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.

K23

REV	ECN	DESCRIPTION OF REVISION	CK APPD / DATE
A	0000774489	PRODUCTION RELEASED	2009-08-20

LAST_MODIFIED=Wed Sep 2 16:45:56 2009

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18	19	MCP PCI & LPC	K22	09/02/2009
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20	21	MCP HDA & MISC	K22	09/02/2009
21	22	MCP Power & Ground	K22	09/02/2009
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27	31	DDR3 SO-DIMMs 0 & 2	K22	07/06/2009
28	32	DDR3 SO-DIMM CONNECTOR B	K22	09/02/2009
29	33	DDR3 SUPPORT AND BITSWAPS	MASTER	N/A
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31	37	Ethernet PHY (RTL8211CL)	K22	09/02/2009
32	38	Ethernet Support	K22	09/02/2009
33	39	ETHERNET CONNECTOR	MASTER	N/A
34	41	FireWire LLC/PHY (XIO2213B)	K22	09/02/2009
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52	64	AUDIO: Tweeter Amp 1	SKIPAUDIO	04/20/2009
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71	90	Display: Int DP Connector	MARKVIDEO	03/12/2009
72	91	Display: BiDiVi Mux1	MARKVIDEO	03/12/2009
73	92	BIDIVI DP MUX2	MASTER	N/A
74	94	Display: Ext DP Connector	MARKVIDEO	03/12/2009
75	95	Display: BiDiVi Support	MARKVIDEO	03/12/2009
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83	107	Graphics Constraints	MASTER	N/A
84	108	K22/K23 SPECIFIC CONSTRAINTS	K22	09/02/2009
85	109	K22/K23 RULE DEFINITIONS	K22	09/02/2009
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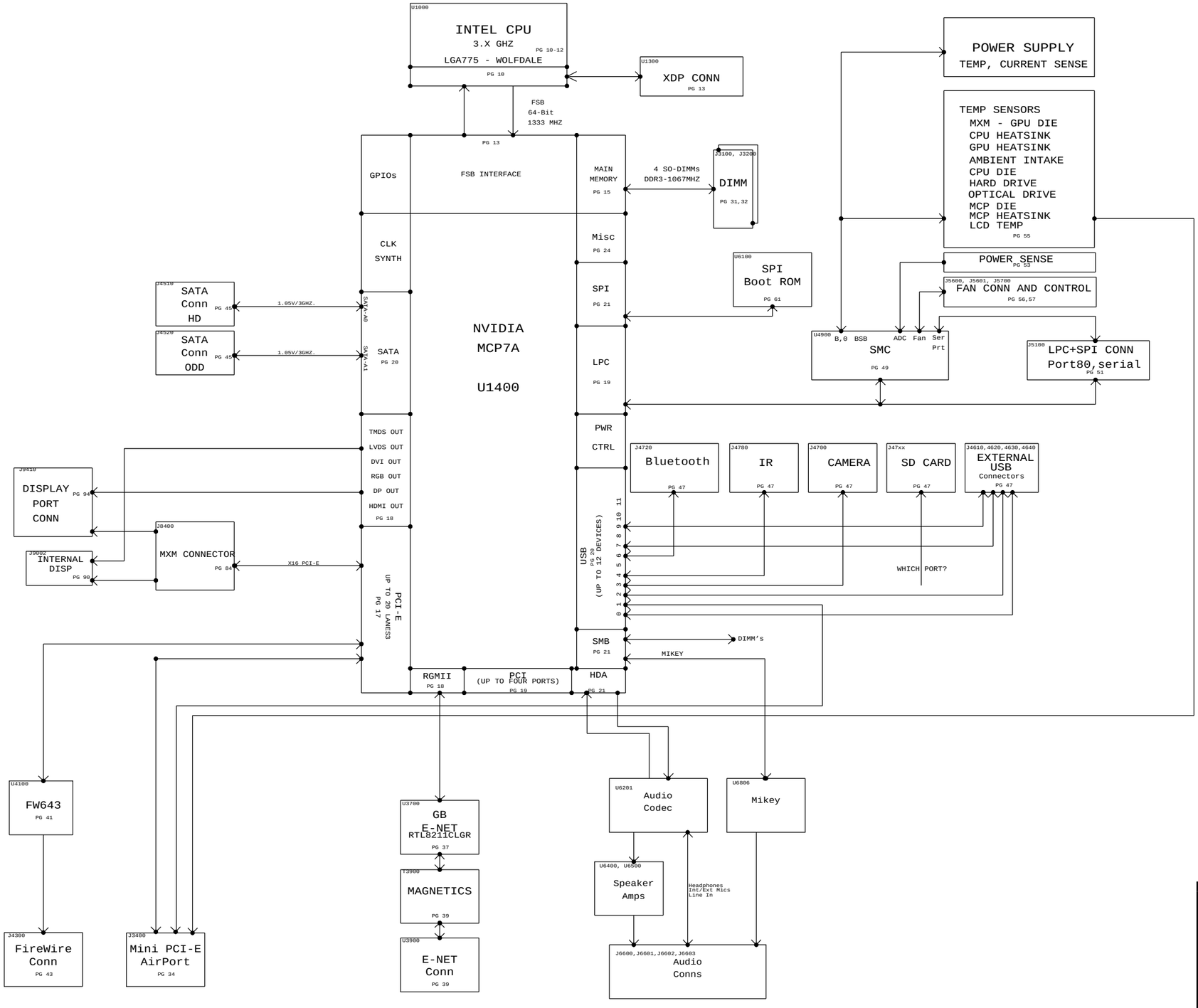

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System Block Diagram

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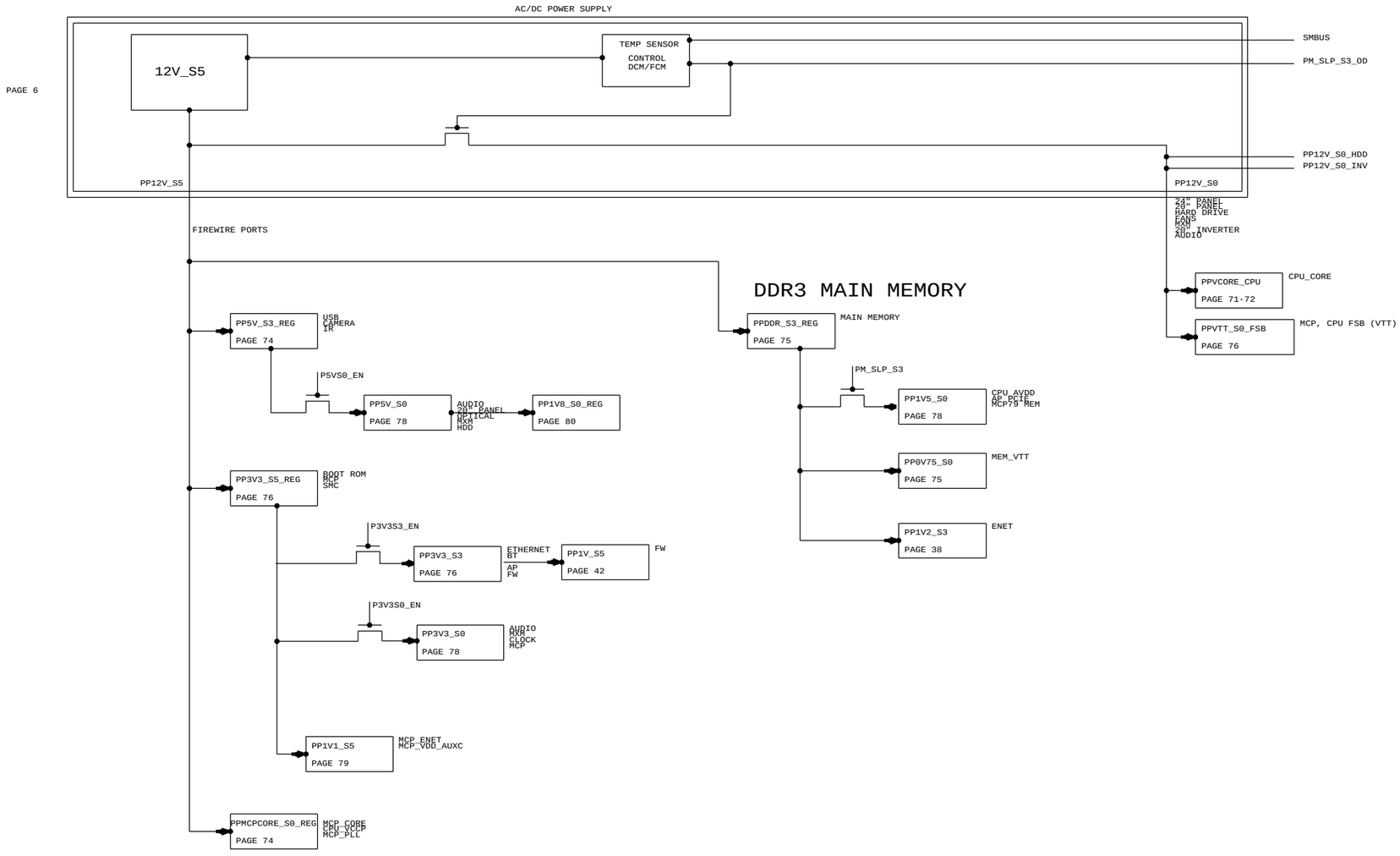

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Power Block Diagram

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BOM Variants

BOM NUMBER	BOM NAME	BOM OPTIONS
630-9879	PCBA,MLB,BETTER,K23	K23,2P80GHZ_CPU,BASIC,MXM,K23_MXM
639-0394	PCBA,MLB,2.80 GHZ-2M,K23	K23,2P80GHZ_2M_CPU,BASIC,MXM,K23_MXM
639-0185	PCBA,MLB,2.93 GHZ,K23	K23,2P93GHZ_CPU,BASIC,MXM,K23_MXM
639-9983	PCBA,MLB,BEST,K23	K23,3P0GHZ_CPU,BASIC,MXM,K23_MXM
639-0509	PCBA,MLB,3.06 GHZ,K23	K23,3P06GHZ_CPU,BASIC,MXM,K23_MXM
639-0109	PCBA,MLB,3.16 GHZ,K23(INVESTIGATION)	K23,3P16GHZ_CPU,BASIC,MXM,K23_MXM
630-9880	PCBA,MLB,ULTIMATE,K23	K23,3P33GHZ_CPU,BASIC,MXM,K23_MXM
607-4427	PCBA,MLB,DEV,K23	DEVELOPMENT,DEV_GROUP

BOM GROUPS

BOM GROUP	BOM OPTIONS
BASIC	COMMON,ALTERNATE,MCP7A,XDP,BETTER,MCP_ISL9563A,PRODUCTION
MCP7A	BOOT_MODE_USER,MEMRESET_HW,MEMRESET_MCP
DEV_GROUP	XDP_CONN,LPCPLUS,VREFMRGN,MCP_PWR_SENSE,MCP_CPU_TDIODE,PECI_SMB,MOJOMUX

BOARD STACK-UP

TOP	SIGNAL
2	GROUND
3	SIGNAL
4	POWER
5	POWER
6	SIGNAL
7	GROUND
BOTTOM	SIGNAL

COMMON

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
338S0731	1	IC,GMCP,MCP7A-JA,B03,35X35MM,BGA1437,DT	U1400	CRITICAL	IG
338S0732	1	IC,MCP,MCP7A-DA,B03,35X35MM,BGA1437,DT	U1400	CRITICAL	MXM
341T0170	1	IC,EFI BOOTROM,K22/K23	U6100	CRITICAL	
338S0765	1	IC,XIO2211ZAY,1394B,167BGA	U4100	CRITICAL	
338S0694	1	IC,RTL8251CA,GIGE TRANSCEIVER, 48P TQFP	U3700	CRITICAL	
825-7122	1	MLB LABEL,48.0X4.8	X14	CRITICAL	

MCP -J SKU HAS INTEGRATED GPU
MCP -D SKU DOES NOT

CPUS

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
337S3745	1	WLF,QXXX,QS,2.80G,65W,1066,R0,3M,LGA	CPU	CRITICAL	2P80GHZ_CPU
337S3742	1	WLF,SLB9J,PRQ,2.83G,65W,1333,E0,6M,LGA	CPU	CRITICAL	2P83GHZ_CPU
337S3726	1	WLF,SLB9J,PRQ,3.0G,65W,1333,E0,6M,LGA	CPU	CRITICAL	3P0GHZ_CPU
337S3715	1	WLF,SLB9K,PRQ,3.16G,65W,1333,E0,6M,LGA	CPU	CRITICAL	3P16GHZ_CPU
337S3727	1	WLF,SLB9L,PRQ,3.33G,65W,1333,E0,6M,LGA	CPU	CRITICAL	3P33GHZ_CPU
337S3807	1	WLF,SLB9L,PRQ,2.93G,65W,1333,E0,6M,LGA	CPU	CRITICAL	2P93GHZ_CPU
337S3766	1	WLF,SLB9L,PRQ,3.06G,65W,1333,E0,6M,LGA	CPU	CRITICAL	3P06GHZ_CPU
337S3804	1	WLF,SLGU9,PRQ,2.80G,65W,1066,R0,2M,LGA	CPU	CRITICAL	2P80GHZ_2M_CPU

K23 PARTS

	PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
	051-7863	1	SCH,K23,MLB	SCH1		K23
	820-2507	1	PCBF,K23,MLB	MLB1		K23
(338S0489 - BLNK)	341T0169	1	IC,SMC,K23	U4900	CRITICAL	K23

ALTERNATES

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BOM Configuration

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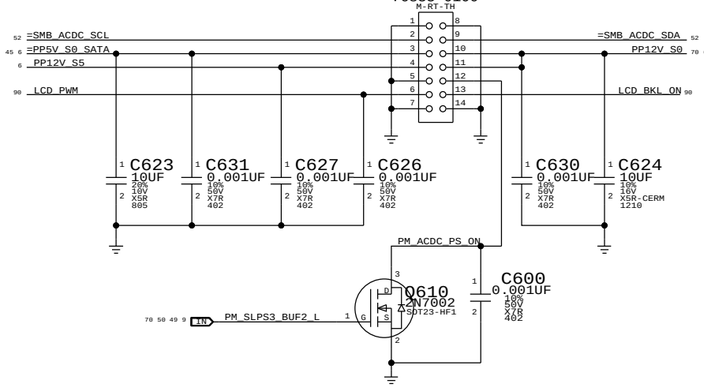
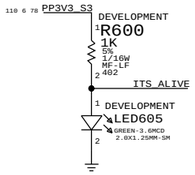
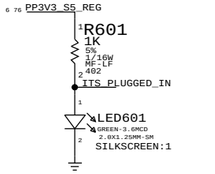
8 7 6 5 4 3 2 1

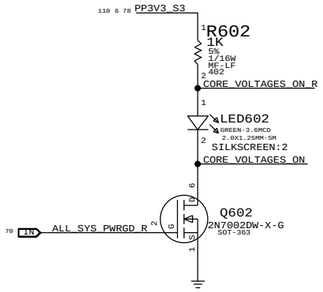
EMC: C600,C626,C627,C628,C629,C630,C631
PLACE AT J600.

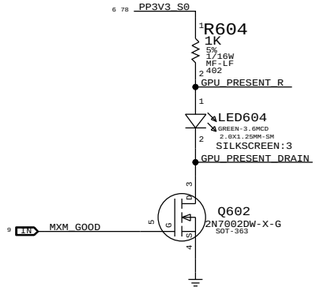
518-0352
CRITICAL
J600
76833-0100
M-RT-TH

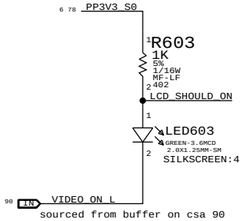






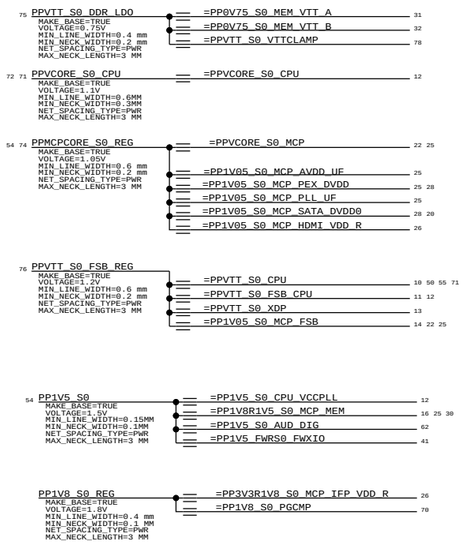






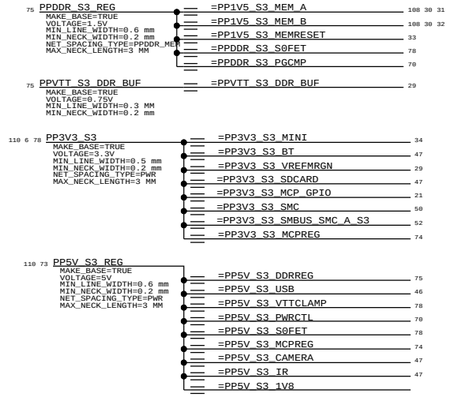
"S0" RAILS

ONLY ON IN RUN



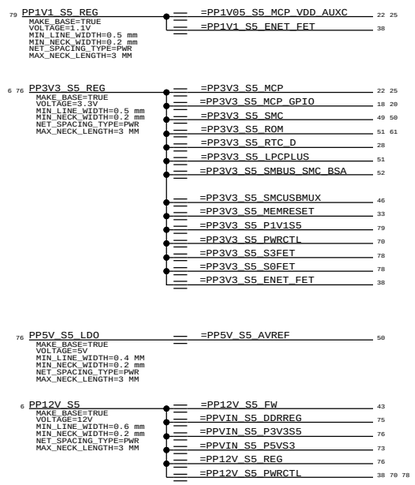
"S3" RAILS

ON IN RUN AND SLEEP

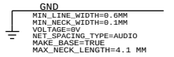


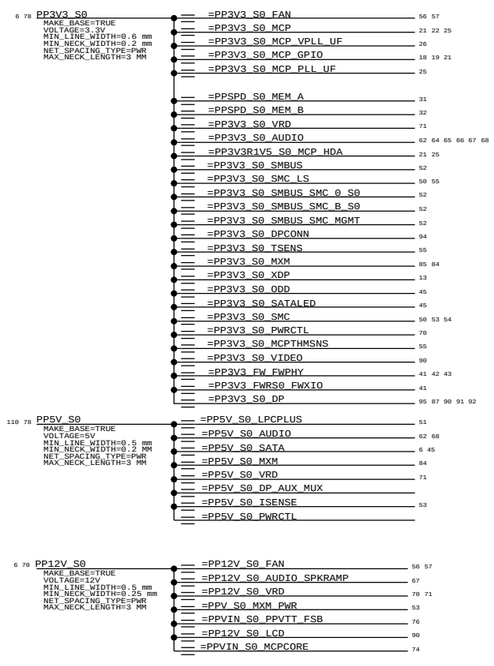
"S5" RAILS

ALWAYS ON WHEN UNIT HAS AC POWER (TRICKLE)



GND RAILS





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Power Conn / Alias

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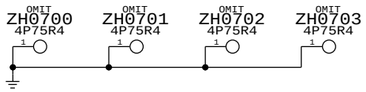
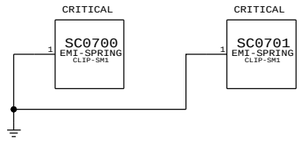
CPU Heatsink

4mm Plated Holes (998-0850)



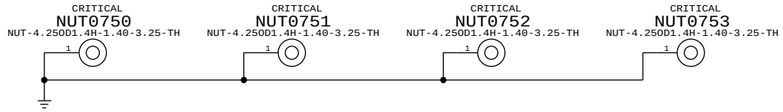
MCP Heatsink

EMC Springs (870-1125)



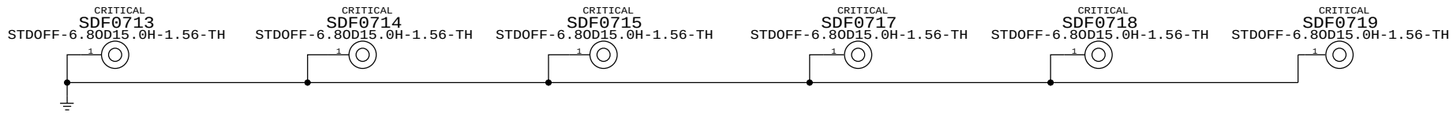
DIMM CONNECTOR NUTS

Nuts (805-9582)



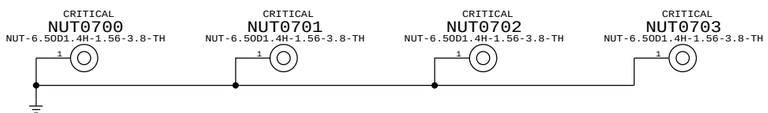
Rear Cover

Standoffs (860-1255)



Backer Plate

Nuts (835-0269)



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NC ON UNUSED ALIASES

18	MCP_TV_DAC_RSET	=	NC_MCP_TV_DAC_RSET	MAKE_BASE=TRUE NO_TEST=TRUE
18	MCP_TV_DAC_VREF	=	NC_MCP_TV_DAC_VREF	MAKE_BASE=TRUE NO_TEST=TRUE
18	MCP_CLK27M_XTALIN	=	NC_MCP_CLK27M_XTALIN	MAKE_BASE=TRUE NO_TEST=TRUE
18	MCP_CLK27M_XTALOUT	=	NC_MCP_CLK27M_XTALOUT	MAKE_BASE=TRUE NO_TEST=TRUE
18	CRT_IG_R_C_PR	=	NC_CRT_IG_R_C_PR	MAKE_BASE=TRUE NO_TEST=TRUE
18	CRT_IG_G_Y_Y	=	NC_CRT_IG_G_Y_Y	MAKE_BASE=TRUE NO_TEST=TRUE
18	CRT_IG_B_COMP_PB	=	NC_CRT_IG_B_COMP_PB	MAKE_BASE=TRUE NO_TEST=TRUE
18	CRT_IG_HSYNC	=	NC_CRT_IG_HSYNC	MAKE_BASE=TRUE NO_TEST=TRUE
18	CRT_IG_VSYNC	=	NC_CRT_IG_VSYNC	MAKE_BASE=TRUE NO_TEST=TRUE
18	TP_MCP_RGB_HSYNC	=	NC_MCP_RGB_HSYNC	MAKE_BASE=TRUE NO_TEST=TRUE
18	TP_MCP_RGB_VSYNC	=	NC_MCP_RGB_VSYNC	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_AD<31..15>	=	NC_PCI_AD<31..15>	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_IRDY_L	=	NC_PCI_IRDY_L	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_C_BE_L<1..0>	=	NC_PCI_C_BE_L<1..0>	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_SERR_L	=	NC_PCI_SERR_L	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_DEVSEL_L	=	NC_PCI_DEVSEL_L	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_PERR_L	=	NC_PCI_PERR_L	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_LPC_DRQ0_L	=	NC_LPC_DRQ0_L	MAKE_BASE=TRUE NO_TEST=TRUE
21	TP_MCP_BUF_SIO_CLK	=	NC_MCP_BUF_SIO_CLK	MAKE_BASE=TRUE NO_TEST=TRUE
18	TP_ENET_INTR_L	=	NC_ENET_INTR_L	MAKE_BASE=TRUE NO_TEST=TRUE
18	TP_ENET_PWRDWN_L	=	NC_ENET_PWDWN_L	MAKE_BASE=TRUE NO_TEST=TRUE
21	TP_MCP_KBDRSTIN_L	=	NC_MCP_KBDRSTIN_L	MAKE_BASE=TRUE NO_TEST=TRUE
	TP_MCP_GPIO_18	=	NC_MCP_GPIO_18	MAKE_BASE=TRUE NO_TEST=TRUE
21	TP_MLB_RAM_SIZE	=	NC_MLB_RAM_SIZE	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_C_BE_L<3>	=	NC_PCI_C_BE_L<3>	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_CLK0	=	NC_PCI_CLK0	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_CLK1	=	NC_PCI_CLK1	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_FRAME_L	=	NC_PCI_FRAME_L	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_GNT0_L	=	NC_MCP_PCI_GNT0_L	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_GNT1_L	=	NC_PCI_GNT1_L	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_INTW_L	=	NC_PCI_INTW_L	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_INTX_L	=	NC_PCI_INTX_L	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_INTY_L	=	NC_PCI_INTY_L	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_INTZ_L	=	NC_PCI_INTZ_L	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_PAR	=	NC_PCI_PAR	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_RESET1_L	=	NC_PCI_RESET1_L	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_STOP_L	=	NC_PCI_STOP_L	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_TRDY_L	=	NC_PCI_TRDY_L	MAKE_BASE=TRUE NO_TEST=TRUE
17	TP_PCIE_CLK100M_PE4N	=	NC_PCIE_CLK100M_PE4N	MAKE_BASE=TRUE NO_TEST=TRUE
17	TP_PCIE_CLK100M_PE4P	=	NC_PCIE_CLK100M_PE4P	MAKE_BASE=TRUE NO_TEST=TRUE
17	TP_PCIE_CLK100M_PE5N	=	NC_PCIE_CLK100M_PE5N	MAKE_BASE=TRUE NO_TEST=TRUE
17	TP_PCIE_CLK100M_PE5P	=	NC_PCIE_CLK100M_PE5P	MAKE_BASE=TRUE NO_TEST=TRUE
17	TP_PCIE_CLK100M_PE6P	=	NC_PCIE_CLK100M_PE6P	MAKE_BASE=TRUE NO_TEST=TRUE
17	TP_PCIE_CLK100M_PE6N	=	NC_PCIE_CLK100M_PE6N	MAKE_BASE=TRUE NO_TEST=TRUE
17	PCIE_EXCARD_PRSNT_L	=	NC_PCIE_EXCARD_PRSNT_L	MAKE_BASE=TRUE NO_TEST=TRUE
17	TP_PE4_CLKREQ_L	=	NC_PE4_CLKREQ_L	MAKE_BASE=TRUE NO_TEST=TRUE
17	TP_PE4_PRSNT_L	=	NC_PE4_PRSNT_L	MAKE_BASE=TRUE NO_TEST=TRUE
21	TP_SB_A20GATE	=	NC_SB_A20GATE	MAKE_BASE=TRUE NO_TEST=TRUE
20	TP_USB_10N	=	NC_USB_10N	MAKE_BASE=TRUE NO_TEST=TRUE
20	TP_USB_10P	=	NC_USB_10P	MAKE_BASE=TRUE NO_TEST=TRUE
20	USB_MINI_N	=	NC_USB_MINI_N	MAKE_BASE=TRUE NO_TEST=TRUE
20	USB_MINI_P	=	NC_USB_MINI_P	MAKE_BASE=TRUE NO_TEST=TRUE
20	USB_EXCARD_N	=	NC_USB_EXCARD_N	MAKE_BASE=TRUE NO_TEST=TRUE
20	USB_EXCARD_P	=	NC_USB_EXCARD_P	MAKE_BASE=TRUE NO_TEST=TRUE
21	ODD_PWR_EN_L	=	NC_ODD_PWR_EN_L	MAKE_BASE=TRUE NO_TEST=TRUE
17	PCIE_CLK100M_EXCARD_P	=	NC_PCIE_CLK100M_EXCARD_P	MAKE_BASE=TRUE NO_TEST=TRUE
17	PCIE_CLK100M_EXCARD_N	=	NC_PCIE_CLK100M_EXCARD_N	MAKE_BASE=TRUE NO_TEST=TRUE
17	EXCARD_CLKREQ_L	=	NC_EXCARD_CLKREQ_L	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_AD<12..10>	=	NC_PCI_AD<12..10>	MAKE_BASE=TRUE NO_TEST=TRUE
19	TP_PCI_AD<8>	=	NC_PCI_AD<8>	MAKE_BASE=TRUE NO_TEST=TRUE

17	TP_PCIE_PE4_R2D_CP	=	NC_PCIE_PE4_R2D_CP	MAKE_BASE=TRUE NO_TEST=TRUE
17	TP_PCIE_PE4_R2D_CN	=	NC_PCIE_PE4_R2D_CN	MAKE_BASE=TRUE NO_TEST=TRUE
17	TP_PCIE_PE4_D2RP	=	NC_PCIE_PE4_D2RP	MAKE_BASE=TRUE NO_TEST=TRUE
17	TP_PCIE_PE4_D2RN	=	NC_PCIE_PE4_D2RN	MAKE_BASE=TRUE NO_TEST=TRUE
17	PCIE_EXCARD_D2R_P	=	NC_PCIE_EXCARD_D2R_P	MAKE_BASE=TRUE NO_TEST=TRUE
17	PCIE_EXCARD_D2R_N	=	NC_PCIE_EXCARD_D2R_N	MAKE_BASE=TRUE NO_TEST=TRUE
17	PCIE_EXCARD_R2D_C_P	=	NC_PCIE_EXCARD_R2D_C_P	MAKE_BASE=TRUE NO_TEST=TRUE
17	PCIE_EXCARD_R2D_C_N	=	NC_PCIE_EXCARD_R2D_C_N	MAKE_BASE=TRUE NO_TEST=TRUE
20	USB_TPAD_N	=	NC_USB_TPAD_N	MAKE_BASE=TRUE NO_TEST=TRUE
20	USB_TPAD_P	=	NC_USB_TPAD_P	MAKE_BASE=TRUE NO_TEST=TRUE

MCP HAS INTERNAL 15K PULL-DOWNS

UNUSED MEMORY SIGNALS

15	TP_MEM_A_CLK2P	=	NC_MEM_A_CLK2P	MAKE_BASE=TRUE NO_TEST=TRUE
15	TP_MEM_A_CLK2N	=	NC_MEM_A_CLK2N	MAKE_BASE=TRUE NO_TEST=TRUE
16	TP_MEM_A_CLK5P	=	NC_MEM_A_CLK5P	MAKE_BASE=TRUE NO_TEST=TRUE
16	TP_MEM_A_CLK5N	=	NC_MEM_A_CLK5N	MAKE_BASE=TRUE NO_TEST=TRUE
15	TP_MEM_B_CLK2P	=	NC_MEM_B_CLK2P	MAKE_BASE=TRUE NO_TEST=TRUE
15	TP_MEM_B_CLK2N	=	NC_MEM_B_CLK2N	MAKE_BASE=TRUE NO_TEST=TRUE
16	TP_MEM_B_CLK5P	=	NC_MEM_B_CLK5P	MAKE_BASE=TRUE NO_TEST=TRUE
16	TP_MEM_B_CLK5N	=	NC_MEM_B_CLK5N	MAKE_BASE=TRUE NO_TEST=TRUE

UNUSED GMUX JTAG FROM MCP

17	GMUX_JTAG_TCK_L	=	NC_GMUX_JTAG_TCK_L	MAKE_BASE=TRUE NO_TEST=TRUE
17	GMUX_JTAG_TDO	=	NC_GMUX_JTAG_TDO	MAKE_BASE=TRUE NO_TEST=TRUE
19	GMUX_JTAG_TDI	=	NC_GMUX_JTAG_TDI	MAKE_BASE=TRUE NO_TEST=TRUE
19	GMUX_JTAG_TMS	=	NC_GMUX_JTAG_TMS	MAKE_BASE=TRUE NO_TEST=TRUE

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE

UNUSED SIGNAL ALIAS

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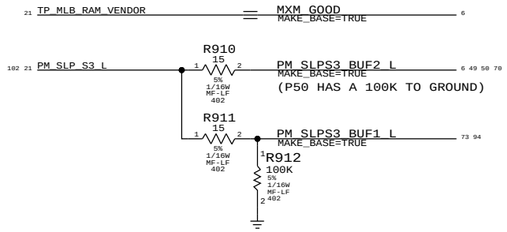
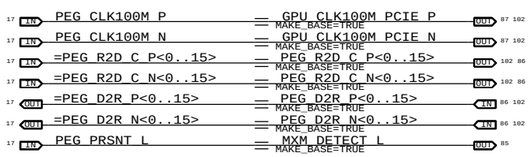
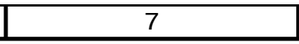
SIGNAL ALIAS



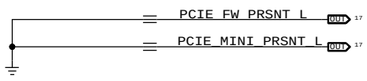
PEG Slot Support





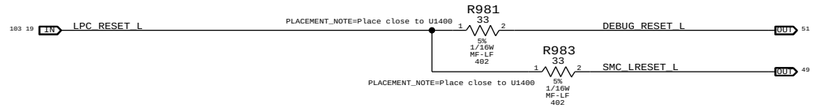
K22/K23 Use one GPIO for both ports 2&3 OC

USB PORT 2 AND 3 (C AND D) SHARE OVER-CURRENT WITH PORT 2
PREVIOUSLY, PORT 3 HAD IT'S OWN BUT EFI MAPS THAT TO EXPRESSCARD
SEE RDAR://6250424

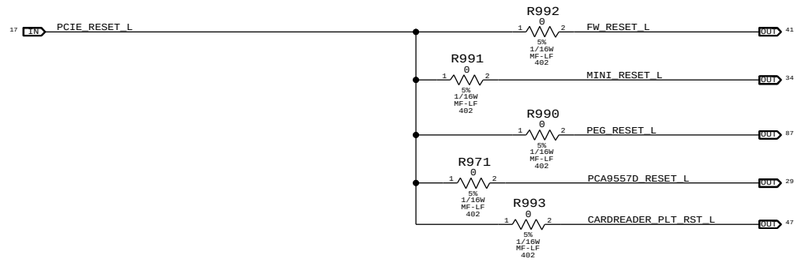


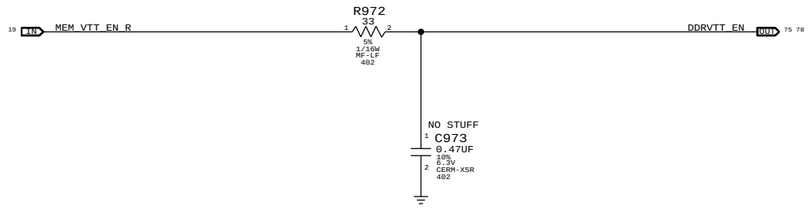
Platform Reset Connections

LPC Reset (Unbuffered)

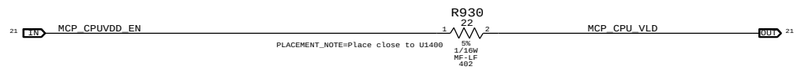


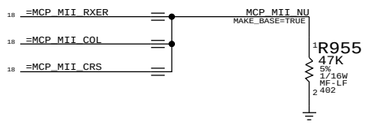
PCIE Reset (Unbuffered)





MCP_CPUVDD_EN WILL ASSERT AFTER MCP_PS_PWRGD IS UP





SYNC_MASTER=MASTER SYNC_DATE=N/A

PAGE TITLE
Signal Aliases

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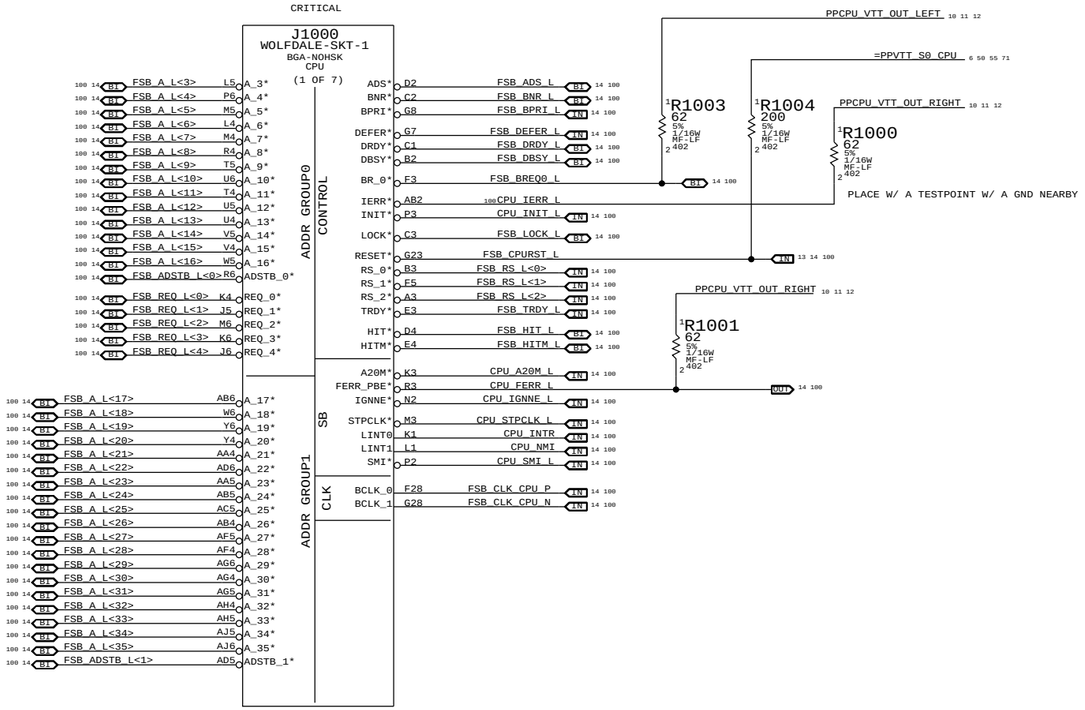

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE

CPU FSB

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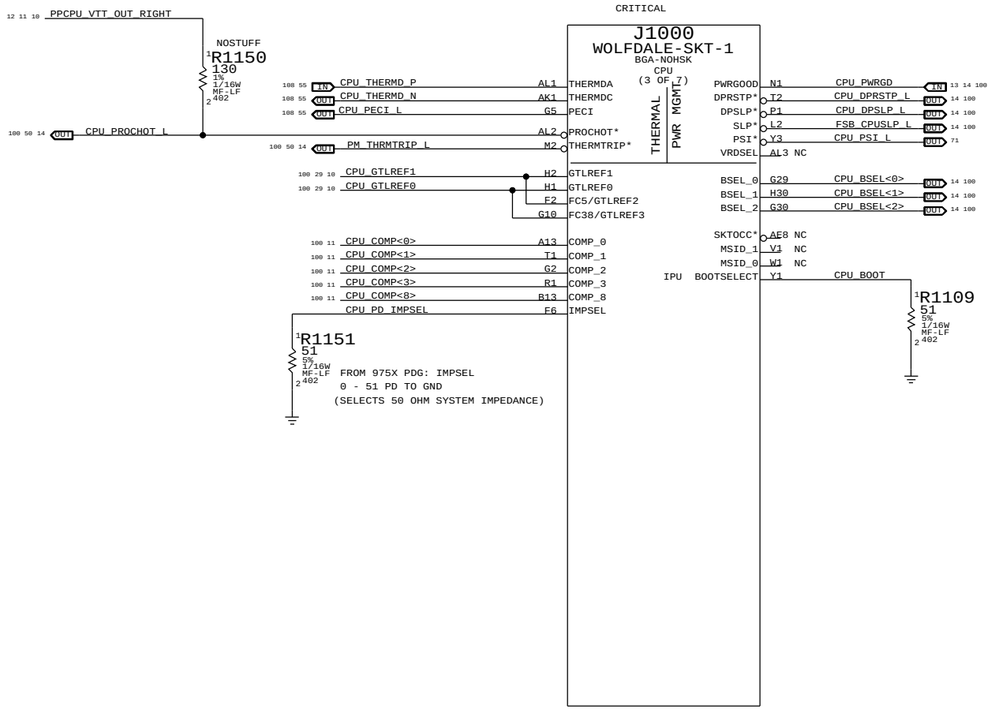

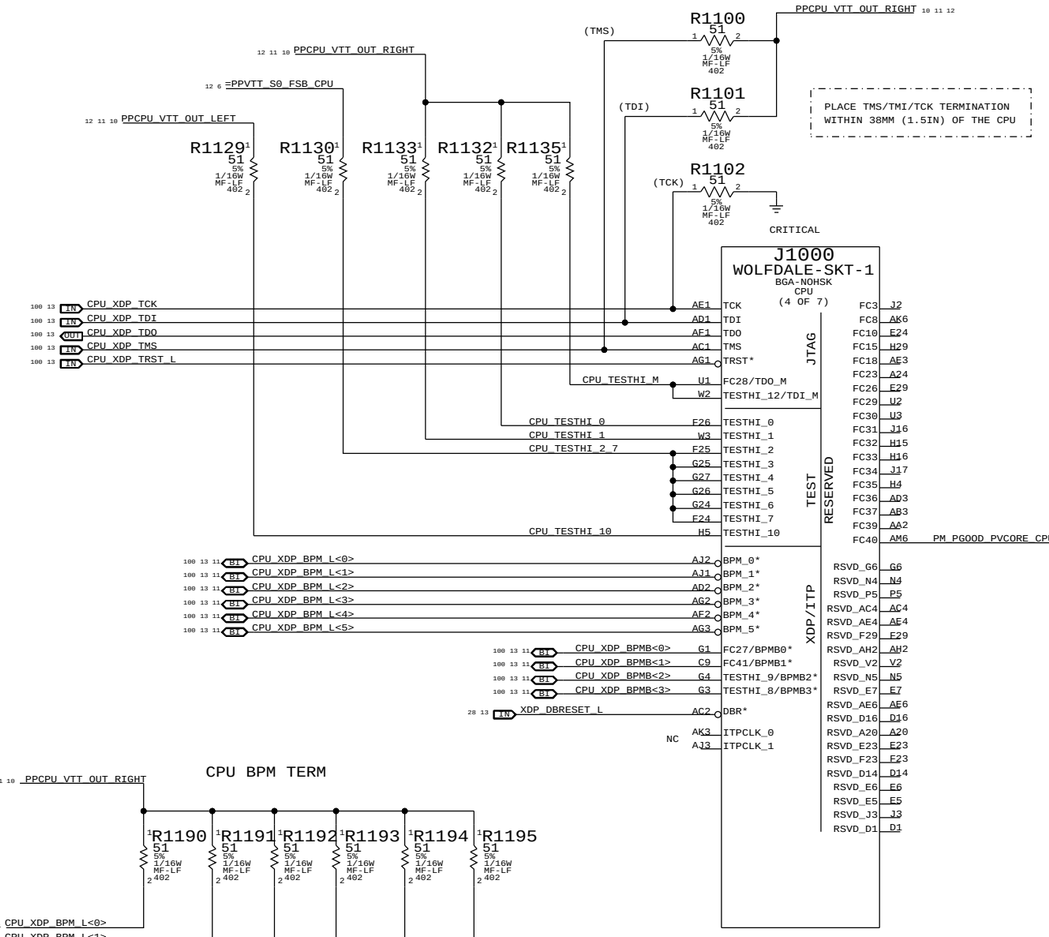

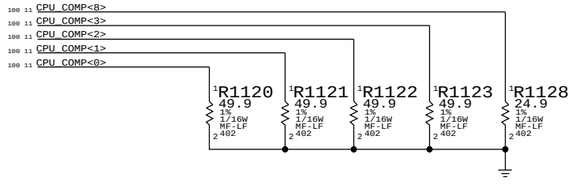

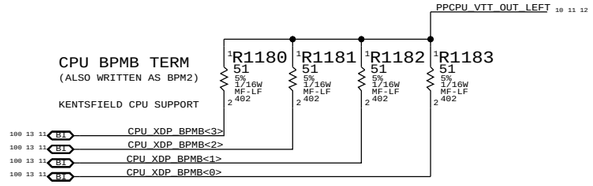

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE

CPU TEST & MISC.

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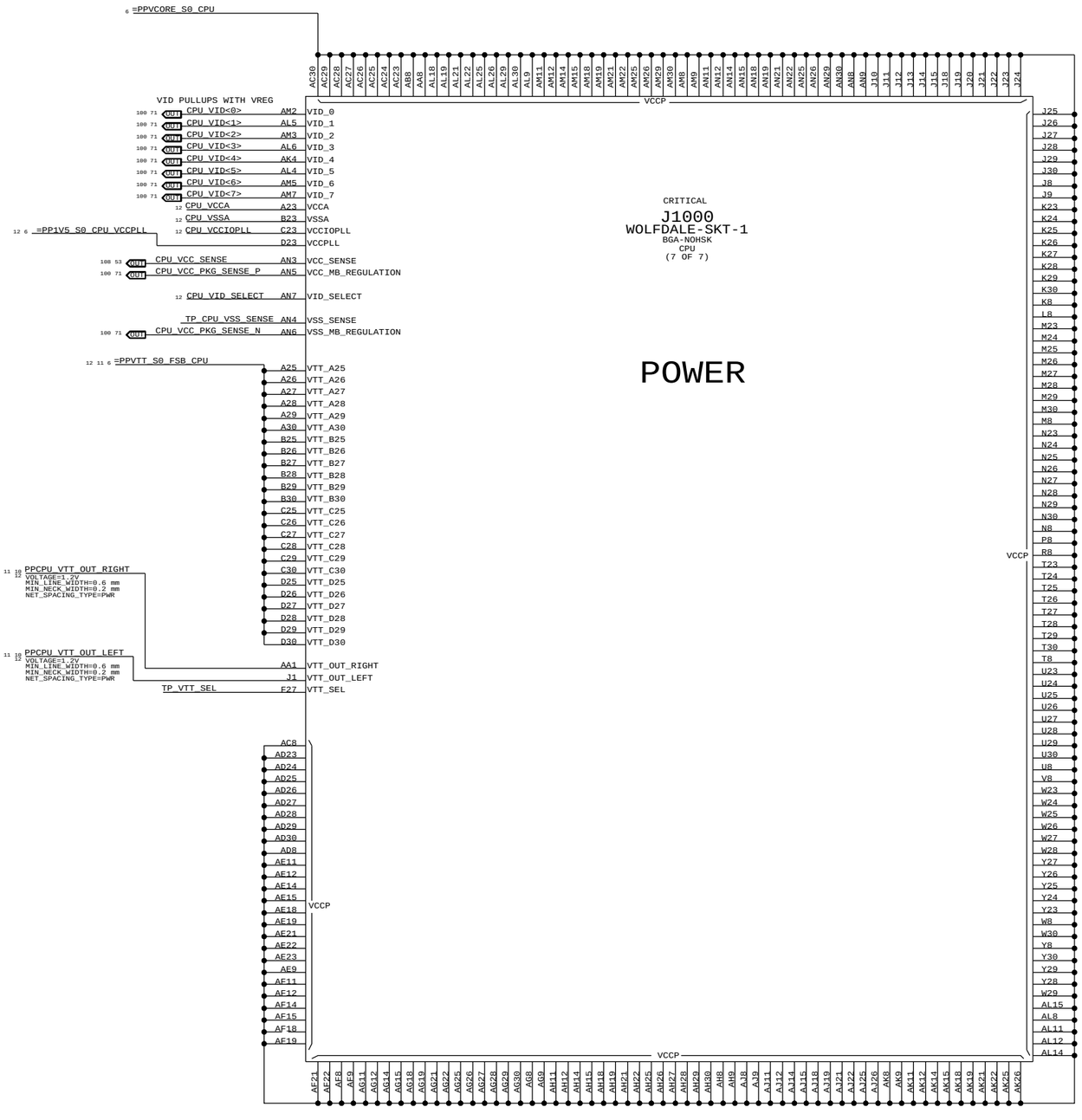
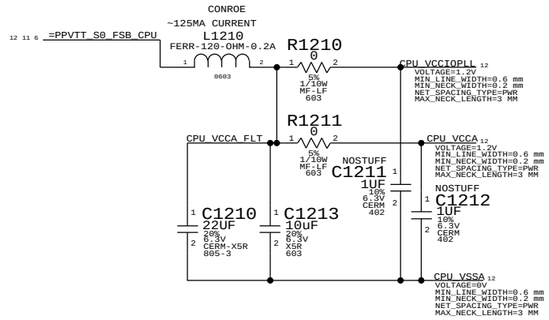
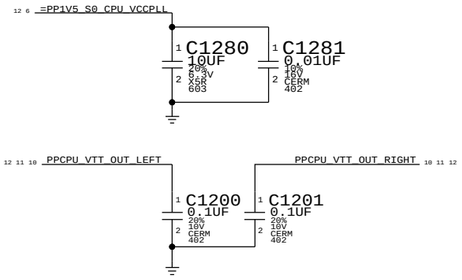


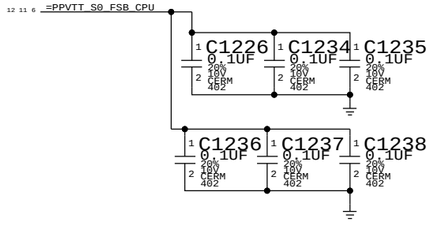
THIS IS FOR OLDER CPU SUPPORT
WILL PLACE FILTER BUT NOT CONNECT FOR WOLFDALE



VCC PLL DECOUPLING

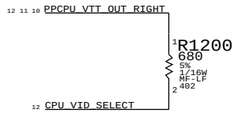


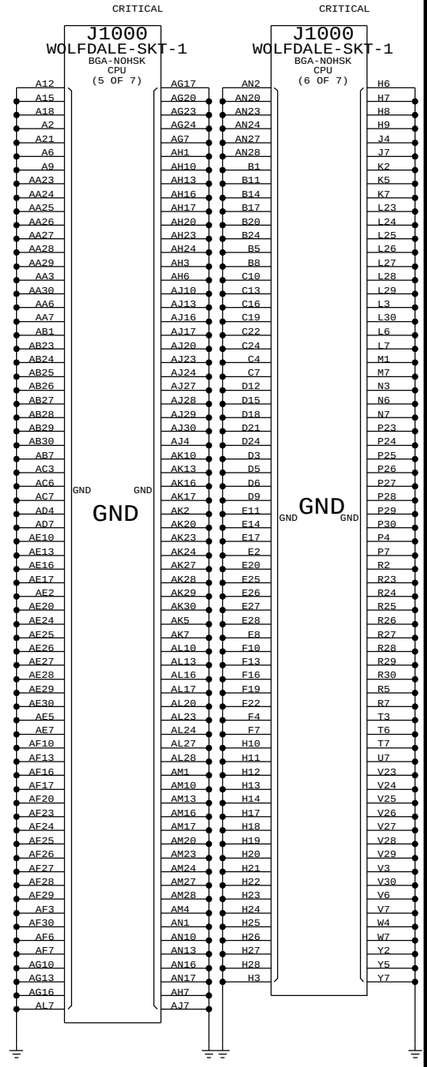
FSB VTT DECOUPLING



VCCP CORE DECOUPLING

(SEE VREG PAGE)





SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE

CPU POWER, GND, DECAPS

Apple Inc.

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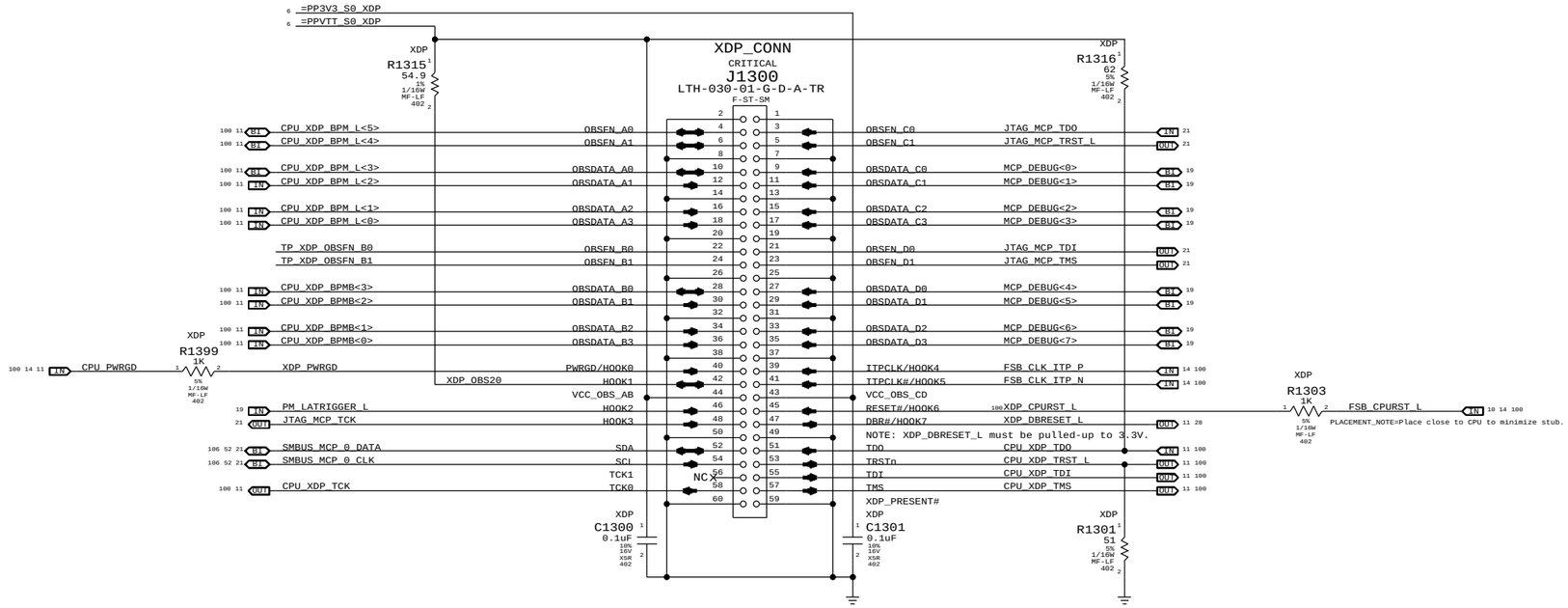
MCP79-specific pinout



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PAGE TITLE

eXtended Debug Port (XDP)

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SHEET

OMIT

U1400
MCP7A
BGA
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FSB

FSB_DSTB_L_P<0>	T40	CPU_DSTBP0*	
FSB_DSTB_L_N<0>	U40	CPU_DSTBN0*	
FSB_DINV_L<0>	V41	CPU_DBI0*	
FSB_DSTB_L_P<1>	W39	CPU_DSTBP1*	
FSB_DSTB_L_N<1>	W37	CPU_DSTBN1*	
FSB_DINV_L<1>	V35	CPU_DBI1*	
FSB_DSTB_L_P<2>	N37	CPU_DSTBP2*	
FSB_DSTB_L_N<2>	L36	CPU_DSTBN2*	
FSB_DINV_L<2>	N35	CPU_DBI2*	
FSB_DSTB_L_P<3>	M39	CPU_DSTBP3*	
FSB_DSTB_L_N<3>	M41	CPU_DSTBN3*	
FSB_DINV_L<3>	J41	CPU_DBI3*	
FSB_A_L<3>	AB35	CPU_A3*	
FSB_A_L<4>	AE37	CPU_A4*	
FSB_A_L<5>	AC33	CPU_A5*	
FSB_A_L<6>	AC35	CPU_A6*	
FSB_A_L<7>	AC34	CPU_A7*	
FSB_A_L<8>	AE35	CPU_A8*	
FSB_A_L<9>	AE34	CPU_A9*	
FSB_A_L<10>	AG39	CPU_A10*	
FSB_A_L<11>	AE33	CPU_A11*	
FSB_A_L<12>	AG38	CPU_A12*	
FSB_A_L<13>	AG37	CPU_A13*	
FSB_A_L<14>	AF35	CPU_A14*	
FSB_A_L<15>	AG35	CPU_A15*	
FSB_A_L<16>	AG34	CPU_A16*	
FSB_A_L<17>	AJ34	CPU_A17*	
FSB_A_L<18>	AG33	CPU_A18*	
FSB_A_L<19>	AJ38	CPU_A19*	
FSB_A_L<20>	AJ37	CPU_A20*	
FSB_A_L<21>	AJ35	CPU_A21*	
FSB_A_L<22>	AL37	CPU_A22*	
FSB_A_L<23>	AJ36	CPU_A23*	
FSB_A_L<24>	AL39	CPU_A24*	
FSB_A_L<25>	AL38	CPU_A25*	
FSB_A_L<26>	AJ33	CPU_A26*	
FSB_A_L<27>	AL35	CPU_A27*	
FSB_A_L<28>	AL34	CPU_A28*	
FSB_A_L<29>	AN37	CPU_A29*	
FSB_A_L<30>	AL33	CPU_A30*	
FSB_A_L<31>	AN38	CPU_A31*	
FSB_A_L<32>	AN35	CPU_A32*	
FSB_A_L<33>	AN36	CPU_A33*	
FSB_A_L<34>	AR39	CPU_A34*	
FSB_A_L<35>	AN34	CPU_A35*	
FSB_ADSTB_L<0>	AE36	CPU_ADSTB0*	
FSB_ADSTB_L<1>	AK35	CPU_ADSTB1*	
FSB_REQ_L<0>	AC38	CPU_REQ0*	
FSB_REQ_L<1>	AA33	CPU_REQ1*	
FSB_REQ_L<2>	AE38	CPU_REQ2*	
FSB_REQ_L<3>	AC37	CPU_REQ3*	
FSB_REQ_L<4>	AC39	CPU_REQ4*	
FSB_ADS_L	AD42	CPU_ADS*	
FSB_BNR_L	AD43	CPU_BNR*	
FSB_BREQ0_L	AE40	CPU_BR0*	
FSB_BREQ1_L	AL32	CPU_BR1*	
FSB_DBSY_L	AD39	CPU_DBSY*	
FSB_DRDY_L	AD41	CPU_DRDY*	
FSB_HIT_L	AB42	CPU_HIT*	
FSB_HITM_L	AD40	CPU_HITM*	
FSB_LOCK_L	AC43	CPU_LOCK*	
FSB_TRDY_L	AE41	CPU_TRDY*	
CPU_PECI_MCP	E41	CPU_PECI	
CPU_PROCHOT_L	AJ41	CPU_PROCHOT*	
	AG43	CPU_THERMTRIP*	
CPU_FERR_L	AH40	CPU_FERR*	
	F42	CPU_BSEL2	
	D42	CPU_BSEL1	
	F41	CPU_BSEL0	
FSB_RS_L<0>	AC41	CPU_RS0*	
FSB_RS_L<1>	AB41	CPU_RS1*	
FSB_RS_L<2>	AC42	CPU_RS2*	
PP1V05_S0_MCP_PLL_FSB			
270 mA (A01)			
206 mA	AG27	V1P1_DLLDLCELL_AVDD	
20 mA	AH27	V1P1_PLL_MCLK	
29 mA	AG28	V1P1_PLL_FSB	
15 mA	AH28	V1P1_PLL_CPU	
MCP_BCLK_VML_COMP_VDD	AM39	BCLK_VML_COMP_VDD	
MCP_BCLK_VML_COMP_GND	AM40	BCLK_VML_COMP_GND	
MCP_CPU_COMP_VCC	AM43	CPU_COMP_VCC	
MCP_CPU_COMP_GND	AM42	CPU_COMP_GND	

CPU_D0*	Y41	FSB_D_L<0>	
CPU_D1*	Y43	FSB_D_L<1>	
CPU_D2*	Y40	FSB_D_L<2>	
CPU_D3*	W42	FSB_D_L<3>	
CPU_D4*	Y42	FSB_D_L<4>	
CPU_D5*	Y39	FSB_D_L<5>	
CPU_D6*	V42	FSB_D_L<6>	
CPU_D7*	W41	FSB_D_L<7>	
CPU_D8*	T41	FSB_D_L<8>	
CPU_D9*	T43	FSB_D_L<9>	
CPU_D10*	T42	FSB_D_L<10>	
CPU_D11*	T39	FSB_D_L<11>	
CPU_D12*	U41	FSB_D_L<12>	
CPU_D13*	R41	FSB_D_L<13>	
CPU_D14*	P42	FSB_D_L<14>	
CPU_D15*	R42	FSB_D_L<15>	
CPU_D16*	AA38	FSB_D_L<16>	
CPU_D17*	AA35	FSB_D_L<17>	
CPU_D18*	AA36	FSB_D_L<18>	
CPU_D19*	AA37	FSB_D_L<19>	
CPU_D20*	AA34	FSB_D_L<20>	
CPU_D21*	W33	FSB_D_L<21>	
CPU_D22*	W34	FSB_D_L<22>	
CPU_D23*	W35	FSB_D_L<23>	
CPU_D24*	W38	FSB_D_L<24>	
CPU_D25*	U33	FSB_D_L<25>	
CPU_D26*	U34	FSB_D_L<26>	
CPU_D27*	U35	FSB_D_L<27>	
CPU_D28*	U36	FSB_D_L<28>	
CPU_D29*	U37	FSB_D_L<29>	
CPU_D30*	R33	FSB_D_L<30>	
CPU_D31*	U38	FSB_D_L<31>	
CPU_D32*	R35	FSB_D_L<32>	
CPU_D33*	R34	FSB_D_L<33>	
CPU_D34*	P35	FSB_D_L<34>	
CPU_D35*	N34	FSB_D_L<35>	
CPU_D36*	R38	FSB_D_L<36>	
CPU_D37*	R37	FSB_D_L<37>	
CPU_D38*	N33	FSB_D_L<38>	
CPU_D39*	R39	FSB_D_L<39>	
CPU_D40*	N36	FSB_D_L<40>	
CPU_D41*	N38	FSB_D_L<41>	
CPU_D42*	L37	FSB_D_L<42>	
CPU_D43*	L38	FSB_D_L<43>	
CPU_D44*	L39	FSB_D_L<44>	
CPU_D45*	J37	FSB_D_L<45>	
CPU_D46*	J38	FSB_D_L<46>	
CPU_D47*	J39	FSB_D_L<47>	
CPU_D48*	H40	FSB_D_L<48>	
CPU_D49*	L42	FSB_D_L<49>	
CPU_D50*	P41	FSB_D_L<50>	
CPU_D51*	M40	FSB_D_L<51>	
CPU_D52*	N40	FSB_D_L<52>	
CPU_D53*	N41	FSB_D_L<53>	
CPU_D54*	K42	FSB_D_L<54>	
CPU_D55*	M42	FSB_D_L<55>	
CPU_D56*	M43	FSB_D_L<56>	
CPU_D57*	L41	FSB_D_L<57>	
CPU_D58*	H42	FSB_D_L<58>	
CPU_D59*	H41	FSB_D_L<59>	
CPU_D60*	J40	FSB_D_L<60>	
CPU_D61*	K41	FSB_D_L<61>	
CPU_D62*	H43	FSB_D_L<62>	
CPU_D63*	H39	FSB_D_L<63>	
CPU_BPRI*	AA41	FSB_BPRI_L	
CPU_DEFER*	AA40	FSB_DEFER_L	
BCLK_OUT_CPU_P	G42	FSB_CLK_CPU_P	
BCLK_OUT_CPU_N	G41	FSB_CLK_CPU_N	
BCLK_OUT_ITP_P	AL43	FSB_CLK_ITP_P	
BCLK_OUT_ITP_N	AL42	FSB_CLK_ITP_N	
BCLK_OUT_NB_P	AL41	FSB_CLK_MCP_P	
BCLK_OUT_NB_N	AK42	FSB_CLK_MCP_N	
BCLK_IN_N	AK41		
BCLK_IN_P	AJ40		
CPU_A20M*	AF41	CPU_A20M_L	
CPU_IGNNE*	AH39	CPU_IGNNE_L	
CPU_INIT*	AH42	CPU_INIT_L	
CPU_INTR	AF42	CPU_INTR	
CPU_NMI	AG41	CPU_NMI	
CPU_SMI*	AH41	CPU_SMI_L	
CPU_PWRGD	AH43	CPU_PWRGD	
CPU_RESET*	H38	FSB_CPURST_L	
CPU_SLP*	AM33	FSB_CPUSLP_L	
CPU_DPSLP*	AN33	CPU_DPSLP_L	
CPU_DPWR*	AM32	NC	
CPU_STPCLK*	AG42	CPU_STPCLK_L	
CPU_DPRSTP*	AN32	CPU_DPRSTP_L	

=PP1V05_S0_MCP_FSB

R1410 62 5% 1/16W MF-LF 402

R1416 62 5% 1/16W MF-LF 402

PM_THRMTRIP_L

R1420 470 5% 1/16W MF-LF 402

R1421 470 5% 1/16W MF-LF 402

R1422 470 5% 1/16W MF-LF 402

CPU_BSEL<2>
CPU_BSEL<1>
CPU_BSEL<0>

R1430 49.9 1% 1/16W MF-LF 402

R1435 49.9 1% 1/16W MF-LF 402

R1431 49.9 1% 1/16W MF-LF 402

R1436 49.9 1% 1/16W MF-LF 402

Loop-back clock for delay matching.

=PP1V05_S0_MCP_FSB
NO STUFF
R1440 150 5% 1/16W MF-LF 402

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SYNC_MASTER=K22 SYNC_DATE=09/02/2005

PAGE TITLE: MCP CPU Interface

Apple Inc.

DRAWING NUMBER: 051-7863 SIZE: D
REVISION: A.0.0
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PAGE: 14 OF 110
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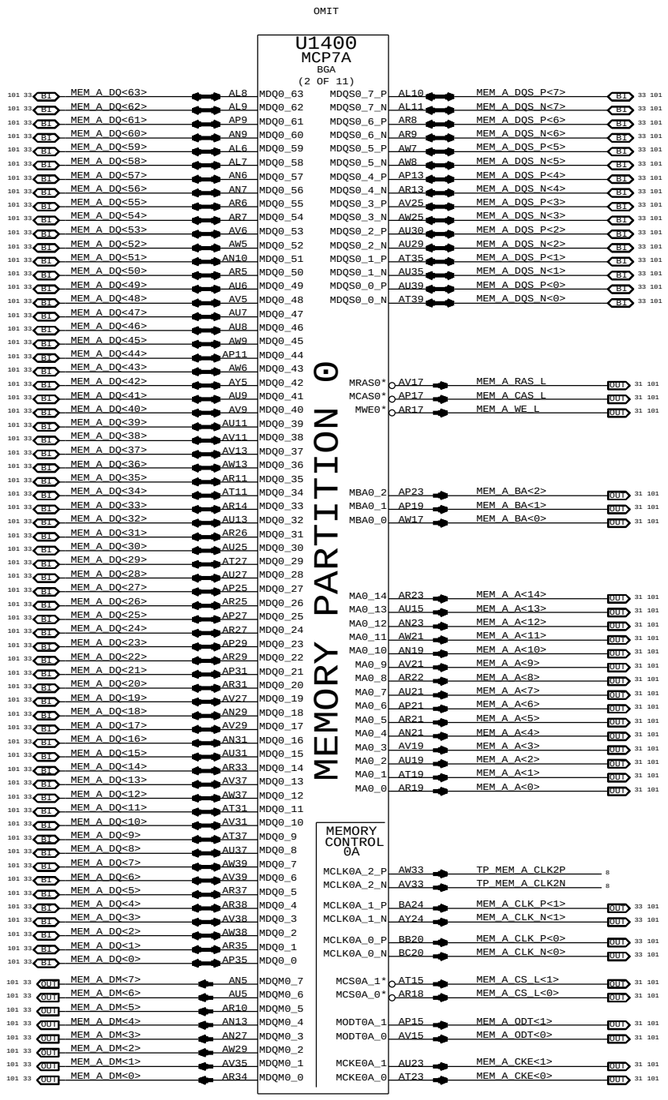

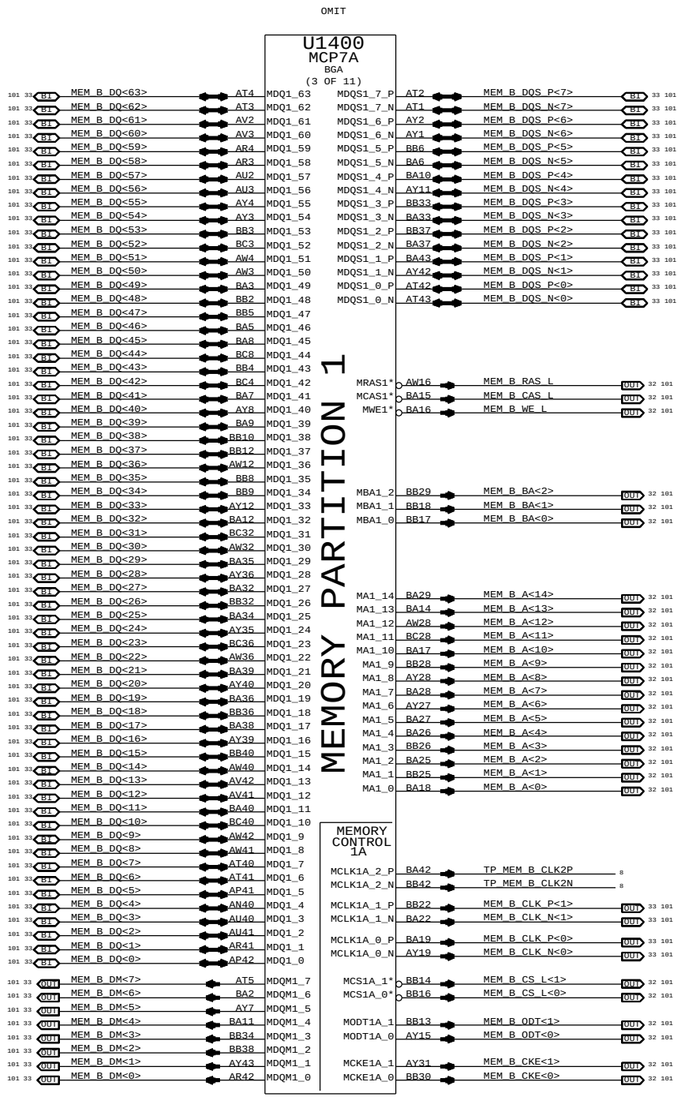

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE
MCP Memory Interface

Apple Inc.

DRAWING NUMBER 051-7863 SIZE D

REVISION A.0.0

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SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

OMIT

U1400
MCP7A
BGA
(4 OF 11)

MEMORY CONTROL 0B

8 TP_MEM_A_CLK5P	AU33	MCLK0B_2_P	
8 TP_MEM_A_CLK5N	AU34	MCLK0B_2_N	
101 33 MEM_A_CLK_P<4>	BB24	MCLK0B_1_P	
101 33 MEM_A_CLK_N<4>	BC24	MCLK0B_1_N	
101 33 MEM_A_CLK_P<3>	BA21	MCLK0B_0_P	
101 33 MEM_A_CLK_N<3>	BB21	MCLK0B_0_N	
101 31 MEM_A_CS_L<2>	AU17	MCS0B_0*	
101 31 MEM_A_CS_L<3>	AR15	MCS0B_1*	
101 31 MEM_A_ODT<2>	AN17	MODT0B_0	
101 31 MEM_A_ODT<3>	AN15	MODT0B_1	
101 31 MEM_A_CKE<2>	AV23	MCKE0B_0	
101 31 MEM_A_CKE<3>	AN25	MCKE0B_1	

MEMORY CONTROL 1B

MCLK1B_2_P	BA41	TP_MEM_B_CLK5P	8
MCLK1B_2_N	BB41	TP_MEM_B_CLK5N	8
MCLK1B_1_P	AY23	MEM_B_CLK_P<4>	33 101
MCLK1B_1_N	BA23	MEM_B_CLK_N<4>	33 101
MCLK1B_0_P	BA20	MEM_B_CLK_P<3>	33 101
MCLK1B_0_N	AY20	MEM_B_CLK_N<3>	33 101
MCS1B_0*	BC16	MEM_B_CS_L<2>	32 101
MCS1B_1*	BA13	MEM_B_CS_L<3>	32 101
MODT1B_0	AY16	MEM_B_ODT<2>	32 101
MODT1B_1	BC13	MEM_B_ODT<3>	32 101
MCKE1B_0	BA30	MEM_B_CKE<2>	32 101
MCKE1B_1	BA31	MEM_B_CKE<3>	32 101

25 PP1V05_S0_MCP_PLL_CORE
87 mA (A01)

17 mA	T28	V1P1_PLL_V
12 mA	U28	V1P1_PLL_DP
19 mA	U27	V1P1_PLL_CORE
39 mA	T27	V1P1_PLL_XREF_XS

MRESET0* AY32 — MCP_MEM_RESET_L → ODT 33
TP or NC for DDR2.

30 25 16 6 =PP1V8R1V5_S0_MCP_MEM

R1610[1] 40.2 1% 1/16W MF-LF 402 [2]

R1611[1] 40.2 1% 1/16W MF-LF 402 [2]

101 MCP_MEM_COMP_GND — AM41 MEM_COMP_GND
101 MCP_MEM_COMP_VDD — AN41 MEM_COMP_1P8V

=PP1V8R1V5_S0_MCP_MEM 6 16 25 30
4771 mA (A01, DDR3)

	AM17	
	AN20	
	AN24	
	AT17	
	AP16	
	AN22	
	AP20	
	AP24	
	AV16	
	AR16	
	AR20	
	AM19	
	AR24	
	AW15	
	AP22	
	AP18	
	AU16	
	AN18	
	AU24	
	AT21	
	AY29	
V1P8_MEM_VDDP	AV24	
	AM21	
	AU20	
	AU22	
	AW27	
	BC17	
	AV20	
	AY17	
	AY18	
	AM15	
	AU18	
	AY25	
	AM23	
	AY26	
	AW19	
	AW24	
	BC25	
	AL30	
	AM31	
	AM25	
	AM27	
	AM29	
	AN16	
	BC29	

	AA22	
	AP12	
	G30	
	P10	
	T10	
	T6	
	V10	
	V34	
	W5	
	AA39	
	AB22	
	AB7	
	AD22	
	AE20	
	AF24	
	AG24	
	AH35	
	AK7	
	AM28	
	AT25	
GND	AP30	
	AR36	
	AU10	
	F28	
	BC21	
	AY9	
	BC9	
	D34	
	F24	
	G32	
	H31	
	K7	
	M38	
	M5	
	M6	
	M7	
	M9	
	N39	
	N8	
	P33	
	P34	
	P37	
	P4	
	P40	
	P7	
	R36	
	R40	
	R43	
	R5	
	T18	
	T20	
	AK11	
	T24	
	T26	

	T33	
	T34	
	T35	
	T37	
GND	T38	
	T7	
	T9	
	U18	
	U20	
	U22	

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PAGE TITLE
MCP MEMORY CNTRL & MISC

Apple Inc.

DRAWING NUMBER 051-7863 SIZE D
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PAGE 16 OF 110
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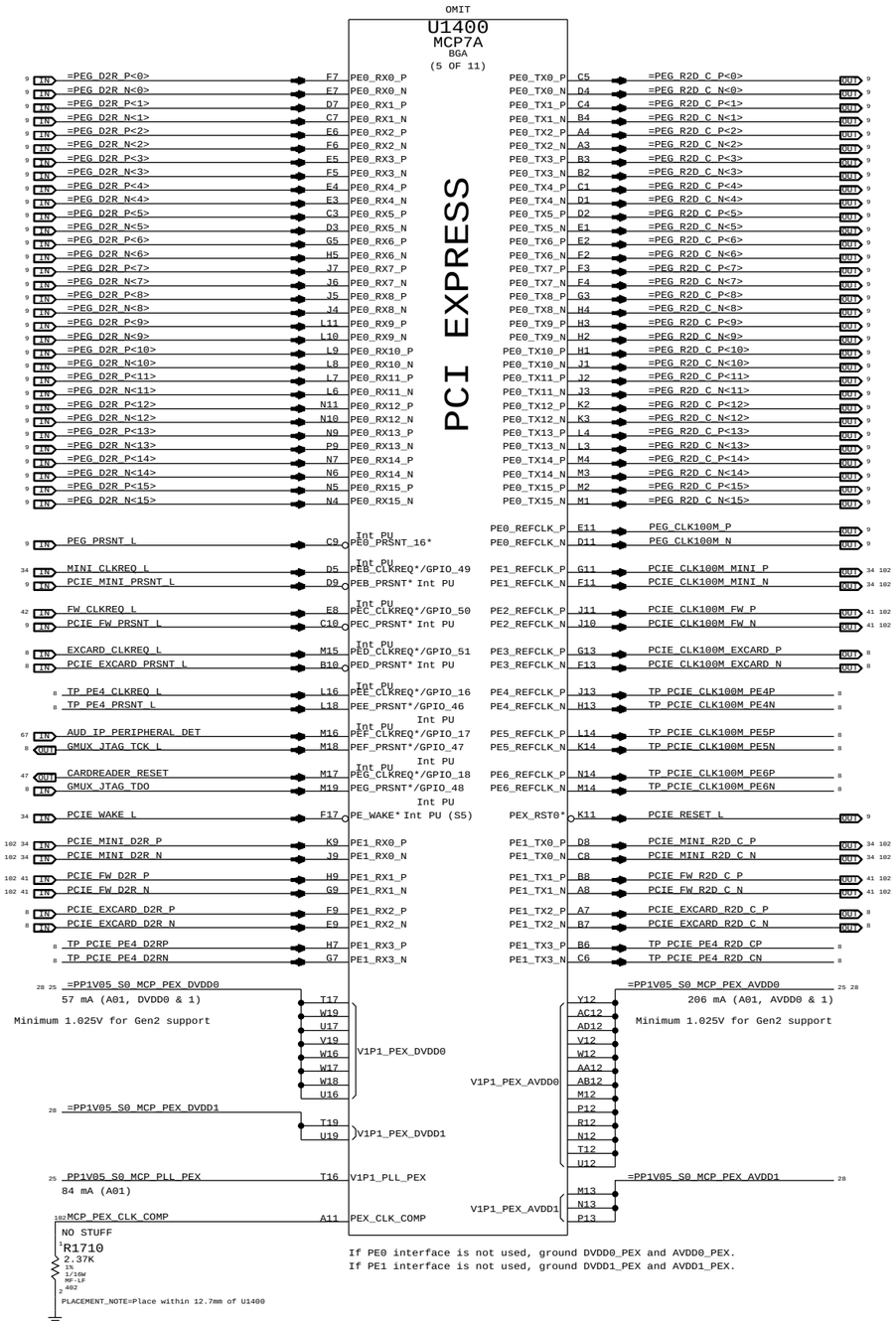

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE
MCP PCIe Interfaces

Apple Inc.

DRAWING NUMBER 051-7863 SIZE D

REVISION A.0.0

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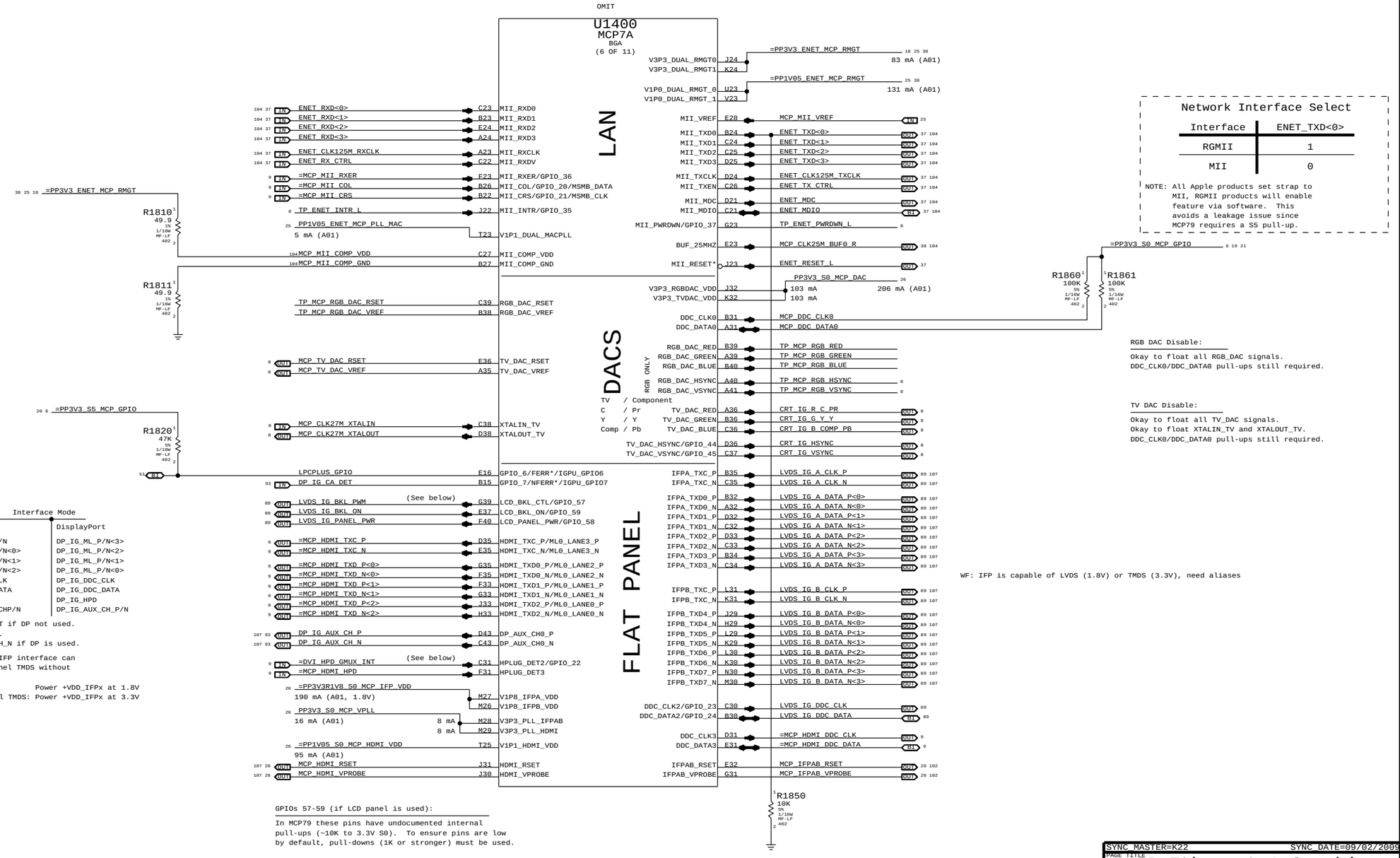

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PAGE TITLE: MCP Ethernet & Graphics

Apple Inc.

DRAWING NUMBER: 051-7863 SIZE: D

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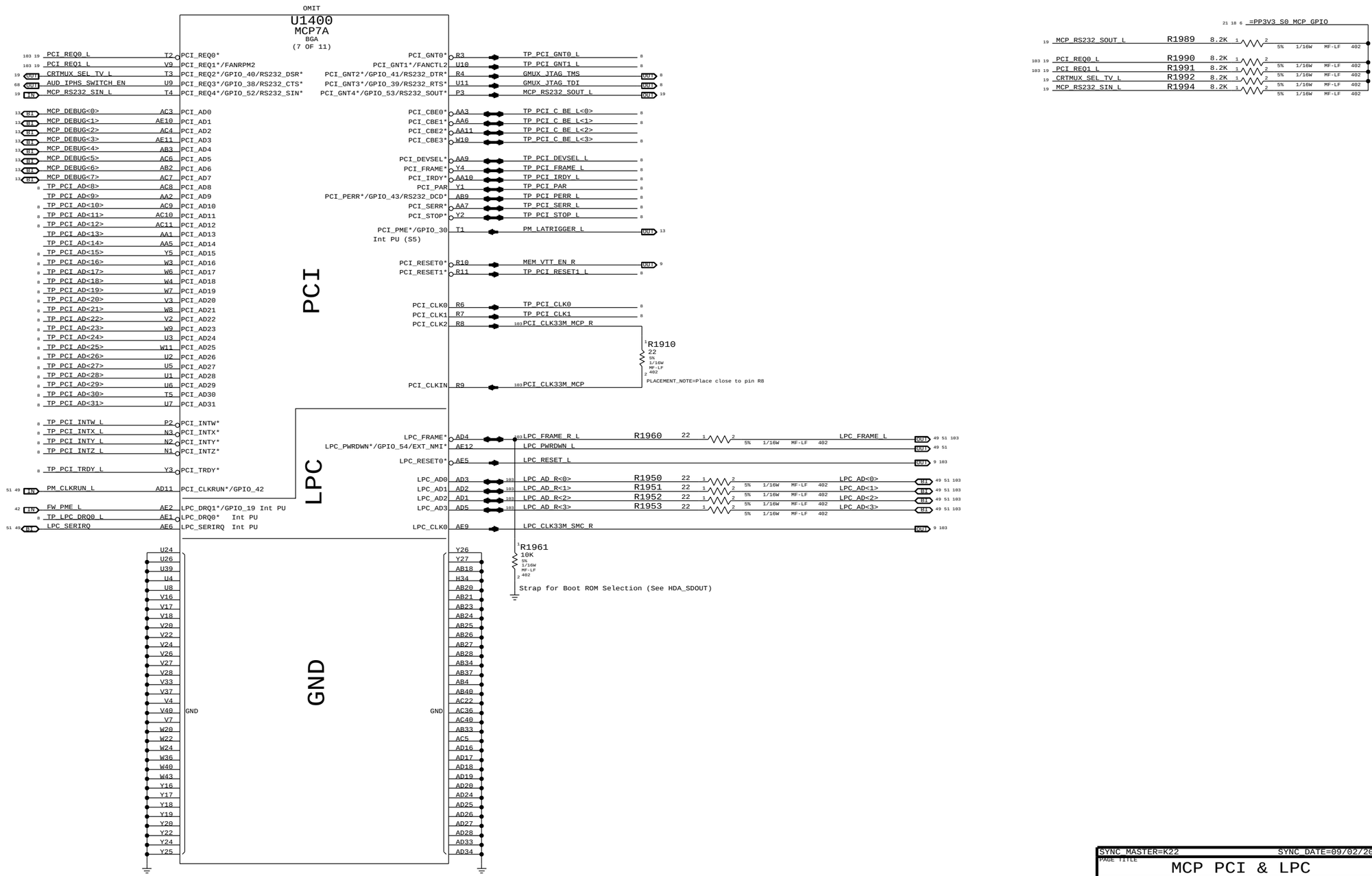

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PAGE TITLE

MCP PCI & LPC

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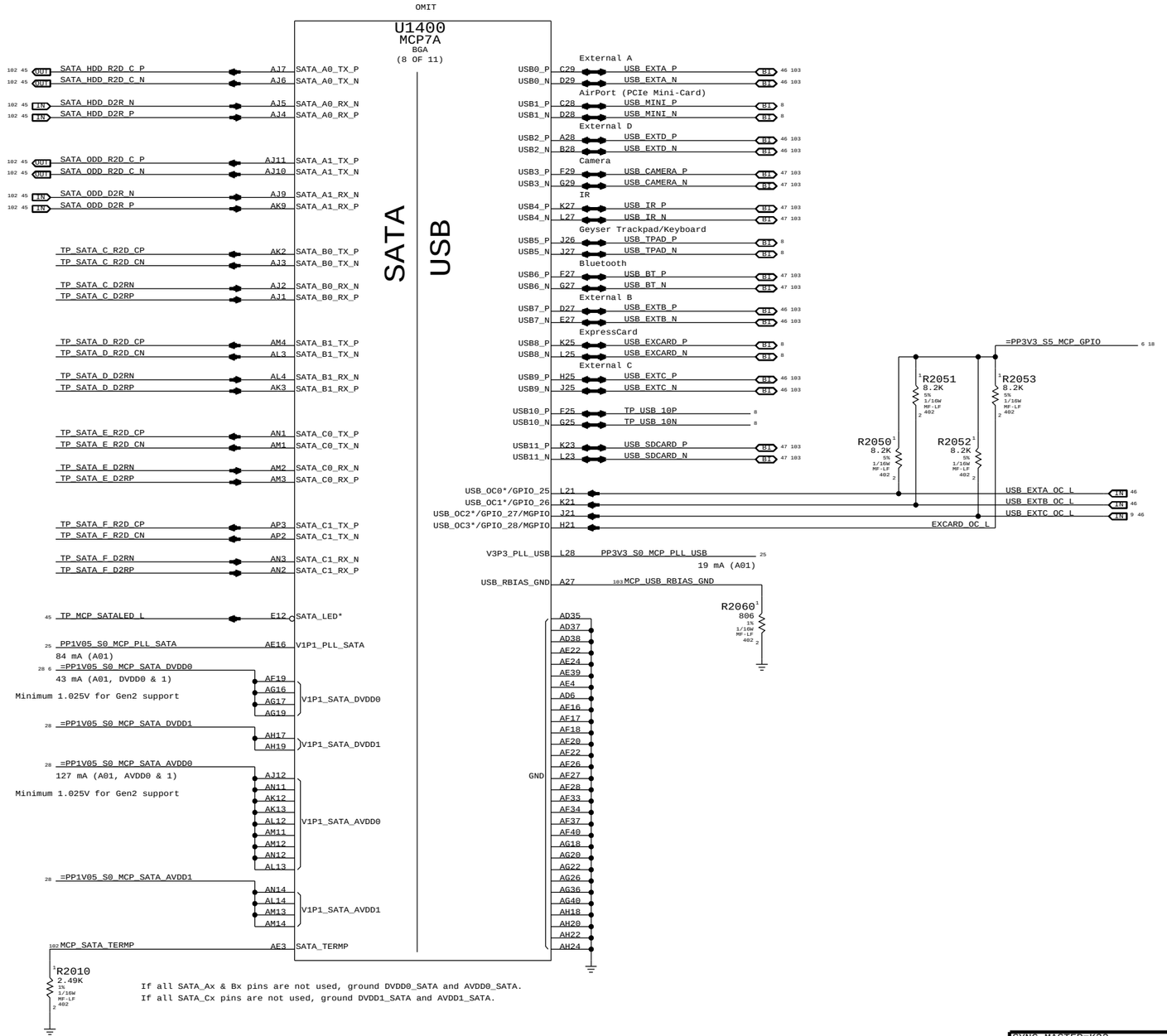

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Apple Inc.	DRAWING NUMBER 051-7863 · SIZE D
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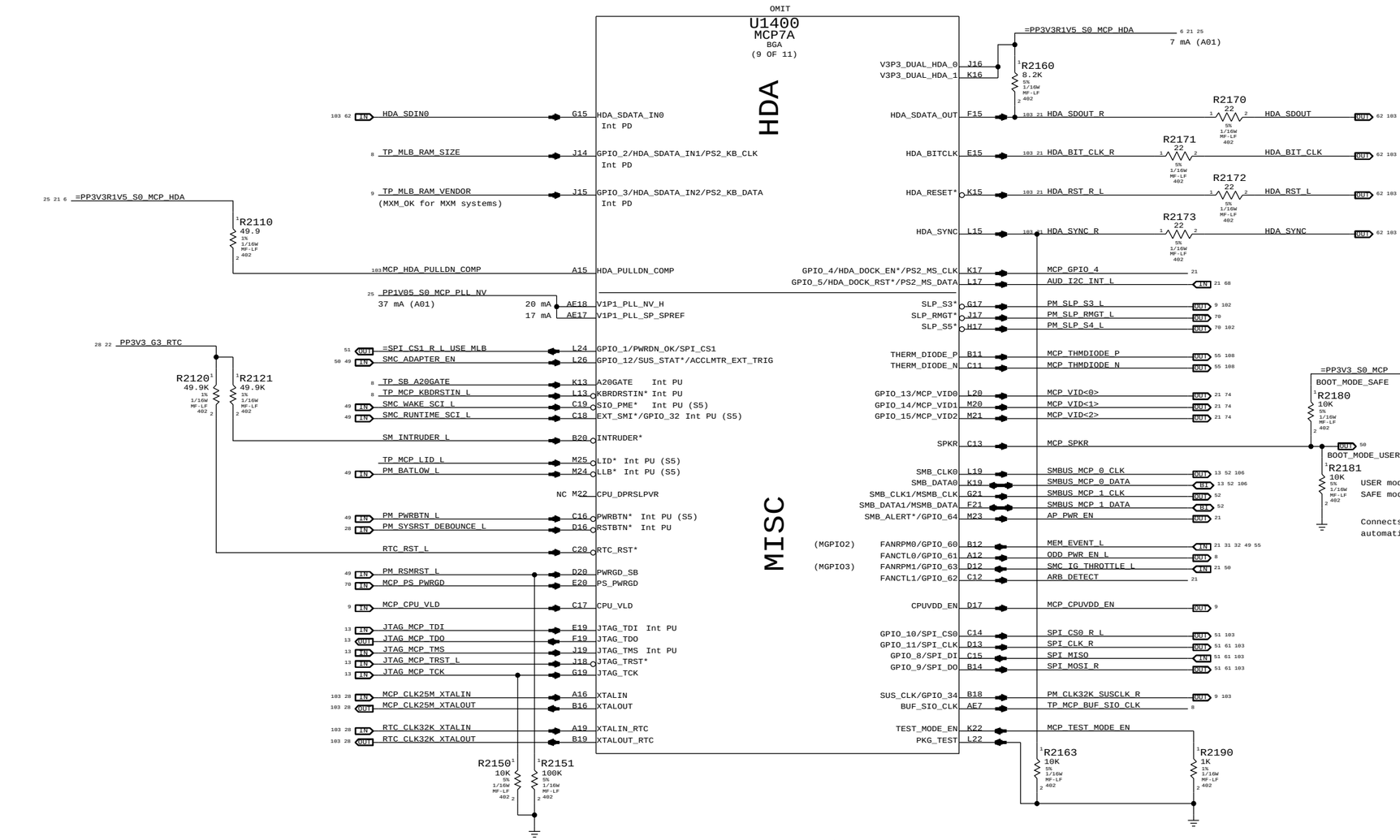
OMIT
U1400
MCP7A
BGA
(9 OF 11)
HDA
MISC
HDA_SDIN0
TP_MLB_RAM_SIZE
TP_MLB_RAM_VENDOR
(MXM_OK for MXM systems)
=PP3V3R1V5_S0_MCP_HDA
R2110 49.9
MCP_HDA_PULLDN_COMP
PP1V05_S0_MCP_PLL_NV
37 mA (A01)
PP3V3_G3_RTC
R2120 49.9K
R2121 49.9K
=SPI_CS1_R_L_USE_MLB
SMC_ADAPTER_EN
TP_SB_A20GATE
TP_MCP_KBDRSTIN_L
SMC_WAKE_SCI_L
SMC_RUNTIME_SCI_L
SM_INTRUDER_L
TP_MCP_LID_L
PM_BATLOW_L
PM_PWRBTN_L
PM_SYSRST_DEBOUNCE_L
RTC_RST_L
PM_RSMRST_L
MCP_PS_PWRGD
MCP_CPU_VLD
JTAG_MCP_TDI
JTAG_MCP_TDO
JTAG_MCP_TMS
JTAG_MCP_TRST_L
JTAG_MCP_TCK
MCP_CLK25M_XTALIN
MCP_CLK25M_XTALOUT
RTC_CLK32K_XTALIN
RTC_CLK32K_XTALOUT
R2150 10K
R2151 100K
G15 HDA_SDATA_IN0 Int PD
J14 GPIO_2/HDA_SDATA_IN1/PS2_KB_CLK Int PD
J15 GPIO_3/HDA_SDATA_IN2/PS2_KB_DATA Int PD
A15 HDA_PULLDN_COMP
AE18 V1P1_PLL_NV_H 20 mA
AE17 V1P1_PLL_SP_SPREF 17 mA
L24 GPIO_1/PWRDN_OK/SPI_CS1
L26 GPIO_12/SUS_STAT*/ACCLMTR_EXT_TRIG
K13 A20GATE Int PU
L13 KBRDRSTIN* Int PU
C19 SIO_PME* Int PU (S5)
C18 EXT_SMI*/GPIO_32 Int PU (S5)
B20 INTRUDER*
M25 LID* Int PU (S5)
M24 LLB* Int PU (S5)
NC M22 CPU_DPRSLPVR
C16 PWRBTN* Int PU (S5)
D16 RSTBTN* Int PU
C20 RTC_RST*
D20 PWRGD_SB
E20 PS_PWRGD
C17 CPU_VLD
E19 JTAG_TDI Int PU
F19 JTAG_TDO
J19 JTAG_TMS Int PU
J18 JTAG_TRST*
G19 JTAG_TCK
A16 XTALIN
B16 XTALOUT
A19 XTALIN_RTC
B19 XTALOUT_RTC
=PP3V3R1V5_S0_MCP_HDA
7 mA (A01)
R2160 8.2K
V3P3_DUAL_HDA_0 J16
V3P3_DUAL_HDA_1 K16
HDA_SDATA_OUT F15
HDA_BITCLK E15
HDA_RESET* K15
HDA_SYNC L15
R2170 22
R2171 22
R2172 22
R2173 22
HDA_SDOUT_R
HDA_BIT_CLK_R
HDA_RST_R_L
HDA_SYNC_R
HDA_SDOUT
HDA_BIT_CLK
HDA_RST_L
HDA_SYNC
GPIO_4/HDA_DOCK_EN*/PS2_MS_CLK K17
GPIO_5/HDA_DOCK_RST*/PS2_MS_DATA L17
MCP_GPIO_4
AUD_I2C_INT_L
SLP_S3* G17
SLP_RMGT* J17
SLP_S5* H17
PM_SLP_S3_L
PM_SLP_RMGT_L
PM_SLP_S4_L
THERM_DIODE_P B11
THERM_DIODE_N C11
MCP_THMDIODE_P
MCP_THMDIODE_N
GPIO_13/MCP_VID0 L20
GPIO_14/MCP_VID1 M20
GPIO_15/MCP_VID2 M21
MCP_VID<0>
MCP_VID<1>
MCP_VID<2>
SPKR C13
MCP_SPKR
SMB_CLK0 L19
SMB_DATA0 K19
SMB_CLK1/MSMB_CLK G21
SMB_DATA1/MSMB_DATA F21
SMB_ALERT*/GPIO_64 M23
SMBUS_MCP_0_CLK
SMBUS_MCP_0_DATA
SMBUS_MCP_1_CLK
SMBUS_MCP_1_DATA
AP_PWR_EN
(MGPIO2) FANRPM0/GPIO_60 B12
FANCTL0/GPIO_61 A12
(MGPIO3) FANRPM1/GPIO_63 D12
FANCTL1/GPIO_62 C12
MEM_EVENT_L
ODD_PWR_EN_L
SMC_IG_THROTTLE_L
ARB_DETECT
CPUVDD_EN D17
MCP_CPUVDD_EN
GPIO_10/SPI_CS0 C14
GPIO_11/SPI_CLK D13
GPIO_8/SPI_DI C15
GPIO_9/SPI_DO B14
SPI_CS0_R_L
SPI_CLK_R
SPI_MISO
SPI_MOSI_R
SUS_CLK/GPIO_34 B18
BUF_SIO_CLK AE7
PM_CLK32K_SUSCLK_R
TP_MCP_BUF_SIO_CLK
TEST_MODE_EN K22
PKG_TEST L22
MCP_TEST_MODE_EN
R2163 10K
R2190 1K
=PP3V3_S0_MCP
BOOT_MODE_SAFE
R2180 10K
BOOT_MODE_USER
R2181 10K
USER mode: Normal
SAFE mode: For ROMSIP recovery
Connects to SMC for automatic recovery.
BIOS Boot Select
I/F | HDA_SDOUT | LPC_FRAME#
LPC | 0 | 0
PCI | 0 | 1
SPI0 | 1 | 0
SPI1 | 1 | 1
SPI0 = SPI_CS0_L, SPI1 = SPI_CS1_L
R1961 and R2160 selects SPI0 ROM by default, LPC+ debug card pulls LPC_FRAME# high for SPI1 ROM override.
NOTE: MCP79 does not support FWH, only LPC ROMs. So Apple designs will not use LPC for BootROM override.
NOTE: MCP79 rev A01 does not support SPI1 option. Rev B01 will.
BUF_SIO_CLK Frequency
Frequency | HDA_SYNC
24 MHz | 1
14.31818 MHz | 0
SPI Frequency Select
Frequency | SPI_DO | SPI_CLK
31 MHz | 0 | 0
42 MHz | 0 | 1
25 MHz | 1 | 0
1 MHz | 1 | 1
NOTE: Straps not provided on this page.
HDA Output Caps
For EMI Reduction on HDA interface
HDA_SDOUT_R
HDA_BIT_CLK_R
HDA_RST_R_L
HDA_SYNC_R
C2170 10PF
C2172 10PF
C2171 10PF
C2173 10PF
=PP3V3_S0_MCP_GPIO
R2140 10K
R2141 10K
R2142 10K
R2143 10K
MCP_GPIO_4
AUD_I2C_INT_L
MEM_EVENT_L
SMC_IG_THROTTLE_L
ARB_DETECT
R2147 100K
=PP3V3_S3_MCP_GPIO
R2154 100K
AP_PWR_EN
R2155 22K
R2156 22K
R2157 22K
MCP_VID<0>
MCP_VID<1>
MCP_VID<2>
SYNC_MASTER=K22
SYNC_DATE=09/02/2009
PAGE TITLE
MCP HDA & MISC
Apple Inc.
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U1400 MCP7A BGA (11 OF 11)

AH26		AV40	
AH33		BA1	
AH34		BA4	
AH37		AW31	
AH38		AY6	
AJ39		L35	
AJ8		BC33	
AK10		BC37	
AK33		BC41	
AK34		AY14	
AK37		BC5	
AK4		C2	
AK40		D10	
AL36		D14	
AL40		D15	
AL5		D18	
AM10		D19	
AM16		D22	
AM18		D23	
AM20		D26	
AM22		D30	
AM24		D37	
AM26		D6	
AM30		E13	
AM34		E17	
AM35		E21	
AM37		E25	
AM38		E29	
AM5		E33	
AM6		F12	
AM7		F16	
AM9		F32	
AP26		F8	
AN28		G10	
AN30		G12	
AN39		G14	
AN4		G16	
Y7		BC12	
AP10		G22	
AU26		G24	
AP14		AW20	
AU14		G34	
AP28		G4	
AP32		G43	
AP34		G6	
AP36	GND	G8	GND
AP37		H11	
AP4		H15	
AP40		AW35	
AP7		H23	
AW23		AN8	
AR28		G40	
AR32		J12	
AR40		J8	
AT10		K10	
AR12		K12	
AT13		K18	
AT29		K26	
AT33		K37	
AT6		K4	
AT7		K40	
AT9		K8	
AY21		AU1	
AY22		L40	
L12		L43	
AU12		L5	
AU28		M10	
AP33		M34	
AU32		M35	
AR30		M37	
AU36		Y28	
AU38		Y33	
AU4		Y34	
G28		Y35	
F20		Y37	
AV28		Y38	
AV32		AB17	
AV36		AB16	
AV4		AN26	
AV7		AD7	
AW11		M11	
G20		AA4	
AR43		AB19	
AW43		AY13	
AY10		P11	
AV12		Y6	
AY30		T11	
AY33		V11	
AY34		Y11	
AY37		AH16	
AY38		T22	
AY41			

OMIT

U1400 MCP7A BGA (10 OF 11)

25 6 =PPVCORE_S0_MCP
23065 mA (A01, 1.2V)
16996 mA (A01, 1.0V)

AA25		R32	
AA26		P31	
AA27		AF32	
AA28		AE32	
AC16		AH32	
AC17		AJ32	
AC18		AK31	
AC19		AK32	
AC20		AD32	
AC21		AL31	
AA17		AB32	
AC23		AC32	
AC24		B41	
AC25		B42	
AC26		C40	
AC27		C41	
AC28		C42	
AD21		D39	
AD23		D40	
W27		D41	
V25		E38	
AA18		F39	
U25		E40	
AE19		F37	
AE21		F38	
AE23	V1P2_CPU_VTT	E39	
AE25		G36	
AE26		G37	
AE27		G38	
AE28		H35	
AE10		H37	
AE11		J34	
AA19		J35	
AH12		J36	
AF2		K33	
AE21		K34	
AF23		K35	
AE25		L32	
AF3	V1P0_CORE_VDD	L33	
AF4		L34	
AF7		M31	
AH23		M32	
AF9		M33	
AA20		N31	
AG10		N32	
AG11		P32	
AG12		Y32	
AG21		AA32	
AG23		T32	
AG25		U32	
AG3		V32	
AG4		W32	
AA21			
AG6	V1P2_CPUCLK_VTT	AG32	43 mA
AG7			
AG5			
AG8			
AG9	=PP3V3_S0_MCP 6 21 25		
AH1		AD10	450 mA (A01)
AH10		AE8	
AH11		AB10	
W26		AD9	
AH2	V3P3	Y10	
AA23		AB11	
W28		AA8	
AH25		Y9	
Y21			
AH21	=PP3V3_S5_MCP 6 25		
AH3		G18	266 mA (A01)
AH4	16 mA	H19	
AH5	V3P3_DUAL	J20	
AH6		K20	
AH7			
AH9		G26	
AA24	250 mA	H27	
W21	V3P3_DUAL_USB	J28	
W23		K28	
Y23			
W25	=PP1V05_S5_MCP_VDD_AUXC 6 25		
AF12		T21	105 mA (A01)
AA16	V1P0_VDD_AUXC	U21	
		V21	

28 21 PP3V3_G3_RTC
10 uA (G3)
80 uA (S0)

A20 V3P3_VBAT

=PP1V05_S0_MCP_FSB 6 14 25
1139 mA
1182 mA (A01)

Current numbers from email Poonacha Kongetira provided 11/30/2007 4:04pm (no official document number).

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE
MCP Power & Ground

Apple Inc.

DRAWING NUMBER 051-7863 SIZE D
REVISION A.0.0
BRANCH
PAGE 22 OF 110
SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

8 7 6 5 4 3 2 1

D C B A

SYNC MASTER=K22 SYNC DATE=09/02/2009

PAGE TITLE

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Apple Inc.

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SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

8 7 6 5 4 3 2 1

8 7 6 5 4 3 2 1

D C B A

SYNC MASTER=K22 SYNC DATE=09/02/2009

PAGE TITLE

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Apple Inc.

DRAWING NUMBER 051-7863 SIZE D

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PAGE 24 OF 110

SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

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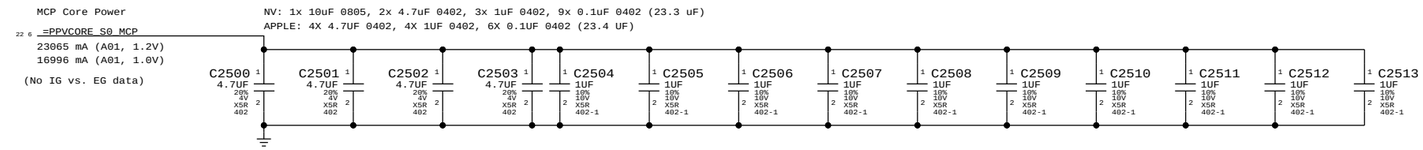
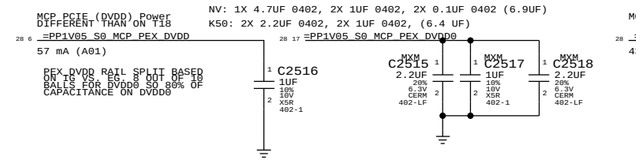
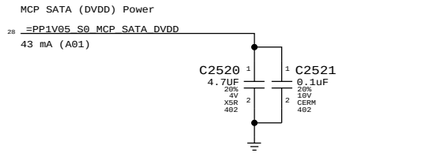
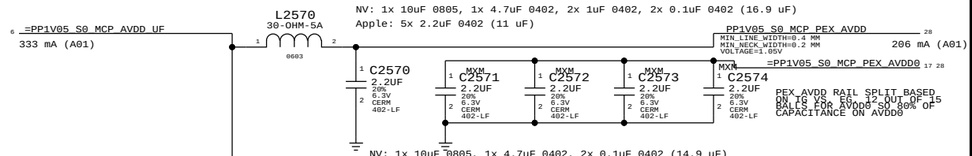
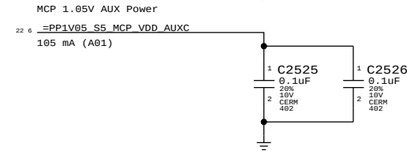


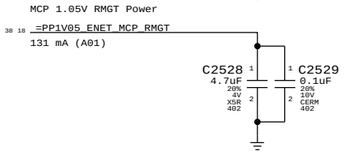
PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	BOM OPTION
116S0004	2	RES,0,5%,0402	C2574,C2518	IG

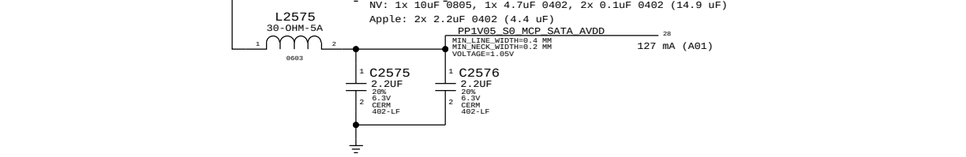


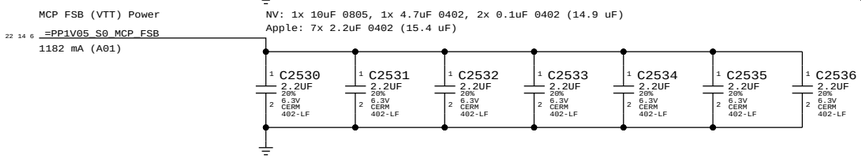


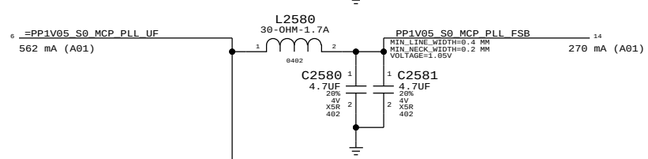


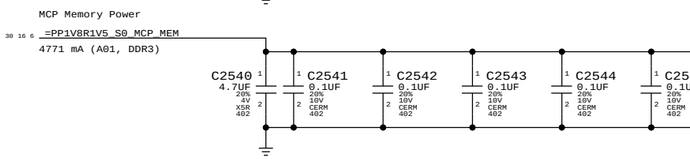


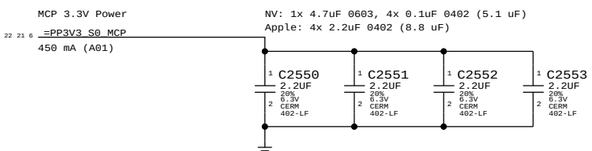


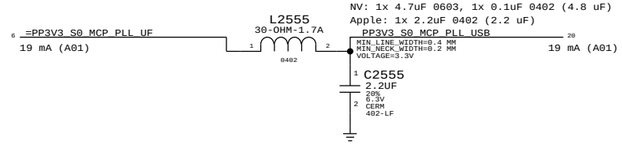


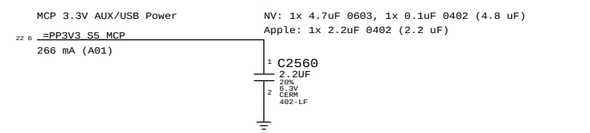


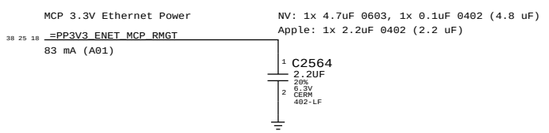


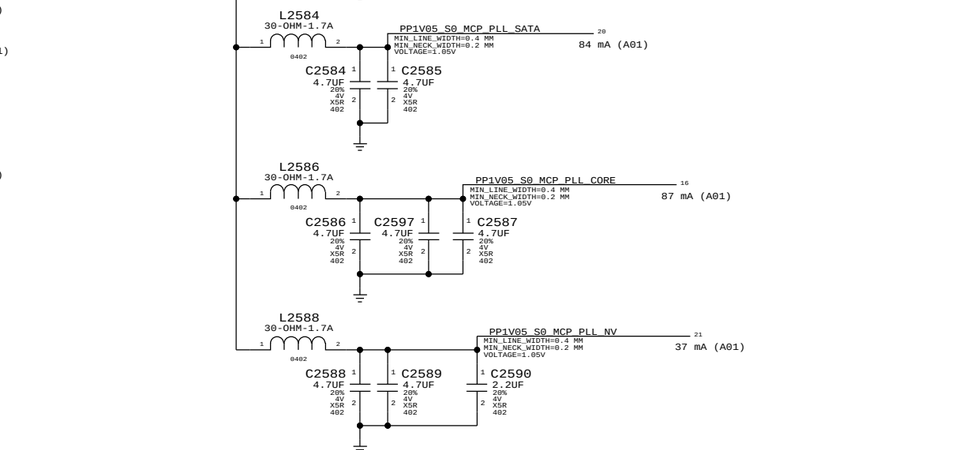


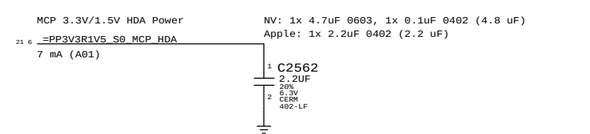


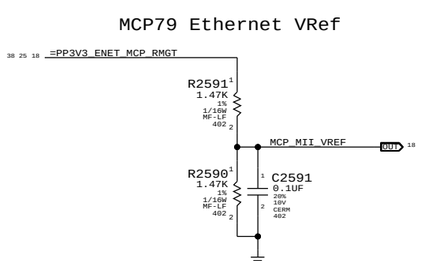


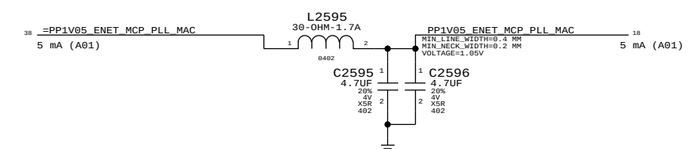












SYNC MASTER=K22 SYNC DATE=09/02/2009

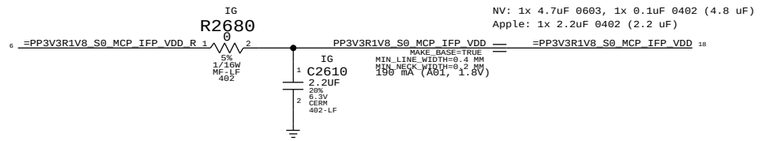
PAGE TITLE
MCP Standard Decoupling

Apple Inc.

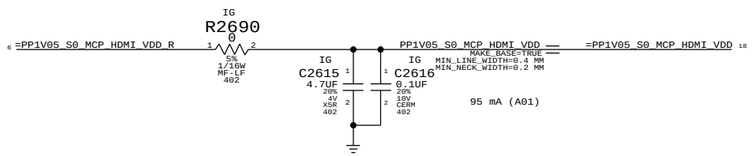
DRAWING NUMBER 051-7863 SIZE D
REVISION A.0.0
BRANCH
PAGE 25 OF 110
SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

Current numbers from email Poonacha Kongetira provided 11/30/2007 4:04pm (no official document number).

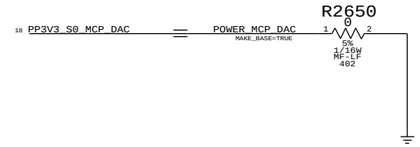
WF: Checklist says 0-ohm resistor placeholder for ferrite bead.

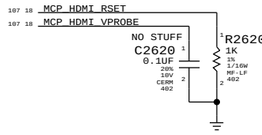


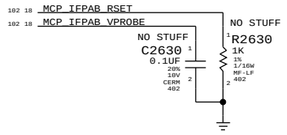
PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
116S0004	1	RES,0,5%,402	C2610		MXM



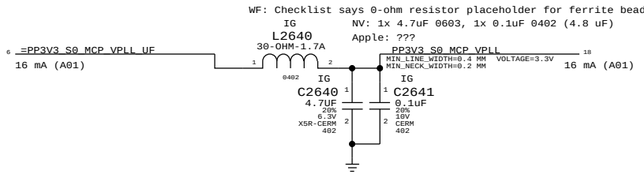
PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
116S0004	1	RES,0,5%,402	C2616		MXM







WF: Checklist says 0-ohm resistor placeholder for ferrite bead.



PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
116S0004	1	RES,0,5%,402	C2641		MXM

Current numbers from email Poonacha Kongetira provided 11/30/2007 4:04pm (no official document number).

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE: MCP Graphics Support

Apple Inc.

DRAWING NUMBER: 051-7863 SIZE: D

REVISION: A.0.0

BRANCH:

PAGE: 26 OF 110

SHEET: <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

8 7 6 5 4 3 2 1

D C B A

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE

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Apple Inc.

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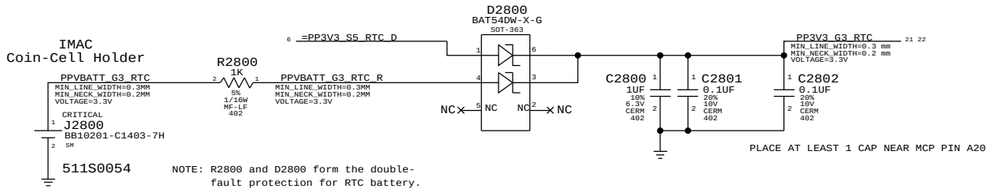
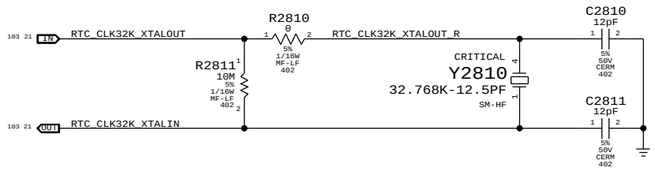
RTC Power Sources

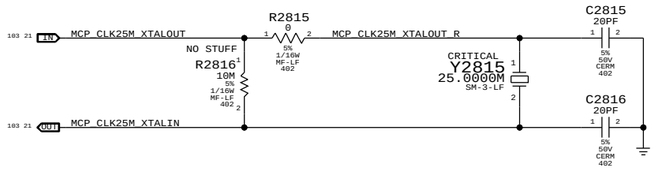


NOTE: R2800 and D2800 form the double-fault protection for RTC battery.

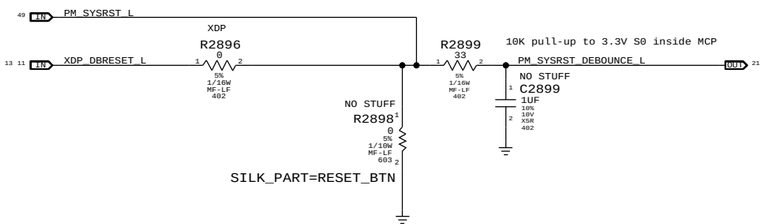
RTC Crystal



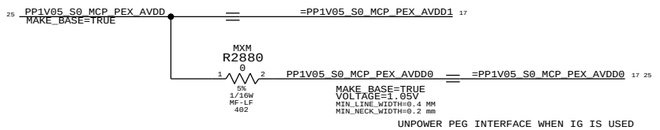
MCP 25MHz Crystal



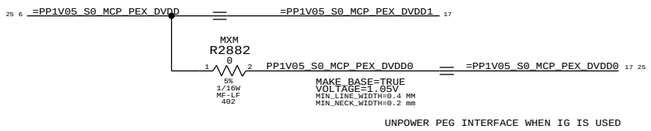
Reset Button



PEG POWER ALIAS/OPTION TO GND UNUSED POWER PIN

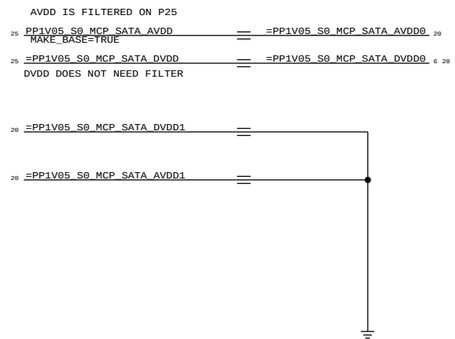


UNPOWER PEG INTERFACE WHEN IG IS USED



UNPOWER PEG INTERFACE WHEN IG IS USED

SATA ALIAS/GROUNDING UNUSED DVDD1 AND AVDD1



SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE: SB Misc

Apple Inc.

DRAWING NUMBER: 051-7863 SIZE: D

REVISION: A.0.0

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Page Notes

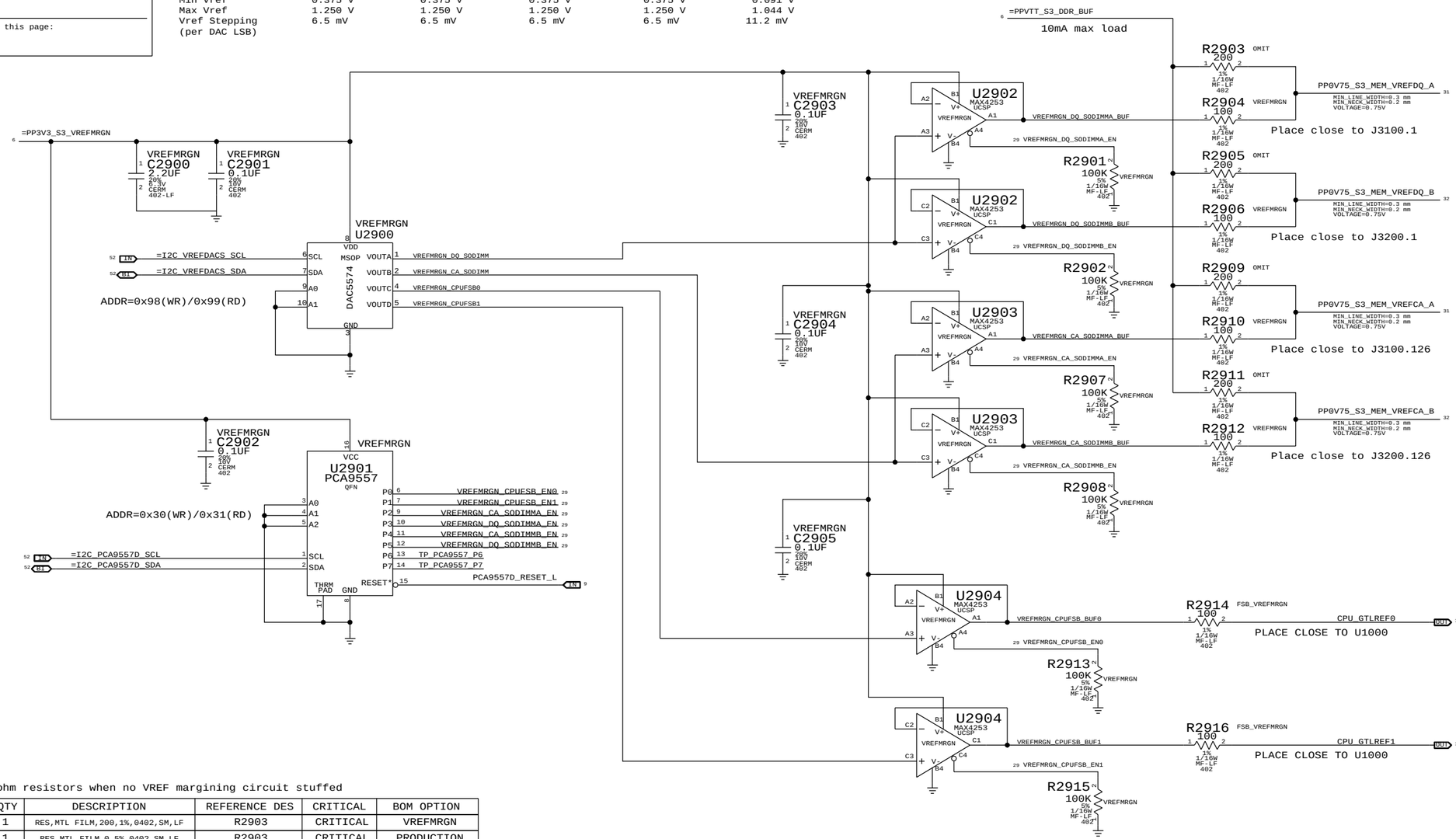
Power aliases required by this page:
- =PP3V3_S3_VREFMRGN
- =PP3V3_S5_VREFMRGN
- =PPVTT_S3_DDR_BUF

Signal aliases required by this page:
- =I2C_VREFDACS_SCL
- =I2C_VREFDACS_SDA
- =I2C_PCA9557D_SCL
- =I2C_PCA9557D_SDA

BOM options provided by this page:
VREFMRGN
PRODUCTION

	MEM A VREF DQ	MEM A VREF CA	MEM B VREF DQ	MEM B VREF CA	CPU FSB VREF
DAC channel	A	B	A	B	C
Min DAC code	0x00	0x00	0x00	0x00	0x00
Max DAC code	0x87	0x87	0x87	0x87	0x55
Max sink I	-3.75 mA	-3.75 mA	-3.75 mA	-3.75 mA	-0.91 mA
Max source I	5 mA	5 mA	5 mA	5 mA	0.52 mA
Nominal Vref	0.75 V	0.75 V	0.75 V	0.75 V	0.70 V
Min Vref	0.375 V	0.375 V	0.375 V	0.375 V	0.091 V
Max Vref	1.250 V	1.250 V	1.250 V	1.250 V	1.044 V
Vref Stepping (per DAC LSB)	6.5 mV	6.5 mV	6.5 mV	6.5 mV	11.2 mV

SO-DIMM A and SO-DIMM B Vref settings should be margined separately
(i.e. not simultaneously) due to current limitation of TPS51116 regulator.



Required zero ohm resistors when no VREF margining circuit stuffed

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
114S0149	1	RES,MTL FILM,200,1%,0402,SM,LF	R2903	CRITICAL	VREFMRGN
116S0004	1	RES,MTL FILM,0,5%,0402,SM,LF	R2903	CRITICAL	PRODUCTION
114S0149	1	RES,MTL FILM,200,1%,0402,SM,LF	R2905	CRITICAL	VREFMRGN
116S0004	1	RES,MTL FILM,0,5%,0402,SM,LF	R2905	CRITICAL	PRODUCTION
114S0149	1	RES,MTL FILM,200,1%,0402,SM,LF	R2909	CRITICAL	VREFMRGN
116S0004	1	RES,MTL FILM,0,5%,0402,SM,LF	R2909	CRITICAL	PRODUCTION
114S0149	1	RES,MTL FILM,200,1%,0402,SM,LF	R2911	CRITICAL	VREFMRGN
116S0004	1	RES,MTL FILM,0,5%,0402,SM,LF	R2911	CRITICAL	PRODUCTION

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE
FSB/DDR3 Vref Margining

Apple Inc.

DRAWING NUMBER 051-7863 SIZE D
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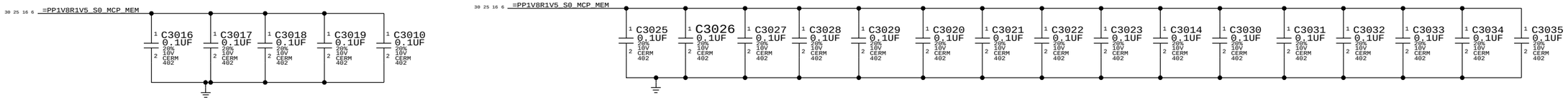
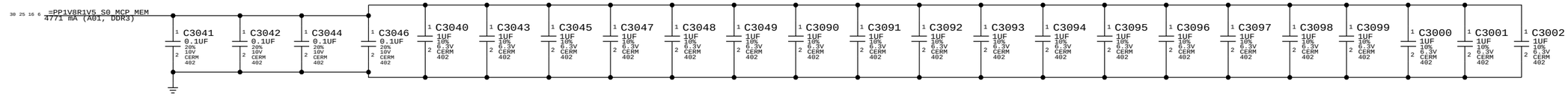
DIMM A (FURTHER FROM MCP)

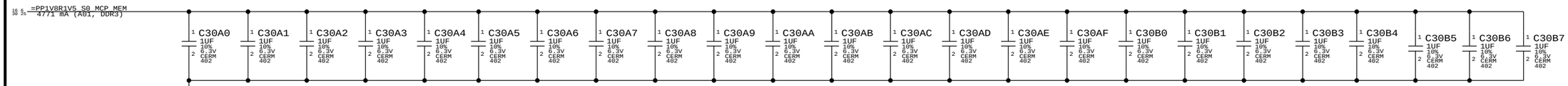
CAPS TO COUPLE MCP 1V5_S0_MEM

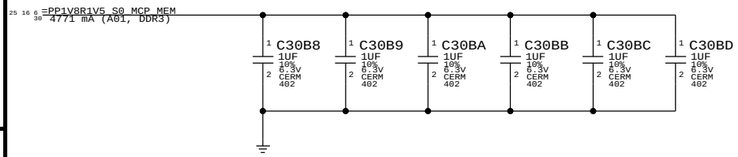
DIMM B (CLOSER TO MCP)



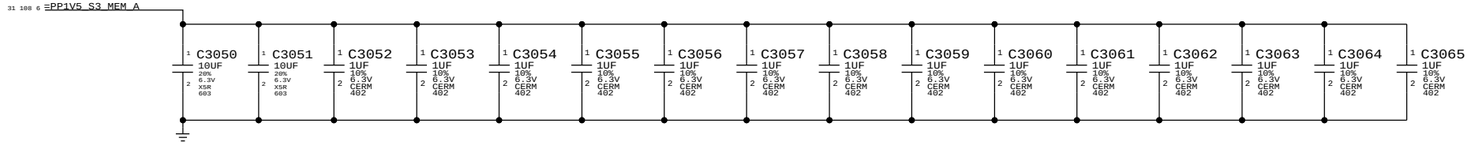
EXTRA DECOUPLING CAPS FOR MCP MEM RAIL



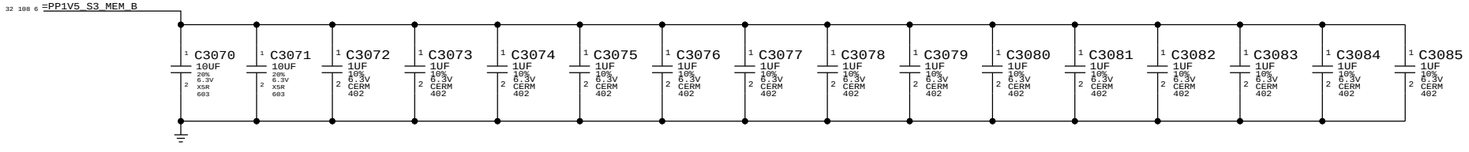




DECOUPLING CAPS FOR DIMM ON CHANNEL A - AT CONNECTOR



DECOUPLING CAPS FOR DIMM ON CHANNEL B - AT CONNECTOR



SYNC_MASTER=MASTER SYNC_DATE=N/A

PAGE TITLE

MEMORY CAPS

Apple Inc.

DRAWING NUMBER 051-7863 SIZE D

REVISION A.0.0

BRANCH

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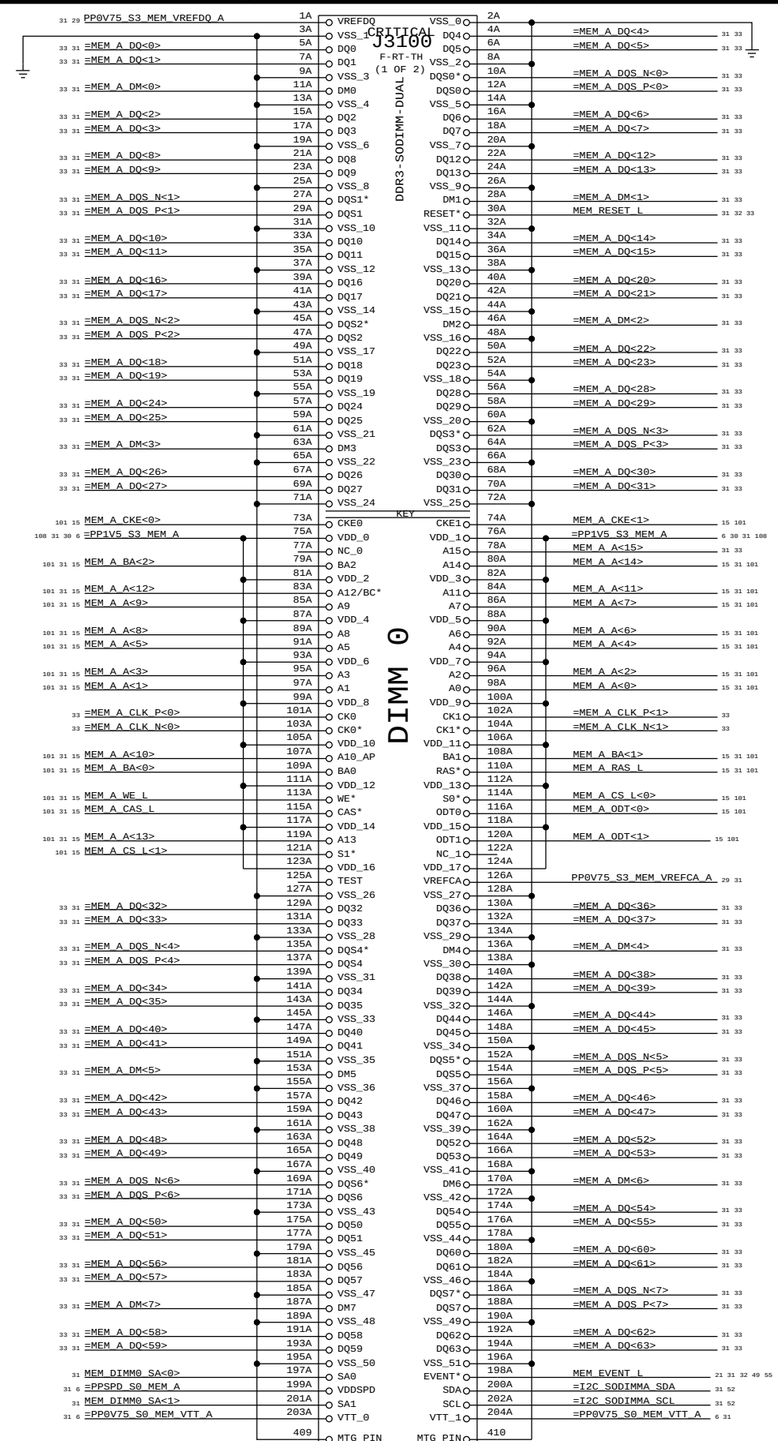
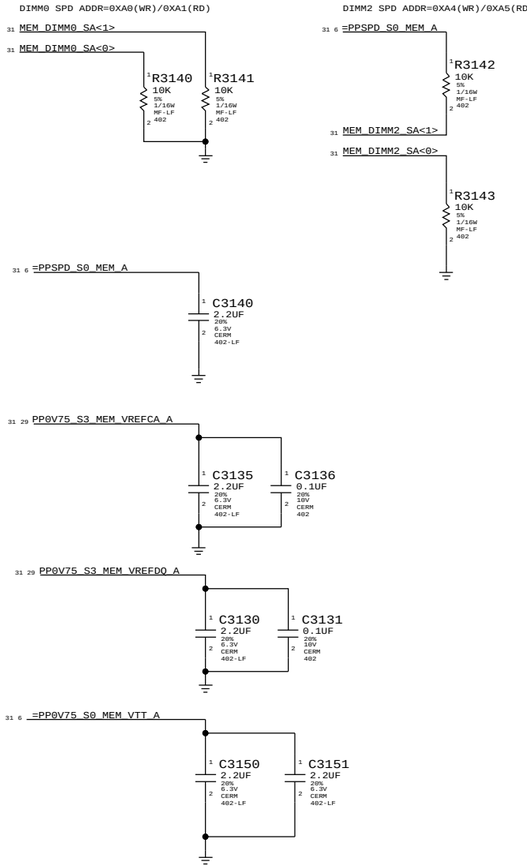
SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>





Page Notes

Power aliases required by this page:
- =PP1V5_S0_MEM_A
- =PP1V5_S3_MEM_A
- =PP0V75_S0_MEM_VTT_A
- =PPSPD_S0_MEM_A (2.5 - 3.3V)

Signal aliases required by this page:
- =I2C_SODIMMA_SCL
- =I2C_SODIMMA_SDA
- ALL DQ, DQS, DM SIGNALS; TO FACILITATE BITSWAPS WITH ALIASES

BOM options provided by this page:
(NONE)

SYNC_MASTER=K22 SYNC_DATE=07/06/2009

PAGE TITLE: DDR3 SO-DIMMs 0 & 2

Apple Inc.

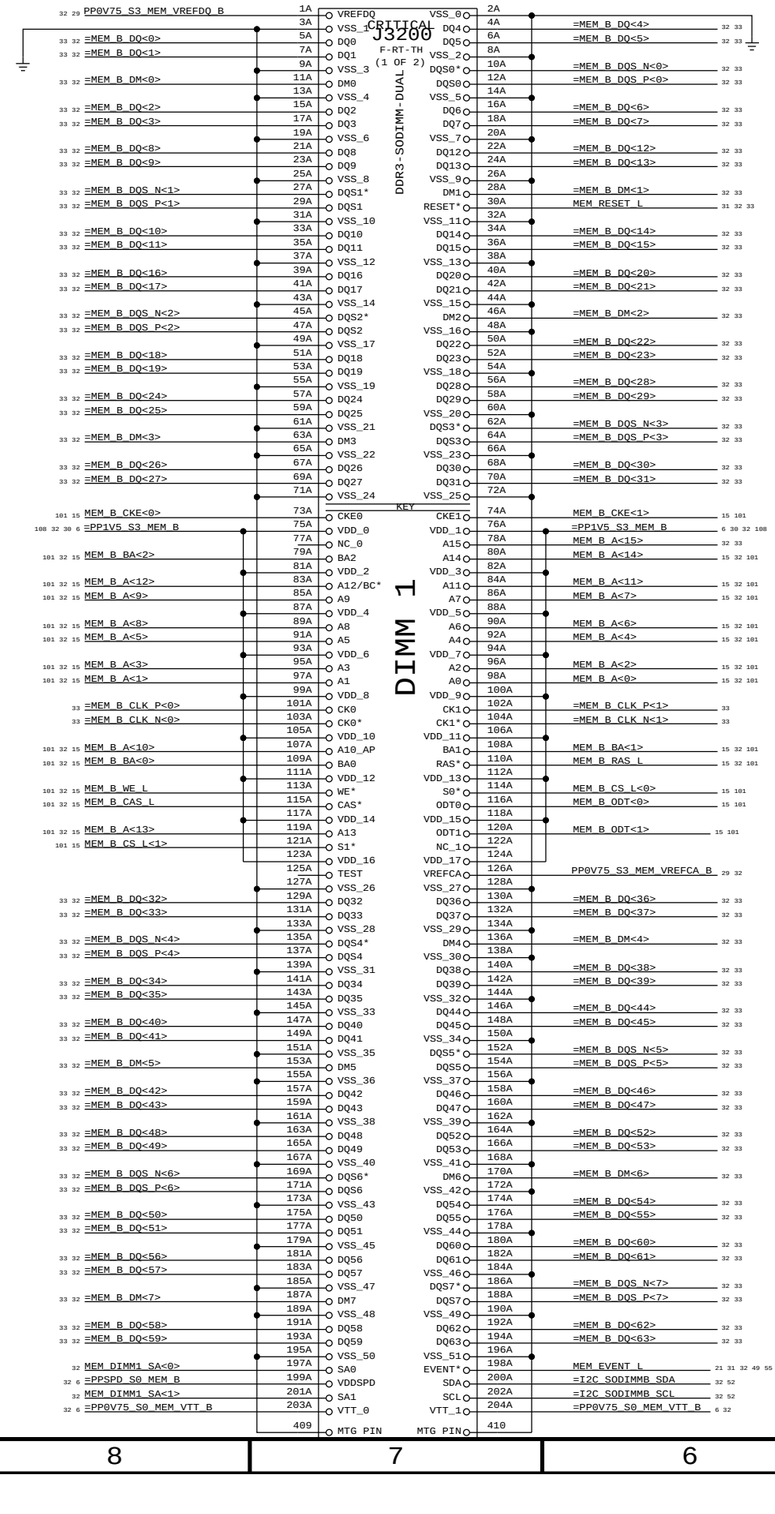
DRAWING NUMBER: 051-7863 SIZE: D

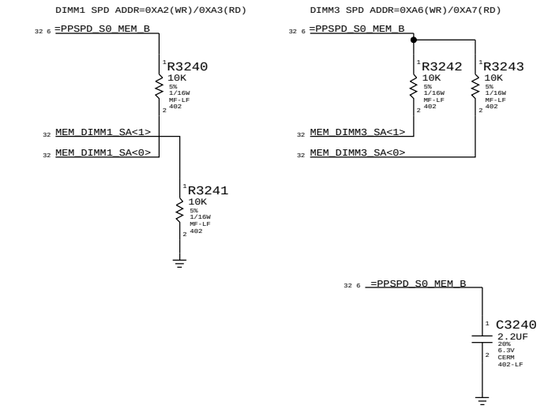
REVISION: A.0.0

BRANCH:

PAGE: 31 OF 110

SHEET: <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>





Page Notes

Power aliases required by this page:

- =PP1V5_S0_MEM_B
- =PP1V5_S3_MEM_B
- =PP0V75_S0_MEM_VTT_B
- =PPSPD_S0_MEM_B (2.5 - 3.3V)

Signal aliases required by this page:

- =I2C_SODIMMB_SCL
- =I2C_SODIMMB_SDA
- ALL DQ, DQS, DM SIGNALS; TO FACILITATE BITSWAPS WITH ALIASES

BOM options provided by this page:

(NONE)

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE

DDR3 SO-DIMM CONNECTOR B

Apple Inc.

DRAWING NUMBER 051-7863 SIZE D

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SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

MCP CHANNEL A DQS 0 -> DIMM A DQS 0

MEM_A_DQS_N<0>	MAKE_BASE=TRUE	=MEM_A_DQS_N<0>	31	15
MEM_A_DQS_P<0>	MAKE_BASE=TRUE	=MEM_A_DQS_P<0>	31	15
MEM_A_DM<0>	MAKE_BASE=TRUE	=MEM_A_DM<0>	31	15
MEM_A_DQ<7>	MAKE_BASE=TRUE	=MEM_A_DQ<7>	31	15
MEM_A_DQ<6>	MAKE_BASE=TRUE	=MEM_A_DQ<6>	31	15
MEM_A_DQ<5>	MAKE_BASE=TRUE	=MEM_A_DQ<5>	31	15
MEM_A_DQ<4>	MAKE_BASE=TRUE	=MEM_A_DQ<4>	31	15
MEM_A_DQ<3>	MAKE_BASE=TRUE	=MEM_A_DQ<3>	31	15
MEM_A_DQ<2>	MAKE_BASE=TRUE	=MEM_A_DQ<2>	31	15
MEM_A_DQ<1>	MAKE_BASE=TRUE	=MEM_A_DQ<1>	31	15
MEM_A_DQ<0>	MAKE_BASE=TRUE	=MEM_A_DQ<0>	31	15

MCP CHANNEL A DQS 1 -> DIMM A DQS 1

MEM_A_DQS_N<1>	MAKE_BASE=TRUE	=MEM_A_DQS_N<1>	31	15
MEM_A_DQS_P<1>	MAKE_BASE=TRUE	=MEM_A_DQS_P<1>	31	15
MEM_A_DM<1>	MAKE_BASE=TRUE	=MEM_A_DM<1>	31	15
MEM_A_DQ<15>	MAKE_BASE=TRUE	=MEM_A_DQ<15>	31	15
MEM_A_DQ<14>	MAKE_BASE=TRUE	=MEM_A_DQ<14>	31	15
MEM_A_DQ<13>	MAKE_BASE=TRUE	=MEM_A_DQ<13>	31	15
MEM_A_DQ<12>	MAKE_BASE=TRUE	=MEM_A_DQ<12>	31	15
MEM_A_DQ<11>	MAKE_BASE=TRUE	=MEM_A_DQ<11>	31	15
MEM_A_DQ<10>	MAKE_BASE=TRUE	=MEM_A_DQ<10>	31	15
MEM_A_DQ<9>	MAKE_BASE=TRUE	=MEM_A_DQ<9>	31	15
MEM_A_DQ<8>	MAKE_BASE=TRUE	=MEM_A_DQ<8>	31	15

MCP CHANNEL A DQS 2 -> DIMM A DQS 2

MEM_A_DQS_N<2>	MAKE_BASE=TRUE	=MEM_A_DQS_N<2>	31	15
MEM_A_DQS_P<2>	MAKE_BASE=TRUE	=MEM_A_DQS_P<2>	31	15
MEM_A_DM<2>	MAKE_BASE=TRUE	=MEM_A_DM<2>	31	15
MEM_A_DQ<23>	MAKE_BASE=TRUE	=MEM_A_DQ<23>	31	15
MEM_A_DQ<22>	MAKE_BASE=TRUE	=MEM_A_DQ<22>	31	15
MEM_A_DQ<21>	MAKE_BASE=TRUE	=MEM_A_DQ<21>	31	15
MEM_A_DQ<20>	MAKE_BASE=TRUE	=MEM_A_DQ<20>	31	15
MEM_A_DQ<19>	MAKE_BASE=TRUE	=MEM_A_DQ<19>	31	15
MEM_A_DQ<18>	MAKE_BASE=TRUE	=MEM_A_DQ<18>	31	15
MEM_A_DQ<17>	MAKE_BASE=TRUE	=MEM_A_DQ<17>	31	15
MEM_A_DQ<16>	MAKE_BASE=TRUE	=MEM_A_DQ<16>	31	15

MCP CHANNEL A DQS 3 -> DIMM A DQS 3

MEM_A_DQS_N<3>	MAKE_BASE=TRUE	=MEM_A_DQS_N<3>	31	15
MEM_A_DQS_P<3>	MAKE_BASE=TRUE	=MEM_A_DQS_P<3>	31	15
MEM_A_DM<3>	MAKE_BASE=TRUE	=MEM_A_DM<3>	31	15
MEM_A_DQ<31>	MAKE_BASE=TRUE	=MEM_A_DQ<31>	31	15
MEM_A_DQ<30>	MAKE_BASE=TRUE	=MEM_A_DQ<30>	31	15
MEM_A_DQ<29>	MAKE_BASE=TRUE	=MEM_A_DQ<29>	31	15
MEM_A_DQ<28>	MAKE_BASE=TRUE	=MEM_A_DQ<28>	31	15
MEM_A_DQ<27>	MAKE_BASE=TRUE	=MEM_A_DQ<27>	31	15
MEM_A_DQ<26>	MAKE_BASE=TRUE	=MEM_A_DQ<26>	31	15
MEM_A_DQ<25>	MAKE_BASE=TRUE	=MEM_A_DQ<25>	31	15
MEM_A_DQ<24>	MAKE_BASE=TRUE	=MEM_A_DQ<24>	31	15

MCP CHANNEL A DQS 4 -> DIMM A DQS 4

MEM_A_DQS_N<4>	MAKE_BASE=TRUE	=MEM_A_DQS_N<4>	31	15
MEM_A_DQS_P<4>	MAKE_BASE=TRUE	=MEM_A_DQS_P<4>	31	15
MEM_A_DM<4>	MAKE_BASE=TRUE	=MEM_A_DM<4>	31	15
MEM_A_DQ<39>	MAKE_BASE=TRUE	=MEM_A_DQ<39>	31	15
MEM_A_DQ<38>	MAKE_BASE=TRUE	=MEM_A_DQ<38>	31	15
MEM_A_DQ<37>	MAKE_BASE=TRUE	=MEM_A_DQ<37>	31	15
MEM_A_DQ<36>	MAKE_BASE=TRUE	=MEM_A_DQ<36>	31	15
MEM_A_DQ<35>	MAKE_BASE=TRUE	=MEM_A_DQ<35>	31	15
MEM_A_DQ<34>	MAKE_BASE=TRUE	=MEM_A_DQ<34>	31	15
MEM_A_DQ<33>	MAKE_BASE=TRUE	=MEM_A_DQ<33>	31	15
MEM_A_DQ<32>	MAKE_BASE=TRUE	=MEM_A_DQ<32>	31	15

MCP CHANNEL A DQS 5 -> DIMM A DQS 5

MEM_A_DQS_N<5>	MAKE_BASE=TRUE	=MEM_A_DQS_N<5>	31	15
MEM_A_DQS_P<5>	MAKE_BASE=TRUE	=MEM_A_DQS_P<5>	31	15
MEM_A_DM<5>	MAKE_BASE=TRUE	=MEM_A_DM<5>	31	15
MEM_A_DQ<47>	MAKE_BASE=TRUE	=MEM_A_DQ<47>	31	15
MEM_A_DQ<46>	MAKE_BASE=TRUE	=MEM_A_DQ<46>	31	15
MEM_A_DQ<45>	MAKE_BASE=TRUE	=MEM_A_DQ<45>	31	15
MEM_A_DQ<44>	MAKE_BASE=TRUE	=MEM_A_DQ<44>	31	15
MEM_A_DQ<43>	MAKE_BASE=TRUE	=MEM_A_DQ<43>	31	15
MEM_A_DQ<42>	MAKE_BASE=TRUE	=MEM_A_DQ<42>	31	15
MEM_A_DQ<41>	MAKE_BASE=TRUE	=MEM_A_DQ<41>	31	15
MEM_A_DQ<40>	MAKE_BASE=TRUE	=MEM_A_DQ<40>	31	15

MCP CHANNEL A DQS 6 -> DIMM A DQS 6

MEM_A_DQS_N<6>	MAKE_BASE=TRUE	=MEM_A_DQS_N<6>	31	15
MEM_A_DQS_P<6>	MAKE_BASE=TRUE	=MEM_A_DQS_P<6>	31	15
MEM_A_DM<6>	MAKE_BASE=TRUE	=MEM_A_DM<6>	31	15
MEM_A_DQ<55>	MAKE_BASE=TRUE	=MEM_A_DQ<55>	31	15
MEM_A_DQ<54>	MAKE_BASE=TRUE	=MEM_A_DQ<54>	31	15
MEM_A_DQ<53>	MAKE_BASE=TRUE	=MEM_A_DQ<53>	31	15
MEM_A_DQ<52>	MAKE_BASE=TRUE	=MEM_A_DQ<52>	31	15
MEM_A_DQ<51>	MAKE_BASE=TRUE	=MEM_A_DQ<51>	31	15
MEM_A_DQ<50>	MAKE_BASE=TRUE	=MEM_A_DQ<50>	31	15
MEM_A_DQ<49>	MAKE_BASE=TRUE	=MEM_A_DQ<49>	31	15
MEM_A_DQ<48>	MAKE_BASE=TRUE	=MEM_A_DQ<48>	31	15

MCP CHANNEL A DQS 7 -> DIMM A DQS 7

MEM_A_DQS_N<7>	MAKE_BASE=TRUE	=MEM_A_DQS_N<7>	31	15
MEM_A_DQS_P<7>	MAKE_BASE=TRUE	=MEM_A_DQS_P<7>	31	15
MEM_A_DM<7>	MAKE_BASE=TRUE	=MEM_A_DM<7>	31	15
MEM_A_DQ<63>	MAKE_BASE=TRUE	=MEM_A_DQ<63>	31	15
MEM_A_DQ<62>	MAKE_BASE=TRUE	=MEM_A_DQ<62>	31	15
MEM_A_DQ<61>	MAKE_BASE=TRUE	=MEM_A_DQ<57>	31	15
MEM_A_DQ<60>	MAKE_BASE=TRUE	=MEM_A_DQ<56>	31	15
MEM_A_DQ<59>	MAKE_BASE=TRUE	=MEM_A_DQ<59>	31	15
MEM_A_DQ<58>	MAKE_BASE=TRUE	=MEM_A_DQ<58>	31	15
MEM_A_DQ<57>	MAKE_BASE=TRUE	=MEM_A_DQ<61>	31	15
MEM_A_DQ<56>	MAKE_BASE=TRUE	=MEM_A_DQ<60>	31	15

MCP CHANNEL B DQS 0 -> DIMM B DQS 0

MEM_B_DQS_N<0>	MAKE_BASE=TRUE	=MEM_B_DQS_N<0>	32	15
MEM_B_DQS_P<0>	MAKE_BASE=TRUE	=MEM_B_DQS_P<0>	32	15
MEM_B_DM<0>	MAKE_BASE=TRUE	=MEM_B_DM<0>	32	15
MEM_B_DQ<7>	MAKE_BASE=TRUE	=MEM_B_DQ<7>	32	15
MEM_B_DQ<6>	MAKE_BASE=TRUE	=MEM_B_DQ<6>	32	15
MEM_B_DQ<5>	MAKE_BASE=TRUE	=MEM_B_DQ<1>	32	15
MEM_B_DQ<4>	MAKE_BASE=TRUE	=MEM_B_DQ<0>	32	15
MEM_B_DQ<3>	MAKE_BASE=TRUE	=MEM_B_DQ<3>	32	15
MEM_B_DQ<2>	MAKE_BASE=TRUE	=MEM_B_DQ<2>	32	15
MEM_B_DQ<1>	MAKE_BASE=TRUE	=MEM_B_DQ<5>	32	15
MEM_B_DQ<0>	MAKE_BASE=TRUE	=MEM_B_DQ<4>	32	15

MCP CHANNEL B DQS 1 -> DIMM B DQS 1

MEM_B_DQS_N<1>	MAKE_BASE=TRUE	=MEM_B_DQS_N<1>	32	15
MEM_B_DQS_P<1>	MAKE_BASE=TRUE	=MEM_B_DQS_P<1>	32	15
MEM_B_DM<1>	MAKE_BASE=TRUE	=MEM_B_DM<1>	32	15
MEM_B_DQ<15>	MAKE_BASE=TRUE	=MEM_B_DQ<15>	32	15
MEM_B_DQ<14>	MAKE_BASE=TRUE	=MEM_B_DQ<14>	32	15
MEM_B_DQ<13>	MAKE_BASE=TRUE	=MEM_B_DQ<13>	32	15
MEM_B_DQ<12>	MAKE_BASE=TRUE	=MEM_B_DQ<12>	32	15
MEM_B_DQ<11>	MAKE_BASE=TRUE	=MEM_B_DQ<11>	32	15
MEM_B_DQ<10>	MAKE_BASE=TRUE	=MEM_B_DQ<10>	32	15
MEM_B_DQ<9>	MAKE_BASE=TRUE	=MEM_B_DQ<9>	32	15
MEM_B_DQ<8>	MAKE_BASE=TRUE	=MEM_B_DQ<8>	32	15

MCP CHANNEL B DQS 2 -> DIMM B DQS 2

MEM_B_DQS_N<2>	MAKE_BASE=TRUE	=MEM_B_DQS_N<2>	32	15
MEM_B_DQS_P<2>	MAKE_BASE=TRUE	=MEM_B_DQS_P<2>	32	15
MEM_B_DM<2>	MAKE_BASE=TRUE	=MEM_B_DM<2>	32	15
MEM_B_DQ<23>	MAKE_BASE=TRUE	=MEM_B_DQ<23>	32	15
MEM_B_DQ<22>	MAKE_BASE=TRUE	=MEM_B_DQ<22>	32	15
MEM_B_DQ<21>	MAKE_BASE=TRUE	=MEM_B_DQ<21>	32	15
MEM_B_DQ<20>	MAKE_BASE=TRUE	=MEM_B_DQ<20>	32	15
MEM_B_DQ<19>	MAKE_BASE=TRUE	=MEM_B_DQ<19>	32	15
MEM_B_DQ<18>	MAKE_BASE=TRUE	=MEM_B_DQ<18>	32	15
MEM_B_DQ<17>	MAKE_BASE=TRUE	=MEM_B_DQ<17>	32	15
MEM_B_DQ<16>	MAKE_BASE=TRUE	=MEM_B_DQ<16>	32	15

MCP CHANNEL B DQS 3 -> DIMM B DQS 3

MEM_B_DQS_N<3>	MAKE_BASE=TRUE	=MEM_B_DQS_N<3>	32	15
MEM_B_DQS_P<3>	MAKE_BASE=TRUE	=MEM_B_DQS_P<3>	32	15
MEM_B_DM<3>	MAKE_BASE=TRUE	=MEM_B_DM<3>	32	15
MEM_B_DQ<31>	MAKE_BASE=TRUE	=MEM_B_DQ<31>	32	15
MEM_B_DQ<30>	MAKE_BASE=TRUE	=MEM_B_DQ<30>	32	15
MEM_B_DQ<29>	MAKE_BASE=TRUE	=MEM_B_DQ<29>	32	15
MEM_B_DQ<28>	MAKE_BASE=TRUE	=MEM_B_DQ<28>	32	15
MEM_B_DQ<27>	MAKE_BASE=TRUE	=MEM_B_DQ<27>	32	15
MEM_B_DQ<26>	MAKE_BASE=TRUE	=MEM_B_DQ<26>	32	15
MEM_B_DQ<25>	MAKE_BASE=TRUE	=MEM_B_DQ<25>	32	15
MEM_B_DQ<24>	MAKE_BASE=TRUE	=MEM_B_DQ<24>	32	15

MCP CHANNEL B DQS 4 -> DIMM B DQS 4

MEM_B_DQS_N<4>	MAKE_BASE=TRUE	=MEM_B_DQS_N<4>	32	15
MEM_B_DQS_P<4>	MAKE_BASE=TRUE	=MEM_B_DQS_P<4>	32	15
MEM_B_DM<4>	MAKE_BASE=TRUE	=MEM_B_DM<4>	32	15
MEM_B_DQ<39>	MAKE_BASE=TRUE	=MEM_B_DQ<39>	32	15
MEM_B_DQ<38>	MAKE_BASE=TRUE	=MEM_B_DQ<38>	32	15
MEM_B_DQ<37>	MAKE_BASE=TRUE	=MEM_B_DQ<37>	32	15
MEM_B_DQ<36>	MAKE_BASE=TRUE	=MEM_B_DQ<36>	32	15
MEM_B_DQ<35>	MAKE_BASE=TRUE	=MEM_B_DQ<35>	32	15
MEM_B_DQ<34>	MAKE_BASE=TRUE	=MEM_B_DQ<34>	32	15
MEM_B_DQ<33>	MAKE_BASE=TRUE	=MEM_B_DQ<33>	32	15
MEM_B_DQ<32>	MAKE_BASE=TRUE	=MEM_B_DQ<32>	32	15

MCP CHANNEL B DQS 5 -> DIMM B DQS 5

MEM_B_DQS_N<5>	MAKE_BASE=TRUE	=MEM_B_DQS_N<5>	32	15
MEM_B_DQS_P<5>	MAKE_BASE=TRUE	=MEM_B_DQS_P<5>	32	15
MEM_B_DM<5>	MAKE_BASE=TRUE	=MEM_B_DM<5>	32	15
MEM_B_DQ<47>	MAKE_BASE=TRUE	=MEM_B_DQ<47>	32	15
MEM_B_DQ<46>	MAKE_BASE=TRUE	=MEM_B_DQ<46>	32	15
MEM_B_DQ<45>	MAKE_BASE=TRUE	=MEM_B_DQ<45>	32	15
MEM_B_DQ<44>	MAKE_BASE=TRUE	=MEM_B_DQ<44>	32	15
MEM_B_DQ<43>	MAKE_BASE=TRUE	=MEM_B_DQ<43>	32	15
MEM_B_DQ<42>	MAKE_BASE=TRUE	=MEM_B_DQ<42>	32	15
MEM_B_DQ<41>	MAKE_BASE=TRUE	=MEM_B_DQ<41>	32	15
MEM_B_DQ<40>	MAKE_BASE=TRUE	=MEM_B_DQ<40>	32	15

MCP CHANNEL B DQS 6 -> DIMM B DQS 6

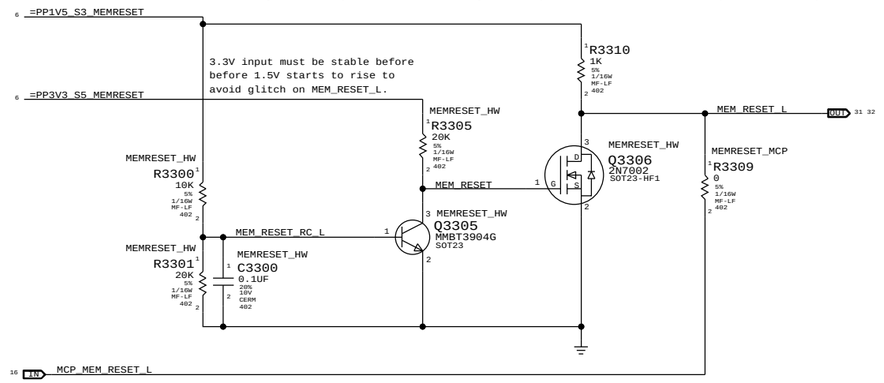
MEM_B_DQS_N<6>	MAKE_BASE=TRUE	=MEM_B_DQS_N<6>	32	15
MEM_B_DQS_P<6>	MAKE_BASE=TRUE	=MEM_B_DQS_P<6>	32	15
MEM_B_DM<6>	MAKE_BASE=TRUE	=MEM_B_DM<6>	32	15
MEM_B_DQ<55>	MAKE_BASE=TRUE	=MEM_B_DQ<55>	32	15
MEM_B_DQ<54>	MAKE_BASE=TRUE	=MEM_B_DQ<54>	32	15
MEM_B_DQ<53>	MAKE_BASE=TRUE	=MEM_B_DQ<53>	32	15
MEM_B_DQ<52>	MAKE_BASE=TRUE	=MEM_B_DQ<52>	32	15
MEM_B_DQ<51>	MAKE_BASE=TRUE	=MEM_B_DQ<51>	32	15
MEM_B_DQ<50>	MAKE_BASE=TRUE	=MEM_B_DQ<50>	32	15
MEM_B_DQ<49>	MAKE_BASE=TRUE	=MEM_B_DQ<49>	32	15
MEM_B_DQ<48>	MAKE_BASE=TRUE	=MEM_B_DQ<48>	32	15

MCP CHANNEL B DQS 7 -> DIMM B DQS 7

MEM_B_DQS_N<7>	MAKE_BASE=TRUE	=MEM_B_DQS_N<7>	32	15
MEM_B_DQS_P<7>	MAKE_BASE=TRUE	=MEM_B_DQS_P<7>	32	15
MEM_B_DM<7>	MAKE_BASE=TRUE	=MEM_B_DM<7>	32	15
MEM_B_DQ<63>	MAKE_BASE=TRUE	=MEM_B_DQ<63>	32	15
MEM_B_DQ<62>	MAKE_BASE=TRUE	=MEM_B_DQ<62>	32	15
MEM_B_DQ<61>	MAKE_BASE=TRUE	=MEM_B_DQ<61>	32	15
MEM_B_DQ<60>	MAKE_BASE=TRUE	=MEM_B_DQ<60>	32	15
MEM_B_DQ<59>	MAKE_BASE=TRUE	=MEM_B_DQ<59>	32	15
MEM_B_DQ<58>	MAKE_BASE=TRUE	=MEM_B_DQ<58>	32	15
MEM_B_DQ<57>	MAKE_BASE=TRUE	=MEM_B_DQ<57>	32	15
MEM_B_DQ<56>	MAKE_BASE=TRUE	=MEM_B_DQ<56>	32	15

DDR3 RESET Support

MCP79 cannot control this signal directly since it must be high in sleep and MCP MEM rails are not powered in sleep.



MCP MEMORY CLOCK ALIASING

MEM_A_CLK_P<0>	MAKE_BASE=TRUE	=MEM_A_CLK_P<0>	31	15
MEM_A_CLK_N<0>	MAKE_BASE=TRUE	=MEM_A_CLK_N<0>	31	15
MEM_A_CLK_P<1>	MAKE_BASE=TRUE	=MEM_A_CLK_P<1>	31	15
MEM_A_CLK_N<1>	MAKE_BASE=TRUE	=MEM_A_CLK_N<1>	31	15
MEM_A_CLK_P<3>	MAKE_BASE=TRUE	=MEM_A_CLK_P<2>	31	16
MEM_A_CLK_N<3>	MAKE_BASE=TRUE	=MEM_A_CLK_N<2>	31	16
MEM_A_CLK_P<4>	MAKE_BASE=TRUE	=MEM_A_CLK_P<3>	31	16
MEM_A_CLK_N<4>	MAKE_BASE=TRUE	=MEM_A_CLK_N<3>	31	16

MEM_B_CLK_P<0>	MAKE_BASE=TRUE	=MEM_B_CLK_P<0>	32	15
MEM_B_CLK_N<0>	MAKE_BASE=TRUE	=MEM_B_CLK_N<0>	32	15
MEM_B_CLK_P<1>	MAKE_BASE=TRUE	=MEM_B_CLK_P<1>	32	15
MEM_B_CLK_N<1>	MAKE_BASE=TRUE	=MEM_B_CLK_N<1>	32	15
MEM_B_CLK_P<3>	MAKE_BASE=TRUE	=MEM_B_CLK_P<2>	32	16
MEM_B_CLK_N<3>	MAKE_BASE=TRUE	=MEM_B_CLK_N<2>	32	16
MEM_B_CLK_P<4>	MAKE_BASE=TRUE	=MEM_B_CLK_P<3>	32	16
MEM_B_CLK_N<4>	MAKE_BASE=TRUE	=MEM_B_CLK_N<3>	32	16

MCP MEMORY TEST POINT ALIASING

TP_MEM_A_A<15>	MAKE_BASE=TRUE	MEM_A_A<15>	31	
TP_MEM_B_A<15>	MAKE_BASE=TRUE	MEM_B_A<15>	32	

SYNC_MASTER=MASTER SYNC_DATE=N/A

PAGE TITLE

DDR3 SUPPORT AND BITSWAPS

Apple Inc.

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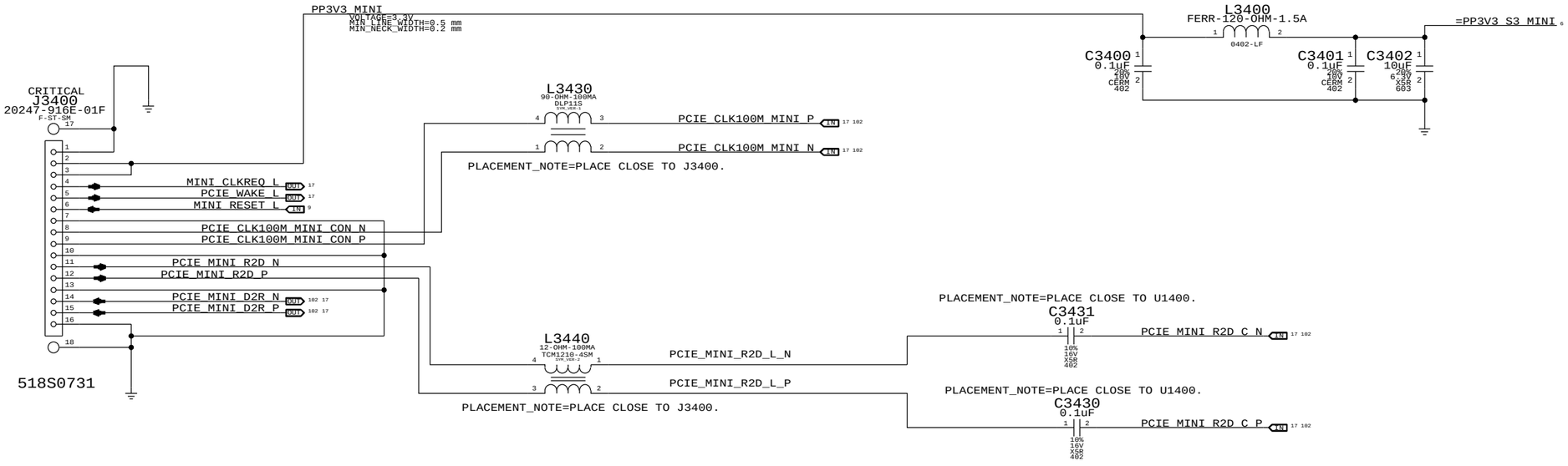
SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>



SYNC_MASTER=K22 SYNC_DATE=05/28/2009

PAGE TITLE

PCI-E Wireless Connector

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8	7	6	5	4	3	2	1

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C

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SYNC MASTER=K22 SYNC DATE=12/02/2008

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8 7 6 5 4 3 2 1

8 7 6 5 4 3 2 1

D C B A

SYNC MASTER=K22 SYNC DATE=12/02/2008

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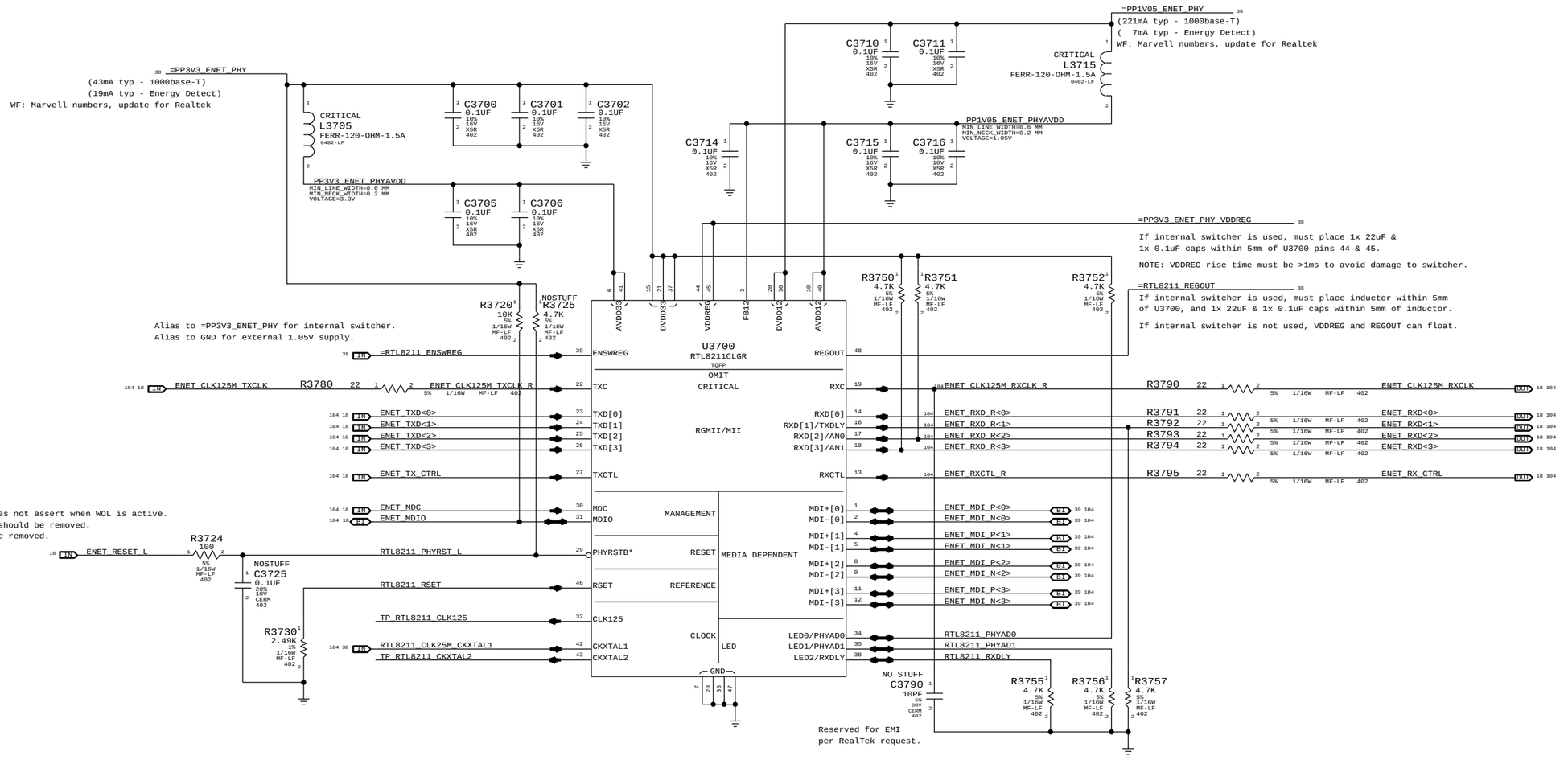
SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

8 7 6 5 4 3 2 1



Configuration Settings:

PHYAD = 01 (PHY Address 00001)
AN[1:0] = 11 (Full auto-negotiation)
RXDLY = 0 (RXCLK transitions with data)
TXDLY = 0 (No TXCLK Delay)

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE: Ethernet PHY (RTL8211CL)

Apple Inc.

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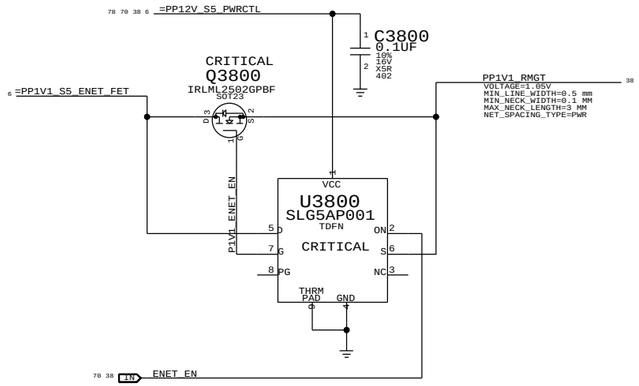
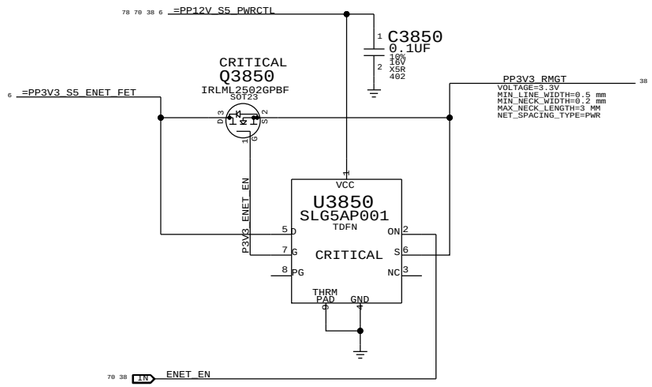
SHEET: <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

1.1V ENET FET



3.3V ENET FET



ENET ALIASES

38 PP1V1_RMGT
MAKE_BASE=TRUE
=PP1V05_ENET_MCP_RMGT 18 25
=PP1V05_ENET_MCP_PLL_MAC 25
=PP1V05_ENET_PHY 37

38 PP3V3_RMGT
MAKE_BASE=TRUE
=PP3V3_ENET_MCP_RMGT 18 25
=PP3V3_ENET_PHY 37

MAKE_BASE=TRUE
=RTL8211_ENSWREG 37

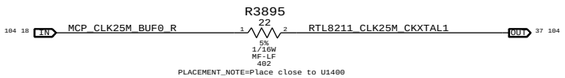
NOTE: NOT USING THE BUILT-IN 1.05V REGULATOR OF THE PHY

NC_RTL8211_REGOUT
MAKE_BASE=TRUE
NO_TEST=TRUE
=RTL8211_REGOUT 37

NC_PP3V3_ENET_PHY_VDDREG
MAKE_BASE=TRUE
NO_TEST=TRUE
=PP3V3_ENET_PHY_VDDREG 37

RTL8211 25MHz Clock

NOTE: MCP79 can provide 25MHz clock, but clock runs whenever RMGT rails are powered.
Designs must ensure PHY is powered whenever RMGT rails are, or use separate crystal.



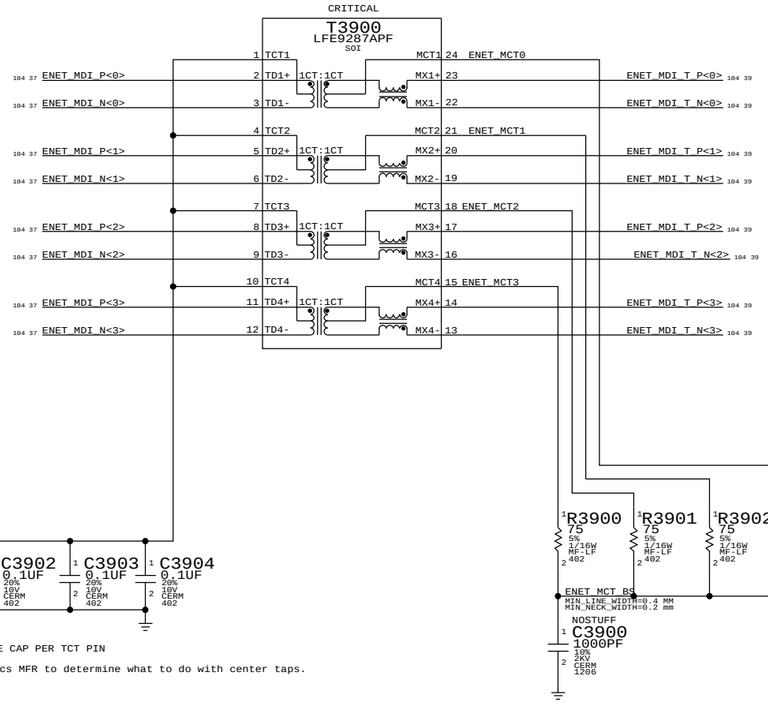
PLACEMENT_NOTE=Place close to U1400

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE: Ethernet Support

Apple Inc.

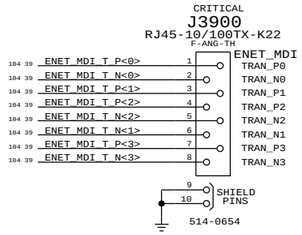
DRAWING NUMBER: 051-7863 SIZE: D
REVISION: A.0.0
BRANCH:
PAGE: 38 OF 110
SHEET: <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>



PLACE ONE CAP PER TCT PIN

NOTE: Check with PHY and Magnetics MFR to determine what to do with center taps.

NOTE: BOB SMITH TERMINATION FOR EMC.



SYNC_MASTER=MASTER SYNC_DATE=N/A

PAGE TITLE

ETHERNET CONNECTOR

Apple Inc.

DRAWING NUMBER 051-7863 SIZE D

REVISION A.0.0

BRANCH

PAGE 39 OF 110

SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

8 7 6 5 4 3 2 1

D C B A

SYNC MASTER=K22 SYNC DATE=12/02/2008

PAGE TITLE

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Apple Inc.

DRAWING NUMBER 051-7863 SIZE D

REVISION A.0.0

BRANCH

PAGE 40 OF 110

SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

8 7 6 5 4 3 2 1

Power Aliases:

FW_FWPHY nets are PHY power, and for multi-port systems must come from bus power.

FWRS0_FWXIO nets are OHCI/PCIe power, and can be S0.

For single-port systems, all FW power should be tied together and powered by S0 or by the 5K pull-down device detect circuit.

PCI EXPRESS

1394B OHCI & PHY

Single-port: PC[0:2] = '000'

Multiple-ports: PC[0:2] = '100'

Alias =FWPHY_PC0 as appropriate

Unused Ports:

TP/NC TPBIASx
TP/NC TPAx_P/TPAx_N
Ground TPBx_P/TPBx_N

DS2 hard-strapped to 1, page assumes no more than 2 FW800 connectors

Strap DSx high on unused ports.

SYNC_MASTER=K22	SYNC_DATE=09/02/2009
PAGE TITLE: FireWire LLC/PHY (XIO2213B)	
Apple Inc.	DRAWING NUMBER: 051-7863 SIZE: D
	REVISION: A.0.0
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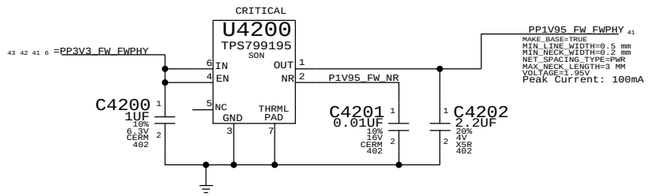
	PAGE: 41 OF 110
	SHEET: <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

1394 PHY 1.95V SUPPLY



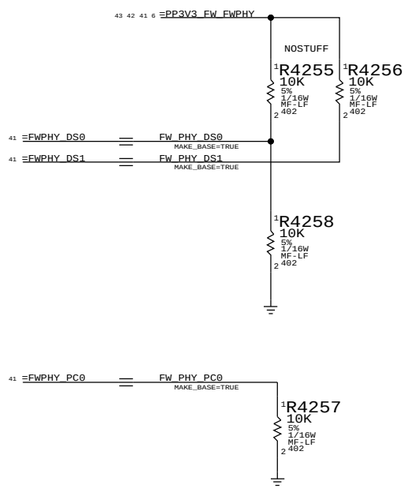
FireWire Aliases For Connectivity

=FW_CLKREQ_L — FW_CLKREQ_L (MAKE_BASE=TRUE)

=FW_PME_L — FW_PME_L (MAKE_BASE=TRUE)

=PPVP_FW_PHY_CPS — PPVP_FW_PHY_CPS (MAKE_BASE=TRUE)

1394 PHY STRAPPING OPTIONS

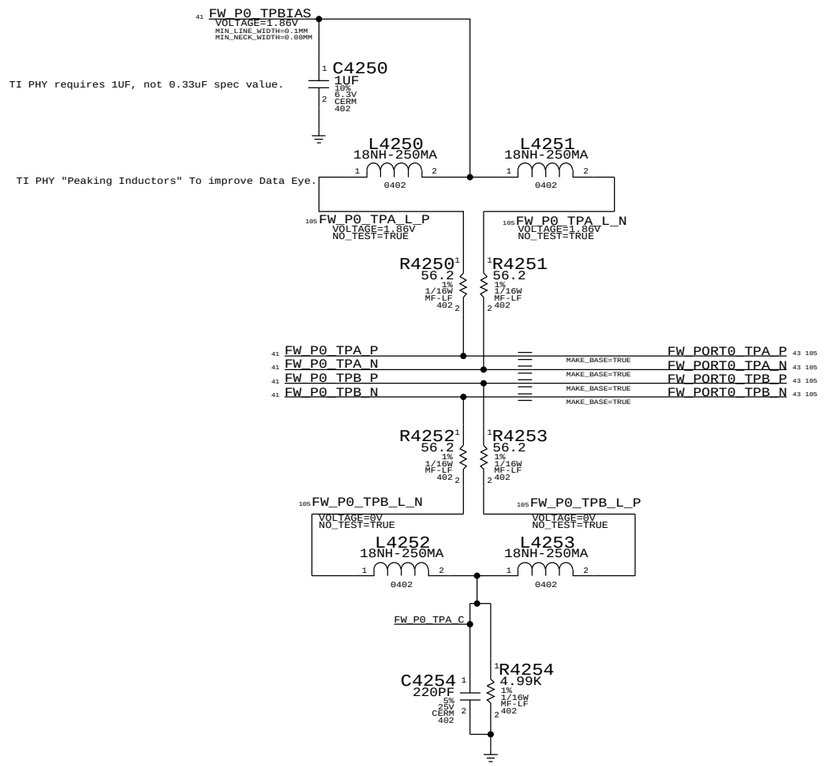


THERE ARE THREE FIREWIRE PORTS, BUT ONLY ONE IS USED.NO STUFF MEANS THAT IT IS IN BILINGUL MODE PULL-UPS ASSERT/ENABLE DATA STROBE ONLY MODE.

iMacs are now one port only and have Power Code "000"

Termination

Place close to FireWire PHY



2ND & 3RD TPA/TPB PAIR UNUSED

FW_P1_TPBIAS — NC_FW_PORT1_TPBIAS (MAKE_BASE=TRUE, NO_TEST=TRUE)

FW_P1_TPA_P — NC_FW_PORT1_TPA_P (MAKE_BASE=TRUE, NO_TEST=TRUE)

FW_P1_TPA_N — NC_FW_PORT1_TPA_N (MAKE_BASE=TRUE, NO_TEST=TRUE)

FW_P2_TPBIAS — NC_FW_PORT2_TPBIAS (MAKE_BASE=TRUE, NO_TEST=TRUE)

FW_P2_TPA_P — NC_FW_PORT2_TPA_P (MAKE_BASE=TRUE, NO_TEST=TRUE)

FW_P2_TPA_N — NC_FW_PORT2_TPA_N (MAKE_BASE=TRUE, NO_TEST=TRUE)

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE: FW: 1394B MISC

Apple Inc.

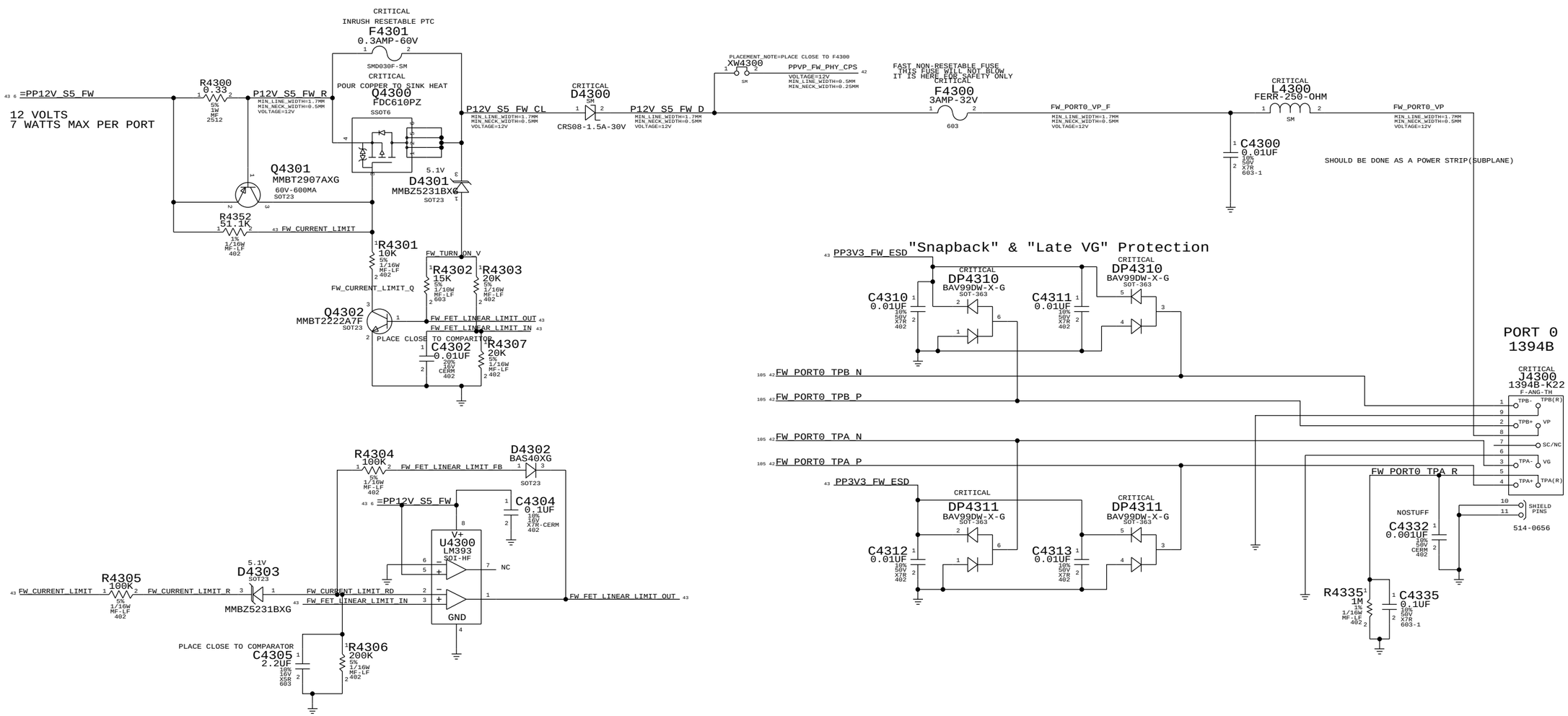
DRAWING NUMBER: 051-7863 SIZE: D

REVISION: A.0.0

BRANCH:

PAGE: 42 OF 110

SHEET: <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>



SYNC MASTER=K22						SYNC DATE=09/02/2009	
PAGE TITLE: FIREWIRE CONNECTOR							
Apple Inc.						DRAWING NUMBER: 051-7863	SIZE: D
						REVISION: A.0.0	
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						PAGE: 43 OF 110	
						SHEET: <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>	

8 7 6 5 4 3 2 1

D C B A

SYNC MASTER=K22 SYNC DATE=12/02/2008

PAGE TITLE

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Apple Inc.

DRAWING NUMBER 051-7863 SIZE D

REVISION A.0.0

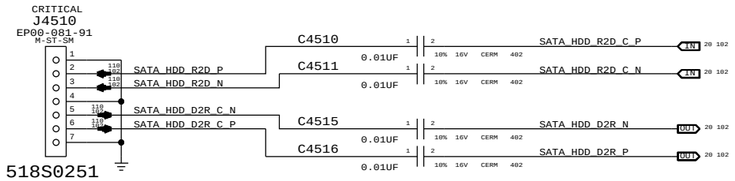
BRANCH

PAGE 44 OF 110

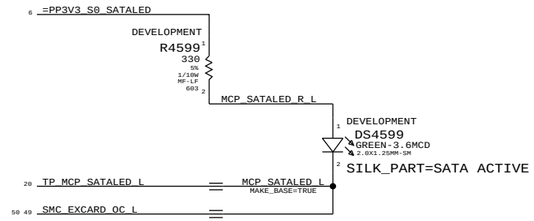
SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

8 7 6 5 4 3 2 1

SATA PORT A0 FOR HDD

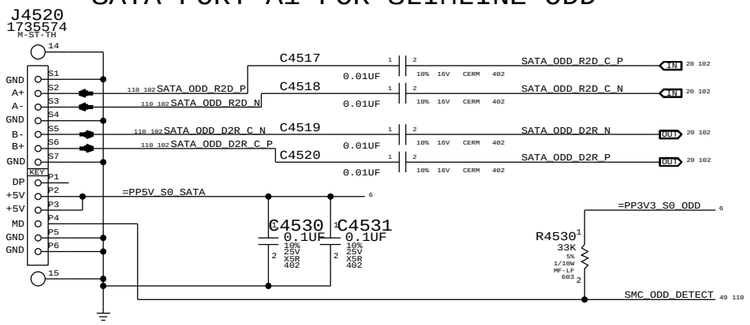


SATA Activity LED



518-0361

SATA PORT A1 FOR SLIMLINE ODD



SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE

SATA Connectors

Apple Inc.

DRAWING NUMBER 051-7863 SIZE D

REVISION A.0.0

BRANCH

PAGE 45 OF 110

SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

USB/SMC DEBUG MUX

PORT 3

=PP5V_S3_USB
U4601 TPS2060 MSOP
USB_EXTC_OC_L
USB_EXTD_OC_L
R4600 10K 5% 1/16W MF-LF 402
USB_PWR_ENA_L
C4605 0.1UF 20% 16V CERM 402
OMIT CRITICAL C4606 150UF 20% 6.3V POLY-TANT CASE-D2-SM
C4621 0.1UF 20% 16V CERM 402
C4631 0.1UF 20% 16V CERM 402
Q4600 2N7002 SOT23-HF
PM_EN_USB_PWR
=PP3V3_S5_SMCUSBMUX
C4650 0.1UF 20% 16V CERM 402
U4650 MOJOMUX PI3USB102ZLE TQFN
SMC_RX_L
SMC_TX_L
USB_EXTD_P
USB_EXTD_N
OE*
SEL
USB_DEBUGPRT_EN_L
SEL=0: CHOOSE SMC
SEL=1: CHOOSE USB
PRODUCTION R4651 0 5% 1/10W MF-LF 402
PRODUCTION R4652 0 5% 1/10W MF-LF 402
L4630 FERR-250-OHM SM
PP5V_USB2_PORT3 VOLTAGE=5V MIN_LINE_WIDTH=0.6MM MIN_NECK_WIDTH=0.2MM
PP5V_USB2_PORT3_F VOLTAGE=5V MIN_LINE_WIDTH=0.6MM MIN_NECK_WIDTH=0.2MM
C4630 0.01UF 20% 16V CERM 402 (PUT CAP ON CONNECTOR SIDE)
L4631 120-OHM-90MA DLP0NS
USB_D_MUXED_N
USB_D_MUXED_P
USB_PORT3_N
USB_PORT3_P
J4630 USB-K22 F-ANG-TH
VDD
D-
D+
GND
VBUS
DATA-
DATA+
514-0659
D4630 RCLAMP0502N SLP1210N6
NC
IO
VBUS
GND

PORT 2

=PP5V_S3_USB
U4600 TPS2060 MSOP
USB_EXTA_OC_L
USB_EXTB_OC_L
C4601 0.1UF 20% 16V CERM 402
OMIT CRITICAL C4602 330UF 20% 6.3V POLY-TANT CASE-D3L-SM1
C4603 0.1UF 20% 16V CERM 402
C4611 0.1UF 20% 16V CERM 402
L4610 FERR-250-OHM SM
PP5V_USB2_PORT1 VOLTAGE=5V MIN_LINE_WIDTH=0.6MM MIN_NECK_WIDTH=0.2MM
PP5V_USB2_PORT1_F VOLTAGE=5V MIN_LINE_WIDTH=0.6MM MIN_NECK_WIDTH=0.2MM
C4610 0.01UF 20% 16V CERM 402 (PUT CAP ON CONNECTOR SIDE)
L4611 120-OHM-90MA DLP0NS
USB_EXTB_N
USB_EXTB_P
USB_PORT1_N
USB_PORT1_P
J4610 USB-K22 F-ANG-TH1
D4610 RCLAMP0502N SLP1210N6
L4620 FERR-250-OHM SM
PP5V_USB2_PORT2 VOLTAGE=5V MIN_LINE_WIDTH=0.6MM MIN_NECK_WIDTH=0.2MM
PP5V_USB2_PORT2_F VOLTAGE=5V MIN_LINE_WIDTH=0.6MM MIN_NECK_WIDTH=0.2MM
C4620 0.01UF 20% 16V CERM 402 (PUT CAP ON CONNECTOR SIDE)
L4621 120-OHM-90MA DLP0NS
USB_EXTC_N
USB_EXTC_P
USB_PORT2_N
USB_PORT2_P
J4620 USB-K22 F-ANG-TH
D4620 RCLAMP0502N SLP1210N6

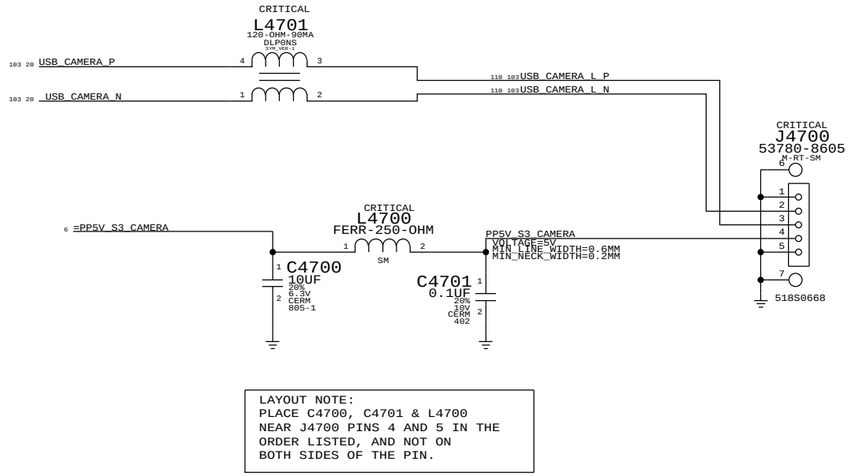
PORT 0

L4600 FERR-250-OHM SM
PP5V_USB2_PORT0 VOLTAGE=5V MIN_LINE_WIDTH=0.6MM MIN_NECK_WIDTH=0.2MM
PP5V_USB2_PORT0_F VOLTAGE=5V MIN_LINE_WIDTH=0.6MM MIN_NECK_WIDTH=0.2MM
C4600 0.01UF 20% 16V CERM 402 (PUT CAP ON CONNECTOR SIDE)
L4601 120-OHM-90MA DLP0NS
USB_EXTA_N
USB_EXTA_P
USB_PORT0_N
USB_PORT0_P
J4600 USB-K22 F-ANG-TH1
D4600 RCLAMP0502N SLP1210N6

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
128S0238	1	330UF, TANT-POLY BULK CAP	C4602	CRITICAL	K23
128S0225	1	150UF, TANY-POLY BULK CAP	C4606	CRITICAL	K22

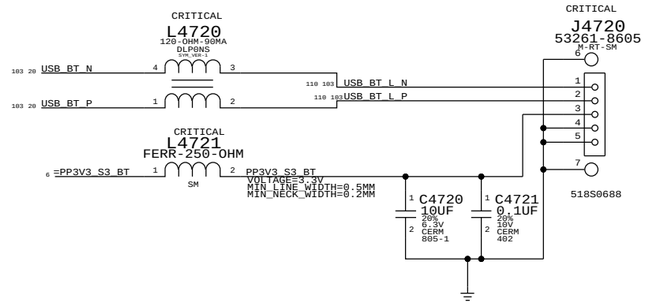
SYNC_MASTER=K22 SYNC_DATE=09/02/2009
PAGE TITLE
EXTERNAL USB CONNECTORS
Apple Inc.
DRAWING NUMBER 051-7863 SIZE D
REVISION A.0.0
BRANCH
PAGE 46 OF 110
SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

CAMERA CONNECTOR & FILTER

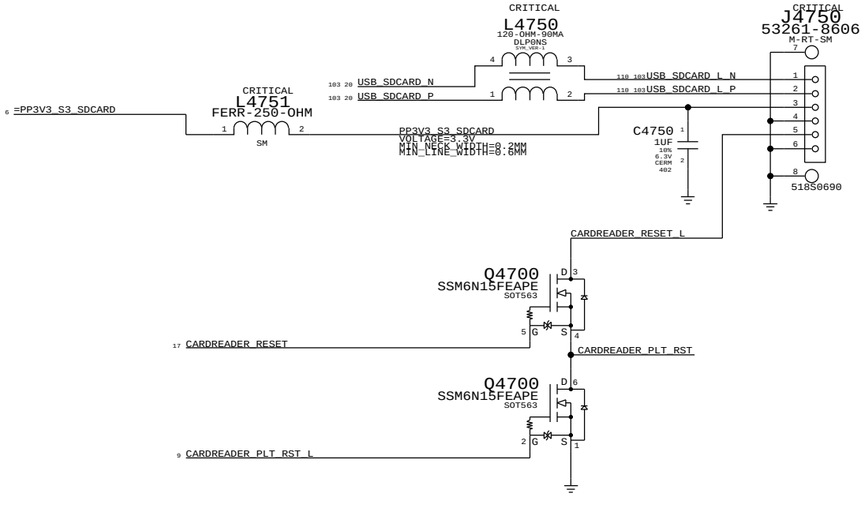


LAYOUT NOTE:
PLACE C4700, C4701 & L4700
NEAR J4700 PINS 4 AND 5 IN THE
ORDER LISTED, AND NOT ON
BOTH SIDES OF THE PIN.

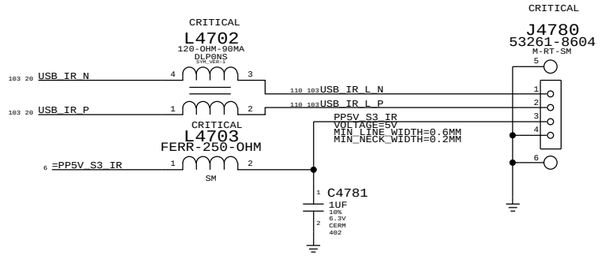
K37L (BLUETOOTH) CONNECTOR



SD Card Reader Board Connector



IR RECEIVER CONNECTOR



SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE_TITLE: Internal USB Connections

Apple Inc.

DRAWING NUMBER: 051-7863 SIZE: D

REVISION: A.0.0

BRANCH:

PAGE: 47 OF 110

SHEET: <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

8 7 6 5 4 3 2 1

D C B A

SYNC MASTER=K22 SYNC DATE=12/02/2008

PAGE TITLE

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Apple Inc.

DRAWING NUMBER 051-7863 SIZE D

REVISION A.0.0

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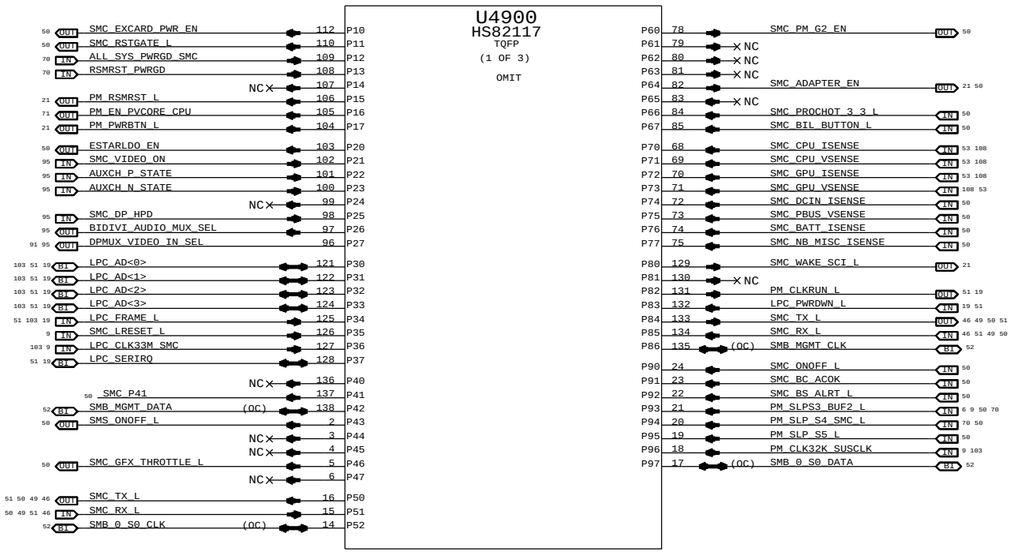
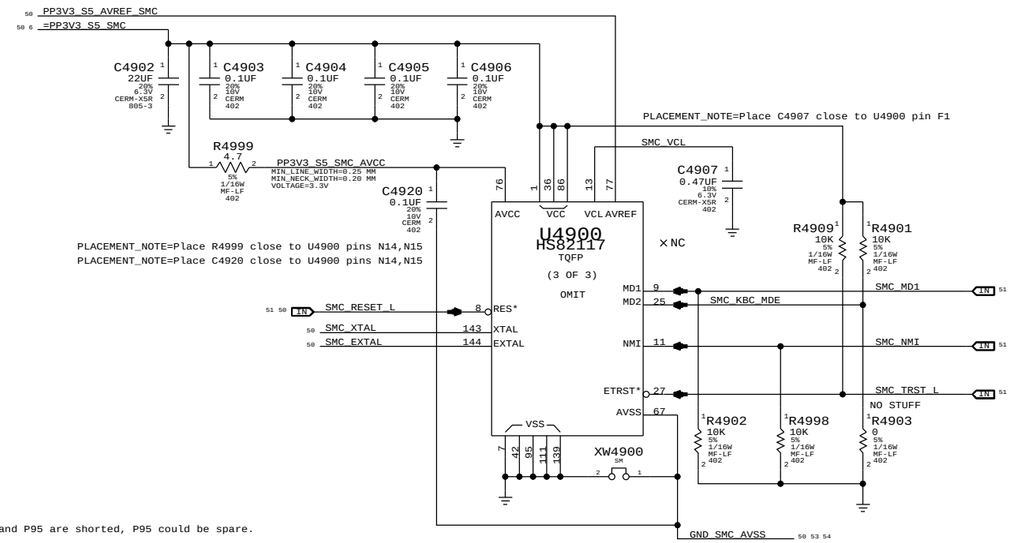
PAGE 48 OF 110

SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

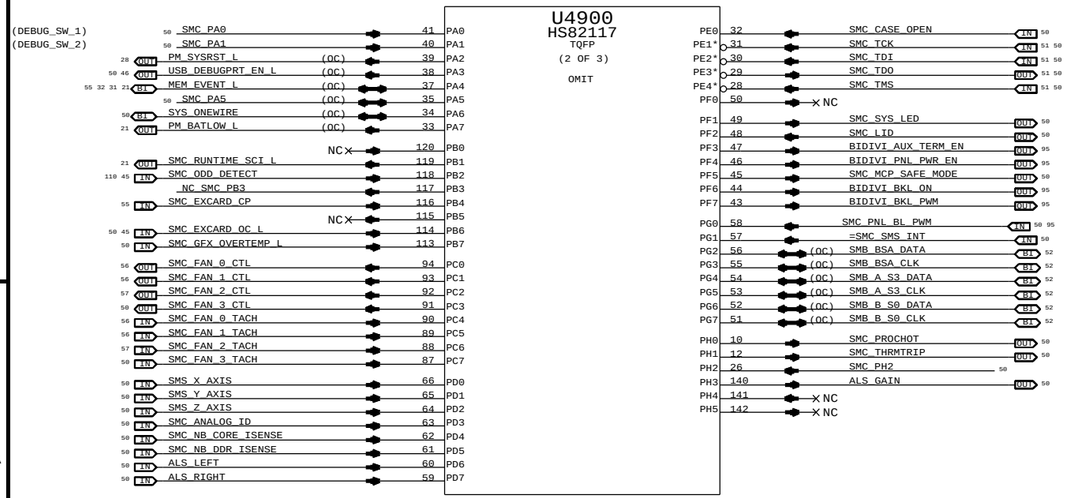
8 7 6 5 4 3 2 1

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





NOTE: P94 and P95 are shorted, P95 could be spare.



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=MARKVIDEO SYNC_DATE=03/12/2009

PAGE TITLE: SMC

Apple Inc.

DRAWING NUMBER: 051-7863 SIZE: D

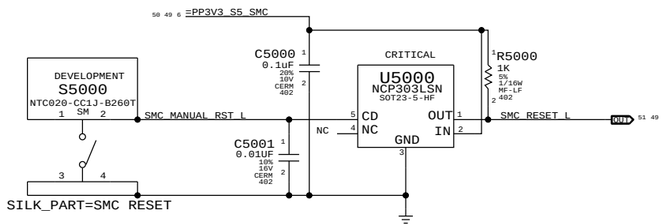
REVISION: A.0.0

BRANCH:

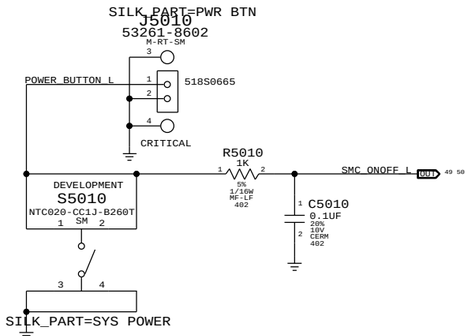
PAGE: 49 OF 110

SHEET: <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

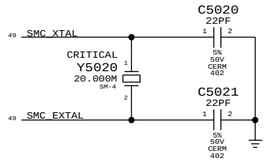
SMC Reset Button / Brownout Detect



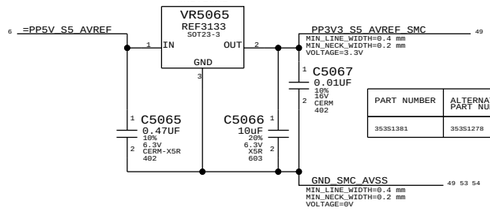
POWER BUTTON



SMC Crystal Circuit

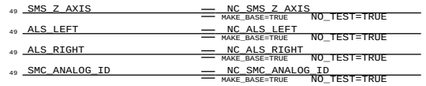


SMC AVREF Supply

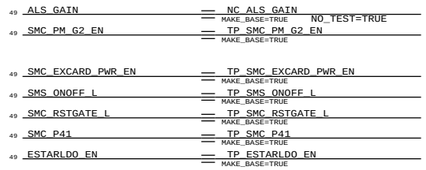


PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
353S1381	353S1278		ALL	Intersil ISL60002-33

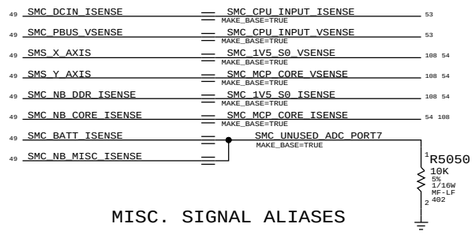
UNUSED TP/NC ALIASES - PORT D - INTERNAL PULLUPS



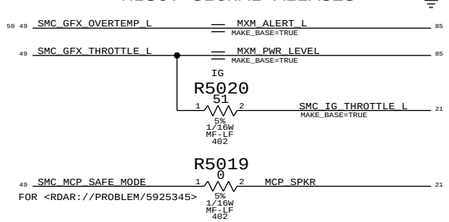
UNUSED TP/NC ALIASES



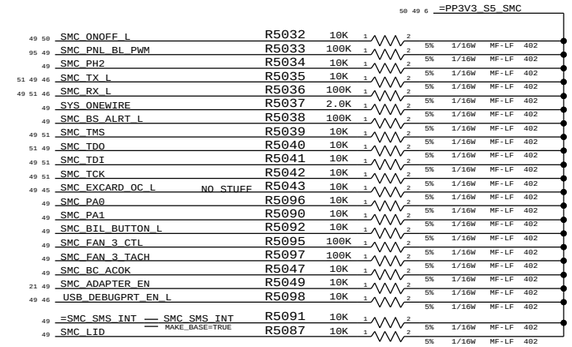
ANALOG SENSORS

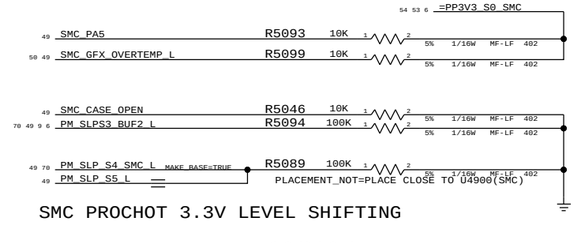


MISC. SIGNAL ALIASES

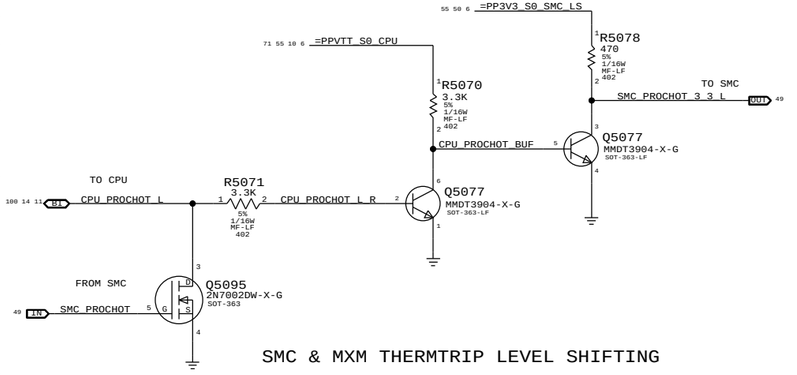


SMC Support

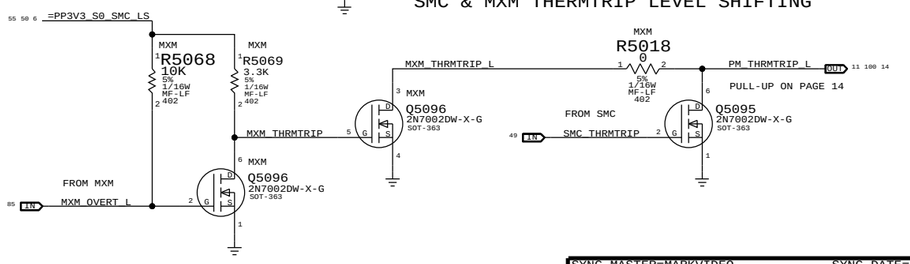




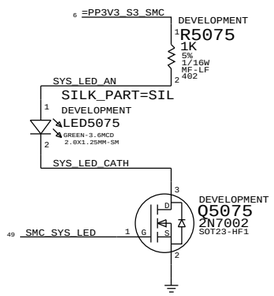
SMC PROCHOT 3.3V LEVEL SHIFTING



SMC & MXM THERMTRIP LEVEL SHIFTING



SIL: FOR DEVELOPMENT USE ONLY



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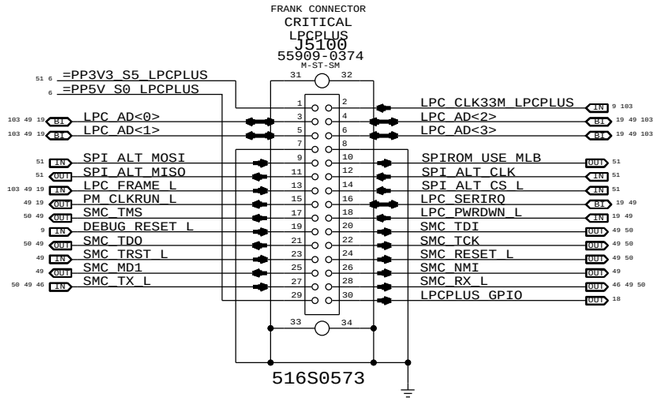
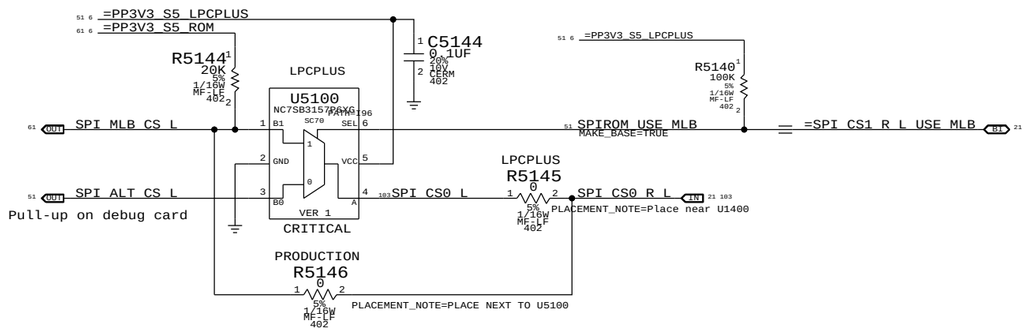
PAGE TITLE: SMC Support	
Apple Inc.	DRAWING NUMBER: 051-7863 SIZE: D
	REVISION: A.0.0
	BRANCH:
	PAGE: 50 OF 110
	SHEET: <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

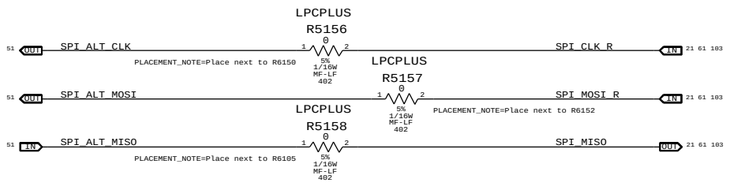
LPC+SPI Connector



Alternate SPI ROM Support



SPI Bus Series Resistance Option



SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE

LPC+SPI Debug Connector

Apple Inc.

DRAWING NUMBER 051-7863 SIZE D

REVISION A.0.0

BRANCH

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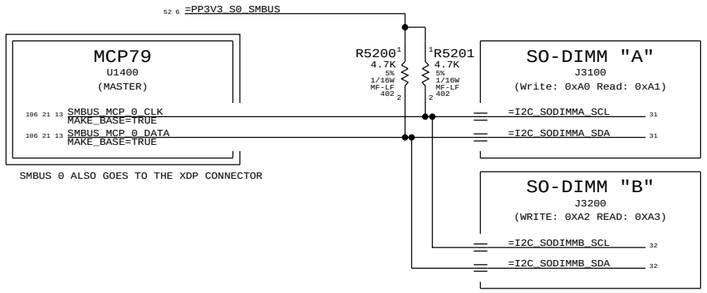
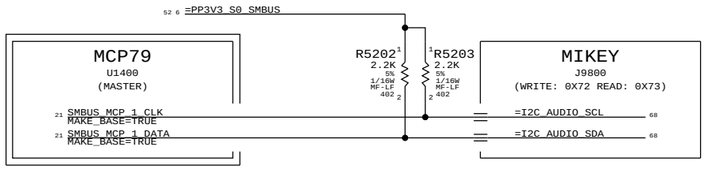
MCP79 SMBUS "0" CONNECTIONS

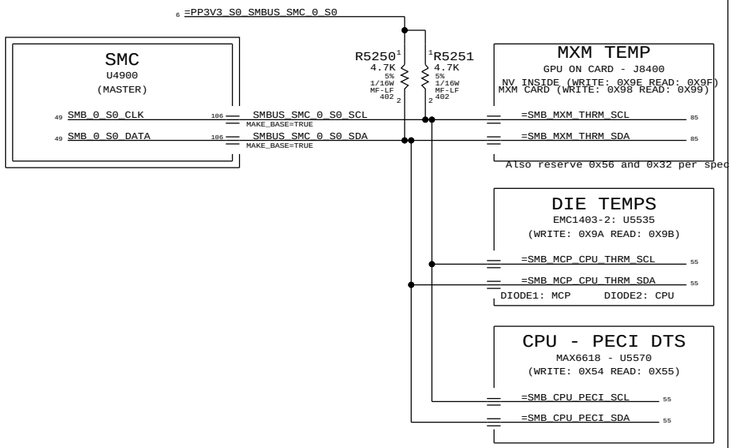


SMBUS 0 ALSO GOES TO THE XDP CONNECTOR

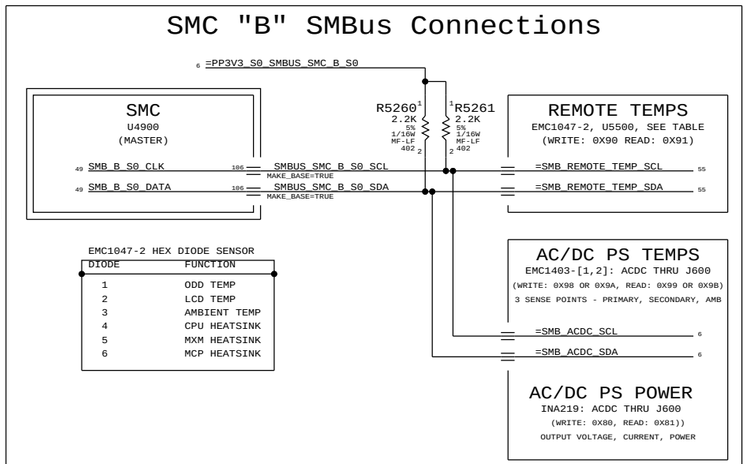
MCP79 SMBUS "1" CONNECTIONS



SMC "0" SMBus Connections



SMC "B" SMBus Connections

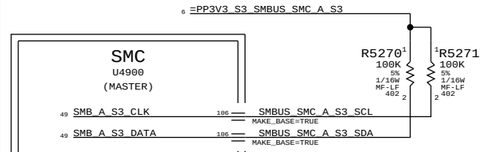


EMC1047-2 HEX DIODE SENSOR

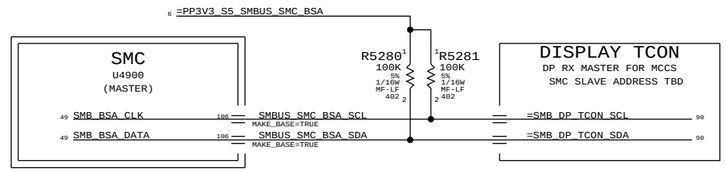
DIODE	FUNCTION
1	ODD TEMP
2	LCD TEMP
3	AMBIENT TEMP
4	CPU HEATSINK
5	MXM HEATSINK
6	MCP HEATSINK

SMC "A" SMBus Connections

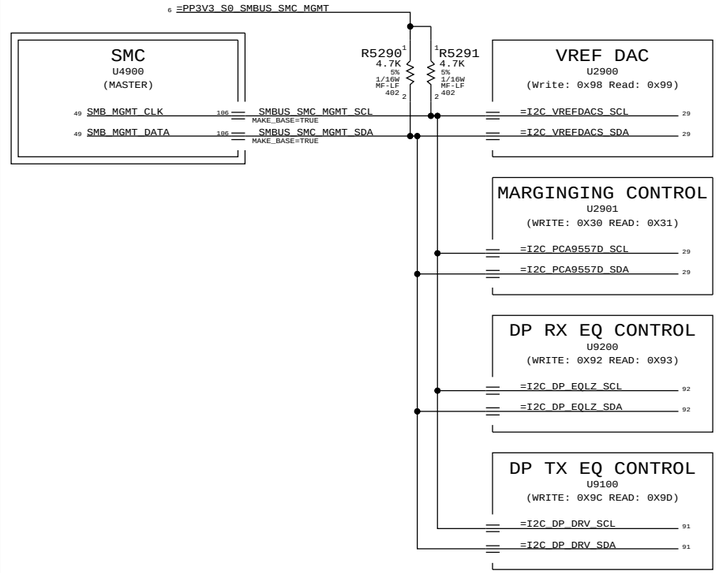
NOTE: SMC RMT BUS REMAINS POWERED AND MAY BE ACTIVE IN S3 STATE



POTENTIAL SMC SLAVE SMBUS CONNECTIONS



SMC "MANAGEMENT" SMBUS CONNECTIONS



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PAGE TITLE: SMBus Connections

Apple Inc.

DRAWING NUMBER: 051-7863 SIZE: D

REVISION: A.0.0

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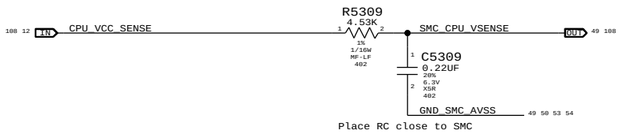
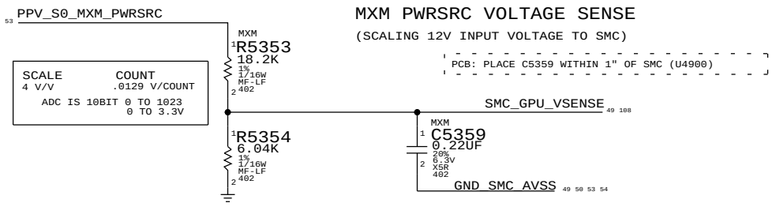
CPU Voltage Sense / Filter



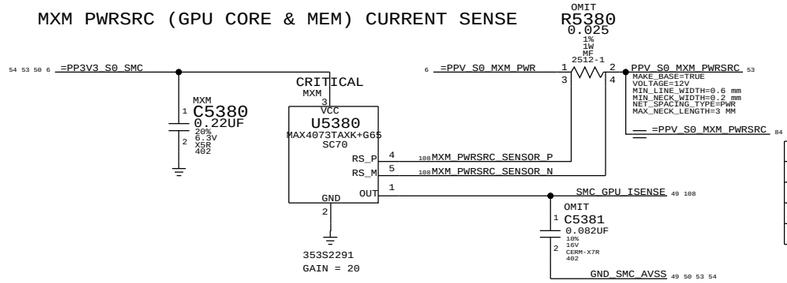
Place RC close to SMC

MXM PWRSRC VOLTAGE SENSE

(SCALING 12V INPUT VOLTAGE TO SMC)



MXM PWRSRC (GPU CORE & MEM) CURRENT SENSE



K50 SET FOR APPROX 2V AT 4A ON PWRSRC

SCALE	COUNT
2 A/V	.0064453 A/COUNT

ADC IS 10BIT 0 TO 1023
0 TO 3.3V

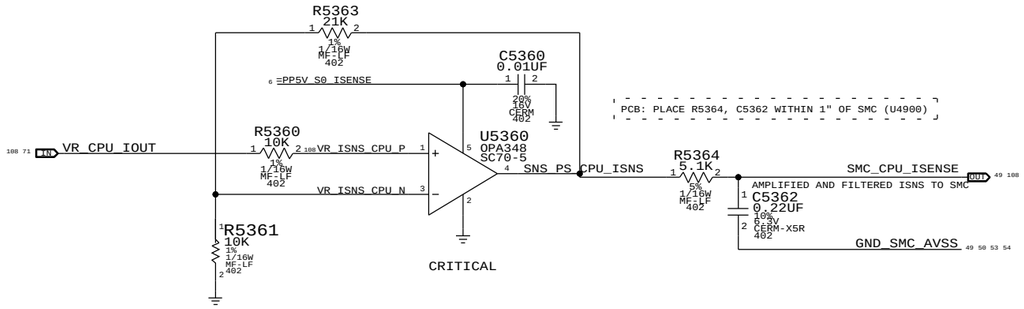
K51 SET FOR APPROX 1.98V AT 5.5A ON PWRSRC

SCALE	COUNT
2.778 A/V	.0087518 A/COUNT

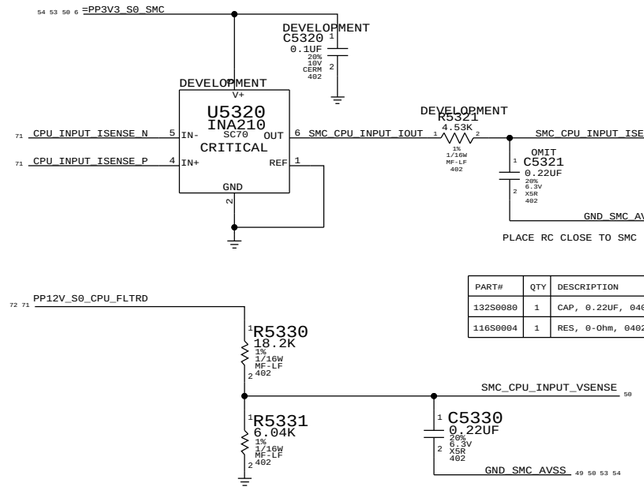
ADC IS 10BIT 0 TO 1023
0 TO 3.3V

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
107S0063	1	25 MILLIOHM	R5380	CRITICAL	K22_MXM
107S0111	1	18 MILLIOHM	R5380	CRITICAL	K23_MXM
132S0242	1	CAP,0.082UF,402	C5381		MXM
116S0090	1	RES,10KOHM,5%,402	C5381		IG

CPU CURRENT SENSE AMP & FILTER



CPU CORE INPUT SIDE CURRENT & VOLTAGE SENSE



PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
132S0080	1	CAP, 0.22UF, 0402	C5321		DEVELOPMENT
116S0004	1	RES, 0-Ohm, 0402	C5321		PRODUCTION

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE
CPU/MXM CURRENT AND VOLTAGE SENSE

Apple Inc.

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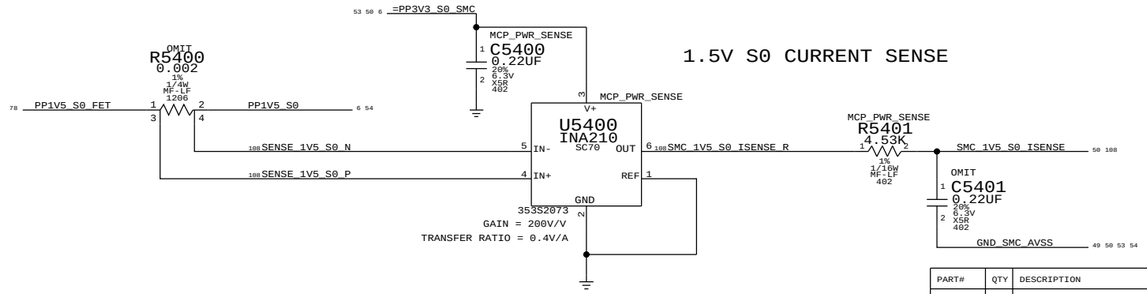
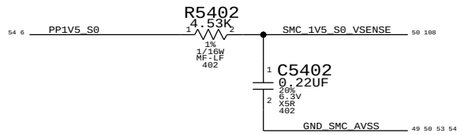
1.5V S0 CURRENT SENSE



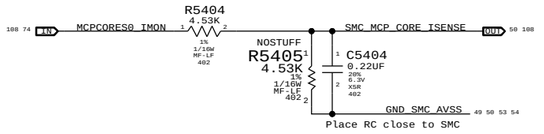
PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
104S0018	1	RES,2 MILLIOHM,1206	R5400	CRITICAL	MCP_PWR_SENSE
101S0414	1	RES,0 OHM,1206,20MILLIOHM MAX	R5400	CRITICAL	PRODUCTION

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
132S0080	1	CAP, 0.22UF, 0402	C5401		MCP_PWR_SENSE
116S0004	1	RES, 0 OHM, 402	C5401		PRODUCTION

1.5V S0 VOLTAGE SENSE

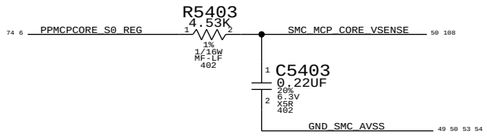


MCP CORE CURRENT SENSE



SCALE IS 0.116 V/A

MCP CORE VOLTAGE SENSE



SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE
MCP CURRENT AND VOLTAGE SENSE

Apple Inc.

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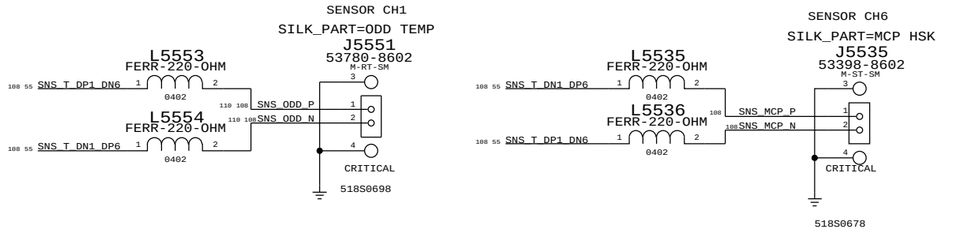
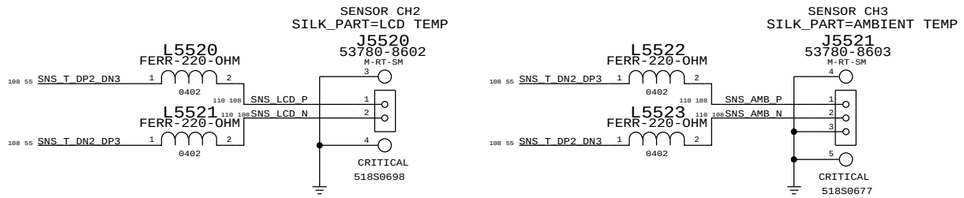
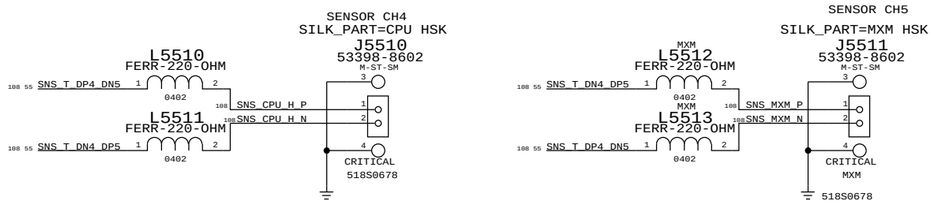
REMOTE THERMAL SENSORS
HEATSINKS, AMBIENT, PANEL AND ODD



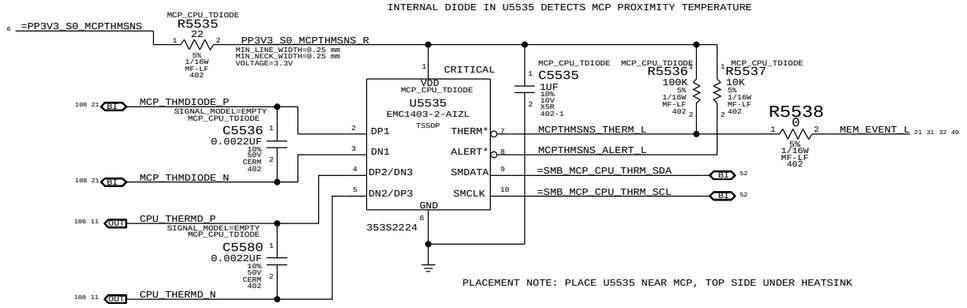


PLACE HSK SENSOR CONN. TOP SIDE NEAR MXM OR CPU

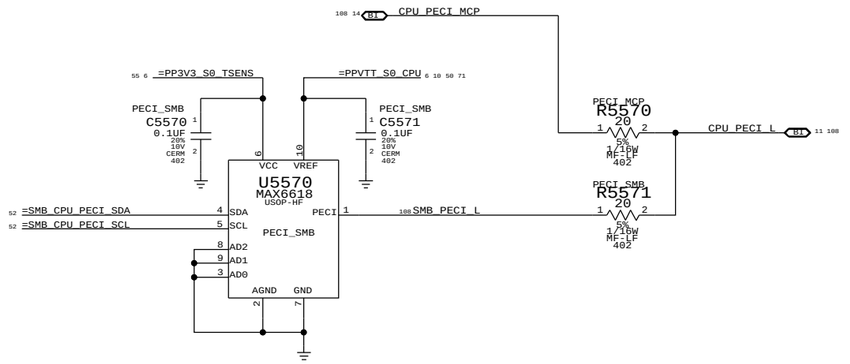


MCP & CPU T-Diode Thermal Sensor

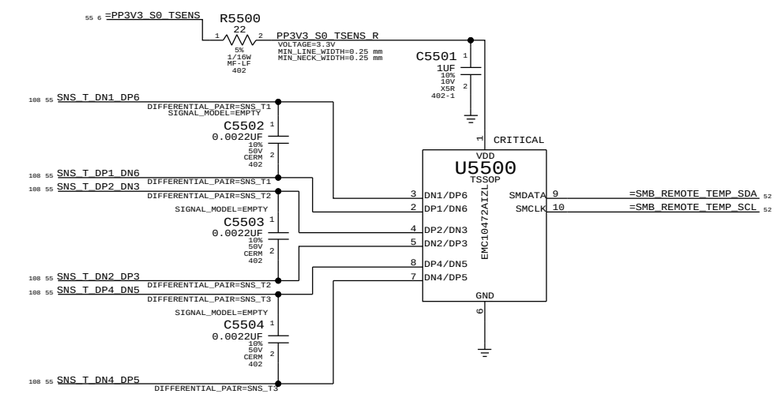
INTERNAL DIODE IN U5535 DETECTS MCP PROXIMITY TEMPERATURE



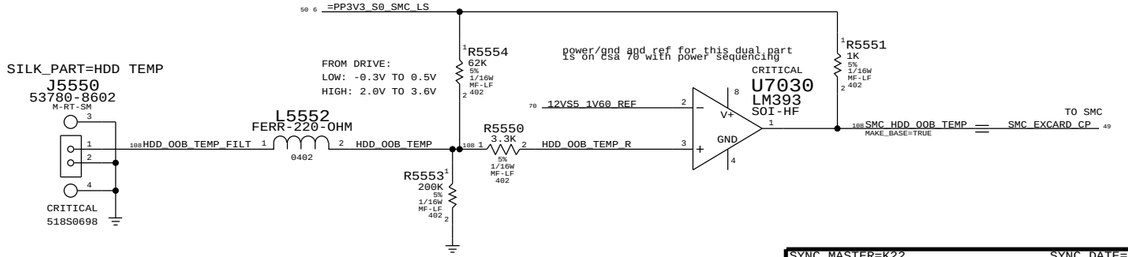
CPU PECI DTS OPTIONS



REMOTE THERMAL SENSORS (HEATSINKS AND ODD)



HDD OUT OF BAND TEMPERATURE SENSING LEVEL SHIFTING



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PAGE TITLE: Thermal Sensors

Apple Inc.

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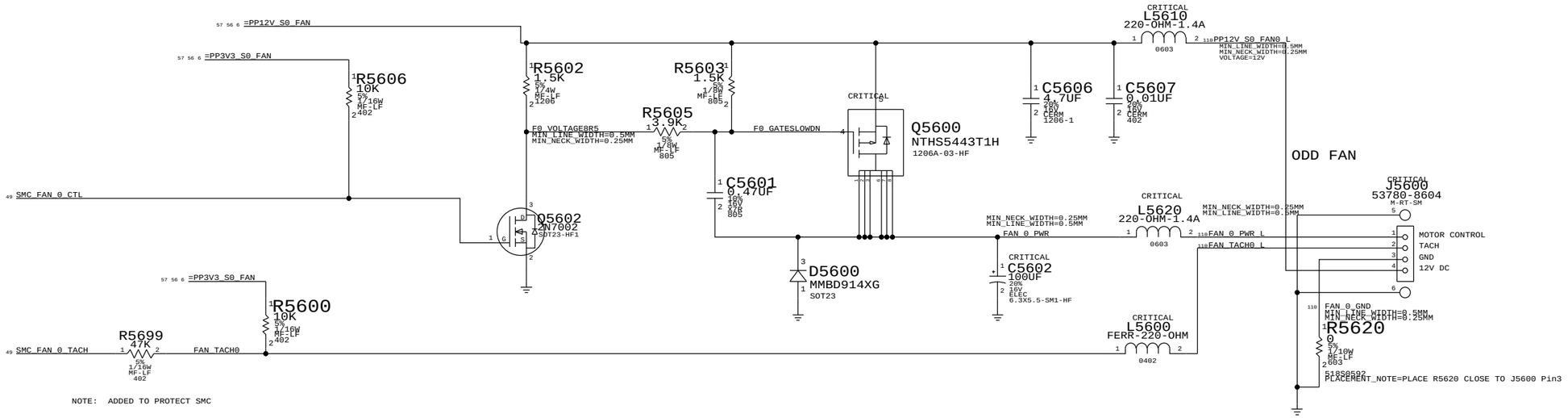
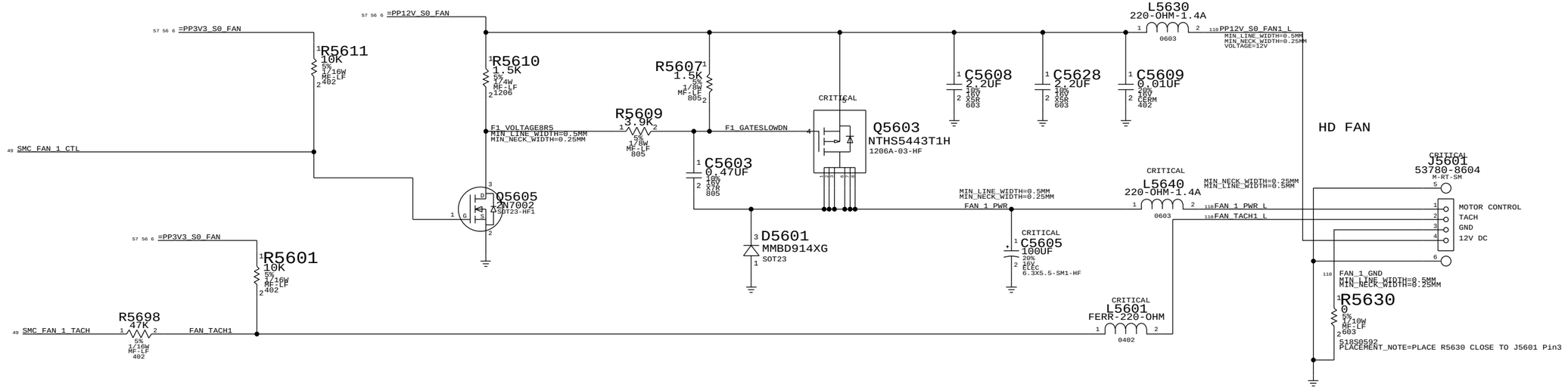
FAN 0



NOTE: ADDED TO PROTECT SMC

FAN 1



SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE: HD AND OD FAN

Apple Inc.

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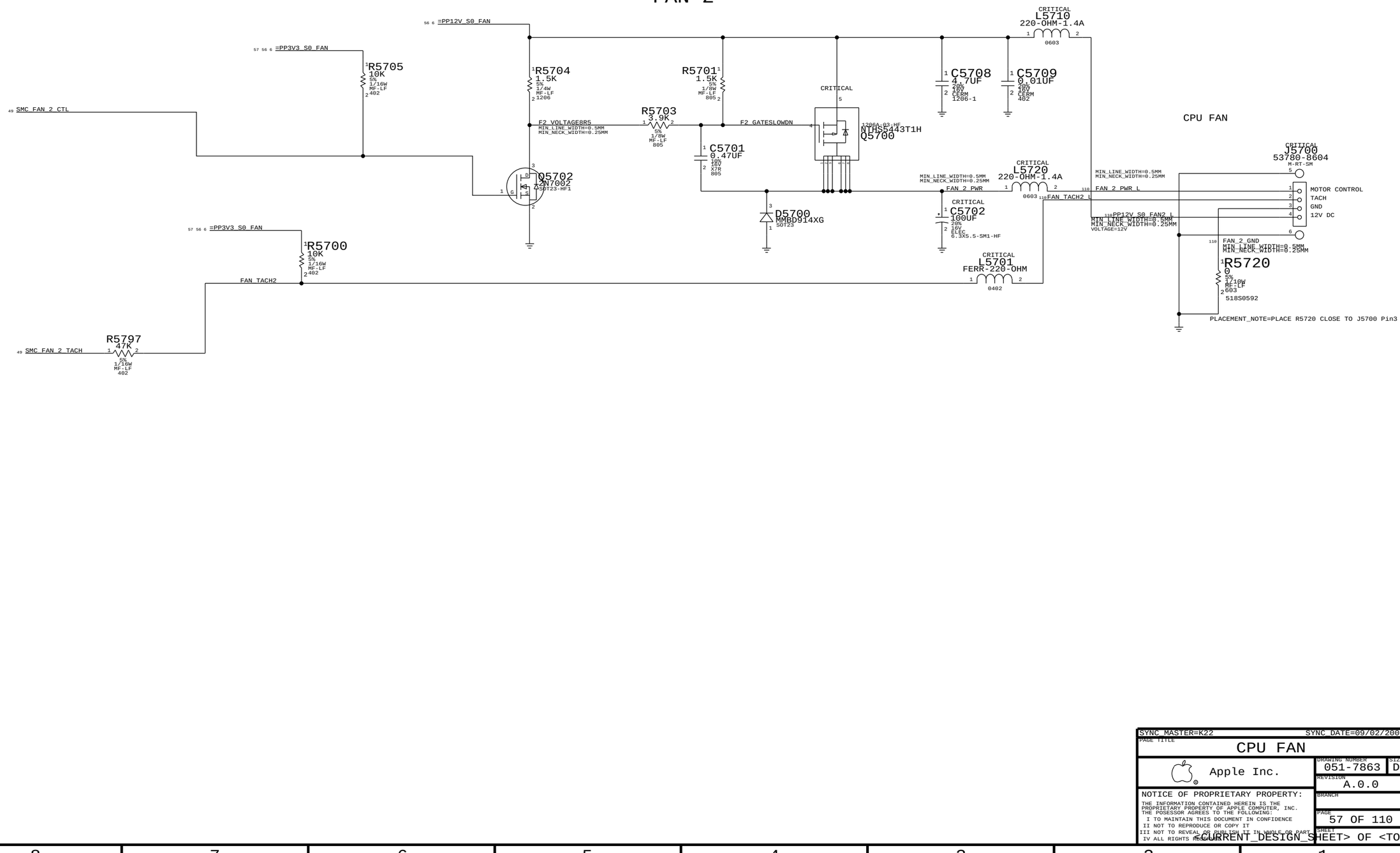
FAN 2



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CPU FAN

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8 7 6 5 4 3 2 1

D C B A

SYNC MASTER=K22 SYNC DATE=12/02/2008

PAGE TITLE

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Apple Inc.

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D C B A

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Apple Inc.

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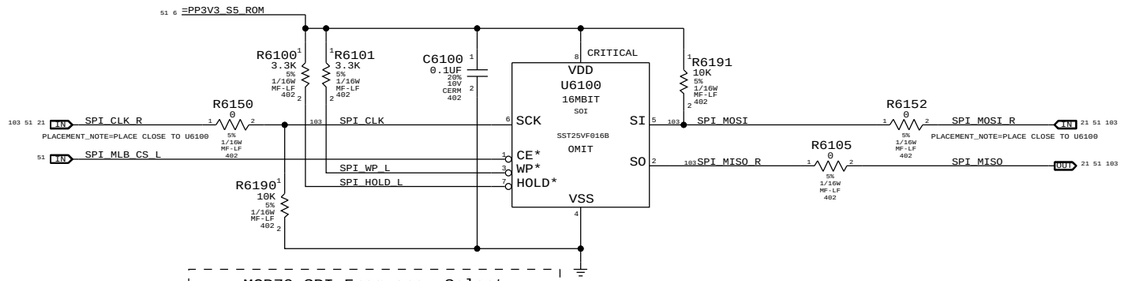

MCP79 SPI Frequency Select

Frequency	SPI_MOSI	SPI_CLK
31 MHz	0	0
42 MHz	0	1
25 MHz	1	0
1 MHz	1	1

NOTE: MCP79 only issues 'READ' (0x03) commands not 'READ_FAST' (0x0B). Limits SPI bus frequency and part selection.

SST25VF016B max speed for READ command is 25MHz.

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE

SPI ROM

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AUDIO CODEC
APPLE P/N 353S2592

=PP1V5_S0_AUD_DIG

C6203 4.7UF 20% 4V X5R 402
C6258 0.47UF 10% 10V X5R 402

C6260 10UF 20% 16V POLY-TANT CASE-B2-SM

C6204 10UF 20% 6.3V X5R 603
C6205 10UF 20% 6.3V X5R 603

C6261 0.47UF 10% 10V X5R 402
C6262 10UF 20% 16V POLY-TANT CASE-B2-SM

C6259 1UF 10% 10V X5R 402-1
C6264 0.47UF 10% 10V X5R 402
C6265 0.47UF 10% 10V X5R 402
C6213 CRITICAL 10UF 20% 6.3V X5R 603

=PP5V_S0_AUDIO
=PP3V3_S0_AUDIO
PP4V5_AUDIO_ANALOG VOLTAGE=4.5V MIN_LINE_WIDTH=0.20MM MIN_NECK_WIDTH=0.10MM
GND_AUDIO_HP_AMP_L
GND_AUDIO_CODEC

GND_AUDIO_HP_AMP_L
PP4V5_AUDIO_ANALOG
R6255 2.67K 1% 1/16W MF-LF 402

K22 = NC
K23 LOW = S/PDIF IN, HIGH = DP SPDIF

U6201 CS4206ACNZC QFN

VD	9		
VA_REF	24		
VA_HP	46		
VA	25		
VBIAS_DAC	29		
VHP_FILT+	44	CS4206 FP	
VHP_FILT-	41	CS4206 FN	
GPIO0/DMIC_SDA1	2	AUD_MUX_CNTRL	
GPIO1/DMIC_SDA2	12	AUD_GPIO_1	
GPIO2 /SPDIF_OUT2	14	AUD_GPIO_2	
GPIO3	15	AUD_GPIO_3	
SENSE_A	13	AUD_SENSE_A	
FLYP	45	CS4206 FLYP	
FLYC	43	CS4206 FLYC	
FLYN	42	CS4206 FLYN	
VL_HD	3		
VL_IF	1		
BITCLK	6	HDA_BIT_CLK	
SYNC	10	HDA_SYNC	
SDI	8	AUD_SDI_R	
SDO	5	HDA_SDOUT	
RESET*	11	HDA_RST_L	
SPDIF_IN	47	AUD_SPDIF_IN_CODEC	
SPDIF_OUT	48	AUD_SPDIF_CHIP	
DGND_THRM_PAD_AGND	7, 49, 26		
HPOUT_L	38	CRITICAL; MIN_LINE_WIDTH=0.30MM; MIN_NECK_WIDTH=0.20MM	AUD_HP_PORT_L
HPOUT_R	40	MIN_LINE_WIDTH=0.30MM; MIN_NECK_WIDTH=0.20MM	AUD_HP_PORT_R
HPREF	39	MIN_LINE_WIDTH=0.2MM; MIN_NECK_WIDTH=0.1MM	AUD_HP_PORT_REF
LINEOUT_L1+	35		AUD_LO1_P_L
LINEOUT_L1-	34		TP_AUD_LO1_N_L NC
LINEOUT_R1+	36		AUD_LO1_P_R
LINEOUT_R1-	37		TP_AUD_LO1_N_R NC
LINEOUT_L2+	31		AUD_LO2_P_L
LINEOUT_L2-	30		TP_AUD_LO2_N_L NC
LINEOUT_R2+	32		AUD_LO2_P_R
LINEOUT_R2-	33		TP_AUD_LO2_N_R NC
MICBIAS	16		AUD_CODEC_MICBIAS
VCOM	28	CS4206 VCOM	
LINEIN_L+	21		AUD_LI_P_L
LINEIN_C-	22	MAKE_BASE=TRUE	AUD_LI_COM
LINEIN_R+	23		AUD_LI_P_R
MICIN_L+	18		AUD_MIC_INP_L
MICIN_L-	17		AUD_MIC_INN_L
MICIN_R+	19		AUD_MIC_INP_R
MICIN_R-	20		AUD_MIC_INN_R
VREF+_ADC	27	CS4206 VREF_ADC NC	
DMIC_SCL	4		TP_AUD_DMIC_CLK NC

AUD_LI_N_L
AUD_LI_N_R

R6254 22 5% 1/10W MF-LF 402
R6257 22 5% 1/10W MF-LF 402
R6295 100K 1% 1/16W MF-LF 402
R6263 NOSTUFF 0 5% 1/16W MF-LF 402
R6267 NOSTUFF 100K 5% 1/10W MF-LF 402

C6211 CRITICAL 1UF 10% 20V TANT CASE-P3-HF
C6263 CRITICAL 10UF 20% 16V POLY-TANT CASE-B2-SM

C6206 2.2UF 20% 6.3V CERM 402-LF
C6208 2.2UF 20% 6.3V CERM 402-LF

XW6201 SM

GND_AUDIO_CODEC
GND_AUDIO_HP_AMP_L
=PP3V3_S0_AUDIO

BETTER: R6299 100K 5% 1/16W MF-LF 402
EDUCATION: R6298 10K 5% 1/16W MF-LF 402
AUD_GPIO_1

DIFF FSINPUT= 2.45VRMS
SE FSINPUT= 1.22VRMS
DAC1 FSOUTPUT= 1.34VRMS
DAC2/3 FSOUTPUTDIFF= 2.67VRMS
DAC2/3 FSOUTPUTSE= 1.34VRMS

HP OUT ZOBEL NETWORK

AUD_HP_PORT_L
AUD_HP_PORT_R
C6298 0.1UF 10% 16V X7R-CERM 402
C6297 0.1UF 10% 16V X7R-CERM 402
AUD_Z_R NC
AUD_Z_L NC
R6296 39 5% 1/16W MF-LF 402
R6297 39 5% 1/16W MF-LF 402
GND_AUDIO_HP_AMP_L

APPLE P/N 353S2456
4.5V POWER SUPPLY FOR CODEC

L6201 FERR-220-OHM 0402
R6201 2.21K 1% 1/10W MF-LF 402
VR6201 TPS71745 SON CRITICAL
C6201 1UF 10% 10V X5R 402-1
C6202 1UF 10% 10V X5R 402-1
C6266 0.1UF 10% 16V X7R-CERM 402
C6207 1UF 10% 10V X5R 402-1

=PP5V_S0_AUDIO
=PP3V3_S0_AUDIO
4V5_REG_IN
4V5_REG_EN
4V5_NR
PP4V5_AUDIO_ANALOG
GND_AUDIO_CODEC

SYNC_MASTER=K22	SYNC_DATE=09/02/2009
PAGE TITLE: AUDIO: CODEC/REGULATOR	
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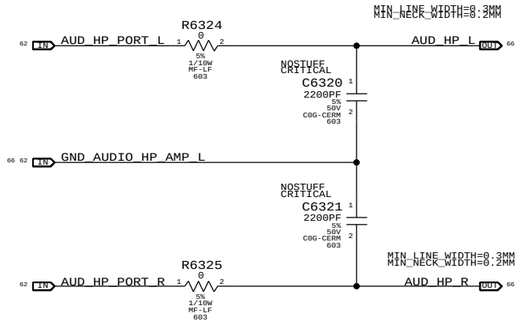
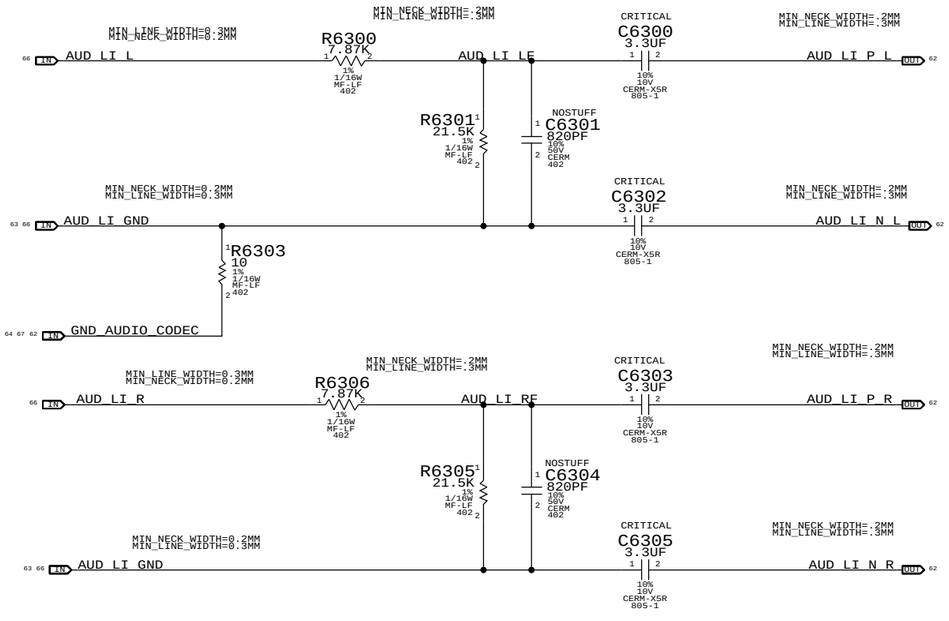
1ST ORDER DAC FILTER PLACEHOLDER



CODEC Nom SE RIN = 20K OHMS
FC = 5 HZ Max
VIN = 2VRMS, CODEC VIN = 1.14 VRMS
NET RIN = 18K OHMS



SYNC_MASTER=SKIPAUDIO SYNC_DATE=04/20/2009

PAGE TITLE
AUDIO: FILTER/BUFFER

Apple Inc.

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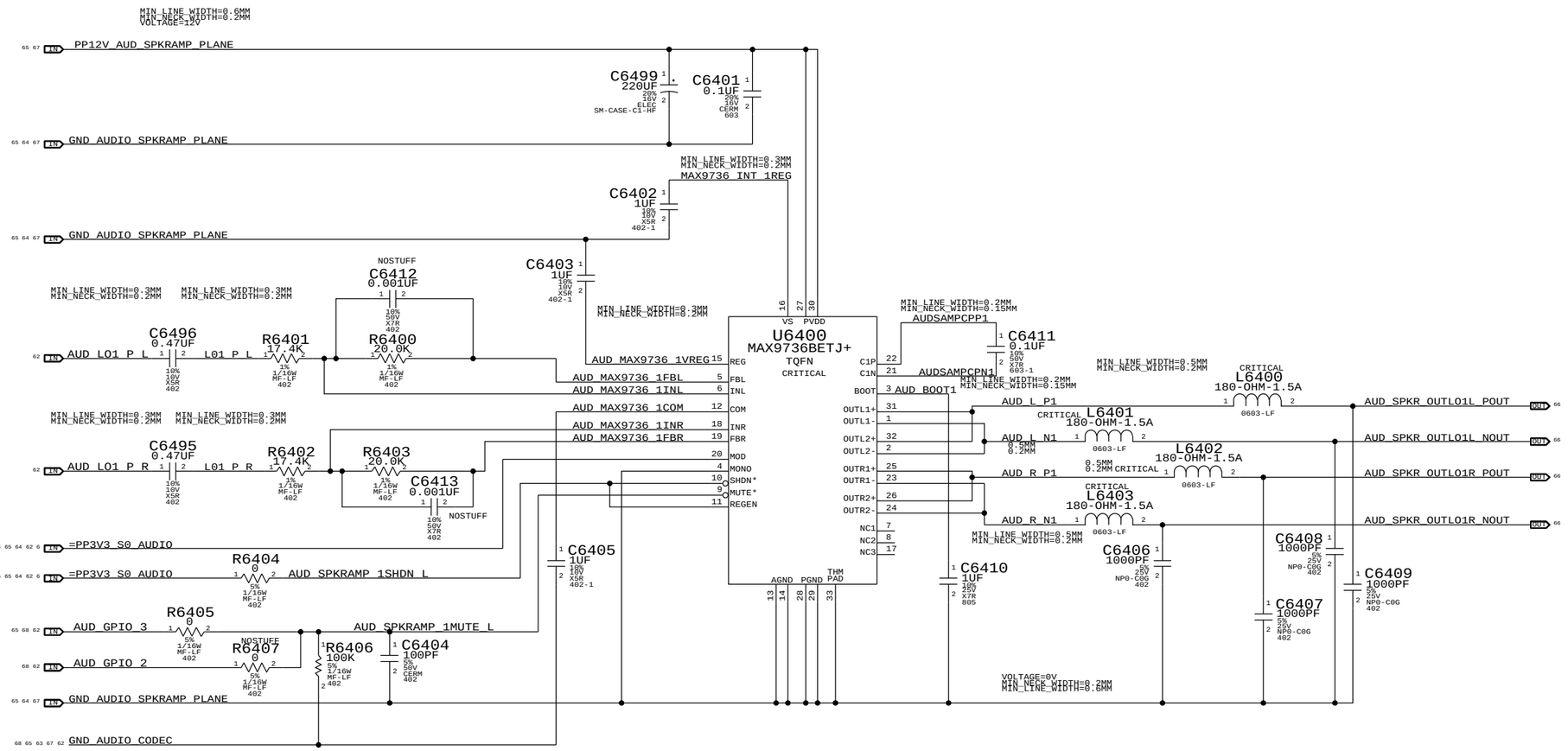
TWEETER SPEAKER AMPLIFIER

MAX9736B APN:353S2042

GAIN = -4.8(20K/17.4K)
CODEC OUT = 1.335VRMS
AMP VOUT = 7.355VRMS

TURN ON TIME: 110MS
TURN ON DELAY: 150MS
RIN = 17.4 OHMS
FC = 19.5 HZ

POUT = 6.76 W INTO 8 OHMS @ 1% THD+N



SYNC_MASTER=SKIPAUDIO SYNC_DATE=04/20/2009

PAGE TITLE: AUDIO: Tweeter Amp 1

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DRAWING NUMBER: 051-7863 SIZE: D
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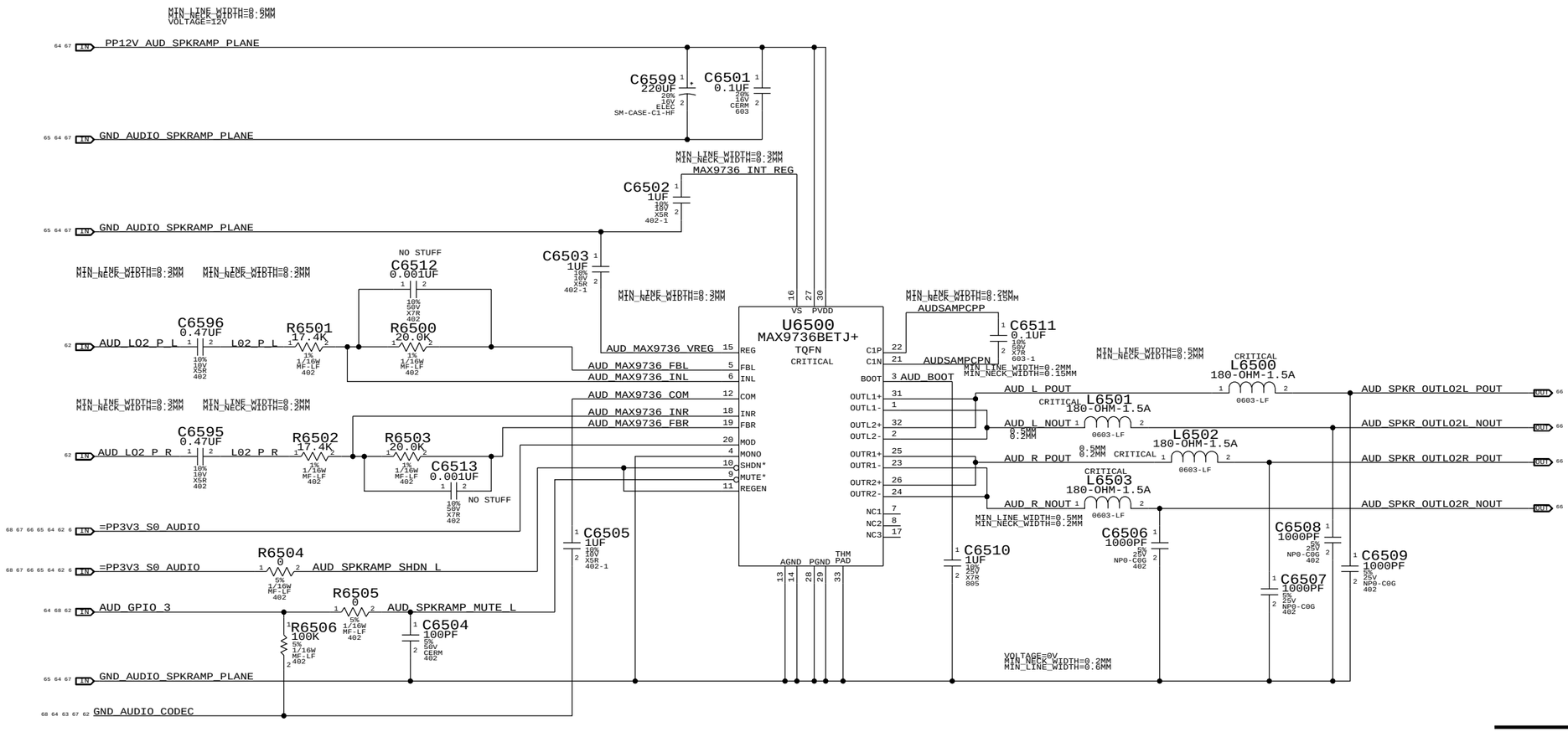
PAGE: 64 OF 110
SHEET: <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

WOOFER SPEAKER AMPLIFIER

MAX9736B APN:353S2042

GAIN = -4.8(20K/17.4K)
CODEC OUT = 1.335VRMS
AMP VOUT = 7.355VRMS
POUT = 6.76 W INTO 8 OHMS @ 1% THD+N

TURN ON TIME: 110MS
TURN ON DELAY: 150MS
RIN = 17.4 OHMS
FC = 19.5 HZ



SYNC_MASTER=SKIPAUDIO
SYNC_DATE=04/20/2009

PAGE TITLE
AUDIO: Woofer Amp

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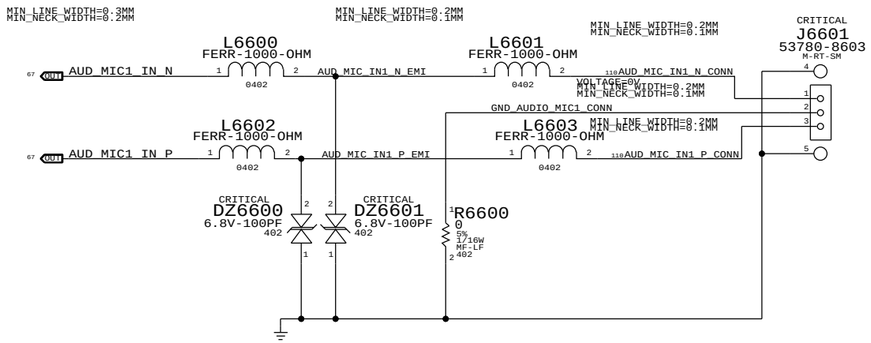
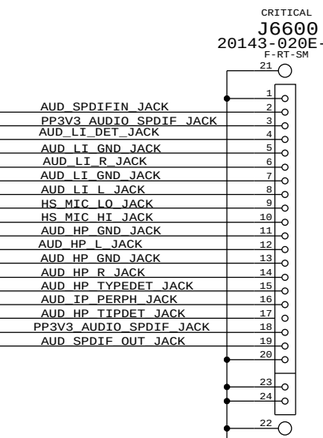
INTERNAL MIC CON
APPLE P/N 518S0677



SPEAKER CABLE CONNECTORS
APPLE P/N 518S0748
APPLE P/N 518S0656

REMOTE I/O CONNECTOR
APPLE P/N 518S0723



SYNC_MASTER=K22	SYNC_DATE=09/02/2009
PAGE TITLE	Audio: MLB to I/O Conn.
Apple Inc.	DRAWING NUMBER 051-7863 SIZE D
	REVISION A.0.0
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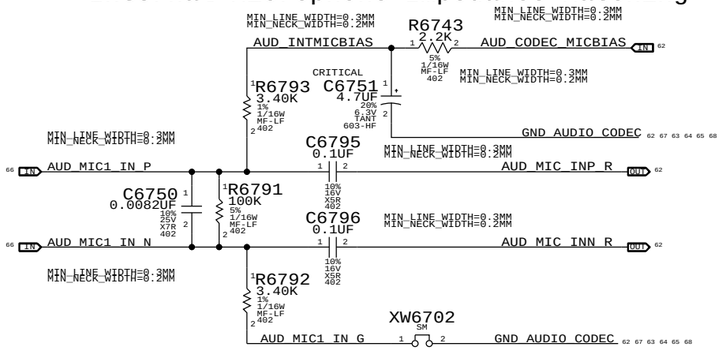
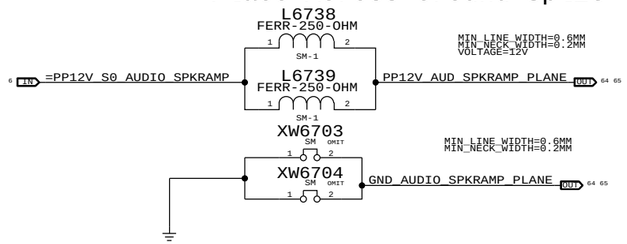
	PAGE 66 OF 110
	SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

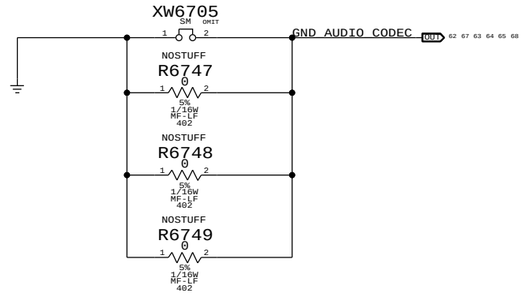
Internal Microphone Impedance Matching



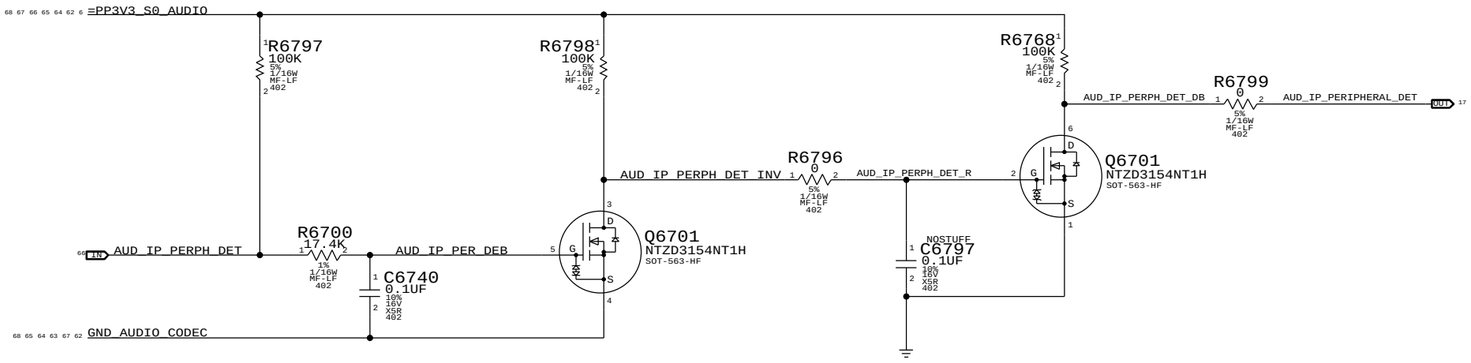
Place Across Ground Split



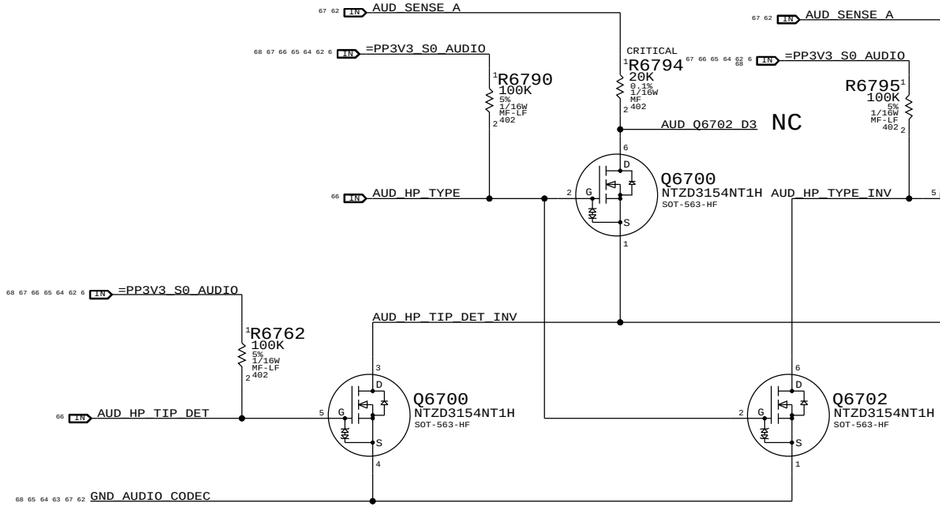
Audio Ground Returns



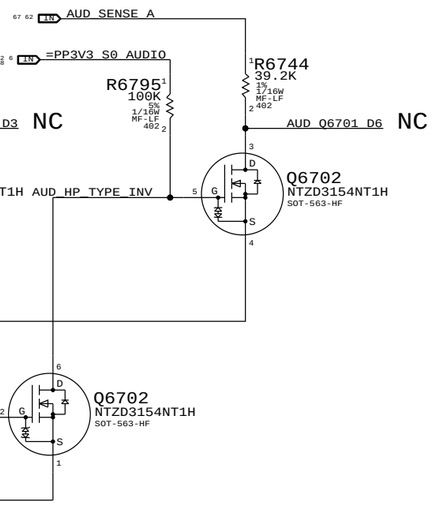
IPHS HS Detect Debounce CKT



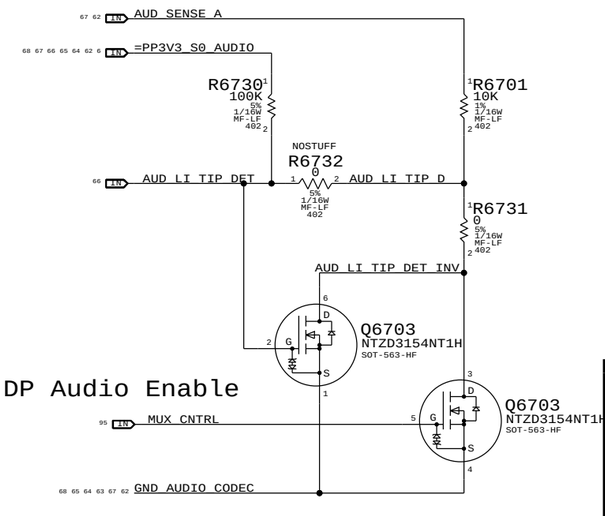
Digital Out



Headphone Out



LI Insert Detect



SYNC_MASTER=SKIPAUDIO SYNC_DATE=04/20/2009

PAGE TITLE: AUDIO: Detects/Grounding

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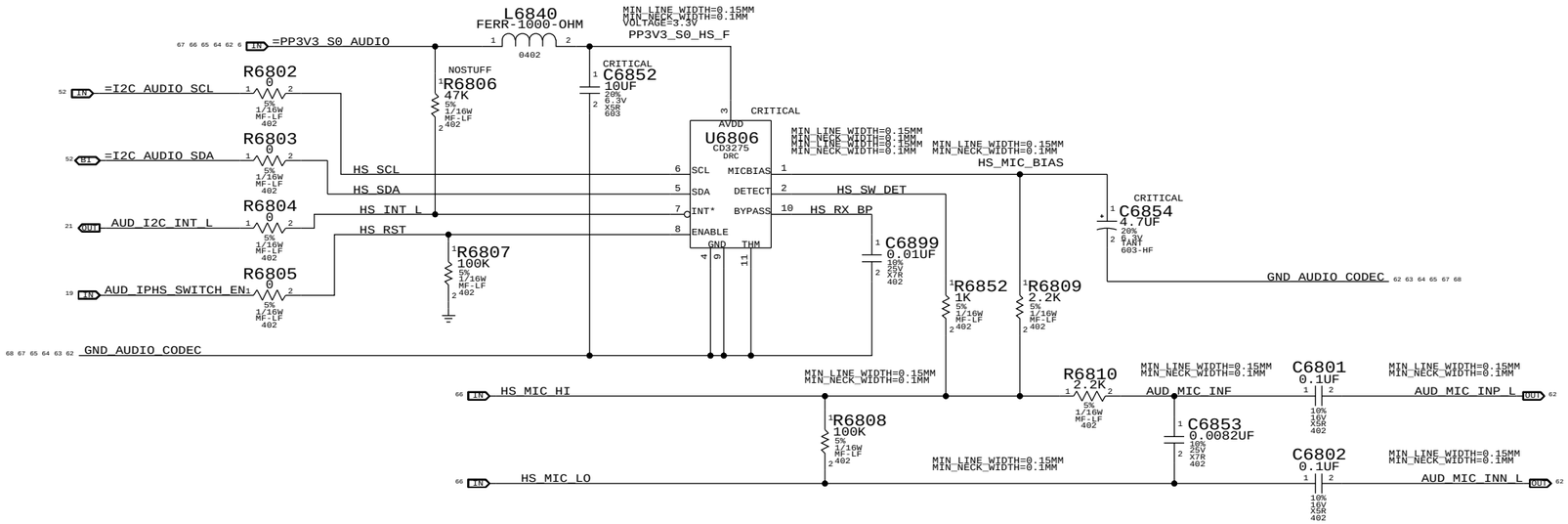
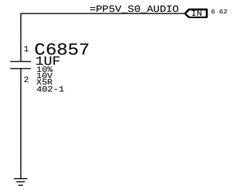
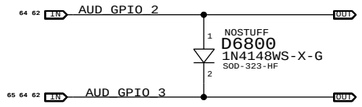
FUNCTION	PIN	CONVERTER	VOLUME	ENABLE/ CNTRL TYPE	DETECT/INTERRUPT
PRIMARY	0X0B	0X04	0X04	GPIO 3	N/A
SECONDARY	0X0A	0X03	0X03	GPIO 3	N/A
HEADPHONES	0X09	0X02	0X02	N/A	0X09 (A)
LINE INPUT	0X0C	0X05	0X05	N/A	LINE IN
BUILT-IN MICROPHONE	0X0D(13,B,RIGHT)	0X06	0X06	MICBIAS 80%	N/A
HEADSET MICROPHONE	0X0D (13,V22,B,LEFT)	0X06	0X06	MIKEY	MIKEY
SPDIF OUT	0X10	0X08	N/A	N/A	0X0C (B)
SPDIF IN	0X0F	0X07	N/A	N/A	N/A
MIKEY	N/A	N/A	N/A	MCP GPIO_38	MCP GPIO_5

MIKEY RECEIVER CKT

WRITE: 0X72 READ: 0X73 APN 353S2256







FLP = 8.82 KHZ
FHP = 80 HZ

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE: AUDIO: Mikey

Apple Inc.

DRAWING NUMBER: 051-7863 SIZE: D

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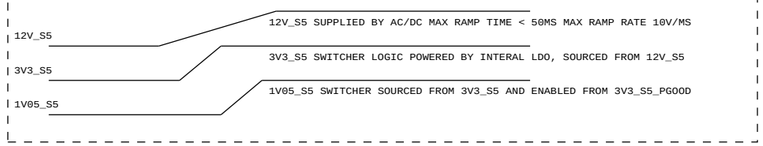
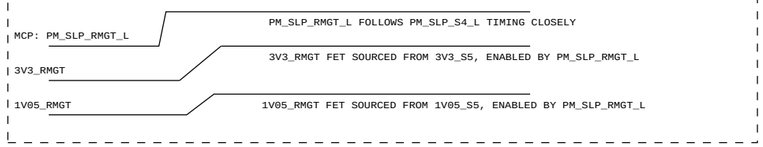
SHEET:

<CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

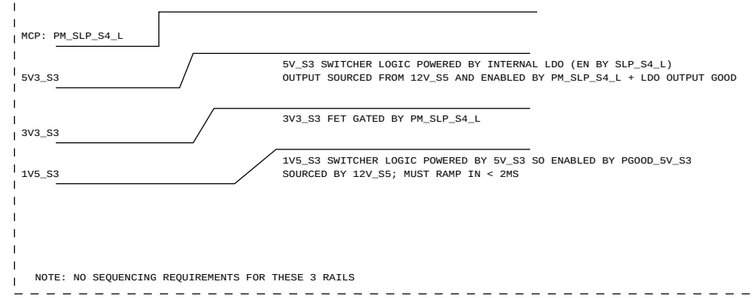
S5 POWER RAIL SEQUENCING



RMGT POWER RAIL SEQUENCING

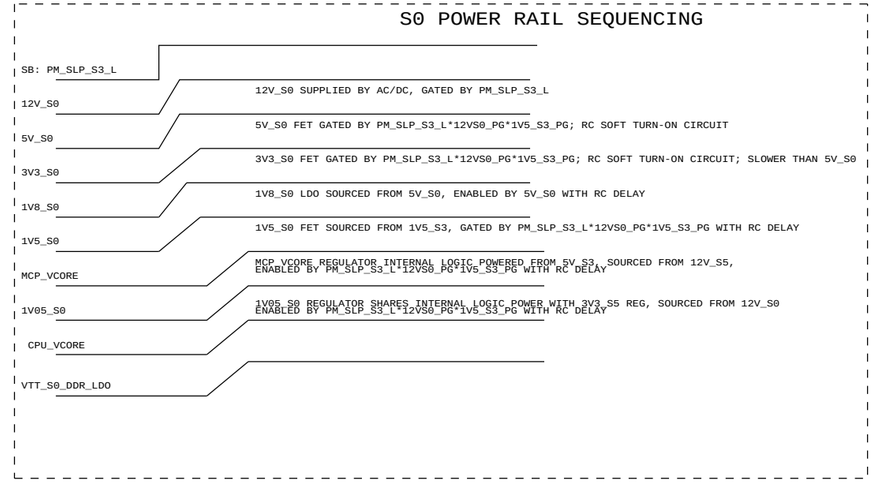


S3 POWER RAIL SEQUENCING

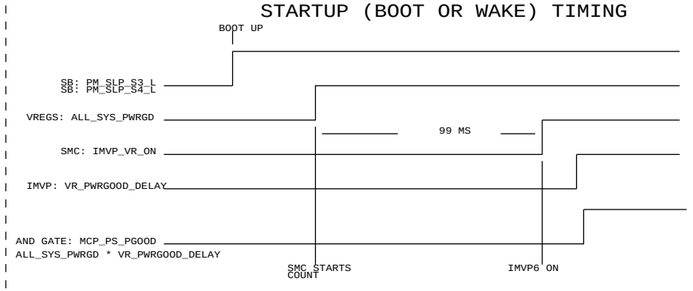


NOTE: NO SEQUENCING REQUIREMENTS FOR THESE 3 RAILS

S0 POWER RAIL SEQUENCING

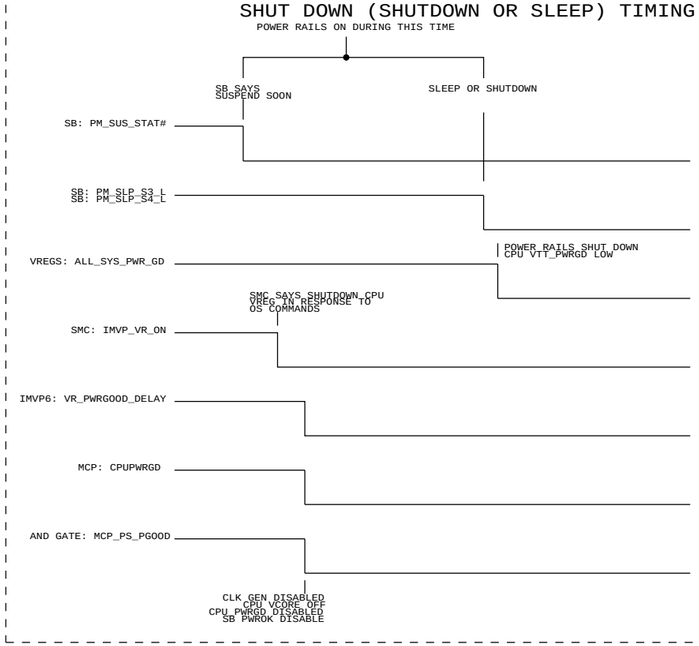


STARTUP (BOOT OR WAKE) TIMING



State	Manageability	SMC_PM_G2_ENABLE	PM_S4_STATE_L	PM_SLP_S3_L	PM_SLP_S4_L	PM_SLP_M_L
Run (S0/M0)	N/A	1	1	1	1	1
Sleep (S3/M1)	On	1	1	0	1	1
Soft-Off (S5/M1)	On	1	0	0	1	1
Sleep (S3/M-Off)	Off	1	1	0	1	0
Soft-Off (S5/M-Off)	Off	1	0	0	0	0
Battery Off (G3Hot)	N/A	0	0	0	0	0

SHUT DOWN (SHUTDOWN OR SLEEP) TIMING



SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE
POWER SEQUENCING BLOCK DIAGRAM

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Power Control Signals
3.3V,5V S3 enable

State	SMC_PM_G2_ENABLE (PORTABLES)	PM_SLP_S4_L	PM_SLP_S3_L
Run (S0)	1	1	1
Sleep (S3)	1	1	0
Soft-Off (S5)	1	0	0
Battery Off (G3Hot)	0	0	0

21 IN PM_SLP_RMGT_L — R7050 0 — ENET_EN OUT 38

FROM MCP (6)

102 21 IN PM_SLP_S4_L (PM_S4_STATE_L) — NOSTUFF R7051 33 — PLACEMENT_NOTE=Place close to U1400

R7052 33 — P3V3S3_EN OUT 78 — Enable FET — PLACEMENT_NOTE=Place close to U1400

R7053 33 — 5VREG_EN OUT 73 — ENABLE REGULATOR — PLACEMENT_NOTE=Place close to U1400

R7054 33 — PM_SLP_S4_SMC_L OUT 49 50 — To SMC — PLACEMENT_NOTE=Place close to U1400

6 =PP5V_S3_PWRCTL — R7072 100K — 70 PGOOD_5V_S3 MAKE_BASE=TRUE — =DDRREG_EN OUT 75 — Enable regulator

70 IN PGOOD_5V_S3 — PM_EN_USB_PWR OUT 46 — USB Port Switch

MXM POWER SEQUENCE

85 IN =PM_MXM_PGOOD_PULLUP — ALL_SYS_PWRGD_R 6 70 MAKE_BASE=TRUE — PM_MXM_EN OUT 85

MXM CARD INPUT POWER ARE 12V_S0, 3V3_S0, 5V_S0
ALL_SYS_PWRGD ENABLES MXM REGULATORS
PM_MXM_PGOOD IS OPEN DRAIN SIGNAL, IT'S PULLED UP TO ALL_SYS_PWRGD

70 6 =PP3V3_S5_PWRCTL — C7058 0.1UF

FROM COMPARATOR — 78 PGOOD_1V5_S3
FROM COMPARATOR — 78 PGOOD_12V_S0 — R7040 10K — S0_RDY MAKE_BASE=TRUE

50 49 9 6 IN PM_SLPS3_BUF2_L (PM_SLP_S3_L) — From SMC (6)

U7059 TC7SZ08AFEAPE SOT665 — (PM_SLP_S3_L_BUF)

PM_SLP_S3_L_AND_S0_RDY — R7085 33 — P5VS0_EN MAKE_BASE=TRUE — =P5VS0_EN OUT 78 — Enable FET — PLACEMENT_NOTE=Place close to U7059

R7080 30K — R7081 43K — R7082 10K — R7083 2.2K — 5% 1/16W MF-LF 402

P3V3S0_EN MAKE_BASE=TRUE — =P3V3S0_EN OUT 78 — Enable FET
MCPDDR_EN MAKE_BASE=TRUE — =MCPDDR_EN OUT 78 — Enable FET DELAY OF ~15MS FROM PM_SLP_S3_L
CPUVTTS0_EN MAKE_BASE=TRUE — =PVTT_S0_EN OUT 76 — Enable regulator DELAY OF ~18MS FROM PM_SLP_S3_L
MCPCORES0_EN MAKE_BASE=TRUE — =MCPCORES0_EN OUT 74 — Enable regulator DELAY OF ~16MS FROM PM_SLP_S3_L

C7080 C7081 C7082 C7083 0.47UF 10% 6.3V CERM-X5R 402

1.5V_S3 NEED TO BE ON BEFORE S0 FET ON
12V_S0 NEED TO BE ON BEFORE MCP REG AND 1.05_S0 REG EN

=PP3V3_S5_PWRCTL — R7031 1K — 79 PGOOD_1V1_S5 — 1V05V_S0 DERIVES FROM 3.3V_S5 — RSMRST_PWRGD OUT 49 — To SMC (2) — FROM THIS SMC GENERATES PM_RSMRST_L WHICH GOES INTO PGOOD_S8 OF MCP DELAY IS ABOUT 200MS

C7031 0.1UF 10% 16V X5R 402

HYSTERESIS NUMBERS CALCULATED BASED ON OUPTPUT PULL UP OF 3.3V

PGOOD Comparators

78 38 6 =PP12V_S5_PWRCTL — R7013 33.2K — R7018 84.5K — C7010 0.1UF

PLACE SHORTS CLOSE TO PLANE CUTS

R7014 100K — R7019 10K

6 PP12V_S0 — XW7000 OMIT SM — R7000 4.99K — 12VS0_PG_CMP1 — (9.91V/9.58V; 330MV HYSTERESIS)

6 =PPDDR_S3_PGCMP — XW7001 OMIT SM — R7001 1.21K — 1V5S3_PG_CMP — (1.30V/1.22V; 80MV HYSTERESIS)

USING COMPARTOR INSTEAD OF REGULATOR PGOOD OUTPUT BECAUSE IF 5V S3 DOES NOT COME UP, PPDDR REGULATOR HAS NO INTERNAL POWER TO PULL PGOOD LOW

CRITICAL — U7010 LM393 SOI-HF — V+ GND

12VS5_9V00_REF — 12VS5_COMP_REF — 12VS5_1V27_REF — 1V5S3_COMP_REF

R7007 49.9K — R7008 49.9K — 1% 1/16W MF-LF 402

PGOOD_12V_S0 OUT 70 — PGOOD_1V5_S3 OUT 70

(PULLUPS ARE NEAR LOADS)

71 6 =PP12V_S0_VRD — MXM R7022 100K — R7020 64.9K — (1.67V/1.53V; 132MV HYSTERESIS) — 55 12VS5_1V60_REF

IG — 6 =PP1V8_S0_PGCMP — XW7002 SM OMIT — R7002 2.0K — 1V8S0_PG_CMP — 1V8S0_COMP_REF — R7021 10K

CRITICAL — U7030 LM393 SOI-HF — R7006 49.9K — C7025 0.1UF

PGOOD_1V8_S0 OUT 70

S0 RAILS PGOOD

70 6 =PP3V3_S5_PWRCTL — R7033 10K

70 IN PGOOD_1V8_S0
75 IN PGOOD_1V5_S0
70 IN PGOOD_5V_S0

6 =PP3V3_S0_PWRCTL — R7030 10K — S0_PWR_CMP_PGOOD MAKE_BASE=TRUE — U7020 TC7SZ08AFEAPE SOT665

74 IN PGOOD_MCPCORE_S0
70 IN PGOOD_1V05_S0 — S0_PWR_REG_PGOOD MAKE_BASE=TRUE

=PP3V3_S5_PWRCTL — C7020 0.1UF — ALL_SYS_PWRGD

PLACE RESISTORS CLOSE TO U7020

R7098 33 — ALL_SYS_PWRGD_SMC OUT 49
R7099 33 — ALL_SYS_PWRGD_R OUT 6 70

	I	Rds(on)	Vgs +/-
IRF7410	13A	7mOHM	8V
IRF7413	9.6A	18mOHM	20V
FDS4435	8.8A	35mOHM	25V
IRF7406	5.8A	70mOHM	20V
IRF6402	3.7A	65mOHM	12V
SI2302	1.6A	115mOHM	8V

70 6 =PP3V3_S5_PWRCTL — C7056 0.1uF

85 IN PM_MXM_PGOOD
71 11 IN PM_PGOOD_PVCORE_CPU — U7056 MC74VHC1G08 SOT23-5-HF — MCP_PS_PWRGD OUT 21

ALL_SYS_PWRGD IS ALSO AN INPUT TO THIS AND GATE BY THE EASY TRAY
PM_MXM_PGOOD IS PULLED UP TO IT

SYNC_MASTER=K22 — SYNC_DATE=09/02/2009

PAGE TITLE
PGOOD and Power Sequencing

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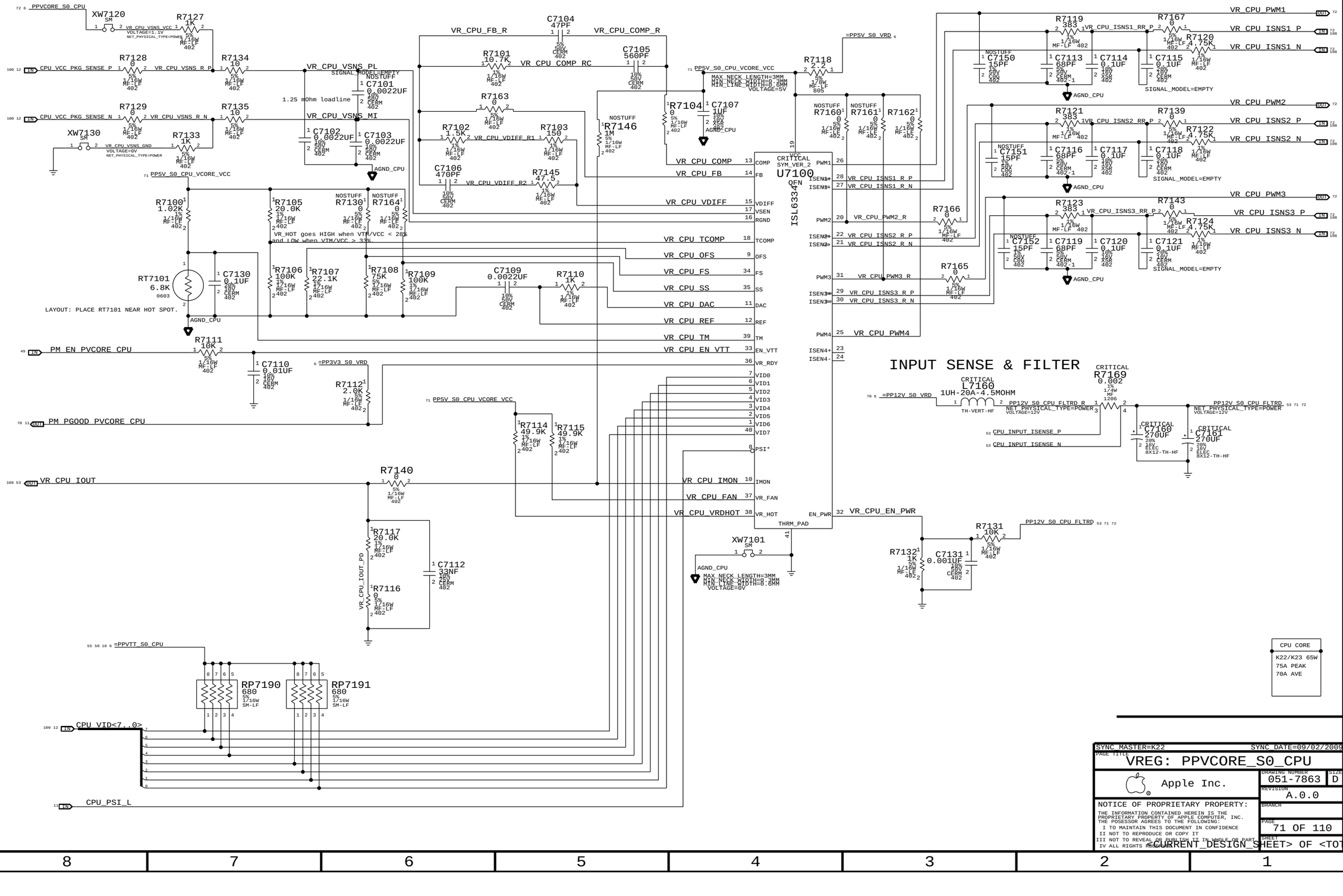

SYNC_MASTER=K22	SYNC_DATE=09/02/2009
PAGE TITLE	VREG: PPVCORE_S0_CPU
Apple Inc.	DRAWING NUMBER 051-7863 SIZE D
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PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
353S1733	2	IC,ISL6612,SYNC,FETDRV,DFN10,LF	U7221,U7241	CRITICAL	

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE

VREG: PPVCORE_S0_CPU

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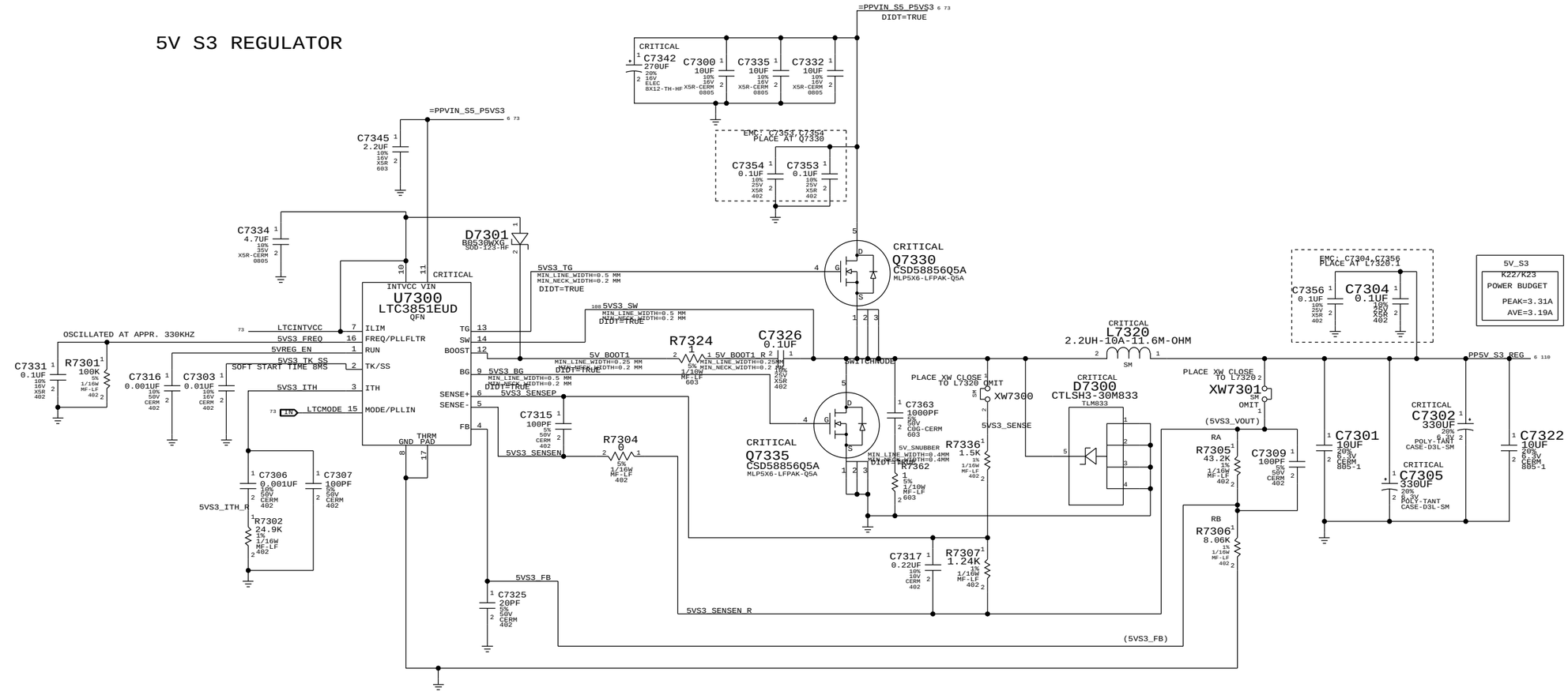
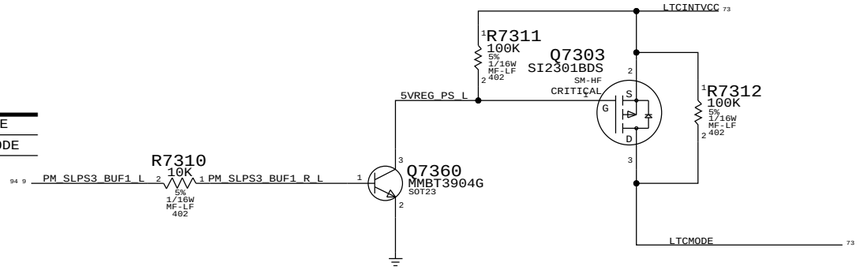
5V S3 REGULATOR



STATE	PM_SLP3_BUF1_L	5VREG_PS_L	LTCMODE	Mode
S0	1	0	1	CONT MODE
S3	0	1	0	BURST MODE



SYNC_MASTER=K22	SYNC_DATE=09/02/2009
PAGE TITLE	5V_S3 REGULATOR
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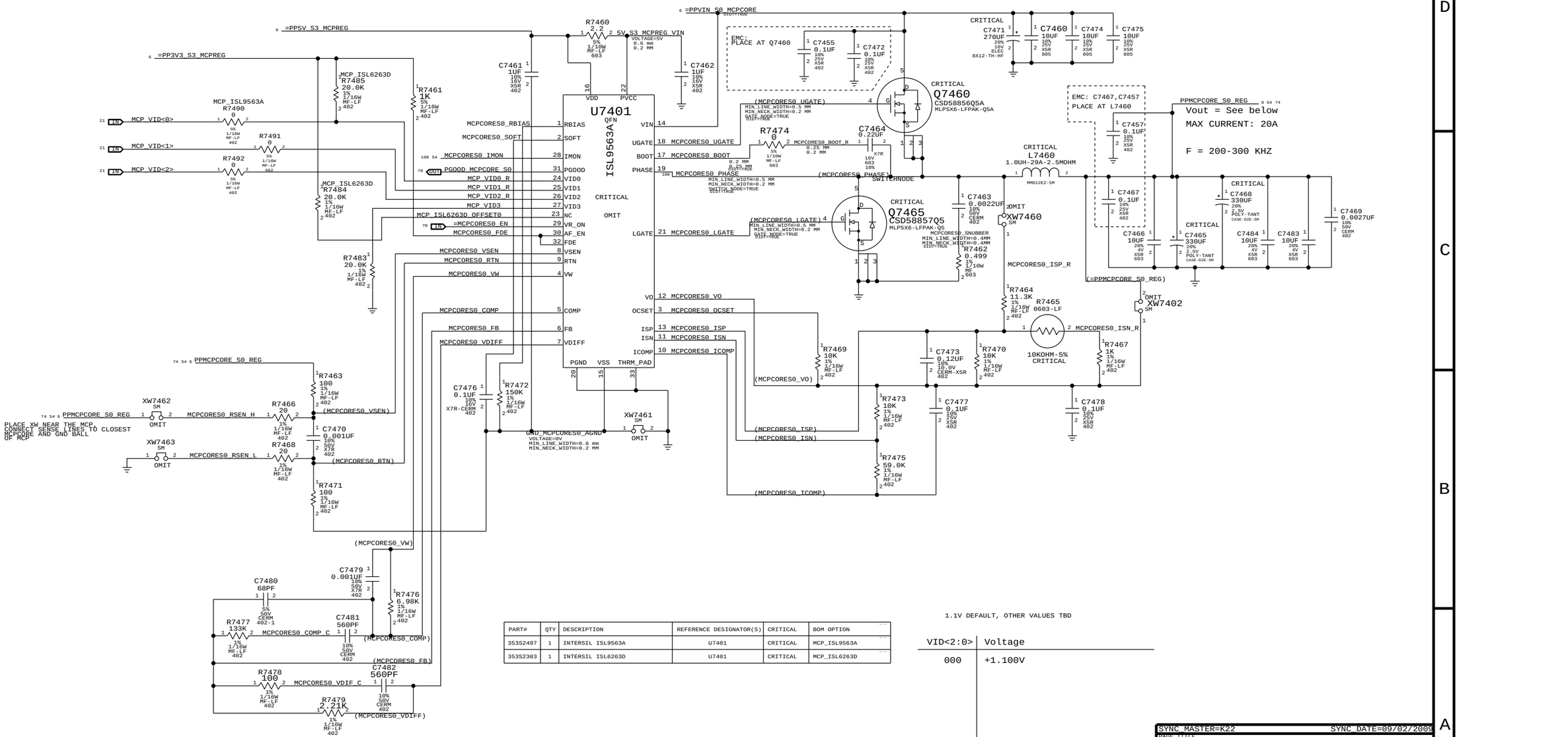
MCP CORE



PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
353S2497	1	INTERSIL ISL9563A	U7401	CRITICAL	MCP_ISL9563A
353S2303	1	INTERSIL ISL6263D	U7401	CRITICAL	MCP_ISL6263D

1.1V DEFAULT, OTHER VALUES TBD

VID<2:0>	Voltage
000	+1.100V

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE: MCP CORE REGULATOR

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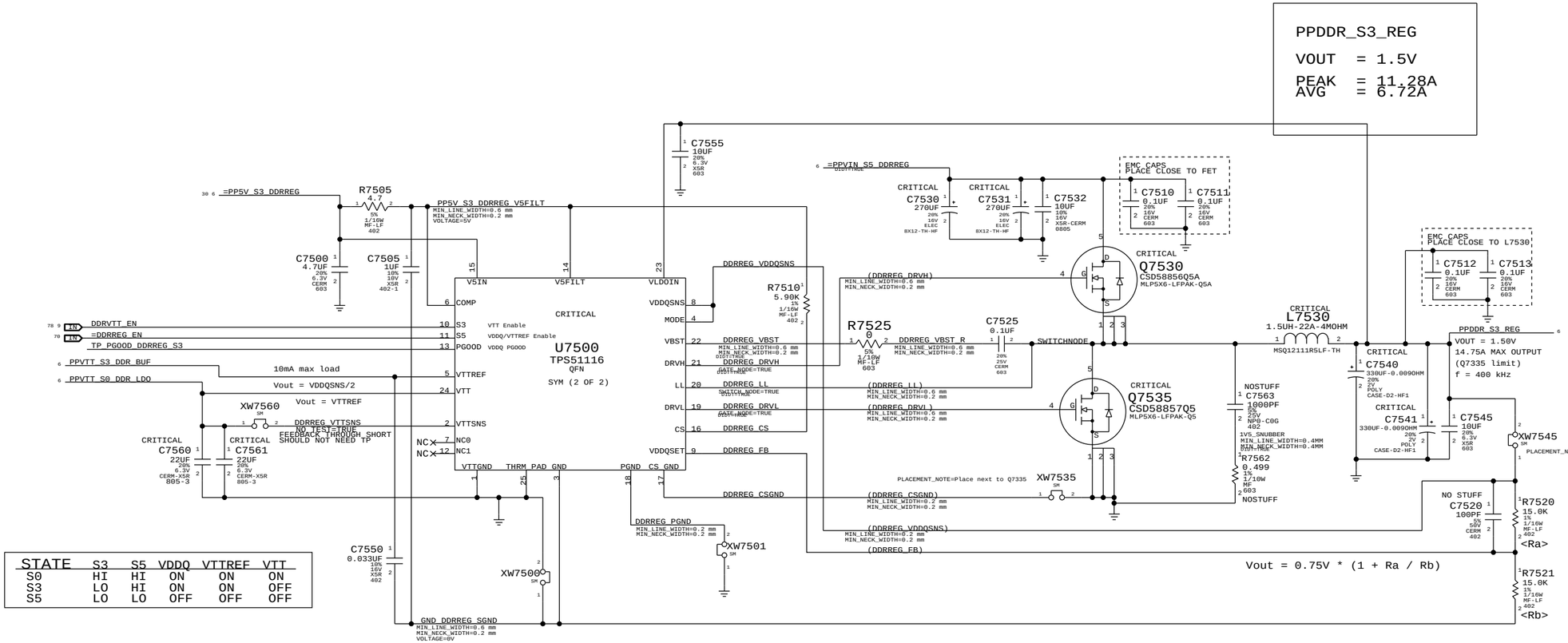
1.5 V DDR SUPPLY

PPDDR_S3_REG
VOUT = 1.5V
PEAK = 11.28A
AVG = 6.72A



STATE	S3	S5	VDDQ	VTTREF	VTT
S0	HI	HI	ON	ON	ON
S3	LO	HI	ON	ON	OFF
S5	LO	LO	OFF	OFF	OFF

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PAGE TITLE: 1.5V DDR SUPPLY

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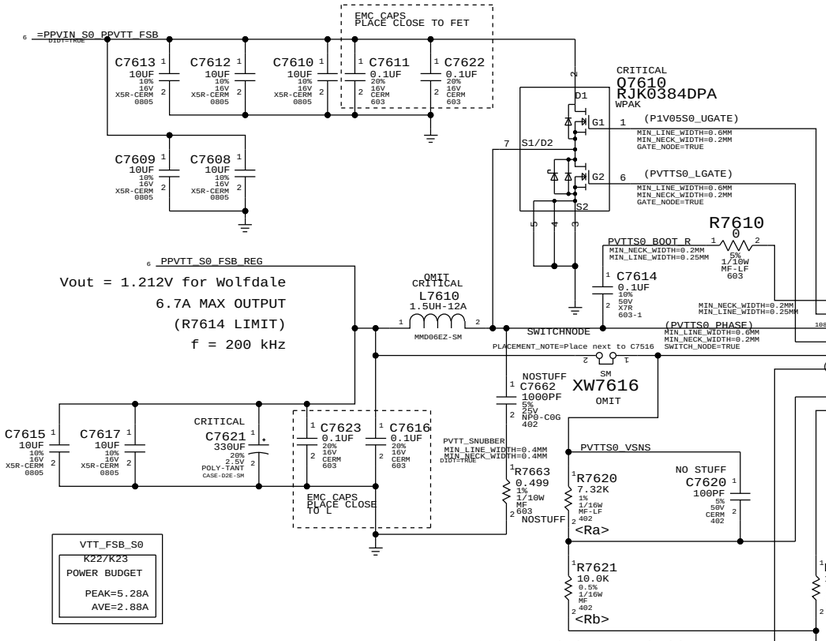
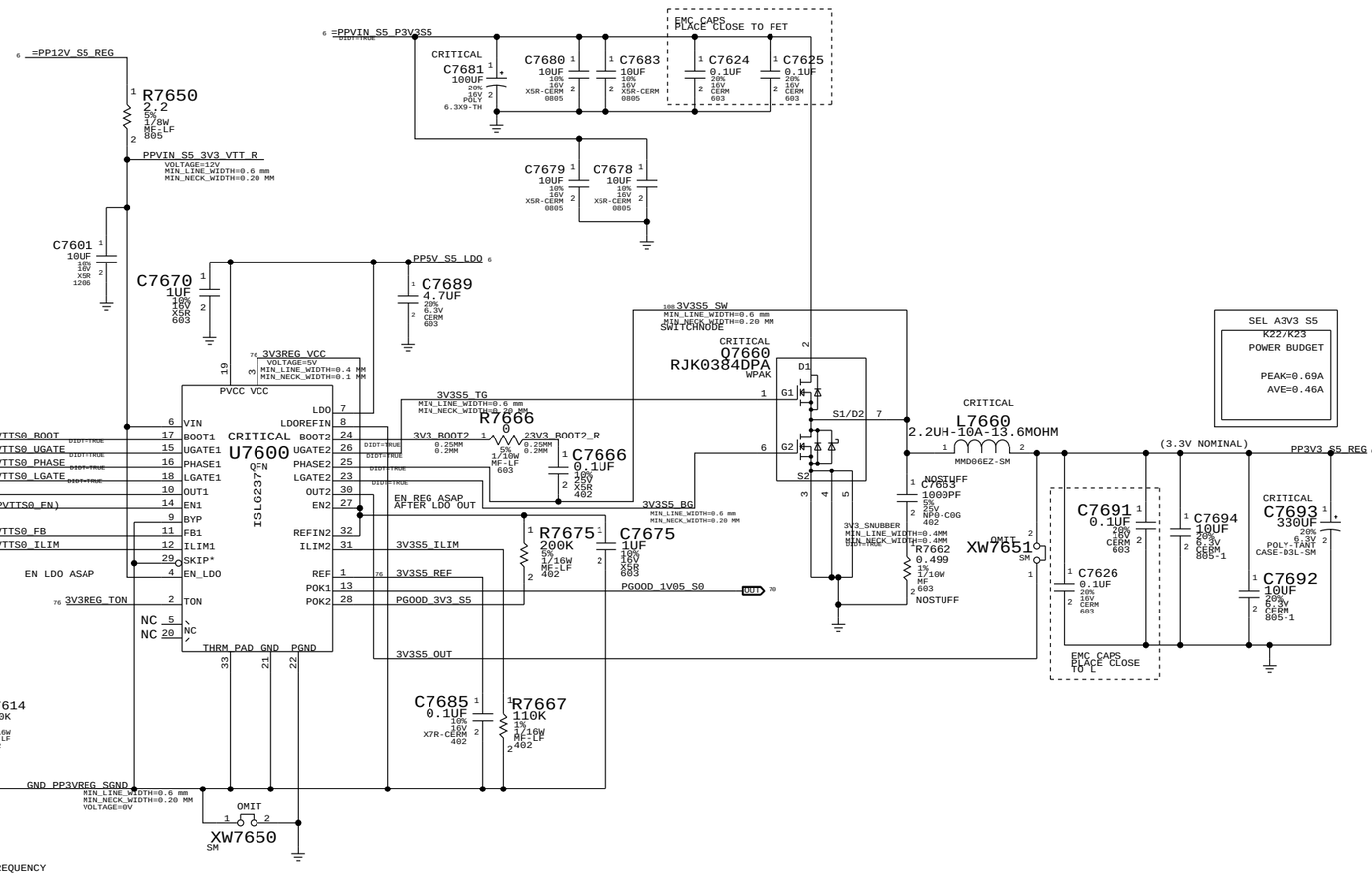
FSB VTT AND 3.3V S5 RAILS

INPUT POWER OF 12V_S0

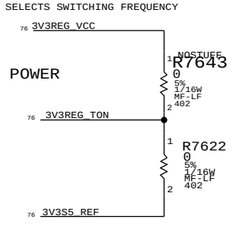


INPUT POWER OF 12V_S5



PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
152S1078	1	IND,PWR,1.5UH,20%,9A,12mOHM	L7610	CRITICAL	

SELECTS SWITCHING FREQUENCY



EN_LDO TIED TO 12V_S5 TO EN LDO FIRST & REGULATOR INTERNAL LOGIC GETS POWER
EN2 (3V3_S5) IS TIED TO VCC, TIED INTERNALLY TO PVCC
TIED EXTERNALLY TO LDO OUT. SO REGULATOR IS ENABLED
AS SOON AS LDO OUTPUT IS GOOD

EN1 (PPVTT_S0) CONTROLLED SEPARATELY

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE: FSB VTT/3.3V S5 SUPPLIES

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8 7 6 5 4 3 2 1

D C B A

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PAGE TITLE

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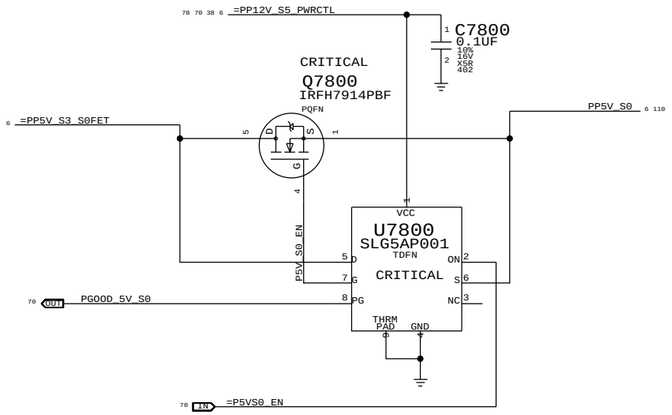
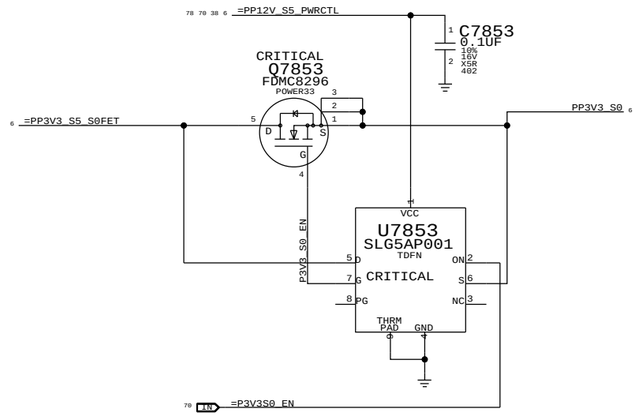
SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

8 7 6 5 4 3 2 1

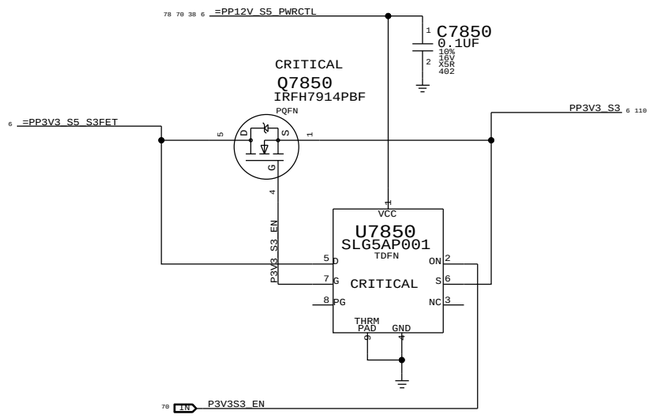
5V S0 FET



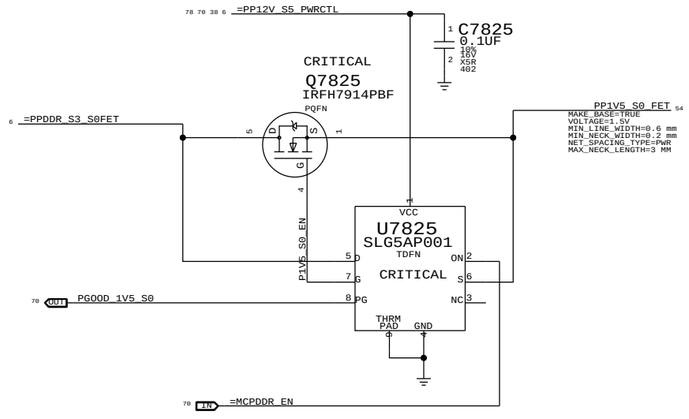
3.3V S0 FET



3.3V S3 FET

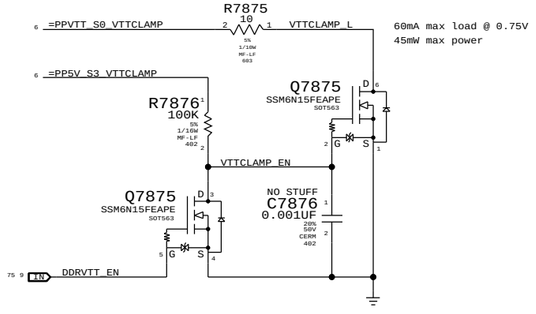


1.5V S0 FET



MCP79 DDRVTT FET

MCP79 DDR PAD LEAKAGE IS HIGH ENOUGH THAT
NVIDIA RECOMMENDS UNPOWERING DURING SLEEP.
IN ORDER TO SUPPORT UNPOWERING RAIL, HARDWARE
MUST GUARANTEE MEM_CKE SIGNALS ARE LOW
BEFORE RAIL IS TURNED OFF, AND REMAINS LOW
UNTIL AFTER RAIL TURNS BACK ON OR DIMMS
WILL EXIT SELF-REFRESH PREMATURELY.
MEM_VTT_EN OUTPUT FROM MCP79 USED TO ENABLE CLAMP
ON VTT RAIL, WHICH PULLS ALL CKE SIGNALS
LOW THROUGH VTT TERMINATION RESISTORS.



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PAGE TITLE

S3 & S0 FETs

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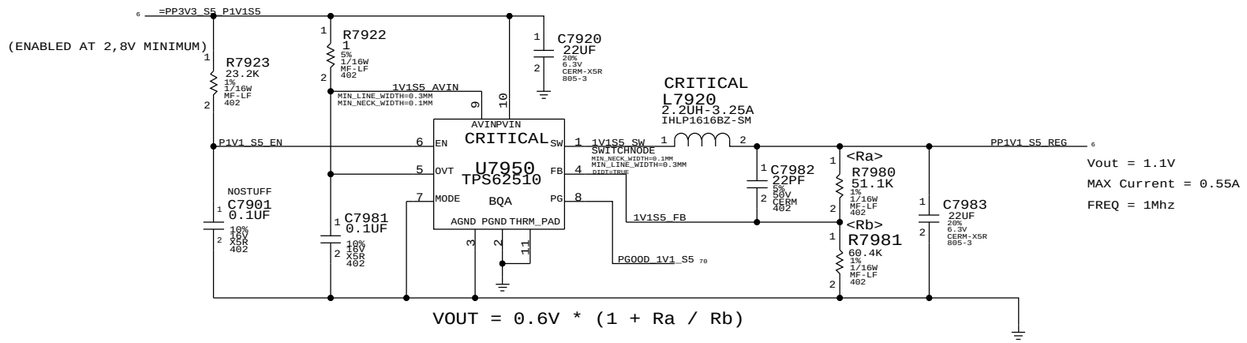
MCP 1.1V_S5 AUXC SUPPLY



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PAGE TITLE
1V1 S5 POWER SUPPLY

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8 7 6 5 4 3 2 1

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8 7 6 5 4 3 2 1

8	7	6	5	4	3	2	1

D

C

B

A

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8 7 6 5 4 3 2 1

8 7 6 5 4 3 2 1

D C B A

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SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

8 7 6 5 4 3 2 1

8 7 6 5 4 3 2 1

D C B A

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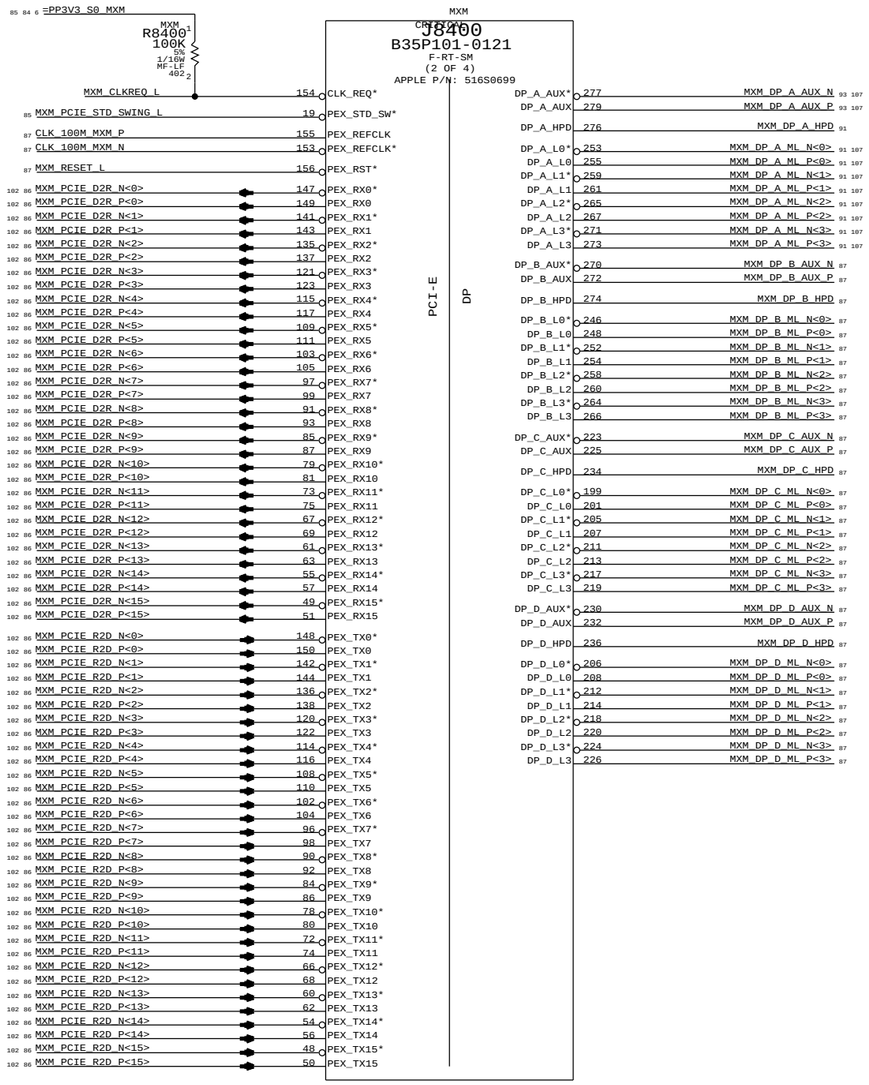
8 7 6 5 4 3 2 1

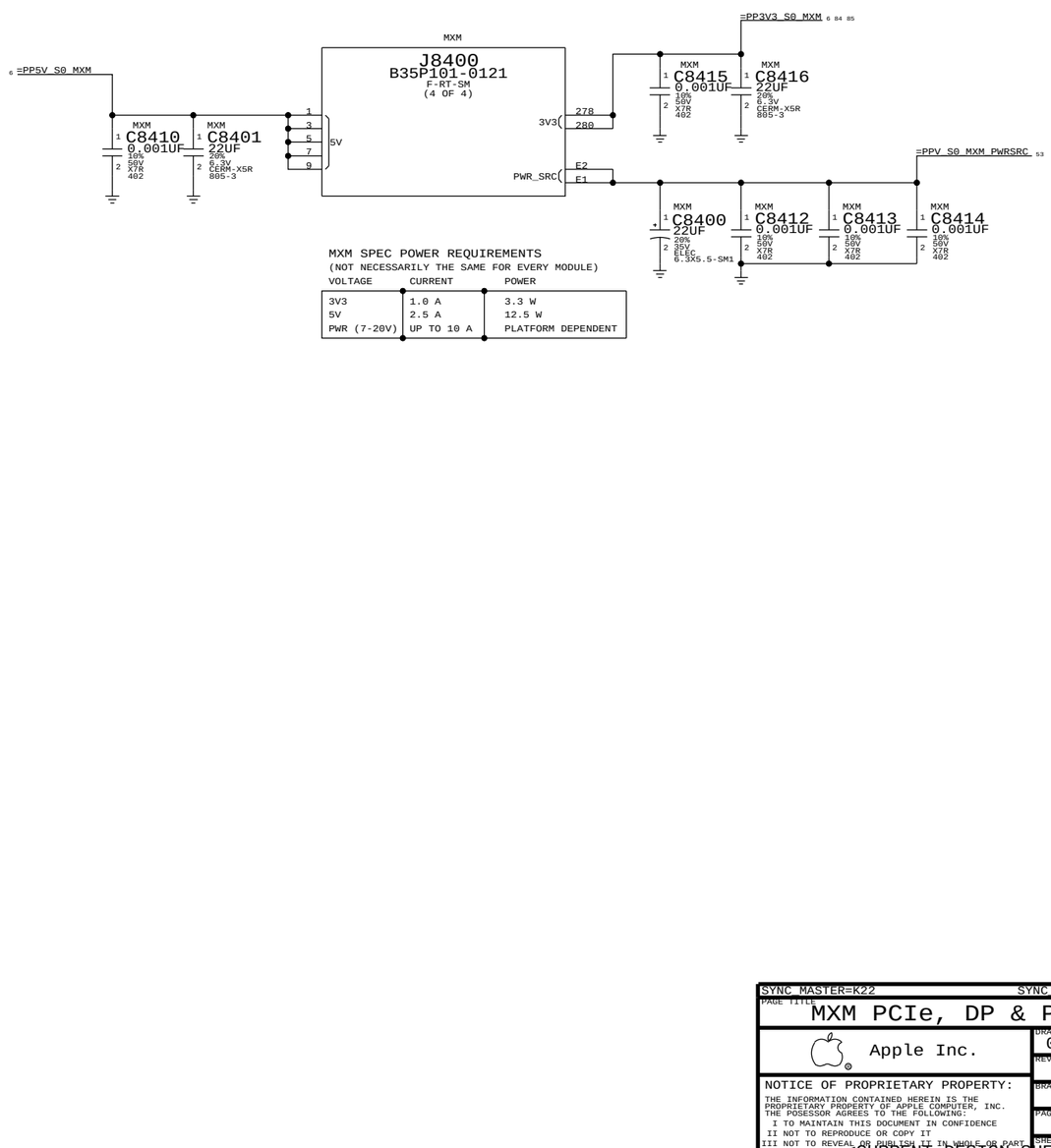
Page Notes

Power aliases required by this page:
- =PP3V3_S0_MXM
- =PP5V_S0_MXM
- =PPV_S0_MXM_PWRSRC

Signal aliases required by this page:
(NONE)

BOM options provided by this page:
- MXM





MXM SPEC POWER REQUIREMENTS
(NOT NECESSARILY THE SAME FOR EVERY MODULE)

VOLTAGE	CURRENT	POWER
3V3	1.0 A	3.3 W
5V	2.5 A	12.5 W
PWR (7-20V)	UP TO 10 A	PLATFORM DEPENDENT

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE
MXM PCIe, DP & Power

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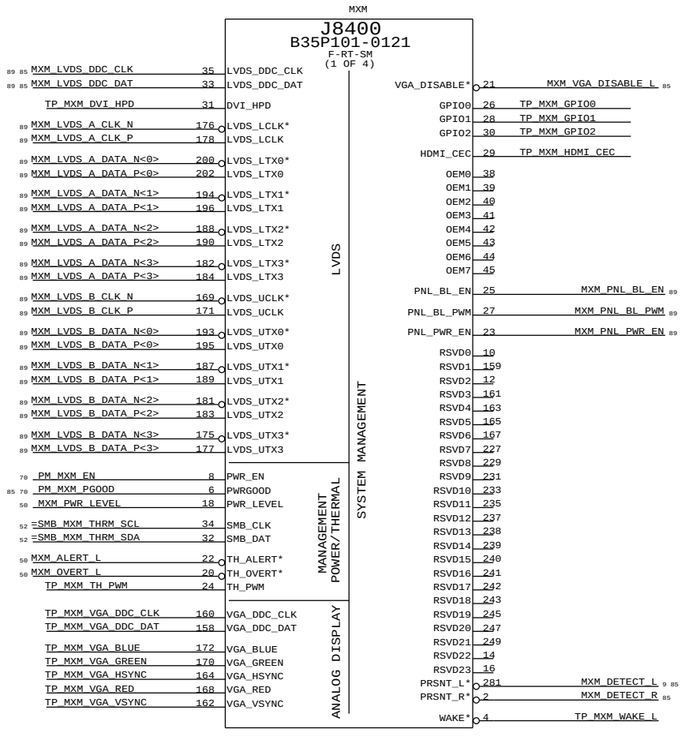
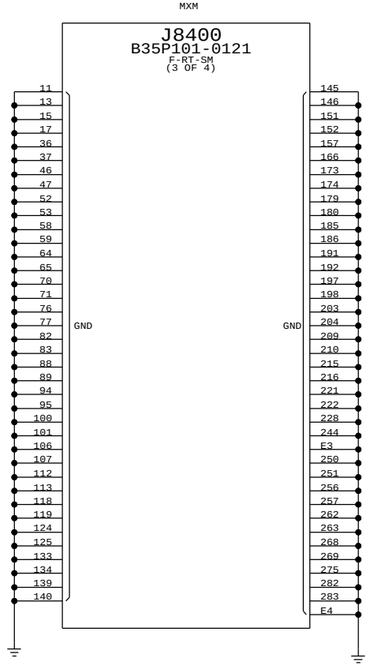
Page Notes

Power aliases required by this page:
- =PP3V3_S0_MXM

Signal aliases required by this page:
- =SMB_MXM_THRM_DATA
- =SMB_MXM_THRM_CLK
- =PM_MXM_PGOOD_PULLUP

BOM options provided by this page:





PULLUPS & PULLDOWNS AT MXM CONNECTOR

FLOAT = NORMAL VGA MODE
GND = SECONDARY DISPLAY CARD

R8510 0 MF-LF 5% 1/16W 402 NOSTUFF
MXM_VGA_DISABLE_L

FLOAT = LOW SWING
GND = HIGH SWING

R8504 0 MF-LF 5% 1/16W 402 MXM
MXM_PCIE_STD_SWING_L

=PP3V3_S0_MXM

R8500 100K MF-LF 5% 1/16W 402
MXM_DETECT_L
PULLED TO GROUND ON MXM
WE DON'T USE CARD DETECT

R8501 100K MF-LF 5% 1/16W 402
MXM_DETECT_R

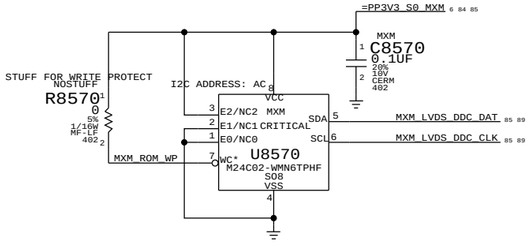
=PM_MXM_PGOOD_PULLUP

SYSTEM INTEGRATOR MUST ALIAS THIS EITHER TO A VOLTAGE RAIL,
OR ANOTHER OPEN-DRAIN PGOOD SIGNAL DEPENDING ON DESIRED BEHAVIOR

R8503 10K MF-LF 5% 1/16W 402
PM_MXM_PGOOD

MXM SYSTEM INFORMATION ROM

PLACE CLOSE TO J7800



SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE: MXM I/O

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MXM TX CAPS

102 9	IN	PEG_R2D_C_N<0>	MXM	C8600	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_P<15>	OUT 84 102
102 9	IN	PEG_R2D_C_P<0>	MXM	C8601	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_N<15>	OUT 84 102
102 9	IN	PEG_R2D_C_P<1>	MXM	C8602	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_P<14>	OUT 84 102
102 9	IN	PEG_R2D_C_N<1>	MXM	C8603	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_N<14>	OUT 84 102
102 9	IN	PEG_R2D_C_N<2>	MXM	C8604	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_P<13>	OUT 84 102
102 9	IN	PEG_R2D_C_P<2>	MXM	C8605	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_N<13>	OUT 84 102
102 9	IN	PEG_R2D_C_N<3>	MXM	C8606	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_P<12>	OUT 84 102
102 9	IN	PEG_R2D_C_P<3>	MXM	C8607	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_N<12>	OUT 84 102
102 9	IN	PEG_R2D_C_N<4>	MXM	C8608	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_P<11>	OUT 84 102
102 9	IN	PEG_R2D_C_P<4>	MXM	C8609	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_N<11>	OUT 84 102
102 9	IN	PEG_R2D_C_N<5>	MXM	C8610	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_P<10>	OUT 84 102
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102 9	IN	PEG_R2D_C_P<6>	MXM	C8613	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_N<9>	OUT 84 102
102 9	IN	PEG_R2D_C_N<7>	MXM	C8614	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_P<8>	OUT 84 102
102 9	IN	PEG_R2D_C_P<7>	MXM	C8615	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_N<8>	OUT 84 102
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102 9	IN	PEG_R2D_C_P<8>	MXM	C8617	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_N<7>	OUT 84 102
102 9	IN	PEG_R2D_C_N<9>	MXM	C8618	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_P<6>	OUT 84 102
102 9	IN	PEG_R2D_C_P<9>	MXM	C8619	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_N<6>	OUT 84 102
102 9	IN	PEG_R2D_C_N<10>	MXM	C8620	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_P<5>	OUT 84 102
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102 9	IN	PEG_R2D_C_P<11>	MXM	C8622	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_P<4>	OUT 84 102
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102 9	IN	PEG_R2D_C_N<12>	MXM	C8624	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_P<3>	OUT 84 102
102 9	IN	PEG_R2D_C_P<12>	MXM	C8625	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_N<3>	OUT 84 102
102 9	IN	PEG_R2D_C_N<13>	MXM	C8626	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_P<2>	OUT 84 102
102 9	IN	PEG_R2D_C_P<13>	MXM	C8627	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_N<2>	OUT 84 102
102 9	IN	PEG_R2D_C_N<14>	MXM	C8628	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_P<1>	OUT 84 102
102 9	IN	PEG_R2D_C_P<14>	MXM	C8629	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_N<1>	OUT 84 102
102 9	IN	PEG_R2D_C_N<15>	MXM	C8630	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_P<0>	OUT 84 102
102 9	IN	PEG_R2D_C_P<15>	MXM	C8631	0.1UF	1	2 10% 16V X5R 402	MXM_PCIE_R2D_N<0>	OUT 84 102

MXM RX CAPS

102 84	IN	MXM_PCIE_D2R_P<15>	MXM	C8632	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_N<0>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_N<15>	MXM	C8633	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_P<0>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_P<14>	MXM	C8634	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_P<1>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_N<14>	MXM	C8635	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_N<1>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_P<13>	MXM	C8636	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_P<2>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_N<13>	MXM	C8637	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_N<2>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_P<12>	MXM	C8638	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_P<3>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_N<12>	MXM	C8639	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_N<3>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_P<11>	MXM	C8640	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_N<4>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_N<11>	MXM	C8641	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_P<4>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_P<10>	MXM	C8642	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_N<5>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_N<10>	MXM	C8643	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_P<5>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_P<9>	MXM	C8644	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_P<6>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_N<9>	MXM	C8645	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_N<6>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_P<8>	MXM	C8646	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_N<7>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_N<8>	MXM	C8647	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_P<7>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_P<7>	MXM	C8648	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_N<8>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_N<7>	MXM	C8649	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_P<8>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_P<6>	MXM	C8650	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_N<9>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_N<6>	MXM	C8651	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_P<9>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_P<5>	MXM	C8652	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_N<10>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_N<5>	MXM	C8653	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_P<10>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_P<4>	MXM	C8654	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_N<11>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_N<4>	MXM	C8655	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_P<11>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_P<3>	MXM	C8656	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_N<12>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_N<3>	MXM	C8657	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_P<12>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_P<2>	MXM	C8658	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_N<13>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_N<2>	MXM	C8659	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_P<13>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_P<1>	MXM	C8662	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_P<14>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_N<1>	MXM	C8663	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_N<14>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_P<0>	MXM	C8660	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_N<15>	OUT 9 102
102 84	IN	MXM_PCIE_D2R_N<0>	MXM	C8661	0.1UF	1	2 10% 16V X5R 402	PEG_D2R_P<15>	OUT 9 102

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE

MXM PCIE CAPS

Apple Inc.

DRAWING NUMBER 051-7863 SIZE D

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BRANCH

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SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

Page Notes

Power aliases required by this page:
- =PP3V3_S0_DP

Signal aliases required by this page:
(NONE)

BOM options provided by this page:
(NONE)

MCP Connections

84 CLK_100M_MXM_P ── GPU_CLK100M_PCIE_P (9 102) MAKE_BASE=TRUE
84 CLK_100M_MXM_N ── GPU_CLK100M_PCIE_N (9 102) MAKE_BASE=TRUE
84 MXM_RESET_L ── PEG_RESET_L (9) MAKE_BASE=TRUE

Unused LVDS Interfaces

18 LVDS_IG_A_CLK_P ── NC_LVDS_IG_A_CLK_P MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_A_CLK_N ── NC_LVDS_IG_A_CLK_N MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_A_DATA_P<0> ── NC_LVDS_IG_A_DATA_P<0> MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_A_DATA_N<0> ── NC_LVDS_IG_A_DATA_N<0> MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_A_DATA_P<1> ── NC_LVDS_IG_A_DATA_P<1> MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_A_DATA_N<1> ── NC_LVDS_IG_A_DATA_N<1> MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_A_DATA_P<2> ── NC_LVDS_IG_A_DATA_P<2> MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_A_DATA_N<2> ── NC_LVDS_IG_A_DATA_N<2> MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_A_DATA_P<3> ── NC_LVDS_IG_A_DATA_P<3> MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_A_DATA_N<3> ── NC_LVDS_IG_A_DATA_N<3> MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_B_CLK_P ── NC_LVDS_IG_B_CLK_P MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_B_CLK_N ── NC_LVDS_IG_B_CLK_N MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_B_DATA_P<0> ── NC_LVDS_IG_B_DATA_P<0> MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_B_DATA_N<0> ── NC_LVDS_IG_B_DATA_N<0> MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_B_DATA_P<1> ── NC_LVDS_IG_B_DATA_P<1> MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_B_DATA_N<1> ── NC_LVDS_IG_B_DATA_N<1> MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_B_DATA_P<2> ── NC_LVDS_IG_B_DATA_P<2> MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_B_DATA_N<2> ── NC_LVDS_IG_B_DATA_N<2> MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_B_DATA_P<3> ── NC_LVDS_IG_B_DATA_P<3> MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_B_DATA_N<3> ── NC_LVDS_IG_B_DATA_N<3> MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_DDC_CLK ── NC_LVDS_IG_DDC_CLK MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_DDC_DATA ── NC_LVDS_IG_DDC_DATA MAKE_BASE=TRUE NO_TEST=TRUE

Unused MXM Interfaces

85 MXM_LVDS_A_CLK_N ── NC_MXM_LVDS_A_CLK_N MAKE_BASE=TRUE NO_TEST=TRUE
85 MXM_LVDS_A_CLK_P ── NC_MXM_LVDS_A_CLK_P MAKE_BASE=TRUE NO_TEST=TRUE
85 MXM_LVDS_A_DATA_N<0> ── NC_MXM_LVDS_A_DATA_N<0> MAKE_BASE=TRUE NO_TEST=TRUE
85 MXM_LVDS_A_DATA_P<0> ── NC_MXM_LVDS_A_DATA_P<0> MAKE_BASE=TRUE NO_TEST=TRUE
85 MXM_LVDS_A_DATA_N<1> ── NC_MXM_LVDS_A_DATA_N<1> MAKE_BASE=TRUE NO_TEST=TRUE
85 MXM_LVDS_A_DATA_P<1> ── NC_MXM_LVDS_A_DATA_P<1> MAKE_BASE=TRUE NO_TEST=TRUE
85 MXM_LVDS_A_DATA_N<2> ── NC_MXM_LVDS_A_DATA_N<2> MAKE_BASE=TRUE NO_TEST=TRUE
85 MXM_LVDS_A_DATA_P<2> ── NC_MXM_LVDS_A_DATA_P<2> MAKE_BASE=TRUE NO_TEST=TRUE
85 MXM_LVDS_A_DATA_N<3> ── NC_MXM_LVDS_A_DATA_N<3> MAKE_BASE=TRUE NO_TEST=TRUE
85 MXM_LVDS_A_DATA_P<3> ── NC_MXM_LVDS_A_DATA_P<3> MAKE_BASE=TRUE NO_TEST=TRUE
85 MXM_LVDS_B_CLK_N ── NC_MXM_LVDS_B_CLK_N MAKE_BASE=TRUE NO_TEST=TRUE
85 MXM_LVDS_B_CLK_P ── NC_MXM_LVDS_B_CLK_P MAKE_BASE=TRUE NO_TEST=TRUE
85 MXM_LVDS_B_DATA_N<0> ── NC_MXM_LVDS_B_DATA_N<0> MAKE_BASE=TRUE NO_TEST=TRUE
85 MXM_LVDS_B_DATA_P<0> ── NC_MXM_LVDS_B_DATA_P<0> MAKE_BASE=TRUE NO_TEST=TRUE
85 MXM_LVDS_B_DATA_N<1> ── NC_MXM_LVDS_B_DATA_N<1> MAKE_BASE=TRUE NO_TEST=TRUE
85 MXM_LVDS_B_DATA_P<1> ── NC_MXM_LVDS_B_DATA_P<1> MAKE_BASE=TRUE NO_TEST=TRUE
85 MXM_LVDS_B_DATA_N<2> ── NC_MXM_LVDS_B_DATA_N<2> MAKE_BASE=TRUE NO_TEST=TRUE
85 MXM_LVDS_B_DATA_P<2> ── NC_MXM_LVDS_B_DATA_P<2> MAKE_BASE=TRUE NO_TEST=TRUE
85 MXM_LVDS_B_DATA_N<3> ── NC_MXM_LVDS_B_DATA_N<3> MAKE_BASE=TRUE NO_TEST=TRUE
85 MXM_LVDS_B_DATA_P<3> ── NC_MXM_LVDS_B_DATA_P<3> MAKE_BASE=TRUE NO_TEST=TRUE

Unused MXM DP Interfaces

84 MXM_DP_B_ML_P<0..3> ── NC_MXM_DP_B_ML_P<0..3> MAKE_BASE=TRUE NO_TEST=TRUE
84 MXM_DP_B_ML_N<0..3> ── NC_MXM_DP_B_ML_N<0..3> MAKE_BASE=TRUE NO_TEST=TRUE
84 MXM_DP_B_AUX_P ── NC_MXM_DP_B_AUX_P MAKE_BASE=TRUE NO_TEST=TRUE
84 MXM_DP_B_AUX_N ── NC_MXM_DP_B_AUX_N MAKE_BASE=TRUE NO_TEST=TRUE
84 MXM_DP_B_HPD ── NC_MXM_DP_B_HPD MAKE_BASE=TRUE NO_TEST=TRUE

84 MXM_DP_D_ML_P<0..3> ── NC_MXM_DP_D_ML_P<0..3> MAKE_BASE=TRUE NO_TEST=TRUE
84 MXM_DP_D_ML_N<0..3> ── NC_MXM_DP_D_ML_N<0..3> MAKE_BASE=TRUE NO_TEST=TRUE
84 MXM_DP_D_AUX_P ── NC_MXM_DP_D_AUX_P MAKE_BASE=TRUE NO_TEST=TRUE
84 MXM_DP_D_AUX_N ── NC_MXM_DP_D_AUX_N MAKE_BASE=TRUE NO_TEST=TRUE
84 MXM_DP_D_HPD ── NC_MXM_DP_D_HPD MAKE_BASE=TRUE NO_TEST=TRUE

Unused MCP Interfaces

18 LVDS_IG_BKL_ON ── NC_LVDS_IG_BKL_ON MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_BKL_PWM ── NC_LVDS_IG_BKL_PWM MAKE_BASE=TRUE NO_TEST=TRUE
18 LVDS_IG_PANEL_PWR ── NC_LVDS_IG_PANEL_PWR MAKE_BASE=TRUE NO_TEST=TRUE

18 =MCP_HDMI_TXD_P<0..2> ── NC_MCP_HDMI_TXD_P<0..2> MAKE_BASE=TRUE NO_TEST=TRUE
18 =MCP_HDMI_TXD_N<0..2> ── NC_MCP_HDMI_TXD_N<0..2> MAKE_BASE=TRUE NO_TEST=TRUE
18 =MCP_HDMI_TXC_P ── NC_MCP_HDMI_TXC_P MAKE_BASE=TRUE NO_TEST=TRUE
18 =MCP_HDMI_TXC_N ── NC_MCP_HDMI_TXC_N MAKE_BASE=TRUE NO_TEST=TRUE

92 91 90 95 6 =PP3V3_S0_DP
R8700 2.7K 5% 1/16W MF-LF 2 402
R8701 2.7K 5% 1/16W MF-LF 2 402

18 =MCP_HDMI_DDC_CLK ── DP_IG_DDC_CLK MAKE_BASE=TRUE
18 =MCP_HDMI_DDC_DATA ── DP_IG_DDC_DATA MAKE_BASE=TRUE
18 =MCP_HDMI_HPD ── DP_IG_HPD

R8710 22K 5% 1/16W MF-LF 2 402

18 DP_IG_AUX_CH_P ── NC_DP_IG_AUX_CH_P MAKE_BASE=TRUE NO_TEST=TRUE
18 DP_IG_AUX_CH_N ── NC_DP_IG_AUX_CH_N MAKE_BASE=TRUE NO_TEST=TRUE

18 DP_IG_CA_DET

R8711 1M 5% 1/16W MF-LF 2 402

SYNC_MASTER=MARKVIDEO SYNC_DATE=03/12/2009
PAGE TITLE: Display: Aliases
Apple Inc.
DRAWING NUMBER: 051-7863 SIZE: D
REVISION: A.0.0
BRANCH:
PAGE: 87 OF 110
SHEET: <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

8 7 6 5 4 3 2 1

D C B A

SYNC MASTER=K23_DAVE SYNC_DATE=01/05/2009

PAGE TITLE

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Apple Inc.

DRAWING NUMBER 051-7863

SIZE D

REVISION A.0.0

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SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

8 7 6 5 4 3 2 1

D C B A

SYNC MASTER=K22 SYNC DATE=12/02/2008

PAGE TITLE

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Apple Inc.

DRAWING NUMBER 051-7863 SIZE D

REVISION A.0.0

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SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

8 7 6 5 4 3 2 1

Page Notes

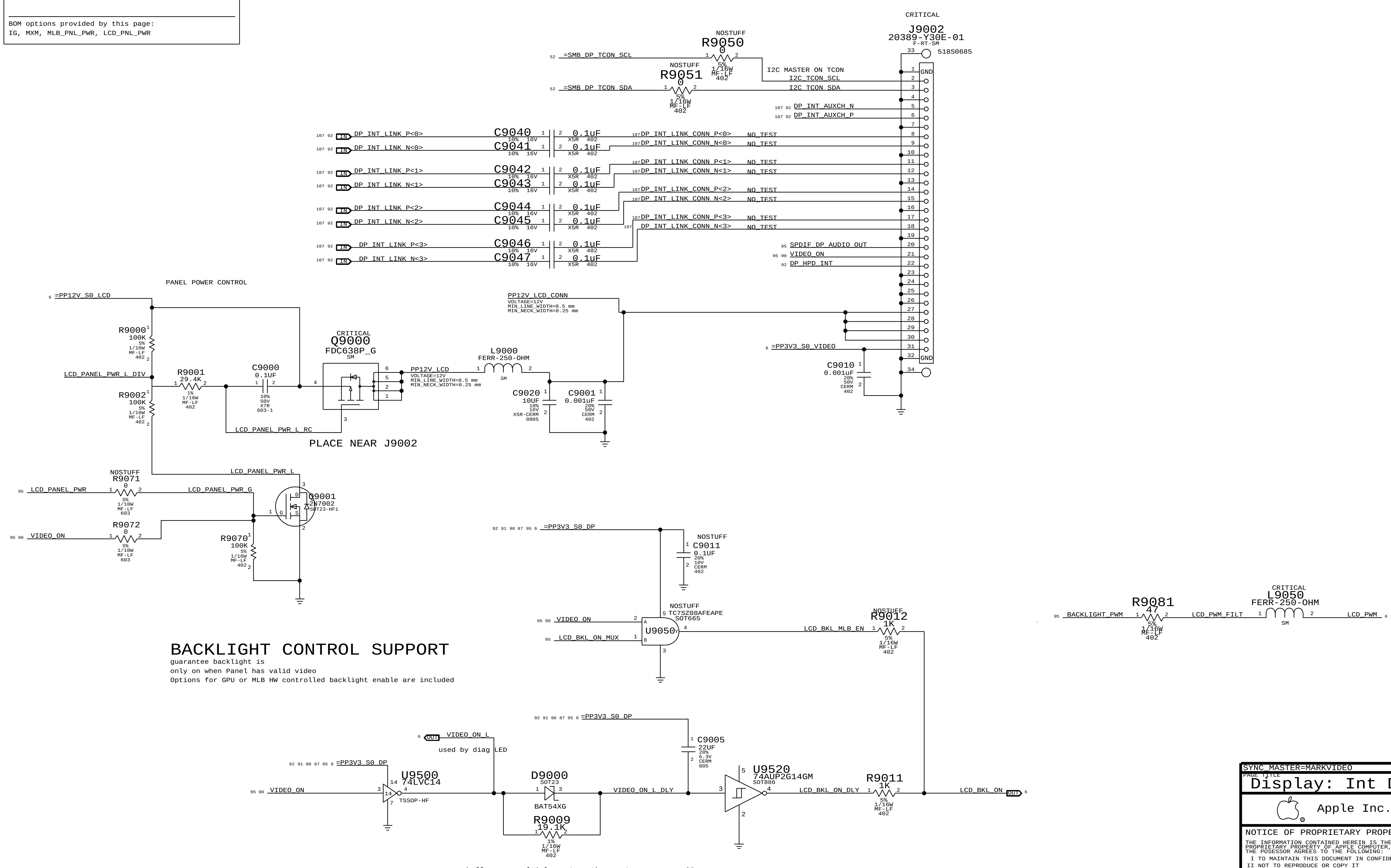
Power aliases required by this page:

- =PP12V_S0_LCD
- =PP3V3_S0_VIDEO

Signal aliases required by this page:
(NONE)

BOM options provided by this page:
IG, MXM, MLB_PNL_PWR, LCD_PNL_PWR

INTERNAL DP INTERFACE



CRITICAL
J9002
20389-Y30E-01
F-RT-SM
518S0685
GND
NOSTUFF
R9050
0
NOSTUFF
R9051
0
=SMB_DP_TCON_SCL
=SMB_DP_TCON_SDA
I2C MASTER ON TCON
I2C_TCON_SCL
I2C_TCON_SDA
DP_INT_AUXCH_N
DP_INT_AUXCH_P
DP_INT_LINK_P<0>
DP_INT_LINK_N<0>
DP_INT_LINK_P<1>
DP_INT_LINK_N<1>
DP_INT_LINK_P<2>
DP_INT_LINK_N<2>
DP_INT_LINK_P<3>
DP_INT_LINK_N<3>
C9040
C9041
C9042
C9043
C9044
C9045
C9046
C9047
0.1uF
DP_INT_LINK_CONN_P<0>
DP_INT_LINK_CONN_N<0>
DP_INT_LINK_CONN_P<1>
DP_INT_LINK_CONN_N<1>
DP_INT_LINK_CONN_P<2>
DP_INT_LINK_CONN_N<2>
DP_INT_LINK_CONN_P<3>
DP_INT_LINK_CONN_N<3>
NO_TEST
SPDIF_DP_AUDIO_OUT
VIDEO_ON
DP_HPD_INT
=PP3V3_S0_VIDEO
C9010
0.001uF
PANEL POWER CONTROL
=PP12V_S0_LCD
R9000
100K
LCD_PANEL_PWR_L_DIV
R9001
29.4K
C9000
0.1UF
CRITICAL
Q9000
FDC638P_G
PP12V_LCD
L9000
FERR-250-OHM
PP12V_LCD_CONN
VOLTAGE=12V
MIN_LINE_WIDTH=0.5 mm
MIN_NECK_WIDTH=0.25 mm
C9020
10UF
C9001
0.001uF
R9002
100K
LCD_PANEL_PWR_L_RC
PLACE NEAR J9002
LCD_PANEL_PWR_L
NOSTUFF
R9071
0
LCD_PANEL_PWR
LCD_PANEL_PWR_G
Q9001
2N7002
SOT23-HF1
R9072
0
VIDEO_ON
R9070
100K
=PP3V3_S0_DP
NOSTUFF
C9011
0.1UF
NOSTUFF
TC7SZ08AFEAPE
SOT665
U9050
VIDEO_ON
LCD_BKL_ON_MUX
LCD_BKL_MLB_EN
NOSTUFF
R9012
1K
R9081
47
CRITICAL
L9050
FERR-250-OHM
BACKLIGHT_PWM
LCD_PWM_FILT
LCD_PWM
BACKLIGHT CONTROL SUPPORT
guarantee backlight is
only on when Panel has valid video
Options for GPU or MLB HW controlled backlight enable are included
=PP3V3_S0_DP
C9005
22UF
VIDEO_ON_L
used by diag LED
=PP3V3_S0_DP
U9500
74LVC14
TSSOP-HF
VIDEO_ON
D9000
SOT23
BAT54XG
VIDEO_ON_L_DLY
R9009
19.1K
U9520
74AUP2G14GM
SOT886
LCD_BKL_ON_DLY
R9011
1K
LCD_BKL_ON
buffers are multiple parts, other parts are on csa 95

SYNC_MASTER=MARKVIDEO SYNC_DATE=03/12/2009

PAGE TITLE
Display: Int DP Connector

Apple Inc.

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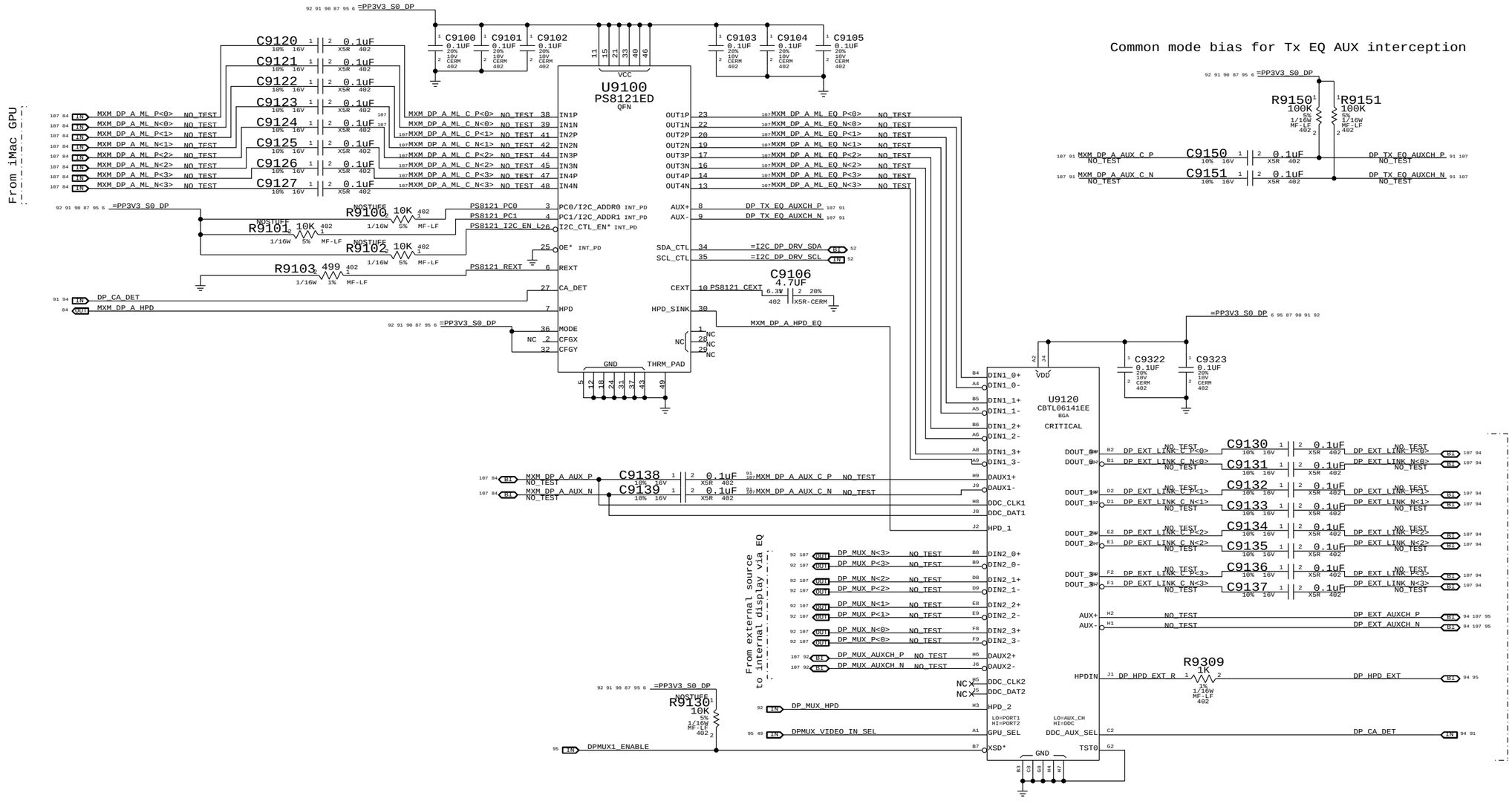
SHEET <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

EQ & Re-Driver for DP source



Common mode bias for Tx EQ AUX interception

DisplayPort Mux 1
Analog mux at External Connector

SYNC_MASTER=MARKVIDEO	SYNC_DATE=03/12/2009
PAGE TITLE: Display: BiDiVi Mux1	
Apple Inc.	DRAWING NUMBER: 051-7863 SIZE: D
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	SHEET: <CURRENT_DESIGN_SHEET> OF <TOTAL_DESIGN_SHEETS>

DisplayPort Equalizer & MUX 2

Note: INT_PD = Internal Pulldown on this pin of >=100 kOhms

=PP3V3_S0_DP

C9200 0.1UF 20% 10V CERM 402
C9201 0.1UF 20% 10V CERM 402
C9202 0.1UF 20% 10V CERM 402
C9203 0.1UF 20% 10V CERM 402
C9204 0.1UF 20% 10V CERM 402

VDD 4 22 38 47 62

U9200 PS8325 QFN CRITICAL

From iMac GPU

MXM_DP_C_ML_P<0>	C9240 0.1uF 10% 16V X5R 402	MXM_DP_C_ML_C_P<0>	NO_TEST
MXM_DP_C_ML_N<0>	C9241 0.1uF 10% 16V X5R 402	MXM_DP_C_ML_C_N<0>	NO_TEST
MXM_DP_C_ML_P<1>	C9242 0.1uF 10% 16V X5R 402	MXM_DP_C_ML_C_P<1>	NO_TEST
MXM_DP_C_ML_N<1>	C9243 0.1uF 10% 16V X5R 402	MXM_DP_C_ML_C_N<1>	NO_TEST
MXM_DP_C_ML_P<2>	C9244 0.1uF 10% 16V X5R 402	MXM_DP_C_ML_C_P<2>	NO_TEST
MXM_DP_C_ML_N<2>	C9245 0.1uF 10% 16V X5R 402	MXM_DP_C_ML_C_N<2>	NO_TEST
MXM_DP_C_ML_P<3>	C9246 0.1uF 10% 16V X5R 402	MXM_DP_C_ML_C_P<3>	NO_TEST
MXM_DP_C_ML_N<3>	C9247 0.1uF 10% 16V X5R 402	MXM_DP_C_ML_C_N<3>	NO_TEST

IN1_D0P	2	DP_D0P
IN1_D0N	3	DP_D0N
IN1_D1P	5	DP_D1P
IN1_D1N	6	DP_D1N
IN1_D2P	8	DP_D2P
IN1_D2N	9	DP_D2N
IN1_D3P	11	DP_D3P
IN1_D3N	12	DP_D3N
IN1_PEQ/SDA_CTL	68	

DP_D0P	61	NO_TEST DP_INT_LINK_P<0>
DP_D0N	60	NO_TEST DP_INT_LINK_N<0>
DP_D1P	58	NO_TEST DP_INT_LINK_P<1>
DP_D1N	57	NO_TEST DP_INT_LINK_N<1>
DP_D2P	55	NO_TEST DP_INT_LINK_P<2>
DP_D2N	54	NO_TEST DP_INT_LINK_N<2>
DP_D3P	52	NO_TEST DP_INT_LINK_P<3>
DP_D3N	51	NO_TEST DP_INT_LINK_N<3>

To Internal display

=I2C_DP_EQLZ_SDA

From external input via MUX 1

DP_MUX_P<0>	14	IN2_D0P
DP_MUX_N<0>	15	IN2_D0N
DP_MUX_P<1>	17	IN2_D1P
DP_MUX_N<1>	18	IN2_D1N
DP_MUX_P<2>	20	IN2_D2P
DP_MUX_N<2>	21	IN2_D2N
DP_MUX_P<3>	23	IN2_D3P
DP_MUX_N<3>	24	IN2_D3N
=I2C_DP_EQLZ_SCL	67	IN2_PEQ/SCL_CTL

TMDS_CH0P	43	NC
TMDS_CH0N	42	NC
TMDS_CH1P	46	NC
TMDS_CH1N	45	NC
TMDS_CH2P	49	NC
TMDS_CH2N	48	NC
TMDS_CLKN	39	NC
TMDS_CLKP	40	NC

=PP3V3_S0_DP

R9221 1K 5% 1/16W MF-LF 402
R9215 1K 5% 1/16W MF-LF 402
R9220 1K 5% 1/16W MF-LF 402

DP_EQLZ_MODE0 → 64 MODE0
DP_EQLZ_MODE1 → 65 MODE1
DP_EQLZ_MODE2 → 69 MODE2

MODE[2..0] = 111 SELECTS I2C CONTROL MODE

R9222 4.99K 1% 1/16W MF-LF 402 — DP_EQLZ_EXTR → 70 REXT

C9212 4.7UF 20% 6.3V X5R-CERM 402 — CEXT 1 DP_EQLZ_EXTC

see below

NC	34	TMDS_SCL	DP_AC_AUXP 30 NO_TEST DP_EQLZ_AUXCH_P
NC	35	TMDS_SDA	DP_AC_AUXN 31 NO_TEST DP_EQLZ_AUXCH_N

=PP3V3_S0_DP

R9280 NOSTUFF 5% 1/16W MF-LF 402 — DP_EQLZ_ADDR → 66 SW/I2C_ADDR

INT_PD

To Internal display

From iMac GPU

MXM_DP_C_AUX_P	C9248 0.1uF 10% 16V X5R 402	MXM_DP_C_AUX_C_P	NO_TEST
MXM_DP_C_AUX_N	C9249 0.1uF 10% 16V X5R 402	MXM_DP_C_AUX_C_N	NO_TEST

From external input via MUX 1

DP_MUX_AUXCH_P	NO_TEST	IN2_AUXP_SCL
DP_MUX_AUXCH_N	NO_TEST	IN2_AUXN_SDA

IN1_AUXP_SCL	28	DP_AUXP_SCL 32 NO_TEST DP_INT_AUXCH_P
IN1_AUXN_SDA	29	DP_AUXN_SDA 33 NO_TEST DP_INT_AUXCH_N

R9281 1M 5% 1/16W MF-LF 402 — DP_EQLZ_CADET → 56 DP_CADET

INT_PDIN1_CADET 7 NC
INT_PDIN2_CADET 16 NC

From Internal display — DP_HPD_INT

DP_HPD	53	INT_PD	IN1_HPDX 10 MXM_DP_C_HPD → TO IMAC GPU
TMDS_HPD	41	INT_PD	IN2_HPDX 19 DP_MUX_HPD → TO EXTERNAL SOURCE VIA MUX1

NC	37	TMDS_PC0
NC	44	TMDS_PC1
NC	71	PIOINT_PD
NC	59	PDINT_PD

GND: 13 27 36 50 63 72 73 — THRM_PAD

Pulls for AUX_CH from DisplayPort Mux #2

=PP3V3_S0_DP

R9212 100K 1% 1/16W MF-LF 402 — MXM_DP_C_AUX_C_N
R9213 100K 1% 1/16W MF-LF 402 — MXM_DP_C_AUX_C_P

AC caps for EQ AUX interception

DP_EQLZ_AUXCH_P — C9290 0.1uF 10% 16V X5R 402 — DP_INT_AUXCH_P
DP_EQLZ_AUXCH_N — C9291 0.1uF 10% 16V X5R 402 — DP_INT_AUXCH_N

SYNC_MASTER=MASTER	SYNC_DATE=N/A
PAGE TITLE	BIDIVI DP MUX2
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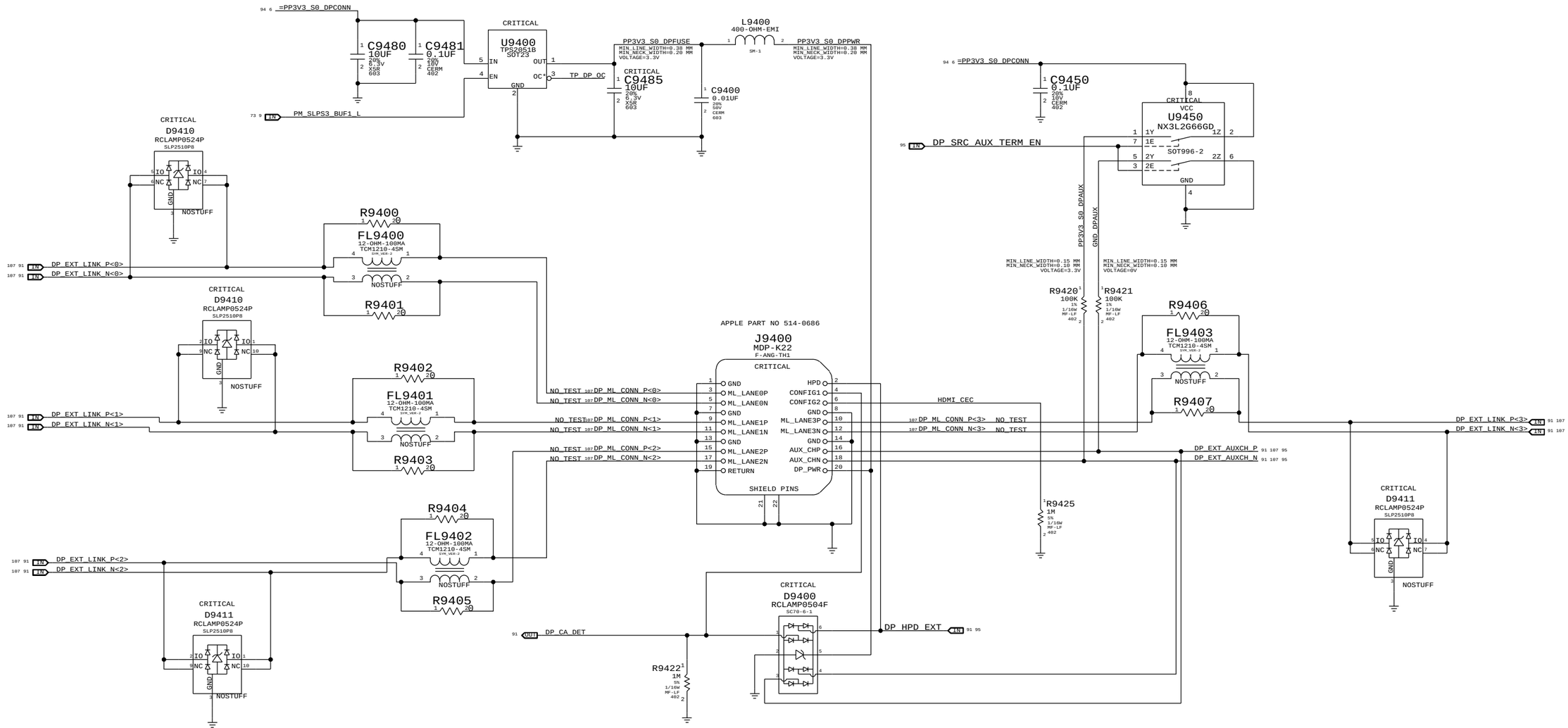

SYNC_MASTER=MARKVIDEO SYNC_DATE=03/12/2009

PAGE TITLE

Display: Ext DP Connector

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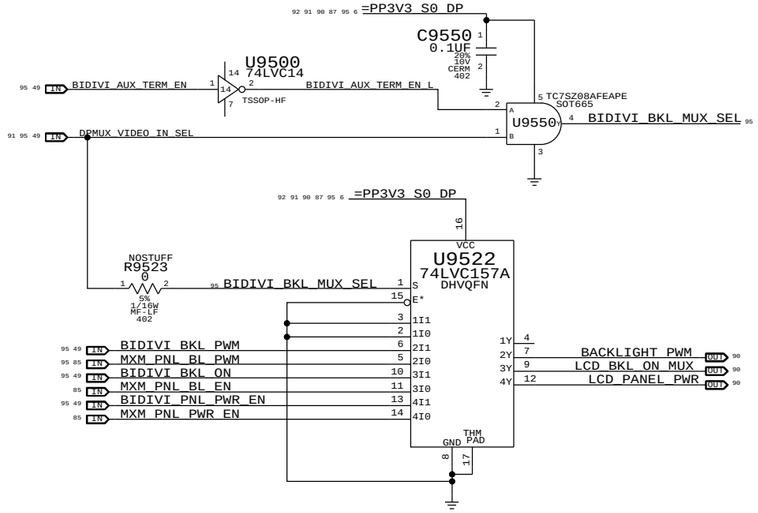
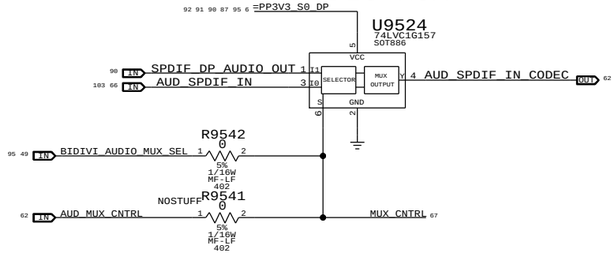
PANEL/BACKLIGHT CONTROL MUX

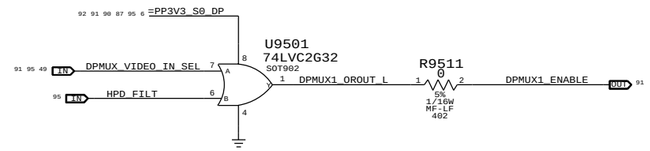


DisplayPort AUDIO MUX

PLACE NEAR U6201

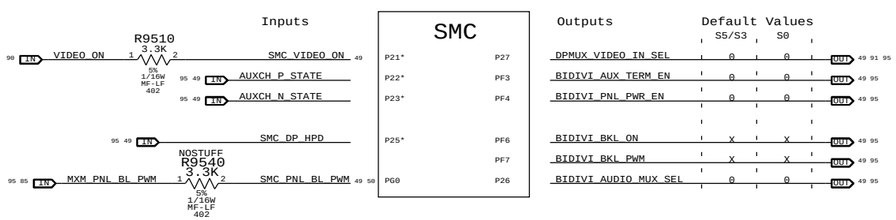


BiDiVi MUX Enable

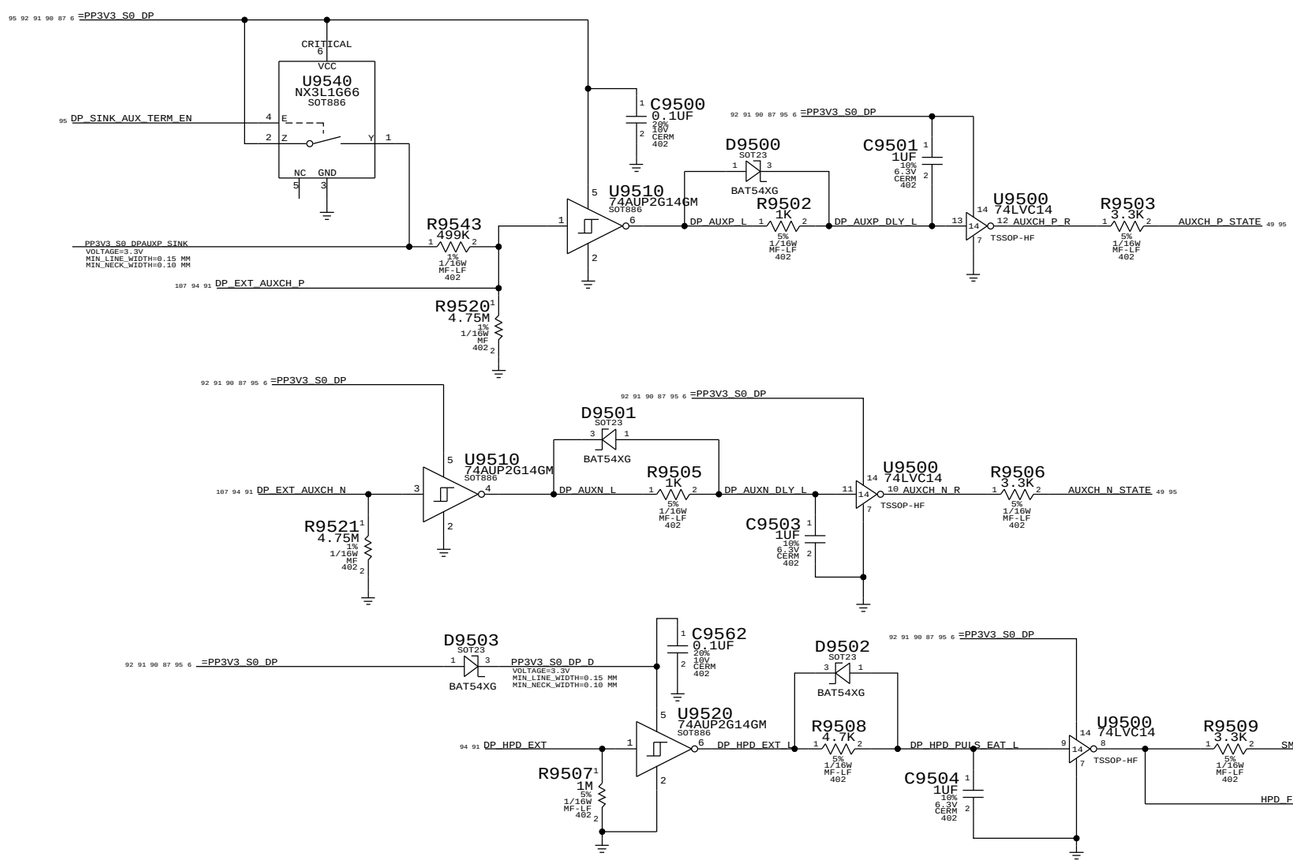


*Some inputs listed below come up as outputs driven low under the SMC flasher
Series R should prevent any issues on the inputs
Ouptuts are OK as low by default

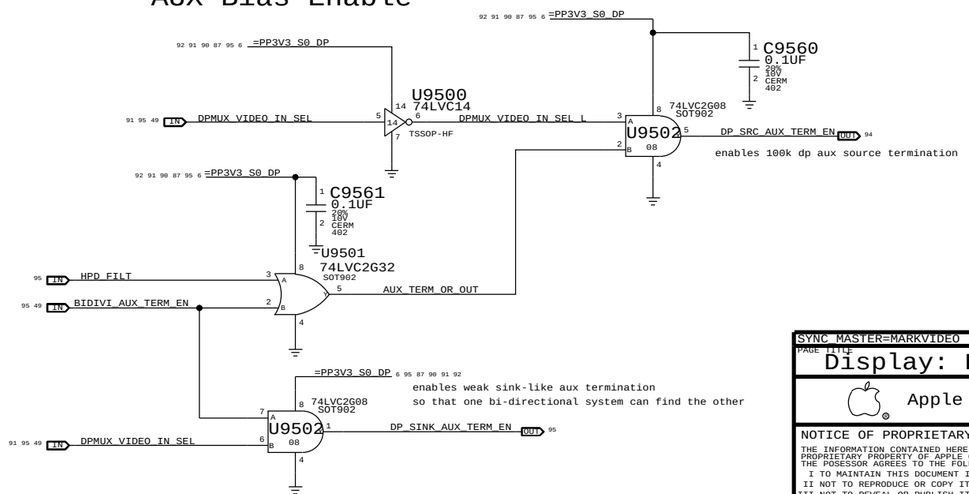
SMC Signals for BiDiVi



External AUX Channel and HPD Buffers & filters



AUX Bias Enable



SYNC_MASTER=MARKVIDEO	SYNC_DATE=03/12/2009
PAGE TITLE	Display: BiDiVi Support
Apple Inc.	DRAWING NUMBER 051-7863 · SIZE D
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FSB (Front-Side 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
FSB_50S	*	=50_OHM_SE	=50_OHM_SE	=50_OHM_SE	=50_OHM_SE	=STANDARD	=STANDARD
FSB_42S	*	=42_OHM_SE	=42_OHM_SE	=42_OHM_SE	=42_OHM_SE	=STANDARD	=STANDARD
FSB_DSTB_42S	*	=42_OHM_SE	=42_OHM_SE	=42_OHM_SE	=42_OHM_SE	=1:1_DIFFPAIR	=1:1_DIFFPAIR

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
FSB_DATA	*	=2x_DIELECTRIC	?
FSB_DSTB	*	=3x_DIELECTRIC	?
FSB_ADDR	*	=STANDARD	?
FSB_ADSTB	*	=2x_DIELECTRIC	?
FSB_1X	*	=STANDARD	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
FSB_DATA	TOP,BOTTOM	=4x_DIELECTRIC	?
FSB_DSTB	TOP,BOTTOM	=5x_DIELECTRIC	?
FSB_ADDR	TOP,BOTTOM	=3x_DIELECTRIC	?
FSB_ADSTB	TOP,BOTTOM	=4x_DIELECTRIC	?
FSB_1X	TOP,BOTTOM	=3x_DIELECTRIC	?

All 2x/1x/Async FSB signals with impedance requirements are 50-ohm single-ended.
All 4x FSB signals with impedance requirements are 42-ohm single-ended.

FSB 4X signals / groups shown in signal table on right.
Signals within each 4x group should be matched within 5 ps of strobe.
DSTB# complementary pairs should be matched within 1 ps of each other, all DSTB#s matched to +/- 90 ps. (Tighther than MCP79)
Spacing is 2x dielectric between DATA#, DINV# signals, with 3x dielectric spacing to the DSTB#s.
DSTB# complementary pairs are spaced normally and are NOT routed as differential pairs.

FSB 2X signals / groups shown in signal table on right.
Signals within each 2x group should be matched within 20 ps. ADTSB#s should be matched +/- 300 ps.
Spacing is 1x dielectric between ADDR#, REQ# signals, with 2x dielectric spacing to ADSTB#.

FSB 1X signals shown in signal table on right.
Signals within each 1x group should be matched to CPU clock, +0/-1000 mils.

Design Guide recommmends each strobe/signal group is routed on the same layer.
Intel Design Guide recommmends FSB signals be routed only on internal layers.

NOTE: Intel Design Guide allows closer spacing if signal lengths can be shortened.

SOURCE: MCP79 Interface DG (DG-03328-001_v01), Section 2.2
SOURCE: Santa Rosa Platform DG, Rev 1.5 (#22294), Sections 4.2 & 4.3

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	=50_OHM_SE	=STANDARD	=STANDARD
CPU_27P4S	*	=27P4_OHM_SE	=27P4_OHM_SE	=27P4_OHM_SE	=27P4_OHM_SE	0.175 MM	0.175 MM

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_BMIL	*	0.2 MM	?
CPU_COMP	*	0.6 MM	?
CPU_GTLREF	*	0.6 MM	?
CPU_ITP	*	=2:1_SPACING	?
CPU_VCCSENSE	*	0.6 MM	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
CPU_AGTL	TOP,BOTTOM	=2x_DIELECTRIC	?

SR DG recommends at least 25 mils, >50 mils preferred

MOST CPU SIGNALS WITH IMPEDANCE REQUIREMENTS ARE 50-OHM SINGLE-ENDED.
Some signals require 27.4-ohm single-ended impedance.

SOURCE: MCP79 Interface DG (DG-03328-001_v01), Section 2.2
SOURCE: Santa Rosa Platform DG, Rev 0.9 (#20517), Sections 4.4 & 5.8.2.4

MCP FSB COMP 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
MCP_50S	*	=50_OHM_SE	=50_OHM_SE	=50_OHM_SE	=50_OHM_SE	=STANDARD	=STANDARD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
MCP_FSB_COMP	*	0.2 MM	?

SOURCE: MCP79 Interface DG (DG-03328-001_v01), Section 2.2.4

FSB Clock 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_FSB_100D	*	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
CLK_FSB	*	=3x_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
CLK_FSB	TOP,BOTTOM	=4x_DIELECTRIC	?

SOURCE: MCP79 Interface DG (DG-03328-001_v01), Section 2.2.5

CPU / FSB Net Properties

	ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
FSB 4X Signal Groups	Group 0				
		FSB_42S	FSB_DATA	FSB_D_L<15..0>	10 14
		FSB_42S	FSB_DATA	FSB_DINV_L<0>	10 14
		FSB_DSTB_42S	FSB_DSTB	FSB_DSTB_L_P<0>	10 14
		FSB_DSTB_42S	FSB_DSTB	FSB_DSTB_L_N<0>	10 14
	Group 1				
		FSB_42S	FSB_DATA	FSB_D_L<31..16>	10 14
		FSB_42S	FSB_DATA	FSB_DINV_L<1>	10 14
		FSB_DSTB_42S	FSB_DSTB	FSB_DSTB_L_P<1>	10 14
		FSB_DSTB_42S	FSB_DSTB	FSB_DSTB_L_N<1>	10 14
	Group 2				
		FSB_42S	FSB_DATA	FSB_D_L<47..32>	10 14
		FSB_42S	FSB_DATA	FSB_DINV_L<2>	10 14
		FSB_DSTB_42S	FSB_DSTB	FSB_DSTB_L_P<2>	10 14
		FSB_DSTB_42S	FSB_DSTB	FSB_DSTB_L_N<2>	10 14
	Group 3				
		FSB_42S	FSB_DATA	FSB_D_L<63..48>	10 14
		FSB_42S	FSB_DATA	FSB_DINV_L<3>	10 14
		FSB_DSTB_42S	FSB_DSTB	FSB_DSTB_L_P<3>	10 14
		FSB_DSTB_42S	FSB_DSTB	FSB_DSTB_L_N<3>	10 14
FSB 2X Signals	Group 0				
		FSB_50S	FSB_ADDR	FSB_A_L<16..3>	10 14
		FSB_50S	FSB_ADDR	FSB_REQ_L<4..0>	10 14
		FSB_50S	FSB_ADSTB	FSB_ADSTB_L<0>	10 14
	Group 1				
		FSB_50S	FSB_ADDR	FSB_A_L<35..17>	10 14
		FSB_50S	FSB_ADSTB	FSB_ADSTB_L<1>	10 14
FSB 1X Signals		FSB_50S	FSB_1X	FSB_ADS_L	10 14
		FSB_50S	FSB_1X	FSB_BREQ0_L	10 14
		FSB_50S	FSB_1X	FSB_BREQ1_L	14
		FSB_50S	FSB_1X	FSB_BNR_L	10 14
		FSB_50S	FSB_1X	FSB_BPRI_L	10 14
		FSB_50S	FSB_1X	FSB_DBSY_L	10 14
		FSB_50S	FSB_1X	FSB_DEFER_L	10 14
		FSB_50S	FSB_1X	FSB_DRDY_L	10 14
		FSB_50S	FSB_1X	FSB_HIT_L	10 14
		FSB_50S	FSB_1X	FSB_HITM_L	10 14
		FSB_50S	FSB_1X	FSB_LOCK_L	10 14
		FSB_50S	FSB_1X	FSB_CPURST_L	10 13 14
		FSB_50S	FSB_1X	FSB_RS_L<2..0>	10 14
		FSB_50S	FSB_1X	FSB_TRDY_L	10 14
		CPU_50S	CPU_AGTL	CPU_A20M_L	10 14
		CPU_50S	CPU_AGTL	CPU_BSEL<2..0>	11 14
		CPU_50S	CPU_BMIL	CPU_FERR_L	10 14
		CPU_50S	CPU_AGTL	CPU_IGNNE_L	10 14
		CPU_50S	CPU_AGTL	CPU_INIT_L	10 14
		CPU_50S	CPU_AGTL	CPU_INTR	10 14
		CPU_50S	CPU_AGTL	CPU_NMI	10 14
		CPU_50S	CPU_AGTL	CPU_PROCHOT_L	11 14 50
		CPU_50S	CPU_AGTL	CPU_PWRGD	11 13 14
		CPU_50S	CPU_AGTL	CPU_SMI_L	10 14
		CPU_50S	CPU_AGTL	CPU_STPCLK_L	10 14
		CPU_50S	CPU_BMIL	PM_THRMTRIP_L	11 14 50
		CPU_50S	CPU_AGTL	FSB_CPUSLP_L	11 14
		CPU_50S	CPU_AGTL	CPU_DPSLP_L	11 14
		CPU_50S	CPU_AGTL	CPU_DPRSTP_L	11 14
		MCP_50S	MCP_FSB_COMP	MCP_BCLK_VML_COMP_VDD	14
		MCP_50S	MCP_FSB_COMP	MCP_BCLK_VML_COMP_GND	14
		MCP_50S	MCP_FSB_COMP	MCP_CPU_COMP_VCC	14
		MCP_50S	MCP_FSB_COMP	MCP_CPU_COMP_GND	14
		CLK_FSB_100D	CLK_FSB	FSB_CLK_CPU_P	10 14
		CLK_FSB_100D	CLK_FSB	FSB_CLK_CPU_N	10 14
		CLK_FSB_100D	CLK_FSB	FSB_CLK_ITP_P	13 14
		CLK_FSB_100D	CLK_FSB	FSB_CLK_ITP_N	13 14
		CLK_FSB_100D	CLK_FSB	FSB_CLK_MCP_P	14
		CLK_FSB_100D	CLK_FSB	FSB_CLK_MCP_N	14
		CPU_50S	CPU_AGTL	CPU_IERR_L	10
		CPU_50S	CPU_GTLREF	CPU_GTLREF0	10 11 29
		CPU_50S	CPU_GTLREF	CPU_GTLREF1	10 11 29
		CPU_27P4S	CPU_COMP	CPU_COMP<8>	11
		CPU_27P4S	CPU_COMP	CPU_COMP<3>	11
		CPU_27P4S	CPU_COMP	CPU_COMP<2>	11
		CPU_27P4S	CPU_COMP	CPU_COMP<1>	11
		CPU_27P4S	CPU_COMP	CPU_COMP<0>	11
		CPU_50S	CPU_ITP	CPU_XDP_TDI	11 13
		CPU_50S	CPU_ITP	CPU_XDP_TDO	11 13
		CPU_50S	CPU_ITP	CPU_XDP_TMS	11 13
		CPU_50S	CPU_ITP	CPU_XDP_TCK	11 13
		CPU_50S	CPU_ITP	CPU_XDP_TRST_L	11 13
		CPU_50S	CPU_ITP	CPU_XDP_BPM_L<5..0>	11 13
		CPU_50S	CPU_ITP	CPU_XDP_BPMB<3..0>	11 13
		CPU_50S	CPU_ITP	XDP_CPURST_L	13
		CPU_50S	CPU_BMIL	CPU_VID<7..0>	12 71
		CPU_27P4S	CPU_VCCSENSE	CPU_VCC_PKG_SENSE_P	12 71
		CPU_27P4S	CPU_VCCSENSE	CPU_VCC_PKG_SENSE_N	12 71
		CPU_27P4S	CPU_VCCSENSE	VR_CPU_VSNS_R_P	71
		CPU_27P4S	CPU_VCCSENSE	VR_CPU_VSNS_R_N	71

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PAGE TITLE: CPU/FSB Constraints

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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_40S	*	=40_OHM_SE	=40_OHM_SE	=40_OHM_SE	=40_OHM_SE	=STANDARD	=STANDARD
MEM_40S_VDD	*	=40_OHM_SE	=40_OHM_SE	=40_OHM_SE	=40_OHM_SE	=STANDARD	=STANDARD
MEM_70D	*	=70_OHM_DIFF	=70_OHM_DIFF	=70_OHM_DIFF	=70_OHM_DIFF	=70_OHM_DIFF	=70_OHM_DIFF
MEM_70D_VDD	*	=70_OHM_DIFF	=70_OHM_DIFF	=70_OHM_DIFF	=70_OHM_DIFF	=70_OHM_DIFF	=70_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
MEM_CLK2MEM	*	=4:1_SPACING	?
MEM_CTRL2CTRL	*	=2:1_SPACING	?
MEM_CTRL2MEM	*	=2.5:1_SPACING	?
MEM_CMD2CMD	*	=1.5:1_SPACING	?
MEM_CMD2MEM	*	=3:1_SPACING	?
MEM_DATA2DATA	*	=1.5:1_SPACING	?
MEM_DATA2MEM	*	=3:1_SPACING	?
MEM_DQS2MEM	*	=3:1_SPACING	?
MEM_2OTHER	*	=3:1_SPACING	?

Memory Bus Spacing Group Assignments

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
MEM_CLK	MEM_CLK	*	MEM_CLK2MEM
MEM_CLK	MEM_CTRL	*	MEM_CLK2MEM
MEM_CLK	MEM_CMD	*	MEM_CLK2MEM
MEM_CLK	MEM_DATA	*	MEM_CLK2MEM
MEM_CLK	MEM_DQS	*	MEM_CLK2MEM

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
MEM_CMD	MEM_CLK	*	MEM_CMD2MEM
MEM_CMD	MEM_CTRL	*	MEM_CMD2MEM
MEM_CMD	MEM_CMD	*	MEM_CMD2CMD
MEM_CMD	MEM_DATA	*	MEM_CMD2MEM
MEM_CMD	MEM_DQS	*	MEM_CMD2MEM

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
MEM_CTRL	MEM_CLK	*	MEM_CTRL2MEM
MEM_CTRL	MEM_CTRL	*	MEM_CTRL2CTRL
MEM_CTRL	MEM_CMD	*	MEM_CTRL2MEM
MEM_CTRL	MEM_DATA	*	MEM_CTRL2MEM
MEM_CTRL	MEM_DQS	*	MEM_CTRL2MEM

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
MEM_DATA	MEM_CLK	*	MEM_DATA2MEM
MEM_DATA	MEM_CTRL	*	MEM_DATA2MEM
MEM_DATA	MEM_CMD	*	MEM_DATA2MEM
MEM_DATA	MEM_DATA	*	MEM_DATA2DATA
MEM_DATA	MEM_DQS	*	MEM_DATA2MEM

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
MEM_DQS	MEM_CLK	*	MEM_DQS2MEM
MEM_DQS	MEM_CTRL	*	MEM_DQS2MEM
MEM_DQS	MEM_CMD	*	MEM_DQS2MEM
MEM_DQS	MEM_DATA	*	MEM_DQS2MEM
MEM_DQS	MEM_DQS	*	MEM_DQS2MEM

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
MEM_CLK	*	*	MEM_2OTHER
MEM_CTRL	*	*	MEM_2OTHER
MEM_CMD	*	*	MEM_2OTHER
MEM_DATA	*	*	MEM_2OTHER
MEM_DQS	*	*	MEM_2OTHER

Need to support MEM_*-style wildcards!

DDR2:
DQ signals should be matched within 20 ps of associated DQS pair.
DQS intra-pair matching should be within 1 ps, no inter-pair matching requirement.
All DQS pairs should be matched within 100 ps of clocks.
CLK intra-pair matching should be within 1 ps, inter-pair matching should be within 140 ps.
A/BA/cmd signals should be matched within 75 ps, no CLK matching requirement.
All memory signals maximum length is 1.005 ps. CLK minimum length is 594 ps (lengths include substrate).
DQ/A/BA/cmd signal spacing is 3x dielectric, DQS/CLK is 4x dielectric.

DDR3:
DQ signals should be matched within 5 ps of associated DQS pair.
DQS intra-pair matching should be within 1 ps, inter-pair matching shoulw be within 180 ps
No DQS to clock matching requirement.
CLK intra-pair matching should be within 1 ps, inter-pair matching should be within 2 ps.
A/BA/cmd signals should be matched within 5 ps of CLK pairs.
All memory signals maximum length is 1.005 ps. CLK minimum length is 594 ps (lengths include substrate).
DQ/A/BA/cmd signal spacing is 3x dielectric, DQS/CLK is 4x dielectric.

SOURCE: MCP79 Interface DG (DG-03328-001_v0D), Section 2.3
SOURCE: Santa Rosa Platform DG, Rev 1.0 (#21112), Section 6.2

MCP MEM COMP 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
MCP_MEM_COMP	*	Y	0.175 MM	0.175 MM	=STANDARD	=STANDARD	=STANDARD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
MCP_MEM_COMP	*	0.2 MM	?

SOURCE: MCP79 Interface DG (DG-03328-001_v0D), Section 2.3.4

Memory Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE: PHYSICAL	NET_TYPE: SPACING		
	MEM_70D_VDD	MEM_CLK	MEM_A_CLK_P<1..0>	15 33
	MEM_70D_VDD	MEM_CLK	MEM_A_CLK_N<1..0>	15 33
	MEM_70D_VDD	MEM_CLK	MEM_A_CLK_P<4..3>	16 33
	MEM_70D_VDD	MEM_CLK	MEM_A_CLK_N<4..3>	16 33
	MEM_40S_VDD	MEM_CTRL	MEM_A_CKE<3..0>	15 16 31
	MEM_40S_VDD	MEM_CTRL	MEM_A_CS_L<3..0>	15 16 31
	MEM_40S_VDD	MEM_CTRL	MEM_A_ODT<3..0>	15 16 31
	MEM_40S_VDD	MEM_CMD	MEM_A_A<14..0>	15 31
	MEM_40S_VDD	MEM_CMD	MEM_A_BA<2..0>	15 31
	MEM_40S_VDD	MEM_CMD	MEM_A_RAS_L	15 31
	MEM_40S_VDD	MEM_CMD	MEM_A_CAS_L	15 31
	MEM_40S_VDD	MEM_CMD	MEM_A_WE_L	15 31
	MEM_40S	MEM_DATA	MEM_A_DQ<7..0>	15 33
	MEM_40S	MEM_DATA	MEM_A_DM<0>	15 33
	MEM_40S	MEM_DATA	MEM_A_DQ<15..8>	15 33
	MEM_40S	MEM_DATA	MEM_A_DM<1>	15 33
	MEM_40S	MEM_DATA	MEM_A_DQ<23..16>	15 33
	MEM_40S	MEM_DATA	MEM_A_DM<2>	15 33
	MEM_40S	MEM_DATA	MEM_A_DQ<31..24>	15 33
	MEM_40S	MEM_DATA	MEM_A_DM<3>	15 33
	MEM_40S	MEM_DATA	MEM_A_DQ<39..32>	15 33
	MEM_40S	MEM_DATA	MEM_A_DM<4>	15 33
	MEM_40S	MEM_DATA	MEM_A_DQ<47..40>	15 33
	MEM_40S	MEM_DATA	MEM_A_DM<5>	15 33
	MEM_40S	MEM_DATA	MEM_A_DQ<55..48>	15 33
	MEM_40S	MEM_DATA	MEM_A_DM<6>	15 33
	MEM_40S	MEM_DATA	MEM_A_DQ<63..56>	15 33
	MEM_40S	MEM_DATA	MEM_A_DM<7>	15 33
	MEM_70D	MEM_DQS	MEM_A_DQS_P<0>	15 33
	MEM_70D	MEM_DQS	MEM_A_DQS_N<0>	15 33
	MEM_70D	MEM_DQS	MEM_A_DQS_P<1>	15 33
	MEM_70D	MEM_DQS	MEM_A_DQS_N<1>	15 33
	MEM_70D	MEM_DQS	MEM_A_DQS_P<2>	15 33
	MEM_70D	MEM_DQS	MEM_A_DQS_N<2>	15 33
	MEM_70D	MEM_DQS	MEM_A_DQS_P<3>	15 33
	MEM_70D	MEM_DQS	MEM_A_DQS_N<3>	15 33
	MEM_70D	MEM_DQS	MEM_A_DQS_P<4>	15 33
	MEM_70D	MEM_DQS	MEM_A_DQS_N<4>	15 33
	MEM_70D	MEM_DQS	MEM_A_DQS_P<5>	15 33
	MEM_70D	MEM_DQS	MEM_A_DQS_N<5>	15 33
	MEM_70D	MEM_DQS	MEM_A_DQS_P<6>	15 33
	MEM_70D	MEM_DQS	MEM_A_DQS_N<6>	15 33
	MEM_70D	MEM_DQS	MEM_A_DQS_P<7>	15 33
	MEM_70D	MEM_DQS	MEM_A_DQS_N<7>	15 33
	MEM_70D_VDD	MEM_CLK	MEM_B_CLK_P<1..0>	15 33
	MEM_70D_VDD	MEM_CLK	MEM_B_CLK_N<1..0>	15 33
	MEM_70D_VDD	MEM_CLK	MEM_B_CLK_P<4..3>	16 33
	MEM_70D_VDD	MEM_CLK	MEM_B_CLK_N<4..3>	16 33
	MEM_40S_VDD	MEM_CTRL	MEM_B_CKE<3..0>	15 16 32
	MEM_40S_VDD	MEM_CTRL	MEM_B_CS_L<3..0>	15 16 32
	MEM_40S_VDD	MEM_CTRL	MEM_B_ODT<3..0>	15 16 32
	MEM_40S_VDD	MEM_CMD	MEM_B_A<14..0>	15 32
	MEM_40S_VDD	MEM_CMD	MEM_B_BA<2..0>	15 32
	MEM_40S_VDD	MEM_CMD	MEM_B_RAS_L	15 32
	MEM_40S_VDD	MEM_CMD	MEM_B_CAS_L	15 32
	MEM_40S_VDD	MEM_CMD	MEM_B_WE_L	15 32
	MEM_40S	MEM_DATA	MEM_B_DQ<7..0>	15 33
	MEM_40S	MEM_DATA	MEM_B_DM<0>	15 33
	MEM_40S	MEM_DATA	MEM_B_DQ<15..8>	15 33
	MEM_40S	MEM_DATA	MEM_B_DM<1>	15 33
	MEM_40S	MEM_DATA	MEM_B_DQ<23..16>	15 33
	MEM_40S	MEM_DATA	MEM_B_DM<2>	15 33
	MEM_40S	MEM_DATA	MEM_B_DQ<31..24>	15 33
	MEM_40S	MEM_DATA	MEM_B_DM<3>	15 33
	MEM_40S	MEM_DATA	MEM_B_DQ<39..32>	15 33
	MEM_40S	MEM_DATA	MEM_B_DM<4>	15 33
	MEM_40S	MEM_DATA	MEM_B_DQ<47..40>	15 33
	MEM_40S	MEM_DATA	MEM_B_DM<5>	15 33
	MEM_40S	MEM_DATA	MEM_B_DQ<55..48>	15 33
	MEM_40S	MEM_DATA	MEM_B_DM<6>	15 33
	MEM_40S	MEM_DATA	MEM_B_DQ<63..56>	15 33
	MEM_40S	MEM_DATA	MEM_B_DM<7>	15 33

Memory Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE: PHYSICAL	NET_TYPE: SPACING		
	MEM_70D	MEM_DQS	MEM_B_DQS_P<0>	15 33
	MEM_70D	MEM_DQS	MEM_B_DQS_N<0>	15 33
	MEM_70D	MEM_DQS	MEM_B_DQS_P<1>	15 33
	MEM_70D	MEM_DQS	MEM_B_DQS_N<1>	15 33
	MEM_70D	MEM_DQS	MEM_B_DQS_P<2>	15 33
	MEM_70D	MEM_DQS	MEM_B_DQS_N<2>	15 33
	MEM_70D	MEM_DQS	MEM_B_DQS_P<3>	15 33
	MEM_70D	MEM_DQS	MEM_B_DQS_N<3>	15 33
	MEM_70D	MEM_DQS	MEM_B_DQS_P<4>	15 33
	MEM_70D	MEM_DQS	MEM_B_DQS_N<4>	15 33
	MEM_70D	MEM_DQS	MEM_B_DQS_P<5>	15 33
	MEM_70D	MEM_DQS	MEM_B_DQS_N<5>	15 33
	MEM_70D	MEM_DQS	MEM_B_DQS_P<6>	15 33
	MEM_70D	MEM_DQS	MEM_B_DQS_N<6>	15 33
	MEM_70D	MEM_DQS	MEM_B_DQS_P<7>	15 33
	MEM_70D	MEM_DQS	MEM_B_DQS_N<7>	15 33
	MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP_VDD	16
	MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP_GND	16

SYNC_MASTER=K22 SYNC_DATE=09/02/2009
PAGE TITLE: Memory Constraints

Apple Inc.

DRAWING NUMBER: 051-7863 SIZE: D
REVISION: A.0.0
BRANCH:
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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_90D	*	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF
CLK_PCIE_100D	*	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
PCIE	*	=3X_DIELECTRIC	?
CLK_PCIE	*	0.5 MM	?
MCP_PEX_COMP	*	0.2 MM	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
PCIE	TOP,BOTTOM	=4X_DIELECTRIC	?

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_100D	*	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
SATA	*	=4x_DIELECTRIC	?
SATA_TERMP	*	0.2 MM	?

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

SOURCE: MCP79 Interface DG (DG-03328-001_v0D), Section 2.7.1.

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
PCIE GRAPHICS				
	PCIE_90D	PCIE	PEG_R2D_C_P<15..0>	9 86
	PCIE_90D	PCIE	PEG_R2D_C_N<15..0>	9 86
	PCIE_90D	PCIE	PEG_D2R_P<15..0>	9 86
	PCIE_90D	PCIE	PEG_D2R_N<15..0>	9 86
	PCIE_90D	PCIE	MXM_PCIE_R2D_P<15..0>	84 86
	PCIE_90D	PCIE	MXM_PCIE_R2D_N<15..0>	84 86
	PCIE_90D	PCIE	MXM_PCIE_D2R_P<15..0>	84 86
	PCIE_90D	PCIE	MXM_PCIE_D2R_N<15..0>	84 86
PCIE I/O				
	PCIE_90D	PCIE	PCIE_MINI_R2D_P	34
	PCIE_90D	PCIE	PCIE_MINI_R2D_N	34
	PCIE_90D	PCIE	PCIE_MINI_R2D_C_P	17 34
	PCIE_90D	PCIE	PCIE_MINI_R2D_C_N	17 34
	PCIE_90D	PCIE	PCIE_MINI_R2D_L_P	34
	PCIE_90D	PCIE	PCIE_MINI_R2D_L_N	34
	PCIE_90D	PCIE	PCIE_MINI_D2R_P	17 34
	PCIE_90D	PCIE	PCIE_MINI_D2R_N	17 34
	PCIE_90D	PCIE	PCIE_FW_R2D_P	41
	PCIE_90D	PCIE	PCIE_FW_R2D_N	41
	PCIE_90D	PCIE	PCIE_FW_R2D_C_P	17 41
	PCIE_90D	PCIE	PCIE_FW_R2D_C_N	17 41
	PCIE_90D	PCIE	PCIE_FW_D2R_P	17 41
	PCIE_90D	PCIE	PCIE_FW_D2R_N	17 41
	PCIE_90D	PCIE	PCIE_FW_D2R_C_P	41
	PCIE_90D	PCIE	PCIE_FW_D2R_C_N	41
PCIE REF CLOCKS				
	CLK_PCIE_100D	CLK_PCIE	GPU_CLK100M_PCIE_P	9 87
	CLK_PCIE_100D	CLK_PCIE	GPU_CLK100M_PCIE_N	9 87
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_MINI_P	17 34
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_MINI_N	17 34
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_MINI_CON_P	34
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_MINI_CON_N	34
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_FW_P	17 41
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_FW_N	17 41
SATA				
	SATA_100D	SATA	SATA_HDD_R2D_C_P	20 45
	SATA_100D	SATA	SATA_HDD_R2D_C_N	20 45
	SATA_100D	SATA	SATA_HDD_R2D_P	45 110
	SATA_100D	SATA	SATA_HDD_R2D_N	45 110
	SATA_100D	SATA	SATA_HDD_D2R_P	20 45
	SATA_100D	SATA	SATA_HDD_D2R_N	20 45
	SATA_100D	SATA	SATA_HDD_D2R_C_P	45 110
	SATA_100D	SATA	SATA_HDD_D2R_C_N	45 110
	SATA_100D	SATA	SATA_ODD_R2D_C_P	20 45
	SATA_100D	SATA	SATA_ODD_R2D_C_N	20 45
	SATA_100D	SATA	SATA_ODD_R2D_P	45 110
	SATA_100D	SATA	SATA_ODD_R2D_N	45 110
	SATA_100D	SATA	SATA_ODD_D2R_P	20 45
	SATA_100D	SATA	SATA_ODD_D2R_N	20 45
	SATA_100D	SATA	SATA_ODD_D2R_C_P	45 110
	SATA_100D	SATA	SATA_ODD_D2R_C_N	45 110
	MCP_SGS	SATA_TERMP	MCP_SATA_TERMP	20
MISC				
	MCP_SGS	MCP_PEX_COMP	MCP_PEX_CLK_COMP	17
	MCP_DV_COMP	MCP_PEX_COMP	MCP_IFPAB_RSET	18 26
	MCP_SGS	MCP_PEX_COMP	MCP_IFPAB_VPROBE	18 26
			PM_SLP_S3_L	9 21
			PM_SLP_S4_L	21 70

SYNC_MASTER=K22 SYNC_DATE=09/02/2009

PAGE TITLE: MCP Constraints 1

Apple Inc.

DRAWING NUMBER: 051-7863 SIZE: D

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BRANCH:

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PCI 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
PCI_55S	*	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=STANDARD	=STANDARD
CLK_PCI_55S	*	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=STANDARD	=STANDARD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
PCI	*	=STANDARD	?
CLK_PCI	*	0.2 MM	?

SOURCE: MCP79 Interface DG (DG-03328-001_v0D), Section 2.8.

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_55S	*	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=STANDARD	=STANDARD
CLK_LPC_55S	*	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=STANDARD	=STANDARD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
LPC	*	0.15 MM	?
CLK_LPC	*	0.2 MM	?

SOURCE: MCP79 Interface DG (DG-03328-001_v0D), Section 2.9.1.

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
MCP_USB_RBIAS	*	=STANDARD	0.2 MM	0.2 MM	=STANDARD	=STANDARD	=STANDARD
USB_90D	*	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF

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

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
USB	TOP,BOTTOM	=4x_DIELECTRIC	?

SOURCE: MCP79 Interface DG (DG-03328-001_v0D), Section 2.10.1.

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_55S	*	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=STANDARD	=STANDARD

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

SOURCE: MCP79 Interface DG (DG-03328-001_v0D), Section 2.11.1.

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_55S	*	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=STANDARD	=STANDARD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
HDA	*	=2x_DIELECTRIC	?
MCP_HDA_COMP	*	0.2 MM	?

SOURCE: MCP79 Interface DG (DG-03328-001_v0D), Section 2.12.1.

SOURCE: MCP79 Interface DG (DG-03328-001_v0D), Section 2.13.

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_55S	*	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=STANDARD	=STANDARD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
SPI	*	0.2 MM	?

SOURCE: MCP79 Interface DG (DG-03328-001_v0D), Section 2.14.

XTAL 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_MCP_XTAL	*	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
XTAL	*	=4X_DIELECTRIC	?

NET_TYPE

ELECTRICAL_CONSTRAINT_SET	PHYSICAL	SPACING		
	PCI_55S	PCI	PCI_REQ0_L	19
	PCI_55S	PCI	PCI_REQ1_L	19
	CLK_PCI_55S	CLK_PCI	PCI_CLK33M_MCP_R	19
	CLK_PCI_55S	CLK_PCI	PCI_CLK33M_MCP	19
	LPC_55S	LPC	LPC_AD<3..0>	19 49 51
	LPC_55S	LPC	LPC_AD_R<3..0>	19
	LPC_55S	LPC	LPC_FRAME_L	19 49 51
	LPC_55S	LPC	LPC_FRAME_R_L	19
	LPC_55S	LPC	LPC_RESET_L	9 19
	CLK_LPC_55S	CLK_LPC	LPC_CLK33M_SMC_R	9 19
	CLK_LPC_55S	CLK_LPC	LPC_CLK33M_SMC	9 49
	CLK_LPC_55S	CLK_LPC	LPC_CLK33M_LPCPLUS	9 51
	CLK_LPC_55S	CLK_LPC	PM_CLK32K_SUSCLK_R	9 21
	CLK_LPC_55S	CLK_LPC	PM_CLK32K_SUSCLK	9 49
	MCP_USB_RBIAS		MCP_USB_RBIAS_GND	20
	USB_90D	USB	USB_EXTA_P	20 46
	USB_90D	USB	USB_EXTA_N	20 46
	USB_90D	USB	USB_PORT0_P	46
	USB_90D	USB	USB_PORT0_N	46
	USB_90D	USB	USB_EXTB_P	20 46
	USB_90D	USB	USB_EXTB_N	20 46
	USB_90D	USB	USB_PORT1_P	46
	USB_90D	USB	USB_PORT1_N	46
	USB_90D	USB	USB_EXTC_P	20 46
	USB_90D	USB	USB_EXTC_N	20 46
	USB_90D	USB	USB_PORT2_P	46
	USB_90D	USB	USB_PORT2_N	46
	USB_90D	USB	USB_EXTD_P	20 46
	USB_90D	USB	USB_EXTD_N	20 46
	USB_90D	USB	USB_D_MUXED_P	46
	USB_90D	USB	USB_D_MUXED_N	46
	USB_90D	USB	USB_PORT3_P	46
	USB_90D	USB	USB_PORT3_N	46
	USB_90D	USB	USB_CAMERA_P	20 47
	USB_90D	USB	USB_CAMERA_N	20 47
	USB_90D	USB	USB_CAMERA_L_P	47 110
	USB_90D	USB	USB_CAMERA_L_N	47 110
	USB_90D	USB	USB_BT_P	20 47
	USB_90D	USB	USB_BT_N	20 47
	USB_90D	USB	USB_BT_L_P	47 110
	USB_90D	USB	USB_BT_L_N	47 110
	USB_90D	USB	USB_IR_P	20 47
	USB_90D	USB	USB_IR_N	20 47
	USB_90D	USB	USB_IR_L_P	47 110
	USB_90D	USB	USB_IR_L_N	47 110
	USB_90D	USB	USB_SDCARD_P	20 47
	USB_90D	USB	USB_SDCARD_N	20 47
	USB_90D	USB	USB_SDCARD_L_P	47 110
	USB_90D	USB	USB_SDCARD_L_N	47 110
	MCP_55S	SPI	SPI_CLK_R	21 51 61
	MCP_55S	SPI	SPI_CLK	61
	MCP_55S	SPI	SPI_MOSI_R	21 51 61
	MCP_55S	SPI	SPI_MOSI	61
	MCP_55S	SPI	SPI_MISO	21 51 61
	MCP_55S	SPI	SPI_MISO_R	61
	MCP_55S	SPI	SPI_CS0_R_L	21 51
	MCP_55S	SPI	SPI_CS0_L	51
	HDA_55S	HDA	HDA_BIT_CLK	21 62
		MCP_HDA_COMP	MCP_HDA_PULLDN_COMP	21
	HDA_55S	HDA	HDA_BIT_CLK_R	21
	HDA_55S	HDA	HDA_RST_L	21 62
	HDA_55S	HDA	HDA_RST_R_L	21
	HDA_55S	HDA	HDA_SDOUT	21 62
	HDA_55S	HDA	HDA_SDOUT_R	21
	HDA_55S	HDA	HDA_SYNC	21 62
	HDA_55S	HDA	HDA_SYNC_R	21
	HDA_55S	HDA	HDA_SDIN0	21 62
	HDA_55S	HDA	AUD_SDI_R	62
		HDA	AUD_SPDIF_IN	9 66
		HDA	AUD_SPDIF_OUT	62 66
		HDA	AUD_SPDIF_CHIP	62
	CLK_MCP_XTAL	XTAL	MCP_CLK25M_XTALOUT	21 28
	CLK_MCP_XTAL	XTAL	MCP_CLK25M_XTALIN	21 28
	CLK_MCP_XTAL	XTAL	RTC_CLK32K_XTALOUT	21 28
	CLK_MCP_XTAL	XTAL	RTC_CLK32K_XTALIN	21 28

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MCP Constraints 2

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MCP RGMII (Ethernet) Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
MCP_MII_COMP	*	=STANDARD	0.2 MM	0.2 MM	=STANDARD	=STANDARD	=STANDARD
ENET_MII_55S	*	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=STANDARD	=STANDARD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
MCP_BUF0_CLK	*	=3:1_SPACING	?
ENET_MII	*	0.3 MM	?

SOURCE: MCP73 Interface DG (DG-02974-001_v01), Sections 2.7.2 & 2.7.4

RTL8211CLGR (ETHERNET PHY) CONSTRAINTS

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
ENET_MDI_100D	*	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
ENET_MDI	*	0.6 MM	?

SOURCE: MCP73 Interface DG (DG-02974-001_v01), Section 2.7.4

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
	MCP_MII_COMP		MCP_MII_COMP_VDD	18
	MCP_MII_COMP		MCP_MII_COMP_GND	18
	ENET_MII_55S	MCP_BUF0_CLK	MCP_CLK25M_BUF0_R	18 38
	ENET_MII_55S	MCP_BUF0_CLK	RTL8211_CLK25M_CKXTAL1	37 38
	ENET_MII_55S	ENET_MII	ENET_MDIO	18 37
	ENET_MII_55S	ENET_MII	ENET_MDC	18 37
	ENET_MII_55S	ENET_MII	ENET_CLK125M_RXCLK	18 37
	ENET_MII_55S	ENET_MII	ENET_CLK125M_RXCLK_R	37
	ENET_MII_55S	ENET_MII	ENET_RXD<0>	18 37
	ENET_MII_55S	ENET_MII	ENET_RXD_R<0>	37
	ENET_MII_55S	ENET_MII	ENET_RXD<3..1>	18 37
	ENET_MII_55S	ENET_MII	ENET_RXD_R<3..1>	37
	ENET_MII_55S	ENET_MII	ENET_RX_CTRL	18 37
	ENET_MII_55S	ENET_MII	ENET_RXCTL_R	37
	ENET_MII_55S	ENET_MII	ENET_CLK125M_TXCLK	18 37
	ENET_MII_55S	ENET_MII	ENET_TXD<0>	18 37
	ENET_MII_55S	ENET_MII	ENET_TXD<3..1>	18 37
	ENET_MII_55S	ENET_MII	ENET_TX_CTRL	18 37
	ENET_MDI_100D	ENET_MDI	ENET_MDI_P<3..0>	37 39
	ENET_MDI_100D	ENET_MDI	ENET_MDI_N<3..0>	37 39
	ENET_MDI_100D	ENET_MDI	ENET_MDI_T_P<3..0>	39
	ENET_MDI_100D	ENET_MDI	ENET_MDI_T_N<3..0>	39

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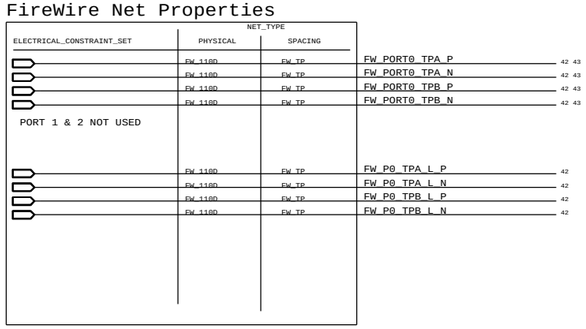
FireWire Interface Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
FW_110D	*	=110_OHM_DIFF	=110_OHM_DIFF	=110_OHM_DIFF	=110_OHM_DIFF	=110_OHM_DIFF	=110_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
FW_TP	*	=3:1_SPACING	?

FireWire Net Properties



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SOURCE: MCP79 Interface DG (DG-03328-001_v0D), Section 2.10.1.

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_55S	*	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=STANDARD	=STANDARD

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

SMC SMBus Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE: PHYSICAL	NET_TYPE: SPACING		
	SMB_55S	SMB	SMBUS_SMC_A_S3_SCL	52
	SMB_55S	SMB	SMBUS_SMC_A_S3_SDA	52
	SMB_55S	SMB	SMBUS_SMC_B_S0_SCL	52
	SMB_55S	SMB	SMBUS_SMC_B_S0_SDA	52
	SMB_55S	SMB	SMBUS_SMC_0_S0_SCL	52
	SMB_55S	SMB	SMBUS_SMC_0_S0_SDA	52
	SMB_55S	SMB	SMBUS_SMC_BSA_SCL	52
	SMB_55S	SMB	SMBUS_SMC_BSA_SDA	52
	SMB_55S	SMB	SMBUS_SMC_MGMT_SCL	52 106
	SMB_55S	SMB	SMBUS_SMC_MGMT_SDA	52 106
	SMB_55S	SMB	SMBUS_SMC_MGMT_SCL	52 106
	SMB_55S	SMB	SMBUS_SMC_MGMT_SDA	52 106
	SMB_55S	SMB	SMBUS_MCP_0_CLK	13 21 52
	SMB_55S	SMB	SMBUS_MCP_0_DATA	13 21 52

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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_100D	*	=100_OHM_DIFF	=100_OHM_DIFF	0.08MM	=100_OHM_DIF	=100_OHM_DIFF	=100_OHM_DIFF
MCP_DV_COMP	*	Y	0.5 MM	0.5 MM	=STANDARD	=STANDARD	=STANDARD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
DISPLAYPORT	*	=3x_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
DISPLAYPORT	TOP,BOTTOM	=4x_DIELECTRIC	?

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
DISPLAYPORT	*	*	3:1_SPACING
DISPLAYPORT	POWER	*	PWR_P2MM
DISPLAYPORT	GND	*	GND_P2MM

LVDS intra-pair matching should be 5 mils. Pairs should be within 100 mils of clock length.
DisplayPort/TMDS intra-pair matching should be 5 ps. Inter-pair matching should be within 150 ps.
DIsplayPort AUX CH intra-pair matching should be 5 ps. No relationship to other signals.
Max length of LVDS/DisplayPort/TMDS traces: 12 inches.
SOURCE: MCP79 Interface DG (DG-03328-001_v0D), Sections 2.5.3 & 2.5.4.

NET_TYPE			
ELECTRICAL_CONSTRAINT_SET	PHYSICAL	SPACING	
ASSINGED IN CONT. MGR.			
	DP_100D	DISPLAYPORT	MXM_DP_A_ML_P<3..0> 84 91
	DP_100D	DISPLAYPORT	MXM_DP_A_ML_N<3..0> 84 91
	DP_100D	DISPLAYPORT	MXM_DP_A_ML_C_P<3..0> 91
	DP_100D	DISPLAYPORT	MXM_DP_A_ML_C_N<3..0> 91
	DP_100D	DISPLAYPORT	MXM_DP_A_ML_EQ_P<3..0> 91
	DP_100D	DISPLAYPORT	MXM_DP_A_ML_EQ_N<3..0> 91
	DP_100D	DISPLAYPORT	MXM_DP_A_AUX_P 84 91
	DP_100D	DISPLAYPORT	MXM_DP_A_AUX_N 84 91
	DP_100D	DISPLAYPORT	MXM_DP_A_AUX_C_P 91
	DP_100D	DISPLAYPORT	MXM_DP_A_AUX_C_N 91
	DP_100D	DISPLAYPORT	DP_EXT_LINK_P<3..0> 91 94
	DP_100D	DISPLAYPORT	DP_EXT_LINK_N<3..0> 91 94
	DP_100D	DISPLAYPORT	DP_EXT_LINK_C_P<3..0> 91
	DP_100D	DISPLAYPORT	DP_EXT_LINK_C_N<3..0> 91
	DP_100D	DISPLAYPORT	DP_EXT_AUXCH_P 91 94 95
	DP_100D	DISPLAYPORT	DP_EXT_AUXCH_N 91 94 95
	DP_100D	DISPLAYPORT	DP_ML_CONN_P<3..0> 94
	DP_100D	DISPLAYPORT	DP_ML_CONN_N<3..0> 94
	DP_100D	DISPLAYPORT	MXM_DP_C_ML_P<3..0> 84 92
	DP_100D	DISPLAYPORT	MXM_DP_C_ML_N<3..0> 84 92
	DP_100D	DISPLAYPORT	MXM_DP_C_ML_C_P<3..0> 92
	DP_100D	DISPLAYPORT	MXM_DP_C_ML_C_N<3..0> 92
	DP_100D	DISPLAYPORT	MXM_DP_C_AUX_P 84 92
	DP_100D	DISPLAYPORT	MXM_DP_C_AUX_N 84 92
	DP_100D	DISPLAYPORT	MXM_DP_C_AUX_C_P 92
	DP_100D	DISPLAYPORT	MXM_DP_C_AUX_C_N 92
	DP_100D	DISPLAYPORT	DP_INT_LINK_P<3..0> 92 90
	DP_100D	DISPLAYPORT	DP_INT_LINK_N<3..0> 92 90
	DP_100D	DISPLAYPORT	DP_INT_LINK_CONN_P<3..0> 90
	DP_100D	DISPLAYPORT	DP_INT_LINK_CONN_N<3..0> 90
	DP_100D	DISPLAYPORT	DP_INT_AUXCH_P 92 90
	DP_100D	DISPLAYPORT	DP_INT_AUXCH_N 92 90
	DP_100D	DISPLAYPORT	DP_MUX_P<3..0> 91 92
	DP_100D	DISPLAYPORT	DP_MUX_N<3..0> 91 92
	DP_100D	DISPLAYPORT	DP_MUX_AUXCH_P 91 92 107
	DP_100D	DISPLAYPORT	DP_MUX_AUXCH_N 91 92 107
	DP_100D	DISPLAYPORT	DP_MUX_AUXCH_P 91 92 107
	DP_100D	DISPLAYPORT	DP_MUX_AUXCH_N 91 92 107
	DP_100D	DISPLAYPORT	DP_TX_EQ_AUXCH_P 91
	DP_100D	DISPLAYPORT	DP_TX_EQ_AUXCH_N 91
	DP_100D	DISPLAYPORT	DP_EQLZ_AUXCH_P 92
	DP_100D	DISPLAYPORT	DP_EQLZ_AUXCH_N 92
	MCP_DV_COMP		MCP_HDMI_RSET 18 26
	MCP_DV_COMP		MCP_HDMI_VPROBE 18 26

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SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
GND	*	=STANDARD	?
PPDDR_MEM	*	=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
MEM_CLK	GND	*	GND_P2MM
MEM_CMD	GND	*	GND_P2MM
MEM_CTRL	GND	*	GND_P2MM
MEM_DATA	GND	*	GND_P2MM
MEM_DQS	GND	*	GND_P2MM
MEM_CLK	PPDDR_MEM	*	PWR_P2MM
MEM_CMD	PPDDR_MEM	*	PWR_P2MM
MEM_CTRL	PPDDR_MEM	*	PWR_P2MM
MEM_DATA	PPDDR_MEM	*	PWR_P2MM
MEM_DQS	PPDDR_MEM	*	PWR_P2MM

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
CLK_PCIE	GND	*	GND_P2MM
PCIE	GND	*	GND_P2MM
SATA	GND	*	GND_P2MM
USB	GND	*	GND_P2MM

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
CLK_FSB	GND	*	GND_P2MM
CPU_COMP	GND	*	GND_P2MM
CPU_GTLREF	GND	*	GND_P2MM
CPU_VCCSENSE	GND	*	GND_P2MM
FSB_DSTB	GND	*	GND_P2MM

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
CLK_PCIE	PWR	*	PWR_P2MM

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
THERMAL	*	*	4:1_SPACING
SWITCHNODE	*	*	SWITCHNODE
THERMAL	PWR	*	PWR_P2MM
THERMAL	GND	*	GND_P2MM
AUDIO	*	*	AUDIO

NET_PHYSICAL_TYPE	AREA_TYPE	PHYSICAL_RULE_SET
THERM_DIFF	*	1:1_DIFFPAIR
SNS_DIFF	*	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
MEM_40S	TOP			0.1 MM	600 MIL		
OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE
MEM_40S_VDD	TOP			0.1 MM	600 MIL		
OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE
MEM_70D	TOP			0.1 MM	600 MIL		
OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE
PCIE_90D	TOP				500 MIL		
OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE
USB_90D	TOP				500 MIL		
OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE
MCP_DV_COMP	TOP			0.1 MM	500 MIL		
OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE
MCP_MEM_COMP	TOP			0.1 MM	500 MIL		
OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE
MCP_MII_COMP	TOP			0.1 MM	500 MIL		
OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE
MCP_USB_RBIAS	TOP			0.1 MM	500 MIL		
OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE
MCP_DV_COMP	*			0.25 MM	250 MIL		
OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE
CPU_27P4S	BOTTOM			0.23 MM	100 MIL		
OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE

K50/K51 SPECIFIC NET PROPERTIES

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
		PPDDR_MEM	=PP1V5_S3_MEM_A	6 30 31
		PPDDR_MEM	=PP1V5_S3_MEM_B	6 30 32
		SWITCHNODE	VR_CPU_SW1	72
		SWITCHNODE	VR_CPU_SW2	72
		SWITCHNODE	VR_CPU_SW3	72
		SWITCHNODE	1V8_SW	80
		SWITCHNODE	1V1S5_SW	79
		SWITCHNODE	PVTTS0_PHASE	76
		SWITCHNODE	3V3S5_SW	76
		SWITCHNODE	5VS3_SW	73
		SWITCHNODE	MCPCORES0_PHASE	74
	THERM_DIFF	THERMAL	SNS_T_DP1_DN6	55
	THERM_DIFF	THERMAL	SNS_T_DN1_DP6	55
	THERM_DIFF	THERMAL	SNS_T_DP2_DN3	55
	THERM_DIFF	THERMAL	SNS_T_DN2_DP3	55
	THERM_DIFF	THERMAL	CPU_THERMD_P	11 55
	THERM_DIFF	THERMAL	CPU_THERMD_N	11 55
	THERM_DIFF	THERMAL	SNS_T_DP4_DN5	55
	THERM_DIFF	THERMAL	SNS_T_DN4_DP5	55
	THERM_DIFF	THERMAL	MCP_THMDIODE_P	21 55
	THERM_DIFF	THERMAL	MCP_THMDIODE_N	21 55
	THERM_DIFF	THERMAL	MXM_PWRSRC_SENSOR_P	53
	THERM_DIFF	THERMAL	MXM_PWRSRC_SENSOR_N	53
	THERM_DIFF	THERMAL	SENSE_1V5_S0_P	54
	THERM_DIFF	THERMAL	SENSE_1V5_S0_N	54
	THERM_DIFF	THERMAL	SNS_LCD_P	55 110
	THERM_DIFF	THERMAL	SNS_LCD_N	55 110
	THERM_DIFF	THERMAL	SNS_ODD_P	55 110
	THERM_DIFF	THERMAL	SNS_ODD_N	55 110
	THERM_DIFF	THERMAL	SNS_CPU_H_P	55
	THERM_DIFF	THERMAL	SNS_CPU_H_N	55
	THERM_DIFF	THERMAL	SNS_MCP_P	55
	THERM_DIFF	THERMAL	SNS_MCP_N	55
	THERM_DIFF	THERMAL	SNS_AMB_P	55 110
	THERM_DIFF	THERMAL	SNS_AMB_N	55 110
	THERM_DIFF	THERMAL	SNS_MXM_P	55
	THERM_DIFF	THERMAL	SNS_MXM_N	55
	SNS_DIFF	THERMAL	VR_CPU_ISNS1_P	71 72
	SNS_DIFF	THERMAL	VR_CPU_ISNS1_N	71 72
	SNS_DIFF	THERMAL	VR_CPU_ISNS1_R_P	71
	SNS_DIFF	THERMAL	VR_CPU_ISNS1_R_N	71
	SNS_DIFF	THERMAL	VR_CPU_ISNS2_P	71 72
	SNS_DIFF	THERMAL	VR_CPU_ISNS2_N	71 72
	SNS_DIFF	THERMAL	VR_CPU_ISNS2_R_P	71
	SNS_DIFF	THERMAL	VR_CPU_ISNS2_R_N	71
	SNS_DIFF	THERMAL	VR_CPU_ISNS3_P	71 72
	SNS_DIFF	THERMAL	VR_CPU_ISNS3_N	71 72
	SNS_DIFF	THERMAL	VR_CPU_ISNS3_R_P	71
	SNS_DIFF	THERMAL	VR_CPU_ISNS3_R_N	71
1214		THERMAL	SMC_CPU_ISENSE	49 53
1215		THERMAL	VR_CPU_IOUT	53 71
1216		THERMAL	VR_ISNS_CPU_P	53
1217		THERMAL	VR_ISNS_CPU_N	53
1218		THERMAL	SNS_PS_CPU_ISNS	53
1219		THERMAL	SMC_CPU_VSENSE	49 53
1220		THERMAL	CPU_VCC_SENSE	12 53
1221		THERMAL	SMC_GPU_VSENSE	49 53
1222		THERMAL	SMC_GPU_ISENSE	49 53
1223		THERMAL	SMC_1V5_S0_ISENSE	50 54
1224		THERMAL	SMC_1V5_S0_ISENSE_R	54
1225		THERMAL	SMC_1V5_S0_VSENSE	50 54
1226		THERMAL	SMC_MCP_CORE_ISENSE	50 54
1227		THERMAL	SMC_MCP_CORE_VSENSE	50 54
1228		THERMAL	MCPCORES0_IMON	54 74
1229		THERMAL	CPU_PECI_L	11 55
1230		THERMAL	SMB_PECI_L	55
1231		THERMAL	CPU_PECI_MCP	14 55
		THERMAL	HDD_OOB_TEMP_FILT	55
1232		THERMAL	HDD_OOB_TEMP	55
1233		THERMAL	HDD_OOB_TEMP_R	55
1234		THERMAL	SMC_HDD_OOB_TEMP	55

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K50/K51 BOARD-SPECIFIC SPACING & PHYSICAL CONSTRAINTS

BOARD LAYERS	BOARD AREAS	BOARD_UNITS (MIL or MM)	ALLEGRO VERSION
TOP,ISL2,ISL3,ISL4,ISL5,ISL6,ISL7,BOTTOM	NO_TYPE,BGA_P1MM	MM	15.5.1

PHYSICAL CONSTRAINTS

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	=50_OHM_SE	=50_OHM_SE	100 MM	0 MM	0 MM
STANDARD	*	Y	=DEFAULT	=DEFAULT	12.7 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
27P4_OHM_SE	TOP,BOTTOM	Y	0.300 MM	0.085 MM	=STANDARD		
27P4_OHM_SE	*	Y	0.275 MM	0.085 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	0.165 MM	0.085 MM	=STANDARD		
40_OHM_SE	*	Y	0.15 MM	0.085 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
42_OHM_SE	TOP,BOTTOM	Y	0.151 MM	0.085 MM	=STANDARD		
42_OHM_SE	*	Y	0.136 MM	0.085 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
50_OHM_SE	TOP,BOTTOM	Y	0.1 MM	0.085 MM	15 MM		
50_OHM_SE	*	Y	0.1 MM	0.085 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
55_OHM_SE	TOP,BOTTOM	Y	0.085 MM	0.085 MM	=STANDARD		
55_OHM_SE	*	Y	0.076 MM	0.075 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
70_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD
70_OHM_DIFF	ISL3,ISL6	Y	0.155 MM	0.085 MM	=STANDARD	0.135 MM	0.1 MM
70_OHM_DIFF	TOP,BOTTOM	Y	0.165 MM	0.085 MM	=STANDARD	0.130 MM	0.1 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,ISL6	Y	0.099 MM	0.085 MM	12 MM	0.200 MM	0.1 MM
90_OHM_DIFF	TOP,BOTTOM	Y	0.110 MM	0.085 MM	=STANDARD	0.200 MM	0.1 MM

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
100_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD
100_OHM_DIFF	ISL3,ISL6	Y	0.081 MM	0.085 MM	=STANDARD	0.25 MM	0.1 MM
100_OHM_DIFF	TOP,BOTTOM	Y	0.091 MM	0.085 MM	=STANDARD	0.25 MM	0.1 MM

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
110_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD
110_OHM_DIFF	TOP,BOTTOM	Y	0.075 MM	0.085 MM	=STANDARD	0.320 MM	0.15 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	0.085 MM
POWER_WIDTH	*	Y	0.600 MM	0.200 MM	3.0 MM	=STANDARD	=STANDARD

NET_PHYSICAL_TYPE	AREA_TYPE	PHYSICAL_RULE_SET
POWER	*	POWER_WIDTH
VR_CTL_PHY	*	POWER_WIDTH

SPACING RULE SET

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
DEFAULT	*	0.1 MM	?
STANDARD	*	=DEFAULT	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
1.5:1_SPACING	*	0.15 MM	?
2:1_SPACING	*	0.2 MM	?
2.5:1_SPACING	*	0.25 MM	?
3:1_SPACING	*	0.3 MM	?
4:1_SPACING	*	0.4 MM	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
CLK_SPACING_0.5MM	*	0.5 MM	?
CLK_SPACING_0.6MM	*	0.6 MM	?
GND_P2MM	*	0.2 MM	1000
PWR_P2MM	*	0.2 MM	1000
SWITCHNODE	*	0.6 MM	1000

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
2X_DIELECTRIC	*	0.150 MM	?
2X_DIELECTRIC	TOP,BOTTOM	0.160 MM	?
3X_DIELECTRIC	*	0.220 MM	?
3X_DIELECTRIC	TOP,BOTTOM	0.240 MM	?
4X_DIELECTRIC	*	0.300 MM	?
4X_DIELECTRIC	TOP,BOTTOM	0.320 MM	?
5X_DIELECTRIC	*	0.380 MM	?
5X_DIELECTRIC	TOP,BOTTOM	0.400 MM	?

CONSTRAINTS FOR BGA AREA

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
BGA_P1MM	*	=DEFAULT	?
BGA_P2MM	*	0.2 MM	?
BGA_P3MM	*	0.3 MM	?

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
*	*	BGA_P1MM	BGA_P1MM
MEM_CLK	*	BGA_P1MM	BGA_P2MM
CLK_FSB	*	BGA_P1MM	BGA_P2MM
CLK_PCIE	*	BGA_P1MM	BGA_P1MM
FSB_DSTB	FSB_DSTB	BGA_P1MM	BGA_P1MM
CLK_LPC	*	BGA_P1MM	BGA_P1MM
CLK_PCI	*	BGA_P1MM	BGA_P1MM

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
MCP_FSB_COMP	*	BGA_P1MM	BGA_P2MM
MCP_MEM_COMP	*	BGA_P1MM	BGA_P2MM
MCP_PEX_COMP	*	BGA_P1MM	BGA_P2MM

CONSTRAINTS ARE BASED ON MCP79 DESIGN GUIDE DG-03328-001_V06
PCI,LPC,SMB,HDA,SPI,RGMII,SMBUS ARE ROUTED AS 55 OHM SE SIGNALS

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FUNCTIONAL TESTPOINTS FOR MAC-1 & ICT

J4700 USB CAMERA

103 47	IN	USB_CAMERA_L_P	FUNC_TEST=TRUE
103 47	IN	USB_CAMERA_L_N	FUNC_TEST=TRUE

1 PP5V_S3_REG Testpoint near J4700
2 Ground Testpoints near J4700

J4750 USB CARD READER

103 47	IN	USB_SDCARD_L_P	FUNC_TEST=TRUE
103 47	IN	USB_SDCARD_L_N	FUNC_TEST=TRUE

1 PP3V3_S3 Testpoint near J4750
2 Ground Testpoints near J4750

J4720 USB BLUETOOTH

103 47	IN	USB_BT_L_P	FUNC_TEST=TRUE
103 47	IN	USB_BT_L_N	FUNC_TEST=TRUE

1 PP3V3_S3 Testpoint near J4720
2 Ground Testpoints near J4720

J4780 IR BOARD

103 47	IN	USB_IR_L_P	FUNC_TEST=TRUE
103 47	IN	USB_IR_L_N	FUNC_TEST=TRUE

1 PP5V_S3_REG Testpoint near J4780
2 Ground Testpoints near J4780

J4520 SATA ODD (HIGH SPEED)

102 45	IN	SATA_ODD_R2D_P	FUNC_TEST=TRUE
102 45	IN	SATA_ODD_R2D_N	FUNC_TEST=TRUE
102 45	IN	SATA_ODD_D2R_C_N	FUNC_TEST=TRUE
102 45	IN	SATA_ODD_D2R_C_P	FUNC_TEST=TRUE
49 45	IN	SMC_ODD_DETECT	FUNC_TEST=TRUE

1 PP5V_S0 Testpoint near J4520
5 Ground Testpoints near J4520

J4510 SATA HDD (HIGH SPEED)

102 45	IN	SATA_HDD_R2D_P	FUNC_TEST=TRUE
102 45	IN	SATA_HDD_R2D_N	FUNC_TEST=TRUE
102 45	IN	SATA_HDD_D2R_C_N	FUNC_TEST=TRUE
102 45	IN	SATA_HDD_D2R_C_P	FUNC_TEST=TRUE

3 Ground Testpoints near J4510

J5520 ANALOG LCD TEMP SENSOR

108 55	IN	SNS_LCD_P	FUNC_TEST=TRUE
108 55	IN	SNS_LCD_N	FUNC_TEST=TRUE

J5521 AMBIENT TEMP SENSOR

108 55	IN	SNS_AMB_P	FUNC_TEST=TRUE
108 55	IN	SNS_AMB_N	FUNC_TEST=TRUE

J5551 ODD TEMP SENSOR

108 55	IN	SNS_ODD_P	FUNC_TEST=TRUE
108 55	IN	SNS_ODD_N	FUNC_TEST=TRUE

J5600 ODD FAN

56	IN	FAN_0_PWR_L	FUNC_TEST=TRUE
56	IN	FAN_TACH0_L	FUNC_TEST=TRUE
56	IN	PP12V_S0_FAN0_L	FUNC_TEST=TRUE
56	IN	FAN_0_GND	FUNC_TEST=TRUE

J5700 CPU FAN

57	IN	FAN_2_PWR_L	FUNC_TEST=TRUE
57	IN	FAN_TACH2_L	FUNC_TEST=TRUE
57	IN	PP12V_S0_FAN2_L	FUNC_TEST=TRUE
57	IN	FAN_2_GND	FUNC_TEST=TRUE

J5601 HD FAN

56	IN	FAN_1_PWR_L	FUNC_TEST=TRUE
56	IN	FAN_TACH1_L	FUNC_TEST=TRUE
56	IN	PP12V_S0_FAN1_L	FUNC_TEST=TRUE
56	IN	FAN_1_GND	FUNC_TEST=TRUE

J6601 AUDIO MICROPHONE

66	IN	AUD_MIC_IN1_N_CONN	FUNC_TEST=TRUE
66	IN	GND_AUDIO_MIC1_CONN	FUNC_TEST=TRUE
66	IN	AUD_MIC_IN1_P_CONN	FUNC_TEST=TRUE

1 Ground Testpoint near J6601

J6602 AUDIO RIGHT SPEAKER

	IN	AUD_SPKR_OUTLO2R_P	FUNC_TEST=TRUE
	IN	AUD_SPKR_OUTLO2R_N	FUNC_TEST=TRUE
	IN	AUD_SPKR_OUTLO1R_P	FUNC_TEST=TRUE
	IN	AUD_SPKR_OUTLO1R_N	FUNC_TEST=TRUE

J6603 AUDIO LEFT SPEAKER

	IN	AUD_SPKR_OUTLO2L_P	FUNC_TEST=TRUE
	IN	AUD_SPKR_OUTLO2L_N	FUNC_TEST=TRUE
	IN	AUD_SPKR_OUTLO1L_P	FUNC_TEST=TRUE
	IN	AUD_SPKR_OUTLO1L_N	FUNC_TEST=TRUE

		GND	16 TP'S	FUNC_TEST=TRUE MIN_ALLOWED_TPS=16
78 6	IN	PP3V3_S3	2 TP'S	FUNC_TEST=TRUE MIN_ALLOWED_TPS=2
73 6	IN	PP5V_S3_REG	2 TP'S	FUNC_TEST=TRUE MIN_ALLOWED_TPS=2
78 6	IN	PP5V_S0		FUNC_TEST=TRUE MIN_ALLOWED_TPS=1

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