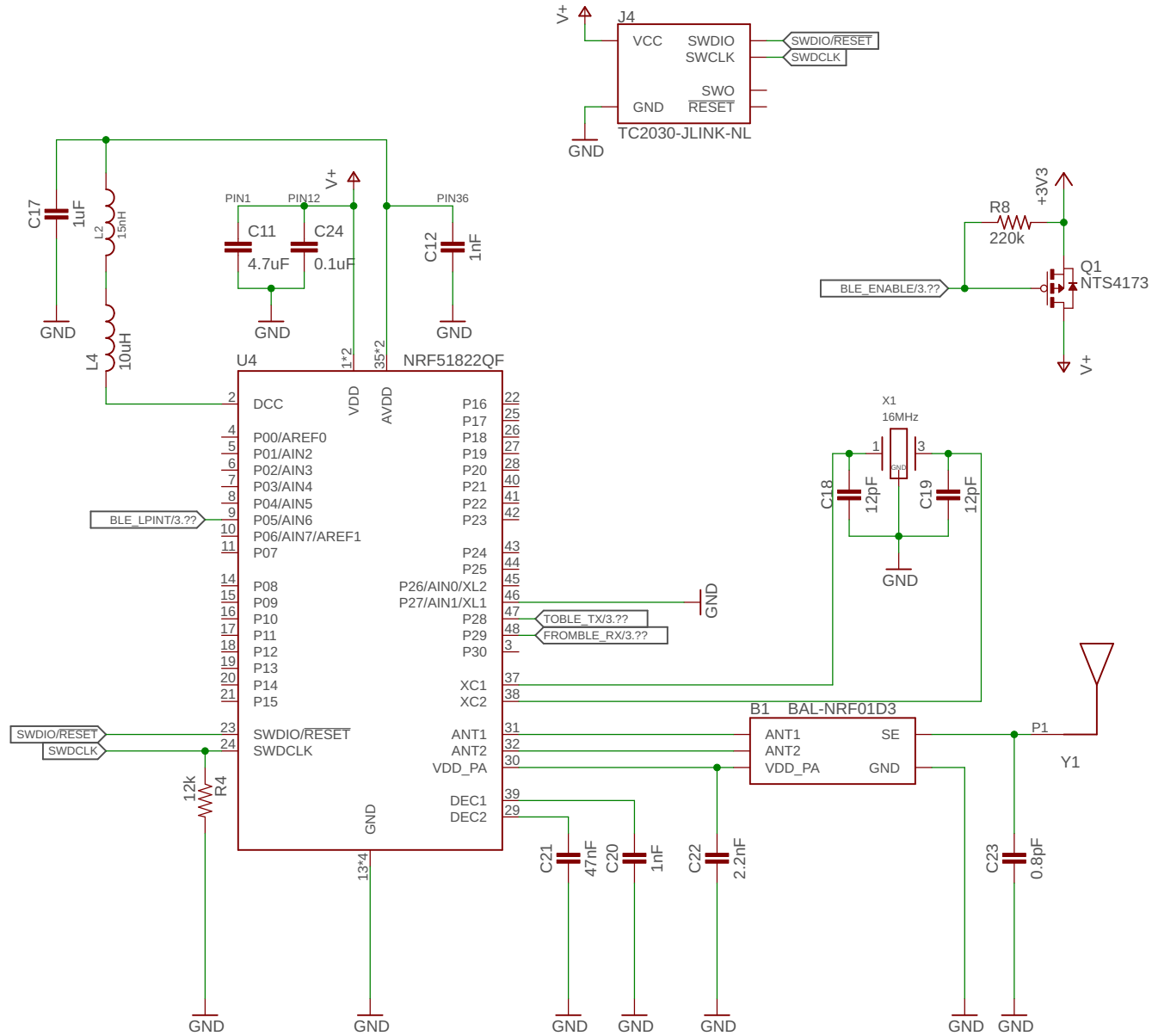


JTAG Connection

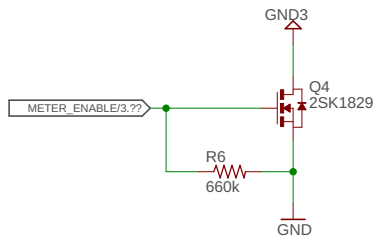


The circuit diagram shows a MAX9910 op-amp configured as a precision current-to-voltage converter. The non-inverting input (P1) is connected to a voltage divider consisting of a 1MΩ resistor (R21) to GND3 and a 1MΩ resistor (R20) to a +3V3 supply. The inverting input (P3) is connected to a 953kΩ resistor (R1) from the input signal VTEST/I.?? and a 953kΩ resistor (R12) to GND3. The feedback path from the output (P4) to the inverting input (P3) consists of a 4.99kΩ resistor (RF) and a capacitor (C13) in parallel. The output (P4) is labeled V_SENSE/3.?? and is also connected to a 0.1μF capacitor (C13) to GND3. The op-amp's supply pins are connected to +3V3 (P5) and GND3 (P2).

Output voltage:

$$-(R_F/R_I) \cdot V_{TEST} + V_{CC}/2$$

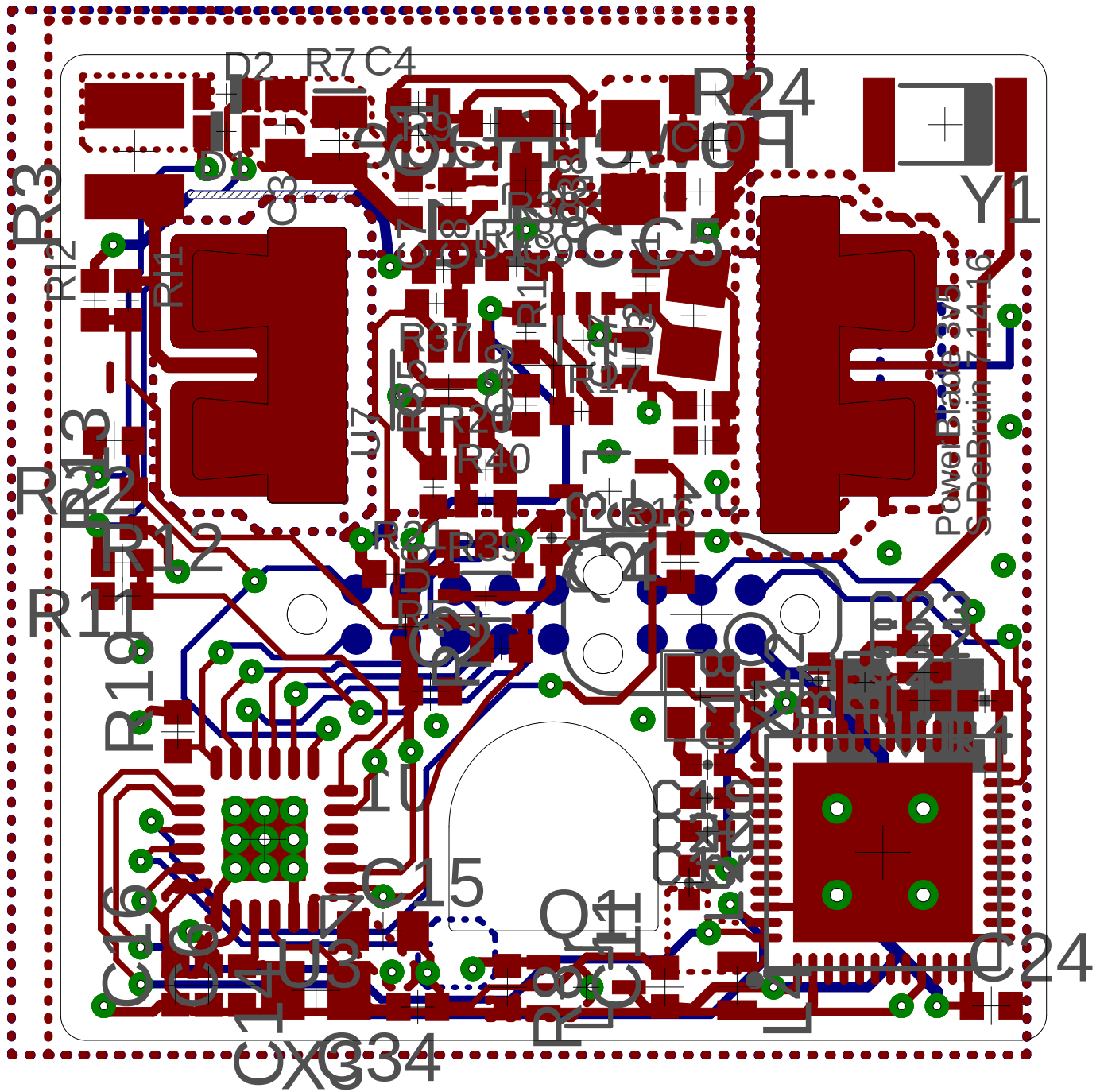
Output voltage:
 $-(R_F/R_I) \cdot V_{TEST} + V_{CC}/2$

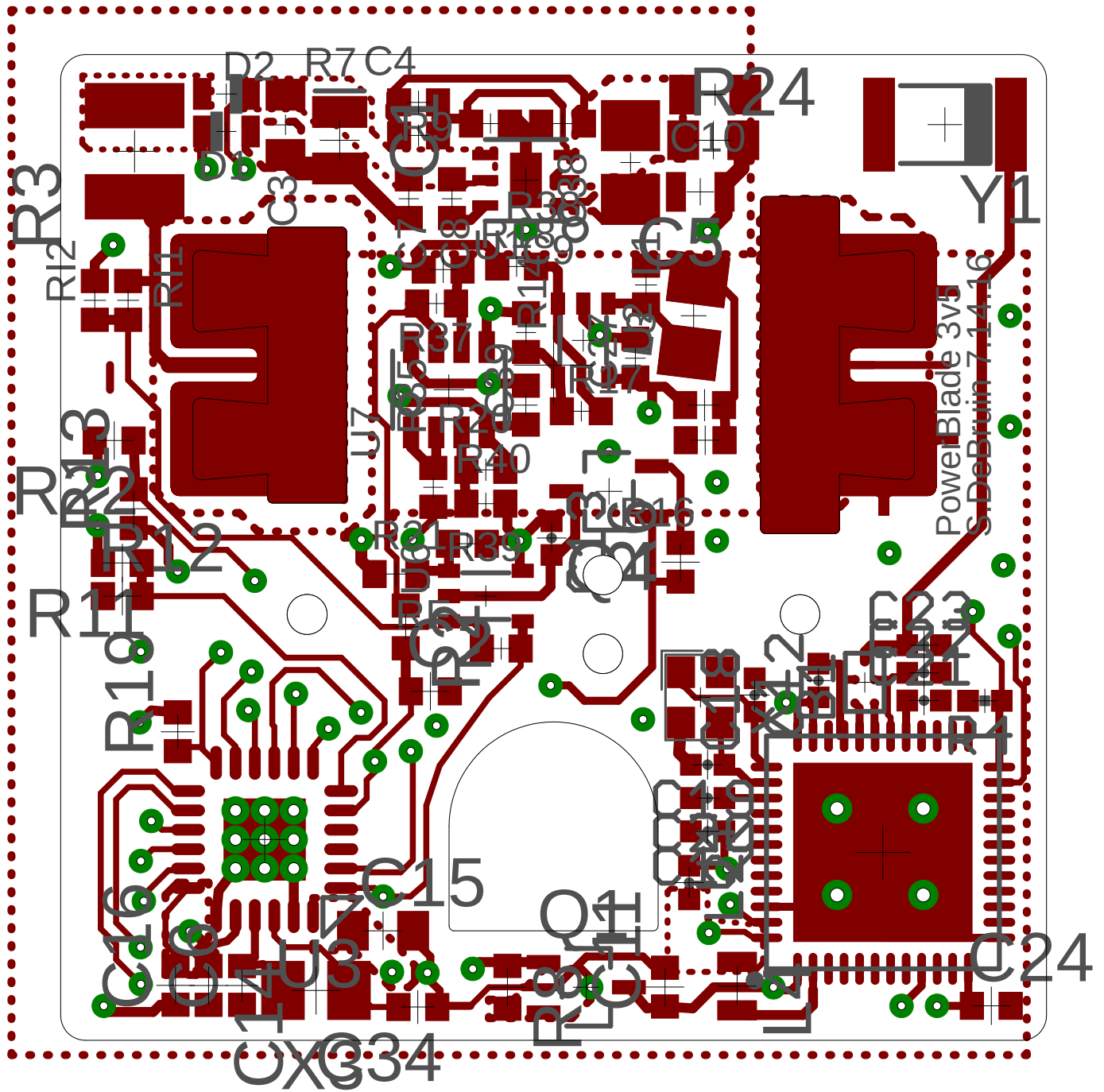


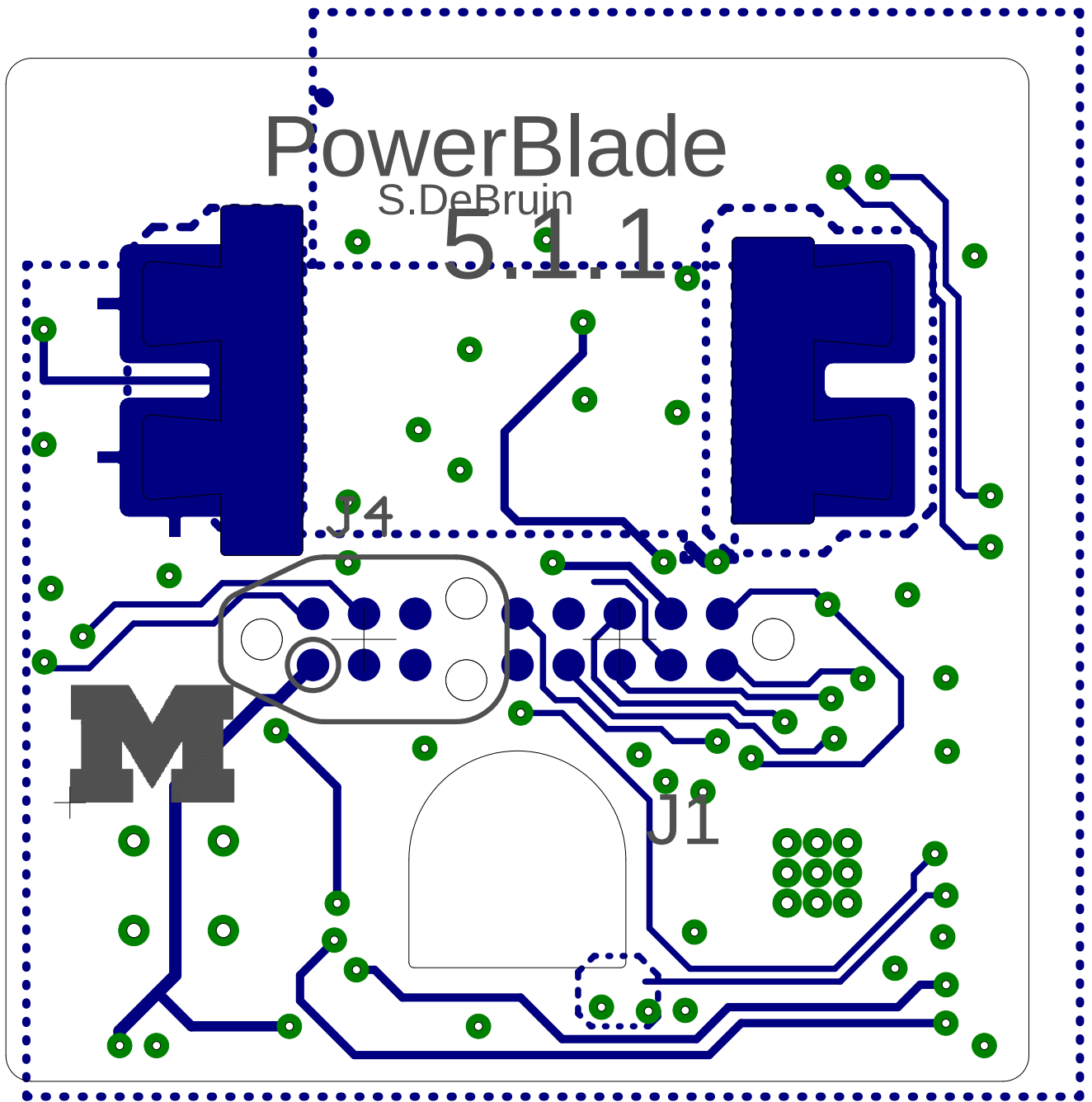
The diagram illustrates a two-stage op-amp circuit for current measurement. The input stage uses an MCP6V3 op-amp (U2) configured as a voltage follower. The input signal is derived from a current source (L3) in series with a resistor (R14, 200Ω). The input is biased by a +3V3 supply through a network of resistors (R15, 1M 1%; R16, 75 1%; R17, 1k 1%; R18, 4.99 1%) and a capacitor (C27, 0.1μF). The output of the first stage (VAMP) is connected to the non-inverting input of a second op-amp stage (U7G\$2, OPA2369). This second stage is configured as a voltage follower with a feedback capacitor (C39, 1.5μF) and a resistor (R37, 887k 1%). The output of the second stage (VEILT) is connected to a load resistor (R2, 3k) and a capacitor (C2, 0.1μF). The circuit is powered by a +3V3 supply and grounded (GND3).

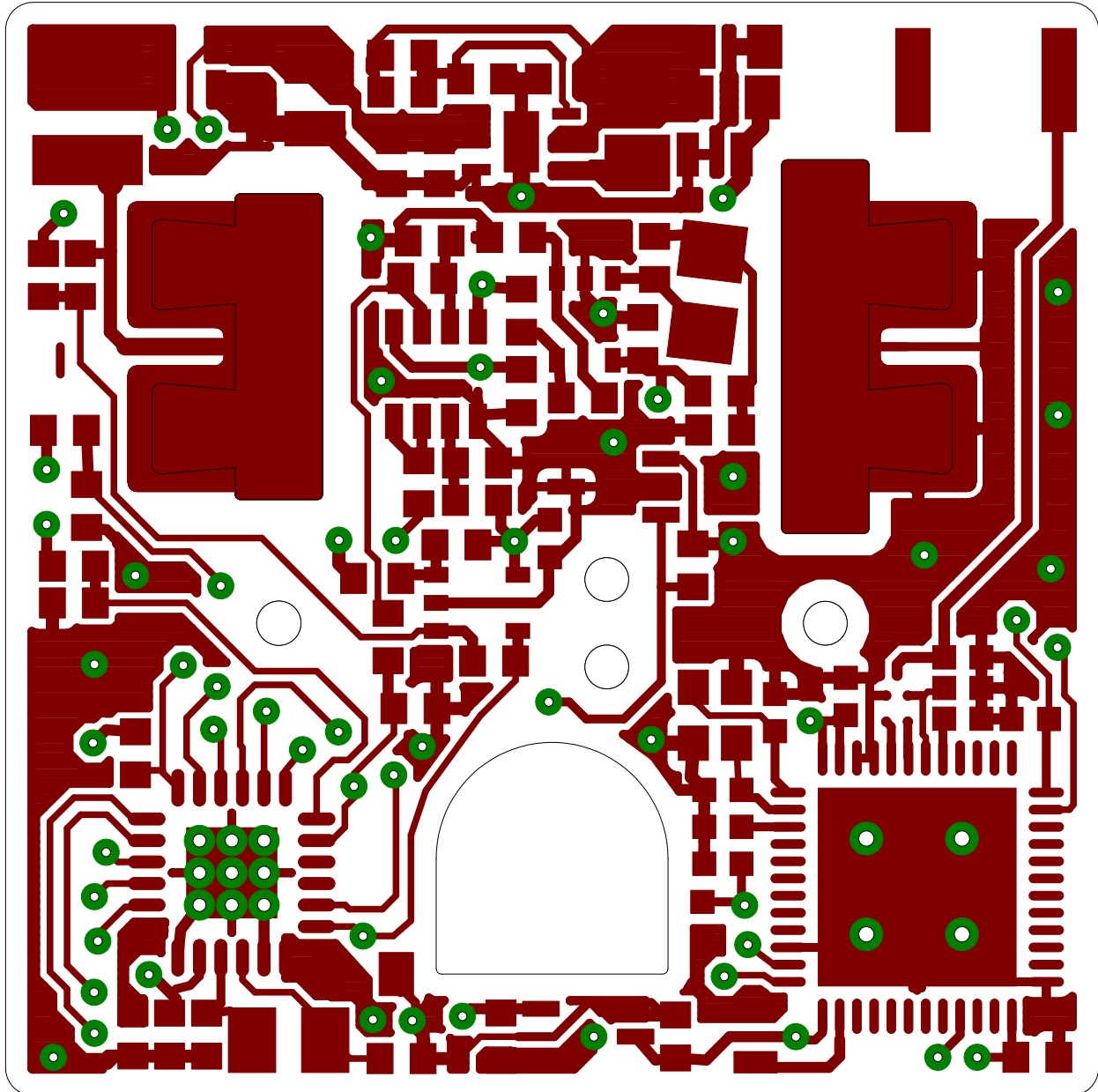
Voltage offset
50uV offset
R15=1M
R16=15

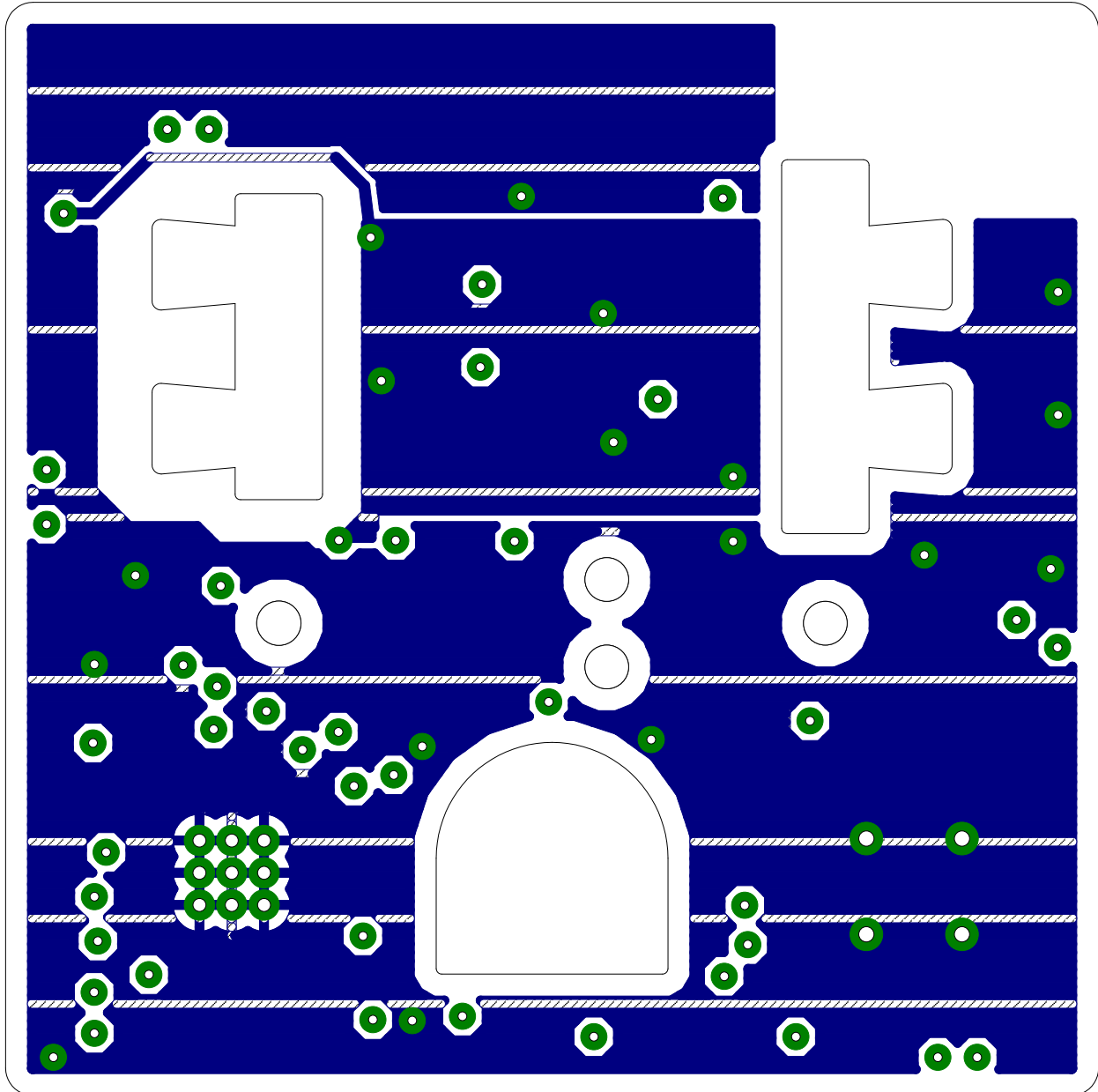
For zero offset:
R15=NP
R16=0

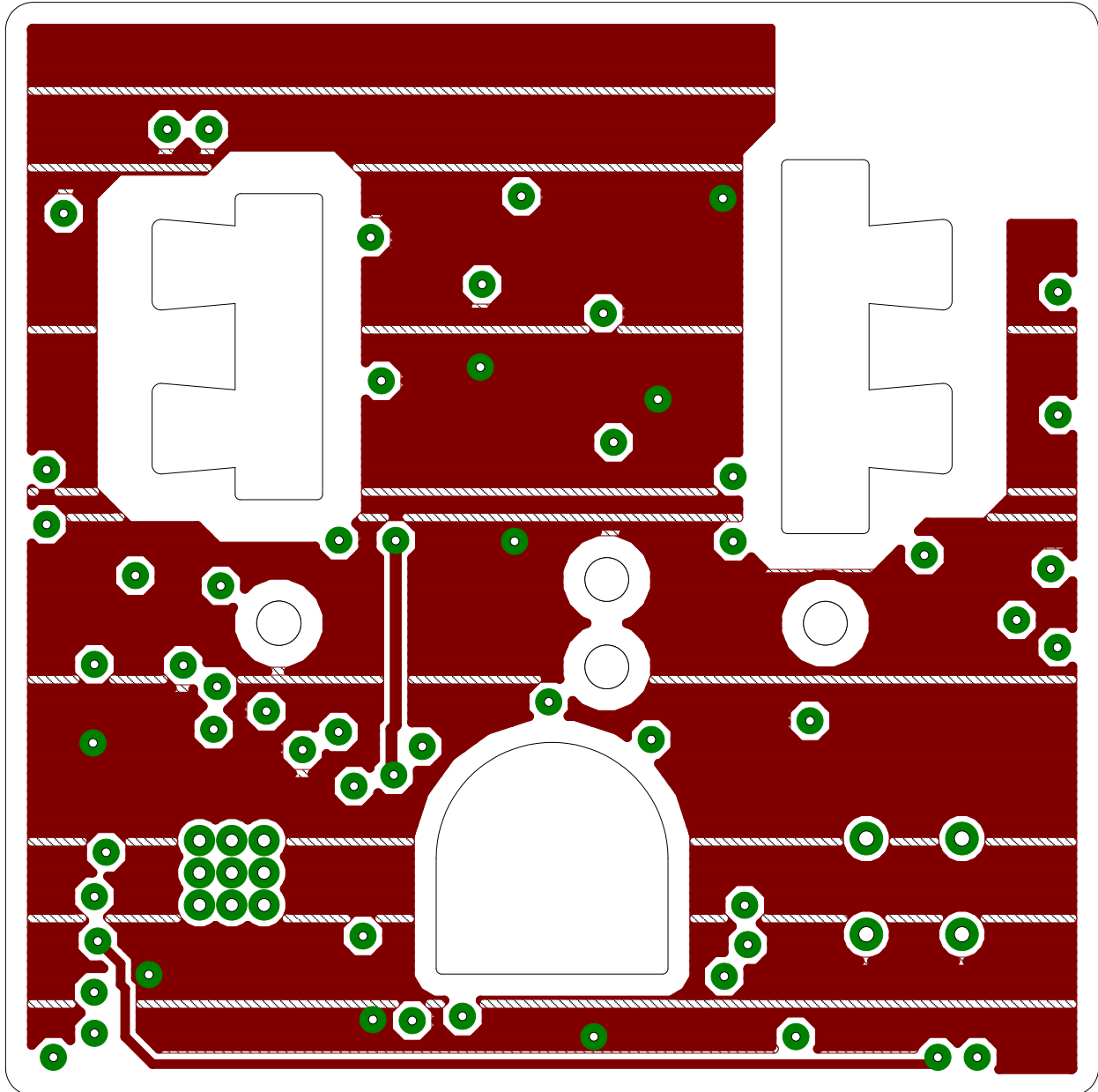




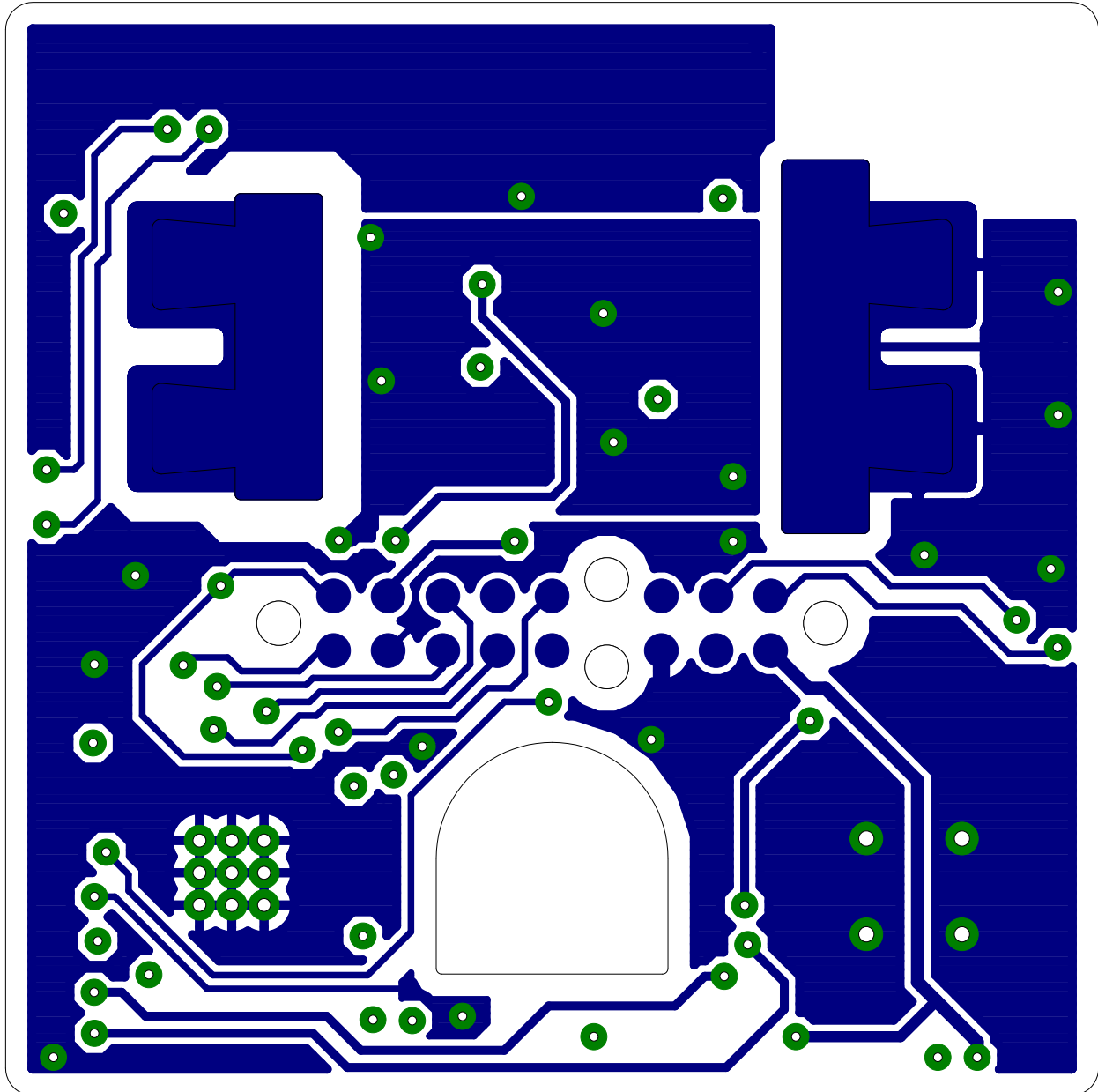


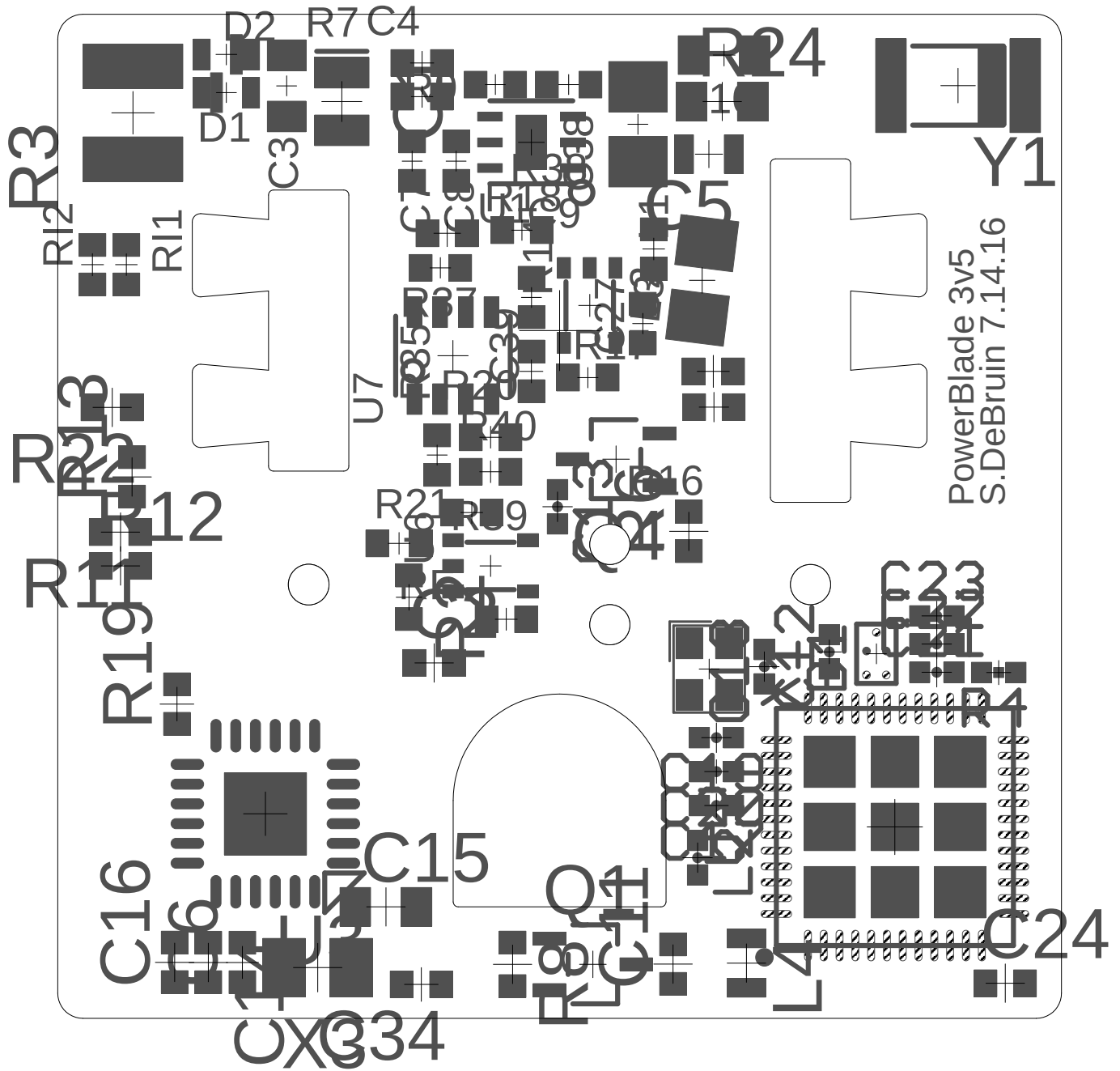


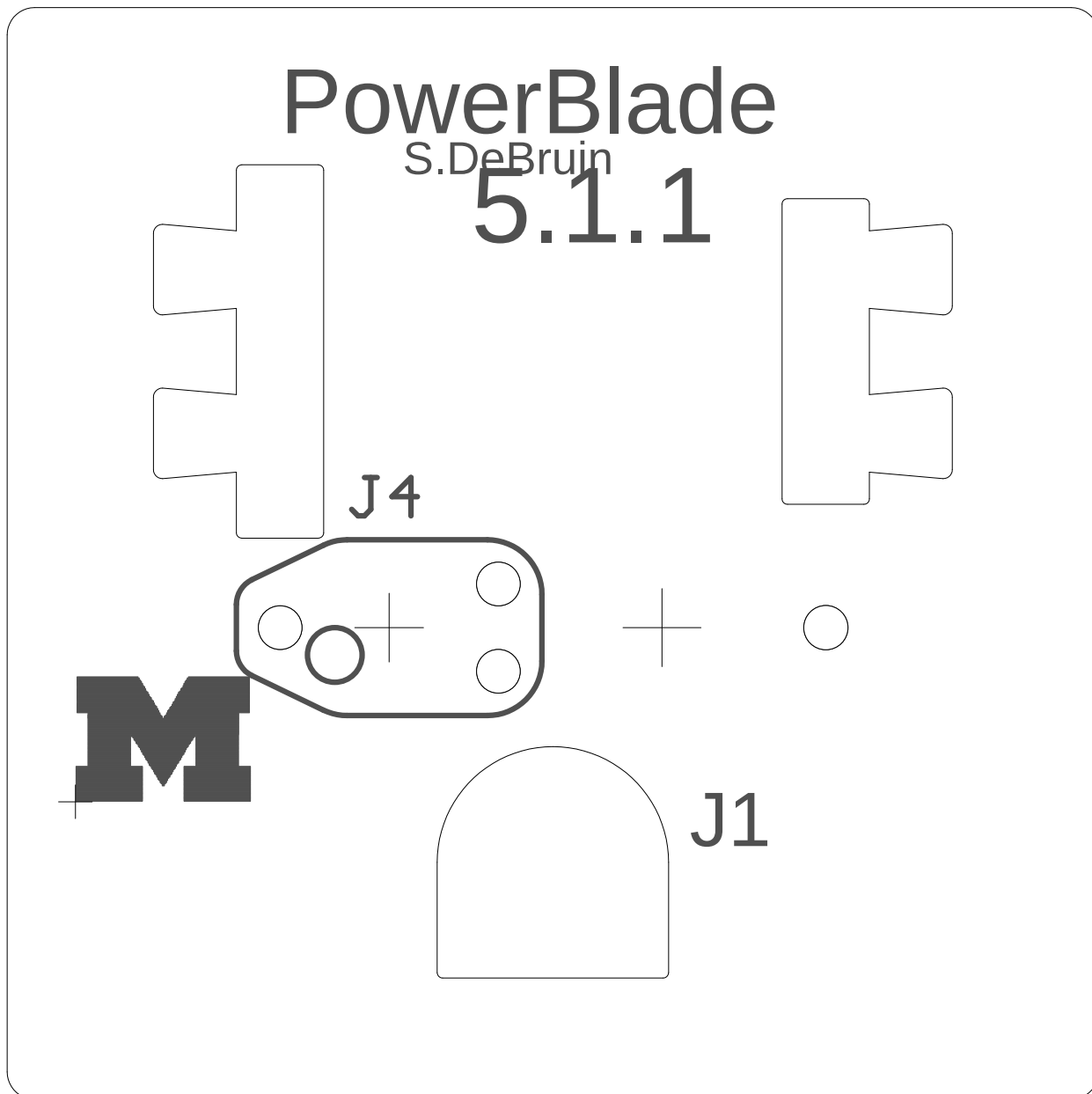




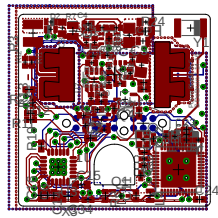
Bottom Copper Layer



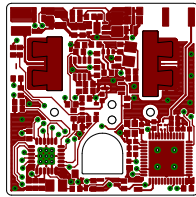


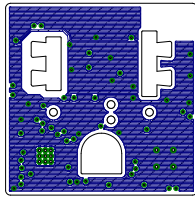


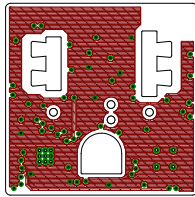
Top and Bottom Layers 1:1 Scale



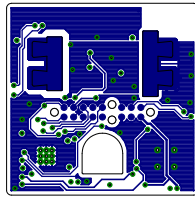
Top Layer 1:1 Scale







Bottom Copper Layer 1:1 Scale



Qty 300

Item	Quantity	Part	Value	Device	Package
1	1	B1	BAL-NRF01D3	BAL-NRF01D3	BAL-NRF01D3
2	1	C1	33uF	CPOL-US0805_SM	CPOL0805_SM
3	1	C11	4.7uF	C-EUC0402	C0402
4	2	C12, C20	1nF	CAPACITOR	0402_CAP
5	1	C15	10uF	C-EUC0603_SM	C0603_SM
6	1	C16	470nF	C-EUC0402	C0402
7	1	C17	1uF	CAPACITOR	0402_CAP
8	2	C18, C19	12pF	CAPACITOR	0402_CAP
9	1	C2	0.1uF	C-EUC0402	C0402
10	1	C21	47nF	CAPACITOR	0402_CAP
11	1	C22	2.2nF	CAPACITOR	0402_CAP
12	1	C23	0.8pF	CAPACITOR	0402_CAP
13	2	C3, C10	22uF	C-EUC0603_SM	C0603_SM
14	1	C39	1.5uF	C-EUC0402	C0402
15	1	C4	22pF	C-EUC0402	C0402
16	1	C5	NP	C-EUC0603_TN	C0603_TN
17	2	C6, C34	8pF	C-EUC0402	C0402
18	1	C7	4.7uF	C-EUC0402	C0402
19	7	C8, C9, C13, C14,	0.1uF	C-EUC0402	C0402
20	1	D1	ZENERBZT52	ZENERBZT52	BZT52
21	1	D2	DIODE	DIODE	BAS521
22	1	J1	JTAG_14PIN_IDC-ND	JTAG_14PIN_IDC-ND	TC2050-IDC-NL-430-ND
23	1	J4	TC2030-JLINK-NL	TC2030-JLINK-NL	TC2030-IDC-NL
24	1	L1	10uH	L-USL0805	L0805
25	1	L2	15nH	INDUCTOR0402	0402_CAP
26	1	L3		L-USL0805	L0805
27	1	L4	10uH	L-USL0603_TN	C0603_TN
28	1	Q1	NTS4173	NTS4173	SC-70-3
29	1	Q4	2SK1829	2SK1829	SC-70-3
30	2	R12, R13	330k	R-US_R0402	R0402
31	1	R14		200 R-US_R0402	R0402
32	4	R15, R20, R21, R4	1M 1%	R-US_R0402	R0402
33	1	R16	75 1%	R-US_R0402	R0402
34	1	R17	1k 1%	R-US_R0402	R0402
35	1	R18	4.99 1%	R-US_R0402	R0402
36	1	R19	47k	R-US_R0402	R0402
37	1	R2	3k	R-US_R0402_SM	R0402_SM
38	1	R24	1 1%	R-US_R0603_SM	R0603_SM
39	1	R3	69.8k	R-US_R1210	R1210
40	1	R35	20k	R-US_R0402	R0402
41	1	R37	887k 1%	R-US_R0402	R0402
42	1	R38	30k 1%	R-US_R0402	R0402
43	1	R39	16k 1%	R-US_R0402	R0402
44	1	R4	12k	RESISTOR	0402_RES
45	3	R6, R11, R22	665k	R-US_R0402	R0402

46	1 R7	560k	R-US_R0402	R0402	
47	1 R8	220k	R-US_R0402_SM	R0402_SM	
48	1 R9	180k	R-US_R0402	R0402	
49	1 RF	4.99k 1%	R-US_R0402	R0402	
50	2 RI1, RI2	953k 1%	R-US_R0402	R0402	
51	1 U1	TPS62122	TPS62122	WDFN-6	
52	1 U2	OPA333	OPA333	SC70-5	
53	1 U3	MSP430FR5738	MSP430FR5738	VQFN-24	
54	1 U4	NRF51822QF	NRF51822QF	QFN-48-6MM	
55	1 U6	MAX9910	MAX9910	SC70-5	
56	1 U7	OPA2369	OPA2369	SOT-23-8	
57	1 X1	16MHz	TXC-8Y	TXC-8Y	
58	1 X3	32.768kHz	CRYSTAL_0805		805
59	1 Y1	UREACH_XTEND	UREACH_XTEND	UREACH_XTEND	
60	4 J2	Ultra Low Profile Spring	Ultra Low Profile Spring	Ultra Low Profile Spring	Pi

Description	Distributor
50 ohm nominal input / conjugate match balun to nRF51422-QFAA,	300
POLARIZED CAPACITOR, American symbol	300
CAPACITOR, European symbol	300
0402 Capacitor	600
CAPACITOR, European symbol	300
CAPACITOR, European symbol	300
0402 Capacitor	300
0402 Capacitor	600
CAPACITOR, European symbol	300
0402 Capacitor	300
0402 Capacitor	300
0402 Capacitor	300
CAPACITOR, European symbol	600
CAPACITOR, European symbol	300
CAPACITOR, European symbol	300
CAPACITOR, European symbol	300
CAPACITOR, European symbol	600
CAPACITOR, European symbol	300
CAPACITOR, European symbol	2100
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INDUCTOR, American symbol	300
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INDUCTOR, American symbol	300
INDUCTOR, American symbol	300
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	300
RESISTOR, American symbol	600
RESISTOR, American symbol	300
RESISTOR, American symbol	1200
RESISTOR, American symbol	300
RESISTOR, American symbol	300
RESISTOR, American symbol	300
RESISTOR, American symbol	300
RESISTOR, American symbol	300
RESISTOR, American symbol	300
RESISTOR, American symbol	300
RESISTOR, American symbol	300
RESISTOR, American symbol	300
Resistor	300
RESISTOR, American symbol	900

RESISTOR, American symbol	300
RESISTOR, American symbol	300
RESISTOR, American symbol	300
RESISTOR, American symbol	300
RESISTOR, American symbol	600
	300
	300
	300
Multiprotocol Bluetooth® 4.0 low energy/2.4 GHz RF SoC	300
	300
	300
2mmx1.6mm SMD Crystal	300
	300
	300
n	1200

Board Summary
Total Unique Parts
SMT placements per board
Thru-hole per board
Fine pitch per board
BGA per board

Dist Part #	Type	Alternate
497-13637-1-ND	BGA	497-13637-1-ND
478-8650-1-ND	smt	478-8650-1-ND
445-5947-1-ND	smt	445-5947-1-ND
490-1303-1-ND	smt	490-1303-1-ND
445-6853-1-ND	smt	445-6853-1-ND
445-4989-1-ND	smt	445-13864-1-ND
1276-1513-1-ND	smt	1276-1513-1-ND
490-6197-1-ND	smt	490-6196-1-ND
490-10777-1-ND	smt	490-10777-1-ND
445-1264-1-ND	smt	445-1264-1-ND
490-5419-1-ND	smt	490-5419-1-ND
490-6269-1-ND	smt	490-6269-1-ND
445-9077-1-ND	smt	445-9077-1-ND
445-13815-1-ND	smt	445-13815-1-ND
445-1239-1-ND	smt	445-1239-1-ND
NP	DNS	NP
445-4890-1-ND	smt	445-4890-1-ND
445-8023-1-ND	smt	445-13820-1-ND
445-4952-1-ND	smt	445-4952-1-ND
BZT52C10T-7DICT-ND	smt	BZT52C10T-7DICT-ND
BAS521-7DICT-ND	smt	BAS521-7DICT-ND
NP	DNS	NP
NP	DNS	NP
490-4990-1-ND	smt	490-4990-1-ND
587-1521-1-ND	smt	587-1521-1-ND
732-3452-1-ND	smt	732-3452-1-ND
490-4025-1-ND	smt	535-12249-1-ND
NTS4173PT1GOSCT-ND	smt	NTS4173PT1GOSCT-ND
2SK1829TE85LFCT-ND	smt	2SK1829TE85LFCT-ND
P330KLCT-ND	smt	P330KLCT-ND
P200LCT-ND	smt	P200LCT-ND
P1.00MLCT-ND	smt	P1.00MLCT-ND
P75.0LCT-ND	smt	P75.0LCT-ND
P1.00KLCT-ND	smt	P1.00KLCT-ND
RMCF0402FT4R99CT-ND	smt	RMCF0402FT4R99CT-ND
P47KJCT-ND	smt	P47KJCT-ND
P3.00KLCT-ND	smt	P3.00KLCT-ND
P1.0AJCT-ND	smt	P1.0AJCT-ND
P69.8KAACT-ND	smt	P69.8KAACT-ND
P20.0KLCT-ND	smt	P20.0KLCT-ND
P887KLCT-ND	smt	P887KLCT-ND
P30.0KLCT-ND	smt	P30.0KLCT-ND
P16.0KLCT-ND	smt	P16.0KLCT-ND
RHM12.0KCDCT-ND	smt	RHM12.0KCDCT-ND
P665KLCT-ND	smt	P665KLCT-ND

P560KLCT-ND	smt	P560KLCT-ND
P220KJCT-ND	smt	P220KJCT-ND
P180KLCT-ND	smt	P180KLCT-ND
P4.99KLCT-ND	smt	P4.99KLCT-ND
P953KLCT-ND	smt	P953KLCT-ND
296-27695-1-ND	fine pitch	296-27695-1-ND
296-19547-1-ND	smt	296-19547-1-ND
296-29232-1-ND	fine pitch	296-29232-1-ND
1490-1032-1-ND	fine pitch	1490-1032-1-ND
296-25252-1-ND	smt	296-25252-1-ND
296-22671-1-ND	smt	296-22671-1-ND
887-2003-1-ND	smt	887-2003-1-ND
535-12373-1-ND	smt	535-12373-1-ND
FR05-S1-N-0-110	smt	FR05-S1-N-0-110
ED1649-ND	smt	ED1649-ND

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