



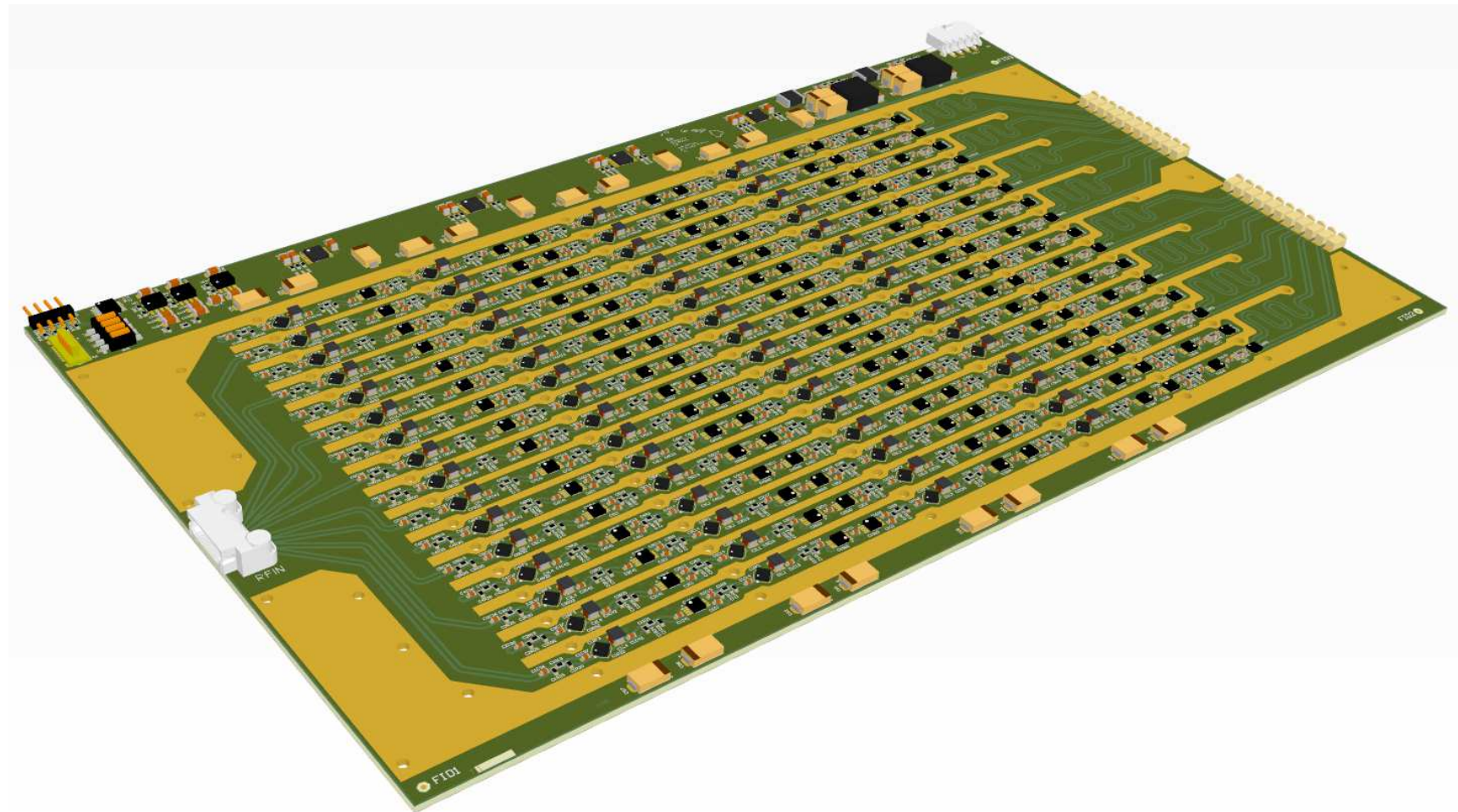
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High Energy Physics Group
Instrumentation Development Laboratory
2505 Correa Road, Honolulu, HI 96822

Production Documentation for:

Project Name: XRM
Board Name: XRM_MainAMP
IDL num: IDL_15_38
Revision: A
Variant: Master

Designer: PO
Drawn by: PO
Approved by: Gary S. Varner

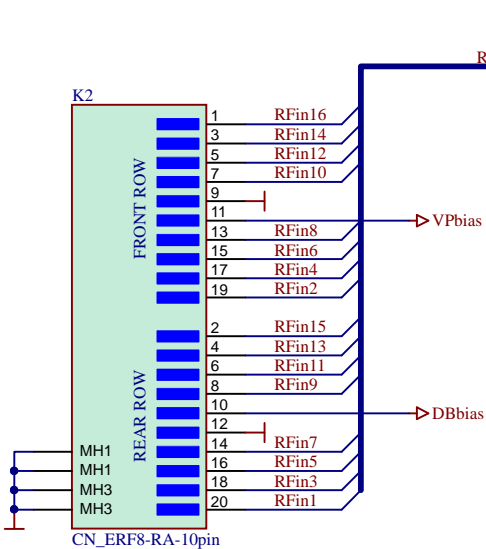


High Energy Physics Group, Instrumentation Development Lab			Designer:	PO	IDLAB design #:	IDL_15_38
Project name: XRM			Drawn By:	PO	Revision:	A
Board name: XRM_MainAMP			Approved By: Gary S. Varner		Variant:	Master
					Modif. Date:	1. nov 2015
					Sheet	1 of 5

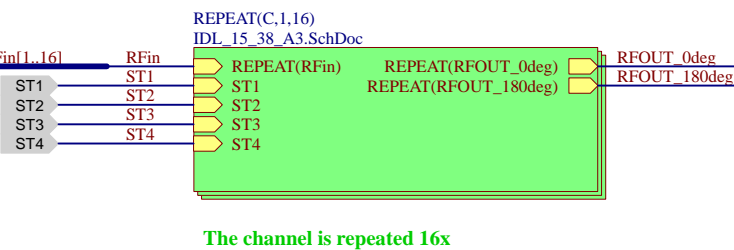


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RF Input

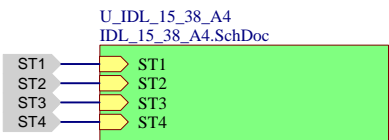


Main RF channel

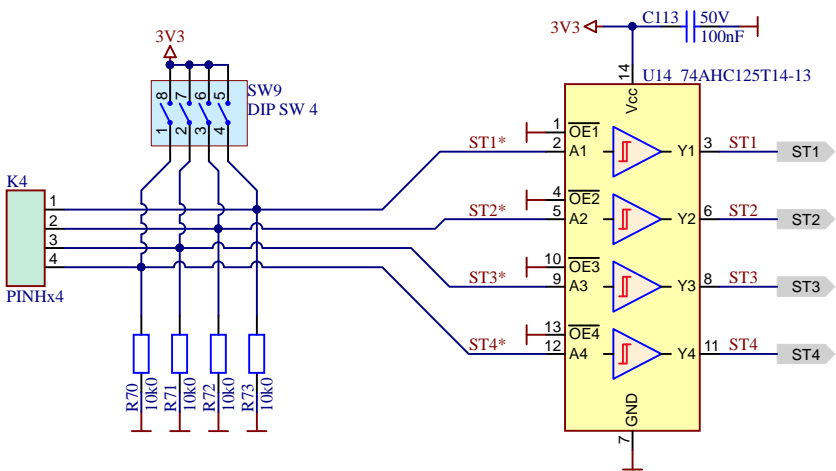


The channel is repeated 16x

Powr Supply Sub-circuit

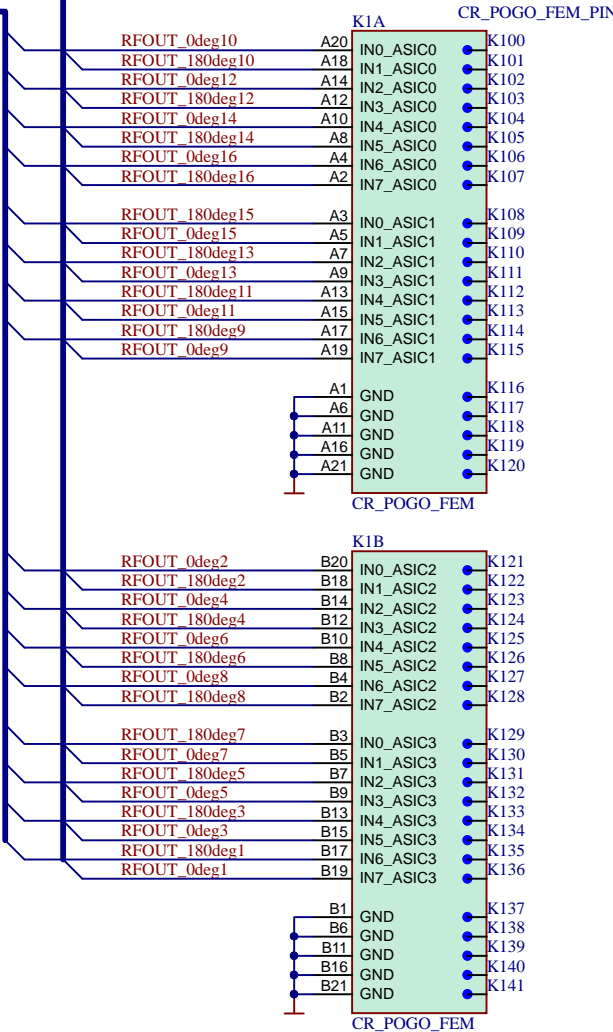


RF Stage Drivig Logic



Stage 1	Stage 2	Stage 3	Stage 4	Gain [dB]
0	0	0	1	2
0	0	0	0	5
0	0	1	1	15
0	0	1	0	18
0	1	0	1	23
1	0	0	1	23
0	1	0	0	26
1	0	0	0	26
0	1	1	1	35
0	1	0	1	35
0	1	1	0	38
1	0	1	0	38
1	1	1	1	44
1	1	0	0	47
1	1	1	1	55
1	1	1	0	58

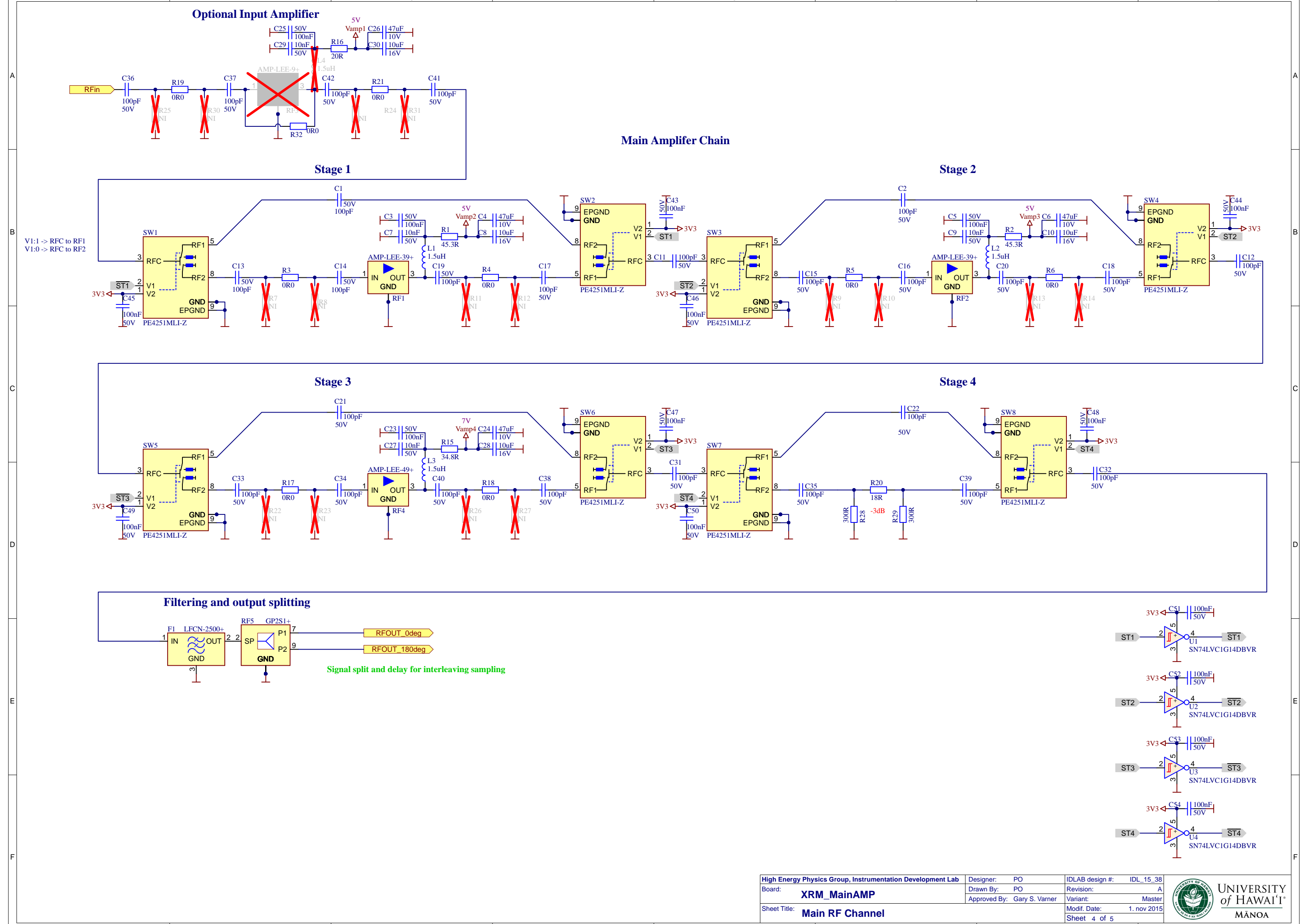
RF Output



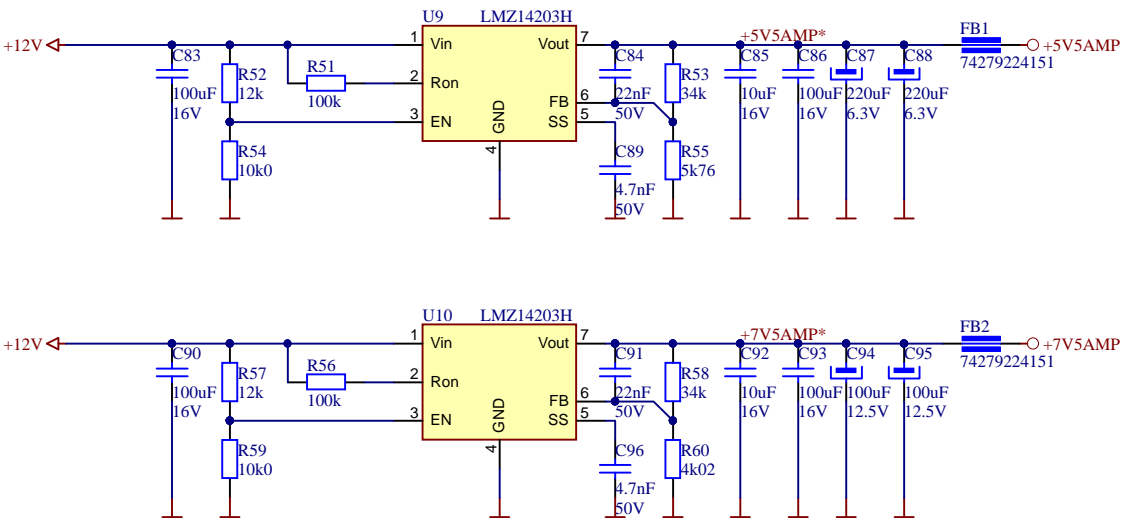
FID1
PCB-FIDRTB
FID2
PCB-FIDRTB
FID3
PCB-FIDRTB



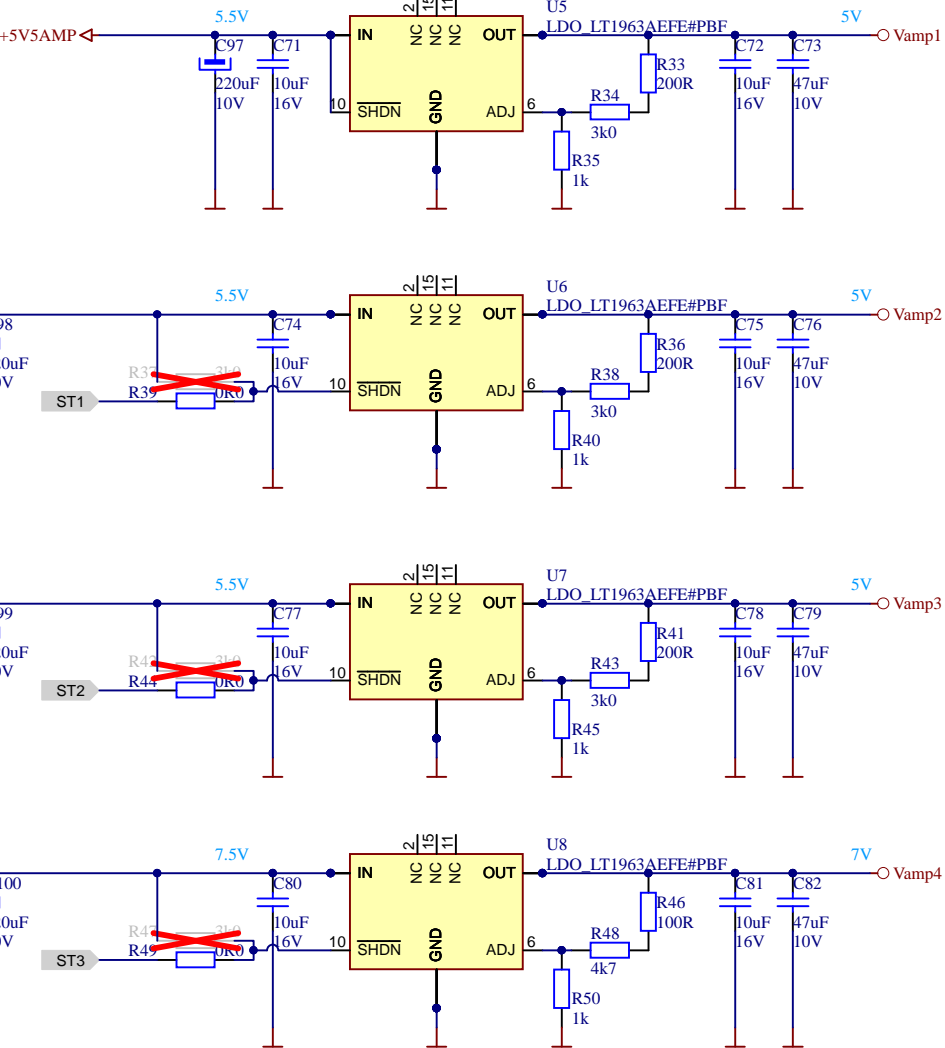
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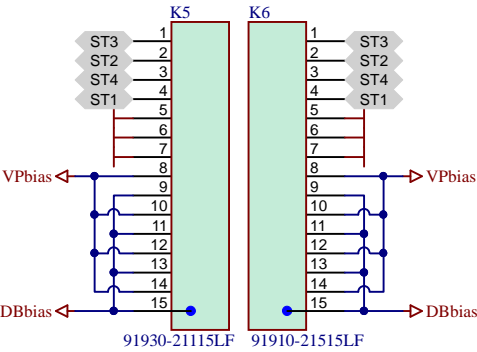
Main Power Supply Input



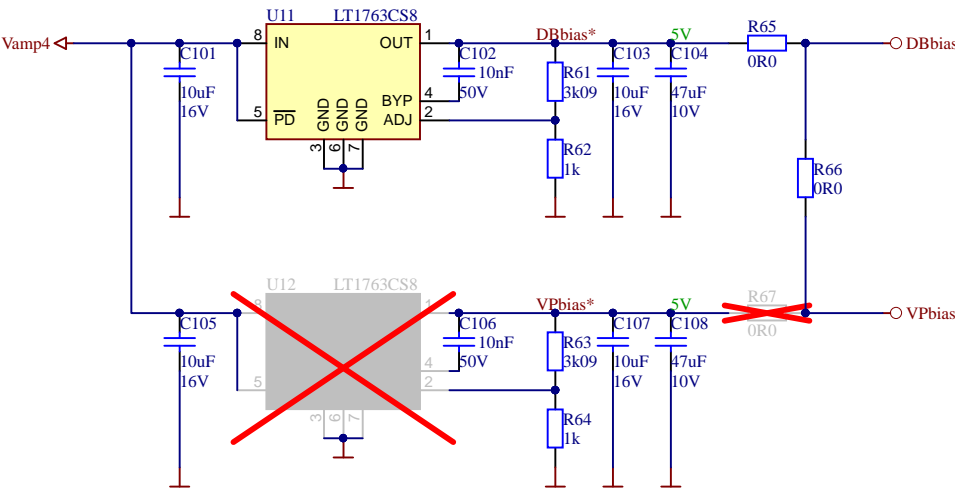
Main Power Supply for RF stages



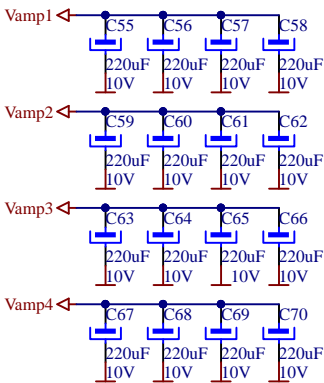
Inter-Board Connection



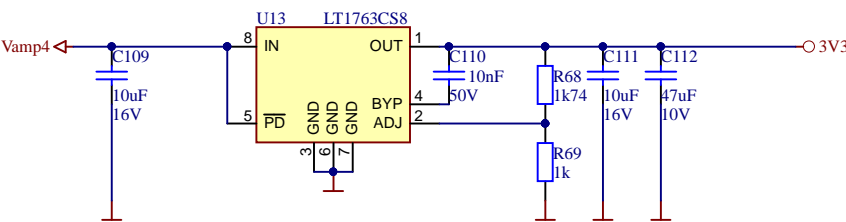
BIAS Power Supply



Main Power Supply Decoupling for RF stages



Peripheral Power Supply



Source Data From:	IDL 15 38 A.PrjPcb
Project:	XRM_MainAMP
Revision:	A
Variant:	Master
IDLAB Design #:	IDL 15 38



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High Energy Physics Group
Instrumentation Development Lab

Report Date:	15:21:51	1. nov 2015
Print Date:	7:33	04.11.2015

Note: The components listed in this document can be purchased from different suppliers, following the original manufacturer's part number.

Standard components (resistors and capacitors) can be produced by different manufacturers, however they must adhere to the quality requirements specified for the original components defined in this document.

For all other components, the purchasing and assembly of alternatives, not specified in this document, must be authorized by the Instrumentation Development Laboratory.

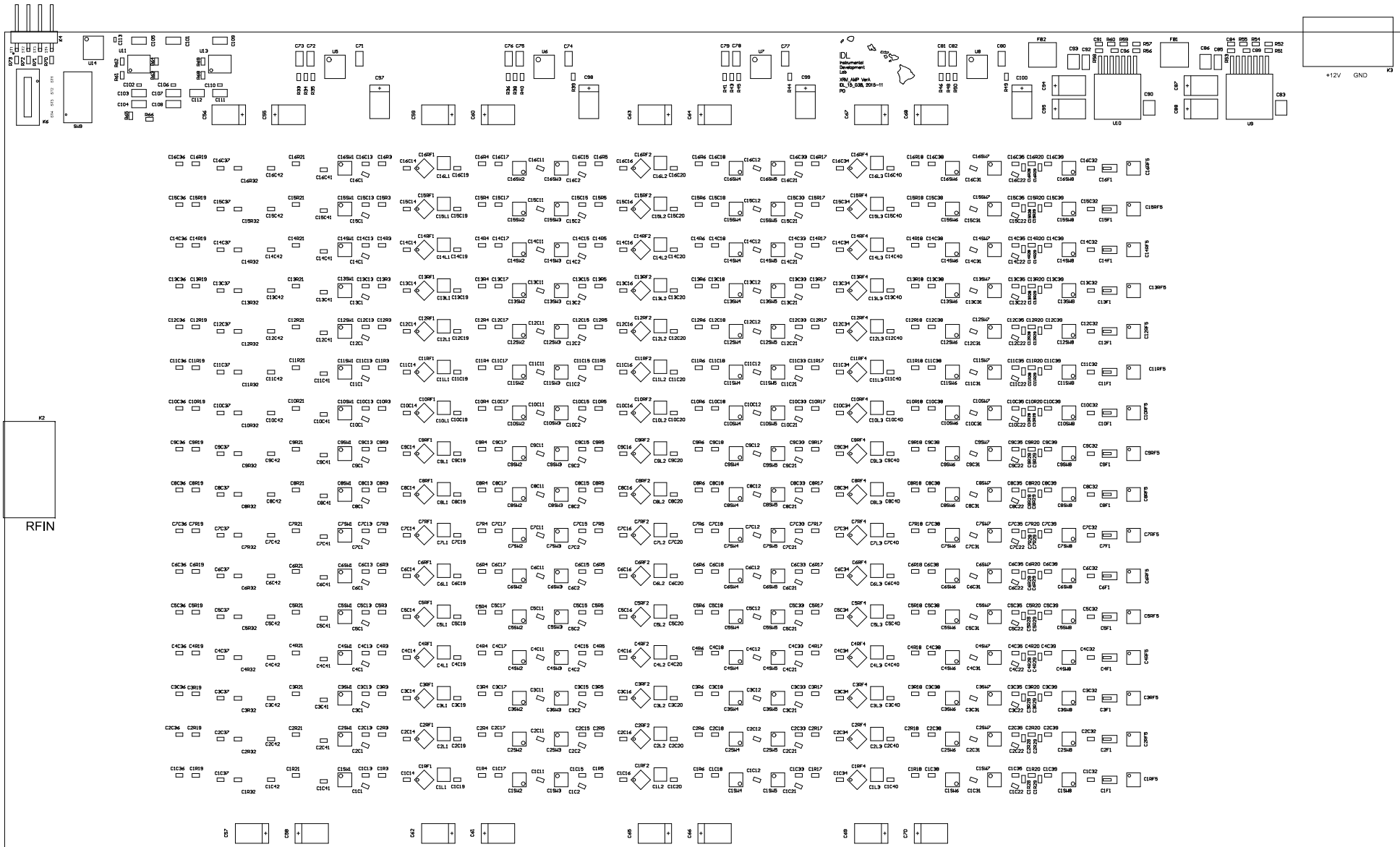
UHM-HEPG-ID Laboratory

#	Designator	Quantity per Board	Description	Comment	Manufacturer	Manufacturer No	Supplier	Supplier Part Number	Supplier Subtotal
3	C1C4, C1C6, C1C24, C1C26, C2C4, C2C6, C2C24, C2C26, C3C4, C3C6, C3C24, C3C26, C4C4, C4C6, C4C24, C4C26, C5C4, C5C6, C5C24, C5C26, C6C4, C6C6, C6C24, C6C26, C7C4, C7C6, C7C24, C7C26, C8C4, C8C6, C8C24, C8C26, C9C4, C9C6, C9C24, C9C26, C10C4, C10C6, C10C24, C10C26, C11C4, C11C6, C11C24, C11C26, C12C4, C12C6, C12C24, C12C26, C13C4, C13C6, C13C24, C13C26, C14C4, C14C6, C14C24, C14C26, C15C4, C15C6, C15C24, C15C26, C16C4, C16C6, C16C24, C16C26, C73, C76, C79, C82, C104, C108, C112	71	Capacitor chip ceramic 1206 10V X5R	47uF	Murata	GRM31CR61A476ME15L	Digi-Key	490-5528-1-ND	31,24
4	C1C7, C1C9, C1C27, C1C29, C2C7, C2C9, C2C27, C2C29, C3C7, C3C9, C3C27, C3C29, C4C7, C4C9, C4C27, C4C29, C5C7, C5C9, C5C27, C5C29, C6C7, C6C9, C6C27, C6C29, C7C7, C7C9, C7C27, C7C29, C8C7, C8C9, C8C27, C8C29, C9C7, C9C9, C9C27, C9C29, C10C7, C10C9, C10C27, C10C29, C11C7, C11C9, C11C27, C11C29, C12C7, C12C9, C12C27, C12C29, C13C7, C13C9, C13C27, C13C29, C14C7, C14C9, C14C27, C14C29, C15C7, C15C9, C15C27, C15C29, C16C7, C16C9, C16C27, C16C29, C102, C106, C110	67	Capacitor chip ceramic 0402 50V X7R	10nF	Murata	GRM155R71H103KA88D	Digi-Key	490-4516-1-ND	0,4422
5	C1C8, C1C10, C1C28, C1C30, C2C8, C2C10, C2C28, C2C30, C3C8, C3C10, C3C28, C3C30, C4C8, C4C10, C4C28, C4C30, C5C8, C5C10, C5C28, C5C30, C6C8, C6C10, C6C28, C6C30, C7C8, C7C10, C7C28, C7C30, C8C8, C8C10, C8C28, C8C30, C9C8, C9C10, C9C28, C9C30, C10C8, C10C10, C10C28, C10C30, C11C8, C11C10, C11C28, C11C30, C12C8, C12C10, C12C28, C12C30, C13C8, C13C10, C13C28, C13C30, C14C8, C14C10, C14C28, C14C30, C15C8, C15C10, C15C28, C15C30, C16C8, C16C10, C16C28, C16C30, C71, C72, C74, C75, C77, C78, C80, C81, C85, C92, C101, C103, C105, C107, C109, C111	80	Capacitor chip ceramic 1206 16V X7R	10uF	TDK	C3216X7R1C106M160AC	Digi-Key	445-1601-1-ND	23,52
6	C1F1, C2F1, C3F1, C4F1, C5F1, C6F1, C7F1, C8F1, C9F1, C10F1, C11F1, C12F1, C13F1, C14F1, C15F1, C16F1	16	Low Pass Filter DC to 225MHz 50R	LFCN-2500+	MiniCircuits	LFCN-2500+	MiniCircuits	LFCN-2500+	31,84
7	C1L1, C1L2, C1L3, C2L1, C2L2, C2L3, C3L1, C3L2, C3L3, C4L1, C4L2, C4L3, C5L1, C5L2, C5L3, C6L1, C6L2, C6L3, C7L1, C7L2, C7L3, C8L1, C8L2, C8L3, C9L1, C9L2, C9L3, C10L1, C10L2, C10L3, C11L1, C11L2, C11L3, C12L1, C12L2, C12L3, C13L1, C13L2, C13L3, C14L1, C14L2, C14L3, C15L1, C15L2, C15L3, C16L1, C16L2, C16L3	48	Chip inductor 1008 0.33A 2.3R	1.5uH	Coilcraft	1008CS-152XJLB	Coilcraft	1008CS-152XJLB	40,8
8	C1R1, C1R2, C2R1, C2R2, C3R1, C3R2, C4R1, C4R2, C5R1, C5R2, C6R1, C6R2, C7R1, C7R2, C8R1, C8R2, C9R1, C9R2, C10R1, C10R2, C11R1, C11R2, C12R1, C12R2, C13R1, C13R2, C14R1, C14R2, C15R1, C15R2, C16R1, C16R2	32	Chip Resistor 2010 500mW 1% 100ppm	45.3R	Rohm	MCR50JZHf45R3	Digi-Key	RHM45.3BFCT-ND	8,1152

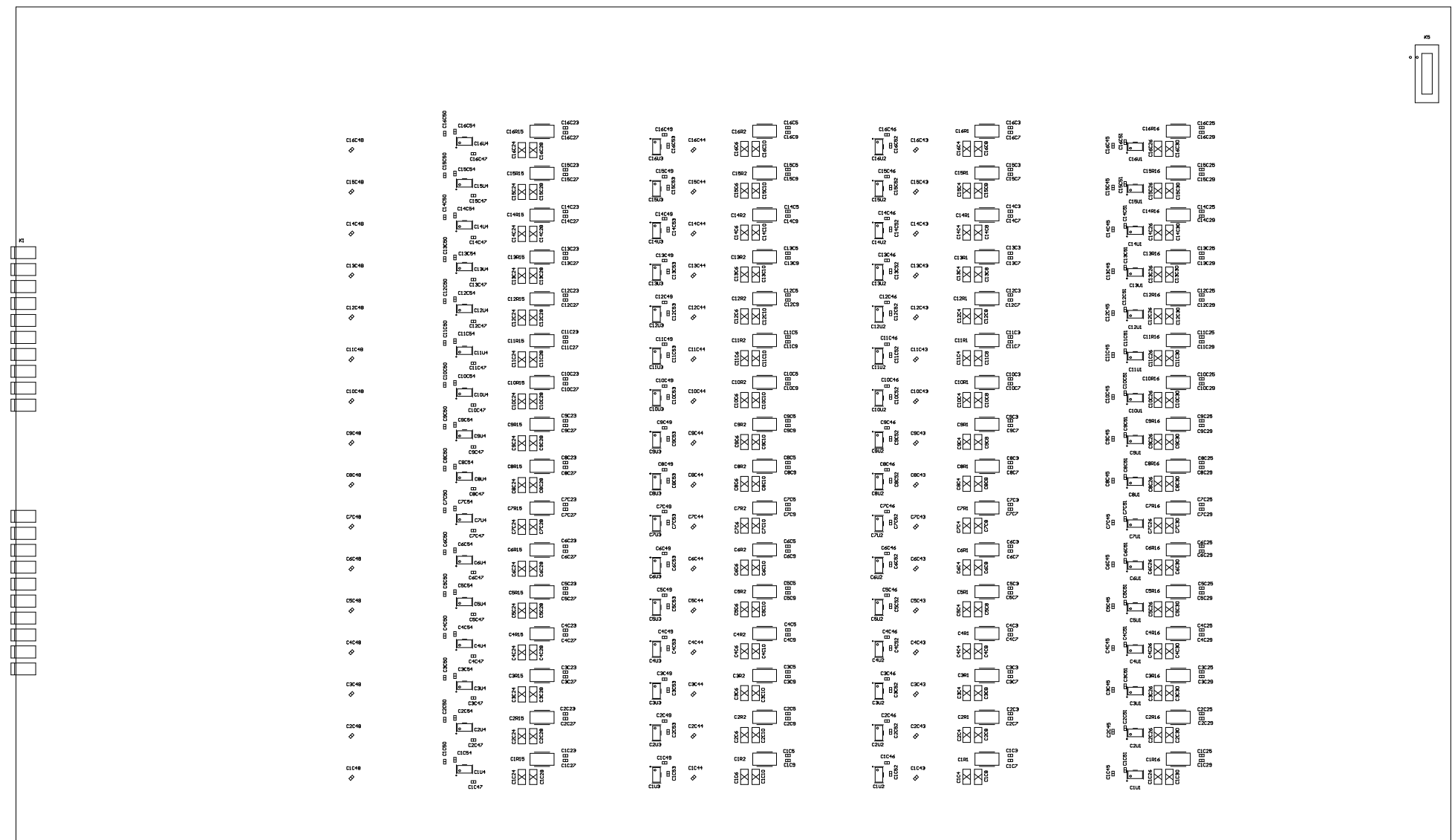
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10	C1R15, C2R15, C3R15, C4R15, C5R15, C6R15, C7R15, C8R15, C9R15, C10R15, C11R15, C12R15, C13R15, C14R15, C15R15, C16R15	16	Chip Resistor 2010 500mW 1% 100ppm	34.8R	Panasonic	ERJ-12SF34R8U	Mouser	667-ERJ-12SF34R8U	4,82456
11	C1R16, C2R16, C3R16, C4R16, C5R16, C6R16, C7R16, C8R16, C9R16, C10R16, C11R16, C12R16, C13R16, C14R16, C15R16, C16R16	16	Chip Resistor 2010 500mW 1% 100ppm	20R	Rohm	MCR50JZHf20R0	Digi-Key	RHM20.0BFCT-ND	5,568
12	C1R20, C2R20, C3R20, C4R20, C5R20, C6R20, C7R20, C8R20, C9R20, C10R20, C11R20, C12R20, C13R20, C14R20, C15R20, C16R20	16	Chip Resistor 0603 100mW 1% 100ppm	18R	Panasonic	ERJ-3EKF18R0V	Mouser	667-ERJ-3EKF18R0V	0,27181
13	C1R28, C1R29, C2R28, C2R29, C3R28, C3R29, C4R28, C4R29, C5R28, C5R29, C6R28, C6R29, C7R28, C7R29, C8R28, C8R29, C9R28, C9R29, C10R28, C10R29, C11R28, C11R29, C12R28, C12R29, C13R28, C13R29, C14R28, C14R29, C15R28, C15R29, C16R28, C16R29	32	Chip Resistor 0603 100mW 1% 100ppm	300R	Panasonic	ERJ-3EKF3000V	Mouser	667-ERJ-3EKF3000V	0,54361
14	C1RF1, C1RF2, C2RF1, C2RF2, C3RF1, C3RF2, C4RF1, C4RF2, C5RF1, C5RF2, C6RF1, C6RF2, C7RF1, C7RF2, C8RF1, C8RF2, C9RF1, C9RF2, C10RF1, C10RF2, C11RF1, C11RF2, C12RF1, C12RF2, C13RF1, C13RF2, C14RF1, C14RF2, C15RF1, C15RF2, C16RF1, C16RF2	32	Monolithic Amplifier DC - 8GHz	AMP-LEE-39+	MiniCircuits	LEE-39+	MiniCircuits	LEE-39+	38,08
15	C1RF4, C2RF4, C3RF4, C4RF4, C5RF4, C6RF4, C7RF4, C8RF4, C9RF4, C10RF4, C11RF4, C12RF4, C13RF4, C14RF4, C15RF4, C16RF4	16	Monolithic Amplifier DC - 5GHz	AMP-LEE-49+	MiniCircuits	LEE-49+	MiniCircuits	LEE-49+	28,64
16	C1RF5, C2RF5, C3RF5, C4RF5, C5RF5, C6RF5, C7RF5, C8RF5, C9RF5, C10RF5, C11RF5, C12RF5, C13RF5, C14RF5, C15RF5, C16RF5	16	Power Splitter / Combiner 2-Way, 50R, 500 MHz to 2500 MHz	GP2S1+	MiniCircuits	GP2S1+	MiniCircuits	GP2S1+	23,84

#	Designator	Quantity per Board	Description	Comment	Manufacturer	Manufacturer No	Supplier	Supplier Part Number	Supplier Subtotal
17	C1SW1, C1SW2, C1SW3, C1SW4, C1SW5, C1SW6, C1SW7, C1SW8, C2SW1, C2SW2, C2SW3, C2SW4, C2SW5, C2SW6, C2SW7, C2SW8, C3SW1, C3SW2, C3SW3, C3SW4, C3SW5, C3SW6, C3SW7, C3SW8, C4SW1, C4SW2, C4SW3, C4SW4, C4SW5, C4SW6, C4SW7, C4SW8, C5SW1, C5SW2, C5SW3, C5SW4, C5SW5, C5SW6, C5SW7, C5SW8, C6SW1, C6SW2, C6SW3, C6SW4, C6SW5, C6SW6, C6SW7, C6SW8, C7SW1, C7SW2, C7SW3, C7SW4, C7SW5, C7SW6, C7SW7, C7SW8, C8SW1, C8SW2, C8SW3, C8SW4, C8SW5, C8SW6, C8SW7, C8SW8, C9SW1, C9SW2, C9SW3, C9SW4, C9SW5, C9SW6, C9SW7, C9SW8, C10SW1, C10SW2, C10SW3, C10SW4, C10SW5, C10SW6, C10SW7, C10SW8, C11SW1, C11SW2, C11SW3, C11SW4, C11SW5, C11SW6, C11SW7, C11SW8, C12SW1, C12SW2, C12SW3, C12SW4, C12SW5, C12SW6, C12SW7, C12SW8, C13SW1, C13SW2, C13SW3, C13SW4, C13SW5, C13SW6, C13SW7, C13SW8, C14SW1, C14SW2, C14SW3, C14SW4, C14SW5, C14SW6, C14SW7, C14SW8, C15SW1, C15SW2, C15SW3, C15SW4, C15SW5, C15SW6, C15SW7, C15SW8, C16SW1, C16SW2, C16SW3, C16SW4, C16SW5, C16SW6, C16SW7, C16SW8	128	High Isolation SPDT, Absorptive SW, DC - 3GHz, 50Ohm	PE4251MLI-Z	Peregrine	PE4251MLI-Z	Digi-Key	1046-1018-6-ND	193,024
18	C1U1, C1U2, C1U3, C1U4, C2U1, C2U2, C2U3, C2U4, C3U1, C3U2, C3U3, C3U4, C4U1, C4U2, C4U3, C4U4, C5U1, C5U2, C5U3, C5U4, C6U1, C6U2, C6U3, C6U4, C7U1, C7U2, C7U3, C7U4, C8U1, C8U2, C8U3, C8U4, C9U1, C9U2, C9U3, C9U4, C10U1, C10U2, C10U3, C10U4, C11U1, C11U2, C11U3, C11U4, C12U1, C12U2, C12U3, C12U4, C13U1, C13U2, C13U3, C13U4, C14U1, C14U2, C14U3, C14U4, C15U1, C15U2, C15U3, C15U4, C16U1, C16U2, C16U3, C16U4	64	Single Schmitt trigger Inverter	SN74LVC1G14DBVR	Texas	SN74LVC1G14DBVR	Digi-Key	296-35945-6-ND	18,1504
19	C55, C56, C57, C58, C59, C60, C61, C62, C63, C64, C65, C66, C67, C68, C69, C70, C97, C98, C99, C100	20	Capacitor tantal smd 7343-20 10V 25mResr	220uF	AVX	TCJY227M010R0025	Digi-Key	478-9504-1-ND	45,98
20	C83, C86, C90, C93	4	Capacitor chip ceramic 1210 16V X5R	100uF	Kemet	C1210C107M4PAC7800	Digi-Key	311-2052-1-ND	7,32
21	C84, C91	2	Capacitor chip ceramic 0603 50V X7R	22nF	TDK	C1608X7R1H223K080AA	Digi-Key	445-1312-6-ND	0,2
22	C87, C88	2	Capacitor Aluminium Polymer, High Ripple, smd 7343-43 6.3V 7mResr	220uF	Panasonic	EEF-UE0J221LR	Digi-Key	PCE4263CT-ND	7,3
23	C89, C96	2	Capacitor chip ceramic 0603 50V X7R	4.7nF	Murata	GRM188R71H472KA01D	Digi-Key	490-1506-6-ND	0,2
24	C94, C95	2	Capacitor Aluminium Polymer, High Ripple, smd 7343-43 12.5V 12mResr	100uF	Murata	ECASD91B107M012K00	Digi-Key	490-5480-6-ND	7,84
25	FB1, FB2	2	Feritite filter smd 2220 5A 10mRdc 150Rac	74279224151	Würth	74279224151	Digi-Key	732-3423-1-ND	2,46
26	K4	1	Pin header 2.54mm male 4pins righth angle	PINHx4	FCI	68016-104HLF	Digi-Key	609-3312-ND	0,4
27	K5	1	Connector FCI 15 pin R1mm low profile vertical female	91930-21115LF	FCI	91930-21115LF	Digi-Key	609-1590-ND	2,69
28	K6	1	Connector FCI 15 pin R1mm low profile vertical male	91910-21515LF	FCI	91910-21515LF	Digi-Key	609-1581-ND	2,45
29	K100, K101, K102, K103, K104, K105, K106, K107, K108, K109, K110, K111, K112, K113, K114, K115, K116, K117, K118, K119, K120, K121, K122, K123, K124, K125, K126, K127, K128, K129, K130, K131, K132, K133, K134, K135, K136, K137, K138, K139, K140, K141	42	ITOP Carrier Pogo Pin Female Receptacle	CR_POGO_FEM_PIN	Mill-Max	7937-0-00-15-00-00-03-0	Digi-Key	ED90501-ND	14,5824
30	R33, R36, R41	3	Chip Resistor 0603 100mW 1% 100ppm	200R	Panasonic	ERJ-3EKF2000V	Digi-Key	P200HCT-ND	0,3
31	R34, R38, R43	3	Chip Resistor 0603 100mW 1% 100ppm	3k0	Panasonic	ERJ-3EKF3001V	Digi-Key	P3.00KHCT-ND	0,3
32	R35, R40, R45, R50, R62, R64, R69	7	Chip Resistor 0603 100mW 1% 100ppm	1k	Yageo	RC0603FR-071KL	Digi-Key	311-1.00KHCT-ND	0,7
33	R46	1	Chip Resistor 0603 100mW 1% 100ppm	100R	Panasonic	ERJ-3EKF1000V	Digi-Key	P100HDKR-ND	0,1
34	R48	1	Chip Resistor 0603 100mW 1% 100ppm	4k7	Panasonic	ERJ-3EKF4701V	Digi-Key	P4.70KHCT-ND	0,1
35	R51, R56	2	Chip Resistor 0603 100mW 1% 100ppm	100k	Panasonic	ERJ-3EKF1003V	Digi-Key	P100KHCT-ND	0,2
36	R52, R57	2	Chip Resistor 0603 100mW 1% 100ppm	12k	Panasonic	ERJ-3EKF1202V	Digi-Key	P12.0KHCT-ND	0,2
37	R53, R58	2	Chip Resistor 0603 100mW 1% 100ppm	34k	Panasonic	ERJ-3EKF3402V	Digi-Key	P34.0KHDKR-ND	0,2
38	R54, R59, R70, R71, R72, R73	6	Chip Resistor 0603 100mW 1% 100ppm	10k0	Panasonic	ERJ-3EKF1002V	Digi-Key	P10.0KHCT-ND	0,6
39	R55	1	Chip Resistor 0603 100mW 1% 100ppm	5k76	Panasonic	ERJ-3EKF5761V	Digi-Key	P5.76KHCT-ND	0,1
40	R60	1	Chip Resistor 0603 100mW 1% 100ppm	4k02	Yageo	RC0603FR-074K02L	Digi-Key	311-4.02KHDKR-ND	0,1
41	R61, R63	2	Chip Resistor 0603 100mW 1% 100ppm	3k09	Yageo	RC0603FR-073K09L	Digi-Key	311-3.09KHDKR-ND	0,2
42	R68	1	Chip Resistor 0603 100mW 1% 100ppm	1k74	Yageo	RC0603FR-071K74L	Digi-Key	311-1.74KHDKR-ND	0,1
43	U5, U6, U7, U8	4	Low drop low noise regulator 1.5A TSSOP16	LDO_LT1963AEFE#PBF	Linear Technology	LT1963AEFE#PBF	Digi-Key	LT1963AEFE#PBF-ND	21,12
44	U9, U10	2	3A SIMPLE SWITCHER® Power Module for High Output Voltage	LMZ14203H	Texas Instruments	LMZ14203HTZ/NOPB	Digi-Key	LMZ14203HTZE/NOPB-ND	40,38
45	U11, U13	2	500mA, Low Noise, LDO	LT1763CS8	Linear Technology	LT1763CS8#PBF	Digi-Key	LT1763CS8#PBF-ND	8,3
46	U14	1	Quad Schmitt trigger buffer	74AHC125T14-13	Diodes	74AHC125T14-13	Mouser		0
47	SW9	1	Dip Switch 4 PCB vertical 2.54mm	DIP SW 4	Omron	A6S-4101-H	Digi-Key	SW1120-ND	1,51
48	K2	1	Samtech ERF8 Righth Angle Multicoax 10pin	CN_ERF8-RA-10pin	Samtech	CN_ERF8-RA-10pin	Samtech	CN_ERF8-RA-10pin	

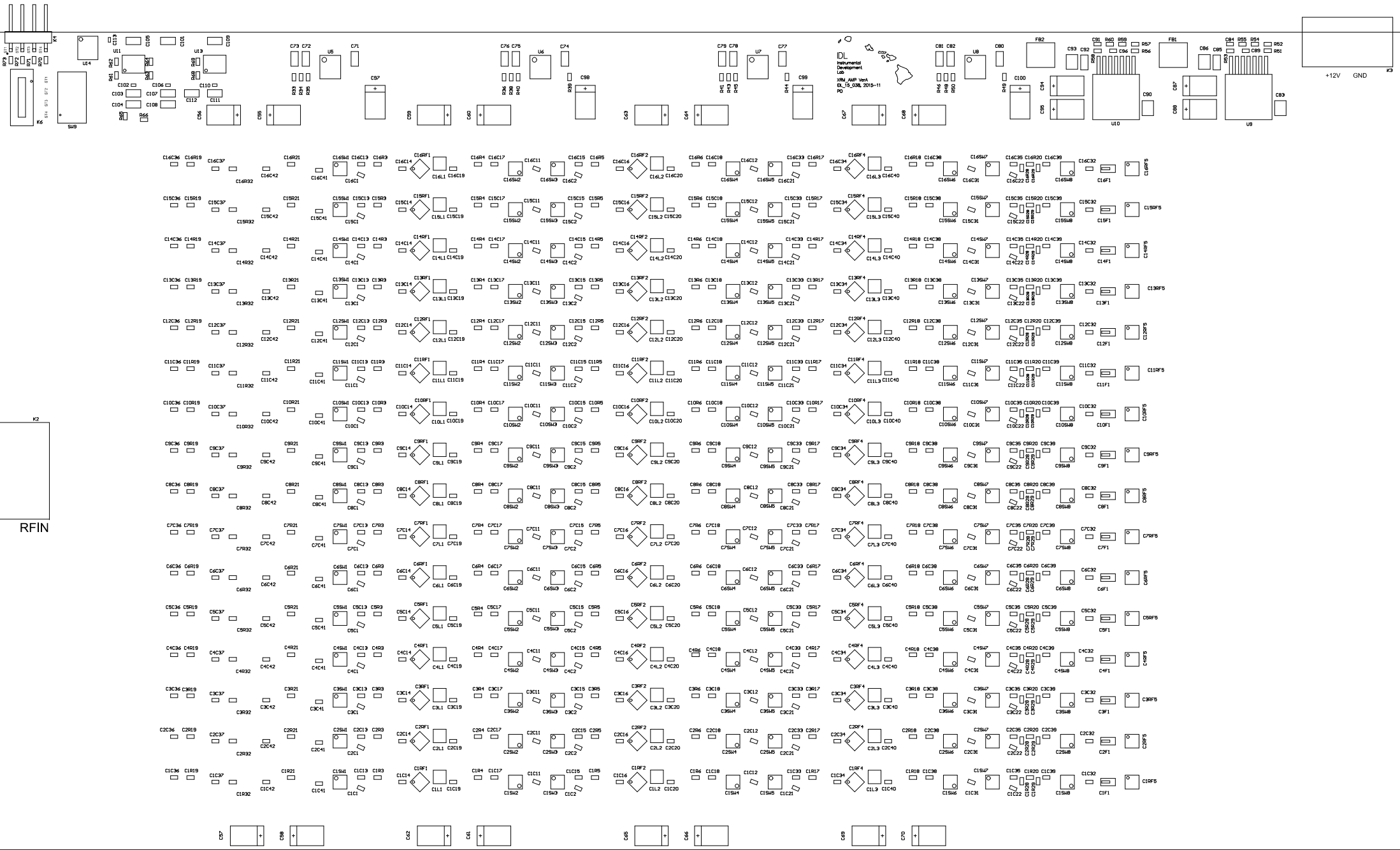
#	Designator	Quantity per Board	Description	Comment	Manufacturer	Manufacturer No	Supplier	Supplier Part Number	Supplier Subtotal
49	K3	1	Connector Header 4 pin righth-angle SMD 3mm 4A	43650-0413	Molex	436500413	Mouser	538-43650-0413	2,50571
Approved		Total Quantity per Board	Notes:						Total Price
Total components:		1595							633,30787

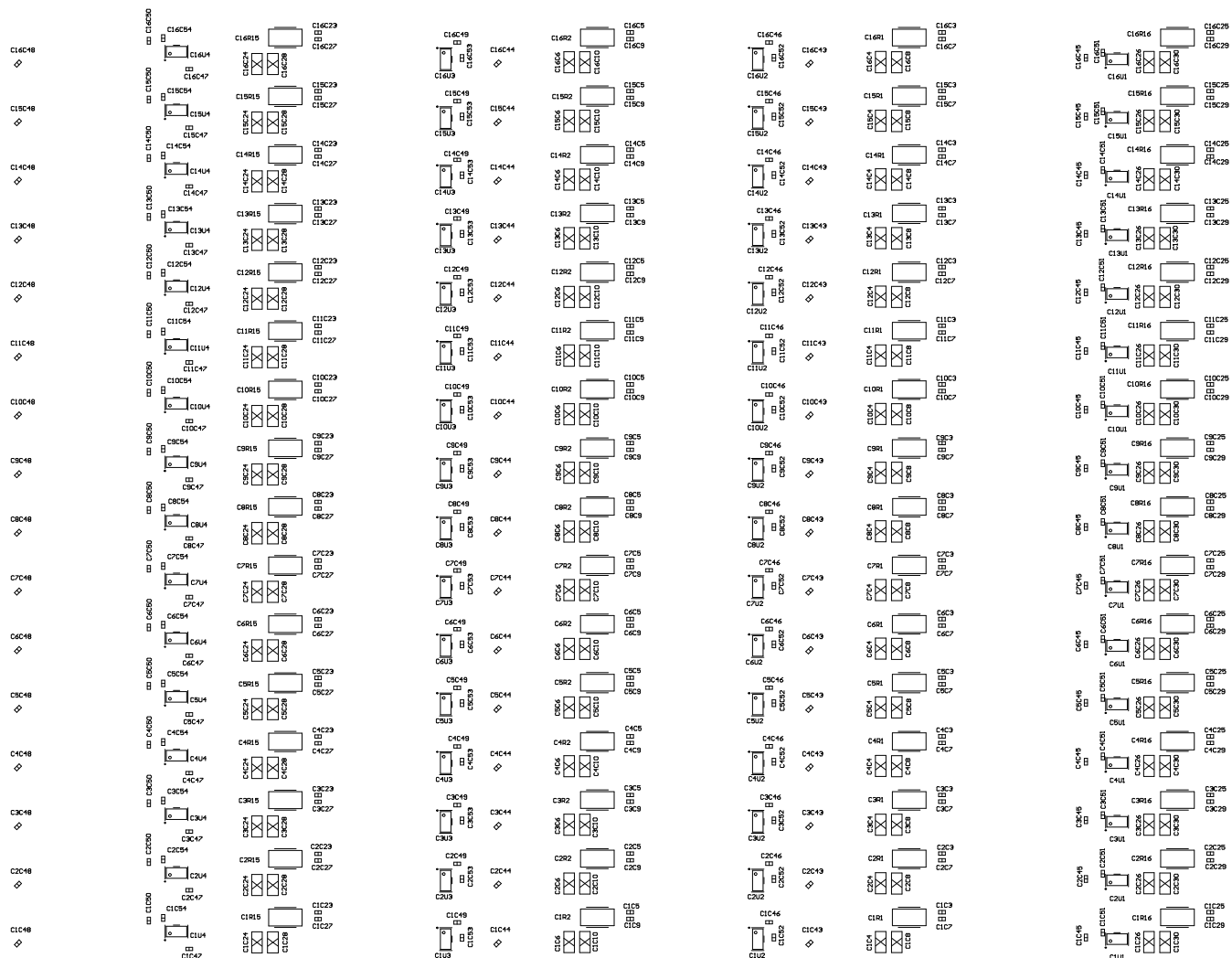


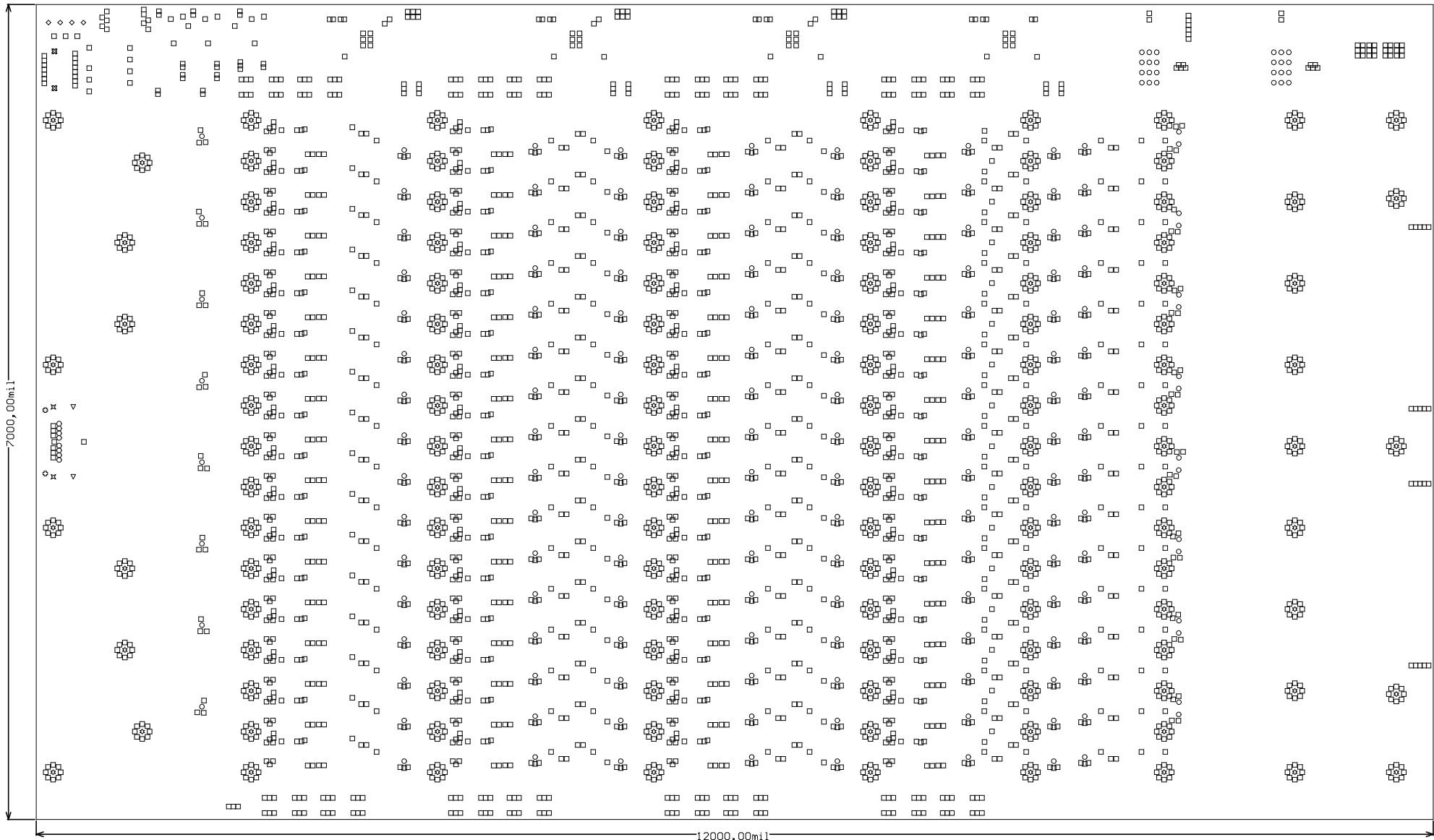
Designer: PO	Revision: .Version	File: IDL_15_38_A.PcbDoc	Sheet 1 of 1	Code: IDL_15_38
Drawn By: PO	Modif. Date: Date	Variant: Master	ASSEMBLY	
Approved By: Gary S. Varner	Print Date: 1. nov 2015	Signature:	Size: A3 H	ID: XRM_MainAMP
Title: Top Assembly Drawing				University of Hawaii at Manoa High Energy Physics Group Instrumentation Development Laboratory



Designer: PO	Revision: .Version	File: IDL_15_38_A,PcbDoc	Sheet 1 of 1	Code: IDL_15_38
Drawn By: PO	Modif. Date: Date	Variant: Master	ASSEMBLY	ID: XRM_MainAMP
Approved By: Gary S. Varner	Print Date: 1. nov 2015	Signature:	Size: A3 H	
Title: <div style="text-align: center;">Bottom Assembly Drawing</div>				University of Hawaii at Manoa High Energy Physics Group Instrumentation Development Laboratory







- Notes:
- Board shall be fabricated - performance class II as per IPC-6011 and IPC6012
 - PCB manufacturer logo, P/N, revision and/or date code of manufacturing shall be printed in top solder mask (not over pcb traces, allowed over copper plane).
The date code shall be in the format: "WWYY" where WW=week and YY= year, max height 0.15 inches
 - Silkscreen printed on both sides
 - Material: high temperature FR4 class epoxy glass rated UL94V-0. UL symbol and rating shall be marked farside
35um copper for external layers and 18um for all internal layers
Must be RoHS compliant and survive a lead-free assembly max reflow of 260 deg C (5 passes)
Td rating: >340 deg C
Tg = 150 deg C (min)
 - Solder mask: SMOBC per IPC-SM-840C, class T must be Rohs compliant, 0.001" max measured over bare copper plating, must clear all lands as indicated on gerber solder mask layers, color= GREEN
 - Finish: electro-less nickel immersion gold (ENIG), 0.05-0.125um Au over 3-6um Ni - over bare copper only
 - Solderability test: Category 2 of J-STD-003
 - Finished boards shall not have nicks, scratches, voids, exposed copper, poor plating or misdrilled holes
 - All holes sizes are after plating
 - PCB manufacturer may add copper thieving as needed to improve manufacturability, thieving to be 0.030" round pads at 0.050" spacing.
Thieving will have a minimum of 0.100" clearance from existing copper and should not be placed under surface mounted devices
 - PCB manufacturer may use tear drops to improve annular rings as long as DRC rules are followed
 - All via connections to power and ground planes are solid
 - All unconnected pads on inner signal layers are removed
 - All finished boards are to be 100% electrically tested
 - Unless otherwise indicated, all linear tolerances shall be XX.X +/-0.2mm and XX.XX +/- 0.1mm
 - Gerber file GM1 shows board outline (milling line)
 - Table 1 shows Layer stack details

Additional notes:

A1. Finished board thickness = 68.5mils +/- 10%; measured over top/bottom copper and solder mask

A1. Blind vias are from L1 to L2 and L5 to L6

Table 1: Layer Stack Details for IDL_15_38 Rev.A (Imperial Units)

Layer	Name	Material	Thickness	Constant	Board Layer Stack
1	Top Overlay				
2	Top Solder	Solder Resist	1.50mil	3.5	
3	Top Layer - SIG1	Copper	1.38mil		
4	Dielectric 1	FR4	15.00mil	4.65	
5	Layer 2 - GND1	Copper	0.70mil		
6	Dielectric 2	FR4	9.00mil	4.65	
7	Layer 3 - SIG2	Copper	0.70mil		
8	Dielectric 3	FR4	12.00mil	4.65	
9	Layer 4 - PWR	Copper	0.70mil		
10	Dielectric 4	FR4	9.00mil	4.65	
11	Layer 5 - GND2	Copper	0.70mil		
12	Dielectric 5	FR4	15.00mil	4.65	
13	Bottom Layer - SIG3	Copper	1.38mil		
14	Bottom Solder	Solder Resist	1.50mil	3.5	
15	Bottom Overlay				

Table 2: NC Drill Details for IDL_15_38 Rev.A

Symbol	Hil Count	Finished Hole Size	Plated	Hole Type
⊕	2	0.630mm (24.80mil)	PTH	Round
⊗	2	1.450mm (57.09mil)	NPTH	Round
▽	2	1.905mm (75.00mil)	PTH	Round
⊗	4	0.760mm (29.92mil)	NPTH	Round
◇	4	1.000mm (39.37mil)	PTH	Round
⊗	126	2.500mm (98.43mil)	PTH	Round
○	184	0.400mm (15.75mil)	PTH	Round
□	3400	0.300mm (11.81mil)	PTH	Round
3724 Total				



- Notes:
- Board shall be fabricated - performance class II as per IPC-6011 and IPC6012
 - PCB manufacturer logo, P/N, revision and/or date code of manufacturing shall be printed in top solder mask (not over pcb traces, allowed over copper plane). The date code shall be in the format: "WWYY" where WW=week and YY= year, max height 0.15 inches
 - Silkscreen printed on both sides
 - Material: high temperature FR4 class epoxy glass rated UL94V-0. UL symbol and rating shall be marked farside
35um copper for external layers and 18um for all internal layers
Must be RoHS compliant and survive a lead-free assembly max reflow of 260 deg C (5 passes)
Td rating: >340 deg C
Tg = 150 deg C (min)
 - Solder mask: SMOBC per IPC-SM-840C, class T must be Rohs compliant, 0.001" max measured over bare copper plating, must clear all lands as indicated on gerber solder mask layers, color= GREEN
 - Finish: electro-less nickel immersion gold (ENIG), 0.05-0.125um Au over 3-6um Ni - over bare copper only
 - Solderability test: Category 2 of J-STD-003
 - Finished boards shall not have nicks, scratches, voids, exposed copper, poor plating or misdrilled holes
 - All holes sizes are after plating
 - PCB manufacturer may add copper thieving as needed to improve manufacturability, thieving to be 0.030" round pads at 0.050" spacing. Thieving will have a minimum of 0.100" clearance from existing copper and should not be placed under surface mounted devices
 - PCB manufacturer may use tear drops to improve annular rings as long as DRC rules are followed
 - All via connections to power and ground planes are solid
 - All unconnected pads on inner signal layers are removed
 - All finished boards are to be 100% electrically tested
 - Unless otherwise indicated, all linear tolerances shall be XX.X +/-0.2mm and XX.XX +/- 0.1mm
 - Gerber file GM1 shows board outline (milling line)
 - Table 1 shows Layer stack details

Additional notes:

A1. Finished board thickness = 68.5mils +/- 10%; measured over top/bottom copper and solder mask

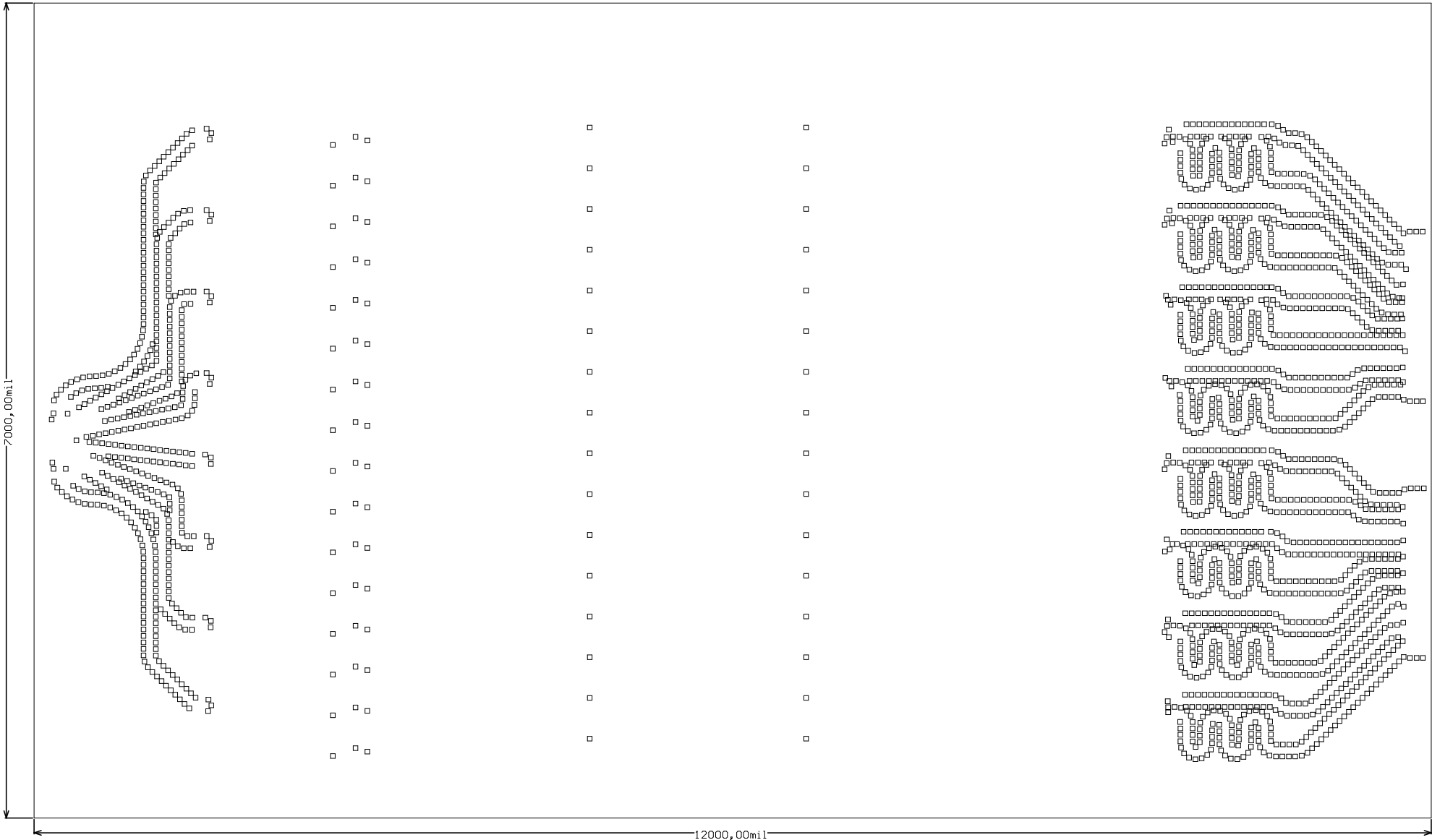
A1. Blind vias are from L1 to L2 and L5 to L6

Table 1: Layer Stack Details for IDL_15_38 Rev.A (Imperial Units)

Layer	Name	Material	Thickness	Constant	Board Layer Stack
1	Top Overlay				
2	Top Solder	Solder Resist	1.50mil	3.5	
3	Top Layer - SIG1	Copper	1.38mil		
4	Dielectric 1	FR4	15.00mil	4.65	
5	Layer 2 - GND1	Copper	0.70mil		
6	Dielectric 2	FR4	9.00mil	4.65	
7	Layer 3 - SIG2	Copper	0.70mil		
8	Dielectric 3	FR4	12.00mil	4.65	
9	Layer 4 - PWR	Copper	0.70mil		
10	Dielectric 4	FR4	9.00mil	4.65	
11	Layer 5 - GND2	Copper	0.70mil		
12	Dielectric 5	FR4	15.00mil	4.65	
13	Bottom Layer - SIG3	Copper	1.38mil		
14	Bottom Solder	Solder Resist	1.50mil	3.5	
15	Bottom Overlay				

Table 2: NC Drill Details for IDL_15_38 Rev.A

Symbol	Hil Count	Finished Hole Size	Plated	Hole Type
□	5335	0.300mm (11.81mil)	PTH	Round
	5335 Total			



- Notes:
- Board shall be fabricated - performance class II as per IPC-6011 and IPC6012
 - PCB manufacturer logo, P/N, revision and/or date code of manufacturing shall be printed in top solder mask (not over pcb traces, allowed over copper plane). The date code shall be in the format: "WWYY" where WW=week and YY= year, max height 0.15 inches
 - Silkscreen printed on both sides
 - Material: high temperature FR4 class epoxy glass rated UL94V-0. UL symbol and rating shall be marked farside
35um copper for external layers and 18um for all internal layers
Must be RoHS compliant and survive a lead-free assembly max reflow of 260 deg C (5 passes)
Td rating: >340 deg C
Tg = 150 deg C (min)
 - Solder mask: SMOBC per IPC-SM-840C, class T must be Rohs compliant, 0.001" max measured over bare copper plating, must clear all lands as indicated on gerber solder mask layers, color= GREEN
 - Finish: electro-less nickel immersion gold (ENIG), 0.05-0.125um Au over 3-6um Ni - over bare copper only
 - Solderability test: Category 2 of J-STD-003
 - Finished boards shall not have nicks, scratches, voids, exposed copper, poor plating or misdrilled holes
 - All holes sizes are after plating
 - PCB manufacturer may add copper thieving as needed to improve manufacturability, thieving to be 0.030" round pads at 0.050" spacing. Thieving will have a minimum of 0.100" clearance from existing copper and should not be placed under surface mounted devices
 - PCB manufacturer may use tear drops to improve annular rings as long as DRC rules are followed
 - All via connections to power and ground planes are solid
 - All unconnected pads on inner signal layers are removed
 - All finished boards are to be 100% electrically tested
 - Unless otherwise indicated, all linear toleracnes shall be XX.X +/-0.2mm and XX.XX +/- 0.1mm
 - Gerber file GM1 shows board outline (milling line)
 - Table 1 shows Layer stack details

Additional notes:

A1. Finished board thickness = 68.5mils +/- 10%; measured over top/bottom copper and solder mask

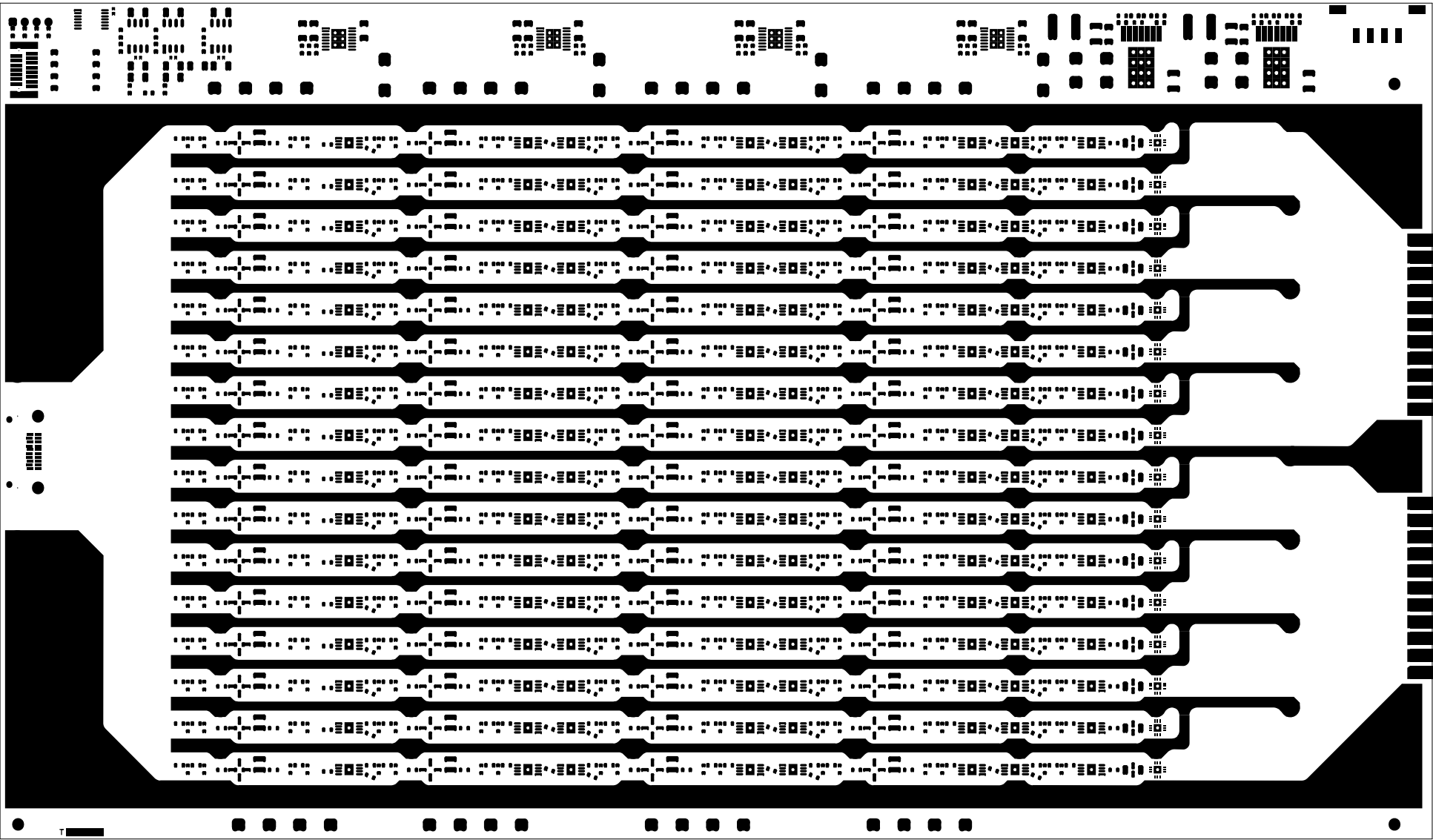
A1. Blind vias are from L1 to L2 and L5 to L6

Table 1: Layer Stack Details for IDL_15_38 Rev.A (Imperial Units)

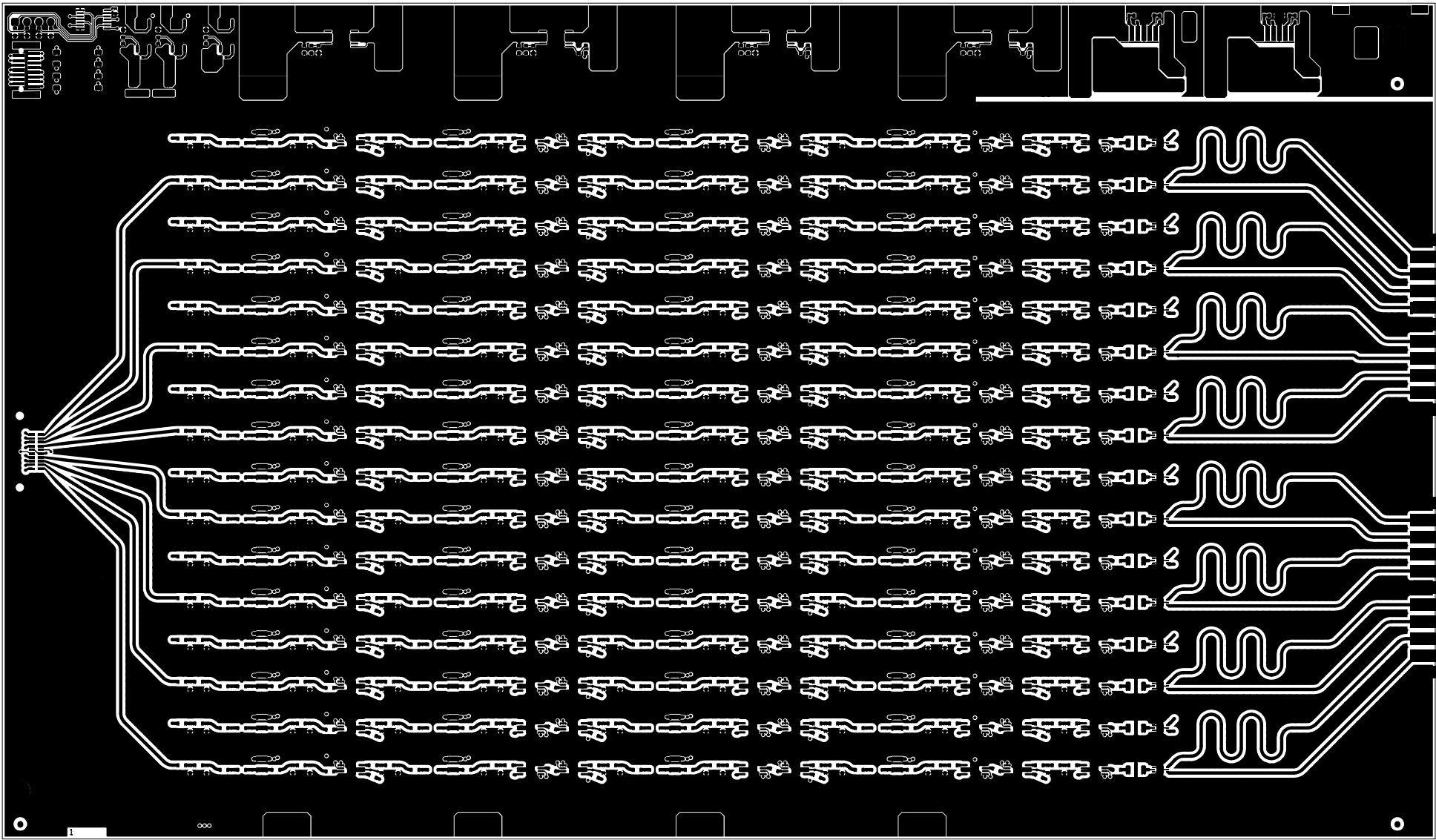
Layer	Name	Material	Thickness	Constant	Board Layer Stack
1	Top Overlay				
2	Top Solder	Solder Resist	1.50mil	3.5	
3	Top Layer - SIG1	Copper	1.38mil		
4	Dielectric 1	FR4	15.00mil	4.65	
5	Layer 2 - GND1	Copper	0.70mil		
6	Dielectric 2	FR4	9.00mil	4.65	
7	Layer 3 - SIG2	Copper	0.70mil		
8	Dielectric 3	FR4	12.00mil	4.65	
9	Layer 4 - PWR	Copper	0.70mil		
10	Dielectric 4	FR4	9.00mil	4.65	
11	Layer 5 - GND2	Copper	0.70mil		
12	Dielectric 5	FR4	15.00mil	4.65	
13	Bottom Layer - SIG3	Copper	1.38mil		
14	Bottom Solder	Solder Resist	1.50mil	3.5	
15	Bottom Overlay				

Table 2: NC Drill Details for IDL_15_38 Rev.A

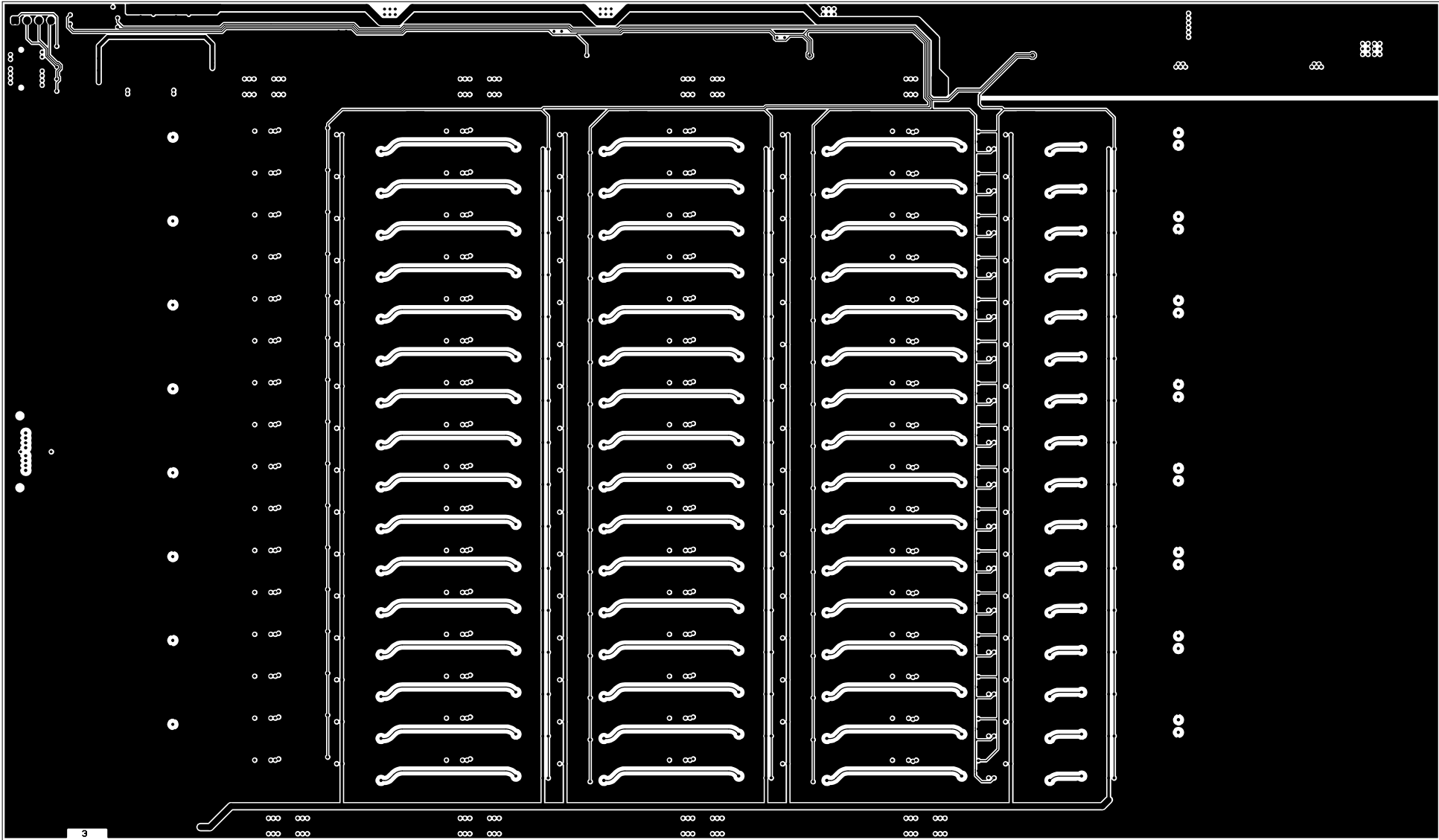
Symbol	Hil Count	Finished Hole Size	Plated	Hole Type
□	2152	0.300mm (11.81mil)	PTH	Round
	2152 Total			



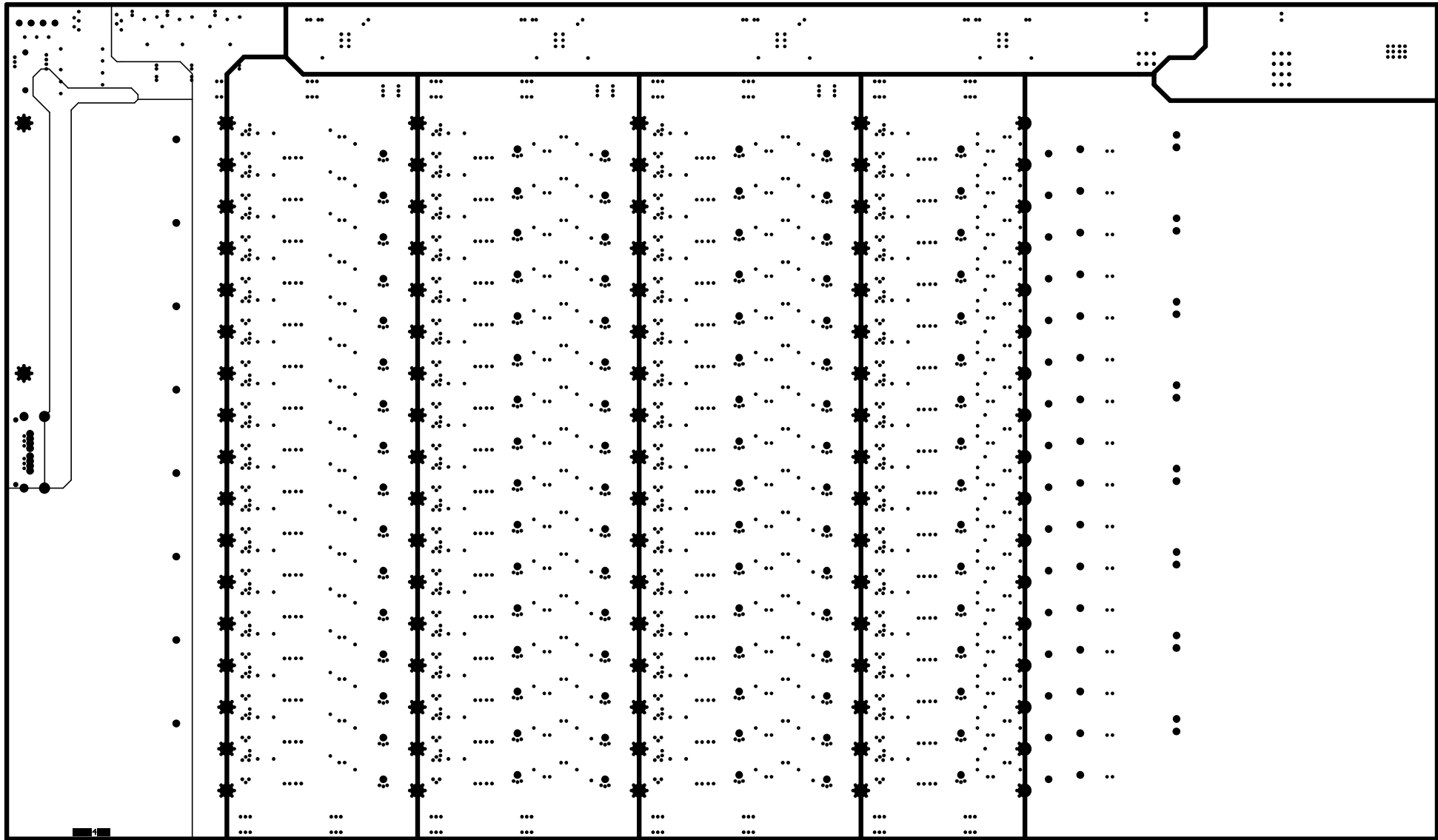
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Approved By: Gary S. Varner	Print Date: 3. nov 2015	Signature:	Size: A3 H	
Title: Top Solder Mask (GTS)				University of Hawaii at Manoa High Energy Physics Group Instrumentation Development Laboratory

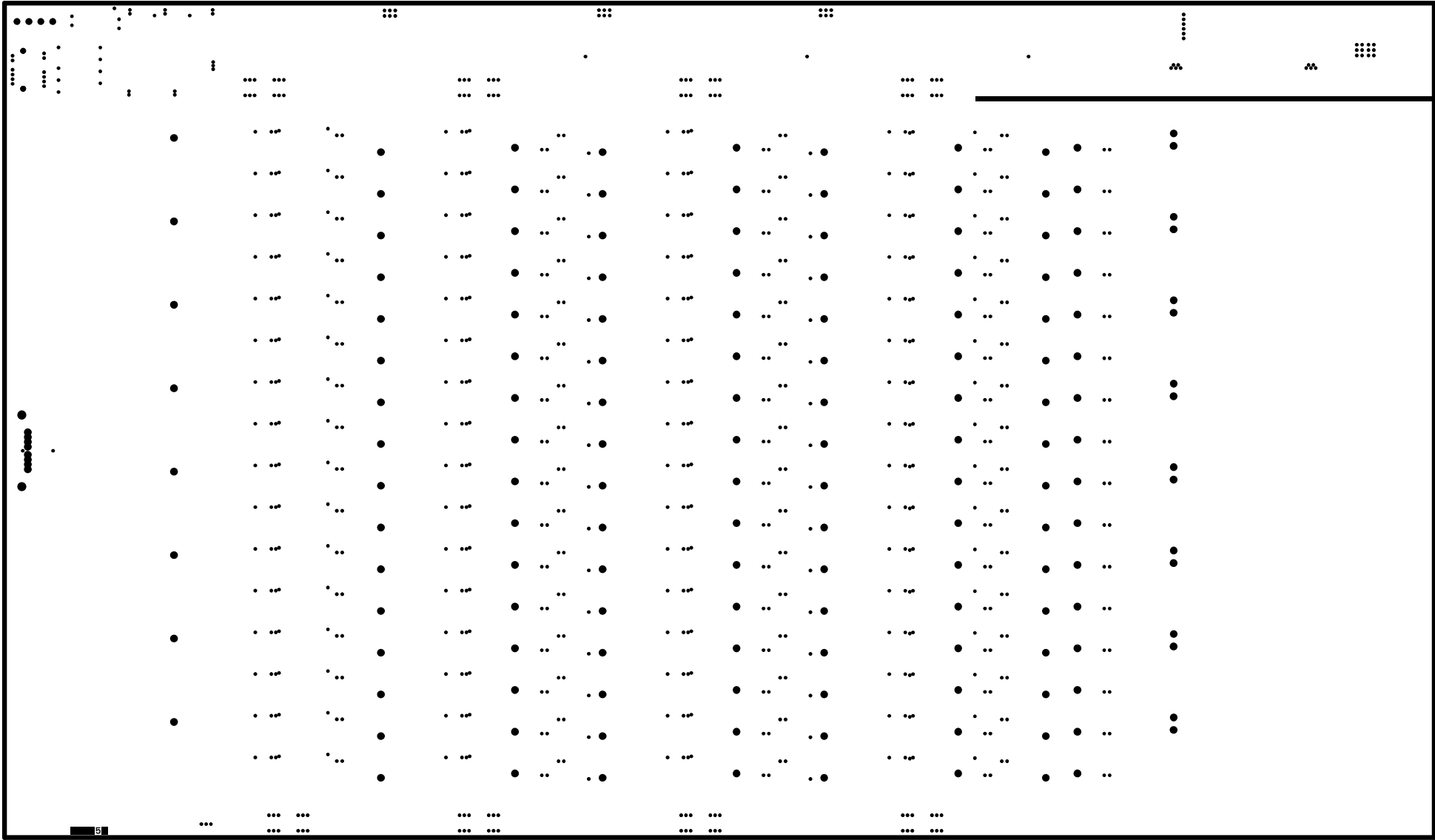


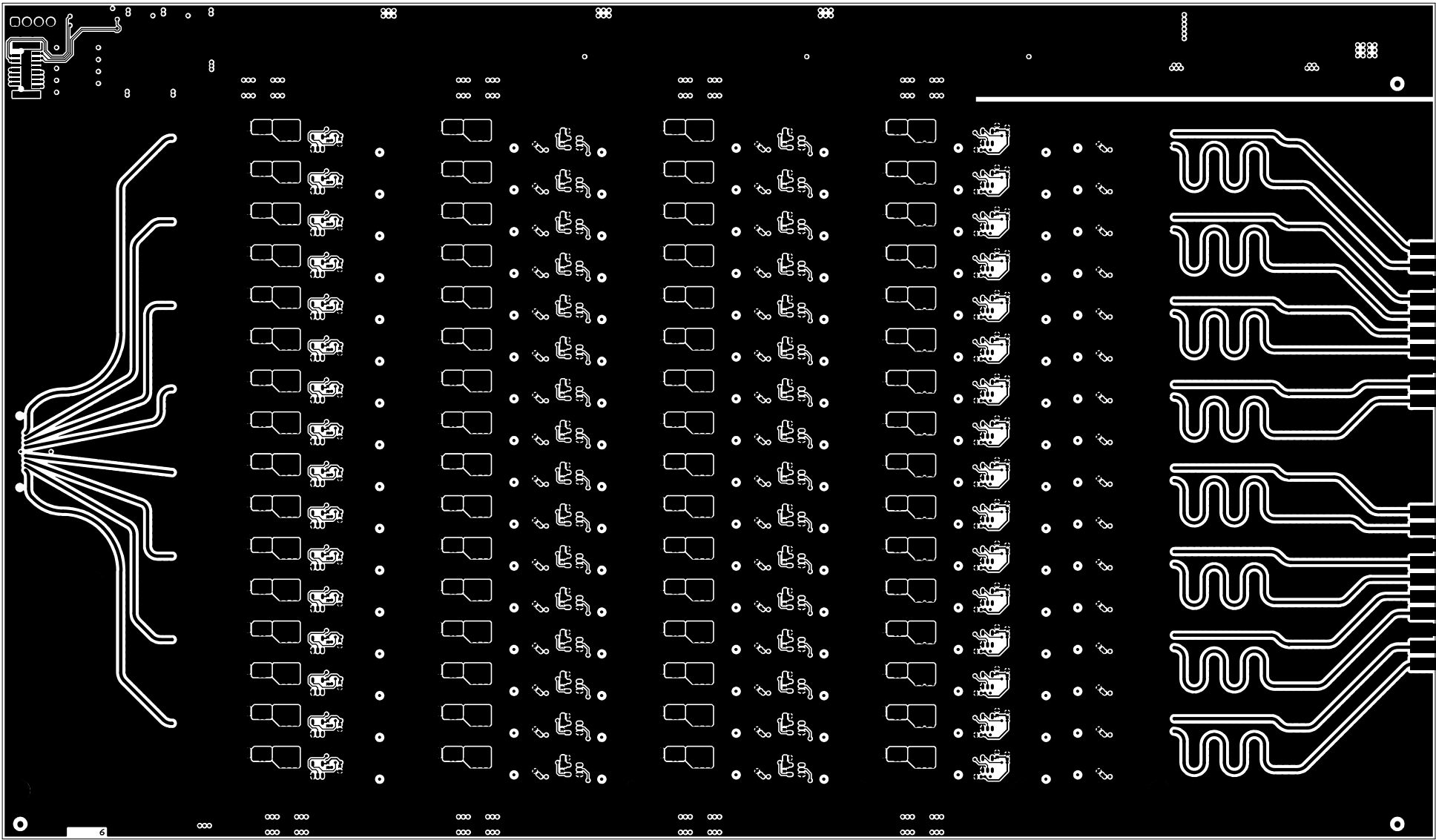
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Approved By: Gary S. Varner	Print Date: 3. nov 2015	Signature:	Size: A3 H	
Title: Top Layer- SIG1 (GTL)				University of Hawaii at Manoa High Energy Physics Group Instrumentation Development Laboratory



Designer: PO	Revision: .Version	File: IDL_15_38_A.PcbDoc	Sheet 1 of 1	Code: IDL_15_38
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Approved By: Gary S. Varner	Print Date: 3. nov 2015	Signature:	Size: A3 H	
Title: Layer 3 - SIG2 (G1)				University of Hawaii at Manoa High Energy Physics Group Instrumentation Development Laboratory







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Approved By: Gary S. Varner	Print Date: 3. nov 2015	Signature:	Size: A3 H	
Title: Bottom Layer - SIG3 (GBL)				University of Hawaii at Manoa High Energy Physics Group Instrumentation Development Laboratory

