

bldc_controller_routed

Design Report

Rev 1 | 2026-09-10 | jlcpcb

kicad-tools 0.20.0

Board Summary

Property	Value
Layers	4 copper (F.Cu, In1.Cu, In2.Cu, B.Cu)
Footprints	42 (36 SMD, 6 THT, 0 other)
Nets	37
Traces	8114 segments
Vias	136
Board Size	70.0 x 90.0 mm

Stackup

Layer	Type	Thickness (mm)	Material
F.Mask	Top Solder Mask	0.01	--
F.Cu	copper	0.035	--
dielectric 1	prepreg	0.2	FR4
In1.Cu	copper	0.035	--
dielectric 2	core	1.0	FR4
In2.Cu	copper	0.035	--
dielectric 3	prepreg	0.2	FR4
B.Cu	copper	0.035	--
B.Mask	Bottom Solder Mask	0.01	--

Design Overview

Theory of Operation

Sensored BLDC Controller

Communication Interfaces

Protocol	Signals
SPI	MISO, MOSI, SCK

Power Architecture

Power Rails: PWR_FLAG

Assembly Notes

1 fine-pitch component; 2 thermal pads; 4 polarized components

- **Fine-pitch components:** 1 (U1)

- **Thermal pads:** 2 -- verify solder paste apertures
- **Polarized components:** 4 -- check orientation markings

Hand-Solder (THT) Components

The following 6 through-hole components are **excluded from the SMT pick-and-place file** and must be hand-soldered (or wave/selective-soldered) after SMT assembly. They appear in the BOM for sourcing.

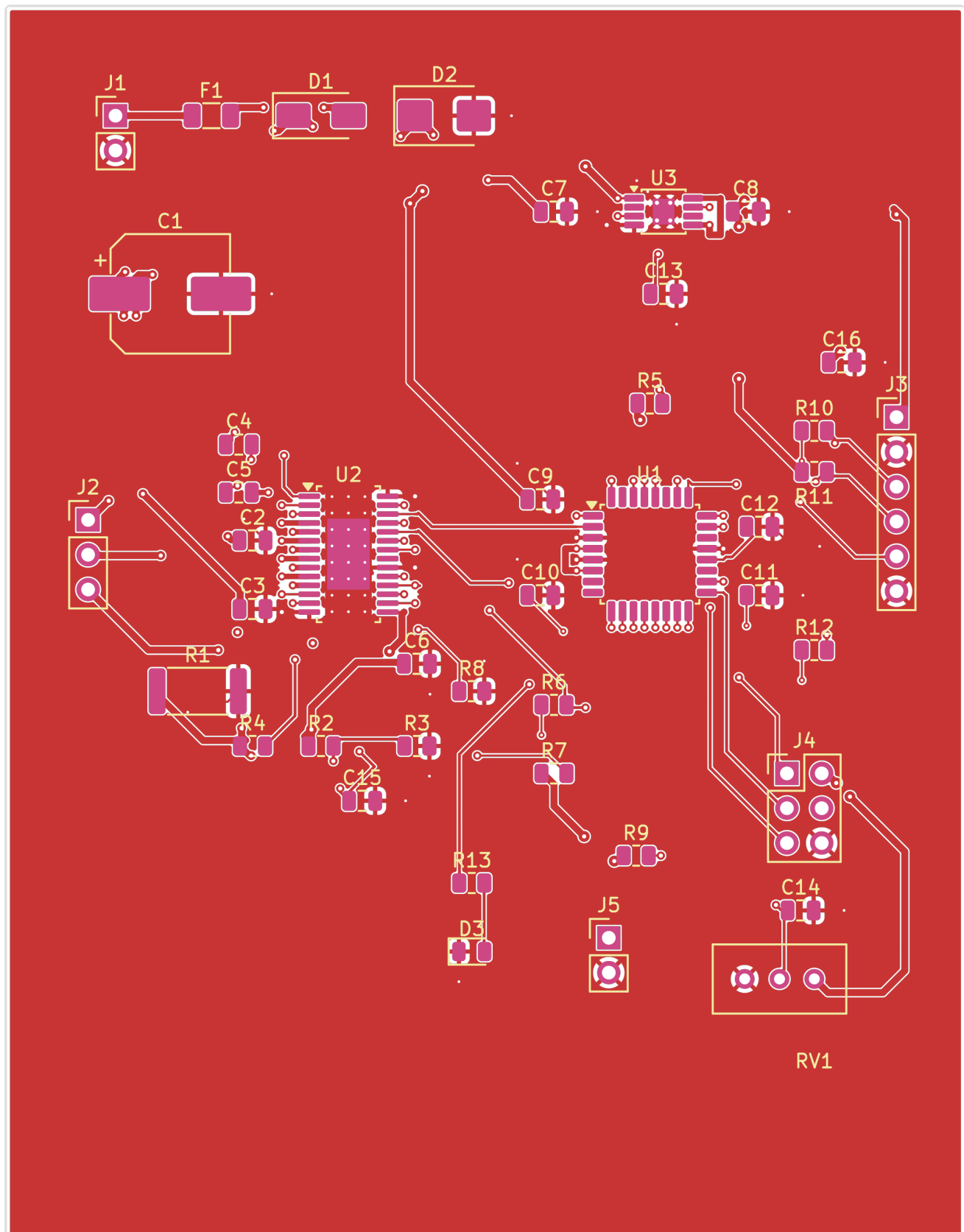
Value	Package	Qty	References
12-24V INPUT	PinHeader_1x02_P2.54 mm_Vertical	1	J1
MOTOR ABC	PinHeader_1x03_P2.54 mm_Vertical	1	J2
HALL	PinHeader_1x06_P2.54 mm_Vertical	1	J3
AVR ISP	PinHeader_2x03_P2.54 mm_Vertical	1	J4
RUN SWITCH	PinHeader_1x02_P2.54 mm_Vertical	1	J5
10k	Potentiometer_Bourns_ 3296W_Vertical	1	RV1

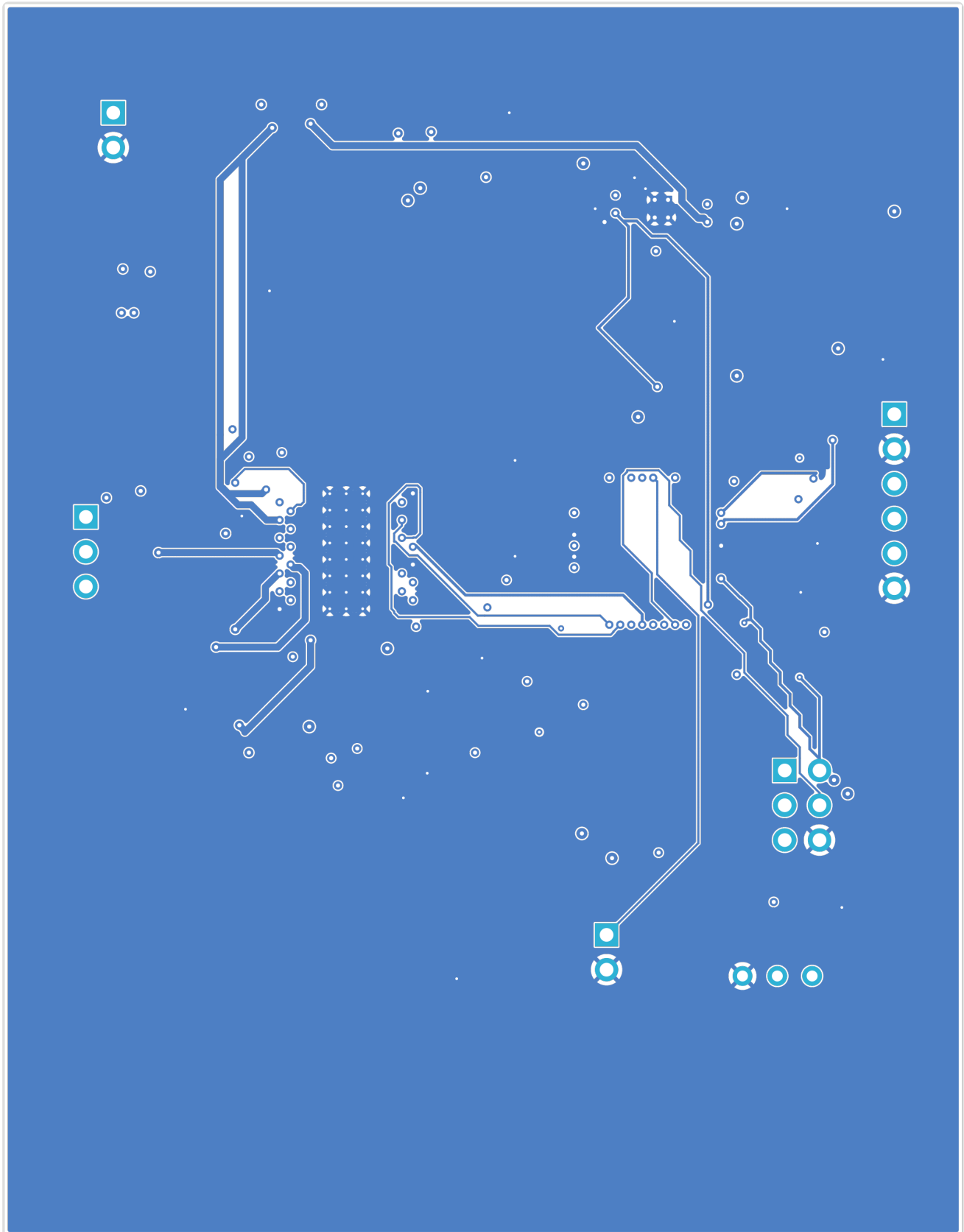
ERC Status

Metric	Count
Errors	0
Warnings	0

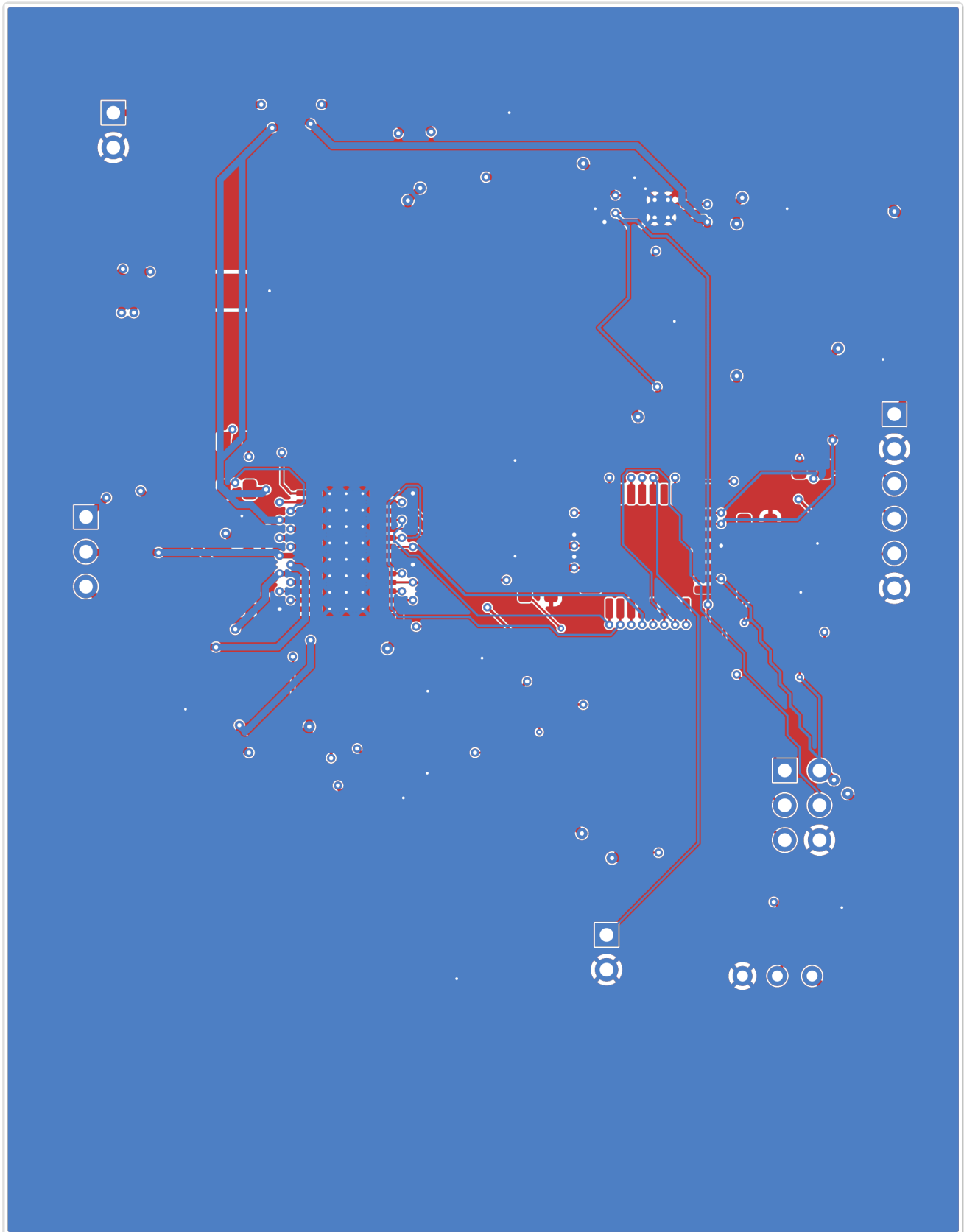
Status: SKIPPED -- ERC skipped by user request

PCB Layout

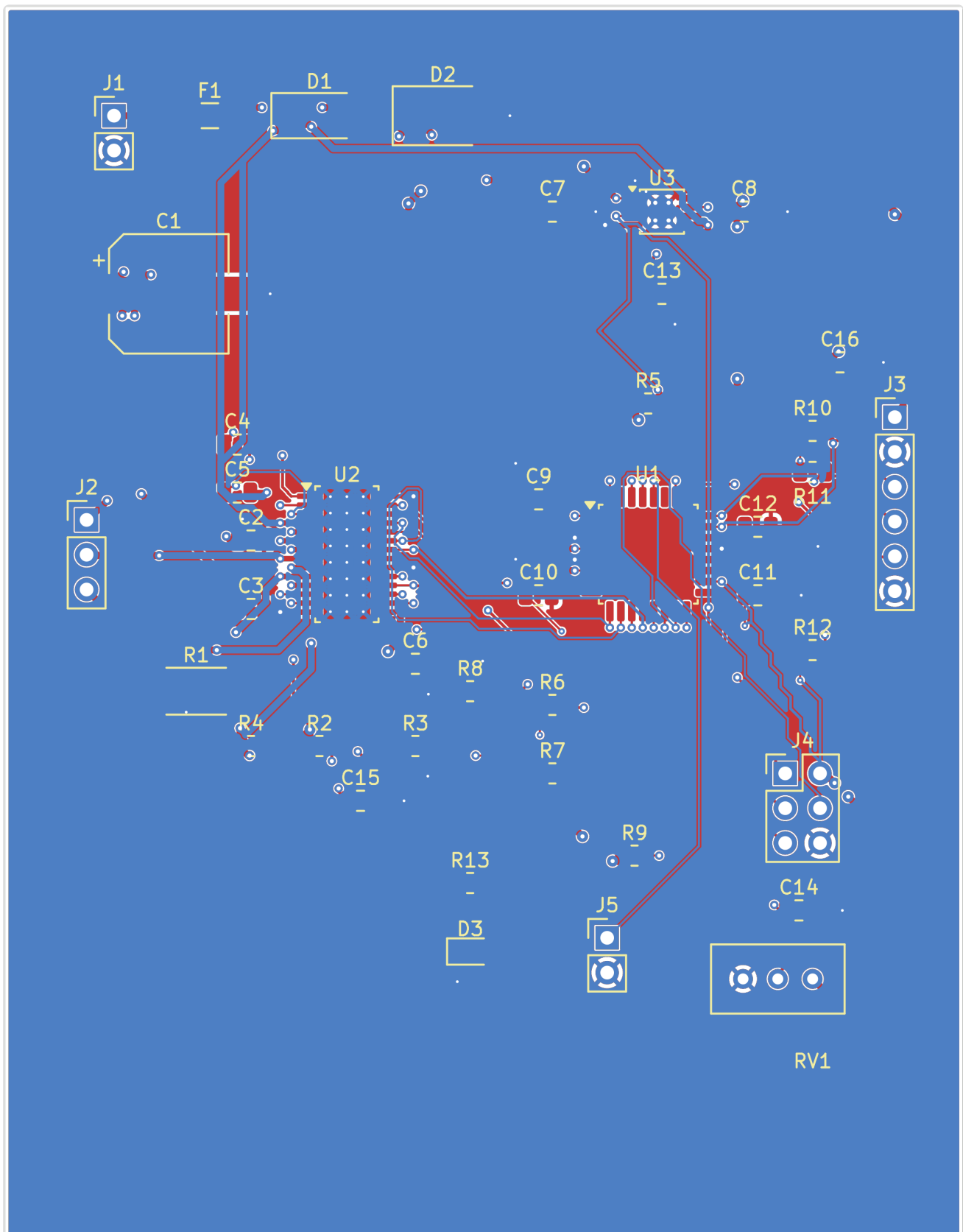




Copper

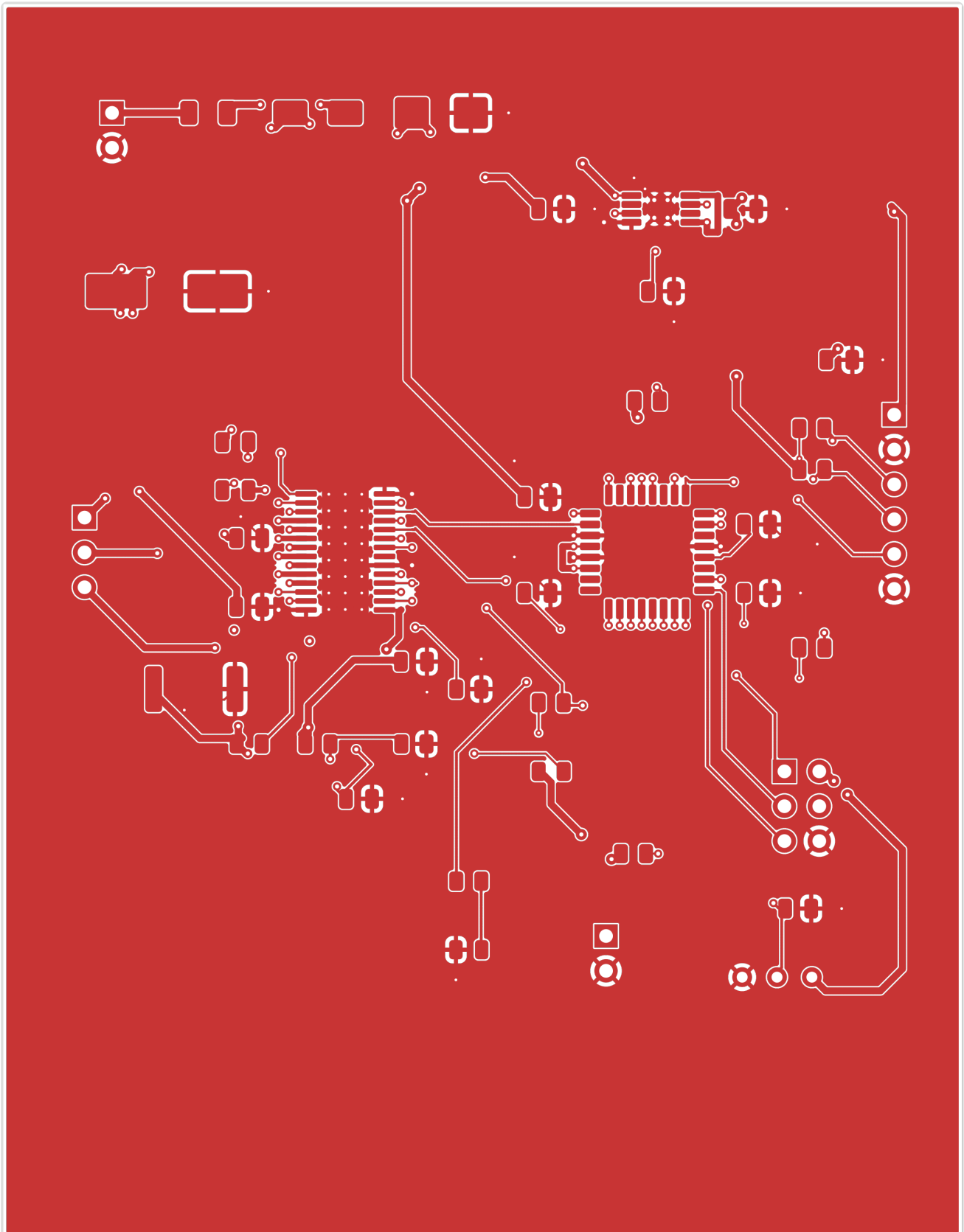


Assembly

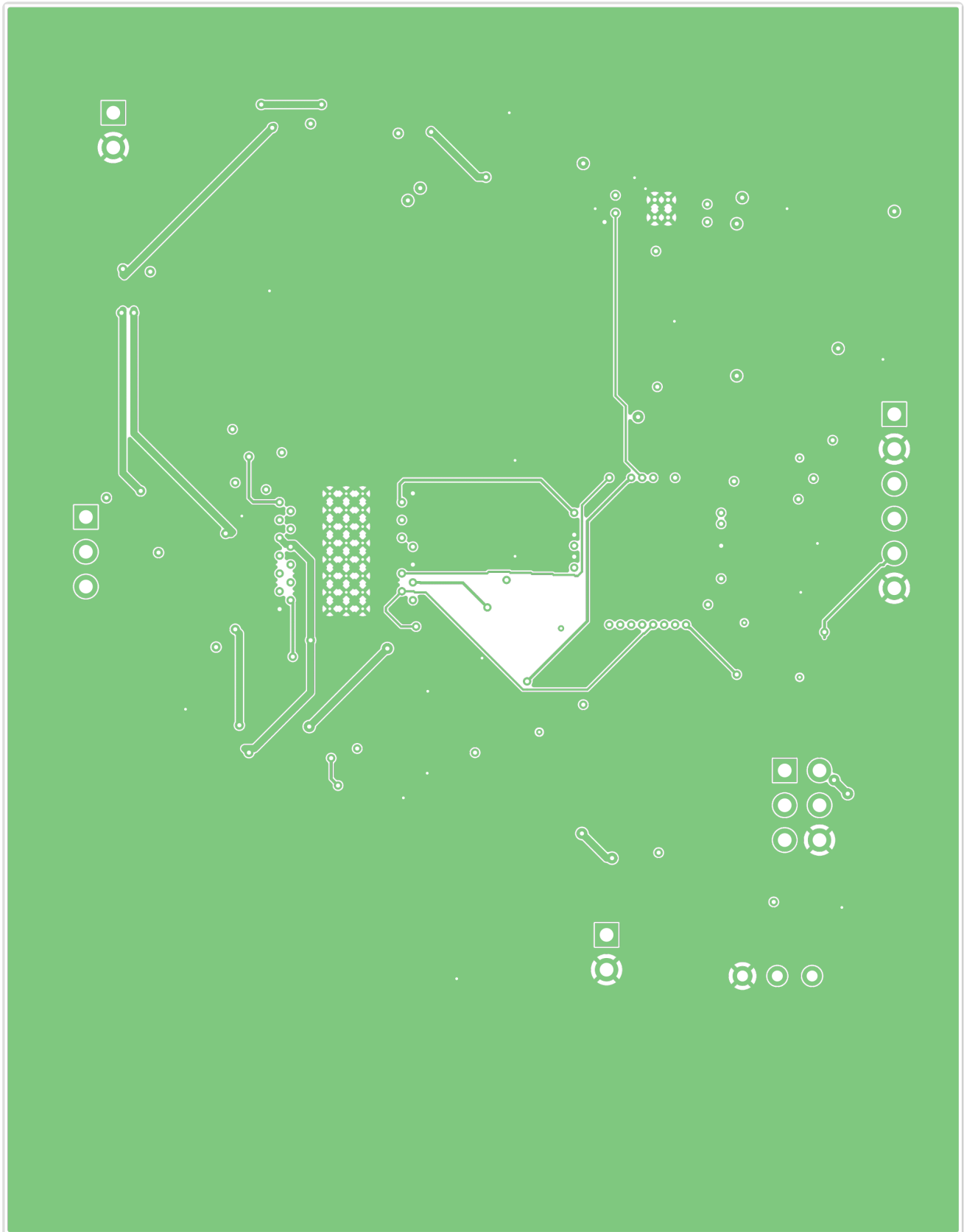


Copper Layers

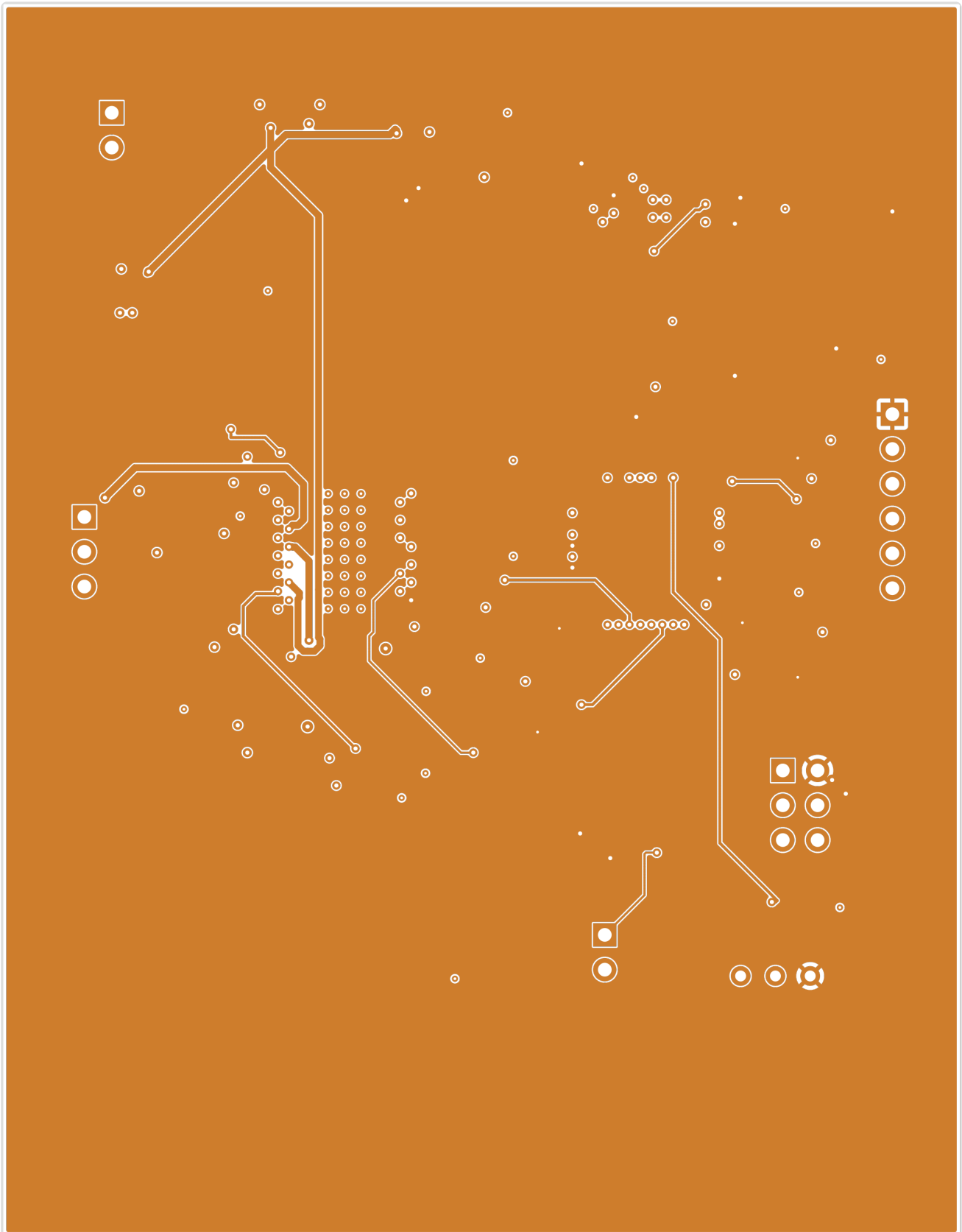
F.Cu



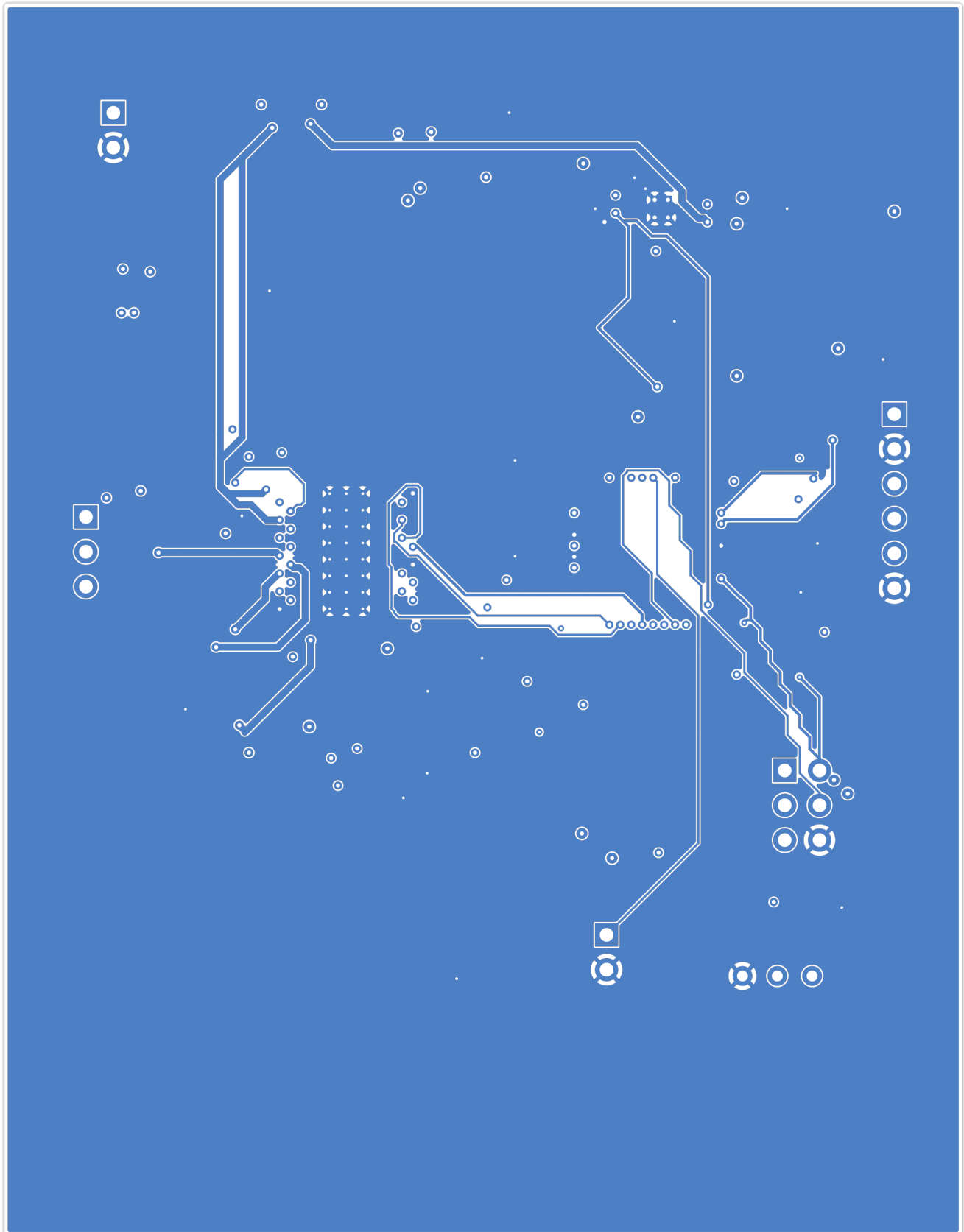
In1.Cu



In2.Cu



B.Cu



Bill of Materials

Value	Package	Qty	References	MPN	LCSC
100nF	C_0805_2012 Metric	10	C2, C3, C5, C9, C10, C11, C12, C14, C15, C16	CC0805KRX7R 9BB104	C49678
10nF	C_0805_2012 Metric	2	C4, C13	CL21B103KBA NNNC	C1710
10uF	C_0805_2012 Metric	1	C8	CL21A106KAY NNNE	C15850
1uF	C_0805_2012 Metric	1	C7	CL21B105KBF NNNE	C28323
220uF 50V	CP_Elec_8x10. 5_PolarityMark	1	C1	EEEFT1H221A P	C178594
470nF	C_0805_2012 Metric	1	C6	CL21B474KBF NNNE	C13967
RED	LED_0805_201 2Metric	1	D3	17-21SURC/ S530-A2/TR8	C131244
SMBJ24A	D_SMB	1	D2	SMBJ24A	C224017
SS36	D_SMA	1	D1	SS36	C16015
1A 63V	Fuse_1206_32 16Metric	1	F1	SF-1206S100- 2	C3167176
12-24V INPUT	PinHeader_1x0 2_P2.54mm_V ertical	1	J1	ZX- PZ2.54-1-2PZ Z	C7501260
AVR ISP	PinHeader_2x0 3_P2.54mm_V ertical	1	J4	2.54-2*3P	C65114
HALL	PinHeader_1x0 6_P2.54mm_V ertical	1	J3	2.54-1*6P	C37208
MOTOR ABC	PinHeader_1x0 3_P2.54mm_V ertical	1	J2	2.54-1*3P	C49257
RUN SWITCH	PinHeader_1x0 2_P2.54mm_V ertical	1	J5	ZX- PZ2.54-1-2PZ Z	C7501260

Value	Package	Qty	References	MPN	LCSC
0.5R	R_2512_6332 Metric	1	R1	WSL2512R500 0FEA	C511023
10k	Potentiometer_ Bourns_3296W _Vertical	1	RV1	3296W-1-103L F	C34846
10k	R_0805_2012 Metric	9	R3, R5, R6, R7, R8, R9, R10, R11, R12	0805W8F1002 T5E	C17414
1k	R_0805_2012 Metric	2	R4, R13	0805W8F1001 T5E	C17513
56k	R_0805_2012 Metric	1	R2	0805W8F5602 T5E	C17756
ATmega328P- AU	TQFP-32_7x7 mm_P0.8mm	1	U1	ATMEGA328P- AU	C14877
DRV8313PWP R	TI_PWP0028C _EP3.4x9.7_M ask3.1x5.18_T hermalVias	1	U2	DRV8313PWP R	C92482
TPS7A1650DG NR	HVSSOP-8-1E P_3x3mm_P0. 65mm_EP1.57 x1.89mm_Ther malVias	1	U3	TPS7A1650DG NR	C468238

DRC Status

Metric	Count
Errors	0
Warnings	0
Blocking	0

Status: PASS

Manufacturing Readiness

Verdict: WARNING

Action Items

- **[OPTIONAL]** Verify zone fill in KiCad for 2 zone-connected nets
- **[OPTIONAL]** Analog net: GND_SENSE — analog signal; noise-sensitive, avoid crossing digital signals
- **[OPTIONAL]** Analog net: SENSE_IN — analog signal; noise-sensitive, avoid crossing digital signals

Routing Status

Metric	Value
Signal Net Completion	100.0% (35/35)
Overall Completion	100.0%
Complete Nets	37 / 37
Zone-Connected Nets	2
Incomplete Nets	0
Unconnected Pads	0

Zone-Connected Nets

- +5V
- GND

Cost Estimate

Metric	Per Board (estimated)
PCB Fabrication	~3.26 USD
Components (estimated)	~2.23 USD
Assembly (estimated)	~2.19 USD
Total (estimated)	~7.67 USD
Batch Quantity	5
Batch Total (estimated)	~38.36 USD