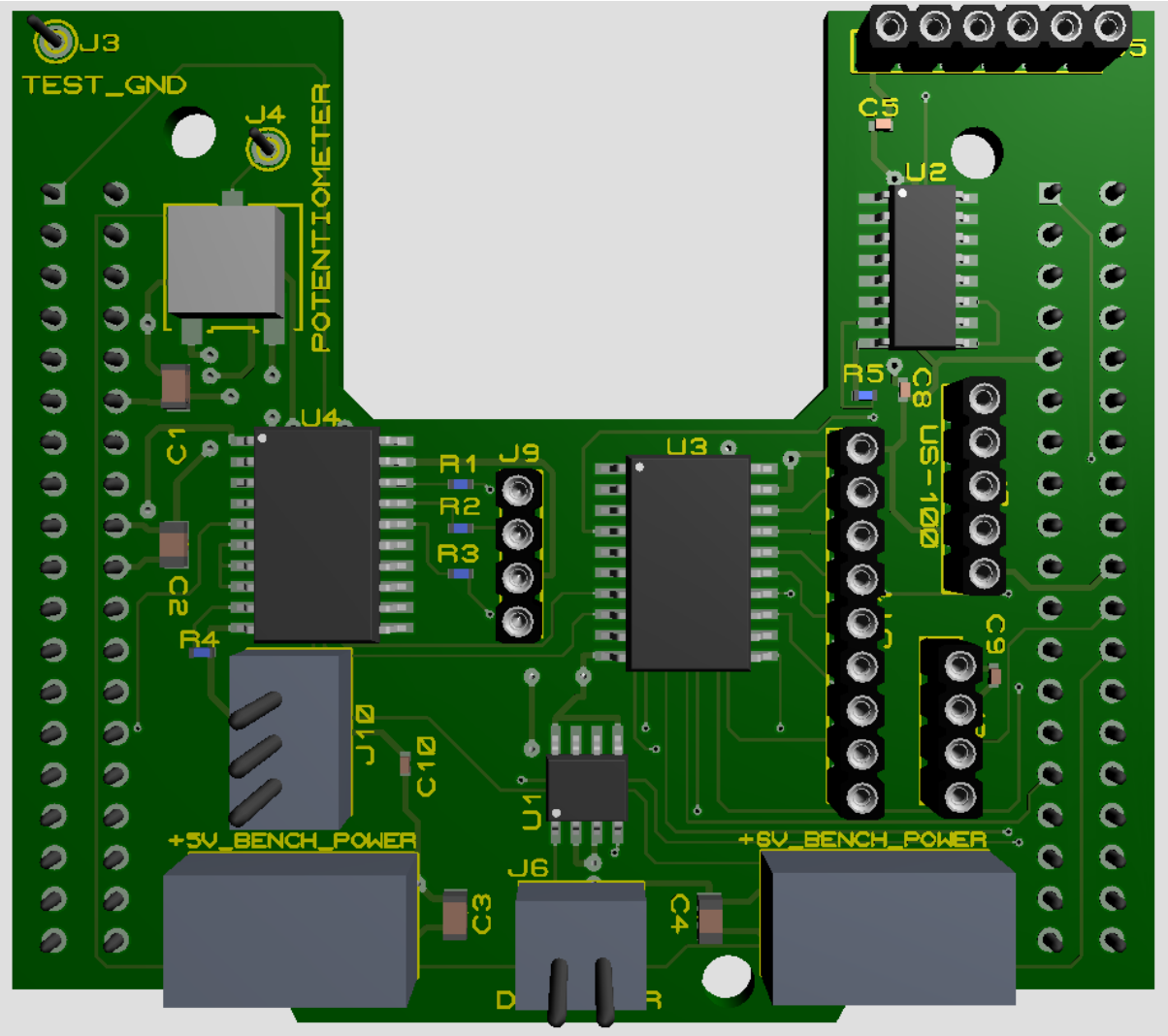


Bottom Paste:

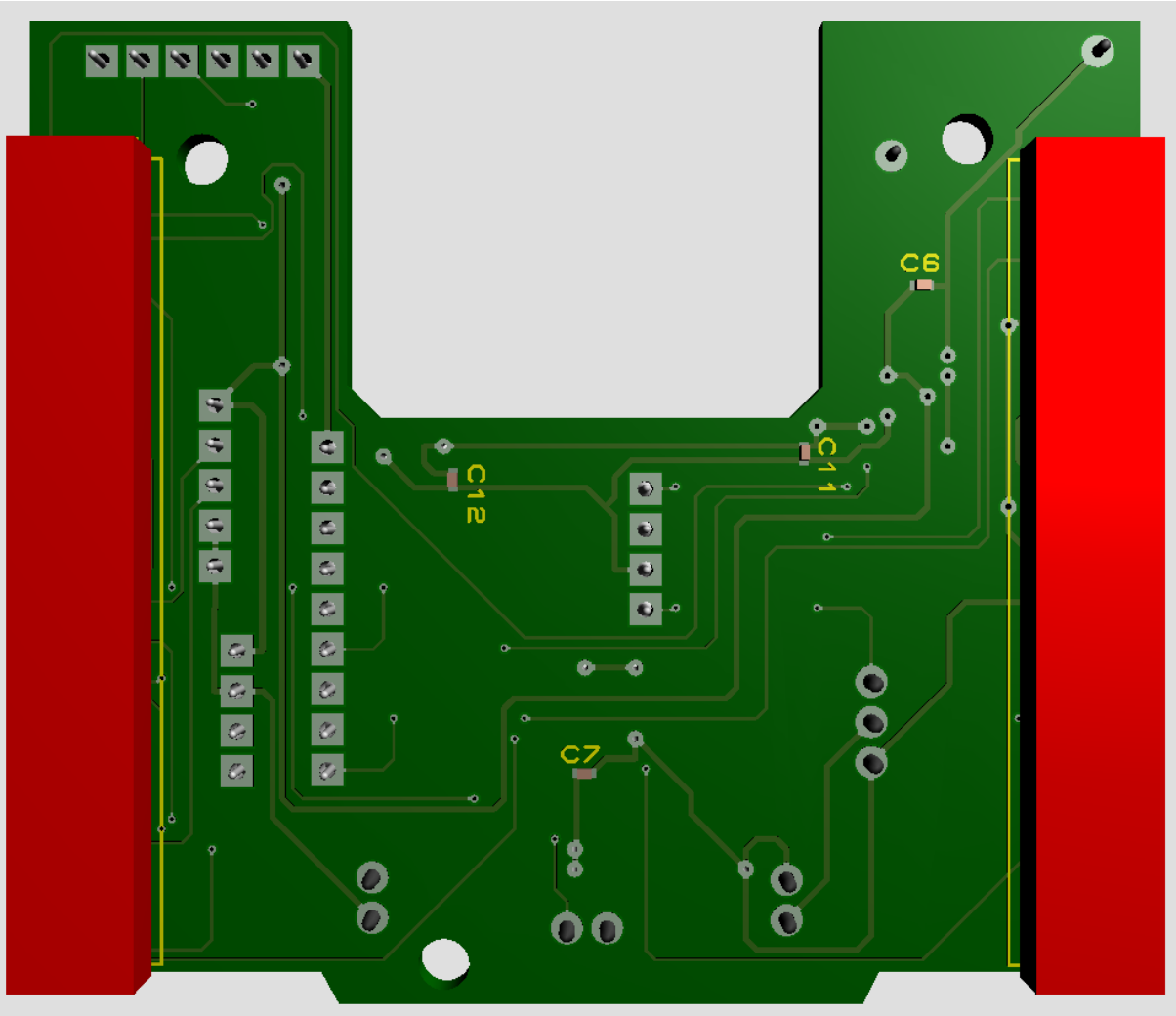


3D View of Complete PCB Assembly

Top View:



Bottom View:



Pick and Place File

	A	B	C	D	E	F	G	H
1	Part ID	Value	Package	Stock Code	Layer	Rotation	X	Y
2	CN7	1-534236-9	ECE298_REVTRANS38DIL-1	1-534236-9	BOT	0	177.362	1019.69
3	CN10	1-534236-9	ECE298_REVTRANS38DIL-1	1-534236-9	BOT	0	2577.36	1021.26
4	U3	ECE298_RS_74HCT541	SO20W		TOP	0	1625.98	1031.5
5	U2	ECE298_RS_CMOS4050	SO16		TOP	0	2185.18	1734.45
6	U1	ECE298_RS_L9110	SO8		TOP	90	1385.83	496.063
7	U4	ECE298_RS_74HCT541	SO20W		TOP	0	748.031	1098.43
8	C1	10u	CAPC2012X100	Digikey PCC2182TR-ND	TOP	90	401.575	1452.76
9	C2	10u	CAPC2012X100	Digikey PCC2182TR-ND	TOP	-90	397.638	1074.8
10	J1	+5V_BENCH_POWER	SIL-100-02R		TOP	90	877.953	179.921
11	C3	10u	CAPC2012X100	Digikey PCC2182TR-ND	TOP	90	1070.87	185.039
12	C4	10u	CAPC2012X100	Digikey PCC2182TR-ND	TOP	-90	1681.1	177.165
13	J2	+6V_BENCH_POWER	SIL-100-02R		TOP	270	1905.51	186.22
14	J3	TEST_GND	PIN		TOP	0	106.299	2287.4
15	POTENTIOMETER	10K	TRIM_3361P	Digikey 3361P-103GLFDKR-ND	TOP	0	533.071	1743.11
16	J4	TEST_POTENTIOMETER	PIN		TOP	0	618.11	2027.56
17	C6	10000pF	CAPC1005X55	Digikey PCC103BQDKR-ND	BOT	0	541.339	1704.72
18	J5	UART/USB ADAPTER	CONN-SIL6		TOP	0	2326.38	2263.78
19	J6	DC MOTOR	SIL-100-02		TOP	0	1372.83	110.236
20	C7	10000pF	CAPC1005X55	Digikey PCC103BQDKR-ND	BOT	0	1379.92	496.063
21	J7	US-100	CONN-SIL5		TOP	-90	2295.28	1208.66
22	C5	10000pF	CAPC1005X55	Digikey PCC103BQDKR-ND	TOP	0	2096.46	2082.68
23	C8	10000pF	CAPC1005X55	Digikey PCC103BQDKR-ND	TOP	-90	2149.61	1446.85
24	J8	SPEED SENSOR	CONN-SIL4		TOP	-90	2240.16	649.213
25	C9	10000pF	CAPC1005X55	Digikey PCC103BQDKR-ND	TOP	270	2366.14	757.874
26	J11	TIMER DISPLAY	CONN-SIL9		TOP	-90	2015.75	903.15
27	J9	RGB LED	CONN-SIL4		TOP	-90	1228.35	1050.79
28	J10	SERVO MOTOR	SIL-100-03		TOP	-90	667.717	622.047
29	R1	80	RESC1005X40	Digikey 311-180JCT-ND	TOP	180	1082.68	1220.47
30	R2	150	RESC1005X40	Digikey 311-150JDKR-ND	TOP	180	1082.68	1114.17
31	R3	80	RESC1005X40	Digikey 311-180JCT-ND	TOP	180	1082.68	1003.94
32	R4	1000	RESC1005X40	Digikey 311-240JCT-ND	TOP	0	460.63	814.961
33	R5	1000	RESC1005X40	Digikey 311-200JCT-ND	TOP	0	2055.12	1433.07
34	C10	10000pF	CAPC1005X55	Digikey PCC103BQDKR-ND	TOP	-90	948.819	545.276
35	C11	10000pF	CAPC1005X55	Digikey PCC103BQDKR-ND	BOT	90	834.646	1289.37
36	C12	10000pF	CAPC1005X55	Digikey PCC103BQDKR-ND	BOT	90	1704.72	1222.44

Bill of Materials

Bill Of Materials for ECE298_RS_ADAPTER

Design Title	ECE298_RS_ADAPTER
Author	
Document Number	
Revision	
Design Created	July 7, 2023
Design Last Modified	December 5, 2024
Total Parts In Design	35

35 Miscellaneous

Quantity	References	Value
4	C1-C4	10u
8	C5-C12	10000pF
2	CN7,CN10	1-534236-9
1	J1	+5V_BENCH_POWER
1	J2	+6V_BENCH_POWER
1	J3	TEST_GND
1	J4	TEST_POTENTIOMETER
1	J5	UART/USB ADAPTER
1	J6	DC MOTOR
1	J7	US-100
1	J8	SPEED SENSOR
1	J9	RGB LED
1	J10	SERVO MOTOR
1	J11	TIMER DISPLAY
1	POTENTIOMETER	10K
2	R1,R3	80
1	R2	150
2	R4-R5	1000
1	U1	ECE298_RS_L9110
1	U2	ECE298_RS_CMOS4050
2	U3-U4	ECE298_RS_74HCT541

Sub-totals:

Totals:

December 5, 2024 1:36:44 PM

Client Proposal

Pipeline	Start Time	Stop Time	Pump RPM	Power (KW)	Total Energy (KWH)	Energy Rate ($/KWH)	Energy Cost ($)	Gallons
Inlet	1:00am	10:48am	87	235	2303	1:00am to 7:00am: 0.024 7:00am to 10:48am: 0.102	124.93	94,000
Zone 2	10:48am	3:10pm	84	220	960.67	All Time: 0.102	97.99	33,000
Zone 1	6:06pm	11:00pm	70	125	612.5	6:06pm to 9:00pm: 0.24 9:00pm to 11:00pm: 0.102	112.50	47,000
Zone 3	11:00pm	1:00am	95	318	636	All Time: 0.024	15.26	14,000

Total energy consumed over the 24 hour operation: 4,512.17 KWH

Total energy cost over the 24 hour operation: $350.68