

bldc_controller_routed

Design Report

kicad-tools 0.14.0

Rev 1 | 2026-07-09 | jlcpcb-tier1

Board Summary

Property	Value
Layers	4 copper (F.Cu, In1.Cu, In2.Cu, B.Cu)
Footprints	55 (40 SMD, 11 THT, 4 other)
Nets	52
Traces	951 segments
Vias	79
Board Size	80.0 x 100.0 mm

Design Overview

Theory of Operation

BLDC Motor Controller

3-Phase Brushless DC Motor Driver

Thermal analysis and high-current routing demo

Power Architecture

Power Rails: +24V, +3V3, +5V, GND, PWR_FLAG

Regulator	Device
U1	LM2596-5.0
U2	AMS1117-3.3

Assembly Notes

1 fine-pitch component; 4 polarized components

- **Fine-pitch components:** 1 (U10)
- **Polarized components:** 4 – check orientation markings

ERC Status

Metric	Count
Errors	0
Warnings	0

Status: SKIPPED – ERC skipped by user request

Schematic Overview

Schematic: bldc_controller

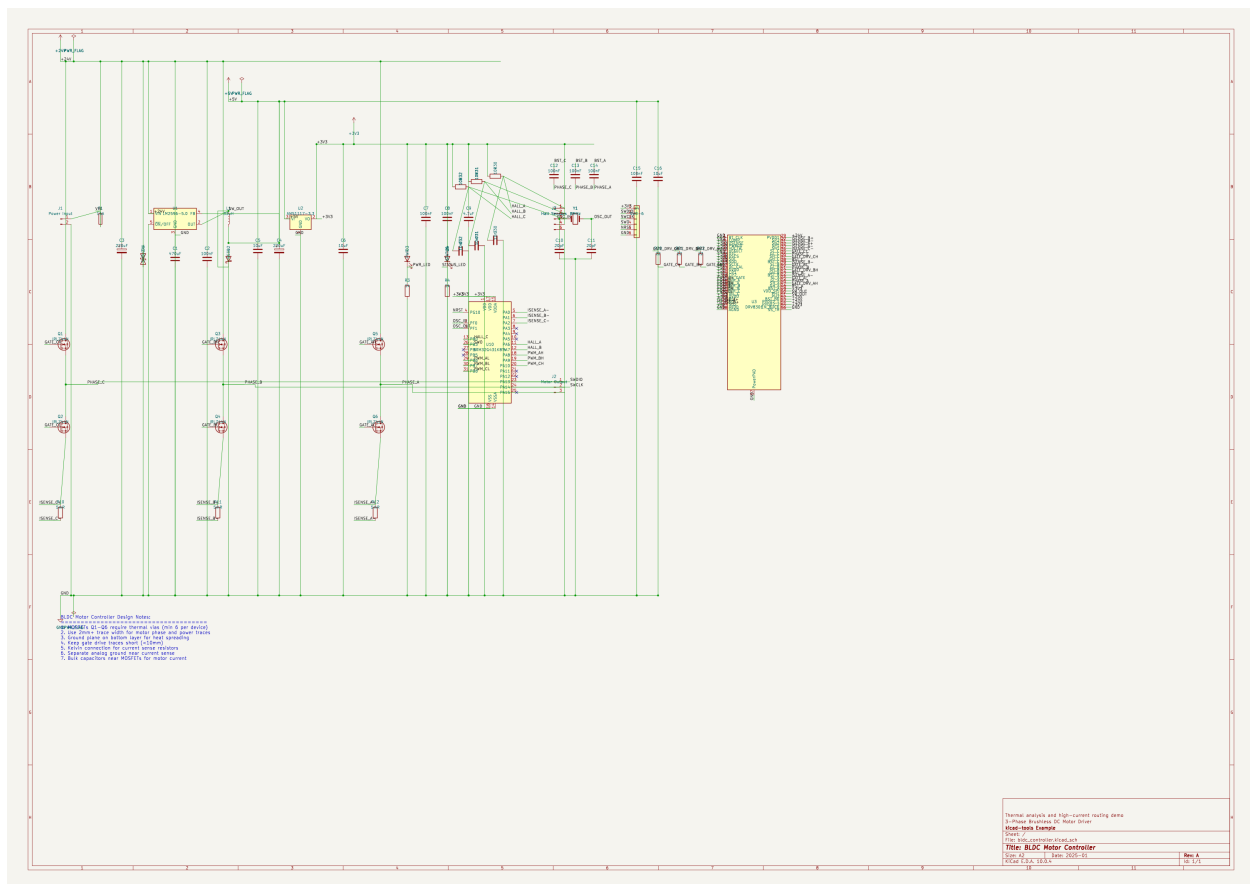


Figure 1: Schematic: bldc_controller

PCB Layout

Copper

Assembly

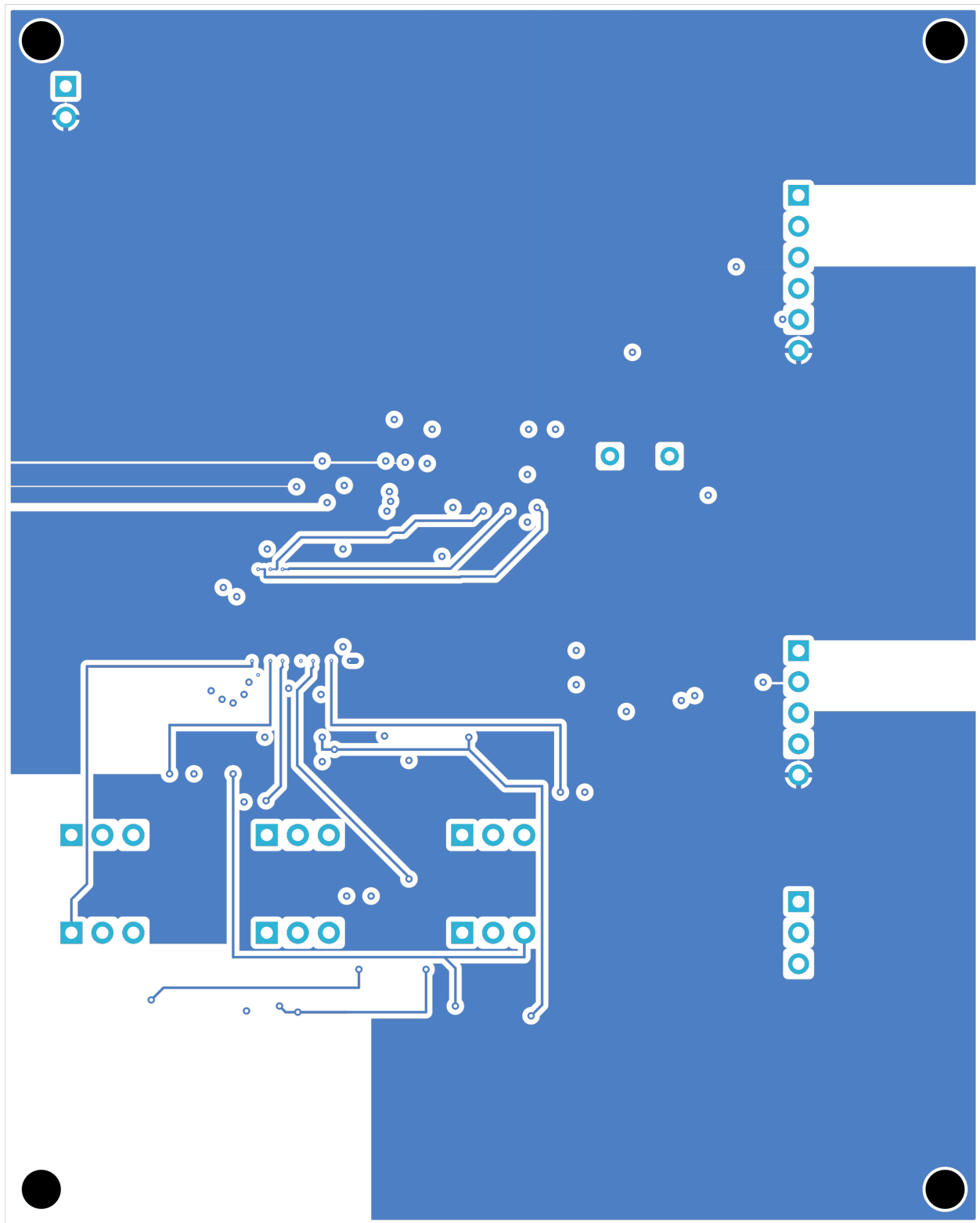


Figure 3: PCB Back

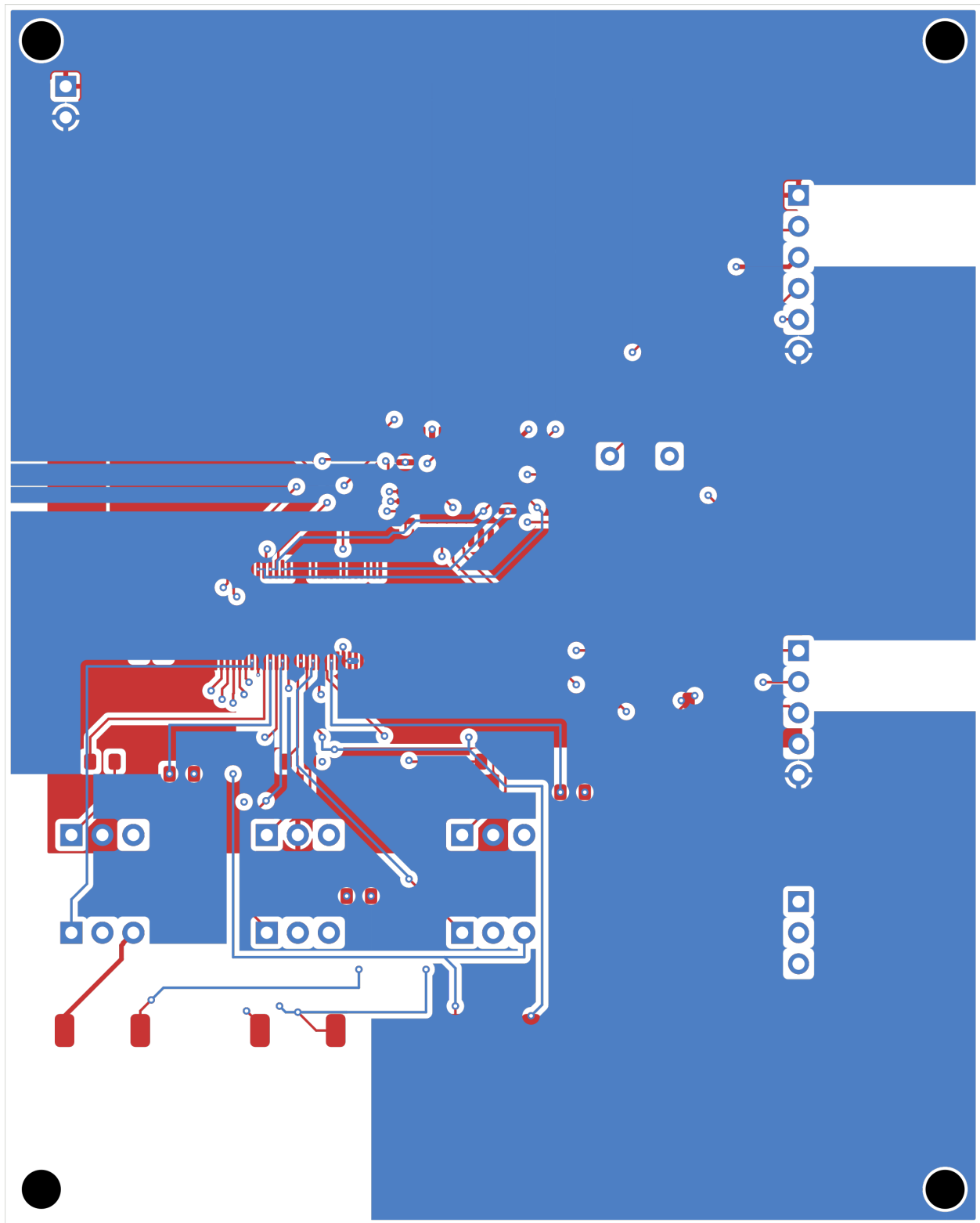


Figure 4: PCB Copper

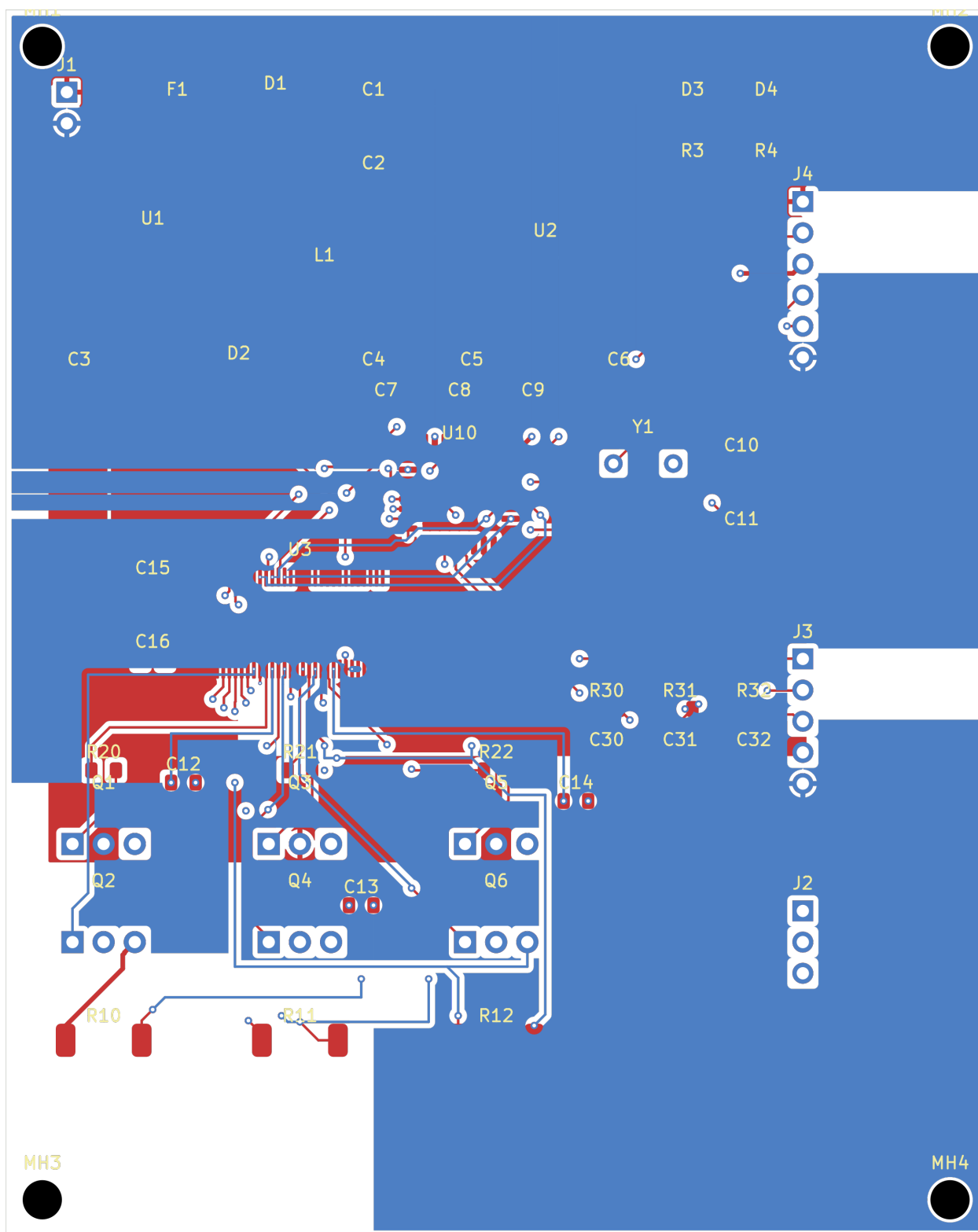


Figure 5: Assembly

Copper Layers

F.Cu

In1.Cu

In2.Cu

B.Cu

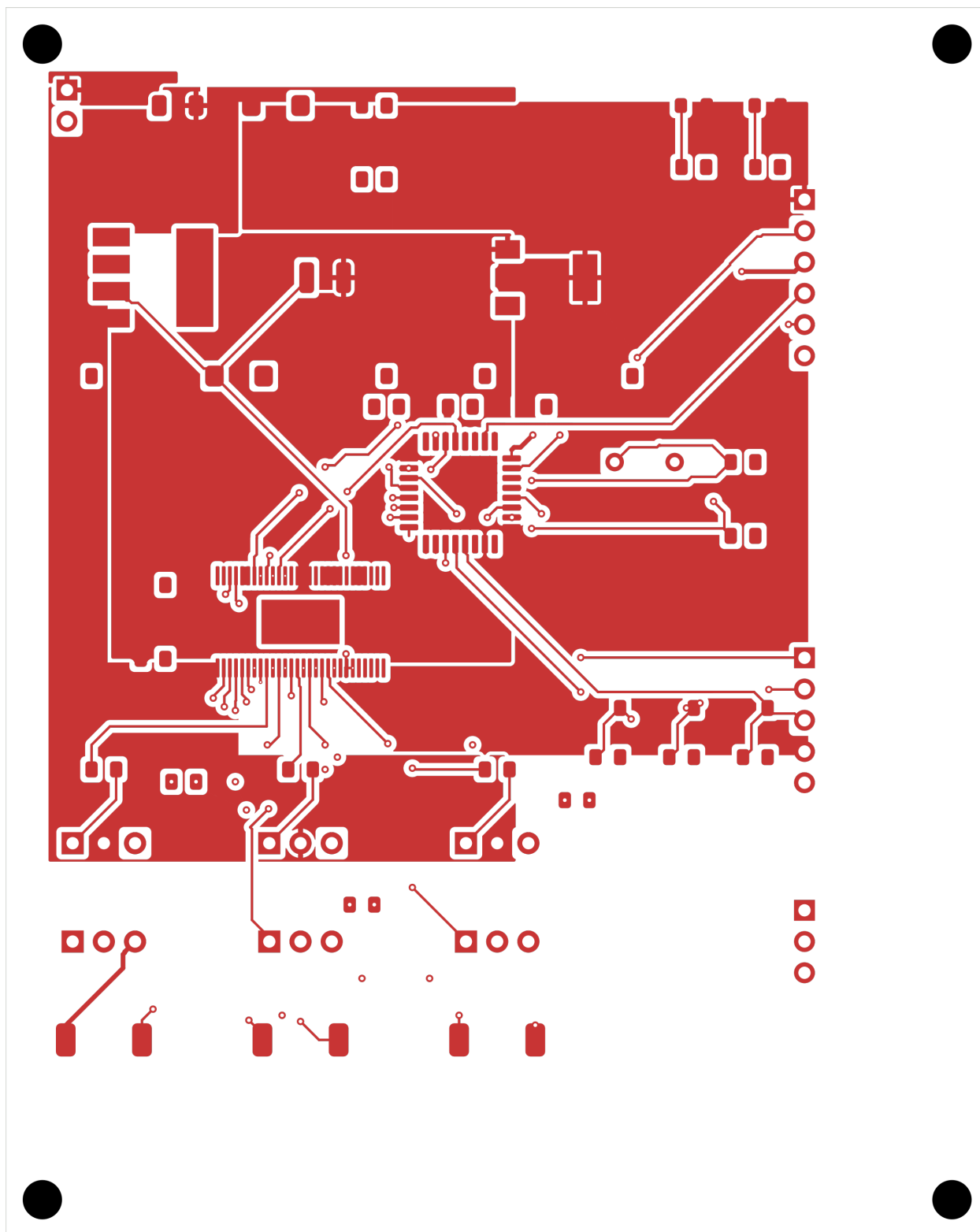


Figure 6: F.Cu

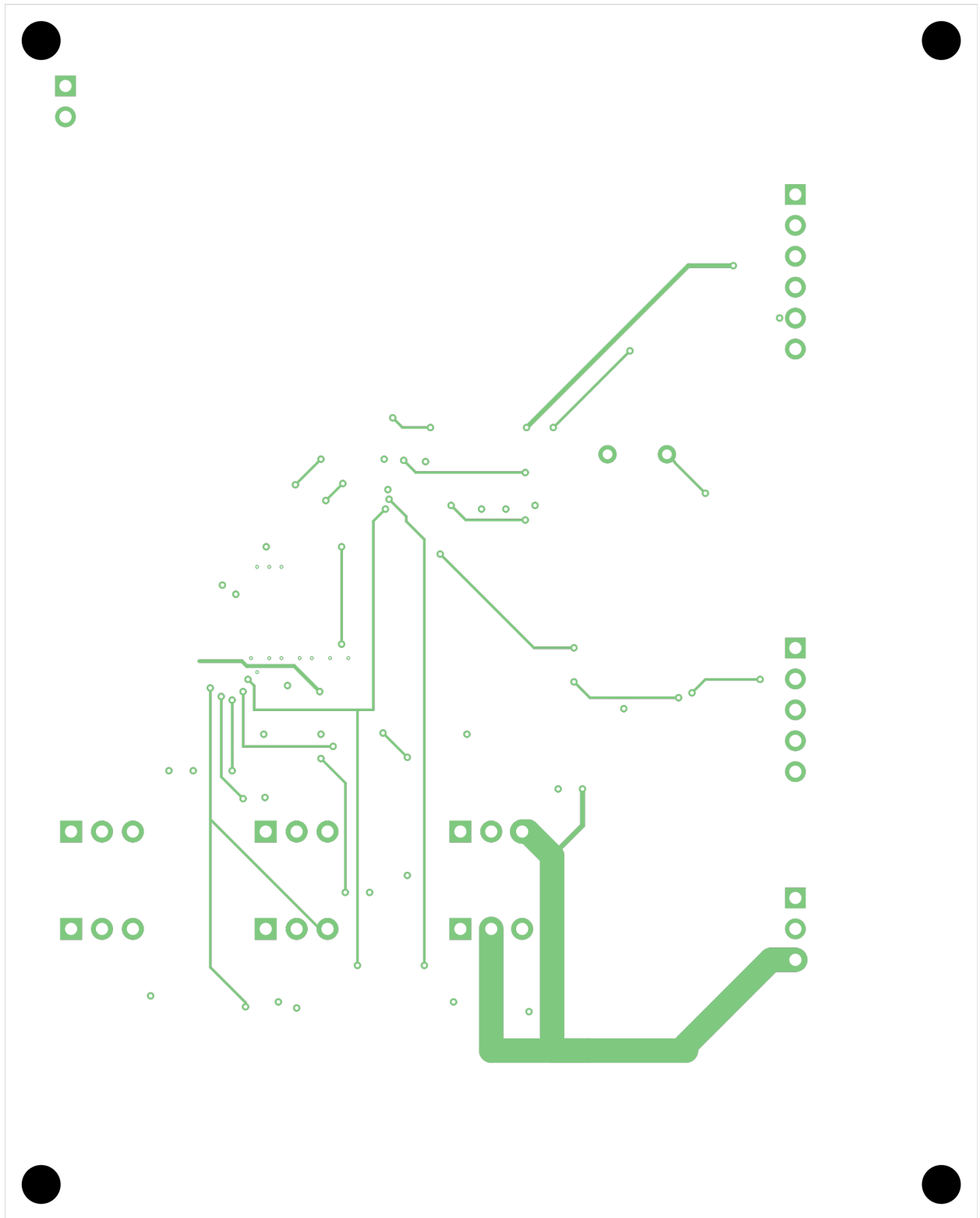


Figure 7: In1.Cu

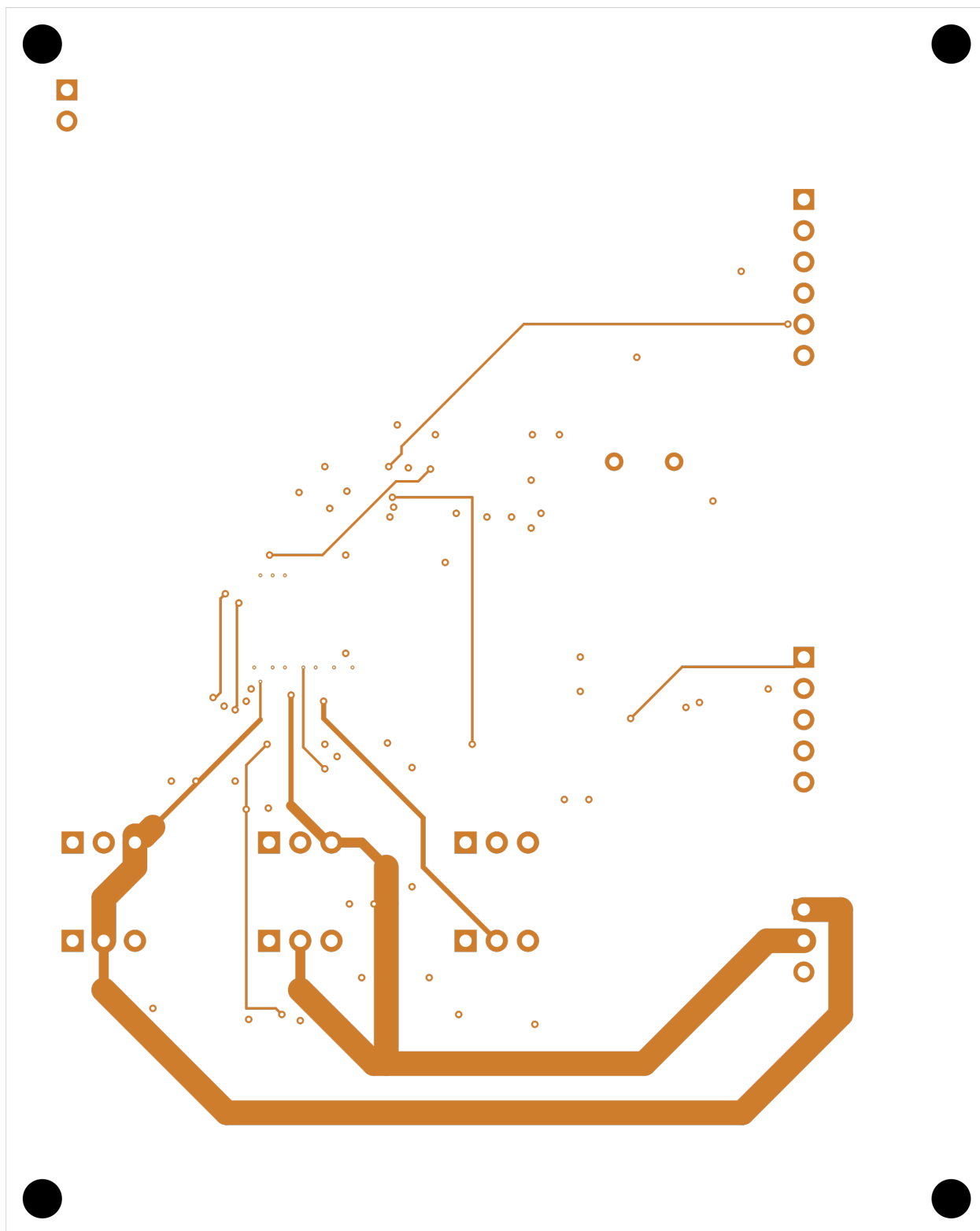


Figure 8: In2.Cu

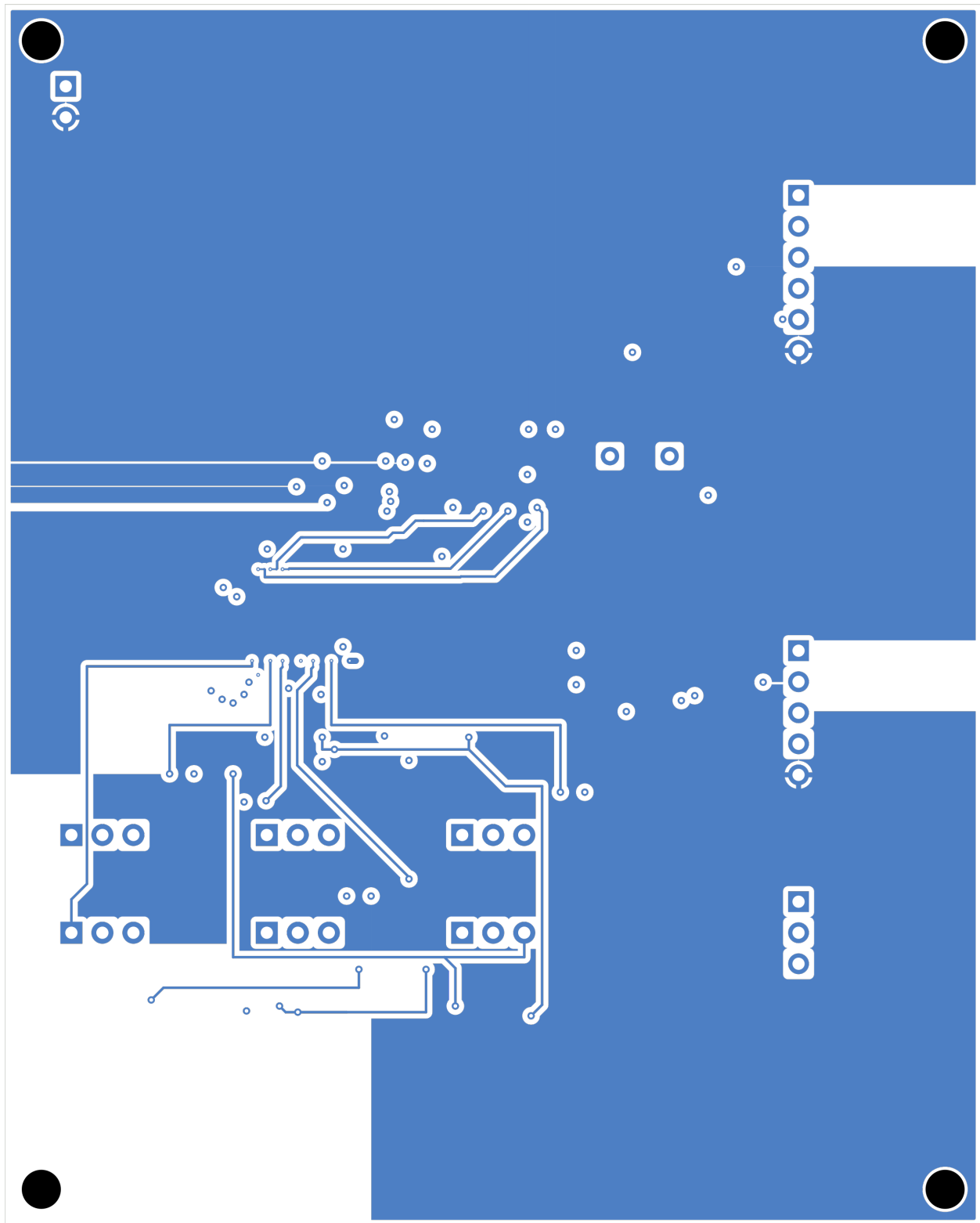


Figure 9: B.Cu

Bill of Materials

Value	Package	Qty	References
100nF	C_0805_2012Metric	7	C2, C7, C8, C12, C13, C14
10nF	C_0805_2012Metric	3	C30, C31, C32
10uF	C_0805_2012Metric	3	C5, C6, C16
20pF	C_0805_2012Metric	2	C10, C11
220uF	C_0805_2012Metric	2	C3, C4
4.7uF	C_0805_2012Metric	1	C9
470uF	C_0805_2012Metric	1	C1
PWR	LED_0805_2012Metric	1	D3
SMBJ24A	D_SMA	1	D1
SS34	D_SMA	1	D2
STATUS	LED_0805_2012Metric	1	D4
15A	Fuse_1206_3216Metric	1	F1
Hall Sensors	PinHeader_1x05_P2.54mm_Vertical	1	J3
Motor Output	PinHeader_1x03_P2.54mm_Vertical	1	J2
Power Input	PinHeader_1x02_P2.54mm_Vertical	1	J1
SWD-6	PinHeader_1x06_P2.54mm_Vertical	1	J4
33uH	L_1210_3225Metric	1	L1
IRLZ44N	TO-220-3_Vertical	6	Q1, Q2, Q3, Q4, Q5, Q6
10k	R_0805_2012Metric	3	R30, R31, R32
1k	R_0805_2012Metric	2	R3, R4
22	R_0805_2012Metric	3	R20, R21, R22
5mR	R_2512_6332Metric	3	R10, R11, R12
AMS1117-3.3	SOT-223-3_TabPin2	1	U2
DRV8301	HTSSOP-56-1EP_6.1x14mm_P0.5mm_EP3.61x6.35mm	1	U3
LM2596-5.0	TO-263-5_TabPin3	1	U1
STM32G431K8Tx	LQFP-32_7x7mm_P0.8mm	1	U10
8MHz	Crystal_HC49-4H_Vertical	1	Y1

DRC Status

Metric	Count
Errors	0
Warnings	11
Blocking	0

Status: PASS ### Violations by Type

Violation Type	Count
single_pad_net	8
silk_over_copper	6
copper_sliver	3
silk_edge_clearance	2

Manufacturing Readiness

Verdict: WARNING

Action Items

- **[OPTIONAL]** Verify zone fill in KiCad: 10 nets appear incomplete but may be connected via zone fills
- **[OPTIONAL]** Verify zone fill in KiCad for 5 zone-connected nets
- **[OPTIONAL]** Review 11 DRC warnings
- **[OPTIONAL]** Analog net: ISENSE_A+ — analog signal; noise-sensitive, avoid crossing digital signals
- **[OPTIONAL]** Analog net: ISENSE_A- — analog signal; noise-sensitive, avoid crossing digital signals
- **[OPTIONAL]** Analog net: ISENSE_B+ — analog signal; noise-sensitive, avoid crossing digital signals
- **[OPTIONAL]** Analog net: ISENSE_B- — analog signal; noise-sensitive, avoid crossing digital signals
- **[OPTIONAL]** Analog net: ISENSE_C+ — analog signal; noise-sensitive, avoid crossing digital signals
- **[OPTIONAL]** Analog net: ISENSE_C- — analog signal; noise-sensitive, avoid crossing digital signals

Routing Status

Metric	Value
Signal Net Completion	100.0% (39/39)
Overall Completion	90.4%
Complete Nets	47 / 52
Zone-Connected Nets	5
Single-Pad Nets	8 (no routing needed)
Incomplete Nets	5
Unconnected Pads	53

Zone-Connected Nets

- +24V
- +3V3
- +5V
- GND
- VIN

Single-Pad Nets

8 single-pad nets (no routing needed) – not listed individually.

Incomplete Nets

- +24V
- +3V3
- +5V
- GND
- VIN

Cost Estimate

Metric	Per Board (estimated)
PCB Fabrication	~3.6 USD
Components (estimated)	~3.17 USD
Assembly (estimated)	~2.35 USD
Total (estimated)	~9.12 USD
Batch Quantity	5
Batch Total (estimated)	~45.61 USD