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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.

X1783

MLB-TKSB

REV

ECN

DESCRIPTION OF REVISION

CK APPD

DATE

2

0018963445

ENGINEERING RELEASED

2019-07-29

LAST_MODIFICATION=Mon Jul 29 19:28:46 2019

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TABLE REV NUMBER=1

RULER_RULE_SBT=RIGID_2016

MANUFACTURING CONFIGURATION

DIELECTRIC BASED SPACING RULES

MULTIPLES

SPMDPIN MAX(UM)

MVIA MAX(UM)

SPMDPIN2SPMDPIN MAX(UM)

1,1.5,1.75,2.6,2-7,7.5,8,9,10

80

80

80

DEFAULT SPACING MULTIPLES

VOID SPACE RATIO

1

2

LAYERS

MINIMUM CU WIDTH RATIO

MINIMUM CU SPACING RATIO

MINIMUM TO DEFAULT RATIO

TOP,BOTTOM

2.8

2.8

1.0

ISL2-ISL3,ISL6,ISL9,ISL12-ISL13

3.125

3.125

1.2

ISL4,ISL11

3.125

3.125

1.2

ISL5,ISL10

2.272

2.272

1.2

ISL7,ISL8

2.23

2.23

1.3

PART#

QTY

DESCRIPTION

REFERENCE DESIGNATOR(S)

CRITICAL

BOM OPTION

051-05232

1

SCH,MLB-TKSB,X1783

SCH

CRITICAL

SCHEM

820-01958

1

PCBF,MLB-TKSB,X1783

MLB

CRITICAL

PCBF

DRAWING TITLE

SCHEM,MLB-TKSB,X1783

Apple Inc.

DRAWING NUMBER

051-05232

SIZE

D

REVISION

2.0.0

BRANCH

proto4b

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Module Parts

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
337S00749	1	CPU, ICL-YN, QSLM, D1, 64EU, 1.0, 1.1, BGA1044	U0500	CRITICAL	CPU_ICLY_P2: BEST
337S00750	1	CPU, ICL-YN, QSLQ, D1, 48EU, 0.7, 1.05, BGA1044	U0500	CRITICAL	CPU_ICLY_P2: GOOD
998-17650	1	INTERPOSER, VTT ADAPTER, ICL-YN, BGA1044	U0500	CRITICAL	CPU_ICLY: INTERPOSER
337S00766	1	CPU, ICLYN, QSSQ, ES2, D2, 1, 1.1, BGA1044	U0500	CRITICAL	CPU_ICLY: BEST
337S00767	1	CPU, ICLYN, QSSS, ES2, D2, 1, 1.05, BGA1044	U0500	CRITICAL	CPU_ICLY: BEDRE
337S00765	1	CPU, ICLYN, QSVZ, ES2, D2, 1, 1.1, 9, BGA1044	U0500	CRITICAL	CPU_ICLY: GOOD

NOTE: BEDRE is Danish for BETTER.

TBT Burnside Bridge

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
998-13316	2	IC, BURNBRIDGE BRIDGE, USB/TB, RAYTOWER, BGA105	U2800, U2900	CRITICAL	TBT_BB:A0
338S00503	2	IC, TBT, BURNBRIDGE BRIDGE, QCOM, ES2, A1, BGA105	U2800, U2900	CRITICAL	TBT_BB:A1
338S00508	2	IC, TBT, BURNBRIDGE BRIDGE, ES2, Q5, A1, BGA105	U2800, U2900	CRITICAL	TBT_BB:QSA1
338S00561	2	IC, TBT, BURNBRIDGE BRIDGE, PQQ, A1, BGA105	U2800, U2900	CRITICAL	TBT_BB:PRQA1

Ace2

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
353S01826	2	IC, CD3217, ACE2, B1, USB PWR SW W/RY, BGA123	U3100, U3200	CRITICAL	ACE2:B1_BGA
353S01960	2	IC, CD3217, ACE2, B2, USB PWR SW W/RY, BGA123	U3100, U3200	CRITICAL	ACE2:B2_BGA
353S02158	2	IC, CD3217, ACE2, B1, USB PWR SW W/RY, BGA123	U3100, U3200	CRITICAL	ACE2:B12_BGA

SOC

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)		CRITICAL	BOM OPTION
339S00370	1	POP, GIBERALTA8+1GB 20NM, H, B0, SCK, CSP1406		U3900	CRITICAL	SOC:B0_1G
339S00372	1	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
		339S00371	339S00370	SOC:B0_1G	ALL	Hynix 1GB SCK
		339S00375	339S00370	SOC:B0_1G	ALL	Micron 1GB SCK
		339S00376	339S00370	SOC:B0_1G	ALL	Hynix 1GB ATK
339S00372	1	POP, GIBERALTA8+2GB 20NM, H, B0, SCK, CSP1406		U3900	CRITICAL	SOC:B0_2G
339S00372	1	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
		339S00373	339S00372	SOC:B0_2G	ALL	Hynix 2GB SCK
		339S00377	339S00372	SOC:B0_2G	ALL	Micron 2GB SCK
		339S00378	339S00372	SOC:B0_2G	ALL	Hynix 2GB ATK

PMU

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
338S00267	1	IC, PMU, CDSPE, 0224940, QTF-A1, CSP124, 5, 4P	U7800	CRITICAL	PMU:A0_A

Wireless

PART#	QTY	DESCRIPTION			REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
339S00616	1	MODULE, WIFI/BT, SAPPORO, ES3, 1, H, LGA451			U3701	CRITICAL	WIRELESS:P0
	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:		
	998-16405	339S00616	WIRELESS:P0	ALL	USI Wireless Module (ES2)		
339S00616	1	MODULE, WIFI/BT, SAPPORO, ES3, 1, H, LGA451			U3701	CRITICAL	WIRELESS:P1
	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:		
	339S00628	339S00616	WIRELESS:P1	ALL	USI Wireless Module (ES2)		
339S00616	1	MODULE, WIFI/BT, SAPPORO, ES3, 1, H, LGA451			U3701	CRITICAL	WIRELESS:P1B
	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:		
	339S00632	339S00616	WIRELESS:P1B	ALL	USI Wireless Module (ES3,1)		

NAND - Landing 0

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION	
998-17175	1	NAND, 30V4, 64GBIT, 648, 2560, H, SUBX, SLGA110	U8600	CRITICAL	NAND_L0:ITLC_128G_HY	
998-17176	1	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
		998-17176	998-17175	NAND_L0:ITLC_128G_HY	U8600	HY 64G Substrate 2 L0
998-16394	1	NAND, 30V4, 64GBIT, 648, 2560, T, SUB X, SLGA110	U8600	CRITICAL	NAND_L0:ITLC_128G_TO	
998-16395	1	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
		998-16395	998-16394	NAND_L0:ITLC_128G_TO	U8600	TO 64G Substrate 2 L0
335S00416	1	NAND, 30V5, 64GBIT, 648, 2560, SS, SLGA110	U8600	CRITICAL	NAND_L0:ITLC_128G_SS	
998-16396	1	NAND, 30V4, 128GBIT, 648, 2560, T, SUBX, SLGA110	U8600	CRITICAL	NAND_L0:ITLC_256G_TO	
998-16397	1	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
		998-16397	998-16396	NAND_L0:ITLC_256G_TO	U8600	TO 128G Substrate 2 L0
998-16945	1	NAND, 30V4, 128GBIT, 648, 2560, SD, SUBX, BGA110	U8600	CRITICAL	NAND_L0:ITLC_256G_SD	
998-16970	1	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
		998-16970	998-16945	NAND_L0:ITLC_256G_SD	U8600	SD 128G Substrate 2 L0
335S00378	1	NAND, 30V4, 128GBIT, 648, 2560, H, SLGA110	U8600	CRITICAL	NAND_L0:ITLC_256G_HY	
998-16400	1	NAND, 30V4, 256GBIT, 648, 2560, T, SUBX, SLGA110	U8600	CRITICAL	NAND_L0:ITLC_512G_TO	
998-16401	1	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
		998-16401	998-16400	NAND_L0:ITLC_512G_TO	U8600	TO 256G Substrate 2 L0
335S00397	1	NAND, 30V4, 32GBIT, XXX, 648, 2560, T, SLGA110	U8600	CRITICAL	NAND_L0:ITLC_512G_TO_P1	
335S00408	1	NAND, 30V4, 32GBIT, XXX, 648, 2560, SD, SLGA110	U8600	CRITICAL	NAND_L0:ITLC_512G_SD	
335S00391	1	NAND, 30V4, 512GBIT, XXX, 648, 2560, SD, SLGA110	U8600	CRITICAL	NAND_L0:ITLC_1P0T_SD	
335S00380	1	NAND, 30V4, 512GBIT, 648, 2560, H, SLGA110	U8600	CRITICAL	NAND_L0:ITLC_1P0T_HY	
335S00433	1	NAND, 30V4, 17BT, XXX, 648, 512G, SD, SLGA110	U8600	CRITICAL	NAND_L0:ITLC_2P0T_SD	
335S00444	1	NAND, 30V5, 1024GBIT, 648, 512G, H, SLGA110	U8600	CRITICAL	NAND_L0:ITLC_2P0T_HY	

NAND - Landing 1

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
998-17175	1	NAND, 30V4, 64GBIT, 648, 2560, H, SUBX, SLGA110	U8700	CRITICAL	NAND_L1:ITLC_128G_HY
	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
	998-17176	998-17175	NAND_L1:ITLC_128G_HY	U8700	HY 64G Substrate 2 L1
998-16394	1	NAND, 30V4, 64GBIT, 648, 2560, T, SUB X, SLGA110	U8700	CRITICAL	NAND_L1:ITLC_128G_TO
	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
	998-16395	998-16394	NAND_L1:ITLC_128G_TO	U8700	TO 64G Substrate 2 L1
335S00416	1	NAND, 30V5, 64GBIT, 648, 2560, SS, SLGA110	U8700	CRITICAL	NAND_L1:ITLC_128G_SS
998-16396	1	NAND, 30V4, 128GBIT, 648, 2560, T, SUBX, SLGA110	U8700	CRITICAL	NAND_L1:ITLC_256G_TO
	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
	998-16397	998-16396	NAND_L1:ITLC_256G_TO	U8700	TO 128G Substrate 2 L1
998-16945	1	NAND, 30V4, 128GBIT, 648, 2560, SD, SUBX, BGA110	U8700	CRITICAL	NAND_L1:ITLC_256G_SD
	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
	998-16970	998-16945	NAND_L1:ITLC_256G_SD	U8700	SD 128G Substrate 2 L1
335S00378	1	NAND, 30V4, 128GBIT, 648, 2560, H, SLGA110	U8700	CRITICAL	NAND_L1:ITLC_256G_HY
335S00396	1	NAND, 30V4, 256GBIT, XXX, 648, 2560, T, SLGA110	U8700	CRITICAL	NAND_L1:ITLC_512G_SSUB_TO
998-16946	1	NAND, 30V4, 256GBIT, 648, 2560, SD, SUBX, BGA110	U8700	CRITICAL	NAND_L1:ITLC_512G_SD
	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
	998-16971	998-16946	NAND_L1:ITLC_512G_SD	U8700	SD 128G Substrate 2 L1
335S00391	1	NAND, 30V4, 512GBIT, XXX, 648, 2560, SD, SLGA110	U8700	CRITICAL	NAND_L1:ITLC_1P0T_SD
335S00380	1	NAND, 30V4, 512GBIT, 648, 2560, H, SLGA110	U8700	CRITICAL	NAND_L1:ITLC_1P0T_HY
335S00433	1	NAND, 30V4, 17BT, XXX, 648, 512G, SD, SLGA110	U8700	CRITICAL	NAND_L1:ITLC_2P0T_SD
335S00444	1	NAND, 30V5, 1024GBIT, 648, 512G, H, SLGA110	U8700	CRITICAL	NAND_L1:ITLC_2P0T_HY

DRAM

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
333S00137	2	IC, LPDDR4X-3733, 32GBIT, 18NM, S, BGA432	U2300, U2500	CRITICAL	DRAM:P1_SAMSUNG_8GB
333S00138	2	IC, LPDDR4X-3733, 64GBIT, 18NM, S, BGA432	U2300, U2500	CRITICAL	DRAM:P1_SAMSUNG_16GB
333S00221	2	IC, LPDDR4X-4266, 32GBIT, 16NM, S, BGA432	U2300, U2500	CRITICAL	DRAM:SAMSUNG_8GB
333S00222	2	IC, LPDDR4X-4266, 64GBIT, 16NM, S, BGA432	U2300, U2500	CRITICAL	DRAM:SAMSUNG_16GB
333S00214	2	IC, LPDDR4X-4266, 32GBIT, 19NM, H, BGA432	U2300, U2500	CRITICAL	DRAM:HYNIX_8GB
333S00215	2	IC, LPDDR4X-4266, 64GBIT, 19NM, H, BGA432	U2300, U2500	CRITICAL	DRAM:HYNIX_16GB
333S00170	2	IC, LPDDR4X-3733, 32GBIT, 18NM, BGA432	U2300, U2500	CRITICAL	DRAM:MICRON_8GB
333S00171	2	IC, LPDDR4X-3733, 64GBIT, 18NM, BGA432	U2300, U2500	CRITICAL	DRAM:MICRON_16GB

Programmables

TBT ROM

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)		CRITICAL	BOM OPTION
335S00133	1	IC, SPI SERIAL FLASH, 96KITS, 3, 0V, US08H	U3060		CRITICAL	TBT_ROM:BLANK
PART NUMBER		ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:	
335S00232		335S00133	TBT_ROM:BLANK	U3060	rdar://problem/50598337	
341S01282	1	IC, ROM (V14, 1) PROTO-0, X1418	U3060		CRITICAL	TBT_ROM:P0
341S01314	1	ROM, TBT (V14, 1, 1) PROTO-0-2, X1418	U3060		CRITICAL	TBT_ROM:P0A
341S01315	1	ROM, TBT (VXXXXXX) PROTO-0-3, X1418	U3060		CRITICAL	TBT_ROM:P0B
341S01337	1	ROM, TBT (V14, 4) PROTO-1, X1418	U3060		CRITICAL	TBT_ROM:P1
341S01410	1	ROM, BBR (VXXXX) PROTO-2, X1418	U3060		CRITICAL	TBT_ROM:P2
341S01450	1	ROM, BBR, ACE (V18, 9) PROTO-3, X1418	U3060		CRITICAL	TBT_ROM:P3
341S01470	1	ROM, BBR, ACE (V29, 3) PROTO-4A, X1783	U3060		CRITICAL	TBT_ROM:P4A
341S01515	1	ROM, BBR/ACE (VXXXX) PROTO-4, X1783	U3060		CRITICAL	TBT_ROM:P4B

BT ROM

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
335S00400	1	IC, SPI, SERIAL FLASH, 4M BIT, 1, 0V, US08H	U3750	CRITICAL	BT_ROM:BLANK
341S01260	1	ROM, BT, SFLASH (VXX) PROTO-1, X1536	U3750	CRITICAL	BT_ROM:P0


Wifi ROM

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
335S00214	1	IC, EEPROM, SER, UM3E, 18E, 1, 0V, SP08	U3710	CRITICAL	WIFI_ROM:BLANK
341S01087	1	IC, WIFI ROM (V00) WWL, X1421	U3710	CRITICAL	WIFI_ROM:P0
341S01394	1	ROM, WIFI (VXX) (MEM FOR DVT) WWL, X1536	U3710	CRITICAL	WIFI_ROM:P2

SOC ROM

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
335S00203	1	IC, FLASH, SERIAL, SPI, 4MB8, 1, 0V, 633MH, SP08	U4770	CRITICAL	SOC_ROM:BLANK

PAGE TITLE

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DRAWING NUMBER051-05232SIZE D

REVISION2.0.0

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BRANCHproto4b

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Shield Cans

DRAM Shield Can

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
806-22435	1	BRKT,MOUNTING,MLB,NK,X1766	BRKT1	CRITICAL	BRACKET

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
806-12387	1	SHIELD CAN,DRAM,X1030	SHLD1	CRITICAL	SHLD_CAN_DRAM

Burnside Bridge Shield Can

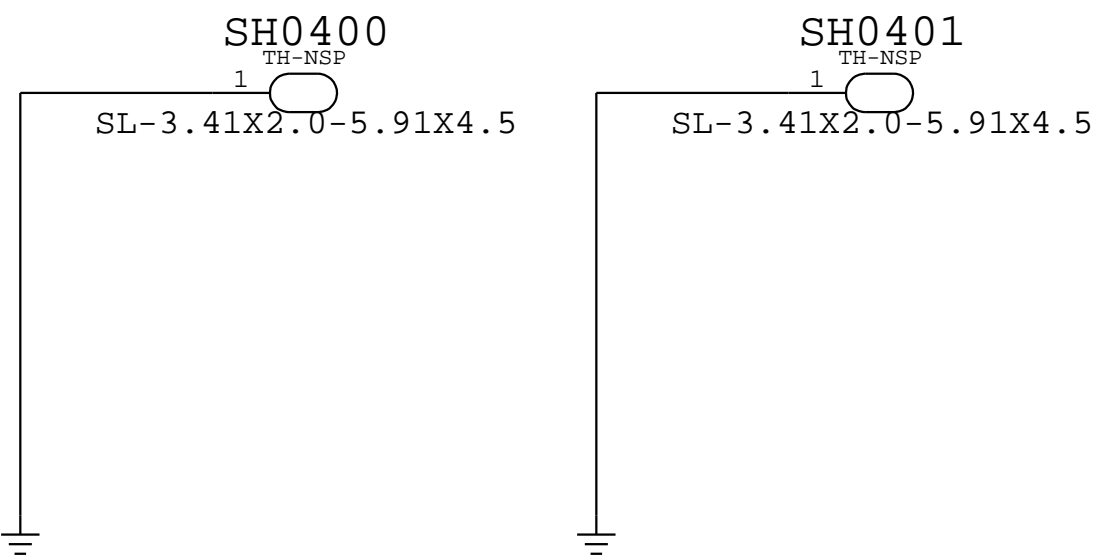
PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
806-19070	1	SHIELD CAN,BURNSIDE BRIDGE,X1419	SHLD3	CRITICAL	SHLD_CAN_BSB

SOC/NAND Shield Fence

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
806-19074	1	SHIELD FRAME,GIBRALTAR,X1419	SHLD4	CRITICAL	SHLD_FNC_SOC

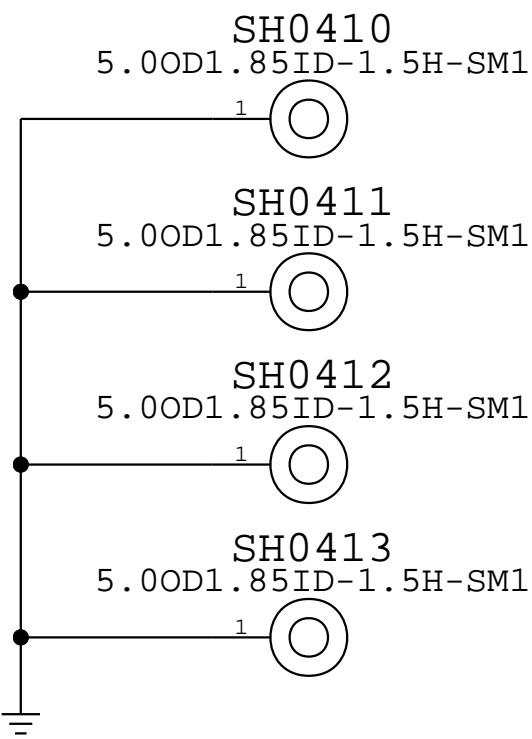
Mounting Holes

998-19374



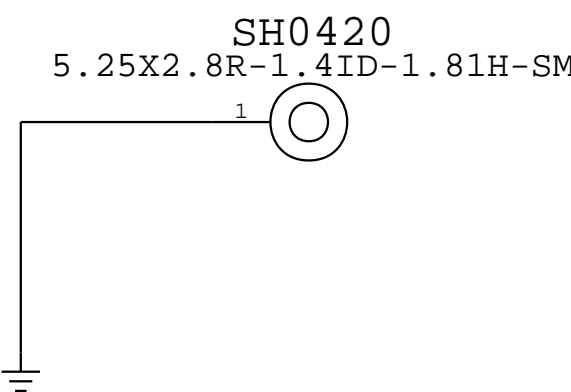
Heatsink Mounting Bosses

860-01043

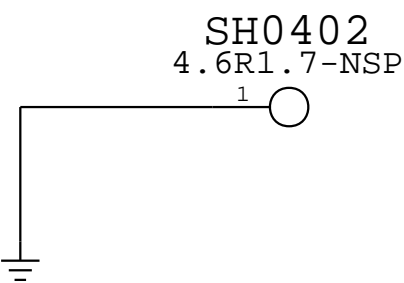


Antenna Cowling Bosses

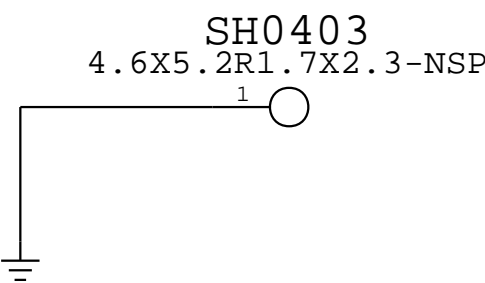
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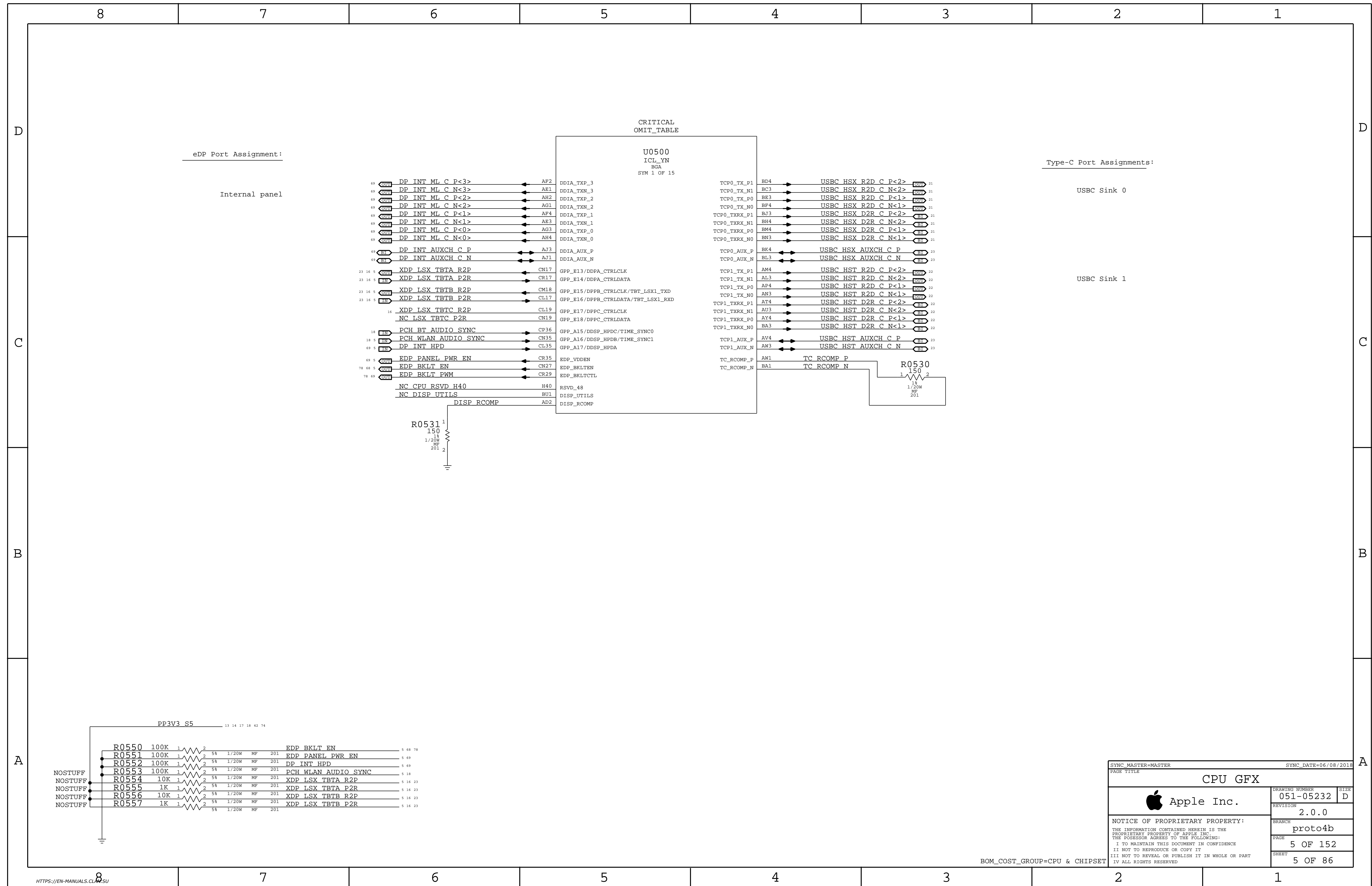


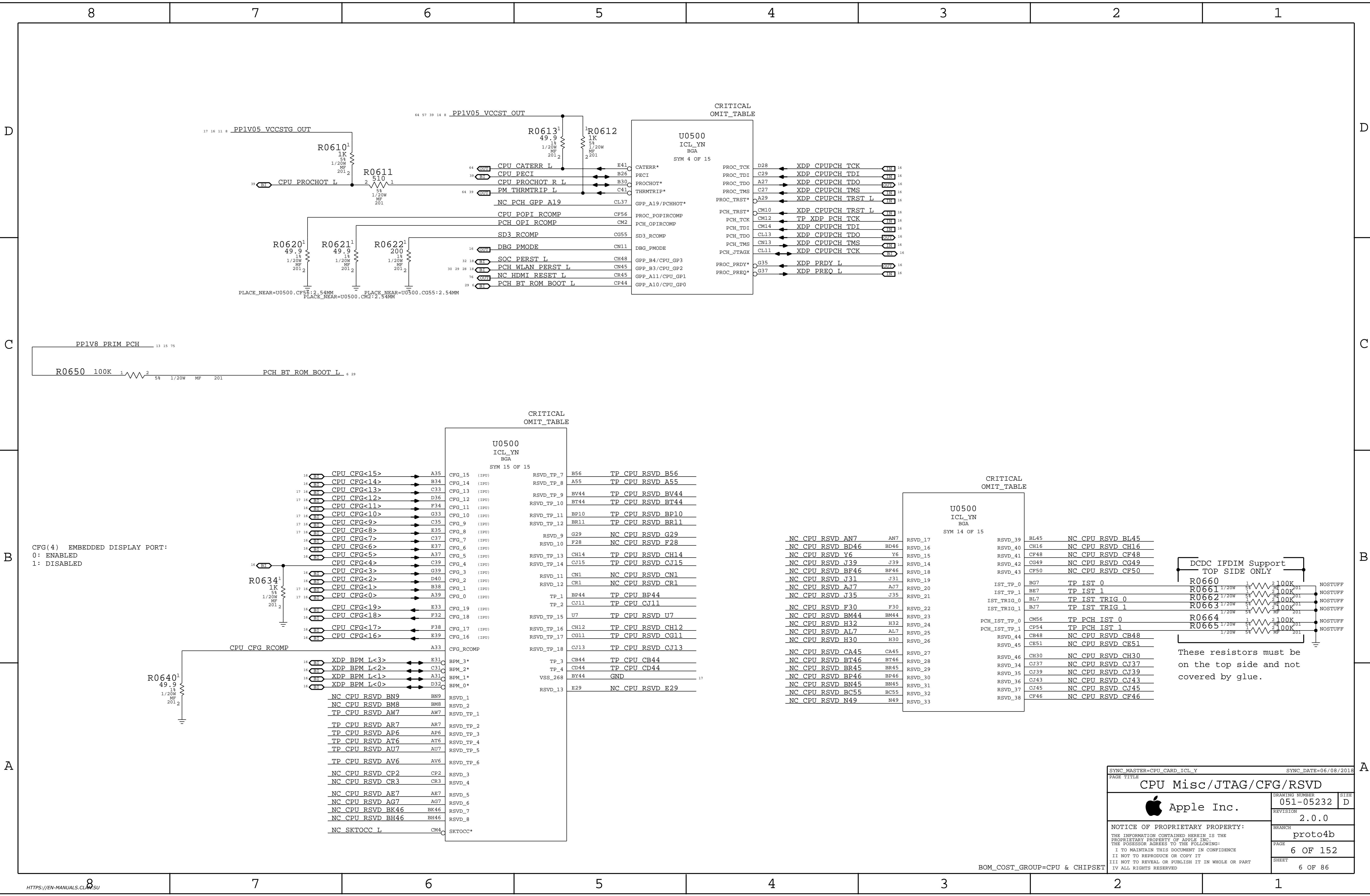
998-11113



998-11114







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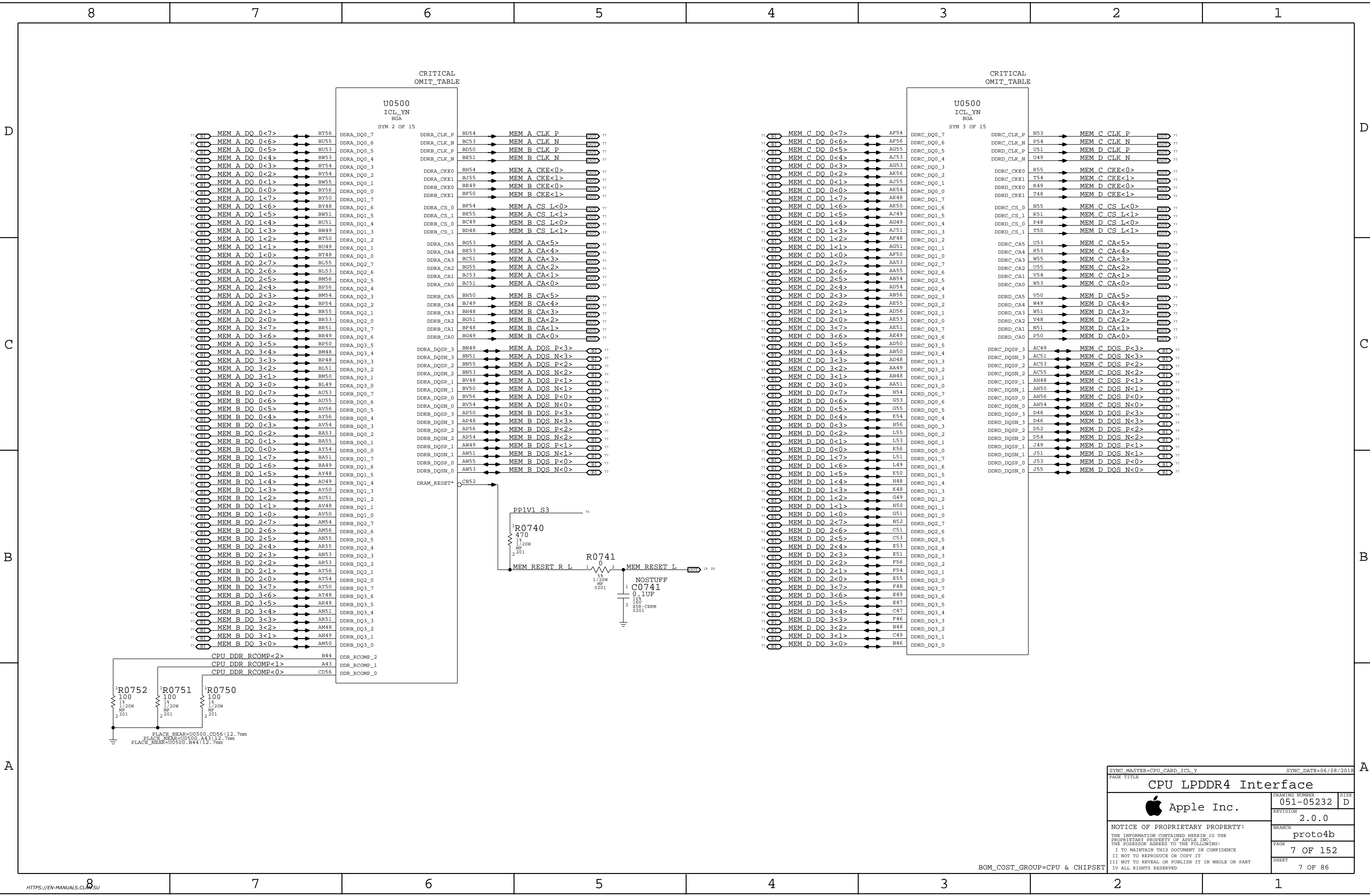
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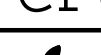
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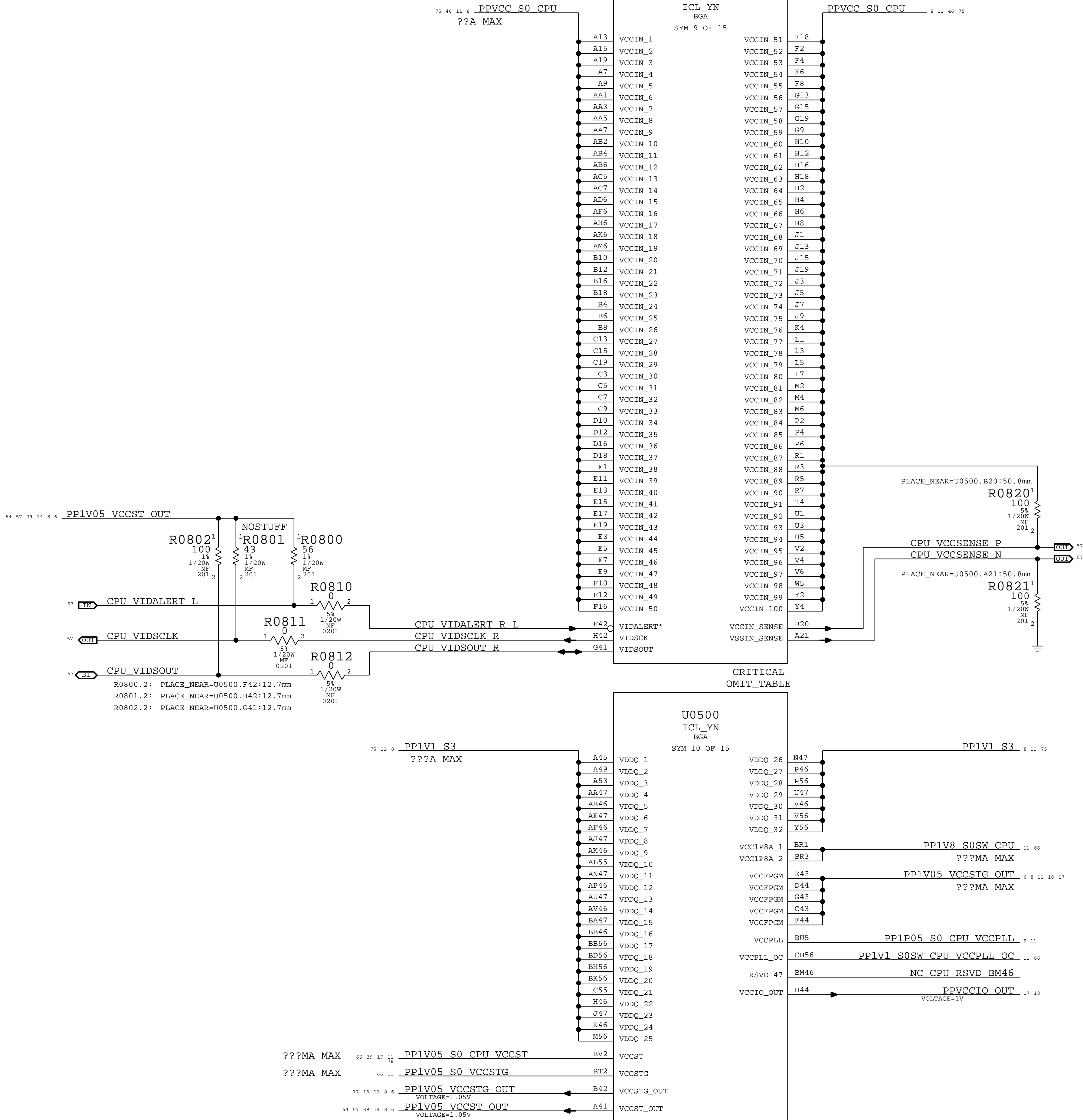
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CPU Misc/JTAG/CFG/RSVD				
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		REVISION	2.0.0	D
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		SHEET	6 OF 86	




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 Apple Inc.			DRAWING NUMBER		SIZE
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			SHEET		
			7 OF 86		

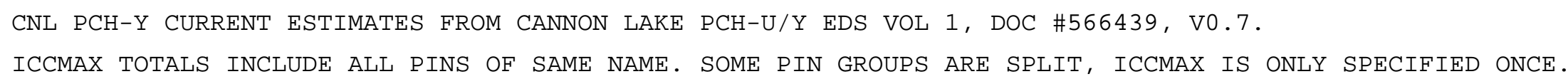
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CNL CPU-Y current estimates from Cannon Lake Processor EDS Vol 1, doc #566214, v0.7.
IccMax totals include all pins of same name. Some pin groups are split, IccMax is only specified once.

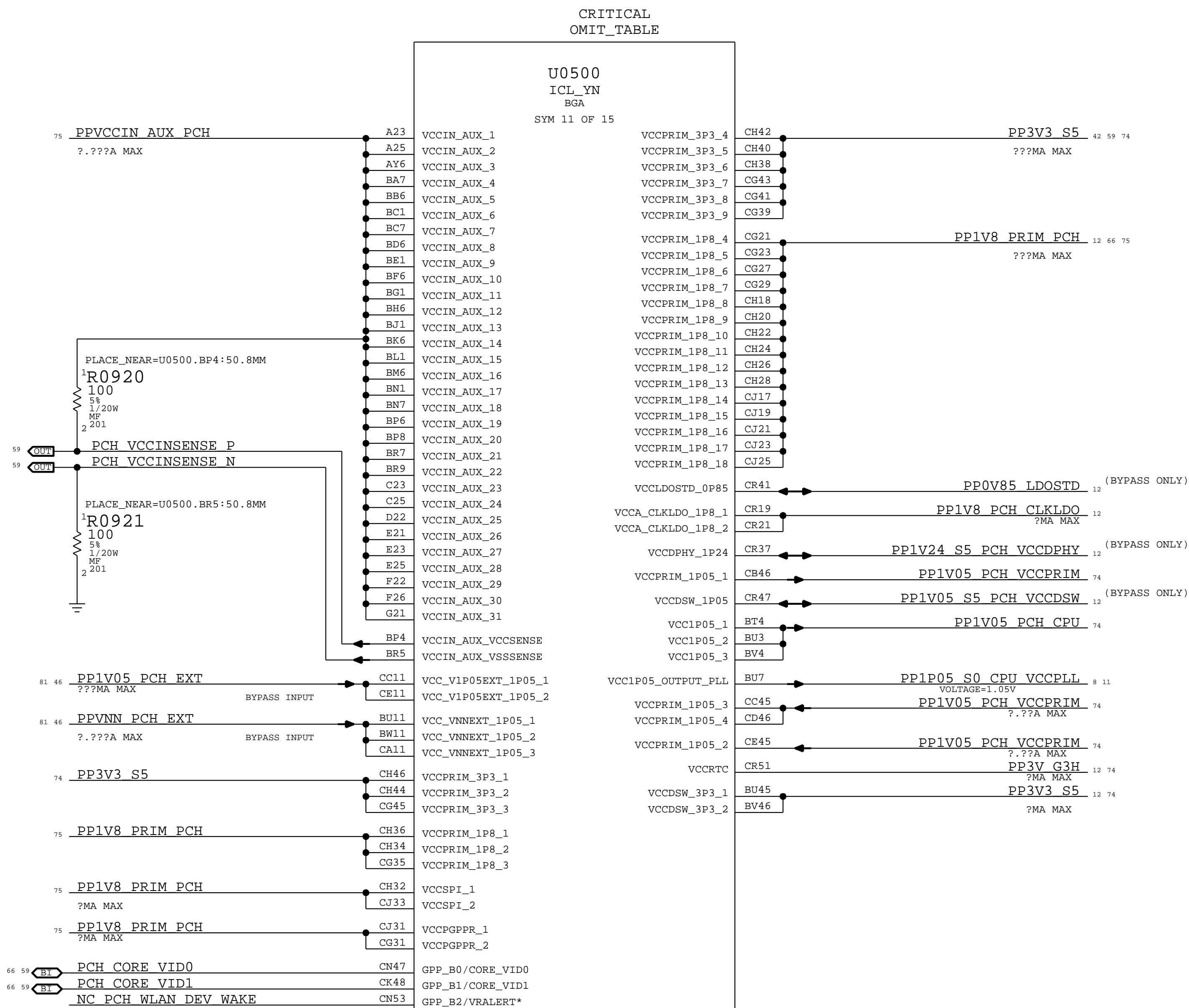


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CPU Power						
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			PAGE		8 OF 152	
			SHEET		8 OF 86	



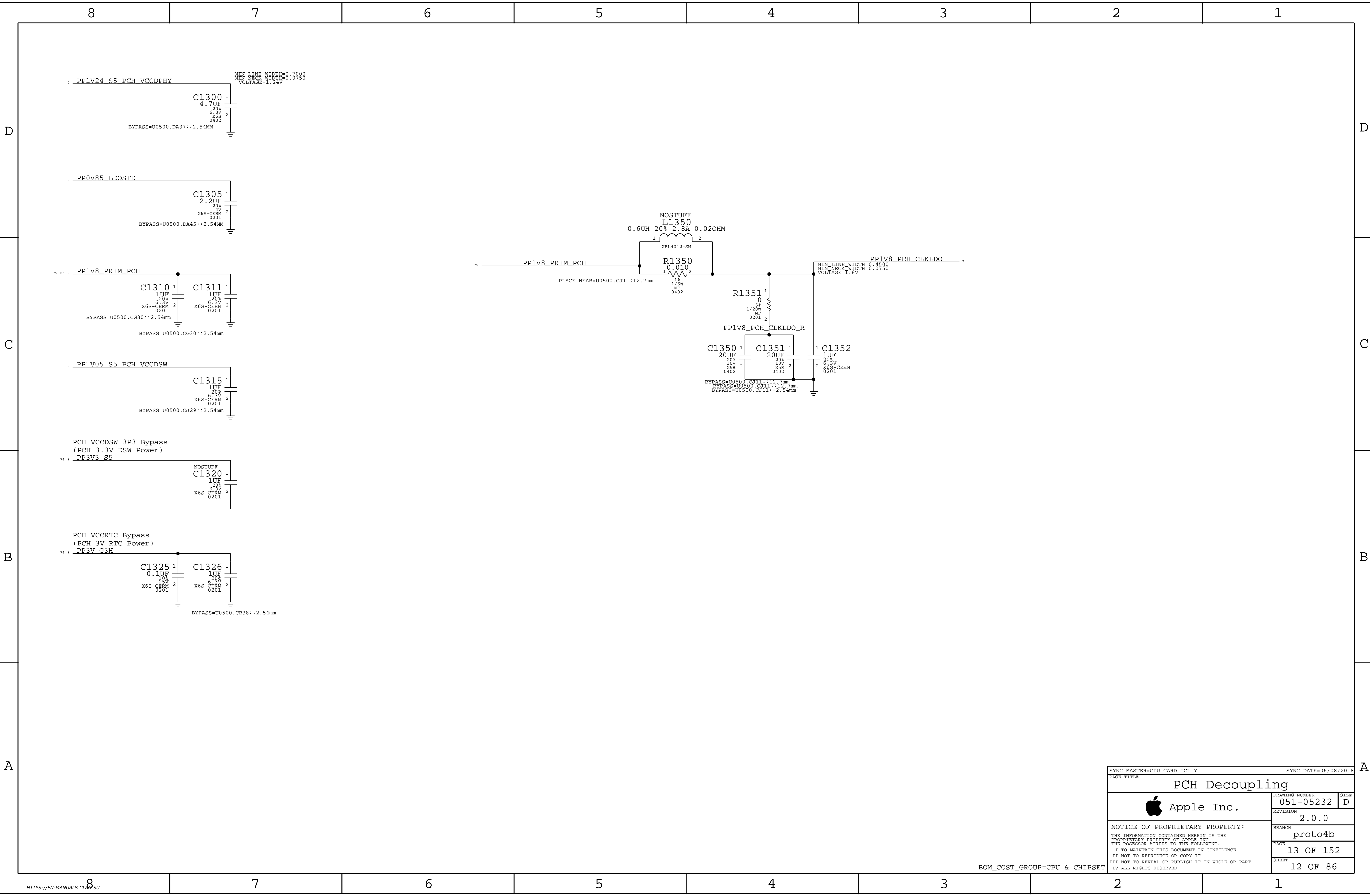
NOTE: ALIASES NOT USED ON CPU SUPPLY OUTPUTS
TO AVOID ANY EXTRANEIOUS CONNECTIONS.




WiFi will be woken up by PCIe In-Band Signal and therefore PCH_WLAN_DEV_WAKE will not be connected

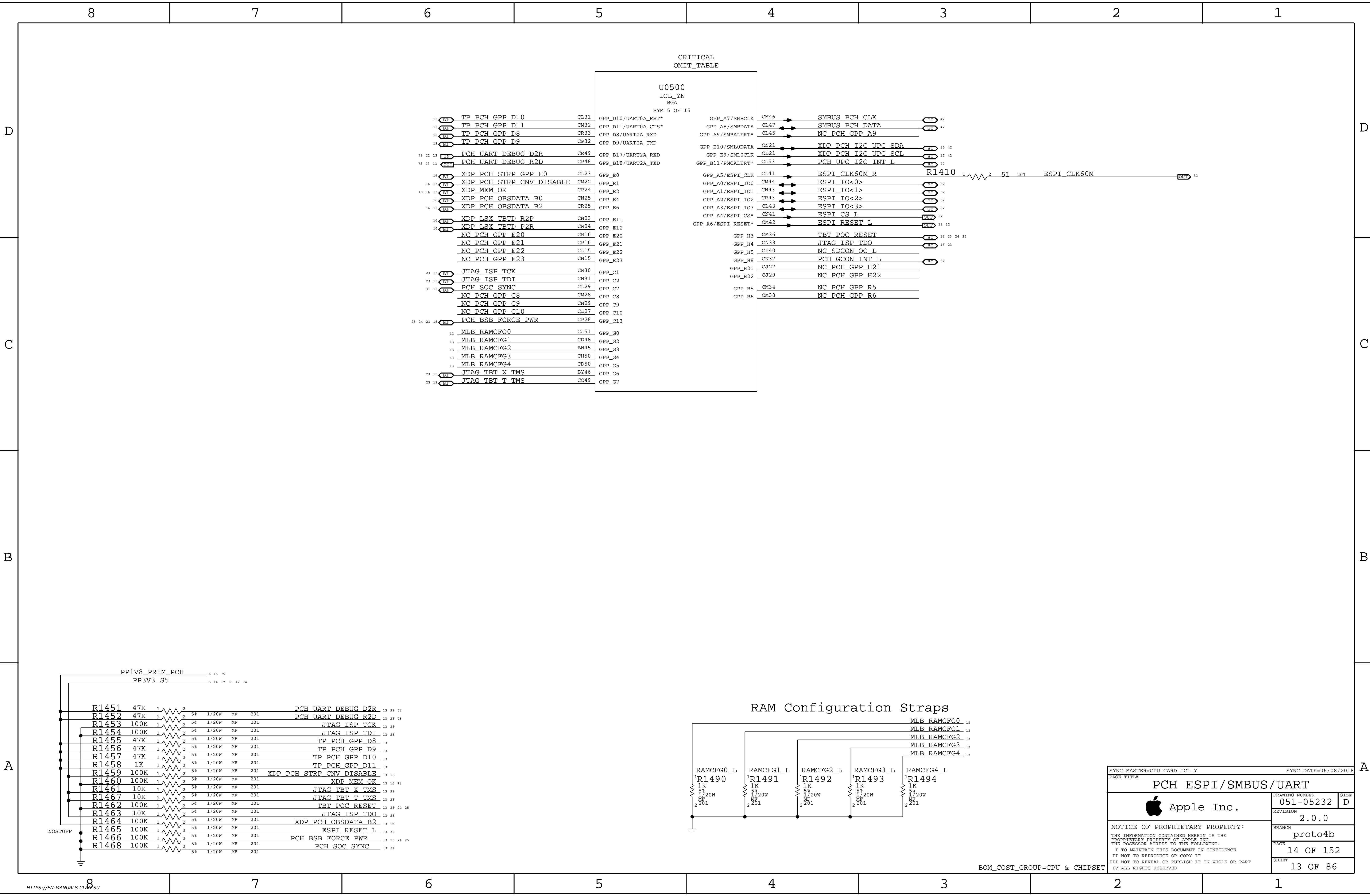
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	REVISION		
	2.0.0		
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PAGE TITLE			
PCH Decoupling			
 Apple Inc.		DRAWING NUMBER	051-05232
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		SHEET	12 OF 86

BOM_COST_GROUP=CPU & CHIPSET



RAM Configuration Straps

RAMCFG0_L

R1490

1K

5%

1/20W

MF

2

201

RAMCFG1_L

R1491

1K

5%

1/20W

MF

2

201

RAMCFG2_L

R1492

1K

5%

1/20W

MF

2

201

RAMCFG3_L

R1493

1K

5%

1/20W

MF

2

201

RAMCFG4_L

R1494

1K

5%

1/20W

MF

2

201

MLB RAMCFG0

13

MLB RAMCFG1

13

MLB RAMCFG2

13

MLB RAMCFG3

13

MLB RAMCFG4

13

SYNC_MASTER=CPU_CARD_ICL_Y

SYNC_DATE=06/08/2018

PAGE TITLE

PCH ESPI/SMBUS/UART

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BRANCH

proto4b

PAGE

14 OF 152

SHEET

13 OF 86

SIZE

D

BOM_COST_GROUP=CPU & CHIPSET

8

7

6

5

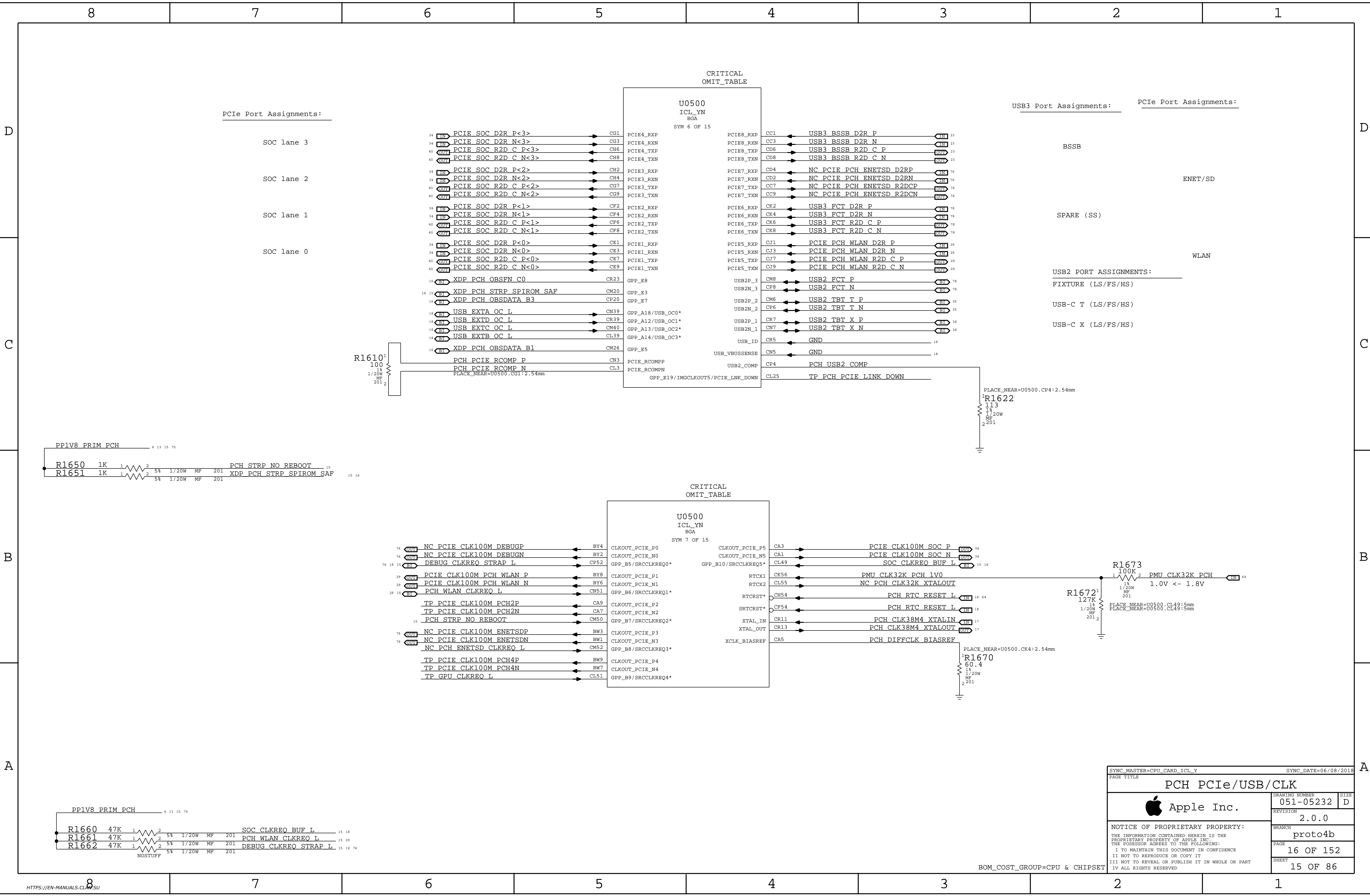
4


3

2

1

HTTPS://EN-MANUALS.CLAPPSU



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PCH PCIe/USB/CLK			
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		BRANCH	proto4b
		PAGE	16 OF 152
		SHEET	15 OF 86

BOM_COST_GROUP=CPU & CHIPSET

D

C

B

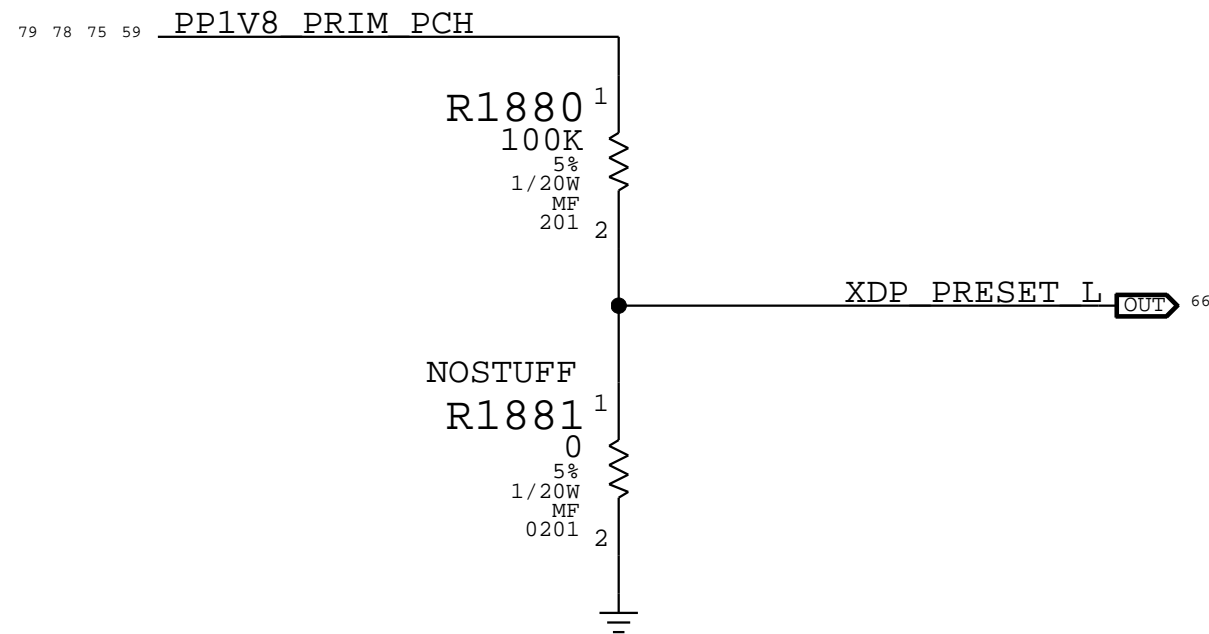
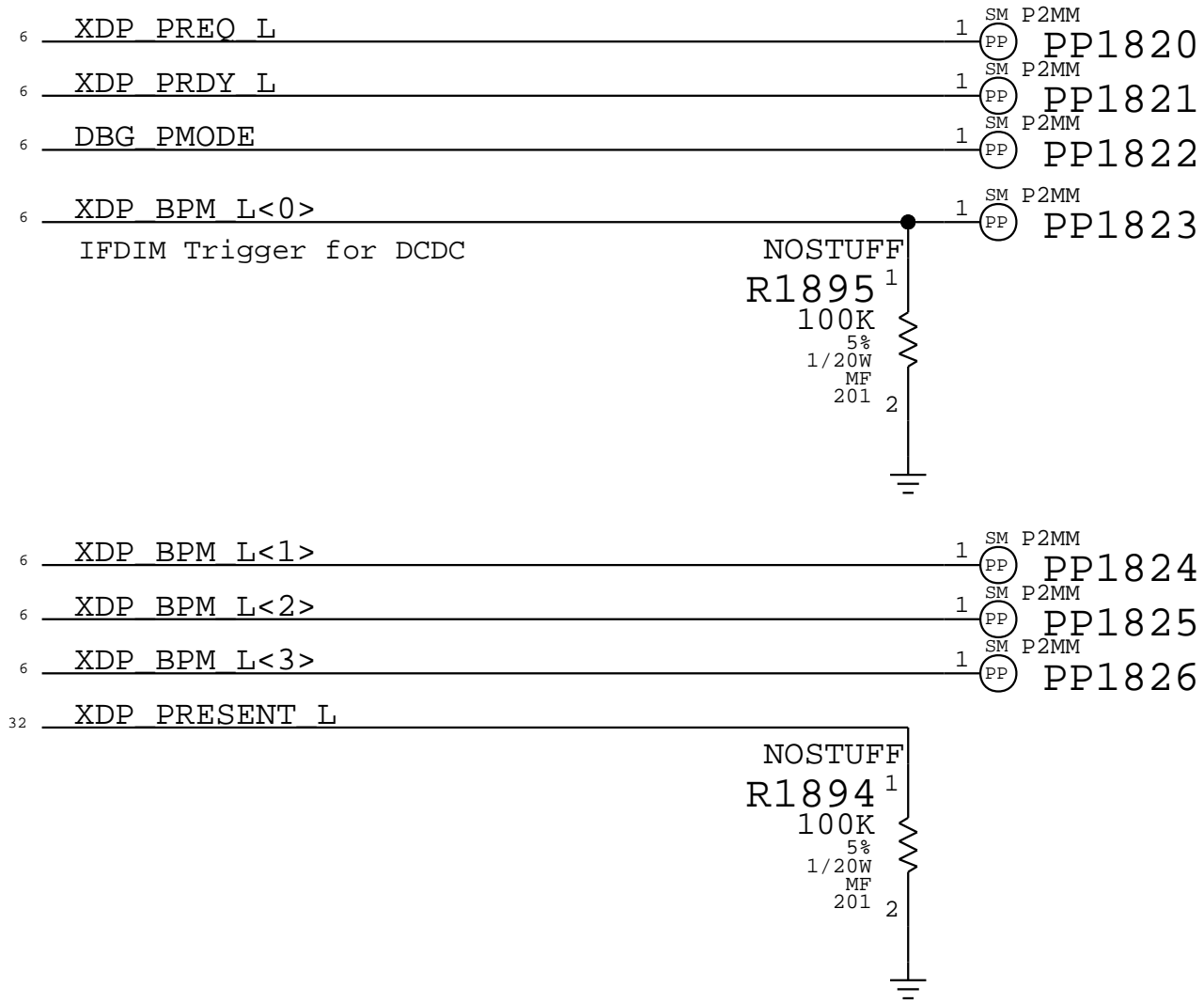
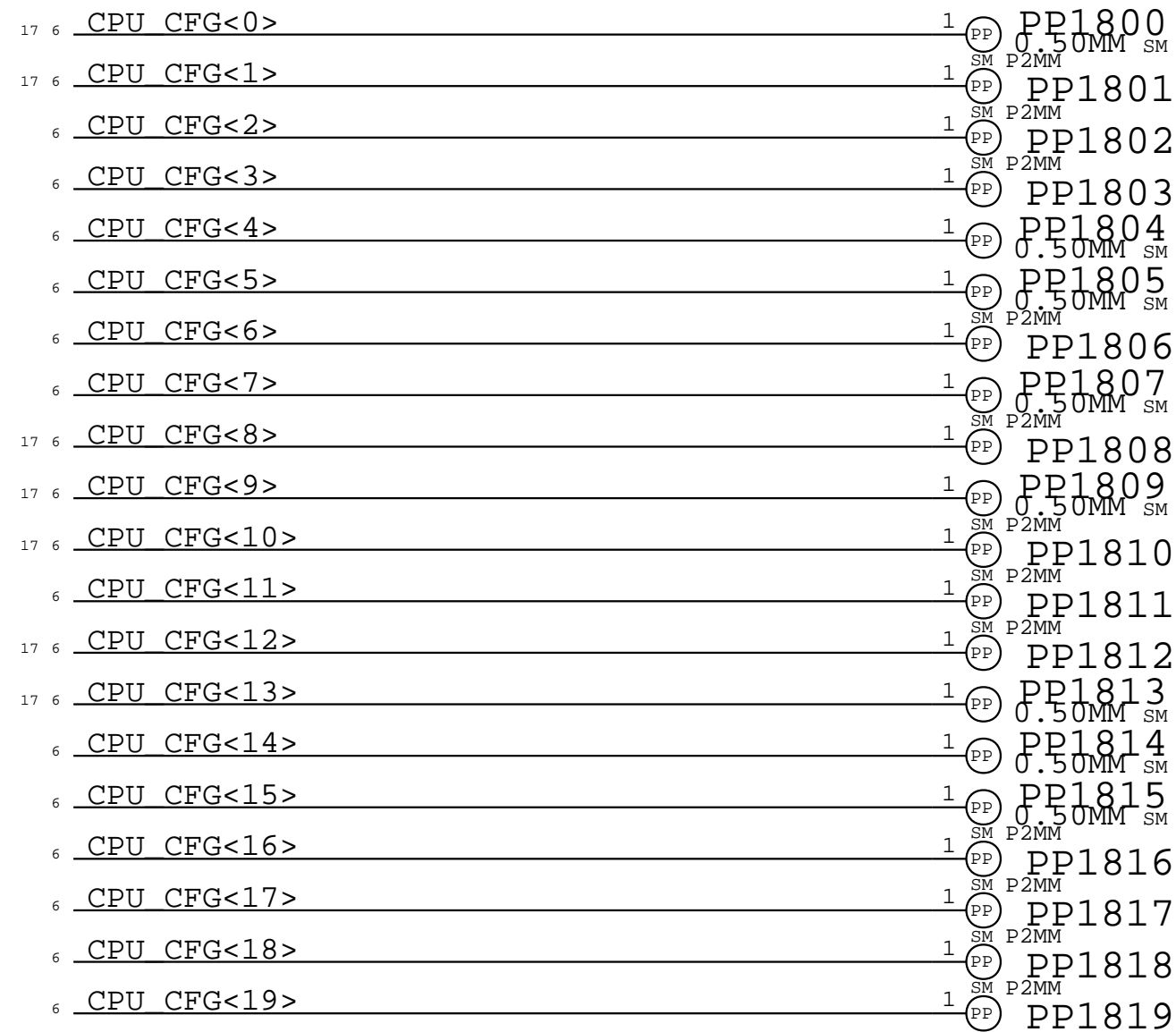
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D

C

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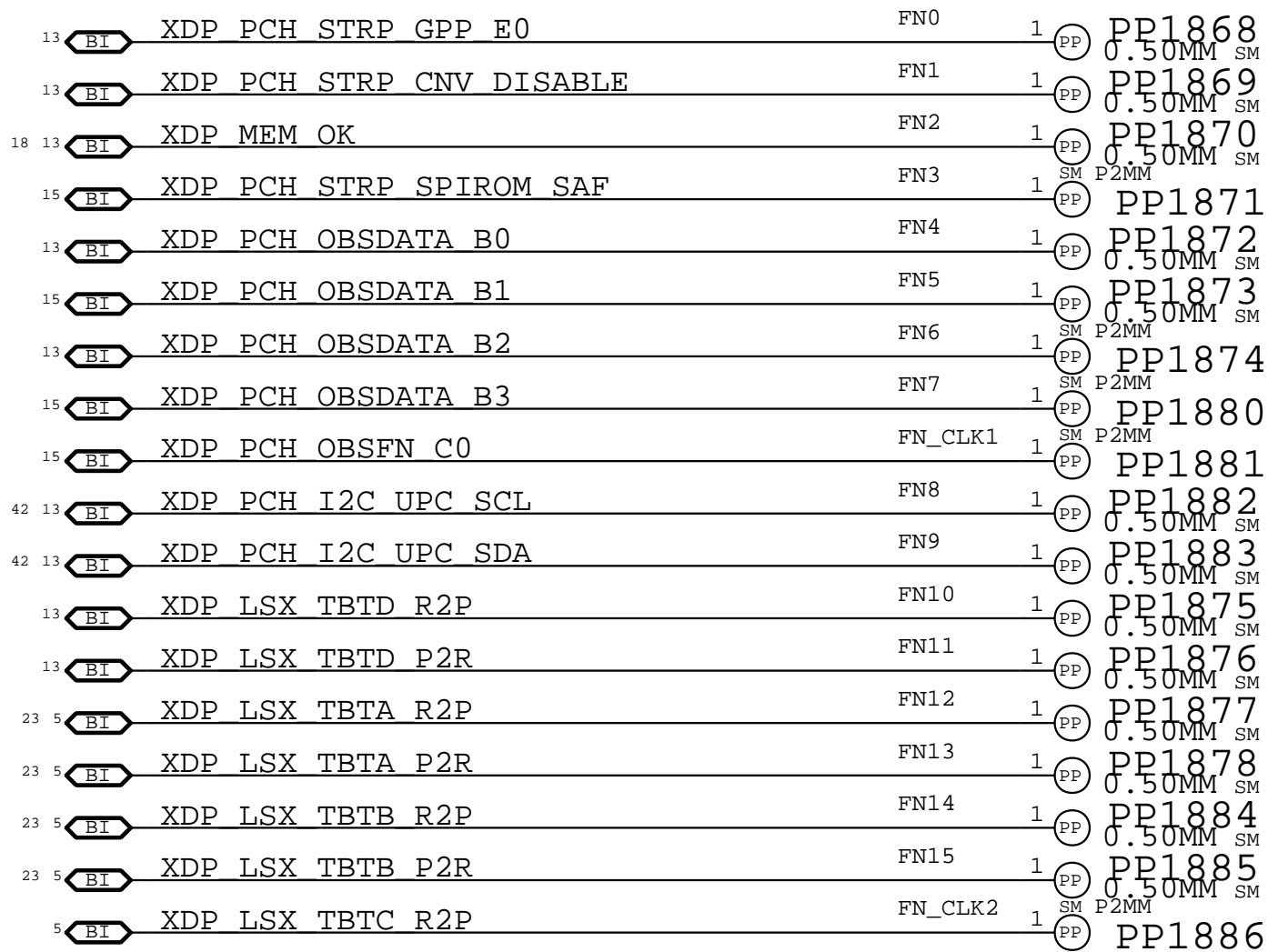
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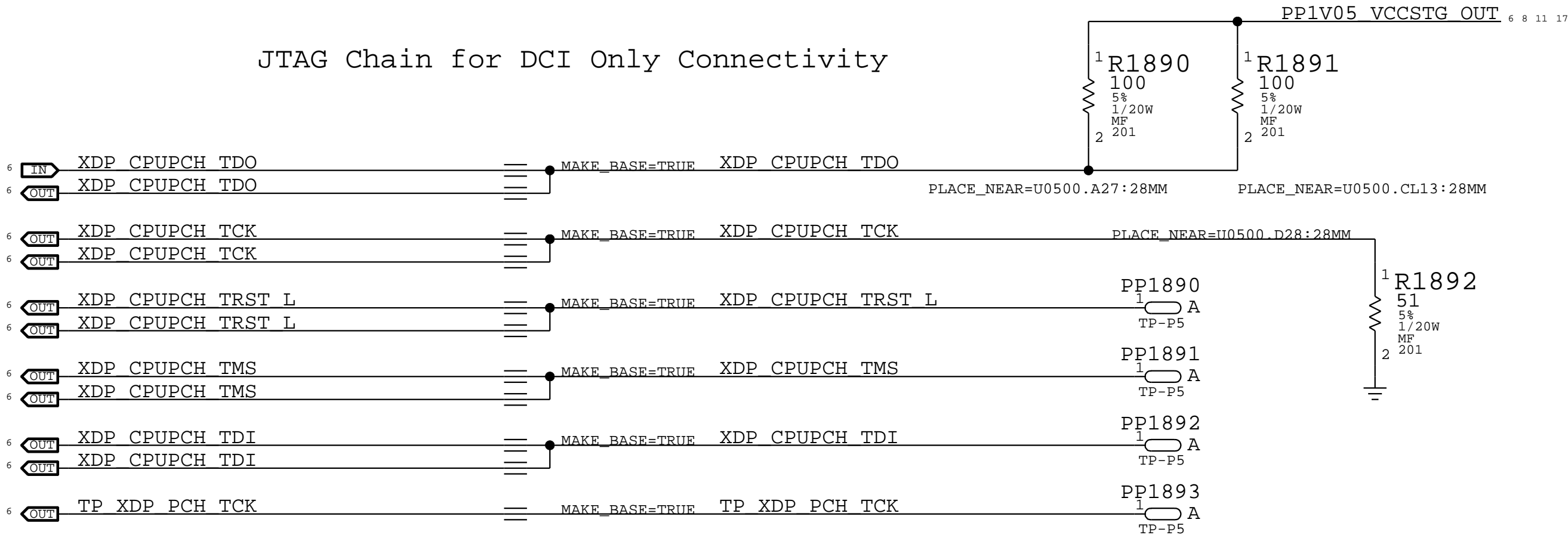
PCH XDP Signals


These signals do not connect to the Primary (Merged) XDP connector in this architecture because it does not exist. The PDG puts them on a secondary XDP connector that is only needed in some PCH debugging situation, but also does not exist. They are listed here to show their secondary XDP functions and to provide test points for signals that are not used elsewhere. Unused GPIOs have TPs.

PCH/XDP Signals



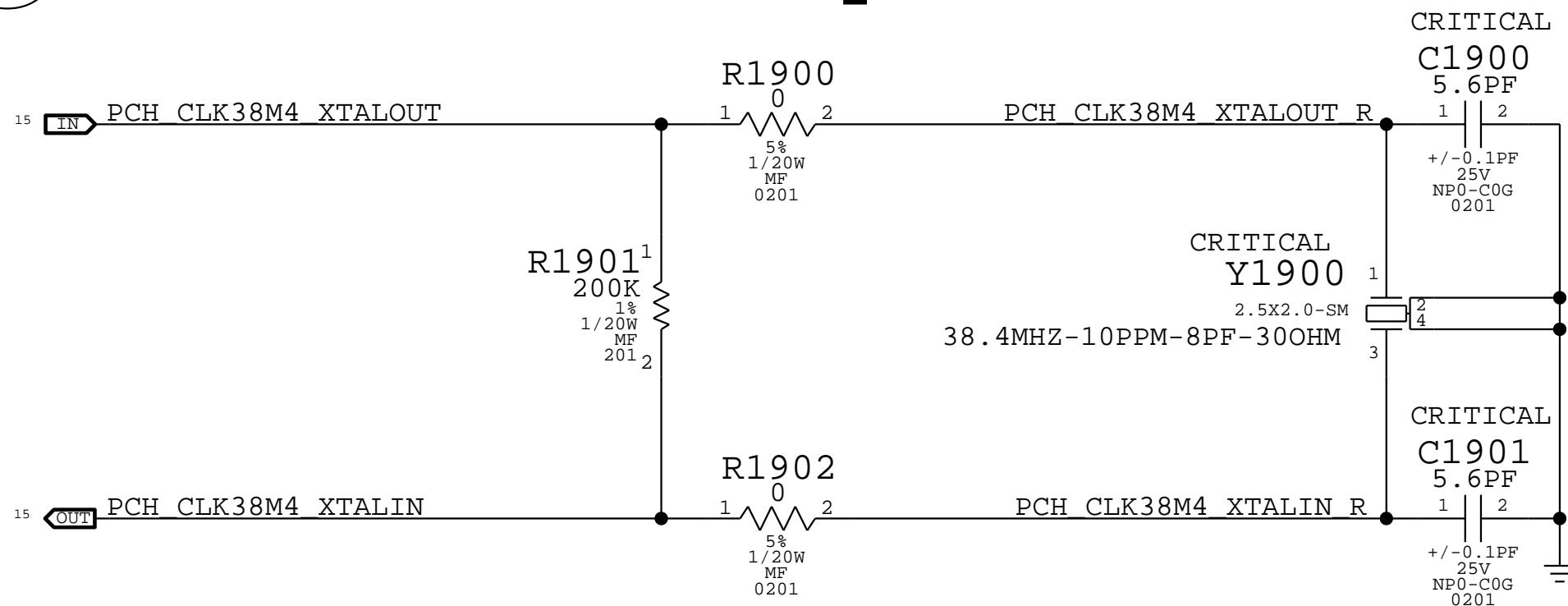
JTAG Chain for DCI Only Connectivity



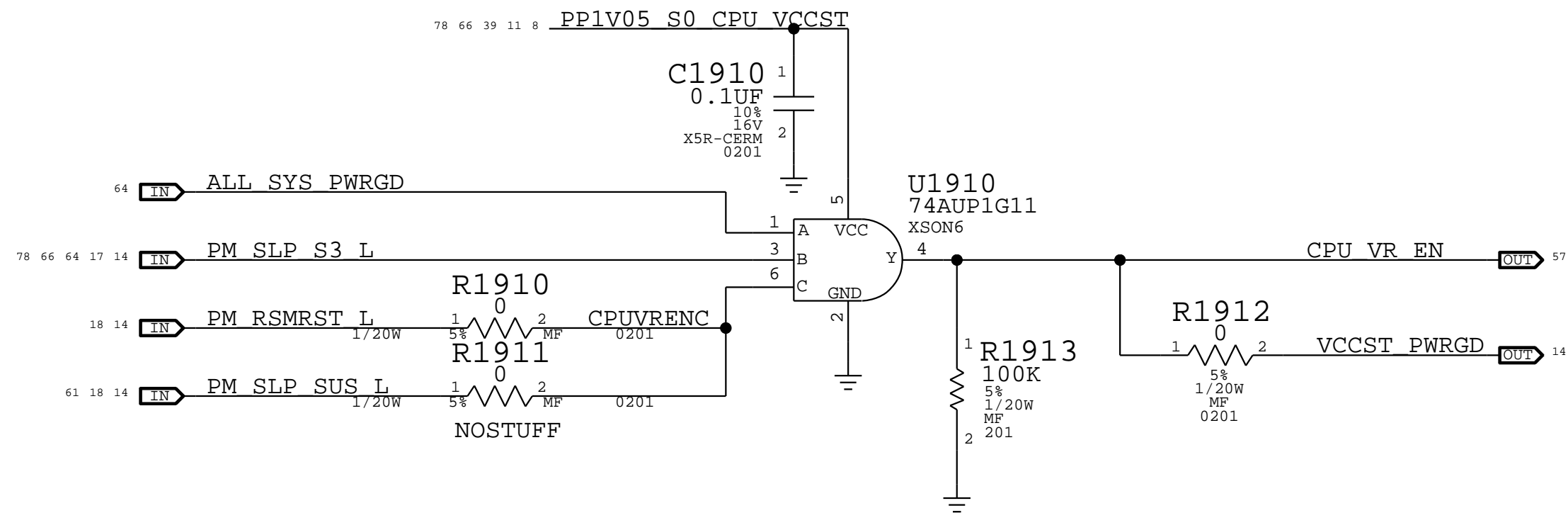
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			BRANCH		proto4b	
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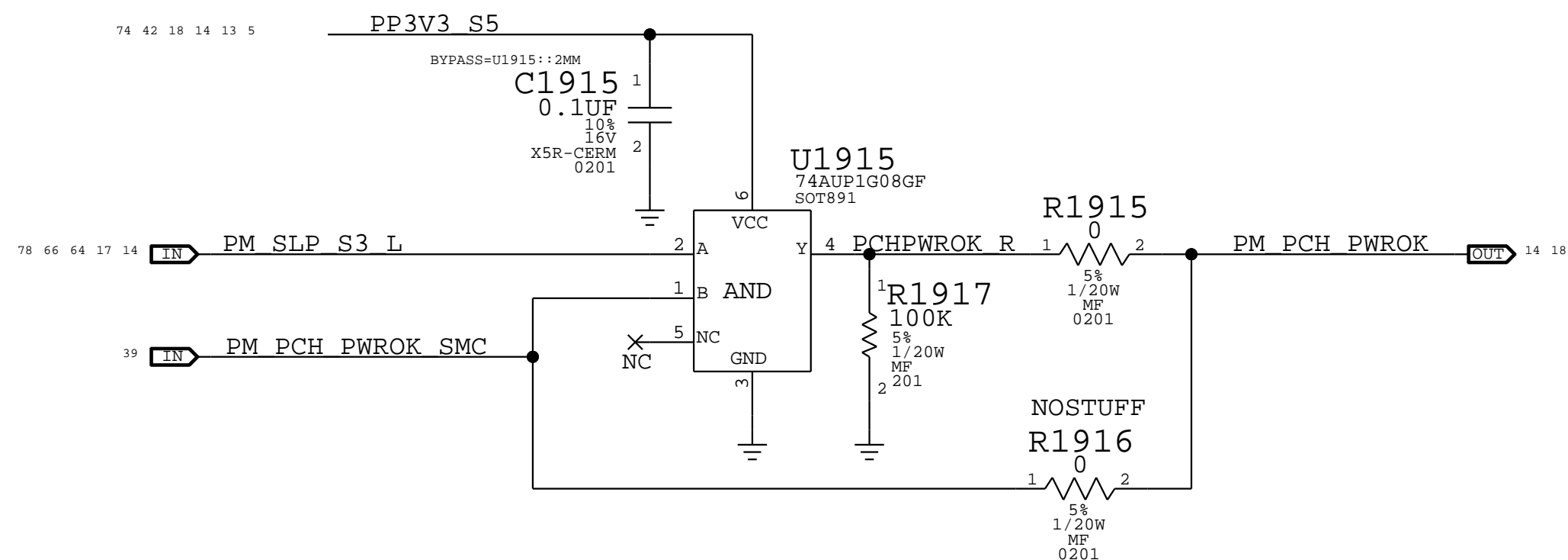
A PCH 38.4MHz Crystal



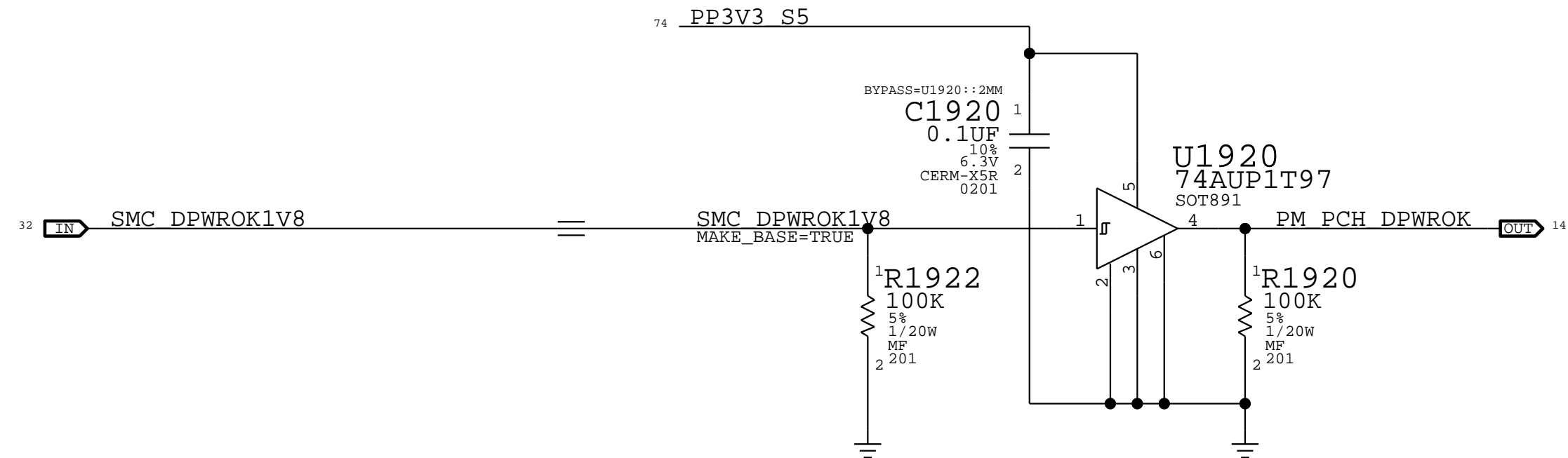
B VCCIN VR EN and VCCST_PWRGD Generation



C PCH_PWROK Generation



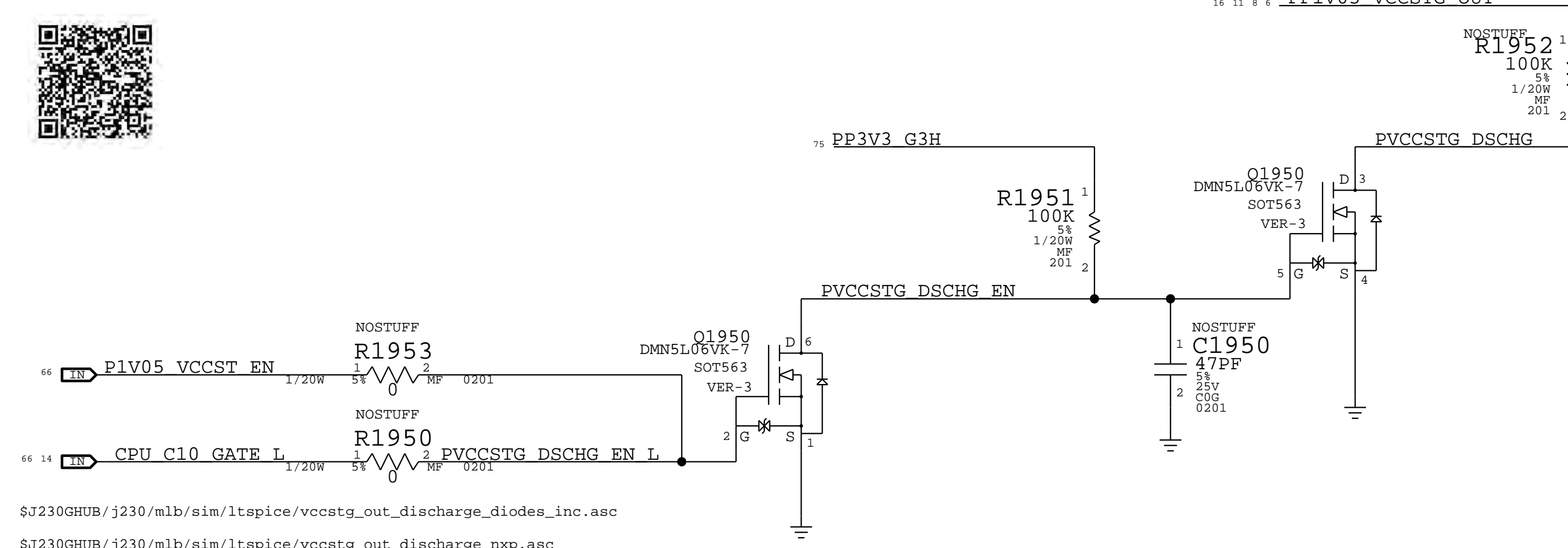
D DSW_PWROK 3.3V Level Shifter



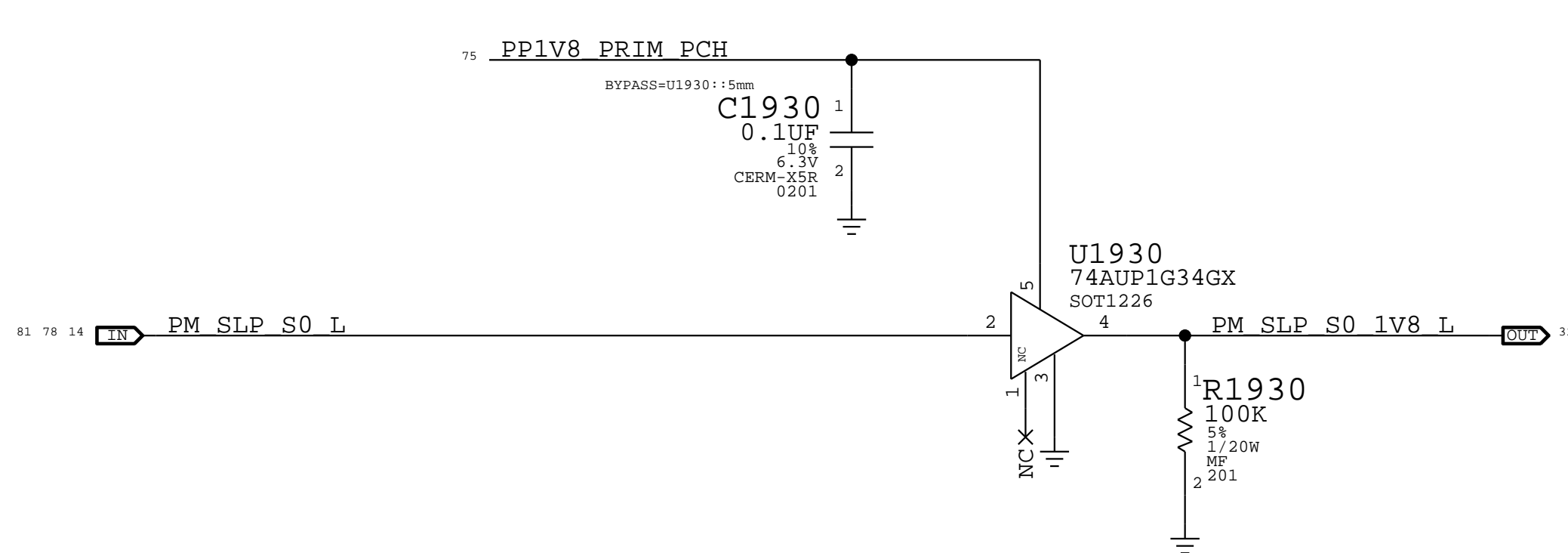
E VCCSTG_OUT Discharge Circuit

Ensure VCCSTG_OUT <= VCCST during power-down (required at all times)

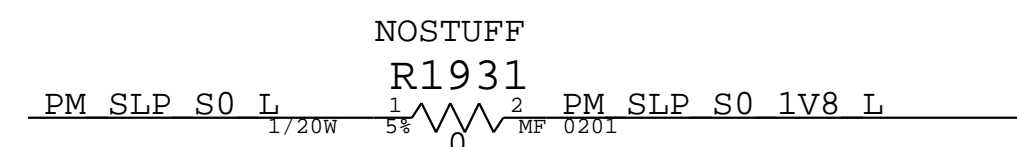
LTSpice Simulation



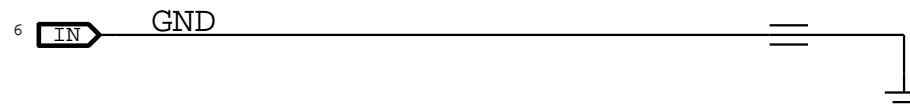
F SLP_S0# 1.8V Level Shifter



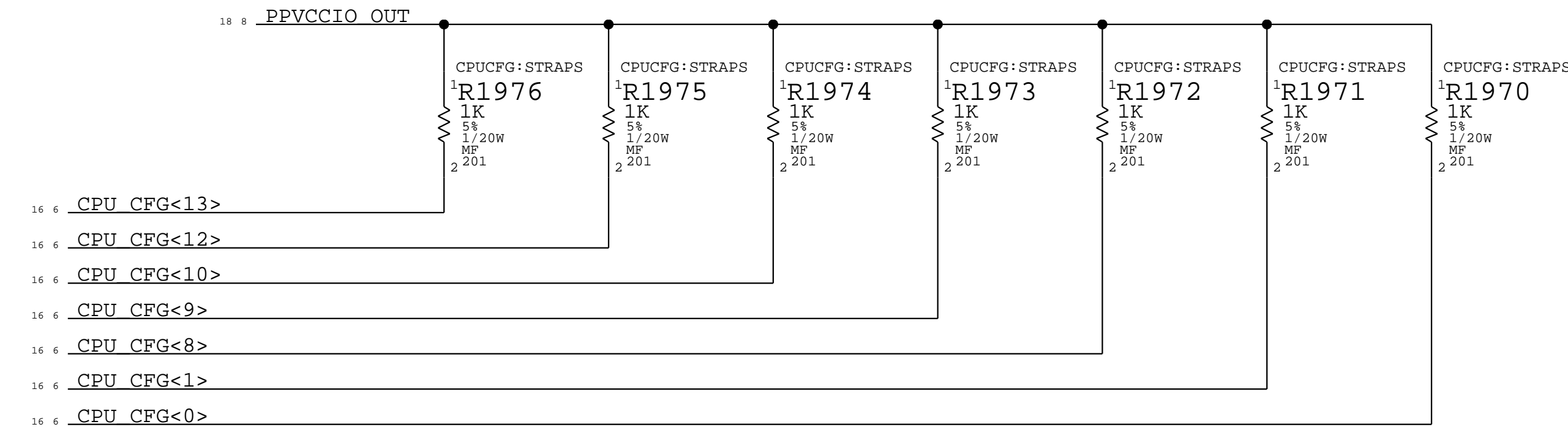
SoC Buffer Bypass




G VSS_268 GND Connection



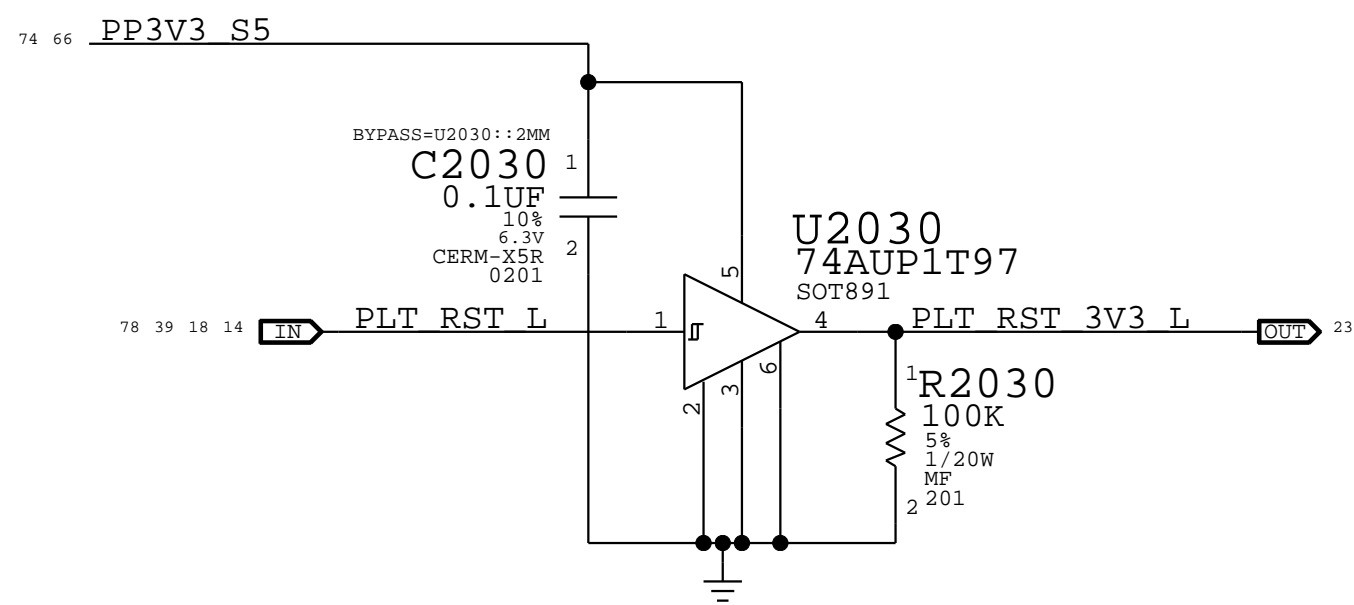
H CFG Boot Straps



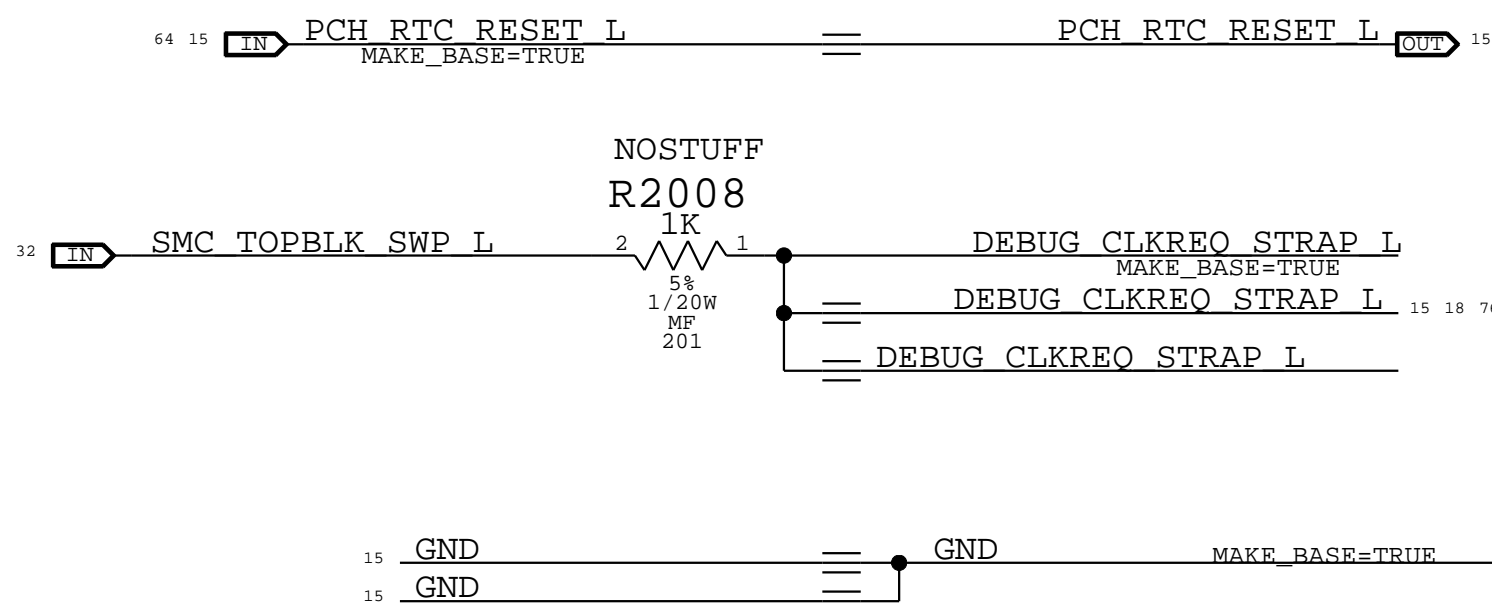
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			051-05232		D	
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			BRANCH		proto4b	
			PAGE		19 OF 152	
			SHEET		17 OF 86	

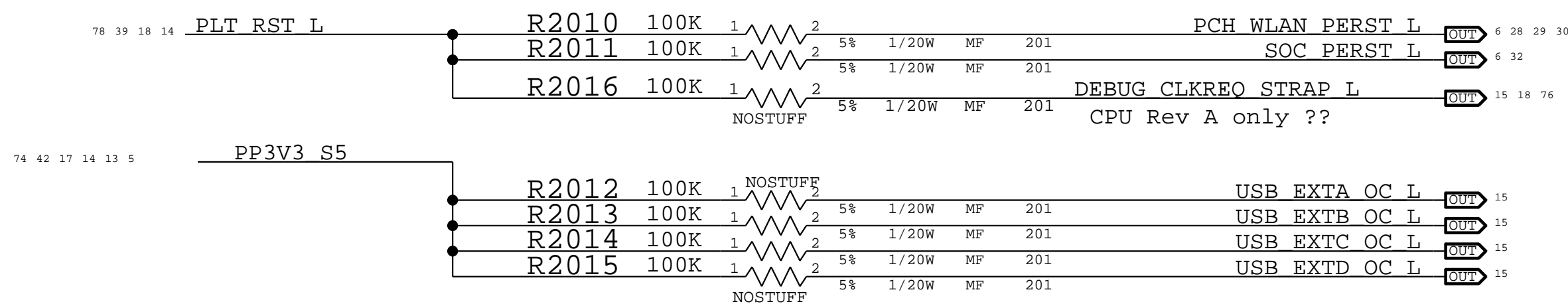
A PLTRST# 3.3V Level Shifter



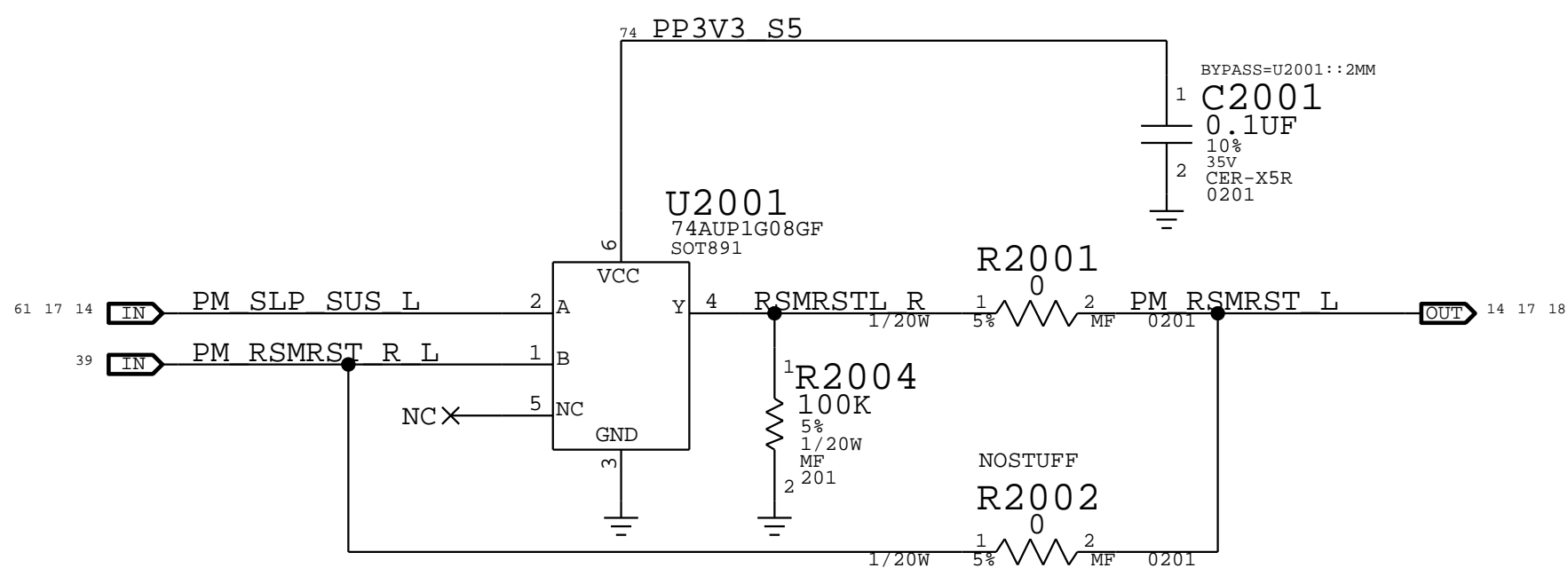
B Miscellaneous Signal Aliases



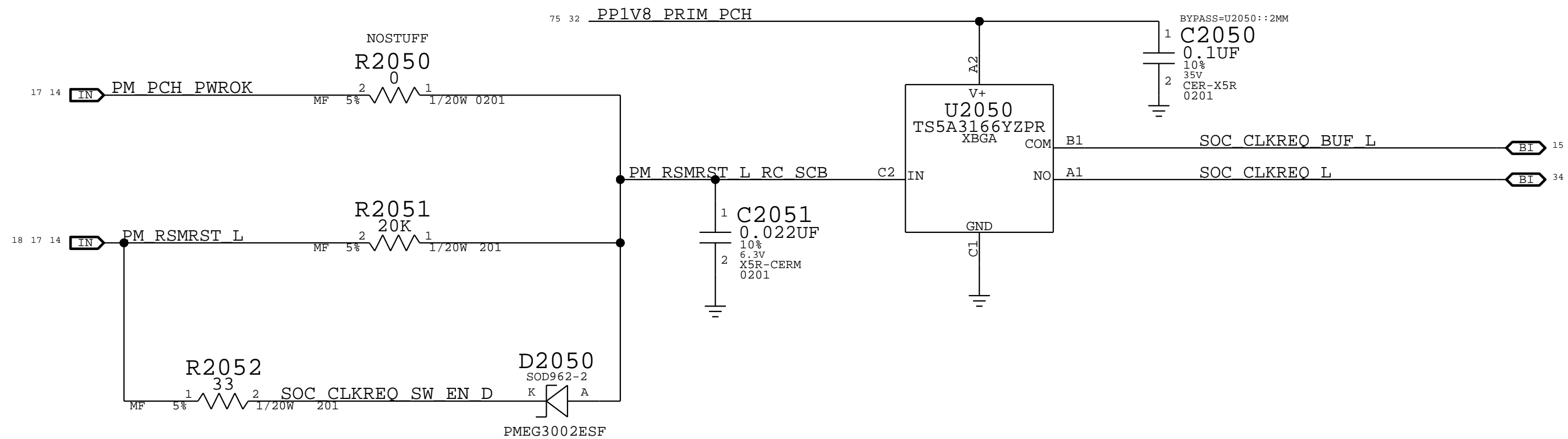
C Miscellaneous Pull-Ups



D PM_RSMRST Control



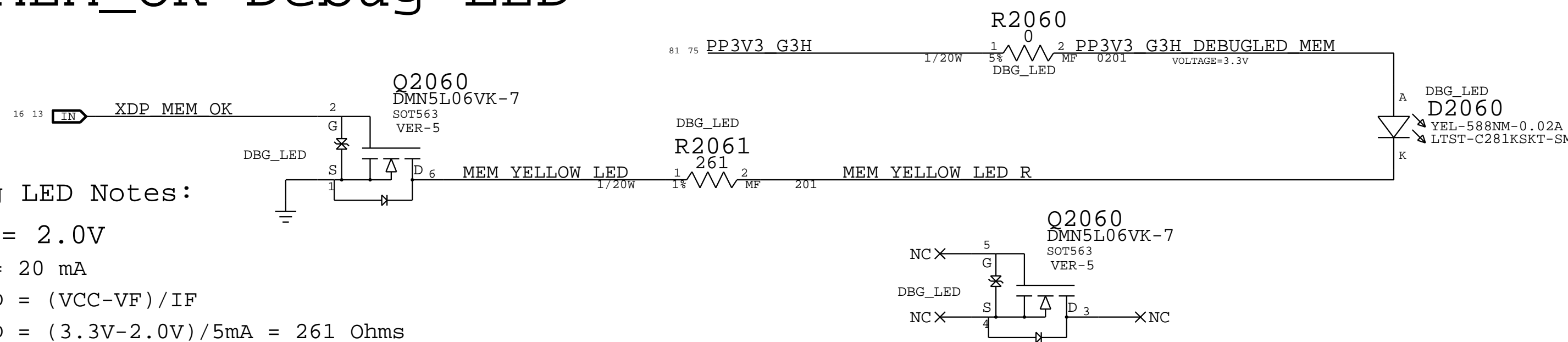
E SOC_CLKREQ Control



tau = RC = 20k * 0.022uF = 440us

PCH latches SOC_CLKREQ_L boot strap 65us after RSMRST# de-assertion

F MEM_OK Debug LED



Debug LED Notes:

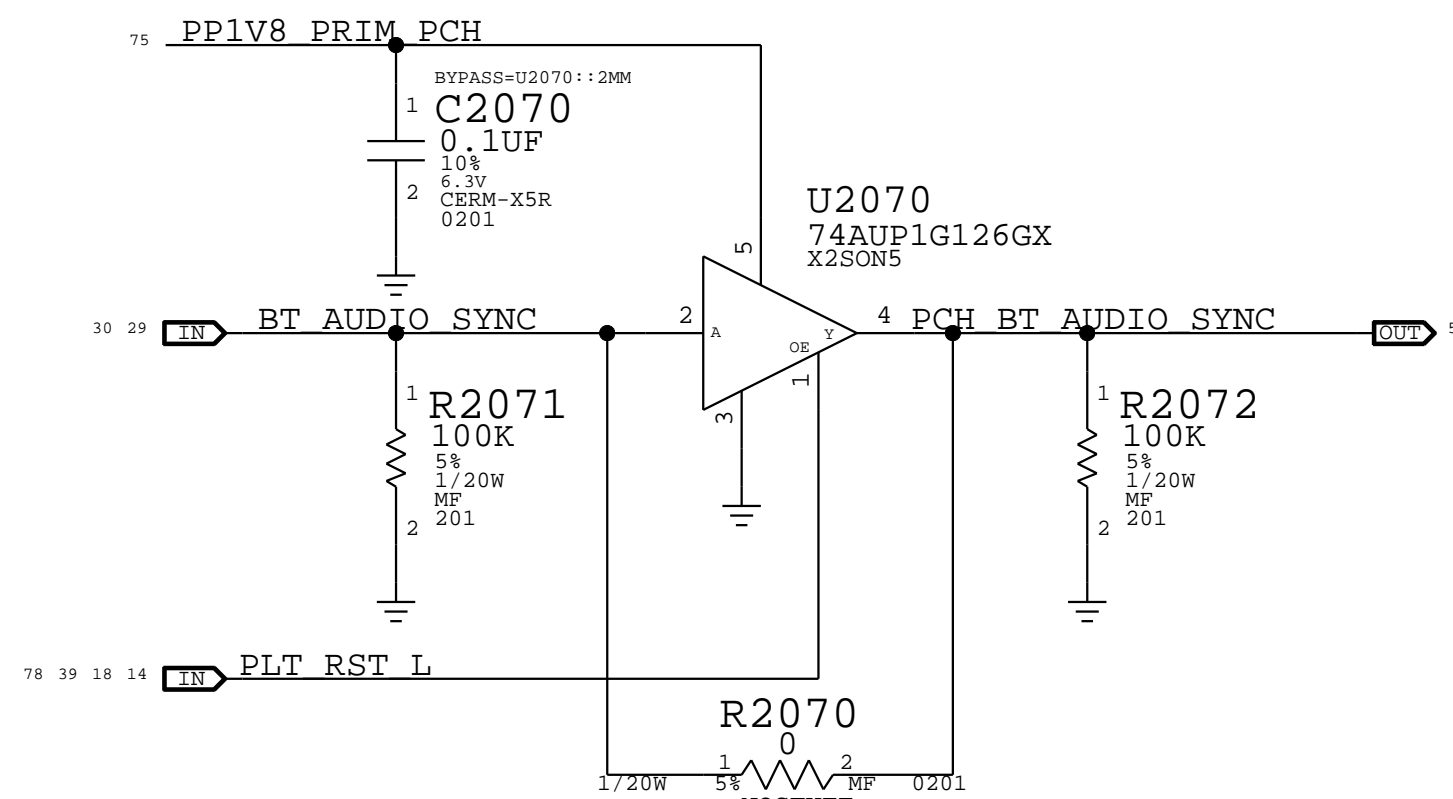
VF = 2.0V

IF = 20 mA

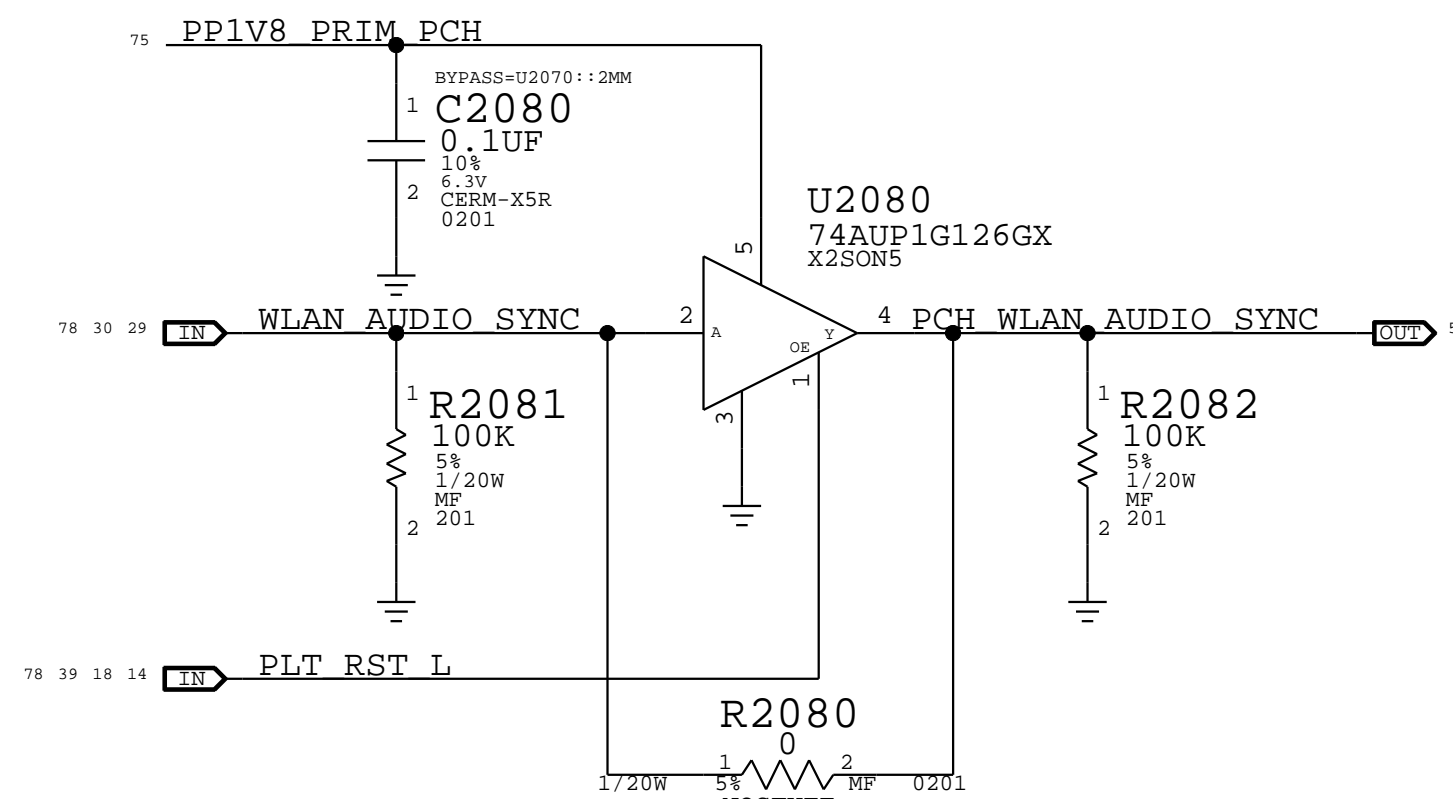
RLED = (VCC-VF)/IF

RLED = (3.3V-2.0V)/5mA = 261 Ohms

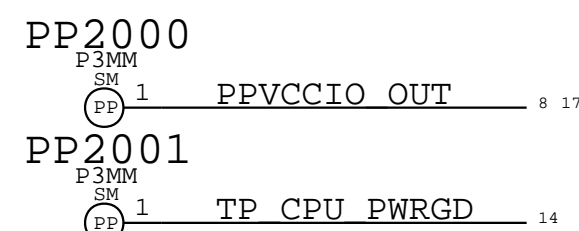
G BT Audio Sync Buf




H WiFi Audio Sync Buf



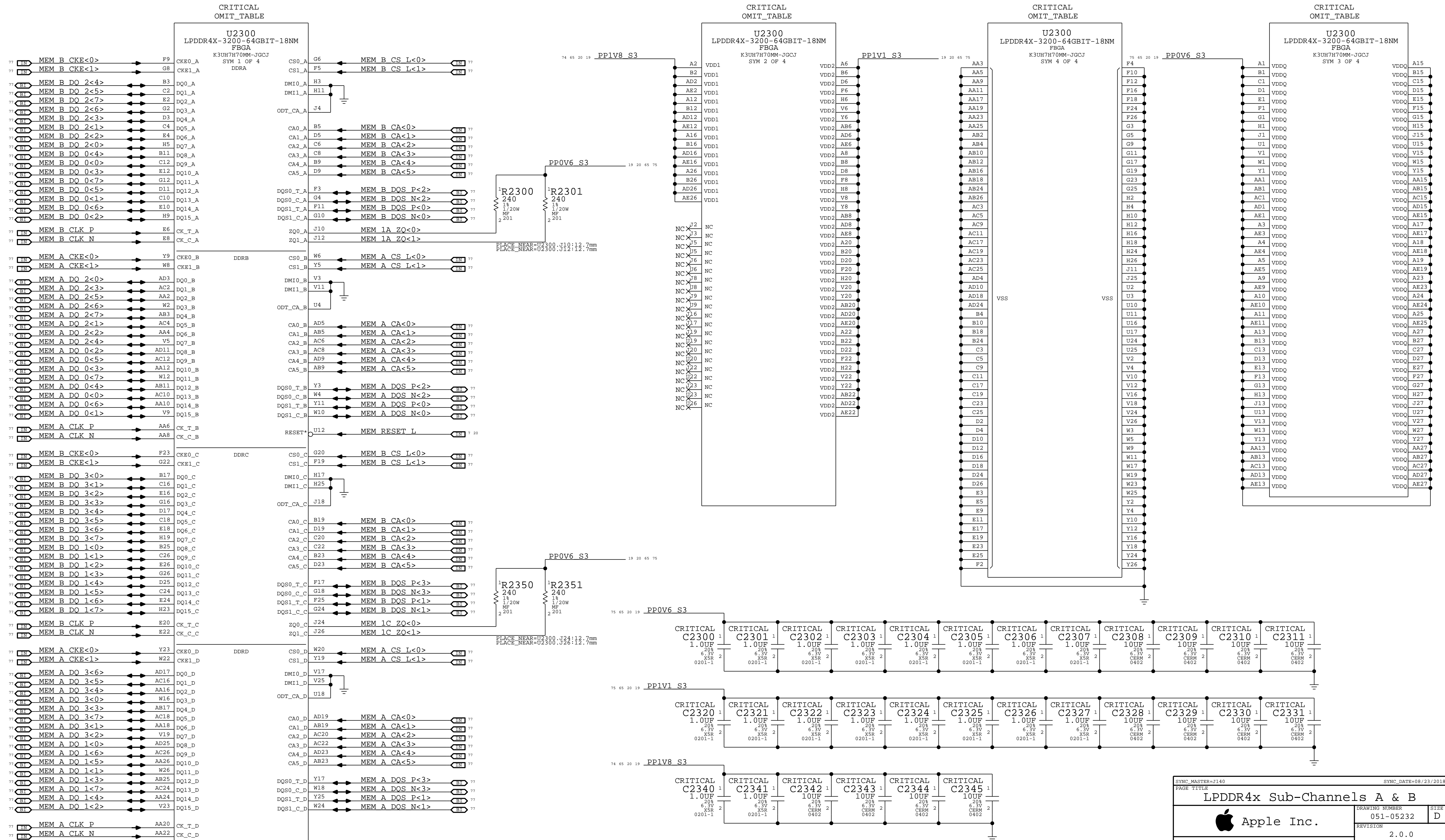
I Miscellaneous Probe Points



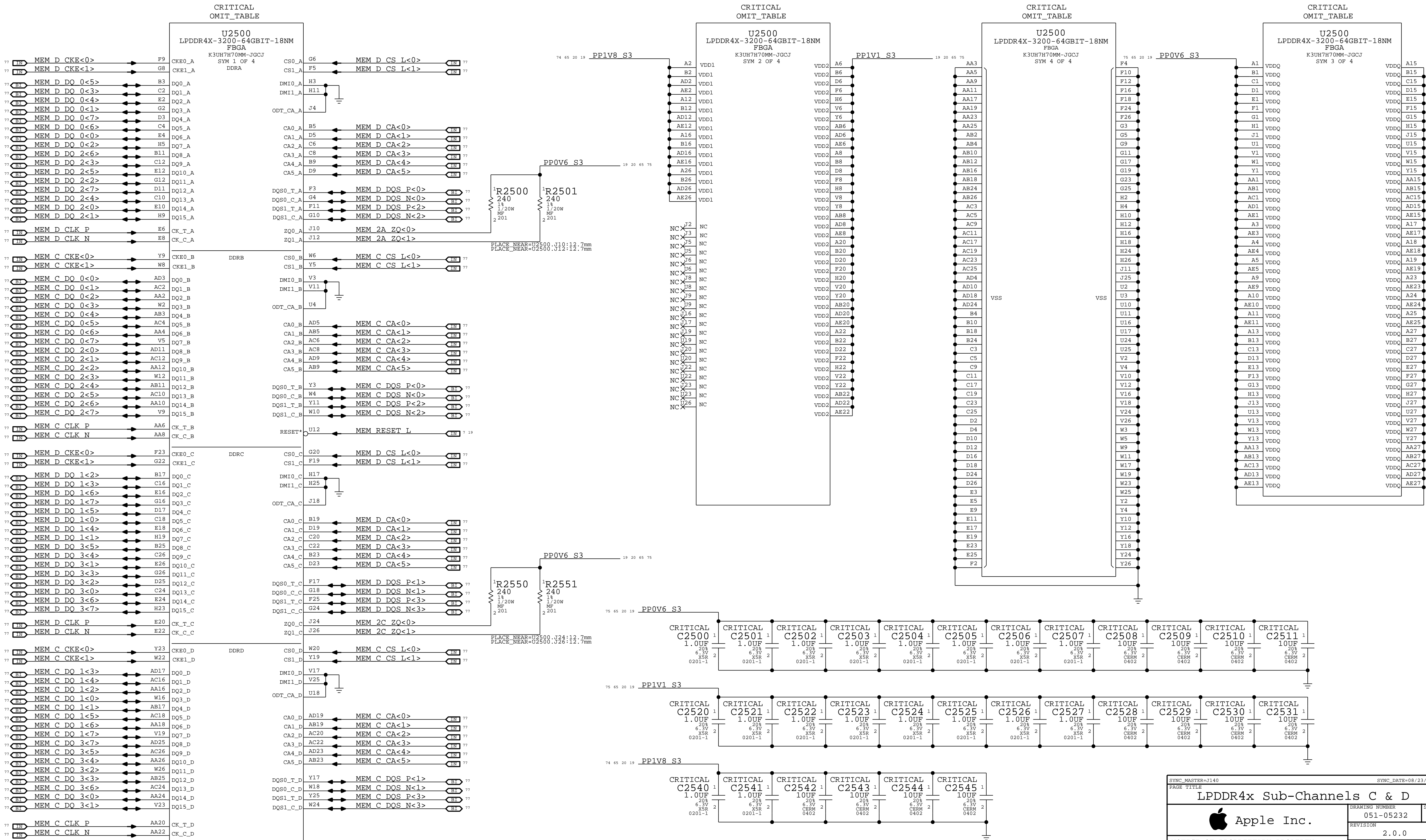
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	20 OF 152		
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LPDDR4x Sub-Channels A & B




LPDDR4x Sub-Channels C & D

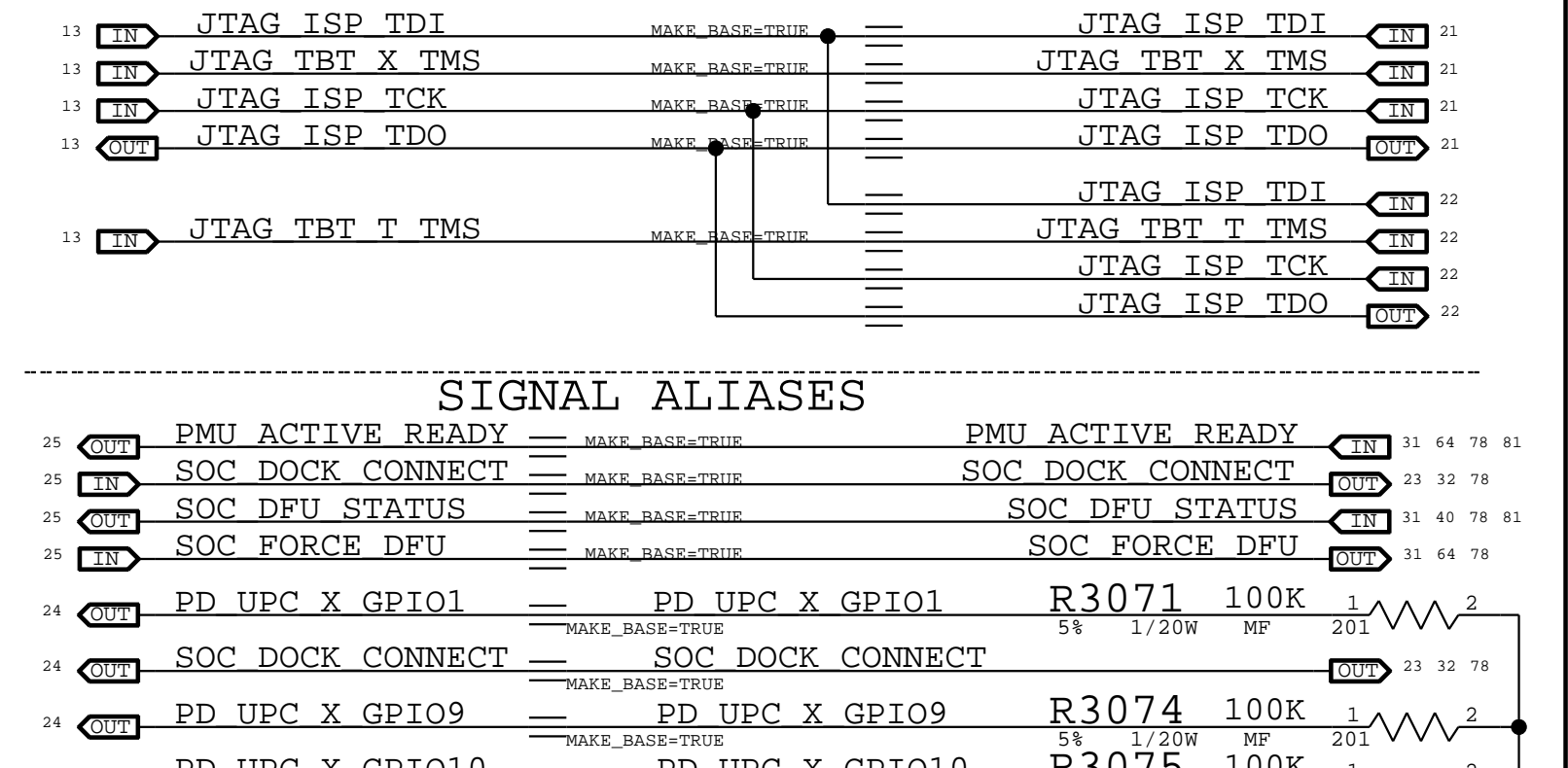
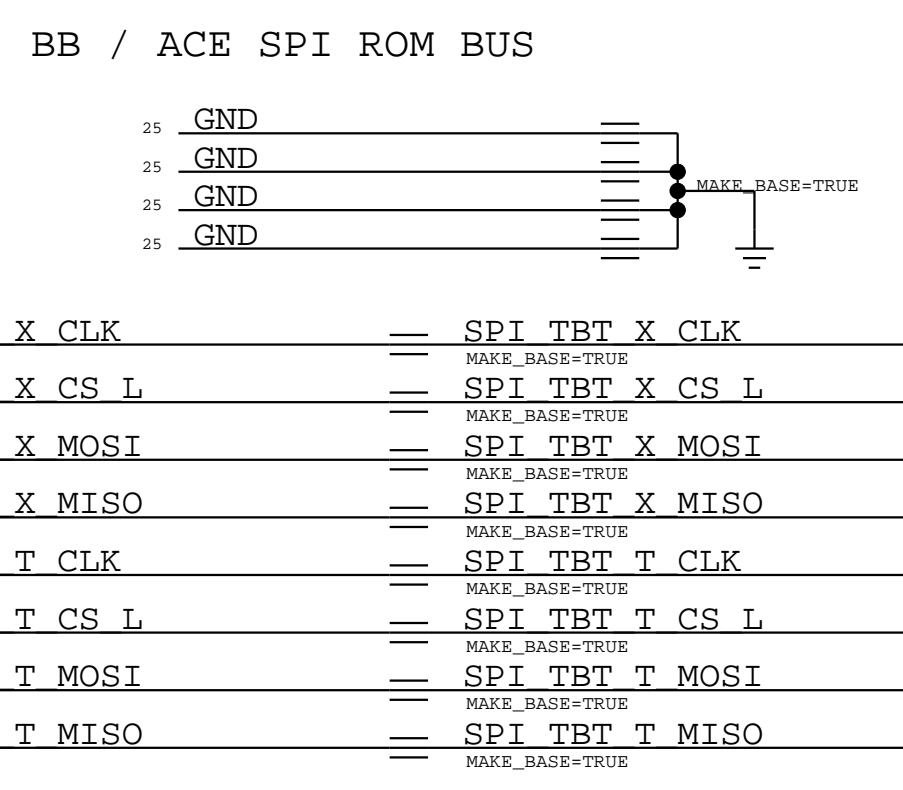
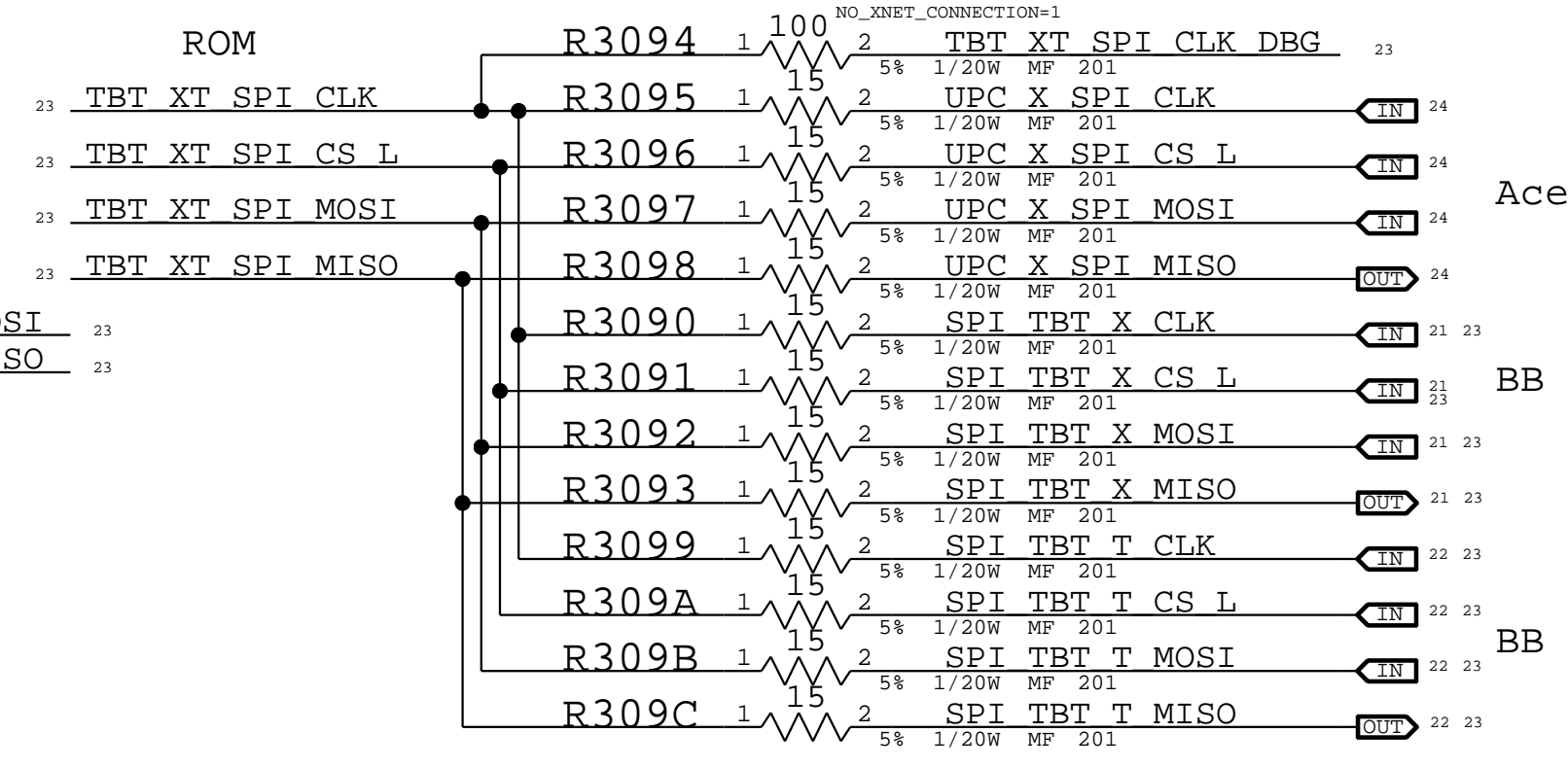
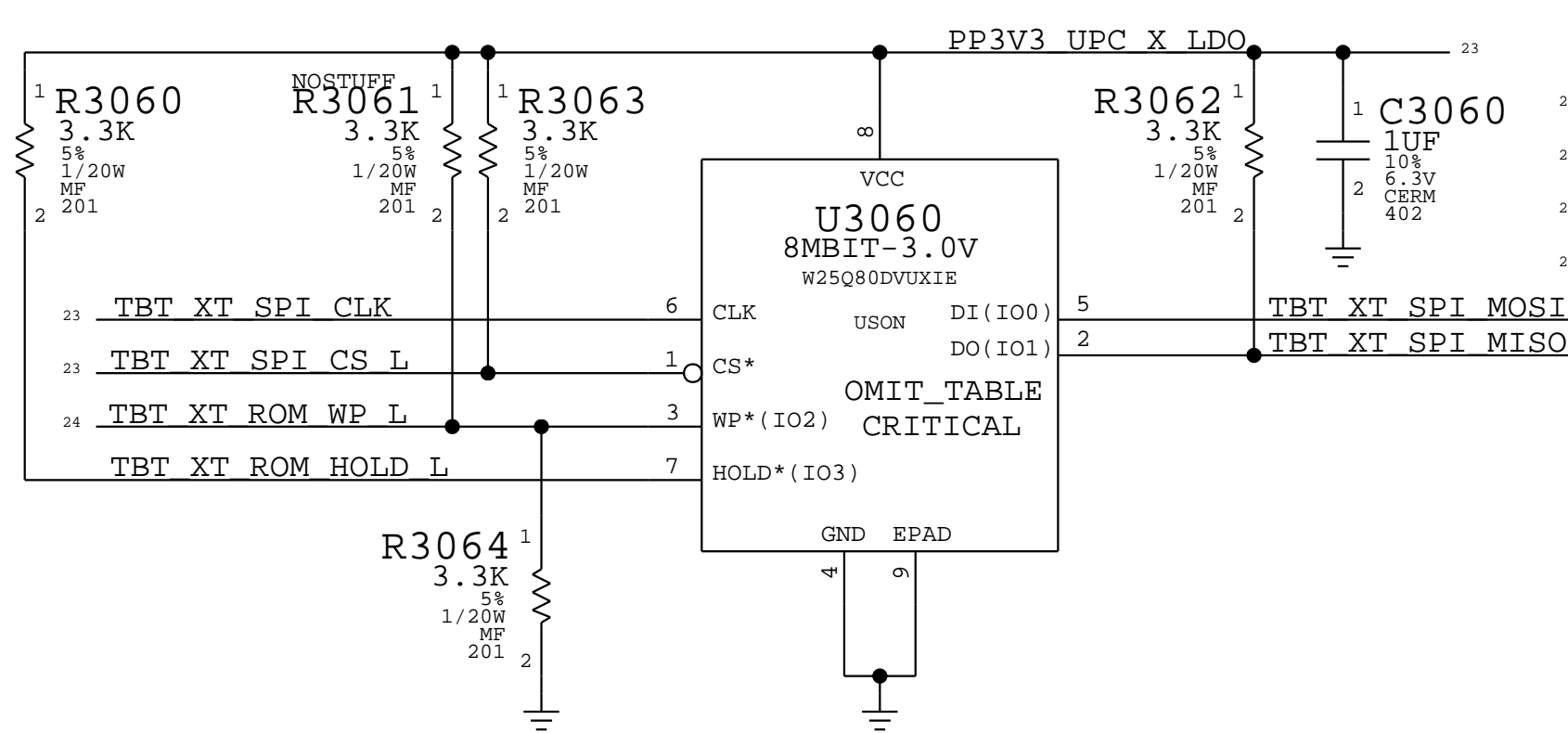


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LPDDR4x Sub-Channels C & D			
 Apple Inc.		DRAWING NUMBER	S128
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		PAGE	25 OF 152
		SHEET	20 OF 86

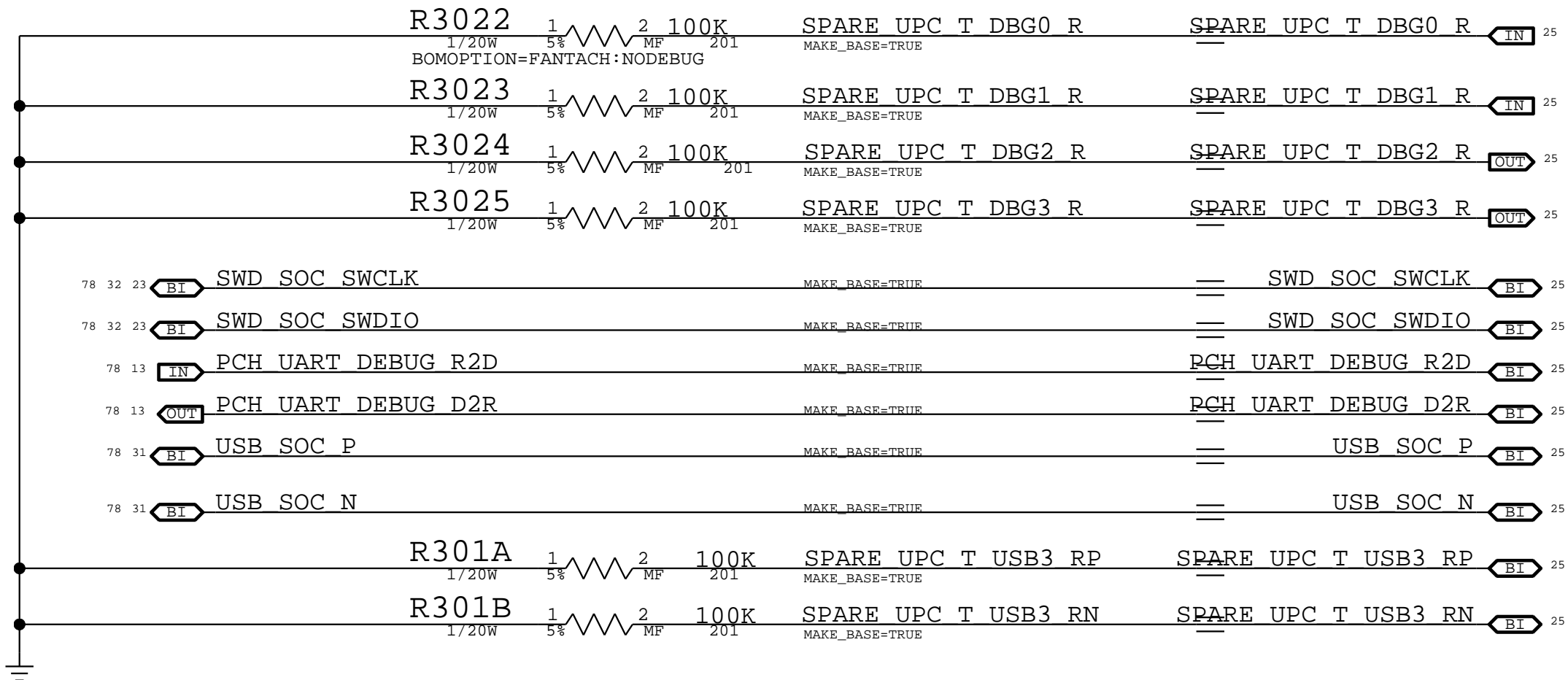
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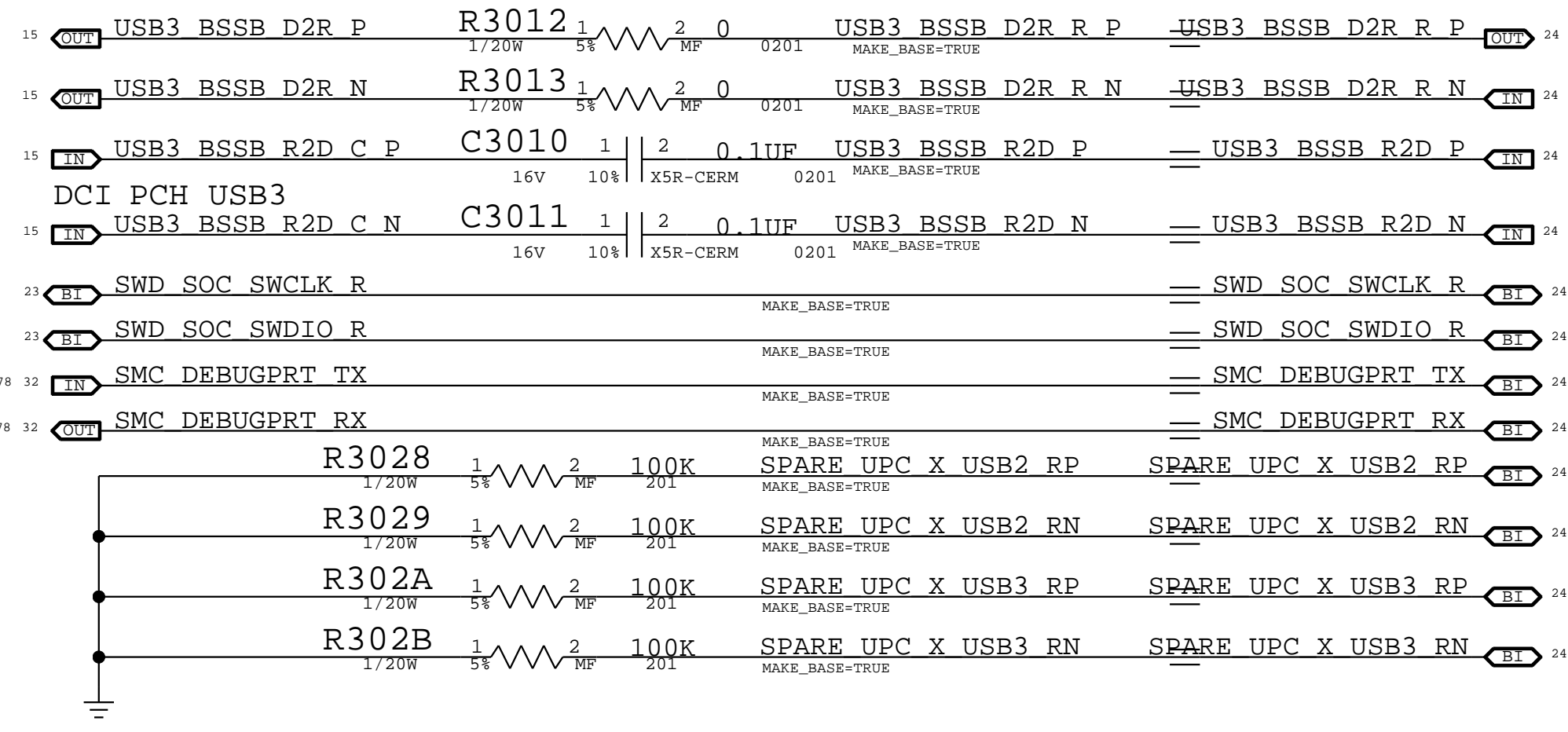
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USB-C HIGH SPEED T (FRONT)			
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Left Front Port

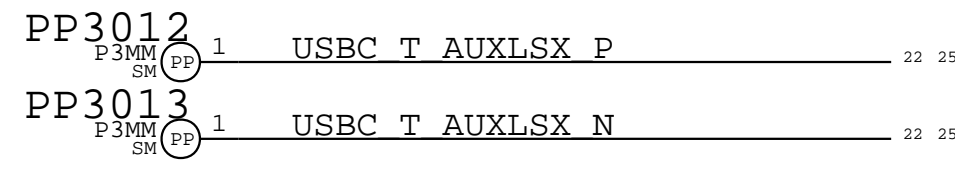


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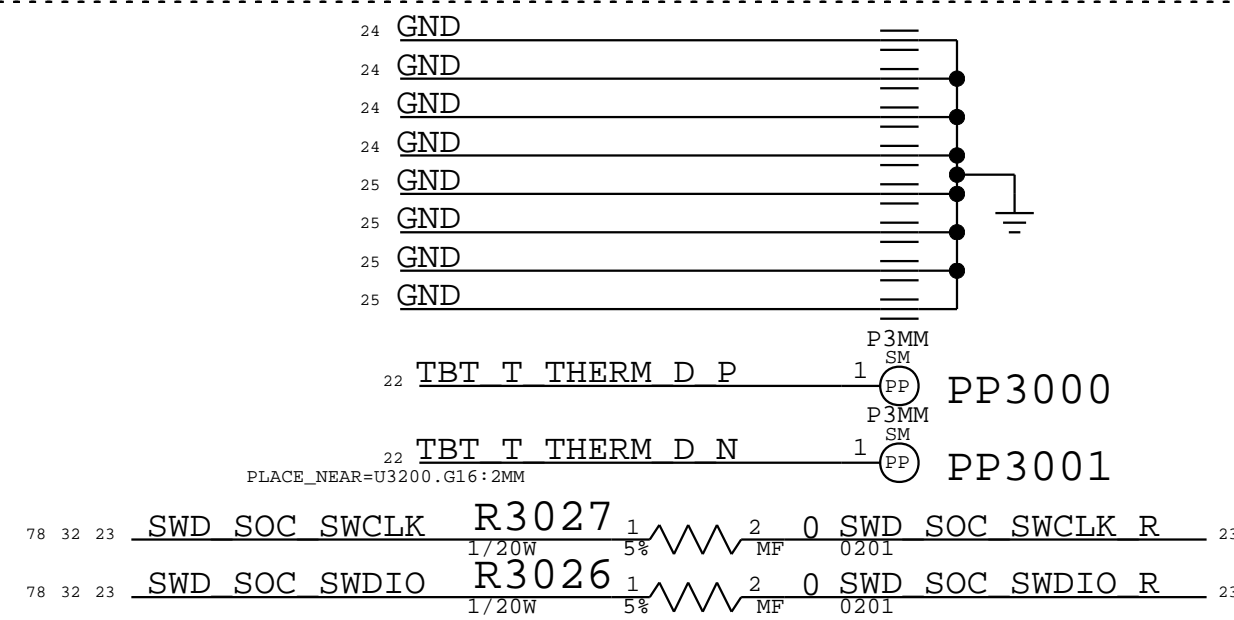
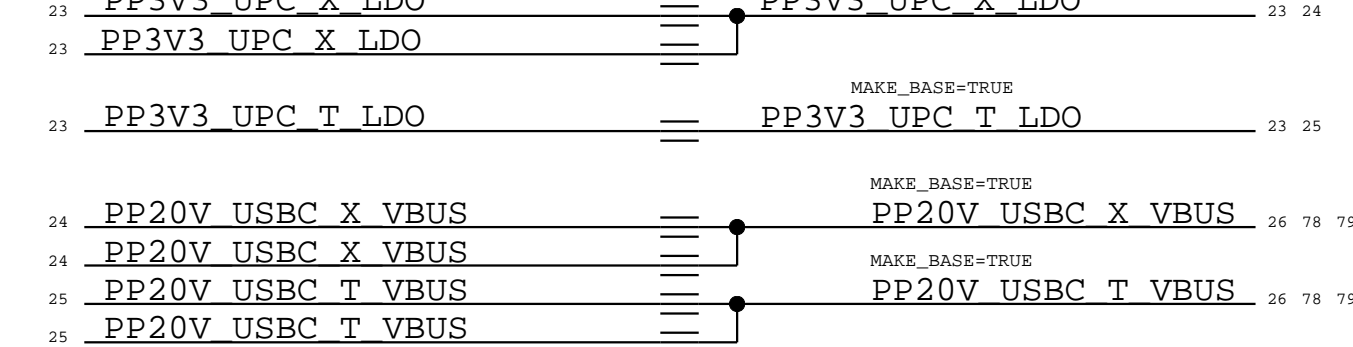


AUXLSX Probe Points

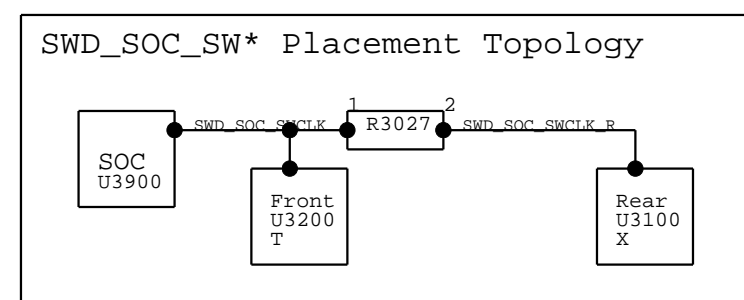
Probe Points for Port X
were removed due to layout
disruption.



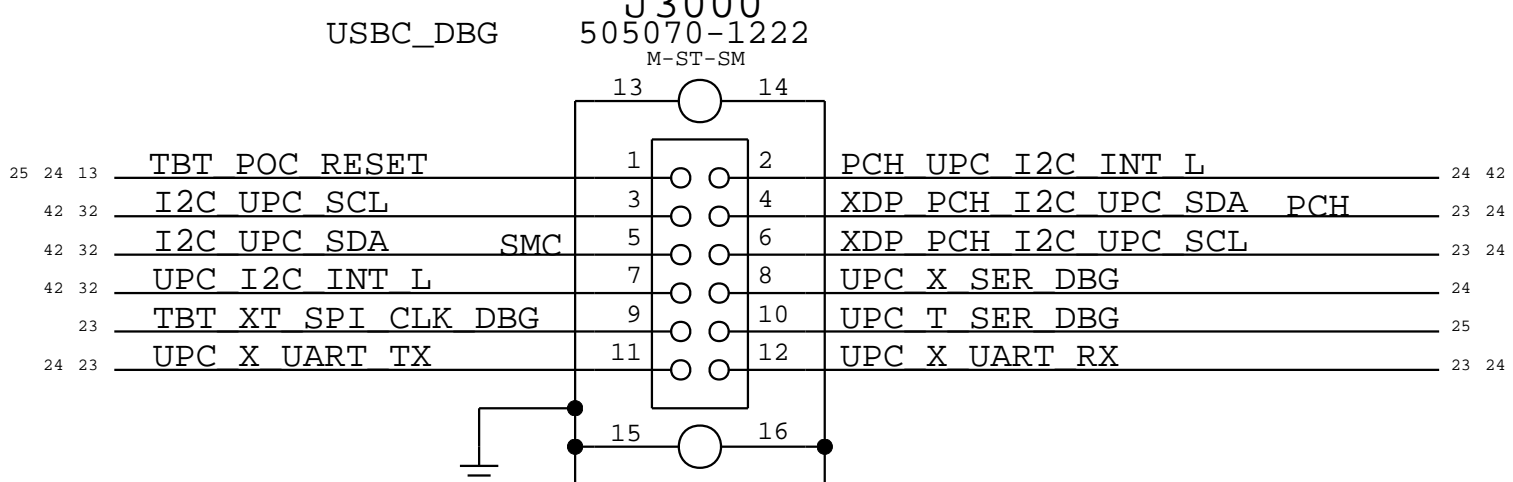
POWER ALIASES



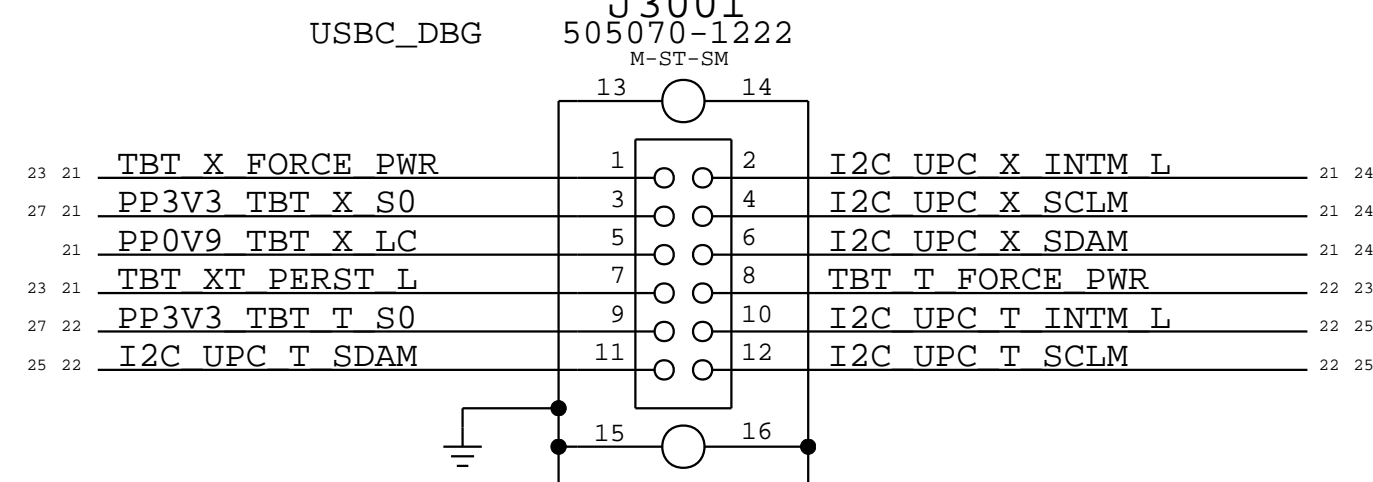
Per Will Ferry, SI will determine R3026 and R3027 values during characterization.



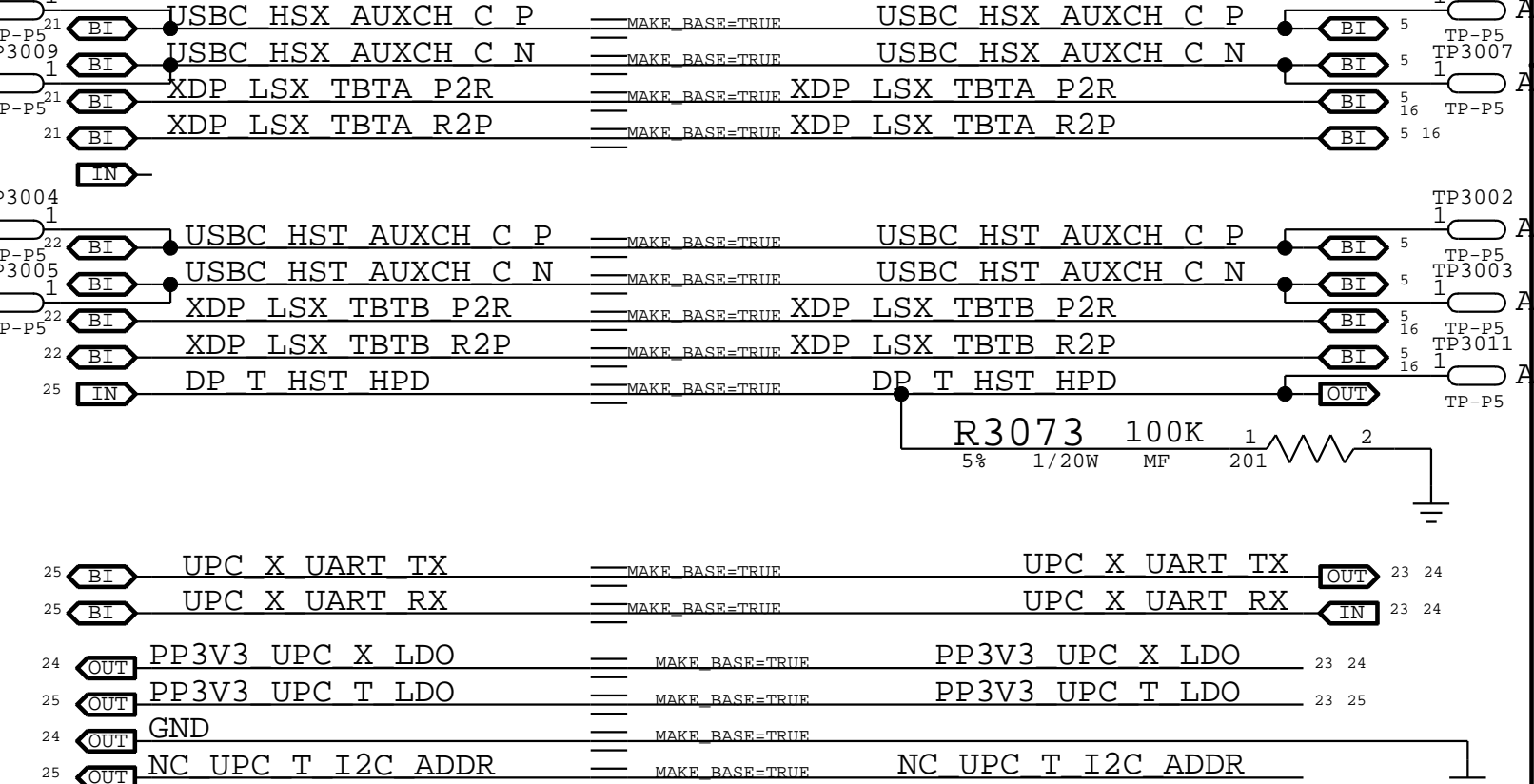
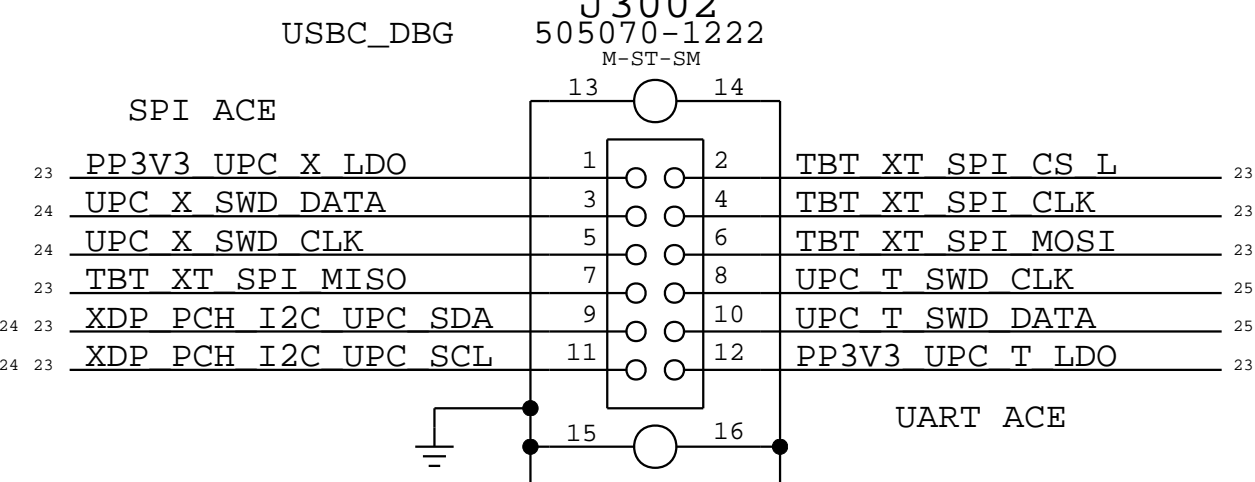
ACE ARKANOID CONN



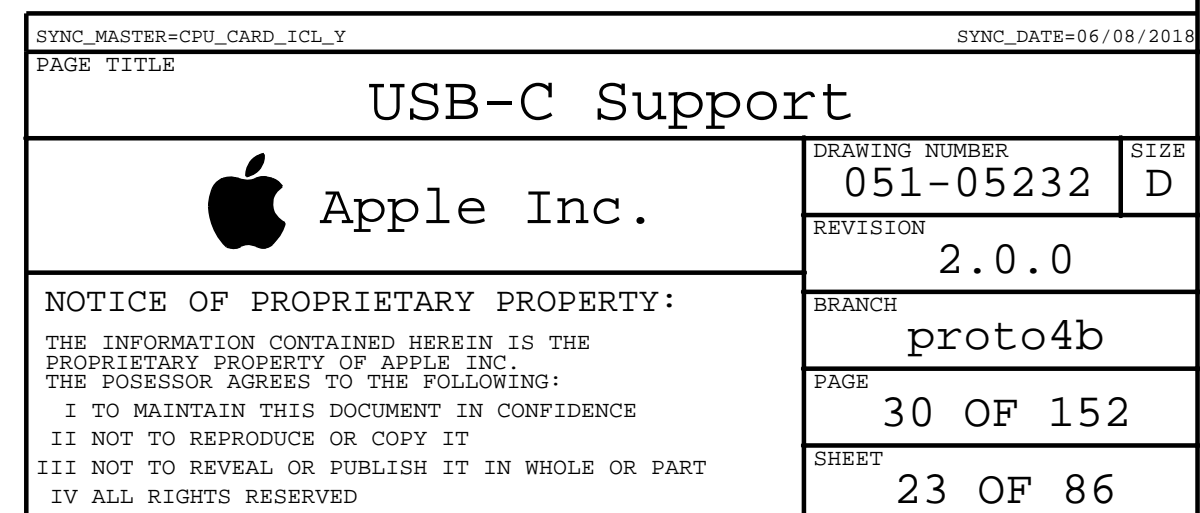
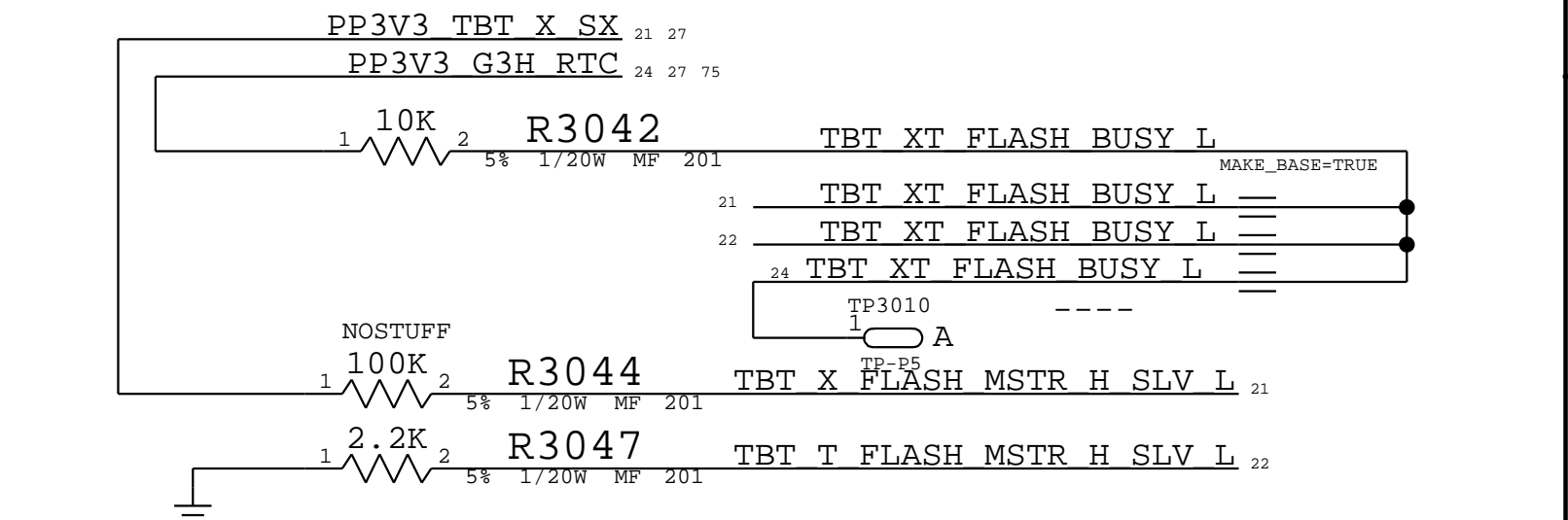
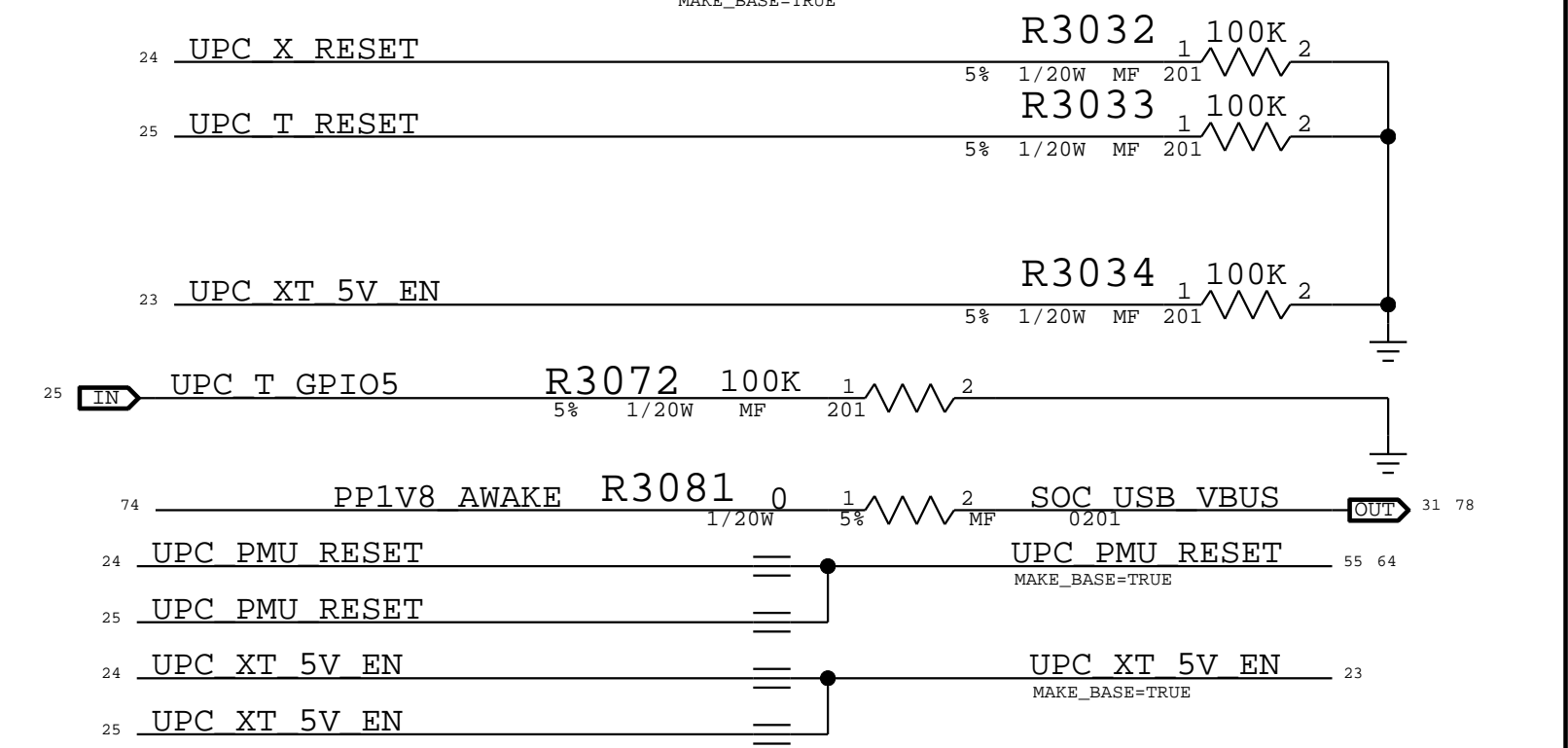
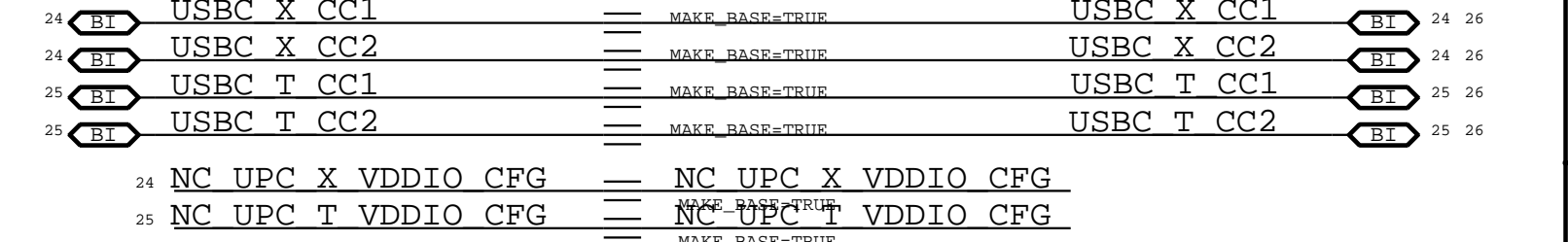
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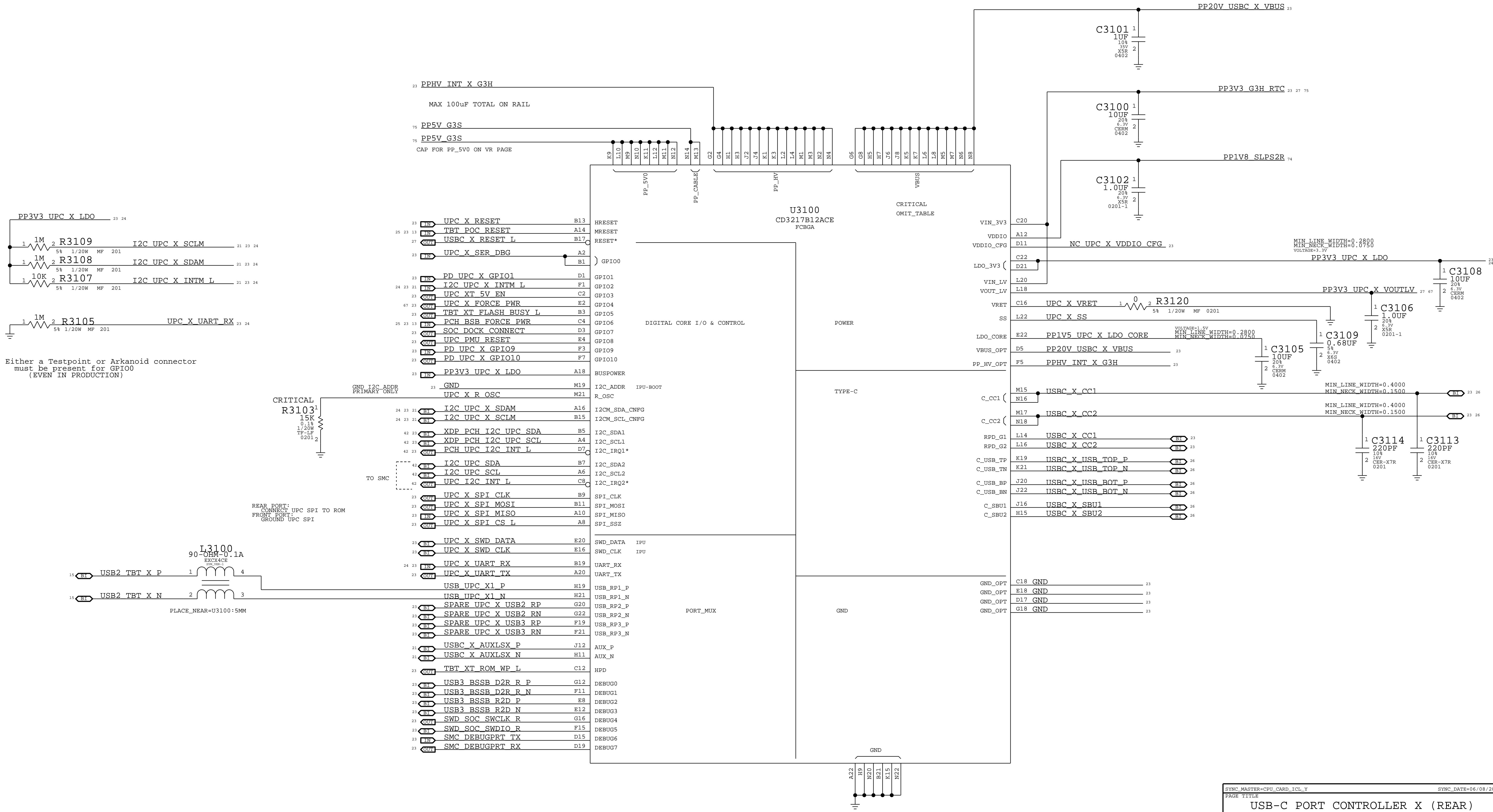
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ACE A/B RPD STRAPPING



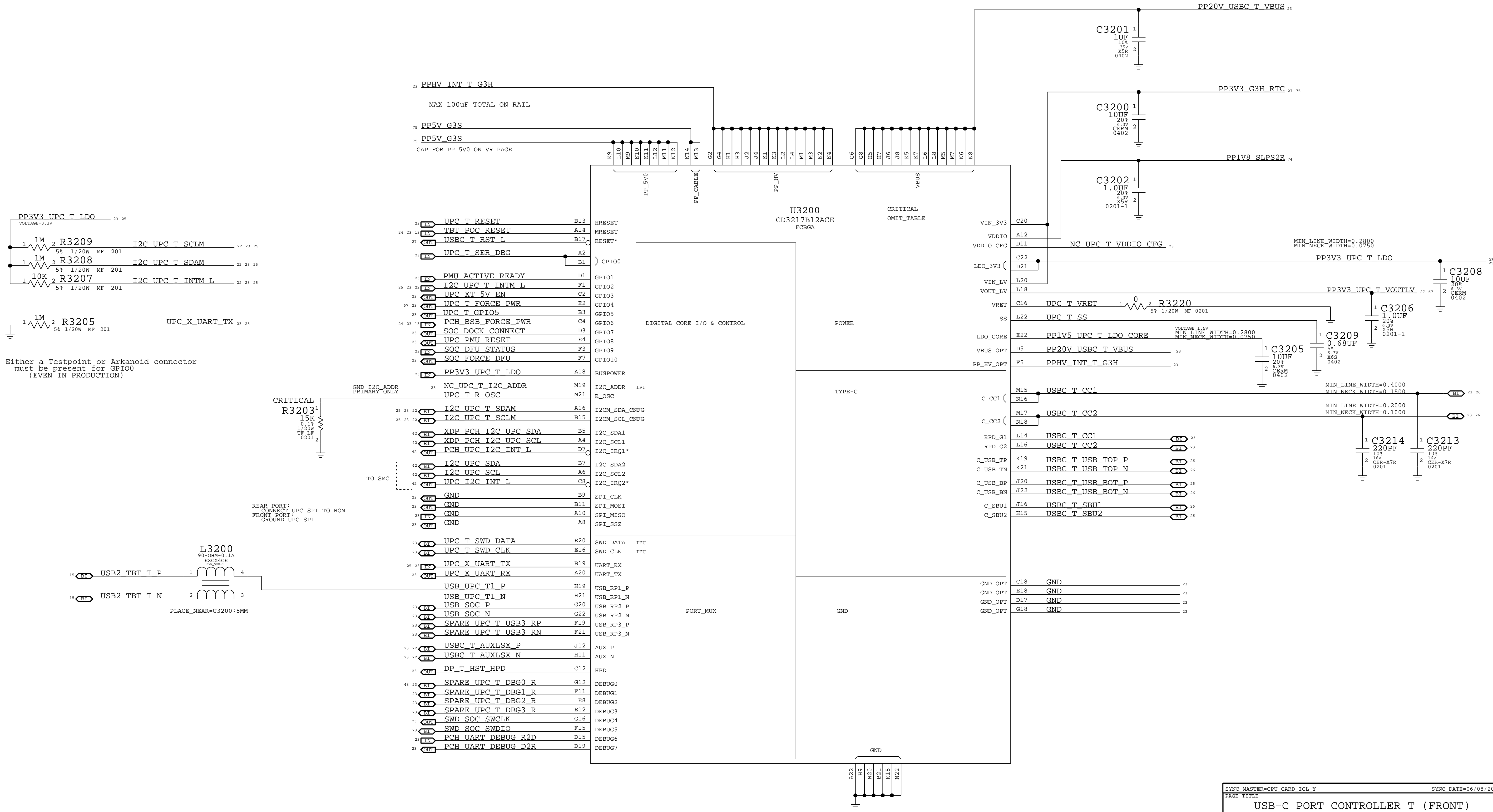
PRIMARY ACE2 USB-C PORT CONTROLLER (UPC)




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		REVISION	2.0.0
		BRANCH	proto4b
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		SHEET	24 OF 86

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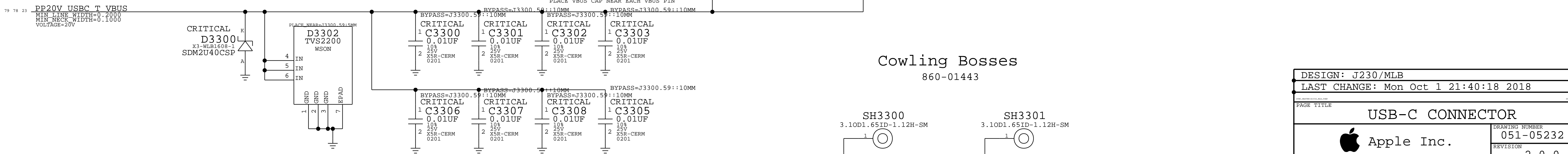
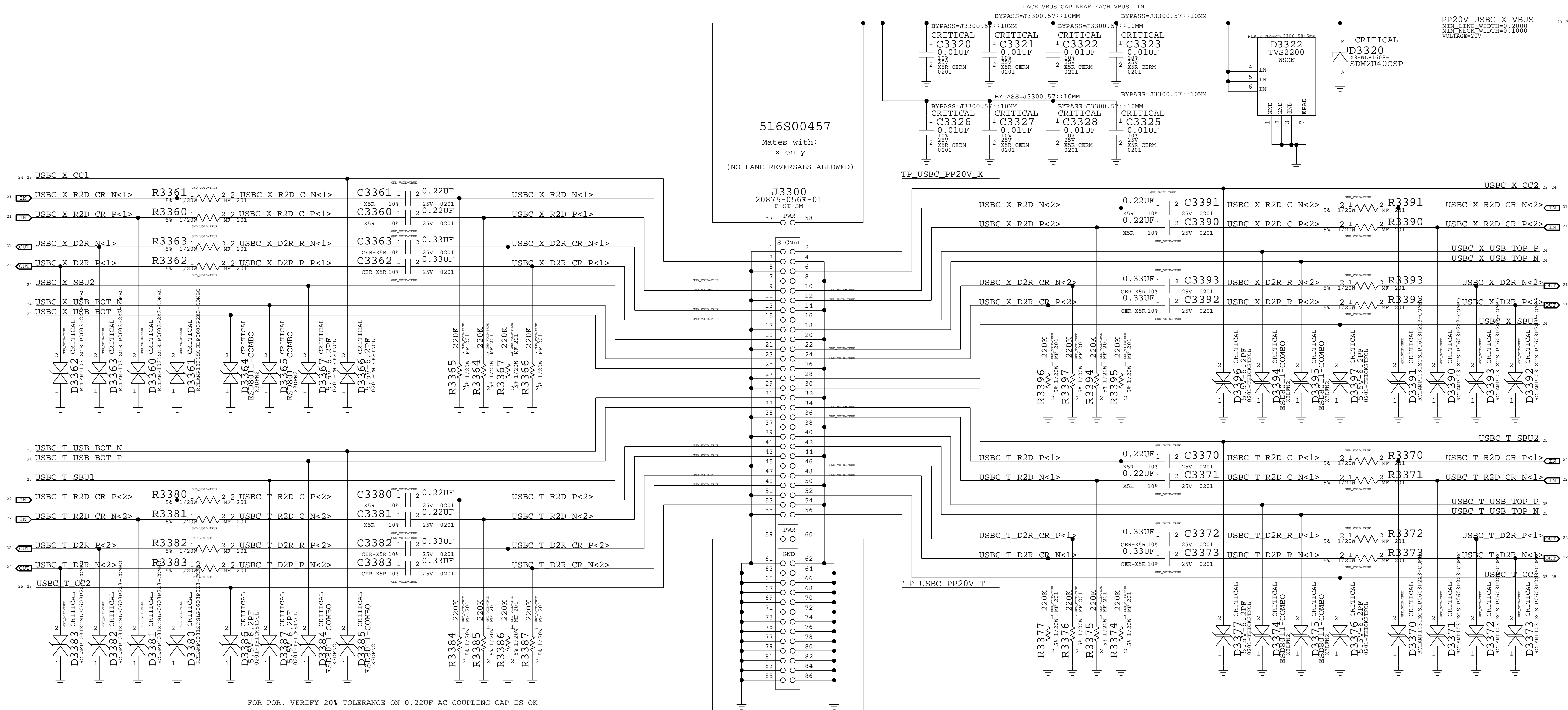
SECONDARY ACE2 USB-C PORT CONTROLLER (UPC)




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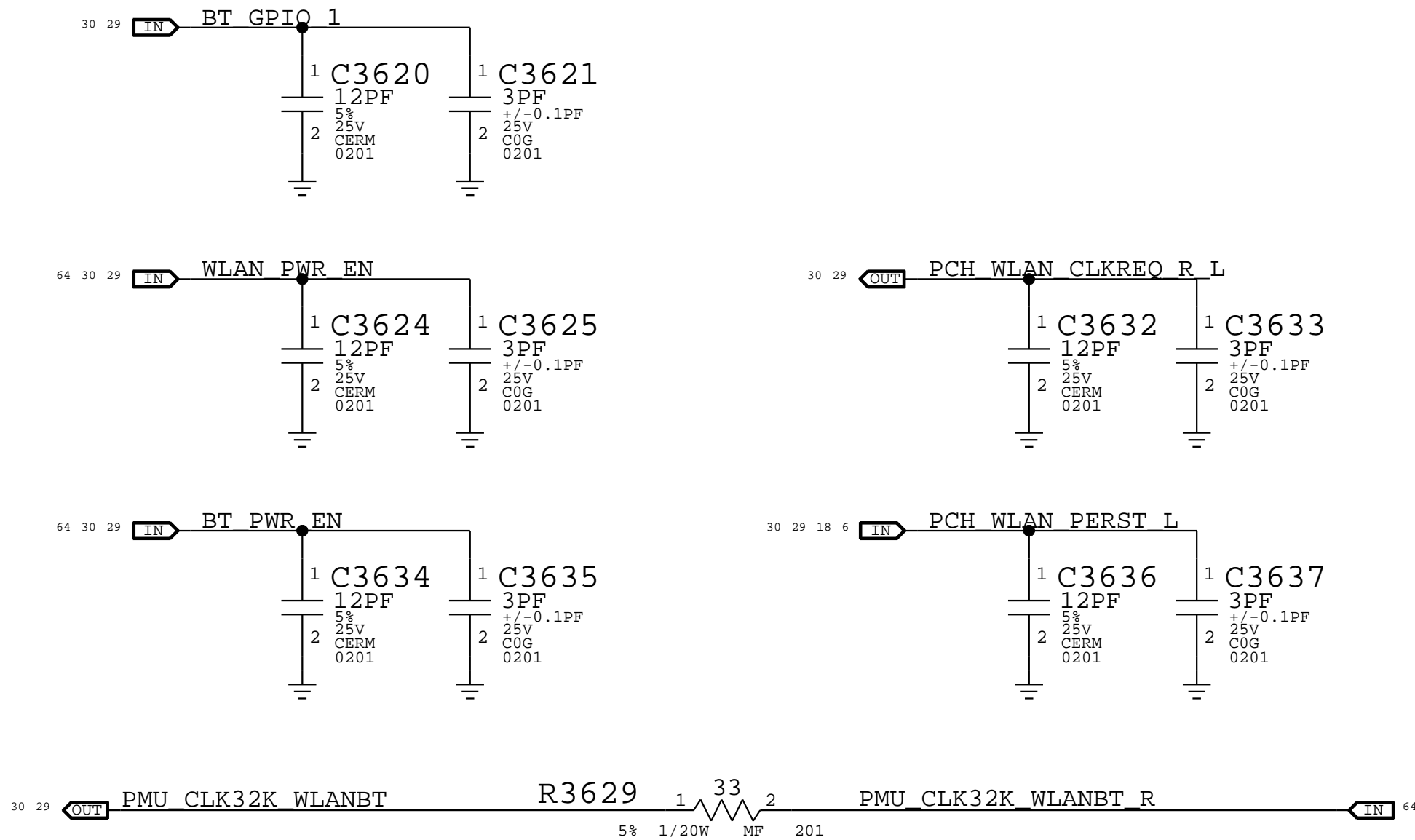
Left Rear Port




Left Front Port

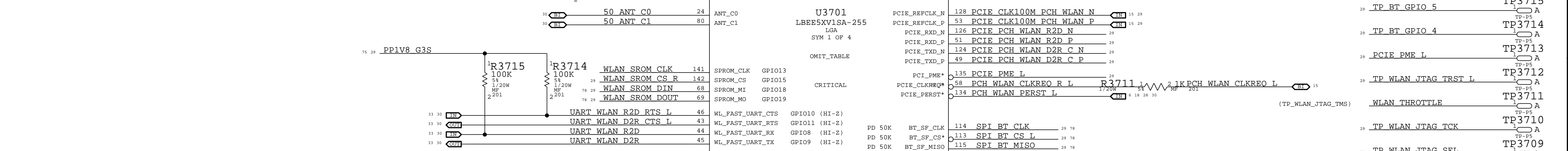
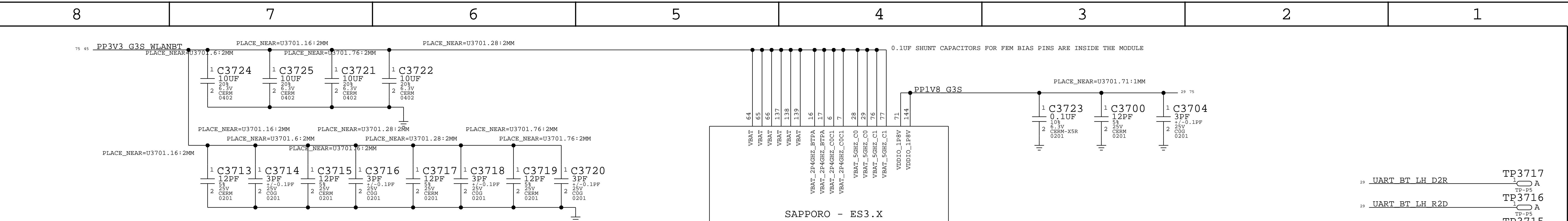
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A Wireless Desense Capacitors

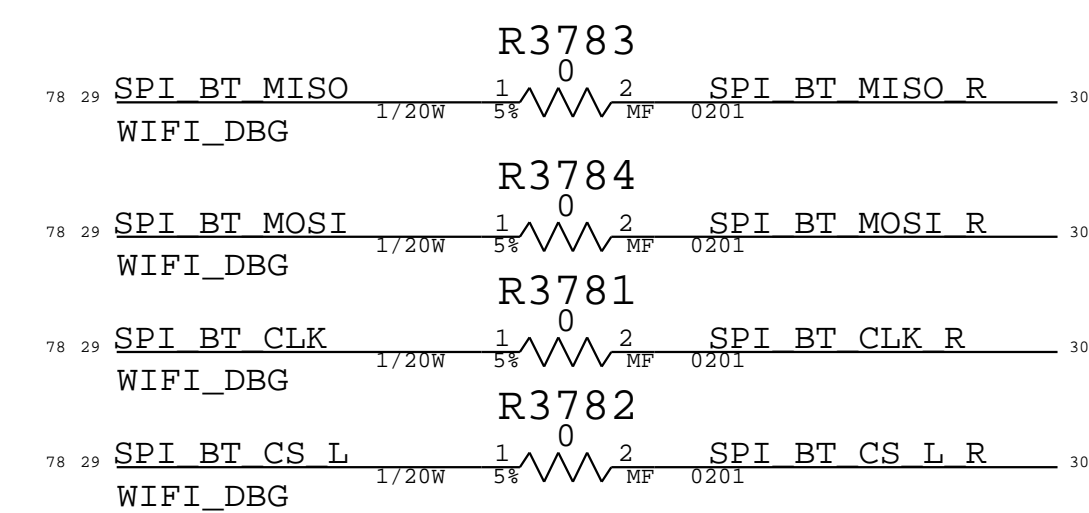


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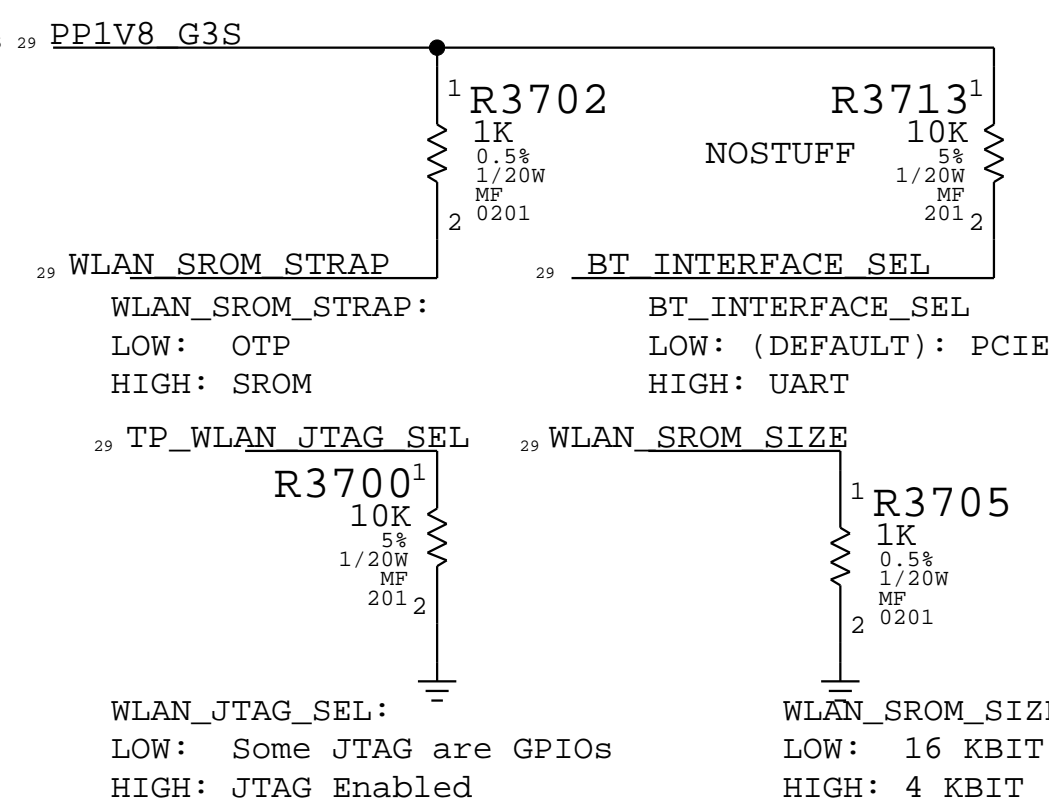
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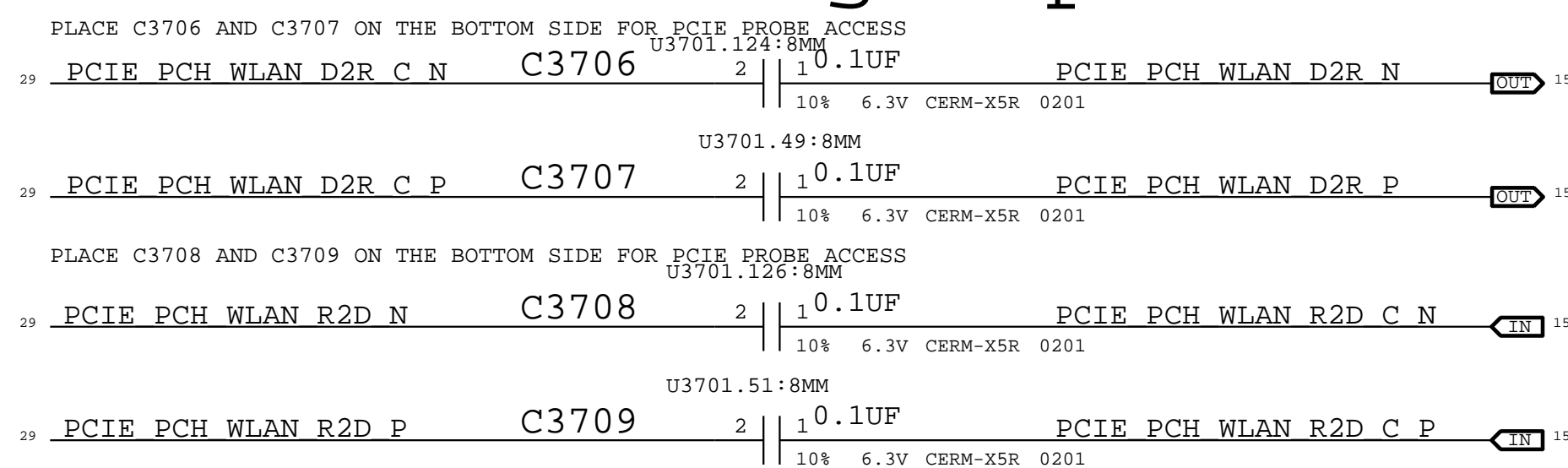
Ⓐ Bluetooth SPI Debug



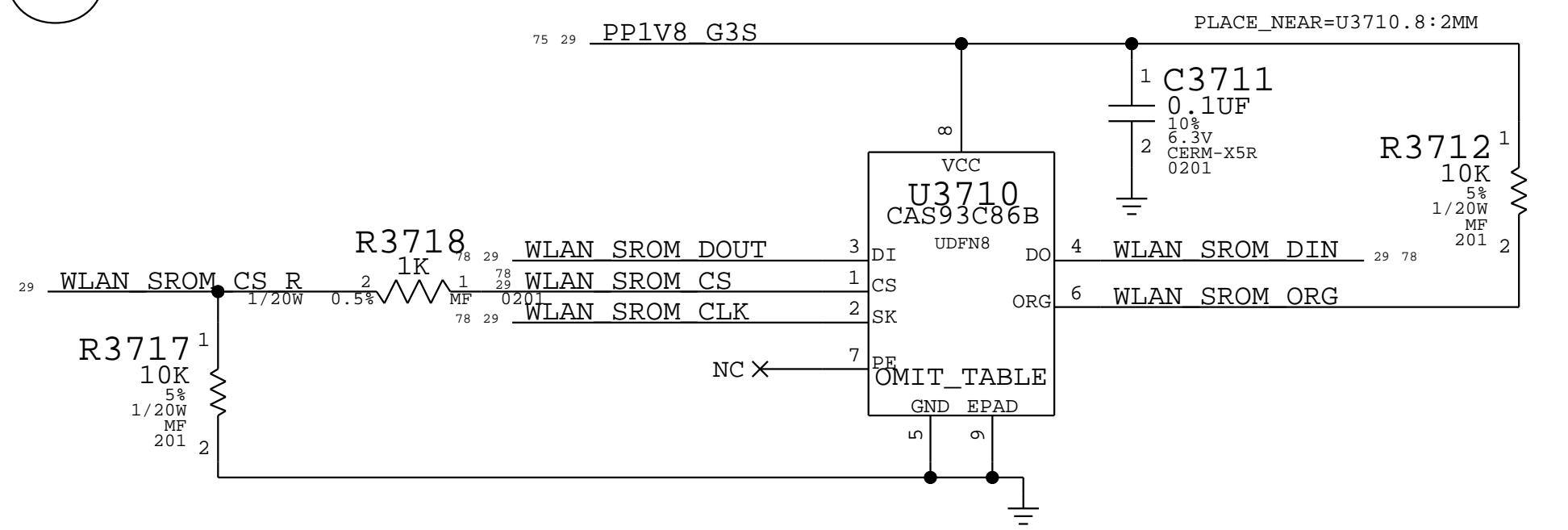
ⓑ Boot Straps



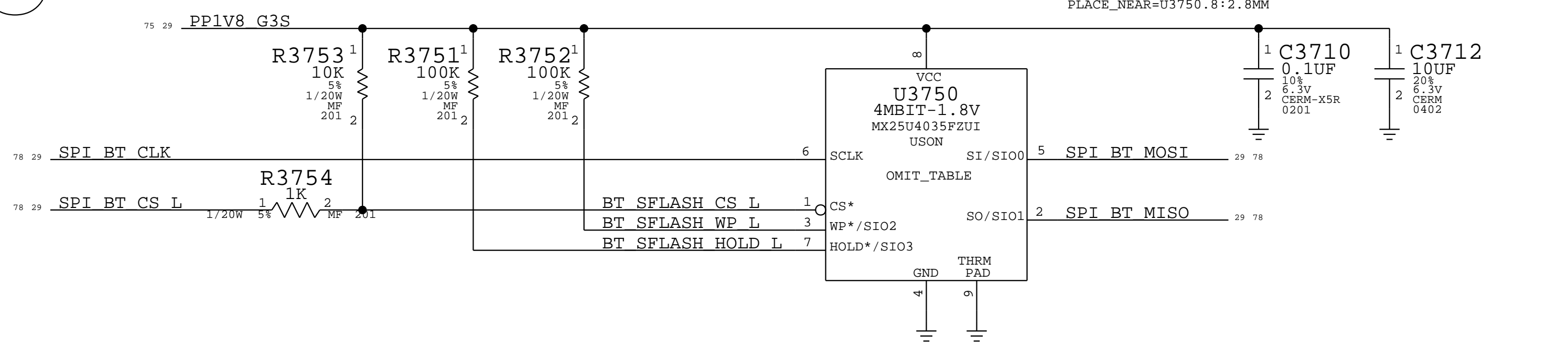
Ⓒ PCIe DC Blocking Caps




④ WLAN Serial EEPROM



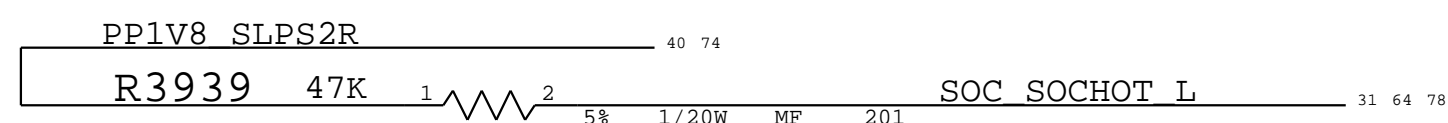
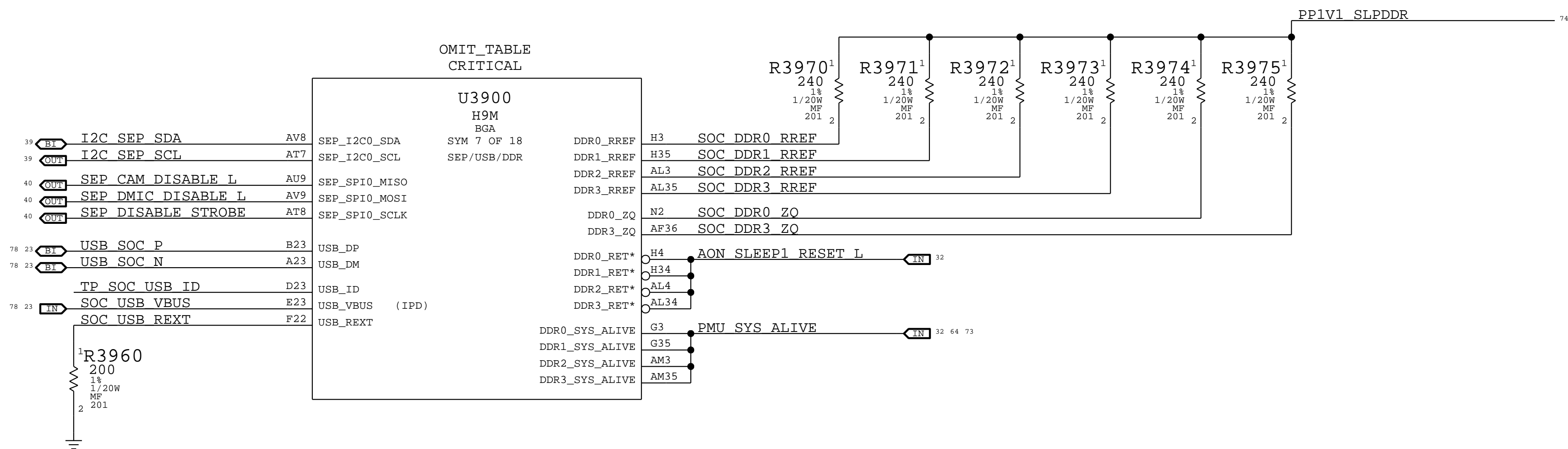
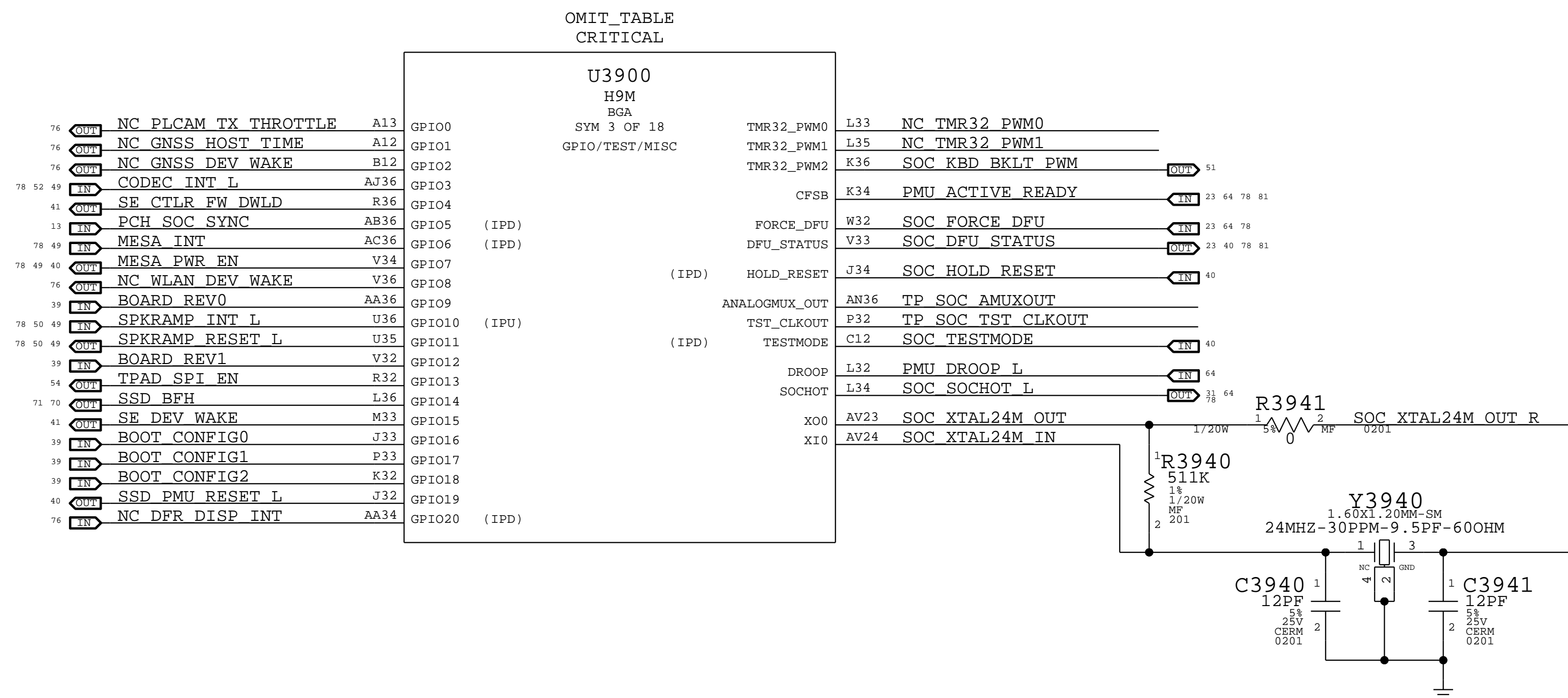
Ⓔ Bluetooth Serial Flash




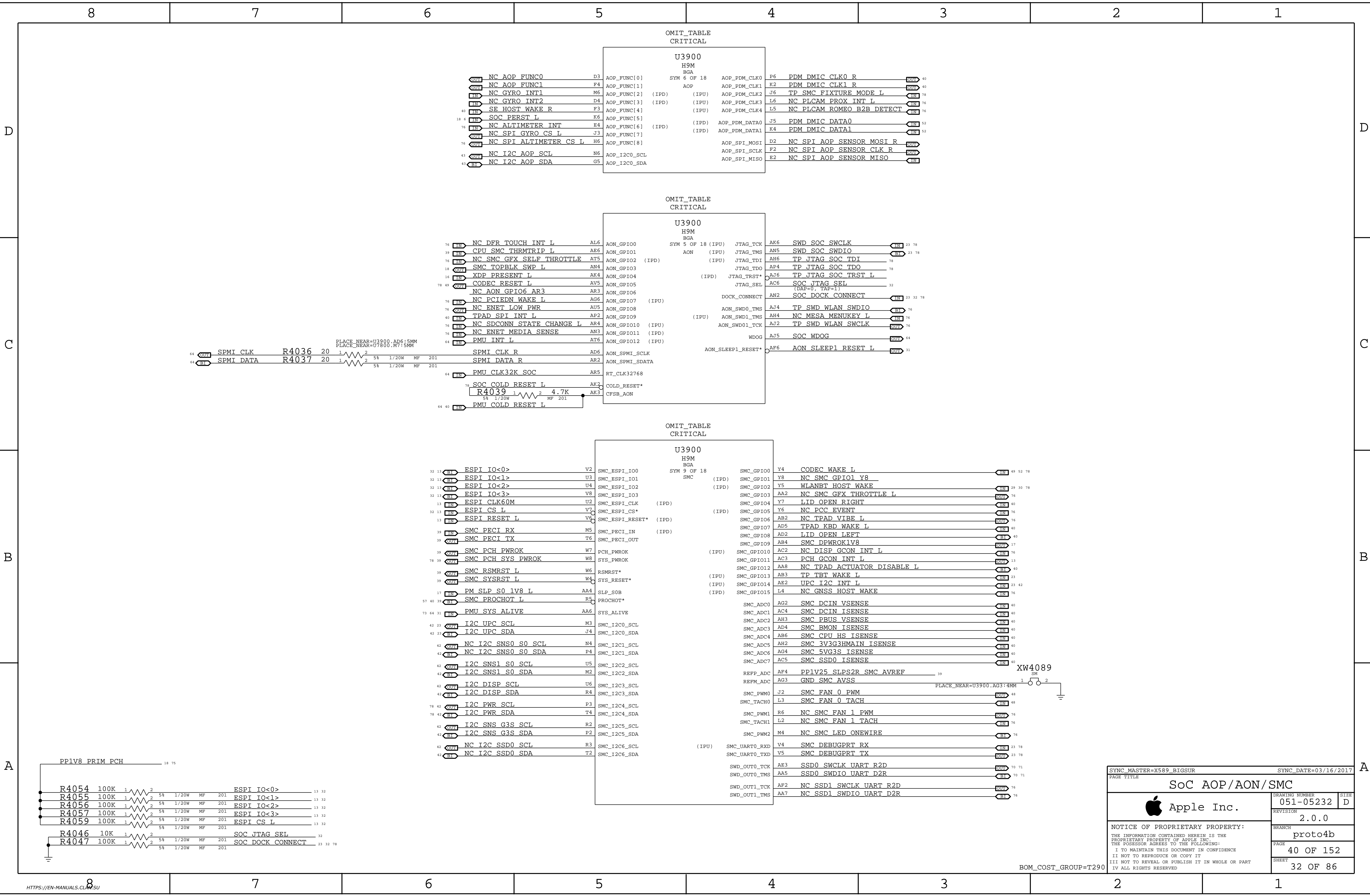
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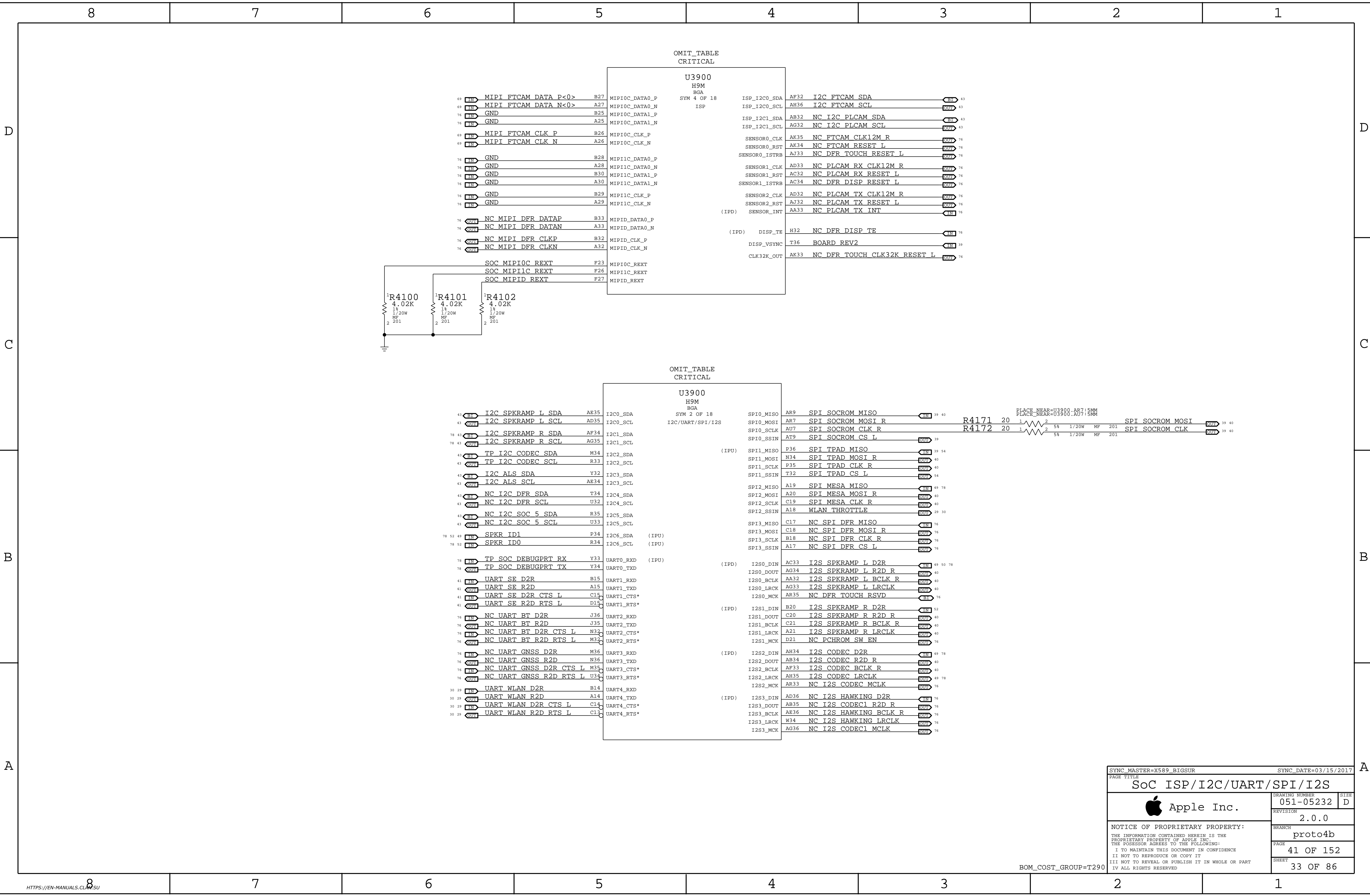
Note 1) IPU represents SW configured state, not HW default

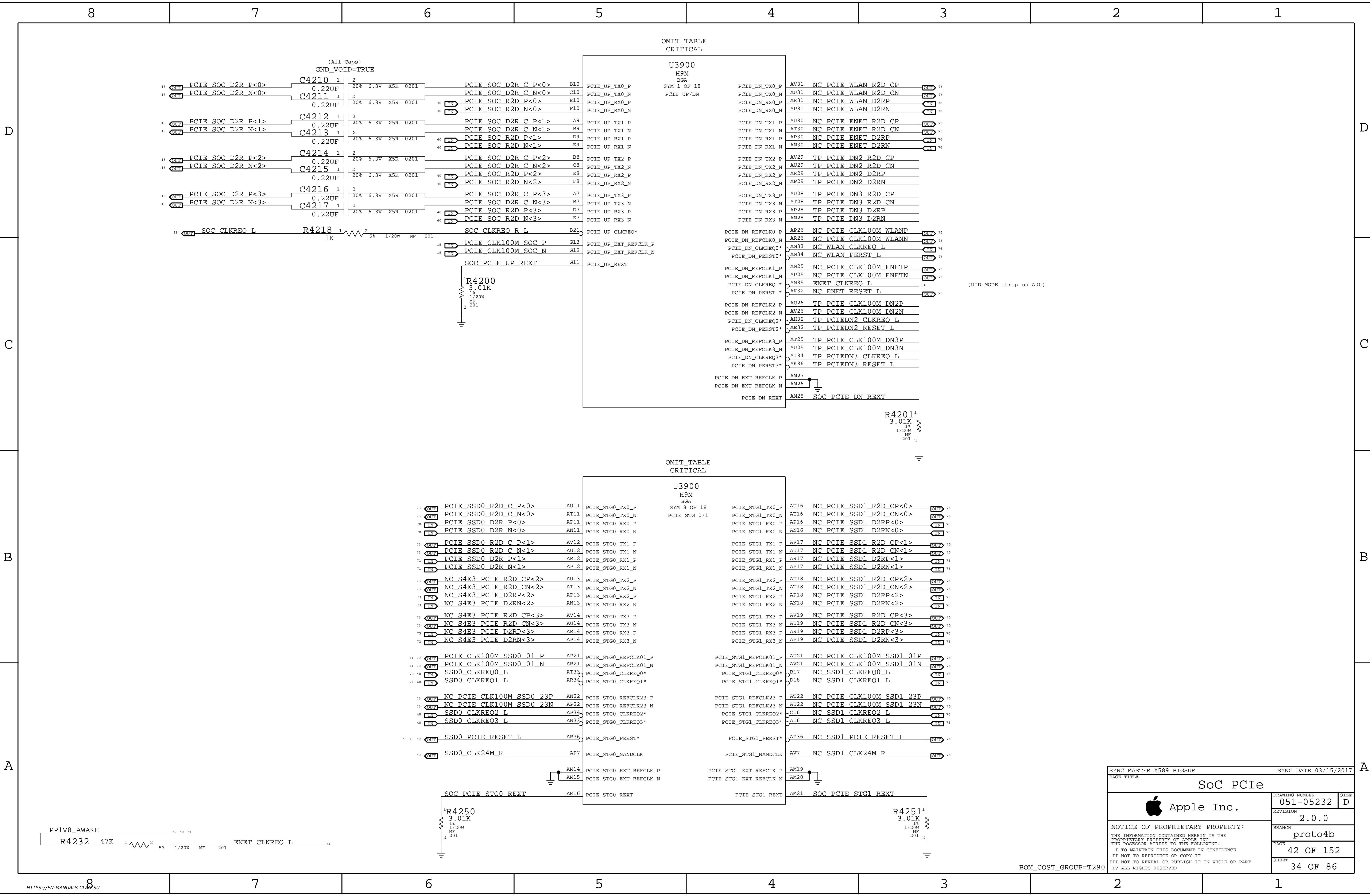



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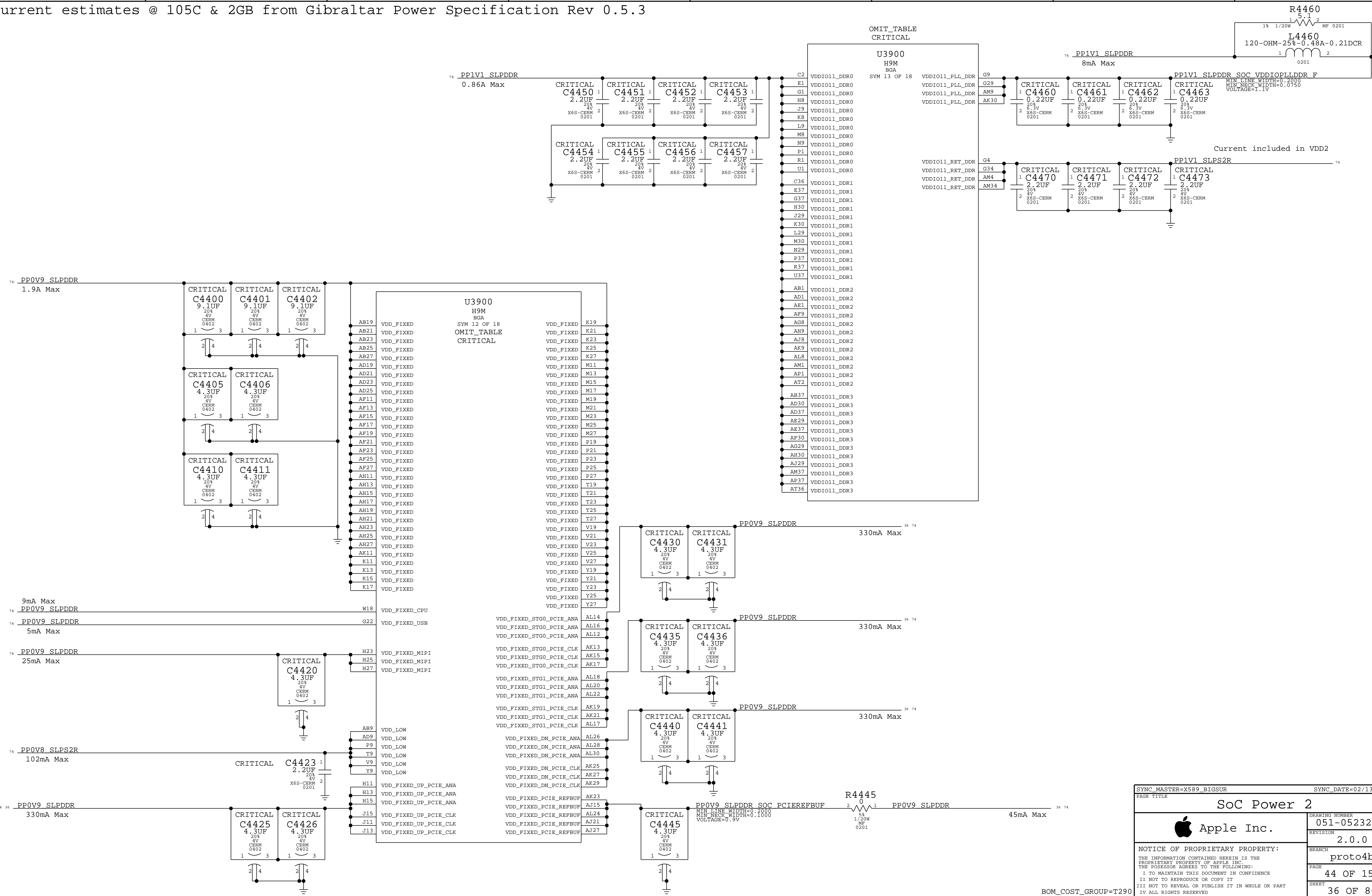
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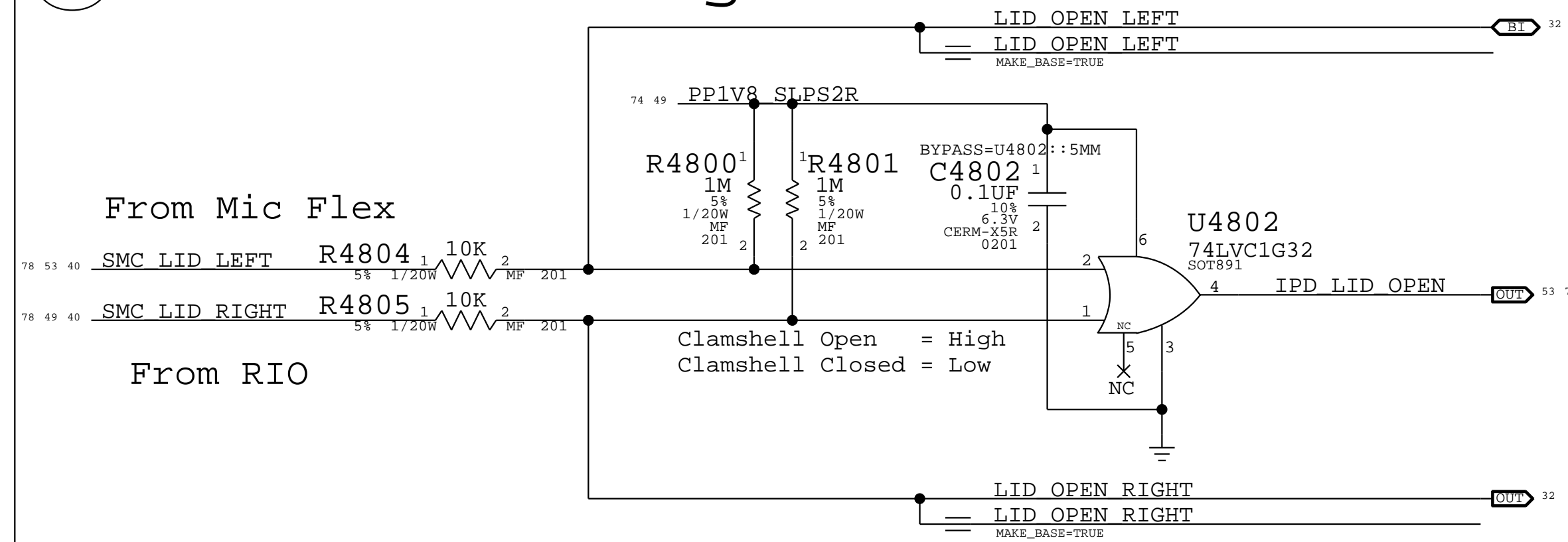
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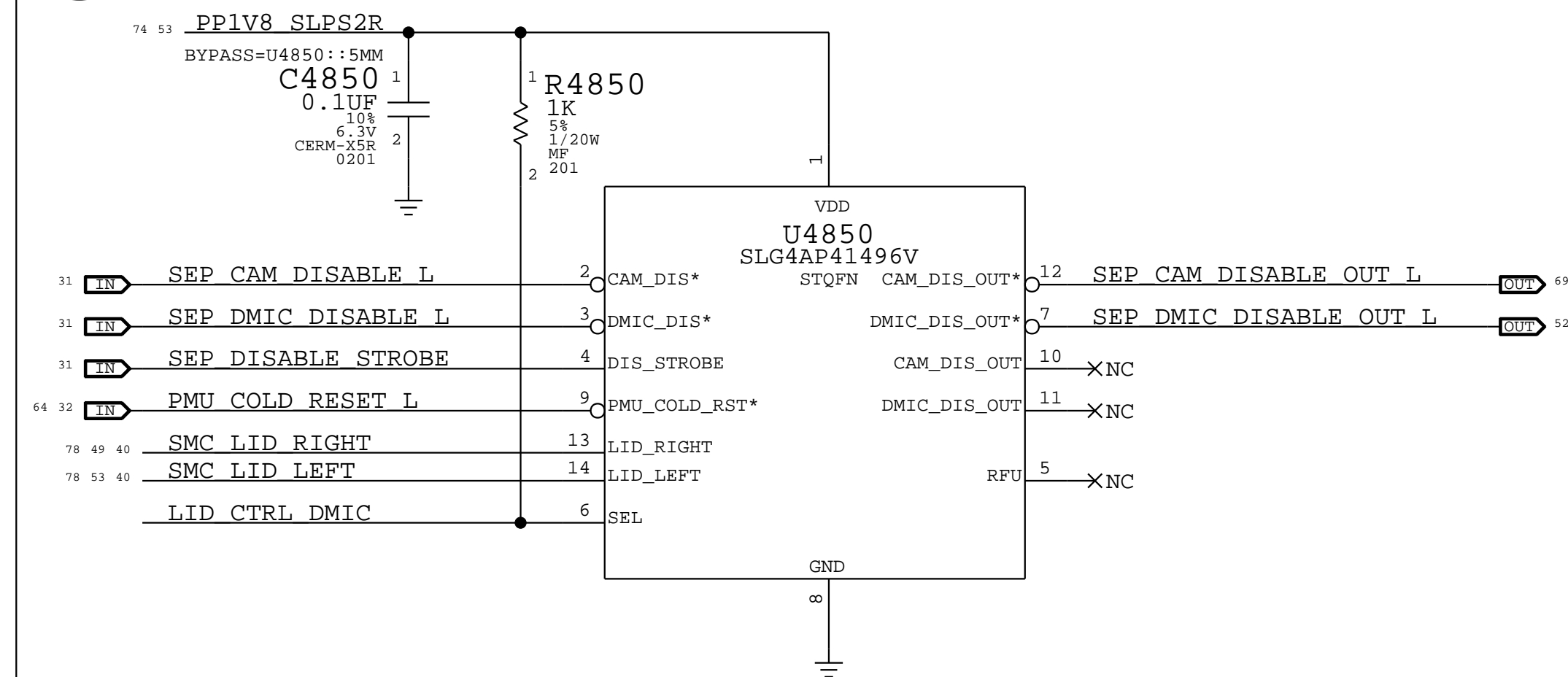


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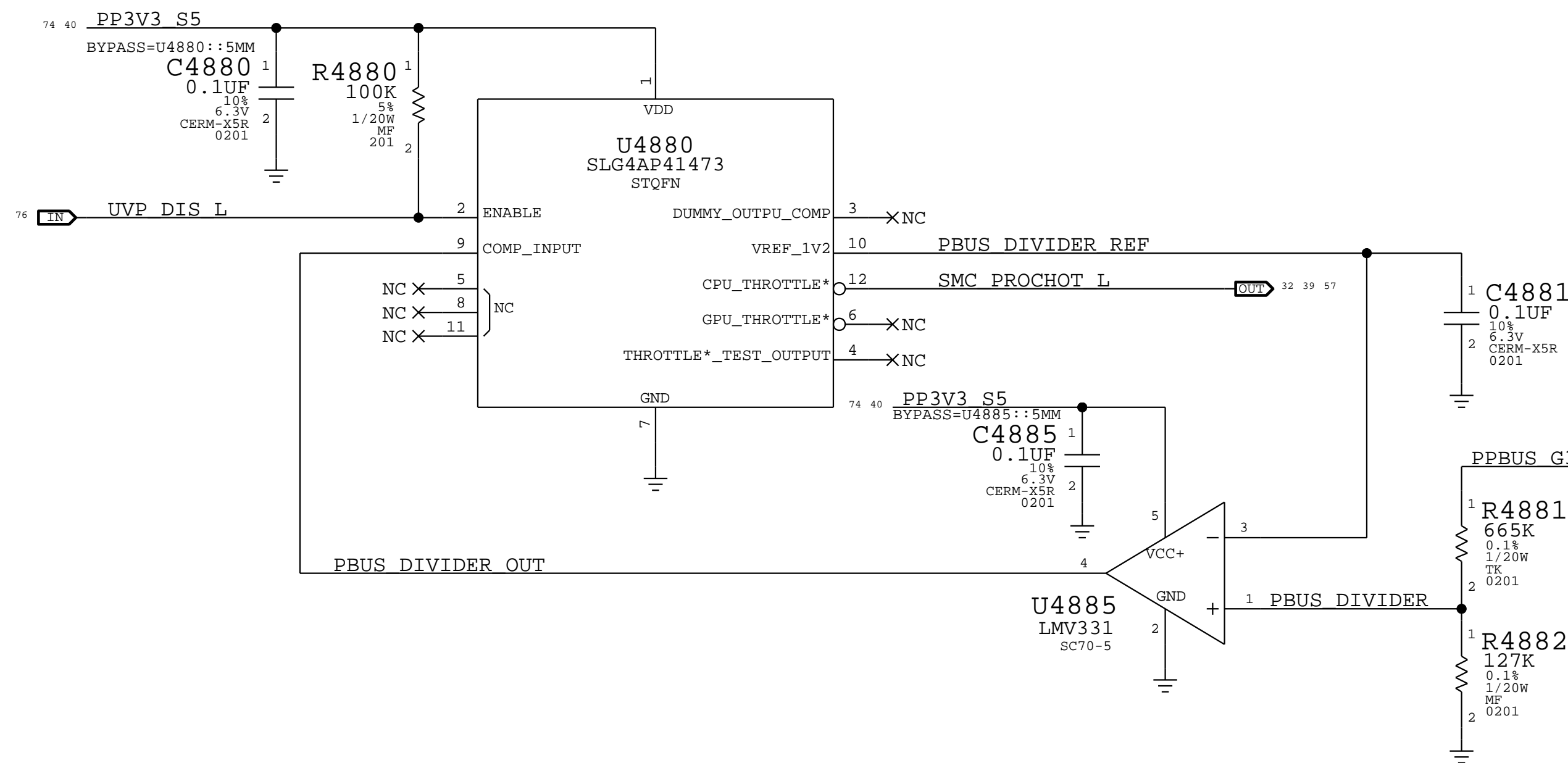
A Lid Detect Logic



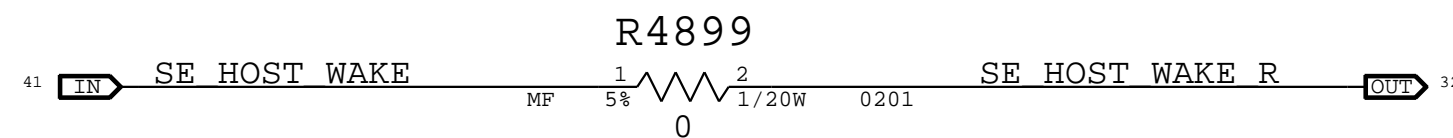
B Secure Disable



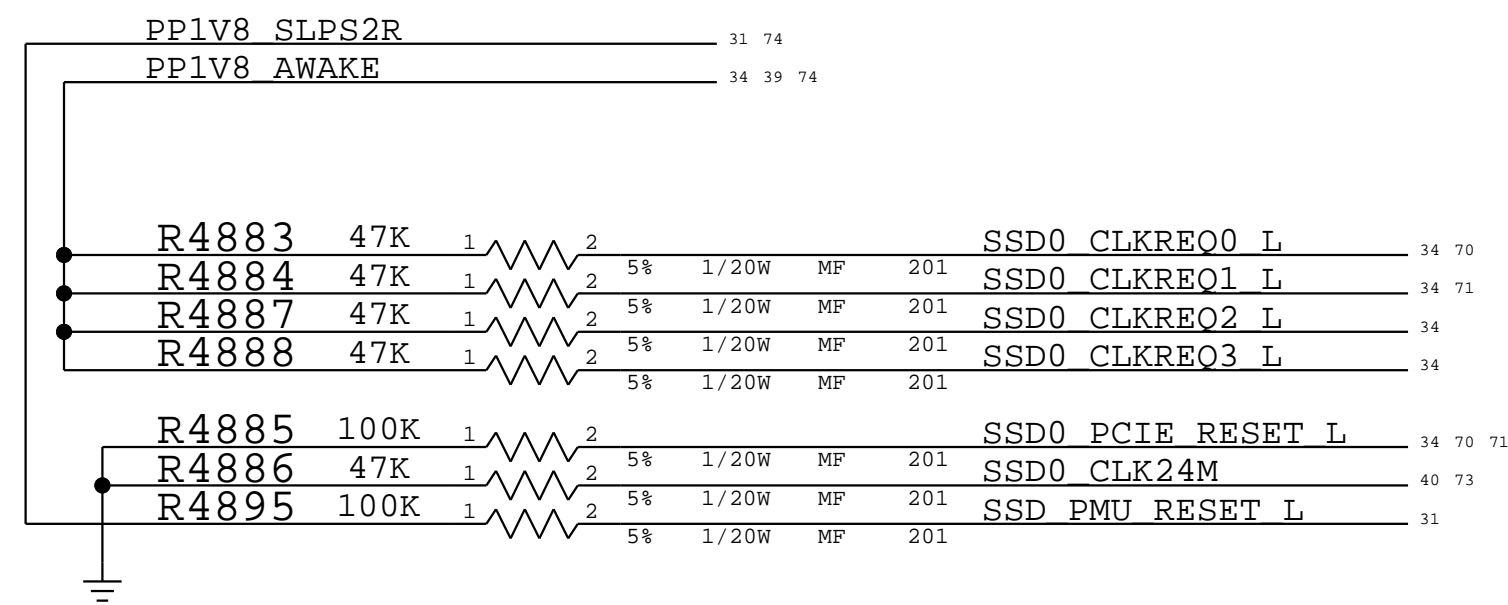
C SMC PROCHOT Control Circuit



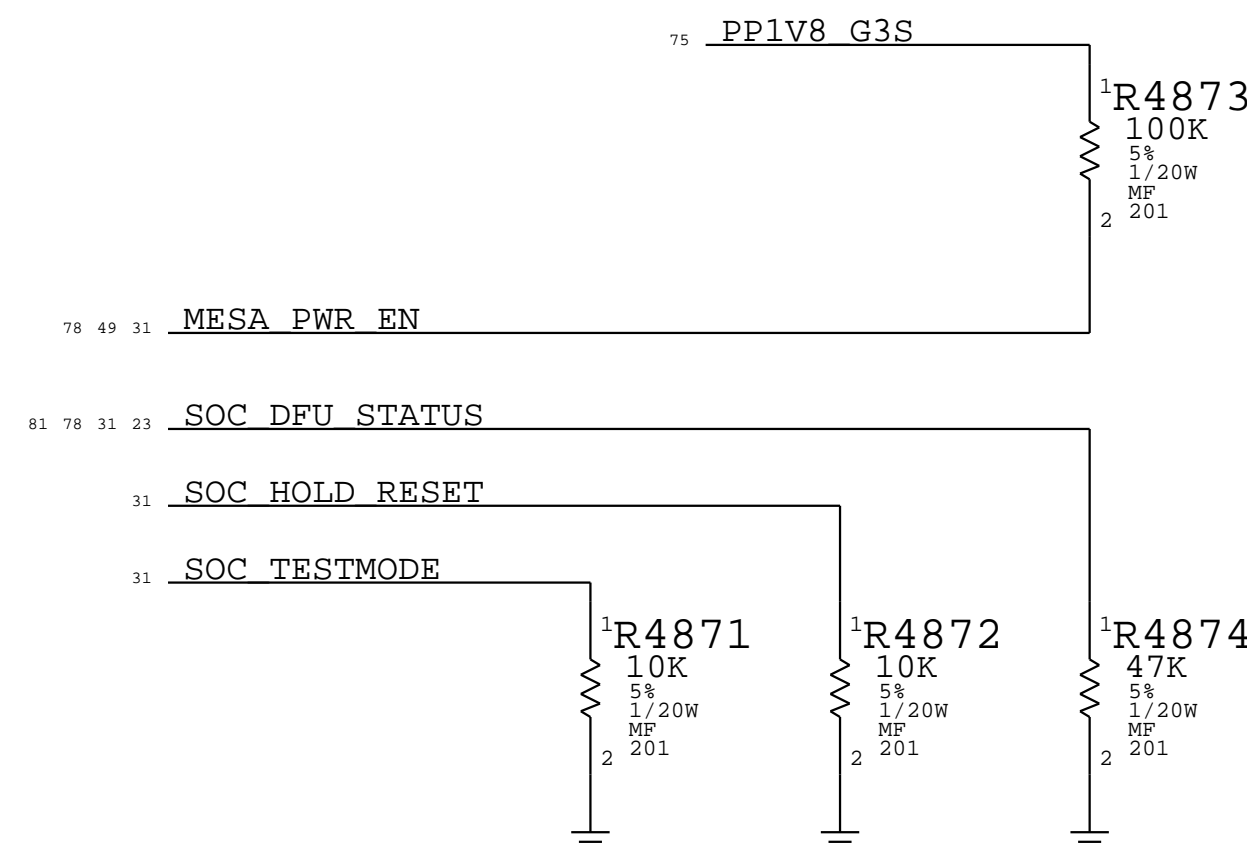
F SE Host Wake



D SSD Pull-Up/Downs



E SoC Pull-Up/Downs



G SMC ADC Assignments

SMC DCIN VSENSE	SMC DCIN VSENSE
SMC DCIN ISENSE	SMC DCIN ISENSE
SMC PBUS VSENSE	SMC PBUS VSENSE
SMC BMON ISENSE	SMC BMON ISENSE
SMC CPU HS ISENSE	SMC CPU HS ISENSE
SMC 3V3G3HMAIN ISENSE	SMC 3V3G3HMAIN ISENSE
SMC 5VG3S ISENSE	SMC 5VG3S ISENSE
SMC SSD0 ISENSE	SMC SSD0 ISENSE

H PCIe Up R2D AC Caps

PCIE SOC R2D C P<0>	C4820 0.22UF	PCIE SOC R2D P<0>
PCIE SOC R2D C N<0>	C4821 0.22UF	PCIE SOC R2D N<0>
PCIE SOC R2D C P<1>	C4822 0.22UF	PCIE SOC R2D P<1>
PCIE SOC R2D C N<1>	C4823 0.22UF	PCIE SOC R2D N<1>
PCIE SOC R2D C P<2>	C4824 0.22UF	PCIE SOC R2D P<2>
PCIE SOC R2D C N<2>	C4825 0.22UF	PCIE SOC R2D N<2>
PCIE SOC R2D C P<3>	C4826 0.22UF	PCIE SOC R2D P<3>
PCIE SOC R2D C N<3>	C4827 0.22UF	PCIE SOC R2D N<3>

I GPIO Source Termination

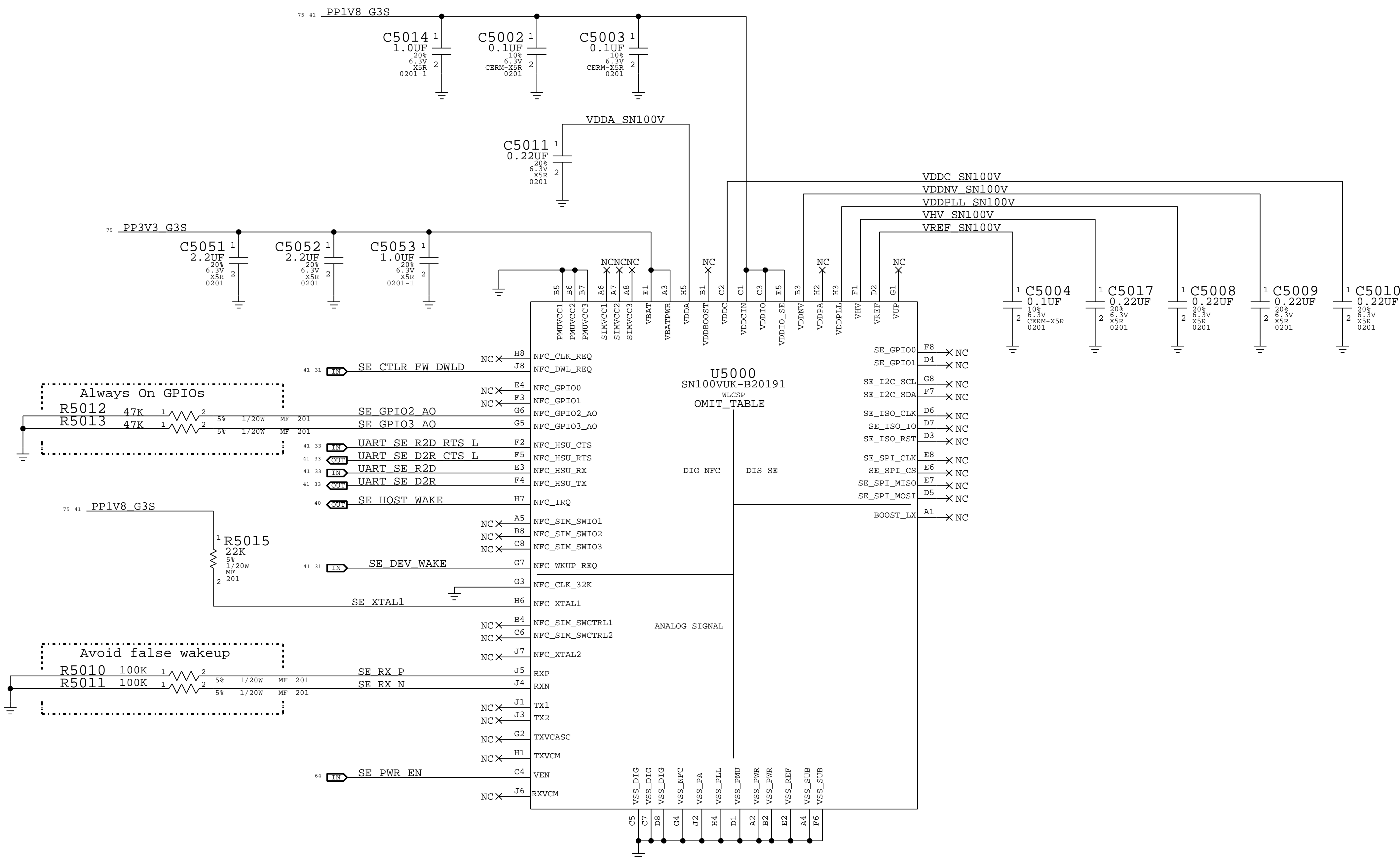
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I2S SPKRAMP L BCLK	R4844 20	I2S SPKRAMP L BCLK
I2S SPKRAMP L LRCLK	R4841 20	I2S SPKRAMP L LRCLK
I2S SPKRAMP R R2D	R4845 20	I2S SPKRAMP R R2D
I2S SPKRAMP R BCLK	R4846 20	I2S SPKRAMP R BCLK
I2S SPKRAMP R LRCLK	R4842 20	I2S SPKRAMP R LRCLK
I2S CODEC R2D	R4847 20	I2S CODEC R2D
I2S CODEC BCLK	R4848 20	I2S CODEC BCLK
SPI TPAD MOSI	R4851 20	SPI TPAD MOSI
SPI TPAD CLK	R4852 20	SPI TPAD CLK
SPI MESA MOSI	R4853 20	SPI MESA MOSI
SPI MESA CLK	R4854 20	SPI MESA CLK
SSD0 CLK24M	R4857 20	SSD0 CLK24M
PDM DMIC CLK0	R4859 20	PDM DMIC CLK0
PDM DMIC CLK1	R4860 20	PDM DMIC CLK1

J Overloaded GPIOs

TPAD KBD WAKE L	TPAD KBD WAKE L
TPAD SPI INT L	TPAD SPI INT L
NC TPAD ACTUATOR DISABLE L	NC TPAD ACTUATOR DISABLE L
SPI SOCROM MOSI	SPI SOCROM MOSI
SPI SOCROM CLK	SPI SOCROM CLK
SPI SOCROM MISO	SPI SOCROM MISO


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	BRANCH proto4b
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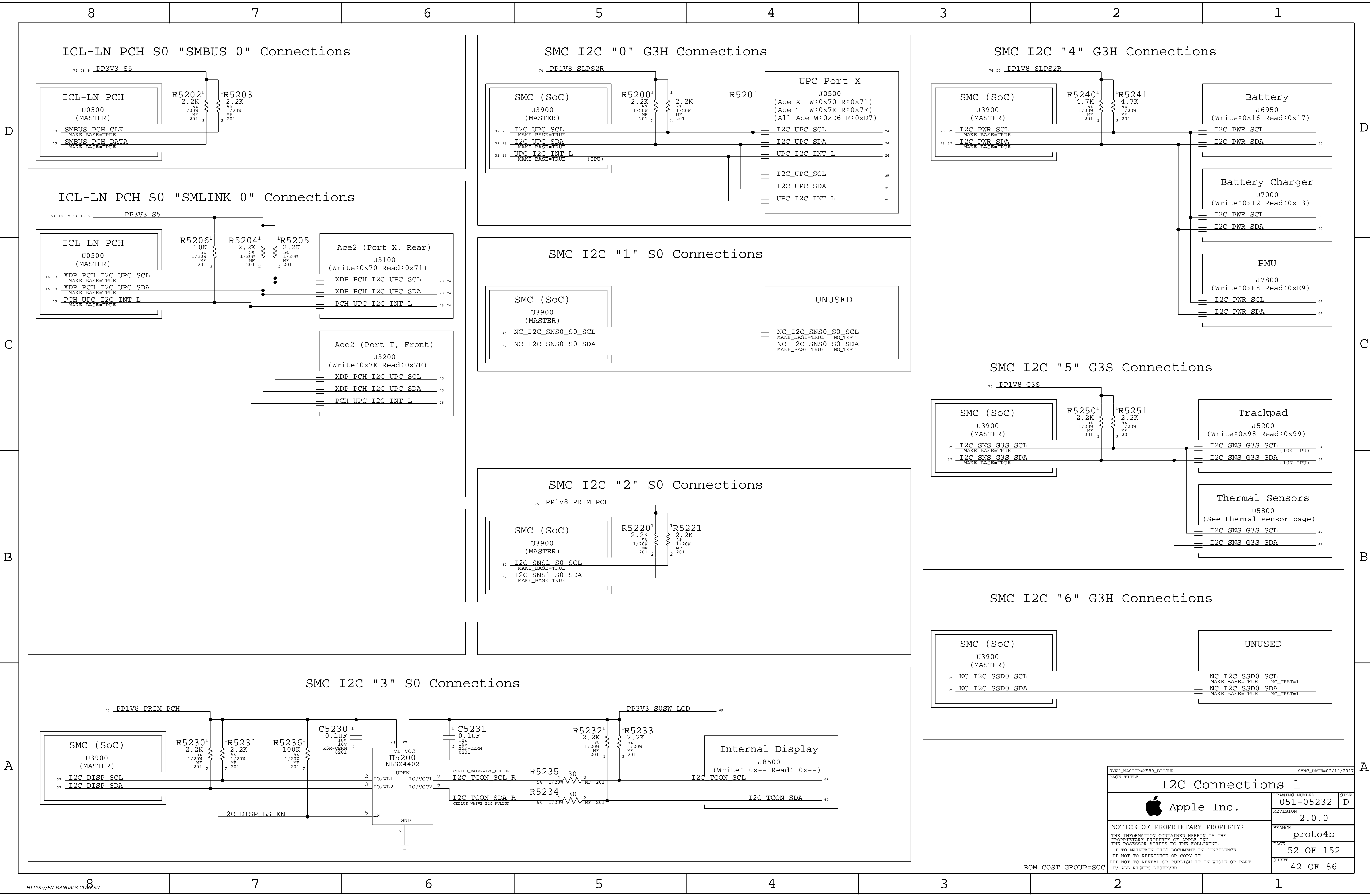
Venus - Secure Element



PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
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338S00445	1	IC, SN100V, VENUS, PROD KEY, B2, SW-N, WLCSF72	U5000	CRITICAL	SE:PROD_SW_N

PP1V8_G3S	75	
R5001	100K	1 2 5% 1/20W MF 201
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
R5006	100K	1 2 5% 1/20W MF 201

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A

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D

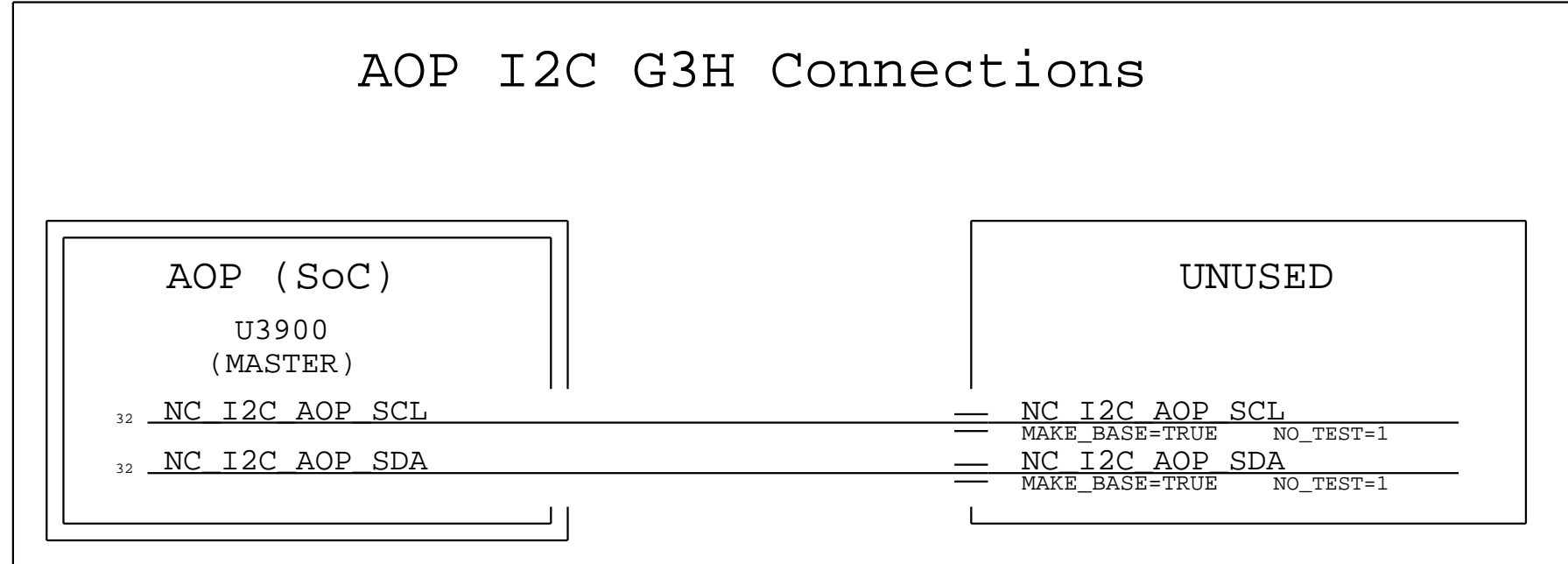
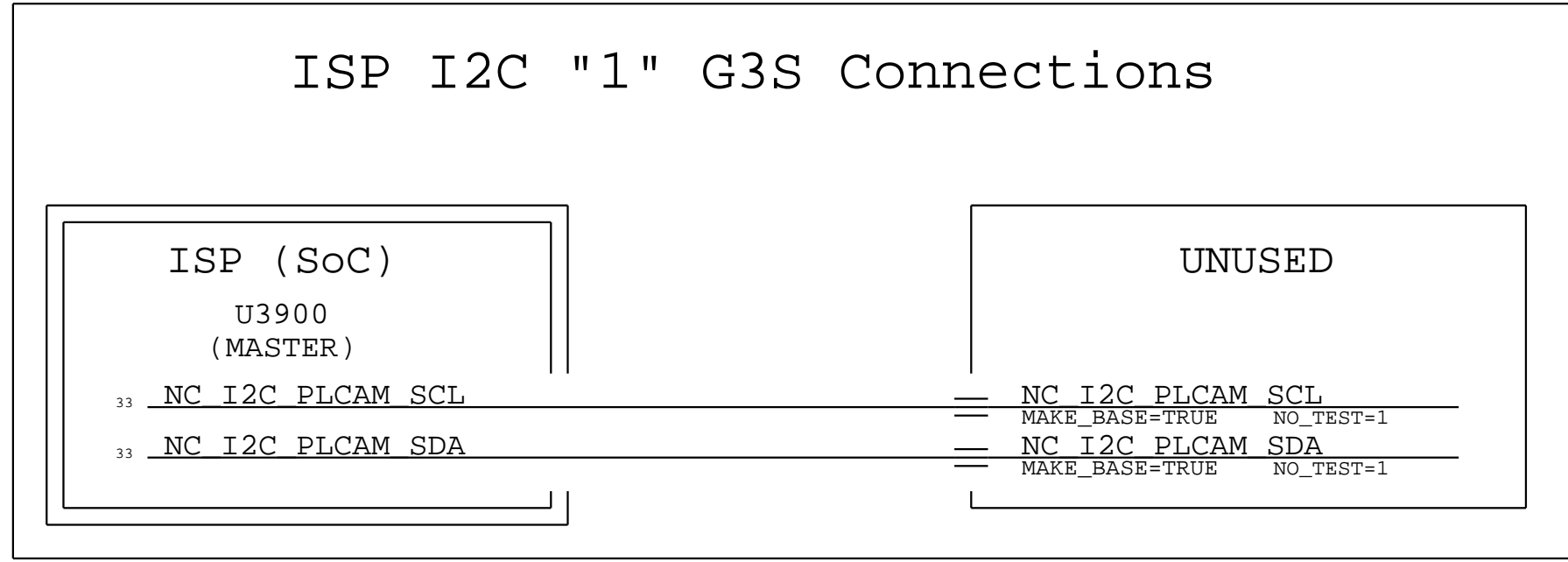
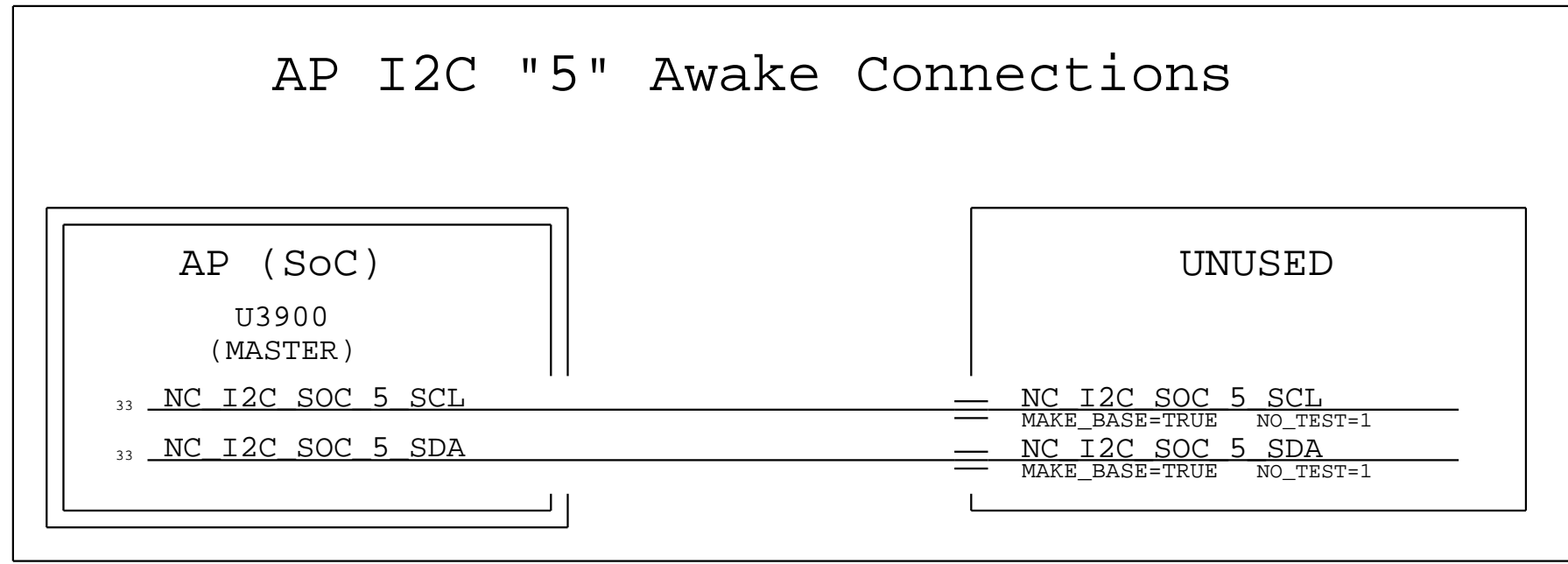
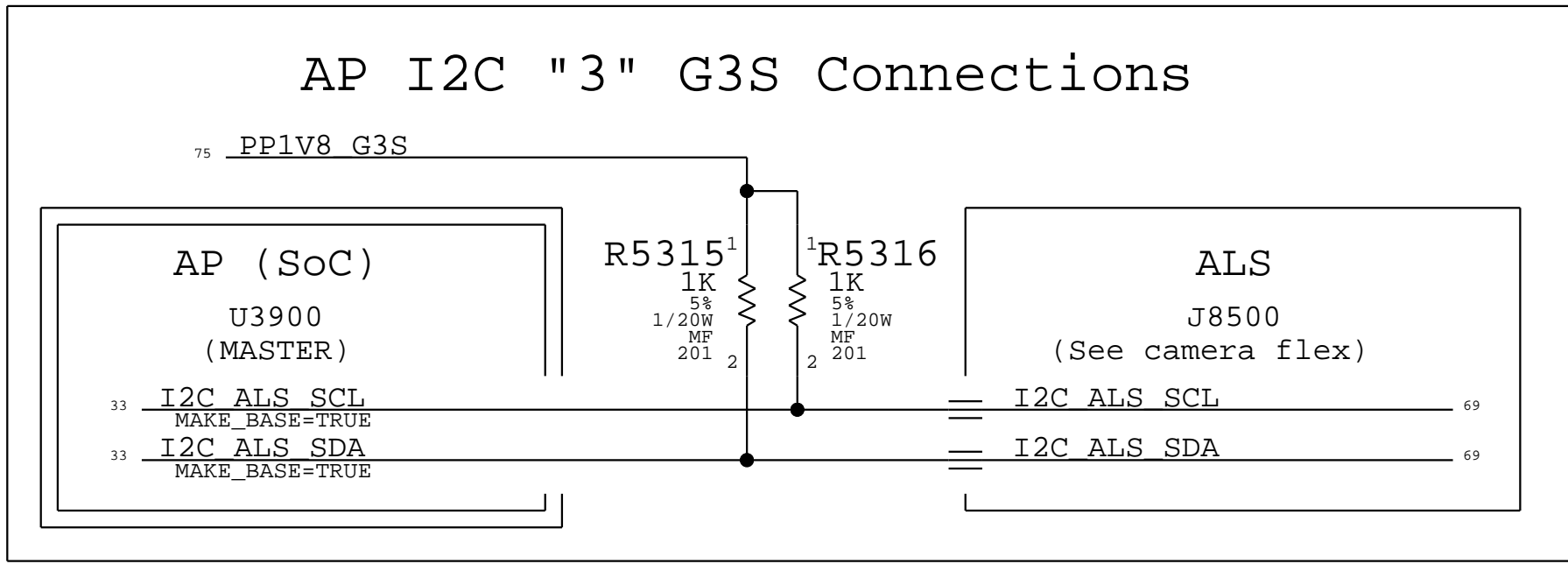
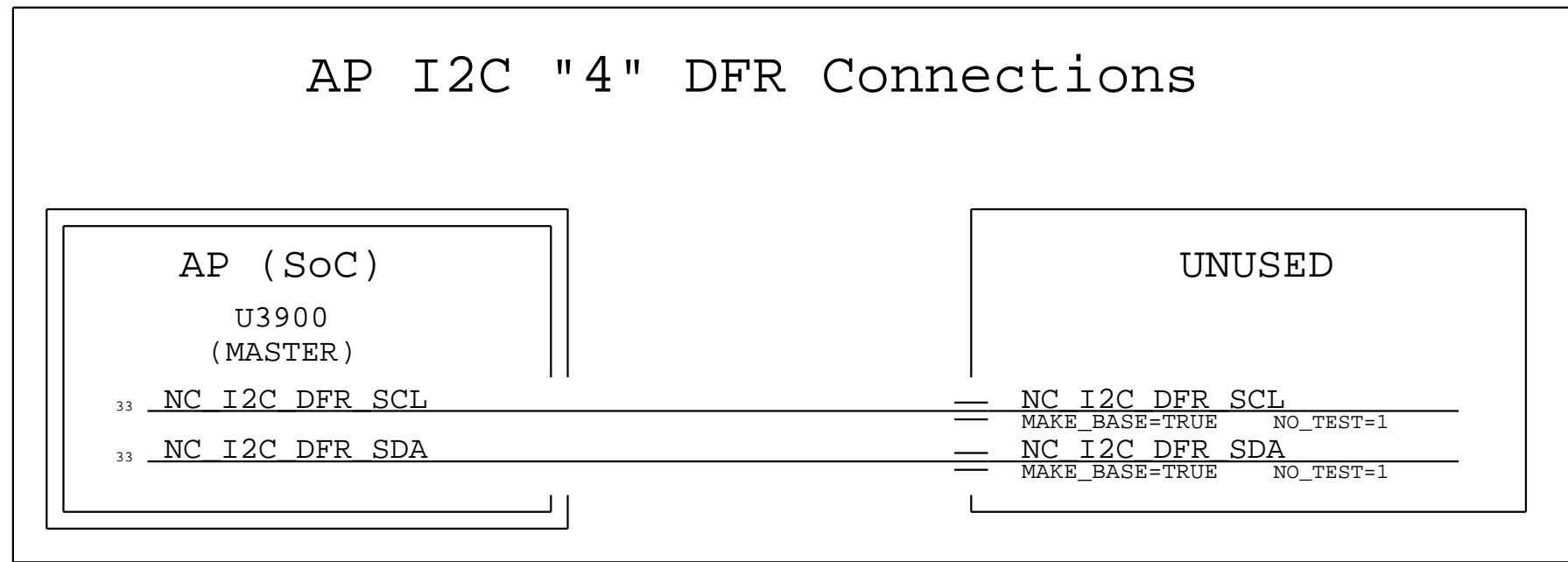
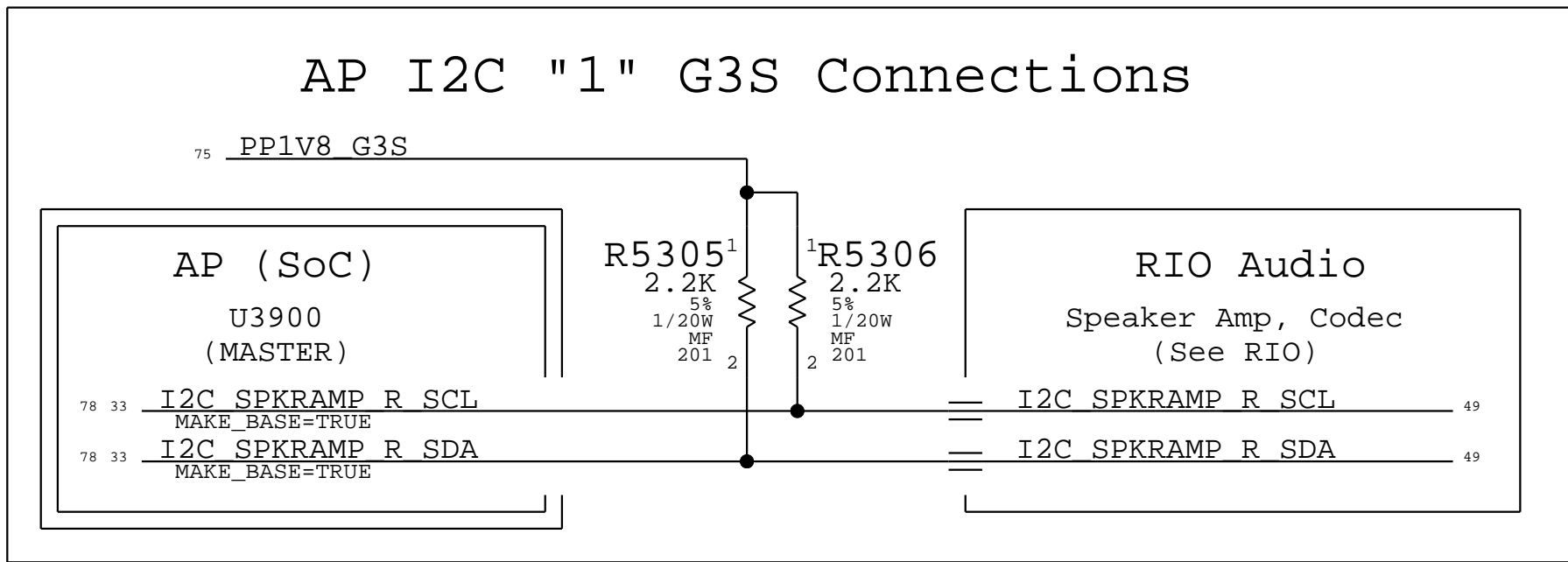
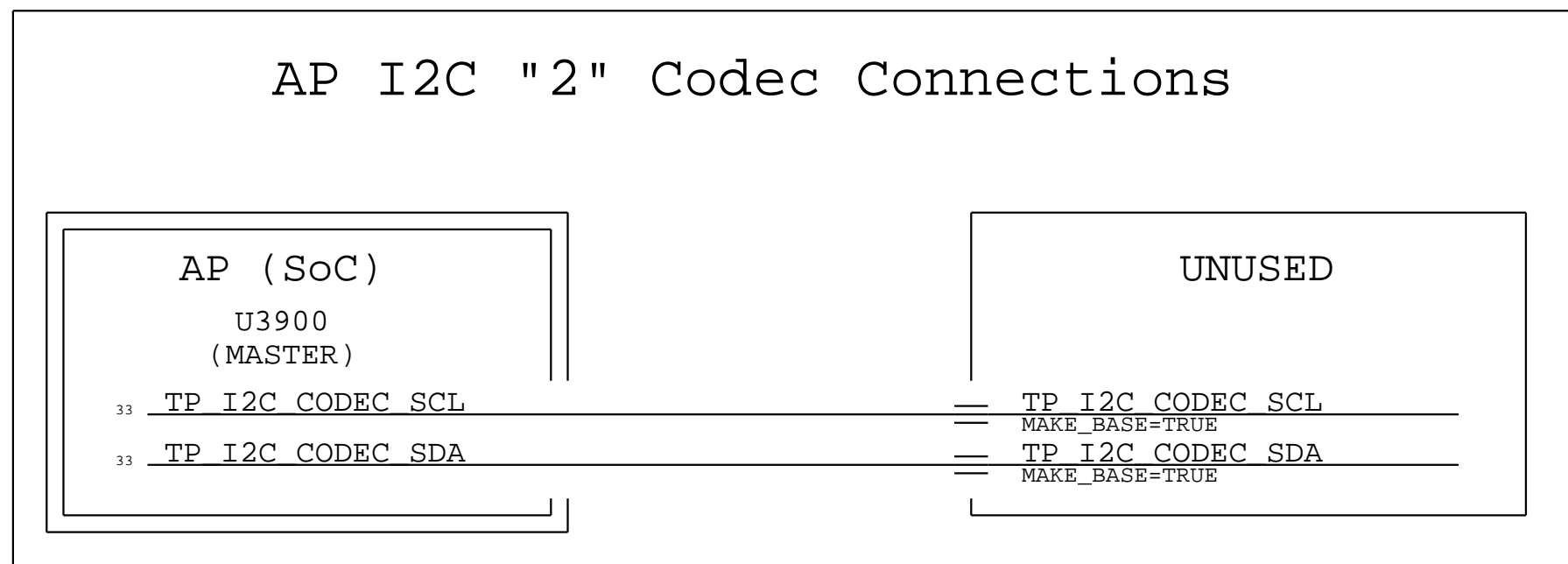
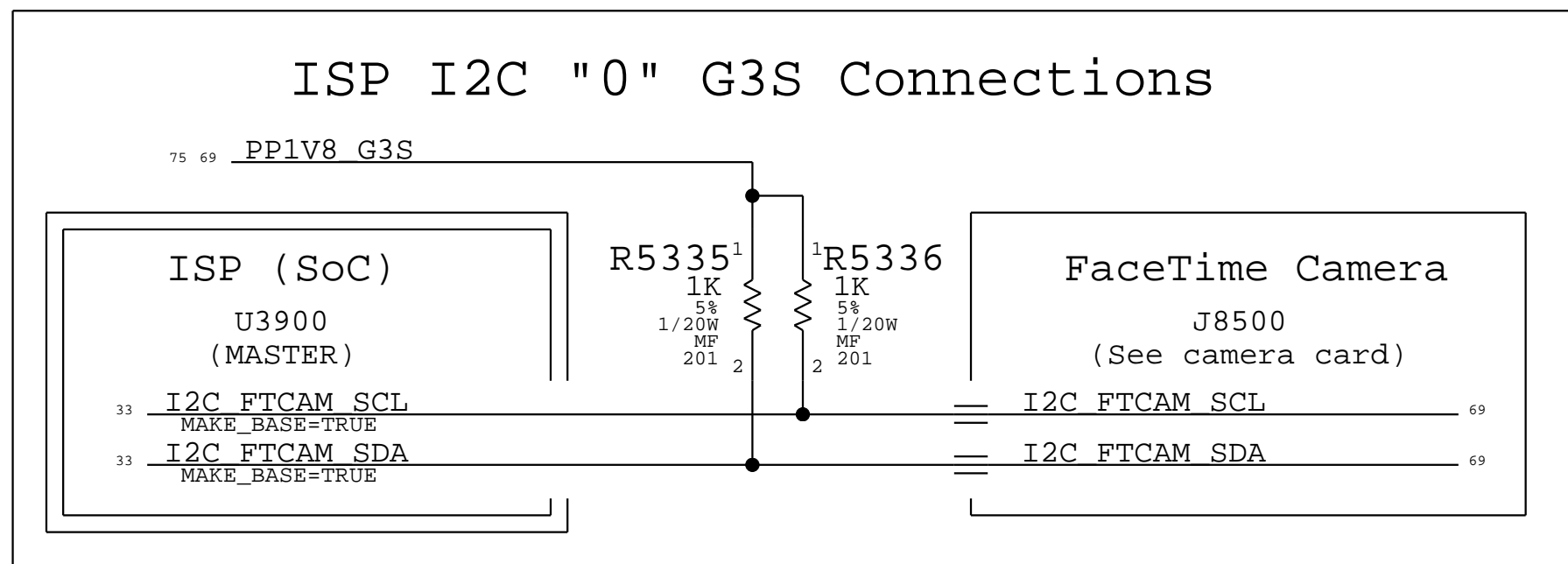
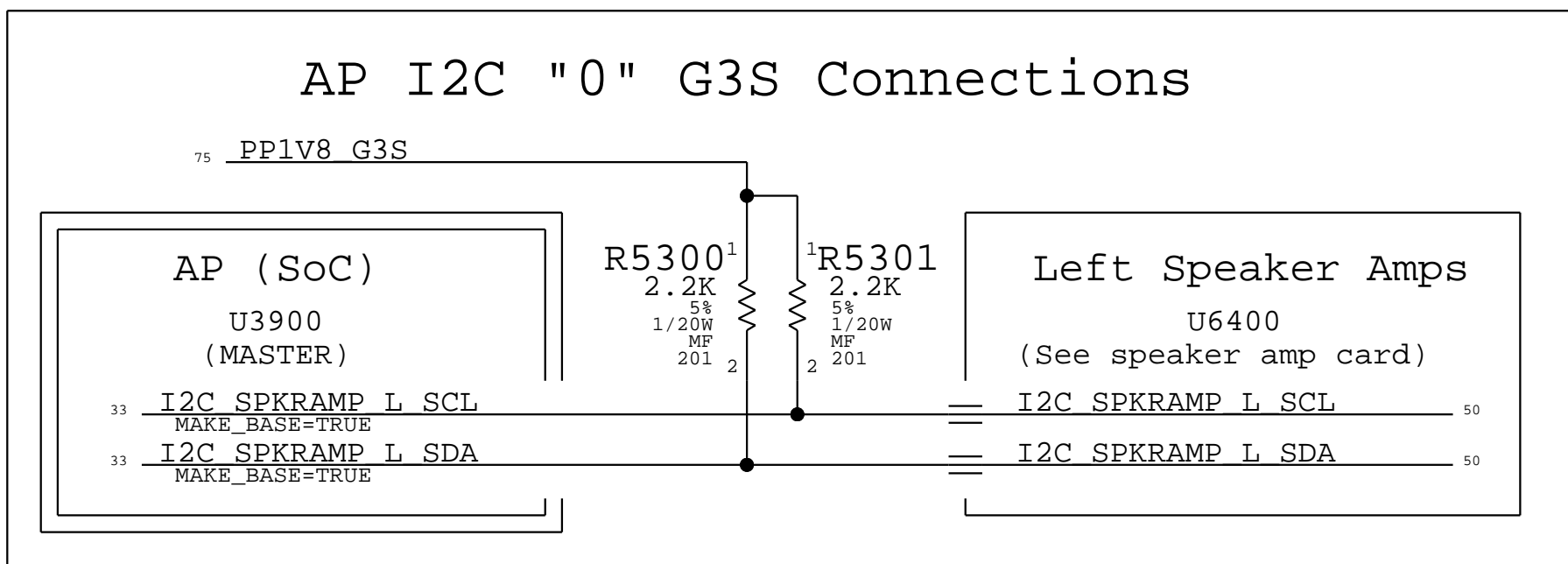
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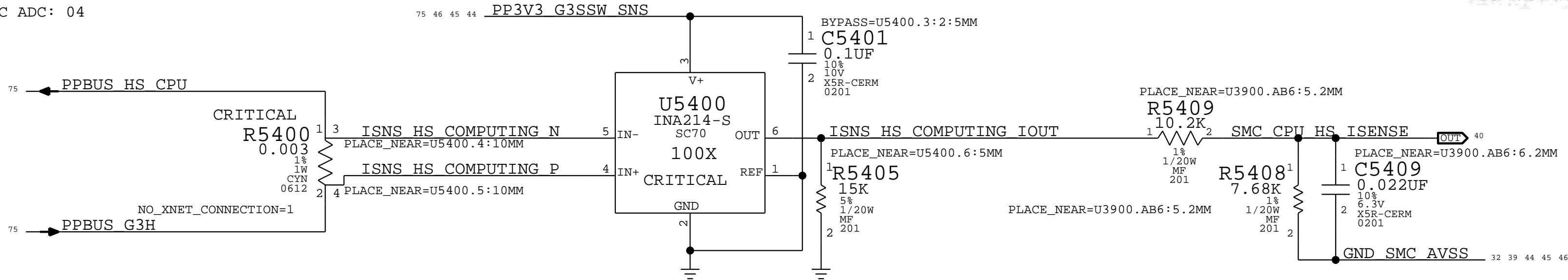
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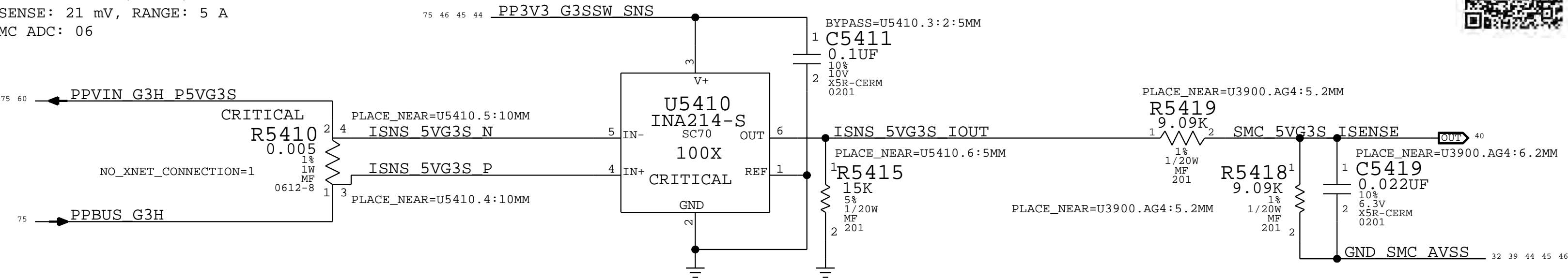
A CPU High Side Current Sense (IC0R)

GAIN: 100X, EDP: 10.16 A
Rsense: 0.003 (R5400)
VSENSE: 30.475 mV, RANGE: 8.842 A
SMC ADC: 04



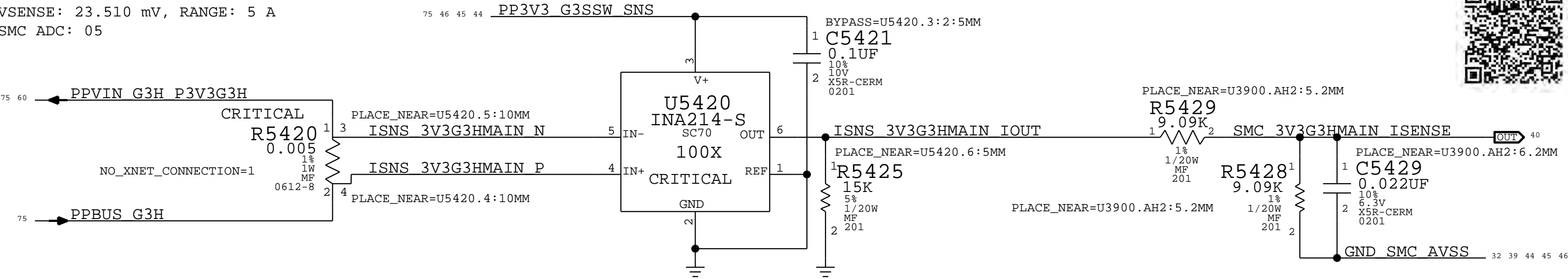
B 5V G3S High Side Current Sense (IO5R)

GAIN: 100X, EDP: 4.2 A
Rsense: 0.005 (R5410)
VSENSE: 21 mV, RANGE: 5 A
SMC ADC: 06



C 3V3 G3H MAIN High Side Current Sense (IO3R)

GAIN: 100X, EDP: 4.702 A
Rsense: 0.005 (R5420)
VSENSE: 23.510 mV, RANGE: 5 A
SMC ADC: 05



D Sensor Documentation

Sensor information can be found in the ERS at the link below or by scanning the QR Code image.

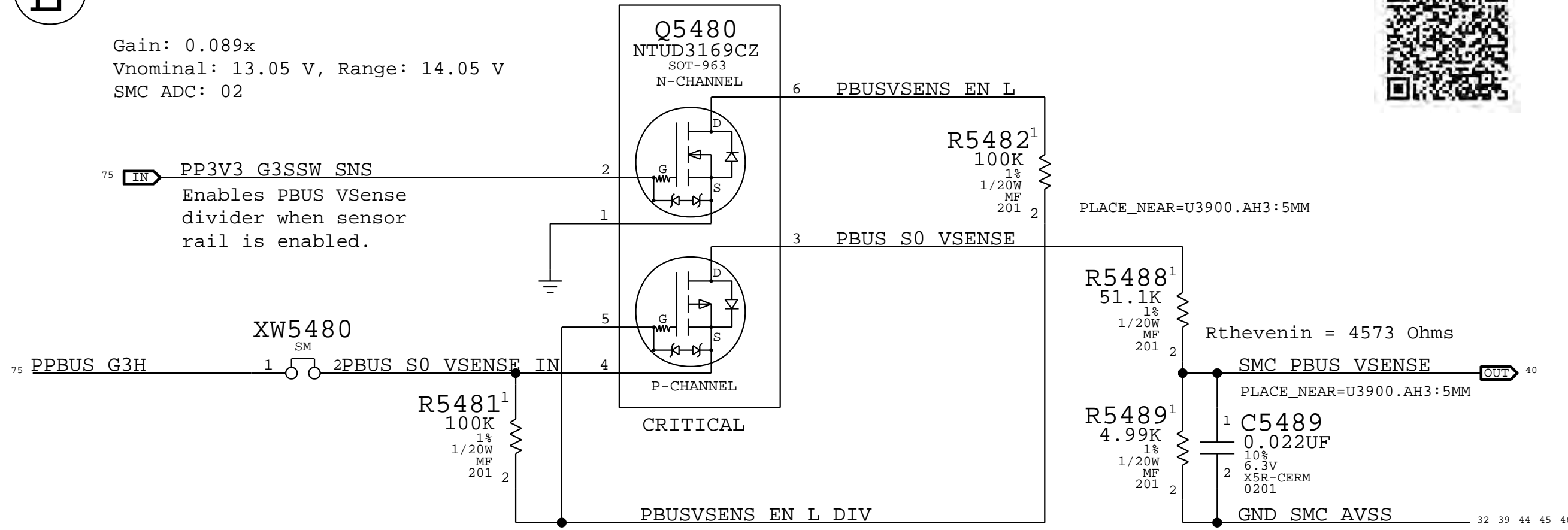


https://github.pie.apple.com/MobileMacIX/j230_hw/blob/master/j230/mlb/docs/sensor_ers/j230_sensor_ers.pdf

INA21X PARTS HAVE MINOR LEAKAGE PATH FROM INPUTS TO OUTPUT WHEN UNPOWERED. PULL-DOWN RESISTORS ON INA OUTPUTS BLEED OFF THE LEAKAGE CURRENT TO PREVENT SIGNAL PUMP-UP.

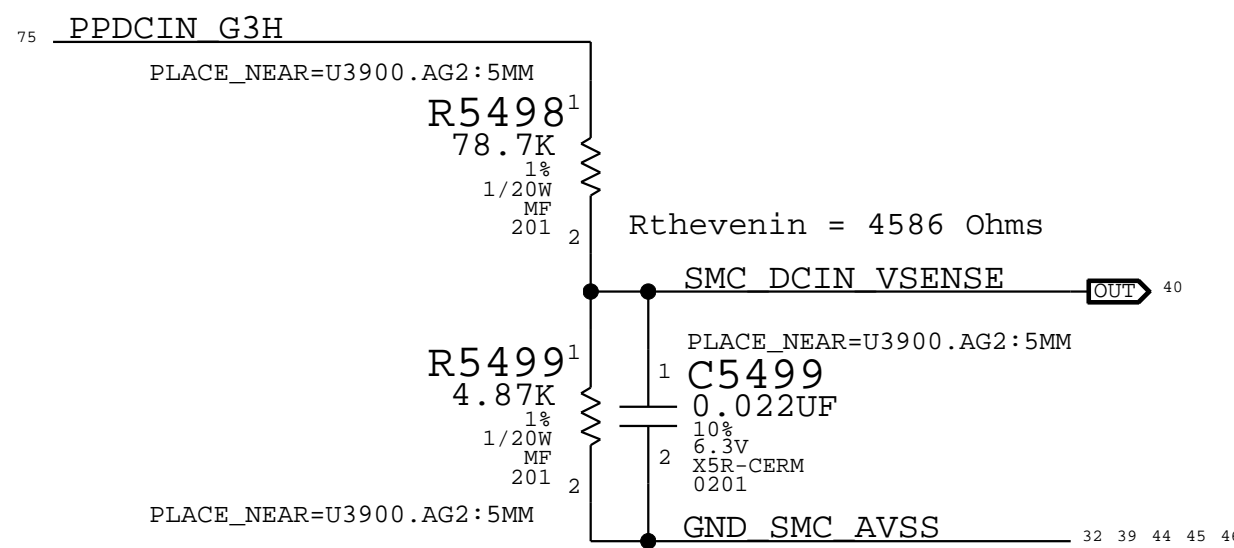
E PBUS Voltage Sense & Enable (VP0R)

Gain: 0.089x
Vnominal: 13.05 V, Range: 14.05 V
SMC ADC: 02



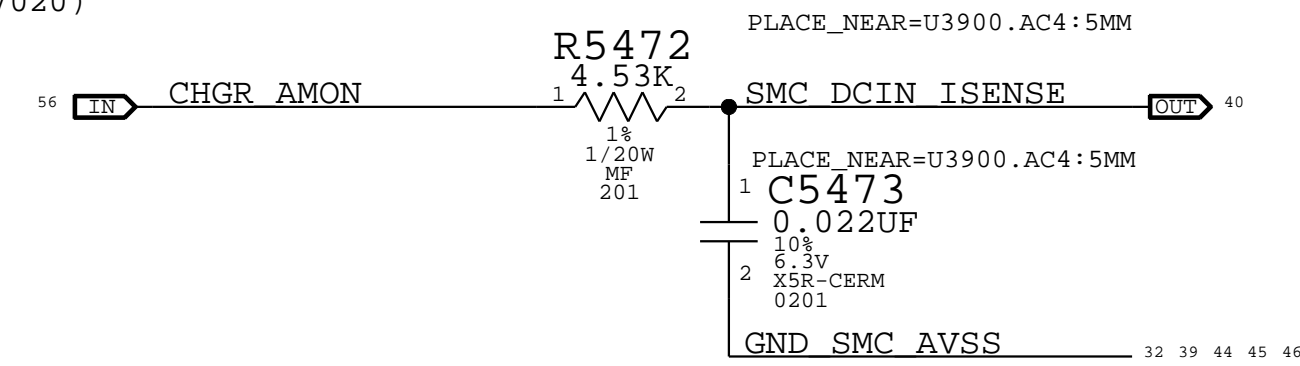
F DC In Voltage Sense (VD0R)

Gain: 0.148x
Vnominal: 16.5 V, Range: 22.29 V
SMC ADC: 00



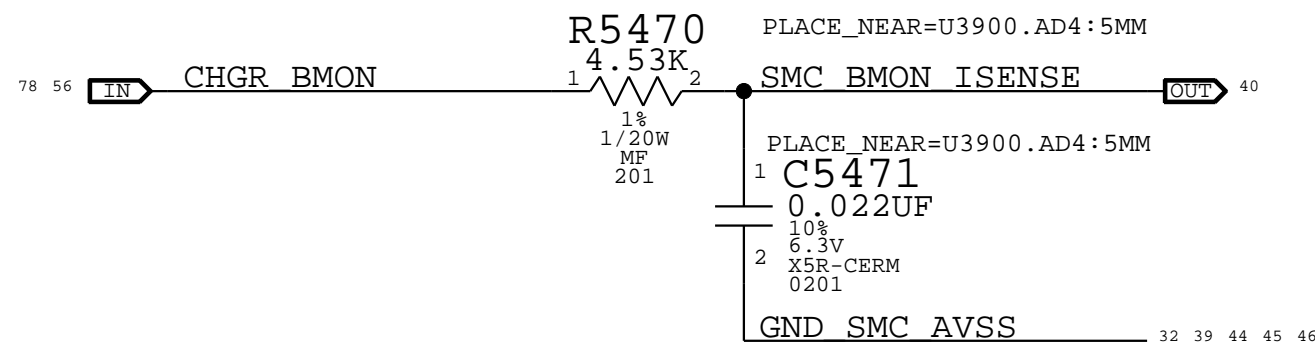
G DC-IN (AMON) Current Sense (ID0R)

Charger Gain: 20x, EDP: 3.0 A
RSENSE: 0.010 (R7020)
SMC ADC: 01



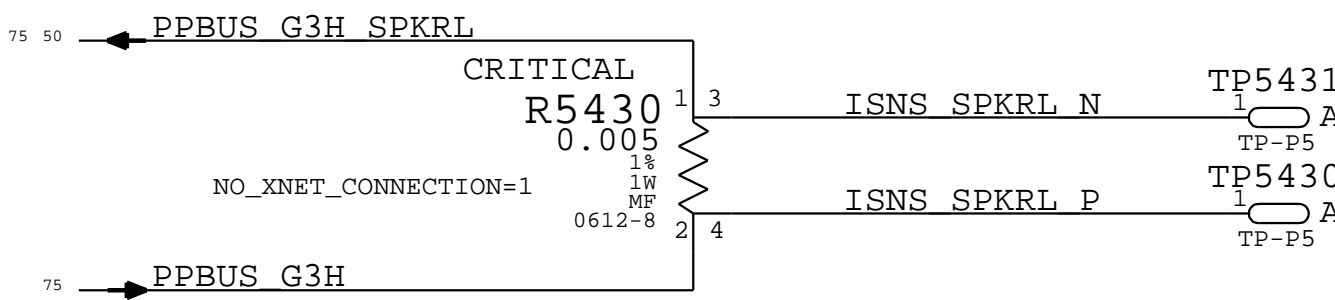
H Charger (BMON) Current Sense (IPBR)

Charger Gain: 7.9x, EDP: 6.5 A
RSENSE: 0.005 (R7060)
SMC ADC: 03



I Speaker Amp Sense (Ixxx)

RSENSE: 0.005
EDP: x A
SMC ADC: 03

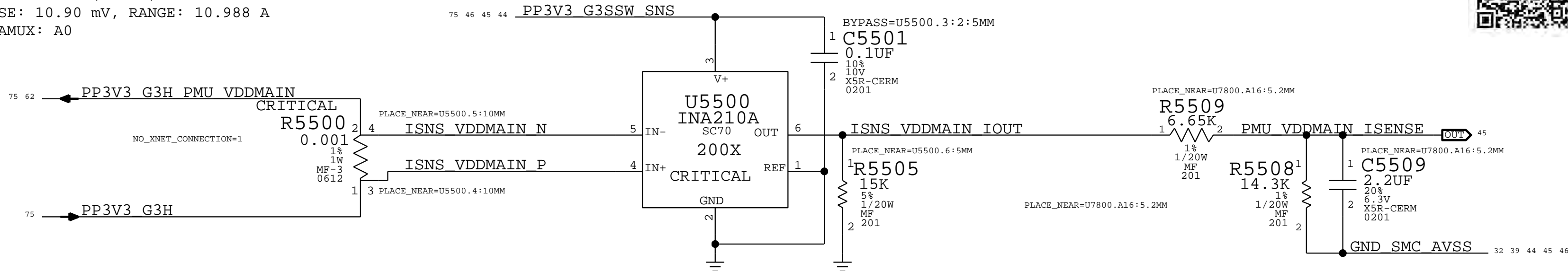


BOM_COST_GROUP=SENSORS

DESIGN: J230/MLB	
LAST CHANGE: Fri Sep 28 20:05:04 2018	
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	DRAWING NUMBER
	051-05232
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BRANCH	proto4b
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A VDDMAIN 3.3V Current Sense (ISLC)

GAIN: 200X, EDP: 10.90 A
Rsense: 0.001 (R5500)
VSENSE: 10.90 mV, RANGE: 10.988 A
PMU AMUX: A0

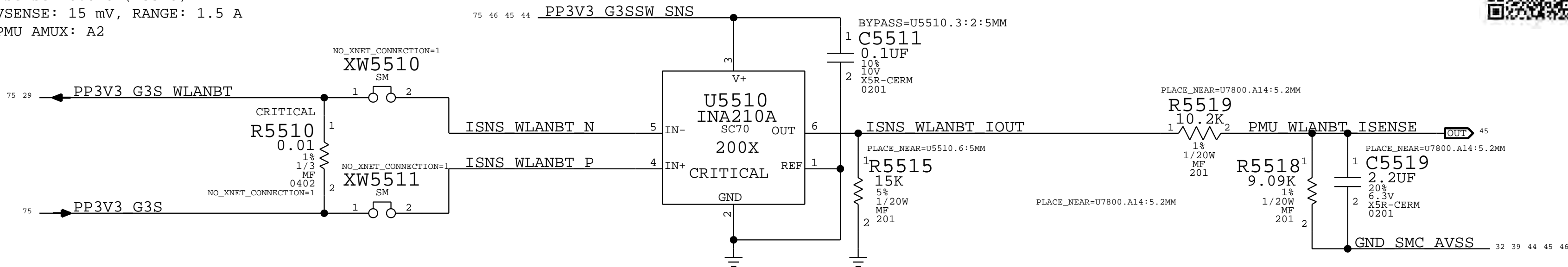


LTSpice Simulation



C Wireless 3.3V Current Sense (IAPC)

GAIN: 200X, EDP: 1.5 A
Rsense: 0.010 (R5510)
VSENSE: 15 mV, RANGE: 1.5 A
PMU AMUX: A2

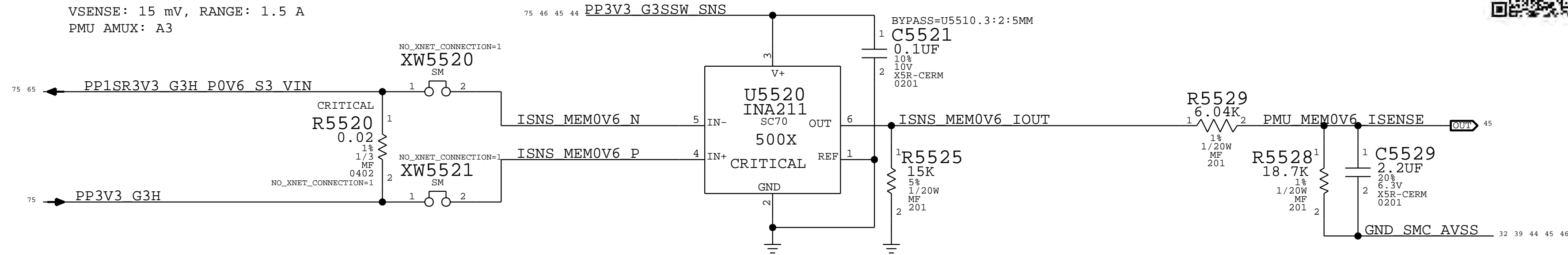


LTSpice Simulation



E MEMORY 0.6V High-Side Current Sense (IM0C)

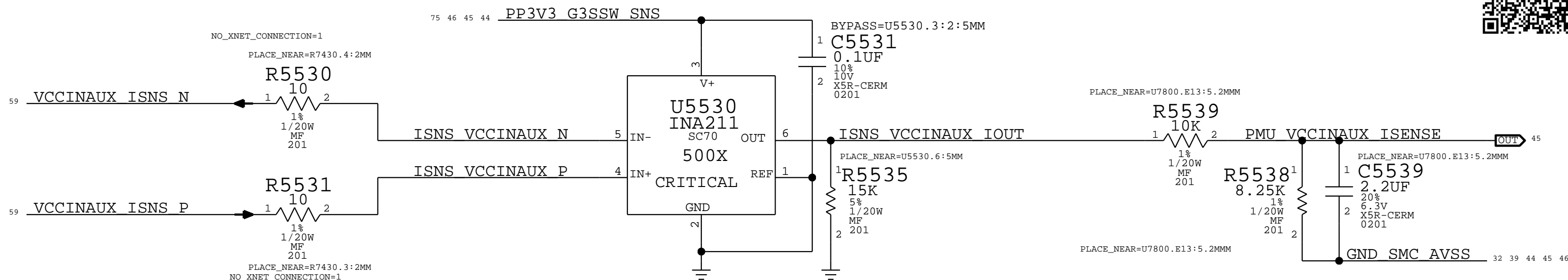
GAIN: 200X, EDP: 1.5 A
Rsense: 0.020 (R5520)
VSENSE: 15 mV, RANGE: 1.5 A
PMU AMUX: A3



LTSpice Simulation



G VCCIN_AUX Current Sense (ICIC)



LTSpice Simulation



B PMU ADC AMUX_A ALIASES

45	PMU VDDMAIN ISENSE	==	PMU VDDMAIN ISENSE	64
	MAKE_BASE=TRUE			
45	PMU MEM1V1 ISENSE	==	PMU MEM1V1 ISENSE	64
	MAKE_BASE=TRUE			
45	PMU WLANBT ISENSE	==	PMU WLANBT ISENSE	64
	MAKE_BASE=TRUE			
45	PMU MEMOV6 ISENSE	==	PMU MEMOV6 ISENSE	64
	MAKE_BASE=TRUE			
46	PMU LCDBKLT ISENSE	==	PMU LCDBKLT ISENSE	64
	MAKE_BASE=TRUE			
46	PMU CPU VSENSE	==	PMU CPU VSENSE	64
	MAKE_BASE=TRUE			
46	PMU NAND VSENSE	==	PMU NAND VSENSE	64
	MAKE_BASE=TRUE			
46	PMU VCCIN_AUX VSENSE	==	PMU VCCIN_AUX VSENSE	64
	MAKE_BASE=TRUE			

D PMU ADC AMUX_B ALIASES

	NC PMU AMUX B0	==	NC PMU AMUX B0	64
	MAKE_BASE=TRUE			
45	PMU VCCIN_AUX ISENSE	==	PMU VCCIN_AUX ISENSE	64
	MAKE_BASE=TRUE			
	NC PMU AMUX B2	==	NC PMU AMUX B2	64
	MAKE_BASE=TRUE			
	NC PMU AMUX B3	==	NC PMU AMUX B3	64
	MAKE_BASE=TRUE			
	NC PMU AMUX B4	==	NC PMU AMUX B4	64
	MAKE_BASE=TRUE			
	NC PMU AMUX B5	==	NC PMU AMUX B5	64
	MAKE_BASE=TRUE			
	NC PMU AMUX B6	==	NC PMU AMUX B6	64
	MAKE_BASE=TRUE			
	NC PMU AMUX B7	==	NC PMU AMUX B7	64
	MAKE_BASE=TRUE			

F Sensor Documentation

Sensor information can be found in the ERS by scanning the QR Code image.

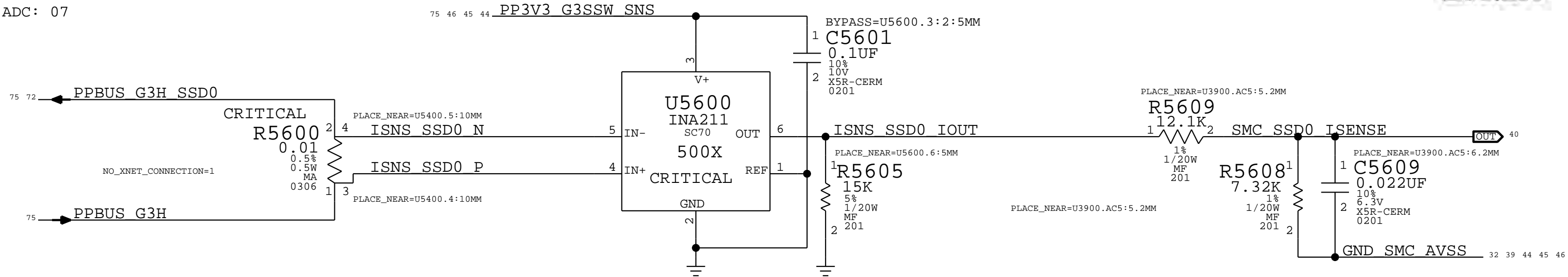


DESIGN: J230/MLB		
LAST CHANGE: Fri Sep 28 20:05:04 2018		
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Power Sensors Load Side		
	DRAWING NUMBER	051-05232
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	PAGE	55 OF 152
	SHEET	45 OF 86

BOM_COST_GROUP=SENSORS

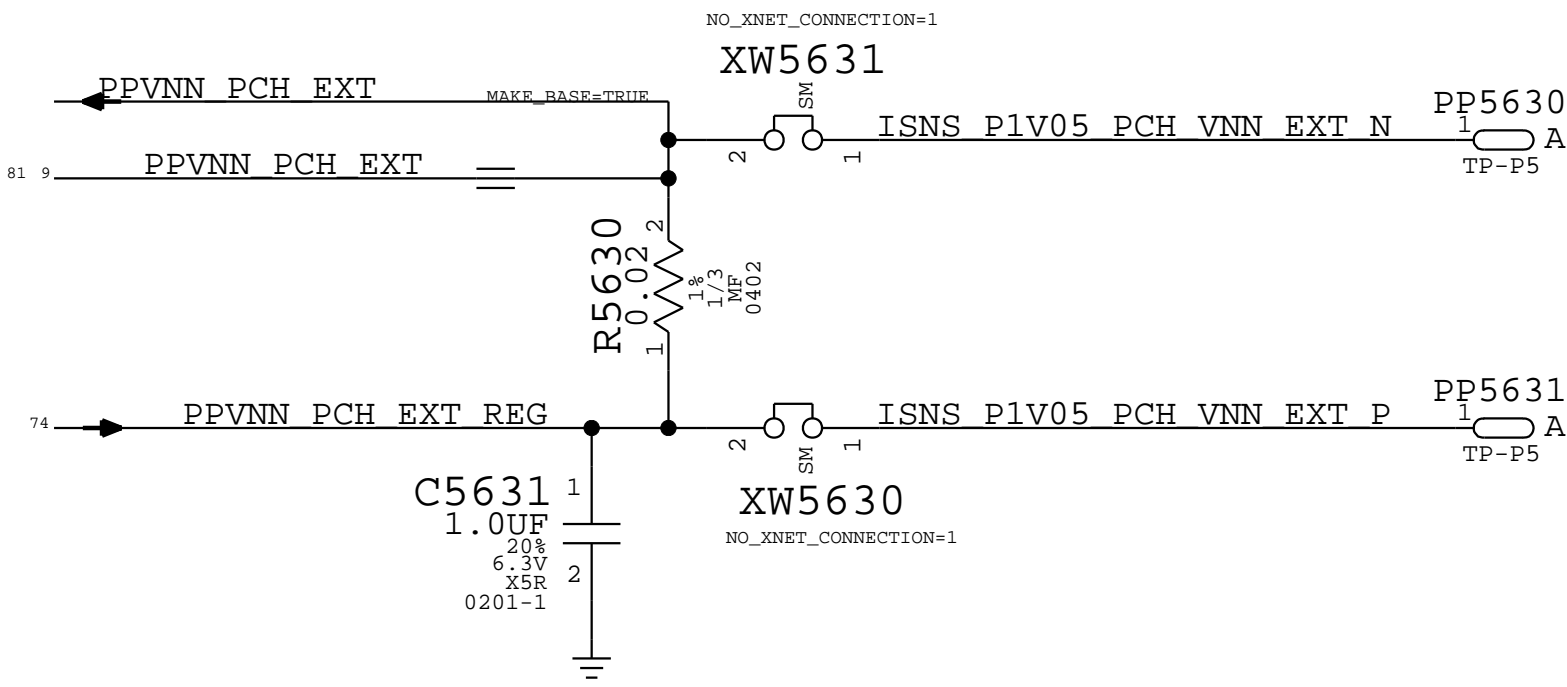
A SSD High Side (IH0R)

GAIN: 500X, EDP: 0.654 A
Rsense: 0.010 (R5600)
VSENSE: 6.536 mV, RANGE: 1.8 A
SMC ADC: 07



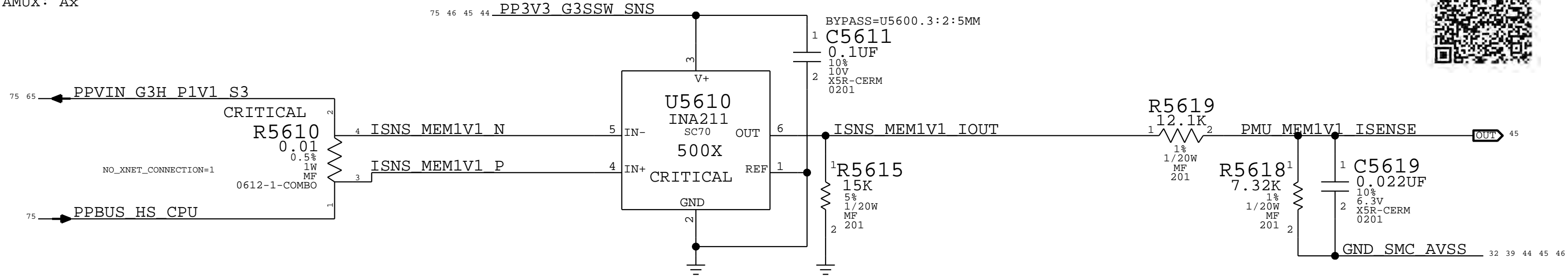
B PCH VNN BYPASS CURRENT SENSE

GAIN: 200X, EDP: 0.2 A



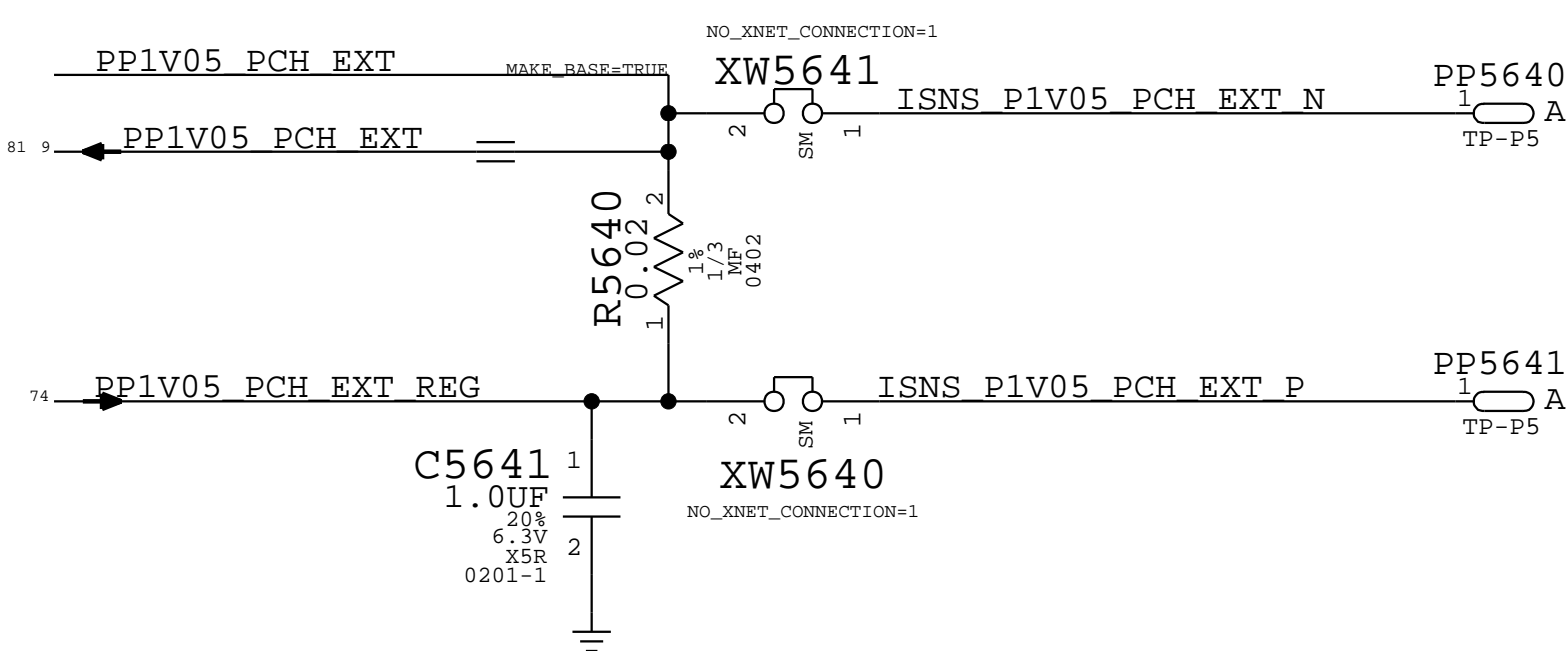
C Memory 1.1V High Side Current Sense (IM1C)

GAIN: x, EDP: 2.3 A
Rsense: 0.010 (R5610)
VSENSE: 23 mV, RANGE: 2.344 A
PMU AMUX: Ax



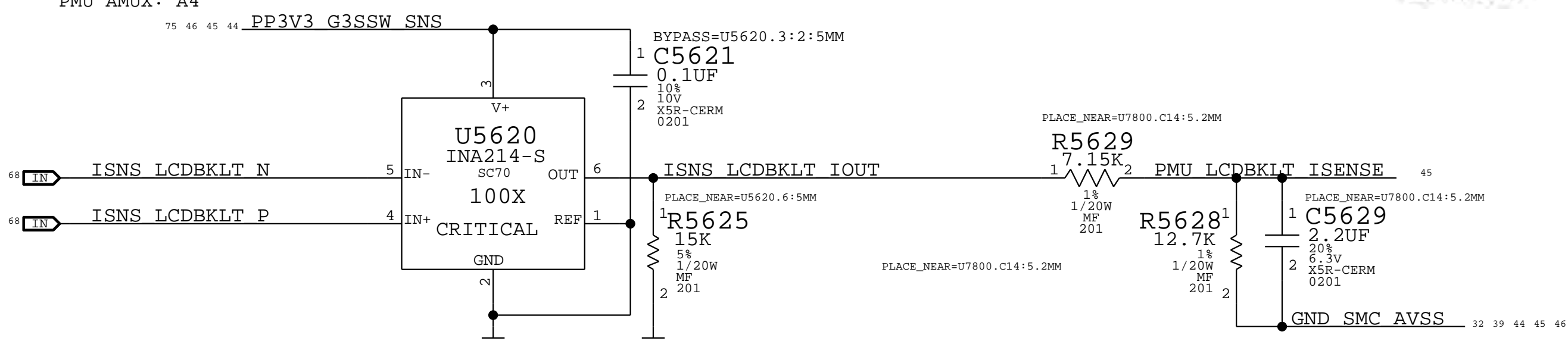
D PCH 1.05V BYPASS CURRENT SENSE

GAIN: 200X, EDP: 0.2 A



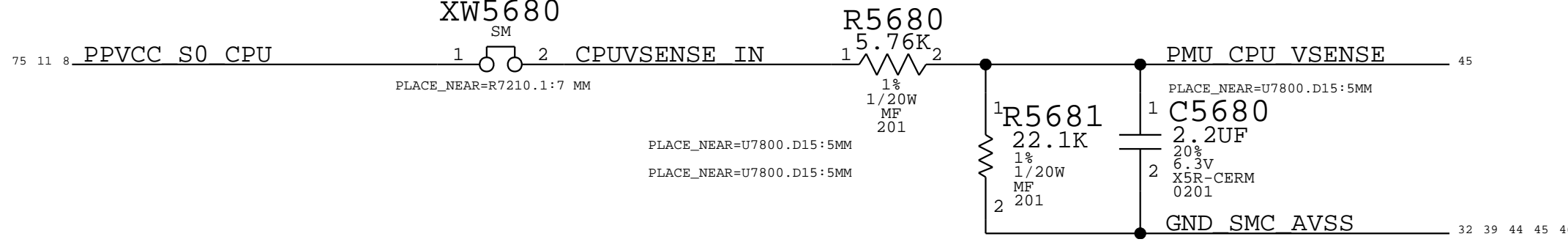
E LCD Backlight (IBLR)

GAIN: 100X, EDP: 0.902 A
Rsense: 0.025 (R5620)
VSENSE: 22.549 mV, RANGE: 0.902 A
PMU AMUX: A4



F CPU VCCIN VOLTAGE SENSE (VCAC)

PMU AMUX: A5



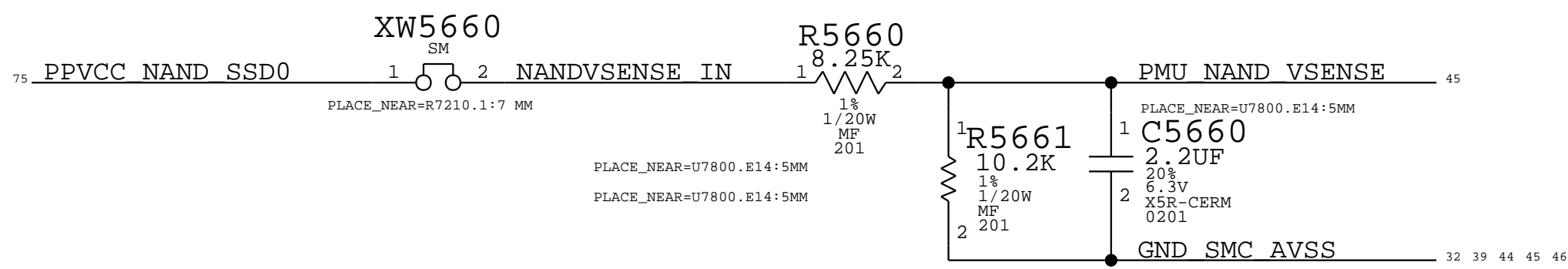
G Sensor Docs

Scan the QR Code for sensor info.



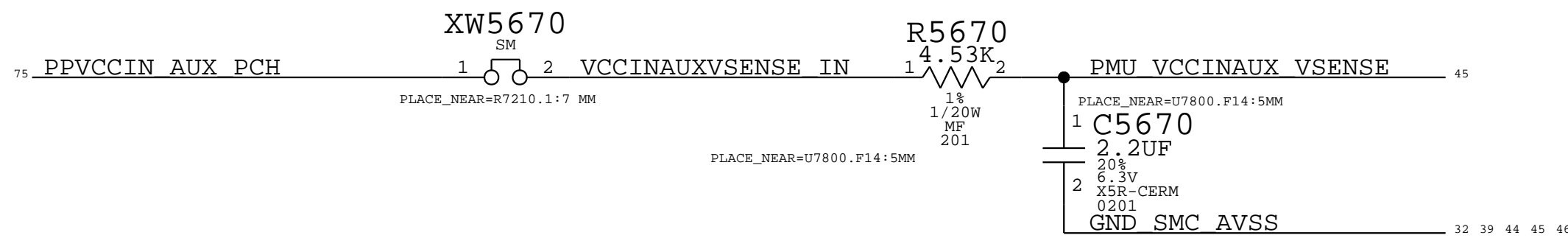
H NAND 2V5 VOLTAGE SENSE (VHNC)

PMU AMUX: A6



I VCCIN_AUX VOLTAGE SENSE (VCIC)

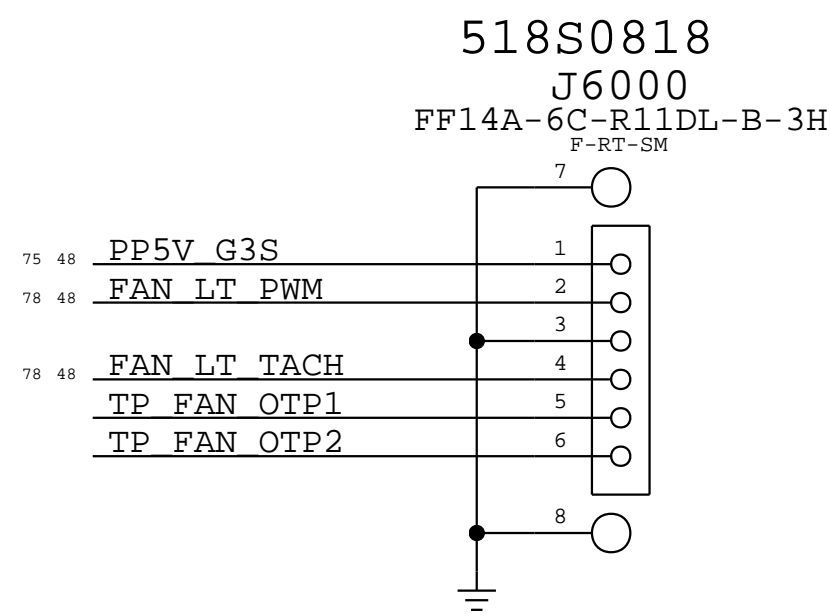
PMU AMUX: A7



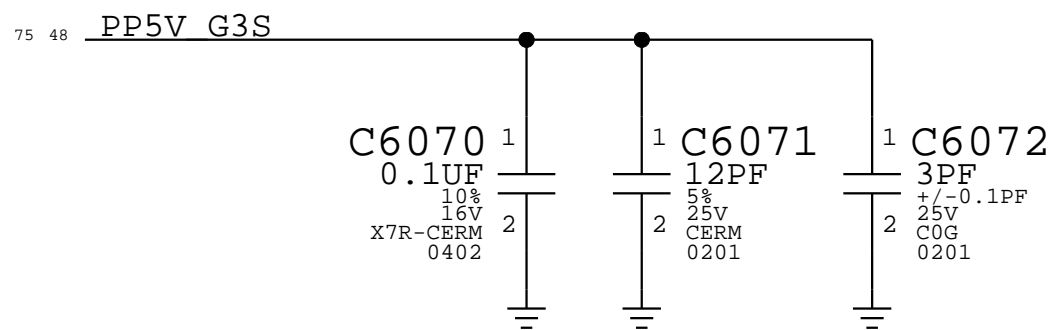
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BOM_COST_GROUP=SENSORS

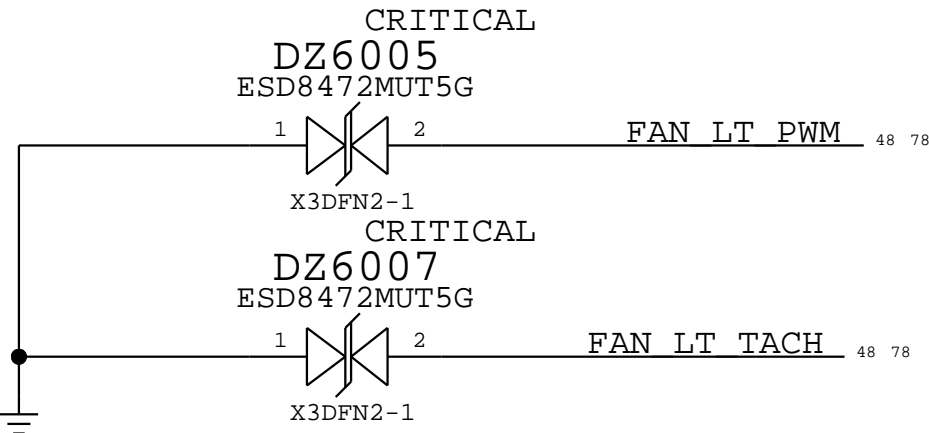
A FAN Connector



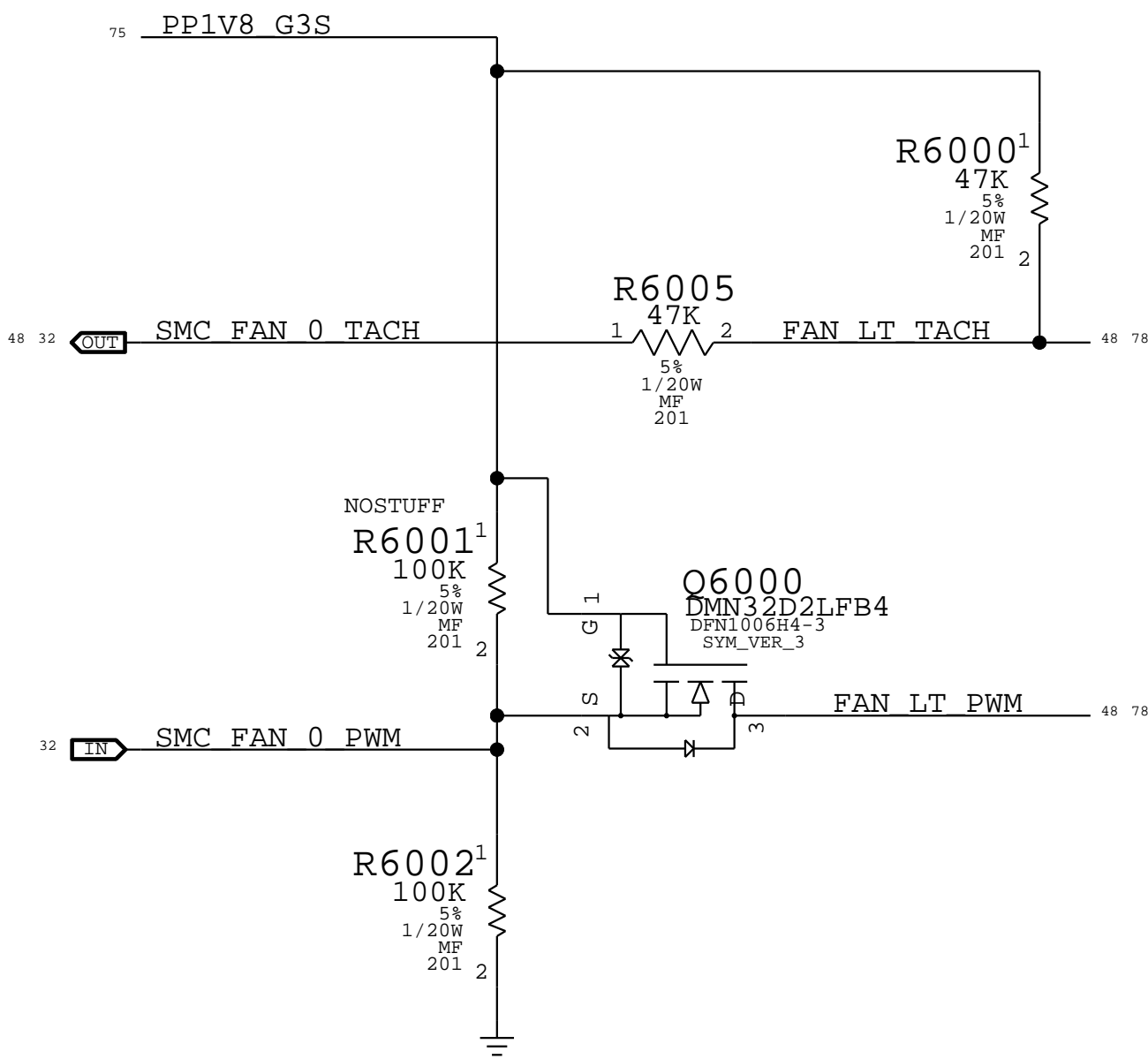
B FAN Bypass Capacitors



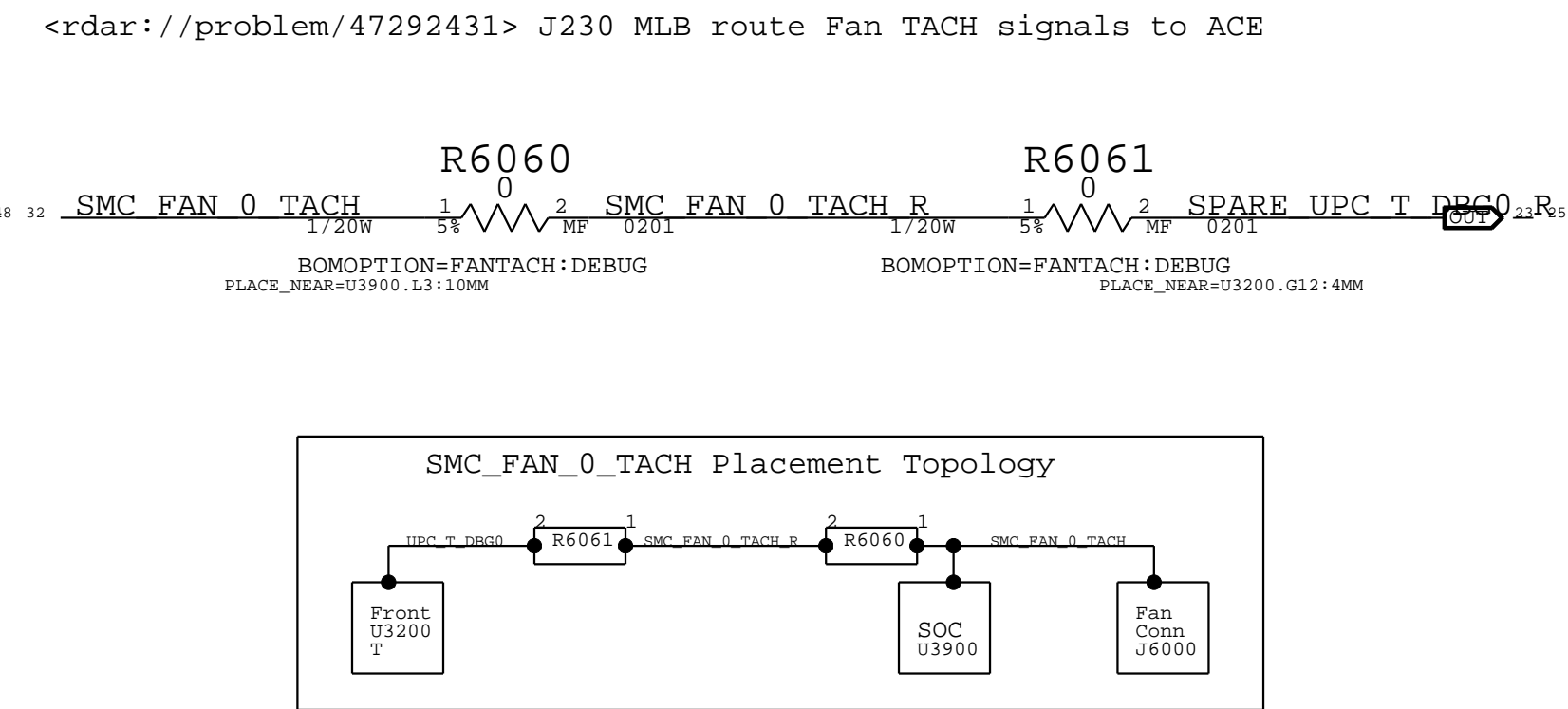
C FAN Protection Diodes




D FAN Support



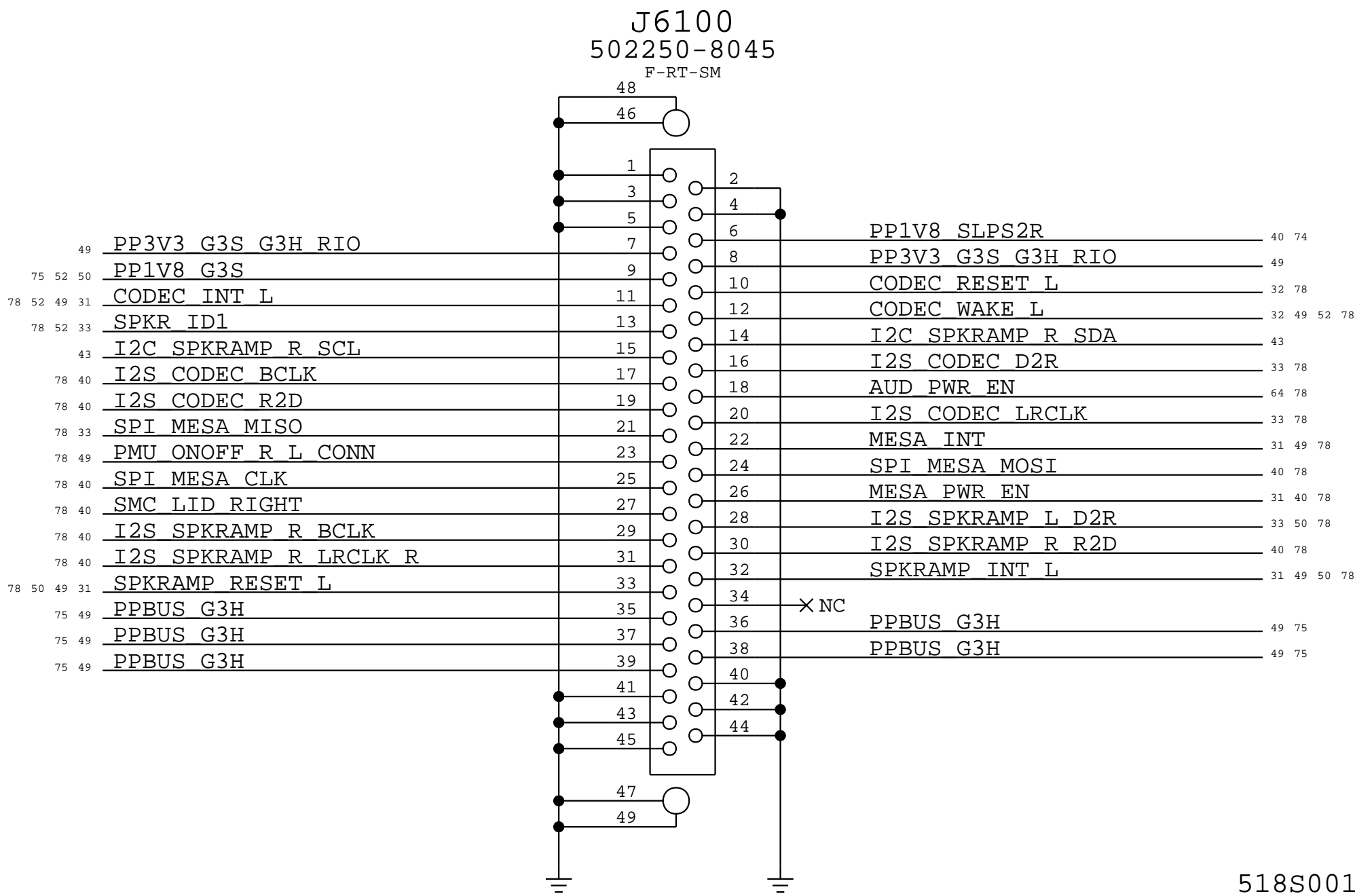
E FAN Debug



SYNC_MASTER=X1032_MLB_P4BP			SYNC_DATE=02/13/2017			
PAGE TITLE						
Fans						
 Apple Inc.			DRAWING NUMBER		SIZE	
			051-05232		D	
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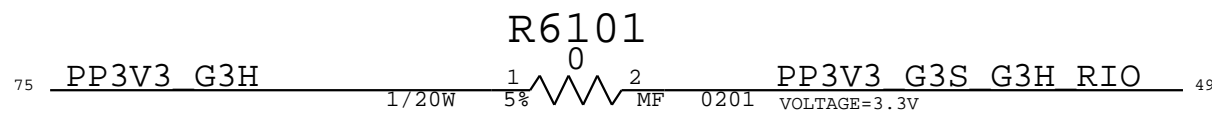
A RIO Flex Connector

On RIO Board:
AMR
CODEC
MESA
SPKR AMP

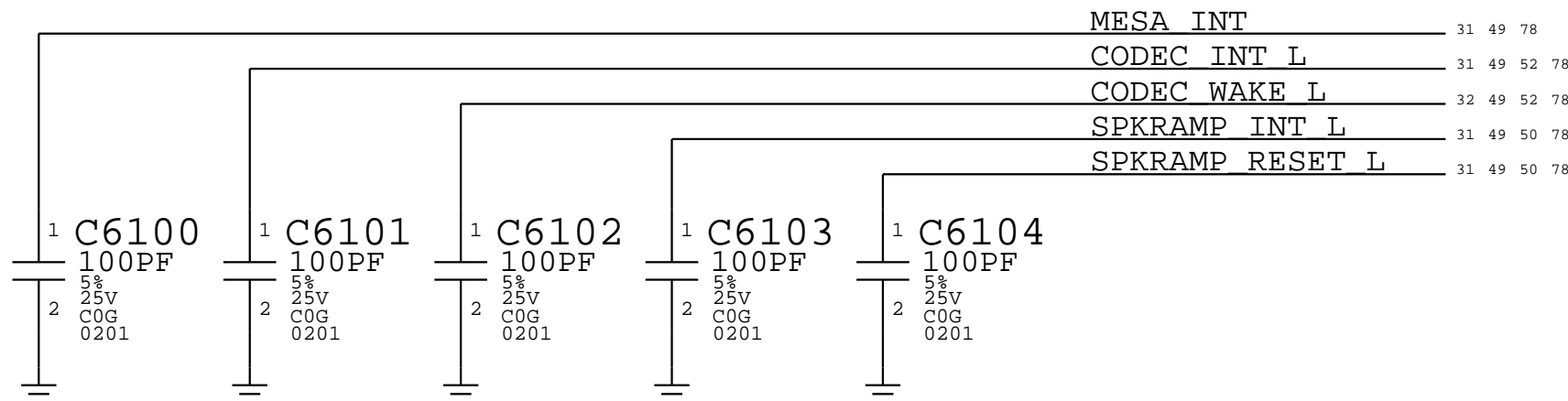


518S00155
Mates with 998-11285
on X1032 RIO Flex J0200

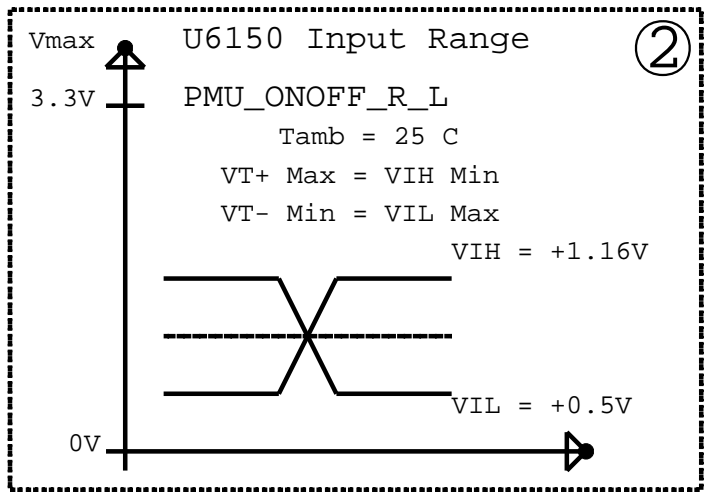
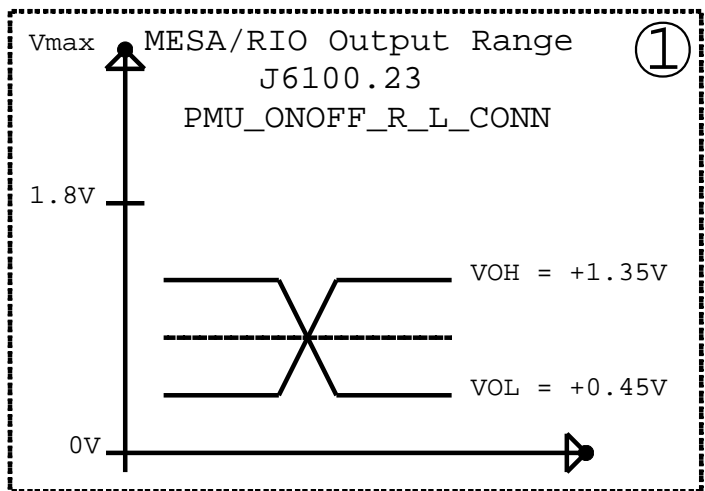
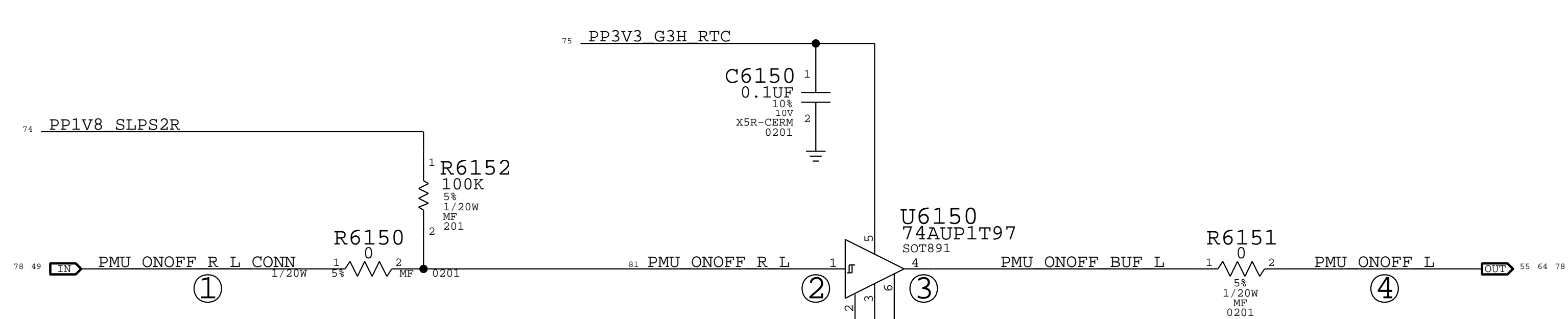
B RIO P3V3_G3H Connection



C RIO Control Signals



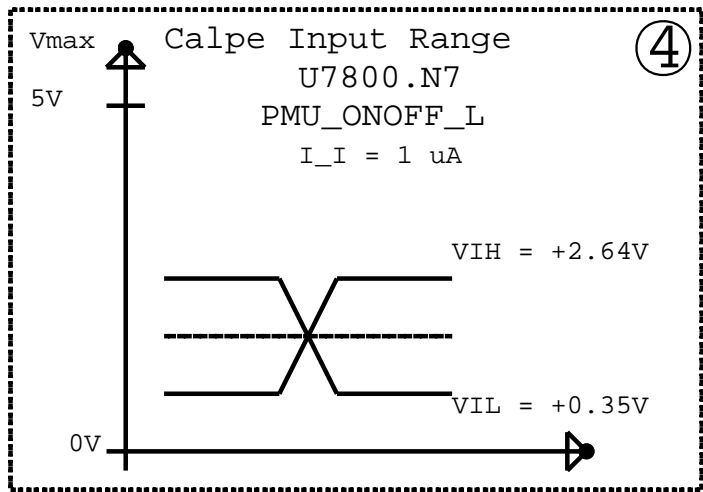
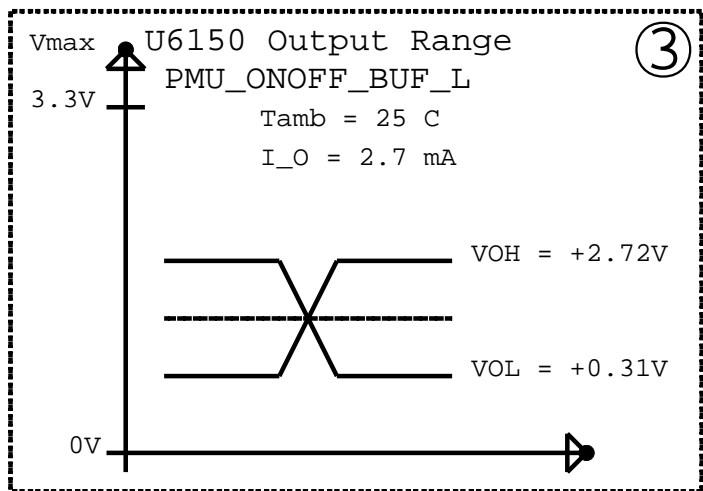
D PMU_ONOFF_L Level Shifter



LTSpice Simulation



\$J230GHUB/j230/mlb/sim/ltspice/pmu_onoff_level_shifter.asc



PAGE TITLE		
RIO Connector		
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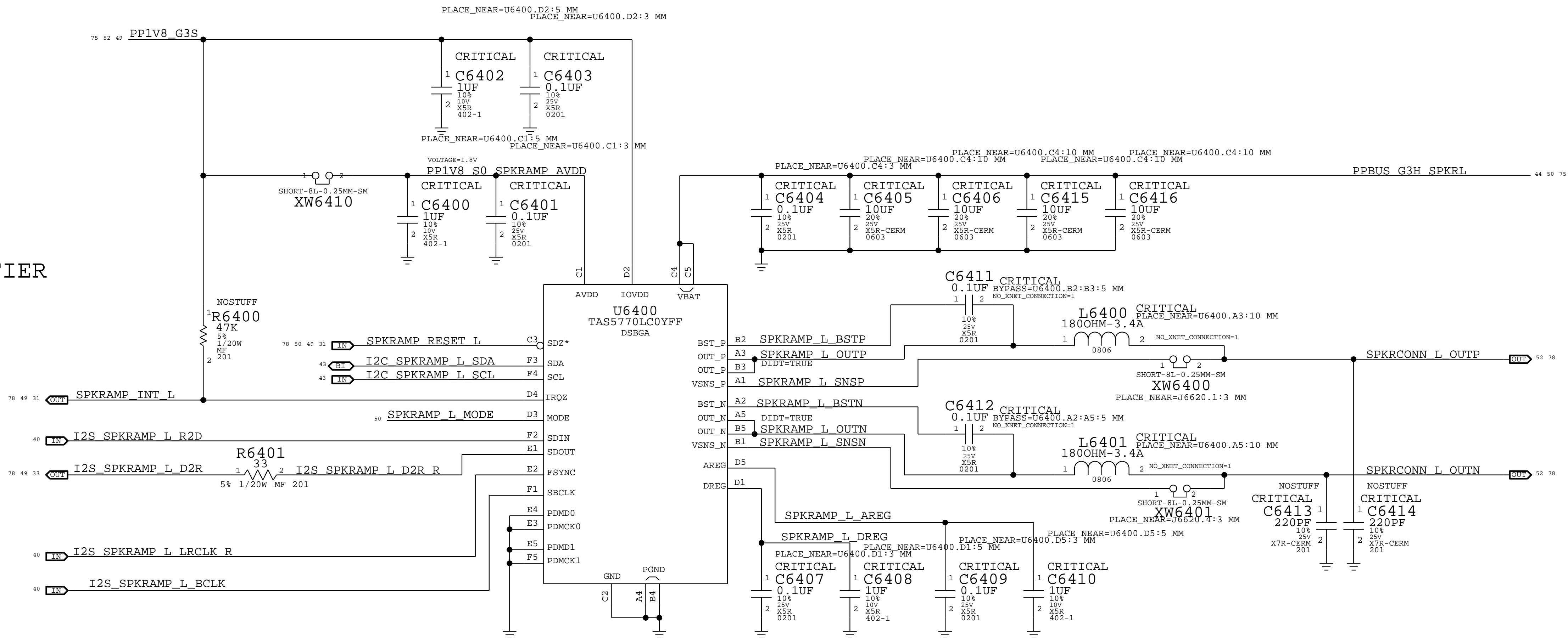
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1X MONO SPEAKER AMPLIFIER

APN: 353S01629
GAIN: 0DBFS = 6.31 VRMS

LEFT AMPLIFIER

LEFT BULK CAPACITANCE



MODE PIN	I2C ADDR	CHANNEL
GND	0x31	LEFT
470 to GND	0x32	
470 to IOVDD	0x33	
2k2 to GND	0x34	
2k2 to IOVDD	0x35	
10k to GND	0x36	
10k to IOVDD	0x37	
47k to IOVDD	0x38	RIGHT

DESIGN: J230/MLB
LAST CHANGE: Fri Sep 28 20:05:04 2018

Audio Speaker Amplifiers



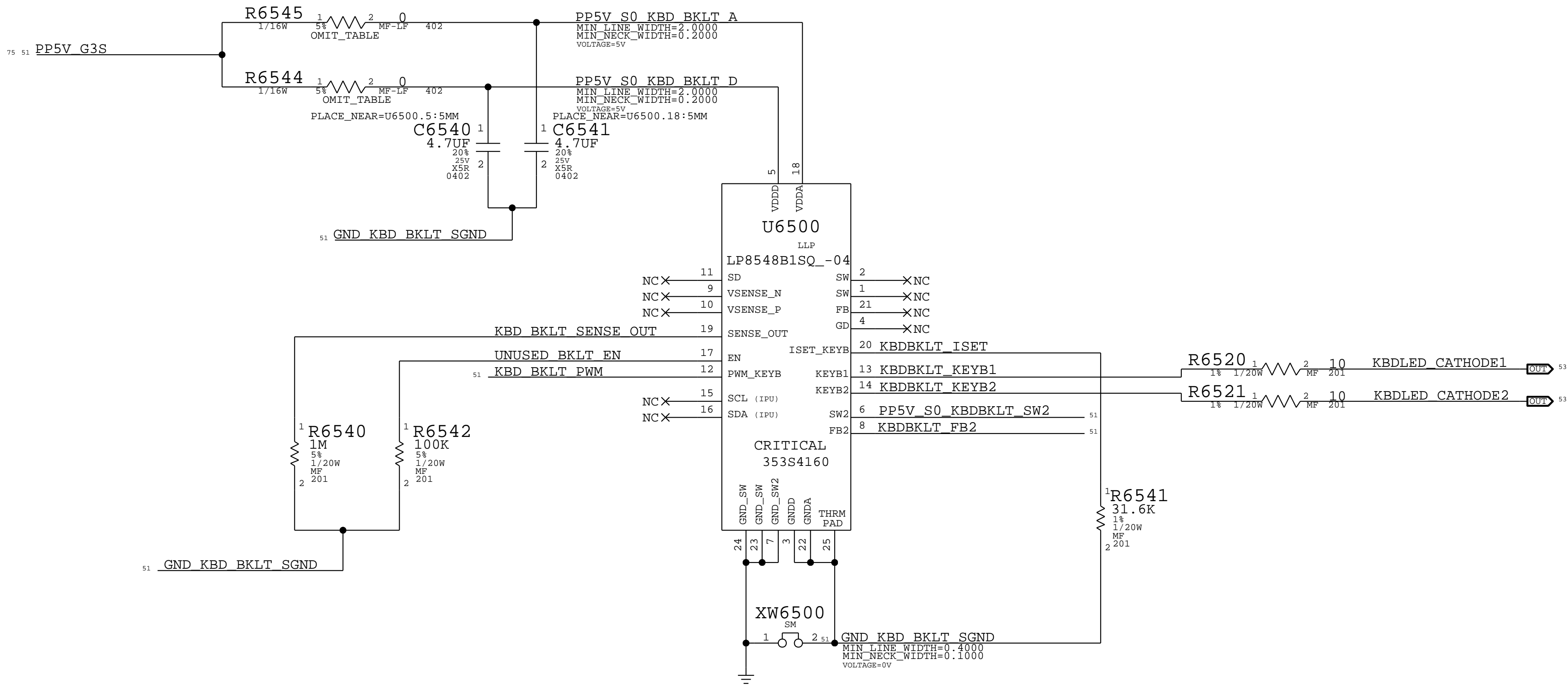
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DRAWING NUMBER	SIZE
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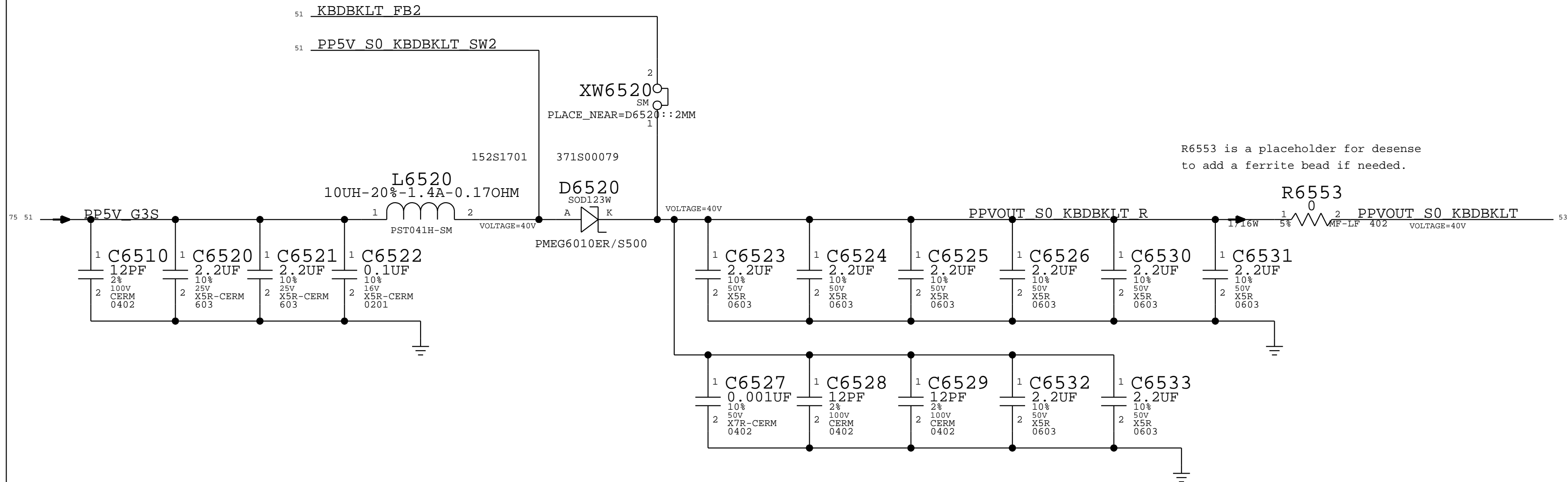
BOM_COST_GROUP=AUDIO

A Keyboard Backlight LED Driver

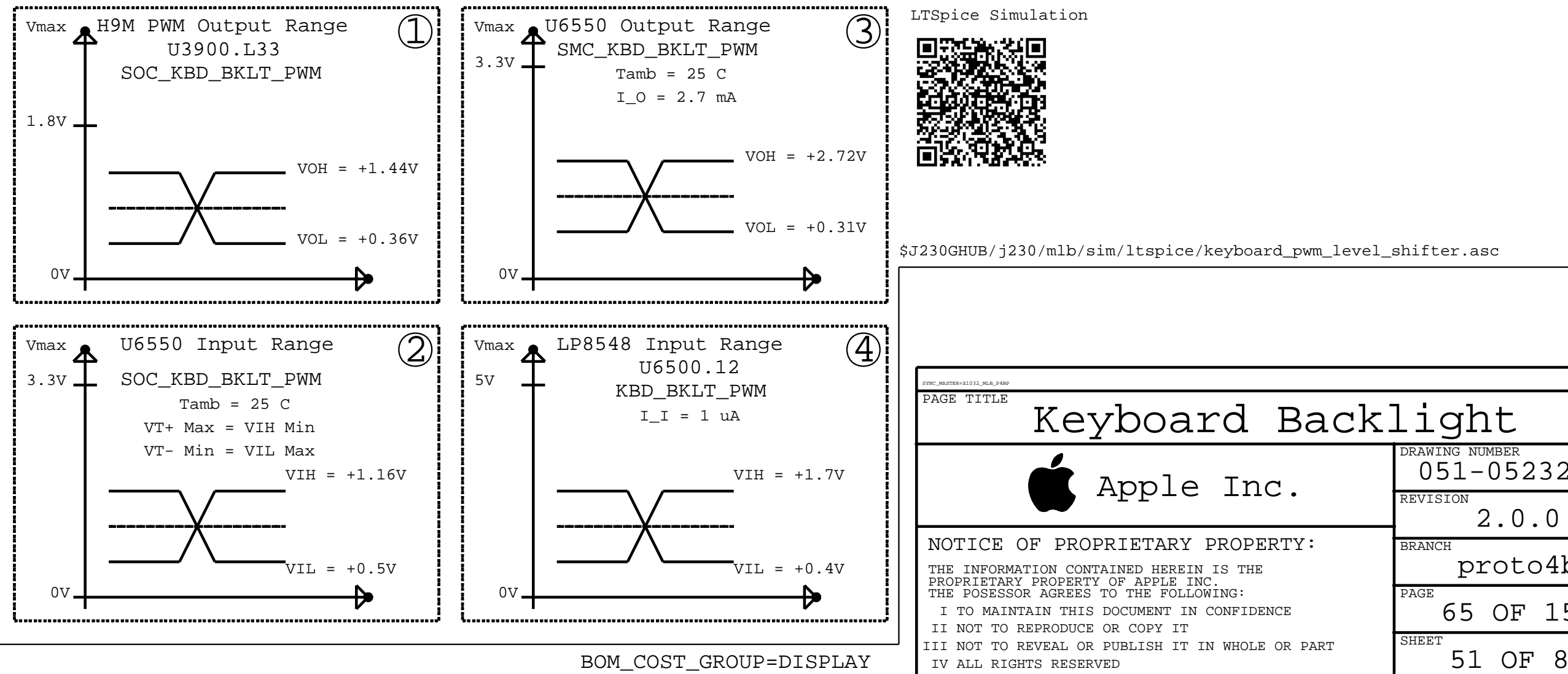
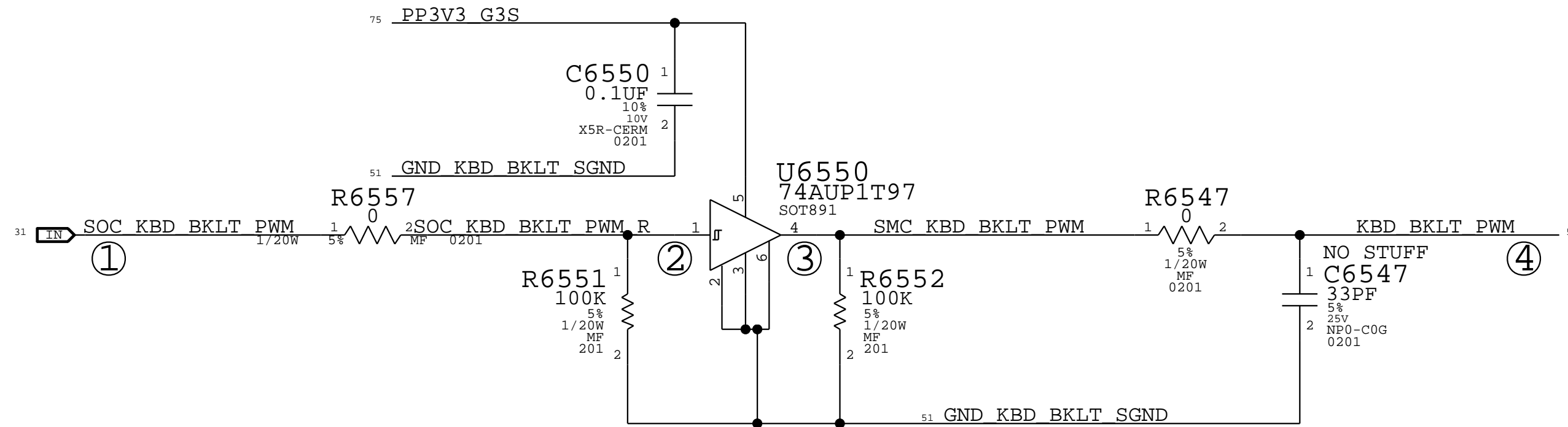
PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	BOM OPTION
114S0023	2	RES,NTL,FLM,1/16W,10 OHM,1,0402,SMD,LF	R6544, R6545	



B Keyboard Boost Converter Support



C Keyboard PWM Level Shifter

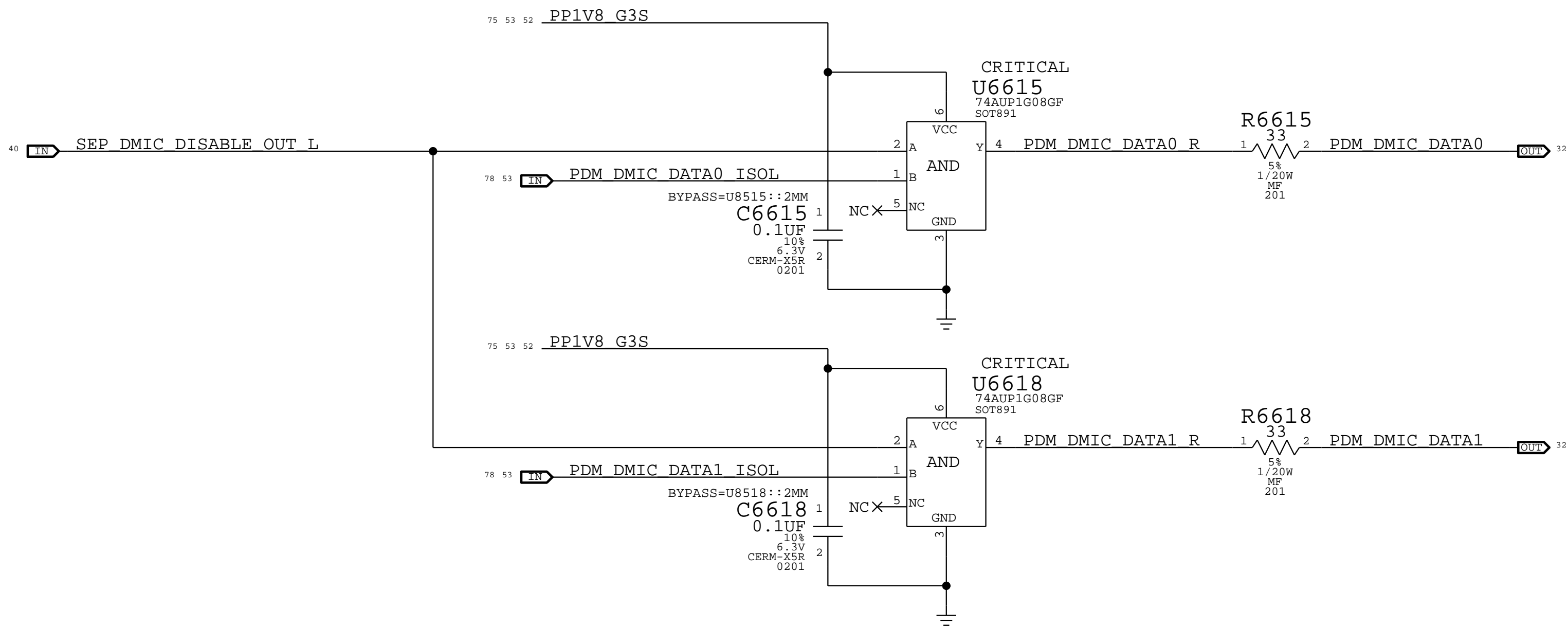


D Keyboard Probe Points

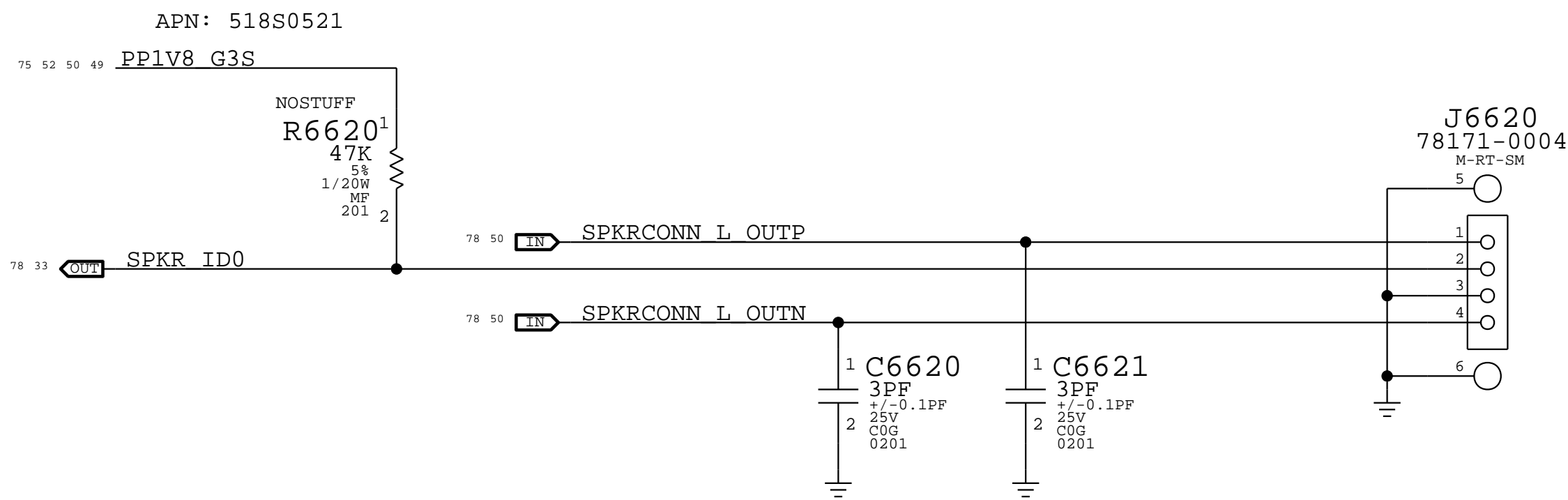
PP6500	PP5V_S0_KBDBKLT_SW2	51
PP6501	KBDBKLT_FB2	51
PP6502	KBD_BKLT_PWM	51
PP6503	GND_KBD_BKLT_SGND	51

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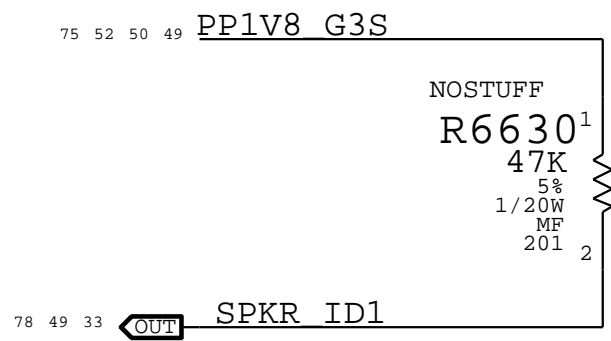
A DMIC Secure Disable



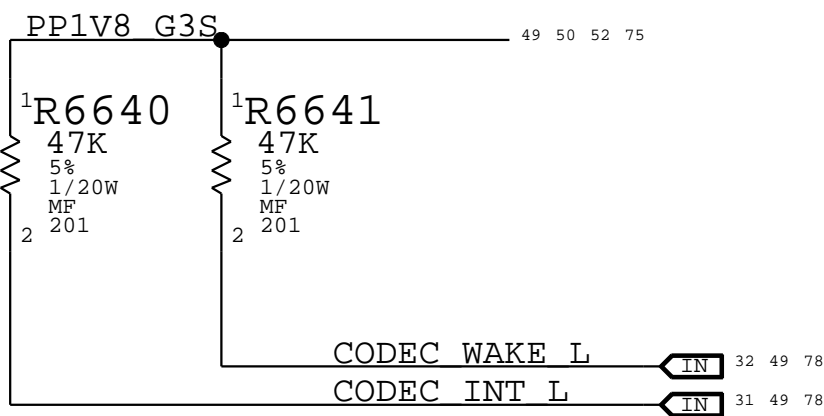
B Left Speaker Connector



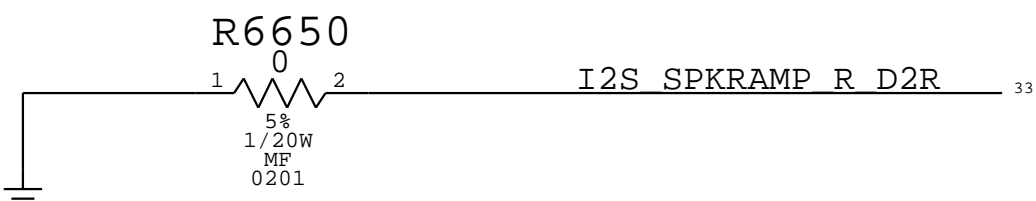
C Right Speaker ID



D Audio Codec Pull-Ups



E Speaker Amp Control

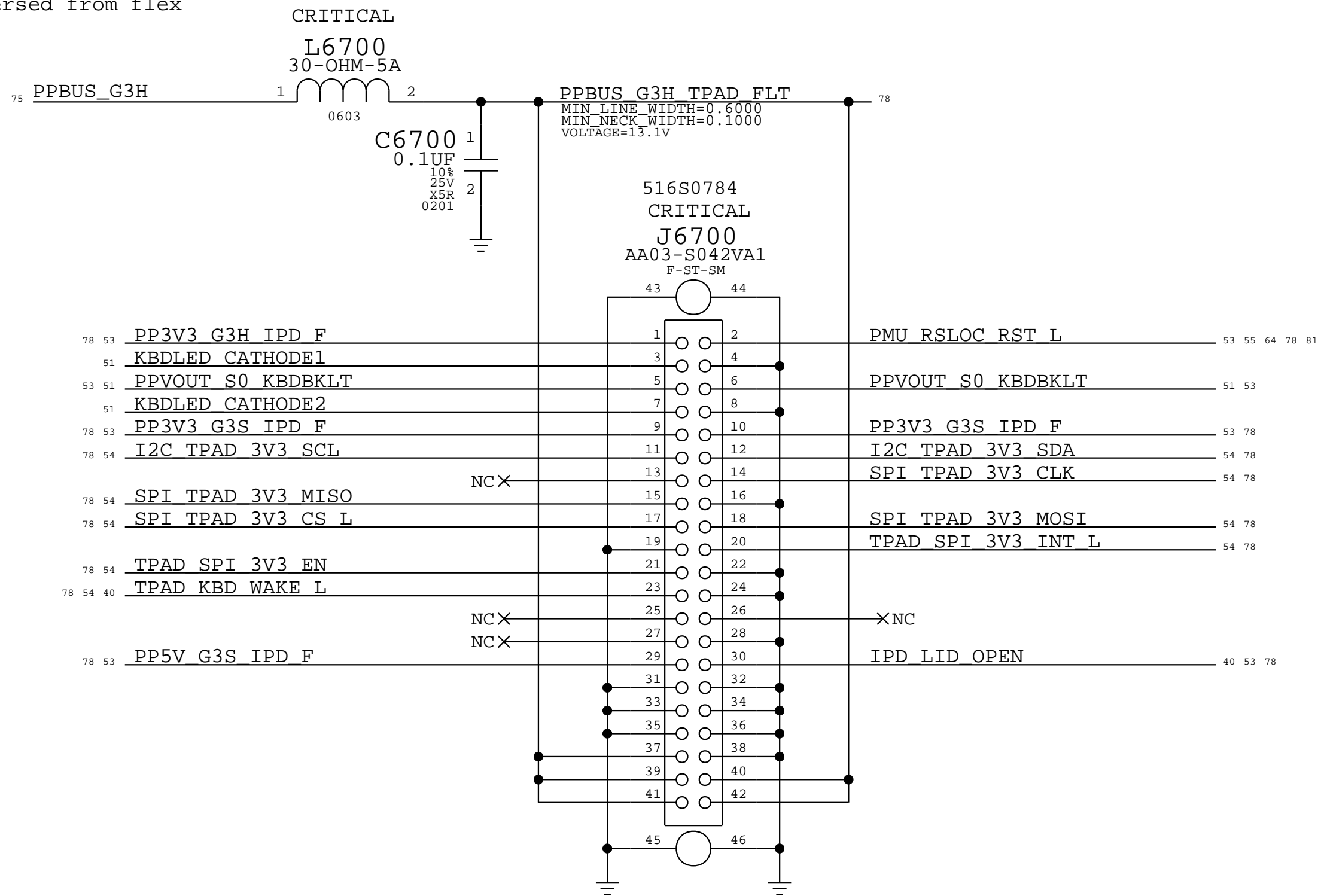


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Audio Connectors		
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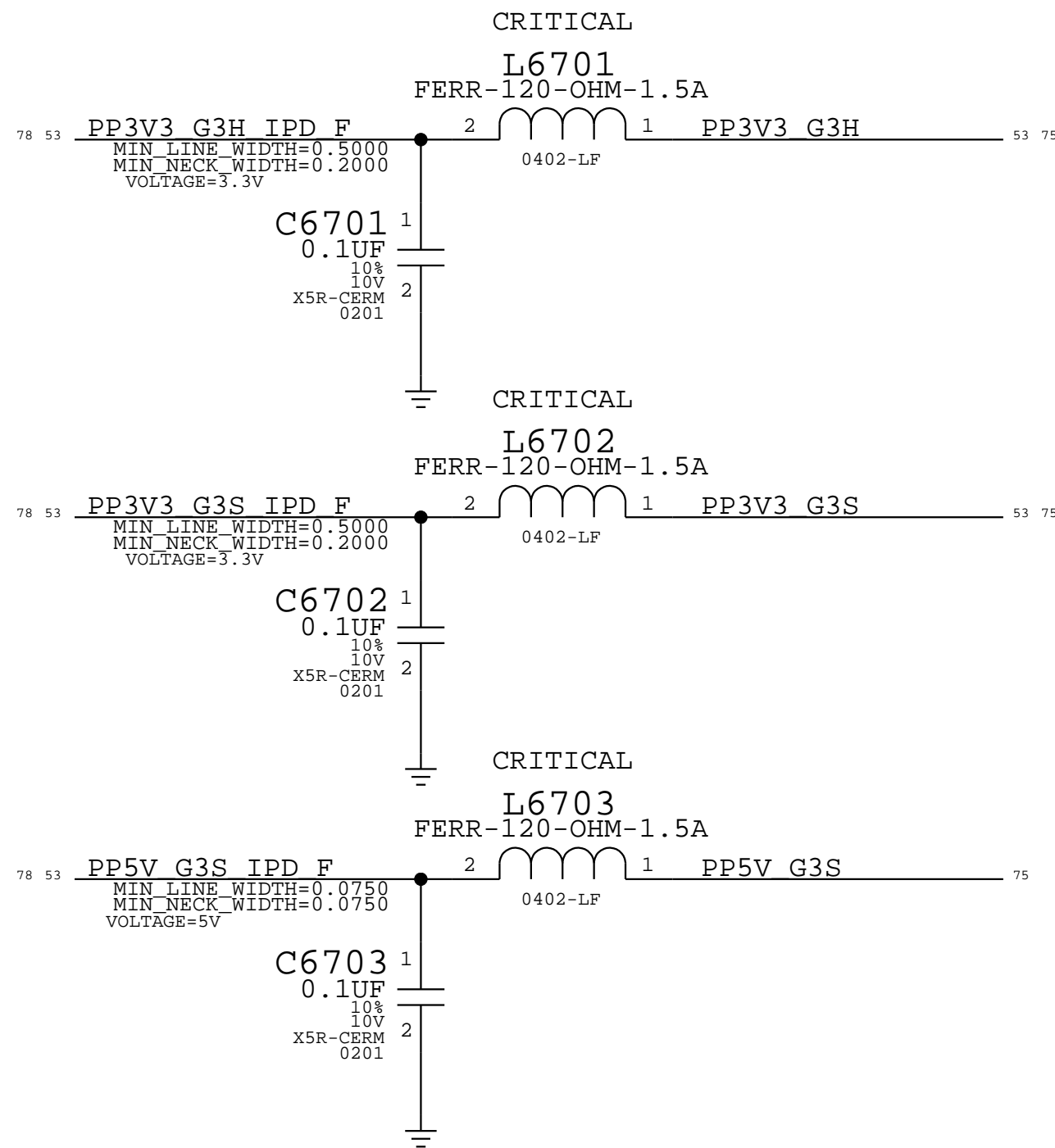
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A IPD B2B CONNECTOR

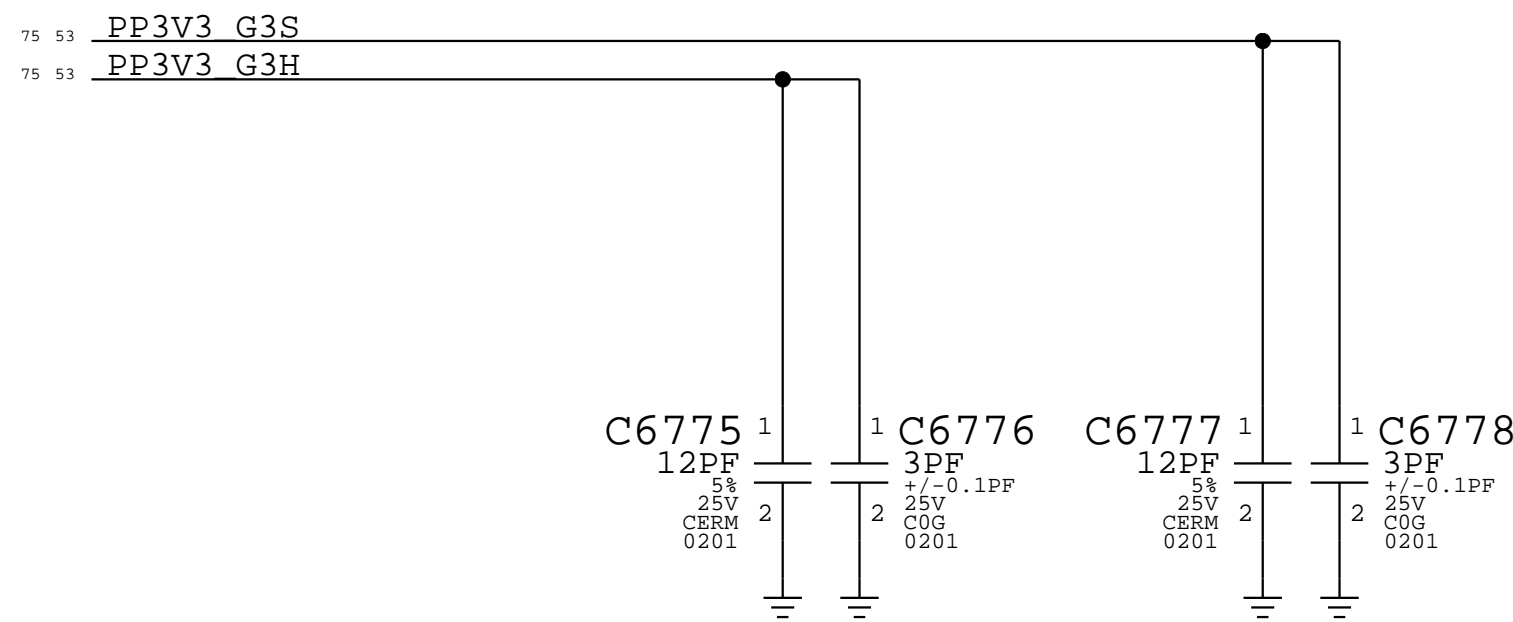
Bottom side contacts used
Pinout reversed from flex



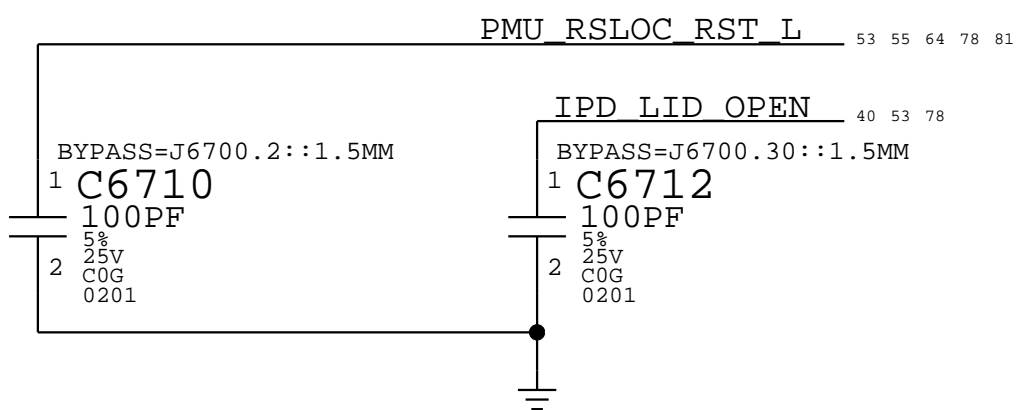
B IPD Power Filters



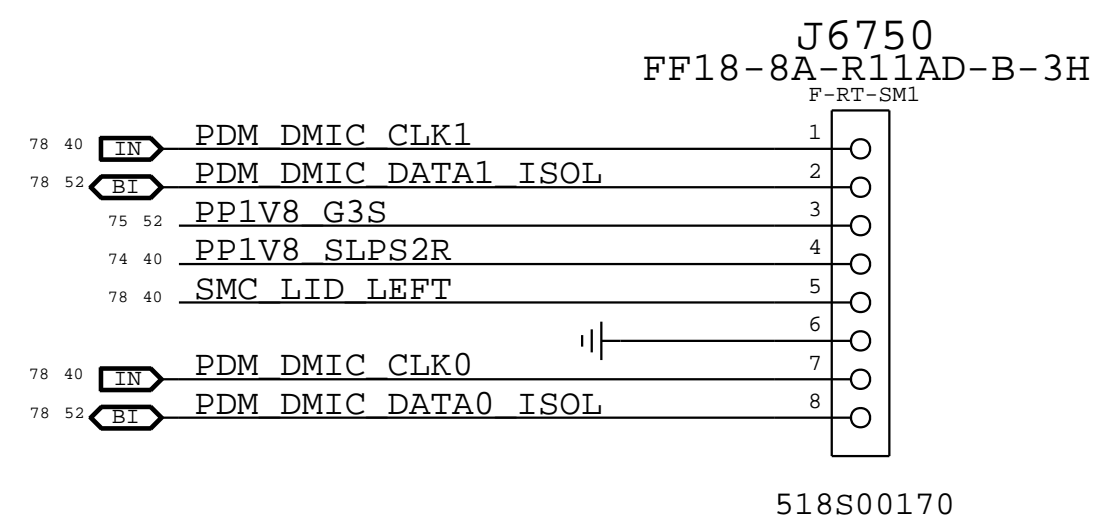
C IPD Desense



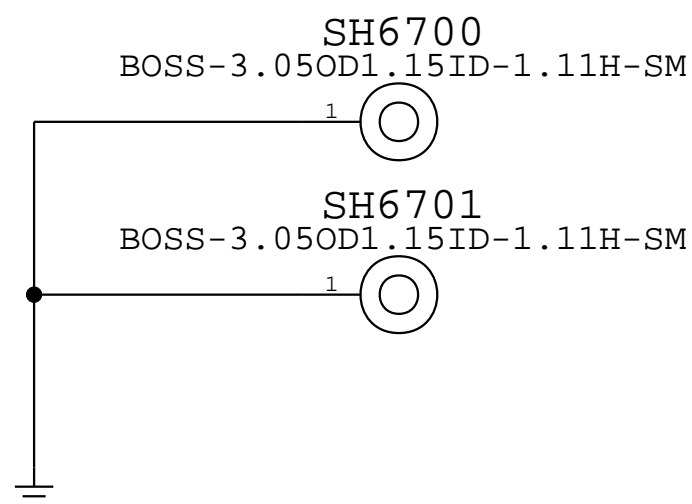
D IPD Control




E Microphone Connector



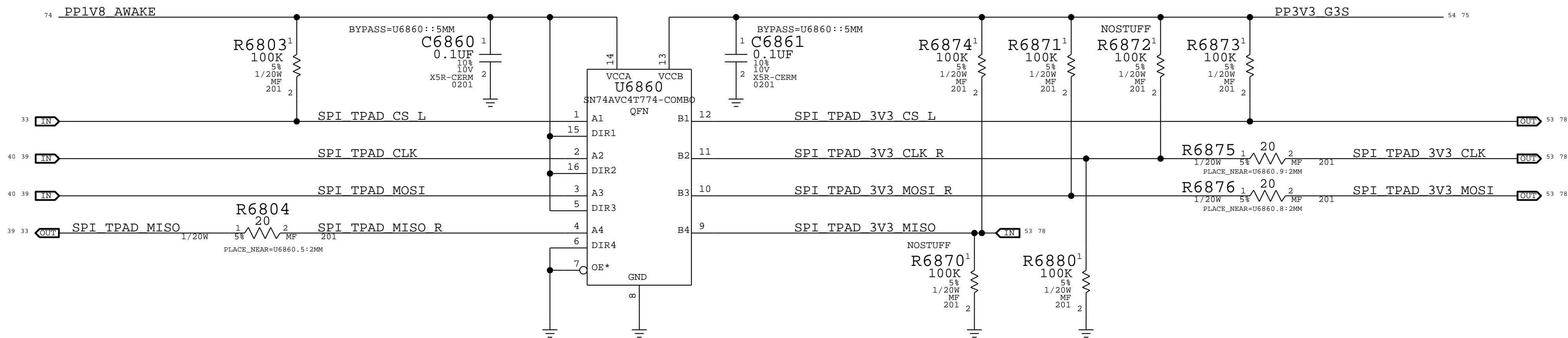
F IPD Connector Bosses



SYNC_MASTER=X260_MLB		SYNC_DATE=02/16/2017	
PAGE TITLE			
Keyboard & Trackpad 1			
 Apple Inc.	DRAWING NUMBER	051-05232	
	REVISION	2.0.0	
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BOM_COST_GROUP=TRACKPAD

A Trackpad SPI Bus Level Shifter (+1.8V to +3.3V)



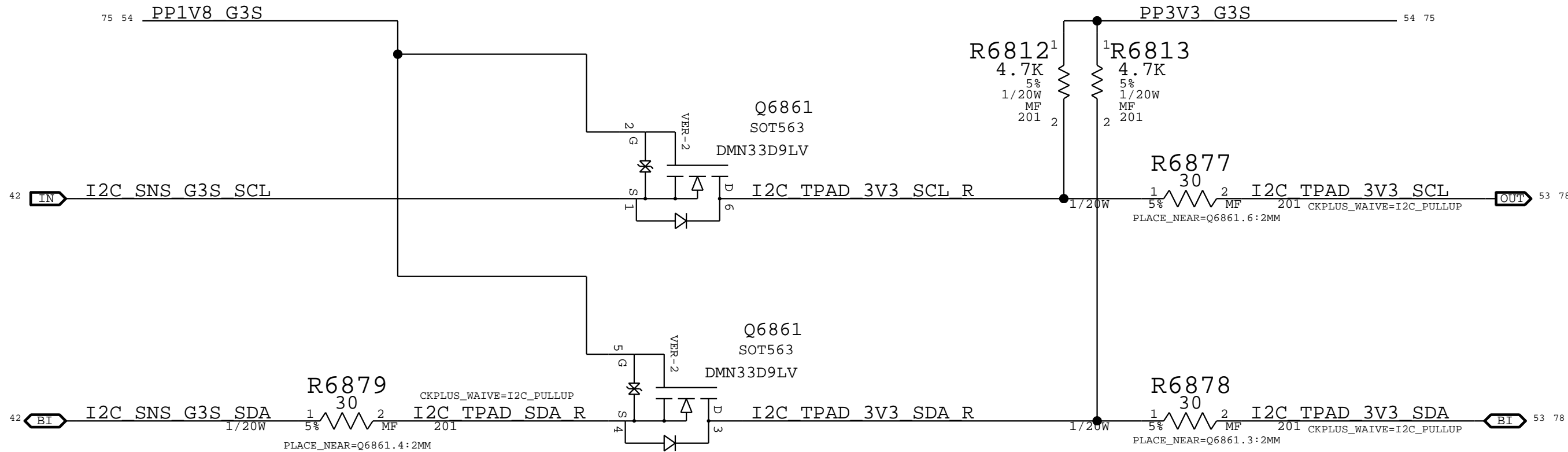
PROJECT	J230k = 0x3F
B RESISTOR	
BOARDID[5]	= SPI_TPAD_CLK 1 pull-down
BOARDID[4]	= SPI_TPAD_MISO* 1 pull-up
BOARDID[3]	= SPI_TPAD_MOSI 1 pull-up
BOARDID[2]	= SPI_SOCROM_MISO 1
BOARDID[1]	= SPI_SOCROM_MOSI 1
BOARDID[0]	= SPI_SOCROM_CLK 1

SN74AVC4T774 Truth Table

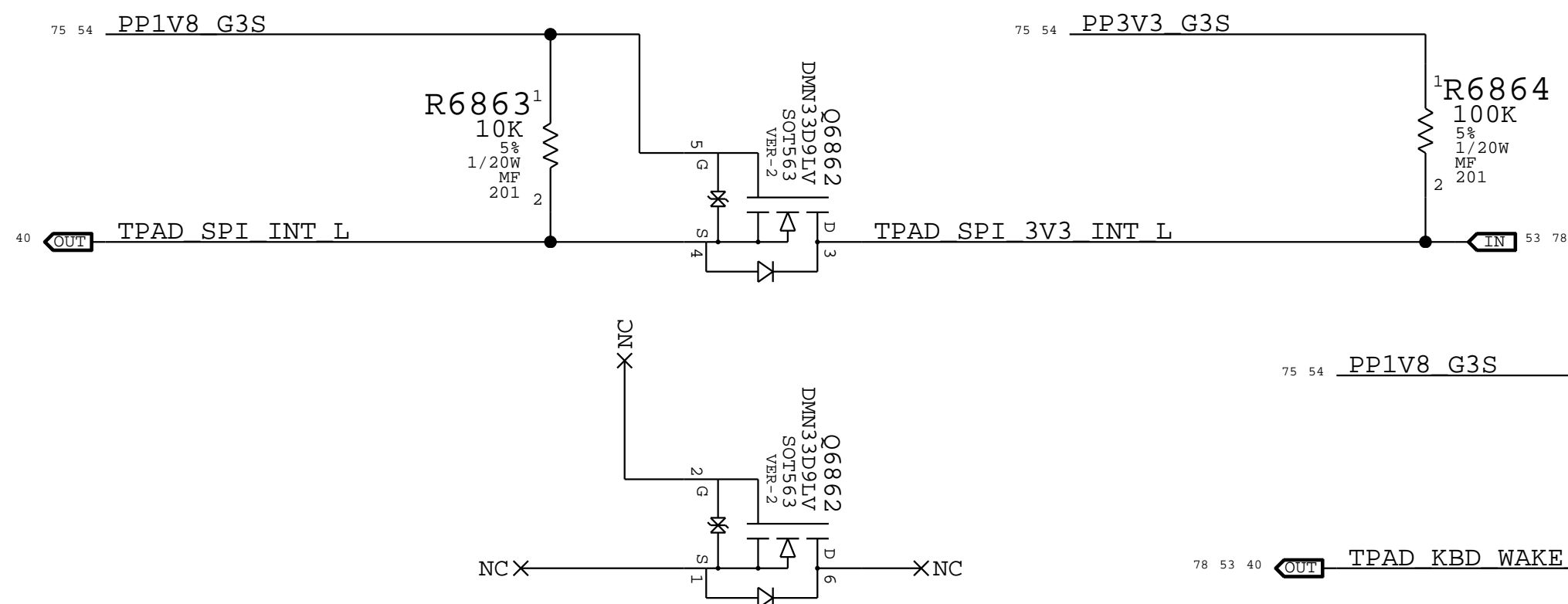
CTRL INPUTS		OUTPUT CIRCUITS		OPERATION
/OE	DIR	A PORT	B PORT	
L	L	Enabled	Hi-Z	B data to A data
L	H	Hi-Z	Enabled	A data to B data
H	X	Hi-Z	Hi-Z	Isolation

SPI_TPAD_CLK, SPI_TPAD_MOSI, and SPI_TPAD_CLK are shared signals with BOARDID on CSA 47.
Ensure signals that drive from +3.3V to +1.8V (i.e., towards Gibraltar) are properly strapped based on the desired BOARDID.

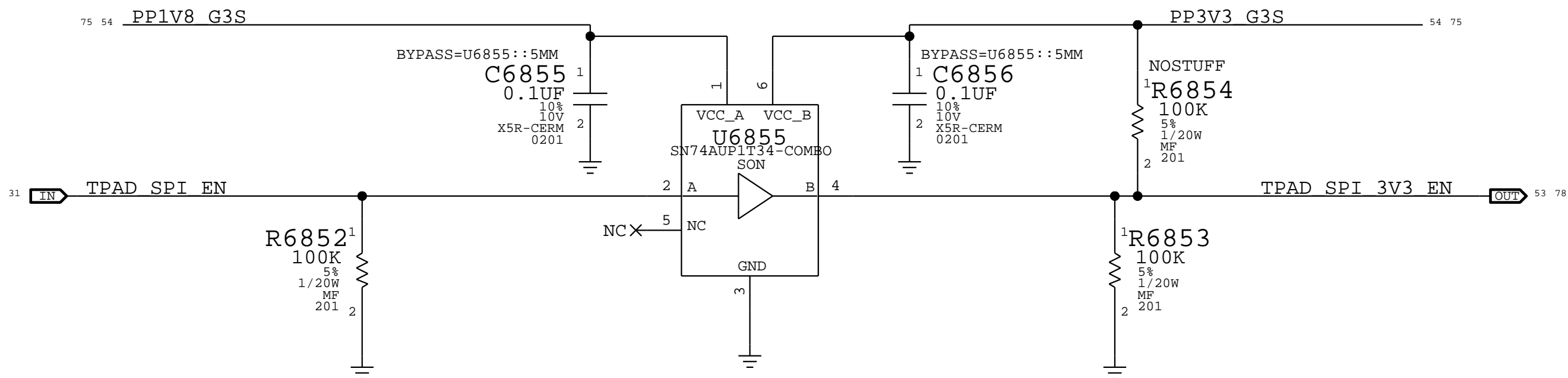
B Trackpad I2C Bus Level Shifter




C Trackpad Control Level Shifter



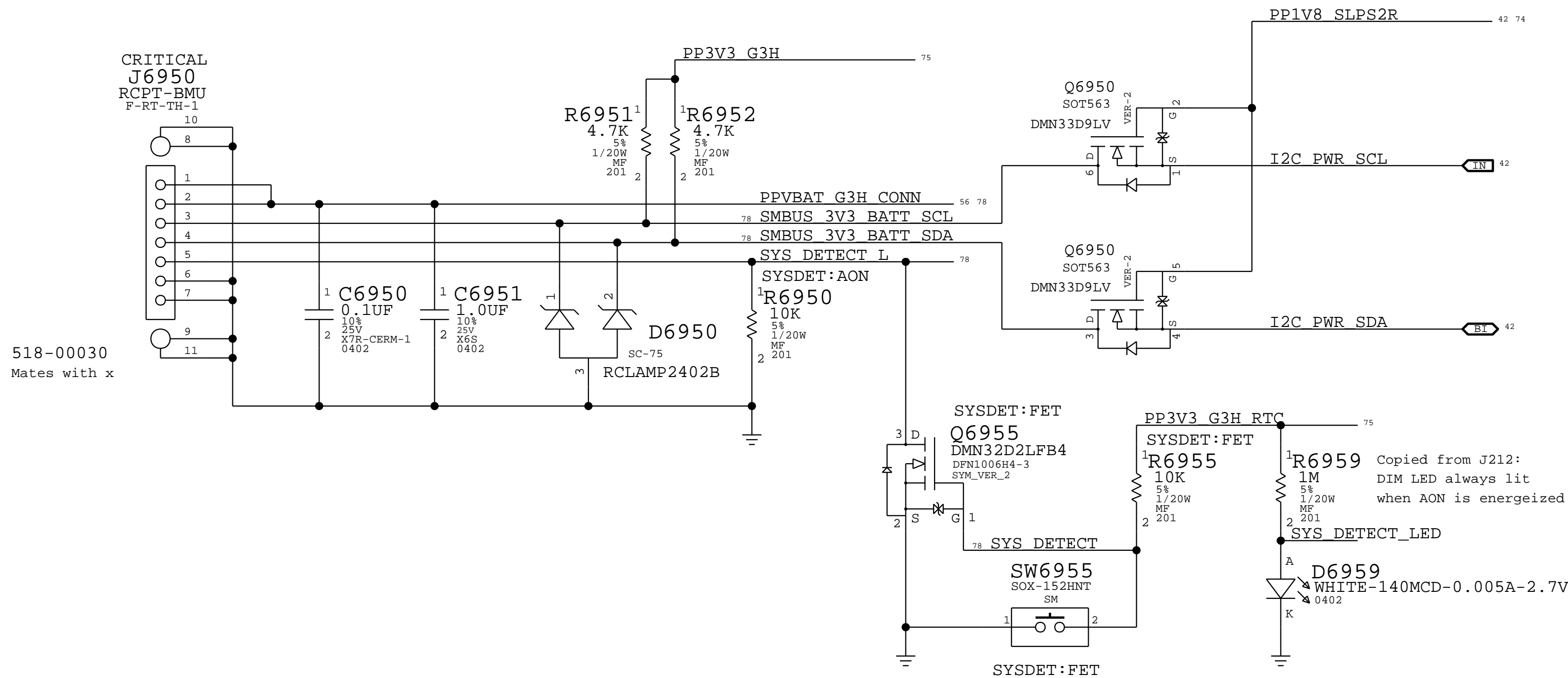
D Trackpad SPI Enable Level Shifter



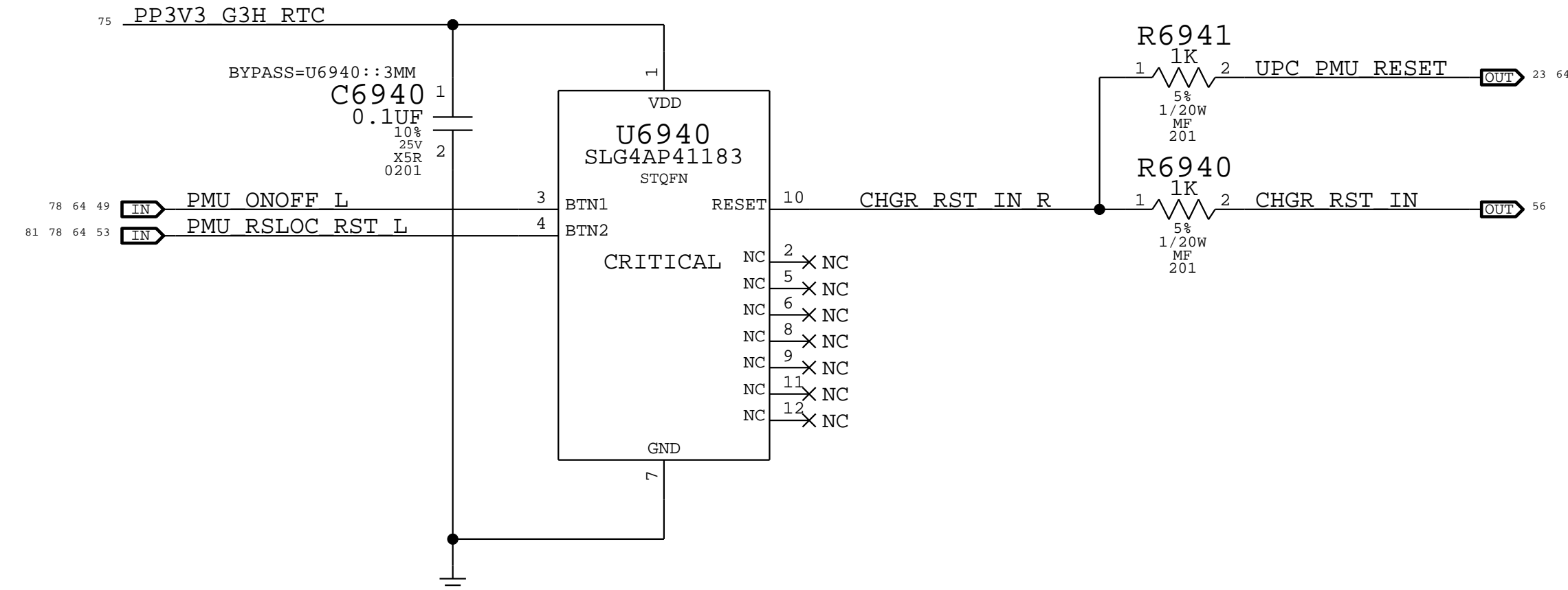
SYNC_MASTER=X569_CARD_IPD		SYNC_DATE=02/16/2017	
PAGE TITLE			
Keyboard & Trackpad 2			
 Apple Inc.		DRAWING NUMBER	051-05232
		REVISION	2.0.0
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		PAGE	68 OF 152
		SHEET	54 OF 86

BOM_COST_GROUP=TRACKPAD

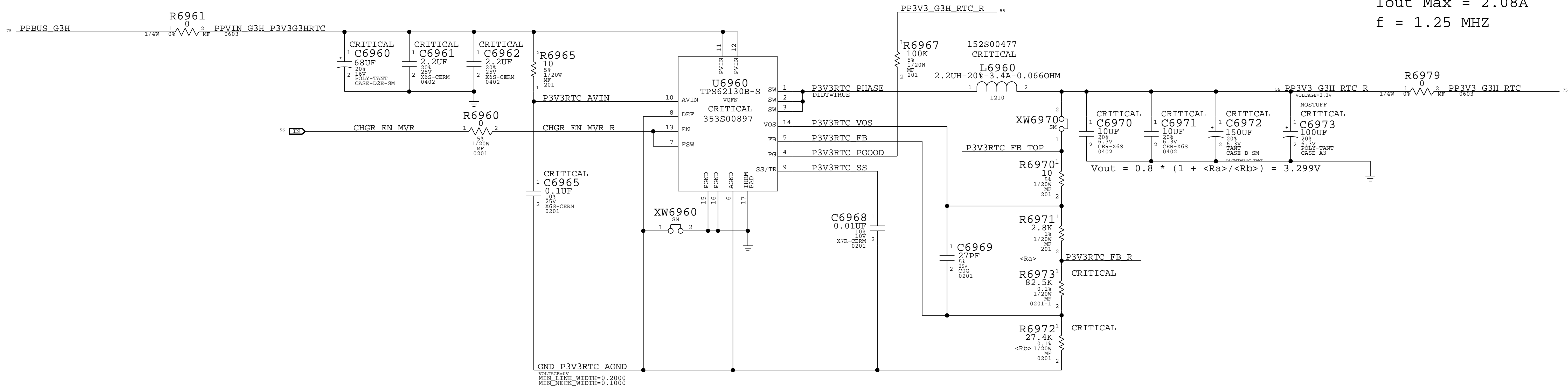
A DC-In & Battery Connector

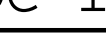


B Charger Reset Circuit

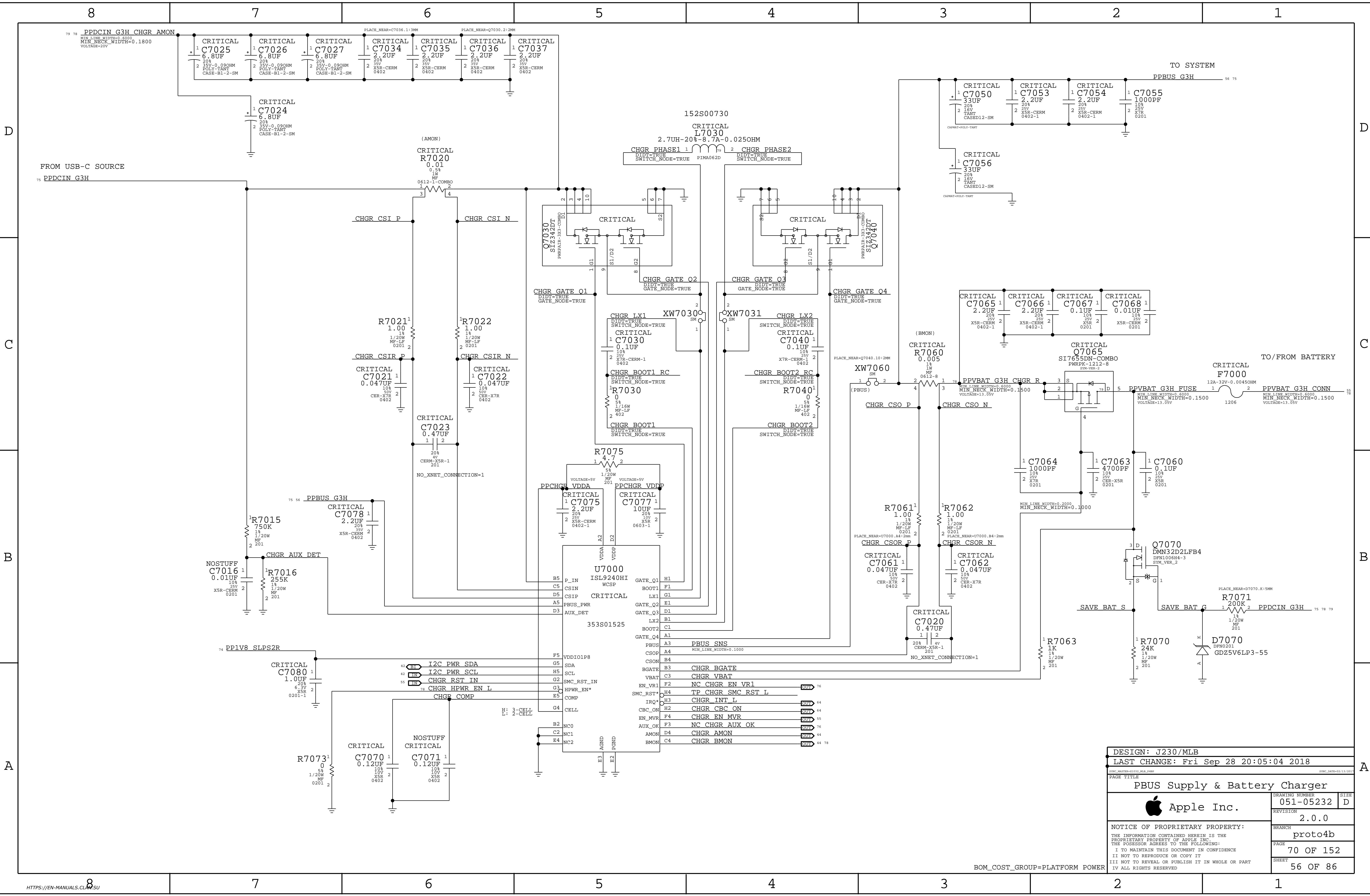


C 3.3V G3H RTC Voltage Regulator

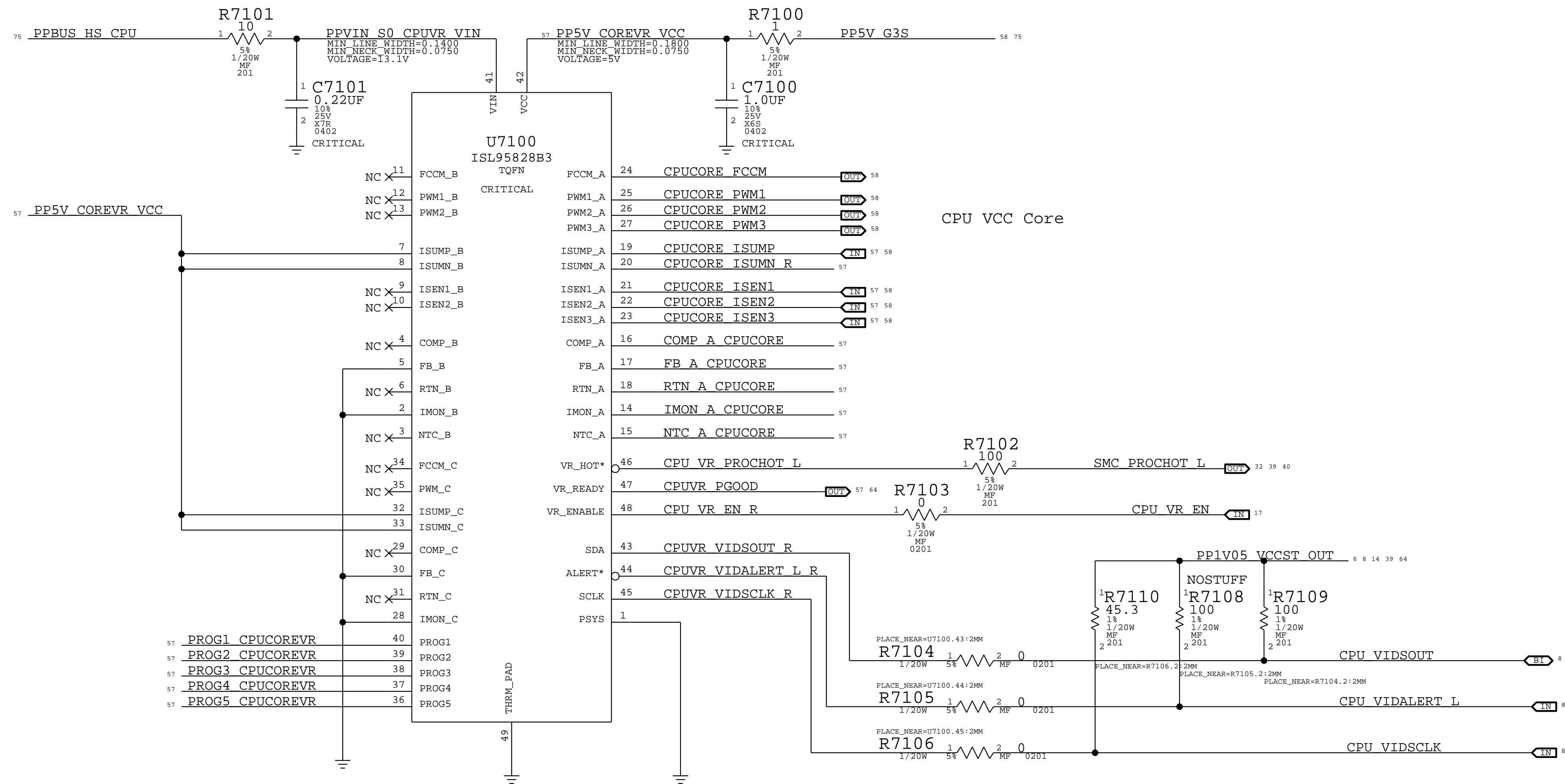


SYNCH_MASTER=apam		SYNCH_DATE=10/18/2016	
PAGE TITLE			
DC-In & Battery Connectors			
 Apple Inc.		DRAWING NUMBER	051-05232
		SIZE	D
		REVISION	2.0.0
		BRANCH	proto4b
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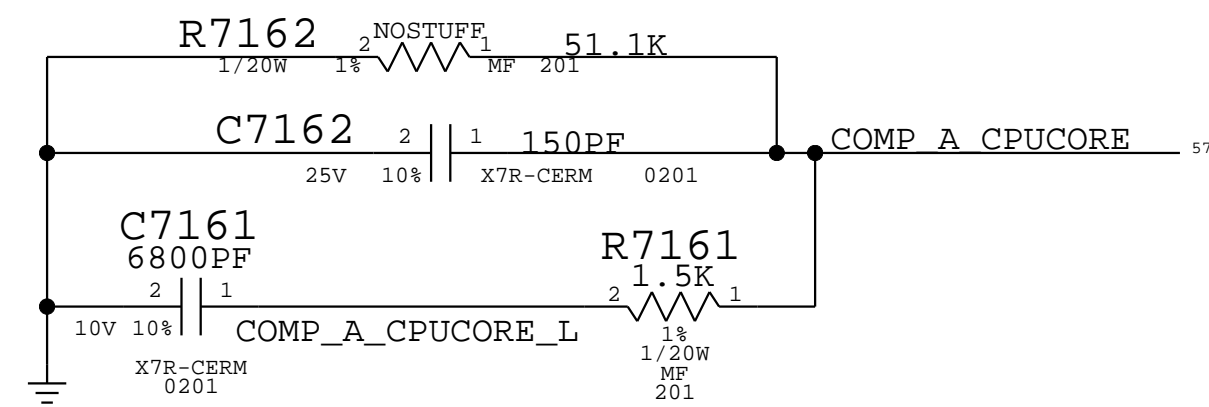
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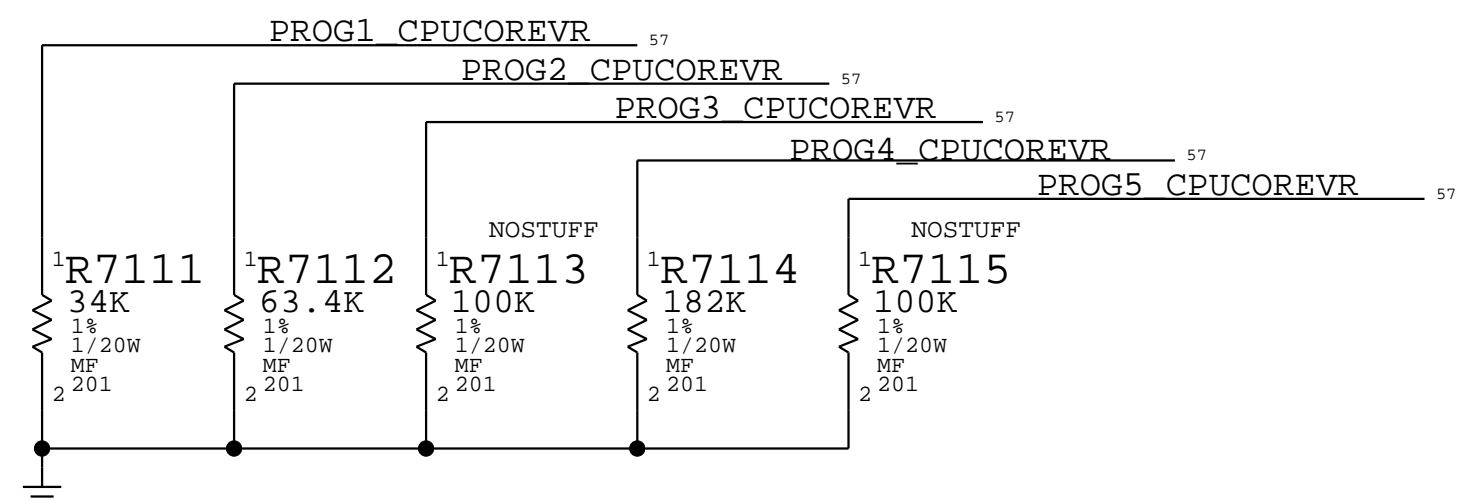
A CPU Core IMVP9 PWM Controller



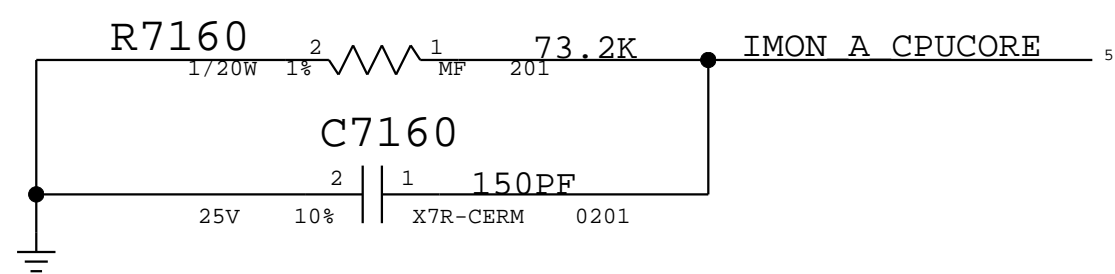
D CPU Core Comp Network



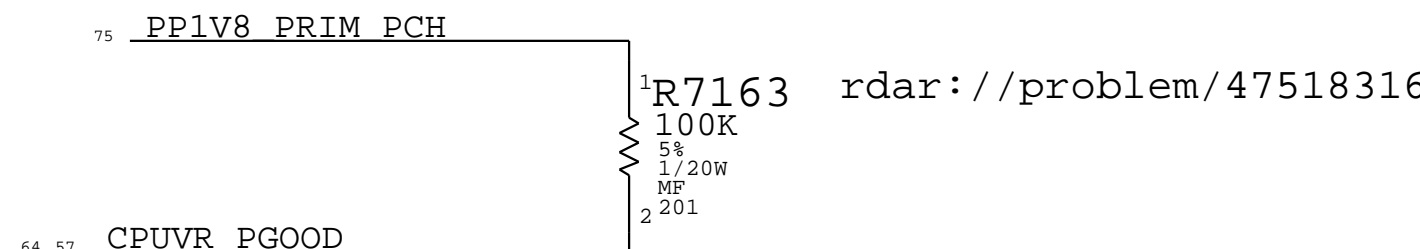
E CPU Core Prog Options



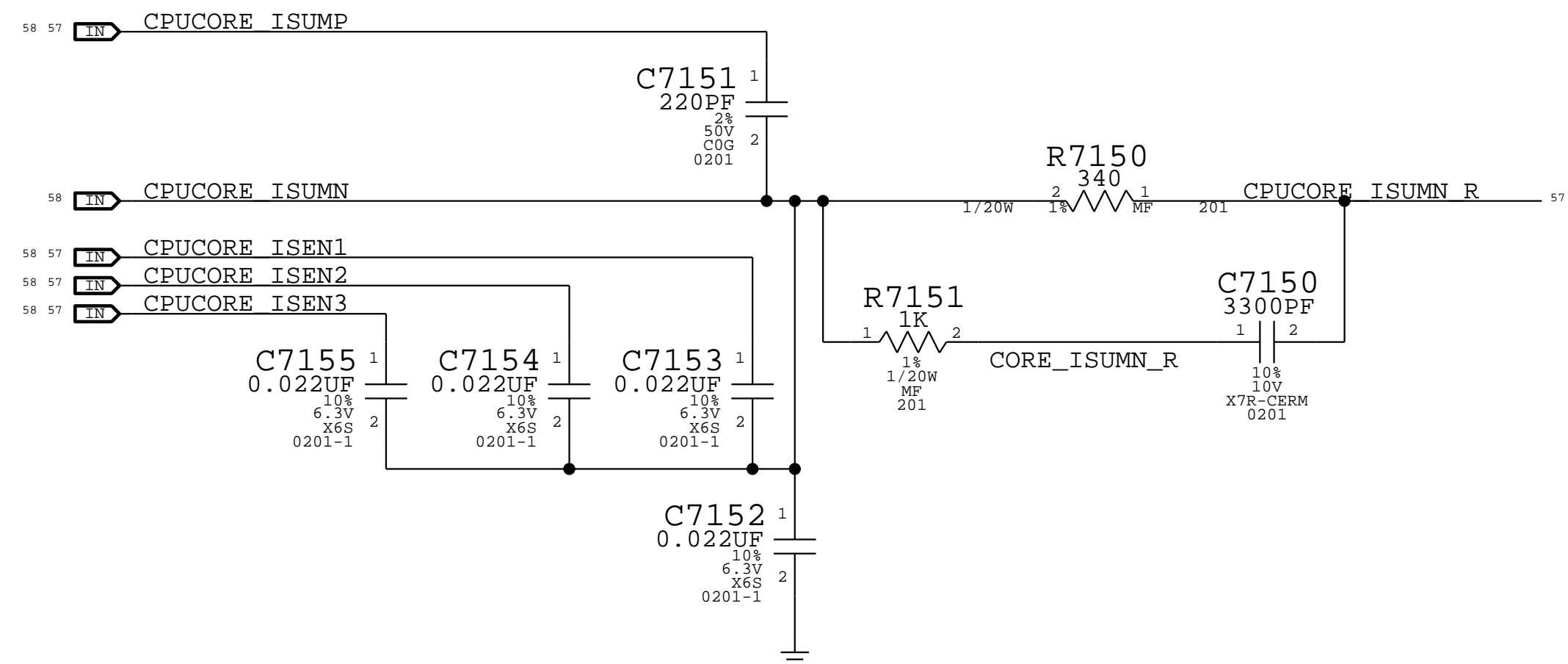
F CPU Core IMON Network



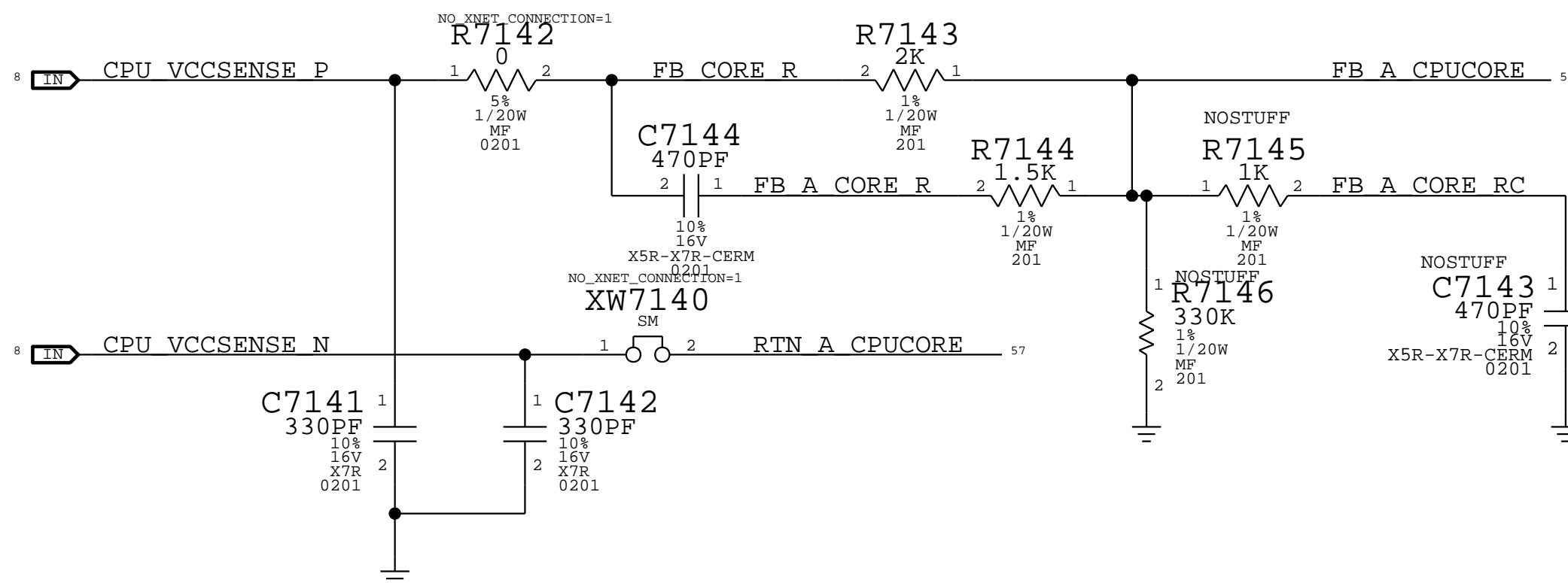
G CPU Core Power Good



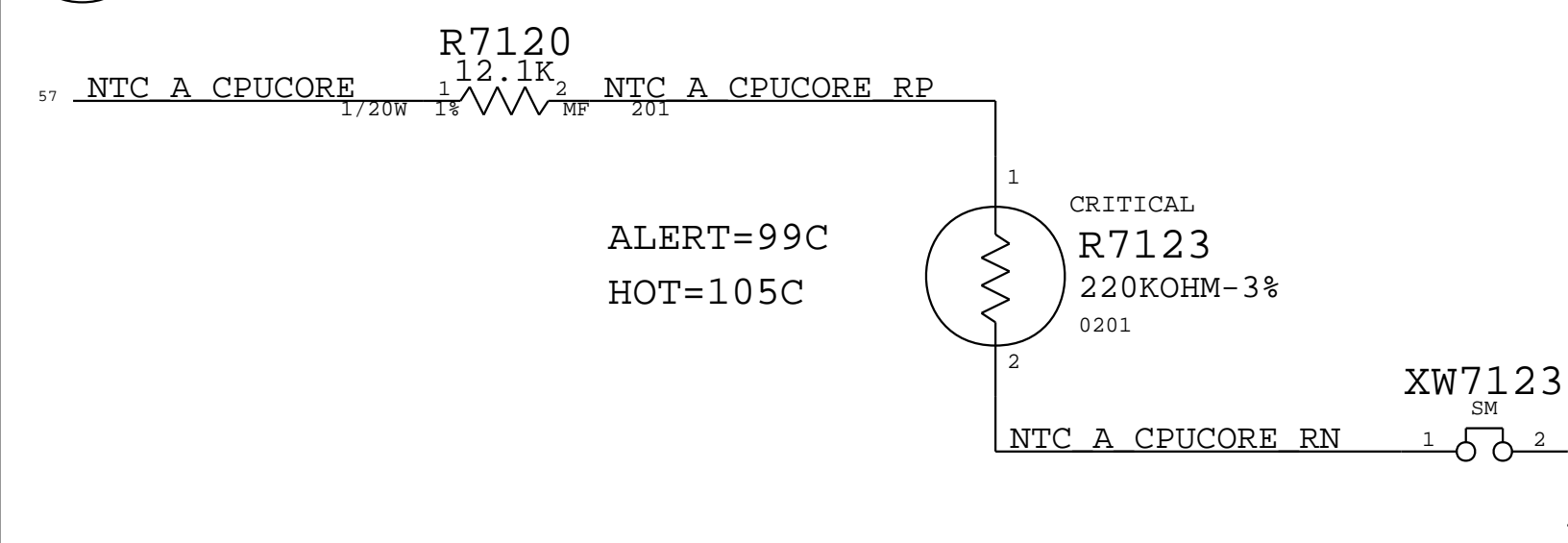
B CPU Core ISUM Network



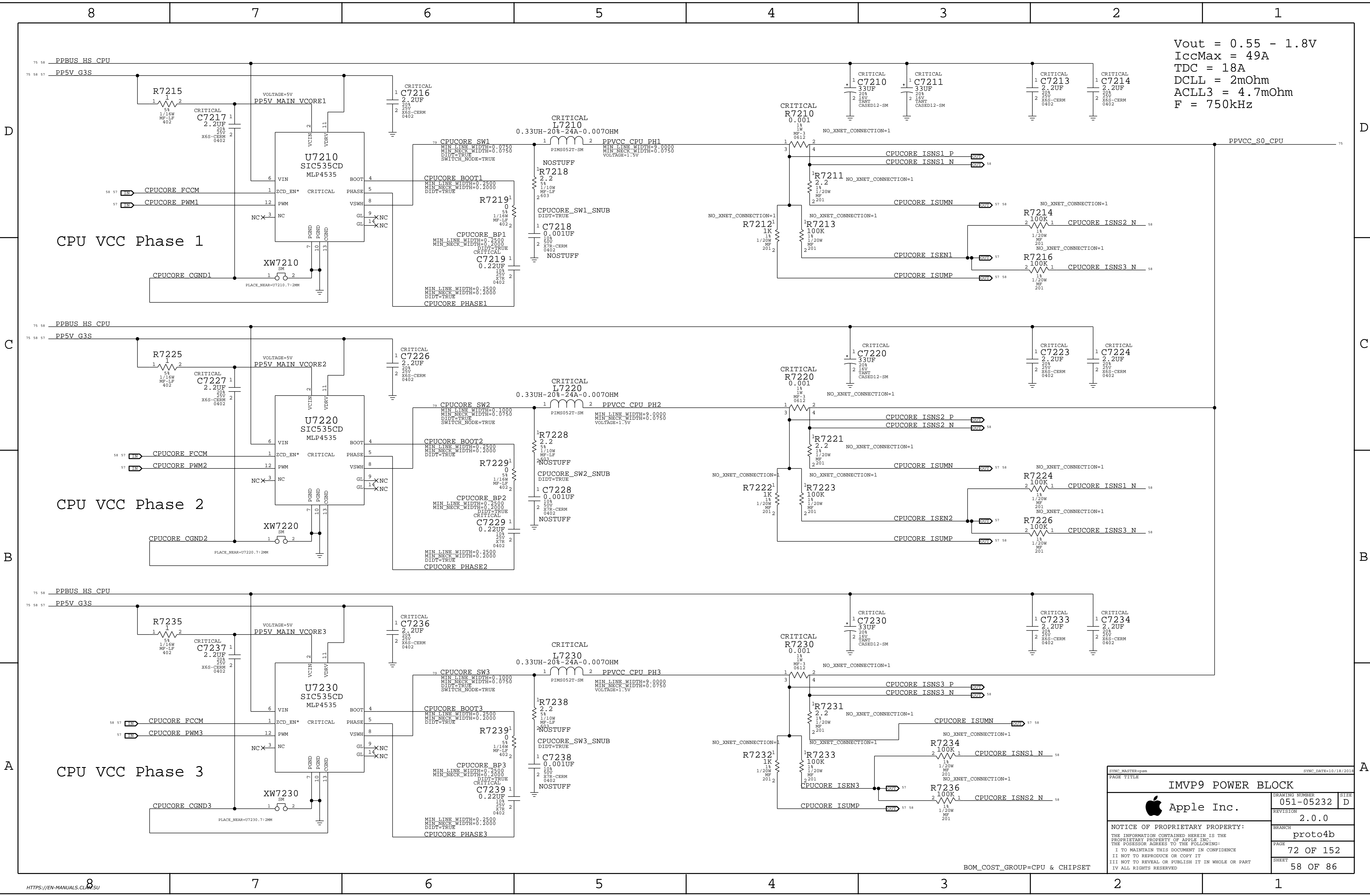
C CPU Core Feedback Network




H CPU Core Thermistor



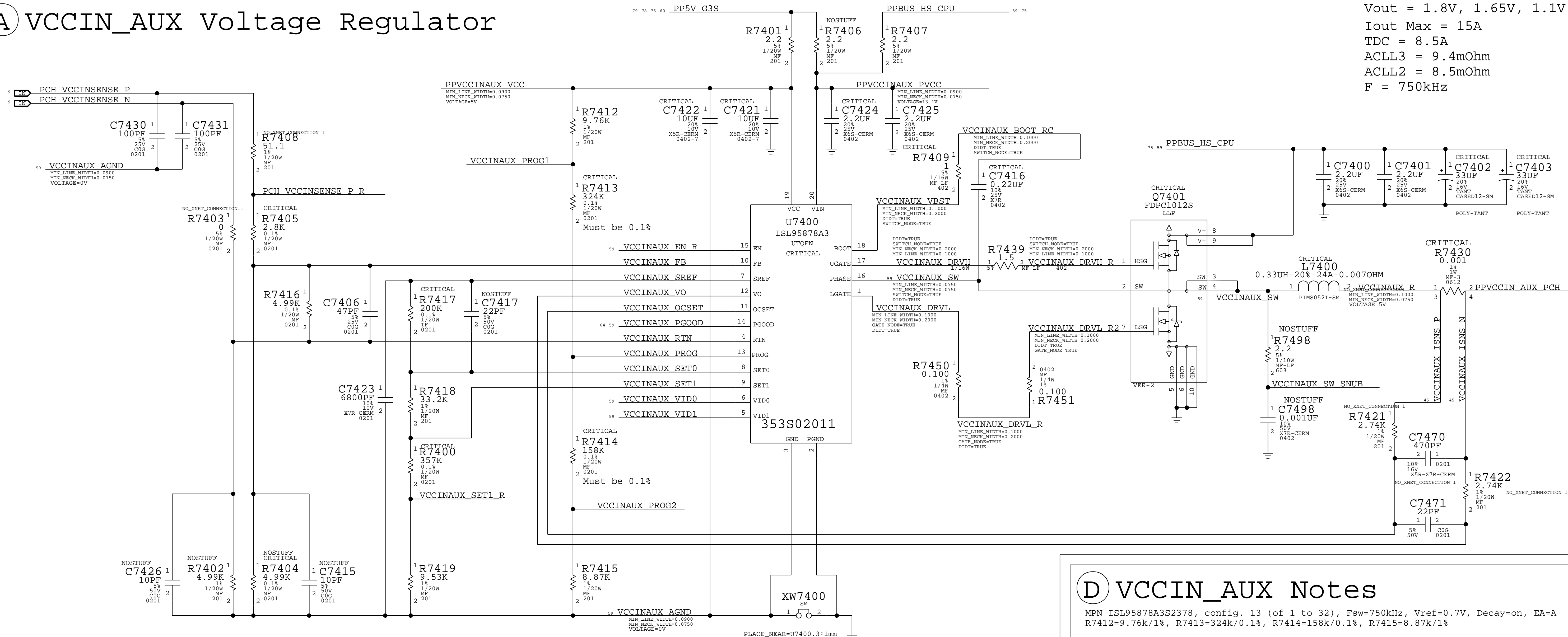
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IMVP9 IC		
	DRAWING NUMBER	051-05232
	REVISION	2.0.0
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	SHEET	57 OF 86



Vout = 0.55 - 1.8V
IccMax = 49A
TDC = 18A
DCLL = 2mOhm
ACLL3 = 4.7mOhm
F = 750kHz

SYNC_MASTER=psm		SYNC_DATE=10/18/2018	
PAGE TITLE			
IMVP9 POWER BLOCK			
	Apple Inc.	DRAWING NUMBER	051-05232
		SIZE	D
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		BRANCH	proto4b
		PAGE	72 OF 152
		SHEET	58 OF 86

A VCCIN_AUX Voltage Regulator

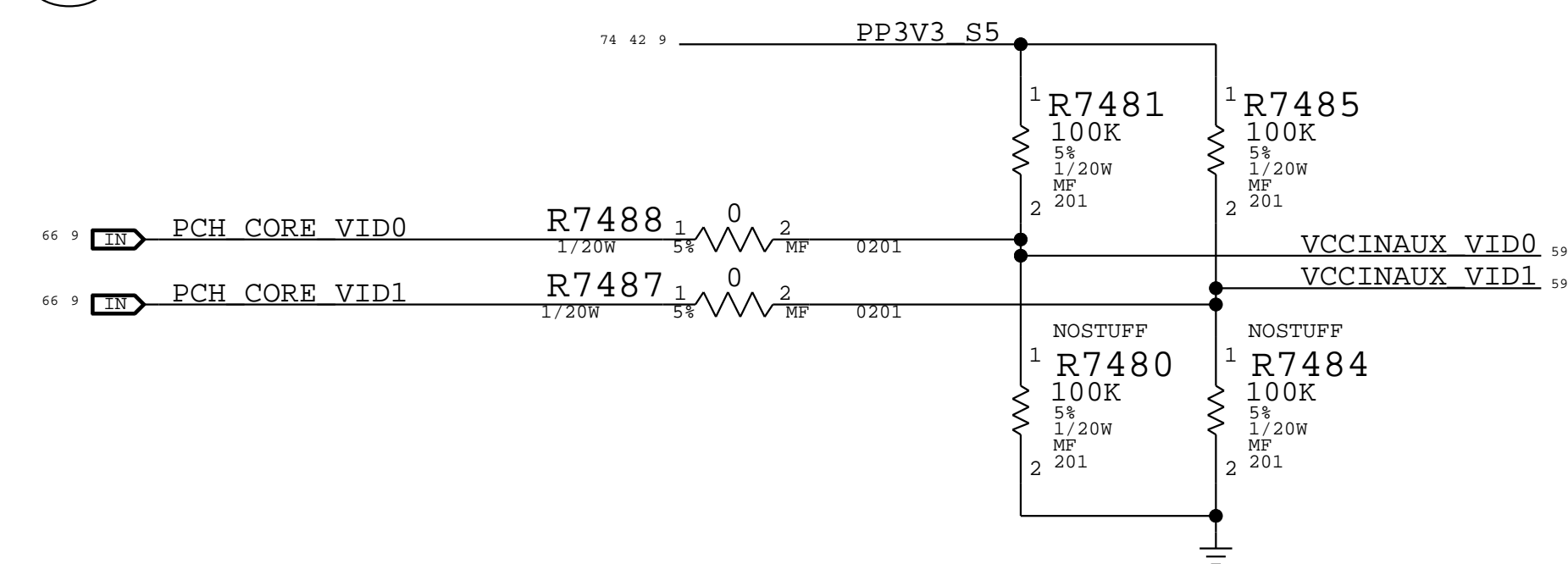


Ⓓ VCCIN_AUX Notes

MPN ISL95878A3S2378, config. 13 (of 1 to 32), Fsw=750kHz, Vref=0.7V, Decay=on, EA=A
R7412=9.76k/1%, R7413=324k/0.1%, R7414=158k/0.1%, R7415=8.87k/1%

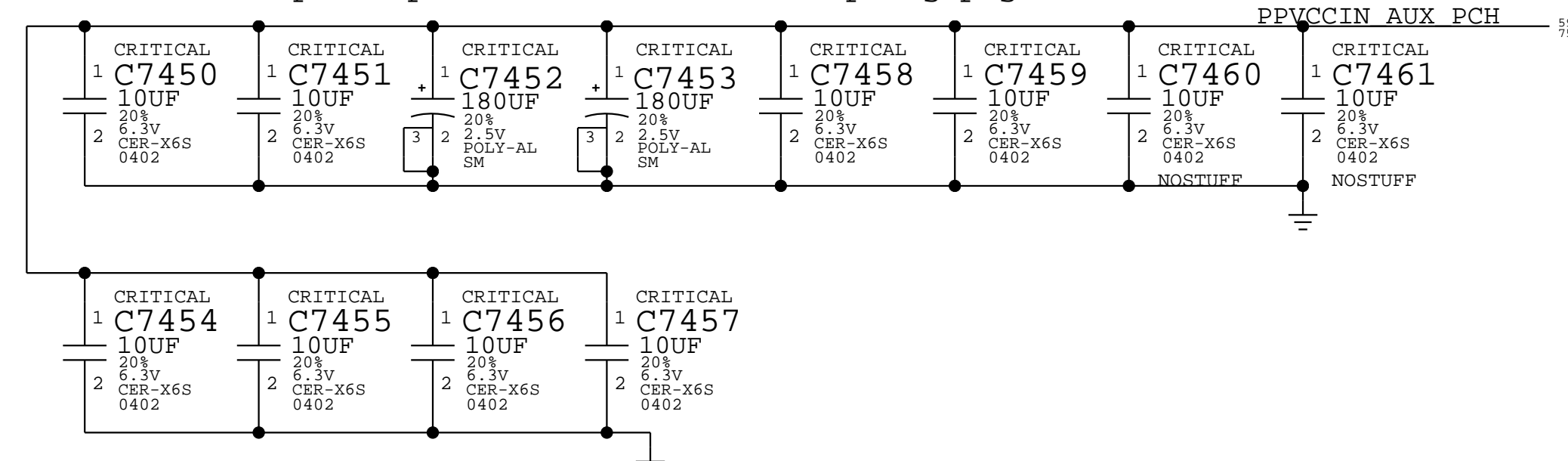
MPN ISL95878A3S2378, config. 9 (of 1 to 32), Fsw=750kHz, Vref=0.7V, Decay=off, EA=A
R7412=47.5k/1%, R7413=324k/0.1%, R7414=127k/0.1%, R7415=1.58k/1%

ⓑ VID Control



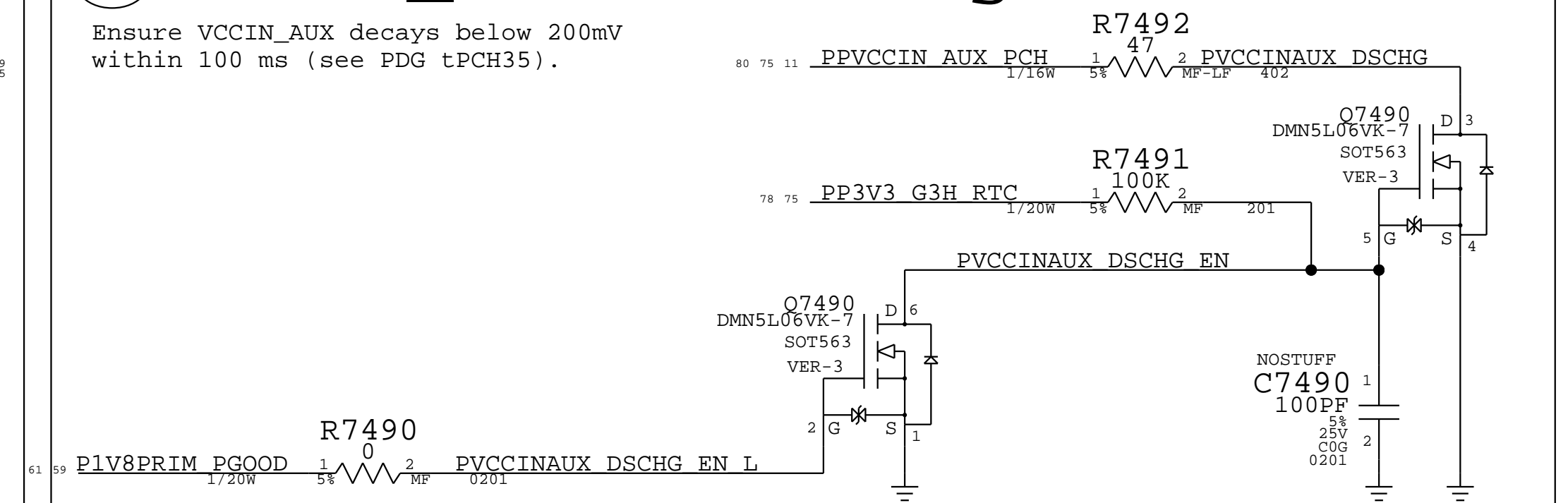
Ⓒ VCCIN_AUX BHC Caps

Additional output caps are on the CPU decoupling page.

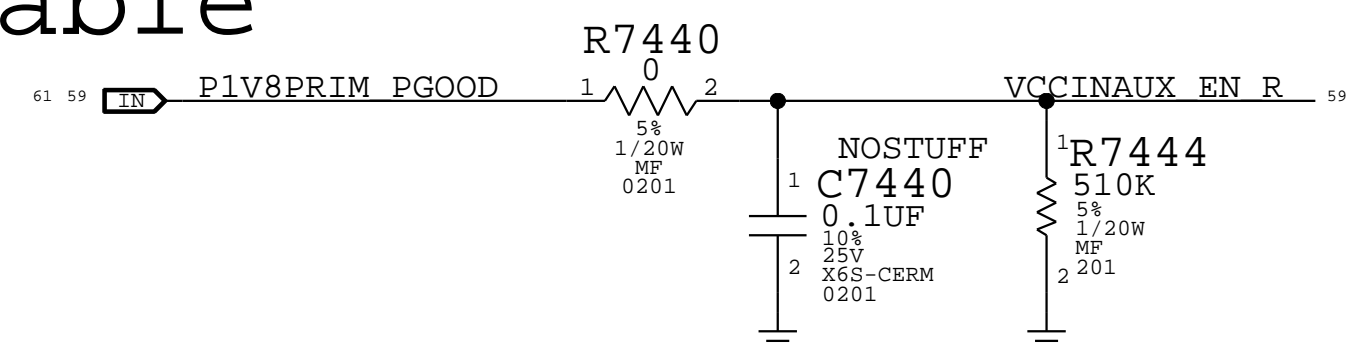


⑦ VCCIN_AUX Discharge

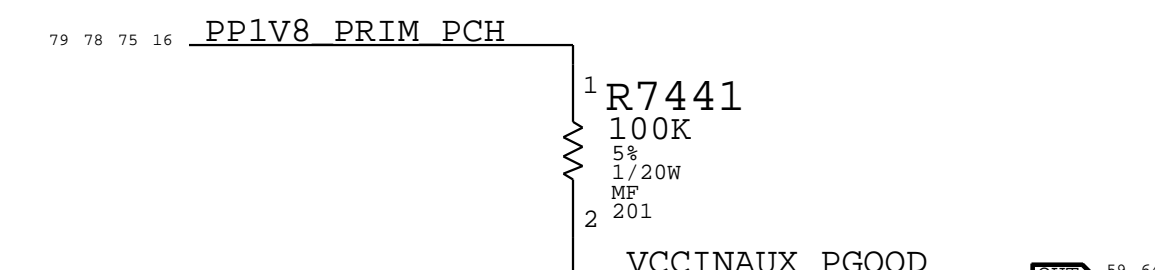
Ensure VCCIN_AUX decays below 200mV within 100 ms (see PDG tPCH35).




Ⓔ VR Enable

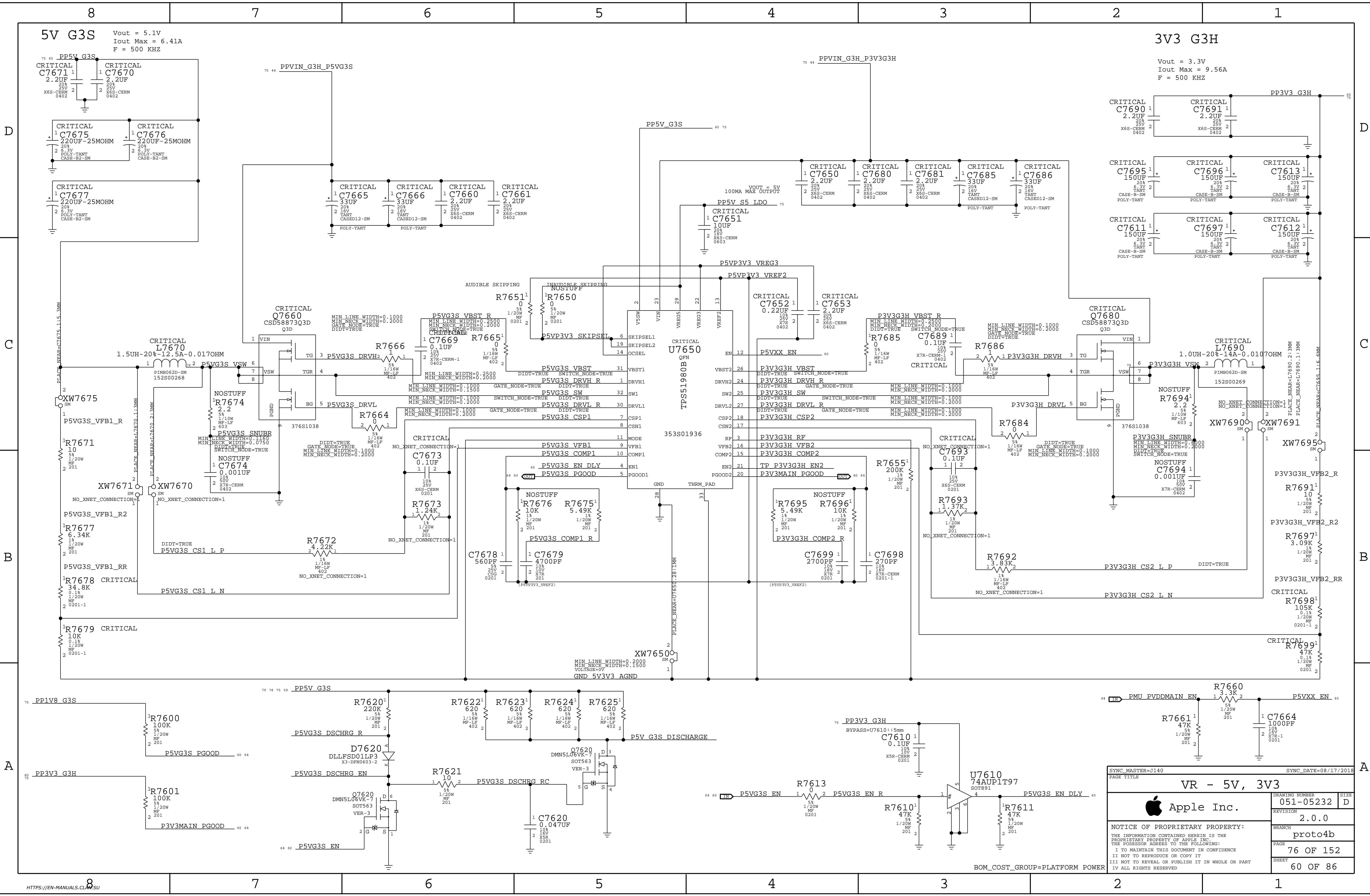



Ⓡ VR PGGOOD



VID[1] Pin State	VID[0] Pin State	VCCIN_AUX (V)	USAGE
0	0	0	Power Saving State
0	1	1.1	Power Saving State
1	0	1.65	Full Current, ICL-Y
1	1	1.8	Initial boot for ICL-U/Y Full Current, ICL-U

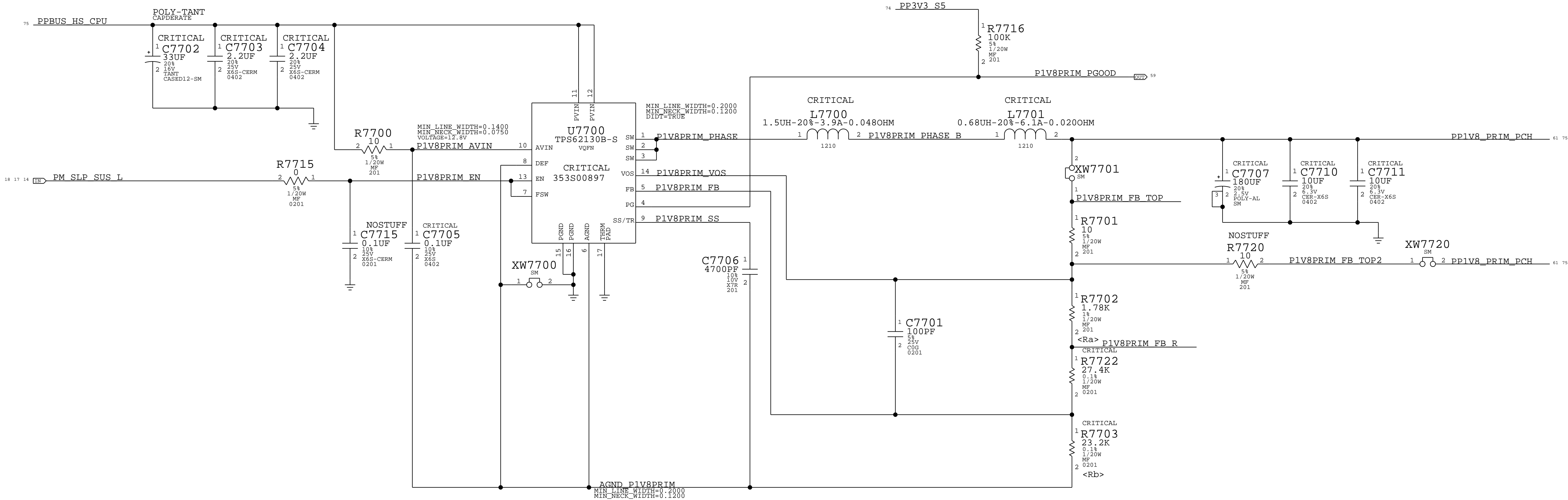
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PAGE TITLE		
<h1>VR: VCCIN_AUX ISL</h1>		
 Apple Inc.	DRAWING NUMBER	SIZE
	051-05232	D
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	2.0.0	
	B.RANCH	proto4b
PAGE	74 OF 152	
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SYNC_MASTER=J140		SYNC_DATE=08/17/2018	
PAGE TITLE			
VR - 5V, 3V3			
 Apple Inc.	DRAWING NUMBER		SIZE
	051-05232		D
	REVISION		
	2.0.0		
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BRANCH		proto4b	
PAGE		76 OF 152	
SHEET		60 OF 86	

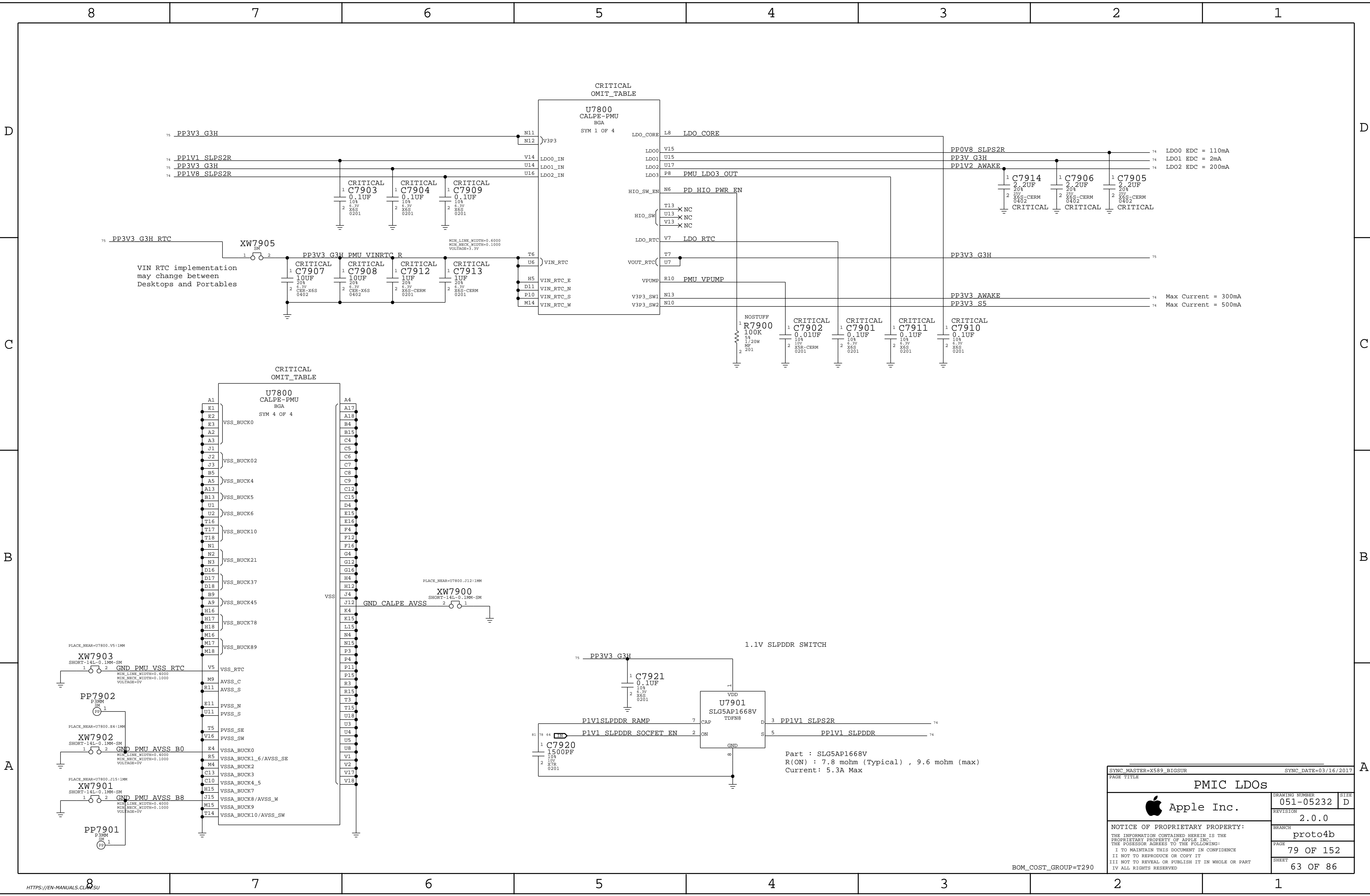
A VCCPRIM_1P8 Voltage Regulator

Output voltage: 1.8 V
Iout Max: 2.07 A
Switching freq: 1250 kHz



BOM_COST_GROUP=GRAPHICS

VR: VCCPRIM_1P8		
Apple Inc.	DRAWING NUMBER	051-05232
	REVISION	2.0.0
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	SHEET	61 OF 86



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C

B


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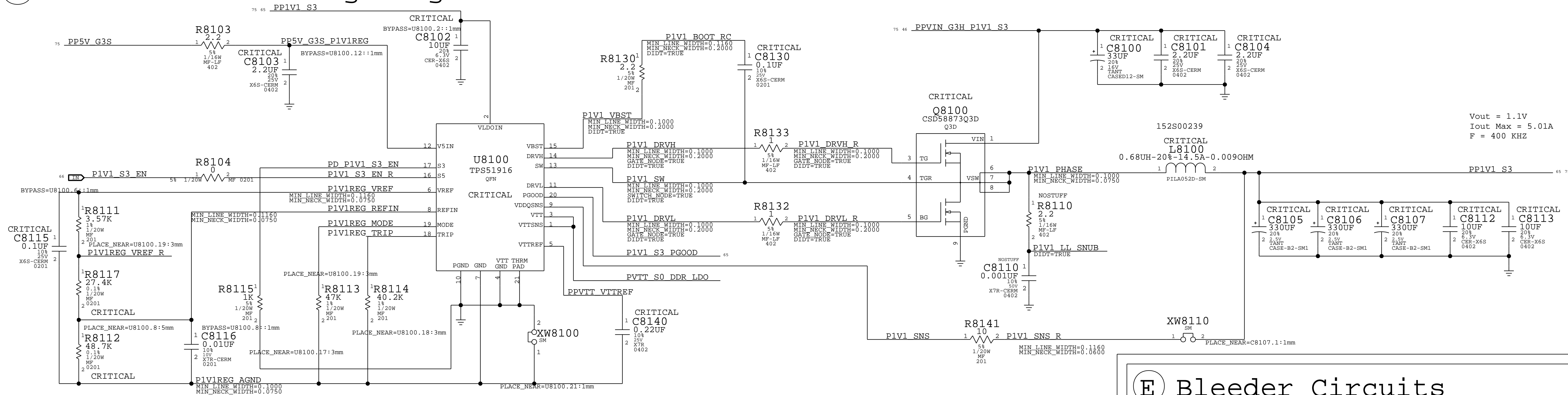
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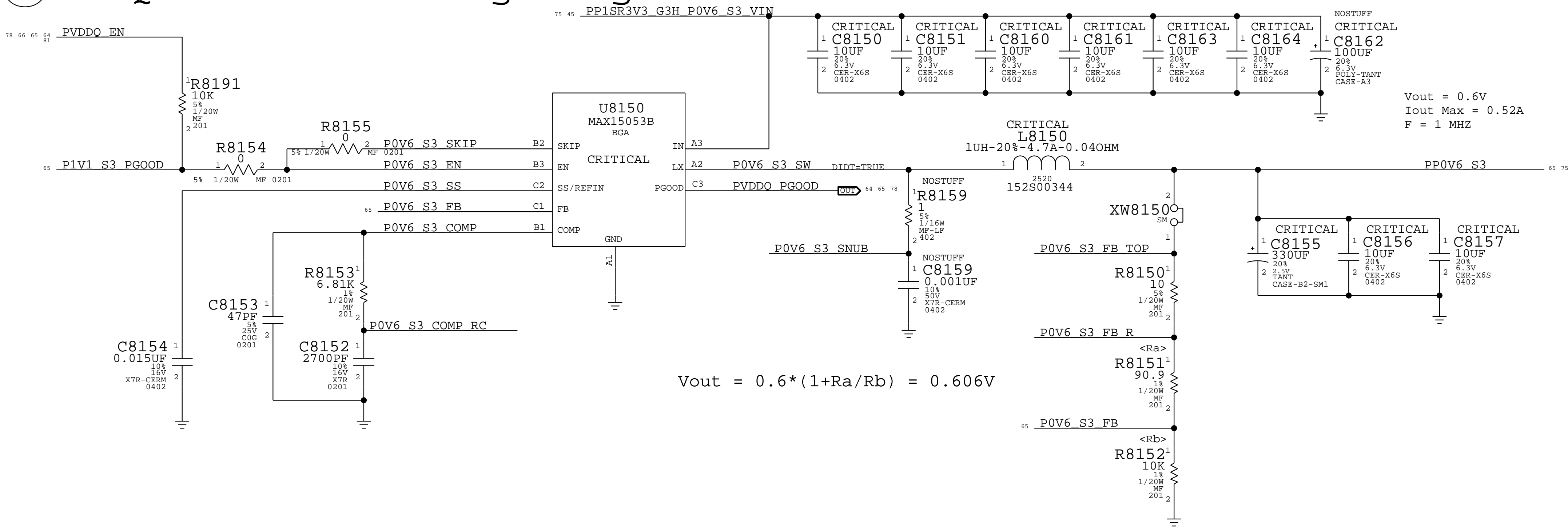
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SYNC_MASTER=X589_BIGSUR		SYNC_DATE=03/16/2017	
PAGE TITLE			
PMIC LDOs			
	DRAWING NUMBER		SIZE
	051-05232		D
Apple Inc.	REVISION		
	2.0.0		
	BRANCH		
	proto4b		
	PAGE		
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63 OF 86			
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A VDD2 1.1V S3 Voltage Regulator

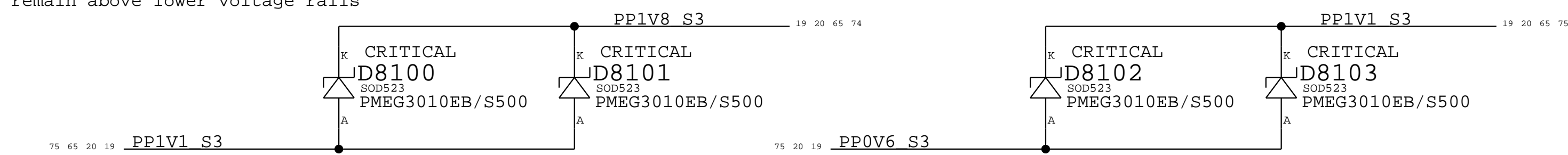


B VDDQ 0.6V S3 Voltage Regulator

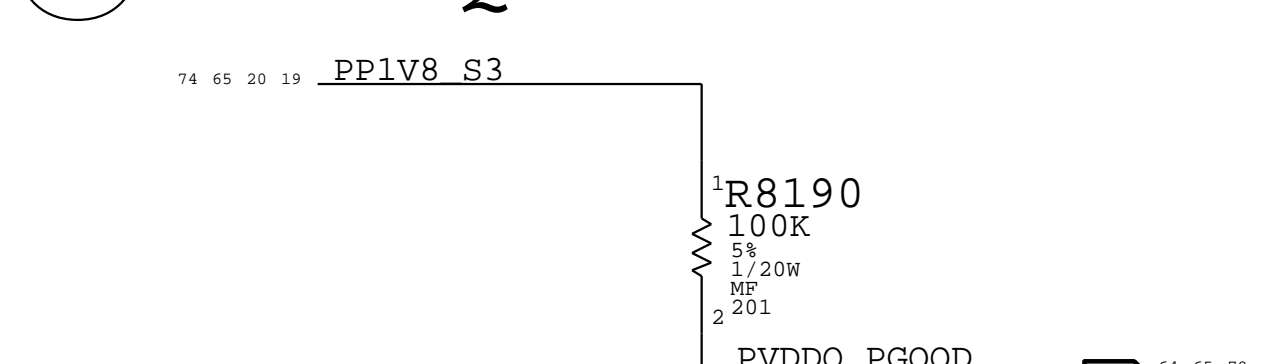


C Protection Diodes

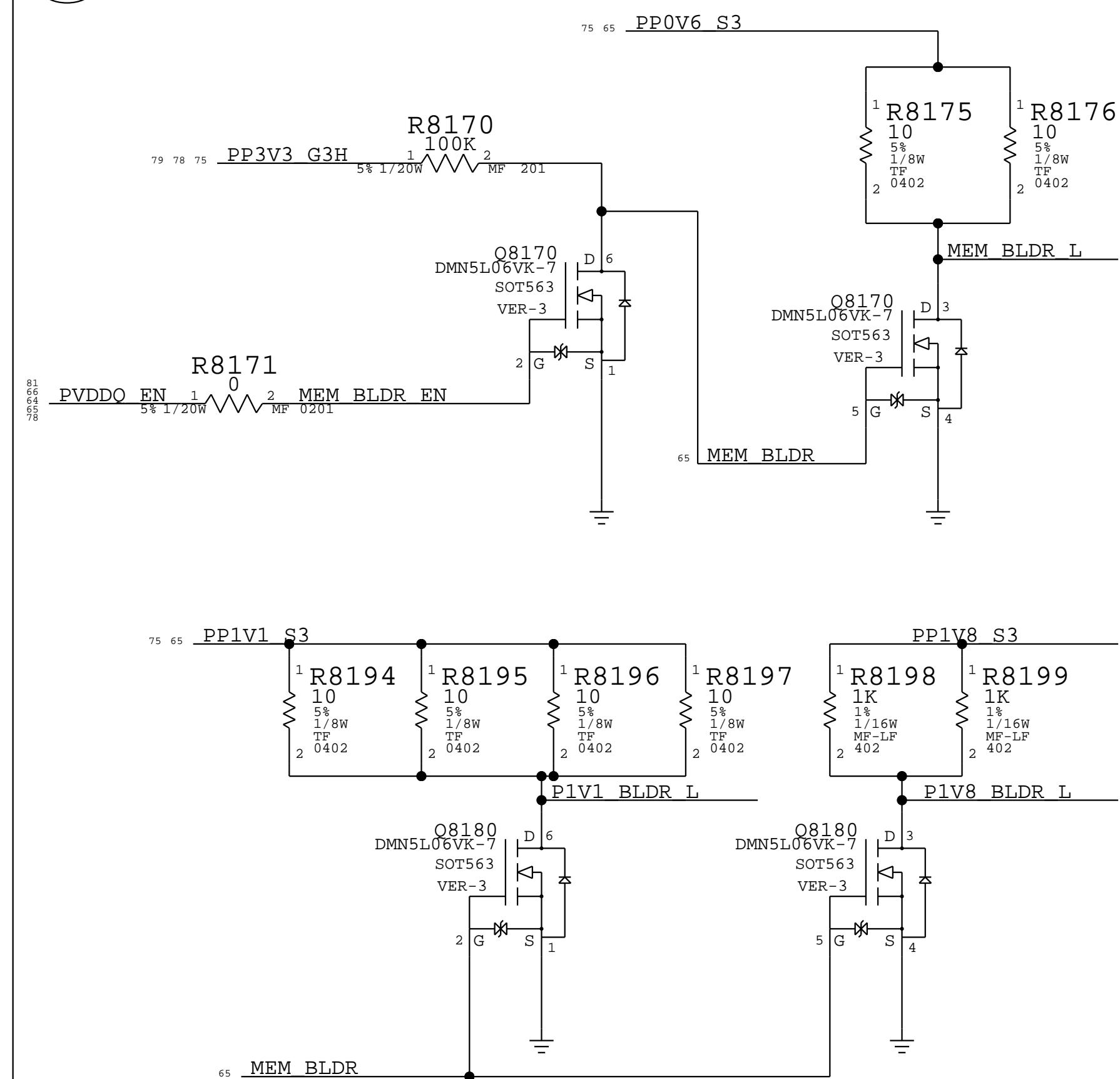
To ensure higher voltage rails remain above lower voltage rails



D PVDDQ PGOOD



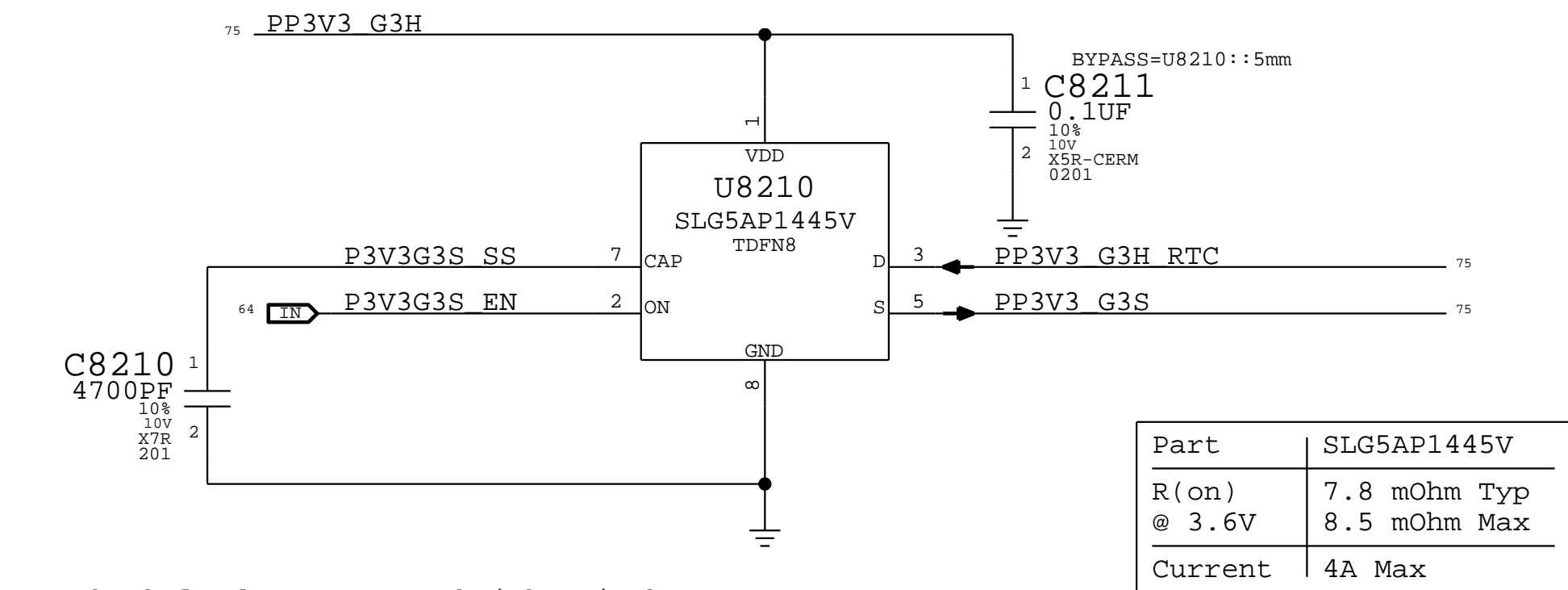
E Bleeder Circuits



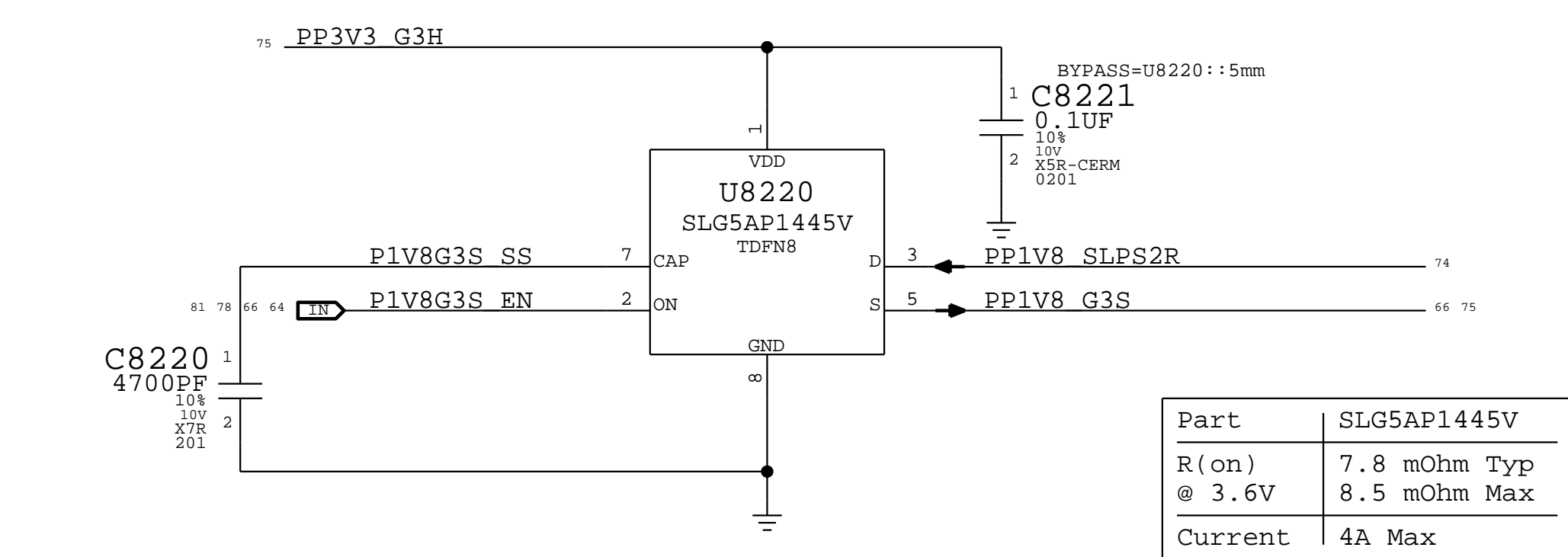
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SYNC_MASTER=X589_CPU_CN1_Y			SYNC_DATE=10/12/2018		
PAGE TITLE			POWER - MEMORY VRs		
			DRAWING NUMBER	051-05232	SIZE
			REVISION	2.0.0	D
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			PAGE	81 OF 152	
			SHEET	65 OF 86	

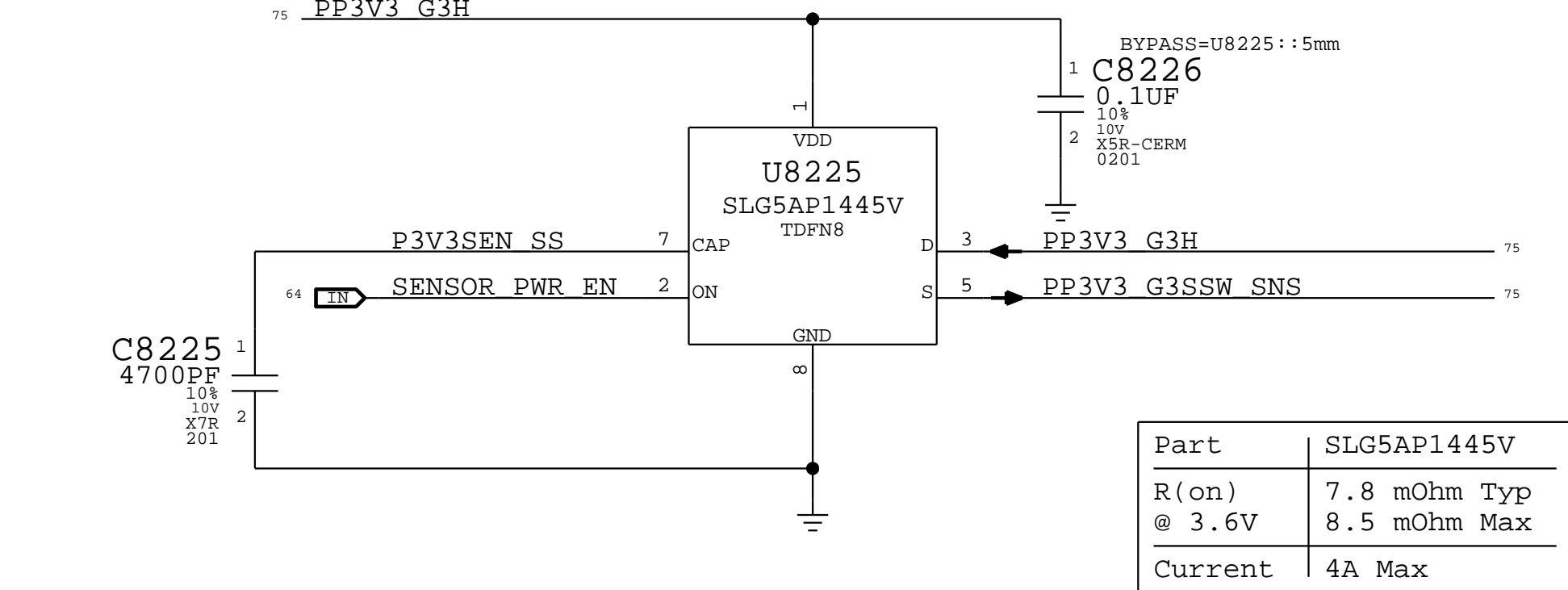
A 3.3V G3 Standby Switch



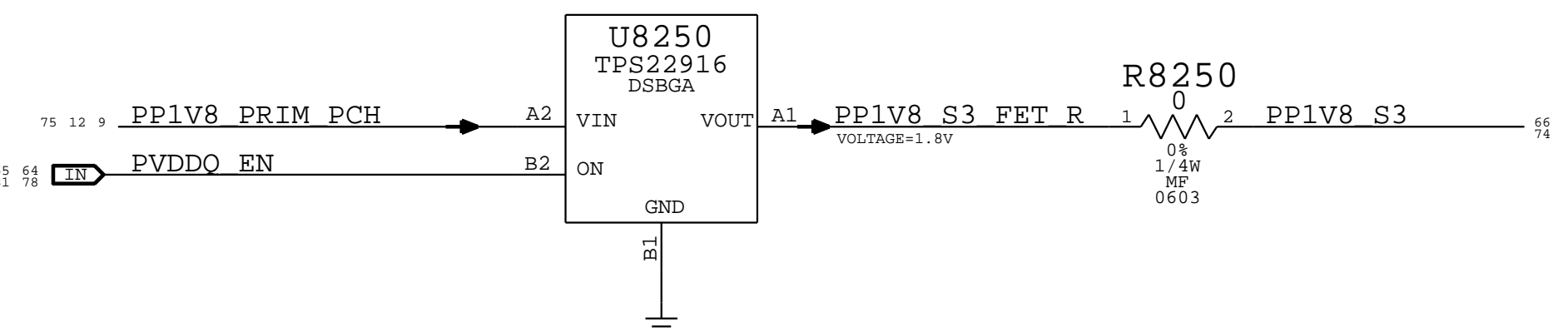
B 1.8V G3 Standby Switch



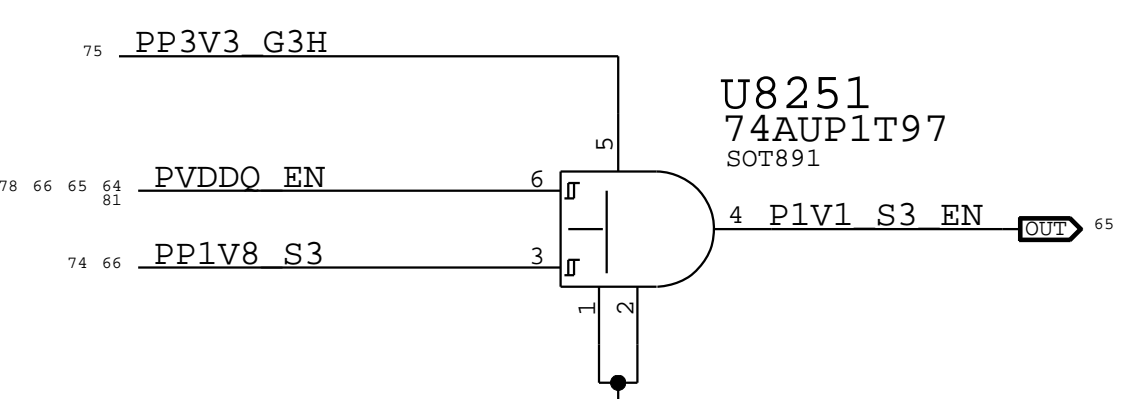
C 3.3V Sensors Switch



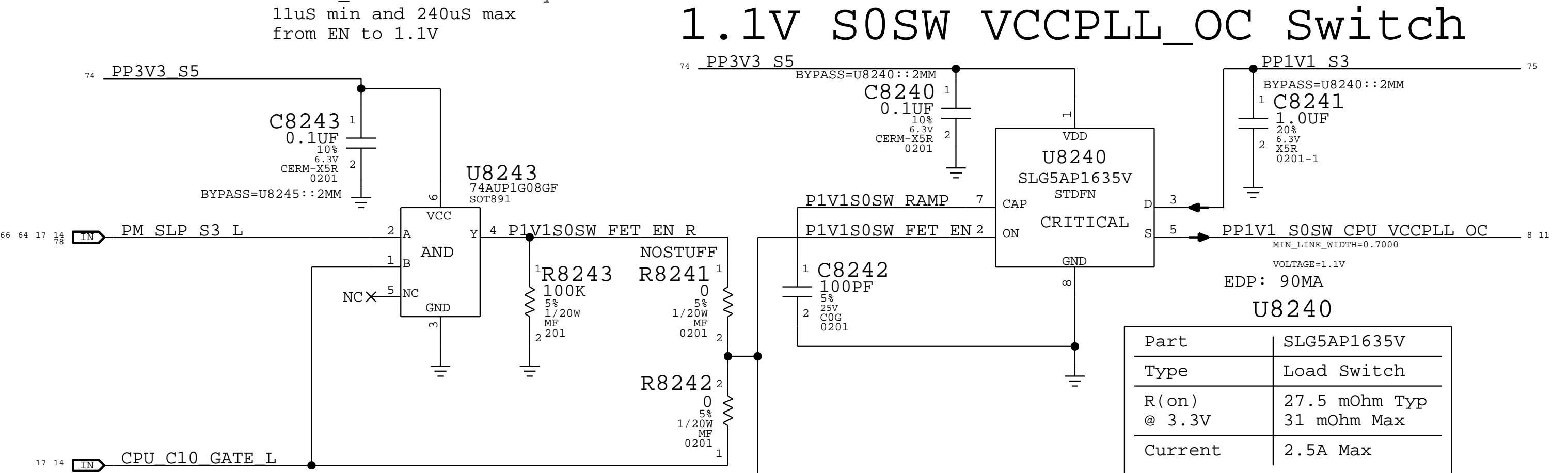
D 1.8V S3 Switch



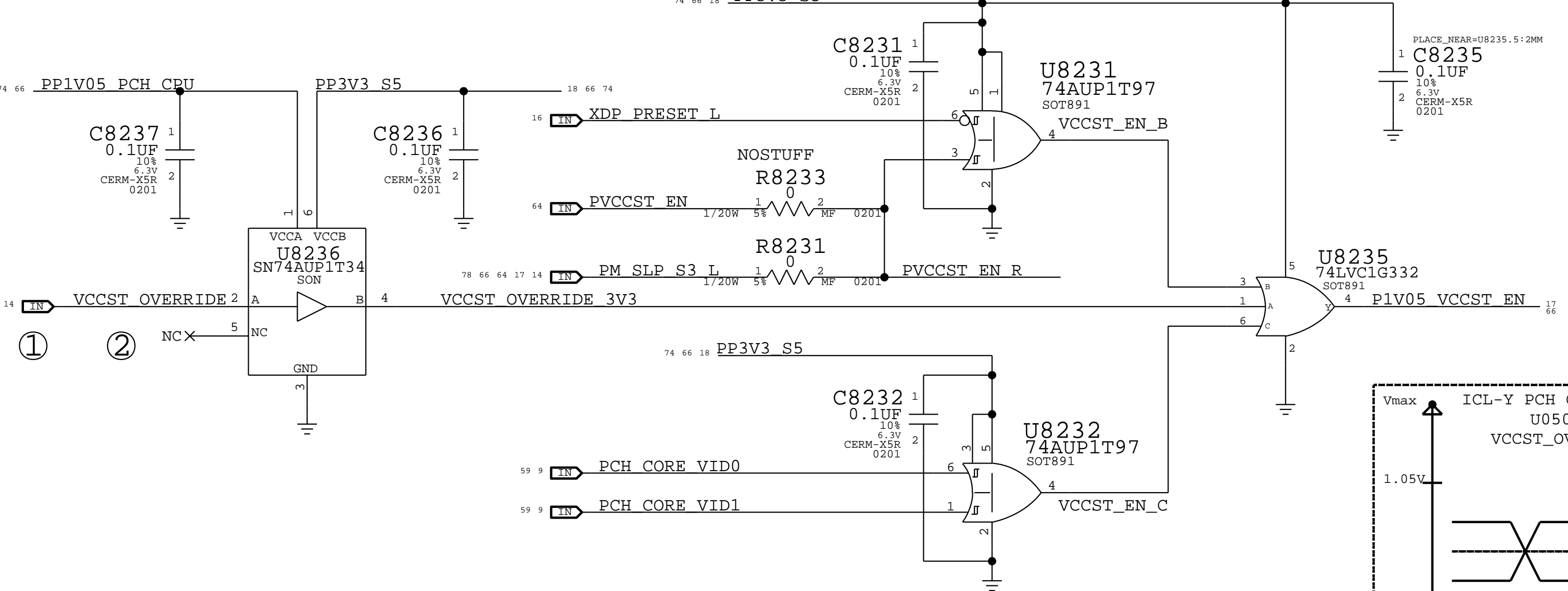
E 1.1V S3 En



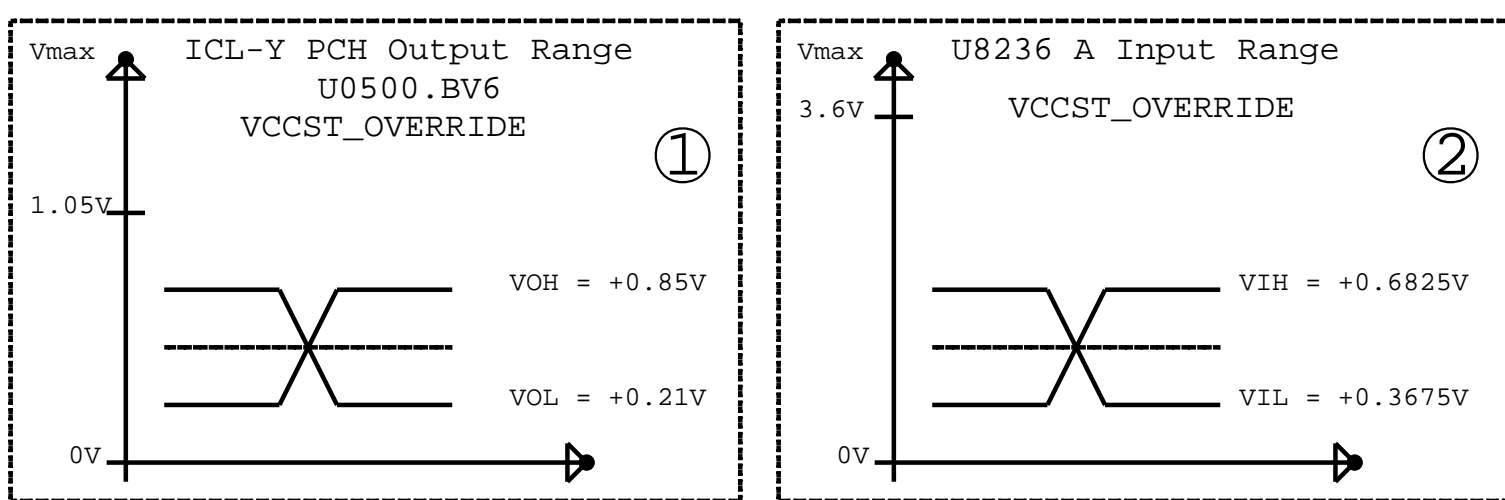
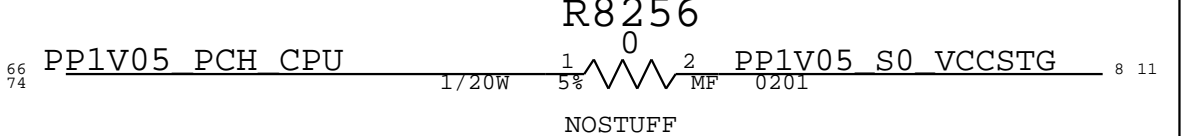
F CPU Switches



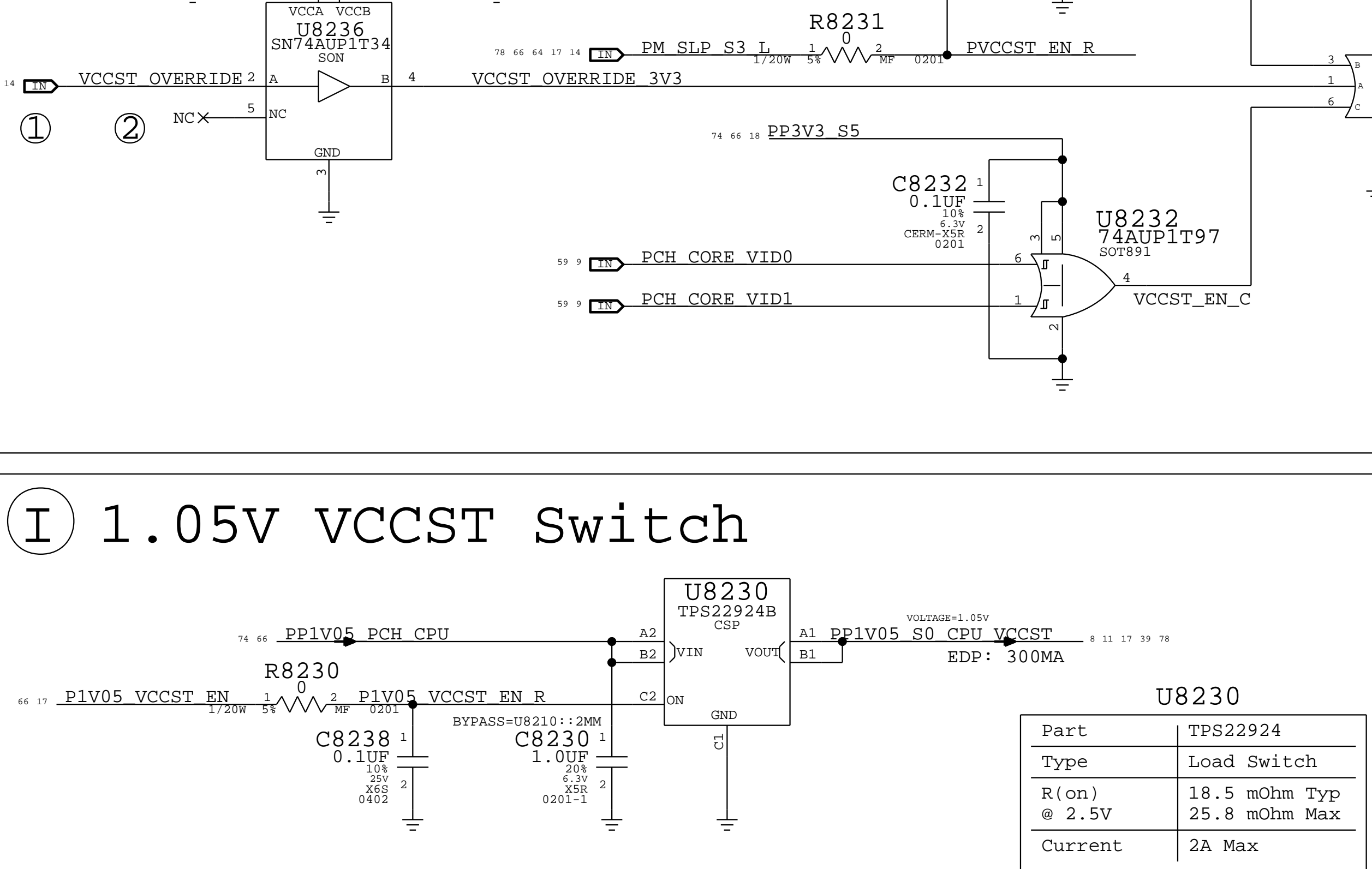
G 1.05V VCCST Switch Control



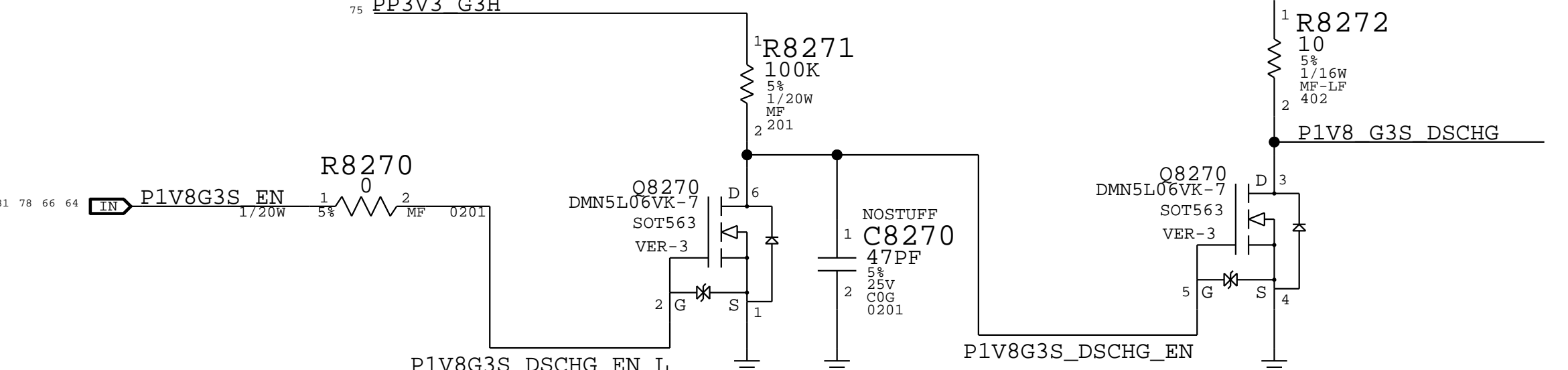
H VCCSTG



I 1.05V VCCST Switch



J PP1V8_G3S Discharge



This discharge circuit was added to enforce timing compliance to a spec for Venus (SE) that NXP provided that would confirm a hardware reset sequence will be power down compliant..

Power FETs			
	DRAWING NUMBER	051-05232	SIZE D
	REVISION	2.0.0	
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BB

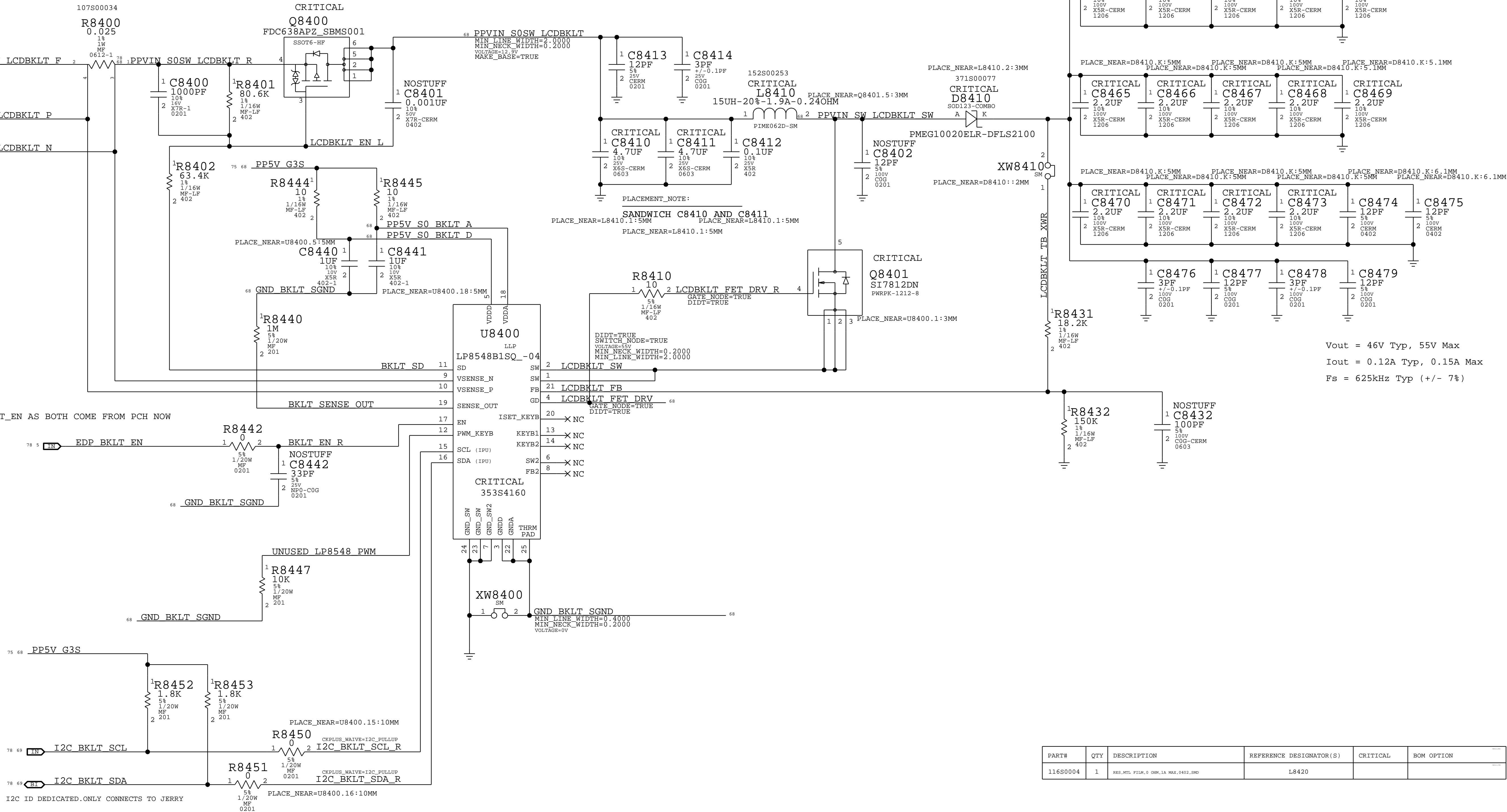
U8220	
Part	SLG5AP1756V
Type	Load Switch
R(on) @ 4A	7.8 mOhm Typ TBD mOhm Max
Current	4A Max

A

Page Notes

Power aliases required by this page:


```
- =PPVIN_S0SW_LCDBKLTFTET    (9-12.6V LCD BACKLIGHT INPUT)
- =PP5V_S0_BKLT              (5V BACKLIGHT DRIVER INPUT)
```



PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
116S0004	1	RES,MTL FILM,0 OHM,1A MAX,0402,SMD	L8420		

LINE WIDTHS		PBUS LINE WIDTHS		LCD BKLT LINE WIDTHS	
<div><div></div><div><div>PP5V_S0_BKLT_A</div><div><div>MIN_LINE_WIDTH=0.0750</div><div>MIN_NECK_WIDTH=0.0750</div><div>VOLTAGE=5V</div></div></div><div>68</div></div>	<div><div></div><div><div>PPVIN_S0SW_LCDBKLT_F</div><div><div>MIN_LINE_WIDTH=2.0000</div><div>MIN_NECK_WIDTH=0.2000</div><div>VOLTAGE=12.9V</div></div></div><div>68</div></div>	<div><div></div><div><div>LCDBKLT_FET_DRV</div><div><div>MIN_LINE_WIDTH=0.6000</div><div>MIN_NECK_WIDTH=0.2000</div><div>VOLTAGE=5V</div></div></div><div>68</div></div>	<div><div></div><div><div>PPVIN_SW_LCDBKLT_SW</div><div><div>MIN_LINE_WIDTH=2.0000</div><div>MIN_NECK_WIDTH=0.1200</div><div>VOLTAGE=55V</div></div></div><div>68</div></div>		
	<div><div></div><div><div>PPVIN_S0SW_LCDBKLT_R</div><div><div>MIN_LINE_WIDTH=2.0000</div><div>MIN_NECK_WIDTH=0.2000</div><div>VOLTAGE=12.9V</div></div></div><div>68 78</div></div>	<div><div></div><div><div>GATE_NODE=TRUE D1D2=TRUE</div></div><div>68 78</div></div>	<div><div></div><div><div>SWITCH_NODE=TRUE D1D2=TRUE</div></div><div>68 68 78</div></div>		
<div><div></div><div><div>PP5V_S0_BKLT_D</div><div><div>MIN_LINE_WIDTH=0.0750</div><div>MIN_NECK_WIDTH=0.0750</div><div>VOLTAGE=5V</div></div></div><div>68</div></div>	<div><div></div><div><div>PPVIN_S0SW_LCDBKLT</div><div><div>MIN_LINE_WIDTH=2.0000</div><div>MIN_NECK_WIDTH=0.2000</div><div>VOLTAGE=12.9V</div></div></div><div>68</div></div>	<div><div></div><div><div>PPVOUT_S0_LCDBKLT</div><div><div>MIN_LINE_WIDTH=0.6000</div><div>MIN_NECK_WIDTH=0.1500</div><div>VOLTAGE=55V</div></div></div><div>68</div></div>	<div><div></div><div><div>PPVOUT_S0_LCDBKLT_F</div><div><div>MIN_LINE_WIDTH=0.5000</div><div>MIN_NECK_WIDTH=0.1500</div><div>VOLTAGE=55V</div></div></div><div>68</div></div>		

BOM_COST_GROUP=DISPLAY

PAGE TITLE		LCD Backlight Driver	
 Apple Inc.	DRAWING NUMBER	051-05232	SIZE D
	REVISION	2.0.0	
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		SHEET	68 OF 86

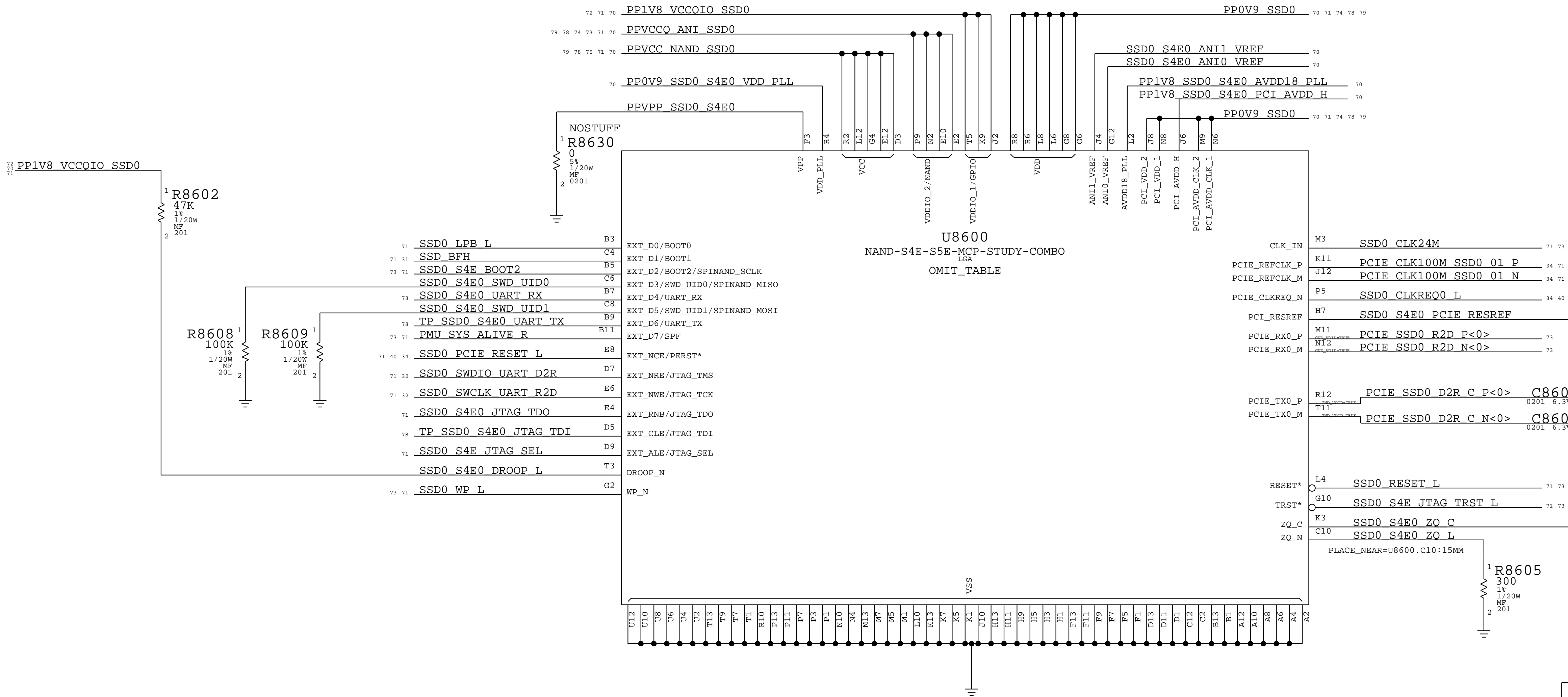
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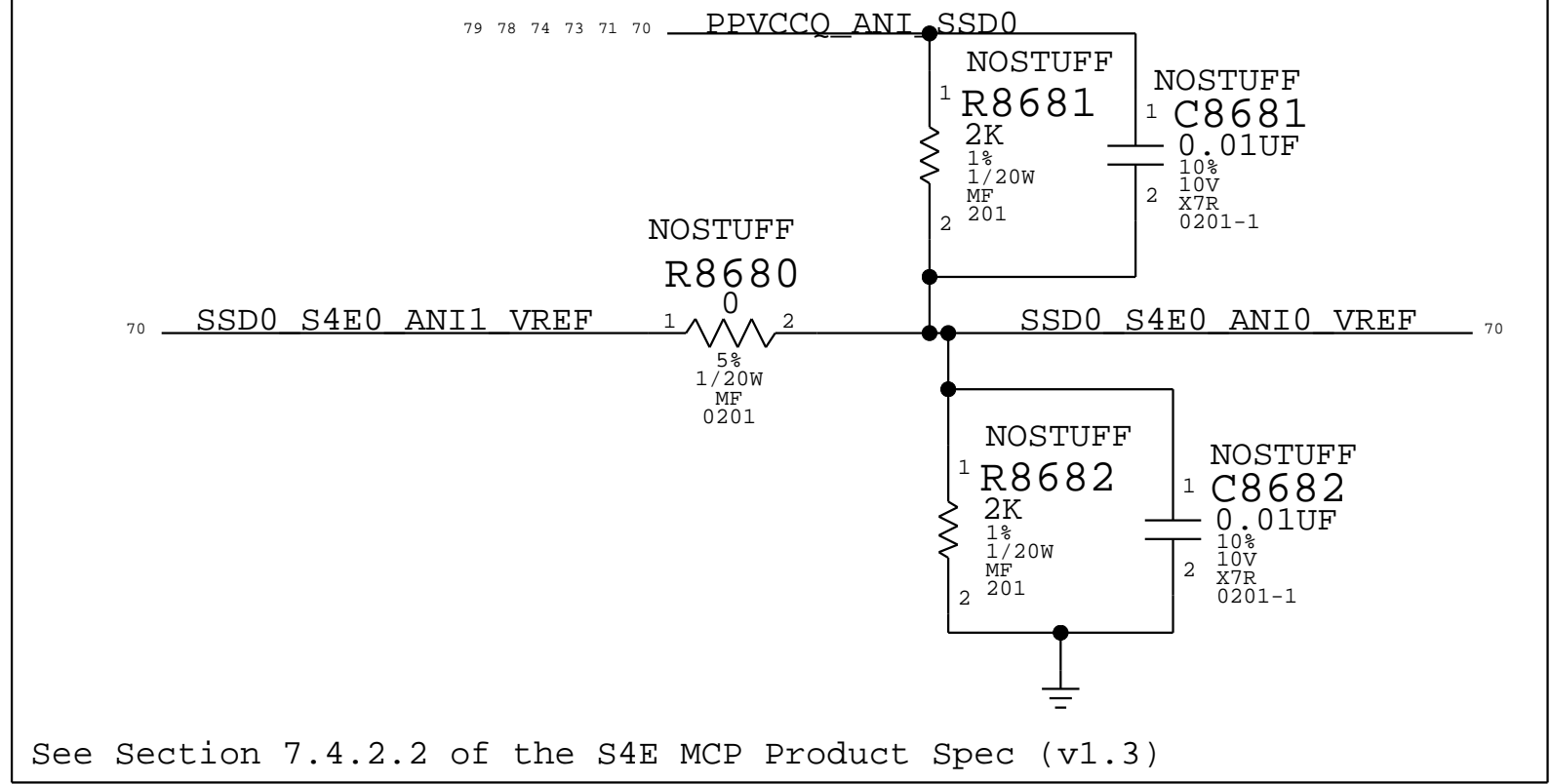
B

5

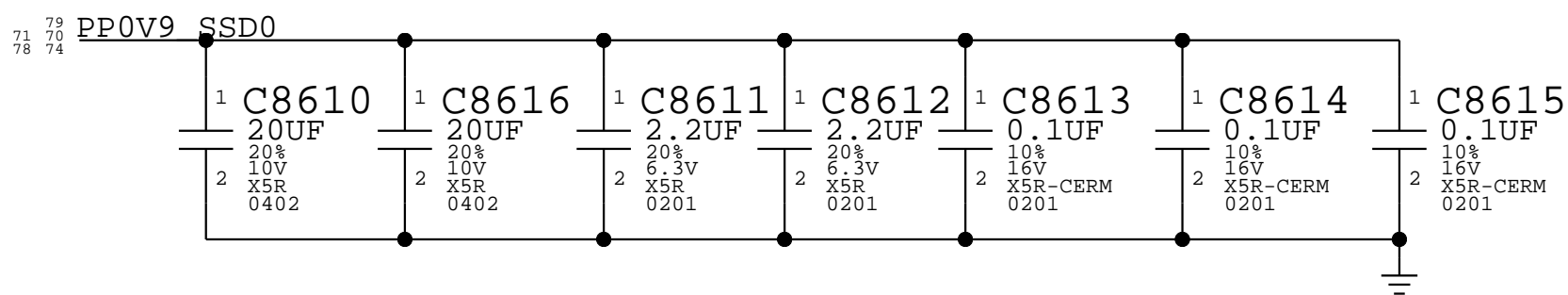
S4E0



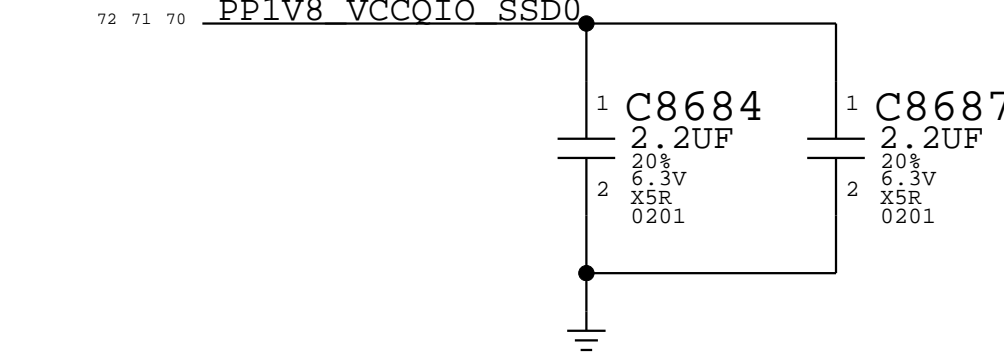
A SSD External VREF



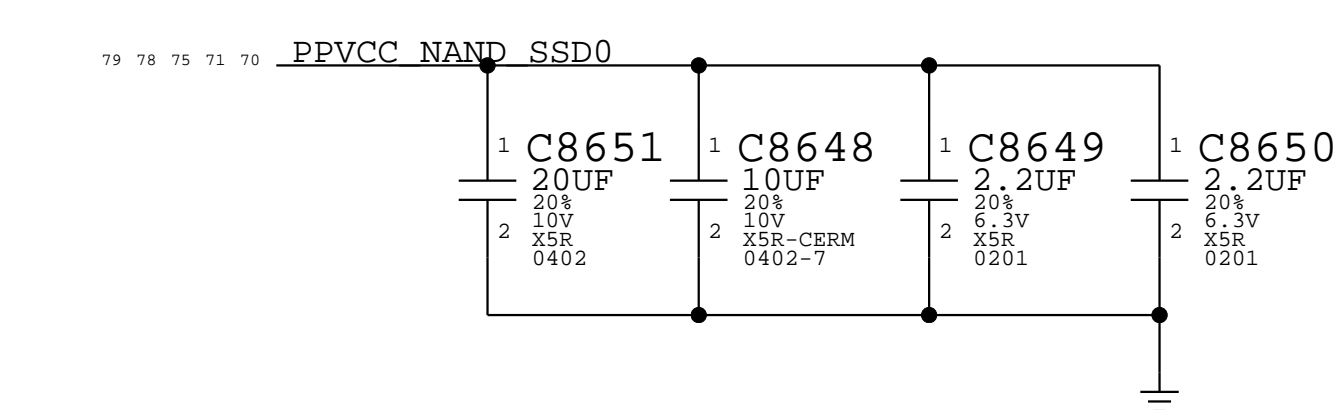
B S4E VDD Decoupling



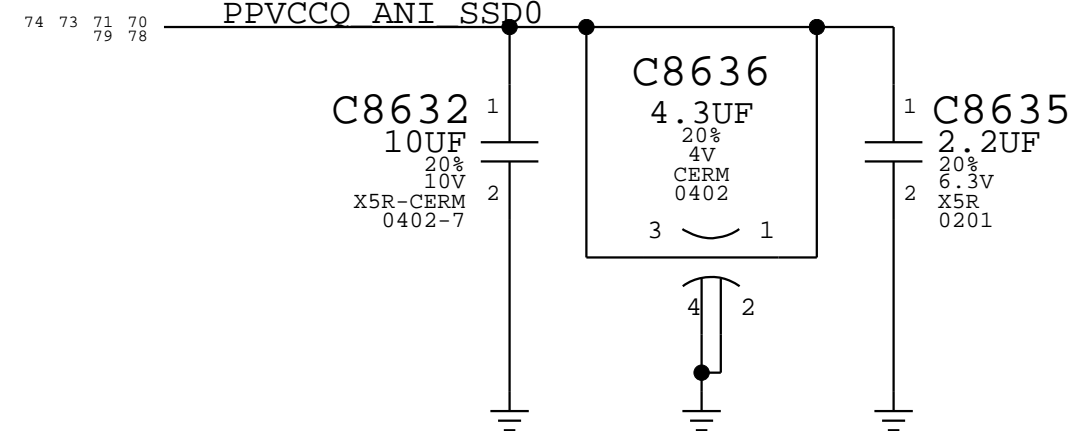
D S4E VDDIO_1



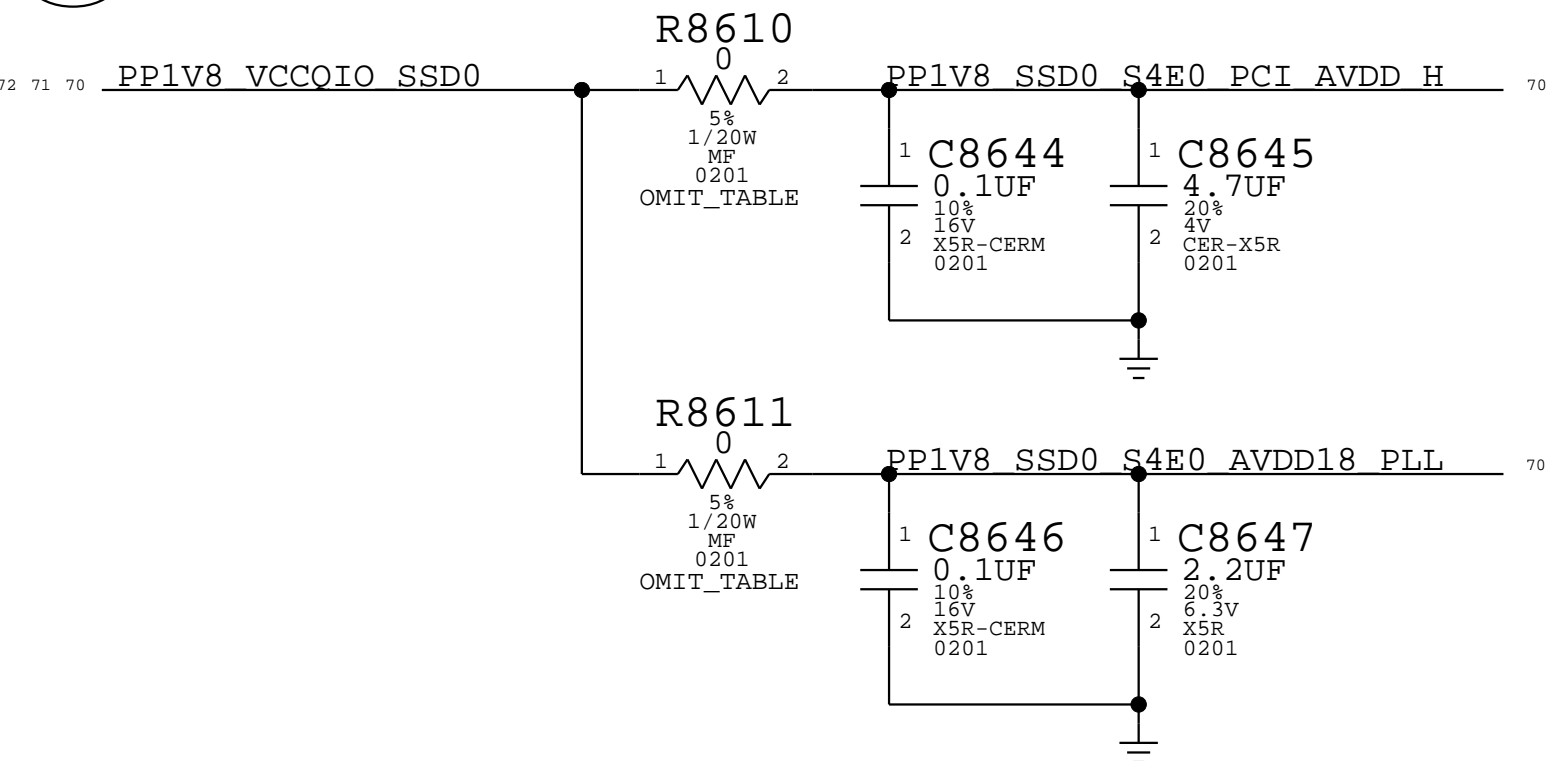
C S4E VCC Decoupling



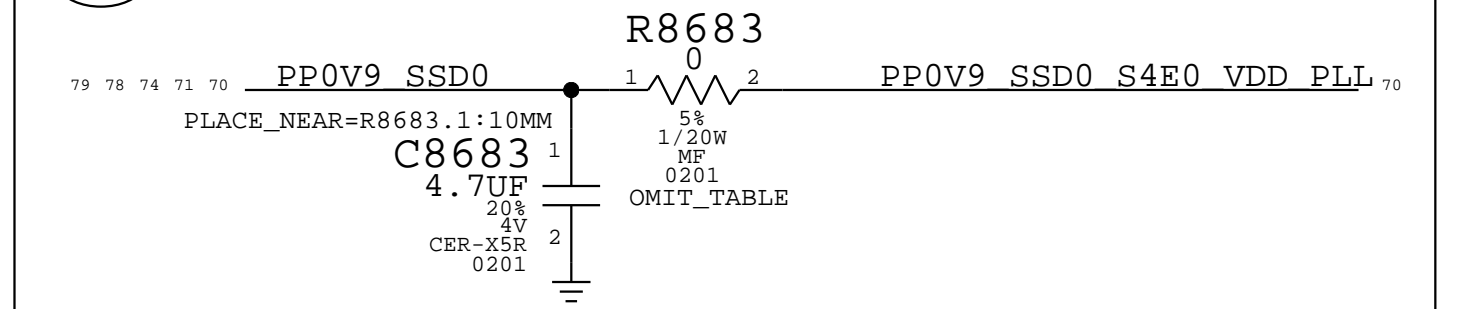
E S4E VDDIO_2



F S4E AVDD_H/AVDD18_PLL



G S4E VDD_PLL



PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
118S0279	1	RES,3.01KOHM,1%,1/20W,0201	R8604	CRITICAL	S4E
103S00429	1	RES,200OHM,0.1%,1/20W,0201	R8604	CRITICAL	S5E
118S0011	1	RES,100OHM,1%,1/20W,0201	R8606	CRITICAL	S4E
118S0273	1	RES,300OHM,1%,1/20W,0201	R8606	CRITICAL	S5E
117S0201	2	RES,0OHM,1/20W,0201	R8683,R8610,R8611	CRITICAL	S4E
155S00161	2	FERR BD,100OHM,0.05 DCR,0201	R8683,R8610	CRITICAL	S5E
118S0794	1	RES,MF,20HM,1%,1/20W,0201	R8611	CRITICAL	S5E



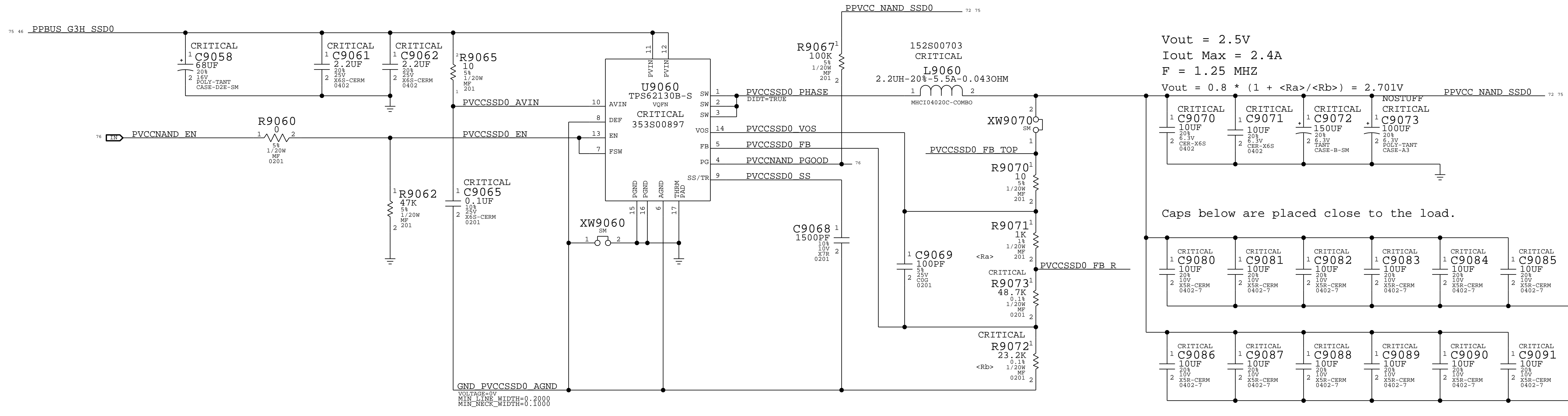
D

B

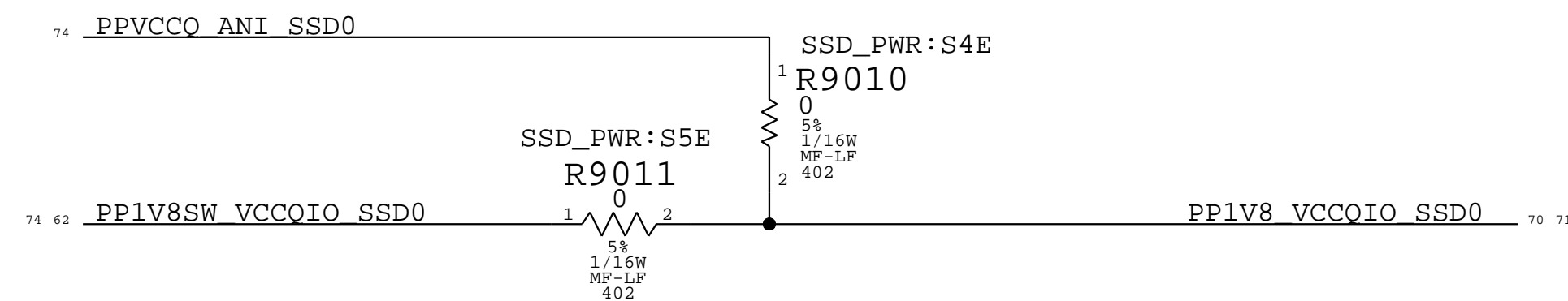
B



Ⓐ NAND VCC (PPVCC_NAND_SSD0) Voltage Regulator



ⓑ NAND VCCQ I/O Selector



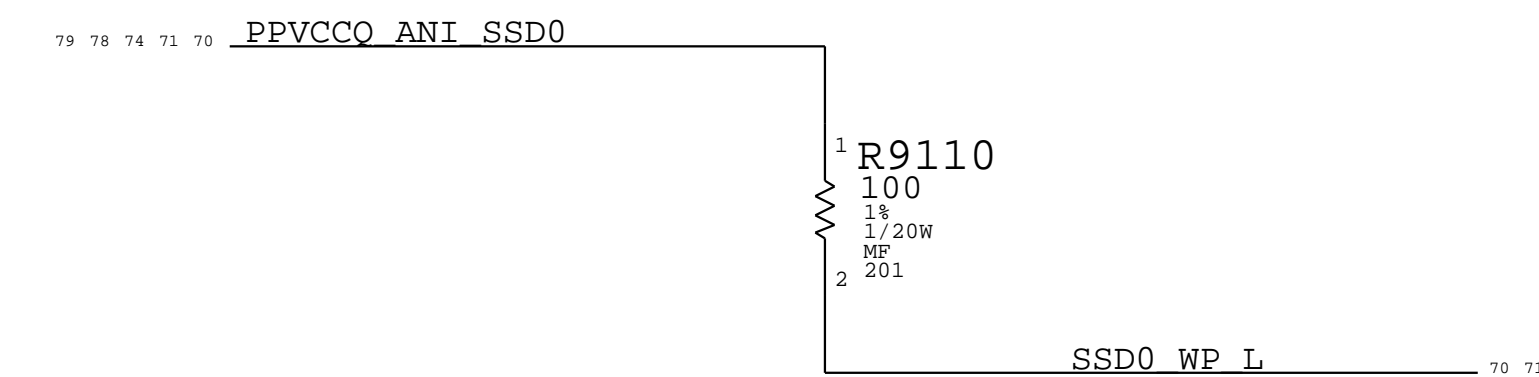
A SSD PCIE AC Coupling Caps

(All Caps)				GND_VOID=TRUE			
34	OUT	PCIE SSD0 R2D C P<0>	C9110	1	2	20% 6.3V X5R 0201	PCIE SSD0 R2D P<0>
						0.22UF	70
34	OUT	PCIE SSD0 R2D C N<0>	C9111	1	2	20% 6.3V X5R 0201	PCIE SSD0 R2D N<0>
						0.22UF	70
34	OUT	PCIE SSD0 R2D C P<1>	C9112	1	2	20% 6.3V X5R 0201	PCIE SSD0 R2D P<1>
						0.22UF	71
34	OUT	PCIE SSD0 R2D C N<1>	C9113	1	2	20% 6.3V X5R 0201	PCIE SSD0 R2D N<1>
						0.22UF	71

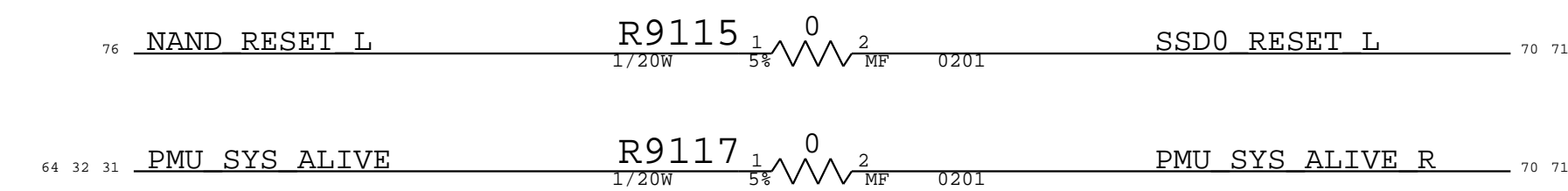
B SSD PCIE Net Aliases

34	OUT	NC S4E3 PCIE R2D CP<2>	==	WAKE_BASE=TRUE	NO_TEST=1	NC S4E3 PCIE R2D CP<2>
34	OUT	NC S4E3 PCIE R2D CN<2>	==	WAKE_BASE=TRUE	NO_TEST=1	NC S4E3 PCIE R2D CN<2>
34	IN	NC S4E3 PCIE D2RP<2>	==	WAKE_BASE=TRUE	NO_TEST=1	NC S4E3 PCIE D2RP<2>
34	IN	NC S4E3 PCIE D2RN<2>	==	WAKE_BASE=TRUE	NO_TEST=1	NC S4E3 PCIE D2RN<2>
34	OUT	NC S4E3 PCIE R2D CP<3>	==	WAKE_BASE=TRUE	NO_TEST=1	NC S4E3 PCIE R2D CP<3>
34	OUT	NC S4E3 PCIE R2D CN<3>	==	WAKE_BASE=TRUE	NO_TEST=1	NC S4E3 PCIE R2D CN<3>
34	IN	NC S4E3 PCIE D2RP<3>	==	WAKE_BASE=TRUE	NO_TEST=1	NC S4E3 PCIE D2RP<3>
34	IN	NC S4E3 PCIE D2RN<3>	==	WAKE_BASE=TRUE	NO_TEST=1	NC S4E3 PCIE D2RN<3>
34	IN	NC PCIE CLK100M SSD0 23N	==	WAKE_BASE=TRUE	NO_TEST=1	NC PCIE CLK100M SSD0 23N
34	IN	NC PCIE CLK100M SSD0 23P	==	WAKE_BASE=TRUE	NO_TEST=1	NC PCIE CLK100M SSD0 23P

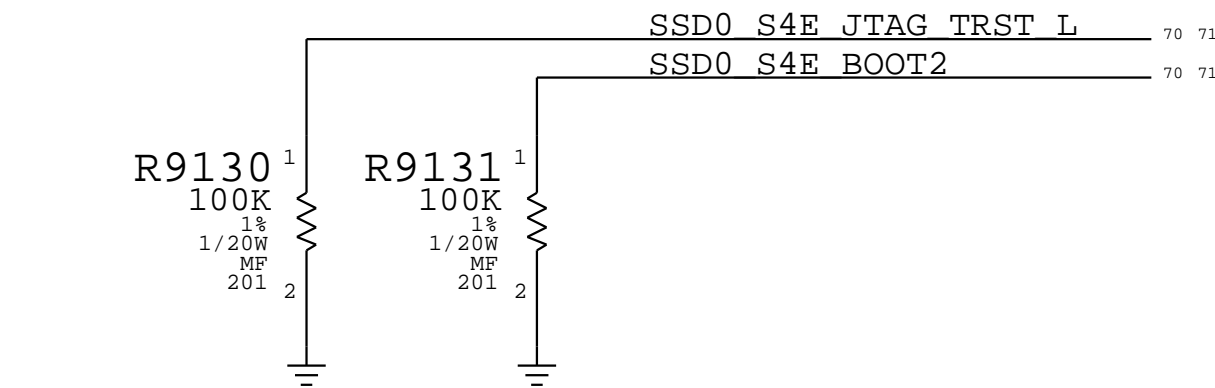
C SSD Write Protect Control



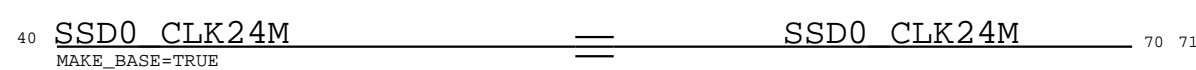
D SSD Miscellaneous Control



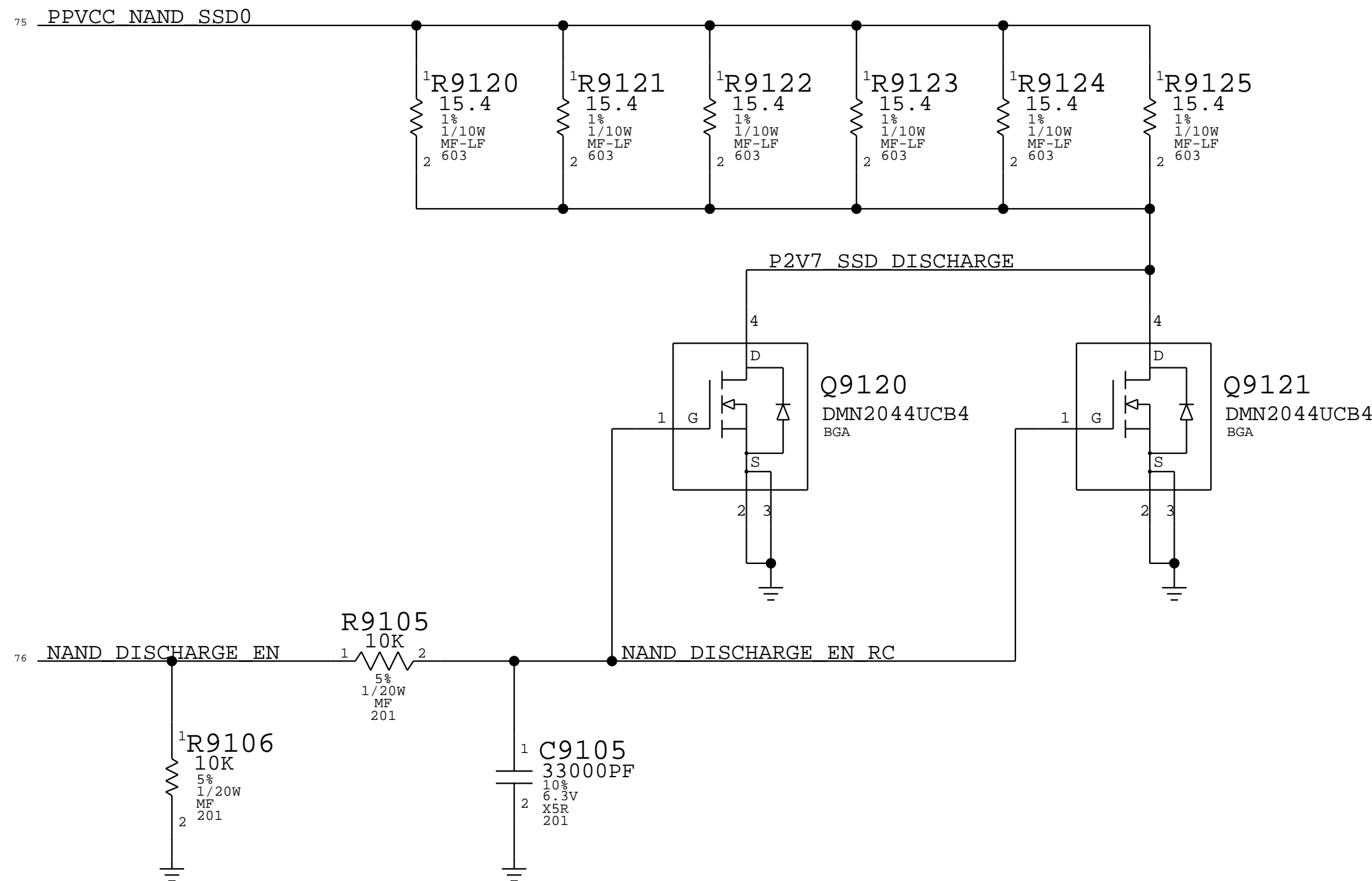
E S4E Pull-Downs



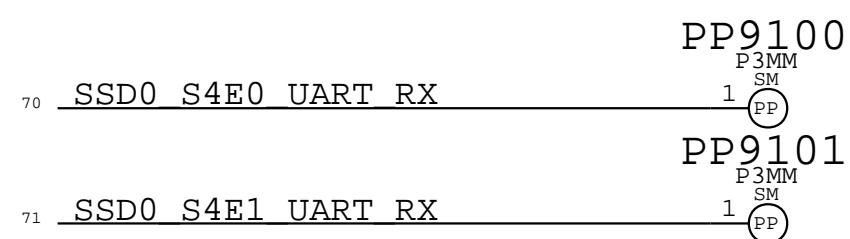
F S4E Control Aliases




G SSD Discharge Circuit

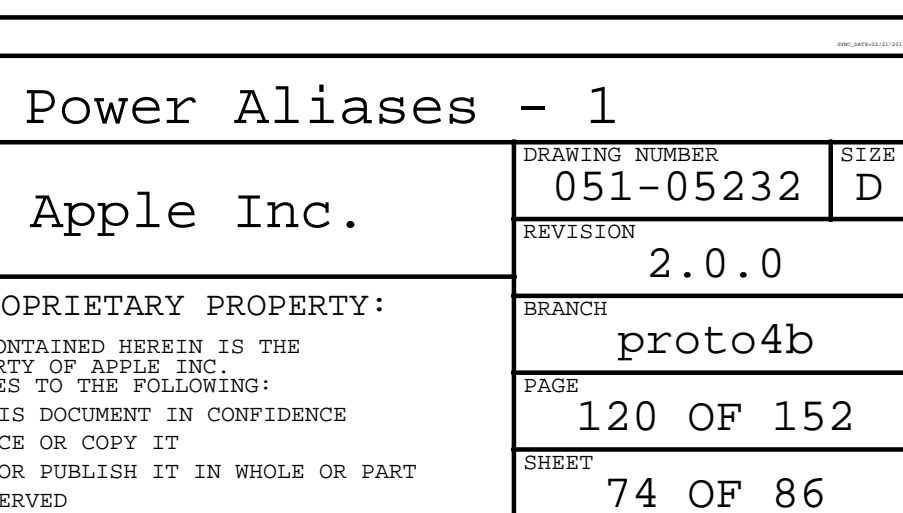
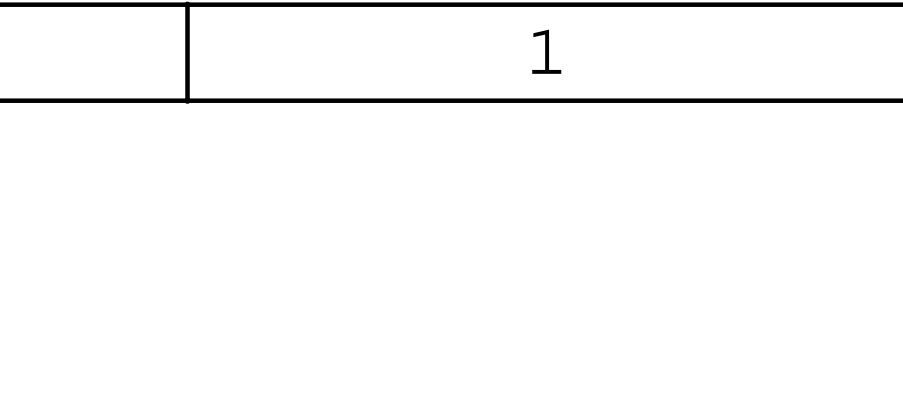
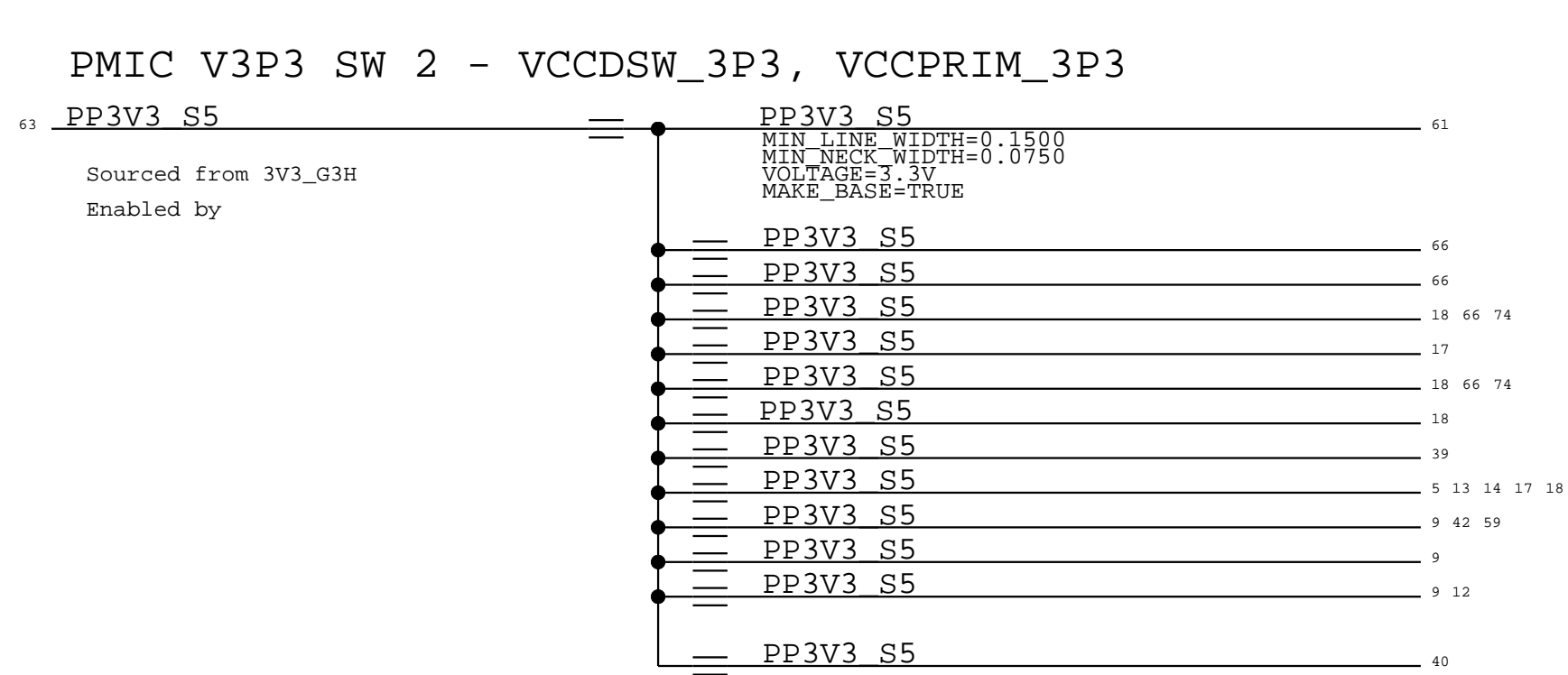
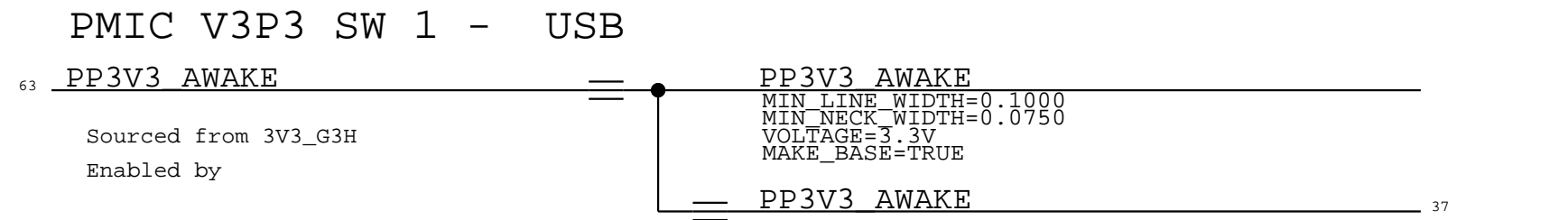
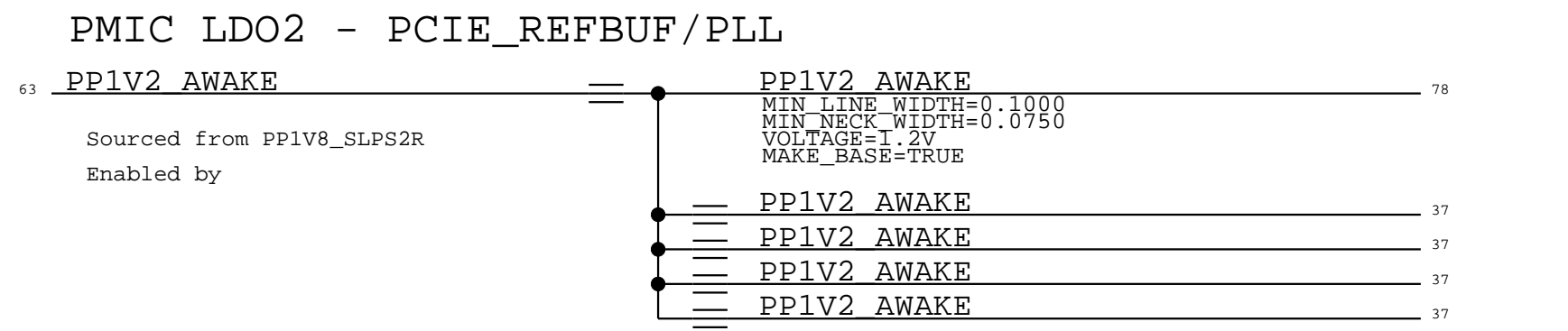
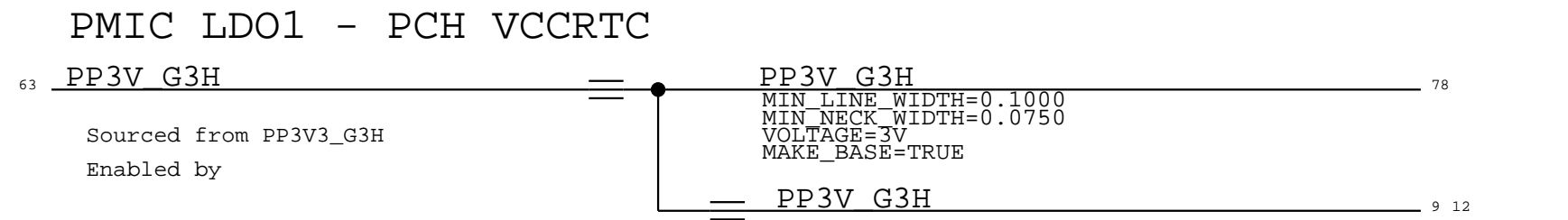
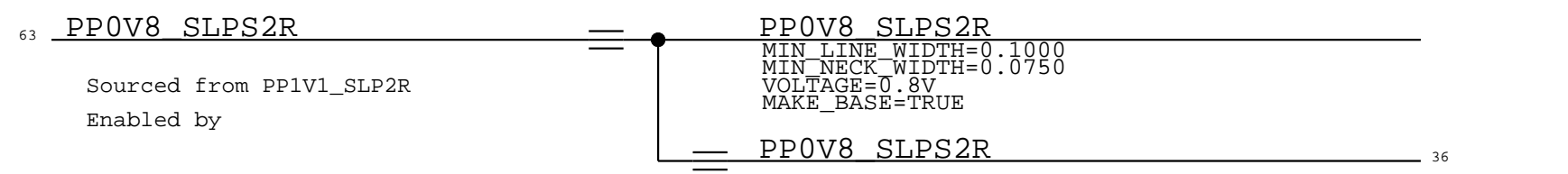
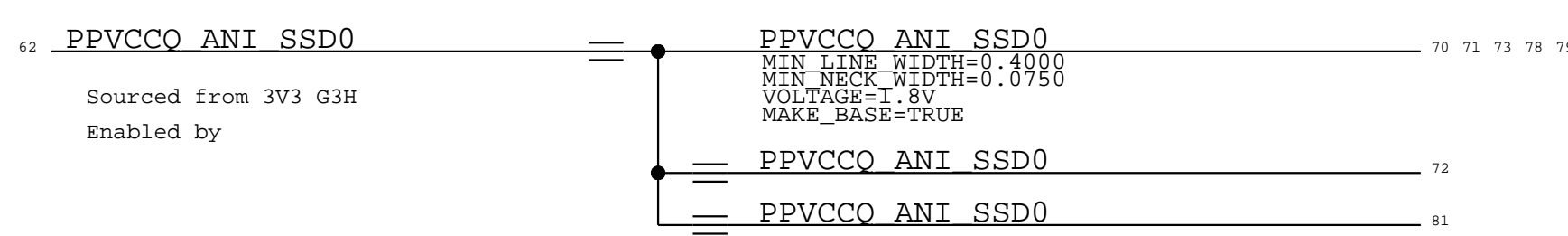
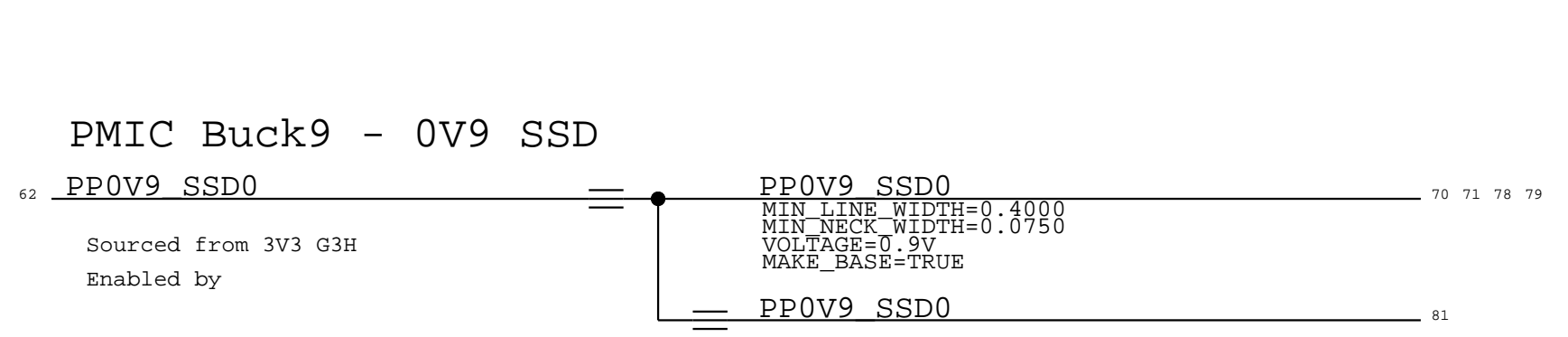
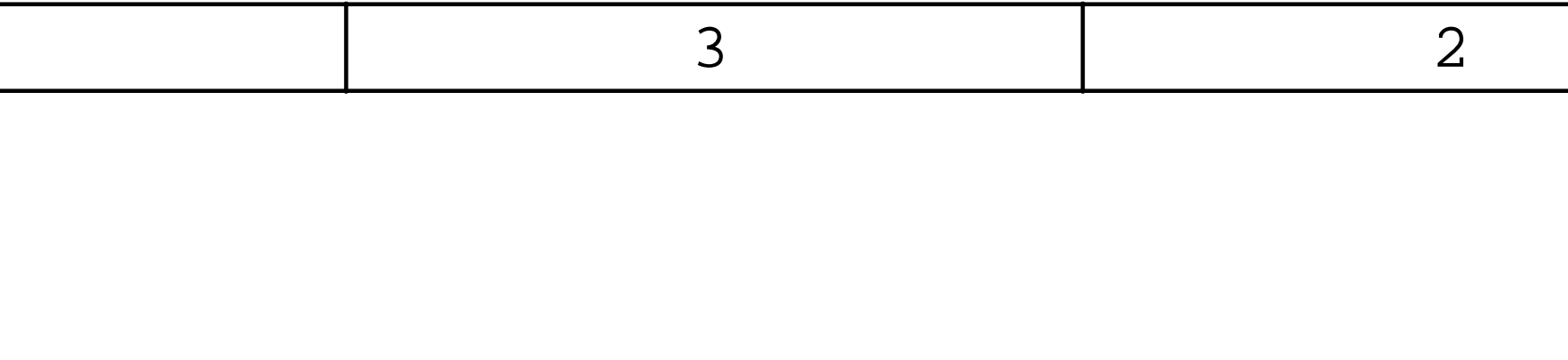
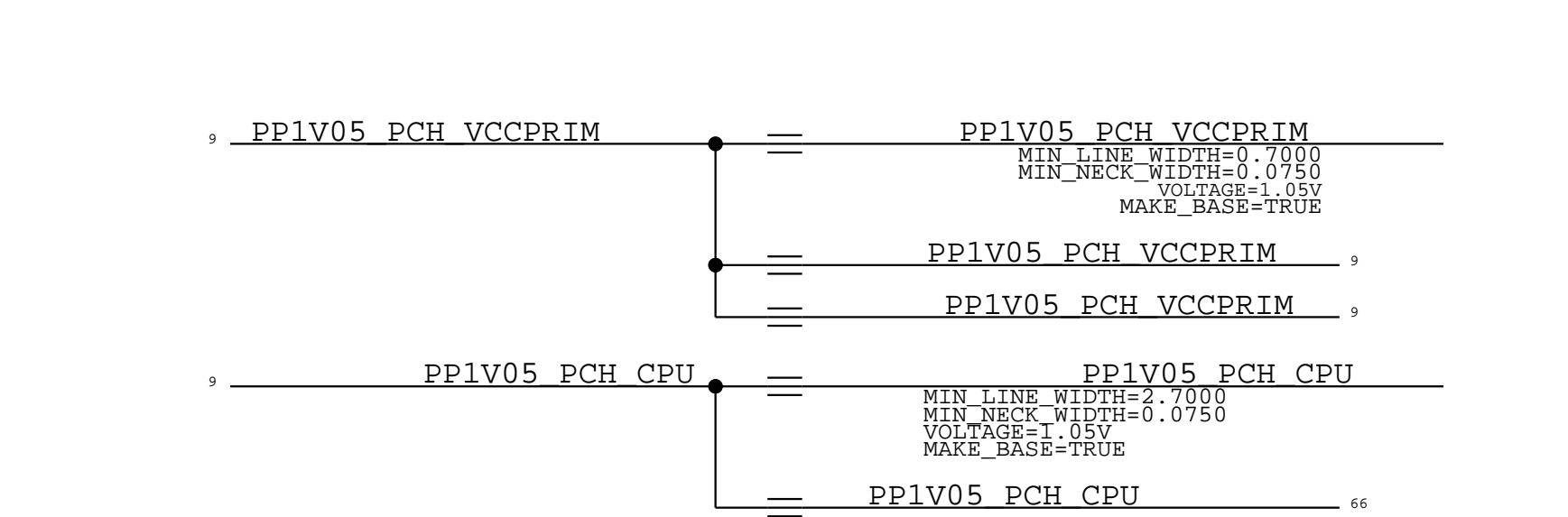
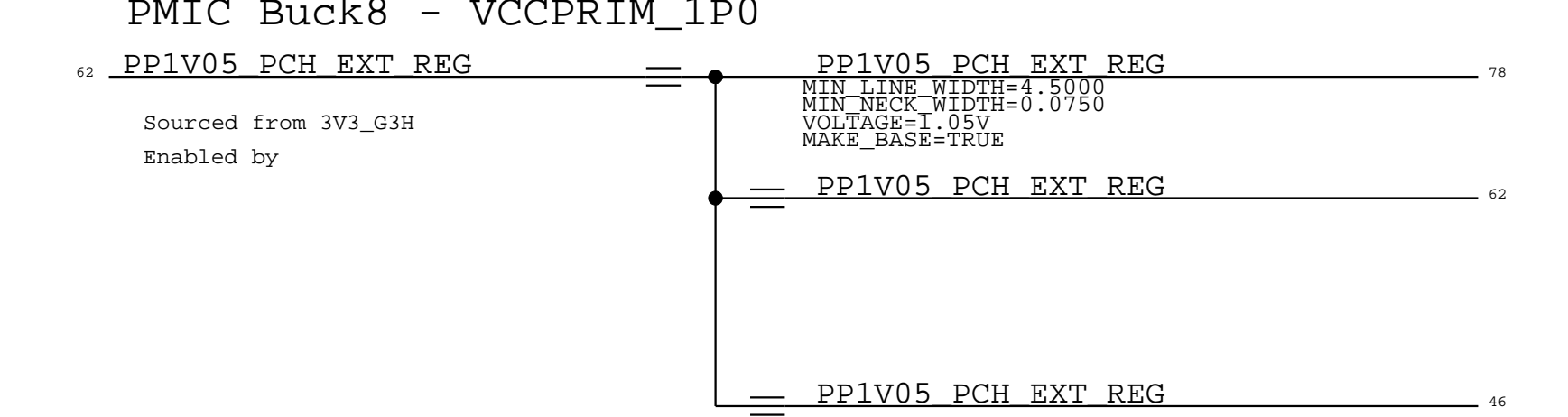
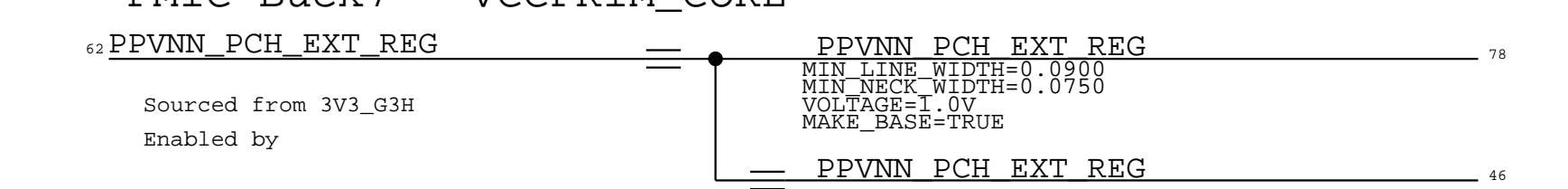
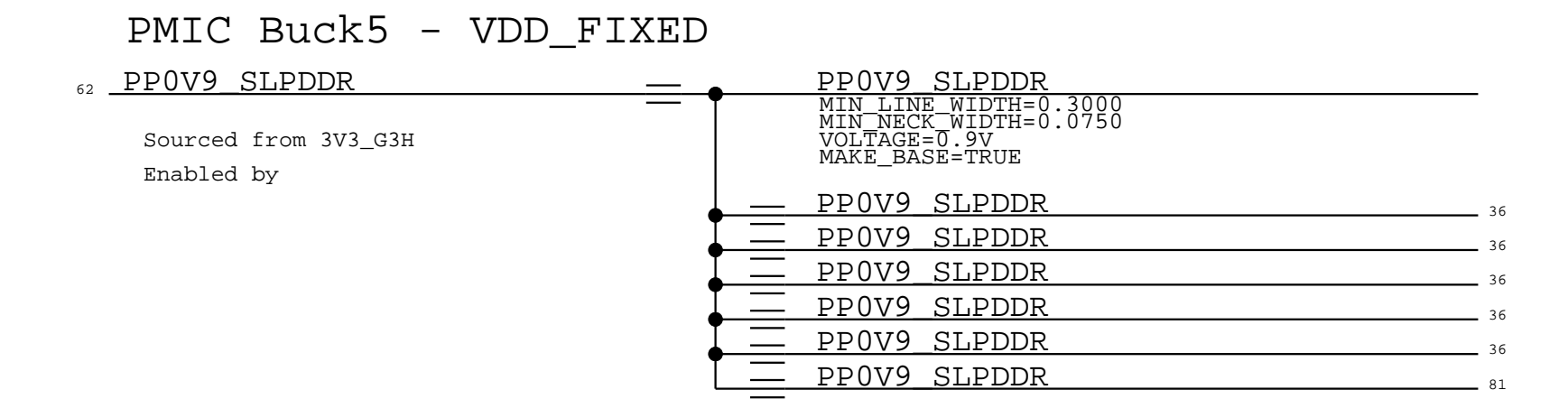
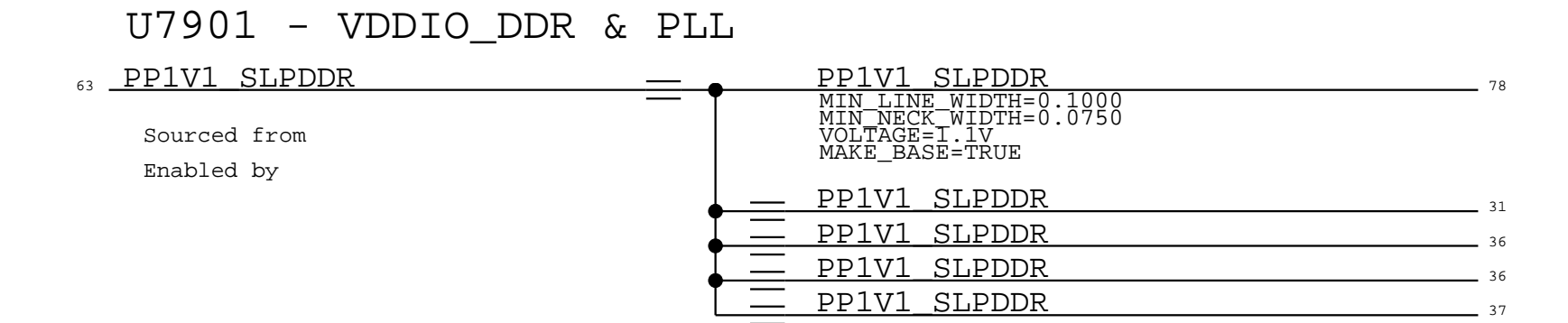
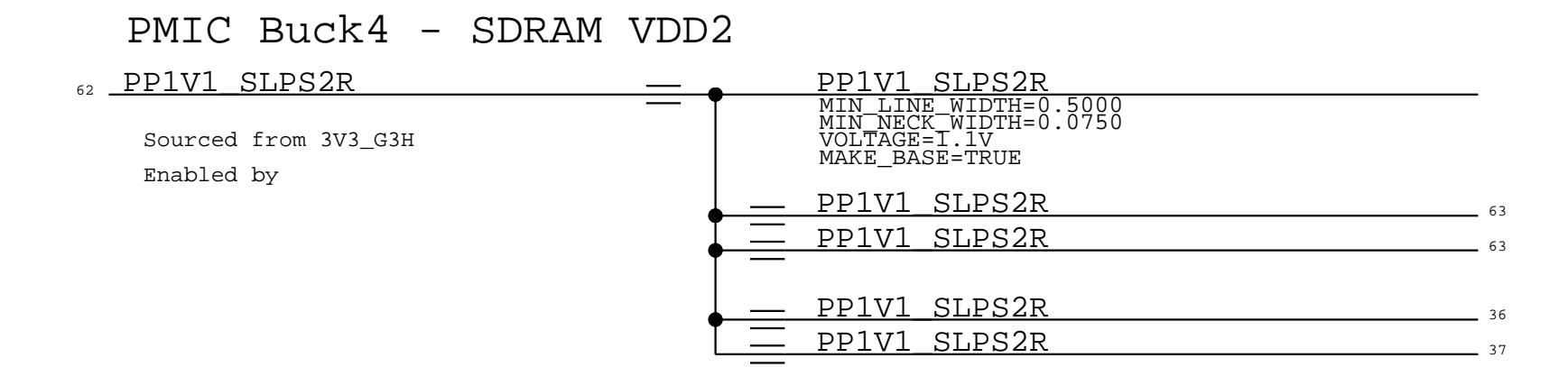
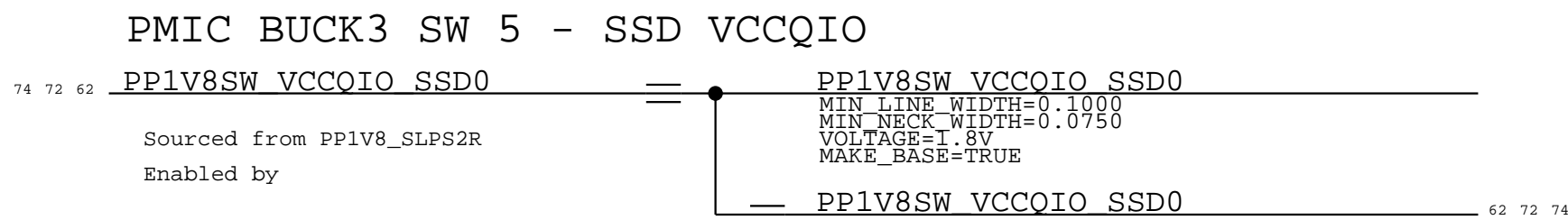
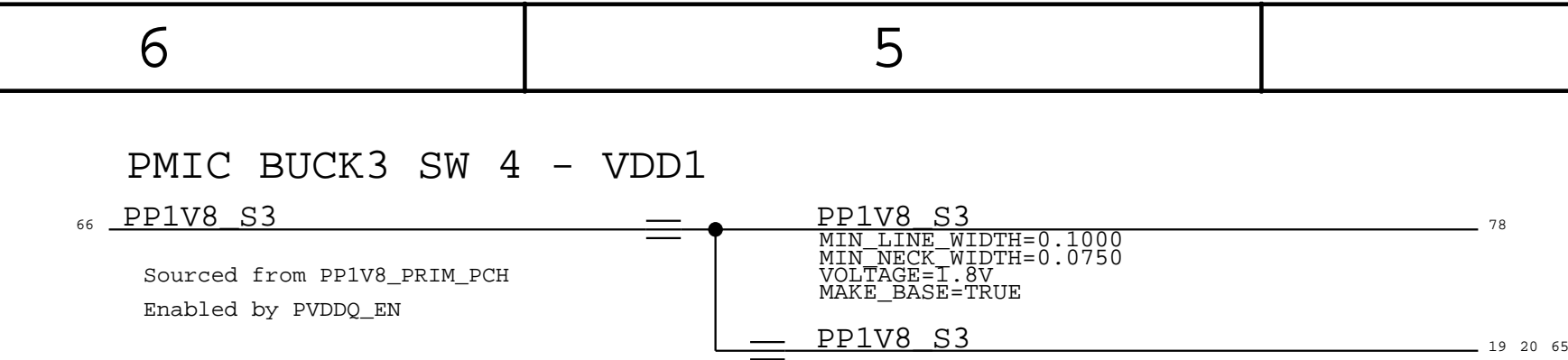
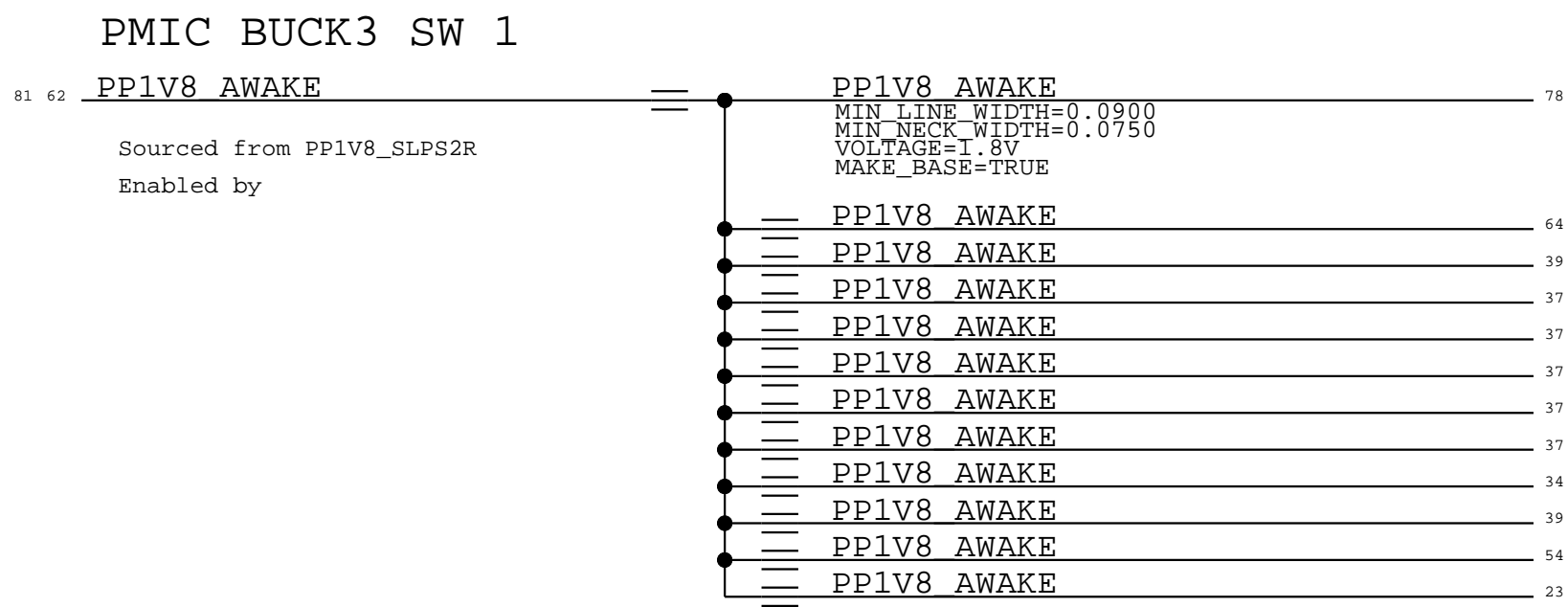
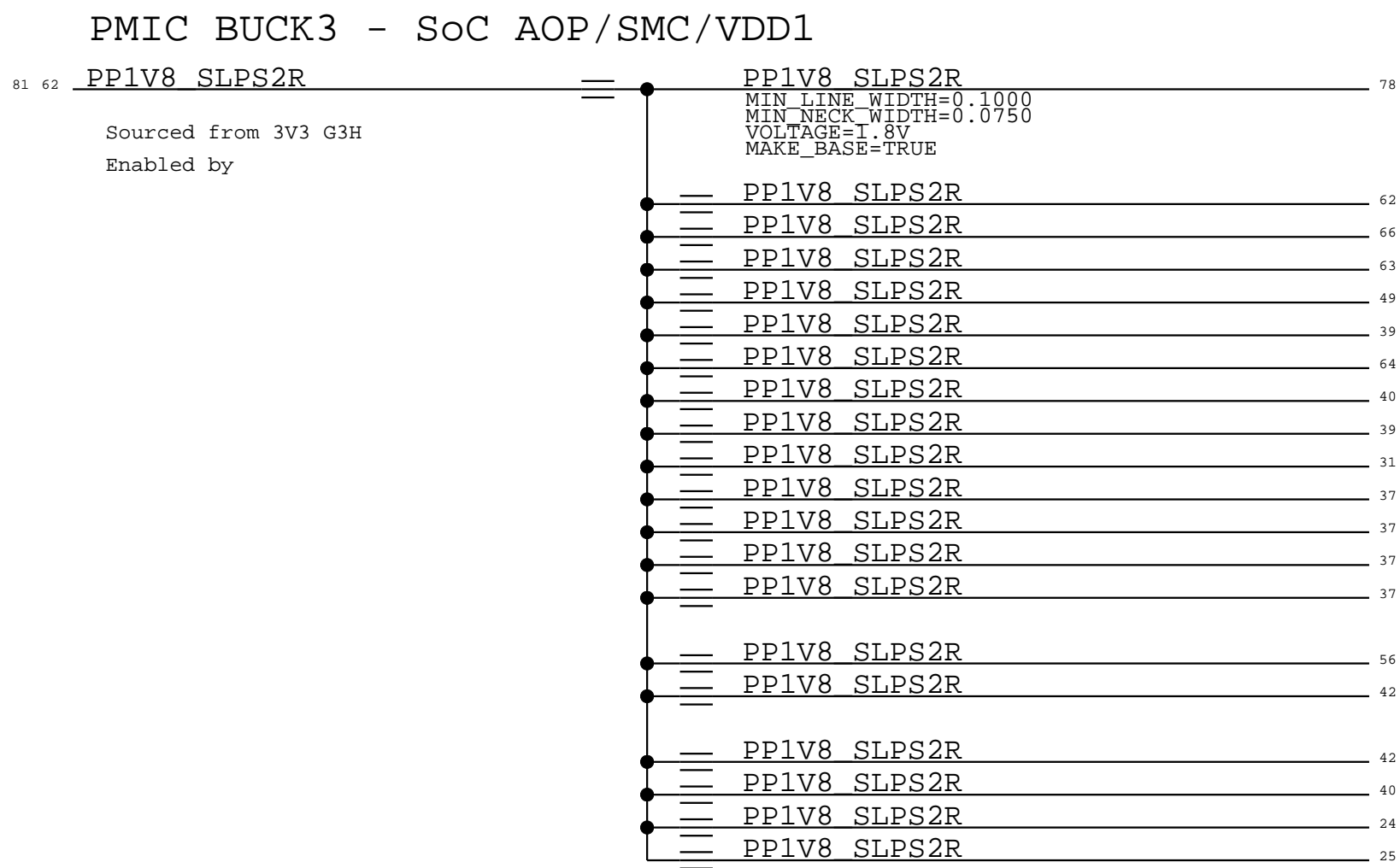
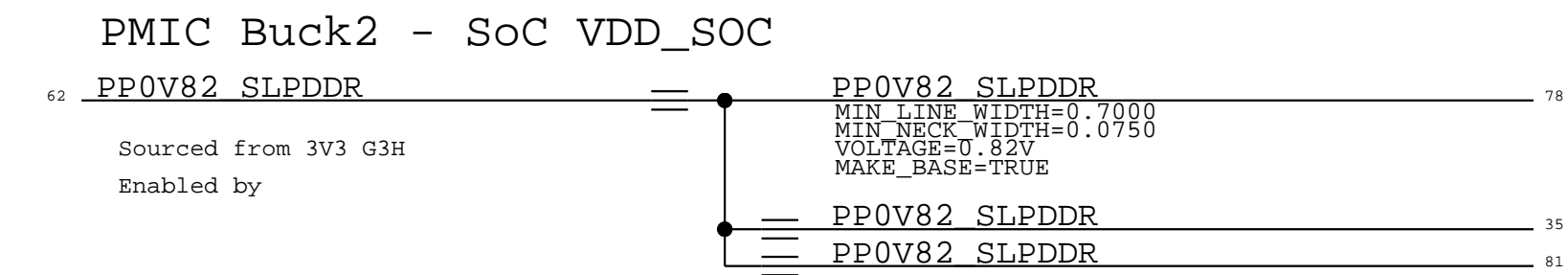
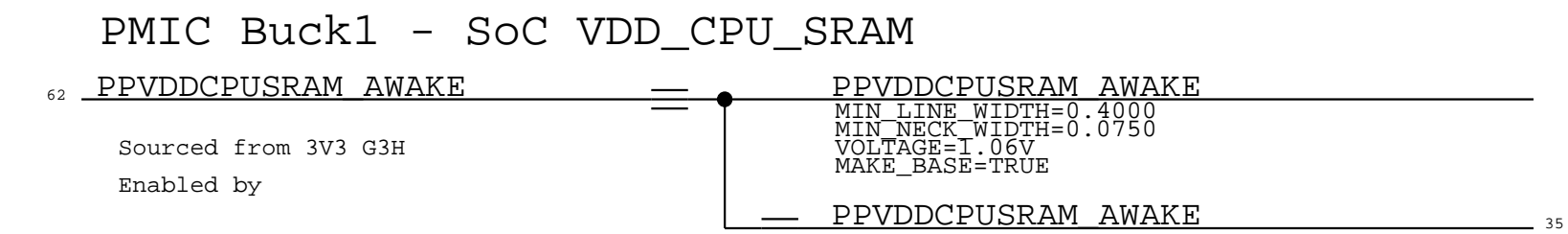
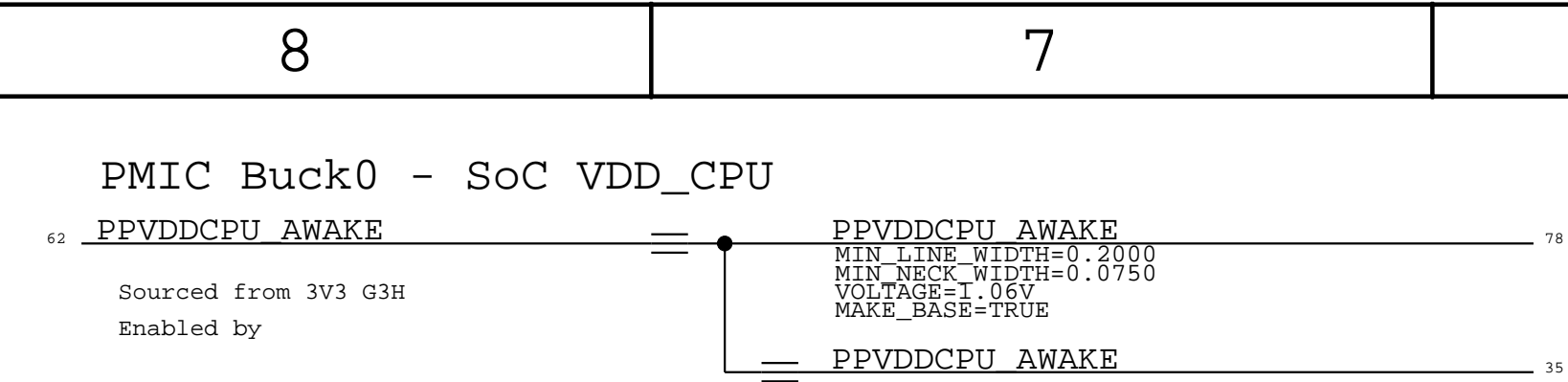


H SSD UART Test Points

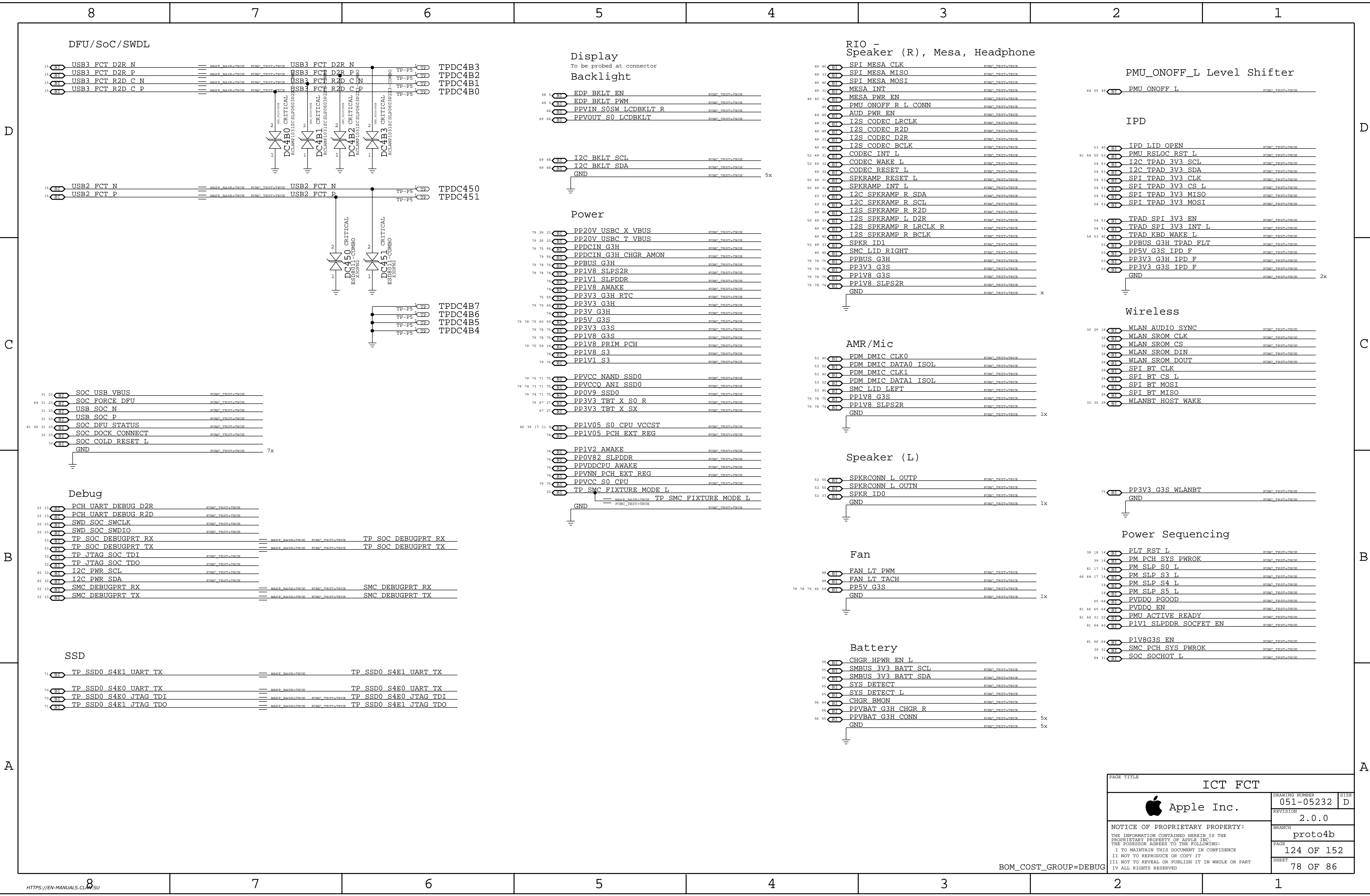


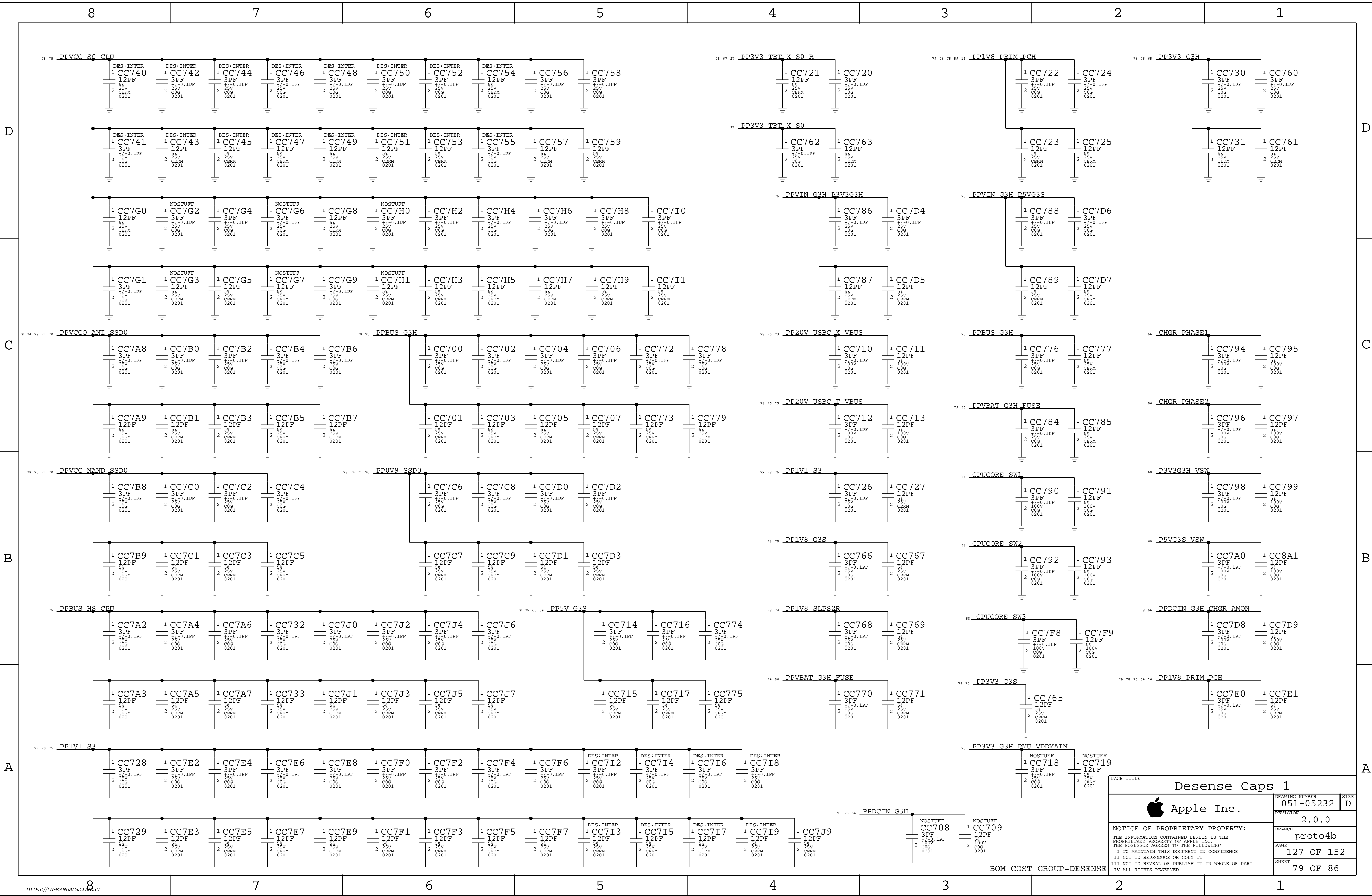
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SSD Support		
 Apple Inc.	DRAWING NUMBER	051-05232
	REVISION	2.0.0
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	PAGE	91 OF 152
	SHEET	73 OF 86

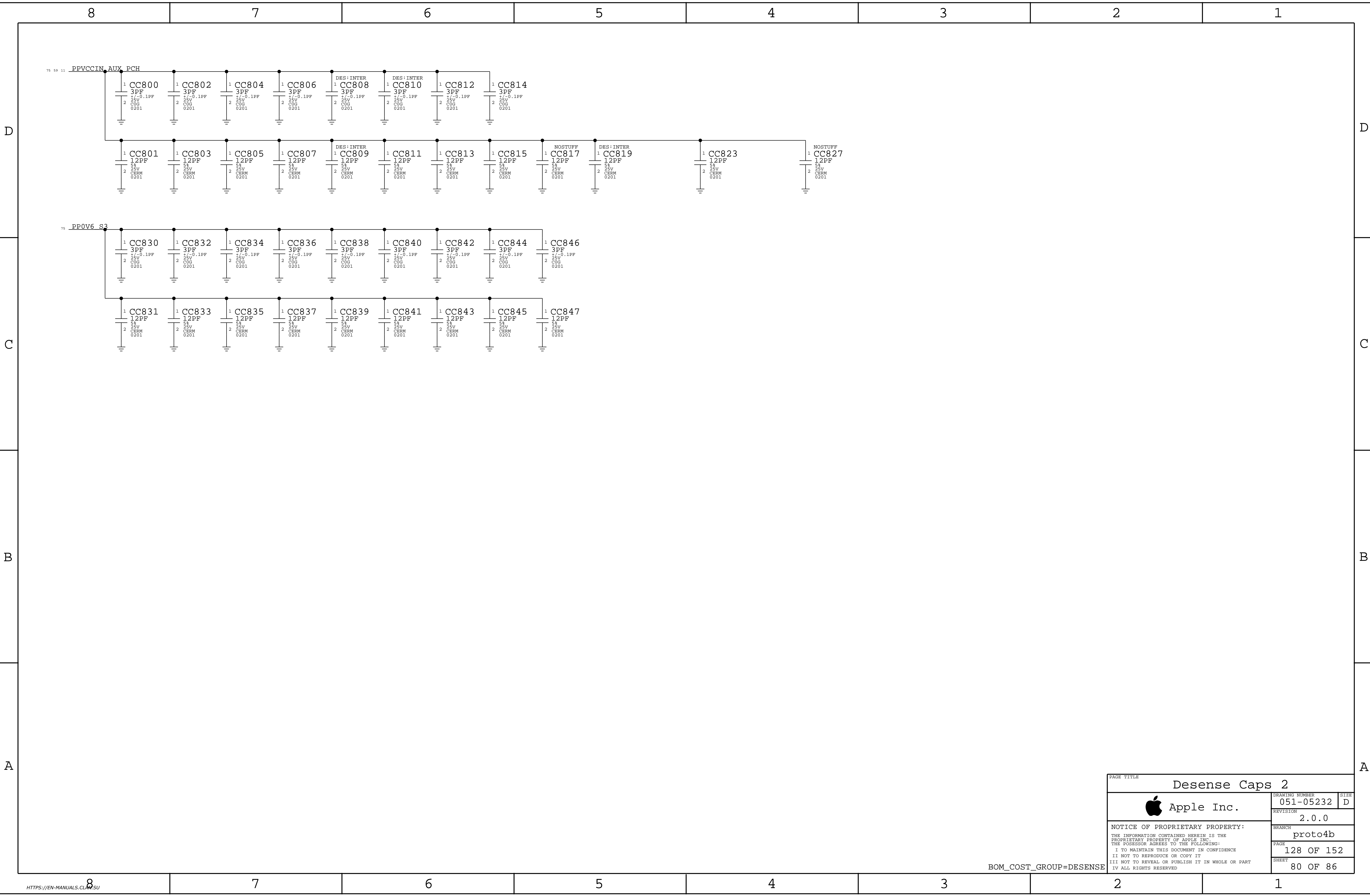
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[illegible]



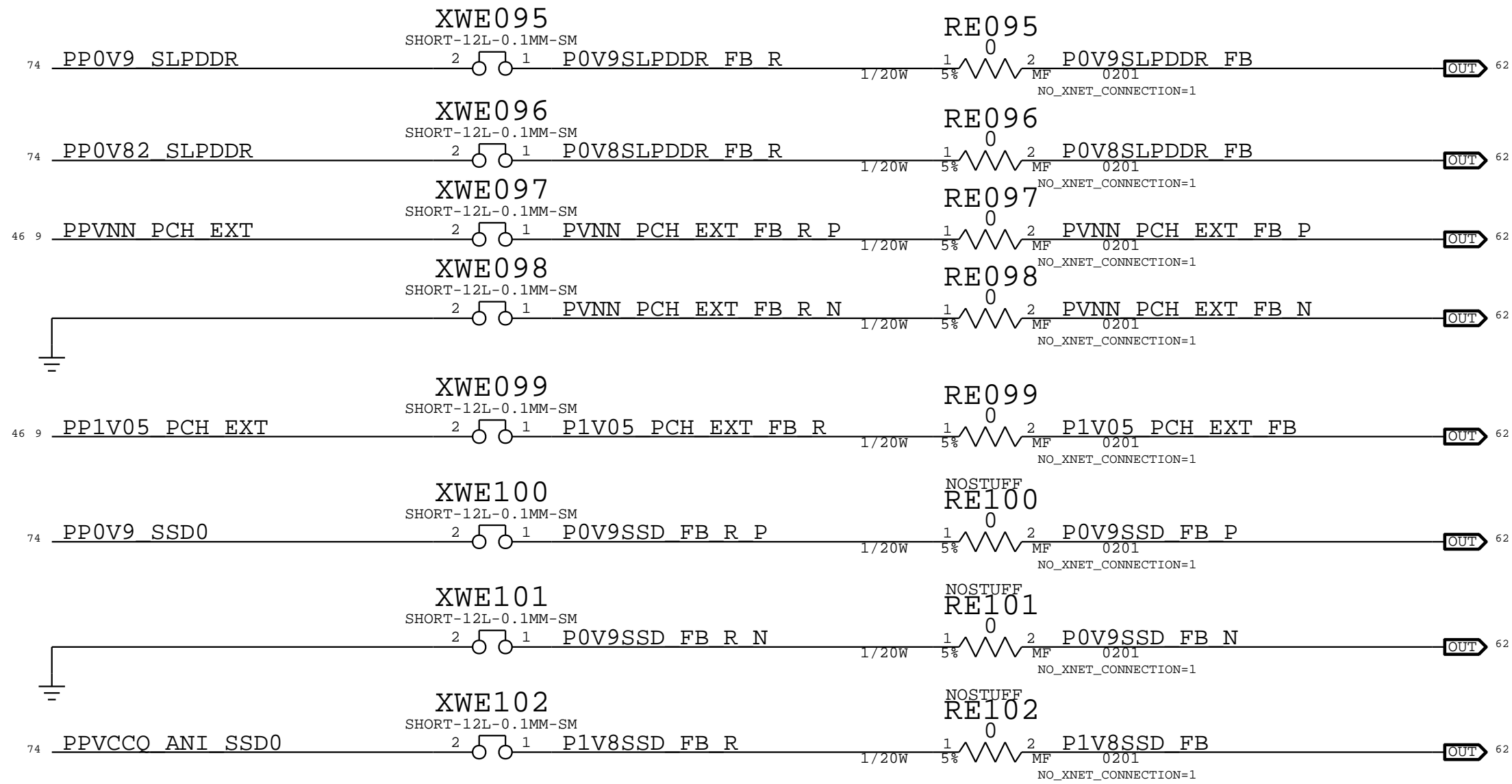




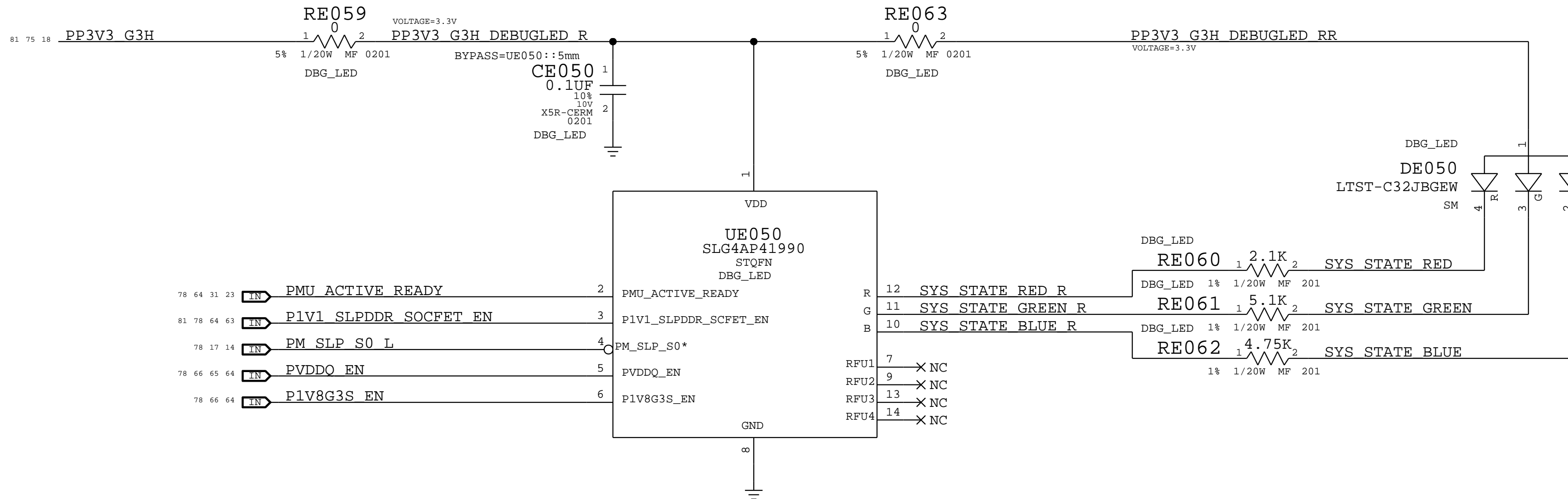
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	REVISION	2.0.0
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	PAGE	128 OF 152
	SHEET	80 OF 86

BOM_COST_GROUP=DESENSE

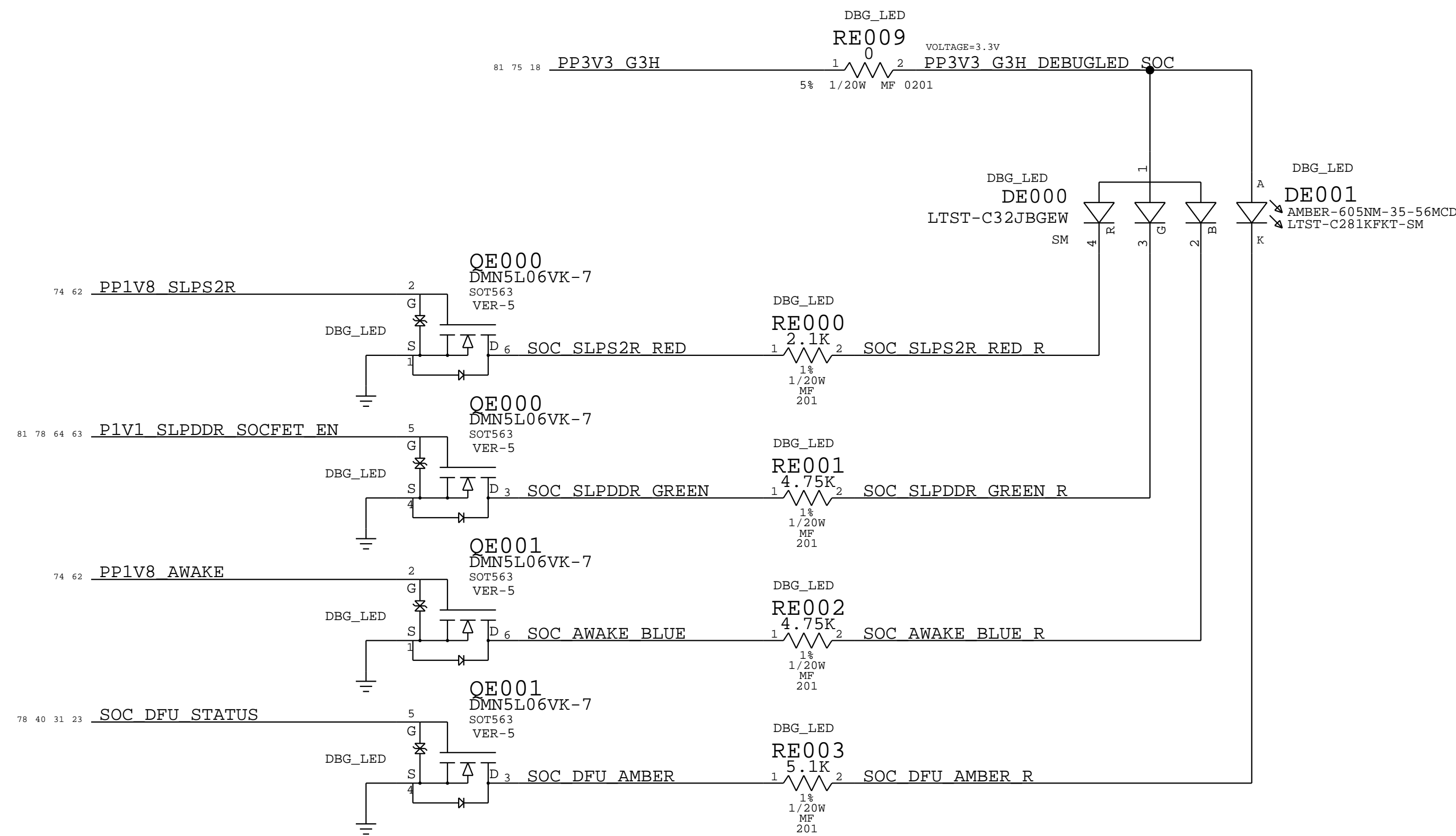
A Remote Sense Support



B System State LED



C SoC State LEDs



Inputs					Outputs			Color	State		
PMU ACT RDY	P1V1_SLPDDR SOCFET_EN	PM_SLP S0_L	PVDDQ EN	P1V8G3S EN	R	G	B		System	SoC	CPU
0	0	0	0	0	BLINK	OFF	OFF	Blinking Red	Shutdown (G3H)	OFF	OFF
0	0	0	0	1	ON	OFF	OFF	Red	Standby (G3S)	SLPS2R	OFF
1	1	0	0	1	ON	ON	OFF	Yellow	Standby (G3S)	AWAKE	OFF
0	0	0	1	1	ON	ON	ON	White	Sleep	SLPS2R	S0i
1	1	0	1	1	OFF	OFF	ON	Blue	Sleep	AWAKE	S0i
1	1	1	1	1	OFF	ON	OFF	Green	Sleep	AWAKE	S0i
1	1	0	0	0	BLINK	ON	OFF	Blinking Yellow & Green	Run	AWAKE	S0

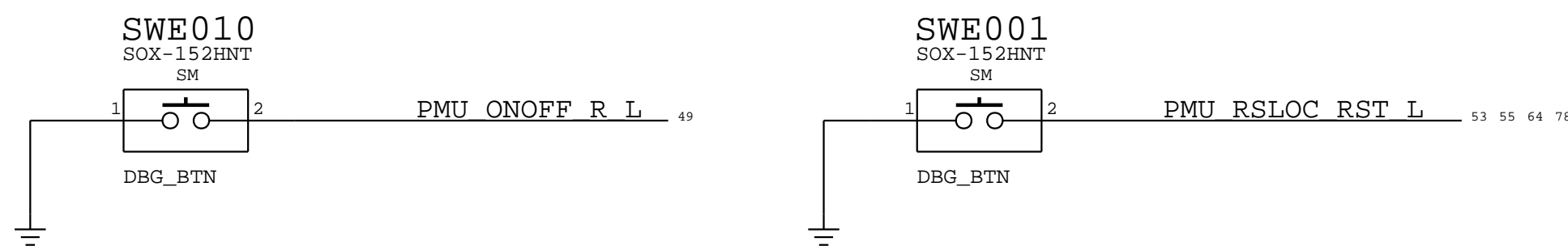
All other states are magenta

D System Power States

System State:	Shutdown (G3H)		Standby (G3S)		Standby (S4)		Sleep (S0i/S3)		Run (S0)	
	CPU/PCH State:		Off (RTC Only)		Standby		Sleep		Run	
Rails	SoC State:		S2R	Awake	S2R	Awake	S2R	Awake	S2R	Awake
PP*_S2R (0.8,1.1,1.8V)	On		On	On	On	On	On	On	On	On
PP*_DDR (0.8,0.9,1.1V)	Off		On	On	Off	On	Off	On	On	On
PP*_AWAKE (CPU,SRAM,1.2,1.8,3.3V)	Off		On	On	Off	On	Off	On	On	On
PP3V3_G3H (VR1)	On		On	On	On	On	On	On	On	On
PP1S_G3H	On		On	On	On	On	On	On	On	On
PP*_G3S (1.8,3.3,5V)	Off		On	On	On	On	On	On	On	On
PP*_S5 (1.8,3.3V)	Off		Off	Off	On	On	On	On	On	On
CPU/PCH VRs	Off		Off	Off	Off/On	Off/On	Off/On	Off/On	Off/On	On

- * System: Shutdown Awake is a transition state only.
- * SoC: SLP_DDR is a transition state only.
- * CPU/PCH: S4 is only used by desktops for USB wakes.
- * CPU/PCH: S5 is a transition state. May also be used for RTC wakes.

E Debug Buttons




SYNC_MASTER=X569_BIGSUR			SYNC_DATE=04/12/2017		
PAGE TITLE			Dev Support		
			DRAWING NUMBER	051-05232	SIZE
			REVISION	2.0.0	D
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			PAGE	140 OF 152	
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BOM_COST_GROUP=DEBUG

BOM Variants

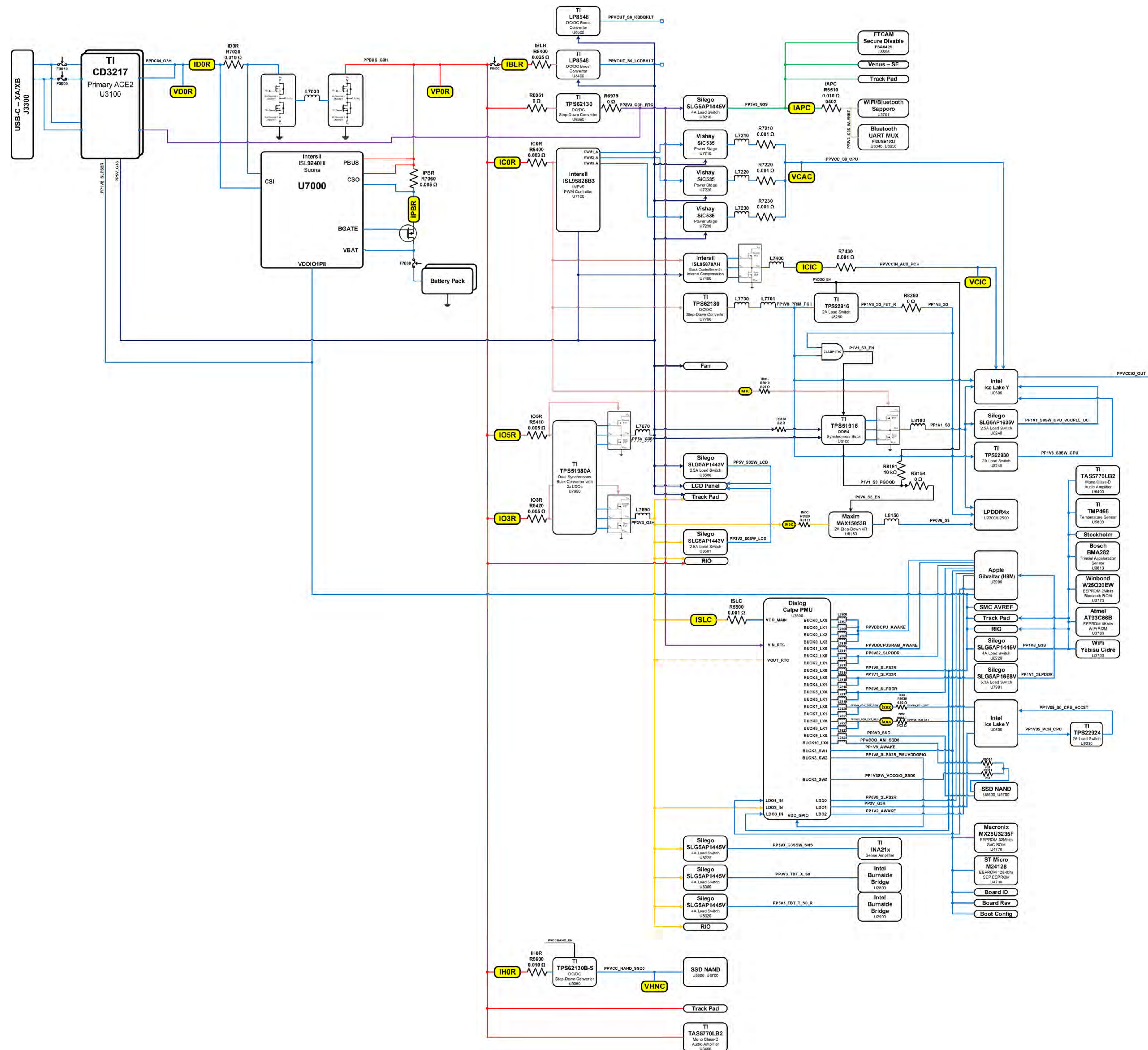
EEEE	BOM NUMBER	BOM NAME	BOM OPTIONS
N5MV	639-09000	PCBA,MLB-TKSB,GOOD,HY-8G,HY-128G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:HYNIX_R8B,NANDCFG:ITLC_S4E_128G_HY
MY53	639-08762	PCBA,MLB-TKSB,GOOD,HY-8G,SS-128G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:HYNIX_R8B,NANDCFG:ITLC_S4E_128G_SS
MY5G	639-08763	PCBA,MLB-TKSB,GOOD,HY-8G,TO-128G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:HYNIX_R8B,NANDCFG:ITLC_S4E_128G_TO
N5N6	639-09001	PCBA,MLB-TKSB,GOOD,MI-8G,HY-128G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:MICRON_R8B,NANDCFG:ITLC_S4E_128G_HY
MY5T	639-08764	PCBA,MLB-TKSB,GOOD,MI-8G,SS-128G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:MICRON_R8B,NANDCFG:ITLC_S4E_128G_SS
MY65	639-08765	PCBA,MLB-TKSB,GOOD,MI-8G,TO-128G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:MICRON_R8B,NANDCFG:ITLC_S4E_128G_TO
N5NK	639-09002	PCBA,MLB-TKSB,GOOD,SS-8G,HY-128G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:SAMSUNG_R8B,NANDCFG:ITLC_S4E_128G_HY
MY6J	639-08766	PCBA,MLB-TKSB,GOOD,SS-8G,SS-128G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:SAMSUNG_R8B,NANDCFG:ITLC_S4E_128G_SS
MY6W	639-08767	PCBA,MLB-TKSB,GOOD,SS-8G,TO-128G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:SAMSUNG_R8B,NANDCFG:ITLC_S4E_128G_TO
N5NX	639-09003	PCBA,MLB-TKSB,GOOD,HY-16G,HY-128G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_S4E_128G_HY
MY77	639-08768	PCBA,MLB-TKSB,GOOD,HY-16G,SS-128G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_S4E_128G_SS
MY7L	639-08769	PCBA,MLB-TKSB,GOOD,HY-16G,TO-128G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_S4E_128G_TO
N5P9	639-09004	PCBA,MLB-TKSB,GOOD,MI-16G,HY-128G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_S4E_128G_HY
MY7Y	639-08770	PCBA,MLB-TKSB,GOOD,MI-16G,SS-128G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_S4E_128G_SS
MY89	639-08771	PCBA,MLB-TKSB,GOOD,MI-16G,TO-128G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_S4E_128G_TO
N5PN	639-09005	PCBA,MLB-TKSB,GOOD,SS-16G,HY-128G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_S4E_128G_HY
MY8N	639-08772	PCBA,MLB-TKSB,GOOD,SS-16G,SS-128G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_S4E_128G_SS
MY91	639-08773	PCBA,MLB-TKSB,GOOD,SS-16G,TO-128G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_S4E_128G_TO
MY9D	639-08774	PCBA,MLB-TKSB,GOOD,HY-8G,HY-256G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:HYNIX_R8B,NANDCFG:ITLC_S4E_256G_HY
MY9Q	639-08775	PCBA,MLB-TKSB,GOOD,HY-8G,SD-256G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:HYNIX_R8B,NANDCFG:ITLC_S4E_256G_SD
MYC3	639-08776	PCBA,MLB-TKSB,GOOD,HY-8G,TO-256G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:HYNIX_R8B,NANDCFG:ITLC_S4E_256G_TO
MYCG	639-08777	PCBA,MLB-TKSB,GOOD,MI-8G,HY-256G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:MICRON_R8B,NANDCFG:ITLC_S4E_256G_HY
MYCT	639-08778	PCBA,MLB-TKSB,GOOD,MI-8G,SD-256G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:MICRON_R8B,NANDCFG:ITLC_S4E_256G_SD
MYD5	639-08779	PCBA,MLB-TKSB,GOOD,MI-8G,TO-256G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:MICRON_R8B,NANDCFG:ITLC_S4E_256G_TO
MYDJ	639-08780	PCBA,MLB-TKSB,GOOD,SS-8G,HY-256G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:SAMSUNG_R8B,NANDCFG:ITLC_S4E_256G_HY
MYDW	639-08781	PCBA,MLB-TKSB,GOOD,SS-8G,SD-256G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:SAMSUNG_R8B,NANDCFG:ITLC_S4E_256G_SD
MYF7	639-08782	PCBA,MLB-TKSB,GOOD,SS-8G,TO-256G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:SAMSUNG_R8B,NANDCFG:ITLC_S4E_256G_TO
MYFL	639-08783	PCBA,MLB-TKSB,GOOD,HY-16G,HY-256G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_S4E_256G_HY
MYFY	639-08784	PCBA,MLB-TKSB,GOOD,HY-16G,SD-256G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_S4E_256G_SD
MYG9	639-08785	PCBA,MLB-TKSB,GOOD,HY-16G,TO-256G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_S4E_256G_TO
MYGN	639-08786	PCBA,MLB-TKSB,GOOD,MI-16G,HY-256G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_S4E_256G_HY
MYH1	639-08787	PCBA,MLB-TKSB,GOOD,MI-16G,SD-256G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_S4E_256G_SD
MYHD	639-08788	PCBA,MLB-TKSB,GOOD,MI-16G,TO-256G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_S4E_256G_TO
MYHQ	639-08789	PCBA,MLB-TKSB,GOOD,SS-16G,HY-256G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_S4E_256G_HY
MYJ3	639-08790	PCBA,MLB-TKSB,GOOD,SS-16G,SD-256G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_S4E_256G_SD
MYJG	639-08791	PCBA,MLB-TKSB,GOOD,SS-16G,TO-256G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_S4E_256G_TO
MYK5	639-08792	PCBA,MLB-TKSB,GOOD,HY-8G,SD-512G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:HYNIX_R8B,NANDCFG:ITLC_S4E_512G_SD
MYKJ	639-08793	PCBA,MLB-TKSB,GOOD,HY-8G,TO-512G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:HYNIX_R8B,NANDCFG:ITLC_S4E_512G_TO
MYKW	639-08794	PCBA,MLB-TKSB,GOOD,MI-8G,SD-512G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:MICRON_R8B,NANDCFG:ITLC_S4E_512G_SD
MYL7	639-08795	PCBA,MLB-TKSB,GOOD,MI-8G,TO-512G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:MICRON_R8B,NANDCFG:ITLC_S4E_512G_TO
MYLL	639-08796	PCBA,MLB-TKSB,GOOD,SS-8G,SD-512G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:SAMSUNG_R8B,NANDCFG:ITLC_S4E_512G_SD
MYLY	639-08797	PCBA,MLB-TKSB,GOOD,SS-8G,TO-512G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:SAMSUNG_R8B,NANDCFG:ITLC_S4E_512G_TO
MYM9	639-08798	PCBA,MLB-TKSB,GOOD,HY-16G,SD-512G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_S4E_512G_SD
MYMN	639-08799	PCBA,MLB-TKSB,GOOD,HY-16G,TO-512G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_S4E_512G_TO
MYN1	639-08800	PCBA,MLB-TKSB,GOOD,MI-16G,SD-512G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_S4E_512G_SD
MYND	639-08801	PCBA,MLB-TKSB,GOOD,MI-16G,TO-512G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_S4E_512G_TO
MYNQ	639-08802	PCBA,MLB-TKSB,GOOD,SS-16G,SD-512G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_S4E_512G_SD
MYP3	639-08803	PCBA,MLB-TKSB,GOOD,SS-16G,TO-512G,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_S4E_512G_TO
MYPG	639-08804	PCBA,MLB-TKSB,GOOD,HY-8G,HY-1.0T,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:HYNIX_R8B,NANDCFG:ITLC_S4E_1P0T_HY
MYPT	639-08805	PCBA,MLB-TKSB,GOOD,HY-8G,SD-1.0T,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:HYNIX_R8B,NANDCFG:ITLC_S4E_1P0T_SD
MYQ5	639-08806	PCBA,MLB-TKSB,GOOD,MI-8G,HY-1.0T,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:MICRON_R8B,NANDCFG:ITLC_S4E_1P0T_HY
MYQJ	639-08807	PCBA,MLB-TKSB,GOOD,MI-8G,SD-1.0T,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:MICRON_R8B,NANDCFG:ITLC_S4E_1P0T_SD
MYQW	639-08808	PCBA,MLB-TKSB,GOOD,SS-8G,HY-1.0T,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:SAMSUNG_R8B,NANDCFG:ITLC_S4E_1P0T_HY
MYR7	639-08809	PCBA,MLB-TKSB,GOOD,SS-8G,SD-1.0T,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:SAMSUNG_R8B,NANDCFG:ITLC_S4E_1P0T_SD
MYRL	639-08810	PCBA,MLB-TKSB,GOOD,HY-16G,HY-1.0T,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_S4E_1P0T_HY
MYRY	639-08811	PCBA,MLB-TKSB,GOOD,HY-16G,SD-1.0T,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_S4E_1P0T_SD
MYT9	639-08812	PCBA,MLB-TKSB,GOOD,MI-16G,HY-1.0T,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_S4E_1P0T_HY
MYTN	639-08813	PCBA,MLB-TKSB,GOOD,MI-16G,SD-1.0T,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_S4E_1P0T_SD
MYV1	639-08814	PCBA,MLB-TKSB,GOOD,SS-16G,HY-1.0T,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_S4E_1P0T_HY
MYVR	639-08816	PCBA,MLB-TKSB,GOOD,SS-16G,SD-1.0T,X1783	CHN_PARTS_BOM.DEV_PARTS_BOM.ALTERNATE,CPU_ICLY:GOOD,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_S4E_1P0T_SD

EEEE	BOM NUMBER	BOM NAME	BOM OPTIONS
NRK3	639-09934	PCBA,MLB-TKSB,GOOD,HY-8G,HY-2.0T,X1783	CMN_PARTS_BOM,DEV_PARTS_BOM,ALTERNATE,CPU_ICLTY:GOOD,DRAMCPG:HYNIX_8GB,NANDCPG:ITLC_S48_2POT_HY
MYW4	639-08817	PCBA,MLB-TKSB,GOOD,HY-8G,SD-2.0T,X1783	CMN_PARTS_BOM,DEV_PARTS_BOM,ALTERNATE,CPU_ICLTY:GOOD,DRAMCPG:HYNIX_8GB,NANDCPG:ITLC_S48_2POT_SD
NRKG	639-09935	PCBA,MLB-TKSB,GOOD,MI-8G,HY-2.0T,X1783	CMN_PARTS_BOM,DEV_PARTS_BOM,ALTERNATE,CPU_ICLTY:GOOD,DRAMCPG:MICRON_8GB,NANDCPG:ITLC_S48_2POT_HY
MYWH	639-08818	PCBA,MLB-TKSB,GOOD,MI-8G,SD-2.0T,X1783	CMN_PARTS_BOM,DEV_PARTS_BOM,ALTERNATE,CPU_ICLTY:GOOD,DRAMCPG:MICRON_8GB,NANDCPG:ITLC_S48_2POT_SD
NRKT	639-09936	PCBA,MLB-TKSB,GOOD,SS-8G,HY-2.0T,X1783	CMN_PARTS_BOM,DEV_PARTS_BOM,ALTERNATE,CPU_ICLTY:GOOD,DRAMCPG:SAMSUNG_8GB,NANDCPG:ITLC_S48_2POT_HY
MYWV	639-08819	PCBA,MLB-TKSB,GOOD,SS-8G,SD-2.0T,X1783	CMN_PARTS_BOM,DEV_PARTS_BOM,ALTERNATE,CPU_ICLTY:GOOD,DRAMCPG:SAMSUNG_8GB,NANDCPG:ITLC_S48_2POT_SD
NRL5	639-09937	PCBA,MLB-TKSB,GOOD,HY-16G,HY-2.0T,X1783	CMN_PARTS_BOM,DEV_PARTS_BOM,ALTERNATE,CPU_ICLTY:GOOD,DRAMCPG:HYNIX_16GB,NANDCPG:ITLC_S48_2POT_HY
MYX6	639-08820	PCBA,MLB-TKSB,GOOD,HY-16G,SD-2.0T,X1783	CMN_PARTS_BOM,DEV_PARTS_BOM,ALTERNATE,CPU_ICLTY:GOOD,DRAMCPG:HYNIX_16GB,NANDCPG:ITLC_S48_2POT_SD
NRLJ	639-09938	PCBA,MLB-TKSB,GOOD,MI-16G,HY-2.0T,X1783	CMN_PARTS_BOM,DEV_PARTS_BOM,ALTERNATE,CPU_ICLTY:GOOD,DRAMCPG:MICRON_16GB,NANDCPG:ITLC_S48_2POT_HY
MYXK	639-08821	PCBA,MLB-TKSB,GOOD,MI-16G,SD-2.0T,X1783	CMN_PARTS_BOM,DEV_PARTS_BOM,ALTERNATE,CPU_ICLTY:GOOD,DRAMCPG:MICRON_16GB,NANDCPG:ITLC_S48_2POT_SD
NRLW	639-09939	PCBA,MLB-TKSB,GOOD,SS-16G,HY-2.0T,X1783	CMN_PARTS_BOM,DEV_PARTS_BOM,ALTERNATE,CPU_ICLTY:GOOD,DRAMCPG:SAMSUNG_16GB,NANDCPG:ITLC_S48_2POT_HY
MYXX	639-08822	PCBA,MLB-TKSB,GOOD,SS-16G,SD-2.0T,X1783	CMN_PARTS_BOM,DEV_PARTS_BOM,ALTERNATE,CPU_ICLTY:GOOD,DRAMCPG:SAMSUNG_16GB,NANDCPG:ITLC_S48_2POT_SD

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	<table><tr><th>PART NUMBER</th><th>ALTERNATE FOR PART NUMBER</th><th>BOM OPTION</th><th>REF DES</th><th>COMMENTS:</th></tr><tr><td>107S00033</td><td>107S00034</td><td></td><td>ALL</td><td>rdar:///problem/31026333</td></tr><tr><td>107S00076</td><td>107S00044</td><td></td><td>ALL</td><td>rdar:///problem/31026474</td></tr><tr><td>107S00139</td><td>107S00178</td><td></td><td>ALL</td><td>rdar:///problem/31026896</td></tr><tr><td>107S0248</td><td>107S0250</td><td></td><td>ALL</td><td>rdar:///problem/31026938</td></tr><tr><td>128S00087</td><td>128S00011</td><td></td><td>ALL</td><td>rdar:///problem/31104542</td></tr><tr><td>128S00026</td><td>128S00011</td><td></td><td>ALL</td><td>rdar:///problem/31104542</td></tr><tr><td>128S00031</td><td>128S00011</td><td></td><td>ALL</td><td>rdar:///problem/31104542</td></tr><tr><td>197S00120</td><td>197S00118</td><td></td><td>ALL</td><td>rdar:///problem/32474316</td></tr><tr><td>152S00368</td><td>152S00269</td><td></td><td>ALL</td><td>rdar:///problem/32986667</td></tr><tr><td>152S00786</td><td>152S00344</td><td></td><td>ALL</td><td>rdar:///problem/32988704</td></tr><tr><td>152S00785</td><td>152S00477</td><td></td><td>ALL</td><td>rdar:///problem/32989930</td></tr><tr><td>152S00182</td><td>152S00703</td><td></td><td>ALL</td><td>rdar:///problem/32989310</td></tr><tr><td>128S0364</td><td>128S0264</td><td></td><td>ALL</td><td>rdar:///problem/32981497</td></tr><tr><td>128S00039</td><td>128S00038</td><td></td><td>ALL</td><td>rdar:///problem/32984088</td></tr><tr><td>128S0302</td><td>128S00038</td><td></td><td>ALL</td><td>rdar:///problem/32984088</td></tr><tr><td>128S0631</td><td>128S0352</td><td></td><td>ALL</td><td>rdar:///problem/32984967</td></tr><tr><td>152S00734</td><td>152S00730</td><td></td><td>ALL</td><td>rdar:///problem/32986265</td></tr><tr><td>107S00029</td><td>107S00087</td><td></td><td>ALL</td><td>rdar:///problem/33006830</td></tr><tr><td>376S00227</td><td>376S00203</td><td></td><td>ALL</td><td>rdar:///problem/32990227</td></tr><tr><td>376S00204</td><td>376S00203</td><td></td><td>ALL</td><td>rdar:///problem/32990227</td></tr><tr><td>376S00226</td><td>376S00203</td><td></td><td>ALL</td><td>rdar:///problem/32990227</td></tr><tr><td>152S00800</td><td>152S00268</td><td></td><td>ALL</td><td>rdar:///problem/32986455</td></tr><tr><td>128S0445</td><td>128S0436</td><td></td><td>ALL</td><td>rdar:///problem/32981936</td></tr><tr><td>128S0392</td><td>128S0436</td><td></td><td>ALL</td><td>rdar:///problem/32981936</td></tr><tr><td>128S00042</td><td>128S0311</td><td></td><td>ALL</td><td>rdar:///problem/32982452</td></tr><tr><td>128S00043</td><td>128S0311</td><td></td><td>ALL</td><td>rdar:///problem/32982452</td></tr><tr><td>128S0329</td><td>128S0311</td><td></td><td>ALL</td><td>rdar:///problem/32982452</td></tr><tr><td>128S00058</td><td>128S00098</td><td></td><td>ALL</td><td>rdar:///problem/32983704</td></tr><tr><td>376S00007</td><td>376S1179</td><td></td><td>ALL</td><td>rdar:///problem/33006121</td></tr><tr><td>376S00228</td><td>376S1179</td><td></td><td>ALL</td><td>rdar:///problem/33006121</td></tr><tr><td>138S00084</td><td>138S00060</td><td></td><td>ALL</td><td>rdar:///problem/31227858</td></tr><tr><td>197S00047</td><td>197S00036</td><td></td><td>ALL</td><td>rdar:///problem/31509365</td></tr><tr><td>197S00048</td><td>197S00036</td><td></td><td>ALL</td><td>rdar:///problem/31509365</td></tr><tr><td>197S00046</td><td>197S00036</td><td></td><td>ALL</td><td>rdar:///problem/31509365</td></tr><tr><td>311S00060</td><td>311S0273</td><td></td><td>ALL</td><td>rdar:///problem/31512477</td></tr><tr><td>138S1101</td><td>138S0738</td><td></td><td>ALL</td><td>rdar:///problem/31491081</td></tr><tr><td>371S00180</td><td>371S00077</td><td></td><td>ALL</td><td>rdar:///problem/31927114</td></tr><tr><td>138S00049</td><td>138S0831</td><td></td><td>ALL</td><td>rdar:///problem/31284882</td></tr><tr><td>138S00109</td><td>138S0914</td><td></td><td>ALL</td><td>rdar:///problem/46640234</td></tr><tr><td>138S00291</td><td>138S0835</td><td></td><td>ALL</td><td>rdar:///problem/48092454</td></tr><tr><td>138S00181</td><td>138S0835</td><td></td><td>ALL</td><td>rdar:///problem/48092454</td></tr><tr><td>353S01320</td><td>353S01346</td><td></td><td>ALL</td><td>rdar:///problem/48088900</td></tr><tr><td>132S00229</td><td>132S00010</td><td></td><td>ALL</td><td>rdar:///problem/47305238</td></tr><tr><td>353S4376</td><td>353S3384</td><td></td><td>ALL</td><td>rdar:///problem/48089312</td></tr><tr><td>371S00220</td><td>371S00181</td><td></td><td>ALL</td><td>rdar:///problem/48058127</td></tr></table>	PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:	107S00033	107S00034		ALL	rdar:///problem/31026333	107S00076	107S00044		ALL	rdar:///problem/31026474	107S00139	107S00178		ALL	rdar:///problem/31026896	107S0248	107S0250		ALL	rdar:///problem/31026938	128S00087	128S00011		ALL	rdar:///problem/31104542	128S00026	128S00011		ALL	rdar:///problem/31104542	128S00031	128S00011		ALL	rdar:///problem/31104542	197S00120	197S00118		ALL	rdar:///problem/32474316	152S00368	152S00269		ALL	rdar:///problem/32986667	152S00786	152S00344		ALL	rdar:///problem/32988704	152S00785	152S00477		ALL	rdar:///problem/32989930	152S00182	152S00703		ALL	rdar:///problem/32989310	128S0364	128S0264		ALL	rdar:///problem/32981497	128S00039	128S00038		ALL	rdar:///problem/32984088	128S0302	128S00038		ALL	rdar:///problem/32984088	128S0631	128S0352		ALL	rdar:///problem/32984967	152S00734	152S00730		ALL	rdar:///problem/32986265	107S00029	107S00087		ALL	rdar:///problem/33006830	376S00227	376S00203		ALL	rdar:///problem/32990227	376S00204	376S00203		ALL	rdar:///problem/32990227	376S00226	376S00203		ALL	rdar:///problem/32990227	152S00800	152S00268		ALL	rdar:///problem/32986455	128S0445	128S0436		ALL	rdar:///problem/32981936	128S0392	128S0436		ALL	rdar:///problem/32981936	128S00042	128S0311		ALL	rdar:///problem/32982452	128S00043	128S0311		ALL	rdar:///problem/32982452	128S0329	128S0311		ALL	rdar:///problem/32982452	128S00058	128S00098		ALL	rdar:///problem/32983704	376S00007	376S1179		ALL	rdar:///problem/33006121	376S00228	376S1179		ALL	rdar:///problem/33006121	138S00084	138S00060		ALL	rdar:///problem/31227858	197S00047	197S00036		ALL	rdar:///problem/31509365	197S00048	197S00036		ALL	rdar:///problem/31509365	197S00046	197S00036		ALL	rdar:///problem/31509365	311S00060	311S0273		ALL	rdar:///problem/31512477	138S1101	138S0738		ALL	rdar:///problem/31491081	371S00180	371S00077		ALL	rdar:///problem/31927114	138S00049	138S0831		ALL	rdar:///problem/31284882	138S00109	138S0914		ALL	rdar:///problem/46640234	138S00291	138S0835		ALL	rdar:///problem/48092454	138S00181	138S0835		ALL	rdar:///problem/48092454	353S01320	353S01346		ALL	rdar:///problem/48088900	132S00229	132S00010		ALL	rdar:///problem/47305238	353S4376	353S3384		ALL	rdar:///problem/48089312	371S00220	371S00181		ALL	rdar:///problem/48058127	Alternates	Alternates	Alternates	Alternates	Alternates	Alternates	Alternates
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Power Supply Sub-System



Power Block Diagram



Apple Inc.

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