

8		7		6		5		4		3		2		1						
1. ALL RESISTANCE VALUES ARE IN OHMS, 0.1 WATT +/- 5%. 2. ALL CAPACITANCE VALUES ARE IN MICROFARADS. 3. ALL CRYSTALS & OSCILLATOR VALUES ARE IN HERTZ.												REV	ECN	DESCRIPTION OF REVISION	CK APPD / DATE					
												2			2019-06-19					
SCHEM, MLB, X970																				
D	PAGE	CSA	CONTENTS	SYNC	DATE	PAGE	CSA	CONTENTS	SYNC	DATE	PAGE	CSA	CONTENTS	SYNC	DATE					
	1	1	MLB	ANDY	01/17/2019	51	52	I2C Connections 1	ZIFENG	02/14/2019	101	104	GPU Navi14 GDDR6 CHs A, B							
	2	2	BOM Configuration 1		08/22/2018	52	53	I2C Connections 2	ZIFENG	02/14/2019	102	105	GPU Navi14 GDDR6 CHs C, D							
	3	3	BOM Configuration 2		08/22/2018	53	54	Power Sensors High Side		01/17/2019	103	106	GPU Core Rails Controller		08/22/2018					
	4	4	PD Parts		10/14/2018	54	55	Power Sensors Load Side	RAYMOND	02/12/2019	104	107	GPU Core GFX/SOC Phases		08/22/2018					
	5	5	CPU DMI/PEG/FDI/RSVD		01/17/2019	55	56	Power Sensors Extended 1	RAYMOND	02/12/2019	105	108	GPU Memory Rails		08/22/2018					
	6	6	CPU Clock/Misc/JTAG/CFG		01/17/2019	56	57	Power Sensors Extended 2	RAYMOND	01/17/2019	106	109	GPU 1.8V / 0.75V	SEAN	08/22/2018					
	7	7	CPU DDR4 Interfaces		01/17/2019	57	58	Thermal Sensors	RAYMOND	02/12/2019	107	110	USB-C HIGH SPEED 1	YANIR	01/17/2019					
	8	8	CPU Power		01/17/2019	58	59	Power Sensor Extended 3		01/17/2019	108	111	USB-C HIGH SPEED 2	ANDY	01/17/2019					
	9	9	CPU Ground		01/17/2019	59	60	Fans/SMC/AMUX Support	ARMIN	01/17/2019	109	112	USB-C T Support	YANIR	01/17/2019					
C	10	10	CPU Decoupling 1		01/17/2019	60	62	Audio Placeholder		01/17/2019	110	113	USB-C PORT CONTROLLER TA	YANIR	01/17/2019					
	11	11	CPU Decoupling 2	ANDY	01/17/2019	61	63	Audio Jack Codec	ADRIEN	01/17/2019	111	114	USB-C PORT CONTROLLER TB	YANIR	01/17/2019					
	12	12	PCH RTC/CLK/ESPI/PM		01/17/2019	62	64	Audio Left Amplifiers	ADRIEN	01/17/2019	112	115	USB-C T CONNECTOR	YANIR	01/17/2019					
	13	13	PCH DMI/JTAG/SPI/HDA		01/17/2019	63	65	Audio Right Amplifiers	ADRIEN	01/17/2019	113	116	USBC T Connector Support	ANDY	03/26/2019					
	14	14	PCH PCI-E/USB		01/17/2019	64	66	Audio Flex Connectors	ADRIEN	01/17/2019	114	117	USB-C T 5V VR		01/17/2019					
	15	15	PCH GPIO/MISC/NCTF		01/17/2019	65	67	Keyboard Support	SHAN	01/17/2019	115	118	GPU 3.3V / Discharge	TUZMAN	09/05/2018					
	16	16	PCH Power		01/17/2019	66	68	Trackpad Support	RAYMOND	01/17/2019	116	119	GPU Sequencing & Straps	J780	08/22/2018					
	17	17	PCH Decoupling		01/17/2019	67	69	VR 3.3V G3H & Battery Conn		01/17/2019	117	120	Power Alias 1	ZIFENG	01/17/2019					
	18	18	CPU/PCH Merged XDP		01/17/2019	68	70	PBUS Supply & Battery Charger		01/17/2019	118	121	Power Alias 2		01/17/2019					
	19	19	Chipset Support 1	ARMIN	01/17/2019	69	71	IMVP IC		01/17/2019	119	122	Signal Alias		01/17/2019					
B	20	20	Chipset Support 2	ANDY	02/19/2019	70	72	IMVP VCC Block		01/17/2019	120	123	High speed No Testpoints	ANDY	01/17/2019					
	21	22	DDR4 VREF Margining		01/17/2019	71	73	IMVP SA Block		01/17/2019	121	124	DFU TEST POINTS	ANDY	01/17/2019					
	22	23	DDR4 SDRAM Channel A 1		01/17/2019	72	74	IMVP GT Block		01/17/2019	122	125	FCT TESTPOINTS 2	ANDY	01/17/2019					
	23	24	DDR4 SDRAM Channel A 2		01/17/2019	73	76	Power 5V 3.3V Supply		01/17/2019	123	126	ICT, MAC-1, & EE Testpoints	ANDY	03/26/2019					
	24	25	DDR4 SDRAM Channel B 1		01/17/2019	74	77	VR 2.5V & 1.2V/VTT		01/17/2019	124	127	Desense Caps 1	ZIFENG	08/22/2018					
	25	26	DDR4 SDRAM Channel B 2		01/17/2019	75	78	PMIC BUCKS AND Sws		01/17/2019	125	128	Desense Caps 2	ZIFENG	10/14/2018					
	26	27	DDR4 Termination		01/17/2019	76	79	PMIC LDOs	ARMIN	01/17/2019	126	129	Desense Caps 3	ZIFENG	08/22/2018					
	27	28	USB-C HIGH SPEED 1	YANIR	01/17/2019	77	80	PMIC GPIOs & Control		01/17/2019	127	130	Desense Caps 4	ZIFENG	06/05/2019					
	28	29	USB-C HIGH SPEED 2	ANDY	01/17/2019	78	81	VR VCCIO		01/17/2019	128	131	Memory Bite/Byte Swizzle		01/17/2019					
	29	30	USB-C X Support	YANIR	01/17/2019	79	82	Power FETs	ARMIN	01/17/2019	129	140	Debug	ANDY	10/14/2018					
A	30	31	USB-C PORT CONTROLLER XA	YANIR	01/17/2019	80	83	SOC/PMIC Aliases	ARMIN	01/17/2019	130	141	BOM 639 XTA		10/14/2018					
	31	32	USB-C PORT CONTROLLER XB	YANIR	01/17/2019	81	84	LCD Backlight Driver		01/17/2019	131	143	BOM 639 XLA		10/14/2018					
	32	33	USB-C X Connector	YANIR	01/17/2019	82	85	eDP Display Connector		01/17/2019	132	144	BOM 639 MISC		10/14/2018					
	33	34	USBC X Connector Support	YANIR	01/17/2019	83	86	SSD1 S4E 0		01/17/2019	133	147	BOM Alt Table		01/17/2019					
	34	35	TBT 5V REGULATOR		01/17/2019	84	87	SSD1 S4E 1		01/17/2019	134	148	More BOM Alt Table	SEAN	01/17/2019					
	35	36	WIFI/BT: Support	METE	01/17/2019	85	88	SSD1 S4E 2		01/17/2019	135	200	Dev Support		10/14/2018					
	36	37	WIFI/BT: MODULE 1	ANDY	01/17/2019	86	89	SSD1 S4E 3		01/17/2019	LAST_MODIFICATION= Tue Jun 18 17:59:51 2019									
	37	38	AP & BT Conn	ANDY	01/17/2019	87	90	SSD1 PMIC & VR		01/17/2019	OK2FAB CANDIDATE									
	38	39	SoC GPIO/SEP/USB/DDR/Test	ANDY	01/17/2019	88	91	SSD0 S4E 0		01/17/2019										
	39	40	SoC AOP/AON/SMC	ANDY	02/19/2019	89	92	SSD0 S4E 1		01/17/2019										
	40	41	SoC ISP/I2C/UART/SPI/I2S		01/17/2019	90	93	SSD0 S4E 2		01/17/2019	LAST_MODIFICATION= Tue Jun 18 17:59:51 2019									
	41	42	SoC PCIe		01/17/2019	91	94	SSD0 S4E 3		01/17/2019										
	42	43	SoC Power 1		01/17/2019	92	95	SSD0 PMIC & VR		01/17/2019	LAST_MODIFICATION= Tue Jun 18 17:59:51 2019									
	43	44	SoC Power 2		01/17/2019	93	96	GPU VRAM CHs A, B	J187_ALAN	09/18/2018										
	44	45	SoC Power 3		01/17/2019	94	97	GPU VRAM CHs C, D	J187_ALAN	09/18/2018	LAST_MODIFICATION= Tue Jun 18 17:59:51 2019									
	45	46	SoC Ground		01/17/2019	95	98	EDP Mux		08/22/2018										
	46	47	SoC Shared Support	ARMIN	01/17/2019	96	99	GPU PCC / Sensors	J780	08/22/2018	LAST_MODIFICATION= Tue Jun 18 17:59:51 2019									
	47	48	SoC Project Support	ANDY	02/19/2019	97	100	GPU Navi14 PCIe / DP A / Misc	SEAN	08/22/2018										
	48	49	MESA	ARMIN	01/17/2019	98	101	GPU Navi14 DP / GPIO / Debug		08/22/2018	LAST_MODIFICATION= Tue Jun 18 17:59:51 2019									
	49	50	SECURE ELEMENT	ANDY	02/19/2019	99	102	GPU Navi14 Power	SEAN	08/22/2018										
	50	51	DFR Support	ARMIN	01/17/2019	100	103	GPU Navi14 VSS & Decoupling		08/22/2018	LAST_MODIFICATION= Tue Jun 18 17:59:51 2019									
LAST_MODIFICATION= Tue Jun 18 17:59:51 2019																				
DRAWING TITLE: SCHEM, MLB-NAVI, X970																				
Apple Inc.												DRAWING NUMBER	051-04492	SIZE	D					
												REVISION	2.15.0							
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												PAGE	1	OF	200					
												SHEET	1	OF	135					
8		7		6		5		4		3		2		1						
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TITLE=MLB
ABBREV=ABBREV
LAST MODIFIED= Tue Jun 18 17:59:51 2019

Schematic / PCB #'s

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
051-04492	1	SCHEM, MLB-NAVI, X970	SCH	CRITICAL	SCH
820-01700	1	PCBF, MLB-NAVI, X970	PCB	CRITICAL	PCB

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TITLE=MLB
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Schematic / PCB #'s

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
051-04492	1	SCHEM, MLB-NAVI, X970	SCH	CRITICAL	SCH
820-01700	1	PCBF, MLB-NAVI, X970	PCB	CRITICAL	PCB

X970 BOM Groups

BOM GROUP	BOM OPTIONS
SSD_LANDS:6	ALTERNATE,S4E_L6
SSD_LANDS:7	ALTERNATE,S4E_L6,S4E_L7
SSD_LANDS:8	ALTERNATE,S4E_L6,S4E_L7,S4E_L8
X970_COMMON	SCH,PCB,COMMON,ALTERNATE,COMMON1,COMMON2,COMMON3,PROGPARTS
COMMON1	CPUPEG:X8X4X4,EDP:YES,BOARD_ID:0X3A,SE:DEV_2019,EN_VP0R_LPS:YES
COMMON2	PCC:YES,RF_TUNING,BOARD_REV:010,BAT_I2C:3V3
COMMON3	SKIP_5V3V3:AUDIBLE,XDP:YES,VCCSPI:3V3,SVID_PU:CORE
SNS	LOADISNS,LOADRC:YES,SENSOR:DEV
DEVEL:ENG	ALTERNATE,SNS,DBGLED,XDP_CONN,USBC_DBG,DBG_BTN,WIFI_DBG,B00TCFG0,ESPI_DBG
DEVEL:PVT	ALTERNATE,LOADRC:NO

BOM Variants

BOM NUMBER	BOM NAME	BOM OPTIONS
685-00271	COMMON PARTS,MLB-NAVI,X970	X970_COMMON
685-00308	ITLC 6L Parts,MLB-NAVI,X970	SSD_LANDS:6
685-00309	ITLC 7L Parts,MLB-NAVI,X970	SSD_LANDS:7
685-00310	ITLC 8L Parts,MLB-NAVI,X970	SSD_LANDS:8
985-00889	DEV PARTS,MLB-NAVI,X970	DEVEL:ENG
685-00296	VRAM PARTS,MICRON,4GB,MLB-NAVI,X970	VRAM:MC-4GB
685-00297	VRAM PARTS,SAMSUNG,4GB,MLB-NAVI,X970	VRAM:SS-4GB
685-00298	VRAM PARTS,HYNIX,8GB,MLB-NAVI,X970	VRAM:HY-8GB
685-00299	VRAM PARTS,MICRON,8GB,MLB-NAVI,X970	VRAM:MC-8GB
685-00300	VRAM PARTS,SAMSUNG,8GB,MLB-NAVI,X970	VRAM:SS-8GB

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
685-00271	1	COMMON PARTS,MLB-NAVI,X970	BASE	CRITICAL	BOM_BASE
685-00308	1	ITLC 6L Parts,MLB-NAVI,X970	6L	CRITICAL	SSD_BOM:6L
685-00309	1	ITLC 7L Parts,MLB-NAVI,X970	7L	CRITICAL	SSD_BOM:7L
685-00310	1	ITLC 8L Parts,MLB-NAVI,X970	8L	CRITICAL	SSD_BOM:8L
985-00889	1	DEV PARTS,MLB-NAVI,X970	DEVEL	CRITICAL	BOM_DEV

Board ID[7:0] = 8b'001111010 = 8h'3A

BOM GROUP	BOM OPTIONS
BOARD_ID:0X3A	BOARDID5,BOARDID4,BOARDID3,BOARDID1

Memory Options 内存配置表

BOM GROUP	BOM OPTIONS
MEM:HY-16GB	DRAM:HY-16GB, RAMCFG0:L
MEM:MC-16GB	DRAM:MC-16GB, RAMCFG1:L
MEM:HY-32GB	DRAM:HY-32GB, RAMCFG3:L, RAMCFG0:L
MEM:MC-32GB	DRAM:MC-32GB, RAMCFG3:L, RAMCFG1:L
MEM:MC-64GB	DRAM:MC-64GB, RAMCFG2:L, RAMCFG1:L

VRAM Options

BOM GROUP	BOM OPTIONS
VRAM:MC-4GB	VRAM_SIZE:4GB, VRAM_IC:MC-4GB
VRAM:SS-4GB	VRAM_SIZE:4GB, VRAM_IC:SS-4GB
VRAM:HY-8GB	VRAM_SIZE:8GB, VRAM_IC:HY-8GB
VRAM:MC-8GB	VRAM_SIZE:8GB, VRAM_IC:MC-8GB
VRAM:SS-8GB	VRAM_SIZE:8GB, VRAM_IC:SS-8GB

SSD Options

BOM GROUP	BOM OPTIONS
SSD:TS-256	SSD_NAND:TS-256,SOC:1GB,JTAG:L5
SSD:WD-256	SSD_NAND:WD-256,SOC:1GB,JTAG:L5
SSD:TS-512	SSD_NAND:TS-512,SOC:1GB,JTAG:L5
SSD:SS-512	SSD_NAND:SS-512,SOC:1GB,JTAG:L5
SSD:WD-512	SSD_NAND:WD-512,SOC:1GB,JTAG:L5
SSD:TS-1TB	SSD_NAND:TS-1TB,SOC:2GB,JTAG:L6,SSD_BOM:6L
SSD:WD-1TB	SSD_NAND:WD-1TB,SOC:2GB,JTAG:L6,SSD_BOM:6L
SSD:TS-2TB	SSD_NAND:TS-2TB,SOC:2GB,JTAG:L7,SSD_BOM:7L
SSD:WD-2TB	SSD_NAND:WD-2TB,SOC:2GB,JTAG:L7,SSD_BOM:7L
SSD:HY-4TB	SSD_NAND:HY-4TB,SOC:2GB,SSD_BOM:8L
SSD:WD-4TB	SSD_NAND:WD-4TB,SOC:2GB,SSD_BOM:8L
SSD:WD-8TB	SSD_NAND:WD-8TB,SOC:2GB,SSD_BOM:8L

SYNC MASTER

SYNC DATE:09/22/2018

PAGE TITLE

BOM Configuration 1

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051-04492

REVISION
2.15.0

BRANCH

PAGE
2 OF 200

SHEET
2 OF 135

SIZE
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CPU

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
337S08722	1	CPU, CFLH, SRF6U, PRQ, 2, 6, 1, 15, 6C, BGA1440	U0500	CRITICAL	CPU: 6C-2.66
337S08731	1	CPU, CFLH, SRF0D1, PRQ, 2, 3, 1, 2, 8C, BGA1440	U0500	CRITICAL	CPU: 8C-2.36
337S08724	1	CPU, CFLH, SRF0D, PRQ, 2, 4, 1, 25, 8C, BGA1440	U0500	CRITICAL	CPU: 8C-2.46
998-12472	1	INTERPOSER, CFL-H, BGA1440	U0500	CRITICAL	CPU: INTERPOSER

DRAM

Note: Two rows per part for legibility

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
333S08200	8	IC, D0R4-2666, 8GBIT, 19NM, M, 8GA78	U206, U215, U219, U235, U240, U241, U242, U243	CRITICAL	DRAM:HY-16GB
333S08200	8	IC, D0R4-2666, 8GBIT, 19NM, M, 8GA78	U206, U215, U219, U235, U240, U241, U242, U243	CRITICAL	DRAM:HY-16GB
333S09163	8	IC, D0R4-2666, 8GBIT, Z118, 18NM, M, 8GA78	U206, U215, U219, U235, U240, U241, U242, U243	CRITICAL	DRAM:MC-16GB
333S09163	8	IC, D0R4-2666, 8GBIT, Z118, 18NM, M, 8GA78	U206, U215, U219, U235, U240, U241, U242, U243	CRITICAL	DRAM:MC-16GB
333S08201	8	IC, D0R4-2666, 16GBIT, 19NM, M, 8GA78	U206, U216, U219, U235, U240, U241, U242, U243	CRITICAL	DRAM:HY-32GB
333S09291	8	IC, D0R4-2666, 16GBIT, 19NM, M, 8GA78	U206, U215, U219, U235, U240, U241, U242, U243	CRITICAL	DRAM:HY-32GB
998-18917	8	IC, D0R4-3200, 16GBIT, 16NM, ES, M, 8GA78	U206, U215, U219, U235, U240, U241, U242, U243	CRITICAL	DRAM:MC-32GB
998-18917	8	IC, D0R4-3200, 16GBIT, 16NM, ES, M, 8GA78	U206, U215, U219, U235, U240, U241, U242, U243	CRITICAL	DRAM:MC-32GB
998-18918	8	IC, D0R4-3200, 32GBIT, 16NM, ES, M, 8GA78	U206, U215, U219, U235, U240, U241, U242, U243	CRITICAL	DRAM:MC-64GB
998-18918	8	IC, D0R4-3200, 32GBIT, 16NM, ES, M, 8GA78	U206, U215, U219, U235, U240, U241, U242, U243	CRITICAL	DRAM:MC-64GB

GPU

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
337S08719	1	GPU, AMD, NAVI14, ULA, A0, ES, BGA1125	UA000	CRITICAL	GPU: ULA
337S08720	1	GPU, AMD, NAVI14, PROA, A0, ES, BGA1125	UA000	CRITICAL	GPU: PRA
998-19127	1	GPU, AMD, NAVI14, ULA, A0, ES, TDP, BGA1125	UA000	CRITICAL	GPU: TDP
998-19125	1	GPU, AMD, NAVI14, ULA, A0, ES, FF, PSL, BGA1125	UA000	CRITICAL	GPU: UFS
998-19126	1	GPU, AMD, NAVI14, ULA, A0, ES, SS, PSL, BGA1125	UA000	CRITICAL	GPU: USS
998-19109	1	GPU, AMD, NAVI14, ULA, A0, ES, FF, MTAG, BGA1125	UA000	CRITICAL	GPU: UFS
998-19110	1	GPU, AMD, NAVI14, ULA, A0, ES, SS, MTAG, BGA1125	UA000	CRITICAL	GPU: USU
998-19111	1	NAVI14 ADPTR, VDDGFX, VDDSOC, D406	UA000	CRITICAL	GPU: ADPTR_VDDCX
998-19112	1	NAVI14 ADPTR, VDDCI, MVDD, D407	UA000	CRITICAL	GPU: ADPTR_VNMEM

VRAM

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
333S00209	4	IC, GD008, 8GB1T, 14GBPS, 1.35V, 18NM, M, B6180	U9600, U9610, U9700, U9710	CRITICAL	VRAM_IC:MC-4GB
333S00210	4	IC, GD008, 8GB1T, 14GBPS, 1.35V, 18NM, S, B6180	U9600, U9610, U9700, U9710	CRITICAL	VRAM_IC:SS-4GB
333S00211	4	IC, GD008, 16GB1T, 14GBPS, 1.35V, 19NM, M, B180	U9600, U9610, U9700, U9710	CRITICAL	VRAM_IC:HY-8GB
333S00212	4	IC, GD008, 16GB1T, 14GBPS, 1.35V, 16NM, M, B180	U9600, U9610, U9700, U9710	CRITICAL	VRAM_IC:MC-8GB
333S00213	4	IC, GD008, 16GB1T, 14GBPS, 1.35V, 18NM, S, B180	U9600, U9610, U9700, U9710	CRITICAL	VRAM_IC:SS-8GB

PCH CNL-H

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
337500552	1	IC, CNL PCH-H, USFF, SR40F, PRQ, B6A499	U1200	CRITICAL	

ACE & Ridges

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
338S08041	2	IC,TBT,TITAN RIDGE DP,SLNHS,PRQ,C1, CSP937	U2800,UB000	CRITICAL	
353S01960	4	IC,CD3217,ACE2,BZ,USP PWR SM W/HV,BGA123	U3100,U3200,UB300,UB400	CRITICAL	

Power Controllers

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
353S01525	1	IC, ISL9240HIB8Z, PMU, S0UNA, WCP40, 2.1X3.3MM	U7000	CRITICAL	
353S00928	1	IC, ISL95828BA, IMVP8 CPU REG, QFN48, 6X6MM	U7100	CRITICAL	
338S00267	1	IC, PMU, CALPE, 02249A0, OTP-1A1, ESP324, 0.4P	U7800	CRITICAL	
353S02108	1	IC, RA225101A2, SV12, CONTROLLER, QFN40, 5X5	UA600	CRITICAL	
353S01660	1	IC, SUPPLY, INTERSL, ISL62778, SV12, 0. QFN48	UA800	CRITICAL	

WIFI/BT Module & Alternate

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
339S00609	1	IC, MODULE, WFI1/0T, MURATA, HARPOON, M, ES7.7, LG4385	U3730	CRITICAL	

PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
339S00610	339S00609	ANY	ALL	WIFI/BT Module

Programmable Parts

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
341S01435	1	TBT -X, R0 (VXXXX) PROTO-3, X970	U2890	CRITICAL	
341S01436	1	TBT -T, R1 (VXXXX) PROTO-3, X970	U8090	CRITICAL	
341S01434	1	ROM, BT SFLASH (V37) PROTO-3, X970	U3750	CRITICAL	
341S00725	1	WIFI ROM (V01) Ww1, X655	U3710	CRITICAL	
341S01403	1	ROM, VBIOS, NAVI-14, PR0A (VXXX) P-B-A, X970	UA130	CRITICAL	GPU: PRA
341S01404	1	ROM, VBIOS, NAVI-14, ULA (VXXX) P-B-A, X970	UA130	CRITICAL	GPU: ULA

H9M & Alternates

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
339S00373	1	POP, G18BALTAR+2GB 21NM, H, B0, SCK, CSP1406	U3900	CRITICAL	SOC:2GB
339S00371	1	POP, G18BALTAR+1GB 21NM, H, B0, ATK, CSP1406	U3900	CRITICAL	SOC:1GB

PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
339S00372	339S00373	ANY	ALL	H9M 2GB
339S00377	339S00373	ANY	ALL	H9M 2GB
339S00378	339S00373	ANY	ALL	H9M 2GB
339S00376	339S00371	ANY	ALL	H9M 1GB
339S00370	339S00371	ANY	ALL	H9M 1GB
339S00375	339S00371	ANY	ALL	H9M 1GB

SSD NAND

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
998-16395	5	NAND, 3DV4, 64GBt, S4E, 256G, T, SUB Y, SLGA110	U8600, U9100, U9200, U9300, U9400	CRITICAL	SSD_NAND: TS- 256
998-16969	5	NAND, 3DV4, 64GBt, S4E, 256G, SD, SUBY, SLGA110	U8600, U9100, U9200, U9300, U9400	CRITICAL	SSD_NAND: WD- 256
998-18397	5	NAND, 3DV4, 128GBt, S4E, 256G, T, SUBY, SLGA110	U8600, U9100, U9200, U9300, U9400	CRITICAL	SSD_NAND: TS- 512
335S00424	5	NAND, 3DV5, 128GBt, S4E, 256G, SS, SLGA110	U8600, U9100, U9200, U9300, U9400	CRITICAL	SSD_NAND: SS- 512
998-16970	5	NAND, 3DV4, 128GBt, S4E, 256G, SD, SBY, SLGA110	U8600, U9100, U9200, U9300, U9400	CRITICAL	SSD_NAND: WD- 512
335S00395	6	NAND, 3DV4, 192GBt, XXX, S4E, 256G, T, SLGA110	U8600, U8700, U9100, U9200, U9300, U9400	CRITICAL	SSD_NAND: TS- 1TB
335S00407	6	NAND, 3DV4, 192GBt, XXX, S4E, 256G, H, SLGA110	U8600, U8700, U9100, U9200, U9300, U9400	CRITICAL	SSD_NAND: WD- 1TB
335S00395	1	NAND, 3DV4, 192GBt, XXX, S4E, 256G, T, SLGA110	U8000	CRITICAL	SSD_NAND: TS- 2TB
335S00397	6	NAND, 3DV4, 320GBt, XXX, S4E, 256G, T, SLGA110	U8600, U8700, U9100, U9200, U9300, U9400	CRITICAL	SSD_NAND: TS- 2TB
335S00407	1	NAND, 3DV4, 192GBt, XXX, S4E, 256G, H, SLGA110	U8000	CRITICAL	SSD_NAND: WD- 2TB
335S00408	6	NAND, 3DV4, 320GBt, XXX, S4E, 256G, SD, SLGA110	U8600, U8700, U9100, U9200, U9300, U9400	CRITICAL	SSD_NAND: WD- 2TB
335S00380	8	NAND, 3DV4, 512GBt, S4E, 256G, H, SLGA110	U8000, U8700, U8800, U9000, U9100, U9200, U9300, U9400	CRITICAL	SSD_NAND: HY- 4TB
335S00391	8	NAND, 3DV4, 512GBt, XXX, S4E, 256G, SD, SLGA110	U8000, U8700, U8800, U9000, U9100, U9200, U9300, U9400	CRITICAL	SSD_NAND: WD- 4TB
335S00433	8	NAND, 3DV4, 1TBt, XXX, S4E, 512G, SD, SLGA110	U8000, U8700, U8800, U9000, U9100, U9200, U9300, U9400	CRITICAL	SSD_NAND: WD- 8TB

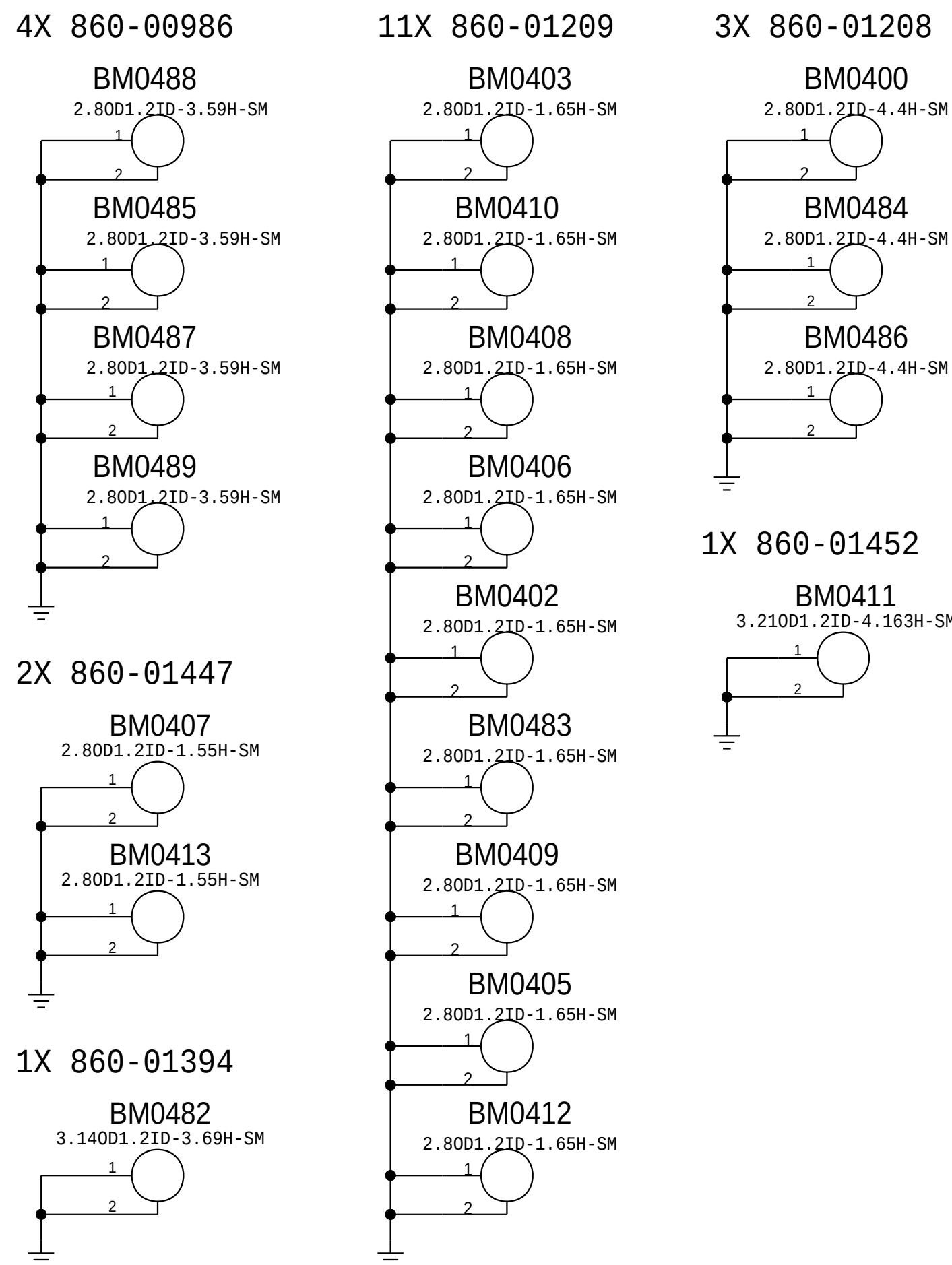
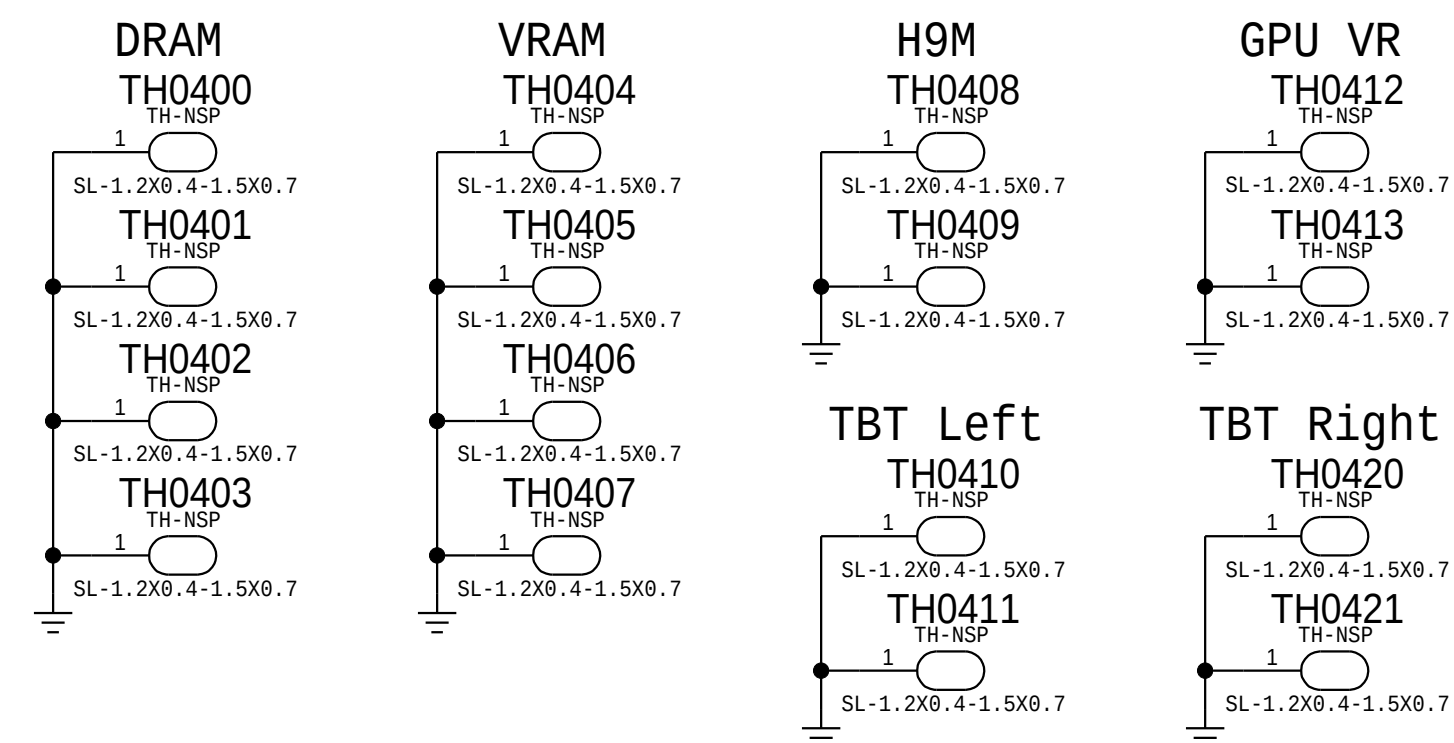
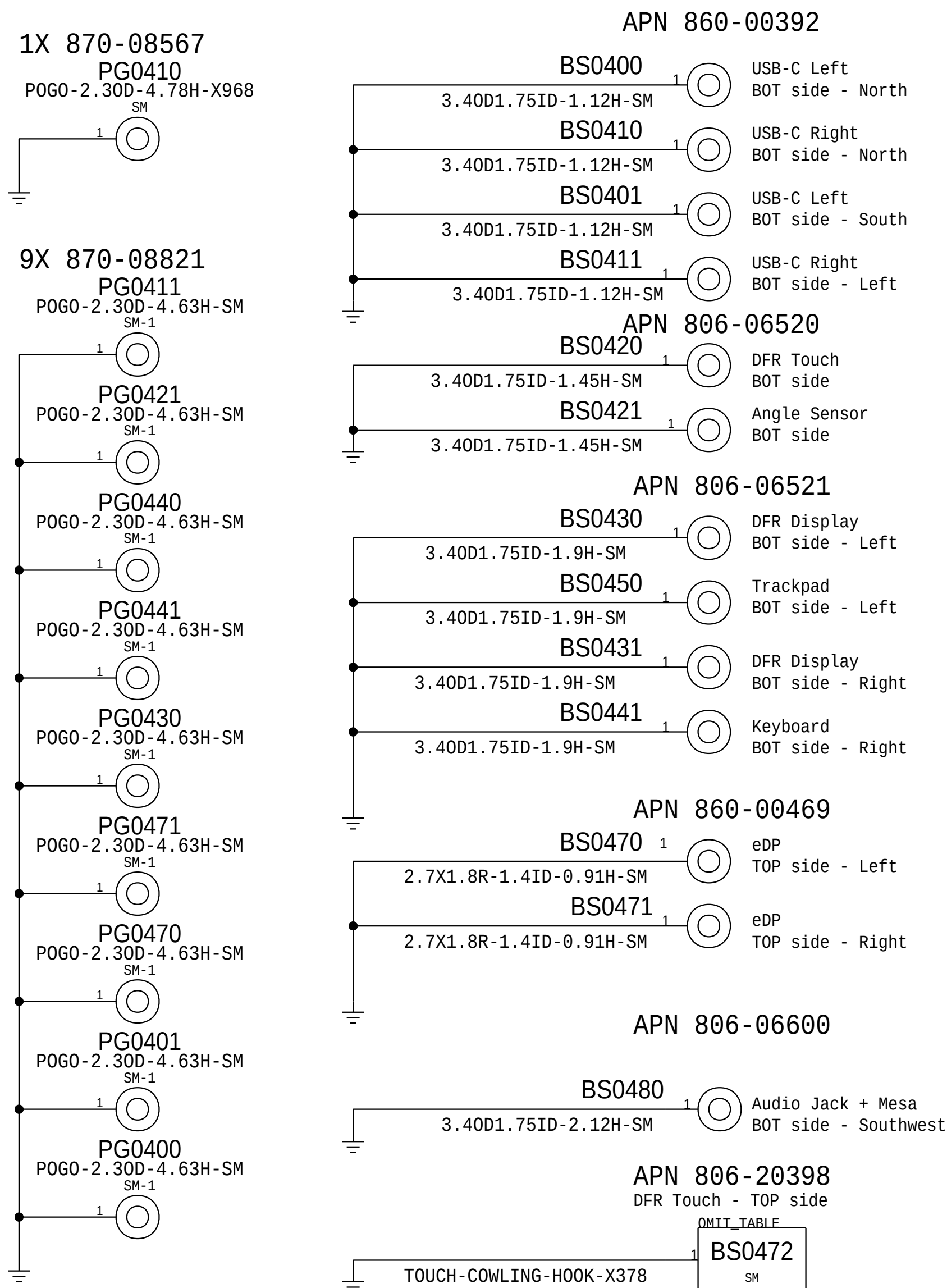
SSD NAND Substrate Alts

Sub1	Sub2			
PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
998-16394	998-16395	ANY	ALL	SSD NAND: TB_256
998-16944	998-16969	ANY	ALL	SSD NAND: WD_256
998-16396	998-16397	ANY	ALL	SSD NAND: TB_512
998-16945	998-16970	ANY	ALL	SSD NAND: WD_512

Plasma Cleaned POR

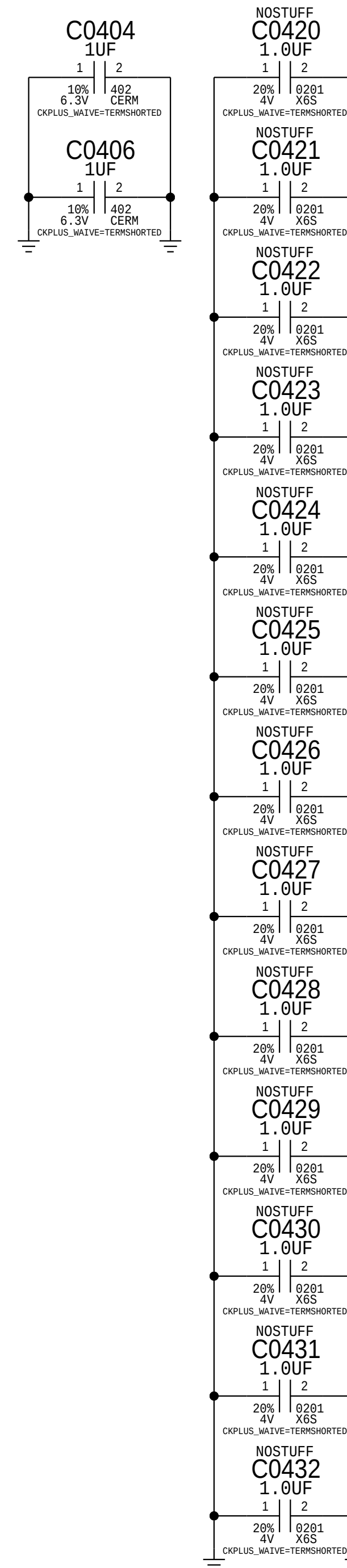
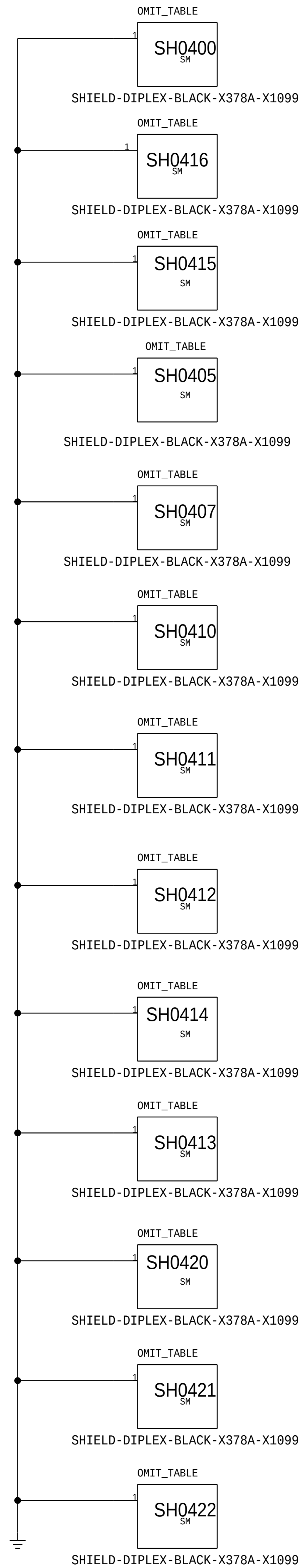
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998-18459	335S00391	ANY	ALL	SSD NAND: WD-4TB Plasma

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BOM Configuration 2			
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	PAGE		
	3 OF 200		
	SHEET		
	3 OF 135		

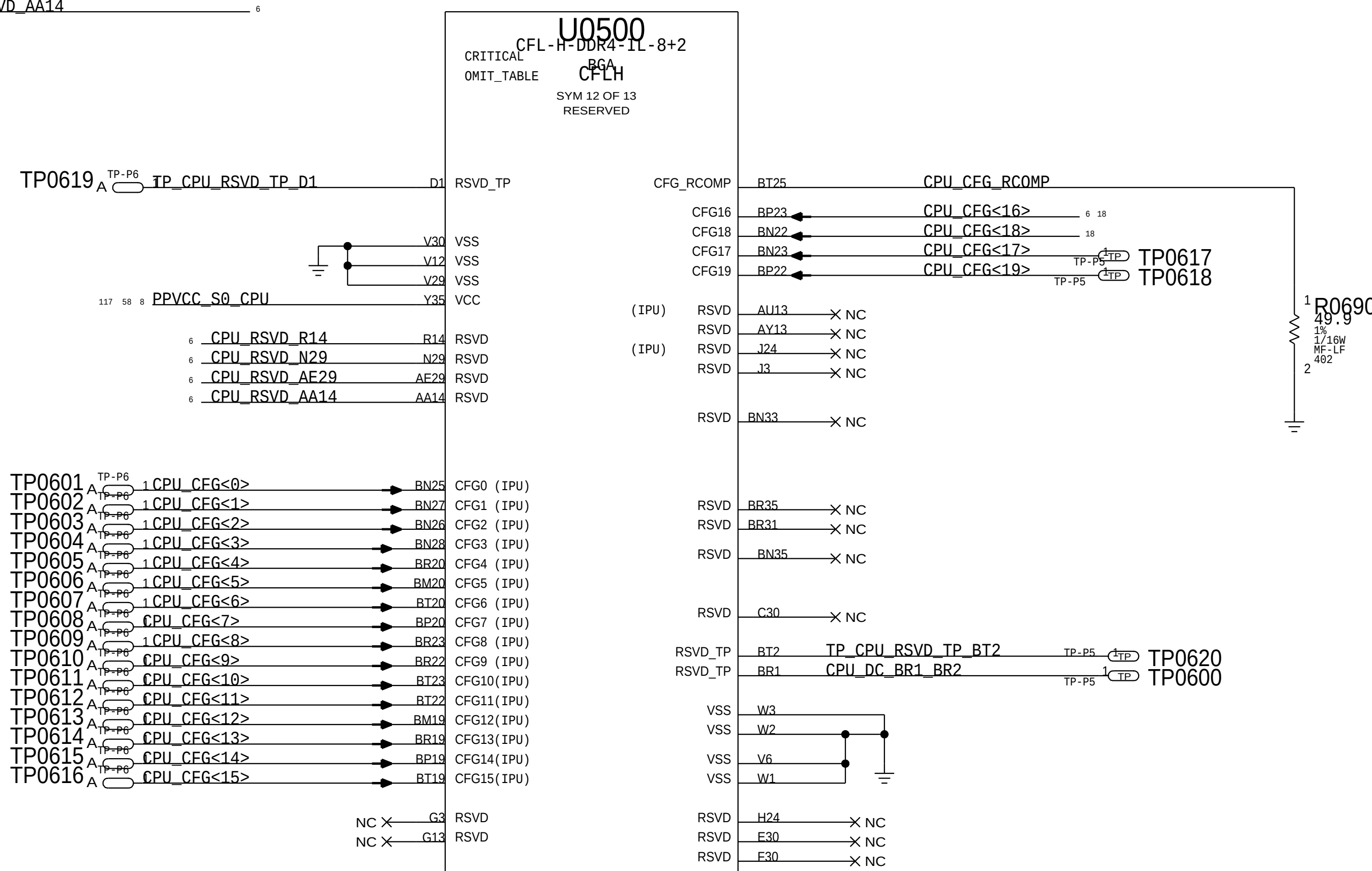
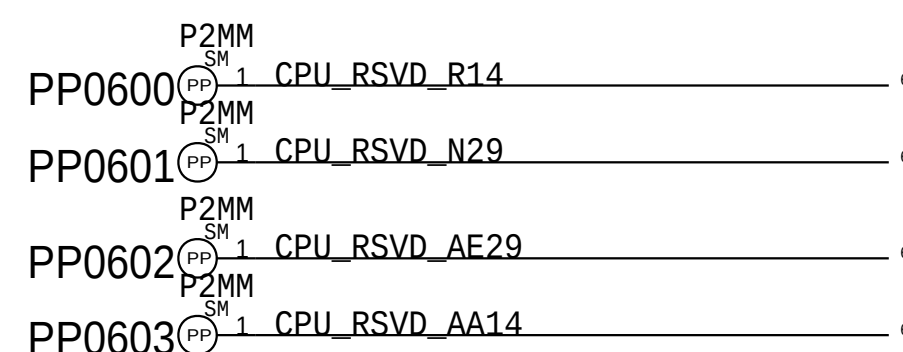
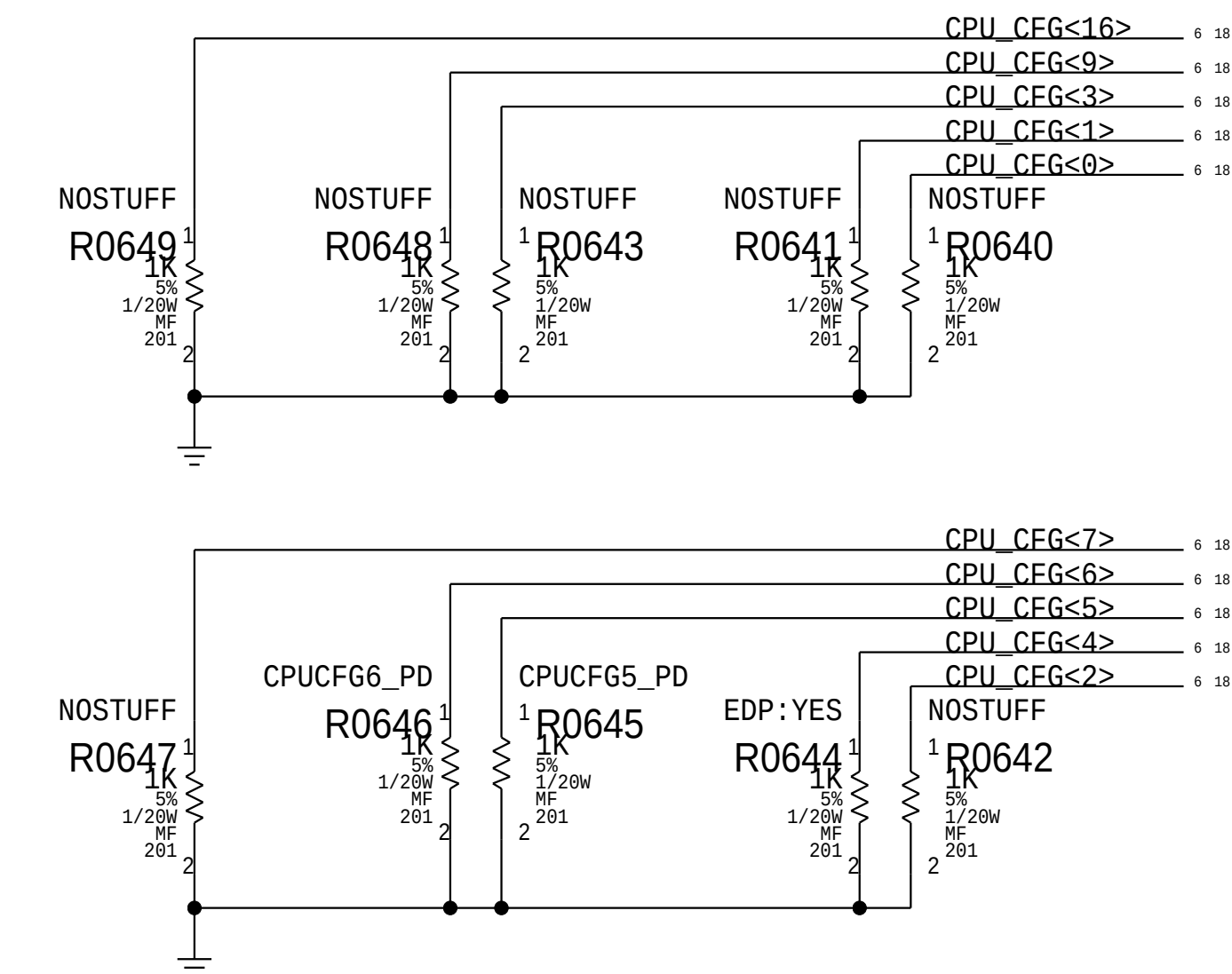
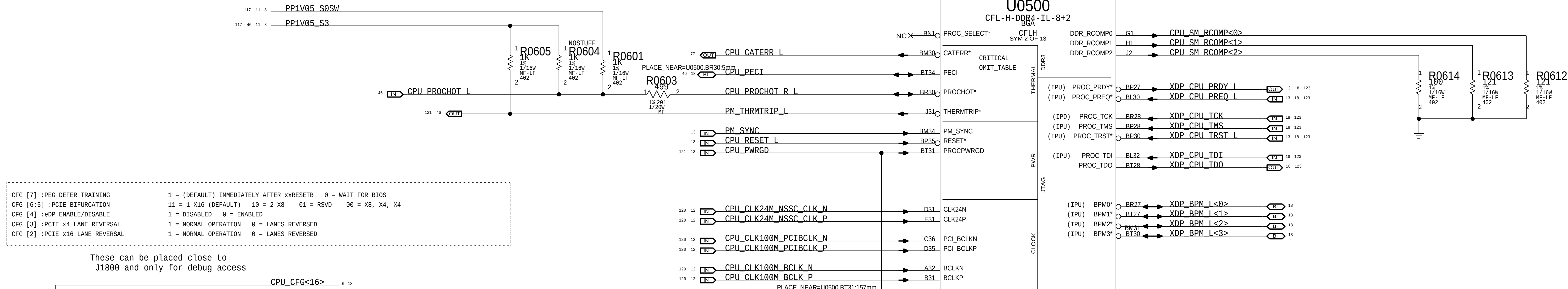


Shield Cans & Cowlings

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
806-29400	1	SHIELD, FENCE, DIPLEX, X968	SH0400	CRITICAL	
806-17111	1	SHIELD, FENCE, H9M, X1181	SH0405	CRITICAL	
806-17029	1	SHIELD, FENCE, TR, RT, X1181	SH0407	CRITICAL	
806-20399	1	SHIELD, FENCE, TR, LT, X968	SH0410	CRITICAL	
806-21174	2	SHIELD, FENCE, DRAM, X1181	SH0411, SH0412	CRITICAL	
806-15004	2	SHIELD, SLED, GPU, X1183	SH0413, SH0415	CRITICAL	
806-13997	2	SHIELD, SLED, CPU, X1181	SH0414, SH0416	CRITICAL	
806-20878	1	SHIELD, FENCE, VRAM, X968	SH0420	CRITICAL	
806-20877	1	SHIELD, FENCE, VRAM, BTM, X968	SH0421	CRITICAL	
806-20876	1	SHIELD, FENCE, GPU VR, X968	SH0422	CRITICAL	
806-20398	1	TOP MODULE TOUCH, COWLING, SMT HOOK, X968	BS0472	CRITICAL	



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PD Parts		051-04492		D	
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		PAGE		4 OF 200	
		SHEET		4 OF 135	



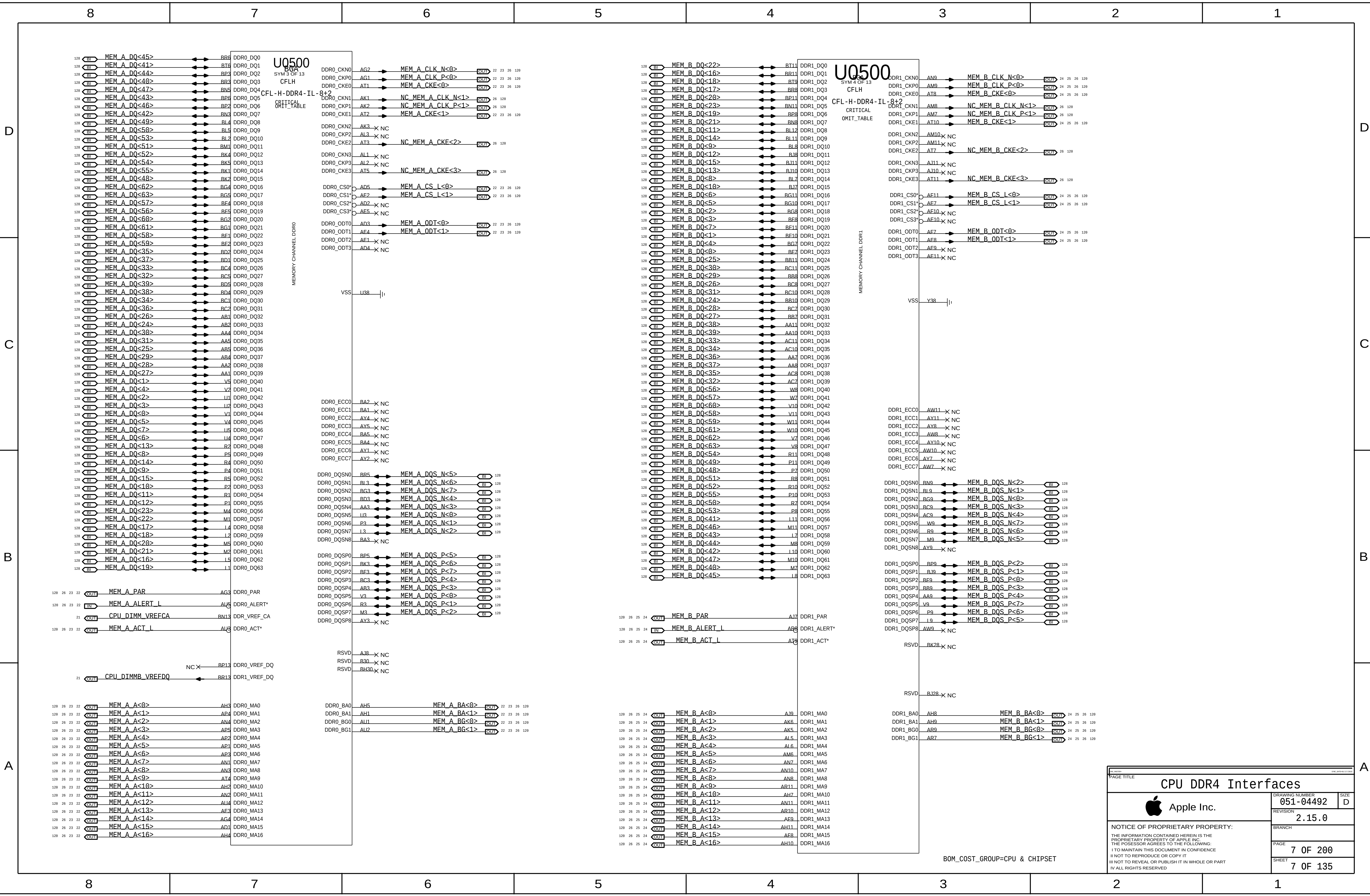
BOM GROUP	BOM OPTIONS
CPUPEG: X8X8	CPUCFG5_PD
CPUPEG: X8X4X4	CPUCFG6_PD, CPUCFG5_PD

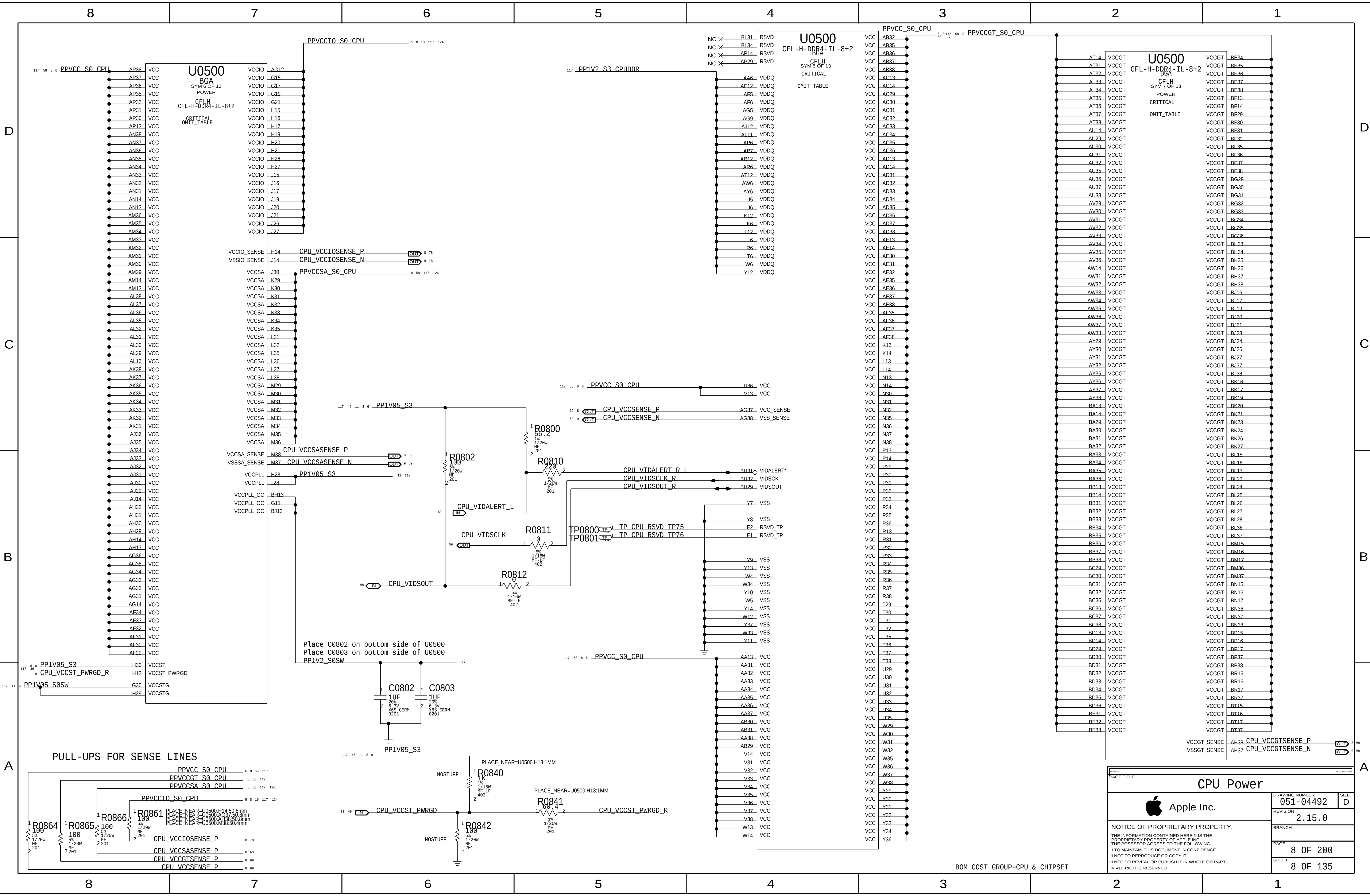
To use PEG X16 configuration, simply remove CPUPEG:X8X8 and CPUPEG:X8X4X4 from BOMs.

CFL H		
Name	Ball#	Signal Name
BN25	CFG[0]	NOA_N_0
BN27	CFG[1]	NOA_N_1
BN26	CFG[2]	NOA_N_2
BN28	CFG[3]	NOA_N_3
BR20	CFG[4]	NOA_N_4
BM20	CFG[5]	NOA_N_5
BT20	CFG[6]	NOA_N_6
BP20	CFG[7]	NOA_N_7
BR23	CFG[8]	NOA_N_8
BR22	CFG[9]	NOA_N_9
BT23	CFG[10]	NOA_N_10
BT22	CFG[11]	NOA_N_11
BM19	CFG[12]	NOA_N_12
BR19	CFG[13]	NOA_N_13
BP19	CFG[14]	NOA_N_14
BT19	CFG[15]	NOA_N_15
BN23	CFG[17]	NOA_STB_P_0
BP22	CFG[19]	NOA_STB_P_1
D1	RSVD_TP	PEG_VIEW0
E1	RSVD_TP	PEG_VIEW1
E2	RSVD_TP	PEG_VIEW3
E3	IST_TRIG	PEG_VIEW2
BT2	RSVD_TP	DDR_VIEW1
BR1	RSVD_TP	DDR_VIEW0

PAGE TITLE		DRAWING NUMBER		SIZE	
CPU Clock/Misc/JTAG/CFG		051-04492		D	
 Apple Inc.		REVISION		2.15.0	
		BRANCH			
		PAGE		6 OF 200	
SHEET		6 OF 135			

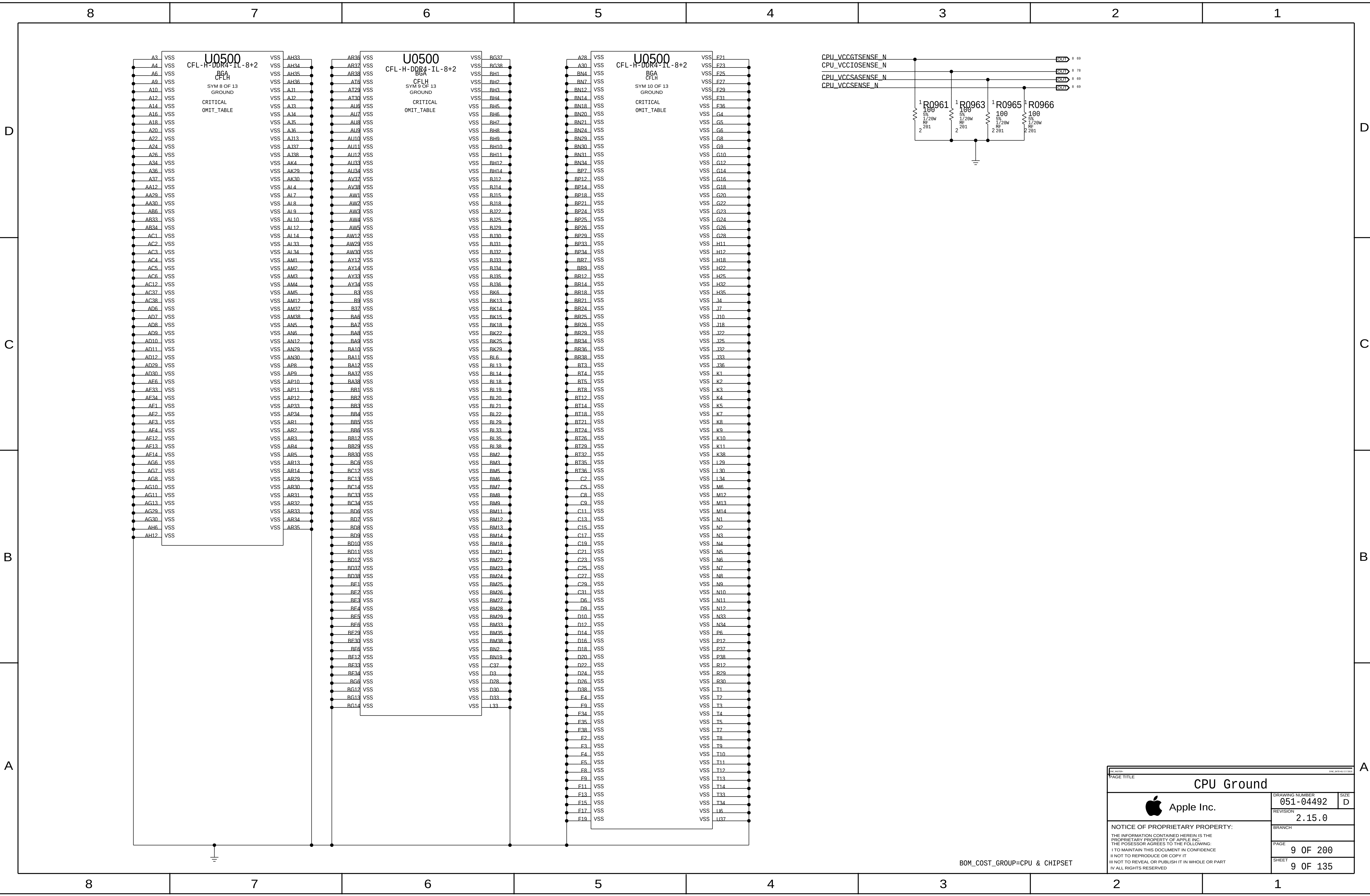
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8 OF 200		SIZE D
8 OF 135		SHEET

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SHEET	9 OF 135		

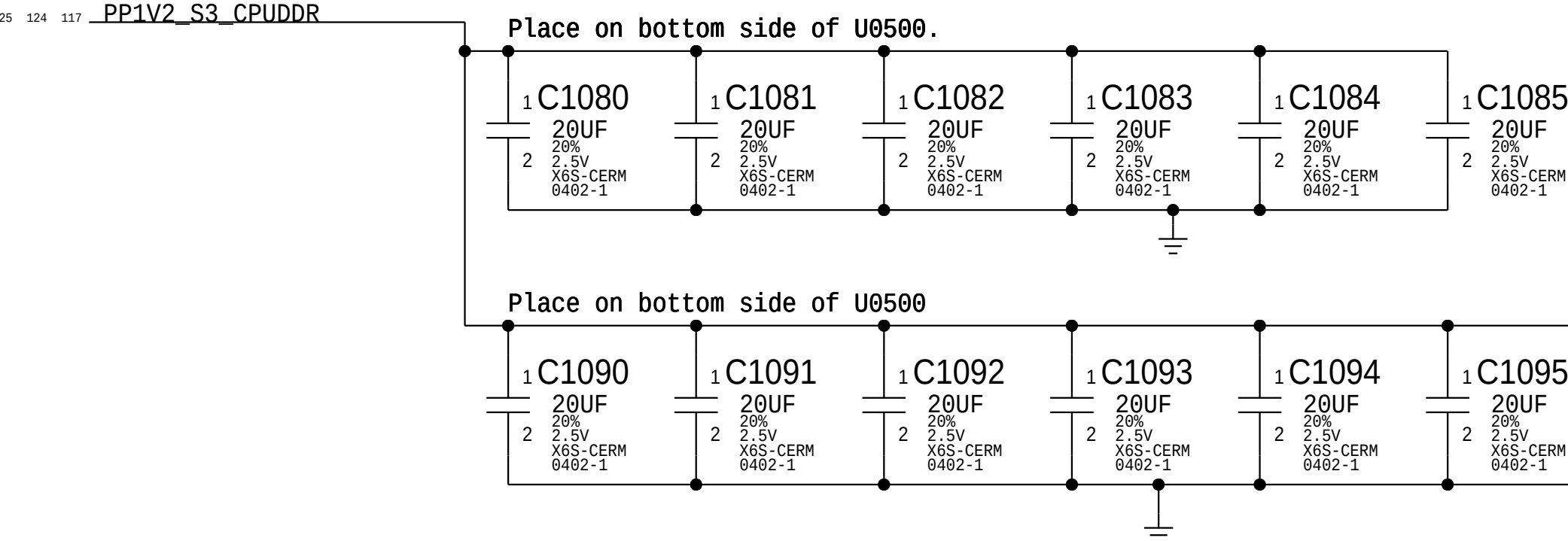
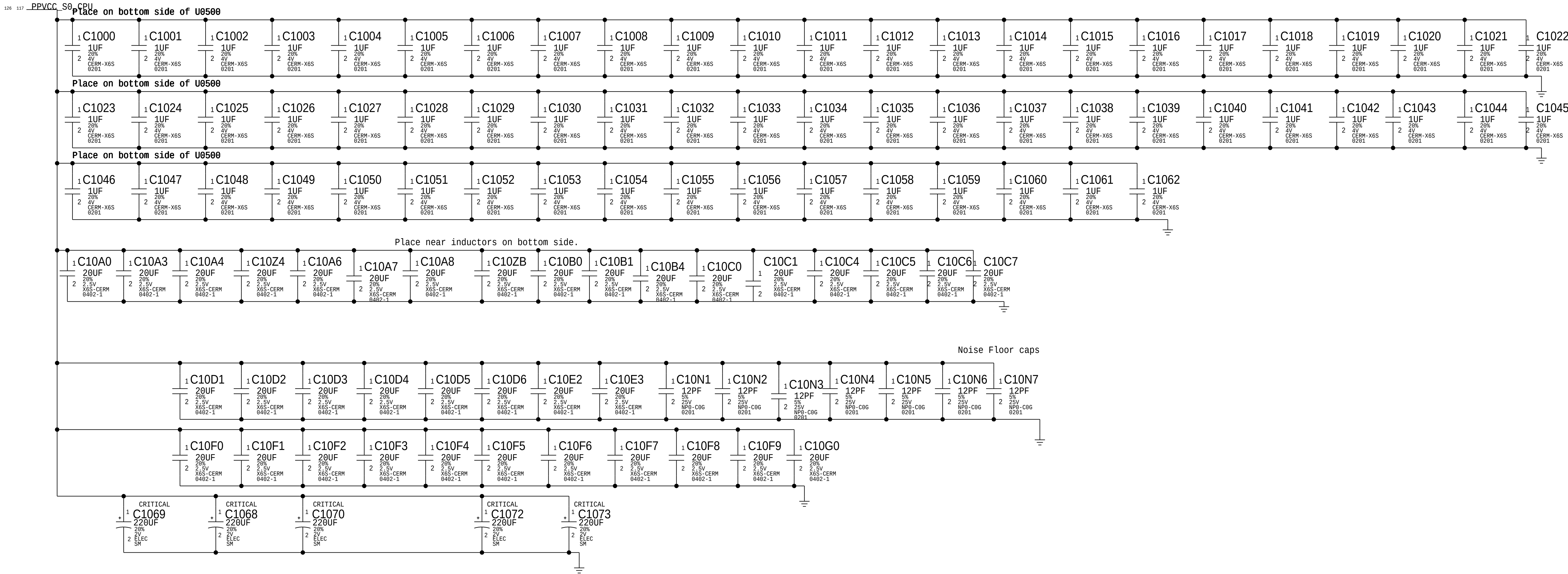
BOM_COST_GROUP=CPU & CHIPSET

CPU VCORE Decoupling

Intel recommendation: 5x 220uF ESR 5m ohms ESL 1.9nH each,4x 47uF 0805 8x22uF 0603, 28x 10uF 0402, 3x 10uF 0402, 69x 1uF 0201
Apple Implementation:

Vcc CPU Core Decoupling from 20140905 BOM

Board Edge: 2x 220uF, 4x 47uF rest on the back side



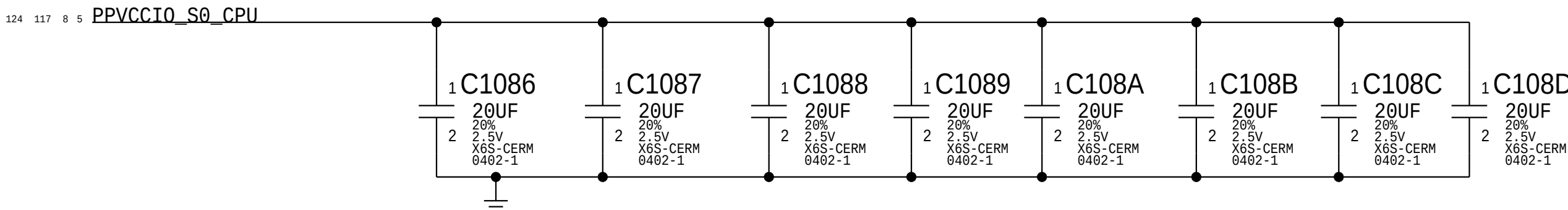
CPU VDDQ Decoupling

Intel recommendation: 10x 10uF 0402, 4x 22uF 0602
Apple Implementation:

CPU VCCIO Decoupling

Intel recommendation: 3x 10uF 0402 (opposite CPU)
Apple Implementation:

Place near U0500 on bottom side



NOTE: Intel decoupling recommendations from CBR schematics for Skylake H doc#557227 and PDG section 48.1 (document# 546884)

BOM_COST_GROUP=CPU & CHIPSET

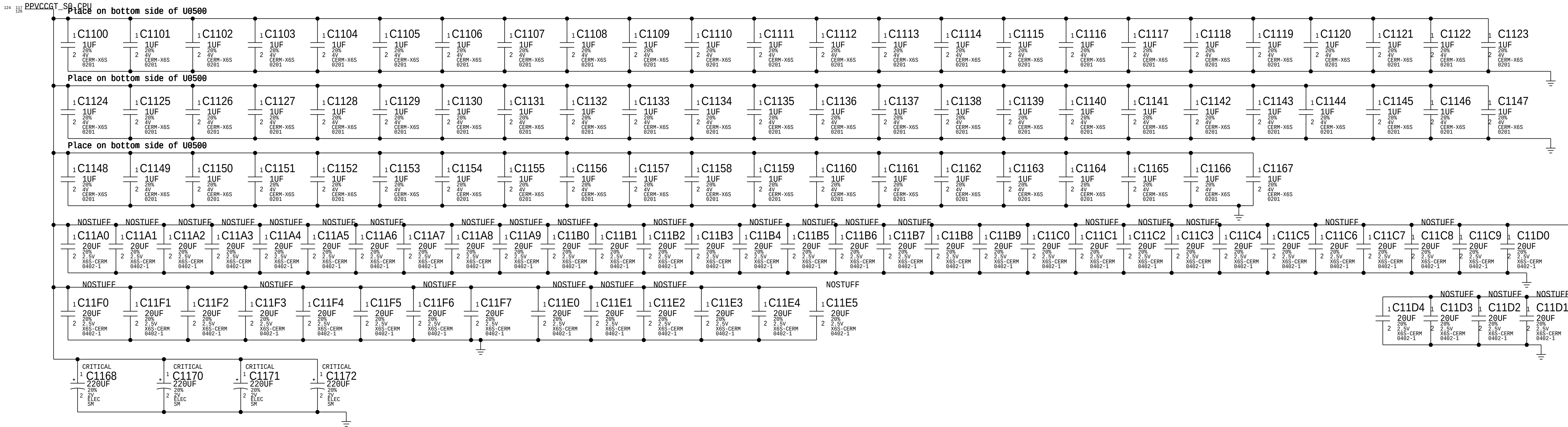
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CPU Decoupling 1		
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	PAGE	10 OF 200
	SHEET	10 OF 135

CPU VGTSlice Decoupling

Intel recommendation: 7x 220uF, 6x 47uF 0805, 6x 22uF 0603, 35x 10uF 0402, 68 1uF 0201
Apple Implementation:

Vcc GT Slice Core Decoupling from 20140905 BOM

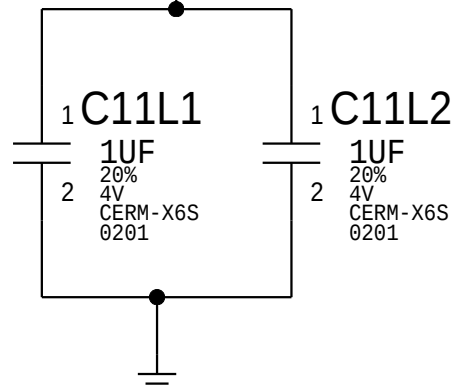
Board Edge: 4x220uF, 7x 47uF rest on back side



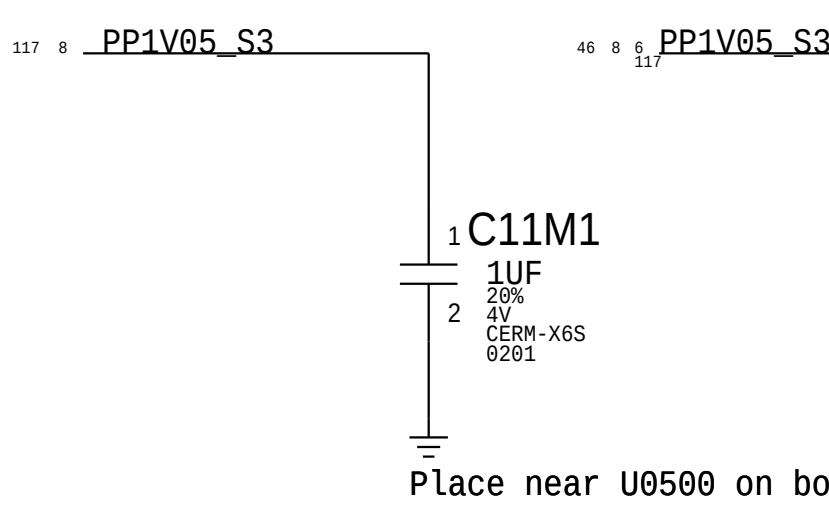
CPU VCCSTG Decoupling

117 8 6 PP1V05_S0SW

Place near U0500 on bottom side



CPU VCCPLL and VCCST Decoupling



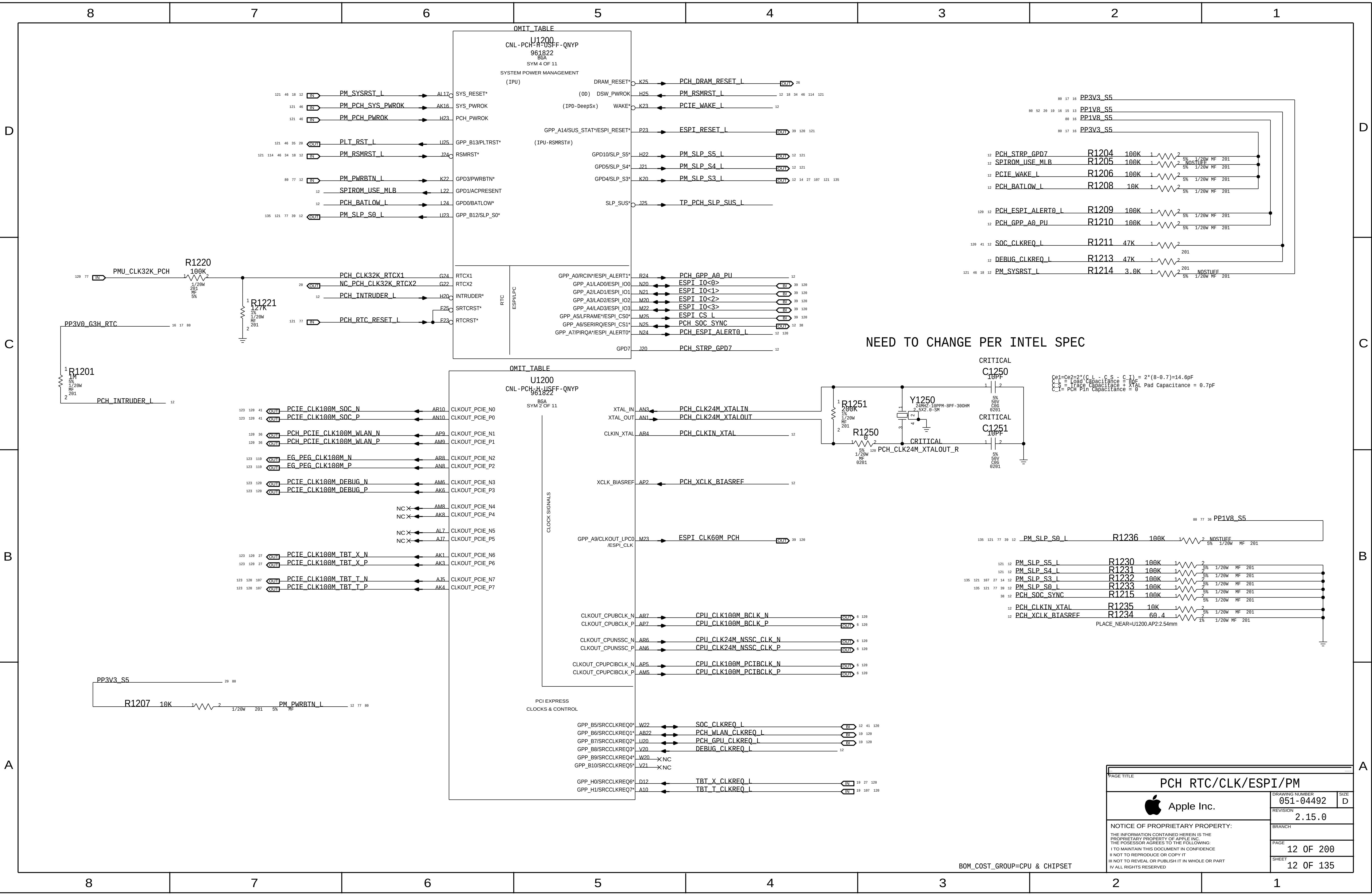
CPU VCCSA Decoupling

Intel recommendation: 2x 220uF, 1x 47uF 0805, 1x 22uF, 7x 10uF 0402, 3x 1uF 0201
Apple Implementation: 2x 220uF, 1x 22uF on board edge, everything else on back side

NOTE: Intel decoupling recommendations from CBR schematics for Skylake H doc#557227 and PDG section 48.1 (document# 546884)

BOM_COST_GROUP=CPU & CHIPSET

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CPU Decoupling 2		
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	PAGE	11 OF 200
	SHEET	11 OF 135



NEED TO CHANGE PER INTEL SPEC

$$C_{e1} = C_{e2} \cdot 2 \cdot (C_{L1} - C_{S1} - C_{L1}) = 2 \cdot (8 - 0.7) = 14.6 \text{ pF}$$

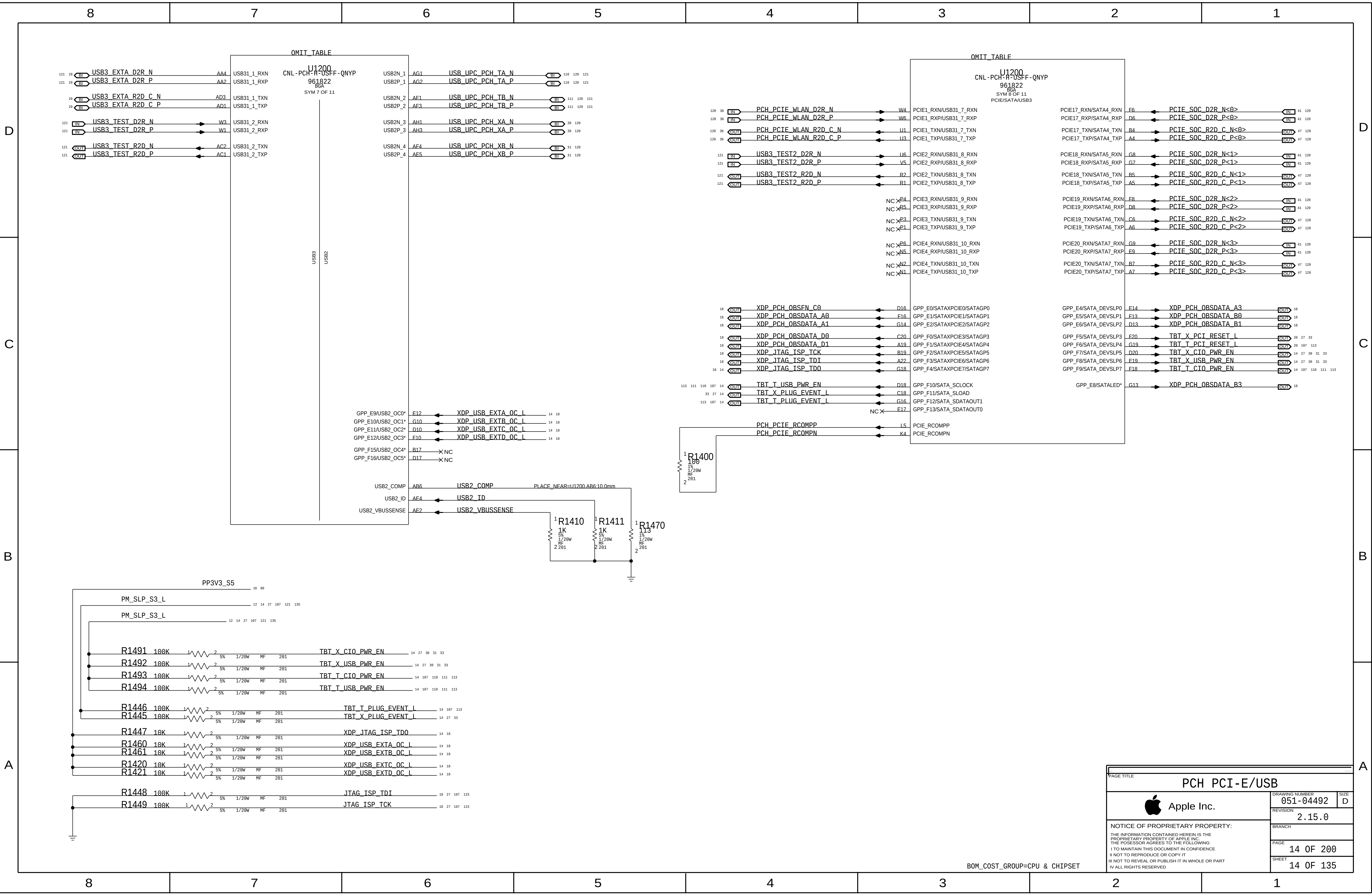
$$C_{L1} = \text{Load Capacitance} = 80 \text{ pF}$$

$$C_{S1} = \text{Trace Capacitance} + \text{XTAL Pad Capacitance} = 0.7 \text{ pF}$$

$$C_{L1} = \text{PCH Pin Capacitance} = 0$$

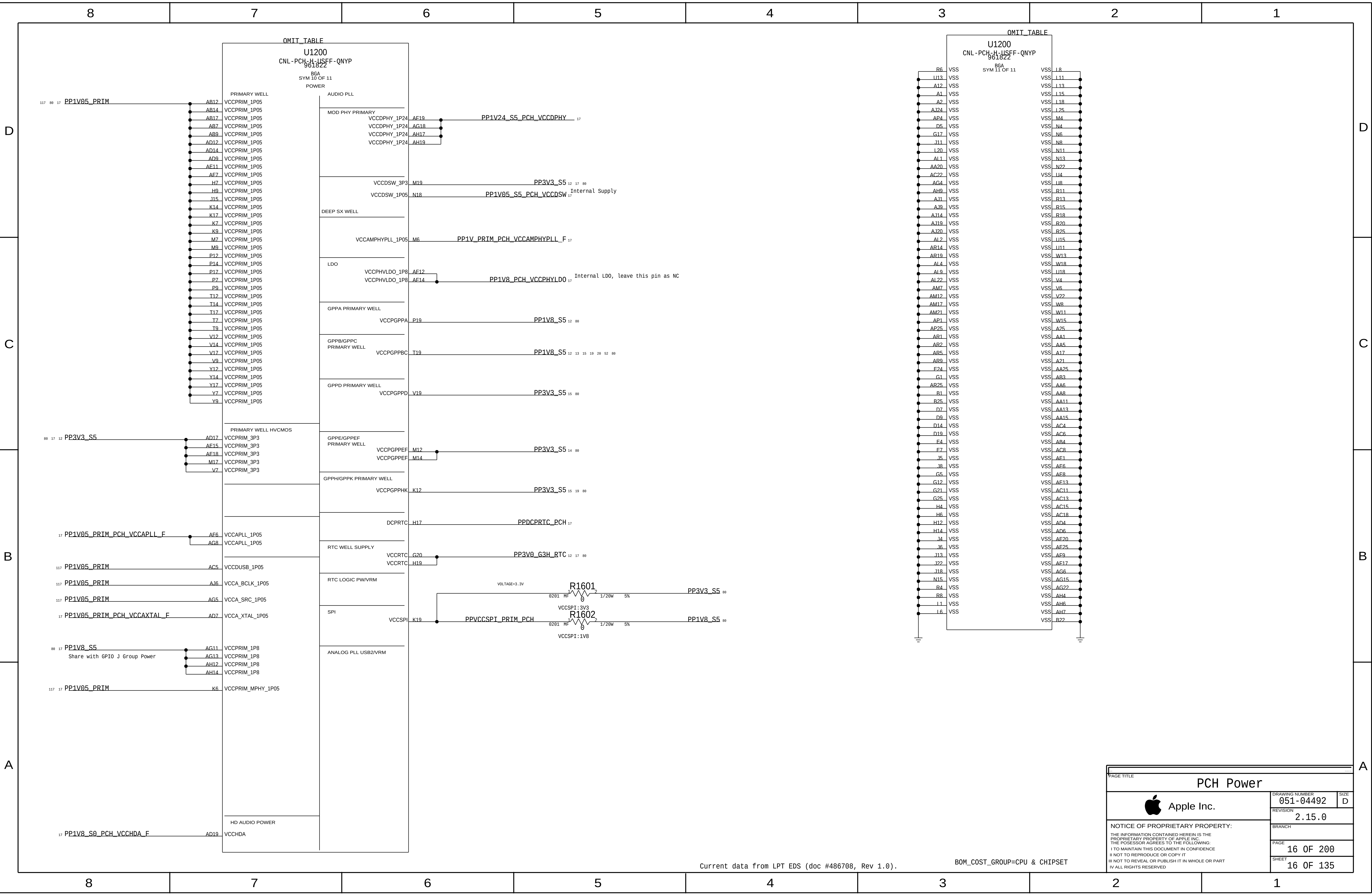
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PCH RTC/CLK/ESPI/PM		
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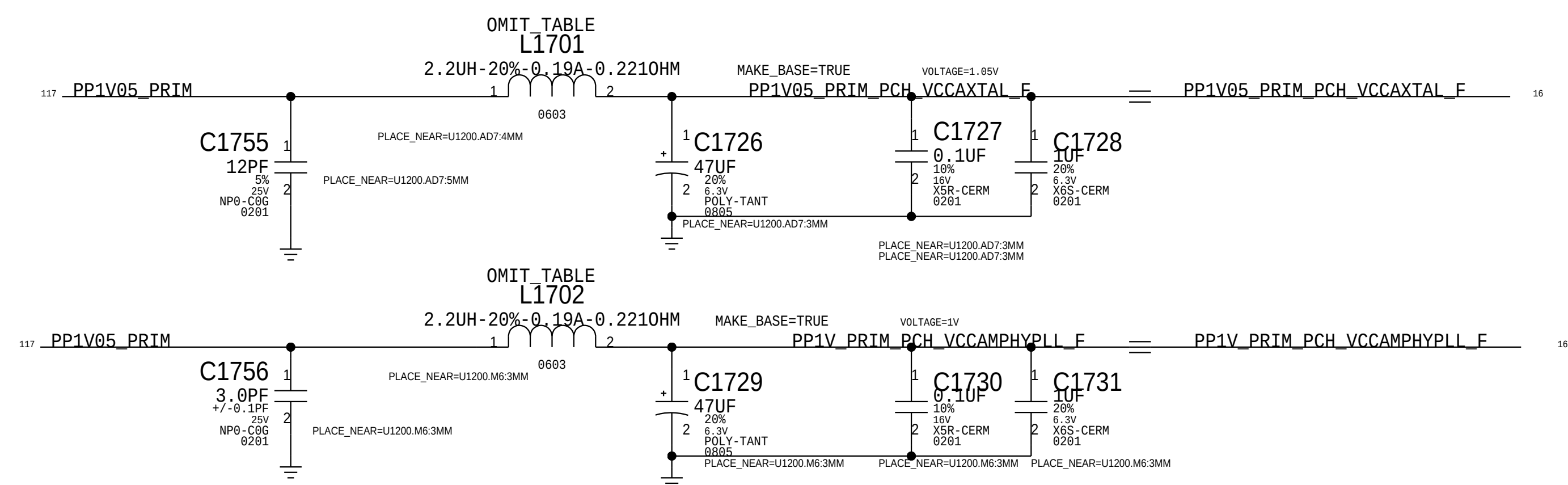
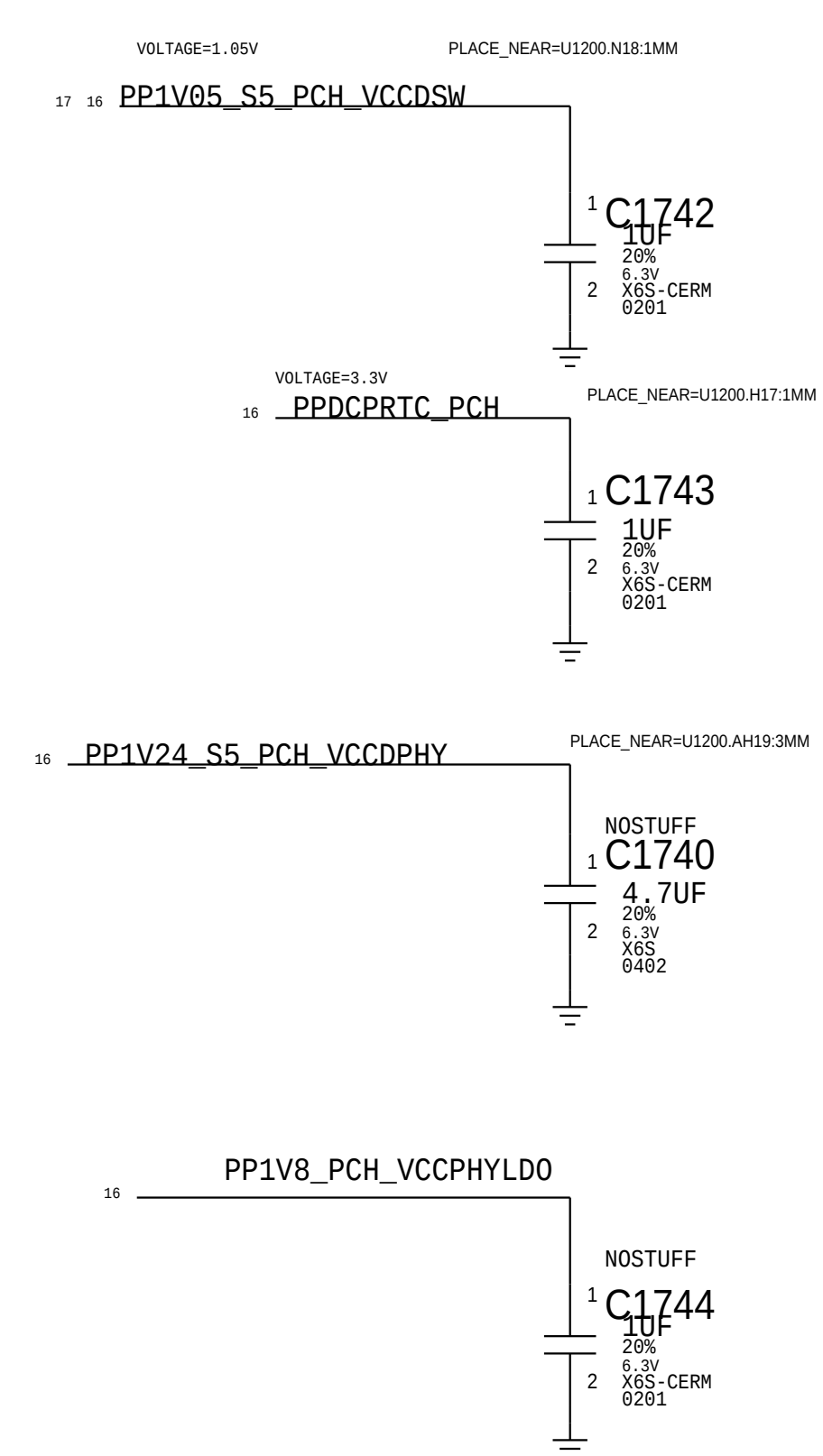
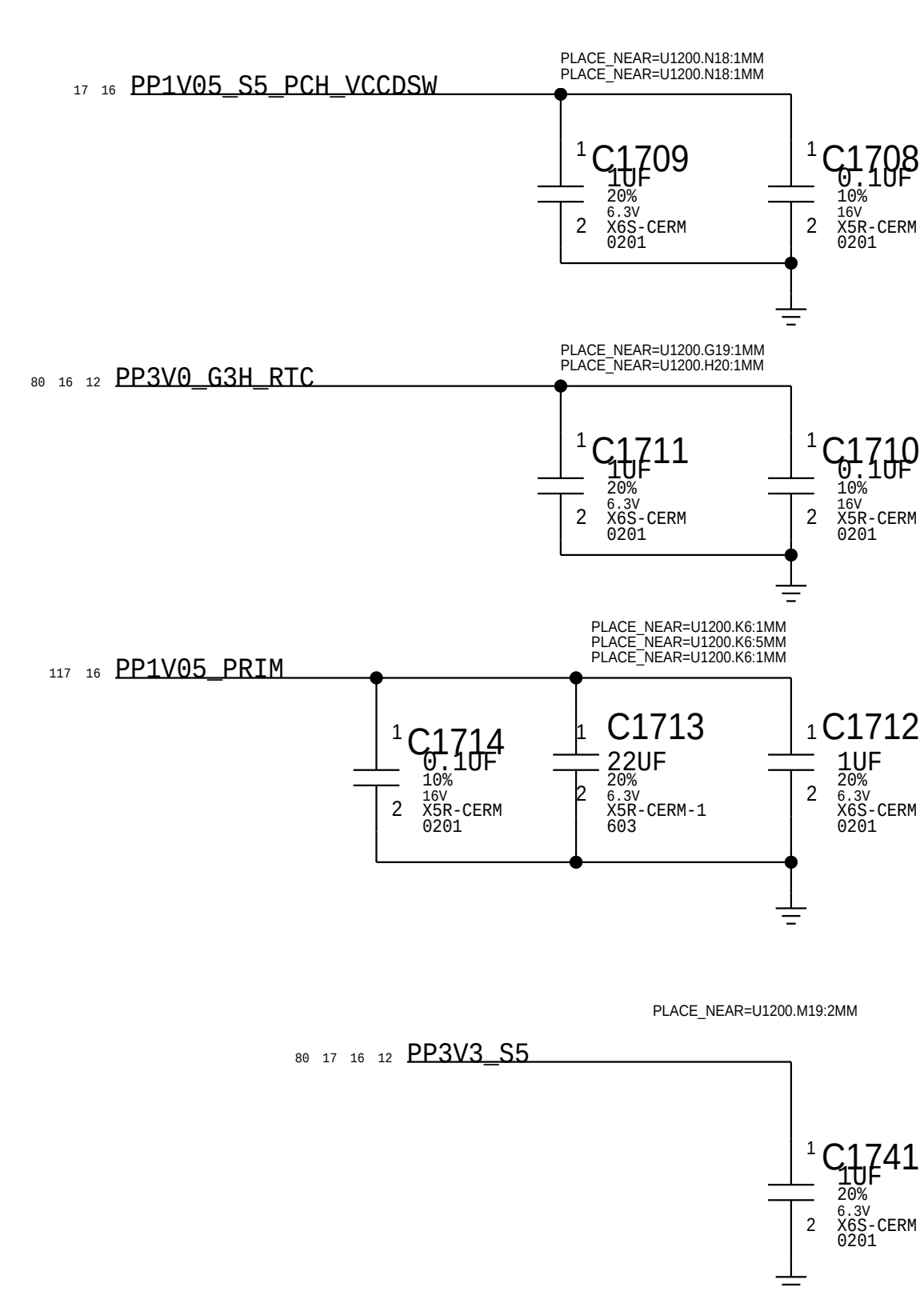
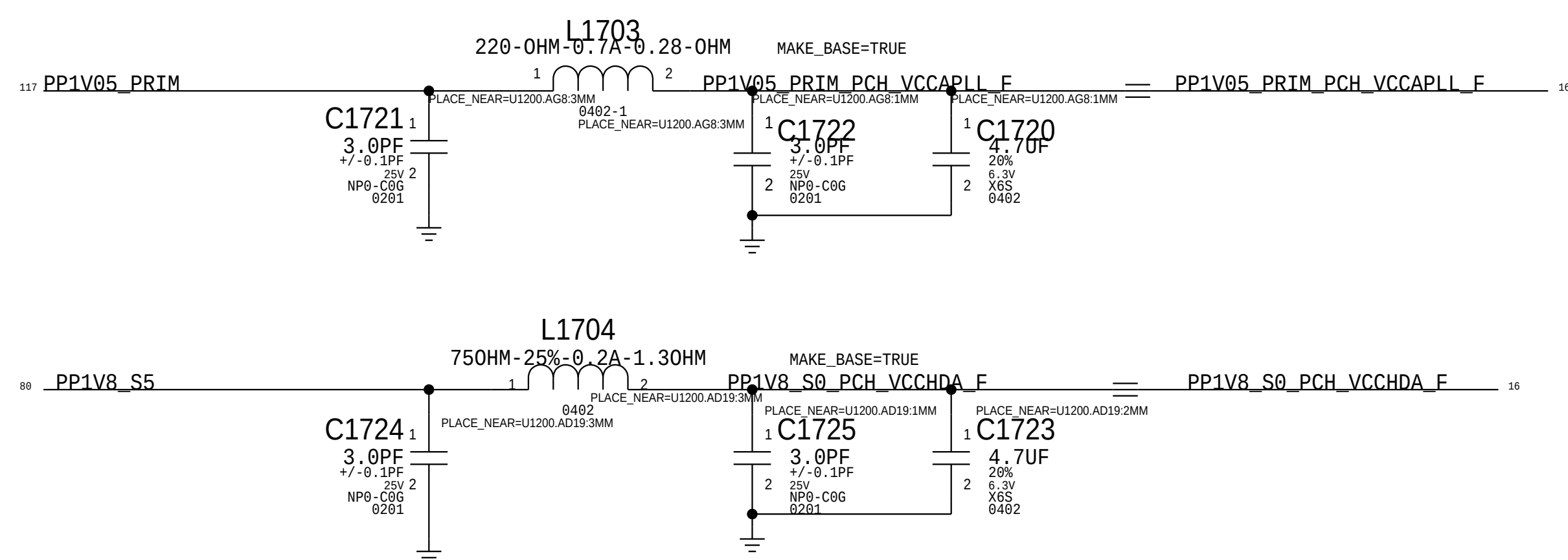
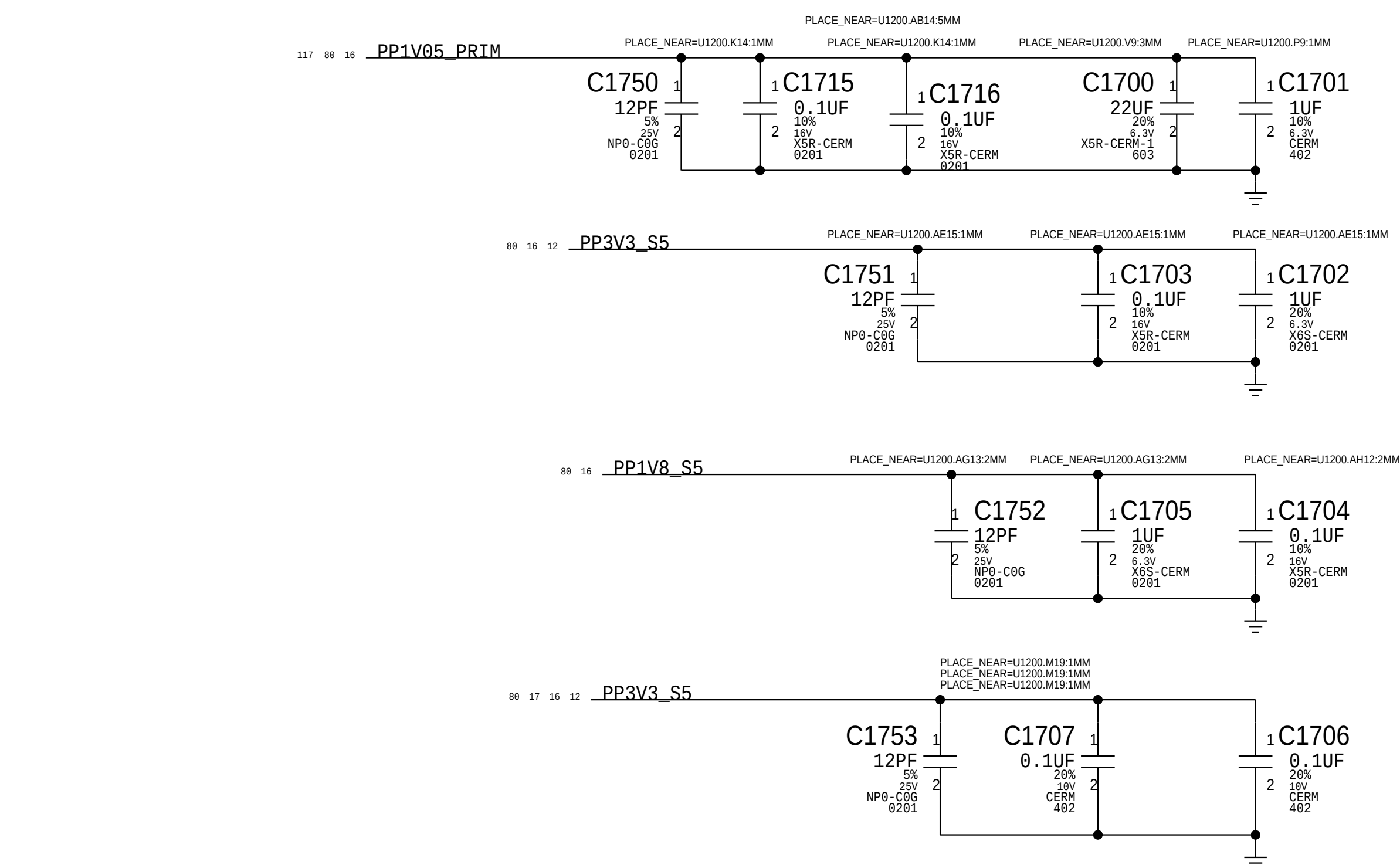


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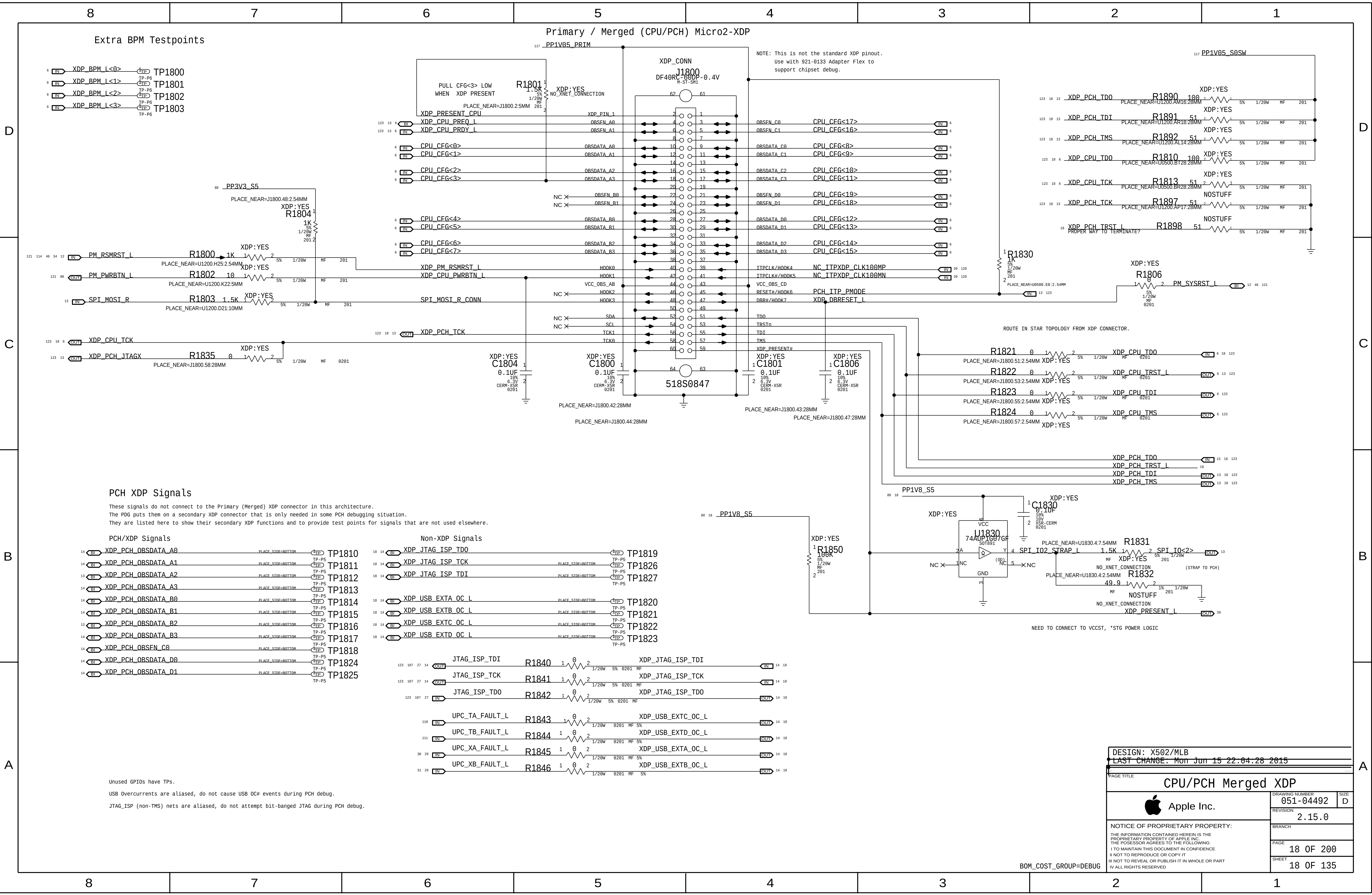


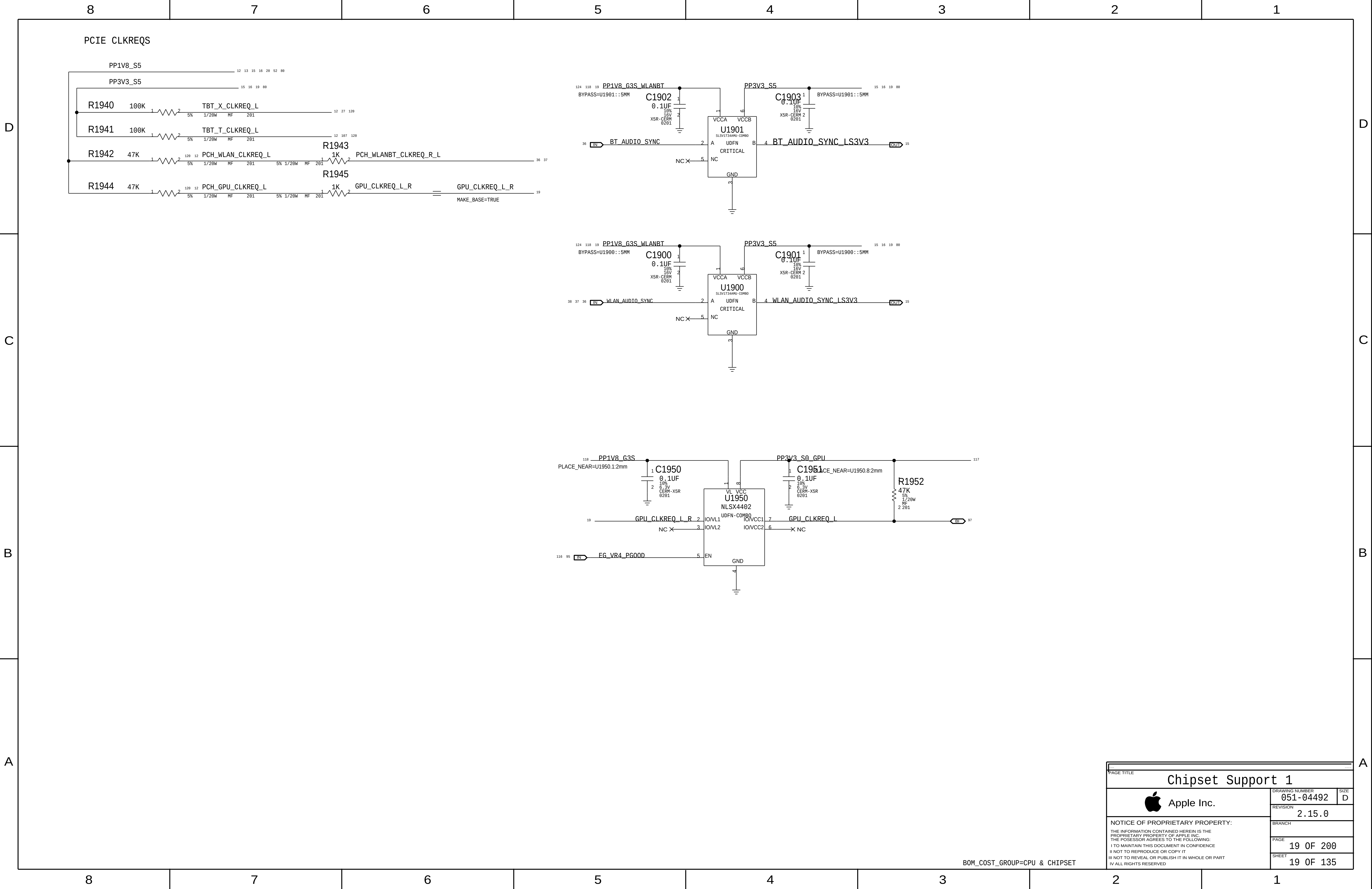
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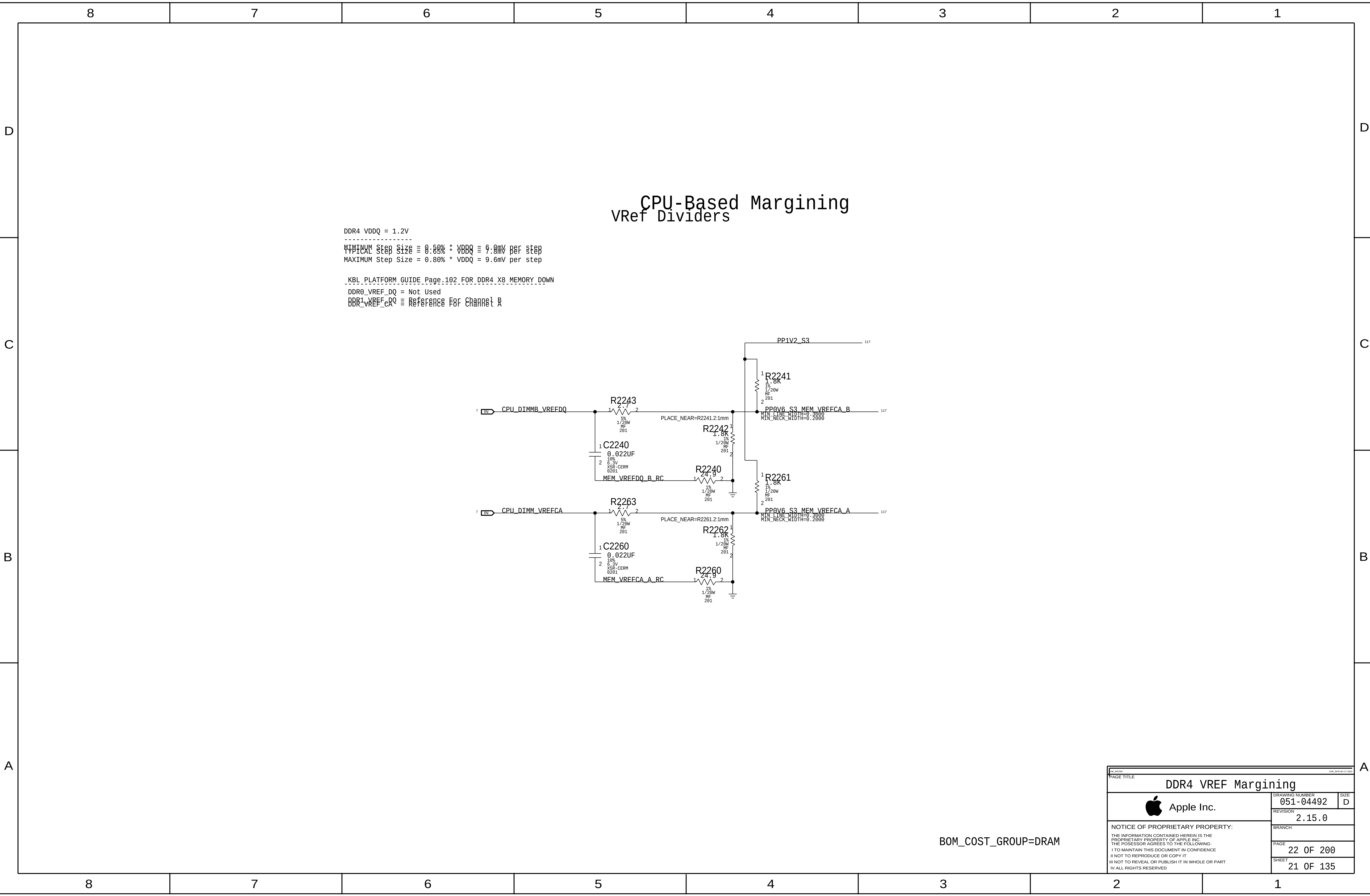


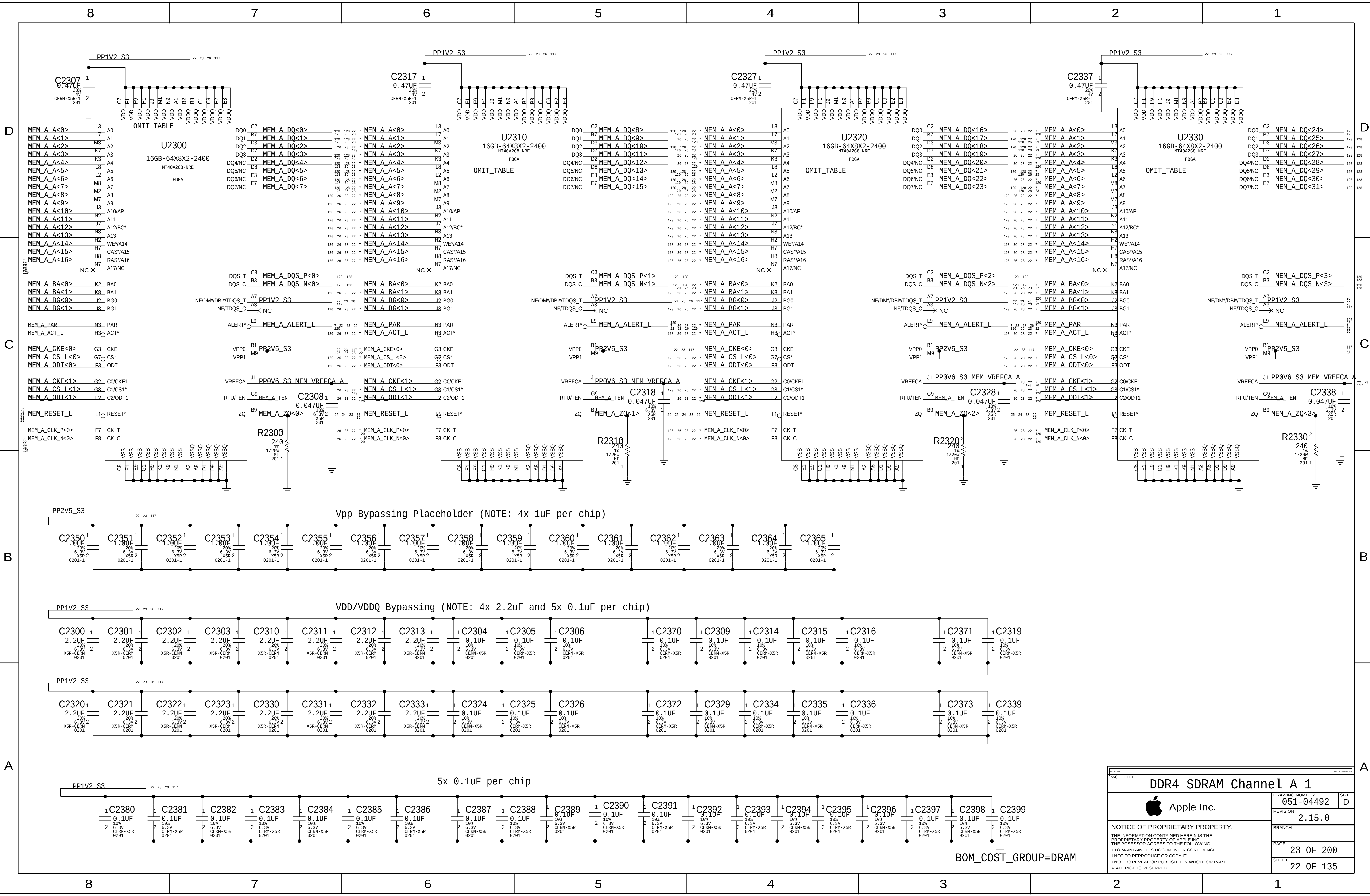
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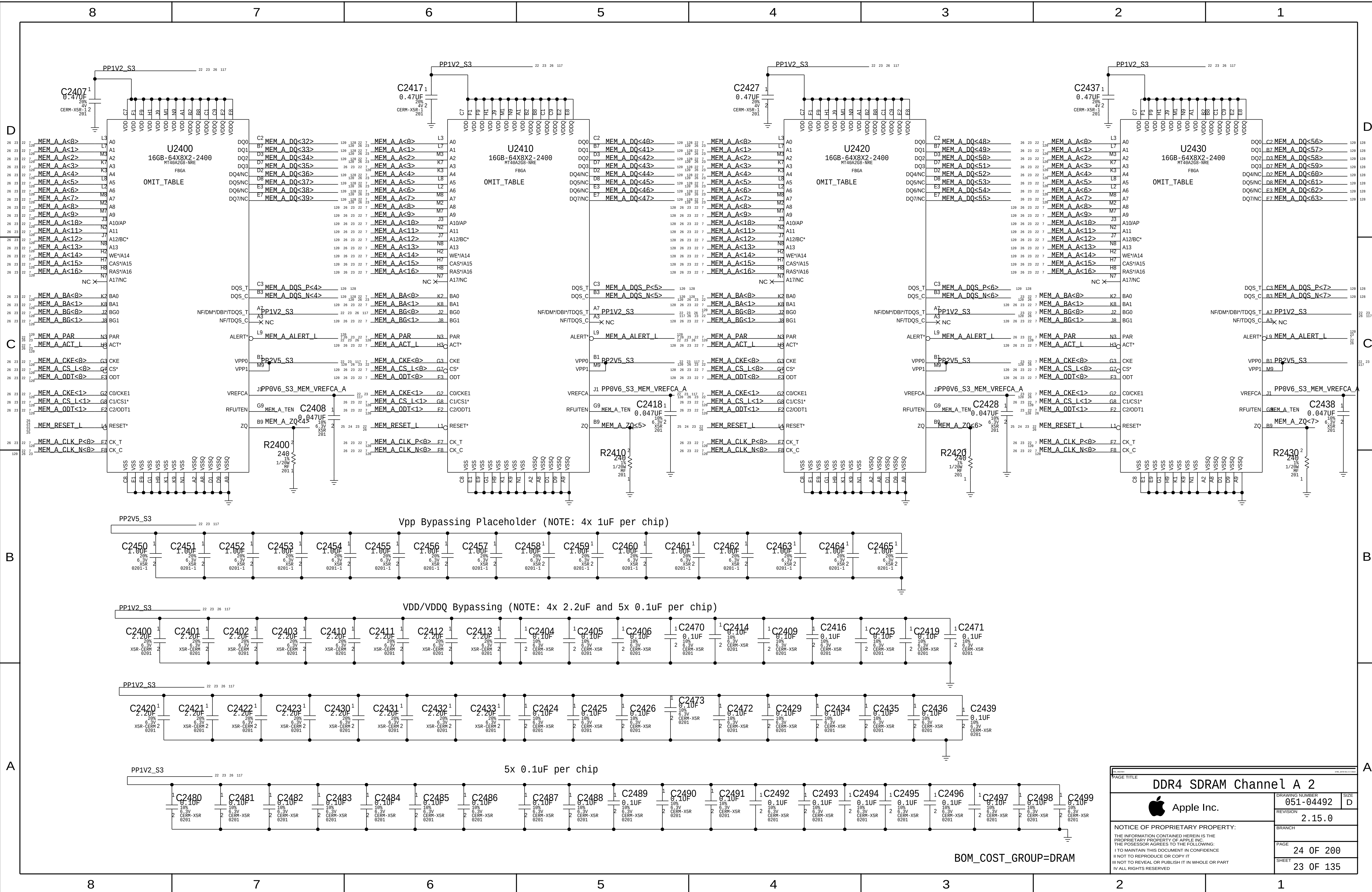
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		PAGE	
		17 OF 200	
		SHEET	
		17 OF 135	

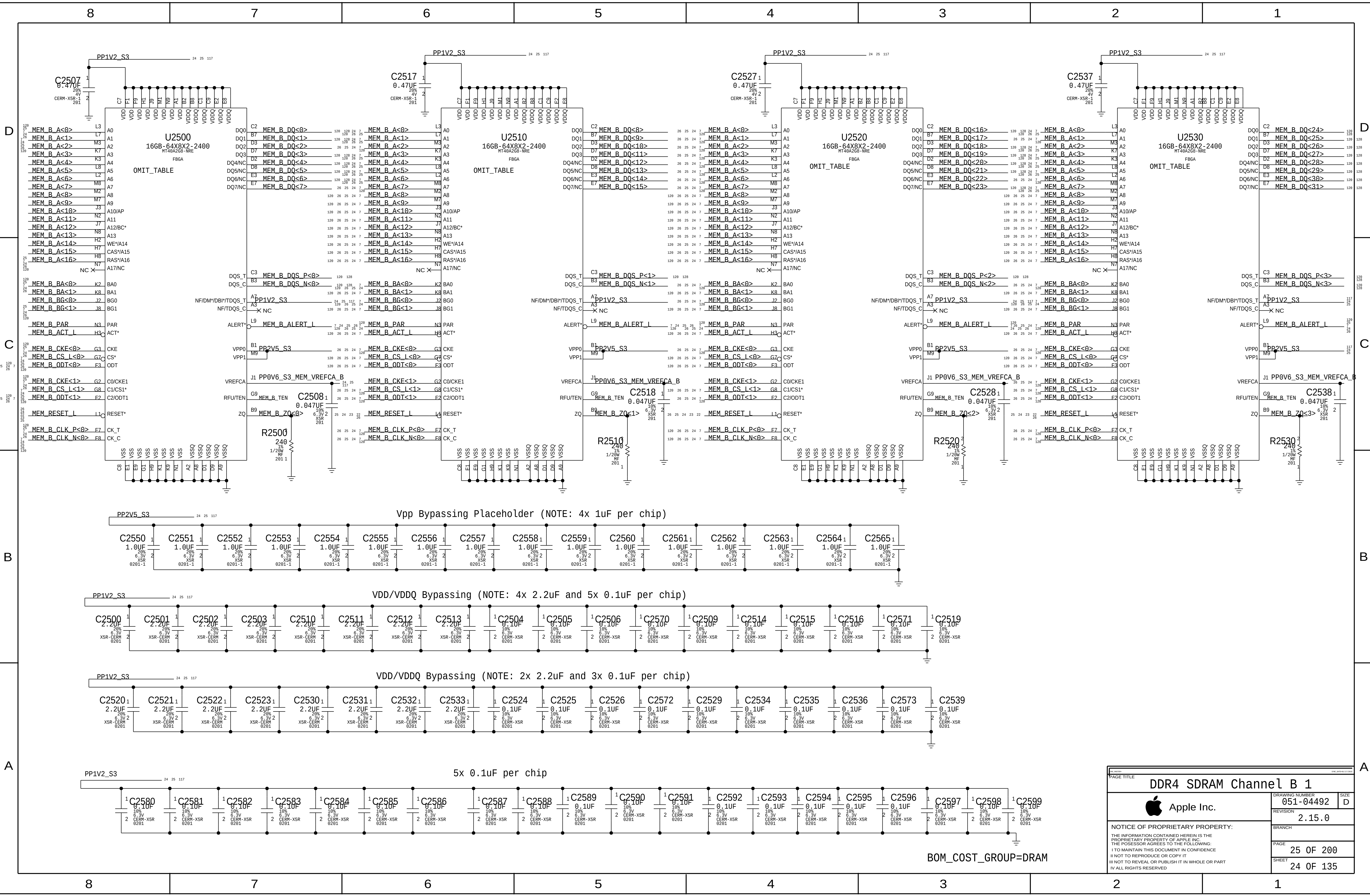






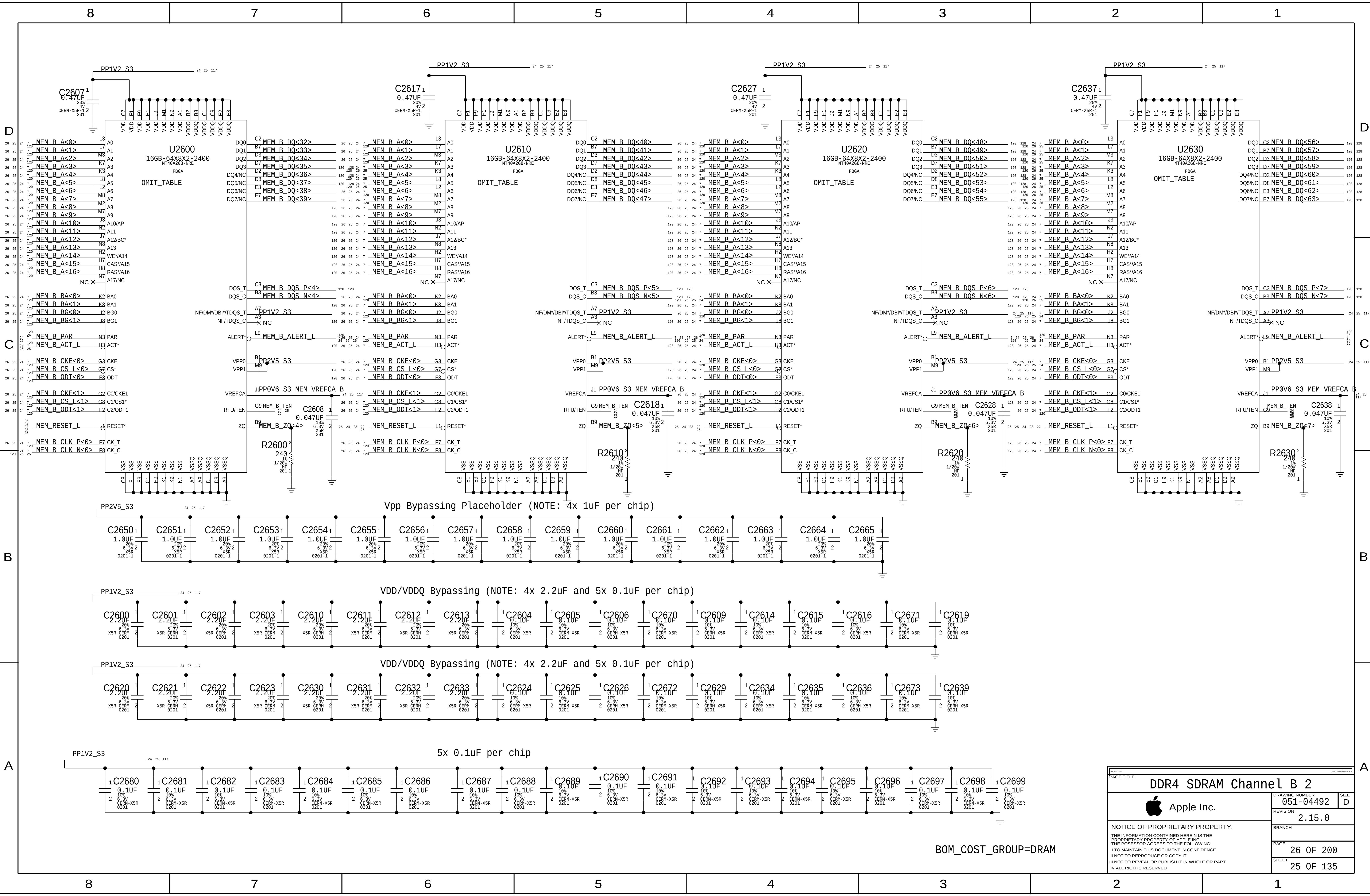






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			PAGE	26	OF 200
			SHEET	25	OF 135

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C

B

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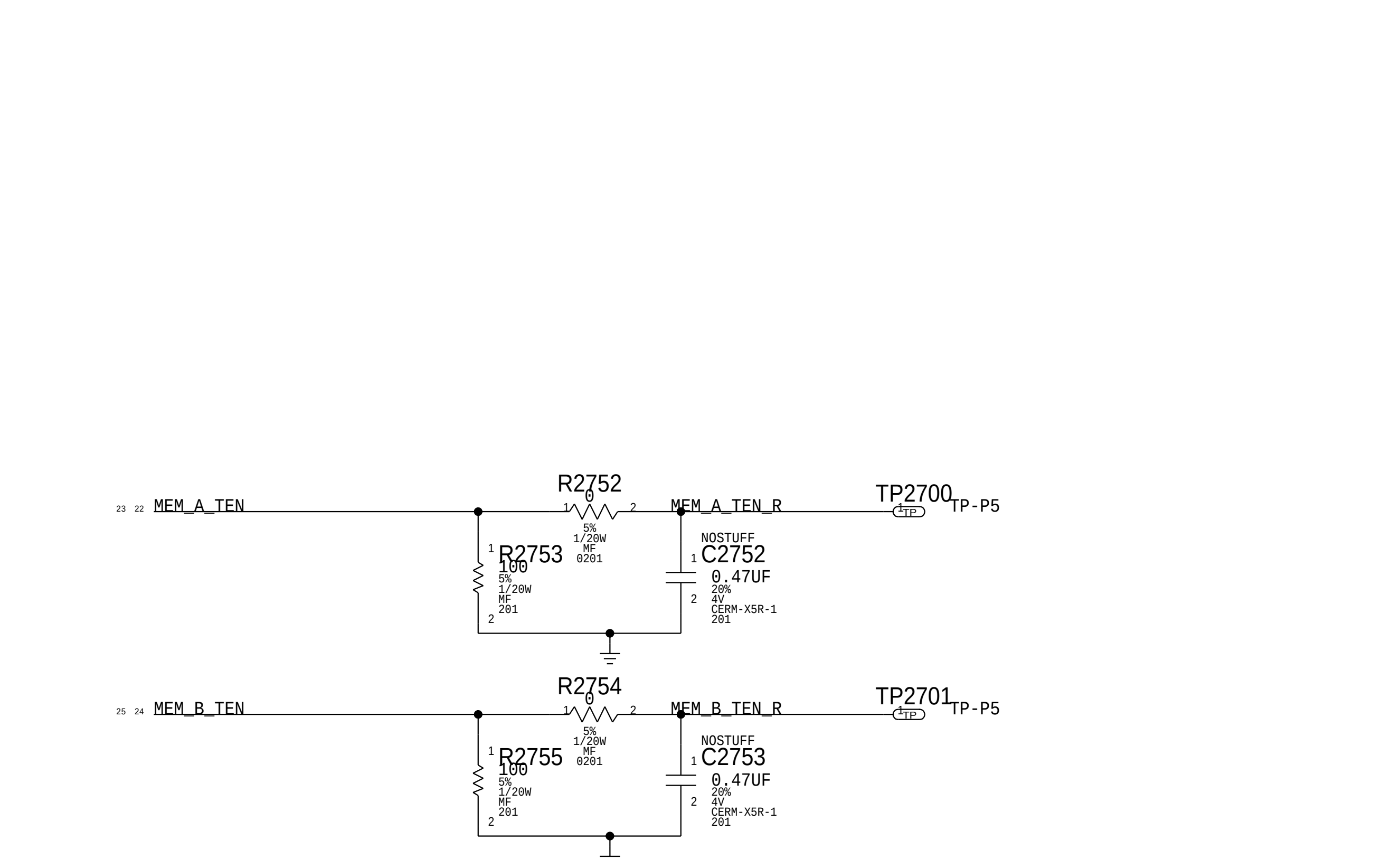
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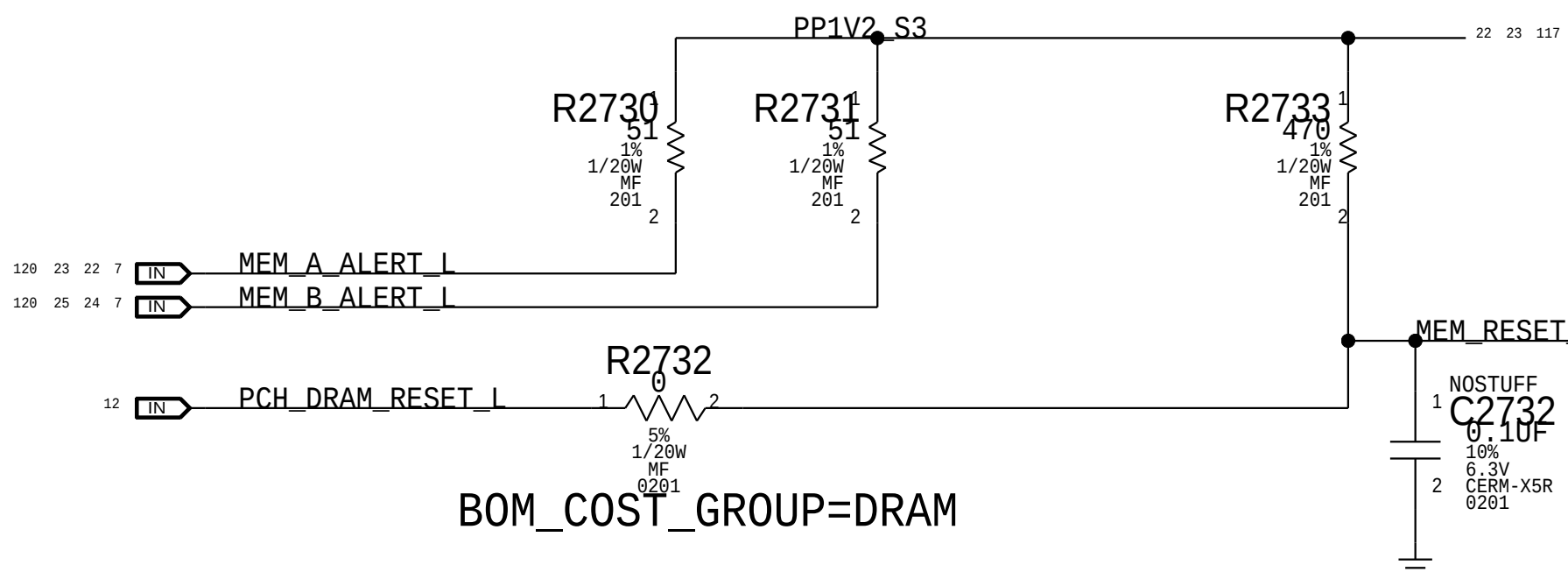
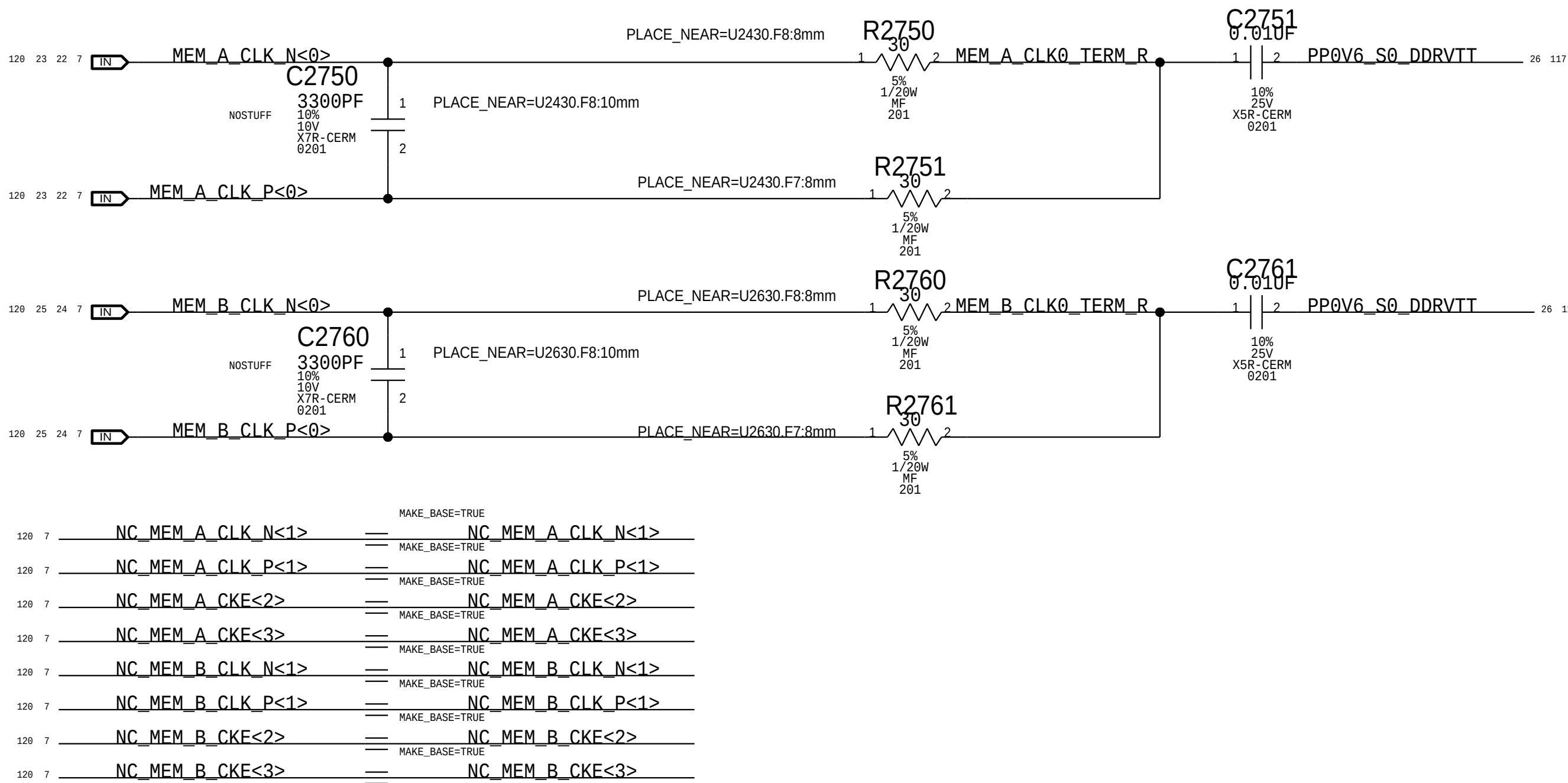
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JEDEC 4.20.18 Unbuffered SODIMM Raw Card F spec recommends 36 Ohm term to VTT for CS,CKE,ODT and 36 Ohm for BA,A,RAS,CAS,WE

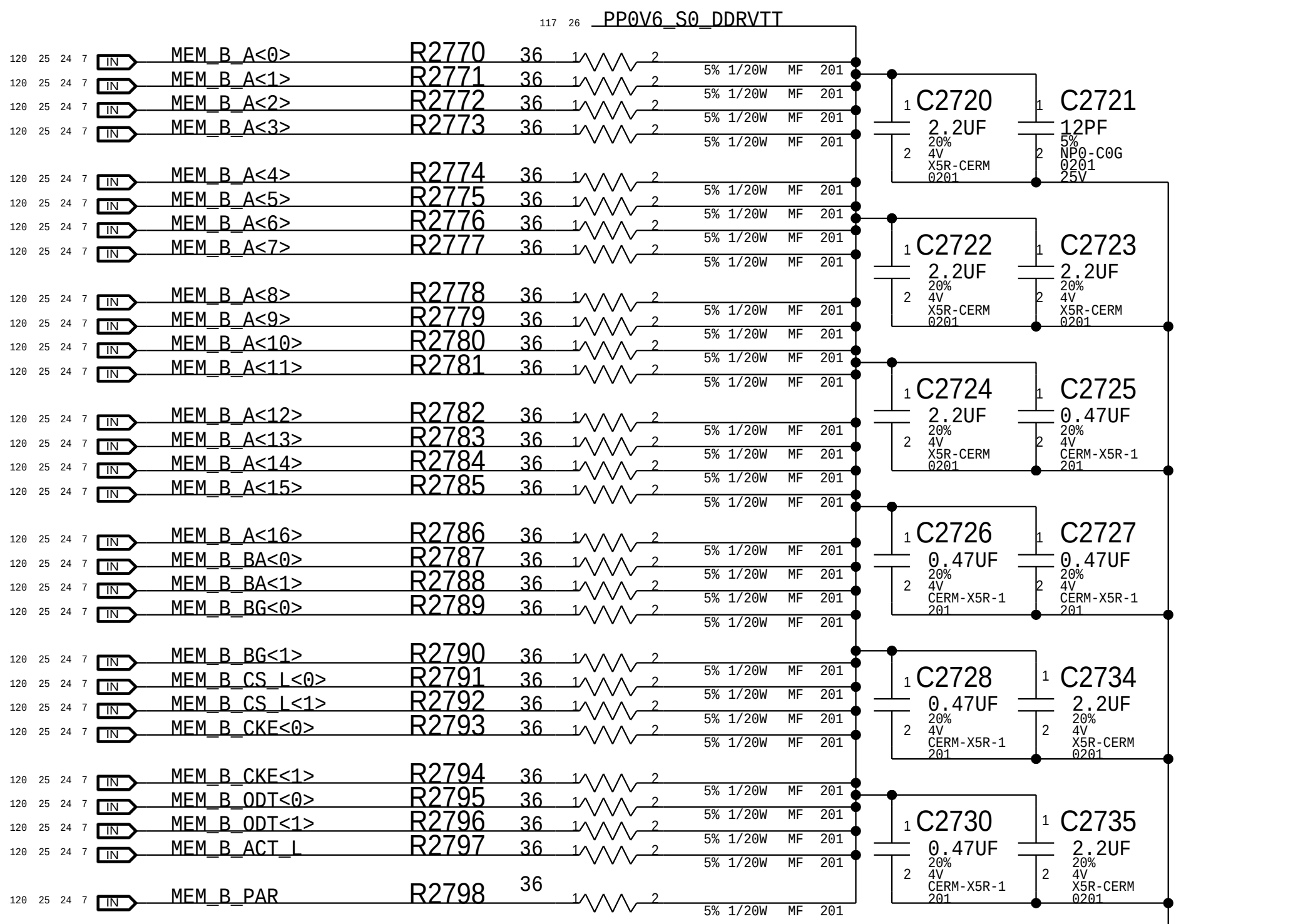
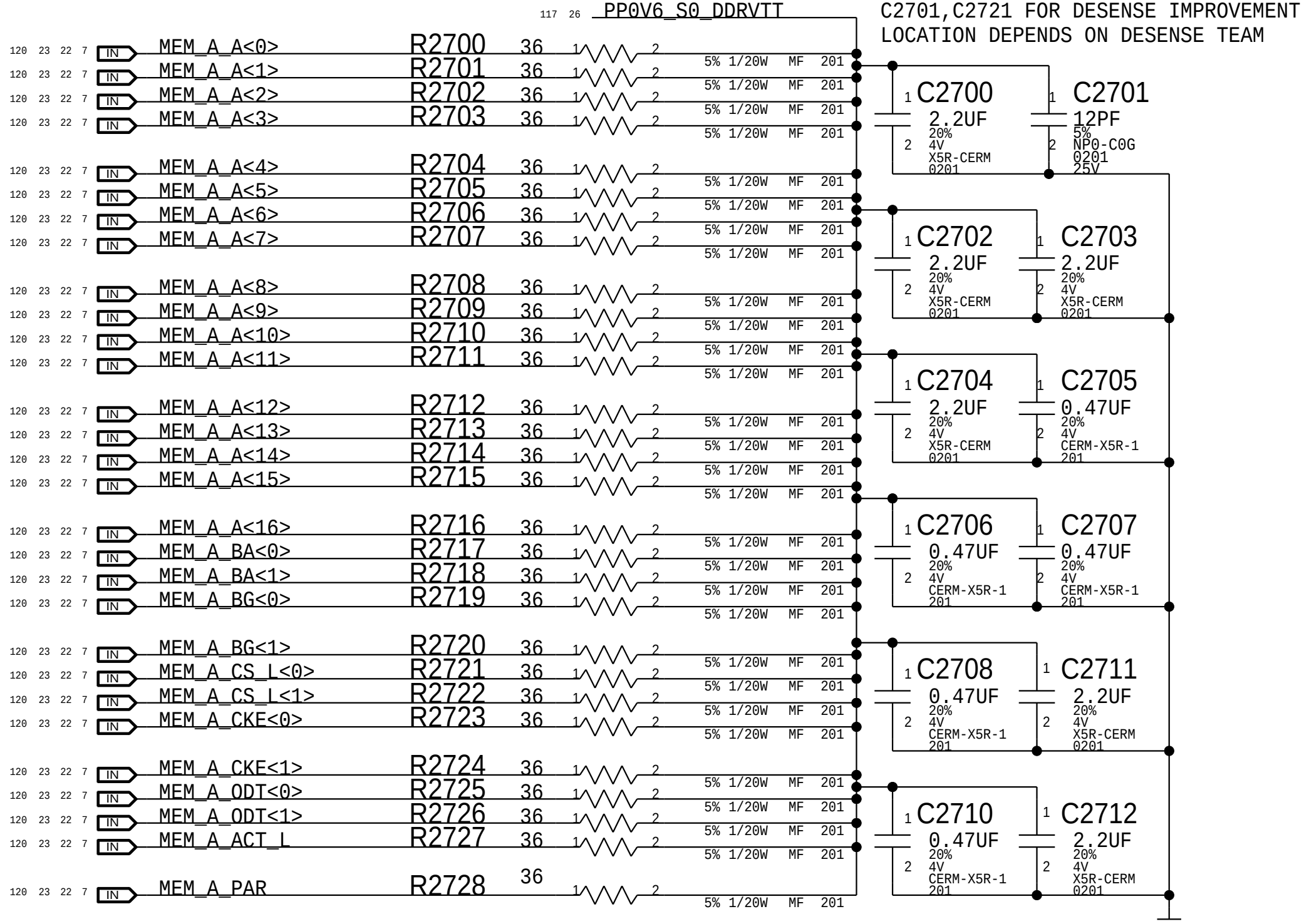


MEM Clock Termination

Place RC end termination after last DRAM
Place Source Cterm at neckdown at first DRAM



BOM_COST_GROUP=DRAM



DDR4 Termination

Apple Inc.

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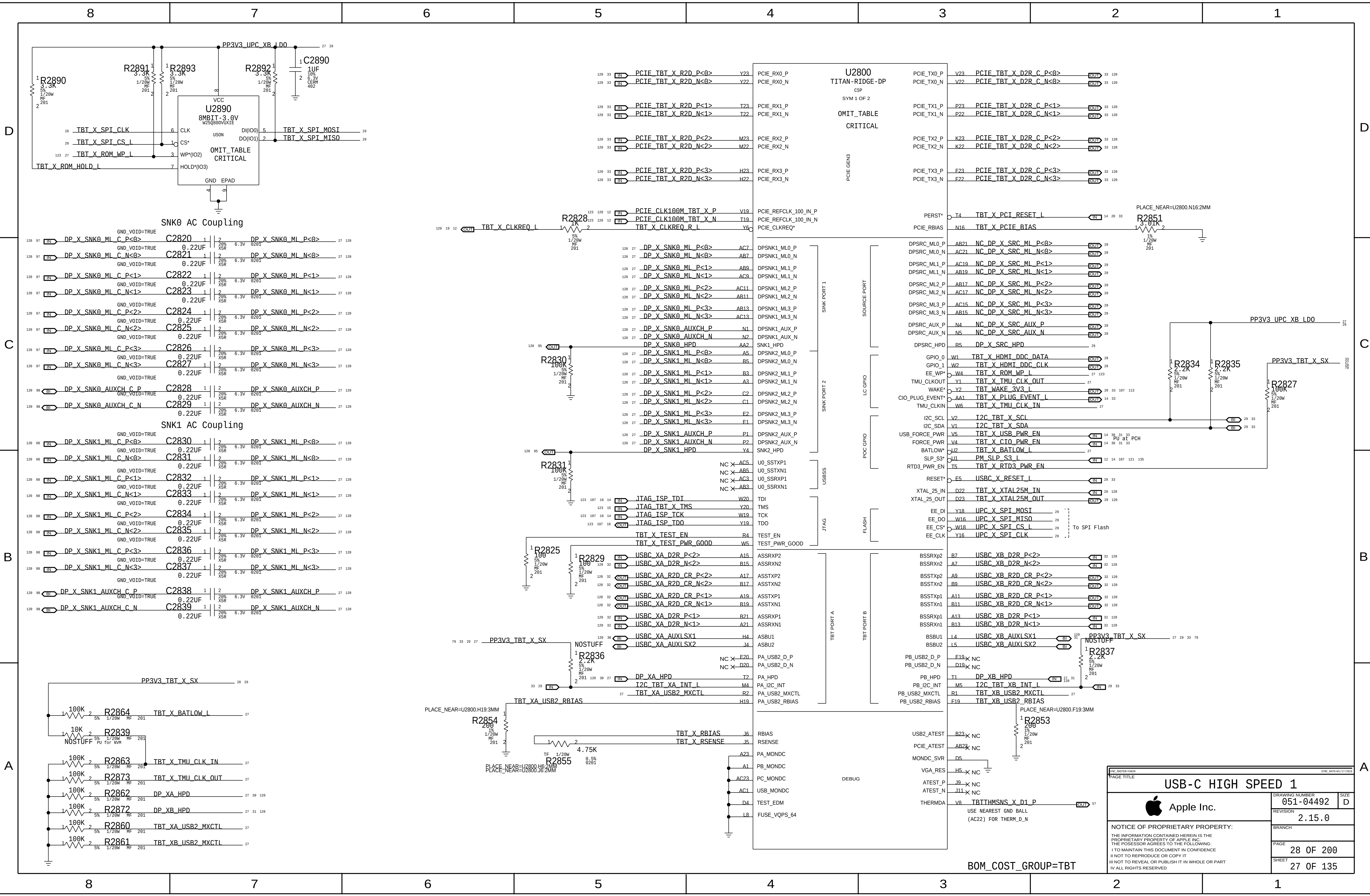
DRAWING NUMBER
051-04492

REVISION
2.15.0

BRANCH

PAGE
27 OF 200

SHEET
26 OF 135



SYMC MASTER-VAVER
PAGE TITLE

SYMC DATE:01/17/2019

USB-C HIGH SPEED 1

 Apple Inc.

DRAWING NUMBER
051-04492

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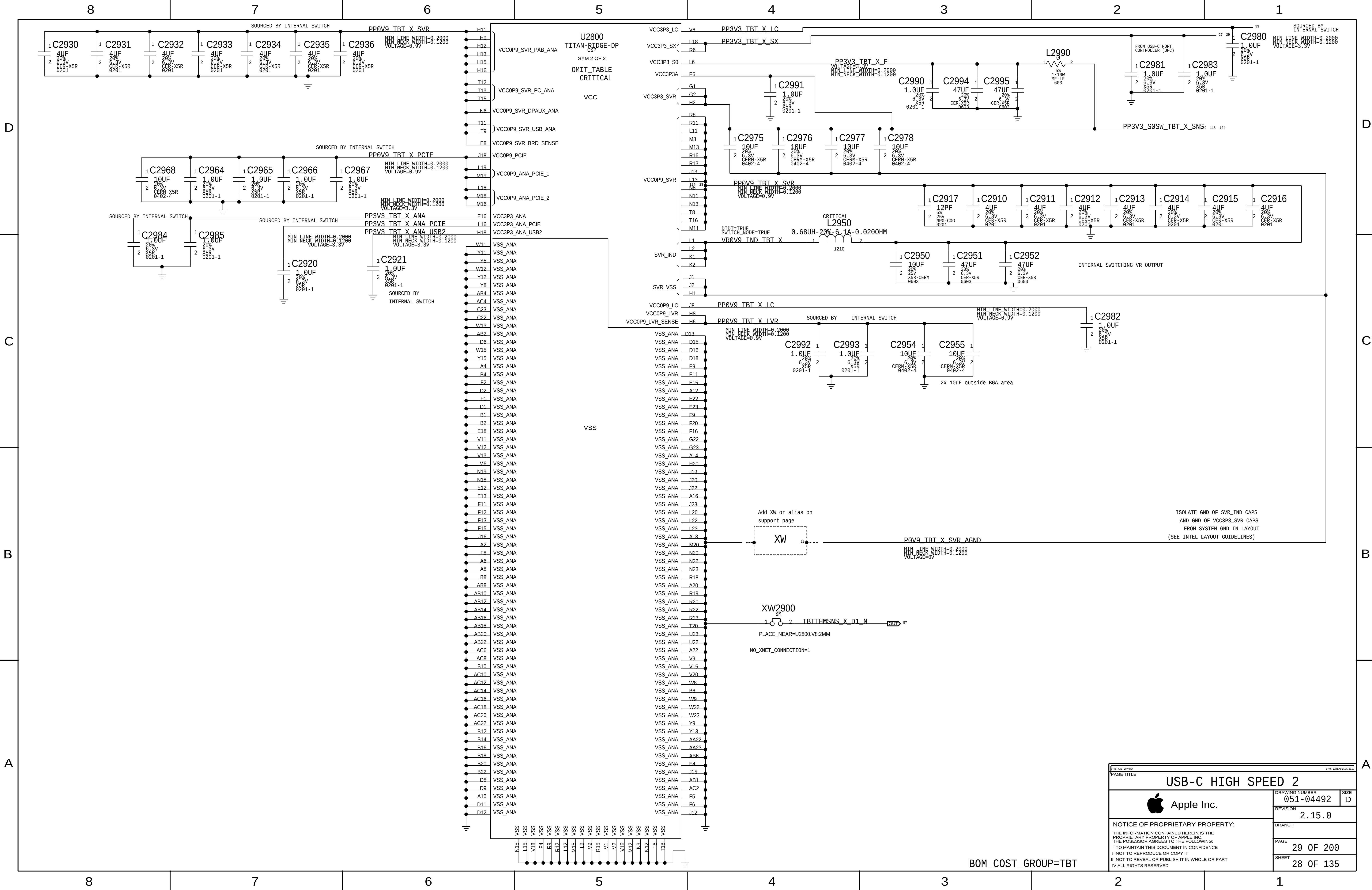
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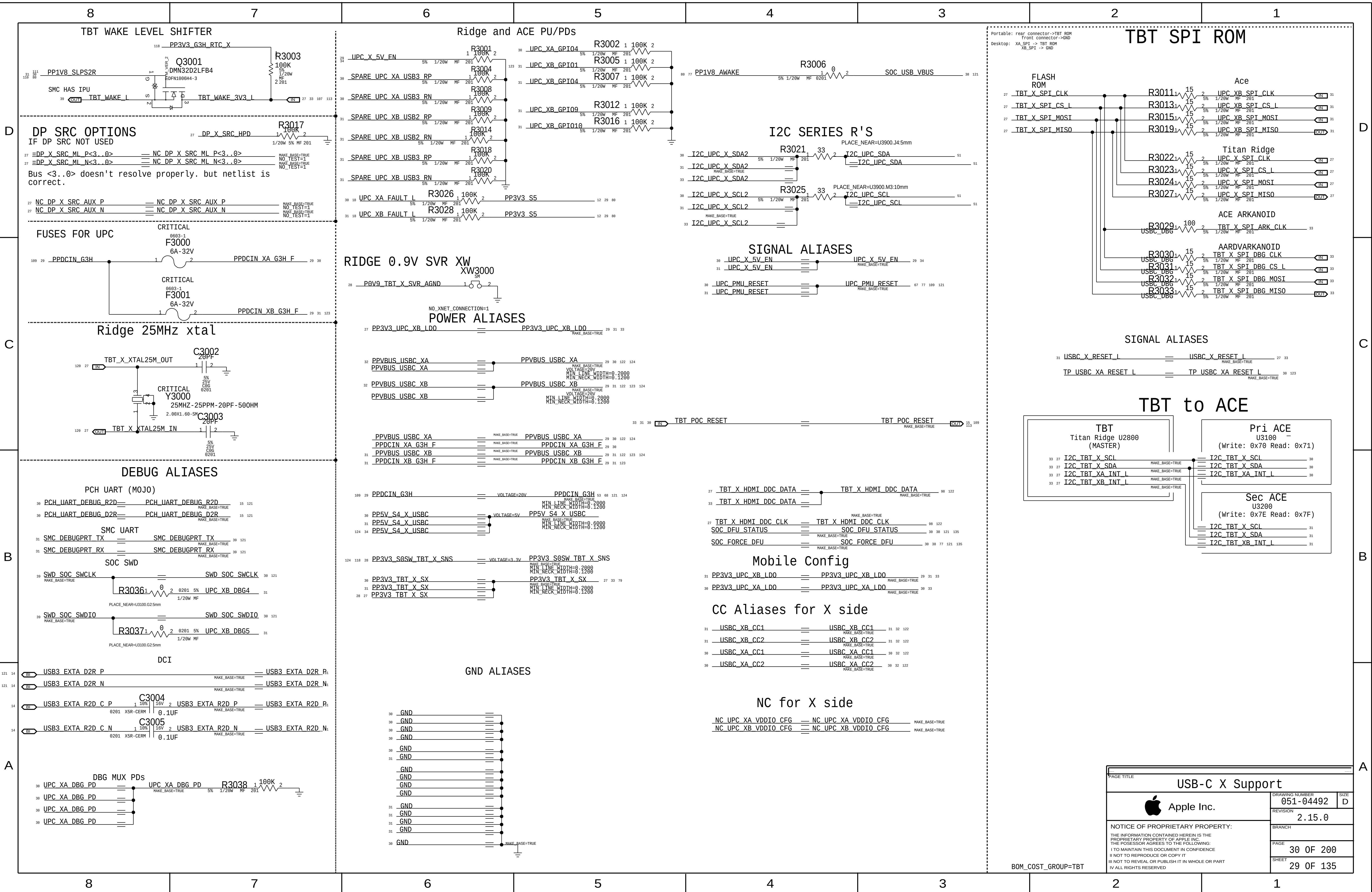
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27 OF 135

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BOM_COST_GROUP=TBT



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USB-C HIGH SPEED 2		
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PAGE		29 OF 200
SHEET		28 OF 135

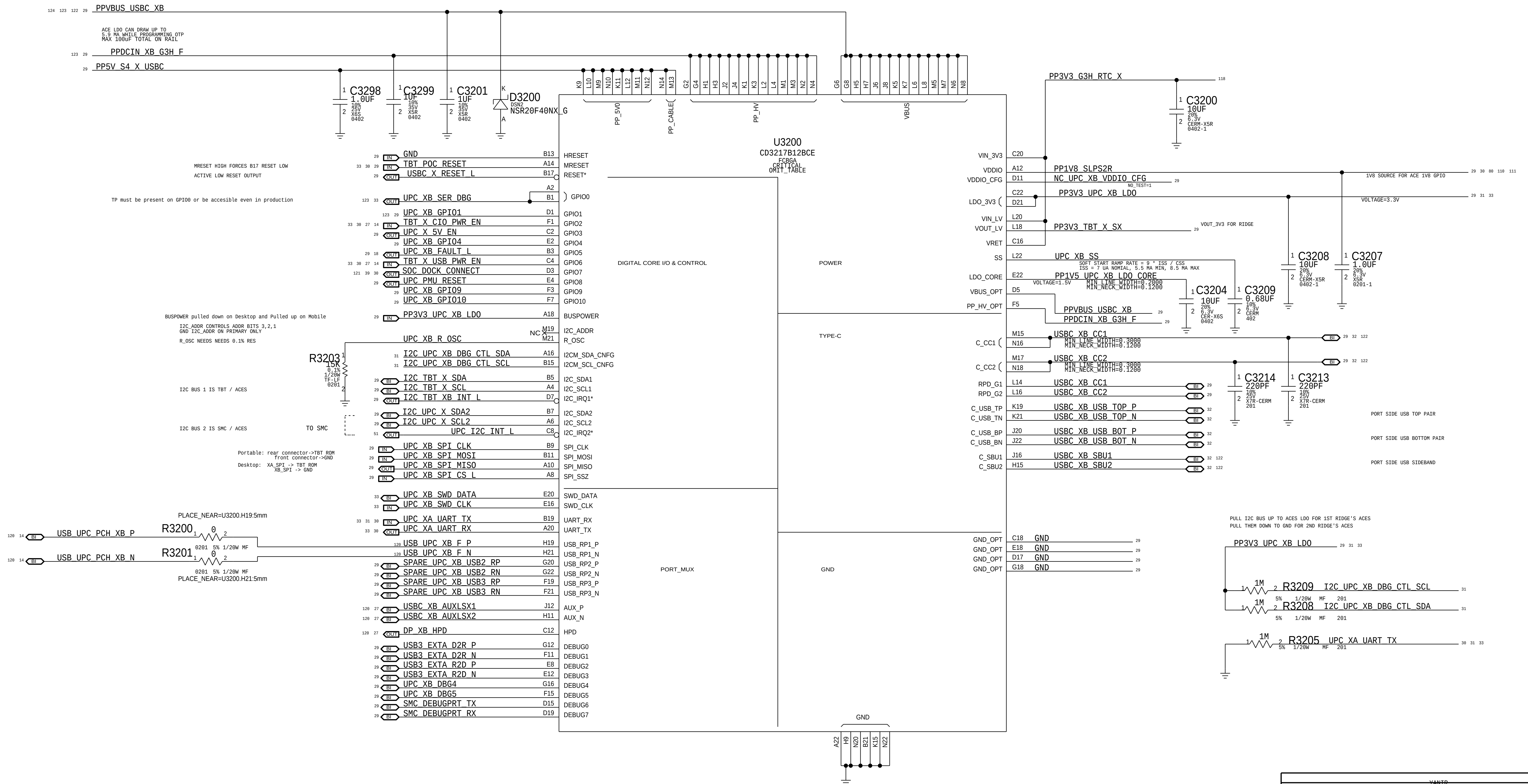


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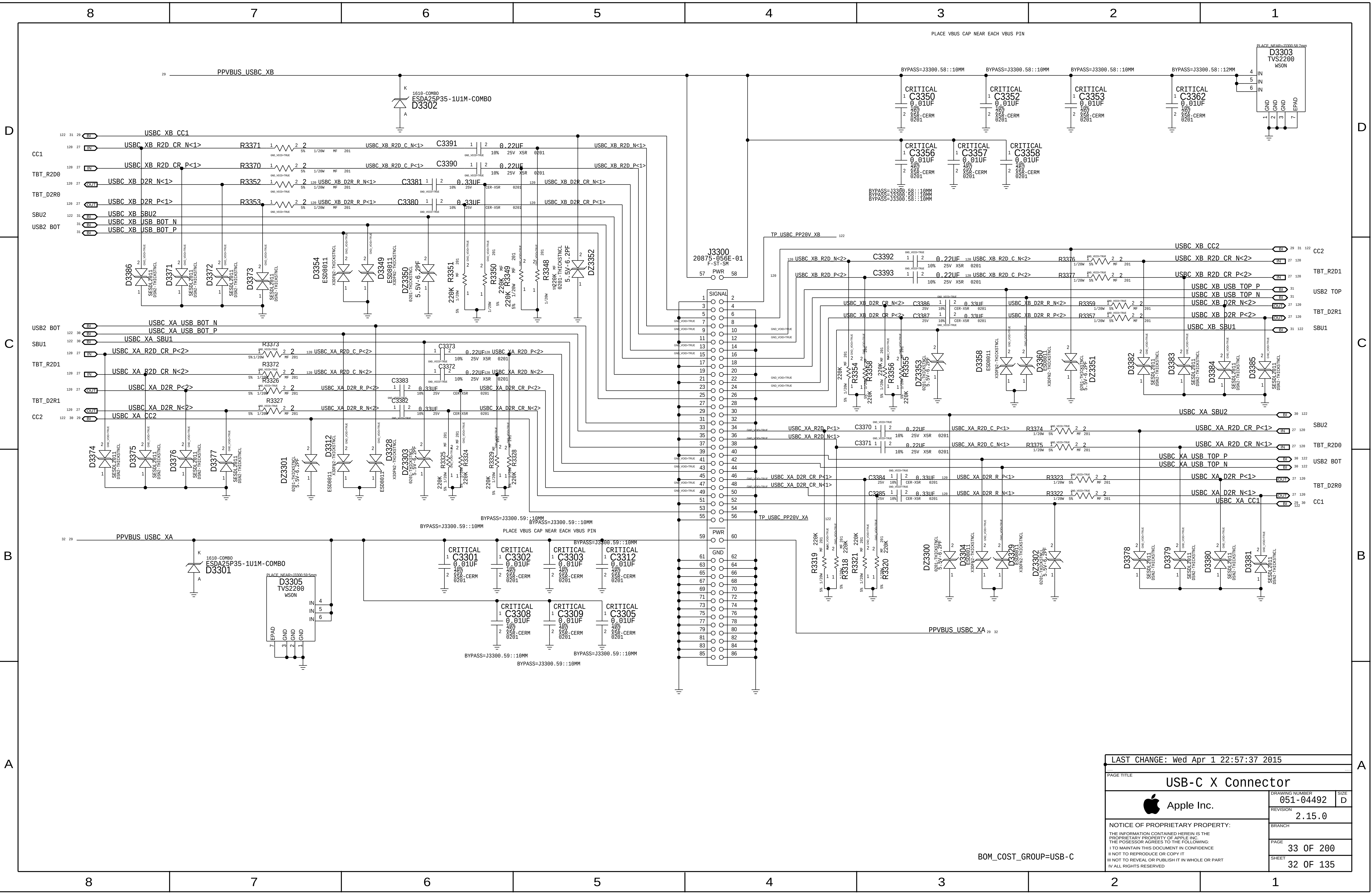
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X SECONDARY ACE USB-C PORT CONTROLLER (UPC)



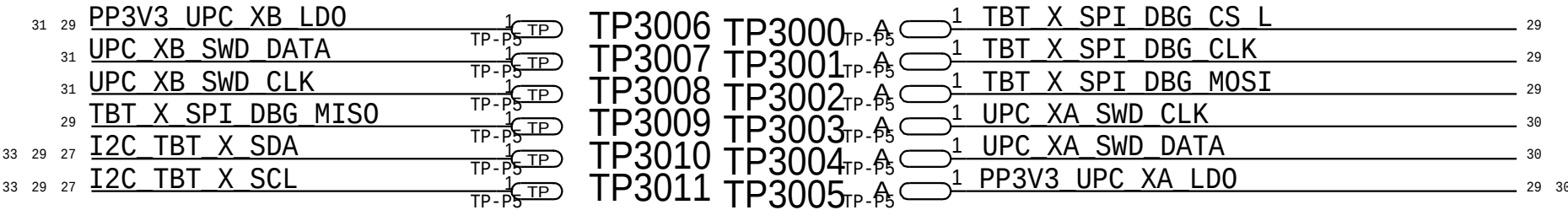
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		PAGE		32 OF 200	
		SHEET		31 OF 135	

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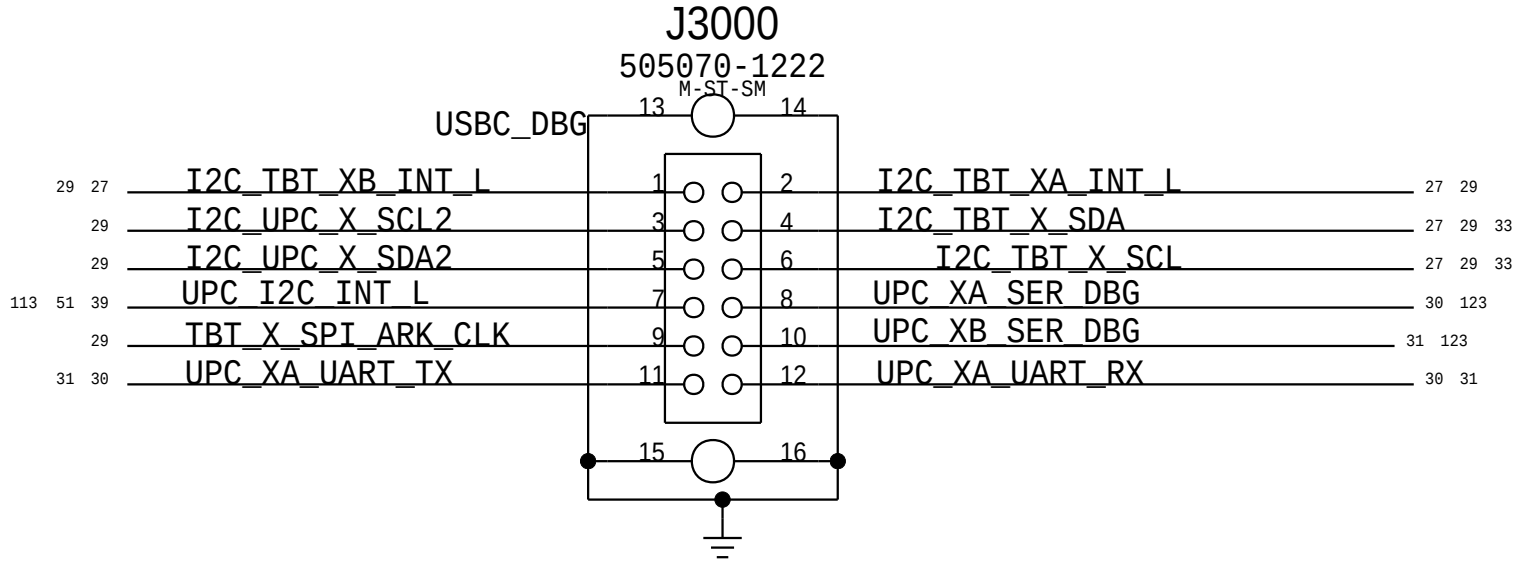


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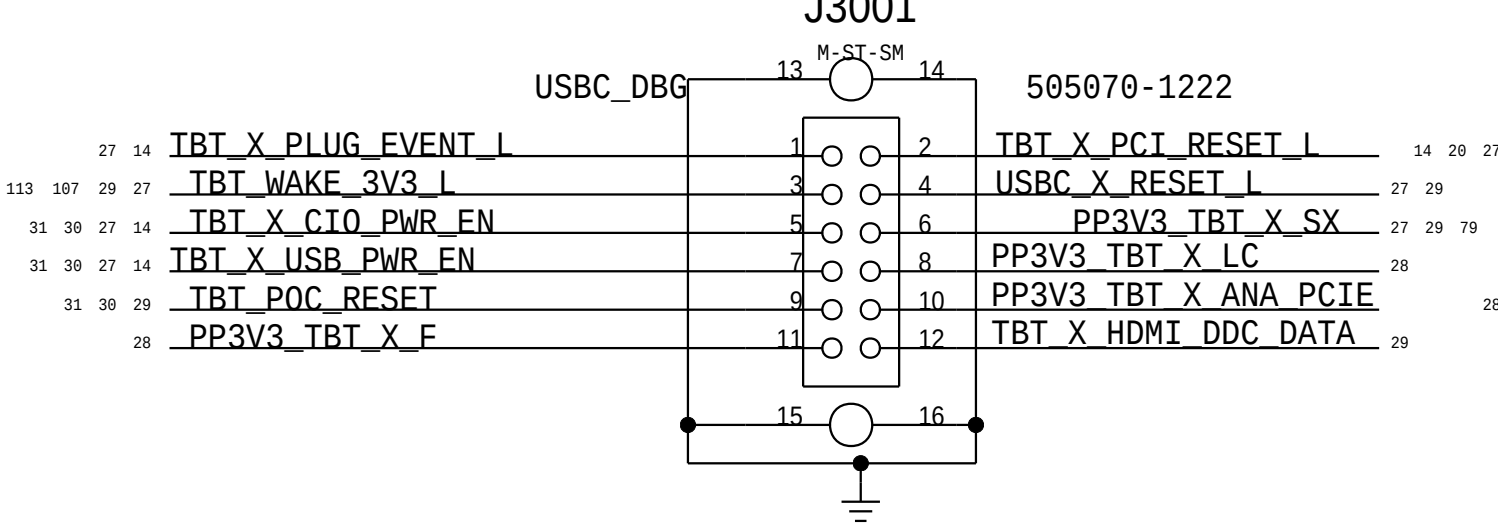
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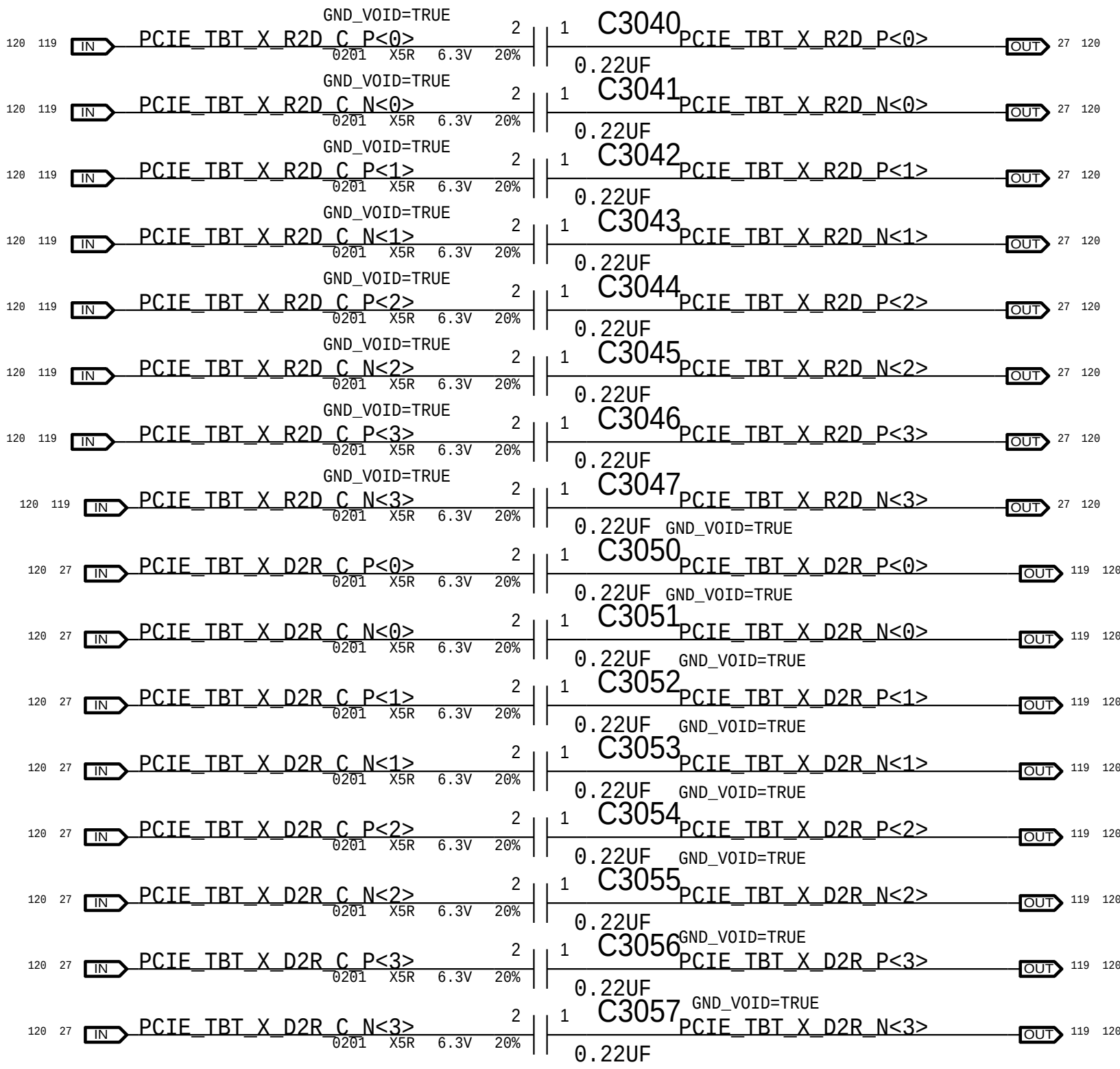
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RIDGE ARKANOID CONN
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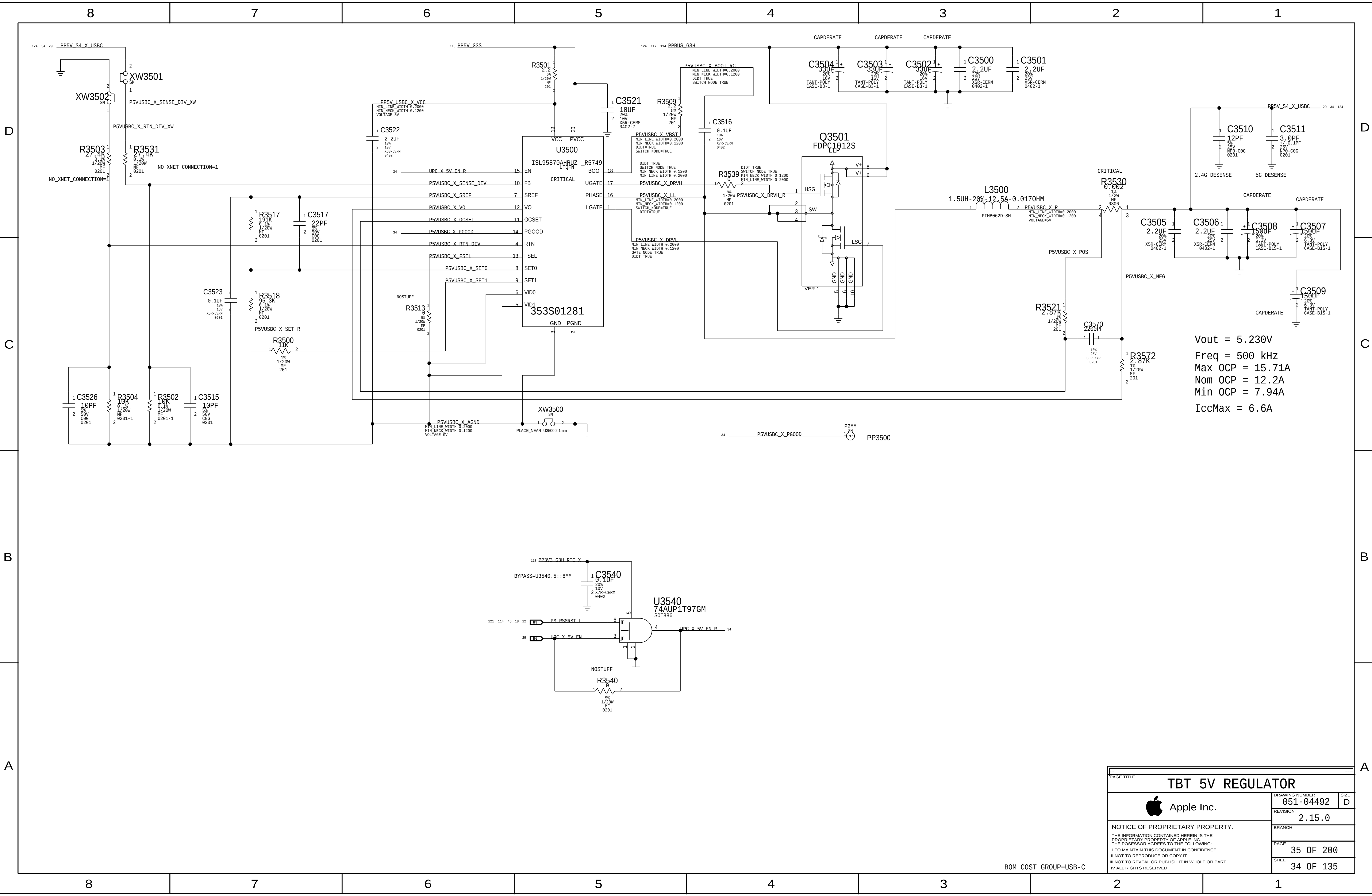


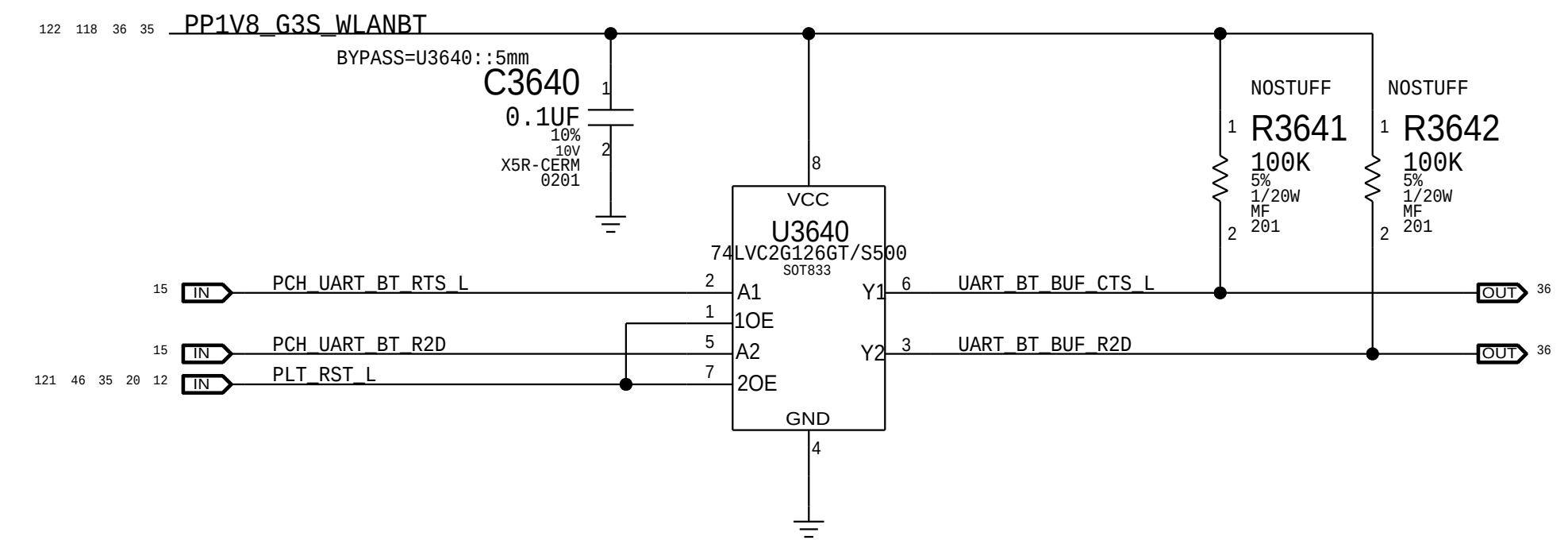
Ridge PCIE Caps



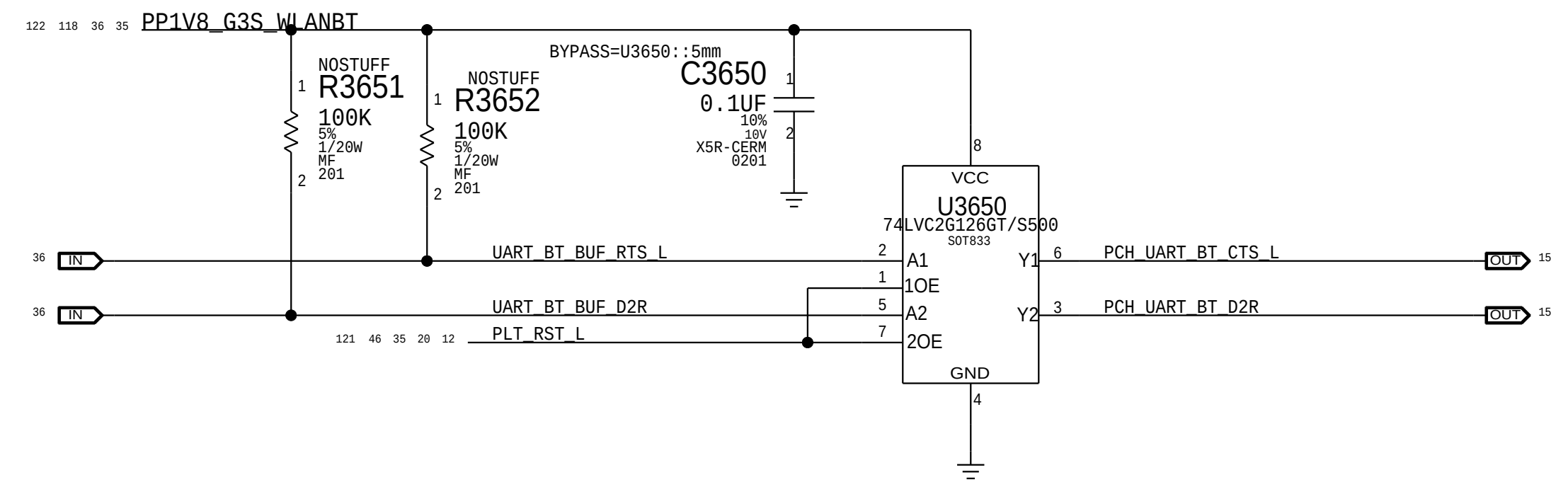
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PAGE		34 OF 200
SHEET		33 OF 135

BOM_COST_GROUP=USB-C

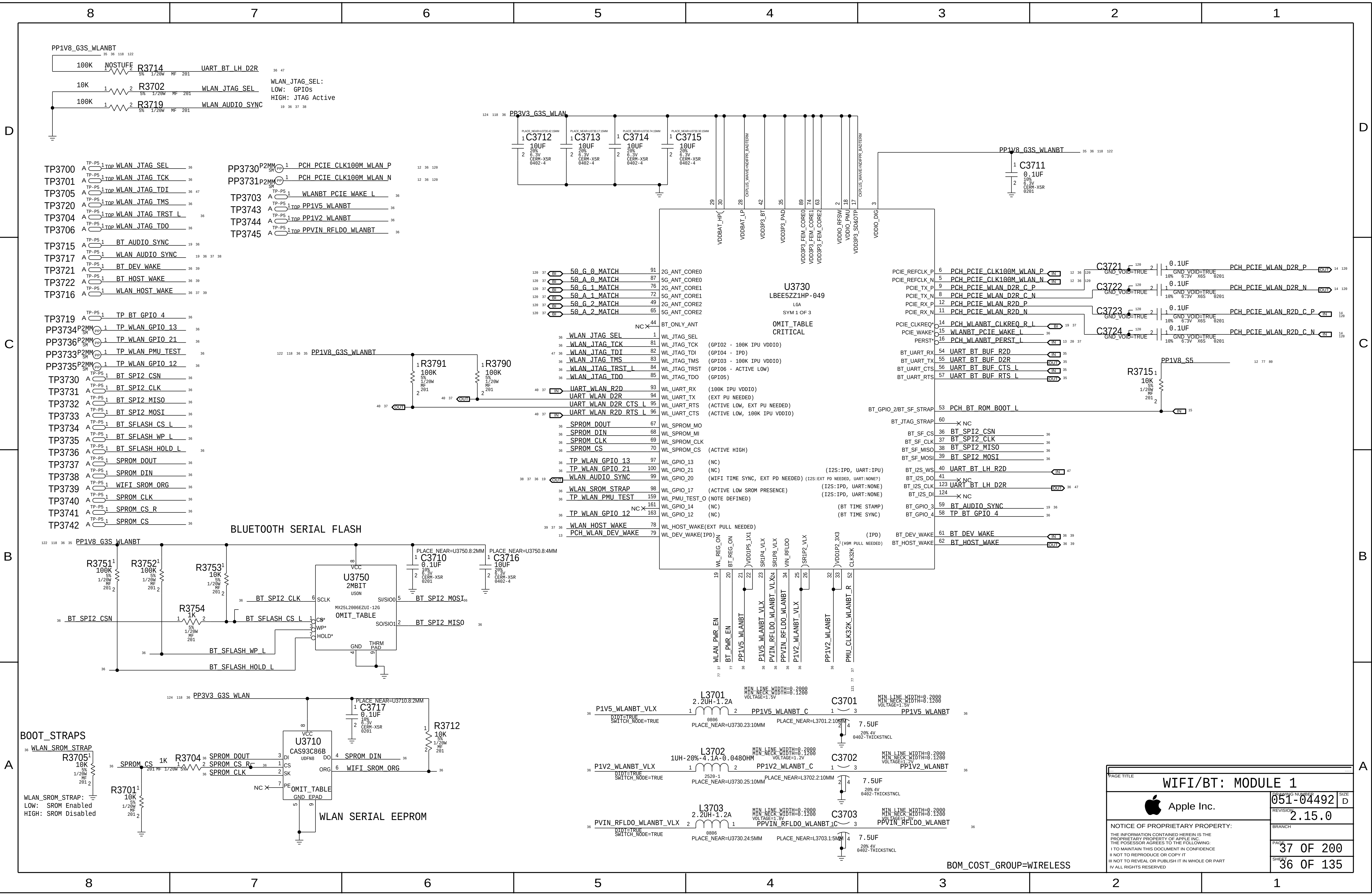




BT UART BUFFERS

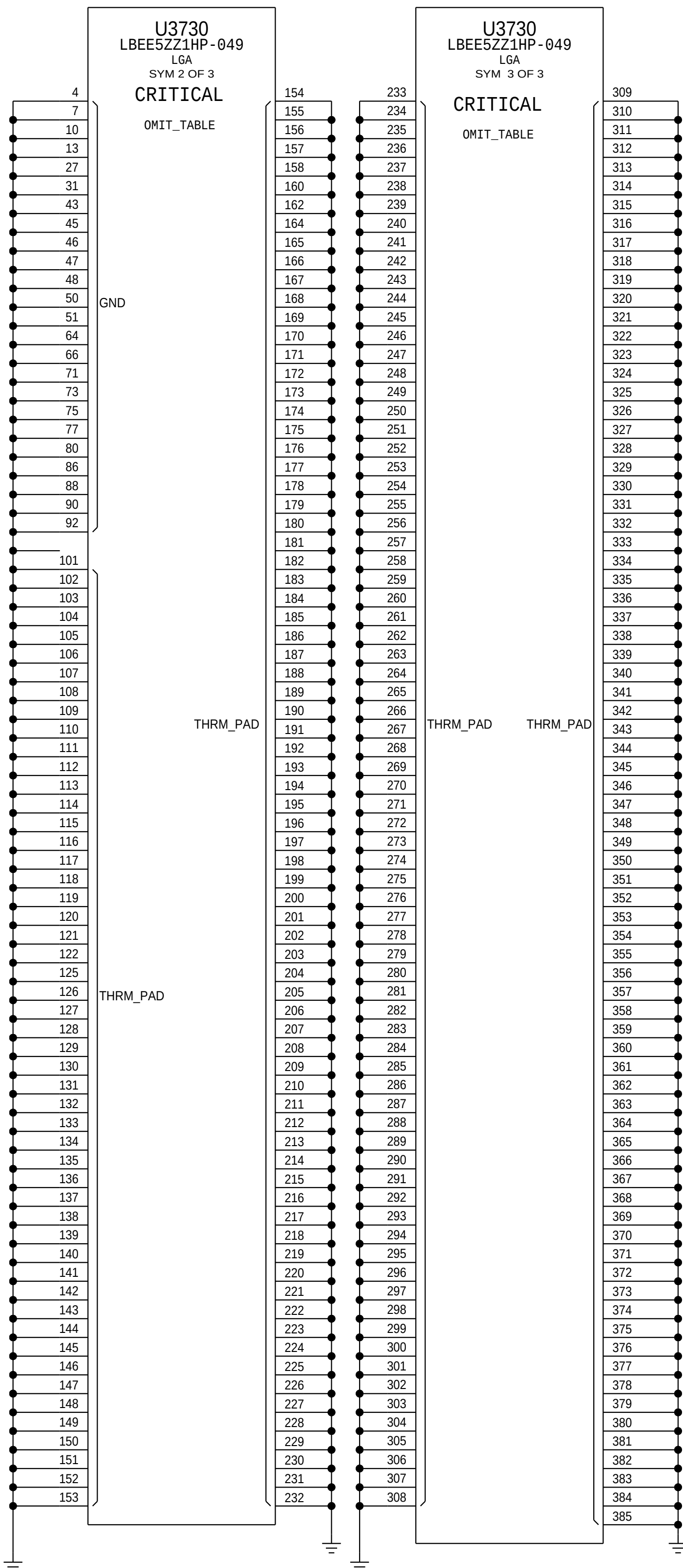
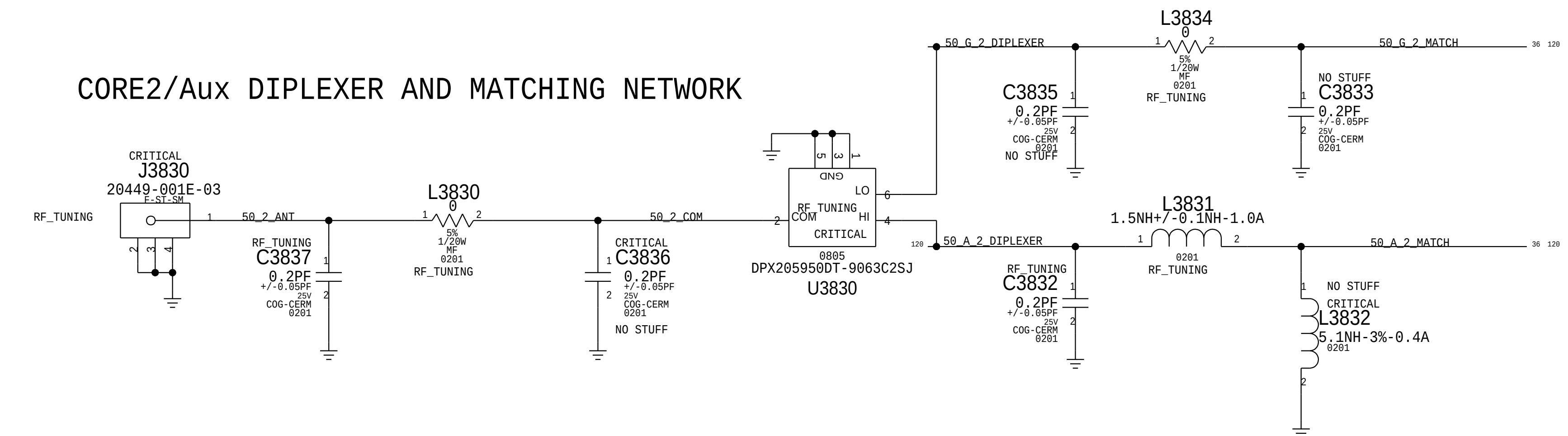
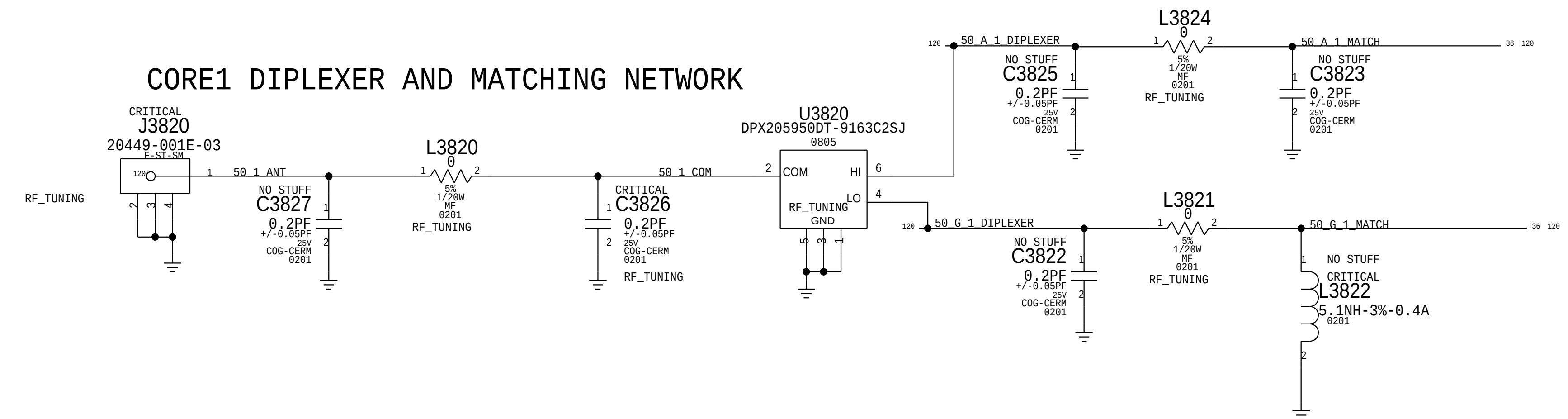
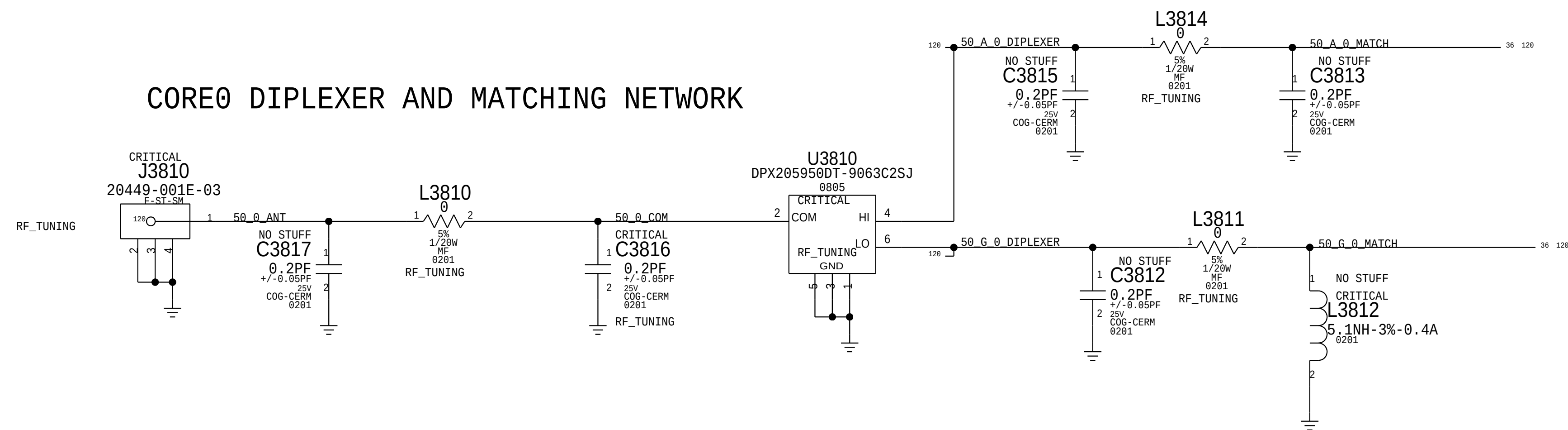
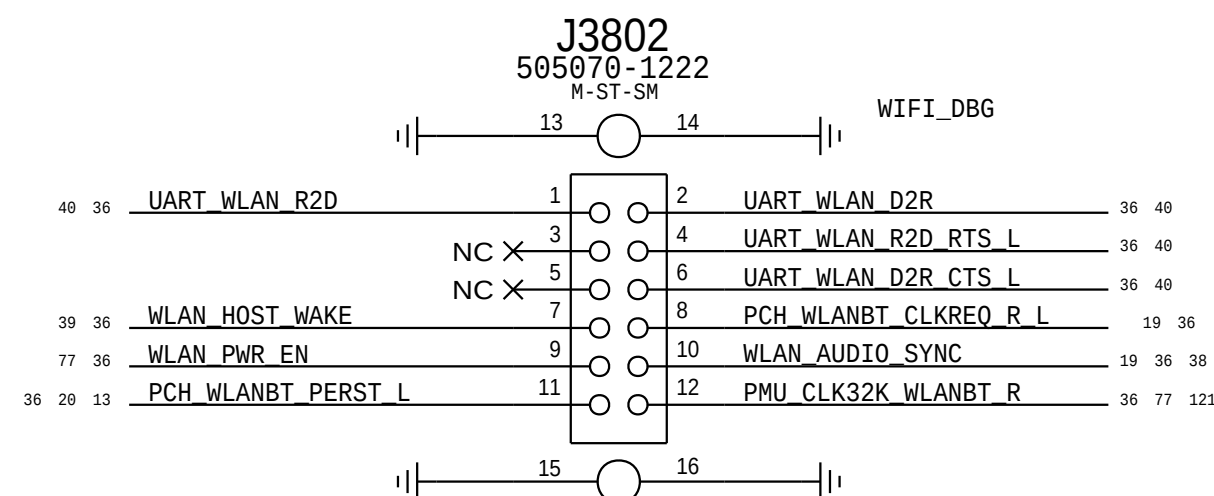


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		SHEET	35 OF 135



PAGE TITLE		
WIFI/BT: MODULE 1		
	051-04492	SIZE D
	REVISION 2.15.0	BRANCH
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PAGE 37 OF 200		
SHEET 36 OF 135		

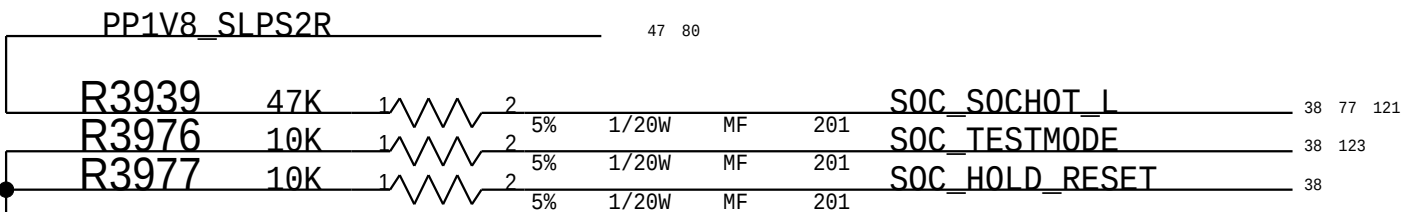
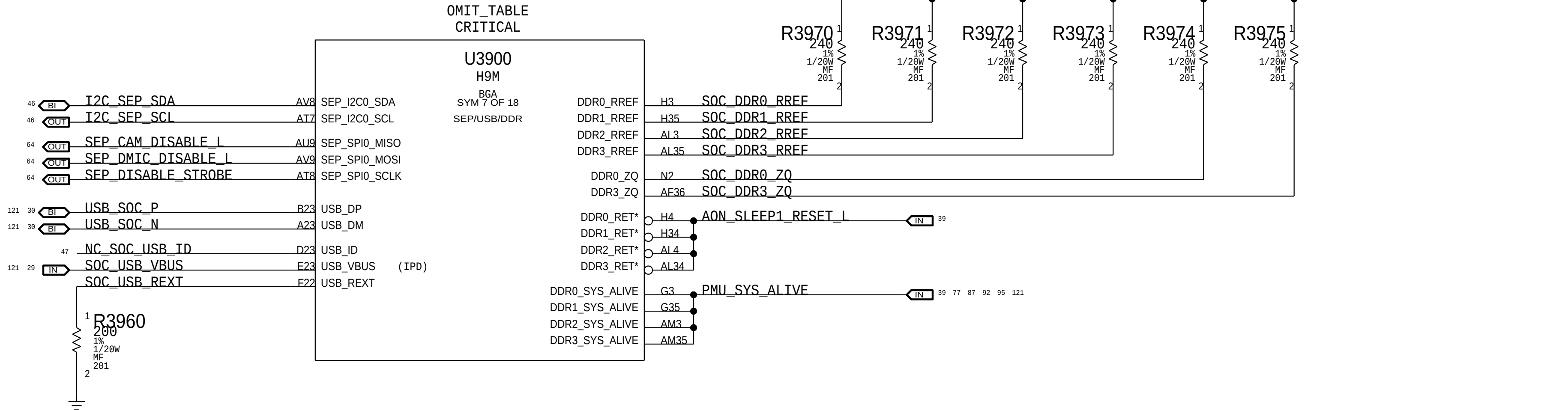
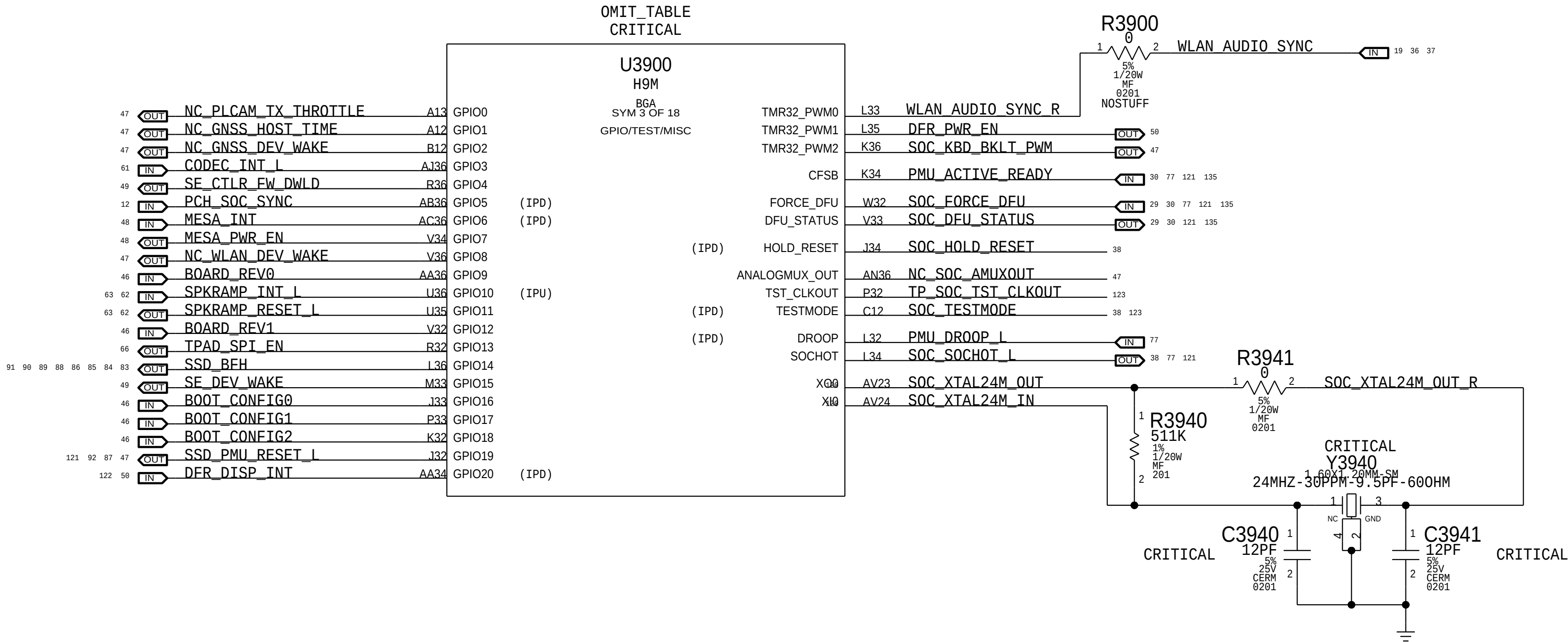
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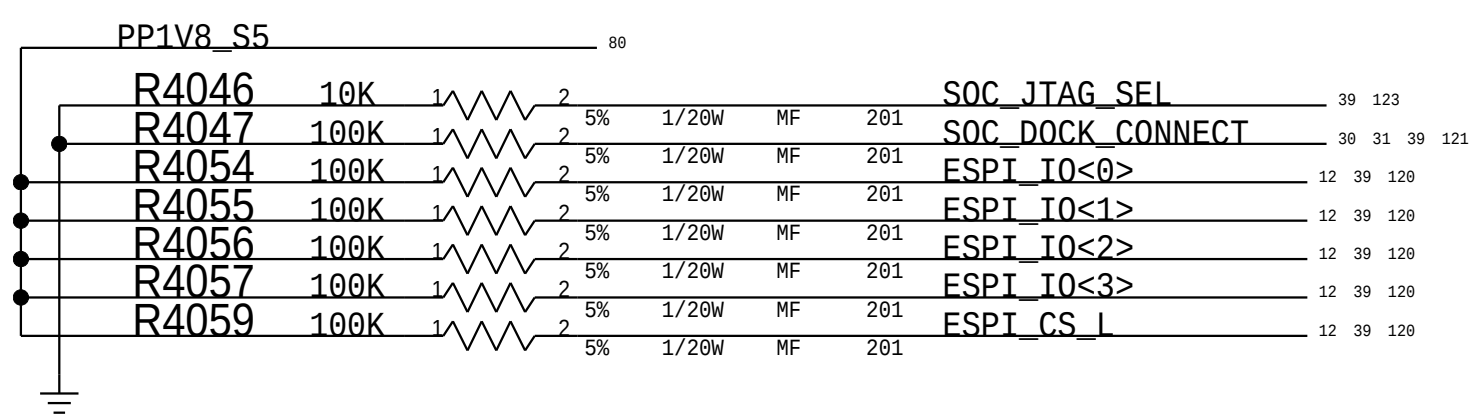
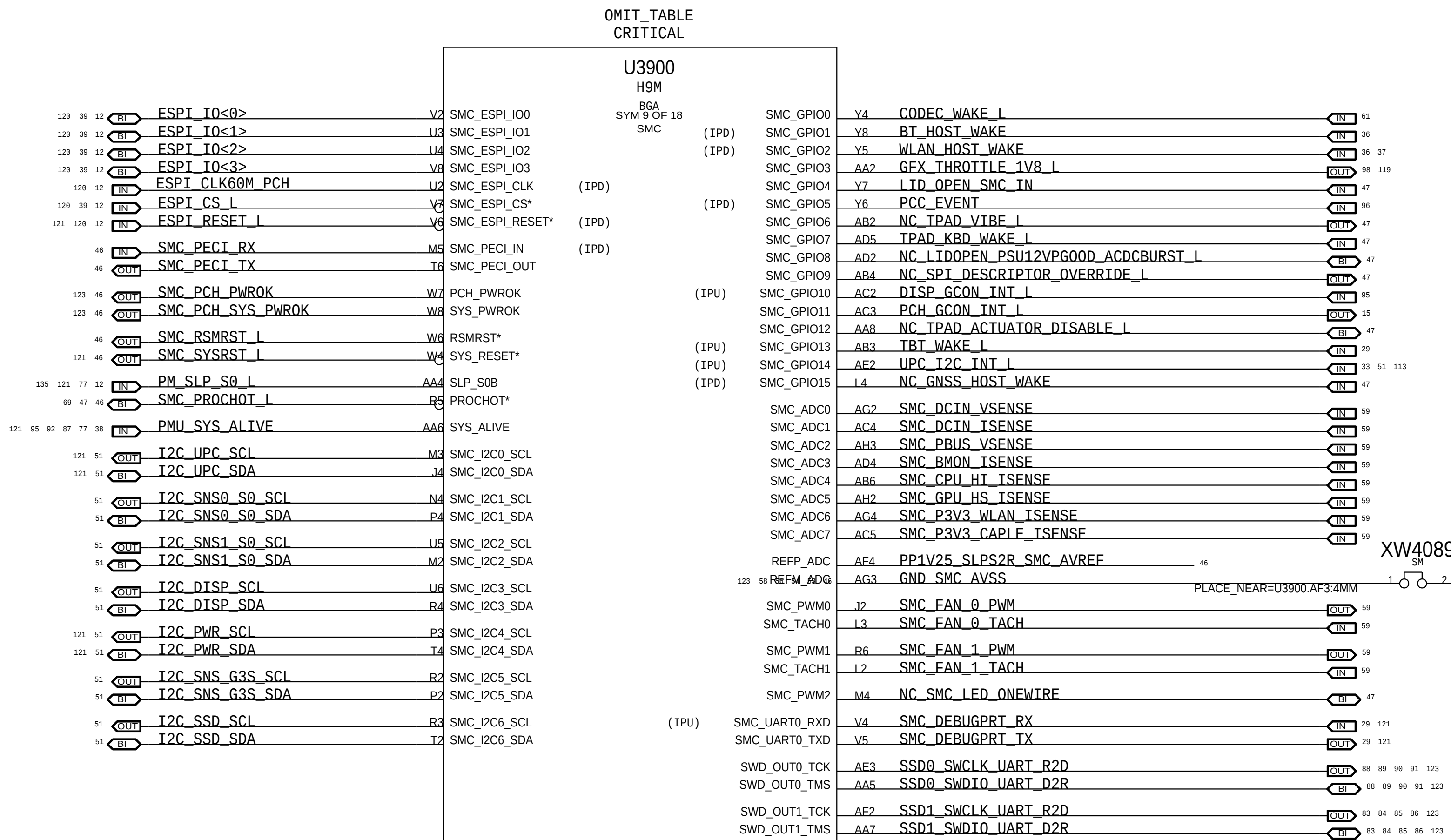
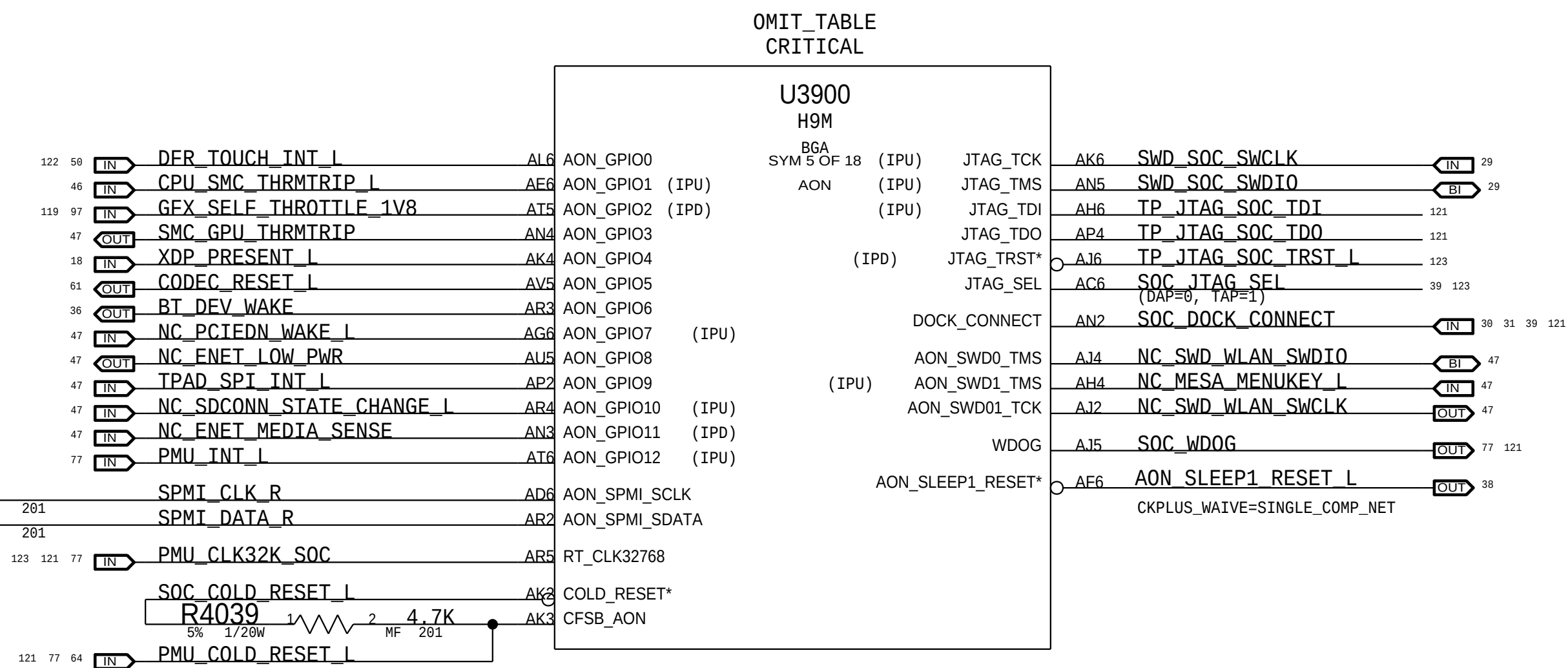
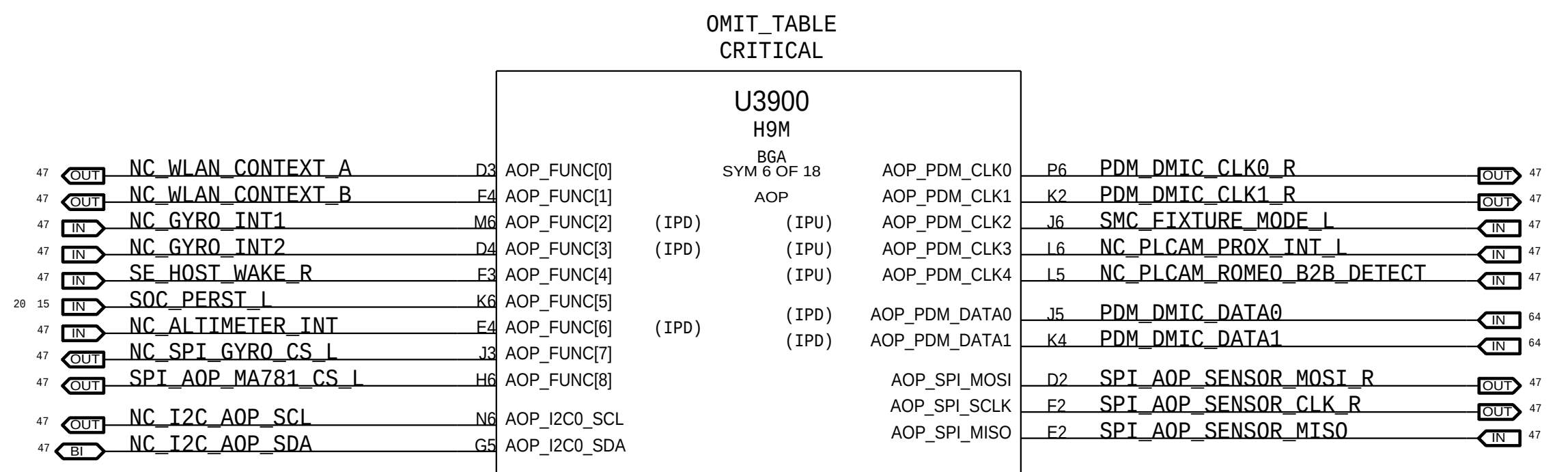
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Note 1) IPU represents SW configured state, not HW default



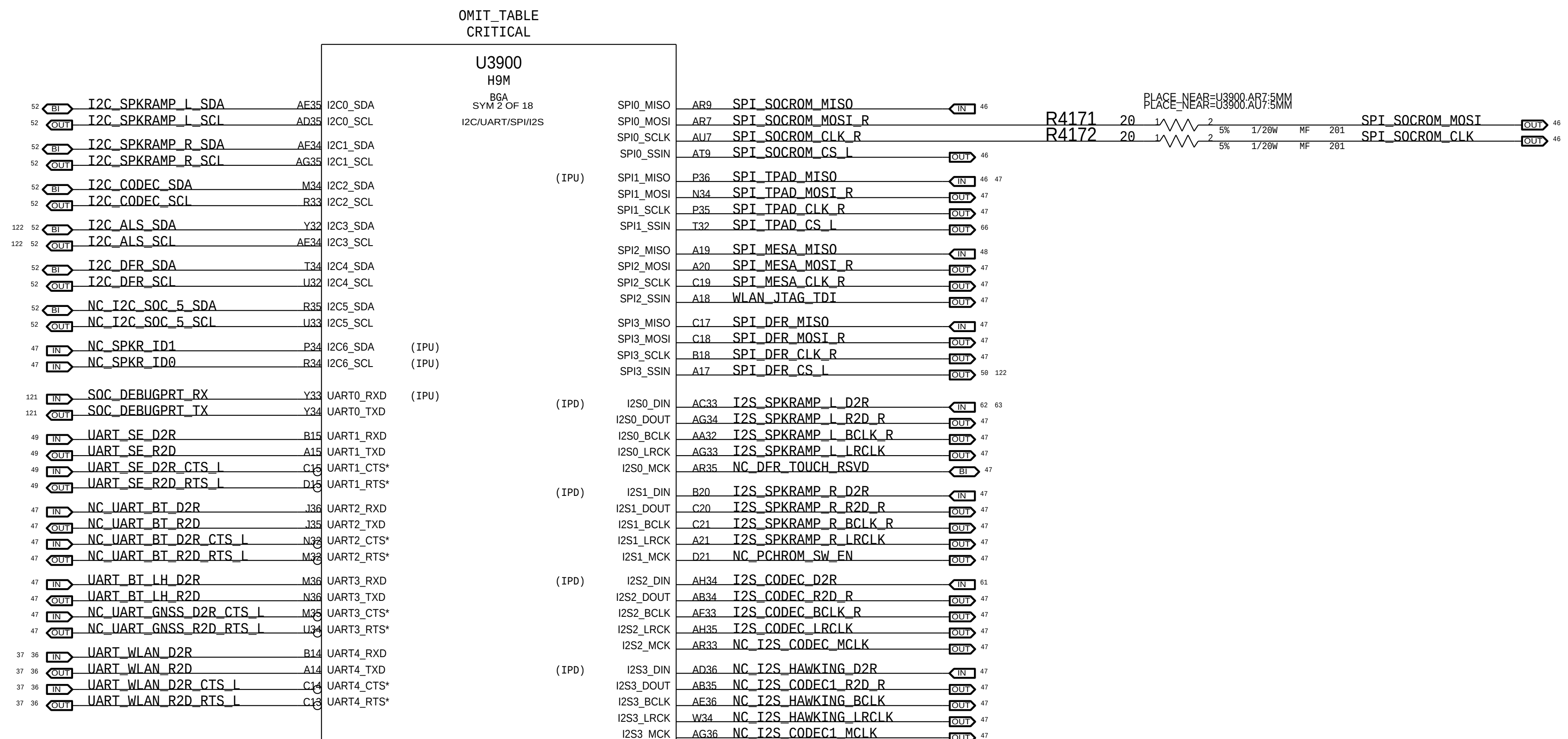
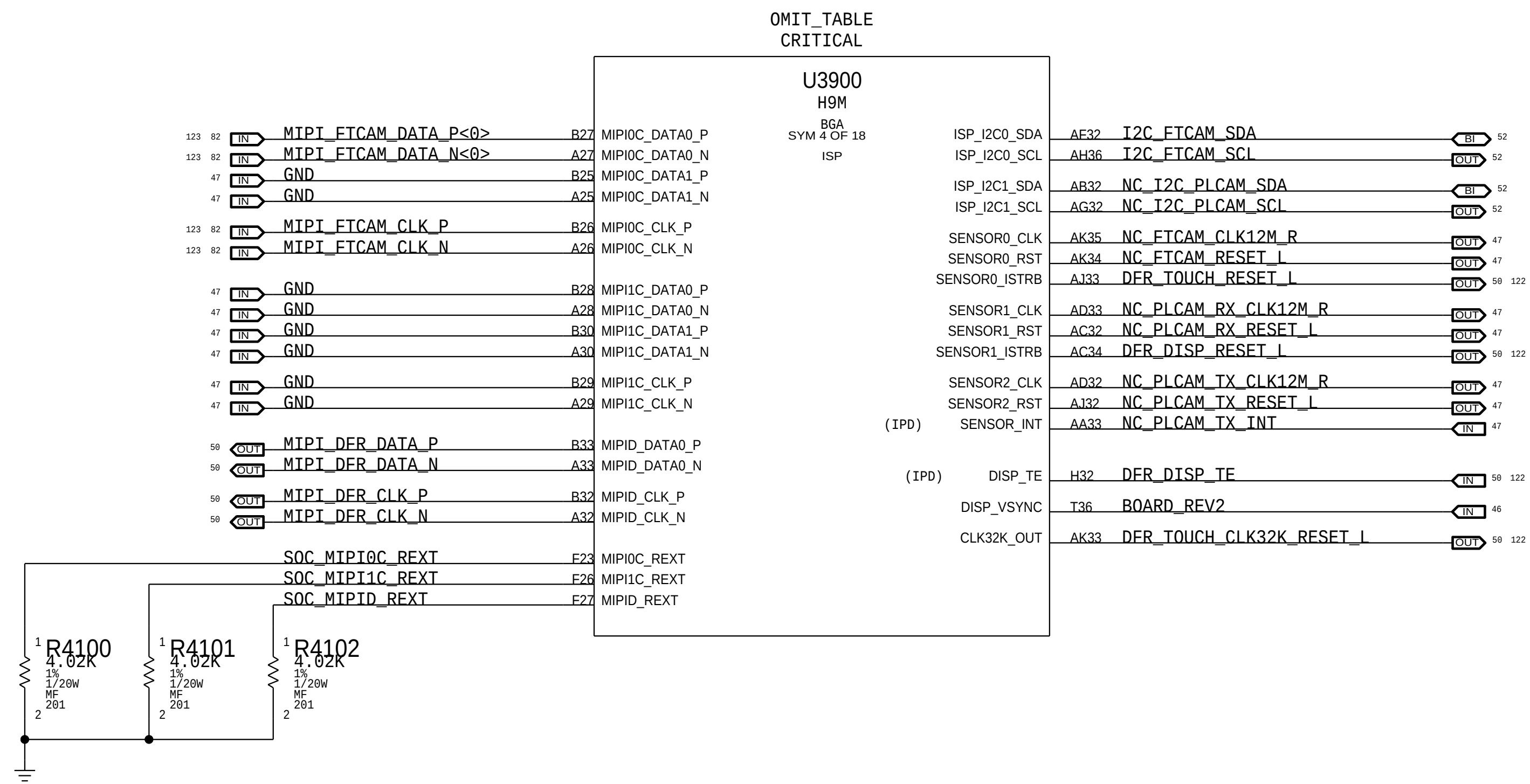
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			PAGE		
			39 OF 200		
			SHEET		
			38 OF 135		



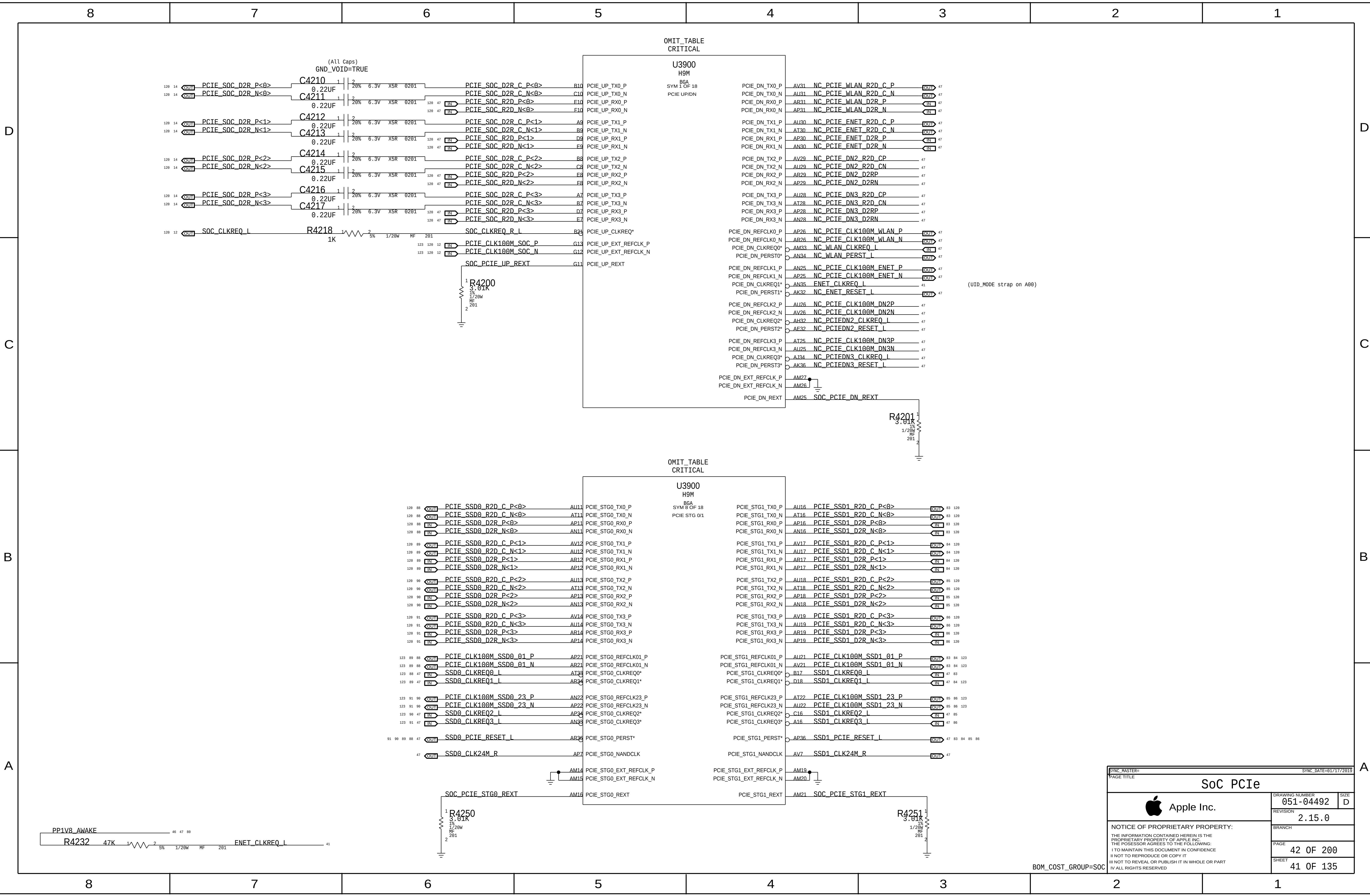
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PAGE		40 OF 200	
SHEET		39 OF 135	

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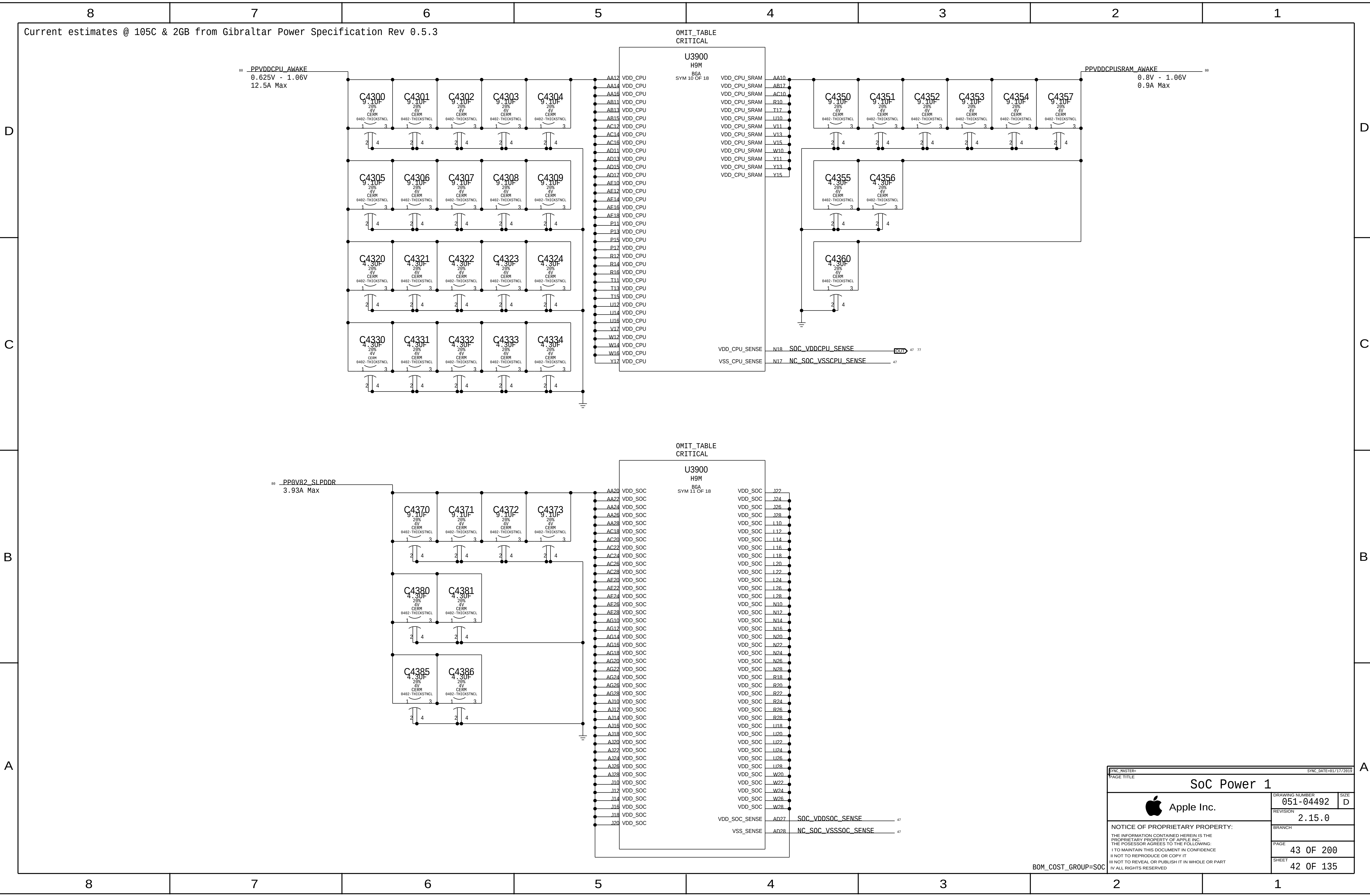
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		SHEET 40 OF 135	

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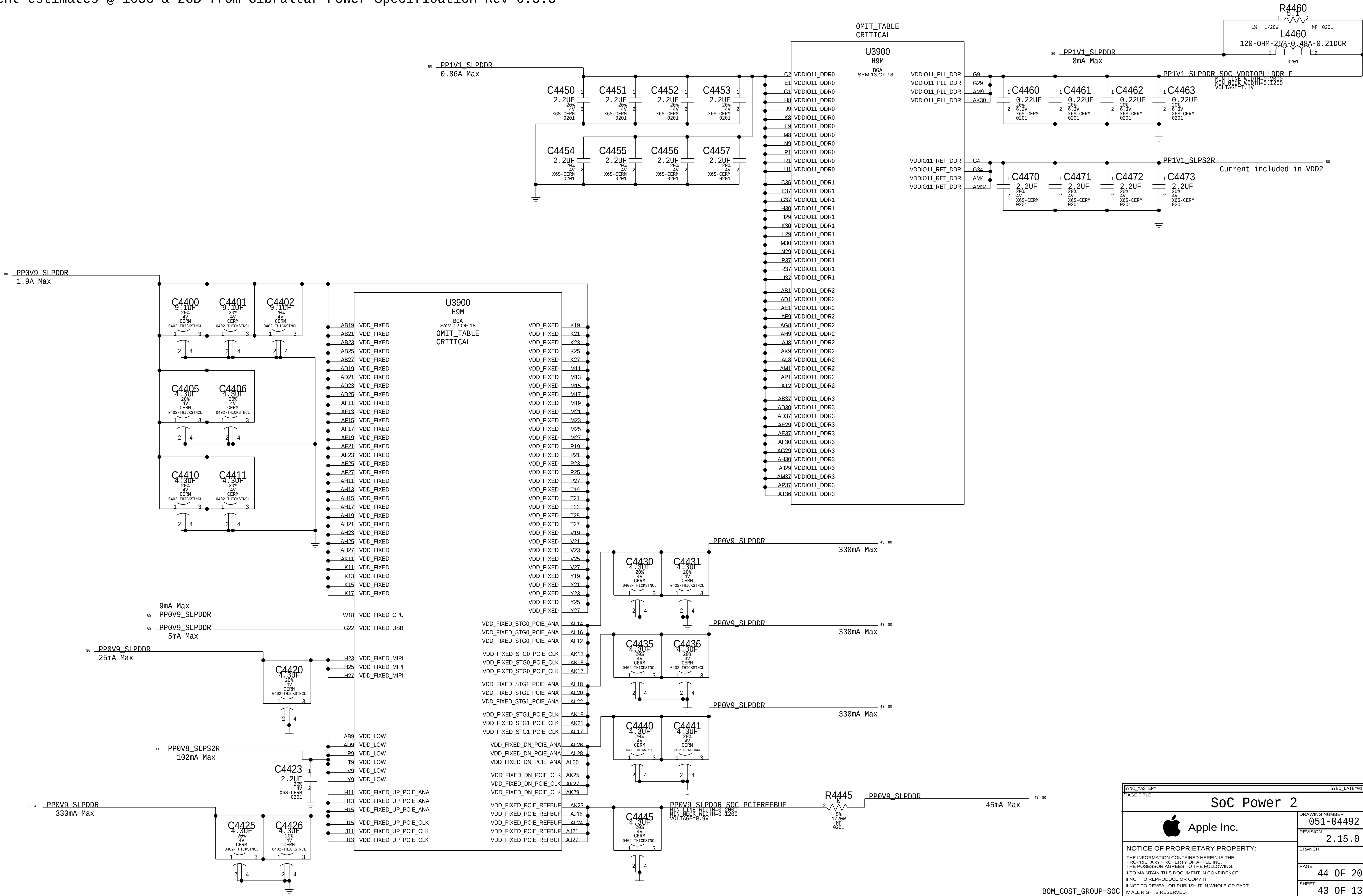
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			PAGE	42	OF 200
			SHEET	41	OF 135

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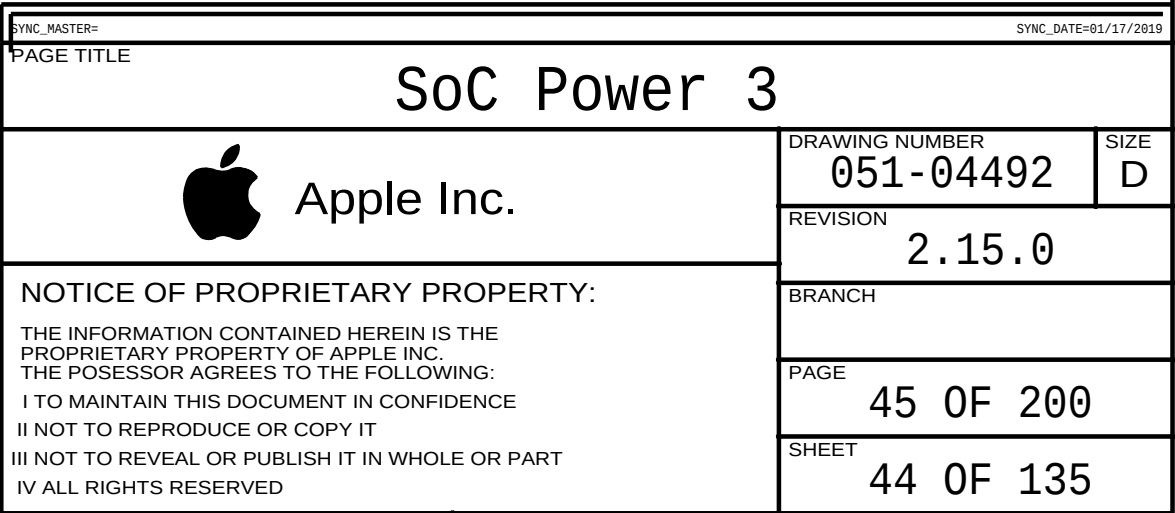


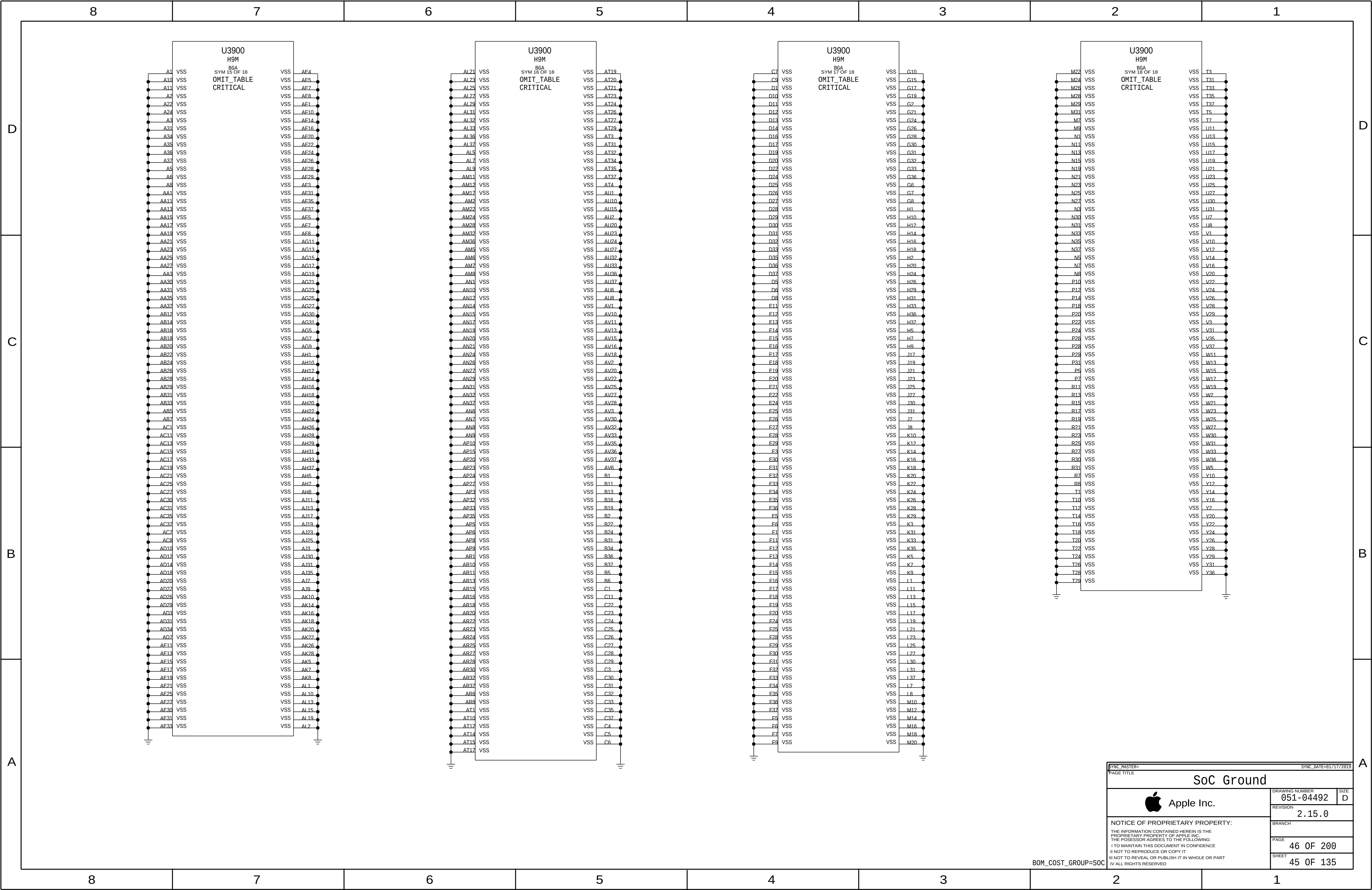
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SHEET		42 OF 135	

Current estimates @ 105C & 2GB from Gibraltar Power Specification Rev 0.5.3



SYNC_MASTER=		SYNC_DATE=01/17/2019	
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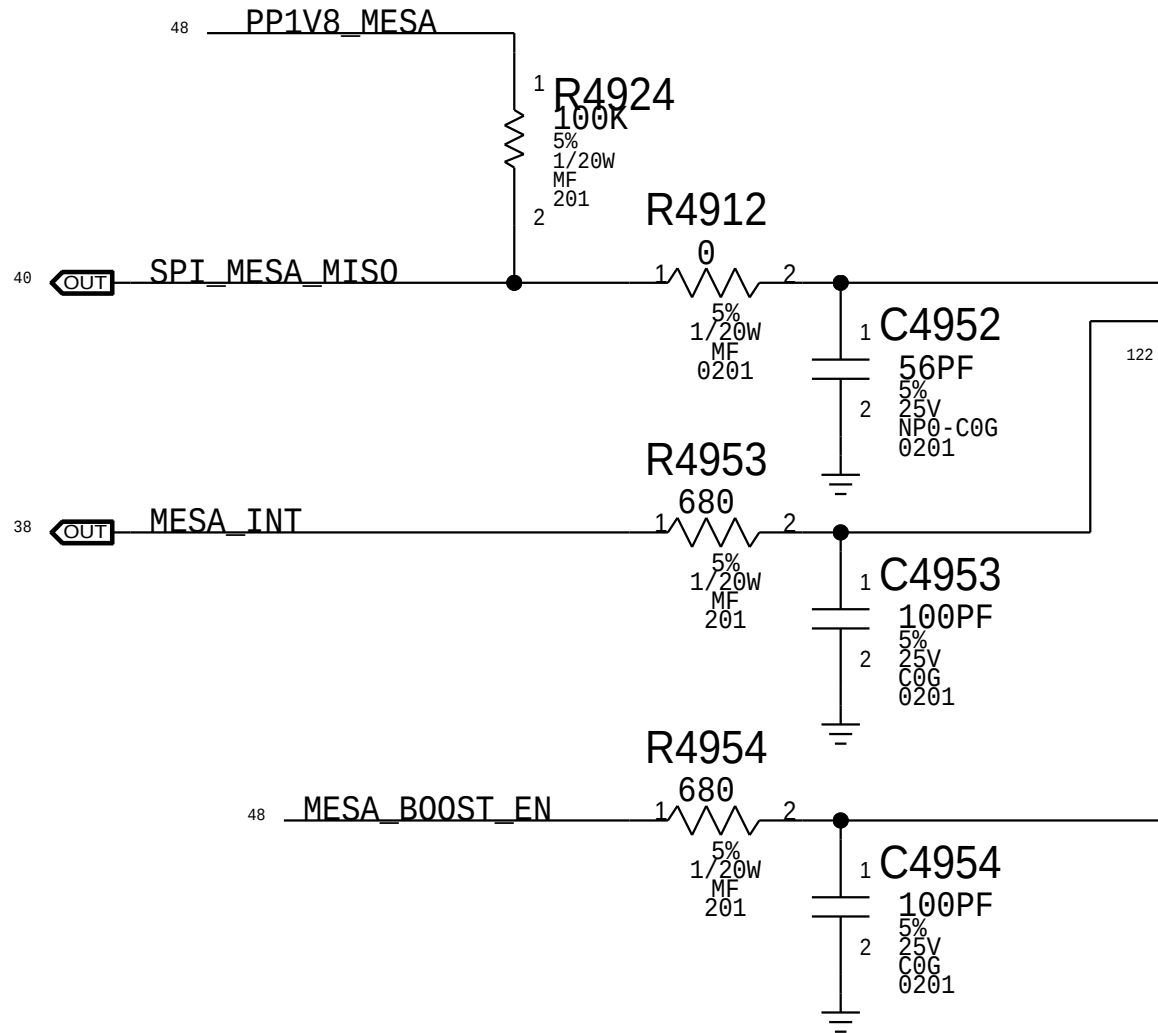
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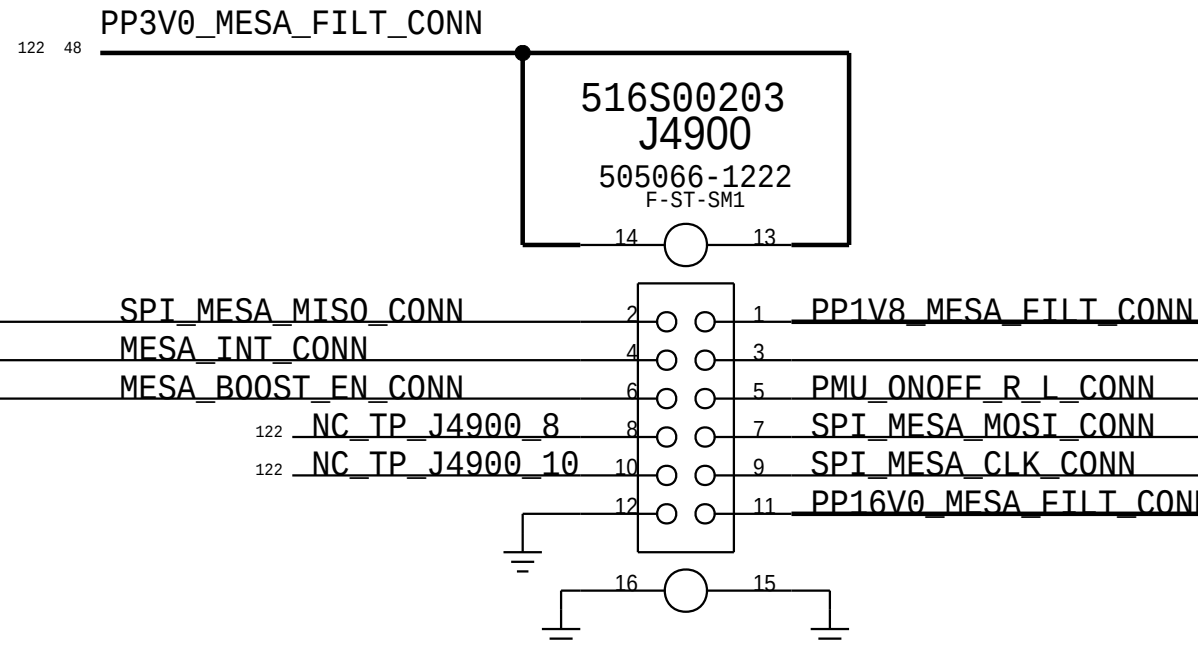
ESD Filters

ISOLATE FROM OTHER COMPONENTS/NETS AS MUCH AS POSSIBLE



MESA FLEX CONNECTOR

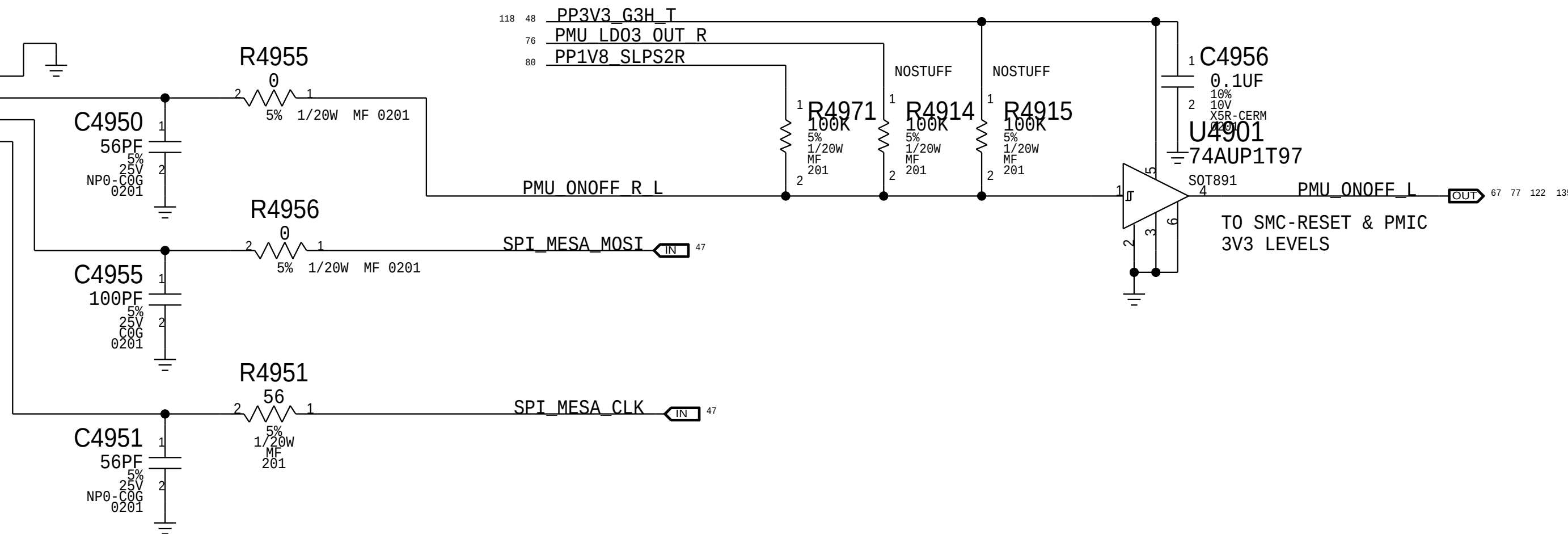
MLB = RECEPTACLE = 516S00203
FLEX = PLUG = 516S00115



ESD Filters

OPINIONS ARE NOT AFFECTED BY MESA MODULE PIN 5&7 DIFFEENCES

ISOLATE FROM OTHER COMPONENTS/NETS AS MUCH AS POSSIBLE



MESA POWER SEQUENCING REQUIREMENTS:

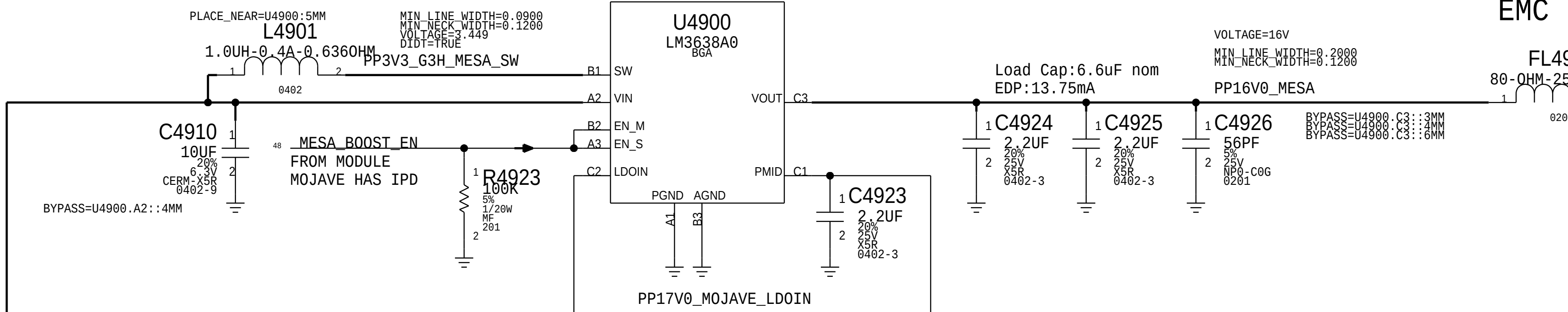
Power On: 1V8 -> 3V3 -> 16V0

Output Voltage	16.0V +/- 2%
Iout (max avg)	6mA
OCP (min)	13 mA
Active Discharge	15 mA sink
Max Output Cap	0.5uF @ 16V

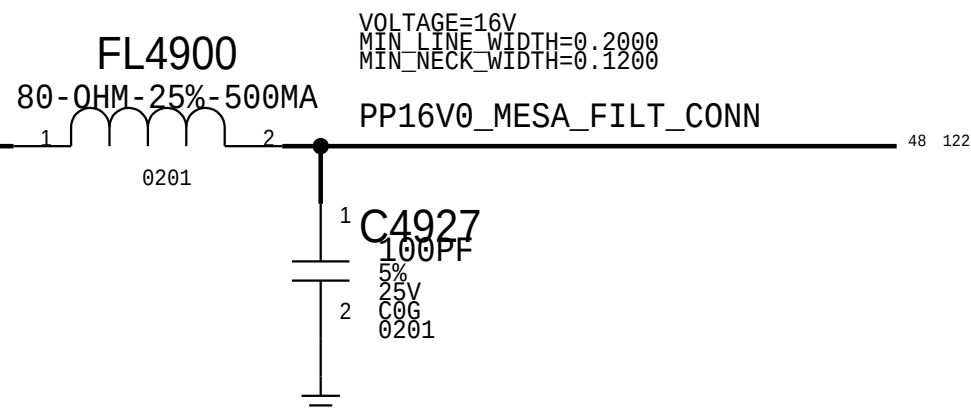
Output Voltage	3.0V +/- 2%
Iout (max avg)	250mA
Dropout Voltage	155mV
OCP (min)	250 mA
Active Discharge	280 Ohm Typ

Output Voltage	1.825V +/- 2%
Iout (max avg)	250mA
Dropout Voltage	50mV Typ @ 100mA
OCP (min)	250 mA
Active Discharge	230 Ohm Typ
Max Output Cap	10uF

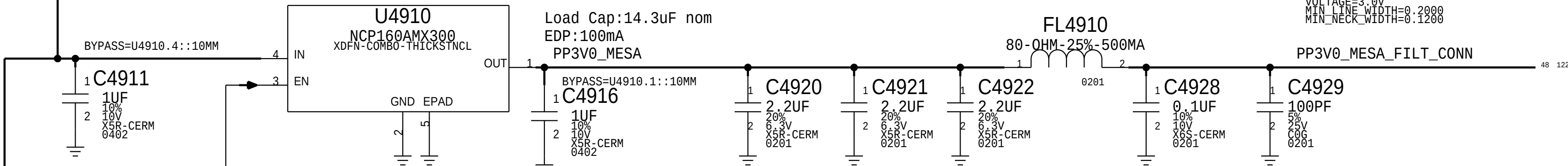
MOJAVE 16V BOOST



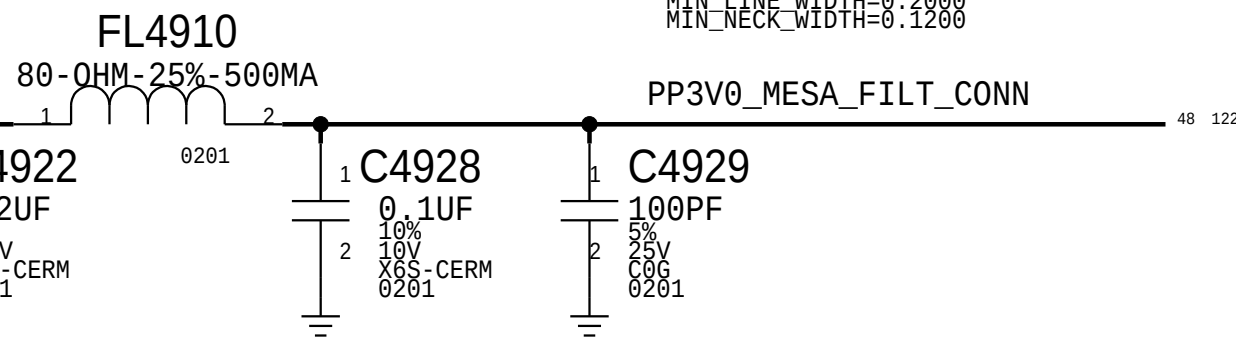
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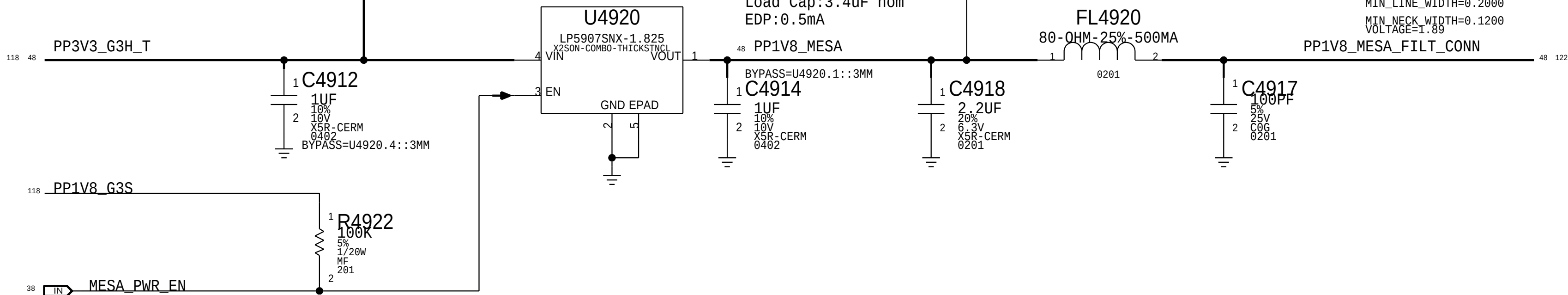
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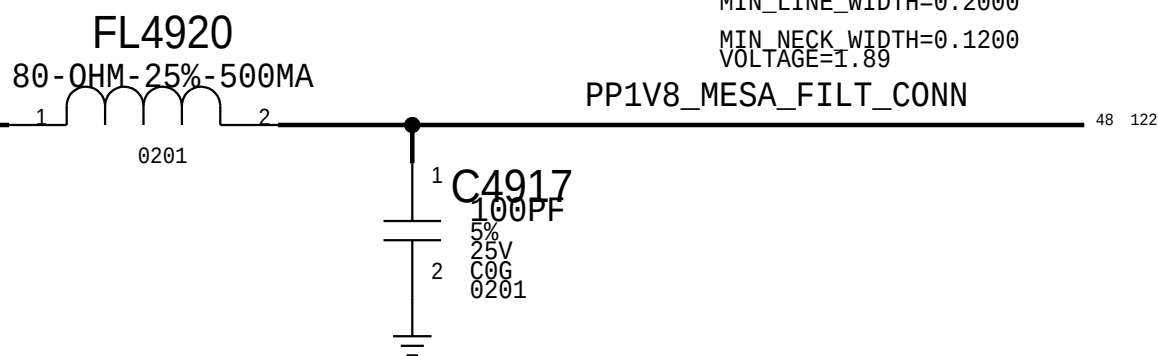
EMC Filter



1.8V MESA



EMC Filter



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PAGE		49 OF 200
SHEET		48 OF 135

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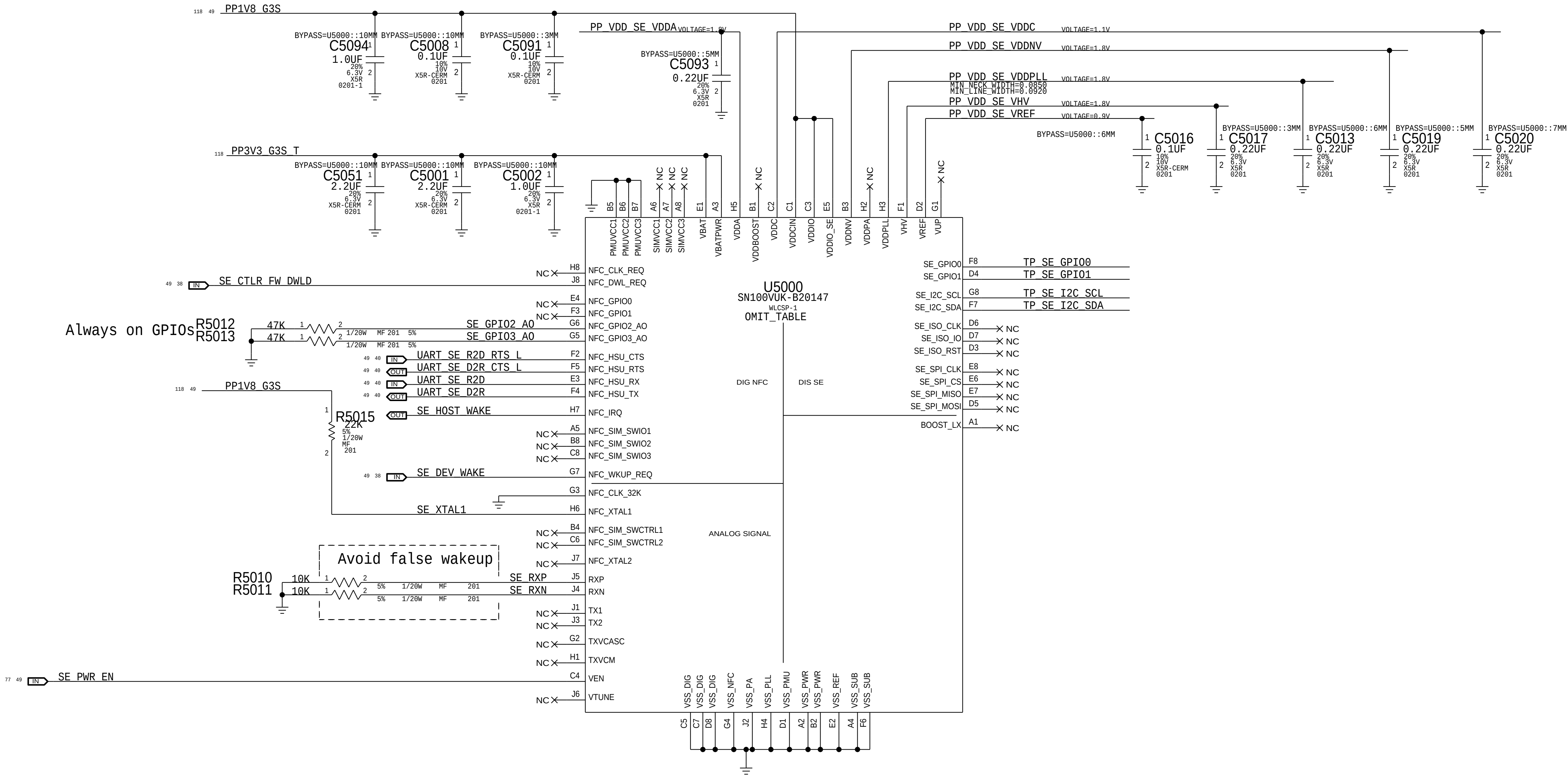
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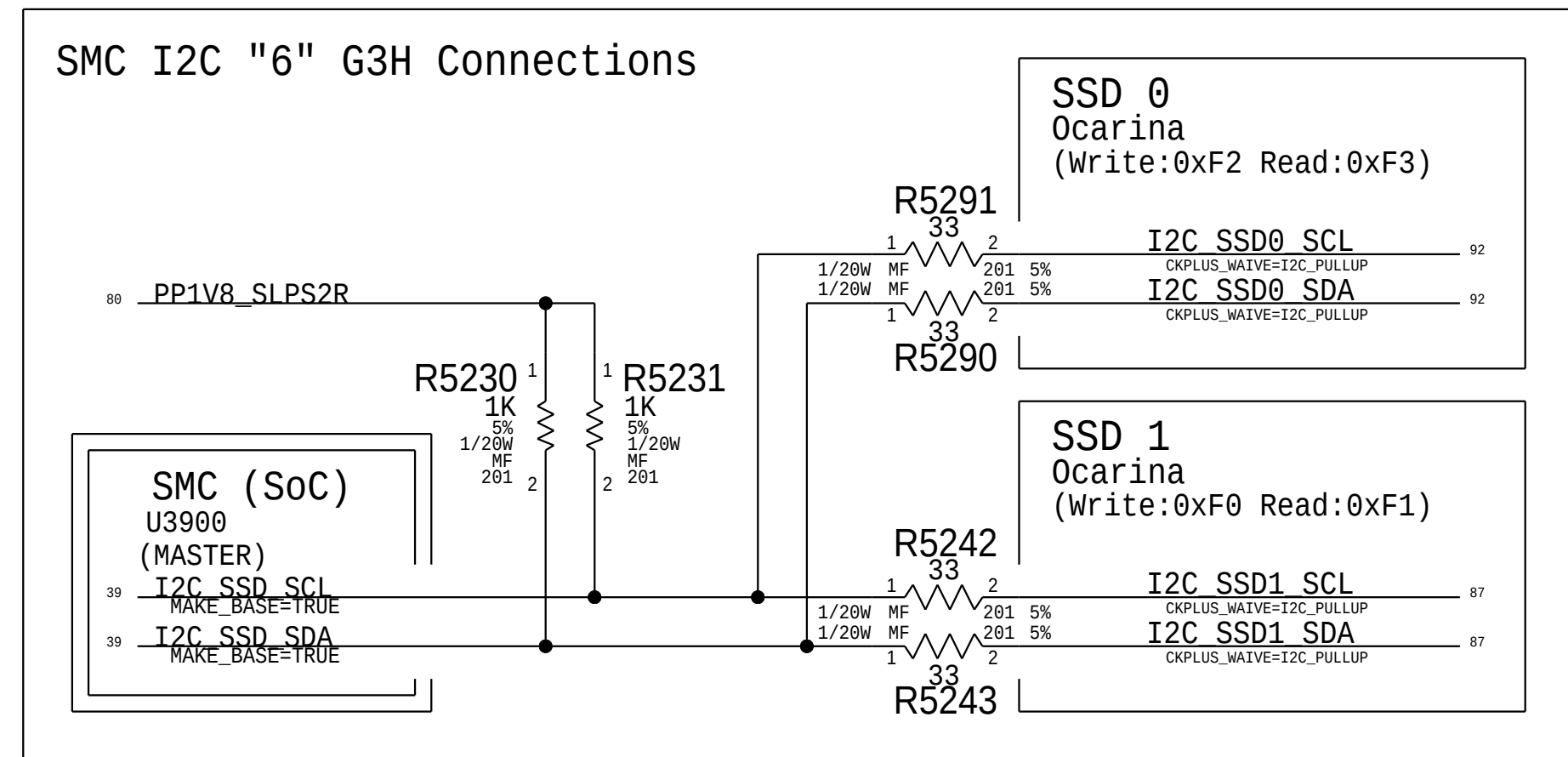
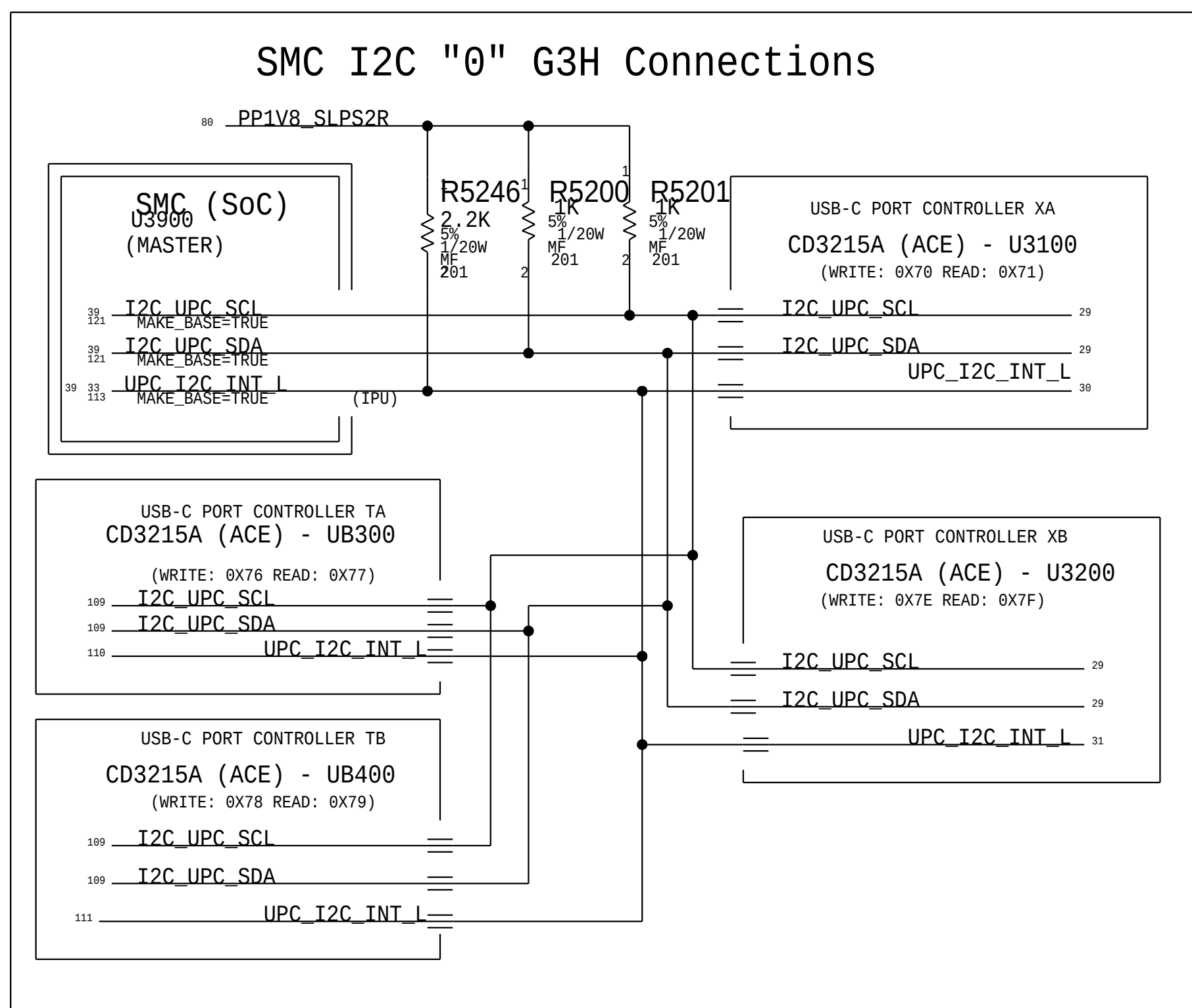
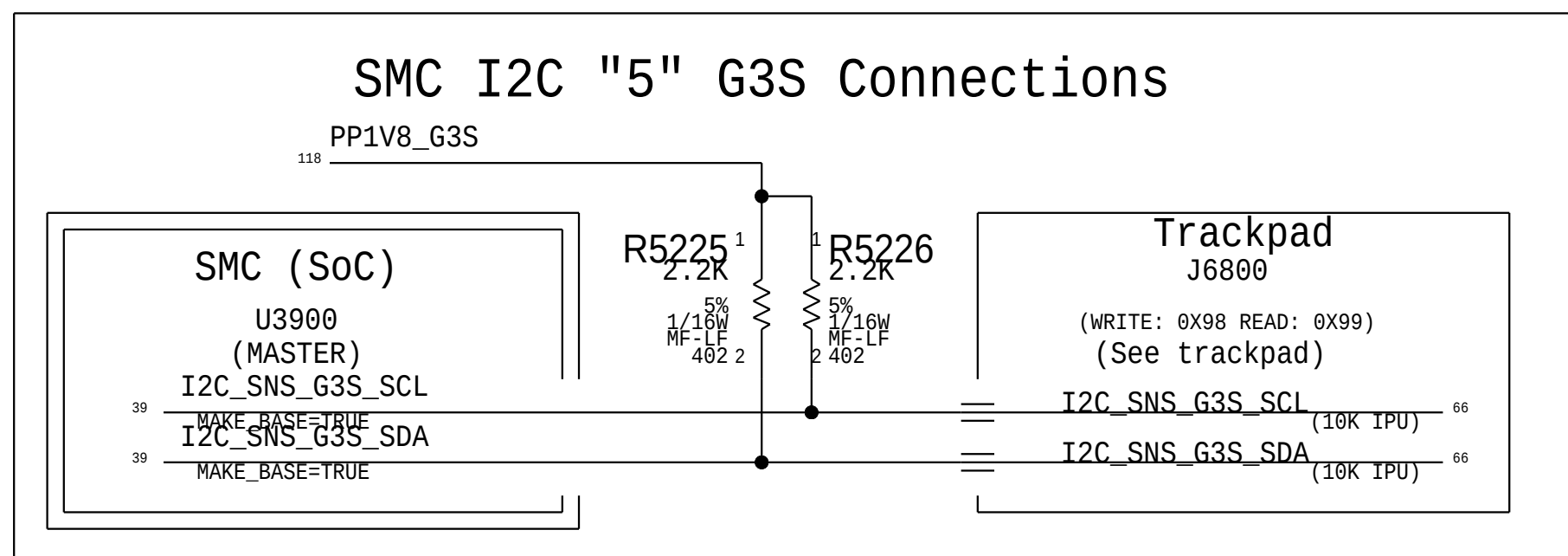
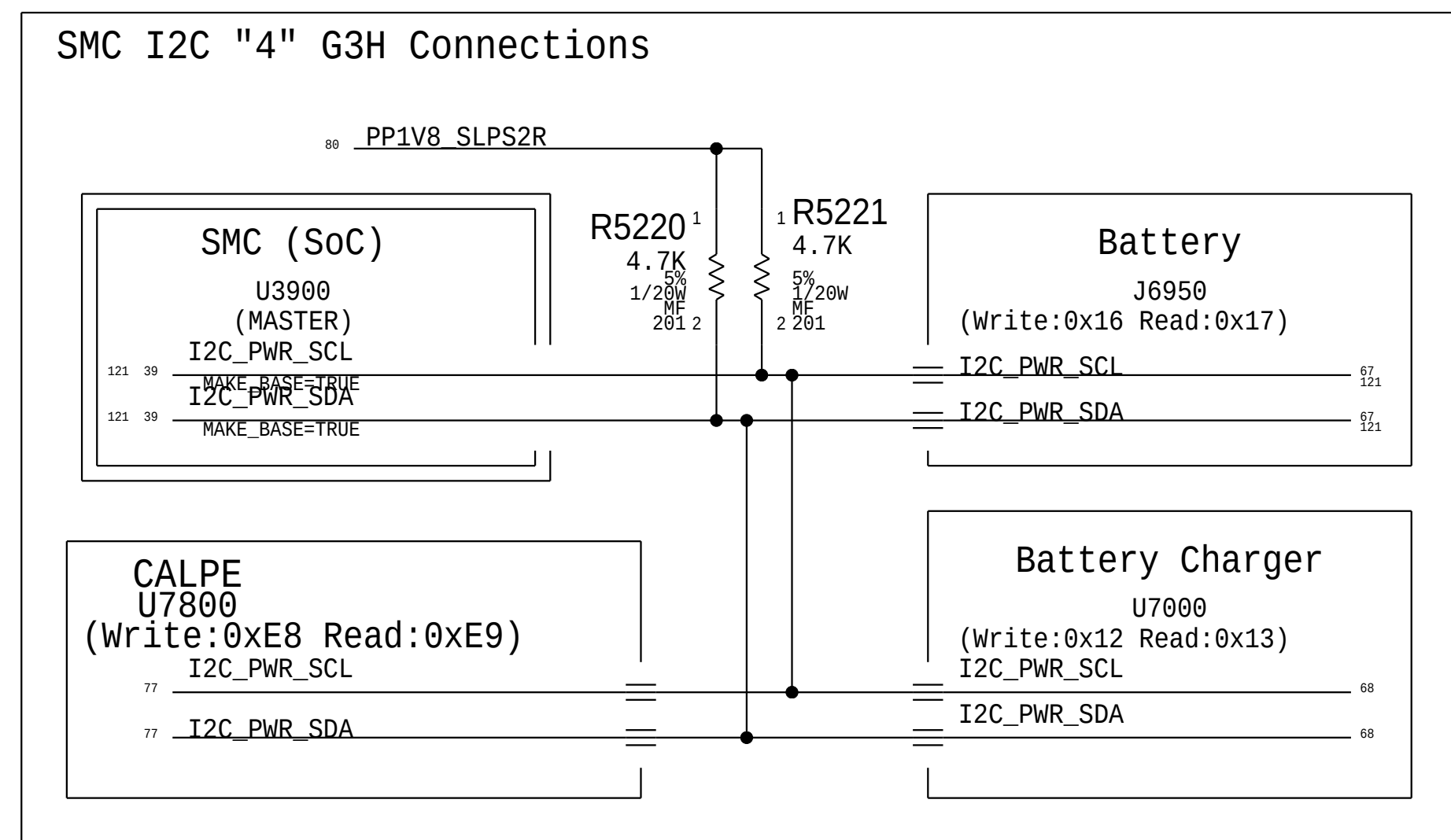
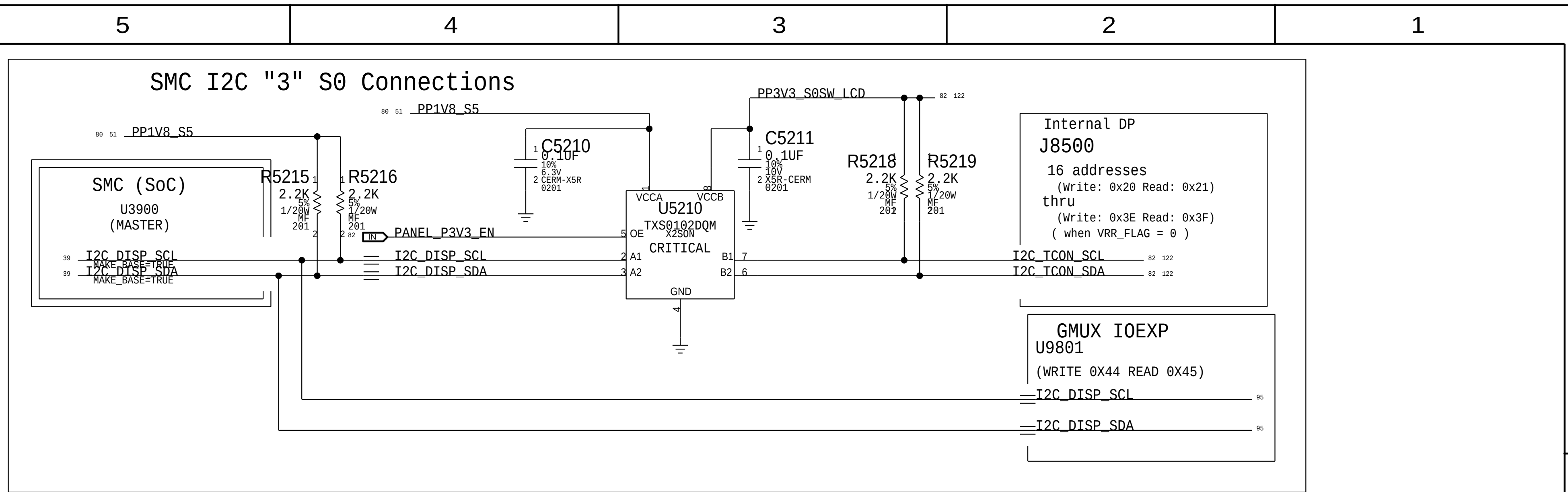
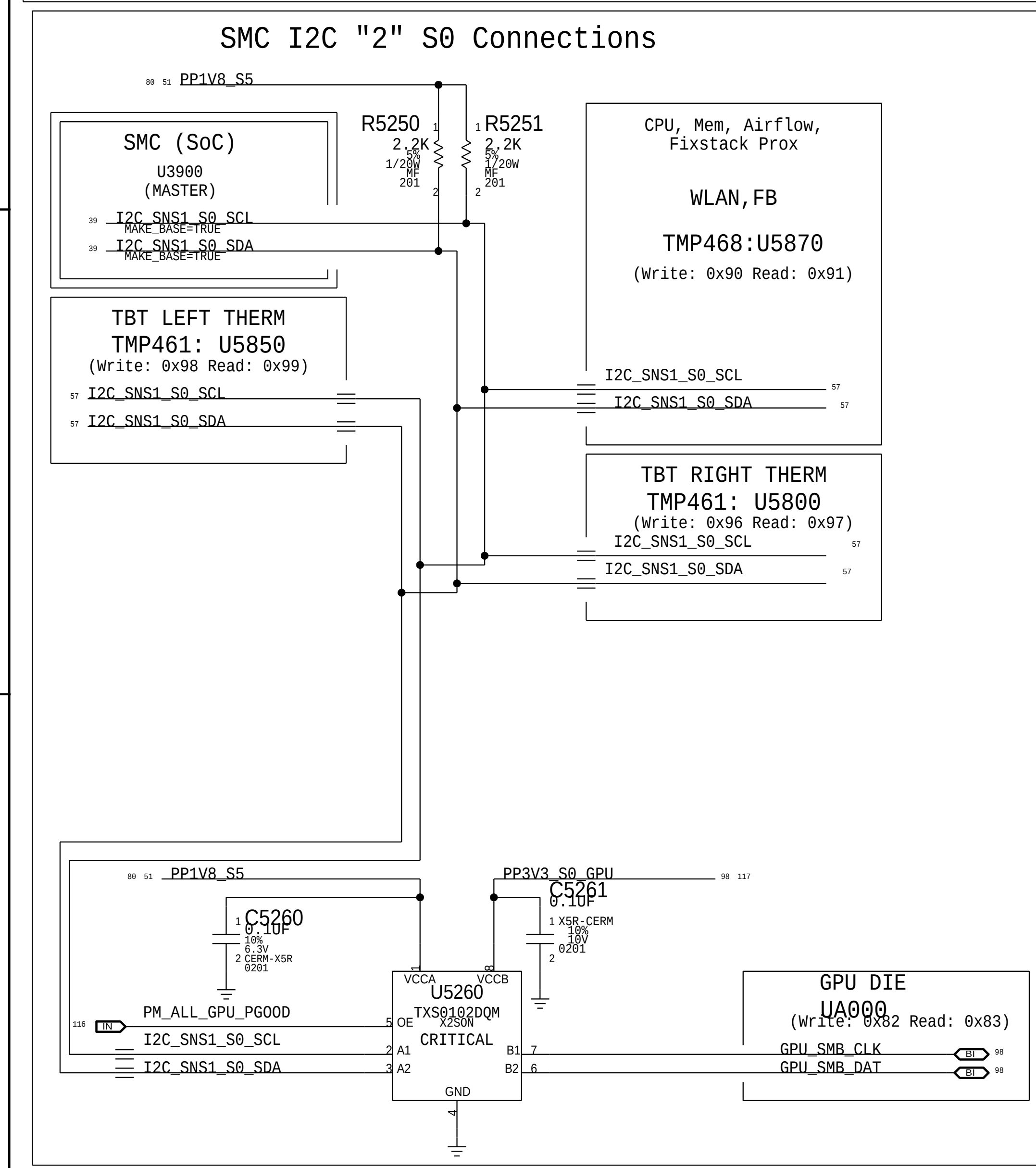
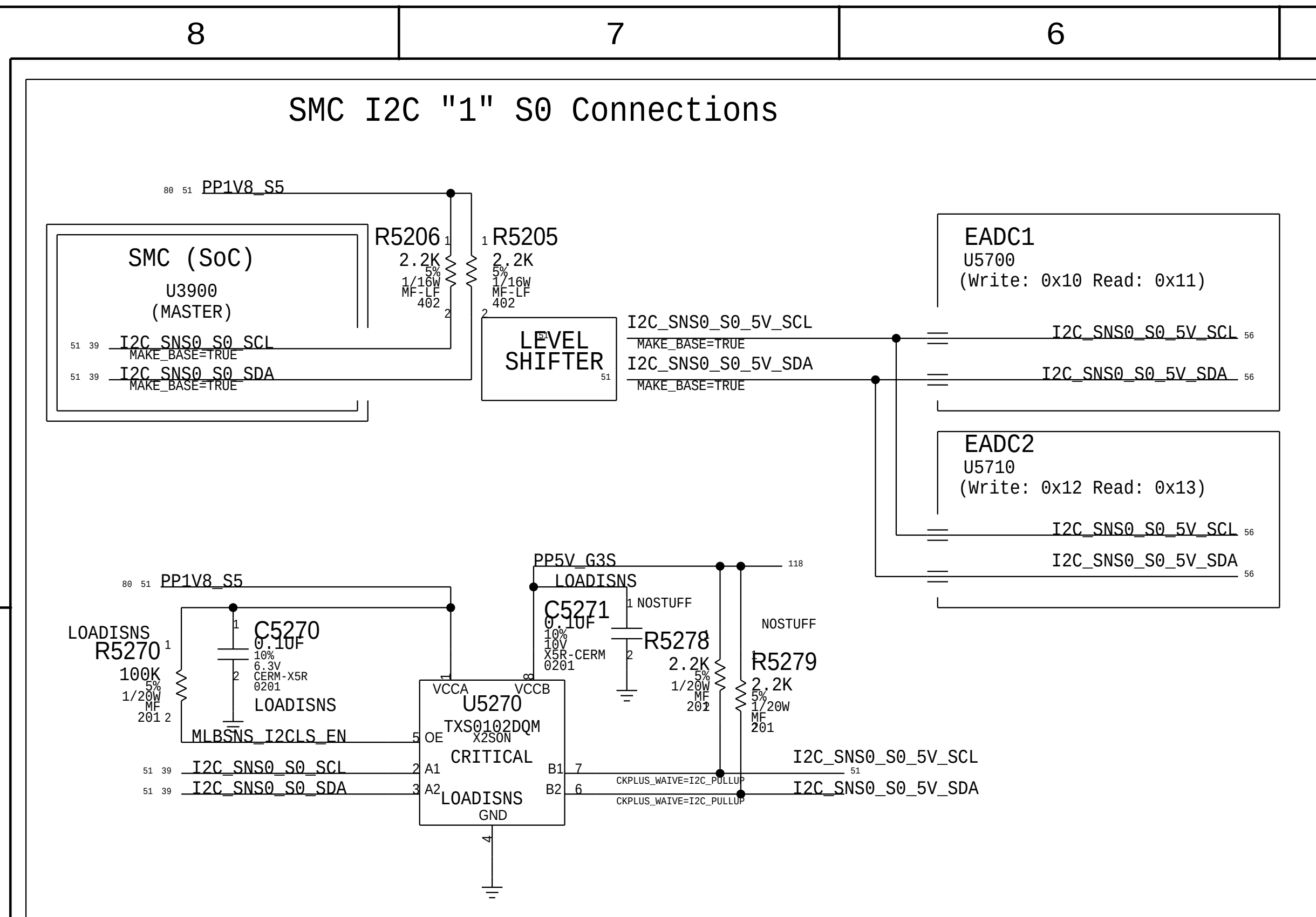


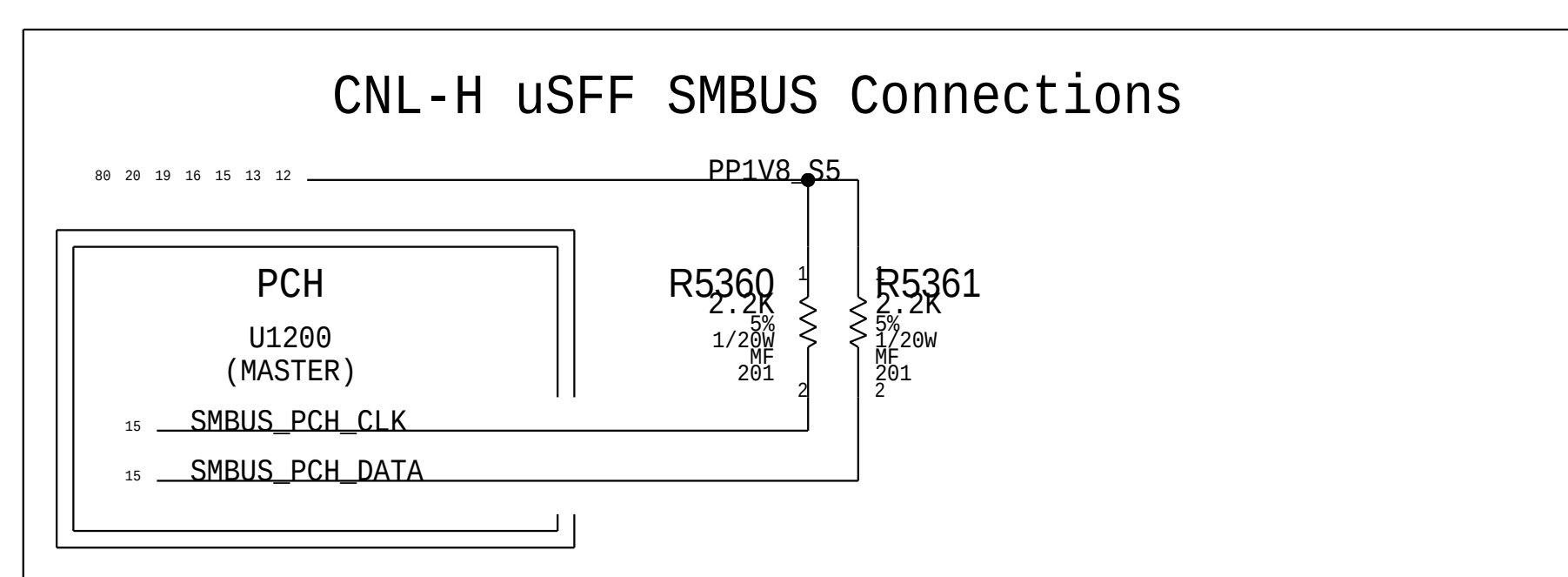
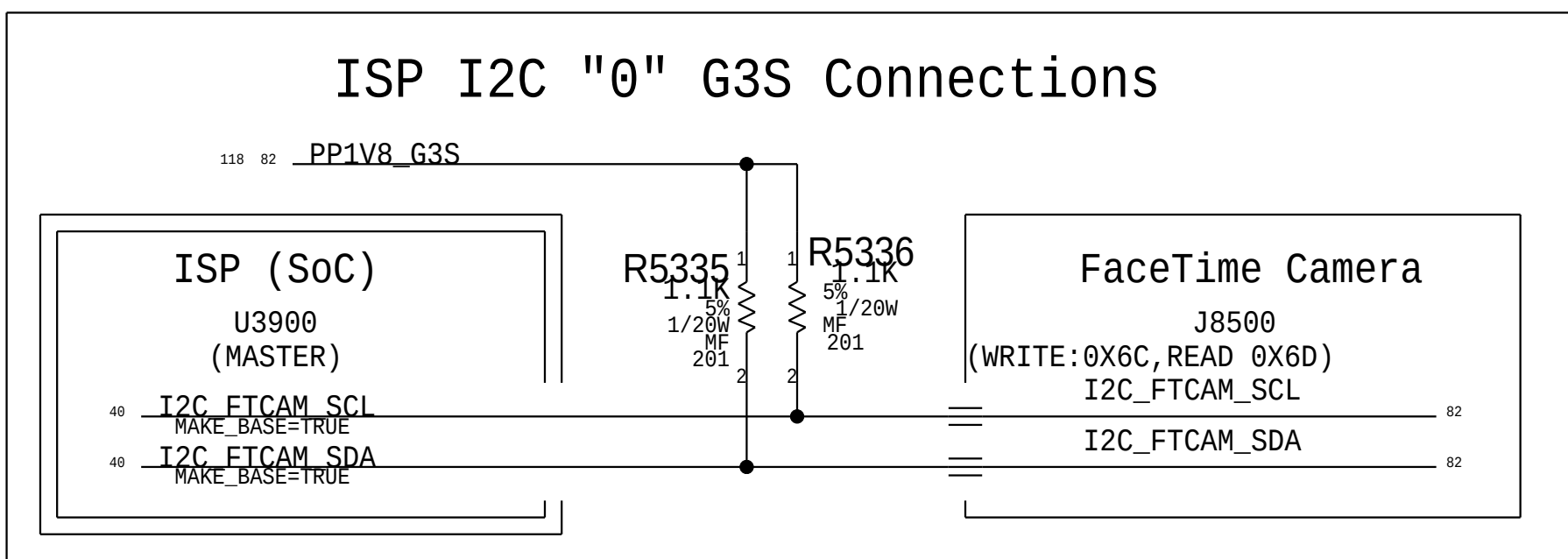
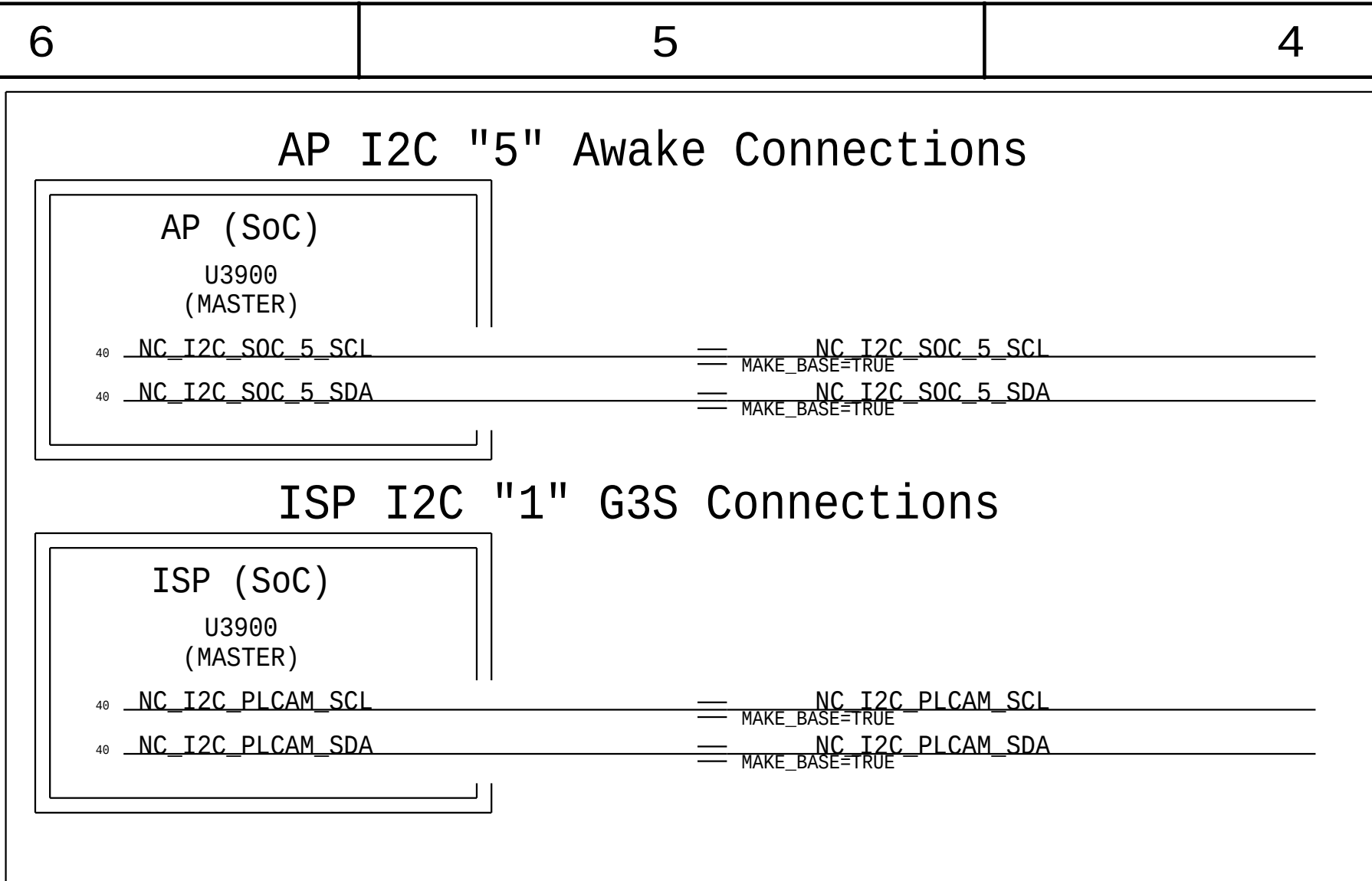
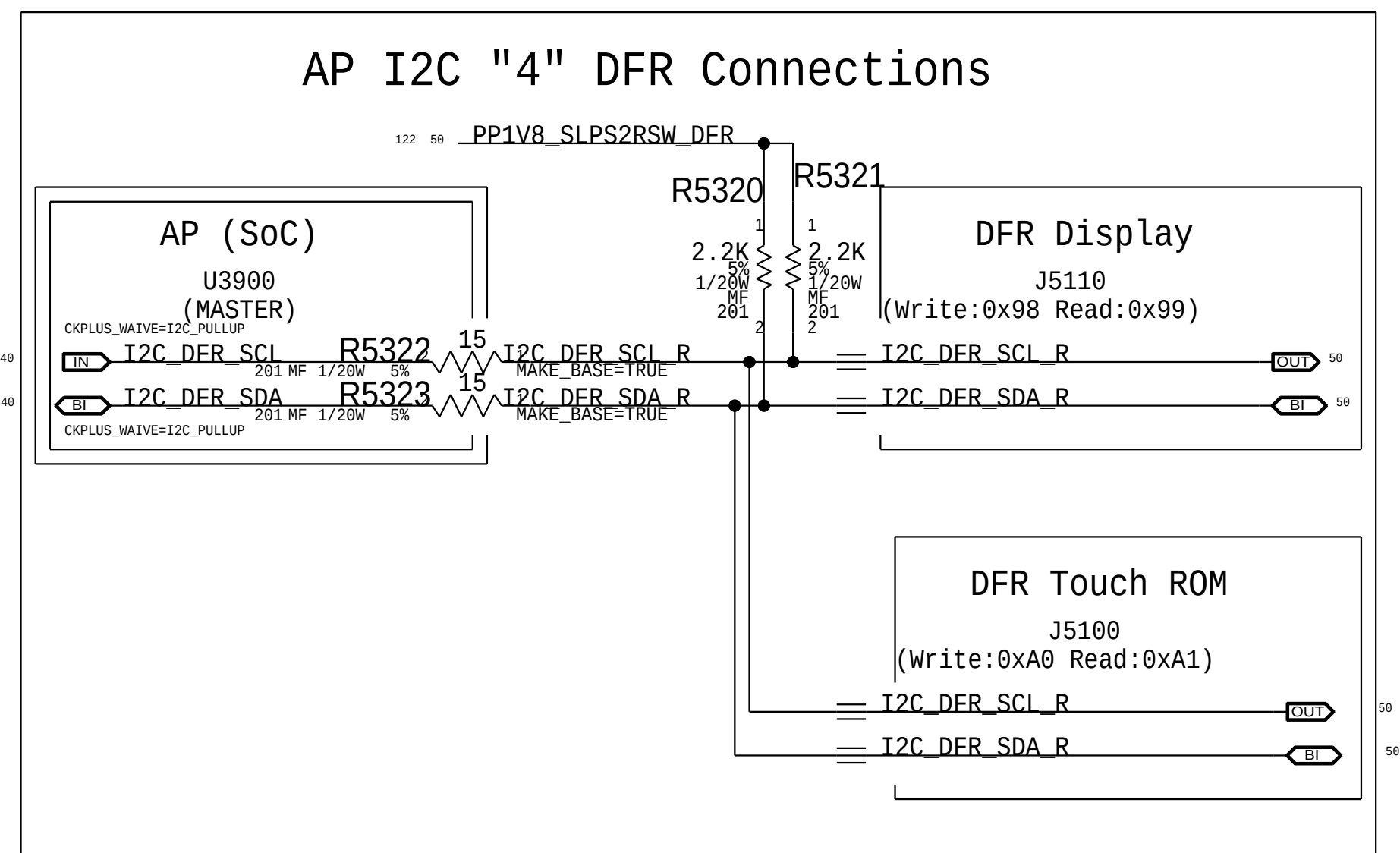
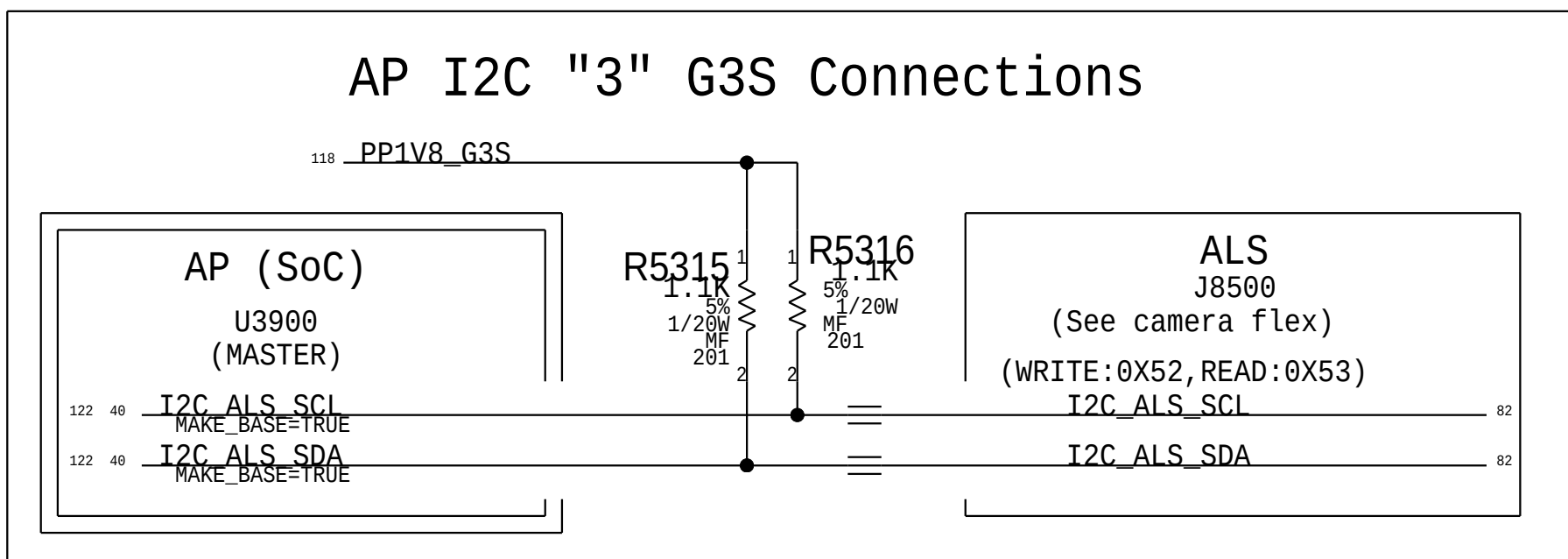
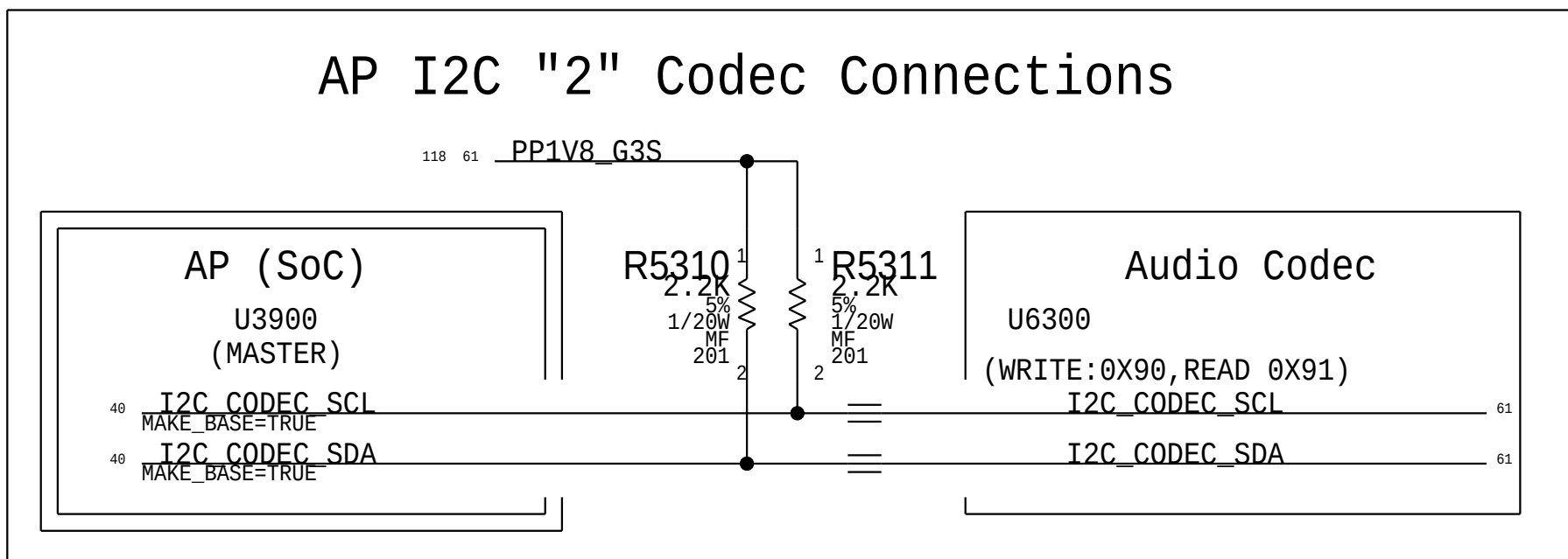
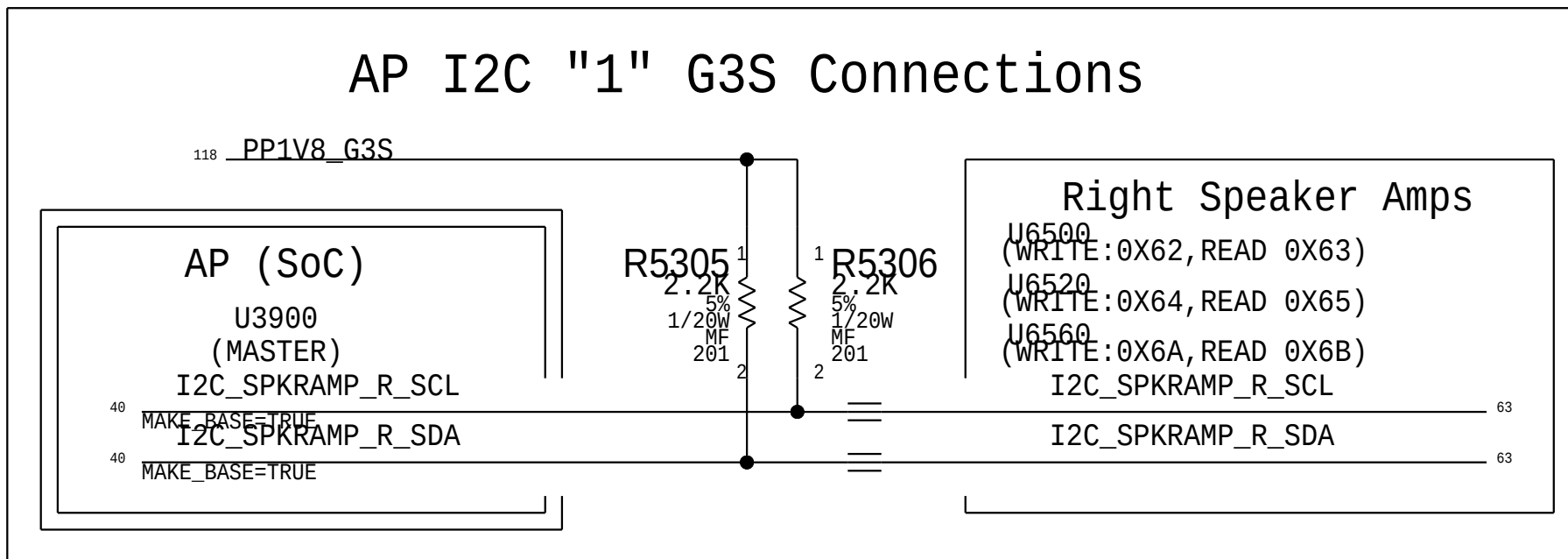
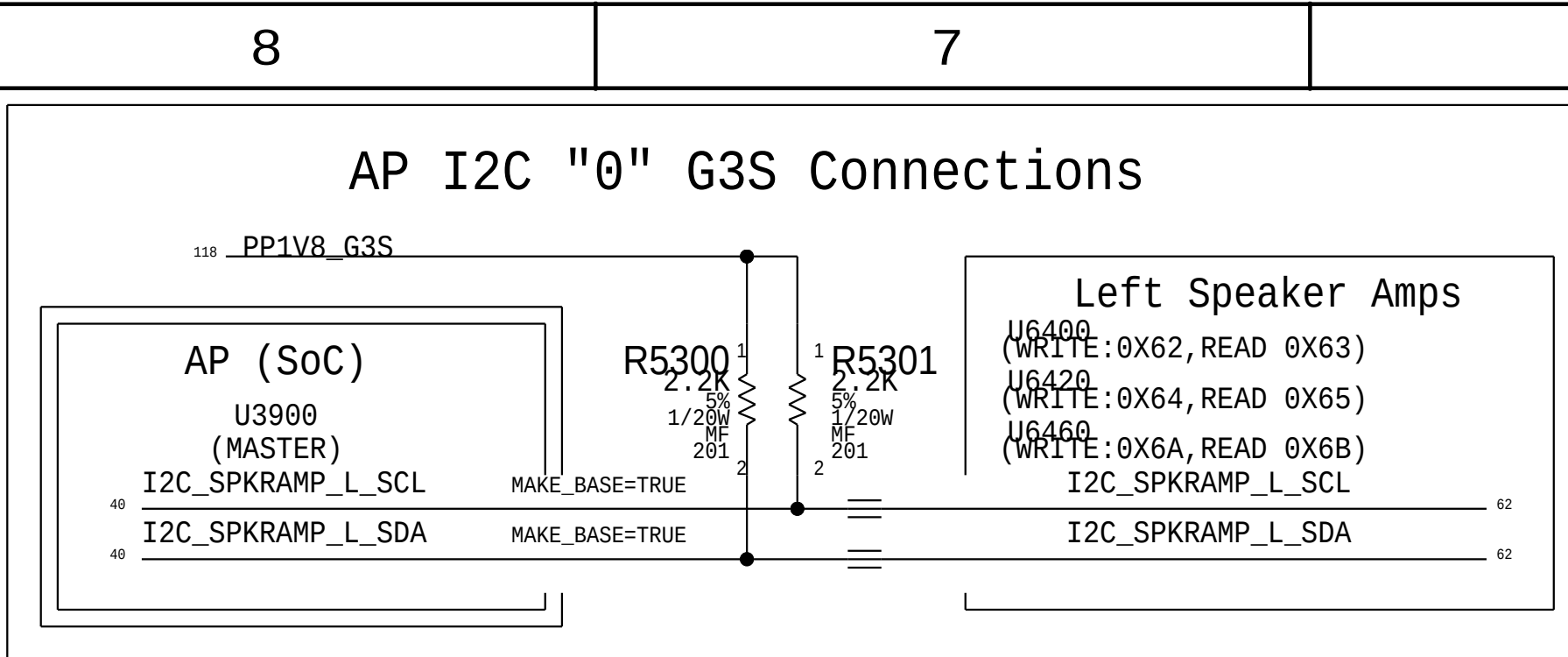
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998-15216	1	IC, SN100V, DEV, B2, WLCSP72	U5000	CRITICAL	SE:DEV_2019
338S00445	1	IC, SN100V, PR0D, B2, WLCSP72	U5000	CRITICAL	SE:PROD_2019

PP1V8_G3S	47	118	121	122
R5001	100K	1	2	UART_SE_R2D
R5002	100K	1	2	5% 1/20W MF 201
R5003	100K	1	2	5% 1/20W MF 201
R5004	100K	1	2	5% 1/20W MF 201
R5000	100K	1	2	5% 1/20W MF 201
R5005	100K	1	2	5% 1/20W MF 201
R5006	100K	1	2	5% 1/20W MF 201

BOM_COST_GROUP=SOC

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PAGE		
50 OF 200		
SHEET		
49 OF 135		





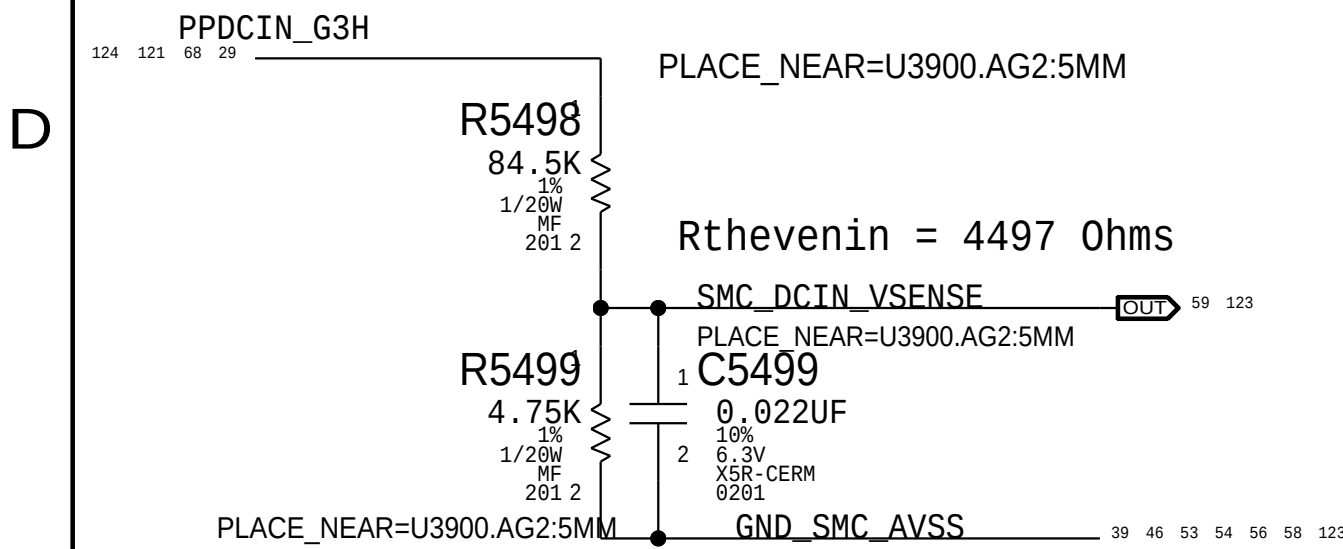
2		1	
I2C Device Address			
Device		SMC IF	ADDR. (8b)
ACE XA		I2C0	0X70/1
ACE XB		I2C0	0X7E/F
ACE TA		I2C0	0X76/7
ACE TB		I2C0	0X78/9
EADC1		I2C1	0X10/1
EADC2		I2C1	0X12/3
Temp. Sensor Left		I2C2	0X98/9
Temp. Sensor Right		I2C2	0X96/7
CPU, MEM, WLAN Thermal		I2C2	0X90/1
GPU Analog Die Thermal		I2C2	0X92/3
GPU Digital Die Thermal		I2C2	0X82/3
TC0N		I2C3	0X20/1
GMUX IOEXP		I2C3	0X44/5
Charger		I2C4	0X12/3
Battery		I2C4	0X16/7
Calpe		I2C4	0XE8/9
Trackpad		I2C5	0X98/9
SSD0		I2C6	0XF2/3
SSD1		I2C6	0XF0/1
SoC IF			
Left Spkr Amp.(U6400)		I2C0	0X62/3
Left Spkr Amp.(U6420)		I2C0	0X64/5
Left Spkr Amp.(U6460)		I2C0	0X6A/B
Right Spkr Amp.(U6500)		I2C1	0X62/3
Right Spkr Amp.(U6520)		I2C1	0X63/4
Right Spkr Amp.(U6560)		I2C1	0X6A/B
Audio Codec		I2C2	0X90/1
ALS		I2C3	0X52/3
DFR Display		I2C4	0X98/9
DFR Touch		I2C4	0XA0/1
NC.		I2C5	
NC.Spkr ID1		I2C6_SDA	
NC.Spkr ID0		I2C6_SCL	
ISP IF			
FT Camera		I2C0	0X6C/D
NC.		I2C1	
AOP IF			
NC.		I2C0	
PCH IF			
NC.		PULL -UP	

PAGE TITLE			
I2C Connections 2			
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	2.15.0		
	BRANCH		
	PAGE		
	53 OF 200		
	SHEET		
	52 OF 135		

BOM_COST_GROUP=SMC

DC-IN Voltage Sense (VD0R)

Gain: 0.05322x
Vnominal: 20 V, Range: 23.49 V
SMC ADC: 00
Enables DC-In VSense divider when AC present.
2.2KHz

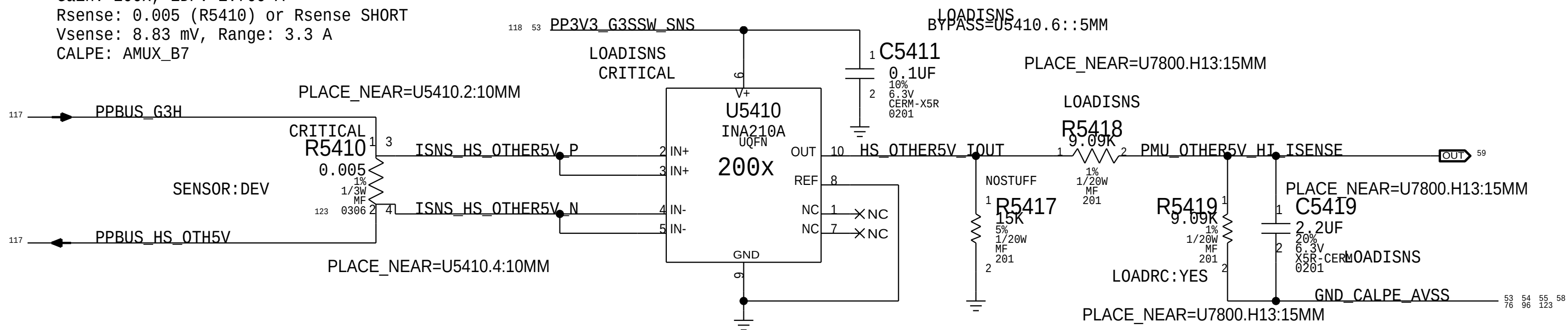


J152 Sensor Settings

IC	Vref	Vmax	SMC Sample Freq.	ADR RC filter
H9M	1.25	1.8	10kHz	0.1ms
CALPE	1.5	5.0	100Hz	10ms
EADC	2.5	5.0	1-2Hz (10Hz)	100ms

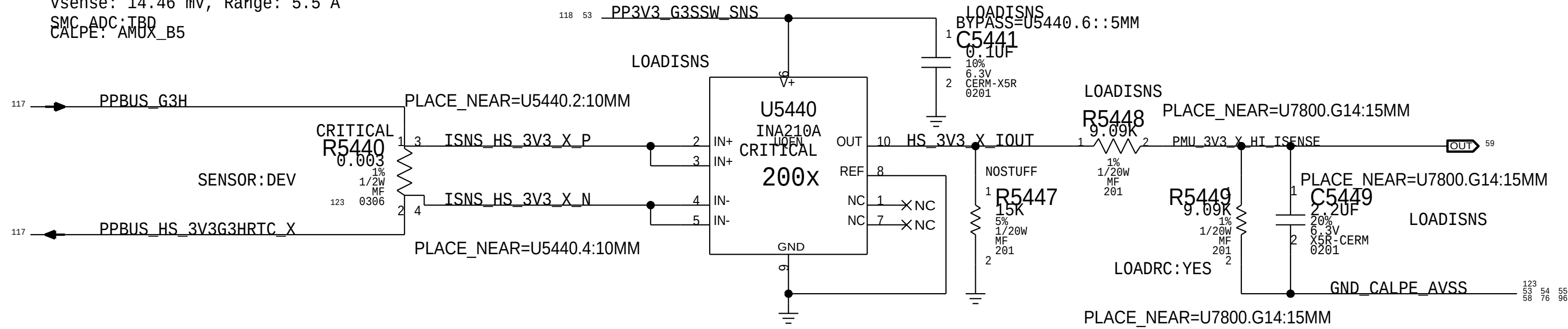
OTHER 5V High Side Current Sense (I05R)

Gain: 200x, EDP: 1.766 A
Rsense: 0.005 (R5410) or Rsense SHORT
Vsense: 8.83 mV, Range: 3.3 A
CALPE: AMUX_B7



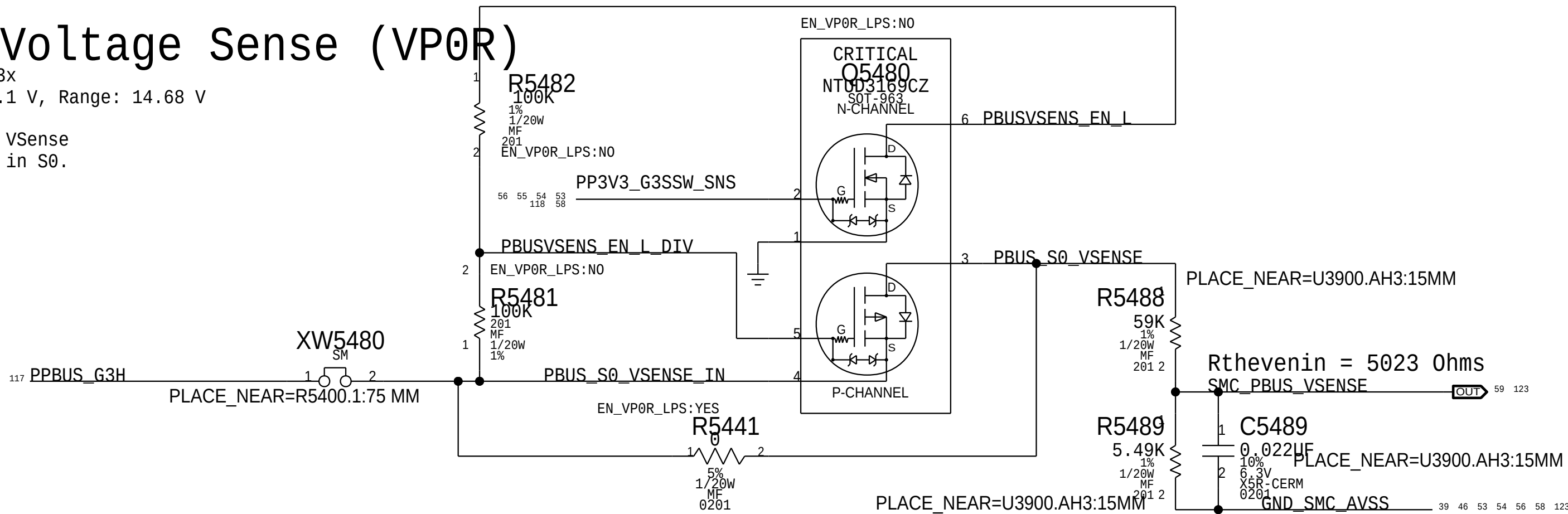
LEFT SIDE 3.3V High Side Current Sense (I0LR)

Gain: 200x, EDP: 4.82 A
Rsense: 0.003 (R5440) or Rsense SHORT
Vsense: 14.46 mV, Range: 5.5 A
CALPE: AMUX_B5



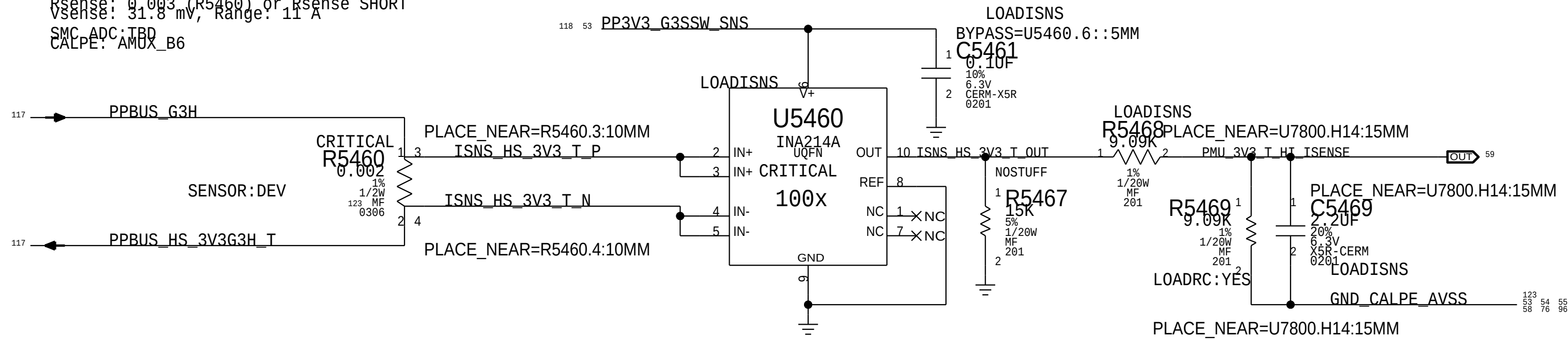
PBUS Voltage Sense (VP0R)

Gain: 0.08513x
Vnominal: 13.1 V, Range: 14.68 V
SMC ADC: 02
Enables PBUS VSense divider when in S0.



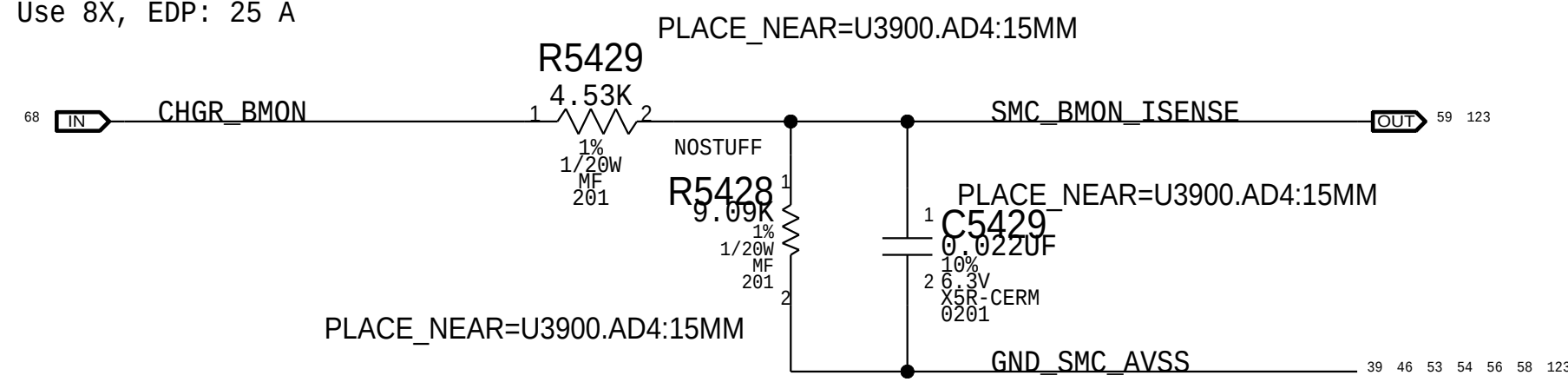
RIGHT SIDE 3.3V High Side Current Sense (I0RR)

Gain: 100x, EDP: 10.6 A
Rsense: 0.003 (R5460) or Rsense SHORT
Vsense: 31.8 mV, Range: 11 A
CALPE: AMUX_B6



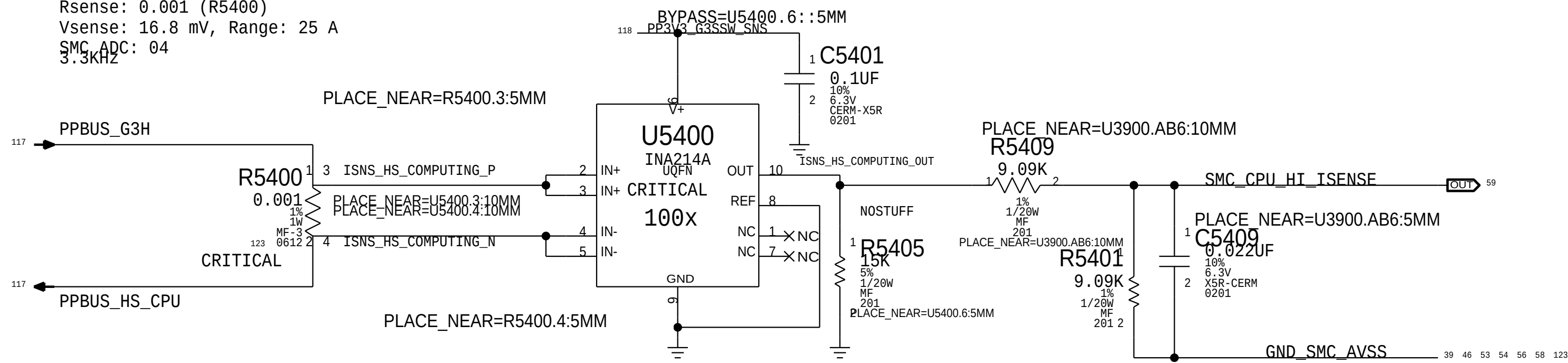
Discharger BMON Current Sense (IPBR)

Charger Gain: 8X OR 64x, Use 8X, EDP: 25 A
Rsense: 0.005 (R7060)
SMC ADC: 03



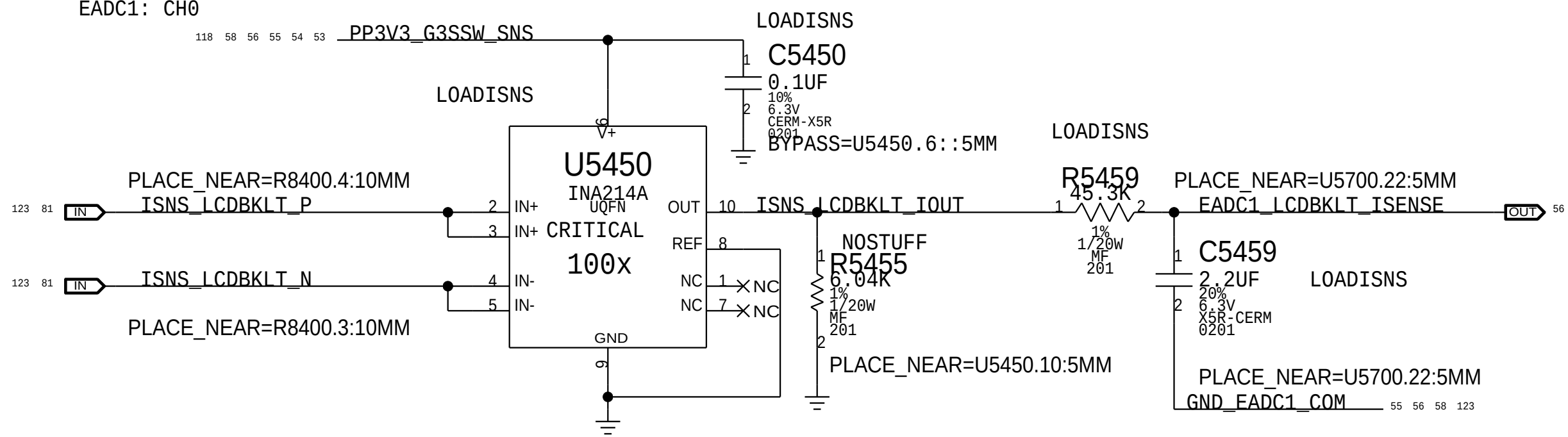
CPU High Side Curent Sense (IC0R)

Gain: 100x, EDP: 16.8 A
Rsense: 0.001 (R5400)
Vsense: 16.8 mV, Range: 25 A
SMC ADC: 04
3.3KHz



LCD Backlight Current Sense (IBLR)

Gain: 100x, EDP: 0.87 A
Rsense: 0.025 (R8400)
Vsense: 21.75 mV, Range: 1.32 A
EADC1: CH0



PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
117S0008	3	RES,MTL FL1M,100K,1/16W,0201,SMD,LF	R5449,R5469,R5419		LOADRC:NO

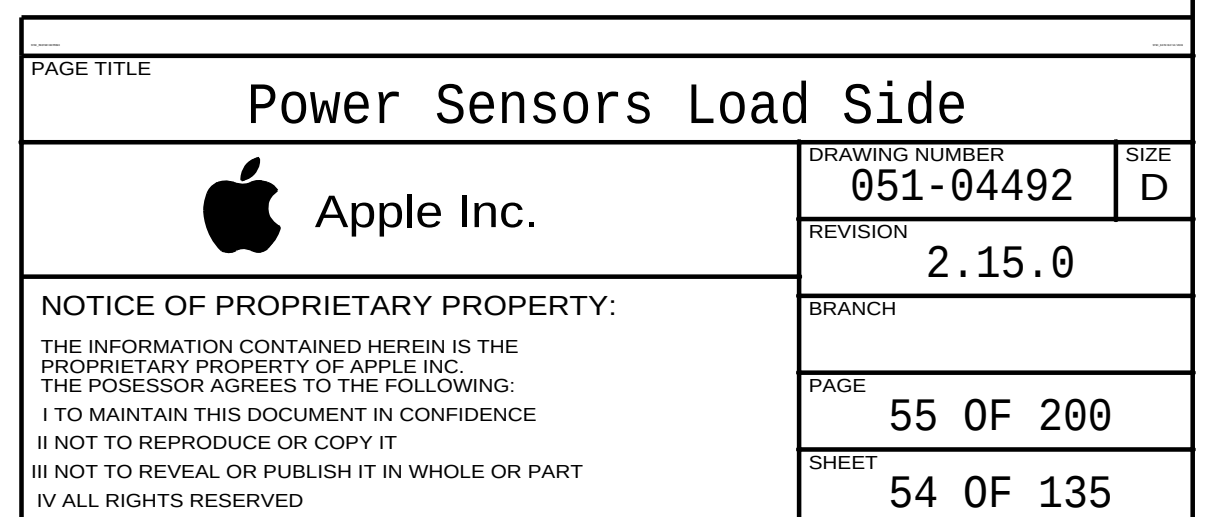
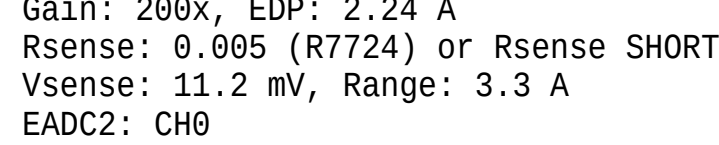
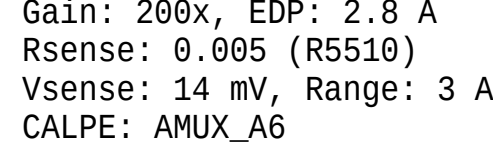
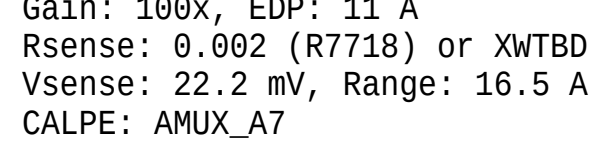
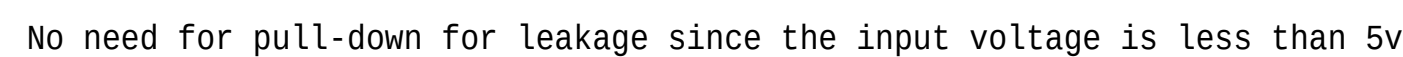
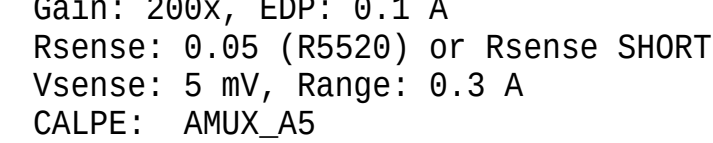
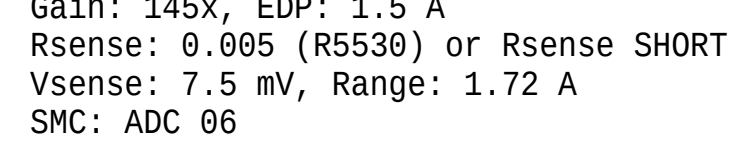
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Power Sensors High Side		
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	PAGE	54 OF 200
	SHEET	53 OF 135

BOM_COST_GROUP=SENSORS

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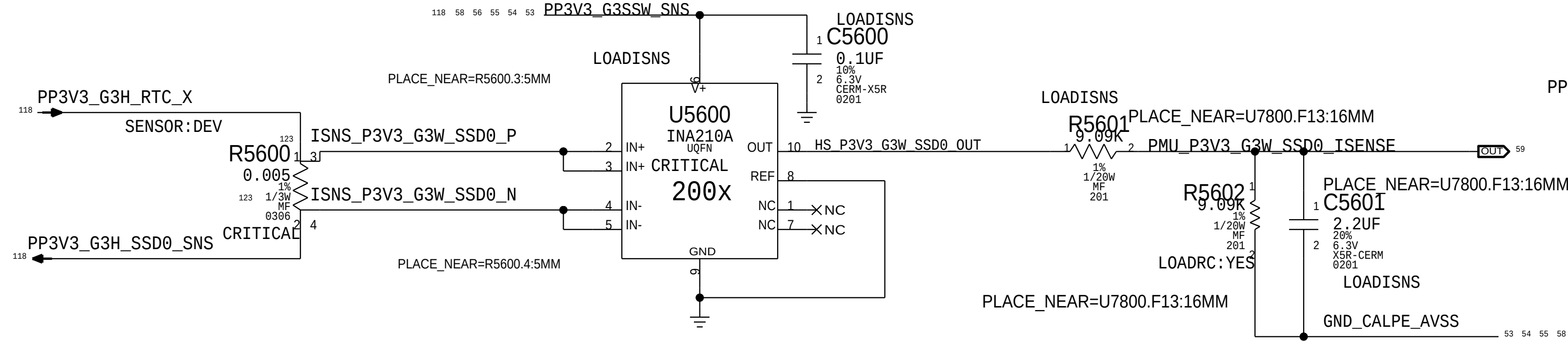
GaIn: 89.48x, EDP: 128 A
Rsense: 3x of 0.00075
R7210,R7220,R7230),Rsum: 0.00025
Vsense:16.75 mV, Range: 134.11 A
CALPE AMUX: A0

```



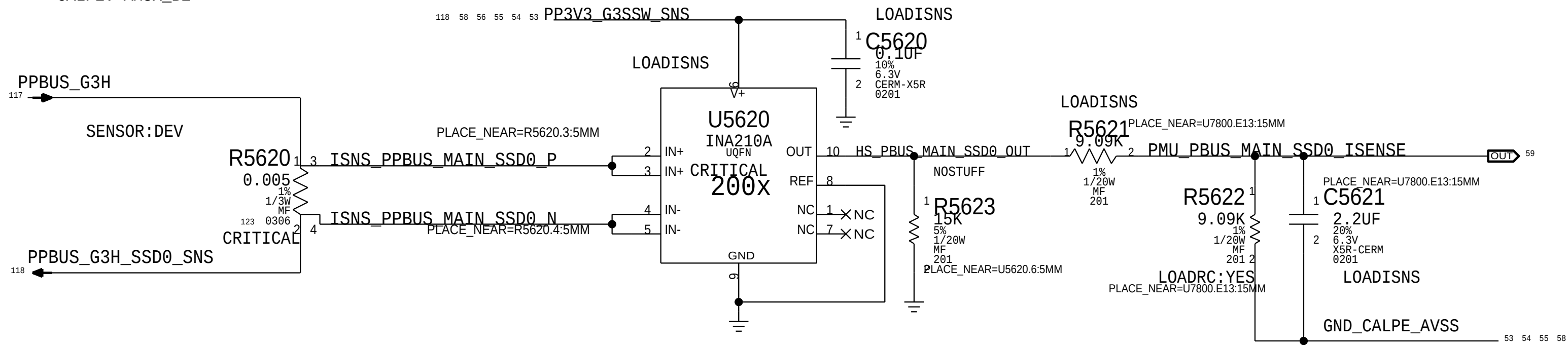
PP3V3_G3W_SSD0 HIGH SIDE CURRENT SENSE (KEY IH0C)

```
GAIN: 200X, EDP: 1.48 A
RSENSE: 0.005 (RK710) OR RSENSE SHORT
VSENSE: 13 MV, RANGE: 2.5 A
CALPE: AMUX_B3
```



PP12V SSD0 HIGH SIDE CURRENT SENSE (KEY IH0R)

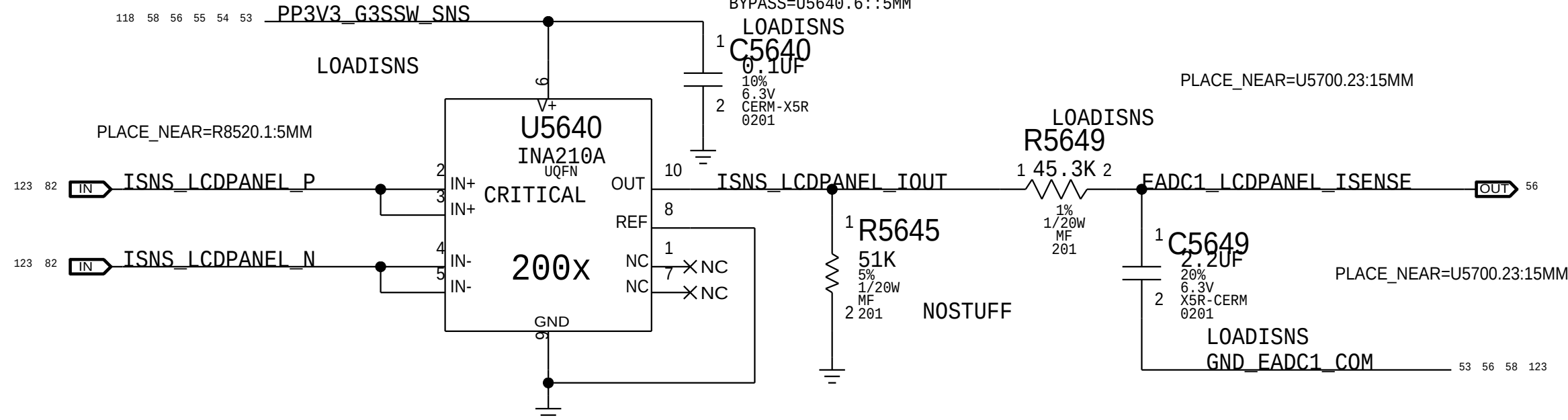
```
GAIN: 200X, EDP: 0.5 A
RSENSE: 0.005 (RK610) OR RSENSE SHORT
VSENSE: 13 MV, RANGE: 2.5 A
CALPE: AMUX_B1
```



LCD Panel Current Sense (ILDC)

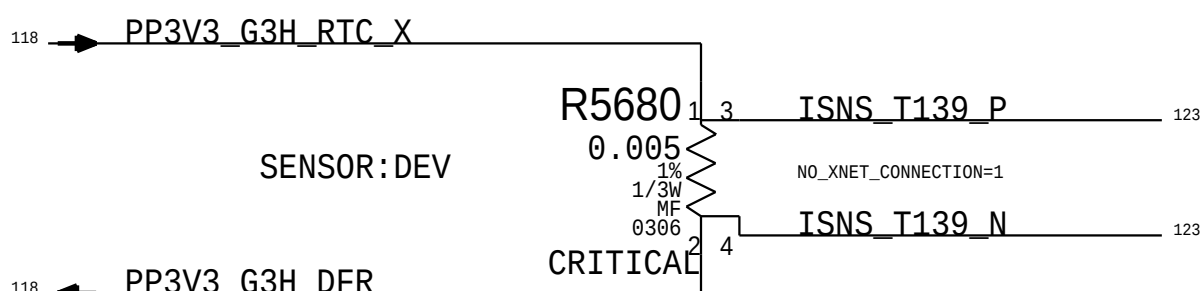
Gain: 200x. EDP: 1 A
RSENSE: 0.01 (R8520) or Rsense SHORT
Vsense: 5 mV, Range: 1.25 A

EADC1: CH1



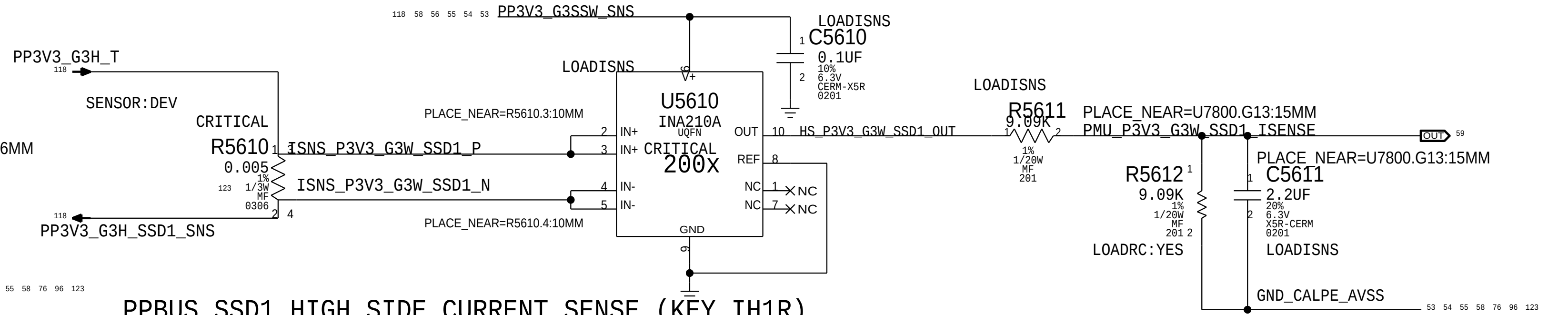
T139 Current Sense resistor

EDP: 0.06 A
Rsense: 0.05 (R5680) or Rsense SHORT



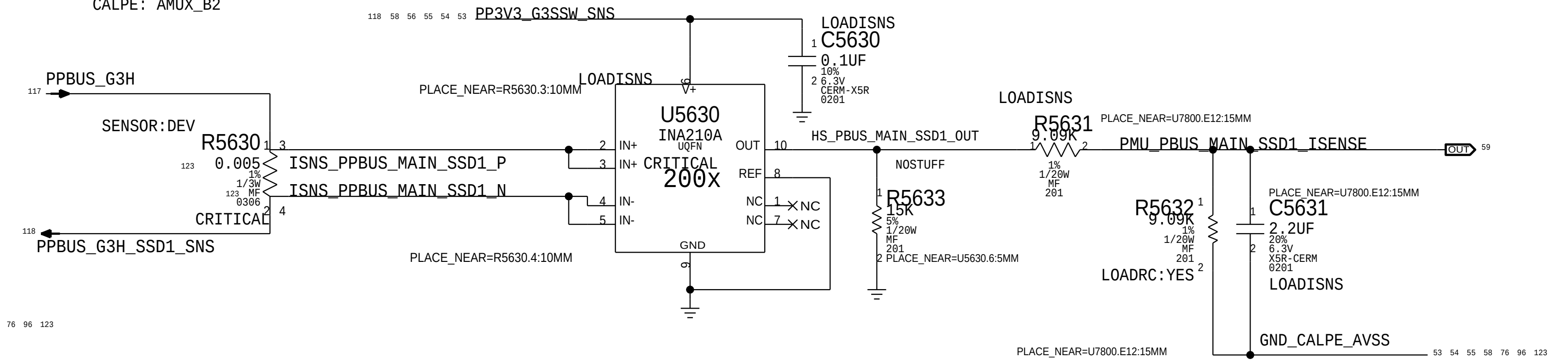
PP3V3_G3W_SSD1 HIGH SIDE CURRENT SENSE (KEY IH1C)

GAIN: 200X, EDP: 1.48 A
RSENSE: 0.005 (RK760) OR RSENSE SHORT
VSENSE: 13 MV, RANGE: 2.5 A
CALPE: AMUX_B4



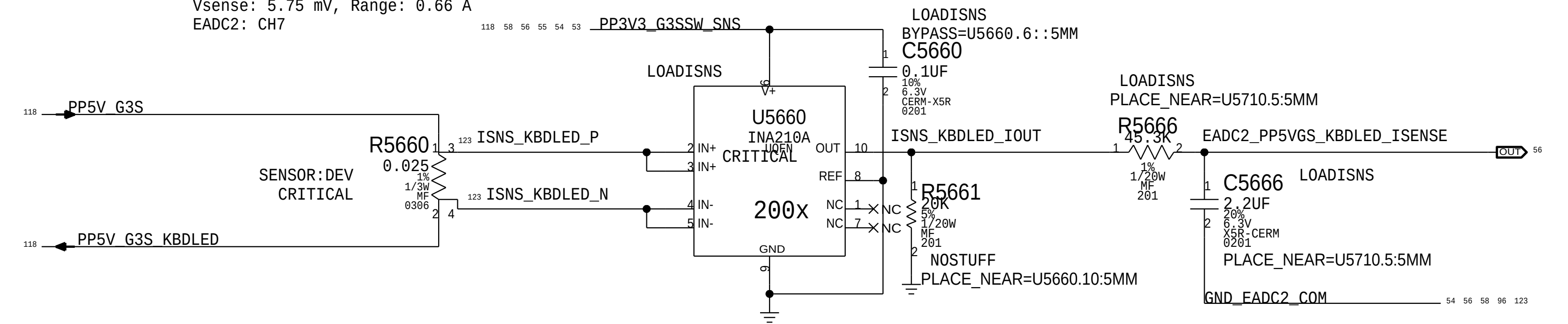
PPBUS SSD1 HIGH SIDE CURRENT SENSE (KEY IH1R)

GAIN: 200X, EDP: 0.5 A
RSENSE: 0.005 (R5607) OR RSENSE SHORT
VSENSE: 13 MV, RANGE: 2.5 A
CALPE: AMUX_B2



Keyboard backlight Current Sense (IKBC)

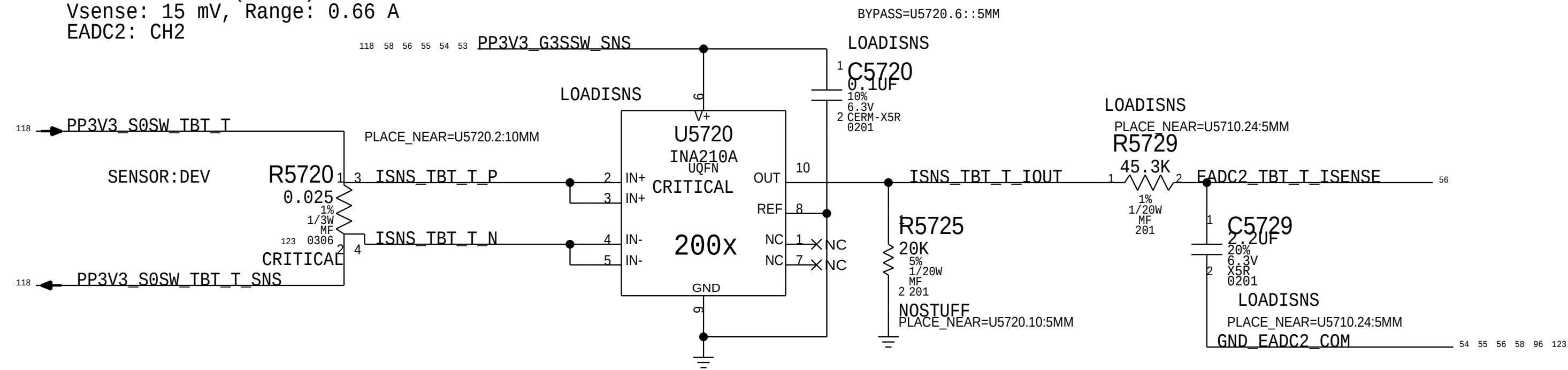
```
Gain: 200x, EDP: 0.23 A
Rsense: 0.025 (R5660) or Rsense SHORT
Vsense: 5.75 mV, Range: 0.66 A
EADC2: CH7
```



PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
117S0008	4	RES, MTL FLIM, 100K, 1/16W, 0201, SMD, LF	R5602, R5612, R5622, R5632		LOADRC: N0

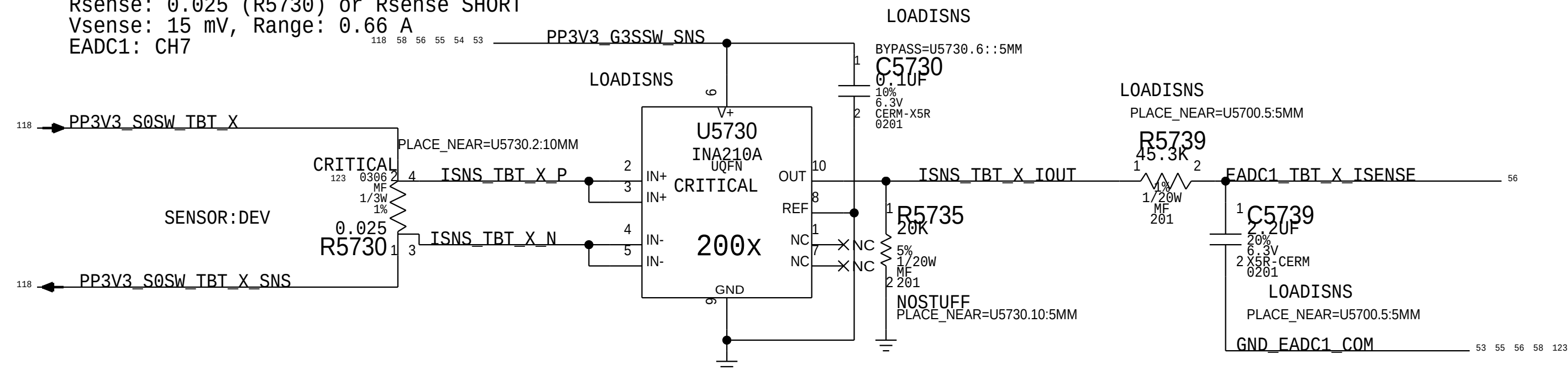
Thunderbolt TBT RIGHT Current Sense (IURC)

Gain: 200x, EDP: 0.6 A
Rsense: 0.025 (R5720) or Rsense SHORT
Vsense: 15 mV, Range: 0.66 A
EADC2: CH2



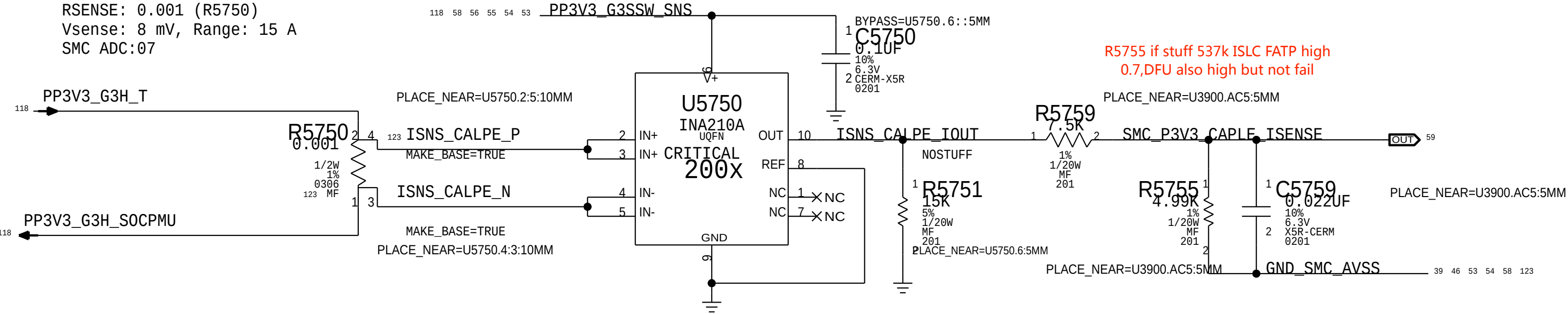
Thunderbolt TBT LEFT Current Sense (IULC)

Gain: 200x, EDP: 0.6 A
Rsense: 0.025 (R5730) or Rsense SHORT
Vsense: 15 mV, Range: 0.66 A
EADC1: CH7

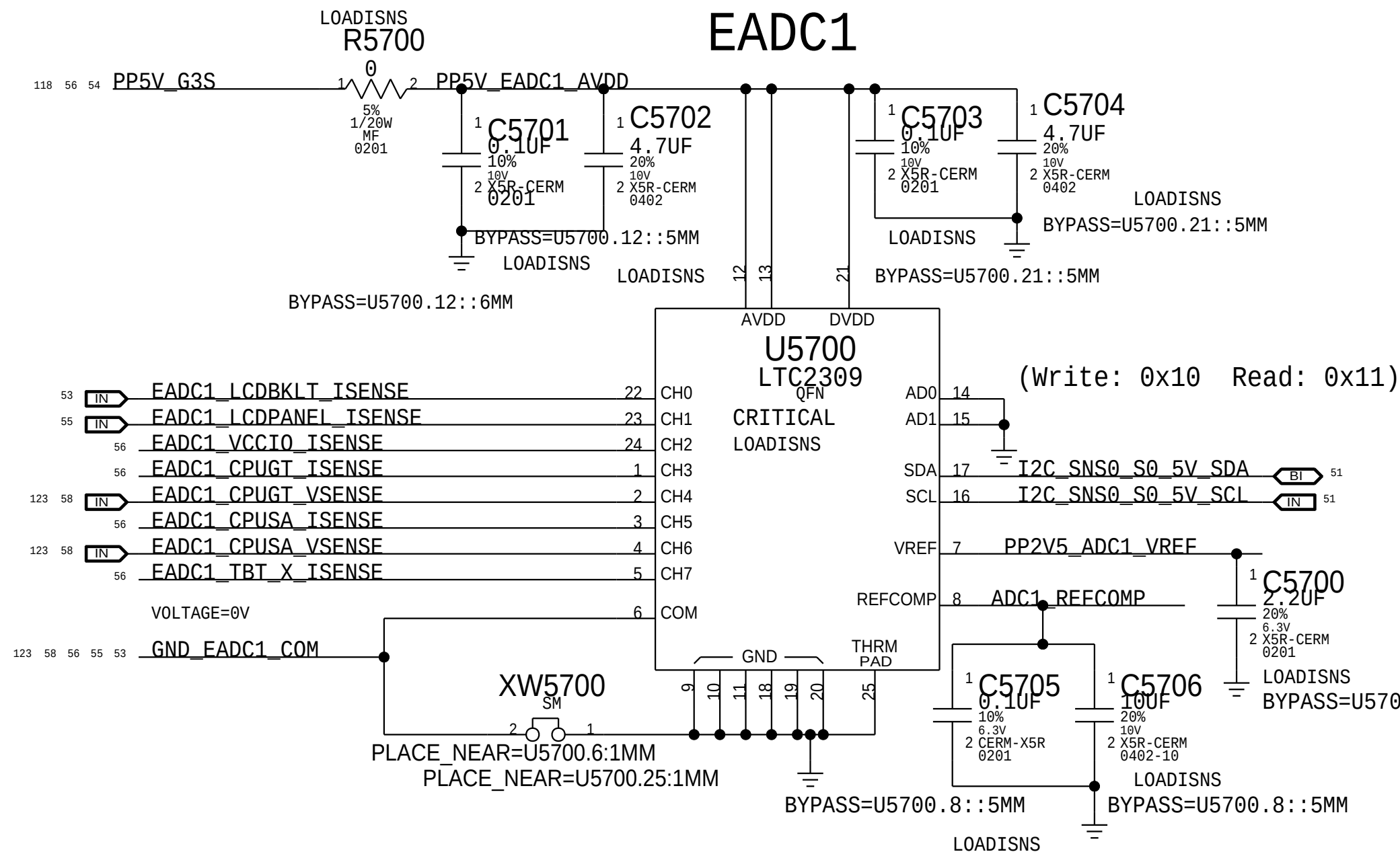


Calpe 3V3 Current Sense (ISLC)

Gain: 200x, EDP: 8 A
RSense: 0.001 (R5750)
Vsense: 8 mV, Range: 15 A
SMC ADC: 07

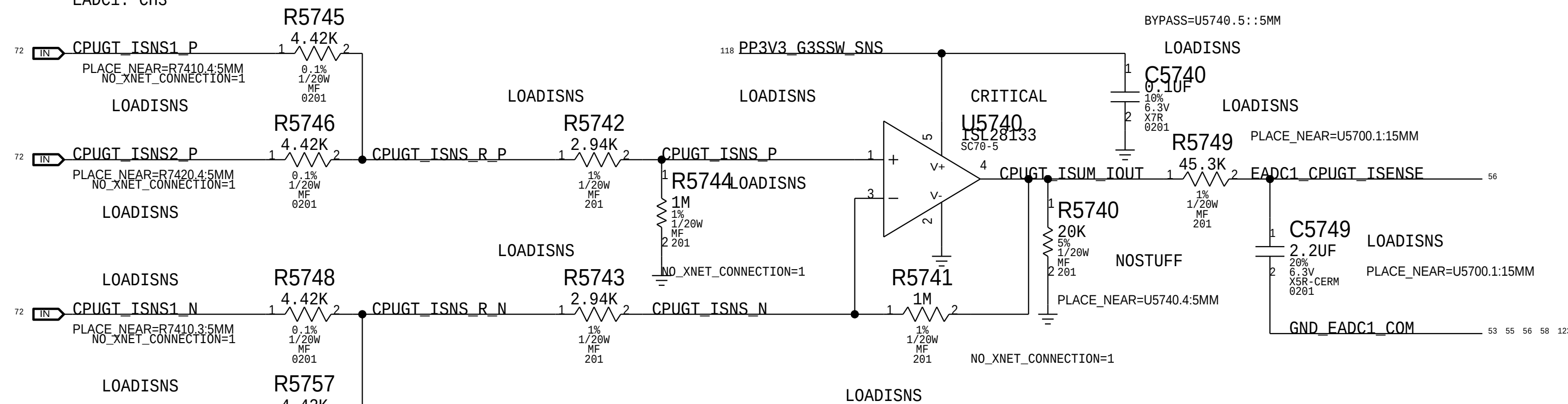


EADC1



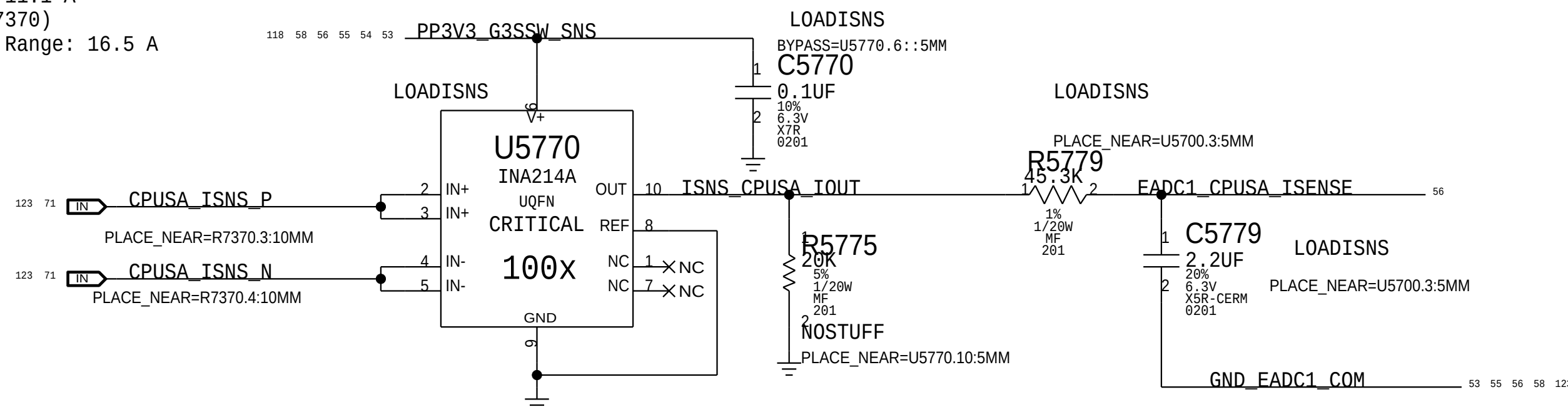
CPU GT Current Sense (ICTC)

Gain: 240.78x, EDP: 32 A
Rsense: 2x of 0.00075 (R7410, R7420), Rsum: 0.000375
Vsense: 12 mV, Range: 36.55 A
EADC1: CH3



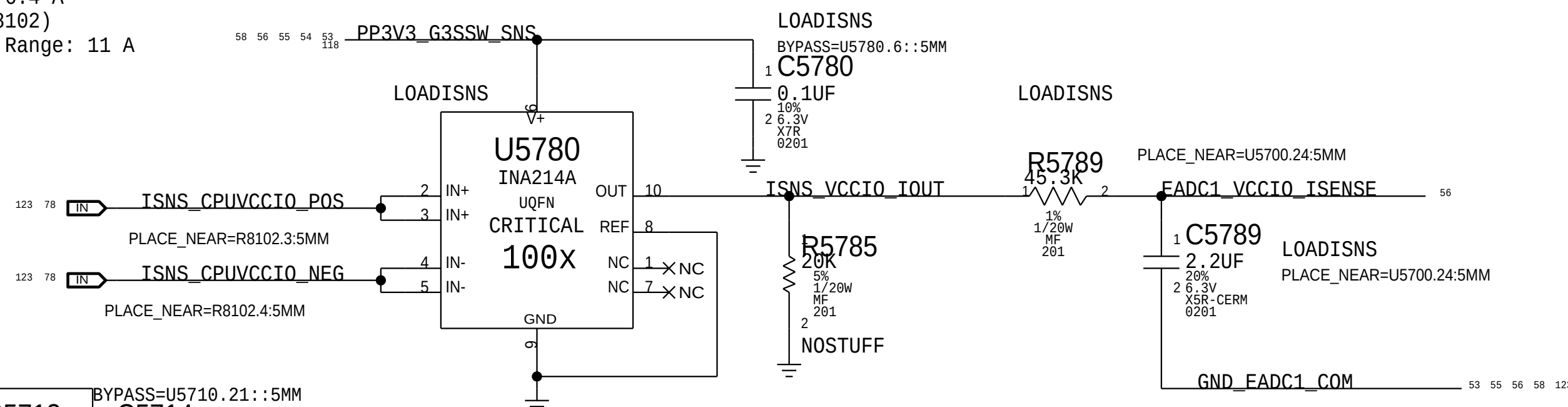
CPU SA Current Sense (ICSC)

Gain: 100x, EDP: 11.1 A
Rsense: 0.002 (R7370)
Vsense: 22.2 mV, Range: 16.5 A
EADC1: CH5

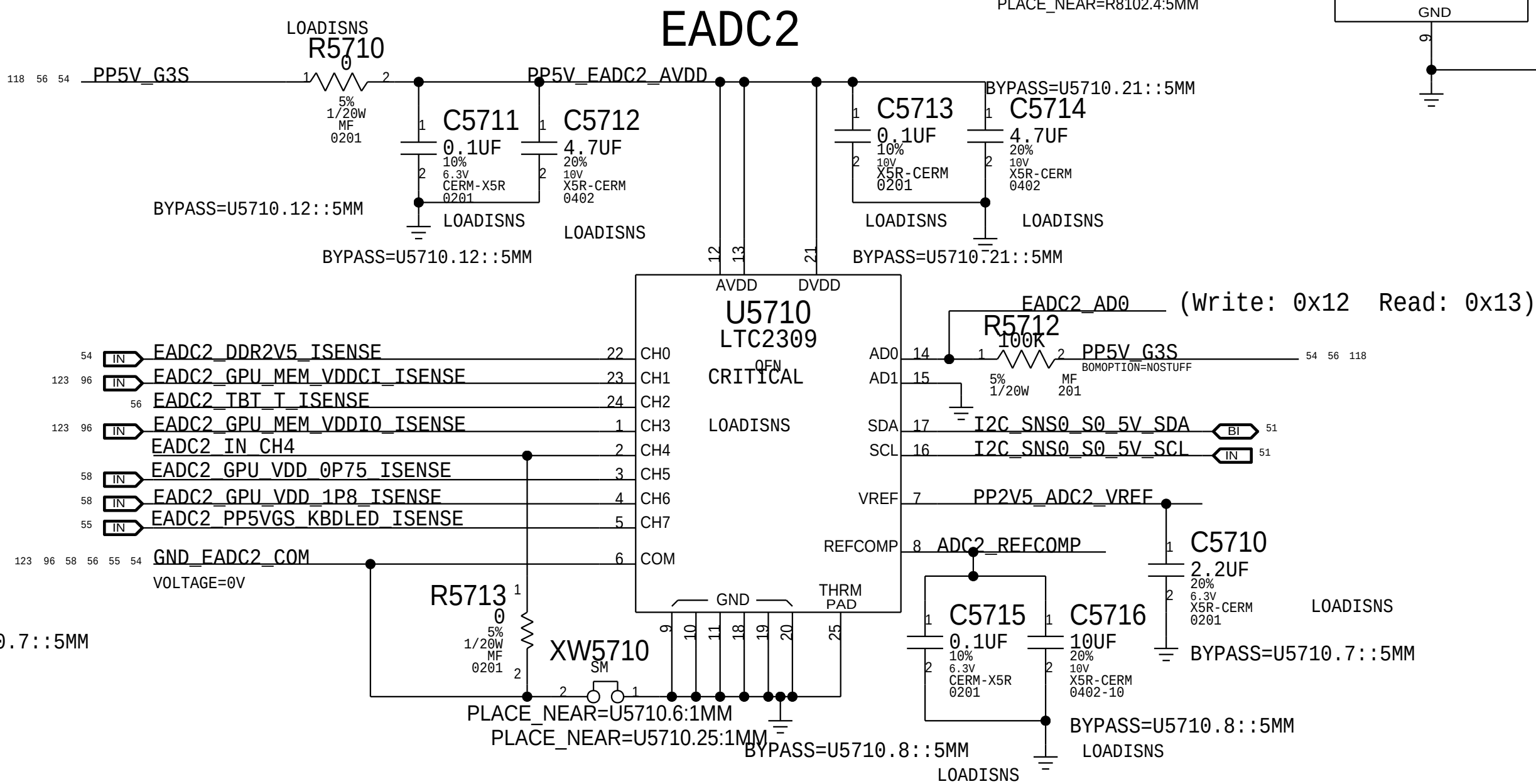


CPU VCCIO Current Sense (ICIC)

Gain: 100x, EDP: 6.4 A
Rsense: 0.003 (R8102)
Vsense: 19.2 mV, Range: 11 A
EADC1: CH2



EADC2



Power Sensors Extended 2

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DRAWING NUMBER
051-04492

SIZE
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REVISION
2.15.0

BRANCH

PAGE
57 OF 200

SHEET
56 OF 135

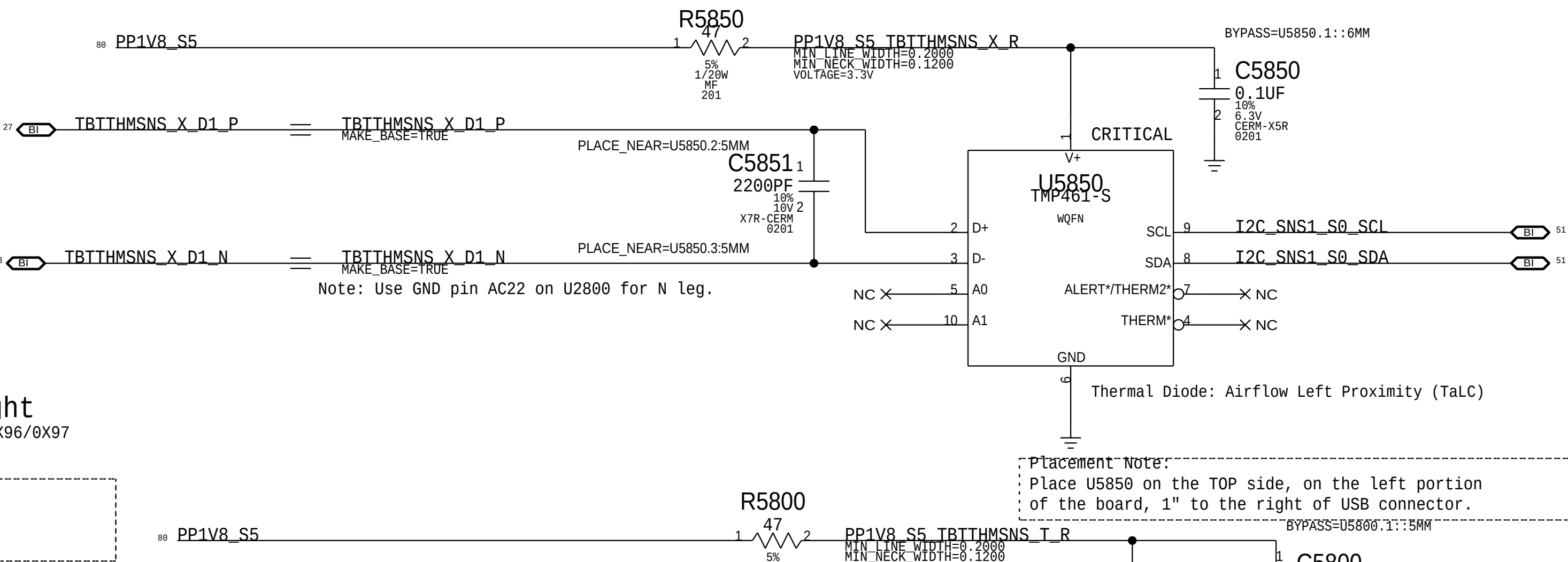
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BOM_COST_GROUP=SENSORS

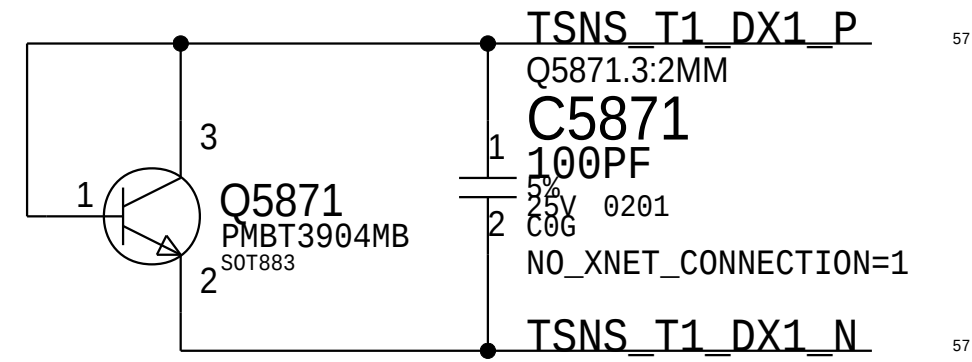
Thermal Sensor A:
Thunderbolt Die, Airflow Left
U5850 I2C Address:TMP461 A1->Floating A0->Floating 0X98/0X99

Thermal Diode: TBT Die (TTLD)
Placement Note:
The P leg connects to THERMDA pin of the TBT chip, the N leg connect to pin AC22.

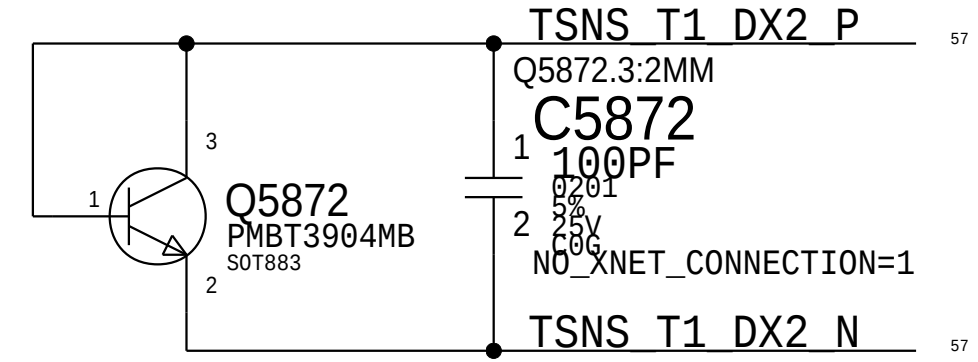
Thermal Sensor C:
Thunderbolt Die, Air Flow Right
U5800 I2C Address:TMP461 A1->Floating A0->GND 0X96/0X97
Thermal Diode: TBT Die (TTRD)
Placement Note:
The P leg connects to THERMDA pin of the TBT chip, the N leg connect to pin AC22.



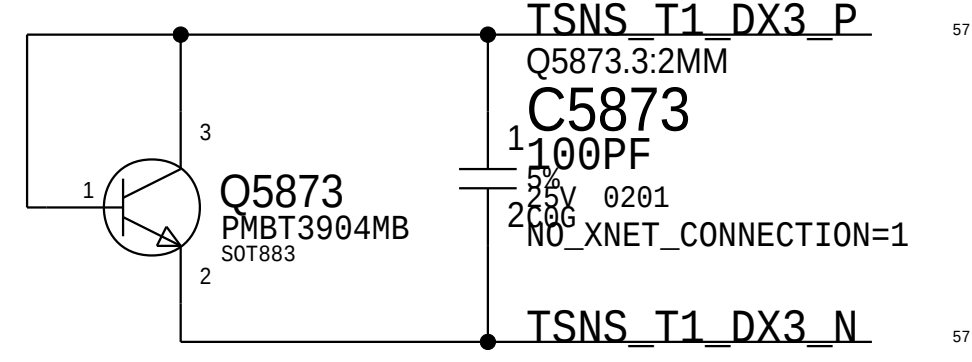
THERMAL DIODE: CPU PROX (KEY TC0P)
Placement Note:
Place Q5871 under the CPU ON BOTTOM SIDE



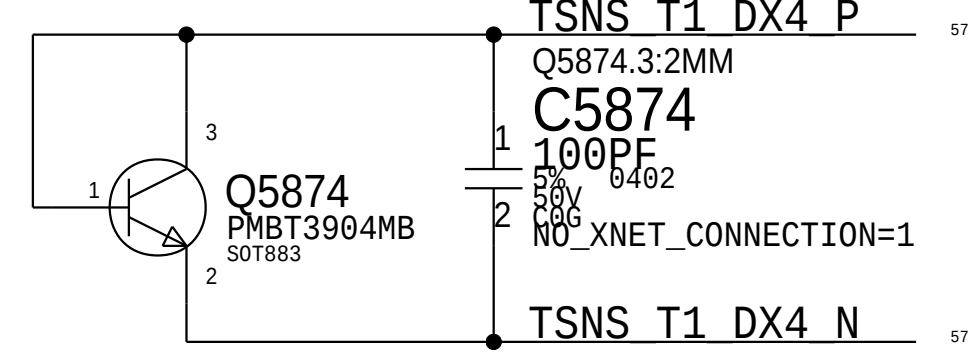
THERMAL DIODE: FIN STACK LEFT (KEY TH2H)
Placement Note:
Place Q5872, AIRFLOW THERMAL INDICATOR, ABOVE THE X100, ON THE TOP SIDE



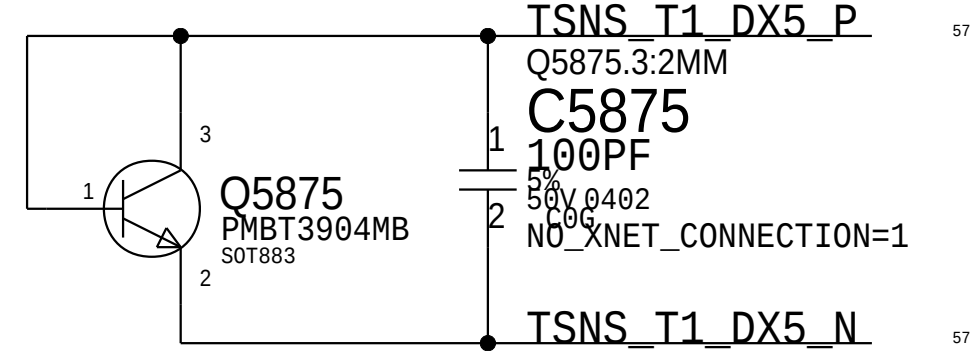
THERMAL DIODE: FIN STACK RIGHT (KEY TH1H)
Placement Note:
Place Q5873 AT THE CORNER NEAR RIGHT FAN, ON THE TOP SIDE



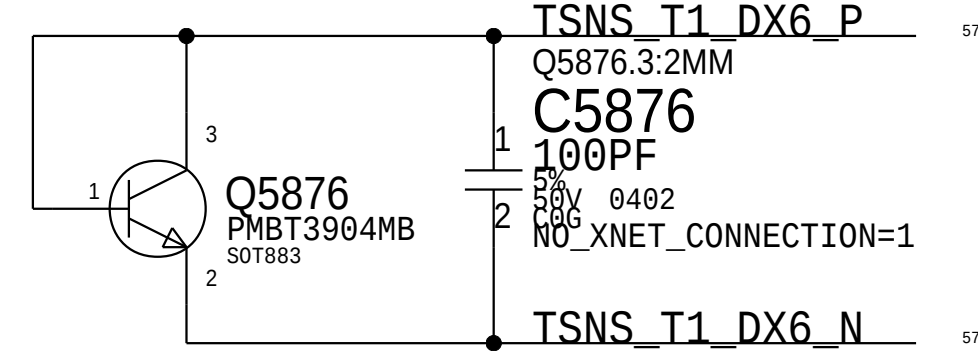
THERMAL DIODE: Memory Proximity (KEY TM0P)
Placement Note:
Place Q5874 between two rows of Memory devices, between channel A and CHANNEL B PN BOTTOM SIDES



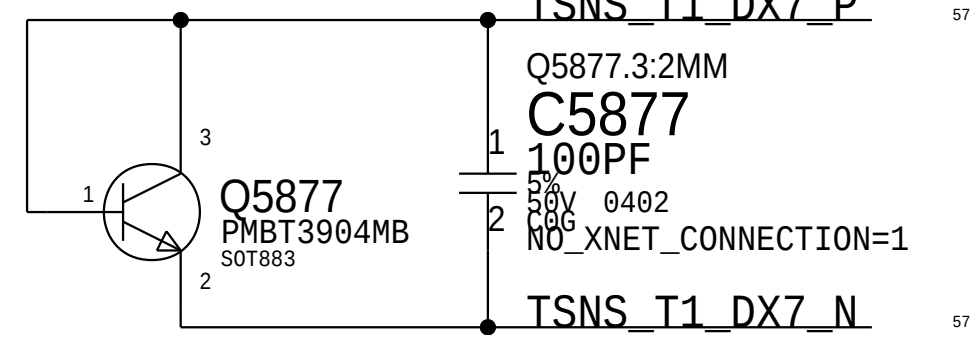
THERMAL DIODE: X100 PROXIMITY (KEY TW0P)
Placement Note:
Place Q5875 near X100 on bottom



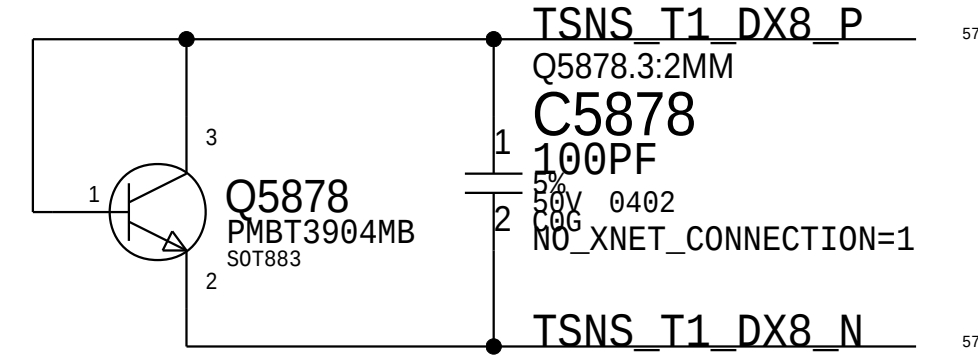
THERMAL DIODE: GPU PROXIMITY (KEY TG0P)
Placement Note:
Place Q5876 near GPU, Top side, Opposite side of GPU



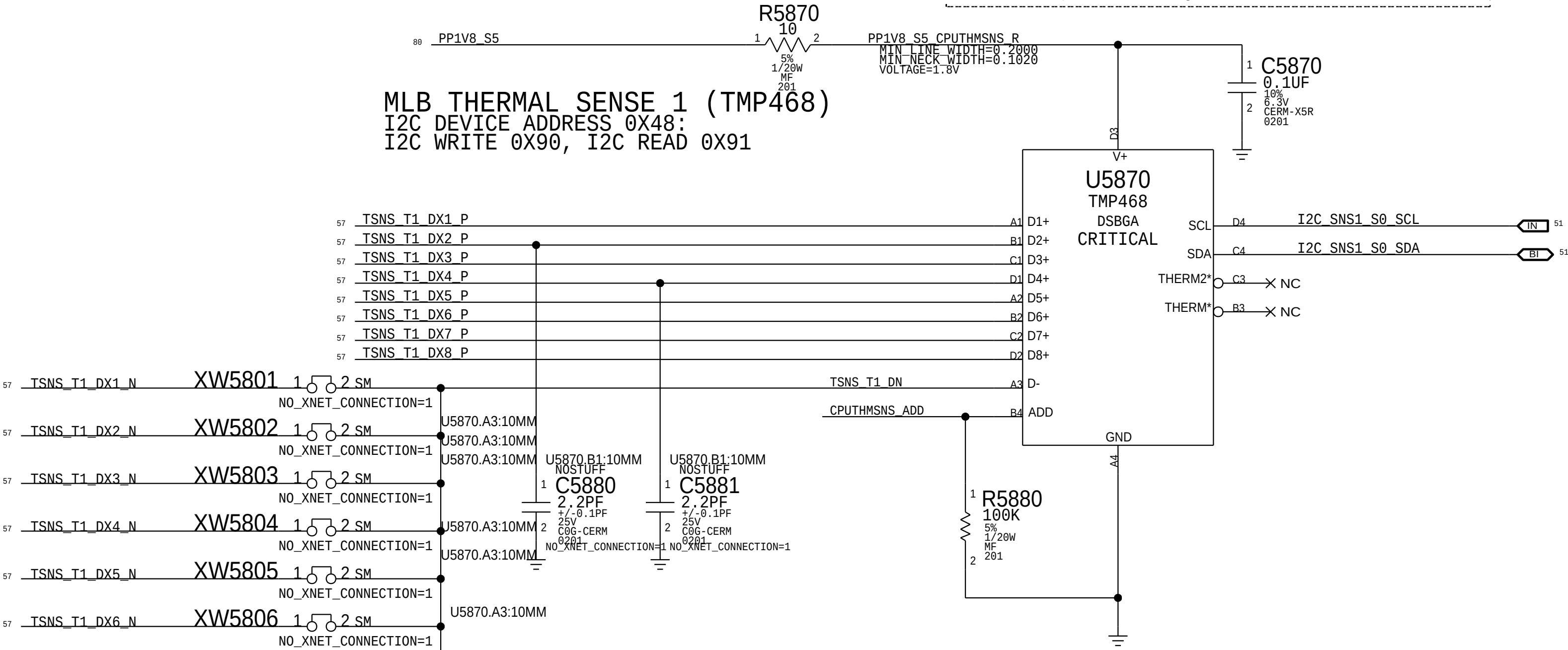
THERMAL DIODE: GPU VR PROXIMITY (KEY TG1P)
Placement Note:
Place Q5877 near GPU VR, Bottom side



THERMAL DIODE: GPU VRAM PROXIMITY (KEY TGVP)
Placement Note:
Place Q5878 near GPU VRAM.



MLB THERMAL SENSE 1 (TMP468)
I2C DEVICE ADDRESS 0X48:
I2C WRITE 0X90, I2C READ 0X91



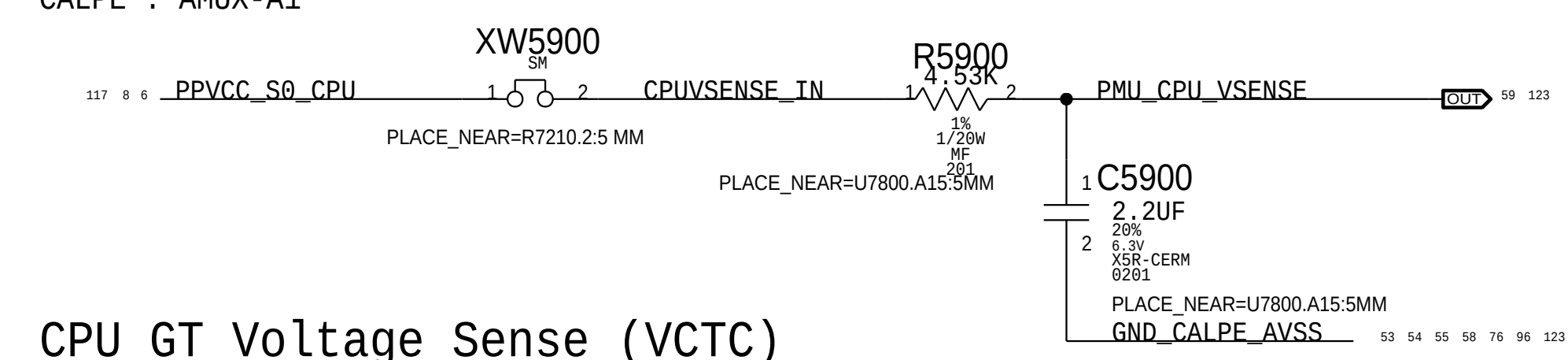
MLB PROX 2 is read from the on-chip temp sensors U5870

Place U5870 near Calpe (U7800)

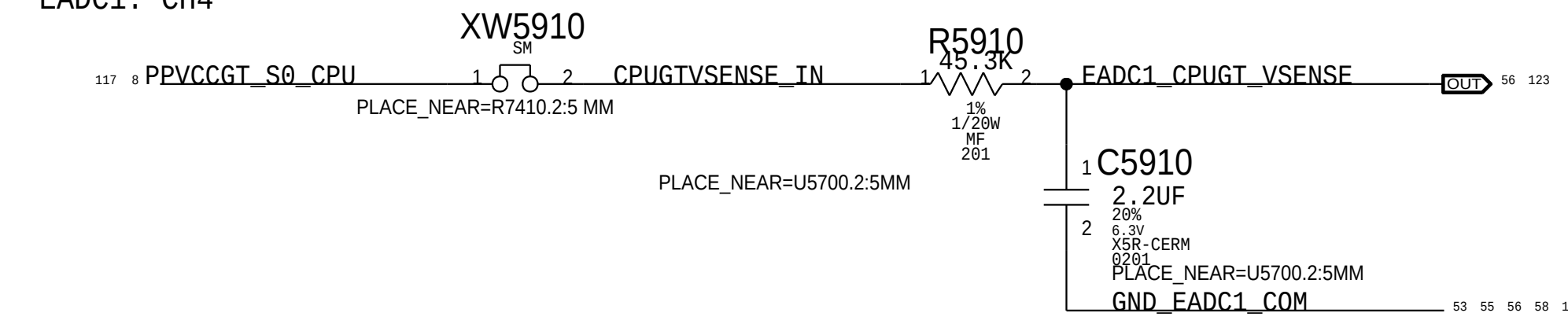
PAGE TITLE		
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	DRAWING NUMBER	051-04492
	REVISION	2.15.0
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	PAGE	58 OF 200
	SHEET	57 OF 135

BOM_COST_GROUP=SENSORS

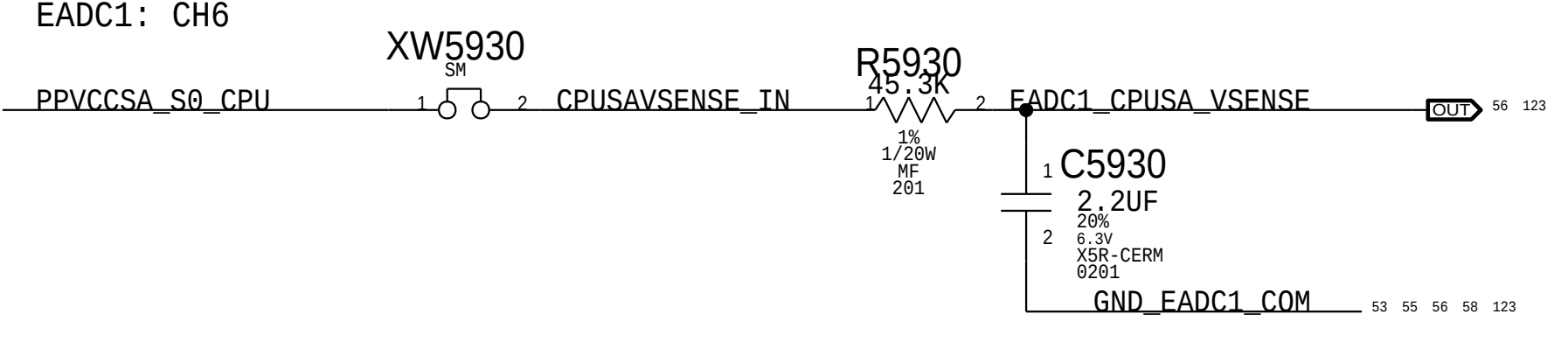
CPU Core Voltage Sense (VCAC)



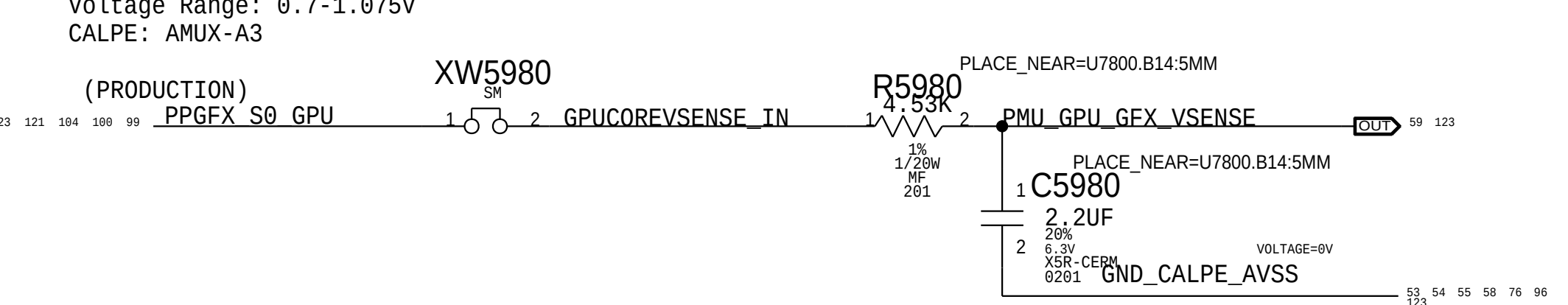
CPU GT Voltage Sense (VCTC)



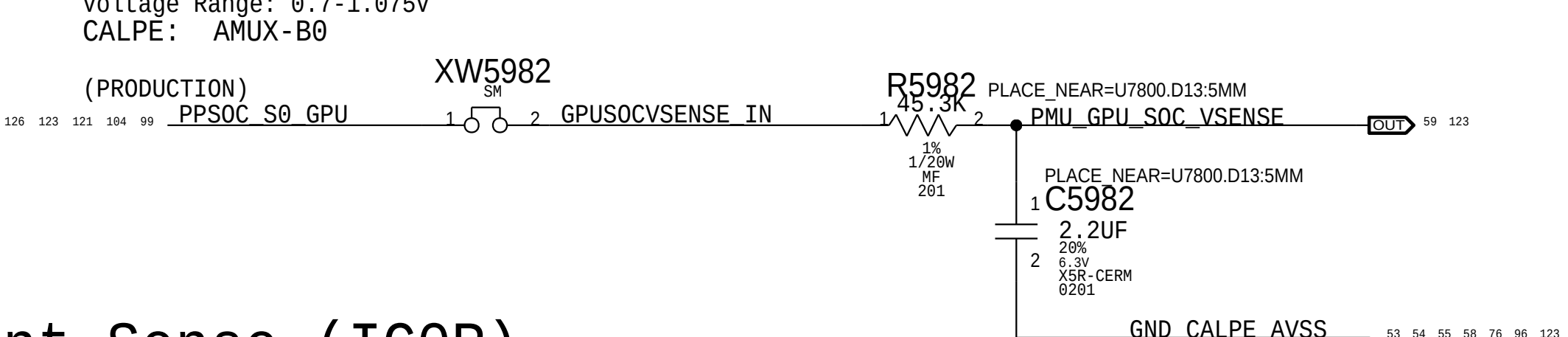
CPU SA Voltage Sense (VCSC)



GPU GFX Voltage Sense (VG0C)

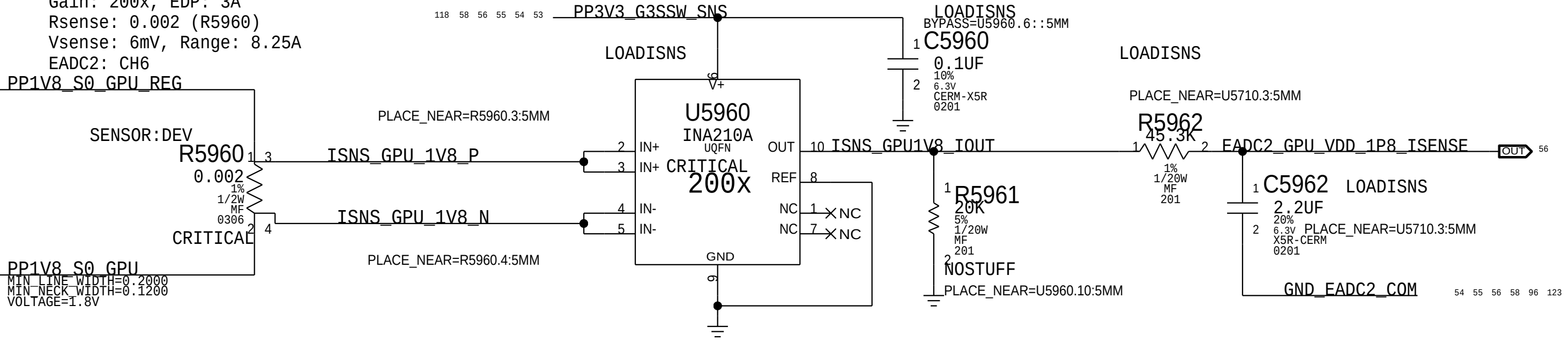


GPU SOC Voltage Sense (VG1C)

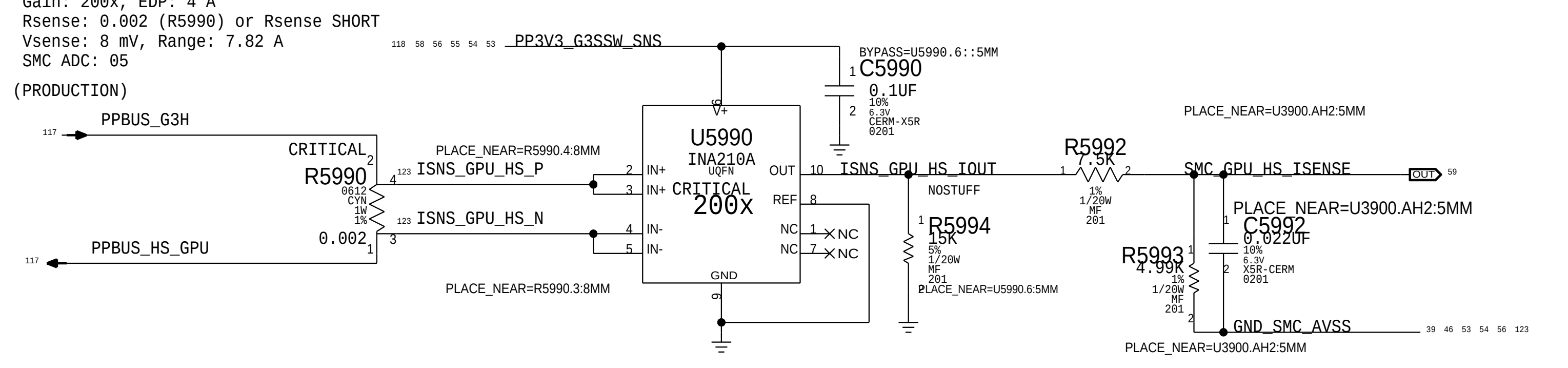


GPU SENSORS

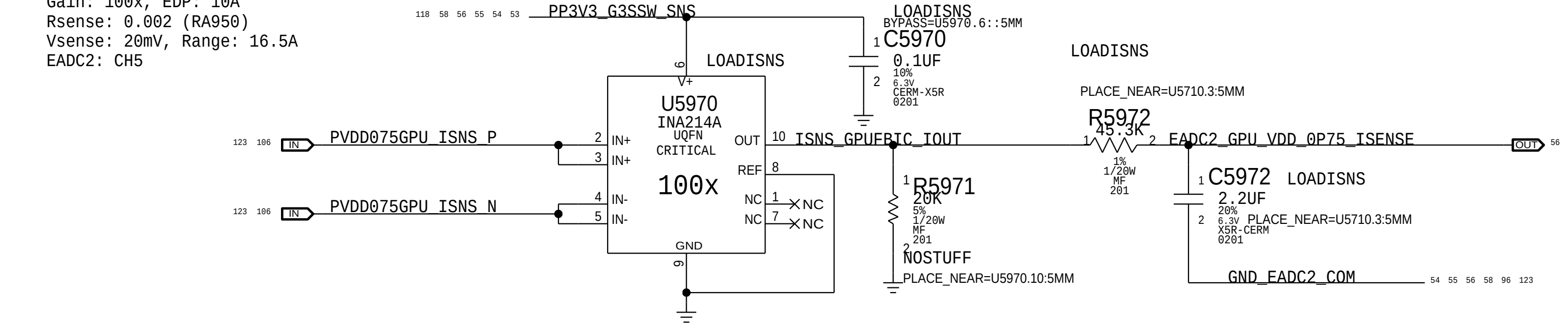
GPU 1.8V Current Sense (IG3C)



GPU HIGH SIDE Current Sense (IG0R)



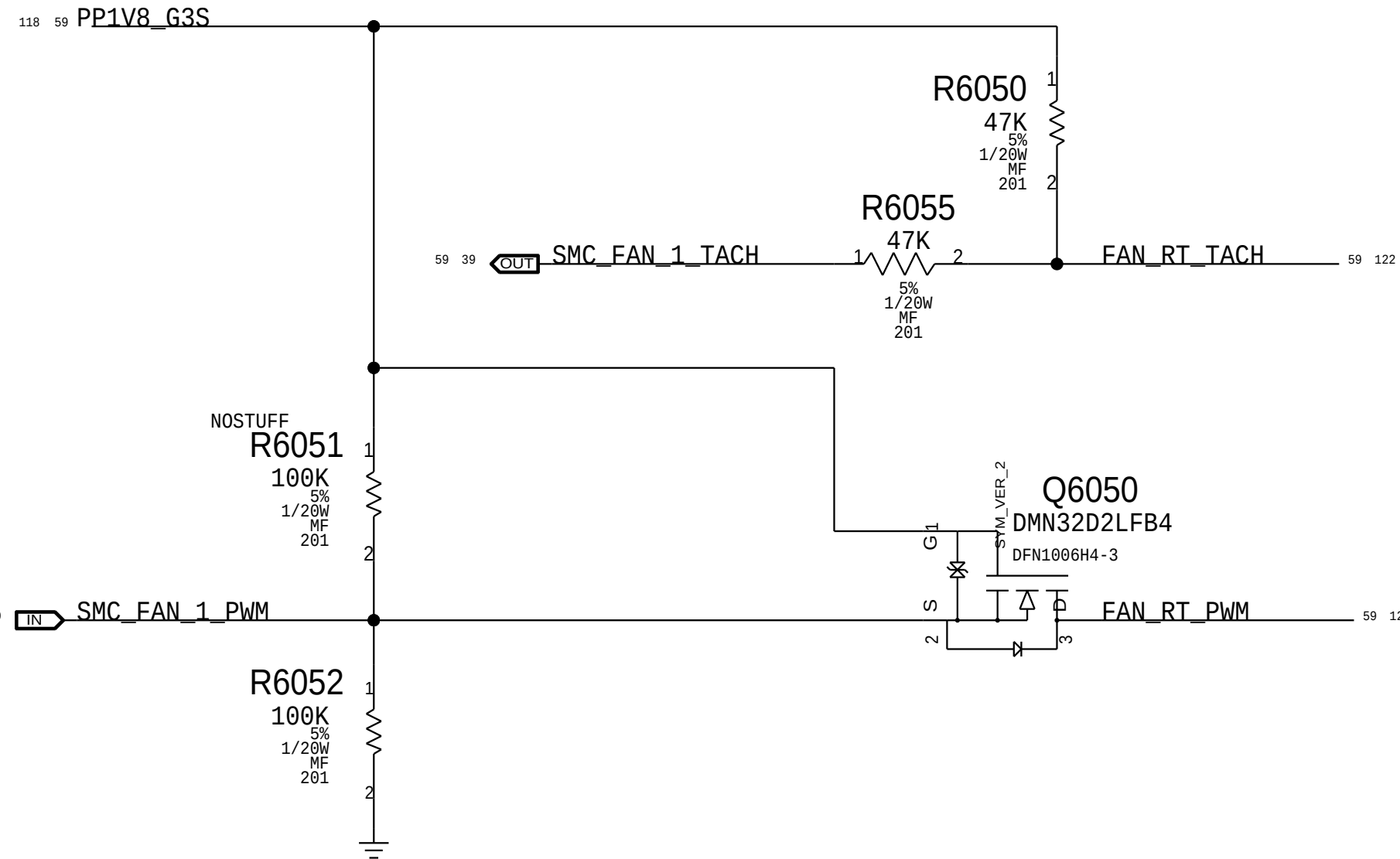
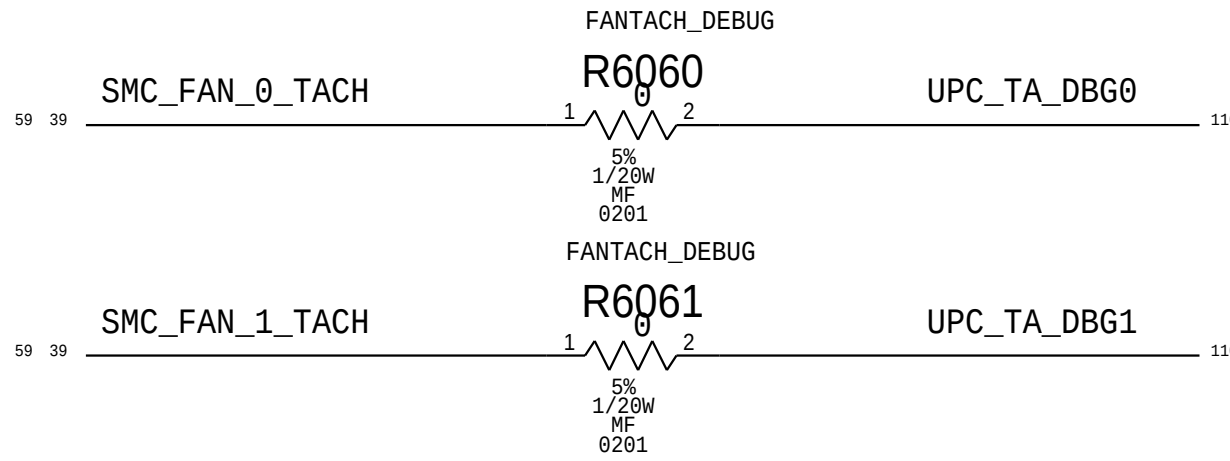
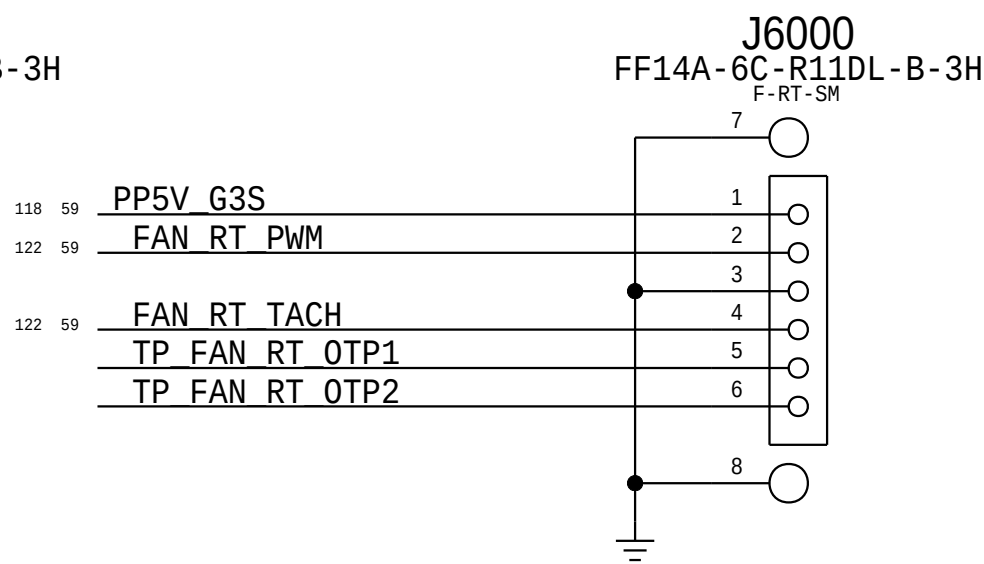
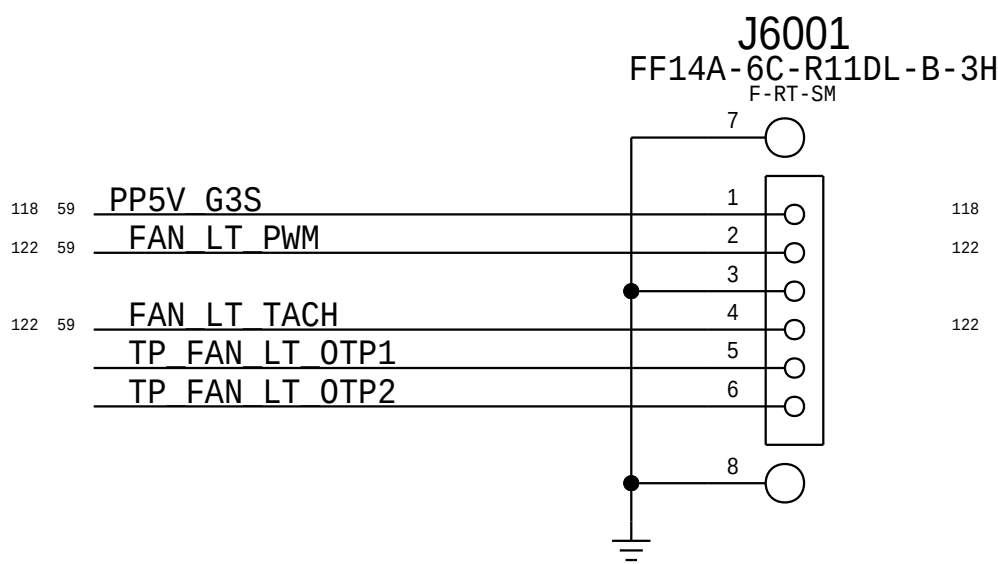
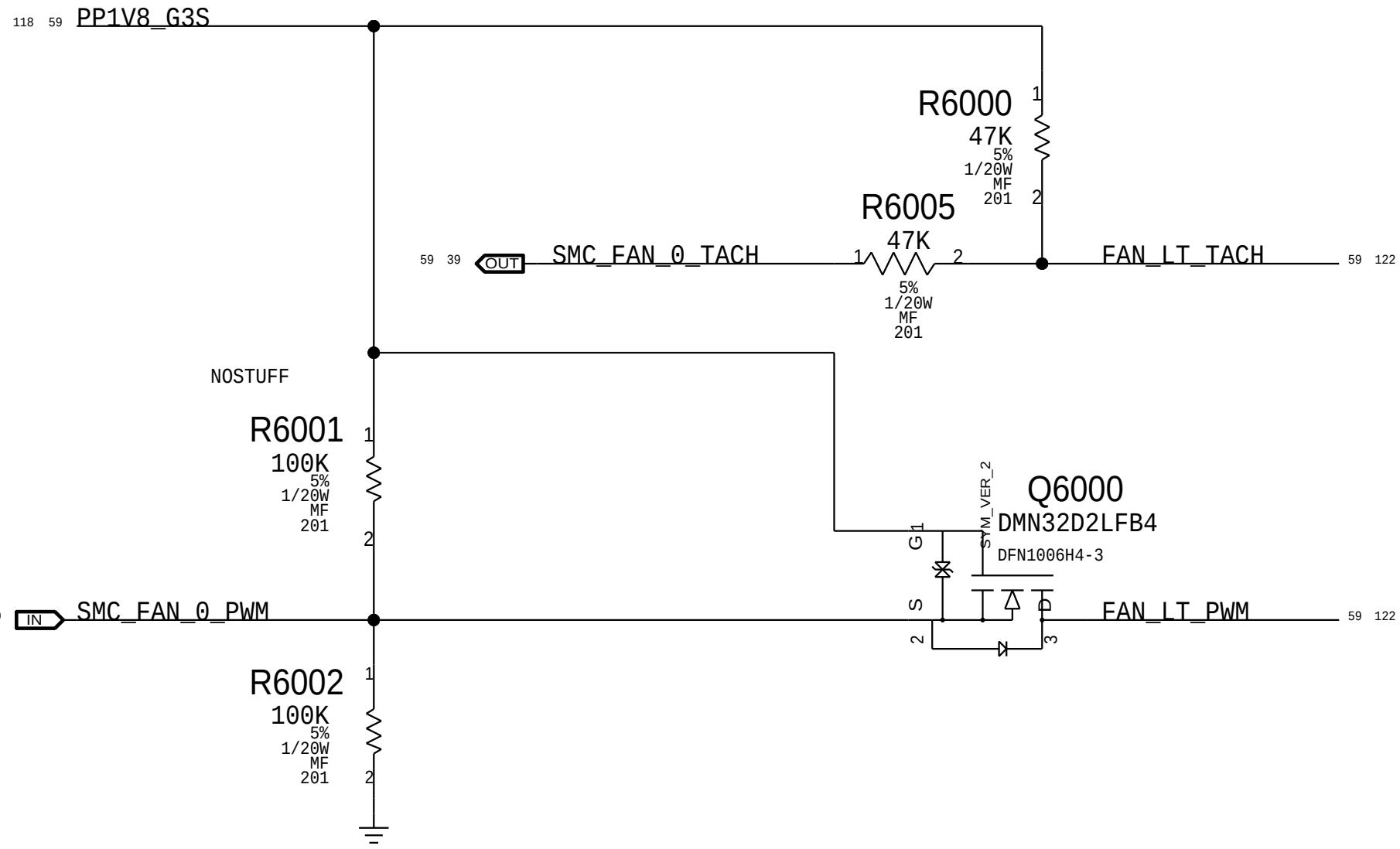
GPU 0.75V Current Sense (IG5C)



PAGE TITLE		
Power Sensor Extended 3		
	DRAWING NUMBER	051-04492
	REVISION	2.15.0
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	PAGE	59 OF 200
	SHEET	58 OF 135

BOM_COST_GROUP=SENSORS

FAN CONNECTOR



H9M SMC ADC Assignments

IN	SMC_DCIN_VSENSE	=	SMC_DCIN_VSENSE
IN	SMC_DCIN_ISENSE	=	SMC_DCIN_ISENSE
IN	SMC_PBUS_VSENSE	=	SMC_PBUS_VSENSE
IN	SMC_BMON_ISENSE	=	SMC_BMON_ISENSE
IN	SMC_CPU_HT_ISENSE	=	SMC_CPU_HT_ISENSE
IN	SMC_GPU_HS_ISENSE	=	SMC_GPU_HS_ISENSE
IN	SMC_P3V3_WLAN_ISENSE	=	SMC_P3V3_WLAN_ISENSE
IN	SMC_P3V3_CAPLE_ISENSE	=	SMC_P3V3_CAPLE_ISENSE

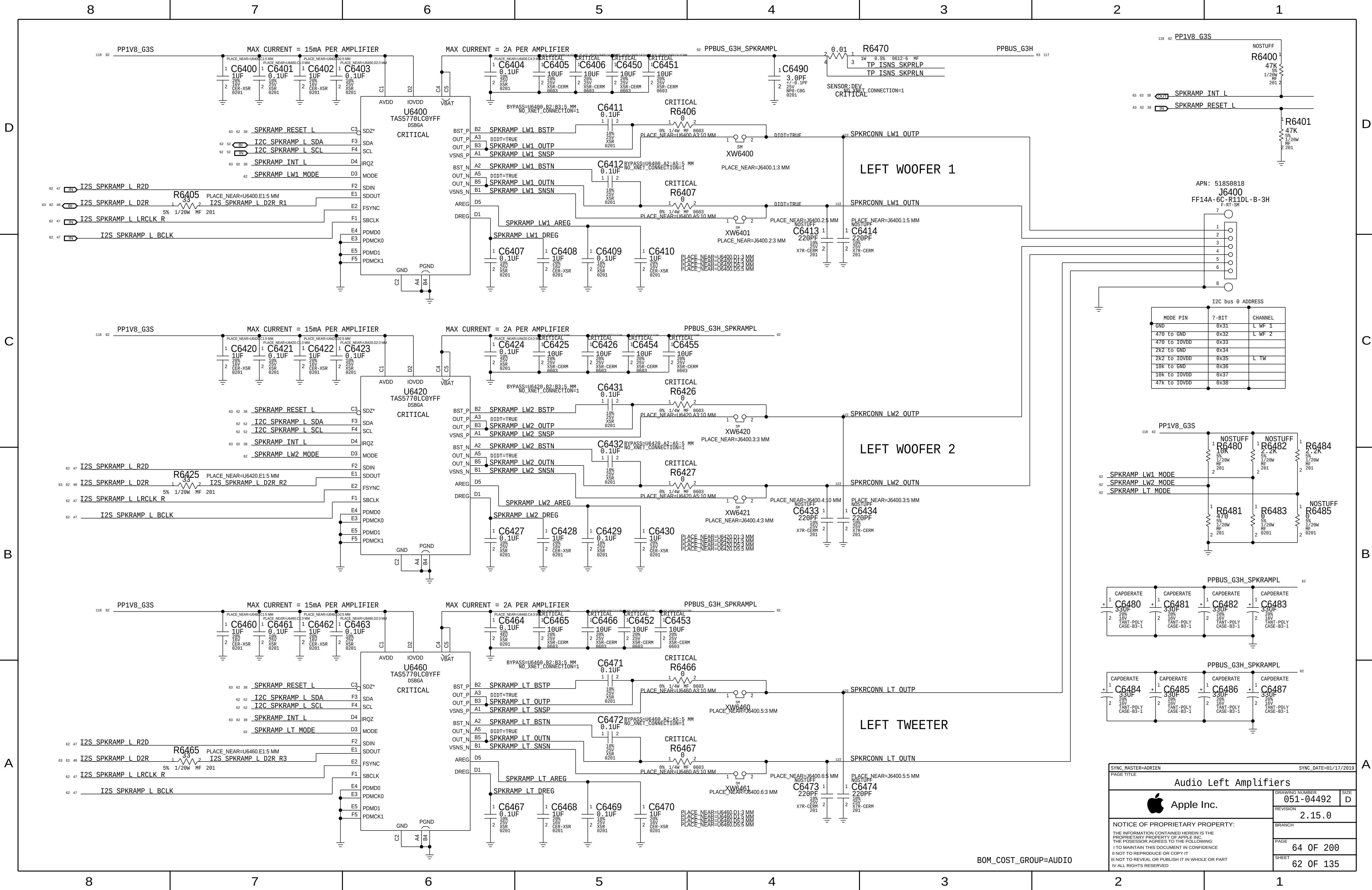
CALPE AMUX Assignments

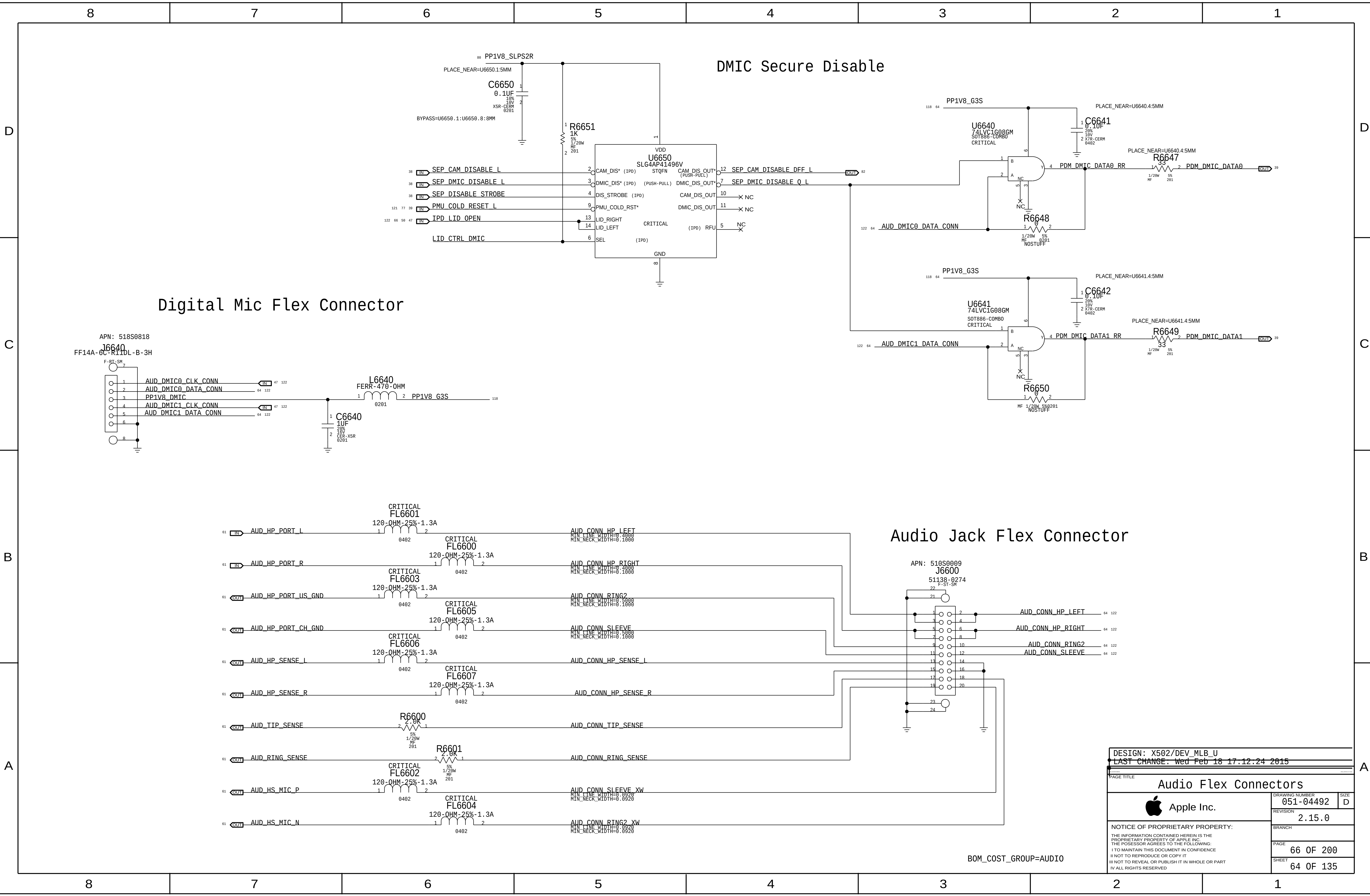
OUT	PMU_CPU_ISENSE	=	PMU_CPU_ISENSE
OUT	PMU_CPU_VSENSE	=	PMU_CPU_VSENSE
OUT	PMU_GPU_GFX_ISENSE	=	PMU_GPU_GFX_ISENSE
OUT	PMU_GPU_GFX_VSENSE	=	PMU_GPU_GFX_VSENSE
OUT	PMU_GPU_SOC_ISENSE	=	PMU_GPU_SOC_ISENSE
OUT	PMU_P1V8_WLAN_ISENSE	=	PMU_P1V8_WLAN_ISENSE
OUT	PMU_CPUDDR_ISENSE	=	PMU_CPUDDR_ISENSE
OUT	PMU_DDR1V2_ISENSE	=	PMU_DDR1V2_ISENSE

OUT	PMU_GPU_SOC_VSENSE	=	PMU_GPU_SOC_VSENSE
OUT	PMU_PBUS_MAIN_SSD0_ISENSE	=	PMU_PBUS_MAIN_SSD0_ISENSE
OUT	PMU_PBUS_MAIN_SSD1_ISENSE	=	PMU_PBUS_MAIN_SSD1_ISENSE
OUT	PMU_P3V3_G3W_SSD0_ISENSE	=	PMU_P3V3_G3W_SSD0_ISENSE
OUT	PMU_P3V3_G3W_SSD1_ISENSE	=	PMU_P3V3_G3W_SSD1_ISENSE
OUT	PMU_3V3_X_HT_ISENSE	=	PMU_3V3_X_HT_ISENSE
OUT	PMU_3V3_T_HT_ISENSE	=	PMU_3V3_T_HT_ISENSE
OUT	PMU_OTHERSV_HT_ISENSE	=	PMU_OTHERSV_HT_ISENSE

PAGE TITLE		
Fans/SMC/AMUX Support		
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	REVISION	2.15.0
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IV ALL RIGHTS RESERVED		

BOM_COST_GROUP=FAN





DMIC Secure Disable

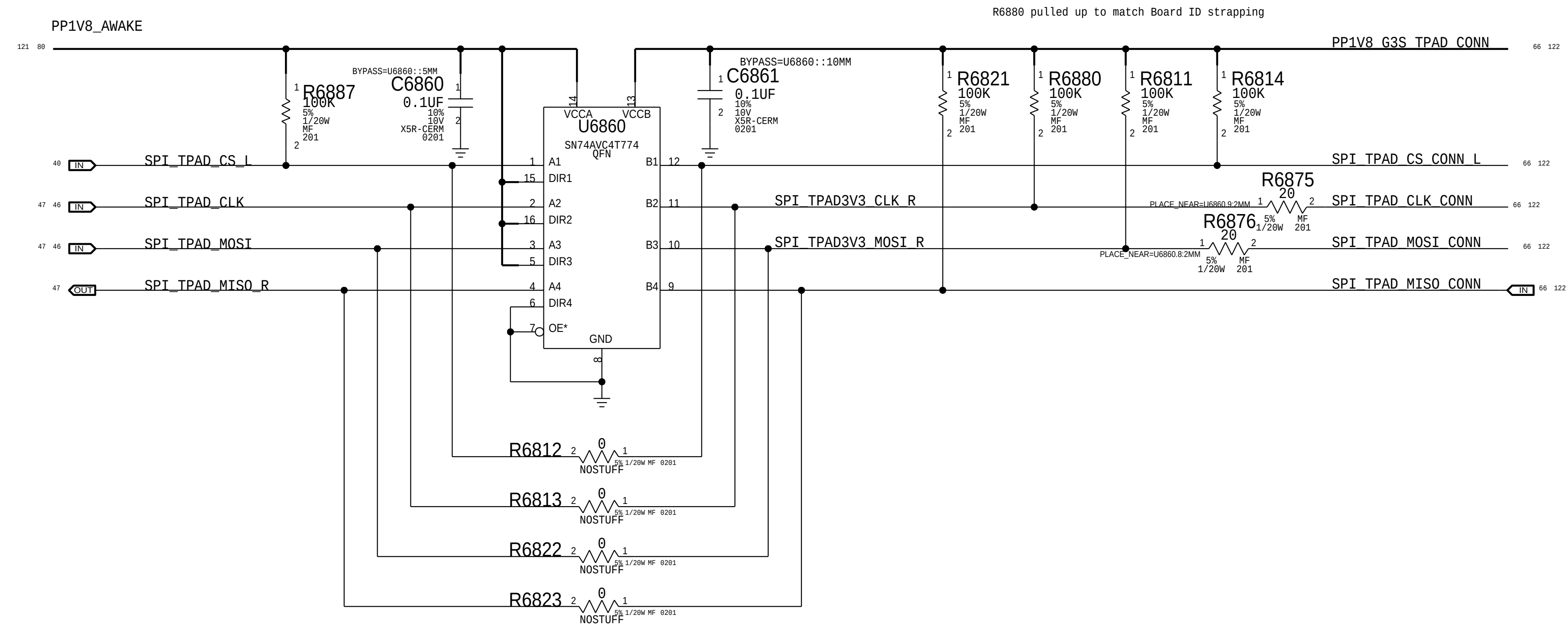
Digital Mic Flex Connector

Audio Jack Flex Connector

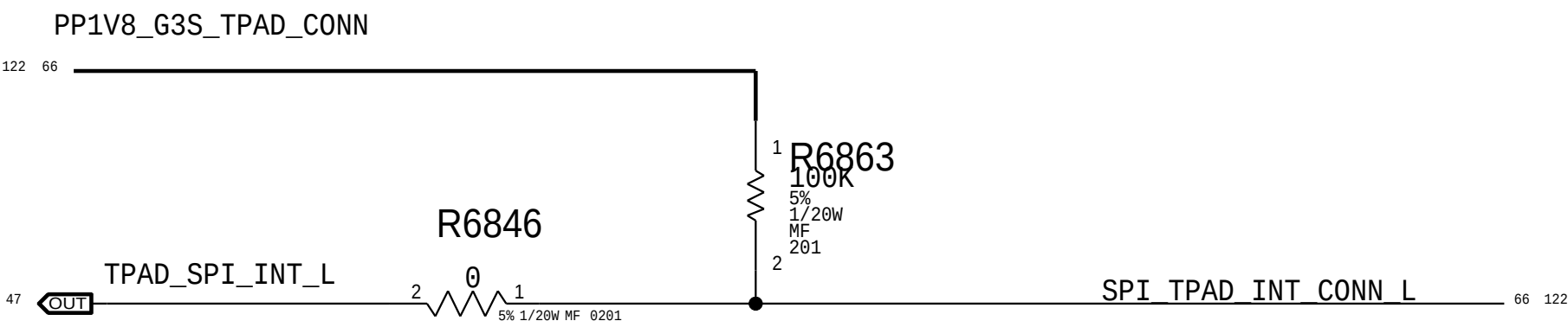
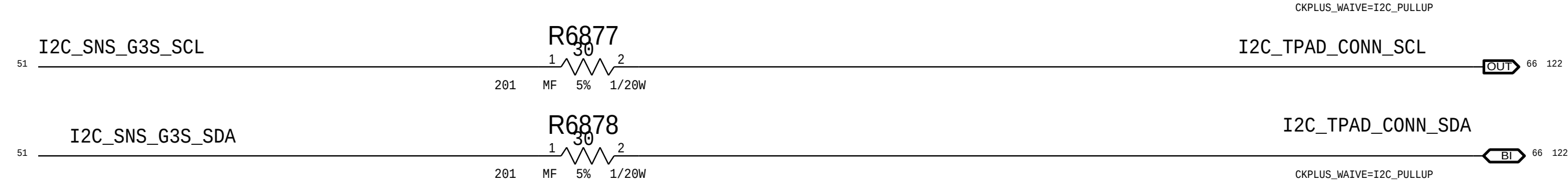
DESIGN: X502/DEV_MLB_U		
LAST CHANGE: wed Feb 18 17:12:24 2015		
PAGE TITLE		
Audio Flex Connectors		
	DRAWING NUMBER	051-04492
	REVISION	2.15.0
	PAGE	66 OF 200
	SHEET	64 OF 135
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BOM_COST_GROUP=AUDIOIO

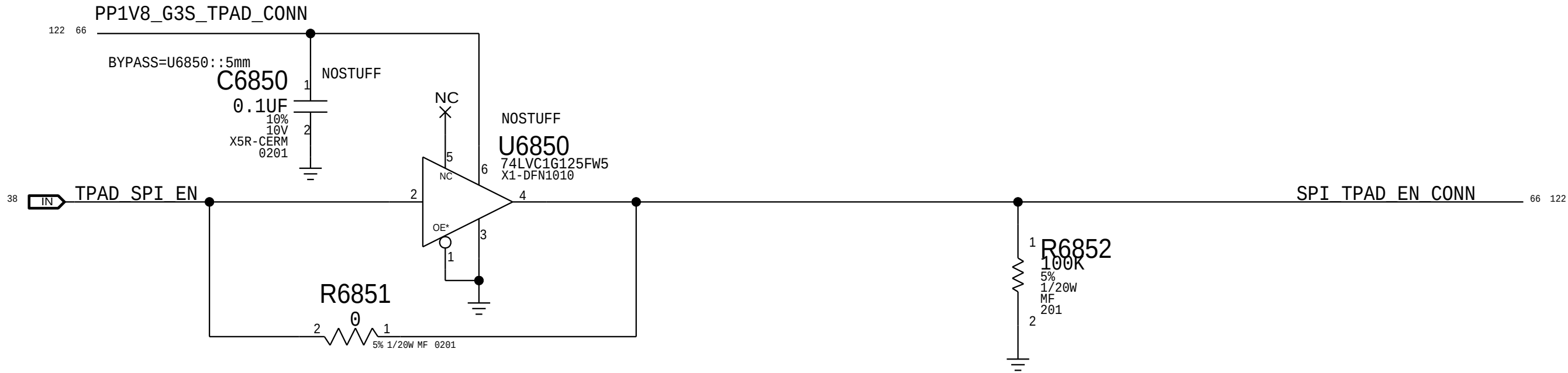
TPAD SPI AWAKE , G3S POWER RAILS ISOLATION, PULL-UPS ON G3S SIDE NEED TO MATCH BOARD_ID



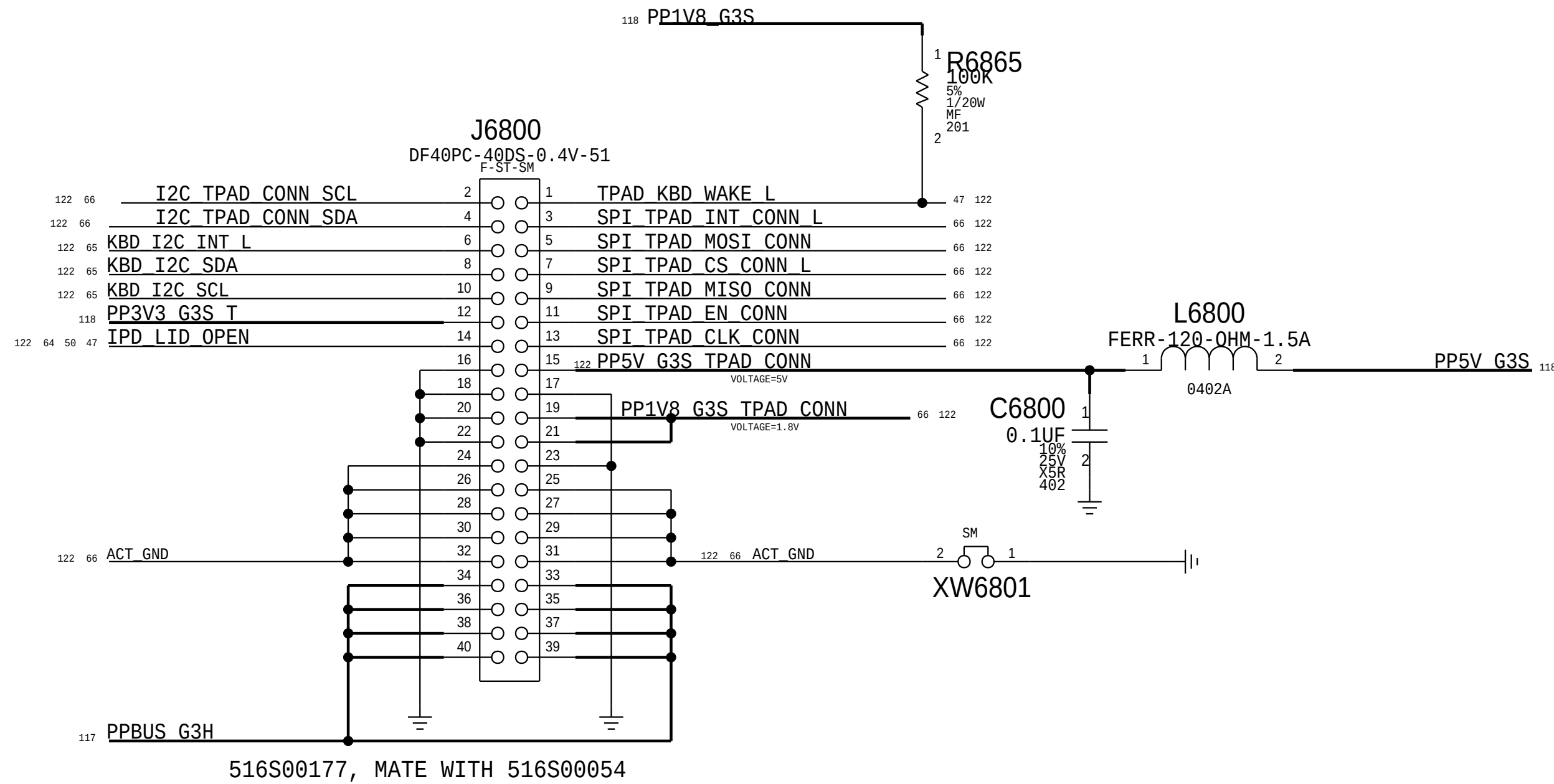
TPAD I2C, INT



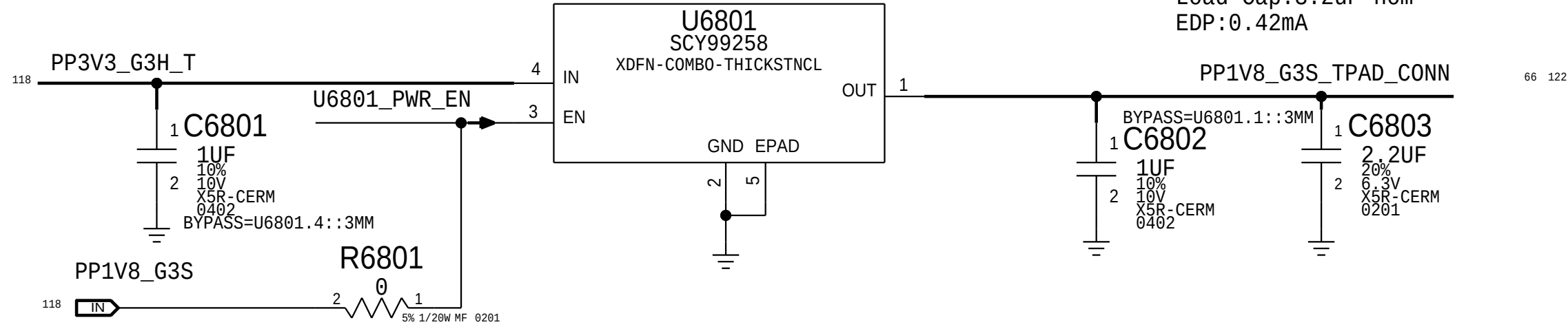
TPAD SPI_EN G3S POWER DOMAIN



TPAD CONNECTOR



1.8V TRACKPAD



(Placeholder for 450mA part symbol)

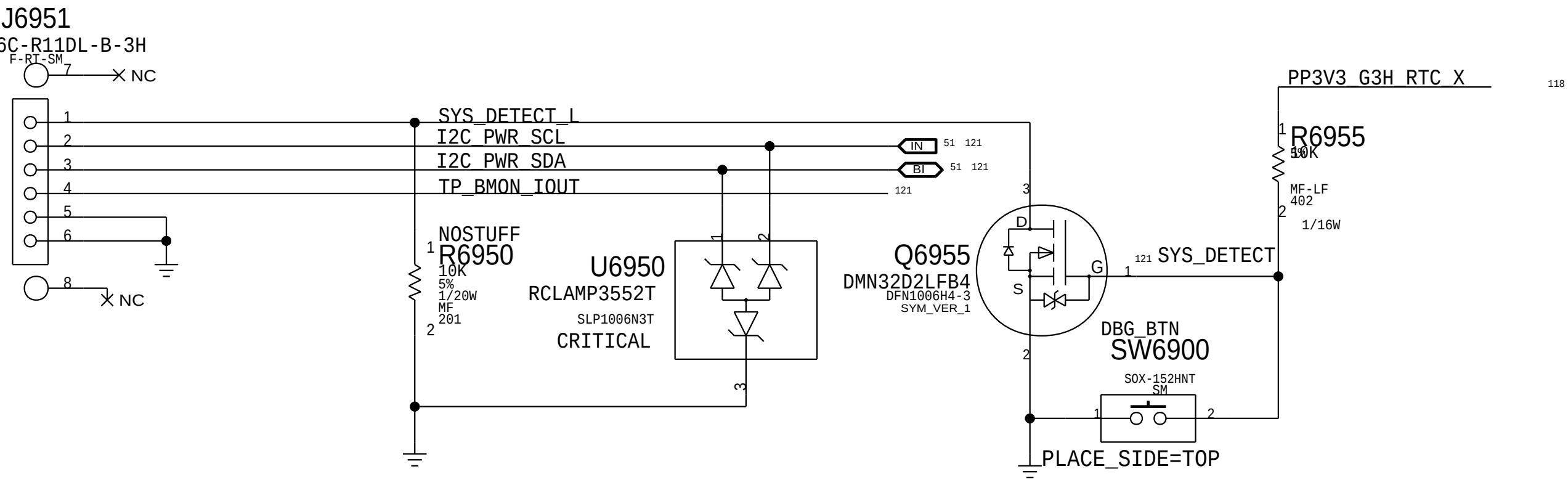
MIN_LINE_WIDTH=0.2000
MIN_NECK_WIDTH=0.1200
VOLTAGE=1.8V
Load Cap:3.2uF nom
EDP:0.42mA

Trackpad Support		
 Apple Inc.	DRAWING NUMBER	051-04492
	REVISION	2.15.0
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	PAGE	68 OF 200
	SHEET	66 OF 135

BOM_COST_GROUP=KEYBOARD

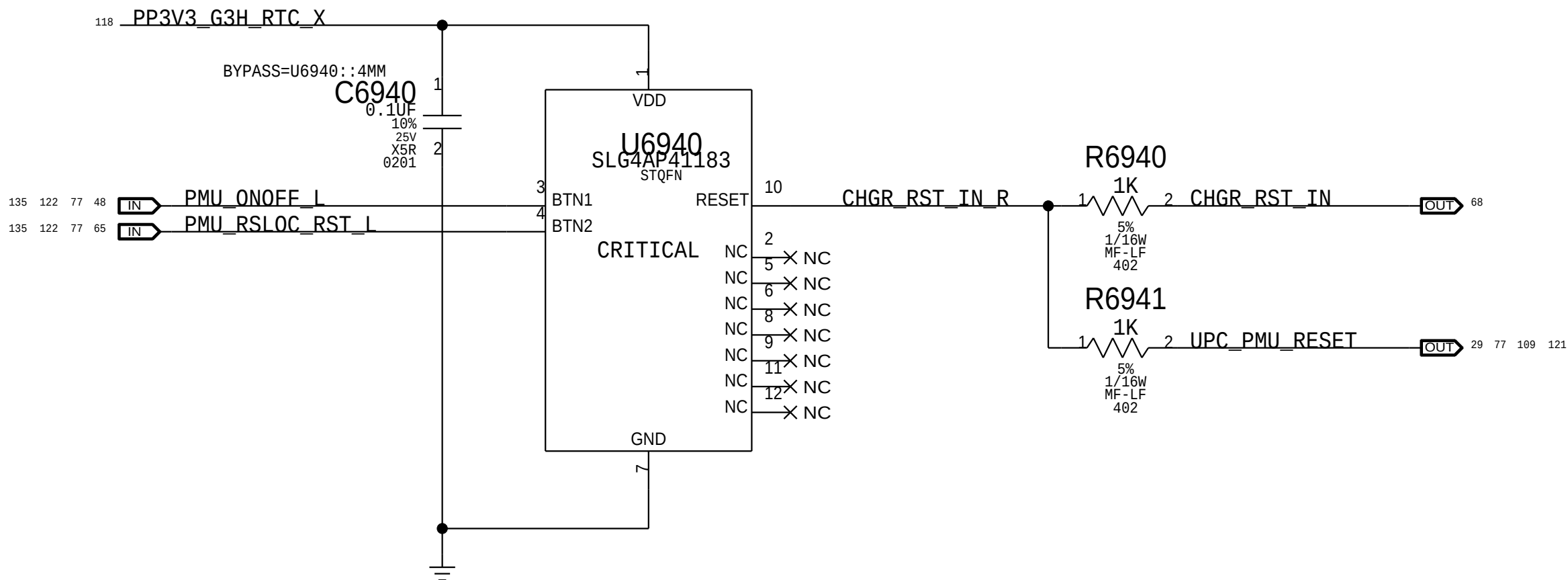
J80 Battery Hotbar Flex Pads 998-03902
Flex Pad TO MLB 998-03780.

APN:518S0818



SMC Reset Circuit

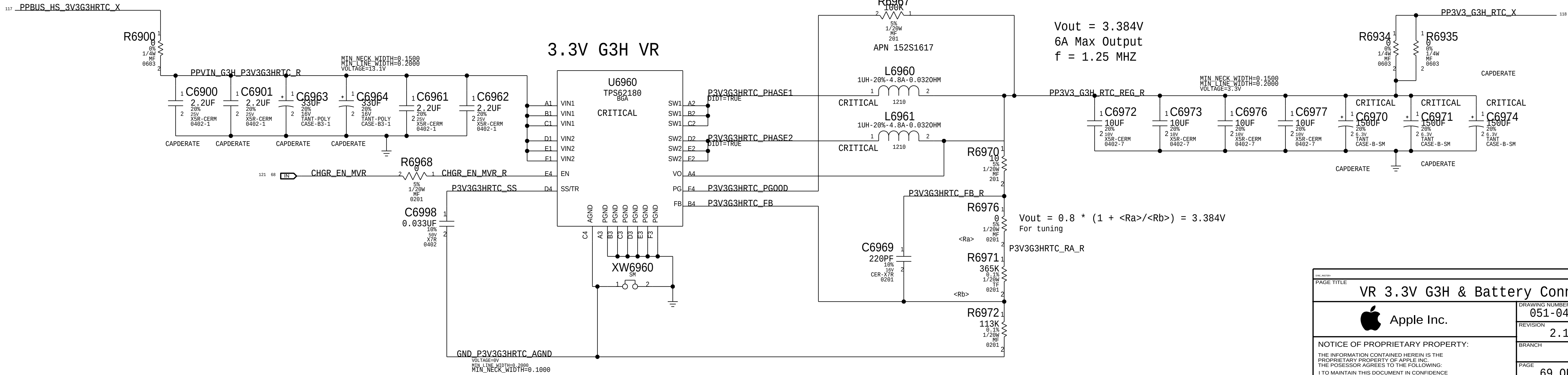
Right Shift & Left Option Control
followed by ON OFF button press.

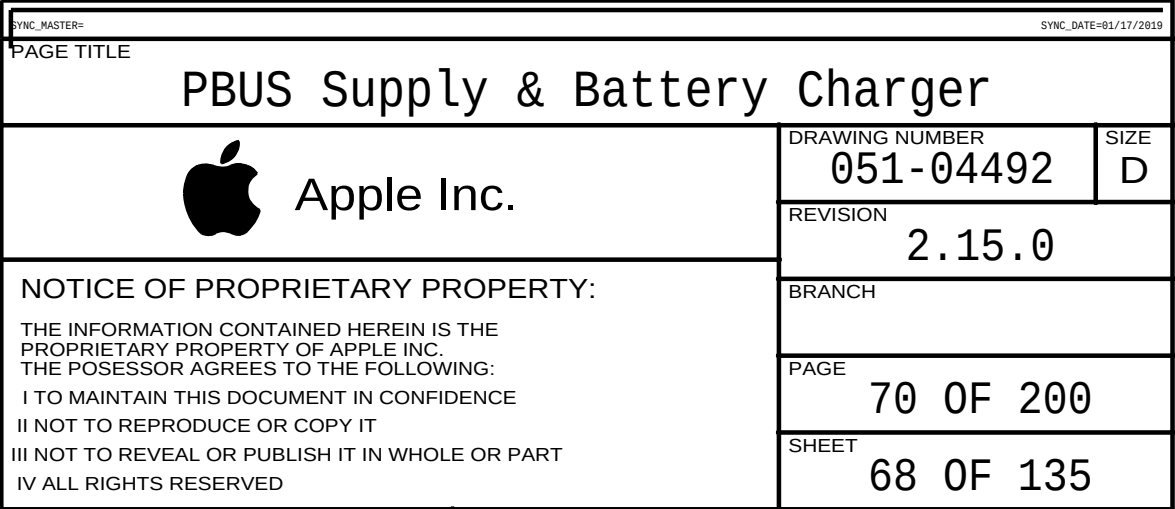


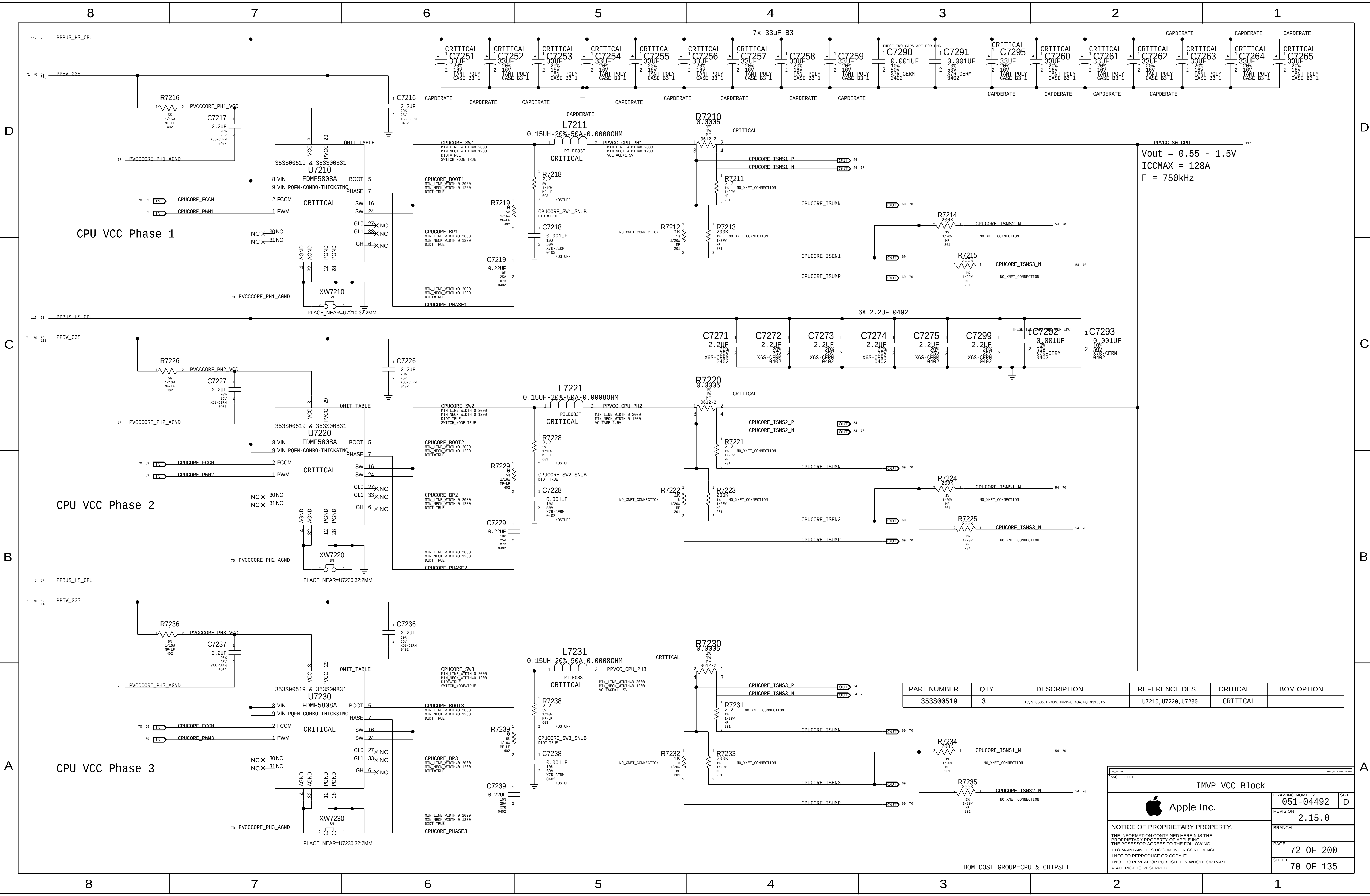
Power Button

BMU POWER FLEX HOTBAR'd TO THE MLB:

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
632-00862	1	PCBA, FLEX, BMU PWR, X363	J6950	CRITICAL	

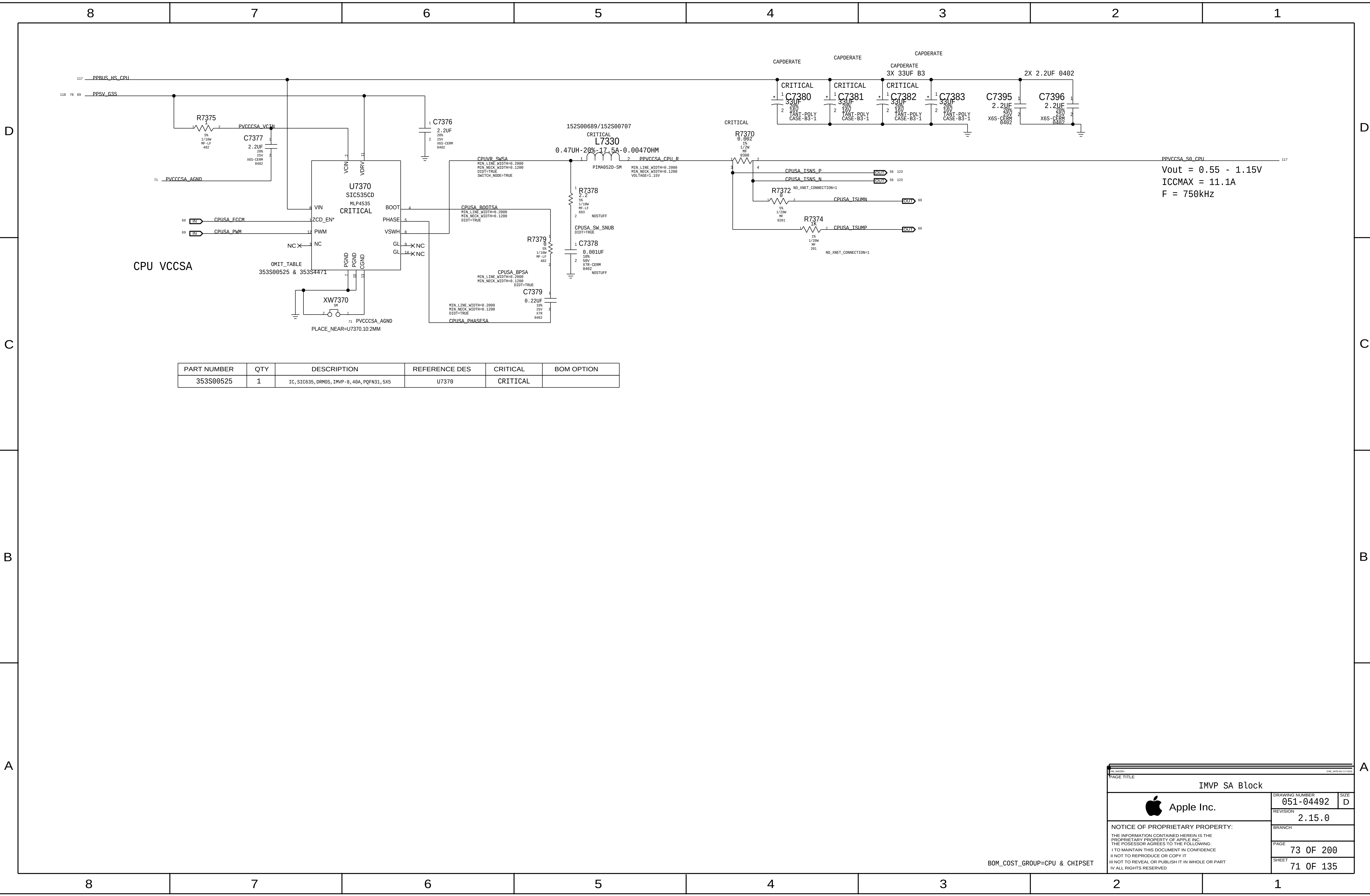






Vout = 0.55 - 1.5V
ICCMAX = 128A
F = 750kHz

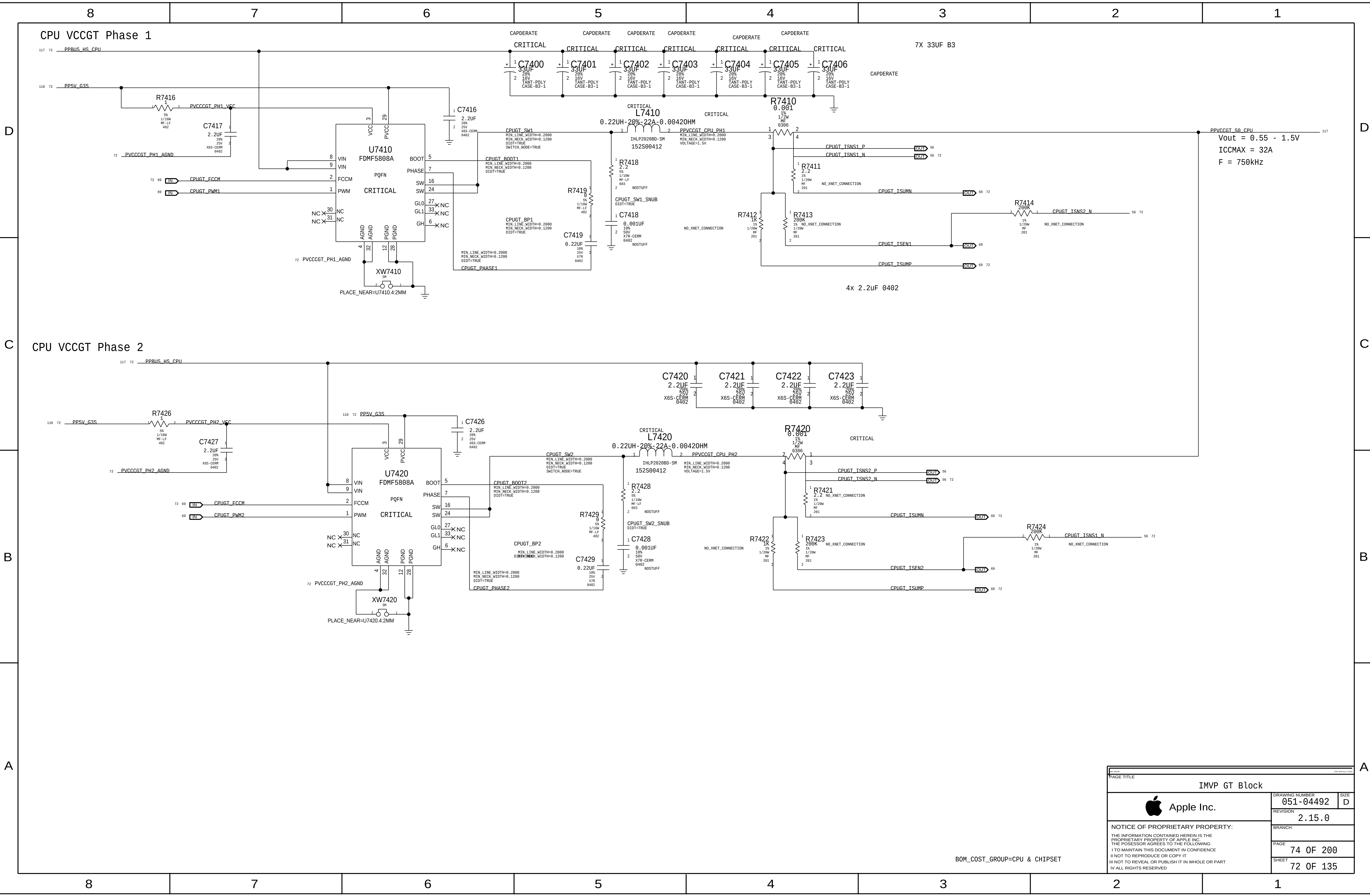
BOM_COST_GROUP=CPU & CHIPSET



PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
353S00525	1	IC, SIC635, DRMOS, IMVP-8, 40A, PQFN31, 5X5	U7370	CRITICAL	

PAGE TITLE			IMVP SA Block		
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		REVISION	2.15.0		
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		PAGE	73 OF 200		
		SHEET	71 OF 135		

BOM_COST_GROUP=CPU & CHIPSET



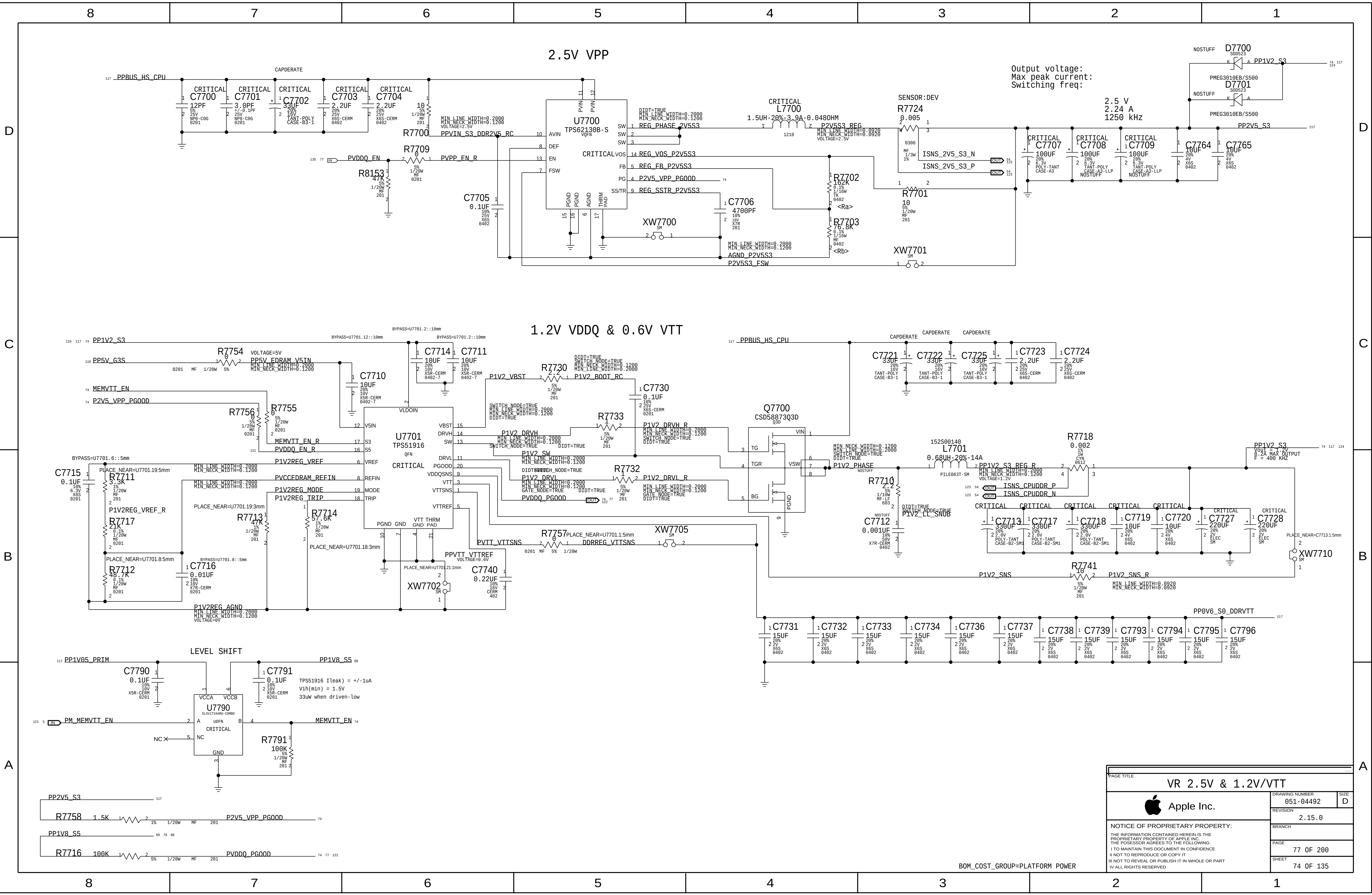
PAGE TITLE		
IMVP GT Block		
	DRAWING NUMBER	051-04492
	REVISION	2.15.0
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	PAGE	74 OF 200
	SHEET	72 OF 135

BOM_COST_GROUP=CPU & CHIPSET

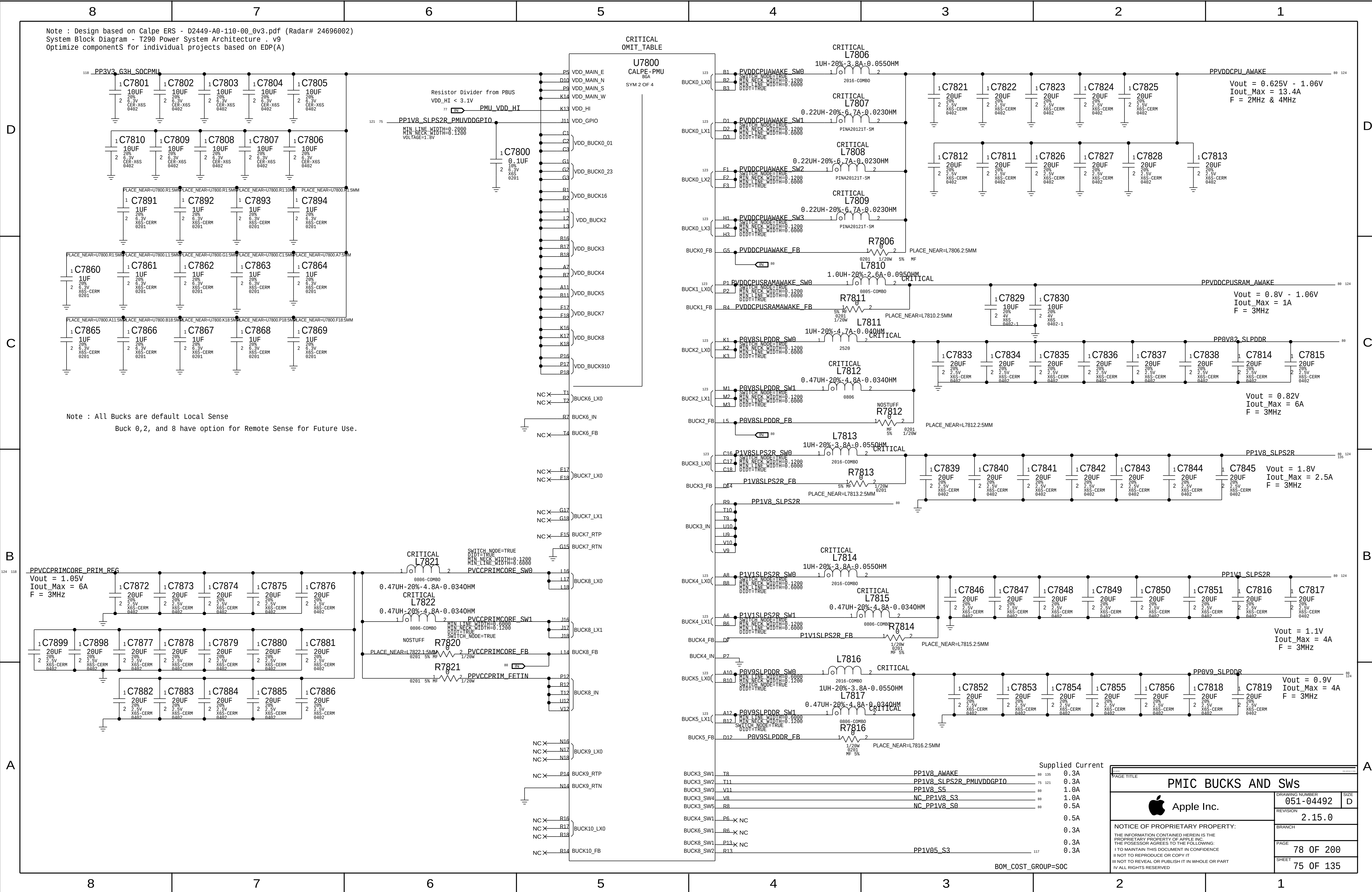


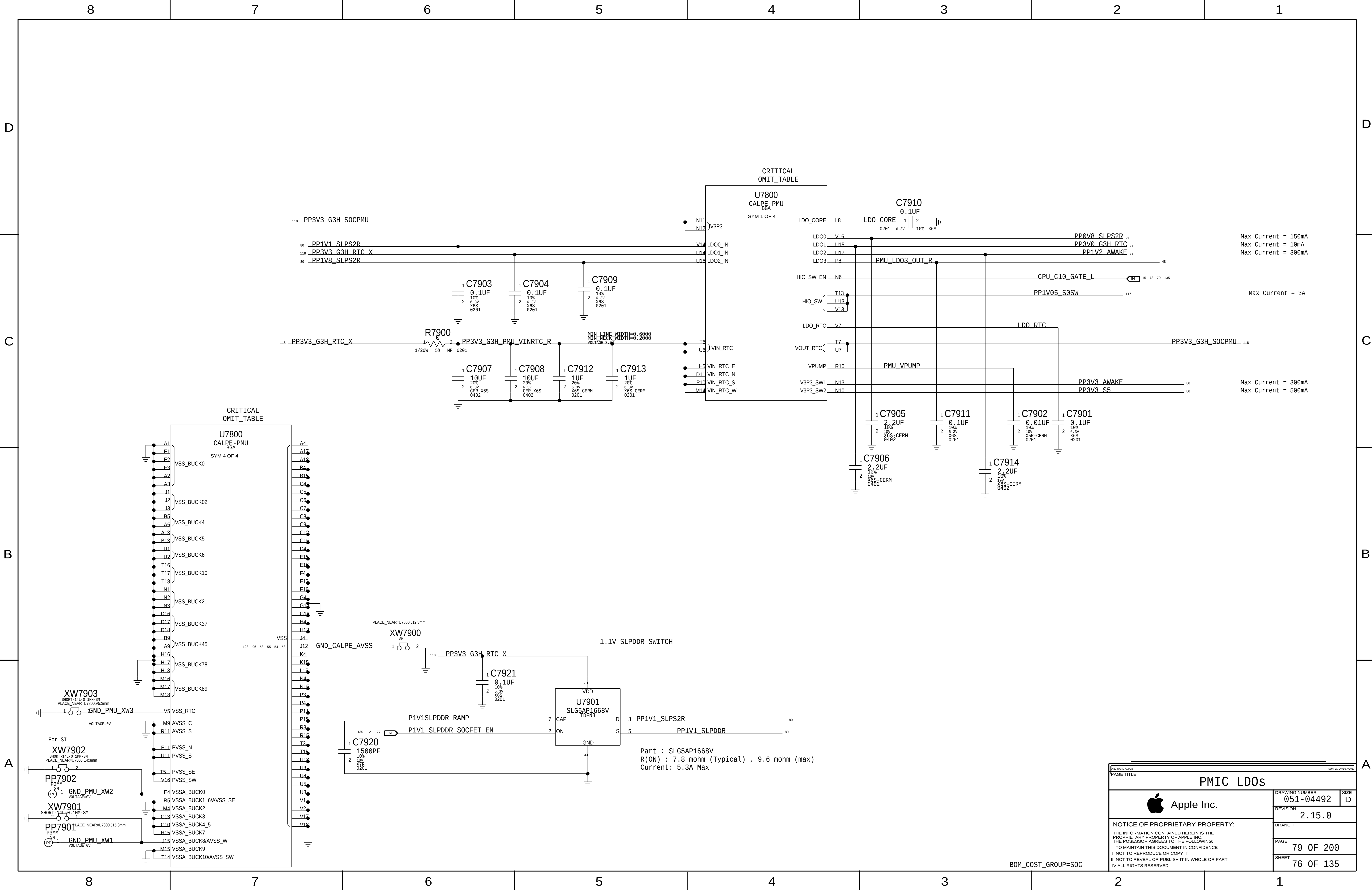
The schematic diagram illustrates the signal paths for the PMU_PVDDMAIN_EN and P5VG3S_EN signals. The PMU_PVDDMAIN_EN signal is connected to a 47K resistor (R7653) and a 3K resistor (R7652). The P5VG3S_EN signal is connected to a 47K resistor (R7691). Both signals are connected to a 2.2uF capacitor (C7640 and C7641 respectively) and a 1000PF capacitor (C7642). The capacitors are connected to ground. The signal paths are labeled with component values and part numbers.

PAGE TITLE			
Power 5V 3.3V Supply			
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	BRANCH		
	PAGE		
	76 OF 200		
SHEET			
			73 OF 135



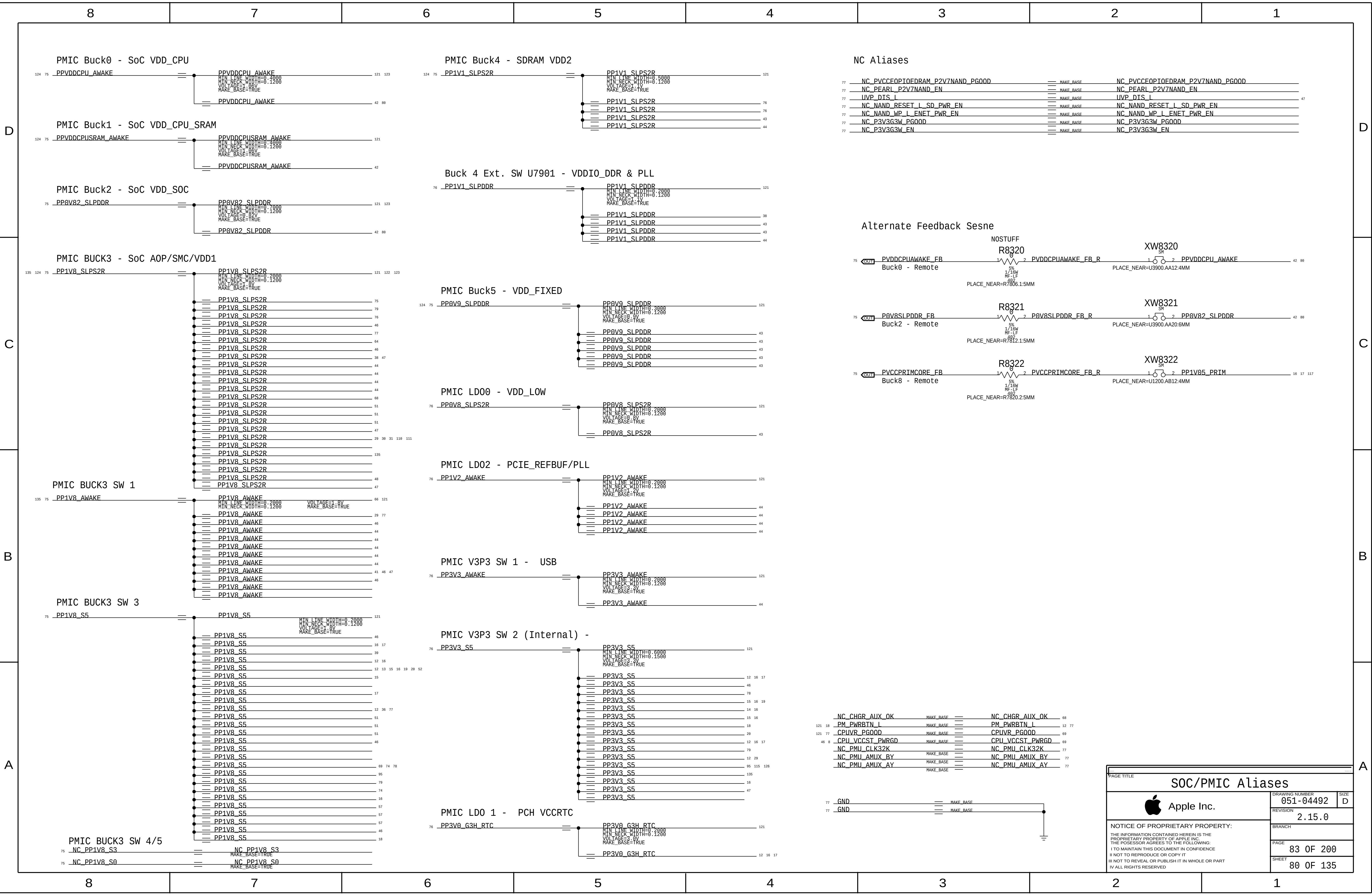
PAGE TITLE		
VR 2.5V & 1.2V/VTT		
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	REVISION	2.15.0
	BRANCH	
	PAGE	77 OF 200
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			051-04492			D		
			REVISION			2.15.0		
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			PAGE			79 OF 200		
			SHEET			76 OF 135		

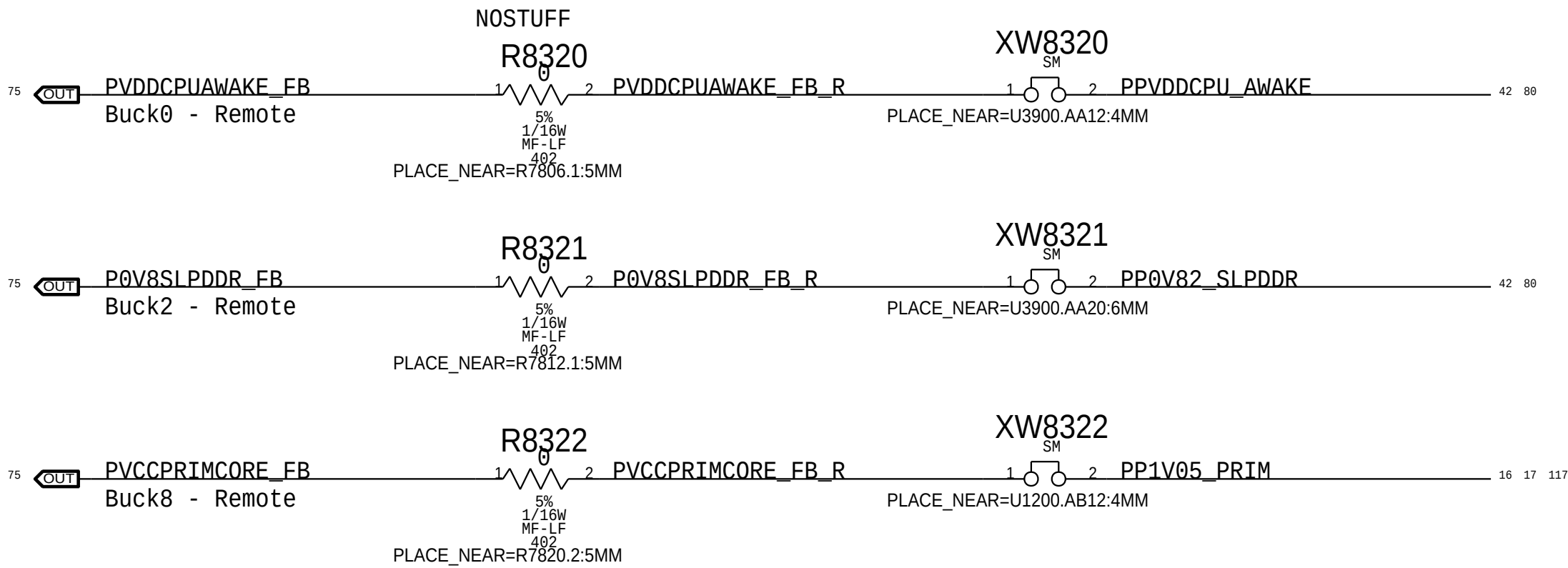
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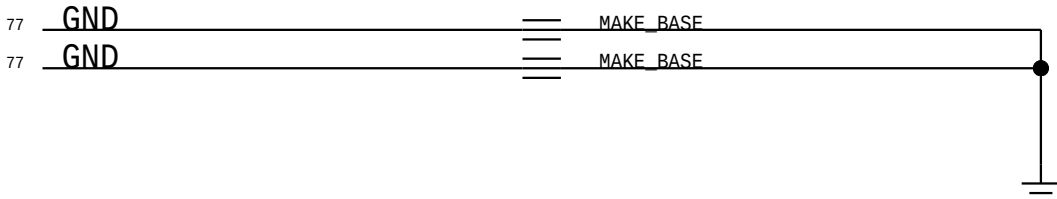
NC Aliases

77	NC_PVCCEOPTIOEDRAM_P2V7NAND_PG00D	MAKE_BASE	NC_PVCCEOPTIOEDRAM_P2V7NAND_PG00D
77	NC_PEARL_P2V7NAND_EN	MAKE_BASE	NC_PEARL_P2V7NAND_EN
77	UVP_DIS_I	MAKE_BASE	UVP_DIS_I
77	NC_NAND_RESET_I_SD_PWR_EN	MAKE_BASE	NC_NAND_RESET_I_SD_PWR_EN
77	NC_NAND_WP_I_ENET_PWR_EN	MAKE_BASE	NC_NAND_WP_I_ENET_PWR_EN
77	NC_P3V3G3W_PG00D	MAKE_BASE	NC_P3V3G3W_PG00D
77	NC_P3V3G3W_EN	MAKE_BASE	NC_P3V3G3W_EN

Alternate Feedback Sesne



NC_CHGR_AUX_OK	MAKE_BASE	NC_CHGR_AUX_OK
PM_PWRBTN_I	MAKE_BASE	PM_PWRBTN_I
CPUVR_PG00D	MAKE_BASE	CPUVR_PG00D
CPU_VCCST_PWRGD	MAKE_BASE	CPU_VCCST_PWRGD
NC_PMU_CLK32K	MAKE_BASE	NC_PMU_CLK32K
NC_PMU_AMUX_BY	MAKE_BASE	NC_PMU_AMUX_BY
NC_PMU_AMUX_AY	MAKE_BASE	NC_PMU_AMUX_AY

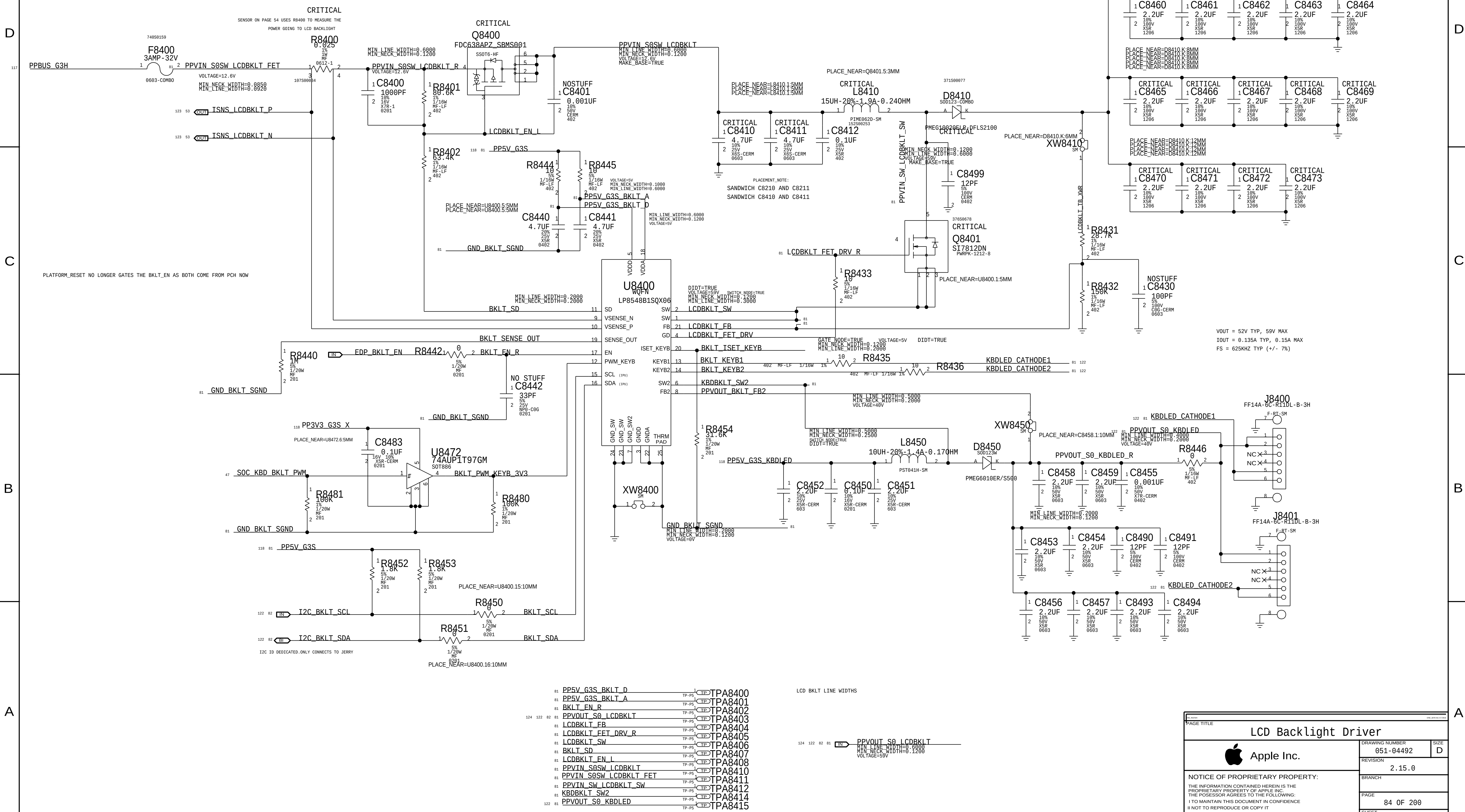


PAGE TITLE			
SOC/PMIC Aliases			
 Apple Inc.	DRAWING NUMBER	051-04492	SIZE D
	REVISION	2.15.0	
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PAGE		83	OF 200
SHEET		80	OF 135

Page Notes

Power aliases required by this page:

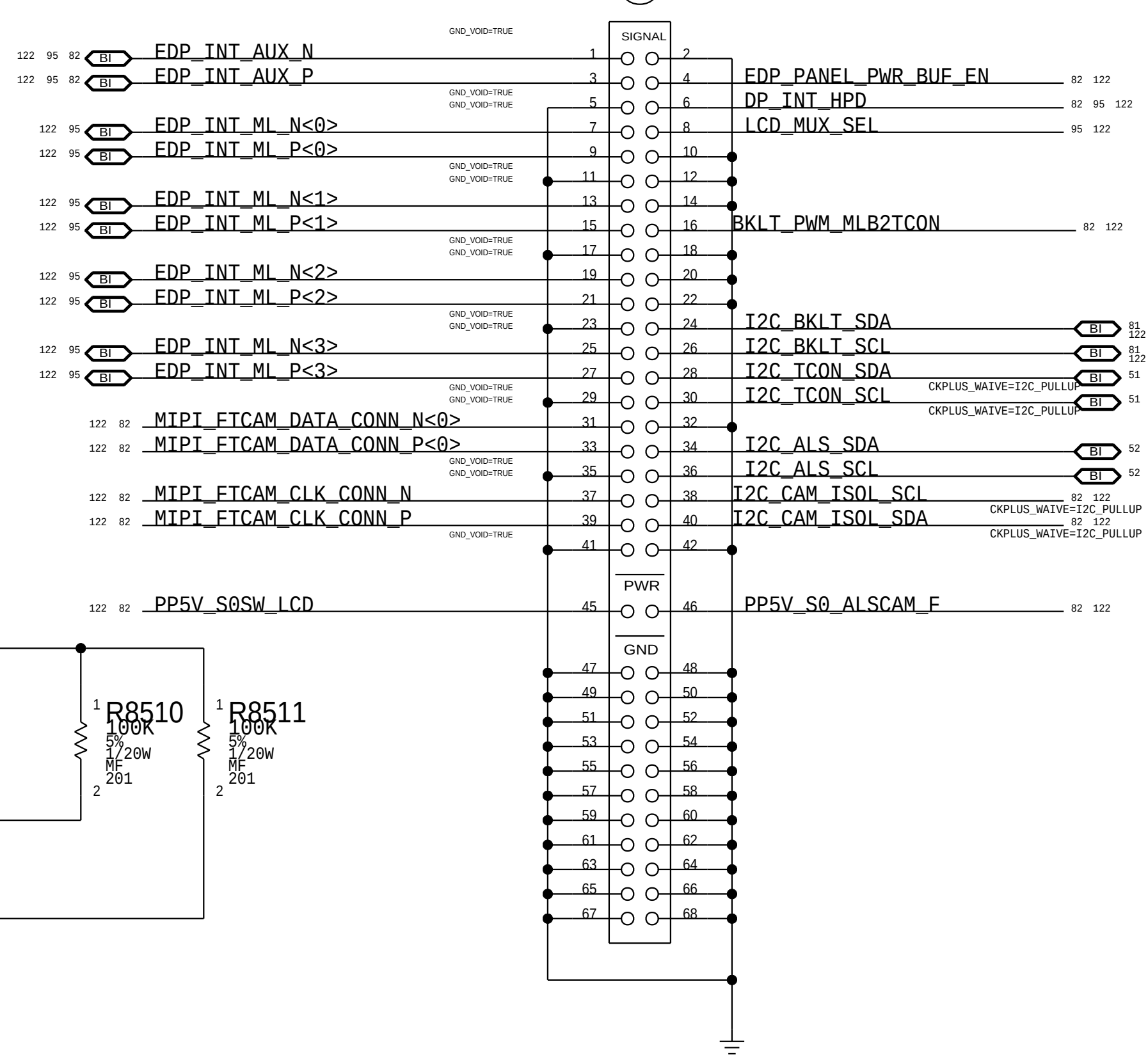
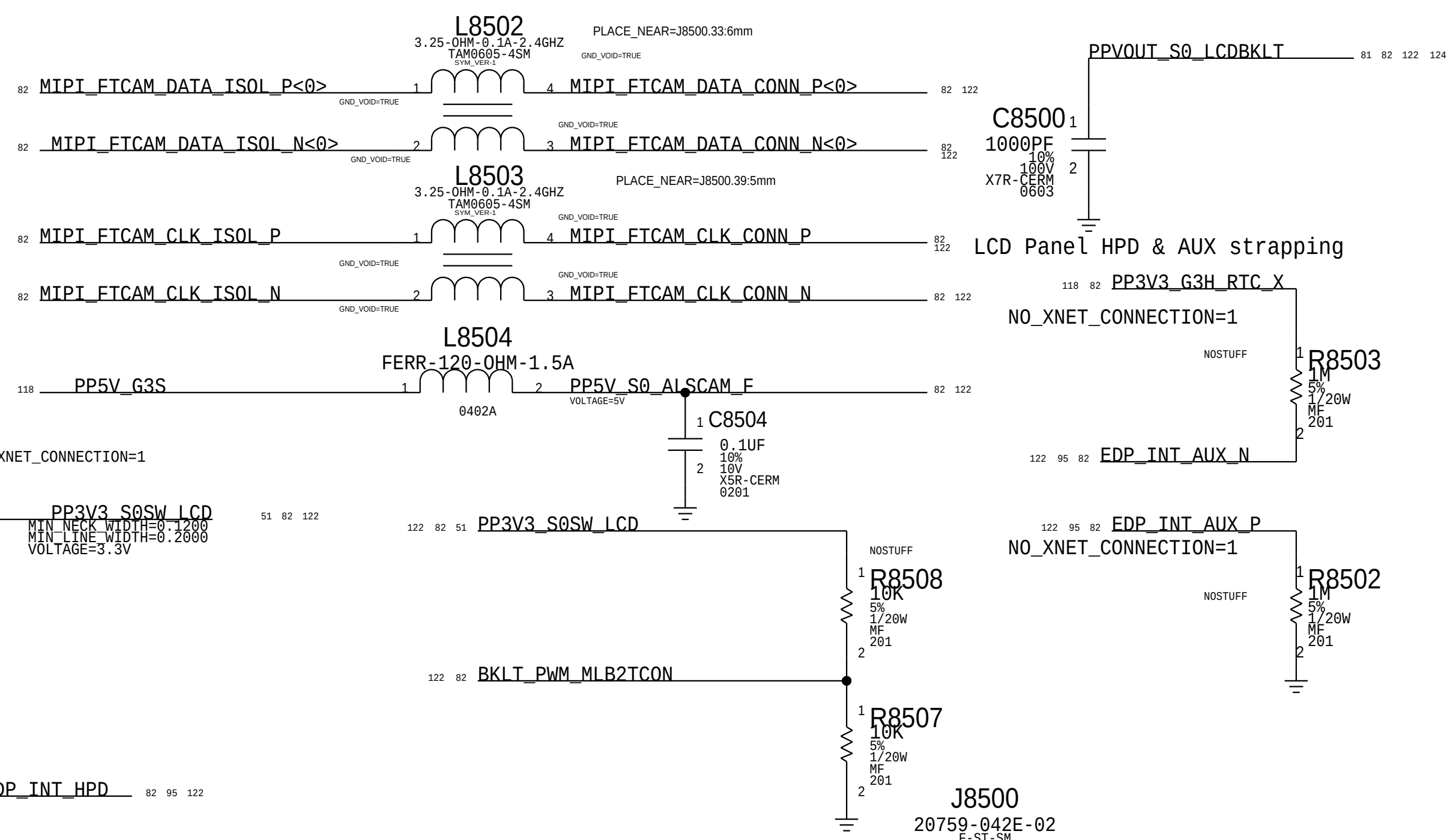
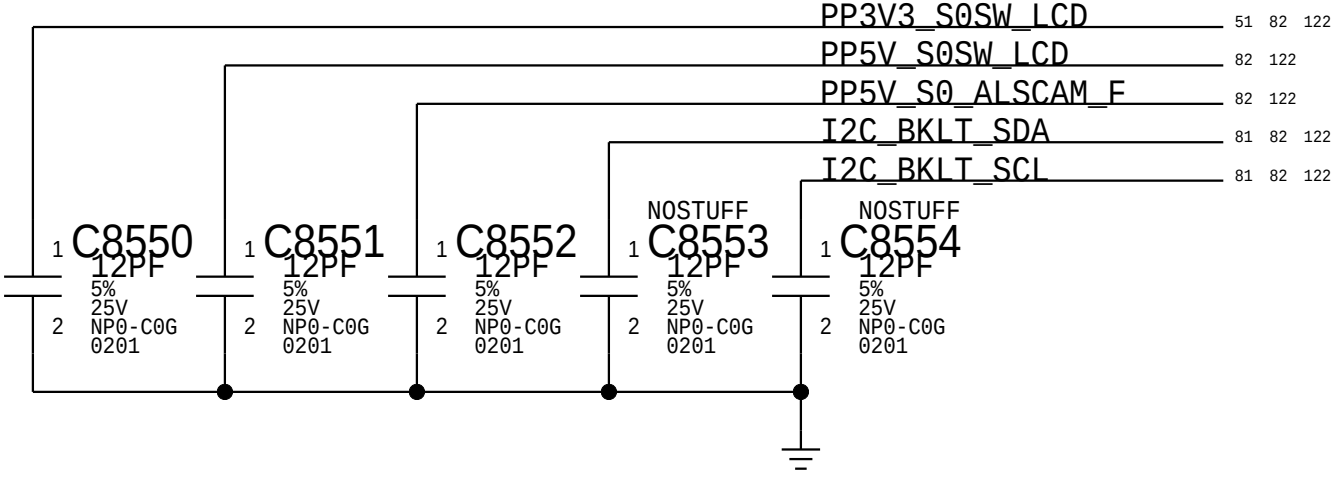
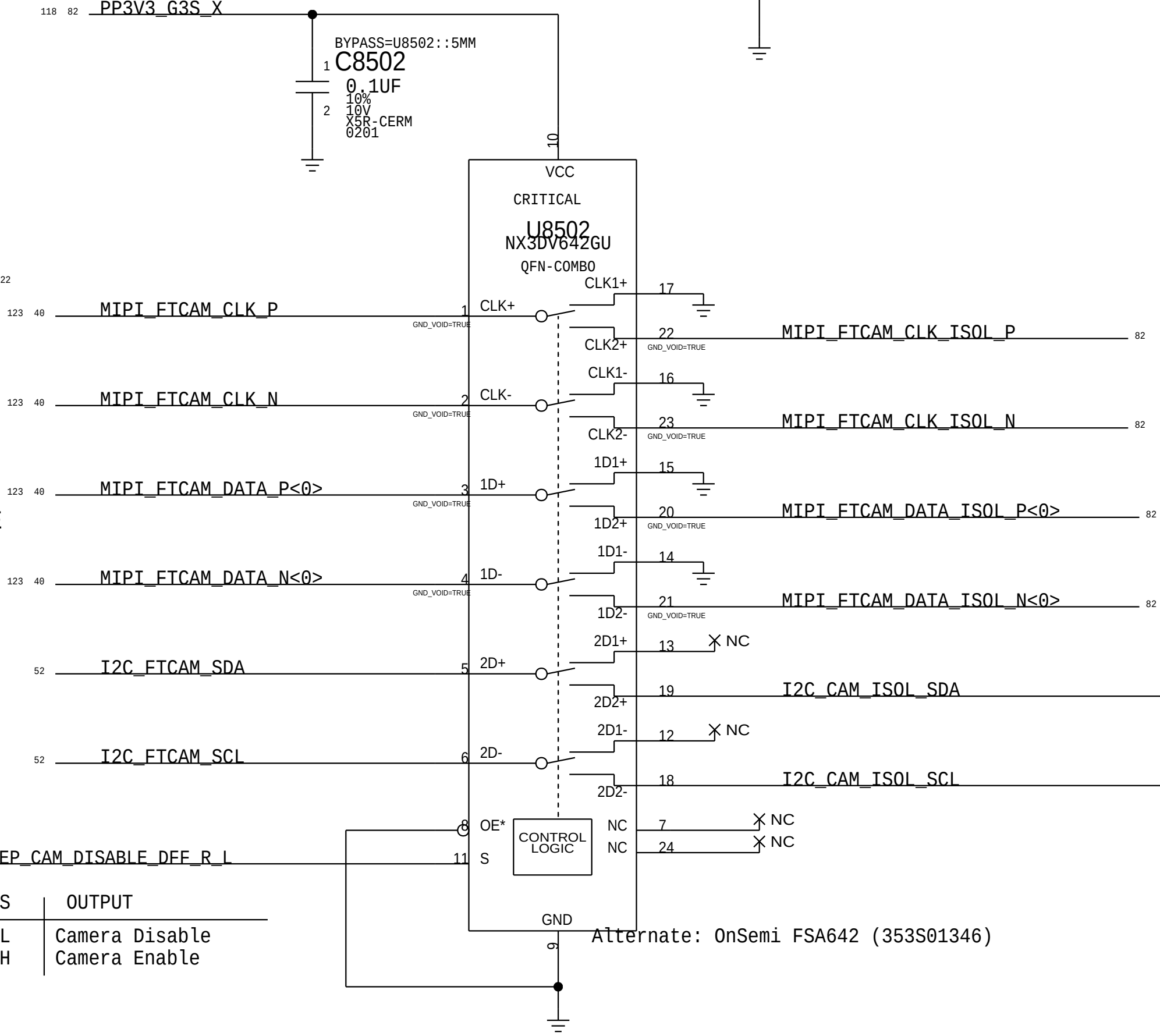
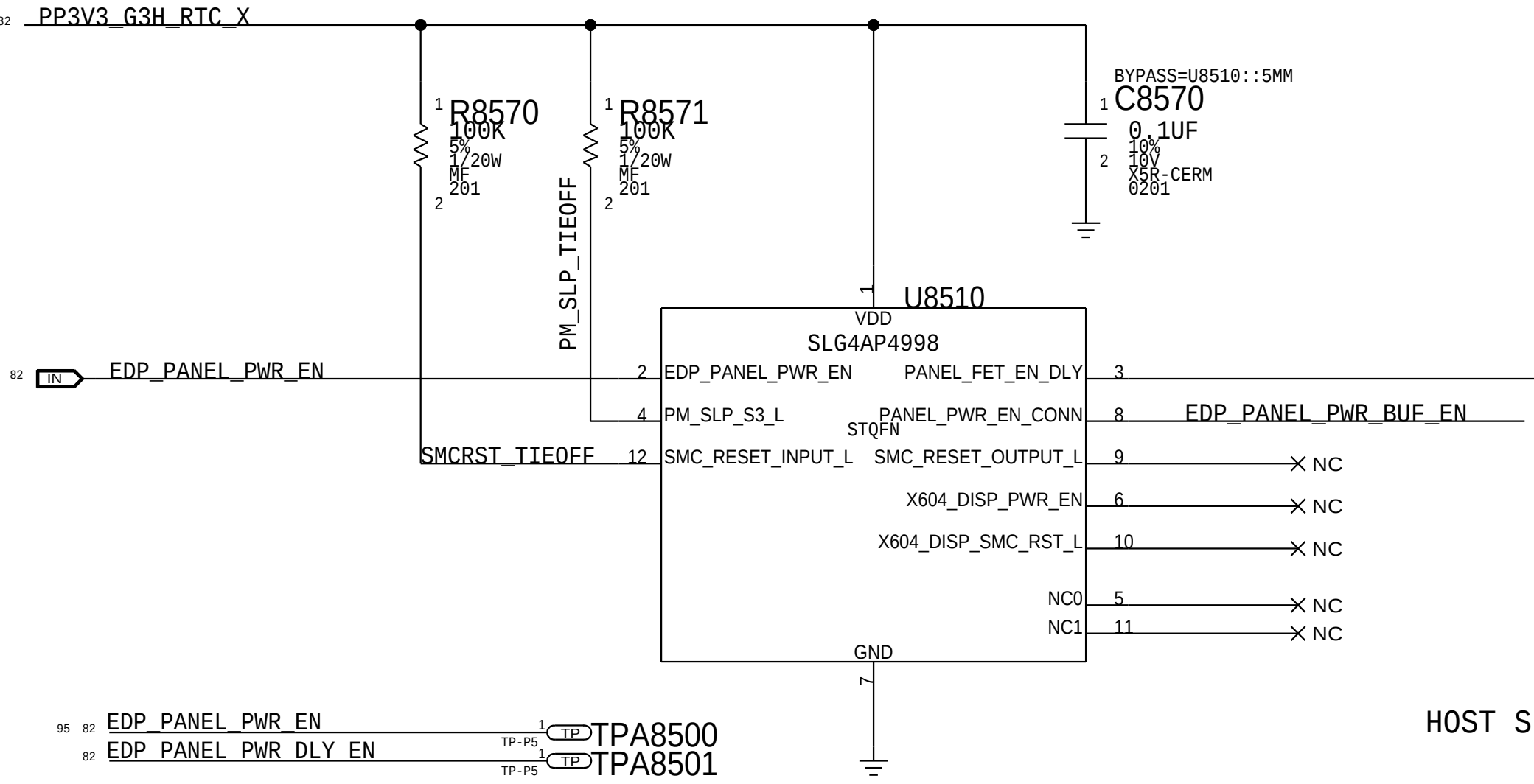
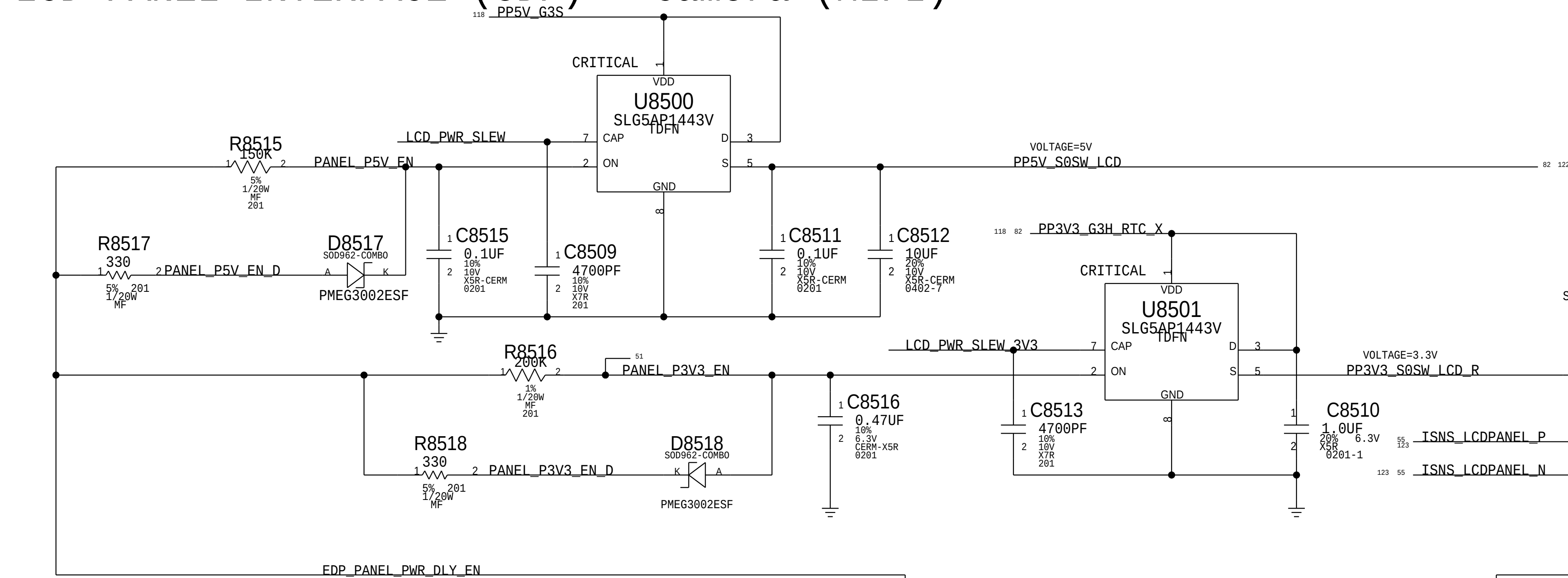
- PPVIN_S05W_LCDBKLTFT (9-12.6V LCD BACKLIGHT INPUT)
- PPSV_03S_BKLT (5V BACKLIGHT DRIVER INPUT)



PAGE TITLE		LCD Backlight Driver	
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	SIZE	D	
	REVISION	2.15.0	
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PAGE	84 OF 200		
SHEET	81 OF 135		

LCD PANEL INTERFACE (eDP) + Camera (MIPI)

MIPIC FILTERING



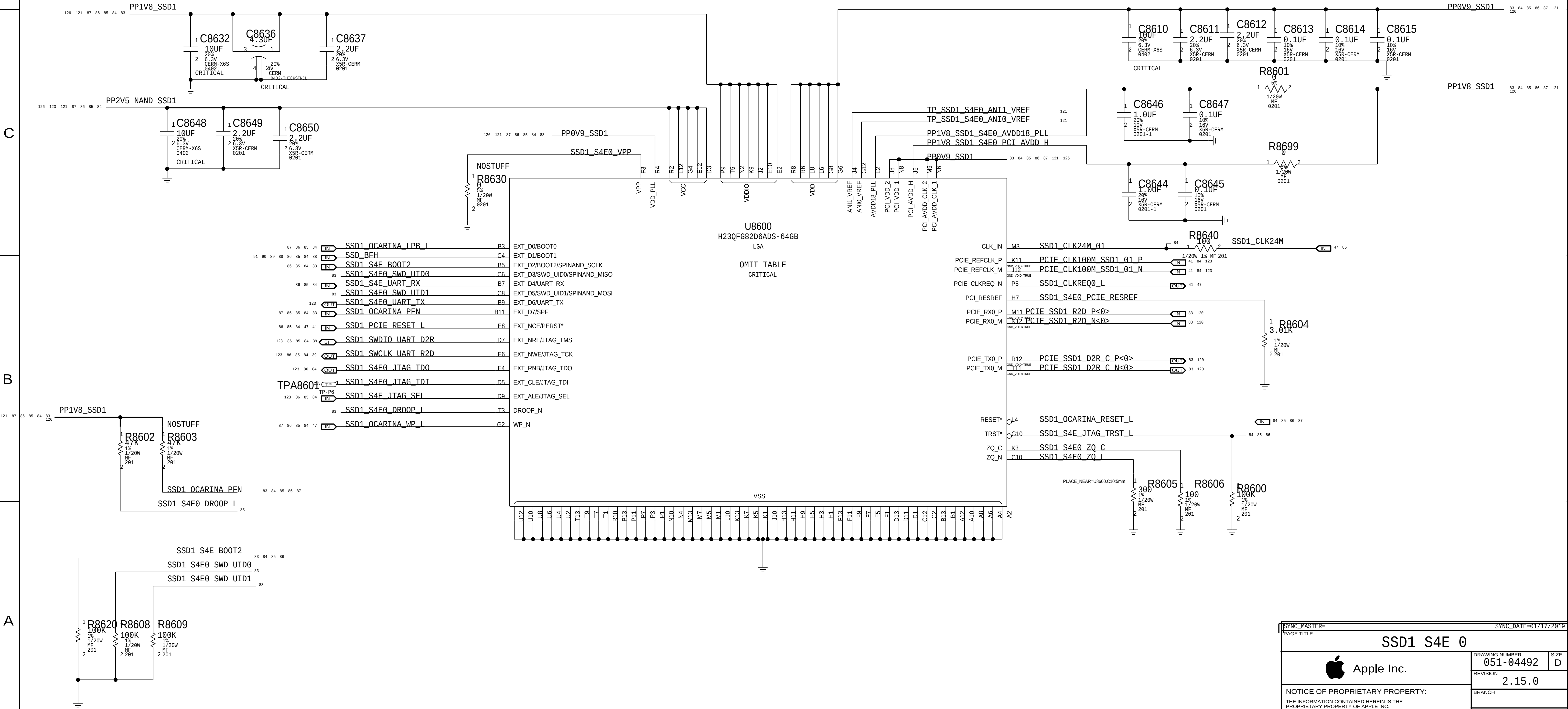
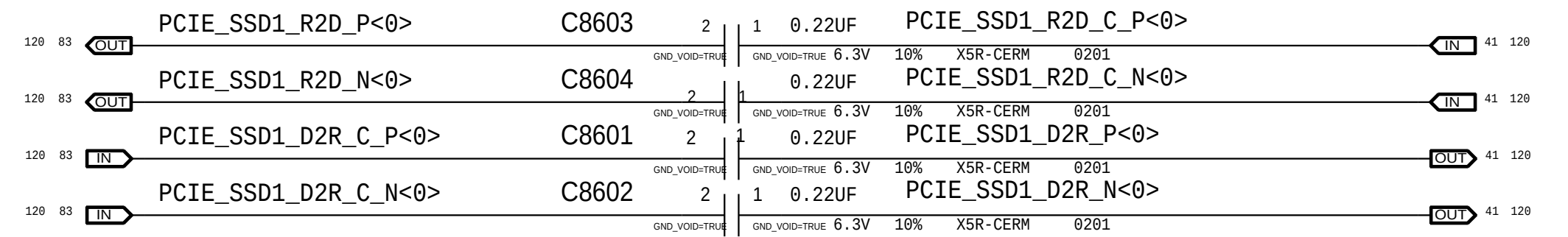
S	OUTPUT
L	Camera Disable
H	Camera Enable

Alternate: OnSemi FSA642 (353S01346)

PAGE TITLE		
eDP Display Connector		
 Apple Inc.	DRAWING NUMBER	SIZE
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	BRANCH	
	PAGE	85 OF 200
	SHEET	82 OF 135

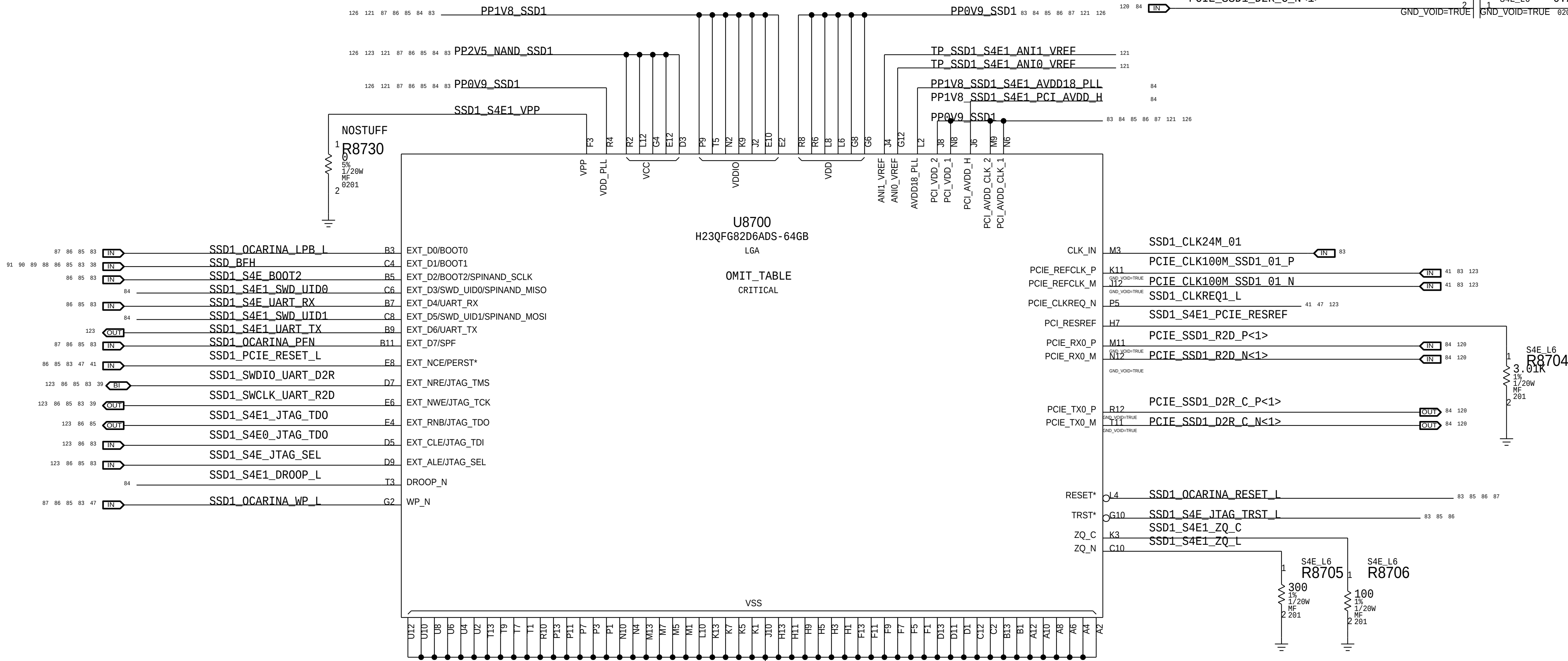
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S4E0



SYNCH MASTER=		SYNCH_DATE=01/17/2019	
PAGE TITLE			
SSD1 S4E 0			
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	051-04492		D
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	2, 15, 0		
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		PAGE	
		86 OF 200	
		SHEET	
		83 OF 135	

S4E1



D

D

C

C

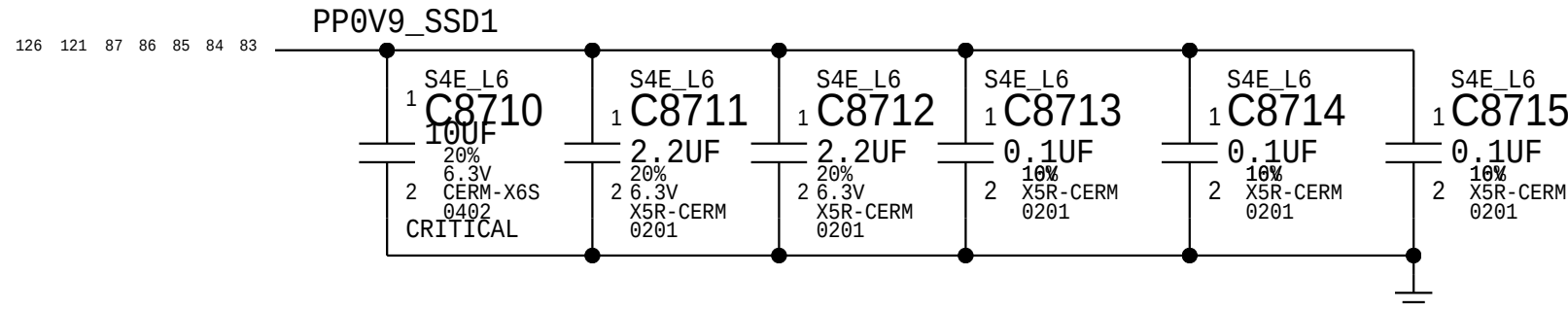
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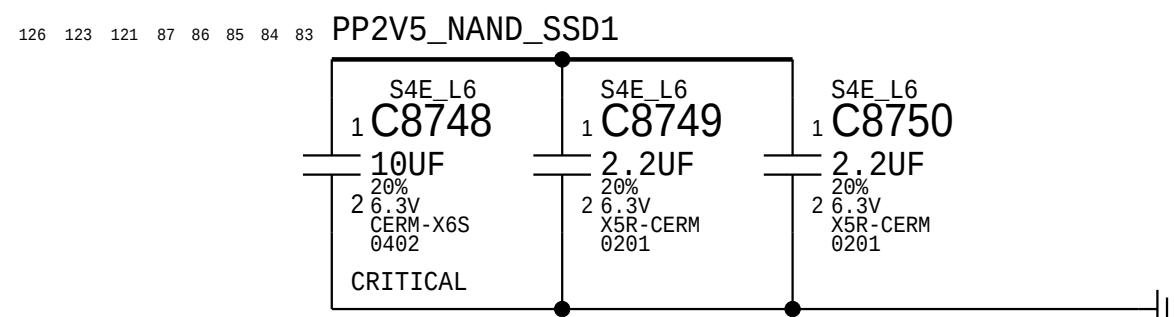
A

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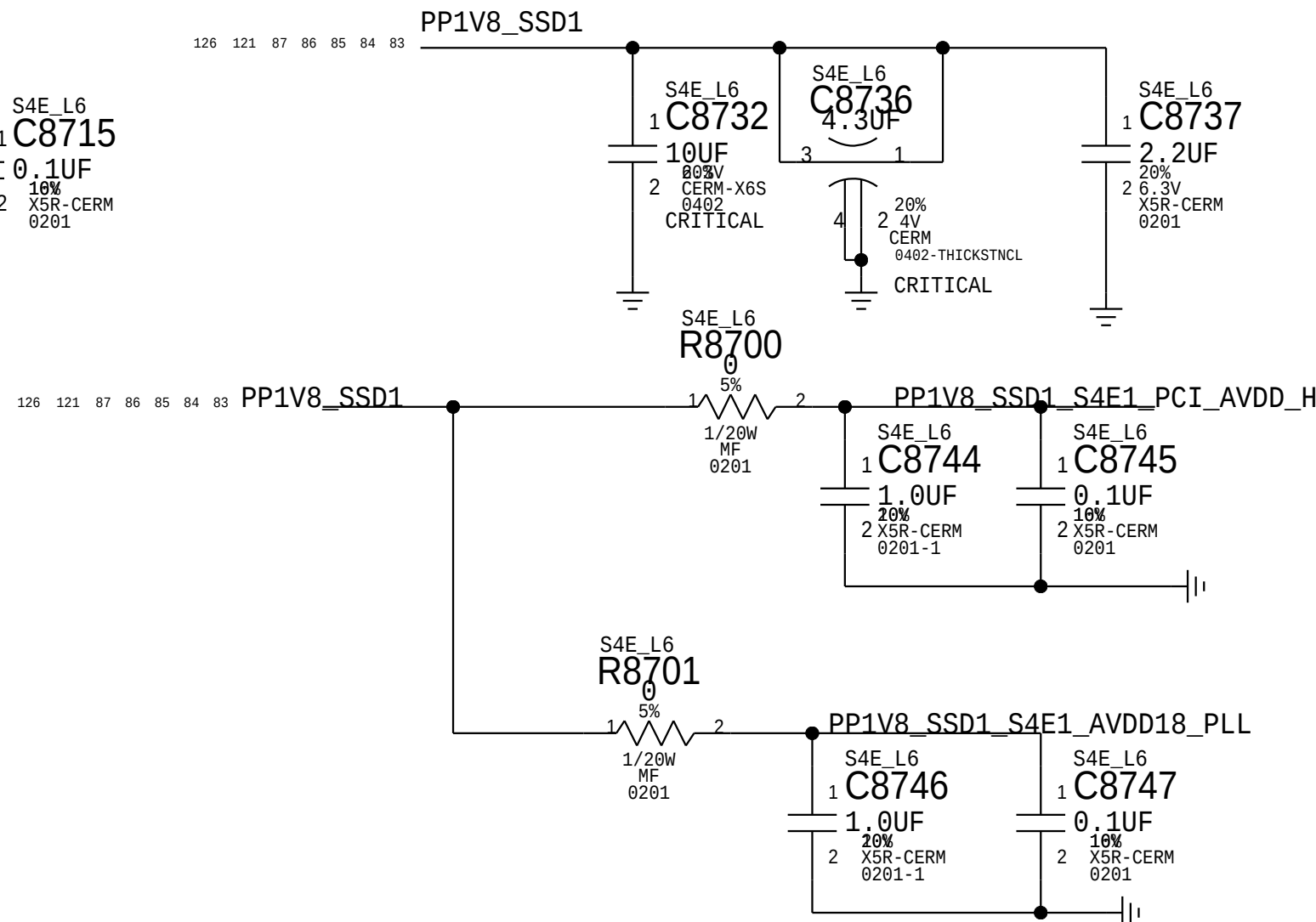
S4E VDD



VCC CAP



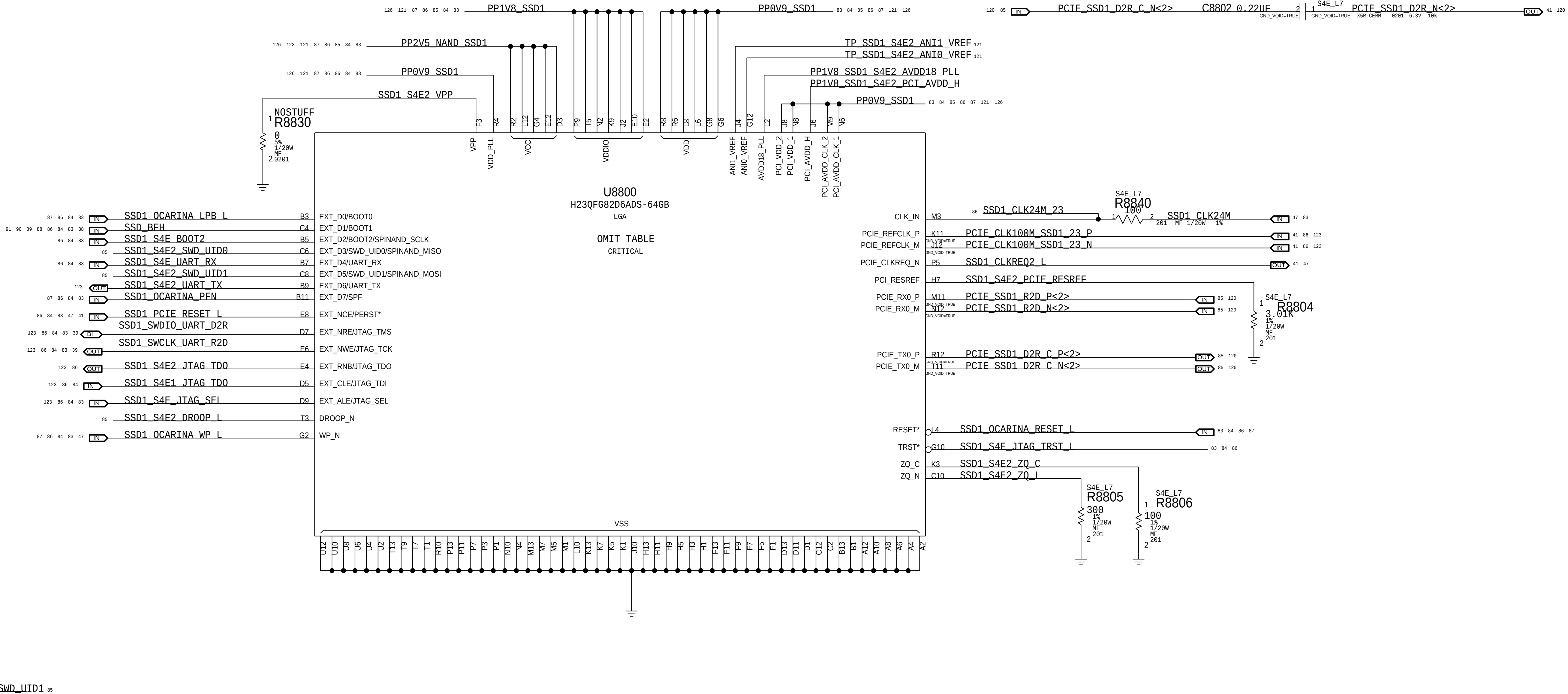
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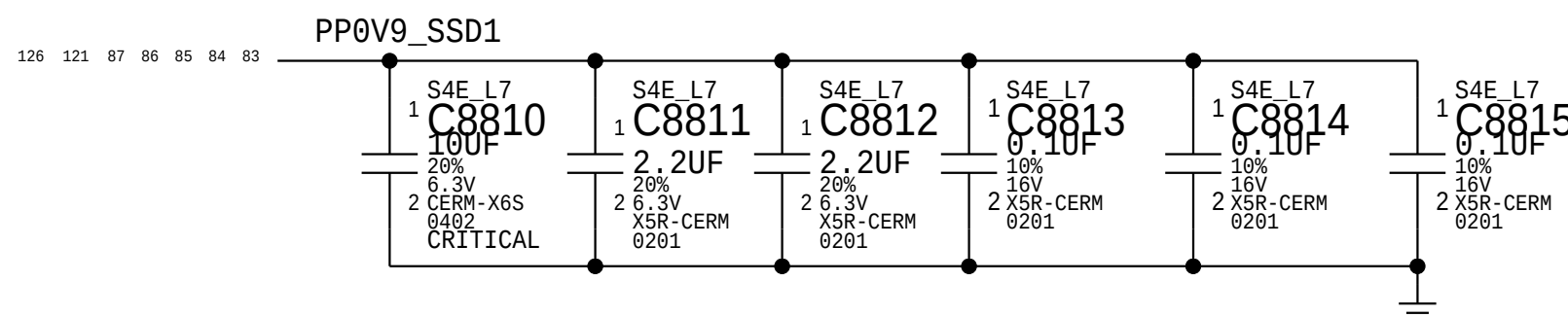
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			PAGE	87 OF 200	
			SHEET	84 OF 135	

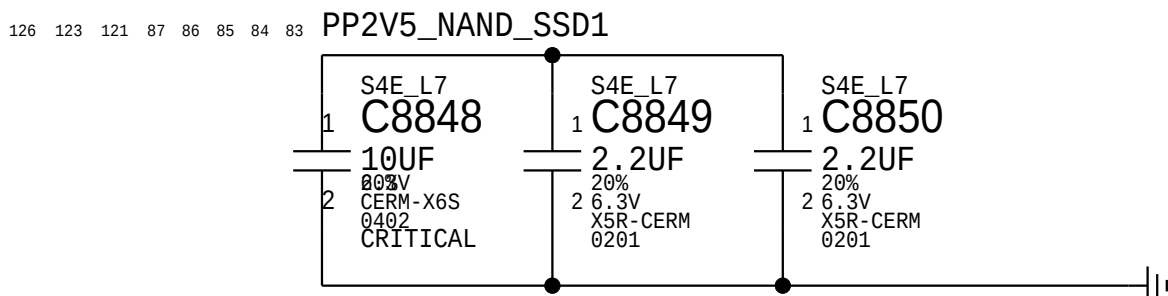
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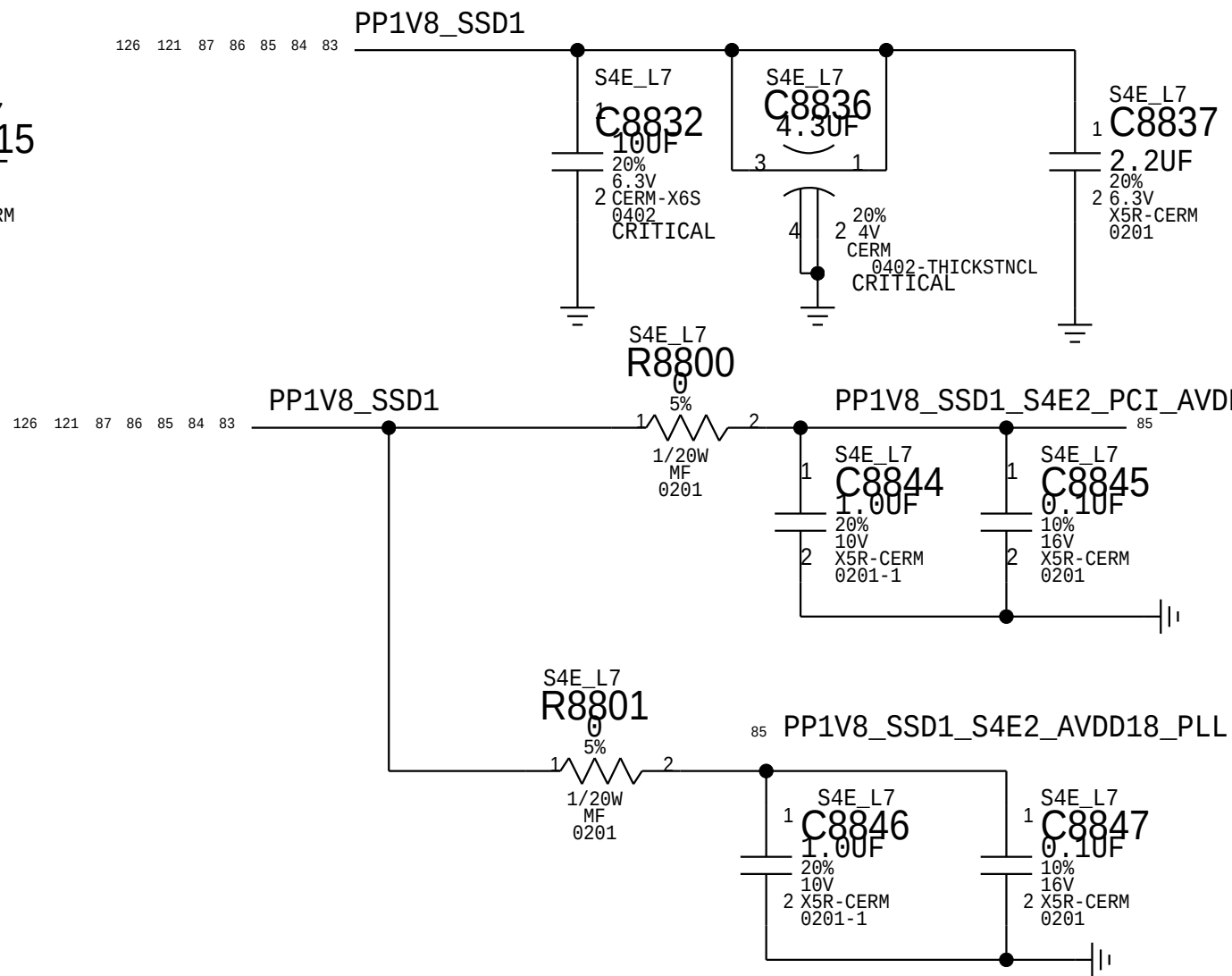
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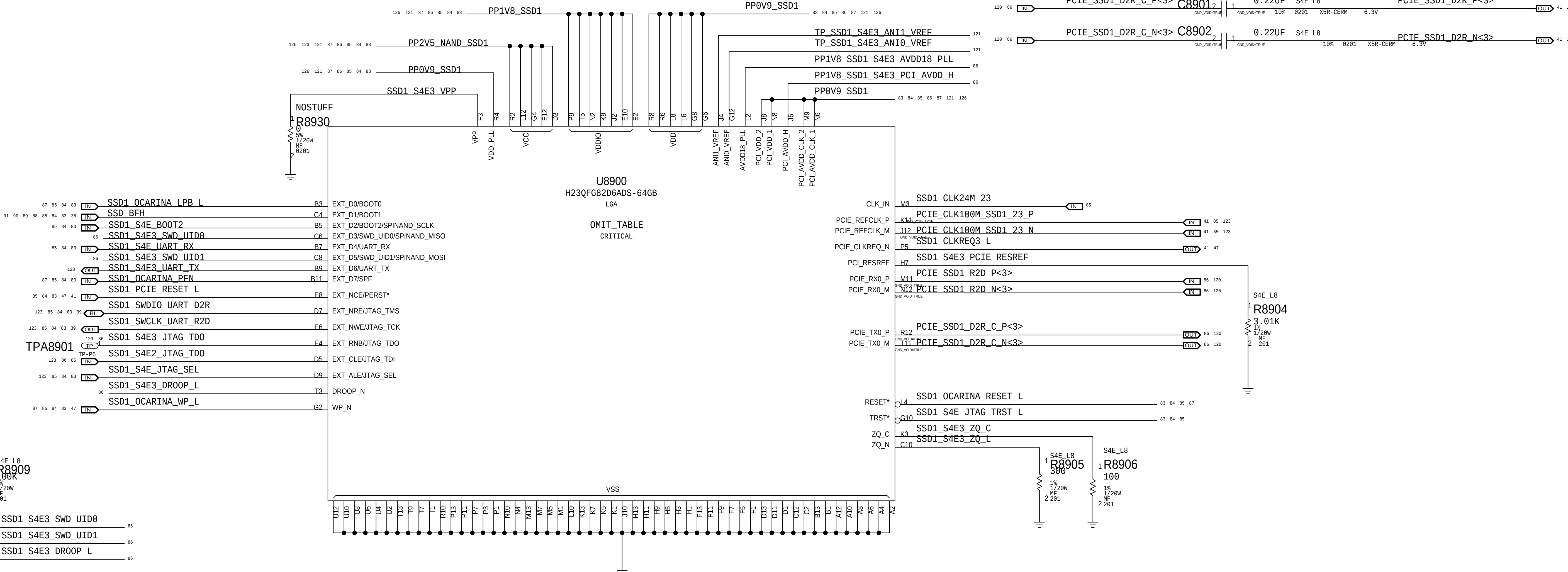
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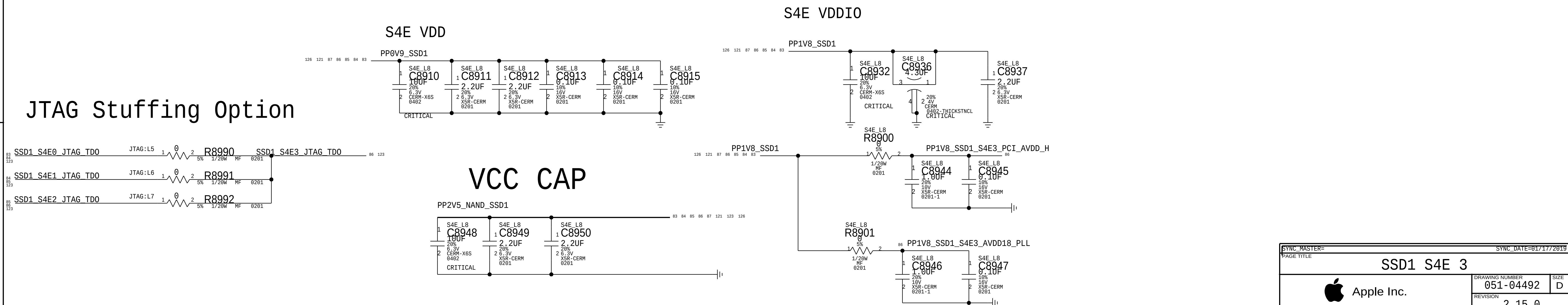
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		SHEET	85 OF 135

S4E3

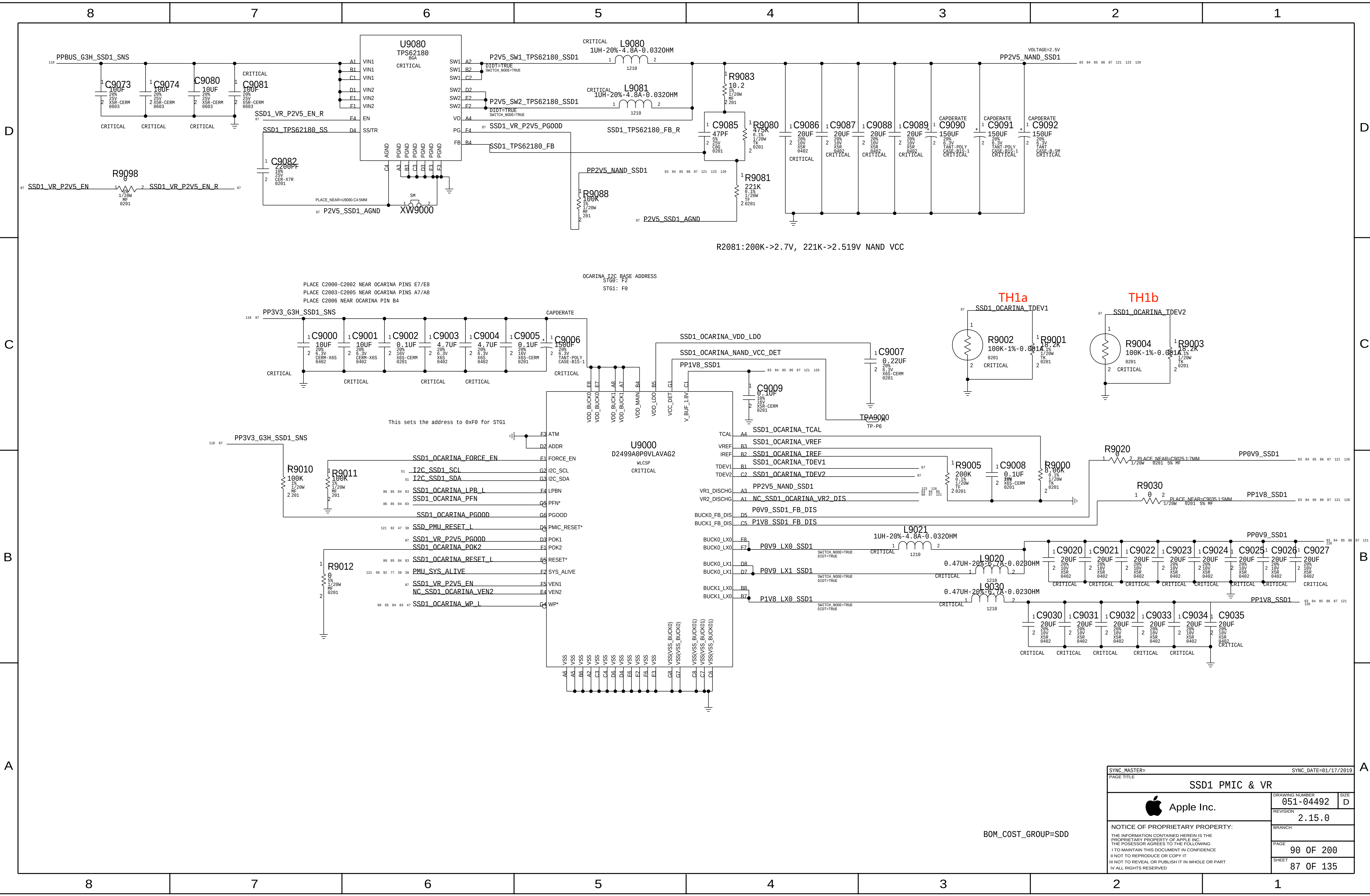


JTAG Stuffing Option



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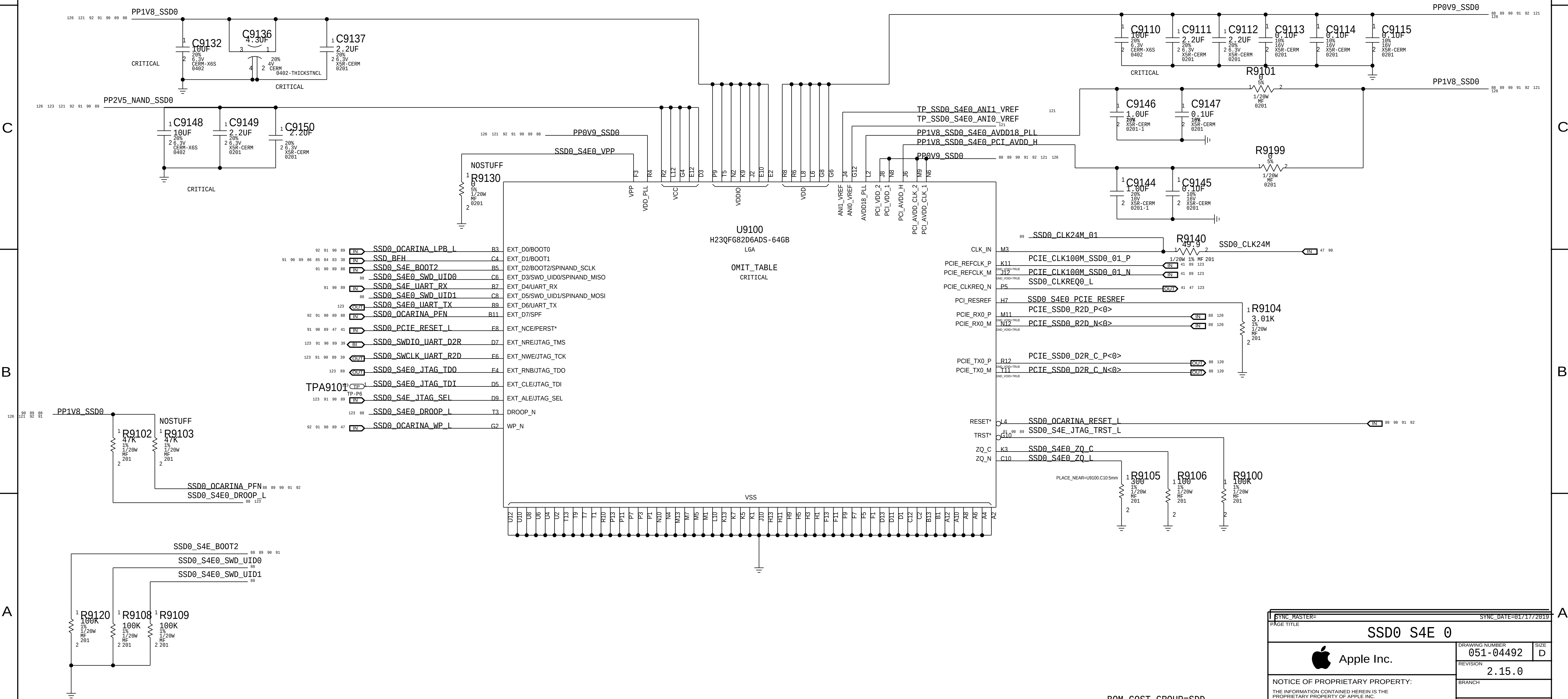


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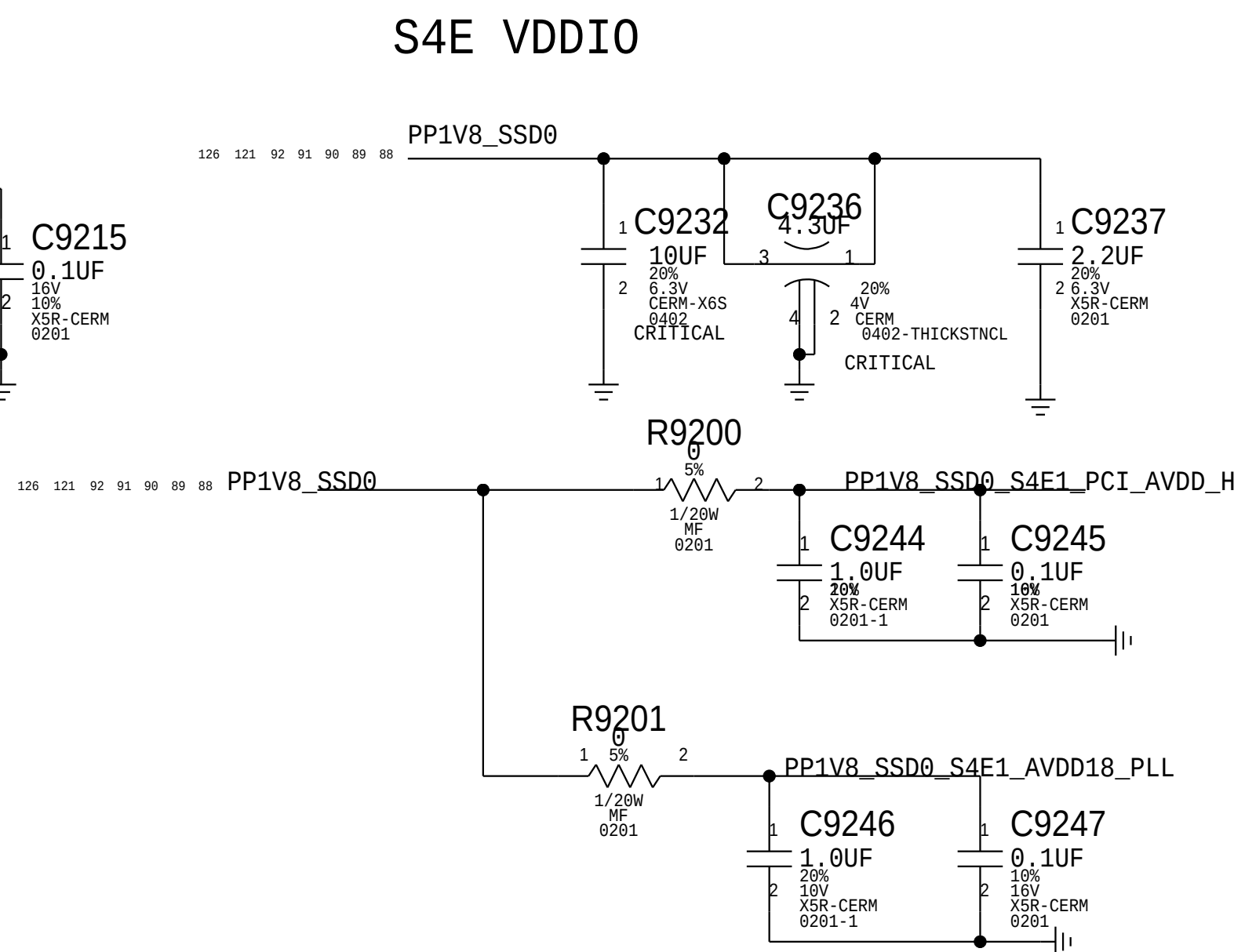
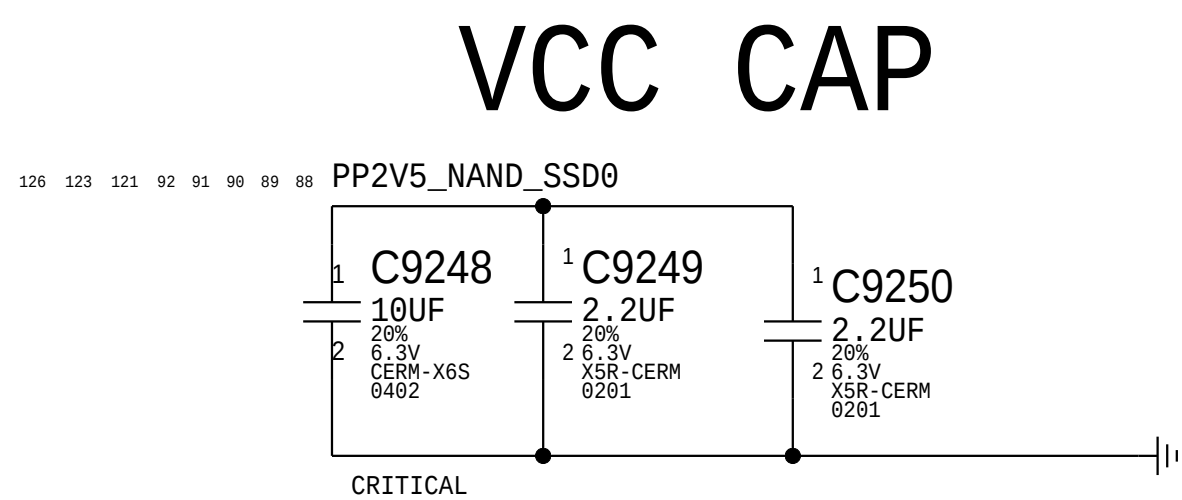
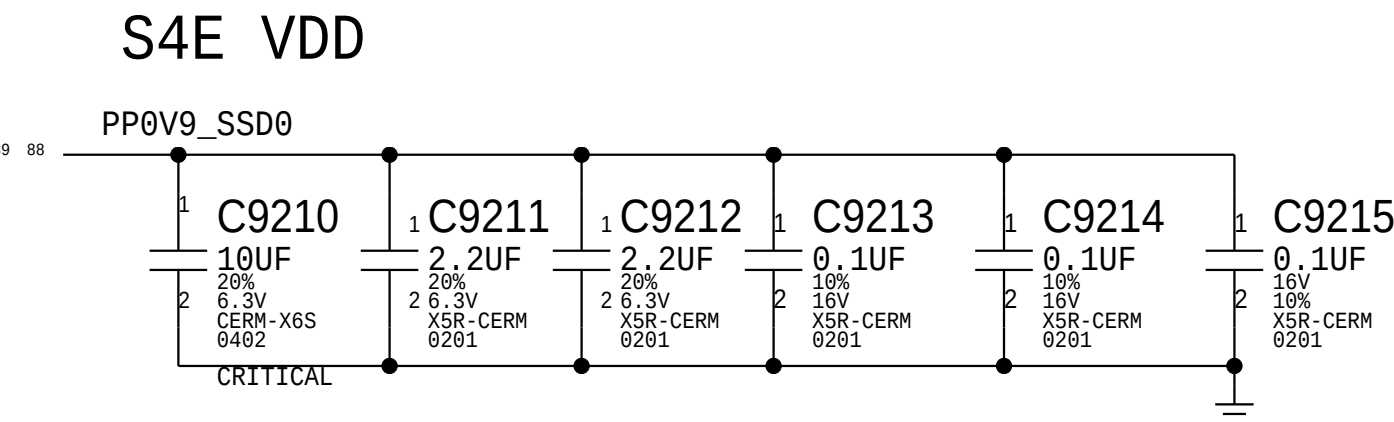
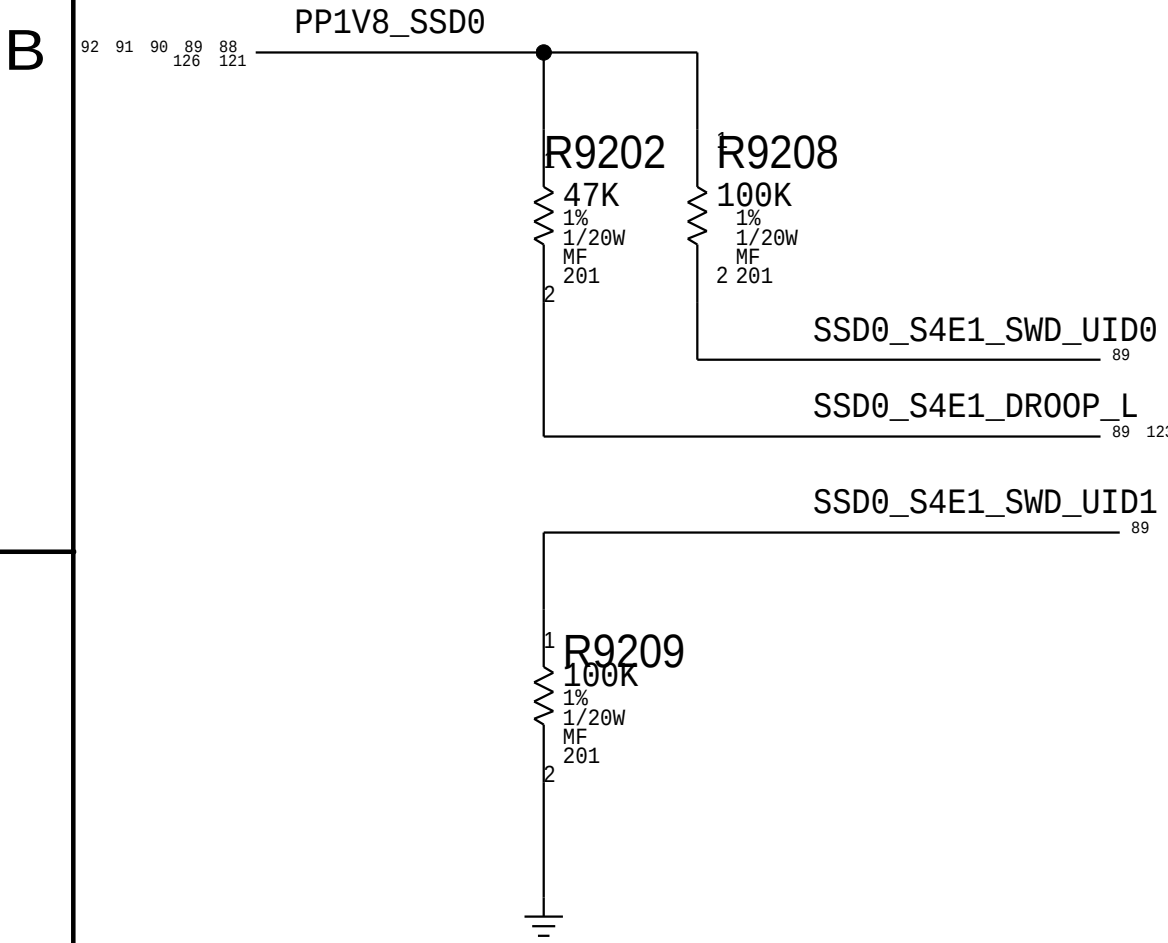
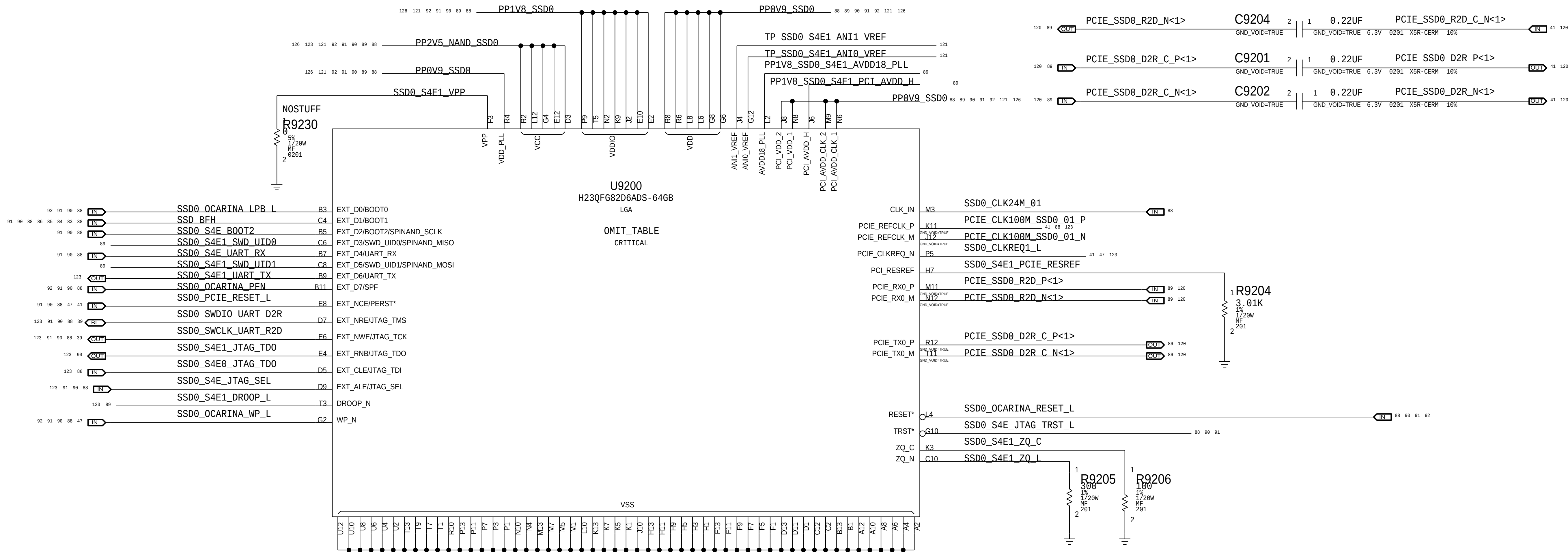
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		SHEET	88 OF 135

S4E1



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S4E2

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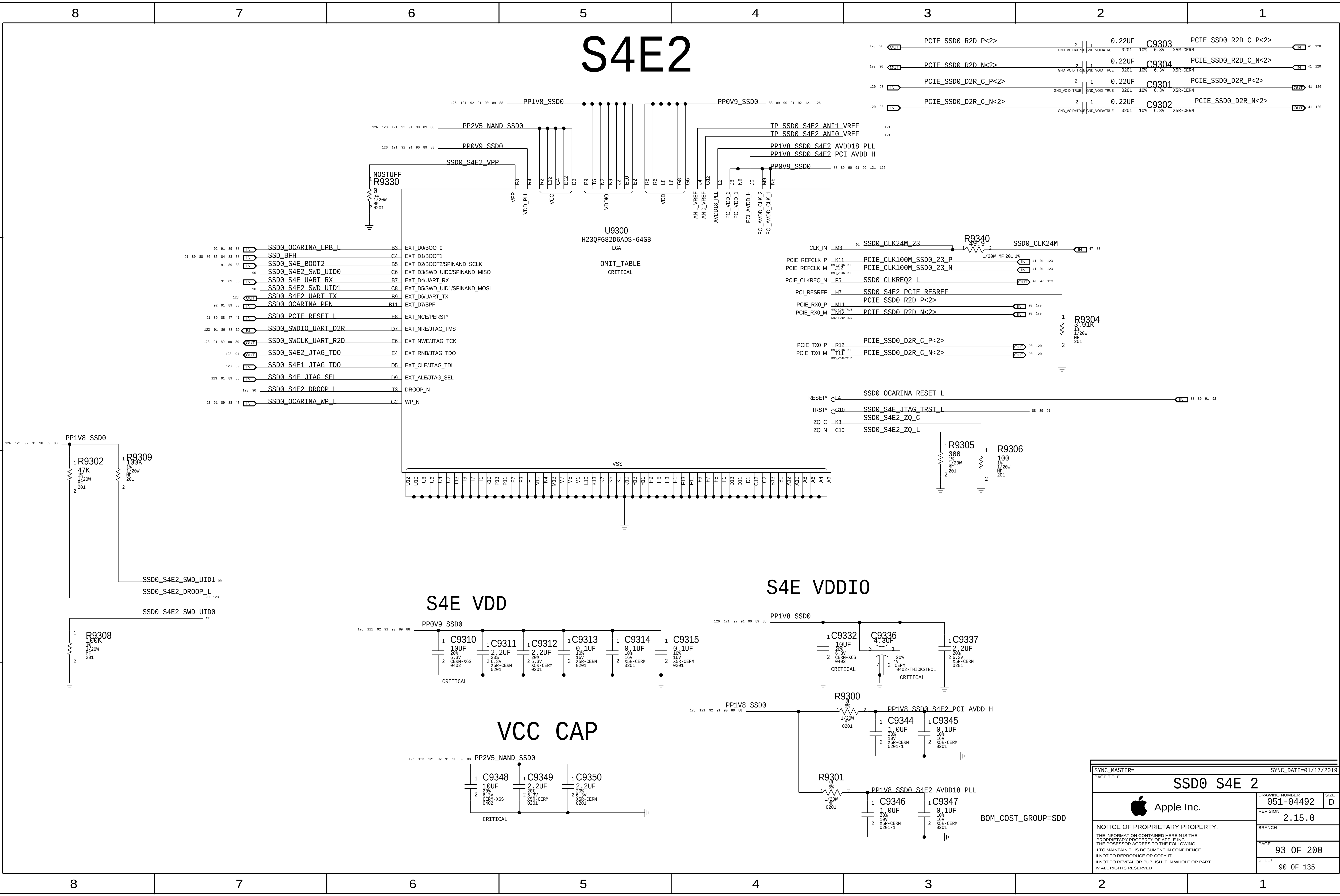
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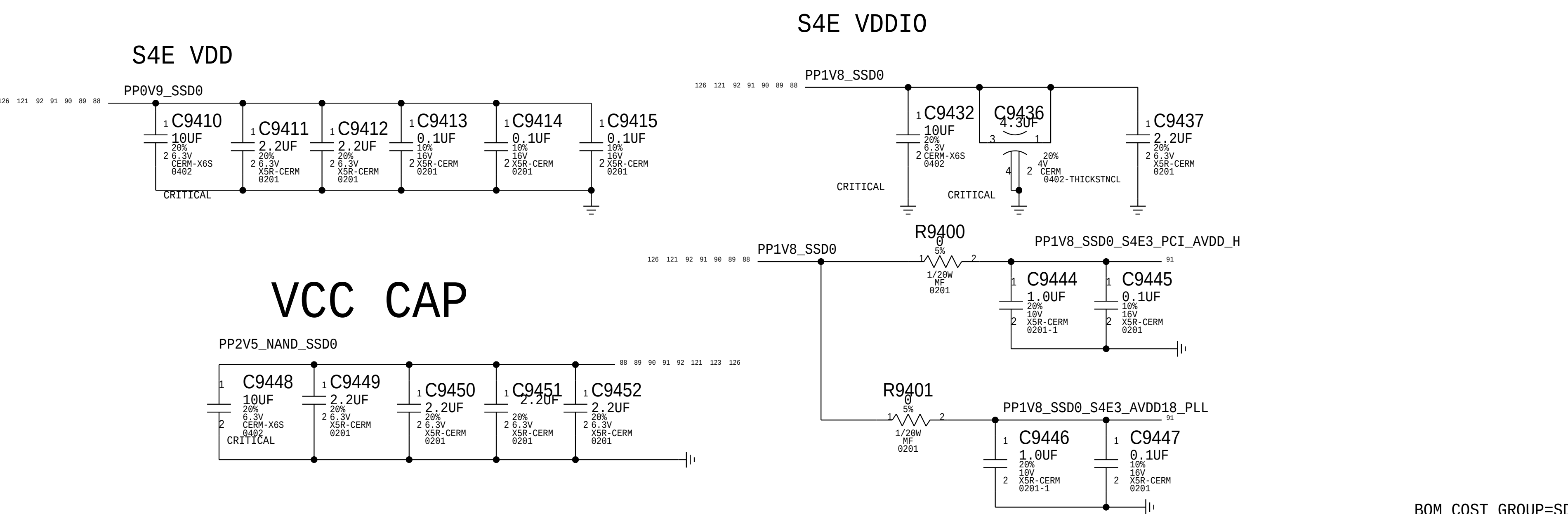
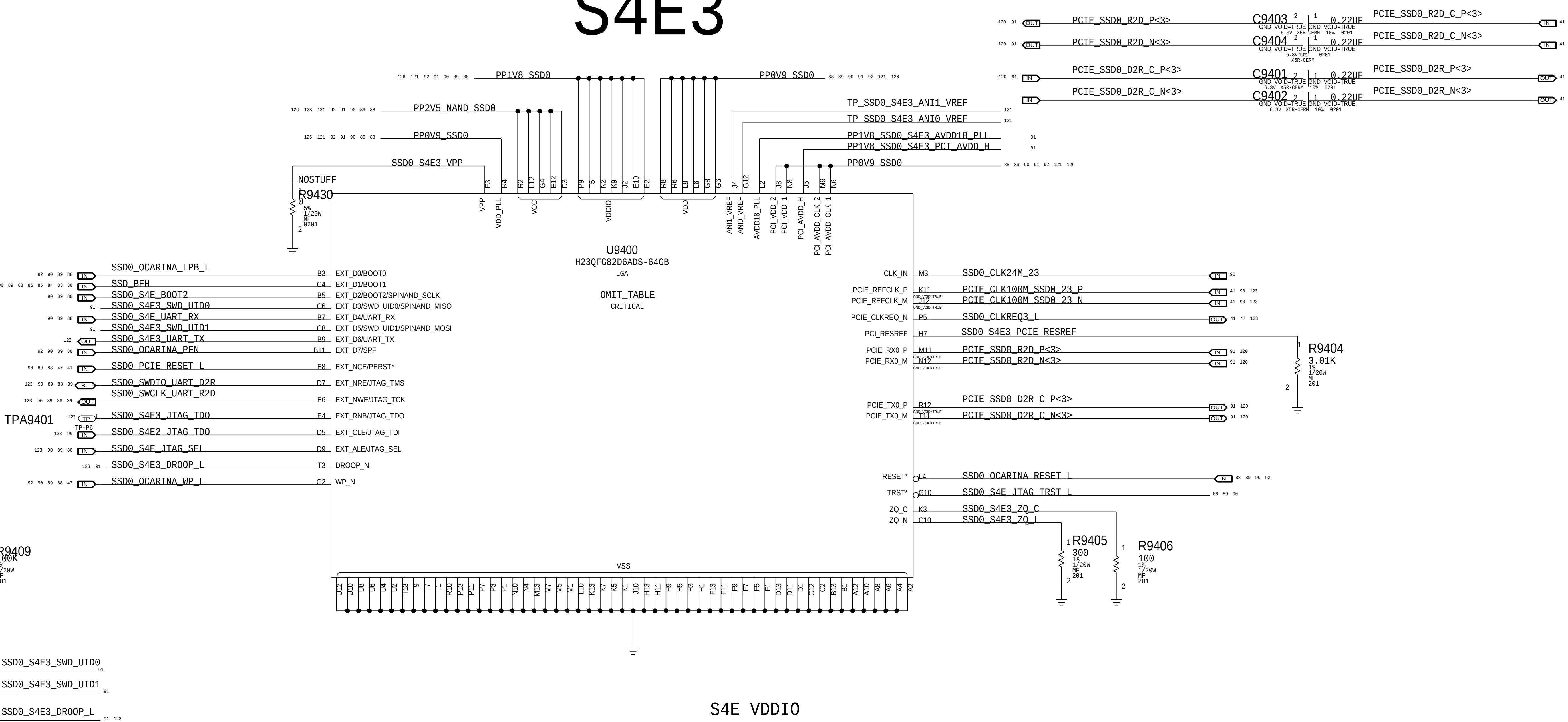
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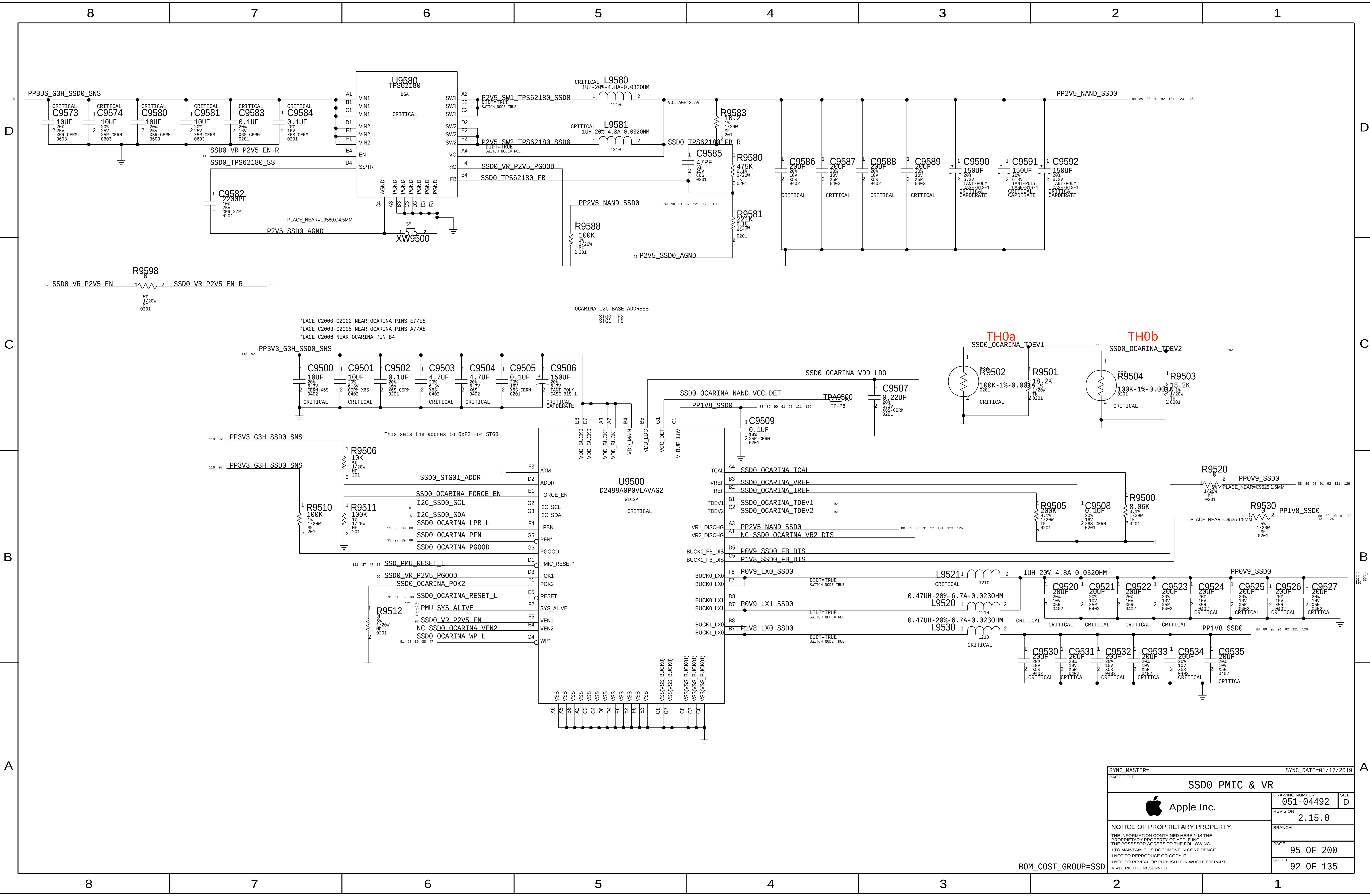
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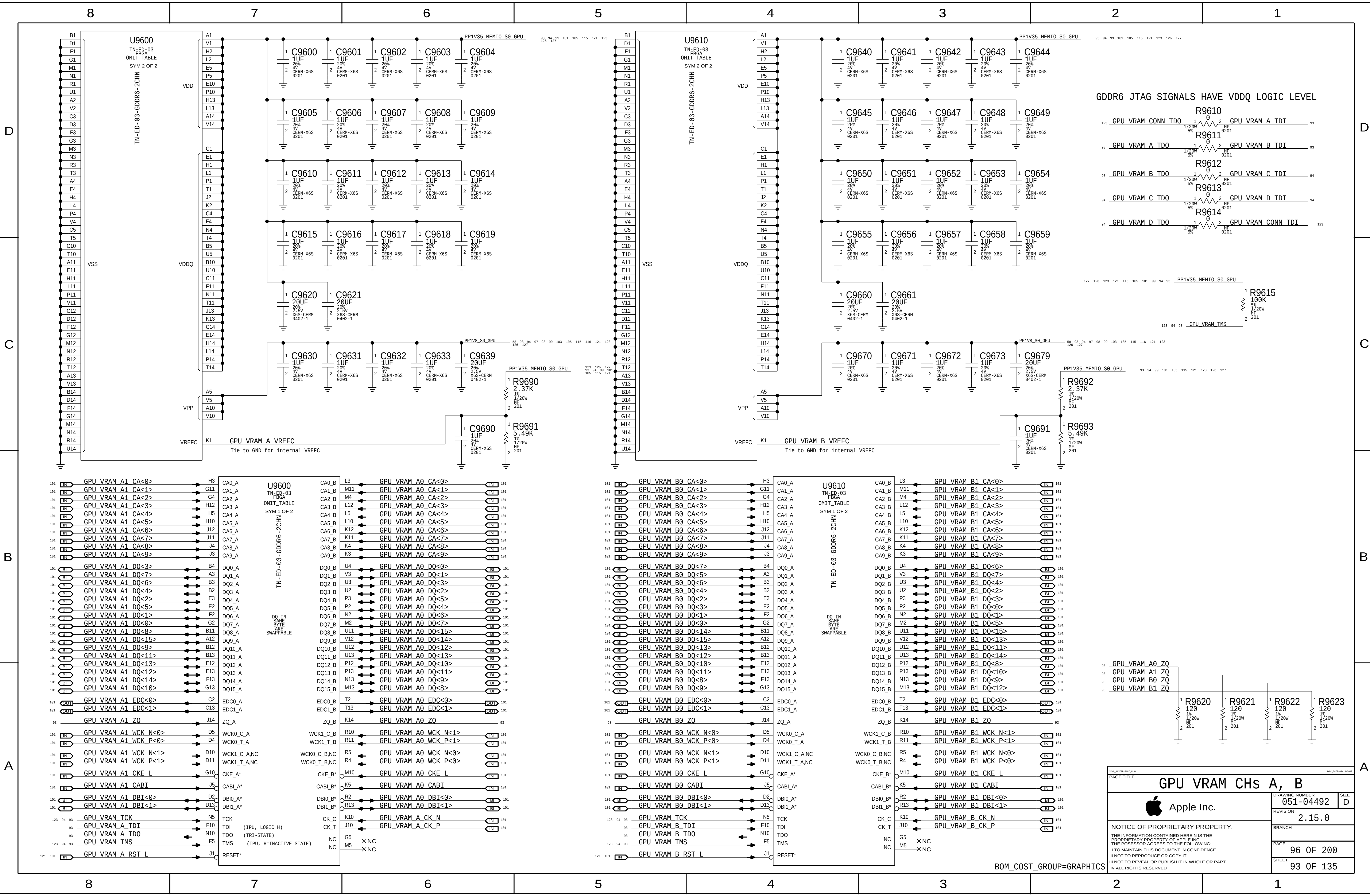
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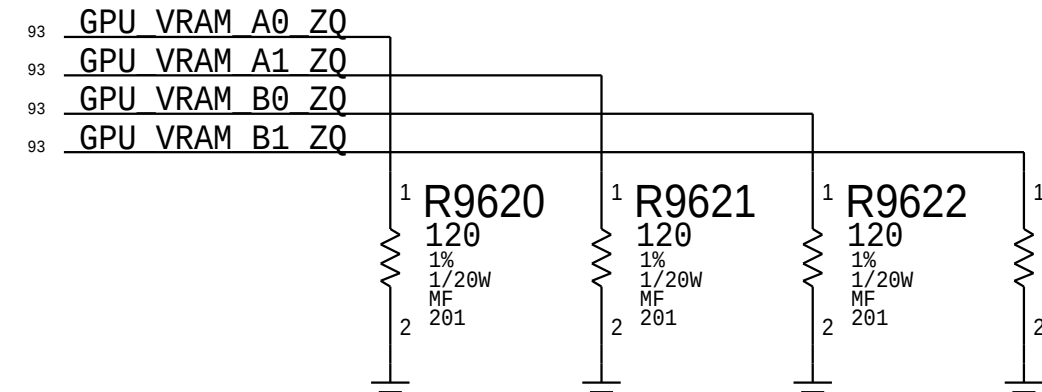
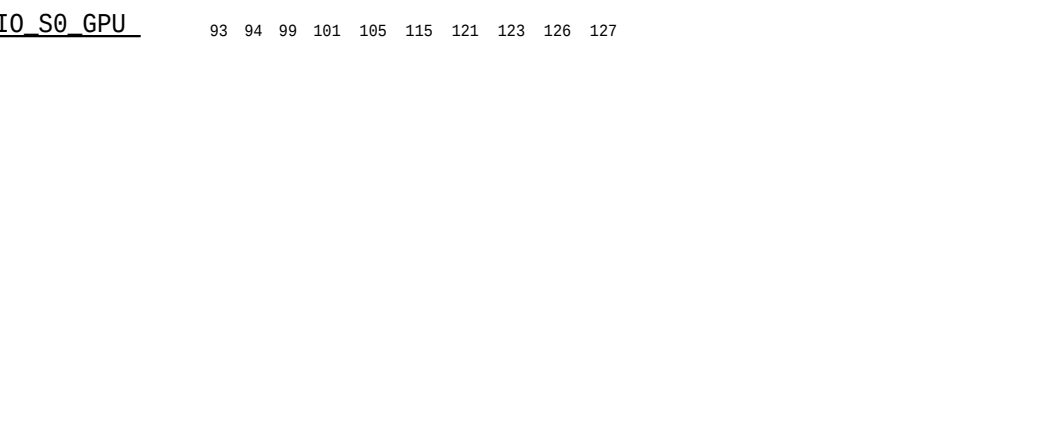
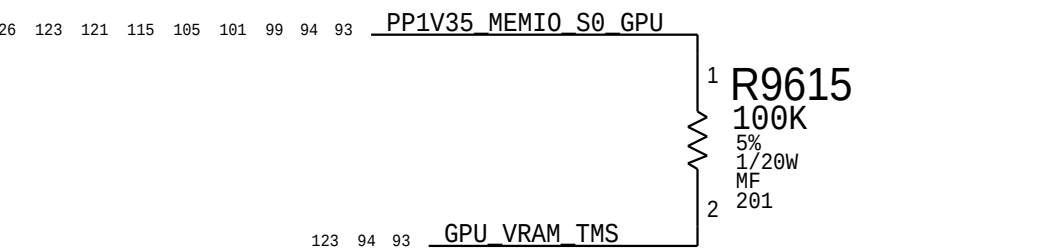
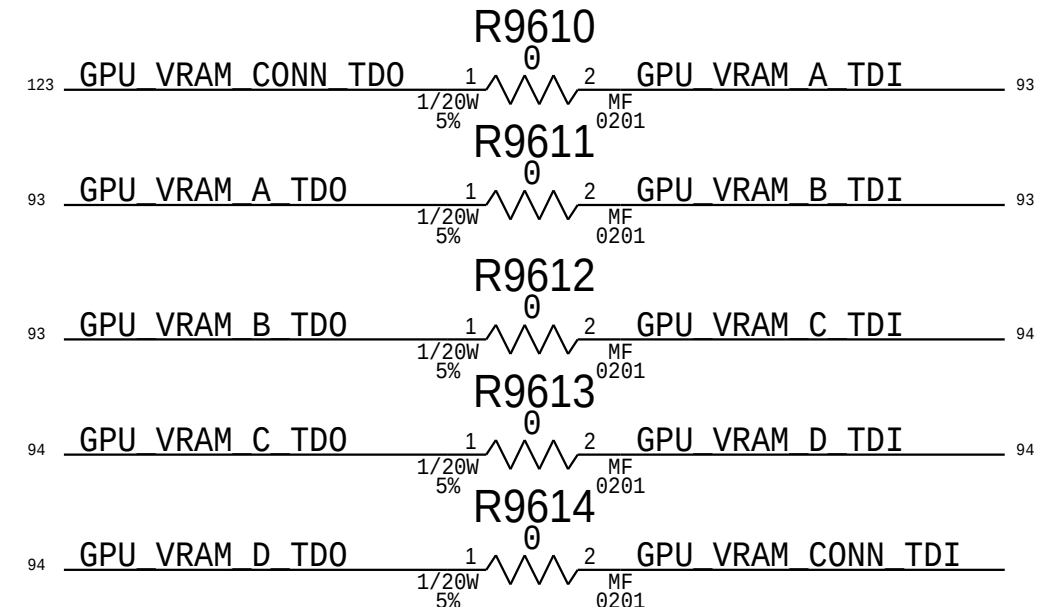
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		94 OF 200	
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		91 OF 135	



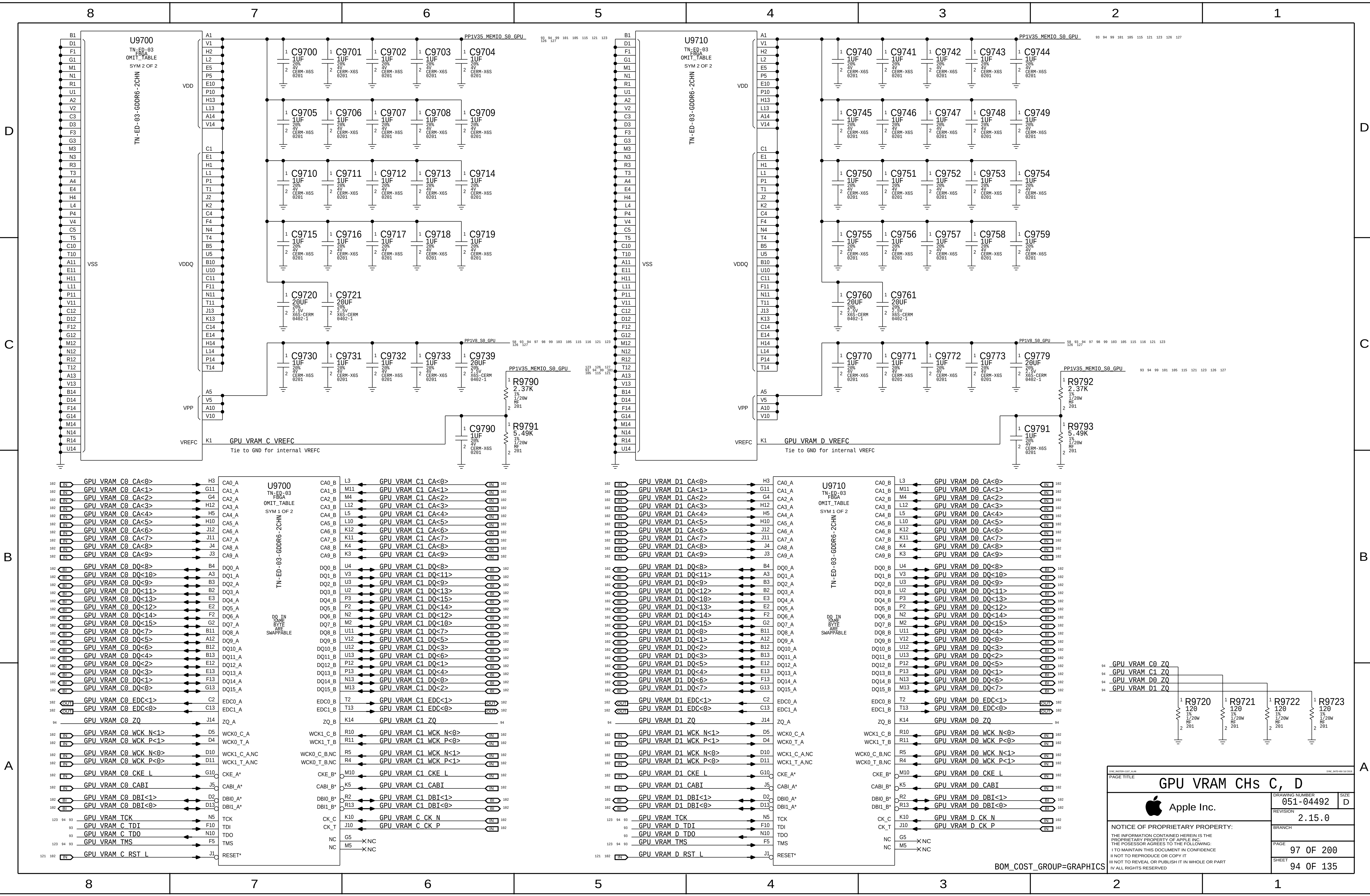
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GDDR6 JTAG SIGNALS HAVE VDDQ LOGIC LEVEL

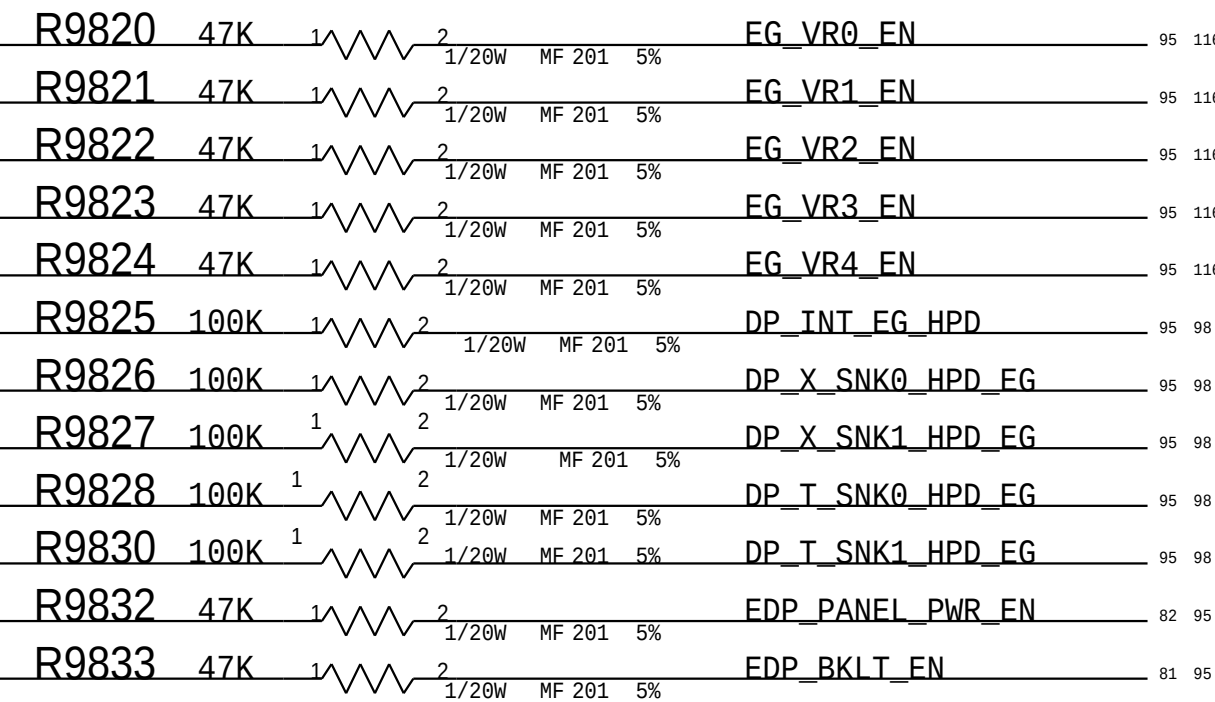
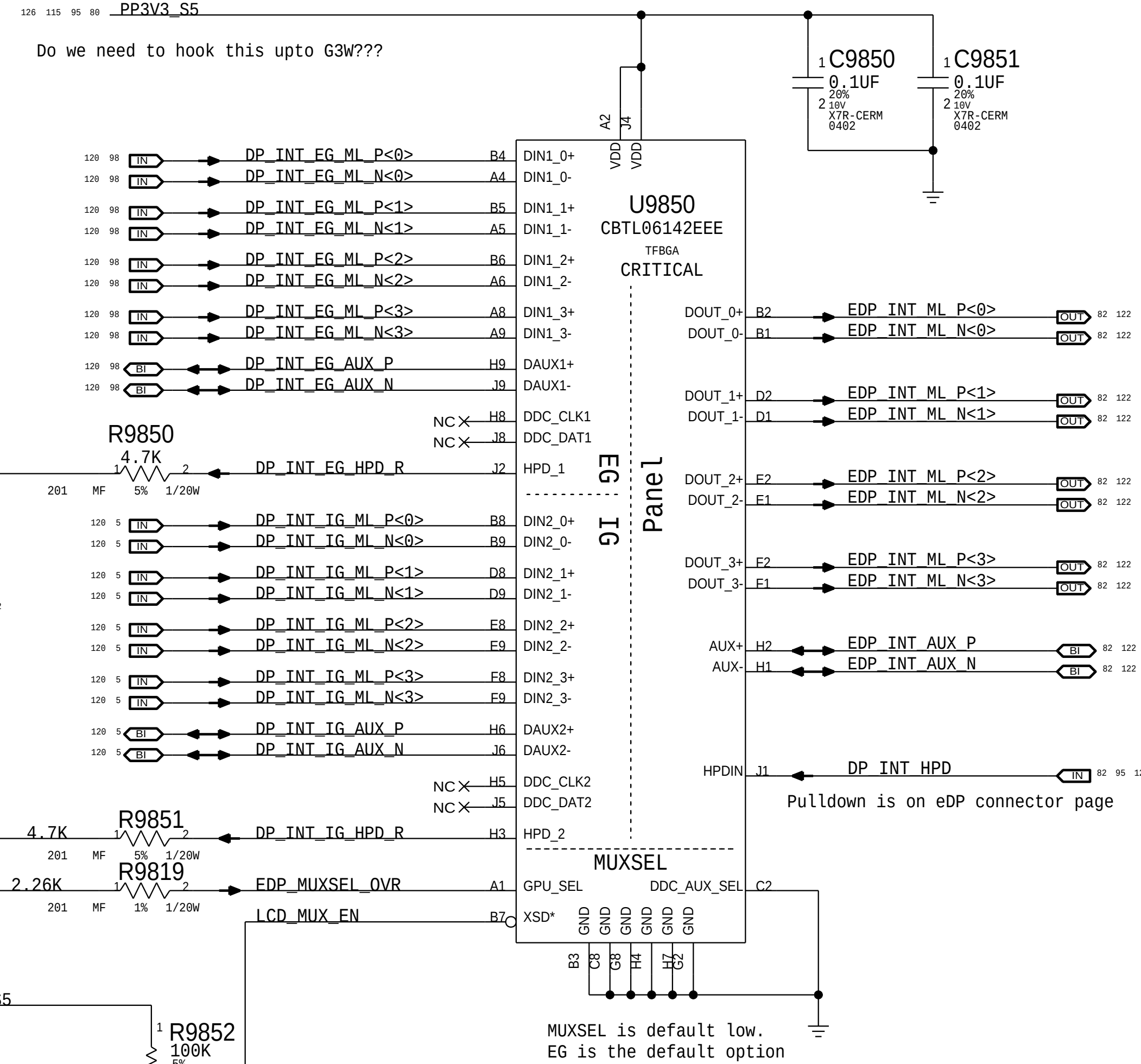
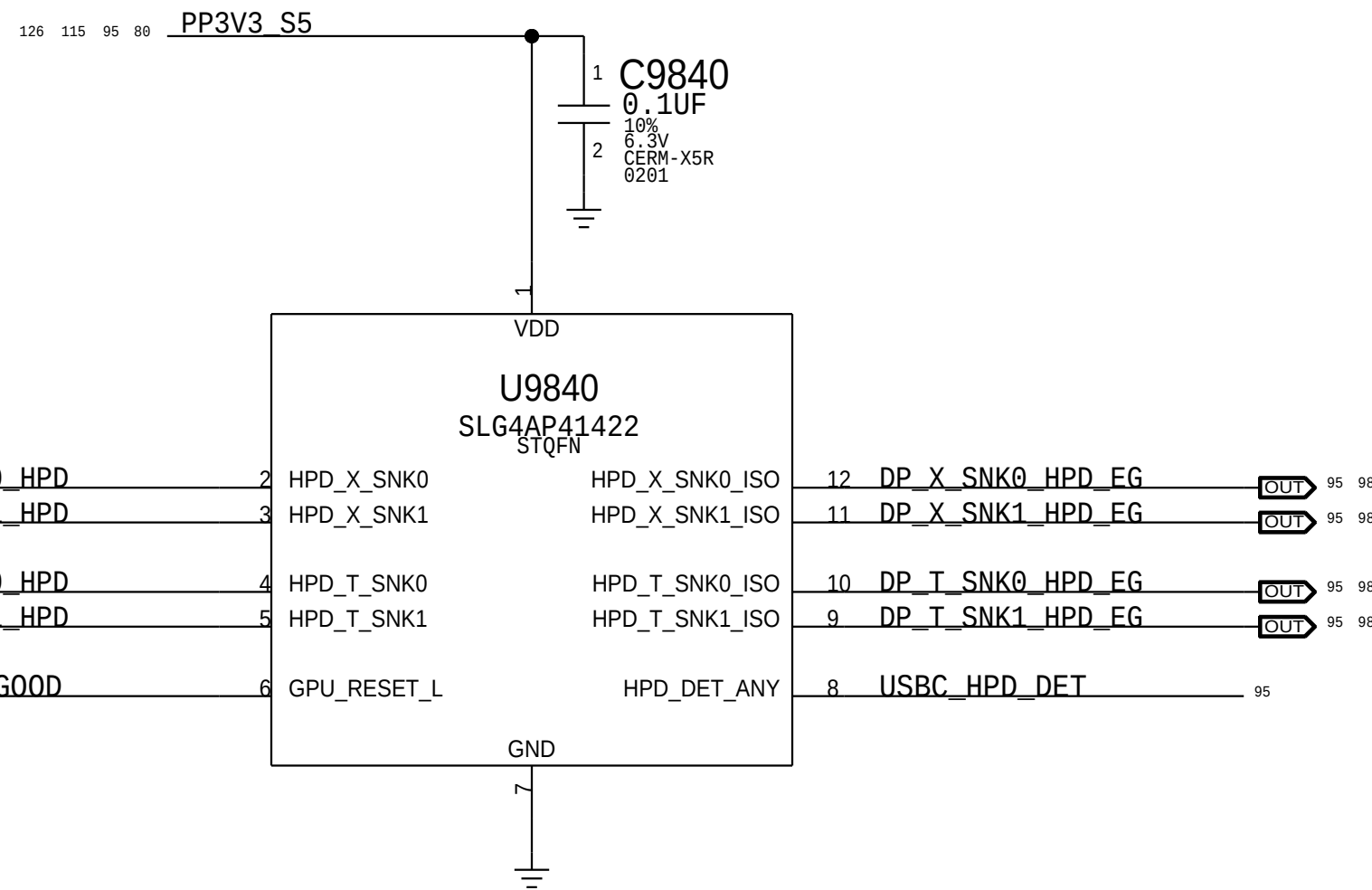
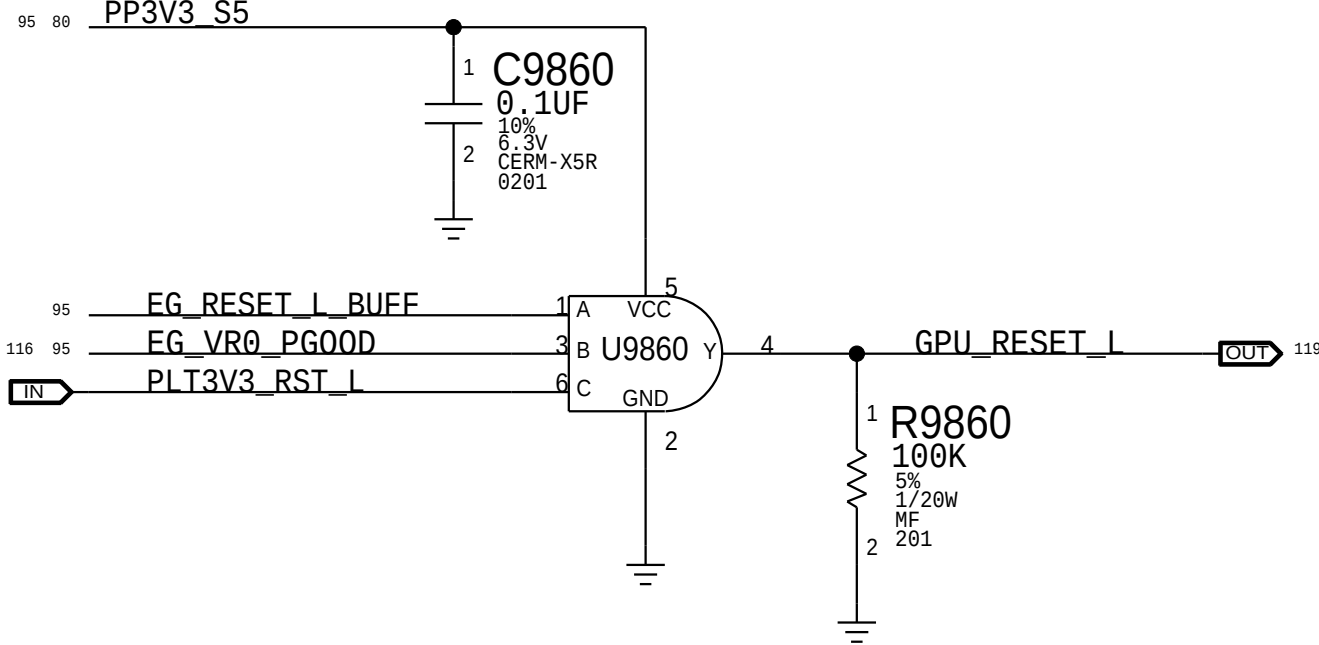
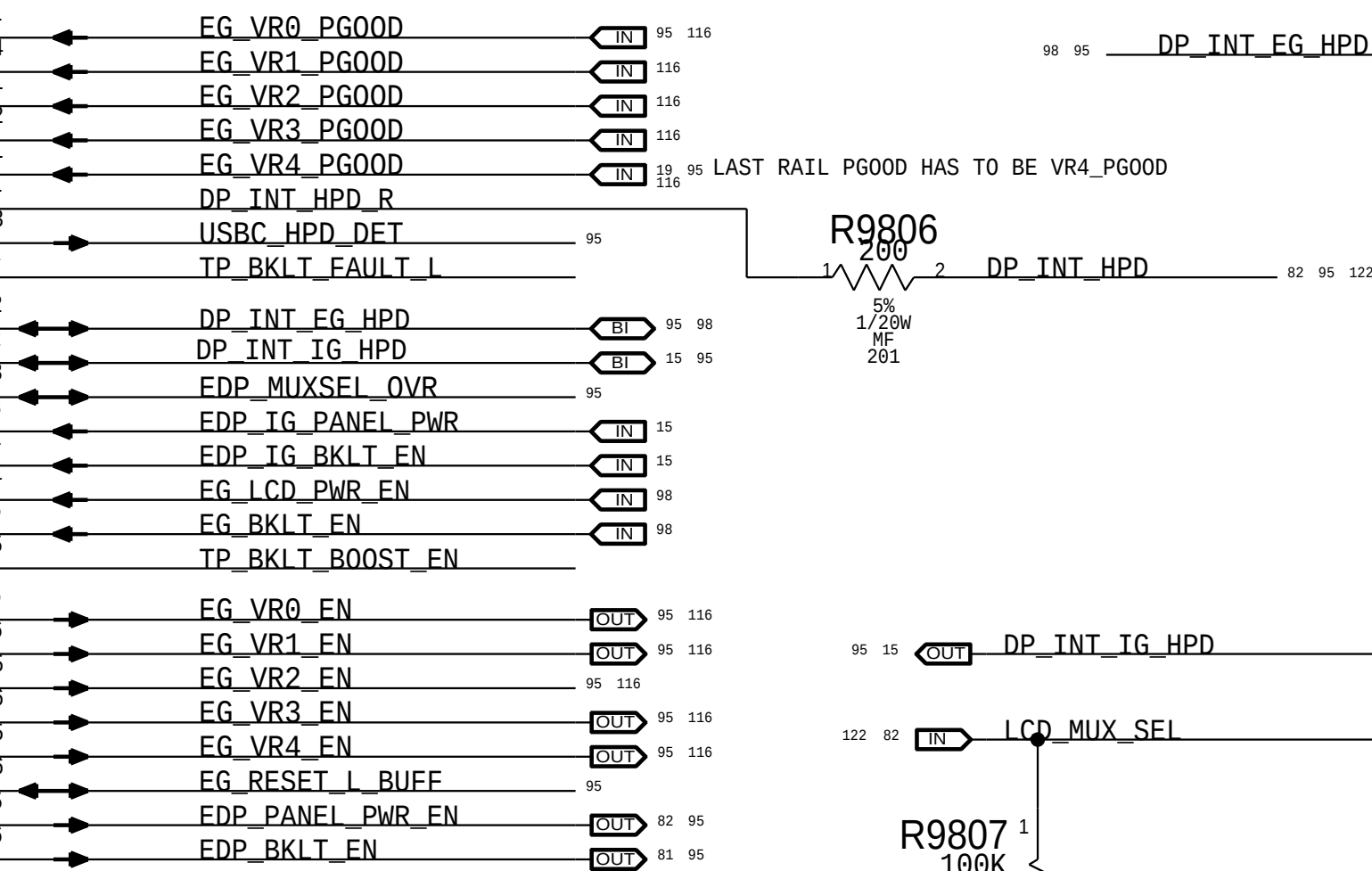
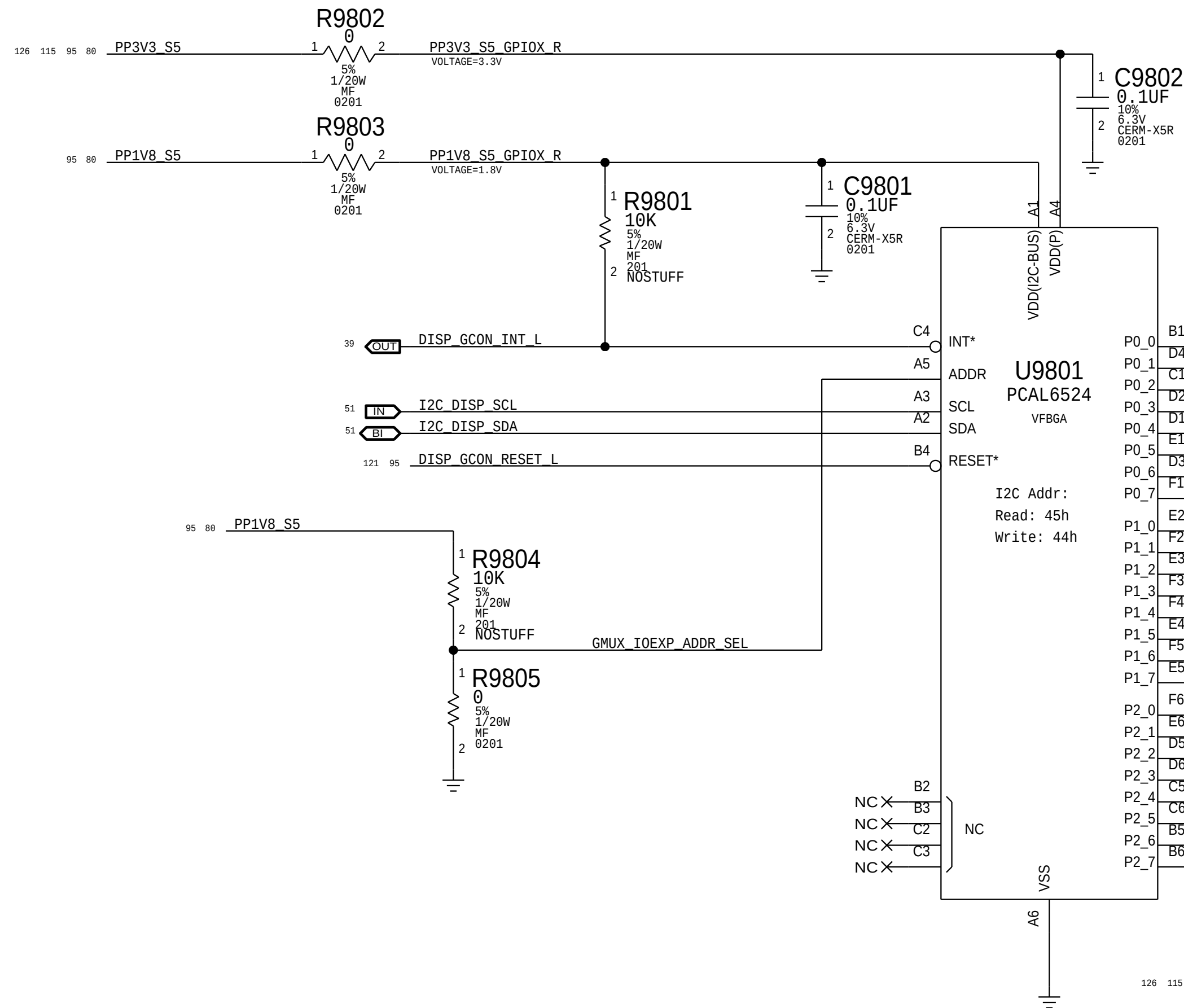


GPU VRAM CHS A, B		
Apple Inc.		
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DRAWING NUMBER 051-04492	REVISION 2.15.0	SIZE D
PAGE 96 OF 200		SHEET 93 OF 135



GMUX GPIO Expander

DP 2:1 Analog MUX

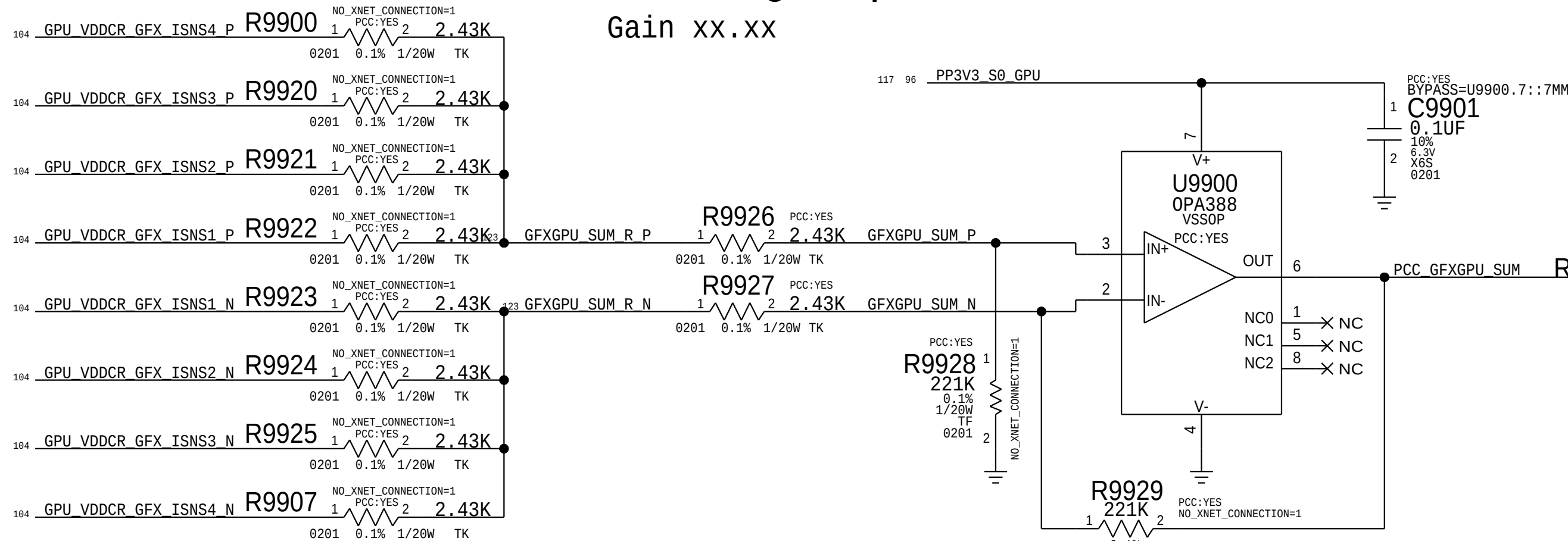


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	BRANCH	
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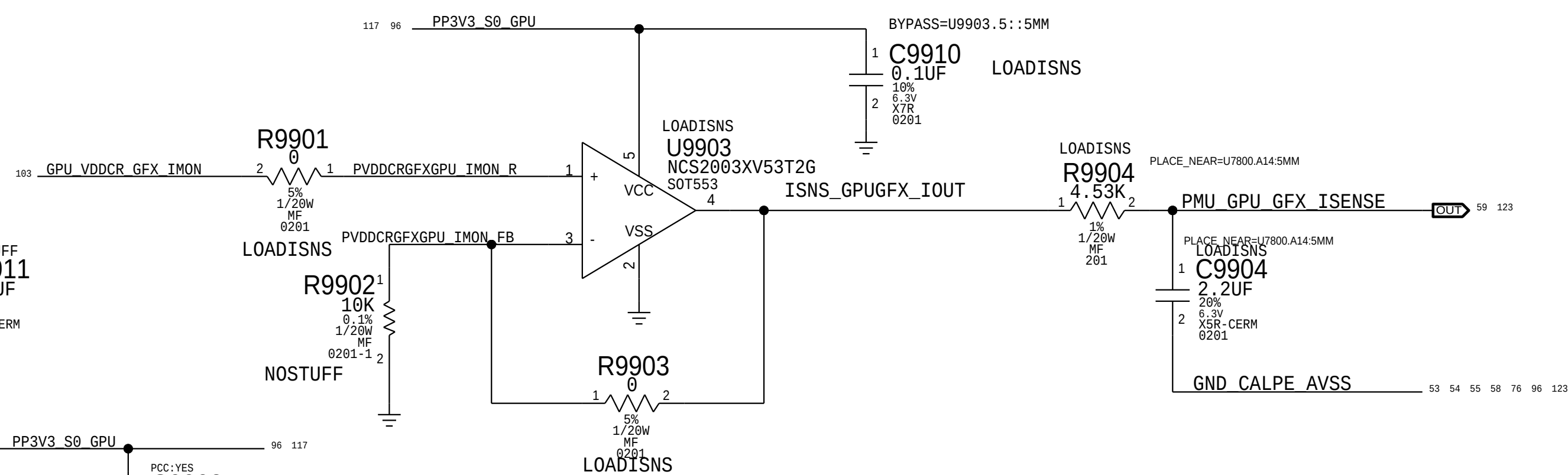
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Gain xx.xx



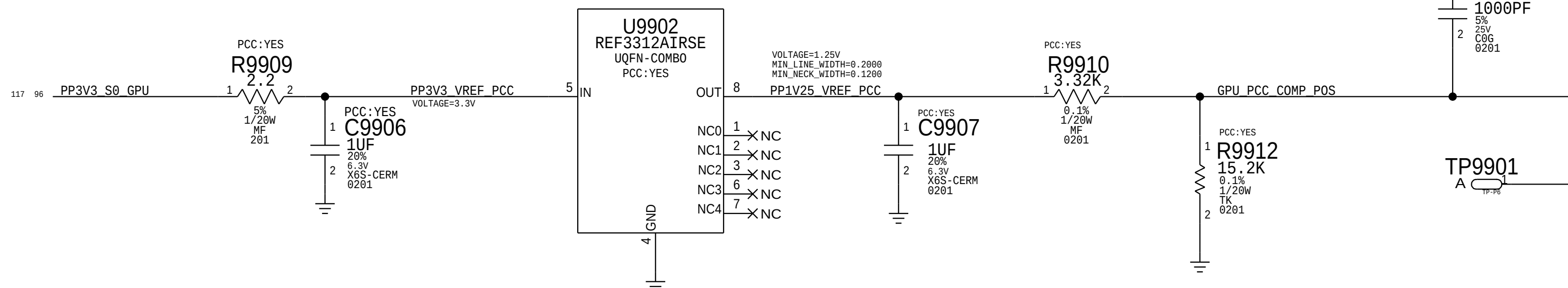
GPU GFX Current Sense (IG0C)

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OPAMP GAIN: 1X IMON ICCMAX: 1.209V ADC INPUT: 1.209V
CALPE: AMUX-A2

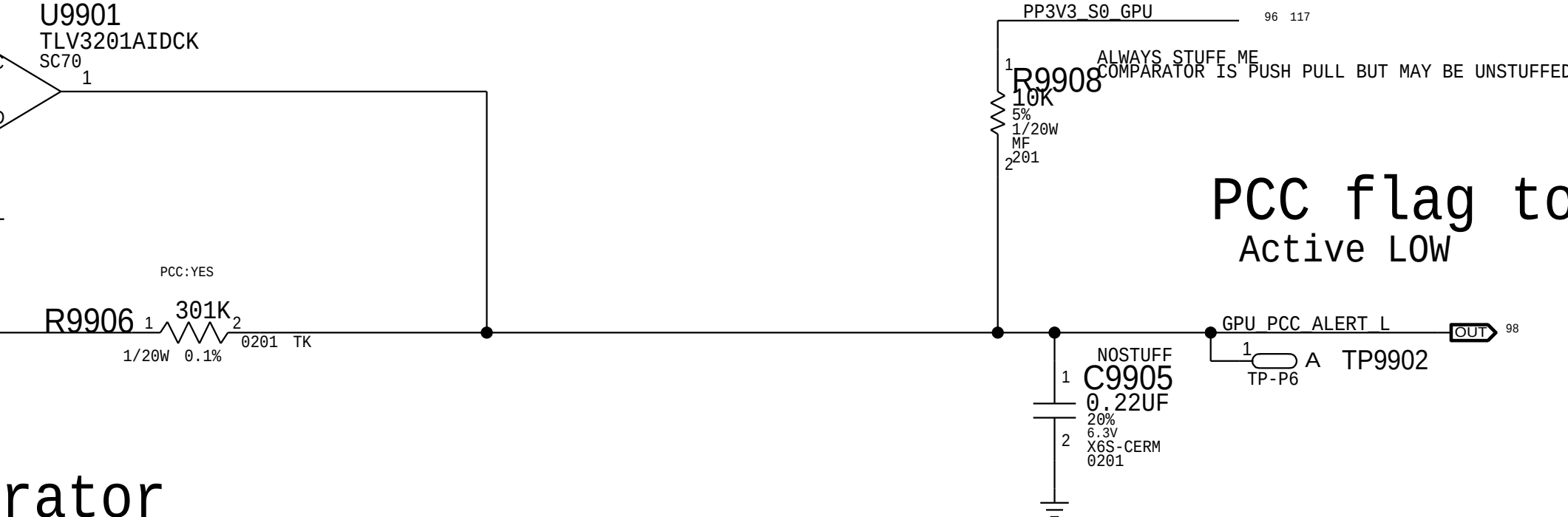


Trip Point Voltage Gen

Footprint supports 353S91042 alternate



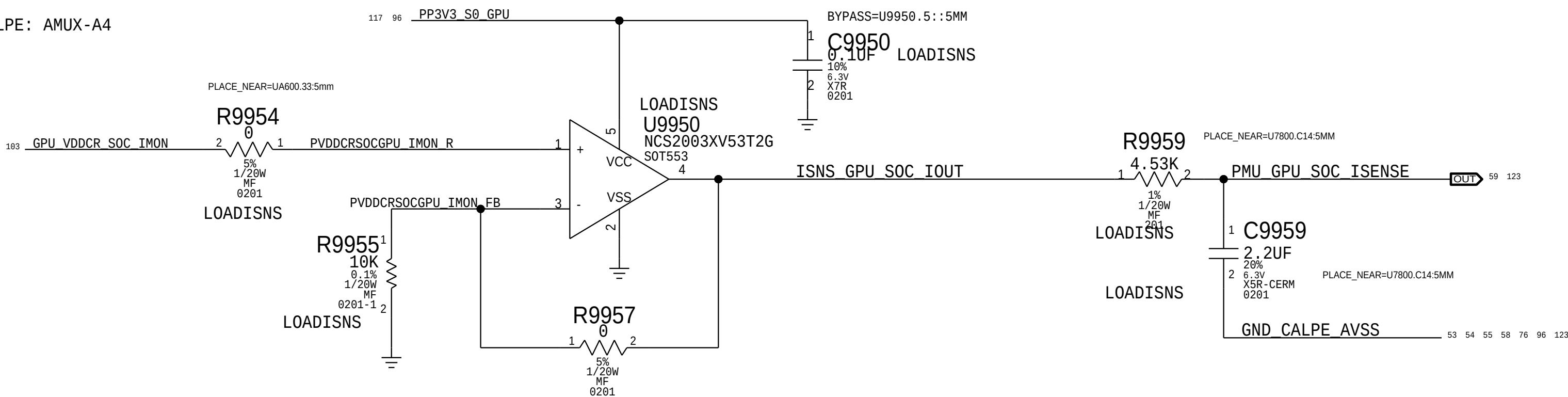
Comparator



PCC flag to GPU
Active LOW

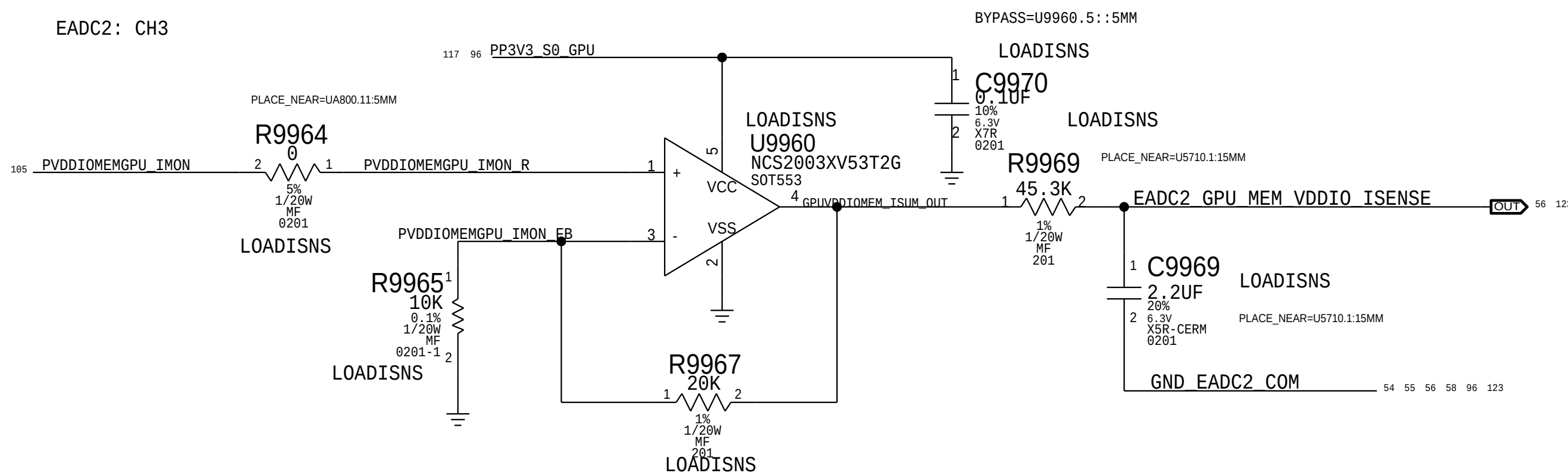
GPU SOC Current Sense (IG1C)

EDP: 15A, 0.7-1.075V
OPAMP GAIN = 1X IMON ICCMAX = 1.185V ADC INPUT = 1.185V
CALPE: AMUX-A4



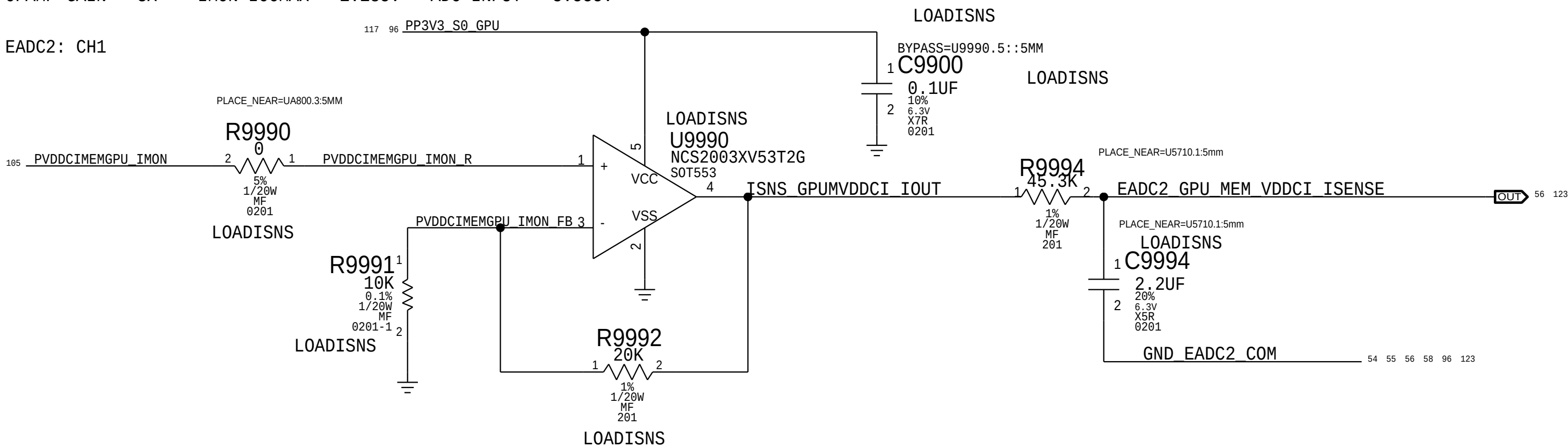
GPU MEM VDDIO Current Sense (IG6C)

EDP: 26.5A, 1.35V
OPAMP GAIN: 3X IMON ICCMAX: 1.208V ADC INPUT: 3.624V
EADC2: CH3



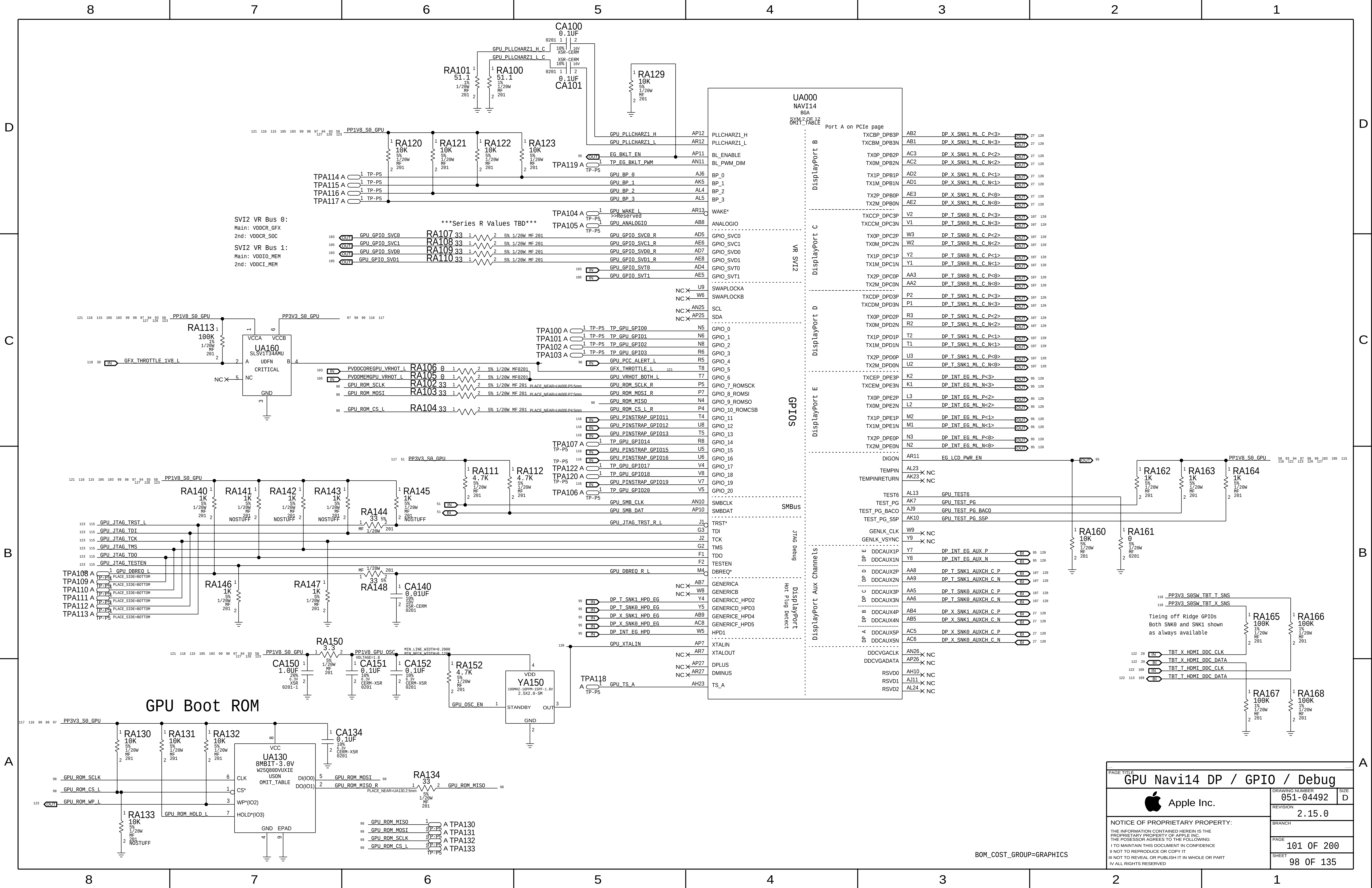
GPU MEM VDDCI Current Sense (IG2C)

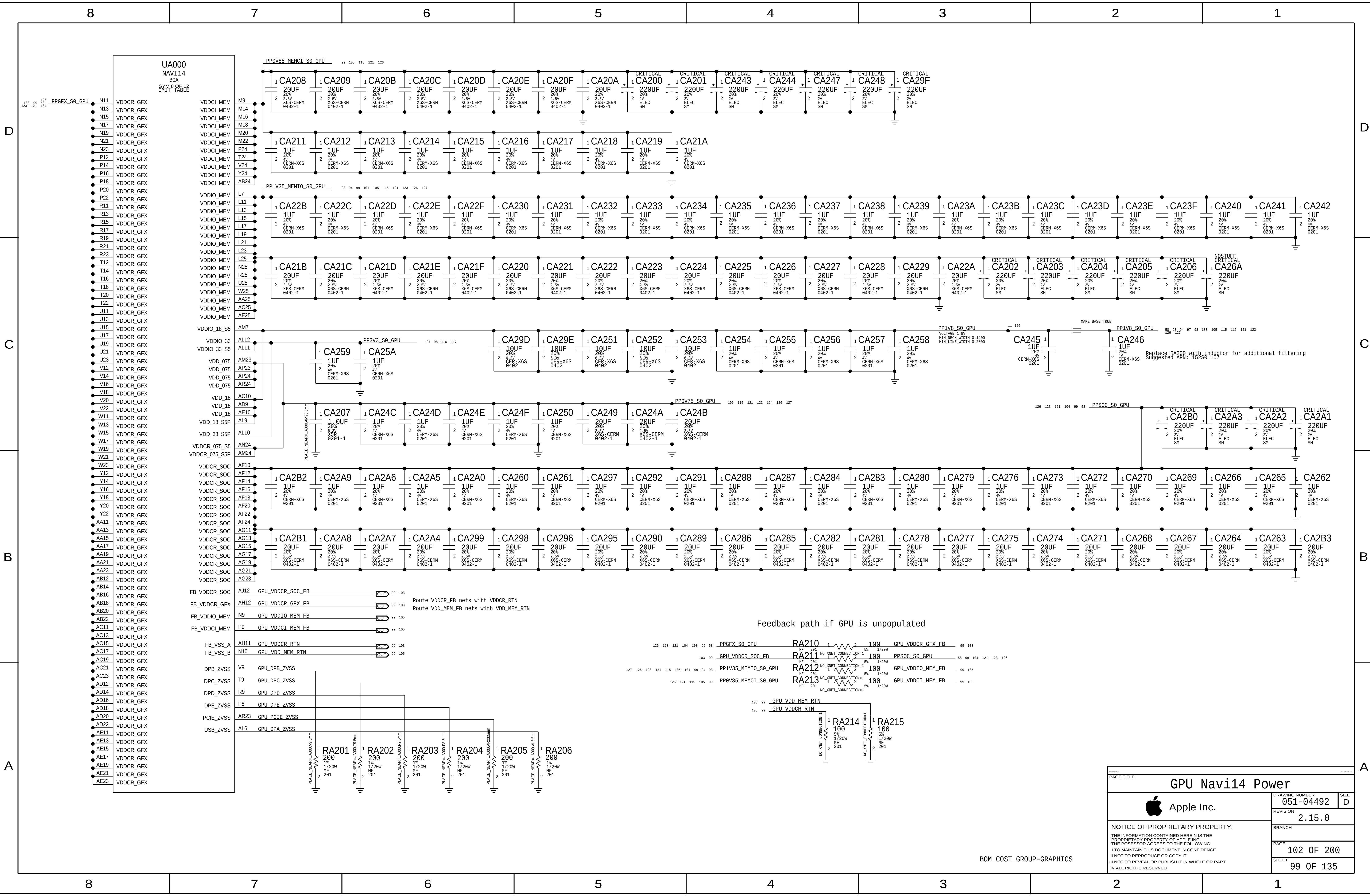
EDP: 15A, 0.85V
OPAMP GAIN = 3X IMON ICCMAX = 1.185V ADC INPUT = 3.555V
EADC2: CH1

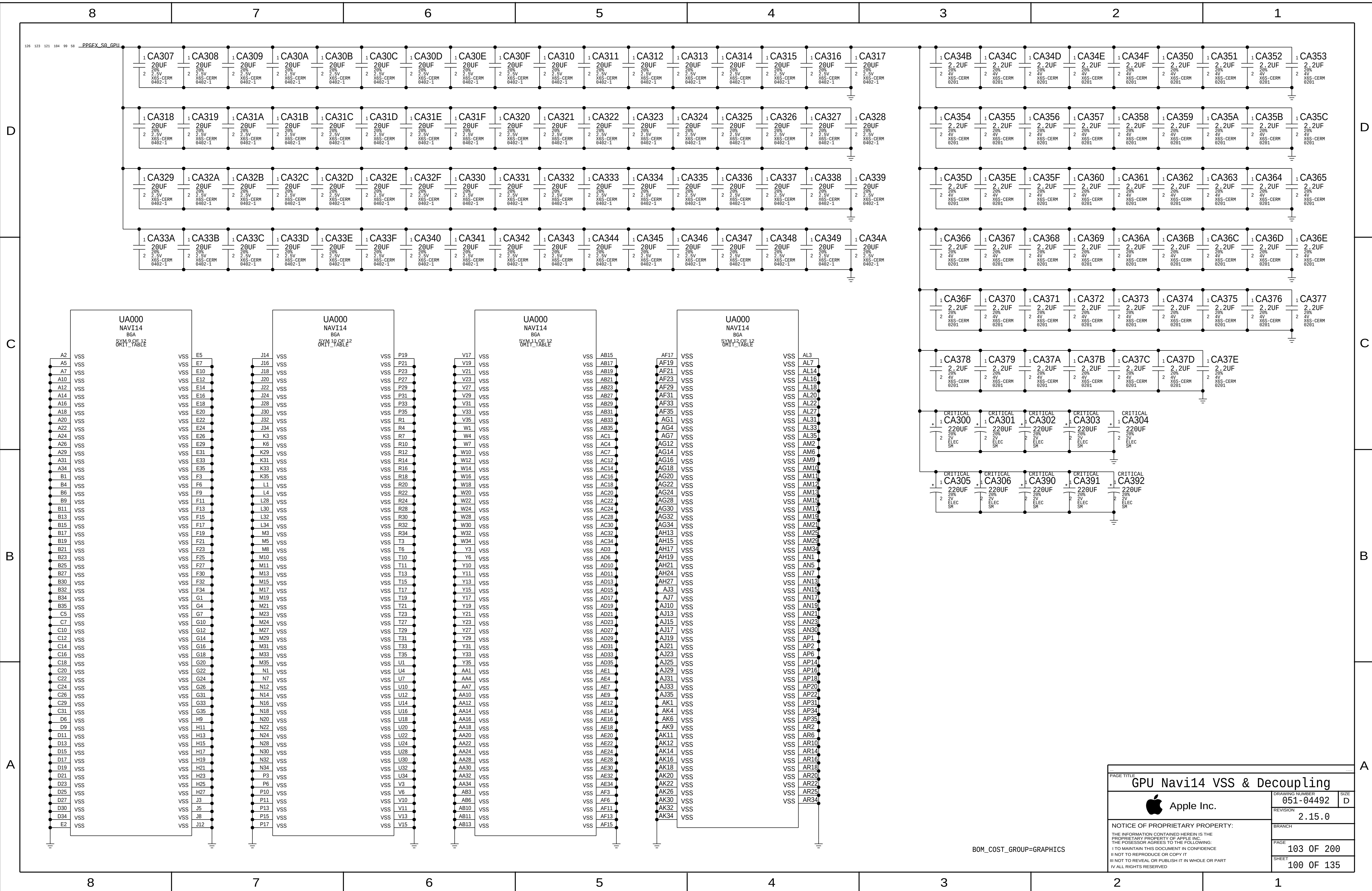


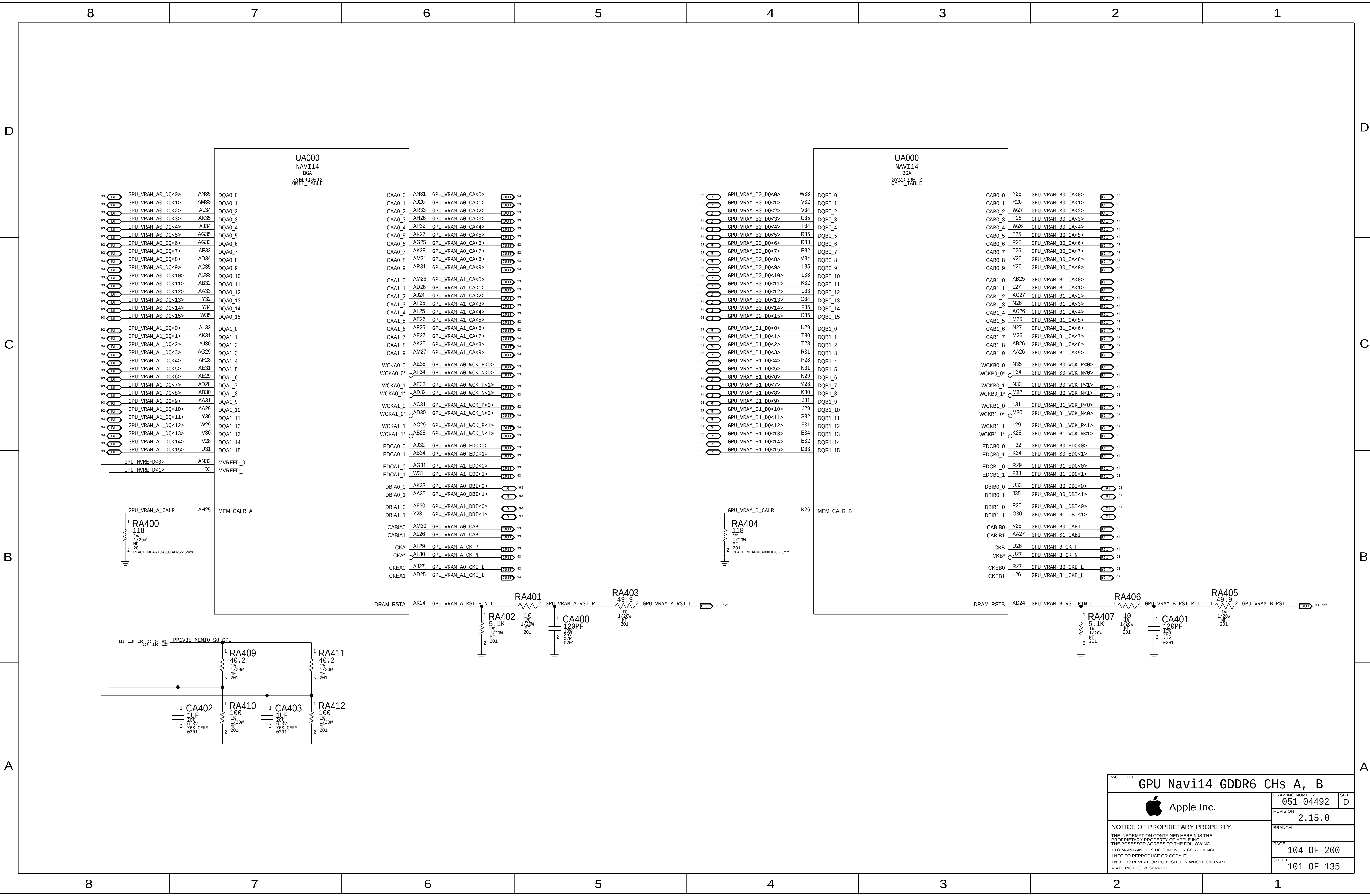
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	PAGE	99 OF 200
	SHEET	96 OF 135

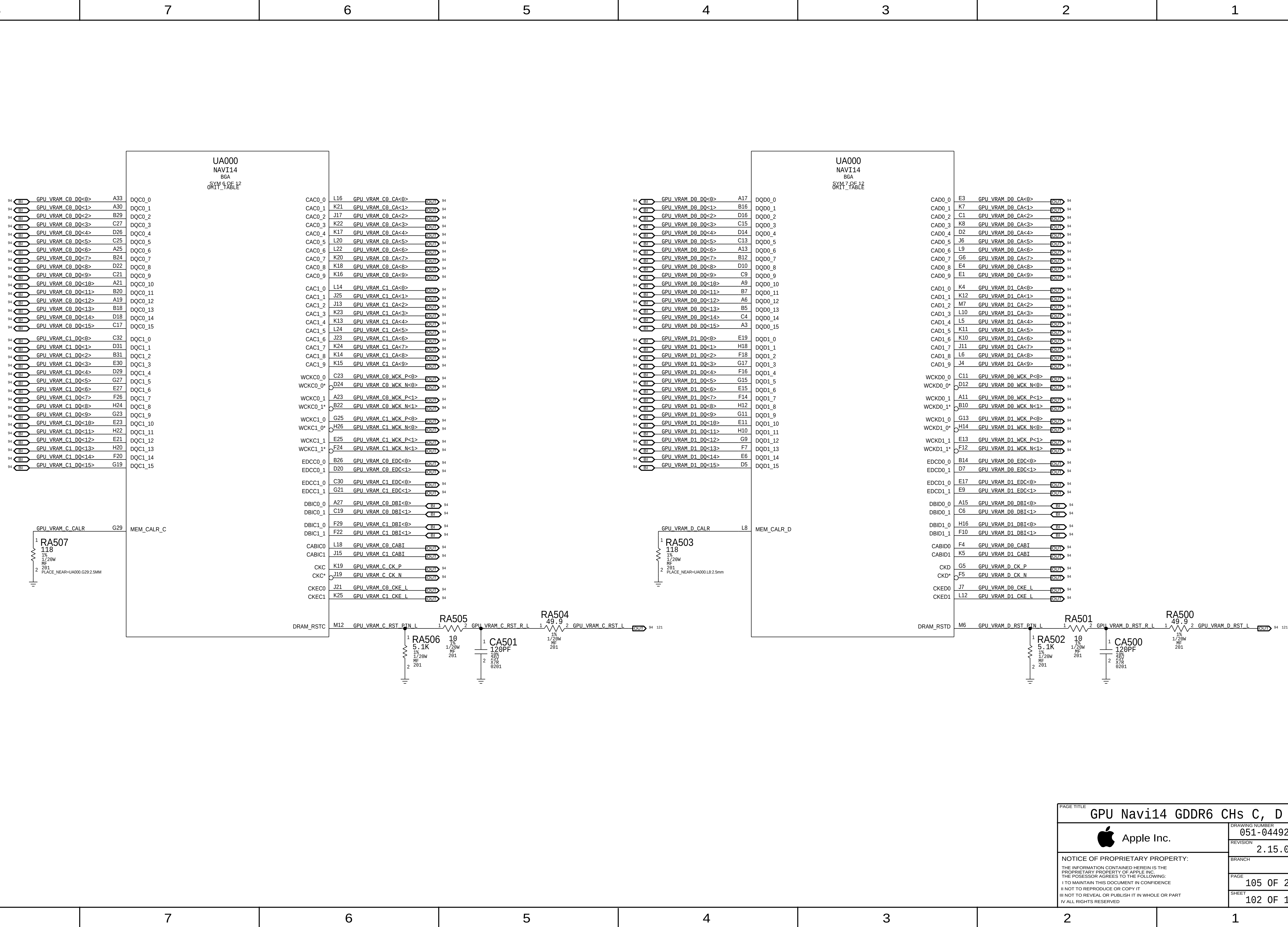
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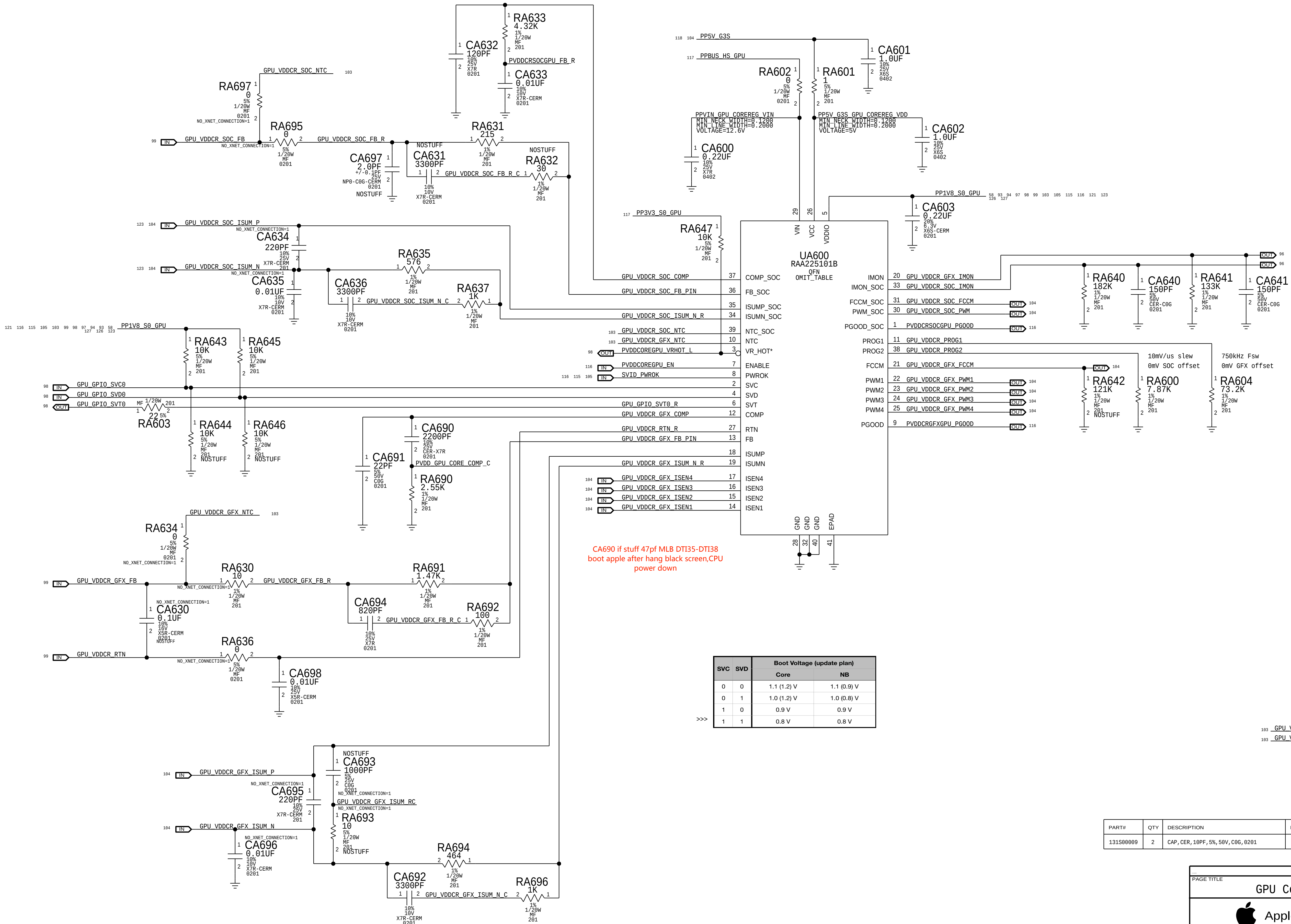
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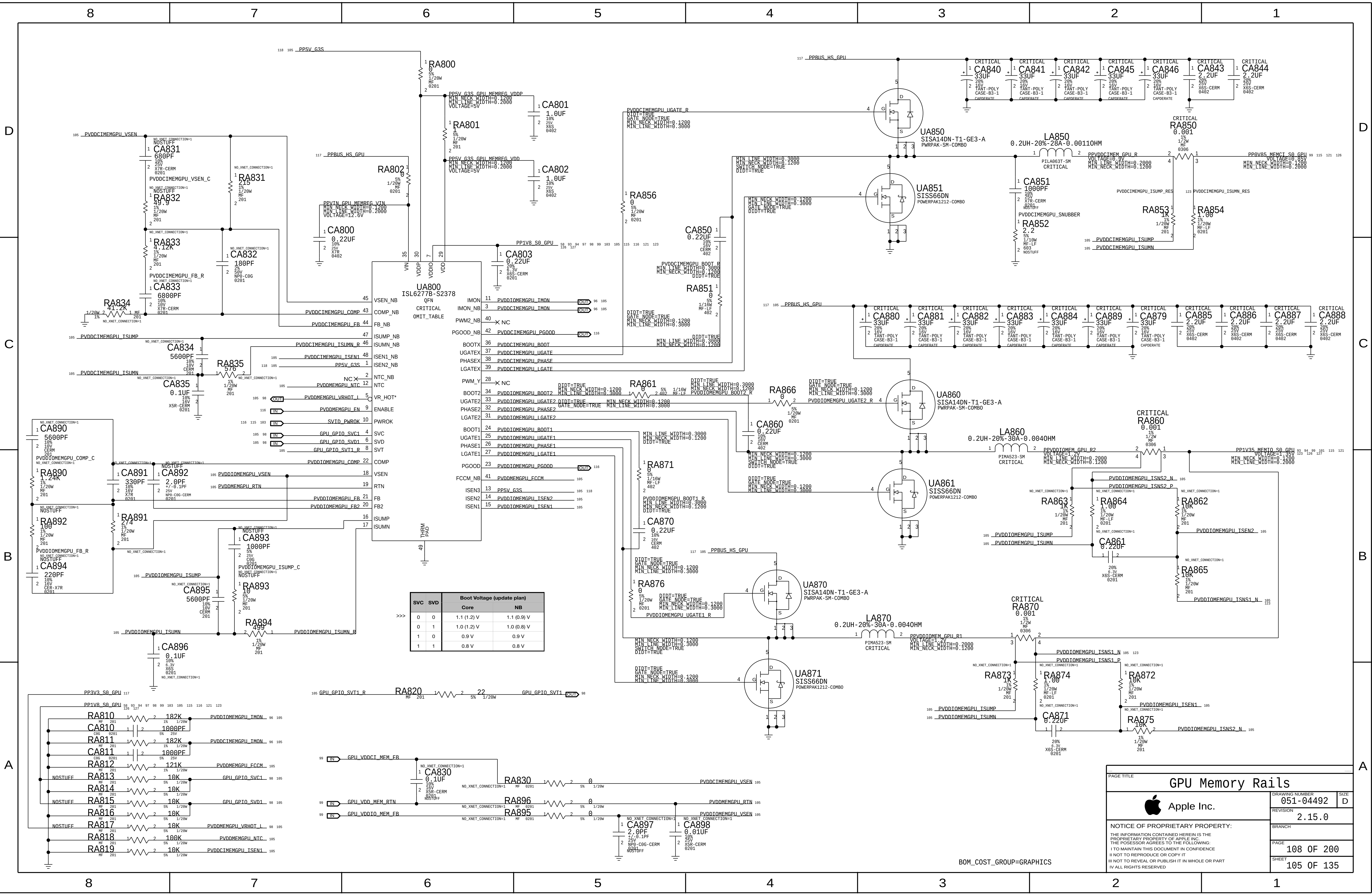


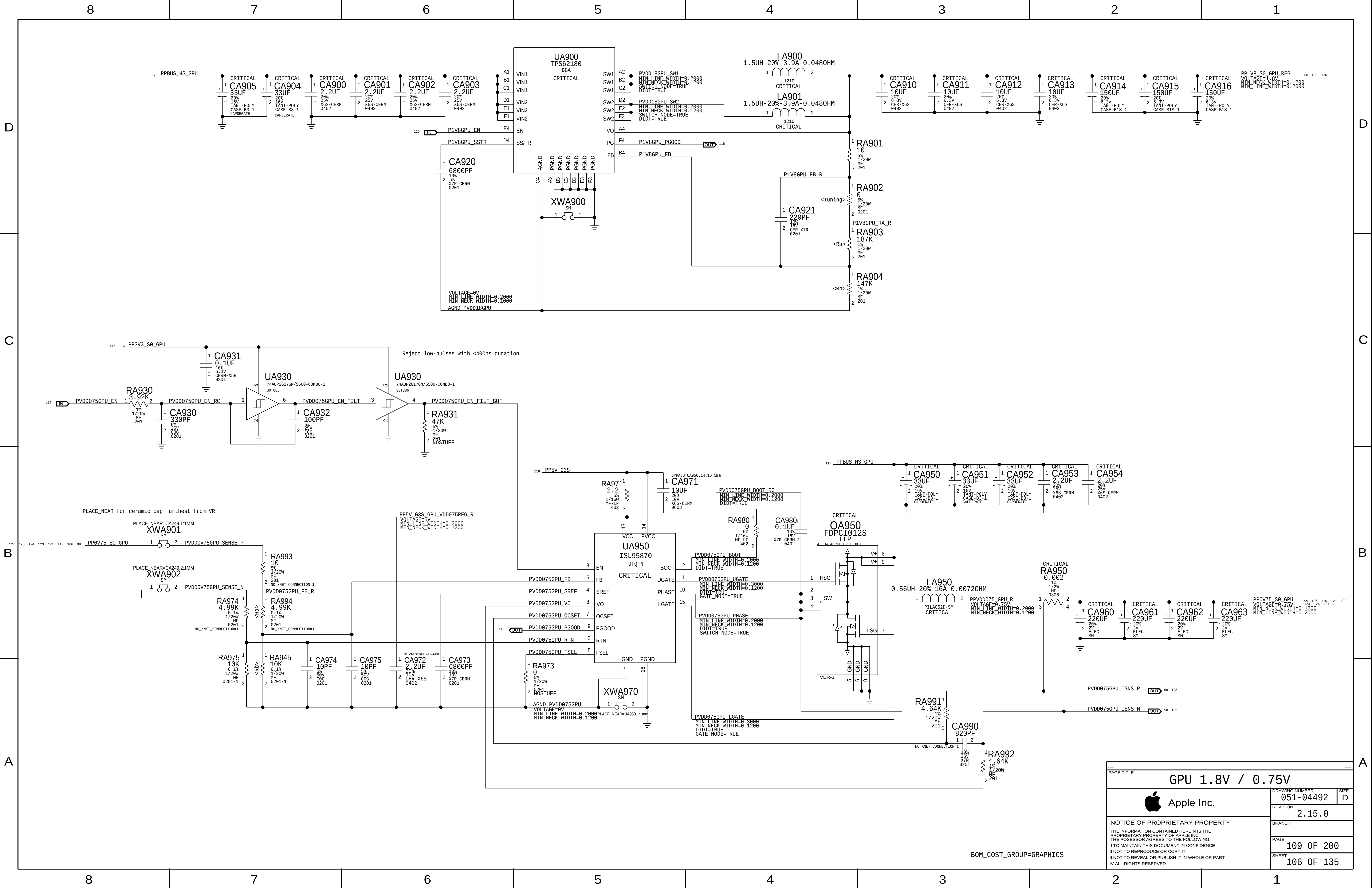
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		Core	NB
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0	1	1.0 (1.2) V	1.0 (0.8) V
1	0	0.9 V	0.9 V
1	1	0.8 V	0.8 V

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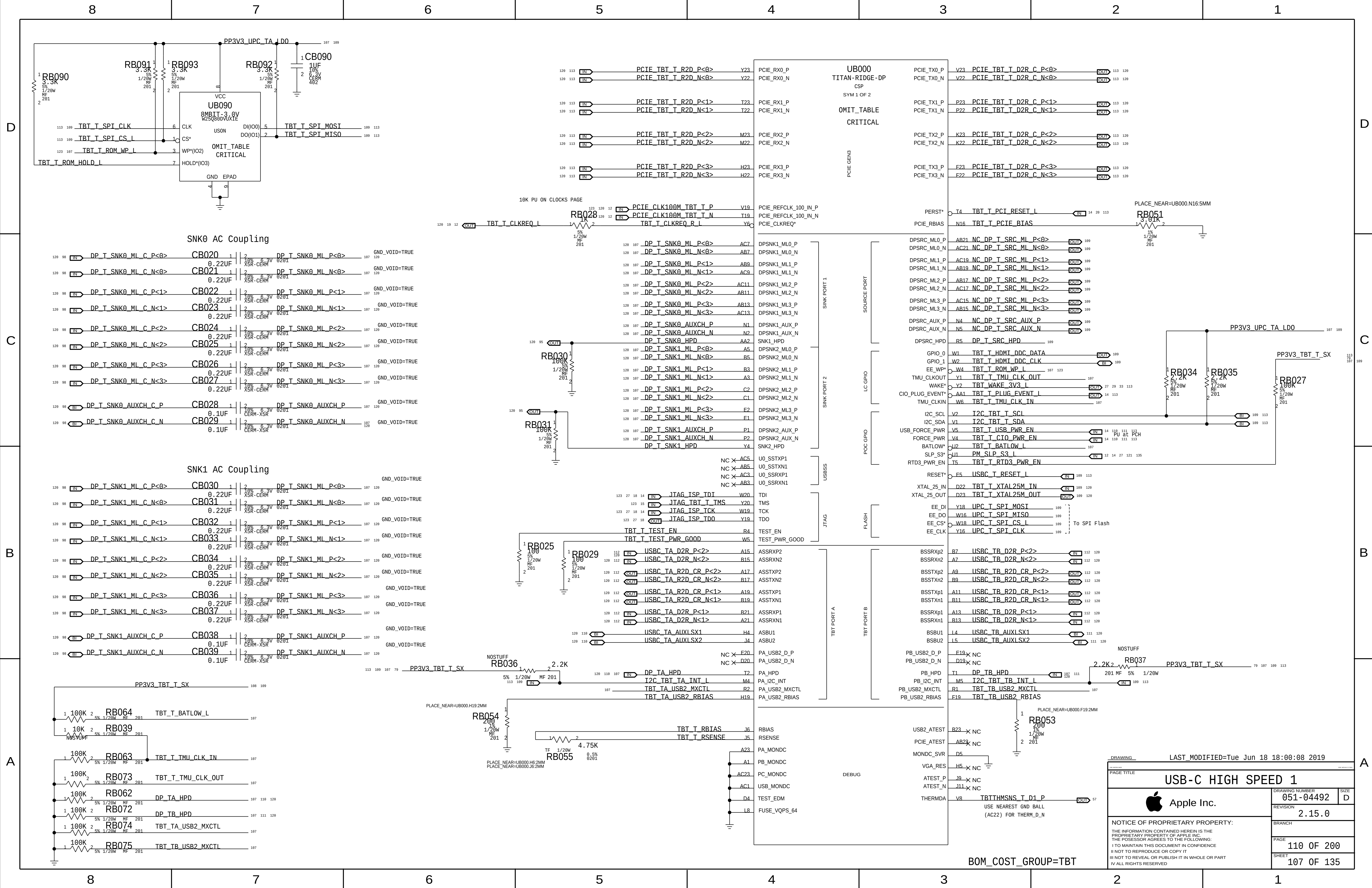
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	PAGE	106 OF 200
	SHEET	103 OF 135

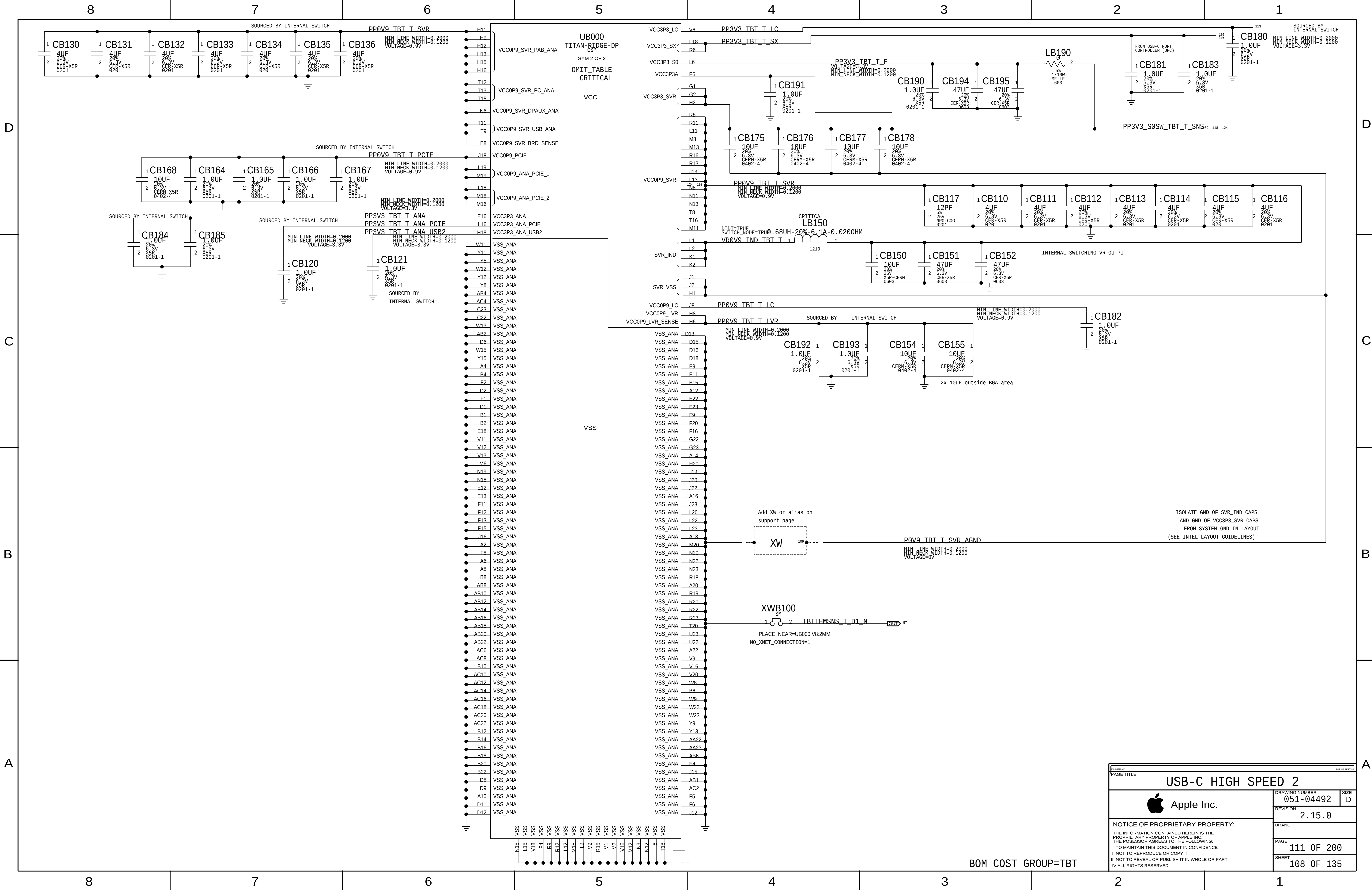
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	PAGE	111 OF 200
	SHEET	108 OF 135

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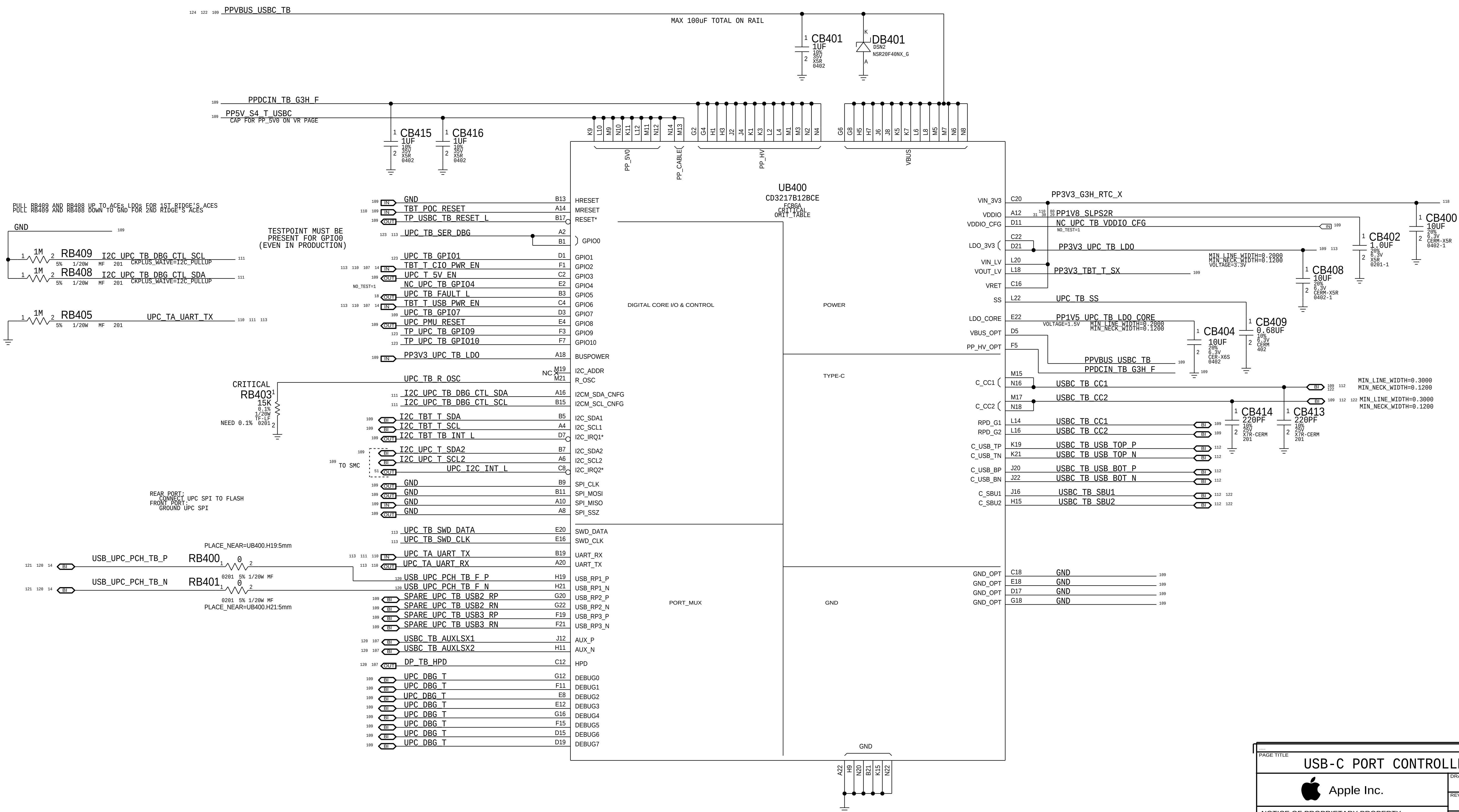
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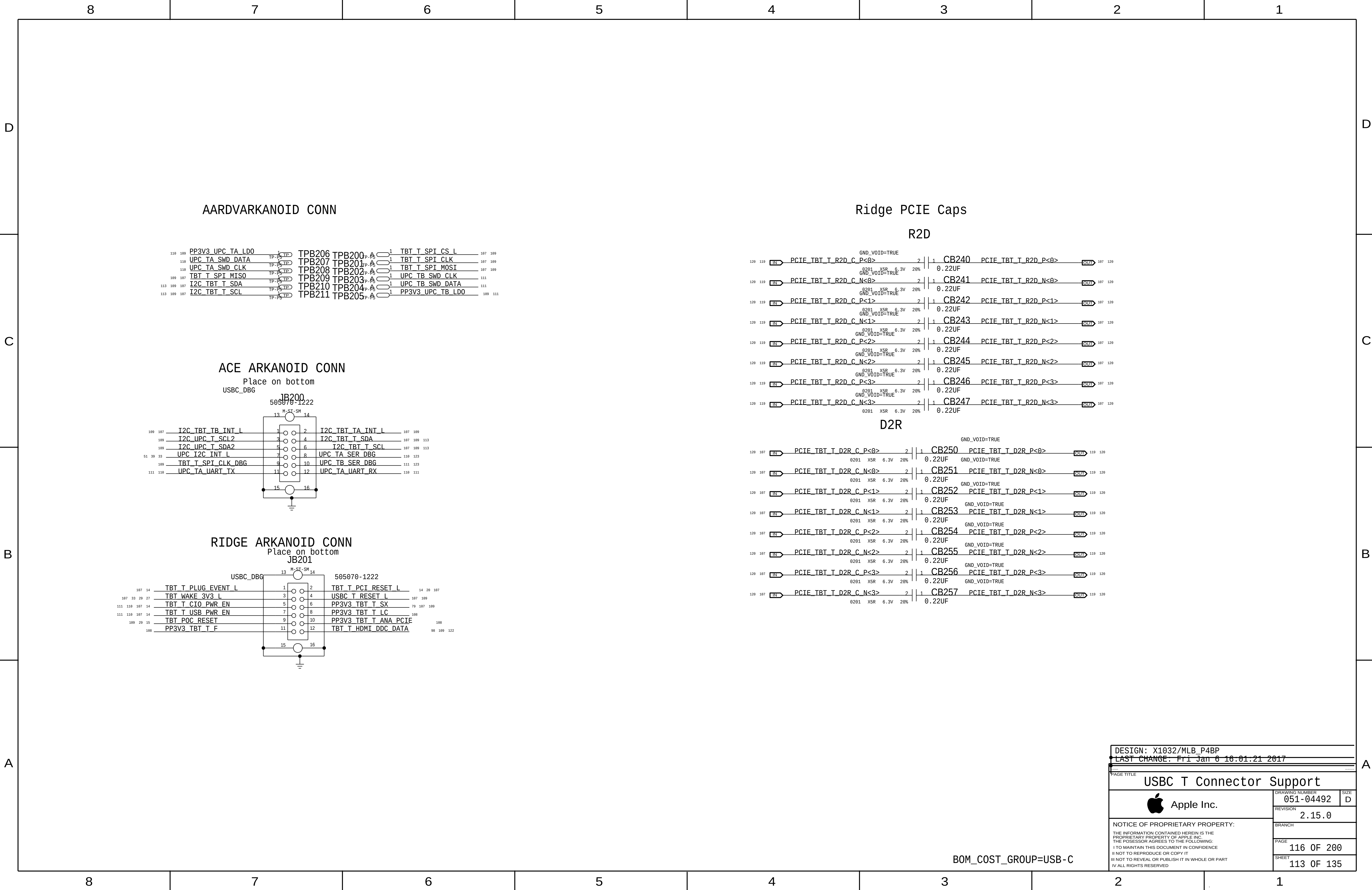
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SECONDARY ACE USB-C PORT CONTROLLER (UPC)



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BRANCH		
PAGE		
114 OF 200		
SHEET		
111 OF 135		



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DESIGN: X1032/MLB_P4BP

LAST CHANGE: Fri Jan 6 10:01:21 2017

USBC T Connector Support

Apple Inc.

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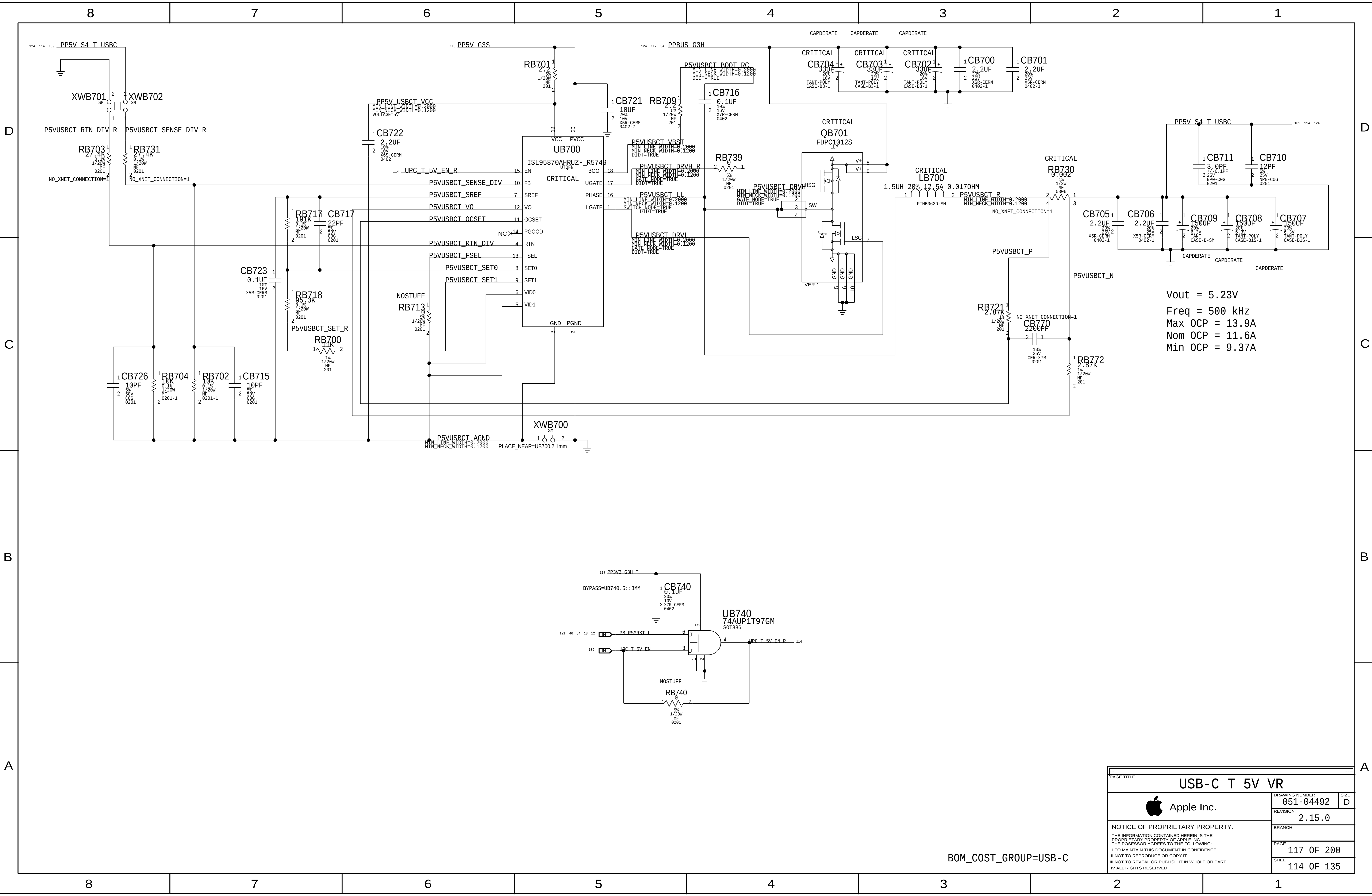
116 OF 200

SHEET

113 OF 135

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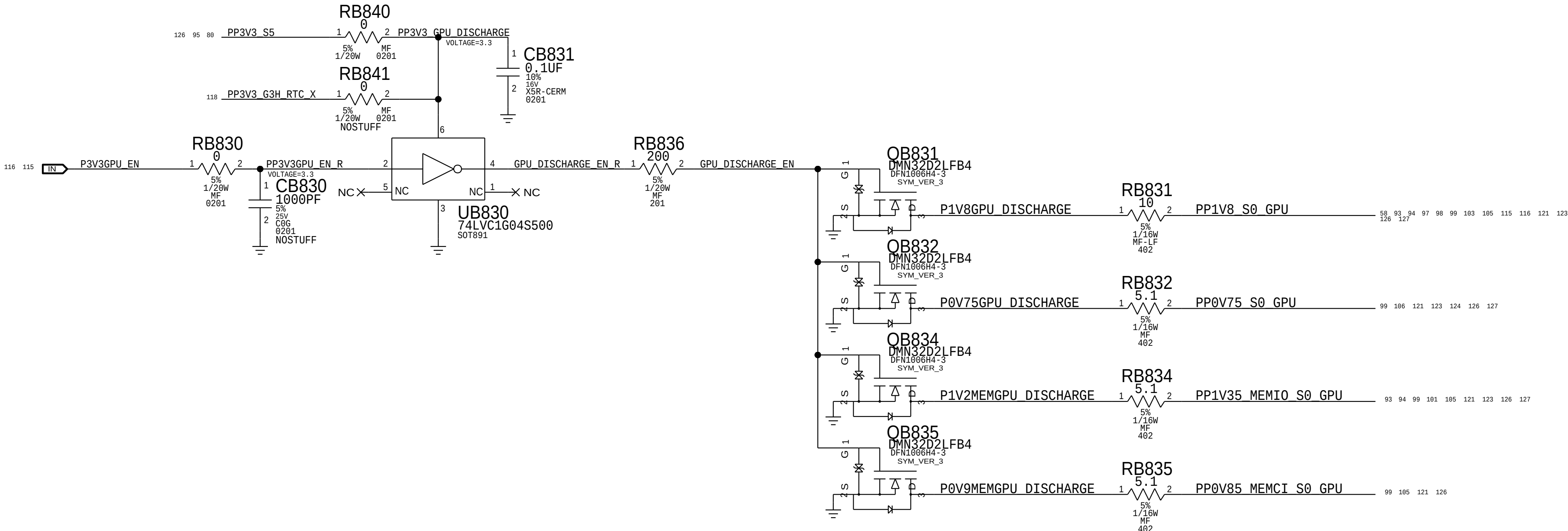
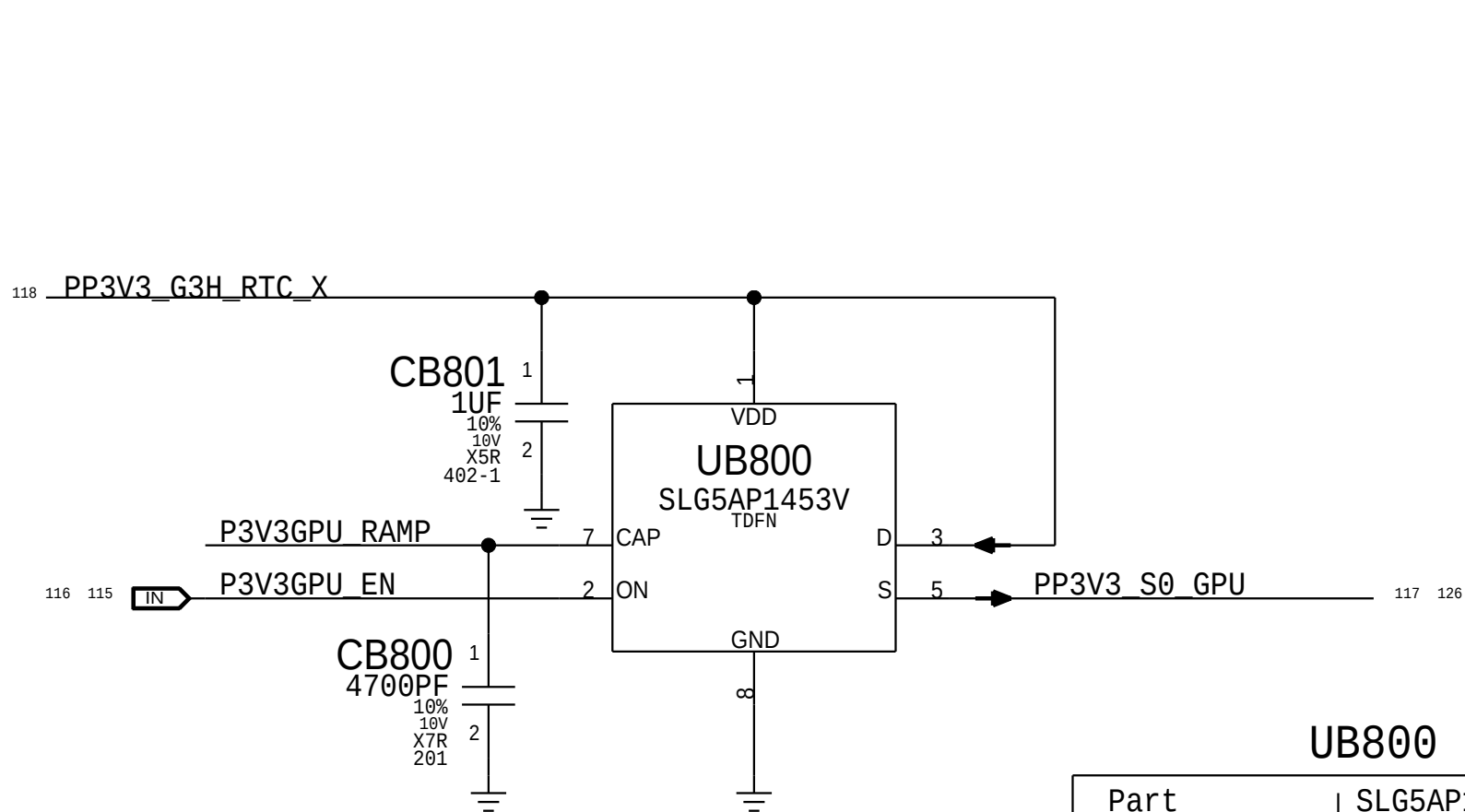
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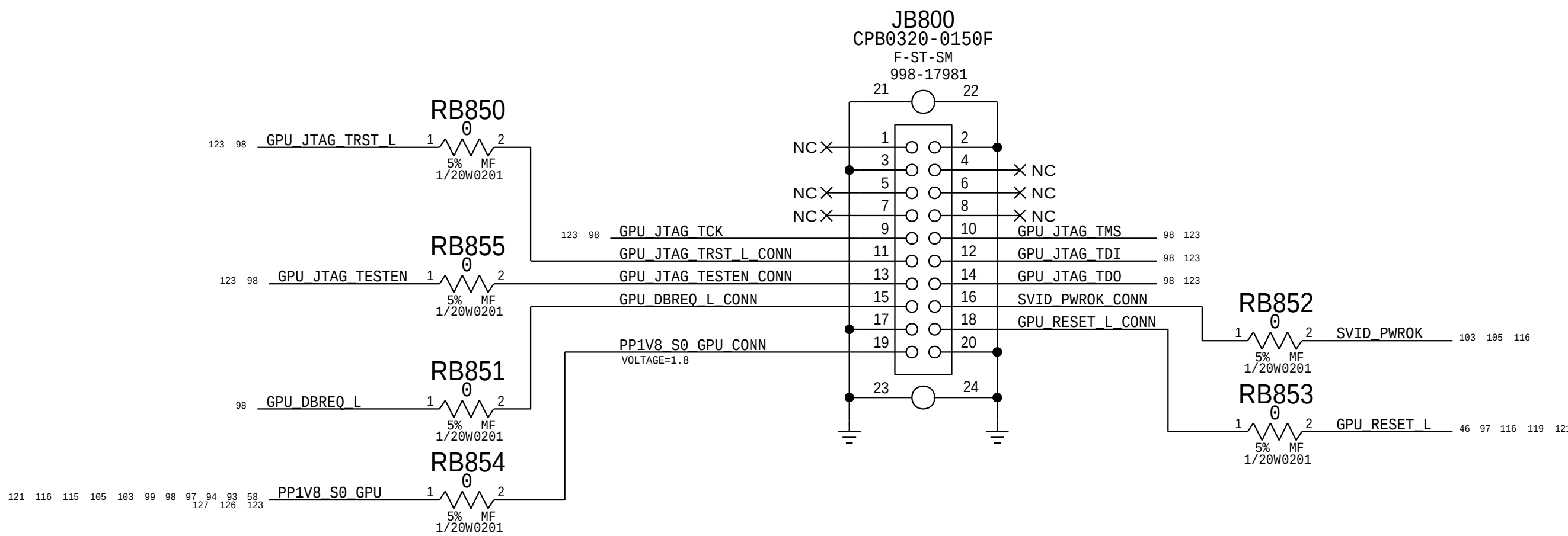
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Active Discharge



Nano-HDT



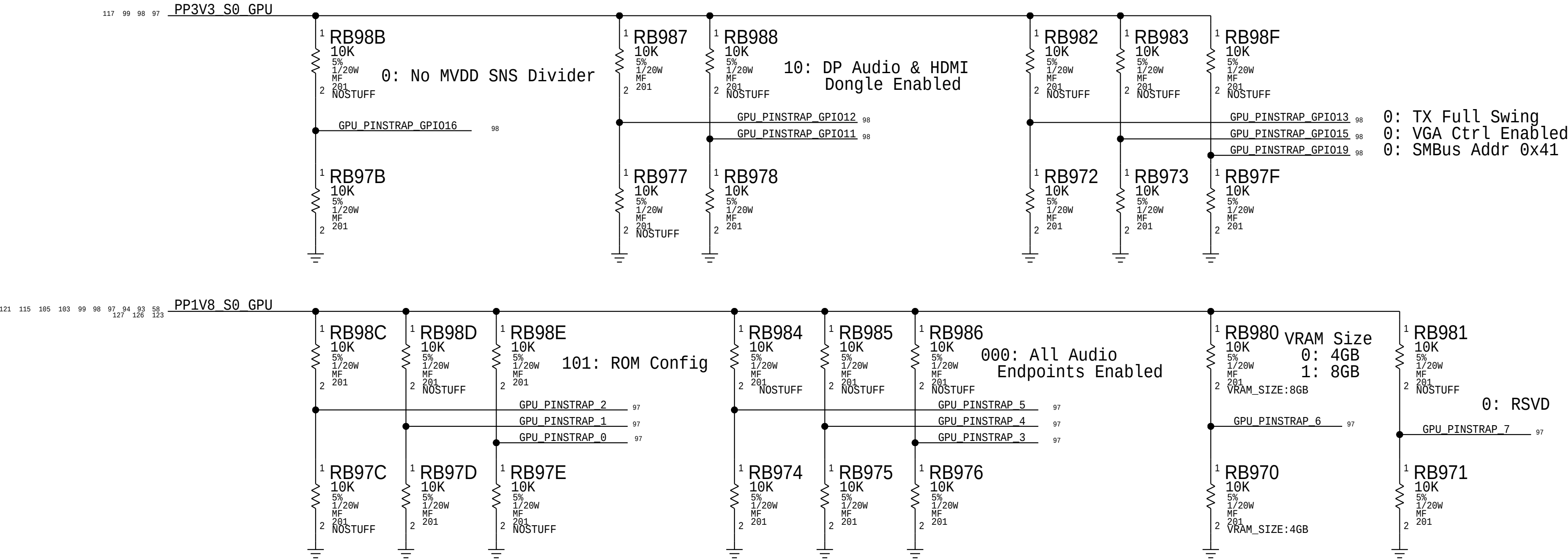
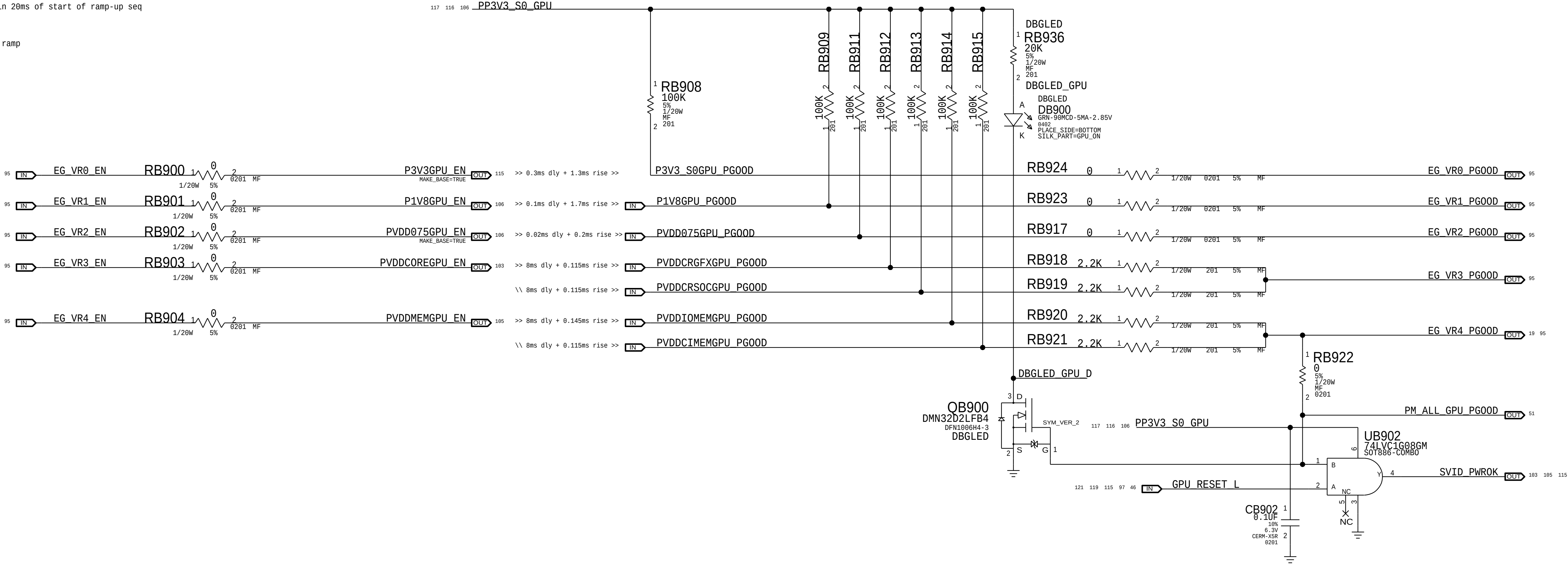
PAGE TITLE		
GPU 3.3V / Discharge		
	DRAWING NUMBER	051-04492
	REVISION	2.15.0
	BRANCH	
	PAGE	118 OF 200
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AMD POWER SEQUENCE REQUIREMENTS:

>> All GPU supplies (except VDDIO_33) must reach their nominal voltages within 20ms of start of ramp-up seq
(Shorter duration is preferred)
>> VDDIO_33 is recommended to ramp first
>> VDD_18 must reach steaty state >10us before VDDCR_x and VDDx_MEM start to ramp
>> GDDR6 VPP should reach its nominal voltage before applying VDDIO_MEM
>> PERSTB must wait >100ms to de-assert after all rails are stable
>> PCIE_REFCLK must be stable >100us before PERSTB de-assert
>> All rails (except VDDIO_33) must ramp-down within 20ms

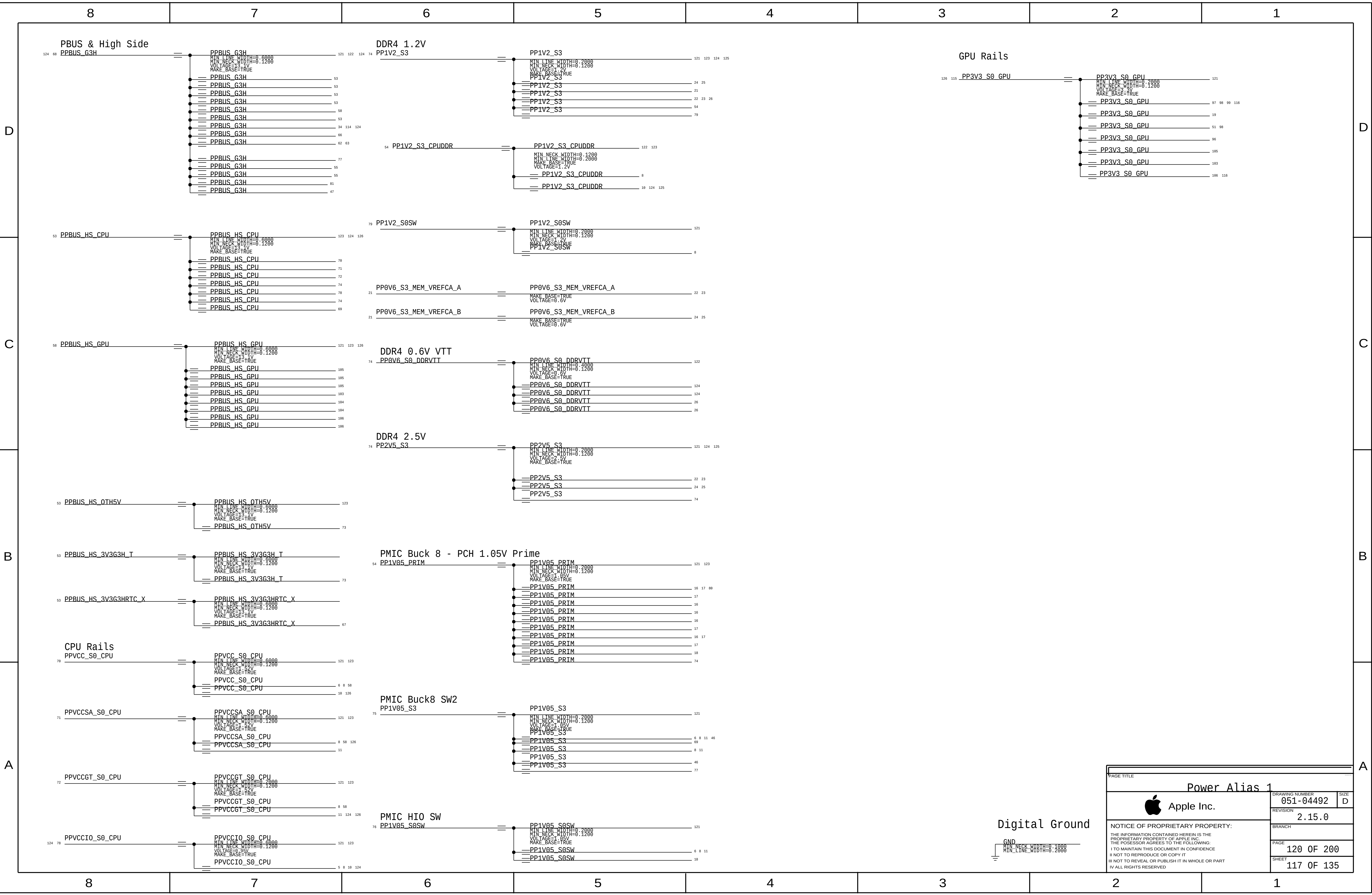
GCON POWER SEQUENCE GUIDANCE (absolute timing):

>> VR0_EN @ t=0ms
>> VR1_EN @ t=2ms
>> VR2_EN @ t=5ms
>> VR3_EN @ t=5ms
>> VR4_EN @ t=6ms

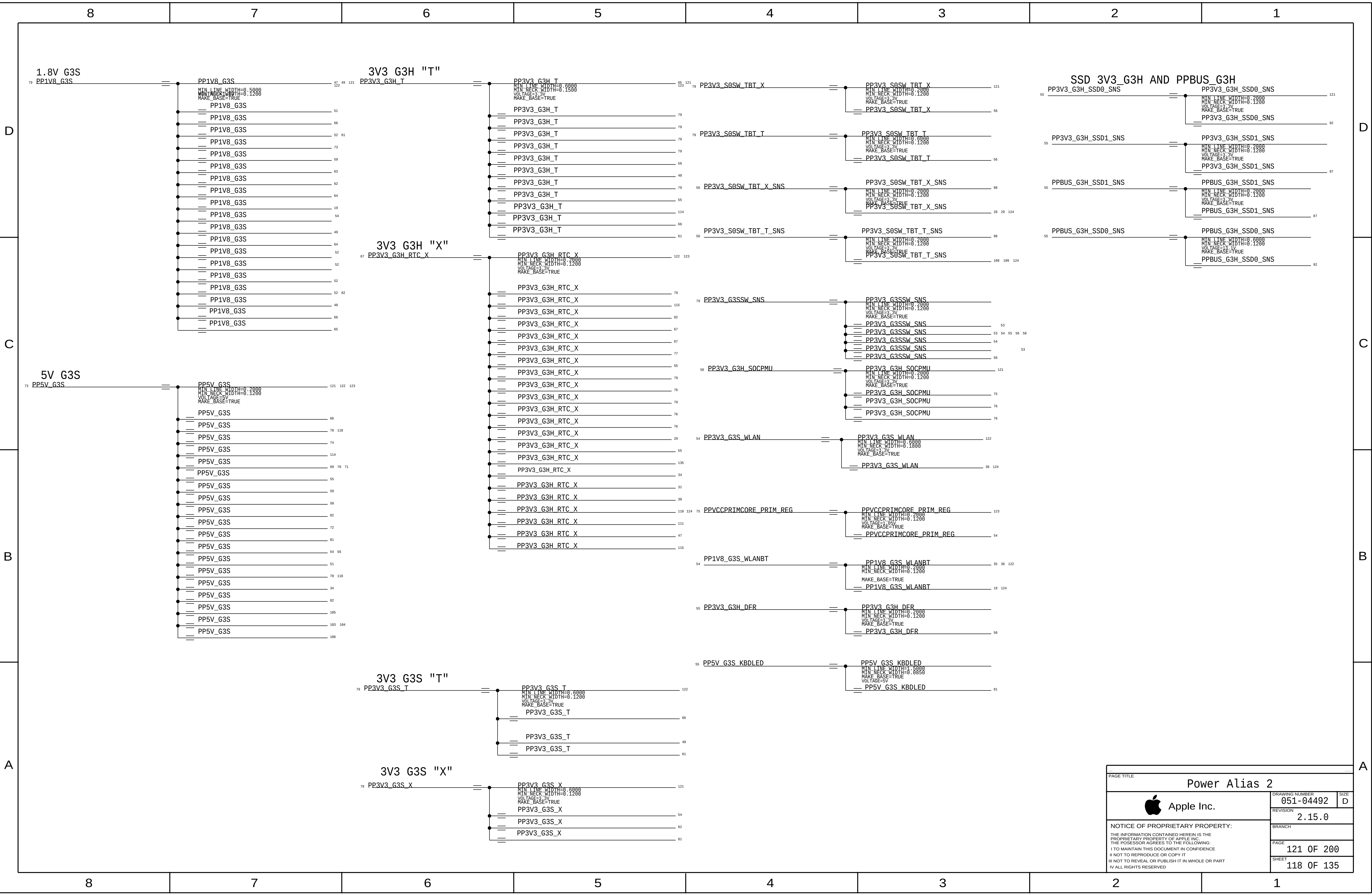


PAGE TITLE		
GPU Sequencing & Straps		
	DRAWING NUMBER	051-04492
	REVISION	2.15.0
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	PAGE	119 OF 200
	SHEET	116 OF 135

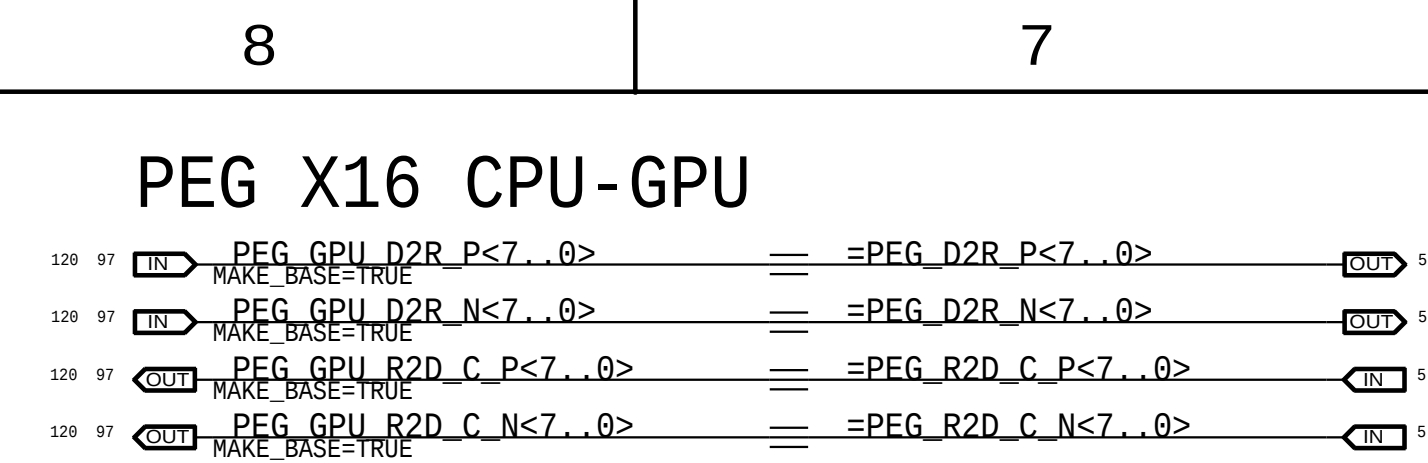
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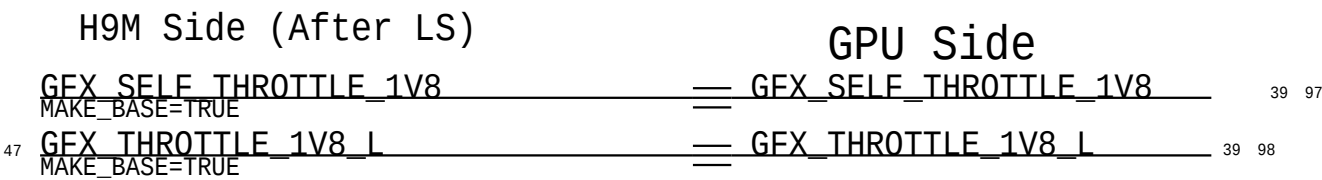
PAGE TITLE		
Power Alias 1		
 Apple Inc.	DRAWING NUMBER	051-04492
	REVISION	2.15.0
	BRANCH	
	PAGE	120 OF 200
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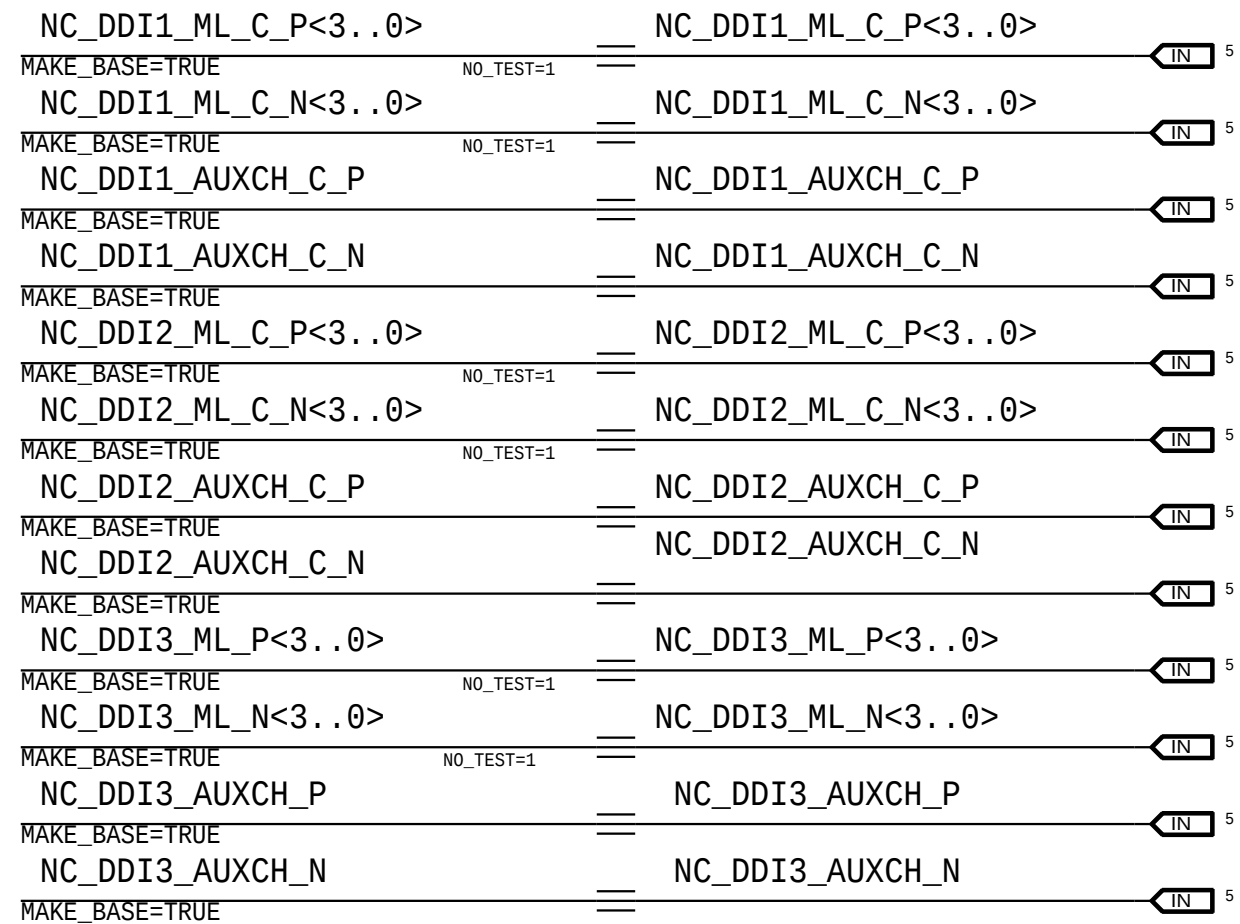
PAGE TITLE			
Power Alias 2			
 Apple Inc.	DRAWING NUMBER	051-04492	SIZE D
	REVISION	2.15.0	
	BRANCH		
	PAGE	121 OF 200	
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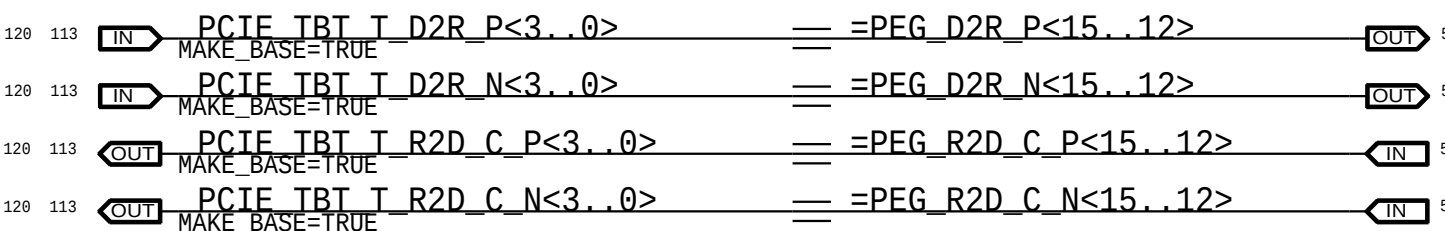
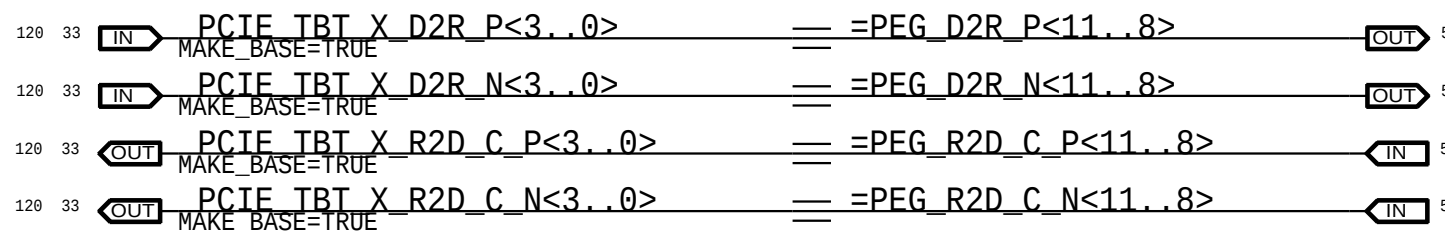
GPU Throttle



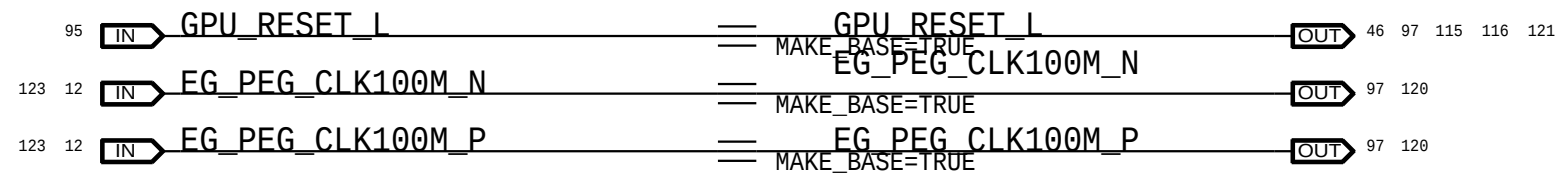
CPU Display Aliases



Thunderbolt Signals Through PEG



GPU ALIAS



PAGE TITLE			
Signal Alias			
 Apple Inc.	DRAWING NUMBER		SIZE
	051-04492		D
	REVISION		
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ICT TESTPOINTS , High Speed NO_TEST

PEG / GPU

119	97	IN	PEG_GPU_D2R_P<7..0>	NO_TEST=1
119	97	IN	PEG_GPU_D2R_N<7..0>	NO_TEST=1
97	IN	PEG_GPU_D2R_C_P<7..0>	NO_TEST=1	
97	IN	PEG_GPU_D2R_C_N<7..0>	NO_TEST=1	
97	IN	PEG_GPU_R2D_P<7..0>	NO_TEST=1	
97	IN	PEG_GPU_R2D_N<7..0>	NO_TEST=1	
119	97	IN	PEG_GPU_R2D_C_P<7..0>	NO_TEST=1
119	97	IN	PEG_GPU_R2D_C_N<7..0>	NO_TEST=1

PEG / TR

119	33	IN	PCIE_TBT_X_D2R_P<3..0>	NO_TEST=1
119	33	IN	PCIE_TBT_X_D2R_N<3..0>	NO_TEST=1
33	27	IN	PCIE_TBT_X_D2R_C_P<3..0>	NO_TEST=1
33	27	IN	PCIE_TBT_X_D2R_C_N<3..0>	NO_TEST=1
33	27	IN	PCIE_TBT_X_R2D_P<3..0>	NO_TEST=1
33	27	IN	PCIE_TBT_X_R2D_N<3..0>	NO_TEST=1
119	33	IN	PCIE_TBT_X_R2D_C_P<3..0>	NO_TEST=1
119	33	IN	PCIE_TBT_X_R2D_C_N<3..0>	NO_TEST=1
119	33	IN	PCIE_TBT_T_D2R_P<3..0>	NO_TEST=1
119	33	IN	PCIE_TBT_T_D2R_N<3..0>	NO_TEST=1
119	33	IN	PCIE_TBT_T_D2R_C_P<3..0>	NO_TEST=1
119	33	IN	PCIE_TBT_T_D2R_C_N<3..0>	NO_TEST=1
119	33	IN	PCIE_TBT_T_R2D_P<3..0>	NO_TEST=1
119	33	IN	PCIE_TBT_T_R2D_N<3..0>	NO_TEST=1
119	33	IN	PCIE_TBT_T_R2D_C_P<3..0>	NO_TEST=1
119	33	IN	PCIE_TBT_T_R2D_C_N<3..0>	NO_TEST=1

CPU EDP

95	5	IN	DP_INT_TG_MI_N<3..0>	NO_TEST=1
95	5	IN	DP_INT_TG_MI_P<3..0>	NO_TEST=1
95	5	IN	DP_INT_TG_AUX_N	
95	5	IN	DP_INT_TG_AUX_P	

DDR

23	22	IN	MEM_A_CLK_P<1..0>	NO_TEST=1
23	22	IN	MEM_A_CLK_N<1..0>	NO_TEST=1
23	22	IN	MEM_A_DQ<63..0>	NO_TEST=1
23	22	IN	MEM_A_DQS_P<7..0>	NO_TEST=1
23	22	IN	MEM_A_DQS_N<7..0>	NO_TEST=1
23	22	IN	MEM_A_CKE<3..0>	NO_TEST=1
23	22	IN	MEM_A_CS_L<1..0>	NO_TEST=1
23	22	IN	MEM_A_ODT<1..0>	NO_TEST=1
23	22	IN	MEM_A_A<16..0>	NO_TEST=1
23	22	IN	MEM_A_BA<1..0>	NO_TEST=1
23	22	IN	MEM_A_BG<1..0>	NO_TEST=1
23	22	IN	MEM_A_PAR	NO_TEST=1
23	22	IN	MEM_A_ALERT_L	NO_TEST=1
23	22	IN	MEM_A_ACT_L	NO_TEST=1
25	24	IN	MEM_B_CLK_P<1..0>	NO_TEST=1
25	24	IN	MEM_B_CLK_N<1..0>	NO_TEST=1
25	24	IN	MEM_B_DQ<63..0>	NO_TEST=1
25	24	IN	MEM_B_DQS_P<7..0>	NO_TEST=1
25	24	IN	MEM_B_DQS_N<7..0>	NO_TEST=1
25	24	IN	MEM_B_CKE<3..0>	NO_TEST=1
25	24	IN	MEM_B_CS_L<1..0>	NO_TEST=1
25	24	IN	MEM_B_ODT<1..0>	NO_TEST=1
25	24	IN	MEM_B_A<16..0>	NO_TEST=1
25	24	IN	MEM_B_BA<1..0>	NO_TEST=1
25	24	IN	MEM_B_BG<1..0>	NO_TEST=1
25	24	IN	MEM_B_PAR	NO_TEST=1
25	24	IN	MEM_B_ALERT_L	NO_TEST=1
25	24	IN	MEM_B_ACT_L	NO_TEST=1

DP X

27	IN	DP_X_SNK0_ML_P<3...0>	NO_TEST=1	
27	IN	DP_X_SNK0_ML_N<3...0>	NO_TEST=1	
97	27	IN	DP_X_SNK0_ML_C_P<3...0>	NO_TEST=1
97	27	IN	DP_X_SNK0_ML_C_N<3...0>	NO_TEST=1
27	IN	DP_X_SNK1_ML_P<3...0>	NO_TEST=1	
27	IN	DP_X_SNK1_ML_N<3...0>	NO_TEST=1	
98	27	IN	DP_X_SNK1_ML_C_P<3...0>	NO_TEST=1
98	27	IN	DP_X_SNK1_ML_C_N<3...0>	NO_TEST=1
27	IN	DP_X_SNK0_AUXCH_P		
27	IN	DP_X_SNK0_AUXCH_N		
98	27	IN	DP_X_SNK0_AUXCH_C_P	
98	27	IN	DP_X_SNK0_AUXCH_C_N	
95	27	IN	DP_X_SNK0_HPD	
98	27	IN	DP_XA_HPD	
27	IN	DP_X_SNK1_AUXCH_P		
27	IN	DP_X_SNK1_AUXCH_N		
98	27	IN	DP_X_SNK1_AUXCH_C_P	
98	27	IN	DP_X_SNK1_AUXCH_C_N	
95	27	IN	DP_X_SNK1_HPD	
31	27	IN	DP_XB_HPD	

H9M ESPI

39	12	IN	ESPI_CLK60M_PCH	NO_TEST=1
39	12	IN	ESPI_RESET_L	
39	12	IN	ESPI_IO<3..0>	NO_TEST=1
39	12	IN	ESPI_CS_L	NO_TEST=1
12	IN	PCH_ESPI_ALERT0_L	NO_TEST=1	

DMI

13	5	IN	DMI_S2N_P<3..0>	NO_TEST=1
13	5	IN	DMI_S2N_N<3..0>	NO_TEST=1
13	5	IN	DMI_N2S_P<3..0>	NO_TEST=1
13	5	IN	DMI_N2S_N<3..0>	NO_TEST=1

PCH/WLANBT

36	14	IN	PCH_PCIE_WLAN_D2R_P	
36	14	IN	PCH_PCIE_WLAN_D2R_N	
36	14	IN	PCH_PCIE_WLAN_D2R_C_P	
36	14	IN	PCH_PCIE_WLAN_D2R_C_N	
36	14	IN	PCH_PCIE_WLAN_R2D_P	
36	14	IN	PCH_PCIE_WLAN_R2D_N	
36	14	IN	PCH_PCIE_WLAN_R2D_C_P	
36	14	IN	PCH_PCIE_WLAN_R2D_C_N	

PCH/SOC

41	14	IN	PCIE_SOC_D2R_P<3..0>	NO_TEST=1
41	14	IN	PCIE_SOC_D2R_N<3..0>	NO_TEST=1
41	14	IN	PCIE_SOC_D2R_C_P<3..0>	NO_TEST=1
41	14	IN	PCIE_SOC_D2R_C_N<3..0>	NO_TEST=1
47	41	IN	PCIE_SOC_R2D_P<3..0>	NO_TEST=1
47	41	IN	PCIE_SOC_R2D_N<3..0>	NO_TEST=1
47	41	IN	PCIE_SOC_R2D_C_P<3..0>	NO_TEST=1
47	41	IN	PCIE_SOC_R2D_C_N<3..0>	NO_TEST=1

USB2 HS D+/D-

30	14	IN	USB_UPC_PCH_XA_P	
30	14	IN	USB_UPC_PCH_XA_N	NO_TEST=1
31	14	IN	USB_UPC_PCH_XB_P	NO_TEST=1
31	14	IN	USB_UPC_PCH_XB_N	NO_TEST=1
121	110	14	USB_UPC_PCH_TA_P	
121	110	14	USB_UPC_PCH_TA_N	
121	111	14	USB_UPC_PCH_TB_P	
121	111	14	USB_UPC_PCH_TB_N	
30	IN	USB_UPC_PCH_XA_F_P	NO_TEST=1	
30	IN	USB_UPC_PCH_XA_F_N	NO_TEST=1	
31	IN	USB_UPC_XB_F_P	NO_TEST=1	
31	IN	USB_UPC_XB_F_N	NO_TEST=1	
110	IN	USB_UPC_PCH_TA_F_P	NO_TEST=1	
110	IN	USB_UPC_PCH_TA_F_N	NO_TEST=1	
111	IN	USB_UPC_PCH_TB_F_P	NO_TEST=1	
111	IN	USB_UPC_PCH_TB_F_N	NO_TEST=1	

DP T

107	IN	DP_T_SNK0_ML_P<3..0>	NO_TEST=1
107	IN	DP_T_SNK0_ML_N<3..0>	NO_TEST=1
107 98	IN	DP_T_SNK0_ML_C_P<3..0>	NO_TEST=1
107 98	IN	DP_T_SNK0_ML_C_N<3..0>	NO_TEST=1
107	IN	DP_T_SNK1_ML_P<3..0>	NO_TEST=1
107	IN	DP_T_SNK1_ML_N<3..0>	NO_TEST=1
107 98	IN	DP_T_SNK1_ML_C_P<3..0>	NO_TEST=1
107 98	IN	DP_T_SNK1_ML_C_N<3..0>	NO_TEST=1
107	IN	DP_T_SNK0_AUXCH_P	
107	IN	DP_T_SNK0_AUXCH_N	
107 98	IN	DP_T_SNK0_AUXCH_C_P	
107 98	IN	DP_T_SNK0_AUXCH_C_N	
107 95	IN	DP_T_SNK0_HPD	
110 107	IN	DP_TA_HPD	
107	IN	DP_T_SNK1_AUXCH_P	
107	IN	DP_T_SNK1_AUXCH_N	
107 98	IN	DP_T_SNK1_AUXCH_C_P	
107 98	IN	DP_T_SNK1_AUXCH_C_N	
107 95	IN	DP_T_SNK1_HPD	
111 107	IN	DP_TB_HPD	

CPU/PCH CLK (TP FOR PROTO BUILDS)

12	6	IN	CPU_CLK24M_NSSC_CLK_N	
12	6	IN	CPU_CLK24M_NSSC_CLK_P	
12	6	IN	CPU_CLK100M_PCTBCLK_N	
12	6	IN	CPU_CLK100M_PCTBCLK_P	
12	6	IN	CPU_CLK100M_BCLK_N	
12	6	IN	CPU_CLK100M_BCLK_P	
41	12	IN	PCIE_CLK100M_SOC_P	
41	12	IN	PCIE_CLK100M_SOC_N	
41	12	IN	SOC_CLKREQ_L	
36	12	IN	PCH_PCIE_CLK100M_WLAN_P	
36	12	IN	PCH_PCIE_CLK100M_WLAN_N	
19	12	IN	PCH_WLAN_CLKREQ_L	
19	12	IN	EG_PEG_CLK100M_P	
19	12	IN	EG_PEG_CLK100M_N	
19	12	IN	PCH_GPU_CLKREQ_L	
19	12	IN	PCIE_CLK100M_DEBUG_P	
19	12	IN	PCIE_CLK100M_DEBUG_N	
19	12	IN	PCH_GPU_CLKREQ_L	
19	12	IN	PCIE_CLK100M_TBT_X_P	
19	12	IN	PCIE_CLK100M_TBT_X_N	
19	12	IN	TBT_X_CLKREQ_L	
19	12	IN	PCIE_CLK100M_TBT_T_P	
19	12	IN	PCIE_CLK100M_TBT_T_N	
19	12	IN	TBT_T_CLKREQ_L	
19	12	IN	NC_ITPXPDP_CLK100MN	
19	12	IN	NC_ITPXPDP_CLK100MP	

USB-C X

32	27	IN	USBC_XA_D2R_P<2..1>	NO_TEST=1
32	27	IN	USBC_XA_D2R_N<2..1>	NO_TEST=1
32	27	IN	USBC_XA_D2R_R_P<2..1>	NO_TEST=1
32	27	IN	USBC_XA_D2R_R_N<2..1>	NO_TEST=1
32	27	IN	USBC_XA_D2R_CR_P<2..1>	NO_TEST=1
32	27	IN	USBC_XA_D2R_CR_N<2..1>	NO_TEST=1
32	27	IN	USBC_XA_R2D_P<2..1>	NO_TEST=1
32	27	IN	USBC_XA_R2D_N<2..1>	NO_TEST=1
32	27	IN	USBC_XA_R2D_C_P<2..1>	NO_TEST=1
32	27	IN	USBC_XA_R2D_C_N<2..1>	NO_TEST=1
32	27	IN	USBC_XA_R2D_CR_P<2..1>	NO_TEST=1
32	27	IN	USBC_XA_R2D_CR_N<2..1>	NO_TEST=1
32	27	IN	USBC_XA_AUXLSX1	
32	27	IN	USBC_XA_AUXLSX2	
32	27	IN	USBC_XB_D2R_P<2..1>	NO_TEST=1
32	27	IN	USBC_XB_D2R_R_P<2..1>	NO_TEST=1
32	27	IN	USBC_XB_D2R_R_N<2..1>	NO_TEST=1
32	27	IN	USBC_XB_D2R_CR_P<2..1>	NO_TEST=1
32	27	IN	USBC_XB_R2D_P<2..1>	NO_TEST=1
32	27	IN	USBC_XB_R2D_N<2..1>	NO_TEST=1
32	27	IN	USBC_XB_R2D_C_P<2..1>	NO_TEST=1
32	27	IN	USBC_XB_R2D_C_N<2..1>	NO_TEST=1
32	27	IN	USBC_XB_R2D_CR_P<2..1>	NO_TEST=1
32	27	IN	USBC_XB_R2D_CR_N<2..1>	NO_TEST=1
31	27	IN	USBC_XB_AUXLSX1	
31	27	IN	USBC_XB_AUXLSX2	

USB-C T

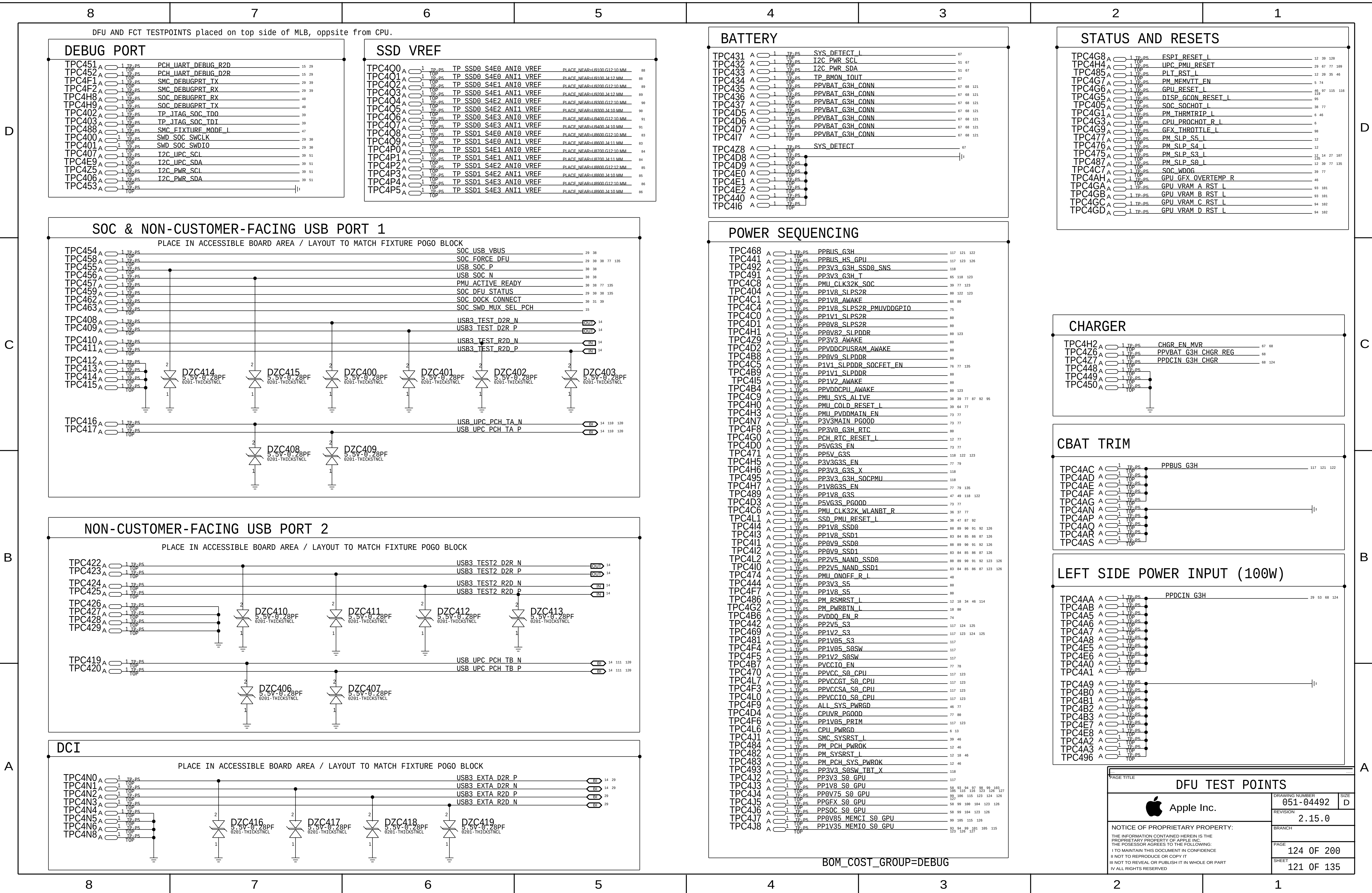
107	IN	USBC_TA_D2R_P<2..1>	NO_TEST=1
107	IN	USBC_TA_D2R_N<2..1>	NO_TEST=1
112	IN	USBC_TA_D2R_R_P<2..1>	NO_TEST=1
112	IN	USBC_TA_D2R_R_N<2..1>	NO_TEST=1
112	IN	USBC_TA_D2R_CR_P<2..1>	NO_TEST=1
112	IN	USBC_TA_D2R_CR_N<2..1>	NO_TEST=1
112	IN	USBC_TA_R2D_P<2..1>	NO_TEST=1
112	IN	USBC_TA_R2D_N<2..1>	NO_TEST=1
112	IN	USBC_TA_R2D_C_P<2..1>	NO_TEST=1
112	IN	USBC_TA_R2D_C_N<2..1>	NO_TEST=1
112	IN	USBC_TA_R2D_CR_P<2..1>	NO_TEST=1
112	IN	USBC_TA_R2D_CR_N<2..1>	NO_TEST=1
107	IN	USBC_TA_AUXLSX1	
107	IN	USBC_TA_AUXLSX2	
107	IN	USBC_TB_D2R_P<2..1>	NO_TEST=1
107	IN	USBC_TB_D2R_N<2..1>	NO_TEST=1
112	IN	USBC_TB_D2R_R_P<2..1>	NO_TEST=1
112	IN	USBC_TB_D2R_R_N<2..1>	NO_TEST=1
112	IN	USBC_TB_D2R_CR_P<2..1>	NO_TEST=1
112	IN	USBC_TB_D2R_CR_N<2..1>	NO_TEST=1
112	IN	USBC_TB_R2D_P<2..1>	NO_TEST=1
112	IN	USBC_TB_R2D_N<2..1>	NO_TEST=1
112	IN	USBC_TB_R2D_C_P<2..1>	NO_TEST=1
112	IN	USBC_TB_R2D_C_N<2..1>	NO_TEST=1
107	IN	USBC_TB_R2D_CR_P<2..1>	NO_TEST=1
107	IN	USBC_TB_R2D_CR_N<2..1>	NO_TEST=1
111	IN	USBC_TB_AUXLSX1	
111	IN	USBC_TB_AUXLSX2	

H9M SSD NAND

91	90	89	88	IN	PCIE_SSD0_R2D_P<3..0>	NO_TEST=1	
91	90	89	88	IN	PCIE_SSD0_R2D_N<3..0>	NO_TEST=1	
91	90	89	88	41	IN	PCIE_SSD0_D2R_P<3..0>	NO_TEST=1
91	90	89	88	41	IN	PCIE_SSD0_D2R_N<3..0>	NO_TEST=1
91	90	89	88	41	IN	PCIE_SSD0_R2D_C_P<3..0>	NO_TEST=1
91	90	89	88	41	IN	PCIE_SSD0_R2D_C_N<3..0>	NO_TEST=1
91	90	89	88	IN	PCIE_SSD0_D2R_C_P<3..0>	NO_TEST=1	
91	90	89	88	IN	PCIE_SSD0_D2R_C_N<3..0>	NO_TEST=1	
86	85	84	83	IN	PCIE_SSD1_R2D_P<3..0>	NO_TEST=1	
86	85	84	83	IN	PCIE_SSD1_R2D_N<3..0>	NO_TEST=1	
86	85	84	83	41	IN	PCIE_SSD1_D2R_P<3..0>	NO_TEST=1
86	85	84	83	41	IN	PCIE_SSD1_D2R_N<3..0>	NO_TEST=1
86	85	84	83	41	IN	PCIE_SSD1_R2D_C_P<3..0>	NO_TEST=1
86	85	84	83	41	IN	PCIE_SSD1_R2D_C_N<3..0>	NO_TEST=1
86	85	84	83	IN	PCIE_SSD1_D2R_C_P<3..0>	NO_TEST=1	
86	85	84	83	IN	PCIE_SSD1_D2R_C_N<3..0>	NO_TEST=1	

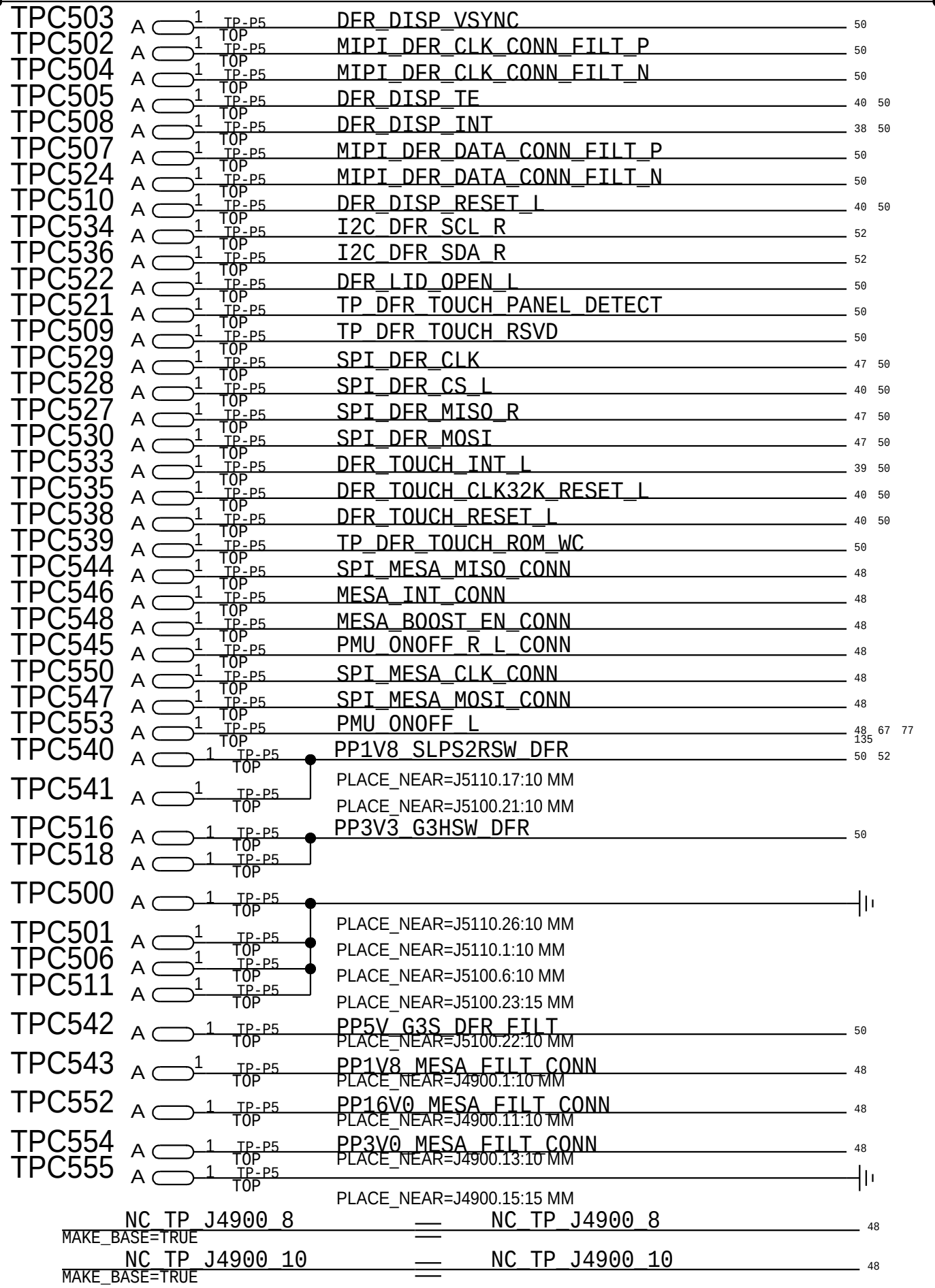
XTAL

29	27	IN	TBT_X_XTAL25M_IN	NO_TEST=1
29	27	IN	TBT_X_XTAL25M_OUT	NO_TEST=1
109	107	IN	TBT_T_XTAL25M_IN	NO_TEST=1

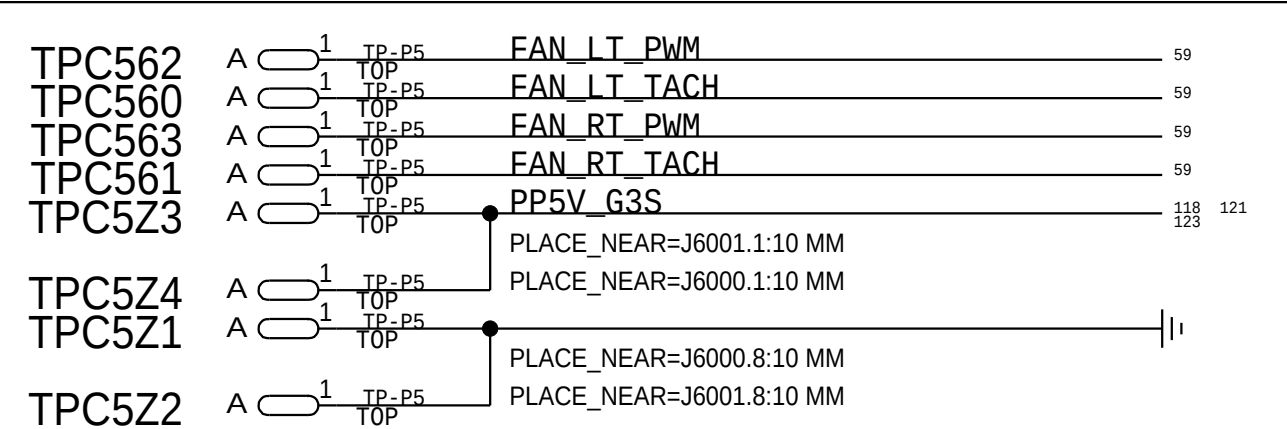


FCT TEST POINTS (TOP SIDE OF MLB)

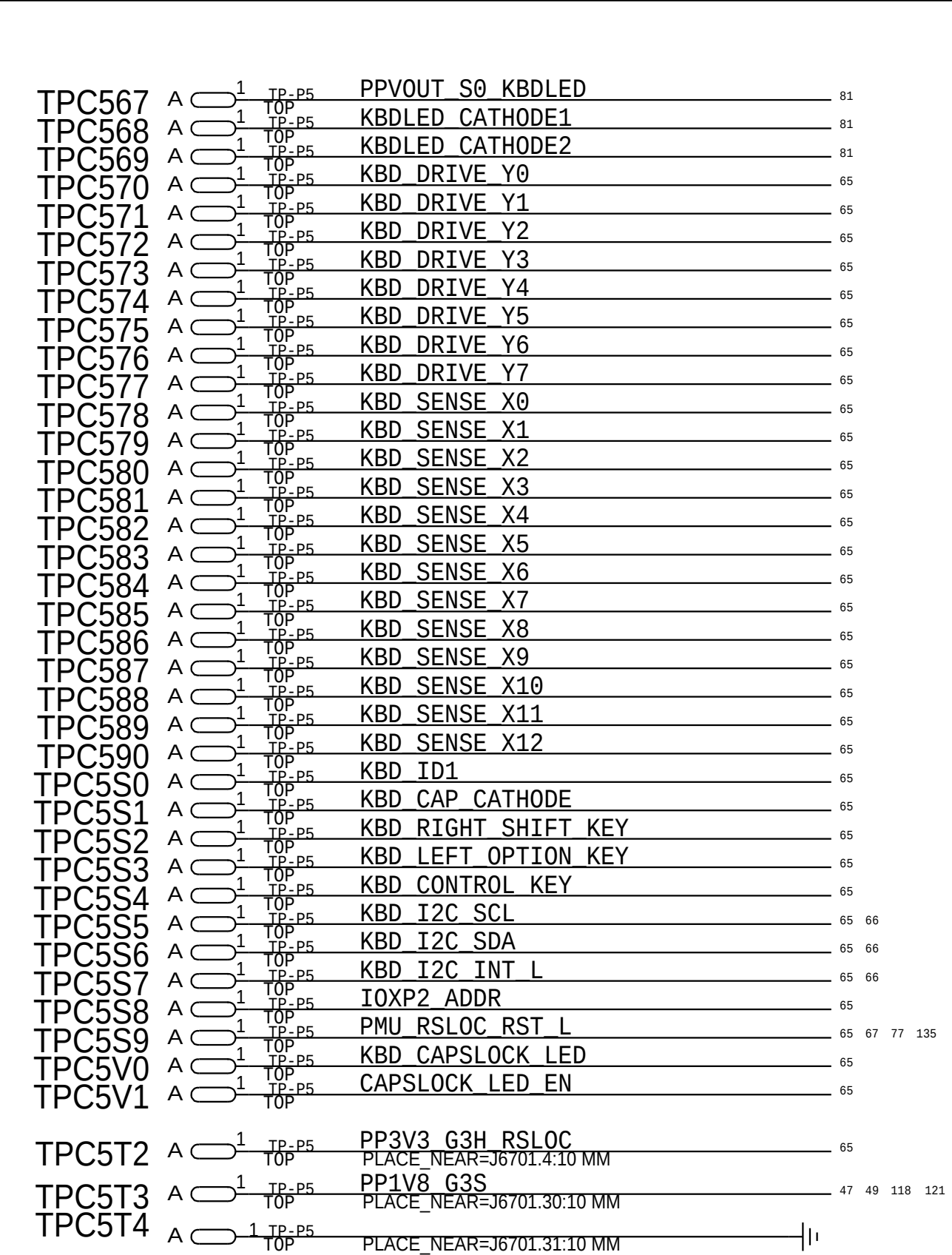
DFR/MESA



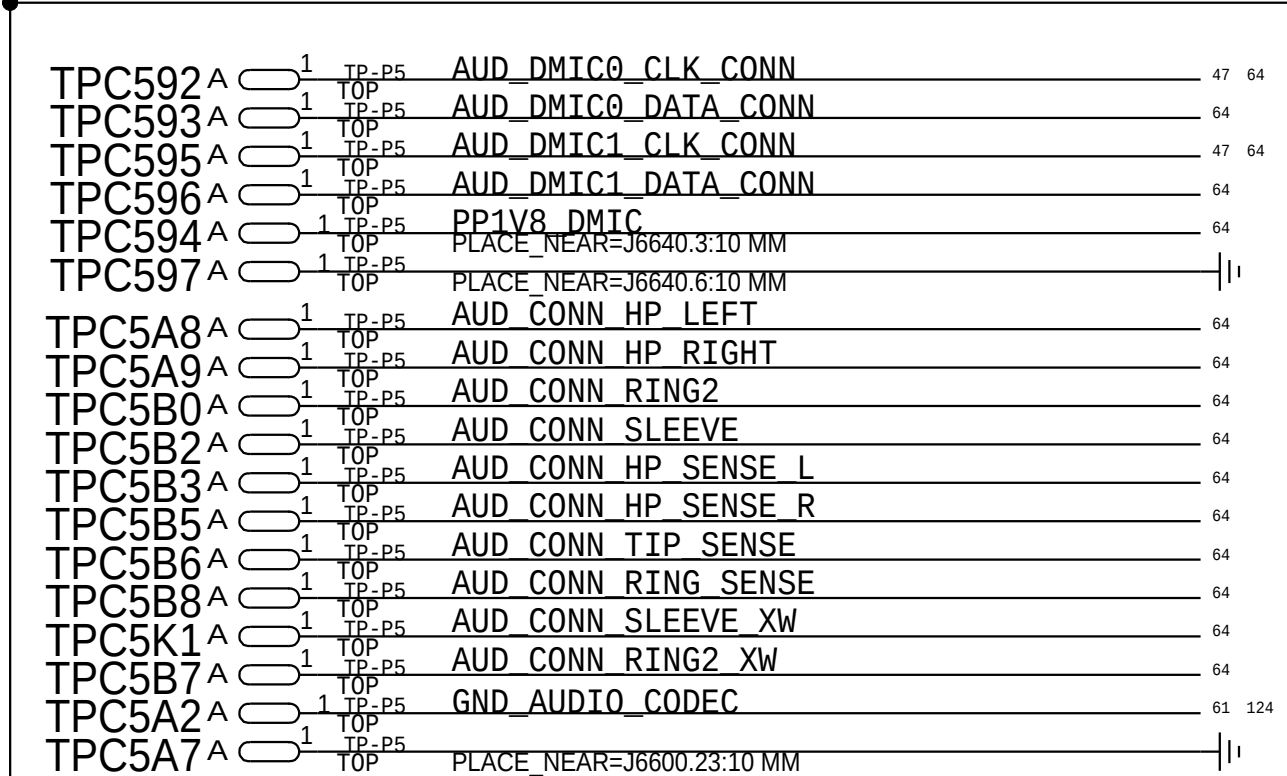
FAN



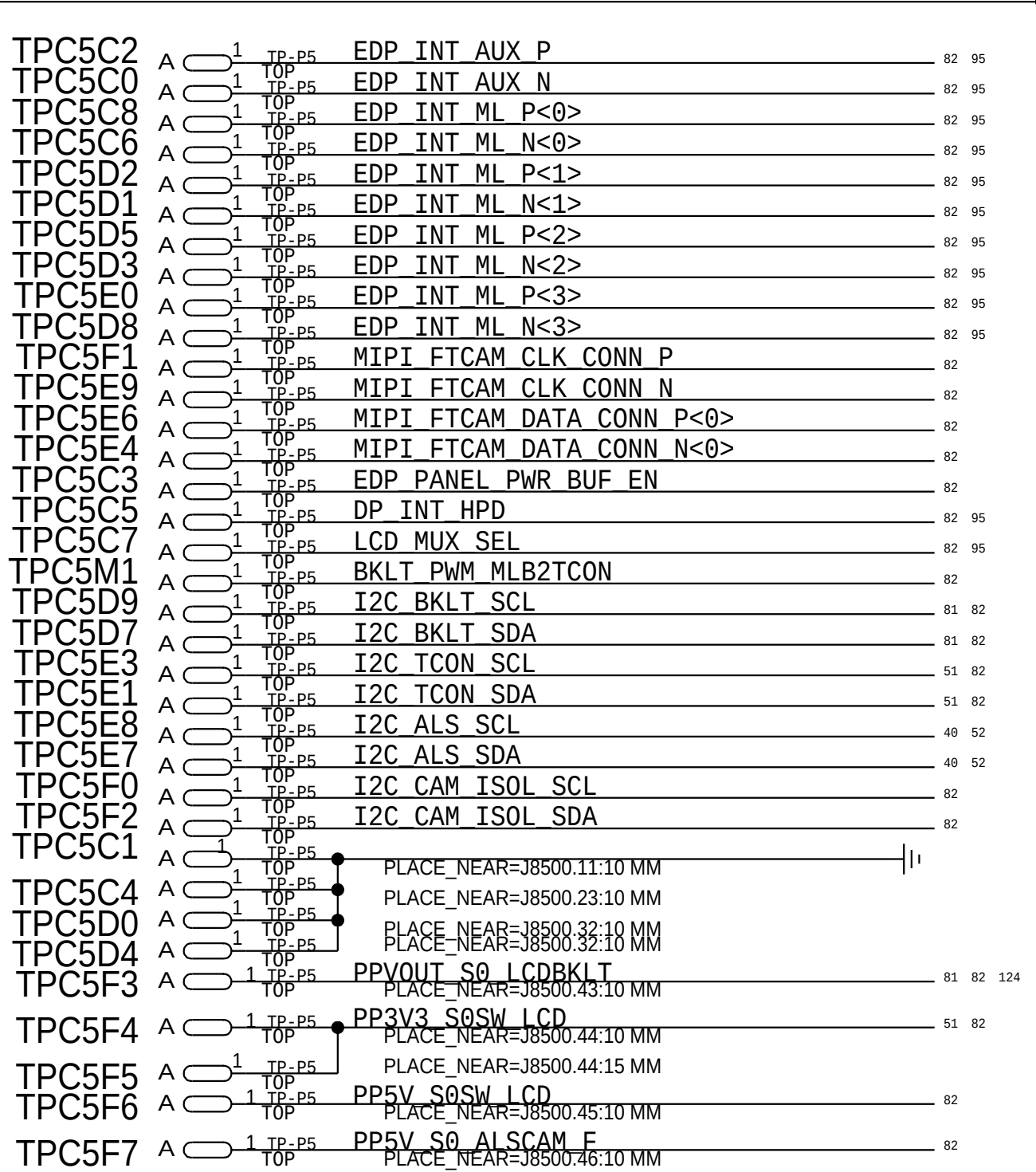
KEYBOARD



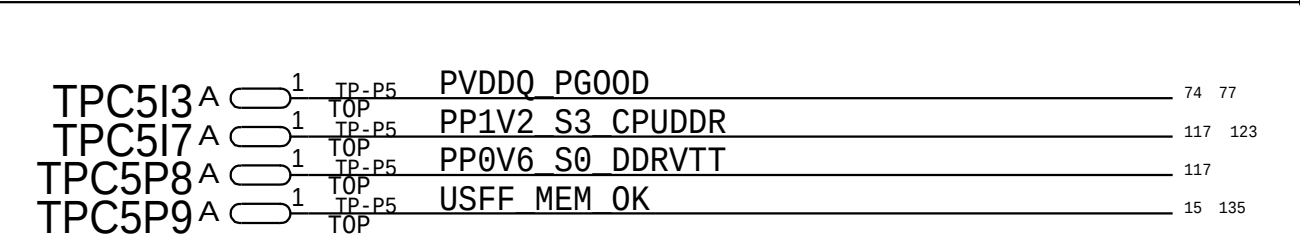
DMIC AND AUDIO JACK



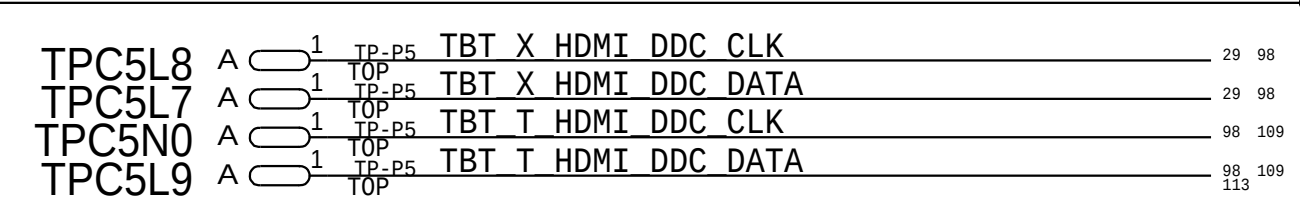
EDP, CAMERA, ALS



MEMORY

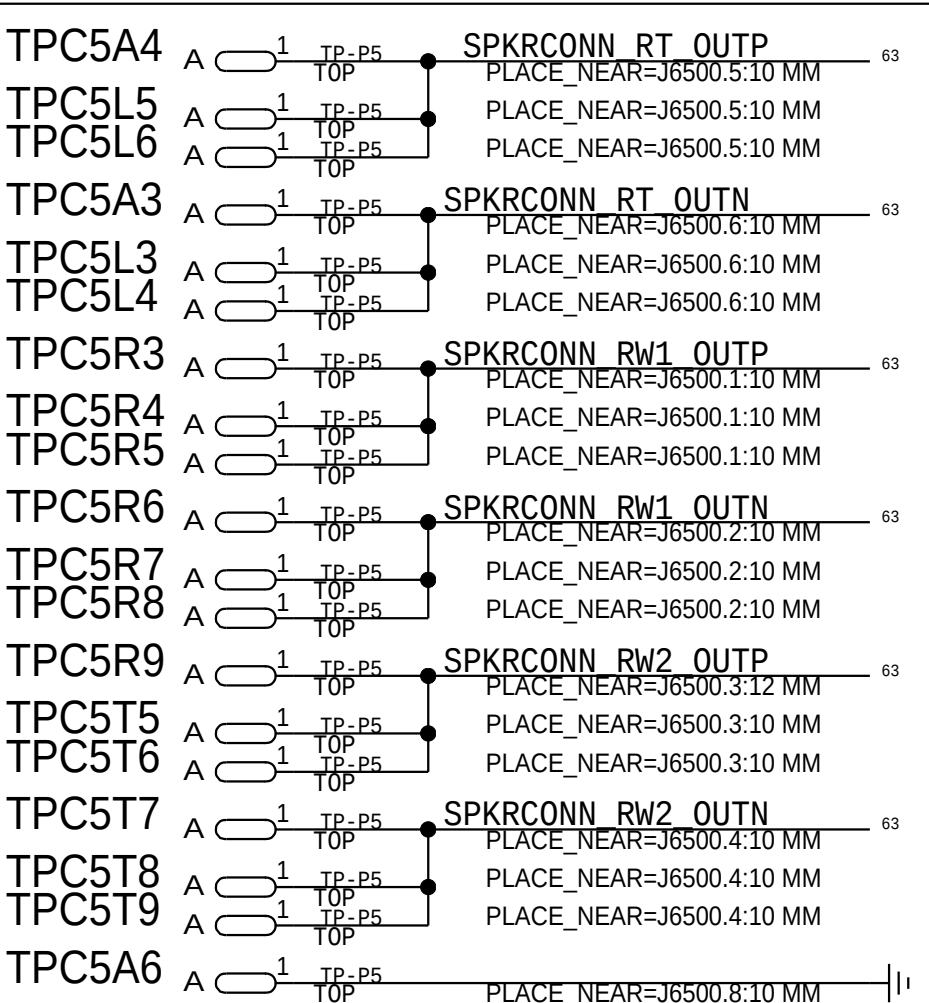
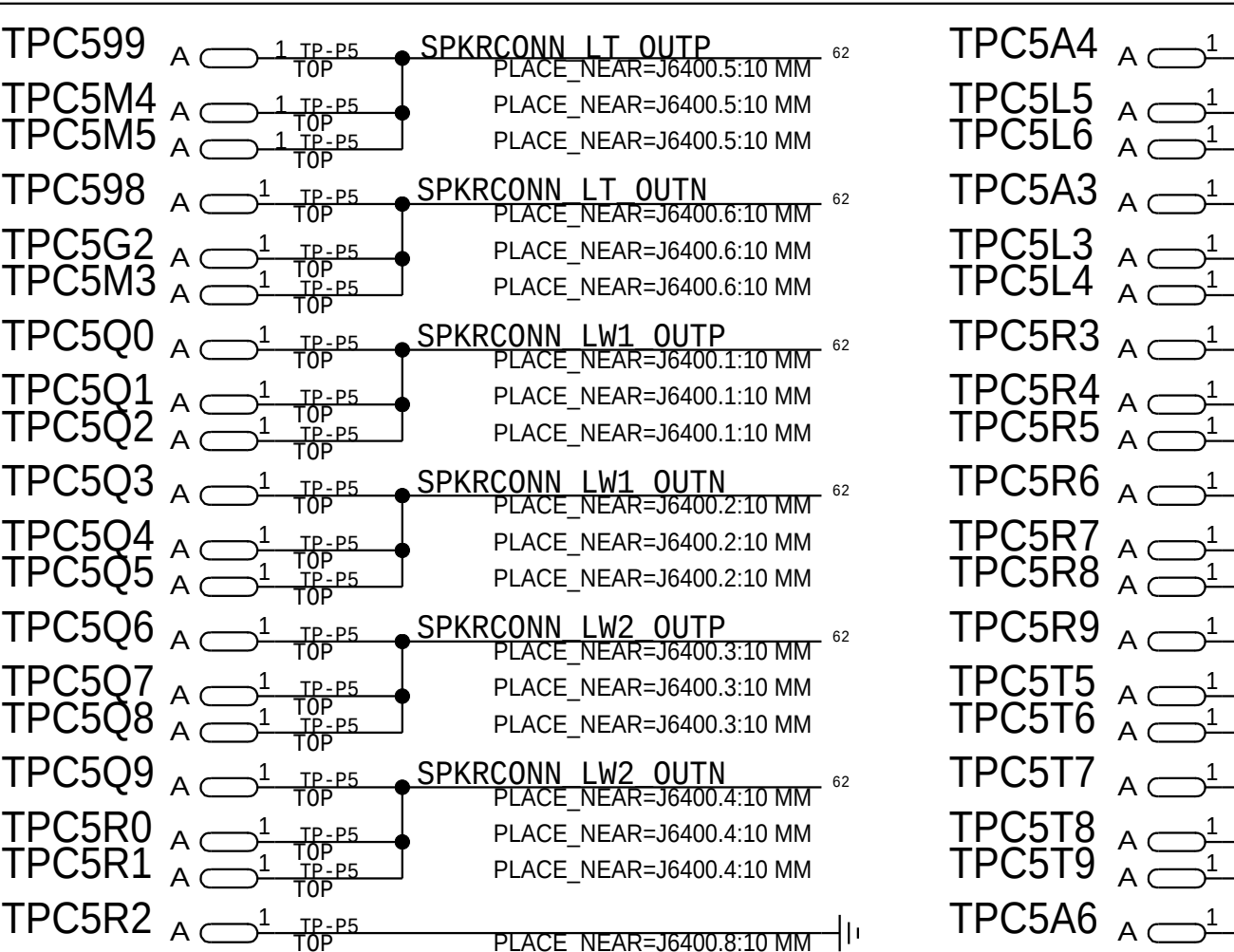


DP SINK FORCING

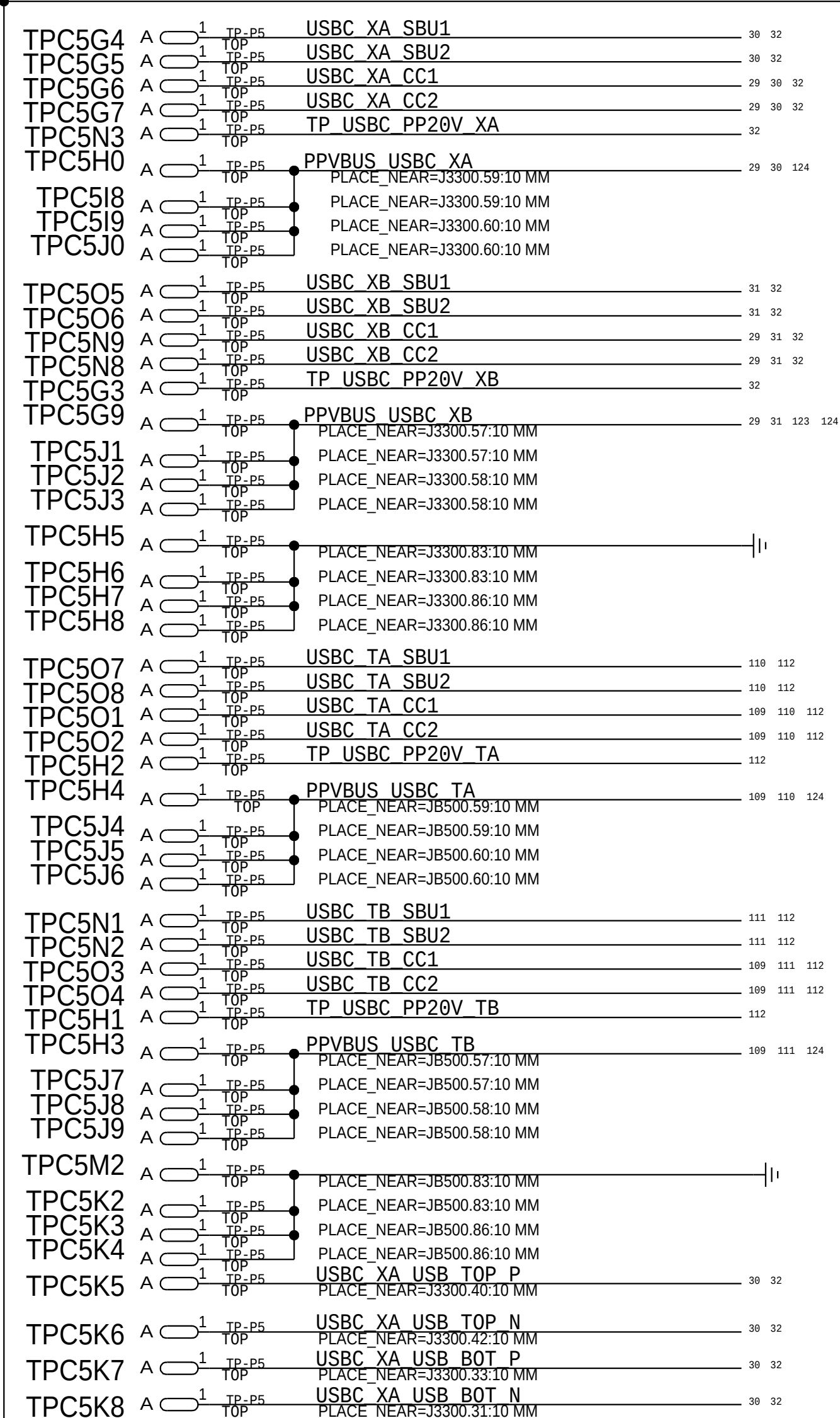


DATA	CLK	ACTION (ON BOOT)
0	0	ONLY SNK0 AVAILABLE
0	1	NORMAL OPERATION
1	0	NO SNKS AVAILABLE
1	1	ONLY SNK1 AVAILABLE

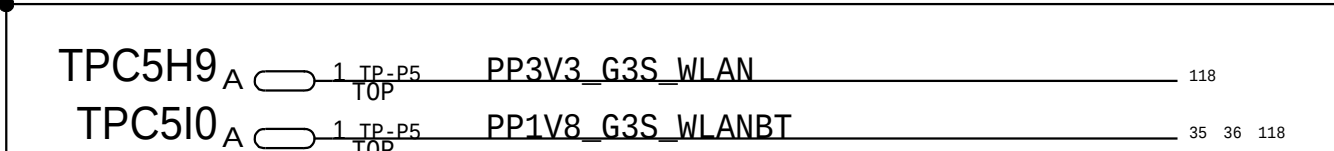
SPEAKERS



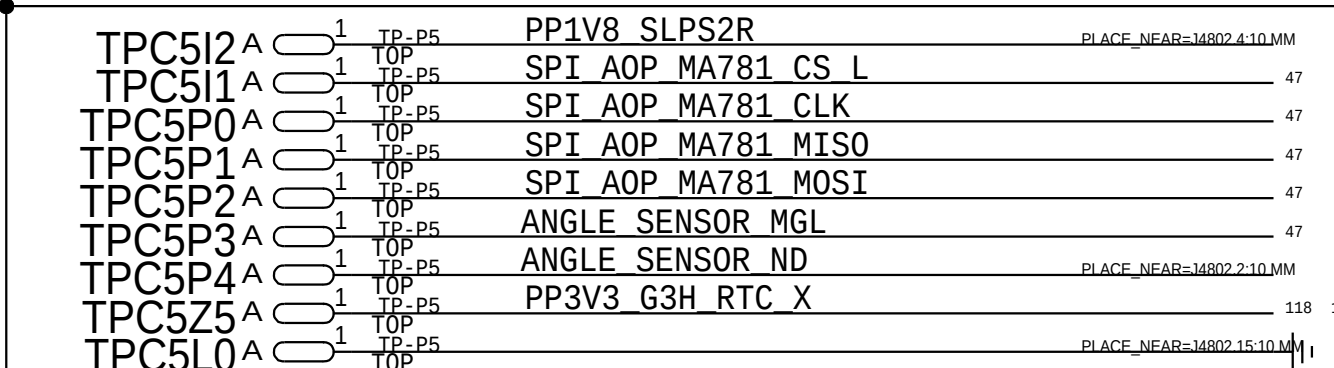
USBC (PLACE NEAR CONNECTOR)



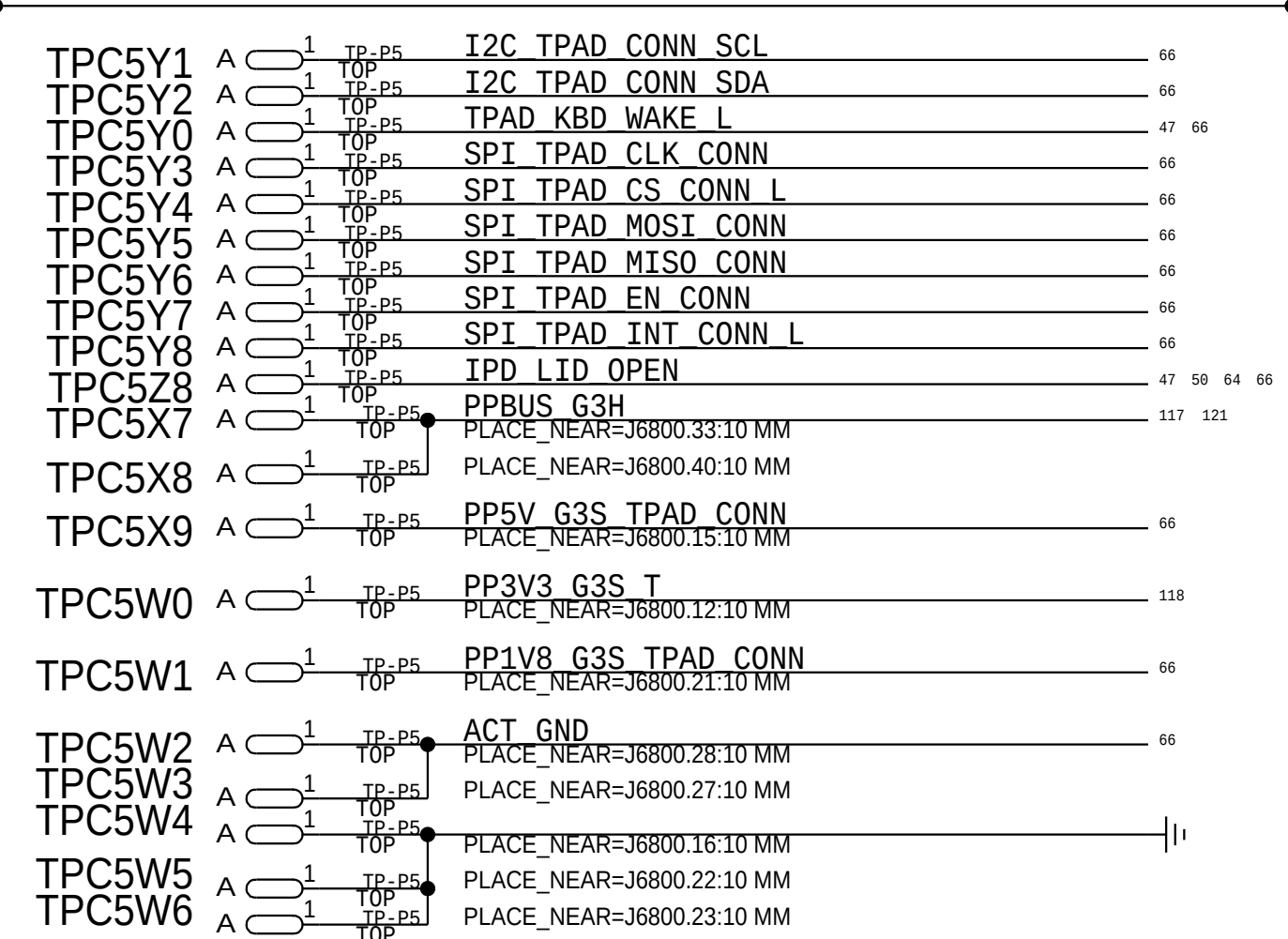
WIRELESS



LID ANGLE SENSOR



TRACKPAD



PAGE TITLE		
FCT TESTPOINTS 2		
Apple Inc.		DRAWING NUMBER 051-04492
REVISION 2.15.0		SIZE D
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PAGE 125 OF 200		
SHEET 122 OF 135		

JTAG

ACE

TPC600	TP	TP-P5	TP USBC_XA RESET_L	29	30
TPC601	CTP	TP-P5	TP USBC_TB RESET_L	109	
TPC602	CTP	TP-P5	UPC_XA SER_DBG	30	33
TPC603	CTP	TP-P5	UPC_XB SER_DBG	31	33
TPC604	CTP	TP-P5	UPC_TA SER_DBG	110	113
TPC605	CTP	TP-P5	UPC_TB SER_DBG	111	113
TPC606	CTP	TP-P5	UPC_XB GPIO1	29	31
TPC627	CTP	TP-P5	UPC_TA GPIO1	110	
TPC629	CTP	TP-P5	UPC_TB GPIO1	111	
TPC607	CTP	TP-P5	TP UPC_TA GPIO10	110	
TPC608	CTP	TP-P5	TP UPC_TB GPIO9	111	
TPC609	CTP	TP-P5	TP UPC_TB GPIO9	111	
TPC610	CTP	TP-P5	TP UPC_TB GPIO10	111	

TBT

107	27	18	14	BI	JTAG_ISP_TCK	FUNC_TEST=TRUE	
107	27	18	14	BI	JTAG_ISP_TDI	FUNC_TEST=TRUE	
107	27	18		BI	JTAG_ISP_TDO	FUNC_TEST=TRUE	
27	15			BI	JTAG_TBT_X_TMS	FUNC_TEST=TRUE	
107	15			BI	JTAG_TBT_T_TMS	FUNC_TEST=TRUE	
27				BI	TBT_X_TEST_EN	FUNC_TEST=TRUE	
27				BI	TBT_X_TEST_PWR_GOOD	FUNC_TEST=TRUE	
107				BI	TBT_T_TEST_EN	FUNC_TEST=TRUE	
107				BI	TBT_T_TEST_PWR_GOOD	FUNC_TEST=TRUE	

GPU

115	90			BI	GPU_JTAG_TESTEN		
115	90			BI	GPU_JTAG_TCK		
115	90			BI	GPU_JTAG_TDI		
115	90			BI	GPU_JTAG_TDO		
115	90			BI	GPU_JTAG_TMS		
115	90			BI	GPU_JTAG_TRST_L		
115	90			BI	GPU_RESET_R_L		
97				BI	GPU_RESET_L_R		

VRAM

94	93			BI	GPU_VRAM_TCK		
				BI	GPU_VRAM_CONN_TDI	CKPLUS_MWAVE=SINGLE_NODENET	
				BI	GPU_VRAM_CONN_TDO	CKPLUS_MWAVE=SINGLE_NODENET	
94	93			BI	GPU_VRAM_TMS		

SOC

39				BI	TP_JTAG_SOC_TRST_L	FUNC_TEST=TRUE	
39				BI	SOC_JTAG_SEL	FUNC_TEST=TRUE	
39				BI	SOC_TESTMODE	FUNC_TEST=TRUE	

H9M BOUNDARY SCAN TESTPOINTS ON FCT TP PAGE

SSD BOUNDARY SCAN

91	90	89	88	39	IN	SSD0_SWCLK_UART_R2D	FUNC_TEST=TRUE
91	90	89	88	39	IN	SSD0_SWDIO_UART_D2R	FUNC_TEST=TRUE
86	85	84	83	39	IN	SSD1_SWCLK_UART_R2D	FUNC_TEST=TRUE
86	85	84	83	39	IN	SSD1_SWDIO_UART_D2R	FUNC_TEST=TRUE
91	90	89	88	39	IN	SSD0_S4F_JTAG_SEL	FUNC_TEST=TRUE
88				IN	SSD0_S4E0_JTAG_TDI	FUNC_TEST=TRUE	
88				IN	SSD0_S4E0_JTAG_TDO	FUNC_TEST=TRUE	
90	89			IN	SSD0_S4E1_JTAG_TDO	FUNC_TEST=TRUE	
91	90			IN	SSD0_S4E2_JTAG_TDO	FUNC_TEST=TRUE	
91				IN	SSD0_S4E3_JTAG_TDO	FUNC_TEST=TRUE	
86	85	84	83	39	IN	SSD1_S4E_JTAG_SEL	FUNC_TEST=TRUE
88				IN	SSD1_S4E0_JTAG_TDI	FUNC_TEST=TRUE	
86	84			IN	SSD1_S4E0_JTAG_TDO	FUNC_TEST=TRUE	
86	85	84		IN	SSD1_S4E1_JTAG_TDO	FUNC_TEST=TRUE	
86	85			IN	SSD1_S4E2_JTAG_TDO	FUNC_TEST=TRUE	
86				IN	SSD1_S4E3_JTAG_TDO	FUNC_TEST=TRUE	

TPC690A	CTP	TP-P5	SSD0_S4E0_UART_TX	88	
TPC691A	CTP	TP-P5	SSD1_S4E0_UART_TX	83	
TPC692A	CTP	TP-P5	SSD0_S4E1_UART_TX	89	
TPC693A	CTP	TP-P5	SSD1_S4E1_UART_TX	84	
TPC694A	CTP	TP-P5	SSD0_S4E2_UART_TX	90	
TPC695A	CTP	TP-P5	SSD0_S4E3_UART_TX	91	
TPC696A	CTP	TP-P5	SSD1_S4E2_UART_TX	86	
TPC697A	CTP	TP-P5	SSD0_S4E1_DR00P_L	89	
TPC698A	CTP	TP-P5	SSD1_S4E2_UART_TX	89	
TPC699A	CTP	TP-P5	SSD0_CLKREQ2_L	41	47
TPC699A	CTP	TP-P5	SSD0_S4E3_DR00P_L	91	
TPC698A	CTP	TP-P5	SSD0_S4E2_DR00P_L	90	
TPC69CA	CTP	TP-P5	SSD0_CLKREQ3_L	41	47
TPC69DA	CTP	TP-P5	SSD0_S4E0_DR00P_L	88	

KEYBOARD

TPC6H0	CTP	TP-P5	CAPSLCK_LED_DRV	65	
TPC6H1	CTP	TP-P5	KBD_RIGHT_SHIFT_L	65	
TPC6H2	CTP	TP-P5	KBD_LEFT_OPTION_L	65	
TPC6H3	CTP	TP-P5	KBD_CONTROL_L	65	
TPC6H4	CTP	TP-P5	IOXP_I2C_SCL	65	
TPC6H5	CTP	TP-P5	IOXP_I2C_SDA	65	

EE TESTS SWE

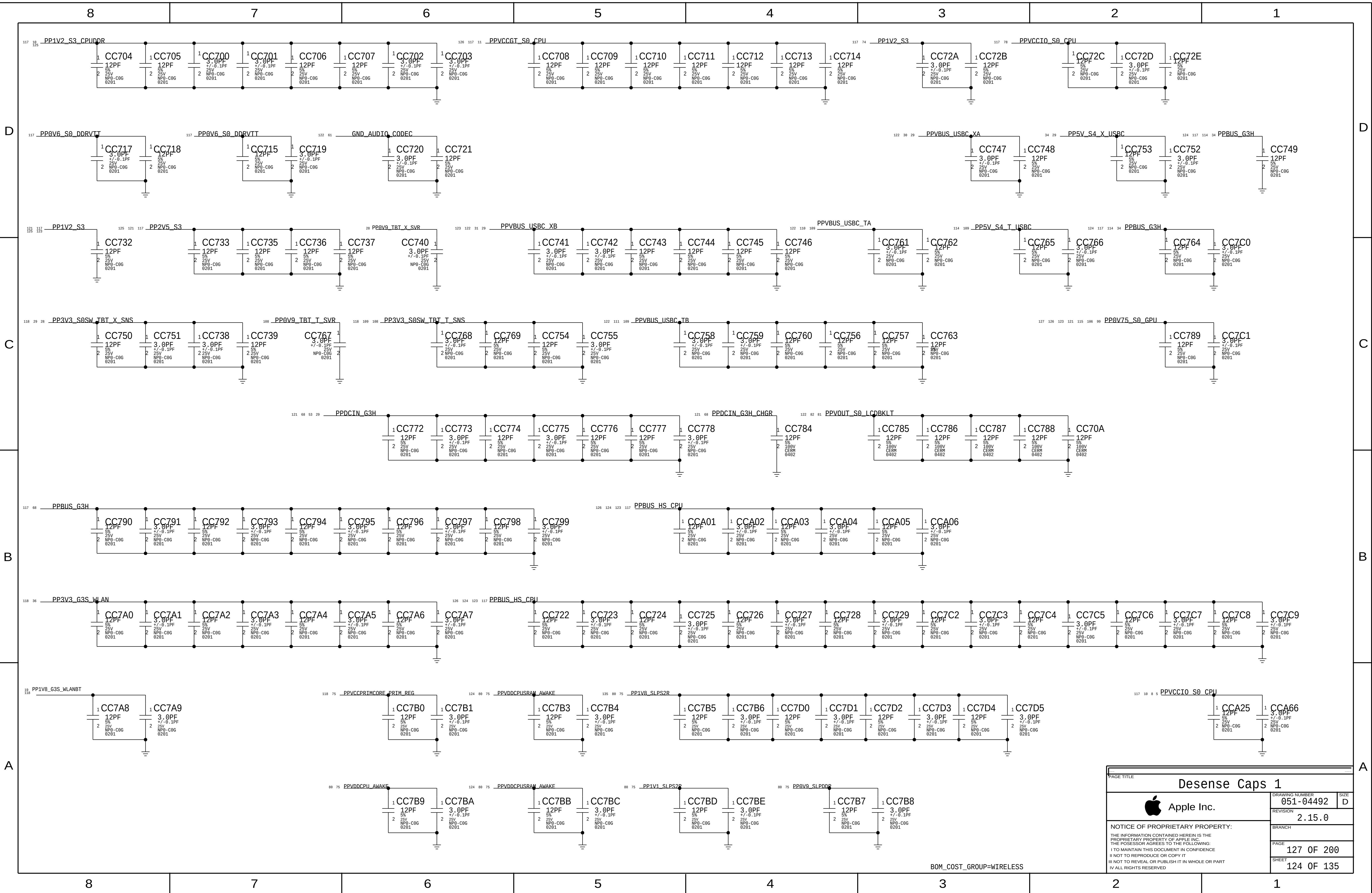
TPC6F4	CTP	TP-P5	PVDD075GPU_ISNS_P	50	100
TPC6F5	CTP	TP-P5	PVDD075GPU_ISNS_N	50	100
TPC6F6	CTP	TP-P5	ISNS_GPU_1V8_P	50	
TPC6F7	CTP	TP-P5	ISNS_GPU_1V8_N	50	
TPC650	CTP	TP-P5	ISNS_HS_COMPUTING_P	53	
TPC651	CTP	TP-P5	ISNS_HS_COMPUTING_N	53	
TPC652	CTP	TP-P5	ISNS_HS_OTHER5V_P	53	
TPC653	CTP	TP-P5	ISNS_HS_OTHER5V_N	53	
TPC654	CTP	TP-P5	ISNS_HS_3V3_X_P	53	
TPC655	CTP	TP-P5	ISNS_HS_3V3_X_N	53	
TPC656	CTP	TP-P5	ISNS_HS_3V3_T_P	53	
TPC657	CTP	TP-P5	ISNS_HS_3V3_T_N	53	
TPC658	CTP	TP-P5	ISNS_LCDCLKLT_P	53	81
TPC659	CTP	TP-P5	ISNS_LCDCLKLT_N	53	81
TPC660	CTP	TP-P5	ISNS_1V0_P	54	
TPC661	CTP	TP-P5	ISNS_1V0_N	54	
TPC662	CTP	TP-P5	ISNS_CPUDDR_P	54	74
TPC663	CTP	TP-P5	ISNS_CPUDDR_N	54	74
TPC664	CTP	TP-P5	ISNS_CPUVDDQ_P	54	
TPC665	CTP	TP-P5	ISNS_CPUVDDQ_N	54	
TPC666	CTP	TP-P5	CPUVR_ISNS_P	54	
TPC667	CTP	TP-P5	CPUVR_ISNS_N	54	
TPC668	CTP	TP-P5	ISNS_WLAN_P	54	
TPC669	CTP	TP-P5	ISNS_WLAN_P	54	
TPC670	CTP	TP-P5	ISNS_WL1V8_P	54	
TPC671	CTP	TP-P5	ISNS_WL1V8_N	54	
TPC672	CTP	TP-P5	ISNS_LCDPANEL_P	55	82
TPC673	CTP	TP-P5	ISNS_LCDPANEL_N	55	82
TPC674	CTP	TP-P5	ISNS_CALPE_P	56	
TPC675	CTP	TP-P5	ISNS_CALPE_N	56	
TPC676	CTP	TP-P5	CPUGT_ISNS_R_P	56	
TPC677	CTP	TP-P5	CPUGT_ISNS_R_N	56	
TPC678	CTP	TP-P5	CPUSA_ISNS_P	56	71
TPC679	CTP	TP-P5	CPUSA_ISNS_N	56	71
TPC680	CTP	TP-P5	ISNS_CPUVCCIO_P0S	56	78
TPC681	CTP	TP-P5	ISNS_CPUVCCIO_NEG	56	78
TPC683	CTP	TP-P5	PMU_GPU GFX_ISENSE	59	96
TPC684	CTP	TP-P5	PMU_GPU_SOC_ISENSE	59	96
TPC685	CTP	TP-P5	EADC2_GPU_MEM_VDDCI_ISENSE	56	96
TPC686	CTP	TP-P5	EADC2_GPU_MEM_VDDIO_ISENSE	56	96
TPC687	CTP	TP-P5	GND_EADC1_COM	53	55
TPC688	CTP	TP-P5	SMC_DCIN_ISENSE	53	59
TPC689	CTP	TP-P5	SMC_BMON_ISENSE	53	59
TPC6G0	CTP	TP-P5	ISNS_TBT_X_P	56	
TPC6G1	CTP	TP-P5	ISNS_TBT_X_N	56	
TPC6G2	CTP	TP-P5	ISNS_2V5_S3_P	54	74
TPC6G3	CTP	TP-P5	ISNS_2V5_S3_N	54	74
TPC6G4	CTP	TP-P5	ISNS_TBT_T_P	56	
TPC6G5	CTP	TP-P5	ISNS_TBT_T_N	56	
TPC6G6	CTP	TP-P5	ISNS_KBDLED_P	55	
TPC6G7	CTP	TP-P5	ISNS_KBDLED_N	55	
TPC6G9	CTP	TP-P5	GND_SMC_AVSS	55	
TPC6A2	CTP	TP-P5	ISNS_GPU_HS_P	58	
TPC6A3	CTP	TP-P5	ISNS_GPU_HS_N	58	
TPC6A4	CTP	TP-P5	SMC_PBUS_VSENSE	53	59
TPC6A5	CTP	TP-P5	PMU_CPU_VSENSE	50	59
TPC6A6	CTP	TP-P5	PMU_GPU_GFX_VSENSE	50	59
TPC6A7	CTP	TP-P5	EADC1_CPUGT_VSENSE	50	58
TPC6A8	CTP	TP-P5	GND_CALPE_AVSS	53	54
TPC6A9	CTP	TP-P5	EADC1_CPUSA_VSENSE	50	58
TPC6B0	CTP	TP-P5	PMU_GPU_SOC_VSENSE	50	59
TPC6B1	CTP	TP-P5	GND_EADC2_COM	54	55
TPC6B2	CTP	TP-P5	SMC_DCIN_VSENSE	53	55
TPC6B7	CTP	TP-P5	ISNS_PPBUS_MAIN_SSD0_P	55	
TPC6B8	CTP	TP-P5	ISNS_PPBUS_MAIN_SSD0_N	55	
TPC6B9	CTP	TP-P5	ISNS_PPBUS_MAIN_SSD1_P	55	
TPC6C0	CTP	TP-P5	ISNS_PPBUS_MAIN_SSD1_N	55	
TPC6C1	CTP	TP-P5	ISNS_P3V3_G3W_SSD0_P	55	
TPC6C2	CTP	TP-P5	ISNS_P3V3_G3W_SSD0_N	55	
TPC6C3	CTP	TP-P5	ISNS_P3V3_G3W_SSD1_P	55	
TPC6C4	CTP	TP-P5	ISNS_P3V3_G3W_SSD1_N	55	
TPC6C7	CTP	TP-P5	ISNS_T139_P	55	
TPC6C8	CTP	TP-P5	ISNS_T139_N	55	
TPC6L0	CTP	TP-P5	CHGR_CS0_R_P	60	
TPC6L1	CTP	TP-P5	CHGR_CS0_R_N	60	
TPC6L2	CTP	TP-P5	GFGPU_SUM_R_P	96	
TPC6L3	CTP	TP-P5	GFGPU_SUM_R_N	96	
TPC6L4	CTP	TP-P5	GPU_VDDCR_SOC_ISUM_P	103	104
TPC6L5	CTP	TP-P5	GPU_VDDCR_SOC_ISUM_N	103	104
TPC6L6	CTP	TP-P5	PVDDCIEMEMGPU_ISUMP_RES	105	
TPC6L7	CTP	TP-P5	PVDDCIEMEMGPU_ISUMN_RES	105	
TPC6L8	CTP	TP-P5	PVDDIOMEMGPU_ISNS1_P	105	
TPC6L9	CTP	TP-P5	PVDDIOMEMGPU_ISNS1_N	105	
TPC6B4	CTP	TP-P5	CHGR_CSI_R_P	60	
TPC6B5	CTP	TP-P5	CHGR_CSI_R_N	60	
TPC6B6	CTP	TP-P5	TP_SOC_TST_CLKOUT	38	

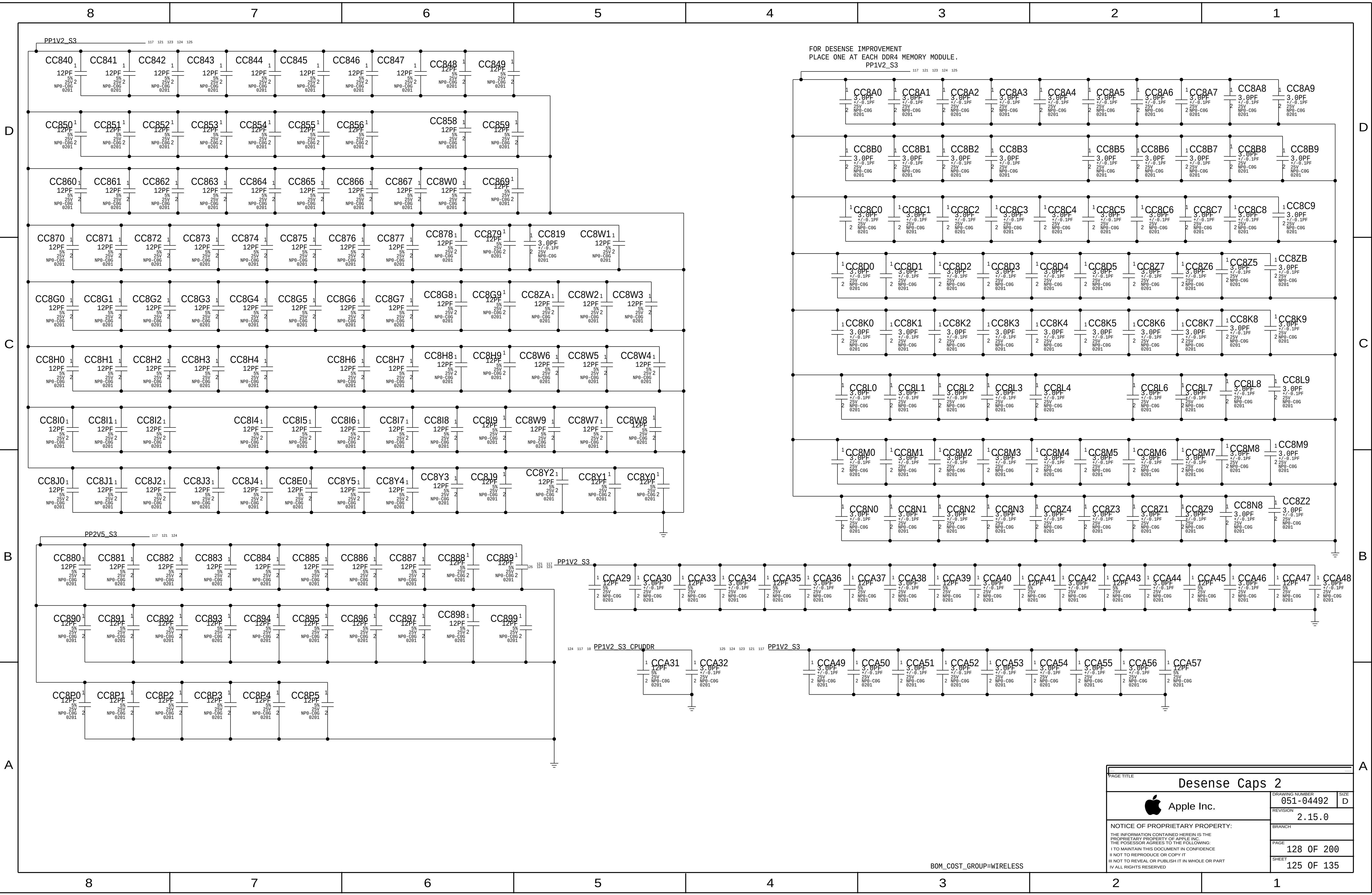
PPC690	SM	PP	1	P3MM	PMU_CLK32K_SOC	39	77	121
PPC657	SM	PP	1	P3MM	PPVBUS_USBC_XB	29	31	122
PPC658	SM	PP	1	P3MM	PPDCIN_XB_G3H_F	29	31	
PPC659	SM	PP	1	P3MM				
PPC660	SM	PP	1	P3MM				

4 WIRE ICT

TPC6E0	CTP	TP-P5	VSNS_PPGFX_S0_GPU_POS	1	2	PPGFX_S0_GPU	59	99	100	104	121
TPC6E1	CTP	TP-P5	VSNS_PPVCC_S0_CPU_POS	1	2	PPVCC_S0_CPU	117	121			
TPC6E2	CTP	TP-P5	VSNS_PPVCCGT_S0_CPU_POS	1	2	PPVCCGT_S0_CPU	117	121			
TPC6E3	CTP	TP-P5	VSNS_PPVCCSA_S0_CPU_POS	1	2	PPVCCSA_S0_CPU	117	121			
TPC6E4	CTP	TP-P5	VSNS_PPVDDCPU_AWAKE_POS	1	2	PPVDDCPU_AWAKE	80	121			
TPC6E5	CTP	TP-P5	VSNS_PP0V82_SLPDDR_POS	1	2	PP0V82_SLPDDR	80	121			
TPC6J0	CTP	TP-P5	VSNS_PP1V2_S3_CPUDDR_POS	1	2	PP1V2_S3_CPUDDR	117	122			
TPC6J1	CTP	TP-P5	VSNS_PP1V35_MEMIO_S0_GPU_POS	1	2	PP1V35_MEMIO_S0_GPU	90	94	90	100	105
TPC6J2	CTP	TP-P5	VSNS_PPSOC_S0P_GPU_POS	1	2	PPSOC_S0_GPU	50	99	104	121	126
TPC6J3	CTP	TP-P5	VSNS_PPVIN_S0_CPUVR_VIN_POS	1	2	PPVIN_S0_CPUVR_VIN	69				
TPCJ4	CTP	TP-P5	VSNS_PP3V3_G3H_T_POS	1	2	PP3V3_G3H_T	65	110	121		
TPC6J5	CTP	TP-P5	VSNS_PPVCCIO_S0_CPU_POS	1	2	PPVCCIO_S0_CPU	117	121			
TPC6J6	CTP	TP-P5	VSNS_PP0V75_S0_GPU_POS	1	2	PP0V75_S0_GPU	99	100	100	117	121
TPC6K5	CTP	TP-P5	VSNS_PP1V05_PRIM_POS	1	2	PP1V05_PRIM	117	121			

PC6K6	TP	TP-P5	VSNS PP1V2 S3 P0S	XW6E28 ^{SH}	1	2	PP1V2 S3	117	121	124	125
PC6K7	TP	TP-P5	VSNS PP1V8 S0 GPU P0S	XW6E29 ^{SH}	1	2	PP1V8 S0 GPU	121	126	127	128 99
PC6K8	TP	TP-P5	VSNS PP1V8 S0 GPU REG P0S	XW6E30 ^{SH}	1	2	PP1V8 S0 GPU REG	50	100	120	
PC6K9	TP	TP-P5	VSNS PP1V8 SLPS2R P0S	XW6E31 ^{SH}	1	2	PP1V8 SLPS2R	80	121	122	
PC6M0	TP	TP-P5	VSNS PP2V5 NAND SSD0 P0S	XW6E32 ^{SH}	1	2	PP2V5 NAND SSD0	88	89	90	91 92
PC6M1	TP	TP-P5	VSNS PP2V5 NAND SSD1 P0S	XW6E33 ^{SH}	1	2	PP2V5 NAND SSD1	80	84	85	86 87
PC6M2	TP	TP-P5	VSNS PP3V3 G3H RTC X P0S	XW6E34 ^{SH}	1	2	PP3V3 G3H RTC X	110	122		
PC6M3	TP	TP-P5	VSNS PPVCCPRIMCORE PRIM REG P0S	XW6E35 ^{SH}	1	2	PPVCCPRIMCORE PRIM REG	118			
PC6M4	TP	TP-P5	VSNS PP5V G3S P0S	XW6E36 ^{SH}	1	2	PP5V G3S	110	121	122	
PC6M5	TP	TP-P5	VSNS PPBUS HS CPU P0S	XW6E37 ^{SH}	1	2	PPBUS HS CPU	117	124	120	
PC6M6	TP	TP-P5	VSNS PPBUS HS GPU P0S	XW6E38 ^{SH}	1	2	PPBUS HS GPU	117	121	120	
PC6M7	TP	TP-P5	VSNS PPBUS HS 0TH5V P0S	XW6E39 ^{SH}	1	2	PPBUS HS 0TH5V	117			





PAGE TITLE		
Desense Caps 2		
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	REVISION	2.15.0
	BRANCH	
	PAGE	128 OF 200
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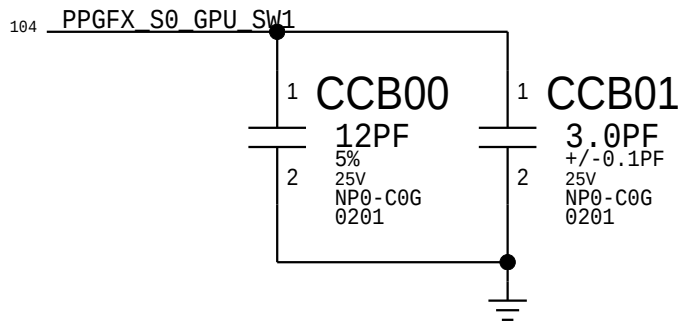
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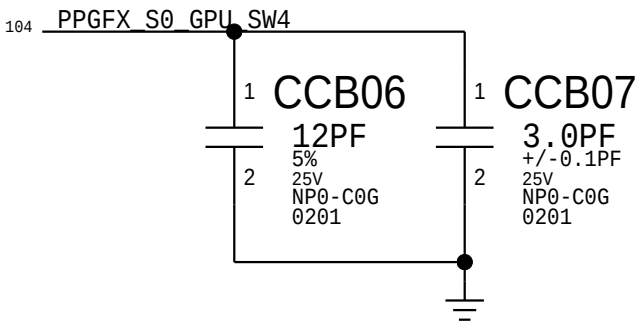
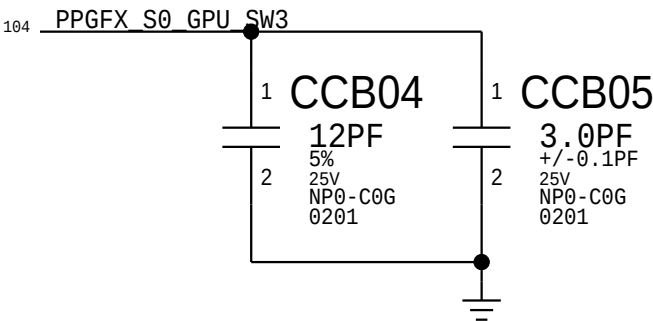
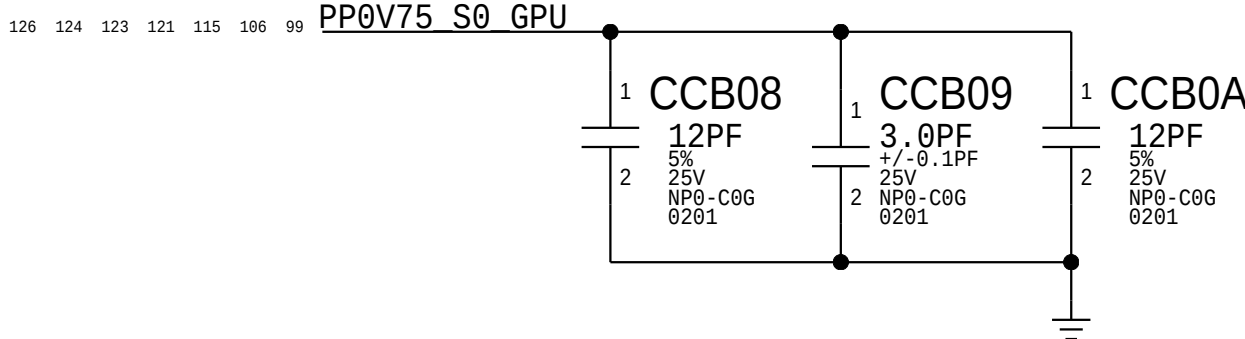
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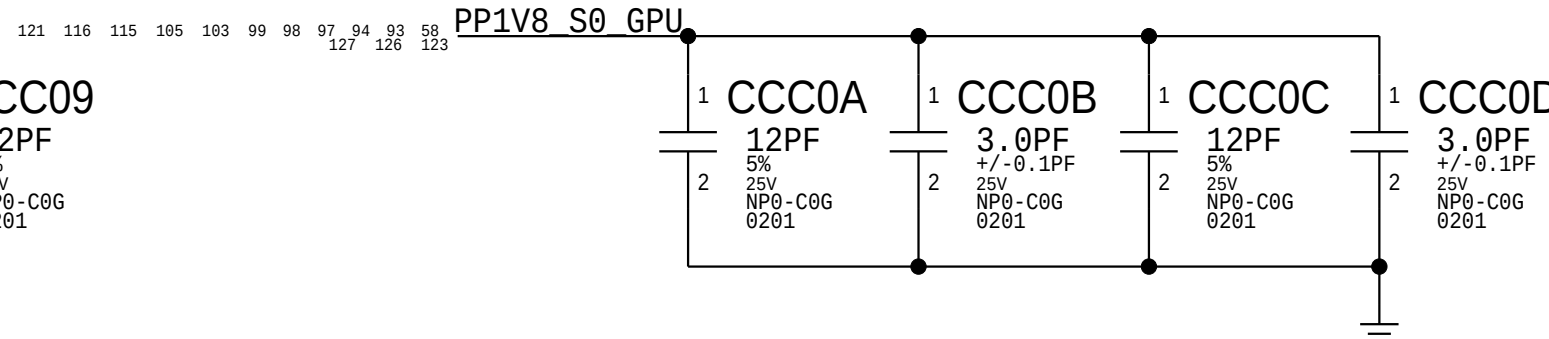
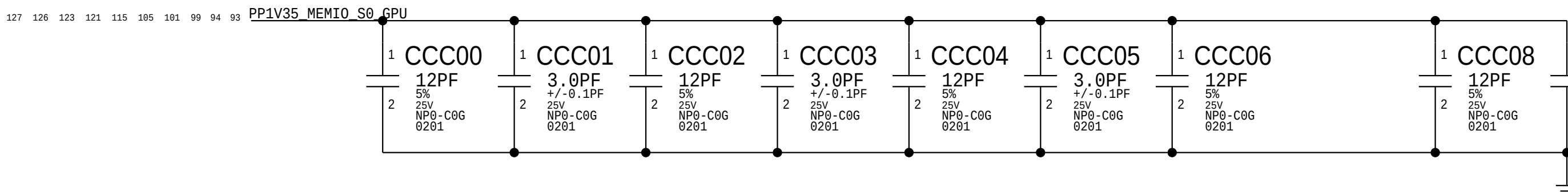
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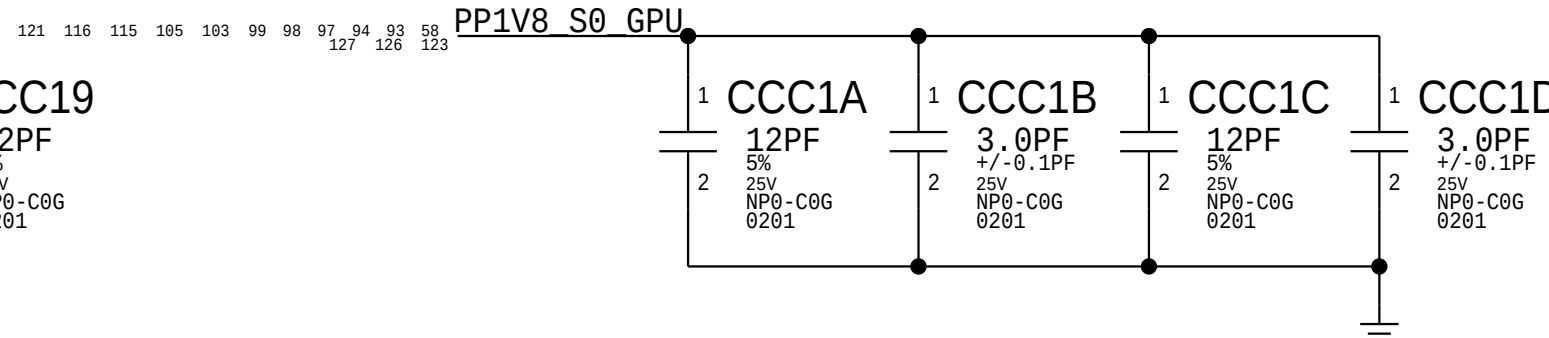
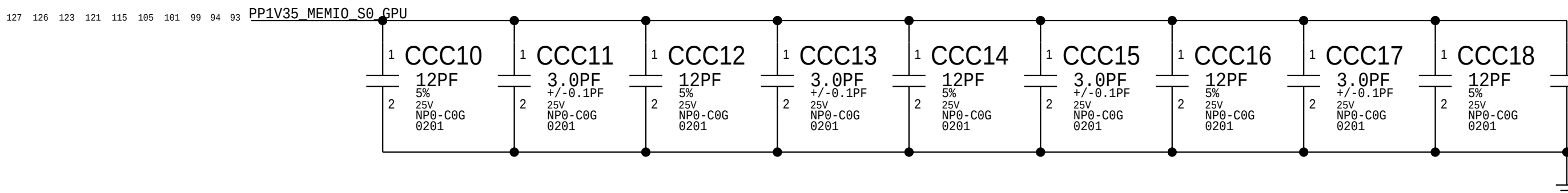
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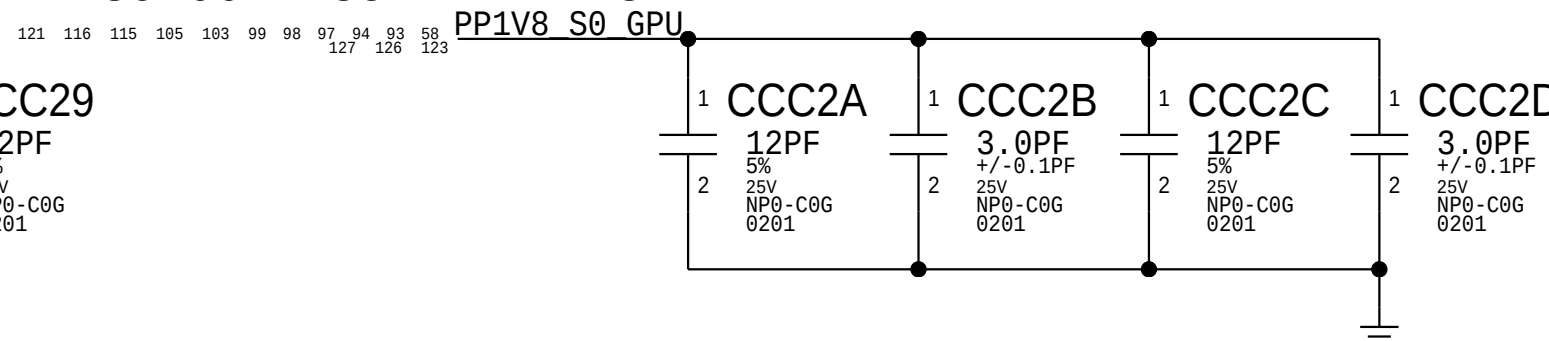
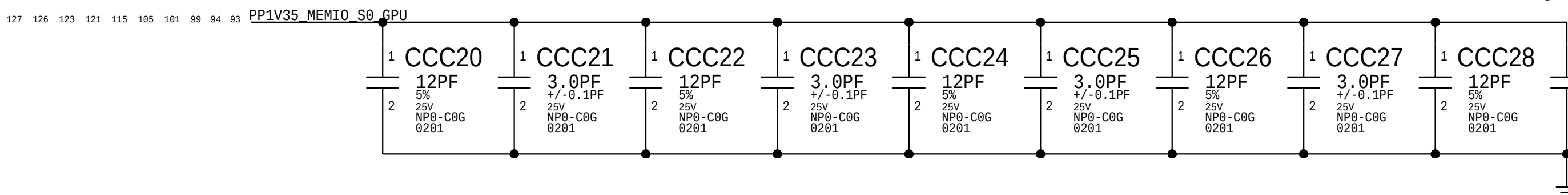
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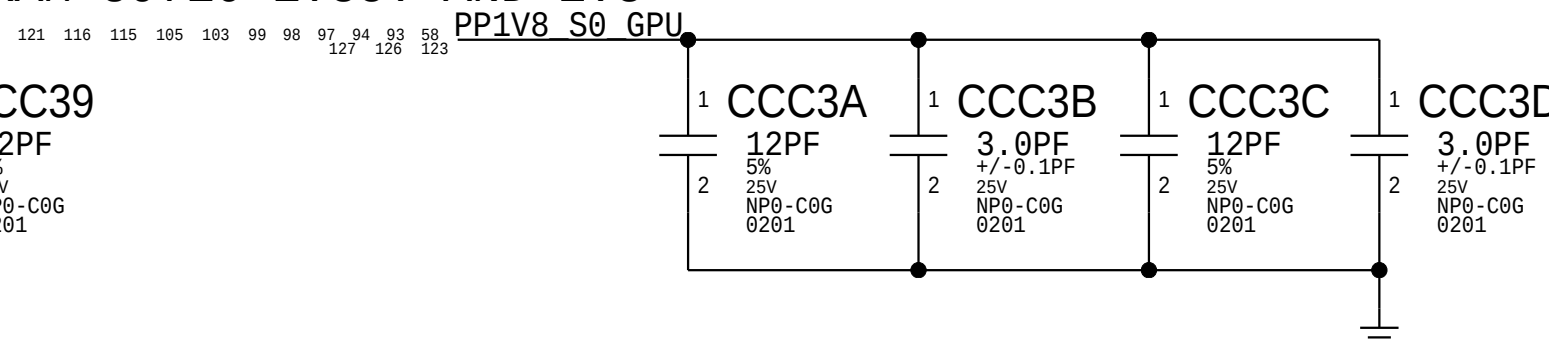
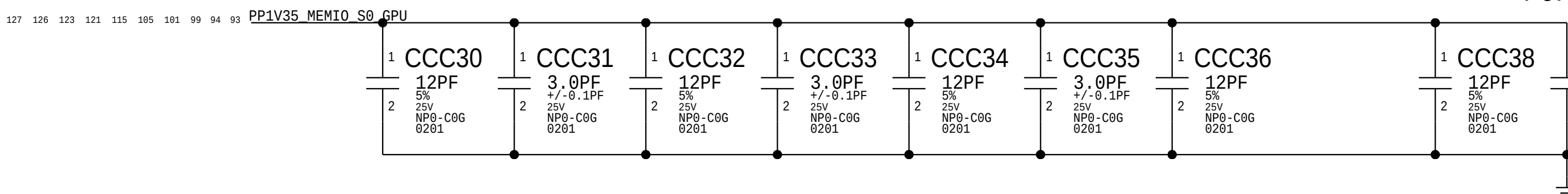
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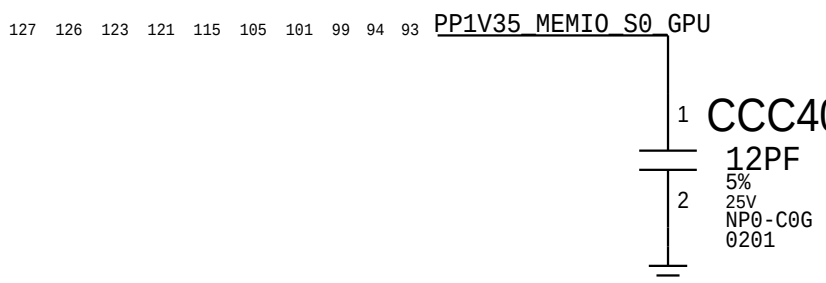
FOR VRAM U9700 1V35V AND 1V8



FOR VRAM U9710 1V35V AND 1V8



CLOSE TO 1V35V REG OUTPUT



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8		7		6		5		4		3		2		1		
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		PAGE	
		SHEET	
		140 OF 200	
		129 OF 135	

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	2.15.0		
	BRANCH		
	PAGE		
	141 OF 200		
	SHEET		
	130 OF 135		

Proto XLA BOMs

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		PAGE	143 OF 200
		SHEET	131 OF 135

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639-08641	MLB, 6C-2.6G, HY-32, ULA, HY-8GB, WD-1TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: HY-32GB, GPU: ULA, VRAM: HY-8GB, SSD: WD-1TB																																																																									
C	<table><tr><th>BOM NUMBER</th><th>BOM NAME</th><th>BOM OPTIONS</th></tr><tr><td>639-08608</td><td>MLB, 8C-2.3G, HY-16, ULA, MC-4GB, TS-1TB, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: ULA, VRAM: MC-4GB, SSD: TS-1TB</td></tr><tr><td>639-08609</td><td>MLB, 8C-2.3G, MC-16, PRA, MC-4GB, WD-8TB, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: MC-16GB, GPU: PRA, VRAM: MC-4GB, SSD: WD-8TB</td></tr><tr><td>639-08610</td><td>MLB, 8C-2.4G, HY-32, ULA, SS-8GB, WD-2TB, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.4G, MEM: HY-32GB, GPU: ULA, VRAM: SS-8GB, SSD: WD-2TB</td></tr><tr><td>639-08639</td><td>MLB, 8C-2.4G, MC-16, PRA, MC-4GB, WD-512, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.4G, MEM: MC-16GB, GPU: PRA, VRAM: MC-4GB, SSD: WD-512</td></tr><tr><td>639-08640</td><td>MLB, 6C-2.6G, HY-16, PRA, MC-4GB, WD-256, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: HY-16GB, GPU: PRA, VRAM: MC-4GB, SSD: WD-256</td></tr><tr><td>639-08641</td><td>MLB, 6C-2.6G, HY-32, ULA, HY-8GB, WD-1TB, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: HY-32GB, GPU: ULA, VRAM: HY-8GB, SSD: WD-1TB</td></tr><tr><td>639-08840</td><td>MLB, 8C-2.3G, HY-16, ULA, MC-4GB, TS-256, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: ULA, VRAM: MC-4GB, SSD: TS-256</td></tr><tr><td>639-08841</td><td>MLB, 6C-2.6G, MC-16, PRA, SS-4GB, TS-256, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-16GB, GPU: PRA, VRAM: SS-4GB, SSD: TS-256</td></tr><tr><td>639-08863</td><td>MLB, 8C-2.3G, MC-16, ULA, MC-4GB, TS-1TB, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: MC-16GB, GPU: ULA, VRAM: MC-4GB, SSD: TS-1TB</td></tr><tr><td>639-08916</td><td>MLB, 6C-2.6G, MC-32, ULA, SS-4GB, TS-512, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-32GB, GPU: ULA, VRAM: SS-4GB, SSD: TS-512</td></tr><tr><td>639-08917</td><td>MLB, 8C-2.4G, HY-32, ULA, SS-8GB, HY-4TB, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.4G, MEM: HY-32GB, GPU: ULA, VRAM: SS-8GB, SSD: HY-4TB</td></tr><tr><td>639-08918</td><td>MLB, 8C-2.3G, HY-32, ULA, MC-4GB, WD-8TB, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-32GB, GPU: ULA, VRAM: MC-4GB, SSD: WD-8TB</td></tr><tr><td>639-09008</td><td>MLB, 8C-2.3G, HY-16, ULA, MC-4GB, TS-1TB, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: ULA, VRAM: MC-4GB, SSD: TS-1TB</td></tr><tr><td>639-09014</td><td>MLB, 6C-2.6G, MC-16, PRA, SS-4GB, WD-256, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-16GB, GPU: PRA, VRAM: SS-4GB, SSD: WD-256</td></tr><tr><td>639-09015</td><td>MLB, 8C-2.3G, HY-16, ULA, MC-4GB, WD-512, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: ULA, VRAM: MC-4GB, SSD: WD-512</td></tr><tr><td>639-09016</td><td>MLB, 6C-2.6G, MC-16, PRA, SS-4GB, WD-256, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-16GB, GPU: PRA, VRAM: SS-4GB, SSD: WD-256</td></tr><tr><td>639-09017</td><td>MLB, 6C-2.6G, MC-16, PRA, SS-4GB, WD-256, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-16GB, GPU: PRA, VRAM: SS-4GB, SSD: WD-256</td></tr><tr><td>639-09018</td><td>MLB, 8C-2.4G, HY-32, PRA, SS-4GB, WD-256, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.4G, MEM: HY-32GB, GPU: PRA, VRAM: SS-4GB, SSD: WD-256</td></tr></table>														BOM NUMBER	BOM NAME	BOM OPTIONS	639-08608	MLB, 8C-2.3G, HY-16, ULA, MC-4GB, TS-1TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: ULA, VRAM: MC-4GB, SSD: TS-1TB	639-08609	MLB, 8C-2.3G, MC-16, PRA, MC-4GB, WD-8TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: MC-16GB, GPU: PRA, VRAM: MC-4GB, SSD: WD-8TB	639-08610	MLB, 8C-2.4G, HY-32, ULA, SS-8GB, WD-2TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.4G, MEM: HY-32GB, GPU: ULA, VRAM: SS-8GB, SSD: WD-2TB	639-08639	MLB, 8C-2.4G, MC-16, PRA, MC-4GB, WD-512, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.4G, MEM: MC-16GB, GPU: PRA, VRAM: MC-4GB, SSD: WD-512	639-08640	MLB, 6C-2.6G, HY-16, PRA, MC-4GB, WD-256, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: HY-16GB, GPU: PRA, VRAM: MC-4GB, SSD: WD-256	639-08641	MLB, 6C-2.6G, HY-32, ULA, HY-8GB, WD-1TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: HY-32GB, GPU: ULA, VRAM: HY-8GB, SSD: WD-1TB	639-08840	MLB, 8C-2.3G, HY-16, ULA, MC-4GB, TS-256, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: ULA, VRAM: MC-4GB, SSD: TS-256	639-08841	MLB, 6C-2.6G, MC-16, PRA, SS-4GB, TS-256, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-16GB, GPU: PRA, VRAM: SS-4GB, SSD: TS-256	639-08863	MLB, 8C-2.3G, MC-16, ULA, MC-4GB, TS-1TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: MC-16GB, GPU: ULA, VRAM: MC-4GB, SSD: TS-1TB	639-08916	MLB, 6C-2.6G, MC-32, ULA, SS-4GB, TS-512, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-32GB, GPU: ULA, VRAM: SS-4GB, SSD: TS-512	639-08917	MLB, 8C-2.4G, HY-32, ULA, SS-8GB, HY-4TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.4G, MEM: HY-32GB, GPU: ULA, VRAM: SS-8GB, SSD: HY-4TB	639-08918	MLB, 8C-2.3G, HY-32, ULA, MC-4GB, WD-8TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-32GB, GPU: ULA, VRAM: MC-4GB, SSD: WD-8TB	639-09008	MLB, 8C-2.3G, HY-16, ULA, MC-4GB, TS-1TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: ULA, VRAM: MC-4GB, SSD: TS-1TB	639-09014	MLB, 6C-2.6G, MC-16, PRA, SS-4GB, WD-256, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-16GB, GPU: PRA, VRAM: SS-4GB, SSD: WD-256	639-09015	MLB, 8C-2.3G, HY-16, ULA, MC-4GB, WD-512, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: ULA, VRAM: MC-4GB, SSD: WD-512	639-09016	MLB, 6C-2.6G, MC-16, PRA, SS-4GB, WD-256, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-16GB, GPU: PRA, VRAM: SS-4GB, SSD: WD-256	639-09017	MLB, 6C-2.6G, MC-16, PRA, SS-4GB, WD-256, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-16GB, GPU: PRA, VRAM: SS-4GB, SSD: WD-256	639-09018	MLB, 8C-2.4G, HY-32, PRA, SS-4GB, WD-256, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.4G, MEM: HY-32GB, GPU: PRA, VRAM: SS-4GB, SSD: WD-256	C			
	BOM NUMBER	BOM NAME	BOM OPTIONS																																																																								
	639-08608	MLB, 8C-2.3G, HY-16, ULA, MC-4GB, TS-1TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: ULA, VRAM: MC-4GB, SSD: TS-1TB																																																																								
	639-08609	MLB, 8C-2.3G, MC-16, PRA, MC-4GB, WD-8TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: MC-16GB, GPU: PRA, VRAM: MC-4GB, SSD: WD-8TB																																																																								
	639-08610	MLB, 8C-2.4G, HY-32, ULA, SS-8GB, WD-2TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.4G, MEM: HY-32GB, GPU: ULA, VRAM: SS-8GB, SSD: WD-2TB																																																																								
	639-08639	MLB, 8C-2.4G, MC-16, PRA, MC-4GB, WD-512, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.4G, MEM: MC-16GB, GPU: PRA, VRAM: MC-4GB, SSD: WD-512																																																																								
	639-08640	MLB, 6C-2.6G, HY-16, PRA, MC-4GB, WD-256, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: HY-16GB, GPU: PRA, VRAM: MC-4GB, SSD: WD-256																																																																								
	639-08641	MLB, 6C-2.6G, HY-32, ULA, HY-8GB, WD-1TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: HY-32GB, GPU: ULA, VRAM: HY-8GB, SSD: WD-1TB																																																																								
	639-08840	MLB, 8C-2.3G, HY-16, ULA, MC-4GB, TS-256, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: ULA, VRAM: MC-4GB, SSD: TS-256																																																																								
	639-08841	MLB, 6C-2.6G, MC-16, PRA, SS-4GB, TS-256, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-16GB, GPU: PRA, VRAM: SS-4GB, SSD: TS-256																																																																								
	639-08863	MLB, 8C-2.3G, MC-16, ULA, MC-4GB, TS-1TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: MC-16GB, GPU: ULA, VRAM: MC-4GB, SSD: TS-1TB																																																																								
	639-08916	MLB, 6C-2.6G, MC-32, ULA, SS-4GB, TS-512, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-32GB, GPU: ULA, VRAM: SS-4GB, SSD: TS-512																																																																								
	639-08917	MLB, 8C-2.4G, HY-32, ULA, SS-8GB, HY-4TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.4G, MEM: HY-32GB, GPU: ULA, VRAM: SS-8GB, SSD: HY-4TB																																																																								
	639-08918	MLB, 8C-2.3G, HY-32, ULA, MC-4GB, WD-8TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-32GB, GPU: ULA, VRAM: MC-4GB, SSD: WD-8TB																																																																								
	639-09008	MLB, 8C-2.3G, HY-16, ULA, MC-4GB, TS-1TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: ULA, VRAM: MC-4GB, SSD: TS-1TB																																																																								
	639-09014	MLB, 6C-2.6G, MC-16, PRA, SS-4GB, WD-256, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-16GB, GPU: PRA, VRAM: SS-4GB, SSD: WD-256																																																																								
	639-09015	MLB, 8C-2.3G, HY-16, ULA, MC-4GB, WD-512, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: ULA, VRAM: MC-4GB, SSD: WD-512																																																																								
	639-09016	MLB, 6C-2.6G, MC-16, PRA, SS-4GB, WD-256, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-16GB, GPU: PRA, VRAM: SS-4GB, SSD: WD-256																																																																								
	639-09017	MLB, 6C-2.6G, MC-16, PRA, SS-4GB, WD-256, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-16GB, GPU: PRA, VRAM: SS-4GB, SSD: WD-256																																																																								
	639-09018	MLB, 8C-2.4G, HY-32, PRA, SS-4GB, WD-256, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.4G, MEM: HY-32GB, GPU: PRA, VRAM: SS-4GB, SSD: WD-256																																																																								
B	<table><tr><th>BOM NUMBER</th><th>BOM NAME</th><th>BOM OPTIONS</th></tr><tr><td>939-08060</td><td>MLB, NO CPU, NO GPU, NO SSD, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV</td></tr><tr><td>939-08061</td><td>MLB, CPU INTERPOSER, NO GPU, NO SSD, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: INTERPOSER</td></tr><tr><td>939-08062</td><td>MLB, NO CPU, GPU ADPTR VDDCR, NO SSD, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, GPU: ADPTR_VDDCR</td></tr><tr><td>939-08063</td><td>MLB, NO CPU, GPU ADPTR VMEM, NO SSD, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, GPU: ADPTR_VMEM</td></tr><tr><td>939-08197</td><td>MLB, 6C-2.6G, MC-32, UFU, SS-8GB, WD-4TB, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-32GB, GPU: UFU, VRAM: SS-8GB, SSD: WD-4TB</td></tr><tr><td>939-08198</td><td>MLB, 6C-2.6G, MC-32, USU, SS-8GB, WD-4TB, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-32GB, GPU: USU, VRAM: SS-8GB, SSD: WD-4TB</td></tr><tr><td>939-08199</td><td>MLB, 8C-2.3G, HY-16, UFU, MC-4GB, TS-1TB, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: UFU, VRAM: MC-4GB, SSD: TS-1TB</td></tr><tr><td>939-08200</td><td>MLB, 8C-2.3G, HY-16, USU, MC-4GB, TS-1TB, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: USU, VRAM: MC-4GB, SSD: TS-1TB</td></tr><tr><td>939-08201</td><td>MLB, 8C-2.3G, HY-16, UFU, SS-4GB, TS-512, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: UFU, VRAM: SS-4GB, SSD: TS-512</td></tr><tr><td>939-08202</td><td>MLB, 8C-2.3G, HY-16, USU, SS-4GB, TS-512, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: USU, VRAM: SS-4GB, SSD: TS-512</td></tr><tr><td>939-08203</td><td>MLB, 6C-2.6G, HY-32, UFS, HY-8GB, WD-8TB, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: HY-32GB, GPU: UFS, VRAM: HY-8GB, SSD: WD-8TB</td></tr><tr><td>939-08204</td><td>MLB, 6C-2.6G, HY-32, USS, HY-8GB, WD-8TB, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: HY-32GB, GPU: USS, VRAM: HY-8GB, SSD: WD-8TB</td></tr><tr><td>939-08312</td><td>MLB, 8C-2.3G, MC-16, UFU, SS-8GB, TS-1TB, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: MC-16GB, GPU: UFU, VRAM: SS-8GB, SSD: TS-1TB</td></tr><tr><td>939-08313</td><td>MLB, 8C-2.3G, MC-16, USU, SS-8GB, TS-1TB, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: MC-16GB, GPU: USU, VRAM: SS-8GB, SSD: TS-1TB</td></tr><tr><td>939-08203</td><td>MLB, 6C-2.6G, HY-32, UFS, HY-8GB, WD-8TB, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: HY-32GB, GPU: UFS, VRAM: HY-8GB, SSD: WD-8TB</td></tr><tr><td>939-08204</td><td>MLB, 6C-2.6G, HY-32, USS, HY-8GB, WD-8TB, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: HY-32GB, GPU: USS, VRAM: HY-8GB, SSD: WD-8TB</td></tr><tr><td>939-08312</td><td>MLB, 8C-2.3G, MC-16, UFU, SS-8GB, TS-1TB, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: MC-16GB, GPU: UFU, VRAM: SS-8GB, SSD: TS-1TB</td></tr></table>														BOM NUMBER	BOM NAME	BOM OPTIONS	939-08060	MLB, NO CPU, NO GPU, NO SSD, X970	ALTERNATE, BOM_BASE, BOM_DEV	939-08061	MLB, CPU INTERPOSER, NO GPU, NO SSD, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: INTERPOSER	939-08062	MLB, NO CPU, GPU ADPTR VDDCR, NO SSD, X970	ALTERNATE, BOM_BASE, BOM_DEV, GPU: ADPTR_VDDCR	939-08063	MLB, NO CPU, GPU ADPTR VMEM, NO SSD, X970	ALTERNATE, BOM_BASE, BOM_DEV, GPU: ADPTR_VMEM	939-08197	MLB, 6C-2.6G, MC-32, UFU, SS-8GB, WD-4TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-32GB, GPU: UFU, VRAM: SS-8GB, SSD: WD-4TB	939-08198	MLB, 6C-2.6G, MC-32, USU, SS-8GB, WD-4TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-32GB, GPU: USU, VRAM: SS-8GB, SSD: WD-4TB	939-08199	MLB, 8C-2.3G, HY-16, UFU, MC-4GB, TS-1TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: UFU, VRAM: MC-4GB, SSD: TS-1TB	939-08200	MLB, 8C-2.3G, HY-16, USU, MC-4GB, TS-1TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: USU, VRAM: MC-4GB, SSD: TS-1TB	939-08201	MLB, 8C-2.3G, HY-16, UFU, SS-4GB, TS-512, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: UFU, VRAM: SS-4GB, SSD: TS-512	939-08202	MLB, 8C-2.3G, HY-16, USU, SS-4GB, TS-512, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: USU, VRAM: SS-4GB, SSD: TS-512	939-08203	MLB, 6C-2.6G, HY-32, UFS, HY-8GB, WD-8TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: HY-32GB, GPU: UFS, VRAM: HY-8GB, SSD: WD-8TB	939-08204	MLB, 6C-2.6G, HY-32, USS, HY-8GB, WD-8TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: HY-32GB, GPU: USS, VRAM: HY-8GB, SSD: WD-8TB	939-08312	MLB, 8C-2.3G, MC-16, UFU, SS-8GB, TS-1TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: MC-16GB, GPU: UFU, VRAM: SS-8GB, SSD: TS-1TB	939-08313	MLB, 8C-2.3G, MC-16, USU, SS-8GB, TS-1TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: MC-16GB, GPU: USU, VRAM: SS-8GB, SSD: TS-1TB	939-08203	MLB, 6C-2.6G, HY-32, UFS, HY-8GB, WD-8TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: HY-32GB, GPU: UFS, VRAM: HY-8GB, SSD: WD-8TB	939-08204	MLB, 6C-2.6G, HY-32, USS, HY-8GB, WD-8TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: HY-32GB, GPU: USS, VRAM: HY-8GB, SSD: WD-8TB	939-08312	MLB, 8C-2.3G, MC-16, UFU, SS-8GB, TS-1TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: MC-16GB, GPU: UFU, VRAM: SS-8GB, SSD: TS-1TB	B						
	BOM NUMBER	BOM NAME	BOM OPTIONS																																																																								
	939-08060	MLB, NO CPU, NO GPU, NO SSD, X970	ALTERNATE, BOM_BASE, BOM_DEV																																																																								
	939-08061	MLB, CPU INTERPOSER, NO GPU, NO SSD, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: INTERPOSER																																																																								
	939-08062	MLB, NO CPU, GPU ADPTR VDDCR, NO SSD, X970	ALTERNATE, BOM_BASE, BOM_DEV, GPU: ADPTR_VDDCR																																																																								
	939-08063	MLB, NO CPU, GPU ADPTR VMEM, NO SSD, X970	ALTERNATE, BOM_BASE, BOM_DEV, GPU: ADPTR_VMEM																																																																								
	939-08197	MLB, 6C-2.6G, MC-32, UFU, SS-8GB, WD-4TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-32GB, GPU: UFU, VRAM: SS-8GB, SSD: WD-4TB																																																																								
	939-08198	MLB, 6C-2.6G, MC-32, USU, SS-8GB, WD-4TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-32GB, GPU: USU, VRAM: SS-8GB, SSD: WD-4TB																																																																								
	939-08199	MLB, 8C-2.3G, HY-16, UFU, MC-4GB, TS-1TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: UFU, VRAM: MC-4GB, SSD: TS-1TB																																																																								
	939-08200	MLB, 8C-2.3G, HY-16, USU, MC-4GB, TS-1TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: USU, VRAM: MC-4GB, SSD: TS-1TB																																																																								
	939-08201	MLB, 8C-2.3G, HY-16, UFU, SS-4GB, TS-512, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: UFU, VRAM: SS-4GB, SSD: TS-512																																																																								
	939-08202	MLB, 8C-2.3G, HY-16, USU, SS-4GB, TS-512, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: HY-16GB, GPU: USU, VRAM: SS-4GB, SSD: TS-512																																																																								
	939-08203	MLB, 6C-2.6G, HY-32, UFS, HY-8GB, WD-8TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: HY-32GB, GPU: UFS, VRAM: HY-8GB, SSD: WD-8TB																																																																								
	939-08204	MLB, 6C-2.6G, HY-32, USS, HY-8GB, WD-8TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: HY-32GB, GPU: USS, VRAM: HY-8GB, SSD: WD-8TB																																																																								
	939-08312	MLB, 8C-2.3G, MC-16, UFU, SS-8GB, TS-1TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: MC-16GB, GPU: UFU, VRAM: SS-8GB, SSD: TS-1TB																																																																								
	939-08313	MLB, 8C-2.3G, MC-16, USU, SS-8GB, TS-1TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: MC-16GB, GPU: USU, VRAM: SS-8GB, SSD: TS-1TB																																																																								
	939-08203	MLB, 6C-2.6G, HY-32, UFS, HY-8GB, WD-8TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: HY-32GB, GPU: UFS, VRAM: HY-8GB, SSD: WD-8TB																																																																								
	939-08204	MLB, 6C-2.6G, HY-32, USS, HY-8GB, WD-8TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: HY-32GB, GPU: USS, VRAM: HY-8GB, SSD: WD-8TB																																																																								
	939-08312	MLB, 8C-2.3G, MC-16, UFU, SS-8GB, TS-1TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.3G, MEM: MC-16GB, GPU: UFU, VRAM: SS-8GB, SSD: TS-1TB																																																																								
	A	<table><tr><th>BOM NUMBER</th><th>BOM NAME</th><th>BOM OPTIONS</th></tr><tr><td>939-08336</td><td>MLB, 8C-2.4G, MC-32, UFS, SS-8GB, WD-4TB, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.4G, MEM: MC-32GB, GPU: UFS, VRAM: SS-8GB, SSD: WD-4TB</td></tr><tr><td>939-08337</td><td>MLB, 8C-2.4G, MC-32, USS, SS-8GB, WD-4TB, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.4G, MEM: MC-32GB, GPU: USS, VRAM: SS-8GB, SSD: WD-4TB</td></tr><tr><td>939-08338</td><td>MLB, 6C-2.6G, MC-64, USS, SS-4GB, TS-512, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-64GB, GPU: USS, VRAM: SS-4GB, SSD: TS-512</td></tr><tr><td>939-08339</td><td>MLB, 6C-2.6G, MC-64, UFS, SS-4GB, TS-512, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-64GB, GPU: UFS, VRAM: SS-4GB, SSD: TS-512</td></tr><tr><td>939-08522</td><td>MLB, 6C-2.6G, MC-32, USS, SS-4GB, TS-512, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-32GB, GPU: USS, VRAM: SS-4GB, SSD: TS-512</td></tr><tr><td>939-08523</td><td>MLB, 6C-2.6G, MC-32, UFS, SS-4GB, TS-512, X970</td><td>ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-32GB, GPU: UFS, VRAM: SS-4GB, SSD: TS-512</td></tr></table>														BOM NUMBER	BOM NAME	BOM OPTIONS	939-08336	MLB, 8C-2.4G, MC-32, UFS, SS-8GB, WD-4TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.4G, MEM: MC-32GB, GPU: UFS, VRAM: SS-8GB, SSD: WD-4TB	939-08337	MLB, 8C-2.4G, MC-32, USS, SS-8GB, WD-4TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.4G, MEM: MC-32GB, GPU: USS, VRAM: SS-8GB, SSD: WD-4TB	939-08338	MLB, 6C-2.6G, MC-64, USS, SS-4GB, TS-512, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-64GB, GPU: USS, VRAM: SS-4GB, SSD: TS-512	939-08339	MLB, 6C-2.6G, MC-64, UFS, SS-4GB, TS-512, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-64GB, GPU: UFS, VRAM: SS-4GB, SSD: TS-512	939-08522	MLB, 6C-2.6G, MC-32, USS, SS-4GB, TS-512, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-32GB, GPU: USS, VRAM: SS-4GB, SSD: TS-512	939-08523	MLB, 6C-2.6G, MC-32, UFS, SS-4GB, TS-512, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-32GB, GPU: UFS, VRAM: SS-4GB, SSD: TS-512	A																																						
BOM NUMBER		BOM NAME	BOM OPTIONS																																																																								
939-08336		MLB, 8C-2.4G, MC-32, UFS, SS-8GB, WD-4TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.4G, MEM: MC-32GB, GPU: UFS, VRAM: SS-8GB, SSD: WD-4TB																																																																								
939-08337		MLB, 8C-2.4G, MC-32, USS, SS-8GB, WD-4TB, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 8C-2.4G, MEM: MC-32GB, GPU: USS, VRAM: SS-8GB, SSD: WD-4TB																																																																								
939-08338		MLB, 6C-2.6G, MC-64, USS, SS-4GB, TS-512, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-64GB, GPU: USS, VRAM: SS-4GB, SSD: TS-512																																																																								
939-08339		MLB, 6C-2.6G, MC-64, UFS, SS-4GB, TS-512, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-64GB, GPU: UFS, VRAM: SS-4GB, SSD: TS-512																																																																								
939-08522		MLB, 6C-2.6G, MC-32, USS, SS-4GB, TS-512, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-32GB, GPU: USS, VRAM: SS-4GB, SSD: TS-512																																																																								
939-08523		MLB, 6C-2.6G, MC-32, UFS, SS-4GB, TS-512, X970	ALTERNATE, BOM_BASE, BOM_DEV, CPU: 6C-2.6G, MEM: MC-32GB, GPU: UFS, VRAM: SS-4GB, SSD: TS-512																																																																								
<table><tr><td colspan="2">PAGE/TITLE</td><td colspan="2">BOM 639 MISC</td><td colspan="2">DRAWING NUMBER</td><td colspan="2">051-04492</td><td colspan="2">SIZE</td><td colspan="2">D</td></tr><tr><td colspan="2" rowspan="2"> Apple Inc.</td><td colspan="2">REVISION</td><td colspan="2">2.15.0</td><td colspan="2">BRANCH</td><td colspan="2"></td><td colspan="2"></td></tr><tr><td colspan="2">PAGE</td><td colspan="2">144 OF 200</td><td colspan="2">SHEET</td><td colspan="2">132 OF 135</td></tr></table>														PAGE/TITLE		BOM 639 MISC		DRAWING NUMBER		051-04492		SIZE		D		 Apple Inc.		REVISION		2.15.0		BRANCH						PAGE		144 OF 200		SHEET		132 OF 135																															
PAGE/TITLE		BOM 639 MISC		DRAWING NUMBER		051-04492		SIZE		D																																																																	
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		PAGE		144 OF 200		SHEET		132 OF 135																																																																			
8		7		6		5		4		3		2		1																																																													

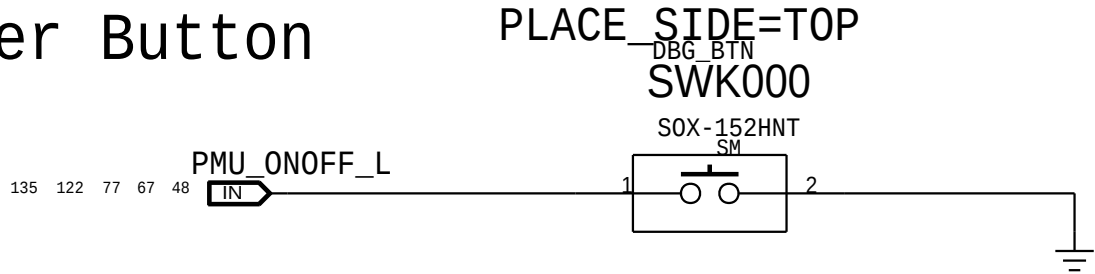
8					7					6					5					4					3					2					1				
Alternate Parts																																							
D	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:				
	197S00046	197S00036	ANY	ALL	Epson w/ TXC	353S00078	353S00599	ANY	ALL		103S00248	103S00247	ANY	ALL	8.06k 0.1% Resistor	152S00371	152S00412	ANY	ALL		103S00250	103S00249	ANY	ALL	18.2k 0.1% Resistor	197S00181	197S00106	ANY	ALL		131S00299	131S00118	ANY	ALL					
	197S00047	197S00036	ANY	ALL	Kyocera w/ TXC	371S00190	371S00085	ANY	ALL		116S00006	116S0175	ANY	ALL	00hm Resistor	131S00398	131S00037	ANY	ALL		128S00094	128S00067	ANY	ALL	150uF POLY CAP	197S00143	197S00142	ANY	ALL		132S00229	132S00010	ANY	ALL					
	197S00048	197S00036	ANY	ALL	Murata w/ TXC	107S00248	107S0250	ANY	ALL		128S00069	128S00067	ANY	ALL	150uF POLY CAP	132S00230	132S00035	ANY	ALL		128S00065	128S00067	ANY	ALL	150uF POLY CAP	138S00772	138S00013	ANY	ALL		311S00025	311S0539	ANY	ALL					
	376S1080	376S00820	ANY	ALL		107S00103	107S00058	ANY	ALL	Cyntec w/ Yageo	107S00101	107S00005	ANY	ALL	3150708: 5mOhm	152S00708	152S00265	ANY	ALL		107S00007	107S00029	ANY	ALL	31560843: 5mOhm	138S00086	138S0884	ANY	ALL		197S00708	197S00190	ANY	ALL	47889287: GPU OSC				
	152S00726	152S00592	ANY	ALL		311S00013	311S0508	ANY	ALL	Part wi	107S00100	107S00057	ANY	ALL	31561063: 2mOhm	197S00229	197S00190	ANY	ALL	47889287: GPU OSC	107S00086	107S00056	ANY	ALL	31560937: 3mOhm	138S00139	138S00138	ANY	ALL	47826168: GPU GFX VR DeCap	152S01139	152S01107	ANY	ALL	47566674: GPU 1.8V Filter				
	376S1053	376S0604	ANY	ALL	Diodes alt to Fairchild	132S00064	132S0409	ANY	ALL		107S00240	107S0255	ANY	ALL	31561401: 1mOhm	116S00007	116S00006	ANY	ALL	48352711: Res 0R 3A	138S00047	138S00073	ANY	ALL		376S00321	376S00397	ANY	ALL	48352623: GPU MEM VR LS FET	371S00064	371S00193	ANY	ALL	43721339: Schottky Diode				
	353S00036	353S4037	ANY	ALL		128S0364	128S0264	ANY	ALL	Kemet w/ Panasonic	107S00139	107S0178	ANY	ALL	31561213: 220k Resistor	152S00786	152S00344	ANY	ALL		152S00176	152S01173	ANY	ALL	48689463: GPU MEMIO VR Ind	376S00373	376S1038	ANY	ALL										
	155S00007	155S00667	ANY	ALL		128S00058	128S00098	ANY	ALL	NEC w/ Rohm	128S00286	138S00037	ANY	ALL	31563978: 10uF CER	138S00045	138S0706	ANY	ALL	NEC w/ Vishay	138S00093	138S00035	ANY	ALL		138S00084	138S00060	ANY	ALL	31564055: 47uF CER									
	376S1106	376S0678	ANY	ALL	Fairchild alt to Vishay	107S00071	107S00053	ANY	ALL		138S00738	138S1101	ANY	ALL	Samsung alt to Murata	138S00759	138S0762	ANY	ALL		138S00056	138S1100	ANY	ALL		138S00024	138S0986	ANY	ALL										
371S00127	371S00182	ANY	ALL		102S00054	102S00053	ANY	ALL		311S00195	311S00196	ANY	ALL		107S00055	107S00055	ANY	ALL		152S00094	197S00050	ANY	ALL	Kyocera w/ TXC	197S00054	197S00050	ANY	ALL	NDK w/ TXC										
C	152S00769	152S000659	ANY	ALL		376S00086	376S0761	ANY	ALL		353S00059	353S4262	ANY	ALL	TI w/ OnSemi	128S00009	128S00093	ANY	ALL		152S00369	152S00268	ANY	ALL		371S00074	371S0602	ANY	ALL		376S00303	376S00012	ANY	ALL					
	372S00016	372S00015	ANY	ALL		138S0775	138S0800	ANY	ALL		740S00019	740S00007	ANY	ALL	Bourns w/ Polytronics	128S00009	128S00093	ANY	ALL		152S00369	152S00268	ANY	ALL		371S00074	371S0602	ANY	ALL		376S00303	376S00012	ANY	ALL					
	372S00016	372S00015	ANY	ALL		353S00075	138S0800	ANY	ALL		353S00075	138S0800	ANY	ALL		128S00009	128S00093	ANY	ALL		152S00369	152S00268	ANY	ALL		371S00074	371S0602	ANY	ALL		376S00303	376S00012	ANY	ALL					
	107S00041	107S00039	ANY	ALL		138S0789	138S0941	ANY	ALL	Murata w/ SS	152S00363	152S00048	ANY	ALL		155S00204	155S0731	ANY	ALL		152S00369	152S00268	ANY	ALL		371S00074	371S0602	ANY	ALL		376S00303	376S00012	ANY	ALL					
	740S00041	740S0159	ANY	ALL		152S00369	152S00268	ANY	ALL		155S00204	155S0731	ANY	ALL		155S00204	155S0731	ANY	ALL		152S00369	152S00268	ANY	ALL		371S00074	371S0602	ANY	ALL		376S00303	376S00012	ANY	ALL					
	311S00138	311S0436	ANY	ALL		152S00369	152S00268	ANY	ALL		155S00204	155S0731	ANY	ALL		155S00204	155S0731	ANY	ALL		152S00369	152S00268	ANY	ALL		371S00074	371S0602	ANY	ALL		376S00303	376S00012	ANY	ALL					
	152S00725	152S00590	ANY	ALL		152S00369	152S00268	ANY	ALL		155S00204	155S0731	ANY	ALL		155S00204	155S0731	ANY	ALL		152S00369	152S00268	ANY	ALL		371S00074	371S0602	ANY	ALL		376S00303	376S00012	ANY	ALL					
	152S00041	152S00238	ANY	ALL		152S00369	152S00268	ANY	ALL		155S00204	155S0731	ANY	ALL		155S00204	155S0731	ANY	ALL		152S00369	152S00268	ANY	ALL		371S00074	371S0602	ANY	ALL		376S00303	376S00012	ANY	ALL					
	376S00219	376S00079	ANY	ALL	TI for Fairchild	152S00369	152S00268	ANY	ALL		155S00204	155S0731	ANY	ALL		155S00204	155S0731	ANY	ALL		152S00369	152S00268	ANY	ALL		371S00074	371S0602	ANY	ALL		376S00303	376S00012	ANY	ALL					
	311S00121	311S0398	ANY	ALL		152S00369	152S00268	ANY	ALL		155S00204	155S0731	ANY	ALL		155S00204	155S0731	ANY	ALL		152S00369	152S00268	ANY	ALL		371S00074	371S0602	ANY	ALL		376S00303	376S00012	ANY	ALL					
B	311S0596	311S0593	ANY	ALL		152S00369	152S00268	ANY	ALL		155S00204	155S0731	ANY	ALL		155S00204	155S0731	ANY	ALL		152S00369	152S00268	ANY	ALL		371S00074	371S0602	ANY	ALL		376S00303	376S00012	ANY						

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Alternate Parts Keyboard															
PART NUMBER		ALTERNATE FOR PART NUMBER		BOM OPTION		REF DES		COMMENTS:							
138S0786		138S0847		ANY		ALL									
131S00059		131S0852		ANY		ALL									
138S00087		138S1086		ANY		ALL									
152S00812		152S1701		ANY		ALL									
371S00217		371S00079		ANY		ALL									
353S00497		353S00796		ANY		ALL									
152S01024		152S00386		ANY		ALL									
152S00997		152S00476		ANY		ALL									
371S00220		371S00181		ANY		ALL		DIODE							
353S01831		353S00519		ANY		ALL									
138S00181		138S0835		ANY		ALL									

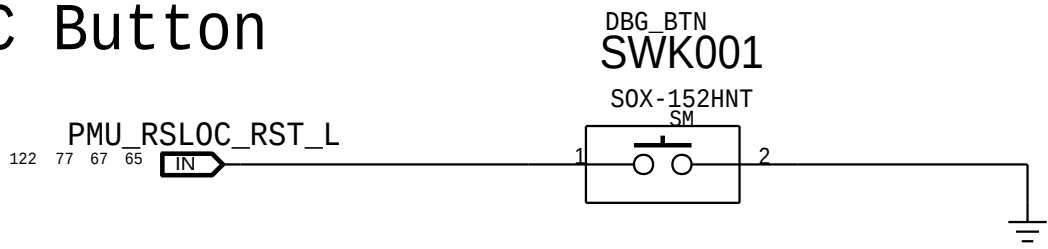
PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
138S0786	138S0847	ANY	ALL	
131S00059	131S0052	ANY	ALL	
138S00087	138S1086	ANY	ALL	
152S00012	152S1701	ANY	ALL	
371S00217	371S00079	ANY	ALL	
353S00497	353S00796	ANY	ALL	
152S01024	152S00386	ANY	ALL	
152S00997	152S00476	ANY	ALL	
371S00220	371S00181	ANY	ALL	DIODE
353S01031	353S00519	ANY	ALL	
138S00181	138S0035	ANY	ALL	

PAGE/TITLE			More BOM Alt Table		
 Apple Inc.		DRAWING NUMBER	051-04492	SIZE	D
		REVISION	2.15.0		
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				148 OF 200	
				SHEET	
				134 OF 135	

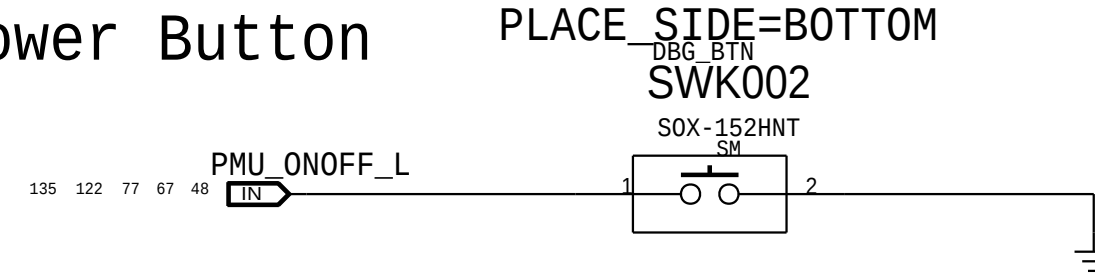
Power Button



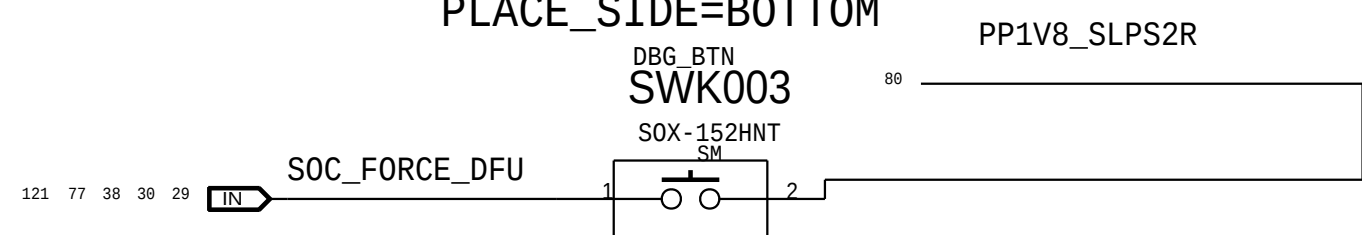
RSLOC Button



Power Button

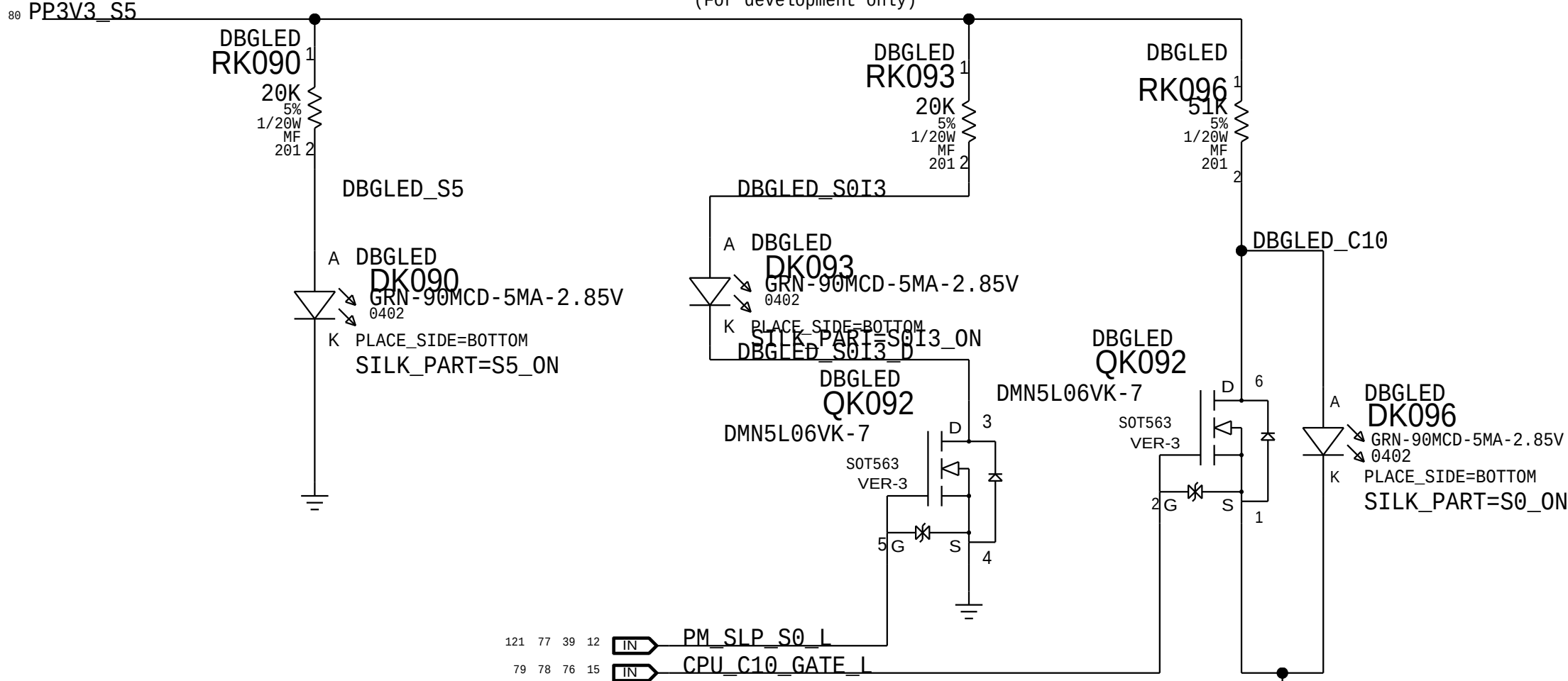


Button for Force DFU



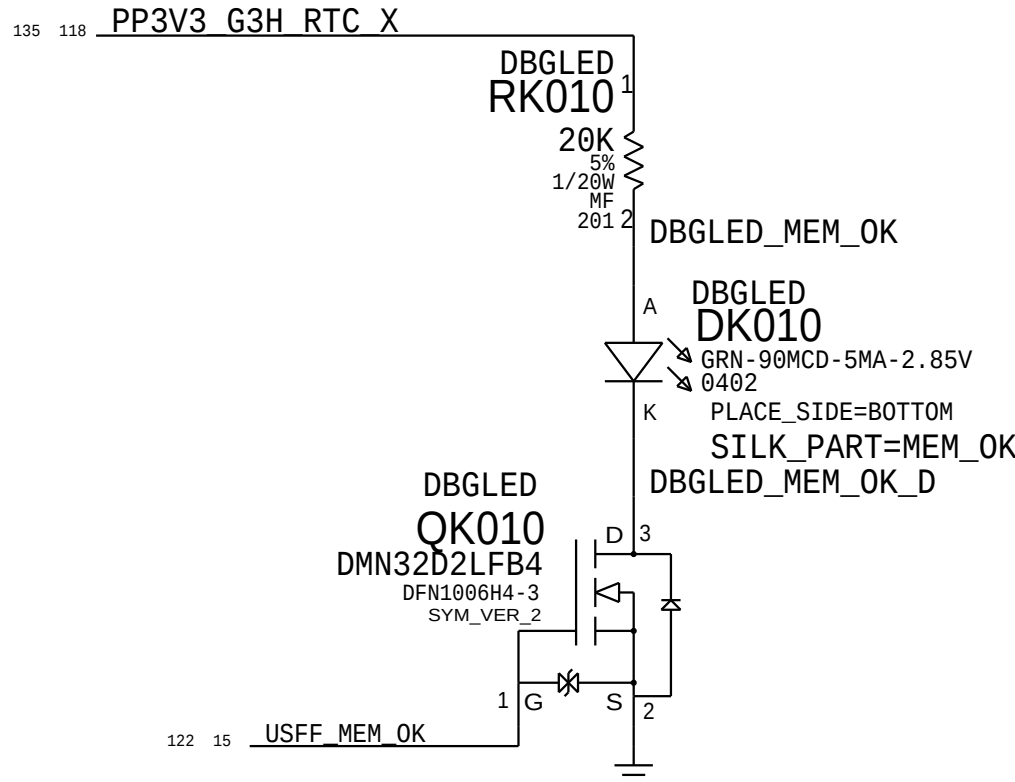
Power State Debug LEDs

(For development only)



Memory Debug LED

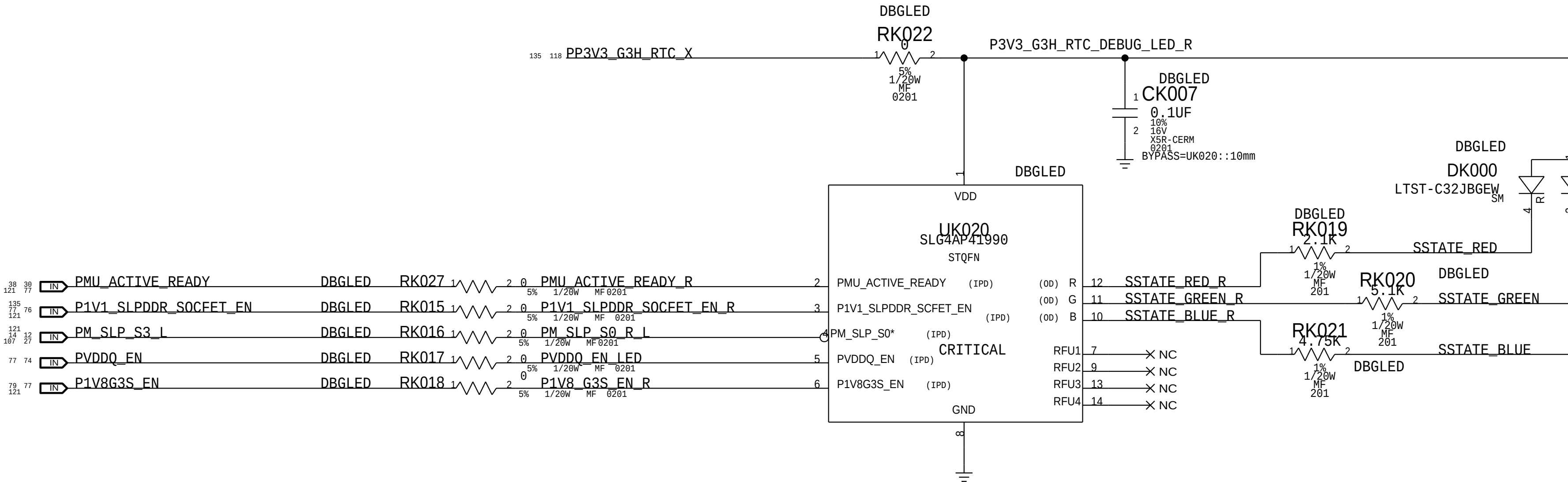
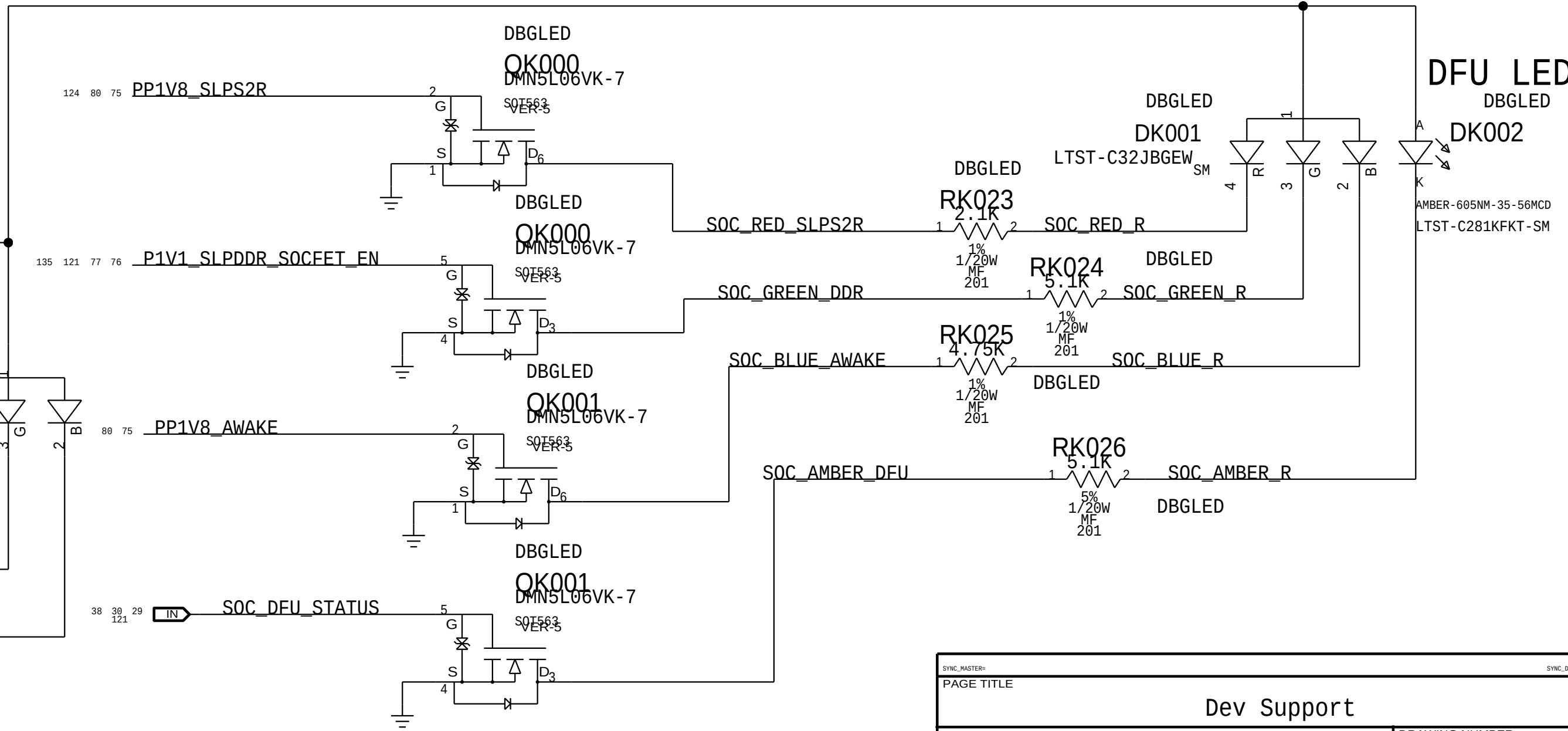
(For development only)



System State LEDs

DK000 Color	System State	SoC State	CPU State
Breathing RED	ShutDown (G3H)	OFF	OFF
RED	StandBy (G3S)	SLPS2R	OFF
YELLOW	StandBy (G3S)	AWAKE	OFF
WHITE	Sleep	SLPS2R	S3
BLUE	Sleep	AWAKE	S3
GREEN	Active	AWAKE	S0
PURPLE	INVALID - DO NOT CARE		

SoC State LEDs



PAGE TITLE		
Dev Support		
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	PAGE	200 OF 200
	SHEET	135 OF 135

BOM_COST_GROUP=PLATFORM POWER