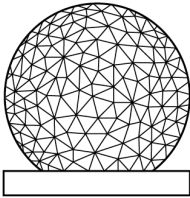


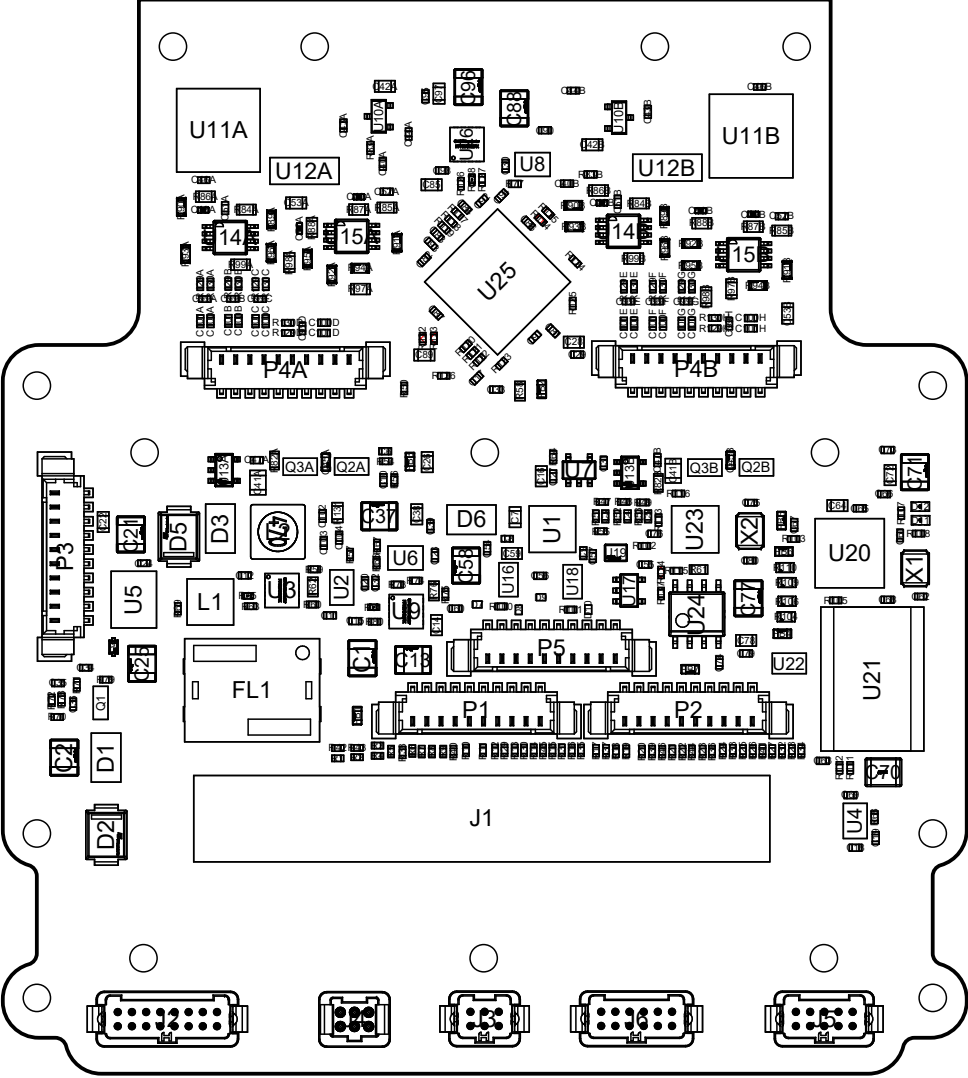
AeroVista Hrafn  
Dimensions and Overview



MIT  
HAYSTACK  
OBSERVATORY

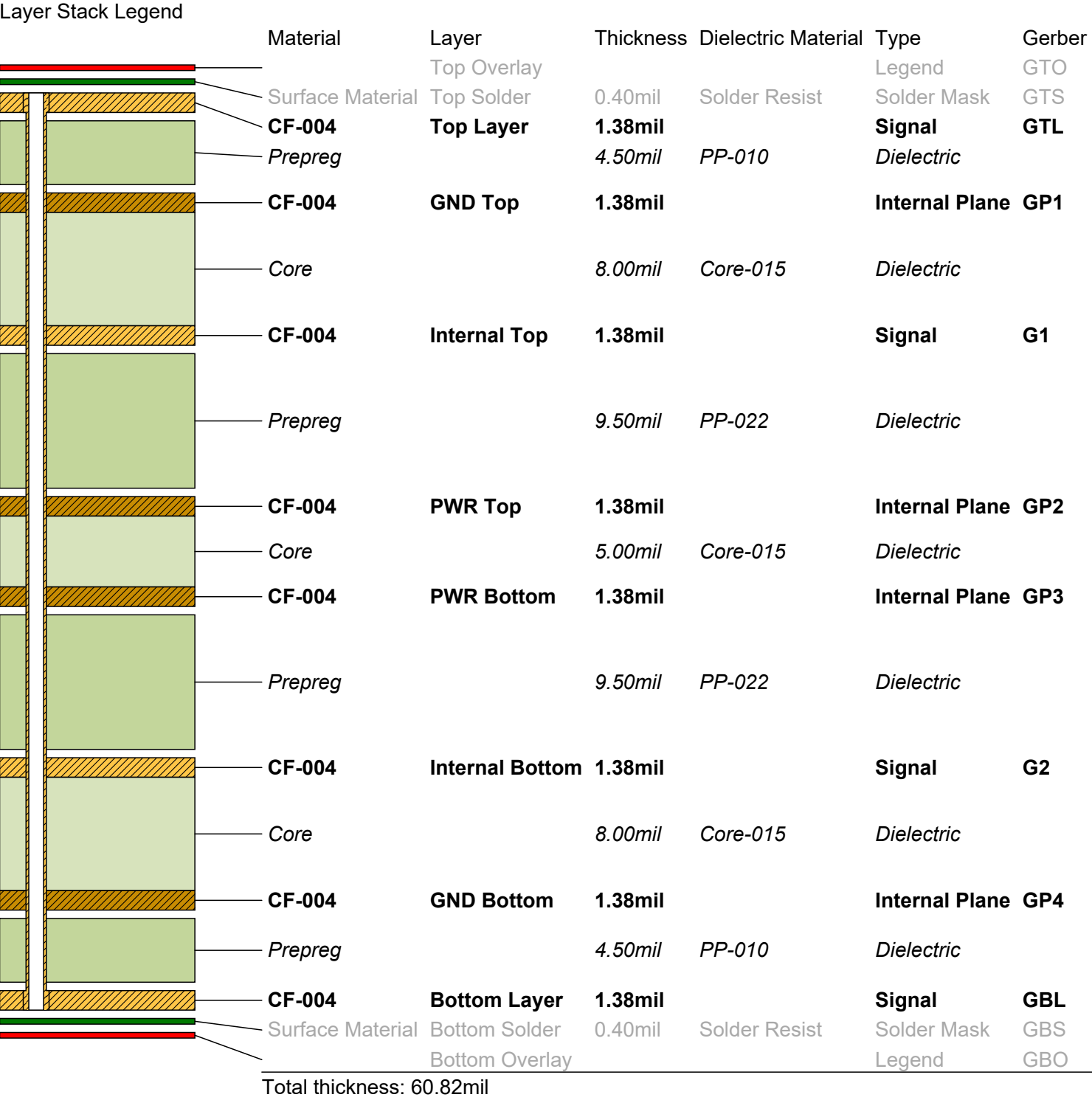


View from Top side (Scale 3:2)



AeroVista Hrafn

Stackup and Impedance



Transmission Line Structure Table

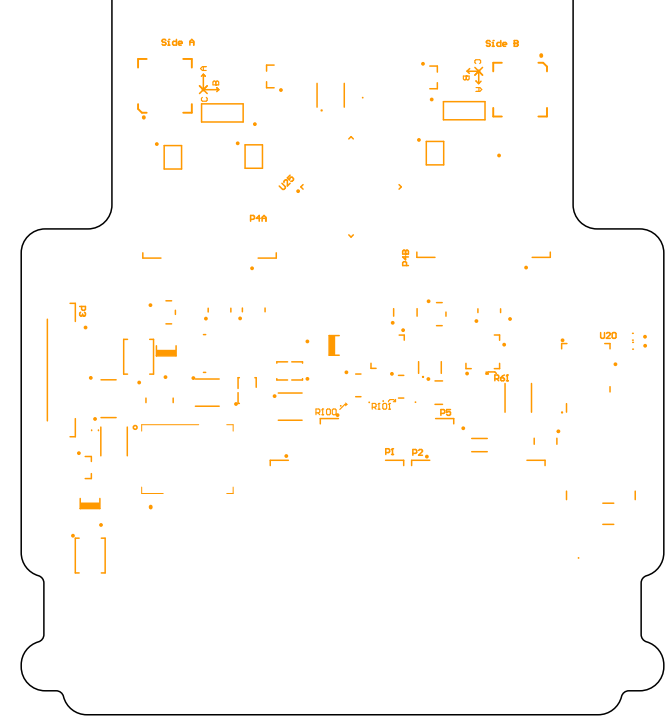
Impedance Id	Transmission Line	Target Impedance	Calculated Impedance	Trace layer	Wide Trace Width	Narrow Trace Width	Gap	Reference layers	Substack
1	Edge-Coupled Coated Microstrip	100	103.59	Top Layer	0.15mm	0.15mm	0.18mm	GND Top	Board Layer Stack
2	Edge-Coupled Offset Stripline	100	103.93	Internal Top	0.15mm	0.15mm	0.30mm	GND Top,PWR Top	Board Layer Stack
3	Edge-Coupled Offset Stripline	100	103.93	Internal Bottom	0.15mm	0.15mm	0.30mm	PWR Bottom,GND Bottom	Board Layer Stack
4	Edge-Coupled Coated Microstrip	100	103.59	Bottom Layer	0.15mm	0.15mm	0.18mm	GND Bottom	Board Layer Stack

Impedance Tolerance	
Blanket Tolerance	All impedance tolerances are ± 10%

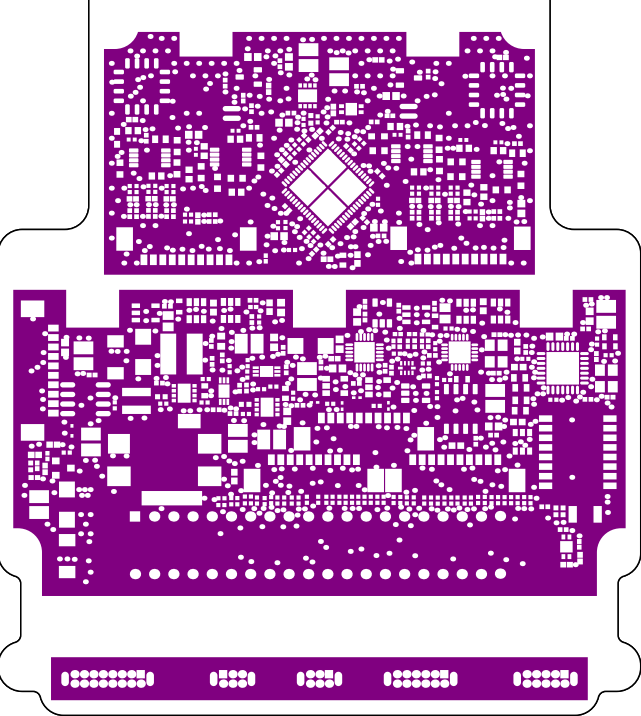
# AeroVista Hrafn

## Surface Layers

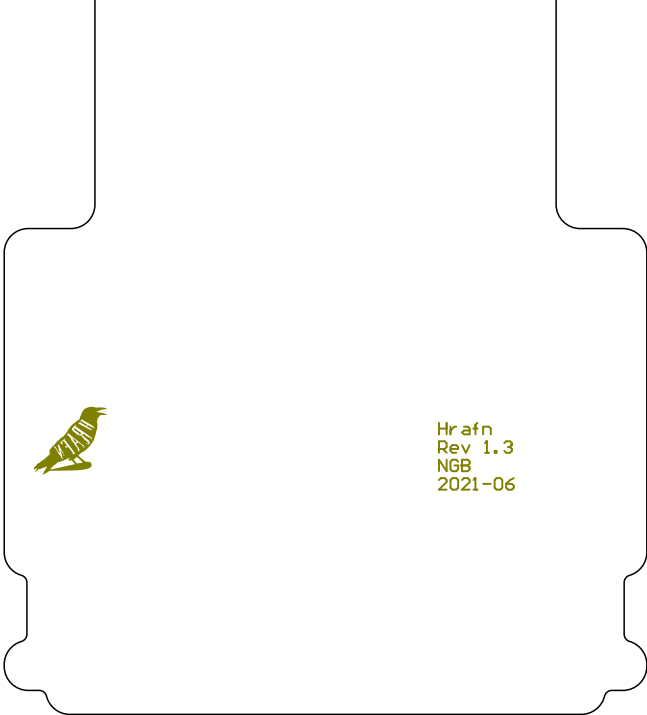
Top Overlay (Scale 1:1)



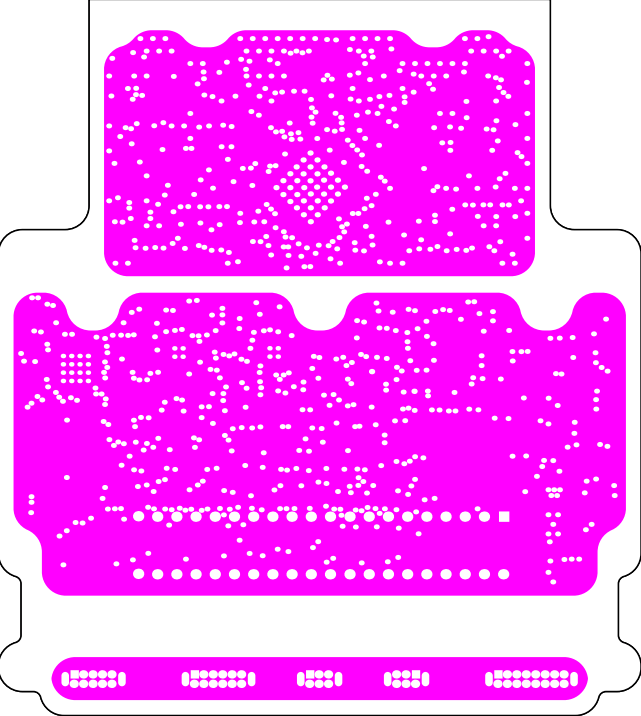
Top Solder (Scale 1:1)



Bottom Overlay (Scale 1:1)



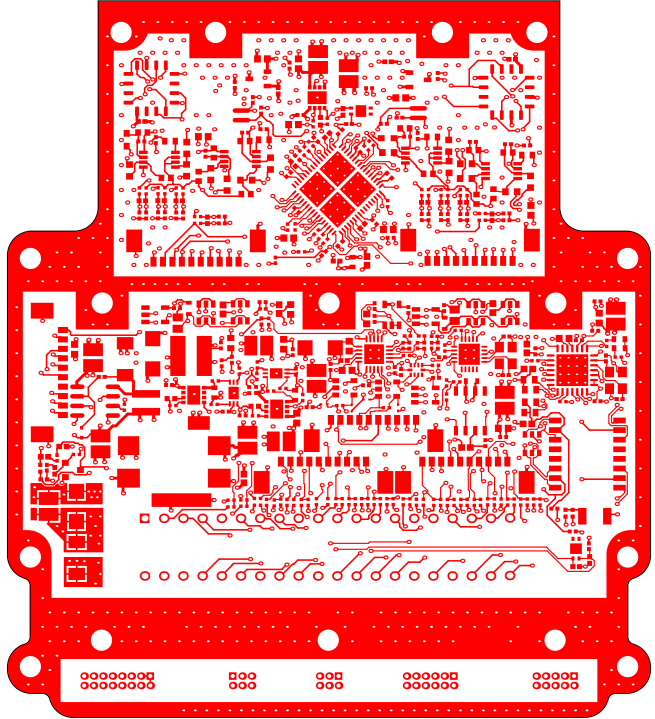
Bottom Solder (Scale 1:1)



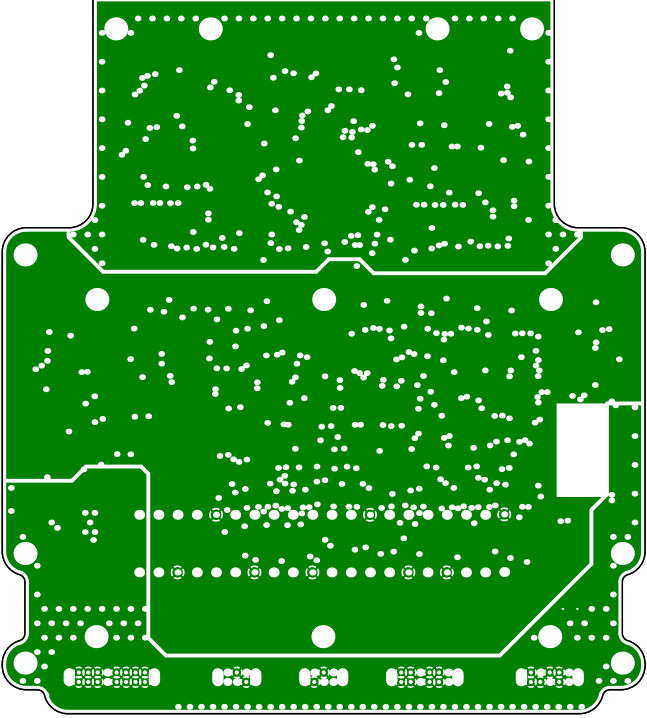
Bottom surface layers shown in bottom view

AeroVista Hrafn  
Inner Layers

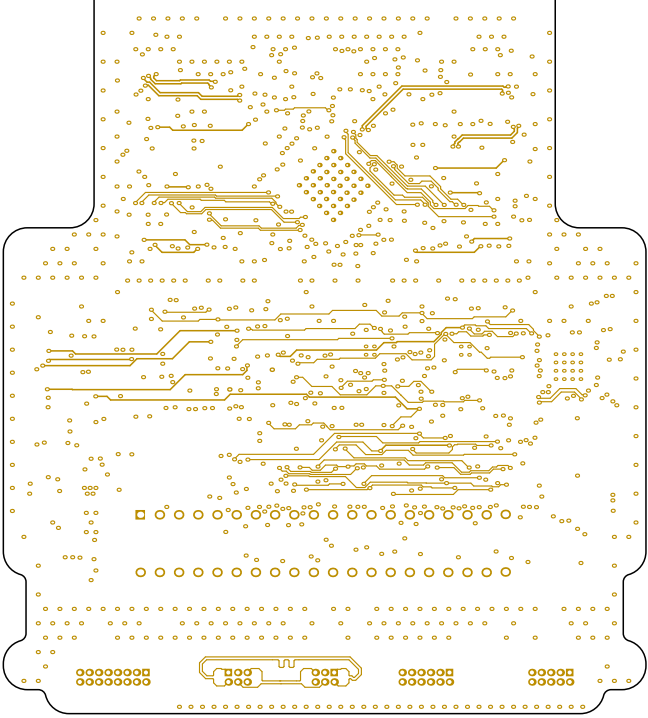
Top Layer (Scale 1:1)



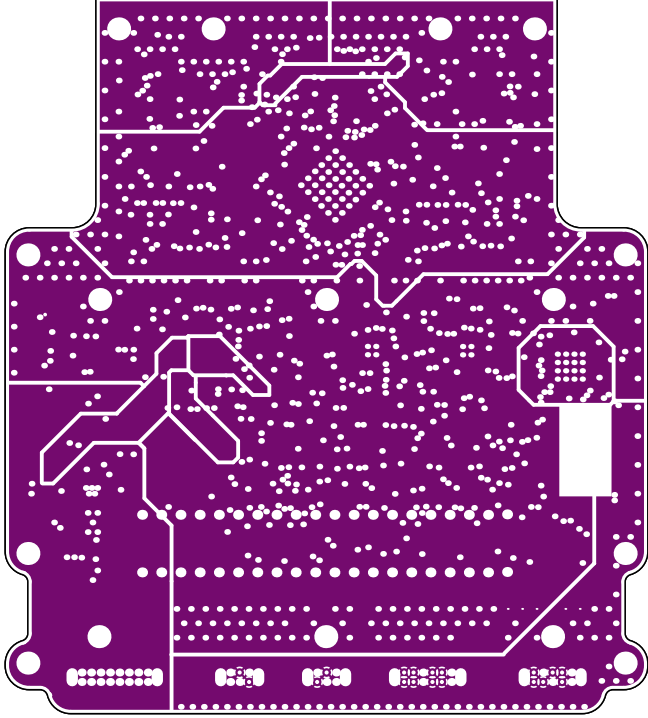
GND Top (Scale 1:1)



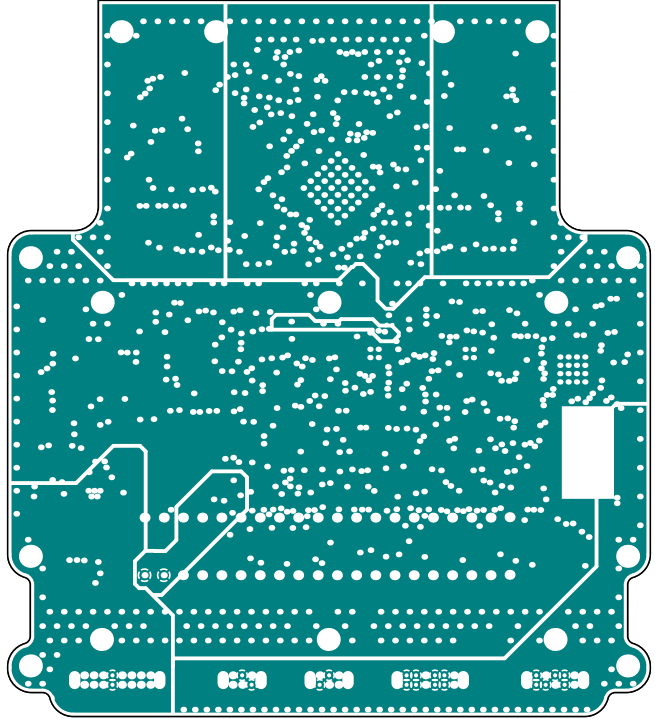
Internal Top (Scale 1:1)



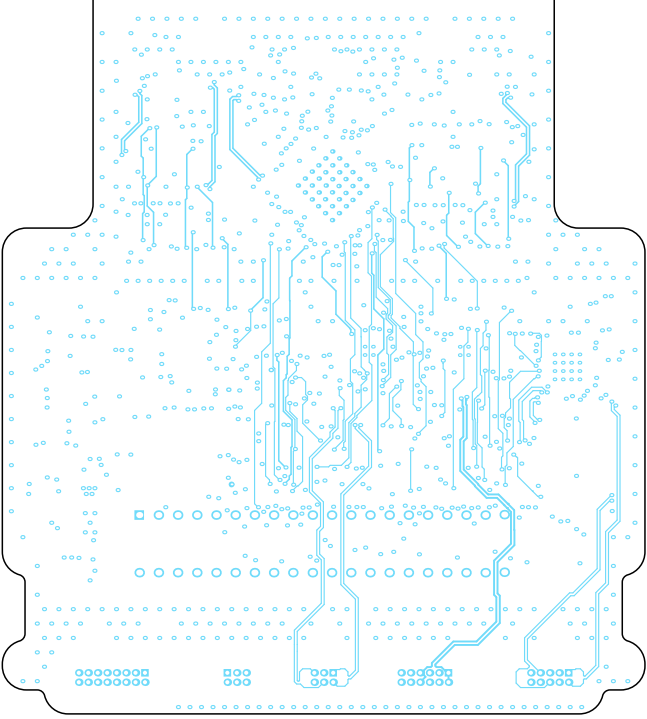
PWR Top (Scale 1:1)



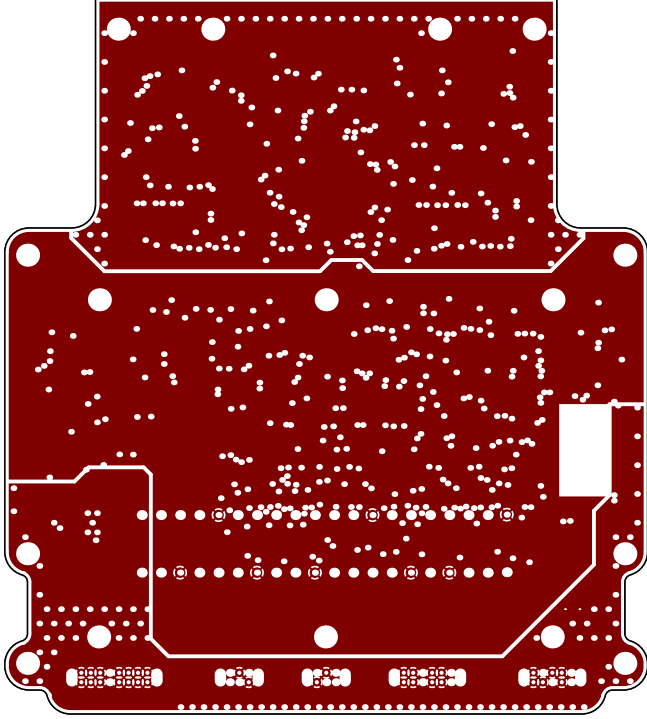
PWR Bottom (Scale 1:1)



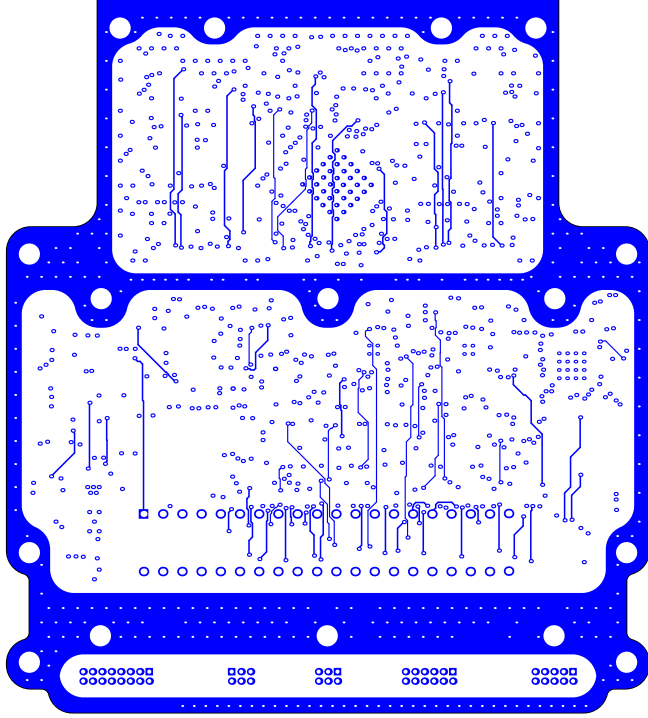
Internal Bottom (Scale 1:1)



GND Bottom (Scale 1:1)

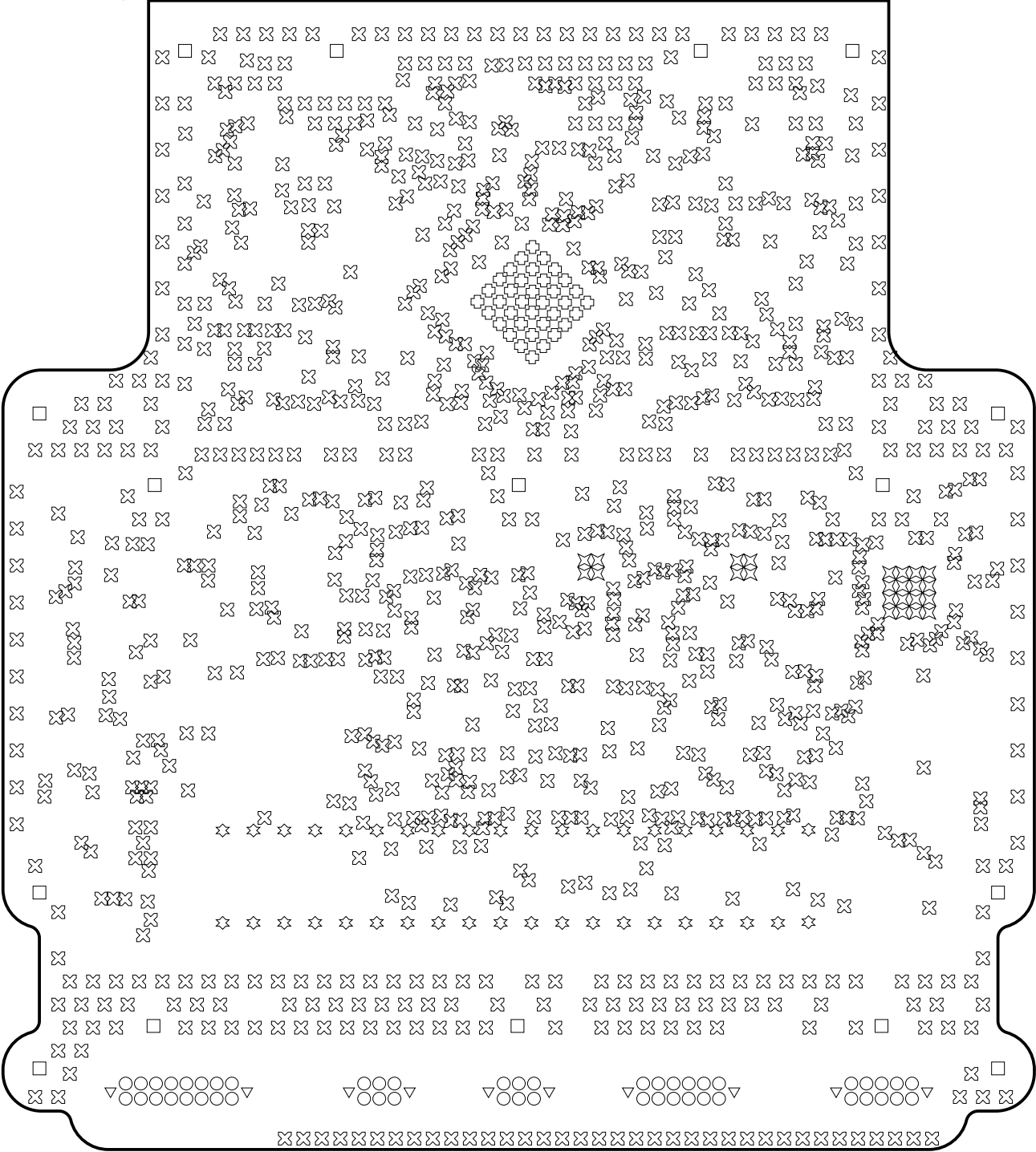


Bottom Layer (Scale 1:1)



AeroVista Hrafn  
Drill Details

Drill Drawing View (Scale 2:1)



Drill Table

Symbol	Count	Hole Size	Plated	Hole Tolerance
✕	24	7.87mil	Plated	
⊕	36	9.84mil	Plated	
⊗	1096	10.00mil	Plated	
○	50	21.65mil	Plated	
☆	40	32.00mil	Plated	+/-3.00mil
▽	10	39.37mil	Non-Plated	
□	16	100.00mil	Non-Plated	
1272 Total				

Hole tolerance ±3 mil unless otherwise specified



# AeroVista Hrafn

## Manufacturing Requirements

### Design Information

File Name	Clock_Board.PcbDoc
File Type	Gerber Set
Surface Mount	1 Side
Circuit Type	PTH Multilayer
# of Layers	8
ODB File	ODB file is provided as a reference, but in the case of any discrepancies, the Gerber set should be the primary reference

### Material

General	Copper Clad, High Temperature FR4 Class Epoxy Glass Rated UL94V-0
Core/Prepreg Material	Isola 408HR (or equivalent with written consent from Aero-Vista Payload Engineering)
Solderability	Must Survive a lead-free assembly max reflow of 260 deg C (6 passes)
Tolerance	In A/W ANSI IPC-6012 Type 2 Class 3 unless otherwise specified
Bow & Twist	In A/W ANSI IPC-6012 Type 2 Class 3

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Tolerance	In A/W ANSI IPC-6012 Type 2 Class 3 unless otherwise specified
Bow & Twist	In A/W ANSI IPC-6012 Type 2 Class 3

### Structure

Layers	As shown in layer table
Finished Board Thickness	60 mil ±7 mil

### Vias

Thru	Yes
Blind	No
Buried	No
Minimum PTH Thickness	0.7 mil
Via Filling	Vias in pad shall be filled with non-conductive epoxy, planarized, and plated over with copper, both primary and secondary side (process may be performed on other vias as well)

### Drilling

Viewed From	Component Side
Reference	As shown
File Type	NC_Drill

### Legend / Screen Print

Color	White non-conductive ink
Clipping	Clip silkscreen on pads, plated through-holes, and non-tented vias

### Solder Mask

Type	LPI
Process	SMOBC per IPC-SM-840C, class T
Color	Green
Finish	Gloss
Via Tenting	No

### Vendor Modifications

Copper Thieving	No thieving allowed without prior authorization
Non-Functional Pads	Vendor may remove non-functional pads
Tear Drops	Vendor may use tear drops to improve angular rings as long as DRC rules are followed

### Manufacture Requirements

RoHS Certification	No RoHS compliance necessary
IPC Fabrication	Fabricate per IPC-6012 Class 3 specification
Edge Plating	Edge Plate edges. Outer GND planes must connect (layers 1, 8). Board finish to be ENIG per IPC 4552 to include all plated board edges
Conductor Width	IPC Class 3 compliant tolerances
Dielectric withstand	All boards shall be capable of meeting the requirements of dielectric withstanding voltage per IPC-6012 Class 3

### Manufacturer Product ID Markings

Manufacturability	Any additional markings shall comply with DRC rules
Part Number	Bottom overlay
Revision	Bottom Overlay
Date	Bottom Overlay
ID/Logo	Bottom Overlay
Manufacturer Accreditation (i.e. ISO9001)	Bottom Overlay
Serialized	PCBs must be serialized in S/N field on Bottom Overlay

### Test Articles

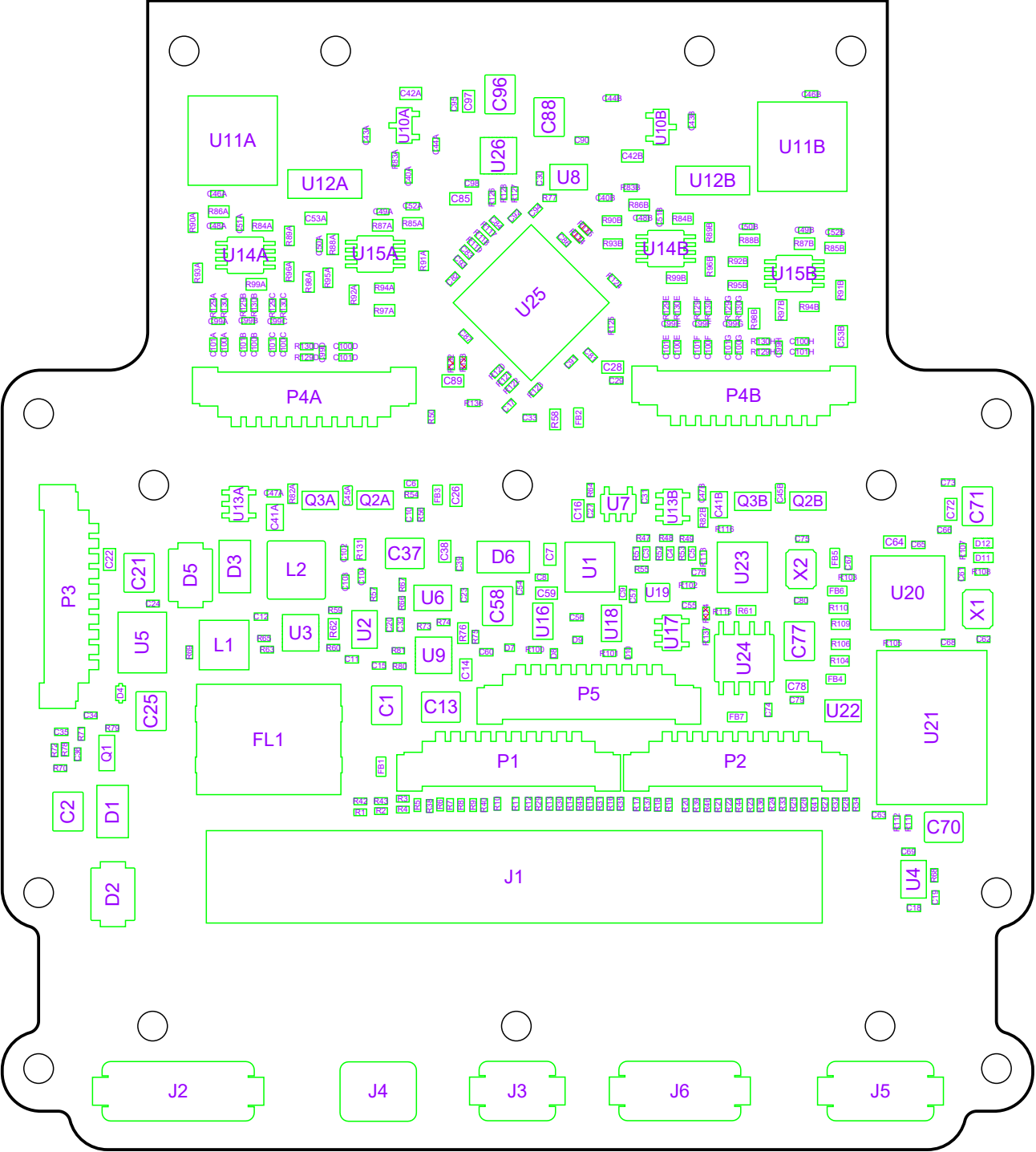
Netlist Test Report	Each board lot shall include a netlist test report including number of boards tested, number of boards passed, voltage, continuity, and isolation values used. All PCBs shall recieve 100% netlist testing per IPC-9252 (latest revision) test level C. Use 0.050" minimum adjacency . Golden board or "self-learn" is not acceptable. Minimum voltage of 50 Volts. All accepted boards must be marked with a stamp (preferably traceable to the test operator)
First Article Report	Each board lot shall include a First Article Report verifying all drawing requirements have been complied with (i.e. board dimensions, hole sizes, board thickness etc.)
Cross Section Coupons	Each board lot shall include detailed cross-section evaluation coupons including but not limited to: all copper and dielectric thicknesses, all via structures and the most used component hole. The coupons shall be evaluated by microsection before and after being subjected to thermal stress per IPC-TM-650 2.6.8 Condition A.
Impedance Control	Fabricator to test impedance coupons for all elements in the impedance table from each process panel. Each board lot shall include a report with all impedance readings with the delivered boards.
Coupon Contents and Marking	Each process panel will have a coupon set containing, at a minimum: plated hole evaluation of all via structures with X & Y orientation, copper peel strength, D coupon, and when applicable, controlled impedance coupons. Fabricator developed or legacy IPC coupons may be substituted with AERO-VISTA Payload Engineering approval.
Coupon Markings	Coupons shall be marked with all of the following in silkscreen or copper etch: PCB P/N and REV, Cage Code, Manufacturer ID, Lot Number, Panel ID Number, Panel Location ID.

### Additional Requirements

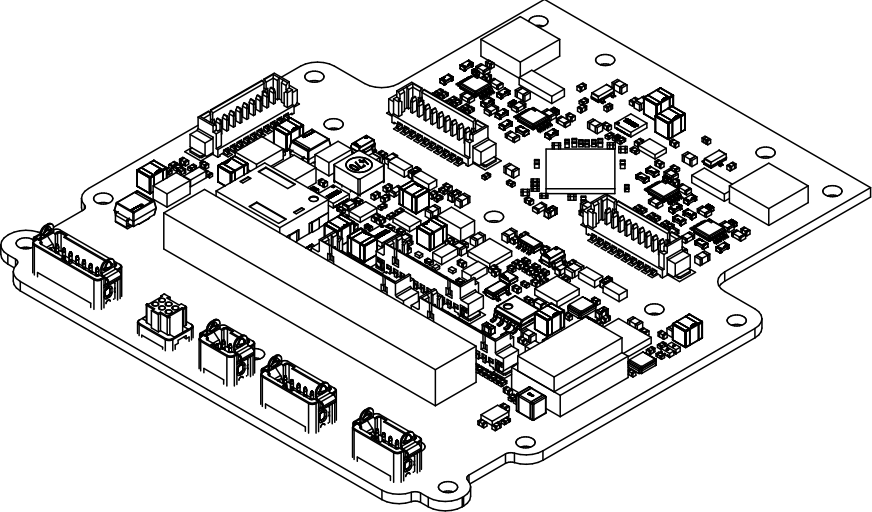
Overall quality	Finished boards shall not have nicks, scratches, voids, exposed copper, poor plating, misdrilled holes, and must be free of any residues
Outgassing	All materials to be low outgassing (TML<1.0% / CMCL<0.1%)
Packaging	PCBs shall be packaged individually with desiccant to ensure no board-on-board contact damage. All materials that contact the board must be sulphur free. All materials in the shipping carton must be packaged in ESD bags, and must ensure no damage to the boards during handling and transport.

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Component Placement

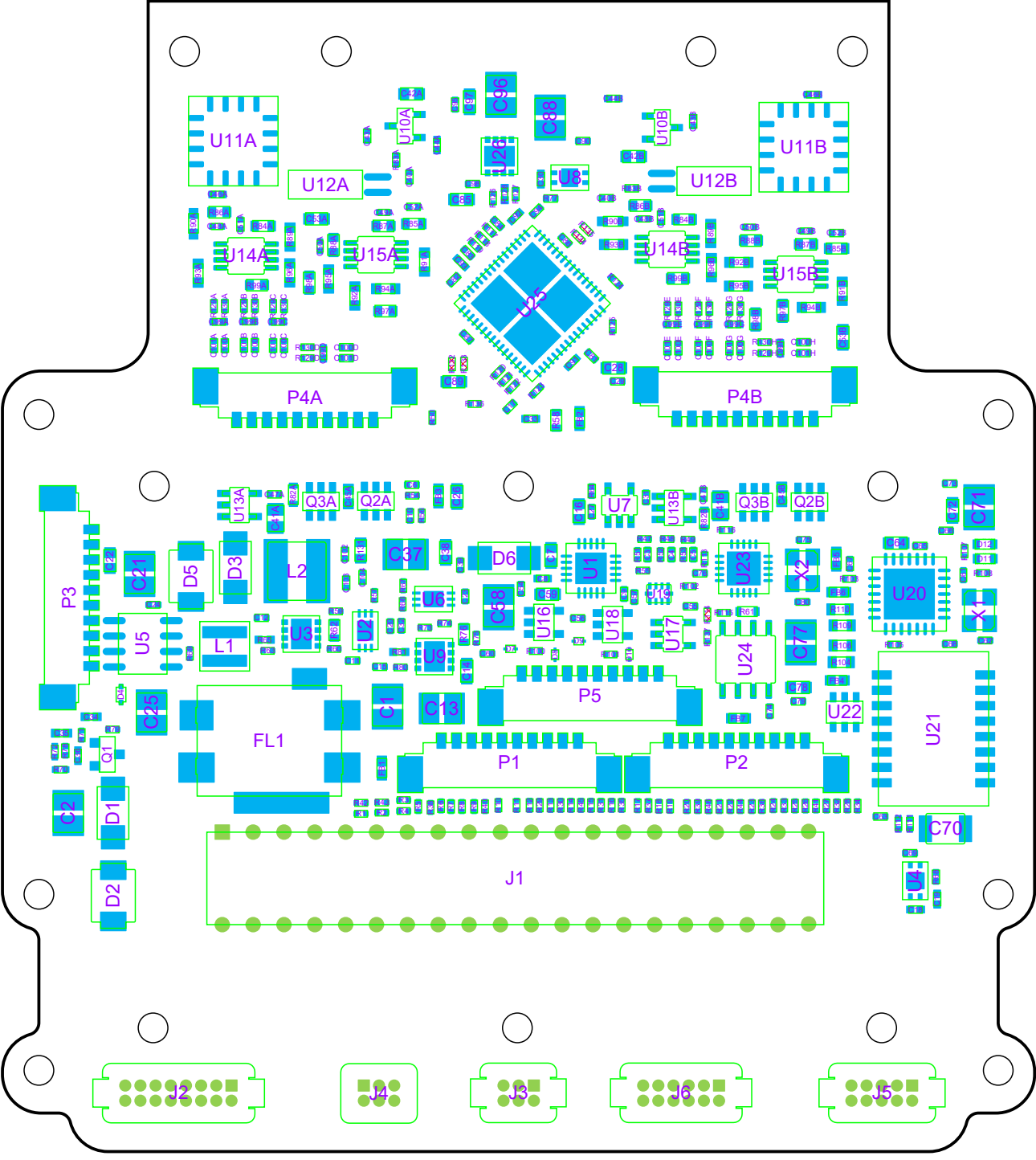
View from Top side (Scale 2:1)



View from Front side (Scale 1:1)



View from Top side (Scale 2:1)



DNP Components	
List of components not to be fitted by manufacturer	R114, R132, R133, R134, R135
Documentation	DNP Components marked with red hash in component placement views. DNP components not included in BOM

AeroVista Hrafn  
Component Placement

Bill Of Materials

Line #	Designator	Name	Quantity
	X1, X2	ABM8G-25.000MHZ-18-D2Y-T	2
	U25	AD7779	1
	U4, U8	AD590J	2
	U12A, U12B	AD590L/M	2
	U1	AD7298BCPZ	1
	U5	LT1959CS8#PBF	1
	U2, U6	LT6105	2
	J4	Gecko_6_F	1
	J3	Gecko_6_M	1
	J5	Gecko_10	1
	J6	Gecko_12	1
	J2	Gecko_16	1
	U11A, U11B	HMC1053	2
	C48A, C48B, C49A, C49B, C50A, C50B	C0402C471F5GACTU	6
	C35	04025C332JAT2A	1
	U20	ENC28J60-I/ML	1
	U23	MCP2515T-I/ML	1
	P1, P2, P3, P4A, P4B, P5	53398-1071	6
	J1	PiZero	1
	FB1, FB2, FB3, FB4, FB5, FB6, FB7	BLM18PG121SH1D	7
	FL1	BNX028-01L	1
	C8, C44A, C44B, C46A, C46B, C91, C92, C93, C99A, C99B, C99C, C99D, C99E, C99F, C99G, C99H	C0402C105M8PACTU	16
	C7, C14, C16, C22, C26, C28, C38, C42A, C42B, C53A, C53B, C59, C64, C72, C78, C85, C89, C97	EMK107BBJ106MA-T	18
	C24	GRM155R61A274KE15D	1
	C36	GRM155R71H153KA12J	1
	C45A, C45B	GRM188R6YA475KE15D	2
	C41A, C41B	GRM219R61A226MEA0D	2
	C61, C62, C75, C80	GRM1555C1H180JA01D	4
	C1, C2, C13, C21, C25, C37, C58, C71, C77, C88, C96	GRT32EC81C476ME13L	11
	D6	1SMA5915BT3G	1
	U22	CM1224-04SO	1
	D7, D8, D9, D10	ESD9R3.3ST5G	4
	Q1	MMBT2222ALT3G	1
	D1, D3	SZ1SMA5919BT3G	2
	D4	1N914BWT	1
	U3, U9, U26	FPF2701MPX	3
	R68, R77, R78, R83A, R83B	ERA-2AEB202X	5
	R137	ERJ2GE0R00X	1
	R107, R108	ERJ-2GEJ102X	2

Bill Of Materials

Line #	Designator	Name	Quantity
	R29, R30, R31, R32, R33, R34, R35, R36, R37, R38, R39, R40, R41, R42, R43, R44, R45, R46, R55, R63, R79, R80, R115, R127	ERJ-2GEJ223X	24
	R111, R112	ERJ-2RKF75R0X	2
	R59, R60, R73, R74, R100, R101	ERJ-2RKF1000X	6
	R105	ERJ-2RKF2321X	1
	R56, R57, R66, R67	ERJ-2RKF4991X	4
	R62, R76	RL0603FR-070R02L	2
	U21	HX1188FNL	1
	R61, R82A, R82B	R	3
	D2, D5	STPS3L60U	2
	C3, C4, C5, C6, C9, C10, C11, C12, C15, C17, C20, C23, C27, C29, C31, C32, C39, C40A, C40B, C43A, C43B, C47A, C47B, C51A, C51B, C52A, C52B, C54, C55, C56, C57, C60, C63, C65, C66, C67, C68, C69, C73, C74, C76, C79, C81, C82, C83, C84, C86, C87, C90, C94, C95, C98, C100A, C100B, C100C, C100D, C100E, C100F, C100G, C100H, C101A, C101B, C101C, C101D, C101E, C101F, C101G, C101H, C102, C103, C104	0.1 uF	71
	C18, C19, C30, C33	0402ZC103KAT2A	4
	C70	CGA6P1X7S3D222M250AA	1
	C34	GRM1555C1H101JA01D	1
	U10A, U10B	REF3040AIDBZT	2
	U24	SN65HVD230DR	1
	U13A, U13B	SN74AHC1G04DBVR	2
	U19	TMUX136RSER	1
	U17	TPS3820-33DBVT	1
	U7	TPS79133DBVR	1
	U16, U18	DS90LT012AQMFE/NOPB	2
	U14A, U14B, U15A, U15B	LMP2022MM/NOPB	4
	R75, R126, R136	CRCW0402100KJNED	3
	R65, R81, R128	CRCW0402274KFKED	3
	D11, D12	TLMP1100-GS08	2

Bill Of Materials

Line #	Designator	Name	Quantity
	R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15, R16, R17, R18, R19, R20, R21, R22, R23, R24, R25, R26, R27, R28, R69, R102, R103, R113, R116, R117, R118, R119, R120, R121, R122, R123, R124, R125	220 Ω	42
	R129A, R129B, R129C, R129D, R129E, R129F, R129G, R129H, R130A, R130B, R130C, R130D, R130E, R130F, R130G, R130H	CRCW04023K30JNED	16
	R104, R106, R109, R110	CRCW060350R0FKEA	4
	R131	ERJ-3RQFR22V	1
	R89A, R89B, R90A, R90B, R91A, R91B, R92A, R92B, R93A, R93B, R94A, R94B, R95A, R95B, R96A, R96B	RT0603BRE074K99L	16
	R86A, R86B, R87A, R87B, R88A, R88B, R97A, R97B, R98A, R98B, R99A, R99B	TNPW0603249KBEEA	12
	Q2A, Q2B, Q3A, Q3B	NTGD4167CT1G	4
	L2	74404300047	1
	L1	L	1
	R58	AC0603JR-070RL	1
	R51, R52, R53, R54, R71	CRCW040210K0FKEDHP	5
	R72	ERJ-2RKF1001X	1
	R70	RC0402FR-071K74L	1
	R47, R48, R49, R50	RC0402FR-0720KL	4
	R84A, R84B, R85A, R85B	RC0603JR-070RL	4
	R64	RL0402FR-070R5L	1