

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
4	0021221844	ENGINEERING RELEASED		2019-12-06

## THE KEYBOARD STRIKES BACK!


LAST\_MODIFICATION=Fri Dec 6 19:16:49 2019

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21	28	USB-C HIGH SPEED X (REAR)	CPU_CARD_ICL_Y	06/08/2018	71	87	S4E<1>	j213	09/27/2018
22	29	USB-C HIGH SPEED T (FRONT)	CPU_CARD_ICL_Y	06/08/2018	72	90	NAND VCC VR	psm	10/18/2018
23	30	USB-C Support	CPU_CARD_ICL_Y	06/08/2018	73	91	SSD Support		
24	31	USB-C PORT CONTROLLER X (REAR)	CPU_CARD_ICL_Y	06/08/2018	74	120	Power Aliases - 1	X589_CPU_CNL_Y	02/21/2017
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31	39	SoC GPIO/SEP/USB/DDR/Test	X589_BIGSUR	03/15/2017	81	140	Dev Support	X589_BIGSUR	04/12/2017
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33	41	SoC ISP/I2C/UART/SPI/I2S	X589_BIGSUR	03/15/2017	83	142	BOM Variants 2		
34	42	SoC PCIe	X589_BIGSUR	03/15/2017	84	143	BOM Variants 3		
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40	48	SoC Project Support	X589_BIGSUR	02/13/2017					
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43	53	I2C Connections 2	X589_BIGSUR	02/13/2017					
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45	55	Power Sensors Load Side	X1032_MLB_P4BP	02/14/2017					
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47	58	Thermal Sensors	X1032_MLB_P4BP	02/14/2017					
48	60	Fans	X1032_MLB_P4BP	02/13/2017					
49	61	RIO Connector							
50	64	Audio Speaker Amplifiers	AHAAGE_AUD	05/23/2017					

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
051-05232	1	SCH_MLB-TKSB,X1783	SCH	CRITICAL	SCHM
820-01958	1	PCBP_MLB-TKSB,X1783	MLB	CRITICAL	PCBP

J230GHUB = [https://github.pie.apple.com/MobileMacIxi/j230\\_hw/blob/master/](https://github.pie.apple.com/MobileMacIxi/j230_hw/blob/master/)

RULER_RULE_SET=RIGID_2016				MANUFACTURING CONFIGURATION				TABLE_REV_NUMBER=1	
DIELECTRIC BASED SPACING RULES				DEFAULT SPACING MULTIPLES		VOID SPACE RATIO			
MULTIPLES		SMDPIN MAX(UM)	MVIA MAX(UM)	SMDPIN2SMDPIN MAX(UM)	1	2			
1,1.5,1.75,2.6,2-7,7.5,8,9,10		80	80	80					
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			

DRAWING TITLE				SCHEM,MLB-TKSB,X1783			
 Apple Inc.		DRAWING NUMBER	051-05232	STEP	D		
		REVISION	4.0.0				
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Module Parts

CPU

Table with columns: PART#, QTY, DESCRIPTION, REFERENCE DESIGNATOR(S), CRITICAL, BOM OPTION. Lists various CPU components like CPU\_ICL-19, CPU\_ICL-19, INTERPOSER, etc.

NOTE: BEDRE is Danish for BETTER.

TBT Burnside Bridge

Table with columns: PART#, QTY, DESCRIPTION, REFERENCE DESIGNATOR(S), CRITICAL, BOM OPTION. Lists TBT Burnside Bridge components like IC\_BURNBRIDGE, etc.

Ace2

Table with columns: PART#, QTY, DESCRIPTION, REFERENCE DESIGNATOR(S), CRITICAL, BOM OPTION. Lists Ace2 components like IC\_C03211, etc.

SOC

Table with columns: PART#, QTY, DESCRIPTION, REFERENCE DESIGNATOR(S), CRITICAL, BOM OPTION. Lists SOC components like POP\_C18AALTA8, etc.

Table with columns: PART#, QTY, DESCRIPTION, REFERENCE DESIGNATOR(S), CRITICAL, BOM OPTION. Lists SOC components like POP\_C18AALTA8, etc.

DRAM

Table with columns: PART#, QTY, DESCRIPTION, REFERENCE DESIGNATOR(S), CRITICAL, BOM OPTION. Lists DRAM components like IC\_L1P0D8X, etc.

NAND - Landing 0

Table with columns: PART#, QTY, DESCRIPTION, REFERENCE DESIGNATOR(S), CRITICAL, BOM OPTION. Lists NAND components like NAND\_10V4, NAND\_10V4, NAND\_10V4, etc.

NAND - Landing 1

Table with columns: PART#, QTY, DESCRIPTION, REFERENCE DESIGNATOR(S), CRITICAL, BOM OPTION. Lists NAND components like NAND\_10V4, NAND\_10V4, NAND\_10V4, etc.

Programmables

TBT ROM

Table with columns: PART#, QTY, DESCRIPTION, REFERENCE DESIGNATOR(S), CRITICAL, BOM OPTION. Lists TBT ROM components like IC\_EFI, ROM\_TBT, etc.

BT ROM

Table with columns: PART#, QTY, DESCRIPTION, REFERENCE DESIGNATOR(S), CRITICAL, BOM OPTION. Lists BT ROM components like IC\_EFI, ROM\_BT, etc.

WiFi ROM

Table with columns: PART#, QTY, DESCRIPTION, REFERENCE DESIGNATOR(S), CRITICAL, BOM OPTION. Lists WiFi ROM components like IC\_LEOPON, IC\_XIPFI, etc.

SOC ROM

Table with columns: PART#, QTY, DESCRIPTION, REFERENCE DESIGNATOR(S), CRITICAL, BOM OPTION. Lists SOC ROM components like IC\_FLASH, etc.

PMU

Table with columns: PART#, QTY, DESCRIPTION, REFERENCE DESIGNATOR(S), CRITICAL, BOM OPTION. Lists PMU components like IC\_PMU, etc.

Wireless

Table with columns: PART#, QTY, DESCRIPTION, REFERENCE DESIGNATOR(S), CRITICAL, BOM OPTION. Lists Wireless components like MODULE\_WIFI, etc.

BOM Configuration header with Apple logo, drawing number 051-05232, revision 4.0.0, and page 2 of 152.

## BOM Groups

BOM GROUP	BOM OPTIONS
MLB_COMMON	SCHEM,PCBF,ALTERNATE,COMMON,MLB_PROGPARTS,MLB_USBC,MLB_POWER,MLB_WIRELESS,MLB_MECH,MLB_MISC,MLB_TBT,MLB_TBT_OPTS,RR
MLB_USBC	TBT_BB:PRQA1,ACE2:B12_BGA
MLB_PROGPARTS	BT_ROM:RR,SOC_ROM:BLANK,TBT_ROM:RR,WIFI_ROM:RR,SE:PROD_SW_N
MLB_POWER	PMU:A0_A
MLB_WIRELESS	WIRELESS:P1B
MLB_MECH	BRACKET,SHLD_CAN_DRAM,SHLD_CAN_BSB,SHLD_FNC_SOC
MLB_MISC	BOARDID0,BOARDID1,BOARDID2,BOARDID3,BOARDID4,BOARDID5,SYSDT:FET,BOOTCFG0,RAMCFG3_L,RAMCFG4_L
MLB_TBT	BSB_X_PWR:SWSW_VOUTLV,BSB_T_PWR:SWSW_VOUTLV,BSB_PERST:PLTRST
MLB_TBT_OPTS	BSB_FORCE_PWR:ACE
MLB_DESENSE	DES:INTER
MLB_CPUCFG	CPUCFG:STRAPS

See <rdar://problem/50175583> for BOARDID straps  
[https://confluence.sd.apple.com/display/EMBEDDEDPLATFORM/BOARD\\_ID+Allocation](https://confluence.sd.apple.com/display/EMBEDDEDPLATFORM/BOARD_ID+Allocation)

## Build Specific Groups

BOM GROUP	BOM OPTIONS
PROTO4A	BOARDREV0,SENSORS:DEV
PROTO4B	BOARDREV1,SENSORS:DEV
EVT	BOARDREV1,BOARDREV0,SENSORS:DEV
RR	BOARDREV2,SENSORS:PROD

## NAND Configs

BOM GROUP	BOM OPTIONS
NANDCFG:ITLC_S4E_128G_HY	NAND_L0:ITLC_128G_HY,NAND_L1:ITLC_128G_HY,SOC:B0_1G_PROD,S4E,SSD_PWR:S4E
NANDCFG:ITLC_S4E_128G_TO	NAND_L0:ITLC_128G_TO,NAND_L1:ITLC_128G_TO,SOC:B0_1G_PROD,S4E,SSD_PWR:S4E
NANDCFG:ITLC_S4E_128G_SS	NAND_L0:ITLC_128G_SS,NAND_L1:ITLC_128G_SS,SOC:B0_1G_PROD,S4E,SSD_PWR:S4E
NANDCFG:ITLC_S4E_256G_TO	NAND_L0:ITLC_256G_TO_PROD,NAND_L1:ITLC_256G_TO_PROD,SOC:B0_1G_PROD,S4E,SSD_PWR:S4E
NANDCFG:ITLC_S4E_256G_SD	NAND_L0:ITLC_256G_SD,NAND_L1:ITLC_256G_SD,SOC:B0_1G_PROD,S4E,SSD_PWR:S4E
NANDCFG:ITLC_S4E_256G_HY	NAND_L0:ITLC_256G_HY_PROD,NAND_L1:ITLC_256G_HY_PROD,SOC:B0_1G_PROD,S4E,SSD_PWR:S4E
NANDCFG:ITLC_S4E_512G_TO	NAND_L0:ITLC_512G_TO_P1,NAND_L1:ITLC_512G_SSUB_TO,SOC:B0_1G_PROD,S4E,SSD_PWR:S4E
NANDCFG:ITLC_S4E_512G_SD	NAND_L0:ITLC_512G_SD,NAND_L1:ITLC_512G_SD,SOC:B0_1G_PROD,S4E,SSD_PWR:S4E
NANDCFG:ITLC_S4E_1P0T_SD	NAND_L0:ITLC_1P0T_SD_PROD,NAND_L1:ITLC_1P0T_SD_PROD,SOC:B0_2G_PROD,S4E,SSD_PWR:S4E
NANDCFG:ITLC_S4E_1P0T_HY	NAND_L0:ITLC_1P0T_HY,NAND_L1:ITLC_1P0T_HY,SOC:B0_2G_PROD,S4E,SSD_PWR:S4E
NANDCFG:ITLC_S4E_2P0T_SD	NAND_L0:ITLC_2P0T_SD_PROD,NAND_L1:ITLC_2P0T_SD_PROD,SOC:B0_2G_PROD,S4E,SSD_PWR:S4E
NANDCFG:ITLC_S4E_2P0T_HY	NAND_L0:ITLC_2P0T_HY,NAND_L1:ITLC_2P0T_HY,SOC:B0_2G_PROD,S4E,SSD_PWR:S4E

## CPU DRAM SPD Straps


BOM GROUP	BOM OPTIONS
DRAMCFG:SAMSUNG_8GB	DRAM:SAMSUNG_8GB,RAMCFG0_L
DRAMCFG:SAMSUNG_16GB	DRAM:SAMSUNG_16GB,RAMCFG0_L,RAMCFG2_L
DRAMCFG:HYNIX_8GB	DRAM:HYNIX_8GB,RAMCFG0_L,RAMCFG1_L
DRAMCFG:HYNIX_16GB	DRAM:HYNIX_16GB,RAMCFG0_L,RAMCFG1_L,RAMCFG2_L
DRAMCFG:MICRON_8GB	DRAM:MICRON_8GB
DRAMCFG:MICRON_16GB	DRAM:MICRON_16GB,RAMCFG2_L

RAMCFGx strap is low if in table.

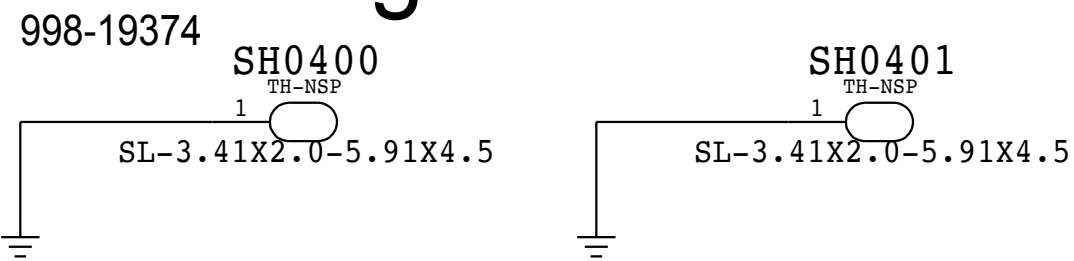
## CPU DRAM CFG Chart

Vendor	CFG 1	CFG 0	Vendor	CFG 2
Hynix	0	0	8GB	1
Samsung	1	0	16GB	0
Unused	0	1		
Micron	1	1		

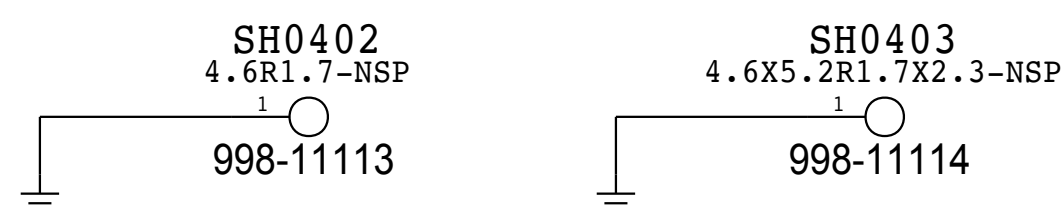
PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
685-00329	1	COMMON PARTS,MLB-TKSB,X1783	CBOM	CRITICAL	CNN_PARTS_BOM
985-01143	1	DEV PARTS,MLB-TKSB,X1783	DEV1	CRITICAL	DEV_PARTS_BOM

PAGE TITLE		
<b>BOM Configuration</b>		
 Apple Inc.	DRAWING NUMBER	051-05232
	REVISION	4.0.0
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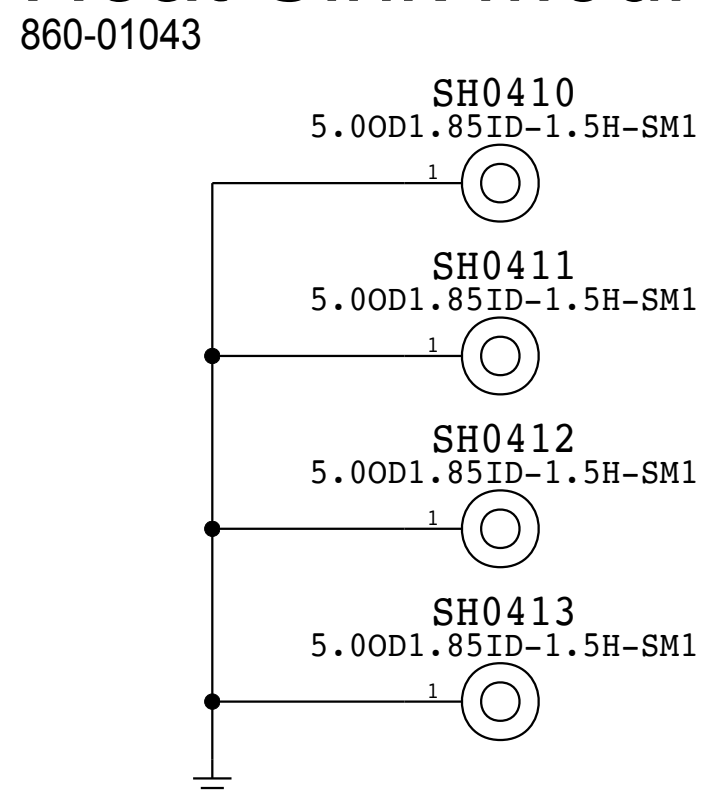
### A Mounting Holes



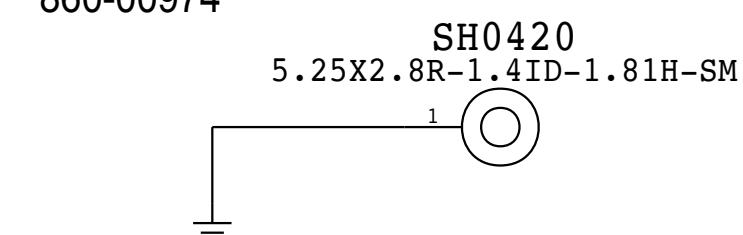
### B Plated Slots



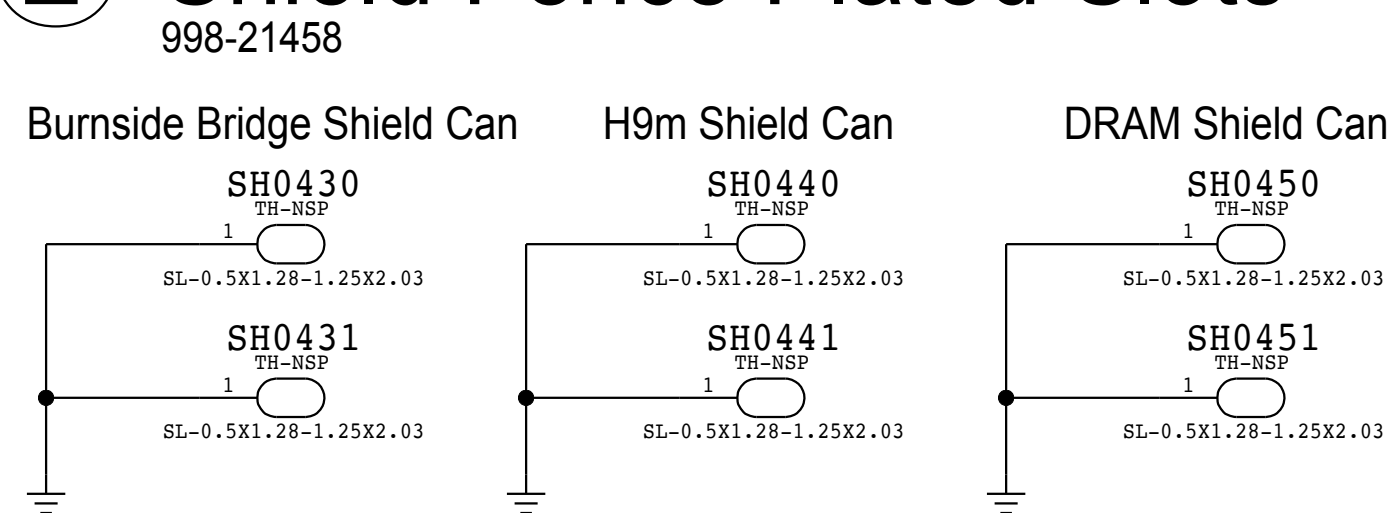
### C Heat Sink Mounting Bosses



### D Antenna Cowling Bosses



### E Shield Fence Plated Slots



### F Shield Cans

#### DRAM Shield Can

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
806-24479	1	SHIELD CAN,MB,DRAM,X1766	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,GIBALTA8,X1419	SHLD4	CRITICAL	SHLD_FNC_SOC

### G Mounting Brackets

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

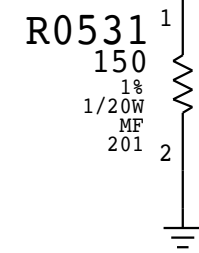
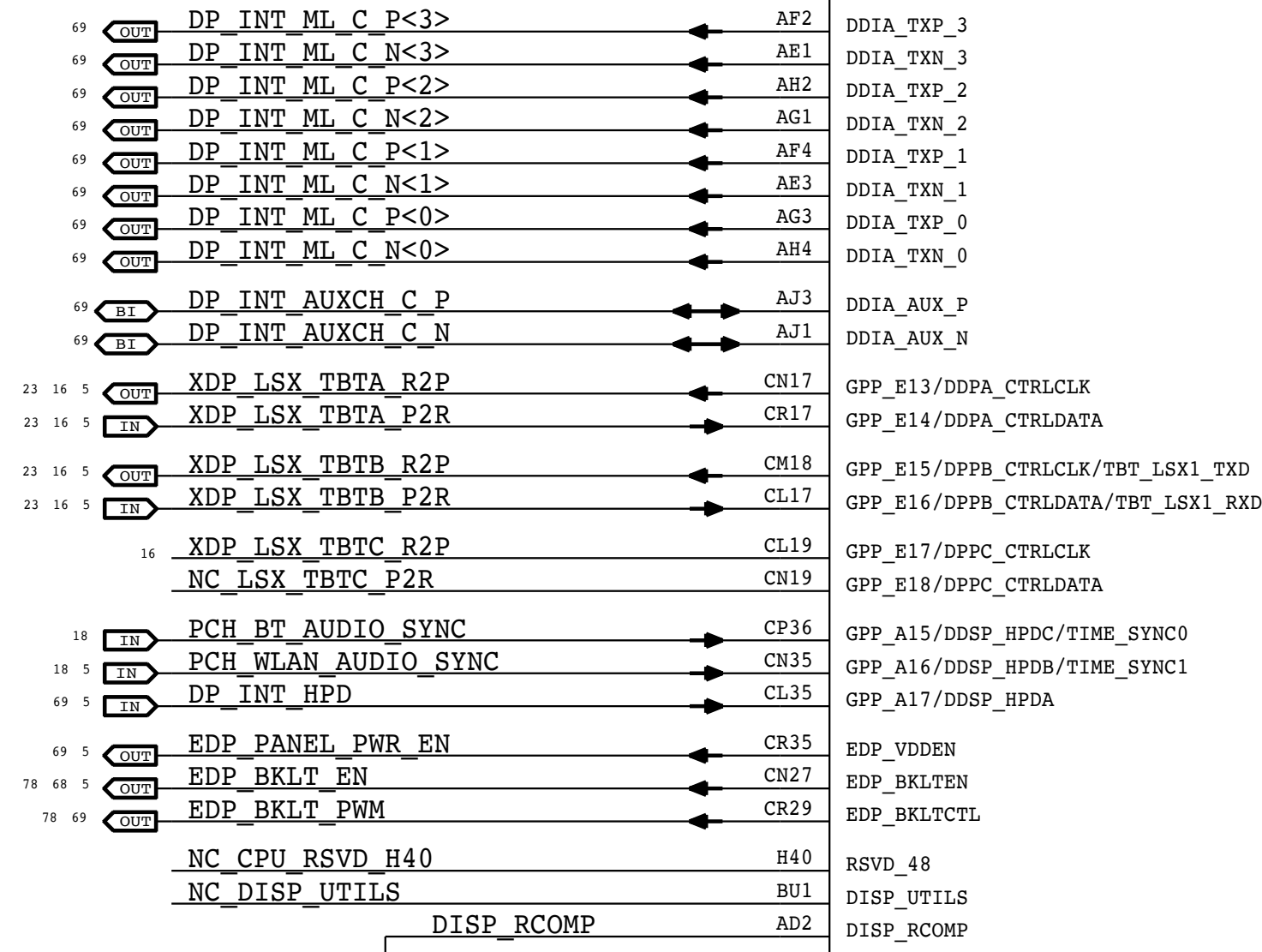
PAGE TITLE			PD Parts		
Apple Inc.	DRAWING NUMBER	051-05232	SIZE	D	
	REVISION	4.0.0			
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D

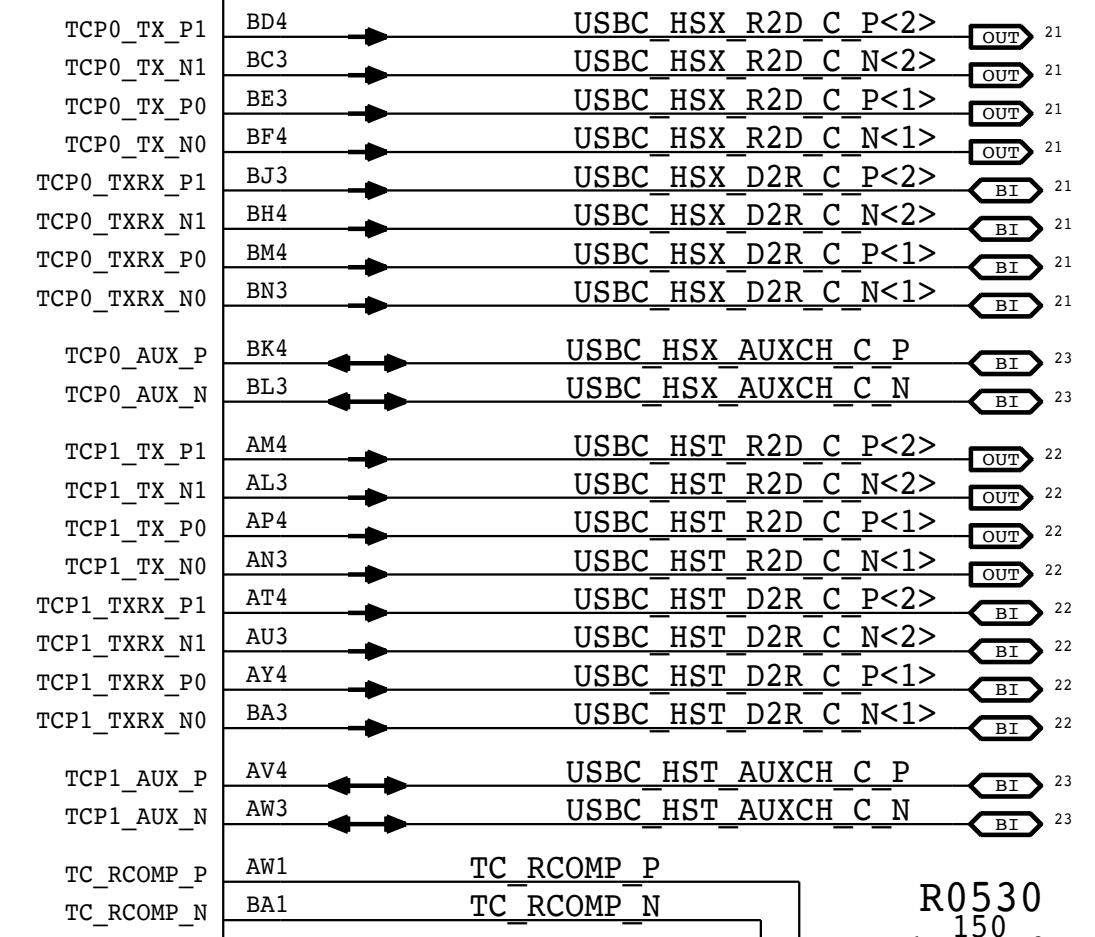
D

eDP Port Assignment:

Internal panel



CRITICAL OMIT TABLE



Type-C Port Assignments:

USBC Sink 0

USBC Sink 1

C

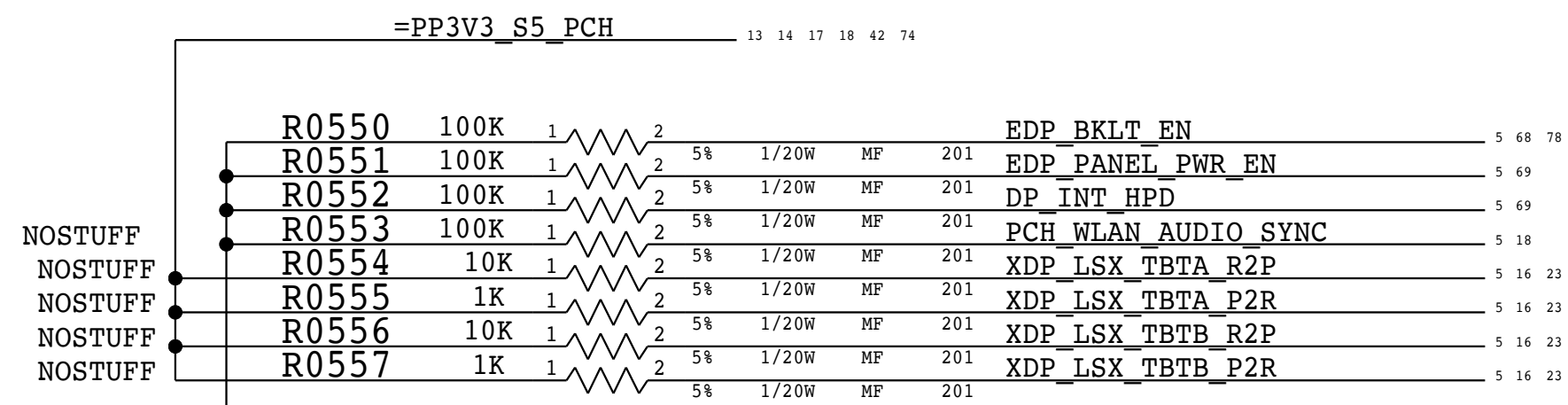
C

B

B

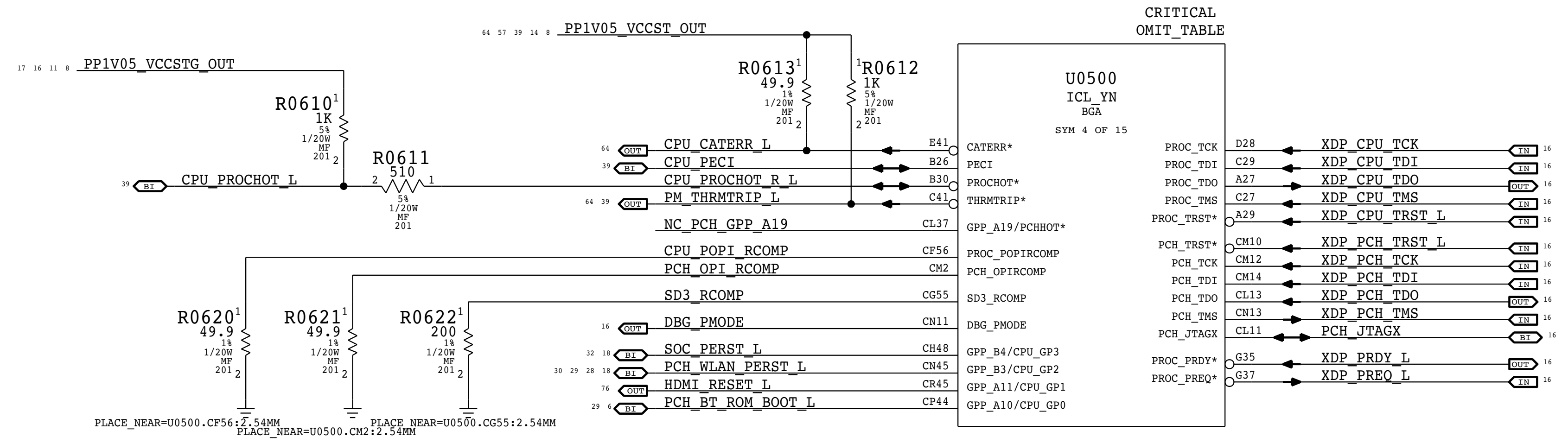
A

A

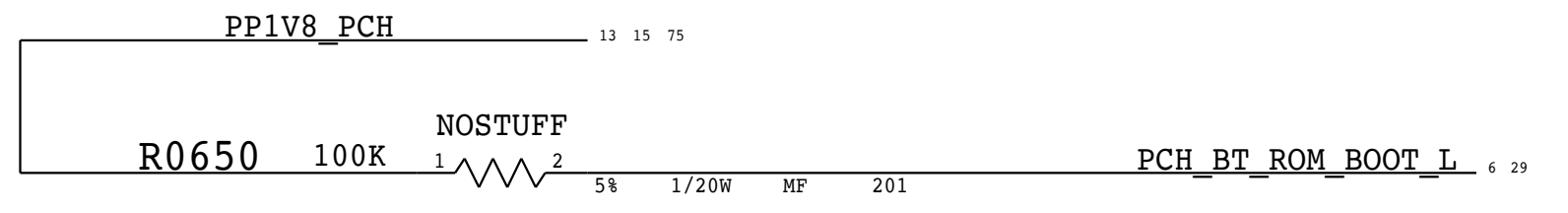


SYNC MASTER=MASTER		SYNC DATE=06/08/2018	
PAGE TITLE			
<b>CPU GFX</b>		DRAWING NUMBER	SIZE
Apple Inc.		051-05232	D
		REVISION	4.0.0
		BRANCH	riskramp
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D

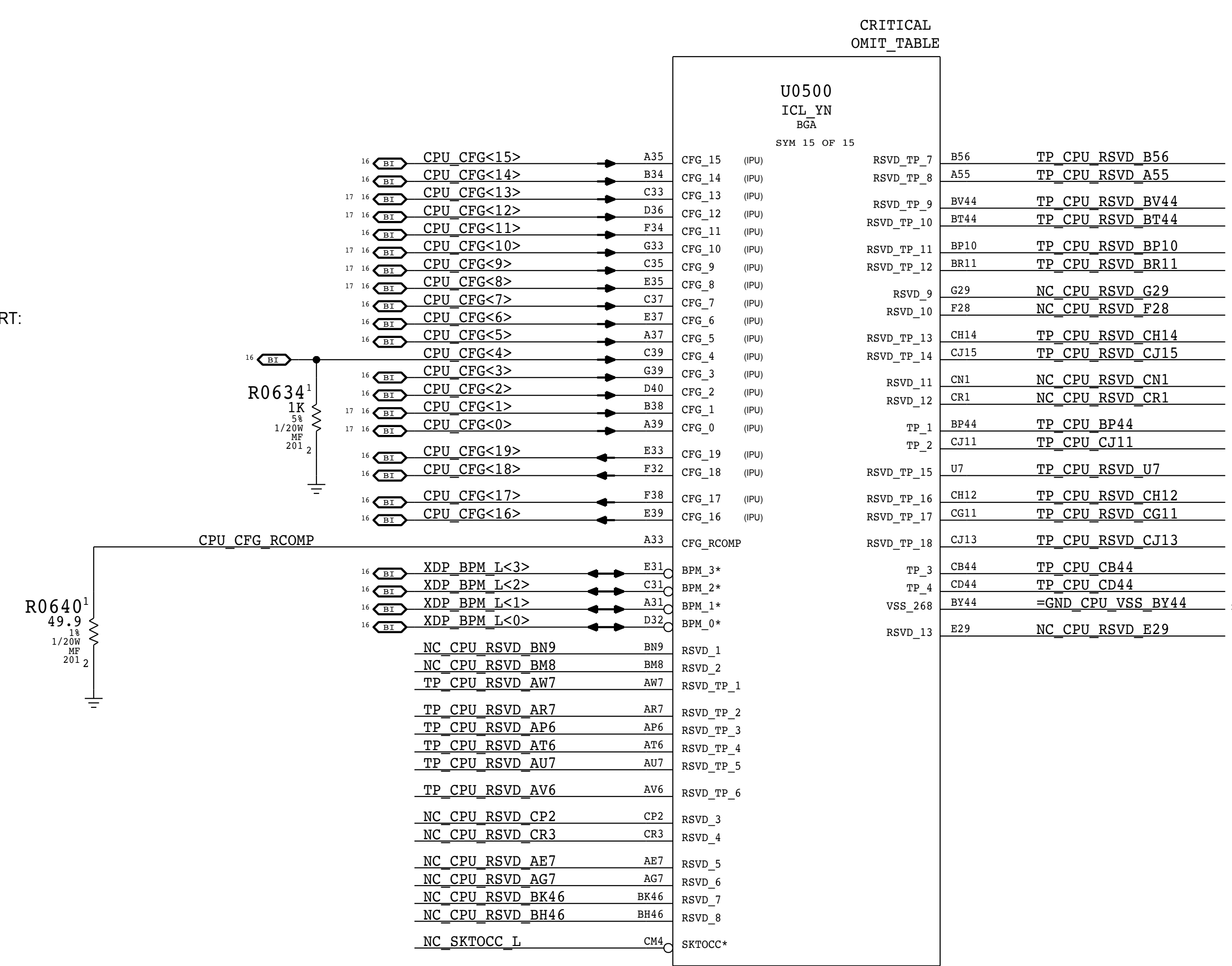


C

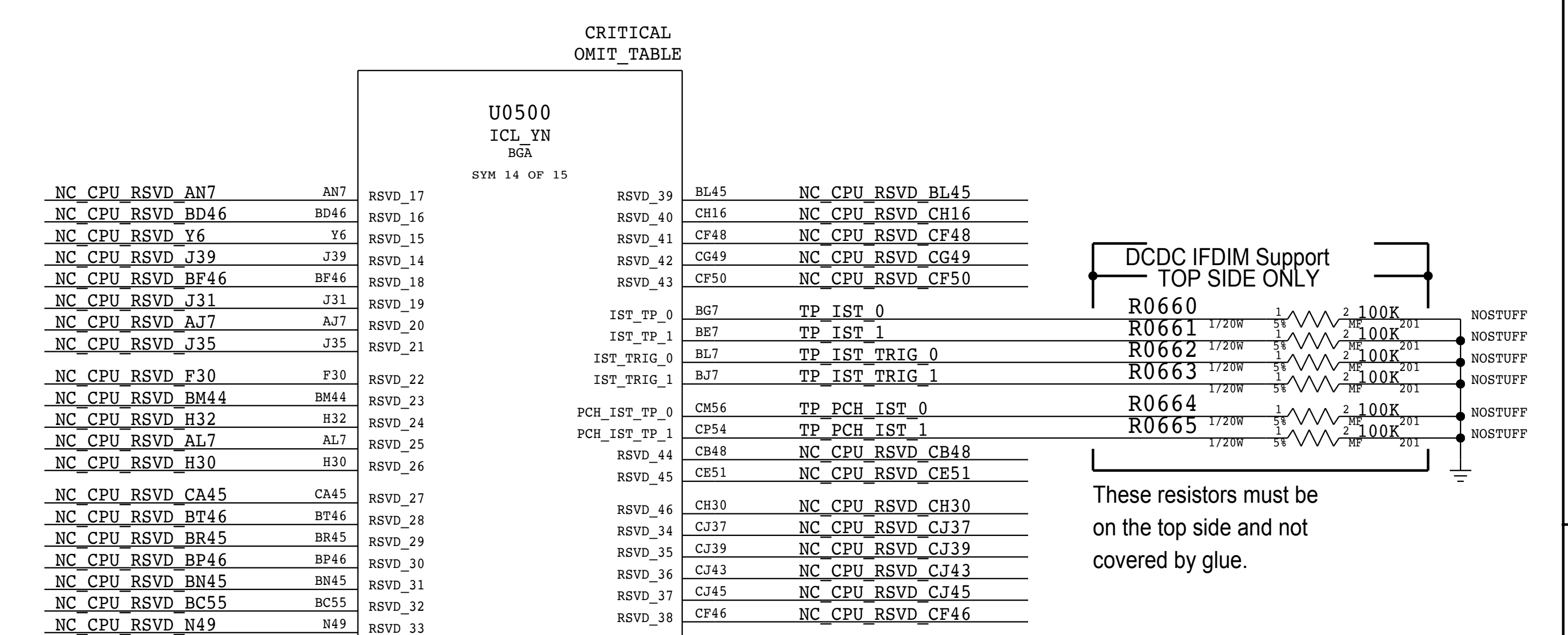


B

CFG(4) EMBEDDED DISPLAY PORT:  
0: ENABLED  
1: DISABLED



A



These resistors must be on the top side and not covered by glue.

SYNC MASTER=CPU_CARD_ICL_Y		SYNC DATE=06/08/2018	
PAGE TITLE CPU Misc/JTAG/CFG/RSVD			
Apple Inc.		DRAWING NUMBER	051-05232
		REVISION	4.0.0
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BOM\_COST\_GROUP=CPU & CHIPSET

D

C

B

A

D

C

B

A

CRITICAL OMIT\_TABLE

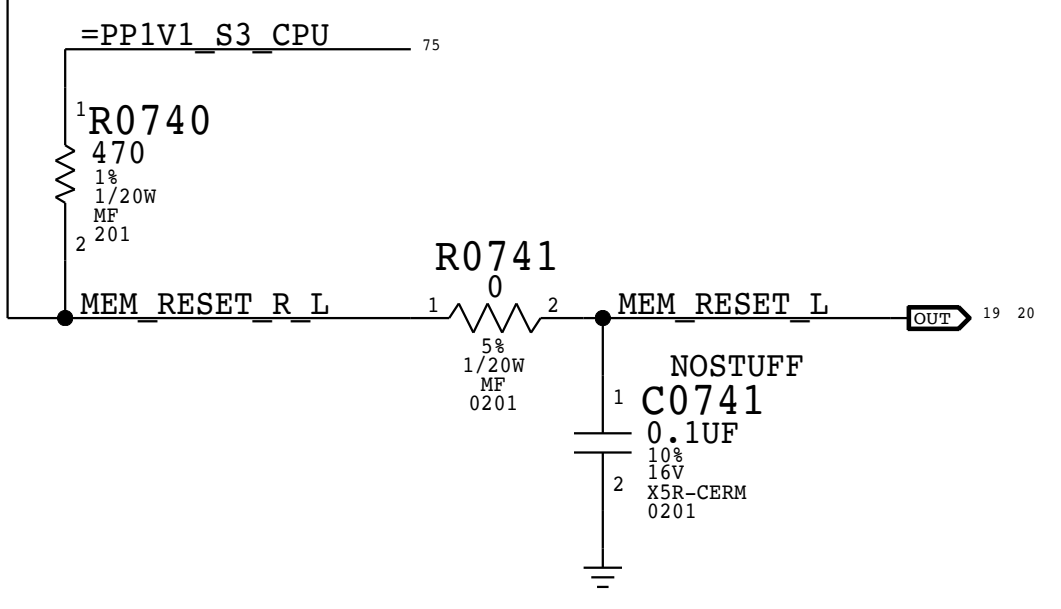
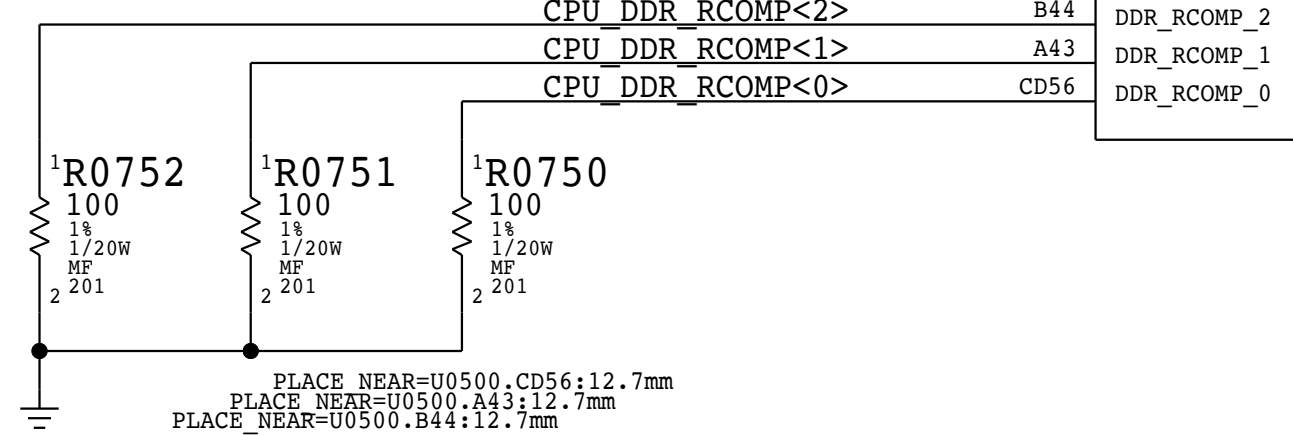
U0500  
ICL\_YN  
BGA  
SYM 2 OF 15

MEM_A_DO_0<7>	BT56	DDRA_DQ0_7	DDRA_CLK_P	BD54	MEM_A_CLK_P
MEM_A_DO_0<6>	BU55	DDRA_DQ0_6	DDRA_CLK_N	BC53	MEM_A_CLK_N
MEM_A_DO_0<5>	BU53	DDRA_DQ0_5	DDRB_CLK_P	BD50	MEM_B_CLK_P
MEM_A_DO_0<4>	BW53	DDRA_DQ0_4	DDRB_CLK_N	BE51	MEM_B_CLK_N
MEM_A_DO_0<3>	BT54	DDRA_DQ0_3	DDRA_CKE0	BH54	MEM_A_CKE<0>
MEM_A_DO_0<2>	BY54	DDRA_DQ0_2	DDRA_CKE1	BJ55	MEM_A_CKE<1>
MEM_A_DO_0<1>	BW55	DDRA_DQ0_1	DDRB_CKE0	BE49	MEM_B_CKE<0>
MEM_A_DO_0<0>	BY56	DDRA_DQ0_0	DDRB_CKE1	BF50	MEM_B_CKE<1>
MEM_A_DO_1<7>	BY50	DDRA_DQ1_7	DDRA_CS_0	BF54	MEM_A_CS_L<0>
MEM_A_DO_1<6>	BY48	DDRA_DQ1_6	DDRA_CS_1	BE55	MEM_A_CS_L<1>
MEM_A_DO_1<5>	BW51	DDRA_DQ1_5	DDRB_CS_0	BC49	MEM_B_CS_L<0>
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MEM_A_DO_1<3>	BW49	DDRA_DQ1_3	DDRA_CA5	BG53	MEM_A_CA<5>
MEM_A_DO_1<2>	BT50	DDRA_DQ1_2	DDRA_CA4	BE53	MEM_A_CA<4>
MEM_A_DO_1<1>	BU49	DDRA_DQ1_1	DDRA_CA3	BC51	MEM_A_CA<3>
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MEM_A_DO_2<7>	BL55	DDRA_DQ2_7	DDRA_CA1	BJ53	MEM_A_CA<1>
MEM_A_DO_2<6>	BL53	DDRA_DQ2_6	DDRA_CA0	BJ51	MEM_A_CA<0>
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MEM_A_DO_2<4>	BP56	DDRA_DQ2_4	DDRB_CA4	BJ49	MEM_B_CA<4>
MEM_A_DO_2<3>	BM54	DDRA_DQ2_3	DDRB_CA3	BH48	MEM_B_CA<3>
MEM_A_DO_2<2>	BP54	DDRA_DQ2_2	DDRB_CA2	BG51	MEM_B_CA<2>
MEM_A_DO_2<1>	BR55	DDRA_DQ2_1	DDRB_CA1	BF48	MEM_B_CA<1>
MEM_A_DO_2<0>	BR53	DDRA_DQ2_0	DDRB_CA0	BG49	MEM_B_CA<0>
MEM_A_DO_3<7>	BR51	DDRA_DQ3_7	DDRA_DQSP_3	BN49	MEM_A_DOS_P<3>
MEM_A_DO_3<6>	BR49	DDRA_DQ3_6	DDRA_DQSN_3	BN51	MEM_A_DOS_N<3>
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MEM_B_DO_1<7>	BA51	DDRB_DQ1_7	DRAM_RESET*	CB52	
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MEM_B_DO_1<3>	AY50	DDRB_DQ1_3			
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MEM_B_DO_2<5>	AM55	DDRB_DQ2_5			
MEM_B_DO_2<4>	AR55	DDRB_DQ2_4			
MEM_B_DO_2<3>	AM53	DDRB_DQ2_3			
MEM_B_DO_2<2>	AR53	DDRB_DQ2_2			
MEM_B_DO_2<1>	AT56	DDRB_DQ2_1			
MEM_B_DO_2<0>	AT54	DDRB_DQ2_0			
MEM_B_DO_3<7>	AT50	DDRB_DQ3_7			
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MEM_B_DO_3<5>	AR49	DDRB_DQ3_5			
MEM_B_DO_3<4>	AN51	DDRB_DQ3_4			
MEM_B_DO_3<3>	AR51	DDRB_DQ3_3			
MEM_B_DO_3<2>	AM48	DDRB_DQ3_2			
MEM_B_DO_3<1>	AM49	DDRB_DQ3_1			
MEM_B_DO_3<0>	AM50	DDRB_DQ3_0			

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ICL\_YN  
BGA  
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MEM_C_DO_0<7>	AF54	DDRC_DQ0_7	DDRC_CLK_P	N53	MEM_C_CLK_P
MEM_C_DO_0<6>	AF56	DDRC_DQ0_6	DDRC_CLK_N	P54	MEM_C_CLK_N
MEM_C_DO_0<5>	AG55	DDRC_DQ0_5	DDRD_CLK_P	U51	MEM_D_CLK_P
MEM_C_DO_0<4>	AJ53	DDRC_DQ0_4	DDRD_CLK_N	U49	MEM_D_CLK_N
MEM_C_DO_0<3>	AG53	DDRC_DQ0_3	DDRC_CKE0	R55	MEM_C_CKE<0>
MEM_C_DO_0<2>	AK56	DDRC_DQ0_2	DDRC_CKE1	T54	MEM_C_CKE<1>
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MEM_C_DO_0<0>	AK54	DDRC_DQ0_0	DDRD_CKE1	T48	MEM_D_CKE<1>
MEM_C_DO_1<7>	AK48	DDRC_DQ1_7	DDRC_CS_0	N55	MEM_C_CS_L<0>
MEM_C_DO_1<6>	AK50	DDRC_DQ1_6	DDRC_CS_1	R51	MEM_C_CS_L<1>
MEM_C_DO_1<5>	AJ49	DDRC_DQ1_5	DDRD_CS_0	P48	MEM_D_CS_L<0>
MEM_C_DO_1<4>	AG49	DDRC_DQ1_4	DDRD_CS_1	T50	MEM_D_CS_L<1>
MEM_C_DO_1<3>	AJ51	DDRC_DQ1_3	DDRC_CA5	U53	MEM_C_CA<5>
MEM_C_DO_1<2>	AP48	DDRC_DQ1_2	DDRC_CA4	R53	MEM_C_CA<4>
MEM_C_DO_1<1>	AG51	DDRC_DQ1_1	DDRC_CA3	W55	MEM_C_CA<3>
MEM_C_DO_1<0>	AF50	DDRC_DQ1_0	DDRC_CA2	U55	MEM_C_CA<2>
MEM_C_DO_2<7>	AE53	DDRC_DQ2_7	DDRC_CA1	V54	MEM_C_CA<1>
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MEM_C_DO_2<5>	AB54	DDRC_DQ2_5	DDRD_CA5	V50	MEM_D_CA<5>
MEM_C_DO_2<4>	AB54	DDRC_DQ2_4	DDRD_CA4	W49	MEM_D_CA<4>
MEM_C_DO_2<3>	AB55	DDRC_DQ2_3	DDRD_CA3	W51	MEM_D_CA<3>
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MEM_C_DO_2<0>	AE51	DDRC_DQ2_0	DDRD_CA0	P50	MEM_D_CA<0>
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MEM_C_DO_3<5>	AB50	DDRC_DQ3_5	DDRC_DQSP_2	AC53	MEM_C_DOS_P<2>
MEM_C_DO_3<4>	AA48	DDRC_DQ3_4	DDRC_DQSN_2	AC55	MEM_C_DOS_N<2>
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MEM_C_DO_3<2>	AA48	DDRC_DQ3_2	DDRC_DQSN_1	AH50	MEM_C_DOS_N<1>
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MEM_D_DO_0<4>	K54	DDRD_DQ0_4	DDRD_DQSP_2	D52	MEM_D_DOS_P<2>
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MEM_D_DO_0<0>	K56	DDRD_DQ0_0	DDRD_DQSP_0	J53	MEM_D_DOS_P<0>
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MEM_D_DO_1<2>	G49	DDRD_DQ1_2			
MEM_D_DO_1<1>	H50	DDRD_DQ1_1			
MEM_D_DO_1<0>	G51	DDRD_DQ1_0			
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MEM_D_DO_2<5>	C53	DDRD_DQ2_5			
MEM_D_DO_2<4>	E53	DDRD_DQ2_4			
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MEM_D_DO_2<2>	F56	DDRD_DQ2_2			
MEM_D_DO_2<1>	F54	DDRD_DQ2_1			
MEM_D_DO_2<0>	E55	DDRD_DQ2_0			
MEM_D_DO_3<7>	F48	DDRD_DQ3_7			
MEM_D_DO_3<6>	E49	DDRD_DQ3_6			
MEM_D_DO_3<5>	E47	DDRD_DQ3_5			
MEM_D_DO_3<4>	C47	DDRD_DQ3_4			
MEM_D_DO_3<3>	F46	DDRD_DQ3_3			
MEM_D_DO_3<2>	B48	DDRD_DQ3_2			
MEM_D_DO_3<1>	C49	DDRD_DQ3_1			
MEM_D_DO_3<0>	B46	DDRD_DQ3_0			



SYNC MASTER=CPU CARD ICL\_Y SYNC DATE=06/08/2018

CPU LPDDR4 Interface

Apple Inc.

051-05232

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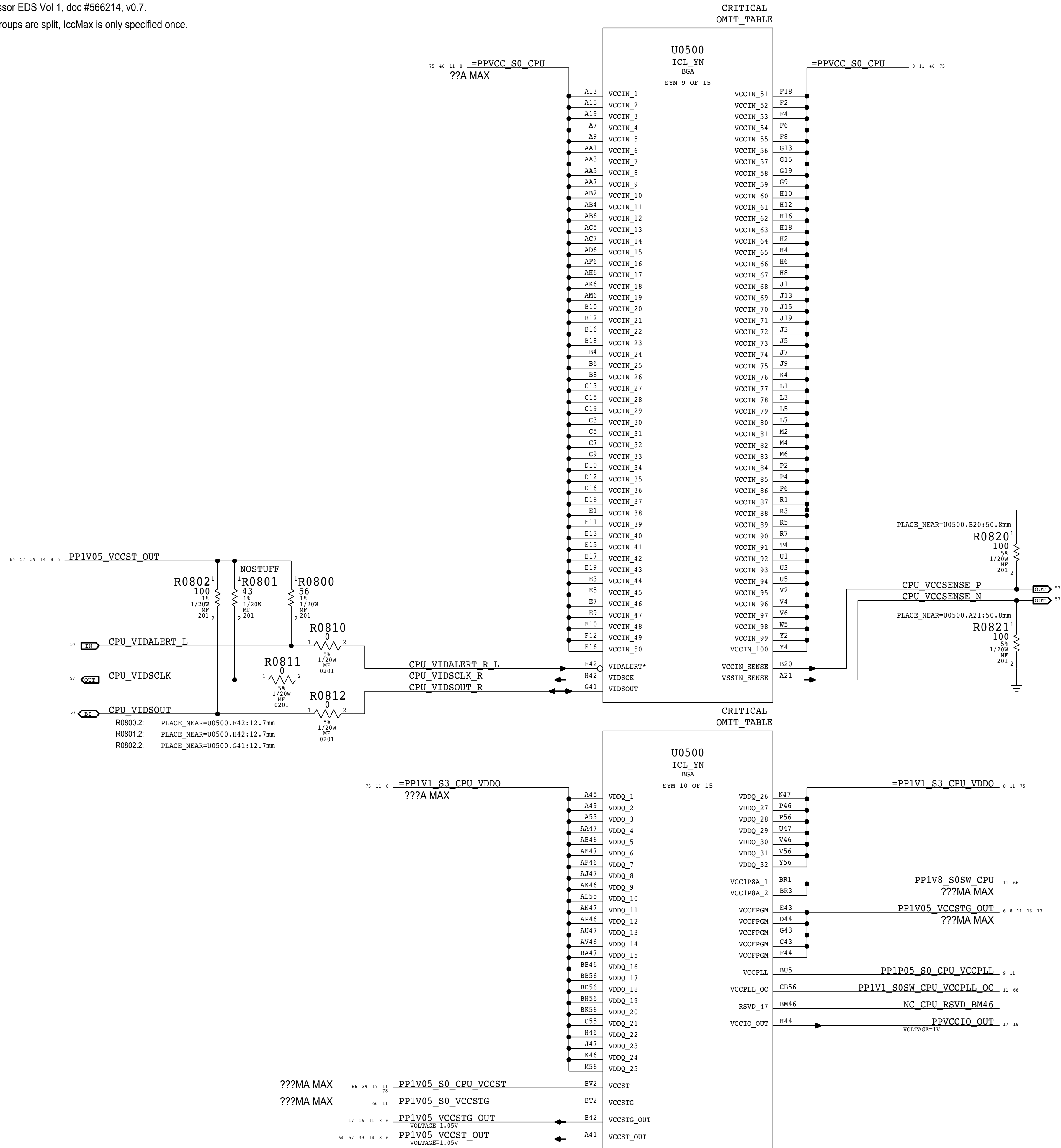
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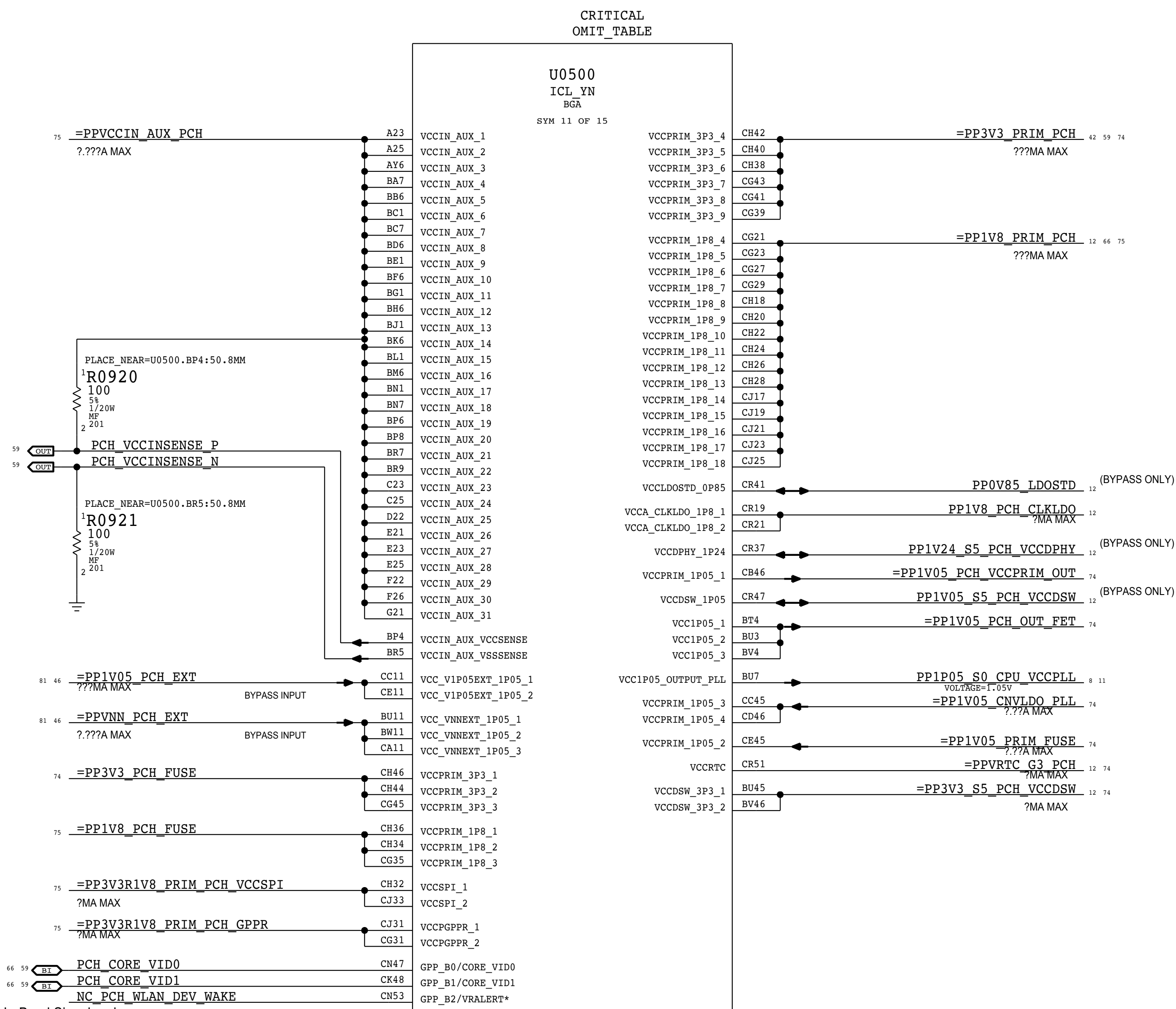
CNL CPU-Y current estimates from Cannon Lake Processor EDS Vol 1, doc #566214, v0.7.  
 lccMax totals include all pins of same name. Some pin groups are split, lccMax is only specified once.



BOM\_COST\_GROUP=CPU & CHIPSET

SYNC MASTER=CPU_CARD_ICL_Y		SYNC DATE=06/08/2018	
PAGE TITLE			
<b>CPU Power</b>			
		DRAWING NUMBER	051-05232
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WiFi will be woken up by PCIe In-Band Signal and therefore PCH\_WLAN\_DEV\_WAKE will not be connected

PAGE TITLE		SYNC MASTER=CPU CARD ICL_Y		SYNC DATE=06/08/2018	
		DRAWING NUMBER		SIZE	
		051-05232		D	
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		BRANCH		riskramp	
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		SHEET		9 OF 86	

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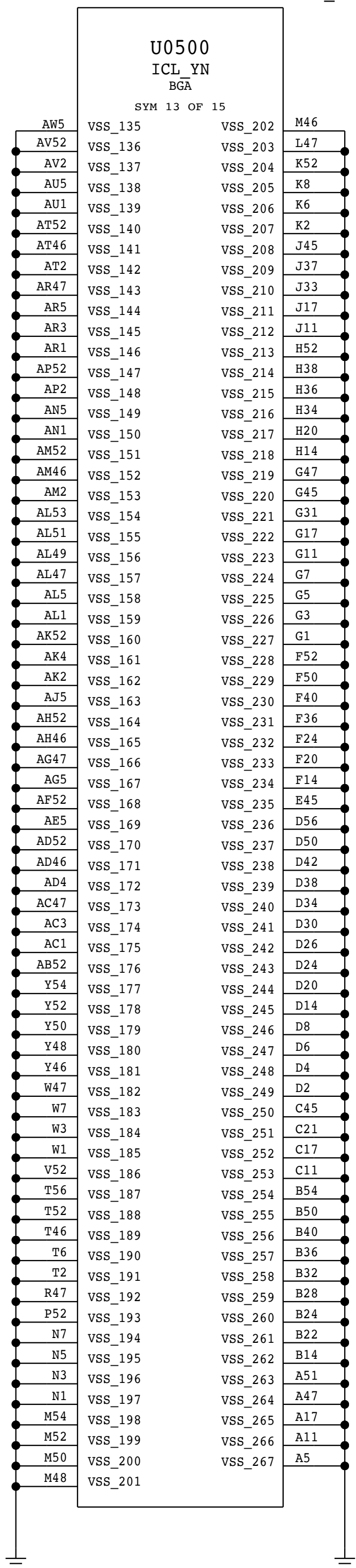
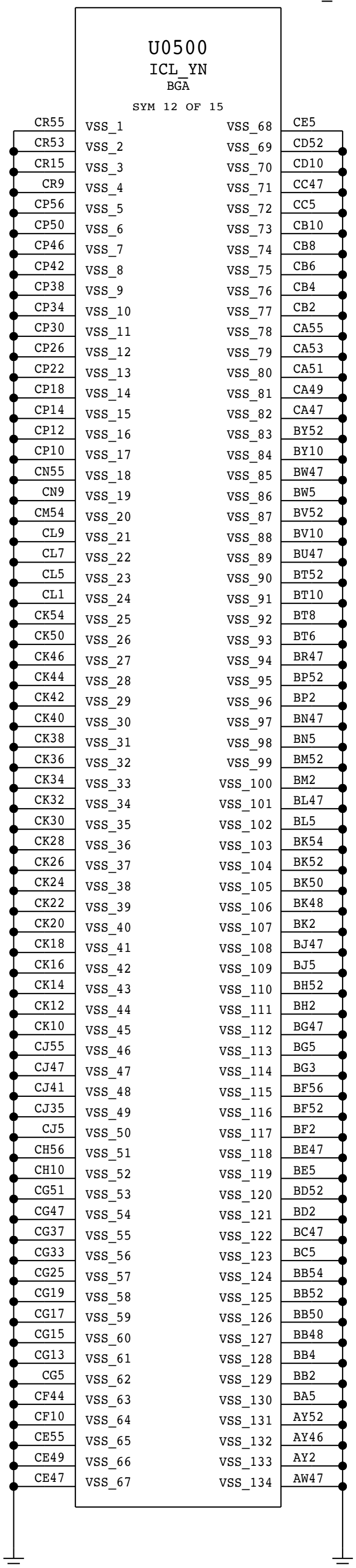
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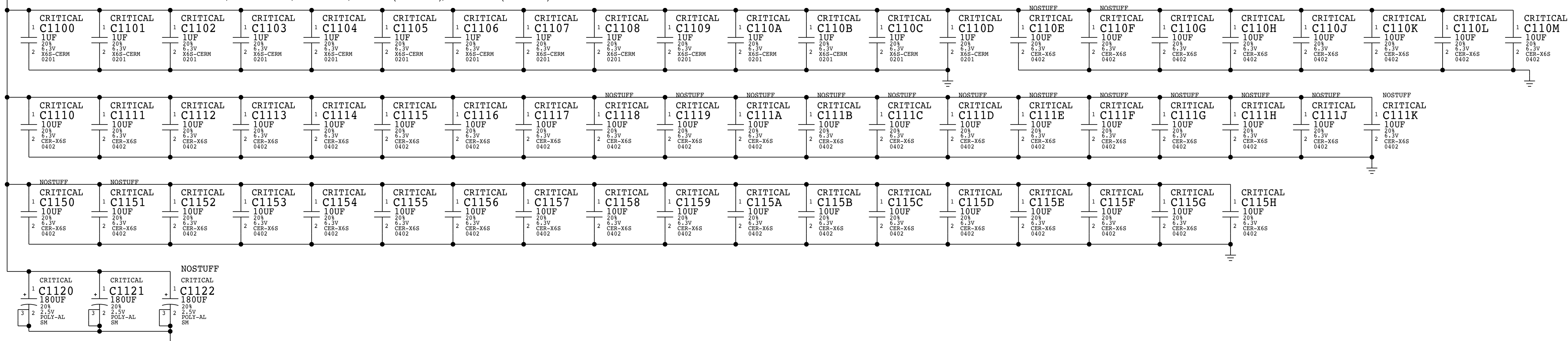
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	DRAWING NUMBER	051-05232	SIZE
	REVISION	4.0.0	D
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Intel recommendations based on #572907, Ice Lake U/Y Platform Design Guide, rev 1.21

### CPU VccIN Decoupling

INTEL RECOMMENDATION (TABLE 10-49): 8X 1uF 0402, 13X 22uF 0402, 1X 220uF D-CASE  
APPLE IMPLEMENTATION : 14x 1uF 0201, 30x 10uF 0402, 2x 180uF D1, 16x 10uF (NOSTUFF), 1x 180uF D1 (NOSTUFF)

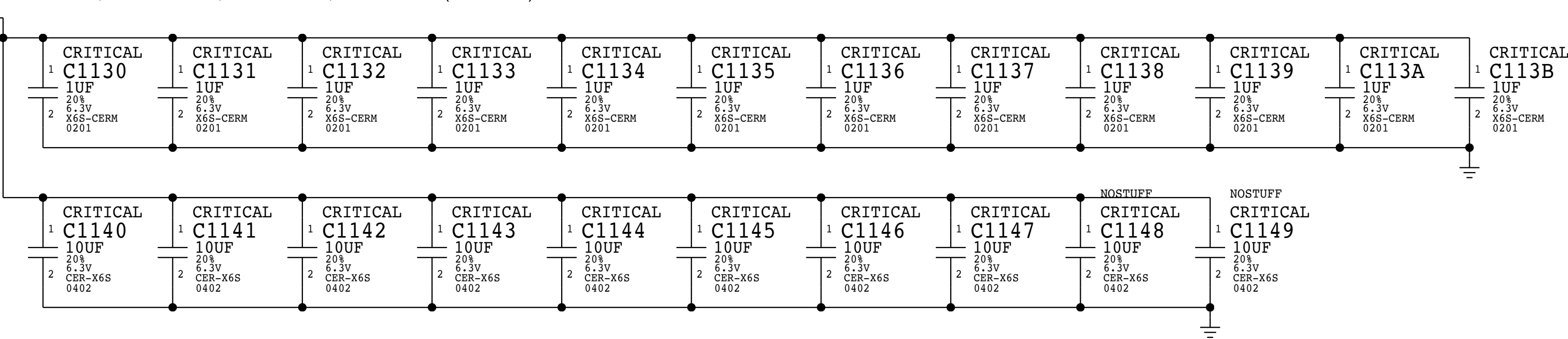
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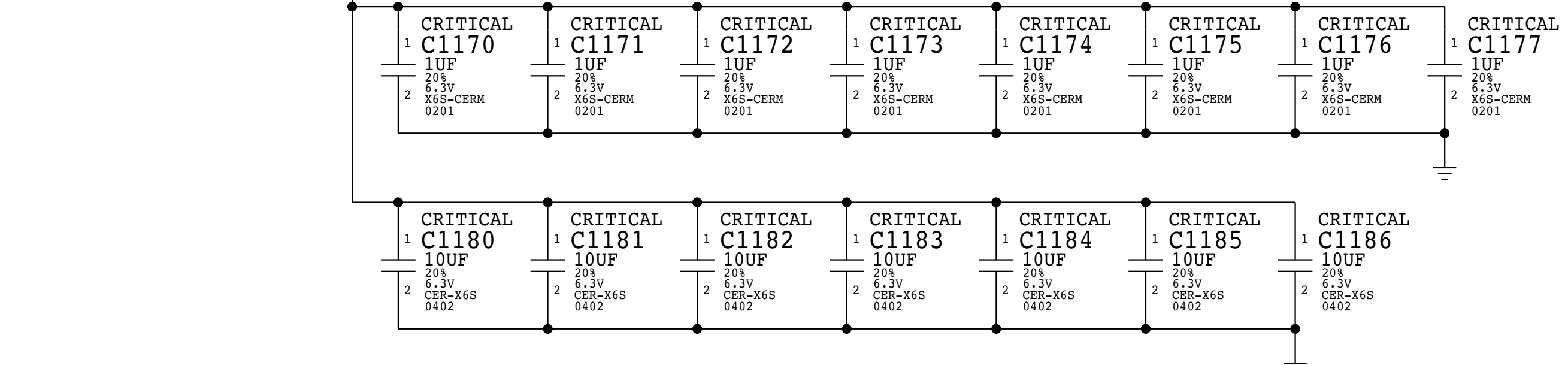
INTEL RECOMMENDATION (TABLE 10-50): 7x 47uF 0805, 8x 10uF 0402, 7x 1uF 0402, 3x 47uF 0805 (placeholder), 3x 10uF 0402 (placeholder)  
APPLE IMPLEMENTATION : 2x 180uF D1, 16x 10uF 0402, 12x 1uF 0201, 6x 10uF 0402 (NOSTUFF)

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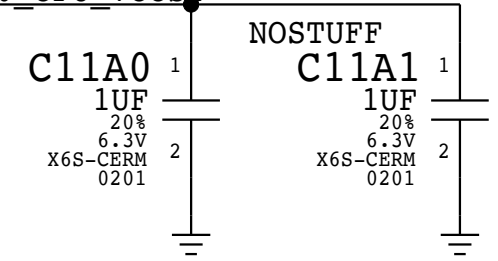


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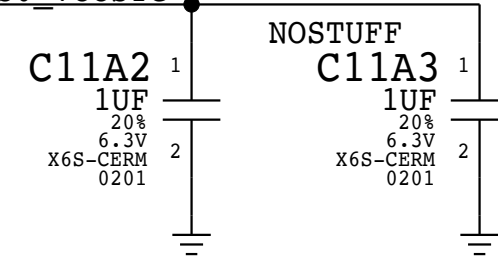
PPVCC\_S0\_CPU



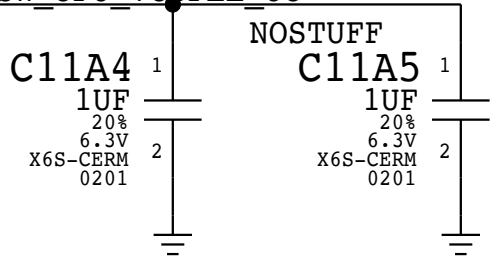
PP1V05\_S0\_CPU\_VCCST



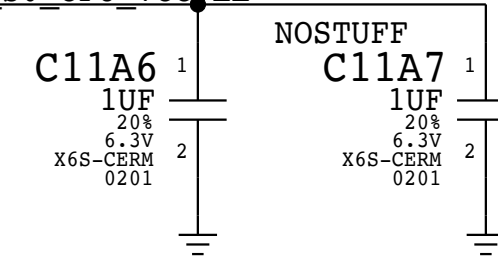
PP1V05\_S0\_VCCSTG



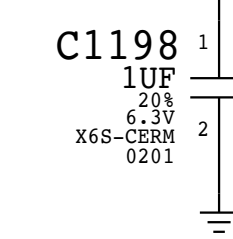
PP1V1\_S0SW\_CPU\_VCCPLL\_OC



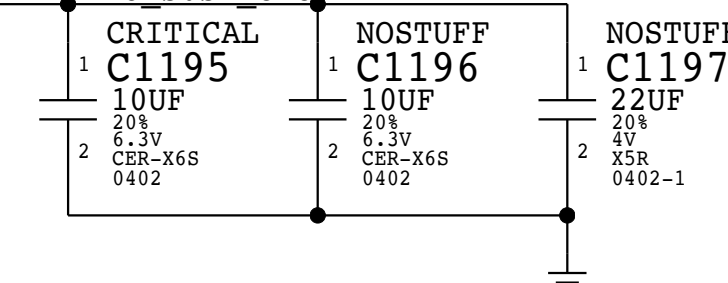
PP1P05\_S0\_CPU\_VCCPLL



PP1V05\_VCCSTG\_OUT



PP1V8\_S0SW\_CPU



BOM\_COST\_GROUP=CPU & CHIPSET

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PAGE TITLE <b>CPU Decoupling</b>			
Apple Inc.		DRAWING NUMBER 051-05232	SIZE D
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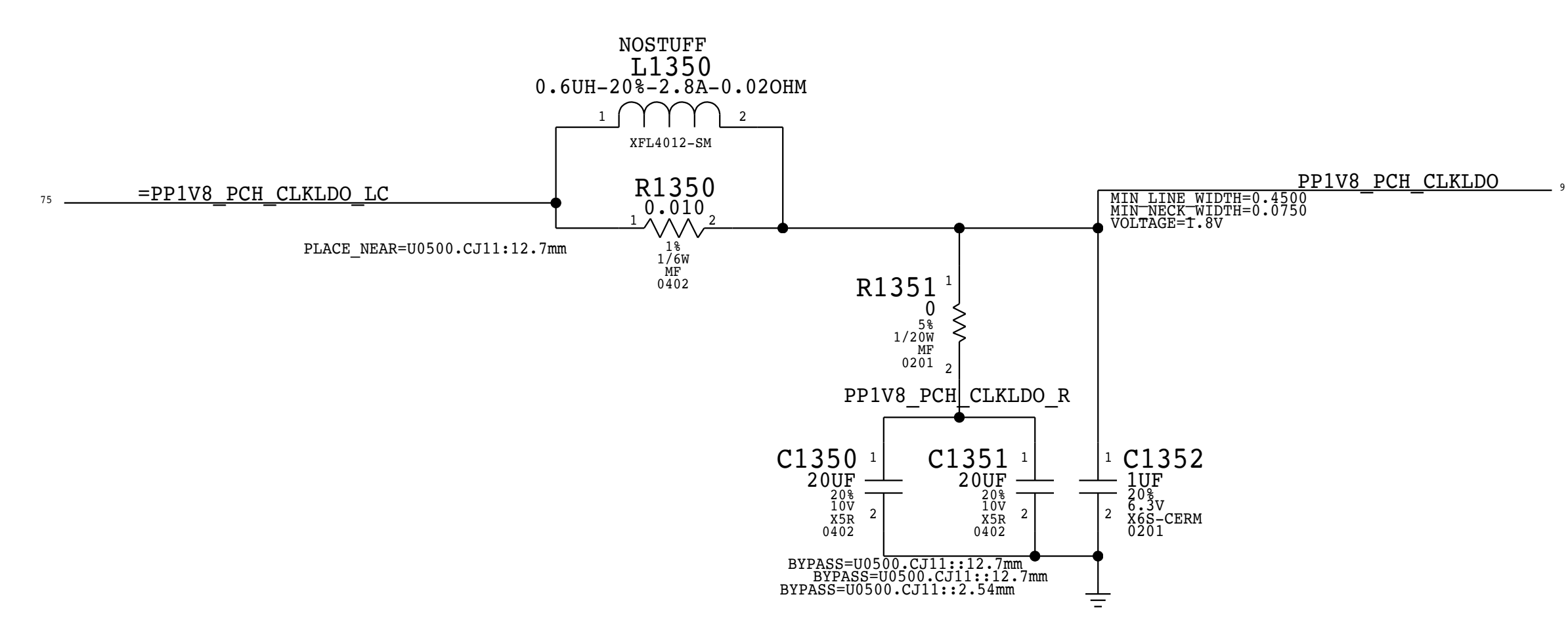
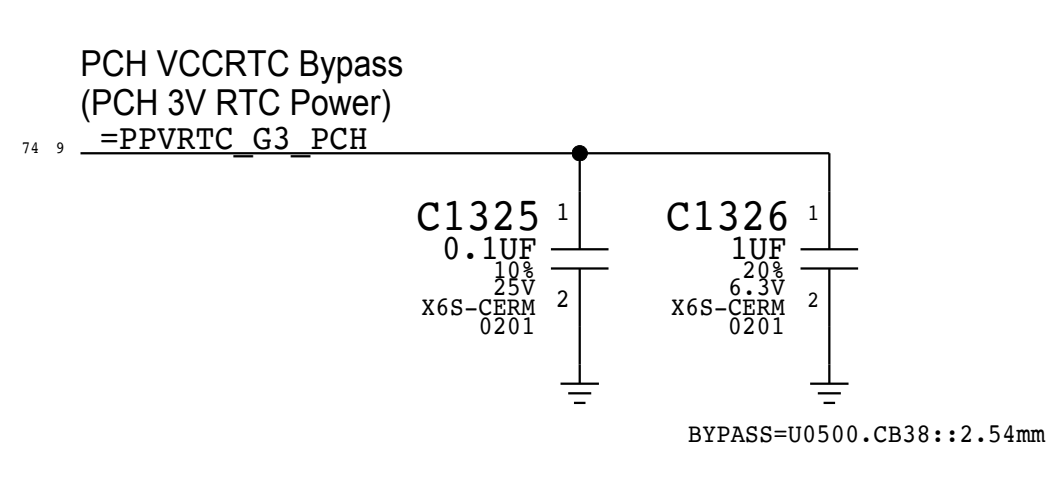
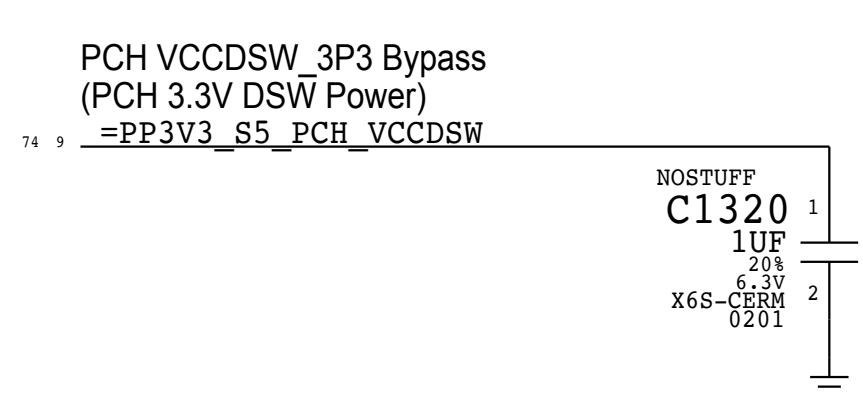
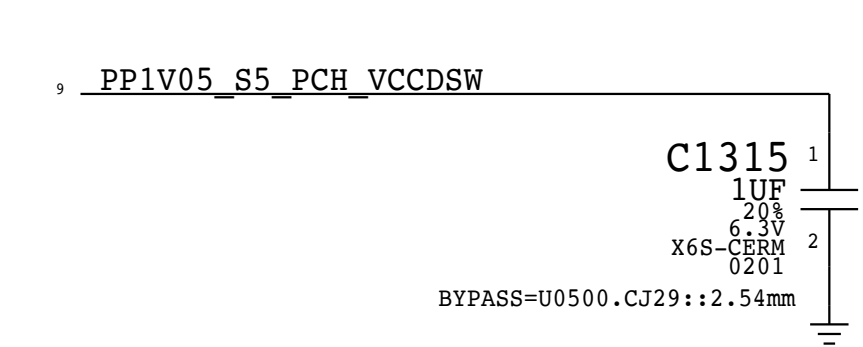
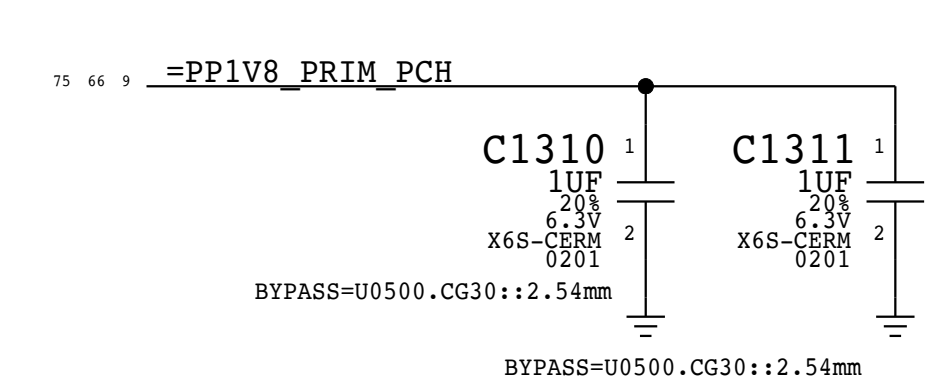
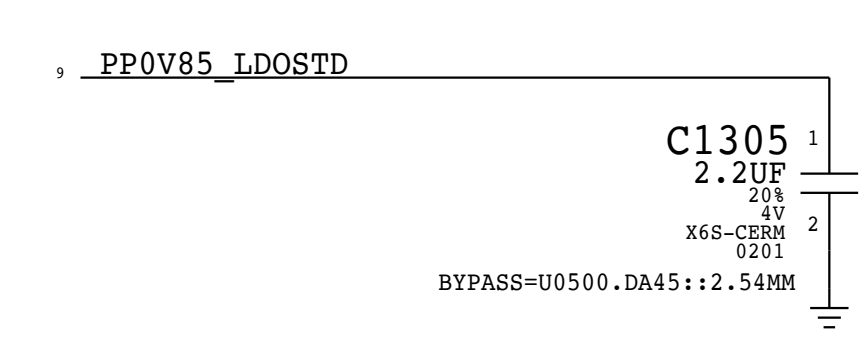
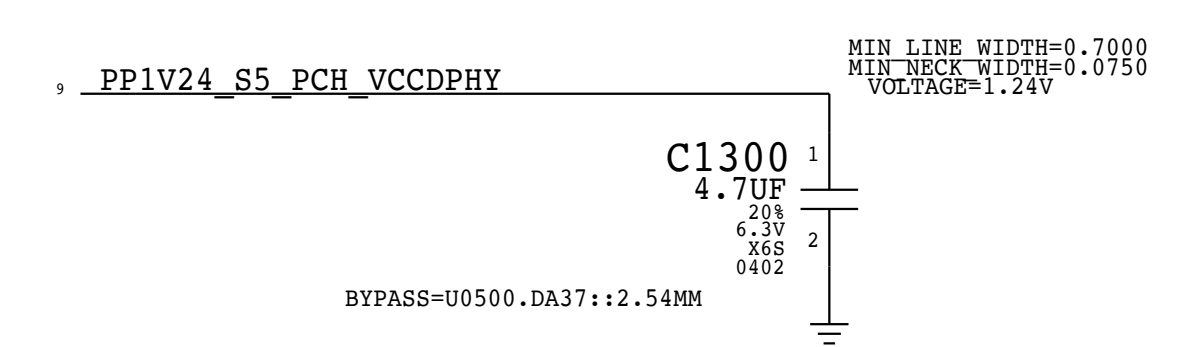
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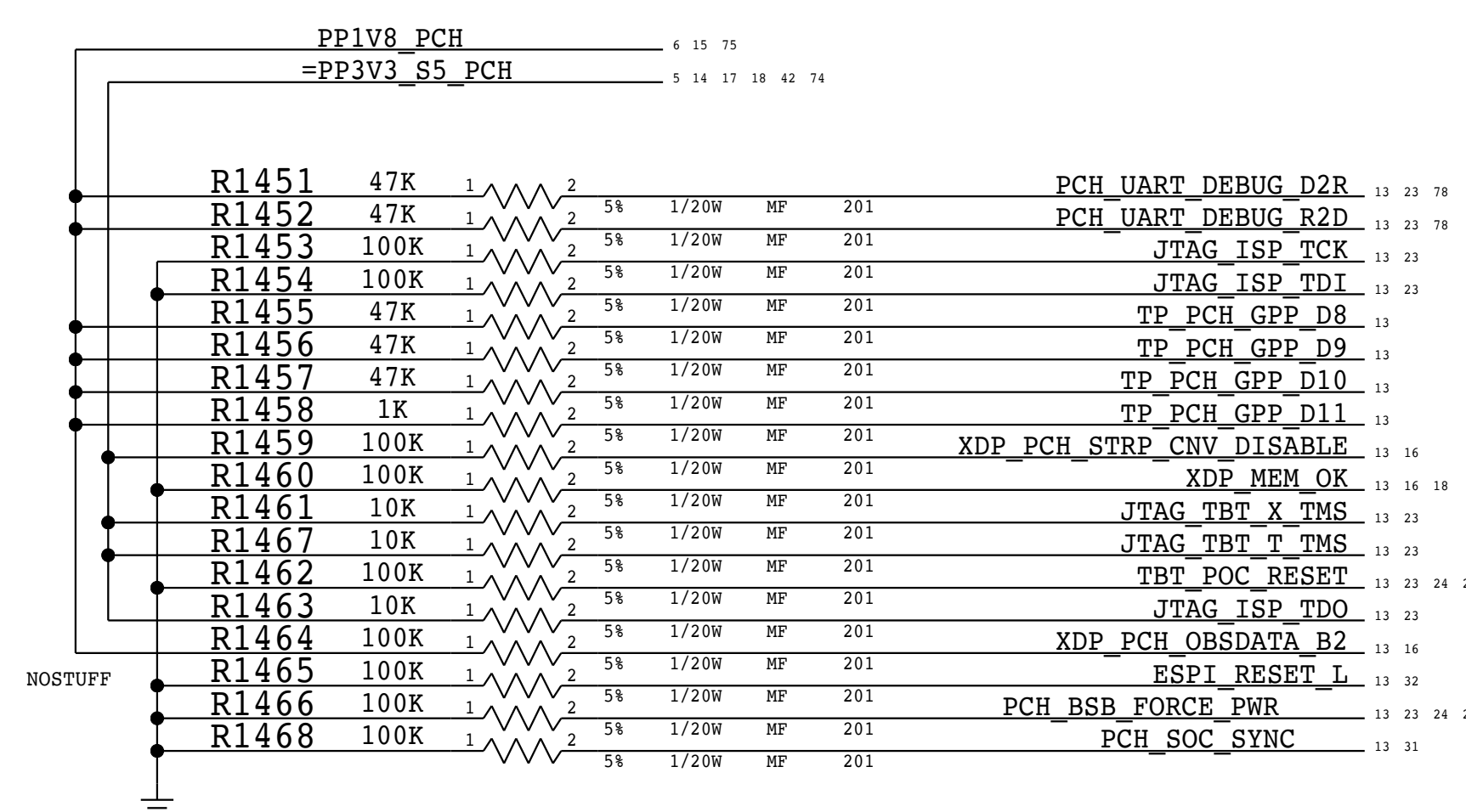
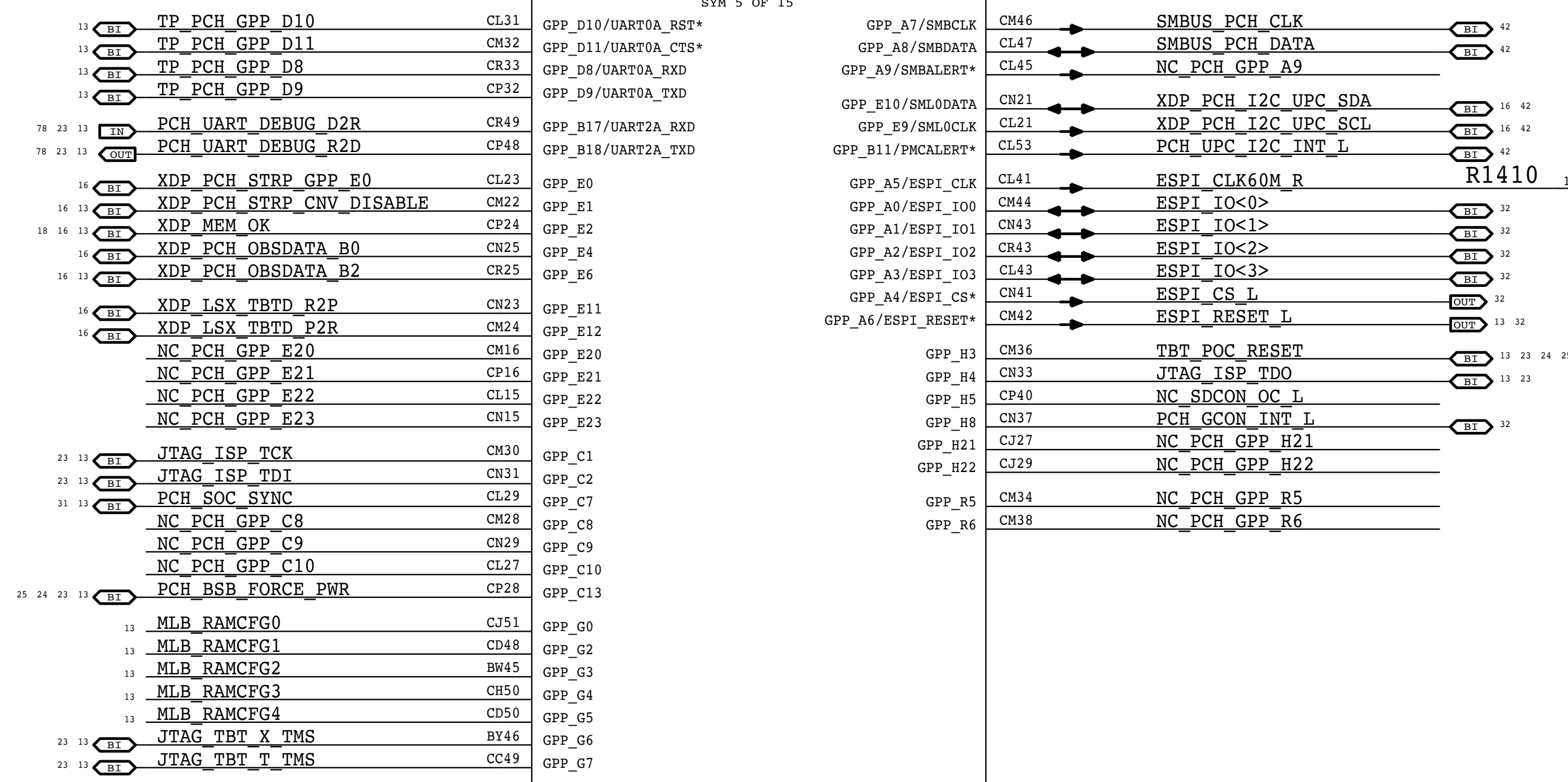


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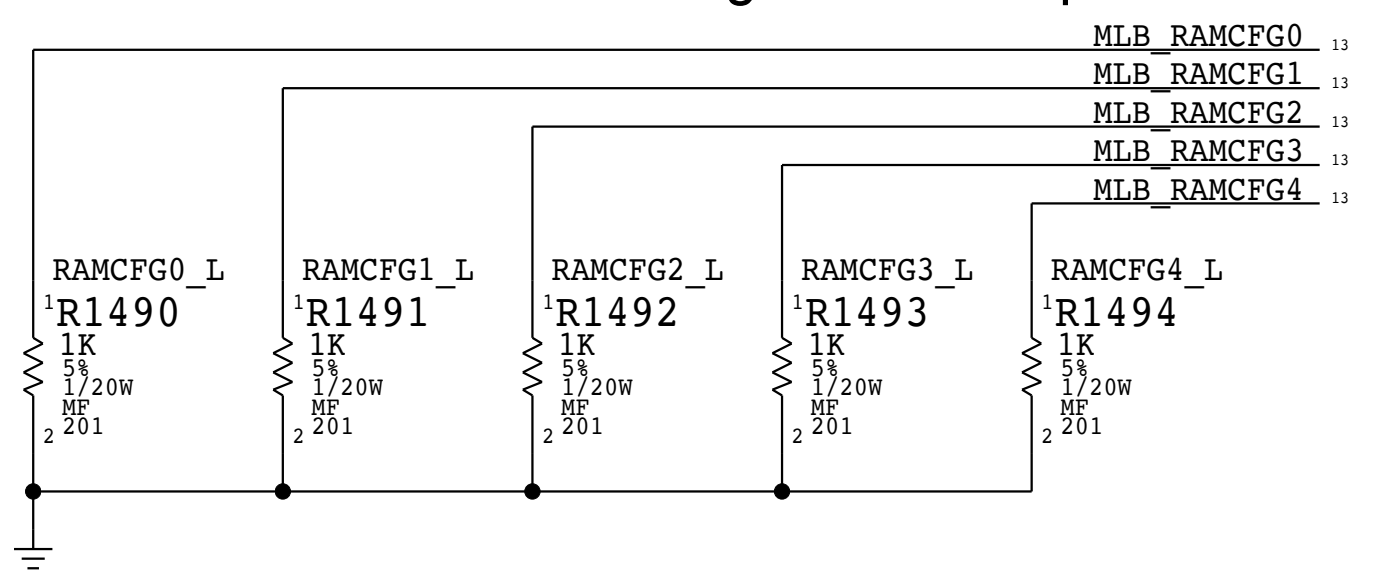
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<b>PCH Decoupling</b>			
	DRAWING NUMBER	051-05232	SIZE
	REVISION	4.0.0	D
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		PAGE	13 OF 152
		SHEET	12 OF 86

CRITICAL OMIT\_TABLE

U0500  
ICL\_YN  
BGA  
SYM 5 OF 15



RAM Configuration Straps



SYNC MASTER=CPU CARD ICL\_Y SYNC DATE=06/08/2018

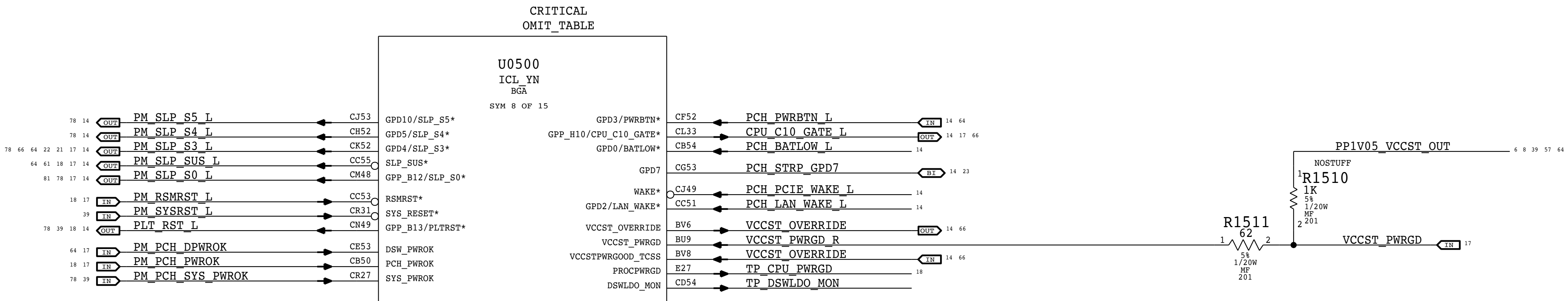
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Apple Inc.

DRAWING NUMBER	051-05232	SIZE	D
REVISION	4.0.0		
BRANCH	riskramp		
PAGE	14 OF 152		
SHEET	13 OF 86		

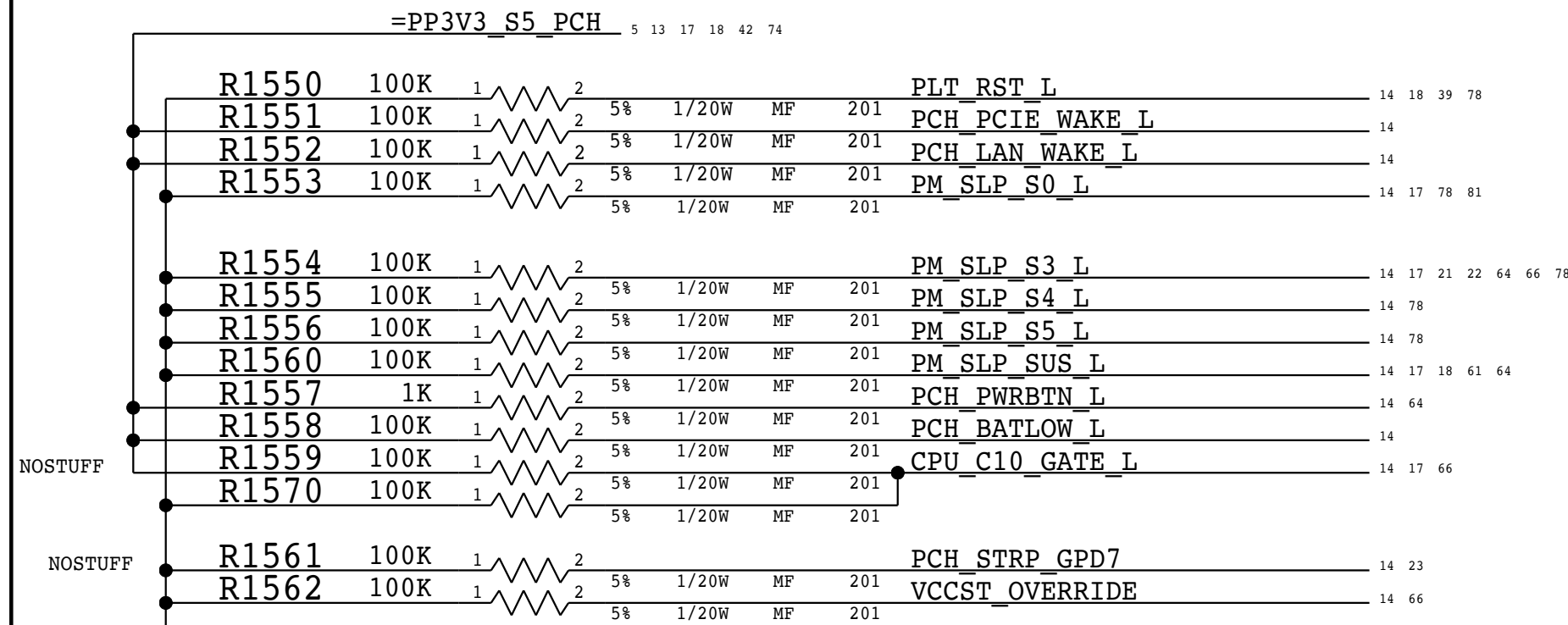
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BOM\_COST\_GROUP=CPU & CHIPSET



**A** PM\_SLP\_S0\_L NOTE

PM\_SLP\_S0\_L has an internal pull-up before RSMRST# is released. This causes a voltage divider with the pull-down R1553. The signal is driven high after RSMRST# is released.



SYNC MASTER=CPU CARD ICL_Y		SYNC DATE=06/08/2018	
<b>PCH Power Management</b>			
		DRAWING NUMBER	SIZE
		051-05232	D
		REVISION	
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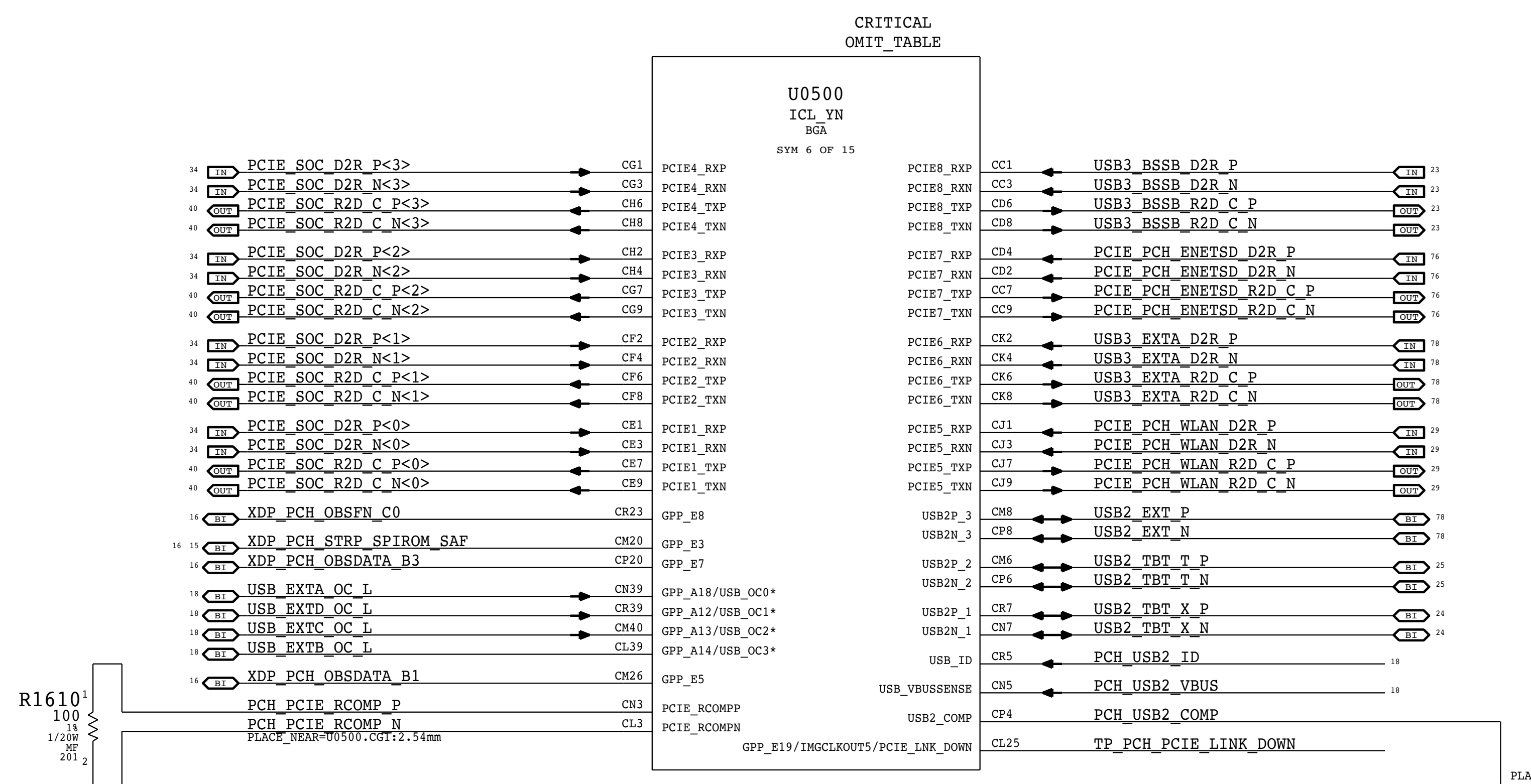
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B

A

PCIe Port Assignments:

- SOC lane 3
- SOC lane 2
- SOC lane 1
- SOC lane 0

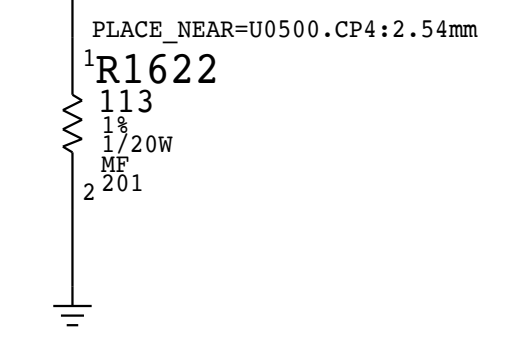
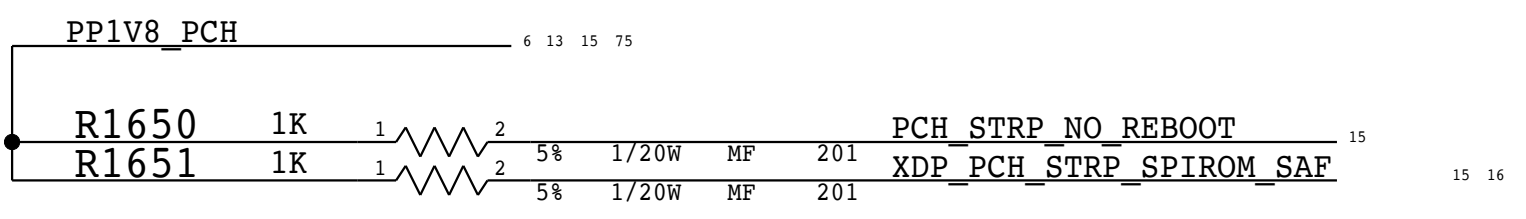


USB3 Port Assignments:

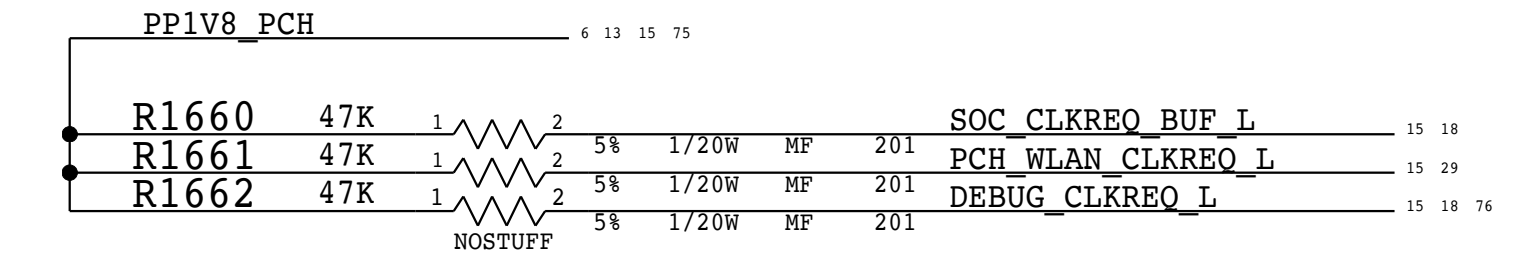
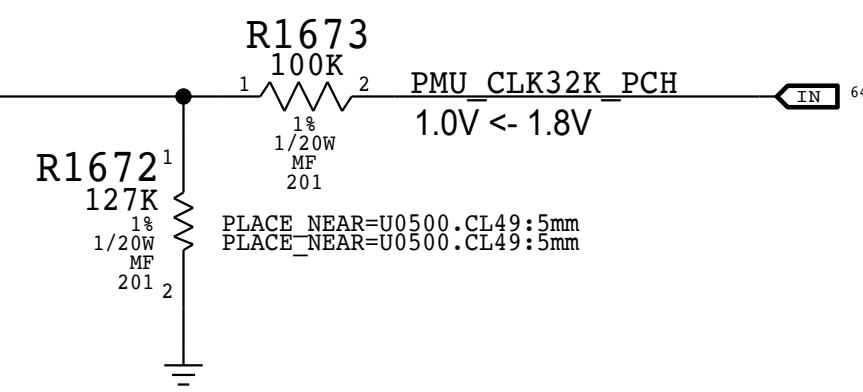
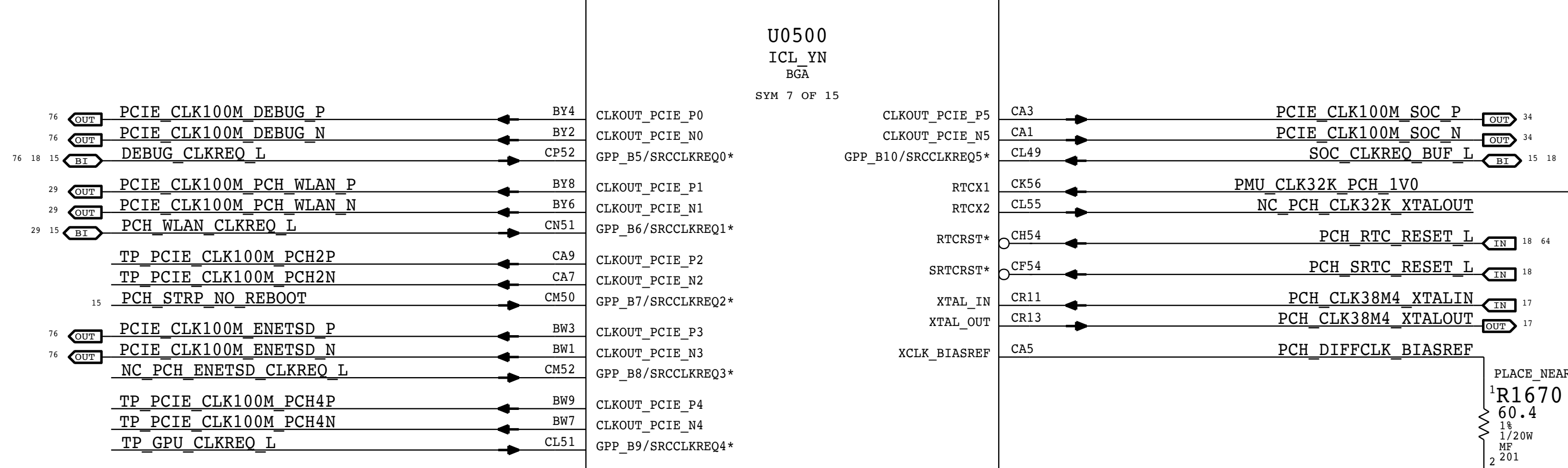
- BSSB
- SPARE (SS)
- USB2 PORT ASSIGNMENTS:
  - FIXTURE (LS/FS/HS)
  - USB-C T (LS/FS/HS)
  - USB-C X (LS/FS/HS)

PCIe Port Assignments:

- ENET/SD
- WLAN



CRITICAL OMIT TABLE

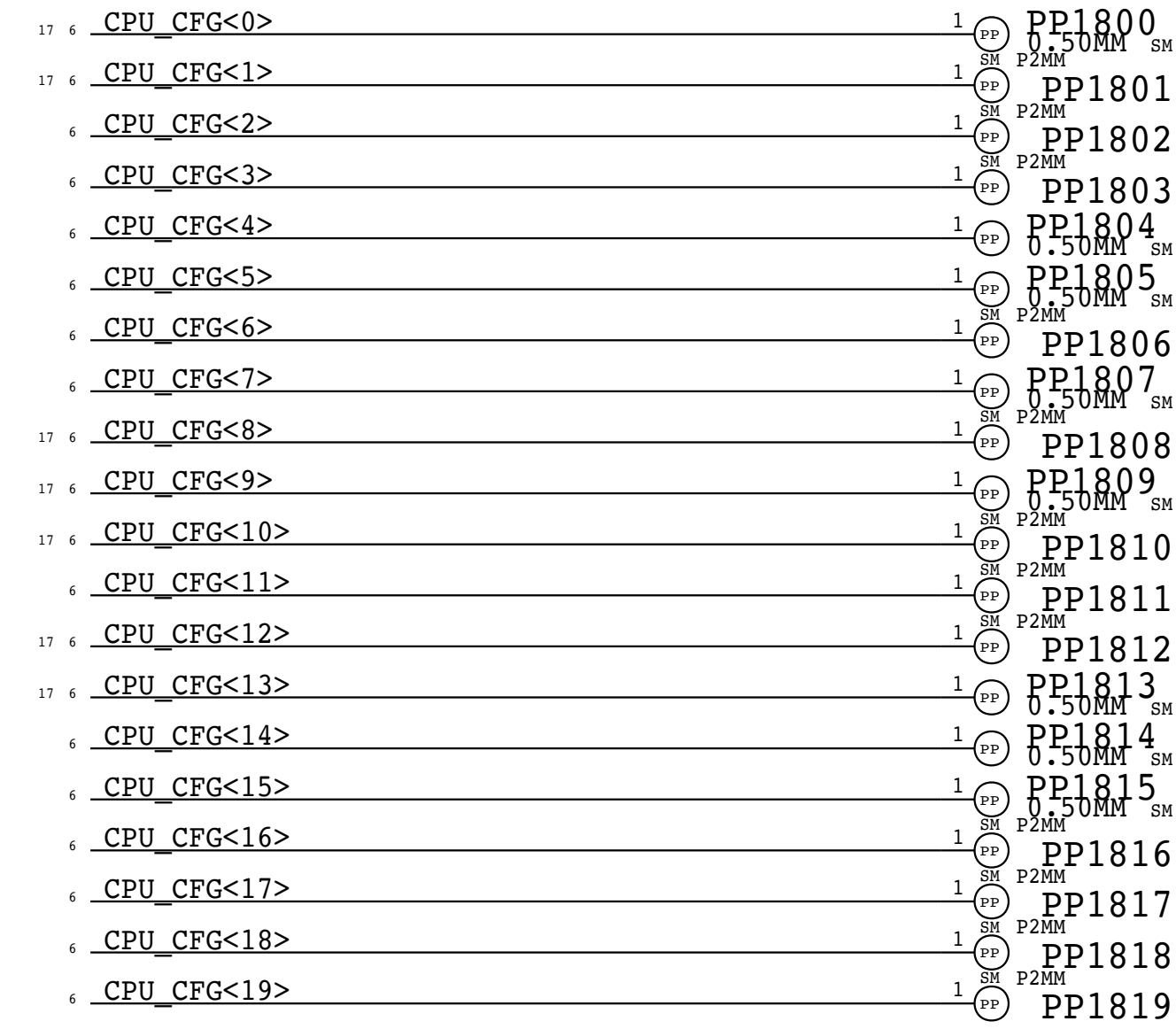


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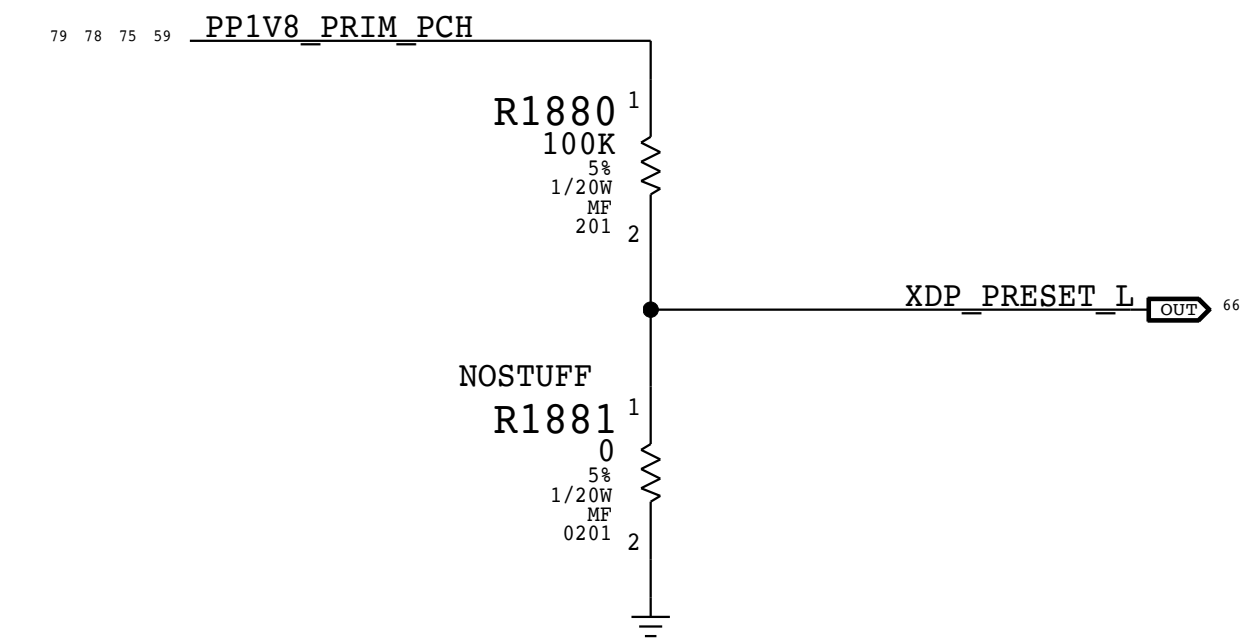
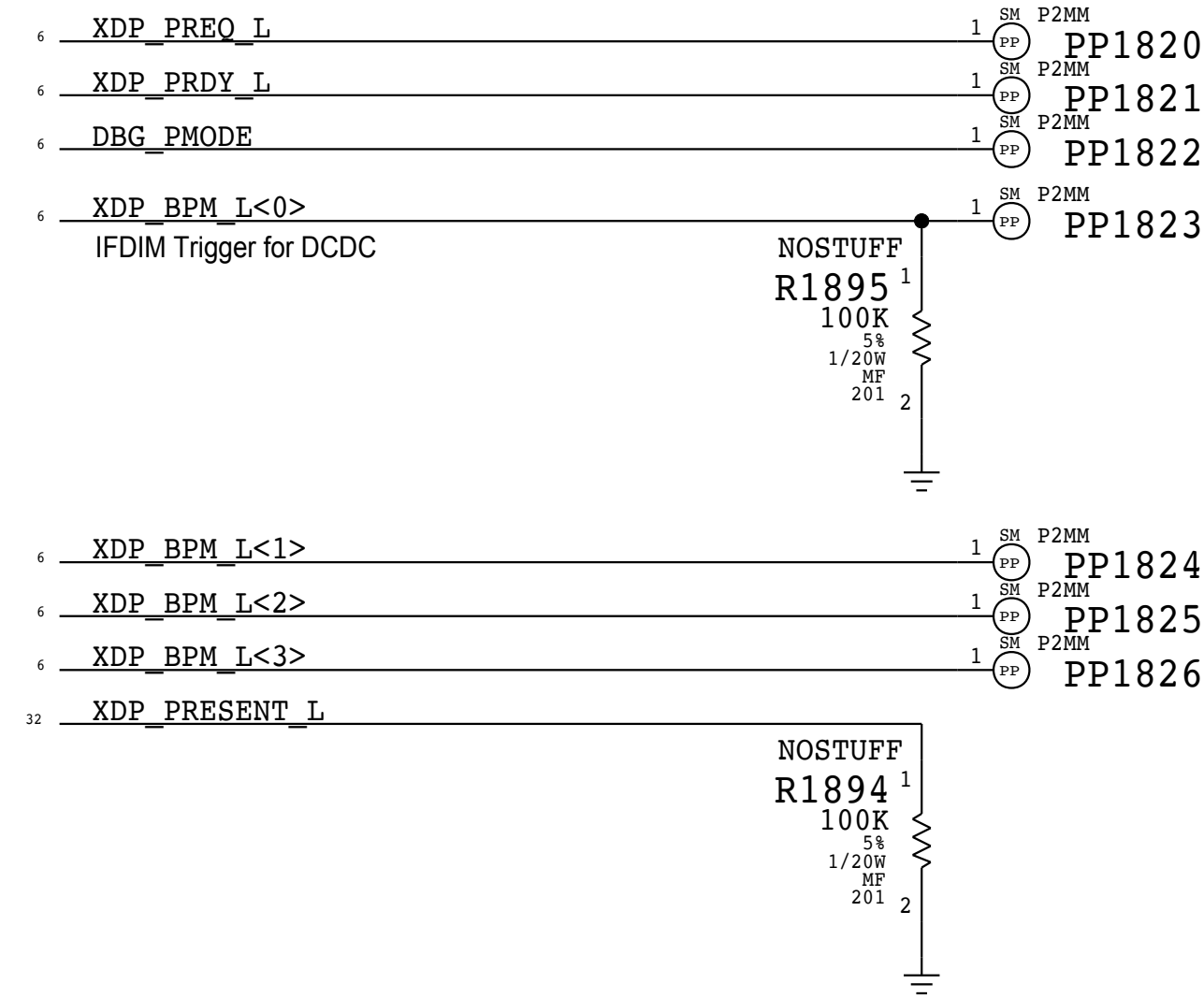
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PAGE TITLE <b>PCH PCIe/USB/CLK</b>			
		DRAWING NUMBER <b>051-05232</b>	SIZE <b>D</b>
		REVISION <b>4.0.0</b>	BRANCH <b>riskramp</b>
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D

D



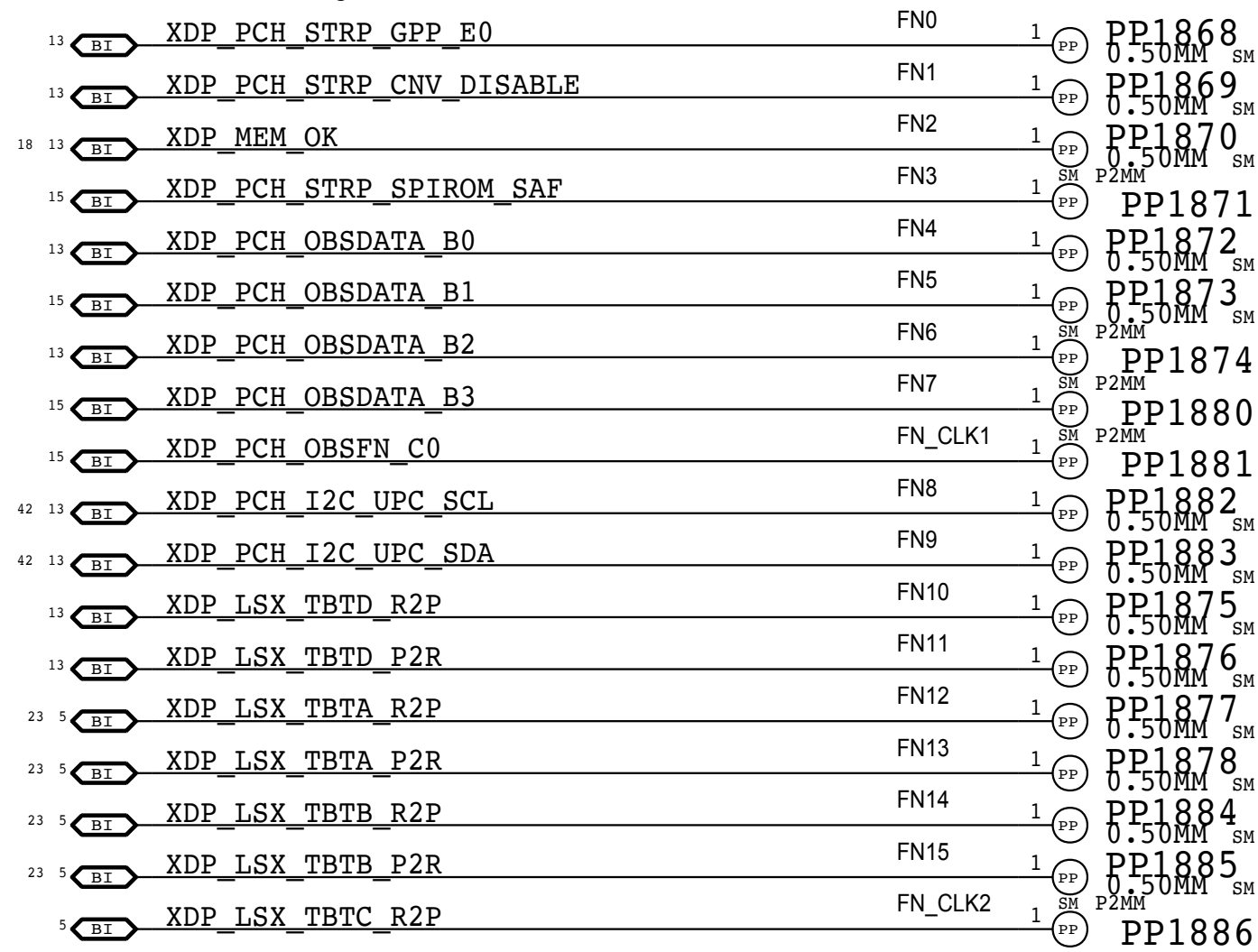
TP XDP Signals



PCH XDP Signals

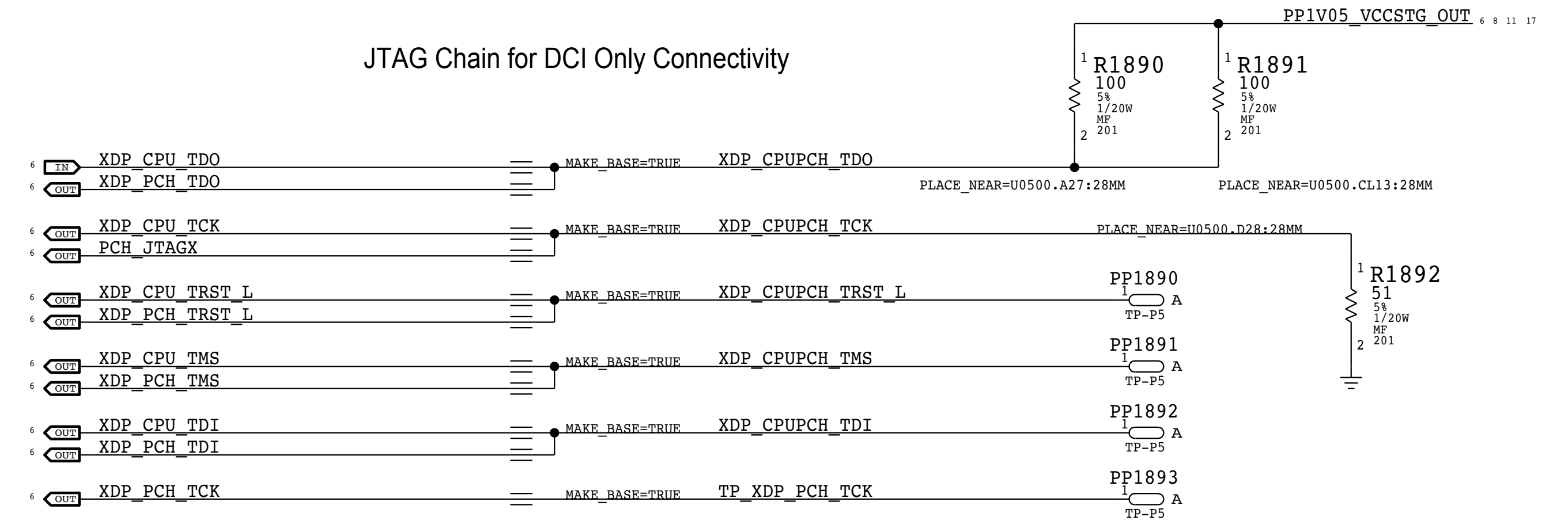
These signals do not connect to the Primary (Merged) XDP connector in this architecture because it does not exist. The PDG puts them on a secondary XDP connector that is only needed in some PCH debugging situation, but also does not exist. They are listed here to show their secondary XDP functions and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

PCH/XDP Signals



Non-XDP Signals

JTAG Chain for DCI Only Connectivity



C

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B

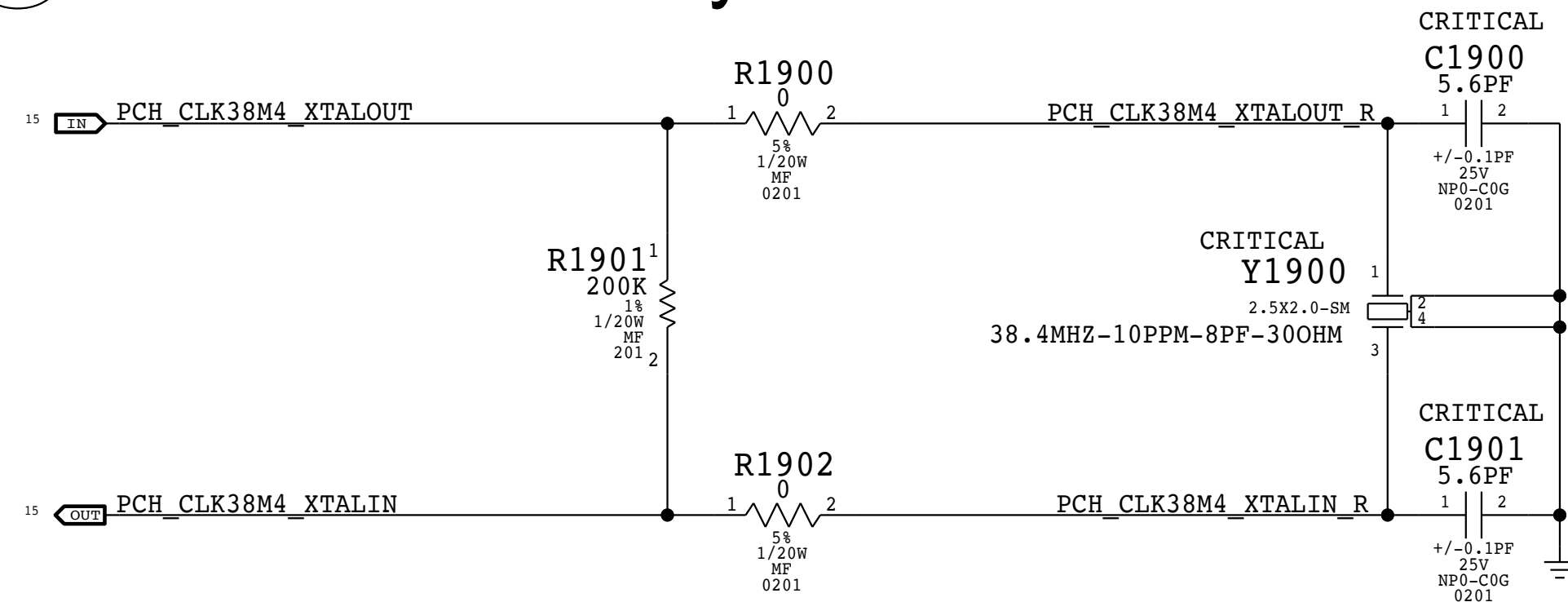
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SYNC MASTER=X589 CPU CNL Y		SYNC DATE=03/13/2017	
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		REVISION	4.0.0
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		PAGE	18 OF 152
		SHEET	16 OF 86

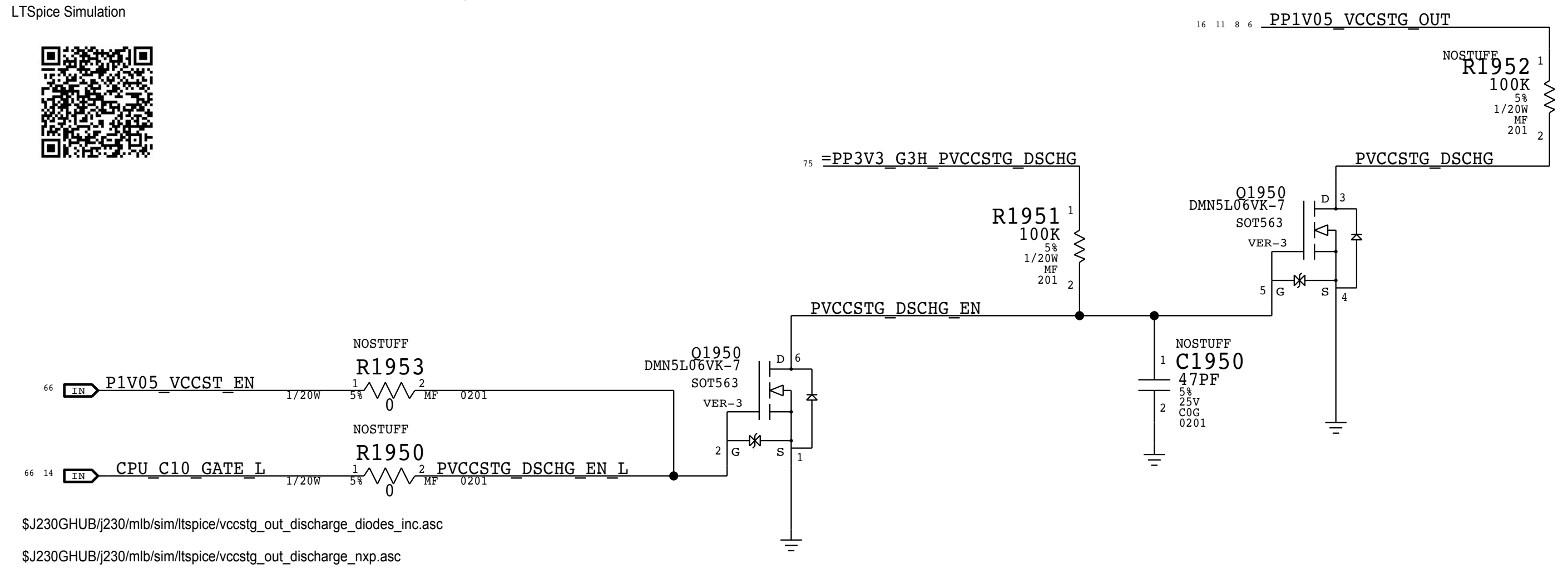


### A PCH 38.4MHz Crystal

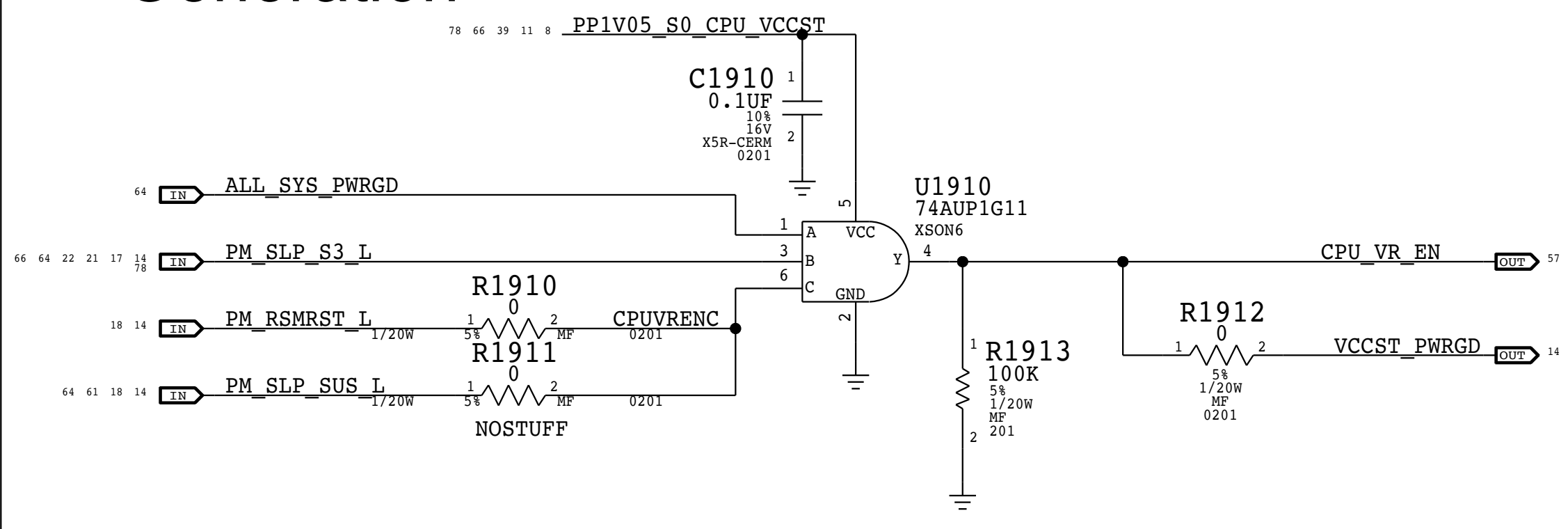


### E VCCSTG\_OUT Discharge Circuit

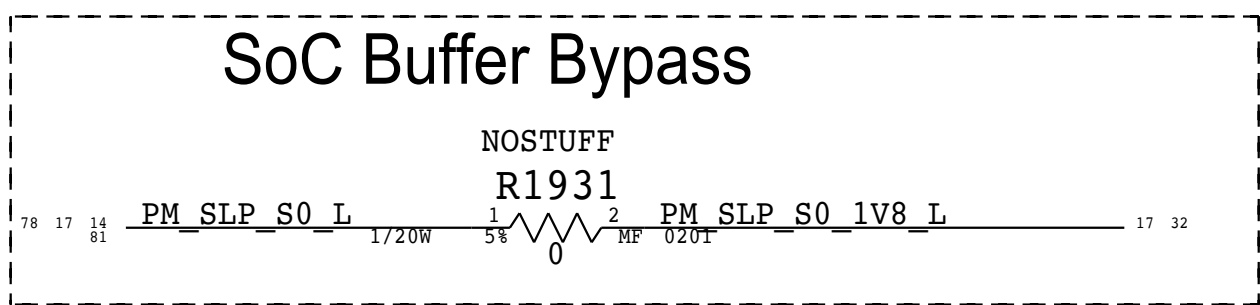
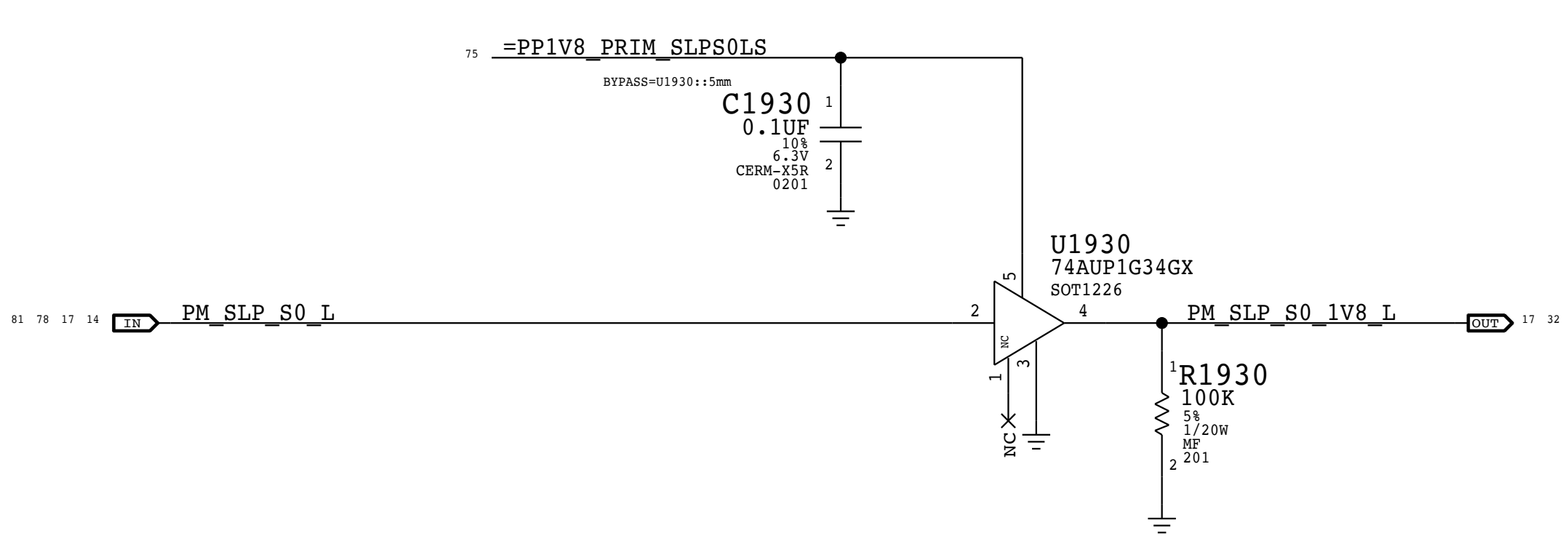
Ensure VCCSTG\_OUT <= VCCST during power-down (required at all times)



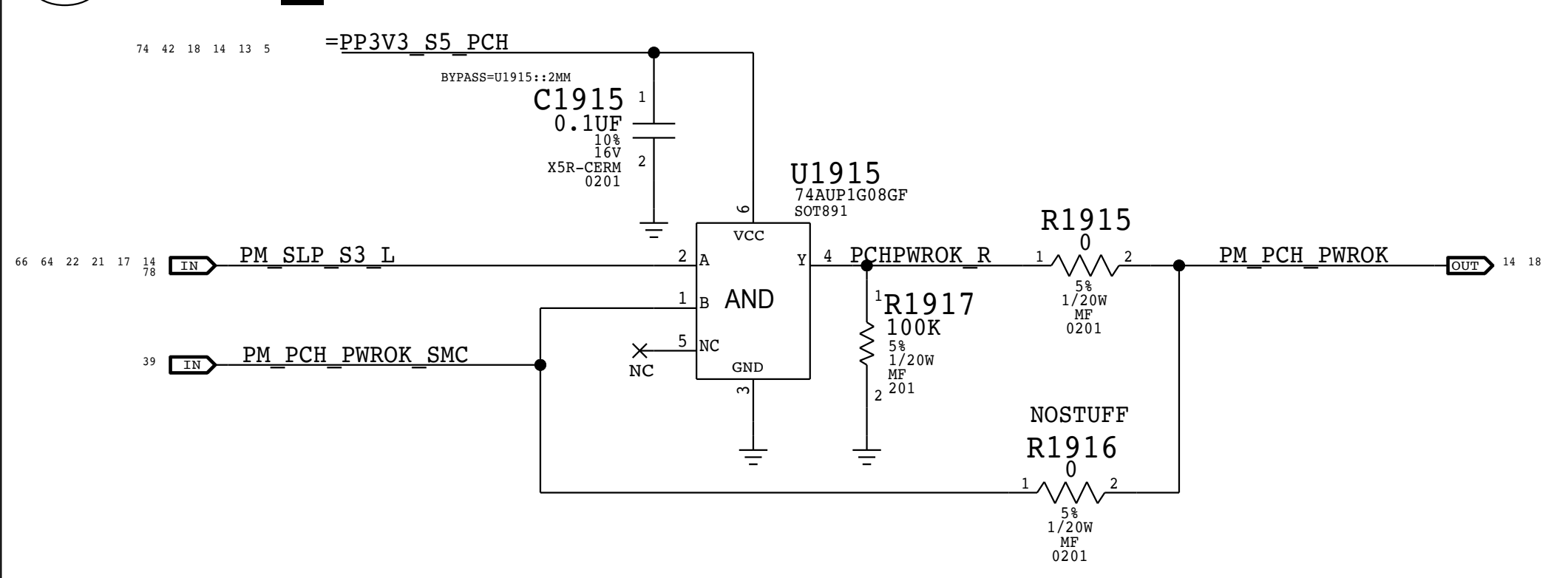
### B VCCIN VR EN and VCCST\_PWRGD Generation



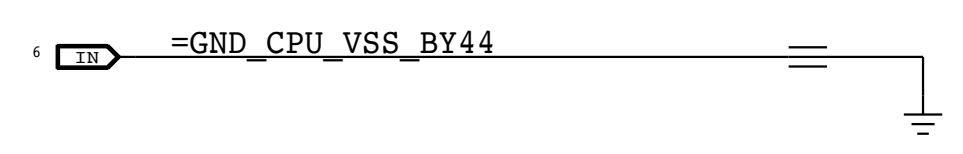
### F SLP\_S0# 1.8V Level Shifter



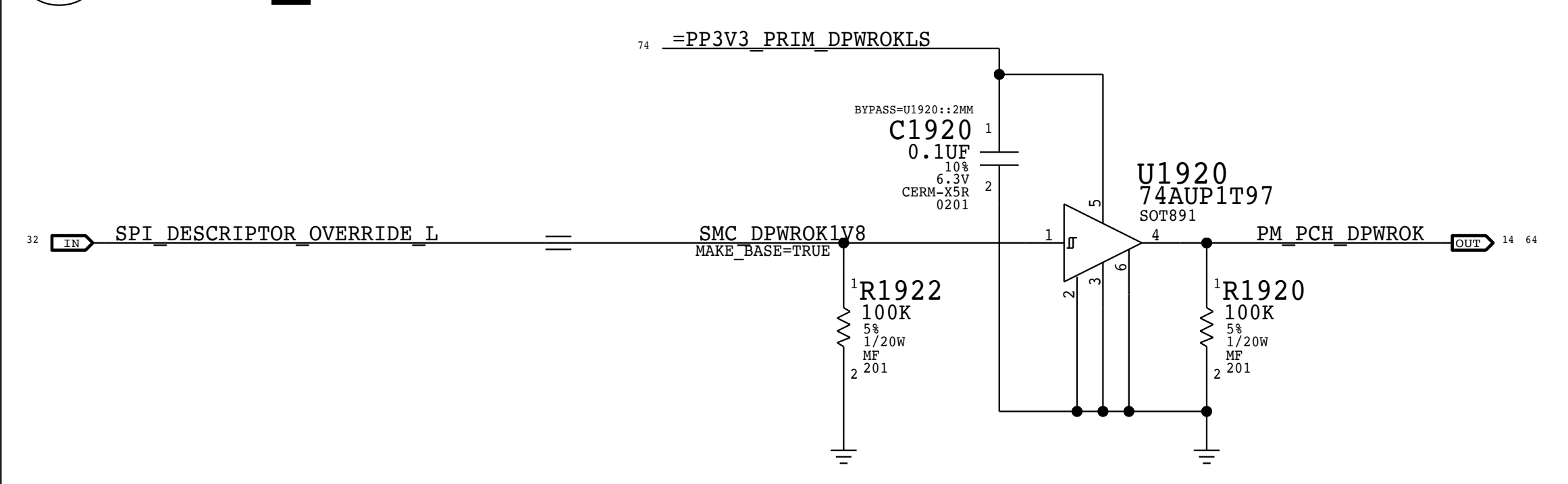
### C PCH\_PWROK Generation



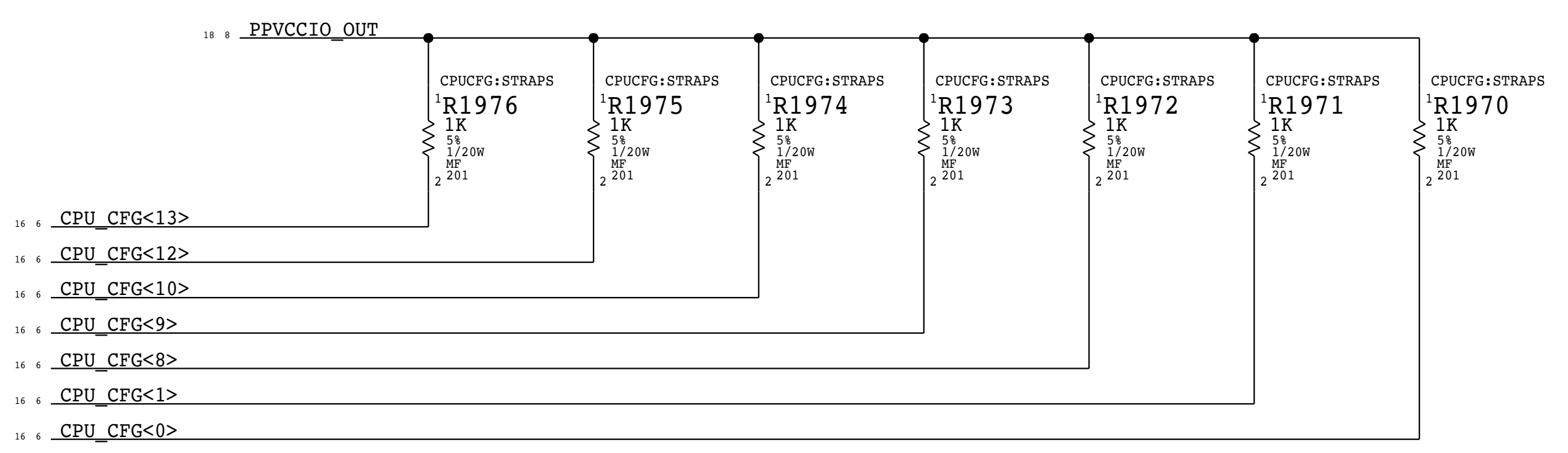
### G VSS\_268 GND Connection



### D DSW\_PWROK 3.3V Level Shifter



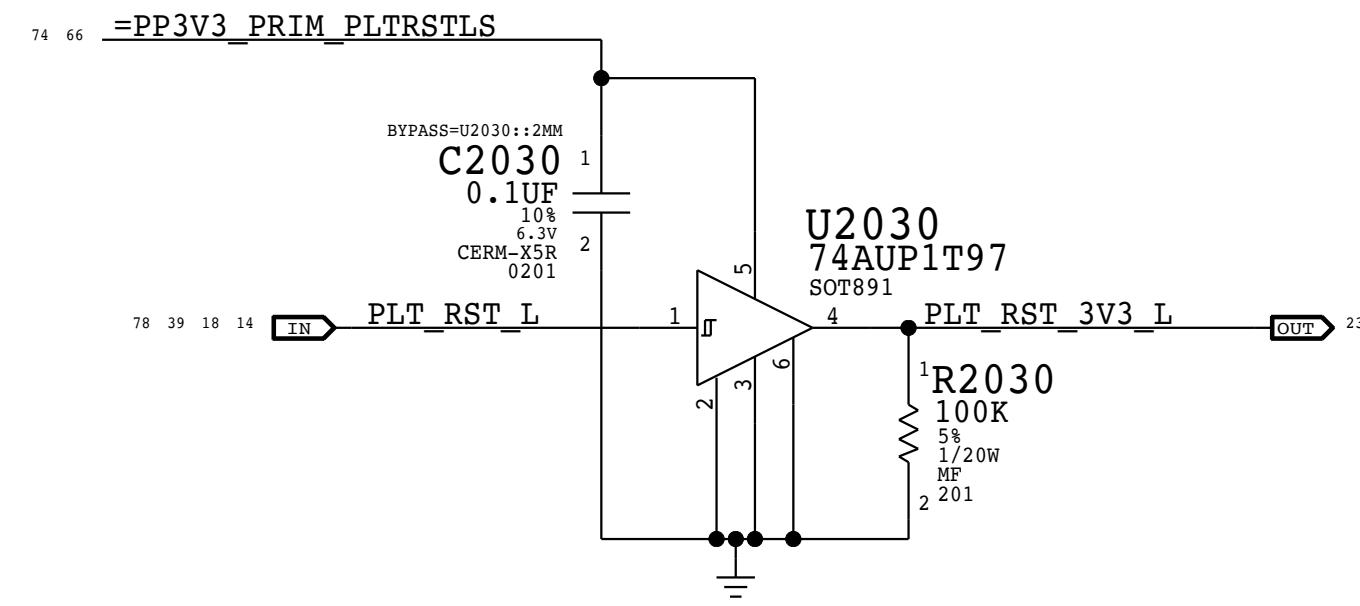
### H CFG Boot Straps



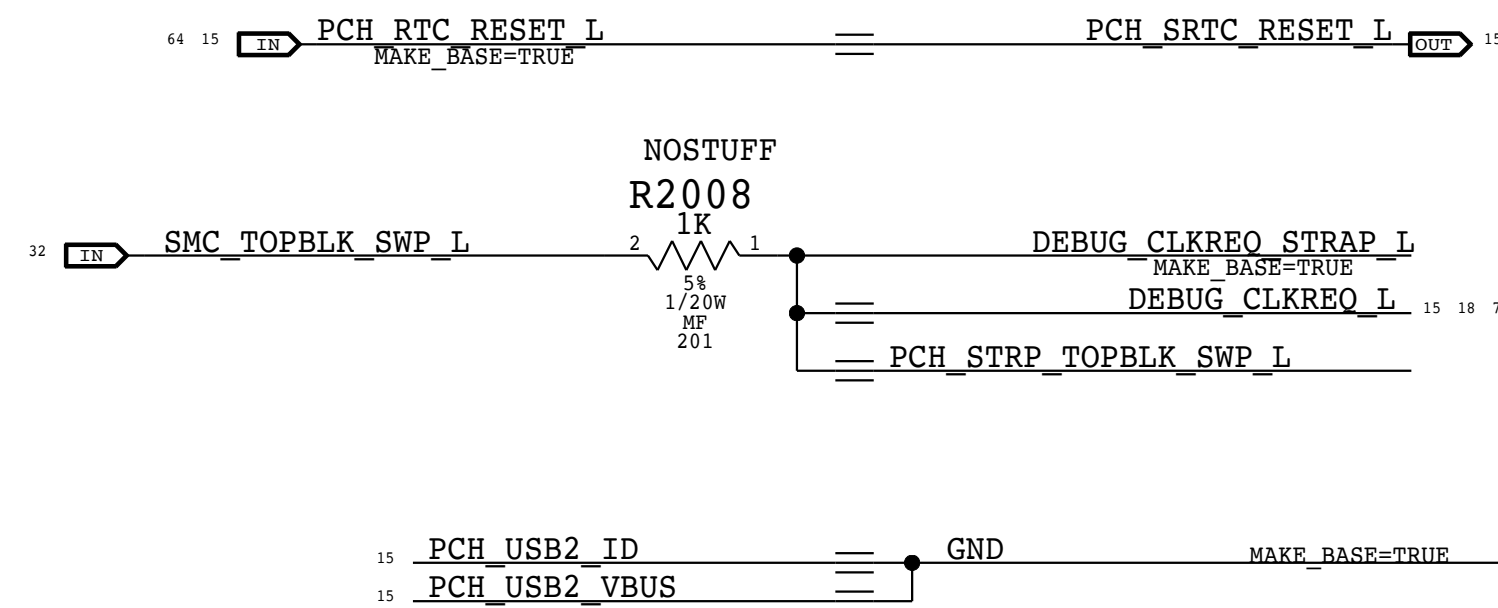
PAGE TITLE		DRAWING NUMBER		SIZE	
Chipset Shared Support		051-05232		D	
REVISION		4.0.0		BRANCH	
				riskramp	
PAGE		19 OF 152		SHEET	
				17 OF 86	

BOM\_COST\_GROUP=CPU & CHIPSET

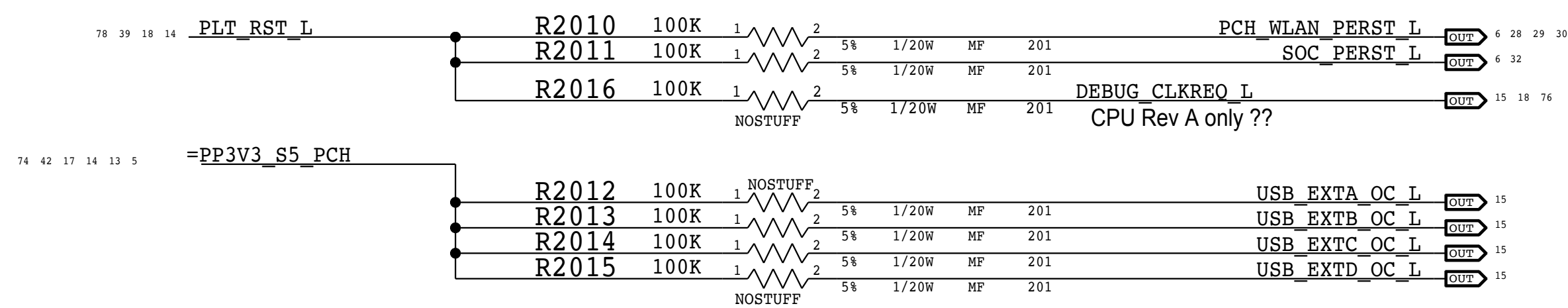
### A PLTRST# 3.3V Level Shifter



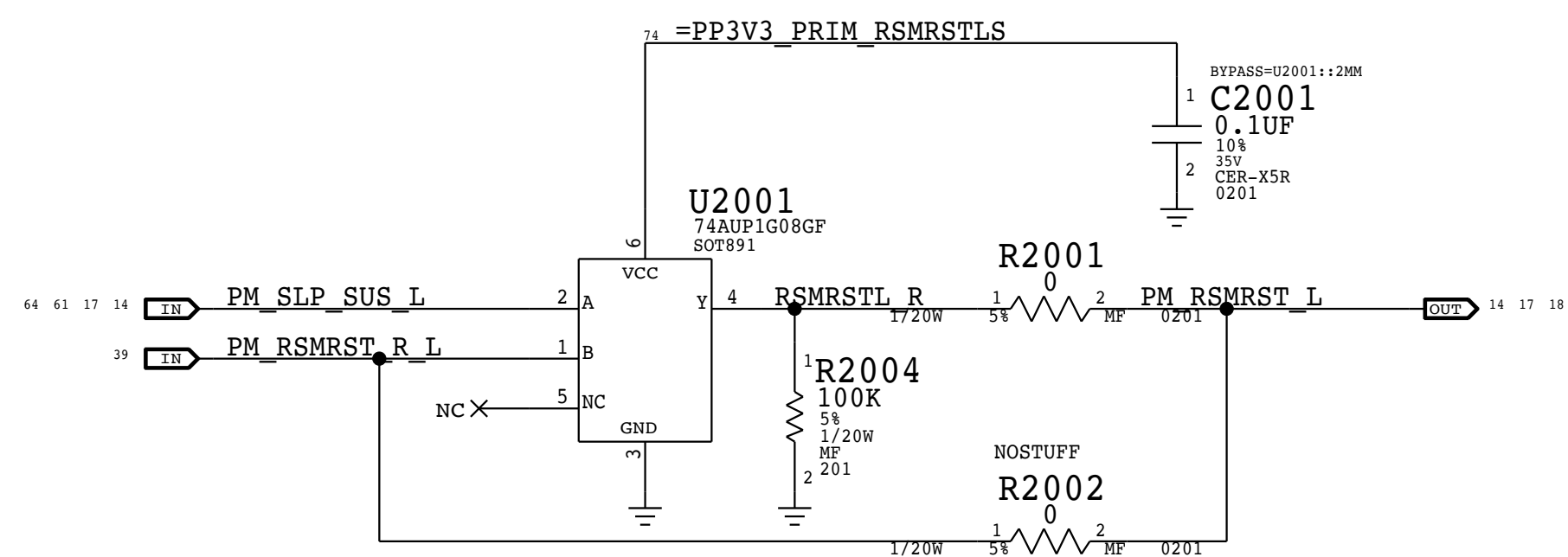
### B Miscellaneous Signal Aliases



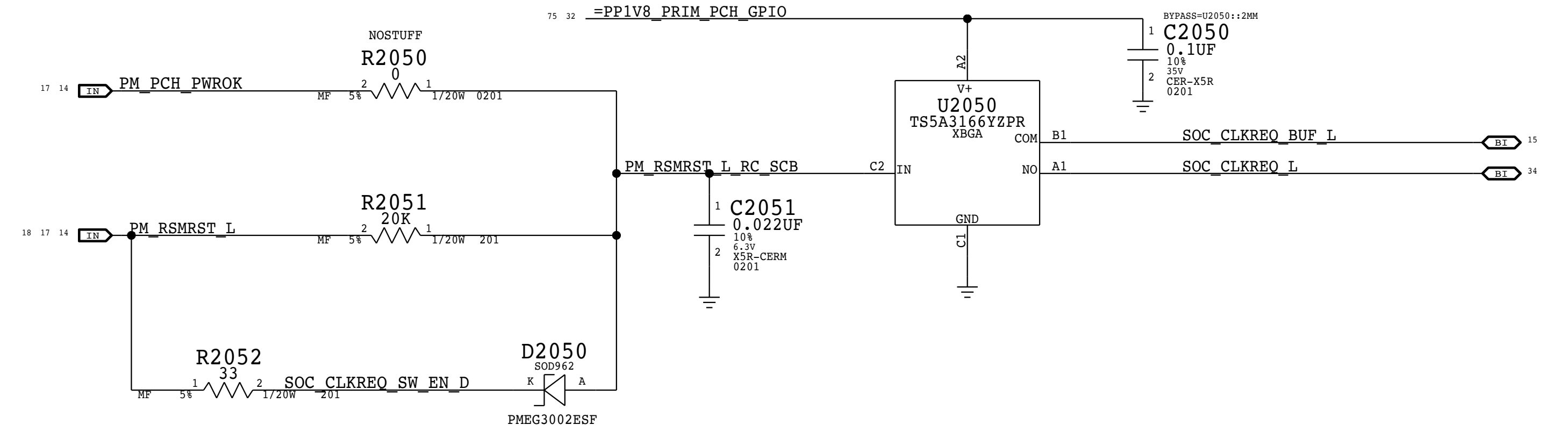
### C Miscellaneous Pull-Ups



### D PM\_RSMRST Control



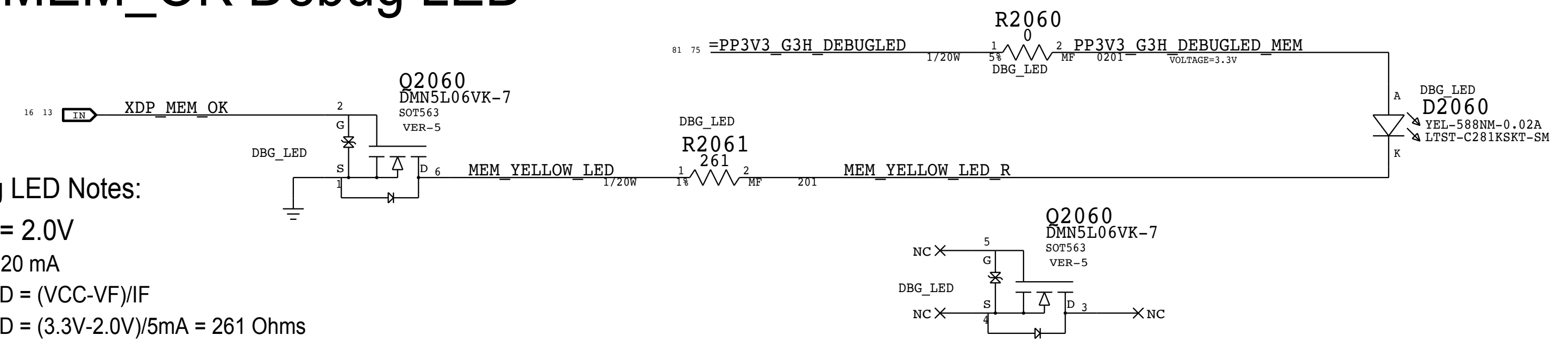
### E SOC\_CLKREQ Control



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

PCH latches SOC\_CLKREQ\_L boot strap 65us after RSMRST# de-assertion

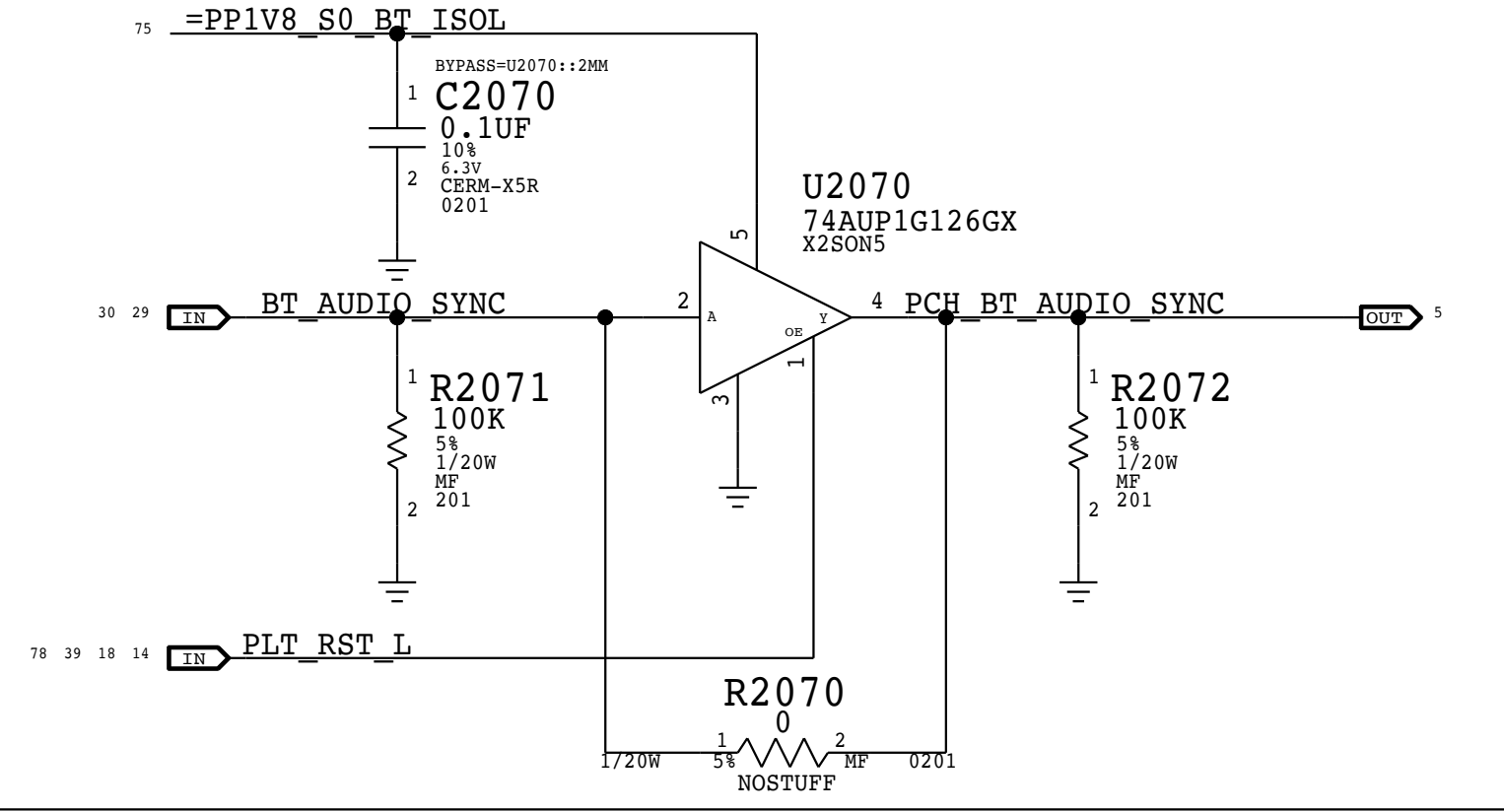
### F MEM\_OK Debug LED



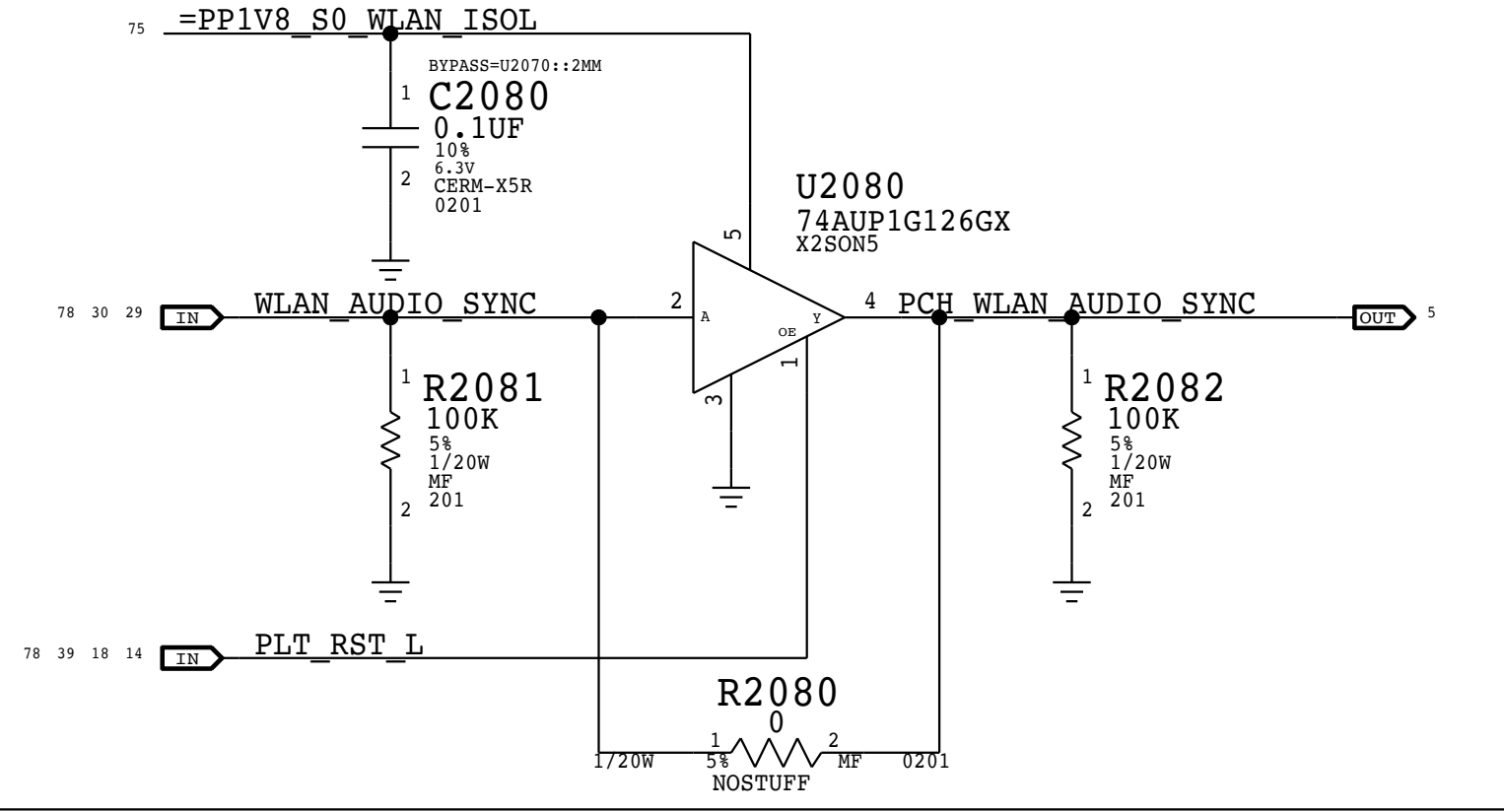
Debug LED Notes:

- VF = 2.0V
- IF = 20 mA
- RLED = (VCC-VF)/IF
- RLED = (3.3V-2.0V)/5mA = 261 Ohms

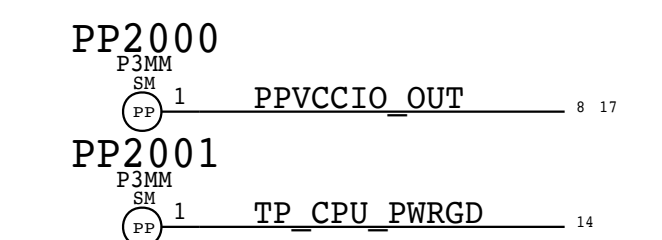
### G BT Audio Sync Buf



### H WiFi Audio Sync Buf



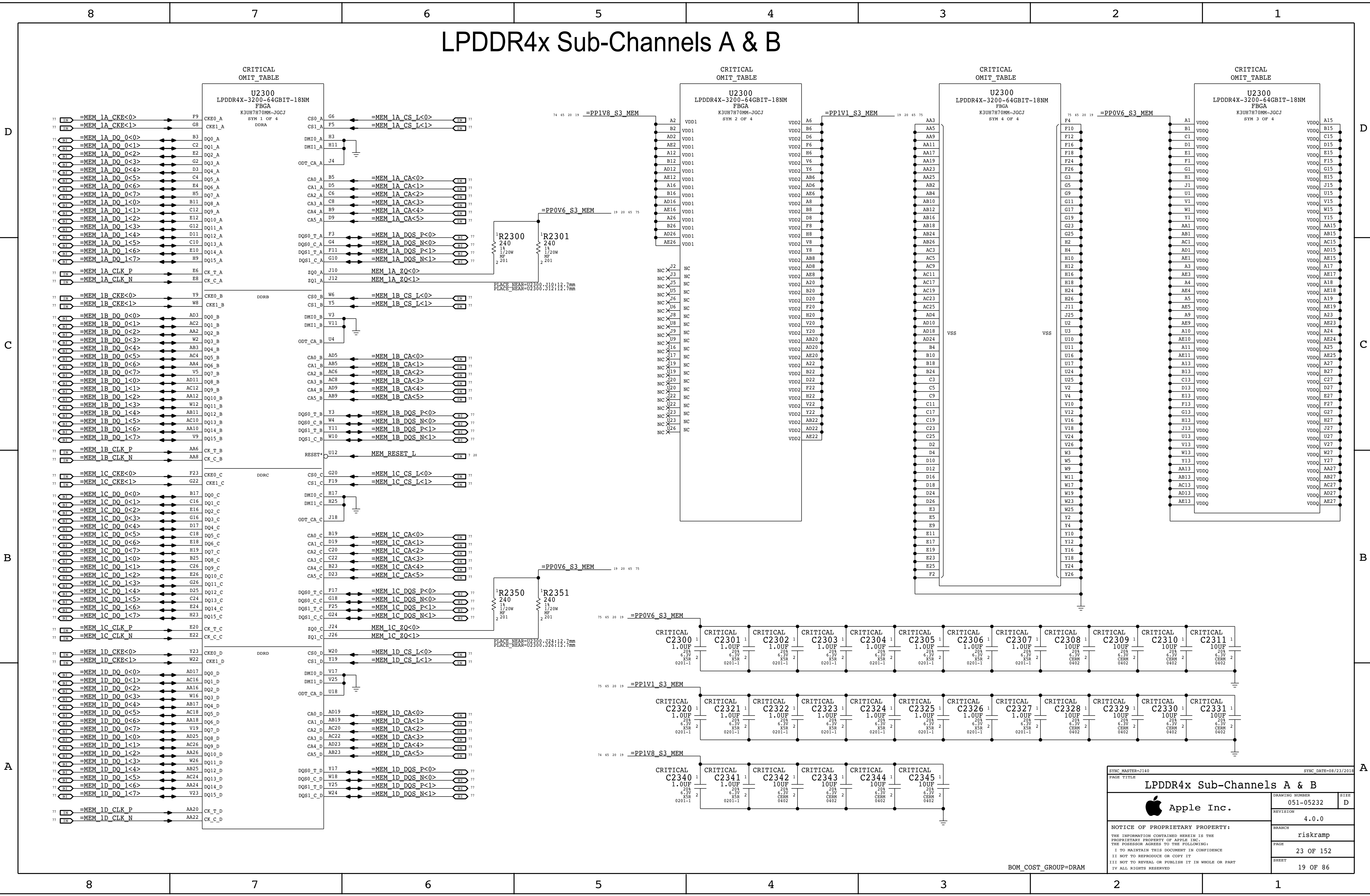
### I Miscellaneous Probe Points



BOM\_COST\_GROUP=CPU & CHIPSET

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Chipset Project Support				DRAWING NUMBER	SIZE
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				REVISION	
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# LPDDR4x Sub-Channels A & B



SYNC\_MASTER=J140 SYNC\_DATE=08/23/2018

LPDDR4x Sub-Channels A & B

Apple Inc.

DRAMING NUMBER: 051-05232

REVISION: 4.0.0

BRANCH: riskramp

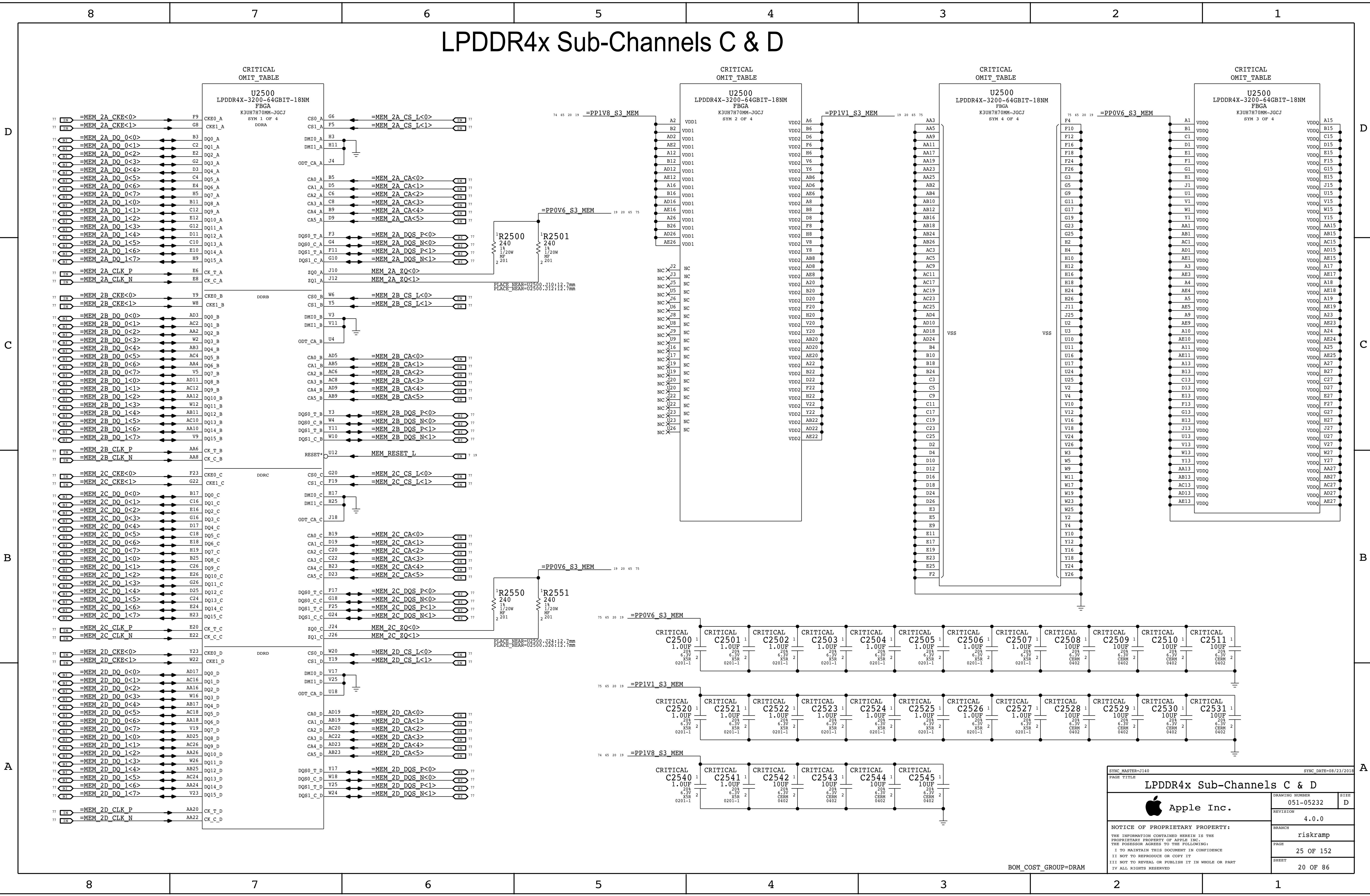
PAGE: 23 OF 152

SHEET: 19 OF 86

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BOM\_COST\_GROUP=DRAM

# LPDDR4x Sub-Channels C & D



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		SHEET	20 OF 86

BOM\_COST\_GROUP=DRAM

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
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D

D

C

C

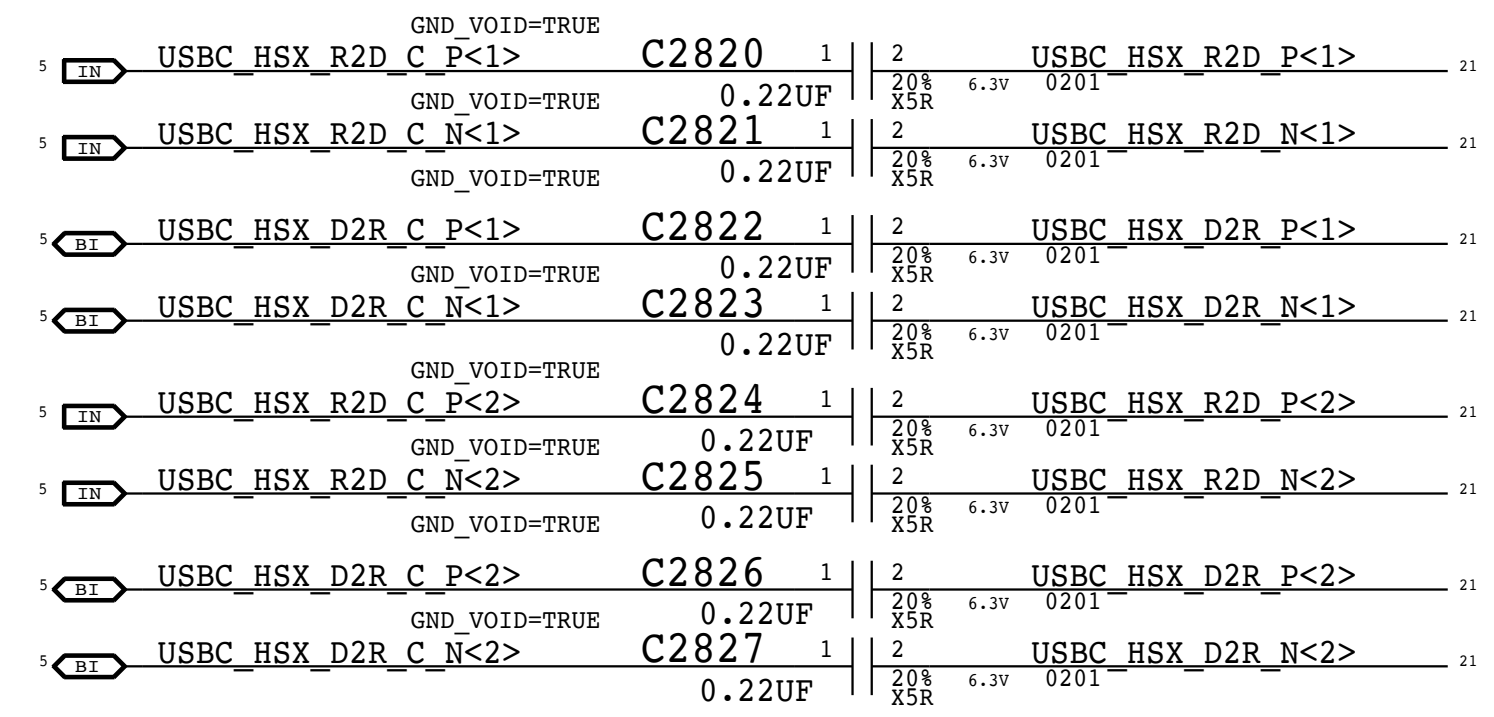
B

B

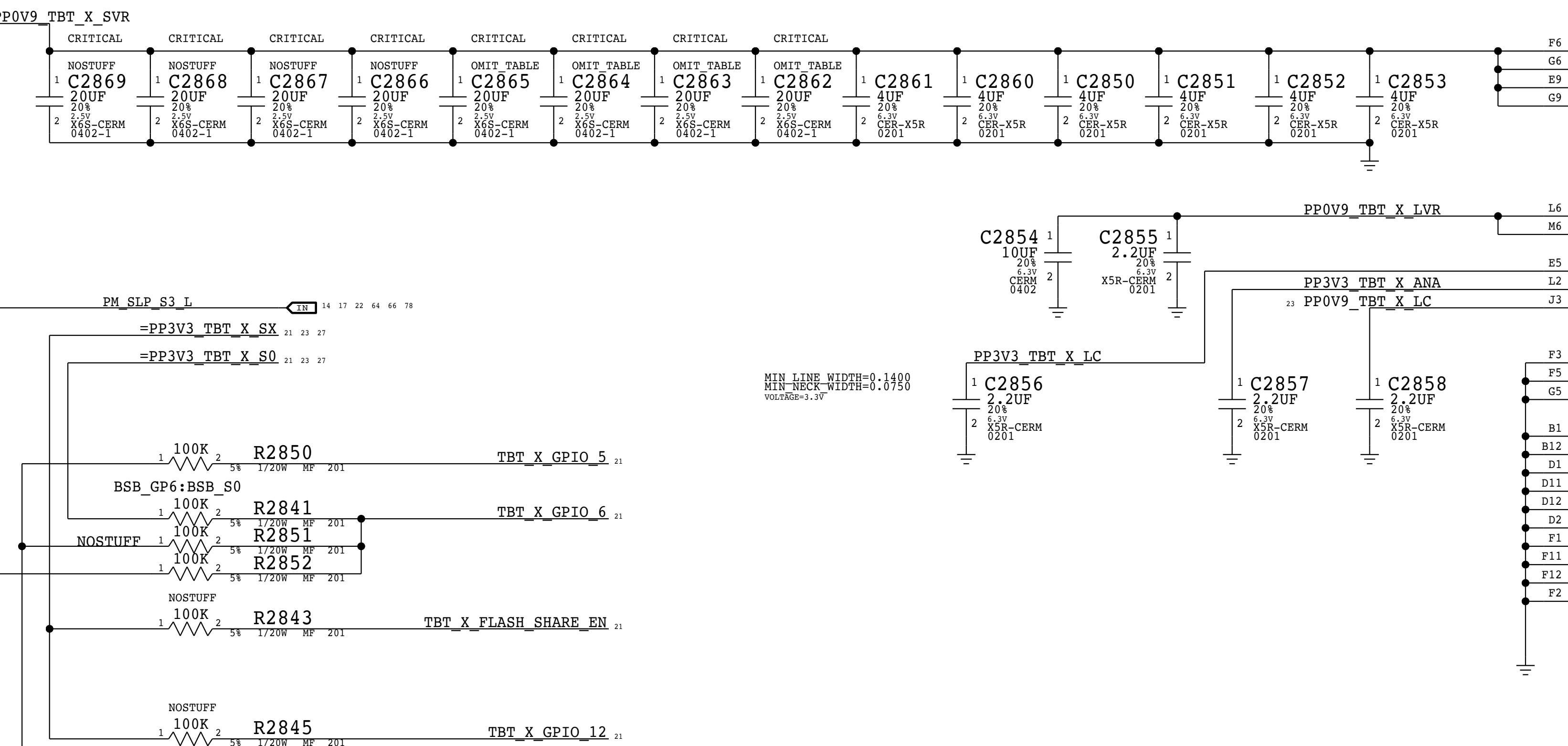
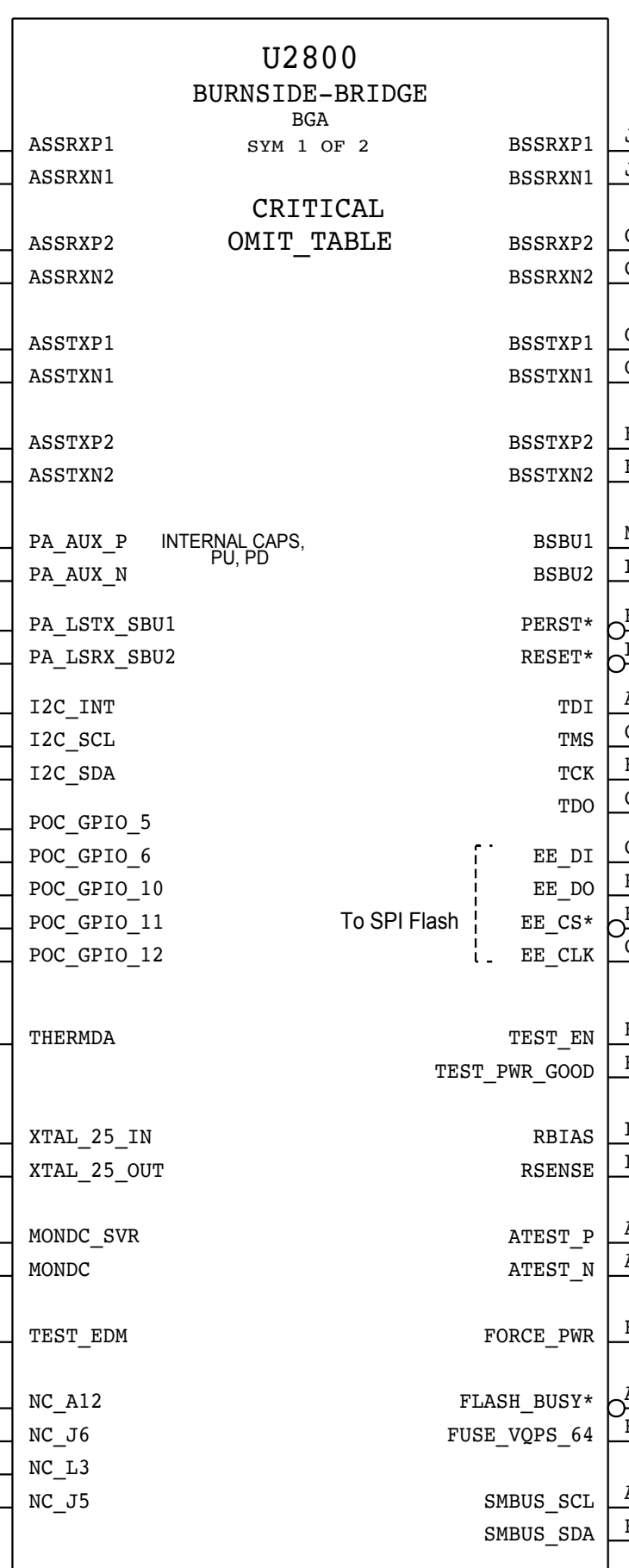
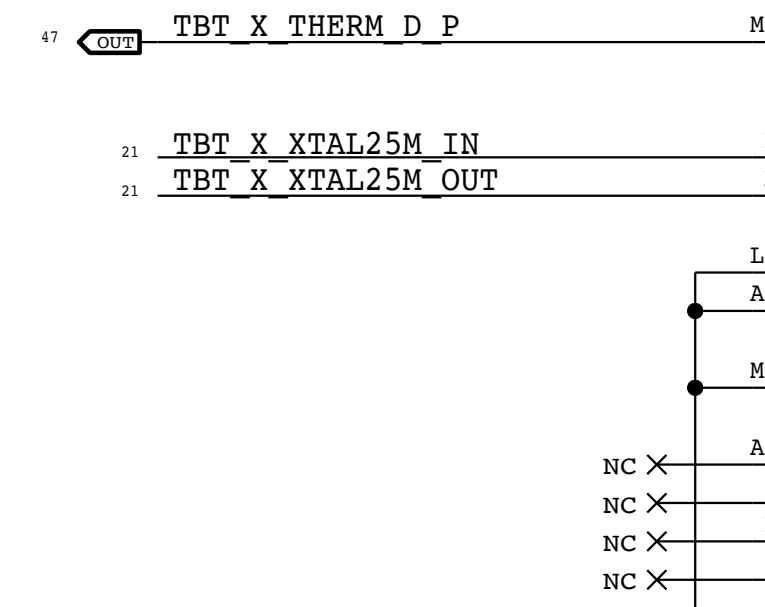
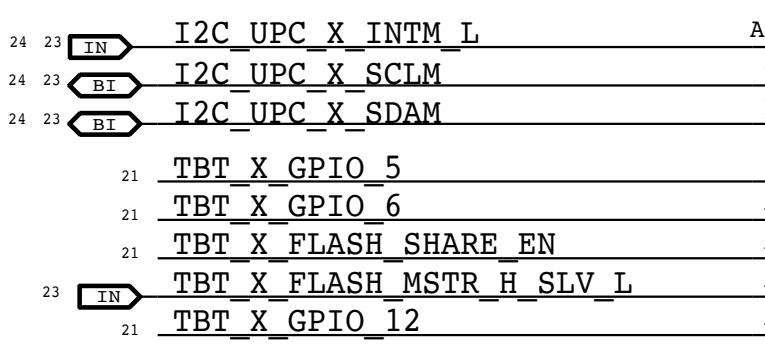
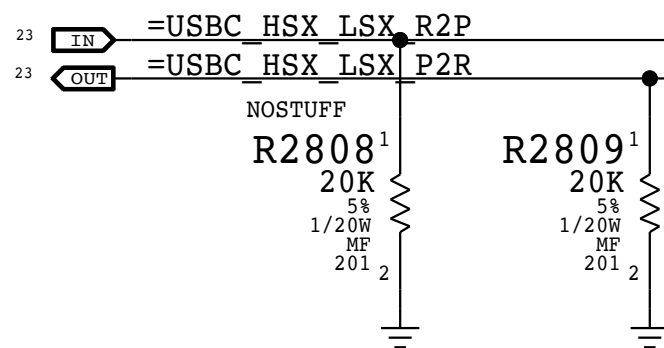
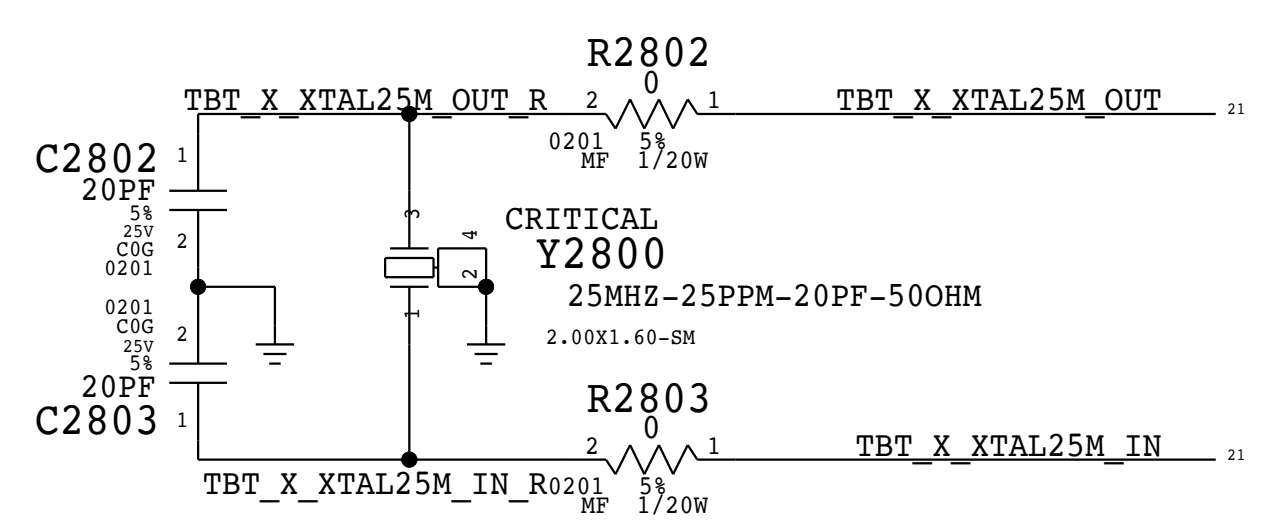
A

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USBC HIGH-SPEED 1 AC COUPLING



BB XTAL



PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
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D

C

B

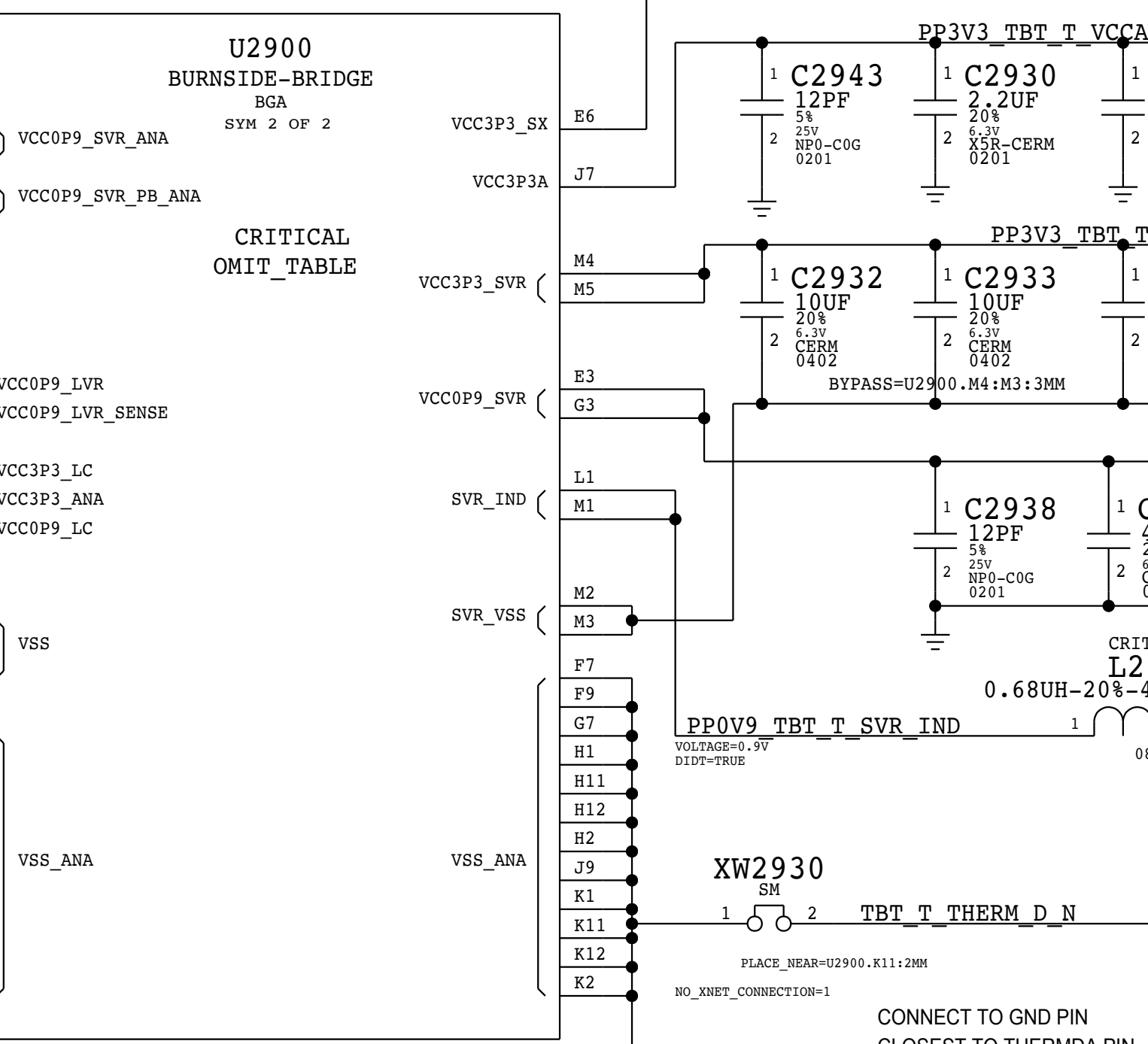
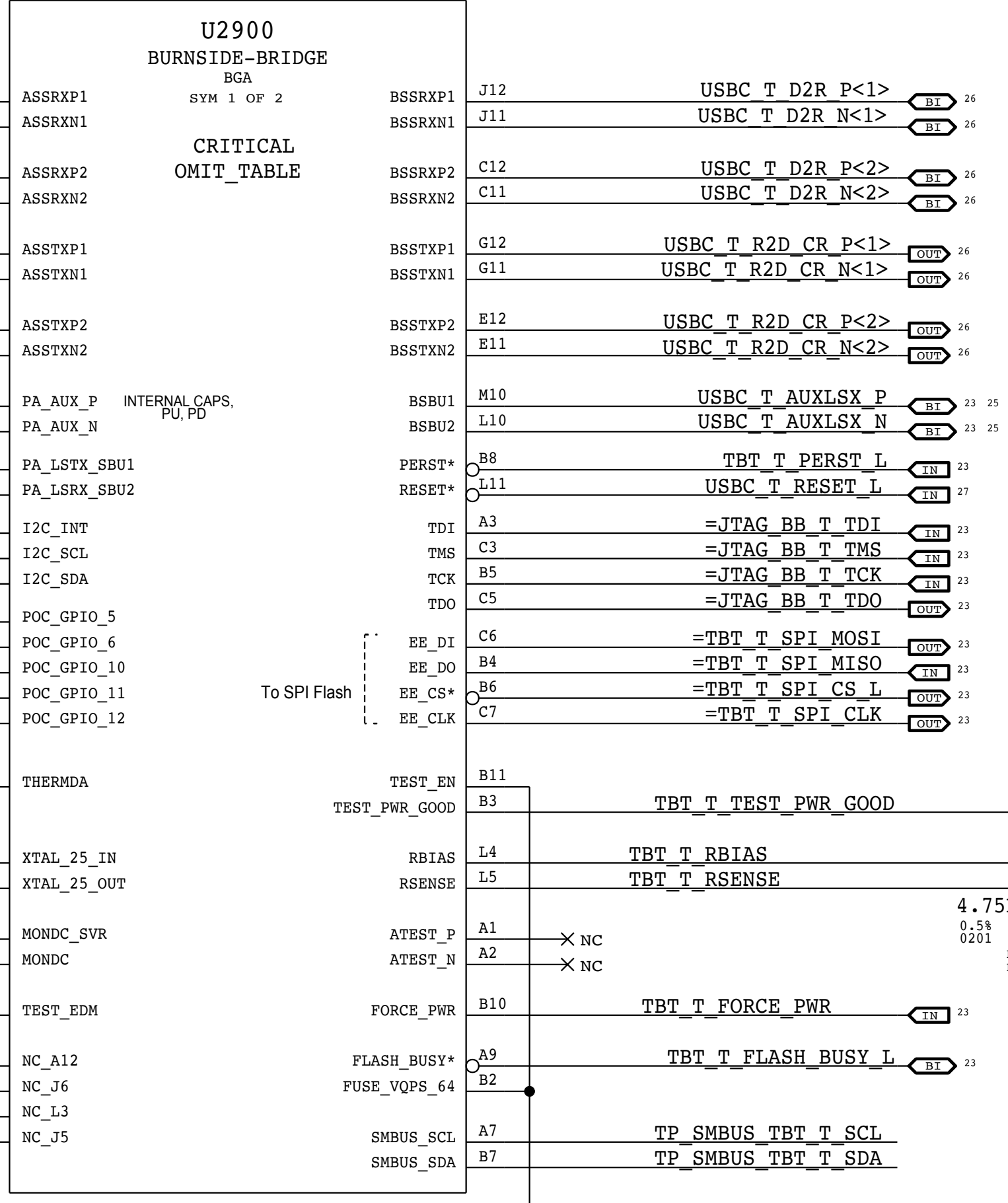
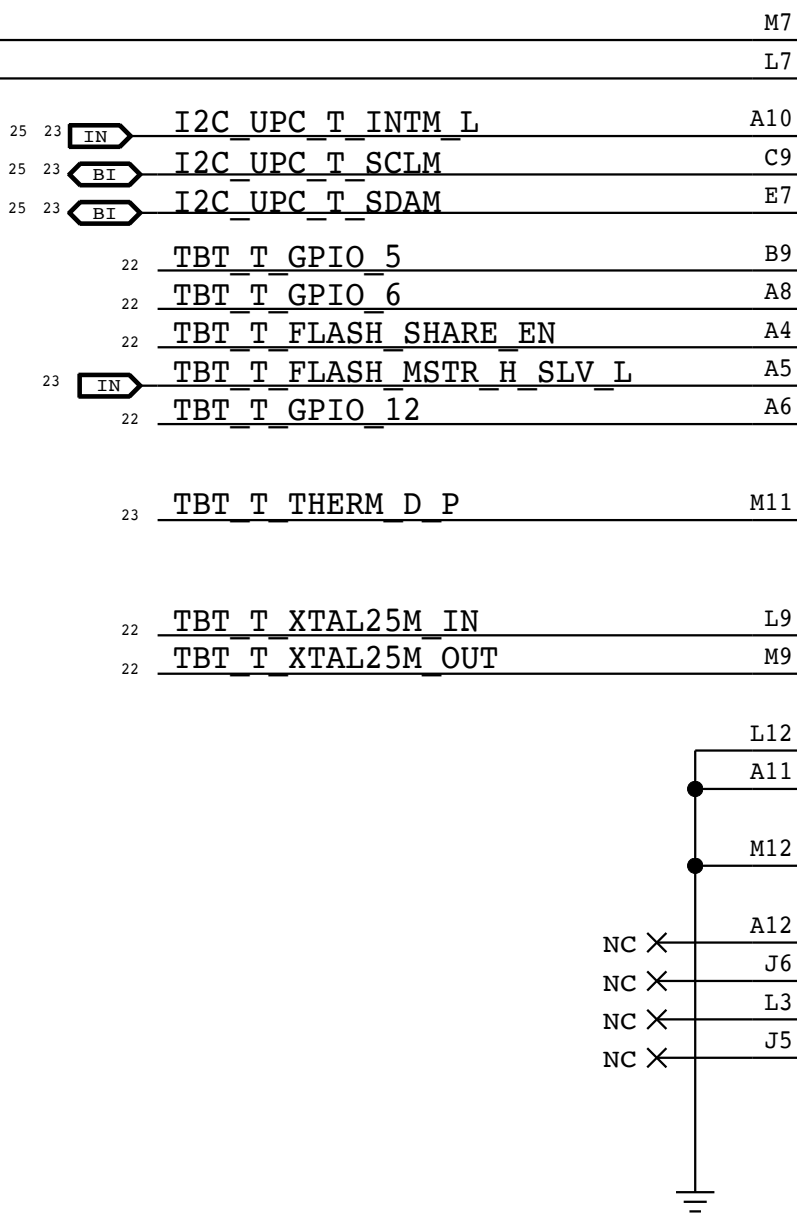
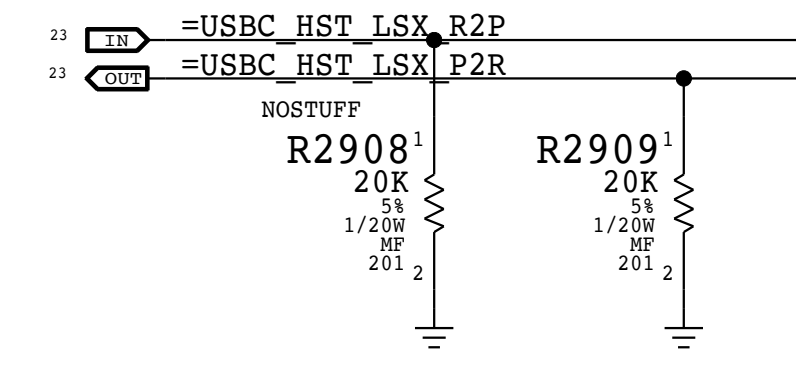
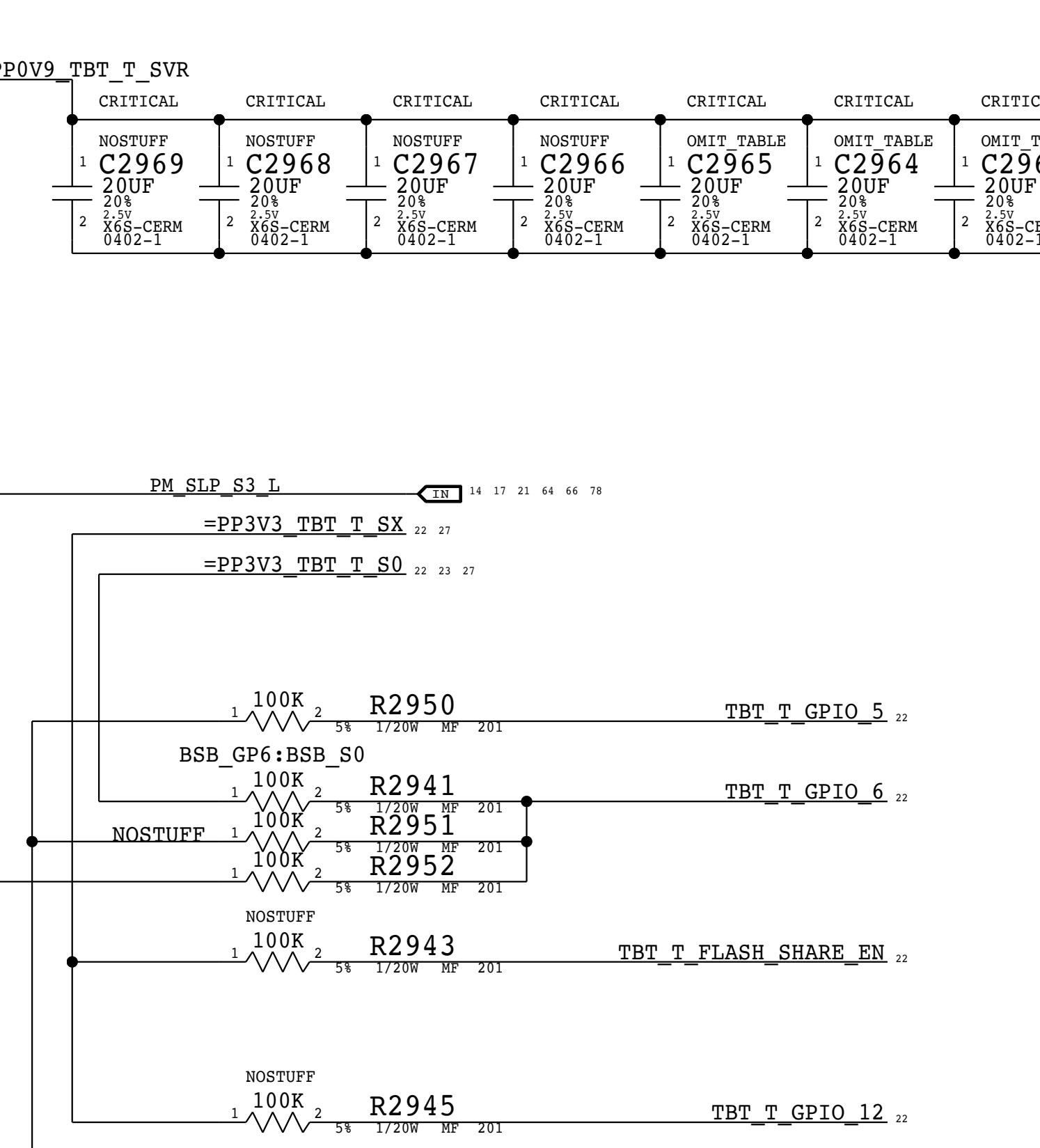
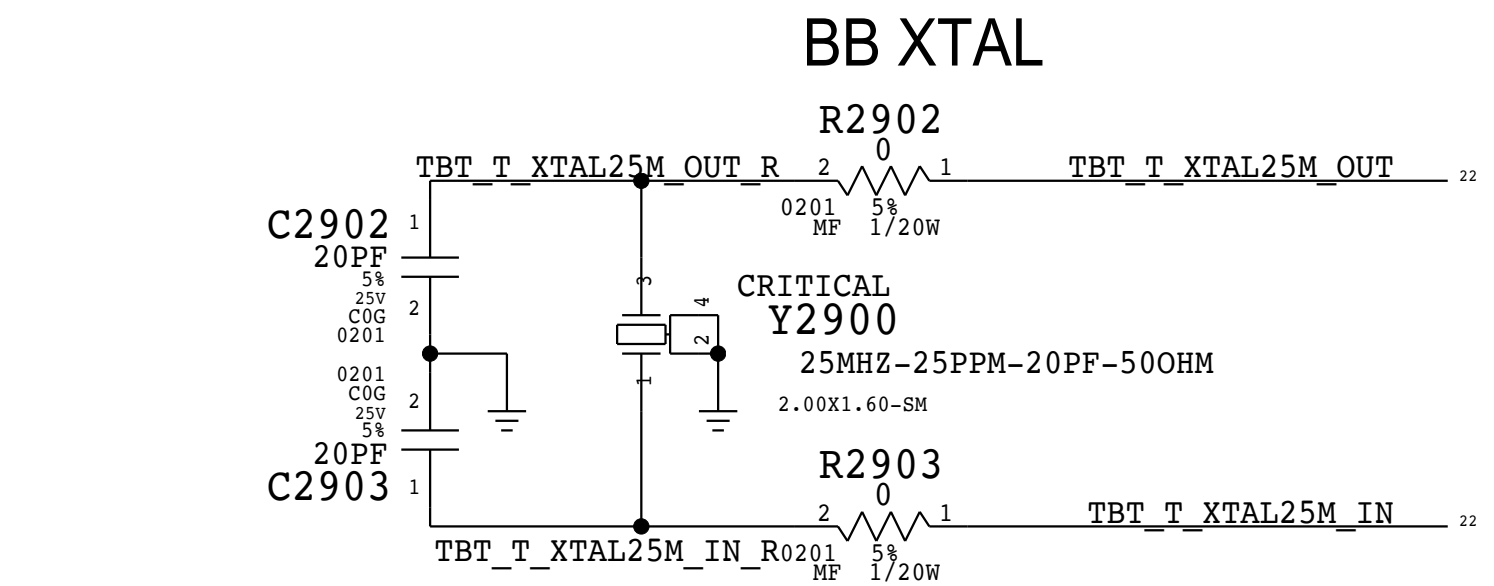
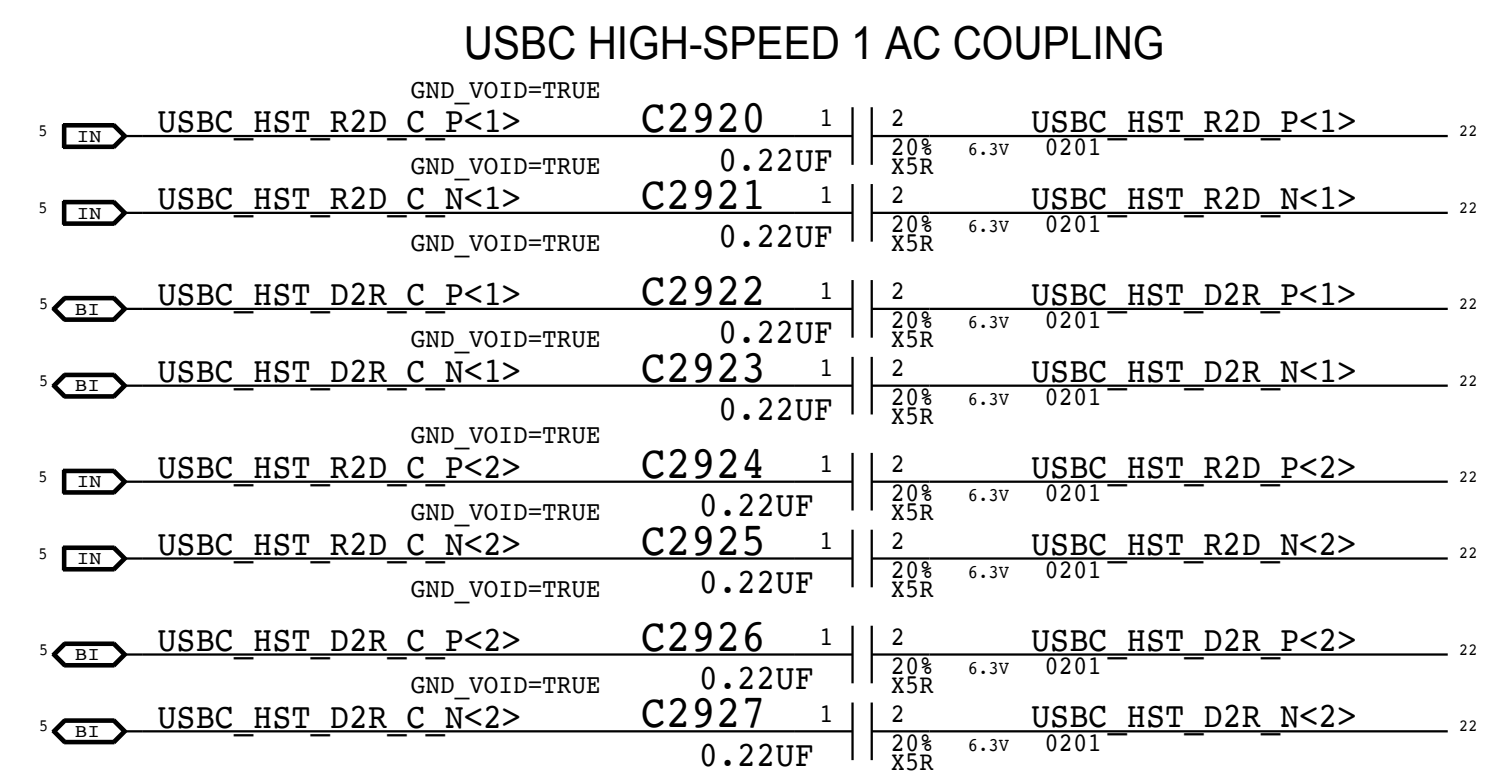
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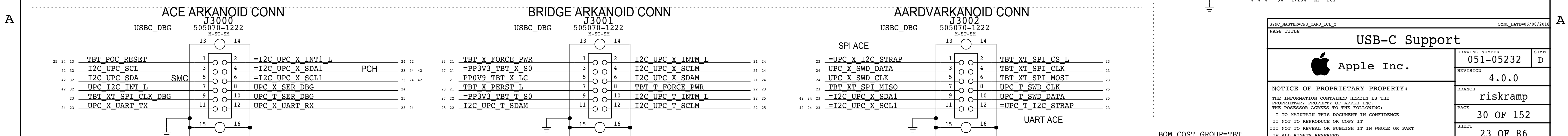
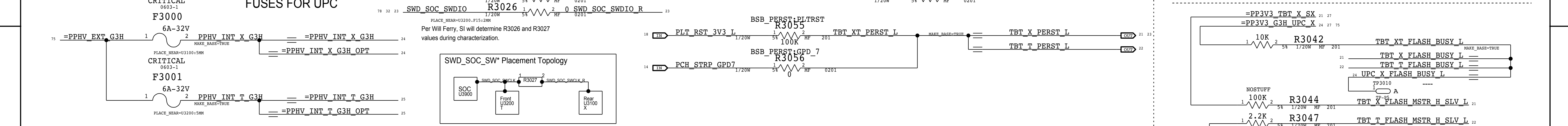
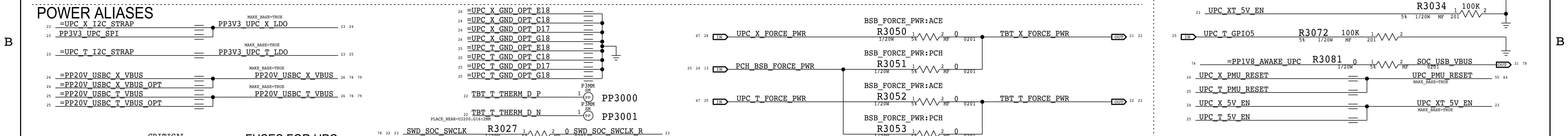
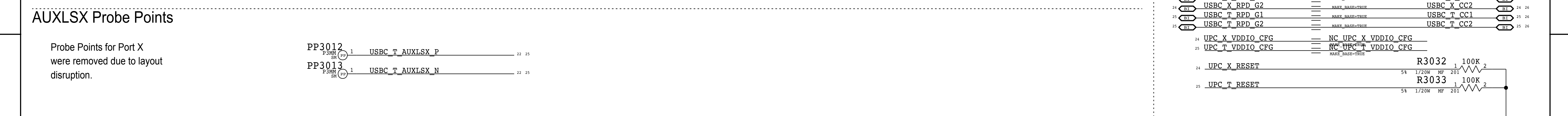
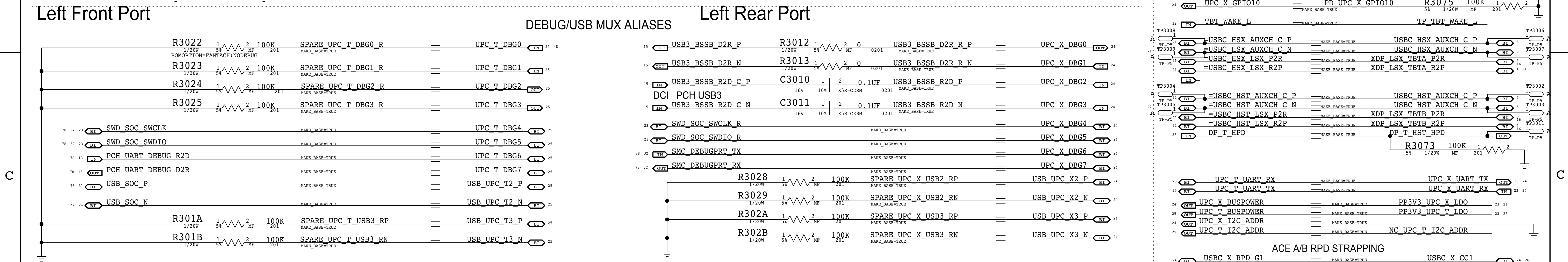
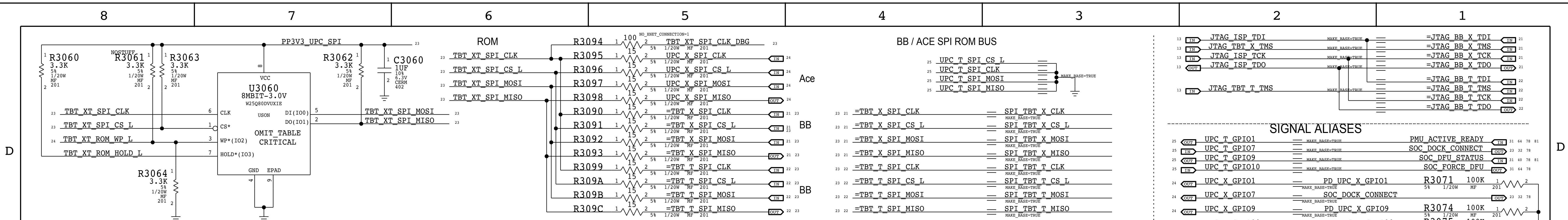
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MIN LINE WIDTH=0.1400  
MIN NECK WIDTH=0.0750  
WIREG=3.3V

BOM\_COST\_GROUP=TBT

SYNC MASTER=CPU_CARD_ICL_V		SYNC DATE=06/08/2018	
PAGE TITLE			
<b>USB-C HIGH SPEED T (FRONT)</b>			
		DRAWING NUMBER	SIZE
		051-05232	D
		REVISION	
		4.0.0	
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SYNC MASTER=CPU\_CARD\_ICL\_V SYNC DATE=06/08/2018

PAGE TITLE

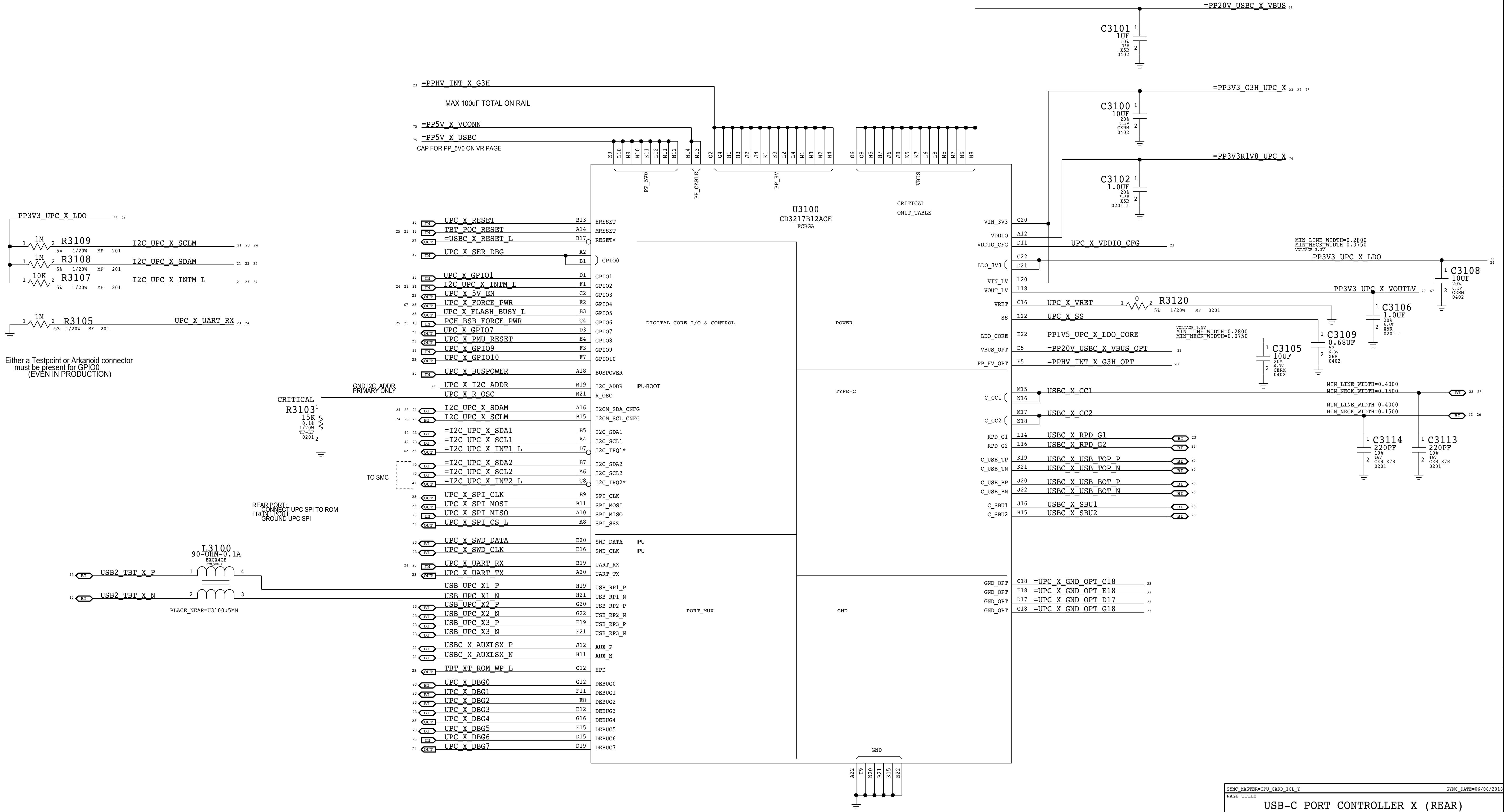
### USB-C Support

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PAGE	30 OF 152	SHEET	23 OF 86

# PRIMARY ACE2 USB-C PORT CONTROLLER (UPC)



Either a Testpoint or Arkanoid connector must be present for GPIO0 (EVEN IN PRODUCTION)

REAR PORT: CONNECT UPC SPI TO ROM FRONT PORT: GROUND UPC SPI

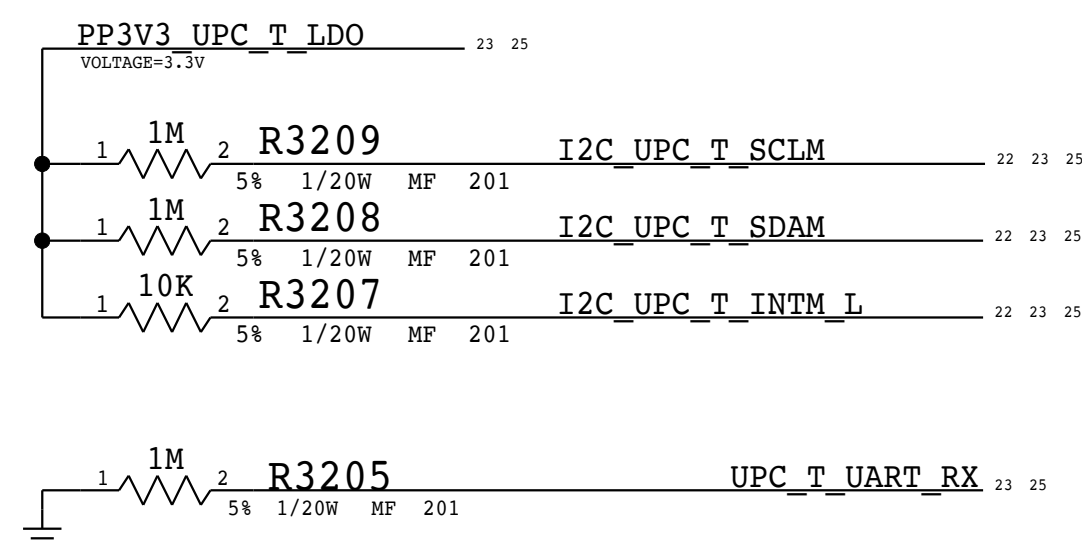
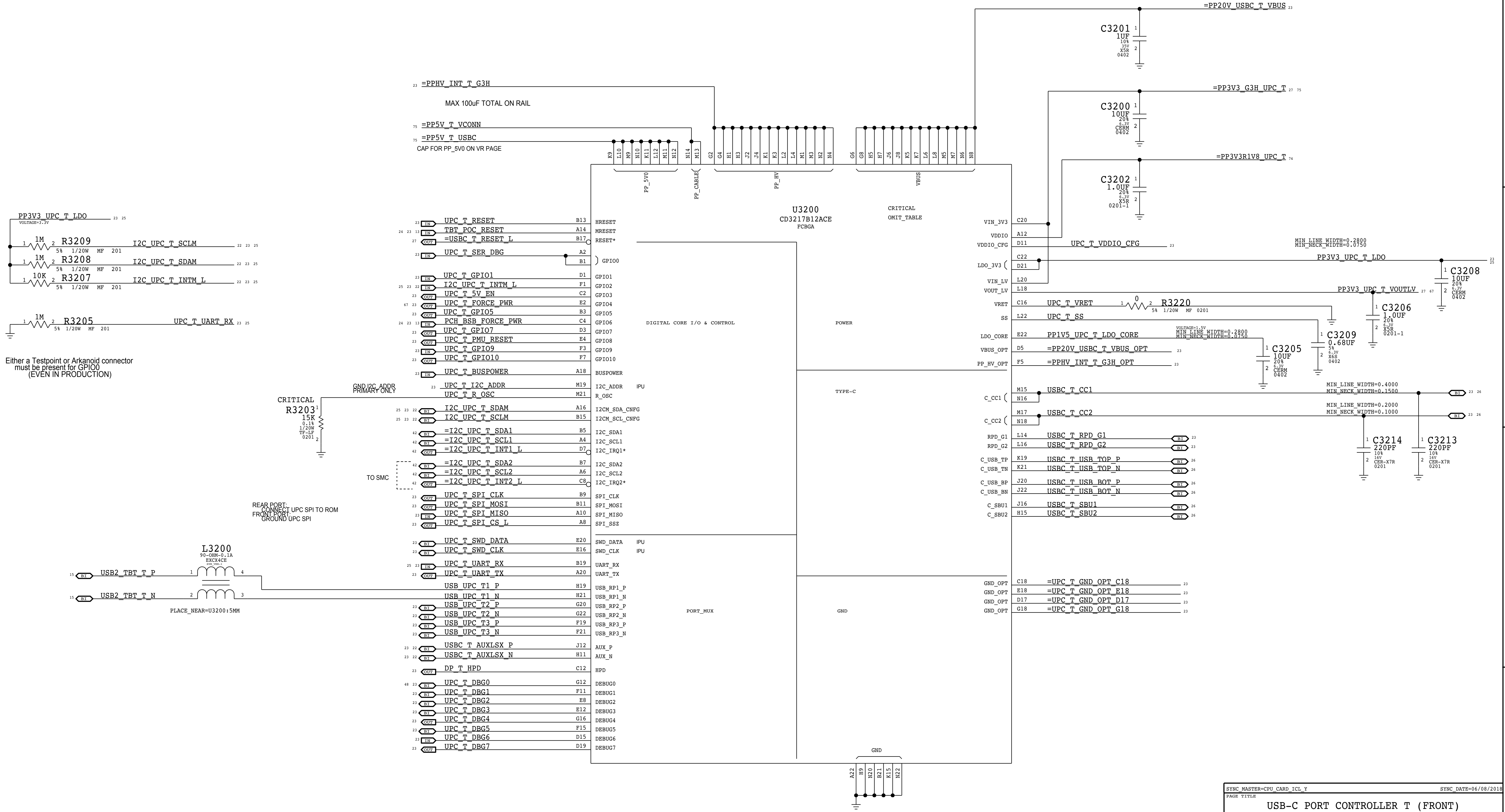
PLACE\_NEAR=U3100:5MM

BOM\_COST\_GROUP=USB-C

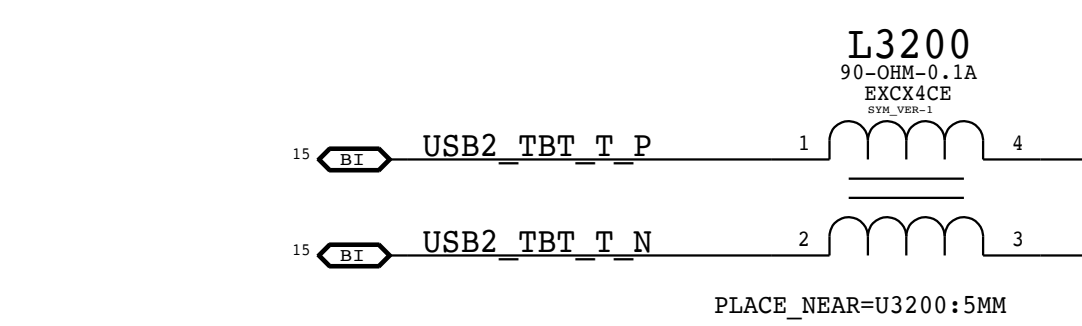
PAGE TITLE		USB-C PORT CONTROLLER X (REAR)	
DRAWING NUMBER		051-05232	
REVISION		4.0.0	
BRANCH		riskramp	
PAGE		31 OF 152	
SHEET		24 OF 86	



# SECONDARY ACE2 USB-C PORT CONTROLLER (UPC)



Either a Testpoint or Arkanoid connector must be present for GPIO0 (EVEN IN PRODUCTION)

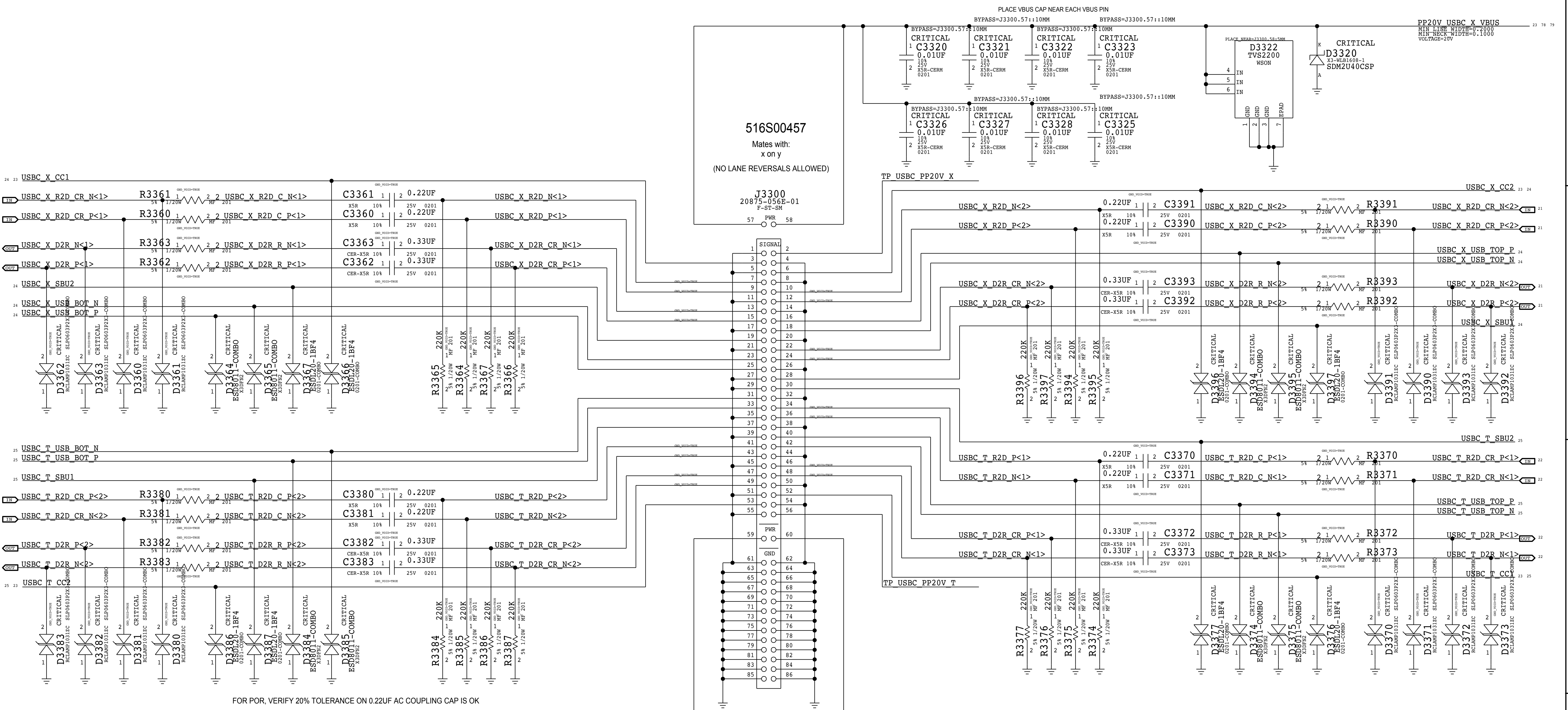


SYNC_MASTER=CPU_CARD_ICL_V		SYNC_DATE=06/08/2018	
PAGE TITLE			
USB-C PORT CONTROLLER T (FRONT)		DRAWING NUMBER	051-05232
Apple Inc.		REVISION	4.0.0
NOTICE OF PROPRIETARY PROPERTY:		BRANCH	riskramp
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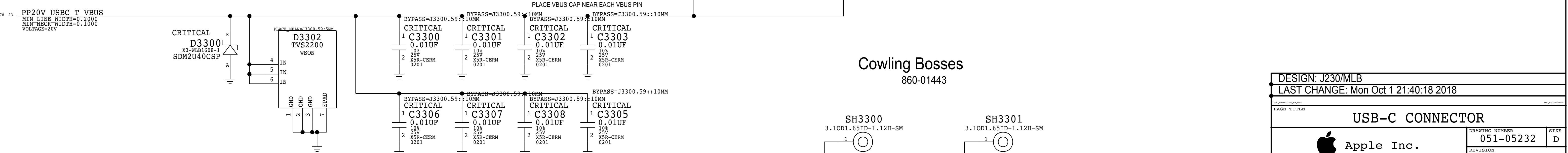
BOM COST GROUP=USB-C

# Left Rear Port

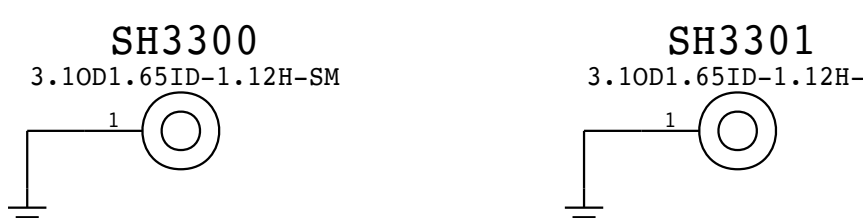
FOR POR, VERIFY 20% TOLERANCE ON 0.22UF AC COUPLING CAP IS OK



516S00457  
Mates with:  
x on y  
(NO LANE REVERSALS ALLOWED)



Cowling Bosses  
860-01443

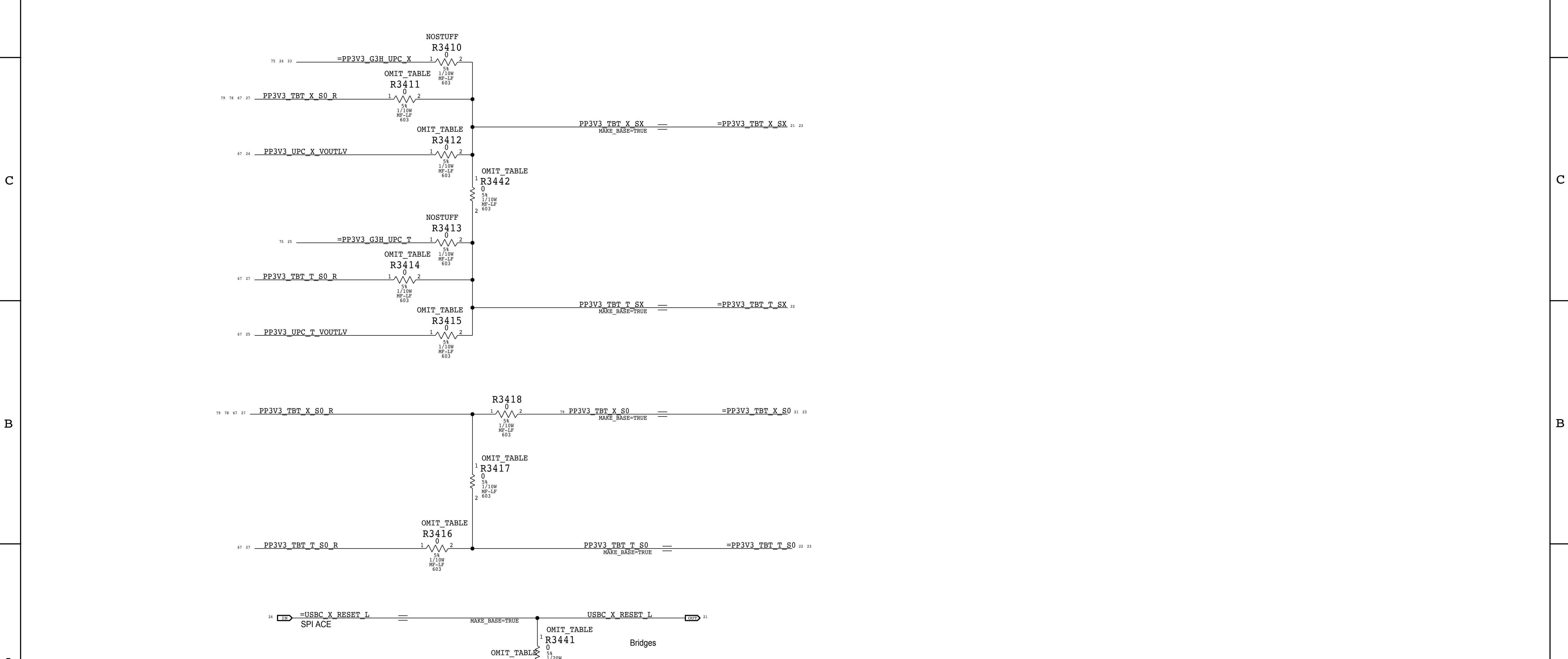


# Left Front Port

BOM\_COST\_GROUP=USB-C

DESIGN: J230/MLB		LAST CHANGE: Mon Oct 1 21:40:18 2018	
PAGE TITLE			
		DRAWING NUMBER	051-05232
		REVISION	4.0.0
		BRANCH	riskramp
		PAGE	33 OF 152
		SHEET	26 OF 86
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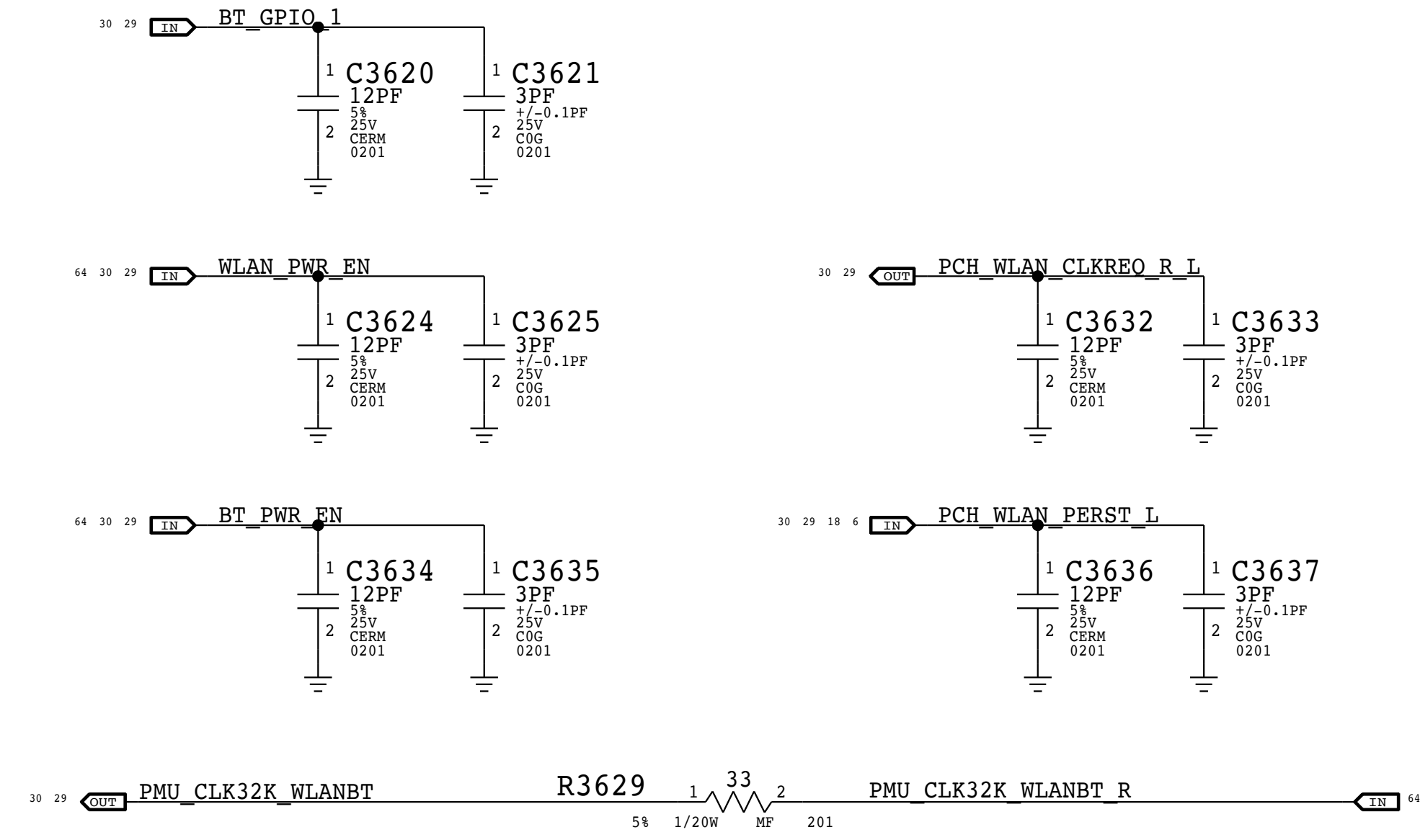
BOMOPTION	BSB XA SX Rail	BSB XA S0 Rail	Load Switch Enable	PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION	PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION	
a	VOUTLV_SW_CALPE	ACE2 VOUT_LV	LD-SW	CALPE/SMC	113S0022	1	RES,MF,1A MAX,00HM,5,0603,SMD,LF	R3412		BSB_X_PWR:VOUTLV_SW_CALPE						
bi	SWSW_VOUTLV	LD-SW	LD-SW	ACE2 VOUT_LV	113S0022	1	RES,MF,1A MAX,00HM,5,0603,SMD,LF	R3411		BSB_X_PWR:SWSW_VOUTLV						
bii	SWSW_FORCEPWR	LD-SW	LD-SW	ACE2/PCH FORCEPWR	113S0022	2	RES,MF,1A MAX,00HM,5,0603,SMD,LF	R3411,R3412		BSB_X_PWR:SWSW_FORCEPWR						
D a	VOUTLV_SW_CALPE	ACE2 VOUT_LV	LD-SW	CALPE/SMC	113S0022	2	RES,MF,1A MAX,00HM,5,0603,SMD,LF	R3415,R3416		BSB_X_PWR:VOUTLV_SW_CALPE	117S0201	1	RES,MF,1A MAX,0.0 OHM,5%,0201,BLACK	R3440		BSB_T_PWR:VOUTLV_SW_CALPE
bi	SWSW_VOUTLV	LD-SW	LD-SW	ACE2 VOUT_LV	113S0022	2	RES,MF,1A MAX,00HM,5,0603,SMD,LF	R3414,R3416		BSB_X_PWR:SWSW_VOUTLV	117S0201	1	RES,MF,1A MAX,0.0 OHM,5%,0201,BLACK	R3440		BSB_T_PWR:SWSW_VOUTLV
bii	SWSW_FORCEPWR	LD-SW	LD-SW	ACE2/PCH FORCEPWR	113S0022	3	RES,MF,1A MAX,00HM,5,0603,SMD,LF	R3414,R3415,R3416		BSB_X_PWR:SWSW_FORCEPWR	117S0201	1	RES,MF,1A MAX,0.0 OHM,5%,0201,BLACK	R3440		BSB_T_PWR:SWSW_FORCEPWR
c	BSB_XA_PWR	BSB XA SX Rail	BSB XA S0 Rail	---	113S0022	2	RES,MF,1A MAX,00HM,5,0603,SMD,LF	R3417,R3442		BSB_T_PWR:BSB_X_PWR	117S0201	1	RES,MF,1A MAX,0.0 OHM,5%,0201,BLACK	R3441		BSB_T_PWR:BSB_X_PWR



PAGE TITLE		SYNC_DATE=06/11/2018	
		DRAWING NUMBER	051-05232
		REVISION	4.0.0
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		PAGE	34 OF 152
		SHEET	27 OF 86

BOM\_COST\_GROUP=USB-C

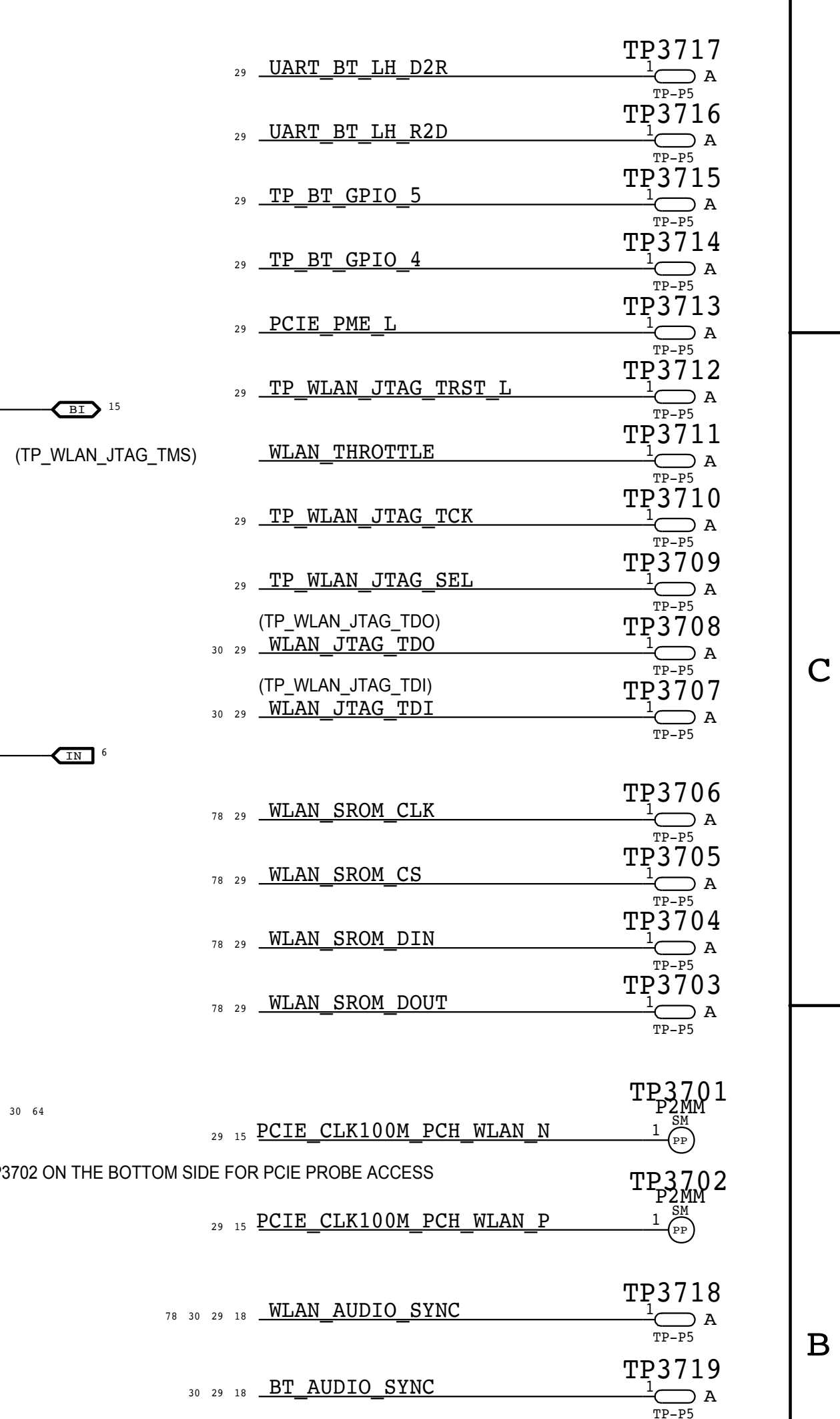
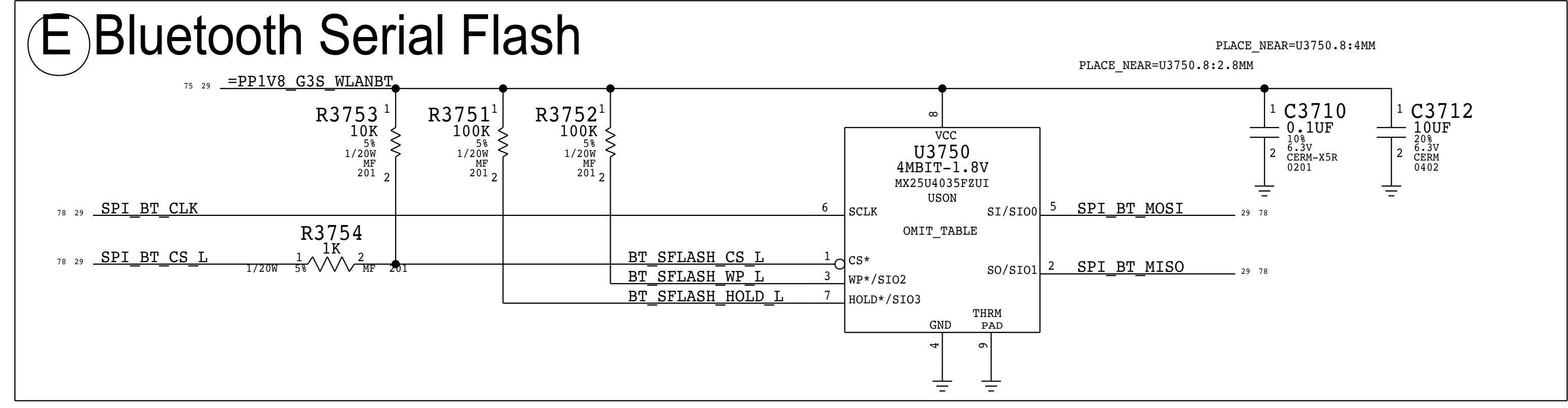
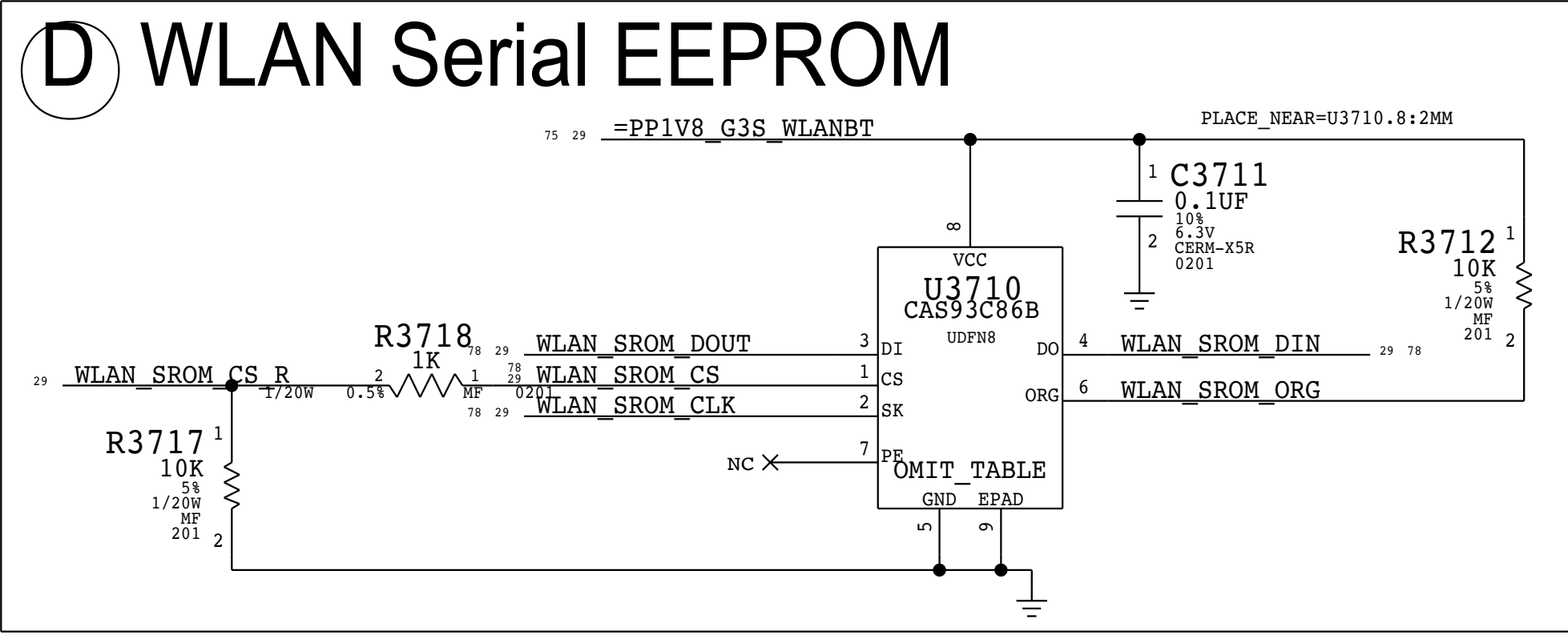
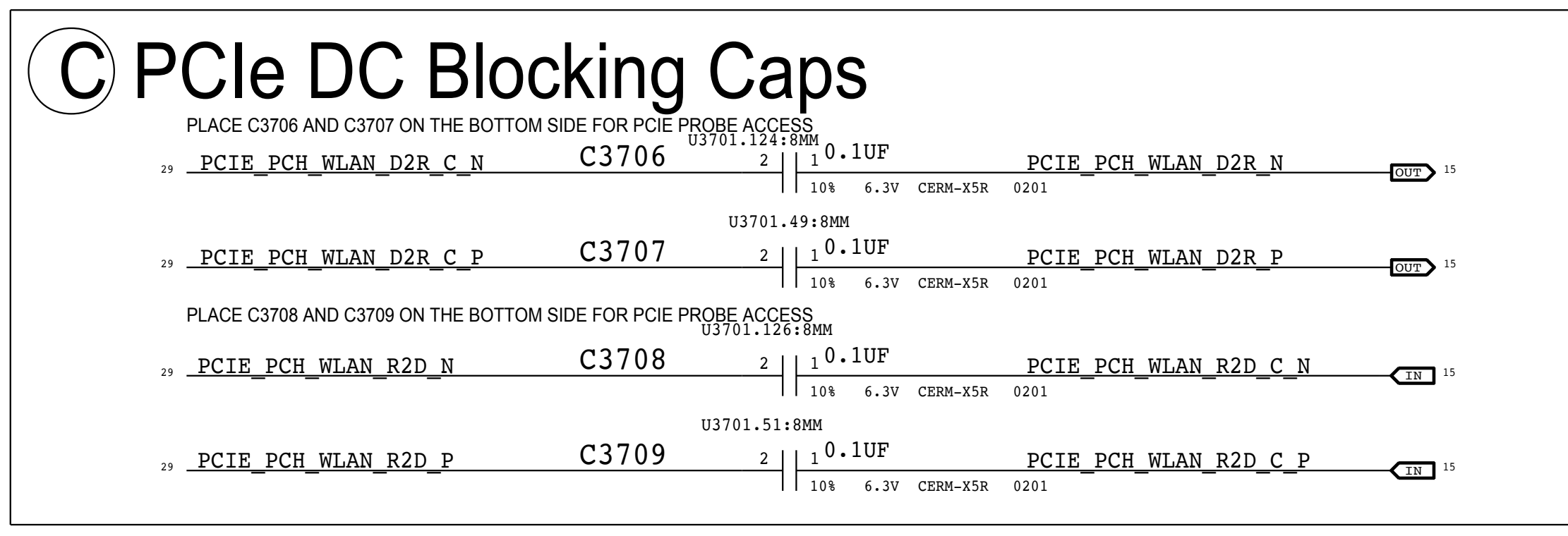
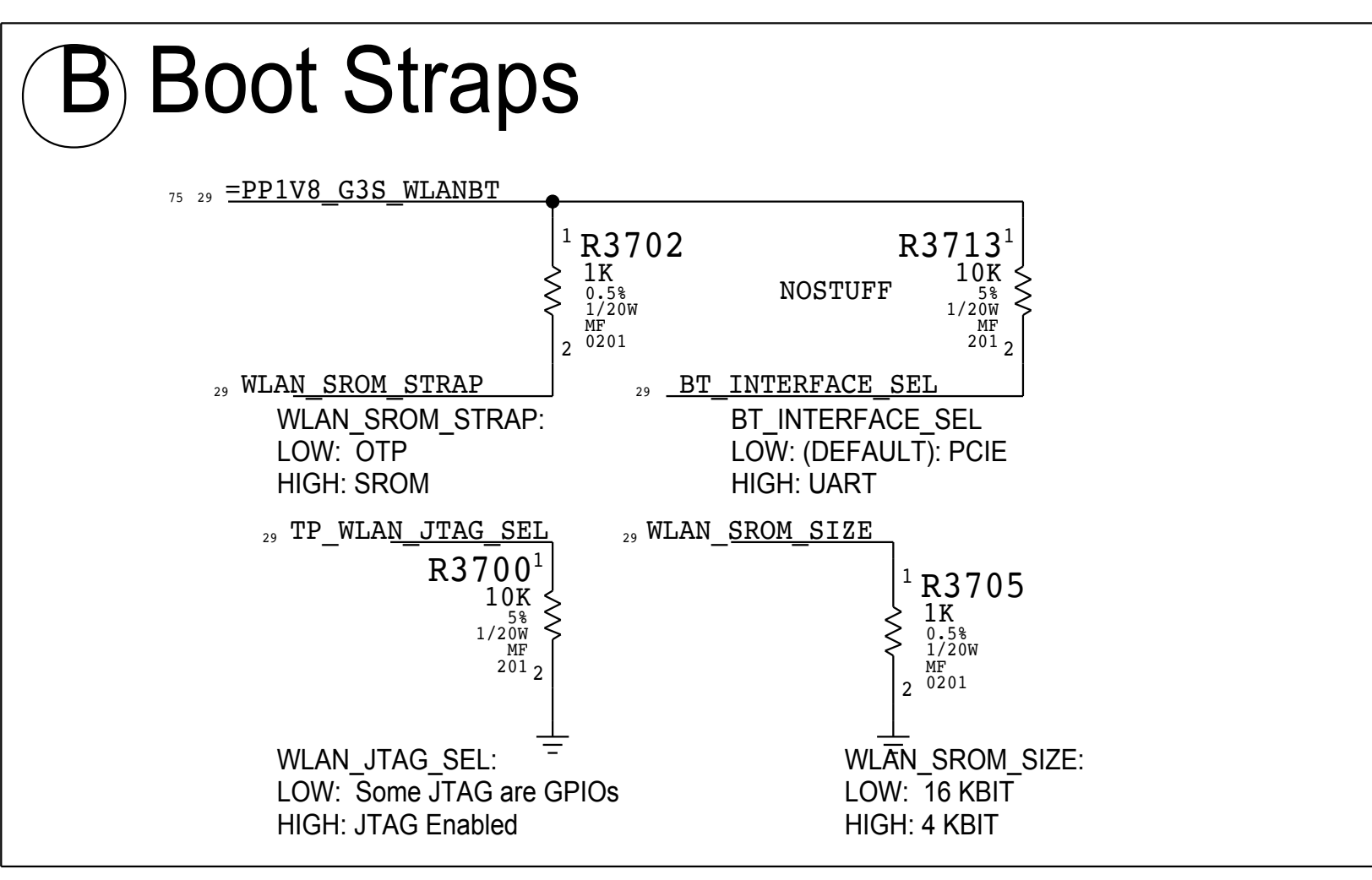
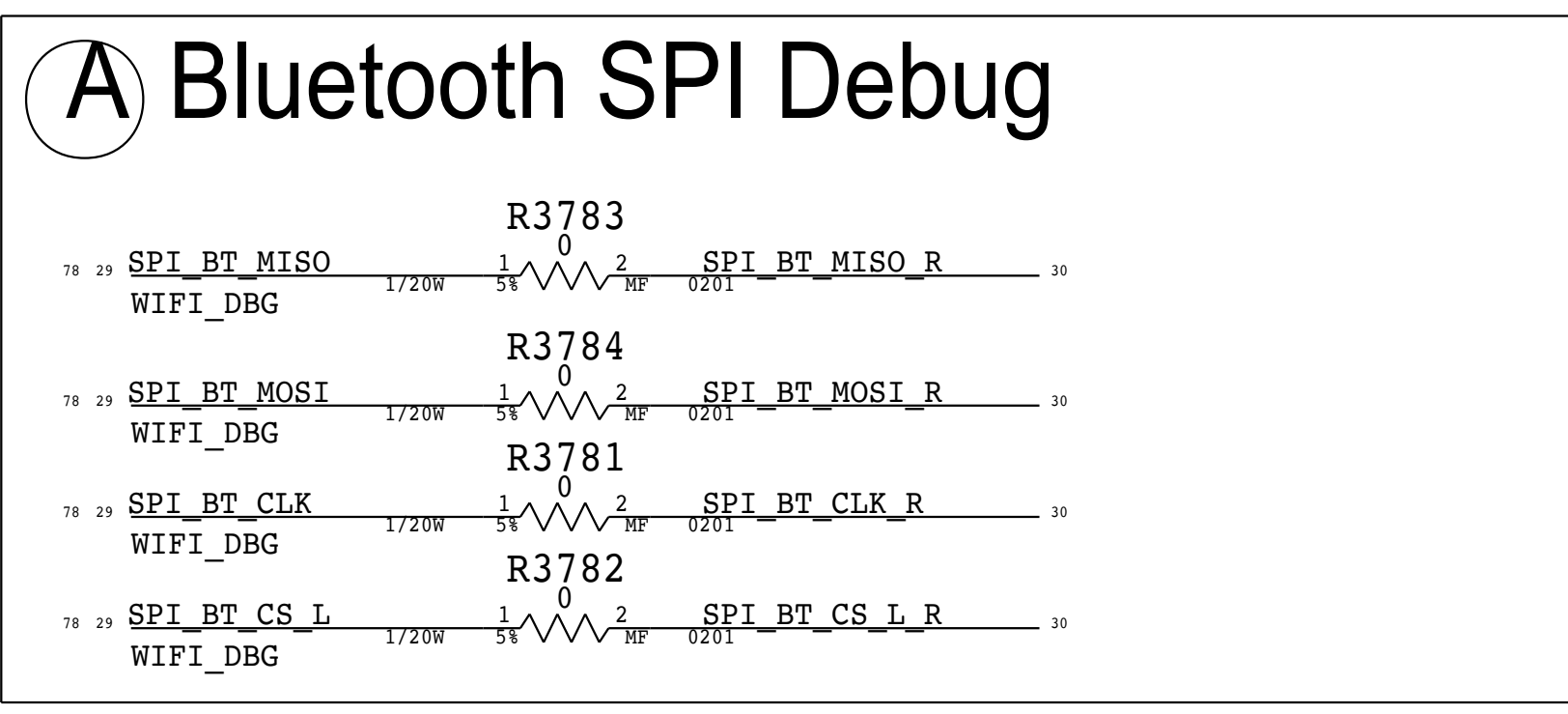
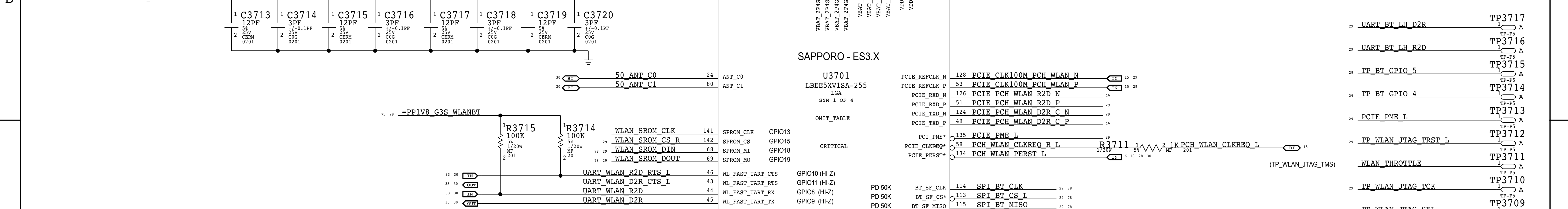
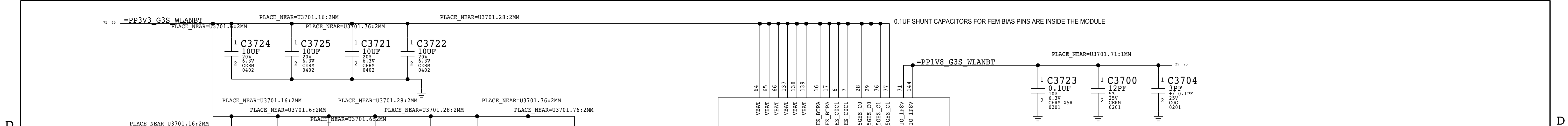
# A Wireless Desense Capacitors



PAGE TITLE		
WIFI/BT Desense		
	DRAWING NUMBER	051-05232
	REVISION	4.0.0
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	PAGE	36 OF 152
	SHEET	28 OF 86

BOM\_COST\_GROUP=WIRELESS

8 7 6 5 4 3 2 1



PAGE TITLE		WIFI/BT MODULE 1	
		DRAWING NUMBER	051-05232
		REVISION	4.0.0
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		PAGE	37 OF 152
		SHEET	29 OF 86

8 7 6 5 4 3 2 1

D

C

B

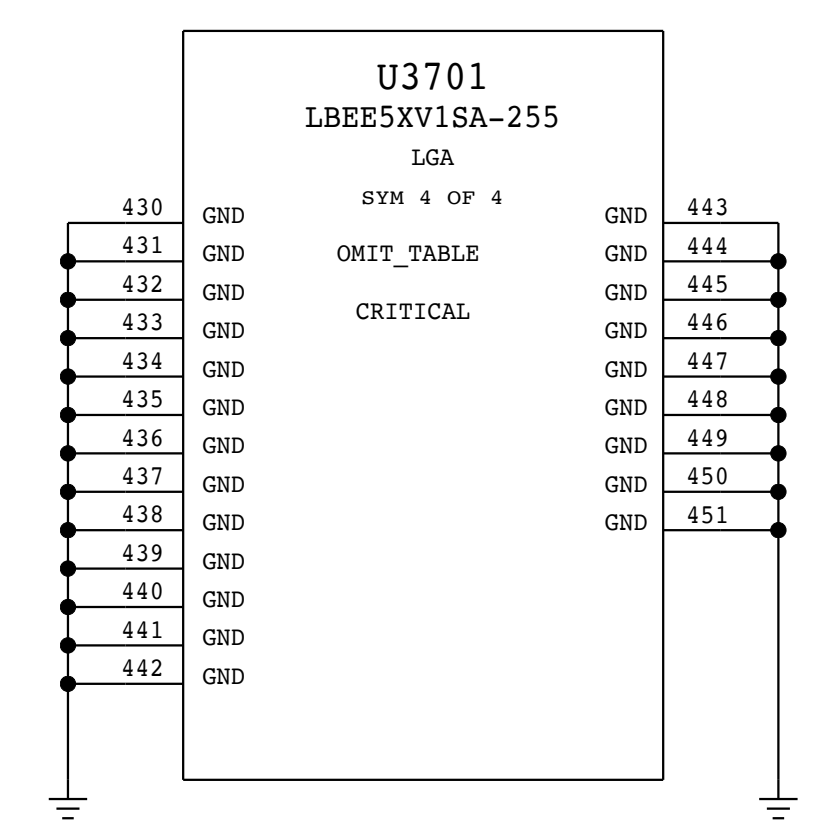
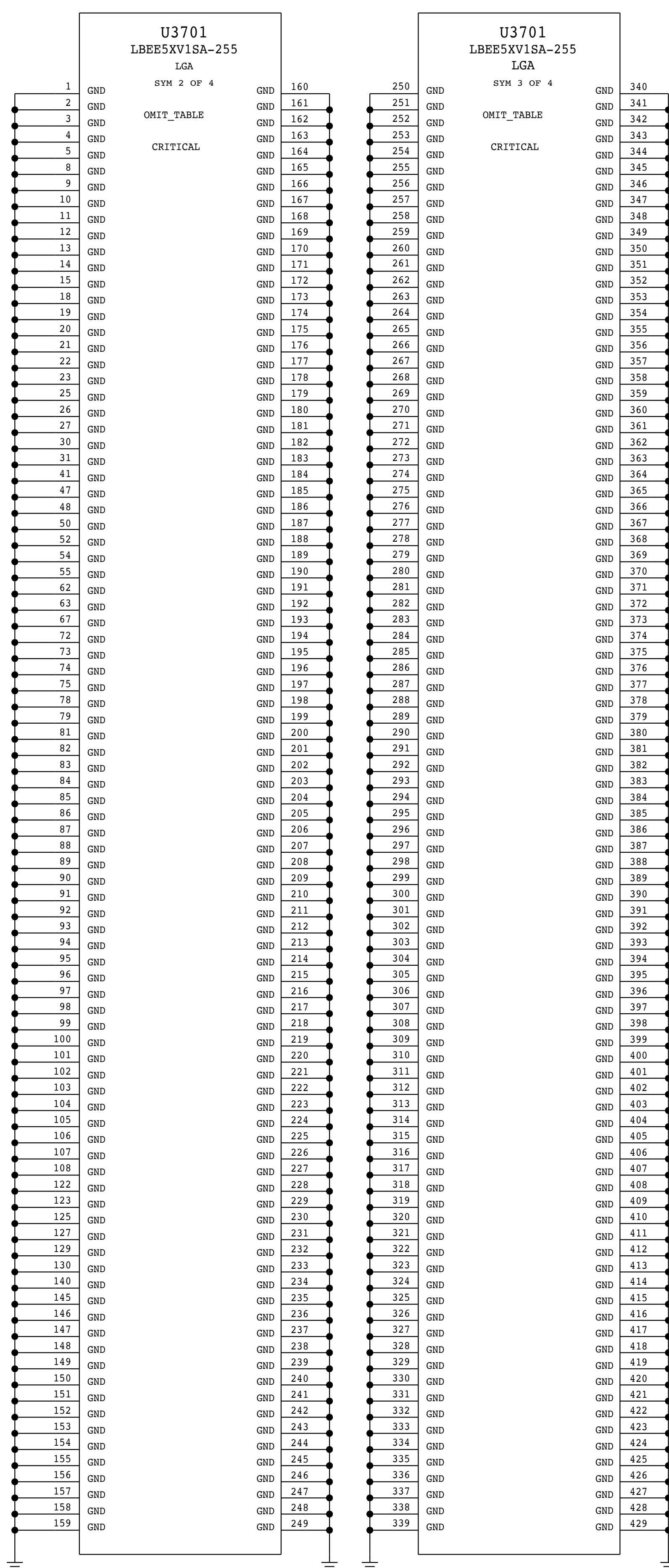
A

D

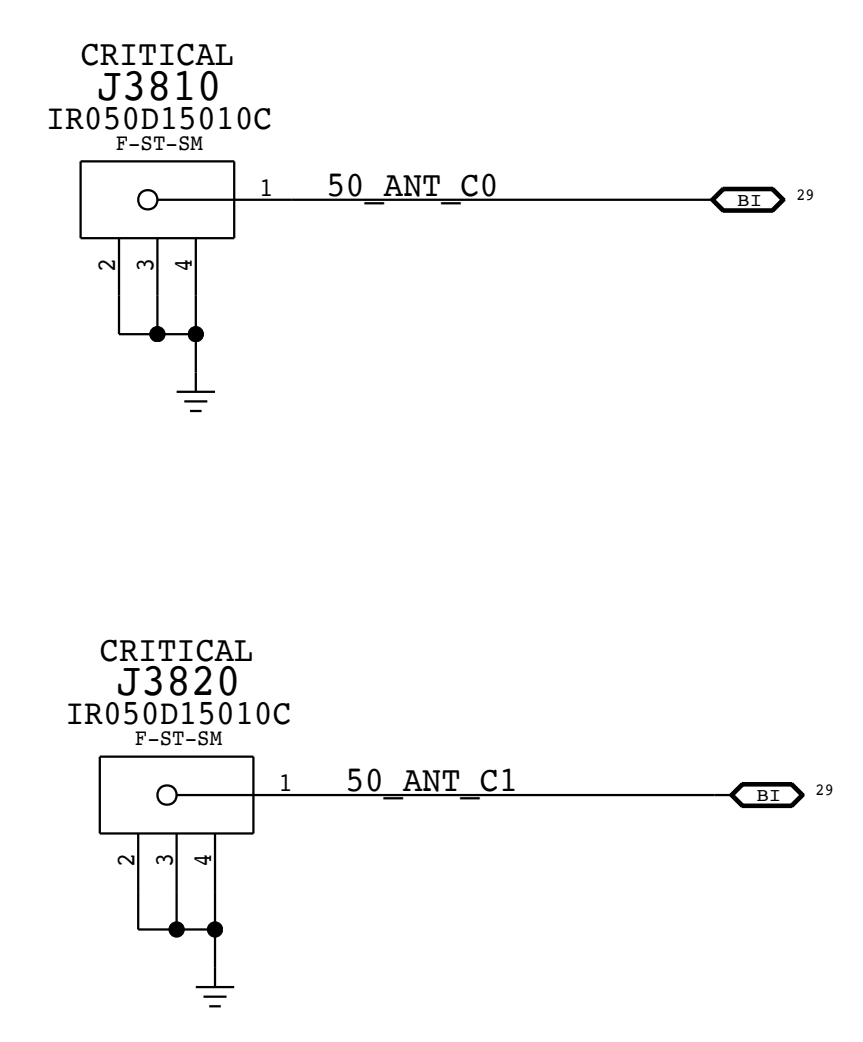
C

B

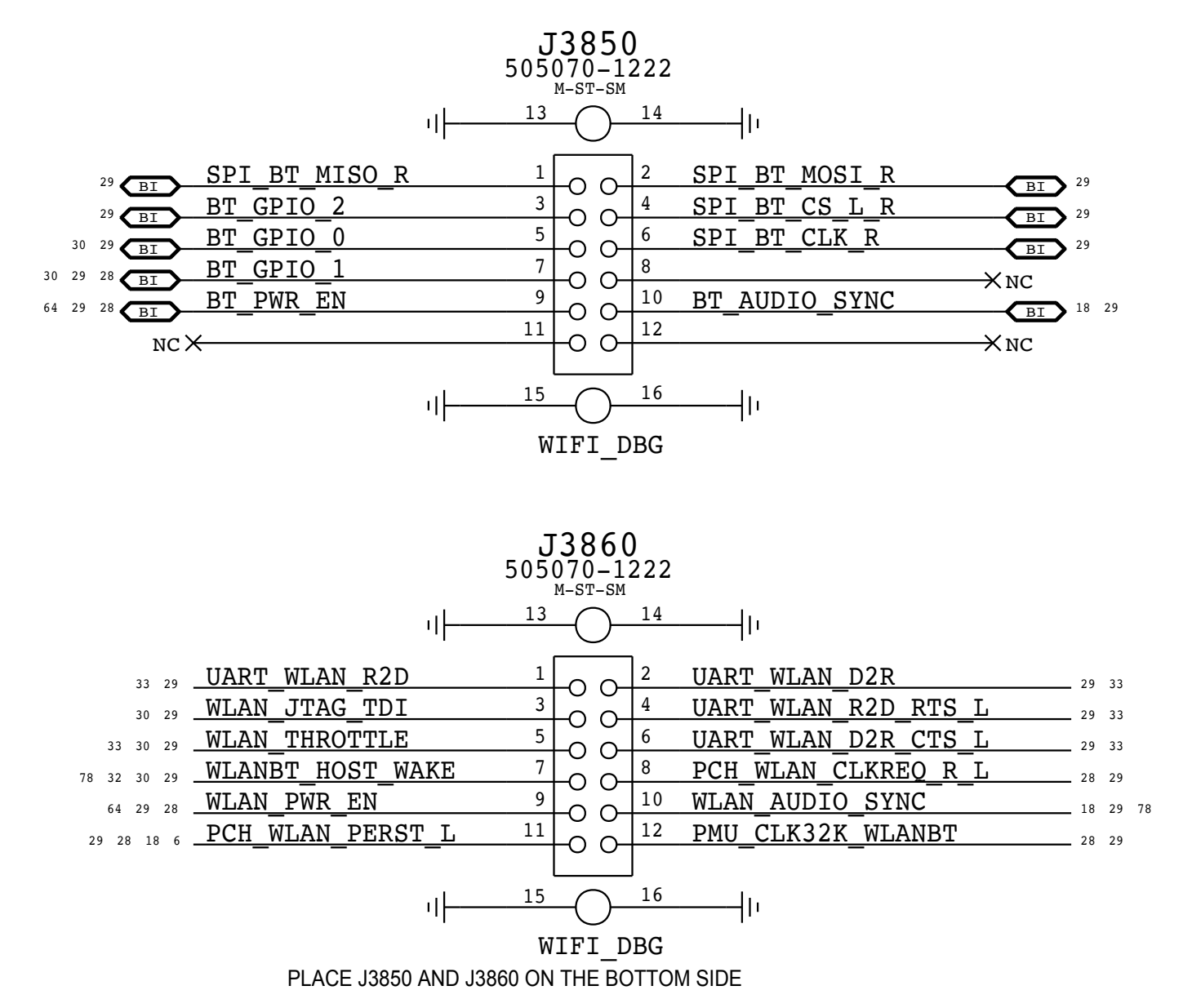
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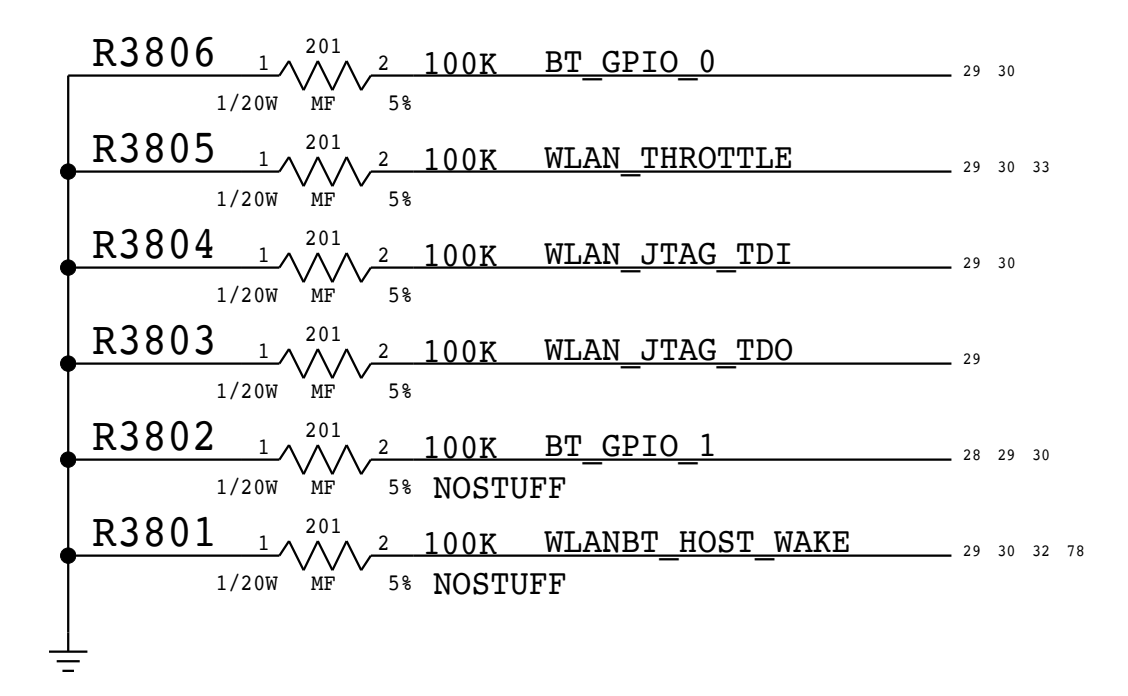
### A RF Connectors



### B WiFi/BT Debug Connectors



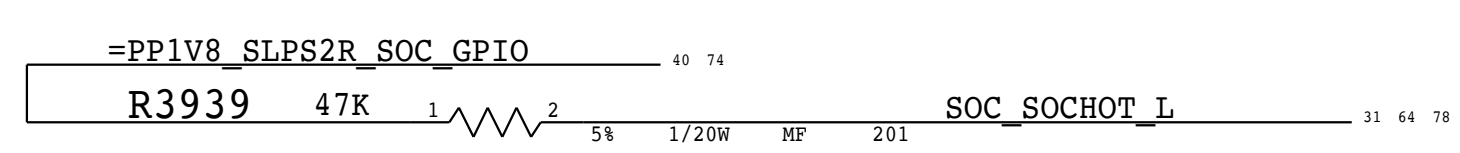
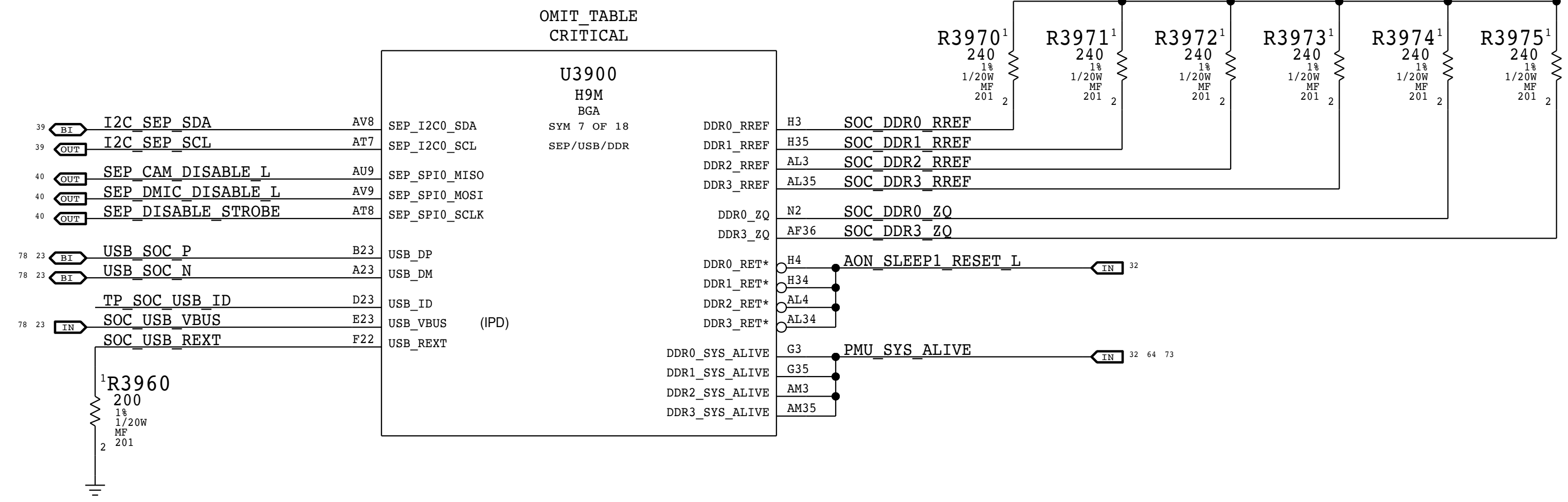
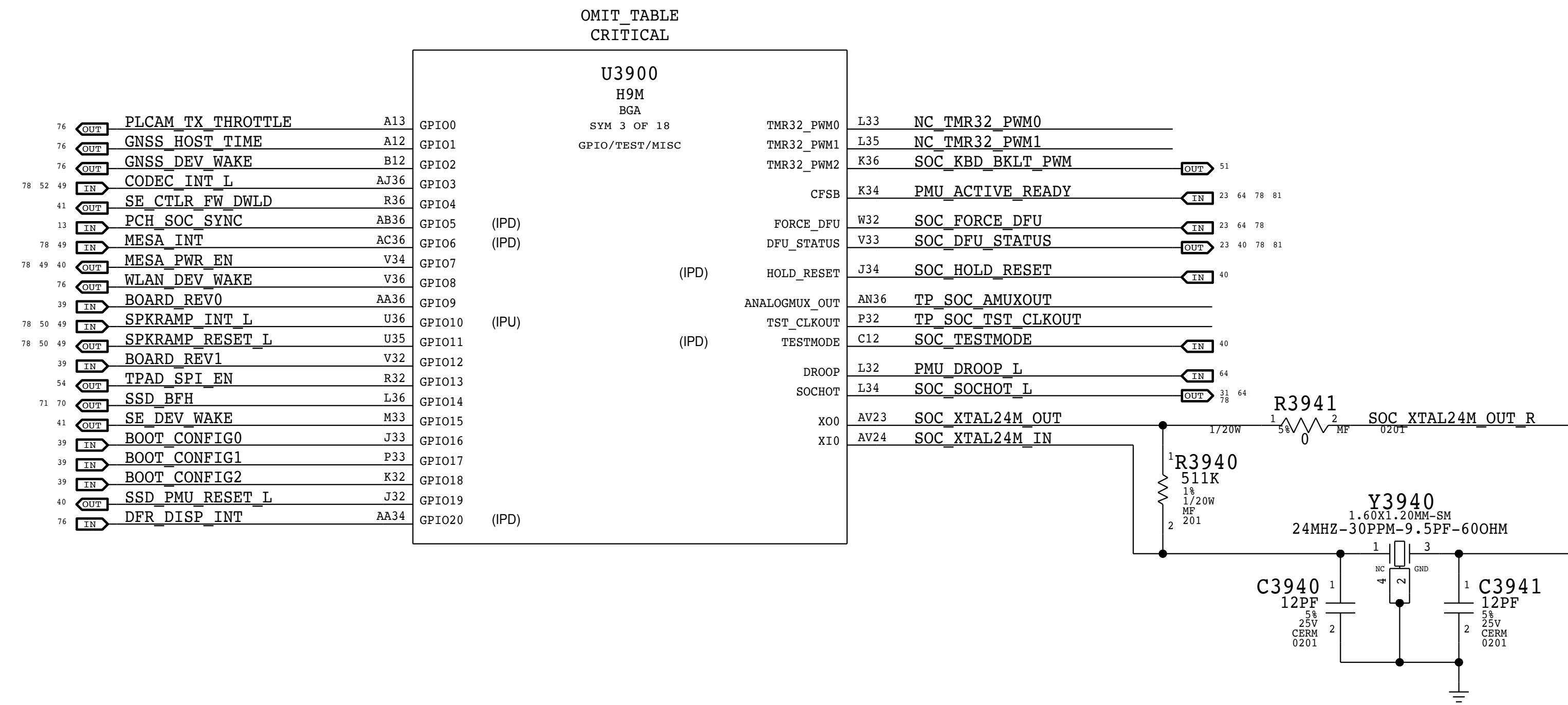
### C WiFi/Bluetooth Straps



BOM\_COST\_GROUP=WIRELESS

PAGE TITLE		WIFI/BT MODULE 2	
		DRAWING NUMBER	051-05232
		REVISION	4.0.0
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		PAGE	38 OF 152
		SHEET	30 OF 86
		SIZE	D

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

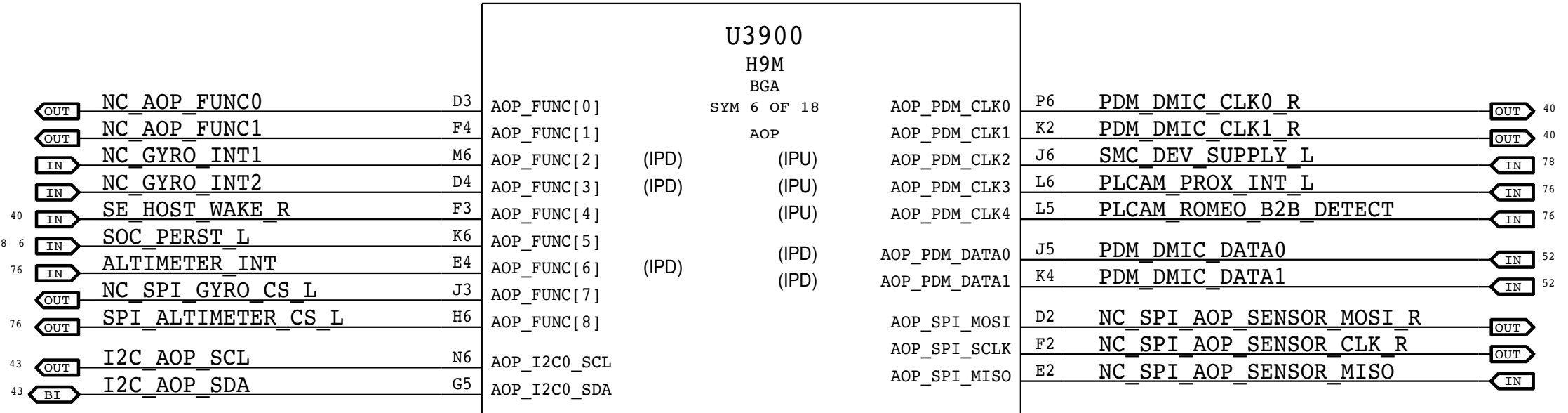


=PP1V1\_SLPDDR\_SOC\_DDRCAL 74

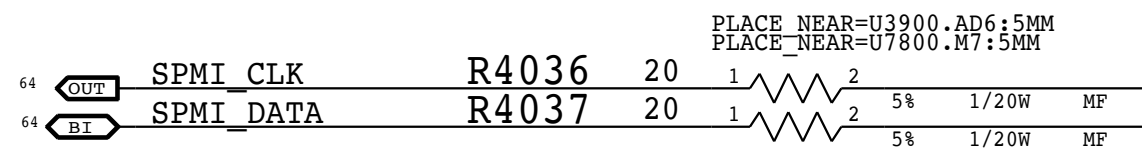
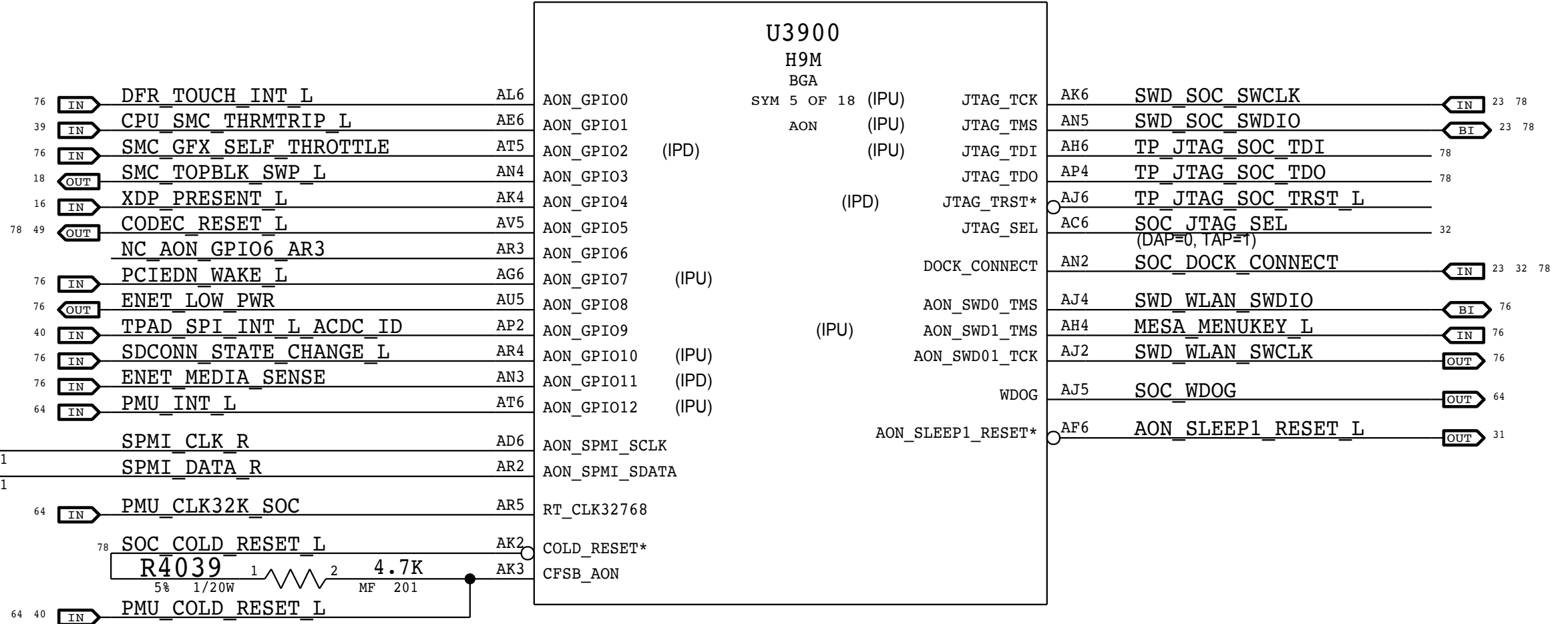
SYNC MASTER=X589 BIGSUR		SYNC DATE=03/15/2017	
PAGE TITLE <b>SOC GPIO/SEP/USB/DDR/Test</b>			
		DRAWING NUMBER 051-05232	SIZE D
		REVISION 4.0.0	
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		PAGE 39 OF 152	
		SHEET 31 OF 86	

BOM\_COST\_GROUP=T290

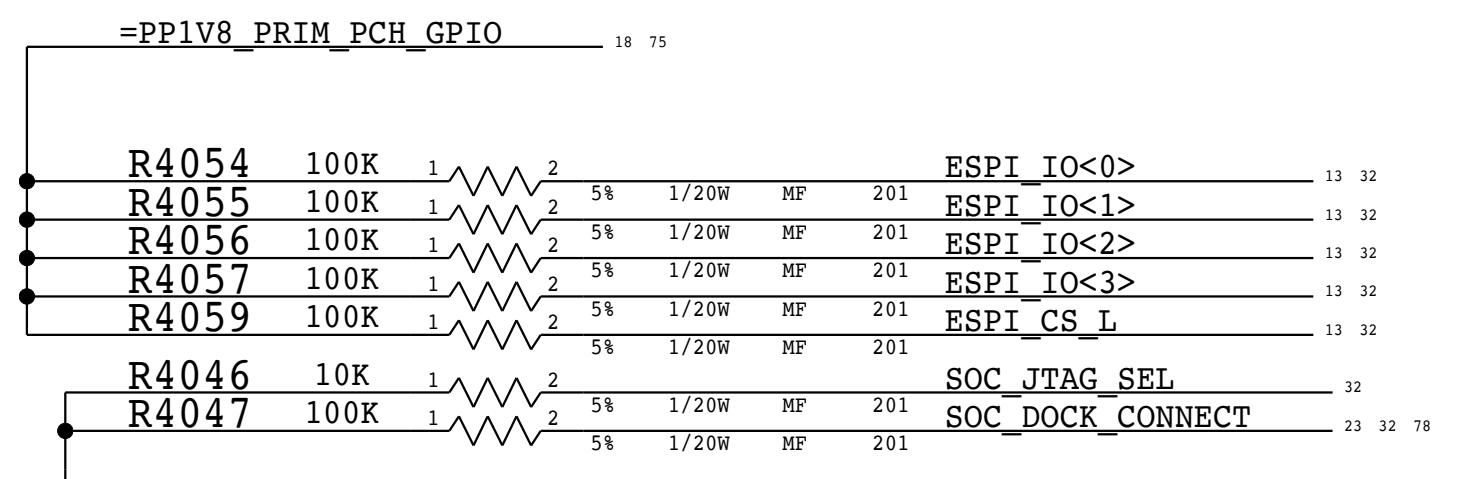
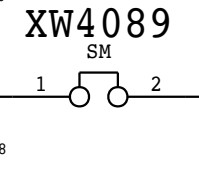
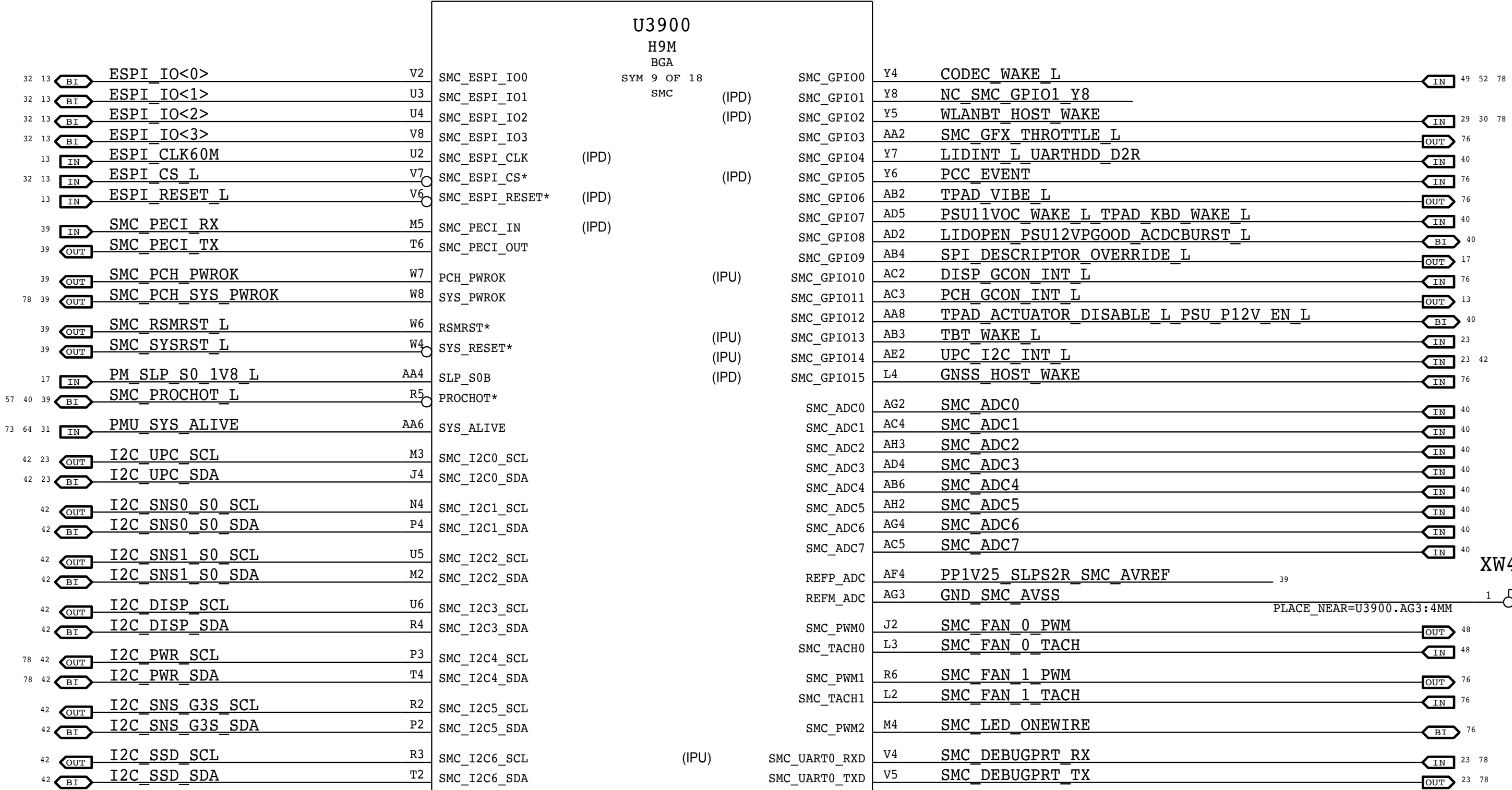
OMIT TABLE CRITICAL



OMIT TABLE CRITICAL



OMIT TABLE CRITICAL



BOM\_COST\_GROUP=T290

SYNC MASTER=X589 BIGSUR SYNC DATE=03/16/2017

SoC AOP/AON/SMC

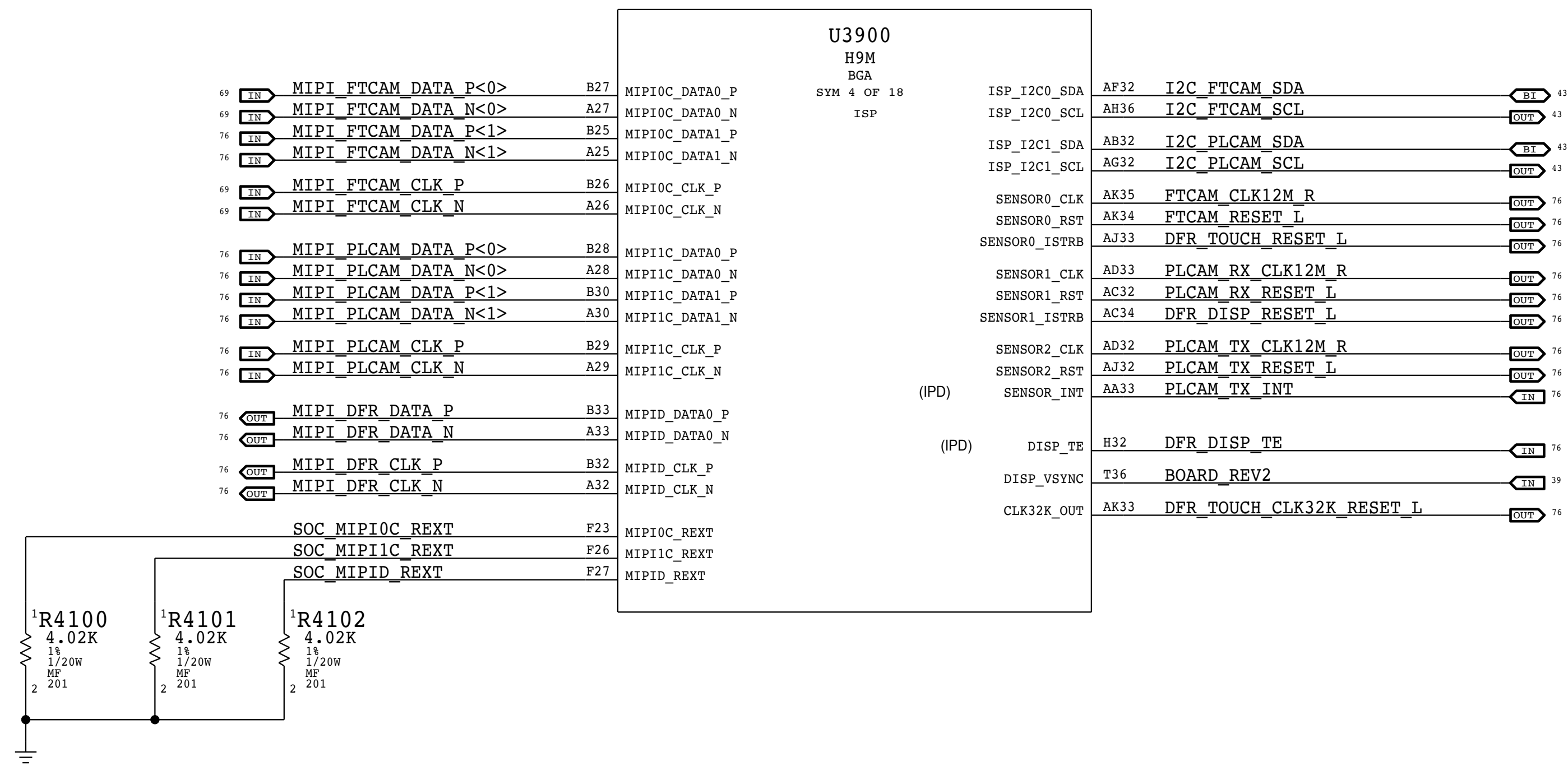
Apple Inc.

DRAWING NUMBER	051-05232	SIZE	D
REVISION	4.0.0	BRANCH	riskramp
PAGE	40 OF 152	SHEET	32 OF 86

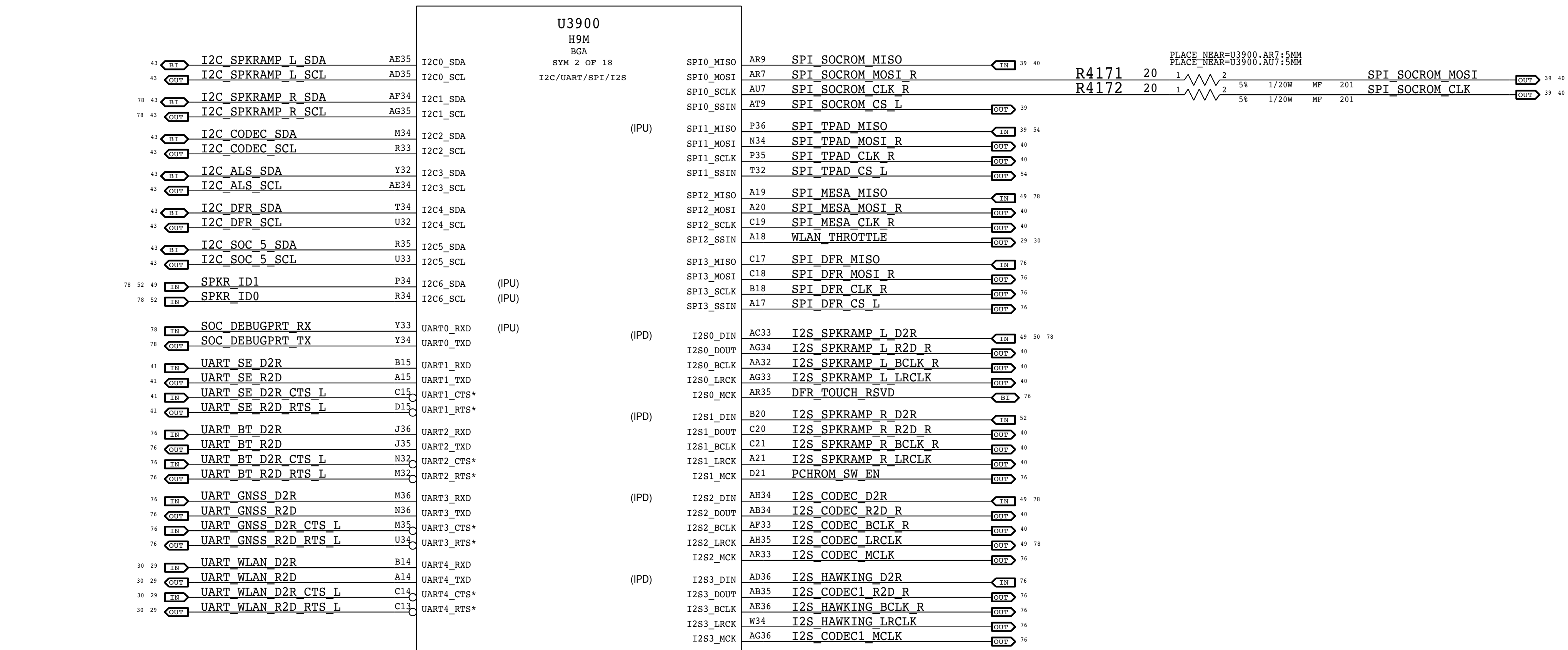
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CRITICAL



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SYNC MASTER=X589 BIGSUR SYNC DATE=03/15/2017

PAGE TITLE: SoC ISP/I2C/UART/SPI/I2S

Apple Inc.

DRAMING NUMBER: 051-05232 SIZE: D

REVISION: 4.0.0

BRANCH: riskramp

PAGE: 41 OF 152

SHEET: 33 OF 86

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BOM\_COST\_GROUP=T290

D

C

B

A

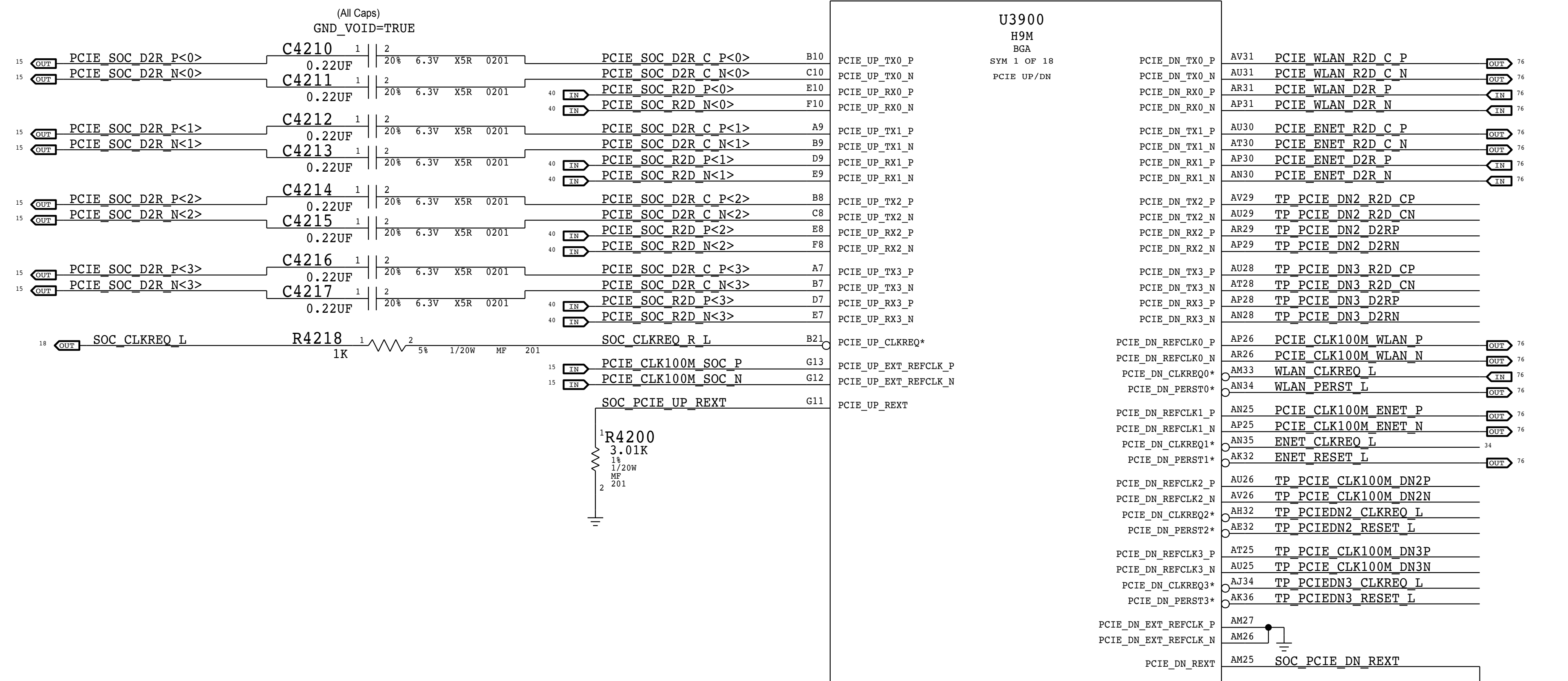
D

C

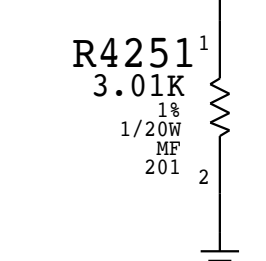
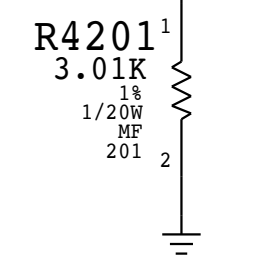
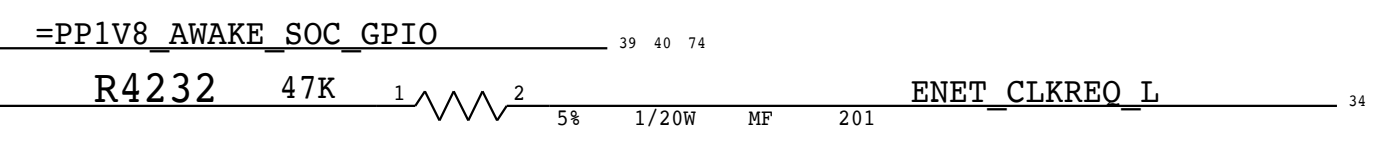
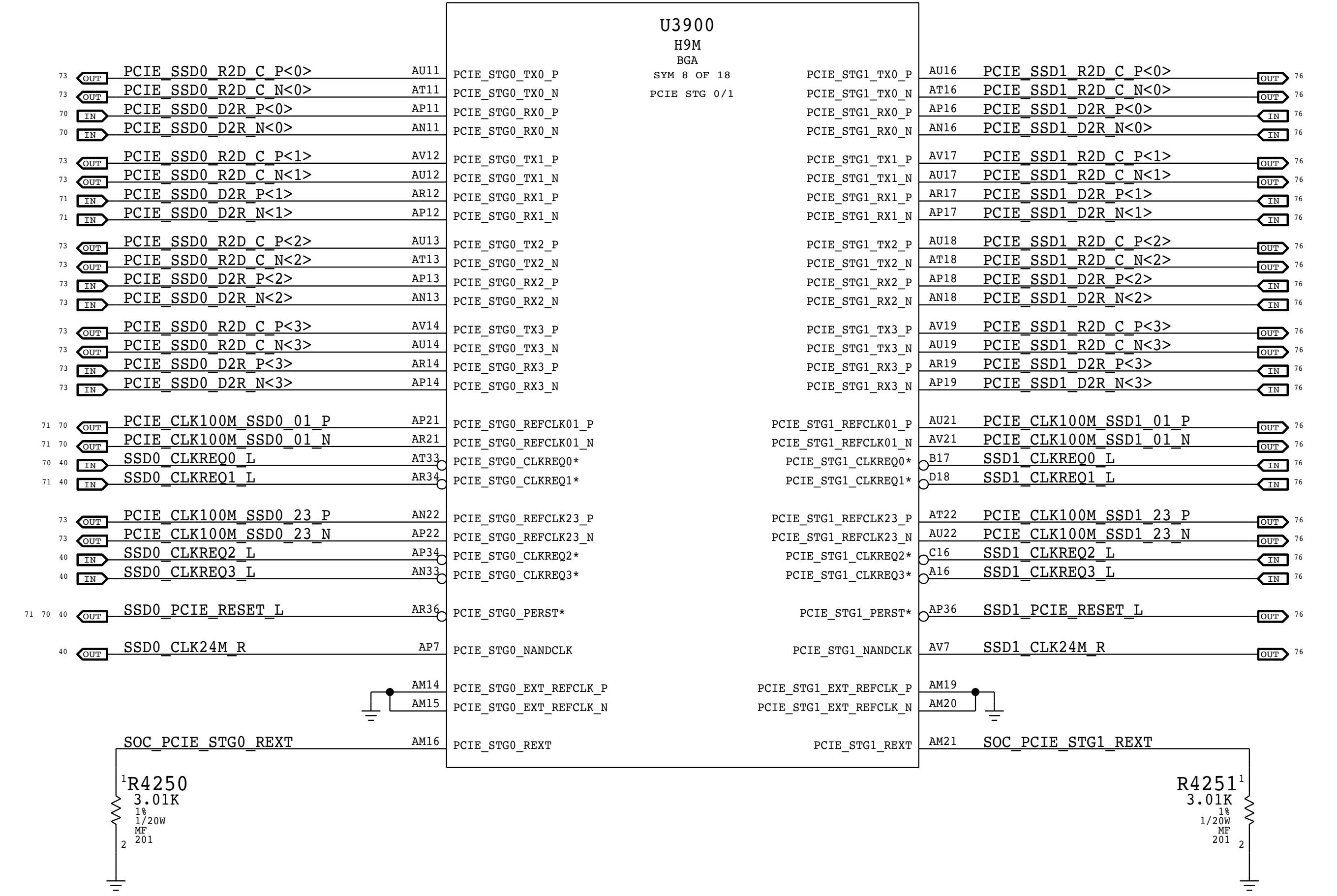
B

A

OMIT TABLE CRITICAL



OMIT TABLE CRITICAL



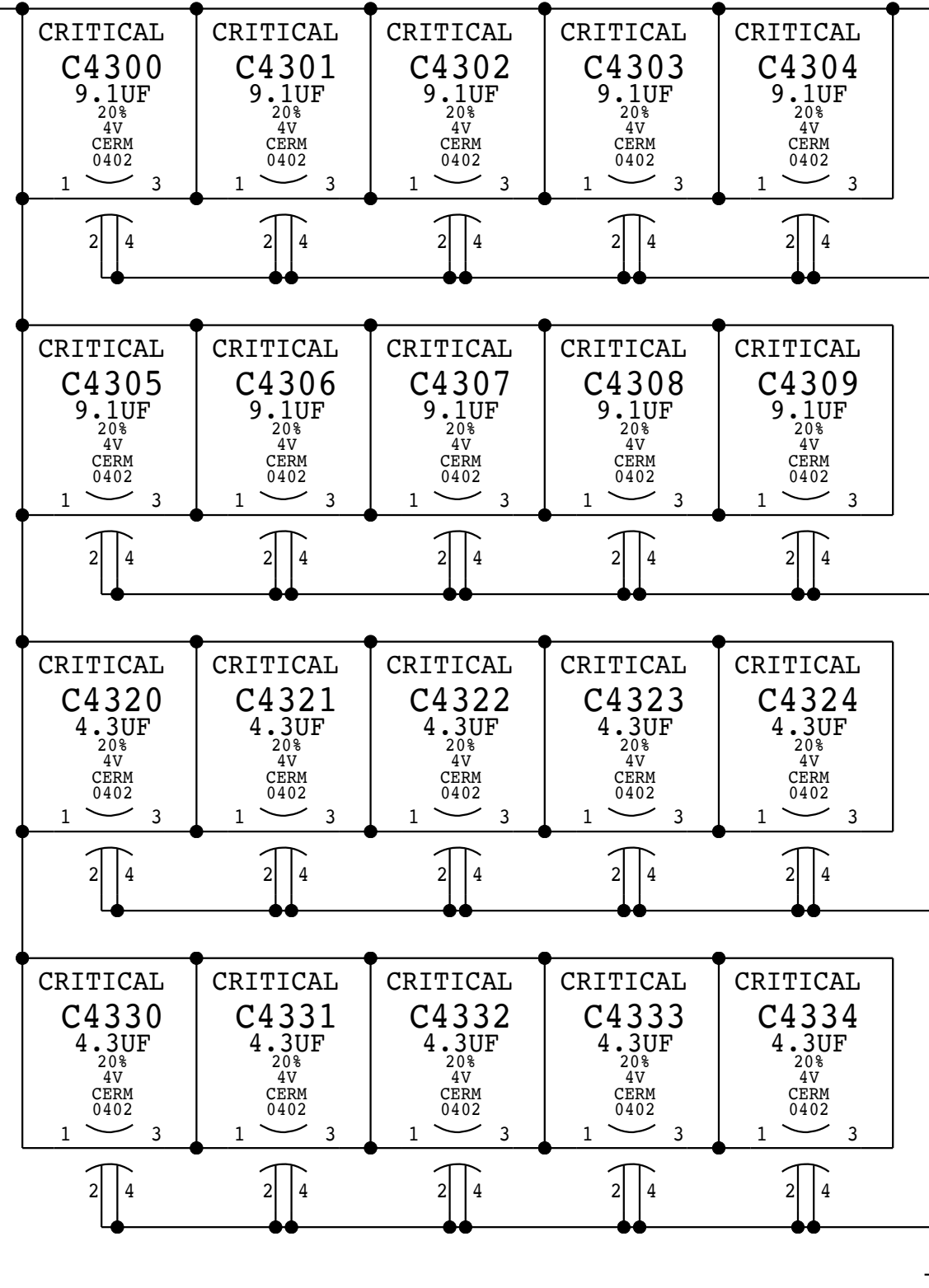
(UID\_MODE strap on A00)

BOM\_COST\_GROUP=T290

SYNC MASTER=X589 BIGSUR		SYNC DATE=03/15/2017	
PAGE TITLE			
SoC PCIe		DRAWING NUMBER	051-05232
		REVISION	4.0.0
		BRANCH	riskramp
		PAGE	42 OF 152
		SHEET	34 OF 86
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Current estimates @ 105C & 2GB from Gibraltar Power Specification Rev 0.5.3

74 =PPVDDCPU\_AWAKE\_SOC  
0.625V - 1.06V  
11.6A Max

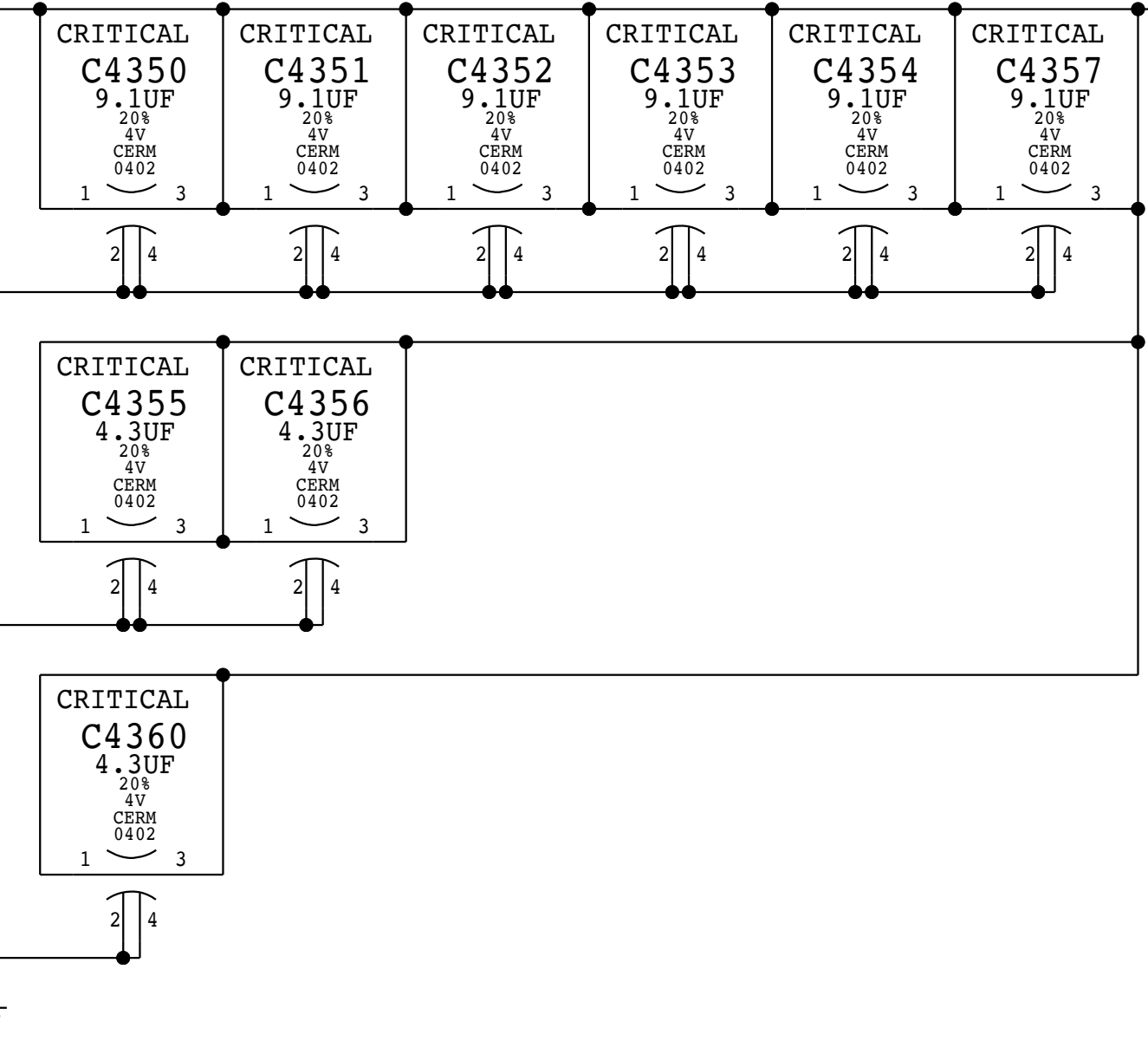


Pin	Signal
AA12	VDD_CPU
AA14	VDD_CPU
AA16	VDD_CPU
AB11	VDD_CPU
AB13	VDD_CPU
AB15	VDD_CPU
AC12	VDD_CPU
AC14	VDD_CPU
AC16	VDD_CPU
AD11	VDD_CPU
AD13	VDD_CPU
AD15	VDD_CPU
AD17	VDD_CPU
AE10	VDD_CPU
AE12	VDD_CPU
AE14	VDD_CPU
AE16	VDD_CPU
AE18	VDD_CPU
P11	VDD_CPU
P13	VDD_CPU
P15	VDD_CPU
P17	VDD_CPU
R12	VDD_CPU
R14	VDD_CPU
R16	VDD_CPU
T11	VDD_CPU
T13	VDD_CPU
T15	VDD_CPU
U12	VDD_CPU
U14	VDD_CPU
U16	VDD_CPU
W14	VDD_CPU
W16	VDD_CPU
Y17	VDD_CPU

OMIT TABLE  
CRITICAL

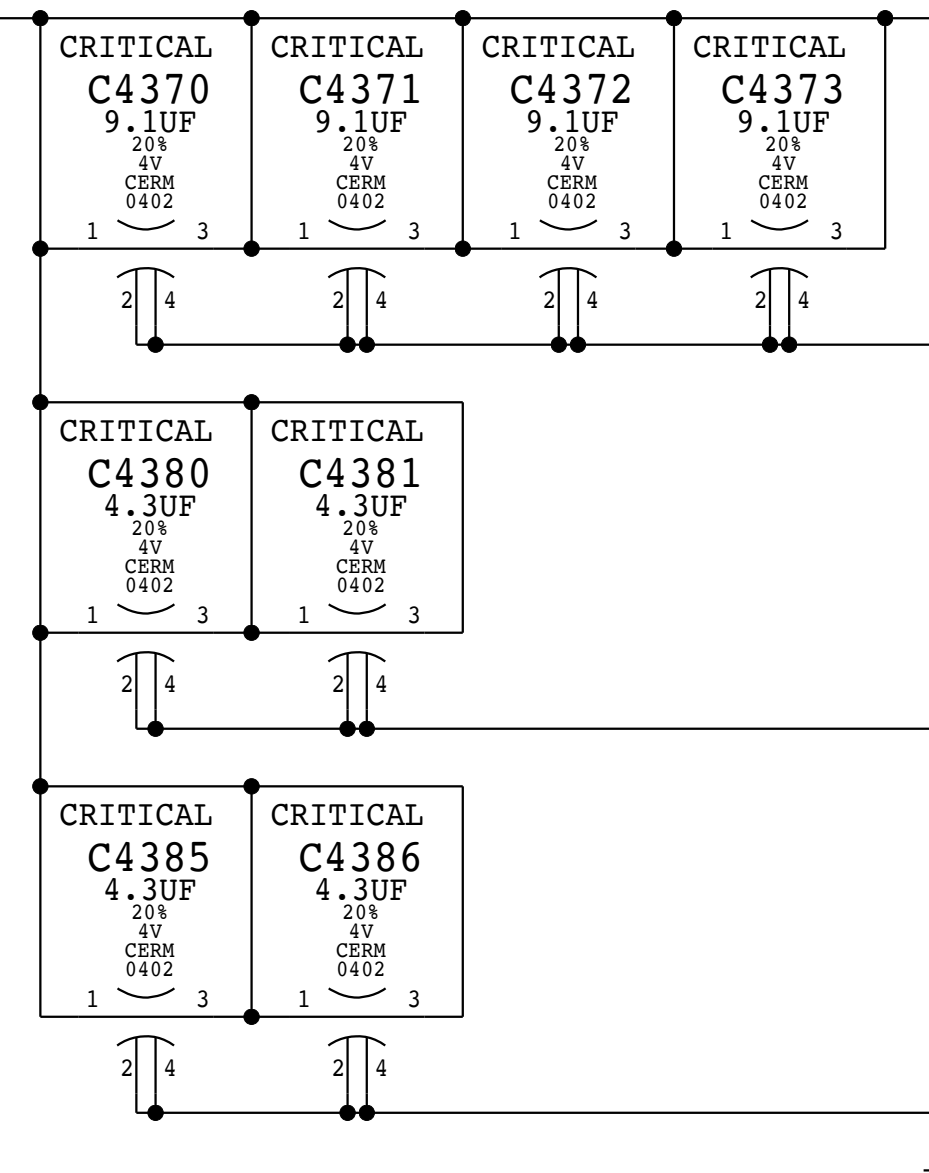
Pin	Signal
AA10	VDD_CPU_SRAM
AA17	VDD_CPU_SRAM
AC10	VDD_CPU_SRAM
R10	VDD_CPU_SRAM
T17	VDD_CPU_SRAM
U10	VDD_CPU_SRAM
V11	VDD_CPU_SRAM
V13	VDD_CPU_SRAM
V15	VDD_CPU_SRAM
W10	VDD_CPU_SRAM
Y11	VDD_CPU_SRAM
Y13	VDD_CPU_SRAM
Y15	VDD_CPU_SRAM

VDD\_CPU\_SENSE N18 SOC\_VDDCPU\_SENSE  
VSS\_CPU\_SENSE N17 TP\_SOC\_VSSCPU\_SENSE



74 =PPVDDCPU\_SRAM\_AWAKE\_SOC  
0.8V - 1.06V  
0.9A Max

74 =PP0V82\_SLPDDR\_VDDSOC  
5.6A Max



Pin	Signal
AA20	VDD_SOC
AA22	VDD_SOC
AA24	VDD_SOC
AA26	VDD_SOC
AA28	VDD_SOC
AC18	VDD_SOC
AC20	VDD_SOC
AC22	VDD_SOC
AC24	VDD_SOC
AC26	VDD_SOC
AC28	VDD_SOC
AE20	VDD_SOC
AE22	VDD_SOC
AE24	VDD_SOC
AE26	VDD_SOC
AE28	VDD_SOC
AG10	VDD_SOC
AG12	VDD_SOC
AG14	VDD_SOC
AG16	VDD_SOC
AG18	VDD_SOC
AG20	VDD_SOC
AG22	VDD_SOC
AG24	VDD_SOC
AG26	VDD_SOC
AG28	VDD_SOC
AJ10	VDD_SOC
AJ12	VDD_SOC
AJ14	VDD_SOC
AJ16	VDD_SOC
AJ18	VDD_SOC
AJ20	VDD_SOC
AJ22	VDD_SOC
AJ24	VDD_SOC
AJ26	VDD_SOC
AJ28	VDD_SOC
J10	VDD_SOC
J12	VDD_SOC
J14	VDD_SOC
J16	VDD_SOC
J18	VDD_SOC
J20	VDD_SOC

OMIT TABLE  
CRITICAL

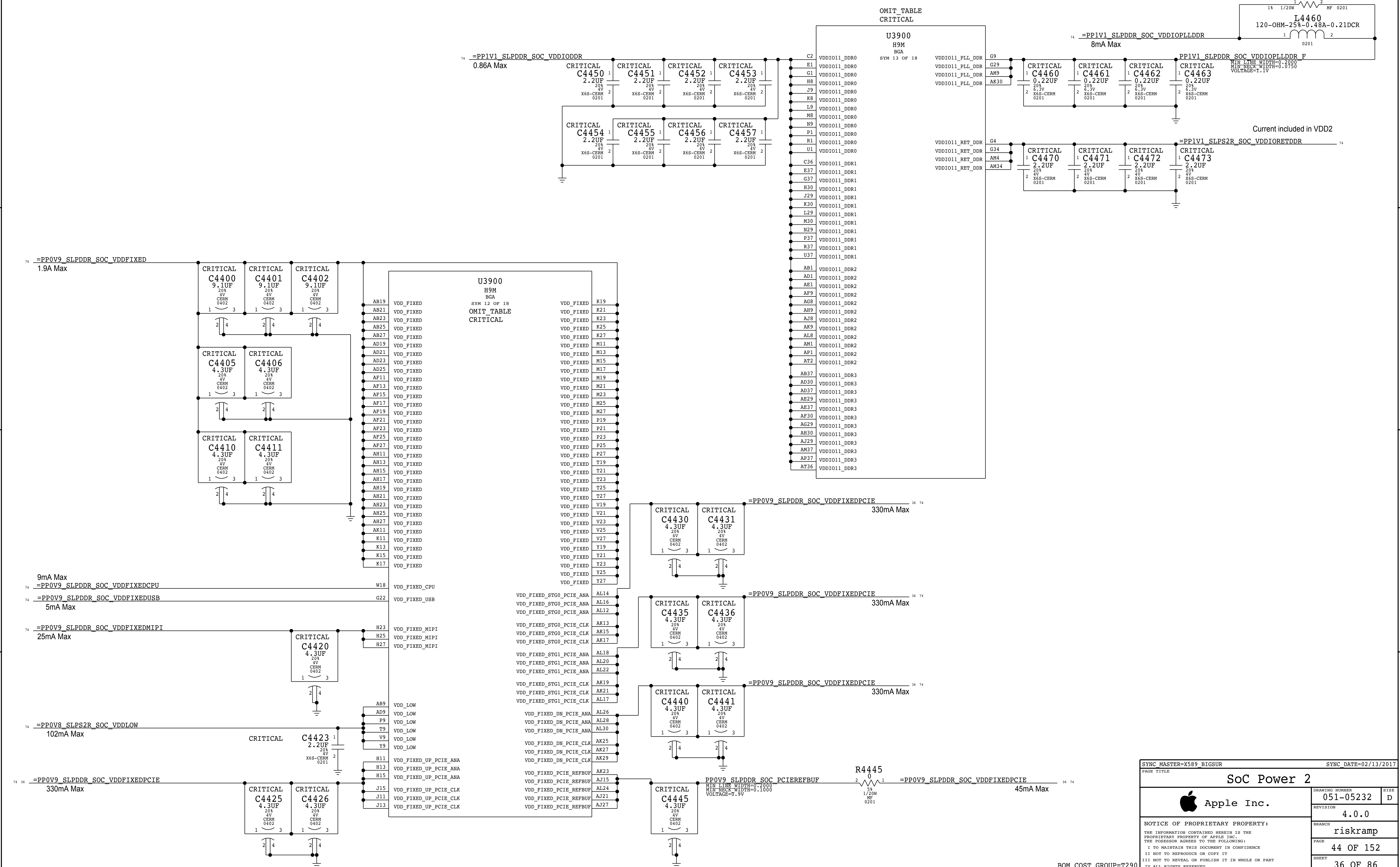
Pin	Signal
J22	VDD_SOC
J24	VDD_SOC
J26	VDD_SOC
J28	VDD_SOC
L10	VDD_SOC
L12	VDD_SOC
L14	VDD_SOC
L16	VDD_SOC
L18	VDD_SOC
L20	VDD_SOC
L22	VDD_SOC
L24	VDD_SOC
L26	VDD_SOC
L28	VDD_SOC
N10	VDD_SOC
N12	VDD_SOC
N14	VDD_SOC
N16	VDD_SOC
N18	VDD_SOC
N20	VDD_SOC
N22	VDD_SOC
N24	VDD_SOC
N26	VDD_SOC
N28	VDD_SOC
R18	VDD_SOC
R20	VDD_SOC
R22	VDD_SOC
R24	VDD_SOC
R26	VDD_SOC
R28	VDD_SOC
U18	VDD_SOC
U20	VDD_SOC
U22	VDD_SOC
U24	VDD_SOC
U26	VDD_SOC
U28	VDD_SOC
W20	VDD_SOC
W22	VDD_SOC
W24	VDD_SOC
W26	VDD_SOC
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VSS\_SENSE AD28 TP\_SOC\_VSSSOC\_SENSE

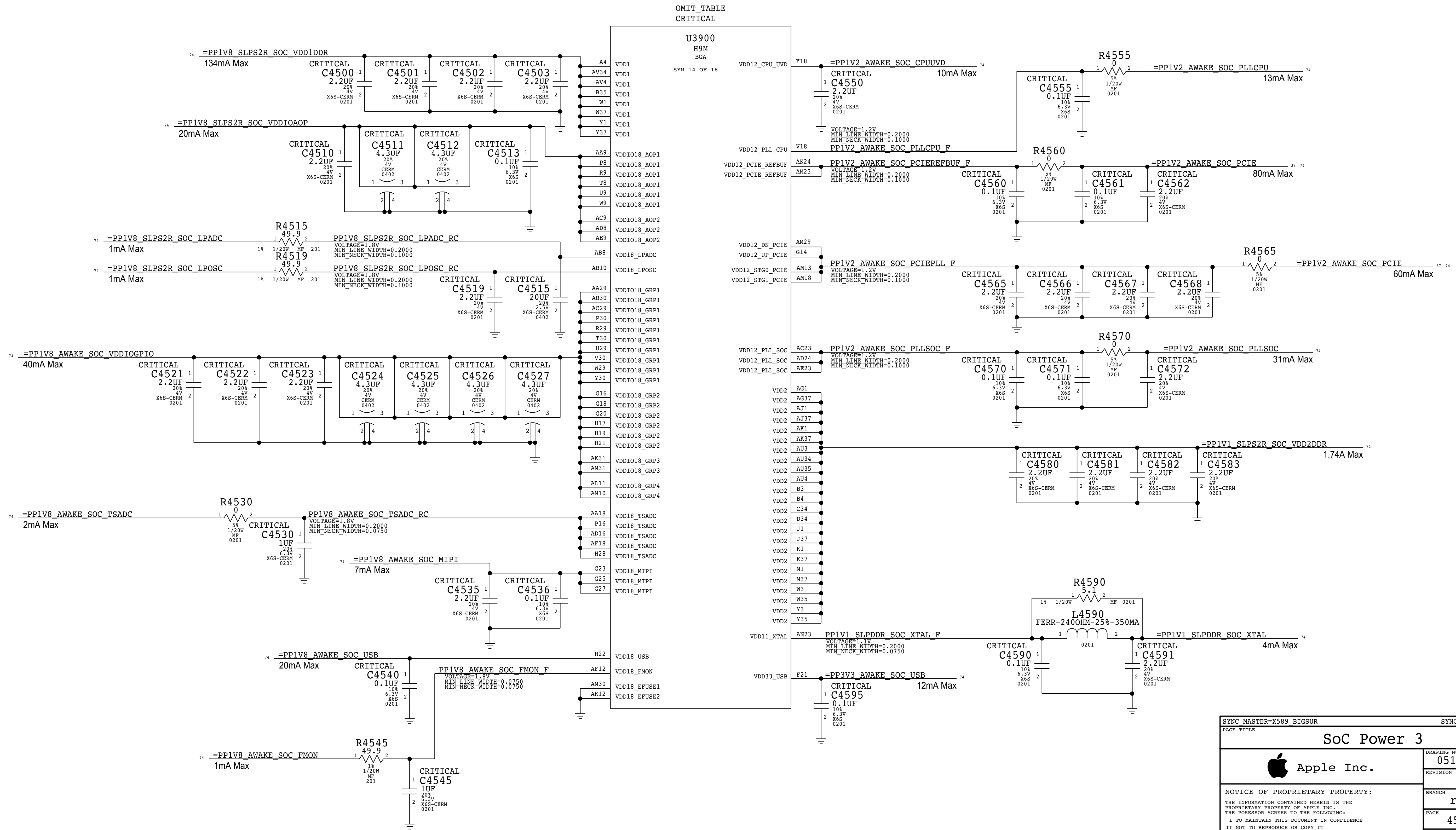
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		PAGE	43 OF 152
		SHEET	35 OF 86

BOM\_COST\_GROUP=T290

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



SYNC MASTER=X589 BIGSUR		SYNC DATE=02/13/2017	
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		BOM_COST_GROUP=T290	



OMIT\_TABLE  
CRITICAL

U3900  
H9M  
BGA  
SYM 14 OF 18

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		PAGE	45 OF 152
		SHEET	37 OF 86

BOM\_COST\_GROUP=T290

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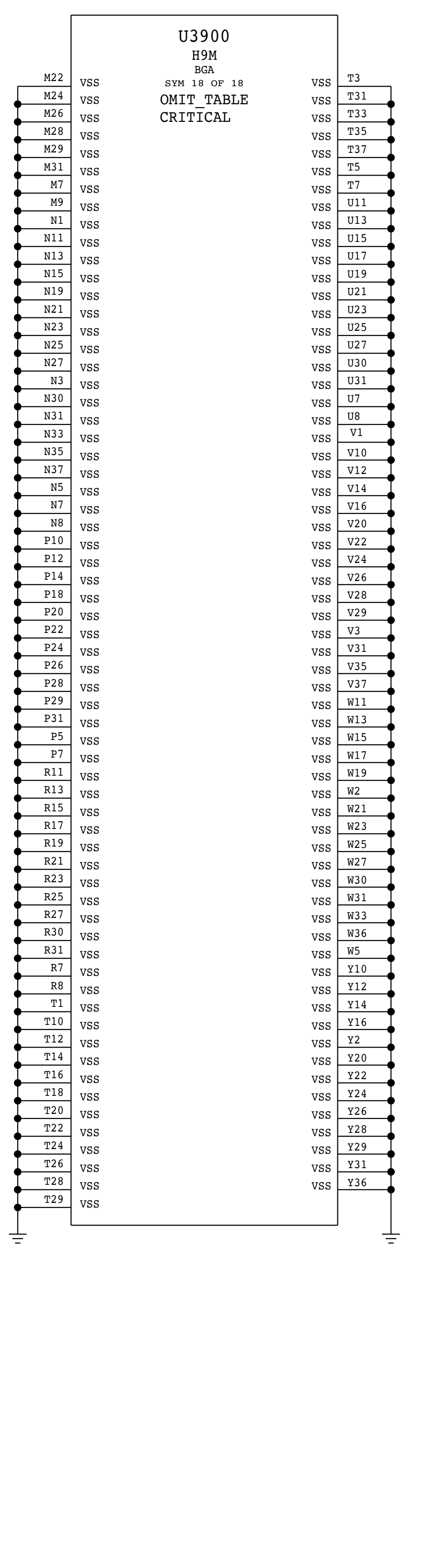
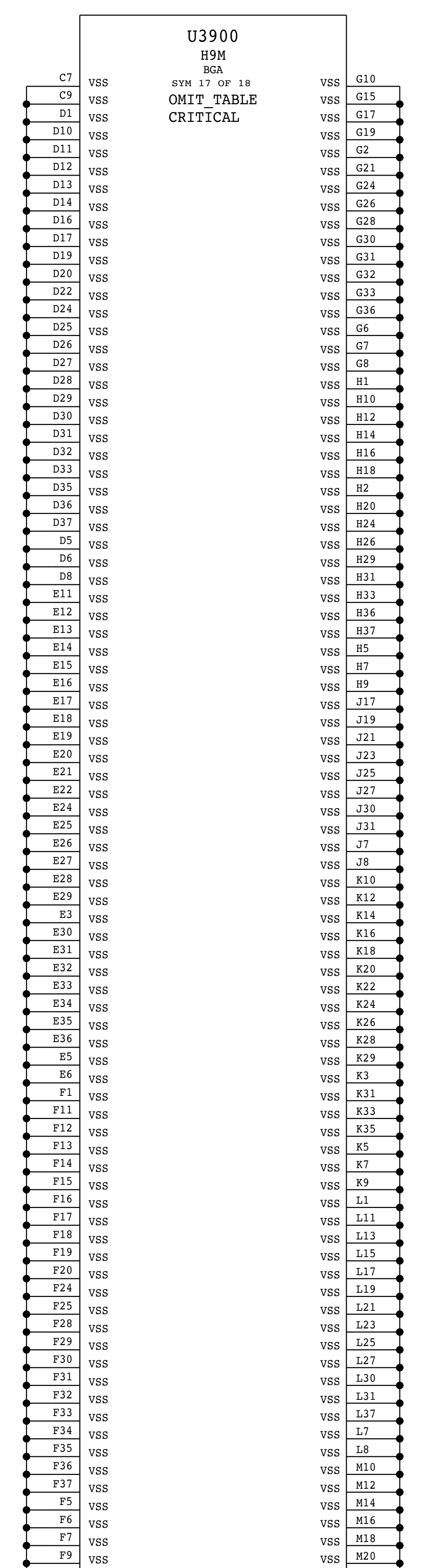
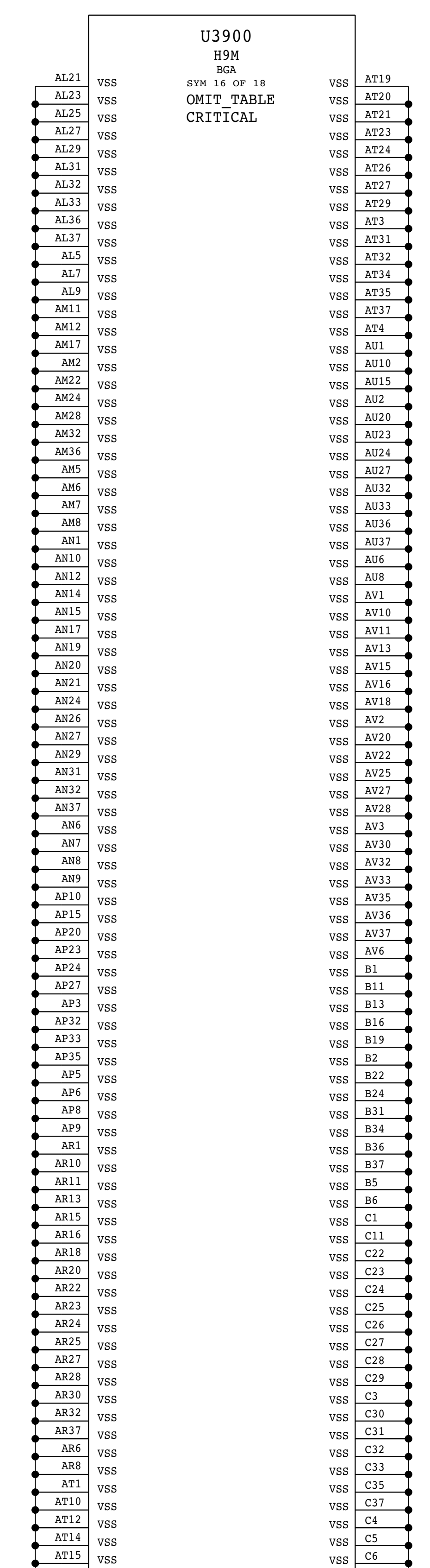
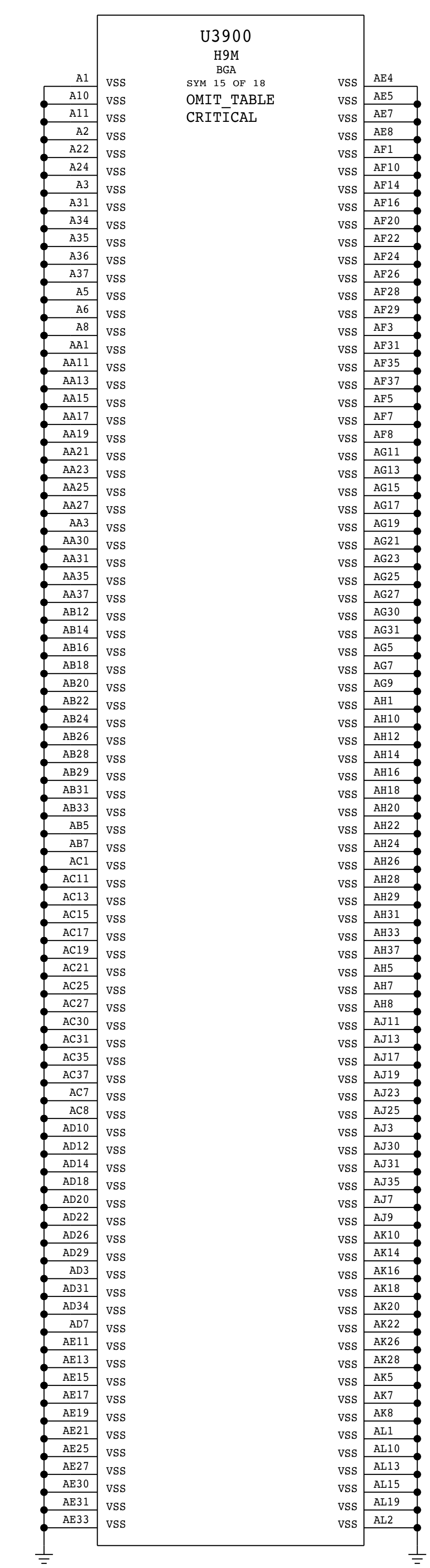
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SYNC MASTER=X589 BIGSUR SYNC DATE=02/13/2017

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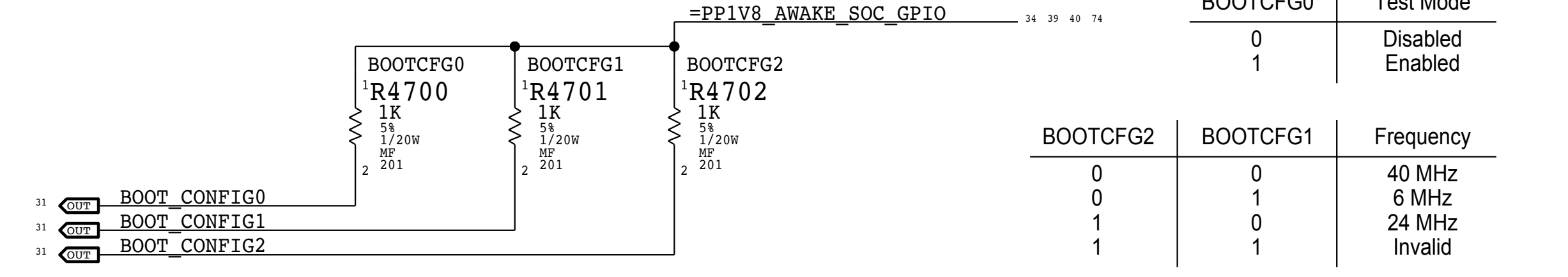
Apple Inc.

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BRANCH	riskramp		
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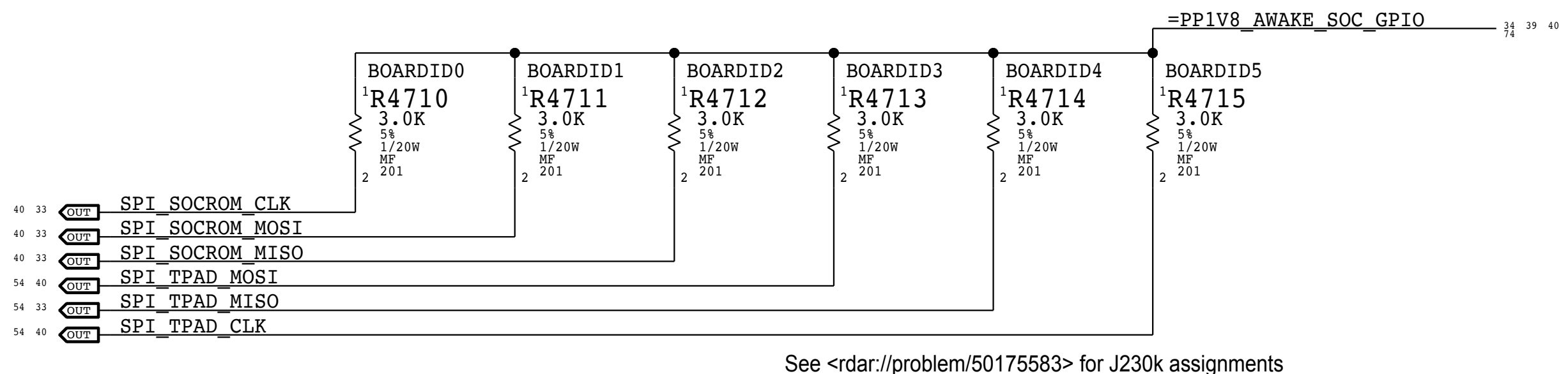
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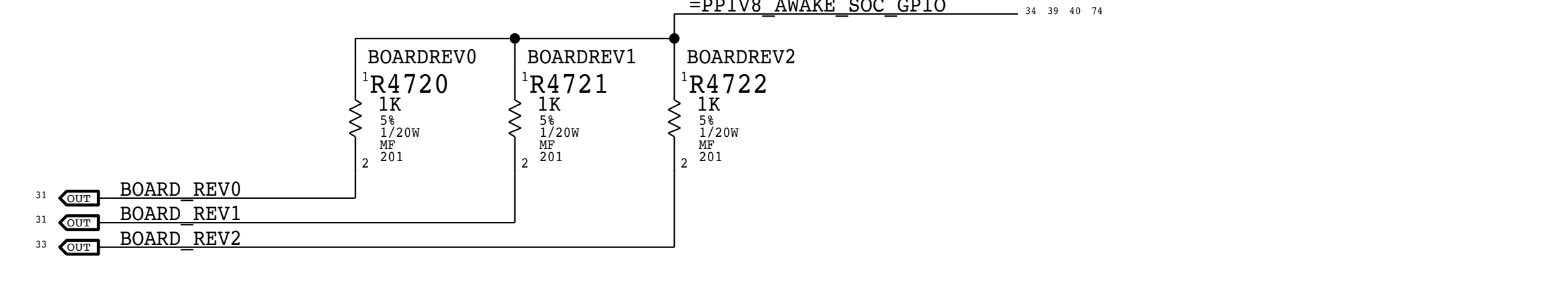
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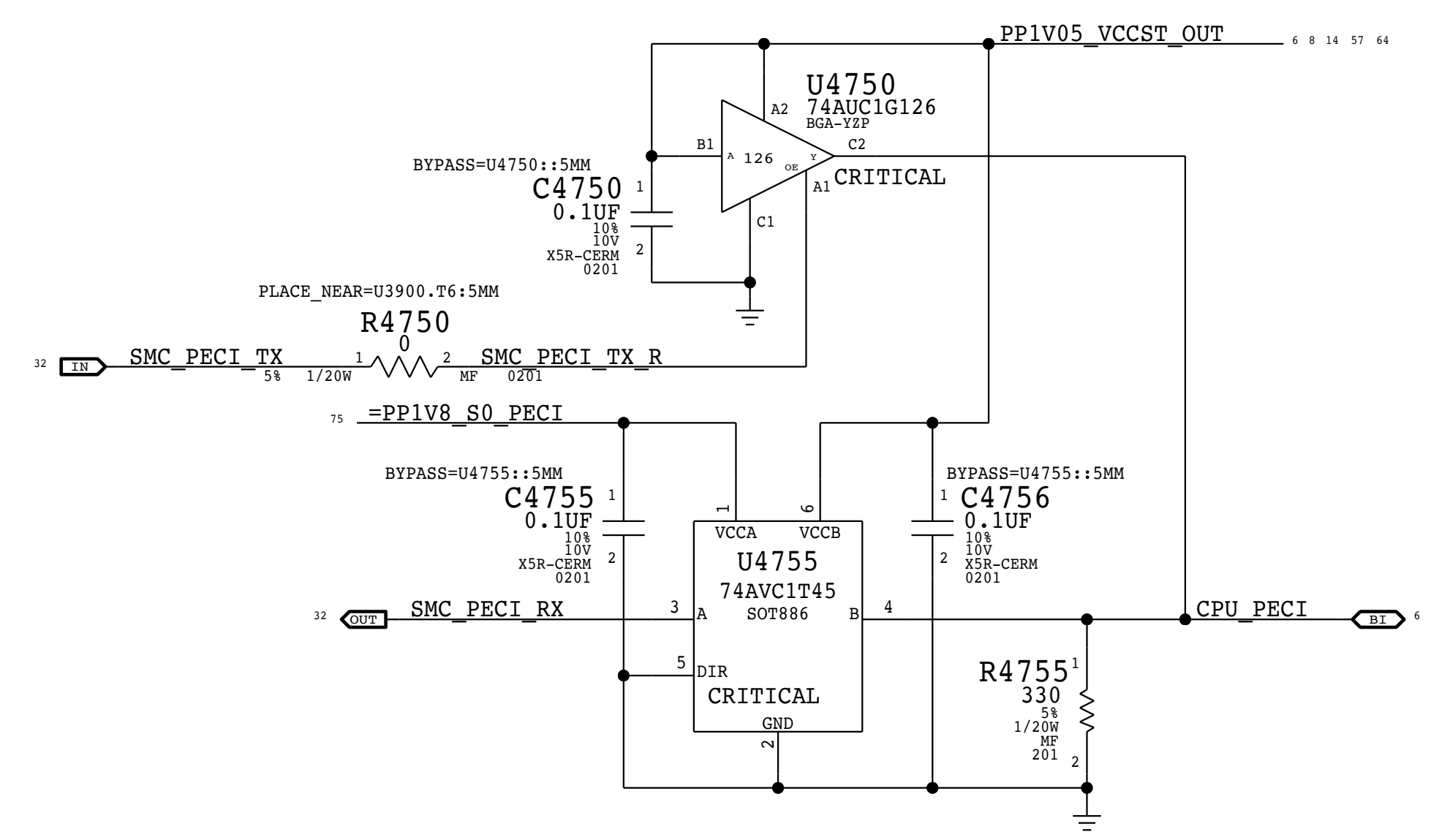
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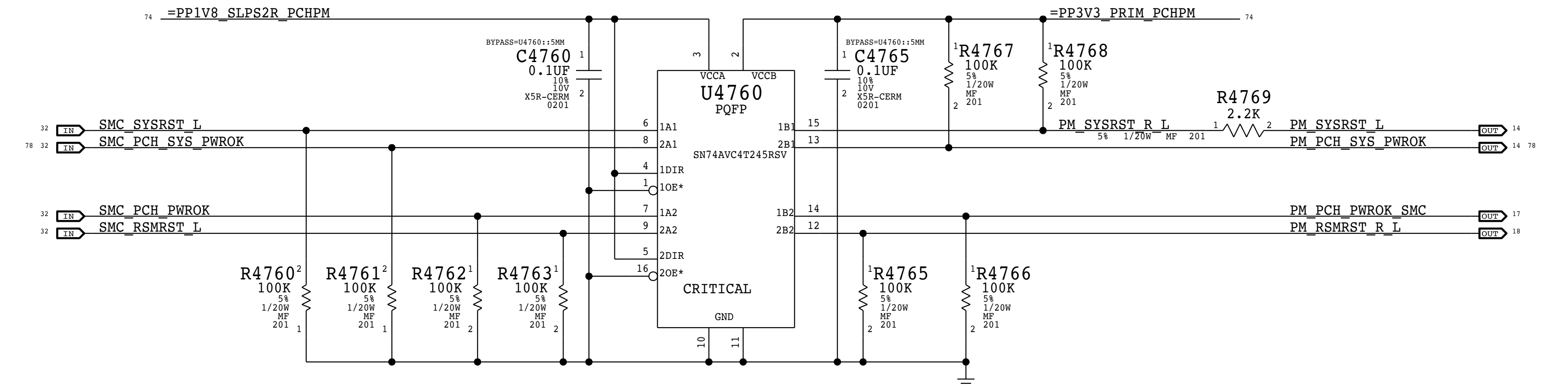
### Board Revision



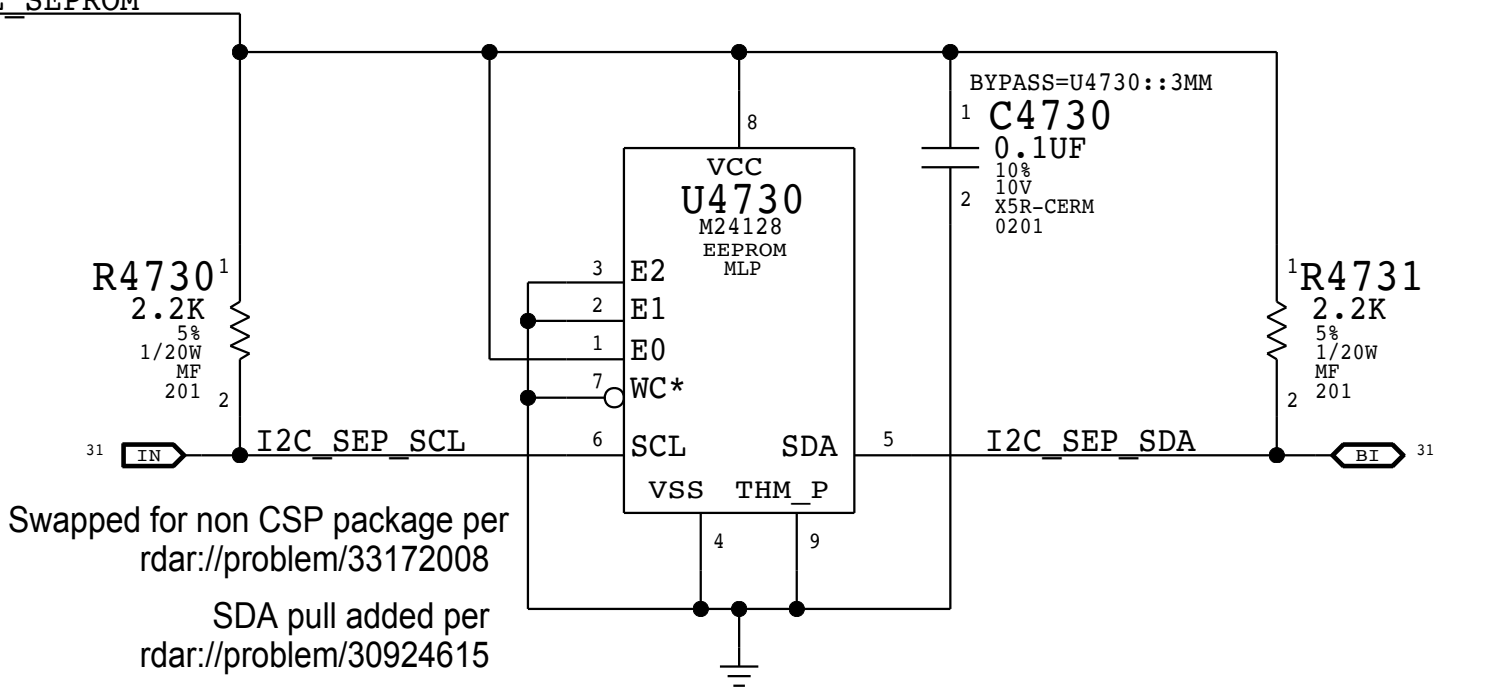
### PECI Level Shifting



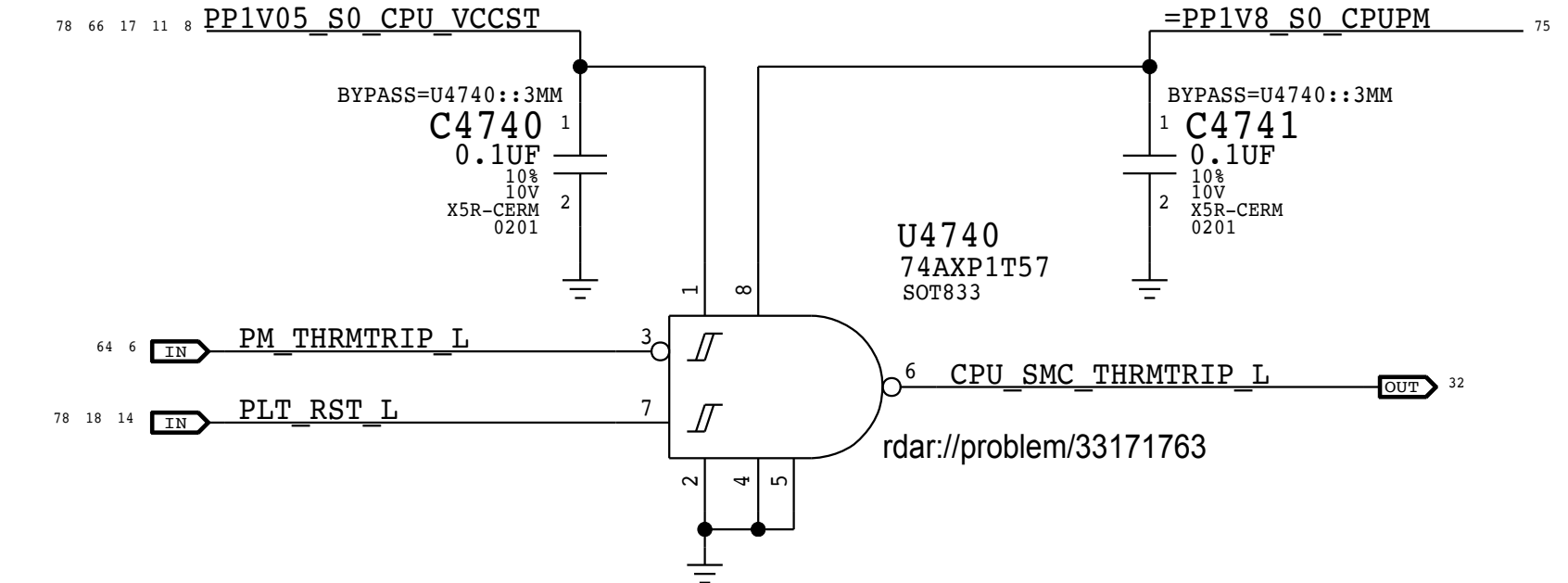
### PCH PM Level Shifting



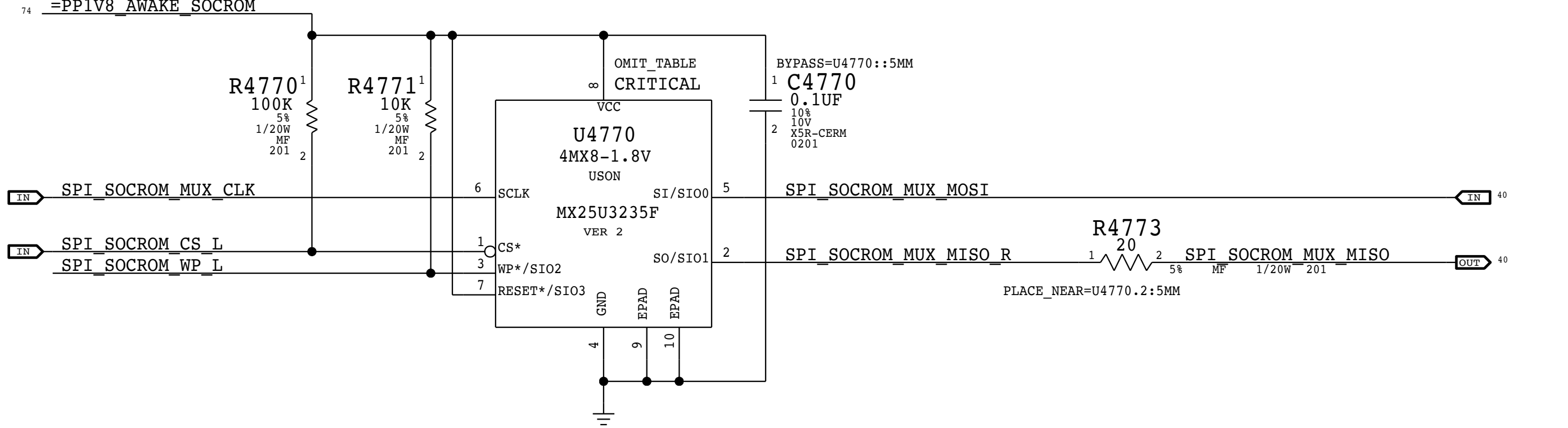
### SEP EEPROM



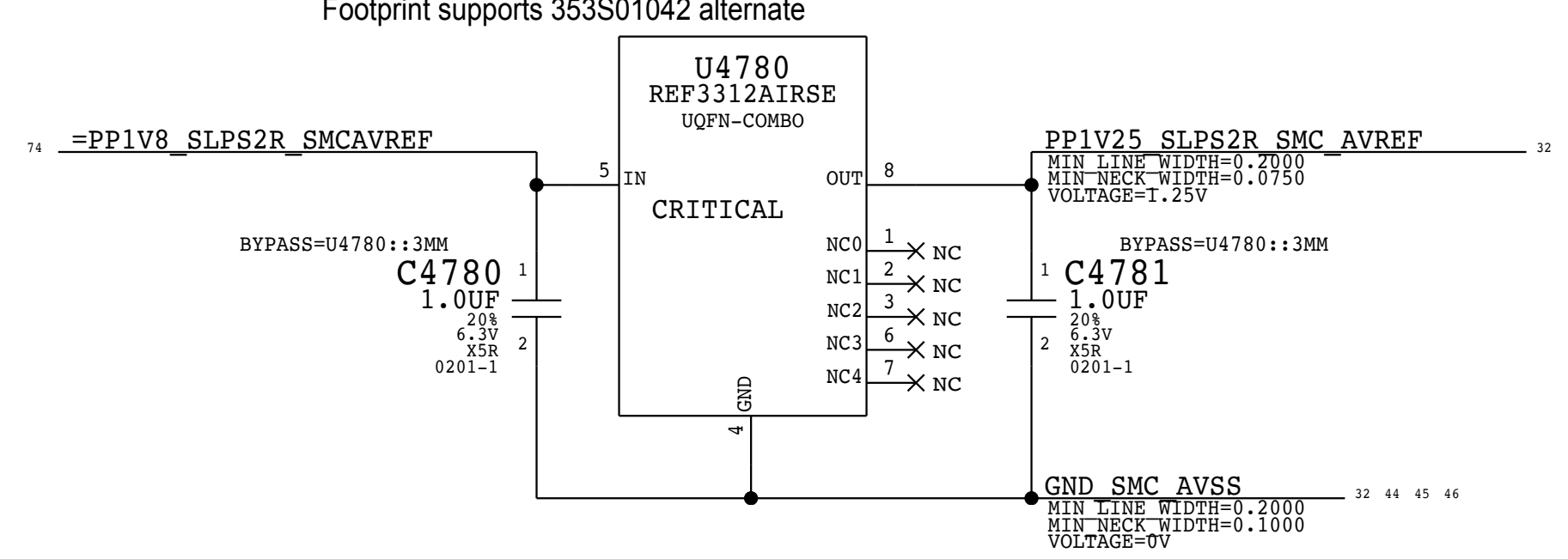
### THRMTRIP# Isolation



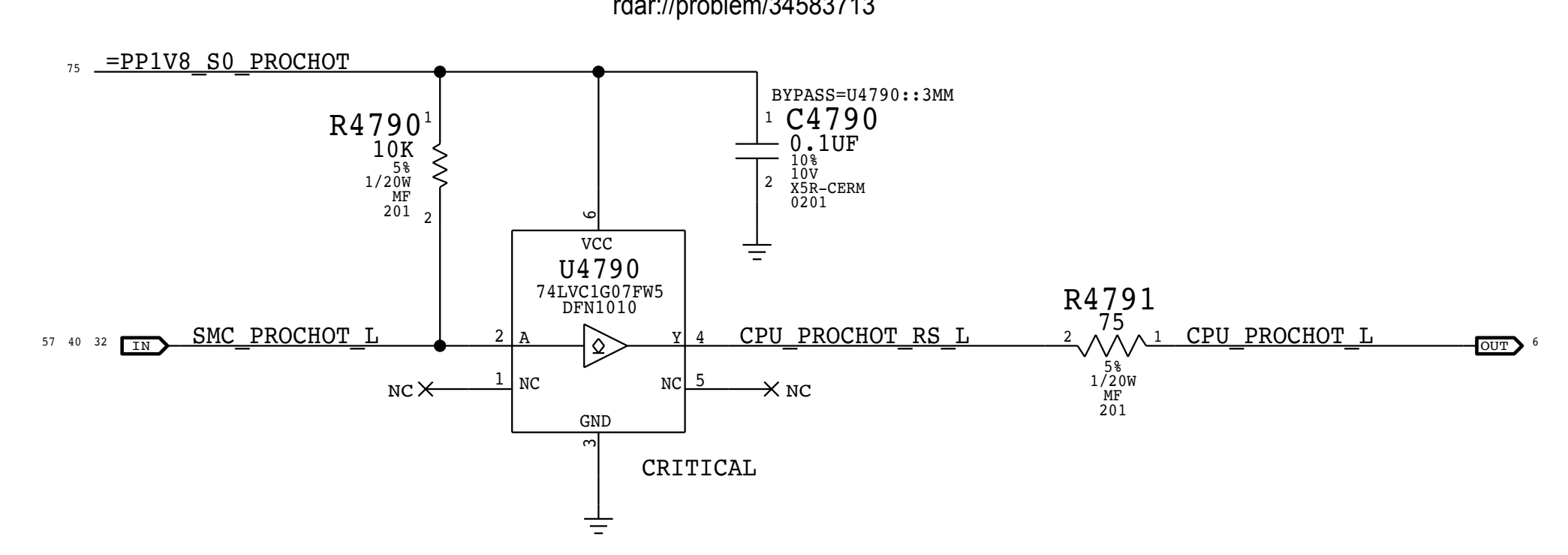
### SoC ROM



### SMC AVREF Supply

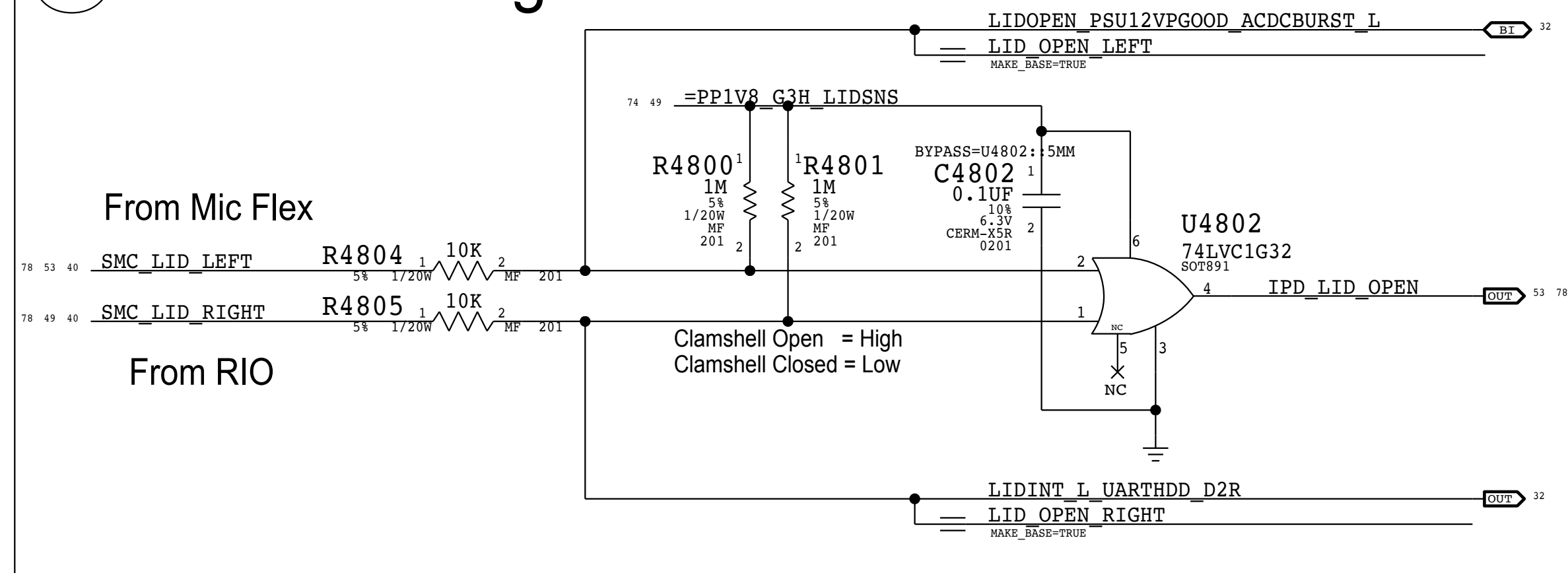


### PROCHOT# Level Shifting

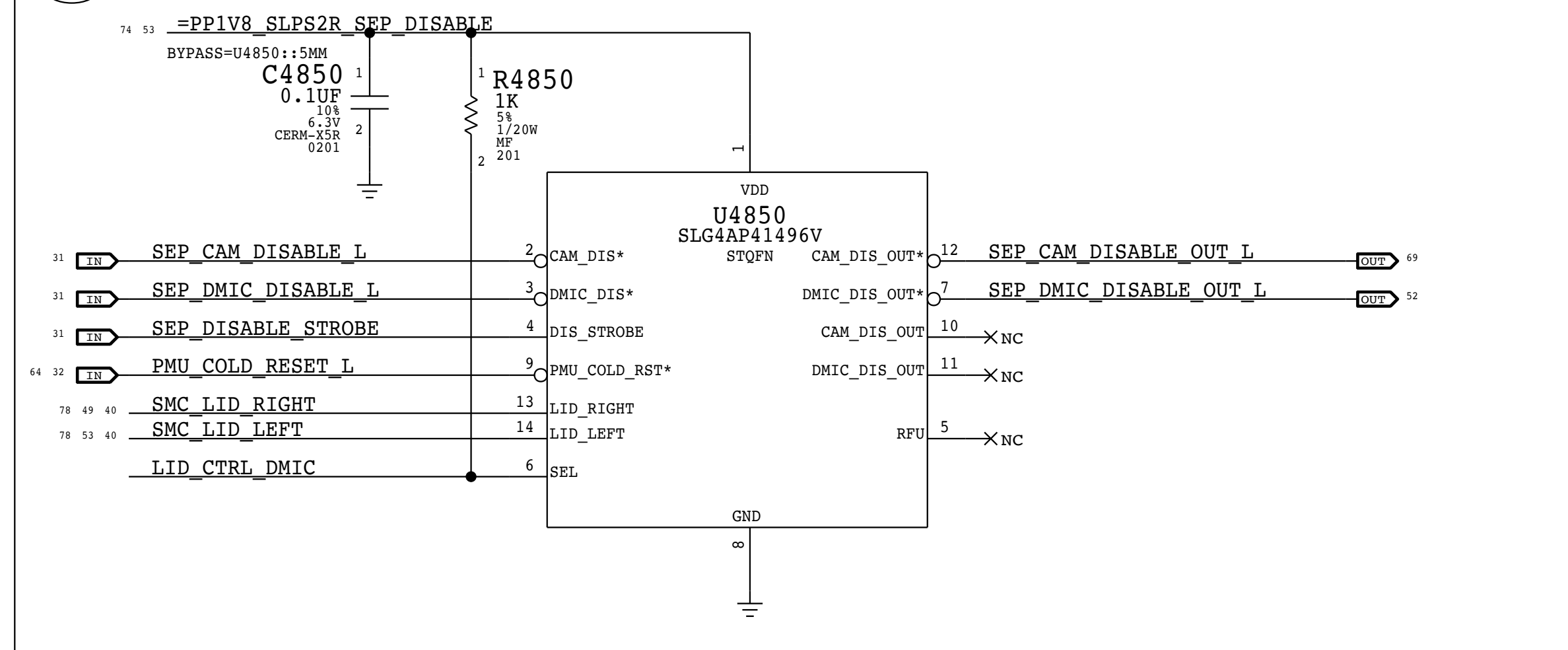


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		BRANCH	riskramp
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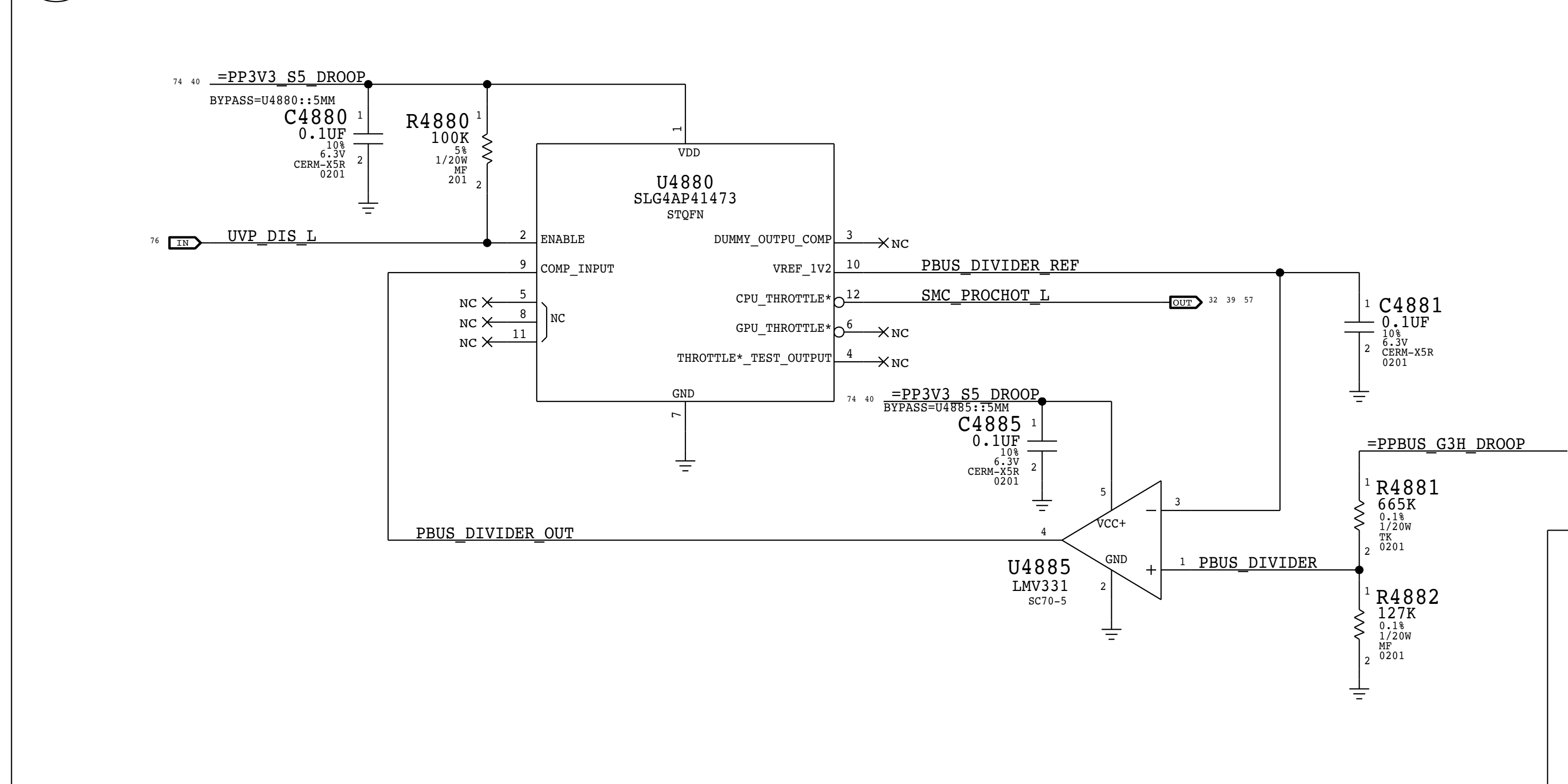
### A Lid Detect Logic



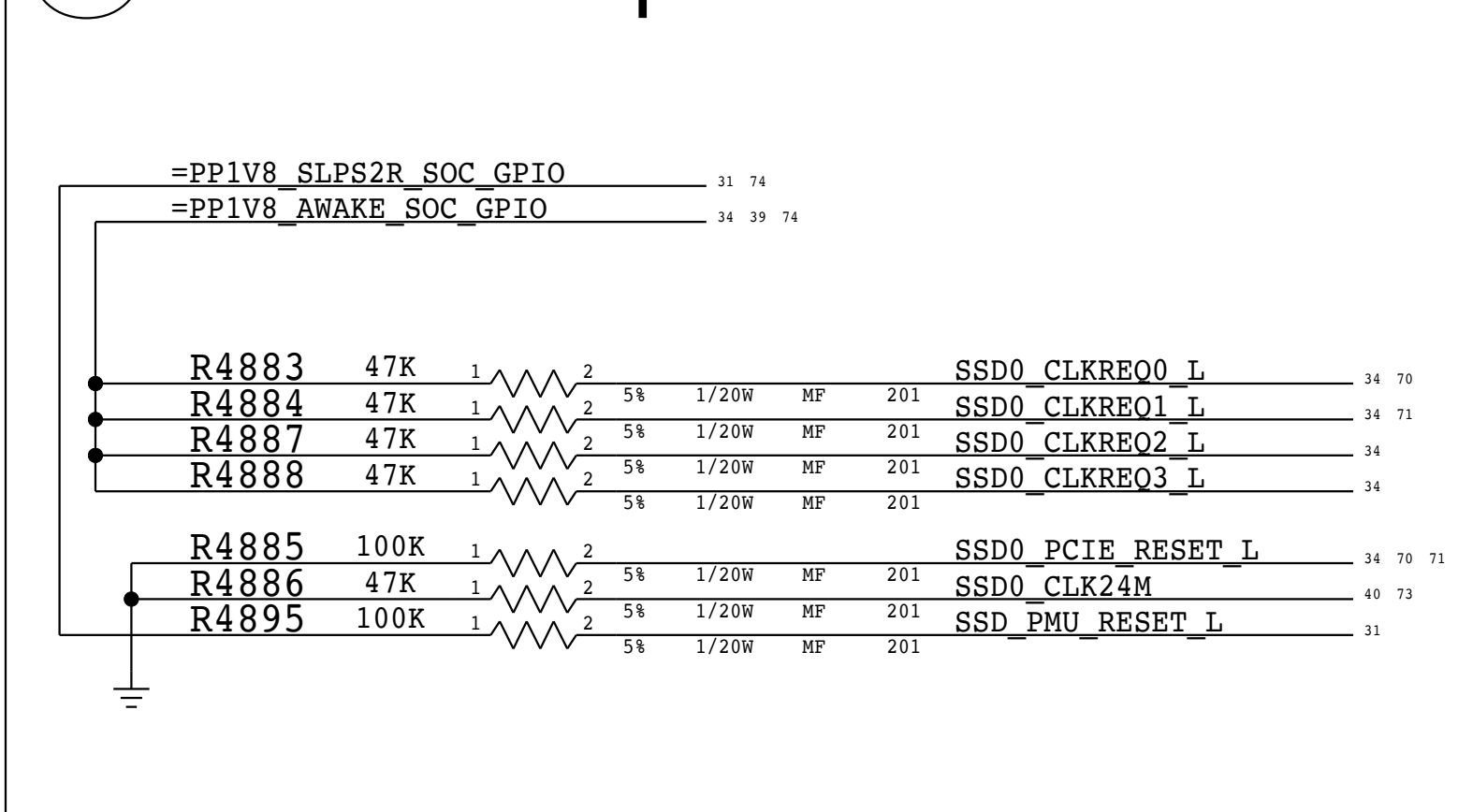
### B Secure Disable



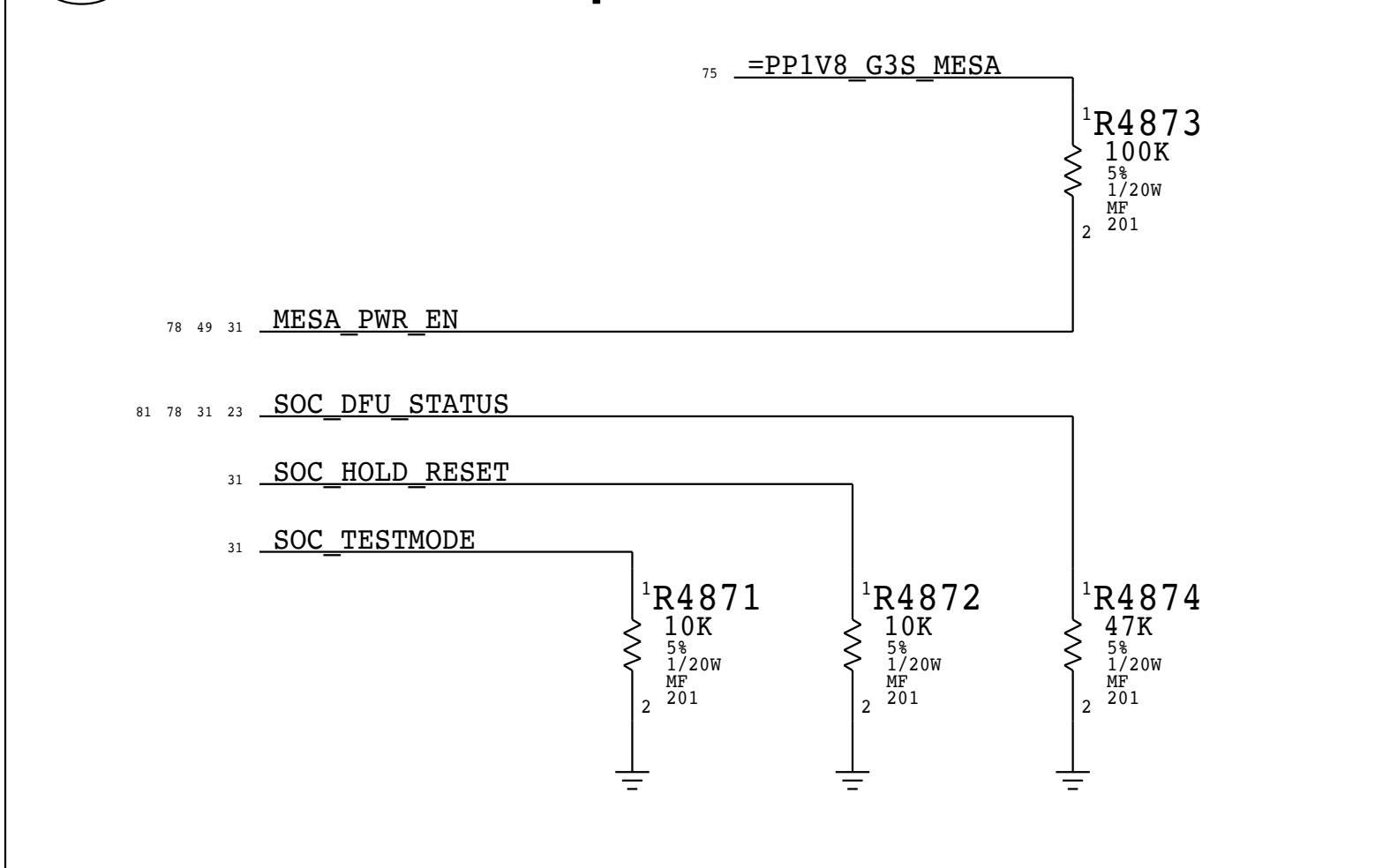
### C SMC PROCHOT Control Circuit



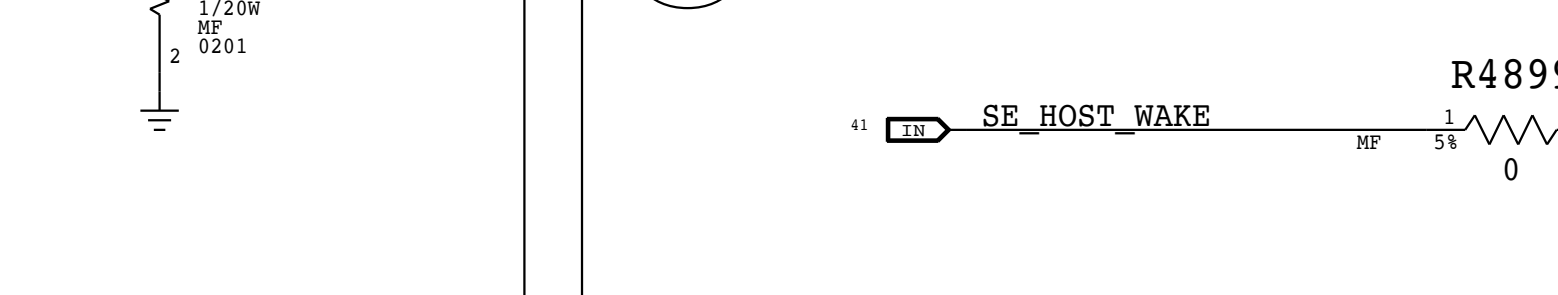
### D SSD Pull-Up/Downs



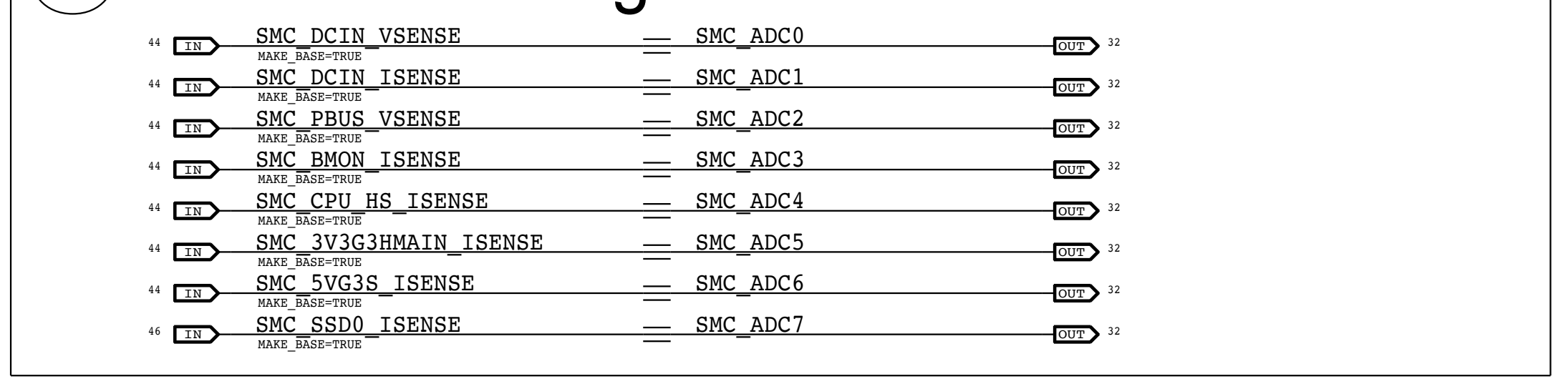
### E SoC Pull-Up/Downs



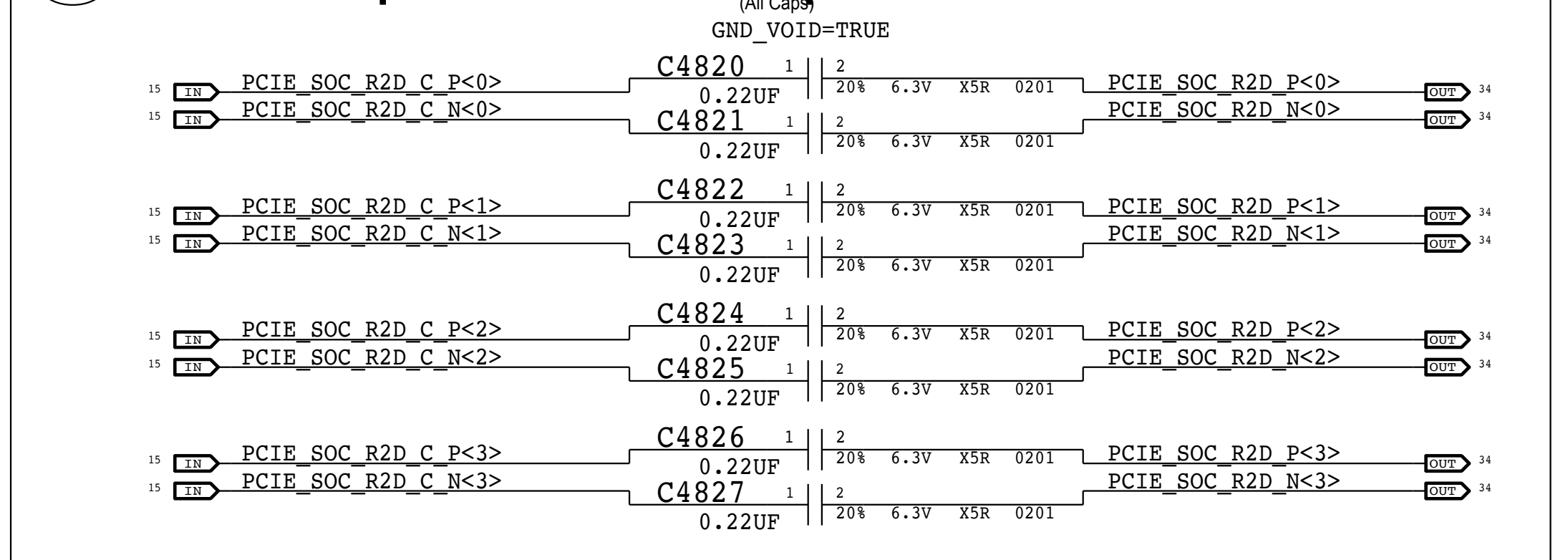
### F SE Host Wake



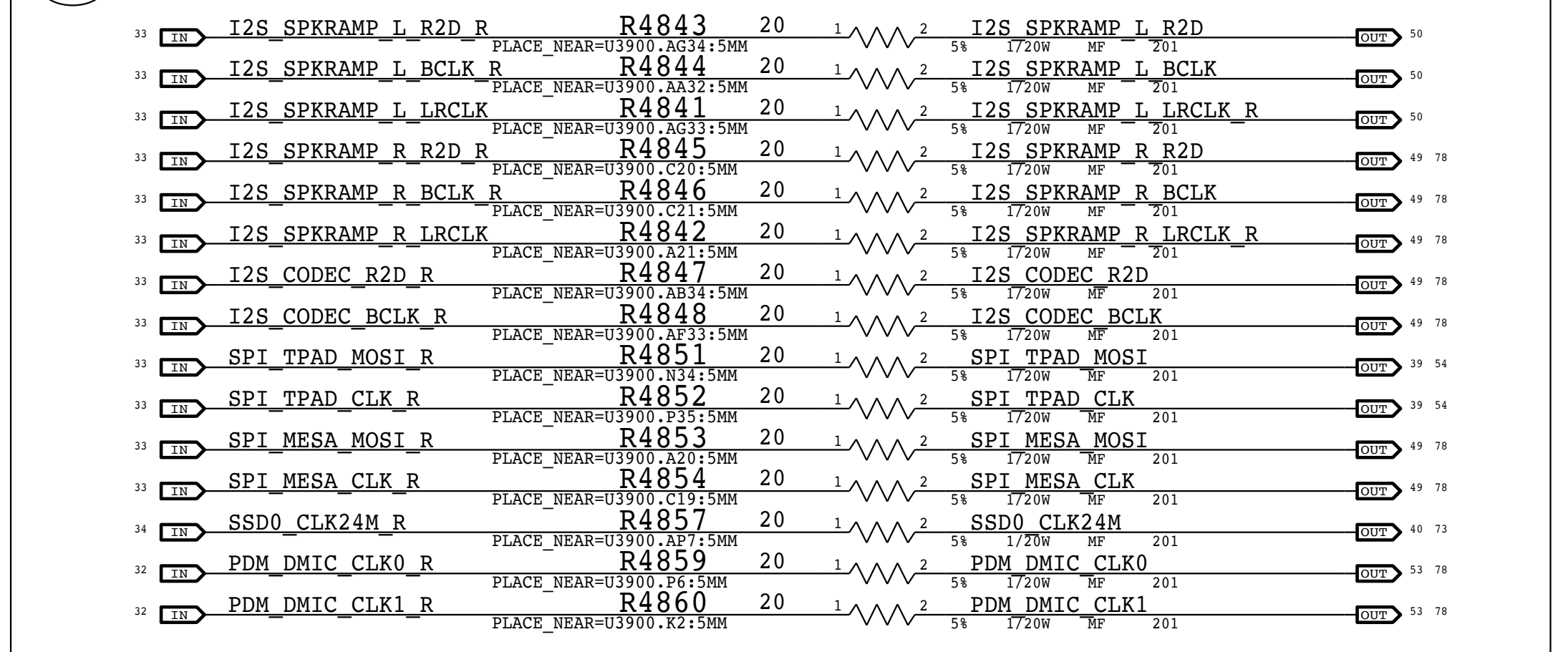
### G SMC ADC Assignments



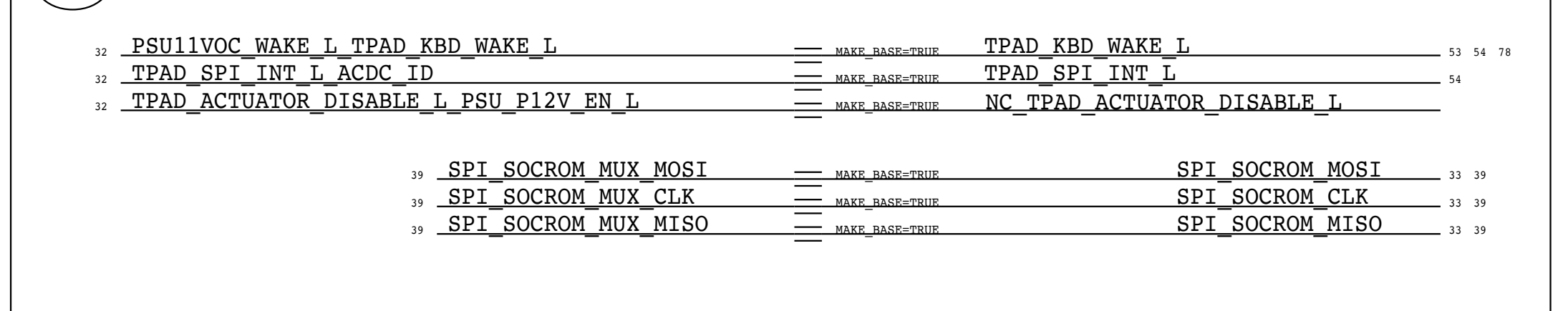
### H PCIe Up R2D AC Caps



### I GPIO Source Termination



### J Overloaded GPIOs



SYNC MASTER=X589 BIGSUR SYNC DATE=02/13/2017

SoC Project Support

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BRANCH: riskramp

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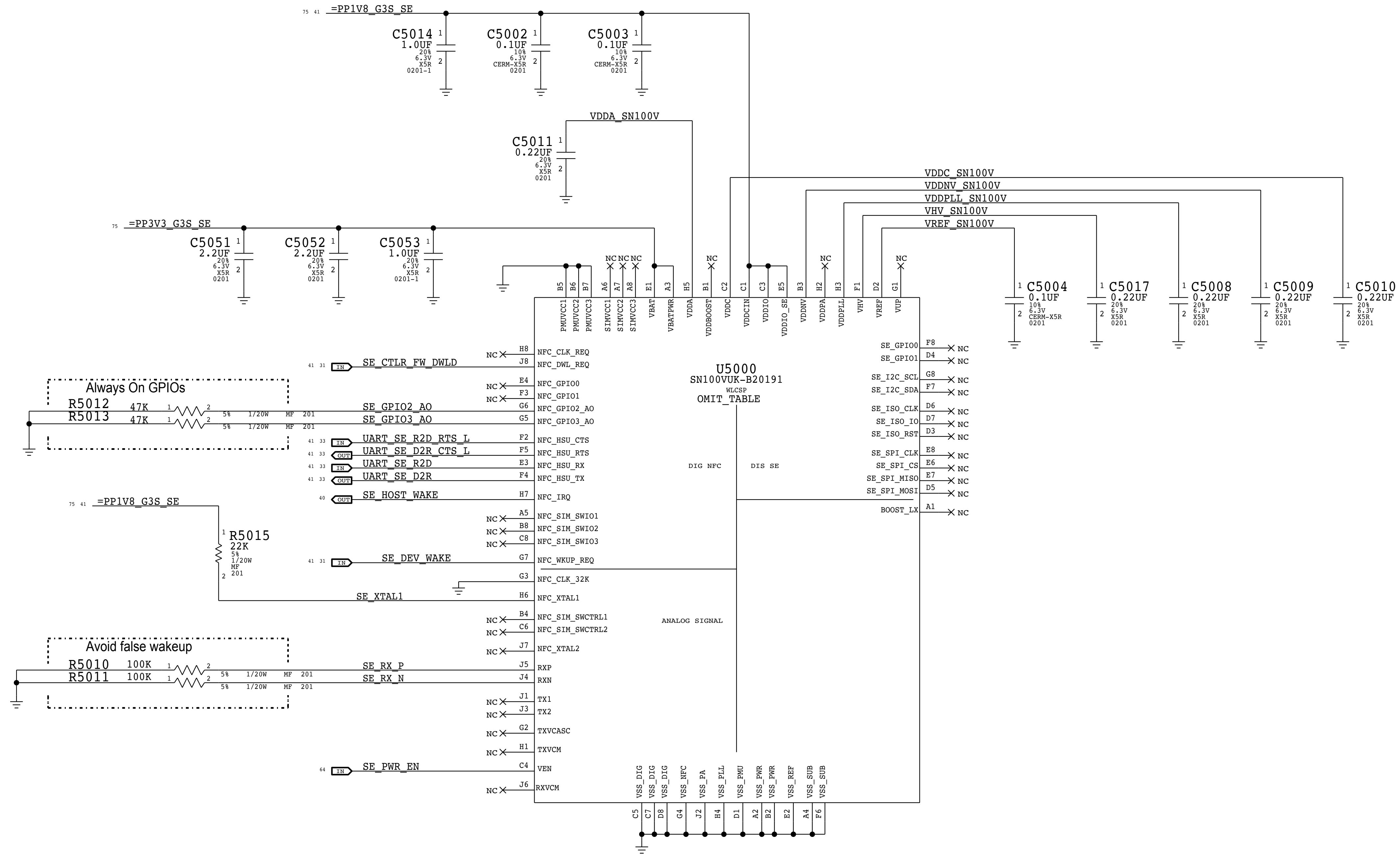
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# Venus - Secure Element



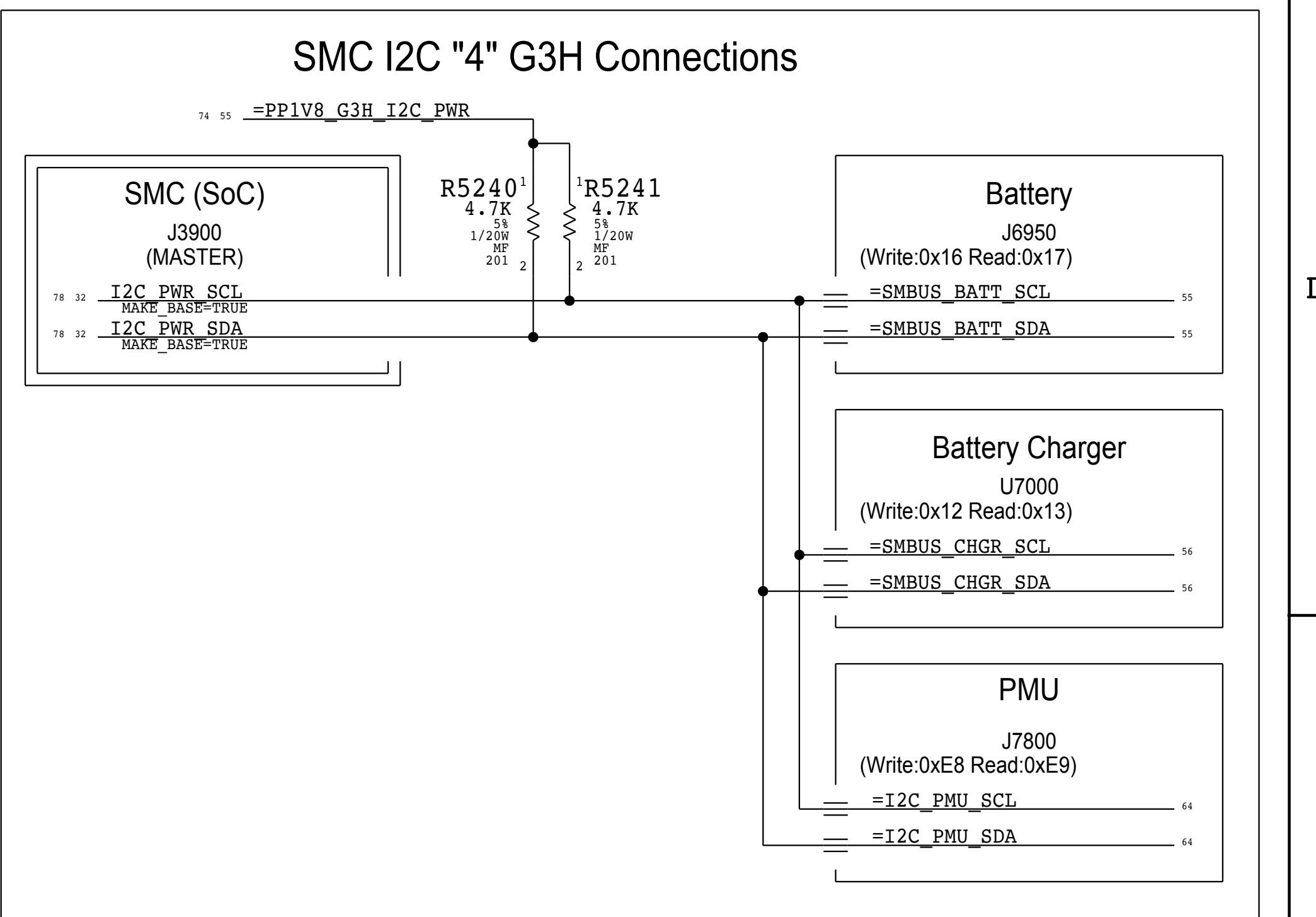
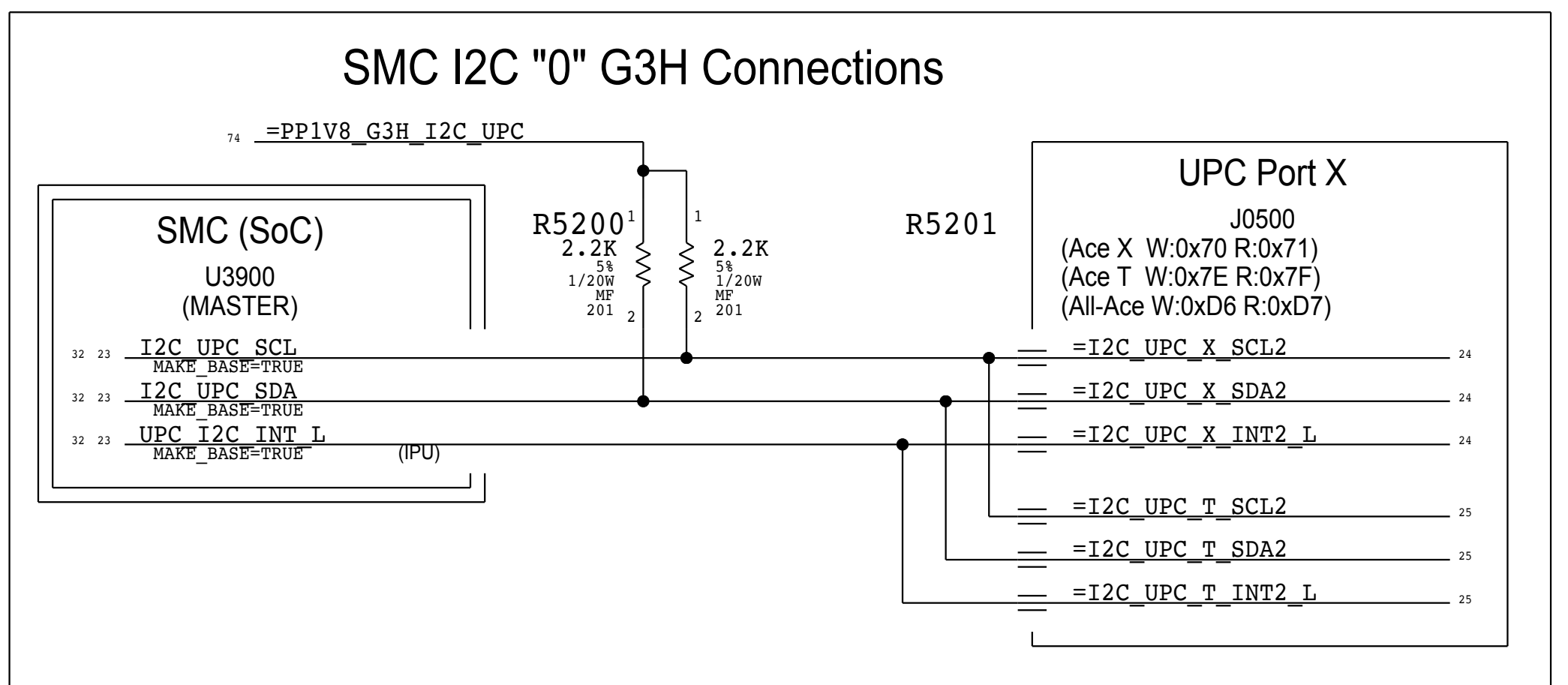
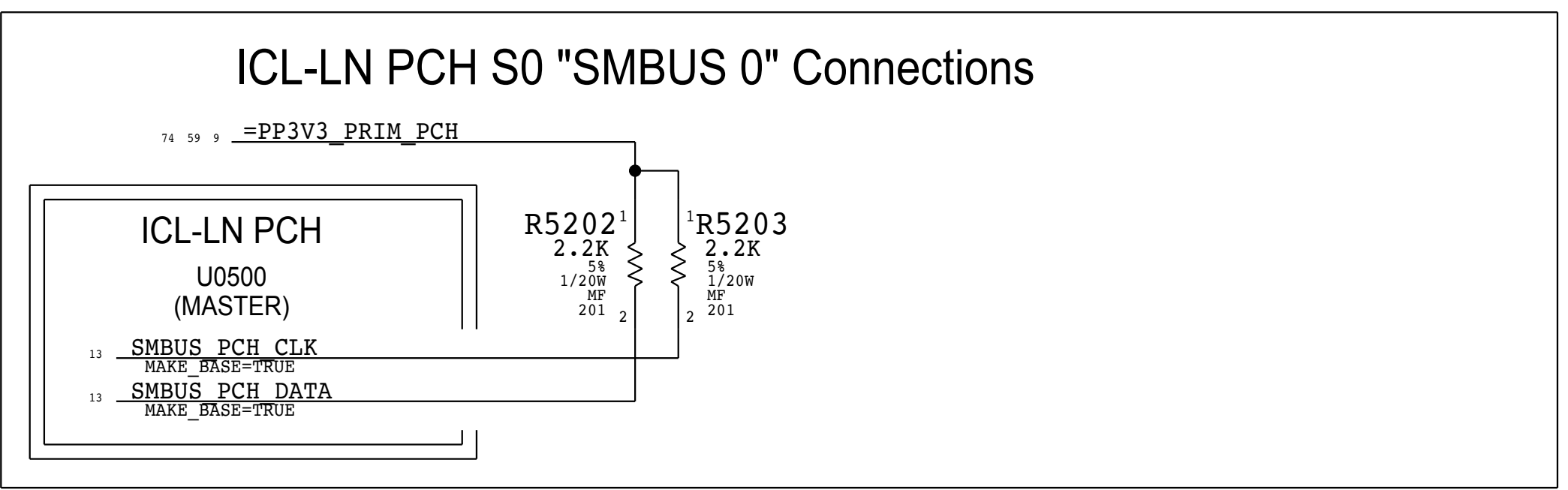
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998-15216	1	IC, SN100V, VENUS, DEV KEY, B2, S/W-M, WLCSP72	U5000	CRITICAL	SE:DEV_SW_N
338S00445	1	IC, SN100V, VENUS, PROD KEY, B2, S/W-N, WLCSP72	U5000	CRITICAL	SE:PROD_SW_N

REF	VALUE	QTY	DESCRIPTION	REF
R5001	100K	1	UART SE R2D	33 41
R5002	100K	1	UART SE D2R	33 41
R5003	100K	1	UART SE R2D RTS L	33 41
R5004	100K	1	UART SE D2R CTS L	33 41
R5000	100K	1	SE CTLR FW DWLD	31 41
R5006	100K	1	SE DEV WAKE	31 41

SYNC MASTER=X941 MLB		SYNC DATE=03/10/2017	
PAGE TITLE			
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		PAGE	50 OF 152
		SHEET	41 OF 86

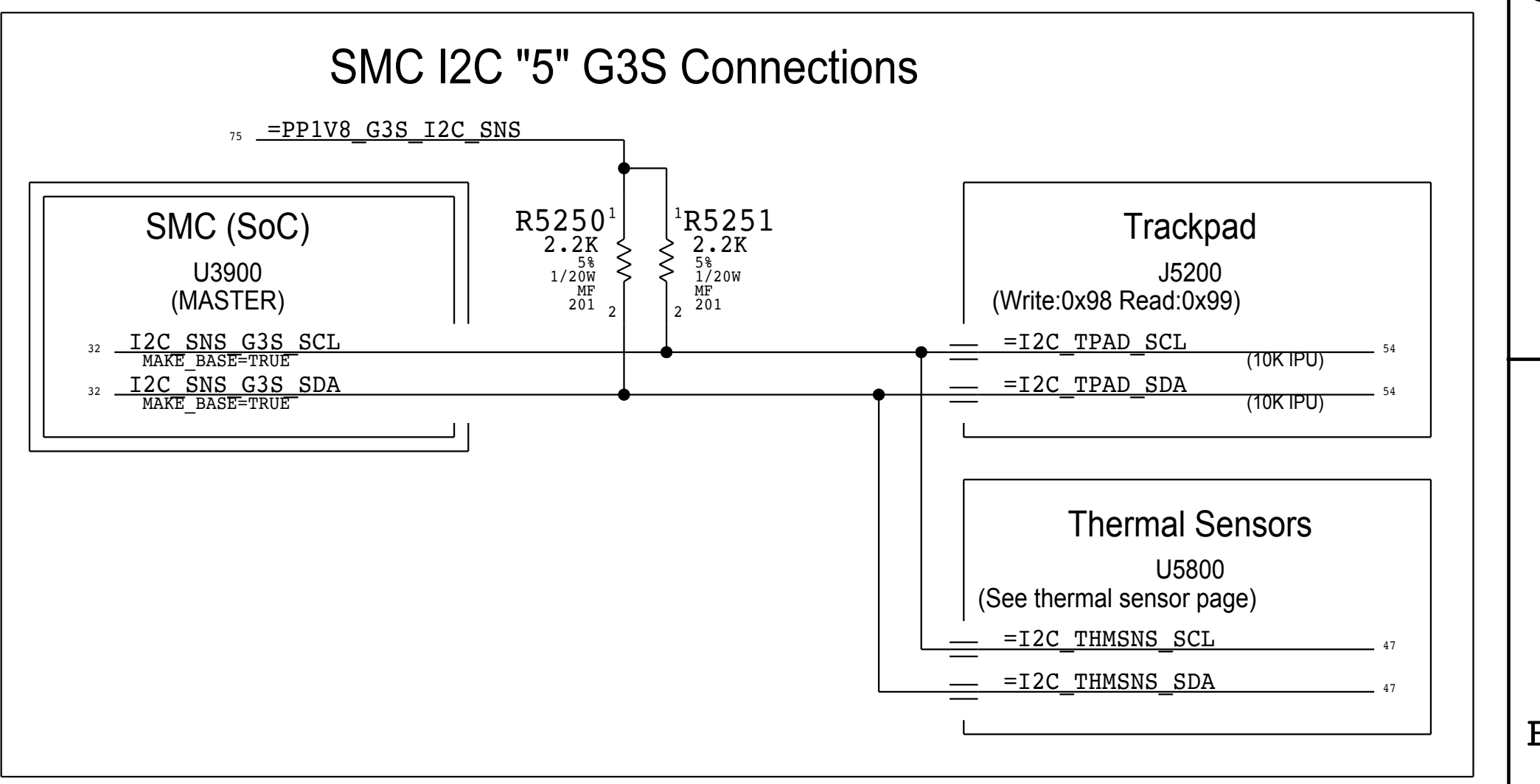
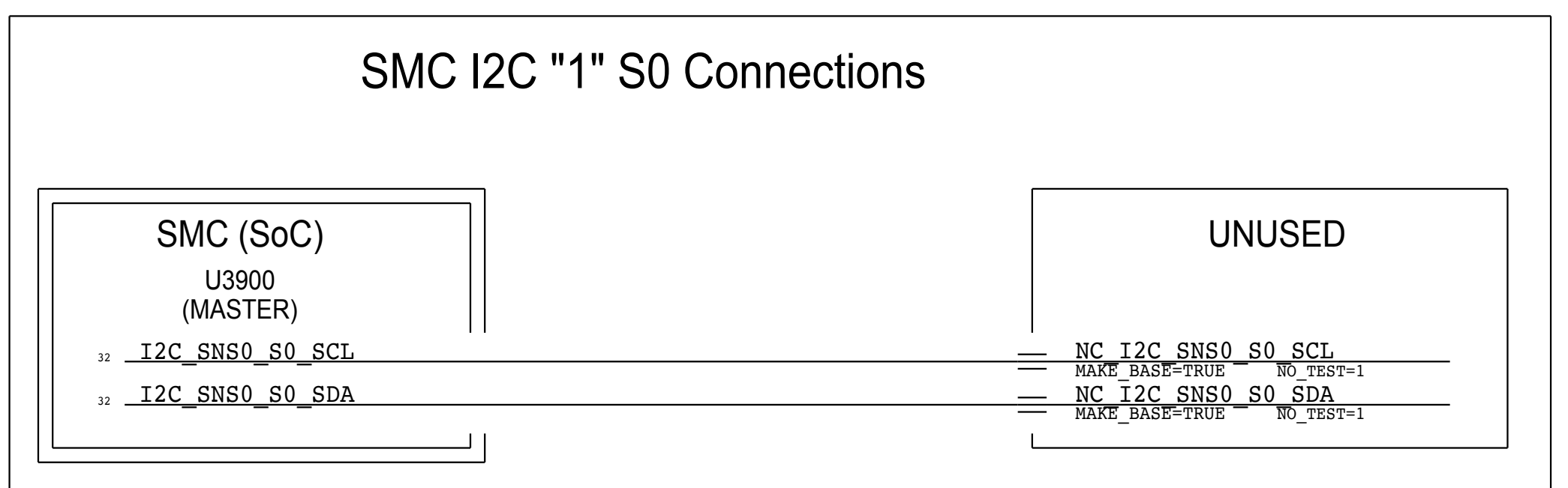
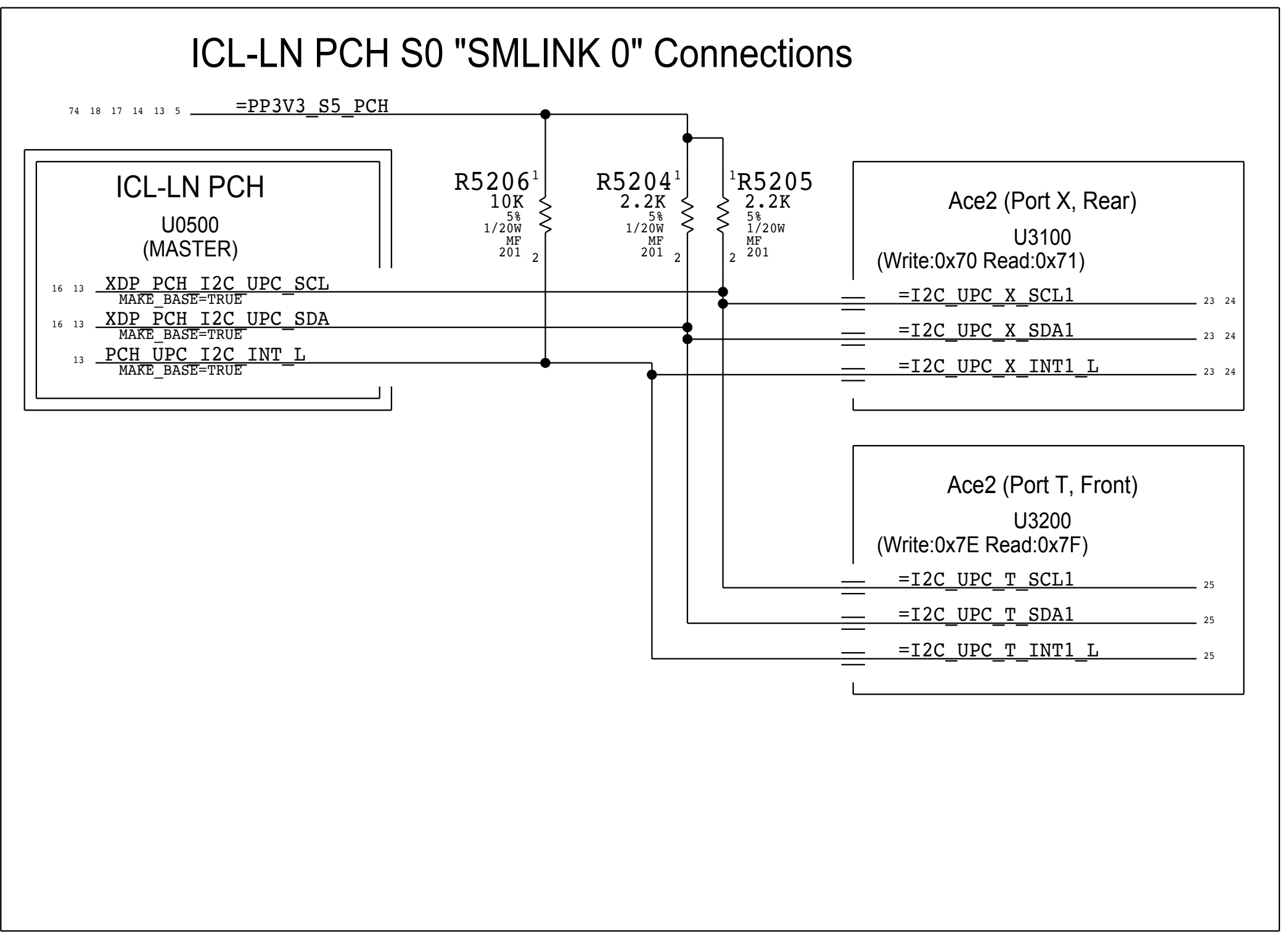
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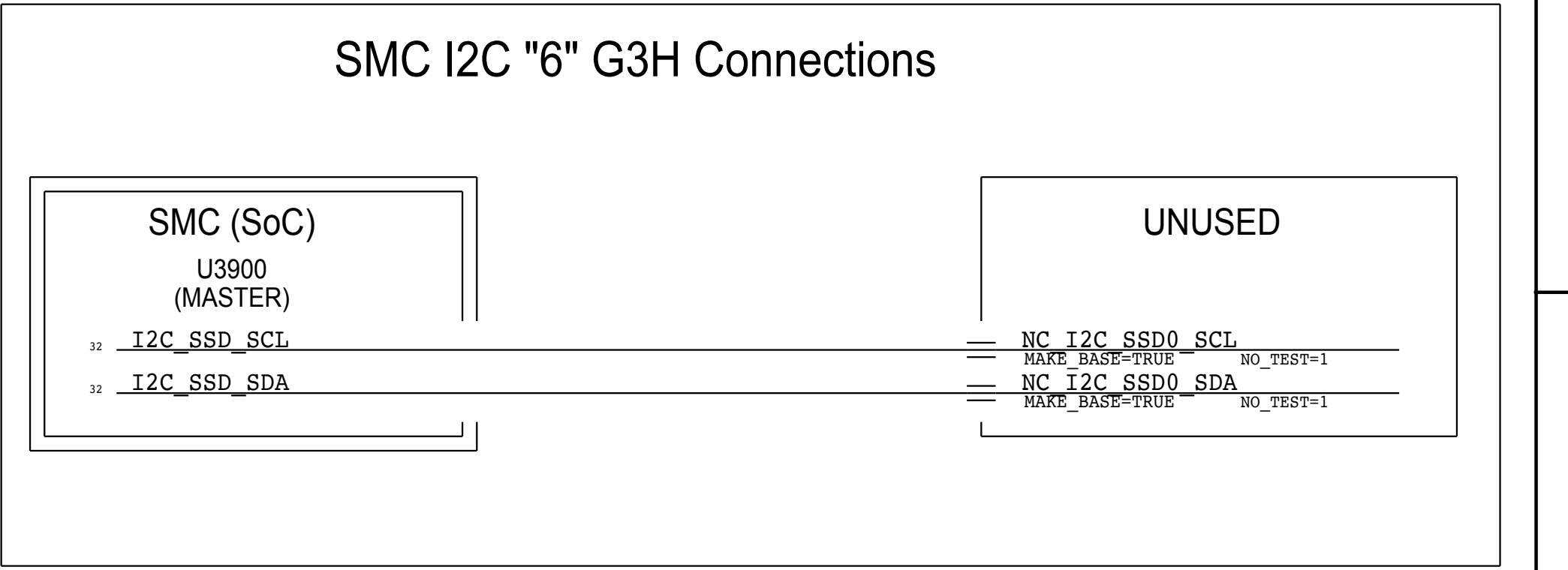
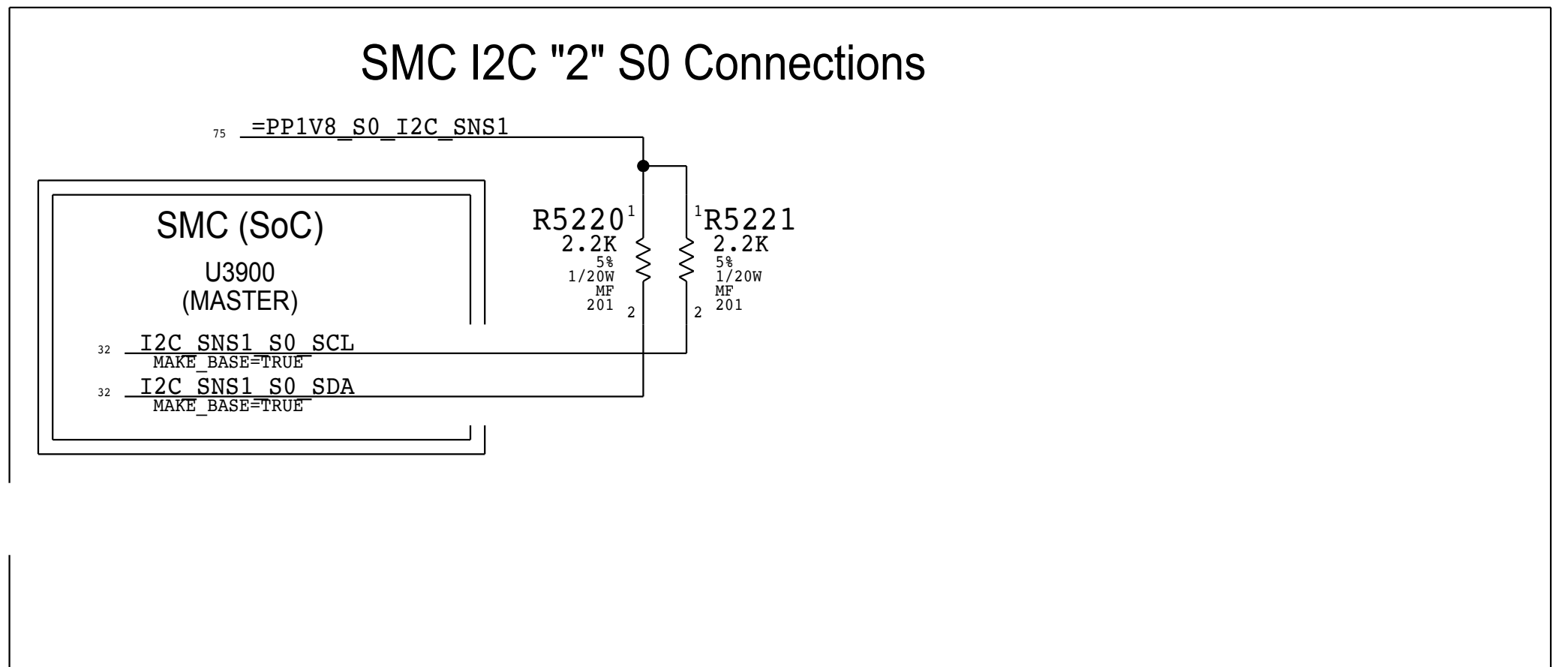
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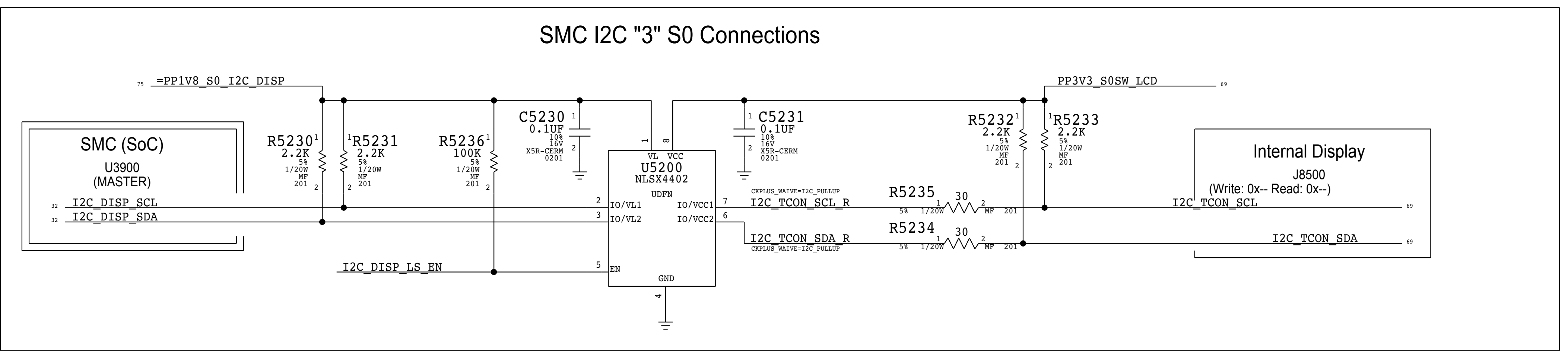
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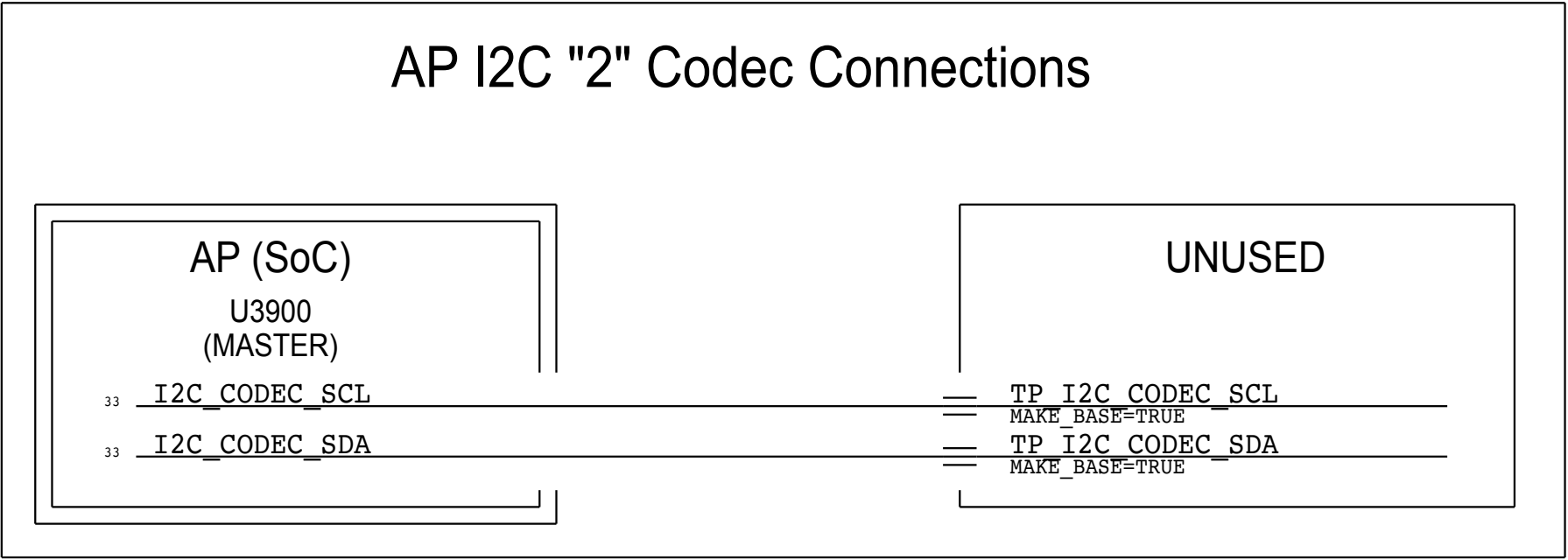
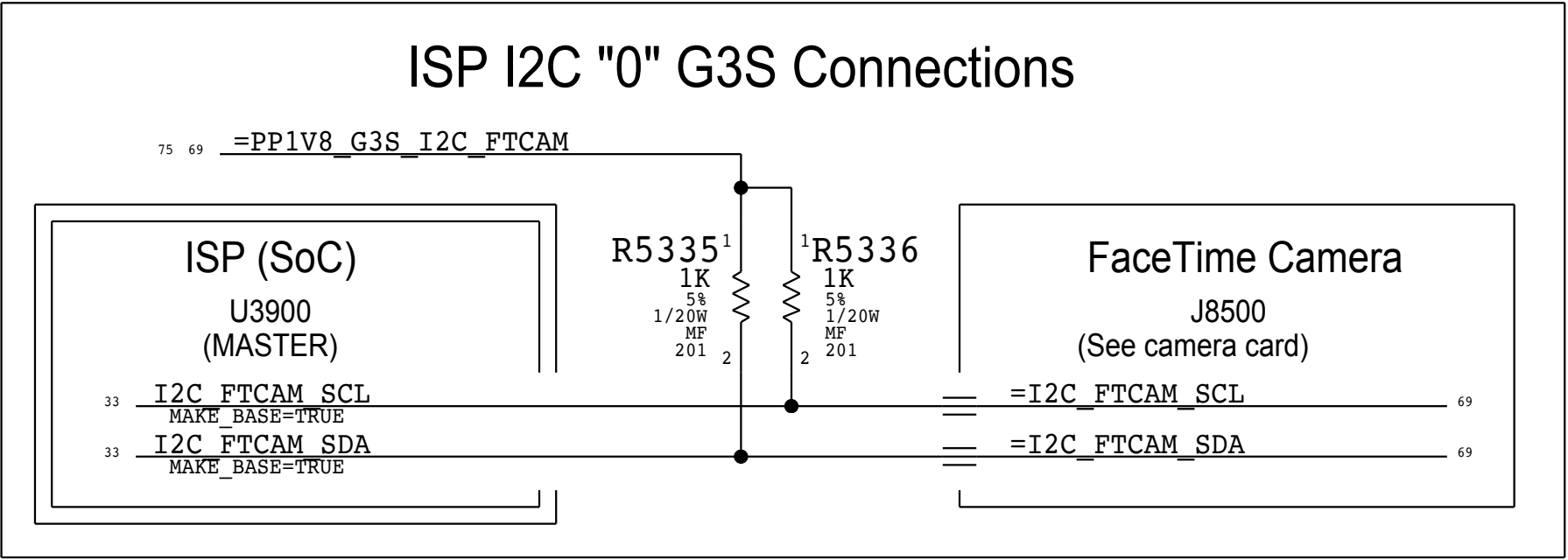
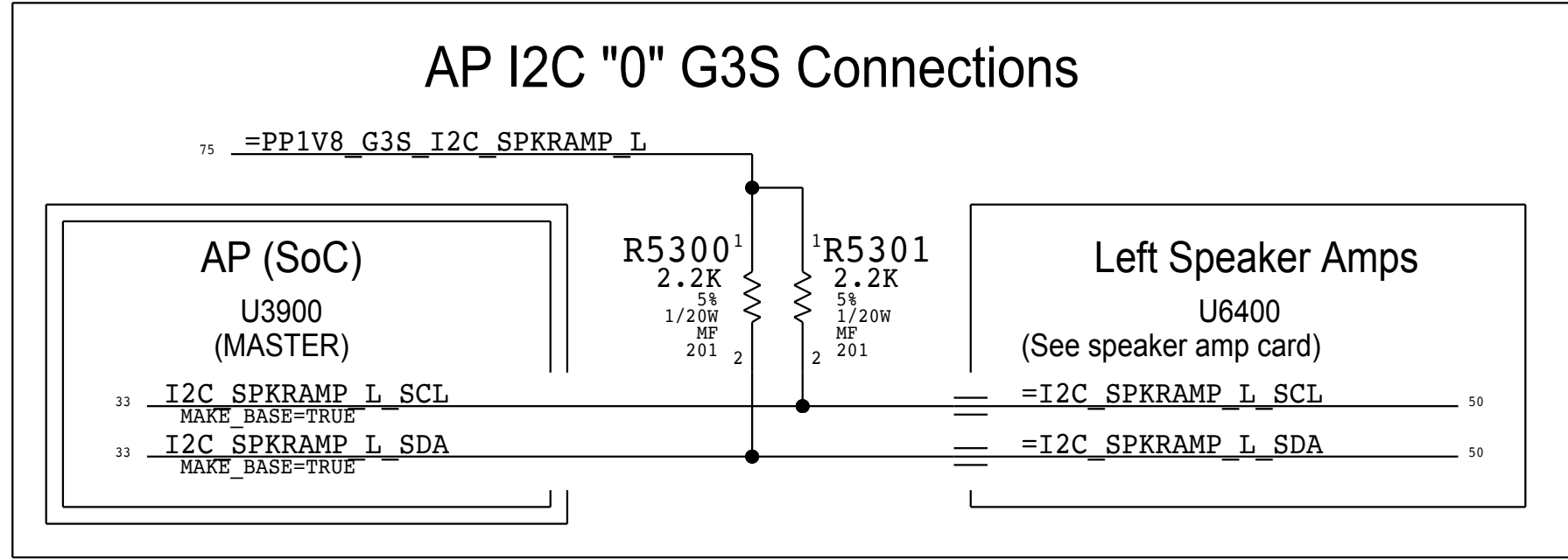
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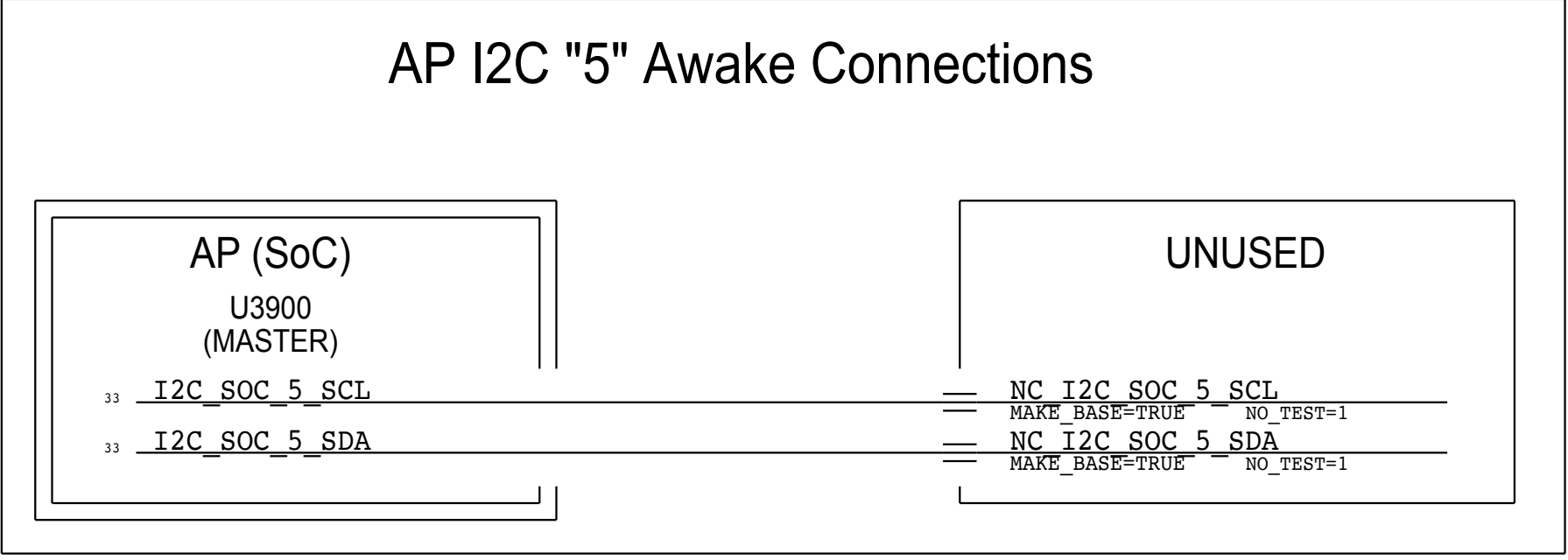
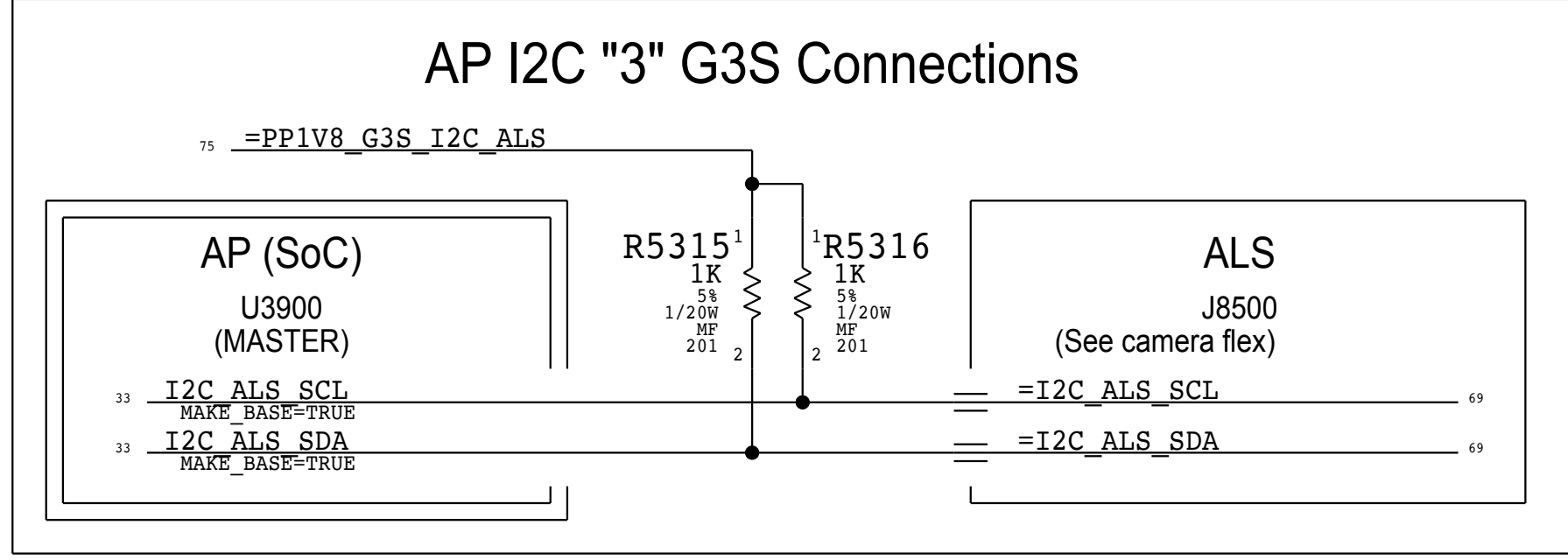
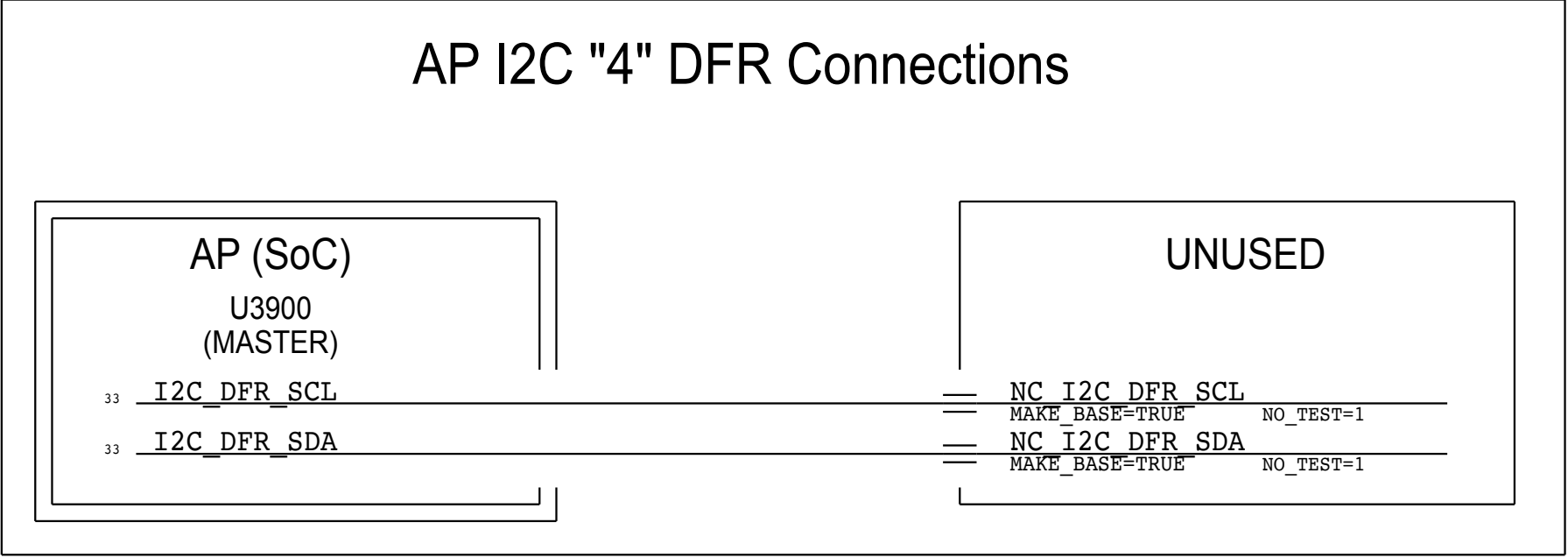
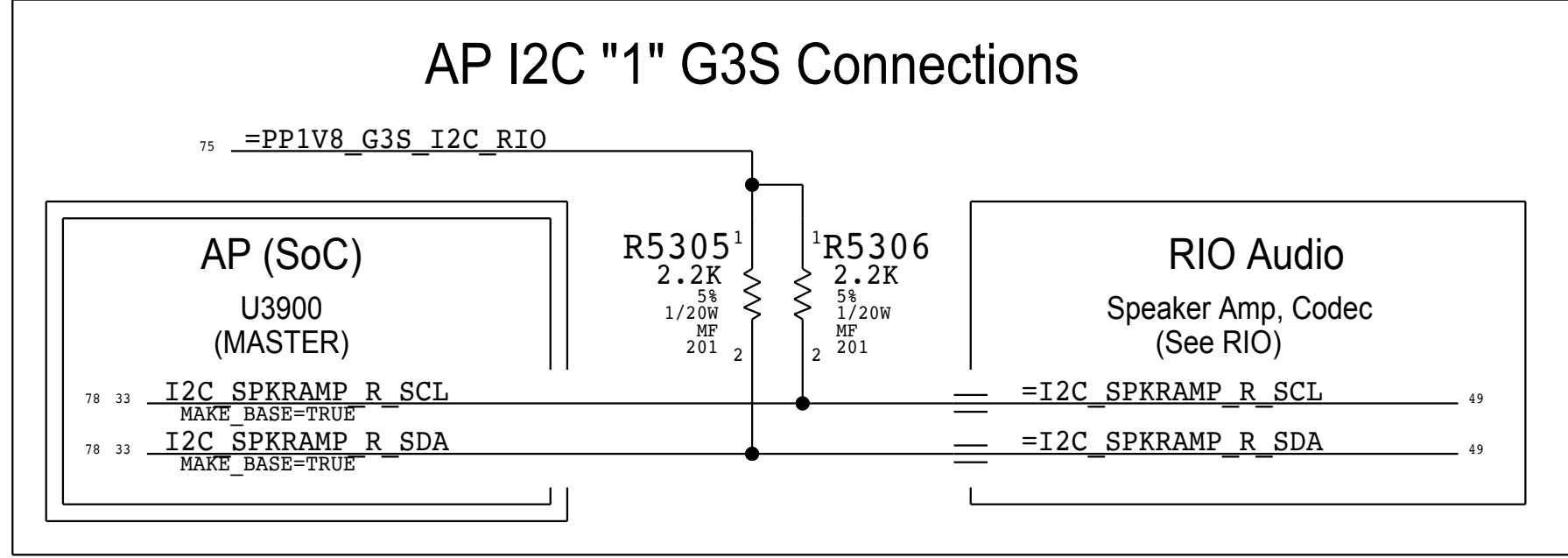
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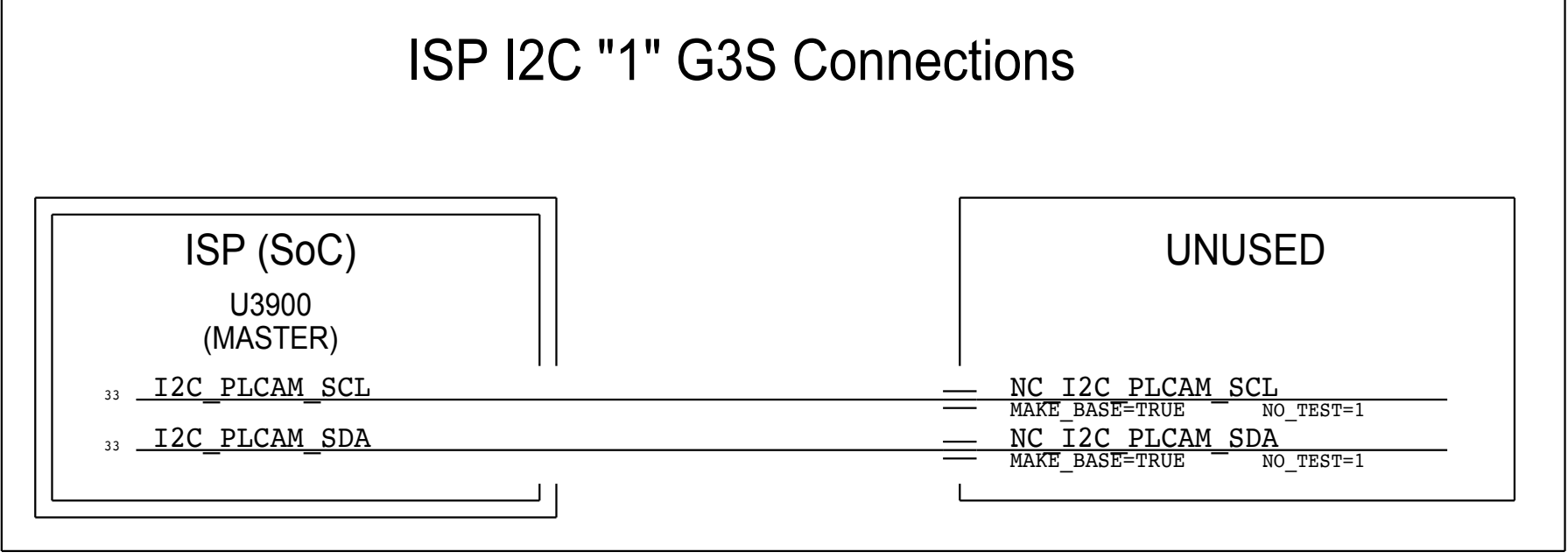
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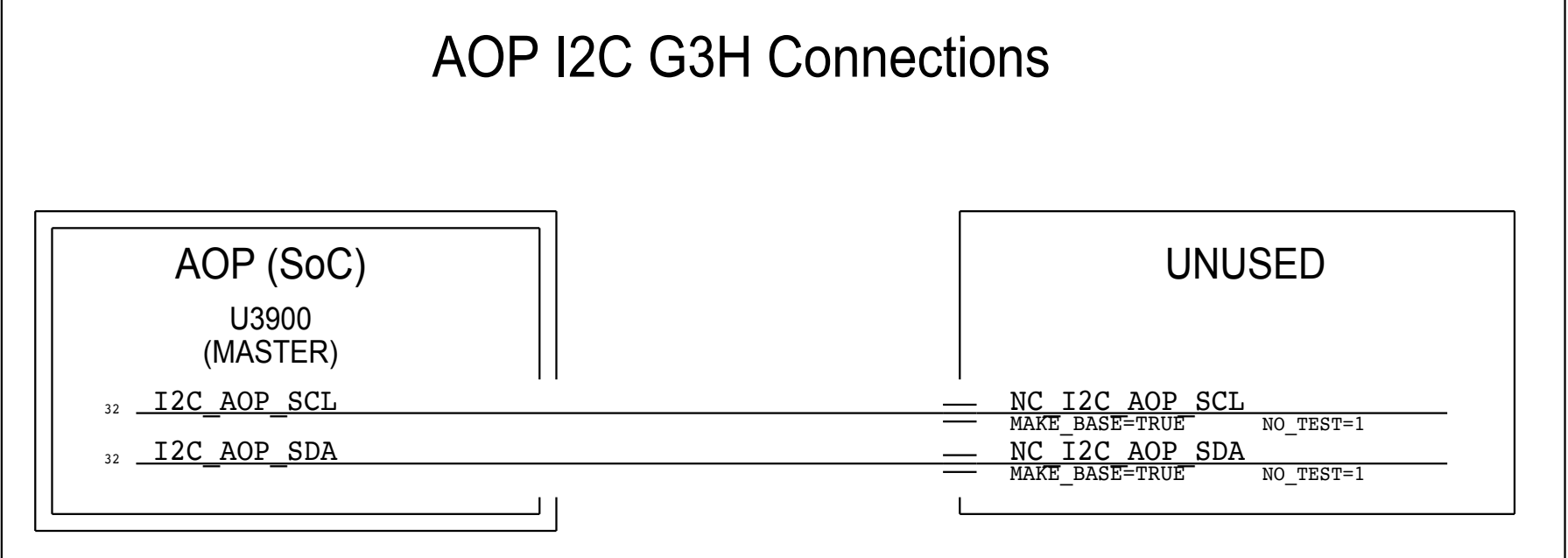
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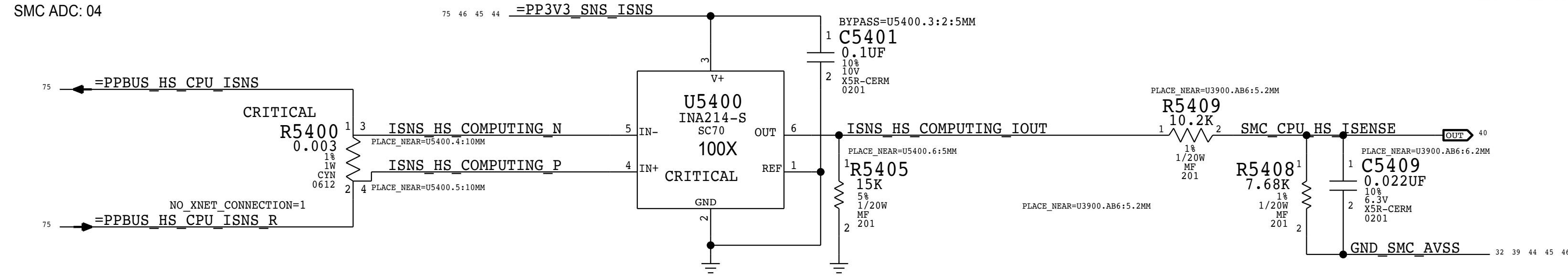


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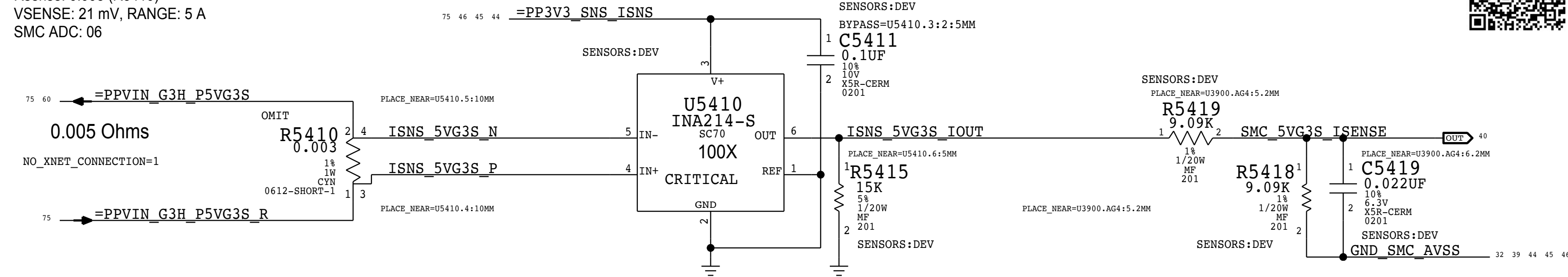
# A CPU High Side Current Sense (IC0R)

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



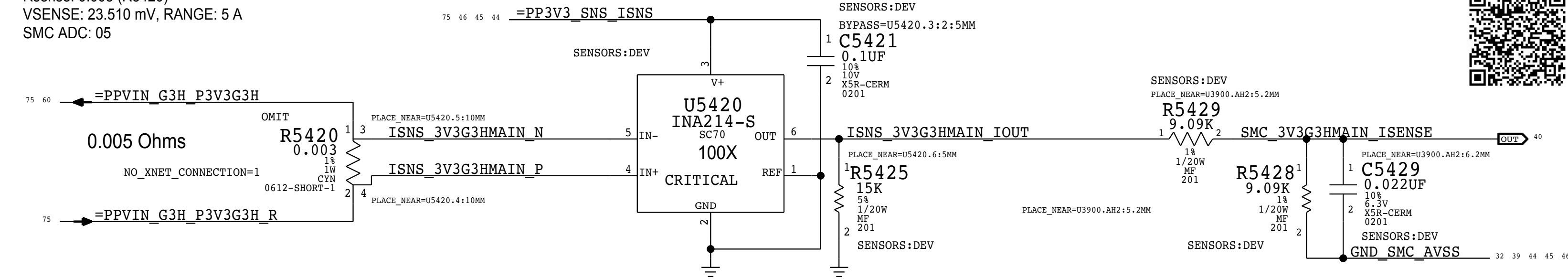
# B 5V G3S High Side Current Sense (IO5R)

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.



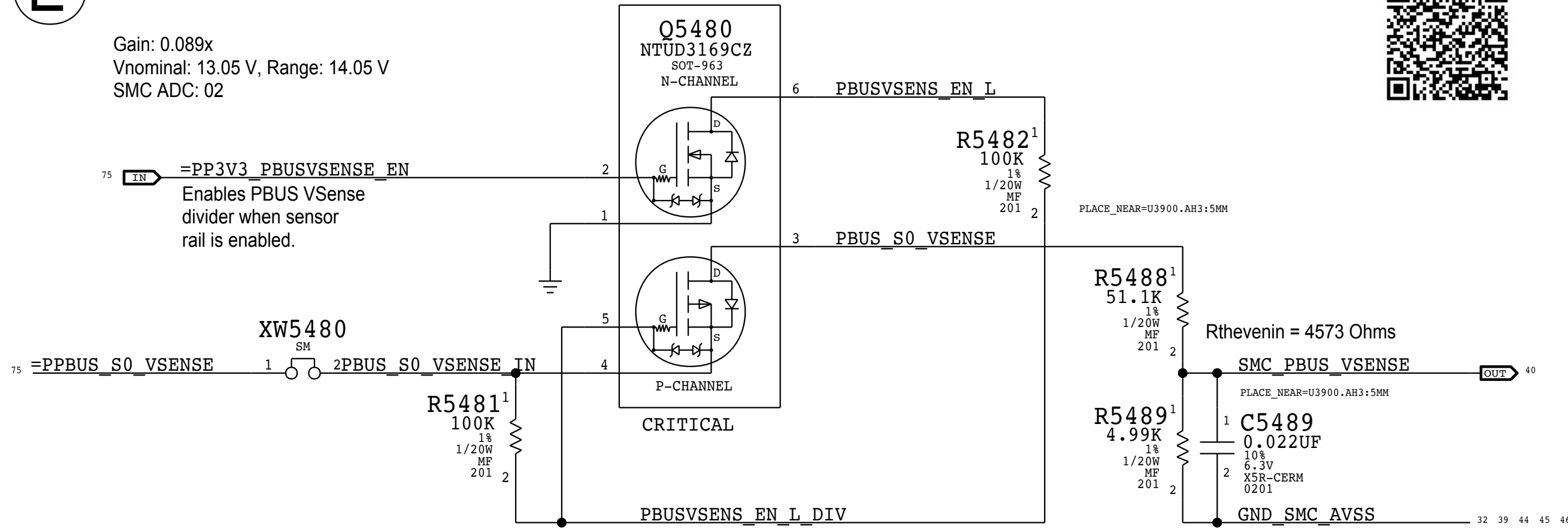
[https://github.pie.apple.com/MobileMac/i230\\_hw/blob/master/i230/mlb/docs/sensor\\_ers/i230\\_sensor\\_ers.pdf](https://github.pie.apple.com/MobileMac/i230_hw/blob/master/i230/mlb/docs/sensor_ers/i230_sensor_ers.pdf)

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.

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
11780008	1	RES, MF, 1/20W, 100K OHM, 5, 0201, SHD	R5418		SENSORS:PROD
11780008	1	RES, MF, 1/20W, 100K OHM, 5, 0201, SHD	R5428		SENSORS:PROD

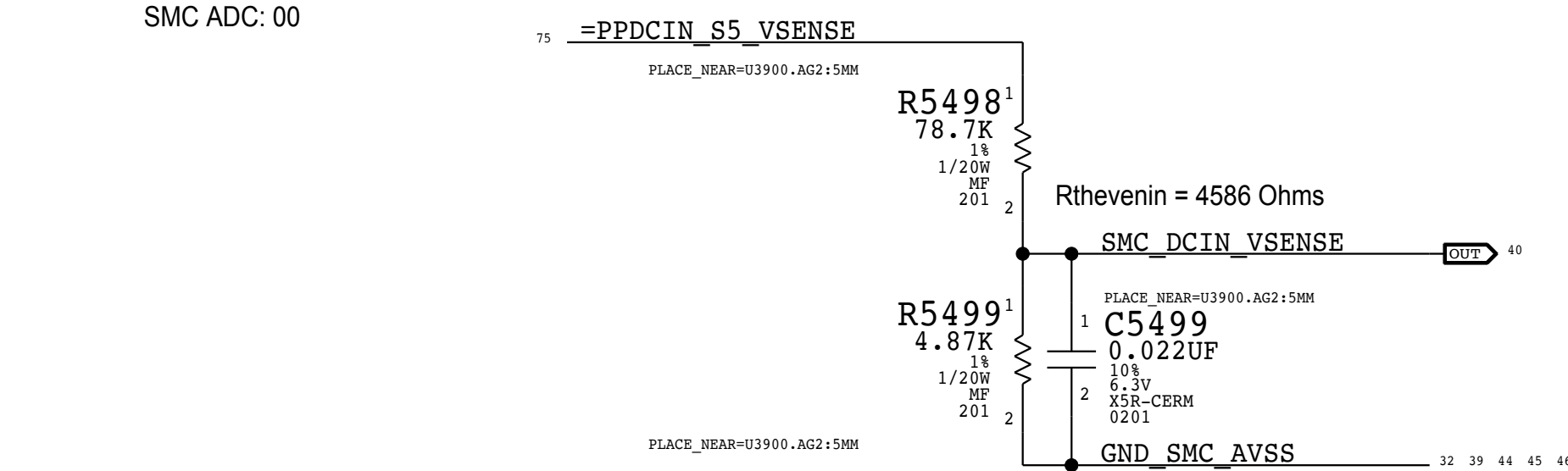
# E PBUS Voltage Sense & Enable (VP0R)

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



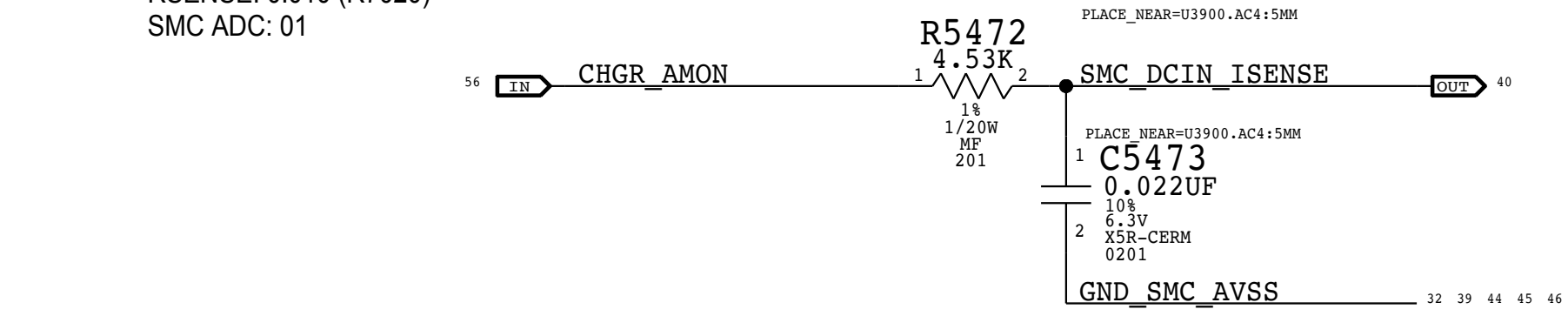
# F DC In Voltage Sense (VD0R)

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



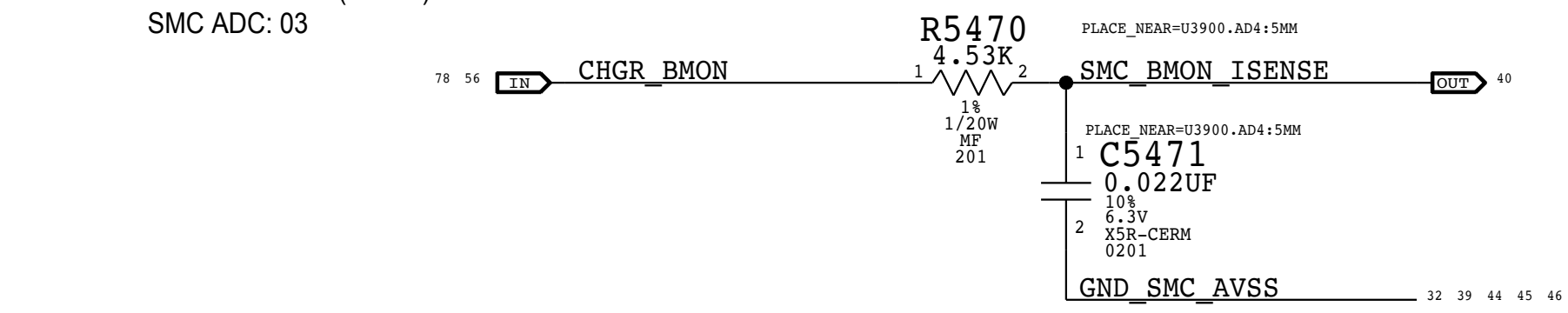
# G DC-IN (AMON) Current Sense (ID0R)

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



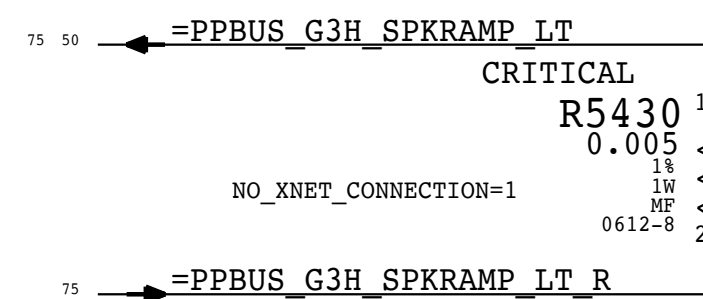
# H Charger (BMON) Current Sense (IPBR)

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

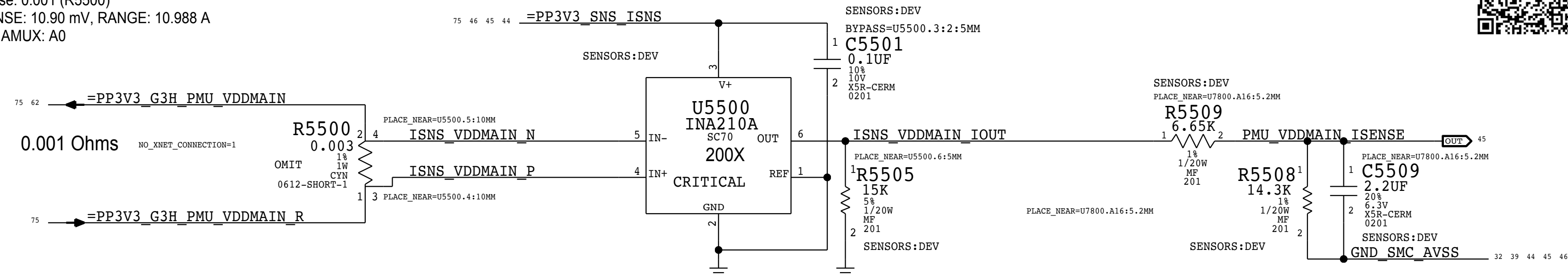


BOM\_COST\_GROUP=SENSORS

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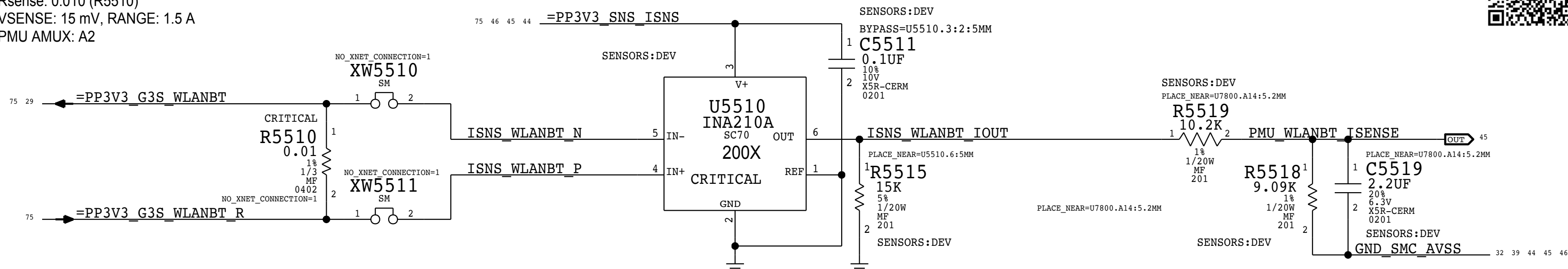
# A VDDMAIN 3.3V Current Sense (ISLC)

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



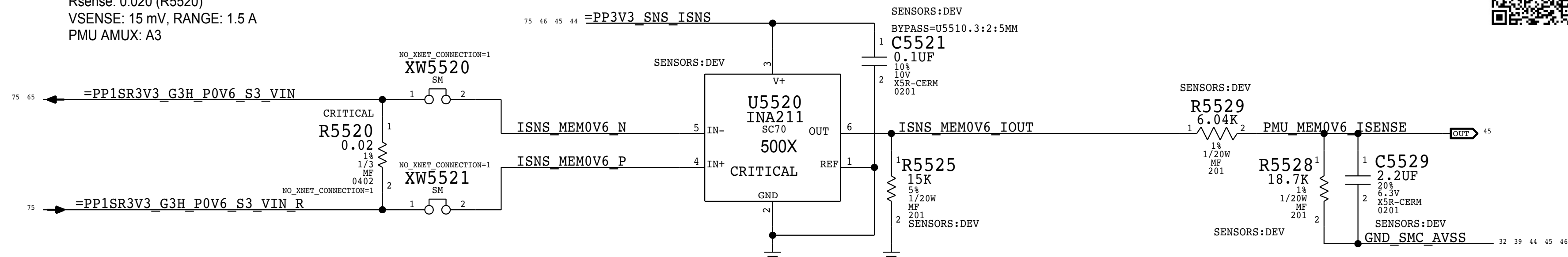
# C Wireless 3.3V Current Sense (IAPC)

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



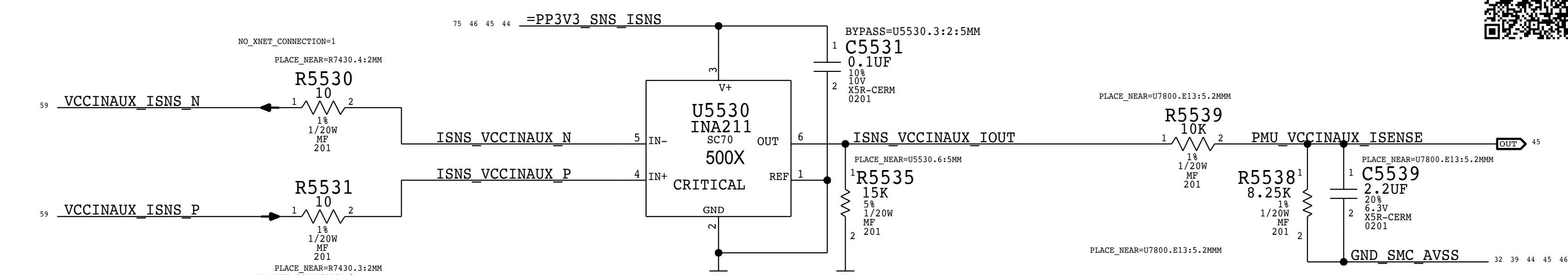
# E MEMORY 0.6V High-Side Current Sense (IM0C)

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



# G VCCIN\_AUX Current Sense (ICIC)

GAIN: 200X, EDP: 10.90 A  
 Rsense: 0.001 (R5530)  
 VSENSE: 10.90 mV, RANGE: 10.988 A  
 PMU AMUX: A0



# B PMU ADC AMUX\_A ALIASES

45	PMU_VDDMAIN_ISENSE	==	TP_PMU_AMUX_A0	64
46	PMU_MEM1V1_ISENSE	==	TP_PMU_AMUX_A1	64
45	PMU_WLANBT_ISENSE	==	TP_PMU_AMUX_A2	64
45	PMU_MEMOV6_ISENSE	==	TP_PMU_AMUX_A3	64
46	PMU_LCDBKLT_ISENSE	==	TP_PMU_AMUX_A4	64
46	PMU_CPU_VSENSE	==	TP_PMU_AMUX_A5	64
46	PMU_NAND_VSENSE	==	TP_PMU_AMUX_A6	64
46	PMU_VCCINAUX_VSENSE	==	TP_PMU_AMUX_A7	64

# D PMU ADC AMUX\_B ALIASES

	NC_PMU_AMUX_B0	==	TP_PMU_AMUX_B0	64
45	PMU_VCCINAUX_ISENSE	==	TP_PMU_AMUX_B1	64
	NC_PMU_AMUX_B2	==	TP_PMU_AMUX_B2	64
	NC_PMU_AMUX_B3	==	TP_PMU_AMUX_B3	64
	NC_PMU_AMUX_B4	==	TP_PMU_AMUX_B4	64
	NC_PMU_AMUX_B5	==	TP_PMU_AMUX_B5	64
	NC_PMU_AMUX_B6	==	TP_PMU_AMUX_B6	64
	NC_PMU_AMUX_B7	==	TP_PMU_AMUX_B7	64

# F Sensor Documentation

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



PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
11780008	1	RES,MP,1/20W,100K OHM,5,0201,SMD	R5508		SENSORS:PROD
11780008	1	RES,MP,1/20W,100K OHM,5,0201,SMD	R5518		SENSORS:PROD
11780008	1	RES,MP,1/20W,100K OHM,5,0201,SMD	R5528		SENSORS:PROD

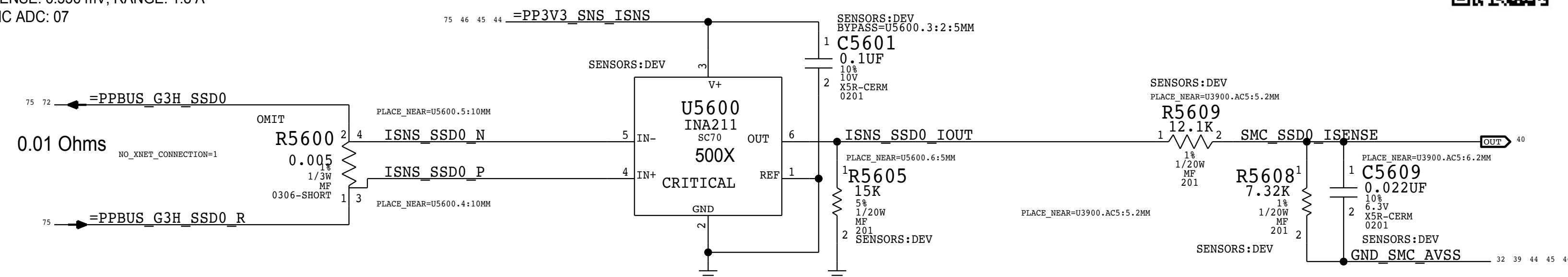
DESIGN: J230/MLB  
 LAST CHANGE: Fri Sep 28 20:05:04 2018

PAGE TITLE		Power Sensors Load Side	
	DRAWING NUMBER	051-05232	SIZE
	REVISION	4.0.0	D
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		SHEET	45 OF 86

BOM\_COST\_GROUP=SENSORS

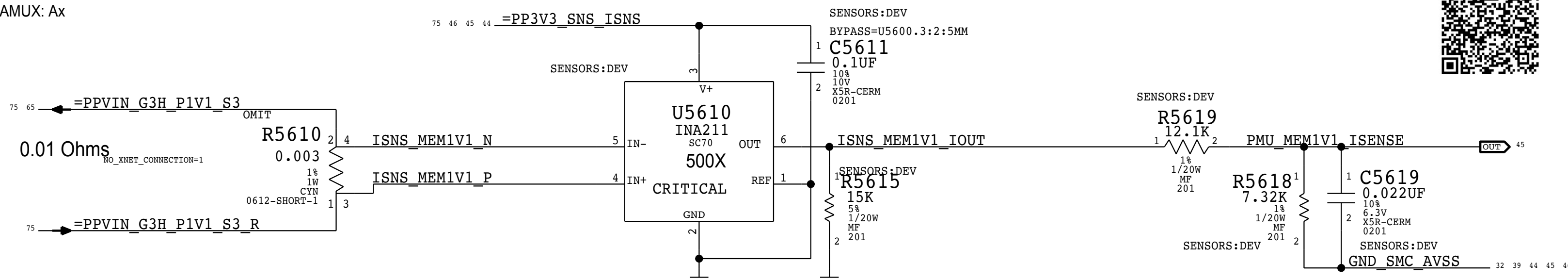
# A SSD High Side (IH0R)

GAIN: 500X, EDP: 0.654 A  
 R<sub>sense</sub>: 0.010 (R5600)  
 V<sub>SENSE</sub>: 6.536 mV, RANGE: 1.8 A  
 SMC ADC: 07



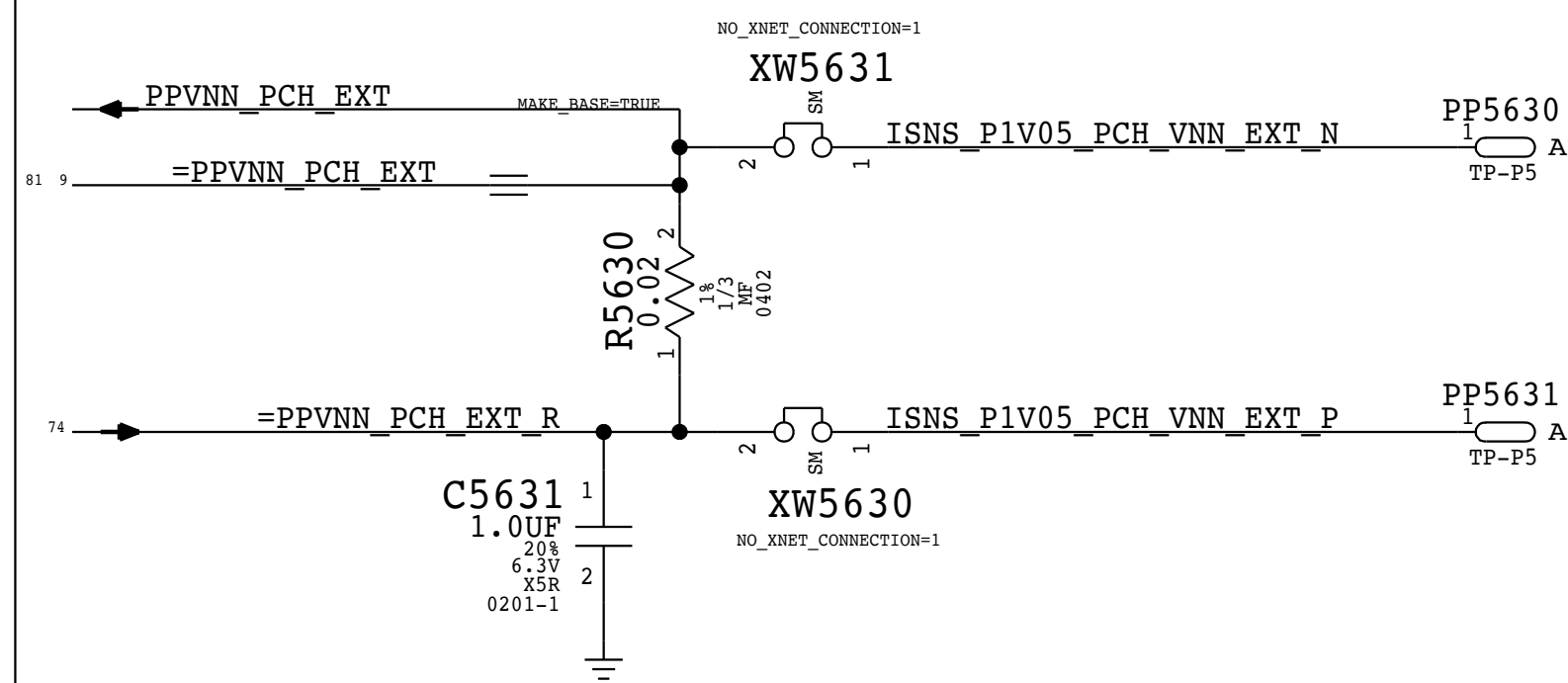
# C Memory 1.1V High Side Current Sense (IM1C)

GAIN: x, EDP: 2.3 A  
 R<sub>sense</sub>: 0.010 (R5610)  
 V<sub>SENSE</sub>: 23 mV, RANGE: 2.344 A  
 PMU AMUX: Ax



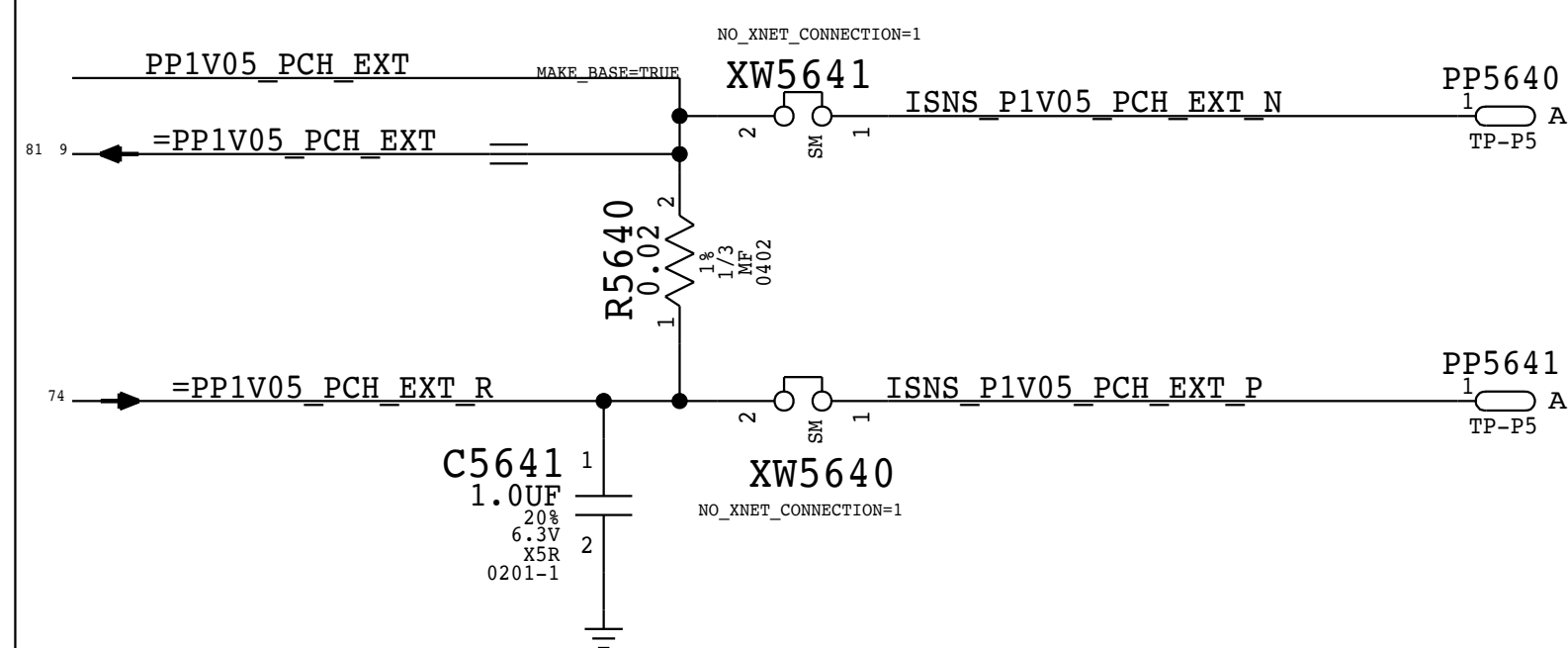
# B PCH VNN BYPASS CURRENT SENSE

GAIN: 200X, EDP: 0.2 A



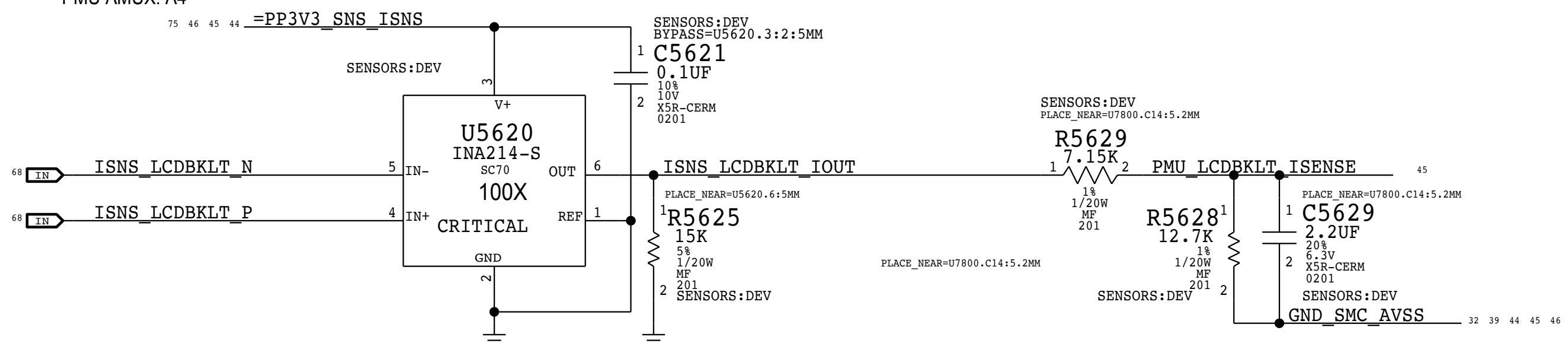
# D PCH 1.05V BYPASS CURRENT SENSE

GAIN: 200X, EDP: 0.2 A



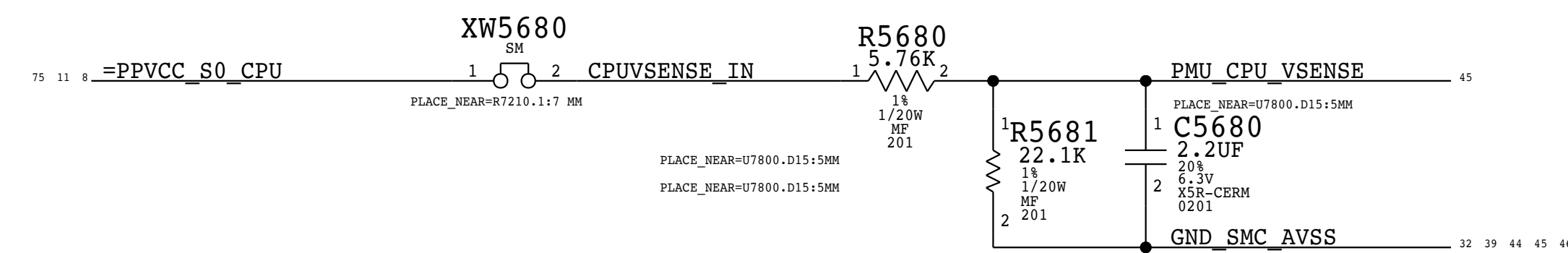
# E LCD Backlight (IBLR)

GAIN: 100X, EDP: 0.902 A  
 R<sub>sense</sub>: 0.025 (R8400)  
 V<sub>SENSE</sub>: 22.549 mV, RANGE: 0.902 A  
 PMU AMUX: A4



# F CPU VCCIN VOLTAGE SENSE (VCAC)

PMU AMUX: A5



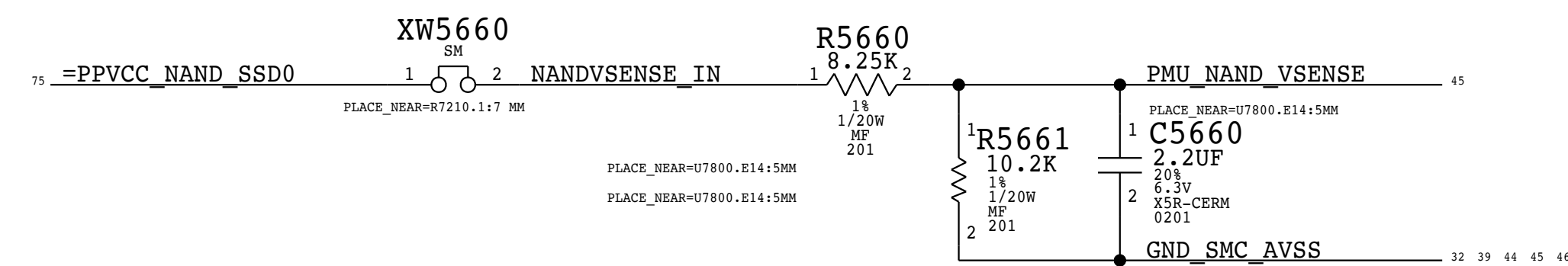
# G Sensor Docs

Scan the QR Code for sensor info.



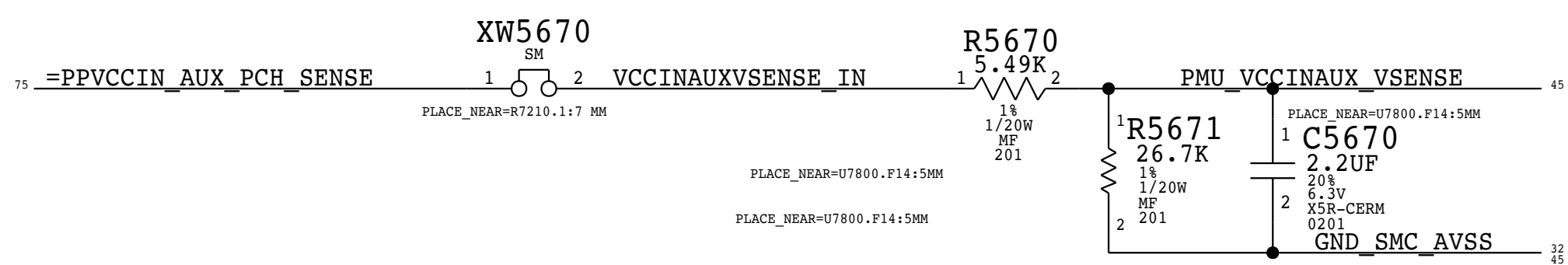
# H NAND 2V5 VOLTAGE SENSE (VHNC)

PMU AMUX: A6



# I VCCIN\_AUX VOLTAGE SENSE (VCIC)

PMU AMUX: A7



PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
11780008	1	RES,MP,1/20W,100K OHM,5,0201,SMD	R5608		SENSORS:PROD
11780008	1	RES,MP,1/20W,100K OHM,5,0201,SMD	R5618		SENSORS:PROD
11780008	1	RES,MP,1/20W,100K OHM,5,0201,SMD	R5628		SENSORS:PROD

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

Power Sensors Extended

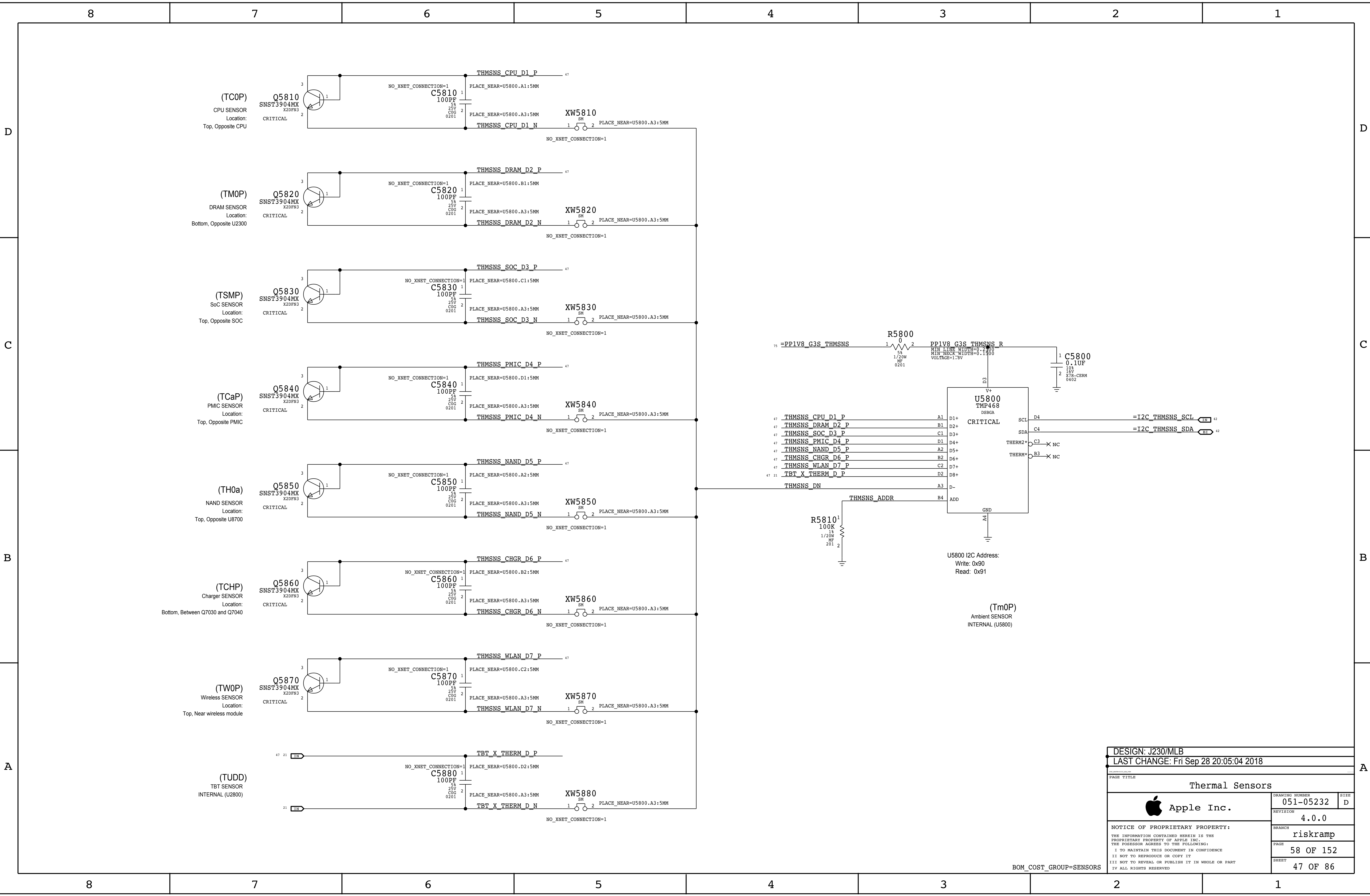


DRAWING NUMBER: 051-05232  
 REVISION: 4.0.0

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BRANCH: riskramp  
 PAGE: 56 OF 152  
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BOM\_COST\_GROUP=SENSORS



(TCOP)  
CPU SENSOR  
Location:  
Top, Opposite CPU

(TMOP)  
DRAM SENSOR  
Location:  
Bottom, Opposite U2300

(TSMP)  
SoC SENSOR  
Location:  
Top, Opposite SOC

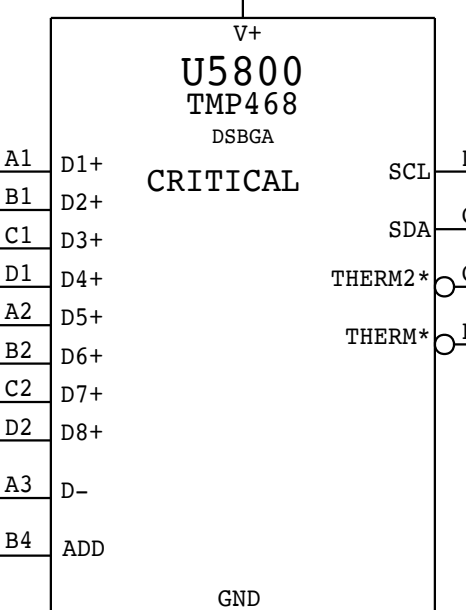
(TCaP)  
PMIC SENSOR  
Location:  
Top, Opposite PMIC

(TH0a)  
NAND SENSOR  
Location:  
Top, Opposite U8700

(TCHP)  
Charger SENSOR  
Location:  
Bottom, Between Q7030 and Q7040

(TWOP)  
Wireless SENSOR  
Location:  
Top, Near wireless module

(TUDD)  
TBT SENSOR  
INTERNAL (U2800)



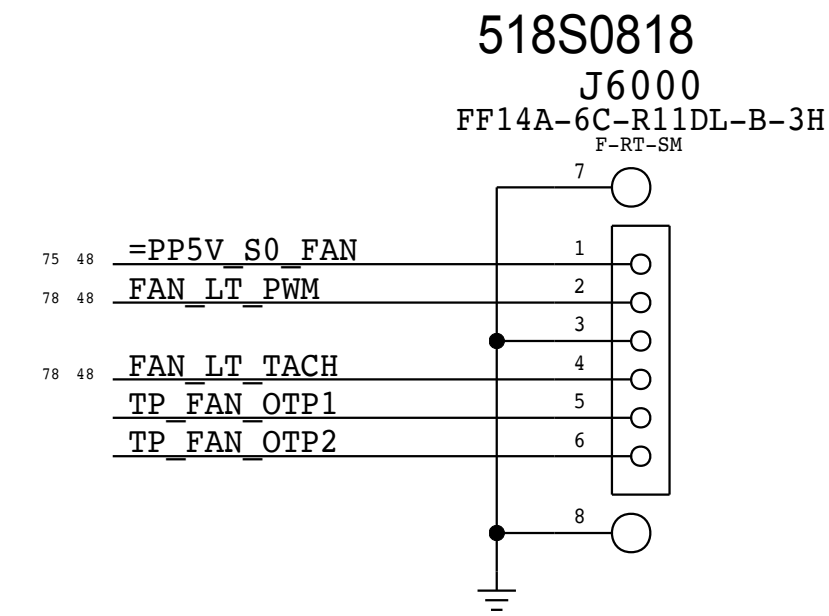
U5800 I2C Address:  
Write: 0x90  
Read: 0x91

(Tm0P)  
Ambient SENSOR  
INTERNAL (U5800)

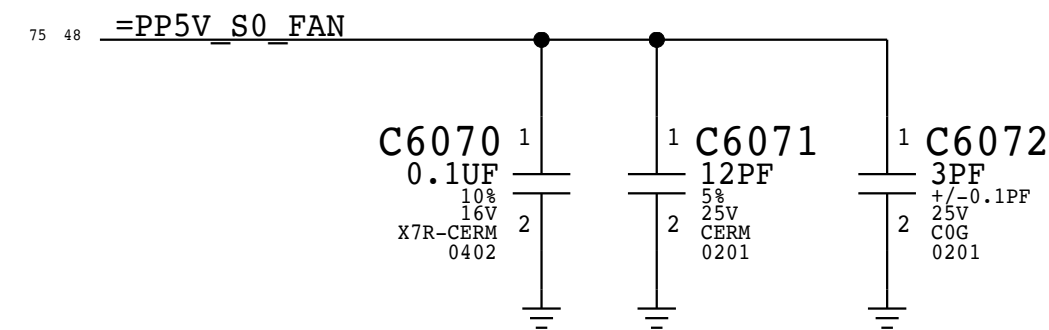
DESIGN: J230/MLB	
LAST CHANGE: Fri Sep 28 20:05:04 2018	
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Thermal Sensors	
	DRAWING NUMBER 051-05232
	REVISION 4.0.0
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BRANCH riskramp	SIZE D
PAGE 58 OF 152	SHEET 47 OF 86

BOM\_COST\_GROUP=SENSORS

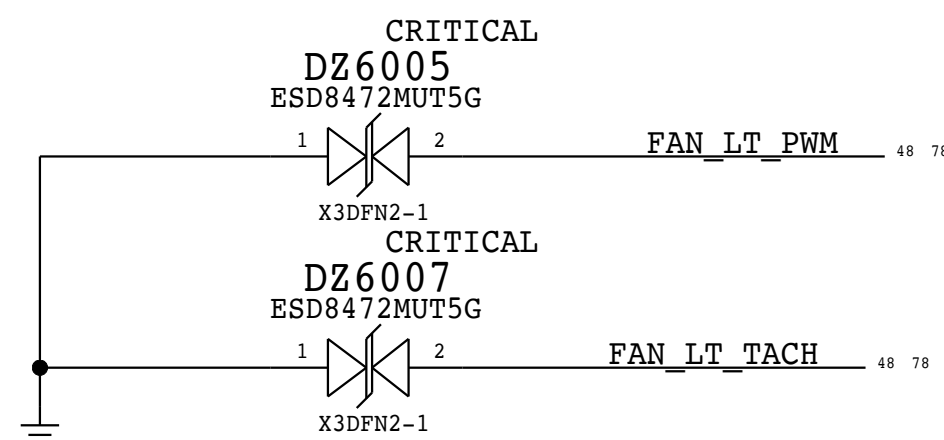
# A FAN Connector



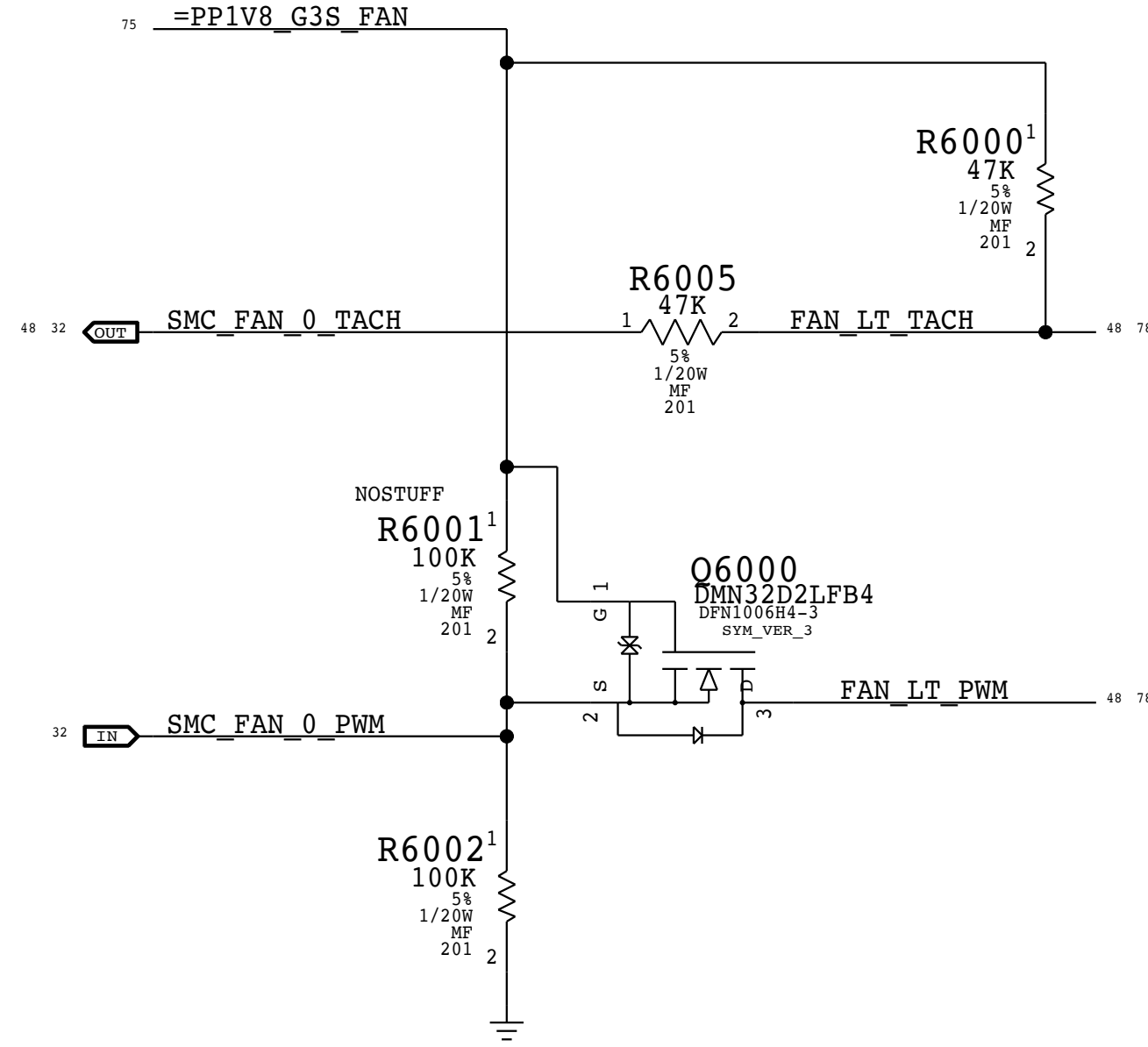
# B FAN Bypass Capacitors



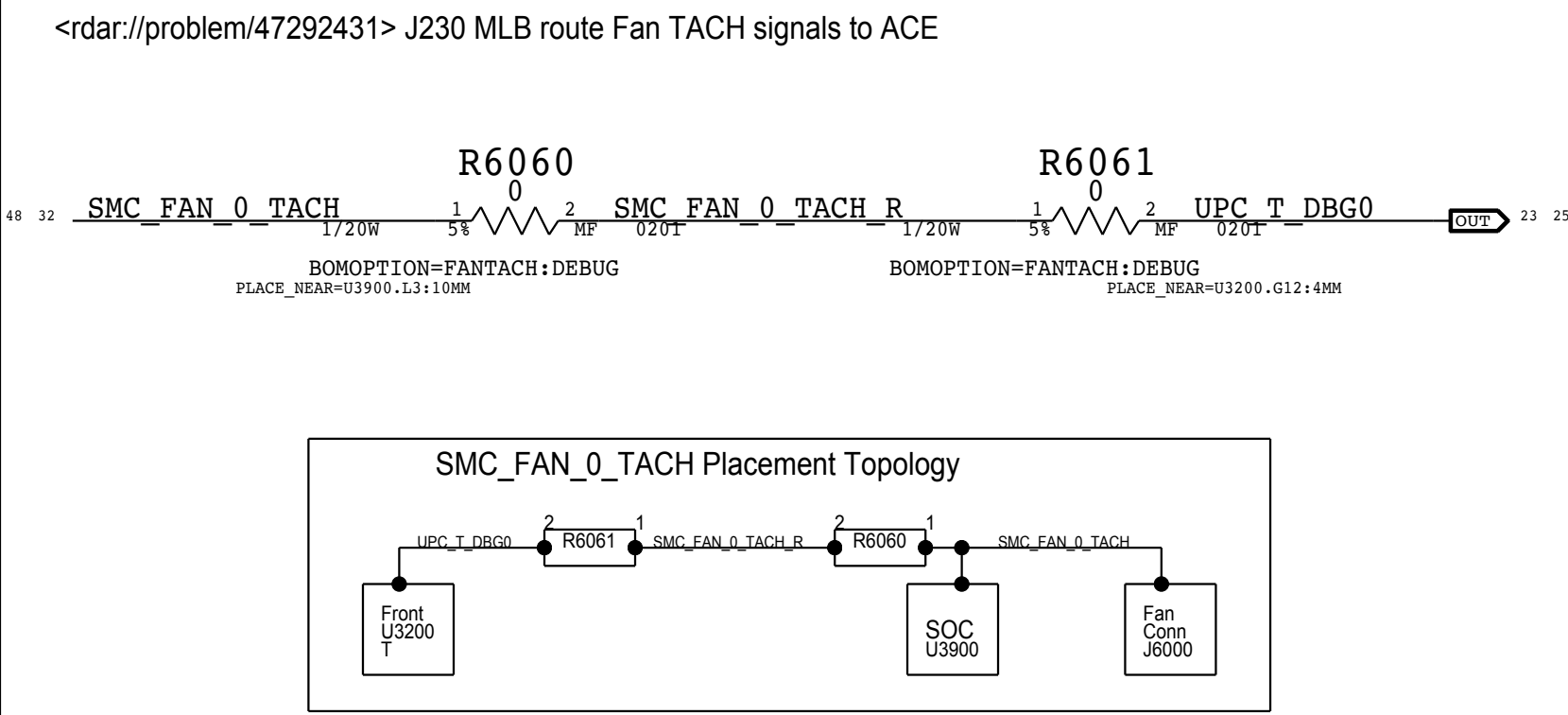
# C FAN Protection Diodes



# D FAN Support



# E FAN Debug



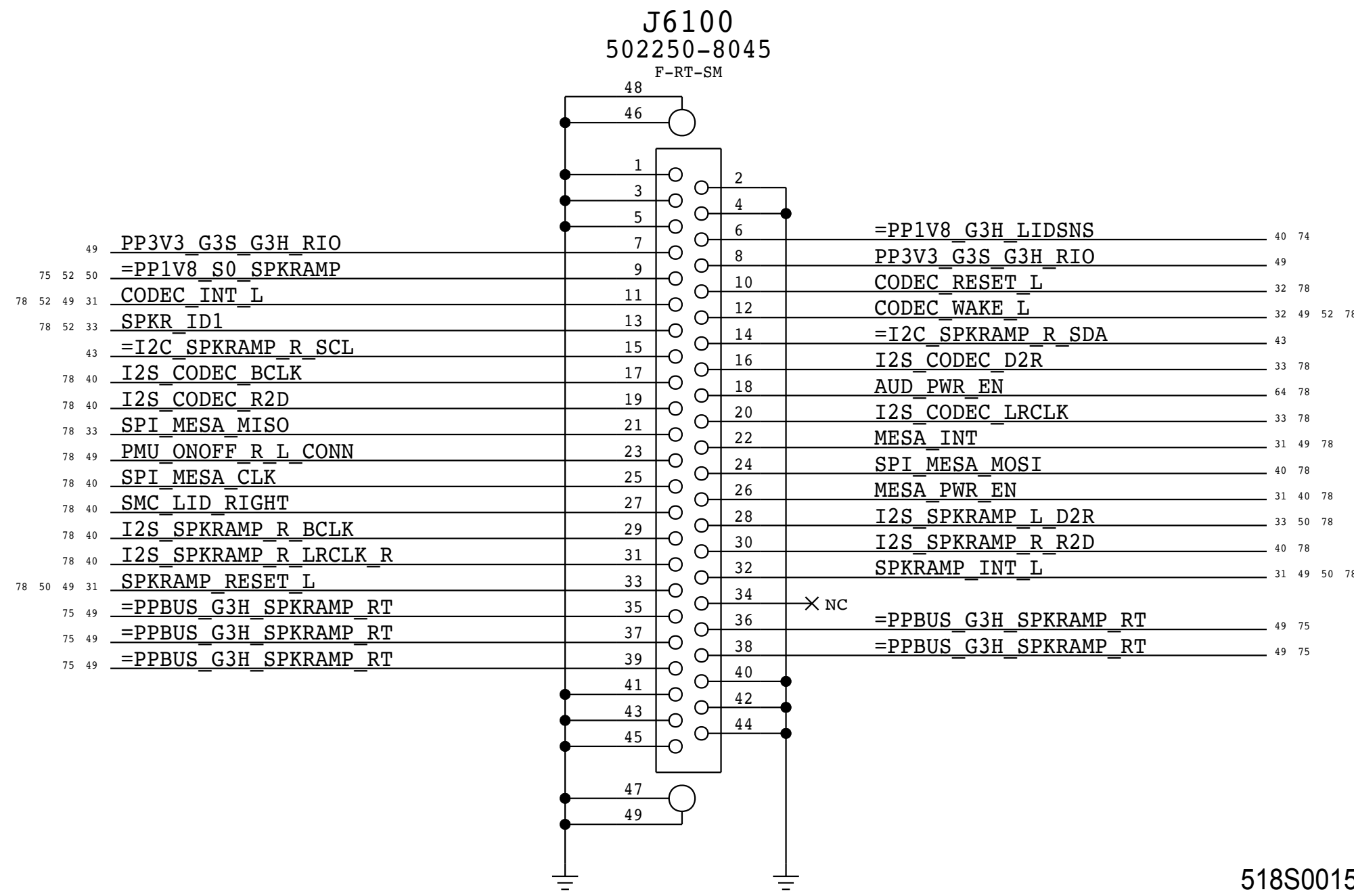
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		DRAWING NUMBER		SIZE	
		051-05232		D	
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		BRANCH		riskramp	
		PAGE		60 OF 152	
		SHEET		48 OF 86	

BOM\_COST\_GROUP=FAN



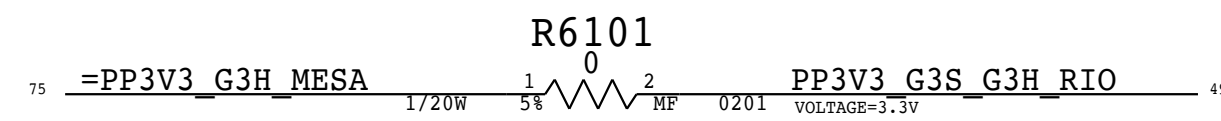
# A RIO Flex Connector

On RIO Board:  
AMR  
CODEC  
MESA  
SPKR AMP

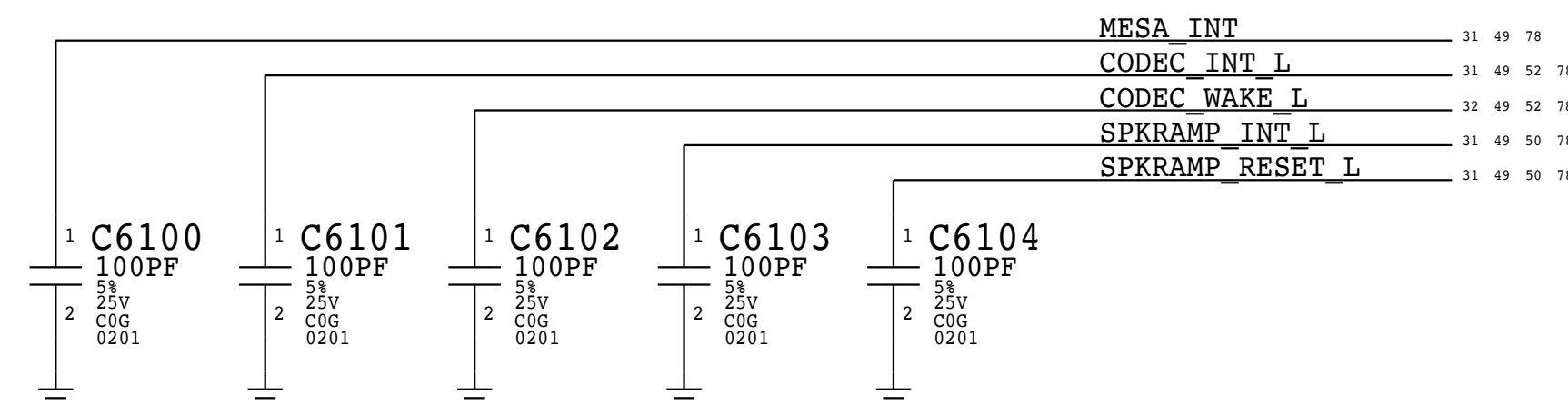


518S00155  
Mates with 998-11285  
on X1032 RIO Flex J0200

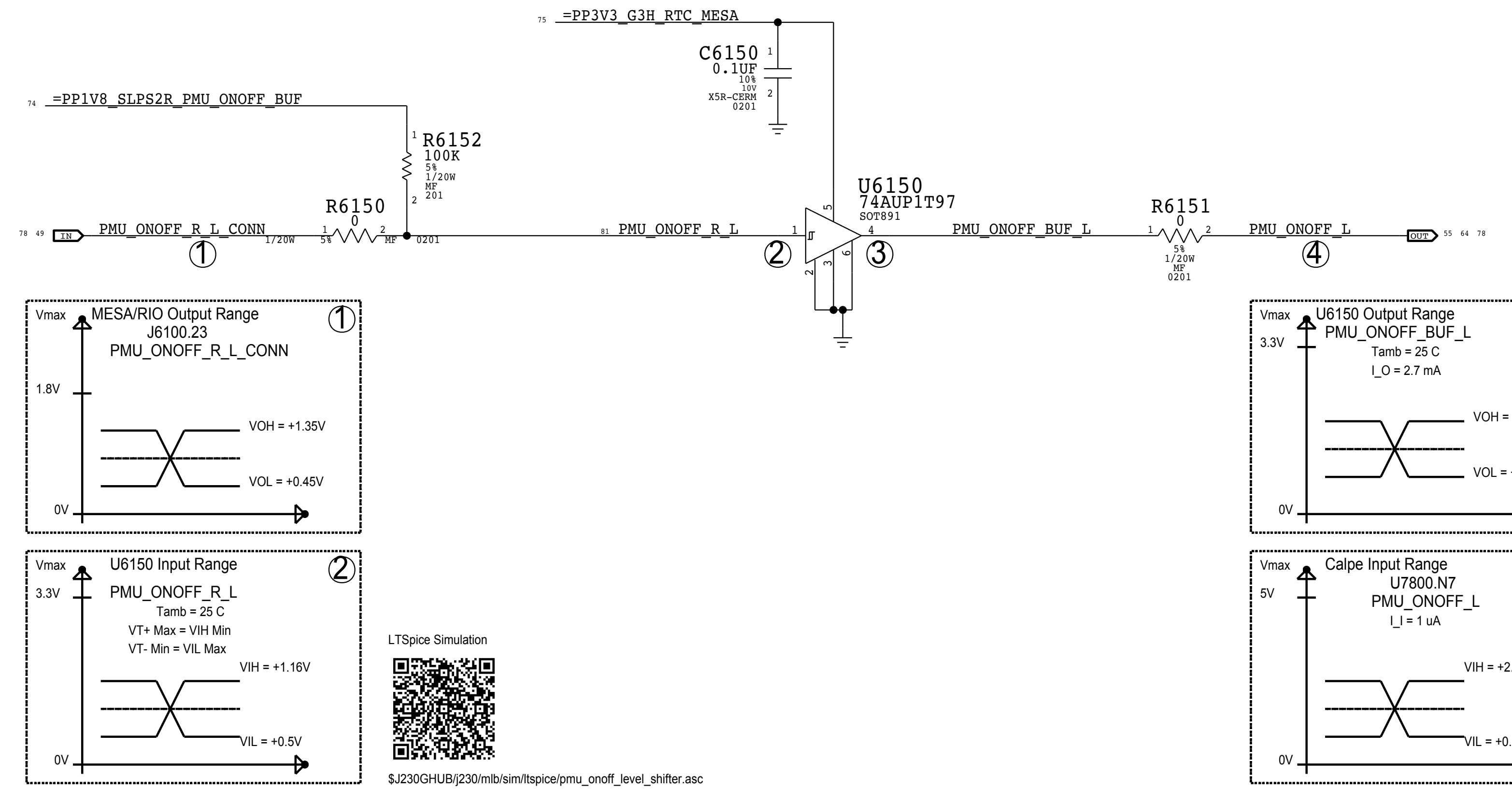
# B RIO P3V3\_G3H Connection



# C RIO Control Signals



# D PMU\_ONOFF\_L Level Shifter



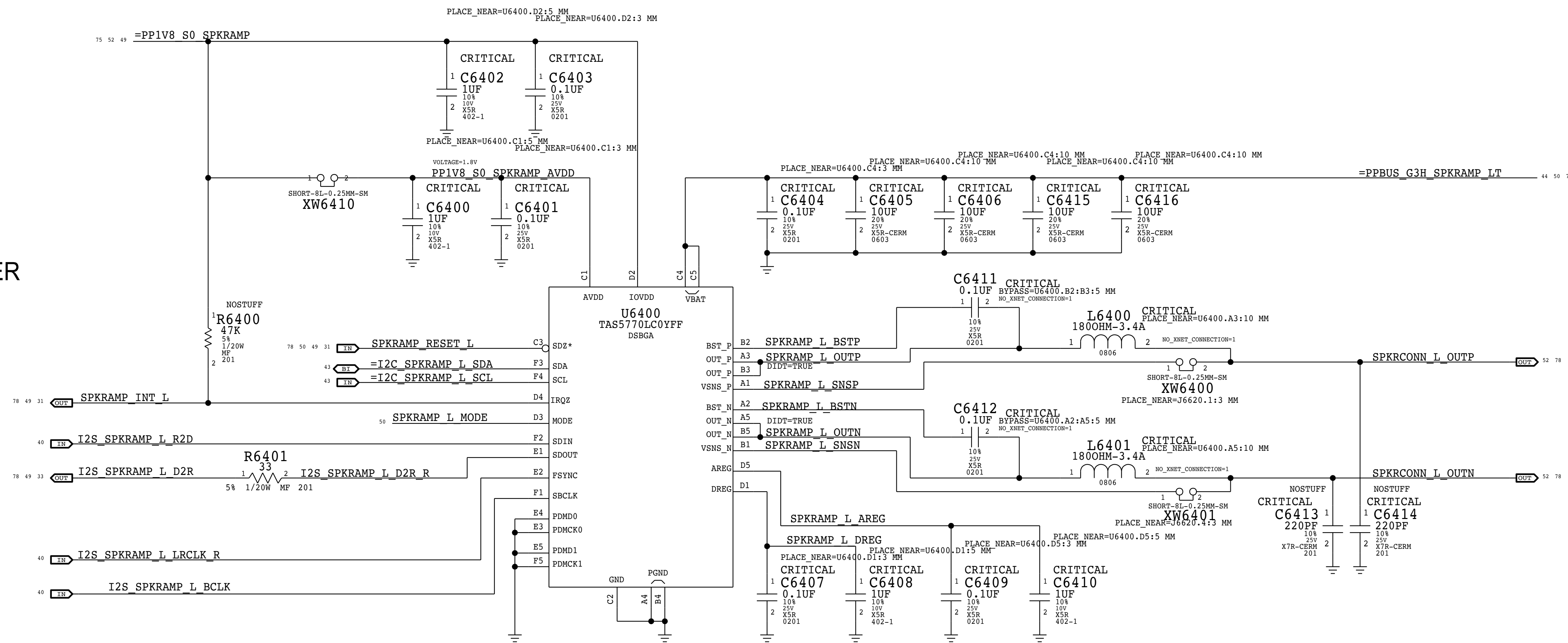
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<b>RIO Connector</b>		
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	REVISION	4.0.0
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	PAGE	61 OF 152
	SHEET	49 OF 86

BOM\_COST\_GROUP=AUDIO

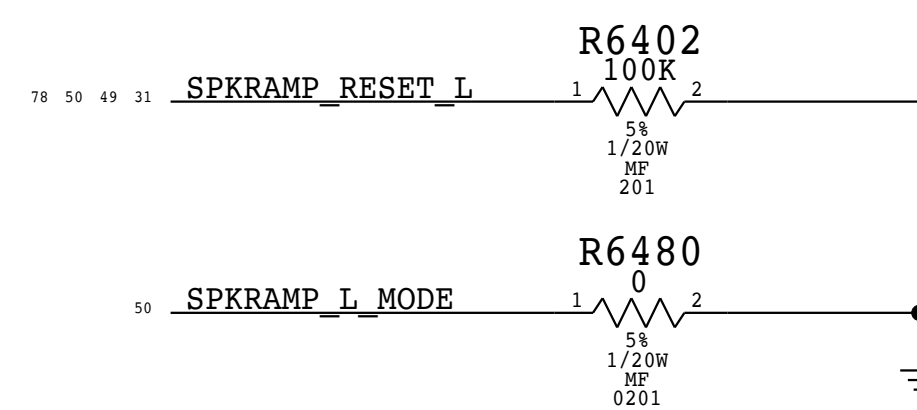
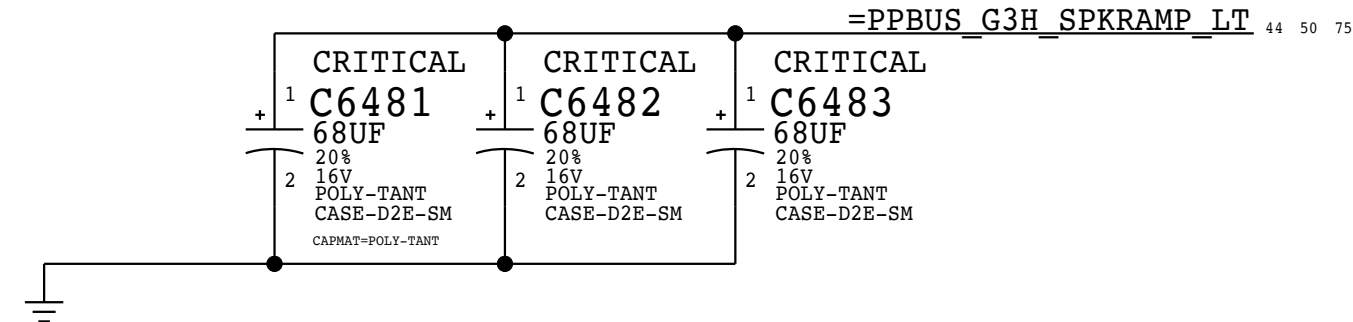
# 1X MONO SPEAKER AMPLIFIER

APN: 353S01629  
GAIN: 0DBFS = 6.31 VRMS

## LEFT AMPLIFIER



### LEFT BULK CAPACITANCE



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

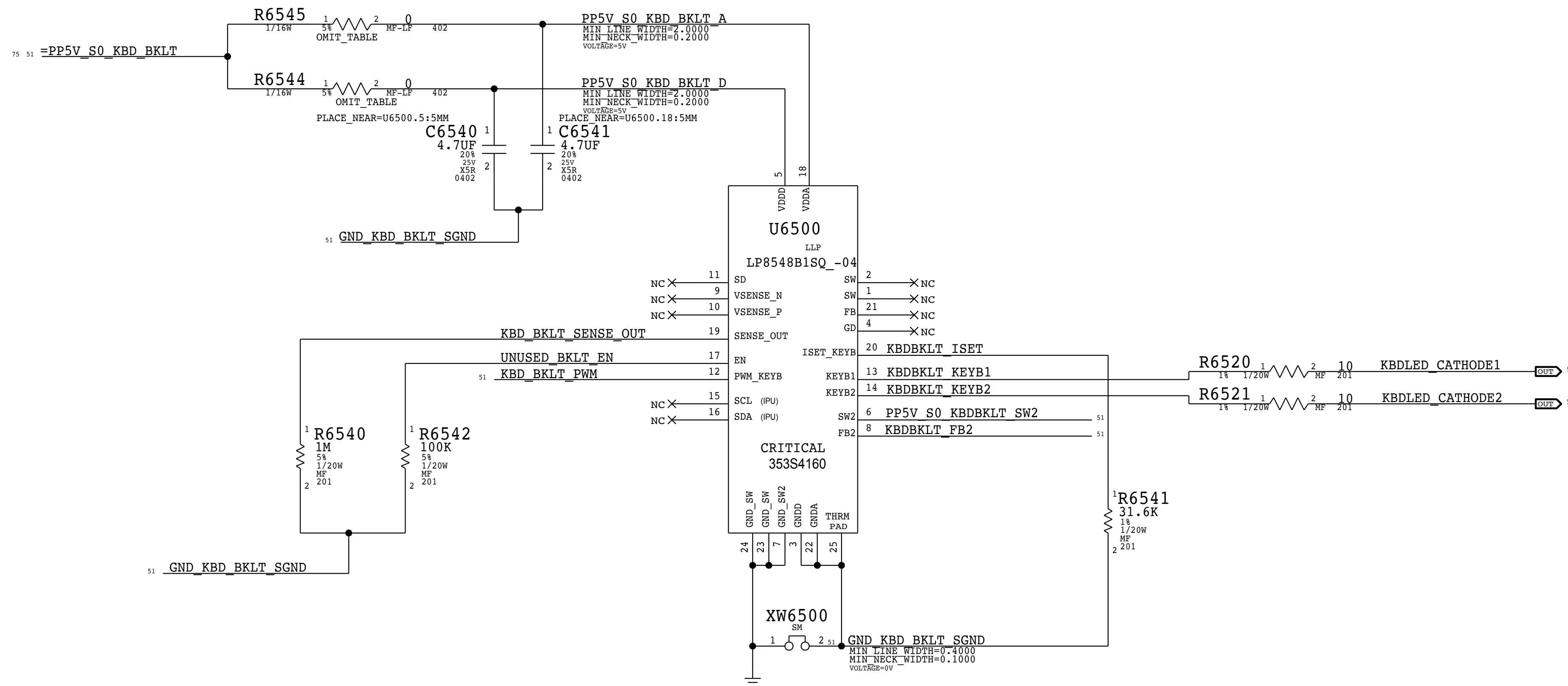
BOM\_COST\_GROUP=AUDIO

DESIGN: J230/MLB	
LAST CHANGE: Fri Sep 28 20:05:04 2018	
PAGE TITLE	
Audio Speaker Amplifiers	
	DRAWING NUMBER
	051-05232
	REVISION
	4.0.0
	BRANCH
	riskramp
	PAGE
	64 OF 152
	SHEET
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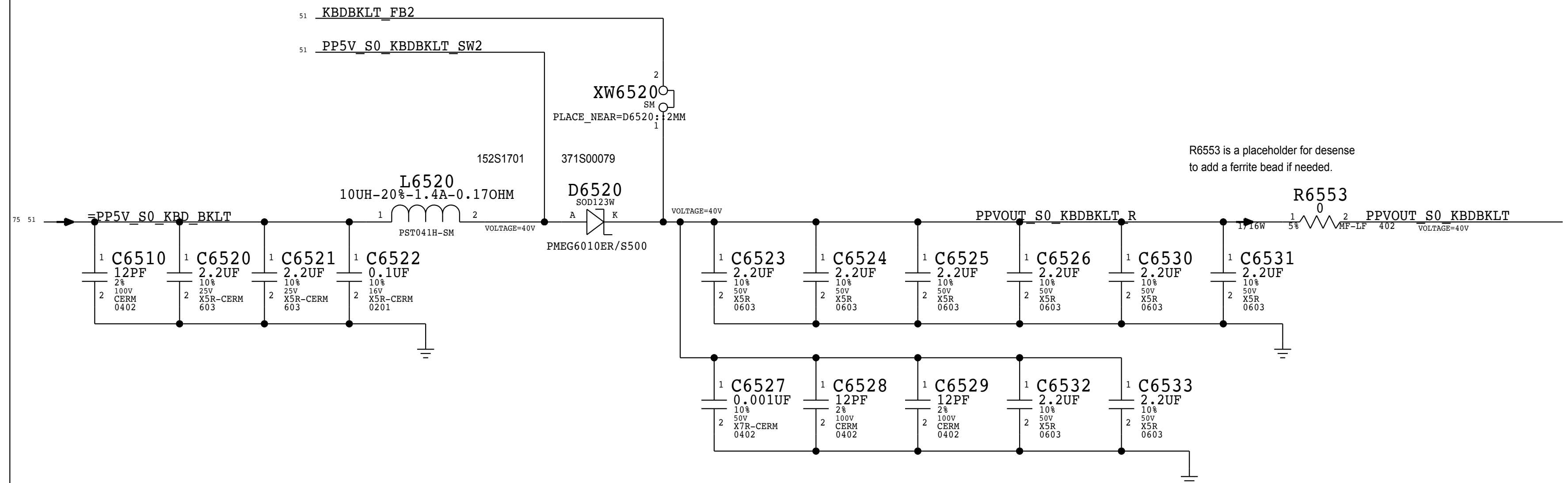
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# A Keyboard Backlight LED Driver

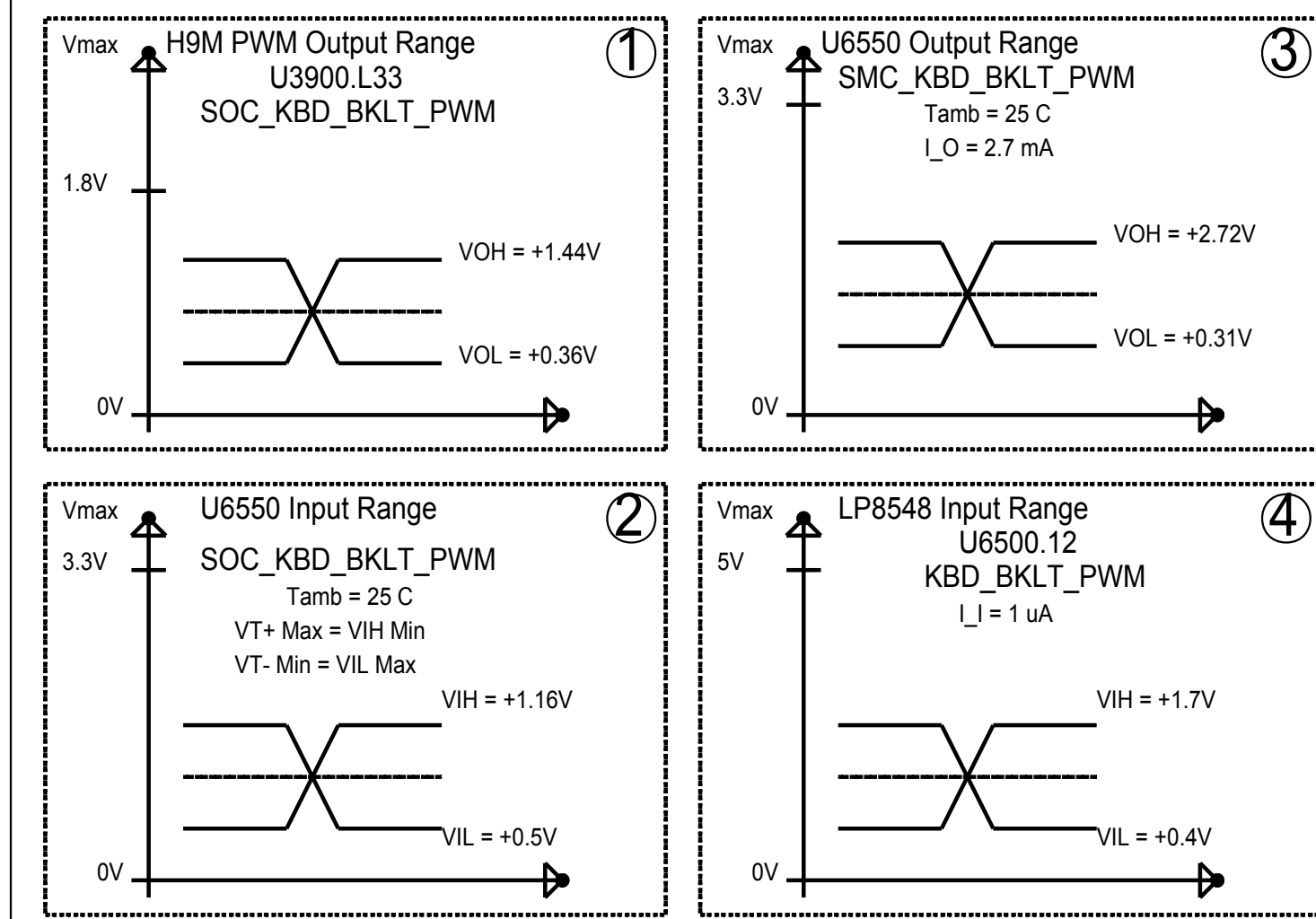
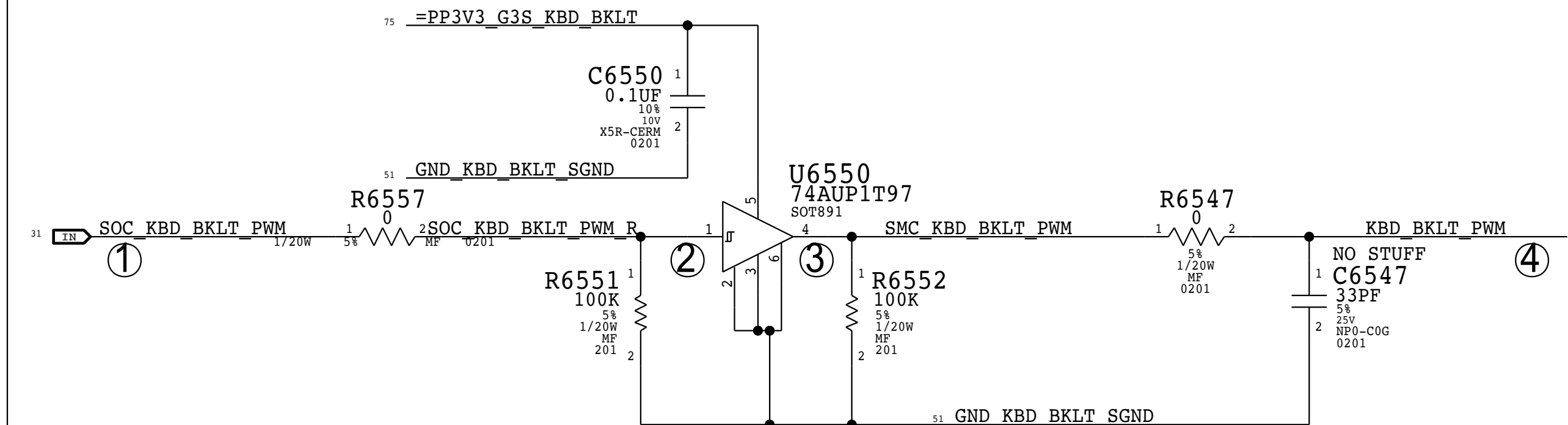
PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	BOM OPTION
11480023	2	BES_MTL_FLM,1/16W,10 OHM,1,0402,SMD,LF	R6544, R6545	



# B Keyboard Boost Converter Support



# C Keyboard PWM Level Shifter



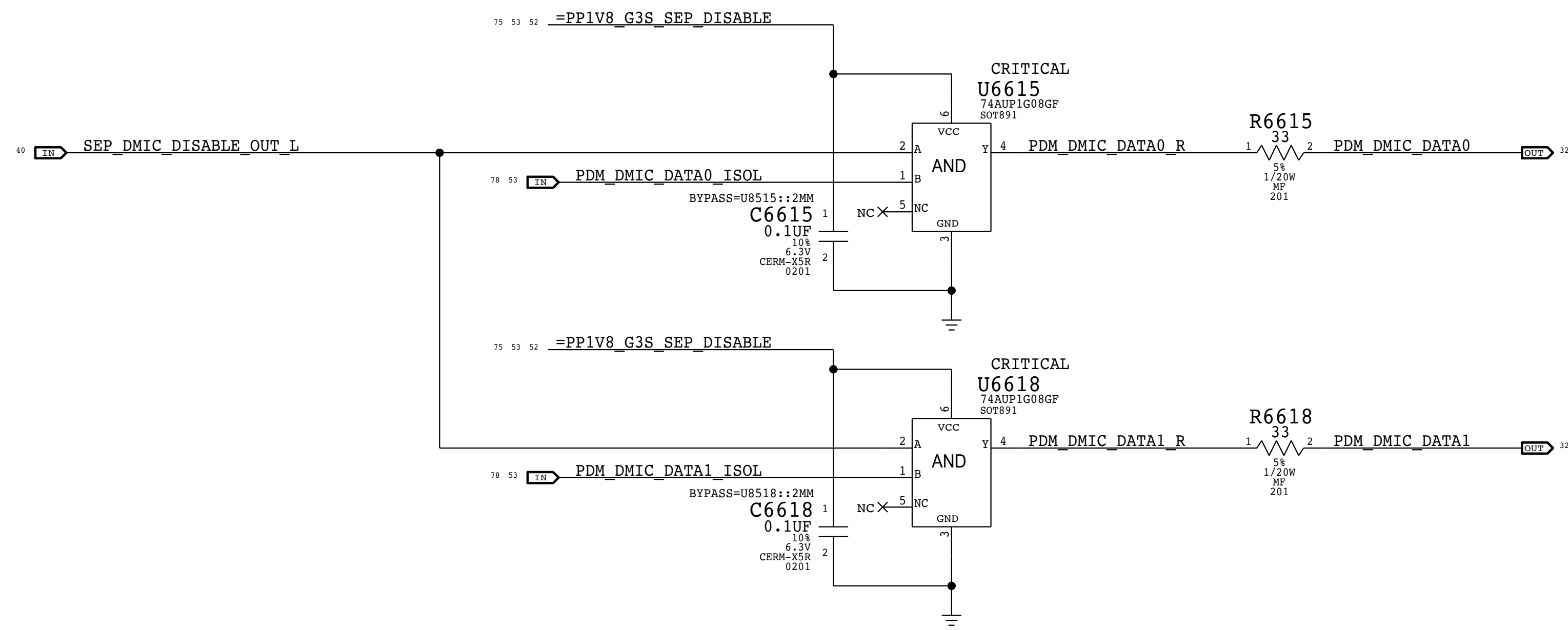
# D Keyboard Probe Points

PP6500	PP5V_S0_KBD_BKLT_SW2	51
PP6501	KBDBKLT_FB2	51
PP6502	KBD_BKLT_PWM	51
PP6503	GND_KBD_BKLT_SGND	51

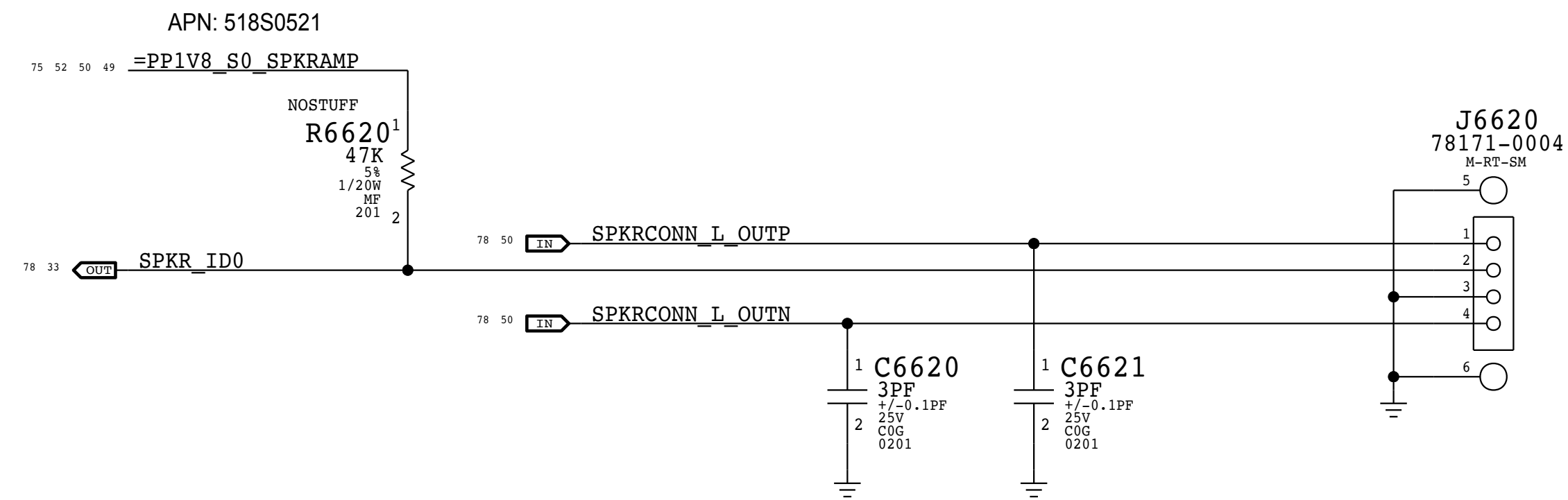
Keyboard Backlight		
Apple Inc.	DRAWING NUMBER	051-05232
	REVISION	4.0.0
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BOM\_COST\_GROUP=DISPLAY

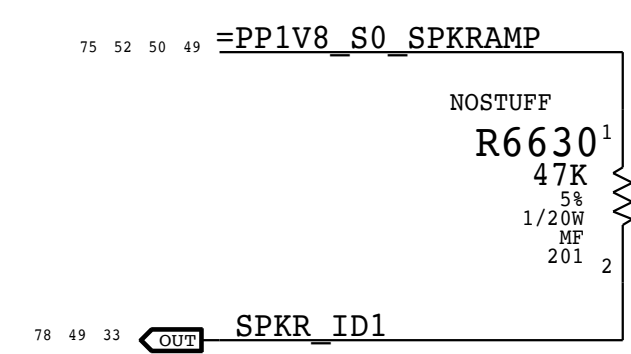
# A) DMIC Secure Disable



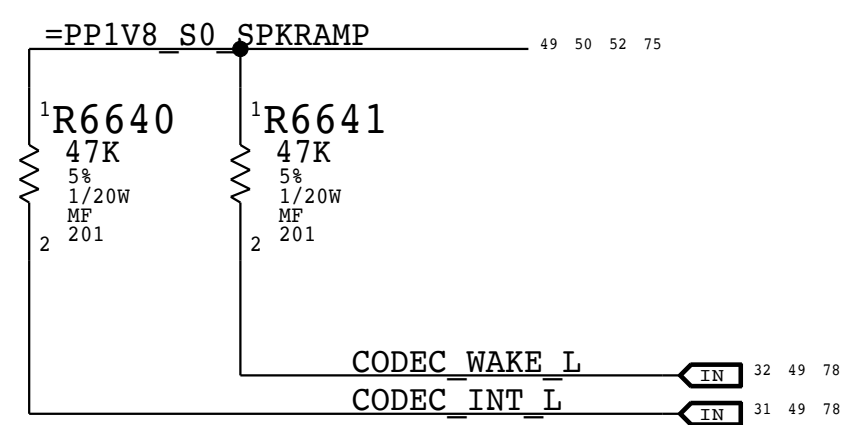
# B) Left Speaker Connector



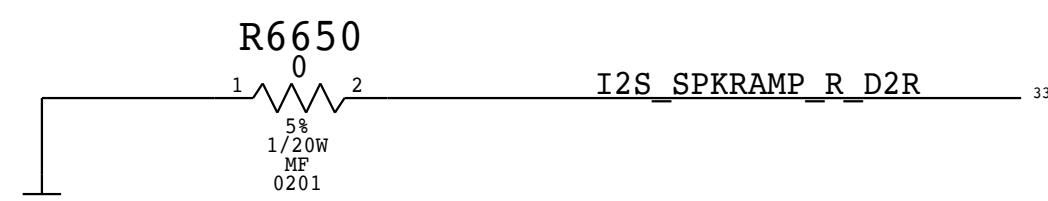
# C) Right Speaker ID



# D) Audio Codec Pull-Ups



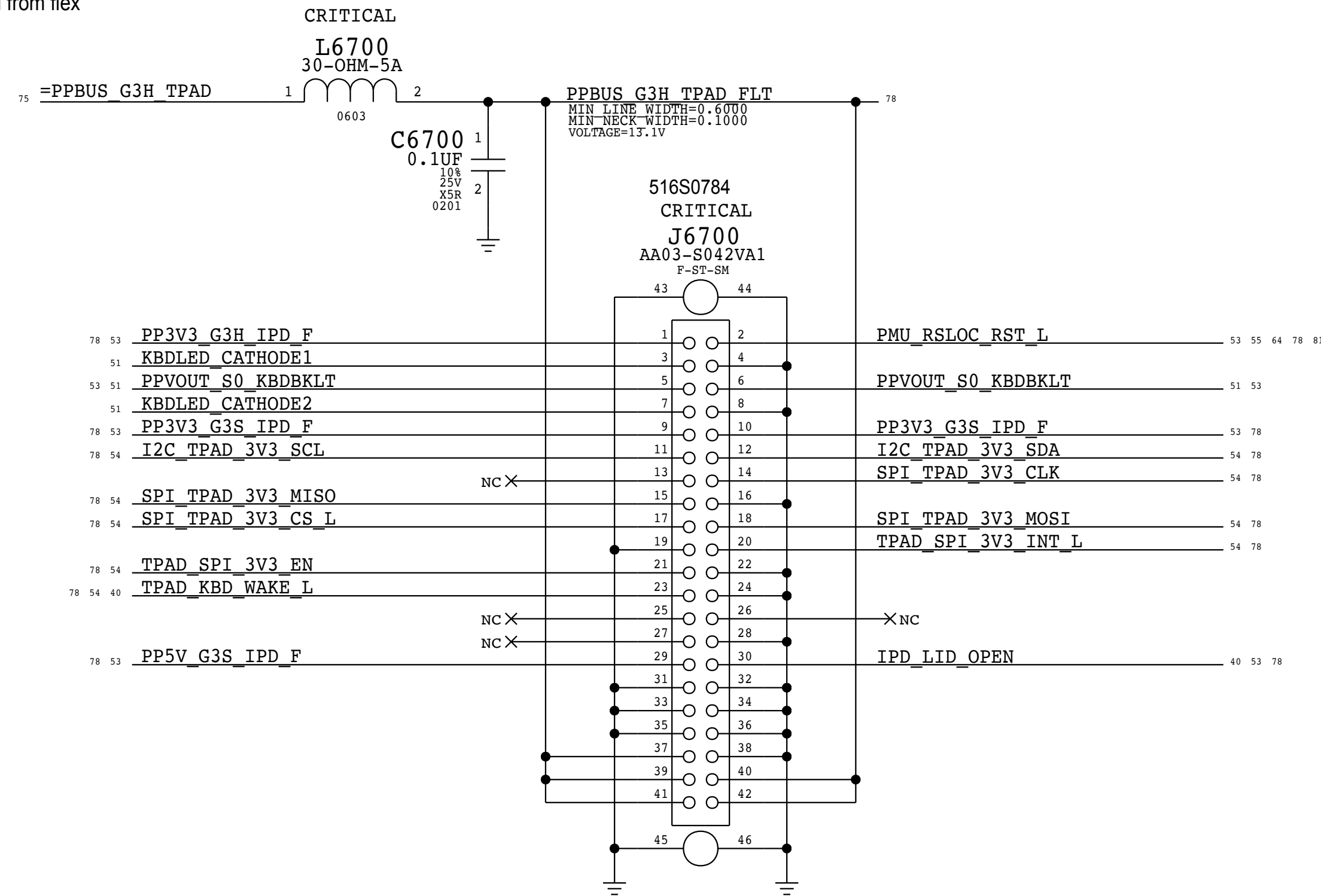
# E) Speaker Amp Control



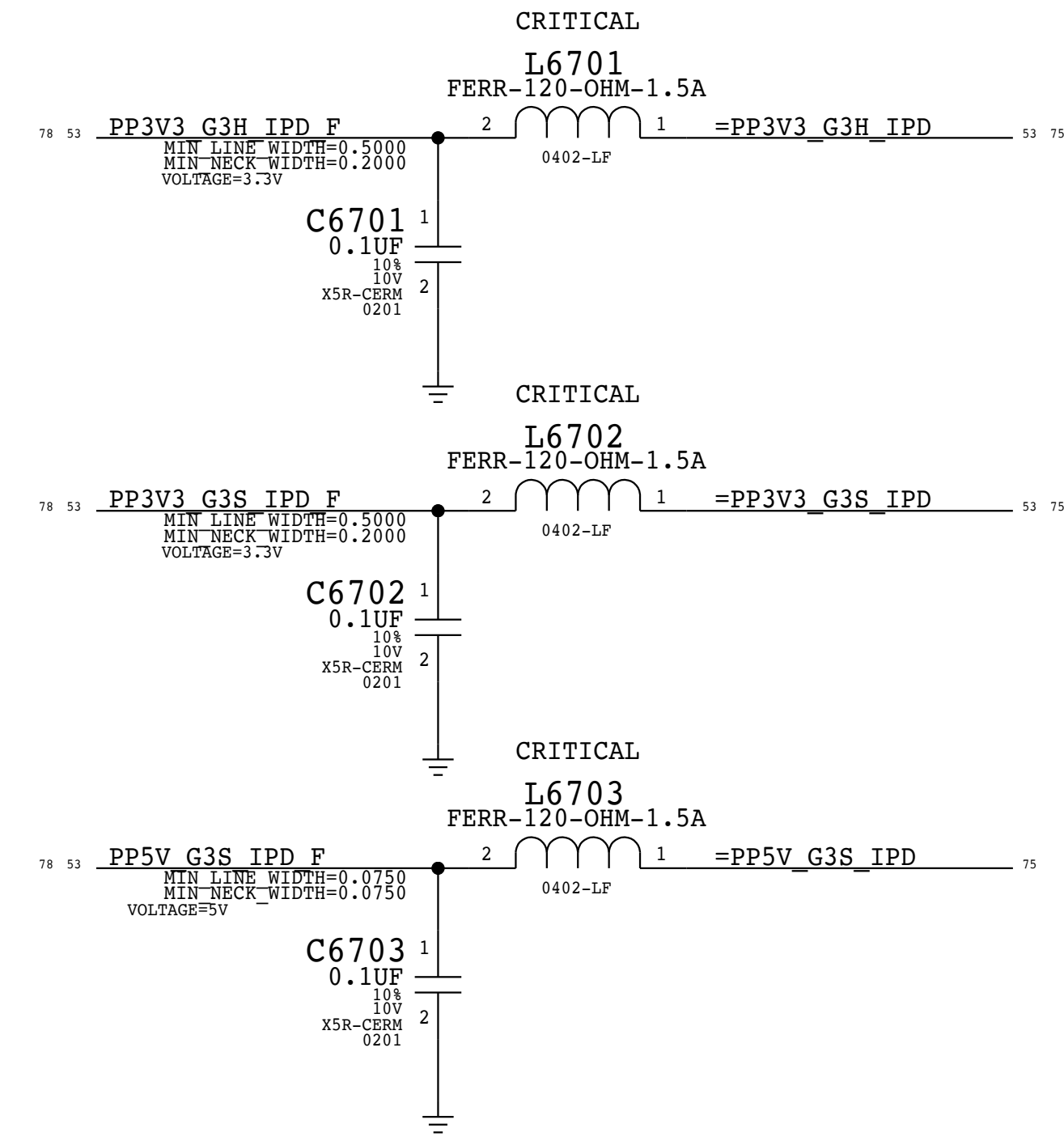
DESIGN: J230/MLB		
LAST CHANGE: Fri Sep 28 20:05:04 2018		
PAGE TITLE		
Audio Connectors		
Apple Inc.	DRAWING NUMBER	051-05232
	REVISION	4.0.0
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	PAGE	66 OF 152
	SHEET	52 OF 86

# A IPD B2B CONNECTOR

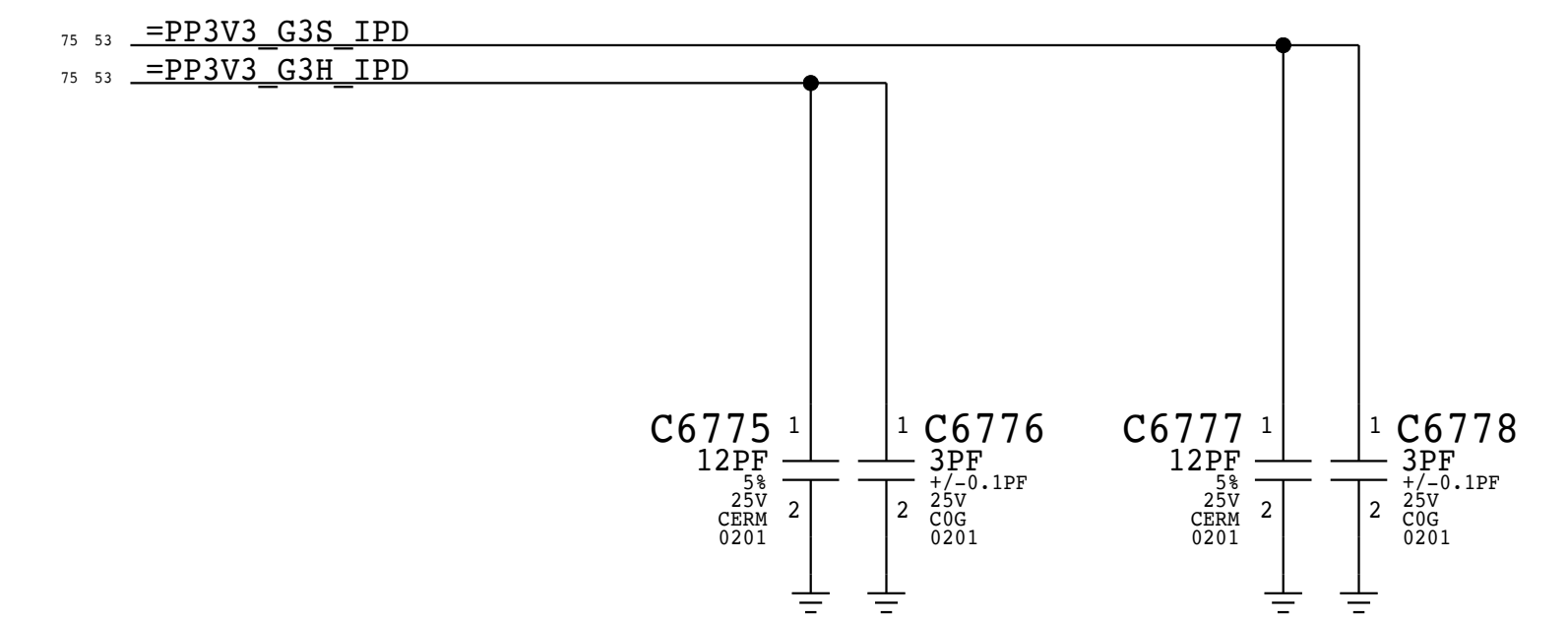
Bottom side contacts used  
Pinout reversed from flex



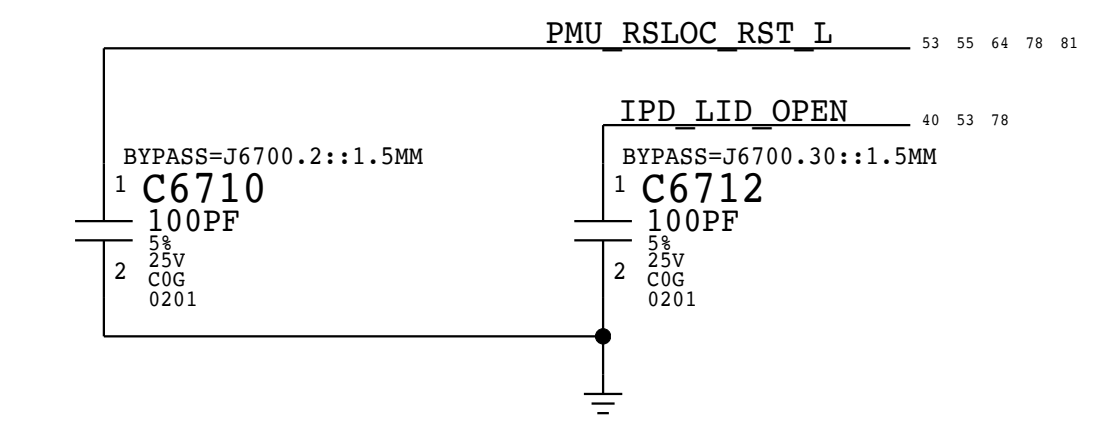
# B IPD Power Filters



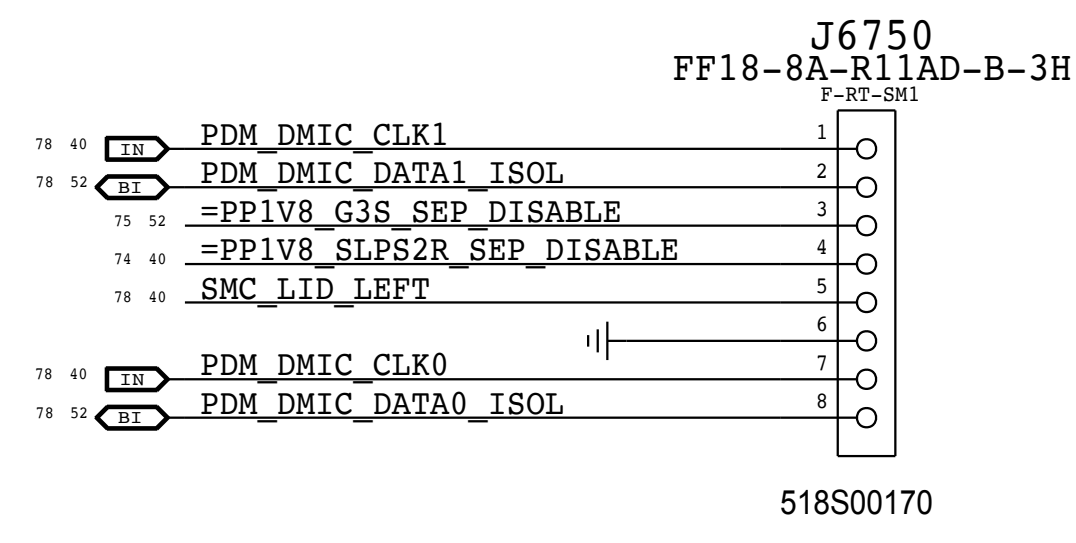
# C IPD Desense



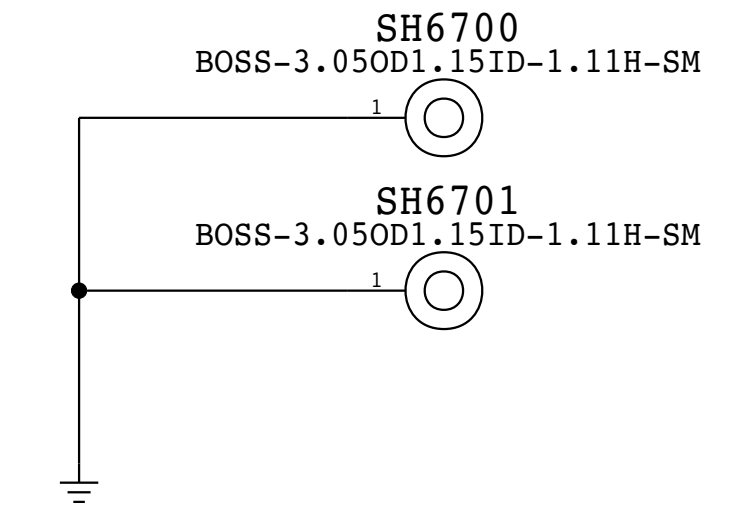
# D IPD Control



# E Microphone Connector



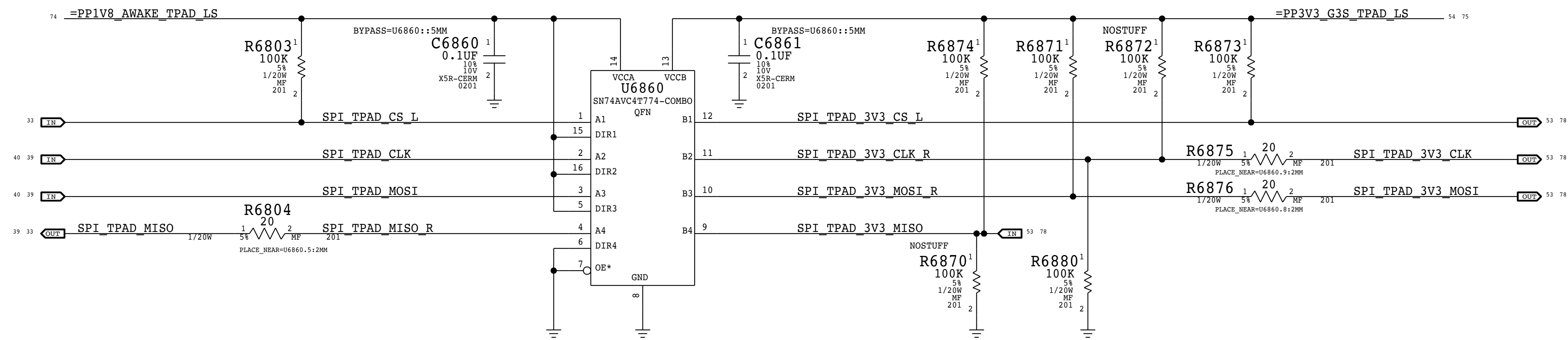
# F IPD Connector Bosses



SYNC MASTER=X260 MLB		SYNC DATE=02/16/2017	
PAGE TITLE <b>Keyboard &amp; Trackpad 1</b>			
	DRAWING NUMBER 051-05232	SIZE D	
	REVISION 4.0.0	BRANCH riskramp	
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BOM\_COST\_GROUP=TRACKPAD

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



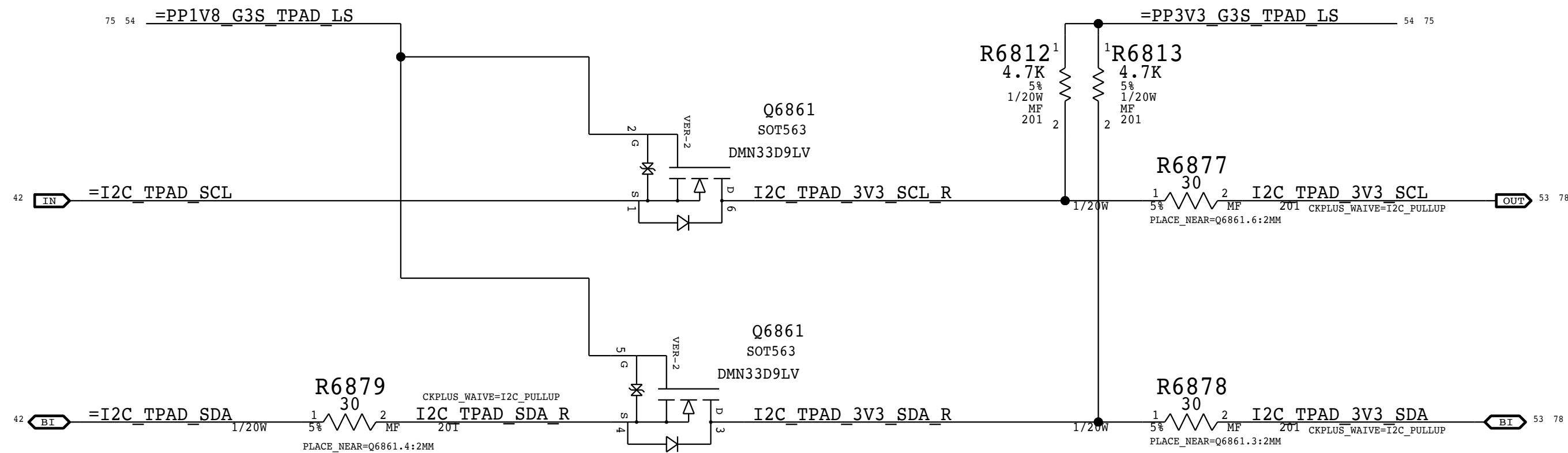
PROJECT	J230k = 0x3F
B RESISTOR	
BOARDID[5] = SPI_TPAD_CLK	1 pull-down
BOARDID[4] = SPI_TPAD_MISO*	1 pull-up
BOARDID[3] = SPI_TPAD_MOSI	1 pull-up
BOARDID[2] = SPI_SOCROM_MISO	1
BOARDID[1] = SPI_SOCROM_MOSI	1
BOARDID[0] = SPI_SOCROM_CLK	1

SN74AVC4T774 Truth Table

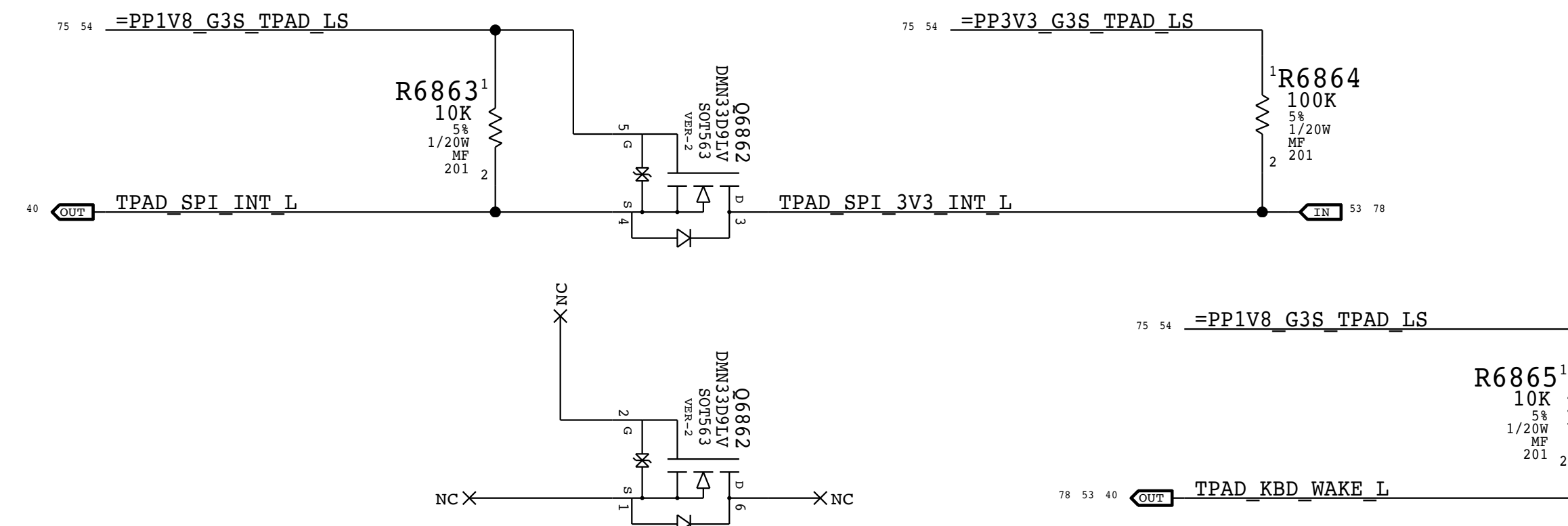
CTRL INPUTS		OUTPUT CIRCUITS		OPERATION
/OE	DIR	A PORT	B PORT	
L	L	Enabled	Hi-Z	B data to A data
L	H	Hi-Z	Enabled	A data to B data
H	X	Hi-Z	Hi-Z	Isolation

SPI\_TPAD\_CLK, SPI\_TPAD\_MOSI, and SPI\_TPAD\_MISO 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.

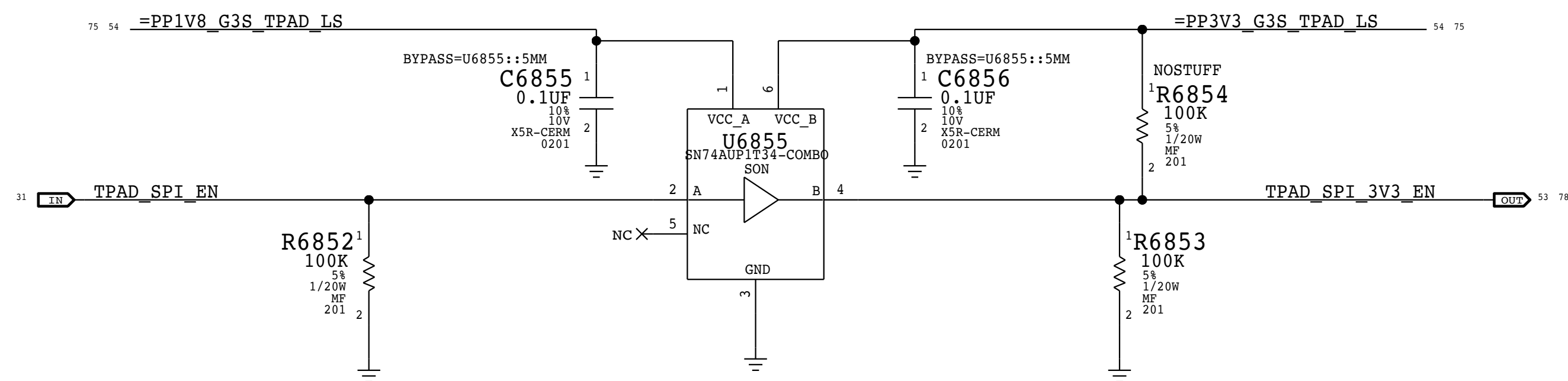
# B Trackpad I2C Bus Level Shifter



# C Trackpad Control Level Shifter



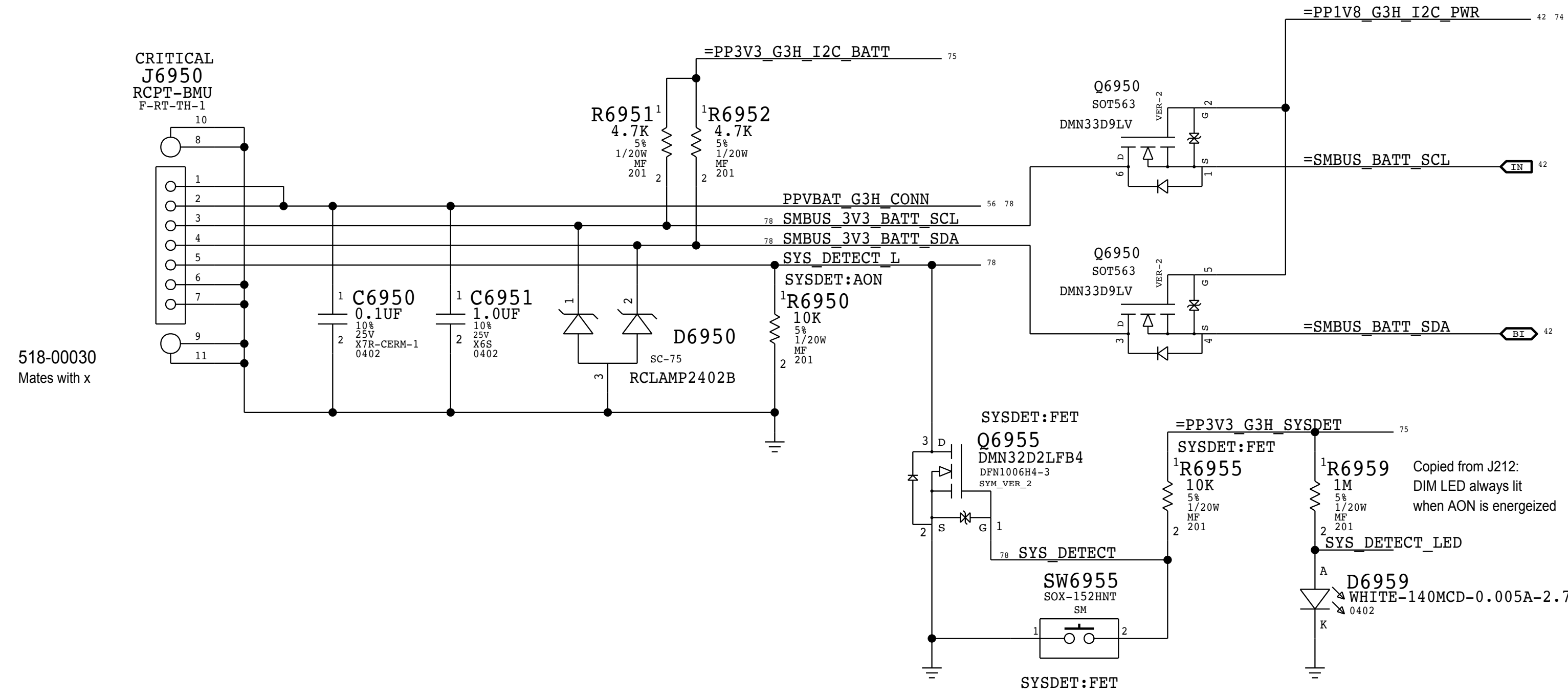
# D Trackpad SPI Enable Level Shifter



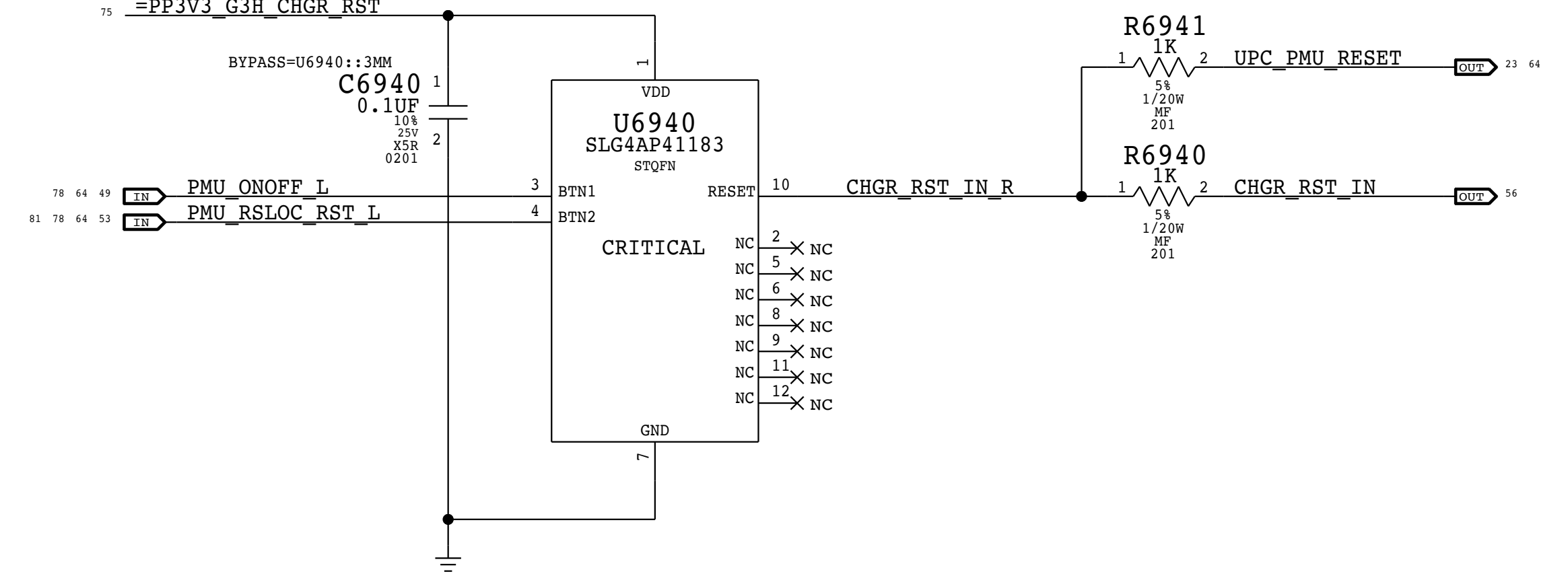
PAGE TITLE		KEYBOARD & TRACKPAD 2	
DRAWING NUMBER		051-05232	SIZE
REVISION		4.0.0	D
BRANCH		riskramp	
PAGE		68 OF 152	
SHEET		54 OF 86	

BOM\_COST\_GROUP=TRACKPAD

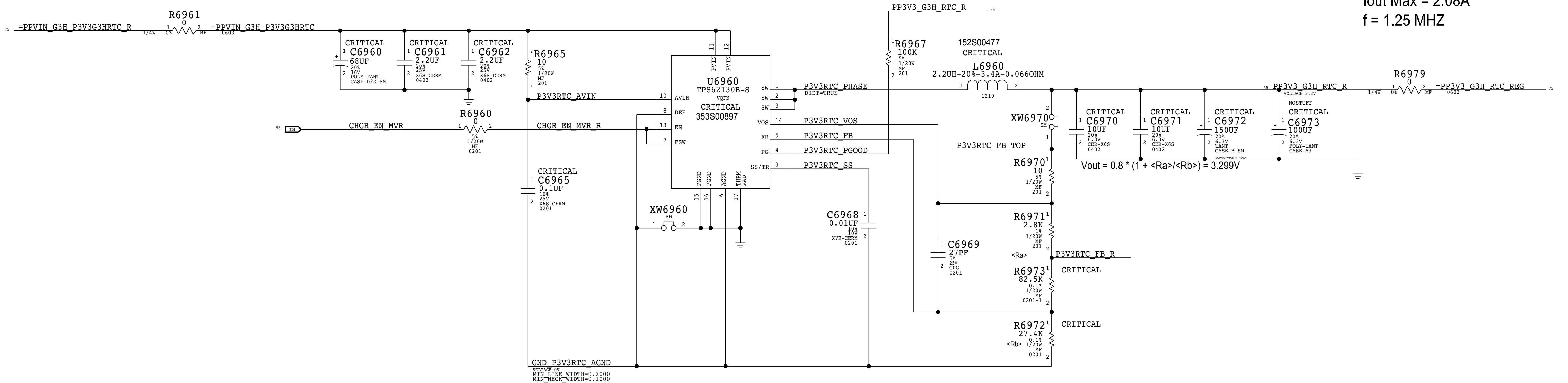
# A DC-In & Battery Connector



# B Charger Reset Circuit

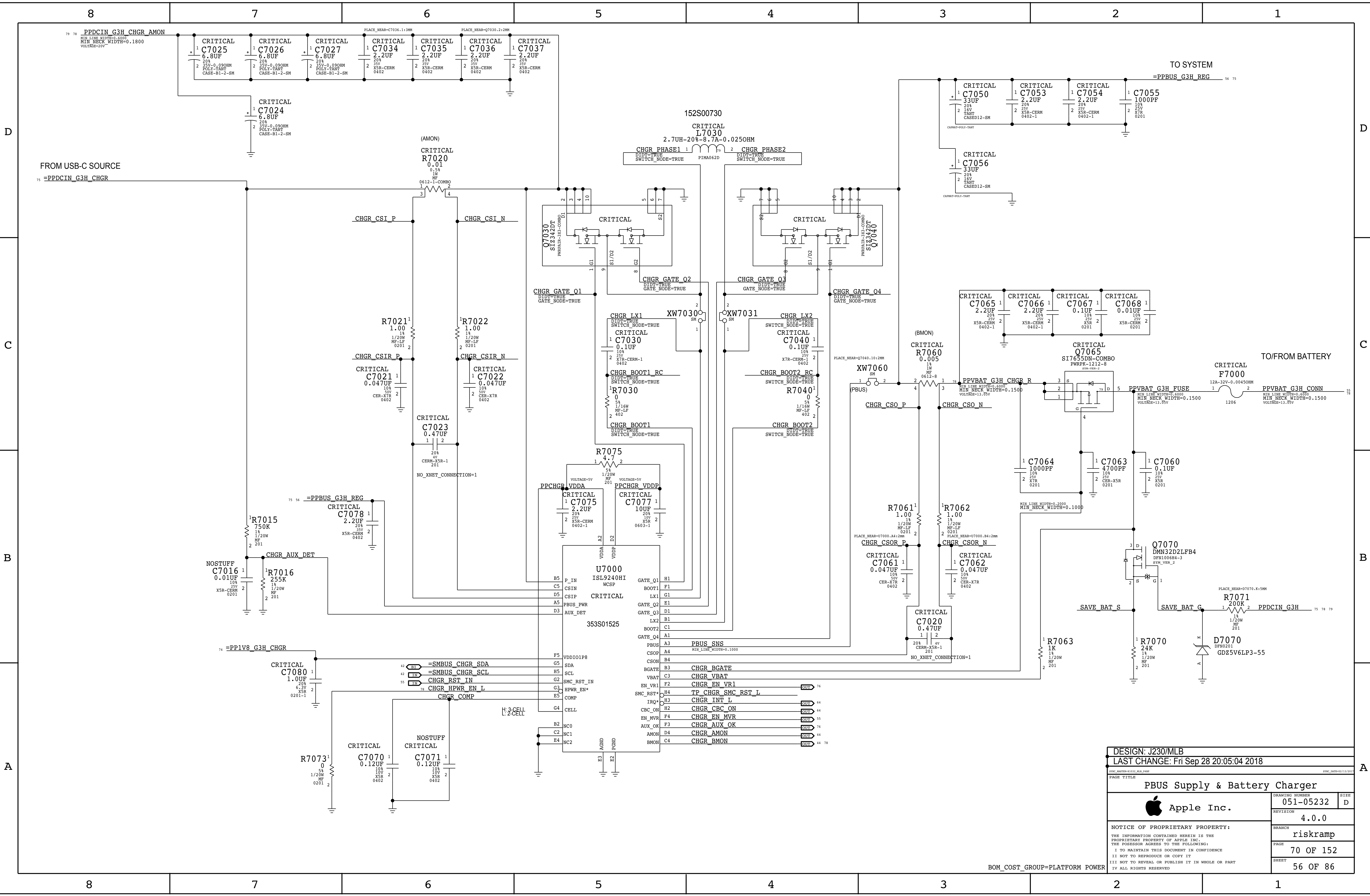


# C 3.3V G3H RTC Voltage Regulator



Vout = 3.3V  
Iout Max = 2.08A  
f = 1.25 MHz

PAGE TITLE		DRAWING NUMBER		SIZE
DC-In & Battery Connectors		051-05232		D
REVISED BY		REVISION		
		4.0.0		
BRANCH		PAGE		
riskramp		69 OF 152		
SHEET		55 OF 86		



U7000 ISL9240HI WSCP

B5	P_IN	GATE_Q1	H1
C5	CSIN	BOOT1	F1
D5	CSIP	LX1	G1
A5	PBUS_PWR	GATE_Q2	E1
D3	AUX_DET	GATE_Q3	D1
		LX2	B1
		BOOT2	C1
		GATE_Q4	A1
A3	PBUS	PBUS_SNS	
A4	CSOP		
B4	CSON		
B3	BGATE	CHGR_BGATE	
C3	VBAT	CHGR_VBAT	
F2	EN_VR1	CHGR_EN_VR1	60
H4	TP_CHGR_SMC_RST_L	CHGR_SMC_RST_L	60
H3	CHGR_INT_L	CHGR_INT_L	64
H2	CHGR_CBC_ON	CHGR_CBC_ON	64
F4	CHGR_EN_MVR	CHGR_EN_MVR	55
F3	CHGR_AUX_OK	CHGR_AUX_OK	76
D4	CHGR_AMON	CHGR_AMON	64
C4	CHGR_BMON	CHGR_BMON	64

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

Apple Inc.

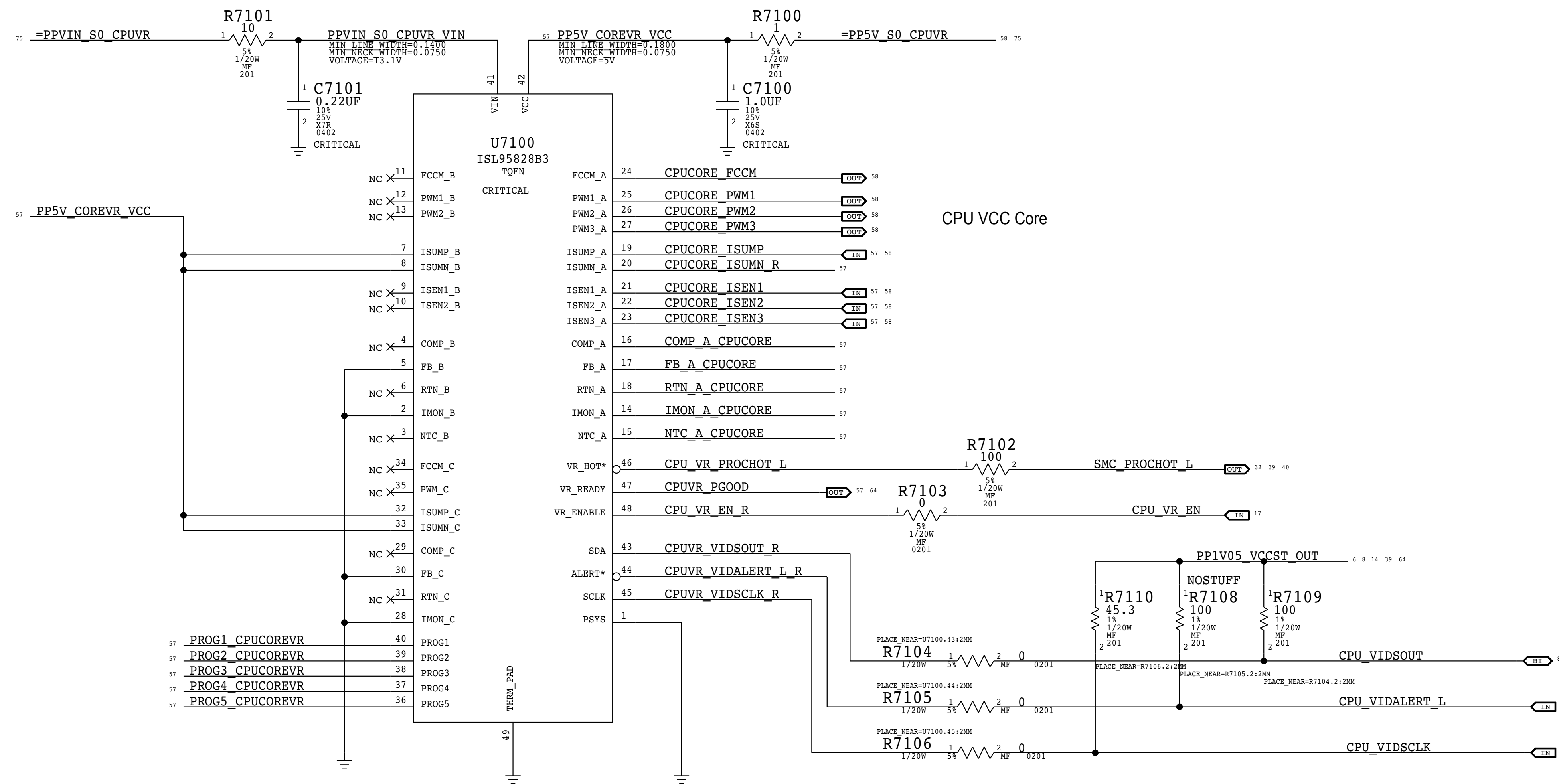
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 REVISION: 4.0.0  
 BRANCH: riskramp  
 PAGE: 70 OF 152  
 SHEET: 56 OF 86

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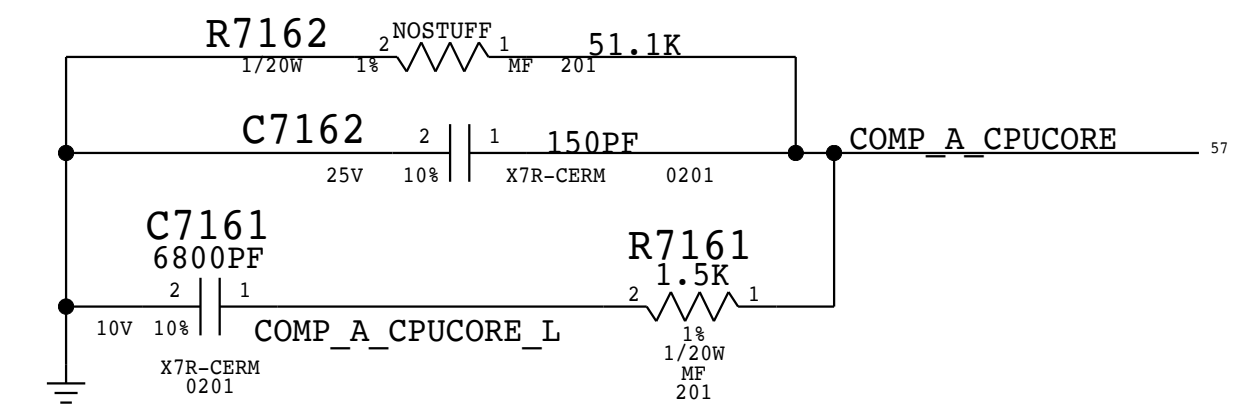
BOM\_COST\_GROUP=PLATFORM POWER



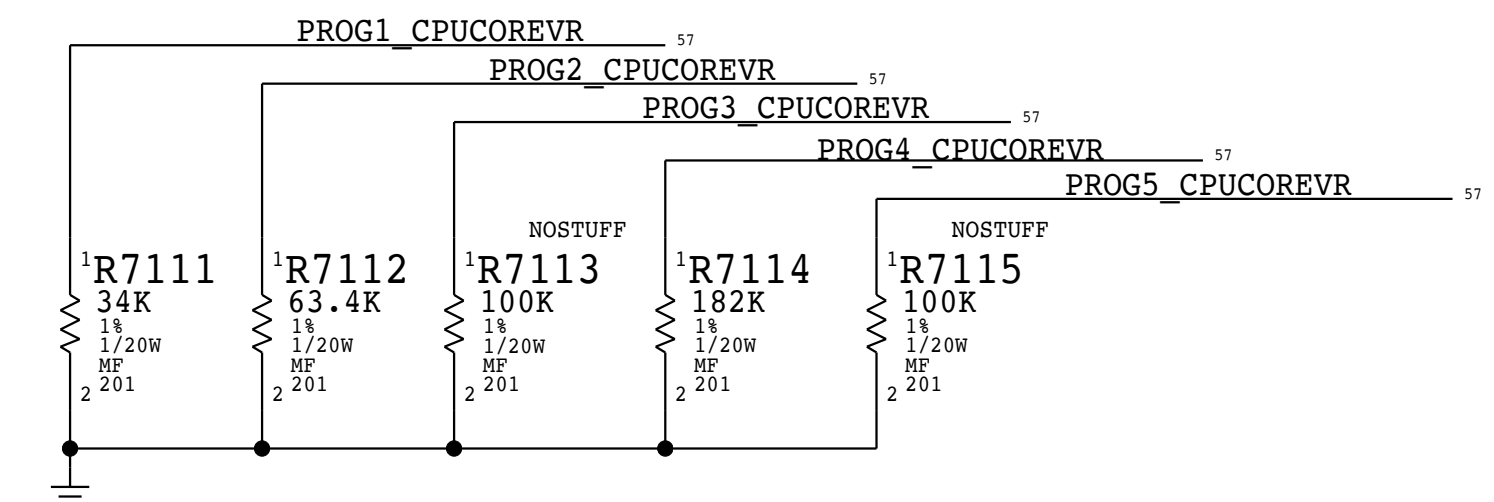
# A CPU Core IMVP9 PWM Controller



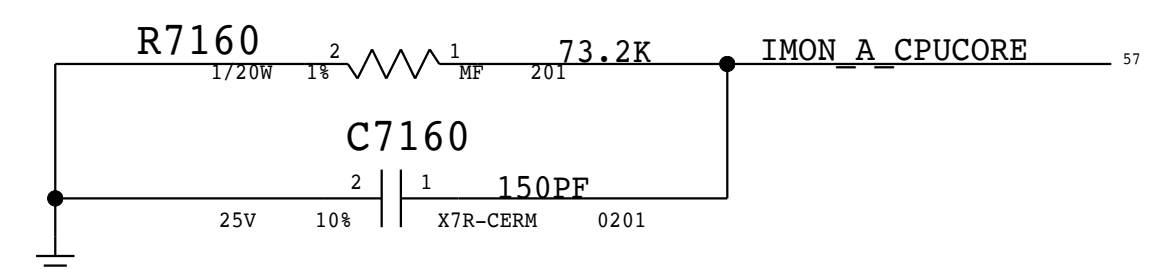
# D CPU Core Comp Network



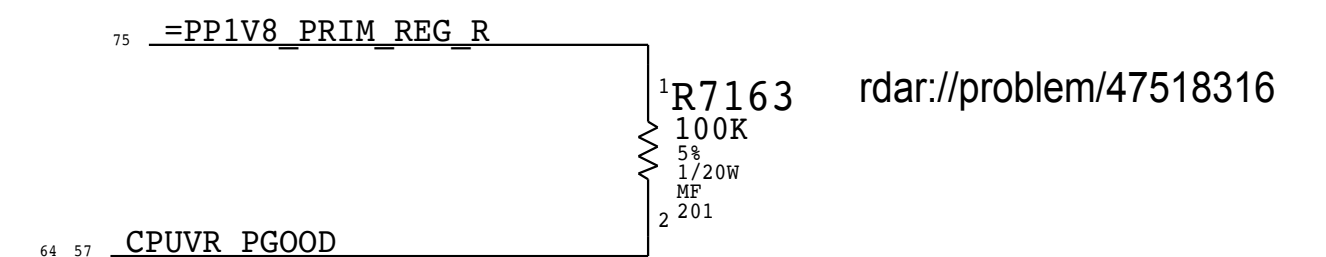
# E CPU Core Prog Options



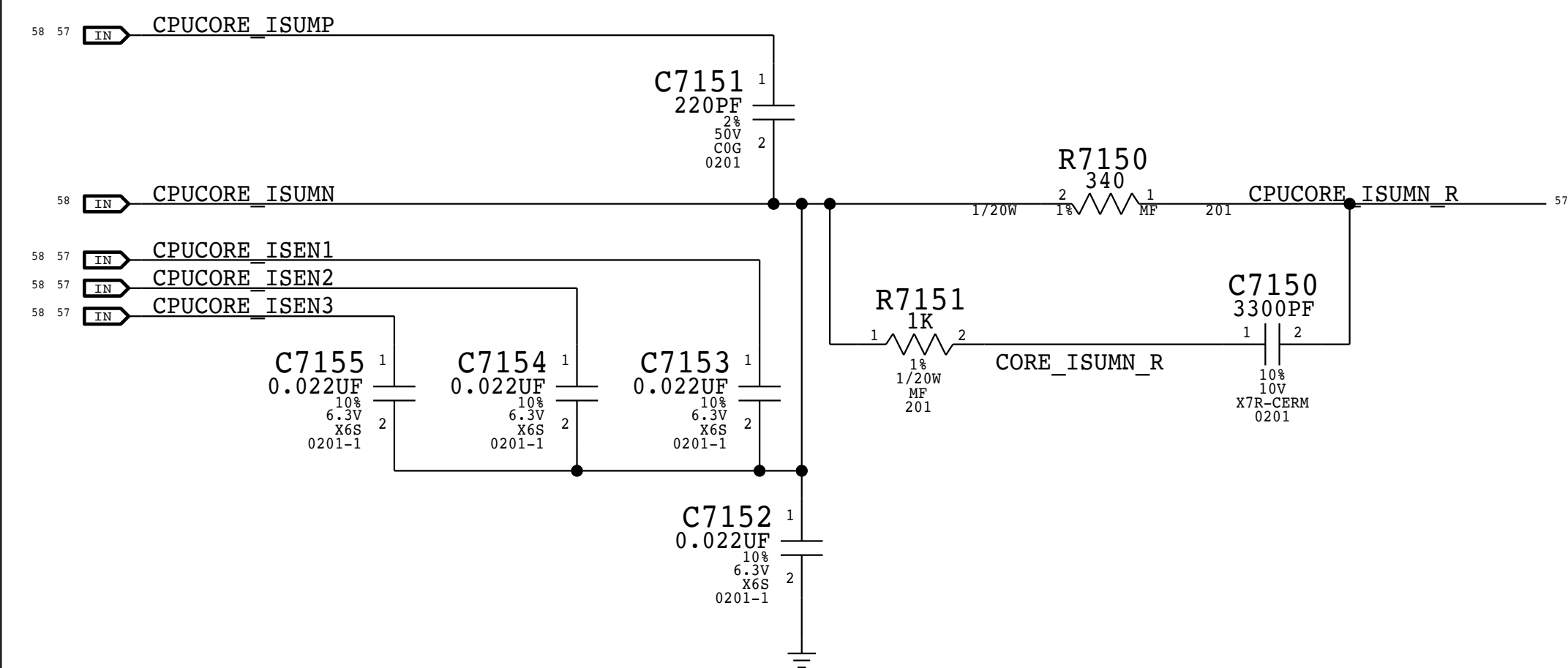
# F CPU Core IMON Network



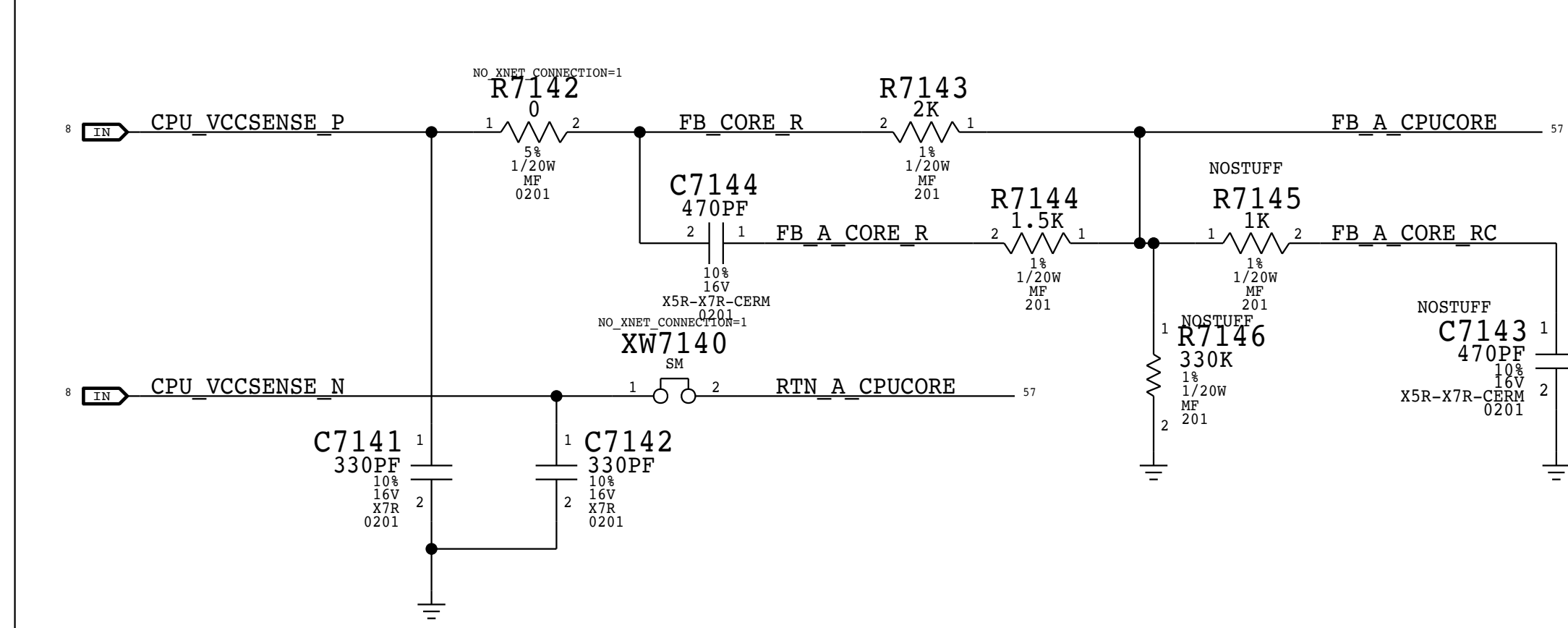
# G CPU Core Power Good



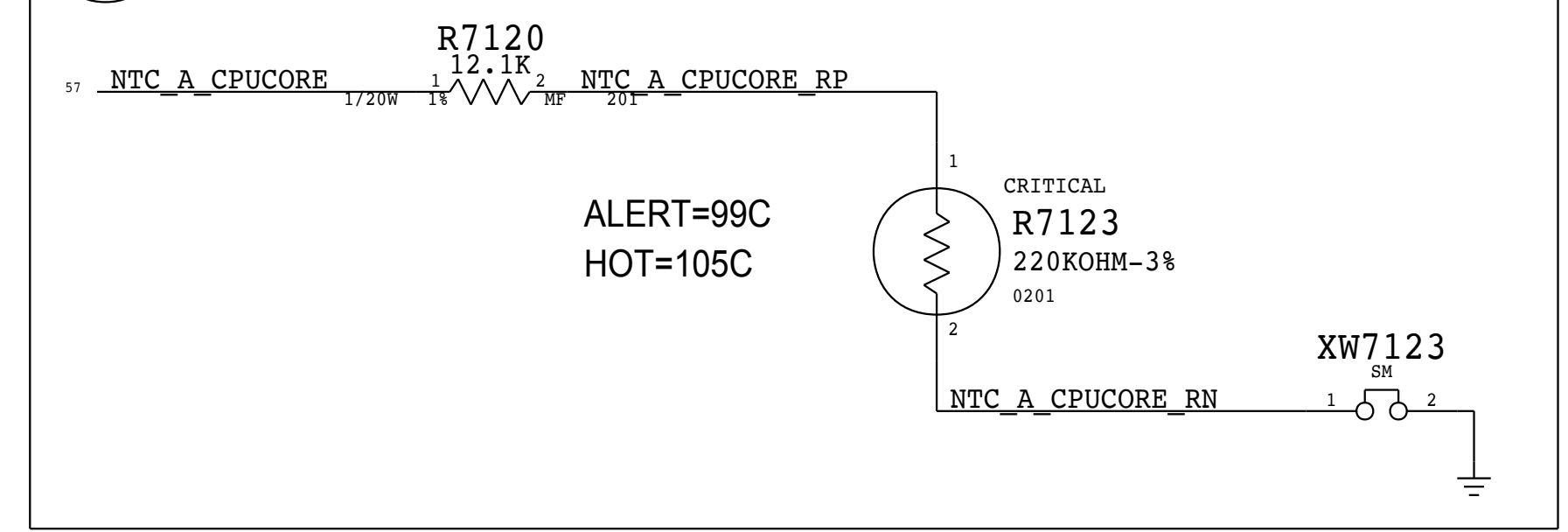
# B CPU Core ISUM Network



# C CPU Core Feedback Network



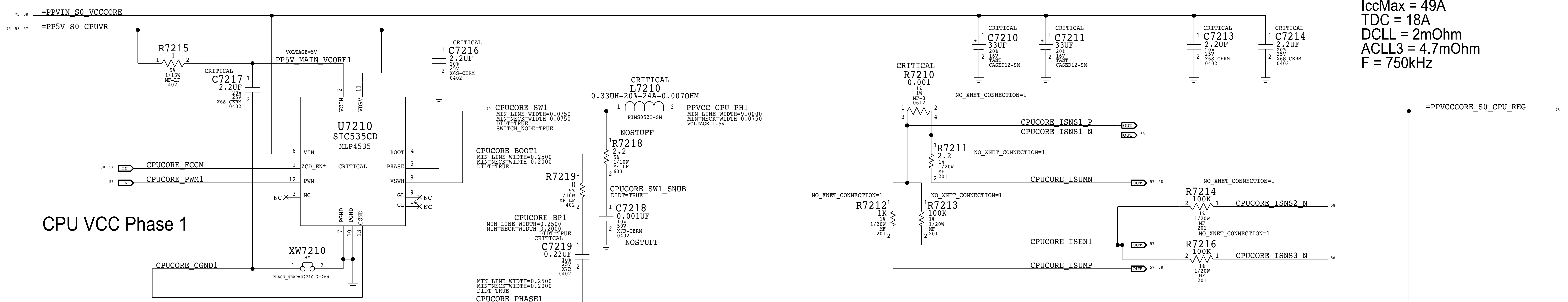
# H CPU Core Thermistor



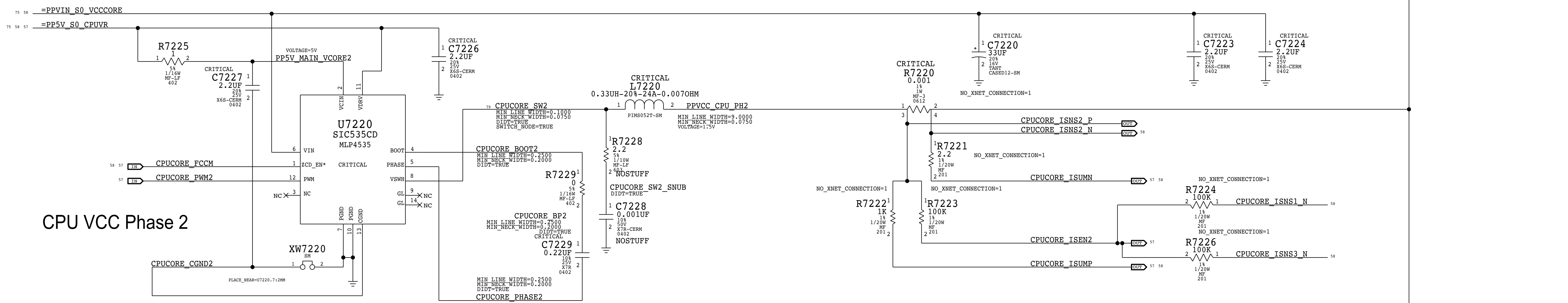
PAGE TITLE			IMVP9 IC	
		DRAWING NUMBER	051-05232	SIZE
		REVISION	4.0.0	D
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		PAGE	71 OF 152	
		SHEET	57 OF 86	

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

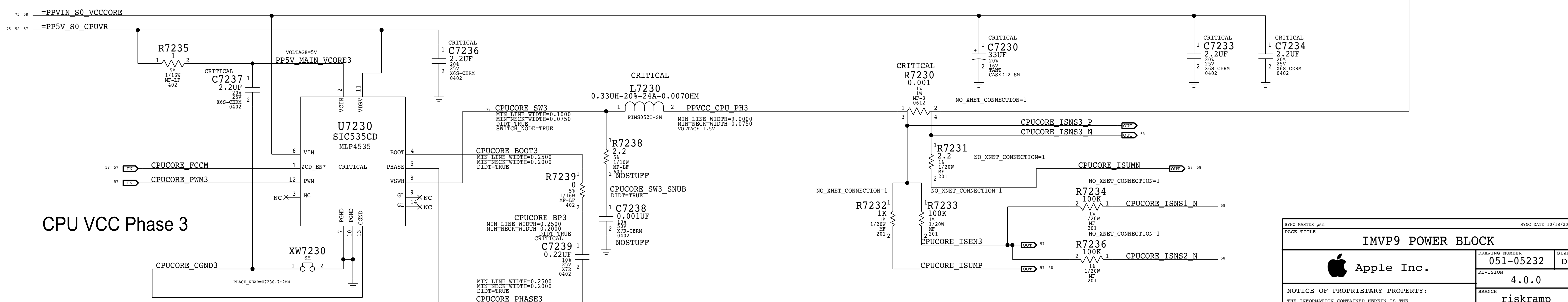
### CPU VCC Phase 1



### CPU VCC Phase 2



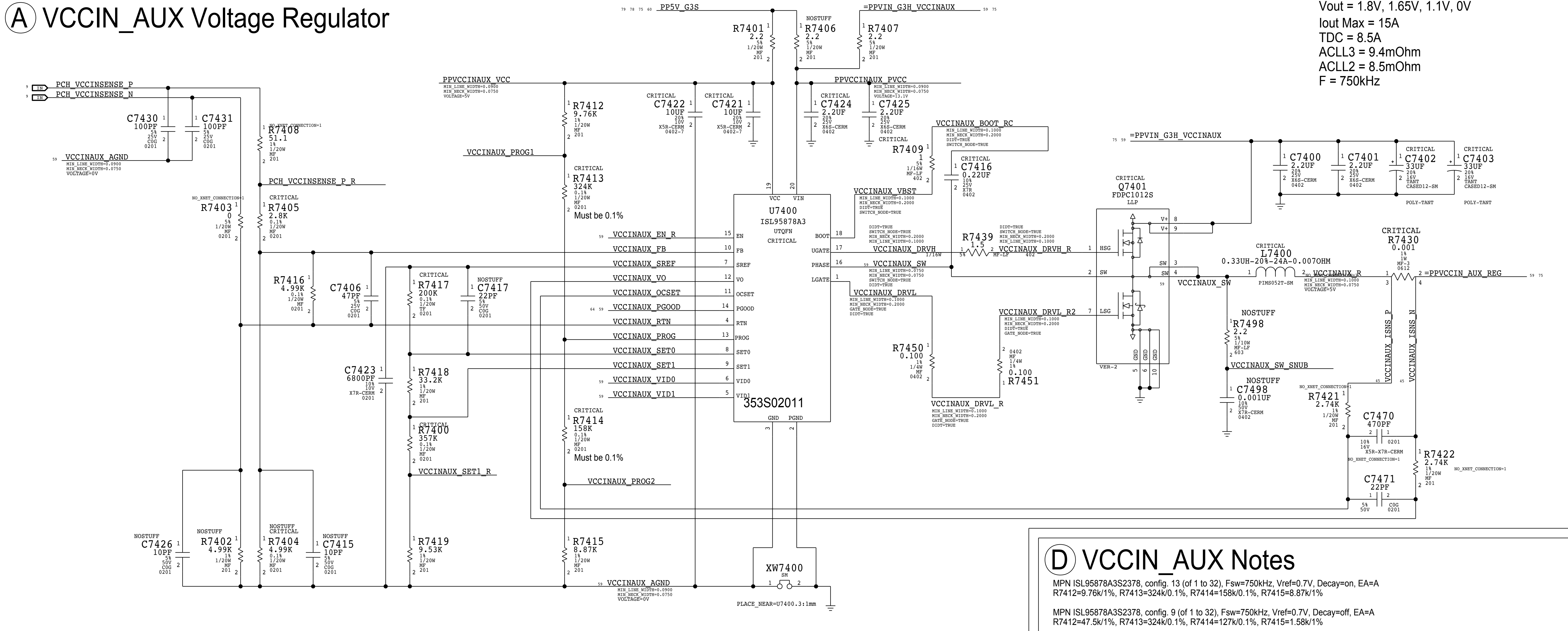
### CPU VCC Phase 3



BOM\_COST\_GROUP=CPU & CHIPSET

SYNC_MASTER=per		SYNC_DATE=10/18/2018	
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		REVISION	4.0.0
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		PAGE	72 OF 152
		SHEET	58 OF 86

# A VCCIN\_AUX Voltage Regulator



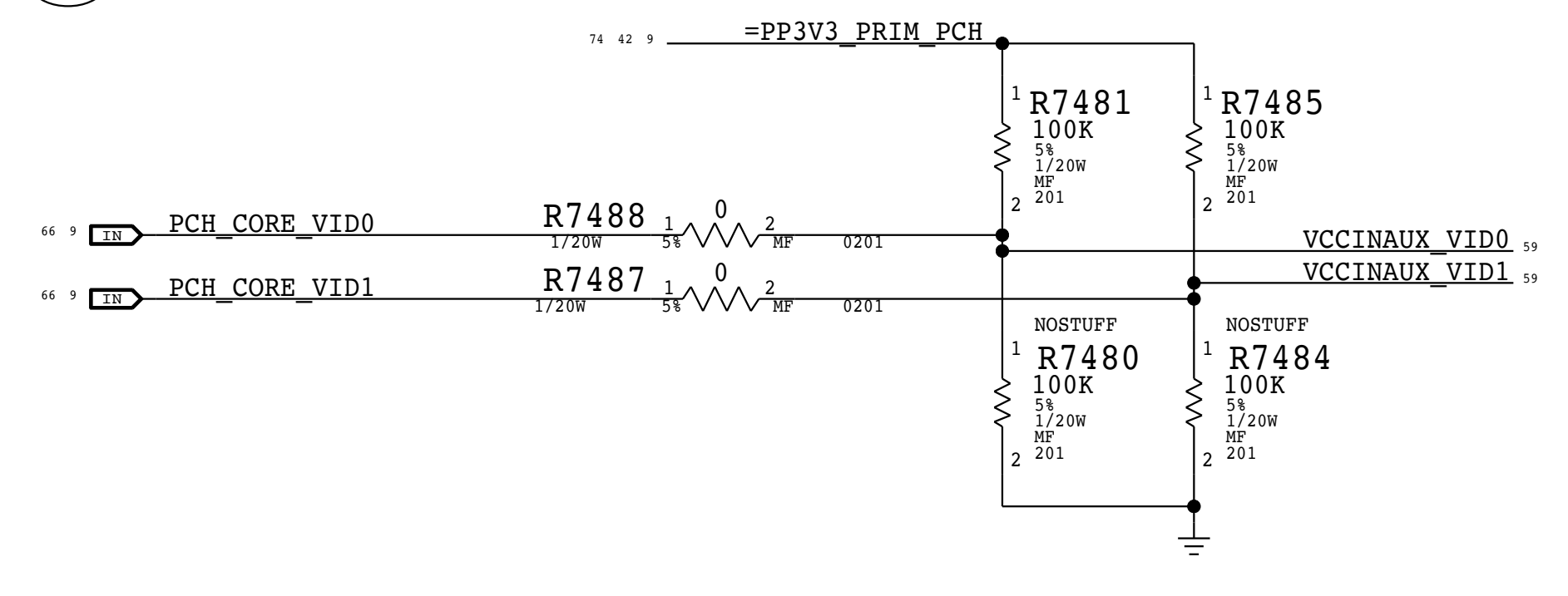
Vout = 1.8V, 1.65V, 1.1V, 0V  
 Iout Max = 15A  
 TDC = 8.5A  
 ACLK3 = 9.4mOhm  
 ACLK2 = 8.5mOhm  
 F = 750kHz

## D VCCIN\_AUX Notes

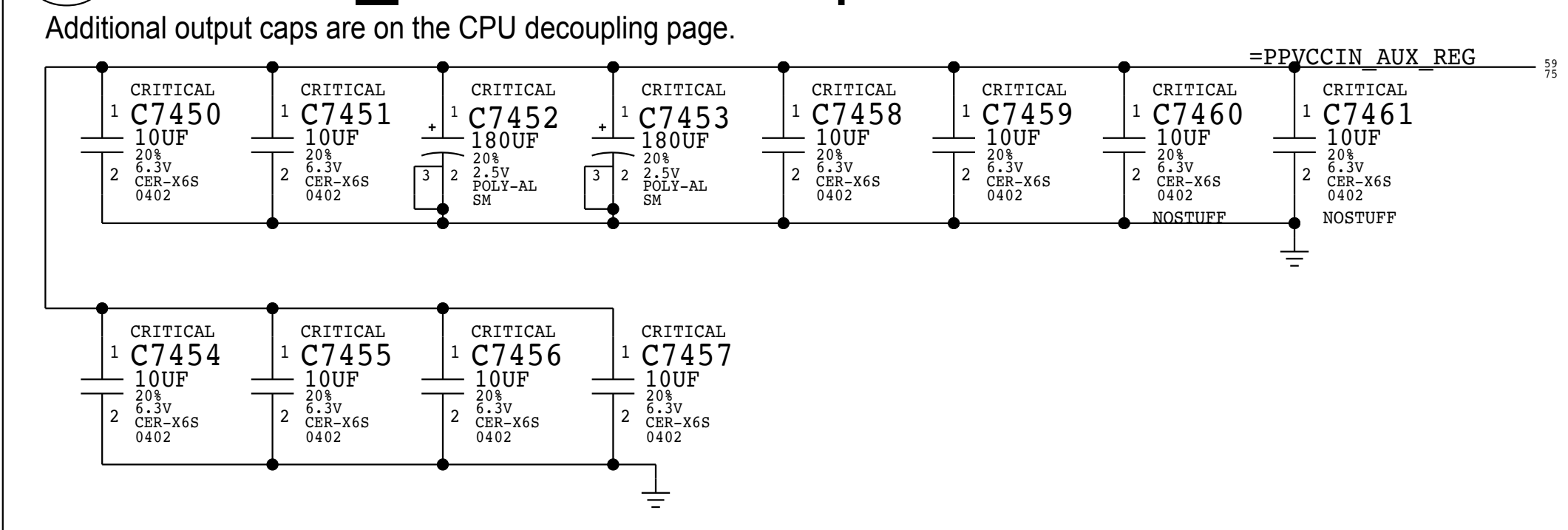
MPN ISL95878A3S2378, config. 13 (of 1 to 32), Fsw=750kHz, Vref=0.7V, Decay=on, EA=A  
 R7412=9.76k/1%, R7413=324k/0.1%, R7414=158k/0.1%, R7415=8.87k/1%

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%

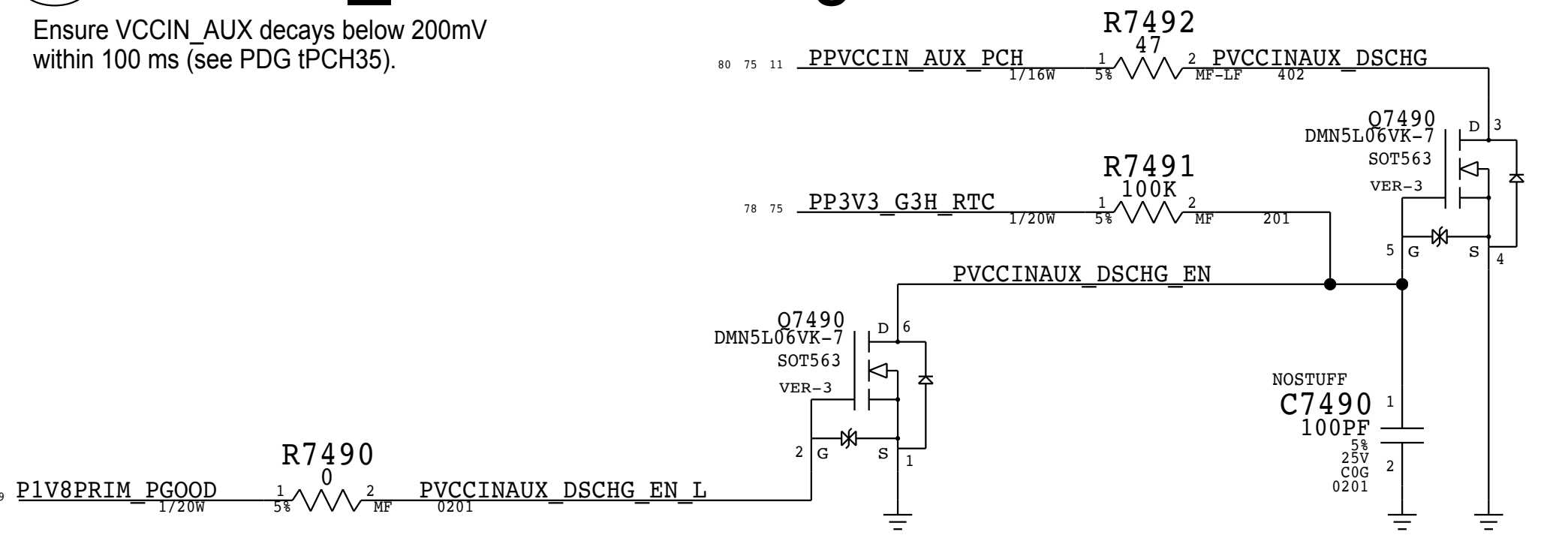
## B VID Control



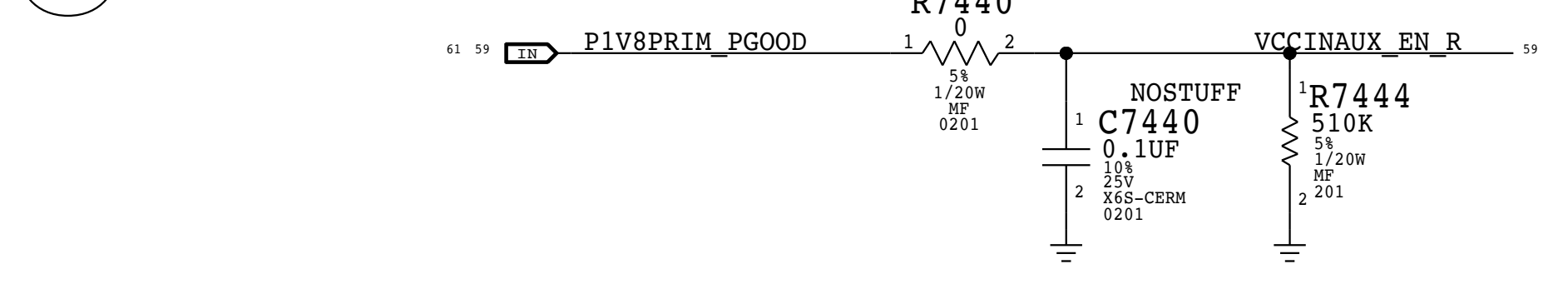
## C VCCIN\_AUX BHC Caps



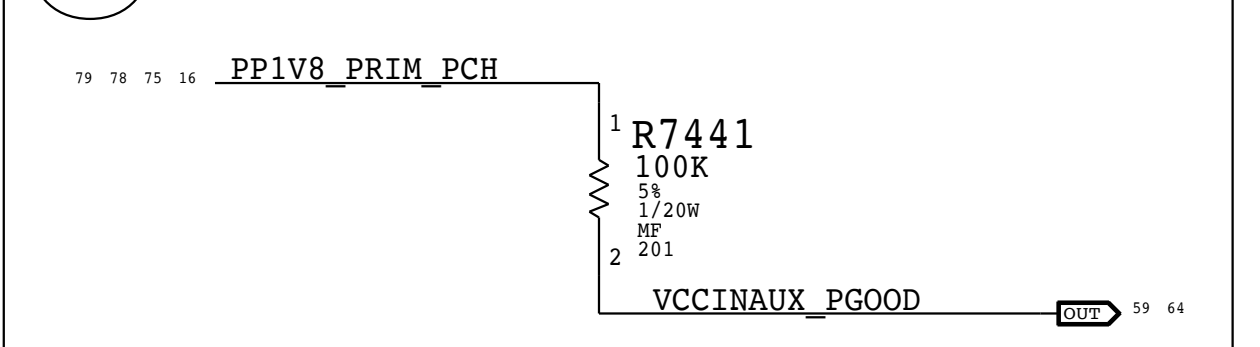
## G VCCIN\_AUX Discharge



## E VR Enable



## F VR PGOOD



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

PAGE TITLE: VR: VCCIN\_AUX ISL

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DRAWING NUMBER: 051-05232

REVISION: 4.0.0

BRANCH: riskramp

PAGE: 74 OF 152

SHEET: 59 OF 86

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5V G3S  
Vout = 5.1V  
Iout Max = 6.41A  
F = 500 KHZ

3V3 G3H  
Vout = 3.3V  
Iout Max = 9.56A  
F = 500 KHZ

D

D

C

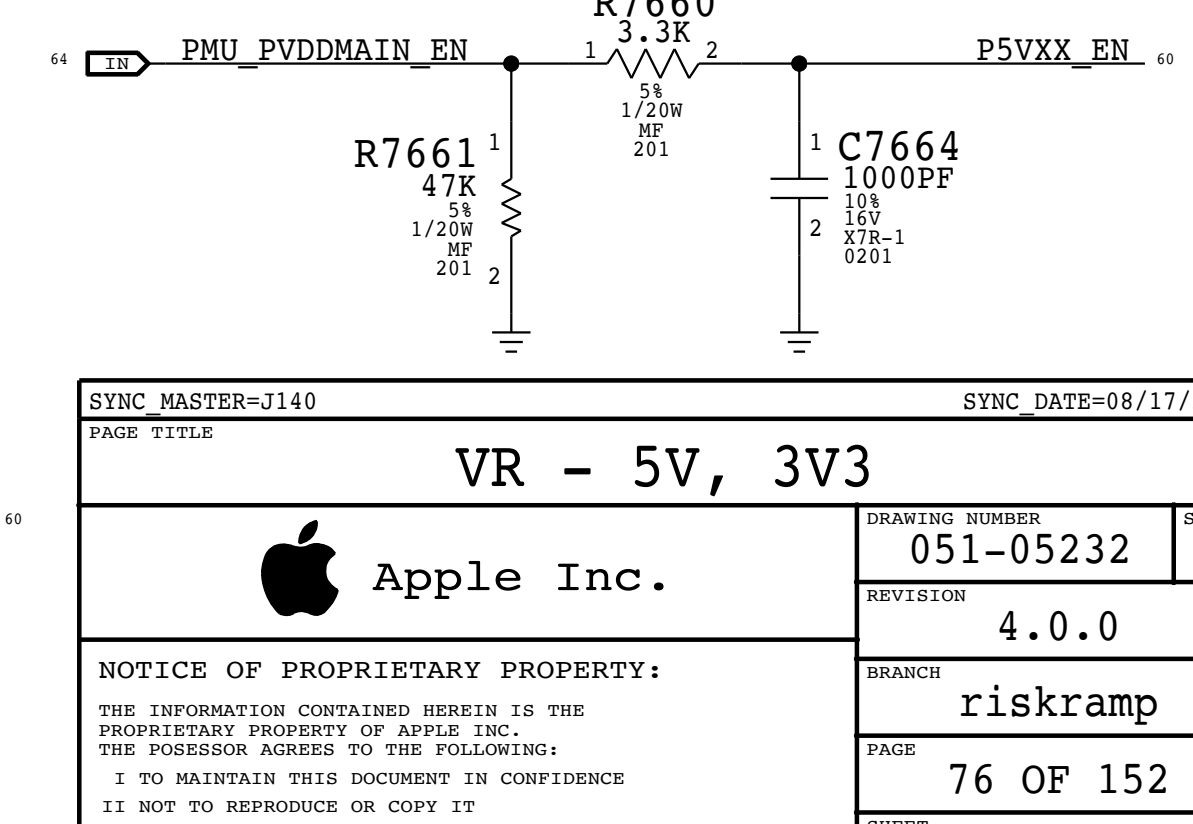
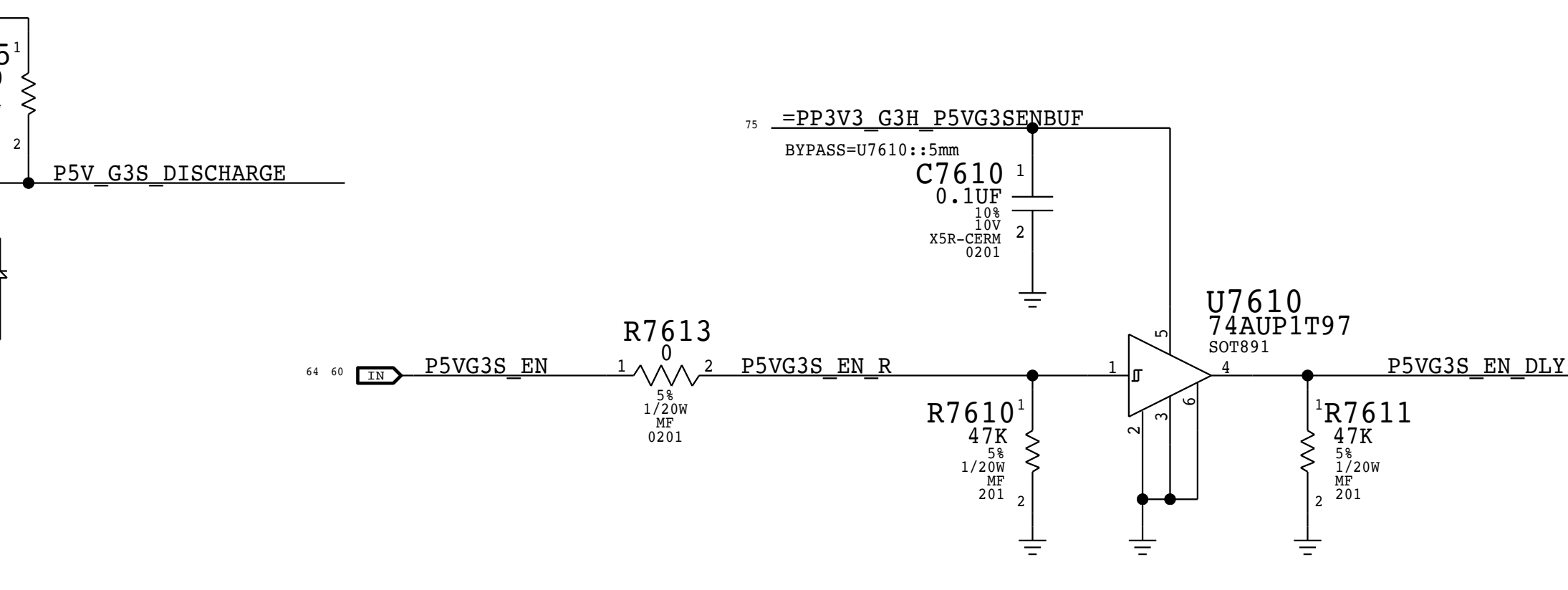
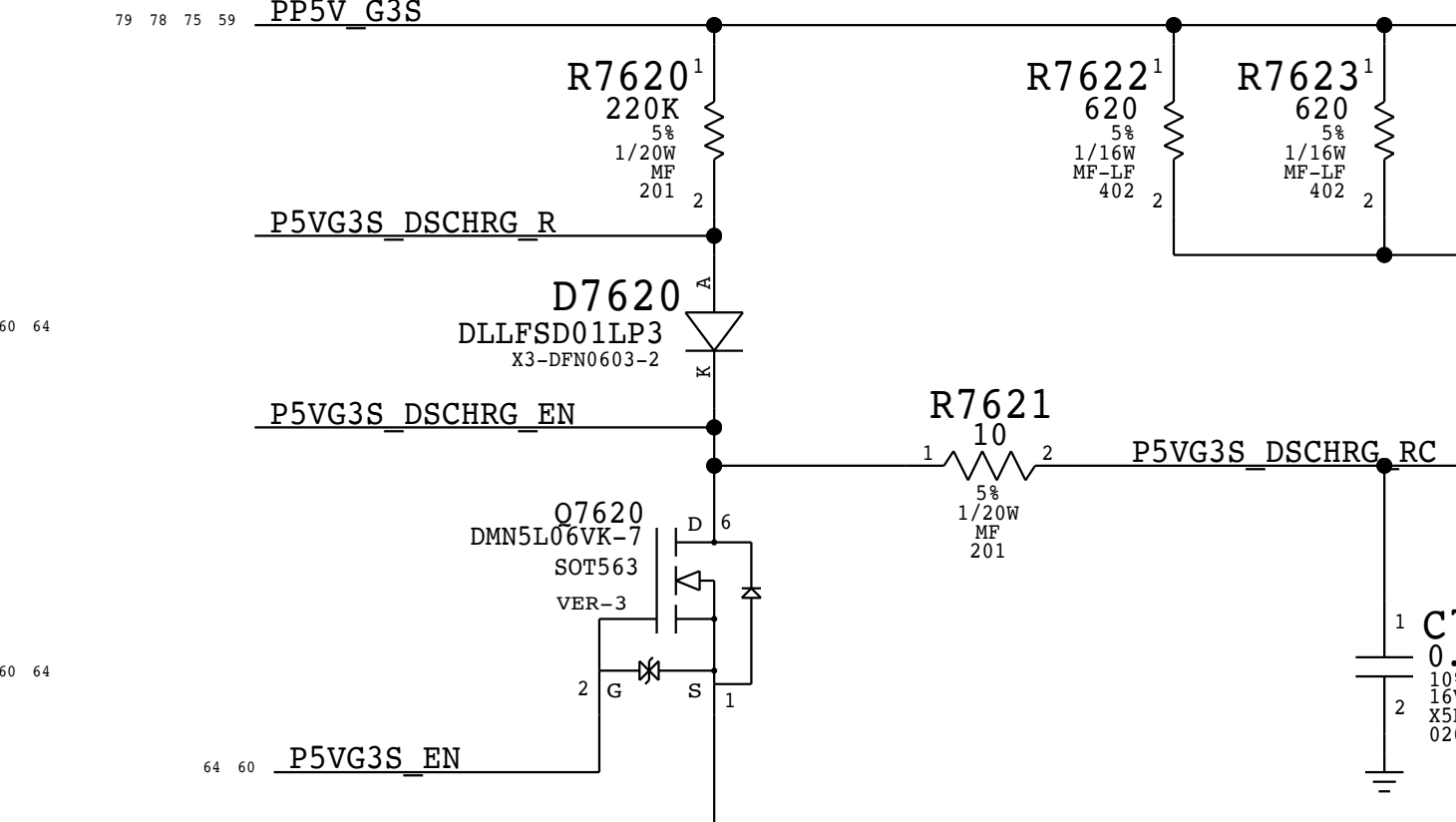
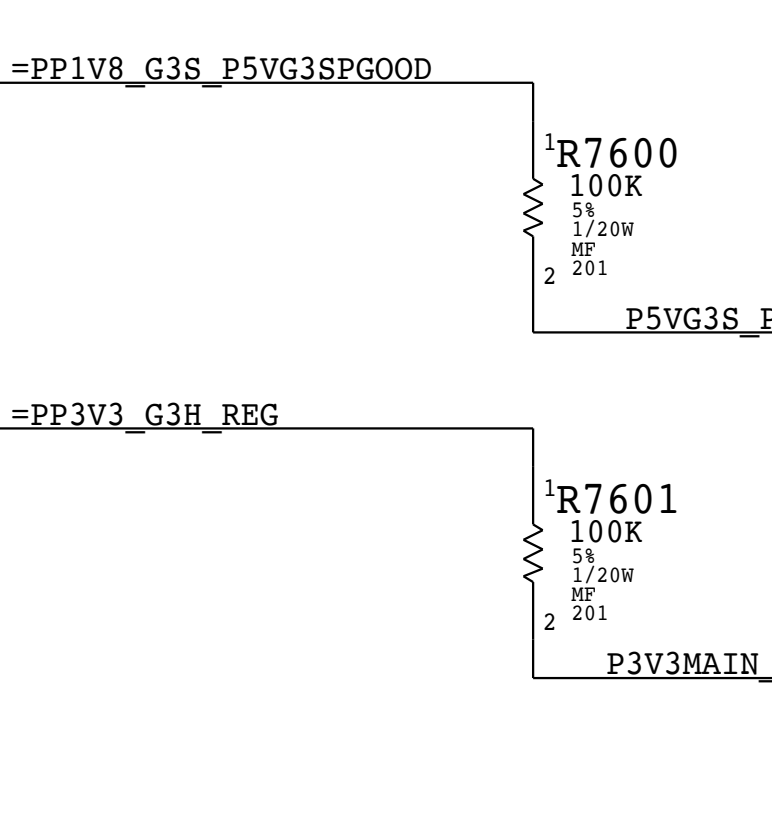
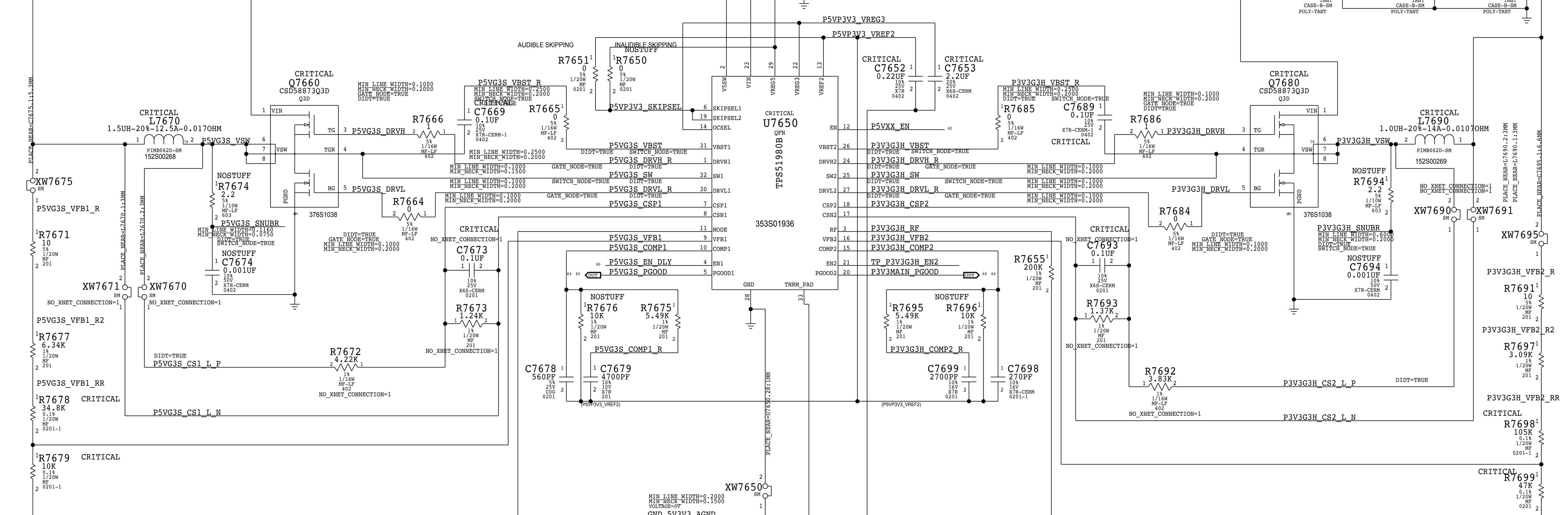
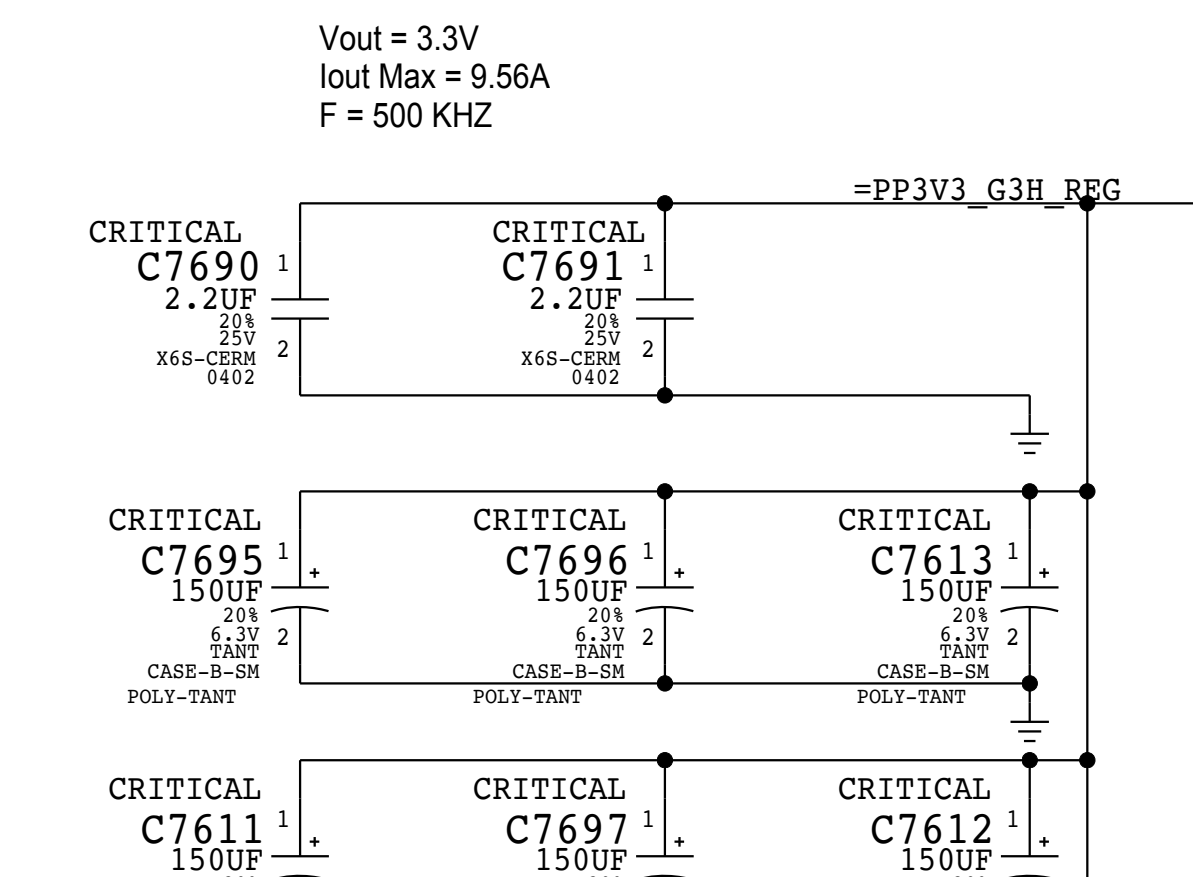
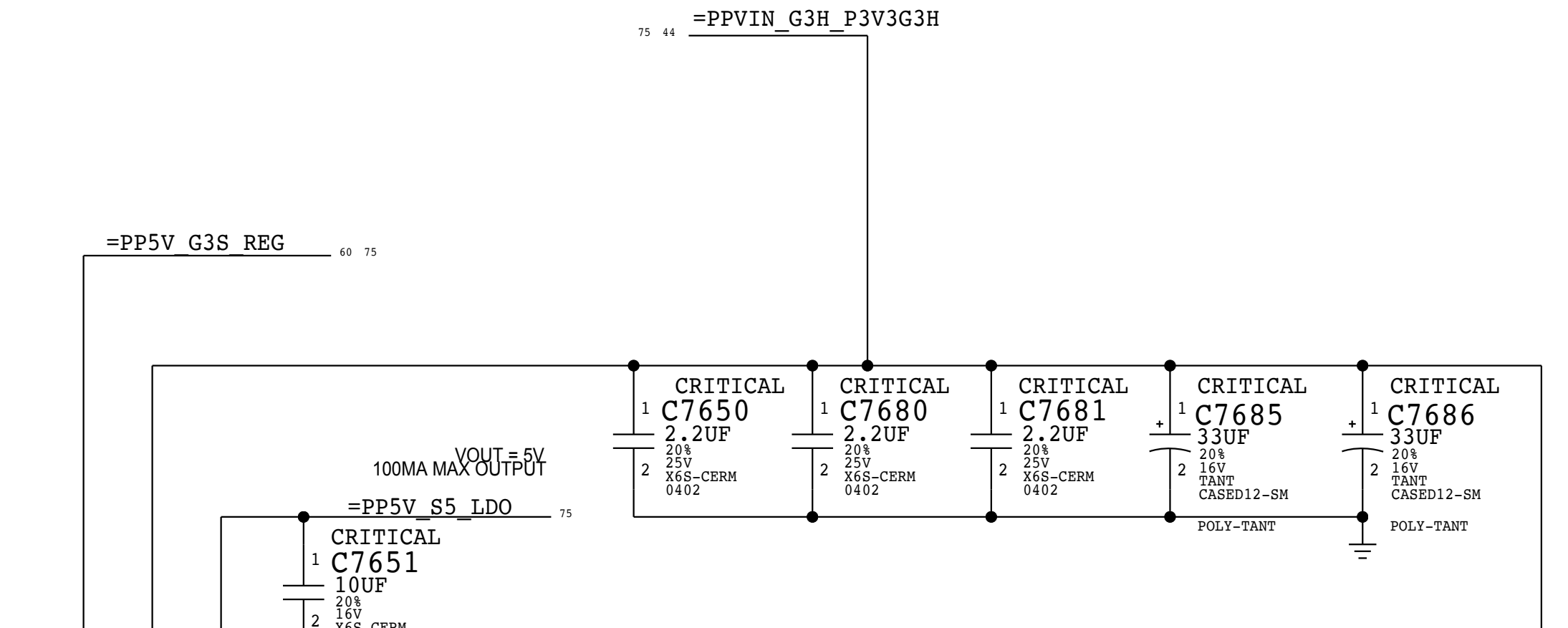
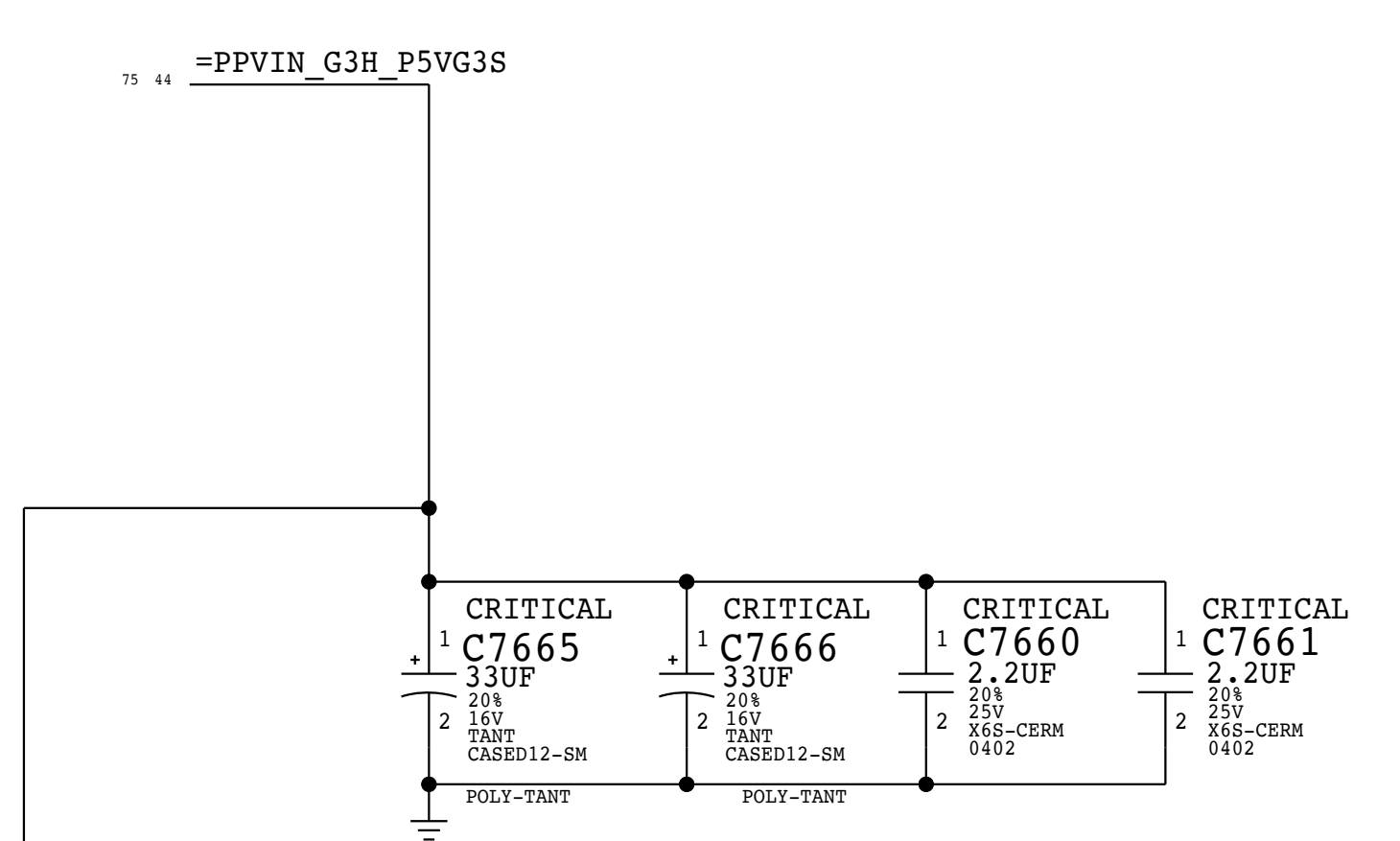
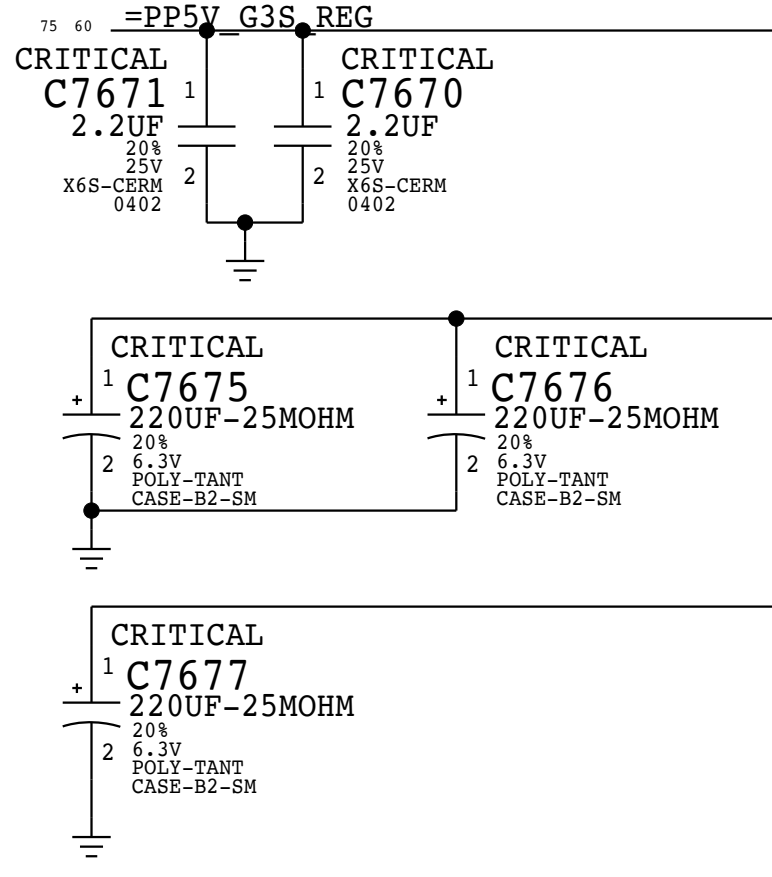
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B

B

A

A

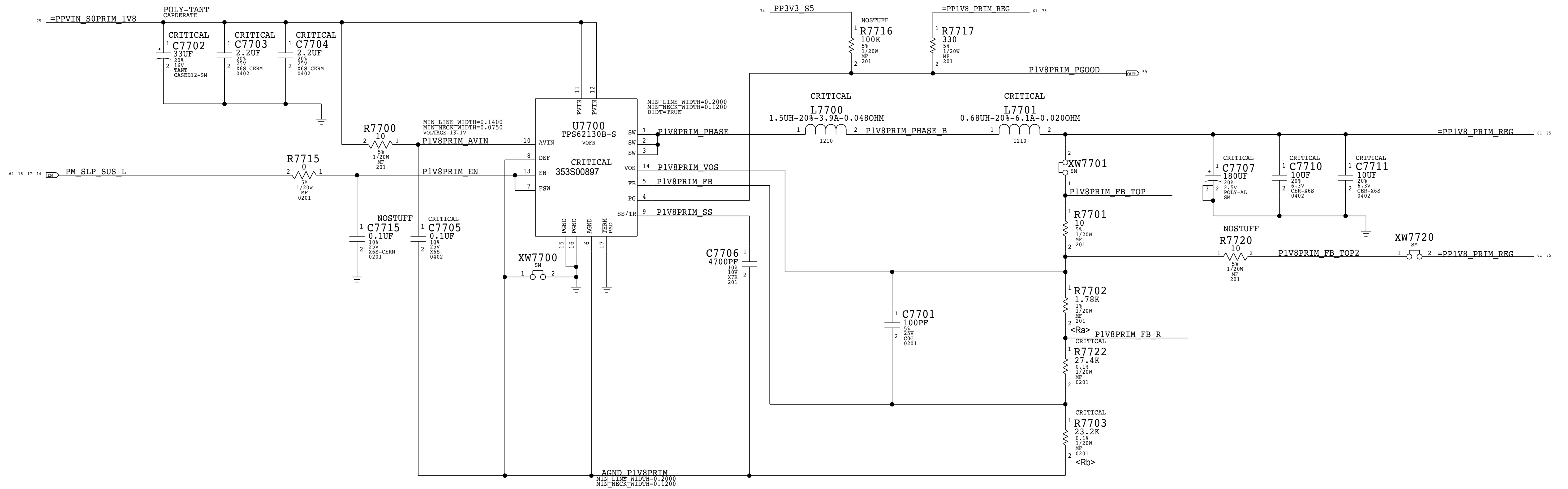


SYNC MASTER=J140		SYNC DATE=08/17/2018	
PAGE TITLE			
<b>VR - 5V, 3V3</b>			
		DRAWING NUMBER	SIZE
		051-05232	D
		REVISION	
		4.0.0	
		BRANCH	
		riskramp	
		PAGE	
		76 OF 152	
		SHEET	
		60 OF 86	

BOM\_COST\_GROUP=PLATFORM POWER

# (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		
	DRAWING NUMBER	051-05232
	REVISION	4.0.0
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	PAGE	77 OF 152
	SHEET	61 OF 86

Note : Design based on Calpe ERS - D2449-A0-110-00\_0v3.pdf (Radar# 24696002)  
 System Block Diagram - T290 Power System Architecture . v9  
 Optimize componentS for individual projects based on EDP(A)

Vout = 0.625V - 1.06V  
 Iout Max = 12.5A  
 F = 2MHz & 4MHz  
 =PPVDDCPU\_AWAKE\_REG

Vout = 0.8V - 1.06V  
 Iout Max = 0.923A  
 F = 3MHz  
 =PPVDDCPUSRAM\_AWAKE\_REG

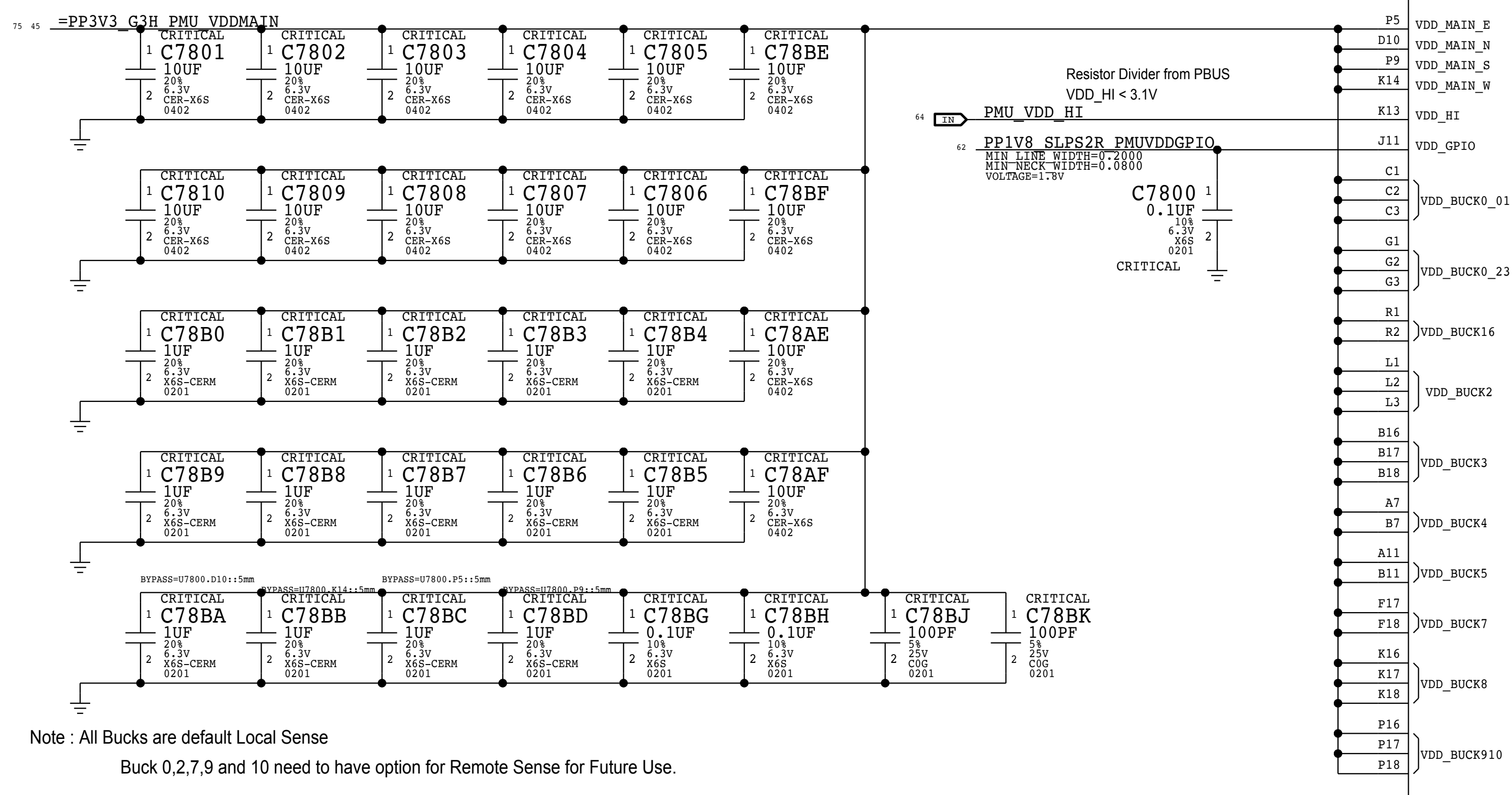
Vout = 0.82V  
 Iout Max = 3.93A  
 F = 3MHz  
 =PPV082\_SLPPDDR\_REG

Vout = 1.8V  
 Iout Max = 1.5A  
 F = 3MHz

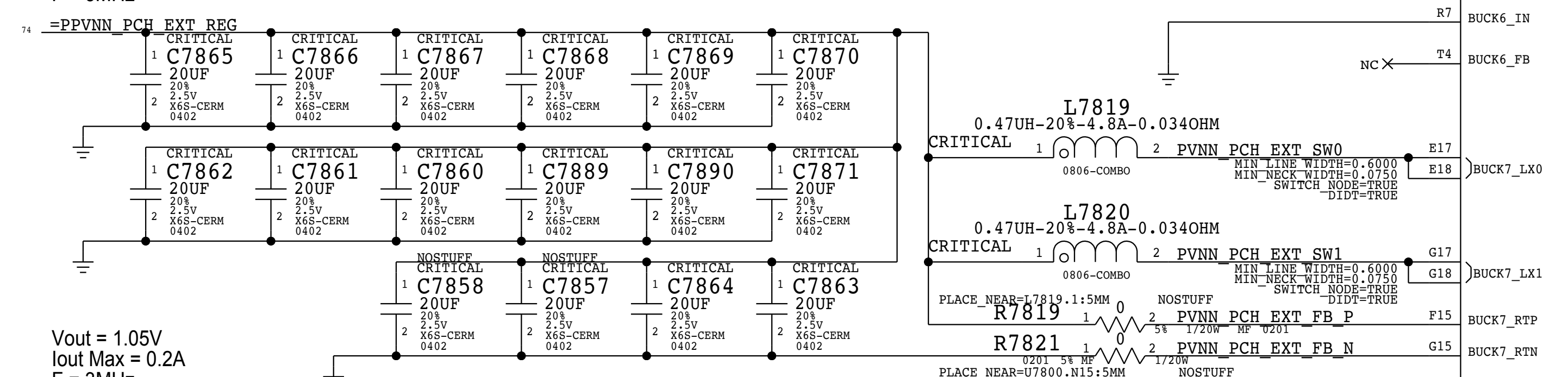
Vout = 1.1V  
 Iout Max = 1.4A  
 F = 3MHz

Vout = 0.9V  
 Iout Max = 2.64A  
 F = 3MHz

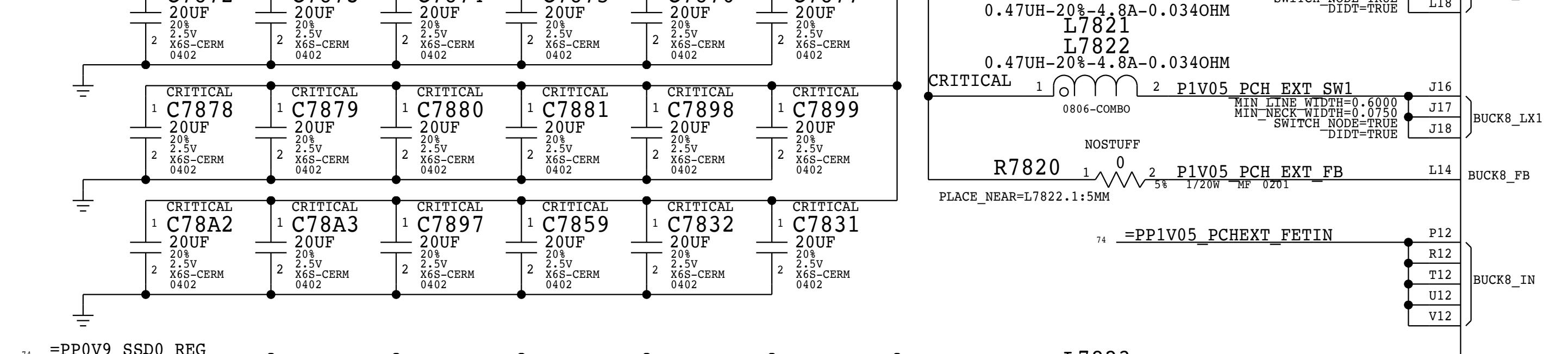
Vout = 1.8V  
 Iout Max = 1.3A  
 F = 3MHz



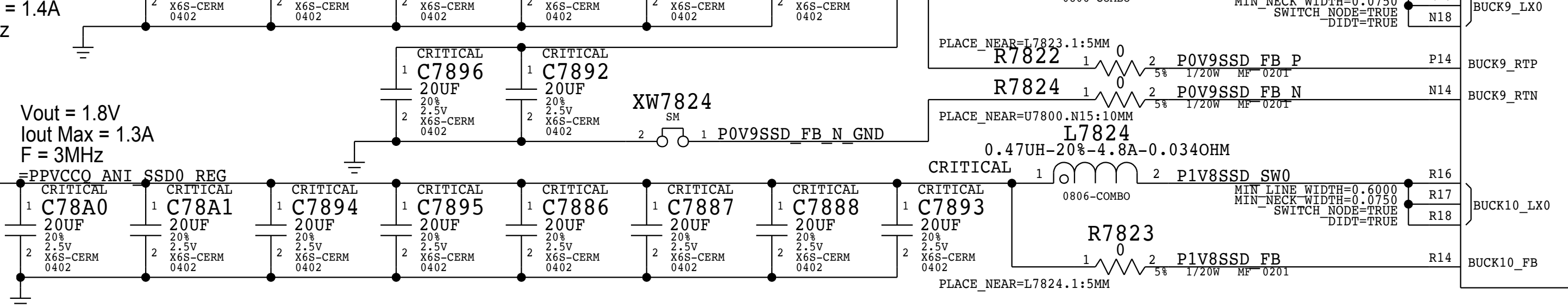
VOUT = 1.05V (0.76V in LPM)  
 Iout Max = 0.2A  
 F = 3MHz



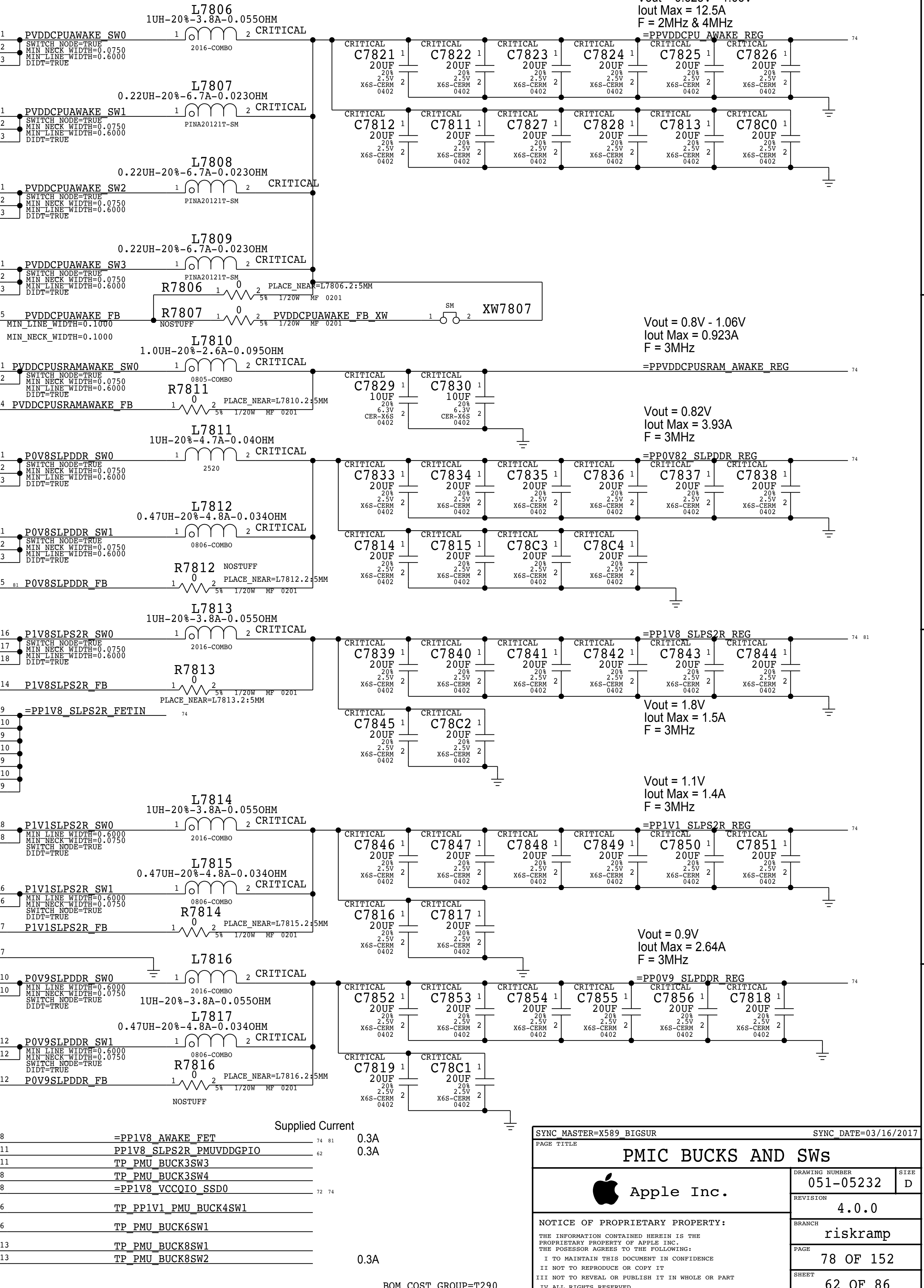
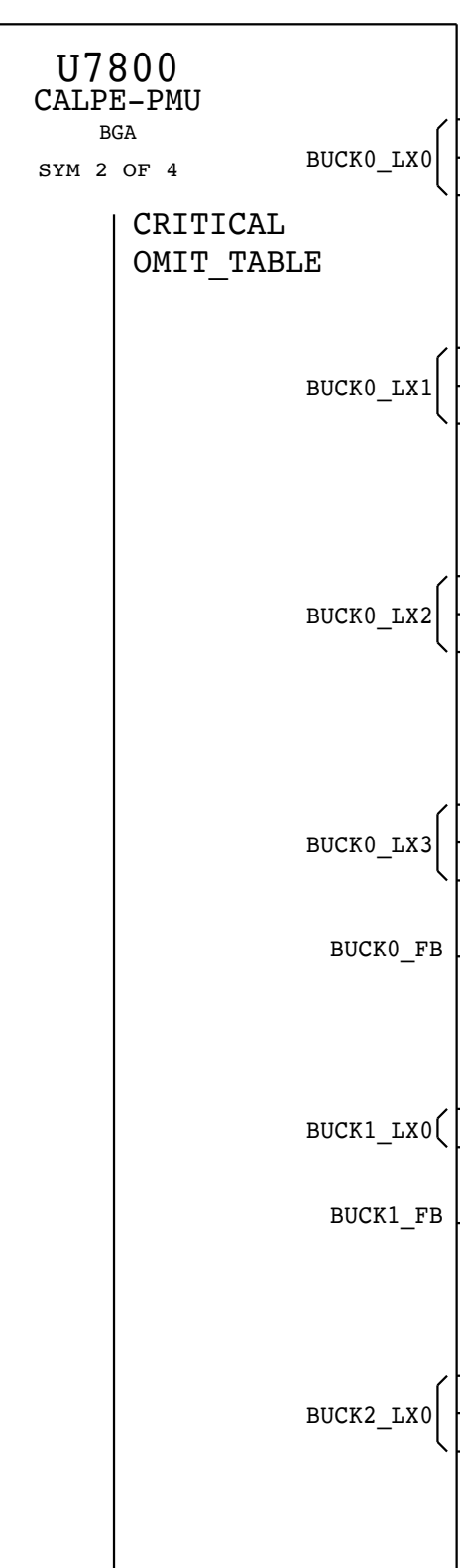
Vout = 1.05V  
 Iout Max = 0.2A  
 F = 3MHz



Vout = 0.9V  
 Iout Max = 1.4A  
 F = 3MHz



Vout = 1.8V  
 Iout Max = 1.3A  
 F = 3MHz



Supplied Current

BUCK3_SW1	T8	=PP1V8_AWAKE_FET	74 81	0.3A
BUCK3_SW2	T11	PP1V8_SLPS2R_PMUVDDGPI0	62	0.3A
BUCK3_SW3	V11	TP_PMU_BUCK3SW3		
BUCK3_SW4	V8	TP_PMU_BUCK3SW4		
BUCK3_SW5	R8	=PP1V8_VCCQIO_SSD0	72 74	
BUCK4_SW1	P6	TP_PP1V1_PMU_BUCK4SW1		
BUCK4_SW2	R6	TP_PMU_BUCK6SW1		
BUCK8_SW1	P13	TP_PMU_BUCK8SW1		
BUCK8_SW2	R13	TP_PMU_BUCK8SW2		0.3A

SYNC MASTER=X589 BIGSUR		SYNC DATE=03/16/2017	
PAGE TITLE			
<b>PMIC BUCKS AND SWs</b>			
Apple Inc.		DRAWING NUMBER	051-05232
		SIZE	D
		REVISION	4.0.0
		BRANCH	riskramp
		PAGE	78 OF 152
		SHEET	62 OF 86
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BOM\_COST\_GROUP=T290



D

D

C

C

B

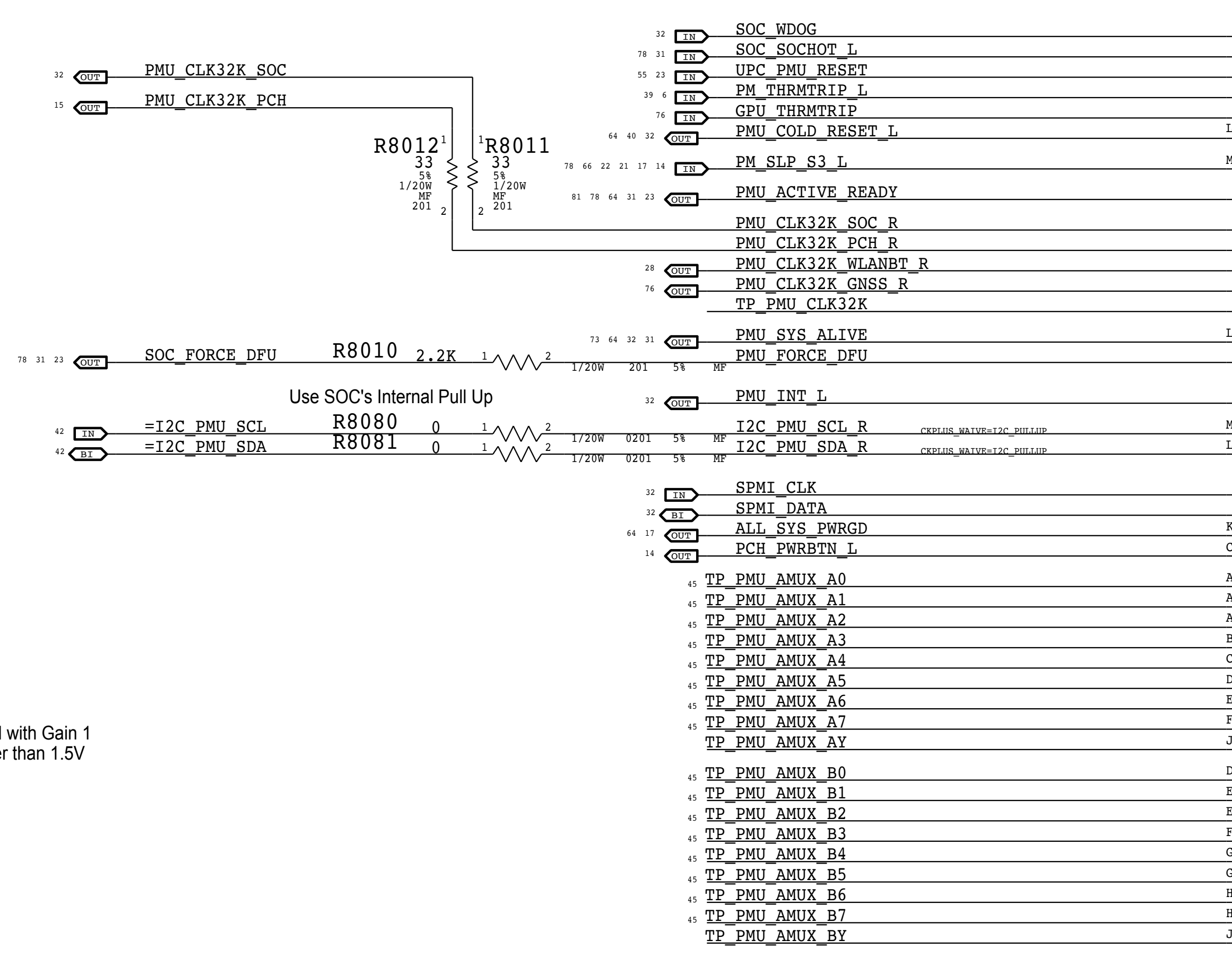
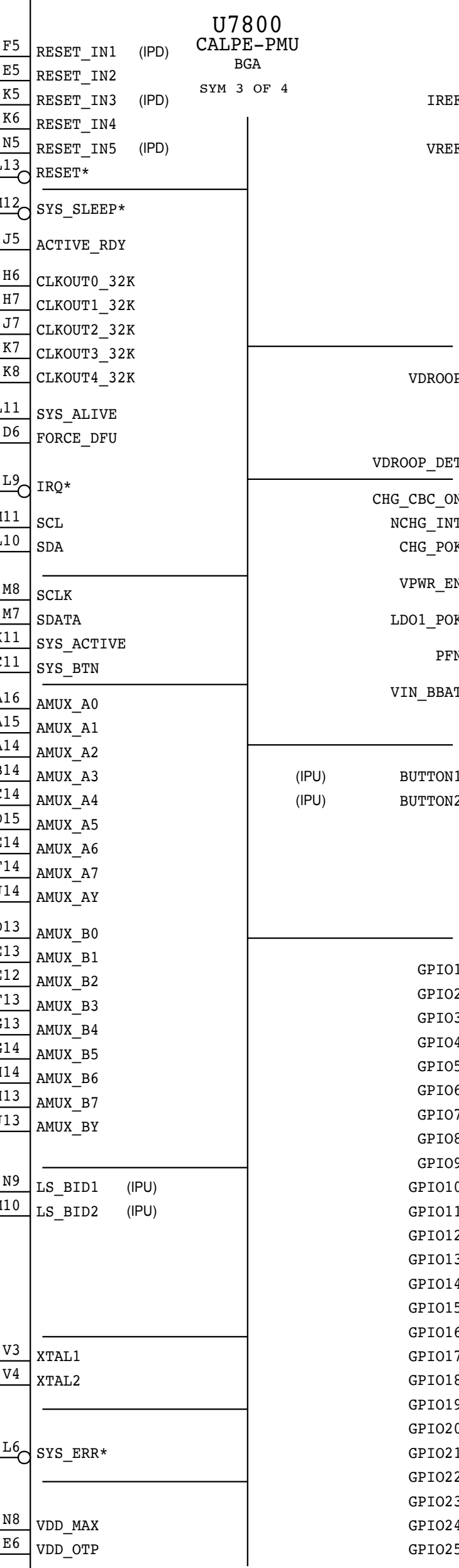
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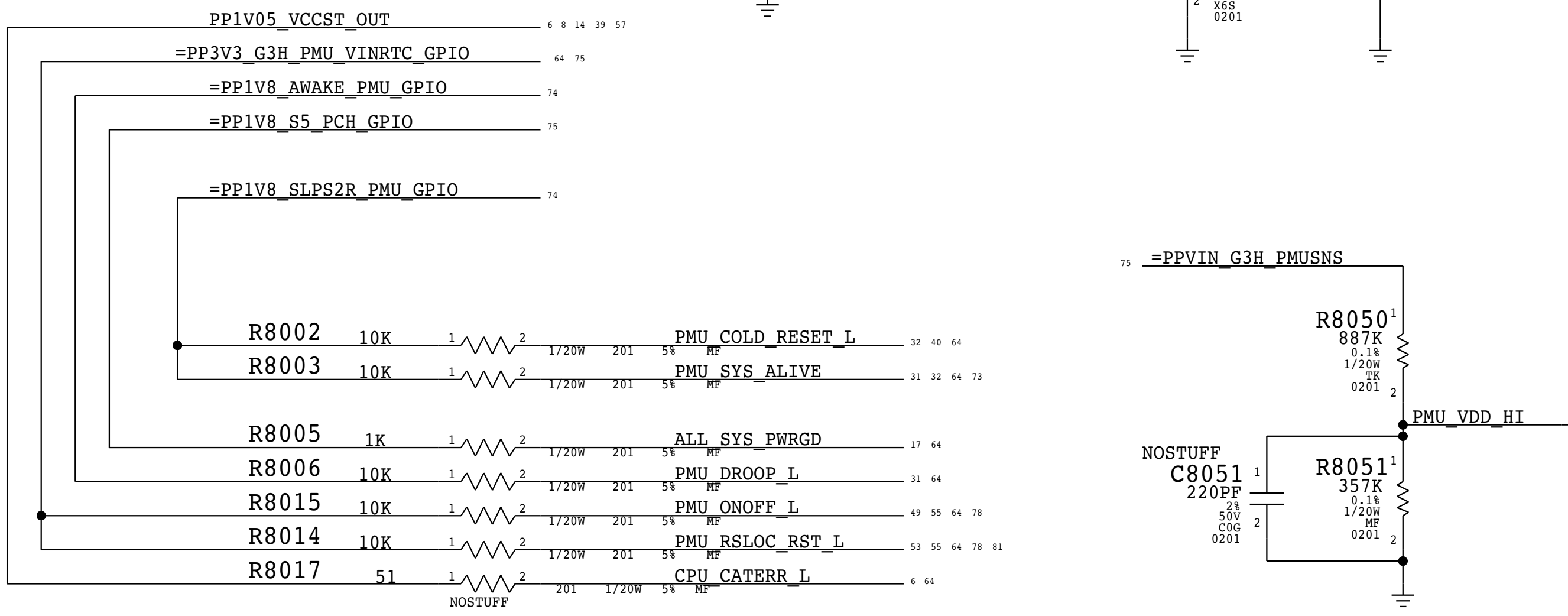
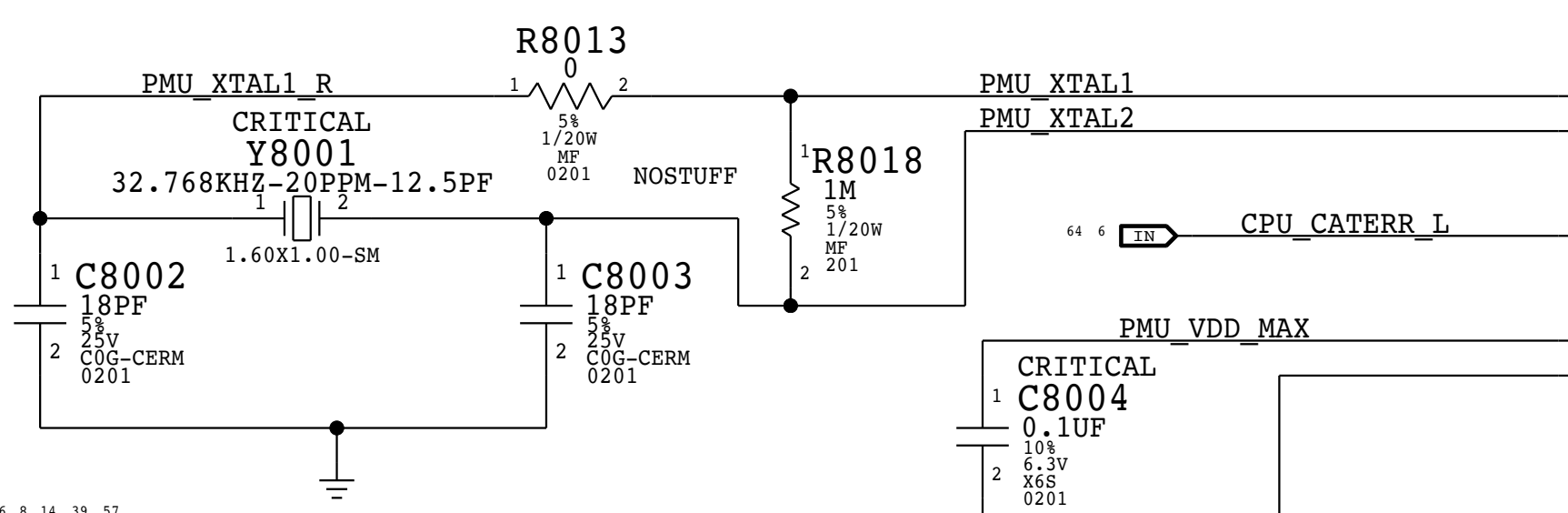
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CRITICAL

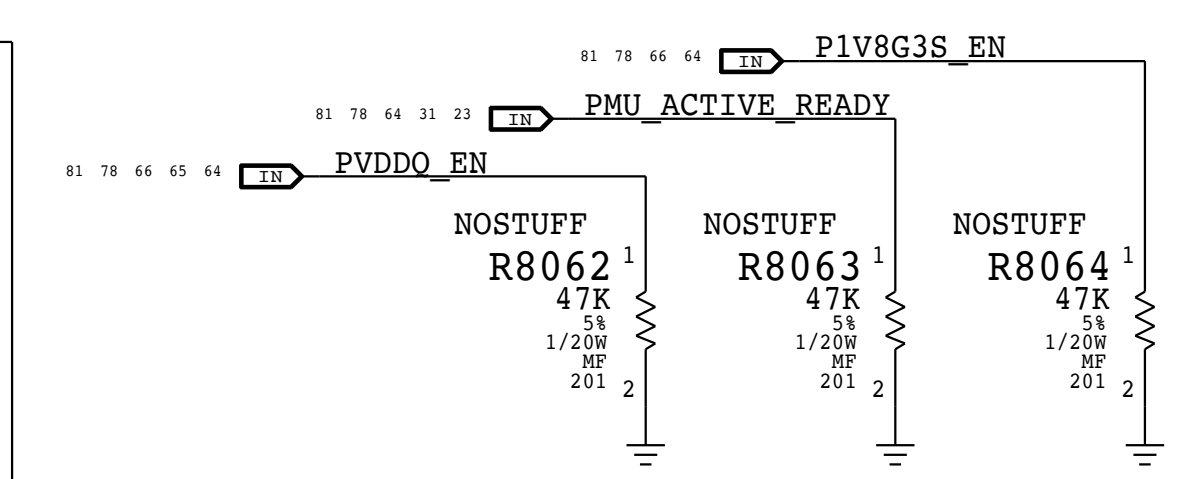
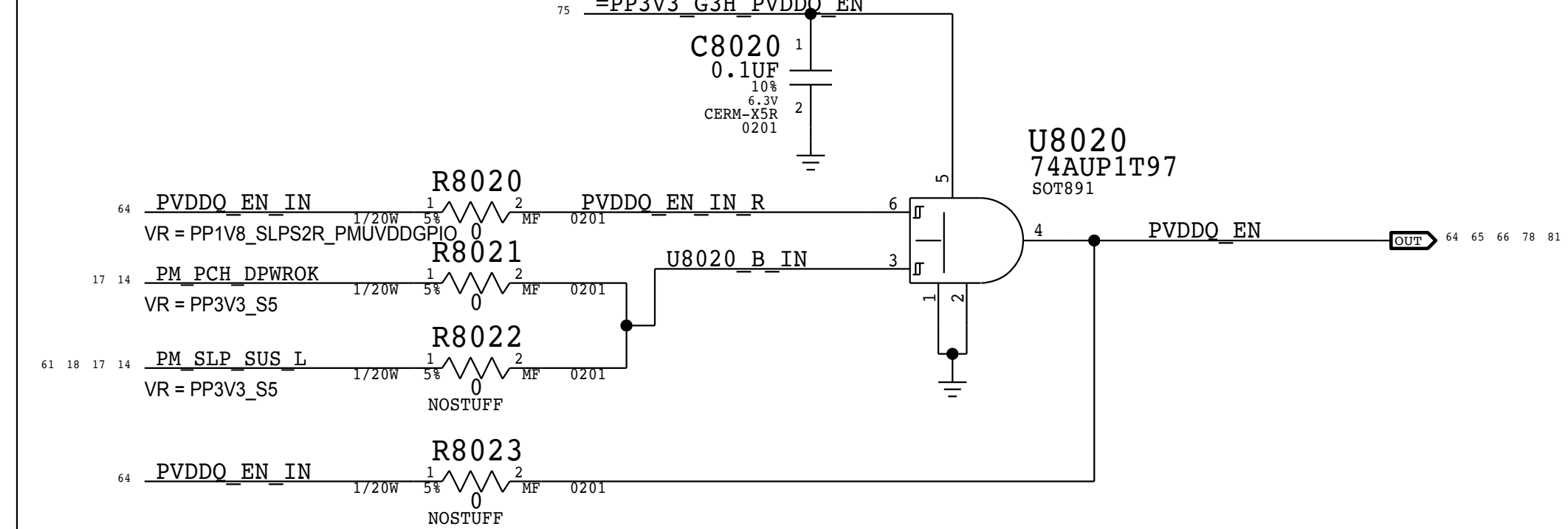
OMIT\_TABLE



Caution : AMUX programmed with Gain 1 should not have inputs greater than 1.5V



A PVDDQ\_EN Sequencing

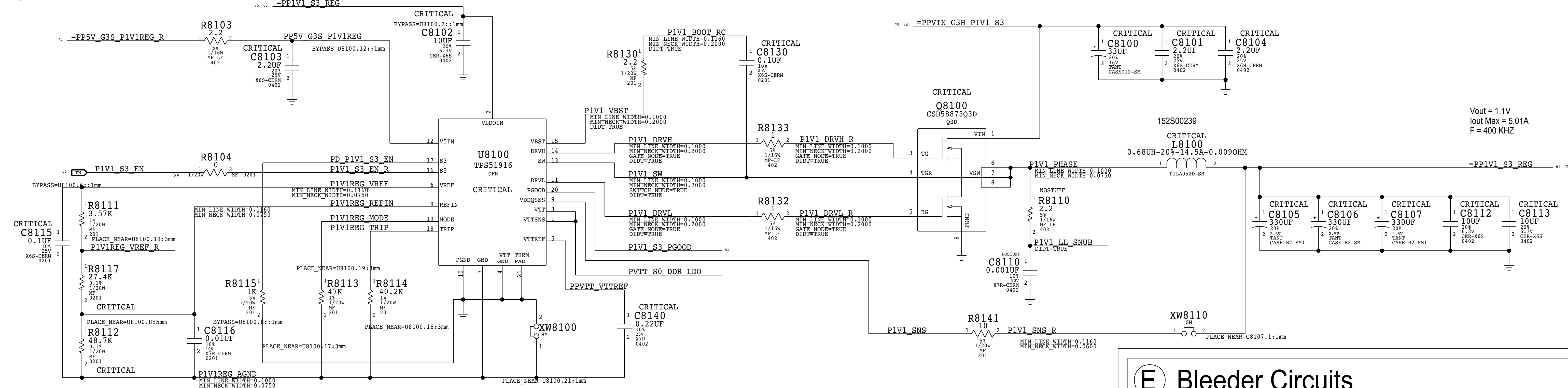


PAGE TITLE		DRAWING NUMBER		SIZE
PMIC GPIOs & Control		051-05232		D
Apple Inc.		REVISION		4.0.0
BRANCH		PAGE		riskramp
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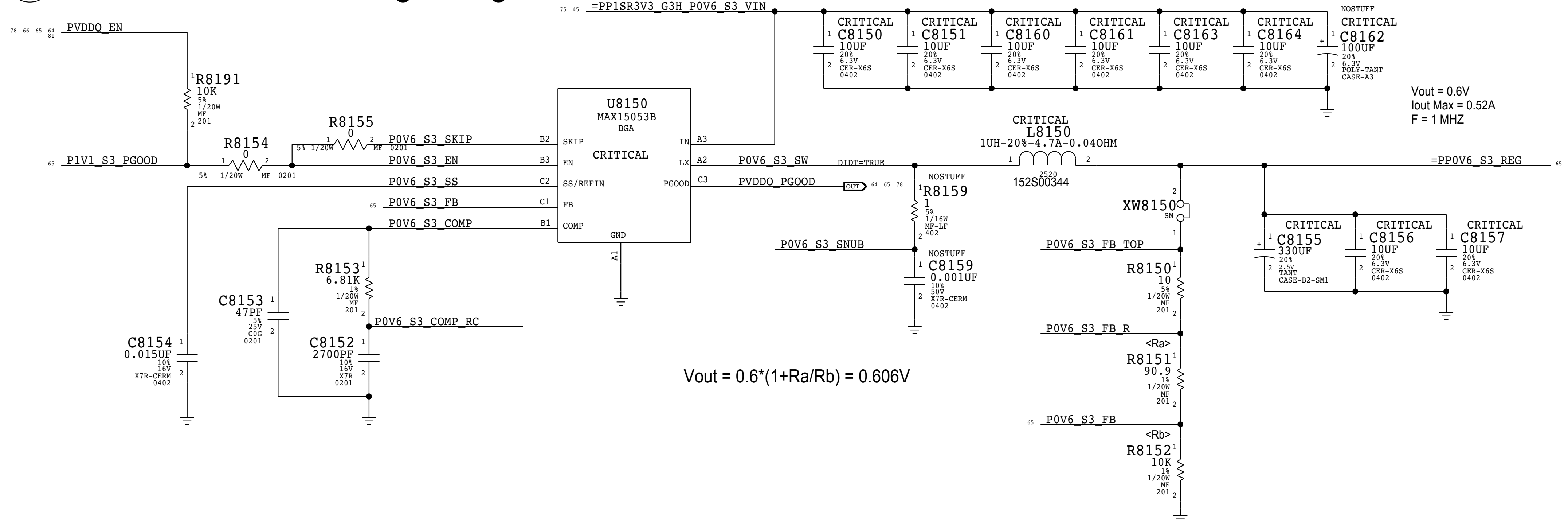
BOM\_COST\_GROUP=T290



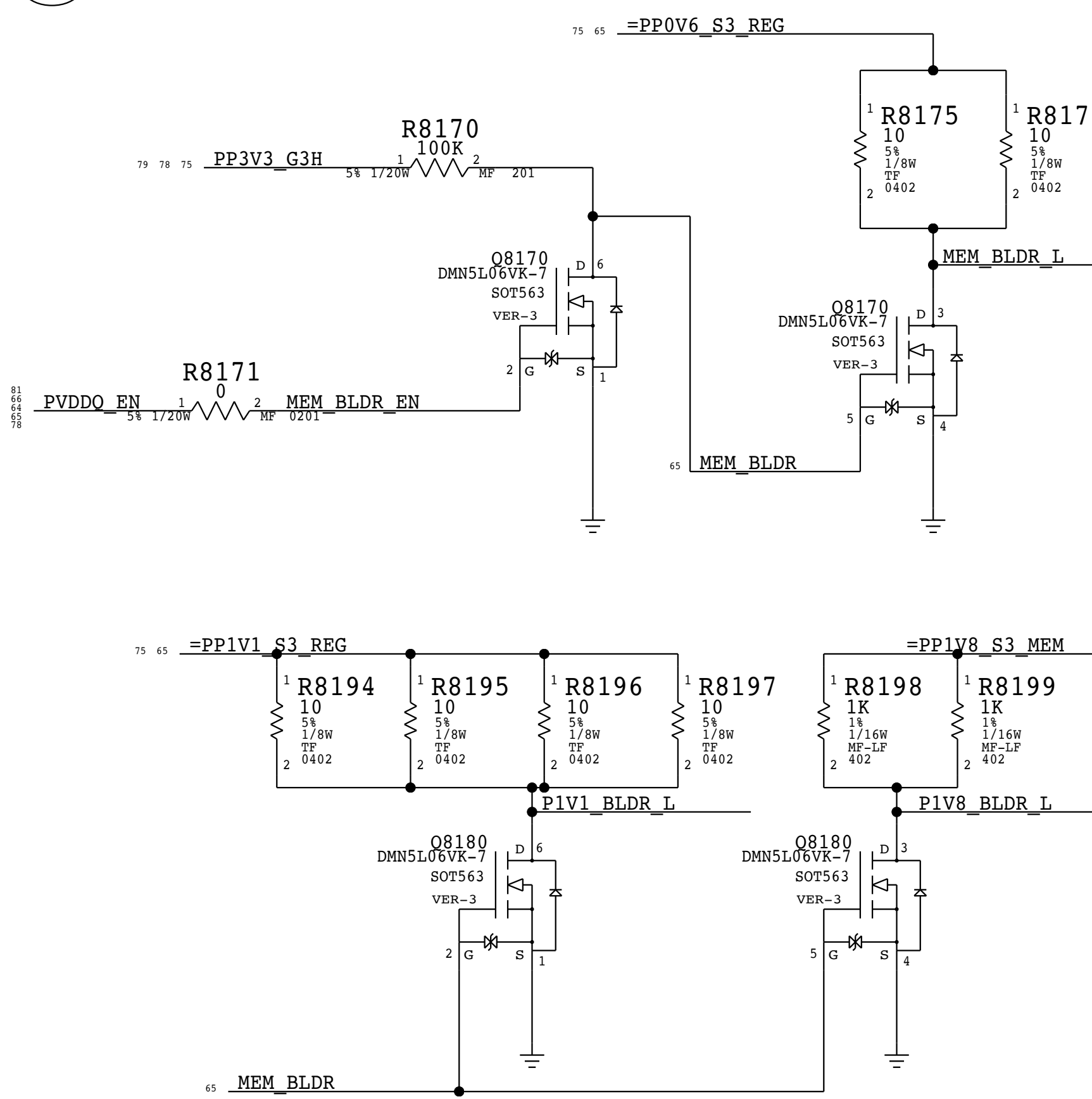
### (A) VDD2 1.1V S3 Voltage Regulator



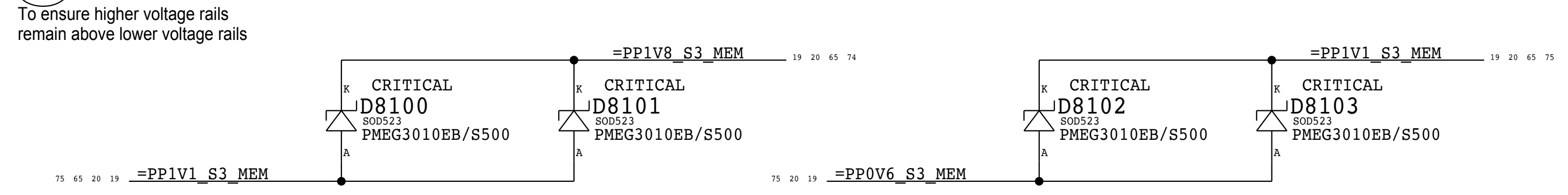
### (B) VDDQ 0.6V S3 Voltage Regulator



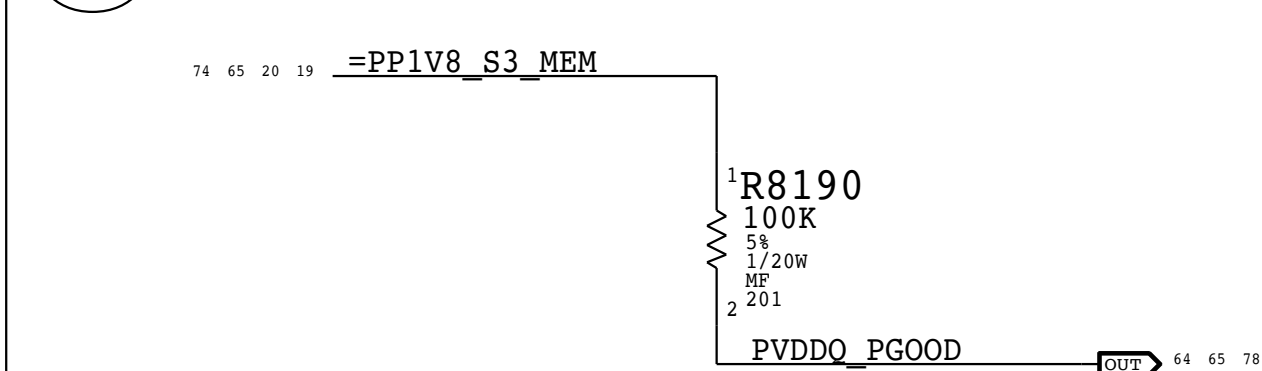
### (E) Bleeder Circuits



### (C) Protection Diodes

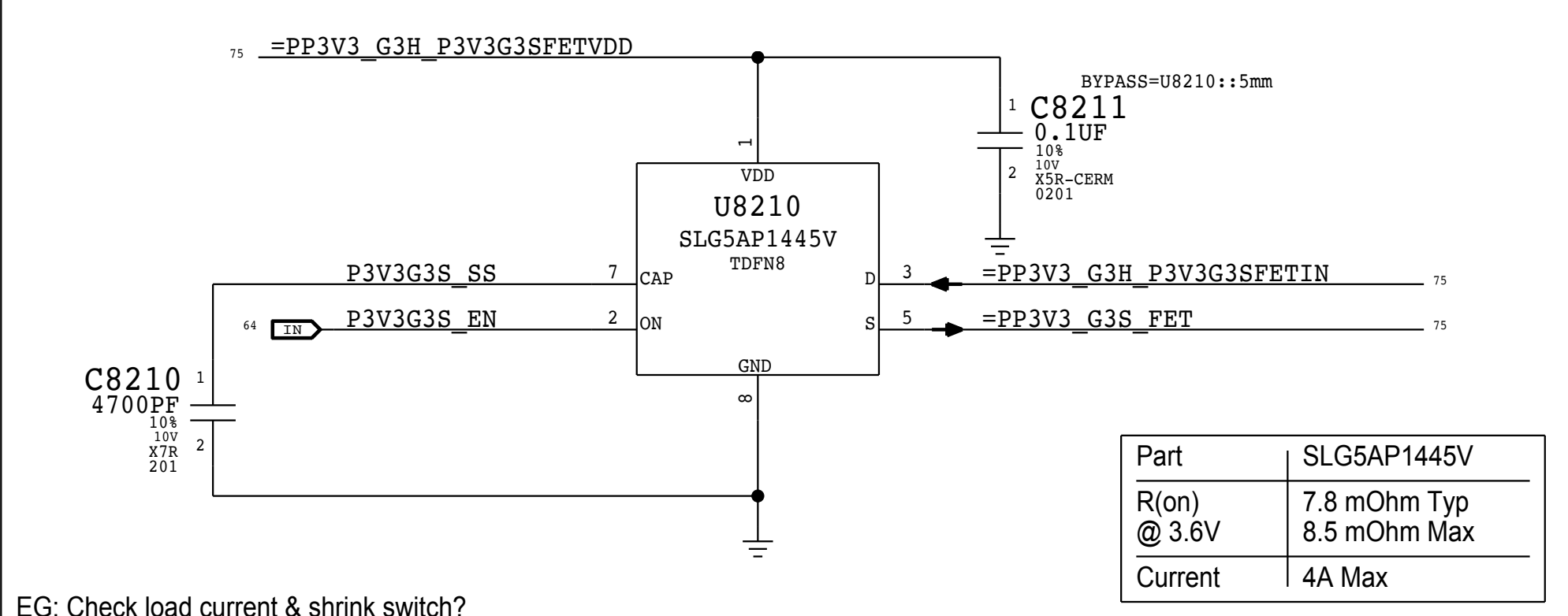


### (D) PVDDQ PGOOD



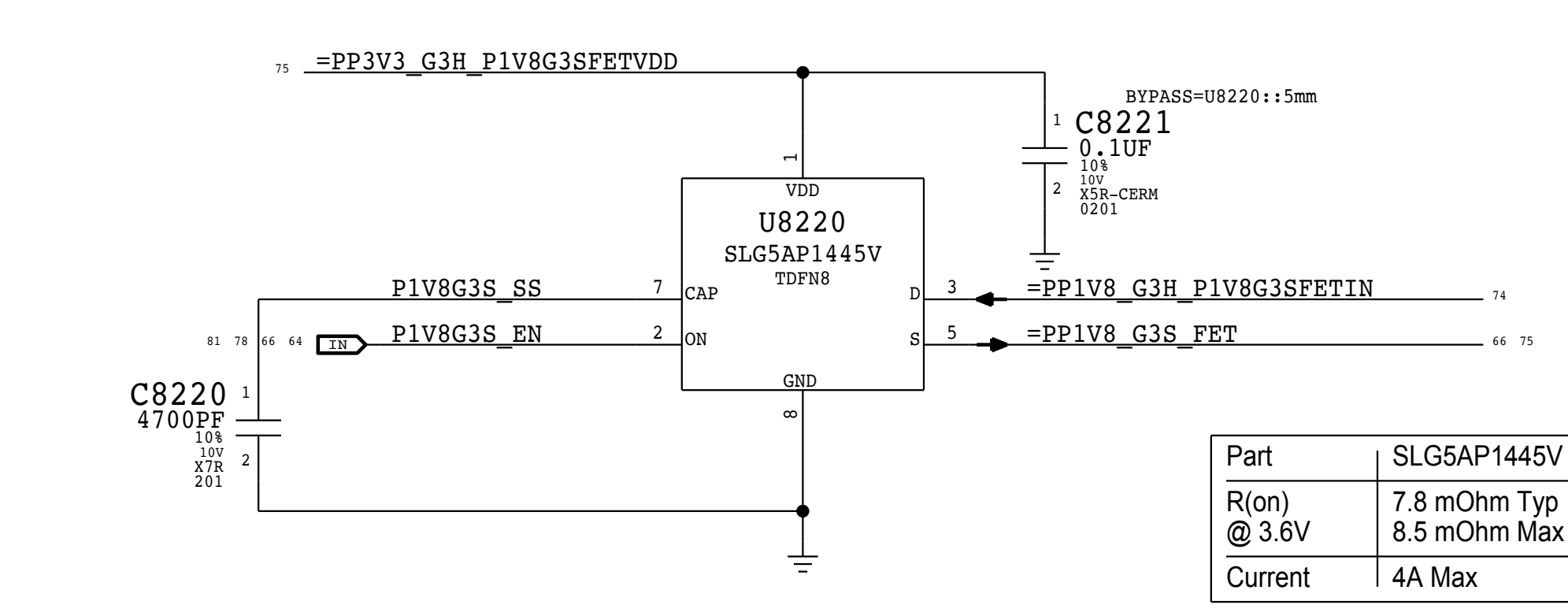
SYNC_MASTER=X589_CPU_CN1_V		SYNC_DATE=10/12/2018	
PAGE TITLE: POWER - MEMORY VRs			
Apple Inc.		DRAWING NUMBER	051-05232
		REVISION	4.0.0
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		PAGE	81 OF 152
		SHEET	65 OF 86

### A 3.3V G3 Standby Switch

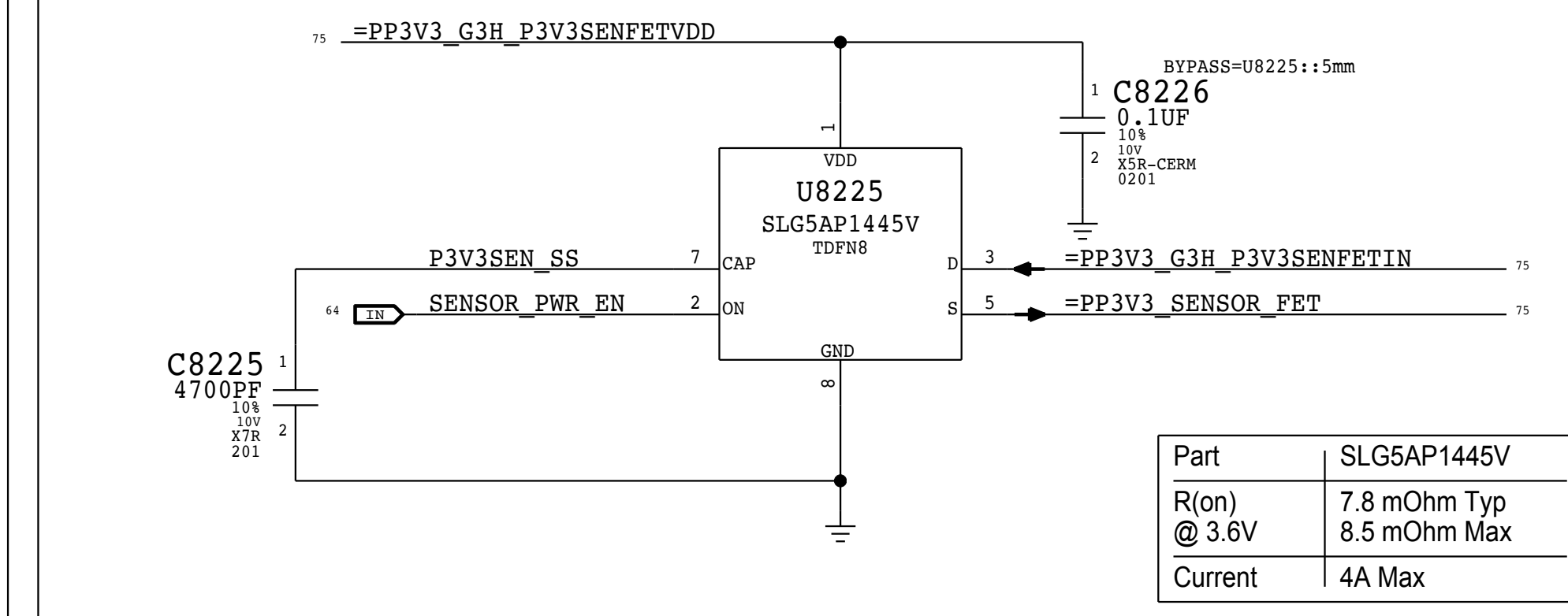


EG: Check load current & shrink switch?

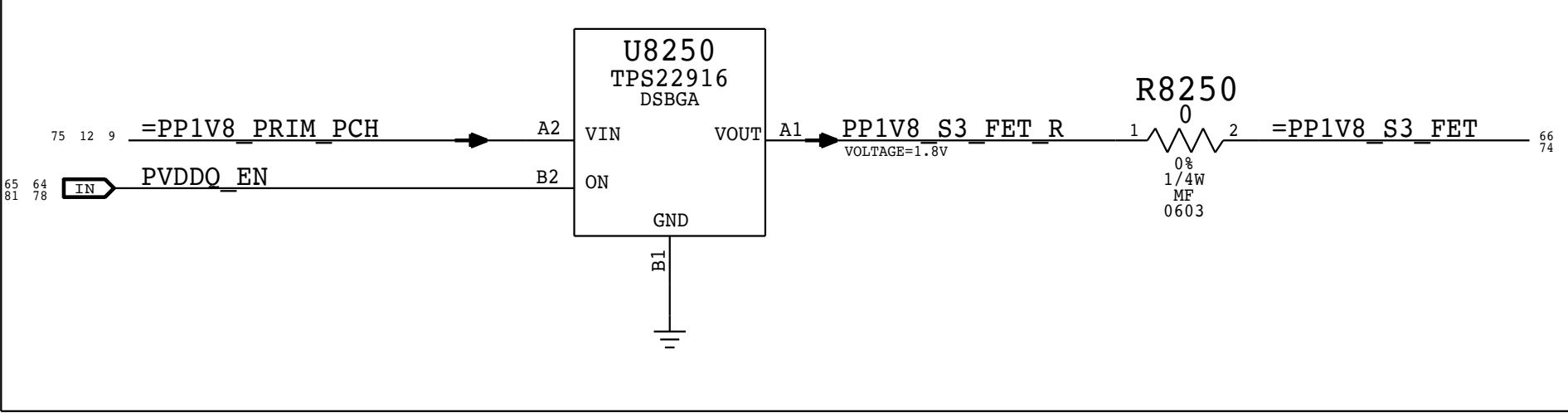
### B 1.8V G3 Standby Switch



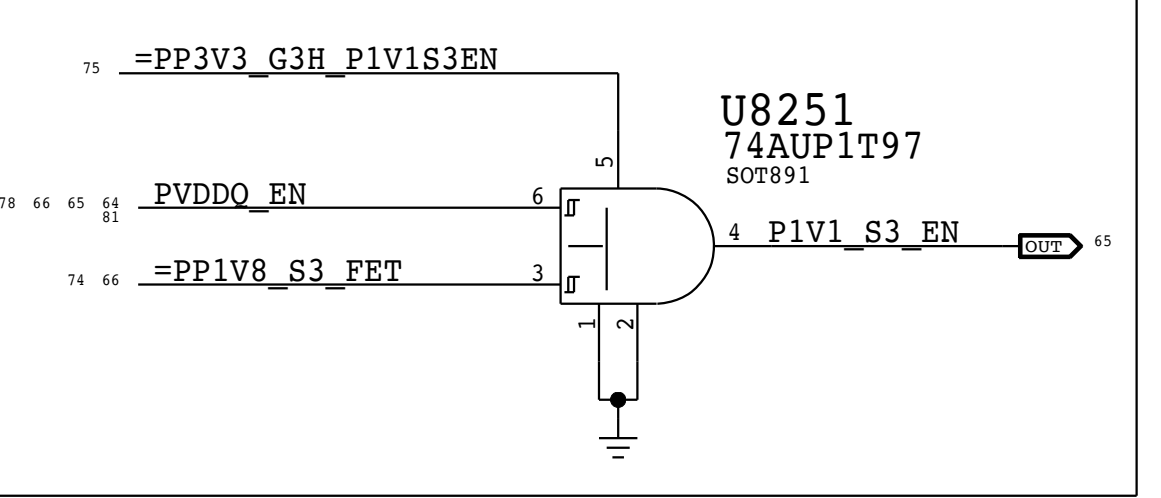
### C 3.3V Sensors Switch



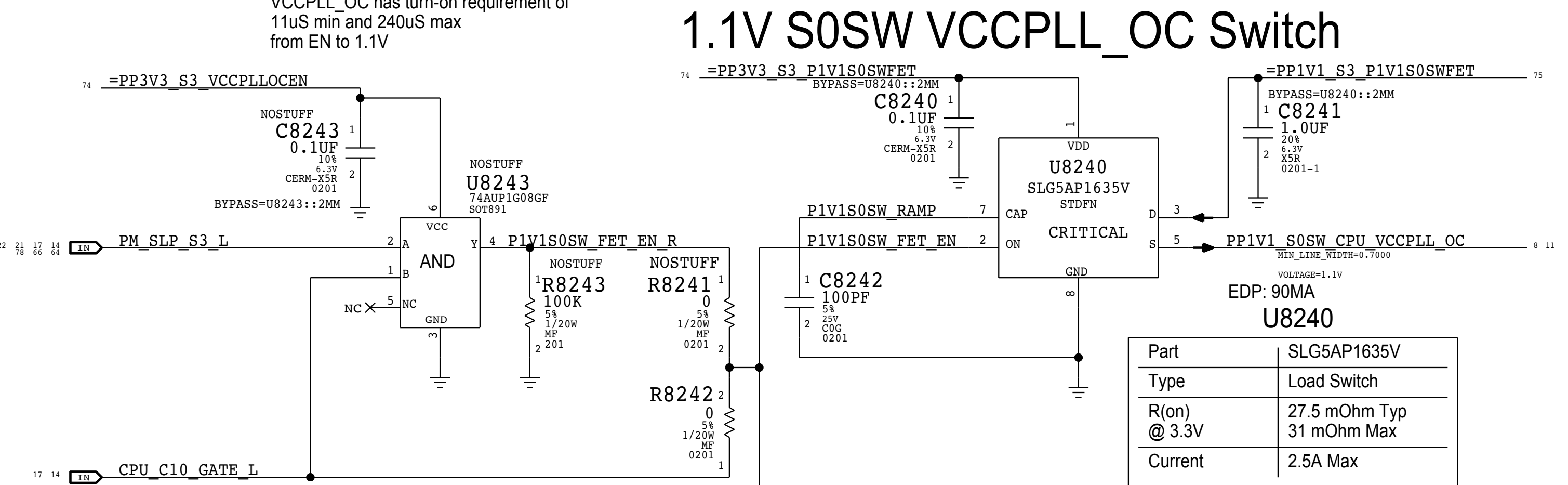
### D 1.8V S3 Switch



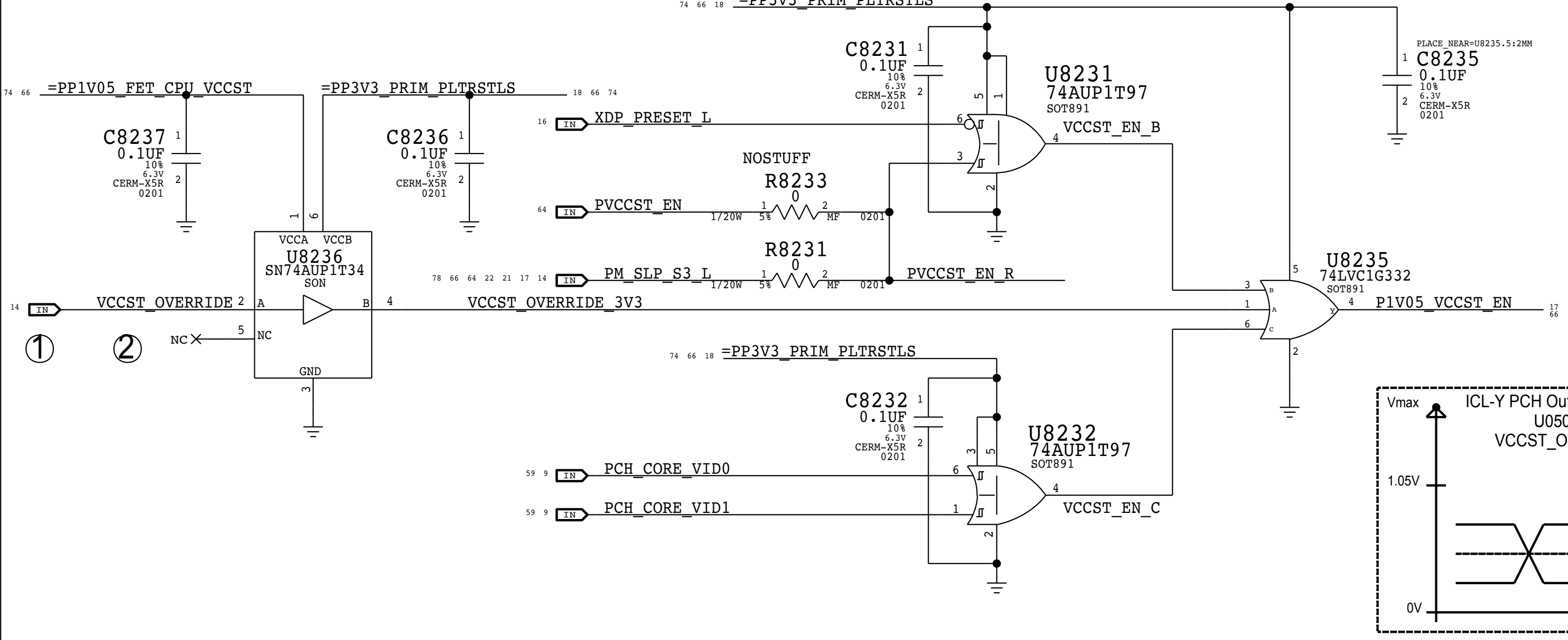
### E 1.1V S3 En



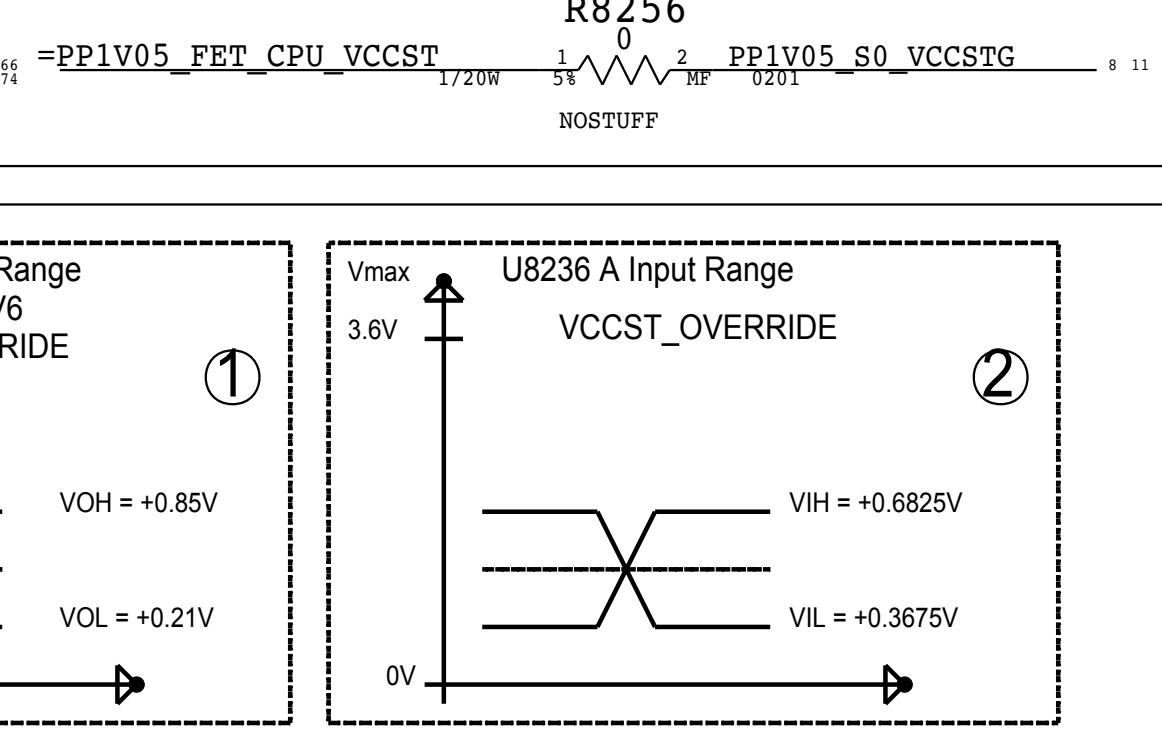
### F CPU Switches



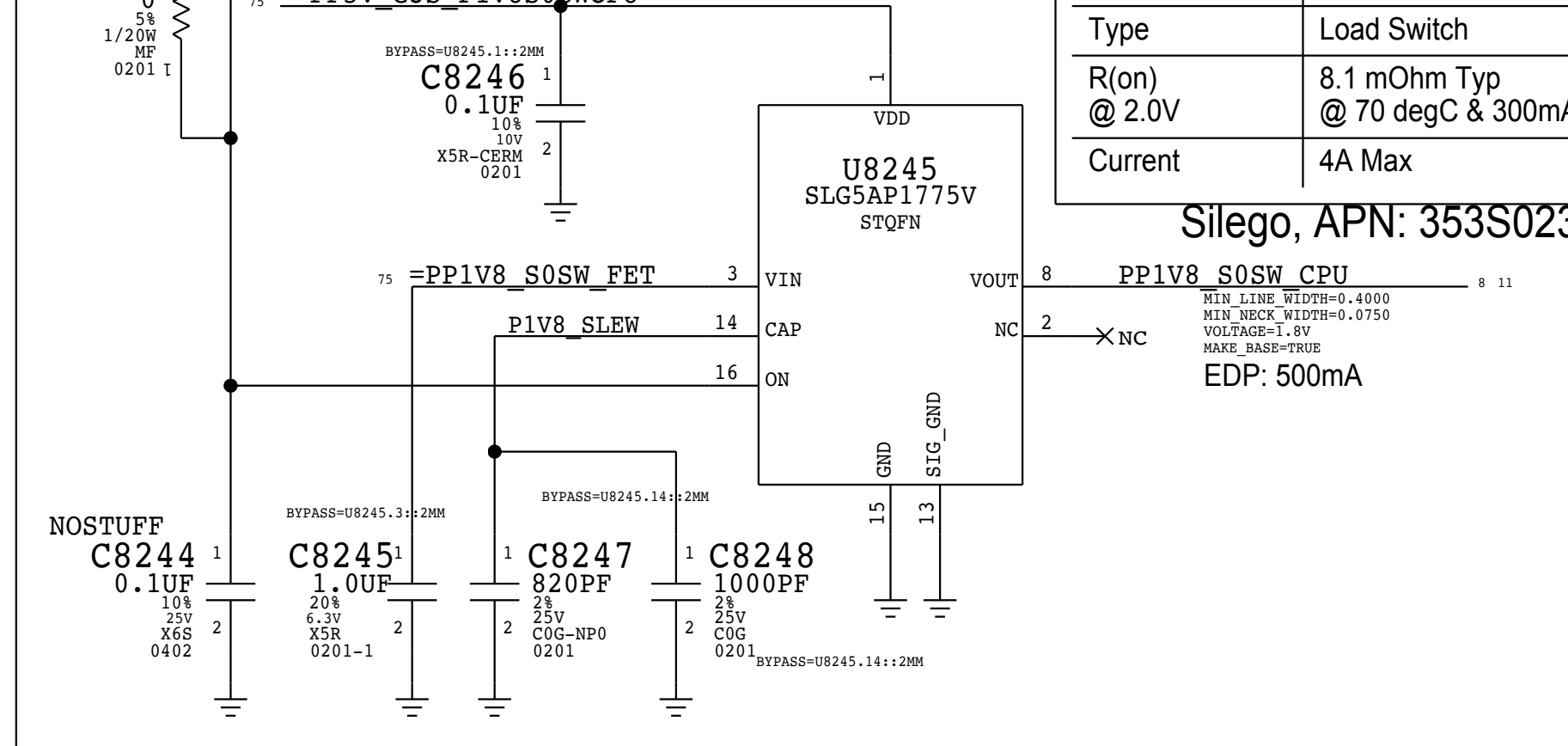
### G 1.05V VCCST Switch Control



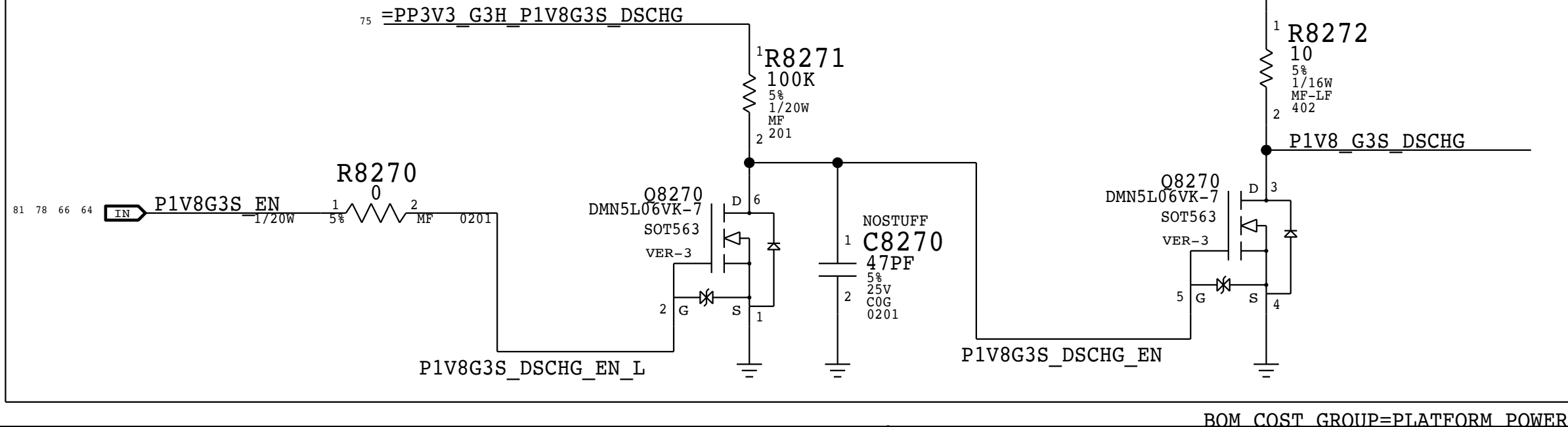
### H VCCSTG



### I 1.05V VCCST Switch



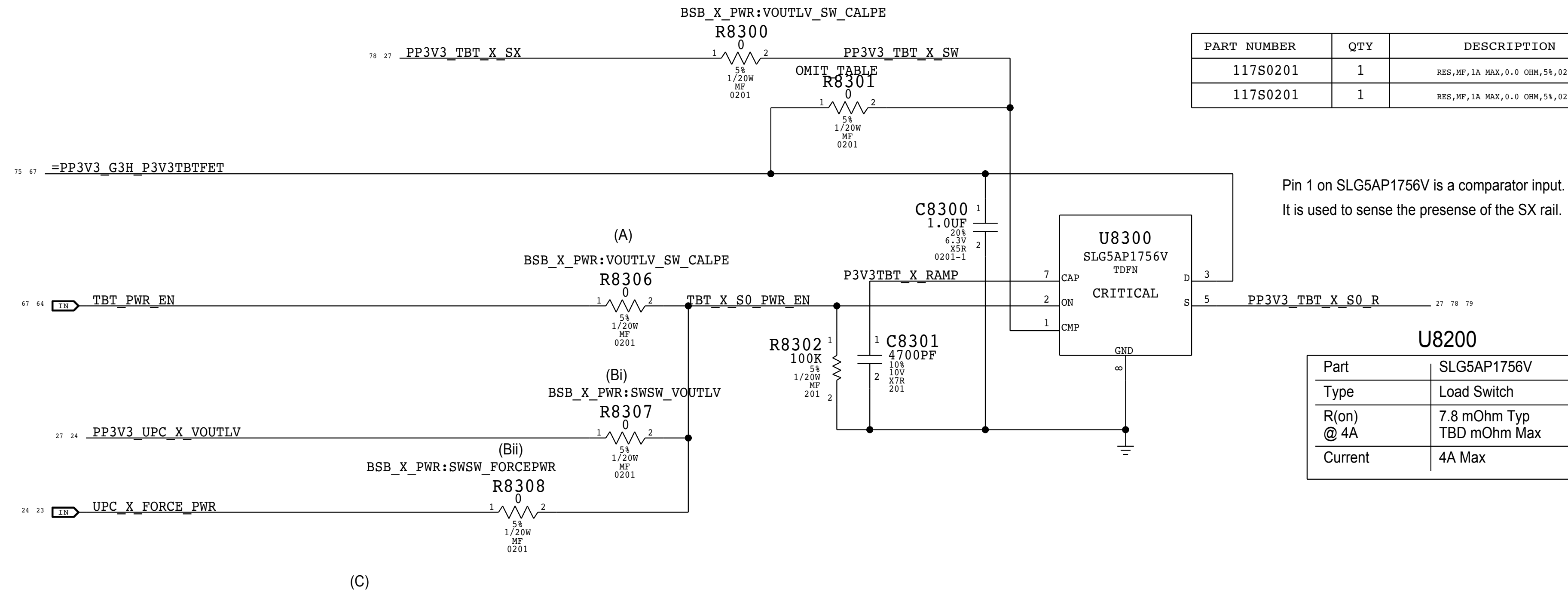
### J PP1V8\_G3S Discharge



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.

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### 3.3V S0SW TBT Switch

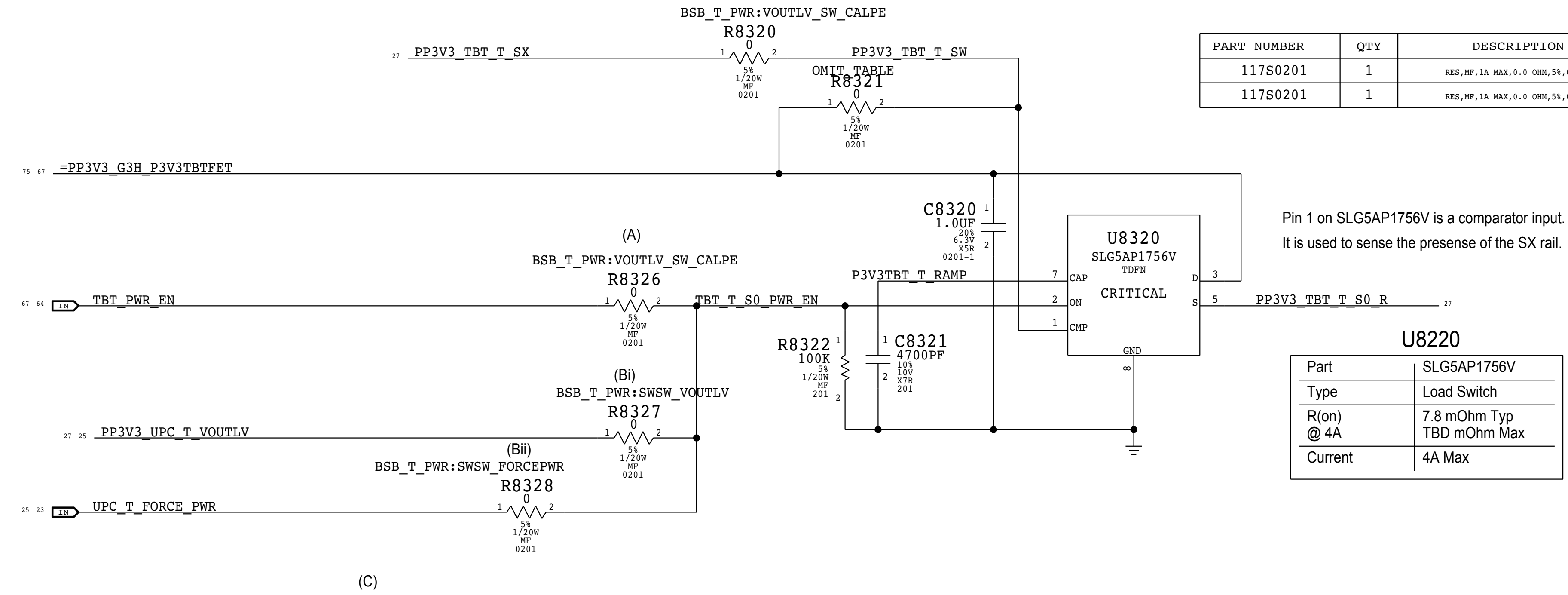


PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
117S0201	1	RES, MF, 1A MAX, 0.0 OHM, 5%, 0201, BLACK	R8301		BSB_X_PWR:SWSW_VOUTLV
117S0201	1	RES, MF, 1A MAX, 0.0 OHM, 5%, 0201, BLACK	R8301		BSB_X_PWR:SWSW_FORCEPWR

Pin 1 on SLG5AP1756V is a comparator input. It is used to sense the presence of the SX rail.

U8200	
Part	SLG5AP1756V
Type	Load Switch
R(on) @ 4A	7.8 mOhm Typ TBD mOhm Max
Current	4A Max

### 3.3V S0SW TBT Switch



PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
117S0201	1	RES, MF, 1A MAX, 0.0 OHM, 5%, 0201, BLACK	R8321		BSB_T_PWR:SWSW_VOUTLV
117S0201	1	RES, MF, 1A MAX, 0.0 OHM, 5%, 0201, BLACK	R8321		BSB_T_PWR:SWSW_FORCEPWR

Pin 1 on SLG5AP1756V is a comparator input. It is used to sense the presence of the SX rail.

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

SYNC_MASTER=CPU_CARD_ICL_V		SYNC_DATE=06/08/2018	
PAGE TITLE <b>Power FETs TBT S0</b>			
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Page Notes

Power aliases required by this page:  
 -PPVIN\_S0SW\_LCDBKLT\_FET (8-12.6V LCD BACKLIGHT INPUT)  
 -PP5V\_S0\_BKLT (5V BACKLIGHT DRIVER INPUT)

D

C

B

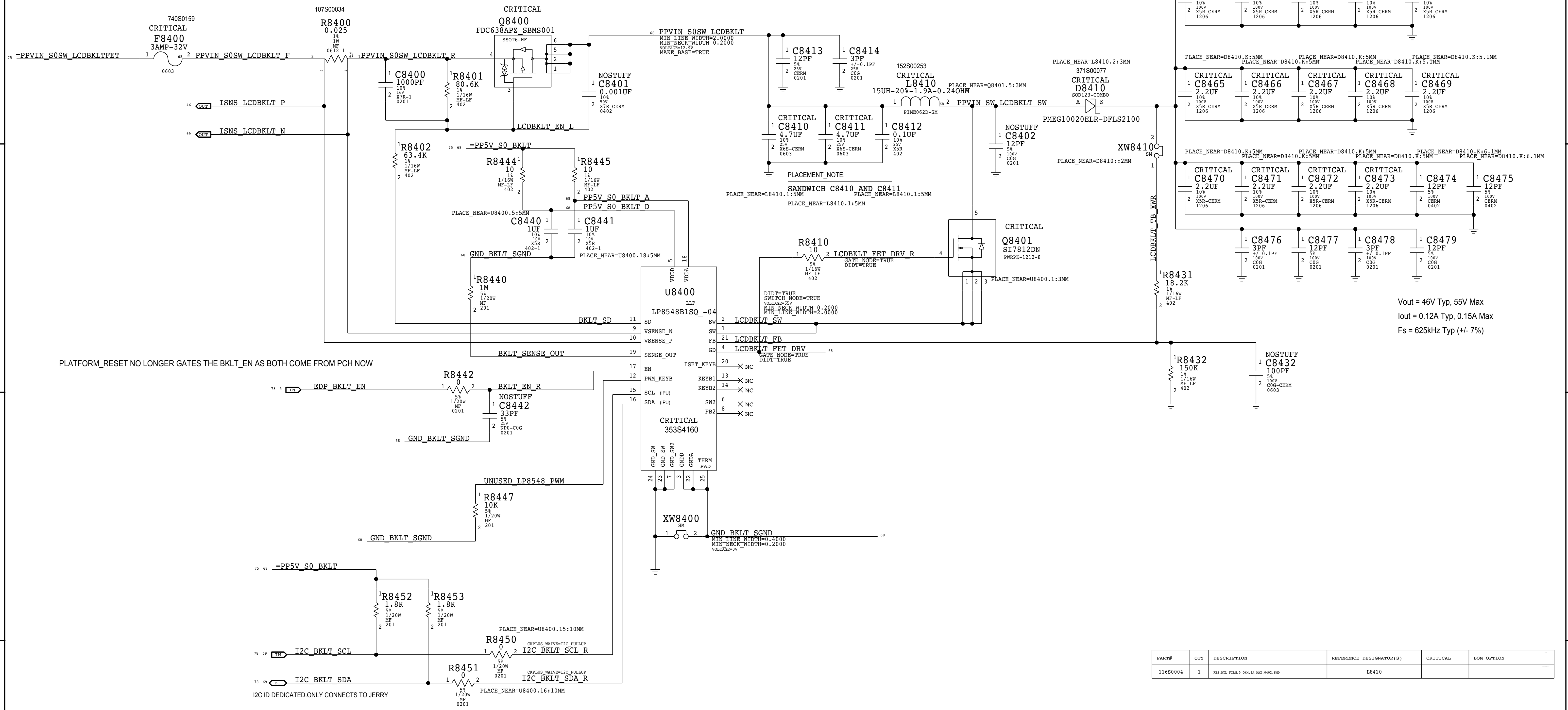
A

D

C

B

A



Vout = 46V Typ, 55V Max  
 Iout = 0.12A Typ, 0.15A Max  
 Fs = 625kHz Typ (+/- 7%)

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
11650004	1	RES,MTL FILM,S OHM,1A MAX,0402,SMD	L8420		

LINE WIDTHS	PBUS LINE WIDTHS	LCD BKLT LINE WIDTHS
PP5V_S0_BKLT_A MIN LINE WIDTH=0.0750 MIN NECK WIDTH=0.0750 VOLTAGE=5V	PPVIN_S0SW_LCDBKLT_F MIN LINE WIDTH=2.0000 MIN NECK WIDTH=0.2000 VOLTAGE=5V	LCDBKLT_FET_DRV MIN LINE WIDTH=0.6000 MIN NECK WIDTH=0.2000 VOLTAGE=5V
PP5V_S0_BKLT_D MIN LINE WIDTH=0.0750 MIN NECK WIDTH=0.0750 VOLTAGE=5V	PPVIN_S0SW_LCDBKLT_R MIN LINE WIDTH=2.0000 MIN NECK WIDTH=0.2000 VOLTAGE=5V	PPVIN_SW_LCDBKLT_SW MIN LINE WIDTH=2.0000 MIN NECK WIDTH=0.1200 VOLTAGE=5V
	PPVIN_S0SW_LCDBKLT MIN LINE WIDTH=2.0000 MIN NECK WIDTH=0.2000 VOLTAGE=5V	PPVOUT_S0_LCDBKLT MIN LINE WIDTH=0.5000 MIN NECK WIDTH=0.1500 VOLTAGE=5V
		PPVOUT_S0_LCDBKLT_F MIN LINE WIDTH=0.3500 MIN NECK WIDTH=0.1500 VOLTAGE=5V

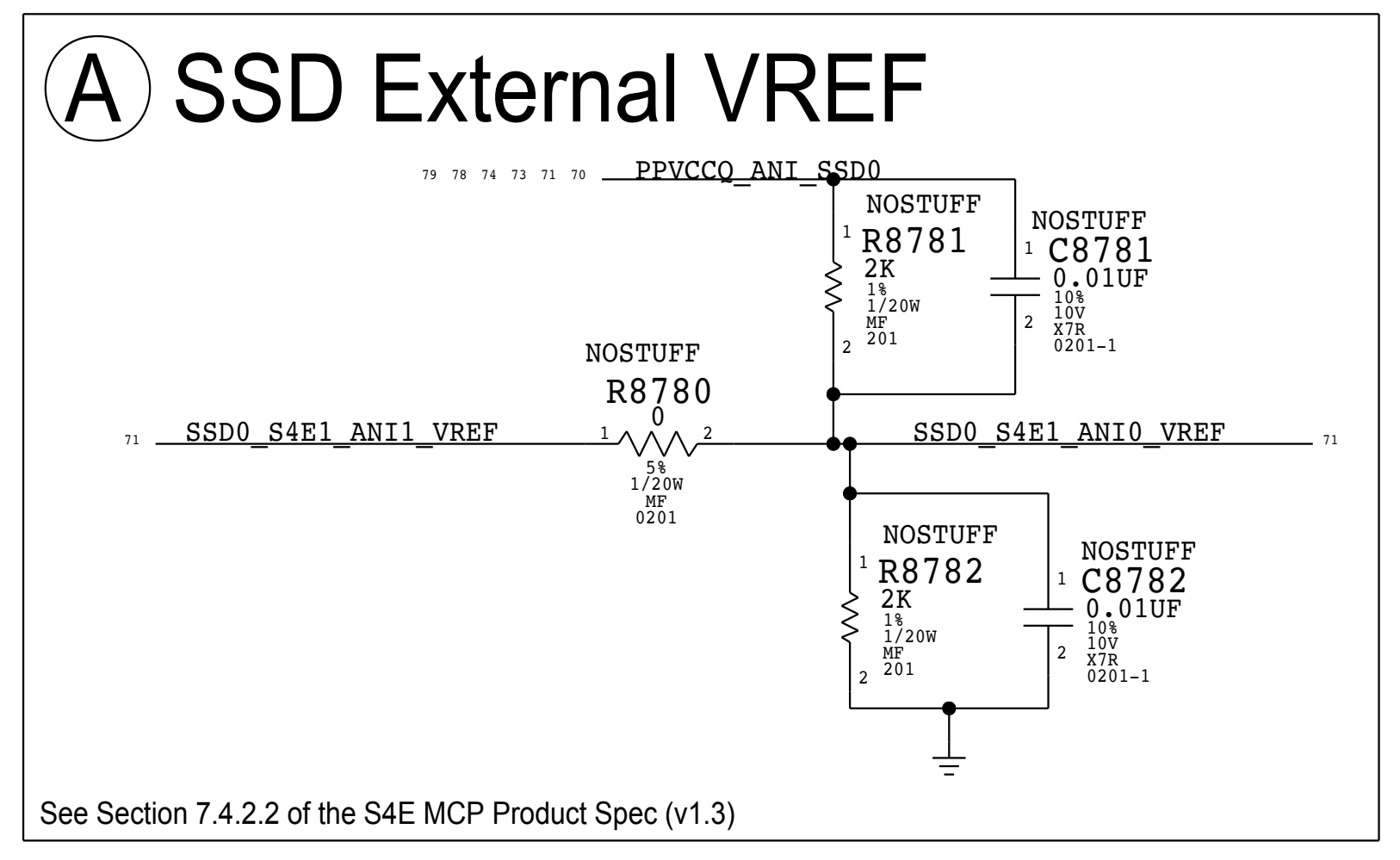
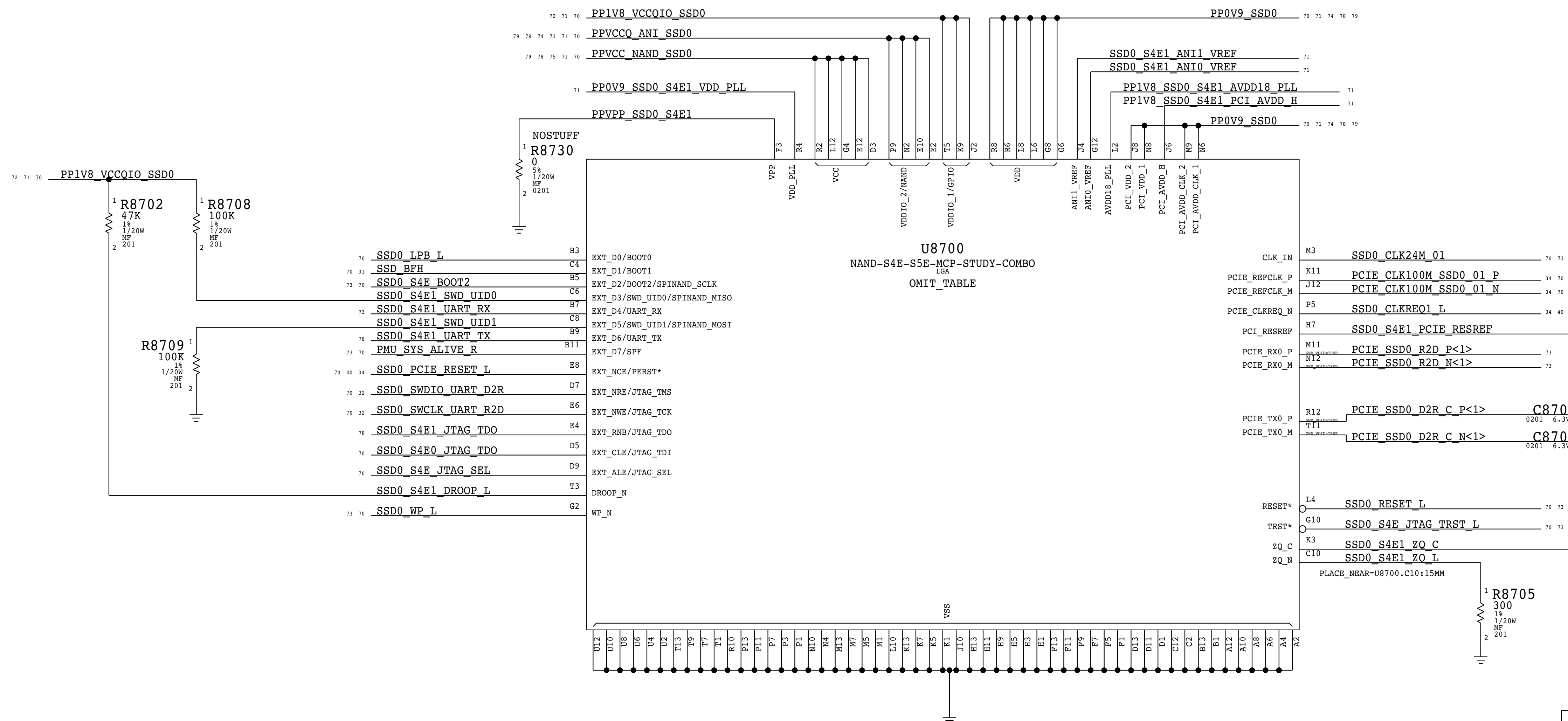
BOM\_COST\_GROUP=DISPLAY

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<p>BRANCH riskramp</p>	<p>PAGE 84 OF 152</p>	<p>SHEET 68 OF 86</p>

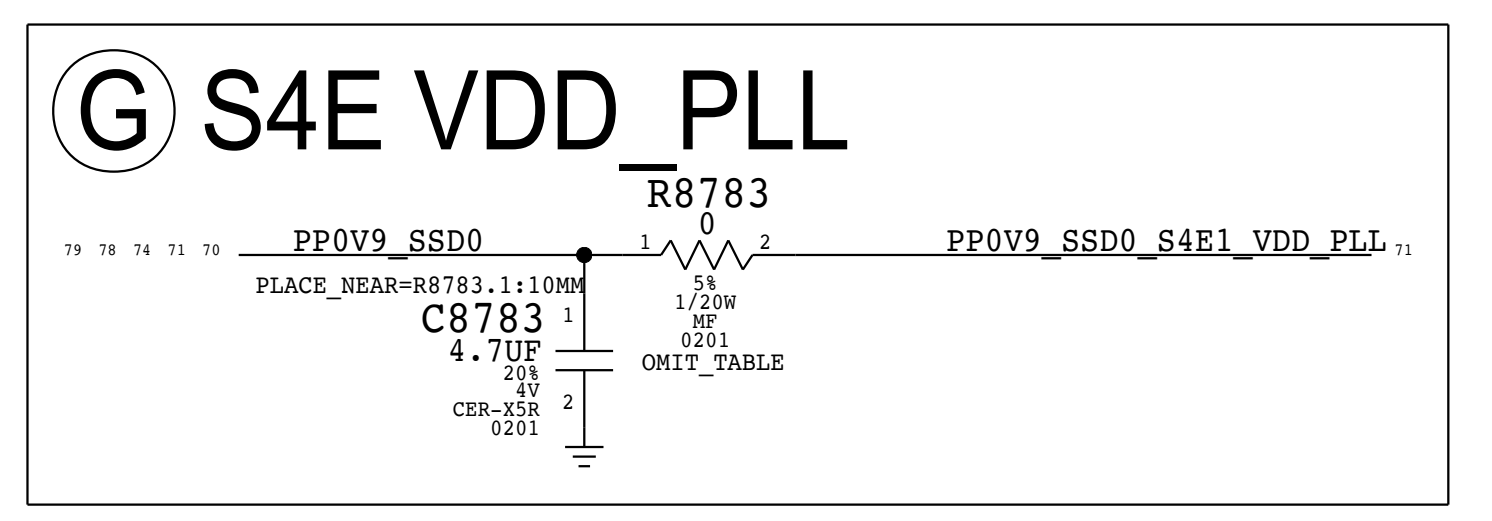
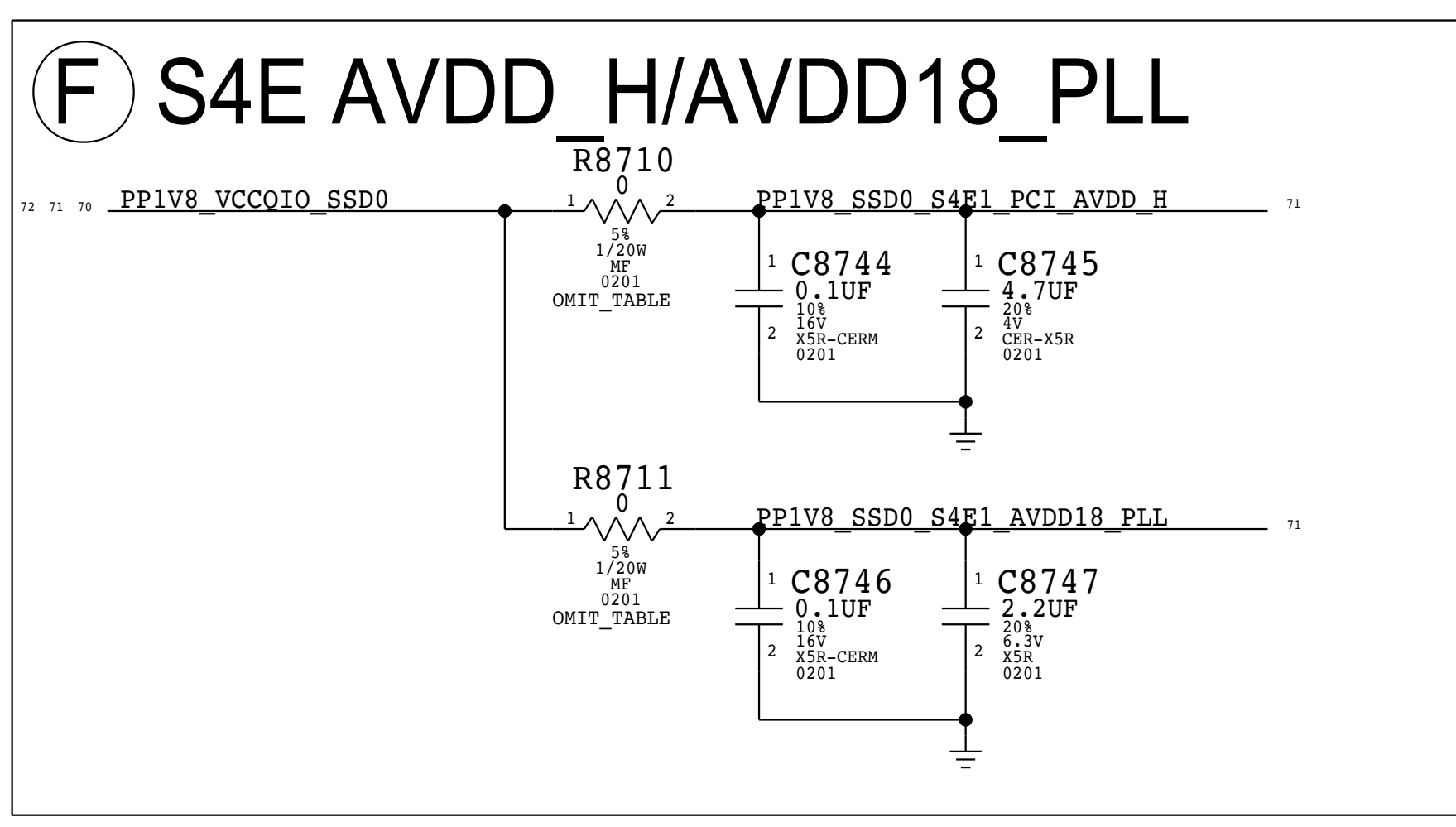
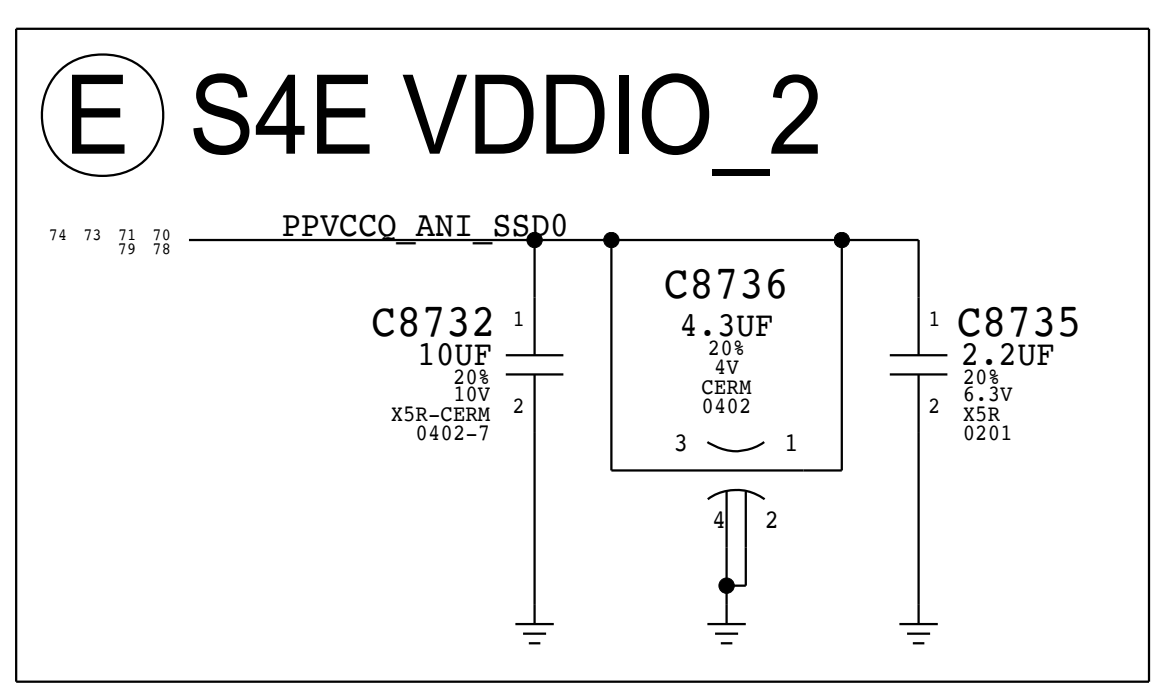
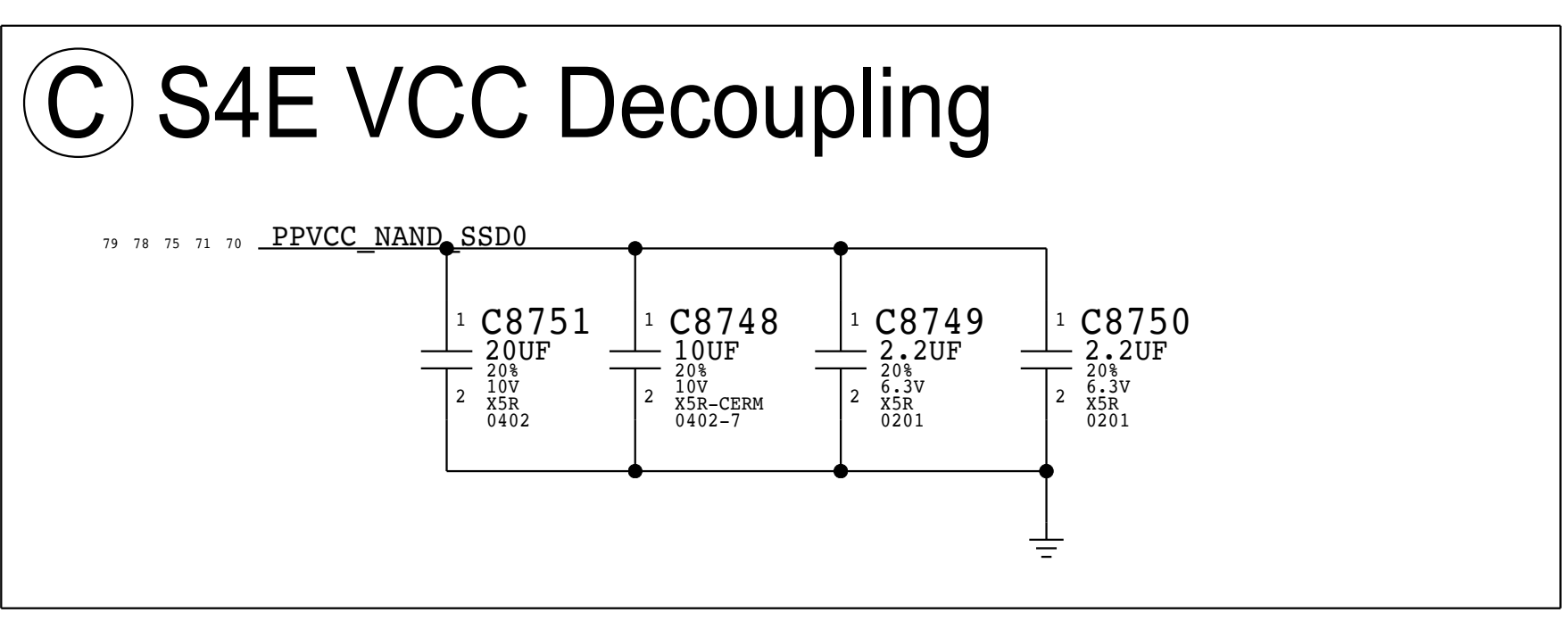
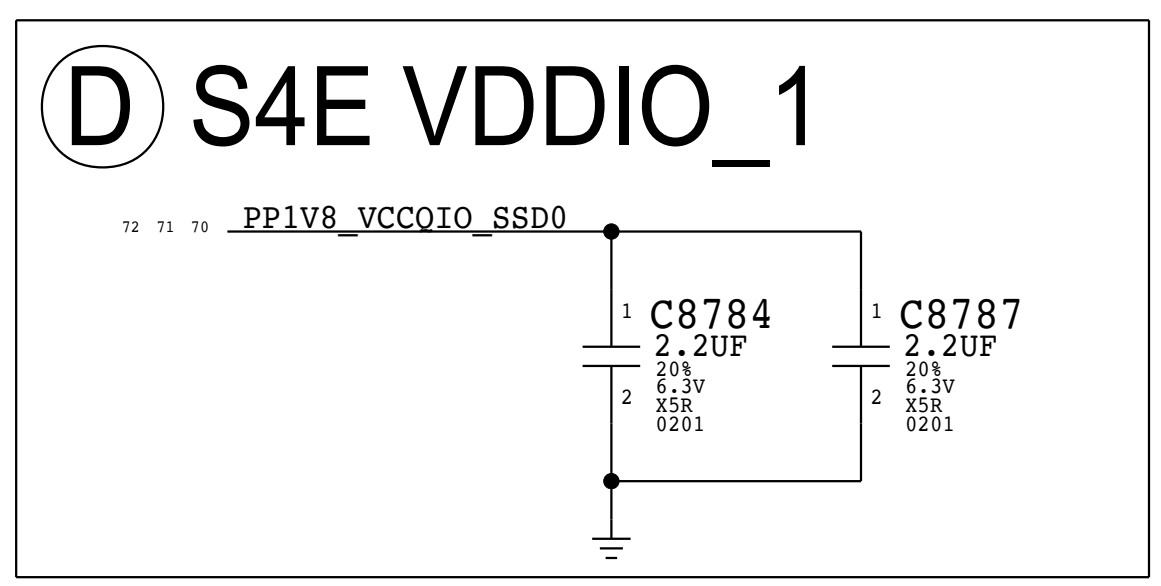
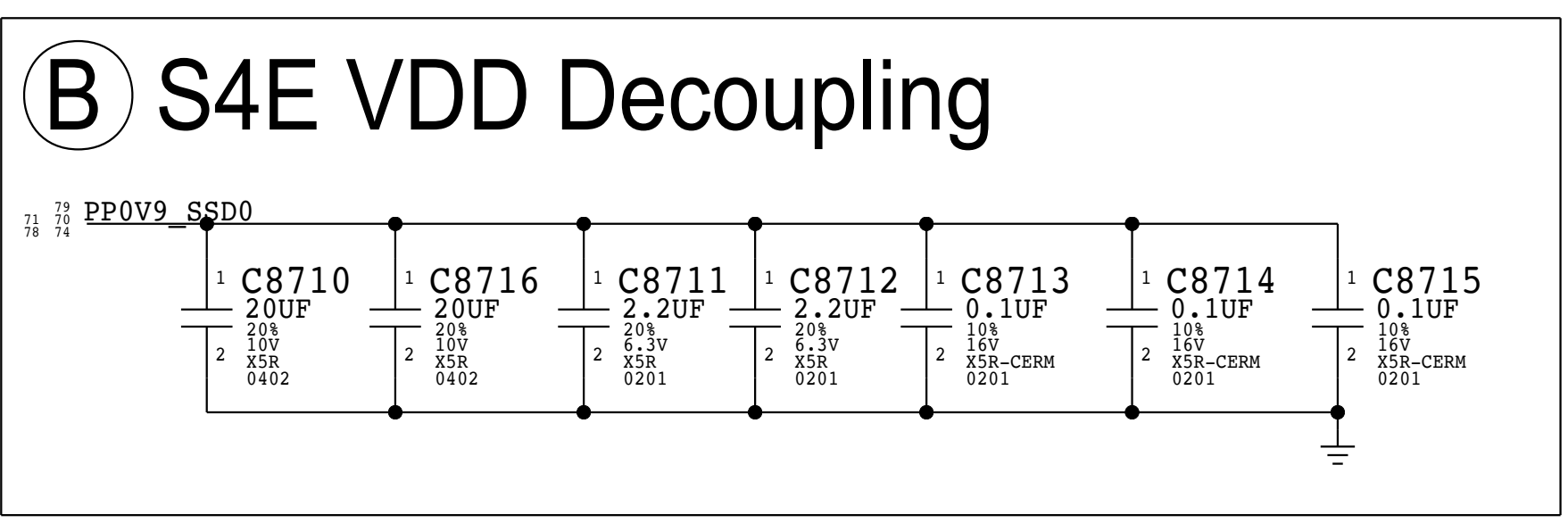




# S4E1



PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
11880279	1	RES, 3.01KOHM, 1%, 1/20W, 0201	R8704	CRITICAL	S4E
103800429	1	RES, 200OHM, 0.1%, 1/20W, 0201	R8704	CRITICAL	S5E
11880011	1	RES, 100OHM, 1%, 1/20W, 0201	R8706	CRITICAL	S4E
11880273	1	RES, 300OHM, 1%, 1/20W, 0201	R8706	CRITICAL	S5E
11780201	2	RES, 0OHM, 1/20W, 0201	R8783, R8710, R8711	CRITICAL	S4E
155800161	2	FERR BD, 100HM, 0.05 DCR, 0201	R8783, R8710	CRITICAL	S5E
11880794	1	RES, MF, 20HM, 1%, 1/20W, 0201	R8711	CRITICAL	S5E



PAGE TITLE: S4E<1>

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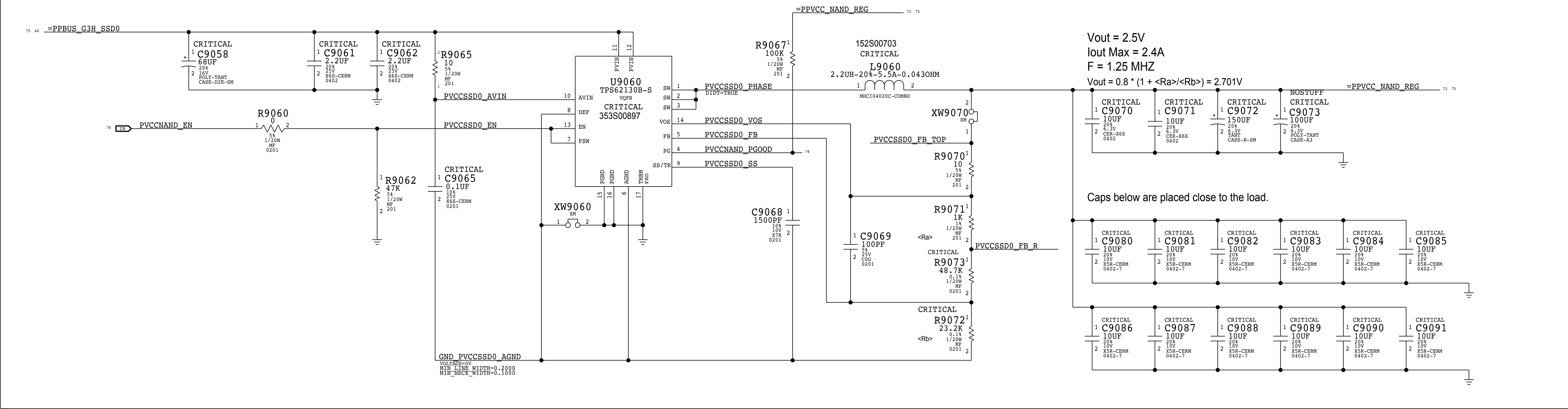
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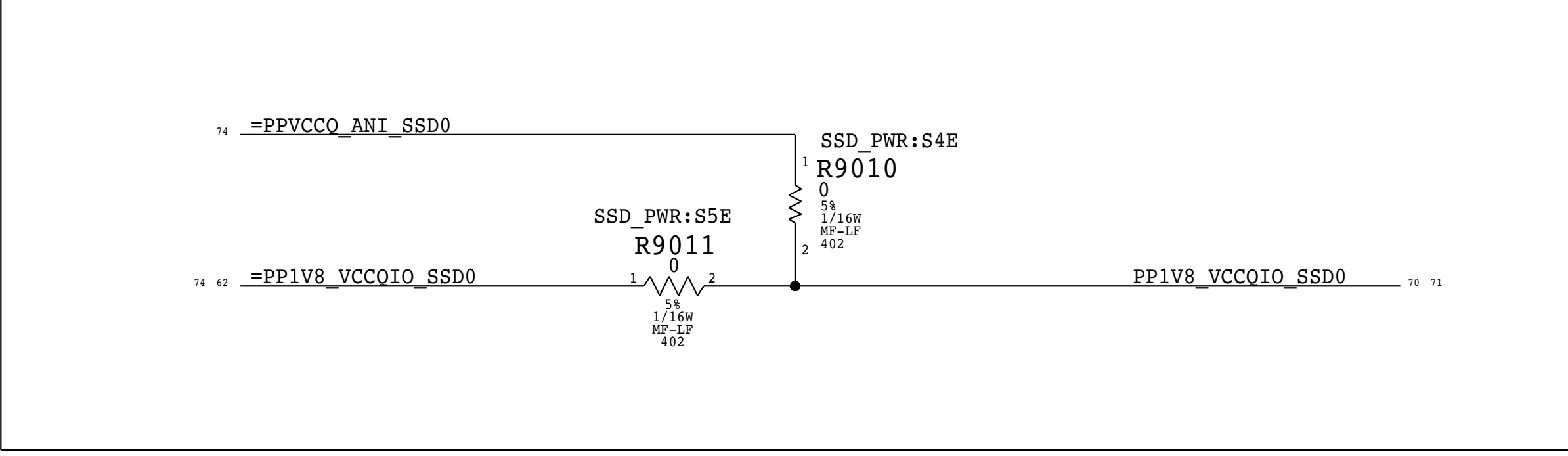
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BOM\_COST\_GROUP=SSD

# (A) NAND VCC (PPVCC\_NAND\_SSD0) Voltage Regulator



# (B) NAND VCCQ I/O Selector



SYMC_MASTER=psm		SYMC_DATE=10/18/2018	
PAGE TITLE			
NAND VCC VR			
	DRAWING NUMBER	051-05232	SIZE
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		BOM_COST_GROUP=SSD	



### A SSD PCIE AC Coupling Caps

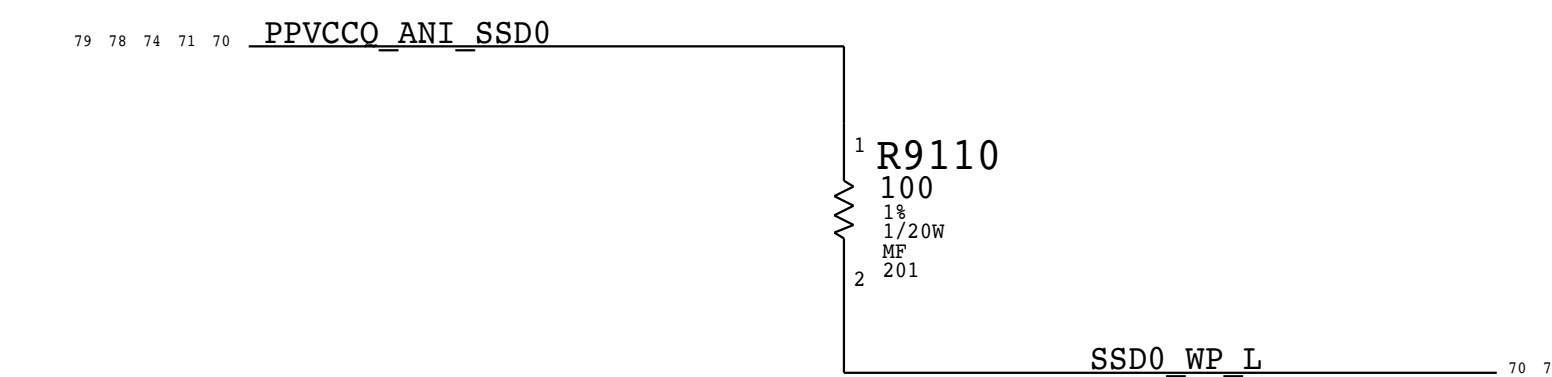
(All Caps)  
GND\_VOID=TRUE

34	OUT	PCIE_SSD0_R2D_C_P<0>	C9110	1	2	20%	6.3V	X5R	0201	PCIE_SSD0_R2D_P<0>	70
34	OUT	PCIE_SSD0_R2D_C_N<0>	C9111	1	2	20%	6.3V	X5R	0201	PCIE_SSD0_R2D_N<0>	70
34	OUT	PCIE_SSD0_R2D_C_P<1>	C9112	1	2	20%	6.3V	X5R	0201	PCIE_SSD0_R2D_P<1>	71
34	OUT	PCIE_SSD0_R2D_C_N<1>	C9113	1	2	20%	6.3V	X5R	0201	PCIE_SSD0_R2D_N<1>	71

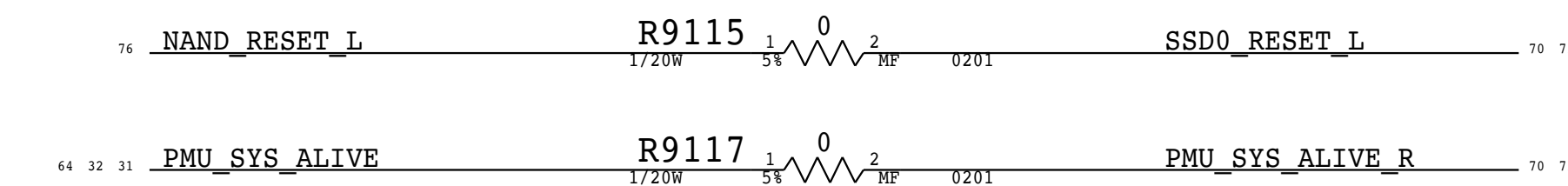
### B SSD PCIE Net Aliases

34	OUT	PCIE_SSD0_R2D_C_P<2>	==	MAKE_BASE=TRUE	NO_TEST=1	NC_S4E3_PCIE_R2D_CP<2>
34	OUT	PCIE_SSD0_R2D_C_N<2>	==	MAKE_BASE=TRUE	NO_TEST=1	NC_S4E3_PCIE_R2D_CN<2>
34	IN	PCIE_SSD0_D2R_P<2>	==	MAKE_BASE=TRUE	NO_TEST=1	NC_S4E3_PCIE_D2RP<2>
34	IN	PCIE_SSD0_D2R_N<2>	==	MAKE_BASE=TRUE	NO_TEST=1	NC_S4E3_PCIE_D2RN<2>
34	OUT	PCIE_SSD0_R2D_C_P<3>	==	MAKE_BASE=TRUE	NO_TEST=1	NC_S4E3_PCIE_R2D_CP<3>
34	OUT	PCIE_SSD0_R2D_C_N<3>	==	MAKE_BASE=TRUE	NO_TEST=1	NC_S4E3_PCIE_R2D_CN<3>
34	IN	PCIE_SSD0_D2R_P<3>	==	MAKE_BASE=TRUE	NO_TEST=1	NC_S4E3_PCIE_D2RP<3>
34	IN	PCIE_SSD0_D2R_N<3>	==	MAKE_BASE=TRUE	NO_TEST=1	NC_S4E3_PCIE_D2RN<3>
34	IN	PCIE_CLK100M_SSD0_23_N	==	MAKE_BASE=TRUE	NO_TEST=1	NC_PCIE_CLK100M_SSD0_23N
34	IN	PCIE_CLK100M_SSD0_23_P	==	MAKE_BASE=TRUE	NO_TEST=1	NC_PCIE_CLK100M_SSD0_23P

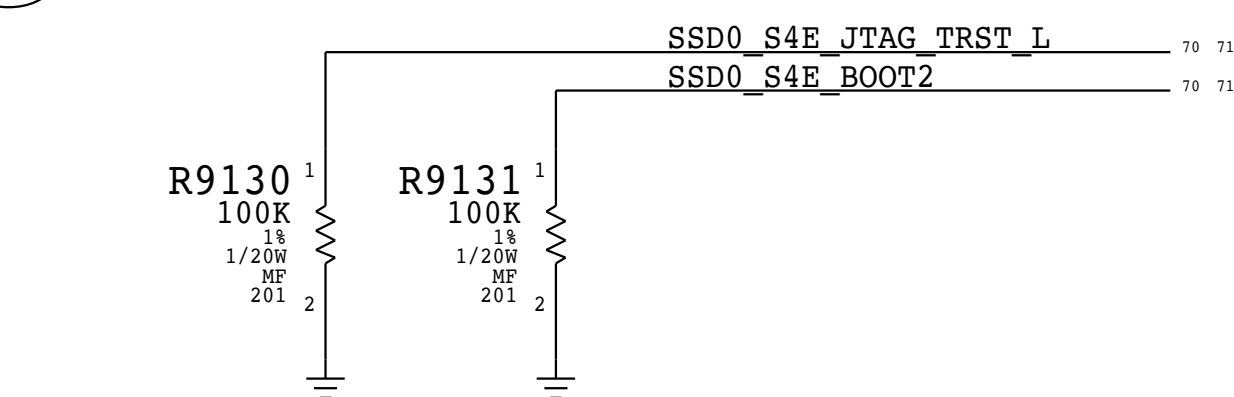
### C SSD Write Protect Control



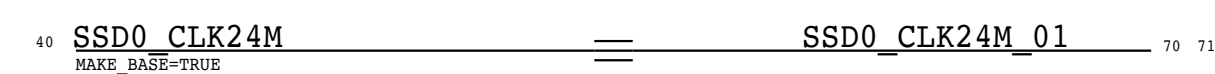
### D SSD Miscellaneous Control



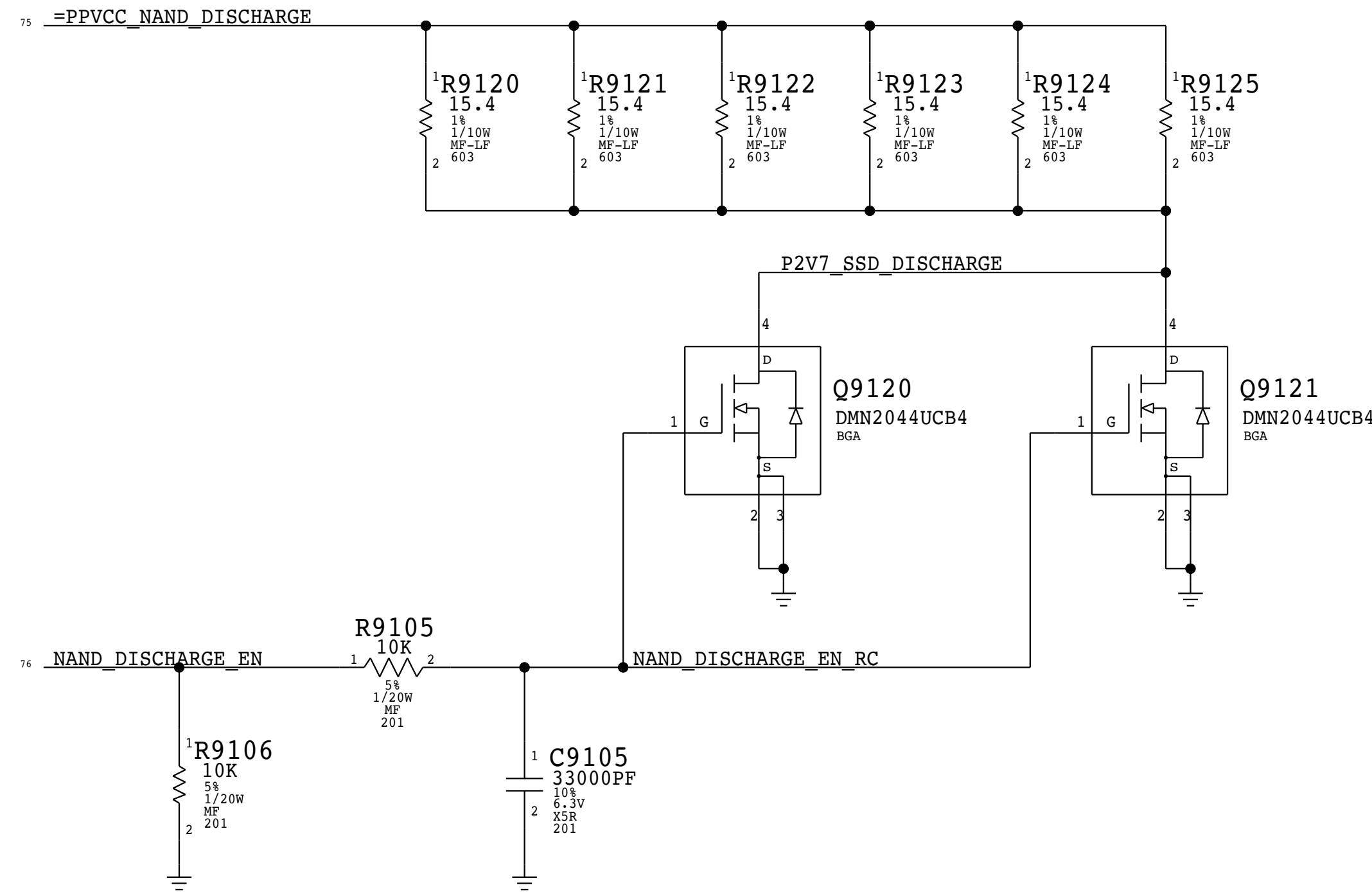
### E S4E Pull-Downs



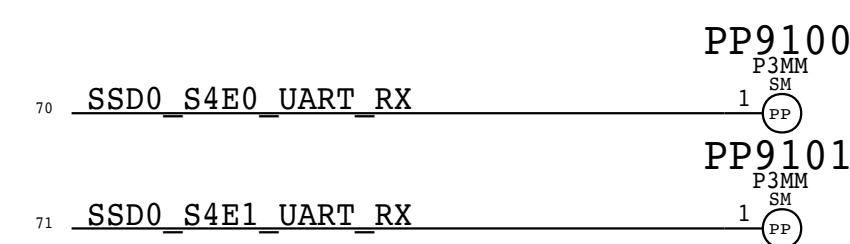
### F S4E Control Aliases



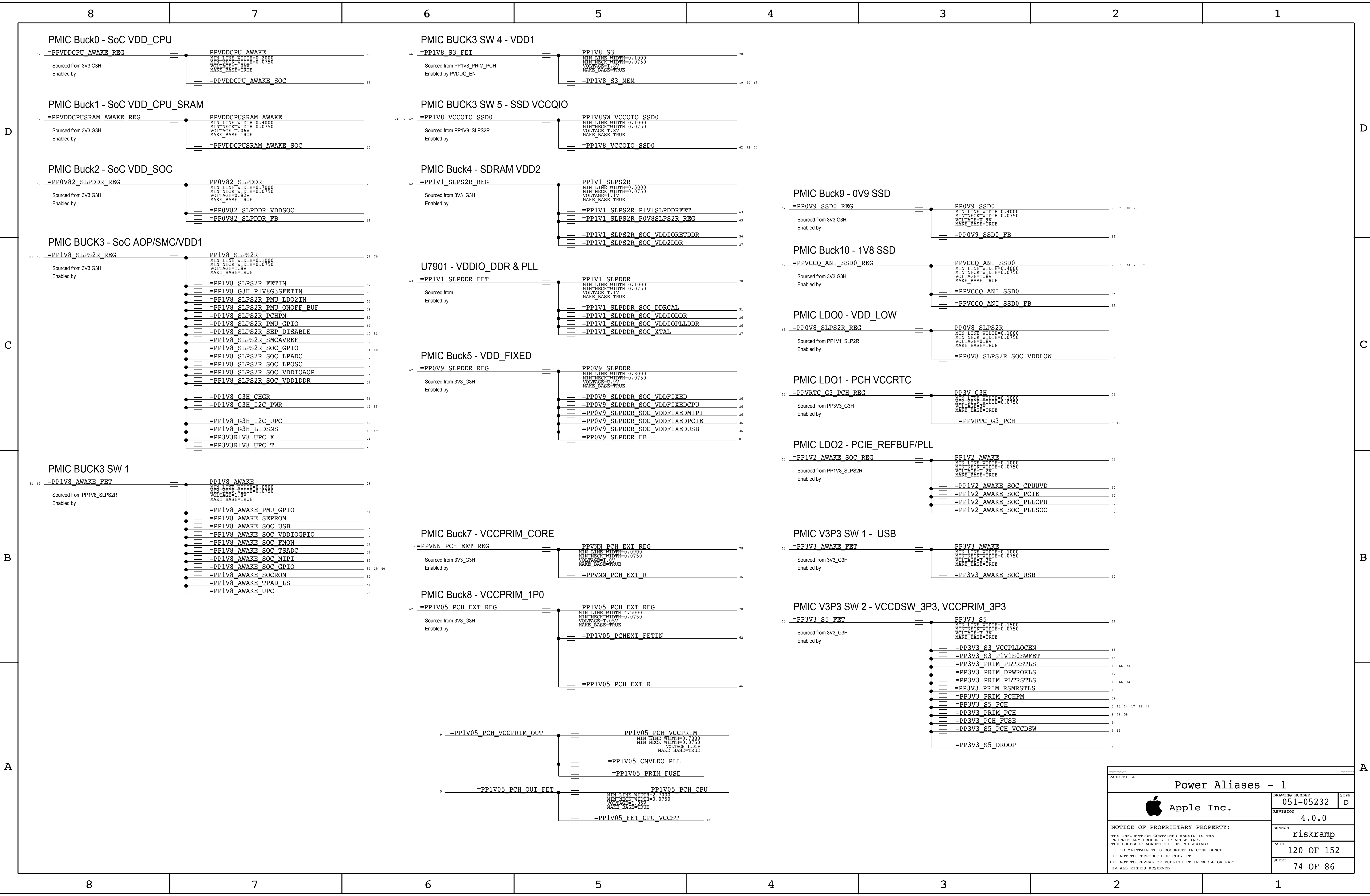
### G SSD Discharge Circuit



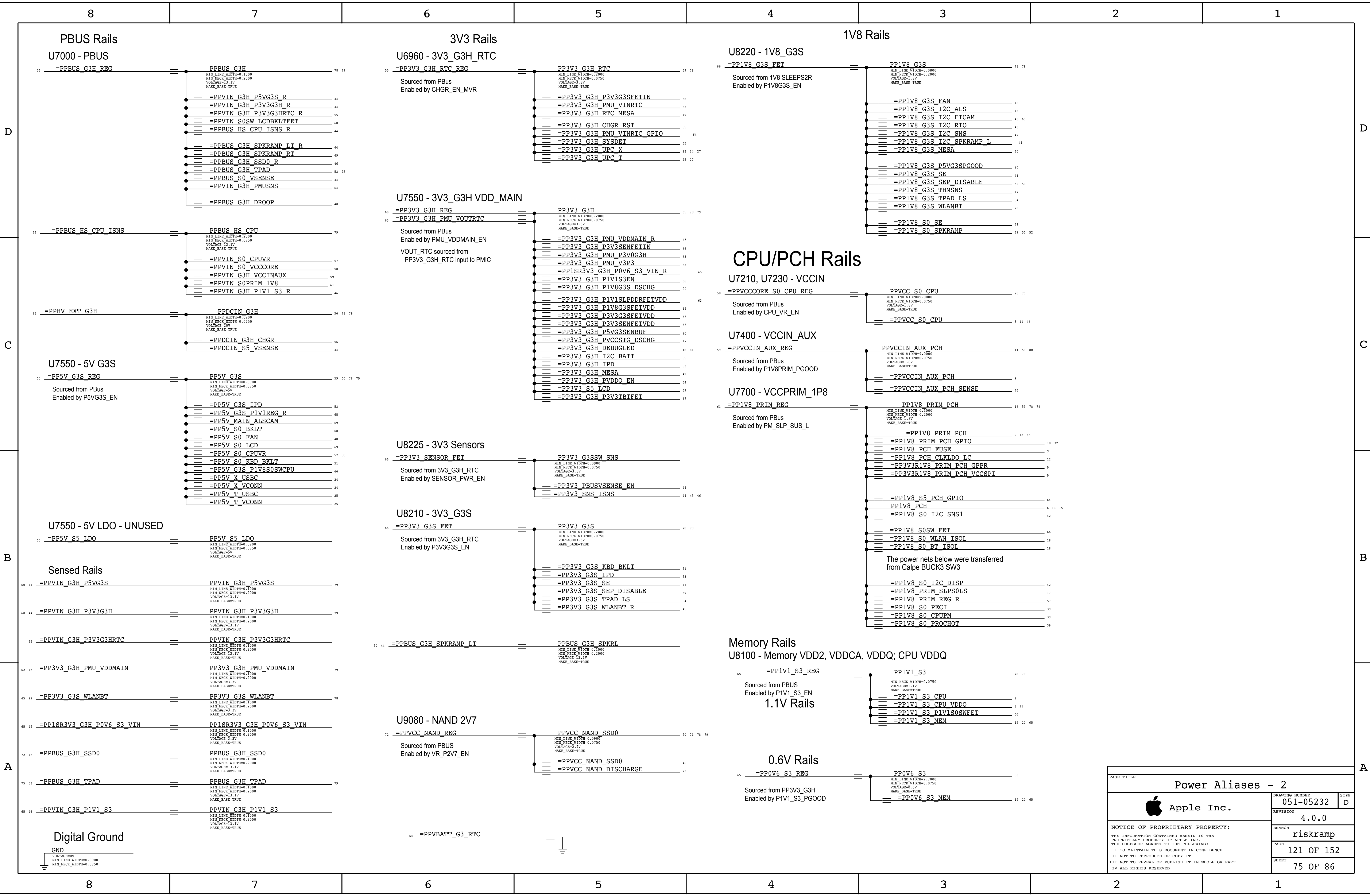
### H SSD UART Test Points



PAGE TITLE		
SSD Support		
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### Unused CPU/PCH Signals

### Unused SoC Signals

15	TEST	PCIE_CLK100M_DEBUG_P	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_CLK100M_DEBUGP
15	TEST	PCIE_CLK100M_DEBUG_N	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_CLK100M_DEBUGN
15	TEST	PCIE_PCH_ENETSD_D2R_P	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_PCH_ENETSD_D2RP
15	TEST	PCIE_PCH_ENETSD_D2R_N	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_PCH_ENETSD_D2RN
15	TEST	PCIE_PCH_ENETSD_R2D_C_P	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_PCH_ENETSD_R2DCP
15	TEST	PCIE_PCH_ENETSD_R2D_C_N	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_PCH_ENETSD_R2DCN
15	TEST	PCIE_CLK100M_ENETSD_P	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_CLK100M_ENETSDP
15	TEST	PCIE_CLK100M_ENETSD_N	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_CLK100M_ENETSDN

32	ALTIMETER_INT	MAKE_BASE+TRIP	NO_TEST=1	NC_ALTIMETER_INT
31	DFR_DISP_INT	MAKE_BASE+TRIP	NO_TEST=1	NC_DFR_DISP_INT
33	DFR_DISP_RESET_L	MAKE_BASE+TRIP	NO_TEST=1	NC_DFR_DISP_RESET_L
33	DFR_DISP_TE	MAKE_BASE+TRIP	NO_TEST=1	NC_DFR_DISP_TE
33	DFR_TOUCH_CLK32K_RESET_L	MAKE_BASE+TRIP	NO_TEST=1	NC_DFR_TOUCH_CLK32K_RESET_L
32	DFR_TOUCH_INT_L	MAKE_BASE+TRIP	NO_TEST=1	NC_DFR_TOUCH_INT_L
32	DFR_TOUCH_RESET_L	MAKE_BASE+TRIP	NO_TEST=1	NC_DFR_TOUCH_RESET_L
33	DFR_TOUCH_RSVD	MAKE_BASE+TRIP	NO_TEST=1	NC_DFR_TOUCH_RSVD
32	DISP_GCON_INT_L	MAKE_BASE+TRIP	NO_TEST=1	NC_DISP_GCON_INT_L
32	ENET_LOW_PWR	MAKE_BASE+TRIP	NO_TEST=1	NC_ENET_LOW_PWR
32	ENET_MEDIA_SENSE	MAKE_BASE+TRIP	NO_TEST=1	NC_ENET_MEDIA_SENSE
32	ENET_RESET_L	MAKE_BASE+TRIP	NO_TEST=1	NC_ENET_RESET_L
33	FTCAM_CLK12M_R	MAKE_BASE+TRIP	NO_TEST=1	NC_FTCAM_CLK12M_R
33	FTCAM_RESET_L	MAKE_BASE+TRIP	NO_TEST=1	NC_FTCAM_RESET_L
31	GNSS_DEV_WAKE	MAKE_BASE+TRIP	NO_TEST=1	NC_GNSS_DEV_WAKE
31	GNSS_HOST_TIME	MAKE_BASE+TRIP	NO_TEST=1	NC_GNSS_HOST_TIME
31	GNSS_HOST_WAKE	MAKE_BASE+TRIP	NO_TEST=1	NC_GNSS_HOST_WAKE
33	I2S_CODEC_MCLK	MAKE_BASE+TRIP	NO_TEST=1	NC_I2S_CODEC_MCLK
33	I2S_CODEC1_MCLK	MAKE_BASE+TRIP	NO_TEST=1	NC_I2S_CODEC1_MCLK
33	I2S_CODEC1_R2D_R	MAKE_BASE+TRIP	NO_TEST=1	NC_I2S_CODEC1_R2D_R
33	I2S_HAWKING_BCLK_R	MAKE_BASE+TRIP	NO_TEST=1	NC_I2S_HAWKING_BCLK_R
33	I2S_HAWKING_D2R	MAKE_BASE+TRIP	NO_TEST=1	NC_I2S_HAWKING_D2R
33	I2S_HAWKING_LRCLK	MAKE_BASE+TRIP	NO_TEST=1	NC_I2S_HAWKING_LRCLK
32	MESA_MENUKEY_L	MAKE_BASE+TRIP	NO_TEST=1	NC_MESA_MENUKEY_L
33	MIPI_DFR_CLK_N	MAKE_BASE+TRIP	NO_TEST=1	NC_MIPI_DFR_CLKN
33	MIPI_DFR_CLK_P	MAKE_BASE+TRIP	NO_TEST=1	NC_MIPI_DFR_CLKP
33	MIPI_DFR_DATA_N	MAKE_BASE+TRIP	NO_TEST=1	NC_MIPI_DFR_DATAN
33	MIPI_DFR_DATA_P	MAKE_BASE+TRIP	NO_TEST=1	NC_MIPI_DFR_DATAP
32	PCC_EVENT	MAKE_BASE+TRIP	NO_TEST=1	NC_PCC_EVENT

18	15	DEBUG_CLKREQ_L	MAKE_BASE+TRIP	PU_DEBUG_CLKREQ_L
18	15	SWD_WLAN_SWDIO	MAKE_BASE+TRIP	TP_SWD_WLAN_SWDIO
18	15	SWD_WLAN_SWCLK	MAKE_BASE+TRIP	TP_SWD_WLAN_SWCLK

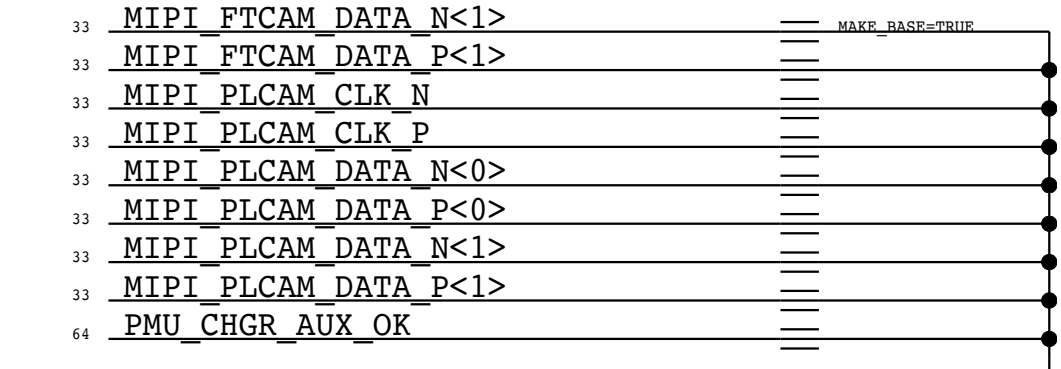
34	PCIE_CLK100M_ENET_N	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_CLK100M_ENETN
34	PCIE_CLK100M_ENET_P	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_CLK100M_ENETP
34	PCIE_CLK100M_SSD1_01_N	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_CLK100M_SSD1_01N
34	PCIE_CLK100M_SSD1_01_P	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_CLK100M_SSD1_01P
34	PCIE_CLK100M_SSD1_23_N	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_CLK100M_SSD1_23N
34	PCIE_CLK100M_SSD1_23_P	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_CLK100M_SSD1_23P
34	PCIE_CLK100M_WLAN_N	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_CLK100M_WLANN
34	PCIE_CLK100M_WLAN_P	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_CLK100M_WLANP
34	PCIE_ENET_D2R_N	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_ENET_D2RN
34	PCIE_ENET_D2R_P	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_ENET_D2RP
34	PCIE_ENET_R2D_C_N	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_ENET_R2D_CN
34	PCIE_ENET_R2D_C_P	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_ENET_R2D_CP
34	PCIE_SSD1_D2R_N<3..0>	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_SSD1_D2RN<3..0>
34	PCIE_SSD1_D2R_P<3..0>	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_SSD1_D2RP<3..0>
34	PCIE_SSD1_R2D_C_N<3..0>	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_SSD1_R2D_CN<3..0>
34	PCIE_SSD1_R2D_C_P<3..0>	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_SSD1_R2D_CP<3..0>
34	PCIE_WLAN_D2R_N	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_WLAN_D2RN
34	PCIE_WLAN_D2R_P	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_WLAN_D2RP
34	PCIE_WLAN_R2D_C_N	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_WLAN_R2D_CN
34	PCIE_WLAN_R2D_C_P	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_WLAN_R2D_CP
32	PCIEDN_WAKE_L	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIEDN_WAKE_L
32	PLCAM_PROX_INT_L	MAKE_BASE+TRIP	NO_TEST=1	NC_PLCAM_PROX_INT_L
32	PLCAM_ROMEO_B2B_DETECT	MAKE_BASE+TRIP	NO_TEST=1	NC_PLCAM_ROMEO_B2B_DETECT
33	PLCAM_RX_CLK12M_R	MAKE_BASE+TRIP	NO_TEST=1	NC_PLCAM_RX_CLK12M_R
33	PLCAM_RX_RESET_L	MAKE_BASE+TRIP	NO_TEST=1	NC_PLCAM_RX_RESET_L
33	PLCAM_TX_CLK12M_R	MAKE_BASE+TRIP	NO_TEST=1	NC_PLCAM_TX_CLK12M_R
33	PLCAM_TX_INT	MAKE_BASE+TRIP	NO_TEST=1	NC_PLCAM_TX_INT
31	PLCAM_TX_RESET_L	MAKE_BASE+TRIP	NO_TEST=1	NC_PLCAM_TX_RESET_L
31	PLCAM_TX_THROTTLE	MAKE_BASE+TRIP	NO_TEST=1	NC_PLCAM_TX_THROTTLE
32	SDCONN_STATE_CHANGE_L	MAKE_BASE+TRIP	NO_TEST=1	NC_SDCONN_STATE_CHANGE_L

### Unused Misc Signals

64	PMU_CLK32K_GNSS_R	MAKE_BASE+TRIP	NO_TEST=1	NC_PMU_CLK32K_GNSS_R
64	GPU_THRMTRIP	MAKE_BASE+TRIP	NO_TEST=1	NC_GPU_THRMTRIP
64	P3V3G3W_EN	MAKE_BASE+TRIP	NO_TEST=1	NC_P3V3G3W_EN
56	CHGR_EN_VR1	MAKE_BASE+TRIP	NO_TEST=1	NC_CHGR_EN_VR1
56	CHGR_AUX_OK	MAKE_BASE+TRIP	NO_TEST=1	NC_CHGR_AUX_OK

34	PCIE_CLK100M_SSD1_23_P	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_CLK100M_SSD1_23P
34	PCIE_CLK100M_WLAN_N	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_CLK100M_WLANN
34	PCIE_CLK100M_WLAN_P	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_CLK100M_WLANP
34	PCIE_ENET_D2R_N	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_ENET_D2RN
34	PCIE_ENET_D2R_P	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_ENET_D2RP
34	PCIE_ENET_R2D_C_N	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_ENET_R2D_CN
34	PCIE_ENET_R2D_C_P	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_ENET_R2D_CP
34	PCIE_SSD1_D2R_N<3..0>	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_SSD1_D2RN<3..0>
34	PCIE_SSD1_D2R_P<3..0>	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_SSD1_D2RP<3..0>
34	PCIE_SSD1_R2D_C_N<3..0>	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_SSD1_R2D_CN<3..0>
34	PCIE_SSD1_R2D_C_P<3..0>	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_SSD1_R2D_CP<3..0>
34	PCIE_WLAN_D2R_N	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_WLAN_D2RN
34	PCIE_WLAN_D2R_P	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_WLAN_D2RP
34	PCIE_WLAN_R2D_C_N	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_WLAN_R2D_CN
34	PCIE_WLAN_R2D_C_P	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIE_WLAN_R2D_CP
32	PCIEDN_WAKE_L	MAKE_BASE+TRIP	NO_TEST=1	NC_PCIEDN_WAKE_L
32	PLCAM_PROX_INT_L	MAKE_BASE+TRIP	NO_TEST=1	NC_PLCAM_PROX_INT_L
32	PLCAM_ROMEO_B2B_DETECT	MAKE_BASE+TRIP	NO_TEST=1	NC_PLCAM_ROMEO_B2B_DETECT
33	PLCAM_RX_CLK12M_R	MAKE_BASE+TRIP	NO_TEST=1	NC_PLCAM_RX_CLK12M_R
33	PLCAM_RX_RESET_L	MAKE_BASE+TRIP	NO_TEST=1	NC_PLCAM_RX_RESET_L
33	PLCAM_TX_CLK12M_R	MAKE_BASE+TRIP	NO_TEST=1	NC_PLCAM_TX_CLK12M_R
33	PLCAM_TX_INT	MAKE_BASE+TRIP	NO_TEST=1	NC_PLCAM_TX_INT
31	PLCAM_TX_RESET_L	MAKE_BASE+TRIP	NO_TEST=1	NC_PLCAM_TX_RESET_L
31	PLCAM_TX_THROTTLE	MAKE_BASE+TRIP	NO_TEST=1	NC_PLCAM_TX_THROTTLE
32	SDCONN_STATE_CHANGE_L	MAKE_BASE+TRIP	NO_TEST=1	NC_SDCONN_STATE_CHANGE_L
32	SMC_FAN_1_PWM	MAKE_BASE+TRIP	NO_TEST=1	NC_SMC_FAN_1_PWM
32	SMC_FAN_1_TACH	MAKE_BASE+TRIP	NO_TEST=1	NC_SMC_FAN_1_TACH
32	SMC_GFX_SELF_THROTTLE	MAKE_BASE+TRIP	NO_TEST=1	NC_SMC_GFX_SELF_THROTTLE
32	SMC_GFX_THROTTLE_L	MAKE_BASE+TRIP	NO_TEST=1	NC_SMC_GFX_THROTTLE_L
32	SMC_LED_ONEWIRE	MAKE_BASE+TRIP	NO_TEST=1	NC_SMC_LED_ONEWIRE
32	SPI_ALTIMETER_CS_L	MAKE_BASE+TRIP	NO_TEST=1	NC_SPI_ALTIMETER_CS_L
34	SSD1_CLK24M_R	MAKE_BASE+TRIP	NO_TEST=1	NC_SSD1_CLK24M_R
34	SSD1_CLKREQ0_L	MAKE_BASE+TRIP	NO_TEST=1	NC_SSD1_CLKREQ0_L
34	SSD1_CLKREQ1_L	MAKE_BASE+TRIP	NO_TEST=1	NC_SSD1_CLKREQ1_L
34	SSD1_CLKREQ2_L	MAKE_BASE+TRIP	NO_TEST=1	NC_SSD1_CLKREQ2_L
34	SSD1_CLKREQ3_L	MAKE_BASE+TRIP	NO_TEST=1	NC_SSD1_CLKREQ3_L
34	SSD1_PCIE_RESET_L	MAKE_BASE+TRIP	NO_TEST=1	NC_SSD1_PCIE_RESET_L
34	SSD1_SWCLK_UART_R2D	MAKE_BASE+TRIP	NO_TEST=1	NC_SSD1_SWCLK_UART_R2D
34	SSD1_SWDIO_UART_D2R	MAKE_BASE+TRIP	NO_TEST=1	NC_SSD1_SWDIO_UART_D2R
32	TPAD_VIBE_L	MAKE_BASE+TRIP	NO_TEST=1	NC_TPAD_VIBE_L
33	UART_GNSS_D2R_CTS_L	MAKE_BASE+TRIP	NO_TEST=1	NC_UART_GNSS_D2R_CTS_L
33	UART_GNSS_R2D_RTS_L	MAKE_BASE+TRIP	NO_TEST=1	NC_UART_GNSS_R2D_RTS_L
33	UART_GNSS_R2D	MAKE_BASE+TRIP	NO_TEST=1	NC_UART_GNSS_R2D
33	UART_GNSS_D2R	MAKE_BASE+TRIP	NO_TEST=1	NC_UART_GNSS_D2R
34	WLAN_CLKREQ_L	MAKE_BASE+TRIP	NO_TEST=1	NC_WLAN_CLKREQ_L
34	WLAN_DEV_WAKE	MAKE_BASE+TRIP	NO_TEST=1	NC_WLAN_DEV_WAKE
34	WLAN_PERST_L	MAKE_BASE+TRIP	NO_TEST=1	NC_WLAN_PERST_L
33	SPI_DFR_CS_L	MAKE_BASE+TRIP	NO_TEST=1	NC_SPI_DFR_CS_L
33	SPI_DFR_CLK_R	MAKE_BASE+TRIP	NO_TEST=1	NC_SPI_DFR_CLK_R
33	SPI_DFR_MOSI_R	MAKE_BASE+TRIP	NO_TEST=1	NC_SPI_DFR_MOSI_R
33	SPI_DFR_MISO	MAKE_BASE+TRIP	NO_TEST=1	NC_SPI_DFR_MISO
33	PCHROM_SW_EN	MAKE_BASE+TRIP	NO_TEST=1	NC_PCHROM_SW_EN
6	HDMI_RESET_L	MAKE_BASE+TRIP	NO_TEST=1	NC_HDMI_RESET_L

### Grounded Signals



### PMIC GPIO Config Select

64	PVCCOPIO_EDRAM_PGOOD_PVCCNAND_PGOOD	MAKE_BASE+TRIP	PVCCNAND_PGOOD	72
64	PEARL_PWREN_PVCCNAND_EN	MAKE_BASE+TRIP	PVCCNAND_EN	72
64	NAND_DISCHARGE_EN_HDD_PWR_EN	MAKE_BASE+TRIP	NAND_DISCHARGE_EN	73
64	NAND_RESET_L_SD_PWR_EN	MAKE_BASE+TRIP	NAND_RESET_L	73
64	NAND_WP_L_ENET_PWR_EN	MAKE_BASE+TRIP	UVP_DIS_L	40
64	PVCCPLLOC_EN	MAKE_BASE+TRIP	PD_PVCCPLLOC_EN	

33	UART_BT_D2R	MAKE_BASE+TRIP	NO_TEST=1	NC_UART_BT_D2R
33	UART_BT_R2D	MAKE_BASE+TRIP	NO_TEST=1	NC_UART_BT_R2D
33	UART_BT_R2D_RTS_L	MAKE_BASE+TRIP	NO_TEST=1	NC_UART_BT_R2D_RTS_L
33	UART_BT_D2R_CTS_L	MAKE_BASE+TRIP	NO_TEST=1	NC_UART_BT_D2R_CTS_L

PAGE TITLE		
<b>Signal Aliases</b>		
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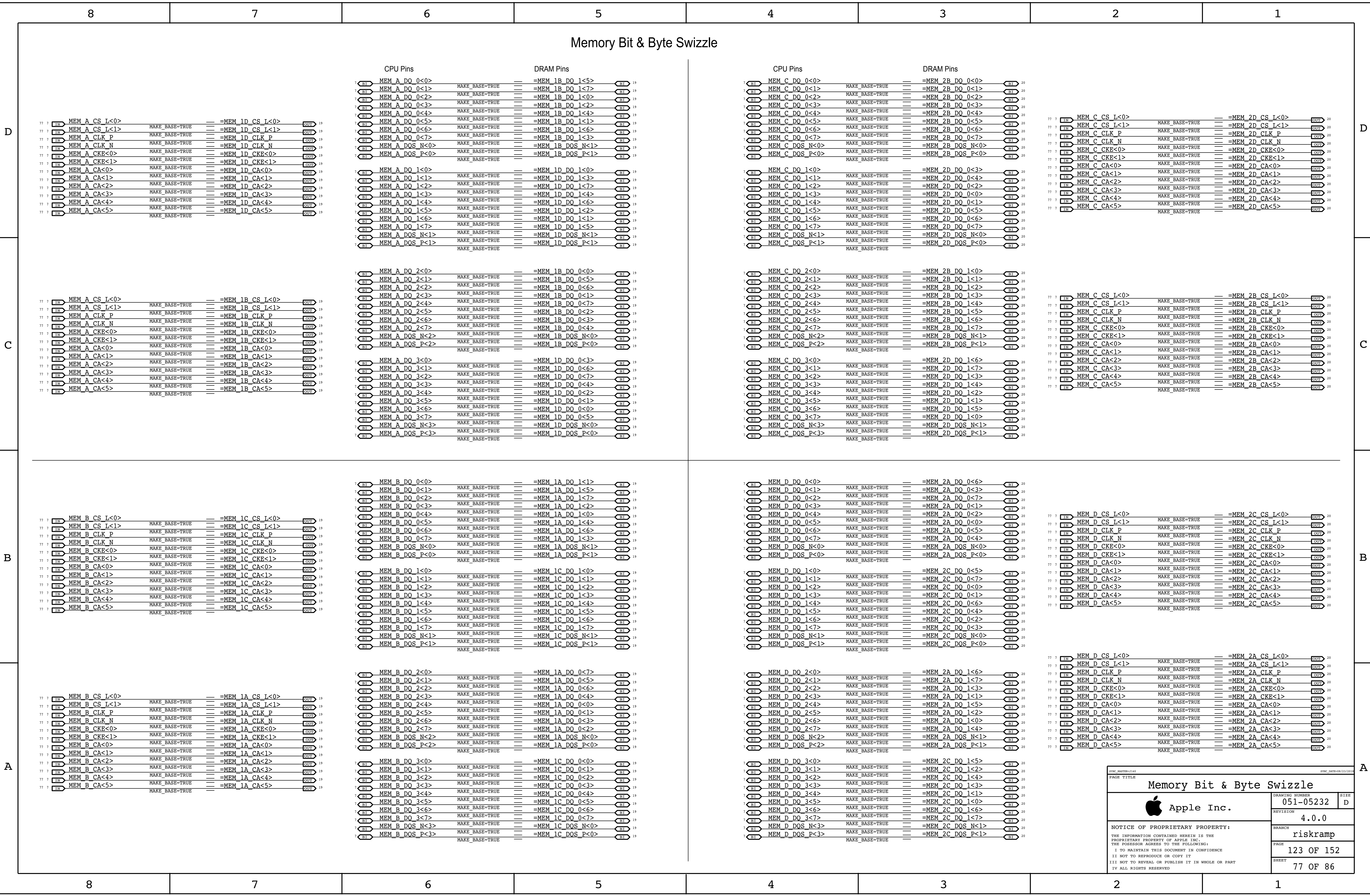
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# Memory Bit & Byte Swizzle



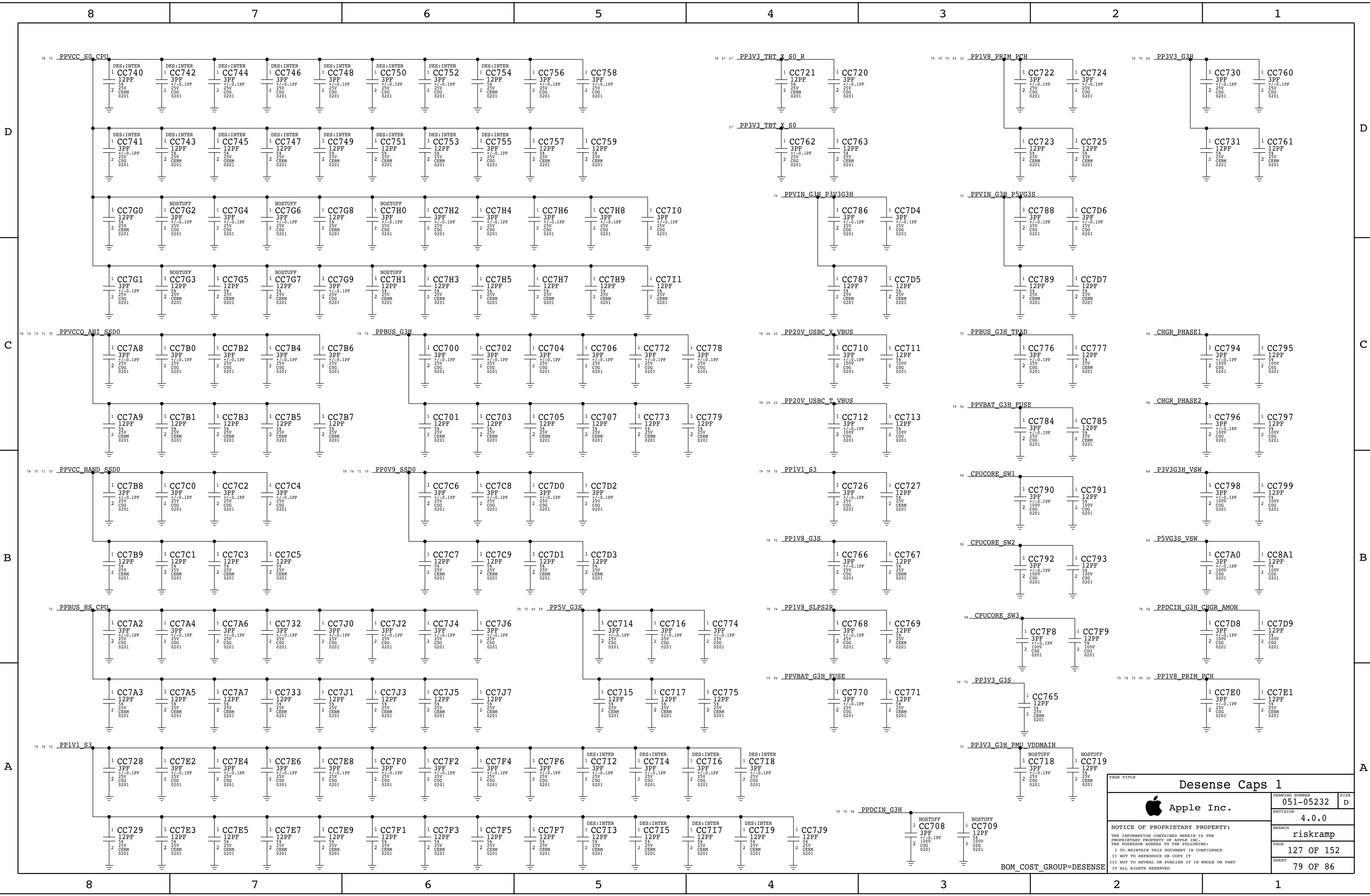
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PAGE TITLE: Memory Bit & Byte Swizzle

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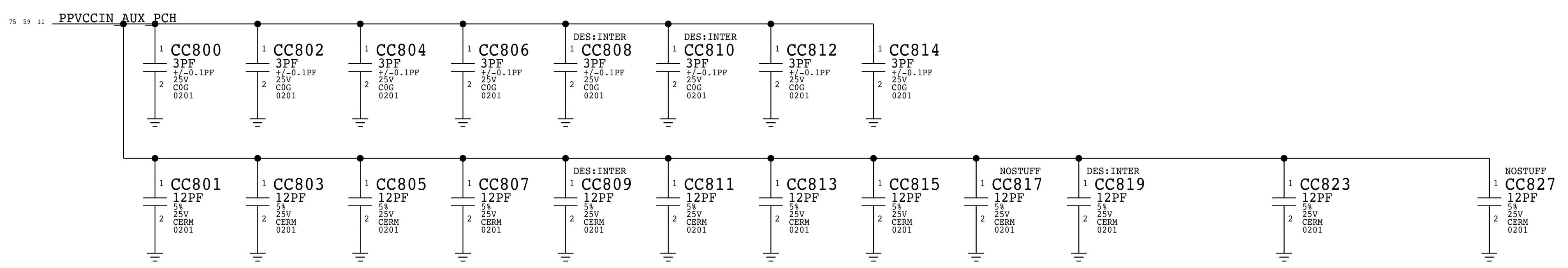


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BOM\_COST\_GROUP=DESENSE

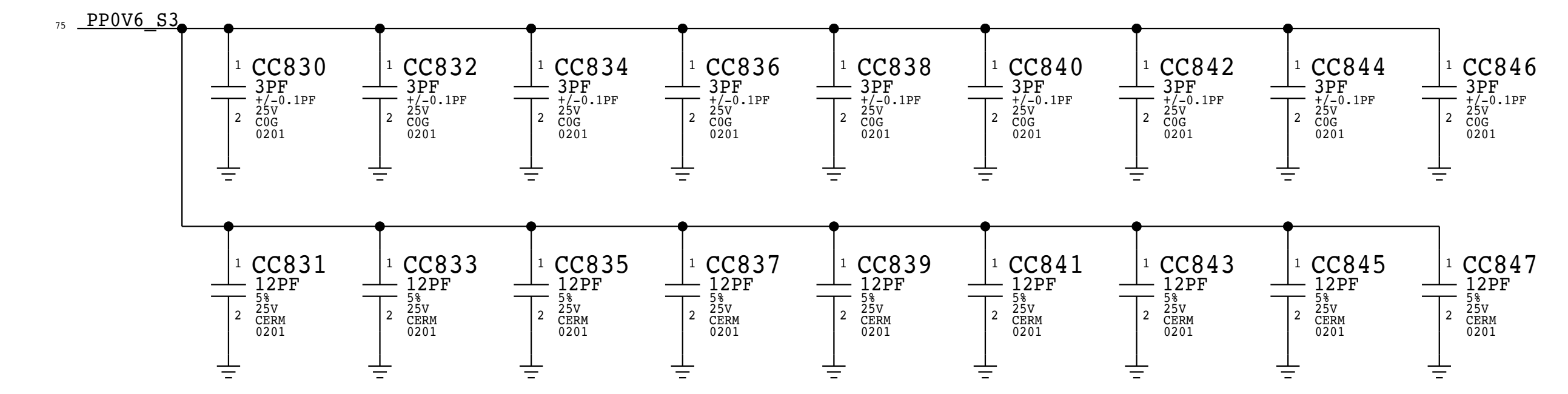
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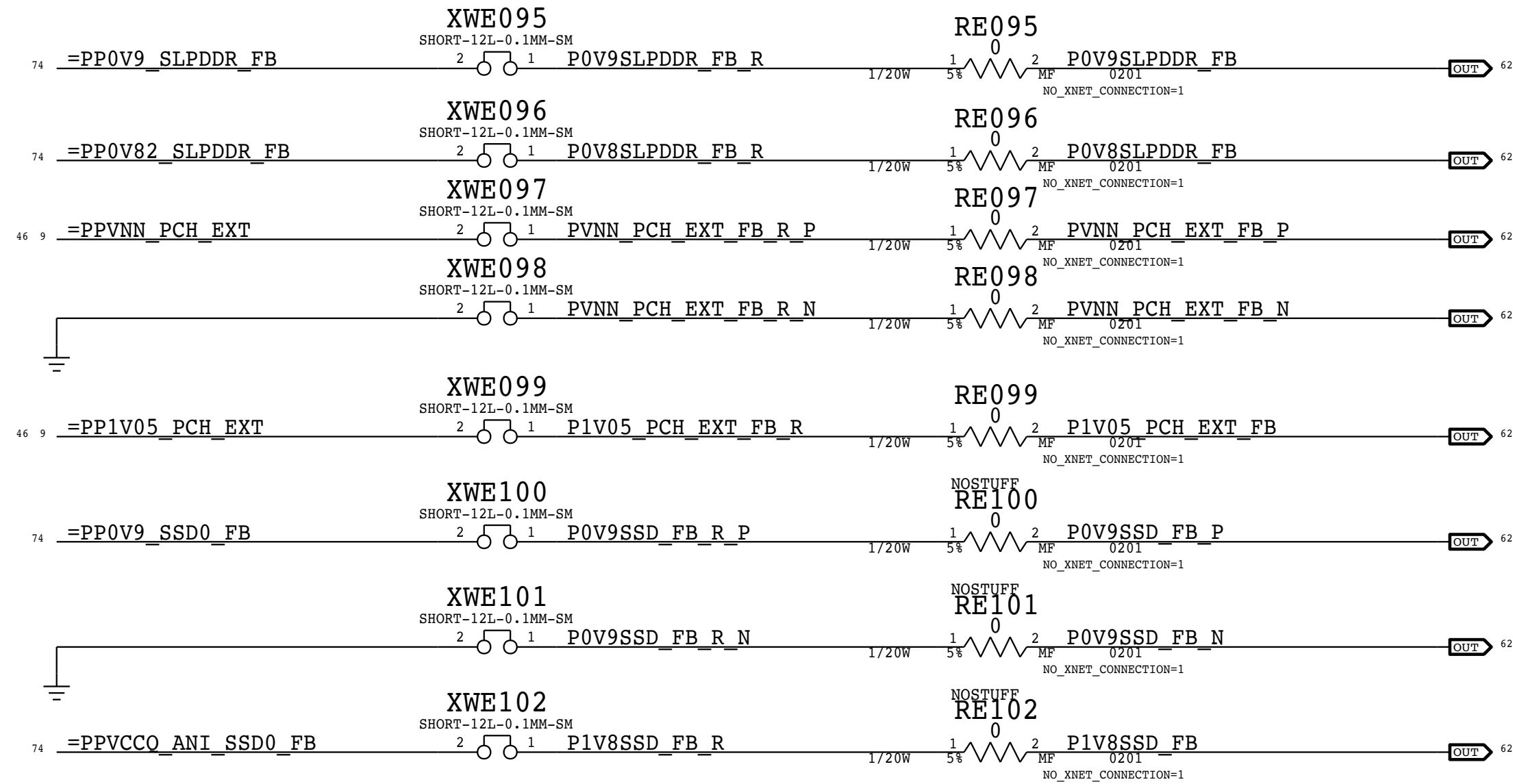
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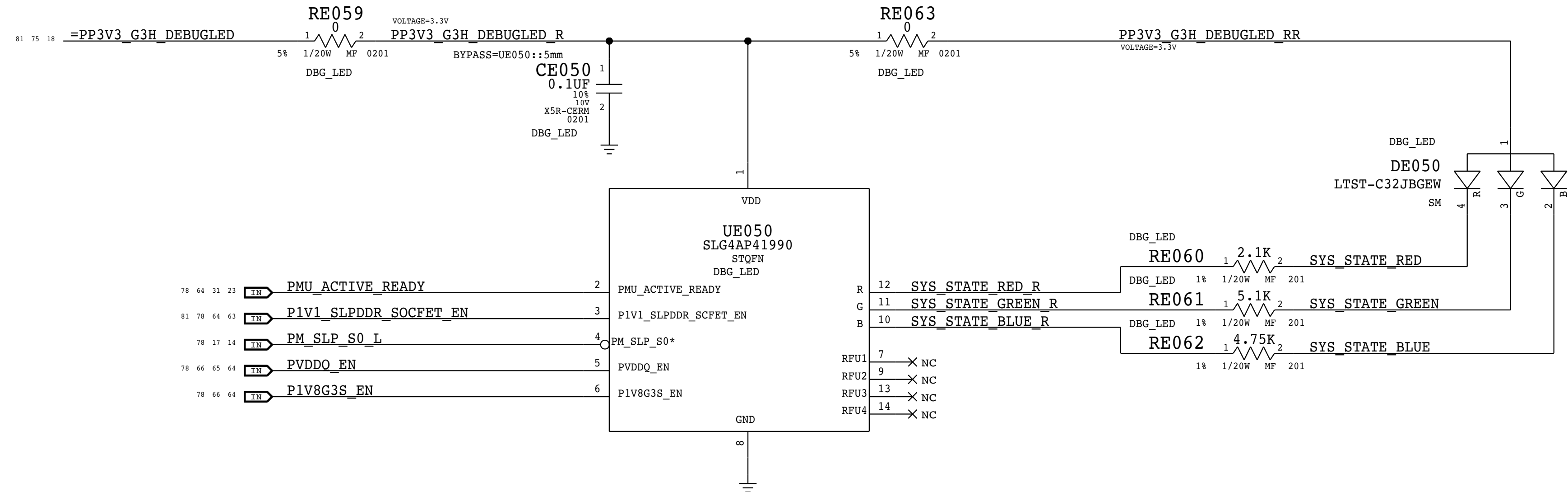
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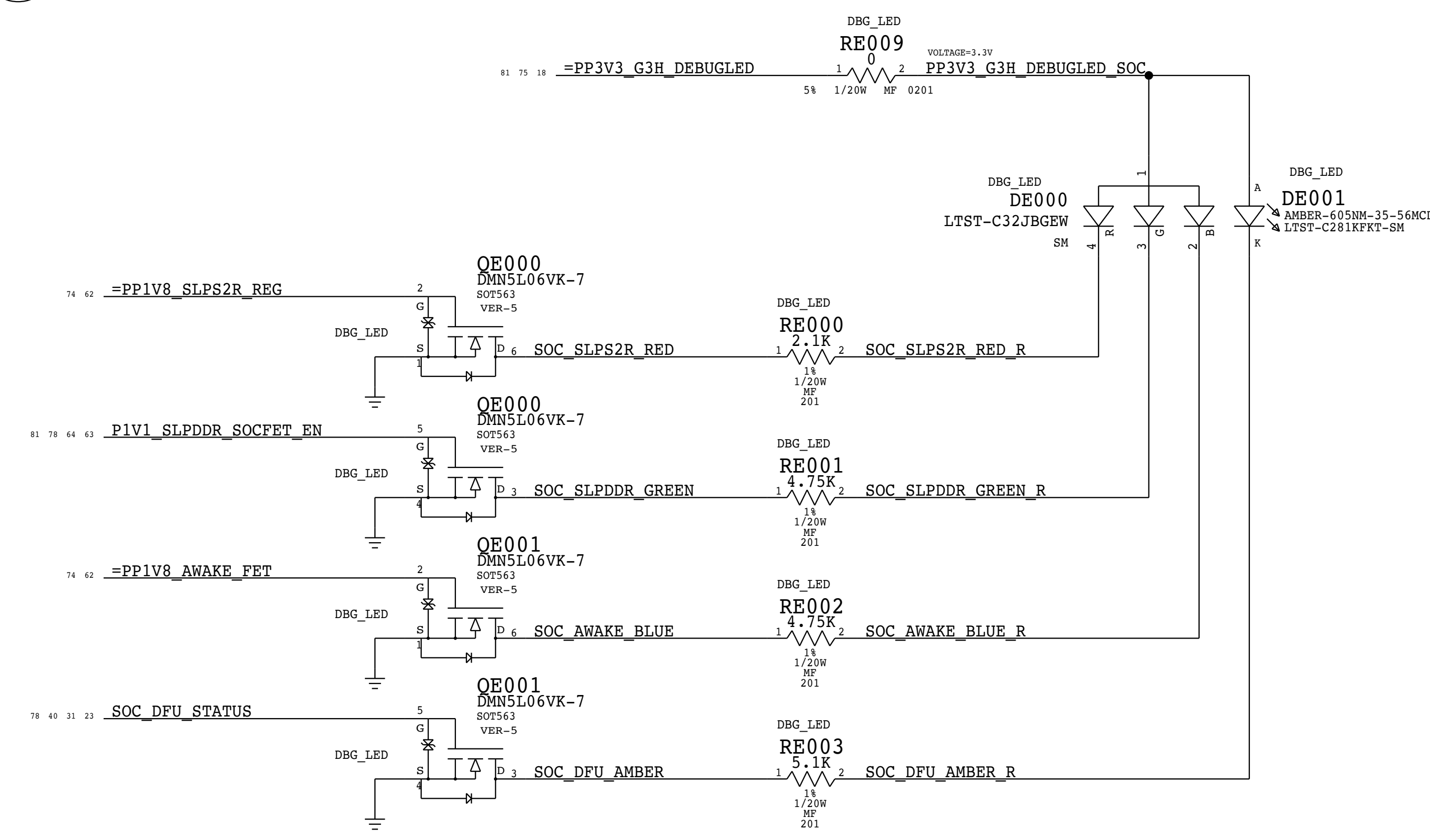
# A Remote Sense Support



# 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	Color	System			
0	0	0	0	0	BLINK	OFF	OFF		Blinking	Red	Shutdown (G3H)	OFF
0	0	0	0	1	ON	OFF	OFF	Standby (G3S)			SLPS2R	OFF
1	1	0	0	1	ON	ON	OFF	Yellow	Yellow & Green	Standby (G3S)	AWAKE	OFF
0	0	0	1	1	ON	ON	ON			Sleep	SLPS2R	S0i
1	1	0	1	1	OFF	OFF	ON	Blue	Blue	Sleep	AWAKE	S0i
1	1	1	1	1	OFF	ON	OFF			Run	AWAKE	S0
1	1	0	0	0	BLINK	ON	OFF	Blinking	Yellow & Green			

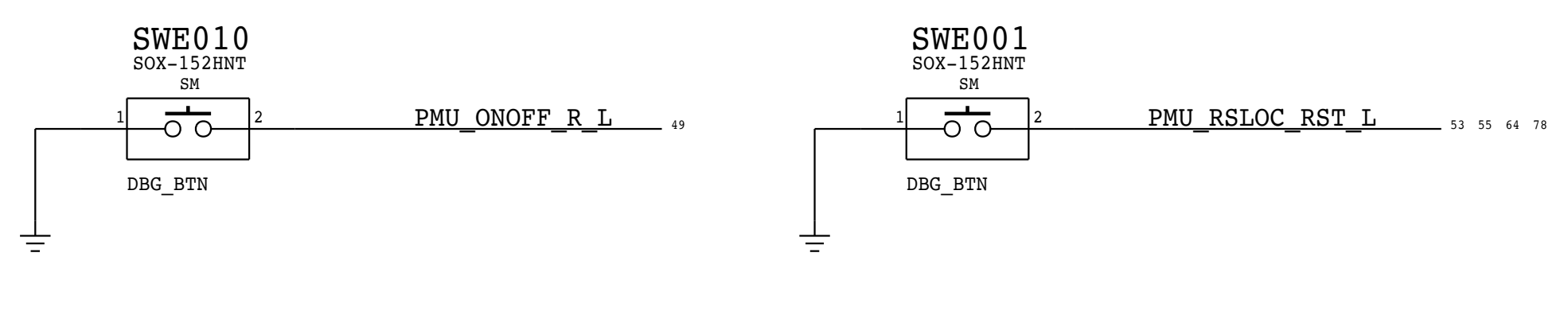
All other states are magenta

# D System Power States

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



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BOM\_COST\_GROUP=DEBUG

BOM Variants

EEEE	BOM NUMBER	BOM NAME	BOM OPTIONS
	685-00329	COMMON PARTS,MLB-TKSB,X1783	MLB_COMMON,MLB_DESENSE,MLB_CPUCFG
	985-01143	DEV PARTS,MLB-TKSB,X1783	DBG_BTN,DBG_LED,USBC_DBG,WIFI_DBG,FANTACH:DEBUG
MVWL	939-08188	PCBA,MLB-TKSB,DCDC,X1783	ALTERNATE,COMMON,DEV_PARTS_BOM,SCHEM,PCBF,CPU_ICLY:INTERPOSER,MLB_POWER,MLB_MISC

EEEE	BOM NUMBER	BOM NAME	BOM OPTIONS
MXHM	639-08714	PCBA,MLB-TKSB,BEST,HY-8G,HY-256G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:HYNIX_8GB,NANDCFG:ITLC_848_256G_HY
MXJ0	639-08715	PCBA,MLB-TKSB,BEST,HY-8G,SD-256G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:HYNIX_8GB,NANDCFG:ITLC_848_256G_SD
MXJC	639-08716	PCBA,MLB-TKSB,BEST,HY-8G,TO-256G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:HYNIX_8GB,NANDCFG:ITLC_848_256G_TO
MXJQ	639-08717	PCBA,MLB-TKSB,BEST,MI-8G,HY-256G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:MICRON_8GB,NANDCFG:ITLC_848_256G_HY
MXK3	639-08718	PCBA,MLB-TKSB,BEST,MI-8G,SD-256G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:MICRON_8GB,NANDCFG:ITLC_848_256G_SD
MXKG	639-08719	PCBA,MLB-TKSB,BEST,MI-8G,TO-256G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:MICRON_8GB,NANDCFG:ITLC_848_256G_TO
MXKT	639-08720	PCBA,MLB-TKSB,BEST,SS-8G,HY-256G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:SAMSUNG_8GB,NANDCFG:ITLC_848_256G_HY
MXL5	639-08721	PCBA,MLB-TKSB,BEST,SS-8G,SD-256G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:SAMSUNG_8GB,NANDCFG:ITLC_848_256G_SD
MXLJ	639-08722	PCBA,MLB-TKSB,BEST,SS-8G,TO-256G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:SAMSUNG_8GB,NANDCFG:ITLC_848_256G_TO
MXLW	639-08723	PCBA,MLB-TKSB,BEST,HY-16G,HY-256G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_848_256G_HY
MXM7	639-08724	PCBA,MLB-TKSB,BEST,HY-16G,SD-256G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_848_256G_SD
MXML	639-08725	PCBA,MLB-TKSB,BEST,HY-16G,TO-256G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_848_256G_TO
MXMY	639-08726	PCBA,MLB-TKSB,BEST,MI-16G,HY-256G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_848_256G_HY
MXN9	639-08727	PCBA,MLB-TKSB,BEST,MI-16G,SD-256G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_848_256G_SD
MXNN	639-08728	PCBA,MLB-TKSB,BEST,MI-16G,TO-256G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_848_256G_TO
MXP1	639-08729	PCBA,MLB-TKSB,BEST,SS-16G,HY-256G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_848_256G_HY
MXPd	639-08730	PCBA,MLB-TKSB,BEST,SS-16G,SD-256G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_848_256G_SD
MXPQ	639-08731	PCBA,MLB-TKSB,BEST,SS-16G,TO-256G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_848_256G_TO
MXQ3	639-08732	PCBA,MLB-TKSB,BEST,HY-8G,SD-512G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:HYNIX_8GB,NANDCFG:ITLC_848_512G_SD
MXQG	639-08733	PCBA,MLB-TKSB,BEST,HY-8G,TO-512G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:HYNIX_8GB,NANDCFG:ITLC_848_512G_TO
MXQT	639-08734	PCBA,MLB-TKSB,BEST,MI-8G,SD-512G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:MICRON_8GB,NANDCFG:ITLC_848_512G_SD
MXR5	639-08735	PCBA,MLB-TKSB,BEST,MI-8G,TO-512G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:MICRON_8GB,NANDCFG:ITLC_848_512G_TO
MXRJ	639-08736	PCBA,MLB-TKSB,BEST,SS-8G,SD-512G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:SAMSUNG_8GB,NANDCFG:ITLC_848_512G_SD
MXRW	639-08737	PCBA,MLB-TKSB,BEST,SS-8G,TO-512G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:SAMSUNG_8GB,NANDCFG:ITLC_848_512G_TO
MXT7	639-08738	PCBA,MLB-TKSB,BEST,HY-16G,SD-512G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_848_512G_SD
MXTN	639-08739	PCBA,MLB-TKSB,BEST,HY-16G,TO-512G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_848_512G_TO
MXV1	639-08740	PCBA,MLB-TKSB,BEST,MI-16G,SD-512G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_848_512G_SD
MXVD	639-08741	PCBA,MLB-TKSB,BEST,MI-16G,TO-512G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_848_512G_TO
MXVQ	639-08742	PCBA,MLB-TKSB,BEST,SS-16G,SD-512G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_848_512G_SD
MXW3	639-08743	PCBA,MLB-TKSB,BEST,SS-16G,TO-512G,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_848_512G_TO
MXWG	639-08744	PCBA,MLB-TKSB,BEST,HY-8G,HY-1.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:HYNIX_8GB,NANDCFG:ITLC_848_1P0T_HY
MXWT	639-08745	PCBA,MLB-TKSB,BEST,HY-8G,SD-1.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:HYNIX_8GB,NANDCFG:ITLC_848_1P0T_SD
MXX5	639-08746	PCBA,MLB-TKSB,BEST,MI-8G,HY-1.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:MICRON_8GB,NANDCFG:ITLC_848_1P0T_HY
MXXJ	639-08747	PCBA,MLB-TKSB,BEST,MI-8G,SD-1.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:MICRON_8GB,NANDCFG:ITLC_848_1P0T_SD
MXXW	639-08748	PCBA,MLB-TKSB,BEST,SS-8G,HY-1.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:SAMSUNG_8GB,NANDCFG:ITLC_848_1P0T_HY
MXY8	639-08749	PCBA,MLB-TKSB,BEST,SS-8G,SD-1.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:SAMSUNG_8GB,NANDCFG:ITLC_848_1P0T_SD
MXYM	639-08750	PCBA,MLB-TKSB,BEST,HY-16G,HY-1.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_848_1P0T_HY
MY11	639-08751	PCBA,MLB-TKSB,BEST,HY-16G,SD-1.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_848_1P0T_SD
MY1F	639-08752	PCBA,MLB-TKSB,BEST,MI-16G,HY-1.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_848_1P0T_HY
MY1R	639-08753	PCBA,MLB-TKSB,BEST,MI-16G,SD-1.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_848_1P0T_SD
MY25	639-08754	PCBA,MLB-TKSB,BEST,SS-16G,HY-1.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_848_1P0T_HY
MY2L	639-08755	PCBA,MLB-TKSB,BEST,SS-16G,SD-1.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_848_1P0T_SD

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NRDT	639-09922	PCBA,MLB-TKSB,BEST,HY-8G,HY-2.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:HYNIX_8GB,NANDCFG:ITLC_848_2P0T_HY
MY2Y	639-08756	PCBA,MLB-TKSB,BEST,HY-8G,SD-2.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:HYNIX_8GB,NANDCFG:ITLC_848_2P0T_SD
NRF5	639-09923	PCBA,MLB-TKSB,BEST,MI-8G,HY-2.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:MICRON_8GB,NANDCFG:ITLC_848_2P0T_HY
MY39	639-08757	PCBA,MLB-TKSB,BEST,MI-8G,SD-2.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:MICRON_8GB,NANDCFG:ITLC_848_2P0T_SD
NRFJ	639-09924	PCBA,MLB-TKSB,BEST,SS-8G,HY-2.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:SAMSUNG_8GB,NANDCFG:ITLC_848_2P0T_HY
MY3N	639-08758	PCBA,MLB-TKSB,BEST,SS-8G,SD-2.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:SAMSUNG_8GB,NANDCFG:ITLC_848_2P0T_SD
NRFW	639-09925	PCBA,MLB-TKSB,BEST,HY-16G,HY-2.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_848_2P0T_HY
MY41	639-08759	PCBA,MLB-TKSB,BEST,HY-16G,SD-2.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_848_2P0T_SD
NRG7	639-09926	PCBA,MLB-TKSB,BEST,MI-16G,HY-2.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_848_2P0T_HY
MY4D	639-08760	PCBA,MLB-TKSB,BEST,MI-16G,SD-2.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_848_2P0T_SD
NRGL	639-09927	PCBA,MLB-TKSB,BEST,SS-16G,HY-2.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_848_2P0T_HY
MY4Q	639-08761	PCBA,MLB-TKSB,BEST,SS-16G,SD-2.0T,X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEST,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_848_2P0T_SD

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EEEE	BOM NUMBER	BOM NAME	BOM OPTIONS
N4XW	639-08952	PCBA,MLB-TKSB,BEDRE, HY-8G, HY-256G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:HYNIX_8GB,NANDCFG:ITLC_84E_256G_HY
N4Y8	639-08953	PCBA,MLB-TKSB,BEDRE, HY-8G, SD-256G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:HYNIX_8GB,NANDCFG:ITLC_84E_256G_SD
N4YM	639-08954	PCBA,MLB-TKSB,BEDRE, HY-8G, TO-256G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:HYNIX_8GB,NANDCFG:ITLC_84E_256G_TO
N500	639-08955	PCBA,MLB-TKSB,BEDRE, MI-8G, HY-256G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:MICRON_8GB,NANDCFG:ITLC_84E_256G_HY
N50G	639-08956	PCBA,MLB-TKSB,BEDRE, MI-8G, SD-256G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:MICRON_8GB,NANDCFG:ITLC_84E_256G_SD
N510	639-08957	PCBA,MLB-TKSB,BEDRE, MI-8G, TO-256G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:MICRON_8GB,NANDCFG:ITLC_84E_256G_TO
N51G	639-08958	PCBA,MLB-TKSB,BEDRE, SS-8G, HY-256G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:SAMSUNG_8GB,NANDCFG:ITLC_84E_256G_HY
N51W	639-08959	PCBA,MLB-TKSB,BEDRE, SS-8G, SD-256G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:SAMSUNG_8GB,NANDCFG:ITLC_84E_256G_SD
N527	639-08960	PCBA,MLB-TKSB,BEDRE, SS-8G, TO-256G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:SAMSUNG_8GB,NANDCFG:ITLC_84E_256G_TO
N52L	639-08961	PCBA,MLB-TKSB,BEDRE, HY-16G, HY-256G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_84E_256G_HY
N52Y	639-08962	PCBA,MLB-TKSB,BEDRE, HY-16G, SD-256G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_84E_256G_SD
N539	639-08963	PCBA,MLB-TKSB,BEDRE, HY-16G, TO-256G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_84E_256G_TO
N53Q	639-08964	PCBA,MLB-TKSB,BEDRE, MI-16G, HY-256G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_84E_256G_HY
N555	639-08965	PCBA,MLB-TKSB,BEDRE, MI-16G, SD-256G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_84E_256G_SD
N55J	639-08966	PCBA,MLB-TKSB,BEDRE, MI-16G, TO-256G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_84E_256G_TO
N55W	639-08967	PCBA,MLB-TKSB,BEDRE, SS-16G, HY-256G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_84E_256G_HY
N567	639-08968	PCBA,MLB-TKSB,BEDRE, SS-16G, SD-256G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_84E_256G_SD
N56L	639-08969	PCBA,MLB-TKSB,BEDRE, SS-16G, TO-256G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_84E_256G_TO
N56Y	639-08970	PCBA,MLB-TKSB,BEDRE, HY-8G, SD-512G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:HYNIX_8GB,NANDCFG:ITLC_84E_512G_SD
N579	639-08971	PCBA,MLB-TKSB,BEDRE, HY-8G, TO-512G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:HYNIX_8GB,NANDCFG:ITLC_84E_512G_TO
N57N	639-08972	PCBA,MLB-TKSB,BEDRE, MI-8G, SD-512G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:MICRON_8GB,NANDCFG:ITLC_84E_512G_SD
N591	639-08973	PCBA,MLB-TKSB,BEDRE, MI-8G, TO-512G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:MICRON_8GB,NANDCFG:ITLC_84E_512G_TO
N59D	639-08974	PCBA,MLB-TKSB,BEDRE, SS-8G, SD-512G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:SAMSUNG_8GB,NANDCFG:ITLC_84E_512G_SD
N59Q	639-08975	PCBA,MLB-TKSB,BEDRE, SS-8G, TO-512G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:SAMSUNG_8GB,NANDCFG:ITLC_84E_512G_TO
N5C4	639-08976	PCBA,MLB-TKSB,BEDRE, HY-16G, SD-512G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_84E_512G_SD
N5CH	639-08977	PCBA,MLB-TKSB,BEDRE, HY-16G, TO-512G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_84E_512G_TO
N5CV	639-08978	PCBA,MLB-TKSB,BEDRE, MI-16G, SD-512G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_84E_512G_SD
N5D6	639-08979	PCBA,MLB-TKSB,BEDRE, MI-16G, TO-512G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_84E_512G_TO
N5DK	639-08980	PCBA,MLB-TKSB,BEDRE, SS-16G, SD-512G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_84E_512G_SD
N5DX	639-08981	PCBA,MLB-TKSB,BEDRE, SS-16G, TO-512G, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_84E_512G_TO
N5F8	639-08982	PCBA,MLB-TKSB,BEDRE, HY-8G, HY-1.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:HYNIX_8GB,NANDCFG:ITLC_84E_1P0T_HY
N5FM	639-08983	PCBA,MLB-TKSB,BEDRE, HY-8G, SD-1.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:HYNIX_8GB,NANDCFG:ITLC_84E_1P0T_SD
N5G0	639-08984	PCBA,MLB-TKSB,BEDRE, MI-8G, HY-1.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:MICRON_8GB,NANDCFG:ITLC_84E_1P0T_HY
N5GC	639-08985	PCBA,MLB-TKSB,BEDRE, MI-8G, SD-1.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:MICRON_8GB,NANDCFG:ITLC_84E_1P0T_SD
N5GP	639-08986	PCBA,MLB-TKSB,BEDRE, SS-8G, HY-1.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:SAMSUNG_8GB,NANDCFG:ITLC_84E_1P0T_HY
N5H3	639-08987	PCBA,MLB-TKSB,BEDRE, SS-8G, SD-1.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:SAMSUNG_8GB,NANDCFG:ITLC_84E_1P0T_SD
N5HG	639-08988	PCBA,MLB-TKSB,BEDRE, HY-16G, HY-1.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_84E_1P0T_HY
N5HV	639-08989	PCBA,MLB-TKSB,BEDRE, HY-16G, SD-1.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_84E_1P0T_SD
N5J6	639-08990	PCBA,MLB-TKSB,BEDRE, MI-16G, HY-1.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_84E_1P0T_HY
N5JL	639-08991	PCBA,MLB-TKSB,BEDRE, MI-16G, SD-1.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_84E_1P0T_SD
N5JY	639-08992	PCBA,MLB-TKSB,BEDRE, SS-16G, HY-1.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_84E_1P0T_HY
N5KC	639-08993	PCBA,MLB-TKSB,BEDRE, SS-16G, SD-1.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_84E_1P0T_SD

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NRGY	639-09928	PCBA,MLB-TKSB,BEDRE, HY-8G, HY-2.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:HYNIX_8GB,NANDCFG:ITLC_84E_2P0T_HY
N5KP	639-08994	PCBA,MLB-TKSB,BEDRE, HY-8G, SD-2.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:HYNIX_8GB,NANDCFG:ITLC_84E_2P0T_SD
NRH9	639-09929	PCBA,MLB-TKSB,BEDRE, MI-8G, HY-2.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:MICRON_8GB,NANDCFG:ITLC_84E_2P0T_HY
N5L2	639-08995	PCBA,MLB-TKSB,BEDRE, MI-8G, SD-2.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:MICRON_8GB,NANDCFG:ITLC_84E_2P0T_SD
NRHN	639-09930	PCBA,MLB-TKSB,BEDRE, SS-8G, HY-2.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:SAMSUNG_8GB,NANDCFG:ITLC_84E_2P0T_HY
N5LF	639-08996	PCBA,MLB-TKSB,BEDRE, SS-8G, SD-2.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:SAMSUNG_8GB,NANDCFG:ITLC_84E_2P0T_SD
NRJ1	639-09931	PCBA,MLB-TKSB,BEDRE, HY-16G, HY-2.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_84E_2P0T_HY
N5LR	639-08997	PCBA,MLB-TKSB,BEDRE, HY-16G, SD-2.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:HYNIX_16GB,NANDCFG:ITLC_84E_2P0T_SD
NRJD	639-09932	PCBA,MLB-TKSB,BEDRE, MI-16G, HY-2.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_84E_2P0T_HY
N5M4	639-08998	PCBA,MLB-TKSB,BEDRE, MI-16G, SD-2.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:MICRON_16GB,NANDCFG:ITLC_84E_2P0T_SD
NRJQ	639-09933	PCBA,MLB-TKSB,BEDRE, SS-16G, HY-2.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_84E_2P0T_HY
N5MH	639-08999	PCBA,MLB-TKSB,BEDRE, SS-16G, SD-2.0T, X1783	CHM_PARTS_BOM,ALTERNATE,CPU_ICLY:BEDRE,DRAMCFG:SAMSUNG_16GB,NANDCFG:ITLC_84E_2P0T_SD

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	SIZE	D

BOM Variants

EEEE	BOM NUMBER	BOM NAME	BOM OPTIONS
MY9D	639-08774	PCBA,MLB-TKSB,GOOD,HY-8G,HY-256G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:HYNIX_8GB,MANDCFG:ITLC_84E_256G_BY
MY9Q	639-08775	PCBA,MLB-TKSB,GOOD,HY-8G,SD-256G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:HYNIX_8GB,MANDCFG:ITLC_84E_256G_SD
MYC3	639-08776	PCBA,MLB-TKSB,GOOD,HY-8G,TO-256G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:HYNIX_8GB,MANDCFG:ITLC_84E_256G_TO
MYCG	639-08777	PCBA,MLB-TKSB,GOOD,MI-8G,HY-256G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:MICRON_8GB,MANDCFG:ITLC_84E_256G_BY
MYCT	639-08778	PCBA,MLB-TKSB,GOOD,MI-8G,SD-256G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:MICRON_8GB,MANDCFG:ITLC_84E_256G_SD
MYD5	639-08779	PCBA,MLB-TKSB,GOOD,MI-8G,TO-256G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:MICRON_8GB,MANDCFG:ITLC_84E_256G_TO
MYDJ	639-08780	PCBA,MLB-TKSB,GOOD,SS-8G,HY-256G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:SAMSUNG_8GB,MANDCFG:ITLC_84E_256G_BY
MYDW	639-08781	PCBA,MLB-TKSB,GOOD,SS-8G,SD-256G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:SAMSUNG_8GB,MANDCFG:ITLC_84E_256G_SD
MYF7	639-08782	PCBA,MLB-TKSB,GOOD,SS-8G,TO-256G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:SAMSUNG_8GB,MANDCFG:ITLC_84E_256G_TO
MYFL	639-08783	PCBA,MLB-TKSB,GOOD,HY-16G,HY-256G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:HYNIX_16GB,MANDCFG:ITLC_84E_256G_BY
MYFY	639-08784	PCBA,MLB-TKSB,GOOD,HY-16G,SD-256G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:HYNIX_16GB,MANDCFG:ITLC_84E_256G_SD
MYG9	639-08785	PCBA,MLB-TKSB,GOOD,HY-16G,TO-256G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:HYNIX_16GB,MANDCFG:ITLC_84E_256G_TO
MYGN	639-08786	PCBA,MLB-TKSB,GOOD,MI-16G,HY-256G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:MICRON_16GB,MANDCFG:ITLC_84E_256G_BY
MYH1	639-08787	PCBA,MLB-TKSB,GOOD,MI-16G,SD-256G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:MICRON_16GB,MANDCFG:ITLC_84E_256G_SD
MYHD	639-08788	PCBA,MLB-TKSB,GOOD,MI-16G,TO-256G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:MICRON_16GB,MANDCFG:ITLC_84E_256G_TO
MYHQ	639-08789	PCBA,MLB-TKSB,GOOD,SS-16G,HY-256G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:SAMSUNG_16GB,MANDCFG:ITLC_84E_256G_BY
MYJ3	639-08790	PCBA,MLB-TKSB,GOOD,SS-16G,SD-256G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:SAMSUNG_16GB,MANDCFG:ITLC_84E_256G_SD
MYJG	639-08791	PCBA,MLB-TKSB,GOOD,SS-16G,TO-256G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:SAMSUNG_16GB,MANDCFG:ITLC_84E_256G_TO
MYK5	639-08792	PCBA,MLB-TKSB,GOOD,HY-8G,SD-512G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:HYNIX_8GB,MANDCFG:ITLC_84E_512G_SD
MYKJ	639-08793	PCBA,MLB-TKSB,GOOD,HY-8G,TO-512G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:HYNIX_8GB,MANDCFG:ITLC_84E_512G_TO
MYKW	639-08794	PCBA,MLB-TKSB,GOOD,MI-8G,SD-512G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:MICRON_8GB,MANDCFG:ITLC_84E_512G_SD
MYL7	639-08795	PCBA,MLB-TKSB,GOOD,MI-8G,TO-512G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:MICRON_8GB,MANDCFG:ITLC_84E_512G_TO
MYLL	639-08796	PCBA,MLB-TKSB,GOOD,SS-8G,SD-512G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:SAMSUNG_8GB,MANDCFG:ITLC_84E_512G_SD
MYLY	639-08797	PCBA,MLB-TKSB,GOOD,SS-8G,TO-512G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:SAMSUNG_8GB,MANDCFG:ITLC_84E_512G_TO
MYM9	639-08798	PCBA,MLB-TKSB,GOOD,HY-16G,SD-512G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:HYNIX_16GB,MANDCFG:ITLC_84E_512G_SD
MYMN	639-08799	PCBA,MLB-TKSB,GOOD,HY-16G,TO-512G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:HYNIX_16GB,MANDCFG:ITLC_84E_512G_TO
MYN1	639-08800	PCBA,MLB-TKSB,GOOD,MI-16G,SD-512G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:MICRON_16GB,MANDCFG:ITLC_84E_512G_SD
MYND	639-08801	PCBA,MLB-TKSB,GOOD,MI-16G,TO-512G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:MICRON_16GB,MANDCFG:ITLC_84E_512G_TO
MYNQ	639-08802	PCBA,MLB-TKSB,GOOD,SS-16G,SD-512G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:SAMSUNG_16GB,MANDCFG:ITLC_84E_512G_SD
MYP3	639-08803	PCBA,MLB-TKSB,GOOD,SS-16G,TO-512G,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:SAMSUNG_16GB,MANDCFG:ITLC_84E_512G_TO
MYPG	639-08804	PCBA,MLB-TKSB,GOOD,HY-8G,HY-1.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:HYNIX_8GB,MANDCFG:ITLC_84E_1P0T_BY
MYPT	639-08805	PCBA,MLB-TKSB,GOOD,HY-8G,SD-1.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:HYNIX_8GB,MANDCFG:ITLC_84E_1P0T_SD
MYQ5	639-08806	PCBA,MLB-TKSB,GOOD,MI-8G,HY-1.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:MICRON_8GB,MANDCFG:ITLC_84E_1P0T_BY
MYQJ	639-08807	PCBA,MLB-TKSB,GOOD,MI-8G,SD-1.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:MICRON_8GB,MANDCFG:ITLC_84E_1P0T_SD
MYQW	639-08808	PCBA,MLB-TKSB,GOOD,SS-8G,HY-1.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:SAMSUNG_8GB,MANDCFG:ITLC_84E_1P0T_BY
MYR7	639-08809	PCBA,MLB-TKSB,GOOD,SS-8G,SD-1.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:SAMSUNG_8GB,MANDCFG:ITLC_84E_1P0T_SD
MYRL	639-08810	PCBA,MLB-TKSB,GOOD,HY-16G,HY-1.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:HYNIX_16GB,MANDCFG:ITLC_84E_1P0T_BY
MYRY	639-08811	PCBA,MLB-TKSB,GOOD,HY-16G,SD-1.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:HYNIX_16GB,MANDCFG:ITLC_84E_1P0T_SD
MYT9	639-08812	PCBA,MLB-TKSB,GOOD,MI-16G,HY-1.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:MICRON_16GB,MANDCFG:ITLC_84E_1P0T_BY
MYTN	639-08813	PCBA,MLB-TKSB,GOOD,MI-16G,SD-1.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:MICRON_16GB,MANDCFG:ITLC_84E_1P0T_SD
MYV1	639-08814	PCBA,MLB-TKSB,GOOD,SS-16G,HY-1.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:SAMSUNG_16GB,MANDCFG:ITLC_84E_1P0T_BY
MYVR	639-08816	PCBA,MLB-TKSB,GOOD,SS-16G,SD-1.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:SAMSUNG_16GB,MANDCFG:ITLC_84E_1P0T_SD

EEEE	BOM NUMBER	BOM NAME	BOM OPTIONS
NRK3	639-09934	PCBA,MLB-TKSB,GOOD,HY-8G,HY-2.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:HYNIX_8GB,MANDCFG:ITLC_84E_2P0T_BY
MYW4	639-08817	PCBA,MLB-TKSB,GOOD,HY-8G,SD-2.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:HYNIX_8GB,MANDCFG:ITLC_84E_2P0T_SD
NRKG	639-09935	PCBA,MLB-TKSB,GOOD,MI-8G,HY-2.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:MICRON_8GB,MANDCFG:ITLC_84E_2P0T_BY
MYWH	639-08818	PCBA,MLB-TKSB,GOOD,MI-8G,SD-2.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:MICRON_8GB,MANDCFG:ITLC_84E_2P0T_SD
NRKT	639-09936	PCBA,MLB-TKSB,GOOD,SS-8G,HY-2.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:SAMSUNG_8GB,MANDCFG:ITLC_84E_2P0T_BY
MYWV	639-08819	PCBA,MLB-TKSB,GOOD,SS-8G,SD-2.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:SAMSUNG_8GB,MANDCFG:ITLC_84E_2P0T_SD
NRL5	639-09937	PCBA,MLB-TKSB,GOOD,HY-16G,HY-2.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:HYNIX_16GB,MANDCFG:ITLC_84E_2P0T_BY
MYX6	639-08820	PCBA,MLB-TKSB,GOOD,HY-16G,SD-2.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:HYNIX_16GB,MANDCFG:ITLC_84E_2P0T_SD
NRLJ	639-09938	PCBA,MLB-TKSB,GOOD,MI-16G,HY-2.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:MICRON_16GB,MANDCFG:ITLC_84E_2P0T_BY
MYXK	639-08821	PCBA,MLB-TKSB,GOOD,MI-16G,SD-2.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:MICRON_16GB,MANDCFG:ITLC_84E_2P0T_SD
NRLW	639-09939	PCBA,MLB-TKSB,GOOD,SS-16G,HY-2.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:SAMSUNG_16GB,MANDCFG:ITLC_84E_2P0T_BY
MYXX	639-08822	PCBA,MLB-TKSB,GOOD,SS-16G,SD-2.0T,X1783	CPU_PARTS_BOM,ALTERNATE,CPU_ICL1:GOOD,DRAMCFG:SAMSUNG_16GB,MANDCFG:ITLC_84E_2P0T_SD

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	DRAWING NUMBER	051-05232
	REVISION	4.0.0
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Alternates

PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
107S00033	107S00034		ALL	rdar://problem/31026333
107S00076	107S00044		ALL	rdar://problem/31026474
107S00139	107S0178		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/32989330
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/48088312
371S00220	371S00181		ALL	rdar://problem/48058127
152S01272	152S00730		ALL	rdar://problem/55450287

Alternate Vendor  
 TFT  
 Yageo  
 Panasonic  
 TFT  
 Panasonic  
 NEC  
 Rohm  
 Epson  
 NEC  
 Cyntec  
 Chilislin  
 Cyntec  
 Kemet  
 NEC  
 Panasonic  
 NEC  
 Chilislin  
 TFT  
 Fairchild  
 Diodes  
 Vishay  
 NEC  
 Panasonic  
 Kemet  
 Panasonic  
 Panasonic  
 Kemet  
 Panasonic  
 Panasonic  
 Rohm  
 AOS  
 Fairchild  
 Taiyo  
 Kyocera  
 Murata  
 Epson  
 Diodes  
 Murata  
 Kyocera  
 Kyocera  
 Samsung  
 NXP  
 Taiyo  
 ON Semi  
 ON Semi  
 Chilislin

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 Cyntec  
 Murata  
 Cyntec  
 Kemet  
 Kemet  
 TXC  
 Cyntec  
 Murata  
 Murata  
 Chilislin  
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 Kemet  
 Kemet  
 Panasonic  
 Cyntec  
 Yageo  
 Vishay  
 Vishay  
 Vishay  
 Cyntec  
 Kemet  
 NEC  
 NEC  
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 Vishay  
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 Murata  
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 TXC  
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 Samsung  
 NXP  
 Murata  
 Murata  
 Murata  
 ON Semi  
 Murata  
 TI  
 Diodes  
 Cyntec

PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
138S00077	138S00035		ALL	rdar://problem/31167038
138S00093	138S00035		ALL	rdar://problem/31167038
132S00012	132S0401		ALL	rdar://problem/31180314
138S00015	138S0777		ALL	rdar://problem/31254330
138S0786	138S0847		ALL	rdar://problem/31253709
152S00398	152S00204		ALL	rdar://problem/33011314
152S00724	152S00311		ALL	rdar://problem/33011211
152S00726	152S00592		ALL	rdar://problem/33011437
152S00725	152S00590		ALL	rdar://problem/33011526
155S00190	155S0914		ALL	rdar://problem/32264855
155S00007	155S0667		ALL	rdar://problem/32415629
155S00203	155S0894		ALL	rdar://problem/32435328
740S0118	740S00028		ALL	rdar://problem/32477706
152S00067	152S00401		ALL	Per CE
155S0741	155S0361		ALL	rdar://problem/32406745
311S00121	311S0398		ALL	rdar://problem/32474809
138S00056	138S1100		ALL	rdar://problem/31411109
311S00104	311S00091		ALL	rdar://problem/31509861
353S01041	353S01042		ALL	rdar://problem/31816775
311S00156	311S00129		ALL	rdar://problem/31941459
138S0775	138S0860		ALL	rdar://problem/46642485
138S0846	138S0811		ALL	rdar://problem/30812097
376S1053	376S0604		ALL	rdar://problem/30812097
152S00359	152S00253		ALL	rdar://problem/30812097
740S00041	740S0159		ALL	rdar://problem/30812097
376S1106	376S0678		ALL	rdar://problem/30812097
371S00074	371S0602		ALL	rdar://problem/33675478
132S00176	132S0640		ALL	rdar://problem/33924830
311S0426	311S00007		ALL	
155S0665	155S00232		ALL	rdar://problem/32364084
311S00138	311S0436		ALL	rdar://problem/32474939
335S00270	335S00203		ALL	rdar://problem/33516617
335S00213	335S0888		ALL	rdar://problem/33927828
378S00029	378S00002		ALL	rdar://problem/3392183
311S00178	311S00177		ALL	rdar://problem/39513462
138S00116	138S00071		ALL	rdar://problem/46491734
138S00117	138S00071		ALL	rdar://problem/46491734
152S00765	152S00239		ALL	rdar://problem/40632537
152S00737	152S00733		ALL	rdar://problem/46492368
152S00997	152S00476		ALL	rdar://problem/46492529
311S00247	311S00139		ALL	rdar://problem/52919470
353S01615	353S4160		ALL	rdar://problem/52866697
376S00401	376S00398		ALL	per J214
376S00403	376S00398		ALL	per J214

Alternate Vendor  
 Taiyo  
 Kyocera  
 Murata/TDK  
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 Cyntec  
 Cyntec  
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 Cyntec  
 Panasonic  
 Panasonic  
 Murata  
 Bussman  
 Murata  
 TDK  
 NXP/Nexperia  
 Murata  
 ON Semi  
 TI  
 TI  
 Murata  
 Murata  
 Fairchild  
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 Vishay  
 NXP  
 Murata  
 Diodes  
 TDK  
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 STMicro  
 Everlight  
 TI  
 Murata  
 Murata  
 Cyntec  
 Cyntec  
 Murata  
 TI  
 TI  
 Diodes  
 Diodes

PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
138S00047	138S00073		ALL	rdar://problem/34812612
152S00403	152S00322		ALL	rdar://problem/34319209
376S1080	376S0820		ALL	rdar://problem/34320959
376S00399	376S0855		ALL	per J214
107S00240	107S0255		ALL	rdar://problem/33930580
377S00123	377S00031		ALL	rdar://problem/35399063
377S00186	377S00060		ALL	per Eric Lee
377S0184	377S0155		ALL	rdar://problem/35404095
376S1137	376S00019		ALL	rdar://problem/35955940
155S0706	155S0302		ALL	rdar://problem/32364222
131S00134	131S00041		ALL	rdar://problem/36353852
353S02004	353S01989		ALL	rdar://problem/48583206
353S02005	353S2216		ALL	rdar://problem/4663854
132S0202	132S00175		ALL	rdar://problem/36674713
311S0562	311S0372		ALL	rdar://problem/47654696
376S00282	376S1128		ALL	rdar://problem/33904000
131S00142	132S0312		ALL	rdar://problem/36993892
371S00085	371S00190		ALL	rdar://problem/40314867
353S00525	353S4471		ALL	rdar://problem/46491385
353S00832	353S4471		ALL	rdar://problem/46491385
376S00281	376S1147		ALL	rdar://problem/46491572
152S01090	152S01085		ALL	rdar://problem/46487936
376S00373	376S1038		ALL	rdar://problem/46490666
138S00229	138S00107		ALL	rdar://problem/46631987
138S00022	138S0801		ALL	rdar://problem/40667960
372S0183	372S00033		ALL	rdar://problem/50349170
114S00002	114S0618		ALL	rdar://problem/47304661
353S01824	353S02068		ALL	rdar://problem/48583357
353S02064	353S4471		ALL	rdar://problem/46491385
353S02065	353S4471		ALL	rdar://problem/46491385
377S00106	377S00166		ALL	rdar://problem/47062814
371S00217	371S00079		ALL	rdar://problem/50601049
197S00244	197S00227		ALL	rdar://problem/50678168
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138S00087	138S1086		ALL	rdar://problem/51371740
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138S0852	138S0818		ALL	rdar://problem/51371555
353S02017	353S4471		ALL	rdar://problem/52837421

Alternate Vendor  
 Taiyo  
 Chilislin  
 Diodes  
 ON Semi  
 TFT  
 Semtech  
 Semtech  
 Infineon  
 Vishay  
 Taiyo  
 Murata  
 ON Semi  
 ON Semi  
 TI  
 Murata/Taiyo  
 TI  
 Nexperia  
 Samsung  
 ON Semi  
 Vishay  
 Fairchild  
 Alpha Omega  
 Chilislin  
 Diodes  
 Kyocera  
 Taiyo Yuden  
 Diodes  
 Panasonic  
 ON Semi  
 Vishay  
 Vishay  
 Vishay  
 ON Semi  
 ROHM  
 TXC  
 ROHM  
 Chilislin  
 Taiyo  
 Taiyo  
 Murata  
 Diodes  
 Samsung  
 AOS

Primary Vendor  
 Murata  
 Murata  
 ON Semi  
 Diodes  
 Cyntec  
 ON Semi  
 ST  
 ON Semi  
 Diodes  
 TI  
 Kyocera/Samsung  
 NXP/Nexperia  
 Diodes  
 Murata  
 Diodes  
 Vishay  
 Vishay  
 ON Semi  
 Murata  
 TI  
 Murata  
 Murata  
 Murata  
 Murata  
 Murata  
 ON Semi  
 ON Semi  
 Cyntec  
 TI  
 Vishay  
 Vishay  
 Vishay  
 Semtech  
 Nexperia  
 NDK  
 NXP  
 Cyntec  
 Murata  
 Kyocera  
 NXP  
 Murata  
 Murata  
 Vishay

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