
BOSEM I/O Interface

Circuit Board Documentation

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Abstract

This circuit (BOSEMIO1) provides an interface between CDS and up to four connected BOSEMDTR1 daughter boards. It has the following features:

- Interface between DSUB9 inputs and outputs and four individual BOSEM daughter boards via DIL sockets
- Replaceable daughter boards
- 6.95 V precision voltage reference (positive and negative)
- Local diagnostics port
- LED power indicator
- Mechanical mounting holes

Key words: coil led driver photodiode readout digital error switch

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Safety Instructions

In order to operate the circuit properly and safely, review the following guidelines before installing and using the unit. Failure to do so may result in equipment damage or bodily injury:



This circuit warms up due to its power consumption. To enable proper cooling, observe the following rules:

- Do not block available air vents.
 - Give the unit free access to the room ambient air for convection.
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This circuit was designed as a laboratory equipment to be operated only by trained and qualified technicians in research institutes or development departments. For safety reasons, usage by other persons or in other environments is *not* recommended.



- This circuit uses extra-low voltage ($< 50 V_{AC}$ and $< 75 V_{DC}$) and is therefore exempt from the regulations of the *Low Voltage Directive* (2014/35/EU).
 - The unit does not contain any mechanical drive system. Therefore, the regulations of the *Machinery Directive* (2006/42/EC) do not apply.
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Sicherheitshinweise

Nehmen Sie vor Aufbau und Inbetriebnahme des Geräts folgende Empfehlungen zur Kenntnis, um die Schaltung korrekt und sicher zu betreiben sowie Schäden und Verletzungen zu vermeiden:



Diese Schaltung erwärmt sich aufgrund ihrer Verlustleistung. Zur Gewährleistung einer sinnvollen Kühlung sind folgende Punkte zu beachten:

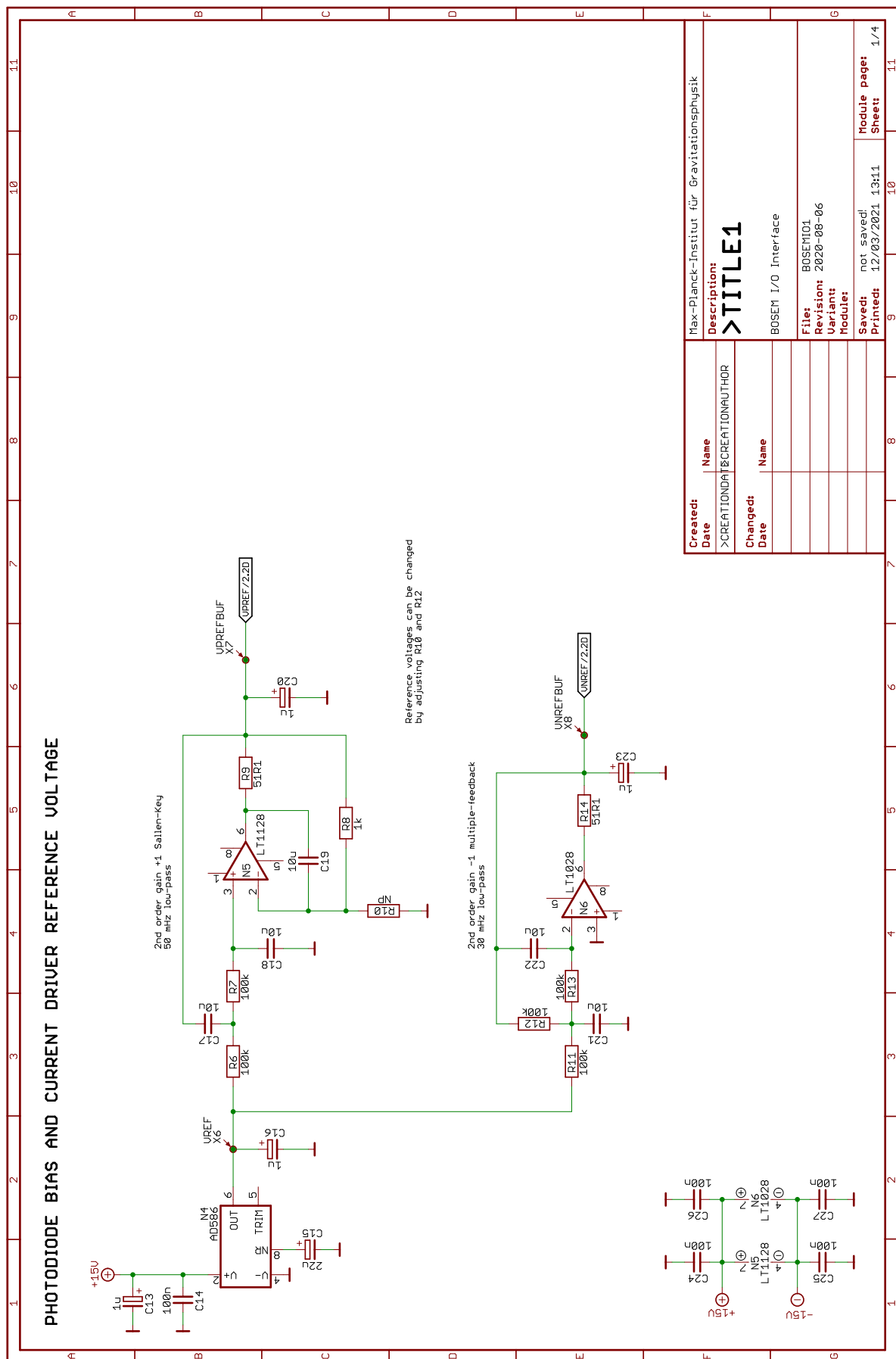
- Vorhandene Lüftungsöffnungen nicht versperren.
 - Gerät zur Konvektion freien Zugang zur Raumluft ermöglichen.
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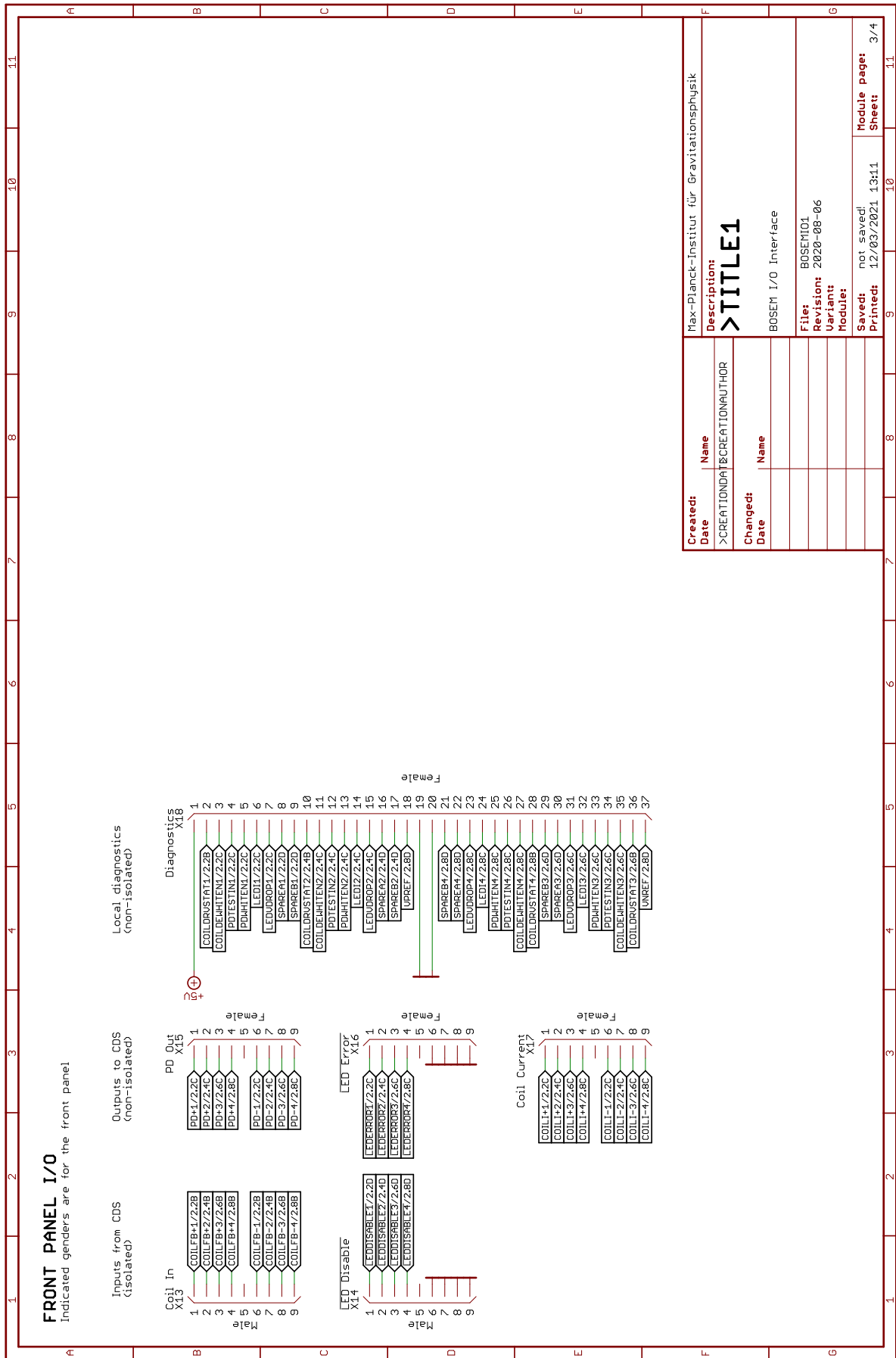


Diese Schaltung wurde als Laborausrüstung entworfen, die nur von qualifizierten und eingewiesenen Technikern in Forschungsinstituten oder Entwicklungsabteilungen benutzt wird. Aus Sicherheitsgründen wird die Verwendung durch andere Personen oder in anderer Umgebung *nicht* empfohlen.



- Diese Schaltung verwendet Kleinspannung ($< 50 V_{AC}$ und $< 75 V_{DC}$) und unterliegt daher nicht den Bestimmungen der *Niederspannungsrichtlinie* (2014/35/EU).
 - Das Gerät enthält kein mechanisches Antriebssystem – die Bestimmungen der *Maschinenrichtlinie* (2006/42/EG) sind daher nicht anwendbar.
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Changed: Date	Name	BOSEM I/O Interface
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Variant:		
Module:		
Saved:	not saved!	Module page: 3/4
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Figure 3: Design schematics (sheet 3)

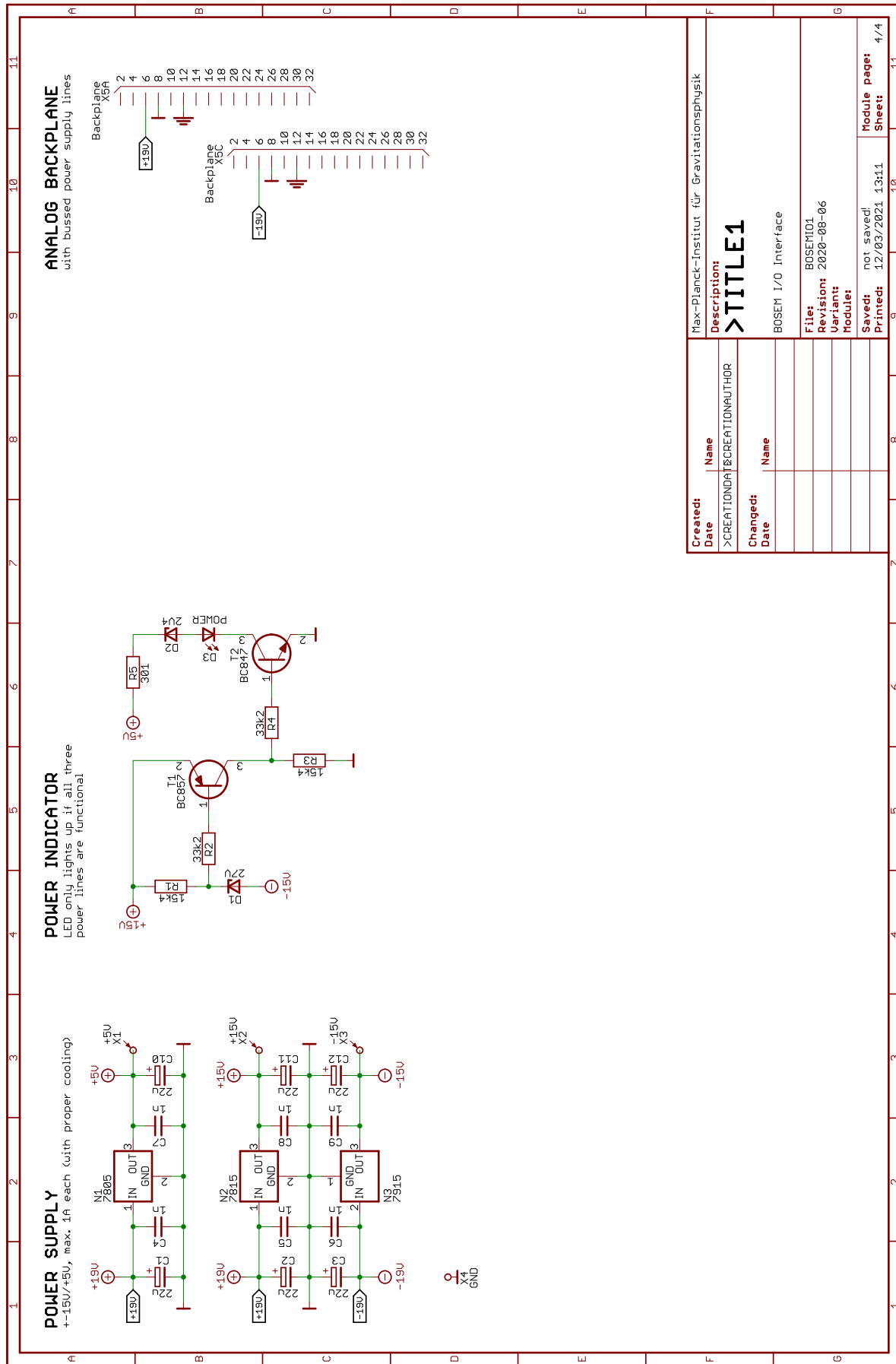
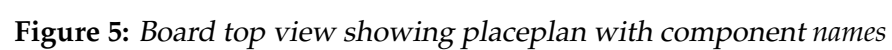


Figure 4: Design schematics (sheet 4)



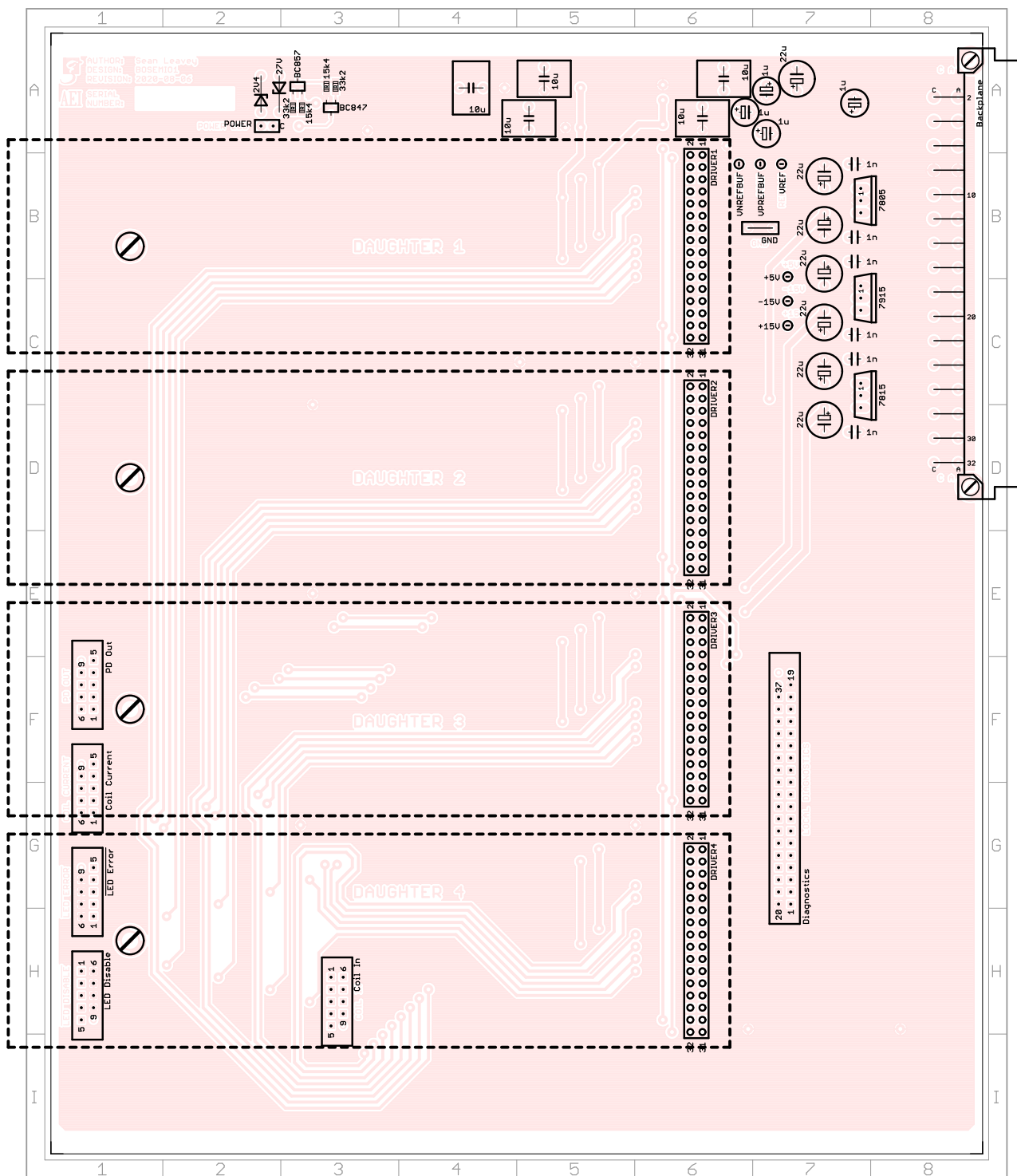


Figure 6: Board top view showing placeplan with component values

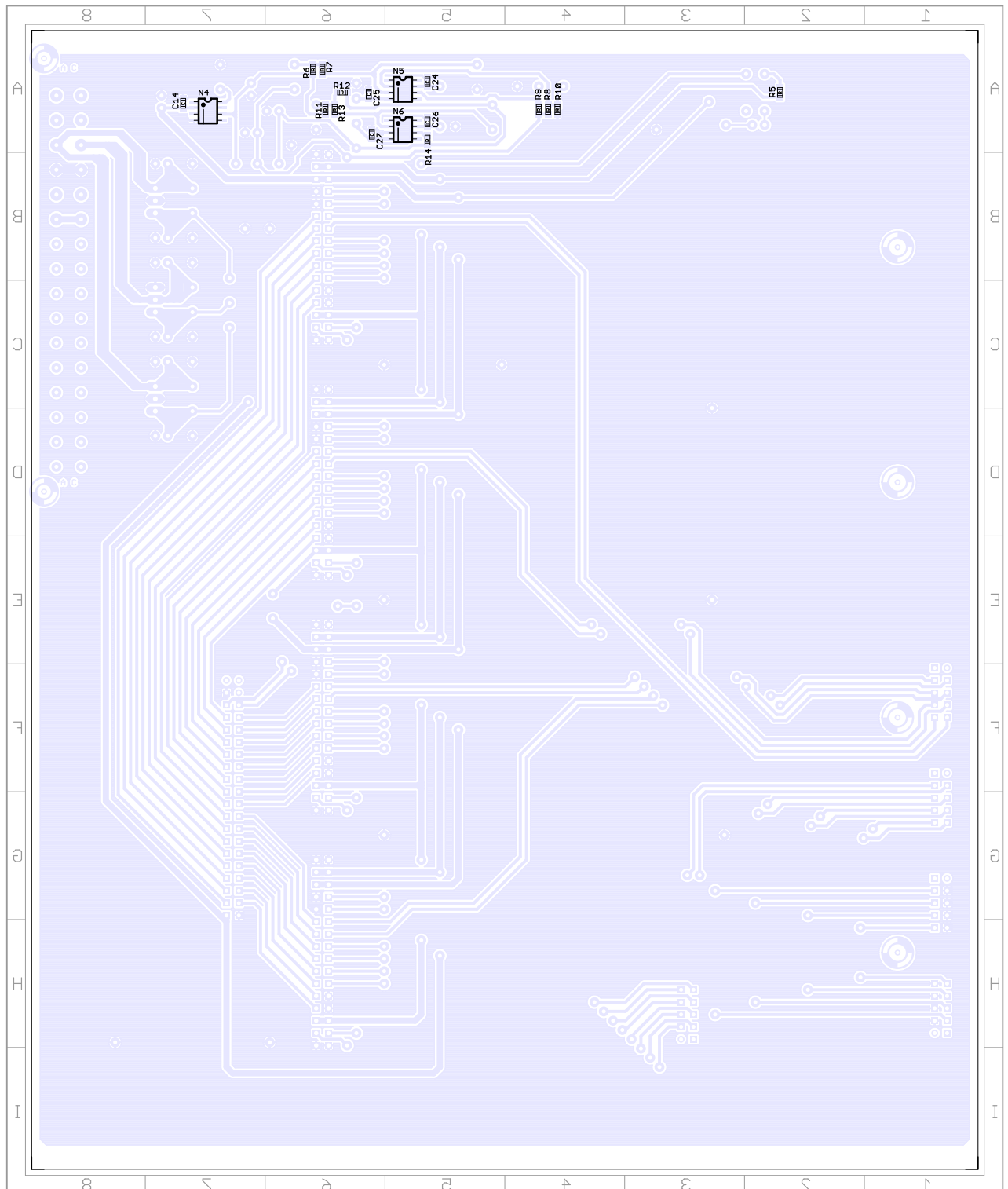
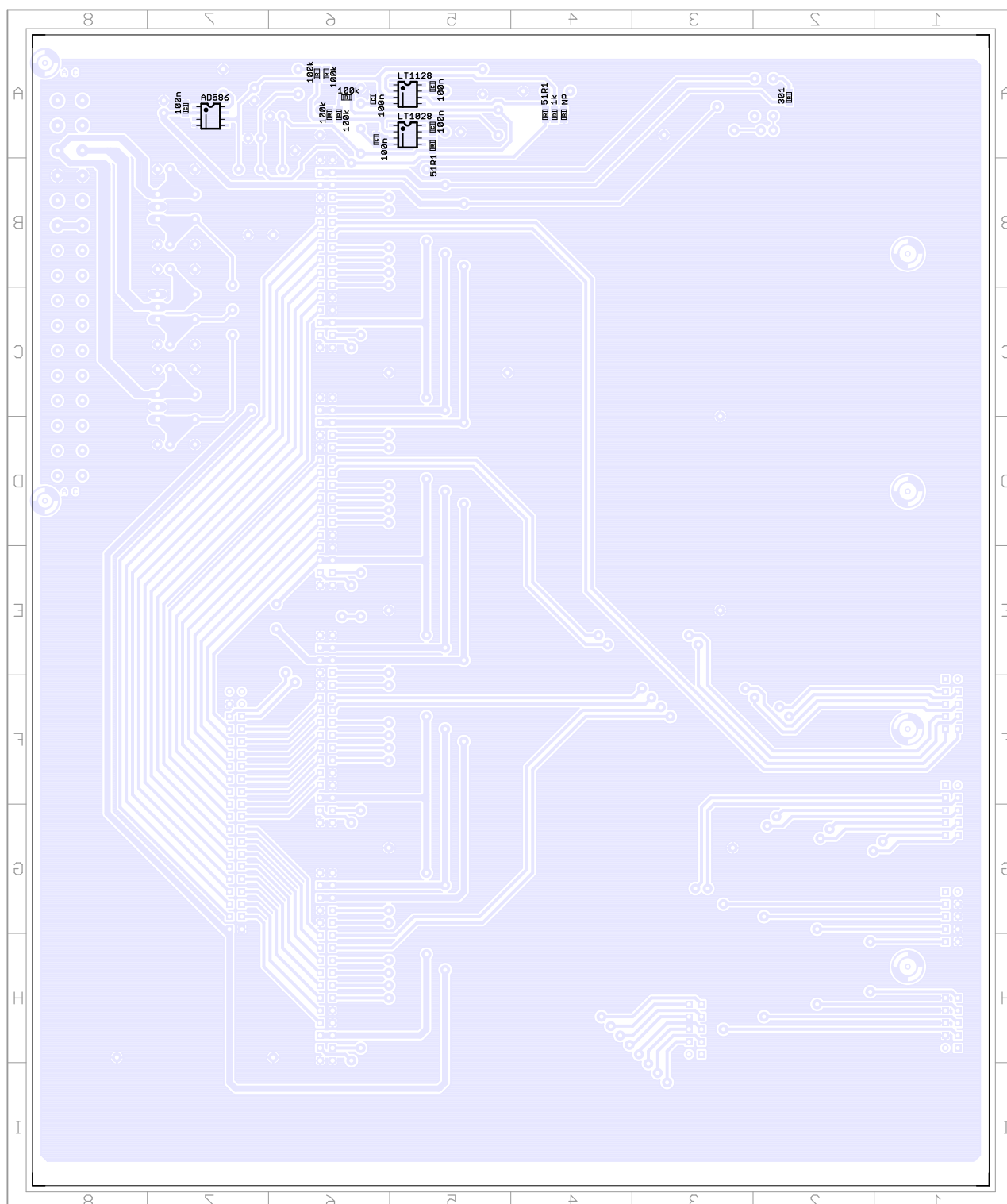


Figure 7: Board bottom view showing placeplan with component names



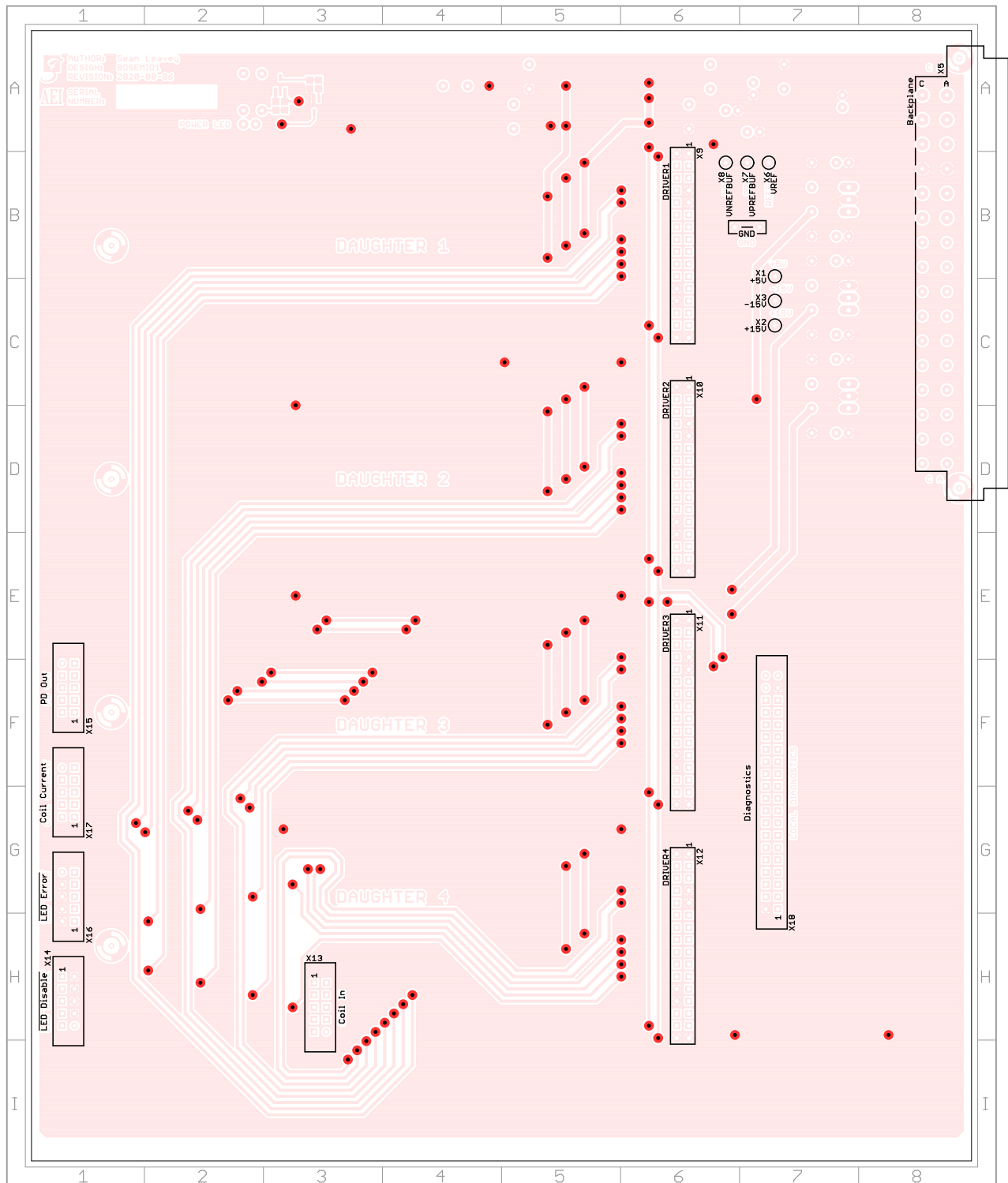


Figure 9: Board top view showing connectors, test points, vias and wired components

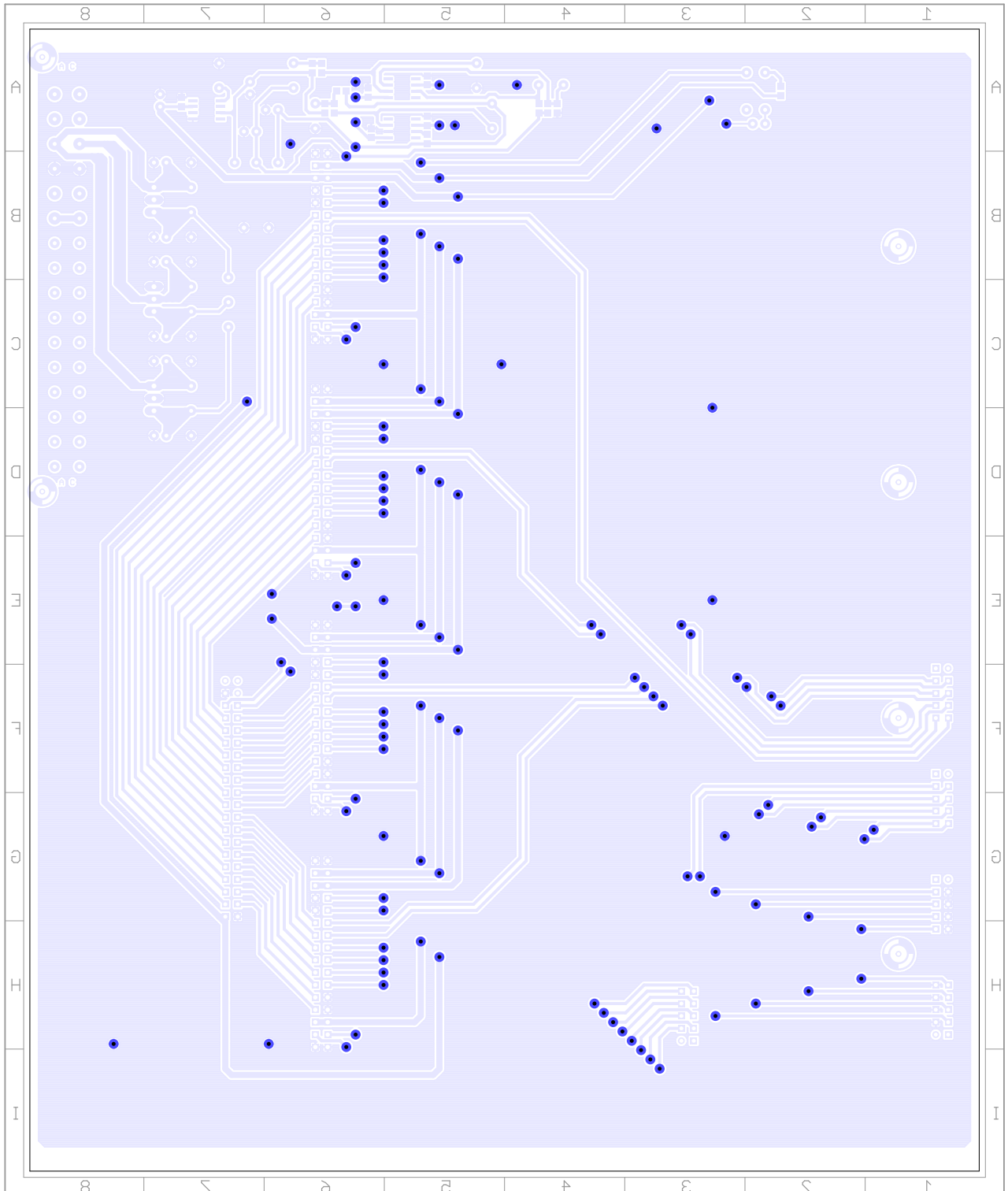


Figure 10: Board bottom view showing connectors, test points, vias and wired components

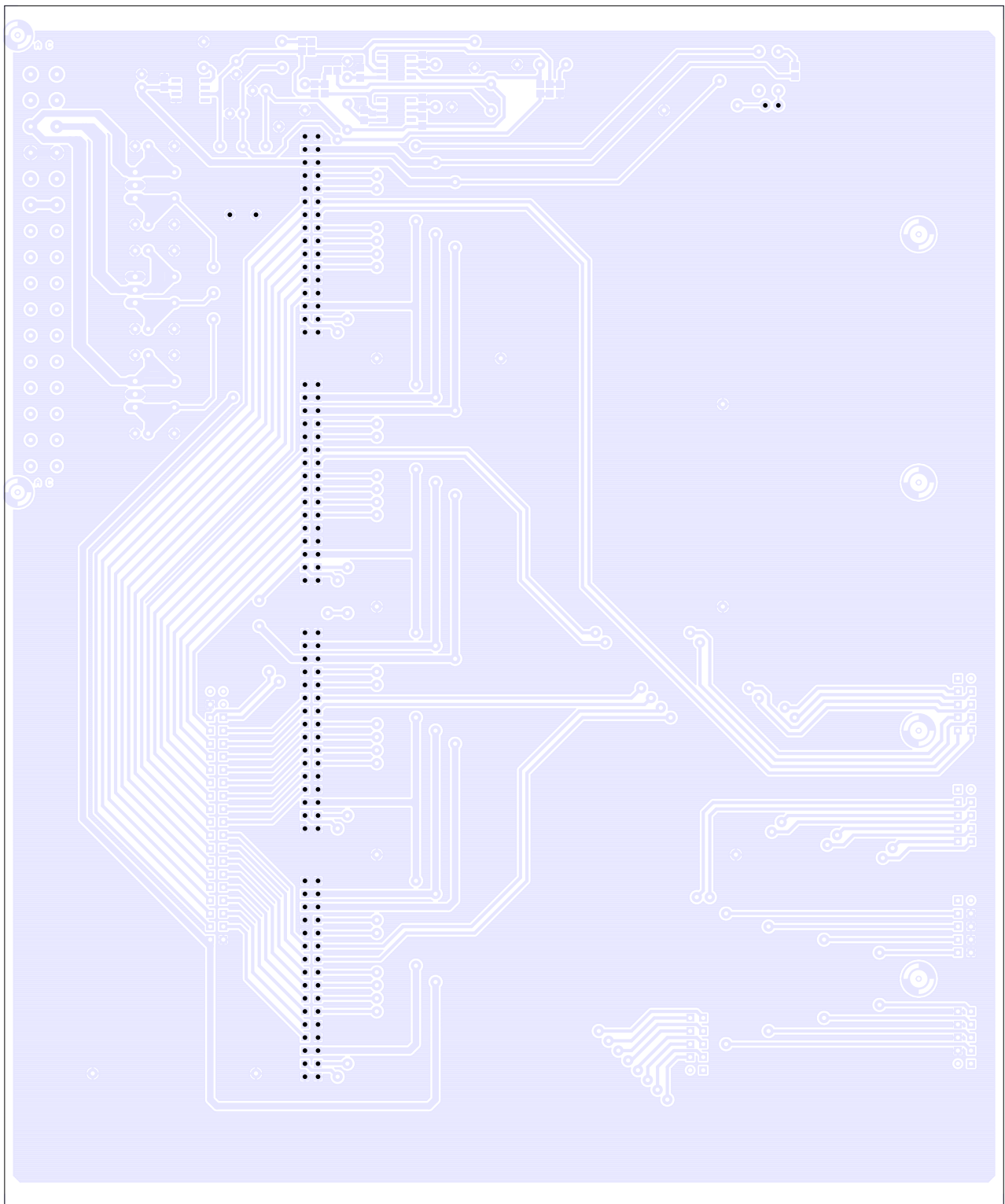


Figure 11: Board bottom view showing drills with $\approx 0.9\text{ mm}$ ($\approx 0.03543\text{ in}$) diameter
($132 \times 889\text{ }\mu\text{m}$)

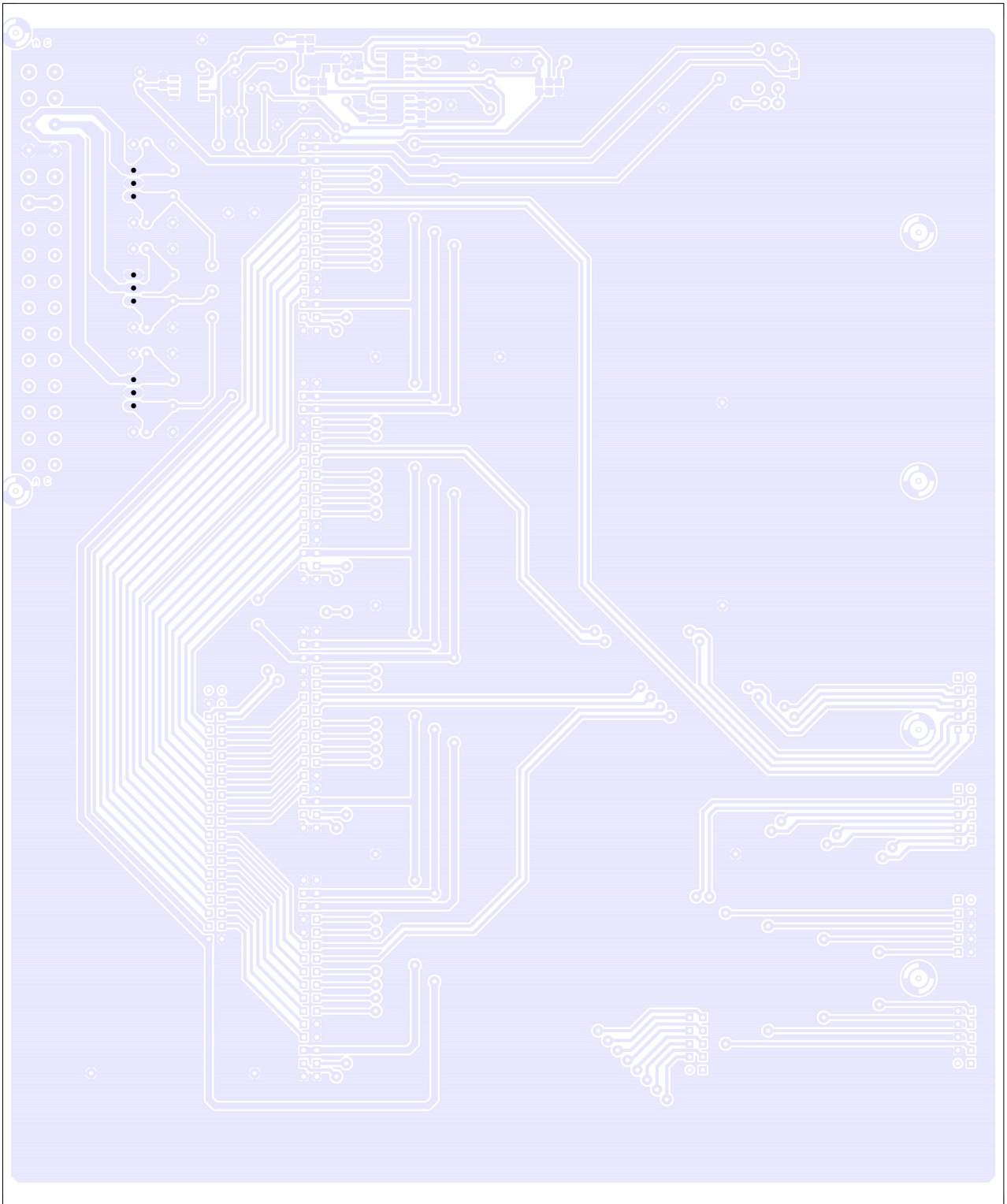


Figure 12: Board bottom view showing drills with ≈ 1.0 mm (≈ 0.03937 in) diameter
($9 \times 991 \mu\text{m}$)

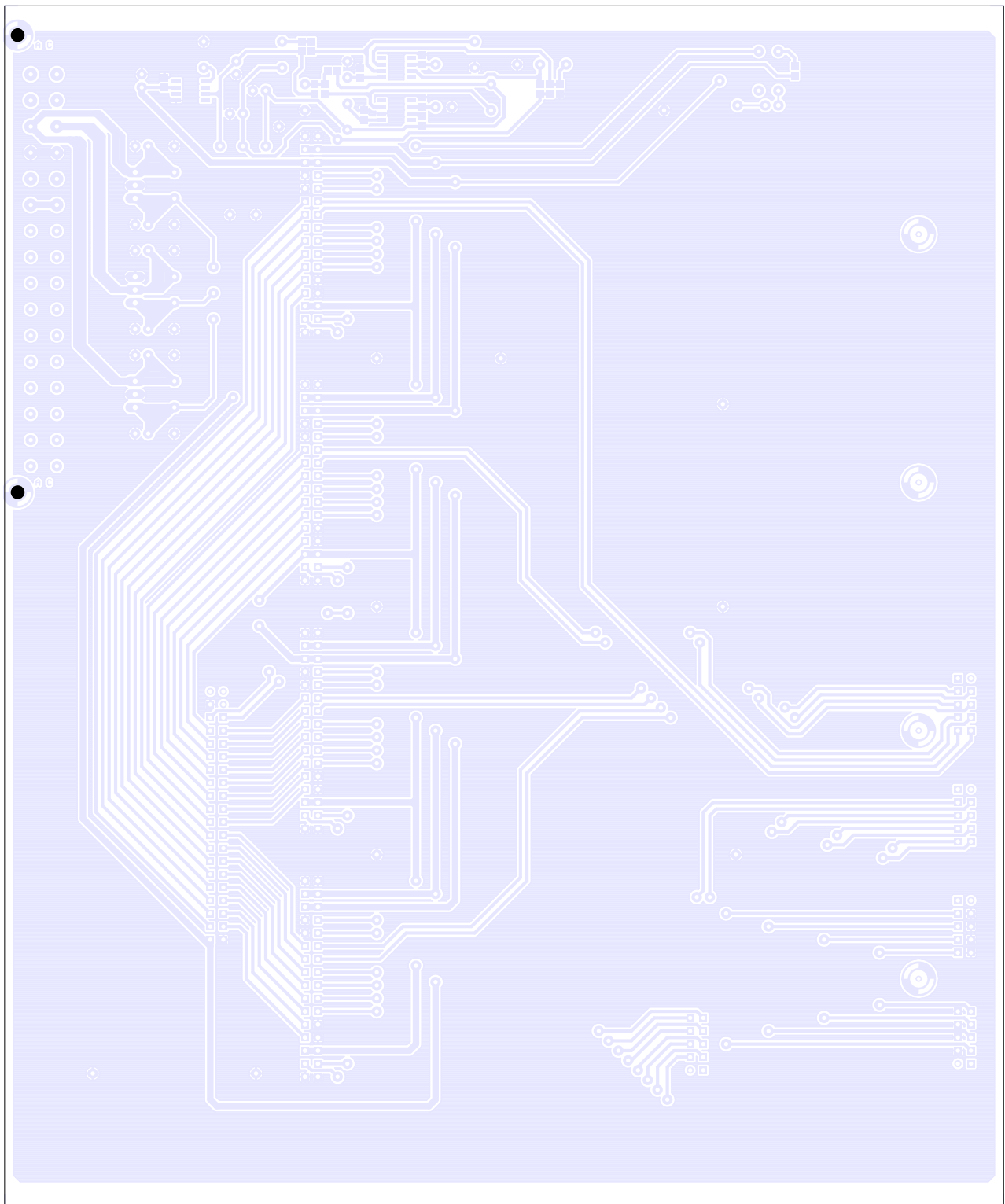


Figure 13: Board bottom view showing drills with ≈ 2.7 mm (≈ 0.1063 in) diameter
($2 \times 2692 \mu\text{m}$)

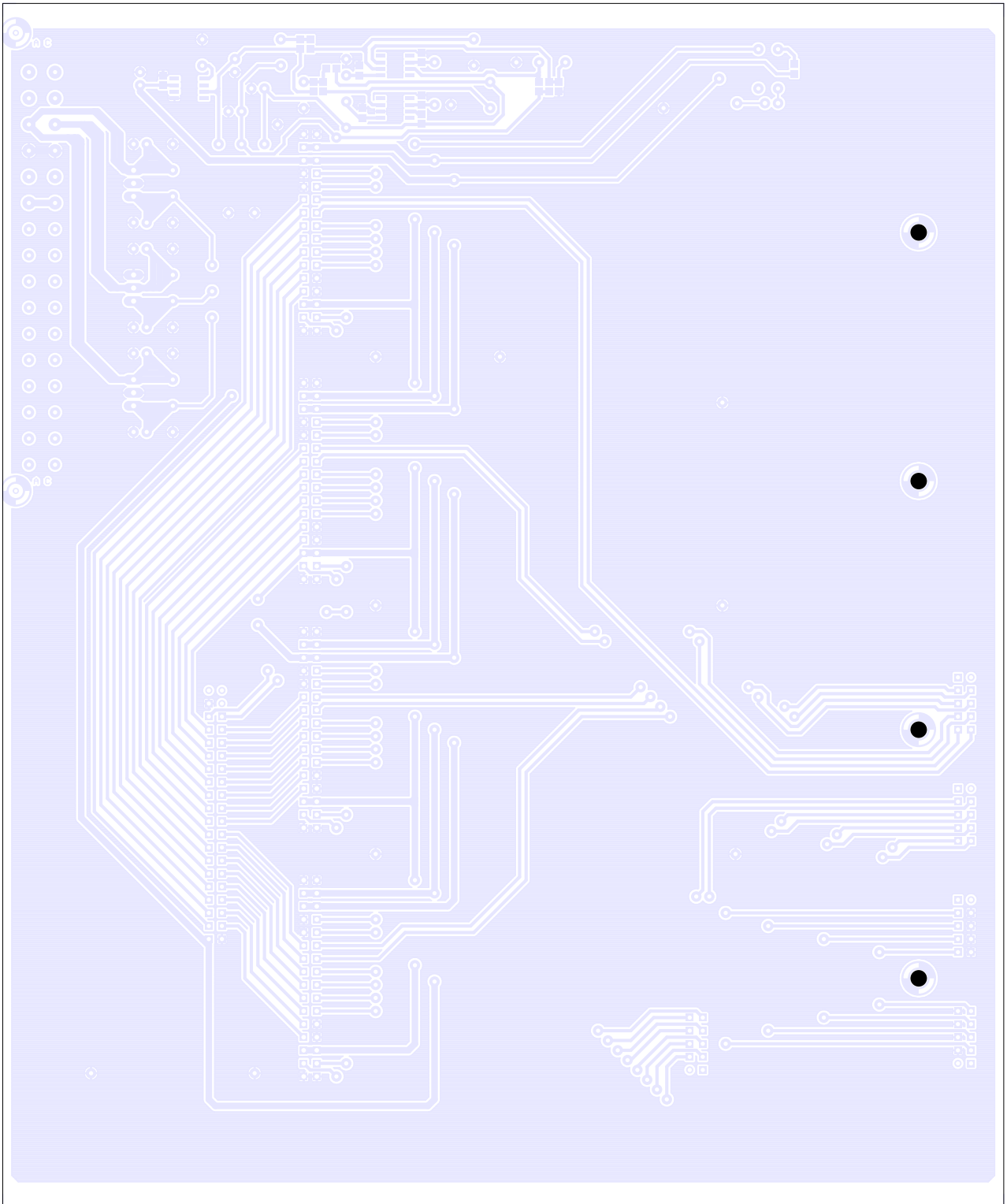


Figure 14: Board bottom view showing drills with 3.2 mm (0.12598 in) diameter
(4×3200 μm)

Circuit Lists

Drill list: The following table shows all *final* drill diameters used in the board. When manually drilling the clearance holes, round up to the nearest available drill bit diameter, ensuring that all components fit well. When manufacturing *through-plated* boards, adjust for the additional copper coating by increasing the diameter accordingly.

Ø [µm]	Ø [mm]	Ø [in]	Count	Plan Ø [mm]
813	0.813	0.03201	295	—
889	0.889	0.035	132	0.9
991	0.991	0.03902	9	1.0
2692	2.692	0.10598	2	2.7
3200	3.2	0.12598	4	3.2
			Total:	442

Table 1: Drill diameters used in the board

Standard properties: If not explicitly stated otherwise in the schematics or value and part lists, the circuit components have the following standard properties. Parts with ‘better’ properties can be easily substituted, but care should be taken if the specifications are *not* met.

- Wired resistors: Metal film 0.6 W, 1%, 200 V, TK 100
- SMD resistors: 1%, 150 V, TK 50, MiniMELF in thin film, other packages in thick film technology

Value list: The following list shows all components available on the board (sorted by part *prefixes* and *values*) and can be used to quickly gather components. Additional information can possibly be found directly on the board (or in the schematics).

Value	Package	Count	Component names (<i>library</i>)
— C —			
1 1n	C-CERAMIC:0.1"	6	C4, C5, C6, C7, C8, C9 (<i>miscs</i>)
2 100n	C-SMD:0805	5	C14, C24-C27 (<i>miscs</i>)
3 1u	CE-TANTAL:0.1"	4	C13, C16, C20, C23 (<i>miscs</i>)
4 10u	C02-MKS2-11.0-N	5	C17-C19, C21, C22 (<i>miscs</i>)
5 22u	CE-TANTAL:0.2"	7	C1, C2, C3, C10, C11, C12, C15 (<i>miscs</i>)
— D —			
6 2V4	DZ-0.3"	1	D2 (<i>diodes</i>)
7 27V	DZ-0.3"	1	D1 (<i>diodes</i>)
8 [ignored]	DL-CABLE-UNCODED-N	1	D3 (<i>optos</i>)
— N —			
9 7805	T0-220	1	N1 (<i>ics</i>)
10 7815	T0-220	1	N2 (<i>ics</i>)
11 7915	T0-220	1	N3 (<i>ics</i>)
12 AD586	S0-8	1	N4 (<i>ics</i>)
13 LT1028	S0-8	1	N6 (<i>opamps</i>)
14 LT1128	S0-8	1	N5 (<i>opamps</i>)
— R —			
15 51R1	R-SMD:0805	2	R9, R14 (<i>miscs</i>)
16 301	R-SMD:0805	1	R5 (<i>miscs</i>)
17 1k	R-SMD:0805	1	R8 (<i>miscs</i>)
18 15k4	R-SMD:0805	2	R1, R3 (<i>miscs</i>)
19 33k2	R-SMD:0805	2	R2, R4 (<i>miscs</i>)
20 100k	R-SMD:0805	5	R6, R7, R11-R13 (<i>miscs</i>)
— T —			
21 BC847	S0T-23	1	T2 (<i>transistors</i>)
22 BC857	S0T-23	1	T1 (<i>transistors</i>)
— X —			
23 [ignored]	Backplane:32p./AC	1	X5 (<i>connectors</i>)

— continued on next page —

Table 1: Value list — continued

	Value	Package	Count	Component names (<i>library</i>)
24	<i>[ignored]</i>	FEM-SKT:2x16p./vert.	4	X9,X10,X11,X12 (<i>connectors</i>)
25	<i>[ignored]</i>	GND-0.2"	1	X4 (<i>connectors</i>)
26	<i>[ignored]</i>	IDC:10p./ribbon	5	X13-X17 (<i>connectors</i>)
27	<i>[ignored]</i>	IDC:40p./ribbon	1	X18 (<i>connectors</i>)
28	<i>[ignored]</i>	PIN:0.8mm/ceram.	6	X1,X2,X3,X6,X7,X8 (<i>connectors</i>)
	— [unpopulated] —			
29	<i>[undefined]</i>		1	R10 (<i>miscs</i>)

Table 1: Value list

Part list: The following list shows all components that are available in both schematics *and* board (sorted by part *names*) and can be used to quickly locate components. Additional information can possibly be found directly in the schematics. The column *Sheet* shows the position of a gate in the schematics: Sheet number followed by the cell of the surrounding frame (if available). The column *Board* shows the position of a component on the board: Population layer (**T** for top, **B** for bottom) followed by the cell of the surrounding frame (if available).

Part	Sheet	Board
Gate		
— C —		
1	C1	4-B1 T-B7
2	C2	4-C1 T-C7
3	C3	4-C1 T-B7
4	C4	4-B2 T-B7
5	C5	4-C2 T-C7
6	C6	4-C2 T-B7
7	C7	4-B2 T-B7
8	C8	4-C2 T-D7
9	C9	4-C2 T-C7
10	C10	4-B3 T-B7
11	C11	4-C3 T-D7
12	C12	4-C3 T-C7
13	C13	1-A1 T-A7
14	C14	1-B1 B-A7
15	C15	1-C1 T-A7
16	C16	1-C2 T-A7
17	C17	1-B3 T-A6
18	C18	1-C4 T-A5

19	C19	1-C5 T-A4
20	C20	1-C6 T-A7
21	C21	1-E3 T-A6
22	C22	1-E4 T-A5
23	C23	1-E5 T-A6
24	C24	1-F1 B-A5
25	C25	1-G1 B-A6
26	C26	1-F2 B-A5
27	C27	1-G2 B-A6
— D —		
28	D1	4-B4 T-A2
29	D2	4-B6 T-A2
30	D3	4-B6 T-A2
— N —		
31	N1	4-A2 T-B7
32	N2	4-B2 T-C7
33	N3	4-C2 T-C7
34	N4	1-B1 B-A7
35	N5	A: 1-B5 B-A5
36		P: 1-F1
37	N6	A: 1-E4 B-A5

38	P: 1-F2		
— R —			
39	R1	4-B4 T-A3	
40	R2	4-B5 T-A3	
41	R3	4-C5 T-A3	
42	R4	4-C6 T-A3	
43	R5	4-A6 B-A2	
44	R6	1-B3 B-A6	
45	R7	1-B4 B-A6	
46	R8	1-C5 B-A4	
47	R9	1-B5 B-A4	
48	R10	1-C4 B-A4	
49	R11	1-E3 B-A6	
50	R12	1-E3 B-A6	
51	R13	1-E4 B-A6	
52	R14	1-E5 B-A5	
— T —			
53	T1	4-B5 T-A3	
54	T2	4-C6 T-A3	
— X —			

55	X1	4-A3 T-B7
56	X2	4-B3 T-C7
57	X3	4-C3 T-C7
58	X4	4-D1 T-B7
59	X5	A: 4-B11 T-B8
60		C: 4-C10
61	X6	1-B2 T-B7
62	X7	1-B6 T-B7
63	X8	1-E6 T-B6
64	X9	2-C3 T-B6
65	X10	2-C5 T-D6
66	X11	2-C7 T-F6
67	X12	2-C9 T-H6
68	X13	3-B1 T-H3
69	X14	3-D1 T-H1
70	X15	3-B3 T-F1
71	X16	3-D3 T-G1
72	X17	3-E3 T-G1
73	X18	3-D5 T-G7

Table 2: Part list

Table 2: *Part list*