1. ALL RESISTANCE VALUES ARE IN OHMS, 0.1 WATT +/- 5%.
2. ALL CAPACITANCE VALUES ARE IN MICROFARADS.
3. ALL CRYSTALS & OSCILLATOR VALUES ARE IN HERTZ.

REV	ECN	DESCRIPTION OF REVISION	CK APPD DATE
<REV>	<ECN>	<ECO_DESCRIPTION>	<ECODATE>

SCHEM,MLB,VENUS,X425G

EVT 01/12/2015

Schematic / PCB #'s

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
051-00383	1	SCHEM,MLB,VENUS,X425G	SCH	CRITICAL	
820-00163	1	PCBF,MLB,VENUS,X425G	PCB	CRITICAL	

DRAWING
TITLE=MLB
ABBREV=ABBREV
LAST_MODIFIED=Mon Jan 12 16:34:40 2015

DRAWING TITLE: <PART_DESCRIPTION>
Apple Inc.
DRAWING NUMBER: <SCH_NUM> SIZE: D
REVISION: <E4LABEL>
BRANCH: <BRANCH>
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BOM Variants

BOM NUMBER	BOM NAME	BOM OPTIONS
685-00042	COMMON PARTS,MLB,VENUS,X425G	X425_COMMON
985-00050	DEV BOM,MLB,VENUS,X425G	X425_DEVEL:ENG
639-00682	PCBA,MLB,VENUS,CTO,16GHYN,VR-4GHYN,X425G	BASE_BOM,DEVEL_BOM,GFX_BOM,CPU_CRW:CTO,RAM:HYNIX_1600,FB_4G_HYNIX
639-00703	PCBA,MLB,VENUS,CTO,16GMIC,VR-4GMIC,X425G	BASE_BOM,DEVEL_BOM,GFX_BOM,CPU_CRW:CTO,RAM:MICRON_1600,FB_4G_MICRON
639-00739	PCBA,MLB,VENUS,CTO,16GHYN,VR-4GMIC,X425G	BASE_BOM,DEVEL_BOM,GFX_BOM,CPU_CRW:CTO,RAM:HYNIX_1600,FB_4G_MICRON
639-00740	PCBA,MLB,VENUS,CTO,16GMIC,VR-4GHYN,X425G	BASE_BOM,DEVEL_BOM,GFX_BOM,CPU_CRW:CTO,RAM:MICRON_1600,FB_4G_HYNIX
639-00798	PCBA,MLB,VENUS,BEST,16GHYN,VR-4GHYN,X425G	BASE_BOM,DEVEL_BOM,GFX_BOM,CPU_CRW:BEST,RAM:HYNIX_1600,FB_4G_HYNIX
639-00799	PCBA,MLB,VENUS,BEST,16GMIC,VR-4GMIC,X425G	BASE_BOM,DEVEL_BOM,GFX_BOM,CPU_CRW:BEST,RAM:MICRON_1600,FB_4G_MICRON
639-00800	PCBA,MLB,VENUS,BEST,16GHYN,VR-4GMIC,X425G	BASE_BOM,DEVEL_BOM,GFX_BOM,CPU_CRW:BEST,RAM:HYNIX_1600,FB_4G_MICRON
639-00801	PCBA,MLB,VENUS,BEST,16GMIC,VR-4GHYN,X425G	BASE_BOM,DEVEL_BOM,GFX_BOM,CPU_CRW:BEST,RAM:MICRON_1600,FB_4G_HYNIX
639-00803	PCBA,MLB,VENUS,NOCPU,16GMIC,VR-4GHYN,X425G	BASE_BOM,DEVEL_BOM,GFX_BOM,RAM:MICRON_1600,FB_4G_HYNIX
639-00974	PCBA,MLB,NOGPU,CTO,16GMIC,VR-4GHYN,X425G	BASE_BOM,DEVEL_BOM,CPU_CRW:CTO,RAM:MICRON_1600,FB_4G_HYNIX

X425 BOM Groups

BOM GROUP	BOM OPTIONS
X425_COMMON	ALTERNATE,COMMON,X425_COMMON1,X425_COMMON2,X425_PROGPARTS,ACAPS:A2
X425_COMMON1	CPUMEM:S0,TBTHV:P15V,SKIP_5V3V3:AUDIBLE,CPUPEG:X8X4X4,S2_PWR:S0,SMC_SUSACK:YES
X425_COMMON2	EDP:YES,XDP,SSD_PWR_EN:GPIO,CAM_WAKE:NO,SAMCONN,APCLKRQ:ISOL,CRW_SPRT,WLAN_SW:SIL
X425_PVT	BKLT:PROD,SENSOR_NONPROD:N
X425_PROGPARTS	SMC_PROG:BASE,BOOTROM_PROG:EVT,TBTROM:PROG,DPMUXMCU:PROG
X425_DEVEL:ENG	ALTERNATE,XDP_DEBUG,S0PGOOD_ISL,SENSOR_NONPROD:Y,SENSOR_NONPROD_R,BKLT:ENG,DBGLED,DPMUX_DEBUG,GPU_ROM:YES,SENSOR_GPU_NONPROD:Y
X425_DEVEL:DVT	ALTERNATE,XDP_DEBUG,BKLT:PROD,SENSOR_NONPROD:N,DBGLED
X425_DEVEL:PVT	XDP_DEBUG
GFX_BOM	VENUS:XTA
XDP_DEBUG	XDP_CONN,XDP_PCH

Module Parts

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
337S00058	1	CRW,SR1ZX,PRQ,C0,2.5,47W,4+3E,1.2,6M,BGA	U0500	CRITICAL	CPU_CRW:BEST
337S00059	1	CRW,SR1ZY,PRQ,C0,2.8,47W,4+3E,1.2,6M,BGA	U0500	CRITICAL	CPU_CRW:CTO
337S4542	1	IC,QEWV,LPT-M,HM87,C2,SR199,PRQ,FCBGA	U1100	CRITICAL	
338S1247	1	IC,TBT,FR-4C,A0,PRQ,CIO,SR1JC,FCBGA288	U2800	CRITICAL	
338S1264	1	IC,BCM15700A2,S2 PCIE CMRA,8X8,208FCBGA	U3900	CRITICAL	
333S0700	1	IC,SDRAM,4GBIT,DDR3L-1600,GEMMA,96B FBGA	U4600	CRITICAL	
333S00032	32	IC,SDRAM,DDR3L-1600,4GBIT,78B FBGA		CRITICAL	HYNIX_1600
333S0660	32	IC,SDRAM,4GBIT,DDR3L-1600,V80A,78P,FBGA		CRITICAL	MICRON_1600
337S00116	1	IC,GPU,VENUS XTAA1,QS,29X29MM,FCBGA989	U8400	CRITICAL	VENUS:XTA
333S00027	4	IC,GDDR5,4GBIT,6GBPS,1.5V,25NM,BGA170	U8800,U8850,U8900,U8950	CRITICAL	FB_4G_HYNIX
333S0766	4	IC,GDDR5,4GBIT,6GBPS,128M*32,25NM,170BGA	U8800,U8850,U8900,U8950	CRITICAL	FB_4G_MICRON

DRAM SPD Straps

BOM GROUP	BOM OPTIONS
RAM:HYNIX_1600	HYNIX_1600,RAMCFG3:H,RAMCFG2:H,RAMCFG1:L,RAMCFG0:L
RAM:MICRON_1600	MICRON_1600,RAMCFG3:H,RAMCFG2:H,RAMCFG1:H,RAMCFG0:L

COMMON/DEVEL BOM

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
685-00042	1	COMMON PARTS,MLB,VENUS,X425G	BASE	CRITICAL	BASE_BOM
985-00050	1	DEV,MLB,VENUS,X425G	DEVEL	CRITICAL	DEVEL_BOM

SYNC_MASTER=CLEAN_X305 SYNC_DATE=05/30/2014

PAGE TITLE: BOM Configuration

Apple Inc.

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Programmables - All builds

335S0915	1	IC,SERIAL SPI FLASH ROM,4MBIT,50MHZ,USON	U2890	CRITICAL	TBTROM:BLANK
341S00166	1	T29,FALCON RIDGE(V27.1)PROTO0,X425G	U2890	CRITICAL	TBTROM:PROG
335S0724	1	1MBIT SERIAL FLASH 2X3X0.6MM UFDFPN8 PKG	U9101	CRITICAL	GPUROM:BLANK
341S3565	1	IC,EDP MUX-95C,(RENESAS) V3.2.8,DVB,D2	U9600	CRITICAL	DPMUXMCU:PROG
337S4313	1	IC,MCU,H8S/2113,9X9MM,TLP-145V	U9600	CRITICAL	DPMUXMCU:BLANK

SMC

338S1214	1	IC,SMC-B1,40MHZ/50DMIPS,SCPL FW,157BGA	U5000	CRITICAL	SMC_PROG:BLANK
341S00157	1	IC,SMC-B1,EXT (V2.25A9) PROTO 0,X425G	U5000	CRITICAL	SMC_PROG:BASE

EFI ROM

335S00007	1	IC,SERIAL FLASH,64MB,3V,WSON,6X5MM	U6100	CRITICAL	BOOTROM_BLANK:WIN
335S00006	1	IC,SERIAL FLASH,64MB,3V,WSON,6X5MM	U6100	CRITICAL	BOOTROM_BLANK:MAC
341S00239	1	IC,EFI ROM (V0145) EVT,X425	U6100	CRITICAL	BOOTROM_PROG:EVT

Alternate Parts

PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
376S1053	376S0604		ALL	Diodes alt to Fairchild
128S0311	128S0329		ALL	NEC alt to Sanyo
138S0739	138S0706		ALL	Samsung alt to Murata
197S0481	197S0480		ALL	Epson Alt to NDK
197S0478	197S0479		ALL	NDK Alt to Epson
371S0713	371S0558		ALL	DDS alt to ST
152S0461	152S1645		ALL	Cyntec alt to Vishay
376S1080	376S0820		ALL	Diodes alt to On Semi
155S0667	155S00008		ALL	Panasonic alt to TDK
376S00074	376S0855		ALL	Toshiba alt to Diodes
376S1129	376S0855		ALL	NXP alt to Diodes
376S1089	376S1128		ALL	NXP alt to Diodes
128S0371	128S0376		ALL	Kemet alt to Sanyo
138S0803	138S0639		ALL	Samsung alt to Murata
138S0843	138S0674		ALL	Samsung alt to Murata
138S0846	138S0811		ALL	Samsung alt to Murata
127S0164	127S0162		ALL	Rohm alt to Vishay
138S0732	138S0715		ALL	Rohm alt to Vishay
128S0364	128S0264		ALL	Kemet alt to Sanyo
333S0704	333S0700		ALL	ELPIDA to HYNIX U4000
311S0649	311S0541		ALL	ON alt to Toshiba
376S00014	376S0761		ALL	Toshiba alt to Vishay
740S00003	740S0135		ALL	AEM alt to Tyco
740S00004	740S0134		ALL	AEM alt to Littlefuse
107S00029	107S00030		ALL	TFT alt to Cyntec
128S0398	128S0220		ALL	Kemet alt to Sanyo
128S0386	128S0284		ALL	Kemet alt to Sanyo
311S00008	311S0271		ALL	Diodes alt to NXP
128S0393	128S0334		ALL	Kemet alt to Sanyo
311S00007	311S0426		ALL	Diodes alt to NXP
371S00017	371S0749		ALL	Diodes alt to Onsemi
107S00033	107S00034		ALL	TFT alt to Cyntec
107S0240	107S0255		ALL	TFT alt to Cyntec
107S0248	107S0250		ALL	TFT alt to Cyntec
107S00031	107S00032		ALL	TFT alt to Cyntec
107S0249	107S0251		ALL	TFT alt to Cyntec
107S00037	107S00038		ALL	TFT alt to Cyntec
107S00015	107S00011		ALL	TFT alt to Cyntec
128S00008	128S0380		ALL	NEC alt to Sanyo
311S00060	311S0273		ALL	Diodes alt to NXP
353S00133	353S2741		ALL	ON Semi alt to TI
353S00394	353S2162		ALL	ON Semi alt to TI
376S00086	376S0761		ALL	Diodes alt to Vishay
112S00001	112S0254		ALL	Yageo alt to Cyntec
353S00095	353S3328		ALL	Pericom alt to TI
128S0397	128S0325		ALL	Kemet alt to Sanyo
311S00004	311S0370		ALL	ON Semi alt to NXP

SYNC_MASTER=J15_MLB SYNC_DATE=10/31/2012

PAGE TITLE

BOM Configuration

Apple Inc.

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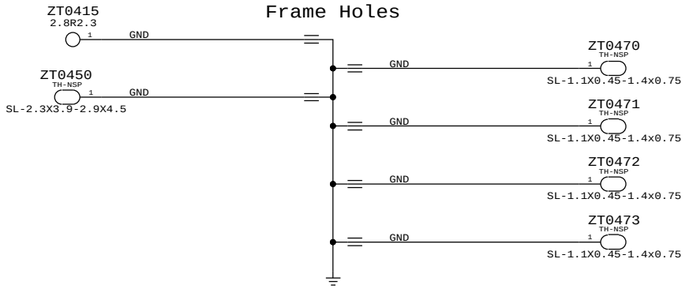
Frame Holes



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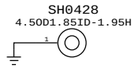

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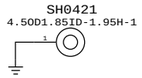

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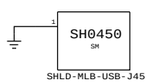

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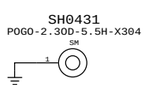

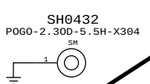

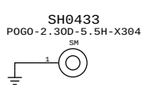

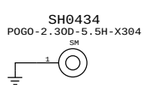

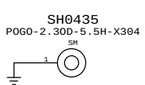

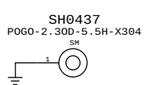

X305G STANDOFF

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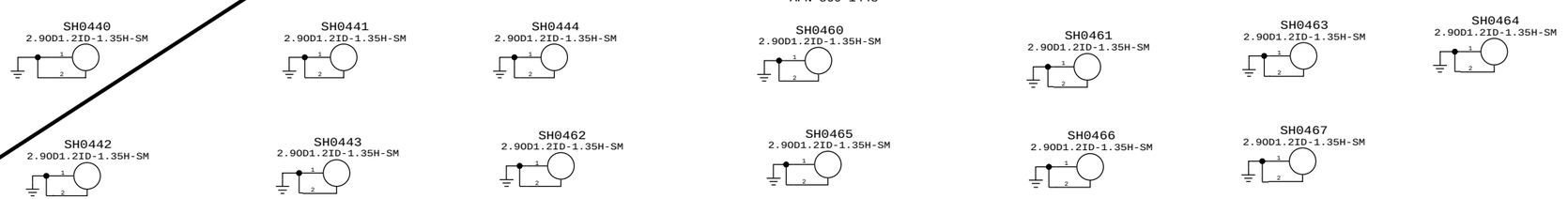

X305G THERMAL MODULE STANDOFF

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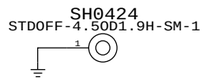

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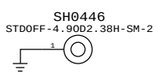

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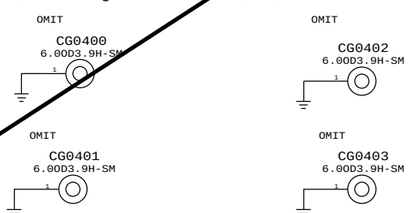
Thermal Module gaskets APN 875-9290



X305G POGO PINS

APN 870-2451

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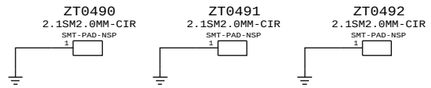

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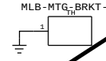
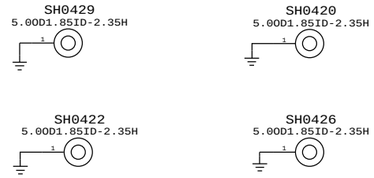


CPU BOSS APN 860-2931

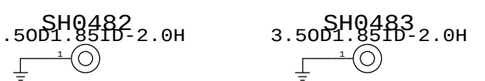


PD parts

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
946-3819	1	D2 MLB DYMAX ADHESIVE SEE-CURE 29993-SC	EDGE_BOND	CRITICAL	

RIO FLEX BRACKET BOSS (860-00166)

IPD FLEX BRACKET BOSS (860-00166)



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Apple Inc.

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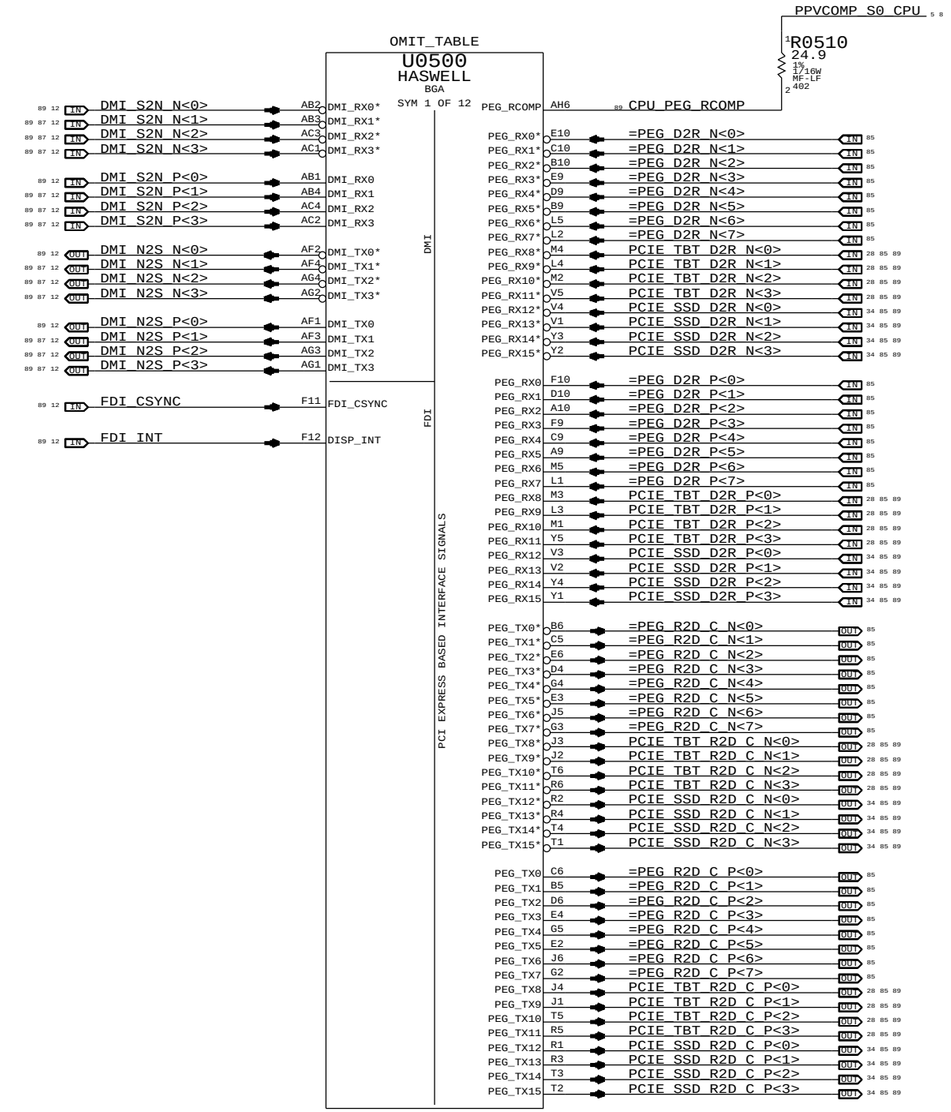

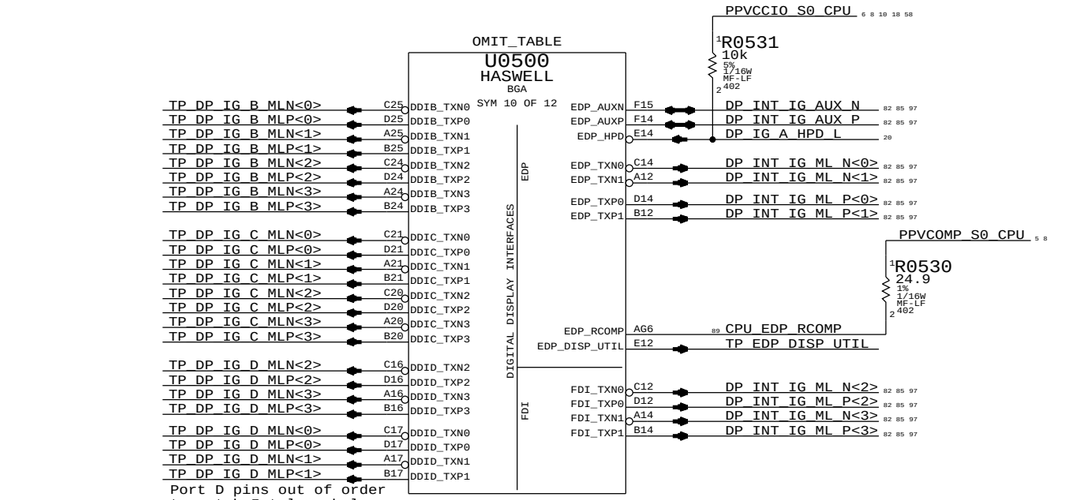

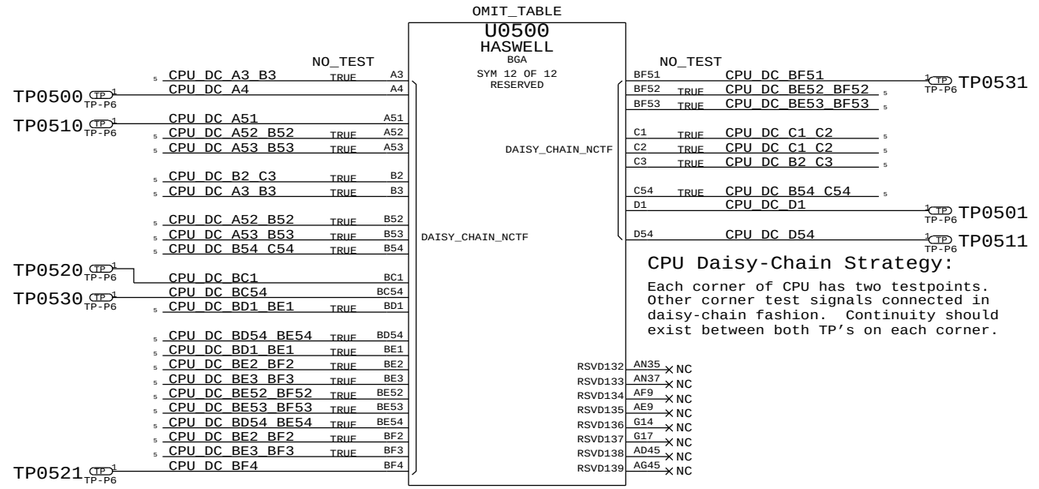

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PAGE TITLE
CPU DMI/PEG/FDI/RSVD

Apple Inc.

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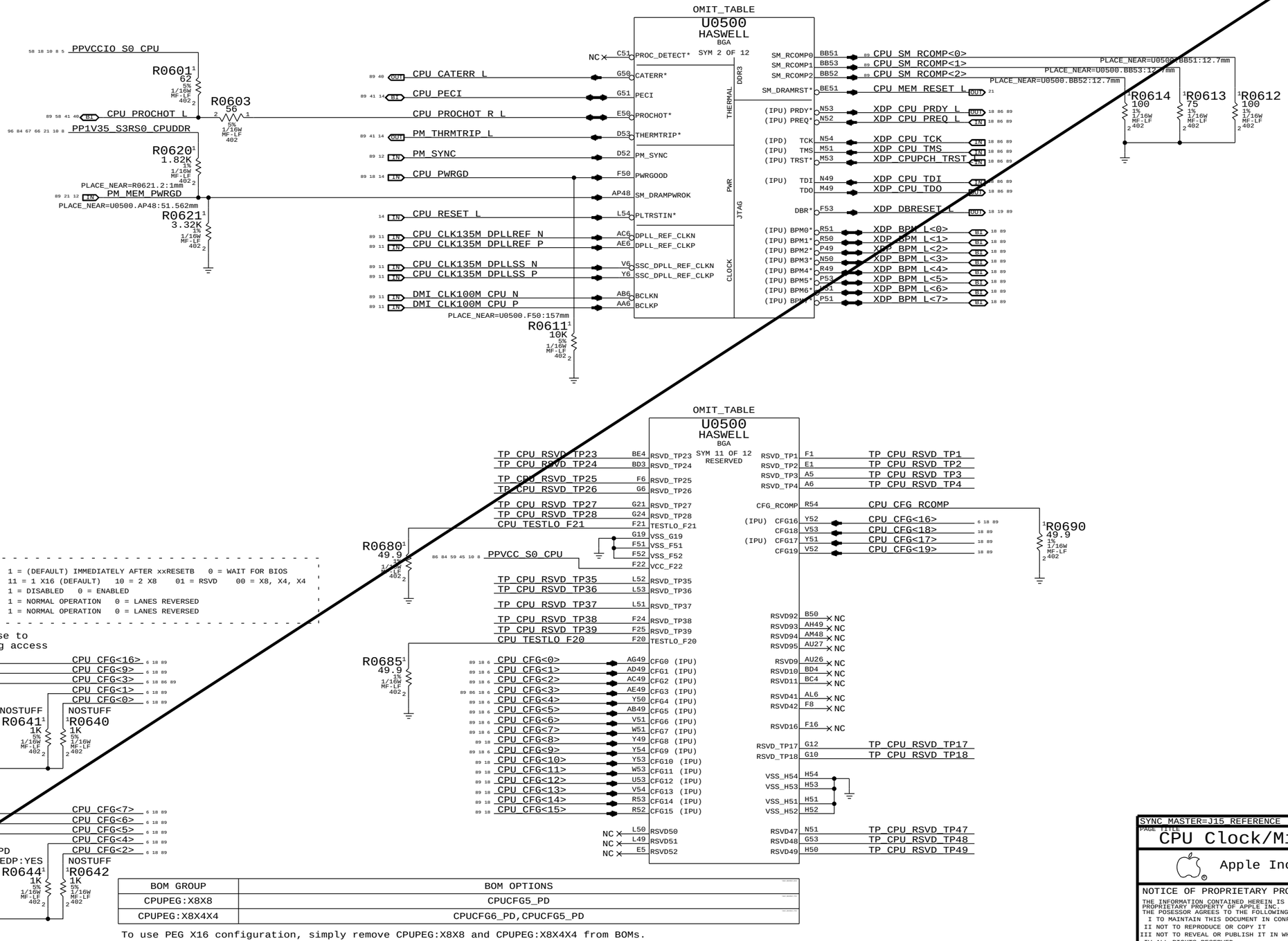

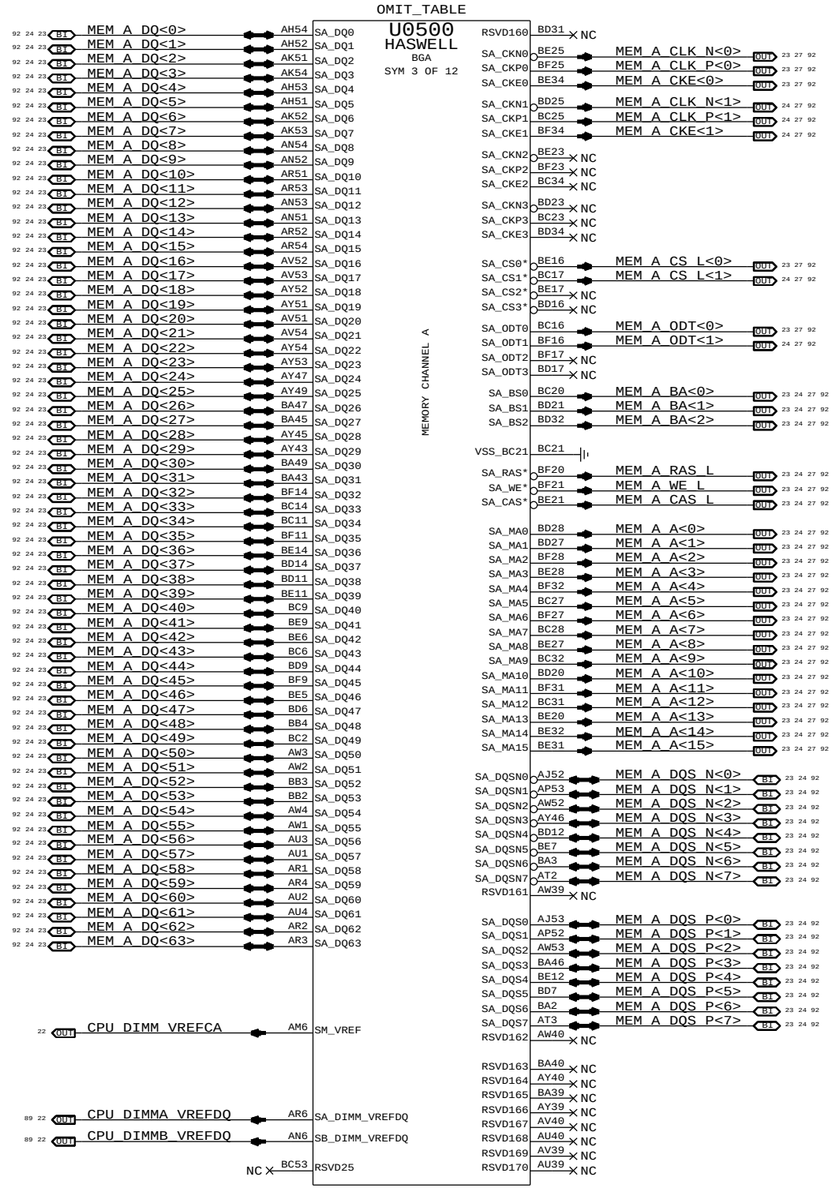

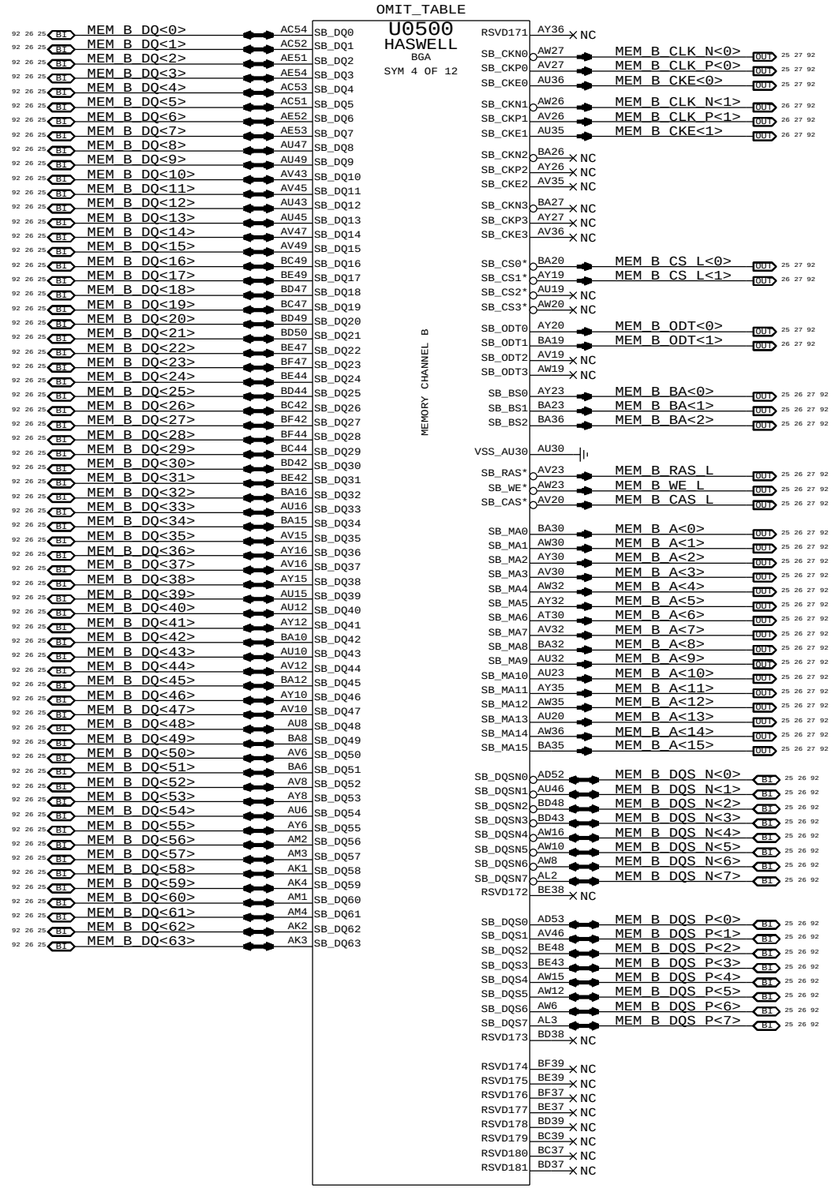

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CPU DDR3 Interfaces

Apple Inc.

DRAWING NUMBER <SCH_NUM> SIZE D

REVISION <E4LABEL>

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NOTE: Aliases not used on CPU supply outputs
to avoid any extraneous connections.

PPVCCIO_S0_CPU
Max load: 300mA MIN_LINE_WIDTH=0.4 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.05V

R0800 75 1% 1/10W MF-LF 402
R0802 110 1% 1/16W MF-LF 402
R0810 43 5% 1/16W MF-LF 402
R0811 0 5% 1/16W MF-LF 402
R0812 0 5% 1/16W MF-LF 402

CPU_VIDALERT_L
CPU_VIDSCLK
CPU_VIDSOUT

R0802.2: PLACE_NEAR=U0500.J50:2.54mm
R0810.2: PLACE_NEAR=U0500.J53:38mm
R0800.2: PLACE_NEAR=R0810.1:2.54mm

PPVCC_S0_CPU
R0860 100 1% 1/10W MF-LF 402
PLACE_NEAR=U0500.C50:50.8mm
PLACE_SIDE=BOTTOM
CPU_VCCSENSE_P

PPVCOMP_S0_CPU
Max load: 300mA MIN_LINE_WIDTH=0.4 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.05V

PP1V35_S3RS0_CPUDDR

U0500
HASWELL
BGA
SYM 5 OF 12
OMIT_TABLE

NC	J17	RSVD64
NC	J21	RSVD65
NC	J26	RSVD66
NC	J31	RSVD67
	AR29	
	AR31	
	AR33	
	AT13	
	AT19	
	AT23	
	AT27	
	AT32	
	AT36	
	AV37	
	AW22	
	AW25	
	AW29	
	AW33	
	AY18	
	BB21	
	BB22	VDDQ
	BB26	
	BB27	
	BB30	
	BB31	
	BB34	
	BB36	
	BD22	
	BD26	
	BD30	
	BD33	
	BE18	
	BE22	
	BE26	
	BE30	
	BE33	
NC	AN31	RSVD68
	L6	VCC_L6
	M6	VCC_M6
NC	AN22	RSVD69
NC	AN18	RSVD70
	C50	VCC_SENSE
NC	AH9	RSVD71
	D51	VCCIO_OUT
NC	F17	FC_F17
	AK6	VCOMP_OUT
NC	AN33	RSVD72
NC	W9	RSVD73
NC	J12	RSVD79(VSS)
NC	AR49	RSVD74
	J53	VIDALERT*
	J52	VIDSCLK
	J50	VIDSOUT
	B51	VSS_B51
	F19	PWR_DEBUG*
	E52	VSS_E52
	V49	RSVD75
	U49	RSVD76
	AM49	IVR_ERROR
	W49	IST_TRIGGER
	V50	VSS_V50(RSVD)
	AN49	VSS_AN49(RSVD)
	AJ49	VSS_AJ49(RSVD)
	AG50	VSS_AG50(RSVD)
	AK49	VSS_AK49(RSVD)
	AJ50	VSS_AJ50(RSVD)
	AP49	VSS_AP49(RSVD)
	AB50	VSS_AB50(RSVD)
	AP50	VSS_AP50(RSVD)
	AD50	VSS_AD50(RSVD)
	AM50	VSS_AM50(RSVD)
	A36	
	A38	
	A39	
	A42	
	A43	
	A45	
	A46	VCC
	A48	
	AA46	
	AA47	
	AA8	
	AA9	

CPU_VIDALERT_R_L
CPU_VIDSCLK_R
CPU_VIDSOUT_R
CPU_PWR_DEBUG
TP_CPU_RSVD_TP75
TP_CPU_RSVD_TP76
TP_CPU_IVR_ERROR
TP_CPU_RSVD_TP78

PPVCC_S0_CPU

	B43	
	B45	
	B46	
	B48	
	C27	
	C28	
	C31	
	C32	
	C34	
	C36	
	C38	
	C39	
	C42	
	C43	
	C45	
	C46	
	C48	
	D27	
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	G43	
	G45	
	G46	
	G48	
	H11	
	H12	
	H13	
	H14	
	H16	
	H17	
	H18	
	H19	
	H20	
	H21	
	H23	
	H24	
	H25	
	H26	
	H27	
	H29	

VCC

Connections are required
for BDW CPU support.

FC_D5 D5 PP1V05_S0_CPU_VCCST
FC_D3 D3 CPU_VCCST_PWRGD

U0500
HASWELL
BGA
SYM 6 OF 12
POWER
OMIT_TABLE

	H33	
	H34	
	H36	
	H37	
	H38	
	H39	
	H40	
	H42	
	H43	
	H45	
	H46	
	H46	
	H48	
	H8	
	H9	
	J10	
	J14	
	J19	
	J24	
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	J33	
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	P8	
	R46	
	R47	
	R8	
	R9	
	T45	
	T46	
	U46	
	U47	
	U8	
	U9	
	V45	
	V46	
	V8	
	W46	
	W47	
	W8	
	Y45	
	Y46	
	Y8	
	A27	
	A28	
	A31	
	A32	
	A34	
	B27	
	B28	
	B31	
	B32	
	B34	
	B36	
	B38	
	B39	
	B42	

VCC

	AB45	
	AB46	
	AB8	
	AD46	
	AD47	
	AD8	
	AD9	
	AE46	
	AE47	
	AE8	
	AF8	
	AG46	
	AG8	
	AH46	
	AH47	
	AH8	
	AJ45	
	AJ46	
	AK46	
	AK47	
	AK8	
	AL45	
	AL46	
	AL8	
	AL9	
	AM46	
	AM47	
	AM8	
	AM9	
	AN10	
	AN12	
	AN13	
	AN14	
	AN15	
	AN16	
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	AP44	
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	AP47	
	AP8	
	AP9	
	AR35	
	AR37	
	AR39	
	AR41	
	AR43	
	AR45	
	AR46	
	H30	
	H31	
	H32	

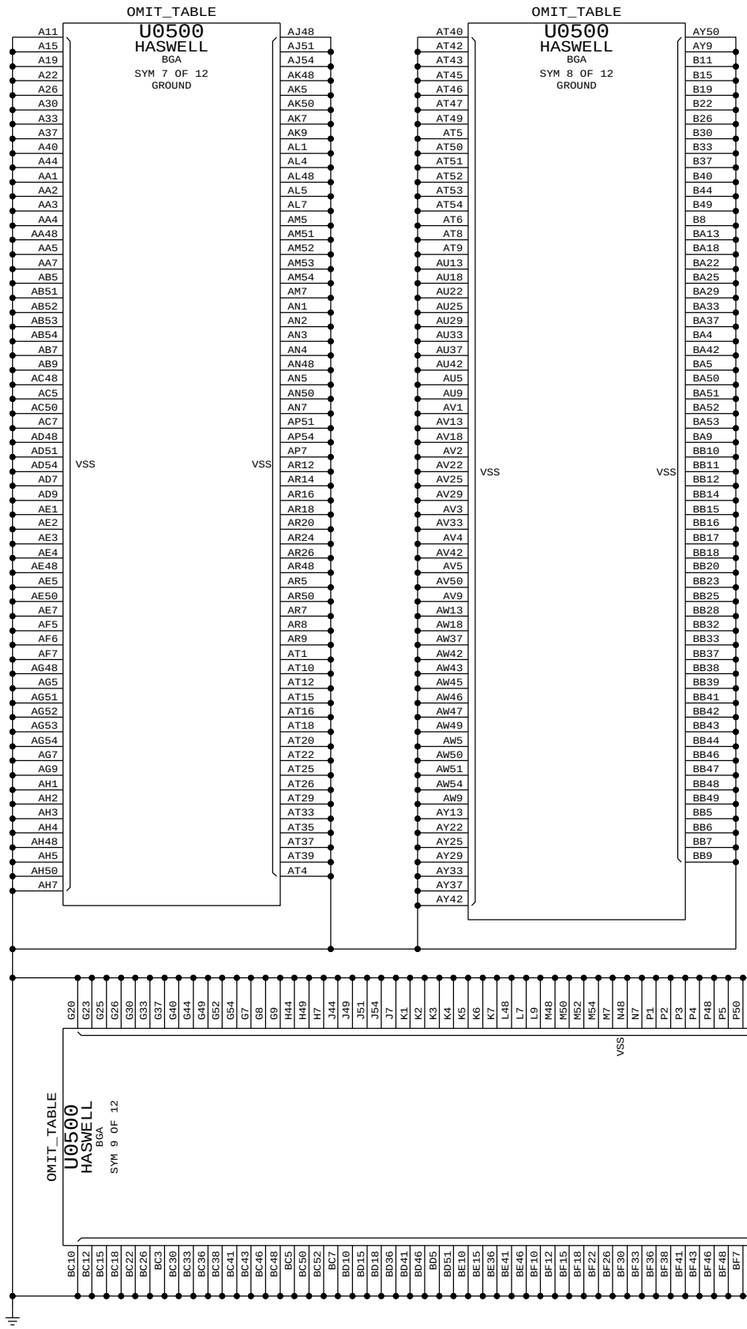
VCC

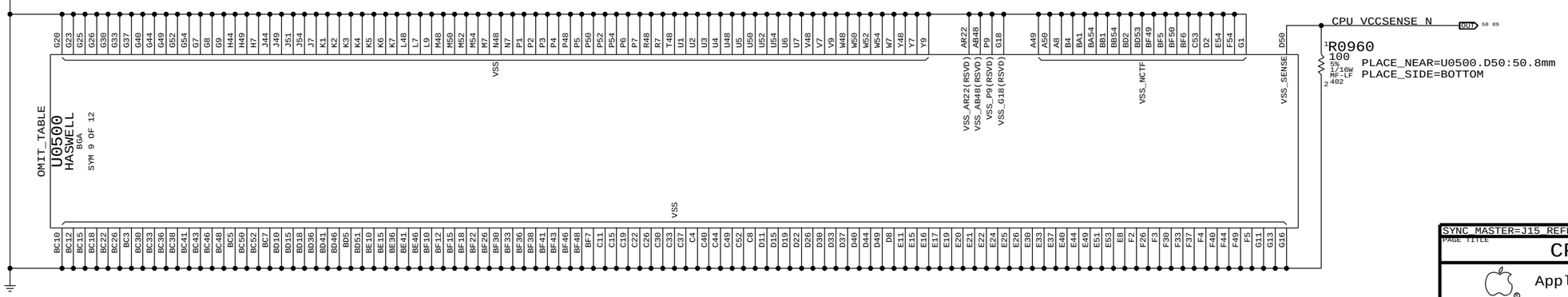
SYNC_MASTER=CLEAN_X425 SYNC_DATE=10/31/2014

PAGE TITLE: CPU Power

Apple Inc.

DRAWING NUMBER: <SCH_NUM> SIZE: D
REVISION: <E4LABEL>
BRANCH: <BRANCH>
PAGE: 8 OF 119
SHEET: 8 OF 97





SYNC_MASTER=J15_REFERENCE SYNC_DATE=12/18/2012

PAGE TITLE

CPU Ground

Apple Inc.

DRAWING NUMBER <SCH_NUM> SIZE D

REVISION <E4LABEL>

BRANCH <BRANCH>

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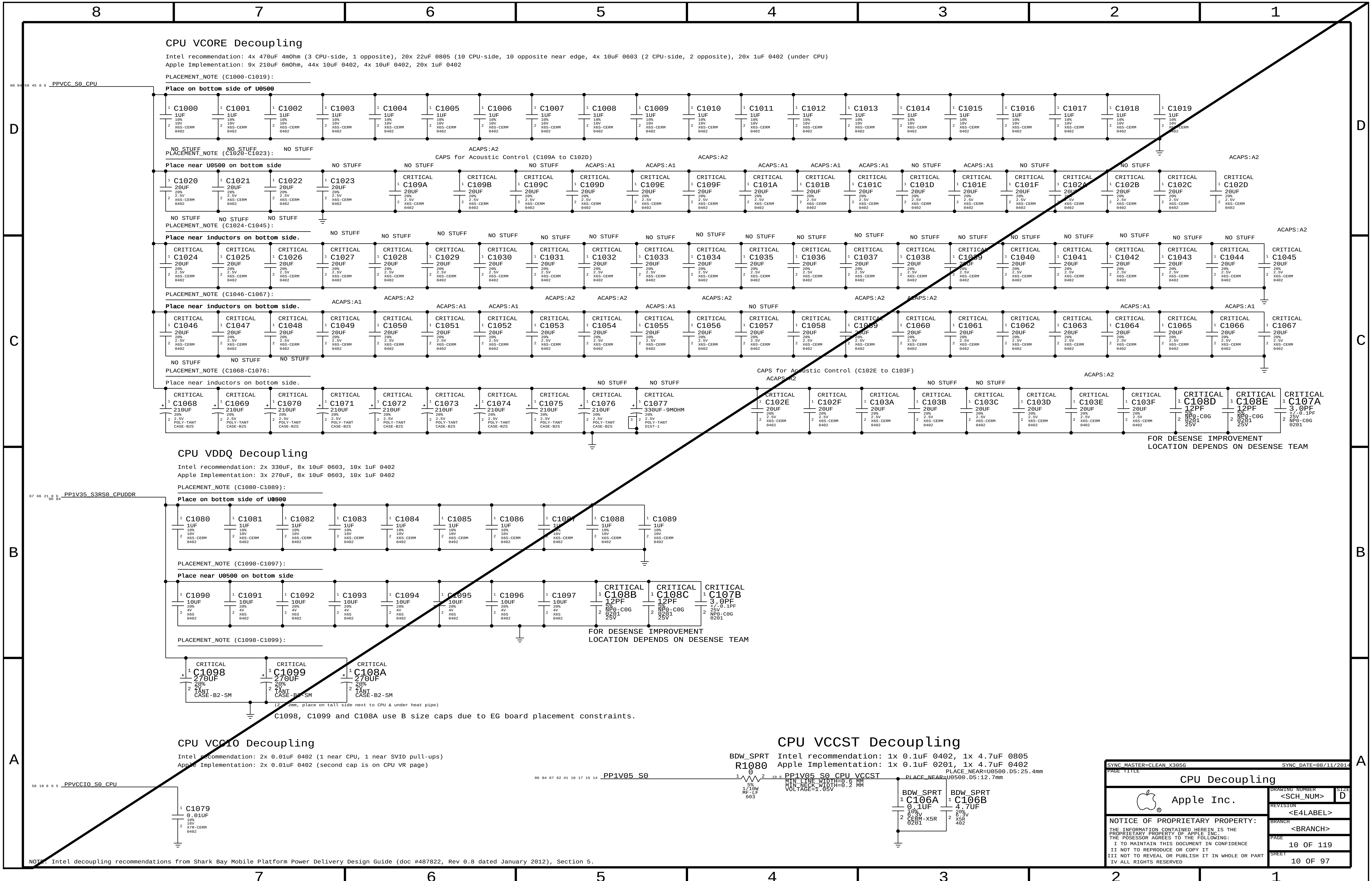

OMIT_TABLE

U1100
LYNXPOINT MOBILE
FCBGA
(1 OF 11)

SYSCLK_CLK32K_RTC → B5 RTCX1
NC ← B4 RTCX2

PCH_SRTCRST_L → B9 SRTCRST*
PCH_INTRUDER_L → A8 INTRUDER*
PCH_INTVRMEN_L → G10 INTVRMEN
RTC_RESET_L → D9 RTCRST*

RTC

HDA_BIT_CLK → R1110 33 → HDA_BIT_CLK_R → B25 HDA_BCLK
HDA_SYNC → R1111 33 → HDA_SYNC_R → A22 HDA_SYNC (IPD-boot)
PCH_SPKR → AL10 SPKR (IPD-PLTRST#)
HDA_RST_L → R1112 33 → HDA_RST_R_L → C24 HDA_RST*
HDA_SDIN0 → L22 HDA_SDI0 (IPD)
NC_HDA_SDIN1 → K22 HDA_SDI1 (IPD)
NC_HDA_SDIN2 → G22 HDA_SDI2 (IPD)
NC_HDA_SDIN3 → F22 HDA_SDI3 (IPD)
HDA_SDOUT → R1113 33 → HDA_SDOUT_R → A24 HDA_SDO (IPD-boot)

AZALIA

DP_TBT_SEL → B17 DOCKEN*/GPIO33 (IPD-DOCKEN#2)
ENET_MEDIA_SENSE_RDIV → C22 HDA_DOCK_RST*/GPIO13

XDP_PCH_TCK → AB3 JTAG_TCK (IPD)
XDP_PCH_TMS → AD1 JTAG_TMS (IPU)
XDP_PCH_TDI → AE2 JTAG_TDI (IPU)
XDP_PCH_TDO → AD3 JTAG_TDO

JTAG

NC ← F8 TP25
NC ← C26 TP22
NC ← AB6 TP20

SATA_RXN0 BC8 NC_SATA_A_D2RN
SATA_RXP0 BE8 NC_SATA_A_D2RP
SATA_TXN0 AW8 NC_SATA_A_R2D_CN
SATA_TXP0 AY8 NC_SATA_A_R2D_CP
SATA_RXN1 BC10 NC_SATA_B_D2RN
SATA_RXP1 BE10 NC_SATA_B_D2RP
SATA_TXN1 AV10 NC_SATA_B_R2D_CN
SATA_TXP1 AW10 NC_SATA_B_R2D_CP
SATA_RXN2 BB9 NC_SATA_ODD_D2RN
SATA_RXP2 BD9 NC_SATA_ODD_D2RP
SATA_TXN2 AY13 NC_SATA_ODD_R2D_CN
SATA_TXP2 AW13 NC_SATA_ODD_R2D_CP
SATA_RXN3 BC12 NC_SATA_D_D2RN
SATA_RXP3 BE12 NC_SATA_D_D2RP
SATA_TXN3 AR13 NC_SATA_D_R2D_CN
SATA_TXP3 AT13 NC_SATA_D_R2D_CP
SATA_RXN4/PERN1 BD13 TP_PCIE_ENET_D2RN
SATA_RXP4/PERP1 BB13 TP_PCIE_ENET_D2RP
SATA_TXN4/PETN1 AV15 TP_PCIE_ENET_R2D_CN
SATA_TXP4/PETP1 AW15 TP_PCIE_ENET_R2D_CP
SATA_RXN5/PERN2 BC14 NC_SATA_F_D2RN
SATA_RXP5/PERP2 BE14 NC_SATA_F_D2RP
SATA_TXN5/PETN2 AP15 NC_SATA_F_R2D_CN
SATA_TXP5/PETP2 AR15 NC_SATA_F_R2D_CP

SATA

SATA_RCOMP AY5 ← PCH_SATA_RCOMP
SATALED* AP3 → SATALED_L
SATA0GP/GPIO21 AT1 → XDP_DC0_DP_AUXCH_ISOL_L
SATA1GP/GPIO19 (IPU-PLTRST#) AU2 → XDP_DC1_SATARDRVR_EN
SATA_IREF BD4

TP9 BA2 NC
TP8 BB2 NC

SATA Port assignments:

Primary HDD/SSD (SATA only)

Secondary HDD/SSD (SATA only)

Reserved: ODD

Unused

PCIe:
Reserved: Ethernet
(if not combo w/SD Card)

Unused

PP1V5_S0 → R1130 7.5K 1% 1/20W MF 201 → PCH_SATA_RCOMP
PLACE_NEAR=U1100.AY5:2.54mm

PPVRTC_G3H
R1100 330K 5% 1/20W MF 201
R1101 1M 5% 1/20W MF 201
R1102 20K 5% 1/20W MF 201
R1103 20K 5% 1/20W MF 201
PCH_SRTCRST_L
PCH_INTRUDER_L
PCH_INTVRMEN_L
RTC_RESET_L
C1102 1UF 10% 10V X5R 402
C1103 1UF 10% 10V X5R 402

OMIT_TABLE

U1100
LYNXPOINT MOBILE
FCBGA
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PCIE_CLK100M_SSD_N → Y43 CLKOUT_PCIE_N0
PCIE_CLK100M_SSD_P → Y45 CLKOUT_PCIE_P0
SSD_CLKREQ_L → AB1 PCIECLKRQ0*/GPIO73
NC_PCIE_CLK100M_ENETSDN → AA44 CLKOUT_PCIE_N1
NC_PCIE_CLK100M_ENETSDP → AA42 CLKOUT_PCIE_P1
XDP_DD2_ENETSD_CLKREQ_L → AF1 PCIECLKRQ1*/GPIO18
PCIE_CLK100M_AP_N → AB43 CLKOUT_PCIE_N2
PCIE_CLK100M_AP_P → AB45 CLKOUT_PCIE_P2
XDP_DD3_AP_CLKREQ_L → AF3 PCIECLKRQ2*/GPIO20/SMI*
PCIE_CLK100M_CAMERA_N → AD43 CLKOUT_PCIE_N3
PCIE_CLK100M_CAMERA_P → AD45 CLKOUT_PCIE_P3
CAMERA_CLKREQ_L → T3 PCIECLKRQ3*/GPIO25
PEG_CLK100M_N → AF43 CLKOUT_PCIE_N4
PEG_CLK100M_P → AF45 CLKOUT_PCIE_P4
TBT_CLKREQ_L → V3 PCIECLKRQ4*/GPIO26
NC_PCIE_CLK100M_PE5N → AE44 CLKOUT_PCIE_N5
NC_PCIE_CLK100M_PE5P → AE42 CLKOUT_PCIE_P5
PCH_CLKRQ5_L_GPIO44 → AA2 PCIECLKRQ5*/GPIO44 (IPU-RSMRST#)
NC_PCIE_CLK100M_SWN → AB40 CLKOUT_PCIE_N6
NC_PCIE_CLK100M_SWP → AB39 CLKOUT_PCIE_P6
PEG_CLKREQ_L → AE4 PCIECLKRQ6*/GPIO45
PCIE_CLK100M_TBT_N → AJ44 CLKOUT_PCIE_N7
PCIE_CLK100M_TBT_P → AJ42 CLKOUT_PCIE_P7
PCH_CLKRQ7_L_GPIO46 → Y3 PCIECLKRQ7*/GPIO46 (IPU-RSMRST#)

NC_ITPXDP_CLK100MN → AH43 CLKOUT_ITPXDP_N
NC_ITPXDP_CLK100MP → AH45 CLKOUT_ITPXDP_P

LPC_CLK33M_SMC_R → D44 CLKOUT_33MHZ0 (IPD-PWROK)
NC_LPC_CLK33M_LPCPLUS_R → E44 CLKOUT_33MHZ1 (IPD-PWROK)
LPC_CLK33M_DPMUX_UC_R → B42 CLKOUT_33MHZ2 (IPD-PWROK)
NC_PCI_CLK33M_OUT3 → F41 CLKOUT_33MHZ3 (IPD-PWROK)
PCH_CLK33M_PCIOUT → A40 CLKOUT_33MHZ4 (IPD-PWROK)

CLOCKS

CLKOUT_PEG_A_N AB35 NC_PCIE_CLK100M_ENETN
CLKOUT_PEG_A_P AB36 NC_PCIE_CLK100M_ENETP
PEG_A_CLKRQ*/GPIO47 AF6 ← ENET_CLKREQ_L
CLKOUT_PEG_B_N Y39 NC_PCIE_CLK100M_PEGBN
CLKOUT_PEG_B_P Y38 NC_PCIE_CLK100M_PEGBP
PEG_B_CLKRQ*/GPIO56 U4 ← PCH_PEGCLKRQB_L_GPIO56

CLKOUT_DMI_N AF39 → DMI_CLK100M_CPU_N
CLKOUT_DMI_P AF40 → DMI_CLK100M_CPU_P
CLKOUT_DP_N AJ40 → CPU_CLK135M_DPLLSS_N
CLKOUT_DP_P AJ39 → CPU_CLK135M_DPLLSS_P
CLKOUT_DPNS_N AF35 → CPU_CLK135M_DPLLREF_N
CLKOUT_DPNS_P AF36 → CPU_CLK135M_DPLLREF_P

CLKIN_DMI_N AY24 ← PCIE_CLK100M_PCH_N
CLKIN_DMI_P AW24 ← PCIE_CLK100M_PCH_P
CLKIN_GND_N AR24 ← PCH_CLKIN_GNDN
CLKIN_GND_P AT24 ← PCH_CLKIN_GNDP
CLKIN_DOT96_N H33 ← PCH_CLK96M_DOT_N
CLKIN_DOT96_P G33 ← PCH_CLK96M_DOT_P
CLKIN_SATA_N BE6 ← PCH_CLK100M_SATA_N
CLKIN_SATA_P BC6 ← PCH_CLK100M_SATA_P
REFCLK14IN F45 ← PCH_CLK14P3M_REFCLK
CLKIN_33MHZLOOPBACK D17 ← PCH_CLK33M_PCIIN
XTAL25_IN AM43 ← SYSCLK_CLK25M_SB_R
XTAL25_OUT AL44 NC

(IPD-PWROK) CLKOUTFLEX0/GPIO64 C40 NC_PCH_GPIO64_CLKOUTFLEX0
(IPD-PWROK) CLKOUTFLEX1/GPIO65 F38 NC_PCH_GPIO65_CLKOUTFLEX1
(IPD-PWROK) CLKOUTFLEX2/GPIO66 F36 NC_PCH_GPIO66_CLKOUTFLEX2
(IPD-PWROK) CLKOUTFLEX3/GPIO67 F39 NC_PCH_GPIO67_CLKOUTFLEX3

ICLK_IREF AM45 ← PP1V5_S0

TP19 AD39 NC
TP18 AD38 NC

DIFFCLK_BIASREF AN44 ← PCH_DIFFCLK_BIASREF
PLACE_NEAR=U1100.AN44:2.54mm
R1190 7.5K 1% 1/20W MF 201 → PP1V5_S0

NOTE: ENET pair only used if SD Card Reader is USB3.

Unused clock terminations for FCIM Mode

PCIE_CLK100M_PCH_N → R1196 10K → NC_PCIE_CLK100M_PCH_N
PCIE_CLK100M_PCH_P → R1195 10K → NC_PCIE_CLK100M_PCH_P
PCH_CLKIN_GNDN → R1171 10K → NC_PCH_CLKIN_GNDN
PCH_CLKIN_GNDP → R1170 10K → NC_PCH_CLKIN_GNDP
PCH_CLK96M_DOT_N → R1192 10K → NC_PCH_CLK96M_DOT_N
PCH_CLK96M_DOT_P → R1191 10K → NC_PCH_CLK96M_DOT_P
PCH_CLK100M_SATA_N → R1194 10K → NC_PCH_CLK100M_SATA_N
PCH_CLK100M_SATA_P → R1193 10K → NC_PCH_CLK100M_SATA_P
PCH_CLK14P3M_REFCLK → R1197 10K → NC_PCH_CLK14P3M_REFCLK

SYSCLK_CLK25M_SB → R1172 340 1% 1/16W MF-LF 402 → SYSCLK_CLK25M_SB_R
1.5V -> 1.1V
R1173 1K 1% 1/20W MF 201

NOTE: SSC control is ganged on PCIe 0-3 and 4-7 clocks.
PEG-attached (CPU) PCIe devices must use one set,
while PCH-attached PCIe devices use the other set.
If 2 or less devices are attached to PEG the
CLKOUT_PEG outputs can be used for those devices.

PP3V3_SUS
PP3V3_S0

R1177 4.7K → PCH_SPKR
R1176 10K → DP_TBT_SEL
R1178 4.7K → PCH_SATALED_L
R1134 10K → DP_AUXCH_ISOL_L
R1133 10K → XDP_DC1_SATARDRVR_EN
R1143 10K → SSD_CLKREQ_L
R1142 10K → XDP_DD2_ENETSD_CLKREQ_L
R1169 10K → AP_CLKREQ_L
R1144 10K → CAMERA_CLKREQ_L
R1145 10K → TBT_CLKREQ_L
R1147 10K → PCH_CLKRQ5_L_GPIO44
R1114 10K → PEG_CLKREQ_L
R1115 10K → PCH_CLKRQ7_L_GPIO46
R1146 10K → ENET_CLKREQ_L
R1148 10K → PCH_PEGCLKRQB_L_GPIO56
R1179 10K → ENET_MEDIA_SENSE_RDIV

Connect to ENET_MEDIA_SENSE via alias if HDA = 3.3V.
Connect to ENET_MEDIA_SENSE via 12K R if HDA = 1.5V.
If HDA = S0, must also ensure that signal cannot be high in S3.

SYNC_MASTER=J15_REFERENCE SYNC_DATE=12/18/2012

PAGE TITLE: PCH RTC/HDA/JTAG/SATA/CLK

Apple Inc.

DRAWING NUMBER: <SCH_NUM> SIZE: D
REVISION: <E4LABEL>
BRANCH: <BRANCH>
PAGE: 11 OF 119
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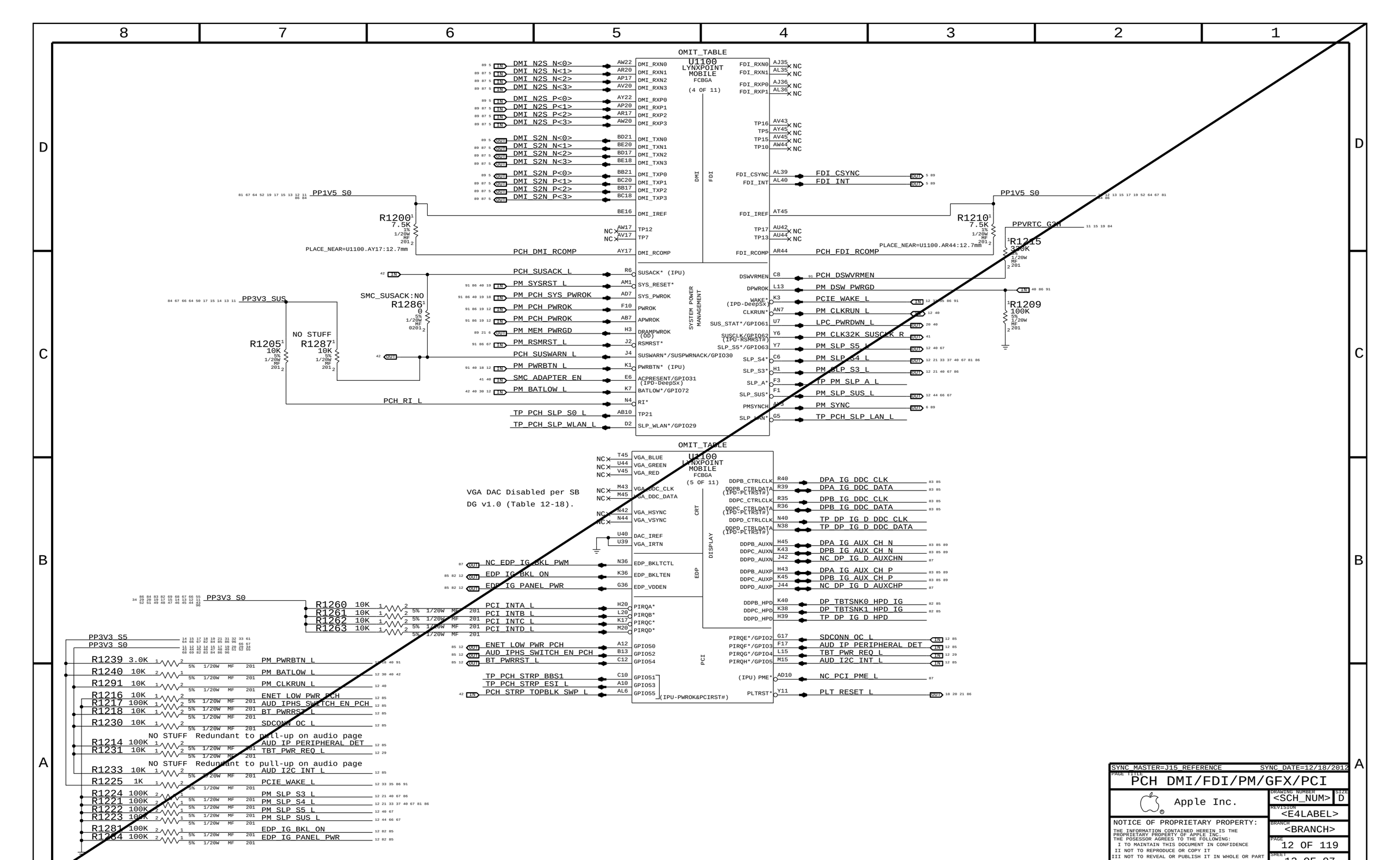

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PAGE TITLE

PCH DMI/FDI/PM/GFX/PCI

Apple Inc.

DRAWING NUMBER <SCH_NUM> SIZE D

REVISION <E4LABEL>

BRANCH <BRANCH>

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USB3 Port Assignments:

Unused

PCIe/USB3 Port Assignments:

SD Card Reader
(& Ethernet if combo)

PCIe Port Assignments:

AirPort

Camera

SSD (Gumstick)
Lane 0
(PCIe-only)
Or PCIe switch if TBT/SSD

SSD (Gumstick)
Lane 1
(PCIe-only)
Or PCIe switch if TBT/SSD

SSD (Gumstick)
Lane 2
(PCIe-only)
Or PCIe switch if TBT/SSD

SSD (Gumstick)
Lane 3
(PCIe-only)
Or PCIe switch if TBT/SSD

OMIT_TABLE

U1100
LYNXPOINT MOBILE
FCBGA
(9 OF 11)

PCI-E | USB

NC_USB3_SPARE_D2RN — AW31 PERN1_USB3RN3
NC_USB3_SPARE_D2RP — AY31 PERP1_USB3RP3
NC_USB3_SPARE_R2D_CN — BE32 PETN1_USB3TN3
NC_USB3_SPARE_R2D_CP — BC32 PETP1_USB3TP3

USB3_SD_D2R_N — AT31 PERN2_USB3RN4
USB3_SD_D2R_P — AR31 PERP2_USB3RP4
USB3_SD_R2D_C_N — BD33 PETN2_USB3TN4
USB3_SD_R2D_C_P — BB33 PETP2_USB3TP4

PCIE_AP_D2R_N — AW33 PERN3
PCIE_AP_D2R_P — AY33 PERP3
PCIE_AP_R2D_C_N — BE34 PETN3
PCIE_AP_R2D_C_P — BC34 PETP3

PCIE_CAMERA_D2R_N — AT33 PERN4
PCIE_CAMERA_D2R_P — AR33 PERP4
PCIE_CAMERA_R2D_C_N — BE36 PETN4
PCIE_CAMERA_R2D_C_P — BC36 PETP4

NC_PCIE_SSD_D2RN<0> — AW36 PERN5
NC_PCIE_SSD_D2RP<0> — AV36 PERP5
NC_PCIE_SSD_R2D_CN<0> — BD37 PETN5
NC_PCIE_SSD_R2D_CP<0> — BB37 PETP5

NC_PCIE_SSD_D2RN<1> — AY38 PERN6
NC_PCIE_SSD_D2RP<1> — AW38 PERP6
NC_PCIE_SSD_R2D_CN<1> — BC38 PETN6
NC_PCIE_SSD_R2D_CP<1> — BE38 PETP6

NC_PCIE_SSD_D2RN<2> — AT40 PERN7
NC_PCIE_SSD_D2RP<2> — AT39 PERP7
NC_PCIE_SSD_R2D_CN<2> — BE40 PETN7
NC_PCIE_SSD_R2D_CP<2> — BC40 PETP7

NC_PCIE_SSD_D2RN<3> — AN38 PERN8
NC_PCIE_SSD_D2RP<3> — AN39 PERP8
NC_PCIE_SSD_R2D_CN<3> — BD42 PETN8
NC_PCIE_SSD_R2D_CP<3> — BD41 PETP8

PP1V5_S0
R1300 7.5K 1% 1/20W MF 201 — PLACE_NEAR=U1100.BD29:12.7mm
PCH_PCIE_RCOMP — BD29 PCIE_RCOMP
BE30 PCIE_IREF
NC — BC30 TP11
NC — BB29 TP6

USB Port Assignments:

Ext A (LS/FS/HS)

Ext C (LS/FS/HS)

Reserved: SD (HS)

Reserved: WiFi (HS)

Unused

Reserved: PSOC (Legacy Trackpad)

Unused

Unused

Ext B (LS/FS/HS)

Ext D (LS/FS/HS)

Reserved: Camera

BT

IR

Trackpad

USB3 Port Assignments:

Ext A (SS)

Ext B (SS)

Ext C (SS)

Ext D (SS)

USB2N0 B37 USB_EXTA_N
USB2P0 D37 USB_EXTA_P
USB2N1 A38 NC_USB_EXTCN
USB2P1 C38 NC_USB_EXTCP
USB2N2 A36 NC_USB_SDN
USB2P2 C36 NC_USB_SDP
USB2N3 A34 NC_USB_WLANN
USB2P3 C34 NC_USB_WLANP
USB2N4 B33 NC_USB_4N
USB2P4 D33 NC_USB_4P
USB2N5 F31 NC_USB_PSOCN
USB2P5 G31 NC_USB_PSOCP
USB2N6 K31 NC_USB_6N
USB2P6 L31 NC_USB_6P
USB2N7 G29 NC_USB_7N
USB2P7 H29 NC_USB_7P
USB2N8 A32 USB_EXTB_N
USB2P8 C32 USB_EXTB_P
USB2N9 A30 NC_USB_EXTDN
USB2P9 C30 NC_USB_EXTDP
USB2N10 B29 TP_USB_CAMERAN
USB2P10 D29 TP_USB_CAMERAP
USB2N11 A28 USB_BT_N
USB2P11 C28 USB_BT_P
USB2N12 G26 NC_USB_IRN
USB2P12 F26 NC_USB_IRP
USB2N13 F24 USB_TPAD_N
USB2P13 G24 USB_TPAD_P
(IPD)

USB3RN1 AR26 USB3_EXTA_D2R_N
USB3RP1 AP26 USB3_EXTA_D2R_P
USB3TN1 BE24 USB3_EXTA_R2D_C_N
USB3TP1 BD23 USB3_EXTA_R2D_C_P
USB3RN2 AW26 USB3_EXTB_D2R_N
USB3RP2 AV26 USB3_EXTB_D2R_P
USB3TN2 BD25 USB3_EXTB_R2D_C_N
USB3TP2 BC24 USB3_EXTB_R2D_C_P
USB3RN5 AW29 NC_USB3_EXTC_D2RN
USB3RP5 AV29 NC_USB3_EXTC_D2RP
USB3TN5 BE26 NC_USB3_EXTC_R2D_CN
USB3TP5 BC26 NC_USB3_EXTC_R2D_CP
USB3RN6 AR29 NC_USB3_EXTD_D2RN
USB3RP6 AP29 NC_USB3_EXTD_D2RP
USB3TN6 BD27 NC_USB3_EXTD_R2D_CN
USB3TP6 BE28 NC_USB3_EXTD_R2D_CP

USBRBIAS* K24
USBRBIAS K26
PCH_USB_RBIAS
PLACE_NEAR=U1100.K24:11.4mm
R1370 22.6 1% 1/20W MF 201

TP24 M33 NC
TP23 L33 NC

OC0*/GPIO59 P3 XDP_DA0_USB_EXTA_OC_L
OC1*/GPIO40 V1 XDP_DA1_USB_EXTC_OC_L
OC2*/GPIO41 U2 XDP_DA2_SSD_PWR_EN
OC3*/GPIO42 P1 XDP_DA3_CAMERA_PWR_EN
OC4*/GPIO43 M3 XDP_DB0_USB_EXTB_OC_L
OC5*/GPIO9 T1 XDP_DB1_USB_EXTD_OC_L
OC6*/GPIO16 N2 XDP_DB2_SD_PWR_EN
OC7*/GPIO14 M1 XDP_DB3_SDCONN_STATE_CHANGE_L

OMIT_TABLE

U1100
LYNXPOINT MOBILE
FCBGA
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LPC | SMBUS | C-LINK | SPI

LPC_AD<0> R1340 33 — LPC_AD_R<0> — A20 LAD0 (IPU)
LPC_AD<1> R1341 33 — LPC_AD_R<1> — C20 LAD1 (IPU)
LPC_AD<2> R1342 33 — LPC_AD_R<2> — A18 LAD2 (IPU)
LPC_AD<3> R1343 33 — LPC_AD_R<3> — C18 LAD3 (IPU)
LPC_FRAME_L R1344 33 — LPC_FRAME_R_L — B21 LFRAME*
NC_LPC_DREQ0_L — D21 LDRQ0* (IPU)
TBT_PWR_EN_PCH — G20 LDRQ1*/GPIO23 (IPU-LDRQ1#7)
LPC_SERIRQ — AL11 SERIRQ

SPI_CLK_R — AJ11 SPI_CLK
SPI_CS0_R_L — AJ7 SPI_CS0* (IPU)
TP_SPI_CS1_L — AL7 SPI_CS1* (IPU)
TP_SPI_CS2_L — AJ10 SPI_CS2* (IPU)
SPI_MOSI_R — AH1 SPI_MOSI (IPD)
SPI_MISO — AH3 SPI_MISO (IPU)
SPI_IO<2> — AJ4 SPI_IO2 (IPU)
SPI_IO<3> — AJ2 SPI_IO3 (IPU)

SMBALERT*/GPIO11 N7 PCH_SMBALERT_L
SMBCLK R10 SMBUS_PCH_CLK
SMBDATA U11 SMBUS_PCH_DATA
SML0ALERT*/GPIO60 N8 PCH_SML0ALERT_L
SML0CLK U8 SML_PCH_0_CLK
SML0DATA R7 SML_PCH_0_DATA
SML1ALERT*/PCHHOT*/GPIO74 H6 PCH_SML1ALERT_L
SML1CLK/GPIO58 K6 SML_PCH_1_CLK
SML1DATA/GPIO75 N11 SML_PCH_1_DATA
(IPU/IPD) CL_CLK AF11 NC_CLINK_CLK
(IPU/IPD) CL_DATA AF10 NC_CLINK_DATA
CL_RST* AF7 NC_CLINK_RESET_L

TP1 BA45 NC
TP2 BC45 NC
TP4 BE43 NC
TP3 BE44 NC
TD_IREF AY43 PCH_TD_IREF
R1380 0.2K 1% 1/20W MF 201

PP3V3_SUS
PP3V3_SUS
PP3V3_S3
PP3V3_S3RS0_CAMERA
PP3V3_S0

R1350 10K 5% 1/20W MF 201 — LPC_SERIRQ
R1351 10K 5% 1/20W MF 201 — TBT_PWR_EN_PCH
R1360 10K 5% 1/20W MF 201 — XDP_DA0_USB_EXTA_OC_L
R1361 10K 5% 1/20W MF 201 — XDP_DA1_USB_EXTC_OC_L
R1362 10K 5% 1/20W MF 201 — SSD_PWR_EN
R1368 10K 5% 1/20W MF 201 — CAMERA_PWR_EN_PCH
R1320 10K 5% 1/20W MF 201 — XDP_DB0_USB_EXTB_OC_L
R1321 10K 5% 1/20W MF 201 — XDP_DB1_USB_EXTD_OC_L
R1367 10K 5% 1/20W MF 201 — SD_PWR_EN
R1369 10K 5% 1/20W MF 201 — XDP_DB3_SDCONN_STATE_CHANGE_L
R1392 1K 5% 1/20W MF 201 — SPI_IO<2>
R1393 1K 5% 1/20W MF 201 — SPI_IO<3>
R1353 10K 5% 1/20W MF 201 — PCH_SMBALERT_L
R1354 10K 5% 1/20W MF 201 — PCH_SML0ALERT_L
R1355 10K 5% 1/20W MF 201 — PCH_SML1ALERT_L

SYNC_MASTER=J15_REFERENCE
SYNC_DATE=12/18/2012

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Pull-up/down on chipset support page (depends on TBT controller)
Falcon Ridge: TBT_CIO_PLUG_EVENT_L, requires pull-up (S0), no isolation necessary.
Cactus Ridge: TBT_CIO_PLUG_EVENT, requires pull-down & isolation.

OMIT_TABLE

U1100
LYNXPOINT MOBILE FCBGA
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TBT_CIO_PLUG_EVENT_L	AT8	BMBUSY*/GPIO0	
FW_PME_L	F13	TACH1/GPIO1	
DPMUX_UC_IRQ	A14	TACH2/GPIO6	
SMC_RUNTIME_SCI_L	G15	TACH3/GPIO7	
XDP_FC0_HDD_PWR_EN	Y1	GPIO8 (IPU-RSMRST#)	
WOL_EN	K13	LAN_PHY_PWR_CTRL/GPIO12	
MEM_VDD_SEL_1V5_L	AB11	GPIO15	
XDP_DD0_SSD_PCIE_SEL_L	AN2	SATA4GP/GPIO16 (IPU-Boot/SATA4GP?)	
LPCPLUS_GPIO	C14	TACH0/GPIO17	
JTAG_TBT_TMS_PCH	BB4	SCLOCK/GPIO22	
TBT_GO2SX_BIDIR	Y10	GPIO24	
SMC_WAKE_SCI_L	R11	GPIO27 (IPU-DeepSx)	
ISOLATE_CPU_MEM_L	AD11	GPIO28	
TBT_POC_RESET_L	AN6	GPIO34	
XDP_FC1_GPU_GOOD	AP1	GPIO35/NMI*	
XDP_DC2_ODD_PWR_EN_L	AT3	SATA2GP/GPIO36 (IPD-PLTRST#)	
XDP_DC3_JTAG_ISP_TCK	AK1	SATA3GP/GPIO37 (IPD-PLTRST#)	
JTAG_ISP_TDO	AT7	SLOAD/GPIO38	
JTAG_ISP_TDI	AM3	SDATAOUT0/GPIO39	
FW_PWR_EN_PCH	AN4	SDATAOUT1/GPIO48	
XDP_DD1_MLB_RAMCFG1	AK3	SATA5GP/GPIO49 (IPU-Boot/SATA5GP?)	
SPIROM_USE_MLB	U12	GPIO57	
MLB_RAMCFG3	C16	TACH4/GPIO68	
MLB_RAMCFG2	D13	TACH5/GPIO69	
SD_SEL_PCIE_L_USB_H	G13	TACH6/GPIO70 (IPU-Boot?)	
MLB_RAMCFG0	H15	TACH7/GPIO71 (IPU-Boot?)	

CPU/MISC

	TP14	AN10	PCH_A20GATE
(IPD) PECI	AY1	PCH_PECI	
RCIN*	AT6	PCH_RCIN_L	
PROCPWRGD	AV3	PCH_PROCPWRGD	
THRMTRIP*	AV1	PM_THRMTRIP_L_R	
PLTRST_PROC*	AU4	CPU_RESET_L	
VSS	N10		
	A2		
	A41		
	A43		
	A44		
	B1		
	B2		
	B44		
	B45		
	BA1		
	BC1		
	BD1		
	BD2		
VSS	BD44		
	BD45		
	BE2		
	BE3		
	E1		
	E1		
	E45		
	A4		
	BE41		
	BE5		
	C45	VSS	
	A5		

GPIO

PP1V05_S0
BDW_SPRT
R1457 1K 5% 1/16W MF-LF 402

NO STUFF
R1470 43 5% 1/20W MF 201 — CPU_PECI
R1440 0 5% 1/20W MF 0201 — CPU_PWRGD
R1456 390 5% 1/20W MF 201 — PM_THRMTRIP_L
CRW_SPRT

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
117S0201	1	RES,MF,1A MAX,0.0 OHM,5%,0201,BLACK	R1456		BDW_SPRT

PP3V3_S0
RAMCFG0:H R1475 10K 5% 1/20W MF 201
RAMCFG1:H R1474 10K 5% 1/20W MF 201
RAMCFG2:H R1473 10K 5% 1/20W MF 201
RAMCFG3:H R1472 10K 5% 1/20W MF 201

BOM GROUP	BOM OPTIONS
RAMCFG_SLOT	RAMCFG3:H,RAMCFG2:H,RAMCFG1:H,RAMCFG0:H

Systems with no chip-down memory should pull all 4 RAMCFG GPIOs high.
Systems with chip-down memory should add pull-downs on another page and set straps per software.

PP3V3_S5
PP3V3_SUS
PP3V3_S0

NOTE: GPIO0 pull-up/down on project-specific page

R1485 10K 5% 1/20W MF 201	FW_PME_L	14 85
R1411 20K 5% 1/20W MF 201	DPMUX_UC_IRQ	14 82 85
R1496 10K 5% 1/20W MF 201	SMC_RUNTIME_SCI_L	14 40
R1494 10K 5% 1/20W MF 201	WOL_EN	14 85
R1489 10K 5% 1/20W MF 201	MEM_VDD_SEL_1V5_L	14 85
R1495 100K 5% 1/20W MF 201	XDP_DD0_SSD_PCIE_SEL_L	14 18
R1490 100K 5% 1/20W MF 201	LPCPLUS_GPIO	14 85
R1412 10K 5% 1/20W MF 201	JTAG_TBT_TMS_PCH	14 20
R1492 10K 5% 1/20W MF 201	TBT_GO2SX_BIDIR	14 85
R1491 10K 5% 1/20W MF 201	SMC_WAKE_SCI_L	14 40
R1498 10K 5% 1/20W MF 201	XDP_DC2_ODD_PWR_EN_L	14 18
R1413 10K 5% 1/20W MF 201	JTAG_ISP_TCK	18 20
R1486 10K 5% 1/20W MF 201	JTAG_ISP_TDO	14 20
R1499 10K 5% 1/20W MF 201	JTAG_ISP_TDI	14 20
R1484 10K 5% 1/20W MF 201	FW_PWR_EN_PCH	14 85
R1493 100K 5% 1/20W MF 201	SPIROM_USE_MLB	14 50 86

NOTE: GPIO70 pull-up/down on project-specific page

R1450 10K 5% 1/20W MF 201	PCH_A20GATE	14
R1455 10K 5% 1/20W MF 201	PCH_RCIN_L	14 91

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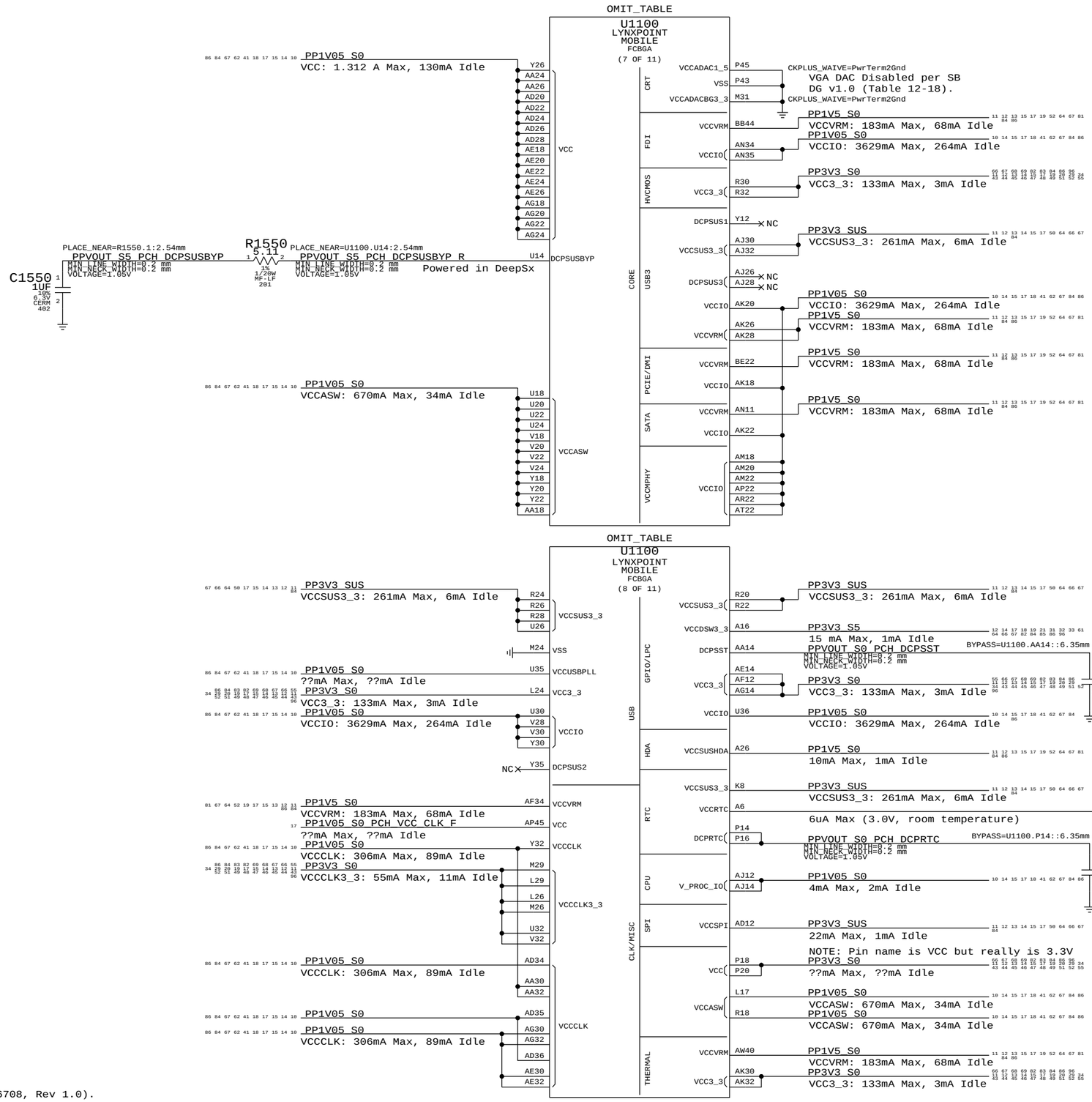

Current data from LPT EDS (doc #486708, Rev 1.0).

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PCH Power

Apple Inc.

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OMIT_TABLE

U1100
LYNXPOINT
MOBILE
FCBGA
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VSS

AL34			K39
AL38			L2
AL8			L44
AM14			M17
AM24			M22
AM26			N12
AM28			N35
AM30			N39
AM32			N6
AM16			P22
AN36			P24
AN40			P26
AN42			P28
AN8			P30
AP13			P32
AP24			R12
AP31			R14
AP43			R16
AR2			R2
AK16			R34
AT10			R38
AT15			R44
AT17	VSS	VSS	R8
AT20			T43
AT26			U10
AT29			U16
AT36			U28
AT38			U34
D42			U38
AV13			U42
AV22			U6
AV24			V14
AV31			V16
AV33			V26
BB25			V43
AV40			W2
AV6			W44
AW2			Y14
F43			Y16
AY10			Y24
AY15			Y28
AY20			Y34
AY26			Y36
AY29			Y40
AY7			Y8
B11			
B15			

OMIT_TABLE

U1100
LYNXPOINT
MOBILE
FCBGA
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VSS

AA16			B19
AA20			B23
AA22			B27
AA28			B31
AA5			B35
AB12			B39
AB34			B7
AB38			BA40
AB8			BD11
AC2			BD15
AC44			BD19
AD14			AY36
AD16			AT43
AD18			BD31
AD30			BD35
AD32			BD39
AD40			BD7
AD6			D25
AD8			AV7
AE16			F15
AE28			F20
AF38			F29
AF8	VSS	VSS	F33
AG16			BC16
AG2			D4
AG26			G2
AG28			G38
AG44			G44
AJ16			G8
AJ18			H10
AJ20			H13
AJ22			H17
AJ24			H22
AJ34			H24
AJ38			H26
AJ6			H31
AJ8			H36
AK14			H40
AK24			H7
AK43			K10
AK45			K15
AL12			K20
AL2			K29
BC22			K33
BB42			BC28

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PCH Grounds

Apple Inc.

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PCH VCCDSW3_3 BYPASS
(PCH 3.3V DSW PWR)
PP3V3_S5

C1700 0.1UF 10% 25V X7R-CERM 0402
BYPASS=U1100.A16::6.35mm

PCH VCCSPI BYPASS
(PCH 3.3V SPI PWR)
PP3V3_SUS

C1702 1.0UF 10% 6.3V X6S 0402
BYPASS=U1100.AD12::6.35mm

PCH VCCSUS3_3 BYPASS
(PCH 3.3V SUSPEND PWR)
PP3V3_SUS

C1704 0.1UF 10% 25V X7R-CERM 0402
BYPASS=U1100.R20::6.35mm

PCH VCCSUS3_3 BYPASS
(PCH 3.3V SUSPEND USB PWR)
PP3V3_SUS

C1706 0.1UF 10% 25V X7R-CERM 0402
BYPASS=U1100.R26::6.35mm

PCH VCCSUS3_3 BYPASS
(PCH 3.3V SUSPEND RTC PWR)
PP3V3_SUS

C1708 1.0UF 10% 6.3V X6S 0402
BYPASS=U1100.K8::6.35mm

PCH VCCCLK3_3 BYPASS
(PCH 3.3V CLK PWR)
PP3V3_S0

C1720 1.0UF 10% 6.3V X6S 0402
C1721 1.0UF 10% 6.3V X6S 0402
C1722 1.0UF 10% 6.3V X6S 0402
C1723 1.0UF 10% 6.3V X6S 0402
BYPASS=U1100.L26::6.35mm
BYPASS=U1100.L29::6.35mm
BYPASS=U1100.M29::6.35mm
BYPASS=U1100.U32::6.35mm

PCH VCC3_3 BYPASS
(PCH 3.3V HVCMOS PWR)
PP3V3_S0

C1726 0.1UF 10% 25V X7R-CERM 0402
BYPASS=U1100.R30::6.35mm

PCH VCC3_3 BYPASS
(PCH 3.3V GPIO/LPC PWR)
PP3V3_S0

C1728 0.01UF 10% 16V X7R-CERM 0402
BYPASS=U1100.AE14::6.35mm

PCH VCC3_3 BYPASS
(PCH 3.3V USB2 PWR)
PP3V3_S0

C1730 0.1UF 10% 25V X7R-CERM 0402
BYPASS=U1100.L24::6.35mm

PCH VCC3_3 BYPASS
(PCH 3.3V THERMAL PWR)
PP3V3_S0

C1732 0.1UF 10% 25V X7R-CERM 0402
BYPASS=U1100.AK30::6.35mm

PCH VCC BYPASS
(PCH 3.3V FUSE PWR)
PP3V3_S0

C1734 1.0UF 10% 6.3V X6S 0402
BYPASS=U1100.P18::6.35mm

PCH VCCASW BYPASS
(PCH 1.05V ME CORE PWR)
PP1V05_S0
670mA Max, 34mA Idle

C1750 22UF 20% 6.3V X5R-CERM-1 603
C1751 1.0UF 10% 6.3V X6S 0402
C1752 1.0UF 10% 6.3V X6S 0402
CRITICAL
C1753 12PF 5% NP0-C0G 0201 25V
PLACE_NEAR=U1100.V20:2.54mm
PLACE_NEAR=U1100.V20:2.54mm
PLACE_NEAR=U1100.V20:2.54mm
Not documented in EDS!

PCH VCC BYPASS
(PCH 1.05V CORE PWR)
PP1V05_S0

C1755 10UF 20% 16V X6S-CERM 0603
C1756 1.0UF 10% 6.3V X6S 0402
C1757 1.0UF 10% 6.3V X6S 0402
C1758 1.0UF 10% 6.3V X6S 0402
CRITICAL
C1759 12PF 5% NP0-C0G 0201 25V
BYPASS=U1100.AG18::12.7mm
BYPASS=U1100.AG22::6.35mm
BYPASS=U1100.AD20::6.35mm
BYPASS=U1100.AE18::6.35mm

PCH VCCIO BYPASS
(PCH 1.05V PCIe/DMI/SATA/USB3 PWR)
PP1V05_S0

C1760 10UF 20% 16V X6S-CERM 0603
C1761 1.0UF 10% 6.3V X6S 0402
C1762 1.0UF 10% 6.3V X6S 0402
C1763 1.0UF 10% 6.3V X6S 0402
C1764 1.0UF 10% 6.3V X6S 0402
CRITICAL
C1765 12PF 5% NP0-C0G 0201 25V
BYPASS=U1100.AK18::12.7mm
BYPASS=U1100.AK22::6.35mm
BYPASS=U1100.AK20::6.35mm
BYPASS=U1100.AM18::6.35mm

PCH VCCUSBPLL BYPASS
(PCH 1.05V USB2 PLL PWR)
PP1V05_S0

C1770 1.0UF 10% 6.3V X6S 0402
BYPASS=U1100.U35::6.35mm

PCH VCCIO BYPASS
(PCH 1.05V FDI PWR)
PP1V05_S0

C1772 1.0UF 10% 6.3V X6S 0402
BYPASS=U1100.AN34::6.35mm

PCH VCCIO BYPASS
(PCH 1.05V USB2 PWR)
PP1V05_S0

C1774 0.1UF 10% 25V X7R-CERM 0402
CRITICAL
C1775 12PF 5% NP0-C0G 0201 25V
BYPASS=U1100.U30::6.35mm

PCH V_PROC_IO BYPASS
(PCH 1.05V CPU I/F PWR)
PP1V05_S0

C1785 1.0UF 10% 6.3V X6S 0402
C1786 0.1UF 10% 25V X7R-CERM 0402
C1787 0.1UF 10% 25V X7R-CERM 0402
BYPASS=U1100.AJ12::12.7mm
BYPASS=U1100.AJ12::6.35mm
BYPASS=U1100.AJ12::6.35mm

PCH VCCCLK BYPASS
(PCH 1.05V SSC100 PWR)
PP1V05_S0

C1776 1.0UF 10% 6.3V X6S 0402
C1777 1.0UF 10% 6.3V X6S 0402
BYPASS=U1100.AE30::6.35mm
BYPASS=U1100.AG30::6.35mm

PCH VCCCLK BYPASS
(PCH 1.05V DIFFCLK PWR)
PP1V05_S0

C1778 1.0UF 10% 6.3V X6S 0402
BYPASS=U1100.AD35::6.35mm

PCH VCCCLK BYPASS
(PCH 1.05V DIFFCLK135 PWR)
PP1V05_S0

C1780 1.0UF 10% 6.3V X6S 0402
BYPASS=U1100.AD34::6.35mm

PCH VCCCLK BYPASS
(PCH 1.05V SSC PWR)
PP1V05_S0

C1782 1.0UF 10% 6.3V X6S 0402
BYPASS=U1100.AA30::6.35mm

PCH VCCSUSHDA BYPASS
(PCH 3.3V/1.5V HDA PWR)
PP1V5_S0

C1710 0.1UF 10% 25V X7R-CERM 0402
BYPASS=U1100.A26::6.35mm

PCH VCCVRM BYPASS
(PCH 1.5V VCCVRM PWR)
PP1V5_S0
183mA Max, 68mA Idle
PP1V5_S0
PP1V5_S0
PP1V5_S0
PP1V5_S0
PP1V5_S0
PP1V5_S0
PP1V5_S0

C1740 10UF 20% 16V X6S-CERM 0603
BYPASS=U1100.AF34::12.7mm

PCH CLK VCC BYPASS
(PCH 1.05V CLK PLL PWR)
PP1V05_S0 PCH_VCC_CLK_F 15
MIN_LINE_WIDTH=0.2 MM
MIN_NECK_WIDTH=0.075 MM
VOLTAGE=1.05V

CRITICAL
OMIT_TABLE
L1790 4.7UH-170MA-0.321OHM 0603

PP1V05_S0
??mA Max, ??mA Idle
R1790 1 5% 1/16W ME-LF 402
PP1V05_S0_PCH_VCC_CLK_R
MIN_LINE_WIDTH=0.2 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V

NO STUFF
C1790 10UF 20% 16V X6S-CERM 0603
C1791 1UF 10% 10V X6S-CERM 0402
BYPASS=U1100.AP45::12.7mm
BYPASS=U1100.AP45::6.35mm

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
113S0022	1	RES,FF,0 OHM,(020OHM MAX),2A,0603	L1790		

Current data from LPT EDS (doc #486708, Rev 1.0).

SYNC_MASTER=CLEAN_X425 SYNC_DATE=10/30/2014

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Extra BPM Testpoints

XDP_BPM_L<2> → TP1802
XDP_BPM_L<3> → TP1803
XDP_BPM_L<4> → TP1804
XDP_BPM_L<5> → TP1805
XDP_BPM_L<6> → TP1806
XDP_BPM_L<7> → TP1807

(TP-P6)

Merged (CPU/PCH) Micro2-XDP

PPVCCIO_S0_CPU

CRITICAL
XDP_CONN
J1800
DF40RC-60DP-0.4V
M-ST-SM1

518S0847

NOTE: This is not the standard XDP pinout.
Use with 921-0133 Adapter Flex to
support chipset debug.

PP1V05_S0 → R1830 150 5% 1/16W MF-LF 402

XDP_CPU_PREQ_L	OBSEN_A0	OBSEN_C0	CPU_CFG<17>
XDP_CPU_PRDY_L	OBSEN_A1	OBSEN_C1	CPU_CFG<16>
CPU_CFG<0>	OBSDATA_A0	OBSDATA_C0	CPU_CFG<8>
CPU_CFG<1>	OBSDATA_A1	OBSDATA_C1	CPU_CFG<9>
CPU_CFG<2>	OBSDATA_A2	OBSDATA_C2	CPU_CFG<10>
CPU_CFG<3>	OBSDATA_A3	OBSDATA_C3	CPU_CFG<11>
XDP_BPM_L<0>	OBSEN_B0	OBSEN_D0	CPU_CFG<19>
XDP_BPM_L<1>	OBSEN_B1	OBSEN_D1	CPU_CFG<18>
CPU_CFG<4>	OBSDATA_B0	OBSDATA_D0	CPU_CFG<12>
CPU_CFG<5>	OBSDATA_B1	OBSDATA_D1	CPU_CFG<13>
CPU_CFG<6>	OBSDATA_B2	OBSDATA_D2	CPU_CFG<14>
CPU_CFG<7>	OBSDATA_B3	OBSDATA_D3	CPU_CFG<15>
XDP_CPU_VCCST_PWRGD	PWRGD/HOOK0	ITPCLK/HOOK4	NC
XDP_CPU_PWRBTN_L	HOOK1	ITPCLK#/HOOK5	NC
	VCC_OBS_AB	VCC_OBS_CD	
CPU_PWR_DEBUG	HOOK2	RESET#/HOOK6	XDP_CPURST_L
XDP_SYS_PWROK	HOOK3	DBR#/HOOK7	XDP_DBRESET_L
SMBUS_PCH_DATA	SDA	TDO	XDP_PCH_TDO
SMBUS_PCH_CLK	SCL	TRSTn	XDP_TRST_L
XDP_PCH_TCK	TCK1	TDI	XDP_PCH_TDI
	TCK0	TMS	XDP_PCH_TMS
		XDP_PRESENT#	

XDP_CPU_PRESENT_L

C1804 0.1UF 10% 6.3V CERM-X5R 0201
R1831 1K 5% 1/16W MF-LF 402
C1800 0.1UF 10% 6.3V CERM-X5R 0201
C1801 0.1UF 10% 6.3V CERM-X5R 0201
C1806 0.1UF 10% 6.3V CERM-X5R 0201

CPU_PWRGD → R1800 1K 5% 1/20W MF 201 (PLACE_NEAR=U0500.F50:2.54mm)
PM_PWRBTN_L → R1802 0 5% 1/20W MF 0201 (PLACE_NEAR=U5000.J3:2.54mm)
PM_PCH_SYS_PWROK → R1804 0 5% 1/16W MF-LF 402

R1805 1K 5% 1/20W MF 201 (PLACE_NEAR=U0500.A67:2.54mm)
PLT_RESET_L

NOTE: XDP_DBRESET_L pulled-up to 3.3V on PCH Support Page

PP1V05_S0 → R1820 51 5% 1/20W MF 201 (PLACE_NEAR=U0500.M49:28mm) → XDP_CPU_TDO
R1823 51 5% 1/20W MF 201 (PLACE_NEAR=U0500.N54:28mm) → XDP_CPU_TCK
R1824 51 5% 1/20W MF 201 (PLACE_NEAR=U0500.M53:28mm) → XDP_CPUPCH_TRST_L

TDI and TMS are terminated in CPU.

CRITICAL Q1840 DMN5L06VK-7 SOT563 VER 5 — XDP_CPU_TDO (PLACE_NEAR=J1800.51:28mm)
CRITICAL Q1840 DMN5L06VK-7 SOT563 VER 5 — XDP_CPUPCH_TRST_L (PLACE_NEAR=J1800.53:28mm, MAKE_BASE=TRUE)
CRITICAL Q1842 DMN5L06VK-7 SOT563 VER 5 — XDP_CPU_TDI (PLACE_NEAR=J1800.55:28mm)
CRITICAL Q1842 DMN5L06VK-7 SOT563 VER 5 — XDP_CPU_TMS (PLACE_NEAR=J1800.57:28mm)

PCH/XDP Signals

		OMIT (All 10 R's)	Non-XDP Signals
XDP_DA0_USB_EXTA_OC_L	R1890 SHORT		USB_EXTA_OC_L
XDP_DA2_SSD_PWR_EN	R1895 SHORT		SSD_PWR_EN
XDP_DA3_CAMERA_PWR_EN	R1893 SHORT		CAMERA_PWR_EN_PCH
XDP_DB0_USB_EXTB_OC_L	R1894 SHORT		USB_EXTB_OC_L
XDP_DB2_SD_PWR_EN	R1896 SHORT		SD_PWR_EN
XDP_DB3_SDCONN_STATE_CHANGE_L	R1897 SHORT		SDCONN_STATE_CHANGE_L
XDP_DC0_DP_AUXCH_ISOL_L	R1872 SHORT		DP_AUXCH_ISOL_L
XDP_DC1_SATARDRVR_EN	MAKE_BASE=TRUE		XDP_DC1_SATARDRVR_EN
XDP_DC2_ODD_PWR_EN_L	MAKE_BASE=TRUE		XDP_DC2_ODD_PWR_EN_L
XDP_DC3_JTAG_ISP_TCK	R1875 SHORT		JTAG_ISP_TCK
XDP_DD0_SSD_PCIE_SEL_L	R1876 SHORT		SSD_PCIE_SEL_L
XDP_DD1_MLB_RAMCFG1	MAKE_BASE=TRUE		XDP_DD1_MLB_RAMCFG1
XDP_DD2_ENETSD_CLKREQ_L	MAKE_BASE=TRUE		XDP_DD2_ENETSD_CLKREQ
XDP_DD3_AP_CLKREQ_L	R1879 SHORT		AP_CLKREQ_L

PCH/XDP Signal Isolation Notes:

'Output' non-XDP signals require pulls.
'Output' PCH/XDP signals require pulls.

R187x and R189x should be placed where signal path needs to split between route from PCH to J1850 and path to non-XDP signal destination (to minimize stub).

Unused PCH/XDP Signals

XDP_DA1_USB_EXTC_OC_L → TP1810
XDP_DB1_USB_EXTD_OC_L → TP1811
XDP_FC0_HDD_PWR_EN → TP1812
XDP_FC1_GPU_GOOD → TP1813

(TP-P6)

CPU JTAG Isolation

PP5V_S0
PP3V3_S5
ALL_SYS_PWRGD

C1845 0.1UF 10% 16V X5R-CERM 0201
U1845 74LVC1G07GF SOT891 (VCC, A, Y, NC, NC, NC, GND)
R1845 330K 5% 1/20W MF 201

XDP_JTAG_CPU_ISOL_L

PP1V05_SUS

R1860 51 5% 1/20W MF 201 (PLACE_NEAR=U1100.AD3:28mm) → XDP_PCH_TDO
R1861 51 5% 1/20W MF 201 (PLACE_NEAR=U1100.AE2:28mm) → XDP_PCH_TDI
R1862 51 5% 1/20W MF 201 (PLACE_NEAR=U1100.AD1:28mm) → XDP_PCH_TMS
R1866 51 5% 1/20W MF 201 (PLACE_NEAR=U1100.AB3:28mm) → XDP_PCH_TCK

SYNC_MASTER=J15_MLB SYNC_DATE=10/31/2012

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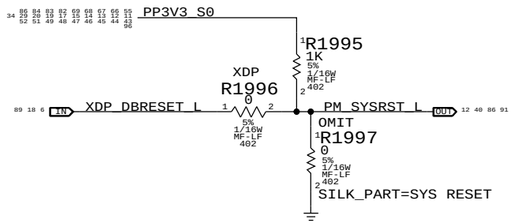
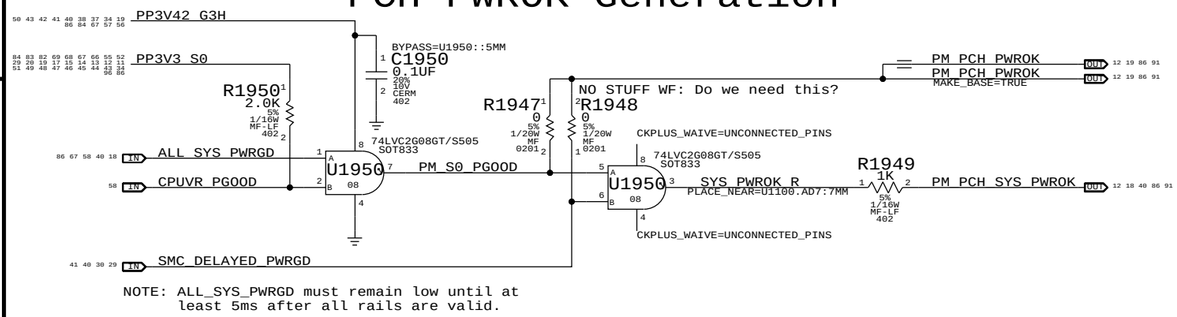
PCH Reset Button

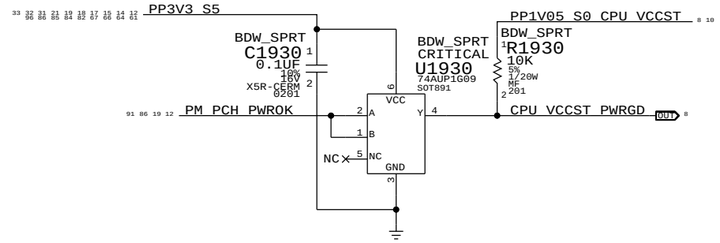


PCH PWROK Generation

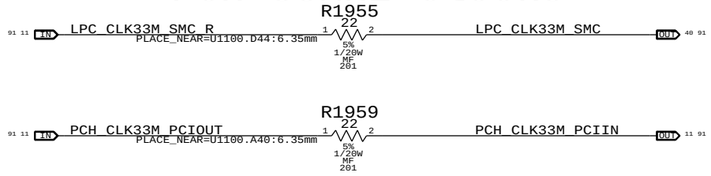


NOTE: ALL_SYS_PWRGD must remain low until at least 5ms after all rails are valid.

VCCST (1.05V S0) PWRGD



PCH 33MHz Clocks



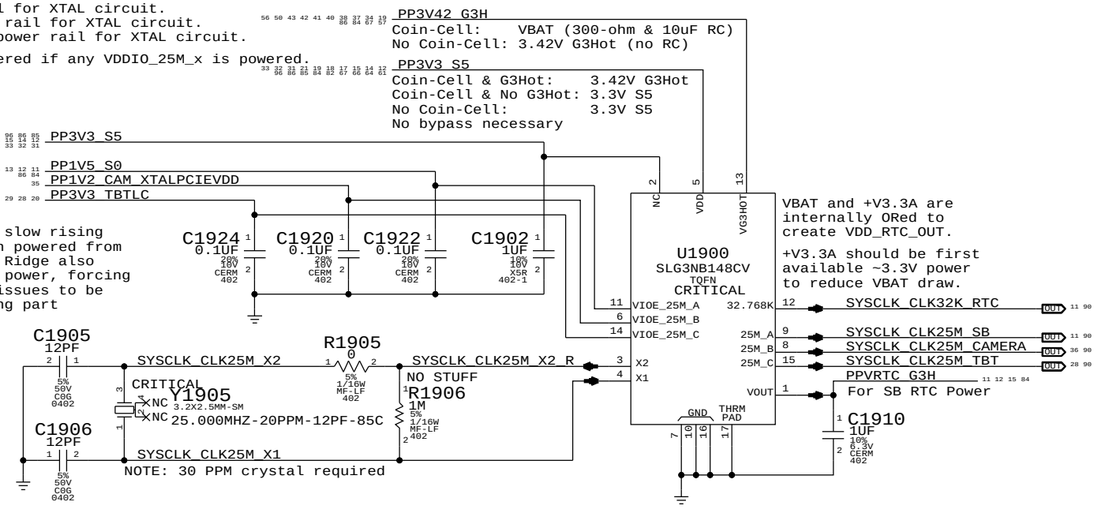
System RTC Power Source & 32kHz / 25MHz Clock Generator

VDDIO_25M_A: SB power rail for XTAL circuit.
VDDIO_25M_B: Camera power rail for XTAL circuit.
VDDIO_25M_C: Thunderbolt power rail for XTAL circuit.

NOTE: VDD_25M must be powered if any VDDIO_25M_x is powered.

GreenClk 25MHz Power
SB XTAL Power
Camera XTAL Power
TBT XTAL Power

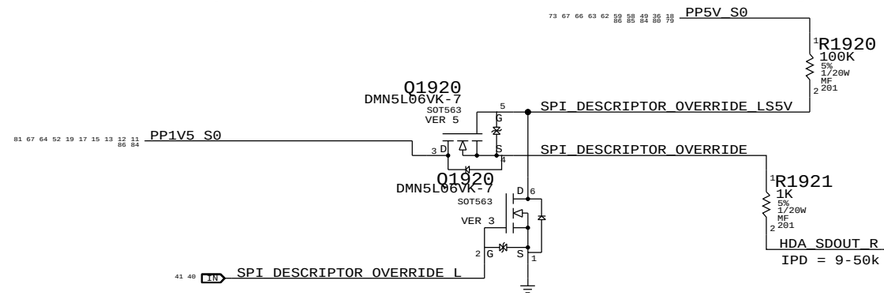
NOTE: SLG3NB148A provides slow rising edge on 25MHZ_B when powered from 1.2V VDDIO. Falcon Ridge also complicates VDD_25M power, forcing at least S4. Both issues to be addressed in upcoming part (SLG3NB148C).



NOTE: 30 PPM crystal required

PCH ME Disable Strap

PCH uses HDA_SDO as a power-up strap. If low, ME functions normally. If high, ME is disabled. This allows for full re-flashing of SPI ROM. SMC controls strap enable to allow in-field control of strap setting. Q1920 & 5V pull-up allows circuit to work regardless of HDA voltage.



SYNC_MASTER=CLEAN_X425 SYNC_DATE=10/31/2014

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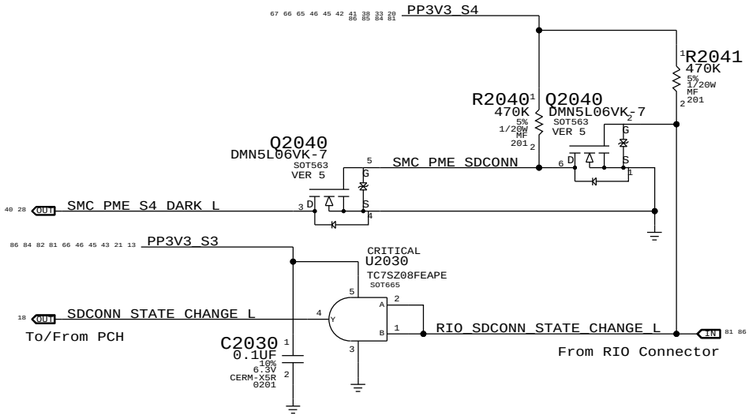
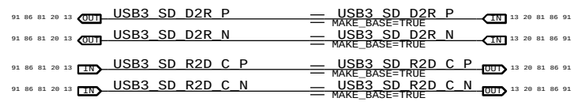
RIO SD Card Reader Support



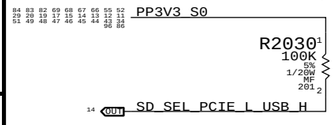
Flexible I/O Aliases

SD Card Reader is always USB3 in this implementaton.



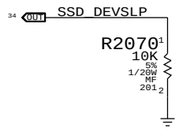
Flexible I/O Configuration Strap

Must pull signal correctly even if always USB or PCIe

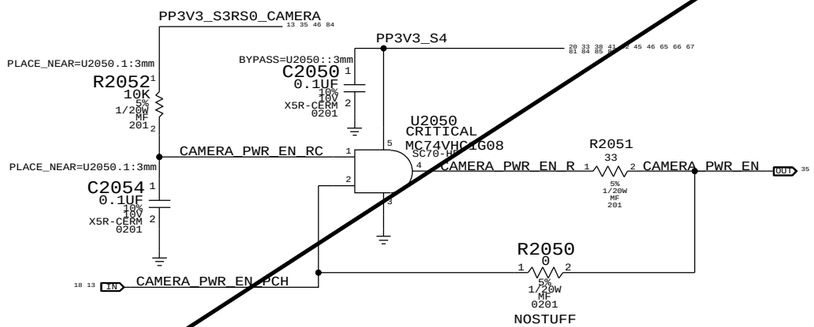


GS3 Connector Support

DEVSLP not supported on LPT-H

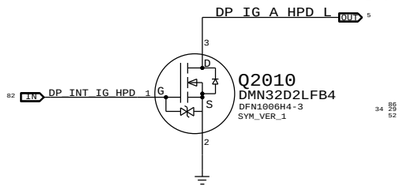


Camera power-up sequencing Support

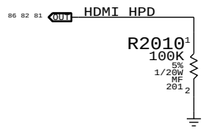


LCD HPD Inverter

(Pull-Up on CPU Page)

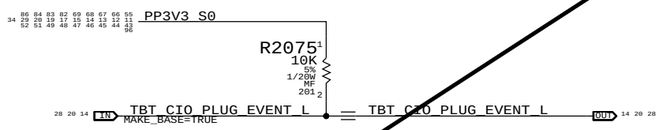


HDMI HPD pull-down



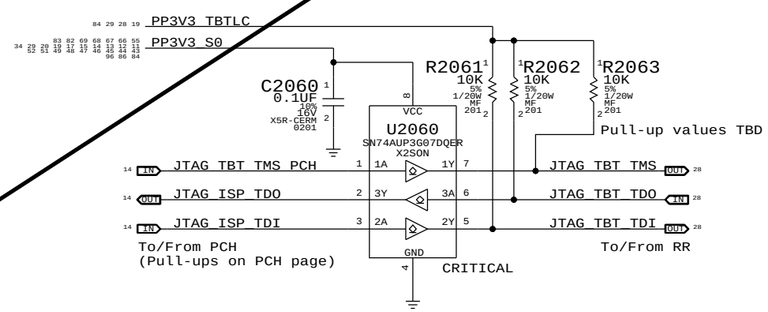
Falcon Ridge Support

RR output is open-drain, no isolation necessary



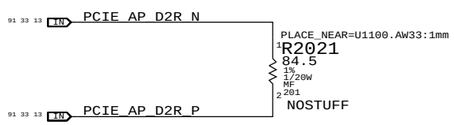
Falcon Ridge JTAG Isolation

TBTLC can be on when S0 is off, and vice-versa
Isolation ensures no leakage to RR or PCH
U2060 supports I/O's powered when VCC=0V

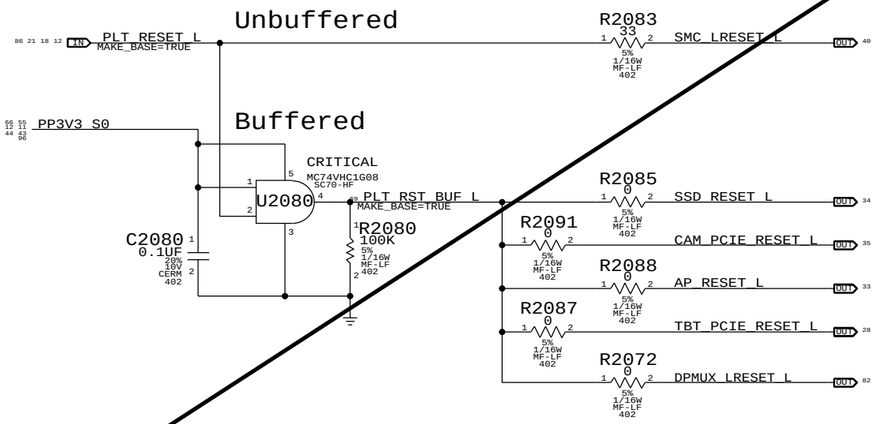


PCH 33MHz Clock for DPMUX

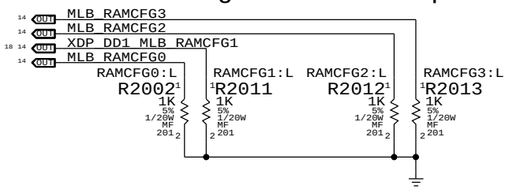
AP PCIE D2R test points



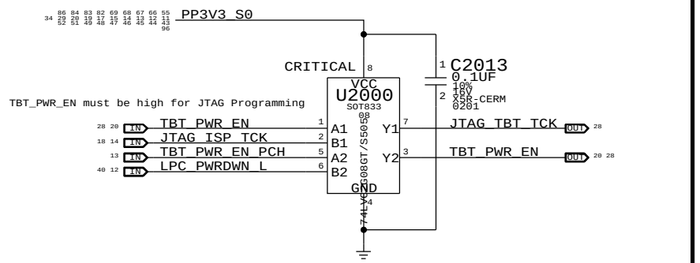
Platform Reset Connections



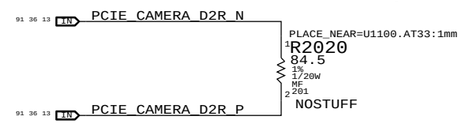
RAM Configuration Straps



GPIO Glitch Prevention



Camera PCIE D2R test points



SYNC_MASTER=J15_REFERENCE SYNC_DATE=01/14/2013

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Project Chipset Support

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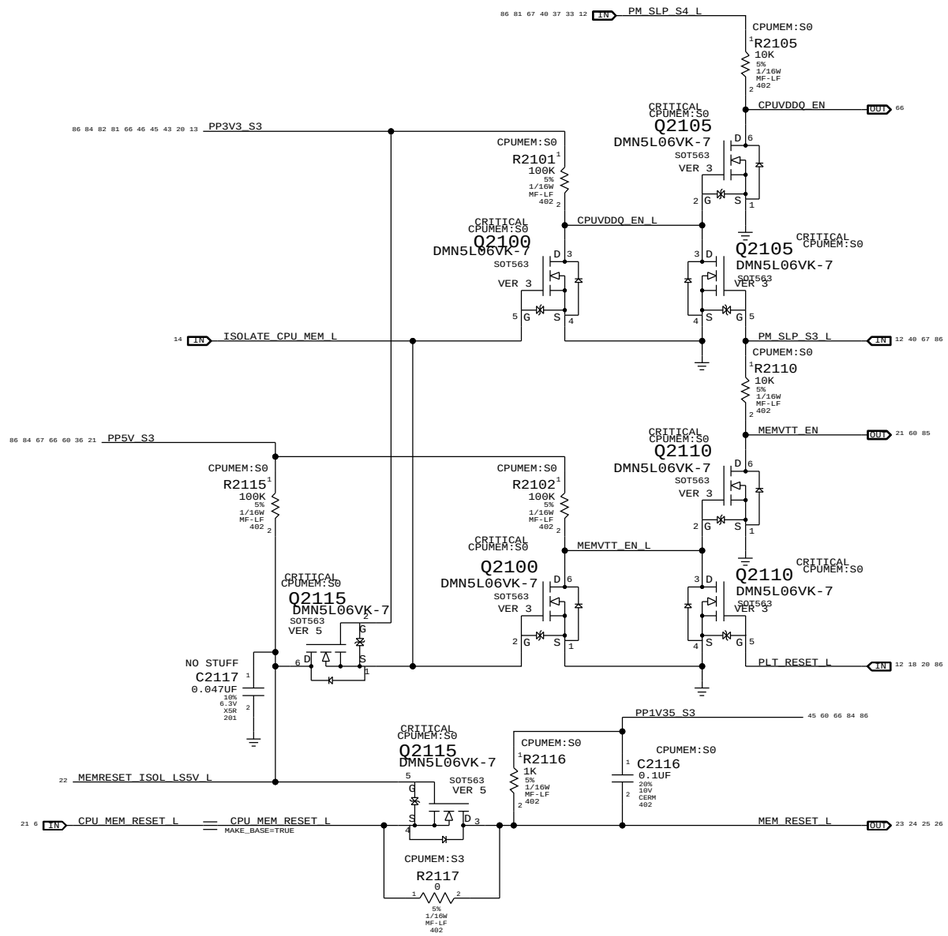
The circuit below handles CPU and VTT power during S0->S3->S0 transitions, as well as isolating the CPU's SM_DRAMRST# output from the SO-DIMMs when necessary.

ISOLATE_CPU_MEM_L GPIO state during S3<->S0 transitions determines behavior of signals.
WHEN HIGH: CPU 1.5V remains powered in S3, VTT follows S0 rails, MEM_RESET_L not isolated.
WHEN LOW: CPU 1.5V follows S0 rails, VTT ensures clean CKE transition, MEM_RESET_L isolated.

CPUVDDQ_EN = (ISOLATE_CPU_MEM_L + PM_SLP_S3_L) * PM_SLP_S4_L
MEMVTT_EN = (ISOLATE_CPU_MEM_L + PLT_RST_L) * PM_SLP_S3_L
MEM_RESET_L = !ISOLATE_CPU_MEM_L + CPU_MEM_RESET_L



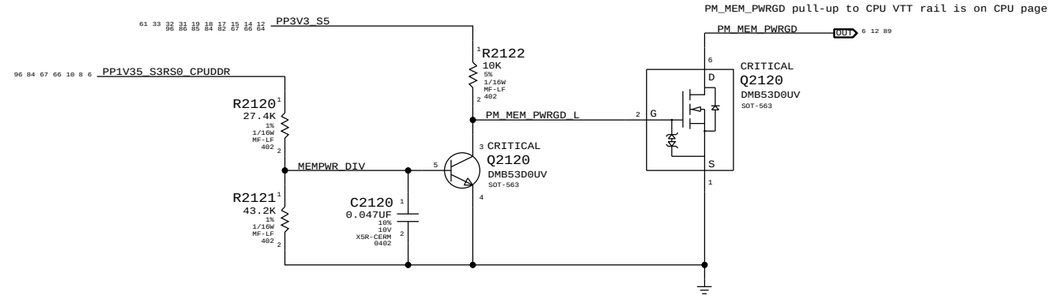
	Step	ISOLATE_CPU_MEM_L	PLT_RESET_L	PM_SLP_S3_L	PM_SLP_S4_L	CPU_MEM_RESET_L	MEM_RESET_L	MEMVTT_EN	CPUVDDQ_EN
S0	0	1	1	1	1	1	CPU_MEM_RESET_L	1	1
to	1	0	1	1	1	1	1	1	1
S3	2	0	0	1	1	1	1	0	1
	3	0	0	0	1	X	1	0	0
to	4	0	0	1	1	X	1	0	1
S0	5	0	1	1	1	0 (*)	1	1	1
	6	0	1	1	1	1	1	1	1
	7	1	1	1	1	1	CPU_MEM_RESET_L	1	1

(*) CPU_MEM_RESET_L asserts due to loss of PM_MEM_PWRGD, must wait for software to clear before deasserting ISOLATE_CPU_MEM_L GPIO.

NOTE: In the event of a S3->S5 transition ISOLATE_CPU_MEM_L will still be asserted on next S5->S0 transition. Rails will power-up as if from S3, but MEM_RESET_L will not properly assert. Software must deassert ISOLATE_CPU_MEM_L and then generate a valid reset cycle on CPU_MEM_RESET_L.

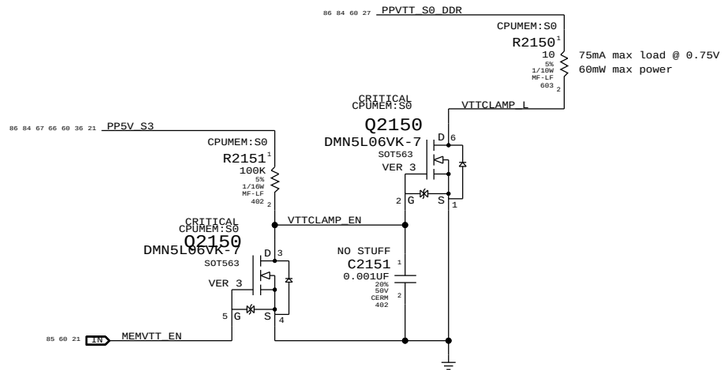
MEM S0 "PGOOD" for CPU

PM_MEM_PWRGD pull-up to CPU VTT rail is on CPU page



MEMVTT Clamp

Ensures CKE signals are held low in S3



SYNC_MASTER=CLEAN_MAXWELL SYNC_DATE=07/02/2014

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Apple Inc.

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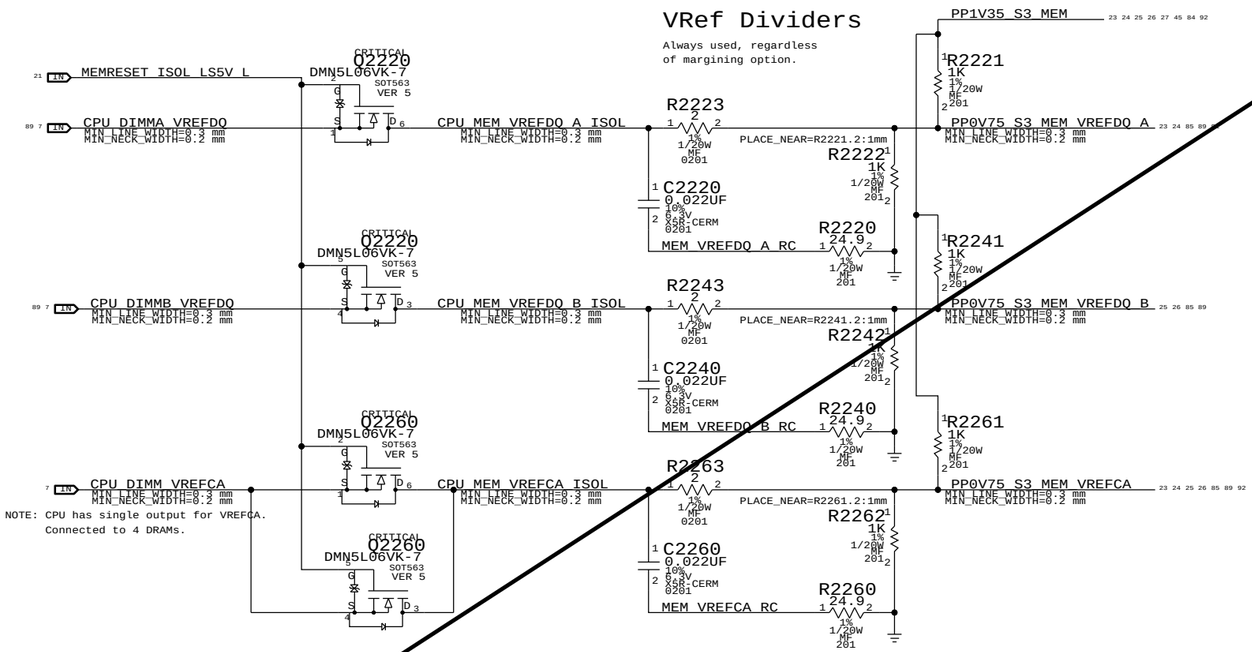
CPU-Based Margining

NOTE: CPU DAC output step sizes:
DDR3 (1.5V) 7.70mV per step
DDR3L (1.35V) 6.99mV per step
LPDDR3 (1.2V) ?.??mV per step

VRef Dividers

Always used, regardless of margining option.



NOTE: CPU has single output for VREFCA.
Connected to 4 DRAMs.

SYNC_MASTER=CLEAN X425 SYNC_DATE=08/11/2014

PAGE TITLE
DDR3 VREF MARGINING

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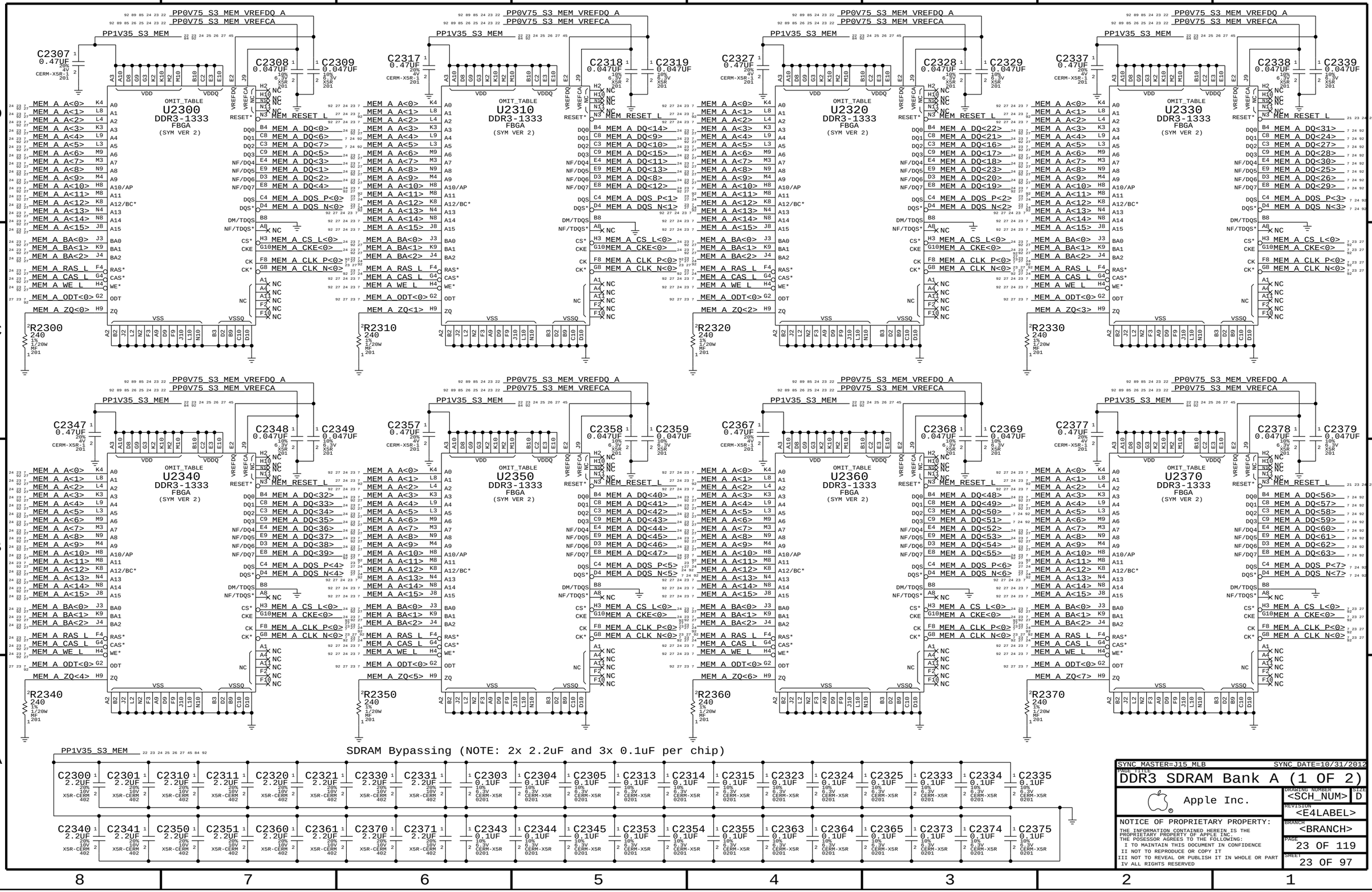
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(SYM VER 2)
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(SYM VER 2)
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FBGA
(SYM VER 2)
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C2300 2.2UF
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C2310 2.2UF
C2311 2.2UF
C2320 2.2UF
C2321 2.2UF
C2330 2.2UF
C2331 2.2UF
C2303 0.1UF
C2304 0.1UF
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C2341 2.2UF
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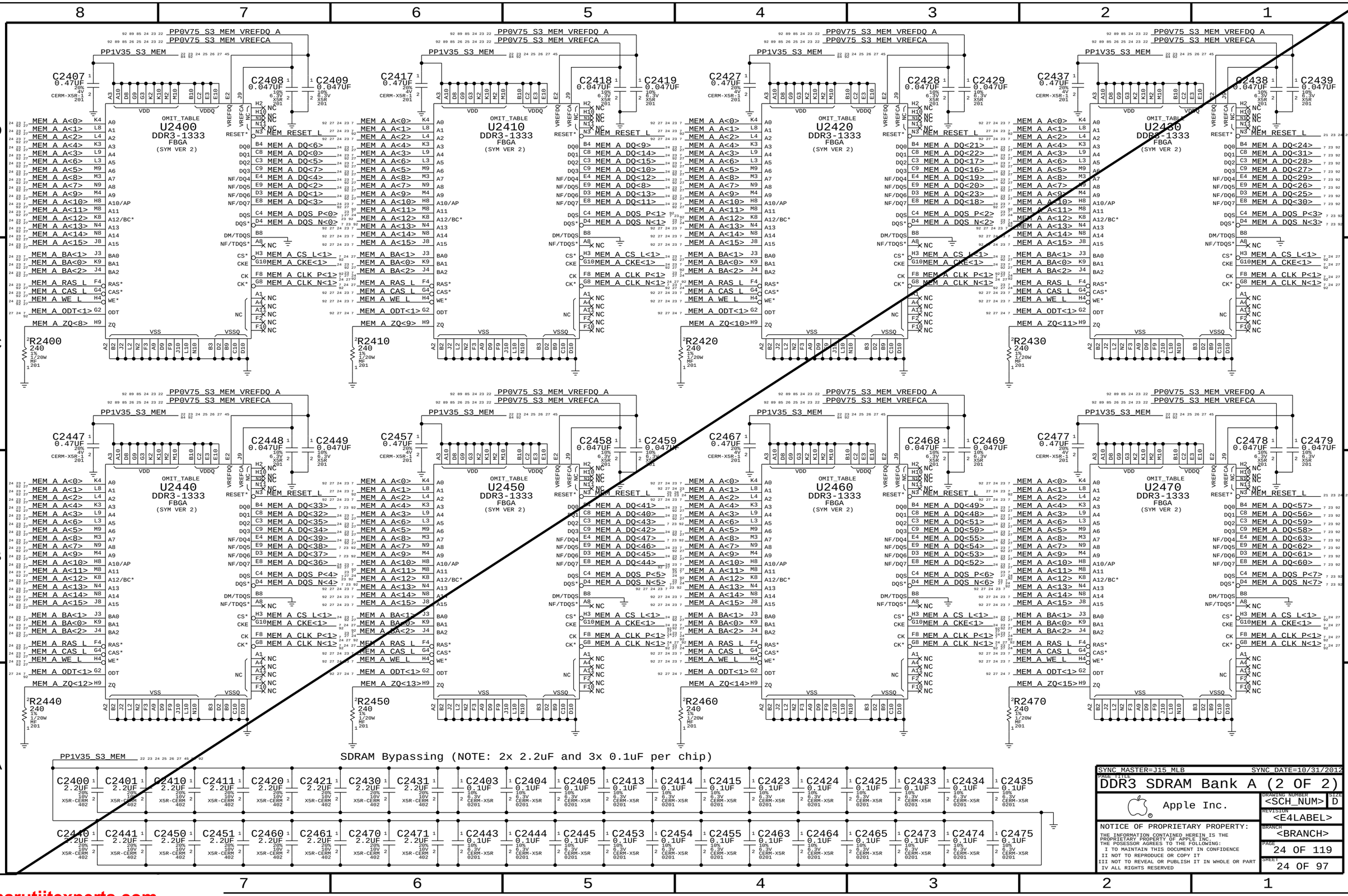

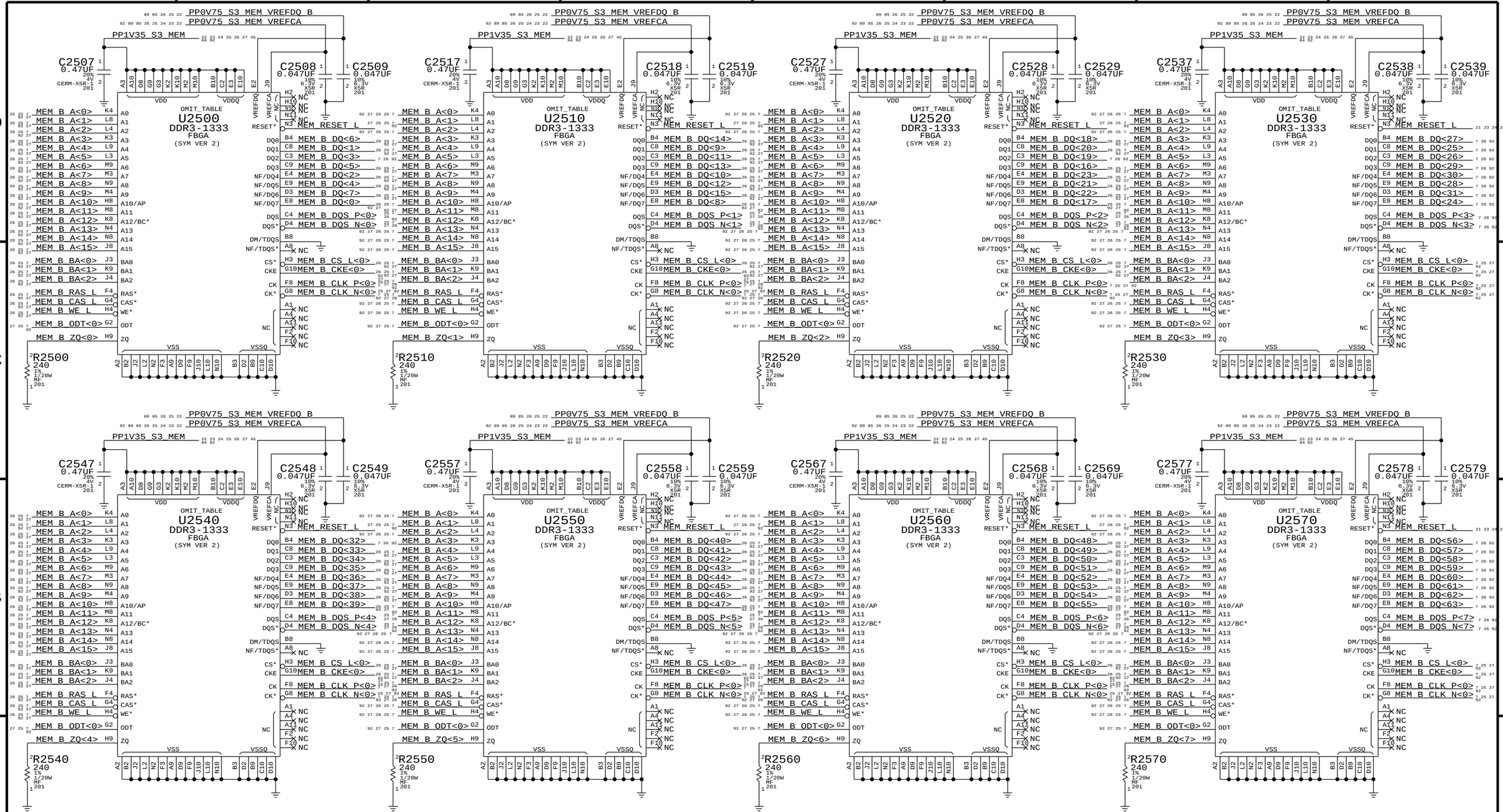

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Apple Inc.

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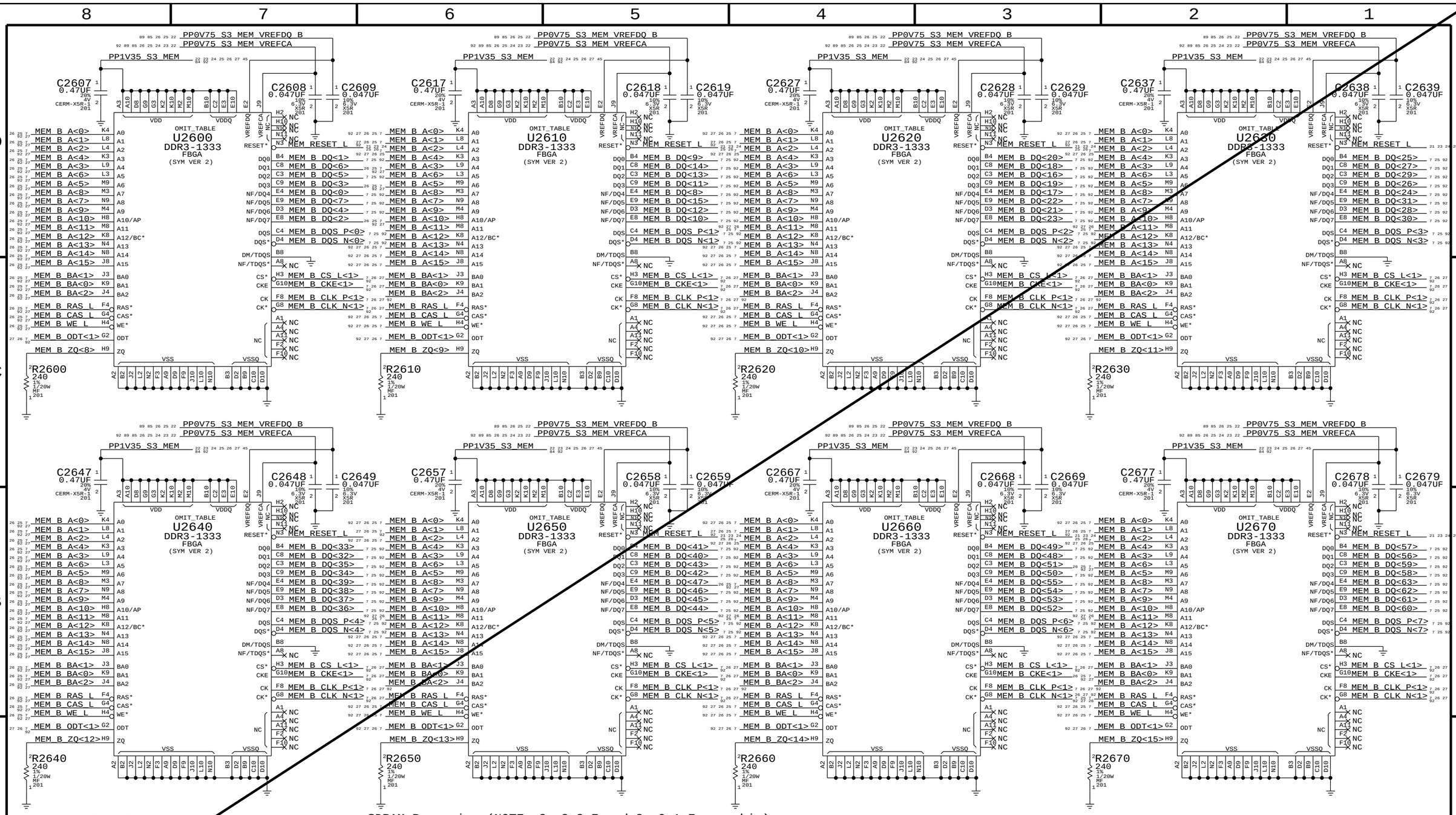

FOR DESENSE IMPROVEMENT
PLACE ONE AT EACH DDR3L MEMORY MODULE.

PP1V35_S3_MEM 22 23 24 25 26 27 45 84 92

CRITICAL C2740 12PF 5% 25V NP0-C0G 0201 1 2
CRITICAL C2741 12PF 5% 25V NP0-C0G 0201 1 2
CRITICAL C2742 12PF 5% 25V NP0-C0G 0201 1 2
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CRITICAL C2747 12PF 5% 25V NP0-C0G 0201 1 2
CRITICAL C2770 12PF 5% 25V NP0-C0G 0201 1 2
CRITICAL C2771 12PF 5% 25V NP0-C0G 0201 1 2
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CRITICAL C2773 12PF 5% 25V NP0-C0G 0201 1 2
CRITICAL C2774 12PF 5% 25V NP0-C0G 0201 1 2
CRITICAL C2775 12PF 5% 25V NP0-C0G 0201 1 2
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CRITICAL C2777 12PF 5% 25V NP0-C0G 0201 1 2

PP1V35_S3_MEM 22 23 24 25 26 27 45 84 92

CRITICAL C2780 12PF 5% 25V NP0-C0G 0201 1 2
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CRITICAL C2782 12PF 5% 25V NP0-C0G 0201 1 2
CRITICAL C2783 12PF 5% 25V NP0-C0G 0201 1 2
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CRITICAL C2785 12PF 5% 25V NP0-C0G 0201 1 2
CRITICAL C2786 12PF 5% 25V NP0-C0G 0201 1 2
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CRITICAL C2797 12PF 5% 25V NP0-C0G 0201 1 2

MEM Clock Termination

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

92 23 7 IN MEM_A_CLK_N<0> — R2750 30 5% 1/20W MF 201 — MEM_A_CLK0_TERM_R — C2751 0.1UF 10% 6.3V CERM-X5R 0201
C2750 3.3PF +/-0.25PF 25V C0G 0201 PLACE_NEAR=U2370.F8:3.2mm
92 23 7 IN MEM_A_CLK_P<0> — R2751 30 5% 1/20W MF 201

92 24 7 IN MEM_A_CLK_N<1> — R2755 30 5% 1/20W MF 201 — MEM_A_CLK1_TERM_R — C2756 0.1UF 10% 6.3V CERM-X5R 0201
C2755 3.3PF +/-0.25PF 25V C0G 0201 PLACE_NEAR=U2470.F8:3.2mm
92 24 7 IN MEM_A_CLK_P<1> — R2756 30 5% 1/20W MF 201

92 25 7 IN MEM_B_CLK_N<0> — R2760 30 5% 1/20W MF 201 — MEM_B_CLK0_TERM_R — C2761 0.1UF 10% 6.3V CERM-X5R 0201
C2760 3.3PF +/-0.25PF 25V C0G 0201 PLACE_NEAR=U2500.F8:3.2mm
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92 26 7 IN MEM_B_CLK_N<1> — R2765 30 5% 1/20W MF 201 — MEM_B_CLK1_TERM_R — C2766 0.1UF 10% 6.3V CERM-X5R 0201
C2765 3.3PF +/-0.25PF 25V C0G 0201 PLACE_NEAR=U2600.F8:3.2mm
92 26 7 IN MEM_B_CLK_P<1> — R2766 30 5% 1/20W MF 201

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

C2701,C2721 FOR DESENSE IMPROVEMENT
LOCATION DEPENDS ON DESENSE TEAM

86 84 60 27 21 PPVTT_S0_DDR

RP2701 36 5% 1/32W 4X0201
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C2707 0.47UF 20% 4V CERM-X5R-1 201 1 2
C2708 0.47UF 20% 4V CERM-X5R-1 201 1 2
C2710 0.47UF 20% 4V CERM-X5R-1 201 1 2

86 84 60 27 21 PPVTT_S0_DDR

RP2720 36 5% 1/32W 4X0201
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C2721 12PF 5% NP0-C0G 0201 25V 1 2
C2722 0.47UF 20% 4V CERM-X5R-1 201 1 2
C2723 0.47UF 20% 4V CERM-X5R-1 201 1 2
C2724 0.47UF 20% 4V CERM-X5R-1 201 1 2
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C2728 0.47UF 20% 4V CERM-X5R-1 201 1 2
C2730 0.47UF 20% 4V CERM-X5R-1 201 1 2

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Apple Inc.

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REVISION: <E4LABEL>
BRANCH: <BRANCH>
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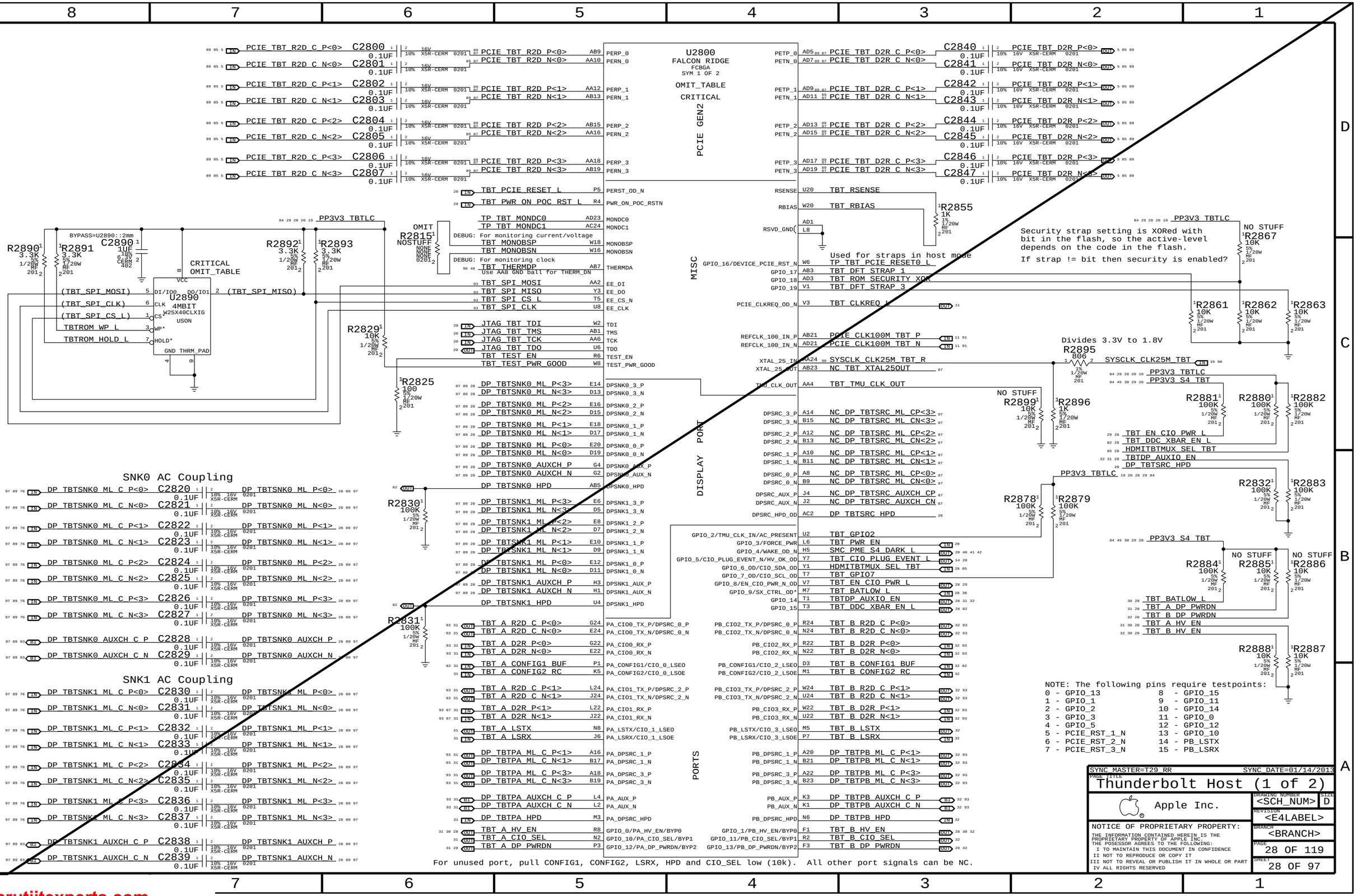

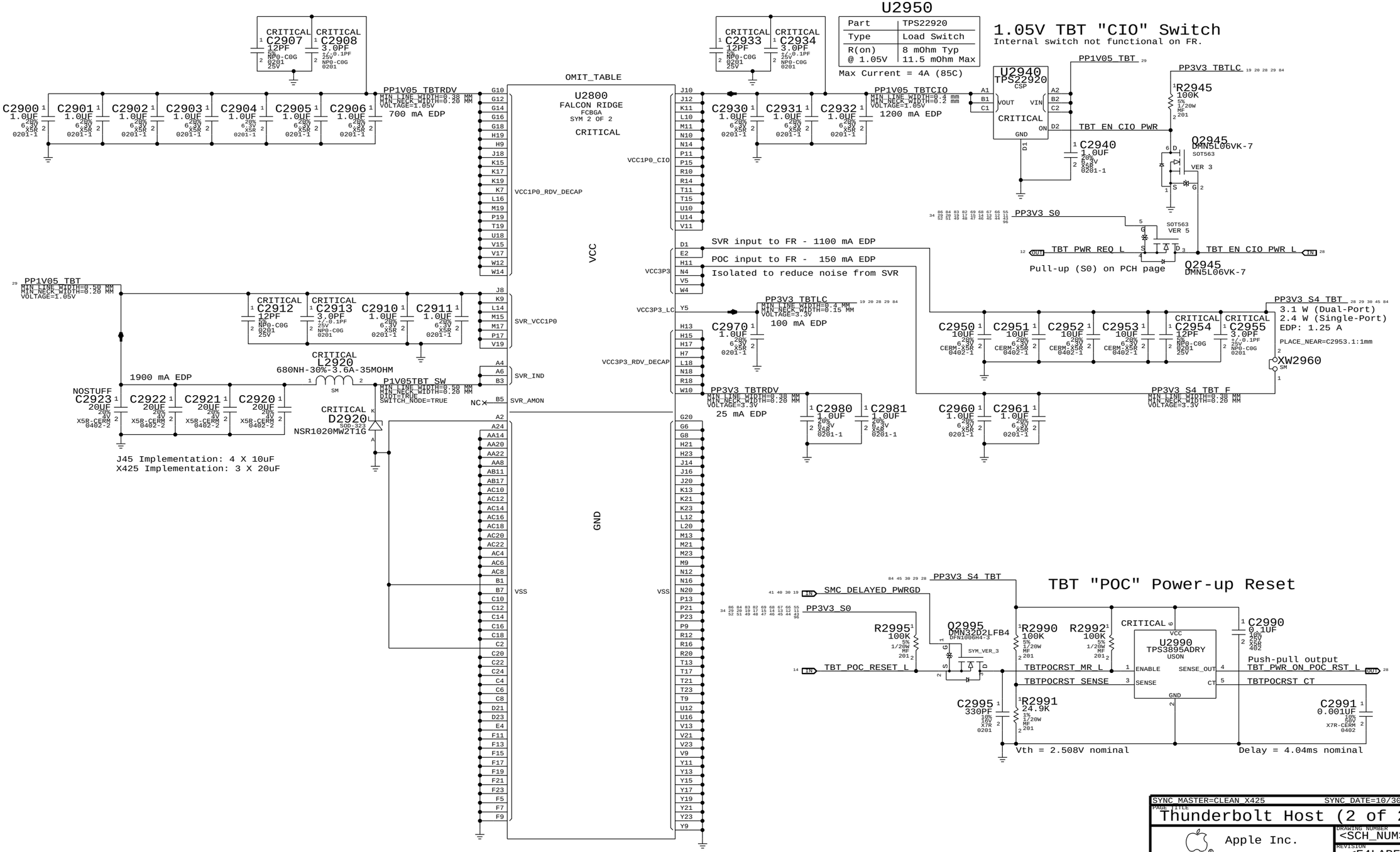

SYNC_MASTER=CLEAN_X425 SYNC_DATE=10/30/2014

PAGE TITLE: Thunderbolt Host (2 of 2)

Apple Inc.

DRAWING NUMBER: <SCH_NUM> SIZE: D

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Page Notes

Power aliases required by this page:
- =PPVIN_SW_TBTBST (8-13V Boost Input)
- =PP15V_TBT_REG (15V Boost Output)

Signal aliases required by this page:
(NONE)

BOM options provided by this page:
(NONE)

Thunderbolt 15V Boost Regulator

C3080 USING 0603 PAKAGE IS FOR DFM TO PROTECT Q3080 (CSP)

PPBUS_G3H
8-13V Input
Changes required
for 2S.

R3080 470K 5% 1/10W MF-LF 402
C3080 0.1UF 10% 50V X7R 603-1
TBTBST_PWREN_DIV_L
R3081 330K 5% 1/10W MF-LF 402
TBTBST_PWREN_L

Q3005 DMN5L06VK-7 SOT563 VER 3
TBT_A_HV_EN
Q3005 DMN5L06VK-7 SOT563 VER 3
TBT_B_HV_EN

CRITICAL
Q3080 SI8409DB BGA

SI8409DB:
Vds(max): -30V
Vgs(max): +/-12V
Vgs(th): -1.4V
Rds(on): 46mOhm @ 4.5V Vgs
Id(max): 3.7A @ 70C

PPVIN_SW_TBTBST
MIN_LINE_WIDTH=0.5 mm
MIN_NECK_WIDTH=0.25 mm
Voltage not specified here,
add property on another page.

R3091 200K 1% 1/10W MF-LF 402 <R1>
R3092 73.2K 1% 1/10W MF-LF 402 <R2>

UVLO(falling) = 1.22 * (R1 + R2) / R2
UVLO(rising) = UVLO(falling) + (2uA * R1)
UVLO = 4.55V (falling), 4.95 (rising)

C3085 2.2UF 20% 10V CER-X6S 0402
C3086 2.2UF 20% 10V CER-X6S 0402
C3087 68PF 5% 50V CERM 0402
C3092 2.2UF 20% 10V CER-X6S 0402
C3093 0.0033UF 10% 50V X7R-CERM 0402
R3093 49.9K 1% 1/10W MF-LF 402
R3094 26.7K 1% 1/10W MF-LF 402
C3094 0.33UF 10% 6.3V X6S-CERM 0402

TBTBST_VC_RC
GND_TBTBST_SGND
MIN_LINE_WIDTH=0.5 mm
MIN_NECK_WIDTH=0.25 mm
VOLTAGE=0V

C3090 10UF 20% 25V X5R-CERM 0603
C3091 10UF 20% 25V X5R-CERM 0603

CRITICAL
L3095 3.3UH-6.5A PIMB063T-SM

TBTBST_BOOST
MIN_LINE_WIDTH=0.5 mm
MIN_NECK_WIDTH=0.25 mm
SWITCH_NODE=TRUE
DIDT=TRUE

CRITICAL
U3090 LT3957 QFN

TBTBST_EN_UVLO
TBTBST_INTVCC
TBTBST_VC
TBTBST_RT
TBTBST_SS
TBTBST_SHDN_DIV

SGND shorted to
GND inside package,
no XW necessary.

Q3088 DMN5L06VK-7 SOT563 VER 3
Max Vgs: 10V
R3088 330K 5% 1/10W MF-LF 402
R3087 330K 5% 1/10W MF-LF 402
Q3088 DMN5L06VK-7 SOT563 VER 3
SMC_DELAYED_PWRGD

TBTBST_SNS1
R3089 0 5% 1/20W MF 0201
CRITICAL
D3095 PDS540XF PWRDI5
TBTBST_SNS2
R3097 10 5% 1/16W MF-LF 402

NOTE: Change R3097 to XW3095 at PVT

TBTBST_VSNS
C3088 10PF 5% 50V CERM 0402
R3095 137K 1% 1/10W MF-LF 402 <Ra>
TBTBST_FBX
NO STUFF
C3089 100PF 5% 25V CERM 402
R3096 15.8K 1% 1/10W MF-LF 402 <Rb>

Vout = 1.6V * (1 + Ra / Rb)

PP15V_TBT
Vout = 15.47V
Max Current = 2A?
Freq = 480KHz

C3095 33UF-0.060HM 20% 25V POLY-TANT CASE-D3L
C3096 10UF 20% 25V X5R-CERM 0603
NO STUFF
C3097 10UF 10% 25V X7R-CERM 1206
C3099 0.001UF 10% 50V X7R-CERM 0402
C3098 10UF 20% 25V X5R-CERM 0603

PLACE_SIDE=BOTTOM
PLACE_SIDE=TOP

NOTE: MIRROR C3096 and C3098

BATLOW# Isolation

Q3000 DMN32D2LFB4 DFN1006H4-3 SYM_VER_3
PP3V3_S4_TBT
Pull-up on RR page
PM_BATLOW_L
TBT_BATLOW_L
TBT_BATLOW_L
MAKE_BASE=TRUE

SYNC_MASTER=CLEAN_X305 SYNC_DATE=06/24/2014

PAGE TITLE: Thunderbolt Mobile Support

Apple Inc.

DRAWING NUMBER: <SCH_NUM> SIZE: D
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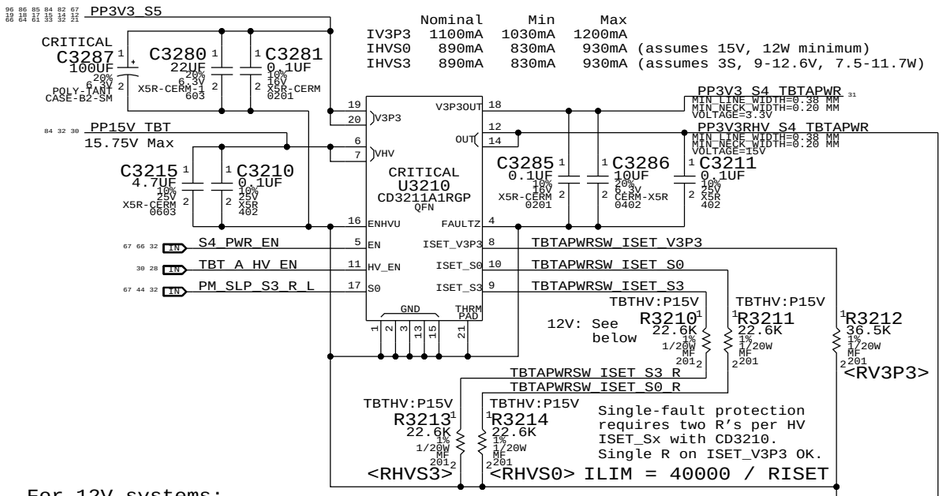
3.3V/HV Power MUX

V3P3 must be S4 to support
wake from Thunderbolt devices.



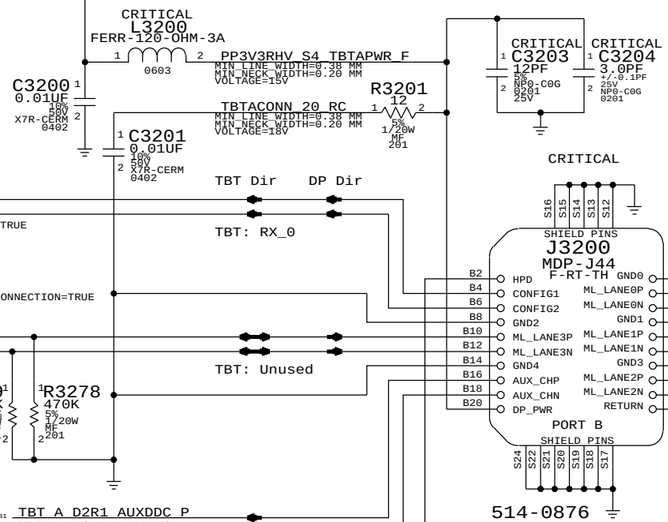
	Nominal	Min	Max	
IV3P3	1100mA	1030mA	1200mA	
IHVS0	890mA	830mA	930mA	(assumes 15V, 12W minimum)
IHVS3	890mA	830mA	930mA	(assumes 3S, 9-12.6V, 7.5-11.7W)

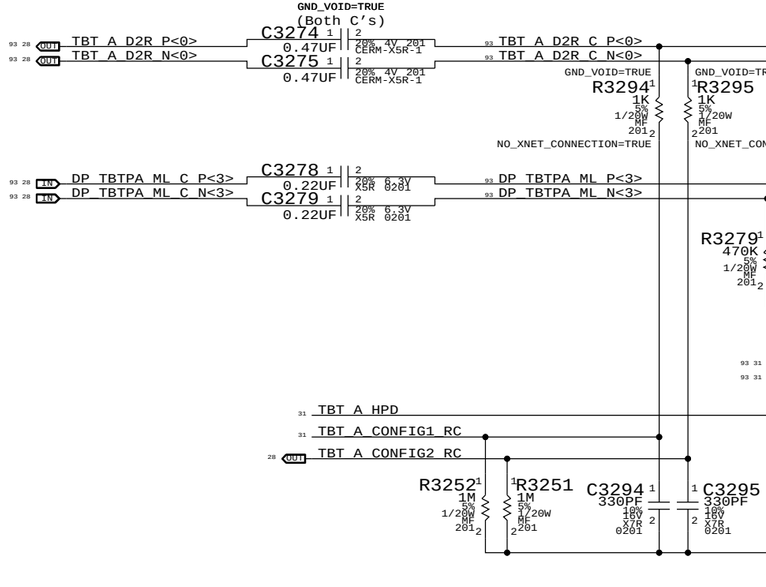
For 12V systems:

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
118S0145	2	RES,MTL FILM,1/20W,17.8K,1,0201,SMD,LF	R3210,R3213		TBTHV:P12V
118S0145	2	RES,MTL FILM,1/20W,17.8K,1,0201,SMD,LF	R3211,R3214		TBTHV:P12V

	Nominal	Min	Max	
IHVS0/S3	1120mA	1090mA	1170mA	(12W minimum)

Thunderbolt Connector A





SYNC_MASTER=CLEAN_X425	SYNC_DATE=10/30/2014
PAGE TITLE	Thunderbolt Connector A
Apple Inc.	DRAWING NUMBER <SCH_NUM> SIZE D
	REVISION <E4LABEL>
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3.3V/HV Power MUX

V3P3 must be S4 to support
wake from Thunderbolt devices.

	Nominal	Min	Max	
IV3P3	1100mA	1030mA	1200mA	
IHVS0	890mA	830mA	930mA	(assumes 15V, 12W minimum)
IHVS3	890mA	830mA	930mA	(assumes 3S, 9-12.6V, 7.5-11.7W)

PP3V3_S5
PP15V_TBT
15.75V Max
CRITICAL C3387 100UF 20% 6.3V POLY TANT CASE-B2-SM
C3380 22UF 20% 6.3V X5R-CERM 0603
C3381 0.1UF 10% 16V X5R-CERM 0201
C3315 4.7UF 10% 25V X5R-CERM 0603
C3310 0.1UF 10% 16V X5R 402
CRITICAL U3310 CD3211A1RGP QFN
V3P3
VHV
ENHVU
EN
HV_EN
S0
V3P3OUT
OUT
FAULTZ
ISET_V3P3
ISET_S0
ISET_S3
GND
THRM PAD
C3385 0.1UF 10% 16V X5R-CERM 0201
C3386 10UF 20% 6.3V CERM-X5R 0402
C3311 0.1UF 10% 25V X5R 402
PP3V3_S4_TBTBPWR
MIN_LINE_WIDTH=0.38 MM
MIN_NECK_WIDTH=0.20 MM
VOLTAGE=3.3V
PP3V3RHV_S4_TBTBPWR
MIN_LINE_WIDTH=0.38 MM
MIN_NECK_WIDTH=0.20 MM
VOLTAGE=15V
S4_PWR_EN
TBT_B_HV_EN
PM_SLP_S3_R_L
TBTBPWRSW_ISET_V3P3
TBTBPWRSW_ISET_S0
TBTBPWRSW_ISET_S3
TBTHV:P15V
12V: See below
R3310 22.6K 1% 1/20W MF 201
R3311 22.6K 1% 1/20W MF 201
R3312 36.5K 1% 1/20W MF 201 <RV3P3>
TBTBPWRSW_ISET_S3_R
TBTBPWRSW_ISET_S0_R
R3313 22.6K 1% 1/20W MF 201 <RHVS3>
R3314 22.6K 1% 1/20W MF 201 <RHVS0>
Single-fault protection requires two R's per HV ISET_Sx with CD3210. Single R on ISET_V3P3 OK.
ILIM = 40000 / RISET

For 12V systems:

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
118S0145	2	RES,MTL FILM,1/20W,17.8K,1,0201,SMD,LF	R3310,R3313		TBTHV:P12V
118S0145	2	RES,MTL FILM,1/20W,17.8K,1,0201,SMD,LF	R3311,R3314		TBTHV:P12V

	Nominal	Min	Max	
IHVS0/S3	1120mA	1090mA	1170mA	(12W minimum)

Thunderbolt Connector B

CRITICAL L3300 FERR-120-OHM-3A 0603
PP3V3RHV_S4_TBTBPWR_F
C3300 0.01UF 20% 50V X7R-CERM 0402
C3301 0.01UF 10% 50V X7R-CERM 0402
TBTBCONN_20_RC
MIN_LINE_WIDTH=0.38 MM
MIN_NECK_WIDTH=0.20 MM
VOLTAGE=18V
R3301 12 5% 1/20W MF 201
CRITICAL C3303 12PF 5% 25V NP0-C0G 0201
CRITICAL C3304 3.0PF +/-0.1PF 25V NP0-C0G 0201
CRITICAL J3200 MDP-J44 F-RT-TH
SHIELD PINS S5 S4 S3 S2 S1
HPD CONFIG1 CONFIG2 GND2 ML_LANE3P ML_LANE3N GND4 AUX_CHP AUX_CHN DP_PWR
ML_LANE0P ML_LANE0N GND1 ML_LANE1P ML_LANE1N GND3 ML_LANE2P ML_LANE2N RETURN
PORT A
SHIELD PINS S23 S11 S10 S9 S8 S7 S6
514-0876

GND_VOID=TRUE (Both C's)
C3374 0.47UF 20% 4V 201 CERM-X5R-1
C3375 0.47UF 20% 4V 201 CERM-X5R-1
TBT_B_D2R_P<0>
TBT_B_D2R_N<0>
TBT_B_D2R_C_P<0>
TBT_B_D2R_C_N<0>
R3394 1K 5% 1/20W MF 201 NO_XNET_CONNECTION=TRUE
R3395 1K 5% 1/20W MF 201 NO_XNET_CONNECTION=TRUE
TBT Dir DP Dir
TBT: RX_0

DP_TBTPB_ML_C_P<3>
DP_TBTPB_ML_C_N<3>
C3378 0.22UF 20% 6.3V X5R 0201
C3379 0.22UF 20% 6.3V X5R 0201
DP_TBTPB_ML_P<3>
DP_TBTPB_ML_N<3>
R3379 470K 5% 1/20W MF 201
R3378 470K 5% 1/20W MF 201
TBT: Unused

TBT_B_D2R1_AUXDDC_P
TBT_B_D2R1_AUXDDC_N
TBT: RX_1

TBT_B_HPD
TBT_B_CONFIG1_RC
TBT_B_CONFIG2_RC
R3352 1M 5% 1/20W MF 201
R3351 1M 5% 1/20W MF 201
C3394 330PF 10% 16V X7R 0201
C3395 330PF 10% 16V X7R 0201
R3341 100K 5% 1/20W MF 201
C3302 0.01UF 10% 16V X5R-CERM 0201
DP Source must pull down HPD input with greater than or equal to 100K (DPv1.1a).
Sink HPD range:
High: 2.0 - 5.0V
Low: 0 - 0.8V

PP3V3_S4_TBTBPWR
C3320 0.1UF 10% 16V X5R-CERM 0201
SIGNAL_MODEL=TBT_MUX
CRITICAL U3320 CBTL05024 HVQFN24-COMBO
VDD
TB- TB+ AUX- AUX+ DDC_DAT DDC_CLK CA_DETOUT DP+ DP- LSTX (IPU) LSRX (IPD) HPDOUT
TB_ENA AUXIO_EN DP_PWRDN (IPU) AUXIO- (IPD) AUXIO+ CA_DET DPML0+ DPML0- HPD
GND THMPAD

TBT_B_D2R_C_N<1>
TBT_B_D2R_C_P<1>
C3377 0.47UF 20% 4V 201 CERM-X5R-1
C3376 0.47UF 20% 4V 201 CERM-X5R-1
GND_VOID=TRUE (Both C's)
DP_TBTPB_AUXCH_C_N
DP_TBTPB_AUXCH_C_P
C3330 0.1UF 10% 16V X5R-CERM 0201
C3331 0.1UF 10% 16V X5R-CERM 0201
DP_TBTPB_DDC_DATA
DP_TBTPB_DDC_CLK
TBT_B_CONFIG1_BUF
DP_TBTPB_ML_C_P<1>
DP_TBTPB_ML_C_N<1>
C3332 0.22UF 20% 6.3V X5R 0201
C3333 0.22UF 20% 6.3V X5R 0201
DP_TBTPB_ML_P<1>
DP_TBTPB_ML_N<1>
TBT_B_LSTX
TBT_B_LSRX
DP_TBTPB_HPD
TBT_B_CIO_SEL
TBTDP_AUXIO_EN
TBT_B_DP_PWRDN
TBT_B_D2R1_AUXDDC_N
TBT_B_D2R1_AUXDDC_P
TBT: RX_1
TBT_B_CONFIG1_RC
TBT_B_HPD
TBT: LSX_A_R2P/P2R (P/N)

TBTBCONN_1_C
MIN_LINE_WIDTH=0.38 MM
MIN_NECK_WIDTH=0.20 MM
VOLTAGE=18.5V (0-18.9V)
GND_VOID=TRUE
C3305 0.01UF 10% 25V X5R-CERM 0201
GND_VOID=TRUE (Both C's)
C3370 0.22UF 20% 6.3V X5R 0201
C3371 0.22UF 20% 6.3V X5R 0201
TBT_B_R2D_C_P<0>
TBT_B_R2D_C_N<0>
TBT: TX_0
TBTBCONN_7_C
MIN_LINE_WIDTH=0.38 MM
MIN_NECK_WIDTH=0.20 MM
VOLTAGE=18.9V (0-18.9V)
C3306 0.01UF 10% 25V X5R-CERM 0201
R3370 470K 5% 1/20W MF 201
R3371 470K 5% 1/20W MF 201
DP_B_LSX_ML_P<1>
DP_B_LSX_ML_N<1>
TBT: LSX_A_R2P/P2R (P/N)
C3372 0.22UF 20% 6.3V X5R 0201
C3373 0.22UF 20% 6.3V X5R 0201
TBT_B_R2D_P<1>
TBT_B_R2D_N<1>
TBT: TX_1
R3372 470K 5% 1/20W MF 201
R3373 470K 5% 1/20W MF 201
470k R's for ESD protection on AC-coupled signals.

SYNC_MASTER=CLEAN_X425 SYNC_DATE=10/30/2014
PAGE TITLE: Thunderbolt Connector B
Apple Inc.
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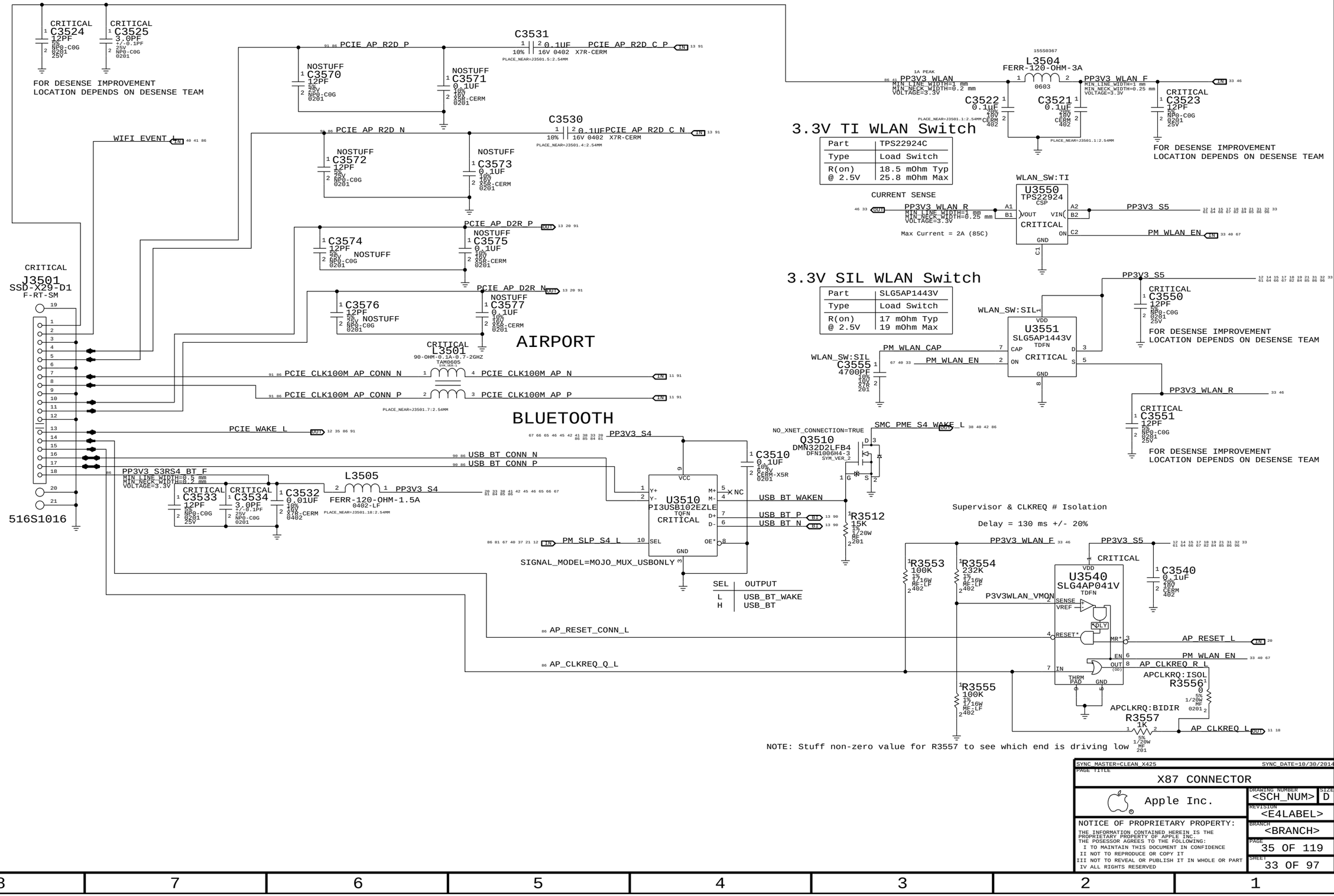

SYNC_MASTER=CLEAN_X425 SYNC_DATE=10/30/2014

PAGE TITLE: X87 CONNECTOR

Apple Inc.

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FOR DESENSE IMPROVEMENT

C3722 12PF 5% 50V C0G 0201 25V — PLACE_NEAR=J3700.3:2mm
C3723 12PF 5% 50V C0G 0201 25V — PLACE_NEAR=J3700.4:2mm
C3724 12PF 5% 50V C0G 0201 25V — PLACE_NEAR=J3700.5:2mm

PLACE_NEAR=J3700.1:3mm
CRITICAL
L3700 FERR-26-OHM-6A 0603

86 84 45 34 PP3V3_S0SW_SSD

C3701 0.1UF 10% 10V X5R-CERM 0201 — PLACE_NEAR=L3700.1:1mm
C3702 0.1UF 10% 10V X5R-CERM 0201 — PLACE_NEAR=L3700.1:1mm

PP3V3_S0SW_SSD_FLT
MIN_LINE_WIDTH=0.6mm
MIN_NECK_WIDTH=0.15mm
VOLTAGE=3.3V

514S0449
CRITICAL
J3700 SSD-GS3 F-RT-SM

NOSTUFF R3700 100K 1% 1/20W MF 201

34 86 84 83 82 59 58 57 56 55 52 51 49 48 47 46 45 44 43 96 PP3V3_S0

GND_VOID	1	53	GND_VOID		
	2	52	SMC_OOB1_R2D_CONN_L		
	3	51	SMC_OOB1_D2R_CONN_L		
	4				
	5	50	SSD_PCIE_SEL_L	OUT	18
	6	49	SSD_DEVSLP	IN	20
	7	48	SMC_PWRFAIL_WARN_L	IN	40
	8	47	SSD_PWR_FET_EN	IN	34 66
	9				
	10	46			
TRUE	11	45 TRUE	PCIE_SSD_D2R_N<3>	OUT	5 85 89
TRUE	12	44 TRUE	PCIE_SSD_D2R_P<3>	OUT	5 85 89
	13	43			
TRUE	14	42 TRUE	PCIE_SSD_D2R_N<2>	OUT	5 85 89
TRUE	15	41 TRUE	PCIE_SSD_D2R_P<2>	OUT	5 85 89
	16	40			
	17	39			
TRUE	18	38 TRUE	PCIE_SSD_D2R_N<1>	OUT	5 85 89
TRUE	19	37 TRUE	PCIE_SSD_D2R_P<1>	OUT	5 85 89
	20	36			
TRUE	21	35 TRUE	PCIE_SSD_D2R_N<0>	OUT	5 85 89
TRUE	22	34 TRUE	PCIE_SSD_D2R_P<0>	OUT	5 85 89
	23	33			
	24		SSD_CLKREQ_CONN_L		
	25	32			
	26	31	PCIE_CLK100M_SSD_N	IN	11 91
	27	30	PCIE_CLK100M_SSD_P	IN	11 91
	28	29			
	54	59			
	55	60			
	56	61			
	57	62			
	58	63			

89 85 5 IN PCIE_SSD_R2D_C_N<3> — C3710 0.22UF 20% 6.3V X6S-CERM 0201 — GND_VOID=TRUE — 89 PCIE_SSD_R2D_N<3>
89 85 5 IN PCIE_SSD_R2D_C_P<3> — C3711 0.22UF 20% 6.3V X6S-CERM 0201 — GND_VOID=TRUE — 89 PCIE_SSD_R2D_P<3>
89 85 5 IN PCIE_SSD_R2D_C_N<2> — C3712 0.22UF 20% 6.3V X6S-CERM 0201 — GND_VOID=TRUE — 89 PCIE_SSD_R2D_N<2>
89 85 5 IN PCIE_SSD_R2D_C_P<2> — C3713 0.22UF 20% 6.3V X6S-CERM 0201 — GND_VOID=TRUE — 89 PCIE_SSD_R2D_P<2>
89 85 5 IN PCIE_SSD_R2D_C_N<1> — C3714 0.22UF 20% 6.3V X6S-CERM 0201 — GND_VOID=TRUE — 89 PCIE_SSD_R2D_N<1>
89 85 5 IN PCIE_SSD_R2D_C_P<1> — C3715 0.22UF 20% 6.3V X6S-CERM 0201 — GND_VOID=TRUE — 89 PCIE_SSD_R2D_P<1>
89 85 5 IN PCIE_SSD_R2D_C_N<0> — C3716 0.22UF 20% 6.3V X6S-CERM 0201 — GND_VOID=TRUE — 89 PCIE_SSD_R2D_N<0>
89 85 5 IN PCIE_SSD_R2D_C_P<0> — C3717 0.22UF 20% 6.3V X6S-CERM 0201 — GND_VOID=TRUE — 89 PCIE_SSD_R2D_P<0>

Per Intel PDG, use PCIe style decoupling, when muxing PCIe & SATA

OOB Isolation

86 84 45 34 PP3V3_S0SW_SSD

C3718 0.1UF 10% 10V X5R-CERM 0201 — BYPASS=U3710::5 mm

CRITICAL
74LVC1G08 SOT891
U3710 08 NC

SMC_OOB1_R2D_L — IN 40

NC

34 86 84 83 82 59 58 57 56 55 52 51 49 48 47 46 45 44 43 96 PP3V3_S0

C3719 0.1UF 10% 10V X5R-CERM 0201 — BYPASS=U3711::5 mm

CRITICAL
74LVC1G08 SOT891
U3711 08 NC

SMC_OOB1_D2R_L — OUT 40

NC

R3701 100K 1% 1/20W MF 201

Supervisor & CLKREQ# Isolation

Delay = ~55ms

PP3V3_S0SW_SSD 34 45 84 86

R3740 100K 5% 1/20W MF 201
R3741 232K 1% 1/20W MF 201

P3V3SSD_VMON

CRITICAL
U3740 SLG4AP016V TDFN

VDD
SENSE 0.7V
POLY
RESET*
MR* 3
EN 6
OUT (OD) 8
IN 7
THRM PAD
GND

PP3V42_G3H 19 37 38 40 41 42 43 50 56 57 67 84 86

C3740 0.1UF 10% 6.3V CERM X5R 0201

APN 343S0511

SSD_RESET_L — IN 20
SSD_PWR_FET_EN — IN 34 66
SSD_CLKREQ_L — OUT 11

R3742 100K 1% 1/20W MF 201

66 34 SSD_PWR_FET_EN = SSD_PWR_FET_EN 34 66
MAKE_BASE=TRUE

Gumstick3 Connector

SYNC_MASTER=CLEAN_X425	SYNC_DATE=08/15/2014
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	SHEET 34 OF 97

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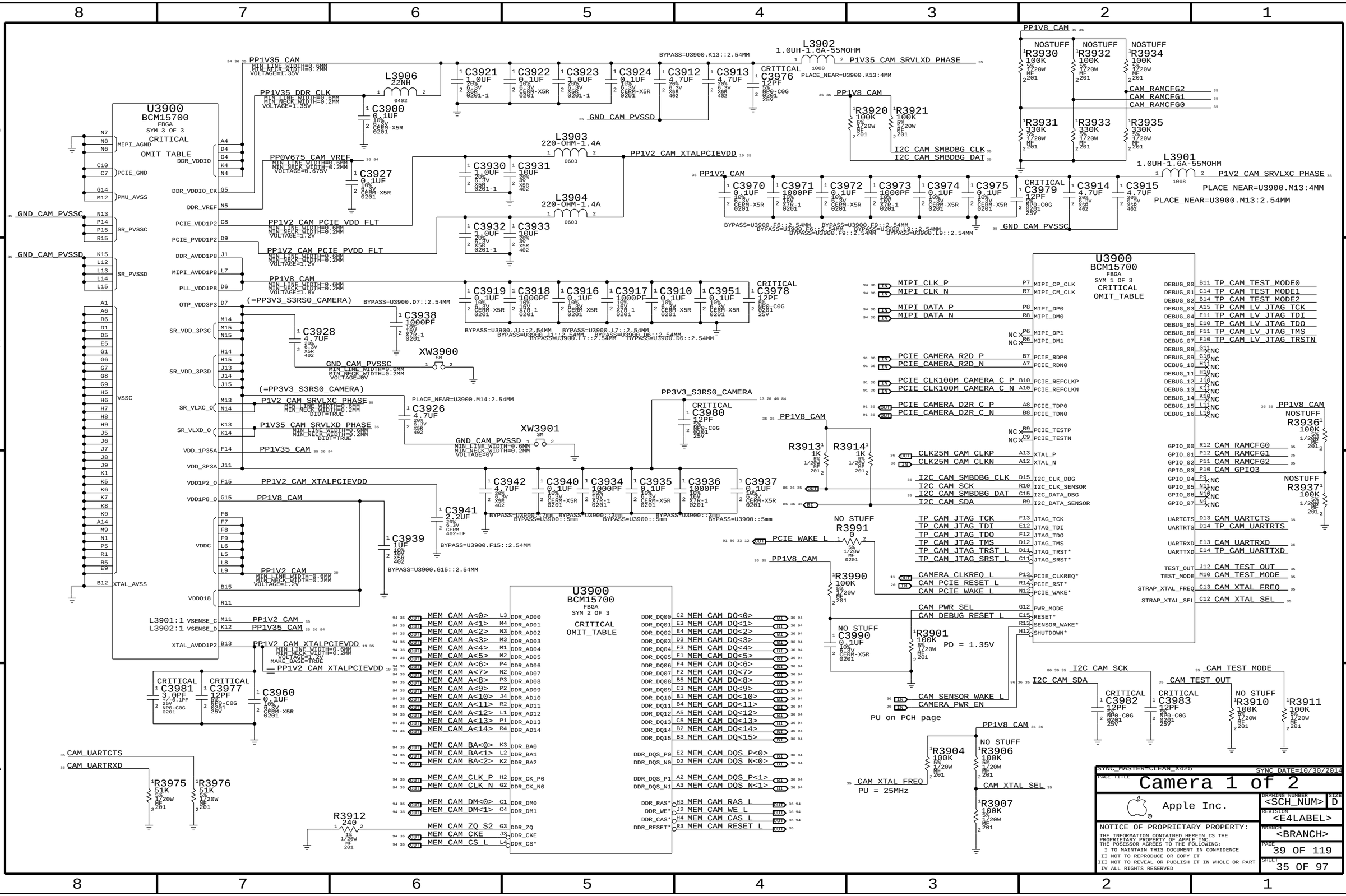
U3900
BCM15700
FBGA
SYM 3 OF 3
CRITICAL
OMIT_TABLE
PP1V35_CAM
PP1V35_DDR_CLK
L3906
22NH
C3900
0.1UF
L3902
1.0UH-1.6A-55MOHM
P1V35_CAM_SRVLXD_PHASE
C3976
12PF
PP1V8_CAM
R3930
R3932
R3934
R3931
R3933
R3935
R3920
R3921
CAM_RAMCFG2
CAM_RAMCFG1
CAM_RAMCFG0
I2C_CAM_SMBDBG_CLK
I2C_CAM_SMBDBG_DAT
L3903
220-OHM-1.4A
L3904
220-OHM-1.4A
PP1V2_CAM_XTALPCIEVDD
L3901
1.0UH-1.6A-55MOHM
P1V2_CAM_SRVLXC_PHASE
PLACE_NEAR=U3900.M13:4MM
PLACE_NEAR=U3900.M13:2.54MM
PP0V675_CAM_VREF
PP1V2_CAM_PCIE_VDD_FLT
PP1V2_CAM_PCIE_PVDD_FLT
GND_CAM_PVSSC
GND_CAM_PVSSD
PP1V2_CAM
C3970
C3971
C3972
C3973
C3974
C3975
C3979
C3914
C3915
C3919
C3918
C3916
C3917
C3910
C3951
C3978
C3938
C3928
XW3900
(=PP3V3_S3RS0_CAMERA)
C3926
XW3901
PP3V3_S3RS0_CAMERA
C3980
C3942
C3940
C3934
C3935
C3936
C3937
C3941
C3939
C3927
C3930
C3931
C3932
C3933
C3981
C3977
C3960
C3983
C3982
R3913
R3914
R3904
R3906
R3907
R3936
R3937
R3910
R3911
R3912
R3975
R3976
R3990
R3991
NO STUFF
PU on PCH page
PU = 1.35V
PU = 25MHz
MIPI_CLK_P
MIPI_CLK_N
MIPI_DATA_P
MIPI_DATA_N
PCIE_CAMERA_R2D_P
PCIE_CAMERA_R2D_N
PCIE_CLK100M_CAMERA_C_P
PCIE_CLK100M_CAMERA_C_N
PCIE_CAMERA_D2R_C_P
PCIE_CAMERA_D2R_C_N
CLK25M_CAM_CLKP
CLK25M_CAM_CLKN
I2C_CAM_SCK
I2C_CAM_SDA
TP_CAM_JTAG_TCK
TP_CAM_JTAG_TDI
TP_CAM_JTAG_TDO
TP_CAM_JTAG_TMS
TP_CAM_JTAG_TRST_L
TP_CAM_JTAG_SRST_L
CAMERA_CLKREQ_L
CAM_PCIE_RESET_L
CAM_PCIE_WAKE_L
CAM_PWR_SEL
CAM_DEBUG_RESET_L
CAM_SENSOR_WAKE_L
CAMERA_PWR_EN
CAM_UARTCTS
CAM_UARTRXD
CAM_XTAL_FREQ
CAM_XTAL_SEL
CAM_TEST_OUT
CAM_TEST_MODE
PCIE_WAKE_L
MEM_CAM_A<0>
MEM_CAM_A<1>
MEM_CAM_A<2>
MEM_CAM_A<3>
MEM_CAM_A<4>
MEM_CAM_A<5>
MEM_CAM_A<6>
MEM_CAM_A<7>
MEM_CAM_A<8>
MEM_CAM_A<9>
MEM_CAM_A<10>
MEM_CAM_A<11>
MEM_CAM_A<12>
MEM_CAM_A<13>
MEM_CAM_A<14>
MEM_CAM_BA<0>
MEM_CAM_BA<1>
MEM_CAM_BA<2>
MEM_CAM_CLK_P
MEM_CAM_CLK_N
MEM_CAM_DM<0>
MEM_CAM_DM<1>
MEM_CAM_ZQ_S2
MEM_CAM_CKE
MEM_CAM_CS_L
MEM_CAM_DQ<0>
MEM_CAM_DQ<1>
MEM_CAM_DQ<2>
MEM_CAM_DQ<3>
MEM_CAM_DQ<4>
MEM_CAM_DQ<5>
MEM_CAM_DQ<6>
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MEM_CAM_DQ<12>
MEM_CAM_DQ<13>
MEM_CAM_DQ<14>
MEM_CAM_DQ<15>
MEM_CAM_DQS_P<0>
MEM_CAM_DQS_N<0>
MEM_CAM_DQS_P<1>
MEM_CAM_DQS_N<1>
MEM_CAM_RAS_L
MEM_CAM_WE_L
MEM_CAM_CAS_L
MEM_CAM_RESET_L
TP_CAM_TEST_MODE0
TP_CAM_TEST_MODE1
TP_CAM_TEST_MODE2
TP_CAM_LV_JTAG_TCK
TP_CAM_LV_JTAG_TDI
TP_CAM_LV_JTAG_TDO
TP_CAM_LV_JTAG_TMS
TP_CAM_LV_JTAG_TRSTN
CAM_GPIO3
CAM_UARTCTS
CAM_UARTRTS
CAM_UARTRXD
CAM_UARTTXD
CAM_TEST_OUT
CAM_TEST_MODE
CAM_XTAL_FREQ
CAM_XTAL_SEL
SYNC_MASTER=CLEAN_X42S
SYNC_DATE=10/30/2014
PAGE TITLE
Camera 1 of 2
Apple Inc.
DRAWING NUMBER
<SCH_NUM>
SIZE
D
REVISION
<E4LABEL>
BRANCH
<BRANCH>
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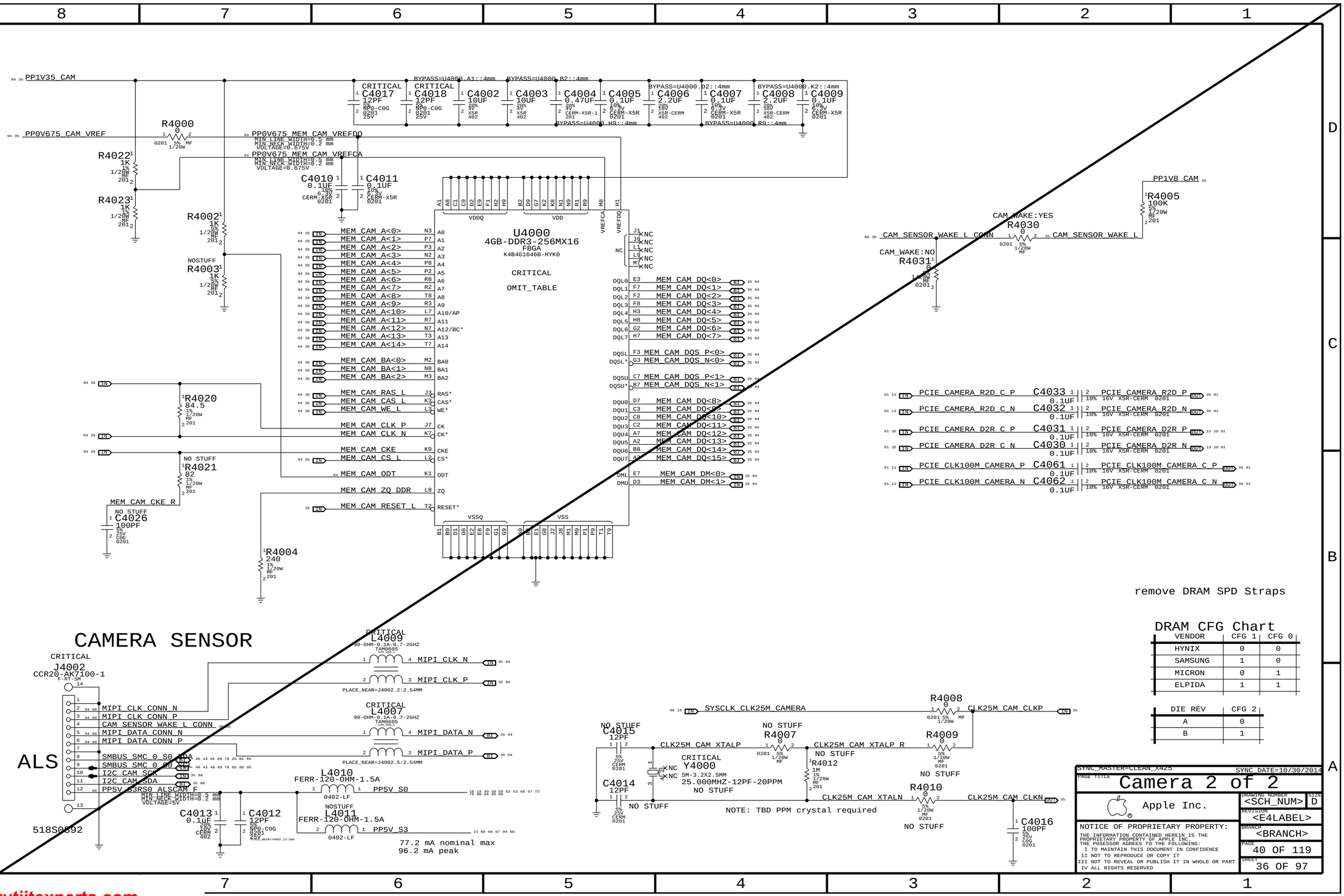
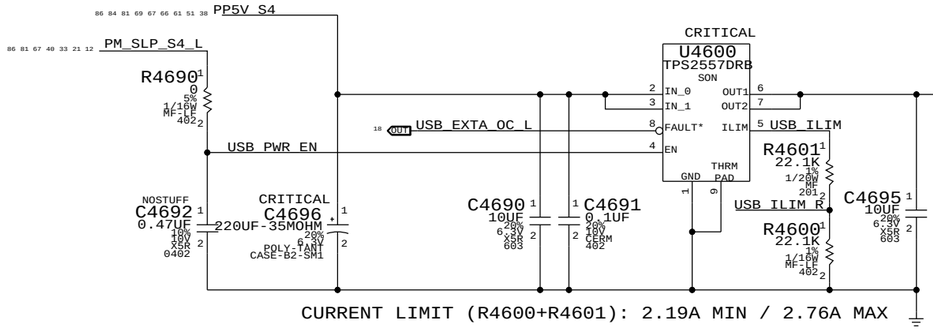
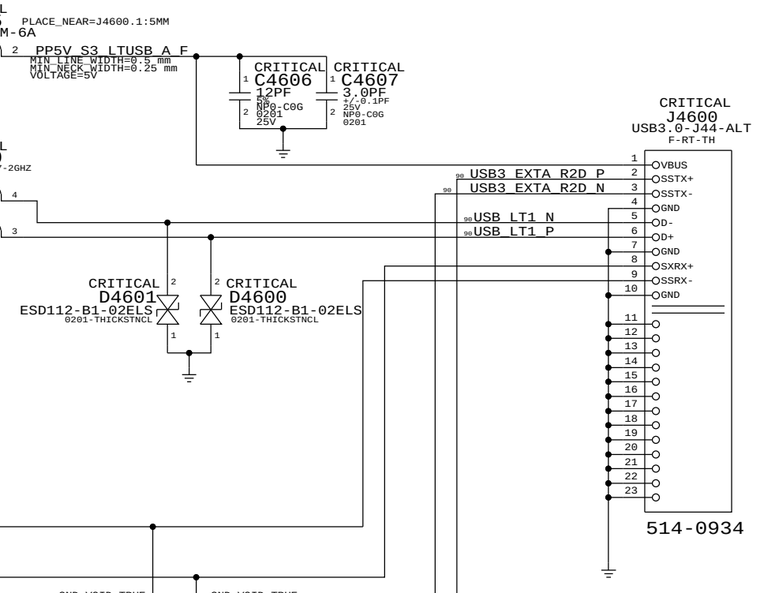


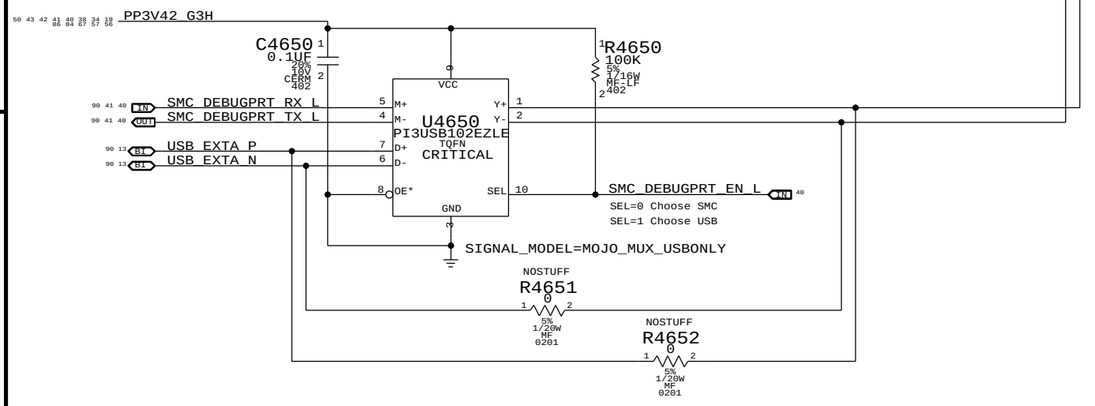
USB Port Power Switch



Left USB Port A



USB/SMC Debug Mux



SYNC_MASTER=CLEAN_X425 SYNC_DATE=10/30/2014

PAGE TITLE

USB 3.0 CONNECTORS

Apple Inc.

DRAWING NUMBER <SCH_NUM> SIZE D

REVISION <E4LABEL>

BRANCH <BRANCH>

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IPD CONNECTOR

CRITICAL J4801 DF40CG1.5-48DS-0.4V F-ST-SM

XW4801 SM PLACE_NEAR=J4801:3MM

F4809 2.5A-16V-0.10HM 1812

PPVIN_S4_TPAD → PPVIN_S4_TPAD_FUSE

C4805 12PF 10% 100V CERM 0402

C4808 1.0UF 10% 35V CERM-X5R 0402

C4806 0.1UF 10% 35V CER-X5R 0201

C4807 0.1UF 10% 35V CER-X5R 0201 PLACE_NEAR=J4801.7:5mm

GND_ACTUATOR

	1	2	
	3	4	
	5	6	
	7	8	
	9	10	
	11	12	
	13	14	
	15	16	
SMBUS_SMC_2_S3_SDA	19	20	SMC_ACTUATOR_EN_R_L
SMBUS_SMC_2_S3_SCL	21	22	TPAD_VBUS_EN
TPAD_NC3	23	24	TPAD_ACTUATOR_THRMTRIP_L
SMC_PME_S4_WAKE_L	25	26	PP5V_S4_TPAD_F
PP3V3_S4	27	28	SMC_LID
	29	30	
	31	32	
TPAD_SPI_INT_L	35	36	USB_TPAD_P
TPAD_SPI_BUS_EN	37	38	USB_TPAD_N
	39	40	
TPAD_SPI_SCLK	41	42	I2C_IOXP_SCL
TPAD_SPI_MISO	43	44	IOXP2_INT_L
TPAD_SPI_CS_L	45	46	I2C_IOXP_SDA
TPAD_SPI_MOSI	47	48	TPAD_NC4
	51	52	

NOSTUFF R4891 0 5% 1/16W MF-LF 0402

NOSTUFF R4890 0 5% 1/16W MF-LF 0402

NOSTUFF R4893 100K 5% 1/20W MF 0201

R4808 0 1/20W MF 0201

SMC_ACTUATOR_EN_L (OUT)

C4801 100PF 5% 25V C0G 0201

C4803 0.1UF 10% 10V CERM 0402

C4804 12PF 5% 25V NPO-C0G 0201 CRITICAL

L4803 FERR-120-OHM-1.5A 0402-LF

PP5V_S4

APN 516S1035
CONNECT WITH 516S1037

PART WILL NOT WORK WITH BOOST.

SMC Manual Reset & Isolation

LEFT SHIFT, OPTION & CONTROL KEYS COMBINED WITH POWER BUTTON CAUSE SMC RESET# ASSERTION.
Keys ANDed with PSoC power to isolate when PSoC is not powered.
No IPD on OE input pin PP3V3_S4 (symbol error).

PP3V42_G3H → BYPASS=U4850.10:5:5 mm

C4850 0.1UF 10% 10V X7R-CERM 0402

U4850 SLG4AP4103 TQFN

PP3V3_S4	4	OE (IPD)		
WS_LEFT_SHIFT_KBD	1	IN_1 (IPD)	OUT_1 9	WS_LEFT_SHIFT_KEY
WS_LEFT_OPTION_KBD	2	IN_2 (IPD)	OUT_2 8	WS_LEFT_OPTION_KEY
WS_CONTROL_KBD	3	IN_3 (IPD)	OUT_3 7	WS_CONTROL_KEY
			OUT_ALL# 6	SMC_TPAD_RST_L (OUT)

Pull-up in U5110.

VDD, THRM PAD, GND 5, 11

IO EXPANDER / KEYBOARD INTERFACE

U4820 PCAL6416A VFBGA

IOXP1_INT_L	A3	INT*	P0_0 A1 WS_KBD23
	B5	ADDR	P0_1 C3 WS_KBD2
I2C_IOXP_SCL	A5	SCL	P0_2 B1 WS_KBD1
I2C_IOXP_SDA	A4	SDA	P0_3 C1 WS_KBD3
IOXP1_RESET_L	A2	RESET*	P0_4 C2 WS_KBD4
			P0_5 D1 WS_KBD20
			P0_6 E1 WS_KBD22
			P0_7 D2 WS_KBD21
			P1_0 E3 TP_IOXP1_0
			P1_1 E4 TP_IOXP1_1
			P1_2 D3 TP_IOXP1_2
			P1_3 E5 TP_IOXP1_3
			P1_4 D4 TP_IOXP1_4
			P1_5 D5 IOXP1_DEBUG
			P1_6 C5 WS_KBD16N
			P1_7 C4 IOXP1_LED_DRV

VCCI B3, VCCP B4, GND E2

R4821 10K 5% 1/20W MF 0201

R4820 100K 5% 1/20W MF 0201

C4820 1UF 10% 6.3V CERM 402

C4821 0.1UF 10% 6.3V CERM-X5R 0201

C4822 0.1UF 10% 6.3V CERM-X5R 0201

R4822 2.0K 5% 1/20W MF 0201

R4823 2.0K 5% 1/20W MF 0201

NOSTUFF C4824 0.01UF 10% 16V X5R-CERM 0201

NOSTUFF R4824 0 5% 1/20W MF 0201 SMC_ONOFF_L

311S0597
(Write: 0x40 Read: 0x41)

Keyboard Connector

518S0752 CRITICAL J4813 F-RT-SM

FF14A-30C-R11DL-B-3H

PP3V3_S4, PP3V42_G3H

C4811 12PF 5% 25V NPO-C0G 0201 CRITICAL

C4812 12PF 5% 25V NPO-C0G 0201 CRITICAL

	32		
	30	29	
WS_KBD1	28	27	WS_KBD2
WS_KBD3	26	25	WS_KBD4
WS_KBD5	24	23	WS_KBD6
WS_KBD7	22	21	WS_KBD8
WS_KBD9	20	19	WS_KBD10
WS_KBD11	18	17	WS_KBD12
WS_KBD13	16	15	WS_KBD14
WS_KBD15_CAP	14	13	WS_KBD16_NUM
WS_KBD17	12	11	WS_KBD18
WS_KBD19	10	9	WS_KBD20
WS_KBD21	8	7	WS_KBD22
WS_KBD23	6	5	WS_KBD_ONOFF_L
	4	3	WS_LEFT_SHIFT_KBD
	2	1	WS_LEFT_OPTION_KBD
	31		WS_CONTROL_KBD

R4814 113 1% 1/10W MF-LF 402 ← WS_KBD15_C

R4815 0 5% 1/10W MF-LF 402 ← WS_KBD16N

R4810 1K 5% 1/10W MF-LF 402 ← SMC_ONOFF_L

C4810 0.1UF 10% 10V CERM 402

PLACE_NEAR=J4813.5:5MM

R4831 10K 5% 1/20W MF 0201

R4830 100K 5% 1/20W MF 0201

CRITICAL C4833 12PF 5% 25V NPO-C0G 0201

C4830 1UF 10% 6.3V CERM 402

BYPASS=U4830.B4:E2:5MM

C4831 0.1UF 10% 6.3V CERM-X5R 0201

C4832 0.1UF 10% 6.3V CERM-X5R 0201

BYPASS=U4830.B3:E2:2MM

BYPASS=U4830.B4:E2:2MM

U4830 PCAL6416A VFBGA

IOXP2_INT_L	A3	INT*	P0_0 A1 WS_KBD5
	B5	ADDR	P0_1 C3 WS_KBD6
I2C_IOXP_SCL	A5	SCL	P0_2 B1 WS_KBD7
I2C_IOXP_SDA	A4	SDA	P0_3 C1 WS_KBD9
IOXP2_RESET_L	A2	RESET*	P0_4 C2 WS_KBD12
			P0_5 D1 WS_KBD8
			P0_6 E1 WS_KBD17
			P0_7 D2 WS_KBD18
			P1_0 E3 WS_KBD19
			P1_1 E4 WS_KBD10
			P1_2 D3 WS_KBD14
			P1_3 E5 WS_KBD13
			P1_4 D4 WS_KBD11
			P1_5 D5
			P1_6 C5 WS_CONTROL_KEY
			P1_7 C4 WS_LEFT_OPTION_KEY
			WS_LEFT_SHIFT_KEY

VCCI B3, VCCP B4, GND E2

R4802 10K 5% 1/20W MF 0201

R4801 10K 5% 1/20W MF 0201

R4852 10K 5% 1/20W MF 0201

R4853 10K 5% 1/20W MF 0201

R4854 10K 5% 1/20W MF 0201

R4855 10K 5% 1/20W MF 0201

R4856 10K 5% 1/20W MF 0201

R4857 10K 5% 1/20W MF 0201

R4858 10K 5% 1/20W MF 0201

R4859 10K 5% 1/20W MF 0201

R4860 10K 5% 1/20W MF 0201

R4861 10K 5% 1/20W MF 0201

R4862 10K 5% 1/20W MF 0201

NOSTUFF C4834 0.01UF 10% 16V X5R-CERM 0201

311S0597
(Write: 0x42 Read: 0x43)

Q4840 DMN32D2LFB4 DFN1006H4-3 SYM_VER_2

WS_KBD15_C

R4840 100K 1% 1/16W MF-LF 402

SYNC_MASTER=CLEAN_X425G	SYNC_DATE=09/10/2014
PAGE TITLE	KEYBOARD/TRACKPAD (1 OF 2)
Apple Inc.	DRAWING NUMBER <SCH_NUM> SIZE D
	REVISION <E4LABEL>
	BRANCH <BRANCH>
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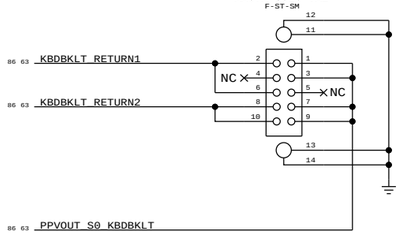
Keyboard Backlight Connector

516S0899
CRITICAL

J4915
AA07A-S010-VA1
F-ST-SM



SYNC_MASTER=CLEAN_MAXWELL SYNC_DATE=07/02/2014

PAGE TITLE
KEYBOARD/TRACKPAD (2 OF 2)

Apple Inc.

DRAWING NUMBER <SCH_NUM> SIZE D

REVISION <E4LABEL>

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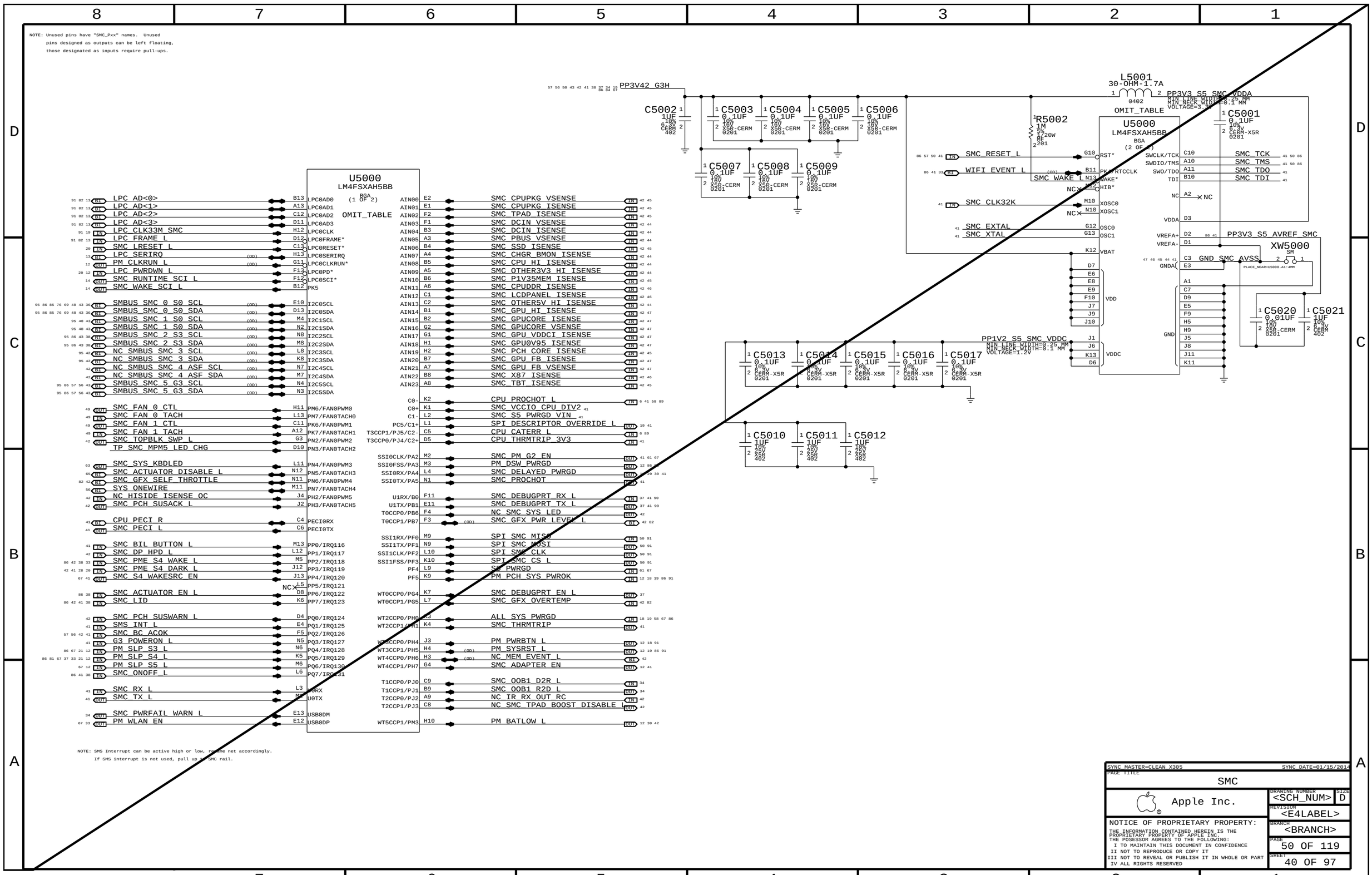
NOTE: Unused pins have "SMC_Pxx" names. Unused pins designed as outputs can be left floating, those designated as inputs require pull-ups.



NOTE: SMS Interrupt can be active high or low, rename net accordingly.
If SMS interrupt is not used, pull up to SMC rail.

SYNC_MASTER=CLEAN_X305	SYNC_DATE=01/15/2014
PAGE TITLE	SMC
Apple Inc.	DRAWING NUMBER <SCH_NUM> SIZE D
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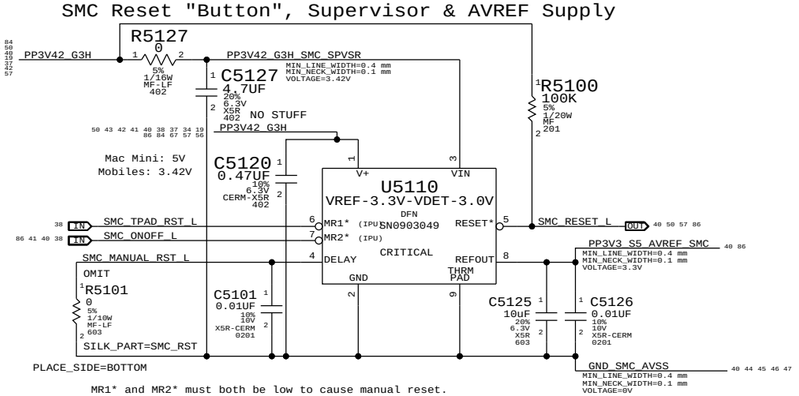
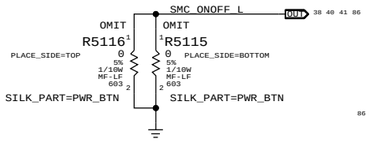
SMC Reset "Button", Supervisor & AVREF Supply



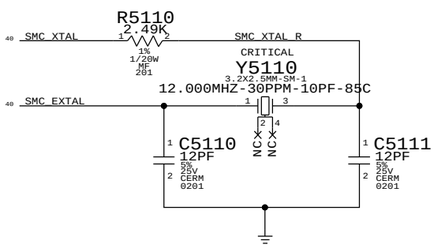
MR1* and MR2* must both be low to cause manual reset.
Used on mobiles to support SMC reset via keyboard.

NOTE: Internal pull-ups are to VIN, not V+.

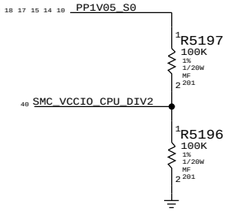
Debug Power "Buttons"



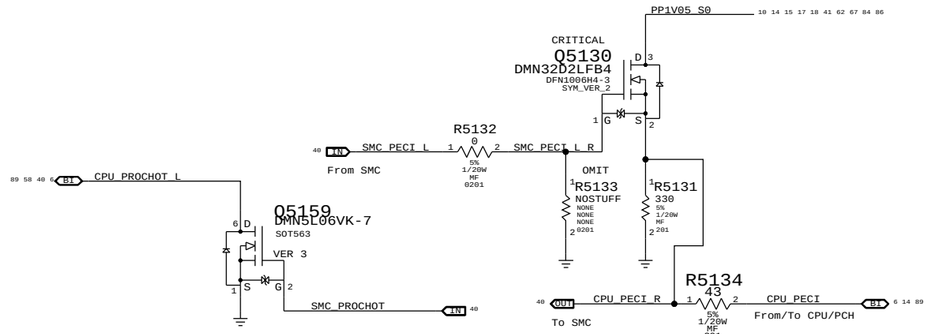
SMC Crystal Circuit

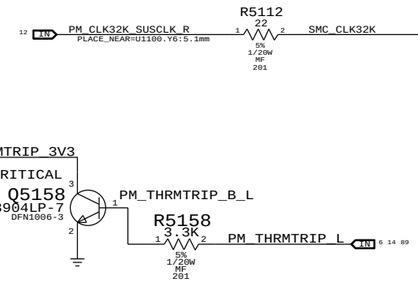


SMC USB CLOCK REQUIRE THESE CRYSTAL VALUES:5,6,8,10,12,16,18,20,24,25 MHZ



SMC12 PECI SUPPORT





SYNC_MASTER=CLEAN_X305 SYNC_DATE=06/24/2014

PAGE TITLE
SMC Shared Support

Apple Inc.

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8	7	6	5	4	3	2	1

SMC_BC_ACOK — SMC_BC_ACOK (MAKE_BASE=TRUE)
NC_HISIDE_ISENSE_OC — NC_HISIDE_ISENSE_OC (MAKE_BASE=TRUE NO_TEST=TRUE)
SMC_CPUPKG_VSENSE — SMC_CPUPKG_VSENSE (MAKE_BASE=TRUE)
SMC_CPUPKG_ISENSE — SMC_CPUPKG_ISENSE (MAKE_BASE=TRUE)
SMC_TPAD_ISENSE — SMC_TPAD_ISENSE (MAKE_BASE=TRUE)
SMC_DCIN_VSENSE — SMC_DCIN_VSENSE (MAKE_BASE=TRUE)
SMC_DCIN_ISENSE — SMC_DCIN_ISENSE (MAKE_BASE=TRUE)
SMC_PBUS_VSENSE — SMC_PBUS_VSENSE (MAKE_BASE=TRUE)
SMC_SSD_ISENSE — SMC_SSD_ISENSE (MAKE_BASE=TRUE)
SMC_CHGR_BMON_ISENSE — SMC_CHGR_BMON_ISENSE (MAKE_BASE=TRUE)
SMC_CPU_HI_ISENSE — SMC_CPU_HI_ISENSE (MAKE_BASE=TRUE)
SMC_OTHER3V3_HI_ISENSE — SMC_OTHER3V3_HI_ISENSE (MAKE_BASE=TRUE)
SMC_P1V35MEM_ISENSE — SMC_P1V35MEM_ISENSE (MAKE_BASE=TRUE)
SMC_CPUDDR_ISENSE — SMC_CPUDDR_ISENSE (MAKE_BASE=TRUE)
SMC_LCDPANEL_ISENSE — SMC_LCDPANEL_ISENSE (MAKE_BASE=TRUE)
SMC_OTHER5V_HI_ISENSE — SMC_OTHER5V_HI_ISENSE (MAKE_BASE=TRUE)
SMC_GPU_HI_ISENSE — SMC_GPU_HI_ISENSE (MAKE_BASE=TRUE)
SMC_GPUCORE_ISENSE — SMC_GPUCORE_ISENSE (MAKE_BASE=TRUE)
SMC_GPUCORE_VSENSE — SMC_GPUCORE_VSENSE (MAKE_BASE=TRUE)
SMC_GPU_VDDCI_ISENSE — SMC_GPU_VDDCI_ISENSE (MAKE_BASE=TRUE)
SMC_GPU0V95_ISENSE — SMC_GPU0V95_ISENSE (MAKE_BASE=TRUE)
SMC_PCH_CORE_ISENSE — SMC_PCH_CORE_ISENSE (MAKE_BASE=TRUE)
SMC_GPU_FB_ISENSE — SMC_GPU_FB_ISENSE (MAKE_BASE=TRUE)
SMC_GPU_FB_VSENSE — SMC_GPU_FB_VSENSE (MAKE_BASE=TRUE)
SMC_X87_ISENSE — SMC_X87_ISENSE (MAKE_BASE=TRUE)
SMC_TBT_ISENSE — SMC_TBT_ISENSE (MAKE_BASE=TRUE)
NC_SMBUS_SMC_4_ASF_SCL — NC_SMBUS_SMC_4_ASF_SCL (MAKE_BASE=TRUE NO_TEST=TRUE)
NC_SMBUS_SMC_4_ASF_SDA — NC_SMBUS_SMC_4_ASF_SDA (MAKE_BASE=TRUE NO_TEST=TRUE)
NC_SMBUS_SMC_3_SCL — NC_SMBUS_SMC_3_SCL (MAKE_BASE=TRUE NO_TEST=TRUE)
NC_SMBUS_SMC_3_SDA — NC_SMBUS_SMC_3_SDA (MAKE_BASE=TRUE NO_TEST=TRUE)
NC_SMC_TPAD_BOOST_DISABLE_L — NC_SMC_TPAD_BOOST_DISABLE_L (MAKE_BASE=TRUE NO_TEST=TRUE)
SMC_PME_S4_DARK_L — SMC_PME_S4_DARK_L (MAKE_BASE=TRUE)
SMC_PME_S4_DARK_L — SMC_PME_S4_DARK_L

NC_SMC_SYS_LED — NC_SMC_SYS_LED (MAKE_BASE=TRUE NO_TEST=TRUE)
NC_MEM_EVENT_L — NC_MEM_EVENT_L (MAKE_BASE=TRUE NO_TEST=TRUE)
NC_IR_RX_OUT_RC — NC_IR_RX_OUT_RC (MAKE_BASE=TRUE NO_TEST=TRUE)
SMC_GFX_SELF_THROTTLE — SMC_GFX_SELF_THROTTLE (MAKE_BASE=TRUE)
SMC_GFX_PWR_LEVEL_L — SMC_GFX_PWR_LEVEL_L (MAKE_BASE=TRUE)

GPU HI ISENSE

PM_THRMTRIP_L_R

SMC_SUSACK:YES
R5230 0 5% 1/20W MF 201
SMC_PCH_SUSWARN_L — PCH_SUSWARN_L
R5231 0 5% 1/20W MF 201
SMC_PCH_SUSACK_L — PCH_SUSACK_L
SMC_SUSACK:YES

Spare S4 IRQ

PP3V3_S4
R5259 100K 5% 1/20W MF 201
SMC_DP_HPD_L

Q5260 DMN32D2LFB4 (DFN1006H4-3, SYM_VER_2) CRITICAL
SMC_GFX_OVERTEMP

PP3V3_S4
R5282 100K 5% 1/20W MF 201
SMC_PME_S4_WAKE_L (MAKE_BASE=TRUE)

Hall Effect pads

APN: 998-3029
OMIT_TABLE
J5250
HALL-SENSOR-MLB-PADS-K99
SM
NC, NC, NC, NC
PP3V42_G3H
SMC_LID_R
R5250 0 5% 1/20W MF 0201
SMC_LID
C5250 0.001UF 10% 50V X7R-CERM 0402

R5283 1K 5% 1/20W MF 201
SMC_TOPBLK_SWP_L — PCH_STRP_TOPBLK_SWP_L
PM_BATLOW_L — PM_BATLOW_L (MAKE_BASE=TRUE)

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
607-6811	1	SUBASSY,PCBA HALL EFFECT,K99	J5250	CRITICAL	

PAGE TITLE: SMC Project Support
Apple Inc.
DRAWING NUMBER: <SCH_NUM> SIZE: D
REVISION: <E4LABEL>
BRANCH: <BRANCH>
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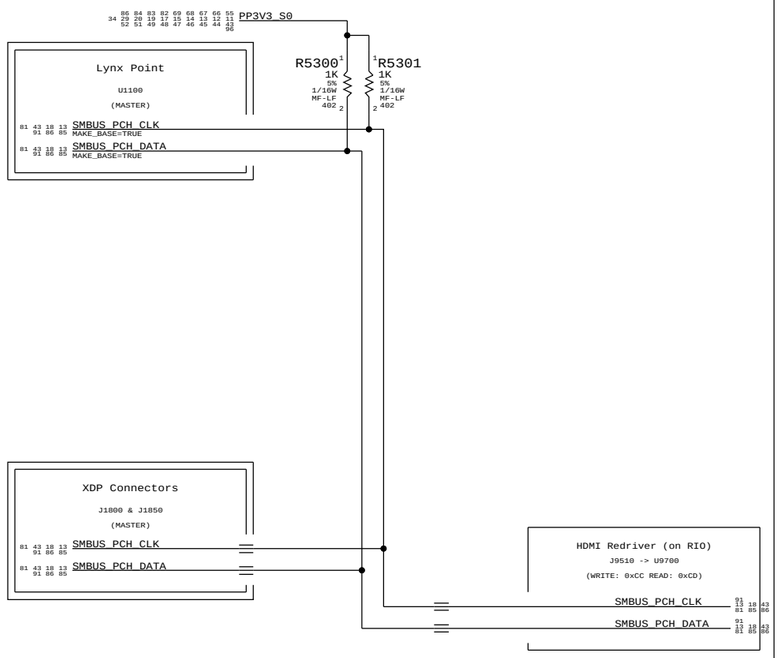
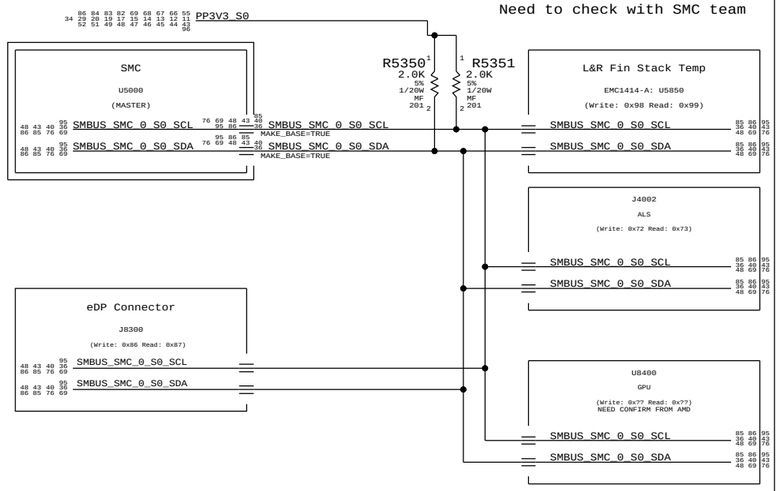
PCH SMBus "0" Connections

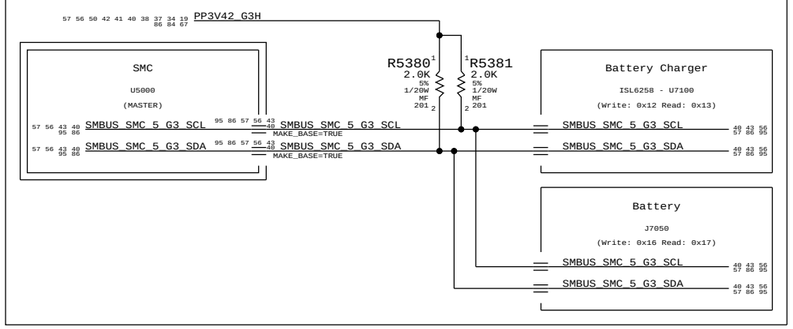


SMC "0" SMBus Connections

Need to check with SMC team



SMC "5" SMBUS CONNECTIONS

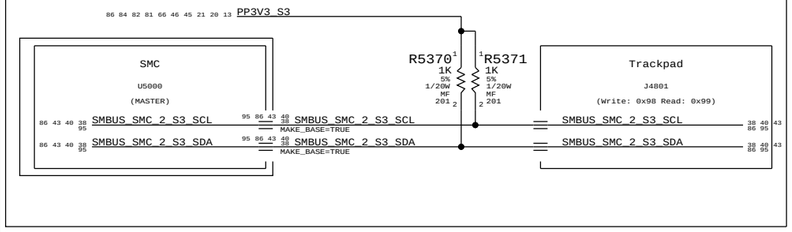


SMC "4" SMBUS CONNECTIONS

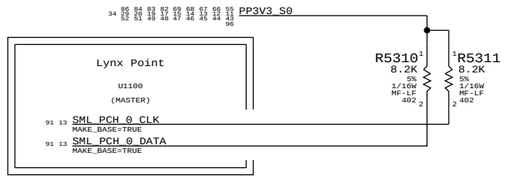
SMC "3" SMBUS CONNECTIONS

SMC "2" SMBUS CONNECTIONS

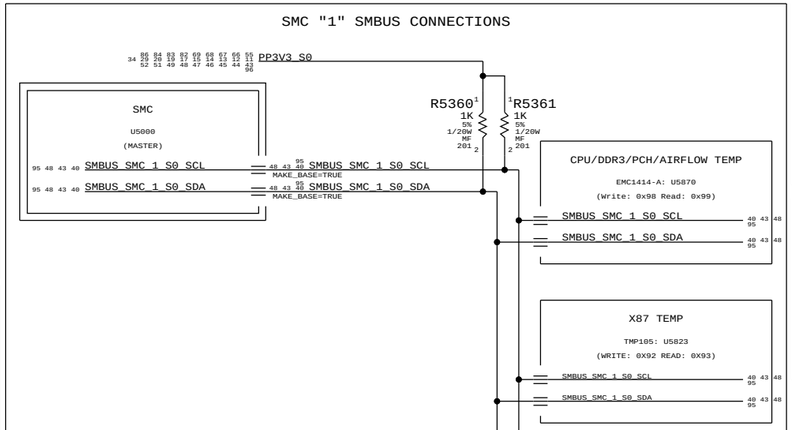
NOTE: SMC RMT bus remains powered and may be active in S3 state



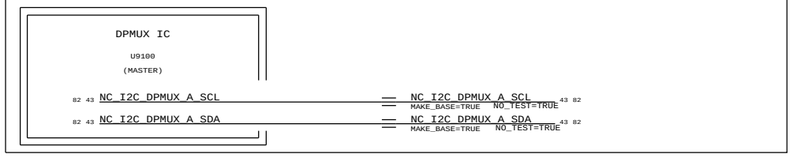
PCH "SMLink 0" Connections

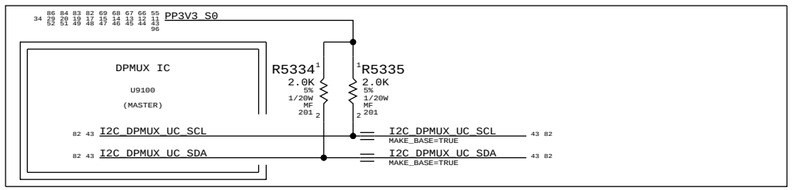


SMC "1" SMBUS CONNECTIONS

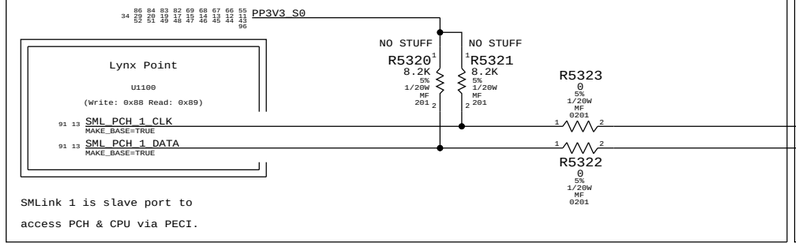


DPMUX IC





PCH "SMLink 1" Connections



SMLink 1 is slave port to

access PCH & CPU via PECI.

SYNC_MASTER=CLEAN_X305G SYNC_DATE=08/11/2014

PAGE TITLE

SMBus Connections

Apple Inc.

DRAWING NUMBER <SCH_NUM> SIZE D

REVISION <E4LABEL>

BRANCH <BRANCH>

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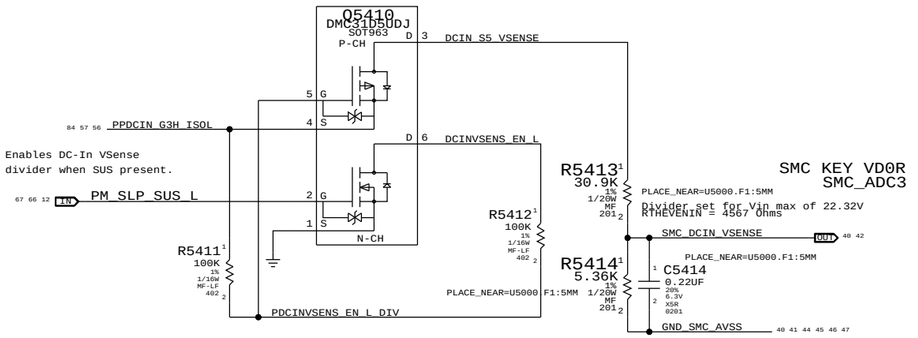
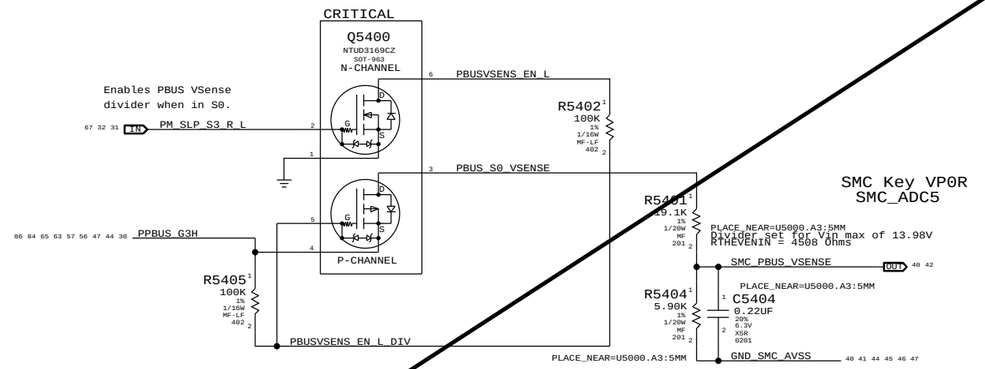
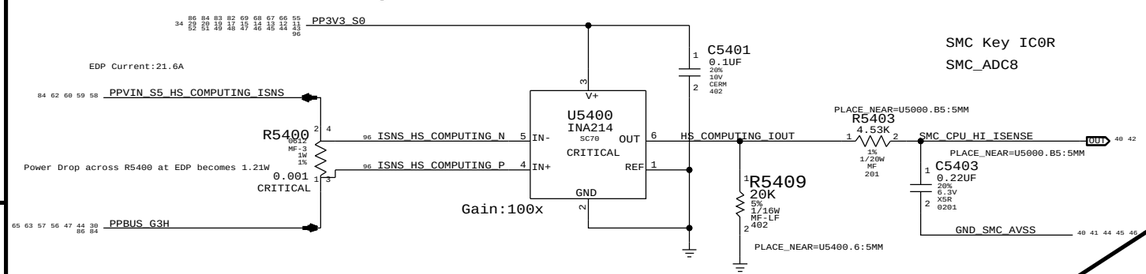
DC-In Voltage Sense Enable & Filter



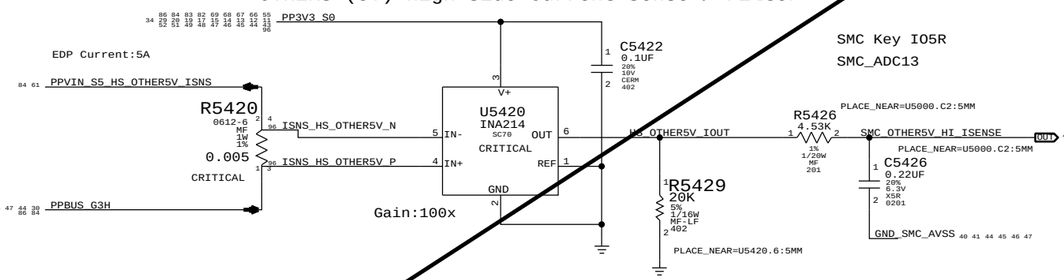
PBUS Voltage Sense Enable & Filter



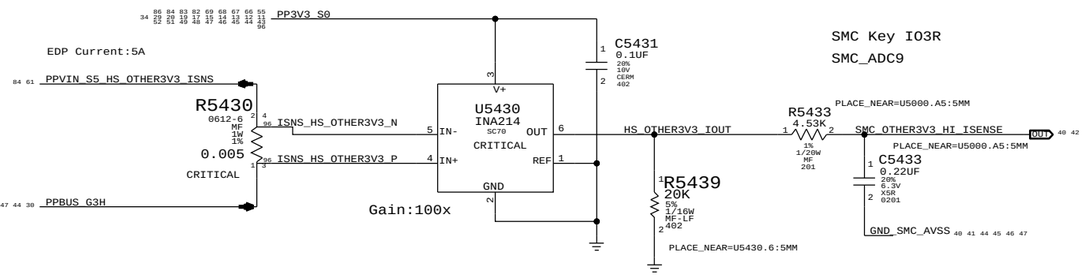
COMPUTING High Side Current Sense / Filter



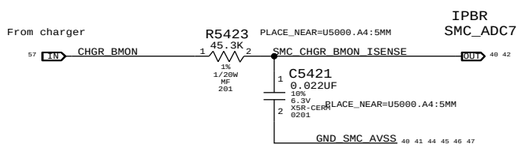
OTHERS (5V) High Side Current Sense / Filter



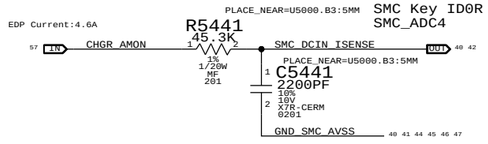
OTHERS (3.3V) High Side Current Sense / Filter



CHARGER BMON HIGH SIDE (BATTERY DISCHARGE) CURRENT SENSE & FILTER



DC-IN (AMON) Current Sense Filter



SYNC_MASTER=CLEAN_X305_PEG SYNC_DATE=02/18/2014

PAGE TITLE: High Side Voltage and Current Sensing

Apple Inc.

DRAWING NUMBER: <SCH_NUM> SIZE: D
REVISION: <E4LABEL>
BRANCH: <BRANCH>
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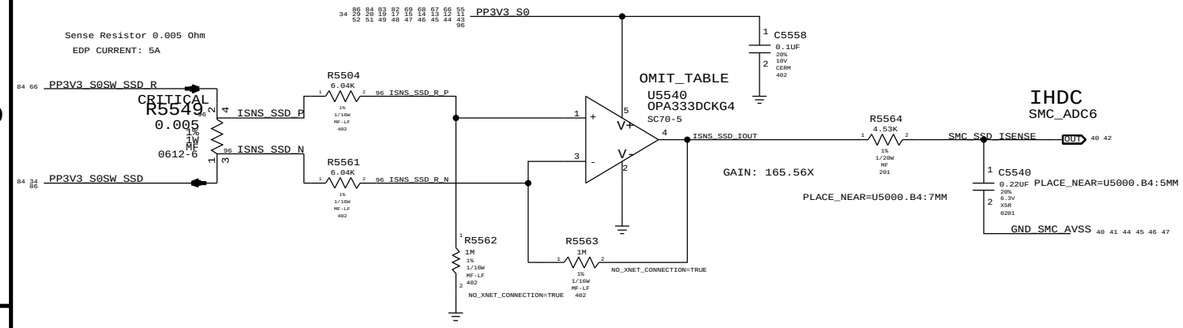
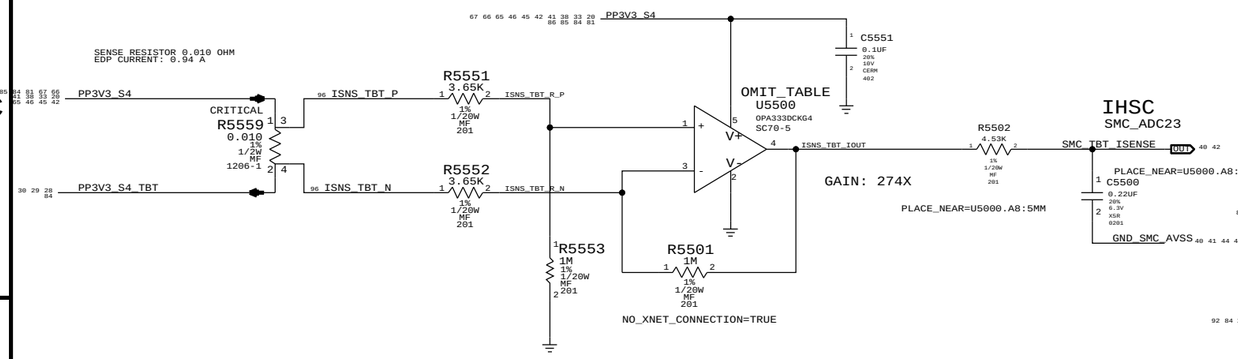
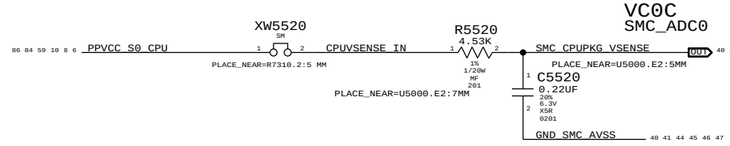
SSD CURRENT SENSE



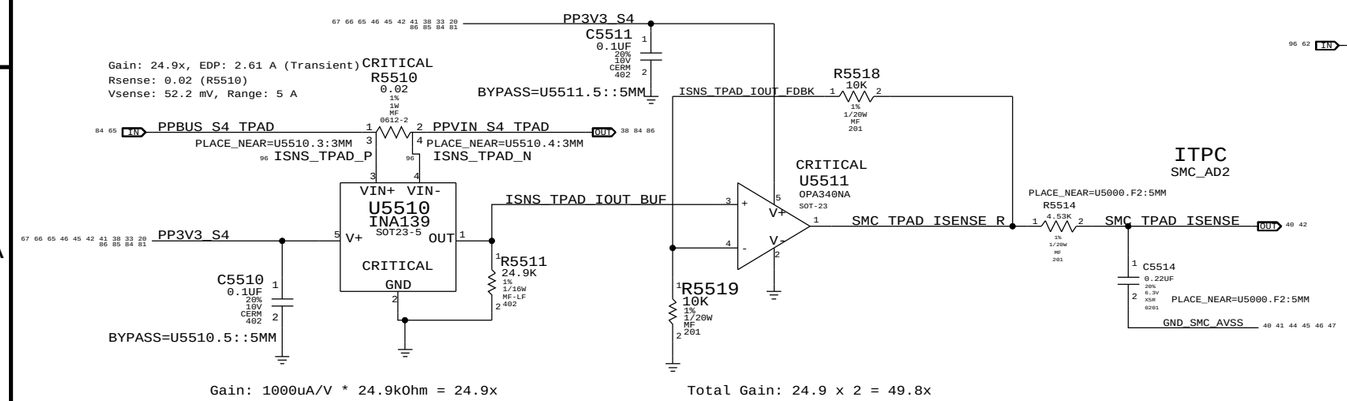
TBT Router CURRENT SENSE



CPU Vcore Voltage Sense / Filter



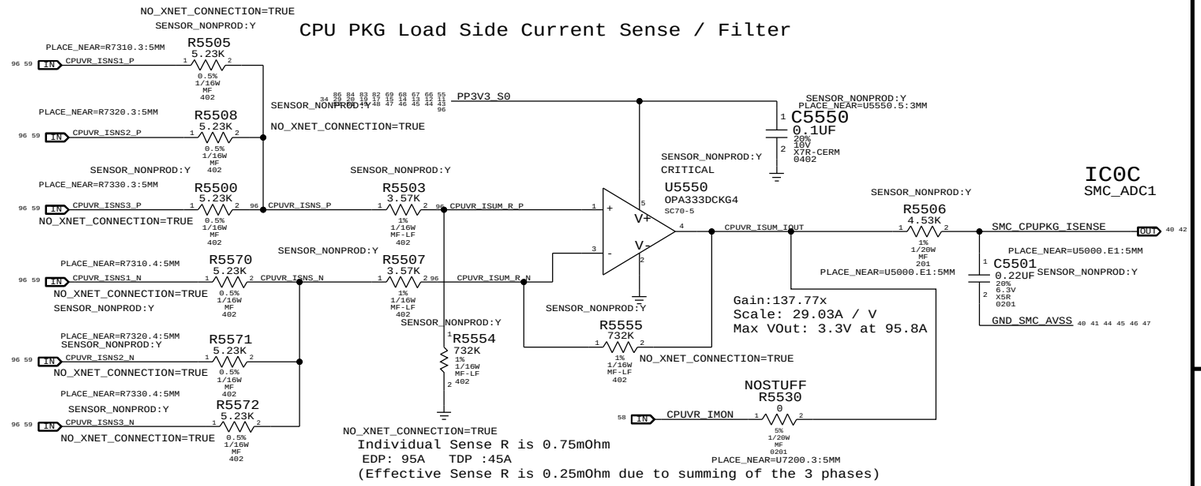
TRACKPAD CURRENT SENSE



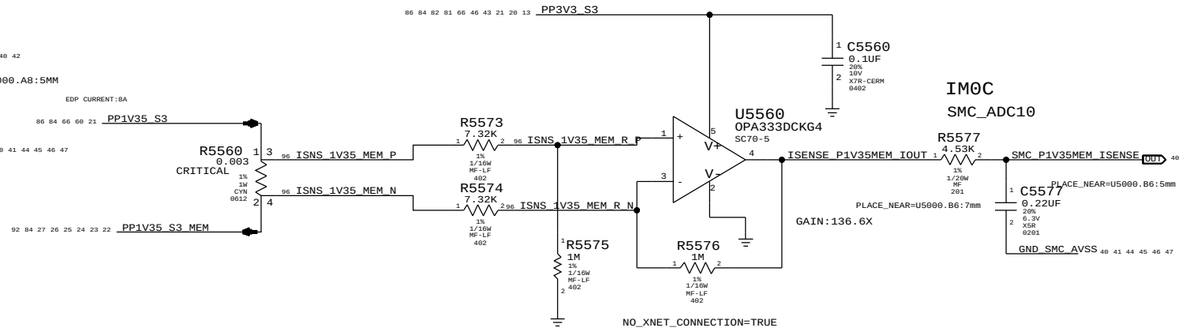
Gain: 1000uA/V * 24.9kOhm = 24.9x

Total Gain: 24.9 x 2 = 49.8x

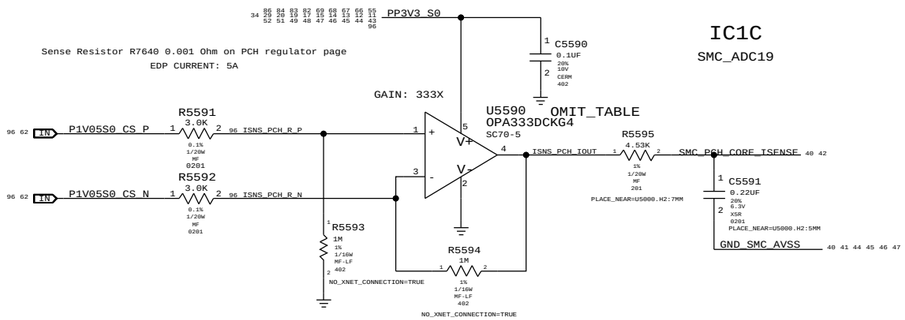
CPU PKG Load Side Current Sense / Filter



DDR3L 1.35V DRAM ONLY CURRENT SENSE / FILTER



PCH CORE CURRENT SENSE



PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
353S00107	3	IC,OPAMP,NCS333QS3,SC70-5	U5500,U5540,U5590	CRITICAL	

SYNC_MASTER=CLEAN_X425G SYNC_DATE=09/10/2014

PAGE TITLE: Load Side Voltage and Current Sensing

Apple Inc.

DRAWING NUMBER: <SCH_NUM> SIZE: D
REVISION: <E4LABEL>
BRANCH: <BRANCH>
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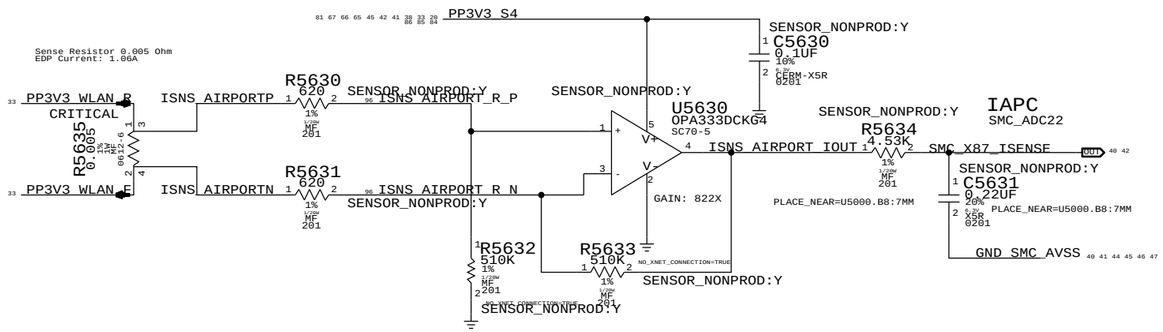
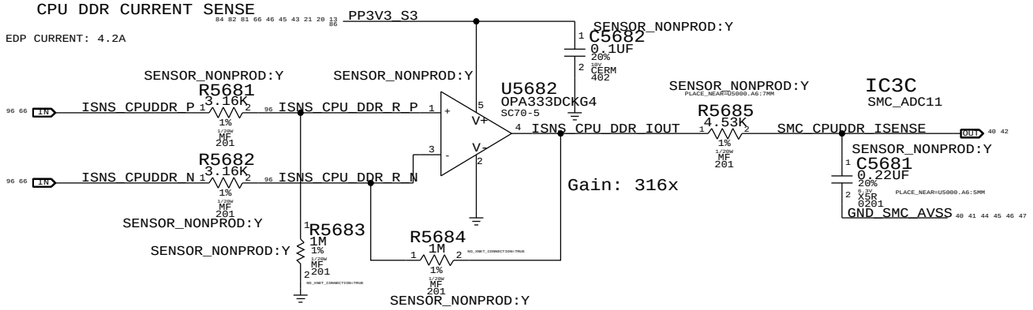
X87 AIRPORT CURRENT SENSE



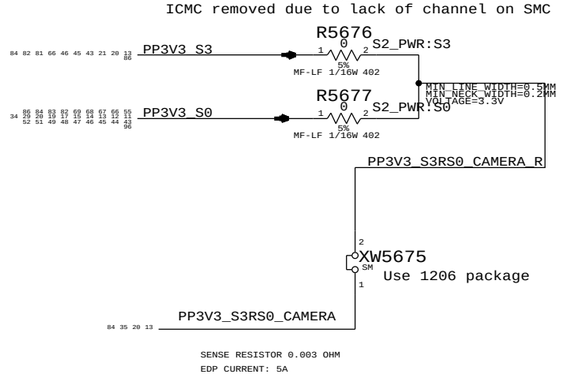
PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
117S0008	5	RES,MTL FILM,100K,5,1/20W,0201,SMD,LF	C5601,C5631,C5600,C5681,C5671		SENSOR_NONPROD:N

CPU DDR CURRENT SENSE

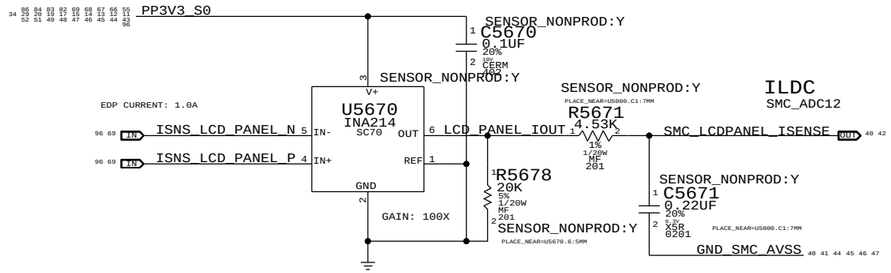


S2 CAMERA CONTROLLER CURRENT SENSE

ICMC removed due to lack of channel on SMC



LCD PANEL CURRENT SENSE



DRAWING NUMBER <SCH_NUM> SIZE D
REVISION <E4LABEL>
BRANCH <BRANCH>
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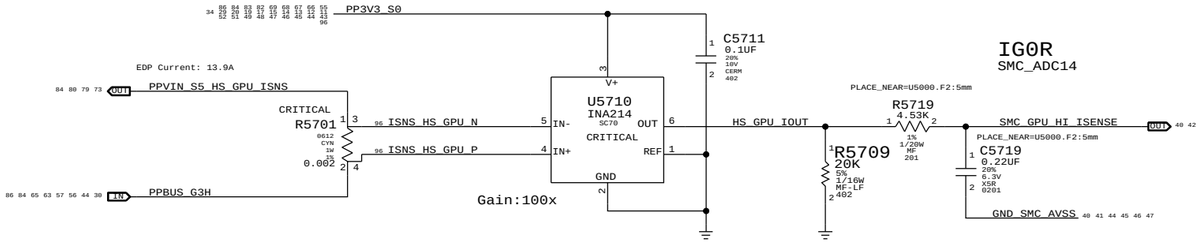
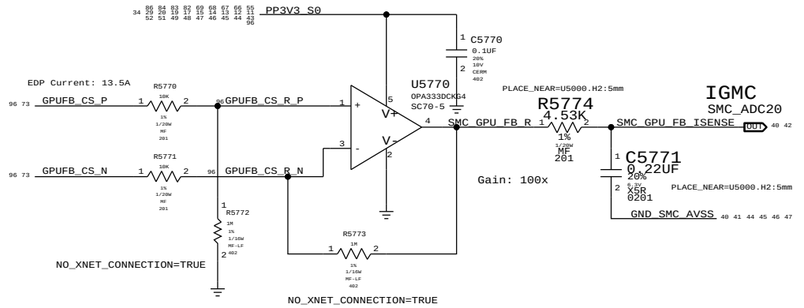
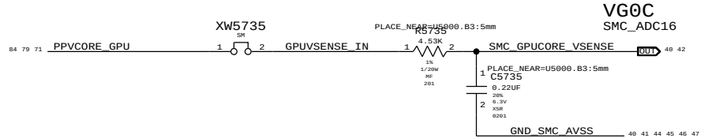
GRAPHICS High Side Current Sense



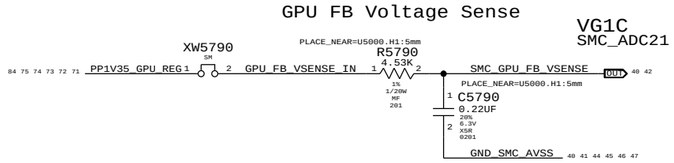
GPU FB Current Sense



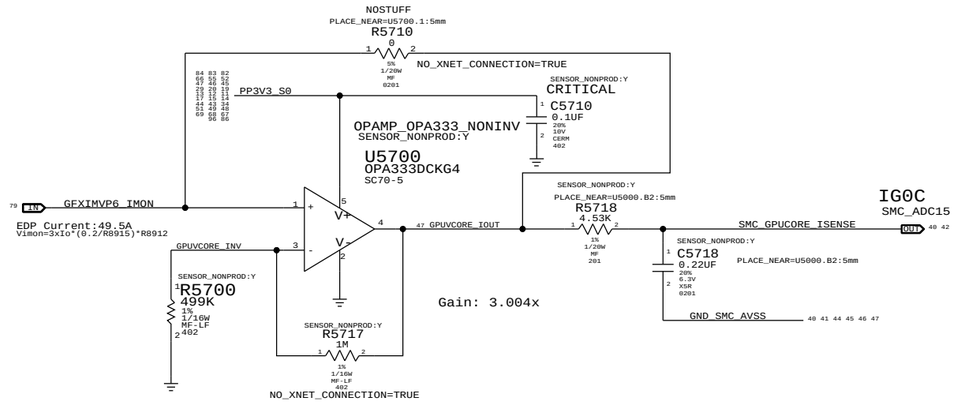
GPU VCORE Voltage Sense



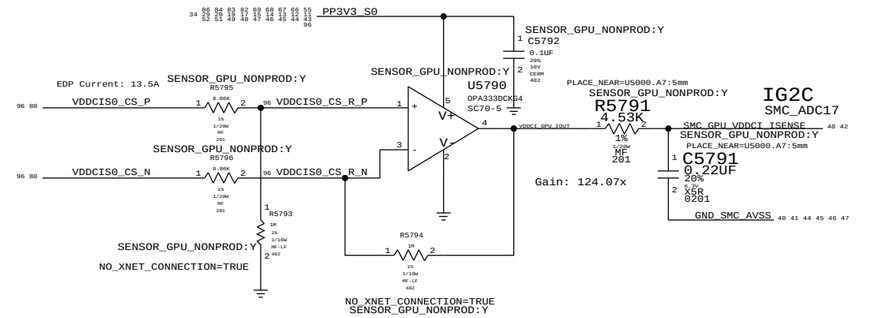
GPU FB Voltage Sense



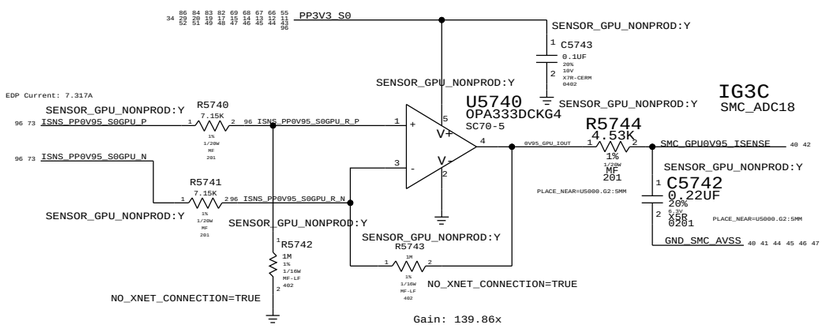
GPU VCORE Current Sense



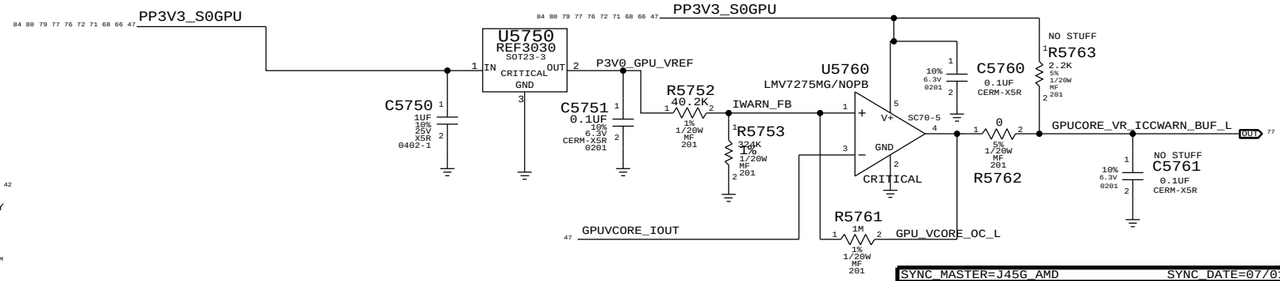
VDDCI Current Sense



GPU 0V95 Current Sense



GPU VR OCP



SYNC_MASTER=J45G_AMD SYNC_DATE=07/01/2014

PAGE TITLE: GPU V/I Sensors

Apple Inc.

DRAWING NUMBER: <SCH_NUM> SIZE: D

REVISION: <E4LABEL>

BRANCH: <BRANCH>

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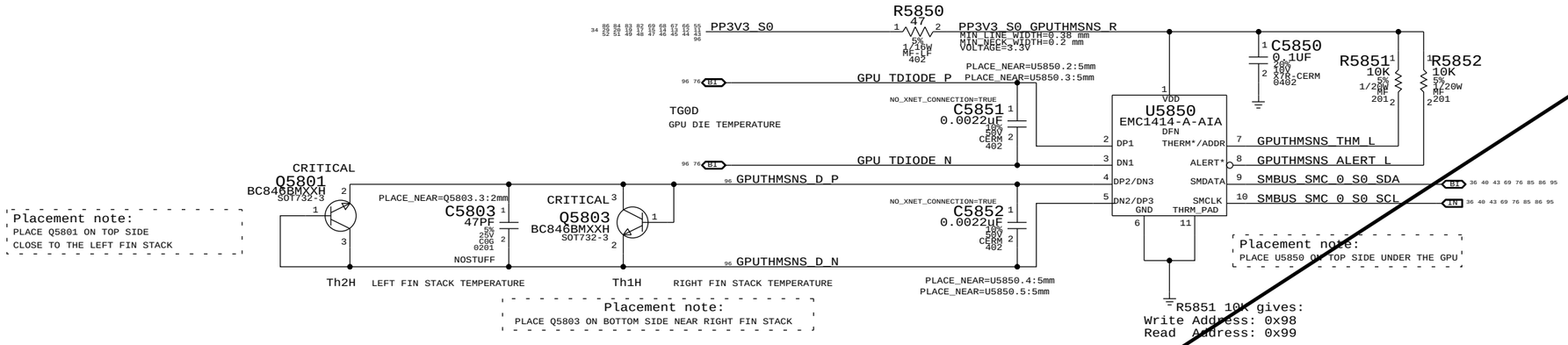
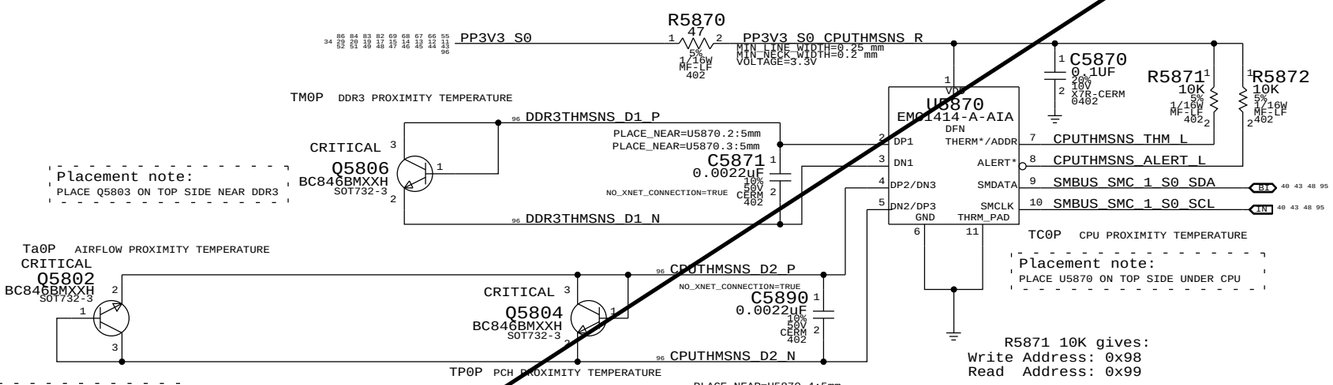
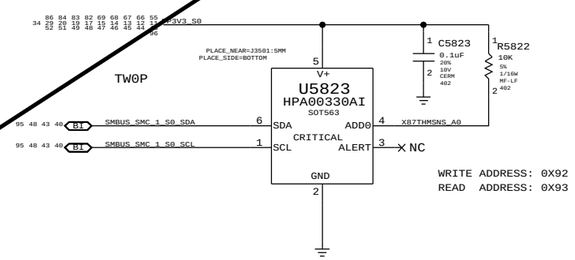
GPU PROXIMITY/GPU DIE/LEFT FIN STACK/RIGHT FIN STACK



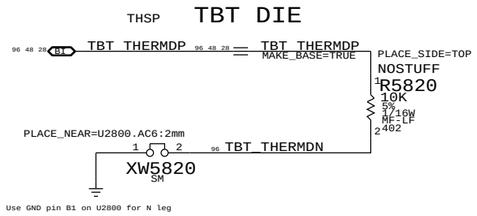
DDR3 PROXIMITY/CPU PROXIMITY/PCH PROXIMITY/AIRFLOW PROXIMITY



X87 PROXIMITY



TBT DIE



SYNC_MASTER=CHANG_J45 SYNC_DATE=11/26/2012

PAGE TITLE: Thermal Sensors

Apple Inc.

DRAWING NUMBER: <SCH_NUM> SIZE: D

REVISION: <E4LABEL>

BRANCH: <BRANCH>

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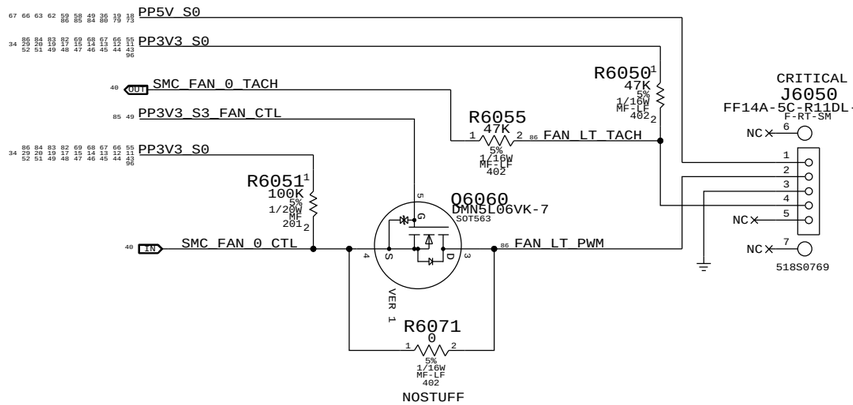
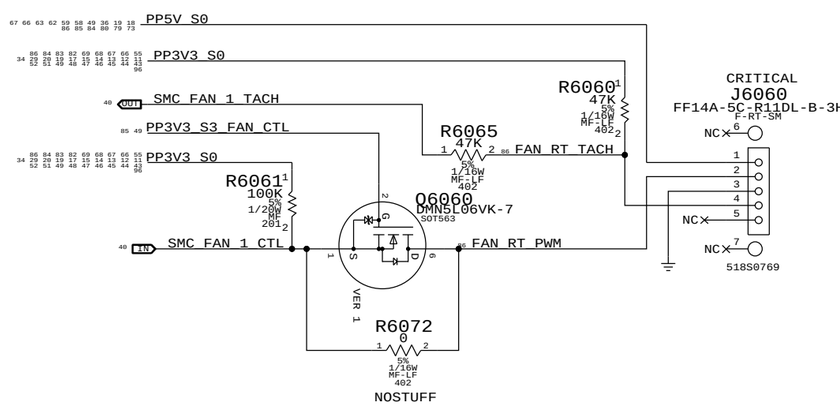
Left Fan



Right Fan



SYNC_MASTER=J15_MLB SYNC_DATE=10/31/2012

PAGE TITLE

Fan Connectors

Apple Inc.

DRAWING NUMBER <SCH_NUM> SIZE D

REVISION <E4LABEL>

BRANCH <BRANCH>

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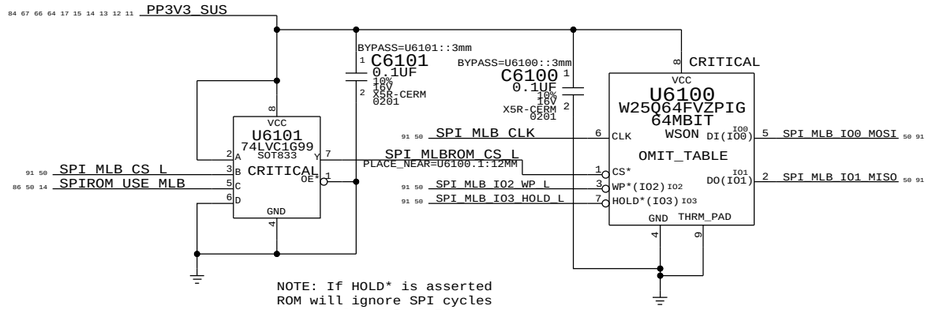
SPI ROM

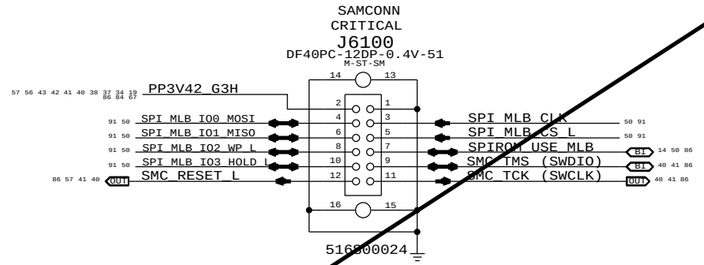
Quad-IO Mode (Mode 0 & 3) supported.
SPI Frequency: 50MHz for CPU, 20MHz for SMC.



NOTE: If HOLD* is asserted
ROM will ignore SPI cycles
in normal and Dual-IO modes.

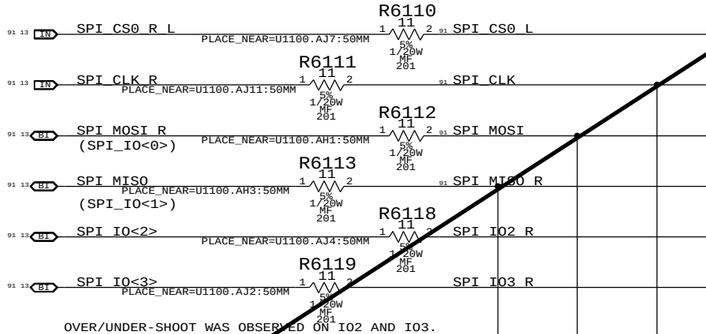
Quad SPI and QPI instructions require the non-volatile Quad Enable bit (QE)
in Status Register-2 to be set. When QE=1, the /WP pin becomes IO2 and /HOLD pin becomes IO3.

SPI+SWD SAM Connector



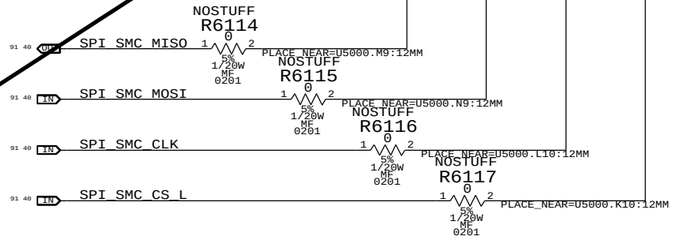
SPI Bus Series Termination

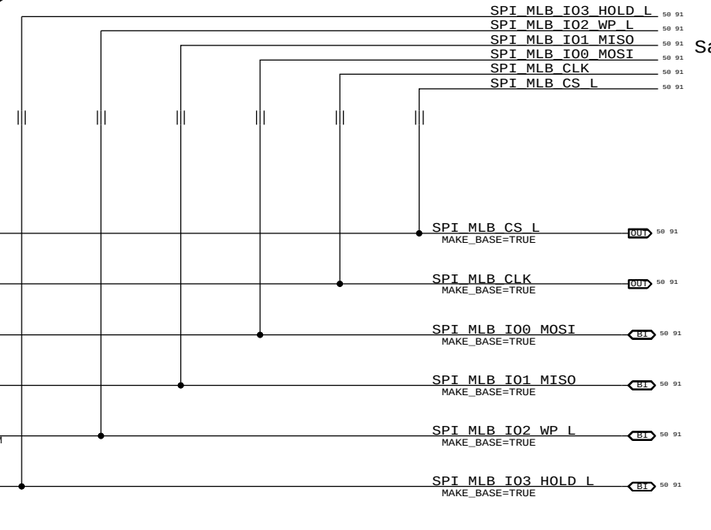
PCH Master



OVER/UNDER-SHOOT WAS OBSERVED ON IO2 AND IO3.
0HOM WERE ADDED FOR R6118&R6119 AS PLACEHOLDER.
FINAL VALUE NEEDS TO BE TUNED.

SMC12 Master





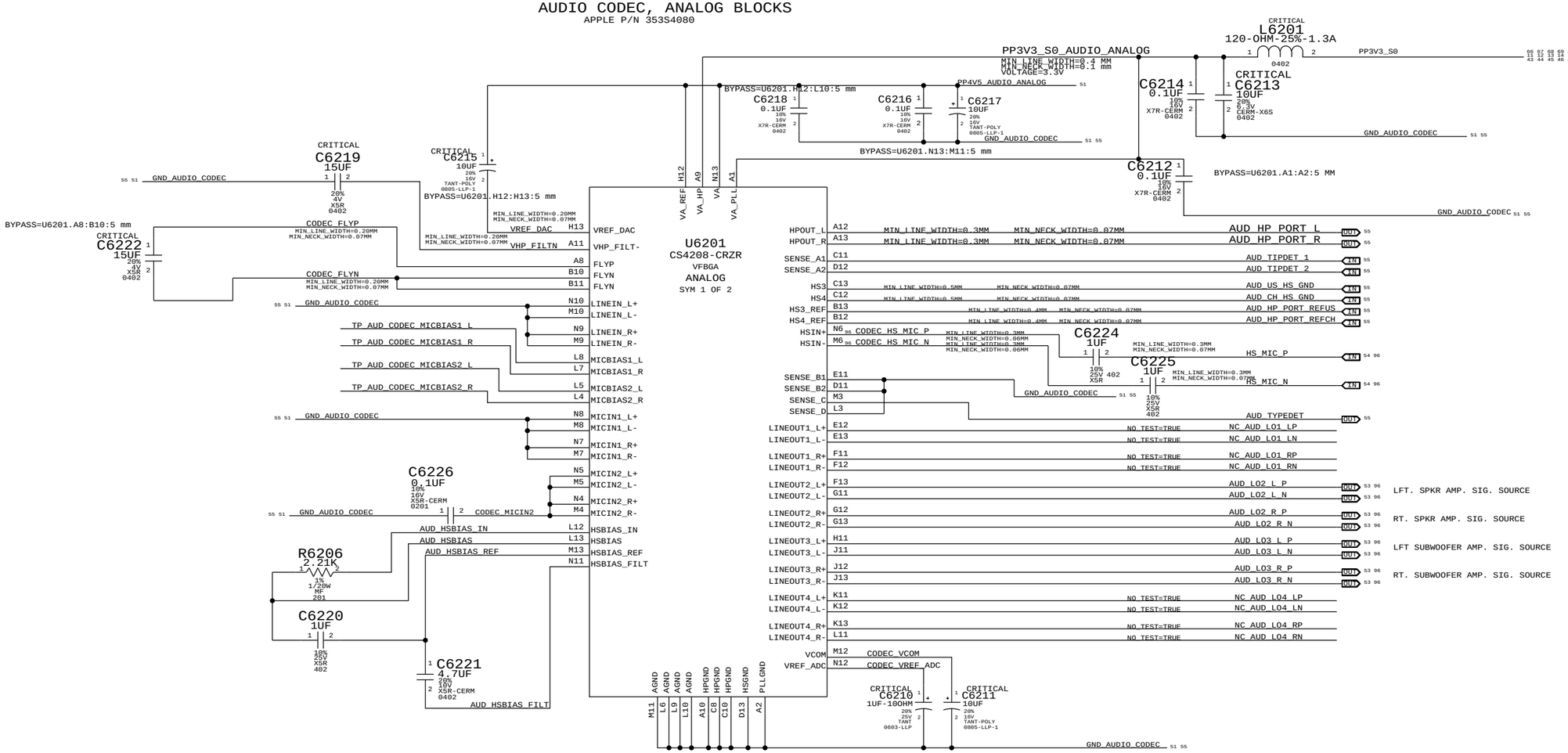
Sam Card ROM Slave

SPI ROM Slave

SYNC_MASTER=CLEAN_X425	SYNC_DATE=08/15/2014
PAGE TITLE: SPI Debug Connector	
Apple Inc.	DRAWING NUMBER: <SCH_NUM> SIZE: D
	REVISION: <E4LABEL>
	BRANCH: <BRANCH>
	PAGE: 61 OF 119
	SHEET: 50 OF 97

AUDIO CODEC, ANALOG BLOCKS

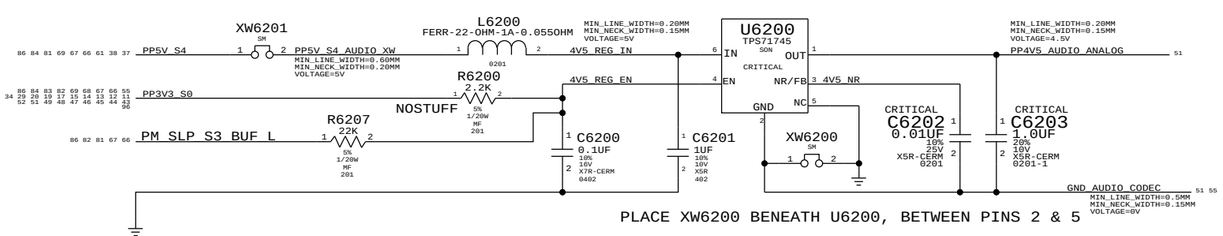
APPLE P/N 353S4080



4.5V POWER SUPPLY FOR CODEC

APPLE P/N 353S2456

PLACE XW6201 NEAR 5V SOURCE



PLACE XW6200 BENEATH U6200, BETWEEN PINS 2 & 5

SYNC_MASTER=J0E_J45	SYNC_DATE=07/30/2013
PAGE TITLE	AUDIO:CODEC, ANALOG
Apple Inc.	DRAWING NUMBER <SCH_NUM> SIZE D
	REVISION <E4LABEL>
	BRANCH <BRANCH>
	PAGE 62 OF 119
	SHEET 51 OF 97

AUDIO CODEC, DIGITAL BLOCKS

APPLE P/N 353S4080

L6300
FERR-22-OHM-1A-0.055OHM
0201

PP1V5_S0 → C6300 4.7UF 20% 4V X5R-1 402; C6301 0.1UF 10% 16V X7R-CERM 0201 (BYPASS=U6201.J2:J1:5 mm)

PP1V5_S0_AUDIO_DIG
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.07MM
VOLTAGE=1.5V

C6302 0.1UF 10% 16V X7R-CERM 0402 (BYPASS=U6201.E1:F1:5 mm)

PP3V3_S0 → R6324 100K 5% 1/20W MF 201; R6325 100K 5% 1/20W MF 201

R6323 100K 5% 1/20W MF 201 — PD_CS4208_GPIO1

NOSTUFF R6322 100K 5% 1/20W MF 201

R6331 22 5% 1/20W MF 201

C6303 0.1UF 10% 6.3V CERM-XSR 0201 (BYPASS=U6201.G1:F1:5 mm)
C6304 0.1UF 10% 6.3V CERM-XSR 0201
C6305 10UF 20% 6.3V CERM-X6S 0402 (BYPASS=U6201.K1:K3:5 mm)

PP3V3_S0 → C6306 10UF 20% 6.3V CERM-X6S 0402; C6307 0.1UF 10% 6.3V CERM-XSR 0201 (BYPASS=U6201.A7:E3:5 mm)

OMIT R6302 SHORT 402

R6330 33 5% 1/10W MF-LF 402 — SPDIF_OUT_JACK

R6332 75 1% 1/10W MF-LF 402 — DMIC_CLK3

U6201
CS4208-CRZR
VFBGA
DIGITAL
SYM 2 OF 2

GPIO0_SPKR_SHUTDOWN	H3	GPIO0
SPKRCONN_L_ID	H2	GPIO1
SPKRCONN_R_ID	H1	GPIO2
DFET_OPENUS	C4	GPIO3
DFET_OPENCH	C5	GPIO4
	C7	GPIO5
NC_CS4208_GPO0 (NO_TEST=TRUE)	C9	GPO0
NC_CS4208_GPO1 (NO_TEST=TRUE)	B9	GPO1
HDA_BIT_CLK	F2	BCLK
HDA_SYNC	E2	SYNC
CS4208_HDA_SDOUT0_R	D1	SDI0
HDA_SDIN0 / TP_CS4208_HDA_SDOUT1	C1	SDI1
HDA_SDOUT	D2	SDO0
	C2	SDO1
	C3	SDO2
HDA_RST_L	B1	SDO3
	D3	RST*
NC_CS4208_MCLKA (NO_TEST=TRUE)	A5	MCLK_A
NC_CS4208_SCLKA (NO_TEST=TRUE)	B2	SCLK_A
NC_CS4208_LRCLKA (NO_TEST=TRUE)	B4	LRCK_A
NC_CS4208_SDOUTA (NO_TEST=TRUE)	A3	SDOUT_A
	B3	SDIN_A
NC_CS4208_MCLKB (NO_TEST=TRUE)	A6	MCLK_B
NC_CS4208_SCLKB (NO_TEST=TRUE)	B6	SCLK_B
NC_CS4208_LRCLKB (NO_TEST=TRUE)	B5	LRCK_B
NC_CS4208_SDOUTB (NO_TEST=TRUE)	B8	SDOUT_B
	A4	SDIN_B
	C6	SDA
	B7	SCL
	J1	DGND
	F1	LGND
	E3	LGND
	F3	LGND
	J3	LGND
	K3	LGND
	VD J2	
	VL_HD E1	
	VL_SP A7	
	VL_IF G1	
	VL_DM K1	
SPDIF_IN	G3	CS4208_SPDIF_IN
SPDIF_OUT	G2	CS4208_SPDIF_OUT
DMIC_SDA0	N3	
DMIC_SCL0	N2	NO_TEST=TRUE — NC_DMIC_CLK0
DMIC_SDA1	N1	
DMIC_SCL1	M1	NO_TEST=TRUE — NC_DMIC_CLK1
DMIC_SDA2	M2	
DMIC_SCL2	L1	NO_TEST=TRUE — NC_DMIC_CLK2
DMIC_SDA3	K2	
DMIC_SCL3	L2	
NC	F6	
NC	F7	
NC	F8	
NC	G6	
NC	G7	
NC	G8	
NC	H6	
NC	H7	
NC	H8	

PP6301 P3MMSM — DMIC_SDA3 — PLACE_NEAR=U6201.N3:5 mm

PP6302 P3MMSM — HDA_BIT_CLK — PLACE_NEAR=U6201.F2:5 mm

PP6303 P3MMSM — HDA_SYNC — PLACE_NEAR=U6201.E2:5 mm

PP6304 P3MMSM — HDA_SDOUT — PLACE_NEAR=U6201.D2:5 mm

PP6305 P3MMSM — CS4208_HDA_SDOUT0_R — PLACE_NEAR=U6201.D1:5 mm

SYNC_MASTER=JOE_J45 SYNC_DATE=07/30/2013

PAGE TITLE: AUDIO:CODEC, DIGITAL

Apple Inc.

DRAWING NUMBER: <SCH_NUM> SIZE: D
REVISION: <E4LABEL>
BRANCH: <BRANCH>
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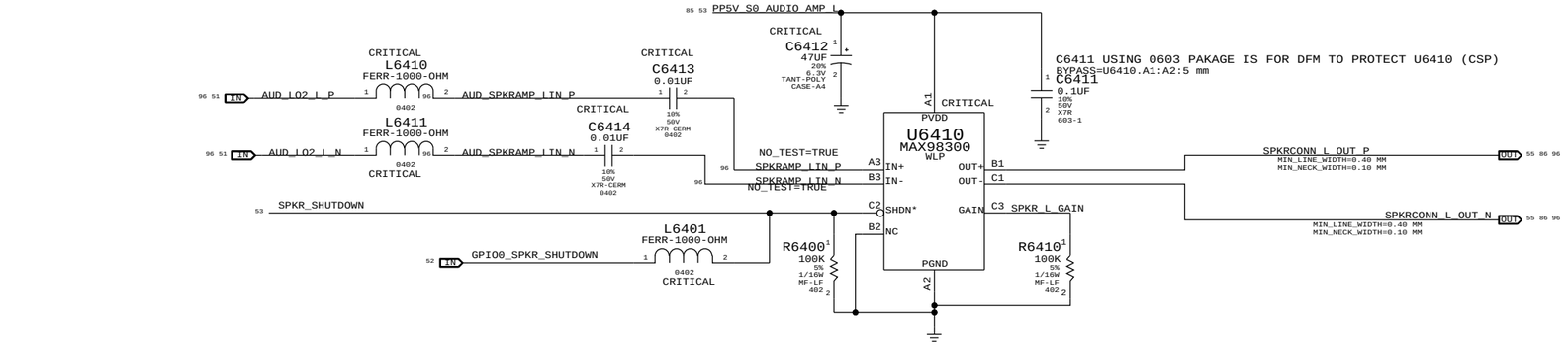
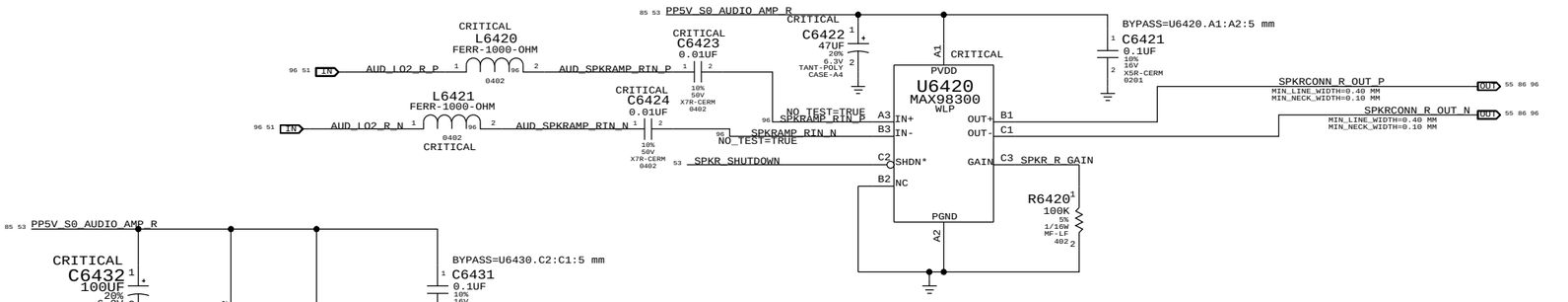
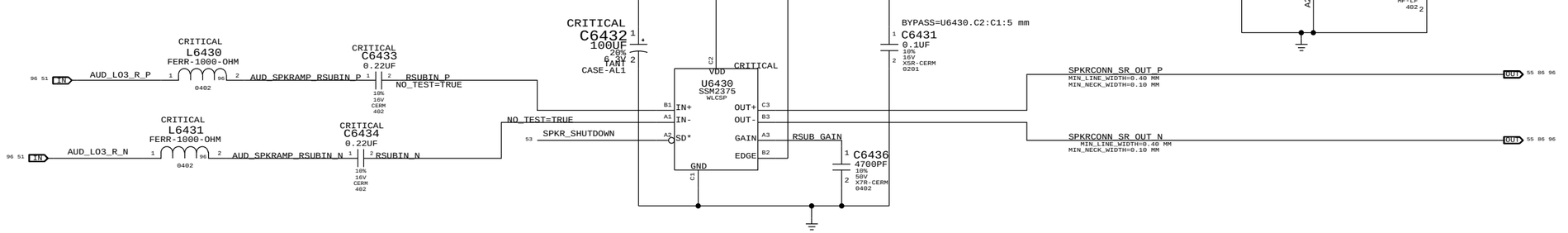
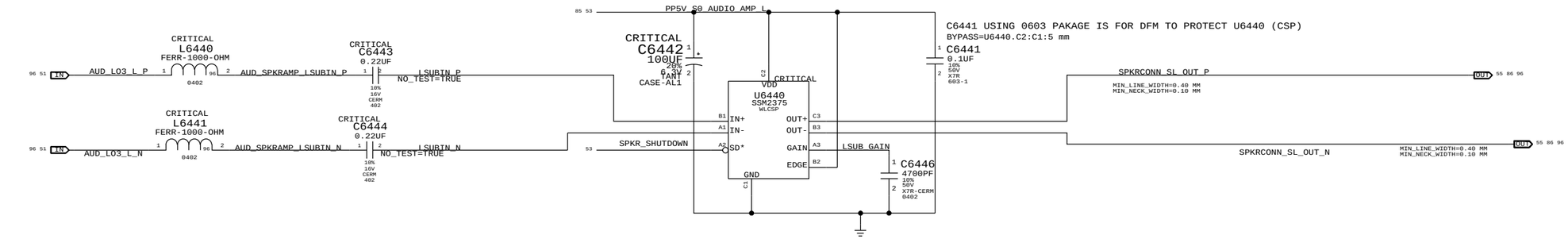
4X MONO SPEAKER AMPLIFIERS (MAX98300 & SSM2375)
APN: 353S2888 & 353S2958
GAIN = +3 DB
1ST ORDER FC (L&R) = NOM 569 HZ
1ST ORDER FC (SUB) = NOM 9 HZ









SYNC_MASTER=JOE_J45 SYNC_DATE=07/30/2013

PAGE TITLE
AUDIO: SPEAKER AMP

Apple Inc.

DRAWING NUMBER <SCH_NUM> SIZE D
REVISION <E4LABEL>
BRANCH <BRANCH>
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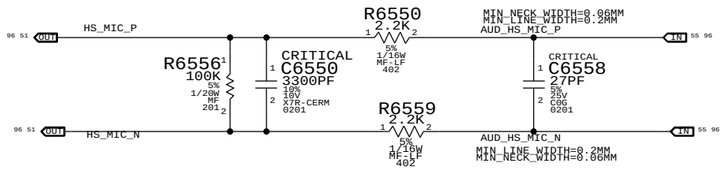

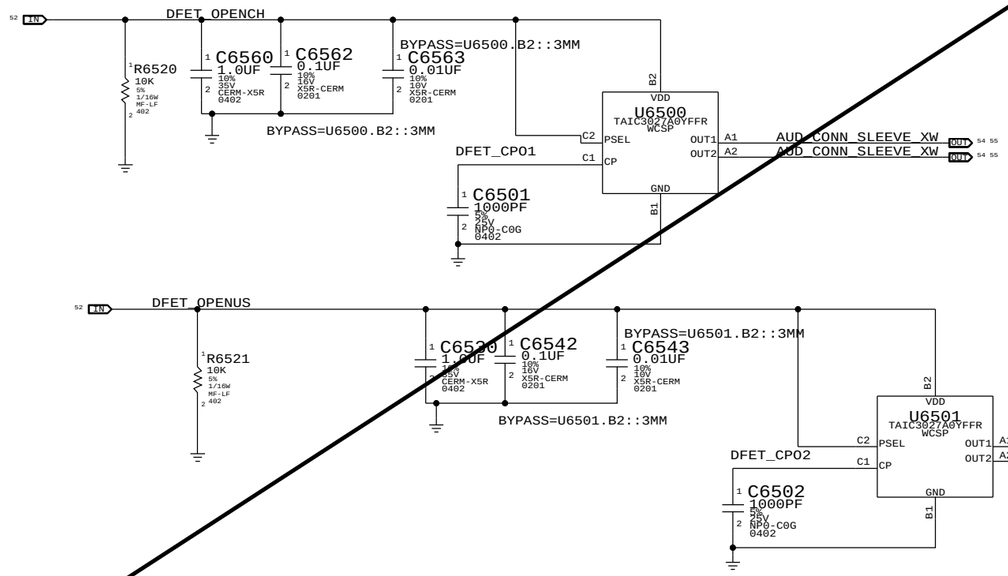

SYNC_MASTER=CLEAN_X305 SYNC_DATE=06/24/2014

PAGE TITLE

AUDIO: JACK

Apple Inc.

DRAWING NUMBER <SCH_NUM> SIZE D

REVISION <E4LABEL>

BRANCH <BRANCH>

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CODEC OUTPUT SIGNAL PATHS

FUNCTION	VOLUME	CONVERTER	PIN COMPLEX	MUTE CONTROL
HP/HS OUT	0X02 (2)	0X02 (2)	0X10 (16)	N/A
TWEETERS	0X03 (3)	0X03 (3)	0X12 (18)	CODEC GPIO0
SUB	0X04 (4)	0X04 (4)	0X13 (19)	CODEC GPIO0
SPDIF OUT	N/A	0X0E (14)	0X21 (33)	N/A

CODEC INPUT SIGNAL PATHS

FUNCTION	CONVERTER	PIN COMPLEX	VREF
DMIC 1	0X09 (9)	0X1C (28)	3.3V
DMIC 2	0X09 (9)	0X1C (28)	3.3V
HEADSET MIC	0X07 (7)	0X18 (24)	2.7V

OTHER CODEC GPIO LINES

LEFT SPEAKER ID	GPIO2	INPUT	HIGH = FG, LOW = MERRY
RIGHT SPEAKER ID	GPIO3	INPUT	HIGH = FG, LOW = MERRY
DFET CONTROL	GPIO4	OUTPUT	HIGH = DFETs OPEN

2-MIC CONNECTOR
APN: 518S0769

J6601
FF14A-5C-R11DL-B-3H
F-RT-SM

PP3V3_S0
DMIC_SDA3
DMIC_CLK3
OMIT
R6680
SHORT
402
DMIC_SDA2

SPEAKER CONNECTOR HP=80HZ
APN: 518S0672

CRITICAL
J6602
78171-6006
M-RT-SM
SPKRCONN_L_OUT_P
SPKRCONN_L_OUT_N
SPKRCONN_L_ID
SPKRCONN_SL_OUT_P
SPKRCONN_SL_OUT_N

CRITICAL
J6603
78171-6006
M-RT-SM
SPKRCONN_R_OUT_P
SPKRCONN_R_OUT_N
SPKRCONN_R_ID
SPKRCONN_SR_OUT_P
SPKRCONN_SR_OUT_N

CRITICAL L6611 120-OHM-25%-1.3A 0402
AUD_HP_PORT_REFCH
AUD_CONN_SLEEVE
MIN_LINE_WIDTH=0.4MM
MIN_NECK_WIDTH=0.06MM
PLACE_NEAR=J6600.3:2.54mm
XW6600 SM
CRITICAL L6612 120-OHM-25%-1.3A 0402
AUD_CONN_SLEEVE_XW
MIN_LINE_WIDTH=0.5MM
MIN_NECK_WIDTH=0.1MM
AUD_CH_HS_GND
XW6601 SM
AUD_HS_MIC_P

CRITICAL L6613 120-OHM-25%-1.3A 0402
AUD_HP_PORT_REFUS
AUD_CONN_RING2
MIN_LINE_WIDTH=0.4MM
MIN_NECK_WIDTH=0.06MM
PLACE_NEAR=J6600.5:2.54mm
XW6602 SM
CRITICAL L6614 120-OHM-25%-1.3A 0402
AUD_CONN_RING2_XW
MIN_LINE_WIDTH=0.5MM
MIN_NECK_WIDTH=0.1MM
AUD_US_HS_GND
XW6603 SM
AUD_HS_MIC_N

CRITICAL L6604 120-OHM-25%-1.3A 0402
AUD_HP_PORT_L
AUD_CONN_HP_LEFT
MIN_LINE_WIDTH=0.3MM
MIN_NECK_WIDTH=0.06MM
R6602 2.2K 5% 1/20W MF 201
CRITICAL L6608 FERR-470-OHM 0201
AUD_TIPDET_2
AUD_CONN_TIPDET_2
GND_AUDIO_CODEC
R6603 2.2K 5% 1/20W MF 201
CRITICAL L6607 FERR-470-OHM 0201
AUD_TIPDET_1
CRITICAL L6605 120-OHM-25%-1.3A 0402
AUD_CONN_TIPDET_1
AUD_HP_PORT_R
AUD_CONN_HP_RIGHT
MIN_LINE_WIDTH=0.3MM
MIN_NECK_WIDTH=0.06MM
CRITICAL L6606 FERR-470-OHM 0201
AUD_TYPEDET
AUD_CONN_TYPEDET
SPDIF_OUT_JACK
PP3V3_S0

APN: 514-0875
J6600
AUDIO-SPDIF-J44
F-RT-TH
MIC
AUDIO GND
2RTN
DET2
DET1
1RTN
R.AUDIO
AUDIO GND
AUDIO
NC
VIN
VDD
GND
OPERATING VOLTAGE 3.3
POF
SHELL PINS

R6601 10K 5% 1/16W MF-LF 402
CRITICAL DZ6607 ESDALC5-1BM2 SOD882
C6603 100PF 5% 25V C0G 0201
CRITICAL DZ6601 ESDALC5-1BM2 SOD882
C6602 100PF 5% 25V C0G 0201
C6604 100PF 5% 25V C0G 0201
CRITICAL DZ6602 ESDALC5-1BM2 SOD882
C6605 100PF 5% 25V C0G 0201
CRITICAL DZ6603 ESDALC5-1BM2 SOD882
C6606 100PF 5% 25V C0G 0201
CRITICAL DZ6606 ESDALC5-1BM2 SOD882
CRITICAL DZ6605 ESDALC5-1BM2 SOD882
C6607 100PF 5% 25V C0G 0201
C6608 100PF 5% 25V C0G 0201
CRITICAL DZ6604 ESDALC5-1BM2 SOD882
C6600 1UF 10% 10V X5R 402-1
C6601 0.1UF 10% 6.3V CERM-X5R 0201

SYNC_MASTER=CLEAN_X305 SYNC_DATE=06/24/2014
PAGE TITLE
AUDIO: JACK TRANSLATORS

Apple Inc.

DRAWING NUMBER <SCH_NUM> SIZE D
REVISION <E4LABEL>
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MagSafe DC Power Jack

CRITICAL
F7005
6AMP-32V-0.00950HM
0603

PPDCIN G3H

CRITICAL
J7000
WTB-PWR-M82
M-RT-SM

PP20V_DCIN_FUSE
MIN_LINE_WIDTH=1MM
MIN_NECK_WIDTH=0.20MM
VOLTAGE=20V

NOSTUFF
C7005
0.01UF
20%
50V
CERM
0603

TP_TDM_ONEWIRE_MPM

518S0508

PP3V42_G3H

C7008
0.1UF
20%
10V
CERM
402
PLACEMENT_NOTE=PLACE NEAR U7100 and U7001

CRITICAL
U7001
TC7SZ08FEAPE
SOT665

SMC_BC_ACOK_VCC
SMC_BC_ACOK
SMC_BC_ACOK_L

C7000
0.1UF
20%
10V
CERM
402

R7029
2.0K
5%
1/16W
MF-LF
402

U7000
MAX9940
SC70-5
CRITICAL
VCC
EXT
INT
NC
GND

ADAPTER_SENSE
SYS_ONEWIRE
1-Wire_BI

1-Wire OverVoltage Protection

The chassis ground will otherwise float and can send transients onto ADAPTER_SENSE when AC is connected.

R7012
22.1K
1%
1/20W
MF
201

Input impedance of 22.1K meets sparkitecture requirements for D2 design only

Q7010
SI5419DU
POWERPAK

R7010
100K
5%
1/20W
MF
201

C7012
0.047UF
10%
25V
X7R
0402

R7011
10K
5%
1/20W
MF
201

When input voltage is 2V the FET will be off blocking the leakage path and 22.1K can be properly detected.

When input voltage is at 16V+, FET will conduct and power charger and 3.42V reg

DCIN_ISOL_GATE_R
DCIN_ISOL_GATE
PPDCIN_G3H_ISOL

D7010
CDZ6.8B
SM
6.8V Zener

R7020
47
1%
1/2W
MF
805

PP20V_DCIN_CONN_R
MIN_LINE_WIDTH=0.5 mm
MIN_NECK_WIDTH=0.25 mm
VOLTAGE=20V

CRITICAL
D7005
BAT30CWFILM
SOT-323

R7005
10
5%
1/8W
MF-LF
805

PPBUS_G3H
PPBUS_G3H_R
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.25 mm
VOLTAGE=18.5V

PPVIN_G3H_P3V42G3H
MIN_LINE_WIDTH=0.4 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=20V

APN:353S3733
3.425V "G3Hot" Supply

Supply needs to guarantee 3.31V delivered to SMC VRef generator

NOTE: MIRROR C7092 and C7096

NOSTUFF C7090 4.7UF 10% 25V X5R-CERM 0603
NOSTUFF C7091 4.7UF 10% 25V X5R-CERM 0603
C7092 4.7UF 10% 25V X5R-CERM 0603
C7093 4.7UF 10% 25V X5R-CERM 0603
C7096 4.7UF 10% 25V X5R-CERM 0603
C7097 4.7UF 10% 25V X5R-CERM 0603

NOTE: MIRROR C7093 and C7097

R7001
0
5%
1/20W
MF
0201

P3V42G3H_SHDN_L

OMIT
C7001
NOSTUFF
NONE
NONE
NONE
402

NOSTUFF
R7002
49.9K
1%
1/20W
MF
201

U7090
LT3470AED
DFN
CRITICAL
VIN
BOOST
SHDN*
NC
SW
BIAS
FB
THRM
GND
PAD

P3V42G3H_BOOST
DIDT=TRUE

C7094
0.22UF
10%
16V
CERM
402

CRITICAL
L7095
10UH-20%-0.85A-0.460HM
2520

P3V42G3H_SW
MIN_LINE_WIDTH=0.5 mm
MIN_NECK_WIDTH=0.25 mm
SWITCH_NODE=TRUE
DIDT=TRUE

PP3V42_G3H

Vout = 3.425V
300MA MAX OUTPUT
(Switcher limit)

NOTE: R7097 can be replaced by SHORT at PVT

R7097
0
5%
1/10W
MF-LF
402

C7099
10UF
20%
6.3V
CERM-X6S
0402

C7098
10UF
20%
6.3V
CERM-X6S
0402

P3V42G3H_BIAS
<Ra>
R7095
348K
1%
1/20W
MF
201

C7095
22PF
5%
50V
C0G
0201

P3V42G3H_FB
<Rb>
R7096
200K
1%
1/20W
MF
201

Vout = 1.25V * (1 + Ra / Rb)

BATTERY CONNECTOR

518-0376
CRITICAL
J7050
BAT-J5
F-ST-TH

POS 1
POS 2
POS 3
POS 4
SCL 5
SDA 6
SYS_DETECT 7
NEG 8
NEG 9
NEG 10
NEG 11
NC
NC
VER 1

PP_BAT_G3H_CONN
SMBUS_SMC_5_G3_SCL
SMBUS_SMC_5_G3_SDA
SYS_DETECT_L

C7050
0.1UF
10%
25V
X7R-CERM
0402

C7060
1UF
10%
16V
CER-X6S
0402

CRITICAL
D7050
RCLAMP2402B
SC-75

R7050
10K
5%
1/16W
MF-LF
402

SYNC_MASTER=CLEAN X425
SYNC_DATE=11/04/2014

PAGE TITLE
DC-In & Battery Connectors

Apple Inc.

DRAWING NUMBER <SCH_NUM>
SIZE D
REVISION <E4LABEL>
BRANCH <BRANCH>
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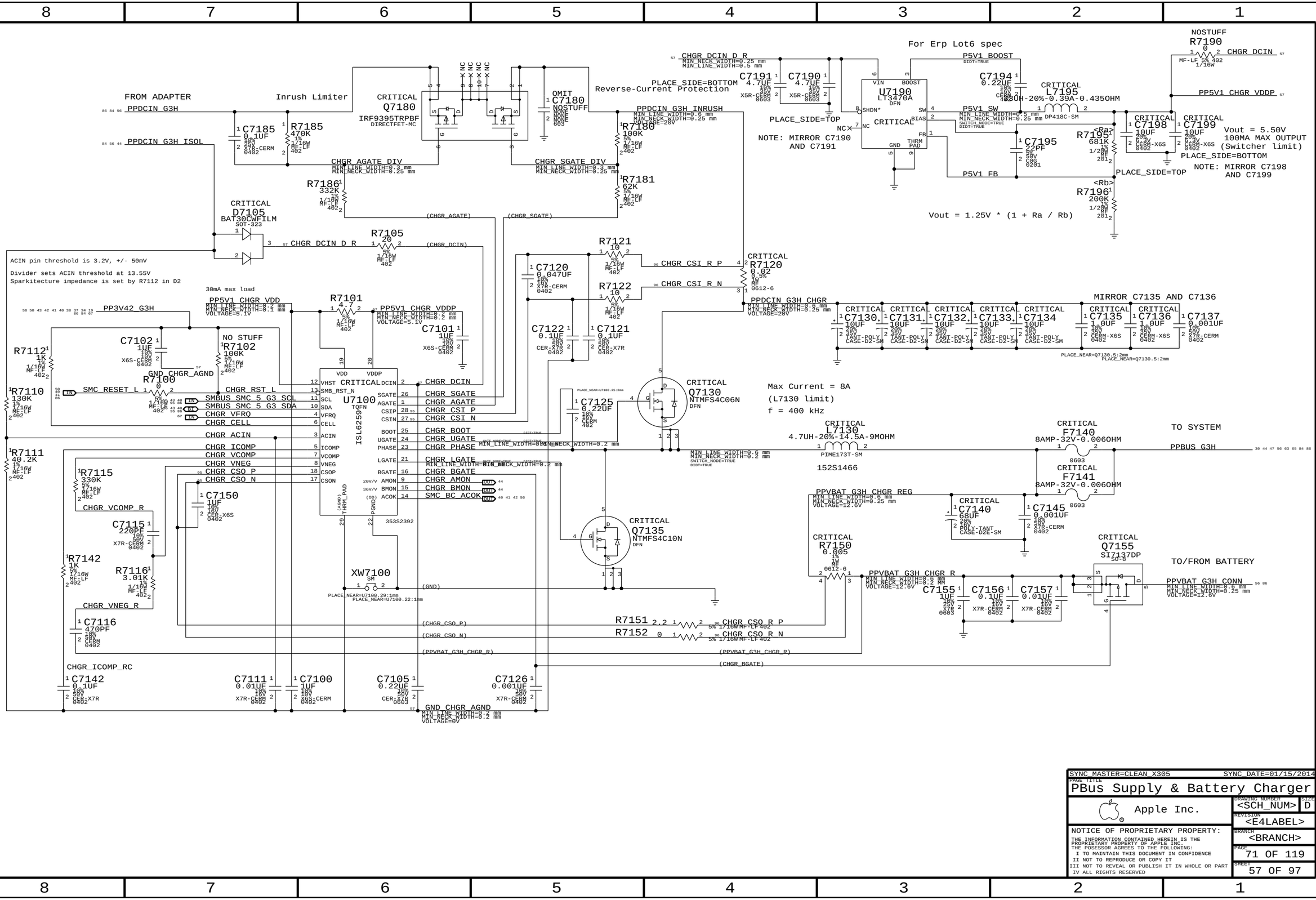
FROM ADAPTER
PPDCIN G3H
PPDCIN G3H ISOL
Inrush Limiter
CRITICAL
Q7180
IRF9395TRPBF
DIRECTFET-MC
Reverse-Current Protection
PLACE_SIDE=BOTTOM
OMIT
C7180
NOSTUFF
PPDCIN G3H INRUSH
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.25 mm
VOLTAGE=20V
R7180
100K
R7185
470K
C7185
0.1UF
CHGR AGATE DIV
CHGR SGATE DIV
R7186
332K
R7181
62K
CRITICAL
D7105
BAT30CWFILM
SOT-323
CHGR DCIN D R
R7105
20
(CHGR_AGATE)
(CHGR_SGATE)
(CHGR_DCIN)
ACIN pin threshold is 3.2V, +/- 50mV
Divider sets ACIN threshold at 13.55V
Sparkitecture impedance is set by R7112 in D2
30mA max load
PP3V42_G3H
PP5V1 CHGR VDD
PP5V1 CHGR VDDP
R7101
4.7
C7101
1UF
R7112
1K
C7102
1UF
NO STUFF
R7102
100K
GND_CHGR_AGND
R7100
0
R7110
130K
SMC_RESET_L
CHGR_RST_L
SMBUS_SMC_5_G3_SCL
SMBUS_SMC_5_G3_SDA
CHGR_VFRQ
CHGR_CELL
CHGR_ACIN
R7111
40.2K
R7115
330K
C7150
1UF
CHGR_VCOMP_R
C7115
220PF
R7142
1K
R7116
3.01K
CHGR_VNEG_R
C7116
470PF
CHGR_ICOMP_RC
C7142
0.1UF
C7111
0.01UF
C7100
1UF
C7105
0.22UF
C7126
0.001UF
GND_CHGR_AGND
MIN_LINE_WIDTH=0.2 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=0V
U7100
ISL6259
TQFN
VHST
SMB_RST_N
SCL
SDA
VFRQ
CELL
ACIN
ICOMP
VCOMP
VNEG
VSOP
VSON
(AGND)
THRM_PAD
PGND
DCIN
SGATE
AGATE
CSIP
CSIN
BOOT
UGATE
PHASE
LGATE
BGATE
AMON
BMON
ACOK
CHGR_DCIN
CHGR_SGATE
CHGR_AGATE
CHGR_CSI_P
CHGR_CSI_N
CHGR_BOOT
CHGR_UGATE
CHGR_PHASE
CHGR_LGATE
CHGR_BGATE
CHGR_AMON
CHGR_BMON
SMC_BC_ACOK
353S2392
XW7100
SM
(GND)
PLACE_NEAR=U7100.29:1mm
PLACE_NEAR=U7100.22:1mm
R7121
10
R7122
10
CHGR_CSI_R_P
CHGR_CSI_R_N
C7120
0.047UF
C7122
0.1UF
C7121
0.1UF
CRITICAL
R7120
0.02
PPDCIN_G3H_CHGR
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.25 mm
VOLTAGE=20V
CRITICAL
Q7130
NTMFS4C06N
DFN
C7125
0.22UF
Max Current = 8A
(L7130 limit)
f = 400 kHz
CRITICAL
L7130
4.7UH-20%-14.5A-9MOHM
PIME173T-SM
152S1466
CRITICAL
Q7135
NTMFS4C10N
DFN
PPVBAT_G3H_CHGR_REG
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.25 mm
VOLTAGE=12.6V
CRITICAL
R7150
0.005
1%
1W
MF
0612-6
R7151
2.2
R7152
0
CHGR_CSO_R_P
CHGR_CSO_R_N
(CHGR_CSO_P)
(CHGR_CSO_N)
(PPVBAT_G3H_CHGR_R)
(CHGR_BGATE)
PPVBAT_G3H_CHGR_R
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=12.6V
C7155
1UF
C7156
0.1UF
C7157
0.01UF
CRITICAL
Q7155
SI7137DP
SO-8
TO/FROM BATTERY
PPVBAT_G3H_CONN
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.25 mm
VOLTAGE=12.6V
For Erp Lot6 spec
CHGR_DCIN_D_R
C7191
4.7UF
C7190
4.7UF
P5V1 BOOST
U7190
LT3470A
DFN
VIN
BOOST
SHDN*
SW
BIAS
FB
THRM
GND
PAD
C7194
0.22UF
CRITICAL
L7195
2.2UH-20%-0.39A-0.435OHM
DP418C-SM
P5V1 SW
P5V1 FB
C7195
22PF
<Ra>
R7195
681K
<Rb>
R7196
200K
Vout = 1.25V * (1 + Ra / Rb)
NOSTUFF
R7190
0
CHGR_DCIN
PP5V1_CHGR_VDDP
CRITICAL
C7198
10UF
CRITICAL
C7199
10UF
Vout = 5.50V
100MA MAX OUTPUT
(Switcher limit)
PLACE_SIDE=BOTTOM
NOTE: MIRROR C7198
AND C7199
PLACE_SIDE=TOP
NOTE: MIRROR C7190
AND C7191
MIRROR C7135 AND C7136
CRITICAL
C7130
CRITICAL
C7131
CRITICAL
C7132
CRITICAL
C7133
CRITICAL
C7134
CRITICAL
C7135
CRITICAL
C7136
C7137
0.001UF
PLACE_NEAR=Q7130.5:2mm
TO SYSTEM
PPBUS_G3H
CRITICAL
F7140
8AMP-32V-0.006OHM
CRITICAL
F7141
8AMP-32V-0.006OHM
C7140
68UF
C7145
0.001UF
SYNC_MASTER=CLEAN_X305
SYNC_DATE=01/15/2014
PAGE TITLE
PBus Supply & Battery Charger
Apple Inc.
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<SCH_NUM>
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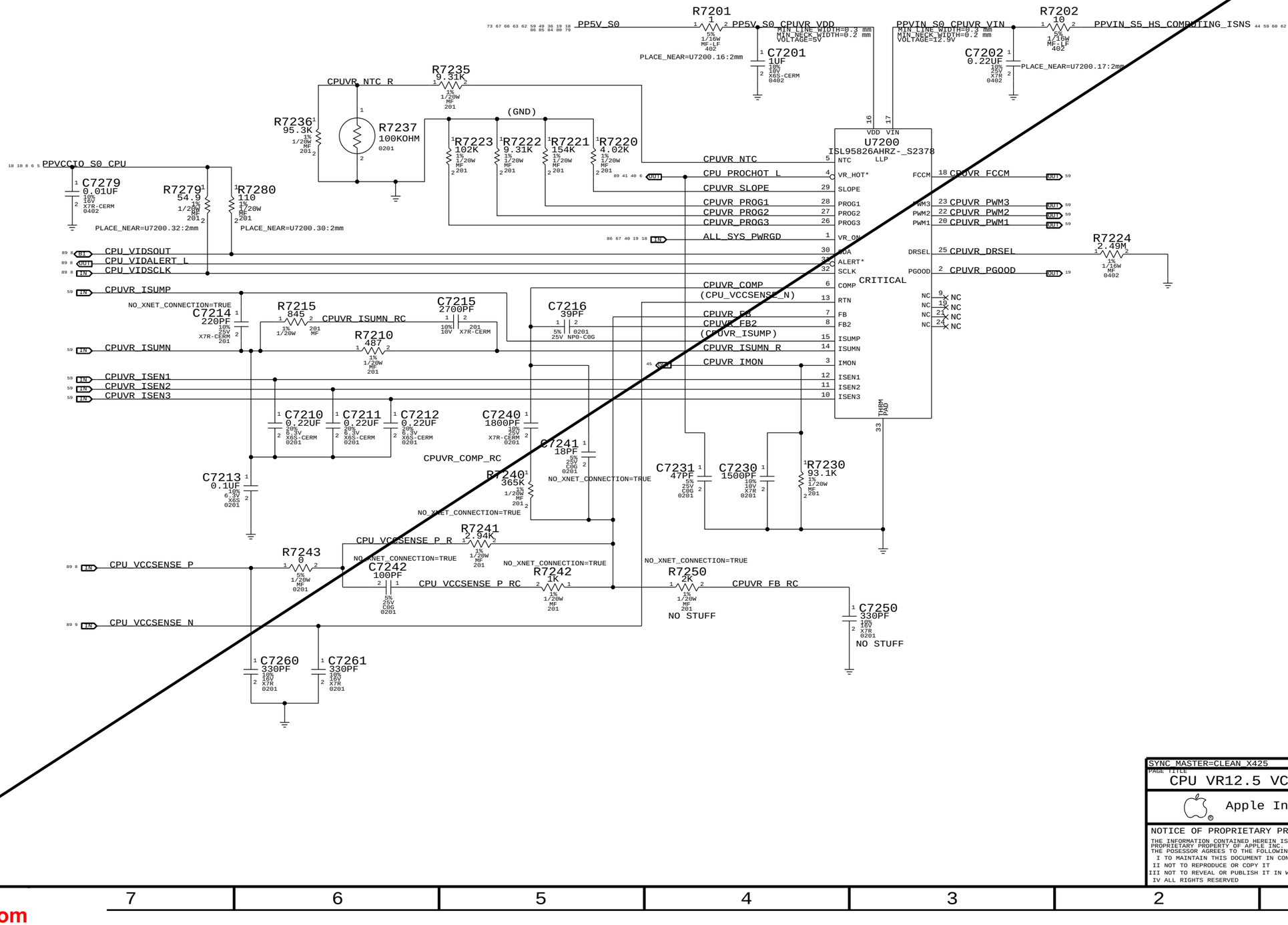

SYNC_MASTER=CLEAN_X425	SYNC_DATE=01/09/2015
PAGE TITLE	CPU VR12.5 VCC Regulator IC
Apple Inc.	DRAWING NUMBER <SCH_NUM> SIZE D
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FOR DESENSE IMPROVEMENT
LOCATION DEPENDS ON DESENSE TEAM

PPVIN_S5_HS_COMPUTING_ISNS

PP5V_S0

PHASE 1

U7310 FDMF6808N PQFN CRITICAL
353S3836

R7311 0 5% 1/10W MF-LF 402
C7311 0.22UF 10% 16V CERM 402
C7310 1UF 10% 16V X6S-CERM 0402

CPUVR_BOOT1_RC — MIN_LINE_WIDTH=0.25 MM, MIN_NECK_WIDTH=0.2 MM, DIDT=TRUE
CPUVR_BOOT1 — MIN_LINE_WIDTH=0.25 MM, MIN_NECK_WIDTH=0.2 MM, DIDT=TRUE
CPUVR_PHASE1_K
CPUVR_PWM1
CPUVR_FCCM

C7340 CRITICAL 12PF 5% NP0-C0G 0201 25V
C7341 CRITICAL 3.0PF ±0.1PF 25V NP0-C0G 0201

C7313 CRITICAL 68UF 20% 16V POLY-TANT CASE-D2E-SM
C7314 CRITICAL 68UF 20% 16V POLY-TANT CASE-D2E-SM
C7315 NOSTUFF CRITICAL 10UF 20% 16V X6S-CERM 0603
C7316 NOSTUFF CRITICAL 10UF 20% 16V X6S-CERM 0603
C7317 1UF 10% 16V X6S-CERM 0402
C7318 0.001UF 10% 50V X7R-CERM 0402
C7319 0.001UF 10% 50V X7R-CERM 0402
THESE TWO CAPS ARE FOR EMC

R7310 0.00075 1% 1W MF 0612-1 CRITICAL
L7310 CRITICAL 0.36UH-20%-36A-0.001080HM PIMS103T-SM 152S1538
CPUVR_PHASE1 — MIN_LINE_WIDTH=1.5 MM, MIN_NECK_WIDTH=0.2 MM, DIDT=TRUE, SWITCH_NODE=TRUE
PPVCC_S0_CPU_PH1 — MIN_LINE_WIDTH=0.6 MM, MIN_NECK_WIDTH=0.25 MM, VOLTAGE=1.8V
CPUVR_ISNS1_P
CPUVR_ISNS1_N
R7312 NOSTUFF 2.2 5% 1/10W MF-LF 603
C7312 0.001UF 10% 50V X7R-CERM 0402 DIDT=TRUE NOSTUFF
CPUVR_PH1_SNUB
R7314 3.9 1% 1/20W MF 201 NO_XNET_CONNECTION=TRUE
R7315 1K 1% 1/20W MF 201 NO_XNET_CONNECTION=TRUE
R7316 10K 1% 1/20W MF 201 NO_XNET_CONNECTION=TRUE
CPUVR_ISUMN
CPUVR_ISEN1
CPUVR_ISUMP
R7317 10K 1% 1/20W MF 201 CPUVR_ISNS2_N NO_XNET_CONNECTION=TRUE
R7318 10K 1% 1/20W MF 201 CPUVR_ISNS3_N NO_XNET_CONNECTION=TRUE

Additonal Input Bulk Caps

C7370 CRITICAL 68UF 20% 16V POLY-TANT CASE-D2E-SM
C7371 CRITICAL 68UF 20% 16V POLY-TANT CASE-D2E-SM
C7372 CRITICAL 68UF 20% 16V POLY-TANT CASE-D2E-SM
C7373 CRITICAL 68UF 20% 16V POLY-TANT CASE-D2E-SM
C7374 CRITICAL 68UF 20% 16V POLY-TANT CASE-D2E-SM
C7375 CRITICAL 68UF 20% 16V POLY-TANT CASE-D2E-SM
C7376 CRITICAL 68UF 20% 16V POLY-TANT CASE-D2E-SM
C7377 CRITICAL 15UF 20% 16V TANT SM
C7378 CRITICAL 15UF 20% 16V TANT SM
C7379 CRITICAL 15UF 20% 16V TANT SM
C7380 CRITICAL 15UF 20% 16V TANT SM

PP5V_S0

PHASE 2

U7320 FDMF6808N PQFN CRITICAL
353S3836

R7321 0 5% 1/10W MF-LF 402
C7321 0.22UF 10% 16V CERM 402
C7320 1UF 10% 16V X6S-CERM 0402

CPUVR_BOOT2_RC — MIN_LINE_WIDTH=0.25 MM, MIN_NECK_WIDTH=0.2 MM, DIDT=TRUE
CPUVR_BOOT2 — MIN_LINE_WIDTH=0.25 MM, MIN_NECK_WIDTH=0.2 MM, DIDT=TRUE
CPUVR_PHASE2_K
CPUVR_PWM2
CPUVR_FCCM

C7323 CRITICAL 68UF 20% 16V POLY-TANT CASE-D2E-SM
C7324 CRITICAL 68UF 20% 16V POLY-TANT CASE-D2E-SM
C7325 NOSTUFF CRITICAL 10UF 20% 16V X6S-CERM 0603
C7326 NOSTUFF CRITICAL 10UF 20% 16V X6S-CERM 0603
C7327 1UF 10% 16V X6S-CERM 0402
C7328 0.001UF 10% 50V X7R-CERM 0402
C7329 0.001UF 10% 50V X7R-CERM 0402
THESE TWO CAPS ARE FOR EMC

R7320 0.00075 1% 1W MF 0612-1 CRITICAL
L7320 CRITICAL 0.36UH-20%-36A-0.001080HM PIMS103T-SM 152S1538
CPUVR_PHASE2 — MIN_LINE_WIDTH=1.5 MM, MIN_NECK_WIDTH=0.2 MM, DIDT=TRUE, SWITCH_NODE=TRUE
PPVCC_S0_CPU_PH2 — MIN_LINE_WIDTH=0.6 MM, MIN_NECK_WIDTH=0.25 MM, VOLTAGE=1.8V
CPUVR_ISNS2_P
CPUVR_ISNS2_N
R7322 NOSTUFF 2.2 5% 1/10W MF-LF 603
C7322 0.001UF 10% 50V X7R-CERM 0402 DIDT=TRUE NOSTUFF
CPUVR_PH2_SNUB
R7324 3.9 1% 1/20W MF 201 NO_XNET_CONNECTION=TRUE
R7325 1K 1% 1/20W MF 201 NO_XNET_CONNECTION=TRUE
R7326 10K 1% 1/20W MF 201 NO_XNET_CONNECTION=TRUE
CPUVR_ISUMN
CPUVR_ISEN2
CPUVR_ISUMP
R7327 10K 1% 1/20W MF 201 CPUVR_ISNS1_N NO_XNET_CONNECTION=TRUE
R7328 10K 1% 1/20W MF 201 CPUVR_ISNS3_N NO_XNET_CONNECTION=TRUE

PPVCC_S0_CPU

Vout = 1.85V max
95A max output
f = 450 kHz

PP5V_S0

PHASE 3

U7330 FDMF6808N PQFN CRITICAL
353S3836

R7331 0 5% 1/10W MF-LF 402
C7331 0.22UF 10% 16V CERM 402
C7330 1UF 10% 16V X6S-CERM 0402

CPUVR_BOOT3_RC — MIN_LINE_WIDTH=0.25 MM, MIN_NECK_WIDTH=0.2 MM, DIDT=TRUE
CPUVR_BOOT3 — MIN_LINE_WIDTH=0.25 MM, MIN_NECK_WIDTH=0.2 MM, DIDT=TRUE
CPUVR_PHASE3_K
CPUVR_PWM3
CPUVR_FCCM

C7333 CRITICAL 68UF 20% 16V POLY-TANT CASE-D2E-SM
C7334 CRITICAL 68UF 20% 16V POLY-TANT CASE-D2E-SM
C7335 NOSTUFF CRITICAL 10UF 20% 16V X6S-CERM 0603
C7336 NOSTUFF CRITICAL 10UF 20% 16V X6S-CERM 0603
C7337 1UF 10% 16V X6S-CERM 0402
C7338 0.001UF 10% 50V X7R-CERM 0402
C7339 0.001UF 10% 50V X7R-CERM 0402
THESE TWO CAPS ARE FOR EMC

R7330 0.00075 1% 1W MF 0612-1 CRITICAL
L7330 CRITICAL 0.36UH-20%-36A-0.001080HM PIMS103T-SM 152S1538
CPUVR_PHASE3 — MIN_LINE_WIDTH=1.5 MM, MIN_NECK_WIDTH=0.2 MM, DIDT=TRUE, SWITCH_NODE=TRUE
PPVCC_S0_CPU_PH3 — MIN_LINE_WIDTH=0.6 MM, MIN_NECK_WIDTH=0.25 MM, VOLTAGE=1.8V
CPUVR_ISNS3_P
CPUVR_ISNS3_N
R7332 NOSTUFF 2.2 5% 1/10W MF-LF 603
C7332 0.001UF 10% 50V X7R-CERM 0402 DIDT=TRUE NOSTUFF
CPUVR_PH3_SNUB
R7334 3.9 1% 1/20W MF 201 NO_XNET_CONNECTION=TRUE
R7335 1K 1% 1/20W MF 201 NO_XNET_CONNECTION=TRUE
R7336 10K 1% 1/20W MF 201 NO_XNET_CONNECTION=TRUE
CPUVR_ISUMN
CPUVR_ISEN3
CPUVR_ISUMP
R7337 10K 1% 1/20W MF 201 CPUVR_ISNS1_N NO_XNET_CONNECTION=TRUE
R7338 10K 1% 1/20W MF 201 CPUVR_ISNS2_N NO_XNET_CONNECTION=TRUE

SYNC_MASTER=CLEAN_X425 SYNC_DATE=01/09/2015

PAGE TITLE: CPU VR12.5 VCC Power Stage

Apple Inc.

DRAWING NUMBER: <SCH_NUM> SIZE: D
REVISION: <E4LABEL>
BRANCH: <BRANCH>
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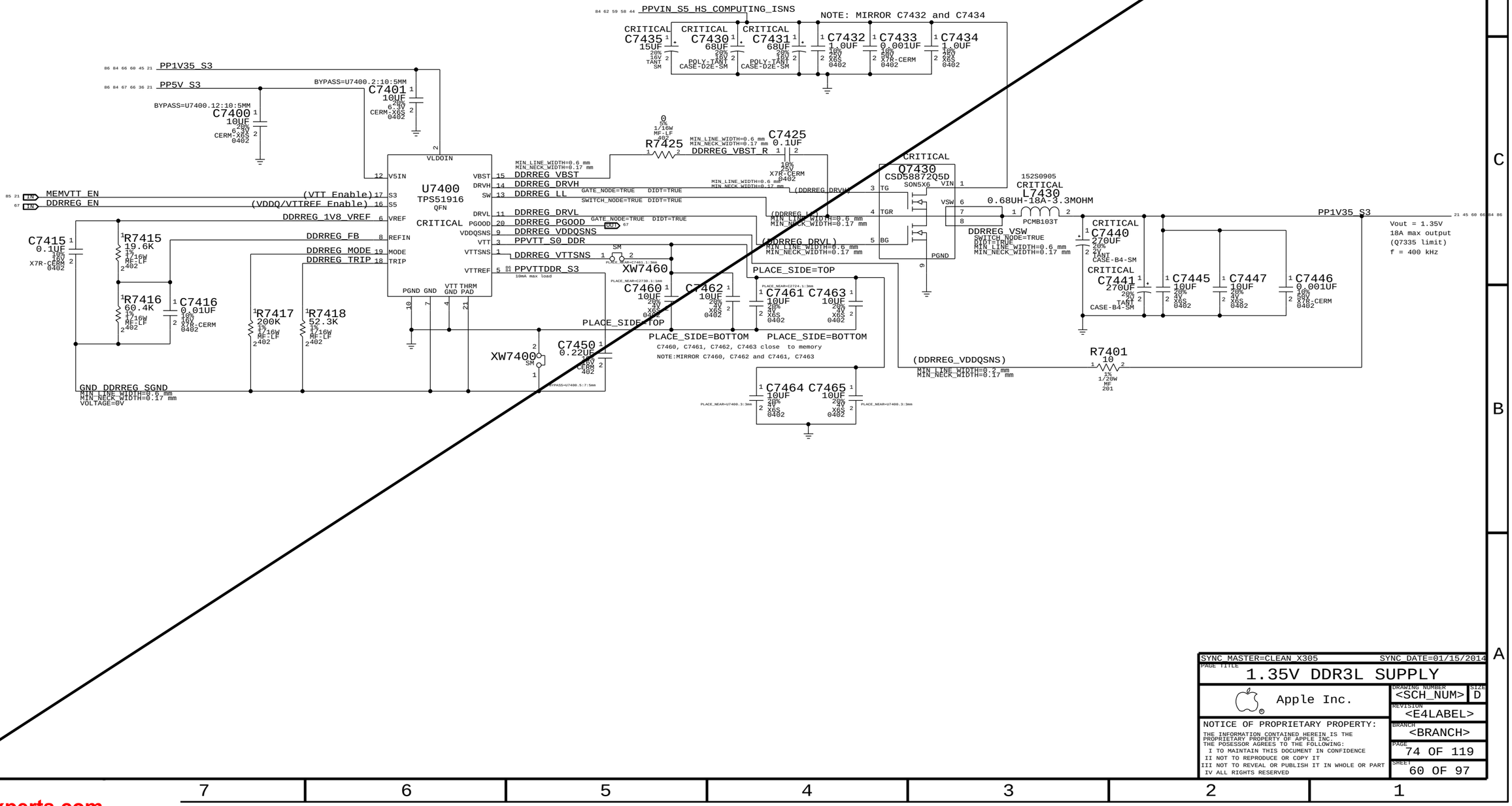
DDR3L (1V35 S3) REGULATOR



SYNC_MASTER=CLEAN_X305	SYNC_DATE=01/15/2014
PAGE TITLE	1.35V DDR3L SUPPLY
Apple Inc.	DRAWING NUMBER <SCH_NUM> SIZE D
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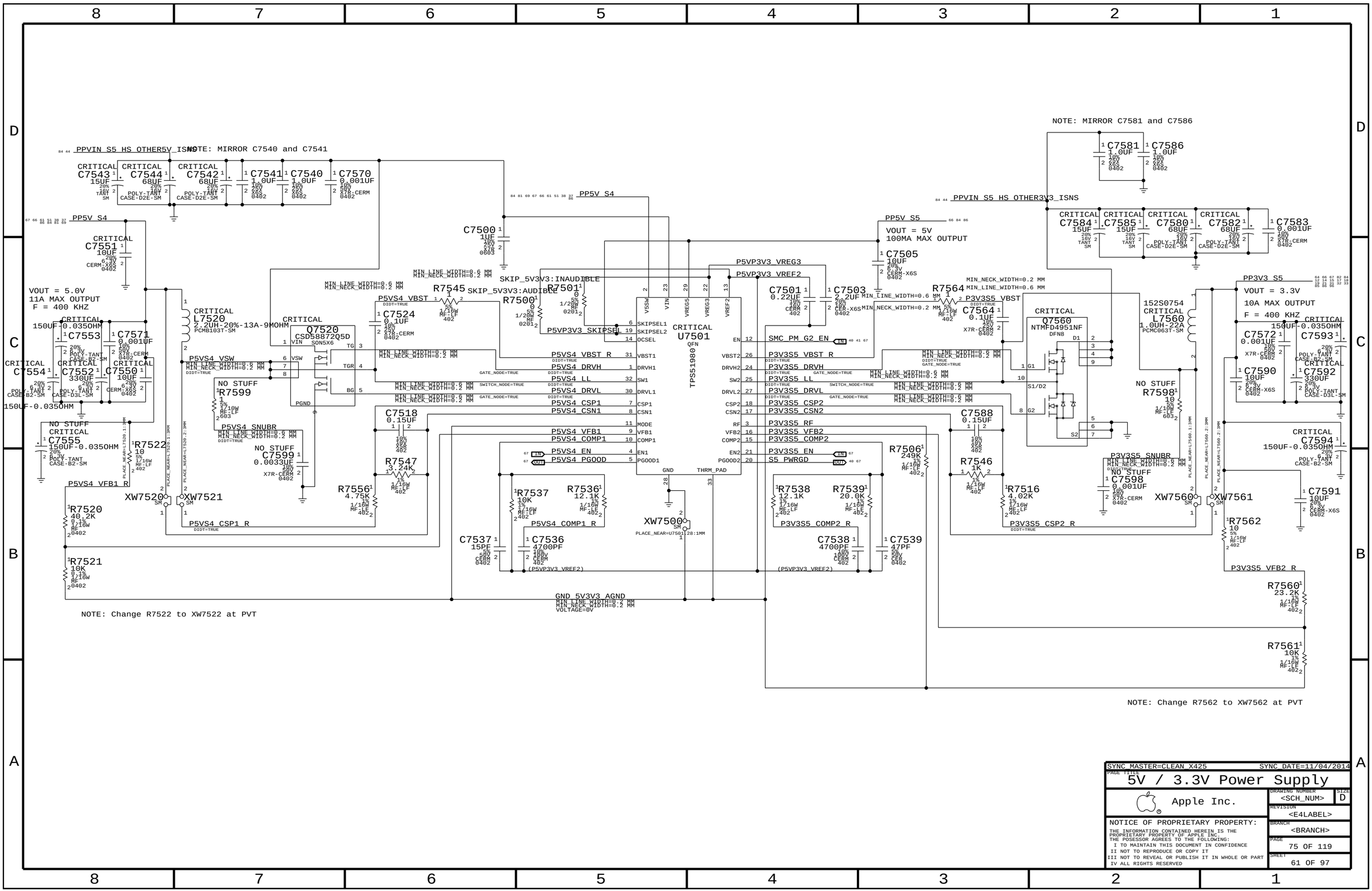
PPVIN_S5_HS_OTHER5V_ISNS
NOTE: MIRROR C7540 and C7541
CRITICAL C7543 15UF 20% 16V TANT SM
CRITICAL C7544 68UF 20% 16V POLY-TANT CASE-D2E-SM
CRITICAL C7542 68UF 20% 16V POLY-TANT CASE-D2E-SM
C7541 1.0UF 10% 25V X6S 0402
C7540 1.0UF 10% 25V X6S 0402
C7570 0.001UF 10% 50V X7R-CERM 0402
PP5V_S4
CRITICAL C7551 10UF 20% 6.3V CERM-X5S 0402
VOUT = 5.0V
11A MAX OUTPUT
F = 400 KHZ
CRITICAL 150UF-0.035OHM 20% 6.3V POLY-TANT CASE-B2-SM
C7553
C7571 0.001UF 10% 50V X7R-CERM 0402
CRITICAL C7554 150UF-0.035OHM 20% 6.3V POLY-TANT CASE-B2-SM
CRITICAL C7552 330UF 20% 6.3V POLY-TANT CASE-D3L-SM
C7550 10UF 20% 6.3V CERM-X5S 0402
150UF-0.035OHM
NO STUFF
CRITICAL
C7555 150UF-0.035OHM 20% 6.3V POLY-TANT CASE-B2-SM
R7522 10 5% 1/16W MF-LF 402
PLACE_NEAR=L7520.1:3MM
P5VS4_VFB1_R
R7520 40.2K 0.1% 1/16W MF 0402
XW7520 SM
XW7521 SM
PLACE_NEAR=L7520.2:3MM
P5VS4_CSP1_R
DIDT=TRUE
R7521 10K 0.1% 1/16W MF 0402
CRITICAL L7520 2.2UH-20%-13A-9MOHM PCMB103T-SM
P5VS4_VSW
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
CRITICAL Q7520 CSD58872Q5D VIN SON5X6
TG
TGR
BG
PGND
NO STUFF
R7599 1 5% 1/10W MF-LF 603
P5VS4_SNUBR
NO STUFF
C7599 0.0033UF 10% 50V X7R-CERM 0402
C7518 0.15UF 10% 10V X6S 402
R7547 3.24K 1% 1/16W MF-LF 402
R7556 4.75K 1% 1/10W MF-LF 402
P5VS4_VBST
C7524 0.1UF 10% 25V X7R-CERM 0402
R7545 1 5% 1/10W MF-LF 402
SKIP_5V3V3:AUDIBLE
R7500 0 5% 1/20W MF 0201
SKIP_5V3V3:INAUDIBLE
R7501 0 5% 1/20W MF 0201
P5VP3V3_SKIPSEL
P5VS4_VBST_R
P5VS4_DRVH
P5VS4_LL
P5VS4_DRVL
P5VS4_CSP1
P5VS4_CSN1
P5VS4_VFB1
P5VS4_COMP1
P5VS4_EN
P5VS4_PGOOD
C7537 15PF 5% 50V CERM 0402
C7536 4700PF 10% 100V CERM 402
P5VS4_COMP1_R
(P5VP3V3_VREF2)
PP5V_S4
C7500 1UF 10% 25V X5R 0603
P5VP3V3_VREG3
P5VP3V3_VREF2
SKIPSEL1
SKIPSEL2
OCSEL
VBST1
DRVH1
SW1
DRVL1
CSP1
CSN1
MODE
VFB1
COMP1
EN1
PGOOD1
CRITICAL U7501 QFN TPS51980
GND
THRM_PAD
XW7500 SM PLACE_NEAR=U7501:28:1MM
GND_5V3V3_AGND
MIN_LINE_WIDTH=0.2 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=0V
NOTE: Change R7522 to XW7522 at PVT
PP5V_S5
VOUT = 5V
100MA MAX OUTPUT
C7505 10UF 20% 6.3V CERM-X6S 0402
C7501 0.22UF 10% 16V CERM 402
C7503 2.2UF 20% 10V CER-X6S 0402
SMC_PM_G2_EN
P3V3S5_VBST_R
P3V3S5_DRVH
P3V3S5_LL
P3V3S5_DRVL
P3V3S5_CSP2
P3V3S5_CSN2
P3V3S5_RF
P3V3S5_VFB2
P3V3S5_COMP2
P3V3S5_EN
S5_PWRGD
R7506 249K 1% 1/16W MF-LF 402
C7588 0.15UF 10% 10V X6S 402
R7546 1K 1% 1/16W MF-LF 402
R7538 12.1K 1% 1/16W MF-LF 402
R7539 20.0K 1% 1/16W MF-LF 402
C7538 4700PF 10% 100V CERM 402
C7539 47PF 5% 50V CERM 0402
P3V3S5_COMP2_R
(P5VP3V3_VREF2)
NOTE: MIRROR C7581 and C7586
C7581 1.0UF 10% 25V X6S 0402
C7586 1.0UF 10% 25V X6S 0402
PPVIN_S5_HS_OTHER3V3_ISNS
CRITICAL C7584 15UF 20% 16V TANT SM
CRITICAL C7585 15UF 20% 16V TANT SM
CRITICAL C7580 68UF 20% 16V POLY-TANT CASE-D2E-SM
CRITICAL C7582 68UF 20% 16V POLY-TANT CASE-D2E-SM
C7583 0.001UF 10% 50V X7R-CERM 0402
R7564 1 5% 1/10W MF-LF 402
P3V3S5_VBST
C7564 0.1UF 10% 25V X7R-CERM 0402
CRITICAL Q7560 NTMFD4951NF DFN8
P3V3S5_VBST_R
P3V3S5_DRVH
P3V3S5_LL
P3V3S5_DRVL
P3V3S5_CSP2
P3V3S5_CSN2
P3V3S5_VFB2
P3V3S5_COMP2
P3V3S5_EN
P3V3S5_SNUBR
NO STUFF
C7598 0.001UF 10% 50V X7R-CERM 0402
P3V3S5_CSP2_R
DIDT=TRUE
PP3V3_S5
VOUT = 3.3V
10A MAX OUTPUT
F = 400 KHZ
152S0754
CRITICAL L7560 1.0UH-22A PCMC063T-SM
CRITICAL 150UF-0.035OHM 20% 6.3V POLY-TANT CASE-B2-SM
C7572 0.001UF 10% 50V X7R-CERM 0402
C7593
C7590 10UF 20% 6.3V CERM-X5S 0402
CRITICAL C7592 330UF 20% 6.3V POLY-TANT CASE-D3L-SM
NO STUFF
R7598 10 5% 1/10W MF-LF 603
CRITICAL C7594 150UF-0.035OHM 20% 6.3V POLY-TANT CASE-B2-SM
C7591 10UF 20% 6.3V CERM-X6S 0402
XW7560 SM
XW7561 SM
R7562 10 5% 1/16W MF-LF 402
P3V3S5_VFB2_R
R7560 23.2K 1% 1/16W MF-LF 402
R7561 10K 1% 1/16W MF-LF 402
NOTE: Change R7562 to XW7562 at PVT
SYNC_MASTER=CLEAN_X425
SYNC_DATE=11/04/2014
PAGE TITLE
5V / 3.3V Power Supply
Apple Inc.
DRAWING NUMBER <SCH_NUM>
SIZE D
REVISION <E4LABEL>
BRANCH <BRANCH>
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1V05 S0 REGULATOR

PLACE_NEAR=U1100.AJ12:1MM
XW7601
SM
PP1V05 S0
P1V05S0 SENSE P
PLACE_NEAR=U1100.AK14:1MM
XW7602
SM
P1V05S0 SENSE N
NO_XNET_CONNECTION=TRUE
R7604 3.01K 1% 1/10W MF-LF 402
<Ra>
Vout = 0.5V * (1 + Ra / Rb)
NO_XNET_CONNECTION=TRUE
R7644 3.01K 1% 1/10W MF-LF 402
<Ra>
R7605 2.74K 1% 1/10W MF-LF 402
<Rb>
R7645 2.74K 1% 1/10W MF-LF 402
<Rb>
C7604 10PF 5% 50V CERM 0402
C7605 10PF 5% 50V CERM 0402
PPVIN S5 HS COMPUTING ISNS
PP5V S0
R7601 2.2 5% 1/10W MF-LF 402
C7601 10UF 20% 6.3V CERM-X6S 0402
BYPASS=U7600.14:16:5mm
P1V05S0 BOOT RC
MIN_LINE_WIDTH=0.3 mm
MIN_NECK_WIDTH=0.2 mm
DIDT=TRUE
R7630 0 5% 1/10W MF-LF 603
C7630 1UF 10% 16V CER-X5S 0402
PP5V S0 P1V05S0 VCC
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=5V
U7600
ISL95870
UTQFN
CRITICAL
VCC PVCC
EN FB SREF VO OCSET PGOOD RTN FSEL
BOOT UGATE PHASE LGATE
GND PGND
P1V05S0 EN
P1V05S0 FB
P1V05S0 SREF
P1V05S0 VO
P1V05S0 OCSET
P1V05S0 PGOOD
P1V05S0 RTN
P1V05S0 FSEL
P1V05S0 VBST
MIN_LINE_WIDTH=0.3 mm
MIN_NECK_WIDTH=0.2 mm
DIDT=TRUE
P1V05S0 DRVH
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
GATE_NODE=TRUE
DIDT=TRUE
P1V05S0 LL
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
SWITCH_NODE=TRUE
DIDT=TRUE
P1V05S0 DRVL
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
GATE_NODE=TRUE
DIDT=TRUE
CRITICAL
Q7630
NTMFD4951NF
DFN8
D1 S1/D2 S2 G1 G2
376S00043
(P1V05S0_LL)
C7602 2.2UF 10% 25V CER-X5S 0402
BYPASS=U7600.13:1.5mm
R7603 0 5% 1/10W MF-LF 402
NO STUFF
C7603 0.047UF 10% 16V X7R-CERM 0402
P1V05S0 AGND
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=0V
XW7600
SM
PLACE_NEAR=U7600.1:1mm
(PCHVCCIOS0_OCSET)
(PCHVCCIOS0_VO)
OCP = R7641 x 8.5uA / R7640
OCP = 14.4A
NOTE: MIRROR C7624 and C7625
CRITICAL C7620 68UF 20% 16V POLY-TANT CASE-D2E-SM
CRITICAL C7621 68UF 20% 16V POLY-TANT CASE-D2E-SM
C7622 1000PF 5% 25V CERM 0402
C7624 1.0UF 10% 25V X5S 0402
C7625 1.0UF 10% 25V X5S 0402
BYPASS=Q7630.2:5:6mm
CRITICAL
L7630
0.68UH-25A-5.5MOHM
PCMC063T-SM
152S0955
CRITICAL
R7640 0.001 1% 1W MF-3 0612
PP1V05 S0 REG R2
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.05V
PLACE_NEAR=L7630.2:1.5mm
C7623 1000PF 5% 25V CERM 0402
CRITICAL
C7649 270UF 20% 2V TANT CASE-B4-SM
CRITICAL
C7648 270UF 20% 2V TANT CASE-B4-SM
PP1V05 S0
Vout = 1.05V
12A MAX OUTPUT
f = 500 kHz
P1V05S0 CS P MAKE_BASE=TRUE
P1V05S0 CS N MAKE_BASE=TRUE
R7641 1.37K 1% 1/20W MF 201
C7640 0.0018UF 10% 50V X7R-CERM 0402
R7642 1.37K 1% 1/20W MF 201
P1V05S0_CS_N
P1V05S0_CS_P

SYNC_MASTER=CLEAN_X305_PEG SYNC_DATE=02/18/2014

PAGE TITLE: 1V05V POWER SUPPLY

Apple Inc.

DRAWING NUMBER: <SCH_NUM> SIZE: D
REVISION: <E4LABEL>
BRANCH: <BRANCH>
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Page Notes

Power aliases required by this page:
- =PPVIN_S0_LCDBKLT (9-12.6V LCD Backlight Input)
- =PP5V_S0_BKLTCTRL (5V Backlight Driver Input)
- =PP5V_S0_KBDLED (5V Keyboard Backlight Input)

BOM options provided by this page:
BKLT:ENG - Stuffs 10.2 ohm series R for engineering builds
BKLT:PROD - Stuffs 0 ohm series R for production

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
116S0004	2	RES,MTL FILM,0 OHM,1A MAX,0402,SMD	R7723,R7724		BKLT:PROD

PPBUS_G3H
CRITICAL F7700 3AMP-32V 0603
PPBUS_S0_LCDBKLT_FUSED MIN_LINE_WIDTH=2 MM MIN_NECK_WIDTH=0.25 MM VOLTAGE=12.6V
CRITICAL R7700 0.025 1% 1W MF 0612-1
PPBUS_SW_LCDBKLT_PWR MIN_LINE_WIDTH=2 MM MIN_NECK_WIDTH=0.25 MM VOLTAGE=12.6V
CRITICAL Q7706 FDC638APZ_SBMS001 SSOT6-HF
PPBUS_SW_BKL MIN_LINE_WIDTH=2 MM MIN_NECK_WIDTH=0.25 MM VOLTAGE=12.6V
C7700 1000PF 10% 16V X7R-1 0201
R7701 80.6K 1% 1/20W MF 201
NOSTUFF C7701 0.001UF 10% 50V CERM 402
C7710 4.7UF 10% 25V X5S-CERM 0603
C7711 4.7UF 10% 25V X5S-CERM 0603
C7712 0.1UF 10% 25V X5R 402
152S1527
CRITICAL L7710 22UH-20%-2.4A-0.105OHM DEM8030C-SM
PPBUS_S0_LCDBKLT_PWR_SW MIN_LINE_WIDTH=2 MM MIN_NECK_WIDTH=0.25 MM VOLTAGE=45V SWITCH_NODE=TRUE DIDT=TRUE
PLACE_NEAR=L7710.2:3MM
CRITICAL D7701 POWERDI-123 DFLS2100
PPBUS_S0_LCDBKLT_PWR_SW SHOULD BE KEPT AS SHORT AS POSSIBLE
CRITICAL C7715 2.2UF 20% 100V X7R 1210-1
CRITICAL C7716 2.2UF 20% 100V X7R 1210-1
CRITICAL C7718 2.2UF 20% 100V X7R 1210-1
CRITICAL C7719 2.2UF 20% 100V X7R 1210-1
C7717 1000PF 10% 100V X7R-CERM 0603
PPVOUT_S0_LCDBKLT MIN_LINE_WIDTH=0.5 MM MIN_NECK_WIDTH=0.25 MM VOLTAGE=55V
PLACE_NEAR=D7701.K:3MM
PLACE_NEAR=D7701.K:5MM
C7730 12PF 2% 100V CERM 0402
C7731 12PF 2% 100V CERM 0402
ISNS_LCDBKLT_P
ISNS_LCDBKLT_N
LCDBKLT_EN_L
PP5V_S0
CRITICAL Q7701 SI7812DN PWRPK-1212-8
BKL_FET_CNTL_R MIN_LINE_WIDTH=0.5 MM MIN_NECK_WIDTH=0.25 MM DIDT=TRUE
R7708 18.2K 1% 1/10W MF-LF 402
R7709 150K 1% 1/10W MF-LF 402
R7743 0 5% 1/16W MF-LF 402
R7744 0 5% 1/16W MF-LF 402
VOLTAGE=5V MIN_LINE_WIDTH=0.4 MM MIN_NECK_WIDTH=0.2 MM
PP5V_S0_BKLT_VDDA
PP5V_S0_BKLT_VDDD
MIN_LINE_WIDTH=0.4 MM MIN_NECK_WIDTH=0.2 MM VOLTAGE=5V
R7702 63.4K 1% 1/16W MF-LF 402
C7740 1UF 10% 16V X5R 402-2
C7741 1UF 10% 16V X5R 402-2
R7703 0 5% 1/16W MF-LF 402
BKL_FET_CNTL MIN_LINE_WIDTH=0.6 MM MIN_NECK_WIDTH=0.25 MM DIDT=TRUE
GND_BKLT_SGND
R7740 1M 5% 1/20W MF 201
U7701 QFN LP8548B1SQ_-03
BKL_SW MIN_LINE_WIDTH=2 mm MIN_NECK_WIDTH=0.25 mm DIDT=TRUE
BKL_FB
BKLT_SD
(PPBUS_S0_BKLT_PWR_R)
(PPBUS_S0_BKLT_PWR_F)
BKLT_SENSE_OUT
BKLT_EN_R
R7742 0 5% 1/20W MF 0201
LCD_BKLT_EN
NO_STUFF C7742 33PF 5% 25V NPO-C0G 0201
GND_BKLT_SGND
BKLT_ISET_KEYB
BKLT_KEYB1
BKLT_KEYB2
BKLT_PWM_KEYB
R7747 0 5% 1/20W MF 0201
SMC_SYS_KBDLED
NO_STUFF C7747 33PF 5% 25V NPO-C0G 0201
CRITICAL 353S4159
R7741 31.6K 1% 1/20W MF 201
PPVOUT_BKLT_FB2 MIN_LINE_WIDTH=0.4 MM MIN_NECK_WIDTH=0.25 MM VOLTAGE=40V
XW7700 SM
KBDBKLT_SW MIN_LINE_WIDTH=0.5 MM MIN_NECK_WIDTH=0.25 MM DIDT=TRUE
BKLT:ENG R7723 10.2 1% 1/16W MF 402
BKLT:ENG R7724 10.2 1% 1/16W MF 402
KBDBKLT_RETURN1 MIN_LINE_WIDTH=0.5 MM MIN_NECK_WIDTH=0.25 MM
KBDBKLT_RETURN2 MIN_LINE_WIDTH=0.5 MM MIN_NECK_WIDTH=0.25 MM
XW7720 SM
PLACE_NEAR=D7720.K:2MM
C7726 1.0UF 10% 50V X7R 0805
C7727 1.0UF 10% 50V X7R 0805
C7728 12PF 2% 100V CERM 0402
C7729 12PF 2% 100V CERM 0402
PPVOUT_S0_KBDBKLT MIN_LINE_WIDTH=0.5 MM MIN_NECK_WIDTH=0.25 MM VOLTAGE=40V
PP5V_S0
R7783 0 5% 1/16W MF-LF 402
152S1701
CRITICAL L7720 10UH-20%-1.4A-0.17OHM PST041H-CDH46D14-SM
PP5V_S0_KBDLED_R
371S0572
CRITICAL D7720 SOD-123 RB160M-60G
C7720 2.2UF 10% 25V X5R-CERM 603
C7721 2.2UF 10% 25V X5R-CERM 603
C7722 0.1UF 10% 16V X5R-CERM 0201
C7720, C7721 SHOULD BE PLACED MIRRORED
C7723 1.0UF 10% 50V X7R 0805
C7724 1.0UF 10% 50V X7R 0805
C7725 0.001UF 10% 100V X7R-CERM 0402
C7723, C7724 SHOULD BE PLACED MIRRORED
R7760 1.8K 1% 1/20W MF 201
R7761 1.8K 1% 1/20W MF 201
R7758 0 5% 1/20W MF 0201
I2C_BKLT_SCL
BKLT_SCL
R7757 0 5% 1/20W MF 0201
I2C_BKLT_SDA
BKLT_SDA
R7780 0 5% 1/20W MF 0201
LCD_BKLT_PWM
LCD_BKLT_PWM_R

SYNC_MASTER=CLEAN_X425	SYNC_DATE=10/30/2014
PAGE TITLE	LCD/KBD Backlight Driver
Apple Inc.	DRAWING NUMBER <SCH_NUM> SIZE D
	REVISION <E4LABEL>
	BRANCH <BRANCH>
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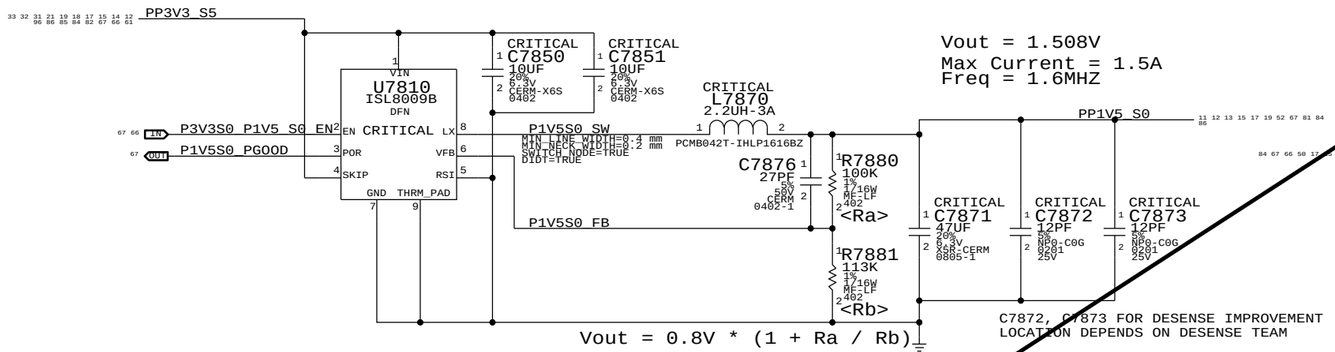
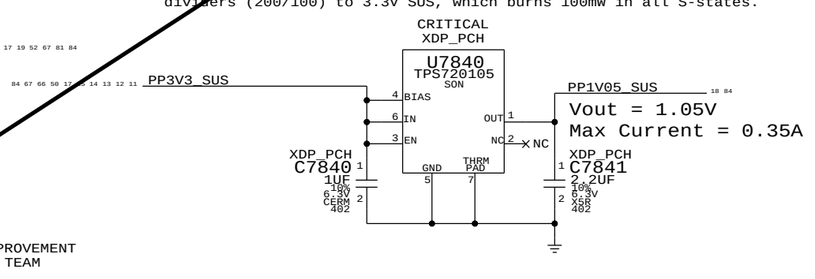
1.5V S0 Regulator



1.05V SUS LDO

Lynx Point-H requires JTAG pull-ups to be powered at 1.05V in SUS.
Pull-ups (3) must be 51 ohms to support XDP (not required in production).
70mA is required to support pull-ups. Alternative is strong voltage
dividers (200/100) to 3.3V SUS, which burns 100mW in all S-states.



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REVISION <E4LABEL>
BRANCH <BRANCH>
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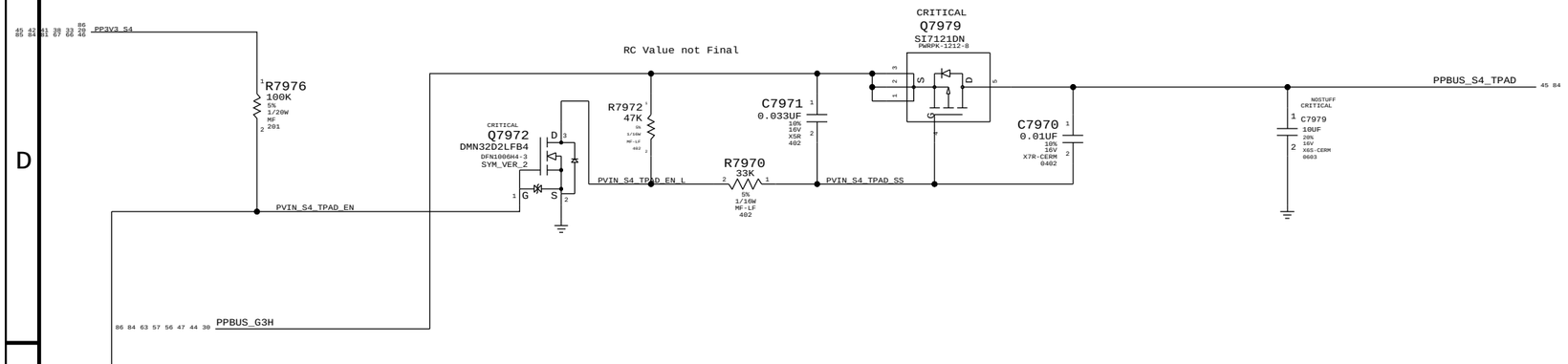

PBUS ONLY CONTROL INPUTS

SYSTEM STATE	SMC_ACTUATOR_DISABLE_L	TPAD_ACTUATOR_THRMTRIP_L	T101 POWER
G3H, S5	X	X	0 V
S4, S3, S0	Hi-Z	Hi-Z	PBUS
S4, S3, S0	0 V	X	0 V
S4, S3, S0	X	0 V	0 V

SYNC_MASTER=CLEAN_MAXWELL SYNC_DATE=07/02/2014

PAGE TITLE

X249 POWER SUPPLY

Apple Inc.

DRAWING NUMBER <SCH_NUM> SIZE D

REVISION <E4LABEL>

BRANCH <BRANCH>

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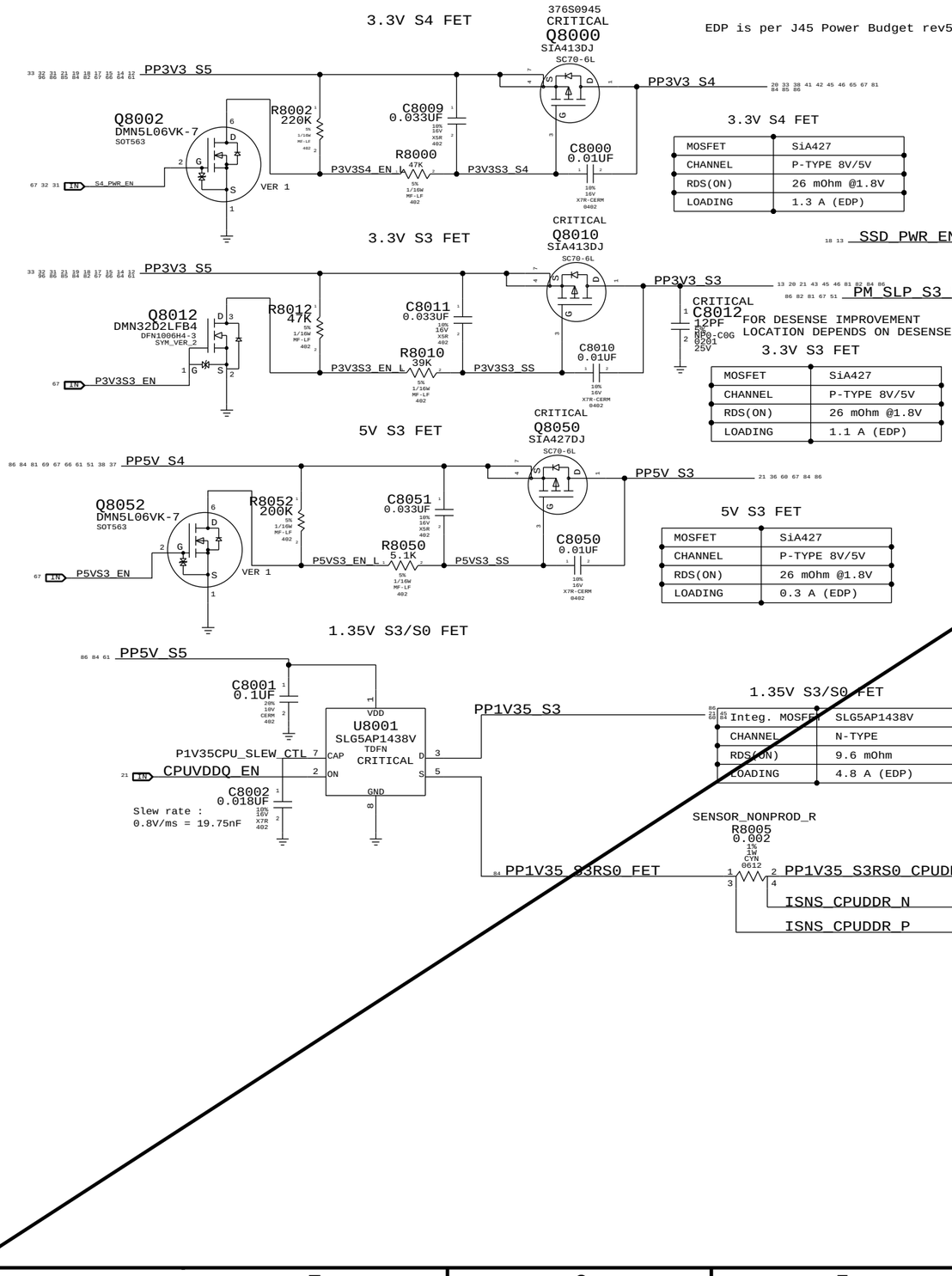
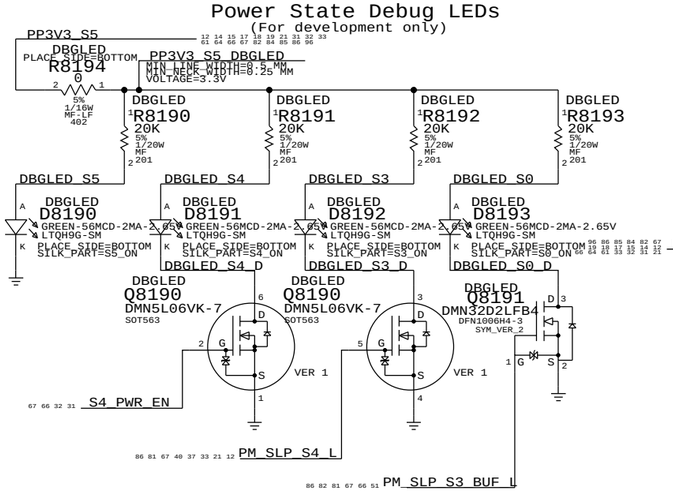


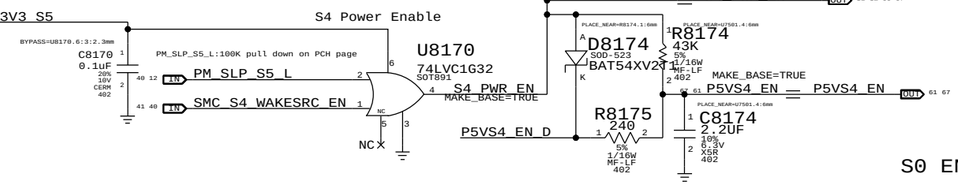
Power State Debug LEDs
(For development only)



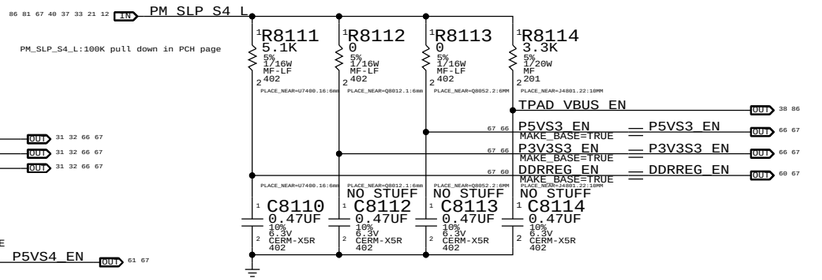
Mobile System Power State Table

State	SMC_ADAPTER_EN	SMC_PM_G2_ENABLE	SMC_S4_WAKESRC_EN	PM_SLP_SUS_L	PM_SLP_S5_L	PM_SLP_S4_L	PM_SLP_S3_L
Run (S0)	X	1	1	1	1	1	1
Sleep (S3AC)	1	1	1	1	1	1	0
Sleep (S3)	0	1	1	1	1	1	0
Deep Sleep (dS4AC)	1	1	1	0	0	0	0
Deep Sleep (dS4)	0	1	1	0	0	0	0
Deep Sleep (dS5AC)	1	1	0	0	0	0	0
Deep Sleep (dS5)	0	1	0	0	0	0	0
Battery Off (G3HotAC)	toggle 3Hz	0	0	0	0	0	0
Battery Off (G3Hot)	1	0	0	0	0	0	0

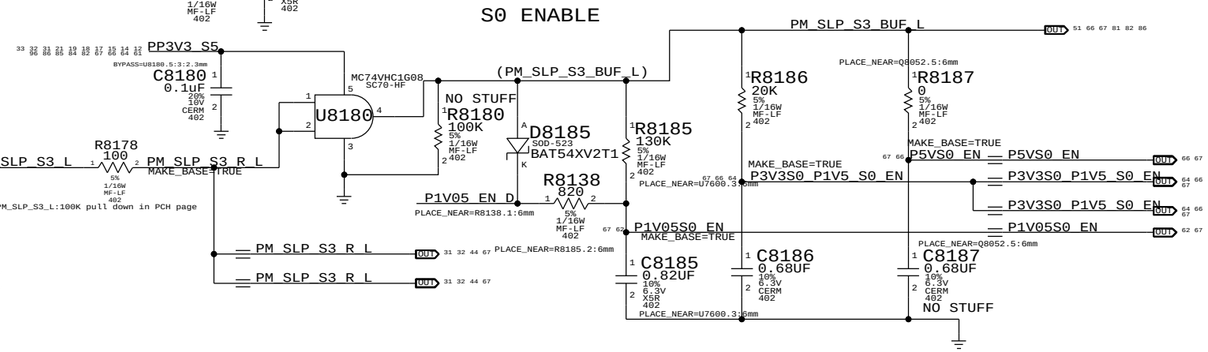
S4 Power Enable



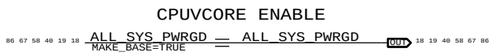
S3 ENABLE



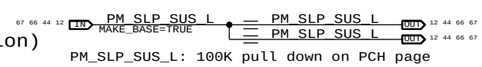
S0 ENABLE



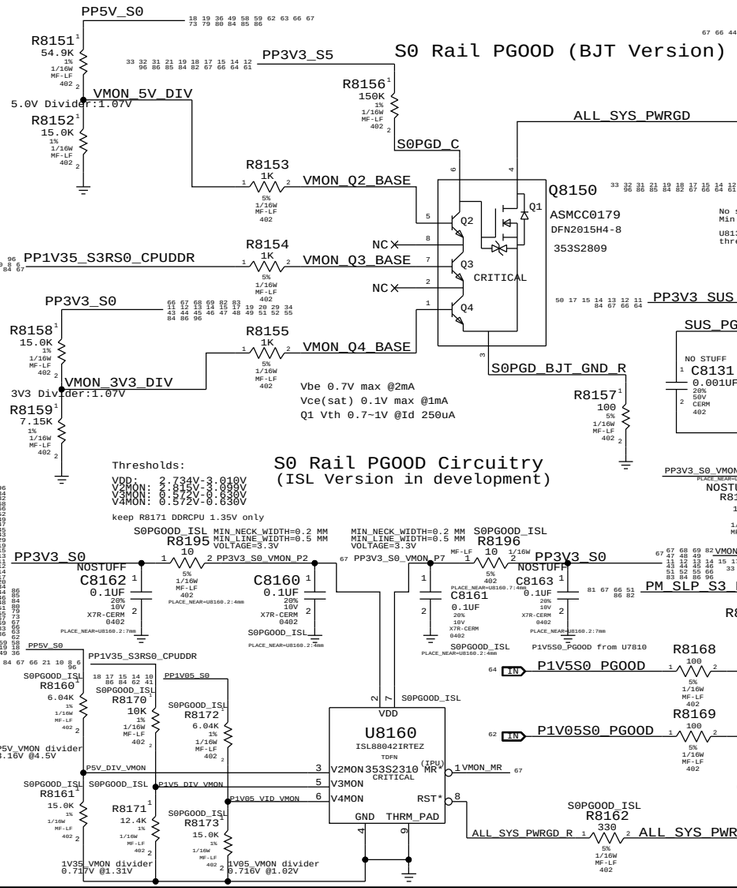
CPUVCORE ENABLE



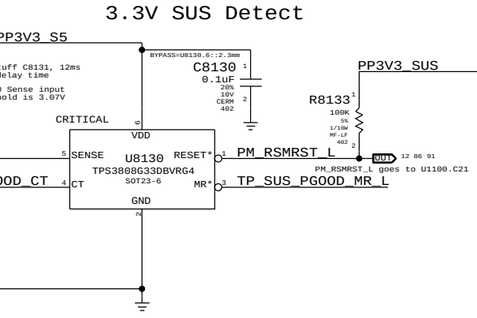
3.3V SUS Enable



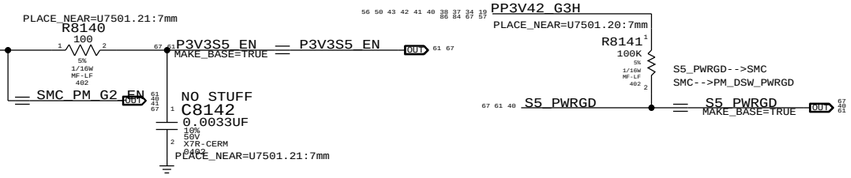
S0 Rail PGOOD (BJT Version)



3.3V SUS Detect

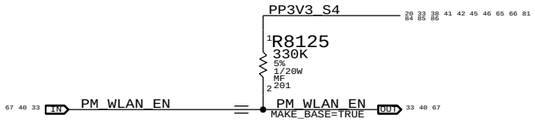


S5 Rail Enables & PGOOD



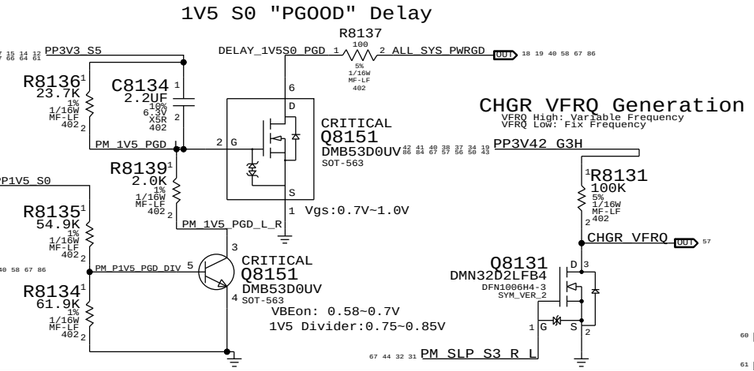
WLAN Enable Generation

"WLAN" = ("S4" && "AP_PWR_EN" && ("AC" || "S0"))
NOTE: S4 term is guaranteed by S4 pull-up on open-drain AP_PWR_EN signal.



S0 Rail PGOOD Circuitry
(ISL Version in development)

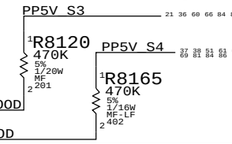
1V5 S0 "PGOOD" Delay



CHGR VFRQ Generation

VFRQ High: Variable Frequency
VFRQ Low: Fix Frequency

Unused PGOOD signals



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Apple Inc.	DRAWING NUMBER <SCH_NUM> SIZE D
	REVISION <E4LABEL>
	BRANCH <BRANCH>
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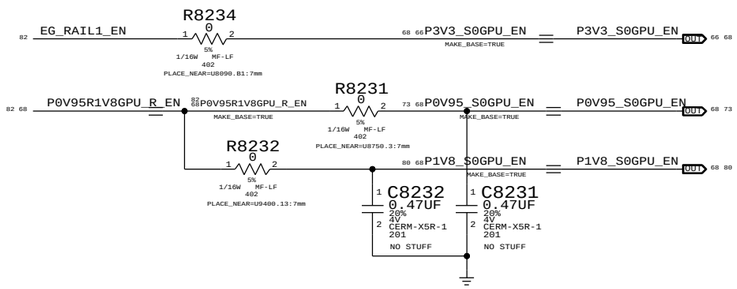
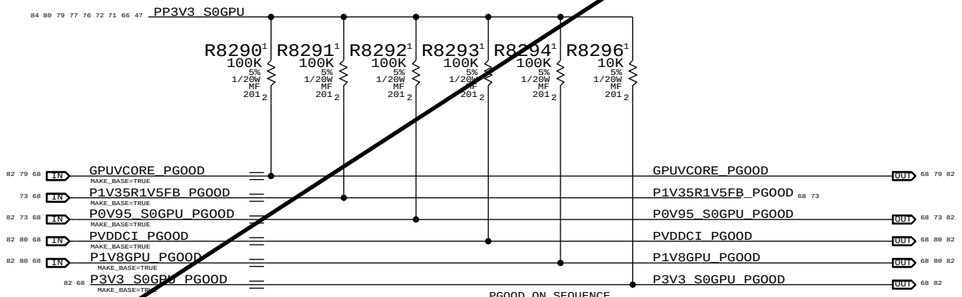
GPU Rails Power UP Sequencing

Venus GPU requires rails to come up in the following order:

1) GPU_3.3V
2) GPU_0V95 (BIF_VDDC) & GPU_1V8 (VDD_CT)
3) GPUVCore
4) VDDCI
5) FB VRAM MVDD



EXT GPU PWRGD Pullup

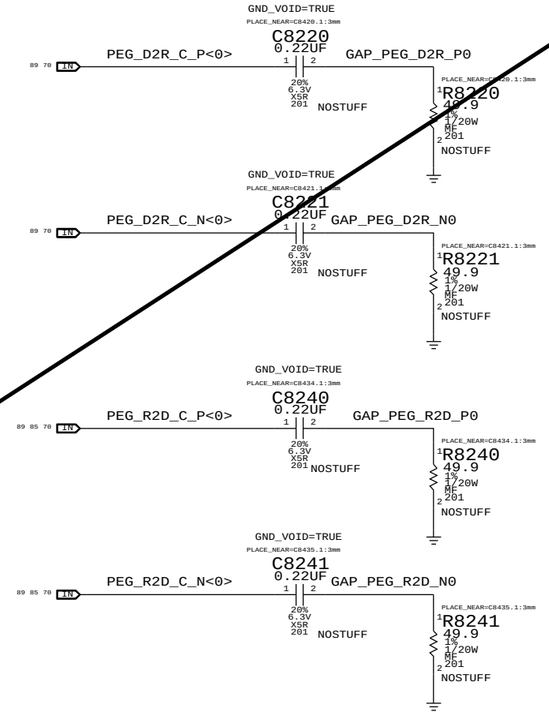


PGOOD ON SEQUENCE

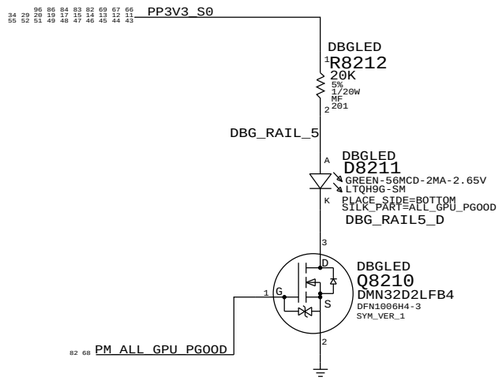
1. GPU 3V3 GPU_PGOOD1
2. 0.95_S0GPU GPU_PGOOD6_2
3. 1V8_GPU GPU_PGOOD2
4. GPUVCORE GPU_PGOOD3
5. VDDCI GPU_PGOOD4
6. FB MVDD GPU_PGOOD5

(GPU_PGOOD6_2 is up before 1V8GPU_PGOOD after 3V3GPU_PGOOD)

PCIE TEST STRUCTURES (FOR LAB USE)
Pending Layout. Can add more.



Power State Debug LEDs
(For development only)



SYNC_MASTER=MARY_X425G	SYNC_DATE=09/11/2014
PAGE TITLE	Power Sequencing EG/PGOOD
Apple Inc.	DRAWING NUMBER <SCH_NUM> SIZE D
	REVISION <E4LABEL>
	BRANCH <BRANCH>
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LCD PANEL INTERFACE (eDP)

3.3V_EDP ON/OFF CONTROL

5V TCON Switch

3.3V TCON Switch

LCD Panel HPD & AUX strapping

U8300	
Part	SLG5AP1443V
Type	Load Switch
R(on) @100mA	17 mOhm Typ 19 mOhm Max
Current	2.5 A Max

U8310	
Part	TPS22904(353S3979)
Type	Load Switch
R(on) @ 3.6V	66 mOhm Typ 90 mOhm Max
Current	0.5A Max

C8305 is placeholder for 3pF cap

SYNC_MASTER=MARY X425G SYNC_DATE=12/11/2014

PAGE TITLE: eDP Display Connector

Apple Inc.

DRAWING NUMBER: <SCH_NUM> SIZE: D
REVISION: <E4LABEL>
BRANCH: <BRANCH>
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Page Notes

Power aliases required by this page:

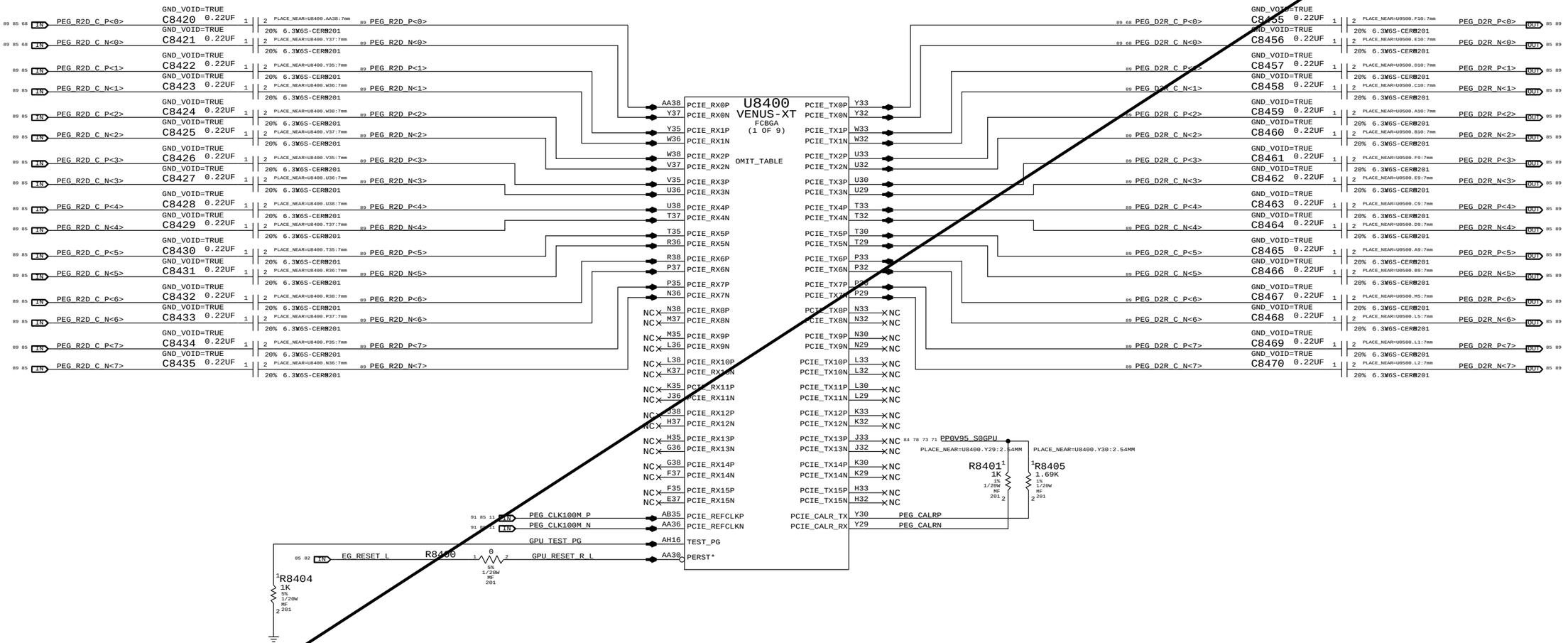
- +PPVS5_GPU_PCIE

Signal aliases required by this page:

(NONE)

BOM options provided by this page:

(NONE)



SYNC_MASTER=MARY_X425G	SYNC_DATE=08/22/2014
PAGE TITLE	Venus PCI-E
	Apple Inc.
DRAWING NUMBER	<SCH_NUM>
SIZE	D
REVISION	<E4LABEL>
BRANCH	<BRANCH>
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GPU

Page Notes

Power aliases required by this page:

- =PPVCORE_GPU
- =PP1V5R1V35_GPU_FB_VDDR1
- =PP1V8_GPU_VDD_CT
- =PP1V8_GPU_PLL
- =PP3V3_GPU_VDDR3
- =PP3V3_GPU_VDDR4
- =PP1V8_GPU_MEM_PLL
- =PP1V8_GPU_PCIE_VDDR
- =PP1V8_GPU_PCIE_VDDC

Signal aliases required by this page:

(NONE)

BOM options provided by this page:

(NONE)

PP1V35_GPU_REG 84 75 74 73 72 47 — 2000mA

C8504 12PF 5% NP0-C0G 0201 25V (CRITICAL)
C8517 3.0PF +/-0.1PF 25V NP0-C0G 0201 (CRITICAL)
C8500 10UF 20% 6.3V CERM-X6S 0402
C8501 10UF 20% 6.3V CERM-X6S 0402
C8502 10UF 20% 6.3V CERM-X6S 0402

C8505 2.2UF 20% 4V X6S-CERM 0201
C8506 2.2UF 20% 4V X6S-CERM 0201
C8507 2.2UF 20% 4V X6S-CERM 0201
C8508 2.2UF 20% 4V X6S-CERM 0201
C8509 2.2UF 20% 4V X6S-CERM 0201
C8510 0.01UF 10% 10V X7R-CERM 0201
C8511 0.01UF 10% 10V X7R-CERM 0201
C8512 0.01UF 10% 10V X7R-CERM 0201
C8513 0.01UF 10% 10V X7R-CERM 0201
C8514 0.01UF 10% 10V X7R-CERM 0201

C8520 0.1UF 10% 6.3V X7R 0201
C8521 0.1UF 10% 6.3V X7R 0201
C8522 0.1UF 10% 6.3V X7R 0201
C8523 0.1UF 10% 6.3V X7R 0201
C8524 0.1UF 10% 6.3V X7R 0201

U8400
VENUS-XT
FCBGA
(7 OF 9)

OMIT_TABLE

AC7 AD11 AF7 AG10 AJ7 AK8 AL9 G11 G14 G17 G20 G23 G26 G29 H10 J7 J9 K11 K13 K8 L12 L16 L21 L23 L26 L7 M11 N11 P7 R11 U11 U7 Y11 Y7 — VDDR1

CRITICAL L8520 120OHM-25%-1.8A-0.06DCR 0402
PP1V8_GPUIFPX 80 78 76 71 84 — PP1V8_GPU_VDD_CT — 250mA
PLACE_NEAR=L8520.1:2.54MM
MIN_LINE_WIDTH=0.3 mm MIN_NECK_WIDTH=0.2 mm VOLTAGE=1.8V
C8515 0.1UF 10% 6.3V X7R 0201
C8525 10UF 20% 6.3V CERM-X6S 0402
C8528 1.0UF 20% 4V X6S 0201
C8529 0.1UF 10% 6.3V X7R 0201
PLACE_NEAR=U8400.AF26:2.54MM
PLACE_NEAR=U8400.AG26:2.54MM

AF26 AF27 AG26 AG27 — VDD_CT

CRITICAL L8551 120OHM-25%-1.8A-0.06DCR 0402
PP3V3_S0GPU 84 72 68 66 47 80 79 77 76 — PP3V3_GPU_VDDR3 — 60mA
PLACE_NEAR=L8551.1:2.54MM
MIN_LINE_WIDTH=0.25 mm MIN_NECK_WIDTH=0.2 mm VOLTAGE=3.3V
C8516 0.1UF 10% 6.3V X7R 0201
C8533 1UF 20% 6.3V X6S-CERM 0201
C8534 1UF 20% 6.3V X6S-CERM 0201
C8535 0.1UF 10% 6.3V X7R 0201
PLACE_NEAR=U8400.AF23:2.54MM
PLACE_NEAR=U8400.AG23:2.54MM

AF23 AF24 AG23 AG24 — VDDR3

AD12 AF11 AF12 AF13 AF15 AG11 AG13 AG15 — VDDR4

PP1V8_GPUIFPX 80 78 76 71 84 — 300mA
C85C0 10UF 20% 6.3V CERM-X6S 0402
C85C1 1.0UF 20% 4V X6S 0201
C85C2 0.1UF 10% 6.3V X7R 0201
PLACE_NEAR=U8400.AF12:2.54MM
PLACE_NEAR=U8400.AG13:2.54MM

CRITICAL L8531 220-OHM-1A 0402
PP1V8_GPUIFPX 84 80 78 76 71 — PP1V8_GPU_MEM_PLL — 150mA
PLACE_NEAR=L8531.1:2.54MM
150mohm DCR
MIN_LINE_WIDTH=0.3 mm MIN_NECK_WIDTH=0.2 mm VOLTAGE=1.8V
C8518 0.1UF 10% 6.3V X7R 0201
C8537 10UF 20% 6.3V CERM-X6S 0402
C8538 1.0UF 20% 4V X6S 0201
C8540 0.1UF 10% 6.3V X7R 0201
PLACE_NEAR=U8400.H8:2.54MM
PLACE_NEAR=U8400.H7:2.54MM

H7 H8 — MPLL_PVDD
AM10 — SPLL_PVDD
AN9 — SPLL_VDDC
GND_SPLL_PVSS — AN10 — SPLL_PVSS

CRITICAL L8532 120OHM-25%-1.8A-0.06DCR 0402
PP1V8_GPUIFPX 84 80 78 76 71 — PP1V8_GPU_PLL — 75mA
PLACE_NEAR=L8532.1:2.54MM
MIN_LINE_WIDTH=0.25 mm MIN_NECK_WIDTH=0.2 mm VOLTAGE=1.8V
C8519 0.1UF 10% 6.3V X7R 0201
C8542 10UF 20% 6.3V CERM-X6S 0402
C8543 1.0UF 20% 4V X6S 0201
C8544 0.1UF 10% 6.3V X7R 0201
XW8542
PLACE_NEAR=U8400.AM10:2.54MM
MIN_LINE_WIDTH=0.25 mm MIN_NECK_WIDTH=0.2 mm VOLTAGE=0V

VSNS_GPU_VDDC_P 96 85 79 71 — AF28 — FB_VDDC
VSNS_GPU_VDDI_P 96 85 80 71 — AG28 — FB_VDDCI
GPU_GND_SENSE 71 — AH29 — FB_GND

CRITICAL L8530 120OHM-25%-1.8A-0.06DCR 0402
PP0V95_S0GPU 73 71 70 84 78 — PP0V95_GPU_PLL — 150mA
PLACE_NEAR=L8530.1:2.54MM
MIN_LINE_WIDTH=0.25 mm MIN_NECK_WIDTH=0.2 mm VOLTAGE=0.95V
C8503 0.1UF 10% 6.3V X7R 0201
C8530 10UF 20% 6.3V CERM-X6S 0402
C8531 1.0UF 20% 4V X6S 0201
C8532 0.1UF 10% 6.3V X7R 0201
PLACE_NEAR=U8400.AN9:2.54MM
PLACE_NEAR=U8400.AB37:2.54MM
PP1V8_GPUIFPX 78 76 71 84 80 — 200mA
C8545 10UF 20% 6.3V CERM-X6S 0402
C8547 1.0UF 20% 4V X6S 0201
C8548 1.0UF 20% 4V X6S 0201

V28 W29 — NC_BIF_VDDC
AA31 AA32 AA33 AA34 W30 Y31 — NC_PCIE_VDDR
AB37 — PCIE_PVDD

PP0V95_S0GPU 84 73 72 71 78 — 2500mA
C8559 12PF 5% NP0-C0G 0201 25V (CRITICAL)
C855A 3.0PF +/-0.1PF 25V NP0-C0G 0201 (CRITICAL)
C8550 10UF 20% 6.3V CERM-X6S 0402
C8551 10UF 20% 6.3V CERM-X6S 0402
C8552 1.0UF 20% 4V X6S 0201
C8553 1.0UF 20% 4V X6S 0201
C8554 1.0UF 20% 4V X6S 0201
C8555 1.0UF 20% 4V X6S 0201
C8556 1.0UF 20% 4V X6S 0201
C8557 1.0UF 20% 4V X6S 0201
C8558 1.0UF 20% 4V X6S 0201

G30 G31 H29 H30 J29 J30 L28 M28 N28 R28 T28 U28 — PCIE_VDDC

PPVCORE_GPU 84 79 71 47 — 52A (63A?)

C8560 2.2UF 20% 4V X6S-CERM 0201
C8561 2.2UF 20% 4V X6S-CERM 0201
C8562 2.2UF 20% 4V X6S-CERM 0201
C8563 2.2UF 20% 4V X6S-CERM 0201
C8564 2.2UF 20% 4V X6S-CERM 0201
C8565 2.2UF 20% 4V X6S-CERM 0201
C8566 2.2UF 20% 4V X6S-CERM 0201
C8567 2.2UF 20% 4V X6S-CERM 0201

C8570 2.2UF 20% 4V X6S-CERM 0201
C8571 2.2UF 20% 4V X6S-CERM 0201
C8572 2.2UF 20% 4V X6S-CERM 0201
C8573 2.2UF 20% 4V X6S-CERM 0201
C8574 2.2UF 20% 4V X6S-CERM 0201
C8575 2.2UF 20% 4V X6S-CERM 0201
C8576 2.2UF 20% 4V X6S-CERM 0201
C8577 2.2UF 20% 4V X6S-CERM 0201

C8590 10UF 20% 6.3V CERM-X6S 0402
C8591 10UF 20% 6.3V CERM-X6S 0402
C8592 10UF 20% 6.3V CERM-X6S 0402
C8593 10UF 20% 6.3V CERM-X6S 0402
C8594 10UF 20% 6.3V CERM-X6S 0402
C8595 10UF 20% 6.3V CERM-X6S 0402
C8596 10UF 20% 6.3V CERM-X6S 0402
C8597 12PF 5% NP0-C0G 0201 25V (CRITICAL)
C8598 3.0PF +/-0.1PF 25V NP0-C0G 0201 (CRITICAL)

AA15 AA17 AA20 AA22 AA24 AA27 AB16 AB18 AB21 AB23 AB26 AB28 — VDDC
AC17 AC20 AC22 AC24 AC27 AD18 AD21 AD23 AD26 AF17 AF20 AF22 AG16 AG18 AH22 AH27 AH28 M26 — BIF_VDDC
N24 N27 R18 R21 R23 R26 T17 T20 T22 T24 — VDDC
T27 U16 U18 U21 U23 U26 V17 V20 V22 V24 V27 Y16 Y18 Y21 Y26 Y28 — VDDC

1200mA — PP0V95_S0GPU 70 71 73 78 84

PPVCORE_GPU 47 71 79 84
NOSTUFF R8510 100 1% 1/20W MF 201 PLACE_NEAR=U8400.AF28:2.54MM
R8510/1/2 only stuffed for GPU VR measurement
VSNS_GPU_VDDC_P 96 85 79 71

GPU_GND_SENSE 71 — VOLTAGE=0.0V MIN_LINE_WIDTH=0.3MM MIN_NECK_WIDTH=0.2MM
NO_XNET_CONNECTION=TRUE
XW8510 — VSNS_GPU_VDDC_N — OUT 79 96
NOSTUFF R8511 100 1% 1/20W MF 201 PLACE_NEAR=U8400.AH29:2.54MM
XW8512 — VSNS_GPU_VDDI_N — OUT 80 96
NO_XNET_CONNECTION=TRUE

PPVDDCI_S0_ISENSE 71 80 84
NOSTUFF R8512 100 1% 1/20W MF 201 PLACE_NEAR=U8400.AG28:2.54MM
VSNS_GPU_VDDI_P 71 80 85 96

PPVDDCI_S0_ISENSE 84 80 71 — 7A@0.9V

AA13 AB13 AC12 AC15 AD13 AD16 M15 M16 M18 M23 N13 N15 N17 N20 N22 R12 R13 R16 T12 T15 V15 Y13 — VDDCI

C85A0 0.1UF 10% 6.3V X7R 0201
C85A1 0.1UF 10% 6.3V X7R 0201
C85A2 0.1UF 10% 6.3V X7R 0201
C85A7 1.0UF 20% 4V X6S 0201
C85A8 1.0UF 20% 4V X6S 0201
C85A9 1.0UF 20% 4V X6S 0201
C85A3 12PF 5% NP0-C0G 0201 25V (CRITICAL)
C85A4 3.0PF +/-0.1PF 25V NP0-C0G 0201 (CRITICAL)
C85B0 10UF 20% 6.3V CERM-X6S 0402

SYNC_MASTER=MARY_X425G — SYNC_DATE=09/22/2014

PAGE TITLE: Venus CORE/FB POWER

Apple Inc.

DRAWING NUMBER: <SCH_NUM> — SIZE: D
REVISION: <E4LABEL>
BRANCH: <BRANCH>
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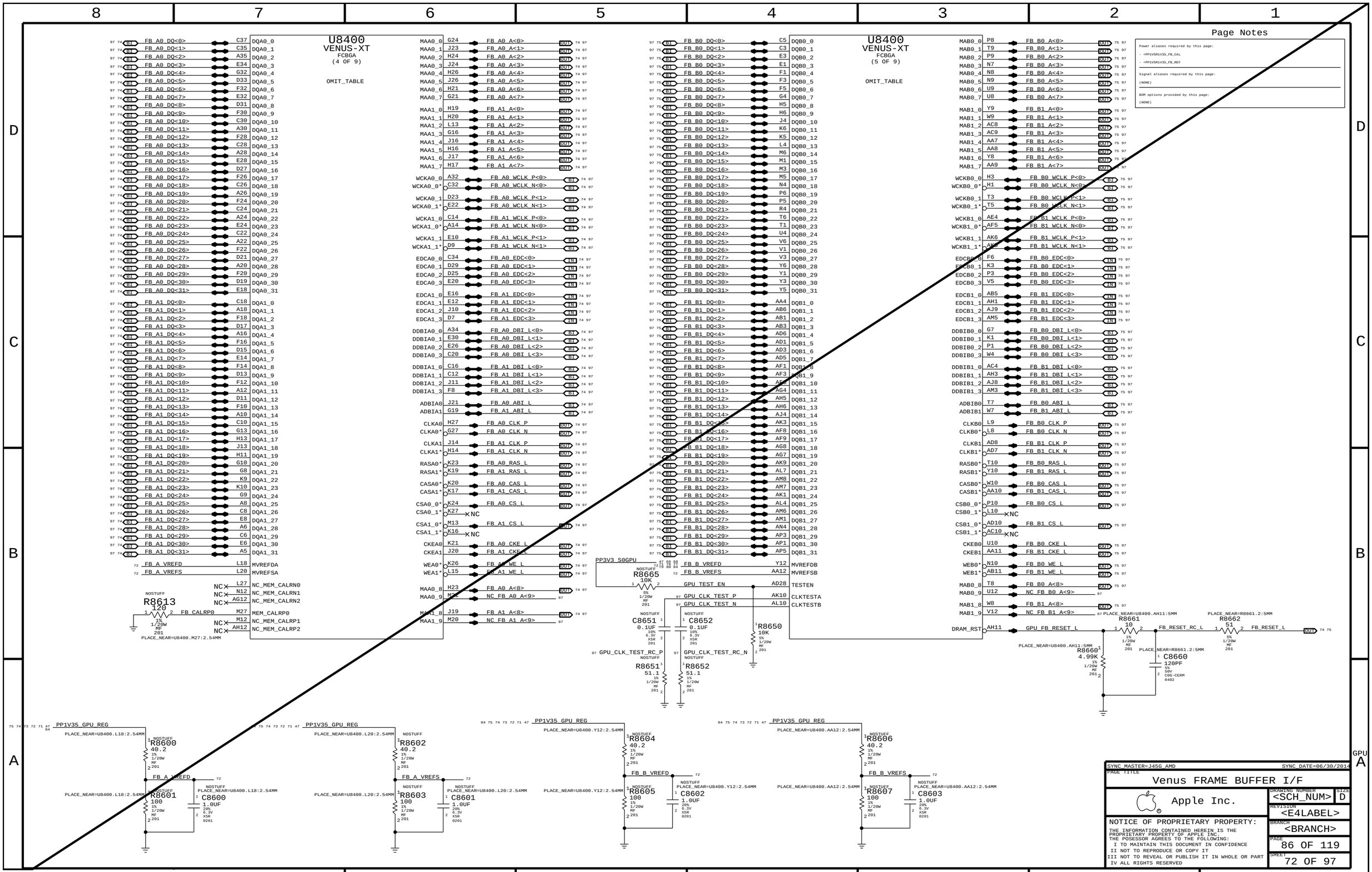

GPU FB SUPPLY

VOUT = 1.5V / 1.35V
12A MAX OUTPUT
F = 500 KHZ

PP5V_S0
PPVIN_S5_HS_GPU_ISNS
PP1V35_GPU_REG
MIRROR C8702 AND C8708
NO_XNET_CONNECTION=TRUE
NO_XNET_CONNECTION=TRUE
XW8703
XW8731
R8731 1.62K 1% 1/20W MF 201
VSNS_GPU_FB_XW_P
R8703 1.62K 1% 1/20W MF 201
VSNS_GPU_FB_XW_N
R8701 2.2 5% 1/20W MF 201
R8706 2.2 5% 1/20W MF 201
PP5V_S0_GPUFB_PVCC
PP5V_S0GPU_P1V35_GPU
C8721 10UF 20% 6.3V CERM-X6S 0402
R8709 0 5% 1/16W MF-LF 402
GPUFB_BOOT_RC
C8705 0.1UF 10% 16V X7R-CERM 0402
C8706 68UF 20% 16V POLY-TANT CASE-D2E-SM
C8707 68UF 20% 16V POLY-TANT CASE-D2E-SM
C8709 33UF 20% 16V POLY-TANT CASED12-SM
C8708 2.2UF 20% 25V X6S-CERM 0402
C8702 2.2UF 20% 25V X6S-CERM 0402
C8703 1000PF 5% 25V CERM 0402
C8701 12PF 5% 50V NP0-C0G 0201
C8704 3.0PF +/-0.1PF 25V NP0-C0G 0201
U8700 ISL95870AH UTQFN CRITICAL
VCC PVCC
EN FB SREF VO OCSET PGOOD RTN FSEL SET0 SET1 VID0 VID1
BOOT UGATE PHASE LGATE
GND PGND
P1V35R1V5FB_EN
GPUFB_SENSE_DIV
GPUFB_SREF
GPUFB_VO
GPUFB_OCSET
P1V35R1V5FB_PGOOD
GPUFB_RTN_DIV
GPUFB_FSEL
GPUFB_SET0
GPUFB_SET1
GPUFB_VBST
GPUFB_DRVH_R
GPUFB_LL
GPUFB_DRVL
R8739 1 5% 1/16W MF-LF 402
GPUFB_DRVH
376S0959 CRITICAL Q8710 SIZ710DT POWERPAK-6X3.7
APN 152S00140 L8710 CRITICAL 0.68UH-20%-14A PILE063T-SM
R8730 0.002 1% 1W CYN 0612
PP1V5R1V35_GPU_REG_R
GPUFB_CS_P
GPUFB_CS_N
C8711 1000PF 5% 25V CERM 0402
C8710 270UF 20% 2V TANT CASE-B2-SM
C8712 270UF 20% 2V TANT CASE-B2-SM
C8713 270UF 20% 2V TANT CASE-B2-SM
C8714 270UF 20% 2V TANT CASE-B2-SM
PP1V35_GPU_REG
R8717 191K 0.1% 1/20W MF 0201
R8718 95.3K 0.1% 1/20W MF 0201
R8700 0 5% 1/20W MF 201
GPUFB_SET_R
R8734 16.9K 0.1% 1/20W MF 0201
C8723 0.01UF 10% 16V X7R-CERM 0402
C8722 2.2UF 10% 10V X6S-CERM 0402
NOSTUFF R8713 0 5% 1/20W MF 201
C8726 10PF 5% 50V C0G 0201
NOSTUFF R8704 4.64K 1% 1/20W MF 201
NOSTUFF R8702 4.64K 1% 1/20W MF 201
C8715 10PF 5% 50V C0G 0201
FBVDD_ALTVO
GPUFB_AGND
XW8700 SM
R8721 4.64K 1% 1/20W MF 201
C8770 2200PF 10% 25V X7R 0201
R8772 4.64K 1% 1/20W MF 201

GPIO 21 --> VID1

VID1	VID0	FBVDD
0	0	1.5V
1	0	1.35V

GPU 0.95V/BIF_VDDC SUPPLY

VOUT = 0.95V
5.2A MAX OUTPUT
F = 500 KHZ

PP0V95_S0GPU
PPVIN_S5_HS_GPU_ISNS
PP5V_S0
MIRROR C8750 AND C8758
NO_XNET_CONNECTION=TRUE
NO_XNET_CONNECTION=TRUE
XW8754
XW8757
R8754 3.01K 0.1% 1/20W MF 0201 <Ra>
R8755 3.01K 0.1% 1/20W MF 0201 <Ra>
VSNS_GPU_0V95_XW_N
VSNS_GPU_0V95_XW_P
R8751 2.2 5% 1/20W MF 201
C8751 10UF 20% 6.3V CERM-X6S 0402
P0V95_GPU_BOOT_RC
R8775 2.2 5% 1/16W MF-LF 402
C8795 0.1UF 10% 16V X7R-CERM 0402
C8756 68UF 20% 16V POLY-TANT CASE-D2E-SM
C8758 2.2UF 20% 25V X6S-CERM 0402
C8750 2.2UF 20% 25V X6S-CERM 0402
C8757 1000PF 5% 25V CERM 0402
C8771 12PF 5% 50V NP0-C0G 0201
C8772 3.0PF +/-0.1PF 25V NP0-C0G 0201
PP5V_S0GPU_P1V05_GPU
U8750 ISL95870 UTQFN CRITICAL
VCC PVCC
P0V95_S0GPU_EN
P0V95_GPU_FB
P0V95_GPU_SREF
P0V95_GPU_VO
P0V95_GPU_OCSET
P0V95_S0GPU_PGOOD
P0V95_GPU_RTN
P0V95_GPU_FSEL
BOOT UGATE PHASE LGATE
GND PGND
P0V95_GPU_VBST
P0V95_GPU_DRVH_R
P0V95_GPU_LL
P0V95_GPU_DRVL
R8796 1 5% 1/16W MF-LF 402
376S1038 CRITICAL Q8760 CSD58873Q3D Q3D
VIN TG TGR VSW BG PGND
P0V95_GPU_LL_FET
152S00139 CRITICAL L8760 1.0UH-20%-8.6A PIME053T-SM
R8795 0.003 1% 1W CYN 0612
P0V95_S0GPU_REG_R
ISNS_P0V95_S0GPU_P
ISNS_P0V95_S0GPU_N
C8759 1000PF 5% 25V CERM 0402
C8760 270UF 20% 2V TANT CASE-B2-SM
C8761 270UF 20% 2V TANT CASE-B2-SM
C8762 270UF 20% 2V TANT CASE-B2-SM
PP0V95_S0GPU
R8756 3.32K 0.1% 1/20W MF 0201 <Rb>
R8757 3.32K 0.1% 1/20W MF 0201 <Rb>
C8754 10PF 5% 50V C0G 0201
C8755 10PF 5% 50V C0G 0201
C8752 2.2UF 10% 10V X6S-CERM 0402
NOSTUFF R8753 0 5% 1/20W MF 201
C8753 0.047UF 10% 16V X7R-CERM 0402
P0V95_GPU_AGND
XW8750 SM
R8771 3.01K 1% 1/20W MF 201
C8700 2200PF 10% 25V X7R 0201
R8705 3.01K 1% 1/20W MF 201

Vout = 0.5V * (1 + Ra / Rb)

SYNC_MASTER=ADITYA_X425G	SYNC_DATE=09/16/2014
PAGE TITLE	0V95 GPU / 1V35 FB Power Supply
	Apple Inc.
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Page Notes

Power aliases required by this page:

- =PP1VSR1V35_S0_FB_VDD

Signal aliases required by this page:

(NONE)

BOM options provided by this page:

PP1V35_GPU_REG

R8801 60.4 1% 1/16W MF-LF 0402 2

R8802 60.4 1% 1/16W MF-LF 0402 2

R8800 120 1% 1/20W MF 0201 2

R8804 1K 5% 1/20W MF 0201 2

R8803 1K 5% 1/20W MF 0201 2

U8800
BGA
H5GC4H24MFR-T2C
SYM 1 OF 2

GDDR5-128MX32-4GB-38NM-MFL

OMIT_TABLE

FB_A1_A<2>	H11	BA0/A2	
FB_A1_A<5>	K10	BA1/A5	
FB_A1_A<4>	K11	BA2/A4	
FB_A1_A<3>	H10	BA3/A3	
FB_A1_A<7>	K4	A8/A7	
FB_A1_A<1>	H5	A9/A1	
FB_A1_A<0>	H4	A10/A0	
FB_A1_A<6>	K5	A11/A6	
FB_A1_CKE_L	J3	CKE*	
FB_A1_CLK_P	J12	CK	
FB_A1_CLK_N	J11	CK*	
FB_A1_CS_L	G12	CS*	
FB_A1_WE_L	L12	WE*	
FB_A1_CAS_L	L3	CAS*	
FB_A1_RAS_L	G3	RAS*	
FB_A1_ZQ	J13	ZQ	
FB_A1_MF	J1	MF (MF=0)	
FB_A1_SEN	J10	SEN	
FB_RESET_L	J2	RESET*	
FB_A1_ABI_L	J4	ABI*	
FB_A1_EDC<0>	C2	EDC0	
FB_A1_EDC<1>	C13	EDC1	
FB_A1_EDC<3>	R13	EDC2	
FB_A1_EDC<2>	R2	EDC3	
FB_A1_WCLK_P<0>	D4	WCK01	
FB_A1_WCLK_N<0>	D5	WCK01*	
FB_A1_WCLK_P<1>	P4	WCK23	
FB_A1_WCLK_N<1>	P5	WCK23*	

DBI0*	D2	FB_A1_DBI_L<0>	B1
DBI1*	D13	FB_A1_DBI_L<1>	B1
DBI2*	P13	FB_A1_DBI_L<3>	B1
DBI3*	P2	FB_A1_DBI_L<2>	B1
DQ0	A4	FB_A1_DQ<2>	B1
DQ1	A2	FB_A1_DQ<5>	B1
DQ2	B4	FB_A1_DQ<4>	B1
DQ3	B2	FB_A1_DQ<6>	B1
DQ4	E4	FB_A1_DQ<1>	B1
DQ5	E2	FB_A1_DQ<7>	B1
DQ6	F4	FB_A1_DQ<0>	B1
DQ7	F2	FB_A1_DQ<3>	B1
DQ8	A11	FB_A1_DQ<8>	B1
DQ9	A13	FB_A1_DQ<9>	B1
DQ10	B11	FB_A1_DQ<10>	B1
DQ11	B13	FB_A1_DQ<11>	B1
DQ12	E11	FB_A1_DQ<12>	B1
DQ13	E13	FB_A1_DQ<14>	B1
DQ14	F11	FB_A1_DQ<15>	B1
DQ15	F13	FB_A1_DQ<13>	B1
DQ16	U11	FB_A1_DQ<28>	B1
DQ17	U13	FB_A1_DQ<31>	B1
DQ18	T11	FB_A1_DQ<29>	B1
DQ19	T13	FB_A1_DQ<25>	B1
DQ20	N11	FB_A1_DQ<27>	B1
DQ21	N13	FB_A1_DQ<26>	B1
DQ22	M11	FB_A1_DQ<24>	B1
DQ23	M13	FB_A1_DQ<30>	B1
DQ24	U4	FB_A1_DQ<21>	B1
DQ25	U2	FB_A1_DQ<16>	B1
DQ26	T4	FB_A1_DQ<20>	B1
DQ27	T2	FB_A1_DQ<19>	B1
DQ28	N4	FB_A1_DQ<17>	B1
DQ29	N2	FB_A1_DQ<23>	B1
DQ30	M4	FB_A1_DQ<18>	B1
DQ31	M2	FB_A1_DQ<22>	B1
VPP/NC	A5	NC	
A12/A13	J5	FB_A1_A<8>	
VPP/NC	U5	NC	

U8800
BGA
H5GC4H24MFR-T2C
SYM 2 OF 2

GDDR5-128MX32-4GB-38NM-MFL

OMIT_TABLE

VDD	C5, C10, D11, G1, G4, G11, G14, L1, L4, L11, L14, P11, R5, R10		
VDDQ	B1, B3, B12, B14, D1, D3, D12, D14, E5, E10, F1, F3, F12, F14, G2, G13, H3, H12, K3, K12, L2, L13, M1, M3, M12, M14, N5, N10, P1, P3, P12, P14, T1, T3, T12, T14		
VSS	B5, B10, D10, G5, G10, H1, H14, K1, K14, L5, L10, P10, T5, T10		
VSSQ	A1, A3, A12, A14, C1, C3, C4, C11, C12, C14, E1, E3, E12, E14, F5, F10, H2, H13, K2, K13, M5, M10, N1, N3, N12, N14, R1, R3, R4, R11, R12, R14, U1, U3, U12, U14		
VREFC	J14	FB_A1_VREFC	
VREFD	A10	FB_A1_VREFD1	
	U10	FB_A1_VREFD2	

C8800 4.7UF 20% 6.3V X6S 0402

C8826 12PF 5% 50V NP0-C0G 0201

C8827 3.0PF +/-0.1PF 25V NP0-C0G 0201

C8806 1.0UF 20% 4V X6S 0201

C8814 1.0UF 20% 4V X6S 0201

C8818 0.1UF 10% 6.3V X7R 0201

C8822 0.1UF 10% 6.3V X7R 0201

R8830 2.37K 1% 1/20W MF 201

R8831 5.49K 1% 1/20W MF 201

R8832 2.37K 1% 1/20W MF 201

R8833 5.49K 1% 1/20W MF 201

R8834 2.37K 1% 1/20W MF 201

R8835 5.49K 1% 1/20W MF 201

C8830 1.0UF 20% 4V X6S 0201

C8831 1.0UF 20% 4V X6S 0201

C8832 1.0UF 20% 4V X6S 0201

C8833 1.0UF 20% 4V X6S 0201

C8834 1.0UF 20% 4V X6S 0201

C8835 1.0UF 20% 4V X6S 0201

U8850
BGA
H5GC4H24MFR-T2C
SYM 1 OF 2

GDDR5-128MX32-4GB-38NM-MFL

OMIT_TABLE

FB_A0_A<2>	H11	BA0/A2	
FB_A0_A<5>	K10	BA1/A5	
FB_A0_A<4>	K11	BA2/A4	
FB_A0_A<3>	H10	BA3/A3	
FB_A0_A<7>	K4	A8/A7	
FB_A0_A<1>	H5	A9/A1	
FB_A0_A<0>	H4	A10/A0	
FB_A0_A<6>	K5	A11/A6	
FB_A0_CKE_L	J3	CKE*	
FB_A0_CLK_P	J12	CK	
FB_A0_CLK_N	J11	CK*	
FB_A0_CS_L	G12	CS*	
FB_A0_WE_L	L12	WE*	
FB_A0_CAS_L	L3	CAS*	
FB_A0_RAS_L	G3	RAS*	
FB_A0_ZQ	J13	ZQ	
FB_A0_MF	J1	MF (MF=0)	
FB_A0_SEN	J10	SEN	
FB_RESET_L	J2	RESET*	
FB_A0_ABI_L	J4	ABI*	
FB_A0_EDC<0>	C2	EDC0	
FB_A0_EDC<1>	C13	EDC1	
FB_A0_EDC<3>	R13	EDC2	
FB_A0_EDC<2>	R2	EDC3	
FB_A0_WCLK_P<0>	D4	WCK01	
FB_A0_WCLK_N<0>	D5	WCK01*	
FB_A0_WCLK_P<1>	P4	WCK23	
FB_A0_WCLK_N<1>	P5	WCK23*	

DBI0*	D2	FB_A0_DBI_L<0>	B1
DBI1*	D13	FB_A0_DBI_L<1>	B1
DBI2*	P13	FB_A0_DBI_L<3>	B1
DBI3*	P2	FB_A0_DBI_L<2>	B1
DQ0	A4	FB_A0_DQ<4>	B1
DQ1	A2	FB_A0_DQ<7>	B1
DQ2	B4	FB_A0_DQ<5>	B1
DQ3	B2	FB_A0_DQ<6>	B1
DQ4	E4	FB_A0_DQ<0>	B1
DQ5	E2	FB_A0_DQ<3>	B1
DQ6	F4	FB_A0_DQ<2>	B1
DQ7	F2	FB_A0_DQ<1>	B1
DQ8	A11	FB_A0_DQ<8>	B1
DQ9	A13	FB_A0_DQ<10>	B1
DQ10	B11	FB_A0_DQ<9>	B1
DQ11	B13	FB_A0_DQ<12>	B1
DQ12	E11	FB_A0_DQ<11>	B1
DQ13	E13	FB_A0_DQ<15>	B1
DQ14	F11	FB_A0_DQ<13>	B1
DQ15	F13	FB_A0_DQ<14>	B1
DQ16	U11	FB_A0_DQ<24>	B1
DQ17	U13	FB_A0_DQ<25>	B1
DQ18	T11	FB_A0_DQ<26>	B1
DQ19	T13	FB_A0_DQ<30>	B1
DQ20	N11	FB_A0_DQ<29>	B1
DQ21	N13	FB_A0_DQ<28>	B1
DQ22	M11	FB_A0_DQ<27>	B1
DQ23	M13	FB_A0_DQ<31>	B1
DQ24	U4	FB_A0_DQ<19>	B1
DQ25	U2	FB_A0_DQ<17>	B1
DQ26	T4	FB_A0_DQ<18>	B1
DQ27	T2	FB_A0_DQ<16>	B1
DQ28	N4	FB_A0_DQ<22>	B1
DQ29	N2	FB_A0_DQ<23>	B1
DQ30	M4	FB_A0_DQ<21>	B1
DQ31	M2	FB_A0_DQ<20>	B1
VPP/NC	A5	NC	
A12/A13	J5	FB_A0_A<8>	
VPP/NC	U5	NC	

U8850
BGA
H5GC4H24MFR-T2C
SYM 2 OF 2

GDDR5-128MX32-4GB-38NM-MFL

OMIT_TABLE

VDD	C5, C10, D11, G1, G4, G11, G14, L1, L4, L11, L14, P11, R5, R10		
VDDQ	B1, B3, B12, B14, D1, D3, D12, D14, E5, E10, F1, F3, F12, F14, G2, G13, H3, H12, K3, K12, L2, L13, M1, M3, M12, M14, N5, N10, P1, P3, P12, P14, T1, T3, T12, T14		
VSS	B5, B10, D10, G5, G10, H1, H14, K1, K14, L5, L10, P10, T5, T10		
VSSQ	A1, A3, A12, A14, C1, C3, C4, C11, C12, C14, E1, E3, E12, E14, F5, F10, H2, H13, K2, K13, M5, M10, N1, N3, N12, N14, R1, R3, R4, R11, R12, R14, U1, U3, U12, U14		
VREFC	J14	FB_A0_VREFC	
VREFD	A10	FB_A0_VREFD1	
	U10	FB_A0_VREFD2	

R8851 60.4 1% 1/16W MF-LF 0402 2

R8852 60.4 1% 1/16W MF-LF 0402 2

R8850 120 1% 1/20W MF 0201 2

R8854 1K 5% 1/20W MF 0201 2

R8853 1K 5% 1/20W MF 0201 2

C8850 4.7UF 20% 6.3V X6S 0402

C8876 12PF 5% 50V NP0-C0G 0201

C8877 3.0PF +/-0.1PF 25V NP0-C0G 0201

C8856 1.0UF 20% 4V X6S 0201

C8860 1.0UF 20% 4V X6S 0201

C8864 1.0UF 20% 4V X6S 0201

C8868 0.1UF 10% 6.3V X7R 0201

C8872 0.1UF 10% 6.3V X7R 0201

R8880 2.37K 1% 1/20W MF 201

R8881 5.49K 1% 1/20W MF 201

R8882 2.37K 1% 1/20W MF 201

R8883 5.49K 1% 1/20W MF 201

R8884 2.37K 1% 1/20W MF 201

R8885 5.49K 1% 1/20W MF 201

C8880 1.0UF 20% 4V X6S 0201

C8881 1.0UF 20% 4V X6S 0201

C8882 1.0UF 20% 4V X6S 0201

C8883 1.0UF 20% 4V X6S 0201

C8884 1.0UF 20% 4V X6S 0201

C8885 1.0UF 20% 4V X6S 0201

SYNC_MASTER=MARY_X425G SYNC_DATE=09/22/2014

PAGE TITLE: GDDR5 Frame Buffer A

Apple Inc.

DRAWING NUMBER: <SCH_NUM> SIZE: D

REVISION: <E4LABEL>

BRANCH: <BRANCH>

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GPU

Page Notes

Power aliases required by this page:

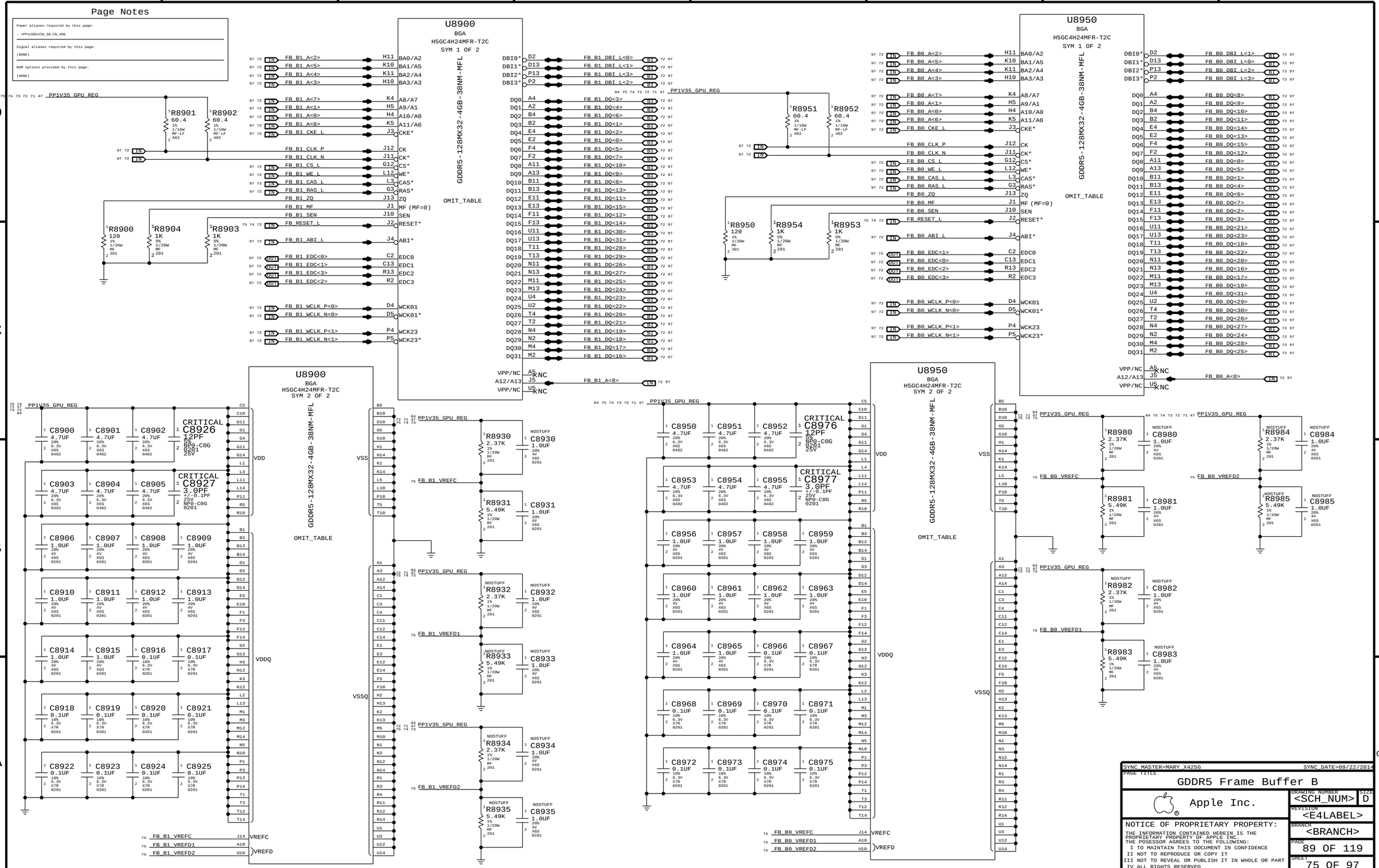
- =PP1VSR1V35_S0_FB_VDD

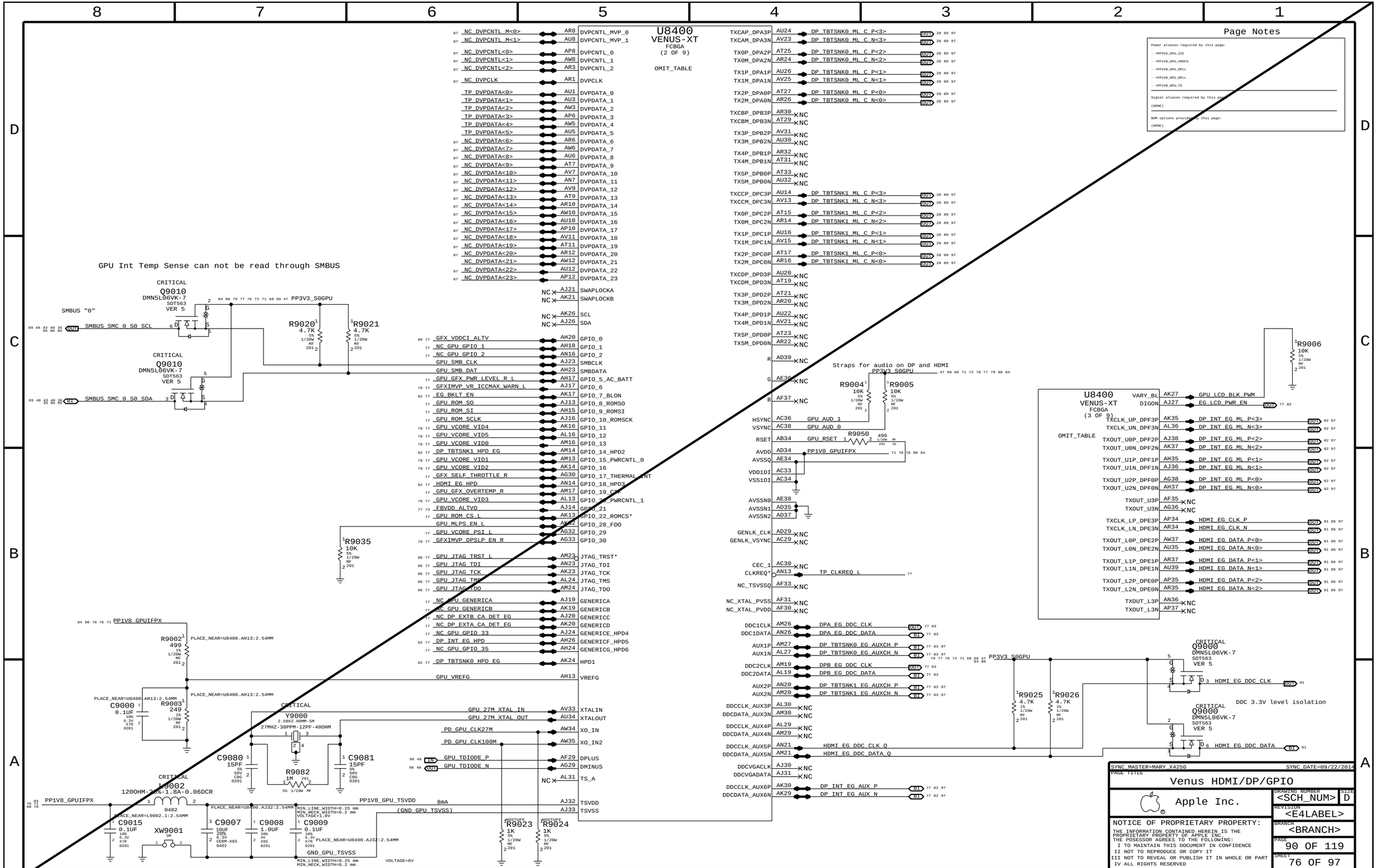
Signal aliases required by this page:

(NONE)

BOM options provided by this page:

(NONE)



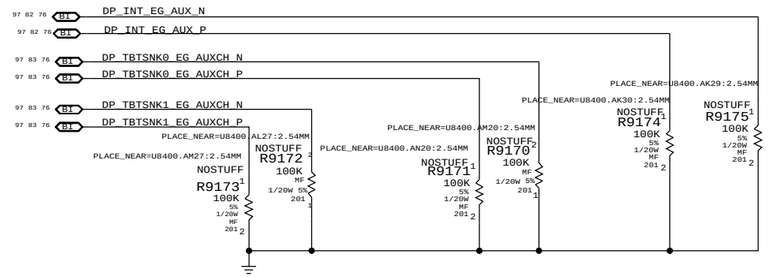


GPU GPIO TABLE

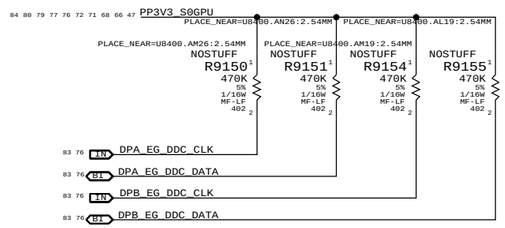
		Native Func			
80 77 76	GFX_VDDCI_ALTV	GP	GFX_VDDCI_ALTV	MAKE_BASE=TRUE	76 77 80
77 76	NC_GPU_GPIO_1	GP	NC_GPU_GPIO_1	MAKE_BASE=TRUE NO_TEST=TRUE	76 77
77 76	NC_GPU_GPIO_2	GP	NC_GPU_GPIO_2	MAKE_BASE=TRUE NO_TEST=TRUE	76 77
77 76	GPU_GFX_PWR_LEVEL_R_L	GP	GPU_GFX_PWR_LEVEL_R_L	MAKE_BASE=TRUE	76 77
79 77 76	GFXIMVP_VR_ICCMAX_WARN_L	GP	GFXIMVP_VR_ICCMAX_WARN_L	MAKE_BASE=TRUE	76 77 79
82 77 76	EG_BKLT_EN	GP	EG_BKLT_EN	MAKE_BASE=TRUE	76 77 82
77 76	GPU_ROM_SO	GP	GPU_ROM_SO	MAKE_BASE=TRUE	76 77
77 76	GPU_ROM_SI	GP	GPU_ROM_SI	MAKE_BASE=TRUE	76 77
77 76	GPU_ROM_SCLK	GP	GPU_ROM_SCLK	MAKE_BASE=TRUE	76 77
79 77 76	GPU_VCORE_VID4	GP	GPU_VCORE_VID4	MAKE_BASE=TRUE	76 77 79
79 77 76	GPU_VCORE_VID5	GP	GPU_VCORE_VID5	MAKE_BASE=TRUE	76 77 79
79 77 76	GPU_VCORE_VID0	GP	GPU_VCORE_VID0	MAKE_BASE=TRUE	76 77 79
82 77 76	DP_TBTSNK1_HPD_EG	GP	DP_TBTSNK1_HPD_EG	MAKE_BASE=TRUE	76 77 82
79 77 76	GPU_VCORE_VID1	GP	GPU_VCORE_VID1	MAKE_BASE=TRUE	76 77 79

		Native Func			
79 77 76	GPU_VCORE_VID2	GP	GPU_VCORE_VID2	MAKE_BASE=TRUE	76 77 79
77 76	GFX_SELF_THROTTLE_R	GP	GFX_SELF_THROTTLE_R	MAKE_BASE=TRUE	76 77
82 77 76	HDMI_EG_HPD	GP	HDMI_EG_HPD	MAKE_BASE=TRUE	76 77 82
77 76	GPU_GFX_OVERTEMP_R	GP	GPU_GFX_OVERTEMP_R	MAKE_BASE=TRUE	76 77
79 77 76	GPU_VCORE_VID3	GP	GPU_VCORE_VID3	MAKE_BASE=TRUE	76 77 79
77 76 73	FBVDD_ALTVO	GP	FBVDD_ALTVO	MAKE_BASE=TRUE	73 76 77
77 76	GPU_ROM_CS_L	GP	GPU_ROM_CS_L	MAKE_BASE=TRUE	76 77
77 76	TP_CLKREQ_L	GP	TP_CLKREQ_L	MAKE_BASE=TRUE	76 77
77 76	NC_GPU_GENERICA	GP	NC_GPU_GENERICA	MAKE_BASE=TRUE NO_TEST=TRUE	76 77
77 76	NC_GPU_GENERICB	GP	NC_GPU_GENERICB	MAKE_BASE=TRUE NO_TEST=TRUE	76 77
77 76	GPU_VCORE_PSI_L	GP	GPU_VCORE_PSI_L	MAKE_BASE=TRUE	76 77
79 77 76	GFXIMVP_DPSLP_EN_R	GP	GFXIMVP_DPSLP_EN_R	MAKE_BASE=TRUE	76 77 79
77 76	NC_DP_EXTB_CA_DET_EG	GP	NC_DP_EXTB_CA_DET_EG	MAKE_BASE=TRUE NO_TEST=TRUE	76 77
77 76	NC_DP_EXTA_CA_DET_EG	GP	NC_DP_EXTA_CA_DET_EG	MAKE_BASE=TRUE NO_TEST=TRUE	76 77
77 76	NC_GPU_GPIO_33	GP	NC_GPU_GPIO_33	MAKE_BASE=TRUE NO_TEST=TRUE	76 77
82 77 76	DP_INT_EG_HPD	GP	DP_INT_EG_HPD	MAKE_BASE=TRUE	76 77 82
77 76	NC_GPU_GPIO_35	GP	NC_GPU_GPIO_35	MAKE_BASE=TRUE NO_TEST=TRUE	76 77
82 77 76	DP_TBTSNK0_HPD_EG	GP	DP_TBTSNK0_HPD_EG	MAKE_BASE=TRUE	76 77 82

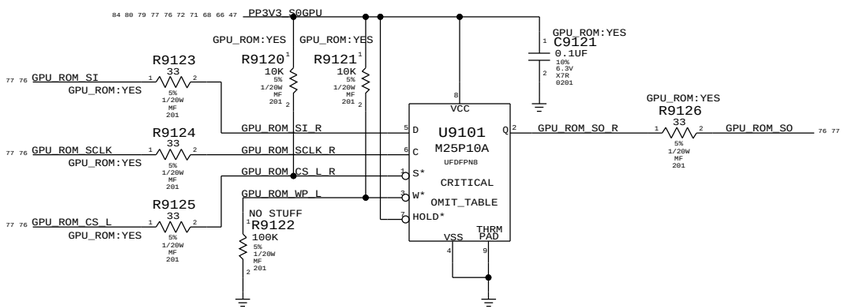
AMD AUX PD



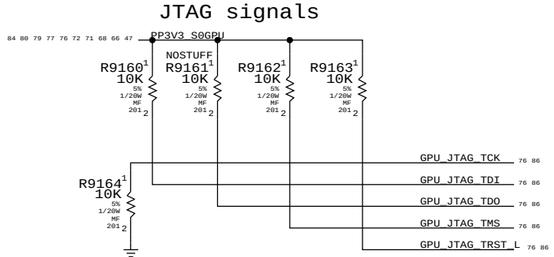
DDC PULL UP



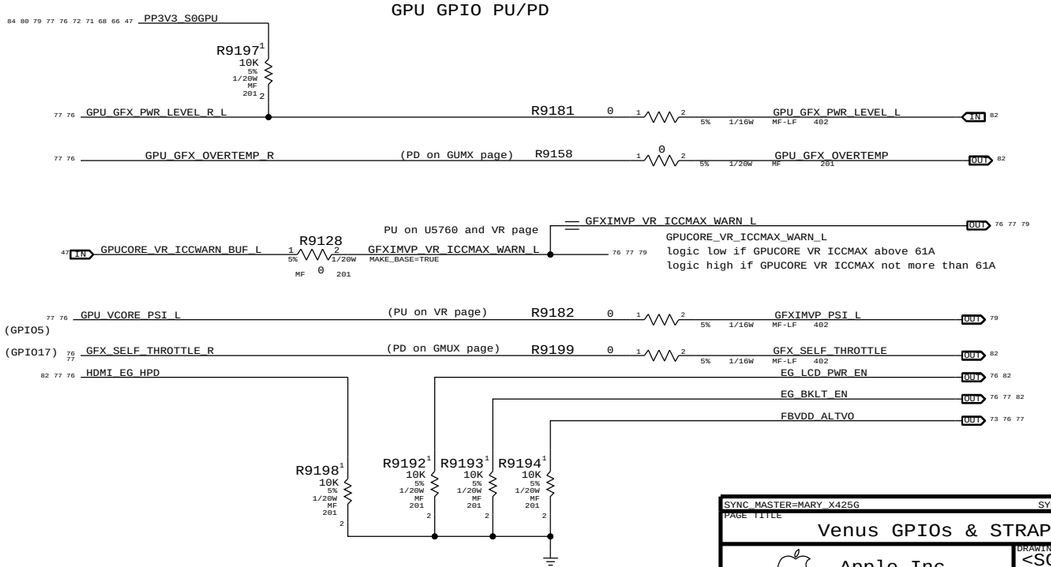
GPU ROM



JTAG signals



GPU GPIO PU/PD



SYNC_MASTER=MARY_X425G SYNC_DATE=11/07/2014

PAGE TITLE: Venus GPIOs & STRAPs

Apple Inc.

DRAWING NUMBER: <SCH_NUM> SIZE: D
REVISION: <E4LABEL>
BRANCH: <BRANCH>
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Page Notes

Power aliases required by this page:

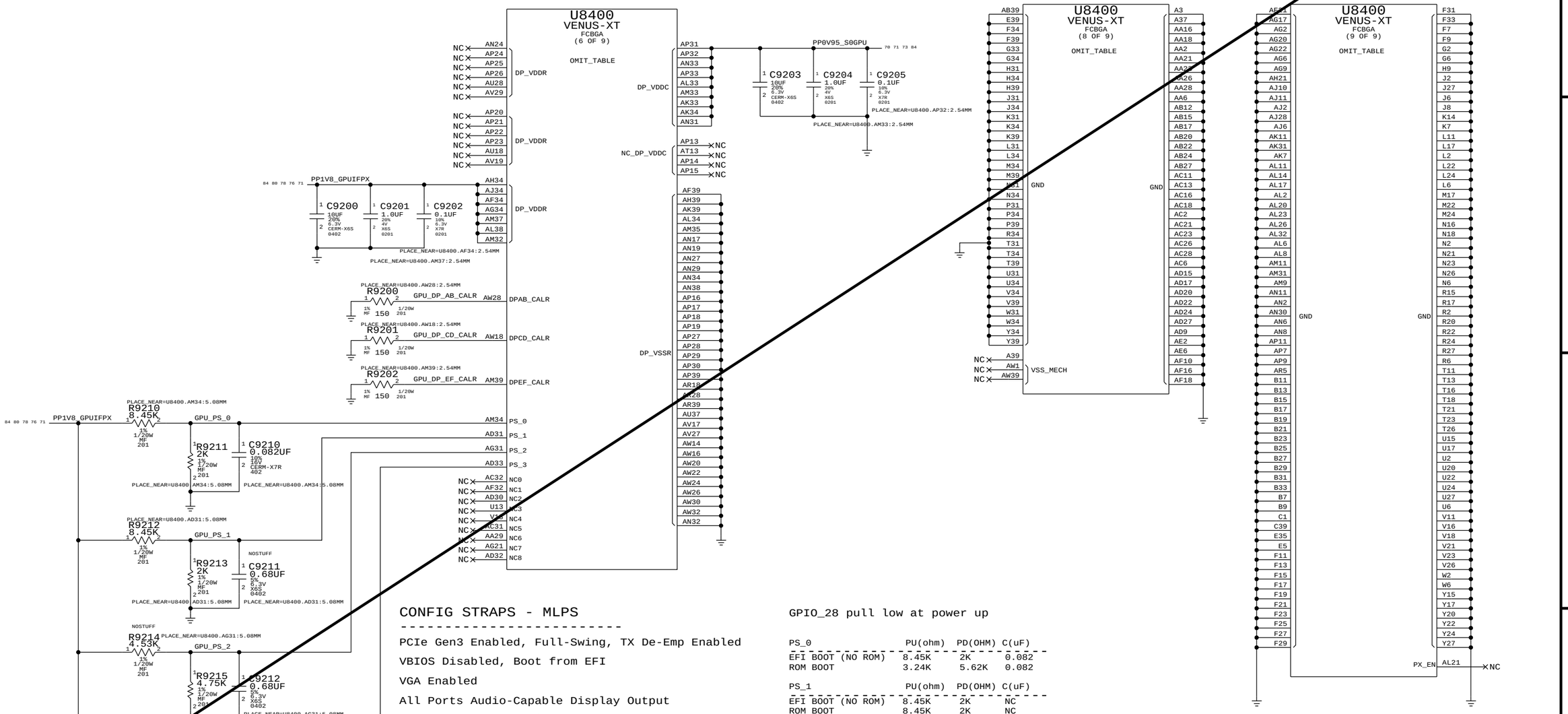
- =PP1V8_GPU_DP_AB
- =PP1V8_GPU_DP_CD
- =PP1V8_GPU_DP_EF
- =PP1V0_GPU_DP_AB
- =PP1V0_GPU_DP_CD
- =PP1V0_GPU_DP_EF

Signal aliases required by this page:

(NONE)

BOM options provided by this page:

(NONE)



CONFIG STRAPS - MLPS

PCIe Gen3 Enabled, Full-Swing, TX De-Emp Enabled

VBIOS Disabled, Boot from EFI

VGA Enabled

All Ports Audio-Capable Display Output

256MB FB Aperture Size

EFI BOOT (NO ROM)

PS_0: R9120=8.45K,R9211=2K,C9210=0.082uF

PS_1: R9122=8.45K,R9213=2K,C9211NOSTUFF

PS_2: R9214 NOSTUFF,R9215=4.75K,C9213=0.68uF

PS_2: R9216 NOSTUFF,R9217=4.75K,C9213=0.68uF

GPIO_28 pull low at power up

PS_0	PU(ohm)	PD(OHM)	C(uF)
EFI BOOT (NO ROM)	8.45K	2K	0.082
ROM BOOT	3.24K	5.62K	0.082

PS_1	PU(ohm)	PD(OHM)	C(uF)
EFI BOOT (NO ROM)	8.45K	2K	NC
ROM BOOT	8.45K	2K	NC

PS_2	PU(ohm)	PD(OHM)	C(uF)
EFI BOOT (NO ROM)	NC	4.75K	0.68
ROM BOOT	4.53K	4.99K	0.68

PS_3	PU(ohm)	PD(OHM)	C(uF)
EFI BOOT (NO ROM)	NC	4.75K	0.68
ROM BOOT	NC	4.75K	0.68

SYNC_MASTER=MARY_X425G SYNC_DATE=09/22/2014

PAGE TITLE: Venus DP PWR/GNDs

Apple Inc.

DRAWING NUMBER: <SCH_NUM> SIZE: D

REVISION: <E4LABEL>

BRANCH: <BRANCH>

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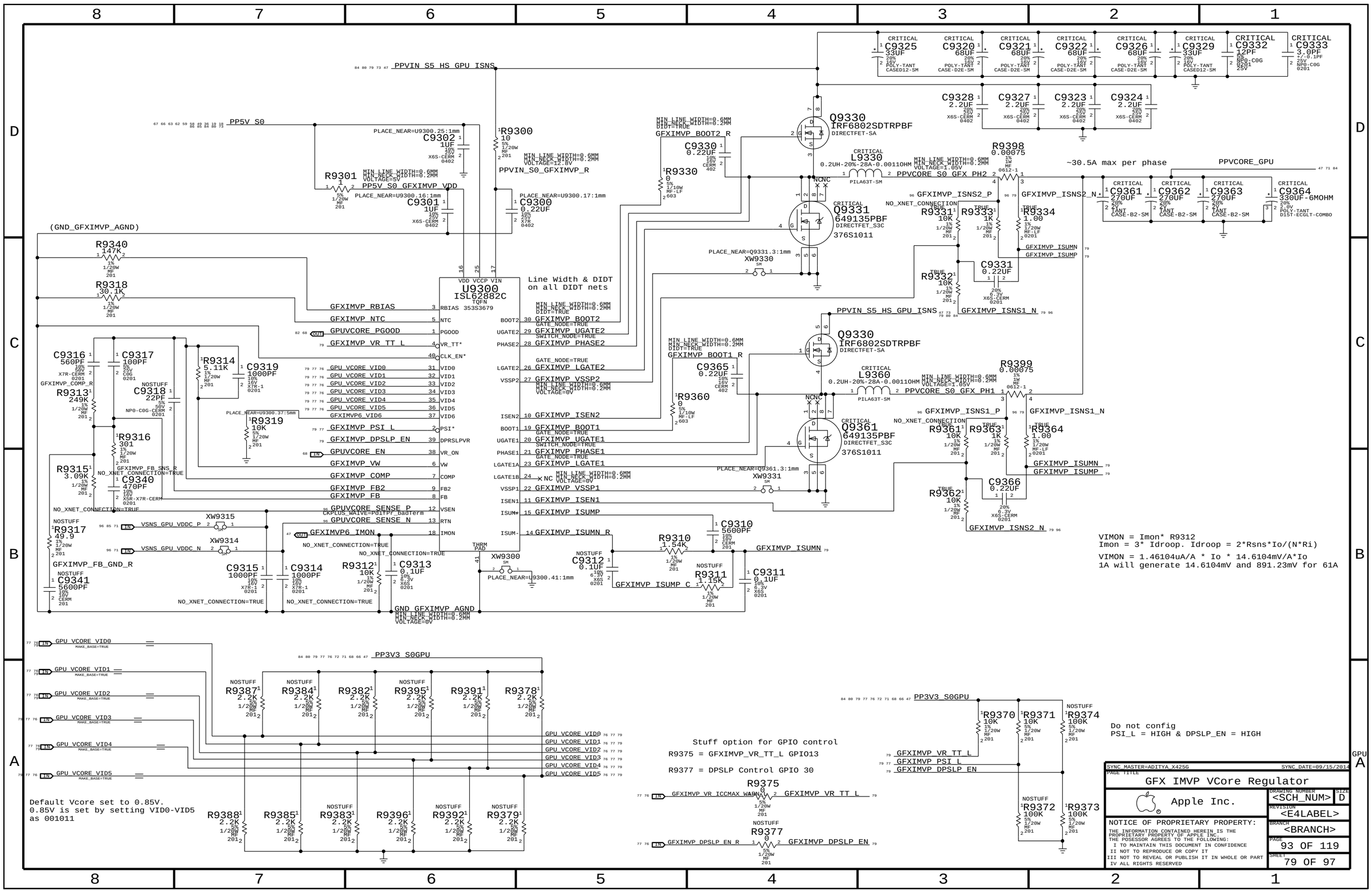
PPVIN S5 HS GPU ISNS
PP5V S0
R9300 10 5% 1/10W MF-LF 0603
PPVIN_S0_GFXIMVP_R
R9301 1 5% 1/20W MF 201
PP5V S0 GFXIMVP VDD
C9302 1UF 10% 25V X6S-CERM 0402
C9301 1UF 10% 25V X6S-CERM 0402
C9300 0.22UF 10% 25V X7R 0402
(GND_GFXIMVP_AGND)
R9340 147K 1% 1/20W MF 201
R9318 30.1K 1% 1/20W MF 201
U9300 ISL62882C TQFN
VDD VCCP VIN
Line Width & DIDT on all DIDT nets
GFXIMVP_RBIAS
GFXIMVP_NTC
GPUVCORE_PGOOD
GFXIMVP_VR_TT_L
GPU_VCORE_VID0
GPU_VCORE_VID1
GPU_VCORE_VID2
GPU_VCORE_VID3
GPU_VCORE_VID4
GPU_VCORE_VID5
GFXIMVP6_VID6
GFXIMVP_PSI_L
GFXIMVP_DPSLP_EN
GPUVCORE_EN
GFXIMVP_VW
GFXIMVP_COMP
GFXIMVP_FB2
GFXIMVP_FB
GPUVCORE_SENSE_P
GPUVCORE_SENSE_N
GFXIMVP6_IMON
GFXIMVP_BOOT2
GFXIMVP_UGATE2
GFXIMVP_PHASE2
GFXIMVP_LGATE2
GFXIMVP_VSSP2
GFXIMVP_ISEN2
GFXIMVP_BOOT1
GFXIMVP_UGATE1
GFXIMVP_PHASE1
GFXIMVP_LGATE1
GFXIMVP_VSSP1
GFXIMVP_ISEN1
GFXIMVP_ISUMP
GFXIMVP_ISUMN_R
GND_GFXIMVP_AGND
C9316 560PF 10% 16V X7R-CERM 0201
C9317 100PF 5% 50V C0G 0201
C9318 22PF 5% 50V NP0-C0G-CERM 0201
R9313 249K 1% 1/20W MF 201
R9314 5.11K 1% 1/20W MF 201
C9319 1000PF 10% 16V X7R-1 0201
R9319 10K 5% 1/20W MF 201
R9316 301 1% 1/20W MF 201
R9315 3.09K 1% 1/20W MF 201
C9340 470PF 10% 16V X5R-X7R-CERM 0201
GFXIMVP_FB_SNS_R
NO_XNET_CONNECTION=TRUE
NOSTUFF R9317 49.9 1% 1/20W MF 201
GFXIMVP_FB_GND_R
NOSTUFF C9341 5600PF 10% 10V CERM 201
XW9315
XW9314
VSNS_GPU_VDDC_P
VSNS_GPU_VDDC_N
C9315 1000PF 10% 16V X7R-1 0201
C9314 1000PF 10% 16V X7R-1 0201
R9312 10K 1% 1/20W MF 201
C9313 0.1UF 10% 6.3V X6S 0201
XW9300
PLACE_NEAR=U9300.41:1mm
THRM PAD 41
R9310 1.54K 1% 1/20W MF 201
NOSTUFF C9312 0.1UF 10% 6.3V X6S 0201
NOSTUFF R9311 1.15K 1% 1/20W MF 201
C9310 5600PF 10% 10V CERM 201
C9311 0.1UF 10% 6.3V X6S 0201
GFXIMVP_ISUMP_C
GFXIMVP_ISUMN
Q9330 IRF6802SDTRPBF DIRECTFET-SA
Q9331 649135PBF DIRECTFET_S3C 376S1011
Q9361 649135PBF DIRECTFET_S3C 376S1011
L9330 0.2UH-20%-28A-0.0011OHM PILA63T-SM
L9360 0.2UH-20%-28A-0.0011OHM PILA63T-SM
R9330 0 5% 1/10W MF-LF 0603
R9360 0 5% 1/10W MF-LF 0603
C9330 0.22UF 10% 16V CERM 402
C9365 0.22UF 10% 16V CERM 402
R9398 0.00075 1% 1W MF 0612-1
R9399 0.00075 1% 1W MF 0612-1
PPVCORE_GPU
~30.5A max per phase
PPVCORE_S0_GFX_PH2
PPVCORE_S0_GFX_PH1
GFXIMVP_ISNS2_P
GFXIMVP_ISNS2_N
GFXIMVP_ISNS1_P
GFXIMVP_ISNS1_N
NO_XNET_CONNECTION
R9331 10K 1% 1/20W MF 201
R9333 1K 1% 1/20W MF 201
R9334 1.00 1% 1/20W MF-LF 0201
R9332 10K 1% 1/20W MF 201
C9331 0.22UF 20% 6.3V X6S-CERM 0201
R9361 10K 1% 1/20W MF 201
R9363 1K 1% 1/20W MF 201
R9364 1.00 1% 1/20W MF-LF 0201
R9362 10K 1% 1/20W MF 201
C9366 0.22UF 20% 6.3V X6S-CERM 0201
C9325 33UF 20% 16V POLY-TANT CASED12-SM
C9320 68UF 20% 16V POLY-TANT CASE-D2E-SM
C9321 68UF 20% 16V POLY-TANT CASE-D2E-SM
C9322 68UF 20% 16V POLY-TANT CASE-D2E-SM
C9326 68UF 20% 16V POLY-TANT CASE-D2E-SM
C9329 33UF 20% 16V POLY-TANT CASED12-SM
C9332 12PF 5% 50V NP0-C0G 0201
C9333 3.0PF +/-0.1PF 25V NP0-C0G 0201
C9328 2.2UF 20% 6.3V X6S-CERM 0402
C9327 2.2UF 20% 6.3V X6S-CERM 0402
C9323 2.2UF 20% 6.3V X6S-CERM 0402
C9324 2.2UF 20% 6.3V X6S-CERM 0402
C9361 270UF 20% 2V POLY-TANT CASE-B2-SM
C9362 270UF 20% 2V POLY-TANT CASE-B2-SM
C9363 270UF 20% 2V POLY-TANT CASE-B2-SM
C9364 330UF-6MOHM 20% 2.0V POLY-TANT D15T-ECGLT-COMBO
VIMON = Imon* R9312
Imon = 3* Idroop. Idroop = 2*Rsns*Io/(N*Ri)
VIMON = 1.46104uA/A * Io * 14.6104mV/A*Io
1A will generate 14.6104mV and 891.23mV for 61A
PP3V3_S0GPU
R9387 2.2K 5% 1/20W MF 201
R9384 2.2K 5% 1/20W MF 201
R9382 2.2K 5% 1/20W MF 201
R9395 2.2K 5% 1/20W MF 201
R9391 2.2K 5% 1/20W MF 201
R9378 2.2K 5% 1/20W MF 201
R9388 2.2K 5% 1/20W MF 201
R9385 2.2K 5% 1/20W MF 201
R9383 2.2K 5% 1/20W MF 201
R9396 2.2K 5% 1/20W MF 201
R9392 2.2K 5% 1/20W MF 201
R9379 2.2K 5% 1/20W MF 201
Default Vcore set to 0.85V.
0.85V is set by setting VID0-VID5 as 001011
Stuff option for GPIO control
R9375 = GFXIMVP_VR_TT_L GPIO13
R9377 = DPSLP Control GPIO 30
R9375 0 5% 1/20W MF 201
R9377 0 5% 1/20W MF 201
R9370 10K 1% 1/20W MF 201
R9371 10K 5% 1/20W MF 201
R9374 100K 5% 1/20W MF 201
R9372 100K 5% 1/20W MF 201
R9373 100K 5% 1/20W MF 201
Do not config
PSI_L = HIGH & DPSLP_EN = HIGH
SYNC_MASTER=ADITYA_X425G
SYNC_DATE=09/15/2014
PAGE TITLE
GFX IMVP VCore Regulator
Apple Inc.
DRAWING NUMBER <SCH_NUM>
SIZE D
REVISION <E4LABEL>
BRANCH <BRANCH>
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GPU VDDCI REGULATOR

VOUT = 0.9V
7A MAX OUTPUT
F = 500 KHZ

Note:
Regulator requires a minimum load to prevent noise in the audio frequencies

VSNS_GPU_VDDI_P
VSNS_GPU_VDDI_N
GPU_VDDCI_SENSE_XW_N
GPU_VDDCI_SENSE_XW_P
XW9470 XW9471
R9470 2.8K 0.1% 1/20W MF 0201
R9471 2.8K 0.1% 1/20W MF 0201
PP5V_S0
R9405 10 5% 1/20W MF 0201
R9406 2.2 5% 1/20W MF 0201
PP5V_VDDCI_VCC
PP5V_VDDCI_PVCC
C9403 1UF 10% 10V CERM 0402
C9404 2.2UF 10% 10V X6S-CERM 0402
AGND_GPU_VDDCI
REG_BOOT_GPU_VDDCI_RC
R9407 2.2 5% 1/16W MF-LF 402
C9405 0.1UF 10% 16V X7S-CERM 0402
U9450
ISL95870AH
UTQFN
VCC PVCC
REG_BOOT_GPU_VDDCI
REG_UGATE_VDDCI_R
REG_UGATE_VDDCI
REG_PHASE_GPU_VDDCI
REG_LGATE_GPU_VDDCI
R9408 1 5% 1/16W MF-LF 402
PVDDCI_GPU_EN
REG_GPU_VDDCI_FB
REG_GPU_VDDCI_SREF
REG_GPU_VDDCI_VO
REG_GPU_VDDCI_OCSET
PVDDCI_PGOOD
REG_GPU_VDDCI_RTN
REG_GPU_VDDCI_FSEL
REG_GPU_VDDCI_SET0
REG_GPU_VDDCI_SET1
EN FB SREF VO OCSET PGOOD RTN FSEL SET0 SET1 VID0 VID1 BOOT UGATE PHASE LGATE GND PGND
C9490 0.033UF 10% 16V X5R 402
R9474 17.4K 0.1% 1/20W MF 0201
C9470 10PF 5% 50V C0G 0201
R9472 4.02K 0.1% 1/20W MF 0201
R9473 4.02K 0.1% 1/20W MF 0201
C9485 10PF 5% 50V C0G 0201
R9475 34.8K 0.1% 1/20W MF 0201-1
R9476 NOSTUFF 0 5% 1/20W MF 0201
R9477 0 5% 1/20W MF 0201
REG_GPU_VDDCI_SET1_R
R9478 249K 0.1% 1/20W MF 0201
XW9473 SM
Vout = 0.5 * (1 + Ra / Rb)
PP3V3_S0GPU
R9484 0 5% 1/20W MF 0201
R9483 10K 5% 1/20W MF 201
R9485 NOSTUFF 0 5% 1/20W MF 0201
GFX_VDDCI_ALTV
GFX_VDDCI_ALTV0
GFX_VDDCI_ALTV1
R9481 10K 5% 1/20W MF 201

VID1	VID0	GPU VDDCI
1	1	0.85V
1	0	0.9V --> DEFAULT

PPVIN_S5_HS_GPU_ISNS
APN376S1005
CRITICAL
Q9410
CSD58873Q3D
Q3D
VIN TG TGR VSW BG PGND
VR_PHASE_GPU_VDDCI
APN152S1822
CRITICAL
L9410
1.0UH-20%-15A-0.00660HM
PIME063T-SM
VRVDDCI_R
CRITICAL C9402 68UF 20% 16V POLY-TANT CASE-D2-SM
CRITICAL C9406 12PF 5% 50V NP0-C0G 0201
CRITICAL C9407 3.0PF +/-0.1PF 25V NP0-C0G 0201
EMC C9409 2.2UF 20% 25V X6S-CERM 0402
EMC C9410 2.2UF 20% 25V X6S-CERM 0402
C9408 1000PF 5% 25V CERM 0402
NOSTUFF C9411 0.001UF 10% 50V X7R-CERM 0402
REG_SNUBBER_GPU_VDDCI
NOSTUFF R9409 2 5% 1/10W MF-LF 603
CRITICAL R9400 0.003 1% 1W CYN 0612
PPVDDCI_S0_ISENSE
C9413 1000PF 5% 25V CERM 0402
R9412 200 5% 1/16W MF-LF 402
CRITICAL C9417 10UF 20% 10V X6S-CERM 0603
CRITICAL C9418 10UF 20% 10V X6S-CERM 0603
CRITICAL C9414 270UF 20% 2V POLY-TANT CASE-B2-SM
CRITICAL C9415 270UF 20% 2V POLY-TANT CASE-B2-SM
CRITICAL C9416 270UF 20% 2V POLY-TANT CASE-B2-SM
CRITICAL C9419 270UF 20% 2V POLY-TANT CASE-B2-SM
CRITICAL C9431 270UF 20% 2V POLY-TANT CASE-B2-SM
REG_GPU_VDDCI_OCSET_R
REG_GPU_VDDCI_VO_R
XW9480 SM VDDCIS0_CS_P
XW9481 SM VDDCIS0_CS_N
R9410 3.92K 1% 1/20W MF 201
C9412 0.0022UF 10% 50V CERM 402
R9411 3.92K 1% 1/20W MF 201
REG_GPU_VDDCI_OCSET
REG_GPU_VDDCI_VO

1.8V S0 GPU Regulator

PPVIN_S5_HS_GPU_ISNS
CRITICAL C9432 12PF 5% 50V NP0-C0G 0201
CRITICAL C9433 3.0PF +/-0.1PF 25V NP0-C0G 0201
CRITICAL C9420 33UF 20% 16V POLY-TANT CASED12-SM
CRITICAL C9421 2.2UF 20% 25V X6S-CERM 0402
CRITICAL C9422 2.2UF 20% 25V X6S-CERM 0402
R9420 10 5% 1/20W MF 201
PPVIN_S0GPU_1V8_RC
P1V8_S0GPU_EN
C9423 0.1UF 10% 16V X5S 0402
AGND_PVDDR
U9400
TPS62130ARGT
AVIN PVIN SW VOS FB EN FSW PG SS/TR PGND AGND THRM PAD
CRITICAL 353S4283
APN152S00137
CRITICAL
L9400
1.5UH-20%-2.61A-0.0680HM
PIFE32251B-SM
REG_PHASE_PVDDR
REG_VOS_PVDDR
REG_FB_PVDDR
P1V8GPU_PGOOD
REG_SSTR_PVDDR
R9421 10 5% 1/20W MF 201
R9422 105K 0.1% 1/20W MF 0201-1 <Ra>
R9423 82.5K 0.1% 1/20W MF 0201-1 <Rb>
C9424 4700PF 10% 16V X7R 201
XW9420 SM
Vout = 0.8V * (Ra + Rb) / Rb
PP1V8_GPUIFPX
CRITICAL C9425 47UF 20% 2V POLY-TANT 0805
CRITICAL C9426 47UF 20% 2V POLY-TANT 0805
CRITICAL C9427 47UF 20% 2V POLY-TANT 0805
CRITICAL C9428 47UF 20% 2V POLY-TANT 0805
CRITICAL C9429 47UF 20% 2V POLY-TANT 0805
CRITICAL C9430 47UF 20% 2V POLY-TANT 0805

Output voltage: 1.818 V
Max peak current: 1.5A
Switching freq: 1250 kHz

SYNC_MASTER=ADITYA X425G SYNC_DATE=09/16/2014
PAGE TITLE: VREG GPU VDDCI
Apple Inc.
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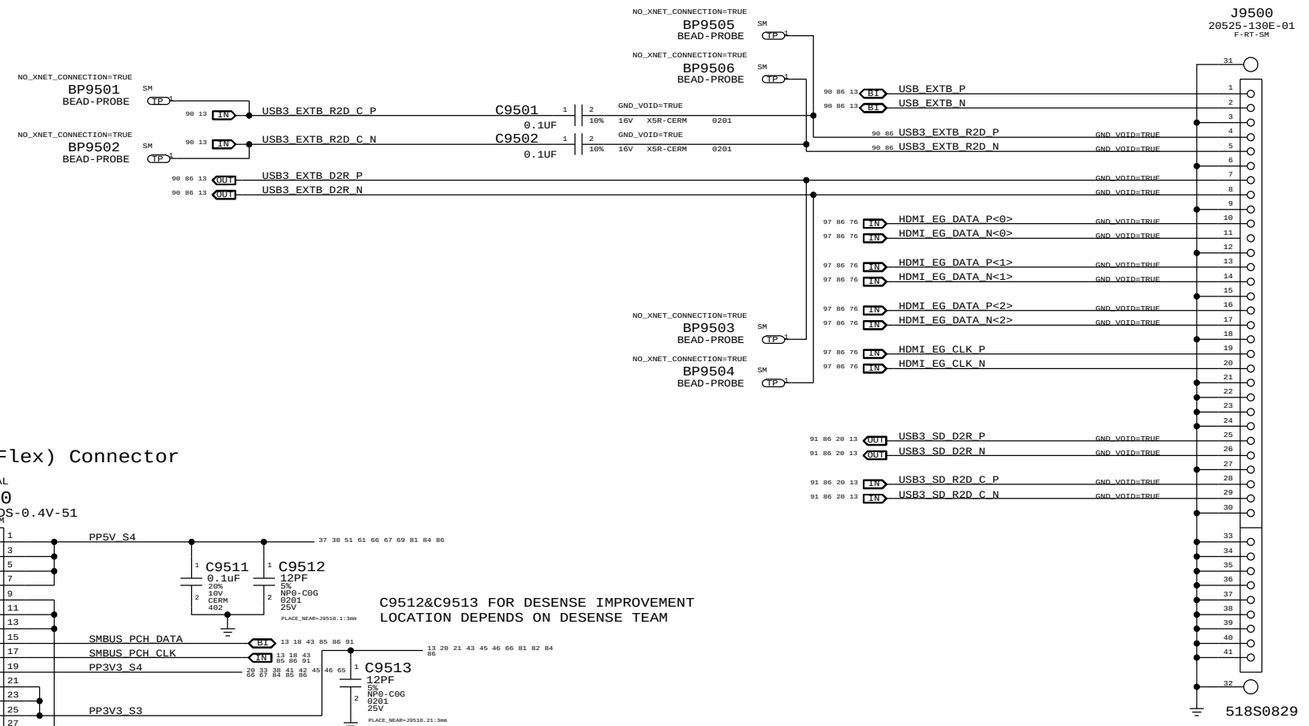
Wire-to-Board (Micro-coax) Connector

CRITICAL

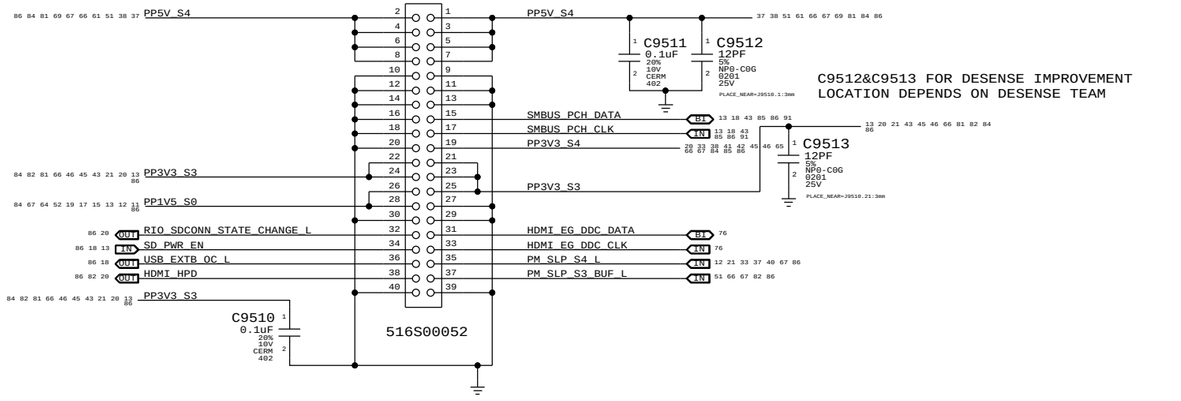
J9500
20525-130E-01
F-RT-SM



Board-to-Board (Flex) Connector

CRITICAL

J9510
DF40HC-3.0-40DS-0.4V-51
F-ST-SM



SYNC_MASTER=CLEAN_MAXWELL SYNC_DATE=07/01/2014

PAGE TITLE: RIO Connectors

Apple Inc.

DRAWING NUMBER: <SCH_NUM> SIZE: D
REVISION: <E4LABEL>
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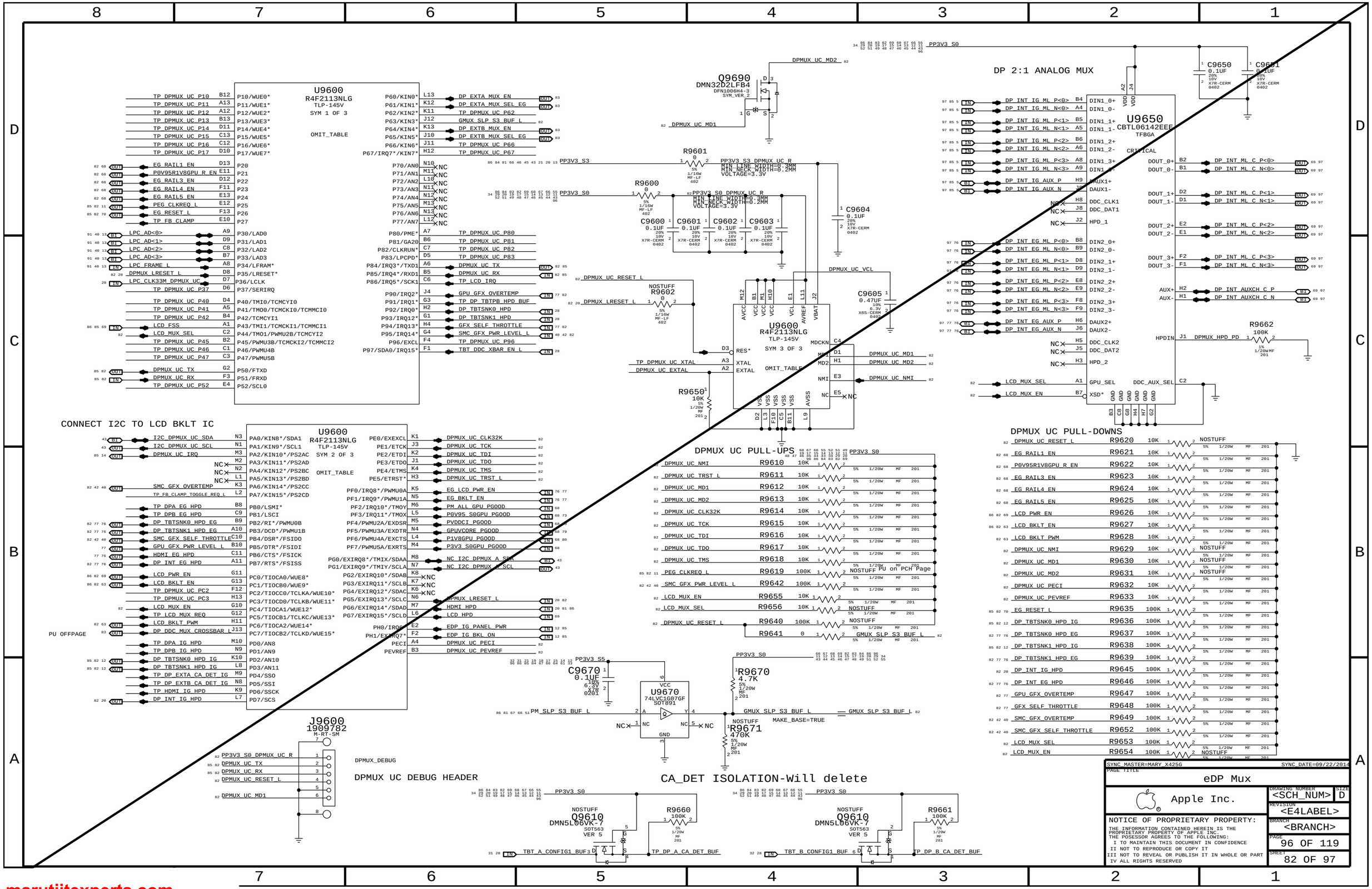
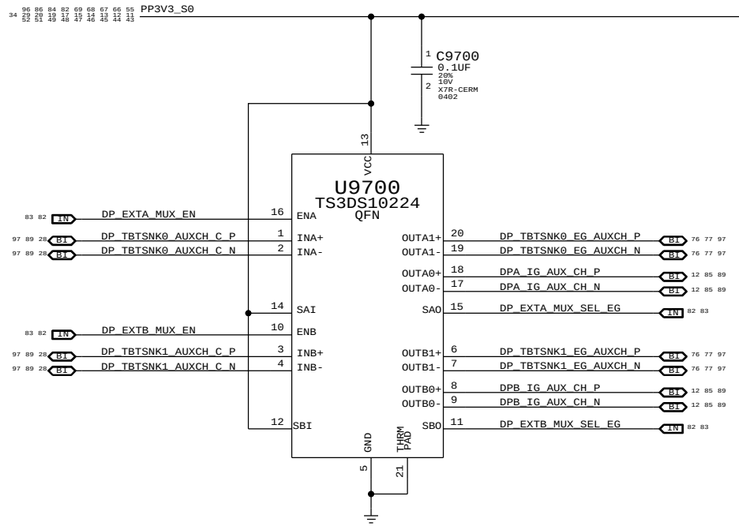
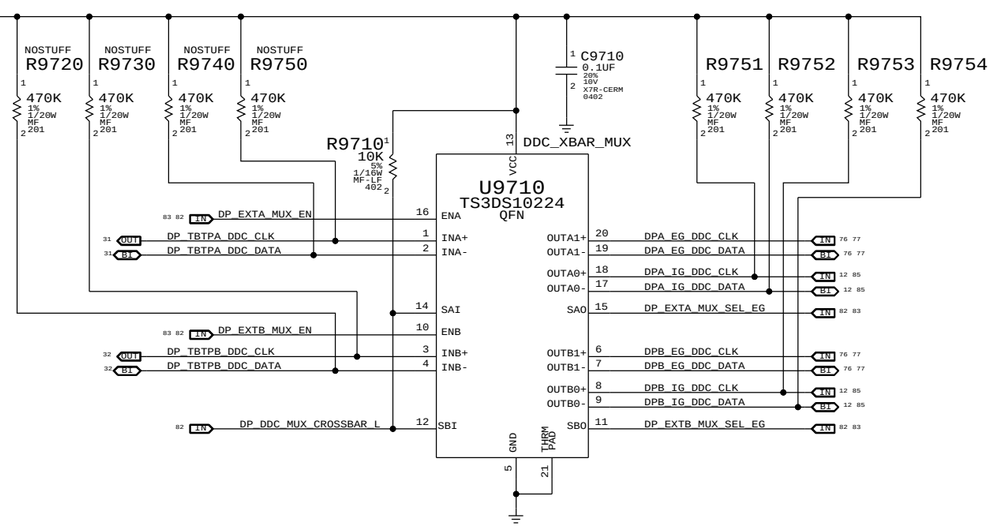


DP A & DP B AUX MUX



DP A & DP B DDC MUX



MUX TRUTH TABLE

SAI/SBI	SAO	SBO	INA	INB
0	0	0	OUTB0	OUTA0
0	0	1	OUTB1	OUTA0
0	1	0	OUTB0	OUTA1
0	1	1	OUTB1	OUTA1
1	0	0	OUTA0	OUTB0
1	0	1	OUTA0	OUTB1
1	1	0	OUTA1	OUTB0
1	1	1	OUTA1	OUTB1

SYNC_MASTER=MARY_X425G SYNC_DATE=10/15/2014

PAGE TITLE: eDP Muxed Graphics Support

Apple Inc.

DRAWING NUMBER: <SCH_NUM> SIZE: D

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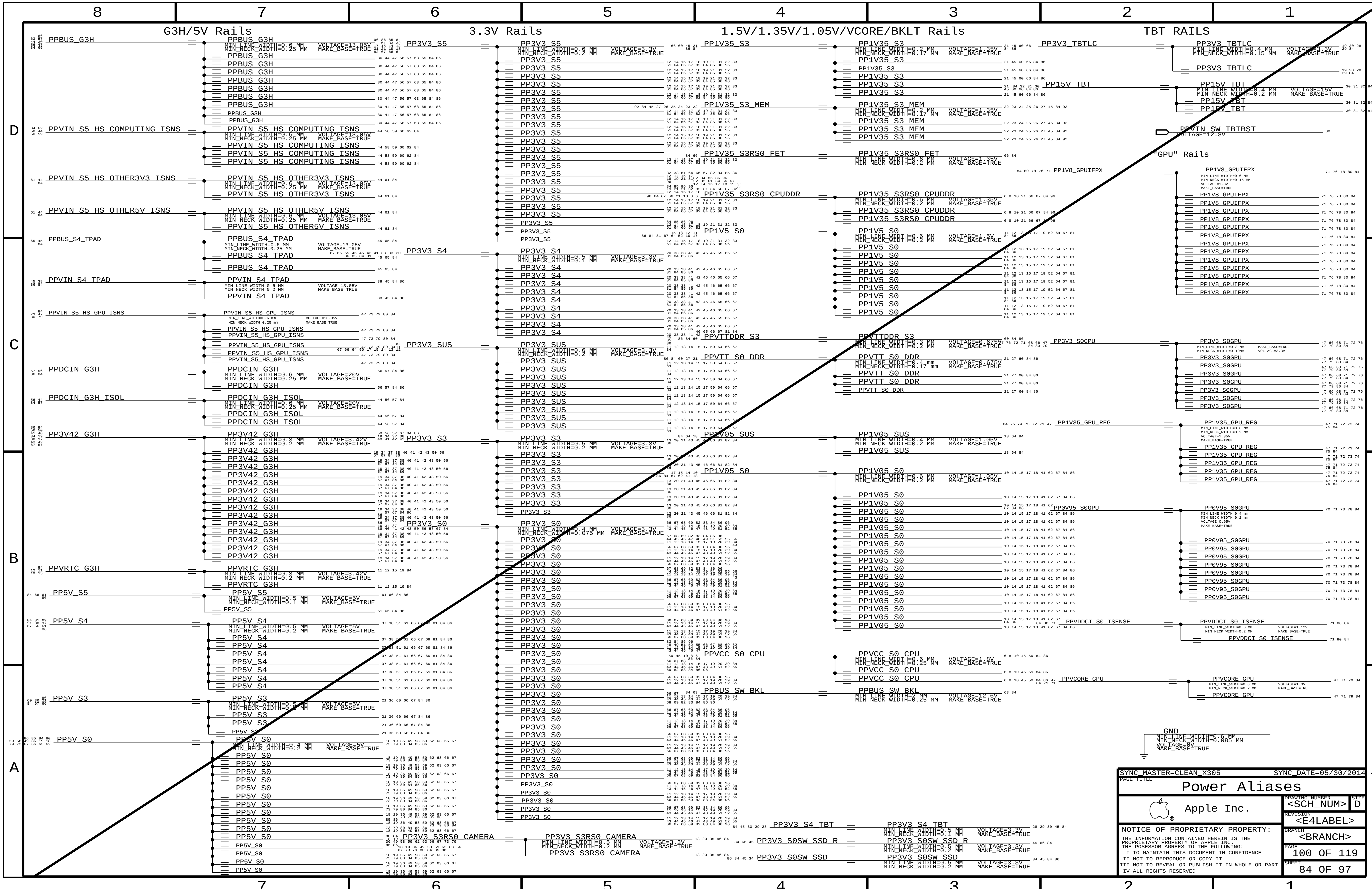

SYNC_MASTER=CLEAN_X305 SYNC_DATE=05/30/2014

PAGE TITLE

Power Aliases

Apple Inc.

DRAWING NUMBER <SCH_NUM> SIZE D

REVISION <E4LABEL>

BRANCH <BRANCH>

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Display Aliases

EDP_IG_PANEL_PWR	MAKE_BASE=TRUE	EDP_IG_PANEL_PWR	
EDP_IG_BKL_ON	MAKE_BASE=TRUE	EDP_IG_BKL_ON	
DP_INT_IG_ML_P<3..0>	MAKE_BASE=TRUE	TP_DP_IG_A_MLP<3..0>	
DP_INT_IG_ML_N<3..0>	MAKE_BASE=TRUE	TP_DP_IG_A_MLN<3..0>	
DP_INT_IG_AUX_P	MAKE_BASE=TRUE	DP_INT_IG_AUX_P	
DP_INT_IG_AUX_N	MAKE_BASE=TRUE	DP_INT_IG_AUX_N	
DPA_IG_AUX_CH_P	MAKE_BASE=TRUE	DPA_IG_AUX_CH_P	
DPA_IG_AUX_CH_N	MAKE_BASE=TRUE	DPA_IG_AUX_CH_N	
DPB_IG_AUX_CH_P	MAKE_BASE=TRUE	DPB_IG_AUX_CH_P	
DPB_IG_AUX_CH_N	MAKE_BASE=TRUE	DPB_IG_AUX_CH_N	
DPA_IG_DDC_CLK	MAKE_BASE=TRUE	DPA_IG_DDC_CLK	
DPA_IG_DDC_DATA	MAKE_BASE=TRUE	DPA_IG_DDC_DATA	
DPB_IG_DDC_CLK	MAKE_BASE=TRUE	DPB_IG_DDC_CLK	
DPB_IG_DDC_DATA	MAKE_BASE=TRUE	DPB_IG_DDC_DATA	
DP_TBTSNK0_HPD_IG	MAKE_BASE=TRUE	DP_TBTSNK0_HPD_IG	
DP_TBTSNK1_HPD_IG	MAKE_BASE=TRUE	DP_TBTSNK1_HPD_IG	
DPMUX_UC_RX	MAKE_BASE=TRUE	DPMUX_UC_RX	
DPMUX_UC_TX	MAKE_BASE=TRUE	DPMUX_UC_TX	
EG_RESET_L	MAKE_BASE=TRUE	EG_RESET_L	
PEG_CLKREQ_L	MAKE_BASE=TRUE	PEG_CLKREQ_L	
DP_AUXCH_ISOL_L	MAKE_BASE=TRUE	DP_AUXCH_ISOL_L	

LCD_FSS	MAKE_BASE=TRUE	LCD_FSS	
PEG_CLK100M_N	MAKE_BASE=TRUE	PEG_CLK100M_N	
PEG_CLK100M_P	MAKE_BASE=TRUE	PEG_CLK100M_P	
VSNS_GPU_VDDC_P	MAKE_BASE=TRUE	VSNS_GPU_VDDC_P	
VSNS_GPU_VDDI_P	MAKE_BASE=TRUE	VSNS_GPU_VDDI_P	

CPU signals

MEMVTT_EN	MAKE_BASE=TRUE	MEMVTT_EN

J9510 RIO FLEX CONN

SMBUS_PCH_DATA		SMBUS_PCH_DATA
SMBUS_PCH_CLK		SMBUS_PCH_CLK

SSD Signals Through PEG

PCIE_SSD_D2R_P<3..0> (IN)	MAKE_BASE=TRUE	=PEG_D2R_P<15..12> (OUT)
PCIE_SSD_D2R_N<3..0> (IN)	MAKE_BASE=TRUE	=PEG_D2R_N<15..12> (OUT)
PCIE_SSD_R2D_C_P<3..0> (OUT)	MAKE_BASE=TRUE	=PEG_R2D_C_P<15..12> (IN)
PCIE_SSD_R2D_C_N<3..0> (OUT)	MAKE_BASE=TRUE	=PEG_R2D_C_N<15..12> (IN)

Thunderbolt Signals Through PEG

PCIE_TBT_D2R_P<3..0> (IN)	MAKE_BASE=TRUE	=PEG_D2R_P<11..8> (OUT)
PCIE_TBT_D2R_N<3..0> (IN)	MAKE_BASE=TRUE	=PEG_D2R_N<11..8> (OUT)
PCIE_TBT_R2D_C_P<3..0> (OUT)	MAKE_BASE=TRUE	=PEG_R2D_C_P<11..8> (IN)
PCIE_TBT_R2D_C_N<3..0> (OUT)	MAKE_BASE=TRUE	=PEG_R2D_C_N<11..8> (IN)

GUP PEG Lanes

PEG_D2R_P<7..0>	MAKE_BASE=TRUE	=PEG_D2R_P<7..0>
PEG_D2R_N<7..0>	MAKE_BASE=TRUE	=PEG_D2R_N<7..0>
PEG_R2D_C_P<7..0>	MAKE_BASE=TRUE	=PEG_R2D_C_P<7..0>
PEG_R2D_C_N<7..0>	MAKE_BASE=TRUE	=PEG_R2D_C_N<7..0>

Unused PCH PCIE Lanes

	MAKE_BASE	NO_TEST	
NC_PCIE_SSD_D2RP<3..0>	TRUE	TRUE	=PCIE_SSD_D2R_P<3..0>
NC_PCIE_SSD_D2RN<3..0>	TRUE	TRUE	=PCIE_SSD_D2R_N<3..0>
NC_PCIE_SSD_R2D_CP<3..0>	TRUE	TRUE	=PCIE_SSD_R2D_C_P<3..0>
NC_PCIE_SSD_R2D_CN<3..0>	TRUE	TRUE	=PCIE_SSD_R2D_C_N<3..0>

Unused TPAD SPI

PP3V3_S4

TPAD_SPI_BUS_EN	MAKE_BASE	TRUE	TPAD_SPI_BUS_EN
TPAD_SPI_CS_L		TRUE	TPAD_SPI_CS_L
TPAD_SPI_INT_L		TRUE	TPAD_SPI_INT_L
TPAD_SPI_MISO		TRUE	TPAD_SPI_MISO
TPAD_SPI_MOSI		TRUE	TPAD_SPI_MOSI
TPAD_SPI_SCLK		TRUE	TPAD_SPI_SCLK

RA294 100K 1% 1/20W MF 201 (2 1)
RA295 100K 1% 1/20W MF 201 (2 1)
RA296 100K 1% 1/20W MF 201 (2 1)
RA297 100K 1% 1/20W MF 201 (2 1)
RA298 100K 1% 1/20W MF 201 (2 1)
RA299 100K 1% 1/20W MF 201 (2 1)

Unused signals

BT_PWRRST_L	
MEM_VDD_SEL_1V5_L	
FW_PWR_EN_PCH	
WOL_EN	
FW_PME_L	
DP_TBT_SEL	
ENET_MEDIA_SENSE_RDIV	
AUD_IPHS_SWITCH_EN_PCH	
AUD_IP_PERIPHERAL_DET	
AUD_I2C_INT_L	
TBT_GO2SX_BIDIR	
DPMUX_UC_IRQ	
PEG_CLKREQ_L	
ENET_CLKREQ_L	
ENET_LOW_PWR_PCH	
HDMITBTMUX_SEL_TBT	
SDCONN_OC_L	
LPCPLUS_GPIO	1400

	VOLTAGE	MAKE_BASE	
PP0V75_S3_MEM_VREFDQ_A	0.675V	TRUE	PP0V75_S3_MEM_VREFDQ_A
PP0V75_S3_MEM_VREFDQ_B	0.675V	TRUE	PP0V75_S3_MEM_VREFDQ_B
PP0V75_S3_MEM_VREFCA	0.675V	TRUE	PP0V75_S3_MEM_VREFCA
PP0V75_S3_MEM_VREFCA			
PP0V75_S3_MEM_VREFCA			

PP3V3_S3_FAN_CTL — PP3V3_S3_FAN_CTL (MIN_LINE_WIDTH=0.4MM, MIN_NECK_WIDTH=0.2MM, VOLTAGE=3.3V, MAKE_BASE=TRUE)

RA201 0 5% 1/20W MF 0201 — PP3V3_S5
RA202 NOSTUFF — PP3V3_S4

EDP CABLE

I2C_BKLT_SCL	MAKE_BASE=TRUE	I2C_BKLT_SCL
I2C_BKLT_SDA	MAKE_BASE=TRUE	I2C_BKLT_SDA
SMBUS_SMC_0_S0_SCL	MAKE_BASE=TRUE	SMBUS_SMC_0_S0_SCL
SMBUS_SMC_0_S0_SDA	MAKE_BASE=TRUE	SMBUS_SMC_0_S0_SDA

PP5V_S0

XWA202 SM — PP5V_S0_AUDIO_AMP_L (MIN_LINE_WIDTH=0.4MM, MIN_NECK_WIDTH=0.2MM, VOLTAGE=5V)
XWA203 SM — PP5V_S0_AUDIO_AMP_R (MIN_LINE_WIDTH=0.4MM, MIN_NECK_WIDTH=0.2MM, VOLTAGE=5V)

SYNC_MASTER=J15_MLB SYNC_DATE=10/31/2012

PAGE TITLE: Signal Aliases

Apple Inc.

DRAWING NUMBER: <SCH_NUM> SIZE: D
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Functional Test Points

J3501 - airport

FUNC_TEST		
TRUE	AP_CLKREQ_Q_L	33
TRUE	AP_RESET_CONN_L	33
TRUE	PCIE_AP_D2R_PI_N	91
TRUE	PCIE_AP_D2R_PI_P	91
TRUE	PCIE_AP_R2D_N	33 91
TRUE	PCIE_AP_R2D_P	33 91
TRUE	PCIE_CLK100M_AP_CONN_N	33 91
TRUE	PCIE_CLK100M_AP_CONN_P	33 91
TRUE	PCIE_WAKE_L	12 33 35 91
TRUE	PP3V3_S3RS4_BT_F	33
TRUE	PP3V3_WLAN	33 41
TRUE	USB_BT_CONN_N	33 90
TRUE	USB_BT_CONN_P	33 90
TRUE	WIFI_EVENT_L	33 40 41
TRUE	GND	4X

J4002 - Camera

TRUE	MIPI_CLK_CONN_N	36 94
TRUE	MIPI_CLK_CONN_P	36 94
TRUE	CAM_SENSOR_WAKE_L_CONN	36
TRUE	MIPI_DATA_CONN_N	36 94
TRUE	MIPI_DATA_CONN_P	36 94
TRUE	SMBUS_SMC_0_S0_SDA	36 40 43 48 69 76 85 86 95
TRUE	SMBUS_SMC_0_S0_SCL	36 40 43 48 69 76 85 86 95
TRUE	I2C_CAM_SCK	35 36
TRUE	I2C_CAM_SDA	35 36
TRUE	PP5V_S3RS0_ALSCAM_F	36
TRUE	GND	

J9500 - rio coax

TRUE	HDMI_EG_CLK_N	76 81 97
TRUE	HDMI_EG_CLK_P	76 81 97
TRUE	HDMI_EG_DATA_N<0>	76 81 97
TRUE	HDMI_EG_DATA_N<1>	76 81 97
TRUE	HDMI_EG_DATA_N<2>	76 81 97
TRUE	HDMI_EG_DATA_P<0>	76 81 97
TRUE	HDMI_EG_DATA_P<1>	76 81 97
TRUE	HDMI_EG_DATA_P<2>	76 81 97
TRUE	USB3_SD_D2R_N	13 20 81 91
TRUE	USB3_SD_D2R_P	13 20 81 91
TRUE	USB3_SD_R2D_C_N	13 20 81 91
TRUE	USB3_SD_R2D_C_P	13 20 81 91
TRUE	USB3_EXTB_D2R_N	13 81 90
TRUE	USB3_EXTB_D2R_P	13 81 90
TRUE	USB3_EXTB_R2D_N	81 90
TRUE	USB3_EXTB_R2D_P	81 90
TRUE	USB_EXTB_N	13 81 90
TRUE	USB_EXTB_P	13 81 90
TRUE	GND	19X

J9510 - rio flex

TRUE	SD_PWR_EN	13 18 81
TRUE	HDMI_DDC_CLK	
TRUE	HDMI_DDC_DATA	
TRUE	HDMI_HPD	20 81 82
TRUE	SMBUS_PCH_CLK	13 18 43 81 85 91
TRUE	SMBUS_PCH_DATA	13 18 43 81 85 91
TRUE	PM_SLP_S3_BUF_L	51 66 67 81 82
TRUE	PM_SLP_S4_L	12 21 33 37 40 67 81
TRUE	PP3V3_S3	3X 13 20 21 43 45 46 66 81 82 84 86
TRUE	PP3V3_S4	20 33 38 41 42 45 46 65 66 67 81 84 85 86
TRUE	PP5V_S4	5X 37 38 51 61 66 67 69 81 84 86
TRUE	RIO_SDCONN_STATE_CHANGE_L	20 81
TRUE	USB_EXTB_OC_L	18 81
TRUE	GND	10X

J5150 - hall effect

TRUE	PP3V42_G3H	19 34 37 38 41 42 43 50 56 57 67 84 86
TRUE	SMC_LID_R	42
TRUE	GND	

J6050 - left fan

TRUE	FAN_LT_PWM	49
TRUE	FAN_LT_TACH	49
TRUE	PP5V_S0	3X 18 19 36 49 58 59 62 63 66 67 73 79 80 84 85 86
TRUE	GND	5X

J6060 - right fan

TRUE	FAN_RT_PWM	49
TRUE	FAN_RT_TACH	49
TRUE	PP5V_S0	3X 18 19 36 49 58 59 62 63 66 67 73 79 80 84 85 86
TRUE	GND	5X

J6100 - spi

FUNC_TEST		
TRUE	PP3V42_G3H	19 34 37 38 40 41 42 43 50 56 57 67 84 86
TRUE	SMC_RESET_L	40 41 50 57
TRUE	SMC_TCK	40 41 50
TRUE	SMC_TMS	40 41 50
TRUE	SPIROM_USE_MLB	14 50
TRUE	GND	2X

J4801 - ipd flex

TRUE	USB_TPAD_N	13 38 90
TRUE	USB_TPAD_P	13 38 90
TRUE	IOXP2_INT_L	38
TRUE	I2C_IOXP_SCL	38
TRUE	I2C_IOXP_SDA	38
TRUE	SMC_PME_S4_WAKE_L	33 38 40 42
TRUE	TPAD_ACTUATOR_THRMTRIP_L	38 65
TRUE	TPAD_VBUS_EN	38 67
TRUE	SMBUS_SMC_2_S3_SCL	38 40 43 95
TRUE	SMBUS_SMC_2_S3_SDA	38 40 43 95
TRUE	SMC_LID	38 40 41 42
TRUE	SMC_ACTUATOR_EN_L	38 40
TRUE	PPVIN_S4_TPAD	4X 38 45 84
TRUE	GND_ACTUATOR	4X 38
TRUE	PP3V3_S4	20 33 38 41 42 45 46 65 66 67 81 84 85 86
TRUE	PP5V_S4	37 38 51 61 66 67 69 81 84 86
TRUE	GND	2X

J4813 - keyboard

TRUE	PP3V3_S4	20 33 38 41 42 45 46 65 66 67 81 84 85 86
TRUE	PP3V42_G3H	19 34 37 38 40 41 42 43 50 56 57 67 84 86
TRUE	WS_CONTROL_KBD	38
TRUE	WS_KBD1	38
TRUE	WS_KBD10	38
TRUE	WS_KBD11	38
TRUE	WS_KBD12	38
TRUE	WS_KBD13	38
TRUE	WS_KBD14	38
TRUE	WS_KBD15_CAP	38
TRUE	WS_KBD16_NUM	38
TRUE	WS_KBD17	38
TRUE	WS_KBD18	38
TRUE	WS_KBD19	38
TRUE	WS_KBD2	38
TRUE	WS_KBD20	38
TRUE	WS_KBD21	38
TRUE	WS_KBD22	38
TRUE	WS_KBD23	38
TRUE	WS_KBD3	38
TRUE	WS_KBD4	38
TRUE	WS_KBD5	38
TRUE	WS_KBD6	38
TRUE	WS_KBD7	38
TRUE	WS_KBD8	38
TRUE	WS_KBD9	38
TRUE	WS_KBD_ONOFF_L	38
TRUE	WS_LEFT_OPTION_KBD	38
TRUE	WS_LEFT_SHIFT_KBD	38
TRUE	GND	2X

J4915 - kbd bklt

TRUE	KBDBKLT_RETURN1	2X 39 63
TRUE	KBDBKLT_RETURN2	2X 39 63
TRUE	PPVOUT_S0_KBDBKLT	39 63
TRUE	GND	4X

J6601 - mic

TRUE	DMIC_CLK3	52 55
TRUE	PP3V3_S0	66 67 68 69 82 83 84 86 96 11 12 13 14 15 17 19 20 29 34 43 44 45 46 47 48 49 51 52 55
TRUE	DMIC_SDA2	55
TRUE	DMIC_SDA3	52 55
TRUE	GND	

J6602 - L speaker

TRUE	SPKRCONN_L_ID	52 55
TRUE	SPKRCONN_L_OUT_N	53 55 96
TRUE	SPKRCONN_L_OUT_P	53 55 96
TRUE	SPKRCONN_SL_OUT_N	53 55 96
TRUE	SPKRCONN_SL_OUT_P	53 55 96
TRUE	GND	

J6603 - R speaker

TRUE	SPKRCONN_R_ID	52 55
TRUE	SPKRCONN_R_OUT_N	53 55 96
TRUE	SPKRCONN_R_OUT_P	53 55 96
TRUE	SPKRCONN_SR_OUT_N	53 55 96
TRUE	SPKRCONN_SR_OUT_P	53 55 96
TRUE	GND	

J7000 - DC PWR

TRUE	ADAPTER_SENSE	56
TRUE	PP20V_DCIN_FUSE	2X 56
TRUE	GND	2X

J7050 - battery

TRUE	PPVBAT_G3H_CONN	8X 56 57
TRUE	SMBUS_SMC_5_G3_SCL	40 43 56 57 95
TRUE	SMBUS_SMC_5_G3_SDA	40 43 56 57 95
TRUE	SYS_DETECT_L	56
TRUE	GND	8X

J8300 - eDP

TRUE	DP_INT_AUX_N	69 97
TRUE	DP_INT_AUX_P	69 97
TRUE	DP_INT_ML_N<0>	69 97
TRUE	DP_INT_ML_N<1>	69 97
TRUE	DP_INT_ML_N<2>	69 97
TRUE	DP_INT_ML_N<3>	69 97
TRUE	DP_INT_ML_P<0>	69 97
TRUE	DP_INT_ML_P<1>	69 97
TRUE	DP_INT_ML_P<2>	69 97
TRUE	DP_INT_ML_P<3>	69 97
TRUE	LCD_FSS	69 82 85
TRUE	LCD_HPD_CONN	69
TRUE	LCD_BKLT_PWM_R	63 69
TRUE	SMBUS_SMC_0_S0_SDA	36 40 43 48 69 76 85 86 95
TRUE	SMBUS_SMC_0_S0_SCL	36 40 43 48 69 76 85 86 95
TRUE	I2C_BKLT_SDA	63 69 85
TRUE	I2C_BKLT_SCL	63 69 85
TRUE	PP5VR3V3_SW_LCD	3X 69
TRUE	PPVOUT_S0_LCDBKLT	63 69
TRUE	GND	16X

Power Rails

TRUE	PM_SLP_S3_L	12 21 40 67
TRUE	PPVTT_S0_DDR	21 27 60 84
TRUE	PP3V3_S0	66 67 68 69 82 83 84 86 96 11 12 13 14 15 17 19 20 29 34 43 44 45 46 47 48 49 51 52 55
TRUE	PP3V3_S3	13 20 21 43 45 46 66 81 82 84 86
TRUE	PP3V3_S5	17 14 15 17 18 19 21 31 32 33 61 64 66 67 82 84 85 96
TRUE	PP3V3_S5_AVREF_SMC	40 41
TRUE	PP3V42_G3H	19 34 37 38 40 41 42 43 50 56 57 67 84 86
TRUE	PP5V_S0	18 19 36 49 58 59 62 63 66 67 73 79 80 84 85 86
TRUE	PP5V_S3	21 36 60 66 67 84
TRUE	PP5V_S5	61 66 84
TRUE	PPBUS_G3H	30 44 47 56 57 63 65 84
TRUE	PPDCIN_G3H	56 57 84
TRUE	PPVCC_S0_CPU	6 8 10 45 59 84
TRUE	PPVTTDDR_S3	60 84
TRUE	PP3V3_S0SW_SSD	34 45 84
TRUE	PP1V5_S0	11 12 13 15 17 19 52 64 67 81 84
TRUE	PP1V35_S3	21 45 60 66 84

XDP

FUNC_TEST		
TRUE	XDP_CPU_TCK	6 18 89
TRUE	XDP_PCH_TCK	11 18
TRUE	XDP_CPU_TDI	6 18 89
TRUE	XDP_CPU_TDO	6 18 89
TRUE	XDP_CPUPCH_TRST_L	6 18 89
TRUE	XDP_CPU_TMS	6 18 89
TRUE	XDP_PCH_TMS	11 18
TRUE	XDP_PCH_TDI	11 18
TRUE	XDP_PCH_TDO	11 18
TRUE	XDP_CPU_PREQ_L	6 18 89
TRUE	XDP_CPU_PRDY_L	6 18 89
TRUE	PM_RSMRST_L	12 67 91
TRUE	PM_PCH_PWROK	12 19 91
TRUE	PM_SYSRST_L	12 19 40 91
TRUE	CPU_CFG<5>	6 18 89
TRUE	PP3V3_S0	10 14 15 17 18 41 62 67 84
TRUE	GND	2X GND

Power Sequence

FUNC_TEST		
TRUE	SMC_ONOFF_L	38 40 41
TRUE	PM_DSW_PWRGD	12 40 91
TRUE	ALL_SYS_PWRGD	18 19 40 58 67
TRUE	PM_PCH_SYS_PWROK	12 18 19 40 91
TRUE	PLT_RESET_L	12 18 20 21
TRUE	LCD_PWR_EN	69 82
TRUE	LCD_BKLT_EN	63 82

GPU_VENUS JTAG

FUNC_TEST		
TRUE	GPU_JTAG_TCK	76 77
TRUE	GPU_JTAG_TDI	76 77
TRUE	GPU_JTAG_TDO	76 77
TRUE	GPU_JTAG_TMS	76 77
TRUE	GPU_JTAG_TRST_L	76 77
TRUE	GPU_PWRGOOD	

SYNC_MASTER=J15_MLB SYNC_DATE=10/31/2012

PAGE TITLE: Functional Test Points

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NC NO_TESTs

PCH

		NO_TEST	MAKE_BASE	
NC_USB3_SPARE_D2RN	=	TRUE	TRUE	NC_USB3_SPARE_D2RN
NC_USB3_SPARE_D2RP	=	TRUE	TRUE	NC_USB3_SPARE_D2RP
NC_USB3_SPARE_R2D_CN	=	TRUE	TRUE	NC_USB3_SPARE_R2D_CN
NC_USB3_SPARE_R2D_CP	=	TRUE	TRUE	NC_USB3_SPARE_R2D_CP
NC_USB3_EXTC_D2RN	=	TRUE	TRUE	NC_USB3_EXTC_D2RN
NC_USB3_EXTC_D2RP	=	TRUE	TRUE	NC_USB3_EXTC_D2RP
NC_USB3_EXTC_R2D_CN	=	TRUE	TRUE	NC_USB3_EXTC_R2D_CN
NC_USB3_EXTC_R2D_CP	=	TRUE	TRUE	NC_USB3_EXTC_R2D_CP
NC_USB3_EXTD_D2RN	=	TRUE	TRUE	NC_USB3_EXTD_D2RN
NC_USB3_EXTD_D2RP	=	TRUE	TRUE	NC_USB3_EXTD_D2RP
NC_USB3_EXTD_R2D_CN	=	TRUE	TRUE	NC_USB3_EXTD_R2D_CN
NC_USB3_EXTD_R2D_CP	=	TRUE	TRUE	NC_USB3_EXTD_R2D_CP
NC_PCIE_ENET_D2RN	=	TRUE	TRUE	NC_PCIE_ENET_D2RN
NC_PCIE_ENET_D2RP	=	TRUE	TRUE	NC_PCIE_ENET_D2RP
NC_PCIE_ENET_R2D_CN	=	TRUE	TRUE	NC_PCIE_ENET_R2D_CN
NC_PCIE_ENET_R2D_CP	=	TRUE	TRUE	NC_PCIE_ENET_R2D_CP
NC_SATA_A_D2RN	=	TRUE	TRUE	NC_SATA_A_D2RN
NC_SATA_A_D2RP	=	TRUE	TRUE	NC_SATA_A_D2RP
NC_SATA_A_R2D_CN	=	TRUE	TRUE	NC_SATA_A_R2D_CN
NC_SATA_A_R2D_CP	=	TRUE	TRUE	NC_SATA_A_R2D_CP
NC_SATA_B_D2RN	=	TRUE	TRUE	NC_SATA_B_D2RN
NC_SATA_B_D2RP	=	TRUE	TRUE	NC_SATA_B_D2RP
NC_SATA_B_R2D_CN	=	TRUE	TRUE	NC_SATA_B_R2D_CN
NC_SATA_B_R2D_CP	=	TRUE	TRUE	NC_SATA_B_R2D_CP
NC_SATA_ODD_D2RN	=	TRUE	TRUE	NC_SATA_ODD_D2RN
NC_SATA_ODD_D2RP	=	TRUE	TRUE	NC_SATA_ODD_D2RP
NC_SATA_ODD_R2D_CN	=	TRUE	TRUE	NC_SATA_ODD_R2D_CN
NC_SATA_ODD_R2D_CP	=	TRUE	TRUE	NC_SATA_ODD_R2D_CP
NC_SATA_D_D2RN	=	TRUE	TRUE	NC_SATA_D_D2RN
NC_SATA_D_D2RP	=	TRUE	TRUE	NC_SATA_D_D2RP
NC_SATA_D_R2D_CN	=	TRUE	TRUE	NC_SATA_D_R2D_CN
NC_SATA_D_R2D_CP	=	TRUE	TRUE	NC_SATA_D_R2D_CP
NC_SATA_F_D2RN	=	TRUE	TRUE	NC_SATA_F_D2RN
NC_SATA_F_D2RP	=	TRUE	TRUE	NC_SATA_F_D2RP
NC_SATA_F_R2D_CN	=	TRUE	TRUE	NC_SATA_F_R2D_CN
NC_SATA_F_R2D_CP	=	TRUE	TRUE	NC_SATA_F_R2D_CP
NC_USB_EXTCN	=	TRUE	TRUE	NC_USB_EXTCN
NC_USB_EXTCP	=	TRUE	TRUE	NC_USB_EXTCP
NC_USB_SDN	=	TRUE	TRUE	NC_USB_SDN
NC_USB_SDP	=	TRUE	TRUE	NC_USB_SDP
NC_USB_WLANN	=	TRUE	TRUE	NC_USB_WLANN
NC_USB_WLANP	=	TRUE	TRUE	NC_USB_WLANP
NC_USB_6N	=	TRUE	TRUE	NC_USB_6N
NC_USB_6P	=	TRUE	TRUE	NC_USB_6P
NC_USB_7N	=	TRUE	TRUE	NC_USB_7N
NC_USB_7P	=	TRUE	TRUE	NC_USB_7P
NC_USB_EXTDN	=	TRUE	TRUE	NC_USB_EXTDN
NC_USB_EXTDP	=	TRUE	TRUE	NC_USB_EXTDP
NC_USB_PSOCN	=	TRUE	TRUE	NC_USB_PSOCN
NC_USB_PSOCP	=	TRUE	TRUE	NC_USB_PSOCP
NC_USB_IRN	=	TRUE	TRUE	NC_USB_IRN
NC_USB_IRP	=	TRUE	TRUE	NC_USB_IRP
NC_ITPXDP_CLK100MN	=	TRUE	TRUE	NC_ITPXDP_CLK100MN
NC_ITPXDP_CLK100MP	=	TRUE	TRUE	NC_ITPXDP_CLK100MP
NC_PCI_PME_L	=	TRUE	TRUE	NC_PCI_PME_L
NC_PCI_CLK33M_OUT3	=	TRUE	TRUE	NC_PCI_CLK33M_OUT3
NC_HDA_SDIN1	=	TRUE	TRUE	NC_HDA_SDIN1
NC_HDA_SDIN2	=	TRUE	TRUE	NC_HDA_SDIN2
NC_HDA_SDIN3	=	TRUE	TRUE	NC_HDA_SDIN3
NC_LPC_DREQ0_L	=	TRUE	TRUE	NC_LPC_DREQ0_L
NC_CLINK_CLK	=	TRUE	TRUE	NC_CLINK_CLK
NC_CLINK_DATA	=	TRUE	TRUE	NC_CLINK_DATA
NC_CLINK_RESET_L	=	TRUE	TRUE	NC_CLINK_RESET_L
NC_LPC_CLK33M_LPCPLUS_R	=	TRUE	TRUE	NC_LPC_CLK33M_LPCPLUS_R
NC_EDP_IG_BKL_PWM	=	TRUE	TRUE	NC_EDP_IG_BKL_PWM
NC_USB_SMCP	=	TRUE	TRUE	NC_USB_SMCP
NC_USB_SMCN	=	TRUE	TRUE	NC_USB_SMCN
NC_SMC_INTERFACE_2	=	TRUE	TRUE	NC_SMC_INTERFACE_2

Thunderbolt

		NO_TEST	MAKE_BASE	
NC_TBT_XTAL25OUT	=	TRUE	TRUE	NC_TBT_XTAL25OUT
TP_DP_TBTSRC_ML_CP<3..0>	=	TRUE	TRUE	NC_DP_TBTSRC_ML_CP<3..0>
TP_DP_TBTSRC_ML_CN<3..0>	=	TRUE	TRUE	NC_DP_TBTSRC_ML_CN<3..0>
NC_DP_TBTSRC_AUXCH_CP	=	TRUE	TRUE	NC_DP_TBTSRC_AUXCH_CP
NC_DP_TBTSRC_AUXCH_CN	=	TRUE	TRUE	NC_DP_TBTSRC_AUXCH_CN
NC_DP_IG_D_AUXCHN	=	TRUE	TRUE	NC_DP_IG_D_AUXCHN
NC_DP_IG_D_AUXCHP	=	TRUE	TRUE	NC_DP_IG_D_AUXCHP
NC_PCIE_CLK100M_PE5N	=	TRUE	TRUE	NC_PCIE_CLK100M_PE5N
NC_PCIE_CLK100M_PE5P	=	TRUE	TRUE	NC_PCIE_CLK100M_PE5P
NC_PCIE_CLK100M_ENETSDN	=	TRUE	TRUE	NC_PCIE_CLK100M_ENETSDN
NC_PCIE_CLK100M_ENETSDP	=	TRUE	TRUE	NC_PCIE_CLK100M_ENETSDP
NC_PCIE_CLK100M_ENETN	=	TRUE	TRUE	NC_PCIE_CLK100M_ENETN
NC_PCIE_CLK100M_ENETP	=	TRUE	TRUE	NC_PCIE_CLK100M_ENETP
NC_PCIE_CLK100M_PEGBN	=	TRUE	TRUE	NC_PCIE_CLK100M_PEGBN
NC_PCIE_CLK100M_PEGBP	=	TRUE	TRUE	NC_PCIE_CLK100M_PEGBP
NC_PCIE_CLK100M_SWN	=	TRUE	TRUE	NC_PCIE_CLK100M_SWN
NC_PCIE_CLK100M_SWP	=	TRUE	TRUE	NC_PCIE_CLK100M_SWP
NC_PCH_GPIO64_CLKOUTFLEX0	=	TRUE	TRUE	NC_PCH_GPIO64_CLKOUTFLEX0
NC_PCH_GPIO65_CLKOUTFLEX1	=	TRUE	TRUE	NC_PCH_GPIO65_CLKOUTFLEX1
NC_PCH_GPIO66_CLKOUTFLEX2	=	TRUE	TRUE	NC_PCH_GPIO66_CLKOUTFLEX2
NC_PCH_GPIO67_CLKOUTFLEX3	=	TRUE	TRUE	NC_PCH_GPIO67_CLKOUTFLEX3
NC_USB_4N	=	TRUE	TRUE	NC_USB_4N
NC_USB_4P	=	TRUE	TRUE	NC_USB_4P
TP_DVPCNTL_M<1..0>	=	TRUE	TRUE	NC_DVPCNTL_M<1..0>
TP_DVPCNTL<2..0>	=	TRUE	TRUE	NC_DVPCNTL<2..0>
NC_DVPCLK	=	TRUE	TRUE	NC_DVPCLK
TP_NC_DVPDATA<23..6>	=	TRUE	TRUE	NC_DVPDATA<23..6>
NC_FB_B0_A<9>	=	TRUE	TRUE	NC_FB_B0_A<9>
NC_FB_B1_A<9>	=	TRUE	TRUE	NC_FB_B1_A<9>
NC_FB_A0_A<9>	=	TRUE	TRUE	NC_FB_A0_A<9>
NC_FB_A1_A<9>	=	TRUE	TRUE	NC_FB_A1_A<9>

TRUE	PCIE_TBT_R2D_P<3..0>	
TRUE	PCIE_TBT_R2D_N<3..0>	
TRUE	PCIE_TBT_D2R_C_P<3..0>	
TRUE	PCIE_TBT_D2R_C_N<3..0>	
TRUE	DMI_S2N_P<3..1>	
TRUE	DMI_S2N_N<3..1>	
TRUE	DMI_N2S_P<3..1>	
TRUE	DMI_N2S_N<3..1>	

PLACEABLE BEAD-PROBES FOR TBT

TBT_A_D2R_P<1>	1	SM	BEAD-PROBE	BPA531 NO_XNET_CONNECTION=TRUE
TBT_A_D2R_N<1>	1	SM	BEAD-PROBE	BPA532 NO_XNET_CONNECTION=TRUE

SYNC_MASTER=J15_MLB SYNC_DATE=10/31/2012

PAGE TITLE: NC & No Test

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X425G BOARD-SPECIFIC SPACING & PHYSICAL CONSTRAINTS

BOARD LAYERS	BOARD AREAS	BOARD UNITS (MIL or MM)	ALLEGRO VERSION
TOP,ISL2,ISL3,ISL4,ISL5,ISL6,ISL7,ISL8,ISL9,ISL10,ISL11,BOTTOM	NO_TYPE,BGA,P65BGA	MM	16.2

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
DEFAULT	*	Y	=45_OHM_SE	=45_OHM_SE	10 MM	0 MM	0 MM
STANDARD	*	Y	=DEFAULT	=DEFAULT	10 MM	=DEFAULT	=DEFAULT

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
50_OHM_SE	TOP,BOTTOM	Y	0.095 MM	0.095 MM			
50_OHM_SE	*	Y	0.066 MM	0.066 MM	=STANDARD	=STANDARD	=STANDARD

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
45_OHM_SE	TOP,BOTTOM	Y	0.116 MM	0.116 MM			
45_OHM_SE	*	Y	0.083 MM	0.083 MM	=STANDARD	=STANDARD	=STANDARD

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
40_OHM_SE	TOP,BOTTOM	Y	0.145 MM	0.095 MM			
40_OHM_SE	*	Y	0.102 MM	0.090 MM	=STANDARD	=STANDARD	=STANDARD

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
37_OHM_SE	TOP,BOTTOM	Y	0.165 MM	0.095 MM			
37_OHM_SE	*	Y	0.118 MM	0.090 MM	=STANDARD	=STANDARD	=STANDARD

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
27P4_OHM_SE	TOP,BOTTOM	Y	0.265 MM	0.095 MM			
27P4_OHM_SE	*	Y	0.186 MM	0.1 MM	=STANDARD	=STANDARD	=STANDARD

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
72_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD
72_OHM_DIFF	ISL3,ISL4,ISL9,ISL10	Y	0.105 MM	0.105 MM		0.120 MM	0.120 MM
72_OHM_DIFF	ISL2,ISL11	Y	0.105 MM	0.105 MM		0.120 MM	0.120 MM
72_OHM_DIFF	TOP,BOTTOM	Y	0.146 MM	0.146 MM		0.120 MM	0.120 MM

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
80_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD
80_OHM_DIFF	ISL3,ISL4,ISL9,ISL10	Y	0.092 MM	0.092 MM		0.120 MM	0.120 MM
80_OHM_DIFF	ISL2,ISL11	Y	0.092 MM	0.092 MM		0.120 MM	0.120 MM
80_OHM_DIFF	TOP,BOTTOM	Y	0.125 MM	0.125 MM		0.155 MM	0.155 MM

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
85_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD
85_OHM_DIFF	ISL3,ISL4,ISL9,ISL10	Y	0.080 MM	0.080 MM		0.120 MM	0.120 MM
85_OHM_DIFF	ISL2,ISL11	Y	0.080 MM	0.080 MM		0.120 MM	0.120 MM
85_OHM_DIFF	TOP,BOTTOM	Y	0.105 MM	0.105 MM		0.125 MM	0.125 MM

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
90_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD
90_OHM_DIFF	ISL3,ISL4,ISL9,ISL10	Y	0.078 MM	0.078 MM		0.200 MM	0.200 MM
90_OHM_DIFF	ISL2,ISL11	Y	0.078 MM	0.078 MM		0.200 MM	0.200 MM
90_OHM_DIFF	TOP,BOTTOM	Y	0.101 MM	0.101 MM		0.180 MM	0.180 MM

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
1:1_DIFFPAIR	*	Y	=STANDARD	=STANDARD	=STANDARD	0.1 MM	0.1 MM

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
*	*	BGA	P072_SPACE
*	*	P65BGA	P075_SPACE

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
DEFAULT	*	0.1 MM	?
STANDARD	*	=DEFAULT	?
BGA_P1MM	*	0.1 MM	?
BGA_P2MM	*	0.2 MM	?
P072_SPACE	*	0.071 MM	?
P075_SPACE	*	0.075 MM	?

Stackup-Defined Spacing Rules

Note: Outer dielectric is 0.058 mm nominal,
Inner dielectric is 0.053 mm nominal.

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
1:1_SPACING	·	0.1 MM	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
1x_DIELECTRIC	TOP,BOTTOM	0.058 MM	?
1x_DIELECTRIC	ISL3,ISL4,ISL9,ISL10	0.053 MM	?
1x_DIELECTRIC	ISL2,ISL5,ISL6,ISL7,ISL8,ISL11	0.101 MM	?

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
P65_BGA	*	Y	0.071MM	0.071MM		0.075MM	0.126MM

NET_PHYSICAL_TYPE	AREA_TYPE	PHYSICAL_RULE_SET
*	P65BGA	P65_BGA

SYNC_MASTER=SIDLE_J45 SYNC_DATE=12/10/2012

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CPU Signal Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
CPU_50S	*	=50_OHM_SE	=50_OHM_SE	=50_OHM_SE	=STANDARD	=STANDARD	=STANDARD
CPU_45S	*	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=STANDARD	=STANDARD
CPU_27P4S	*	=27P4_OHM_SE	=27P4_OHM_SE	=27P4_OHM_SE	=27P4_OHM_SE	7 MIL	7 MIL
CPU_85D	*	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF

NOTE: 7 mil gap is for VCCSense pair, which Intel says to route with 7 mil spacing without specifying a target impedance.

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
CPU_AGTL	*	=STANDARD	?
CPU_8MIL	*	8 MIL	?
CPU_COMP	*	20 MIL	?
CPU_ITP	*	=2:1_SPACING	?
CPU_VCCSENSE	*	25 MIL	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
CPU_AGTL	TOP,BOTTOM	=2x_DIELECTRIC	?
CPU_VID	*	0.457 MM	?
CPU_VREF	*	12 MIL	?

Most CPU signals with impedance requirements are 50-ohm single-ended.
Some signals require 27.4-ohm single-ended impedance.

SOURCE: IVB PLATFORM DG , Tables 205-207

Spacing Rule Sets

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
DMI_2SAME	*	=3X_DIELECTRIC	?
DMI_TXRX	*	=6X_DIELECTRIC	?
DMICLK2N2S	*	=6X_DIELECTRIC	?
DMICLK2S2N	*	=3X_DIELECTRIC	?
DMICLK2OTHER	*	=4X_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
DMI_2SAME	TOP,BOTTOM	=4X_DIELECTRIC	?
DMI_TXRX	TOP,BOTTOM	=10X_DIELECTRIC	?
DMICLK2N2S	TOP,BOTTOM	=10X_DIELECTRIC	?
DMICLK2S2N	TOP,BOTTOM	=6X_DIELECTRIC	?
DMICLK2OTHER	TOP,BOTTOM	=4X_DIELECTRIC	?

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
DMI_*	=SAME	*	DMI_2SAME
DMI_N2S	DMI_S2N	*	DMI_TXRX
DMI_S2N	DMI_N2S	*	DMI_TXRX
CLK_DMI	DMI_N2S	*	DMICLK2N2S
CLK_DMI	DMI_S2N	*	DMICLK2S2N
CLK_DMI	*	*	DMICLK2OTHER

PEG - SSD & TBT

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
PEG_80D	*	=80_OHM_DIFF	=80_OHM_DIFF	=80_OHM_DIFF	=80_OHM_DIFF	=80_OHM_DIFF	=80_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
PEG_2SAME	*	=3X_DIELECTRIC	?
PEG_TXRX	*	=6X_DIELECTRIC	?
PEG_2OTHER	*	=4X_DIELECTRIC	?
PEG_2CLK	*	=7X_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
PEG_2SAME	TOP,BOTTOM	=4X_DIELECTRIC	?
PEG_TXRX	TOP,BOTTOM	=10X_DIELECTRIC	?
PEG_2OTHER	TOP,BOTTOM	=6X_DIELECTRIC	?
PEG_2CLK	TOP,BOTTOM	=10X_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
PEG3_2SAME	*	=4X_DIELECTRIC	?
PEG3_TXRX	*	=8X_DIELECTRIC	?
PEG3_2OTHER	*	=5X_DIELECTRIC	?
PEG3_2CLK	*	=8X_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
PEG3_2SAME	TOP,BOTTOM	=6X_DIELECTRIC	?
PEG3_TXRX	TOP,BOTTOM	=12X_DIELECTRIC	?
PEG3_2OTHER	TOP,BOTTOM	=8X_DIELECTRIC	?
PEG3_2CLK	TOP,BOTTOM	=12X_DIELECTRIC	?

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
PEG_*	=SAME	*	PEG_2SAME
PEG_R2D	PEG_D2R	*	PEG_TXRX
PEG_*	*	*	PEG_2OTHER
PEG_*	CLK_*	*	PEG_2CLK

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
PEG3_*	=SAME	*	PEG3_2SAME
PEG3_R2D	PEG3_D2R	*	PEG3_TXRX
PEG3_*	*	*	PEG3_2OTHER
PEG3_*	CLK_*	*	PEG3_2CLK

DIGITAL VIDEO SIGNAL CONSTRAINTS

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
DP_85D	*	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
DP_2SAME	*	=3x_DIELECTRIC	?
DP_2OTHER	*	=4x_DIELECTRIC	?
HDMICLK_2CLK	*	=7x_DIELECTRIC	?
HDMICLK_2DP	*	=4x_DIELECTRIC	?
HDMICLK_2OTHER	*	=7x_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
DP_2SAME	TOP,BOTTOM	=4x_DIELECTRIC	?
DP_2OTHER	TOP,BOTTOM	=6x_DIELECTRIC	?
HDMICLK_2CLK	TOP,BOTTOM	=10x_DIELECTRIC	?
HDMICLK_2DP	TOP,BOTTOM	=6x_DIELECTRIC	?
HDMICLK_2OTHER	TOP,BOTTOM	=10x_DIELECTRIC	?

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
DISPLAYPORT	=SAME	*	DP_2SAME
DISPLAYPORT	*	*	DP_2OTHER
HDMI_CLK	CLK_*	*	HDMICLK_2CLK
HDMI_CLK	DISPLAYPORT	*	HDMICLK_2DP
HDMI_CLK	*	*	HDMICLK_2OTHER

DisplayPort/TMDS intra-pair matching should be 0.127mm. Inter-pair matching should be within 2.54cm. Max Length 241.3mm.
DIsplayPort AUX CH intra-pair matching should be 0.127mm. Max length 330.2mm.
SOURCE: Calpella SFF DG Rev 1.5 (407364) and Family GPU DG-04202-001-v04.
MAX LENGTH OF DISPLAYPORT/TMDS TRACES: 13 INCHES.

CPU Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE: PHYSICAL	NET_TYPE: SPACING		
DMI_S2N	CPU_85D	DMI_S2N	DMI_S2N_P<3:0>	5 12 87
DMI_S2N	CPU_85D	DMI_S2N	DMI_S2N_N<3:0>	5 12 87
DMI_N2S	CPU_85D	DMI_N2S	DMI_N2S_P<3:0>	5 12 87
DMI_N2S	CPU_85D	DMI_N2S	DMI_N2S_N<3:0>	5 12 87
FDI_INT	CPU_50S	CPU_AGTL	FDI_INT	5 12
FDI_CSYNC	CPU_50S	CPU_AGTL	FDI_CSYNC	5 12
DMI_CLK	CPU_85D	CLK_DMI	DMI_CLK100M_CPU_P	6 11
DMI_CLK	CPU_85D	CLK_DMI	DMI_CLK100M_CPU_N	6 11
CPU_CLK135_PLL	CPU_85D	CLK_PCIE	CPU_CLK135M_DPLLREF_N	6 11
CPU_CLK135_PLL	CPU_85D	CLK_PCIE	CPU_CLK135M_DPLLREF_P	6 11
CPU_CLK135_PLL	CPU_85D	CLK_PCIE	CPU_CLK135M_DPLLSS_N	6 11
CPU_CLK135_PLL	CPU_85D	CLK_PCIE	CPU_CLK135M_DPLLSS_P	6 11
CPU_EDP_COMP	CPU_27P4S	CPU_COMP	CPU_EDP_RCOMP	5
CPU_PEG_COMP	CPU_27P4S	CPU_COMP	CPU_PEG_RCOMP	5
CPU_CFG	CPU_45S	CPU_ITP	CPU_CFG<19..0>	6 18 86
XDP_CLK_PCH	CLK_PCIE_85D	CLK_PCIE	NC_ITPXDP_CLK100MP	11 87
XDP_CLK_PCH	CLK_PCIE_85D	CLK_PCIE	NC_ITPXDP_CLK100MN	11 87
XDP_TDI	CPU_45S	CPU_ITP	XDP_CPU_TDI	6 18 86
XDP_TDO	CPU_45S	CPU_ITP	XDP_CPU_TDO	6 18 86
XDP_TMS	CPU_45S	CPU_ITP	XDP_CPU_TMS	6 18 86
XDP_TCK	CPU_45S	CPU_ITP	XDP_CPU_TCK	6 18 86
XDP_TRST_L	CPU_45S	CPU_ITP	XDP_CPUPCH_TRST_L	6 18 86
XDP_BPM	CPU_45S	CPU_ITP	XDP_BPM_L<3..0>	6 18
XDP_BPM_L	CPU_45S	CPU_ITP	XDP_BPM_L<7..4>	6 18
XDP_DBRESET_L	CPU_45S	CPU_ITP	XDP_DBRESET_L	6 18 19
XDP_PRDY_L	CPU_45S	CPU_ITP	XDP_CPU_PRDY_L	6 18 86
XDP_PREQ_L	CPU_45S	CPU_ITP	XDP_CPU_PREQ_L	6 18 86
CPU_CATERR_L	CPU_45S	CPU_AGTL	CPU_CATERR_L	6 40
CPU_PECI	CPU_45S	CPU_VID	CPU_PECI	6 14 41
CPU_PROCHOT_L	CPU_45S	CPU_AGTL	CPU_PROCHOT_L	6 40 41 58
CPU_PWRGD	CPU_45S	CPU_AGTL	CPU_PWRGD	6 14 18
PM_THRMTRIP_L	CPU_45S	CPU_8MTL	PM_THRMTRIP_L	6 14 41
PM_MEM_PWRGD	CPU_45S	CPU_AGTL	PM_MEM_PWRGD	6 12 21
PM_SYNC	CPU_45S	CPU_AGTL	PM_SYNC	6 12
CPU_SM_RCOMP	CPU_27P4S	CPU_COMP	CPU_SM_RCOMP<2..0>	6
CPU_VID	CPU_45S	CPU_VID	CPU_VIDSOUT	8 58
CPU_VID	CPU_45S	CPU_VID	CPU_VIDSCLK	8 58
CPU_VID	CPU_45S	CPU_VID	CPU_VIDALERT_L	8 58
CPU_VCCSENSE	CPU_27P4S	CPU_VCCSENSE	CPU_VCCSENSE_P	8 58
CPU_VCCSENSE	CPU_27P4S	CPU_VCCSENSE	CPU_VCCSENSE_N	9 58
CPU_MEM_VREF		MEM_12MTL	CPU_DIMMA_VREFDQ	7 22
CPU_MEM_VREF		MEM_12MTL	CPU_DIMMB_VREFDQ	7 22
CPU_MEM_VREF		MEM_PWR	PP0V75_S3_MEM_VREFDQ_A	22 23 24 85 92
CPU_MEM_VREF		CPU_VREF	PP0V75_S3_MEM_VREFDQ_B	22 25 26 85
CPU_MEM_VREF		MEM_PWR	PP0V75_S3_MEM_VREFCA	22 23 24 25 26 85 89 92
CPU_MEM_VREF		MEM_PWR	PP0V75_S3_MEM_VREFCA	22 23 24 25 26 85 89 92
PCIE_D2R_GPU	PEG_80D	PEG3_D2R	PEG_D2R_C_P<7..0>	68 70
PCIE_D2R_GPU	PEG_80D	PEG3_D2R	PEG_D2R_C_N<7..0>	68 70
PCIE_D2R_GPU	PEG_80D	PEG3_D2R	PEG_D2R_P<7..0>	70 85
PCIE_D2R_GPU	PEG_80D	PEG3_D2R	PEG_D2R_N<7..0>	70 85
PCIE_R2D_GPU	PEG_80D	PEG3_R2D	PEG_R2D_C_P<7..0>	68 70 85
PCIE_R2D_GPU	PEG_80D	PEG3_R2D	PEG_R2D_C_N<7..0>	68 70 85
PCIE_R2D_GPU	PEG_80D	PEG3_R2D	PEG_R2D_P<7..0>	70
PCIE_R2D_GPU	PEG_80D	PEG3_R2D	PEG_R2D_N<7..0>	70
PCIE_D2R_SSD	CPU_85D	PEG3_D2R	PCIE_SSD_D2R_P<3..0>	5 34 85
PCIE_D2R_SSD	CPU_85D	PEG3_D2R	PCIE_SSD_D2R_N<3..0>	5 34 85
PCIE_R2D_SSD	CPU_85D	PEG3_R2D	PCIE_SSD_R2D_C_P<3..0>	5 34 85
PCIE_R2D_SSD	CPU_85D	PEG3_R2D	PCIE_SSD_R2D_C_N<3..0>	5 34 85
	CPU_85D	PEG3_R2D	PCIE_SSD_R2D_P<3..0>	34
	CPU_85D	PEG3_R2D	PCIE_SSD_R2D_N<3..0>	34
PEG_D2R_TBT	CPU_85D	PEG_D2R	PCIE_TBT_D2R_P<3..0>	5 28 85
PEG_D2R_TBT	CPU_85D	PEG_D2R	PCIE_TBT_D2R_N<3..0>	5 28 85
	CPU_85D	PEG_D2R	PCIE_TBT_D2R_C_P<3..0>	28 87
	CPU_85D	PEG_D2R	PCIE_TBT_D2R_C_N<3..0>	28 87
PEG_R2D_TBT	CPU_85D	PEG_R2D	PCIE_TBT_R2D_P<3..0>	28 87
PEG_R2D_TBT	CPU_85D	PEG_R2D	PCIE_TBT_R2D_N<3..0>	28 87
	CPU_85D	PEG_R2D	PCIE_TBT_R2D_C_P<3..0>	5 28 85
	CPU_85D	PEG_R2D	PCIE_TBT_R2D_C_N<3..0>	5 28 85

DP AUX NET PROPERTIES

ELECTRICAL_CONSTRAINT_SET	NET_TYPE: PHYSICAL	NET_TYPE: SPACING		
DP_IG_AUX	DP_85D	DISPLAYPORT	DPA_IG_AUX_CH_P	12 83 85
DP_IG_AUX	DP_85D	DISPLAYPORT	DPA_IG_AUX_CH_N	12 83 85
DP_IG_AUX	DP_85D	DISPLAYPORT	DPB_IG_AUX_CH_P	12 83 85
DP_IG_AUX	DP_85D	DISPLAYPORT	DPB_IG_AUX_CH_N	12 83 85

DP / HDMI NET PROPERTIES

ELECTRICAL_CONSTRAINT_SET	NET_TYPE: PHYSICAL	NET_TYPE: SPACING		
DP_TBT_ML0	DP_85D	DISPLAYPORT	DP_TBTSNK0_ML_C_P<3..0>	28 76 97
DP_TBT_ML0	DP_85D	DISPLAYPORT	DP_TBTSNK0_ML_C_N<3..0>	28 76 97
	DP_85D	DISPLAYPORT	DP_TBTSNK0_ML_P<3..0>	28 97
	DP_85D	DISPLAYPORT	DP_TBTSNK0_ML_N<3..0>	28 97
DP_TBT_ML1	DP_85D	DISPLAYPORT	DP_TBTSNK1_ML_C_P<3..0>	28 76 97
DP_TBT_ML1	DP_85D	DISPLAYPORT	DP_TBTSNK1_ML_C_N<3..0>	28 76 97
	DP_85D	DISPLAYPORT	DP_TBTSNK1_ML_P<3..0>	28 97
	DP_85D	DISPLAYPORT	DP_TBTSNK1_ML_N<3..0>	28 97
TBTSNK_AUXCH	DP_85D		DP_TBTSNK0_AUXCH_P	28 97
TBTSNK_AUXCH	DP_85D		DP_TBTSNK0_AUXCH_N	28 97
	DP_85D		DP_TBTSNK0_AUXCH_C_P	28 83 97
	DP_85D		DP_TBTSNK0_AUXCH_C_N	28 83 97
TBTSNK_AUXCH	DP_85D		DP_TBTSNK1_AUXCH_P	28 97
TBTSNK_AUXCH	DP_85D		DP_TBTSNK1_AUXCH_N	28 97
	DP_85D		DP_TBTSNK1_AUXCH_C_P	28 83 97
	DP_85D		DP_TBTSNK1_AUXCH_C_N	28 83 97

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SATA Interface Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
SATA_85D	*	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF
SATA_37SE	*	=37_OHM_SE	=37_OHM_SE	=37_OHM_SE	=37_OHM_SE	=37_OHM_SE	=37_OHM_SE
SATA_45SE	*	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
SATA_2SAME	*	=3X_DIELECTRIC	?
SATA_TXRX	*	=6X_DIELECTRIC	?
SATA_2OTHER	*	=4X_DIELECTRIC	?
SATA_RCOMP	*	=6X_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
SATA_2SAME	TOP,BOTTOM	=4x_DIELECTRIC	?
SATA_TXRX	TOP,BOTTOM	=10X_DIELECTRIC	?
SATA_2OTHER	TOP,BOTTOM	=6X_DIELECTRIC	?
SATA_RCOMP	TOP,BOTTOM	=10X_DIELECTRIC	?

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
SATA_*	=SAME	*	SATA_2SAME
SATA_R2D	SATA_D2R	*	SATA_TXRX
SATA_*	*	*	SATA_2OTHER

USB 2.0 Interface Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
PCH_USB_RBIAS	*	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD
USB_85D	*	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
USB	*	=4X_DIELECTRIC	?
USB_RBIAS	*	=6X_DIELECTRIC	?
BT_WAKE	*	=4X_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
USB	TOP,BOTTOM	=6X_DIELECTRIC	?
USB_RBIAS	TOP,BOTTOM	=10X_DIELECTRIC	?
BT_WAKE	TOP,BOTTOM	=6X_DIELECTRIC	?

USB 3.0 INTERFACE CONSTRAINTS

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
USB3_85D	*	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
USB3_2SAME	*	=3X_DIELECTRIC	?
USB3_TXRX	*	=6X_DIELECTRIC	?
USB3_2OTHER	*	=4X_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
USB3_2SAME	TOP,BOTTOM	=4x_DIELECTRIC	?
USB3_TXRX	TOP,BOTTOM	=10X_DIELECTRIC	?
USB3_2OTHER	TOP,BOTTOM	=6X_DIELECTRIC	?

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
USB3_*	=SAME	*	USB3_2SAME
USB3_R2D	USB3_D2R	*	USB3_TXRX
USB3_*	*	*	USB3_2OTHER

System Clock Signal Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
CLK_SLOW_45S	*	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=STANDARD	=STANDARD
CLK_25M_45S	*	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=STANDARD	=STANDARD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
CLK_SLOW	*	=4x_DIELECTRIC	?
CLK_25M	*	=5x_DIELECTRIC	?

NOTE: 25MHz system clocks very sensitive to noise.
NOTE: Latest Intel DG calls out 50ohms SE for sys clocks

PCH Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
	SATA_85D	SATA_R2D	NC_SATA_A_R2D_CP	11 87
	SATA_85D	SATA_R2D	NC_SATA_A_R2D_CN	11 87
I27	SATA_85D	SATA_D2R	NC_SATA_A_D2RP	11 87
I27	SATA_85D	SATA_D2R	NC_SATA_A_D2RN	11 87
I29	SATA_85D	SATA_R2D	NC_SATA_B_R2D_CP	11 87
I29	SATA_85D	SATA_R2D	NC_SATA_B_R2D_CN	11 87
I30	SATA_85D	SATA_D2R	NC_SATA_B_D2RP	11 87
I30	SATA_85D	SATA_D2R	NC_SATA_B_D2RN	11 87
I213 PCH_SATA_RCOMP	SATA_45SE	SATA_RCOMP	PCH_SATA_RCOMP	11
	USB_85D	USB	USB_EXTA_P	13 37
	USB_85D	USB	USB_EXTA_N	13 37
I24	USB_85D	USB	USB_EXTA_MUXED_P	37
I24	USB_85D	USB	USB_EXTA_MUXED_N	37
I24	USB_85D	USB	USB_LT1_P	37
I24	USB_85D	USB	USB_LT1_N	37
	USB_85D	USB	NC_USB_EXTCP	13 87
	USB_85D	USB	NC_USB_EXTCN	13 87
I23	USB_85D	USB	NC_USB_SDP	13 87
I23	USB_85D	USB	NC_USB_SDN	13 87
I27	CPU_45S	CPU_ITP	SMC_DEBUGPRT_RX_L	37 40 41
I27	CPU_45S	CPU_ITP	SMC_DEBUGPRT_TX_L	37 40 41
	USB_SMC	USB_85D	USB	NC_USB_SMCP	87
	USB_SMC	USB_85D	USB	NC_USB_SMCN	87
I28	USB_85D	USB	NC_USB_6P	13 87
I28	USB_85D	USB	NC_USB_6N	13 87
I28	USB_85D	USB	NC_USB_7P	13 87
I28	USB_85D	USB	NC_USB_7N	13 87
	USB_85D	USB	USB_EXTB_P	13 81 86
	USB_85D	USB	USB_EXTB_N	13 81 86
I26	USB_85D	USB	NC_USB_EXTDP	13 87
I25	USB_85D	USB	NC_USB_EXTDN	13 87
	USB_85D	USB	USB_BT_P	13 33
	USB_85D	USB	USB_BT_N	13 33
	USB_85D	USB	USB_BT_CONN_P	33 86
	USB_85D	USB	USB_BT_CONN_N	33 86
I27	USB_85D	USB	NC_USB_IRP	13 87
I27	USB_85D	USB	NC_USB_IRN	13 87
I28	USB_85D	USB	USB_TPAD_P	13 38 86
I28	USB_85D	USB	USB_TPAD_N	13 38 86
I302	USB_85D	USB	USB_TPAD_R_P	
I307	USB_85D	USB	USB_TPAD_R_N	
PCH_USB_RBIAS	PCH_USB_RBIAS	USB_RBIAS	PCH_USB_RBIAS	13
I22 USB3_EXTA_RX	USB_85D	USB3_D2R	USB3_EXTA_D2R_P	13 37
I23 USB3_EXTA_RX	USB_85D	USB3_D2R	USB3_EXTA_D2R_N	13 37
I26	USB_85D	USB3_D2R	USB3_EXTA_D2R_C_P	
I26	USB_85D	USB3_D2R	USB3_EXTA_D2R_C_N	
I23 USB3_EXTA_TX	USB_85D	USB3_R2D	USB3_EXTA_R2D_P	37
I22 USB3_EXTA_TX	USB_85D	USB3_R2D	USB3_EXTA_R2D_N	37
I26	USB_85D	USB3_R2D	USB3_EXTA_R2D_C_P	13 37
I26	USB_85D	USB3_R2D	USB3_EXTA_R2D_C_N	13 37
I22 USB3_EXTB_RX	USB_85D	USB3_D2R	USB3_EXTB_D2R_P	13 81 86
I22 USB3_EXTB_RX	USB_85D	USB3_D2R	USB3_EXTB_D2R_N	13 81 86
I26	USB_85D	USB3_D2R	USB3_EXTB_D2R_C_P	
I26	USB_85D	USB3_D2R	USB3_EXTB_D2R_C_N	
I22 USB3_EXTB_TX	USB_85D	USB3_R2D	USB3_EXTB_R2D_P	81 86
I22 USB3_EXTB_TX	USB_85D	USB3_R2D	USB3_EXTB_R2D_N	81 86
I26	USB_85D	USB3_R2D	USB3_EXTB_R2D_C_P	13 81
I26	USB_85D	USB3_R2D	USB3_EXTB_R2D_C_N	13 81
I20 NC_USB3	USB_85D	USB3_D2R	NC_USB3_EXTC_D2RP	13 87
I20 NC_USB3	USB_85D	USB3_D2R	NC_USB3_EXTC_D2RN	13 87
I20	USB_85D	USB3_R2D	NC_USB3_EXTC_R2D_CP	13 87
I20	USB_85D	USB3_R2D	NC_USB3_EXTC_R2D_CN	13 87
I20 NC_USB3	USB_85D	USB3_D2R	NC_USB3_EXTD_D2RP	13 87
I20 NC_USB3	USB_85D	USB3_D2R	NC_USB3_EXTD_D2RN	13 87
I20	USB_85D	USB3_R2D	NC_USB3_EXTD_R2D_CP	13 87
I20	USB_85D	USB3_R2D	NC_USB3_EXTD_R2D_CN	13 87

Clock Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
I250 SYSCLK_CLK32K_RTC	CLK_SLOW_45S	CLK_SLOW	SYSCLK_CLK32K_RTC	11 19
I255 SYSCLK_CLK25M_SB	CLK_25M_45S	CLK_25M	SYSCLK_CLK25M_SB	11 19
I255	CLK_25M_45S	CLK_25M	SYSCLK_CLK25M_SB_R	11
I255 SYSCLK_CLK25M_CAM	CLK_25M_45S	CLK_25M	SYSCLK_CLK25M_CAMERA	19 36
I253 SYSCLK_CLK25M_TBT	CLK_25M_45S	CLK_25M	SYSCLK_CLK25M_TBT	19 28
I255	CLK_25M_45S	CLK_25M	SYSCLK_CLK25M_TBT_R	28

SYNC_MASTER=SIDLE_J45 SYNC_DATE=12/10/2012

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LPC Bus Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
LPC_45S	*	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=STANDARD	=STANDARD
CLK_LPC_45S	*	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=STANDARD	=STANDARD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
LPC	*	6 MIL	?
CLK_LPC	*	8 MIL	?

SMBus Interface Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
SMB_45S	*	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=STANDARD	=STANDARD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
SMB	*	=2x_DIELECTRIC	?

HD Audio Interface Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
HDA_45S	*	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=STANDARD	=STANDARD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
HDA	*	=2x_DIELECTRIC	?

SPI Interface Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
SPI_45S	*	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=STANDARD	=STANDARD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
SPI	*	8 MIL	?
SPI3X	*	=3x_DIELECTRIC	?

PCH Single Net Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
PCH_45S	*	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=STANDARD	=STANDARD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
PCH_SE	*	=2x_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
PCH_SE	TOP,BOTTOM	=3x_DIELECTRIC	?

PCI-Express

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
PCIE_85D	*	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF
CLK_PCIE_85D	*	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
PCIE_2SAME	*	=2X_DIELECTRIC	?
PCIE_TXRX	*	=6X_DIELECTRIC	?
PCIE_2OTHER	*	=4X_DIELECTRIC	?
PCIE_2CLK	*	=7X_DIELECTRIC	?
PCIECLK_2OTHER	*	=7X_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
PCIE_2SAME	TOP,BOTTOM	=4X_DIELECTRIC	?
PCIE_TXRX	TOP,BOTTOM	=10X_DIELECTRIC	?
PCIE_2OTHER	TOP,BOTTOM	=6X_DIELECTRIC	?
PCIE_2CLK	TOP,BOTTOM	=10X_DIELECTRIC	?
PCIECLK_2OTHER	TOP,BOTTOM	=10X_DIELECTRIC	?

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
PCIE_*	=SAME	*	PCIE_2SAME
PCIE_R2D	PCIE_D2R	*	PCIE_TXRX
PCIE_*	*	*	PCIE_2OTHER
PCIE_*	CLK_*	*	PCIE_2CLK
CLK_PCIE	*	*	PCIECLK_2OTHER

PCH Net Properties

	ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	SPACING		
	LPC_AD	LPC_45S	LPC	LPC_AD<3..0>	13 40 82
	LPC_FRAME_L	LPC_45S	LPC	LPC_FRAME_L	13 40 82
	SMBUS_PCH_CLK	SMB_45S	SMB	SMBUS_PCH_CLK	13 18 43 81 85 86
	SMBUS_PCH_DATA	SMB_45S	SMB	SMBUS_PCH_DATA	13 18 43 81 85 86
	SMBUS_PCH_0_CLK	SMB_45S	SMB	SML_PCH_0_CLK	13 43
	SMBUS_PCH_0_DATA	SMB_45S	SMB	SML_PCH_0_DATA	13 43
	SMBUS_PCH_1_CLK	SMB_45S	SMB	SML_PCH_1_CLK	13 43
	SMBUS_PCH_1_DATA	SMB_45S	SMB	SML_PCH_1_DATA	13 43
	HDA_BIT_CLK	HDA_45S	HDA	HDA_BIT_CLK	11 52
		HDA_45S	HDA	HDA_BIT_CLK_R	11
	HDA_SYNC	HDA_45S	HDA	HDA_SYNC	11 52
		HDA_45S	HDA	HDA_SYNC_R	11
		HDA_45S	HDA	HDA_RST_R_L	11
	HDA_RST_L	HDA_45S	HDA	HDA_RST_L	11 52
	HDA_SDIN0	HDA_45S	HDA	HDA_SDIN0	11 52
	HDA_SDIN0_R	HDA_45S	HDA	CS4208_HDA_SDOUT0_R	52
	HDA_SDOUT	HDA_45S	HDA	HDA_SDOUT	11 52
		HDA_45S	HDA	HDA_SDOUT_R	11 19
	USB3_SD_R2D	USB3_85D	USB3_R2D	USB3_SD_R2D_C_P	13 20 81 86
	USB3_SD_R2D	USB3_85D	USB3_R2D	USB3_SD_R2D_C_N	13 20 81 86
	USB3_SD_D2R	USB3_85D	USB3_D2R	USB3_SD_D2R_P	13 20 81 86
	USB3_SD_D2R	USB3_85D	USB3_D2R	USB3_SD_D2R_N	13 20 81 86
	PCIE_AP_R2D	PCIE_85D	PCIE_R2D	PCIE_AP_R2D_P	33 86
	PCIE_AP_R2D	PCIE_85D	PCIE_R2D	PCIE_AP_R2D_N	33 86
		PCIE_85D	PCIE_R2D	PCIE_AP_R2D_C_P	13 33
1304		PCIE_85D	PCIE_R2D	PCIE_AP_R2D_C_N	13 33
		PCIE_85D	PCIE_R2D	PCIE_AP_R2D_PI_P	
1305		PCIE_85D	PCIE_R2D	PCIE_AP_R2D_PI_N	
	PCIE_AP_D2R	PCIE_85D	PCIE_D2R	PCIE_AP_D2R_P	13 20 33
	PCIE_AP_D2R	PCIE_85D	PCIE_D2R	PCIE_AP_D2R_N	13 20 33
1276		PCIE_85D	PCIE_D2R	PCIE_AP_D2R_PI_P	86
1276		PCIE_85D	PCIE_D2R	PCIE_AP_D2R_PI_N	86
1275	PCIE_CAMERA_R2D	PCIE_85D	PCIE_R2D	PCIE_CAMERA_R2D_P	35 36
1274	PCIE_CAMERA_R2D	PCIE_85D	PCIE_R2D	PCIE_CAMERA_R2D_N	35 36
1277		PCIE_85D	PCIE_R2D	PCIE_CAMERA_R2D_C_P	13 36
1278		PCIE_85D	PCIE_R2D	PCIE_CAMERA_R2D_C_N	13 36
1272	PCIE_CAMERA_D2R	PCIE_85D	PCIE_D2R	PCIE_CAMERA_D2R_P	13 20 36
1273	PCIE_CAMERA_D2R	PCIE_85D	PCIE_D2R	PCIE_CAMERA_D2R_N	13 20 36
1271		PCIE_85D	PCIE_D2R	PCIE_CAMERA_D2R_C_P	35 36
1270		PCIE_85D	PCIE_D2R	PCIE_CAMERA_D2R_C_N	35 36
		CLK_LPC_45S	CLK_LPC	LPC_CLK33M_SMC_R	11 19
	PCH_LPC_CLK0	CLK_LPC_45S	CLK_LPC	LPC_CLK33M_SMC	19 40
1269		CLK_LPC_45S	CLK_LPC	NC_LPC_CLK33M_LPCPLUS_R	11 87
1240	PCIE_CLK100M	CPU_45S	CLK_PCIE	PCH_CLK33M_PCIIN	11 19
1255	PCIE_CLK100M	CPU_45S	CLK_PCIE	PCH_CLK14P3M_REFCLK	11
1256	PCIE_CLK100M	CPU_45S	CLK_PCIE	PCH_CLK33M_PCIOUT	11 19
1253	PCIE_CLK100M_PCH	CLK_PCIE_85D	CLK_PCIE	PCIE_CLK100M_PCH_P	11
1254	PCIE_CLK100M_PCH	CLK_PCIE_85D	CLK_PCIE	PCIE_CLK100M_PCH_N	11
1292	PCIE_CLK100M_TBT	CLK_PCIE_85D	CLK_PCIE	PCIE_CLK100M_TBT_P	11 28
1293	PCIE_CLK100M_TBT	CLK_PCIE_85D	CLK_PCIE	PCIE_CLK100M_TBT_N	11 28
1291	PCIE_CLK100M_DOT	CLK_PCIE_85D	CLK_PCIE	PCH_CLK96M_DOT_P	11
1290	PCIE_CLK100M_DOT	CLK_PCIE_85D	CLK_PCIE	PCH_CLK96M_DOT_N	11
1262	PCIE_CLK100M_SATA	PCIE_85D	CLK_PCIE	PCH_CLK100M_SATA_P	11
1263	PCIE_CLK100M_SATA	PCIE_85D	CLK_PCIE	PCH_CLK100M_SATA_N	11
	PCIE_CLK100M_ENET	PCIE_85D	CLK_PCIE	PCIE_CLK100M_SD_P	
	PCIE_CLK100M_ENET	PCIE_85D	CLK_PCIE	PCIE_CLK100M_SD_N	
	PCIE_CLK100M_AP	PCIE_85D	CLK_PCIE	PCIE_CLK100M_AP_P	11 33
	PCIE_CLK100M_AP	PCIE_85D	CLK_PCIE	PCIE_CLK100M_AP_N	11 33
1265		PCIE_85D	CLK_PCIE	PCIE_CLK100M_AP_CONN_P	33 86
1266		PCIE_85D	CLK_PCIE	PCIE_CLK100M_AP_CONN_N	33 86
	PCIE_CLK100M_S2	CLK_PCIE_85D	CLK_PCIE	PCIE_CLK100M_CAMERA_P	11 36
	PCIE_CLK100M_S2	CLK_PCIE_85D	CLK_PCIE	PCIE_CLK100M_CAMERA_N	11 36
1334		CLK_PCIE_85D	CLK_PCIE	PCIE_CLK100M_CAMERA_C_P	35 36
1335		CLK_PCIE_85D	CLK_PCIE	PCIE_CLK100M_CAMERA_C_N	35 36
1261	PCIE_CLK100M_FW	CLK_PCIE_85D	CLK_PCIE	PCIE_CLK100M_SSD_P	11 34
1260		CLK_PCIE_85D	CLK_PCIE	PCIE_CLK100M_SSD_N	11 34
1337	PCIE_CLK100M_GPU	CLK_PCIE_85D	CLK_PCIE	PEG_CLK100M_P	11 70 85
1336		CLK_PCIE_85D	CLK_PCIE	PEG_CLK100M_N	11 70 85

PCH Net Properties

	ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	SPACING		
1315	PCH_PM_NET	PCH_45S	PCH_SE	PCH_INTRUDER_L	11
1314	PCH_PM_NET	PCH_45S	PCH_SE	PCH_INTVRMEN_L	11
1316	PCH_PM_NET	PCH_45S	PCH_SE	PCH_DSWVRMEN	12
1317	PCH_PM_NET	PCH_45S	PCH_SE	PCH_SRTCRST_L	11
1309	PCH_PM_NET	PCH_45S	PCH_SE	PM_RSMRST_L	12 67 86
1308	PCH_PM_NET	PCH_45S	PCH_SE	PM_SYSRST_L	12 19 40 86
1311	PCH_PM_NET	PCH_45S	PCH_SE	PM_PCH_PWROK	12 19 86 91
1312	PCH_PM_NET	PCH_45S	PCH_SE	PM_PCH_PWROK	12 19 86 91
1307	PCH_PM_NET	PCH_45S	PCH_SE	PM_DSW_PWRGD	12 40 86
1310	PCH_PM_NET	PCH_45S	PCH_SE	PM_PCH_SYS_PWROK	12 18 19 40 86
1313	PCH_PM_NET	PCH_45S	PCH_SE	PM_PWRBTN_L	12 18 40
1306	PCH_PM_NET	PCH_45S	PCH_SE	PM_THRMTRIP_L_R	14 41 42
1328	PCH_PCIE_WAKE	PCH_45S	PCH_SE	PCIE_WAKE_L	12 33 35 86
1329	PCH_PM_NET	PCH_45S	PCH_SE	PCH_RCIN_L	14
1336	SPI_MLB	SPI_45S	SPI3X	SPI_ALT_CLK	
1326	SPI_MLB	SPI_45S	SPI	SPI_CLK	50
1325	SPI_MLB	SPI_45S	SPI	SPI_CLK_R	13 50
1335	SPI_MLB	SPI_45S	SPI3X	SPI_MLB_CLK	50
1332	SPI_MLB	SPI_45S	SPI3X	SPI_SMC_CLK	40 50
1333	SPI_MLB	SPI_45S	SPI3X	SPI_ALT_CS_L	
1324	SPI_MLB	SPI_45S	SPI	SPI_CS0_L	50
1327	SPI_MLB	SPI_45S	SPI	SPI_CS0_R_L	13 50
1337	SPI_MLB	SPI_45S	SPI3X	SPI_MLB_CS_L	50
1331	SPI_MLB	SPI_45S	SPI3X	SPI_SMC_CS_L	40 50
1330	SPI_MLB	SPI_45S	SPI3X	SPI_ALT_IO1_MISO	
1338	SPI_MLB	SPI_45S	SPI	SPI_MISO	13 50
1340	SPI_MLB	SPI_45S	SPI	SPI_MISO_R	50
1317	SPI_MLB	SPI_45S	SPI3X	SPI_MLB_IO1_MISO	50
1318	SPI_MLB	SPI_45S	SPI3X	SPI_SMC_MISO	40 50
1339	SPI_MLB	SPI_45S	SPI3X	SPI_ALT_IO0_MOSI	
1323	SPI_MLB	SPI_45S	SPI	SPI_MOSI	50
1322	SPI_MLB	SPI_45S	SPI	SPI_MOSI_R	13 50
1321	SPI_MLB	SPI_45S	SPI3X	SPI_MLB_IO0_MOSI	50
1320	SPI_MLB	SPI_45S	SPI3X	SPI_SMC_MOSI	40 50
1319	SPI_MLB_IO2	SPI_45S	SPI3X	SPI_IO<2>	13 50
1342	SPI_MLB_IO2	SPI_45S	SPI3X	SPI_MLB_IO2_WP_L	50
1341	SPI_MLB_IO2	SPI_45S	SPI3X	SPI_ALT_IO2_WP_L	
1343	SPI_MLB_IO3	SPI_45S	SPI3X	SPI_IO<3>	13 50
1344	SPI_MLB_IO3	SPI_45S	SPI3X	SPI_MLB_IO3_HOLD_L	50
1345	SPI_MLB_IO3	SPI_45S	SPI3X	SPI_ALT_IO3_HOLD_L	
1346	SPI_TPAD	SPI_45S	SPI	TPAD_SPI_SCLK	38 85
1347	SPI_TPAD_CS	SPI_45S	SPI	TPAD_SPI_CS_L	38 85
1348	SPI_TPAD	SPI_45S	SPI	TPAD_SPI_MISO	38 85
1349	SPI_TPAD	SPI_45S	SPI	TPAD_SPI_MOSI	38 85

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Memory Bus Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
MEM_37S	*	=37_OHM_SE	=37_OHM_SE	=37_OHM_SE	=37_OHM_SE	=STANDARD	=STANDARD
MEM_40S	*	=40_OHM_SE	=40_OHM_SE	=40_OHM_SE	=40_OHM_SE	=STANDARD	=STANDARD
MEM_72D	*	=72_OHM_DIFF	=72_OHM_DIFF	=72_OHM_DIFF	=72_OHM_DIFF	=72_OHM_DIFF	=72_OHM_DIFF
MEM_45S	*	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=STANDARD	=STANDARD
MEM_85D	*	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF

Spacing Rule Sets

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
MEM_DATA2SELF	*	=2x_DIELECTRIC	?
MEM_DQS2OWNDATA	*	=2x_DIELECTRIC	?
MEM_CMD2CMD	*	=2x_DIELECTRIC	?
MEM_CMD2CTRL	*	=2x_DIELECTRIC	?
MEM_CTRL2CTRL	*	=2x_DIELECTRIC	?
MEM_CLK2CLK	*	=4x_DIELECTRIC	?
MEM_2OTHERMEM	*	=4x_DIELECTRIC	?
MEM_2PWR	*	=2x_DIELECTRIC	?
MEM_2GND	*	=2x_DIELECTRIC	?
MEM_2OTHER	*	=6x_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
MEM_DATA2SELF	TOP,BOTTOM	=5x_DIELECTRIC	?
MEM_DQS2OWNDATA	TOP,BOTTOM	=5x_DIELECTRIC	?
MEM_CMD2CMD	TOP,BOTTOM	=5x_DIELECTRIC	?
MEM_CMD2CTRL	TOP,BOTTOM	=5x_DIELECTRIC	?
MEM_CTRL2CTRL	TOP,BOTTOM	=5x_DIELECTRIC	?
MEM_CLK2CLK	TOP,BOTTOM	=8x_DIELECTRIC	?
MEM_2OTHERMEM	TOP,BOTTOM	=8x_DIELECTRIC	?
MEM_2PWR	TOP,BOTTOM	=4x_DIELECTRIC	?
MEM_2GND	TOP,BOTTOM	=4x_DIELECTRIC	?
MEM_2OTHER	TOP,BOTTOM	=10x_DIELECTRIC	?

Memory Bus Spacing Group Assignments

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
MEM_*_DATA_*	*	*	MEM_2OTHER
MEM_*_DQS_*	*	*	MEM_2OTHER
MEM_CMD	*	*	MEM_2OTHER
MEM_CTRL	*	*	MEM_2OTHER
MEM_CLK	*	*	MEM_2OTHER

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
MEM_*_DATA_*	=SAME	*	MEM_DATA2SELF

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
MEM_CMD	MEM_CMD	*	MEM_CMD2CMD
MEM_CMD	MEM_CTRL	*	MEM_CMD2CTRL
MEM_CTRL	MEM_CTRL	*	MEM_CTRL2CTRL
MEM_CLK	MEM_CLK	*	MEM_CLK2CLK
MEM_*	MEM_*	*	MEM_2OTHERMEM

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
MEM_A_DQS_0	MEM_A_DATA_0	*	MEM_DQS2OWNDATA
MEM_A_DQS_1	MEM_A_DATA_1	*	MEM_DQS2OWNDATA
MEM_A_DQS_2	MEM_A_DATA_2	*	MEM_DQS2OWNDATA
MEM_A_DQS_3	MEM_A_DATA_3	*	MEM_DQS2OWNDATA
MEM_A_DQS_4	MEM_A_DATA_4	*	MEM_DQS2OWNDATA
MEM_A_DQS_5	MEM_A_DATA_5	*	MEM_DQS2OWNDATA
MEM_A_DQS_6	MEM_A_DATA_6	*	MEM_DQS2OWNDATA
MEM_A_DQS_7	MEM_A_DATA_7	*	MEM_DQS2OWNDATA
MEM_B_DQS_0	MEM_B_DATA_0	*	MEM_DQS2OWNDATA
MEM_B_DQS_1	MEM_B_DATA_1	*	MEM_DQS2OWNDATA
MEM_B_DQS_2	MEM_B_DATA_2	*	MEM_DQS2OWNDATA
MEM_B_DQS_3	MEM_B_DATA_3	*	MEM_DQS2OWNDATA
MEM_B_DQS_4	MEM_B_DATA_4	*	MEM_DQS2OWNDATA
MEM_B_DQS_5	MEM_B_DATA_5	*	MEM_DQS2OWNDATA
MEM_B_DQS_6	MEM_B_DATA_6	*	MEM_DQS2OWNDATA
MEM_B_DQS_7	MEM_B_DATA_7	*	MEM_DQS2OWNDATA

DDR3 (Memory Down):

DQ signals should be matched within 0.508mm of associated DQS pair
DQS intra-pair matching should be within 0.127mm, no inter-pair matching requirement.
DQS to clock matching should be within [CLK-139.73mm] and [CLK-30.48mm].
CLK intra-pair matching should be within 0.127mm, inter-pair matching should be within 0.508mm.
CONTROL signals should be matched within [CLK-2.54mm] to [CLK+0mm] of CLK pairs.
A/BA/CMD signals should be matched within [CLK-2.54mm] to [CLK+2.54mm] of CLK pairs.
DQ/DQS/A/BA/cmd signal spacing is 4x dielectric, CLK is 5x dielectric.
Maximum length of any signal from die pad to first DRAM device is 139.7mm max, to last DRAM device is 194.31mm max.

SOURCE: Double checked with Doc#486985 Chief River SFF Platform DG: Memory Down
SOURCE: Need to re-confirm CRW DG for memory down (Intel not yet provided)

Memory to Power Spacing

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
MEM_PWR	MEM_*	*	MEM_2PWR
MEM_PWR	*	*	DEFAULT

Memory to GND Spacing

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
GND	MEM_*	*	MEM_2GND

Memory Net Properties

NET_TYPE	PHYSICAL	SPACING	
ELECTRICAL_CONSTRAINT_SET			
MEM_A_CLK0	MEM_72D	MEM_CLK	MEM_A_CLK_P<0> 7 23 27
MEM_A_CLK0	MEM_72D	MEM_CLK	MEM_A_CLK_N<0> 7 23 27
MEM_A_CLK1	MEM_72D	MEM_CLK	MEM_A_CLK_P<1> 7 24 27
MEM_A_CLK1	MEM_72D	MEM_CLK	MEM_A_CLK_N<1> 7 24 27
MEM_A_CNTL0	MEM_40S	MEM_CTRL	MEM_A_CKE<0> 7 23 27
MEM_A_CNTL1	MEM_40S	MEM_CTRL	MEM_A_CKE<1> 7 24 27
MEM_A_CNTL0	MEM_40S	MEM_CTRL	MEM_A_CS_L<0> 7 23 27
MEM_A_CNTL1	MEM_40S	MEM_CTRL	MEM_A_CS_L<1> 7 24 27
MEM_A_CNTL0	MEM_40S	MEM_CTRL	MEM_A_ODT<0> 7 23 27
MEM_A_CNTL1	MEM_40S	MEM_CTRL	MEM_A_ODT<1> 7 24 27
MEM_A_CMD	MEM_40S	MEM_CMD	MEM_A_A<15..0> 7 23 24 27
MEM_A_CMD	MEM_40S	MEM_CMD	MEM_A_BA<2..0> 7 23 24 27
MEM_A_CMD	MEM_40S	MEM_CMD	MEM_A_RAS_L 7 23 24 27
MEM_A_CMD	MEM_40S	MEM_CMD	MEM_A_CAS_L 7 23 24 27
MEM_A_CMD	MEM_40S	MEM_CMD	MEM_A_WE_L 7 23 24 27
MEM_A_DATA_0	MEM_45S	MEM_A_DATA_0	MEM_A_DQ<7..0> 7 23 24
MEM_A_DATA_1	MEM_45S	MEM_A_DATA_1	MEM_A_DQ<15..8> 7 23 24
MEM_A_DATA_2	MEM_45S	MEM_A_DATA_2	MEM_A_DQ<23..16> 7 23 24
MEM_A_DATA_3	MEM_45S	MEM_A_DATA_3	MEM_A_DQ<31..24> 7 23 24
MEM_A_DATA_4	MEM_45S	MEM_A_DATA_4	MEM_A_DQ<39..32> 7 23 24
MEM_A_DATA_5	MEM_45S	MEM_A_DATA_5	MEM_A_DQ<47..40> 7 23 24
MEM_A_DATA_6	MEM_45S	MEM_A_DATA_6	MEM_A_DQ<55..48> 7 23 24
MEM_A_DATA_7	MEM_45S	MEM_A_DATA_7	MEM_A_DQ<63..56> 7 23 24
MEM_A_DQS0	MEM_85D	MEM_A_DQS_0	MEM_A_DQS_P<0> 7 23 24
MEM_A_DQS0	MEM_85D	MEM_A_DQS_0	MEM_A_DQS_N<0> 7 23 24
MEM_A_DQS1	MEM_85D	MEM_A_DQS_1	MEM_A_DQS_P<1> 7 23 24
MEM_A_DQS1	MEM_85D	MEM_A_DQS_1	MEM_A_DQS_N<1> 7 23 24
MEM_A_DQS2	MEM_85D	MEM_A_DQS_2	MEM_A_DQS_P<2> 7 23 24
MEM_A_DQS2	MEM_85D	MEM_A_DQS_2	MEM_A_DQS_N<2> 7 23 24
MEM_A_DQS3	MEM_85D	MEM_A_DQS_3	MEM_A_DQS_P<3> 7 23 24
MEM_A_DQS3	MEM_85D	MEM_A_DQS_3	MEM_A_DQS_N<3> 7 23 24
MEM_A_DQS4	MEM_85D	MEM_A_DQS_4	MEM_A_DQS_P<4> 7 23 24
MEM_A_DQS4	MEM_85D	MEM_A_DQS_4	MEM_A_DQS_N<4> 7 23 24
MEM_A_DQS5	MEM_85D	MEM_A_DQS_5	MEM_A_DQS_P<5> 7 23 24
MEM_A_DQS5	MEM_85D	MEM_A_DQS_5	MEM_A_DQS_N<5> 7 23 24
MEM_A_DQS6	MEM_85D	MEM_A_DQS_6	MEM_A_DQS_P<6> 7 23 24
MEM_A_DQS6	MEM_85D	MEM_A_DQS_6	MEM_A_DQS_N<6> 7 23 24
MEM_A_DQS7	MEM_85D	MEM_A_DQS_7	MEM_A_DQS_P<7> 7 23 24
MEM_A_DQS7	MEM_85D	MEM_A_DQS_7	MEM_A_DQS_N<7> 7 23 24
MEM_B_CLK0	MEM_72D	MEM_CLK	MEM_B_CLK_P<0> 7 25 27
MEM_B_CLK0	MEM_72D	MEM_CLK	MEM_B_CLK_N<0> 7 25 27
MEM_B_CLK1	MEM_72D	MEM_CLK	MEM_B_CLK_P<1> 7 26 27
MEM_B_CLK1	MEM_72D	MEM_CLK	MEM_B_CLK_N<1> 7 26 27
MEM_B_CNTL0	MEM_40S	MEM_CTRL	MEM_B_CKE<0> 7 25 27
MEM_B_CNTL1	MEM_40S	MEM_CTRL	MEM_B_CKE<1> 7 26 27
MEM_B_CNTL0	MEM_40S	MEM_CTRL	MEM_B_CS_L<0> 7 25 27
MEM_B_CNTL1	MEM_40S	MEM_CTRL	MEM_B_CS_L<1> 7 26 27
MEM_B_CNTL0	MEM_40S	MEM_CTRL	MEM_B_ODT<0> 7 25 27
MEM_B_CNTL1	MEM_40S	MEM_CTRL	MEM_B_ODT<1> 7 26 27
MEM_B_CMD	MEM_40S	MEM_CMD	MEM_B_A<15..0> 7 25 26 27
MEM_B_CMD	MEM_40S	MEM_CMD	MEM_B_BA<2..0> 7 25 26 27
MEM_B_CMD	MEM_40S	MEM_CMD	MEM_B_RAS_L 7 25 26 27
MEM_B_CMD	MEM_40S	MEM_CMD	MEM_B_CAS_L 7 25 26 27
MEM_B_CMD	MEM_40S	MEM_CMD	MEM_B_WE_L 7 25 26 27
MEM_B_DATA_0	MEM_45S	MEM_B_DATA_0	MEM_B_DQ<7..0> 7 25 26
MEM_B_DATA_1	MEM_45S	MEM_B_DATA_1	MEM_B_DQ<15..8> 7 25 26
MEM_B_DATA_2	MEM_45S	MEM_B_DATA_2	MEM_B_DQ<23..16> 7 25 26
MEM_B_DATA_3	MEM_45S	MEM_B_DATA_3	MEM_B_DQ<31..24> 7 25 26
MEM_B_DATA_4	MEM_45S	MEM_B_DATA_4	MEM_B_DQ<39..32> 7 25 26
MEM_B_DATA_5	MEM_45S	MEM_B_DATA_5	MEM_B_DQ<47..40> 7 25 26
MEM_B_DATA_6	MEM_45S	MEM_B_DATA_6	MEM_B_DQ<55..48> 7 25 26
MEM_B_DATA_7	MEM_45S	MEM_B_DATA_7	MEM_B_DQ<63..56> 7 25 26
MEM_B_DQS0	MEM_85D	MEM_B_DQS_0	MEM_B_DQS_P<0> 7 25 26
MEM_B_DQS0	MEM_85D	MEM_B_DQS_0	MEM_B_DQS_N<0> 7 25 26
MEM_B_DQS1	MEM_85D	MEM_B_DQS_1	MEM_B_DQS_P<1> 7 25 26
MEM_B_DQS1	MEM_85D	MEM_B_DQS_1	MEM_B_DQS_N<1> 7 25 26
MEM_B_DQS2	MEM_85D	MEM_B_DQS_2	MEM_B_DQS_P<2> 7 25 26
MEM_B_DQS2	MEM_85D	MEM_B_DQS_2	MEM_B_DQS_N<2> 7 25 26
MEM_B_DQS3	MEM_85D	MEM_B_DQS_3	MEM_B_DQS_P<3> 7 25 26
MEM_B_DQS3	MEM_85D	MEM_B_DQS_3	MEM_B_DQS_N<3> 7 25 26
MEM_B_DQS4	MEM_85D	MEM_B_DQS_4	MEM_B_DQS_P<4> 7 25 26
MEM_B_DQS4	MEM_85D	MEM_B_DQS_4	MEM_B_DQS_N<4> 7 25 26
MEM_B_DQS5	MEM_85D	MEM_B_DQS_5	MEM_B_DQS_P<5> 7 25 26
MEM_B_DQS5	MEM_85D	MEM_B_DQS_5	MEM_B_DQS_N<5> 7 25 26
MEM_B_DQS6	MEM_85D	MEM_B_DQS_6	MEM_B_DQS_P<6> 7 25 26
MEM_B_DQS6	MEM_85D	MEM_B_DQS_6	MEM_B_DQS_N<6> 7 25 26
MEM_B_DQS7	MEM_85D	MEM_B_DQS_7	MEM_B_DQS_P<7> 7 25 26
MEM_B_DQS7	MEM_85D	MEM_B_DQS_7	MEM_B_DQS_N<7> 7 25 26
		MEM_PWR	PP0V75_S3_MEM_VREFDQ_A 22 23 24 85 89
		MEM_PWR	PP0V75_S3_MEM_VREFCA 22 23 24 25 26 85 89
		MEM_PWR	PP1V35_S3_MEM 22 23 24 25 26 27 45 84

SYNC_MASTER=SIDLE_J45 SYNC_DATE=12/10/2012

PAGE TITLE: Memory Constraints

Apple Inc.

DRAWING NUMBER: <SCH_NUM> SIZE: D

REVISION: <E4LABEL>

BRANCH: <BRANCH>

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DisplayPort Signal Constraints

NOTE: DisplayPort Physical/Spacing Constraints provided by Chipset or GPU page.

Thunderbolt SPI Signal Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
TBT_SPI_45S	*	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=STANDARD	=STANDARD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
TBT_SPI	*	=2x_DIELECTRIC	?

Thunderbolt/DP Connector Signal Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
TBTDP_85D	*	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF

SOURCE: Bill Cornelius's Thunderbolt Routing Notes

TBT_DP Interface Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
TBTDP_85D	*	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
TBTDP_2SAME	*	=3X_DIELECTRIC	?
TBTDP_TXRX	*	=6X_DIELECTRIC	?
TBTDP_2OTHER	*	=4X_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
TBTDP_2SAME	TOP,BOTTOM	=4x_DIELECTRIC	?
TBTDP_TXRX	TOP,BOTTOM	=10X_DIELECTRIC	?
TBTDP_2OTHER	TOP,BOTTOM	=6X_DIELECTRIC	?

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
TBTDP_*	=SAME	*	TBTDP_2SAME
TBTDP_R2D	TBTDP_D2R	*	TBTDP_TXRX
TBTDP_*	*	*	TBTDP_2OTHER

Thunderbolt/DP Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE: PHYSICAL	NET_TYPE: SPACING		
TBT_A_R2D	TBTDP_85D	TBTDP_R2D	TBT_A_R2D_C_P<1..0>	28 31
TBT_A_R2D	TBTDP_85D	TBTDP_R2D	TBT_A_R2D_C_N<1..0>	28 31
TBT_A_R2D	TBTDP_85D	TBTDP_R2D	TBT_A_R2D_P<1..0>	31
TBT_A_R2D	TBTDP_85D	TBTDP_R2D	TBT_A_R2D_N<1..0>	31
DP_A_LSX_ML	DP_85D	DISPLAYPORT	DP_TBTPA_ML_C_P<1>	28 31
DP_A_LSX_ML	DP_85D	DISPLAYPORT	DP_TBTPA_ML_C_N<1>	28 31
DP_A_LSX_ML	DP_85D	DISPLAYPORT	DP_TBTPA_ML_P<1>	31
DP_A_LSX_ML	DP_85D	DISPLAYPORT	DP_TBTPA_ML_N<1>	31
DP_A_LSX_ML	DP_85D	DISPLAYPORT	DP_A_LSX_ML_P<1>	31
DP_A_LSX_ML	DP_85D	DISPLAYPORT	DP_A_LSX_ML_N<1>	31
DP_TBTPA_ML	DP_85D	DISPLAYPORT	DP_TBTPA_ML_C_P<3>	28 31
DP_TBTPA_ML	DP_85D	DISPLAYPORT	DP_TBTPA_ML_C_N<3>	28 31
DP_TBTPA_ML	DP_85D	DISPLAYPORT	DP_TBTPA_ML_P<3>	31
DP_TBTPA_ML	DP_85D	DISPLAYPORT	DP_TBTPA_ML_N<3>	31
TBT_A_D2R0	TBTDP_85D	TBTDP_D2R	TBT_A_D2R_C_P<0>	31
TBT_A_D2R0	TBTDP_85D	TBTDP_D2R	TBT_A_D2R_C_N<0>	31
TBT_A_D2R0	TBTDP_85D	TBTDP_D2R	TBT_A_D2R_P<0>	28 31
TBT_A_D2R0	TBTDP_85D	TBTDP_D2R	TBT_A_D2R_N<0>	28 31
TBT_A_D2R1	TBTDP_85D	TBTDP_D2R	TBT_A_D2R_C_P<1>	31
TBT_A_D2R1	TBTDP_85D	TBTDP_D2R	TBT_A_D2R_C_N<1>	31
TBT_A_D2R1	TBTDP_85D	TBTDP_D2R	TBT_A_D2R_P<1>	28 31 87
TBT_A_D2R1	TBTDP_85D	TBTDP_D2R	TBT_A_D2R_N<1>	28 31 87
TBT_A_D2R1	TBTDP_85D	TBTDP_D2R	TBT_A_D2R1_AUXDDC_P	31
TBT_A_D2R1	TBTDP_85D	TBTDP_D2R	TBT_A_D2R1_AUXDDC_N	31
TBT_A_AUXCH	DP_85D		DP_TBTPA_AUXCH_C_P	28 31
TBT_A_AUXCH	DP_85D		DP_TBTPA_AUXCH_C_N	28 31
TBT_A_AUXCH	DP_85D		DP_TBTPA_AUXCH_P	31
TBT_A_AUXCH	DP_85D		DP_TBTPA_AUXCH_N	31
TBT_B_R2D	TBTDP_85D	TBTDP_R2D	TBT_B_R2D_C_P<1..0>	28 32
TBT_B_R2D	TBTDP_85D	TBTDP_R2D	TBT_B_R2D_C_N<1..0>	28 32
TBT_B_R2D	TBTDP_85D	TBTDP_R2D	TBT_B_R2D_P<1..0>	32
TBT_B_R2D	TBTDP_85D	TBTDP_R2D	TBT_B_R2D_N<1..0>	32
DP_B_LSX_ML	DP_85D	DISPLAYPORT	DP_TBTPB_ML_C_P<1>	28 32
DP_B_LSX_ML	DP_85D	DISPLAYPORT	DP_TBTPB_ML_C_N<1>	28 32
DP_B_LSX_ML	DP_85D	DISPLAYPORT	DP_TBTPB_ML_P<1>	32
DP_B_LSX_ML	DP_85D	DISPLAYPORT	DP_TBTPB_ML_N<1>	32
DP_B_LSX_ML	DP_85D	DISPLAYPORT	DP_B_LSX_ML_P<1>	32
DP_B_LSX_ML	DP_85D	DISPLAYPORT	DP_B_LSX_ML_N<1>	32
DP_TBTPB_ML	DP_85D	DISPLAYPORT	DP_TBTPB_ML_C_P<3>	28 32
DP_TBTPB_ML	DP_85D	DISPLAYPORT	DP_TBTPB_ML_C_N<3>	28 32
DP_TBTPB_ML	DP_85D	DISPLAYPORT	DP_TBTPB_ML_P<3>	32
DP_TBTPB_ML	DP_85D	DISPLAYPORT	DP_TBTPB_ML_N<3>	32
TBT_B_D2R0	TBTDP_85D	TBTDP_D2R	TBT_B_D2R_C_P<0>	32
TBT_B_D2R0	TBTDP_85D	TBTDP_D2R	TBT_B_D2R_C_N<0>	32
TBT_B_D2R0	TBTDP_85D	TBTDP_D2R	TBT_B_D2R_P<0>	28 32
TBT_B_D2R0	TBTDP_85D	TBTDP_D2R	TBT_B_D2R_N<0>	28 32
TBT_B_D2R1	TBTDP_85D	TBTDP_D2R	TBT_B_D2R_C_P<1>	32
TBT_B_D2R1	TBTDP_85D	TBTDP_D2R	TBT_B_D2R_C_N<1>	32
TBT_B_D2R1	TBTDP_85D	TBTDP_D2R	TBT_B_D2R_P<1>	28 32
TBT_B_D2R1	TBTDP_85D	TBTDP_D2R	TBT_B_D2R_N<1>	28 32
TBT_B_D2R1	TBTDP_85D	TBTDP_D2R	TBT_B_D2R1_AUXDDC_P	32
TBT_B_D2R1	TBTDP_85D	TBTDP_D2R	TBT_B_D2R1_AUXDDC_N	32
TBT_B_AUXCH	DP_85D		DP_TBTPB_AUXCH_C_P	28 32
TBT_B_AUXCH	DP_85D		DP_TBTPB_AUXCH_C_N	28 32
TBT_B_AUXCH	DP_85D		DP_TBTPB_AUXCH_P	32
TBT_B_AUXCH	DP_85D		DP_TBTPB_AUXCH_N	32

Only used on dual-port hosts.

Thunderbolt IC Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE: PHYSICAL	NET_TYPE: SPACING		
	DP_85D	DISPLAYPORT	DP_TBTSRC_ML_C_P<3..0>	
	DP_85D	DISPLAYPORT	DP_TBTSRC_ML_C_N<3..0>	
	DP_85D	DISPLAYPORT	DP_TBTSRC_AUXCH_C_P	
	DP_85D	DISPLAYPORT	DP_TBTSRC_AUXCH_C_N	
TBT_SPI_CLK	TBT_SPI_45S	TBT_SPI	TBT_SPI_CLK	28
TBT_SPI_MOSI	TBT_SPI_45S	TBT_SPI	TBT_SPI_MOSI	28
TBT_SPI_MISO	TBT_SPI_45S	TBT_SPI	TBT_SPI_MISO	28
TBT_SPI_CS_L	TBT_SPI_45S	TBT_SPI	TBT_SPI_CS_L	28

Only used on hosts supporting Thunderbolt video-in

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MIPI Interface Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
MIPI_85D	*	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
MIPI_2OTHER	*	=4X_DIELECTRIC	?
MIPI_2CLK	*	=6X_DIELECTRIC	?
MIPICLK_2OTHER	*	=7X_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
MIPI_2OTHER	TOP,BOTTOM	=6X_DIELECTRIC	?
MIPI_2CLK	TOP,BOTTOM	=8X_DIELECTRIC	?
MIPICLK_2OTHER	TOP,BOTTOM	=10X_DIELECTRIC	?

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
MIPI_DATA	*	*	MIPI_2OTHER
MIPI_DATA	CLK_MIPI	*	MIPI_2CLK
CLK_MIPI	*	*	MIPICLK_2OTHER

Memory Bus Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
S2_MEM_45S	*	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=STANDARD	=STANDARD
S2_MEM_85D	*	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF

Spacing Rule Sets

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
S2_DATA2SELF	*	=2x_DIELECTRIC	?
S2_DQS2OWNDATA	*	=2x_DIELECTRIC	?
S2_CMD2CMD	*	=2x_DIELECTRIC	?
S2_CMD2CTRL	*	=2x_DIELECTRIC	?
S2_CTRL2CTRL	*	=2x_DIELECTRIC	?
S2_2OTHERMEM	*	=4x_DIELECTRIC	?
S2MEM_2PWR	*	=2x_DIELECTRIC	?
S2MEM_2GND	*	=2x_DIELECTRIC	?
S2MEM_2OTHER	*	=6x_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
S2_DATA2SELF	TOP,BOTTOM	=4x_DIELECTRIC	?
S2_DQS2OWNDATA	TOP,BOTTOM	=4x_DIELECTRIC	?
S2_CMD2CMD	TOP,BOTTOM	=4x_DIELECTRIC	?
S2_CMD2CTRL	TOP,BOTTOM	=4x_DIELECTRIC	?
S2_CTRL2CTRL	TOP,BOTTOM	=4x_DIELECTRIC	?
S2_2OTHERMEM	TOP,BOTTOM	=6x_DIELECTRIC	?
S2MEM_2PWR	TOP,BOTTOM	=4x_DIELECTRIC	?
S2MEM_2GND	TOP,BOTTOM	=4x_DIELECTRIC	?
S2MEM_2OTHER	TOP,BOTTOM	=10x_DIELECTRIC	?

Memory Bus Spacing Group Assignments

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
S2_MEM_DATA*	*	*	S2MEM_2OTHER
S2_MEM_DQS*	*	*	S2MEM_2OTHER
S2_MEM_CMD	*	*	S2MEM_2OTHER
S2_MEM_CTRL	*	*	S2MEM_2OTHER
S2_MEM_CLK	*	*	S2MEM_2OTHER
S2_MEM_DATA*	=SAME	*	S2_DATA2SELF
S2_MEM_CMD	S2_MEM_CMD	*	S2_CMD2CMD
S2_MEM_CMD	S2_MEM_CTRL	*	S2_CMD2CTRL
S2_MEM_CTRL	S2_MEM_CTRL	*	S2_CTRL2CTRL
S2_MEM_*	S2_MEM_*	*	S2_2OTHERMEM

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
S2_MEM_DQS1	S2_MEM_DATA1	*	S2_DQS2OWNDATA
S2_MEM_DQS0	S2_MEM_DATA0	*	S2_DQS2OWNDATA

Memory to Power Spacing

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
S2_MEM_PWR	S2_MEM_*	*	S2MEM_2PWR
S2_MEM_PWR	*	*	DEFAULT

Memory to GND Spacing

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
GND	S2_MEM_*	*	S2MEM_2GND

Camera Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING	
S2_MEM_CLK	S2_MEM_85D	S2_MEM_CLK	MEM_CAM_CLK_P 35 36
S2_MEM_CLK	S2_MEM_85D	S2_MEM_CLK	MEM_CAM_CLK_N 35 36
S2_MEM_CNTL	S2_MEM_45S	S2_MEM_CTRL	MEM_CAM_CKE 35 36
S2_MEM_CNTL	S2_MEM_45S	S2_MEM_CTRL	MEM_CAM_CS_L 35 36
	S2_MEM_45S	S2_MEM_CTRL	MEM_CAM_ODT 36
S2_MEM_CMD	S2_MEM_45S	S2_MEM_CTRL	MEM_CAM_CAS_L 35 36
S2_MEM_CMD	S2_MEM_45S	S2_MEM_CTRL	MEM_CAM_RAS_L 35 36
S2_MEM_CMD	S2_MEM_45S	S2_MEM_CMD	MEM_CAM_WE_L 35 36
S2_MEM_CMD	S2_MEM_45S	S2_MEM_CMD	MEM_CAM_BA<0> 35 36
S2_MEM_CMD	S2_MEM_45S	S2_MEM_CMD	MEM_CAM_BA<1> 35 36
S2_MEM_CMD	S2_MEM_45S	S2_MEM_CMD	MEM_CAM_BA<2> 35 36
S2_MEM_DQS0	S2_MEM_85D	S2_MEM_DQS0	MEM_CAM_DQS_P<0> 35 36
S2_MEM_DQS0	S2_MEM_85D	S2_MEM_DQS0	MEM_CAM_DQS_N<0> 35 36
S2_MEM_DQS1	S2_MEM_85D	S2_MEM_DQS1	MEM_CAM_DQS_P<1> 35 36
S2_MEM_DQS1	S2_MEM_85D	S2_MEM_DQS1	MEM_CAM_DQS_N<1> 35 36
S2_MEM_DATA_0	S2_MEM_45S	S2_MEM_DATA0	MEM_CAM_DM<0> 35 36
S2_MEM_DATA_1	S2_MEM_45S	S2_MEM_DATA1	MEM_CAM_DM<1> 35 36
S2_MEM_A	S2_MEM_45S	S2_MEM_CMD	MEM_CAM_A<14..0> 35 36
S2_MEM_DATA_0	S2_MEM_45S	S2_MEM_DATA0	MEM_CAM_DQ<7..0> 35 36
S2_MEM_DATA_1	S2_MEM_45S	S2_MEM_DATA1	MEM_CAM_DQ<15..8> 35 36
MIPI_DATA_S2	MIPI_85D	MIPI_DATA	MIPI_DATA_P 35 36
MIPI_DATA_S2	MIPI_85D	MIPI_DATA	MIPI_DATA_N 35 36
	MIPI_85D	MIPI_DATA	MIPI_DATA_CONN_P 36 86
	MIPI_85D	MIPI_DATA	MIPI_DATA_CONN_N 36 86
MIPI_CLK_S2	MIPI_85D	CLK_MIPI	MIPI_CLK_P 35 36
MIPI_CLK_S2	MIPI_85D	CLK_MIPI	MIPI_CLK_N 35 36
	MIPI_85D	CLK_MIPI	MIPI_CLK_CONN_P 36 86
	MIPI_85D	CLK_MIPI	MIPI_CLK_CONN_N 36 86
		S2_MEM_PWR	PP1V35_CAM 35 36
		S2_MEM_PWR	PP0V675_CAM_VREF 35 36
		S2_MEM_PWR	PP0V675_MEM_CAM_VREFCA 36
		S2_MEM_PWR	PP0V675_MEM_CAM_VREFDQ 36

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SMC SMBus Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	SPACING		
SMBUS_SMC_2_S3_SCL	SMB_45S	SMB	SMBUS_SMC_2_S3_SCL	38 40 43 86
SMBUS_SMC_2_S3_SDA	SMB_45S	SMB	SMBUS_SMC_2_S3_SDA	38 40 43 86
SMBUS_SMC_1_S0_SCL	SMB_45S	SMB	SMBUS_SMC_1_S0_SCL	40 43 48
SMBUS_SMC_1_S0_SDA	SMB_45S	SMB	SMBUS_SMC_1_S0_SDA	40 43 48
SMBUS_SMC_0_S0_SCL	SMB_45S	SMB	SMBUS_SMC_0_S0_SCL	36 40 43 48 69 76 85 86
SMBUS_SMC_0_S0_SDA	SMB_45S	SMB	SMBUS_SMC_0_S0_SDA	36 40 43 48 69 76 85 86
SMBUS_SMC_5_SCL	SMB_45S	SMB	SMBUS_SMC_5_g3_SCL	40 43 56 57 86
SMBUS_SMC_5_SDA	SMB_45S	SMB	SMBUS_SMC_5_G3_SDA	40 43 56 57 86
SMBUS_SMC_3_SCL	SMB_45S	SMB	NC_SMBUS_SMC_3_SCL	40 42
SMBUS_SMC_3_SDA	SMB_45S	SMB	NC_SMBUS_SMC_3_SDA	40 42

SMBus Charger Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	SPACING		
	1TO1_DIFFPAIR		CHGR_CSI_P	57
	1TO1_DIFFPAIR		CHGR_CSI_N	57
	1TO1_DIFFPAIR		CHGR_CSO_P	57
	1TO1_DIFFPAIR		CHGR_CSO_N	57

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PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
SENSE_1TO1_50S	*	=1:1_DIFFPAIR	=50_OHM_SE	=50_OHM_SE	=50_OHM_SE	=1:1_DIFFPAIR	=1:1_DIFFPAIR
THERM_1TO1_50S	*	=1:1_DIFFPAIR	=50_OHM_SE	=50_OHM_SE	=50_OHM_SE	=1:1_DIFFPAIR	=1:1_DIFFPAIR
DIFFPAIR	*	=1:1_DIFFPAIR			=1:1_DIFFPAIR	=1:1_DIFFPAIR	=1:1_DIFFPAIR
AUDIODIFF	*	=1:1_DIFFPAIR	0.1 MM	0.1 MM	10 MM	0.1 MM	0.1 MM
THERM_45S_CPUVRISNS1	*	=1:1_DIFFPAIR	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	0.2 MM	0.2 MM
THERM_1TO1_45S	*	=1:1_DIFFPAIR	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=1:1_DIFFPAIR	=1:1_DIFFPAIR
SENSE_1TO1_45S	*	=1:1_DIFFPAIR	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=1:1_DIFFPAIR	=1:1_DIFFPAIR

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
SENSE	*	=2X_DIELECTRIC	?
THERM	*	=2X_DIELECTRIC	?
AUDIO	*	=2X_DIELECTRIC	?

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
CPU_COMP	GND	*	GND_P2MM
CPU_VCCSENSE	GND	*	GND_P2MM

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
GND	*	=STANDARD	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
GND_P2MM	*	0.20 MM	1000
PWR_P2MM	*	0.20 MM	1000

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
CLK_PCIE	GND	*	GND_P2MM
GND	PCIE_*	*	GND_P2MM
GND	SATA_*	*	GND_P2MM
USB	GND	*	GND_P2MM
CLK_PCIE	SB_POWER	*	PWR_P2MM
SB_POWER	SATA_*	*	PWR_P2MM
USB	SB_POWER	*	PWR_P2MM

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
MEM_40S	*			0.09 MM	100 MIL		
OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE
MEM_72D	*			0.09 MM	100 MIL		
OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE
MEM_37S	*			0.09 MM	100 MIL		
OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE
MEM_85D	*			0.09 MM	100 MIL		
OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE
PCIE_85D	*			0.09 MM	10 MM		
OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE
USB_85D	TOP			0.1 MM	500 MIL		
CPU_27P4S	BOTTOM			0.23 MM	100 MIL		
USB3_85D	TOP			0.1 MM	500 MIL		
USB3_85D	ISL10			0.075 MM			0.090 MM
DP_85D	ISL9			0.075 MM			0.090 MM
PCIE_85D	ISL10			0.075 MM			0.090 MM

NET_PHYSICAL_TYPE	AREA_TYPE	PHYSICAL_RULE_SET
1TO1_DIFFPAIR	*	1:1_DIFFPAIR

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
SENSE_GPUVR	*	Y	0.300 MM	0.200 MM	3.000 MM	0.400 MM	0.200 MM

AMD Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	GPUFB_CS_P	47 73
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	GPUFB_CS_N	47 73
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	GPU_TDIODE_P	48 76
	THERM_1TO1_45S	THERM	GPU_TDIODE_N	48 76
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	GPU_VDDCISENSE_P	
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	GPU_VDDCISENSE_N	
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	GPU_VDDCI_SENSE_XW_P	80
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	GPU_VDDCI_SENSE_XW_N	80
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	GPUVCORE_SENSE_P	79
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	GPUVCORE_SENSE_N	79
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_PP0V95_S0GPU_R_P	47
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_PP0V95_S0GPU_R_N	47
SENSE_DIFFPAIR	THERM_1TO1_45S	SENSE	VSNS_GPU_0V95_XW_P	73
	THERM_1TO1_45S	SENSE	VSNS_GPU_0V95_XW_N	73
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	VDDCIS0_CS_R_P	47
	SENSE_1TO1_45S	SENSE	VDDCIS0_CS_R_N	47
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	GPUFB_CS_R_P	47
	SENSE_1TO1_45S	SENSE	GPUFB_CS_R_N	47
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	VSNS_GPU_VDDC_P	71 79 85
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	VSNS_GPU_VDDC_N	71 79
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	VSNS_GPU_VDDI_P	71 80 85
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	VSNS_GPU_VDDI_N	71 80
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_1V8_GPU_R_P	
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_1V8_GPU_R_N	
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_1V8_GPU_P	
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_1V8_GPU_N	
SENSE_DIFFPAIR	THERM_1TO1_45S	SENSE	VSNS_GPU_FB_XW_P	73
	THERM_1TO1_45S	SENSE	VSNS_GPU_FB_XW_N	73

X425G Specific Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	ISNS_CPUDDR_P	46 66
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	ISNS_CPUDDR_N	46 66
	THERM_1TO1_45S	THERM	ISNS_CPU_DDR_R_P	46
	THERM_1TO1_45S	THERM	ISNS_CPU_DDR_R_N	46
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	CPUTHMSNS_D2_P	48
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	CPUTHMSNS_D2_N	48
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_LCD_PANEL_P	46 69 96
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_LCD_PANEL_N	46 69 96
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	DDR3THMSNS_D1_P	48
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	DDR3THMSNS_D1_N	48
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	FINTHMSNS_D_P	
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	FINTHMSNS_D_N	
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_1V35_MEM_P	45
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_1V35_MEM_N	45
	SENSE_1TO1_45S	SENSE	ISNS_1V35_MEM_R_P	45
	SENSE_1TO1_45S	SENSE	ISNS_1V35_MEM_R_N	45
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_AIRPORT_P	
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_AIRPORT_N	
	SENSE_1TO1_45S	SENSE	ISNS_AIRPORT_R_P	46
	SENSE_1TO1_45S	SENSE	ISNS_AIRPORT_R_N	46
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_LCDBKLT_N	63
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_LCDBKLT_P	63
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_LCD_PANEL_N	46 69 96
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_LCD_PANEL_P	46 69 96
	SENSE_1TO1_45S	SENSE	ISNS_PCH_R_P	45
	SENSE_1TO1_45S	SENSE	ISNS_PCH_R_N	45
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_TPAD_P	45
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_TPAD_N	45
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_HS_OTHER5V_P	44
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_HS_OTHER5V_N	44
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_HS_OTHER3V3_P	44
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_HS_OTHER3V3_N	44
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_HS_COMPUTING_P	44
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_HS_COMPUTING_N	44
	SENSE_1TO1_45S	SENSE	CPUVR_ISNS_P	45
	SENSE_1TO1_45S	SENSE	CPUVR_ISNS_N	45
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	P1V05_GPU_PEX_IOVDD_SNS_P	
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	P1V05_GPU_PEX_IOVDD_SNS_N	
			DIFFERENTIAL_PAIR	
SENSE_DIFFPAIR	THERM_45S_CPUVRISNS1	THERM	CPUVR_ISNS1 CPUVR_ISNS1_P	45 59
SENSE_DIFFPAIR	THERM_45S_CPUVRISNS1	THERM	CPUVR_ISNS1 CPUVR_ISNS1_N	45 59
SENSE_DIFFPAIR	THERM_45S_CPUVRISNS1	THERM	CPUVR_ISNS2 CPUVR_ISNS2_P	45 59
SENSE_DIFFPAIR	THERM_45S_CPUVRISNS1	THERM	CPUVR_ISNS2 CPUVR_ISNS2_N	45 59
SENSE_DIFFPAIR	THERM_45S_CPUVRISNS1	THERM	CPUVR_ISNS3 CPUVR_ISNS3_P	45 59
SENSE_DIFFPAIR	THERM_45S_CPUVRISNS1	THERM	CPUVR_ISNS3 CPUVR_ISNS3_N	45 59
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	CPUVR_ISUM_R_P	45
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	CPUVR_ISUM_R_N	45
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	GFXIMVP_ISNS1_P	79 96
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	GFXIMVP_ISNS1_N	79 96
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	GFXIMVP_ISNS1_P	79 96
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	GFXIMVP_ISNS1_N	79 96
AUDIO_DIFFPAIR	AUDIODIFF	AUDIO	ISNS_TBT_N	45
AUDIO_DIFFPAIR	AUDIODIFF	AUDIO	ISNS_TBT_P	45
	AUDIODIFF	AUDIO	ISNS_TBT_R_N	45
	AUDIODIFF	AUDIO	ISNS_TBT_R_P	45
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	ISNS_SSD_P	45
	THERM_1TO1_45S	THERM	ISNS_SSD_N	45
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	ISNS_SSD_R_P	45
	THERM_1TO1_45S	THERM	ISNS_SSD_R_N	45
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	P1V05S0_CS_P	45 62
	THERM_1TO1_45S	THERM	P1V05S0_CS_N	45 62
			DIFFERENTIAL_PAIR	
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	P1V05S0_SENSE P1V05S0_SENSE_P	62
	THERM_1TO1_45S	THERM	P1V05S0_SENSE P1V05S0_SENSE_N	62
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	TBT_THERMDP	28 48
	THERM_1TO1_45S	THERM	TBT_THERMDN	48
AUDIO_DIFFPAIR	AUDIODIFF	AUDIO	CHGR_CSI_R_P	57
	AUDIODIFF	AUDIO	CHGR_CSI_R_N	57
AUDIO_DIFFPAIR	AUDIODIFF	AUDIO	CHGR_CSO_R_P	57
	AUDIODIFF	AUDIO	CHGR_CSO_R_N	57
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	GFXIMVP_ISNS2_P	79
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	GFXIMVP_ISNS2_N	79
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_HS_GPU_P	47
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_HS_GPU_N	47
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_PP0V95_S0GPU_P	47 73
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	ISNS_PP0V95_S0GPU_N	47 73
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	VDDCIS0_CS_P	47 80
SENSE_DIFFPAIR	SENSE_1TO1_45S	SENSE	VDDCIS0_CS_N	47 80
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	GPUTHMSNS_D_P	48
SENSE_DIFFPAIR	THERM_1TO1_45S	THERM	GPUTHMSNS_D_N	48

X425G Specific Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
	AUDIODIFF	AUDIO	AUD_SPKRAMP_RSUBIN_P	53
	AUDIODIFF	AUDIO	AUD_SPKRAMP_RSUBIN_N	53
	AUDIODIFF	AUDIO	AUD_SPKRAMP_LSUBIN_P	53
	AUDIODIFF	AUDIO	AUD_SPKRAMP_LSUBIN_N	53
	AUDIODIFF	AUDIO	RSUBIN_P	53
	AUDIODIFF	AUDIO	RSUBIN_N	53
	AUDIODIFF	AUDIO	LSUBIN_P	53
	AUDIODIFF	AUDIO	LSUBIN_N	53
AUDIO_DIFFPAIR	AUDIODIFF	AUDIO	AUD_LO2_R_P	51 53
AUDIO_DIFFPAIR	AUDIODIFF	AUDIO	AUD_LO2_R_N	51 53
AUDIO_DIFFPAIR	AUDIODIFF	AUDIO	AUD_LO2_L_P	51 53
AUDIO_DIFFPAIR	AUDIODIFF	AUDIO	AUD_LO2_L_N	51 53
	AUDIODIFF	AUDIO	AUD_SPKRAMP_RIN_P	53
	AUDIODIFF	AUDIO	AUD_SPKRAMP_RIN_N	53
	AUDIODIFF	AUDIO	AUD_SPKRAMP_LIN_P	53
	AUDIODIFF	AUDIO	AUD_SPKRAMP_LIN_N	53
	AUDIODIFF	AUDIO	SPKRAMP_RIN_P	53
	AUDIODIFF	AUDIO	SPKRAMP_RIN_N	53
	AUDIODIFF	AUDIO	SPKRAMP_LIN_P	53
	AUDIODIFF	AUDIO	SPKRAMP_LIN_N	53
AUDIO_DIFFPAIR	DIFFPAIR	AUDIO	SPKRCONN_SL_OUT_P	53 55 86
AUDIO_DIFFPAIR	DIFFPAIR	AUDIO	SPKRCONN_SL_OUT_N	53 55 86
AUDIO_DIFFPAIR	DIFFPAIR	AUDIO	SPKRCONN_SR_OUT_P	53 55 86
AUDIO_DIFFPAIR	DIFFPAIR	AUDIO	SPKRCONN_SR_OUT_N	53 55 86
AUDIO_DIFFPAIR	DIFFPAIR	AUDIO	SPKRCONN_L_OUT_P	53 55 86
AUDIO_DIFFPAIR	DIFFPAIR	AUDIO	SPKRCONN_L_OUT_N	53 55 86
AUDIO_DIFFPAIR	DIFFPAIR	AUDIO	SPKRCONN_R_OUT_P	53 55 86
AUDIO_DIFFPAIR	DIFFPAIR	AUDIO	SPKRCONN_R_OUT_N	53 55 86
AUDIO_DIFFPAIR	DIFFPAIR	AUDIO	AUD_MIC_IN1_R_P	
AUDIO_DIFFPAIR	DIFFPAIR	AUDIO	AUD_MIC_IN1_R_N	
AUDIO_DIFFPAIR	DIFFPAIR	AUDIO	CODEC_HS_MIC_P	51
AUDIO_DIFFPAIR	DIFFPAIR	AUDIO	CODEC_HS_MIC_N	51
AUDIO_DIFFPAIR	DIFFPAIR	AUDIO	AUD_MIC_IN1_L_P	
	DIFFPAIR	AUDIO	AUD_MIC_IN1_L_N	
	DIFFPAIR	AUDIO	AUD_HS_MIC_P	54 55
	DIFFPAIR	AUDIO	AUD_HS_MIC_N	54 55
	DIFFPAIR	AUDIO	HS_MIC_P	51 54
	DIFFPAIR	AUDIO	HS_MIC_N	51 54
	DIFFPAIR	AUDIO	AUD_CONN_HS_MIC_P	
	DIFFPAIR	AUDIO	AUD_CONN_HS_MIC_N	
AUDIO_DIFFPAIR	AUDIODIFF	AUDIO	AUD_LO3_R_P	51 53
AUDIO_DIFFPAIR	AUDIODIFF	AUDIO	AUD_LO3_R_N	51 53
AUDIO_DIFFPAIR	AUDIODIFF	AUDIO	AUD_LO3_L_P	51 53
AUDIO_DIFFPAIR	AUDIODIFF	AUDIO	AUD_LO3_L_N	51 53
SB_POWER			PP3V3_S5	66 67 82 84 85 86 12 14 15 17 18 19 21 31 32 33
SB_POWER			PP3V3_S0	66 67 68 69 82 83 84 85 86 11 12 13 14 15 17 18 19 20 29 34 43 44 45 46 47 48 49 51 52 55
SB_POWER			PP1V35_S3RS0_CPUDDR	6 8 10 21 66 67 84
GND			GND	

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GDDR5 Frame Buffer Signal Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
GDDR5_45R50SE	*	=50_OHM_SE	=50_OHM_SE	=50_OHM_SE	12.7 MM	=STANDARD	=STANDARD
GDDR5_45SE	*	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=STANDARD	=STANDARD
GDDR5_80D	*	=80_OHM_DIFF	=80_OHM_DIFF	=80_OHM_DIFF	=80_OHM_DIFF	=80_OHM_DIFF	=80_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
GDDR5_CLK	*	=5x_DIELECTRIC	?
GDDR5_CMD	*	=3x_DIELECTRIC	?
GDDR5_DATA	*	=3x_DIELECTRIC	?
GDDR5_EDC	*	=7x_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
GDDR5_CLK	TOP,BOTTOM	=5x_DIELECTRIC	?
GDDR5_CMD	TOP,BOTTOM	=4x_DIELECTRIC	?
GDDR5_DATA	TOP,BOTTOM	=5x_DIELECTRIC	?
GDDR5_EDC	TOP,BOTTOM	=7x_DIELECTRIC	?

GDDR5_CMD spacing can be relaxed to 2x per AMD recommendation for x32_4.5G config.

Breakout Spacing

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
GDDR5_*	*	BGA	GDDR5_BGA

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
GDDR5_BGA	*	=1.3x_DIELECTRIC	?

GDDR5 FB A Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE: PHYSICAL	NET_TYPE: SPACING	
FB_A0_CLK	GDDR5_80D	GDDR5_CLK	FB_A0_CLK_P
FB_A0_CLK	GDDR5_80D	GDDR5_CLK	FB_A0_CLK_N
FB_A1_CLK	GDDR5_80D	GDDR5_CLK	FB_A1_CLK_P
FB_A1_CLK	GDDR5_80D	GDDR5_CLK	FB_A1_CLK_N
FB_A0_CMD	GDDR5_45SE	GDDR5_CMD	FB_A0_A<8..0>
FB_A1_CMD	GDDR5_45SE	GDDR5_CMD	FB_A1_A<8..0>
FB_A0_CMD	GDDR5_45SE	GDDR5_CMD	FB_A0_ABI_L
FB_A1_CMD	GDDR5_45SE	GDDR5_CMD	FB_A1_ABI_L
FB_A0_CMD	GDDR5_45SE	GDDR5_CMD	FB_A0_RAS_L
FB_A1_CMD	GDDR5_45SE	GDDR5_CMD	FB_A1_RAS_L
FB_A0_CMD	GDDR5_45SE	GDDR5_CMD	FB_A0_CAS_L
FB_A1_CMD	GDDR5_45SE	GDDR5_CMD	FB_A1_CAS_L
FB_A0_CMD	GDDR5_45SE	GDDR5_CMD	FB_A0_WE_L
FB_A1_CMD	GDDR5_45SE	GDDR5_CMD	FB_A1_WE_L
FB_A0_CMD	GDDR5_45SE	GDDR5_CMD	FB_A0_CKE_L
FB_A1_CMD	GDDR5_45SE	GDDR5_CMD	FB_A1_CKE_L
FB_A0_CMD	GDDR5_45SE	GDDR5_CMD	FB_A0_CS_L
FB_A1_CMD	GDDR5_45SE	GDDR5_CMD	FB_A1_CS_L
FB_A0_EDC0	GDDR5_45SE	GDDR5_EDC	FB_A0_EDC<0>
FB_A0_EDC1	GDDR5_45SE	GDDR5_EDC	FB_A0_EDC<1>
FB_A0_EDC2	GDDR5_45SE	GDDR5_EDC	FB_A0_EDC<2>
FB_A0_EDC3	GDDR5_45SE	GDDR5_EDC	FB_A0_EDC<3>
FB_A1_EDC0	GDDR5_45SE	GDDR5_EDC	FB_A1_EDC<0>
FB_A1_EDC1	GDDR5_45SE	GDDR5_EDC	FB_A1_EDC<1>
FB_A1_EDC2	GDDR5_45SE	GDDR5_EDC	FB_A1_EDC<2>
FB_A1_EDC3	GDDR5_45SE	GDDR5_EDC	FB_A1_EDC<3>
FB_A0_DBI_L0	GDDR5_45SE	GDDR5_DATA	FB_A0_DBI_L<0>
FB_A0_DBI_L1	GDDR5_45SE	GDDR5_DATA	FB_A0_DBI_L<1>
FB_A0_DBI_L2	GDDR5_45SE	GDDR5_DATA	FB_A0_DBI_L<2>
FB_A0_DBI_L3	GDDR5_45SE	GDDR5_DATA	FB_A0_DBI_L<3>
FB_A1_DBI_L0	GDDR5_45SE	GDDR5_DATA	FB_A1_DBI_L<0>
FB_A1_DBI_L1	GDDR5_45SE	GDDR5_DATA	FB_A1_DBI_L<1>
FB_A1_DBI_L2	GDDR5_45SE	GDDR5_DATA	FB_A1_DBI_L<2>
FB_A1_DBI_L3	GDDR5_45SE	GDDR5_DATA	FB_A1_DBI_L<3>
FB_A0_WCLK0	GDDR5_80D	GDDR5_CLK	FB_A0_WCLK_P<0>
FB_A0_WCLK0	GDDR5_80D	GDDR5_CLK	FB_A0_WCLK_N<0>
FB_A0_WCLK1	GDDR5_80D	GDDR5_CLK	FB_A0_WCLK_P<1>
FB_A0_WCLK1	GDDR5_80D	GDDR5_CLK	FB_A0_WCLK_N<1>
FB_A1_WCLK0	GDDR5_80D	GDDR5_CLK	FB_A1_WCLK_P<0>
FB_A1_WCLK0	GDDR5_80D	GDDR5_CLK	FB_A1_WCLK_N<0>
FB_A1_WCLK1	GDDR5_80D	GDDR5_CLK	FB_A1_WCLK_P<1>
FB_A1_WCLK1	GDDR5_80D	GDDR5_CLK	FB_A1_WCLK_N<1>
FB_A0_DQ_BYTE0	GDDR5_45SE	GDDR5_DATA	FB_A0_DQ<7..0>
FB_A0_DQ_BYTE1	GDDR5_45SE	GDDR5_DATA	FB_A0_DQ<15..8>
FB_A0_DQ_BYTE2	GDDR5_45SE	GDDR5_DATA	FB_A0_DQ<23..16>
FB_A0_DQ_BYTE3	GDDR5_45SE	GDDR5_DATA	FB_A0_DQ<31..24>
FB_A1_DQ_BYTE0	GDDR5_45SE	GDDR5_DATA	FB_A1_DQ<7..0>
FB_A1_DQ_BYTE1	GDDR5_45SE	GDDR5_DATA	FB_A1_DQ<15..8>
FB_A1_DQ_BYTE2	GDDR5_45SE	GDDR5_DATA	FB_A1_DQ<23..16>
FB_A1_DQ_BYTE3	GDDR5_45SE	GDDR5_DATA	FB_A1_DQ<31..24>
FB_A0_CMD_R	GDDR5_45SE	GDDR5_CMD	FB_A0_RESET_L
FB_A1_CMD_R	GDDR5_45SE	GDDR5_CMD	FB_A1_RESET_L

GDDR5 FB B Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE: PHYSICAL	NET_TYPE: SPACING	
FB_B0_CLK	GDDR5_80D	GDDR5_CLK	FB_B0_CLK_P
FB_B0_CLK	GDDR5_80D	GDDR5_CLK	FB_B0_CLK_N
FB_B1_CLK	GDDR5_80D	GDDR5_CLK	FB_B1_CLK_P
FB_B1_CLK	GDDR5_80D	GDDR5_CLK	FB_B1_CLK_N
FB_B0_CMD	GDDR5_45SE	GDDR5_CMD	FB_B0_A<8..0>
FB_B1_CMD	GDDR5_45SE	GDDR5_CMD	FB_B1_A<8..0>
FB_B0_CMD	GDDR5_45SE	GDDR5_CMD	FB_B0_ABI_L
FB_B1_CMD	GDDR5_45SE	GDDR5_CMD	FB_B1_ABI_L
FB_B0_CMD	GDDR5_45SE	GDDR5_CMD	FB_B0_RAS_L
FB_B1_CMD	GDDR5_45SE	GDDR5_CMD	FB_B1_RAS_L
FB_B0_CMD	GDDR5_45SE	GDDR5_CMD	FB_B0_CAS_L
FB_B1_CMD	GDDR5_45SE	GDDR5_CMD	FB_B1_CAS_L
FB_B0_CMD	GDDR5_45SE	GDDR5_CMD	FB_B0_WE_L
FB_B1_CMD	GDDR5_45SE	GDDR5_CMD	FB_B1_WE_L
FB_B0_CMD	GDDR5_45SE	GDDR5_CMD	FB_B0_CKE_L
FB_B1_CMD	GDDR5_45SE	GDDR5_CMD	FB_B1_CKE_L
FB_B0_CMD	GDDR5_45SE	GDDR5_CMD	FB_B0_CS_L
FB_B1_CMD	GDDR5_45SE	GDDR5_CMD	FB_B1_CS_L
FB_B0_EDC0	GDDR5_45SE	GDDR5_EDC	FB_B0_EDC<0>
FB_B0_EDC1	GDDR5_45SE	GDDR5_EDC	FB_B0_EDC<1>
FB_B0_EDC2	GDDR5_45SE	GDDR5_EDC	FB_B0_EDC<2>
FB_B0_EDC3	GDDR5_45SE	GDDR5_EDC	FB_B0_EDC<3>
FB_B1_EDC0	GDDR5_45SE	GDDR5_EDC	FB_B1_EDC<0>
FB_B1_EDC1	GDDR5_45SE	GDDR5_EDC	FB_B1_EDC<1>
FB_B1_EDC2	GDDR5_45SE	GDDR5_EDC	FB_B1_EDC<2>
FB_B1_EDC3	GDDR5_45SE	GDDR5_EDC	FB_B1_EDC<3>
FB_B0_DBI_L0	GDDR5_45SE	GDDR5_DATA	FB_B0_DBI_L<0>
FB_B0_DBI_L1	GDDR5_45SE	GDDR5_DATA	FB_B0_DBI_L<1>
FB_B0_DBI_L2	GDDR5_45SE	GDDR5_DATA	FB_B0_DBI_L<2>
FB_B0_DBI_L3	GDDR5_45SE	GDDR5_DATA	FB_B0_DBI_L<3>
FB_B1_DBI_L0	GDDR5_45SE	GDDR5_DATA	FB_B1_DBI_L<0>
FB_B1_DBI_L1	GDDR5_45SE	GDDR5_DATA	FB_B1_DBI_L<1>
FB_B1_DBI_L2	GDDR5_45SE	GDDR5_DATA	FB_B1_DBI_L<2>
FB_B1_DBI_L3	GDDR5_45SE	GDDR5_DATA	FB_B1_DBI_L<3>
FB_B0_WCLK0	GDDR5_80D	GDDR5_CLK	FB_B0_WCLK_P<0>
FB_B0_WCLK0	GDDR5_80D	GDDR5_CLK	FB_B0_WCLK_N<0>
FB_B0_WCLK1	GDDR5_80D	GDDR5_CLK	FB_B0_WCLK_P<1>
FB_B0_WCLK1	GDDR5_80D	GDDR5_CLK	FB_B0_WCLK_N<1>
FB_B1_WCLK0	GDDR5_80D	GDDR5_CLK	FB_B1_WCLK_P<0>
FB_B1_WCLK0	GDDR5_80D	GDDR5_CLK	FB_B1_WCLK_N<0>
FB_B1_WCLK1	GDDR5_80D	GDDR5_CLK	FB_B1_WCLK_P<1>
FB_B1_WCLK1	GDDR5_80D	GDDR5_CLK	FB_B1_WCLK_N<1>
FB_B0_DQ_BYTE0	GDDR5_45SE	GDDR5_DATA	FB_B0_DQ<7..0>
FB_B0_DQ_BYTE1	GDDR5_45SE	GDDR5_DATA	FB_B0_DQ<15..8>
FB_B0_DQ_BYTE2	GDDR5_45SE	GDDR5_DATA	FB_B0_DQ<23..16>
FB_B0_DQ_BYTE3	GDDR5_45SE	GDDR5_DATA	FB_B0_DQ<31..24>
FB_B1_DQ_BYTE0	GDDR5_45SE	GDDR5_DATA	FB_B1_DQ<7..0>
FB_B1_DQ_BYTE1	GDDR5_45SE	GDDR5_DATA	FB_B1_DQ<15..8>
FB_B1_DQ_BYTE2	GDDR5_45SE	GDDR5_DATA	FB_B1_DQ<23..16>
FB_B1_DQ_BYTE3	GDDR5_45SE	GDDR5_DATA	FB_B1_DQ<31..24>
FB_B0_CMD_R	GDDR5_45SE	GDDR5_CMD	FB_B0_RESET_L
FB_B1_CMD_R	GDDR5_45SE	GDDR5_CMD	FB_B1_RESET_L

MUXGFX & DP AUX MUX NET PROPERTIES

ELECTRICAL_CONSTRAINT_SET	NET_TYPE: PHYSICAL	NET_TYPE: SPACING	
	DP_85D	DISPLAYPORT	DP_INT_ML_C_P<3..0>
	DP_85D	DISPLAYPORT	DP_INT_ML_C_N<3..0>
	DP_85D	DISPLAYPORT	DP_INT_ML_F_P<3..0>
	DP_85D	DISPLAYPORT	DP_INT_ML_F_N<3..0>
DP_INT_ML	DP_85D	DISPLAYPORT	DP_INT_ML_P<3..0>
DP_INT_ML	DP_85D	DISPLAYPORT	DP_INT_ML_N<3..0>
	DP_85D	DISPLAYPORT	DP_INT_AUXCH_C_P
	DP_85D	DISPLAYPORT	DP_INT_AUXCH_C_N
DP_INT_AUXCH	DP_85D	DISPLAYPORT	DP_INT_AUX_P
DP_INT_AUXCH	DP_85D	DISPLAYPORT	DP_INT_AUX_N
	DP_85D	DISPLAYPORT	DP_INT_EG_AUX_P
	DP_85D	DISPLAYPORT	DP_INT_EG_AUX_N
DP_INT_ML	DP_85D	DISPLAYPORT	DP_INT_EG_ML_P<3..0>
	DP_85D	DISPLAYPORT	DP_INT_EG_ML_N<3..0>
	DP_85D	DISPLAYPORT	DP_INT_IG_AUX_P
	DP_85D	DISPLAYPORT	DP_INT_IG_AUX_N
DP_INT_ML	DP_85D	DISPLAYPORT	DP_INT_IG_ML_P<3..0>
	DP_85D	DISPLAYPORT	DP_INT_IG_ML_N<3..0>
DP_EG_AUX	DP_85D	DISPLAYPORT	DP_TBTSNK0_EG_AUXCH_P
DP_EG_AUX	DP_85D	DISPLAYPORT	DP_TBTSNK0_EG_AUXCH_N
DP_EG_AUX	DP_85D	DISPLAYPORT	DP_TBTSNK1_EG_AUXCH_P
DP_EG_AUX	DP_85D	DISPLAYPORT	DP_TBTSNK1_EG_AUXCH_N
TBTSNK_AUXCH	DP_85D	DISPLAYPORT	DP_TBTSNK0_AUXCH_P
TBTSNK_AUXCH	DP_85D	DISPLAYPORT	DP_TBTSNK0_AUXCH_N
	DP_85D	DISPLAYPORT	DP_TBTSNK0_AUXCH_C_P
	DP_85D	DISPLAYPORT	DP_TBTSNK0_AUXCH_C_N
TBTSNK_AUXCH	DP_85D	DISPLAYPORT	DP_TBTSNK1_AUXCH_P
TBTSNK_AUXCH	DP_85D	DISPLAYPORT	DP_TBTSNK1_AUXCH_N
	DP_85D	DISPLAYPORT	DP_TBTSNK1_AUXCH_C_P
	DP_85D	DISPLAYPORT	DP_TBTSNK1_AUXCH_C_N
DP_TBT_ML	DP_85D	DISPLAYPORT	DP_TBTSNK0_ML_P<3..0>
DP_TBT_ML	DP_85D	DISPLAYPORT	DP_TBTSNK0_ML_N<3..0>
	DP_85D	DISPLAYPORT	DP_TBTSNK0_ML_C_P<3..0>
	DP_85D	DISPLAYPORT	DP_TBTSNK0_ML_C_N<3..0>
DP_TBT_ML1	DP_85D	DISPLAYPORT	DP_TBTSNK1_ML_P<3..0>
DP_TBT_ML1	DP_85D	DISPLAYPORT	DP_TBTSNK1_ML_N<3..0>
	DP_85D	DISPLAYPORT	DP_TBTSNK1_ML_C_P<3..0>
	DP_85D	DISPLAYPORT	DP_TBTSNK1_ML_C_N<3..0>

Kepler Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE: PHYSICAL	NET_TYPE: SPACING	
	1:1_DIFFPAIR		GPU_CLK_TEST_RC_P
	1:1_DIFFPAIR		GPU_CLK_TEST_RC_N
GPU_CLK_TEST	1:1_DIFFPAIR		GPU_CLK_TEST_P
GPU_CLK_TEST	1:1_DIFFPAIR		GPU_CLK_TEST_N
HDMI_DATA	DP_85D	DISPLAYPORT	HDMI_EG_DATA_P<2..0>
HDMI_DATA	DP_85D	DISPLAYPORT	HDMI_EG_DATA_N<2..0>
HDMI_CLK	DP_85D	HDMI_CLK	HDMI_EG_CLK_P
HDMI_CLK	DP_85D	HDMI_CLK	HDMI_EG_CLK_N

SYNC_MASTER=J45G_AMD SYNC_DATE=07/01/2014

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