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.

SCHEM,MBP 15"MLB

08/18/2008

REV	ZONE	ECN	DESCRIPTION OF CHANGE	CK APPD / DATE	ENG APPD / DATE
?		?	?	?	?

Schematic / PCB #'s

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
051-7546	1	SCHEM,FIBBO,M98	SCH	CRITICAL	
820-2330	1	PCBF,FIBBO,M98	PCB	CRITICAL	

DRAWING
TITLE=MLB
ABBREV=DRAWING
LAST_MODIFIED=Mon Aug 18 01:48:34 2008

DIMENSIONS ARE IN MILLIMETERS
XX ±
X.XX ±
X.XXX ±
ANGLES ±
DO NOT SCALE DRAWING

THIRD ANGLE PROJECTION

METRIC

DRAFTER		DESIGN CK	
ENG APPD		MFG APPD	
QA APPD		DESIGNER	
RELEASE		SCALE	NONE

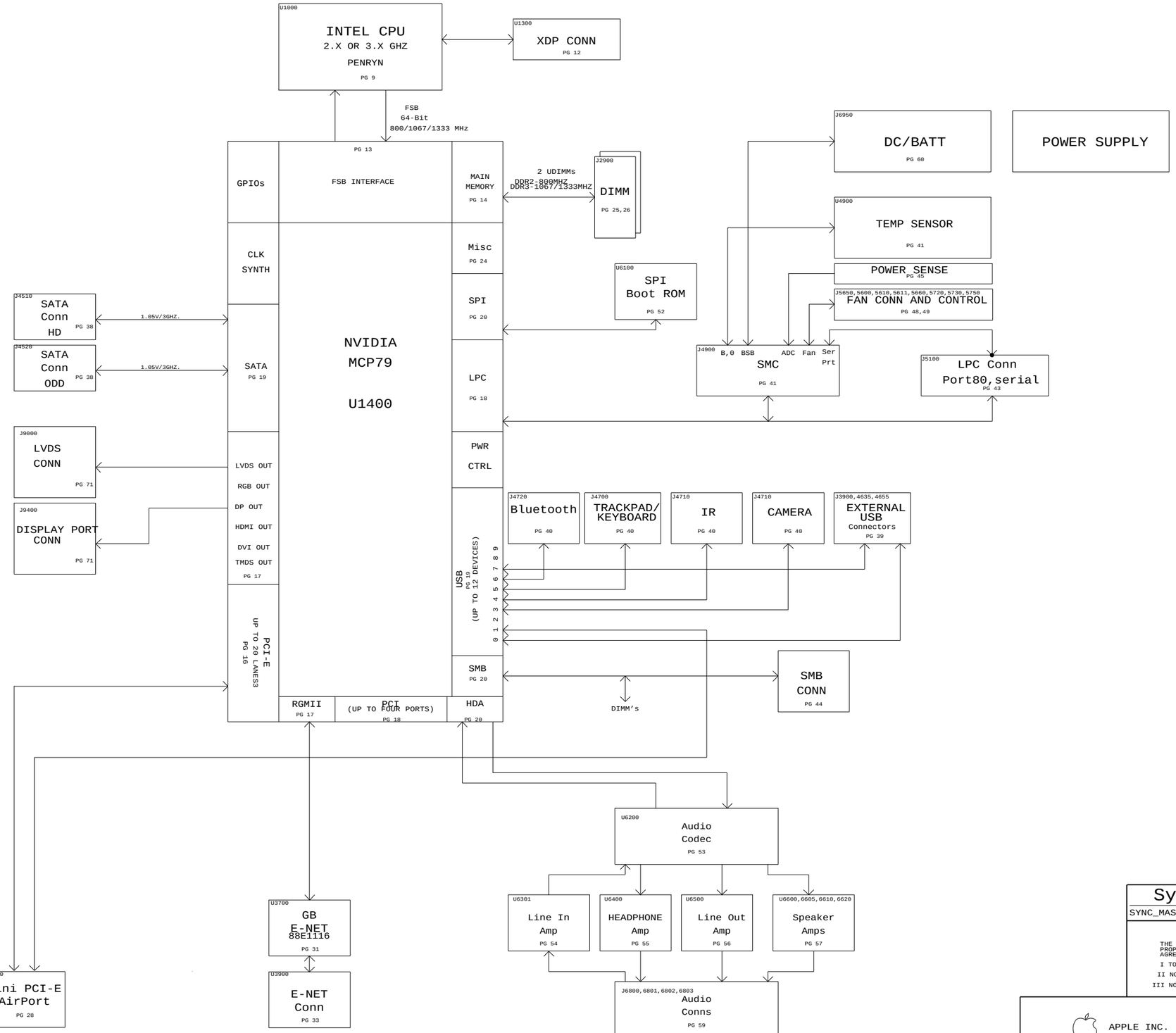
MATERIAL/FINISH NOTED AS APPLICABLE

SIZE D

APPLE INC.

TITLE
SCHEM,MBP 15MLB

DRAWING NUMBER 051-7546
REV. A.0.0
SHT 1 OF 96



System Block Diagram

SYNC_MASTER=T18_MLB SYNC_DATE=12/12/2007

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 2 OF 96	

M98 POWER SYSTEM ARCHITECTURE

AC ADAPTER IN
DCIN(16.5V)
6A FUSE
LIO_DCIN_ISENSE
U5705
ENABLES
VIN
VOUT
(PAGE 60)
PBUS SUPPLY/ BATTERY CHARGER
ISL6258A U7000
CHGR_EN (S5)
D6905
D6905
PPVIN_G3H_P3V42G3H
PBUSB_VSENSE
Q5315
8A FUSE
PPVBAT_G3H_CHGR_REG
PPBUS_G3H
ENABLE 3.425V G3HOT LT3470 U6990 (PAGE 59)
PP3V42_G3H_REG
SMC PWRGD RN5VD30A-E U5000 (PAGE 43)
SMC_RESET_L
SMC_GPU_VSENSE
U5498
GPU VCORE
VIN
VOUT
ISL6263B U8900
EN_PSV
PGOOD
(PAGE 78)
PM_GPUVCORE_EN
GPUVCORE_IOUT
(18A MAX CURRENT)
PPVCORE_GPU_REG
GPUVCORE_PGOOD
CPUVTTS0_EN
VIN
EN_PSV
VOUT
1.05V
TPS51117 U7600 (PAG 66)
PGOOD
PPCPUVTT_S0_REG
(6A MAX CURRENT)
CPUVTTS0_PGOOD
U2830
VR_PWRGD_CLKEN
MCP79
CK_PWRGD
VRMPWRGD
PWRBTN#
PLTRST*
PLT_RST_L
RSMRST*
MCP_PS_PWRGD
PWROK
CPUPWRGD(GPIO49)
CPU_PWRGD
U2850
U1400
(PAGE 14~22)
U5715
SMC_BATT_ISENSE
U5400
SMC_CPU_VSENSE
CPU VCORE
VIN
VOUT
ISL9504B U7100
IMVP_VR_ON_R
VR_ON
PGOOD
(PAGE 61)
PPVCORE_CPU_S0
CPUVCORE_IOUT
VR_PWRGD_CLKEN_L
VR_PWRGOOD_DELAY
J6950
3S2P (9 TO 12.6V)
BATT_POS_F
Q7055
CHGR_BGATE
PPVBAT_G3H_CHGR_R
Q7920
PP5V_S0_FET
P5VS0_SS
CPU
PWRGOOD
U1000
RESET*
(PAGE 10,11)
PPBUS_G3H
P1V1GPU_EN
EN1 VIN
VOUT1
1.103V(L/H)
PP1V1_S0GPU_REG
P1V8FB_EN
EN2
VOUT2
1.8V(R/H)
PP1V8_GPU_REG
TPS51124 U9500 (PAGE 82)
Q7900
PP5V_S3_FET
P5VS3_SS
MCP79
SLP_S5#(H17)
SLP_S3#(G17)
U1400
(PAGE 14~22)
P3V3S3_EN
P5VS3_EN
LIO_S3_EN
SMC
U4900
(PAGE 42)
U7859
SMC_PM_G2_EN
P60(S5)
VIN
5V (L/H)
VOUT1
PP5V_S5_REG
(8A MAX CURRENT)
3.3V (R/H)
VOUT2
PP3V3_S5_REG
(5.5A MAX CURRENT)
TPS51125 U7201 (PAGE 62)
EN0
PGOOD1,2
VREG3
P3V3S5_EN
PP5V_S3
PP3V3_S5
PP1V05_S5_MCP
ISL8009 U7750 (PAGE 66)
V4
Q7910
PP3V3_S3_FET
P3V3S3_SS
U7400
EN/PSV
SC417 (PAGE 64)
ENL
PP5V_RT_REG
P5V_RT_EN
PGOOD
P5V_RT_PGOOD
P5V3V3_S5_PGOOD
Q7930
PP3V3_S0GPU_FET
P3V3S0_SS
Q7970
PP3V3_S0_FET
P3V3GPU_SS
Q3810
P3V3_ENET_FET
P3V3ENET_EN_L
Q3805
WOW_EN
PM_WLAN_EN_L
Q3801
PM_ENET_EN
PM_ENET_EN_L
Q3800
WOL_EN
SMC_ADAPTER_EN
PM_ENET_EN_L
RC DELAY
BKLT_EN
VIN
GOSHAWK6P U9701
ENA
VOUT
(PAGE 84)
PPVOUT_S0_LCDBKLT
P1V2ENET_EN
ENETAVDD_EN
VINLTC3407
RUN2
RUN1
VOUT1
VOUT2
U3850
(PAGE 33)
PP1V9_ENET_REG
PP1V2_ENET_REG
SMC
RSMRST_OUT(P15)
PM_RSMRST_L
ALL_SYS_PWRGD
PWRGD(P12)→99ms DLY→
IMVP_VR_ON(P16)
IMVP_VR_ON
RSMRST_PWRGD
RSMRST_IN(P13)
PLT_RST*
SMC_ONOFF_L
PWR_BUTTON(P90)
P17(BTN_OUT)
PM_PWRBTN_L
RST*
SMC_RESET_L
P1V05S0_PGOOD
P5VRIGHT_PGOOD
MCPCORES0_PGOOD
CPUVTTS0_PGOOD
P1V8S0_PGOOD
P1V5S0_PGOOD
S0PGOOD_PWROK
PM_SLP_S5_L
PM_SLP_S4_L
PM_SLP_S3_L
SLP_S5_L(P95)
SLP_S4_L(P94)
SLP_S3_L(P93)
U4900
(PAGE 42)
PPVIN_S0_DDRREG_LDO
DDRREG_EN
DDRVTT_EN
PM_SLP_S3_L
VIN
VLDOIN
S5 1.8V
VOUT
S3 0.9V
VOUT2
TPS51116 U7300 (PAGE 63)
PPDDR_S3_REG
(12A MAX CURRENT)
PPVTT_S0_DDR_LDO
RC DELAY
P5VRIGHT_EN
P1V8S0_EN
MCPDDR_EN
CPUVTTS0_EN
MCPCORES0_EN
P5VS0_EN (S0)
P3V3S0_EN (S0)
PBUSVSENS_EN (S0)
PM_SLP_S3_DELAY_L (S0)
MCP_CORE
EN2
VOUT2
1.1V
EN1
VOUT1
ISL6236 U7500 (PAGE 65)
MCPCORES0_EN
P1V05S0_EN
MCPCPCORE_S0_REG
(25A MAX CURRENT)
PP5V_RT_REG
(5A MAX CURRENT)
PP5V_S0
PP3V3_S0
PP1V5_S0_REG
V1
V2
V3
V4
LTC2900 U7870 (PAGE 68)
RST*

Power Block Diagram

SYNC_MASTER=T18_MLB
SYNC_DATE=12/12/2007

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 3 OF 96	

Power Block Diagram

SYNC_MASTER=N/A SYNC_DATE=N/A

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE	SHT	OF
NONE	4	96

BOM Variants

BOM NUMBER	BOM NAME	BOM OPTIONS
630-9334	PCBA,2.4GHZ,256SAM_VRAM,M98	M98_COMMON,EEE_0ZA,CPU_2_4GHZ,FB_256_SAMSUNG
630-9335	PCBA,2.4GHZ,256HYN_VRAM,M98	M98_COMMON,EEE_0ZB,CPU_2_4GHZ,FB_256_HYNIX
630-9336	PCBA,2.5GHZ,512SAM_VRAM,M98	M98_COMMON,EEE_0ZC,CPU_2_5GHZ,FB_512_SAMSUNG
630-9337	PCBA,2.5GHZ,512QIM_VRAM,M98	M98_COMMON,EEE_0ZD,CPU_2_5GHZ,FB_512_QIMONDA
630-9585	PCBA,2.8GHZ,512SAM_VRAM,M98	M98_COMMON,EEE_2NH,CPU_2_8GHZ,FB_512_SAMSUNG
630-9586	PCBA,2.8GHZ,512QIM_VRAM,M98	M98_COMMON,EEE_2NJ,CPU_2_8GHZ,FB_512_QIMONDA

M98 BOM Groups

BOM GROUP	BOM OPTIONS
M98_COMMON	ALTERNATE,COMMON,M98_COMMON1,M98_COMMON2,M98_COMMON3,M98_DEBUG,M98_PROGPARTS
M98_COMMON1	ONEWIRE_PU,ISL6258A,MEMRESET_HW,MEMRESET_MCP,MCP_B02,MCP_PROD,MCPSEQ_SMC
M98_COMMON2	BKLT_PLL_NOT,BMON_ENG,MIKEY,BOOT_MODE_USER,GPUVID_1P00V,MUXGFX
M98_COMMON3	DPMUX_EN_S0,DP_ESD,EG_PWRSEQ_HW,DP_CA_DET_EG_PLD,MCP_CS1_NO
M98_DEBUG	SMC_DEBUG_YES,XDP,LPCPLUS,VREFMRGN
M98_PROGPARTS	GMUX_PROG,BOOTROM_PROG,SMC_PROG,TPAD_PROG

BOM GROUP	BOM OPTIONS
FB_256_SAMSUNG	VRAM4,VRAM_256_SAMSUNG
FB_256_HYNIX	VRAM4,VRAM_256_HYNIX
FB_512_SAMSUNG	VRAM4,VRAM_512_SAMSUNG
FB_512_QIMONDA	VRAM4,VRAM_512_QIMONDA

Bar Code Labels / EEE #'s

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
826-4393	1	LBL,P/N LABEL,PCB,28MM X 6 MM	[EEE:0ZA]	CRITICAL	EEE_0ZA
826-4393	1	LBL,P/N LABEL,PCB,28MM X 6 MM	[EEE:0ZB]	CRITICAL	EEE_0ZB
826-4393	1	LBL,P/N LABEL,PCB,28MM X 6 MM	[EEE:0ZC]	CRITICAL	EEE_0ZC
826-4393	1	LBL,P/N LABEL,PCB,28MM X 6 MM	[EEE:0ZD]	CRITICAL	EEE_0ZD
826-4393	1	LBL,P/N LABEL,PCB,28MM X 6 MM	[EEE:2NH]	CRITICAL	EEE_2NH
826-4393	1	LBL,P/N LABEL,PCB,28MM X 6 MM	[EEE:2NJ]	CRITICAL	EEE_2NJ

Module Parts

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
337S3639	1	IC,PDC,SLB4N,PRQ,2.4G,25W,1066,M0,3M,BGA	U1000	CRITICAL	CPU_2_4GHZ
337S3640	1	IC,PDC,SL3BX,PRQ,2.53G,35W,1066,C0,6M,BGA	U1000	CRITICAL	CPU_2_5GHZ
338S0554	1	IC,GPU,55nm,NV G96-GS,BGA969,LF	U8000	CRITICAL	
338S0570	1	IC,RTL8211CL,GIGE TRANSCEIVER,48P TQFP	U3700	CRITICAL	
338S0523	1	IC,FW643-06,1394B PHY/OHCI LINK/PCI-E,12	U4100	CRITICAL	
338S0600	1	IC,GMCP,MCP79-B01,35x35MM,BGA1437	U1400	CRITICAL	MCP_B01
338S0563	1	IC,SMC,HS8/2117,9MMX9MM,TLP	U4900	CRITICAL	SMC_BLANK
341S2289	1	IC,SMC,DEVELOPMENT,M98	U4900	CRITICAL	SMC_PROG
335S0384	1	IC,32MBIT 8-PIN SPI SERIAL FLASH,SOIC8	U6100	CRITICAL	BOOTROM_BLANK
341S2366	1	IC,EFI ROM,DEVELOPMENT,M98	U6100	CRITICAL	BOOTROM_PROG
341S2272	1	IC,HDCP ROM,NVG96, 8 PIN SOIC,LF,HF	U8770	CRITICAL	HDCP_YES
341S2384	1	IR,ENCORE II, CY7C63803-LQXC	U4800	CRITICAL	
338S0635	1	IC,GMCP,MCP79-B02,35x35MM,BGA1437	U1400	CRITICAL	MCP_B02
341S2383	1	IC,PSOC +W/USB,56PIN,MLF,M98	U5701	CRITICAL	TPAD_PROG
337S3641	1	IC,PDC,SLB43,PRQ,2.8G,35W,1066,C0,6M,BGA	U1000	CRITICAL	CPU_2_8GHZ
333S0482	4	IC,SGRAM,GDDR3,16Mx32,800MHZ,136 FBGA	U8400,U8450,U8500,U8550	CRITICAL	VRAM_256_SAMSUNG
333S0483	4	IC,SGRAM,GDDR3,16Mx32,900MHZ,136 FBGA	U8400,U8450,U8500,U8550	CRITICAL	VRAM_256_HYNIX
333S0481	4	IC,SGRAM,GDDR3,32Mx32,900MHZ,136 FBGA	U8400,U8450,U8500,U8550	CRITICAL	VRAM_512_SAMSUNG
333S0472	4	IC,SGRAM,GDDR3,32Mx32,900MHZ,136 FBGA	U8400,U8450,U8500,U8550	CRITICAL	VRAM_512_QIMONDA

PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
138S0603	138S0602		ALL	Murata alt to Samsung
353S1681	353S1294		ALL	LMV2011,OPAMP. GBW
152S0276	152S0683		ALL	Maglayers alt to Dale/Vishay
341S2367	341S2366		ALL	Macronix alt to SST
152S0876	152S0867		ALL	Maglayer alt to Delta
157S0058	157S0055		ALL	Delta alt to TDK Magnetics
353S2312	353S1466		ALL	INTERSIL ALT TO INTERSIL
514-0612	514-0607		ALL	FOXLINK XCVR ALT TO FOXCONN
514-0613	514-0608		ALL	FOXLINK RCVR ALT TO FOXCONN
152S0915	152S0796		ALL	Maglayers alt to Cyntec IND

BOM Configuration

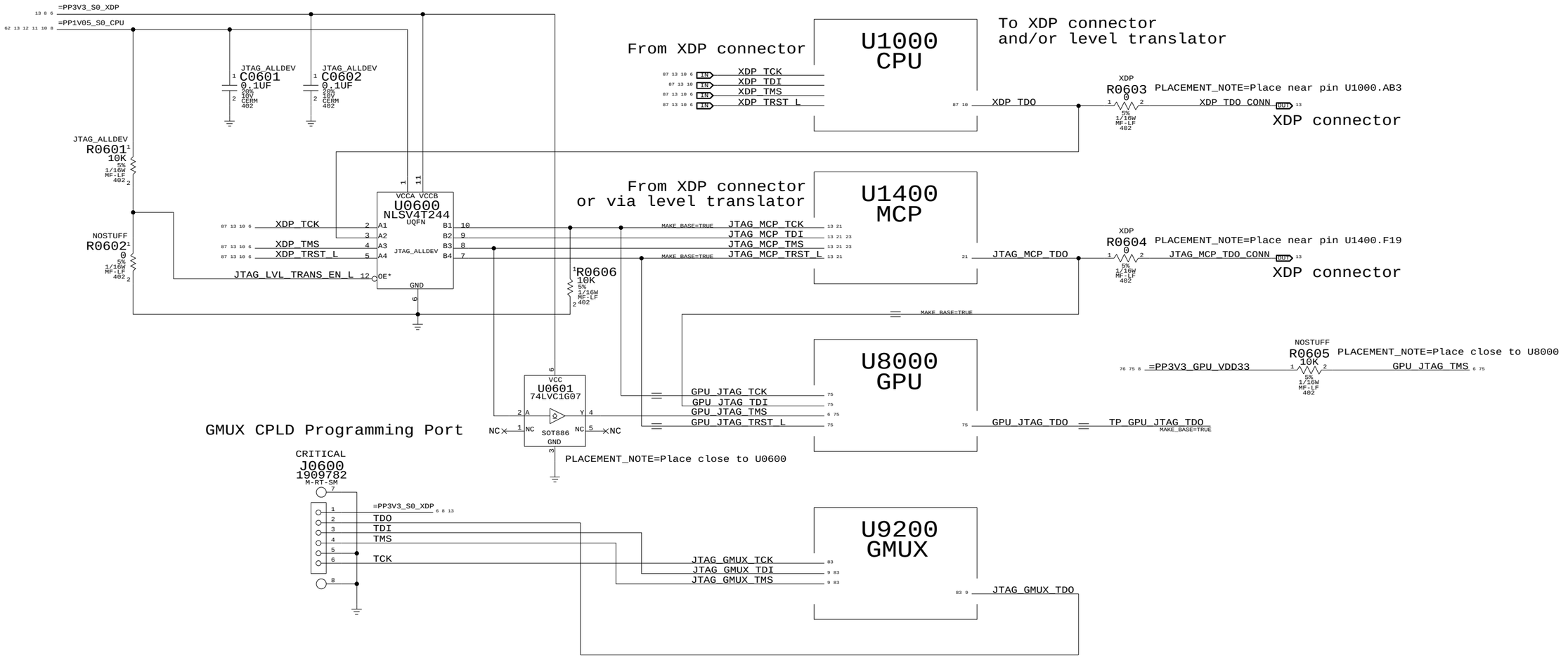
SYNC_MASTER=N/A SYNC_DATE=N/A

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0

SCALE NONE SHT 5 OF 96

1.05V TO 3.3V LEVEL TRANSLATOR (M98: ON ICT FIXTURE)



JTAG Scan Chain

SYNC_MASTER=DDR SYNC_DATE=07/22/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 6 OF 96	

Functional Test Points

Fan Connectors

FUNC_TEST

TRUE	=PP5V_S0_FAN_LT	8 49	3 TPs per Fan
TRUE	FAN_LT_PWM	49	
TRUE	FAN_LT_TACH	49	
TRUE	FAN_RT_PWM	49	
TRUE	FAN_RT_TACH	49	
TRUE	GND		5 TPs per Fan

LVDS Connectors

FUNC_TEST

E566	TRUE	=PP3V3_S0_DDC_LCD	8 76 79
E567	TRUE	PP3V3_SW_LCD	79
E570	TRUE	BKL_SYNC	79 84
E573	TRUE	LVDS_DDC_CLK	79 80
E572	TRUE	LVDS_DDC_DATA	79 80
E573	TRUE	LVDS_CONN_A_DATA_N<0>	79 80 94
E569	TRUE	LVDS_CONN_A_DATA_P<0>	79 80 94
E574	TRUE	LVDS_CONN_A_DATA_N<1>	79 80 94
E566	TRUE	LVDS_CONN_A_DATA_P<1>	79 80 94
E571	TRUE	LVDS_CONN_A_DATA_N<2>	79 80 94
E570	TRUE	LVDS_CONN_A_DATA_P<2>	79 80 94
E577	TRUE	LVDS_CONN_A_CLK_F_N	79 94
E578	TRUE	LVDS_CONN_A_CLK_F_P	79 94
E579	TRUE	LVDS_CONN_B_DATA_N<0>	79 80 94
E580	TRUE	LVDS_CONN_B_DATA_P<0>	79 80 94
E581	TRUE	LVDS_CONN_B_DATA_N<1>	79 80 94
E582	TRUE	LVDS_CONN_B_DATA_P<1>	79 80 94
E583	TRUE	LVDS_CONN_B_DATA_N<2>	79 80 94
E584	TRUE	LVDS_CONN_B_DATA_P<2>	79 80 94
E585	TRUE	LVDS_CONN_B_CLK_F_N	79 94
E586	TRUE	LVDS_CONN_B_CLK_F_P	79 94
E587	TRUE	LED_RETURN_1	79 84
E588	TRUE	LED_RETURN_2	79 84
E589	TRUE	LED_RETURN_3	79 84
E590	TRUE	LED_RETURN_4	79 84
E592	TRUE	LED_RETURN_5	79 84
E591	TRUE	LED_RETURN_6	79 84

EXCARD Connector

FUNC_TEST

E642	TRUE	USB2_EXCARD_CONN_N	32 95
E643	TRUE	USB2_EXCARD_CONN_P	32 95
E644	TRUE	PCIE_CLK100M_EXCARD_CONN_N	32 95
E645	TRUE	PCIE_CLK100M_EXCARD_CONN_P	32 95
E646	TRUE	PCIE_EXCARD_R2D_N	32 89 95
E648	TRUE	PCIE_EXCARD_R2D_P	32 89 95
E647	TRUE	PCIE_EXCARD_D2R_P	17 32 89
E650	TRUE	PCIE_EXCARD_D2R_N	17 32 89
E649	TRUE	PP3V3_S3_EXCARD_SWITCH	32
E653	TRUE	PP3V3_S0_EXCARD_SWITCH	32
E655	TRUE	PP1V5_S0_EXCARD_SWITCH	32
E652	TRUE	PLT_RESET_SWITCH_L	32
E654	TRUE	EXCARD_CPPE_L	32
E655	TRUE	EXCARD_CPUSB_L	32
E641	TRUE	EXCARD_CLKREQ_CONN_L	32
E657	TRUE	SMBUS_MCP_0_CLK	13 21 45 90
E656	TRUE	SMBUS_MCP_0_DATA	13 21 45 90

Speaker Connectors

FUNC_TEST

E557	TRUE	BI_MIC_LO	58 59
E558	TRUE	BI_MIC_SHIELD	58 59
E559	TRUE	BI_MIC_HI	58 59
E560	TRUE	SPKRCONN_L_P_OUT	57 58 95
E561	TRUE	SPKRCONN_L_N_OUT	57 58 95
E562	TRUE	SPKRCONN_R_P_OUT	57 58 95
E563	TRUE	SPKRCONN_R_N_OUT	57 58 95
E564	TRUE	SPKRCONN_S_P_OUT	57 58 95
E565	TRUE	SPKRCONN_S_N_OUT	57 58 95
	TRUE	GND	6 TPs

SATA ODD Connectors

FUNC_TEST

E599	TRUE	PP5V_SW_ODD	4 TPs 39
E594	TRUE	SMC_ODD_DETECT	39 42
E590	TRUE	SATA_ODD_R2D_P	39 89
E597	TRUE	SATA_ODD_R2D_N	39 89
E593	TRUE	SATA_ODD_D2R_C_N	39 89
E598	TRUE	SATA_ODD_D2R_C_P	39 89
	TRUE	GND	5 TPs

POWER RAILS

E600	TRUE	PM_SLP_S3_L	21 34 37 42 44 68 81 83
E602	TRUE	PPBUS_G3H	8 46
E603	TRUE	PPBUS_CPU_IMVP_ISNS	8
E604	TRUE	PP3V42_G3H	7 8 43
E605	TRUE	PP5V_S3	8
E607	TRUE	PP5V_S0	8
E608	TRUE	PPVCORE_S0_CPU	8
E609	TRUE	PPVCORE_S0_MCP_REG	8
E606	TRUE	PPVCORE_S0_MCP	
E610	TRUE	PP3V3_S5	8 95
E612	TRUE	PP3V3_S3	8
E614	TRUE	PP3V3_S0	8 95
E613	TRUE	PP2V5_S0	8
E615	TRUE	PP1V2_S0	8
E616	TRUE	PP1V8_S0	8
E624	TRUE	PP1V8R1V5_S3	8
E625	TRUE	PP1V8R1V5_S0_FET	8
E622	TRUE	PPMCPDDR_ISNS	8
E620	TRUE	PP1V05_S0_REG	8
E621	TRUE	PP1V2R1V05_S5	8
E618	TRUE	PPCPUVTT_S0	8
E619	TRUE	PPCPUFSB_ISNS_R	
E617	TRUE	PP0V9R0V75_S0_DDRVTT	8
E635	TRUE	PP1V2R1V05_ENET	8
E636	TRUE	PP3V3_ENET_PHY	8
E634	TRUE	PPVP_FW	8
E632	TRUE	PP1V0_FW	8
E630	TRUE	PP3V3_S0GPU	8
E639	TRUE	PP1V1_S0GPU_REG	8
E638	TRUE	PP1V8_S0GPU_ISNS	8
E637	TRUE	PPVCORE_GPU	8
E633	TRUE	PP1V8_S0GPU_ISNS_R	8
E629	TRUE	PP3V3_S5_AVREF_SMC	42 43
E626	TRUE	PPVOUT_S0_LCDBKLT	79 84
E601	TRUE	PPDCIN_G3H	8
E627	TRUE	PPVTTDDR_S3	8
E628	TRUE	PP1V8_GPUIFPX	8

ICT Test Points

CPU FSB NO_TESTs

NO_TEST

	TRUE	FSB_A_L<31..3>	10 14 87
	TRUE	FSB_ADS_L	10 14 87
	TRUE	FSB_ADSTB_L<1..0>	10 14 87
	TRUE	FSB_D_L<63..0>	10 14 87
	TRUE	FSB_DINV_L<3..0>	10 14 87
	TRUE	FSB_DSTB_L_N<3..0>	10 14 87
	TRUE	FSB_DSTB_L_P<3..0>	10 14 87
	TRUE	FSB_HIT_L	10 14 87
	TRUE	FSB_HITM_L	10 14 87
	TRUE	FSB_LOCK_L	10 14 87
	TRUE	FSB_REQ_L<4..0>	10 14 87

IPD_FLEX_CONN

E757	TRUE	PP3V3_S3_LDO	51
E758	TRUE	PP18V5_S3	51
E760	TRUE	TPAD_GND_F	7 51
E756	TRUE	Z2_CS_L	50 51
E753	TRUE	Z2_DEBUG3	50 51
E752	TRUE	Z2_MOSI	50 51
E754	TRUE	Z2_MISO	50 51
E755	TRUE	Z2_SCLK	50 51
E761	TRUE	Z2_BOOST_EN	51
E749	TRUE	Z2_HOST_INTN	50 51
E750	TRUE	Z2_BOOT_CFG1	50 51
E748	TRUE	Z2_CLKIN	50 51
E746	TRUE	Z2_KEY_ACT_L	50 51
E747	TRUE	Z2_RESET	50 51
E745	TRUE	PSOC_MISO	50 51
E744	TRUE	PSOC_MOSI	50 51
E743	TRUE	PSOC_SCLK	50 51
E741	TRUE	SMBUS_SMC_A_S3_SDA	45 93
E742	TRUE	SMBUS_SMC_A_S3_SCL	45 93
E740	TRUE	PSOC_F_CS_L	50 51
E739	TRUE	PICKB_L	50 51

KEYBOARD CONN

E730	TRUE	PP3V42_G3H	7 8 43
E737	TRUE	WS_KBD1	50
E735	TRUE	WS_KBD2	50
E734	TRUE	WS_KBD3	50
E733	TRUE	WS_KBD4	50
E731	TRUE	WS_KBD5	50
E732	TRUE	WS_KBD6	50
E736	TRUE	WS_KBD7	50
E728	TRUE	WS_KBD8	50
E729	TRUE	WS_KBD9	50
E726	TRUE	WS_KBD10	50
E727	TRUE	WS_KBD11	50
E725	TRUE	WS_KBD12	50
E724	TRUE	WS_KBD13	50
E723	TRUE	WS_KBD14	50
E722	TRUE	WS_KBD15_CAP	50
E721	TRUE	WS_KBD16_NUM	50
E720	TRUE	WS_KBD17	50
E719	TRUE	WS_KBD18	50
E718	TRUE	WS_KBD19	50
E717	TRUE	WS_KBD20	50
E716	TRUE	WS_KBD21	50
E715	TRUE	WS_KBD22	50
E714	TRUE	WS_KBD23	50
E712	TRUE	WS_KBD_ONOFF_L	50
E711	TRUE	WS_LEFT_SHIFT_KBD	50
E710	TRUE	WS_LEFT_OPTION_KBD	50
E709	TRUE	WS_CONTROL_KBD	50
E708	TRUE	KBDLED_ANODE	51
E762	TRUE	TPAD_GND_F	7 51

Functional / ICT Test

SYNC_MASTER=N/A SYNC_DATE=N/A

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 7 OF 96	

"G3Hot" (Always-Present) Rails

=PPBUS_G3H (61) — PPBUS_G3H (7 46)
MIN_LINE_WIDTH=0.4 mm
MIN_NECK_WIDTH=0.25 mm
VOLTAGE=12.6V
MAKE_BASE=TRUE
- =PPVIN_S5_P5VP3V3 (63)
- =PPVIN_S0_CPUVTTS0 (66)
- =PPBUS_S0_LCDBKLT (85)
- =PPBUS_S5_FWPWRSW (37)
- =PPVIN_GPU_GPUVCORE (78)
- =PPVIN_S5_CPU_IMVP_ISNS_R (46)
- =PPVIN_S0_P5VRTS0_MCPCORE (65)
- =PPVIN_S3_DDRREG (64)
- =PPVIN_S0GPU_P1V8P1V1 (82)
- =PPVBAT_G3H_P3V42G3H (60)
- =PPVIN_S0_P1V05S5 (67)

=PPVIN_S5_CPU_IMVP_ISNS (46) — PPBUS_CPU_IMVP_ISNS (7)
MIN_LINE_WIDTH=0.4 mm
MIN_NECK_WIDTH=0.25 mm
VOLTAGE=12.6V
MAKE_BASE=TRUE
- =PPVIN_S5_CPU_IMVP (62)

=PP18V5_DCIN_CONN (60) — PPDCIN_G3H (7)
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.25 mm
VOLTAGE=12.6V
MAKE_BASE=TRUE
- =PPDCIN_S5_CHGR (61)

=PP3V42_G3H_REG (60) — PP3V42_G3H (7 43)
MIN_LINE_WIDTH=0.3 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=3.42V
MAKE_BASE=TRUE
- =PP3V42_G3H_SMCUSBMUX (40)
- =PP3V42_G3H_SMBUS_SMC_BSA (45)
- =PP3V42_G3H_LIDSWITCH (41)
- =PP3V3_S5_SMC (42 43 52)
- =PP3V3_S5_LPCPLUS (44)
- =PPVIN_S5_SMCVREF (43)
- =PP3V42_G3H_PWRCTL (63 68)
- =PP3V42_G3H_CHGR (61)
- =PP3V3_S5_RTC_D (26)
- =PP3V42_G3H_BATT (60)
- =PP3V42_G3H_TPAD (50)
- =PP3V42_G3H_BMON_ISNS (46)
- =PP3V42_G3H_CPUCOREISNS (46)

5V Rails

=PP5V_S3_REG (63) — PP5V_S3 (7)
MIN_LINE_WIDTH=0.5 mm
MIN_NECK_WIDTH=0.25 mm
VOLTAGE=5V
MAKE_BASE=TRUE
- =PP5V_S3_SYSLED (43)
- =PP5V_S3_BTCAMERA (31)
- =PP5V_S3_WLAN (31)
- =PP5V_S3_IR (41)
- =PP5V_S3_DDRREG (64)
- =PP5V_S3_GPUVCORE (78)
- =PP5V_S3_RTUSB (40)
- =PP5V_S3_TPAD (51)
- =PP5V_S3_P1V05S0FET (69)
- =PP5V_S3_MCPDDRFET (69)
- =PP5V_S3_VTTCLAMP (69)
- =PP5V_S3_AUDIO_PWR (9)

=PP5V_RT_REG (65) — PP5V_S0 (7)
MIN_LINE_WIDTH=0.60 MM
MIN_NECK_WIDTH=0.20 MM
VOLTAGE=5V
MAKE_BASE=TRUE
- =PP5V_S0_FAN_LT (7 49)
- =PP5V_S0_FAN_RT (49)
- =PP5V_S0_CPU_IMVP (62)
- =PP5V_S0_CPUVTTS0 (66)
- =PP5V_S0_KBDLED (51)
- =PP5V_S0GPU_P1V1P1V8_GPU (82)
- =PP5V_S0_LPCPLUS (44)
- =PP5V_S0_ODD (39)
- =PP5V_S0_HDD (39)

Chipset "VCore" Rails

=PPVCORE_S0_CPU_REG (62) — PPVCORE_S0_CPU (7)
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.25 mm
VOLTAGE=1.25V
MAKE_BASE=TRUE
- =PPVCORE_S0_CPU (11 12 46)

=PPMCPCORE_S0_REG (65) — PPVCORE_S0_MCP_REG (7)
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.05V
MAKE_BASE=TRUE
- =PPVCORE_S0_MCP (22 24 46)

3.3V-2.5V Rails

=PP3V3_S5_REG (63) — PP3V3_S5 (7 95)
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=3.42V
MAKE_BASE=TRUE
- =PP3V3_S5_MCP_A01 (23 44)
- =PP3V3_S5_ROM (44 53)
- =PP3V3_S5_MEMRESET (30)
- =PP3V3_S3_P3V3S3FET (69)
- =PP3V3_S5_LCD (79)
- =PP3V3_S0_P3V3S0FET (69)
- =PP3V3_GPU_P3V3GPUFET (69)
- =PP3V3_S5_PWRCTL (68)
- =PP3V3_S5_P1V05FET (69)
- =PP3V3_S5_MCP (22 24)
- =PP3V3_S5_MCP_GPIO (18 20)
- =PP3V3_FW_LATEVG_ACTIVE (37)
- =PP3V3_S5_MCPPWRGD (26)
- =PP3V3_FW_LATEVG (38)
- =PP3V3_S5_P1V05ENETFET (34)
- =PP3V3_S5_P3V3ENETFET (34)
- =PP3V3_S5_DP_PORT_PWR (81)

=PP3V3_S3_FET (69) — PP3V3_S3 (7)
MIN_LINE_WIDTH=0.50MM
MIN_NECK_WIDTH=0.20MM
VOLTAGE=3.3V
MAKE_BASE=TRUE
- =PP3V3_FW_REG (8)
- =PP3V3_S3_SMBUS_SMC_A_S3 (45)
- =PP3V3_S3_SMS (52)
- =PP3V3_S3_REMTHMSNS (48)
- =PP3V3_S3_TPAD (50)
- =PP3V3_S3_WLAN (31)
- =PP3V3_S3_MCP_GPIO (21)
- =PP3V3_S3_VREFMRGN (27)
- =PP3V3_S3_SMBUS_SMC_MGMT (45)
- =PP3V3_S3_EXCARD (32)
- =PP3V3_S3_P1V8S0 (67)

=PP3V3_S0_FET (69) — PP3V3_S0 (7 95)
MIN_LINE_WIDTH=0.30MM
MIN_NECK_WIDTH=0.20MM
VOLTAGE=3.3V
MAKE_BASE=TRUE
- =PP3V3_S0_LPCPLUS (44)
- =PP3V3_S0_SMC (43)
- =PP3V3_S0_SMBUS_SMC_B_S0 (45)
- =PP3V3_S0_MCPDDRISNS (47)
- =PP3V3_S0_GPU1V8ISNS (47)
- =PP3V3_S0_CPUTHMSNS (48)
- =PP3V3_S0_GPUTHMSNS (48)
- =PP3V3_S0_FAN_LT (49)
- =PP3V3_S0_FAN_RT (49)
- =PP3V3_S0_IMVP (62)
- =PP3V3_S0_PWRCTL (68)
- =PP3V3_S0_DDC_LCD (7 76 79)
- =PP3V3_S0_XDP (6 13)
- =PP3V3_S0_MCPCOREISNS (47)
- =PPSPD_S0_MEM_A (28)
- =PPSPD_S0_MEM_B (29)
- =PP3V3_S0_SMBUS_MCP_0 (45)
- =PP3V3_S0_GMUX (83)
- =PP3V3_S0_DPMUX (80)
- =PP3V3_S0_DPCONN (81)
- =PP3V3_S0_P1V2P2V5 (86)
- =PP3V3_S0_MCP_GPIO (18 19 21)
- =PP3V3_S0_HDCPROM (25)
- =PP3V3R1V5_S0_MCP_HDA (21 24)
- =PP3V3_S0_MCP_PLL_UF (24)
- =PP3V3_S0_MCP_VPLL_UF (25)
- =PP3V3_S0_MCP_DAC_UF (25)
- =PP3V3_S0_MCP (21 22 24)
- =PP3V3_S0_AUDIO (54 58 59)
- =PP3V3_S0_ODD (39)
- =PP3V3_S0_VMON (68)
- =PP3V3_S0_SMBUS_MCP_1 (45)
- =PP3V3_FC_CON (32)
- =PP3V3_S0_EXCARD (32)
- =PP3V3_S0_LVDSDDCMUX (80)
- =PP3V3_S0_BATTCHARGERTMPSNSR (48)
- =PP3V3_GPU_SMBUS_SMC_0_S0 (45)
- =PP3V3_S0_TPAD (51)

=PP2V5_S0_REG (86) — PP2V5_S0 (7)
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=2.5V
MAKE_BASE=TRUE
- =PP2V5_S0_GMUX (83)

=PP1V2_S0_REG (86) — PP1V2_S0 (7)
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.2V
MAKE_BASE=TRUE
- =PP1V2_S0_GMUX (83)

1.8V/DDR 1.5V Rails

=PP1V8_S0_REG (67) — PP1V8_S0 (7)
500 mA max supply
MIN_LINE_WIDTH=0.5 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.8V
MAKE_BASE=TRUE
- 190 mA =PP3V3R1V8_S0_MCP_IFP_VDD (18 25)

=PPDDR_S3_REG (64) — PP1V8R1V5_S3 (7)
MIN_LINE_WIDTH=0.8 mm
MIN_NECK_WIDTH=0.1 mm
VOLTAGE=1.5V
MAKE_BASE=TRUE
- =PP1V8R1V5_S0_MCP_FET (69)
- =PPVIN_S0_DDRREG_LDO (64)
- =PP1V5_S3_MEM_A (28)
- =PP1V5_S3_MEM_B (29)
- =PP1V5_S3_MEMRESET (30)

=PP1V8R1V5_S0_FET (69) — PP1V8R1V5_S0_FET (7)
MIN_LINE_WIDTH=0.6mm
MIN_NECK_WIDTH=0.2mm
VOLTAGE=1.5V
MAKE_BASE=TRUE
- 4771 mA =PPMCPDDR_ISNS_R (47)
- 130 mA =PP1V5_S0_CPU (11 12)
- 500 mA =PP1V5_S0_EXCARD (32)
- =PP1V5_S0_VMON (68)
- =PP1V5_FC_CON (32)

=PP1V8R1V5_S0_MCP_MEM (24 16) — PPMCPDDR_ISNS (7)
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.5V
MAKE_BASE=TRUE
- =PP1V5_S0_MEM_A (28)
- =PP1V5_S0_MEM_B (29)
- =PPMCPDDR_ISNS (47)

=PP1V05_S0_FET (69) — PP1V05_S0_REG (7)
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.05V
MAKE_BASE=TRUE
- 1034 mA =PP1V05_S0_MCP_AVDD_UF (24)
- =PP1V05_S0_MCP_PEX_DVDD (8 24)
- =PP1V05_S0_MCP_PLL_UF (24)
- =PP1V05_S0_MCP_SATA_DVDD (8 24)
- =PP1V05_S0_MCP_HDMI_VDD (18 25)
- =PP1V05_S0_VMON (68)

=PP1V05_S0_MCP_PEX_DVDD (24 8) — =PP1V05_S0_MCP_PEX_DVDD0 (17)
=PP1V05_S0_MCP_PEX_DVDD1 (17)

PP1V05_S0_MCP_PEX_AVDD (24) — =PP1V05_S0_MCP_PEX_AVDD0 (17)
MAKE_BASE=TRUE
=PP1V05_S0_MCP_PEX_AVDD1 (17)

=PP1V05_S0_MCP_SATA_DVDD (24 8) — =PP1V05_S0_MCP_SATA_DVDD0 (20)

PP1V05_S0_MCP_SATA_AVDD (24) — =PP1V05_S0_MCP_SATA_AVDD0 (20)
MAKE_BASE=TRUE

=PP1V05_S5_MCP (67) — PP1V2R1V05_S5 (1.1V for A01) (7)
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.05V
MAKE_BASE=TRUE
241 mA max load
- 105 mA/241 mA =PP1V05_S5_MCP_VDD_AUXC (22 24)
- 139 mA/ 0 mA =PP1V05_ENET_P1V05ENETFET (34)
- =PP1V05_S5_P1V05S0FET (69)

=PPCPUVTT_S0_REG (66) — PPCPUVTT_S0 (7)
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.05V
MAKE_BASE=TRUE
5300 mA
- 4500 mA =PP1V05_S0_CPU (6 10 11 12 13 62)
- =PP1V05_S0_SMC_LS (43)
- 1182 mA =PP1V05_S0_MCP_FSB (9 14 22 24)

=PPVTT_S3_DDR_BUF (64 27) — PPVTTDDR_S3 (7)
MIN_LINE_WIDTH=0.3 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=0.75V
MAKE_BASE=TRUE

=PPVTT_S0_DDR_LDO (64) — PP0V9R0V75_S0_DDRVTT (7)
MIN_LINE_WIDTH=2 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=0.9V
MAKE_BASE=TRUE
- =PP0V75_S0_MEM_VTT_A (28)
- =PP0V75_S0_MEM_VTT_B (29)
- =PPVTT_S0_VTTCLAMP (69)
OR 0.75V

ENET Rails

=PP1V05_ENET_FET (34) — PP1V2R1V05_ENET (7)
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.05V
MAKE_BASE=TRUE
- =PP1V05_ENET_MCP_PLL_MAC (24)
- =PP1V05_ENET_MCP_RMGT (18 24)
- =PP1V05_ENET_PHY (33)

=PP3V3_ENET_FET (34) — PP3V3_ENET_PHY (7)
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=3.42V
MAKE_BASE=TRUE
- =PP3V3_ENET_MCP_RMGT (18 24)
- =PP3V3_ENET_PHY (33)

"FW" (FireWire) Rails

=PPBUS_S5_FW_FET (37) — PPVP_FW (7)
MIN_LINE_WIDTH=0.4 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=12.6V
MAKE_BASE=TRUE
- =PPVP_FW_PORT1 (38)
- =PPVP_FW_PHY_CPS_FET (38)

=PP3V3_FW_REG (8) — =PP3V3_FW_FWPHY (36 38)
- =PP3V3_FW_P1V0FW (67)

=PP1V0_FW_REG (67) — PP1V0_FW (7)
MIN_LINE_WIDTH=0.4 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.05V
MAKE_BASE=TRUE
- =PP1V0_FW_FWPHY (36)

"GPU" Rails

=PP3V3_S0GPU_FET (69) — PP3V3_S0GPU (7)
MIN_LINE_WIDTH=0.30MM
MIN_NECK_WIDTH=0.20MM
VOLTAGE=3.3V
MAKE_BASE=TRUE
- =PP3V3_GPU_VDD33 (6 75 76)
- =PP3V3_GPU_MIO (75 76)
- =PP3V3_GPU_LVDS_DDC (80)
- =PP3V3_GPU_PWRCTL (68)
- =PP3V3_GPU_VCORELOGIC (78)
- =PP3V3_GPU_P1V8S0 (67)

=PP1V1_S0GPU_REG (82) — PP1V1_S0GPU_REG (7)
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.1V
MAKE_BASE=TRUE
- =PP1V1_GPU_PEX_IOVDDQ (70)
- =PP1V1_GPU_PEX_IOVDD (70)
- =PP1V1_GPU_PEX_PLLXVDD (70)
- =PP1V1_GPU_PLLVDD (75)
- =PP1V1_GPU_H_PLLVDD (75)
- =PP1V1_GPU_VID_PLLVDD (75)
- =PP1V1_GPU_FBPLLAVDD (72)
- =PP1V1_GPU_IFPCD_IOVDD (77)

=PP1V8_GPUIFPX_REG (67) — PP1V8_GPUIFPX (7)
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.15 mm
VOLTAGE=1.8V
MAKE_BASE=TRUE
- =PP1V8_GPU_IFPX (77)

=PP1V8_S0GPU_ISNS (47) — PP1V8_S0GPU_ISNS (7)
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.8V
MAKE_BASE=TRUE
- =PP1V8_GPU_FB_VDD (73 74)
- =PP1V8_GPU_FB_VDDQ (9 73 74)
- =PP1V8_GPU_FBVDDQ (71)
- =PP1V8_GPU_FBIO (72)

=PPVCORE_GPU_REG (78 46) — PPVCORE_GPU (7)
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.4V
MAKE_BASE=TRUE
- =PPVCORE_GPU (71)

=PP1V8_GPU_REG (82) — PP1V8_S0GPU_ISNS_R (7)
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.45V
MAKE_BASE=TRUE
- =PP1V8_S0GPU_ISNS_R (47)

Power Aliases

SYNC_MASTER=(MASTER) SYNC_DATE=(MASTER)

NOTICE OF PROPRIETARY PROPERTY

THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING

I TO MAINTAIN THE DOCUMENT IN CONFIDENCE

II NOT TO REPRODUCE OR COPY IT

III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 8 OF 96	

Thermal Module Holes

ZT0982 STDOFF-4.50D.98H-1.1-3.48-TH
ZT0983 STDOFF-4.50D.98H-1.1-3.48-TH
Left CPU TM Hole
Right CPU TM Hole
ZT0984 STDOFF-4.50D.98H-1.1-3.48-TH
Top GPU Right TM Hole
ZT0980 STDOFF-4.50D.98H-1.1-3.48-TH
Bottom Left GPU TM Hole
ZT0987 STDOFF-4.50D.98H-1.1-3.48-TH
ZT0981 STDOFF-4.50D.98H-1.1-3.48-TH
ZT0985 STDOFF-4.50D.98H-1.1-3.48-TH
ZT0986 STDOFF-4.50D.98H-1.1-3.48-TH
ZT0930 STDOFF-4.50D.98H-1.1-3.48-TH

SH0902 2.0DIA-TALL-EMI-MLB-M97-M98
SH0900 2.0DIA-TALL-EMI-MLB-M97-M98
SH0903 2.0DIA-TALL-EMI-MLB-M97-M98
SH0901 2.0DIA-TALL-EMI-MLB-M97-M98

CPU signals

TP_IMVP6_CLKEN_L — VR_PWRGD_CLKEN_L
CPU_VID<0..6> — IMVP6_VID<0..6>
CPU_BSEL<0..2> — =MCP_BSEL<0..2>
MEM_VTT_EN — =DDRVTT_EN
TP_SPI_CS1_R_L_USE_MLB — =SPI_CS1_R_L_USE_MLB

GPU signals

PEG_D2R_P<0..15> — =PEG_D2R_P<0..15>
PEG_D2R_N<0..15> — =PEG_D2R_N<0..15>
PEG_R2D_C_P<0..15> — =PEG_R2D_C_P<0..15>
PEG_R2D_C_N<0..15> — =PEG_R2D_C_N<0..15>

PCIE_CLK100M_FC_P — TP_PCIE_CLK100M_PE4P
PCIE_CLK100M_FC_N — TP_PCIE_CLK100M_PE4N
PCIE_FC_R2D_C_P — TP_PCIE_PE4_R2D_CP
PCIE_FC_R2D_C_N — TP_PCIE_PE4_R2D_CN
FC_CLKREQ_L — TP_PE4_CLKREQ_L
FC_PRSNT_L — TP_PE4_PRSNT_L
PCIE_FC_D2R_P — TP_PCIE_PE4_D2RP
PCIE_FC_D2R_N — TP_PCIE_PE4_D2RN

GMUX ALIASES

LCD_BKLT_EN — LVDS_BKL_ON
DP_IG_ML_P<3> — =MCP_HDMI_TXC_P
DP_IG_ML_N<3> — =MCP_HDMI_TXC_N
DP_IG_ML_P<2..0> — =MCP_HDMI_TXD_P<0..2>
DP_IG_ML_N<2..0> — =MCP_HDMI_TXD_N<0..2>
DP_IG_DDC_CLK — =MCP_HDMI_DDC_CLK
DP_IG_DDC_DATA — =MCP_HDMI_DDC_DATA
DP_IG_HPD — =MCP_HDMI_HPD
PM_ALL_GPU_PGOOD — ALL_EG_PGOOD
TP_LVDS_MUX_SEL_EG — LVDS_MUX_SEL_EG
EG_RESET_L — GPU_RESET_L

JTAG_GMUX_TDI — GMUX_JTAG_TDI
JTAG_GMUX_TMS — GMUX_JTAG_TMS
JTAG_GMUX_TDO — GMUX_JTAG_TDO
LVDS_IG_BKL_ON — IG_BKLT_EN
LVDS_IG_PANEL_PWR — IG_LCD_PWR_EN

TP_USB_EXTDP — USB_EXTD_P
TP_USB_EXTDN — USB_EXTD_N
TP_USB_MINIP — USB_MINI_P
TP_USB_MININ — USB_MINI_N
GMUX_INT — =DVI_HPD_GMUX_INT

R0903 0 5% 1/16W MF-LF 402
MCP_SPKR — SMC_MCP_SAFE_MODE

TP_MEM_A_A<15> — MEM_A_A<15>
TP_MEM_B_A<15> — MEM_B_A<15>
TP_USB_EXTCP — USB_EXTC_P
TP_USB_EXTCN — USB_EXTC_N
TP_CPU_PECI_MCP — CPU_PECI_MCP
TP_MCP_GPIO_17 — AUD_IP_PERIPHERAL_DET
PCIE_RESET_L — FC_RESET_L

AUDIO ALIASES

HDA_BITCLK — HDA_BIT_CLK

XW0900
=PP5V_S3_AUDIO_PWR — PP5V_S3_AUDIO (MIN_LINE_WIDTH=0.5 mm, MIN_NECK_WIDTH=0.25 mm, VOLTAGE=5V)
XW0901
PP5V_S3_AUDIO_AMP (MIN_LINE_WIDTH=0.5 mm, MIN_NECK_WIDTH=0.25 mm, VOLTAGE=5V)

R0902 10K 5% 1/16W MF-LF 402
AUD_IPHS_SWITCH_EN

ETHERNET ALIASES

=P3V3ENET_EN — PM_SLP_RMGT_L
=P1V05ENET_EN
=PP3V3_ENET_PHY_VDDREG — TP_PP3V3_ENET_PHY_VDDREG
=RTL8211_REGOUT — NC_RTL8211_REGOUT
=RTL8211_ENSWREG

Frame Holes

ZT0915 3R2P5 — GND_BATT_CHGND
ZT0940 3R2P5 — GND_CHASSIS_LVDS
ZT0945 3R2P5 — GND_CHASSIS_USB
ZT0950 TH — GND_CHASSIS_FAN (SL-3.1X2.7-6CIR-NSP)
ZT0965 3R2P5 — GND_CHASSIS_CLUTCH
ZT0960 3R2P5 — GND_CHASSIS_SATA
ZT0990 3R2P5 — GND_CHASSIS_BATTCONN

R0900 10 1% 1/16W MF-LF 402
=PP1V8_GPU_FB_VDDQ — GPU_FB_A_VREF_DIV — =PP1V8_GPU_FB_VREF_A
R0901 10 1% 1/16W MF-LF 402
GPU_FB_B_VREF_DIV — =PP1V8_GPU_FB_VREF_B

Extra FSB Pull-ups

Exist in MRB but not Intel designs. Here for CYA.
If found to be necessary, will move to page14.csa

=PP1V05_S0_MCP_FSB
R0950 220 5% 1/16W MF-LF 402 — NO STUFF
R0970 200 5% 1/16W MF-LF 402 — NO STUFF
R0990 150 1% 1/16W MF-LF 402 — NO STUFF
R0960 62 5% 1/16W MF-LF 402 — NO STUFF
R0980 150 1% 1/16W MF-LF 402 — NO STUFF

CPU_DPRSTP_L
FSB_BREQ0_L
FSB_CPURST_L
CPU_INTR
CPU_NMI

Bosses for VRAM HS

ZT0951 4.0OD1.65H-M1.6X0.35
ZT0952 4.0OD1.65H-M1.6X0.35
ZT0953 4.0OD1.65H-M1.6X0.35

SH0910 1.4DIA-SHORT-EMI-MLB-M97-M98
SH0911 1.4DIA-SHORT-EMI-MLB-M97-M98
SH0912 1.4DIA-SHORT-EMI-MLB-M97-M98
SH0913 1.4DIA-SHORT-EMI-MLB-M97-M98

ZT0931 STDOFF-4.00D3.0H-TH VENICE
ZT0934 STDOFF-4.00D3.0H-TH
ZT0932 STDOFF-4.00D3.0H-TH VENICE
ZT0935 STDOFF-4.00D3.0H-TH
ZT0933 STDOFF-4.00D3.0H-TH VENICE

NC_LVDS_B_DATAP<3> — LVDS_B_DATA_P<3>
NC_LVDS_B_DATAN<3> — LVDS_B_DATA_N<3>
NC_LVDS_A_DATAP<3> — LVDS_A_DATA_P<3>
NC_LVDS_A_DATAN<3> — LVDS_A_DATA_N<3>
(MAKE_BASE=TRUE, NO_TEST=TRUE)

TP_LVDS_IG_B_CLKP — LVDS_IG_B_CLK_P
TP_LVDS_IG_B_CLKN — LVDS_IG_B_CLK_N
TP_LVDS_IG_BKL_PWM — LVDS_IG_BKL_PWM

ZT0988 STDOFF-4.50D.98H-1.1-3.48-TH
ZT0989 STDOFF-4.50D.98H-1.1-3.48-TH
ZT0991 STDOFF-4.50D.98H-1.1-3.48-TH

NC_LVDS_IG_A_DATAP<3> — LVDS_IG_A_DATA_P<3>
NC_LVDS_IG_A_DATAN<3> — LVDS_IG_A_DATA_N<3>
NC_LVDS_IG_B_DATAP<3> — LVDS_IG_B_DATA_P<3>
NC_LVDS_IG_B_DATAN<3> — LVDS_IG_B_DATA_N<3>
NC_LVDS_A_DATAP<3> — LVDS_A_DATA_P<3>
NC_LVDS_A_DATAN<3> — LVDS_A_DATA_N<3>
NC_LVDS_B_DATAP<3> — LVDS_B_DATA_P<3>
NC_LVDS_B_DATAN<3> — LVDS_B_DATA_N<3>

MCP79 PCIe PRSNT# Straps

These need work. Add other PRSNT# straps if needed. .

R0925 0 5% 1/16W MF-LF 402 — PCIE_FW_PRSNT_L
R0927 0 5% 1/16W MF-LF 402 — NO STUFF — PEG_PRSNT_L
R0926 0 5% 1/16W MF-LF 402 — EG_CLKREQ_OUT_L

MCP_MII_PD
R0930 47K 5% 1/16W MF-LF 402
=MCP_MII_RXER
=MCP_MII_CRS
=MCP_MII_COL

=PP1V05_S0_MCP_SATA_DVDD1
=PP1V05_S0_MCP_SATA_AVDD1

Digital Ground

GND (MIN_LINE_WIDTH=0.6MM, MIN_NECK_WIDTH=0.09MM, VOLTAGE=0V)

Signal Aliases

SYNC_MASTER=(MASTER) SYNC_DATE=(MASTER)

APPLE INC.
SIZE D | DRAWING NUMBER 051-7546 | REV. A.0.0
SCALE NONE | SHT 9 OF 96

OMIT

U1000
PENRYN
FCBGA
1 OF 4

ADDR GROUP0
FSB_A_L<3> J4 A3*
FSB_A_L<4> L5 A4*
FSB_A_L<5> L4 A5*
FSB_A_L<6> K5 A6*
FSB_A_L<7> M3 A7*
FSB_A_L<8> N2 A8*
FSB_A_L<9> J1 A9*
FSB_A_L<10> N3 A10*
FSB_A_L<11> P5 A11*
FSB_A_L<12> P2 A12*
FSB_A_L<13> L2 A13*
FSB_A_L<14> P4 A14*
FSB_A_L<15> P1 A15*
FSB_A_L<16> R1 A16*
FSB_ADSTB_L<0> M1 ADSTB0*

ADDR GROUP1
FSB_A_L<17> Y2 A17*
FSB_A_L<18> U5 A18*
FSB_A_L<19> R3 A19*
FSB_A_L<20> W6 A20*
FSB_A_L<21> U4 A21*
FSB_A_L<22> Y5 A22*
FSB_A_L<23> U1 A23*
FSB_A_L<24> R4 A24*
FSB_A_L<25> T5 A25*
FSB_A_L<26> T3 A26*
FSB_A_L<27> W2 A27*
FSB_A_L<28> W5 A28*
FSB_A_L<29> Y4 A29*
FSB_A_L<30> U2 A30*
FSB_A_L<31> V4 A31*
FSB_A_L<32> W3 A32*
FSB_A_L<33> AA4 A33*
FSB_A_L<34> AB2 A34*
FSB_A_L<35> AA3 A35*
FSB_ADSTB_L<1> V1 ADSTB1*

ICH
CPU_A20M_L A6 A20M*
CPU_FERR_L A5 FERR*
CPU_IGNNE_L C4 IGNNE*
CPU_STPCLK_L D5 STPCLK*
CPU_INTR C6 LINT0
CPU_NMI B4 LINT1
CPU_SMI_L A3 SMI*

RESERVED
TP_CPU_RSVD0 M4 RSVD0
TP_CPU_RSVD1 N5 RSVD1
TP_CPU_RSVD2 T2 RSVD2
TP_CPU_RSVD3 V3 RSVD3
TP_CPU_RSVD4 B2 RSVD4
TP_CPU_RSVD5 F6 RSVD5
TP_CPU_RSVD6 D2 RSVD6
TP_CPU_RSVD7 D22 RSVD7
TP_CPU_RSVD8 D3 RSVD8

CONTROL
ADS* H1 FSB_ADS_L
BNR* E2 FSB_BNR_L
BPRI* G5 FSB_BPRI_L
DEFER* H5 FSB_DEFER_L
DRDY* F21 FSB_DRDY_L
DBSY* E1 FSB_DBSY_L
BR0* F1 FSB_BREQ0_L
IERR* D20 CPU_IERR_L
INIT* B3 CPU_INIT_L
LOCK* H4 FSB_LOCK_L
RESET* C1 FSB_CPURST_L
RS0* F3 FSB_RS_L<0>
RS1* F4 FSB_RS_L<1>
RS2* G3 FSB_RS_L<2>
TRDY* G2 FSB_TRDY_L
HIT* G6 FSB_HIT_L
HITM* E4 FSB_HITM_L

XDP/ITP SIGNALS
BPM0* AD4 XDP_BPM_L<0>
BPM1* AD3 XDP_BPM_L<1>
BPM2* AD1 XDP_BPM_L<2>
BPM3* AC4 XDP_BPM_L<3>
PRDY* AC2 XDP_BPM_L<4>
PREQ* AC1 XDP_BPM_L<5>
TCK AC5 XDP_TCK
TDI AA6 XDP_TDI
TDO AB3 XDP_TDO
TMS AB5 XDP_TMS
TRST* AB6 XDP_TRST_L
DBR* C20 XDP_DBRESET_L

THERMAL
PROCHOT* D21 CPU_PROCHOT_L
THERMDA A24 CPU_THERMD_P
THERMDC B25 CPU_THERMD_N
THERMTRIP* C7 PM_THRMTRIP_L

H CLK
BCLK0 A22 FSB_CLK_CPU_P
BCLK1 A21 FSB_CLK_CPU_N

=PP1V05_S0_CPU
R1002 54.9 1% 1/16W MF-LF 402
PLACE TESTPOINT ON FSB_IERR_L WITH A GND 0.1" AWAY

=PP1V05_S0_CPU
R1003 54.9 1% 1/16W MF-LF 402
R1004 68 5% 1/16W MF-LF 402
PM_THRMTRIP# SHOULD CONNECT TO ICH AND GMCH WITHOUT T (NO STUB)

OMIT

U1000
PENRYN
FCBGA
2 OF 4

DATA GRP 0
FSB_D_L<0> E22 D0*
FSB_D_L<1> F24 D1*
FSB_D_L<2> E26 D2*
FSB_D_L<3> G22 D3*
FSB_D_L<4> F23 D4*
FSB_D_L<5> G25 D5*
FSB_D_L<6> E25 D6*
FSB_D_L<7> E23 D7*
FSB_D_L<8> K24 D8*
FSB_D_L<9> G24 D9*
FSB_D_L<10> J24 D10*
FSB_D_L<11> J23 D11*
FSB_D_L<12> H22 D12*
FSB_D_L<13> F26 D13*
FSB_D_L<14> K22 D14*
FSB_D_L<15> H23 D15*
FSB_DSTB_L_N<0> J26 DSTBN0*
FSB_DSTB_L_P<0> H26 DSTBP0*
FSB_DINV_L<0> H25 DINV0*

DATA GRP 1
FSB_D_L<16> N22 D16*
FSB_D_L<17> K25 D17*
FSB_D_L<18> P26 D18*
FSB_D_L<19> R23 D19*
FSB_D_L<20> L23 D20*
FSB_D_L<21> M24 D21*
FSB_D_L<22> L22 D22*
FSB_D_L<23> M23 D23*
FSB_D_L<24> P25 D24*
FSB_D_L<25> P23 D25*
FSB_D_L<26> P22 D26*
FSB_D_L<27> T24 D27*
FSB_D_L<28> R24 D28*
FSB_D_L<29> L25 D29*
FSB_D_L<30> T25 D30*
FSB_D_L<31> N25 D31*
FSB_DSTB_L_N<1> L26 DSTBN1*
FSB_DSTB_L_P<1> M26 DSTBP1*
FSB_DINV_L<1> N24 DINV1*

DATA GRP 2
D32* Y22 FSB_D_L<32>
D33* AB24 FSB_D_L<33>
D34* V24 FSB_D_L<34>
D35* V26 FSB_D_L<35>
D36* V23 FSB_D_L<36>
D37* T22 FSB_D_L<37>
D38* U25 FSB_D_L<38>
D39* U23 FSB_D_L<39>
D40* Y25 FSB_D_L<40>
D41* W22 FSB_D_L<41>
D42* Y23 FSB_D_L<42>
D43* W24 FSB_D_L<43>
D44* W25 FSB_D_L<44>
D45* AA23 FSB_D_L<45>
D46* AA24 FSB_D_L<46>
D47* AB25 FSB_D_L<47>
DSTBN2* Y26 FSB_DSTB_L_N<2>
DSTBP2* AA26 FSB_DSTB_L_P<2>
DINV2* U22 FSB_DINV_L<2>

DATA GRP 3
D48* AE24 FSB_D_L<48>
D49* AD24 FSB_D_L<49>
D50* AA21 FSB_D_L<50>
D51* AB22 FSB_D_L<51>
D52* AB21 FSB_D_L<52>
D53* AC26 FSB_D_L<53>
D54* AD20 FSB_D_L<54>
D55* AE22 FSB_D_L<55>
D56* AF23 FSB_D_L<56>
D57* AC25 FSB_D_L<57>
D58* AE21 FSB_D_L<58>
D59* AD21 FSB_D_L<59>
D60* AC22 FSB_D_L<60>
D61* AD23 FSB_D_L<61>
D62* AF22 FSB_D_L<62>
D63* AC23 FSB_D_L<63>
DSTBN3* AE25 FSB_DSTB_L_N<3>
DSTBP3* AF24 FSB_DSTB_L_P<3>
DINV3* AC20 FSB_DINV_L<3>

MISC
GTLREF AD26
TEST1 C23
TEST2 D25
TEST3 C24
TEST4 AF26
TEST5 AF1
TEST6 A26
TEST7 C3
BSEL0 B22
BSEL1 B23
BSEL2 C21

COMP0 R26 CPU_COMP<0>
COMP1 U26 CPU_COMP<1>
COMP2 AA1 CPU_COMP<2>
COMP3 Y1 CPU_COMP<3>
DPRSTP* E5 CPU_DPRSTP_L
DPSLP* B5 CPU_DPSLP_L
DPWR* D24 FSB_DPWR_L
PWRGOOD D6 CPU_PWRGD
SLP* D7 FSB_CPUSLP_L
PSI* AE6 CPU_PSI_L

R1016 27.4 1% 1/16W MF-LF 402
R1017 54.9 1% 1/16W MF-LF 402
R1018 27.4 1% 1/16W MF-LF 402
R1019 54.9 1% 1/16W MF-LF 402

LAYOUT NOTE:
COMP0,2 CONNECT WITH ZO=27.4OHM,
MAKE TRACE LENGTH SHORTER THAN 0.5".
COMP1,3 CONNECT WITH ZO=55OHM,
MAKE TRACE LENGTH SHORTER THAN 0.5".

=PP1V05_S0_CPU
R1005 1K 1% 1/16W MF-LF 402
R1006 2.0K 1% 1/16W MF-LF 402
0.5" MAX LENGTH FOR CPU_GTLREF
NOSTUFF C1000 0.1uF 10% 16V X5R 402
PLACE C1000 CLOSE TO CPU_TEST4 PIN. MAKE SURE CPU_TEST4 IS REFERENCED TO GND

NOSTUFF R1030 0 5% 1/16W MF-LF 402
NOSTUFF R1012 1K 5% 1/16W MF-LF 402
NOSTUFF R1007 1K 5% 1/16W MF-LF 402

XDP_TMS R1020 54.9 1% 1/16W MF-LF 402
XDP_TDI R1021 54.9 1% 1/16W MF-LF 402
XDP_TDO R1024 54.9 1% 1/16W MF-LF 402
=PP1V05_S0_CPU
PLACEMENT_NOTE=Place R1024 near ITP connector (if present)

XDP_TCK R1022 54.9 1% 1/16W MF-LF 402
XDP_TRST_L R1023 649 1% 1/16W MF-LF 402

CPU FSB

SYNC_MASTER=M87_MLB SYNC_DATE=10/17/2007

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 10 OF 96	

(CPU CORE POWER)
=PPVCORE_S0_CPU 8 11 12 46

Standard Voltage:	Low Voltage:	Ultra Low Voltage:
44.0 A (Design Target)	23.0 A (Design Target)	17.0 A (Design Target)
41.0 A (HFM)	21.0 A (HFM)	TBD A (HFM)
30.4 A (LFM)	18.7 A (LFM)	TBD A (LFM)
25.5 A (SuperLFM)	TBD A (SuperLFM)	
27.4 A (Auto-Halt/Stop-Grant HFM)	TBD A (Auto-Halt/Stop-Grant HFM)	TBD A (Auto-Halt/Stop-Grant HFM)
17.0 A (Auto-Halt/Stop-Grant SuperLFM)	TBD A (Auto-Halt/Stop-Grant SuperLFM)	TBD A (Auto-Halt/Stop-Grant LFM)
27.4 A (Sleep HFM)	TBD A (Sleep HFM)	TBD A (Sleep HFM)
16.8 A (Sleep SuperLFM)	TBD A (Sleep SuperLFM)	TBD A (Sleep LFM)
25.0 A (Deep Sleep HFM)	TBD A (Deep Sleep HFM)	TBD A (Deep Sleep HFM)
16.0 A (Deep Sleep SuperLFM)	TBD A (Deep Sleep SuperLFM)	TBD A (Deep Sleep LFM)
11.5 A (Deeper Sleep)	TBD A (Deeper Sleep)	TBD A (Deeper Sleep)
9.4 A (Enhanced Deeper Sleep)	TBD A (Enhanced Deeper Sleep)	TBD A (Enhanced Deeper Sleep)

OMIT
U1000
PENRYN
FCBGA
3 OF 4

VCC: A7, A9, A10, A12, A13, A15, A17, A18, A20, B7, B9, B10, B12, B14, B15, B17, B18, B20, C9, C10, C12, C13, C15, C17, C18, D9, D10, D12, D14, D15, D17, D18, E7, E9, E10, E12, E13, E15, E17, E18, E20, F7, F9, F10, F12, F14, F15, F17, F18, F20, AA7, AA9, AA10, AA12, AA13, AA15, AA17, AA18, AA20, AB9, AC10, AB10, AB12, AB14, AB15, AB17, AB18

VCC: AB20, AB7, AC7, AC9, AC12, AC13, AC15, AC17, AC18, AD7, AD9, AD10, AD12, AD14, AD15, AD17, AD18, AE9, AE10, AE12, AE13, AE15, AE17, AE18, AE20, AF9, AF10, AF12, AF14, AF15, AF17, AF18, AF20

(CPU IO POWER 1.05V)
=PP1V05_S0_CPU 6 8 10 12 13 62

4500 mA (before VCC stable)
2500 mA (after VCC stable)

VCCP: G21, V6, J6, K6, M6, J21, K21, M21, N21, N6, R21, R6, T21, T6, V21, W21

(CPU INTERNAL PLL POWER 1.5V)
=PP1V5_S0_CPU 8 12

130 mA

VCCA: B26, C26

VID0	AD6	CPU_VID<0>	OUT 9 87
VID1	AF5	CPU_VID<1>	OUT 9 87
VID2	AE5	CPU_VID<2>	OUT 9 87
VID3	AF4	CPU_VID<3>	OUT 9 87
VID4	AE3	CPU_VID<4>	OUT 9 87
VID5	AF3	CPU_VID<5>	OUT 9 87
VID6	AE2	CPU_VID<6>	OUT 9 87

=PPVCORE_S0_CPU 8 11 12 46

R1100
100
1%
1/16W
MF-LF
402
PLACEMENT_NOTE=Place within 1 inch of CPU, no stub.

VCCSENSE	AF7	CPU_VCCSENSE_P	OUT 62 87
VSSSENSE	AE7	CPU_VCCSENSE_N	OUT 62 87

R1101
100
1%
1/16W
MF-LF
402
PLACEMENT_NOTE=Place within 1 inch of CPU, no stub.

OMIT
U1000
PENRYN
FCBGA
4 OF 4

VSS: A4, A8, A11, A14, A16, A19, A23, AF2, B6, B8, B11, B13, B16, B19, B21, B24, C5, C8, C11, C14, C16, C19, C2, C22, C25, D1, D4, D8, D11, D13, D16, D19, D23, D26, E3, E6, E8, E11, E14, E16, E19, E21, E24, F5, F8, F11, F13, F16, F19, F2, F22, F25, G4, G1, G23, G26, H3, H6, H21, H24, J2, J5, J22, J25, K1, K4, K23, K26, L3, L6, L21, L24, M2, M5, M22, M25, N1, N4, N23, N26, P3, B1

VSS: P6, P21, P24, R2, R5, R22, R25, T1, T4, T23, T26, U3, U6, U21, U24, V2, V5, V22, V25, W1, W4, W23, W26, Y3, Y6, Y21, Y24, AA2, AA5, AA8, AA11, AA14, AA16, AA19, AA22, AA25, AB1, AB4, AB8, AB11, AB13, AB16, AB19, AB23, AB26, AC3, AC6, AC8, AC11, AC14, AC16, AC19, AC21, AC24, AD2, AD5, AD8, AD11, AD13, AD16, AD19, AD22, AD25, AE1, AE4, AE8, AE11, AE14, AE16, AE19, AE23, AE26, A2, AF6, AF8, AF11, AF13, AF16, AF19, AF21, A25, AF25

Current numbers from Merom for Santa Rosa EMTS, doc #22221.

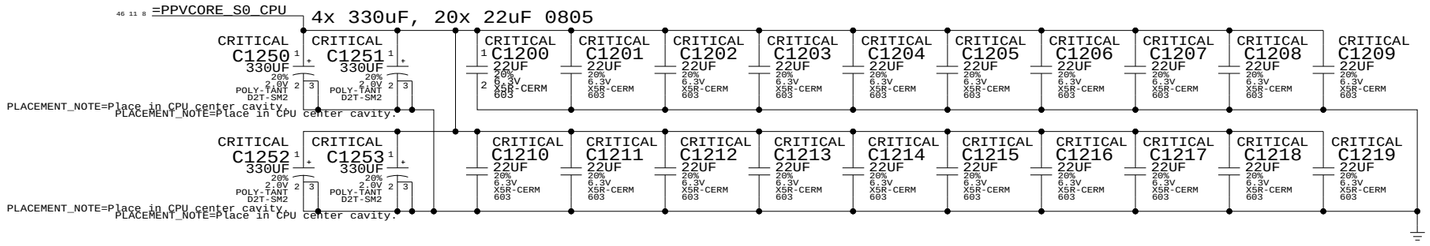
CPU Power & Ground

SYNC_MASTER=M87_MLB SYNC_DATE=10/17/2007

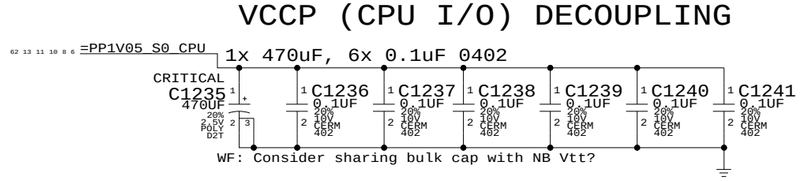
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 11 OF 96	

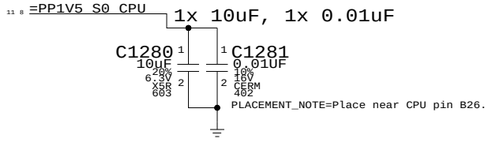
CPU VCORE HF AND BULK DECOUPLING



VCCP (CPU I/O) DECOUPLING



VCCA (CPU AVdd) DECOUPLING



CPU Decoupling & VID

SYNC_MASTER=M87_MLB SYNC_DATE=10/17/2007

APPLE INC.

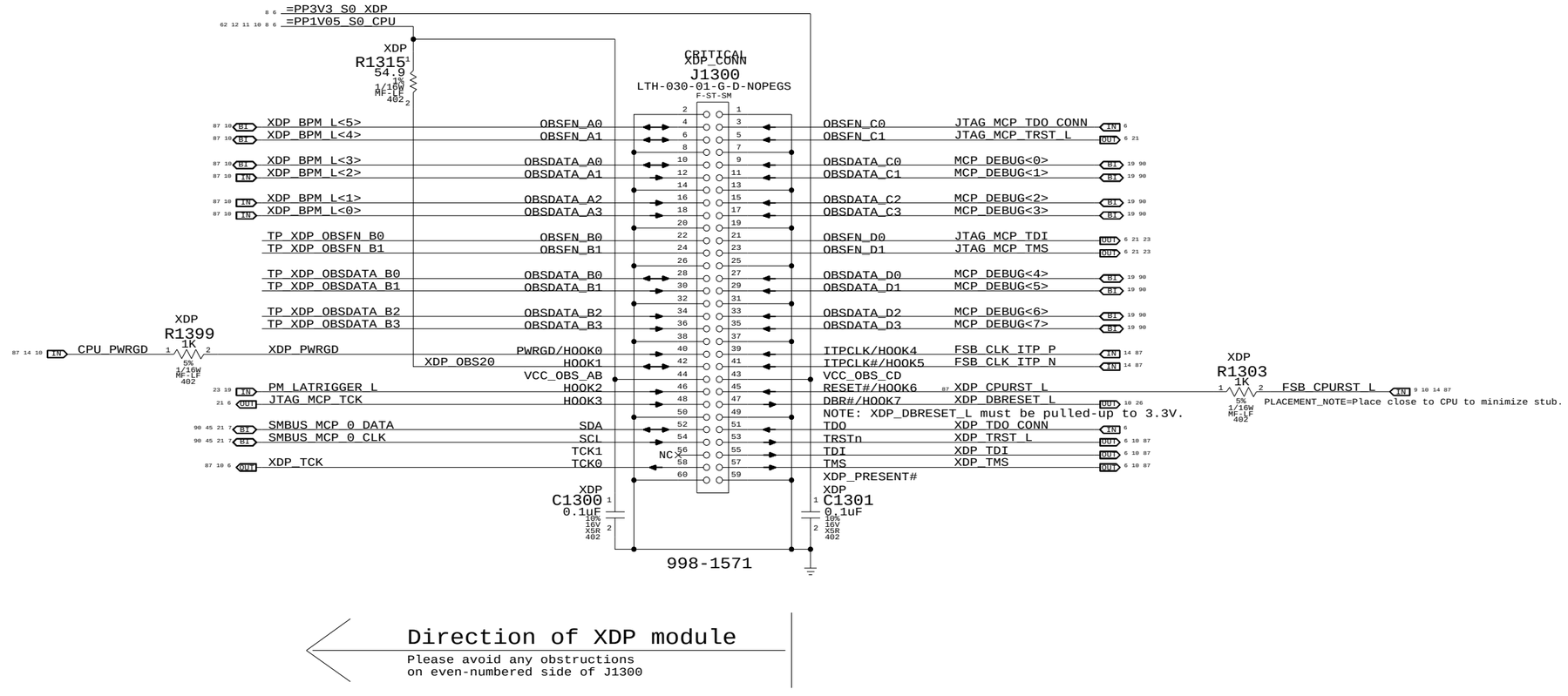
SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 12 OF 96	

Mini-XDP Connector

NOTE: This is not the standard XDP pinout.

Use with 920-0620 adapter board to support CPU, MCP debugging.

MCP79-specific pinout



Direction of XDP module

Please avoid any obstructions
on even-numbered side of J1300

eXtended Debug Port(MiniXDP)

SYNC_MASTER=M99_MLB SYNC_DATE=01/08/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 13 OF 96	

OMIT

U1400
MCP79-TOPO-B
BGA
(1 OF 11)

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>	AC34	CPU_A3#	
FSB_A_L<4>	AE38	CPU_A4#	
FSB_A_L<5>	AE34	CPU_A5#	
FSB_A_L<6>	AC37	CPU_A6#	
FSB_A_L<7>	AE37	CPU_A7#	
FSB_A_L<8>	AE35	CPU_A8#	
FSB_A_L<9>	AB35	CPU_A9#	
FSB_A_L<10>	AF35	CPU_A10#	
FSB_A_L<11>	AG35	CPU_A11#	
FSB_A_L<12>	AG39	CPU_A12#	
FSB_A_L<13>	AE33	CPU_A13#	
FSB_A_L<14>	AG37	CPU_A14#	
FSB_A_L<15>	AG38	CPU_A15#	
FSB_A_L<16>	AG34	CPU_A16#	
FSB_A_L<17>	AN38	CPU_A17#	
FSB_A_L<18>	AL39	CPU_A18#	
FSB_A_L<19>	AG33	CPU_A19#	
FSB_A_L<20>	AL33	CPU_A20#	
FSB_A_L<21>	AJ33	CPU_A21#	
FSB_A_L<22>	AN36	CPU_A22#	
FSB_A_L<23>	AJ35	CPU_A23#	
FSB_A_L<24>	AJ37	CPU_A24#	
FSB_A_L<25>	AJ36	CPU_A25#	
FSB_A_L<26>	AJ38	CPU_A26#	
FSB_A_L<27>	AL37	CPU_A27#	
FSB_A_L<28>	AL34	CPU_A28#	
FSB_A_L<29>	AN37	CPU_A29#	
FSB_A_L<30>	AJ34	CPU_A30#	
FSB_A_L<31>	AL38	CPU_A31#	
FSB_A_L<32>	AL35	CPU_A32#	
FSB_A_L<33>	AN34	CPU_A33#	
FSB_A_L<34>	AR39	CPU_A34#	
FSB_A_L<35>	AN35	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>	AC39	CPU_REQ2#	
FSB_REQ_L<3>	AC33	CPU_REQ3#	
FSB_REQ_L<4>	AC35	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#	
	AH40	CPU_FERR#	
(MCP_BSEL<2>)	F42	CPU_BSEL2	
(MCP_BSEL<1>)	D42	CPU_BSEL1	
(MCP_BSEL<0>)	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	AG27	+V_DLL_DLCELL_AVDD	206 mA
270 mA (A01)	AH27	+V_PLL_MCLK	20 mA
	AG28	+V_PLL_FSB	29 mA
	AH28	+V_PLL_CPU	15 mA
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#	Y43	FSB_D_L<0>
CPU_D1#	W42	FSB_D_L<1>
CPU_D2#	Y40	FSB_D_L<2>
CPU_D3#	W41	FSB_D_L<3>
CPU_D4#	Y39	FSB_D_L<4>
CPU_D5#	V42	FSB_D_L<5>
CPU_D6#	Y41	FSB_D_L<6>
CPU_D7#	Y42	FSB_D_L<7>
CPU_D8#	P42	FSB_D_L<8>
CPU_D9#	U41	FSB_D_L<9>
CPU_D10#	R42	FSB_D_L<10>
CPU_D11#	T39	FSB_D_L<11>
CPU_D12#	T42	FSB_D_L<12>
CPU_D13#	T41	FSB_D_L<13>
CPU_D14#	R41	FSB_D_L<14>
CPU_D15#	T43	FSB_D_L<15>
CPU_D16#	W35	FSB_D_L<16>
CPU_D17#	AA37	FSB_D_L<17>
CPU_D18#	W33	FSB_D_L<18>
CPU_D19#	W34	FSB_D_L<19>
CPU_D20#	AA36	FSB_D_L<20>
CPU_D21#	AA34	FSB_D_L<21>
CPU_D22#	AA38	FSB_D_L<22>
CPU_D23#	AA35	FSB_D_L<23>
CPU_D24#	U38	FSB_D_L<24>
CPU_D25#	U36	FSB_D_L<25>
CPU_D26#	U35	FSB_D_L<26>
CPU_D27#	U33	FSB_D_L<27>
CPU_D28#	U34	FSB_D_L<28>
CPU_D29#	W38	FSB_D_L<29>
CPU_D30#	R33	FSB_D_L<30>
CPU_D31#	U37	FSB_D_L<31>
CPU_D32#	N34	FSB_D_L<32>
CPU_D33#	N33	FSB_D_L<33>
CPU_D34#	R34	FSB_D_L<34>
CPU_D35#	R35	FSB_D_L<35>
CPU_D36#	P35	FSB_D_L<36>
CPU_D37#	R39	FSB_D_L<37>
CPU_D38#	R37	FSB_D_L<38>
CPU_D39#	R38	FSB_D_L<39>
CPU_D40#	L37	FSB_D_L<40>
CPU_D41#	L39	FSB_D_L<41>
CPU_D42#	L38	FSB_D_L<42>
CPU_D43#	N36	FSB_D_L<43>
CPU_D44#	N38	FSB_D_L<44>
CPU_D45#	J39	FSB_D_L<45>
CPU_D46#	J38	FSB_D_L<46>
CPU_D47#	J37	FSB_D_L<47>
CPU_D48#	L42	FSB_D_L<48>
CPU_D49#	M42	FSB_D_L<49>
CPU_D50#	P41	FSB_D_L<50>
CPU_D51#	N41	FSB_D_L<51>
CPU_D52#	N40	FSB_D_L<52>
CPU_D53#	M40	FSB_D_L<53>
CPU_D54#	H40	FSB_D_L<54>
CPU_D55#	K42	FSB_D_L<55>
CPU_D56#	H41	FSB_D_L<56>
CPU_D57#	L41	FSB_D_L<57>
CPU_D58#	H43	FSB_D_L<58>
CPU_D59#	H42	FSB_D_L<59>
CPU_D60#	K41	FSB_D_L<60>
CPU_D61#	J40	FSB_D_L<61>
CPU_D62#	H39	FSB_D_L<62>
CPU_D63#	M43	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	FSB_DPWR_L
CPU_STPCLK#	AG42	CPU_STPCLK_L
CPU_DPRSTP#	AN32	CPU_DPRSTP_L

=PP1V05_S0_MCP_FSB

R1410 54.9 1% 1/10W MF-LF 402
R1415 62 5% 1/16W MF-LF 402
R1416 62 5% 1/16W MF-LF 402

PM_THRMTRIP_L
CPU_FERR_L

NO STUFF
R1420 1K 5% 1/16W MF-LF 402
R1421 1K 5% 1/16W MF-LF 402
R1422 1K 5% 1/16W MF-LF 402

=MCP_BSEL<2>
=MCP_BSEL<1>
=MCP_BSEL<0>

R1430 49.9 1% 1/10W MF-LF 402
R1435 49.9 1% 1/16W MF-LF 402
R1431 49.9 1% 1/10W 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

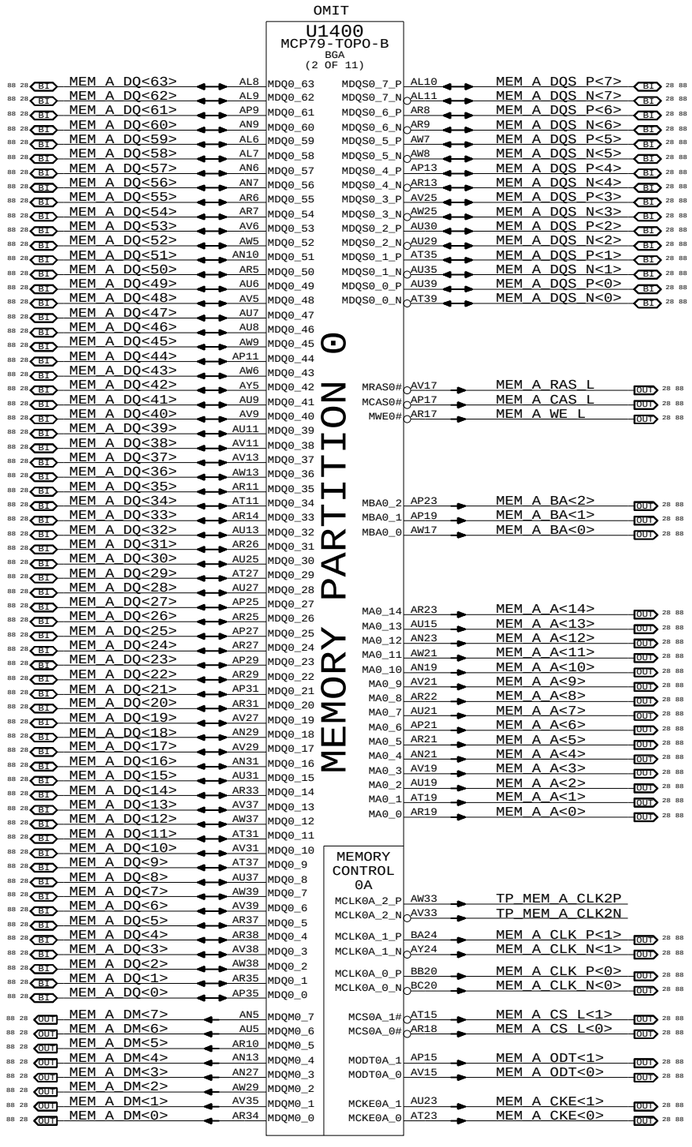
Current numbers from email Poonacha Kongetira provided 11/30/2007 4:04pm (no official document number).

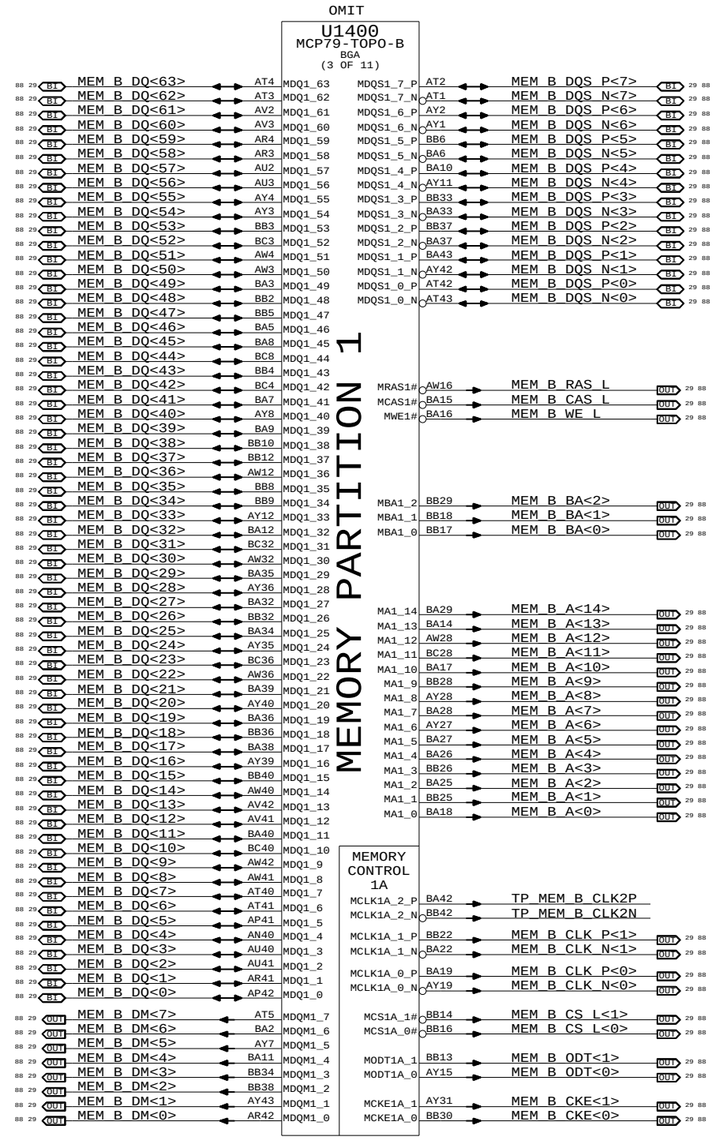
MCP CPU Interface

SYNC_MASTER=T18_MLB SYNC_DATE=06/18/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 14 OF 96	





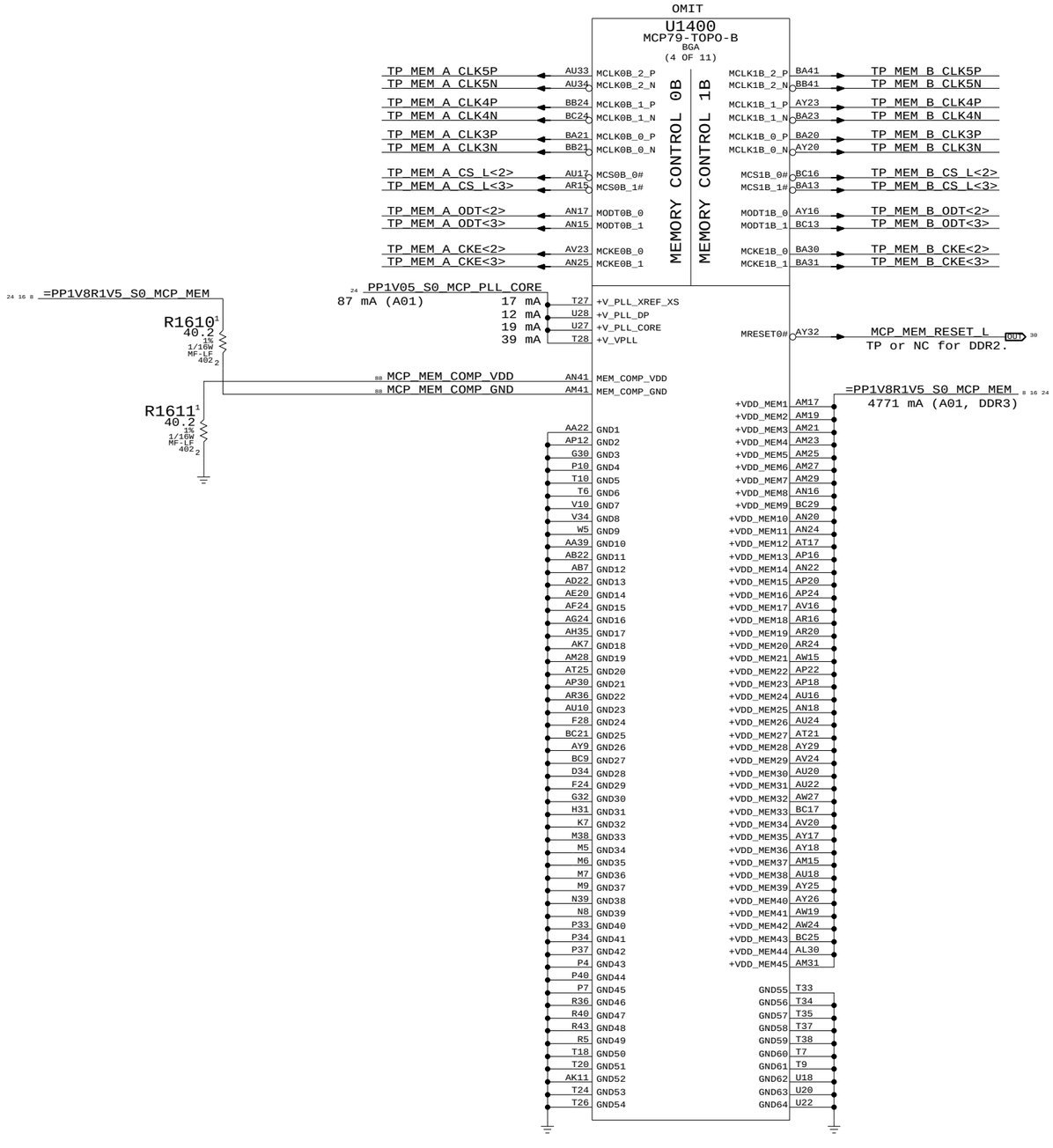
MCP Memory Interface

SYNC_MASTER=T18_MLB SYNC_DATE=06/18/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0

SCALE	SHT	OF
NONE	15	96



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

MCP Memory Misc

SYNC_MASTER=T18_MLB SYNC_DATE=06/18/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 16 OF 96	

OMIT

U1400
MCP79-TOPO-B
BGA
(5 OF 11)

PCI EXPRESS

9 IN	=PEG_D2R_P<0>	F7	PE0_RX0_P	PE0_TX0_P	C5	=PEG_R2D_C_P<0>	OUT 9
9 IN	=PEG_D2R_N<0>	E7	PE0_RX0_N	PE0_TX0_N	D4	=PEG_R2D_C_N<0>	OUT 9
9 IN	=PEG_D2R_P<1>	D7	PE0_RX1_P	PE0_TX1_P	C4	=PEG_R2D_C_P<1>	OUT 9
9 IN	=PEG_D2R_N<1>	C7	PE0_RX1_N	PE0_TX1_N	B4	=PEG_R2D_C_N<1>	OUT 9
9 IN	=PEG_D2R_P<2>	E6	PE0_RX2_P	PE0_TX2_P	A4	=PEG_R2D_C_P<2>	OUT 9
9 IN	=PEG_D2R_N<2>	F6	PE0_RX2_N	PE0_TX2_N	A3	=PEG_R2D_C_N<2>	OUT 9
9 IN	=PEG_D2R_P<3>	E5	PE0_RX3_P	PE0_TX3_P	B3	=PEG_R2D_C_P<3>	OUT 9
9 IN	=PEG_D2R_N<3>	F5	PE0_RX3_N	PE0_TX3_N	B2	=PEG_R2D_C_N<3>	OUT 9
9 IN	=PEG_D2R_P<4>	E4	PE0_RX4_P	PE0_TX4_P	C1	=PEG_R2D_C_P<4>	OUT 9
9 IN	=PEG_D2R_N<4>	E3	PE0_RX4_N	PE0_TX4_N	D1	=PEG_R2D_C_N<4>	OUT 9
9 IN	=PEG_D2R_P<5>	C3	PE0_RX5_P	PE0_TX5_P	D2	=PEG_R2D_C_P<5>	OUT 9
9 IN	=PEG_D2R_N<5>	D3	PE0_RX5_N	PE0_TX5_N	E1	=PEG_R2D_C_N<5>	OUT 9
9 IN	=PEG_D2R_P<6>	G5	PE0_RX6_P	PE0_TX6_P	E2	=PEG_R2D_C_P<6>	OUT 9
9 IN	=PEG_D2R_N<6>	H5	PE0_RX6_N	PE0_TX6_N	F2	=PEG_R2D_C_N<6>	OUT 9
9 IN	=PEG_D2R_P<7>	J7	PE0_RX7_P	PE0_TX7_P	F3	=PEG_R2D_C_P<7>	OUT 9
9 IN	=PEG_D2R_N<7>	J6	PE0_RX7_N	PE0_TX7_N	F4	=PEG_R2D_C_N<7>	OUT 9
9 IN	=PEG_D2R_P<8>	J5	PE0_RX8_P	PE0_TX8_P	G3	=PEG_R2D_C_P<8>	OUT 9
9 IN	=PEG_D2R_N<8>	J4	PE0_RX8_N	PE0_TX8_N	H4	=PEG_R2D_C_N<8>	OUT 9
9 IN	=PEG_D2R_P<9>	L11	PE0_RX9_P	PE0_TX9_P	H3	=PEG_R2D_C_P<9>	OUT 9
9 IN	=PEG_D2R_N<9>	L10	PE0_RX9_N	PE0_TX9_N	H2	=PEG_R2D_C_N<9>	OUT 9
9 IN	=PEG_D2R_P<10>	L9	PE0_RX10_P	PE0_TX10_P	H1	=PEG_R2D_C_P<10>	OUT 9
9 IN	=PEG_D2R_N<10>	L8	PE0_RX10_N	PE0_TX10_N	J1	=PEG_R2D_C_N<10>	OUT 9
9 IN	=PEG_D2R_P<11>	L7	PE0_RX11_P	PE0_TX11_P	J2	=PEG_R2D_C_P<11>	OUT 9
9 IN	=PEG_D2R_N<11>	L6	PE0_RX11_N	PE0_TX11_N	J3	=PEG_R2D_C_N<11>	OUT 9
9 IN	=PEG_D2R_P<12>	N11	PE0_RX12_P	PE0_TX12_P	K2	=PEG_R2D_C_P<12>	OUT 9
9 IN	=PEG_D2R_N<12>	N10	PE0_RX12_N	PE0_TX12_N	K3	=PEG_R2D_C_N<12>	OUT 9
9 IN	=PEG_D2R_P<13>	N9	PE0_RX13_P	PE0_TX13_P	L4	=PEG_R2D_C_P<13>	OUT 9
9 IN	=PEG_D2R_N<13>	P9	PE0_RX13_N	PE0_TX13_N	L3	=PEG_R2D_C_N<13>	OUT 9
9 IN	=PEG_D2R_P<14>	N7	PE0_RX14_P	PE0_TX14_P	M4	=PEG_R2D_C_P<14>	OUT 9
9 IN	=PEG_D2R_N<14>	N6	PE0_RX14_N	PE0_TX14_N	M3	=PEG_R2D_C_N<14>	OUT 9
9 IN	=PEG_D2R_P<15>	N5	PE0_RX15_P	PE0_TX15_P	M2	=PEG_R2D_C_P<15>	OUT 9
9 IN	=PEG_D2R_N<15>	N4	PE0_RX15_N	PE0_TX15_N	M1	=PEG_R2D_C_N<15>	OUT 9
				PE0_REFCLK_P	E11	PEG_CLK100M_P	OUT 70 89
				PE0_REFCLK_N	D11	PEG_CLK100M_N	OUT 70 89
9 IN	PEG_PRSNT_L	C9	PE0_PRSNT_16# Int PU				
31 IN	MINI_CLKREQ_L	D5	PEB_CLKREQ#/GPIO_49 Int PU	PE1_REFCLK_P	G11	PCIE_CLK100M_MINI_P	OUT 31 89
31 IN	PCIE_MINI_PRSNT_L	D9	PEB_PRSNT# Int PU	PE1_REFCLK_N	F11	PCIE_CLK100M_MINI_N	OUT 31 89
36 IN	FW_CLKREQ_L	E8	PEC_CLKREQ#/GPIO_50 Int PU	PE2_REFCLK_P	J11	PCIE_CLK100M_FW_P	OUT 36 89
9 IN	PCIE_FW_PRSNT_L	C10	PEC_PRSNT# Int PU	PE2_REFCLK_N	J10	PCIE_CLK100M_FW_N	OUT 36 89
32 IN	EXCARD_CLKREQ_L	M15	PED_CLKREQ#/GPIO_51 Int PU	PE3_REFCLK_P	G13	PCIE_CLK100M_EXCARD_P	OUT 32 89
32 IN	PCIE_EXCARD_PRSNT_L	B10	PED_PRSNT# Int PU	PE3_REFCLK_N	F13	PCIE_CLK100M_EXCARD_N	OUT 32 89
9	TP_PE4_CLKREQ_L	L16	PEE_CLKREQ#/GPIO_16 Int PU	PE4_REFCLK_P	J13	TP_PCIE_CLK100M_PE4P	9
9	TP_PE4_PRSNT_L	L18	PEE_PRSNT#/GPIO_46 Int PU	PE4_REFCLK_N	H13	TP_PCIE_CLK100M_PE4N	9
9 IN	AUD_IP_PERIPHERAL_DET	M16	PEF_CLKREQ#/GPIO_17 Int PU	PE5_REFCLK_P	L14	TP_PCIE_CLK100M_PE5P	
83 OUT	GMUX_JTAG_TCK_L	M18	PEF_PRSNT#/GPIO_47 Int PU	PE5_REFCLK_N	K14	TP_PCIE_CLK100M_PE5N	
	TP_MCP_GPIO_18	M17	PEG_CLKREQ#/GPIO_18 Int PU	PE6_REFCLK_P	N14	TP_PCIE_CLK100M_PE6P	
9 IN	GMUX_JTAG_TDO	M19	PEG_PRSNT#/GPIO_48 Int PU	PE6_REFCLK_N	M14	TP_PCIE_CLK100M_PE6N	
32 31 23 IN	PCIE_WAKE_L	F17	PE_WAKE# Int PU (S5)	PEX_RST0#	K11	PCIE_RESET_L	OUT 9 26
89 31 IN	PCIE_MINI_D2R_P	K9	PE1_RX0_P	PE1_TX0_P	D8	PCIE_MINI_R2D_C_P	OUT 31 89
89 31 IN	PCIE_MINI_D2R_N	J9	PE1_RX0_N	PE1_TX0_N	C8	PCIE_MINI_R2D_C_N	OUT 31 89
89 36 IN	PCIE_FW_D2R_P	H9	PE1_RX1_P	PE1_TX1_P	B8	PCIE_FW_R2D_C_P	OUT 36 89
89 36 IN	PCIE_FW_D2R_N	G9	PE1_RX1_N	PE1_TX1_N	A8	PCIE_FW_R2D_C_N	OUT 36 89
89 32 7 IN	PCIE_EXCARD_D2R_P	F9	PE1_RX2_P	PE1_TX2_P	A7	PCIE_EXCARD_R2D_C_P	OUT 32 89
89 32 7 IN	PCIE_EXCARD_D2R_N	E9	PE1_RX2_N	PE1_TX2_N	B7	PCIE_EXCARD_R2D_C_N	OUT 32 89
9	TP_PCIE_PE4_D2RP	H7	PE1_RX3_P	PE1_TX3_P	B6	TP_PCIE_PE4_R2D_CP	9
9	TP_PCIE_PE4_D2RN	G7	PE1_RX3_N	PE1_TX3_N	C6	TP_PCIE_PE4_R2D_CN	9

8 =PP1V05_S0_MCP_PEX_DVDD0
57 mA (A01, DVDD0 & 1)
Minimum 1.025V for Gen2 support

T17	+DVDD0_PEX1	
W19	+DVDD0_PEX2	
U17	+DVDD0_PEX3	
V19	+DVDD0_PEX4	
W16	+DVDD0_PEX5	
W17	+DVDD0_PEX6	
W18	+DVDD0_PEX7	
U16	+DVDD0_PEX8	

8 =PP1V05_S0_MCP_PEX_DVDD1

T19	+DVDD1_PEX1	
U19	+DVDD1_PEX2	

24 PP1V05_S0_MCP_PLL_PEX
84 mA (A01)

T16	+V_PLL_PEX	

89 MCP_PEX_CLK_COMP

A11	PEX_CLK_COMP	

NO STUFF
R1710
2.37K
1%
1/16W
MF-LF
402
PLACEMENT_NOTE=Place within 12.7mm of U1400

8 =PP1V05_S0_MCP_PEX_AVDD0
206 mA (A01, AVDD0 & 1)
Minimum 1.025V for Gen2 support

Y12	+AVDD0_PEX1	
AA12	+AVDD0_PEX2	
AB12	+AVDD0_PEX3	
M12	+AVDD0_PEX4	
P12	+AVDD0_PEX5	
R12	+AVDD0_PEX6	
N12	+AVDD0_PEX7	
T12	+AVDD0_PEX8	
U12	+AVDD0_PEX9	
AC12	+AVDD0_PEX10	
AD12	+AVDD0_PEX11	
V12	+AVDD0_PEX12	
W12	+AVDD0_PEX13	

8 =PP1V05_S0_MCP_PEX_AVDD1

M13	+AVDD1_PEX1	
N13	+AVDD1_PEX2	
P13	+AVDD1_PEX3	

If PE0 interface is not used, ground DVDD0_PEX and AVDD0_PEX.
If PE1 interface is not used, ground DVDD1_PEX and AVDD1_PEX.

MCP PCIe Interfaces

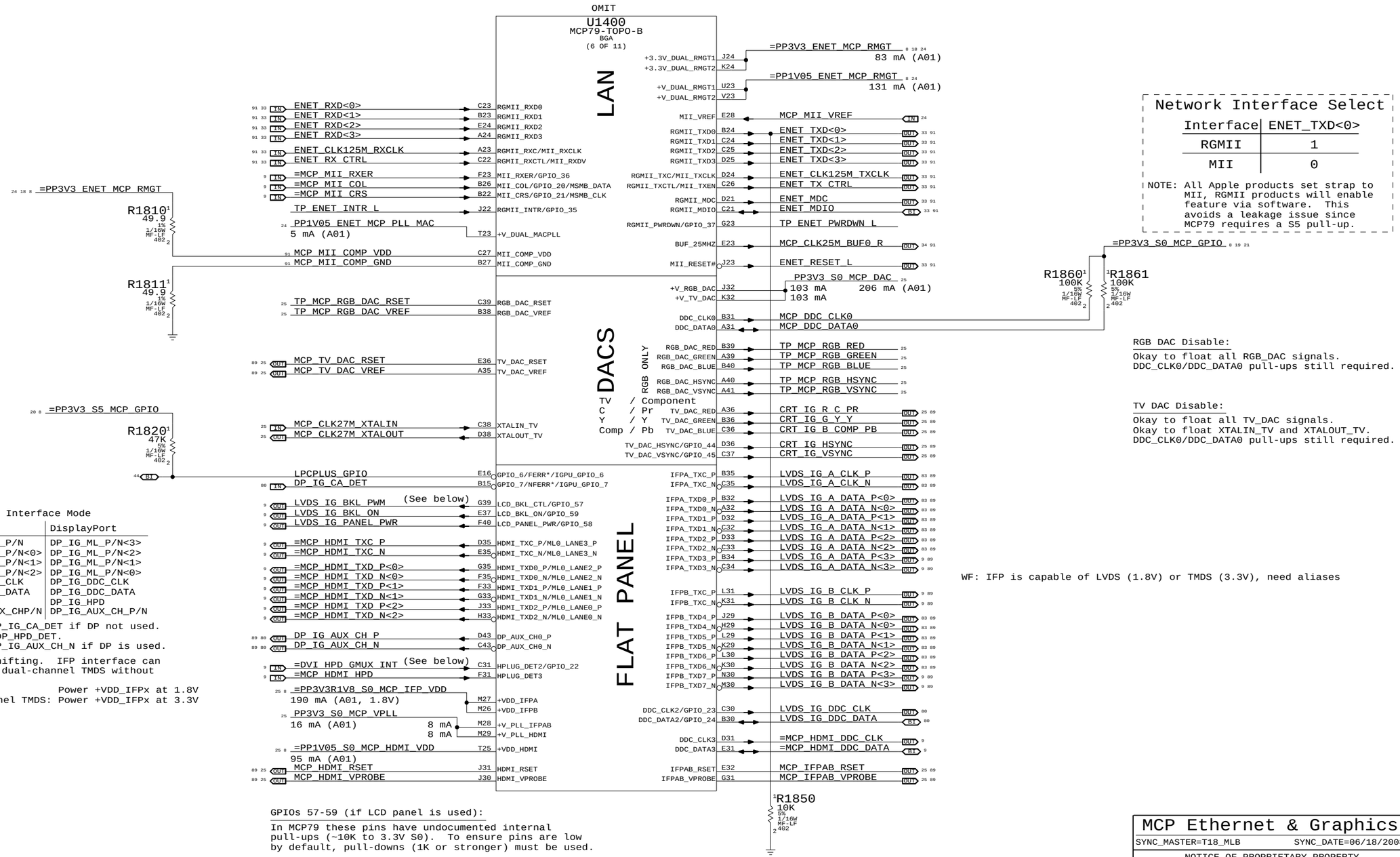
SYNC_MASTER=T18_MLB SYNC_DATE=06/18/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0

SCALE	SHT	OF
NONE	17	96

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



Network Interface Select

Interface	ENET_TXD<0>
RGMII	1
MII	0

NOTE: All Apple products set strap to MII, RGMII products will enable feature via software. This avoids a leakage issue since MCP79 requires a S5 pull-up.

RGB DAC Disable:

Okay to float all RGB_DAC signals.
DDC_CLK0/DDC_DATA0 pull-ups still required.

TV DAC Disable:

Okay to float all TV_DAC signals.
Okay to float XTALIN_TV and XTALOUT_TV.
DDC_CLK0/DDC_DATA0 pull-ups still required.

Interface Mode

MCP Signal	TMDS/HDMI	DisplayPort
=MCP_HDMI_TXC_P/N	TMDS_IG_TXC_P/N	DP_IG_ML_P/N<3>
=MCP_HDMI_TXD_P/N<0>	TMDS_IG_TXD_P/N<0>	DP_IG_ML_P/N<2>
=MCP_HDMI_TXD_P/N<1>	TMDS_IG_TXD_P/N<1>	DP_IG_ML_P/N<1>
=MCP_HDMI_TXD_P/N<2>	TMDS_IG_TXD_P/N<2>	DP_IG_ML_P/N<0>
=MCP_HDMI_DDC_CLK	TMDS_IG_DDC_CLK	DP_IG_DDC_CLK
=MCP_HDMI_DDC_DATA	TMDS_IG_DDC_DATA	DP_IG_DDC_DATA
=MCP_HDMI_HPD	TMDS_IG_HPD	DP_IG_HPD
DP_IG_AUX_CH_P/N	TP_DP_IG_AUX_CHP/N	DP_IG_AUX_CH_P/N

NOTE: 1M pull-down required on DP_IG_CA_DET if DP not used.
NOTE: 20K pull-down required on DP_HPD_DET.
NOTE: 1K pull-down required on DP_IG_AUX_CH_N if DP is used.

NOTE: HDMI port requires level-shifting. IFP interface can be used to provide HDMI or dual-channel TMDS without level-shifters.

LVDS: Power +VDD_IFPx at 1.8V
Dual-channel TMDS: Power +VDD_IFPx at 3.3V

GPIOs 57-59 (if LCD panel is used):

In MCP79 these pins have undocumented internal pull-ups (~10K to 3.3V S0). To ensure pins are low by default, pull-downs (1K or stronger) must be used.

=DVI_HPD_GMUX_INT:

Alias to DVI_HPD for systems using IFP for DVI.
Alias to GMUX_INT for systems with GMUX.
Alias to HPLUG_DET2 for other systems.
Pull-down (20k) required in all cases.

WF: IFP is capable of LVDS (1.8V) or TMDS (3.3V), need aliases

MCP Ethernet & Graphics

SYNC_MASTER=T18_MLB SYNC_DATE=06/18/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 18 OF 96	

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

OMIT

U1400
MCP79-TOPO-B
BGA
(7 OF 11)

PCI

PCI_REQ0 L	T2	PCI_REQ0#	
PCI_REQ1 L	V9	PCI_REQ1#/FANRPM2	
CRTMUX_SEL_TV_L	T3	PCI_REQ2#/GPIO_40/RS232_DSR#	
AUD_IPHS_SWITCH_EN	U9	PCI_REQ3#/GPIO_38/RS232_CTS#	
MCP_RS232_SIN_L	T4	PCI_REQ4#/GPIO_52/RS232_SIN#	
MCP_DEBUG<0>	AC3	PCI_AD0	
MCP_DEBUG<1>	AE10	PCI_AD1	
MCP_DEBUG<2>	AC4	PCI_AD2	
MCP_DEBUG<3>	AE11	PCI_AD3	
MCP_DEBUG<4>	AB3	PCI_AD4	
MCP_DEBUG<5>	AC6	PCI_AD5	
MCP_DEBUG<6>	AB2	PCI_AD6	
MCP_DEBUG<7>	AC7	PCI_AD7	
TP_PCI_AD<8>	AC8	PCI_AD8	
TP_PCI_AD<9>	AA2	PCI_AD9	
TP_PCI_AD<10>	AC9	PCI_AD10	
TP_PCI_AD<11>	AC10	PCI_AD11	
TP_PCI_AD<12>	AC11	PCI_AD12	
TP_PCI_AD<13>	AA1	PCI_AD13	
TP_PCI_AD<14>	AA5	PCI_AD14	
TP_PCI_AD<15>	Y5	PCI_AD15	
TP_PCI_AD<16>	W3	PCI_AD16	
TP_PCI_AD<17>	W6	PCI_AD17	
TP_PCI_AD<18>	W4	PCI_AD18	
TP_PCI_AD<19>	W7	PCI_AD19	
TP_PCI_AD<20>	V3	PCI_AD20	
TP_PCI_AD<21>	W8	PCI_AD21	
TP_PCI_AD<22>	V2	PCI_AD22	
TP_PCI_AD<23>	W9	PCI_AD23	
TP_PCI_AD<24>	U3	PCI_AD24	
TP_PCI_AD<25>	W11	PCI_AD25	
TP_PCI_AD<26>	U2	PCI_AD26	
TP_PCI_AD<27>	U5	PCI_AD27	
TP_PCI_AD<28>	U1	PCI_AD28	
TP_PCI_AD<29>	U6	PCI_AD29	
TP_PCI_AD<30>	T5	PCI_AD30	
TP_PCI_AD<31>	U7	PCI_AD31	
TP_PCI_INTW_L	P2	PCI_INTW#	
TP_PCI_INTX_L	N3	PCI_INTX#	
TP_PCI_INTY_L	N2	PCI_INTY#	
TP_PCI_INTZ_L	N1	PCI_INTZ#	
TP_PCI_TRDY_L	Y3	PCI_TRDY#	
PM_CLKRUN_L	AD11	PCI_CLKRUN#/GPIO_42	
FW_PME_L	AE2	LPC_DRQ1#/GPIO_19	Int PU
TP_LPC_DRQ0_L	AE1	LPC_DRQ0#	Int PU
LPC_SERIRQ	AE6	LPC_SERIRQ	Int PU
PCI_GNT0#	R3	TP_PCI_GNT0_L	
PCI_GNT1#/FANCTL2	U10	TP_PCI_GNT1_L	
PCI_GNT2#/GPIO_41/RS232_DTR#	R4	GMUX_JTAG_TMS	
PCI_GNT3#/GPIO_39/RS232_RTS#	U11	GMUX_JTAG_TDI	
PCI_GNT4#/GPIO_53/RS232_SOUT#	P3	MCP_RS232_SOUT_L	
PCI_CBE0#	AA3	TP_PCI_C_BE_L<0>	
PCI_CBE1#	AA6	TP_PCI_C_BE_L<1>	
PCI_CBE2#	AA11	TP_PCI_C_BE_L<2>	
PCI_CBE3#	W10	TP_PCI_C_BE_L<3>	
PCI_DEVSEL#	AA9	TP_PCI_DEVSEL_L	
PCI_FRAME#	Y4	TP_PCI_FRAME_L	
PCI_IRDY#	AA10	TP_PCI_IRDY_L	
PCI_PAR	Y1	TP_PCI_PAR	
PCI_PERR#/GPIO_43/RS232_DCD#	AB9	TP_PCI_PERR_L	
PCI_SERR#	AA7	TP_PCI_SERR_L	
PCI_STOP#	Y2	TP_PCI_STOP_L	
PCI_PME#/GPIO_30	T1	PM_LATRIGGER_L	
PCI_RESET0#	R10	MEM_VTT_EN_R	
PCI_RESET1#	R11	TP_PCI_RESET1_L	
PCI_CLK0	R6	TP_PCI_CLK0	
PCI_CLK1	R7	TP_PCI_CLK1	
PCI_CLK2	R8	PCI_CLK33M_MCP_R	
PCI_CLKIN	R9	PCI_CLK33M_MCP	

Int PU (S5)

R1910
22
5% 1/16W MF-LF 402
PLACEMENT_NOTE=Place close to pin R8

LPC

LPC_FRAME#	AD4	LPC_FRAME_R_L	R1960 22	LPC_FRAME_L
LPC_PWRDWN#/GPIO_54/EXT_NMI#	AE12	LPC_PWRDWN_L		
LPC_RESET0#	AE5	LPC_RESET_L		
LPC_AD0	AD3	LPC_AD_R<0>	R1950 22	LPC_AD<0>
LPC_AD1	AD2	LPC_AD_R<1>	R1951 22	LPC_AD<1>
LPC_AD2	AD1	LPC_AD_R<2>	R1952 22	LPC_AD<2>
LPC_AD3	AD5	LPC_AD_R<3>	R1953 22	LPC_AD<3>
LPC_CLK0	AE9	LPC_CLK33M_SMC_R		

All resistors: 5% 1/16W MF-LF 402

R1961
10K
5% 1/16W MF-LF 402
Strap for Boot ROM Selection (See HDA_SDOUT)

GND

GND65	U24	GND98	Y26
GND66	U26	GND99	Y27
GND67	U39	GND100	AB18
GND68	U4	GND101	H34
GND69	U8	GND102	AB20
GND70	V16	GND103	AB21
GND71	V17	GND104	AB23
GND72	V18	GND105	AB24
GND73	V20	GND106	AB25
GND74	V22	GND107	AB26
GND75	V24	GND108	AB27
GND76	V26	GND109	AB28
GND77	V27	GND110	AB34
GND78	V28	GND111	AB37
GND79	V33	GND112	AB4
GND80	V37	GND113	AB40
GND81	V4	GND114	AC22
GND82	V40	GND115	AC36
GND83	V7	GND116	AC40
GND84	W20	GND117	AB33
GND85	W22	GND118	AC5
GND86	W24	GND119	AD16
GND87	W36	GND120	AD17
GND88	W40	GND121	AD18
GND89	W43	GND122	AD19
GND90	Y16	GND123	AD20
GND91	Y17	GND124	AD24
GND92	Y18	GND125	AD25
GND93	Y19	GND126	AD26
GND94	Y20	GND127	AD27
GND95	Y22	GND128	AD28
GND96	Y24	GND129	AD33
GND97	Y25	GND130	AD34

=PP3V3_S0_MCP_GPIO

MCP_RS232_SOUT_L	R1989	8.2K
PCI_REQ0_L	R1990	8.2K
PCI_REQ1_L	R1991	8.2K
CRTMUX_SEL_TV_L	R1992	8.2K
MCP_RS232_SIN_L	R1994	8.2K

All resistors: 5% 1/16W MF-LF 402

MCP PCI & LPC

SYNC_MASTER=T18_MLB SYNC_DATE=06/18/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0

SCALE NONE SHT 19 OF 96

OMIT

U1400
MCP79-TOPO-B
BGA
(8 OF 11)

SATA

SATA_HDD_R2D_C_P	AJ7	SATA_A0_TX_P	89 39 OUT
SATA_HDD_R2D_C_N	AJ6	SATA_A0_TX_N	89 39 OUT
SATA_HDD_D2R_N	AJ5	SATA_A0_RX_N	89 39 IN
SATA_HDD_D2R_P	AJ4	SATA_A0_RX_P	89 39 IN
SATA_ODD_R2D_C_P	AJ11	SATA_A1_TX_P	89 39 OUT
SATA_ODD_R2D_C_N	AJ10	SATA_A1_TX_N	89 39 OUT
SATA_ODD_D2R_N	AJ9	SATA_A1_RX_N	89 39 IN
SATA_ODD_D2R_P	AK9	SATA_A1_RX_P	89 39 IN
TP_SATA_C_R2D_CP	AK2	SATA_B0_TX_P	
TP_SATA_C_R2D_CN	AJ3	SATA_B0_TX_N	
TP_SATA_C_D2RN	AJ2	SATA_B0_RX_N	
TP_SATA_C_D2RP	AJ1	SATA_B0_RX_P	
TP_SATA_D_R2D_CP	AM4	SATA_B1_TX_P	
TP_SATA_D_R2D_CN	AL3	SATA_B1_TX_N	
TP_SATA_D_D2RN	AL4	SATA_B1_RX_N	
TP_SATA_D_D2RP	AK3	SATA_B1_RX_P	
TP_SATA_E_R2D_CP	AN1	SATA_C0_TX_P	
TP_SATA_E_R2D_CN	AM1	SATA_C0_TX_N	
TP_SATA_E_D2RN	AM2	SATA_C0_RX_N	
TP_SATA_E_D2RP	AM3	SATA_C0_RX_P	
TP_SATA_F_R2D_CP	AP3	SATA_C1_TX_P	
TP_SATA_F_R2D_CN	AP2	SATA_C1_TX_N	
TP_SATA_F_D2RN	AN3	SATA_C1_RX_N	
TP_SATA_F_D2RP	AN2	SATA_C1_RX_P	
TP_MCP_SATALED_L	E12	SATA_LED#	

24 PP1V05_S0_MCP_PLL_SATA — AE16 +V_PLL_SATA
84 mA (A01)

8 =PP1V05_S0_MCP_SATA_DVDD0 — 43 mA (A01, DVDD0 & 1)
Minimum 1.025V for Gen2 support

AF19	+DVDD0_SATA1	
AG16	+DVDD0_SATA2	
AG17	+DVDD0_SATA3	
AG19	+DVDD0_SATA4	

9 =PP1V05_S0_MCP_SATA_DVDD1

AH17	+DVDD1_SATA1	
AH19	+DVDD1_SATA2	

8 =PP1V05_S0_MCP_SATA_AVDD0 — 127 mA (A01, AVDD0 & 1)
Minimum 1.025V for Gen2 support

AJ12	+AVDD0_SATA1	
AN11	+AVDD0_SATA2	
AK12	+AVDD0_SATA3	
AK13	+AVDD0_SATA4	
AL12	+AVDD0_SATA5	
AM11	+AVDD0_SATA6	
AM12	+AVDD0_SATA7	
AN12	+AVDD0_SATA8	
AL13	+AVDD0_SATA9	

9 =PP1V05_S0_MCP_SATA_AVDD1

AN14	+AVDD1_SATA1	
AL14	+AVDD1_SATA2	
AM13	+AVDD1_SATA3	
AM14	+AVDD1_SATA4	

89 MCP_SATA_TERMP — AE3 SATA_TERMP

R2010 2.49K 1% 1/16W MF-LF 402 2

USB

External A
USB0_P C29 USB_EXTA_P 40 90 BI
USB0_N D29 USB_EXTA_N 40 90 BI

AirPort (PCIe Mini-Card)
USB1_P C28 USB_MINI_P 9 90 BI
USB1_N D28 USB_MINI_N 9 90 BI

External D
USB2_P A28 USB_EXTD_P 9 90 BI
USB2_N B28 USB_EXTD_N 9 90 BI

Camera
USB3_P F29 USB_CAMERA_P 31 90 BI
USB3_N G29 USB_CAMERA_N 31 90 BI

IR
USB4_P K27 USB_IR_P 41 90 BI
USB4_N L27 USB_IR_N 41 90 BI

Geyser Trackpad/Keyboard
USB5_P J26 USB_TPAD_P 50 90 BI
USB5_N J27 USB_TPAD_N 50 90 BI

Bluetooth
USB6_P F27 USB_BT_P 31 90 BI
USB6_N G27 USB_BT_N 31 90 BI

External B
USB7_P D27 USB_EXTB_P 40 90 BI
USB7_N E27 USB_EXTB_N 40 90 BI

ExpressCard
USB8_P K25 USB_EXCARD_P 32 90 BI
USB8_N L25 USB_EXCARD_N 32 90 BI

External C
USB9_P H25 USB_EXTC_P 9 90 BI
USB9_N J25 USB_EXTC_N 9 90 BI

USB10_P F25 TP_USB_10P
USB10_N G25 TP_USB_10N

USB11_P K23 TP_USB_11P
USB11_N L23 TP_USB_11N

USB_OC0#/GPIO_25	L21	USB_EXTA_OC_L	40 IN
USB_OC1#/GPIO_26	K21	USB_EXTB_OC_L	40 IN
USB_OC2#/GPIO_27/MGPIO	J21	USB_EXTC_OC_L	IN
USB_OC3#/GPIO_28/MGPIO	H21	EXCARD_OC_L	32 43 IN

+V_PLL_USB L28 PP3V3_S0_MCP_PLL_USB 24
19 mA (A01)

USB_RBIAS_GND A27 99 MCP_USB_RBIAS_GND

R2060 806 1% 1/10W MF-LF 402 2

GND131	AD35
GND132	AD37
GND133	AD38
GND134	AE22
GND135	AE24
GND136	AE39
GND137	AE4
GND138	AD6
GND139	AF16
GND140	AF17
GND141	AF18
GND142	AF20
GND143	AF22
GND144	AF26
GND145	AF27
GND146	AF28
GND147	AF33
GND148	AF34
GND149	AF37
GND150	AF40
GND151	AG18
GND152	AG20
GND153	AG22
GND154	AG26
GND155	AG36
GND156	AG40
GND157	AH18
GND158	AH20
GND159	AH22
GND160	AH24

=PP3V3_S5_MCP_GPIO 8 18

R2051 8.2K 5% 1/16W MF-LF 402 2
R2053 8.2K 5% 1/16W MF-LF 402 2
R2050 8.2K 5% 1/16W MF-LF 402 2
R2052 8.2K 5% 1/16W MF-LF 402 2

If all SATA_Ax & Bx pins are not used, ground DVDD0_SATA and AVDD0_SATA.
If all SATA_Cx pins are not used, ground DVDD1_SATA and AVDD1_SATA.

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

MCP SATA & USB

SYNC_MASTER=T18_MLB SYNC_DATE=06/18/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 20 OF 96	

OMIT

U1400
MCP79-TOPO-B
BGA
(9 OF 11)

HDA

HDA_SDIN0 → G15 HDA_SDATA_IN0 (Int PD)
TP_MLB_RAM_SIZE → J14 HDA_SDATA_IN1/GPIO_2/PS2_KB_CLK (Int PD)
TP_MLB_RAM_VENDOR (MXM_OK for MXM systems) → J15 HDA_SDATA_IN2/GPIO_3/PS2_KB_DATA (Int PD)

=PP3V3R1V5_S0_MCP_HDA → R2110 49.9 1% 1/16W MF-LF 402 → MCP_HDA_PULLDN_COMP → A15 HDA_PULLDN_COMP

PP1V05_S0_MCP_PLL_NV
37 mA (A01)
20 mA → AE18 +V_PLL_NV_H
17 mA → AE17 +V_PLL_SP_SPREF

PP3V3_G3_RTC → R2120 49.9K 1% 1/16W MF-LF 402 → R2121 49.9K 1% 1/16W MF-LF 402

=SPI_CS1_R_L_USE_MLB → L24 GPIO_1/PWRDN_OK/SPI_CS1
SMC_ADAPTER_EN → L26 GPIO_12/SUS_STAT#/ACCLMTR
TP_SB_A20GATE → K13 A20GATE Int PU
TP_MCP_KBDRSTIN_L → L13 KBRDRSTIN# Int PU
SMC_WAKE_SCI_L → C19 SIO_PME# Int PU (S5)
SMC_RUNTIME_SCI_L → C18 EXT_SMI/GPIO_32# Int PU (S5)
SM_INTRUDER_L → B20 INTRUDER#
TP_MCP_LID_L → M25 LID# Int PU (S5)
PM_BATLOW_L → M24 LLB# Int PU (S5)
PM_DPRSLPVR → M22 CPU_DPRSLPVR
PM_PWRBTN_L → C16 PWRBTN# Int PU (S5)
PM_SYSRST_DEBOUNCE_L → D16 RSTBTN# Int PU
RTC_RST_L → C20 RTC_RST#
PM_RSMRST_L → D20 PWRGD_SB
MCP_PS_PWRGD → E20 PS_PWRGD
MCP_CPU_VLD → C17 CPU_VLD
JTAG_MCP_TDI → E19 JTAG_TDI Int PU
JTAG_MCP_TDO ← F19 JTAG_TDO
JTAG_MCP_TMS → J19 JTAG_TMS Int PU
JTAG_MCP_TRST_L → J18 JTAG_TRST#
JTAG_MCP_TCK → G19 JTAG_TCK
MCP_CLK25M_XTALIN → A16 XTALIN
MCP_CLK25M_XTALOUT ← B16 XTALOUT
RTC_CLK32K_XTALIN → A19 XTALIN_RTC
RTC_CLK32K_XTALOUT ← B19 XTALOUT_RTC

R2150 10K 5% 1/16W MF-LF 402
R2151 100K 5% 1/16W MF-LF 402

=PP3V3R1V5_S0_MCP_HDA
7 mA (A01)
+V_DUAL_HDA1 J16
+V_DUAL_HDA2 K16
R2160 8.2K 5% 1/16W MF-LF 402

HDA_SDATA_OUT F15 → HDA_SDOUT_R → R2170 22 5% 1/16W MF-LF 402 → HDA_SDOUT
HDA_BITCLK E15 → HDA_BIT_CLK_R → R2171 22 5% 1/16W MF-LF 402 → HDA_BIT_CLK
HDA_RESET# K15 → HDA_RST_R_L → R2172 22 5% 1/16W MF-LF 402 → HDA_RST_L
HDA_SYNC L15 → HDA_SYNC_R → R2173 22 5% 1/16W MF-LF 402 → HDA_SYNC

MISC

HDA_DOCK_EN#/GPIO_4/PS2_MS_CLK K17 → MCP_GPIO_4
HDA_DOCK_RST#/GPIO_5/PS2_MS_DATA L17 → AUD_I2C_INT_L
SLP_S3# G17 → PM_SLP_S3_L
SLP_RMGT# J17 → PM_SLP_RMGT_L
SLP_S5# H17 → PM_SLP_S4_L
THERM_DIODE_P B11 → MCP_THMDIODE_P
THERM_DIODE_N C11 → MCP_THMDIODE_N
MCP_VID0/GPIO_13 L20 → MCP_VID<0>
MCP_VID1/GPIO_14 M20 → MCP_VID<1>
MCP_VID2/GPIO_15 M21 → MCP_VID<2>
SPKR C13 → MCP_SPKR
SMB_CLK0 L19 → SMBUS_MCP_0_CLK
SMB_DATA0 K19 → SMBUS_MCP_0_DATA
SMB_CLK1/MSMB_CLK G21 → SMBUS_MCP_1_CLK
SMB_DATA1/MSMB_DATA F21 → SMBUS_MCP_1_DATA
SMB_ALERT#/GPIO_64 M23 → AP_PWR_EN
(MGPIO2) FANRPM0/GPIO_60 B12 → MEM_EVENT_L
FANCTL0/GPIO_61 A12 → ODD_PWR_EN_L
(MGPIO3) FANRPM1/GPIO_63 D12 → SMC_IG_THROTTLE_L
FANCTL1/GPIO_62 C12 → ARB_DETECT
CPUVDD_EN D17 → MCP_CPUVDD_EN
SPI_CS0/GPIO_10 C14 → SPI_CS0_R_L
SPI_CLK/GPIO_11 D13 → SPI_CLK_R
SPI_DI/GPIO_8 C15 → SPI_MISO
SPI_DO/GPIO_9 B14 → SPI_MOSI_R
SUS_CLK/GPIO_34 B18 → PM_CLK32K_SUSCLK_R
BUF_SIO_CLK AE7 → TP_MCP_BUF_SIO_CLK
TEST_MODE_EN K22 → MCP_TEST_MODE_EN
PKG_TEST L22

R2163 10K 5% 1/16W MF-LF 402
R2190 1K 1% 1/16W MF-LF 402

=PP3V3_S0_MCP
BOOT_MODE_SAFE
R2180 10K 5% 1/16W MF-LF 402
BOOT_MODE_USER
R2181 10K 5% 1/16W MF-LF 402
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 5% 50V CERM 402
C2172 10PF 5% 50V CERM 402
C2171 10PF 5% 50V CERM 402
C2173 10PF 5% 50V CERM 402

=PP3V3_S0_MCP_GPIO
R2140 10K 5% 1/16W MF-LF 402
R2141 10K 5% 1/16W MF-LF 402
R2142 10K 5% 1/16W MF-LF 402
R2143 10K 5% 1/16W MF-LF 402
MCP_GPIO_4
AUD_I2C_INT_L
MEM_EVENT_L
SMC_IG_THROTTLE_L
ARB_DETECT
R2147 100K 5% 1/16W MF-LF 402

=PP3V3_S3_MCP_GPIO
R2154 100K 5% 1/16W MF-LF 402
AP_PWR_EN

MCP_VID<0>
MCP_VID<1>
MCP_VID<2>
R2155 22K 5% 1/16W MF-LF 402
R2156 22K 5% 1/16W MF-LF 402
R2157 22K 5% 1/16W MF-LF 402

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

MCP HDA & MISC

SYNC_MASTER=T18_MLB SYNC_DATE=06/18/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 21 OF 96	

OMIT

U1400
MCP79-TOPO-B
BGA
(11 OF 11)

GND

AH26	GND161	GND253	AV40
AH33	GND162	GND254	BA1
AH34	GND163	GND255	BA4
AH37	GND164	GND256	AW31
AH38	GND165	GND257	AY6
AJ39	GND166	GND258	L35
AJ8	GND167	GND259	BC33
AK10	GND168	GND260	BC37
AK33	GND169	GND261	BC41
AK34	GND170	GND262	AY14
AK37	GND171	GND263	BC5
AK4	GND172	GND264	C2
AK40	GND173	GND265	D10
AL36	GND174	GND266	D14
AL40	GND175	GND267	D15
AL5	GND176	GND268	D18
AM10	GND177	GND269	D19
AM16	GND178	GND270	D22
AM18	GND179	GND271	D23
AM20	GND180	GND272	D26
AM22	GND181	GND273	D30
AM24	GND182	GND274	D37
AM26	GND183	GND275	D6
AM30	GND184	GND276	E13
AM34	GND185	GND277	E17
AM35	GND186	GND278	E21
AM37	GND187	GND279	E25
AM38	GND188	GND280	E29
AM5	GND189	GND281	E33
AM6	GND190	GND282	F12
AM7	GND191	GND283	F16
AM9	GND192	GND284	F32
AP26	GND193	GND285	F8
AN28	GND194	GND286	G10
AN30	GND195	GND287	G12
AN39	GND196	GND288	G14
AN4	GND197	GND289	G16
Y7	GND198	GND290	BC12
AP10	GND199	GND291	G22
AU26	GND200	GND292	G24
AP14	GND201	GND293	AW20
AU14	GND202	GND294	G34
AP28	GND203	GND295	G4
AP32	GND204	GND296	G43
AP34	GND205	GND297	G6
AP36	GND206	GND298	G8
AP37	GND207	GND299	H11
AP4	GND208	GND300	H15
AP40	GND209	GND301	AW35
AP7	GND210	GND302	H23
AW23	GND211	GND303	AN8
AR28	GND212	GND304	G40
AR32	GND213	GND305	J12
AR40	GND214	GND306	J8
AT10	GND215	GND307	K10
AR12	GND216	GND308	K12
AT13	GND217	GND309	K18
AT29	GND218	GND310	K26
AT33	GND219	GND311	K37
AT6	GND220	GND312	K4
AT7	GND221	GND313	K40
AT9	GND222	GND314	K8
AY21	GND223	GND315	AU1
AY22	GND224	GND316	L40
L12	GND225	GND317	L43
AU12	GND226	GND318	L5
AU28	GND227	GND319	M10
AP33	GND228	GND320	M34
AU32	GND229	GND321	M35
AR30	GND230	GND322	M37
AU36	GND231	GND323	Y28
AU38	GND232	GND324	Y33
AU4	GND233	GND325	Y34
G28	GND234	GND326	Y35
F20	GND235	GND327	Y37
AV28	GND236	GND328	Y38
AV32	GND237	GND329	AB17
AV36	GND238	GND330	AB16
AV4	GND239	GND331	AN26
AV7	GND240	GND332	AD7
AW11	GND241	GND333	M11
G20	GND242	GND334	AA4
AR43	GND243	GND335	AB19
AW43	GND244	GND336	AY13
AY10	GND245	GND337	P11
AV12	GND246	GND338	Y6
AY30	GND247	GND339	T11
AY33	GND248	GND340	V11
AY34	GND249	GND341	Y11
AY37	GND250	GND342	AH16
AY38	GND251	GND343	T22
AY41	GND252		

OMIT

U1400
MCP79-TOPO-B
BGA
(10 OF 11)

POWER

=PPVCORE_S0_MCP
46 24 8
23065 mA (A01, 1.2V)
16996 mA (A01, 1.0V)

AA25	+VDD_CORE1	+VTT_CPU1	R32	=PP1V05_S0_MCP_FSB	8 9 14 24
AC23	+VDD_CORE2	+VTT_CPU2	AC32	1139 mA	1182 mA (A01)
U25	+VDD_CORE3	+VTT_CPU3	E40		
AH12	+VDD_CORE4	+VTT_CPU4	J36		
AG10	+VDD_CORE5	+VTT_CPU5	N32		
AG5	+VDD_CORE6	+VTT_CPU6	T32		
Y21	+VDD_CORE7	+VTT_CPU7	U32		
Y23	+VDD_CORE8	+VTT_CPU8	V32		
AA16	+VDD_CORE9	+VTT_CPU9	W32		
AA26	+VDD_CORE10	+VTT_CPU10	P31		
AA27	+VDD_CORE11	+VTT_CPU11	AF32		
AA28	+VDD_CORE12	+VTT_CPU12	AE32		
AC16	+VDD_CORE13	+VTT_CPU13	AH32		
AC17	+VDD_CORE14	+VTT_CPU14	AJ32		
AC18	+VDD_CORE15	+VTT_CPU15	AK31		
AC19	+VDD_CORE16	+VTT_CPU16	AK32		
AC20	+VDD_CORE17	+VTT_CPU17	AD32		
AC21	+VDD_CORE18	+VTT_CPU18	AL31		
AA17	+VDD_CORE19	+VTT_CPU19	AB32		
AC24	+VDD_CORE20	+VTT_CPU20	B41		
AC25	+VDD_CORE21	+VTT_CPU21	B42		
AC26	+VDD_CORE22	+VTT_CPU22	C40		
AC27	+VDD_CORE23	+VTT_CPU23	C41		
AC28	+VDD_CORE24	+VTT_CPU24	C42		
AD21	+VDD_CORE25	+VTT_CPU25	D39		
AD23	+VDD_CORE26	+VTT_CPU26	D40		
W27	+VDD_CORE27	+VTT_CPU27	D41		
V25	+VDD_CORE28	+VTT_CPU28	E38		
AA18	+VDD_CORE29	+VTT_CPU29	E39		
AE19	+VDD_CORE30	+VTT_CPU30	F37		
AE21	+VDD_CORE31	+VTT_CPU31	F38		
AE23	+VDD_CORE32	+VTT_CPU32	F39		
AE25	+VDD_CORE33	+VTT_CPU33	G36		
AE26	+VDD_CORE34	+VTT_CPU34	G37		
AE27	+VDD_CORE35	+VTT_CPU35	G38		
AE28	+VDD_CORE36	+VTT_CPU36	H35		
AF10	+VDD_CORE37	+VTT_CPU37	H37		
AF11	+VDD_CORE38	+VTT_CPU38	J34		
AA19	+VDD_CORE39	+VTT_CPU39	J35		
AF2	+VDD_CORE40	+VTT_CPU40	K33		
AF21	+VDD_CORE41	+VTT_CPU41	K34		
AF23	+VDD_CORE42	+VTT_CPU42	K35		
AF25	+VDD_CORE43	+VTT_CPU43	L32		
AF3	+VDD_CORE44	+VTT_CPU44	L33		
AF4	+VDD_CORE45	+VTT_CPU45	L34		
AF7	+VDD_CORE46	+VTT_CPU46	M31		
AH23	+VDD_CORE47	+VTT_CPU47	M32		
AF9	+VDD_CORE48	+VTT_CPU48	M33		
AA20	+VDD_CORE49	+VTT_CPU49	N31		
AG11	+VDD_CORE50	+VTT_CPU50	P32		
AG12	+VDD_CORE51	+VTT_CPU51	Y32		
AG21	+VDD_CORE52	+VTT_CPU52	AA32		
AG23	+VDD_CORE53				
AG25	+VDD_CORE54	+VTT_CPUCLK	AG32	43 mA	
AG3	+VDD_CORE55				
AG4	+VDD_CORE56				
AA21	+VDD_CORE57				
AG6	+VDD_CORE58				
AG7	+VDD_CORE59			=PP3V3_S0_MCP	8 21 24
AG8	+VDD_CORE60	+3.3V_1	AD10	450 mA (A01)	
AG9	+VDD_CORE61	+3.3V_2	AE8		
AH1	+VDD_CORE62	+3.3V_3	AB10		
AH10	+VDD_CORE63	+3.3V_4	AD9		
AH11	+VDD_CORE64	+3.3V_5	Y10		
W26	+VDD_CORE65	+3.3V_6	AB11		
AH2	+VDD_CORE66	+3.3V_7	AA8		
AA23	+VDD_CORE67	+3.3V_8	Y9		
W28	+VDD_CORE68				
AH25	+VDD_CORE69			=PP3V3_S5_MCP	8 24
AH21	+VDD_CORE70	+3.3V_DUAL1	G18	16 mA	266 mA (A01)
AH3	+VDD_CORE71	+3.3V_DUAL2	H19		
AH4	+VDD_CORE72	+3.3V_DUAL3	J20		
AH5	+VDD_CORE73	+3.3V_DUAL4	K20		
AH6	+VDD_CORE74				
AH7	+VDD_CORE75	+3.3V_DUAL_USB1	G26	250 mA	
AH9	+VDD_CORE76	+3.3V_DUAL_USB2	H27		
AA24	+VDD_CORE77	+3.3V_DUAL_USB3	J28		
W21	+VDD_CORE78	+3.3V_DUAL_USB4	K28		
W23	+VDD_CORE79				
W25	+VDD_CORE80				
AF12	+VDD_CORE81				
		+VDD_AUXC1	T21	=PP1V05_S5_MCP_VDD_AUXC	8 24
		+VDD_AUXC2	U21	105 mA (A01)	
A20	+VBAT	+VDD_AUXC3	V21		

26 21 PP3V3_G3_RTC
10 uA (G3)
80 uA (S0)

MCP Power & Ground

SYNC_MASTER=T18_MLB SYNC_DATE=06/18/2008

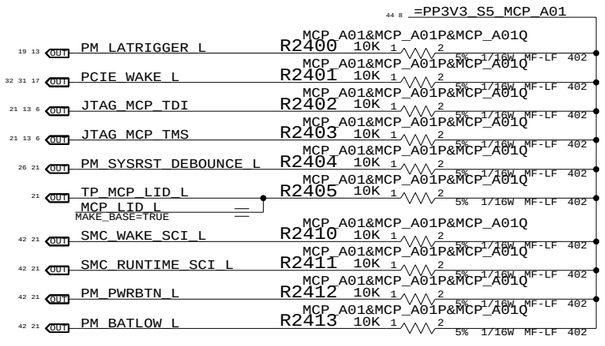
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 22 OF 96	

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

3.3V Interface Pull-ups

These internal pull-ups are missing in Revs A01 & A01P.



MCP79 A01 Silicon Support

SYNC_MASTER=T18_MLB SYNC_DATE=03/31/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 23 OF 96	

MCP Core Power

NV: 1x 10uF 0805, 2x 4.7uF 0402, 3x 1uF 0402, 9x 0.1uF 0402 (23.3 uF)
Apple: 4x 4.7uF 0402, 4x 1uF 0402, 6x 0.1uF 0402 (23.4 uF)

=PPVCORE_S0_MCP
23065 mA (A01, 1.2V)
16996 mA (A01, 1.0V)
(No IG vs. EG data)

C2500 4.7UF 20% 4V X5R 402
C2501 4.7UF 20% 4V X5R 402
C2502 4.7UF 20% 4V X5R 402
C2503 4.7UF 20% 4V X5R 402
C2504 1UF 10% 10V X5R 402-1
C2505 1UF 10% 10V X5R 402-1
C2506 1UF 10% 10V X5R 402-1
C2507 1UF 10% 10V X5R 402-1
C2508 0.1UF 20% 10V CERM 402
C2509 0.1UF 20% 10V CERM 402
C2510 0.1UF 20% 10V CERM 402
C2511 0.1UF 20% 10V CERM 402
C2512 0.1UF 20% 10V CERM 402
C2513 0.1UF 20% 10V CERM 402

MCP PCIE (DVDD) Power

=PP1V05_S0_MCP_PEX_DVDD
57 mA (A01)

C2515 4.7UF 20% 4V X5R 402
C2516 1UF 10% 10V X5R 402-1
C2517 1UF 10% 10V X5R 402-1
C2518 0.1UF 20% 10V CERM 402
C2519 0.1UF 20% 10V CERM 402

MCP SATA (DVDD) Power

=PP1V05_S0_MCP_SATA_DVDD
43 mA (A01)

C2520 4.7UF 20% 4V X5R 402
C2521 0.1UF 20% 10V CERM 402

MCP 1.05V AUX Power

=PP1V05_S5_MCP_VDD_AUXC
105 mA (A01)

C2525 0.1UF 20% 10V CERM 402
C2526 0.1UF 20% 10V CERM 402

MCP 1.05V RMGT Power

=PP1V05_ENET_MCP_RMGT
131 mA (A01)

C2528 4.7UF 20% 4V X5R 402
C2529 0.1UF 20% 10V CERM 402

MCP FSB (VTT) Power

NV: 1x 10uF 0805, 1x 4.7uF 0402, 2x 0.1uF 0402 (14.9 uF)
Apple: 7x 2.2uF 0402 (15.4 uF)

=PP1V05_S0_MCP_FSB
1182 mA (A01)

C2530 2.2UF 20% 6.3V CERM 402-LF
C2531 2.2UF 20% 6.3V CERM 402-LF
C2532 2.2UF 20% 6.3V CERM 402-LF
C2533 2.2UF 20% 6.3V CERM 402-LF
C2534 2.2UF 20% 6.3V CERM 402-LF
C2535 2.2UF 20% 6.3V CERM 402-LF
C2536 2.2UF 20% 6.3V CERM 402-LF

MCP Memory Power

=PP1V8R1V5_S0_MCP_MEM
4771 mA (A01, DDR3)

C2540 4.7UF 20% 4V X5R 402
C2541 0.1UF 20% 10V CERM 402
C2542 0.1UF 20% 10V CERM 402
C2543 0.1UF 20% 10V CERM 402
C2544 0.1UF 20% 10V CERM 402
C2545 0.1UF 20% 10V CERM 402
C2546 0.1UF 20% 10V CERM 402
C2547 0.1UF 20% 10V CERM 402
C2548 0.1UF 20% 10V CERM 402
C2549 0.1UF 20% 10V CERM 402

MCP 3.3V Power

NV: 1x 4.7uF 0603, 4x 0.1uF 0402 (5.1 uF)
Apple: 4x 2.2uF 0402 (8.8 uF)

=PP3V3_S0_MCP
450 mA (A01)

C2550 2.2UF 20% 6.3V CERM 402-LF
C2551 2.2UF 20% 6.3V CERM 402-LF
C2552 2.2UF 20% 6.3V CERM 402-LF
C2553 2.2UF 20% 6.3V CERM 402-LF

MCP 3.3V AUX/USB Power

NV: 1x 4.7uF 0603, 1x 0.1uF 0402 (4.8 uF)
Apple: 1x 2.2uF 0402 (2.2 uF)

=PP3V3_S5_MCP
266 mA (A01)

C2560 2.2UF 20% 6.3V CERM 402-LF

MCP 3.3V/1.5V HDA Power

NV: 1x 4.7uF 0603, 1x 0.1uF 0402 (4.8 uF)
Apple: 1x 2.2uF 0402 (2.2 uF)

=PP3V3R1V5_S0_MCP_HDA
7 mA (A01)

C2562 2.2UF 20% 6.3V CERM 402-LF

=PP1V05_ENET_MCP_PLL_MAC

5 mA (A01)

L2595 30-OHM-1.7A 0402
PP1V05_ENET_MCP_PLL_MAC
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
5 mA (A01)

C2595 4.7UF 20% 4V X5R 402
C2596 0.1UF 20% 10V CERM 402

MCP79 Ethernet VRef

=PP3V3_ENET_MCP_RMGT

R2591 1.47K 1% 1/10W MF-LF 402
R2590 1.47K 1% 1/10W MF-LF 402
MCP_MII_VREF
C2591 0.1UF 20% 10V CERM 402

MCP 3.3V Ethernet Power

NV: 1x 4.7uF 0603, 1x 0.1uF 0402 (4.8 uF)
Apple: 1x 2.2uF 0402 (2.2 uF)

=PP3V3_ENET_MCP_RMGT
83 mA (A01)

C2564 2.2UF 20% 6.3V CERM 402-LF

=PP3V3_S0_MCP_PLL_UF

19 mA (A01)

L2555 30-OHM-1.7A 0402
PP3V3_S0_MCP_PLL_USB
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=3.3V
19 mA (A01)

C2555 2.2UF 20% 6.3V CERM 402-LF

=PP1V05_S0_MCP_AVDD_UF

333 mA (A01)

L2570 30-OHM-5A 0603
PP1V05_S0_MCP_PEX_AVDD
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
206 mA (A01)

NV: 1x 10uF 0805, 1x 4.7uF 0402, 2x 1uF 0402, 2x 0.1uF 0402 (16.9 uF)
Apple: 5x 2.2uF 0402 (11 uF)

C2570 2.2UF 20% 6.3V CERM 402-LF
C2571 2.2UF 20% 6.3V CERM 402-LF
C2572 2.2UF 20% 6.3V CERM 402-LF
C2573 2.2UF 20% 6.3V CERM 402-LF
C2574 2.2UF 20% 6.3V CERM 402-LF

L2575 30-OHM-5A 0603
PP1V05_S0_MCP_SATA_AVDD
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
127 mA (A01)

NV: 1x 10uF 0805, 1x 4.7uF 0402, 2x 0.1uF 0402 (14.9 uF)
Apple: 2x 2.2uF 0402 (4.4 uF)

C2575 2.2UF 20% 6.3V CERM 402-LF
C2576 2.2UF 20% 6.3V CERM 402-LF

=PP1V05_S0_MCP_PLL_UF

562 mA (A01)

R2580 0.2 1% 1/6W MF 402-HF
PP1V05_S0_MCP_PLL_FSB
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
270 mA (A01)

C2580 4.7UF 20% 4V X5R 402
C2581 2.2UF 20% 6.3V CERM 402-LF

L2582 30-OHM-1.7A 0402
PP1V05_S0_MCP_PLL_PEX
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
84 mA (A01)

C2582 4.7UF 20% 4V X5R 402
C2583 0.1UF 20% 10V CERM 402

L2584 30-OHM-1.7A 0402
PP1V05_S0_MCP_PLL_SATA
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
84 mA (A01)

C2584 4.7UF 20% 4V X5R 402
C2585 0.1UF 20% 10V CERM 402

L2586 30-OHM-1.7A 0402
PP1V05_S0_MCP_PLL_CORE
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
87 mA (A01)

C2586 4.7UF 20% 4V X5R 402
C2587 0.1UF 20% 10V CERM 402

L2588 30-OHM-1.7A 0402
PP1V05_S0_MCP_PLL_NV
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
37 mA (A01)

C2588 4.7UF 20% 4V X5R 402
C2589 0.1UF 20% 10V CERM 402
C2590 0.1UF 20% 10V CERM 402

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

MCP Standard Decoupling

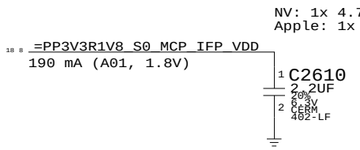
SYNC_MASTER=T18_MLB SYNC_DATE=06/18/2008

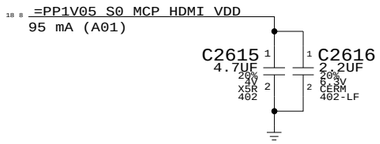
APPLE INC.

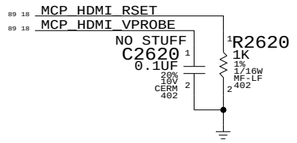
SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 24 OF 96	

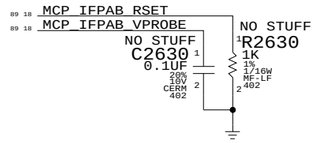
WF: Checklist says 0-ohm resistor placeholder for ferrite bead.

NV: 1x 4.7uF 0603, 1x 0.1uF 0402 (4.8 uF)
Apple: 1x 2.2uF 0402 (2.2 uF)



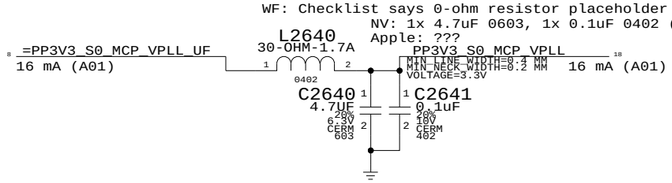


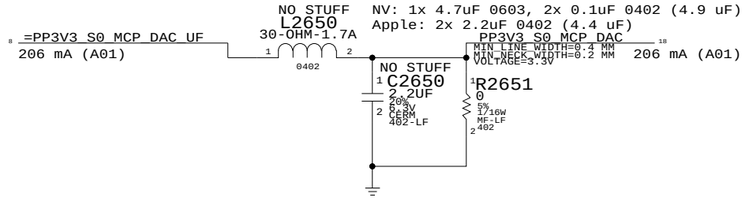




WF: Checklist says 0-ohm resistor placeholder for ferrite bead.

NV: 1x 4.7uF 0603, 1x 0.1uF 0402 (4.8 uF)
Apple: ???



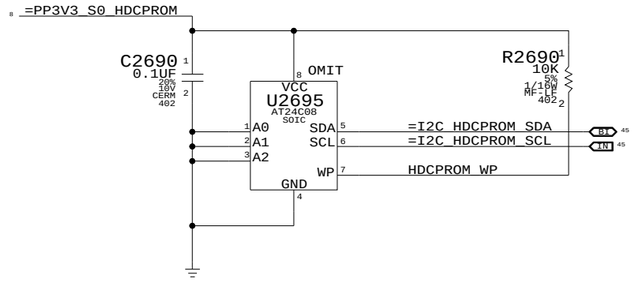


TP_MCP_RGB_RED		NC_MCP_RGB_RED
TP_MCP_RGB_GREEN		NC_MCP_RGB_GREEN
TP_MCP_RGB_BLUE		NC_MCP_RGB_BLUE
TP_MCP_RGB_HSYNC		NC_MCP_RGB_HSYNC
TP_MCP_RGB_VSYNC		NC_MCP_RGB_VSYNC
CRT_IG_R_C_PR		NC_CRT_IG_R_C_PR
CRT_IG_G_Y_Y		NC_CRT_IG_G_Y_Y
CRT_IG_B_COMP_PB		NC_CRT_IG_B_COMP_PB
CRT_IG_HSYNC		NC_CRT_IG_HSYNC
CRT_IG_VSYNC		NC_CRT_IG_VSYNC
TP_MCP_RGB_DAC_RSET		NC_MCP_RGB_DAC_RSET
TP_MCP_RGB_DAC_VREF		NC_MCP_RGB_DAC_VREF
MCP_TV_DAC_RSET		NC_MCP_TV_DAC_RSET
MCP_TV_DAC_VREF		NC_MCP_TV_DAC_VREF
MCP_CLK27M_XTALIN		NC_MCP_CLK27M_XTALIN
MCP_CLK27M_XTALOUT		NC_MCP_CLK27M_XTALOUT

All NC_ nets: MAKE_BASE=TRUE

HDCP ROM

WF: Open question on which packge option(s) nVidia can support.



Current numbers from email Xiaowei Lin provided 11/12/2007 3:22pm (no official document number).

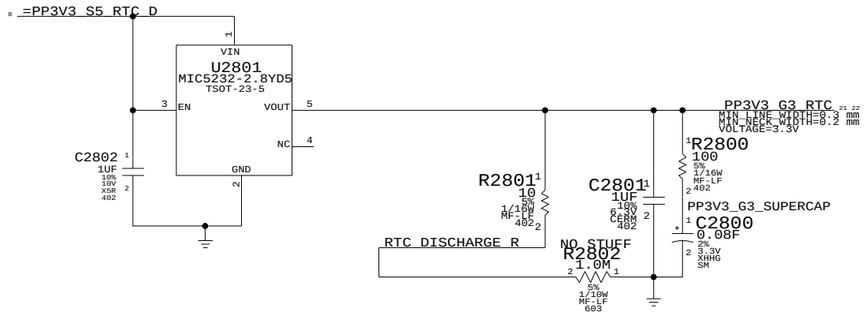
MCP Graphics Support

SYNC_MASTER=AMASON_M98_MLB SYNC_DATE=06/18/2008

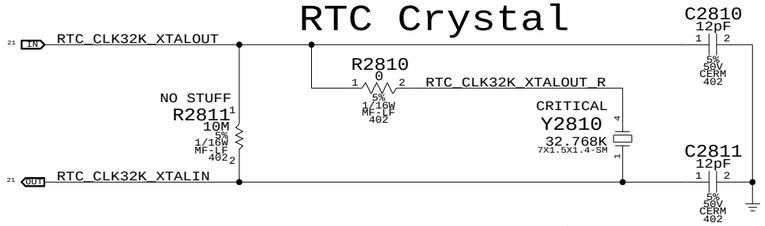
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT: 25	OF: 96

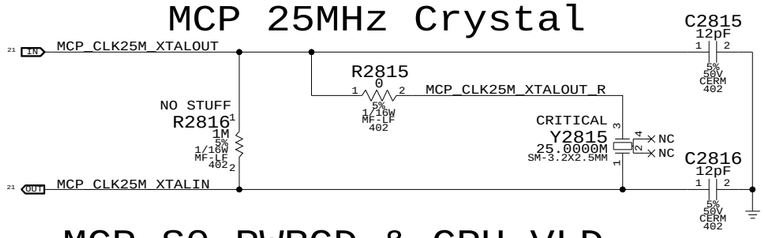
RTC Power Sources



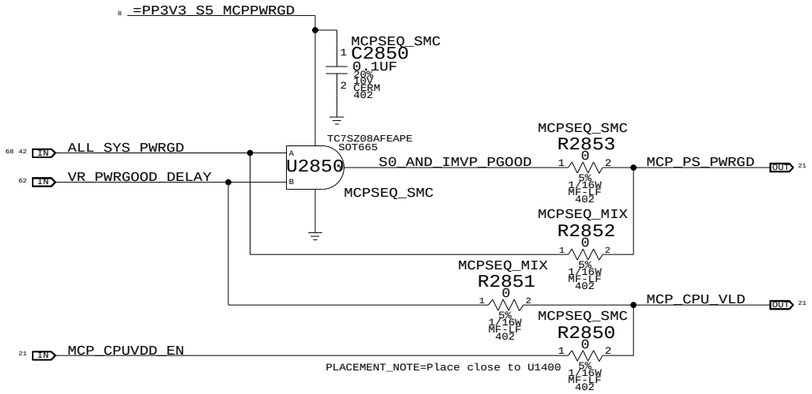
RTC Crystal



MCP 25MHz Crystal



MCP S0 PWRGD & CPU_VLD



MCPSEQ_SMC represents MCP79 'MLB' power sequencing connections, but results in MCP79 ROMSIP sequence happening after CPU powers up.

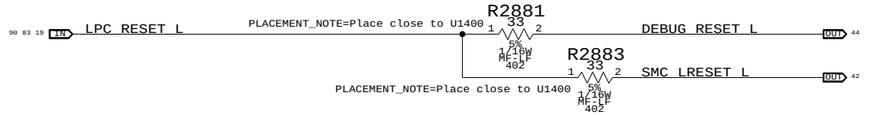
MCPSEQ_MIX is cross between MLB and internal power sequencing, which results in earlier ROMSIP and MCP FSB I/O interface initialization.

SMC 99ms delay from ALL_SYS_PWRGD to IMVP_VR_ON plus IMVP6 delay for VR_PWRGOOD_DELAY should guarantee CPU_VLD does not go high before CPUVDD_EN (which is 40-100ms after PS_PWRGD assertion).

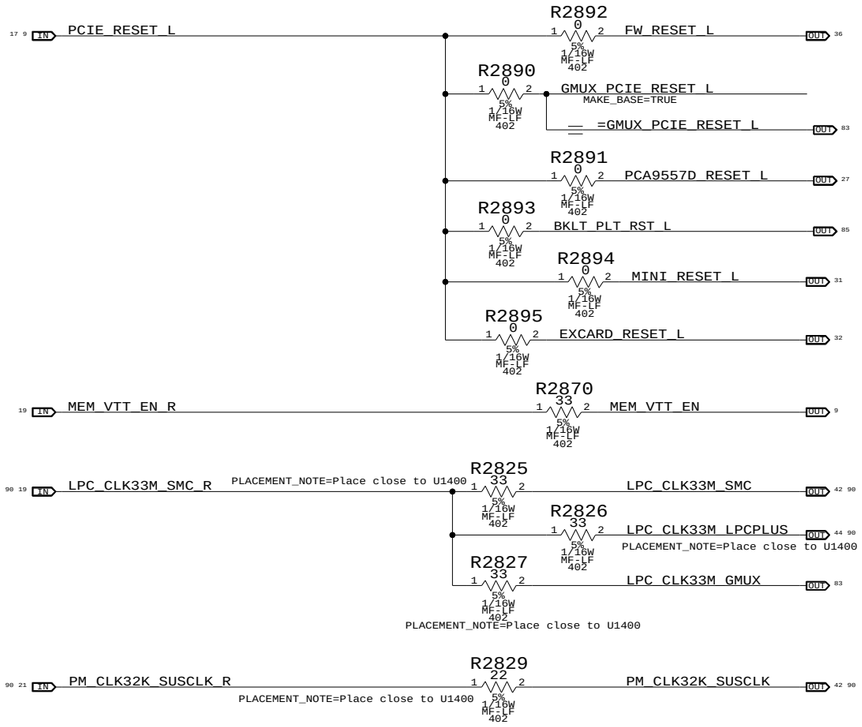
NOTE: If CPU_VLD deasserts during S0 MCP79 will take system to S5 immediately.

Platform Reset Connections

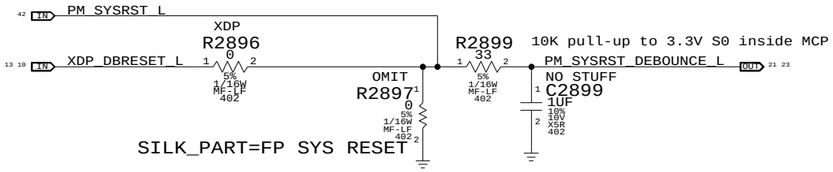
LPC Reset (Unbuffered)



PCIE Reset (Unbuffered)



Reset Button



SB Misc

SYNC_MASTER=T18_MLB SYNC_DATE=12/17/2007

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 26 OF 96	

Page Notes

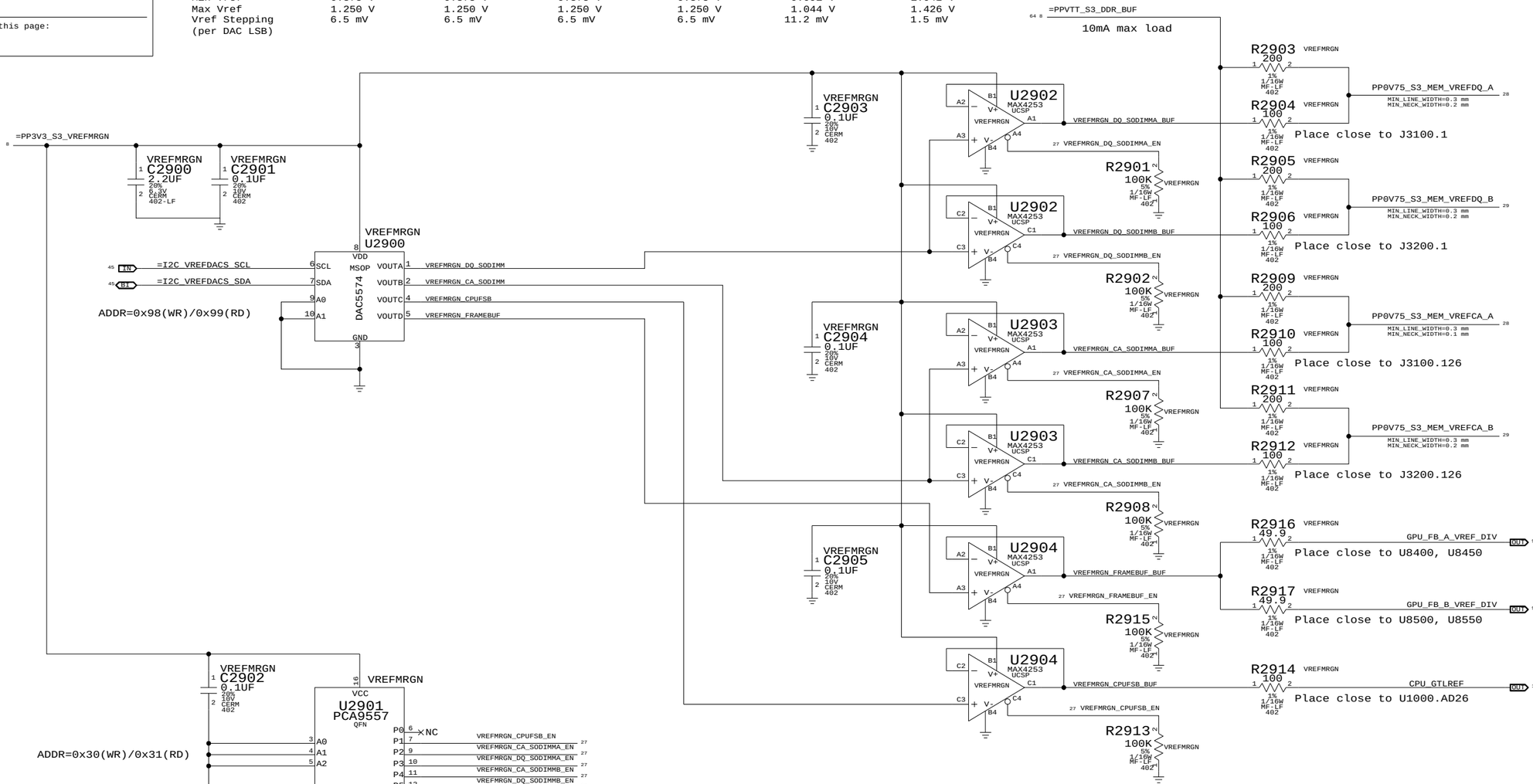
Power aliases required by this page:
- =PP3V3_S3_VREFMRGN
- =PP3V3_S5_VREFMRGN
- =PPVTT_S3_DDR_BUF

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
NO_VREFMRGN

	MEM A VREF DQ	MEM A VREF CA	MEM B VREF DQ	MEM B VREF CA	CPU FSB VREF	FRAME BUFFER VREF
DAC channel	A	B	A	B	C	D
Min DAC code	0x00	0x00	0x00	0x00	0x00	0x00
Max DAC code	0x87	0x87	0x87	0x87	0x55	0xFF
Max sink I	-3.75 mA	-3.75 mA	-3.75 mA	-3.75 mA	-0.91 mA	-59.04 mA
Max source I	5 mA	5 mA	5 mA	5 mA	0.52 mA	51.15 mA
Nominal Vref	0.75 V	0.75 V	0.75 V	0.75 V	0.70 V	1.248 V
Min Vref	0.375 V	0.375 V	0.375 V	0.375 V	0.091 V	1.042 V
Max Vref	1.250 V	1.250 V	1.250 V	1.250 V	1.044 V	1.426 V
Vref Stepping (per DAC LSB)	6.5 mV	6.5 mV	6.5 mV	6.5 mV	11.2 mV	1.5 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
116S0004	1	RES,MTL FILM,0,5%,0402,SM,LF	R2903	CRITICAL	NO_VREFMRGN
116S0004	1	RES,MTL FILM,0,5%,0402,SM,LF	R2905	CRITICAL	NO_VREFMRGN
116S0004	1	RES,MTL FILM,0,5%,0402,SM,LF	R2909	CRITICAL	NO_VREFMRGN
116S0004	1	RES,MTL FILM,0,5%,0402,SM,LF	R2911	CRITICAL	NO_VREFMRGN

FSB/DDR3/FRAMEBUF Vref Margining

SYNC_MASTER=DDR SYNC_DATE=07/22/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0

SCALE: NONE SHT: 27 OF: 96

DDR3 PLANE STITCHING CAPS (SPACE EVENLY ACROSS PLANE SPLIT)

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

BOM options provided by this page:
(NONE)

8 =PP1V5_S0_MEM_A

8 =PP1V5_S3_MEM_A

C3100 10UF 20% 6.3V X6S 603
C3101 10UF 20% 6.3V X6S 603

C3110 C3111 C3112 C3113 C3114 C3115 C3116 C3117 C3118 C3119 C3120 C3121 C3122 C3123
0.1UF 20% 10V CERM 402

27 PP0V75_S3_MEM_VREFDQ_A

C3130 2.2UF 20% 6.3V CERM 402-LF
C3131 0.1UF 20% 10V CERM 402

J3100 F-RT-THB — DDR3-SODIMM-DUAL-M97-3 (SYMBOL 2 OF 2)

	MEM_A_CKE<0>	IN	73	CKE0	CKE1	74	MEM_A_CKE<1>
			75	VDD	VDD	76	
			77	NC	A15	78	MEM_A_A<15>
	MEM_A_BA<2>	IN	79	BA2	A14	80	MEM_A_A<14>
			81	VDD	VDD	82	
	MEM_A_A<12>	IN	83	A12/BC*	A11	84	MEM_A_A<11>
	MEM_A_A<9>	IN	85	A9	A7	86	MEM_A_A<7>
			87	VDD	VDD	88	
	MEM_A_A<8>	IN	89	A8	A6	90	MEM_A_A<6>
	MEM_A_A<5>	IN	91	A5	A4	92	MEM_A_A<4>
			93	VDD	VDD	94	
	MEM_A_A<3>	IN	95	A3	A2	96	MEM_A_A<2>
	MEM_A_A<1>	IN	97	A1	A0	98	MEM_A_A<0>
			99	VDD	VDD	100	
	MEM_A_CLK_P<0>	IN	101	CK0	CK1	102	MEM_A_CLK_P<1>
	MEM_A_CLK_N<0>	IN	103	CK0*	CK1*	104	MEM_A_CLK_N<1>
			105	VDD	VDD	106	
	MEM_A_A<10>	IN	107	A10/AP	BA1	108	MEM_A_BA<1>
	MEM_A_BA<0>	IN	109	BA0	RAS*	110	MEM_A_RAS_L
			111	VDD	VDD	112	
	MEM_A_WE_L	IN	113	WE*	S0*	114	MEM_A_CS_L<0>
	MEM_A_CAS_L	IN	115	CAS*	ODT0	116	MEM_A_ODT<0>
			117	VDD	VDD	118	
	MEM_A_A<13>	IN	119	A13	ODT1	120	MEM_A_ODT<1>
	MEM_A_CS_L<1>	IN	121	S1*	NC	122	
			123	VDD	VDD	124	
			125	TEST	VREFCA	126	
			127	VSS	VSS	128	
	MEM_A_DQ<33>	BI	129	DQ32	DQ36	130	MEM_A_DQ<36>
	MEM_A_DQ<32>	BI	131	DQ33	DQ37	132	MEM_A_DQ<37>
			133	VSS	VSS	134	
	MEM_A_DQS_N<4>	BI	135	DQS4*	DM4	136	MEM_A_DM<4>
	MEM_A_DQS_P<4>	BI	137	DQS4	VSS	138	
			139	VSS	DQ38	140	MEM_A_DQ<38>
	MEM_A_DQ<34>	BI	141	DQ34	DQ39	142	MEM_A_DQ<39>
	MEM_A_DQ<35>	BI	143	DQ35	VSS	144	
			145	VSS	DQ44	146	MEM_A_DQ<47>
	MEM_A_DQ<44>	BI	147	DQ40	DQ45	148	MEM_A_DQ<40>
	MEM_A_DQ<41>	BI	149	DQ41	VSS	150	
			151	VSS	DQS5*	152	MEM_A_DQS_N<5>
	MEM_A_DM<5>	IN	153	DM5	DQS5	154	MEM_A_DQS_P<5>
			155	VSS	VSS	156	
	MEM_A_DQ<45>	BI	157	DQ42	DQ46	158	MEM_A_DQ<46>
	MEM_A_DQ<42>	BI	159	DQ43	DQ47	160	MEM_A_DQ<43>
			161	VSS	VSS	162	
	MEM_A_DQ<52>	BI	163	DQ48	DQ52	164	MEM_A_DQ<48>
	MEM_A_DQ<51>	BI	165	DQ49	DQ53	166	MEM_A_DQ<53>
			167	VSS	VSS	168	
	MEM_A_DQS_N<6>	BI	169	DQS6*	DM6	170	MEM_A_DM<6>
	MEM_A_DQS_P<6>	BI	171	DQS6	VSS	172	
			173	VSS	DQ54	174	MEM_A_DQ<50>
	MEM_A_DQ<55>	BI	175	DQ50	DQ55	176	MEM_A_DQ<49>
	MEM_A_DQ<54>	BI	177	DQ51	VSS	178	
			179	VSS	DQ60	180	MEM_A_DQ<57>
	MEM_A_DQ<61>	BI	181	DQ56	DQ61	182	MEM_A_DQ<56>
	MEM_A_DQ<60>	BI	183	DQ57	VSS	184	
			185	VSS	DQS7*	186	MEM_A_DQS_N<7>
	MEM_A_DM<7>	IN	187	DM7	DQS7	188	MEM_A_DQS_P<7>
			189	VSS	VSS	190	
	MEM_A_DQ<58>	BI	191	DQ58	DQ62	192	MEM_A_DQ<62>
	MEM_A_DQ<59>	BI	193	DQ59	DQ63	194	MEM_A_DQ<63>
			195	VSS	VSS	196	
	MEM_A_SA<0>		197	SA0	EVENT*	198	MEM_EVENT_L
			199	VDDSPD	SDA	200	=I2C_SODIMMA_SDA
	MEM_A_SA<1>		201	SA1	SCL	202	=I2C_SODIMMA_SCL
			203	VTT	VTT	204	=PP0V75_S0_MEM_VTT_A

516-0196
SPD ADDR=0xA0(WR)/0xA1(RD)

8 =PPSPD_S0_MEM_A

C3140 2.2UF 20% 6.3V CERM 402-LF
R3140 10K 5% 1/16W MF-LF 402
R3141 10K 5% 1/16W MF-LF 402

J3100 F-RT-THB — DDR3-SODIMM-DUAL-M97-3 (SYMBOL 1 OF 2) — CRITICAL

			1	VREFDQ	VSS	2	
	MEM_A_DQ<0>	BI	3	VSS	DQ4	4	MEM_A_DQ<4>
	MEM_A_DQ<1>	BI	5	DQ0	DQ5	6	MEM_A_DQ<5>
			7	DQ1	VSS	8	
	MEM_A_DM<0>	IN	9	VSS	DQS0*	10	MEM_A_DQS_N<0>
			11	DM0	DQS0	12	MEM_A_DQS_P<0>
			13	VSS	VSS	14	
	MEM_A_DQ<3>	BI	15	DQ2	DQ6	16	MEM_A_DQ<6>
	MEM_A_DQ<2>	BI	17	DQ3	DQ7	18	MEM_A_DQ<7>
			19	VSS	VSS	20	
	MEM_A_DQ<9>	BI	21	DQ8	DQ12	22	MEM_A_DQ<8>
	MEM_A_DQ<13>	BI	23	DQ9	DQ13	24	MEM_A_DQ<12>
			25	VSS	VSS	26	
	MEM_A_DQS_N<1>	BI	27	DQS1*	DM1	28	MEM_A_DM<1>
	MEM_A_DQS_P<1>	BI	29	DQS1	RESET*	30	MEM_RESET_L
			31	VSS	VSS	32	
	MEM_A_DQ<11>	BI	33	DQ10	DQ14	34	MEM_A_DQ<15>
	MEM_A_DQ<14>	BI	35	DQ11	DQ15	36	MEM_A_DQ<10>
			37	VSS	VSS	38	
	MEM_A_DQ<16>	BI	39	DQ16	DQ20	40	MEM_A_DQ<21>
	MEM_A_DQ<18>	BI	41	DQ17	DQ21	42	MEM_A_DQ<20>
			43	VSS	VSS	44	
	MEM_A_DQS_N<2>	BI	45	DQS2*	DM2	46	MEM_A_DM<2>
	MEM_A_DQS_P<2>	BI	47	DQS2	VSS	48	
			49	VSS	DQ22	50	MEM_A_DQ<17>
	MEM_A_DQ<23>	BI	51	DQ18	DQ23	52	MEM_A_DQ<22>
	MEM_A_DQ<19>	BI	53	DQ19	VSS	54	
			55	VSS	DQ28	56	MEM_A_DQ<29>
	MEM_A_DQ<24>	BI	57	DQ24	DQ29	58	MEM_A_DQ<28>
	MEM_A_DQ<30>	BI	59	DQ25	VSS	60	
			61	VSS	DQS3*	62	MEM_A_DQS_N<3>
	MEM_A_DM<3>	IN	63	DM3	DQS3	64	MEM_A_DQS_P<3>
			65	VSS	VSS	66	
	MEM_A_DQ<27>	BI	67	DQ26	DQ30	68	MEM_A_DQ<26>
	MEM_A_DQ<25>	BI	69	DQ27	DQ31	70	MEM_A_DQ<31>
			71	VSS	VSS	72	

516-0196

PP0V75_S3_MEM_VREFCA_A 27

C3135 2.2UF 20% 6.3V CERM 402-LF
C3136 0.1UF 20% 10V CERM 402

"Factory" (top) slot

DDR3 SO-DIMM Connector A

SYNC_MASTER=DDR SYNC_DATE=07/22/2008

NOTICE OF PROPRIETARY PROPERTY

THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING

I TO MAINTAIN THE DOCUMENT IN CONFIDENCE

II NOT TO REPRODUCE OR COPY IT

III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 28 OF 96	

DDR3 PLANE STITCHING CAPS (SPACE EVENLY ACROSS PLANE SPLIT)

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

BOM options provided by this page:
(NONE)

8 =PP1V5_S0_MEM_B

8 =PP1V5_S3_MEM_B

C3210 0.1UF 20% 10V CERM 402
C3211 0.1UF 20% 10V CERM 402
C3212 0.1UF 20% 10V CERM 402
C3213 0.1UF 20% 10V CERM 402
C3214 0.1UF 20% 10V CERM 402
C3215 0.1UF 20% 10V CERM 402
C3216 0.1UF 20% 10V CERM 402
C3217 0.1UF 20% 10V CERM 402
C3218 0.1UF 20% 10V CERM 402
C3219 0.1UF 20% 10V CERM 402
C3220 0.1UF 20% 10V CERM 402
C3221 0.1UF 20% 10V CERM 402
C3222 0.1UF 20% 10V CERM 402
C3223 0.1UF 20% 10V CERM 402

C3200 10UF 20% 6.3V X6S 603
C3201 10UF 20% 6.3V X6S 603

27 PP0V75_S3_MEM_VREFDQ_B

C3230 2.2UF 20% 6.3V CERM 402-LF
C3231 0.1UF 20% 10V CERM 402

J3200 F-RT-BGA3 DDR3-SODIMM (2 OF 2)

MEM_B_CKE<0>	IN	73	CKE0	CKE1	74	MEM_B_CKE<1>	IN
		75	VDD	VDD	76		
		77	NC	A15	78	MEM_B_A<15>	IN
MEM_B_BA<2>	IN	79	BA2	A14	80	MEM_B_A<14>	IN
		81	VDD	VDD	82		
MEM_B_A<12>	IN	83	A12/BC*	A11	84	MEM_B_A<11>	IN
MEM_B_A<9>	IN	85	A9	A7	86	MEM_B_A<7>	IN
		87	VDD	VDD	88		
MEM_B_A<8>	IN	89	A8	A6	90	MEM_B_A<6>	IN
MEM_B_A<5>	IN	91	A5	A4	92	MEM_B_A<4>	IN
		93	VDD	VDD	94		
MEM_B_A<3>	IN	95	A3	A2	96	MEM_B_A<2>	IN
MEM_B_A<1>	IN	97	A1	A0	98	MEM_B_A<0>	IN
		99	VDD	VDD	100		
MEM_B_CLK_P<0>	IN	101	CK0	CK1	102	MEM_B_CLK_P<1>	IN
MEM_B_CLK_N<0>	IN	103	CK0*	CK1*	104	MEM_B_CLK_N<1>	IN
		105	VDD	VDD	106		
MEM_B_A<10>	IN	107	A10/AP	BA1	108	MEM_B_BA<1>	IN
MEM_B_BA<0>	IN	109	BA0	RAS*	110	MEM_B_RAS_L	IN
		111	VDD	VDD	112		
MEM_B_WE_L	IN	113	WE*	S0*	114	MEM_B_CS_L<0>	IN
MEM_B_CAS_L	IN	115	CAS*	ODT0	116	MEM_B_ODT<0>	IN
		117	VDD	VDD	118		
MEM_B_A<13>	IN	119	A13	ODT1	120	MEM_B_ODT<1>	IN
MEM_B_CS_L<1>	IN	121	S1*	NC	122		
		123	VDD	VDD	124		
		125	TEST	VREFCA	126		
		127	VSS	VSS	128		
MEM_B_DQ<32>	BI	129	DQ32	DQ36	130	MEM_B_DQ<33>	BI
MEM_B_DQ<37>	BI	131	DQ33	DQ37	132	MEM_B_DQ<36>	BI
		133	VSS	VSS	134		
MEM_B_DQS_N<4>	BI	135	DQS4*	DM4	136	MEM_B_DM<4>	IN
MEM_B_DQS_P<4>	BI	137	DQS4	VSS	138		
		139	VSS	DQ38	140	MEM_B_DQ<38>	BI
MEM_B_DQ<34>	BI	141	DQ34	DQ39	142	MEM_B_DQ<39>	BI
MEM_B_DQ<35>	BI	143	DQ35	VSS	144		
		145	VSS	DQ44	146	MEM_B_DQ<44>	BI
MEM_B_DQ<41>	BI	147	DQ40	DQ45	148	MEM_B_DQ<45>	BI
MEM_B_DQ<40>	BI	149	DQ41	VSS	150		
		151	VSS	DQS5*	152	MEM_B_DQS_N<5>	BI
MEM_B_DM<5>	IN	153	DM5	DQS5	154	MEM_B_DQS_P<5>	BI
		155	VSS	VSS	156		
MEM_B_DQ<43>	BI	157	DQ42	DQ46	158	MEM_B_DQ<47>	BI
MEM_B_DQ<42>	BI	159	DQ43	DQ47	160	MEM_B_DQ<46>	BI
		161	VSS	VSS	162		
MEM_B_DQ<55>	BI	163	DQ48	DQ52	164	MEM_B_DQ<48>	BI
MEM_B_DQ<49>	BI	165	DQ49	DQ53	166	MEM_B_DQ<54>	BI
		167	VSS	VSS	168		
MEM_B_DQS_N<6>	BI	169	DQS6*	DM6	170	MEM_B_DM<6>	IN
MEM_B_DQS_P<6>	BI	171	DQS6	VSS	172		
		173	VSS	DQ54	174	MEM_B_DQ<53>	BI
MEM_B_DQ<52>	BI	175	DQ50	DQ55	176	MEM_B_DQ<50>	BI
MEM_B_DQ<51>	BI	177	DQ51	VSS	178		
		179	VSS	DQ60	180	MEM_B_DQ<60>	BI
MEM_B_DQ<56>	BI	181	DQ56	DQ61	182	MEM_B_DQ<61>	BI
MEM_B_DQ<57>	BI	183	DQ57	VSS	184		
		185	VSS	DQS7*	186	MEM_B_DQS_N<7>	BI
MEM_B_DM<7>	IN	187	DM7	DQS7	188	MEM_B_DQS_P<7>	BI
		189	VSS	VSS	190		
MEM_B_DQ<63>	BI	191	DQ58	DQ62	192	MEM_B_DQ<58>	BI
MEM_B_DQ<59>	BI	193	DQ59	DQ63	194	MEM_B_DQ<62>	BI
		195	VSS	VSS	196		
MEM_B_SA<0>		197	SA0	EVENT*	198	MEM_EVENT_L	OUT
		199	VDDSPD	SDA	200	=I2C_SODIMMB_SDA	BI
MEM_B_SA<1>		201	SA1	SCL	202	=I2C_SODIMMB_SCL	IN
		203	VTT	VTT	204	=PP0V75_S0_MEM_VTT_B	8
		205	MTG PIN	MTG PIN	206		
		207	MTG PIN	MTG PIN	208		
		209	MTG PIN	MTG PIN	210		
		211	MTG PIN	MTG PIN	212		

MTG PINS

516s0704

SPD ADDR=0xA2(WR)/0xA3(RD)

J3200 F-RT-BGA3 DDR3-SODIMM (1 OF 2) CRITICAL

		1	VREFDQ	VSS	2		
MEM_B_DQ<0>	BI	3	VSS	DQ4	4	MEM_B_DQ<4>	BI
MEM_B_DQ<1>	BI	5	DQ0	DQ5	6	MEM_B_DQ<5>	BI
		7	DQ1	VSS	8		
MEM_B_DM<0>	IN	9	VSS	DQS0*	10	MEM_B_DQS_N<0>	BI
		11	DM0	DQS0	12	MEM_B_DQS_P<0>	BI
		13	VSS	VSS	14		
MEM_B_DQ<2>	BI	15	DQ2	DQ6	16	MEM_B_DQ<6>	BI
MEM_B_DQ<3>	BI	17	DQ3	DQ7	18	MEM_B_DQ<7>	BI
		19	VSS	VSS	20		
MEM_B_DQ<28>	BI	21	DQ8	DQ12	22	MEM_B_DQ<29>	BI
MEM_B_DQ<24>	BI	23	DQ9	DQ13	24	MEM_B_DQ<25>	BI
		25	VSS	VSS	26		
MEM_B_DQS_N<3>	BI	27	DQS1*	DM1	28	MEM_B_DM<3>	IN
MEM_B_DQS_P<3>	BI	29	DQS1	RESET*	30	MEM_RESET_L	IN
		31	VSS	VSS	32		
MEM_B_DQ<31>	BI	33	DQ10	DQ14	34	MEM_B_DQ<26>	BI
MEM_B_DQ<30>	BI	35	DQ11	DQ15	36	MEM_B_DQ<27>	BI
		37	VSS	VSS	38		
MEM_B_DQ<9>	BI	39	DQ16	DQ20	40	MEM_B_DQ<13>	BI
MEM_B_DQ<8>	BI	41	DQ17	DQ21	42	MEM_B_DQ<12>	BI
		43	VSS	VSS	44		
MEM_B_DQS_N<1>	BI	45	DQS2*	DM2	46	MEM_B_DM<1>	IN
MEM_B_DQS_P<1>	BI	47	DQS2	VSS	48		
		49	VSS	DQ22	50	MEM_B_DQ<14>	BI
MEM_B_DQ<15>	BI	51	DQ18	DQ23	52	MEM_B_DQ<11>	BI
MEM_B_DQ<10>	BI	53	DQ19	VSS	54		
		55	VSS	DQ28	56	MEM_B_DQ<20>	BI
MEM_B_DQ<21>	BI	57	DQ24	DQ29	58	MEM_B_DQ<16>	BI
MEM_B_DQ<17>	BI	59	DQ25	VSS	60		
		61	VSS	DQS3*	62	MEM_B_DQS_N<2>	BI
MEM_B_DM<2>	IN	63	DM3	DQS3	64	MEM_B_DQS_P<2>	BI
		65	VSS	VSS	66		
MEM_B_DQ<18>	BI	67	DQ26	DQ30	68	MEM_B_DQ<19>	BI
MEM_B_DQ<22>	BI	69	DQ27	DQ31	70	MEM_B_DQ<23>	BI
		71	VSS	VSS	72		

KEY

516s0704

PP0V75_S3_MEM_VREFCA_B 27

C3235 2.2UF 20% 6.3V CERM 402-LF
C3236 0.1UF 20% 10V CERM 402

R3240 10K 5% 1/16W MF-LF 402
R3241 10K 5% 1/16W MF-LF 402

8 =PPSPD_S0_MEM_B

C3240 2.2UF 20% 6.3V CERM 402-LF

"Expansion" (bottom) slot

DDR3 SO-DIMM Connector B

SYNC_MASTER=DDR SYNC_DATE=07/22/2008

NOTICE OF PROPRIETARY PROPERTY

THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING

I TO MAINTAIN THE DOCUMENT IN CONFIDENCE

II NOT TO REPRODUCE OR COPY IT

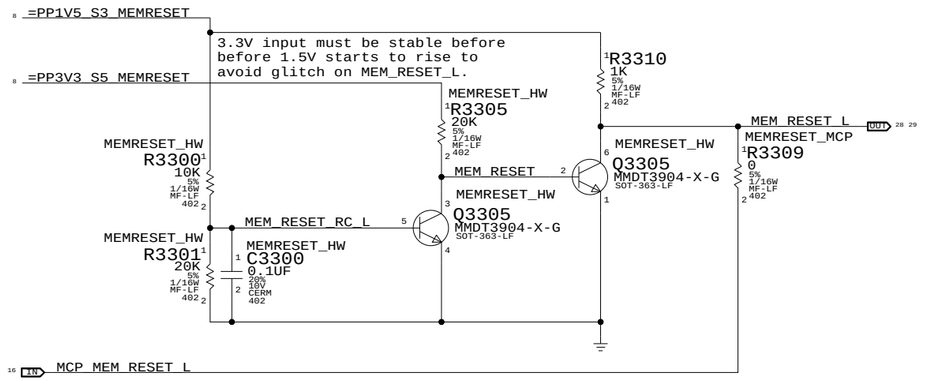
III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 29 OF 96	

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.



DDR3 Support

SYNC_MASTER=T18_MLB SYNC_DATE=06/18/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 30 OF 96	

PCIE_MINI_PRSNT_L

Q3401
SSM6N15FEAPE
SOT563

AP_PWR_EN

MINI_CLKREQ_L

Q3401
SSM6N15FEAPE
SOT563

5V S3 WLAN FET

MOSFET	FDC606P
CHANNEL	P-TYPE
RDS(ON)	26 mOhm @4.5V
LOADING	0.8 A (EDP)

CRITICAL
518S0610
J3401
20347-325E-12
F-RT-SM

PLACEMENT_NOTE=Place close to J3401.

C3431 0.1uF 10% 16V X5R 402 — PCIE_MINI_R2D_C_P

C3430 0.1uF 10% 16V X5R 402 — PCIE_MINI_R2D_C_N

PLACEMENT_NOTE=Place close to J3401.

PCIE_MINI_D2R_P
PCIE_MINI_D2R_N
PCIE_MINI_R2D_P
PCIE_MINI_R2D_N
PCIE_CLK100M_MINI_CONN_P
PCIE_CLK100M_MINI_CONN_N
MINI_CLKREQ_O_L
PCIE_WAKE_L

L3401
90-OHM-100MA
DLP11S

PCIE_CLK100M_MINI_P
PCIE_CLK100M_MINI_N

PLACEMENT_NOTE=Place close to J3401.

AIRPORT

1000 mA peak
750 mA nominal max

L3404
FERR-120-OHM-1.5A
0402-LF

PP5V_WLAN
MIN_LINE_WIDTH=1 mm
MIN_NECK_WIDTH=0.5 mm
VOLTAGE=5V

C3422 0.1UF 10% 16V CERM 402
C3421 0.1UF 10% 16V CERM 402
C3420 10UF 20% 16V X5R 805

PLACEMENT_NOTE=Place close to J3401.
PLACEMENT_NOTE=Place close to Q3450.
PLACEMENT_NOTE=Place close to Q3450.

PP5V_WLAN_F
MIN_LINE_WIDTH=1 mm
MIN_NECK_WIDTH=0.5 mm
VOLTAGE=5V

Q3450
FDC606P_G
SOT-6

C3450 0.1UF 10% 16V X5R 402
C3451 0.033UF 10% 16V X5R 402
R3450 100K 5% 1/16W MF-LF 402
R3451 10K 5% 1/16W MF-LF 402

P5VWLAN_SS

=PP5V_S3_WLAN
MIN_LINE_WIDTH=1 mm
MIN_NECK_WIDTH=0.5 mm
VOLTAGE=5V

PM_WLAN_EN_L

ALS
CAMERA

275 mA peak
200 mA nominal max

L3405
FERR-120-OHM-1.5A
0402-LF

C3452 0.1UF 10% 16V CERM 402

PP5V_S3_BTCAMERA_F
MIN_LINE_WIDTH=0.5 mm
MIN_NECK_WIDTH=0.25 mm
VOLTAGE=5V

=PP5V_S3_BTCAMERA
MIN_LINE_WIDTH=0.5 mm
MIN_NECK_WIDTH=0.25 mm
VOLTAGE=5V

I2C_ALS_SDA
I2C_ALS_SCL

USB_CAMERA_CONN_P
USB_CAMERA_CONN_N

L3402
90-OHM
DLP0NS

USB_CAMERA_P
USB_CAMERA_N

PLACEMENT_NOTE=Place close to J3401.

BLUETOOTH

CONN_USB2_BT_P
CONN_USB2_BT_N

L3403
90-OHM
DLP0NS

USB_BT_P
USB_BT_N

PLACEMENT_NOTE=Place close to J3401.

PP5V_WLAN_F

=PP3V3_S3_WLAN

R3453 33K 5% 1/16W MF-LF 402

U3402
74LVC1G17DRL
SOT-553

TC7SZ08AFEAPE
SOT665
U3401

WLAN_SMIT_BUF
WLAN_SMIT_RC

C3453 1UF 10% 6.3V CERM 402

R3454 62K 5% 1/16W MF-LF 402

MINI_RESET_CONN_L
MINI_RESET_L

Right Clutch Connector

SYNC_MASTER=YITE_M98_MLB SYNC_DATE=07/02/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 31 OF 96	

EXPRESSCARD/34 FLEX CONNECTOR

INPUT DECOUPLING

=PP3V3_S3_EXCARD
C3530 0.1uF 20% 10V CERM 402
C3531 10uF 20% 6.3V X5R 603

=PP1V5_S0_EXCARD
C3534 0.1uF 20% 10V CERM 402
C3535 10uF 20% 6.3V X5R 603

L3502 90-OHM DLP0NS
USB_EXCARD_N → USB2_EXCARD_CONN_N
USB_EXCARD_P → USB2_EXCARD_CONN_P
PLACEMENT_NOTE=Place close to J3500

L3503 90-OHM-100MA DLP11S
PCIE_CLK100M_EXCARD_N → PCIE_CLK100M_EXCARD_CONN_N
PCIE_CLK100M_EXCARD_P → PCIE_CLK100M_EXCARD_CONN_P
PLACEMENT_NOTE=Place close to J3500

PLACEMENT_NOTE=Place close to J3500
C3571 0.1uF 10% 16V X5R 402
PCIE_EXCARD_R2D_C_N → PCIE_EXCARD_R2D_N
PCIE_EXCARD_R2D_C_P → PCIE_EXCARD_R2D_P
C3570 0.1uF 10% 16V X5R 402
PLACEMENT_NOTE=Place close to J3500

CRITICAL
J3500 502250-8727 F-RT-SM

PCIE_EXCARD_R2D_N	4	3	PCIE_EXCARD_R2D_P
PCIE_EXCARD_D2R_P	6	5	PCIE_EXCARD_D2R_N
PCIE_CLK100M_EXCARD_CONN_N	10	9	PCIE_CLK100M_EXCARD_CONN_P
EXCARD_CLKREQ_CONN_L	12	11	EXCARD_CPPE_L
PP3V3_S0_EXCARD_SWITCH	14	13	PP3V3_S0_EXCARD_SWITCH
PP3V3_S3_EXCARD_SWITCH	16	15	PLT_RESET_SWITCH_L
PP1V5_S0_EXCARD_SWITCH	18	17	PCIE_WAKE_L
=SMBUS_EXCARD_SDA	20	19	PP1V5_S0_EXCARD_SWITCH
NC	22	21	=SMBUS_EXCARD_SCL
EXCARD_CPUSB_L	24	23	NC
USB2_EXCARD_CONN_N	26	25	USB2_EXCARD_CONN_P
		27	
		28	
		29	

EXCARD_CPPE_L → R3501 0.1 MF-LF 402 5% 1/16W → PCIE_EXCARD_PRSNT_L

OUTPUT DECOUPLING

CRITICAL
U3500 TPS2231

=PP3V3_S3_EXCARD	17	AUXIN QFN	AUXOUT	15
=PP3V3_S0_EXCARD	2	VIN3P3	VOUT3P3	3
=PP1V5_S0_EXCARD	12	VIN1P5	VOUT1P5	11
SMC_EXCARD_PWR_EN	20	SHDN*	PERST*	8
TP_EXCARD_STBY_L	1	STBY*	CPPE*	10
EXCARD_RESET_L	6	SYSRST*	CPUSB*	9
EXCARD_OC_L	19	OC*		
NC	4	NC0	RCLKEN	18 EXCARD_RCLKEN
NC	5	NC1		
NC	13	NC2		
NC	14	NC3		
NC	16	NC4	THRML_PAD	21
	7	GND		

R3500 0 1/16W MF-LF 402 5% EXCARD_SHDN_L_R

PP3V3_S3_EXCARD_SWITCH: C3500 0.1uF 20% 10V CERM 402, C3503 10uF 20% 6.3V X5R 603 (VOLTAGE=3.3V, MIN_LINE_WIDTH=.3mm, MIN_NECK_WIDTH=0.2mm)
PP3V3_S0_EXCARD_SWITCH: C3501 0.1uF 20% 10V CERM 402, C3504 10uF 20% 6.3V X5R 603 (VOLTAGE=3.3V, MIN_LINE_WIDTH=.6mm, MIN_NECK_WIDTH=0.2mm)
PP1V5_S0_EXCARD_SWITCH: C3502 0.1uF 20% 10V CERM 402, C3505 10uF 20% 6.3V X5R 603 (VOLTAGE=1.5V, MIN_LINE_WIDTH=.6mm, MIN_NECK_WIDTH=0.2mm)
PLT_RESET_SWITCH_L
EXCARD_CPPE_L
EXCARD_CPUSB_L

CRITICAL
J3501 503219-0221 M-ST-SM

FC_CLKREQ_L	1	2	
	3	4	
PCIE_CLK100M_FC_P	5	6	
PCIE_CLK100M_FC_N	7	8	NC
	9	10	=PP3V3_FC_CON
PCIE_FC_R2D_P	11	12	NC
PCIE_FC_R2D_N	13	14	NC
	15	16	=PP1V5_FC_CON
PCIE_FC_D2R_P	17	18	NC
PCIE_FC_D2R_N	19	20	FC_PRSNT_L
	21	22	FC_RESET_L
		23	
		24	
		25	
		26	

PCIE_FC_R2D_C_P → C3573 0.1uF 10% 16V X5R 402 → PCIE_FC_R2D_P
PCIE_FC_R2D_C_N → C3572 0.1uF 10% 16V X5R 402 → PCIE_FC_R2D_N
VENICE
PLACEMENT_NOTE=Place close to J3501.

Venice Connector

EXCARD_CPUSB_L, EXCARD_CPPE_L → U3551 74HC1G00GWDG SC70-5 → SMC_EXCARD_CP
C3550 0.1uF 20% 10V CERM 402

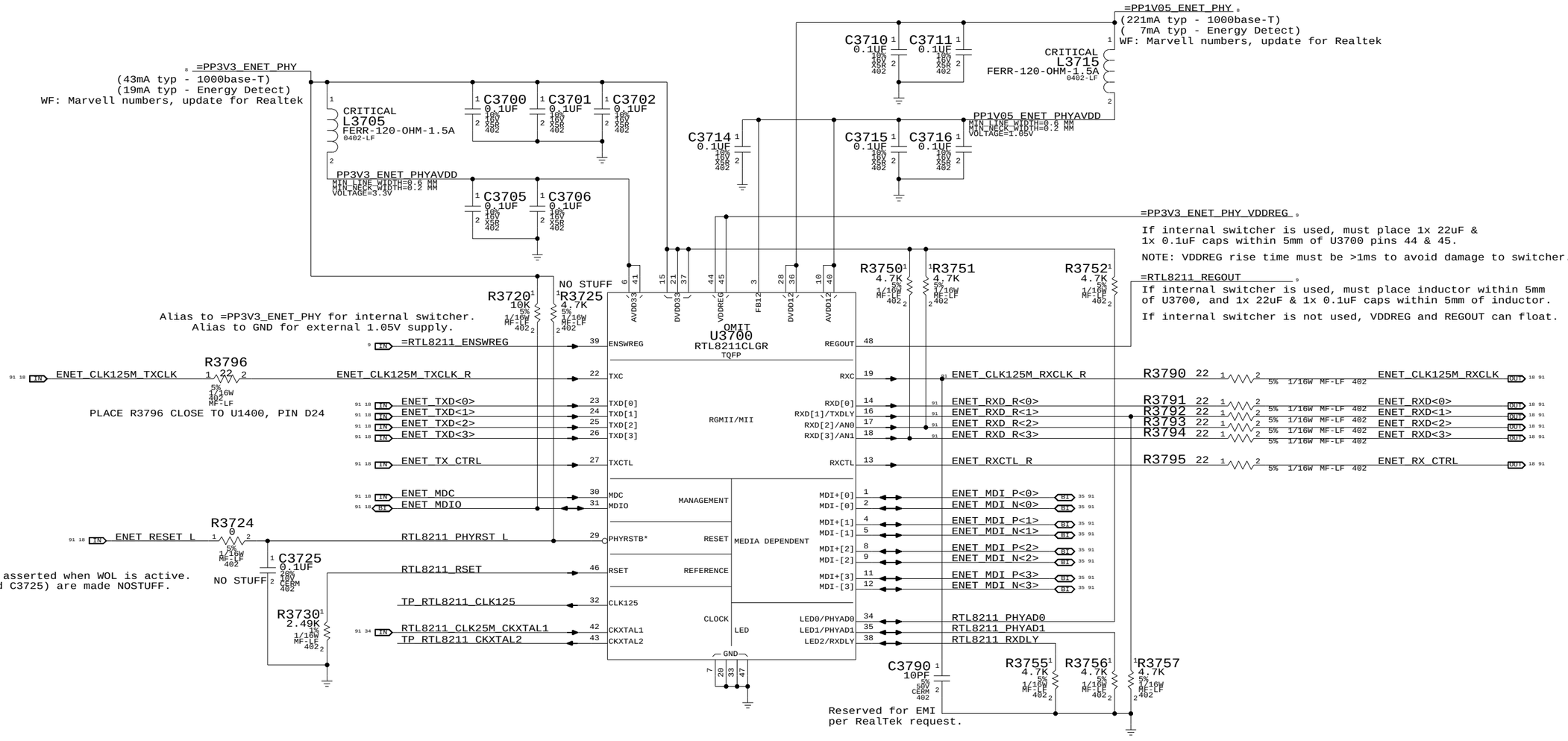
=PP3V3_S0_EXCARD
R3561 100K 1/16W MF-LF 402
EXCARD_CLKREQ_CONN_L → U3561 SN74LVC1G04YZPR BGA
EXCARD_RCLKEN, EXCARD_CLKREQ_CONN → U3560 74HC1G00GWDG SC70-5 → EXCARD_CLKREQ_L
C3560 0.1uF 20% 10V CERM 402

ExpressCard Connector

SYNC_MASTER=YITE_M98_MLB SYNC_DATE=07/02/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 32 OF 96	



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)

Ethernet PHY (RTL8211CL)

SYNC_MASTER=SUMA_M98_MLB SYNC_DATE=07/01/2008

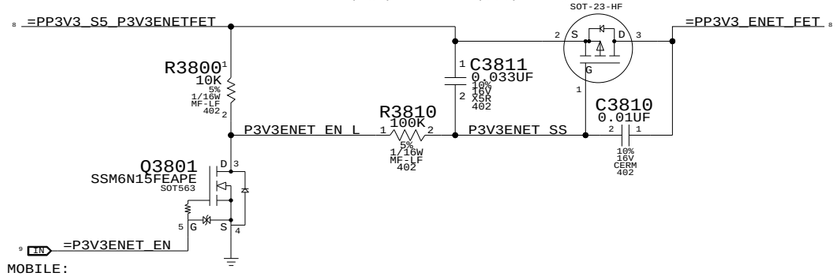
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 33 OF 96	

3.3V ENET FET

@ 2.5V Vgs:
Rds(on) = 90mOhm max
I(max) = 1.7A (85C)

CRITICAL



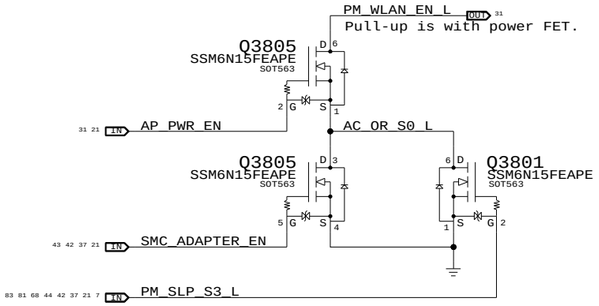
MOBILE:

Recommend aliasing PM_SLP_RMGT_L and
=P3V3ENET_EN. Nets separated on
ARB for alternate power options.

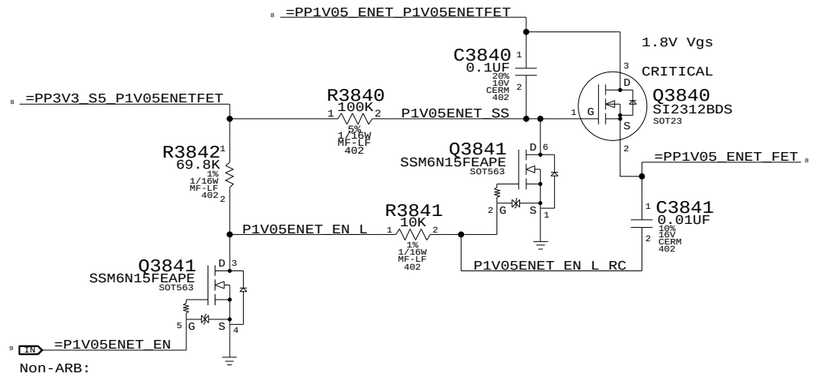
WLAN Enable Generation

"WLAN" = ("S3" && "AP_PWR_EN" && ("AC" || "S0"))

NOTE: S3 term is guaranteed by S3 pull-up on open-drain AP_PWR_EN signal.



1.05V ENET FET

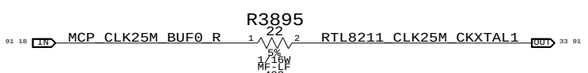


Non-ARB:

Recommend aliasing PM_SLP_RMGT_L and
=P1V05ENET_EN. Nets separated on
ARB for alternate power options.

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

Ethernet & AirPort Support

SYNC_MASTER=SUMA_M98_MLB SYNC_DATE=07/01/2008

APPLE INC.

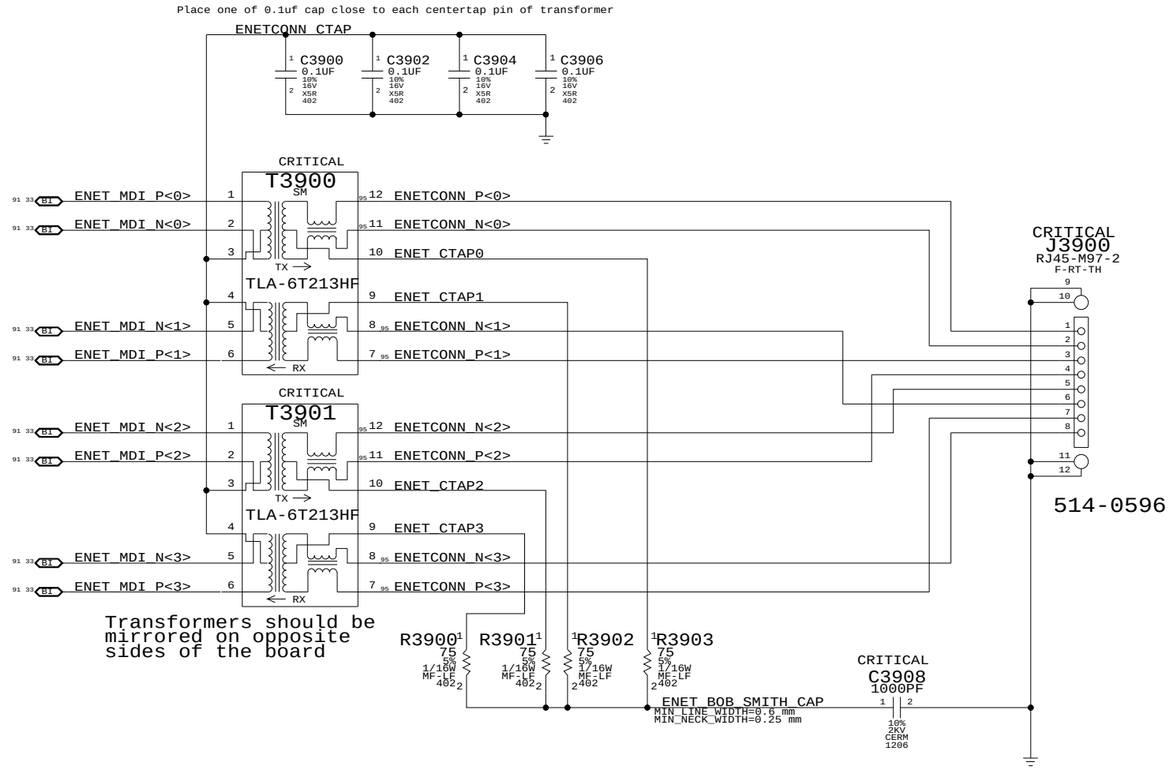
SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 34 OF 96	

Page Notes

Power aliases required by this page:
(NONE)

Signal aliases required by this page:
(NONE)

BOM options provided by this page:
(NONE)

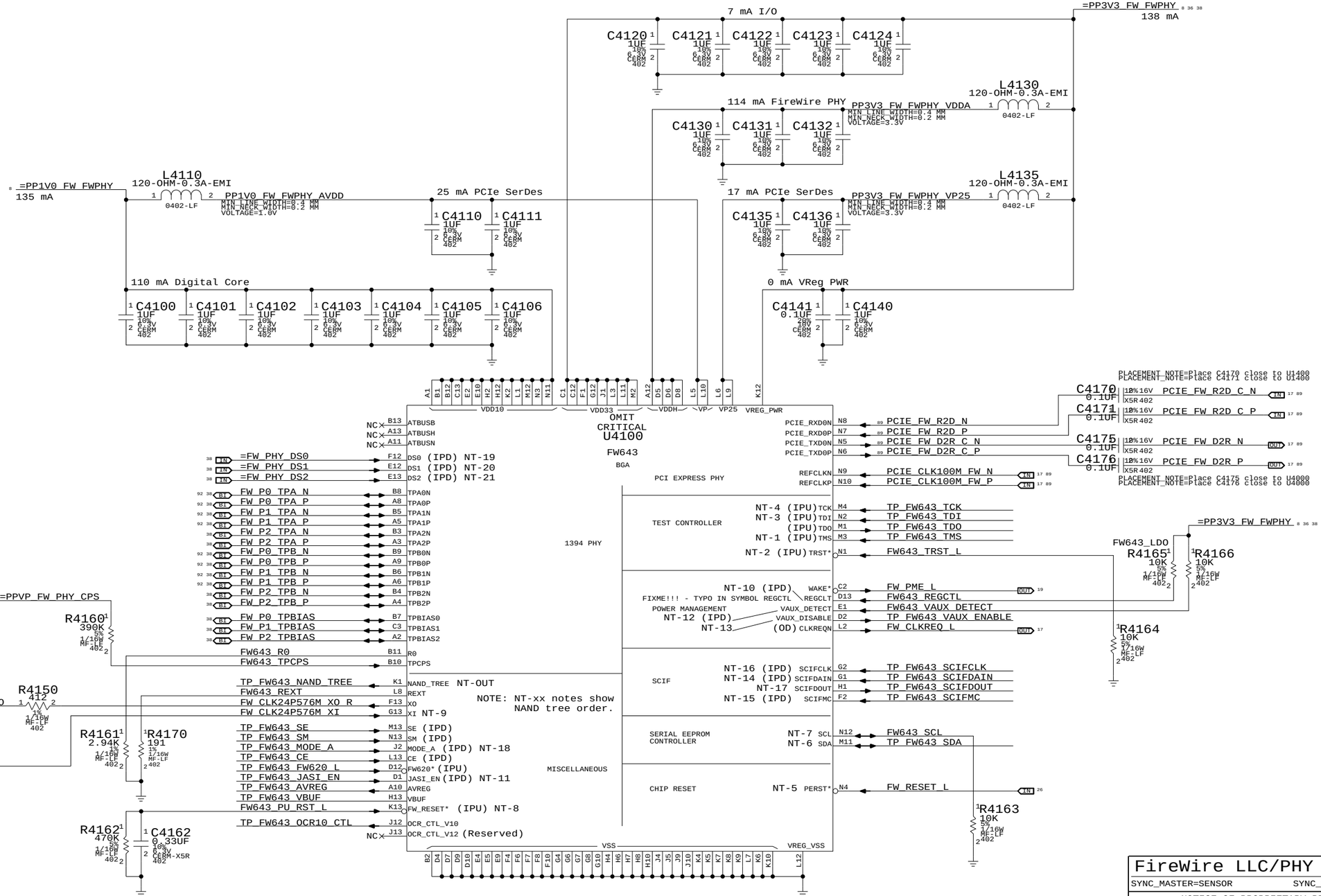


Ethernet Connector

SYNC_MASTER=SUMA_M98_MLB SYNC_DATE=07/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 35 OF 96	



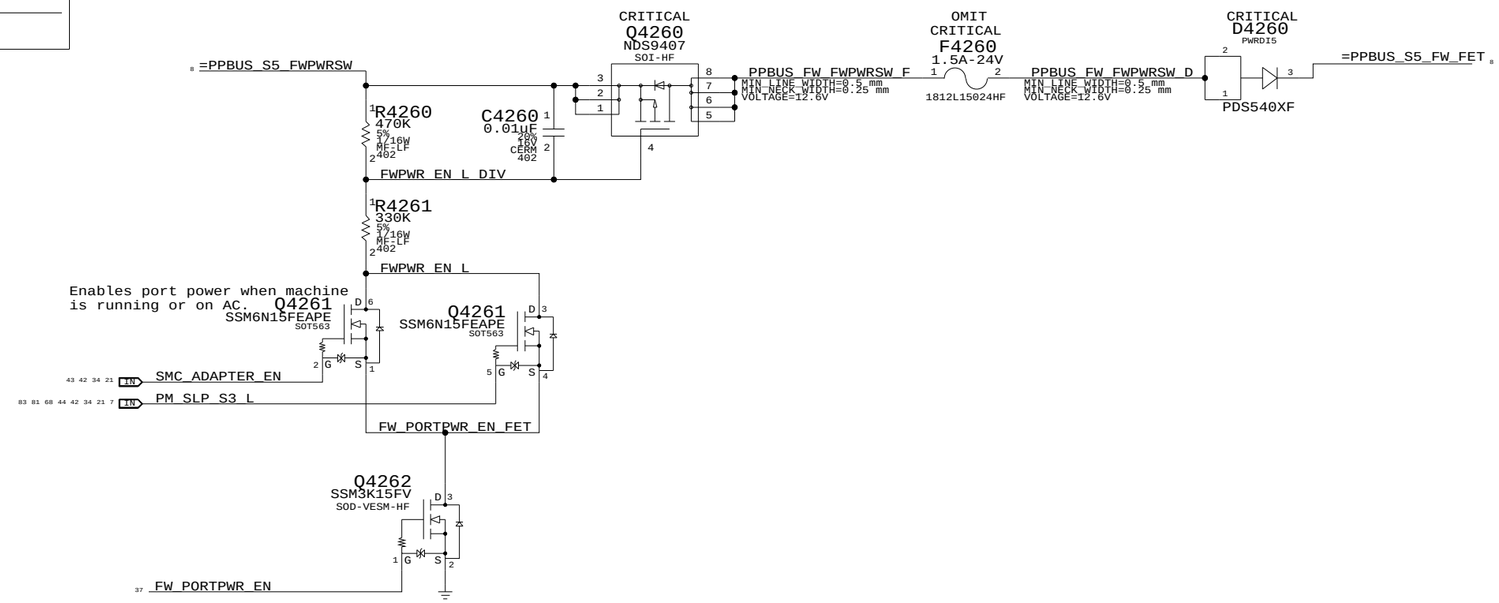
Page Notes

Power aliases required by this page:
- =PPBUS_S5_FWPWRSW (system supply for bus power)
- =PP3V3_FW_LATEVG_ACTIVE
- =PPVP_FW_SUMNODE (power passthru summation node)

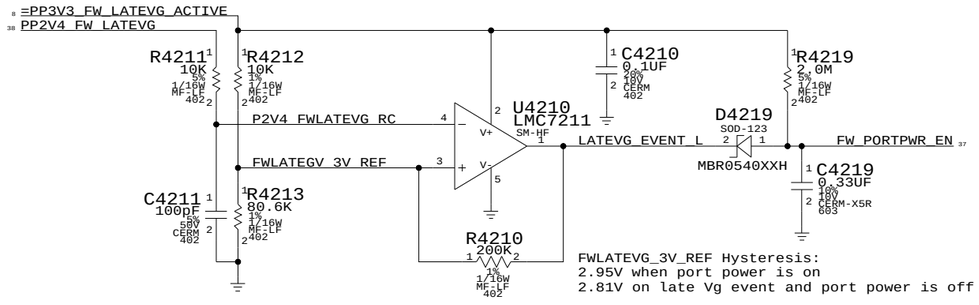
Signal aliases required by this page:
(NONE)

BOM options provided by this page:
- FW_PORT_FAULT_PU

FireWire Port Power Switch



Late-VG Event Detection



PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
740S0080	1	LITTLEFUSE, 1.5A RESETTABLE 24V	F4260	CRITICAL	

FireWire Port Power

SYNC_MASTER=SENSOR SYNC_DATE=08/14/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 37 OF 96	

Page Notes

Power aliases required by this page:

- =PPVP_FW_PORT1
- =PP3V3_FW_LATEVG

- =GND_CHASSIS_FW_PORT1
- =GND_CHASSIS_FW_EMI_R

Signal aliases required by this page:
(NONE)
NOTE: This page is expected to contain the necessary aliases to map the FireWire TPA/TPB pairs to their appropriate connectors and/or to properly terminate unused signals.

BOM options provided by this page:
(NONE)

NOTE: FireWire TPA/TPB pairs are NOT constrained on this page. It is assumed that FireWire PHY page will provide the appropriate constraints to apply to entire TPA/TPB XNets.

1394b implementation based on Apple FireWire Design Guide (FWDG 0.6, 5/14/03)

FireWire PHY Config Straps

Configures PHY for:

- 1-port Portable Power Class (0)

- Port "1" Bilingual (1394B)

38 36 8 =PP3V3_FW_FWPHY

R4382 10K 1% 1/10W MF-LF 402

R4380 10K 1% 1/10W MF-LF 402

FWPHY_DS0 MAKE_BASE=TRUE = =FW_PHY_DS0 36

FWPHY_DS2 MAKE_BASE=TRUE = =FW_PHY_DS2 36

FWPHY_DS1 MAKE_BASE=TRUE = =FW_PHY_DS1 36

R4381 10K 1% 1/10W MF-LF 402

36 FW_P0_TPBIAS = NC_FW0_TPBIAS MAKE_BASE=TRUE

36 FW_P2_TPBIAS = NC_FW2_TPBIAS MAKE_BASE=TRUE

92 36 FW_P0_TPA_N = NC_FW0_TPAN MAKE_BASE=TRUE

92 36 FW_P0_TPA_P = NC_FW0_TPAP MAKE_BASE=TRUE

36 FW_P2_TPA_N = NC_FW2_TPAN MAKE_BASE=TRUE

36 FW_P2_TPA_P = NC_FW2_TPAP MAKE_BASE=TRUE

92 36 FW_P0_TPB_N = NC_FW0_TPBN MAKE_BASE=TRUE

92 36 FW_P0_TPB_P = NC_FW0_TPBP MAKE_BASE=TRUE

36 FW_P2_TPB_N = NC_FW2_TPBN MAKE_BASE=TRUE

36 FW_P2_TPB_P = NC_FW2_TPBP MAKE_BASE=TRUE

Termination

Place close to FireWire PHY

36 FW_P1_TPBIAS

TI PHYs require 1uF even though FW spec calls out 0.33uF

C4360 0.33UF 10% 6.3V CERM-X5R 402

SIGNAL_MODEL=EMPTY

R4360 56.2 1% 1/16W MF-LF 402

R4361 56.2 1% 1/16W MF-LF 402

92 36 FW_P1_TPA_P = FW_PORT1_TPA_P MAKE_BASE=TRUE 38

92 36 FW_P1_TPA_N = FW_PORT1_TPA_N MAKE_BASE=TRUE 38

92 36 FW_P1_TPB_P = FW_PORT1_TPB_P MAKE_BASE=TRUE 38

92 36 FW_P1_TPB_N = FW_PORT1_TPB_N MAKE_BASE=TRUE 38

SIGNAL_MODEL=EMPTY

R4362 56.2 1% 1/16W MF-LF 402

R4363 56.2 1% 1/16W MF-LF 402

FW_PORT1_TPB_C

C4364 220pF 5% 50V CERM 402

R4364 4.99K 1% 1/16W MF-LF 402

8 =PPVP_FW_PHY_CPS_FET

Q4300 BSS8402DW SOT-363 (SYM-VER2)

R4311 470K 5% 1/10W MF-LF 402

PPVP_FW_CPS MAKE_BASE=TRUE MIN_LINE_WIDTH=0.4 mm MIN_NECK_WIDTH=0.2 mm VOLTAGE=12.6V = =PPVP_FW_PHY_CPS 36

CPS_EN_L_DIV

R4312 330K 5% 1/10W MF-LF 402

CPS_EN_L

38 36 8 =PP3V3_FW_FWPHY

Q4300 BSS8402DW SOT-363 (SYM-VER1)

Cable Power

8 =PPVP_FW_PORT1

CRITICAL L4310 FERR-250-OHM SM

Note: Trace PPVP_FW_PORT1 must handle up to 5A

PPVP_FW_PORT1_F MIN_LINE_WIDTH=0.5 mm MIN_NECK_WIDTH=0.25 mm VOLTAGE=33V

C4314 0.01UF 10% 50V X7R 402

"Snapback" & "Late VG" Protection

38 37 PP2V4_FW_LATEVG

DP4310 BAV99DW-X-G SOT-363

C4311 0.01uF 10% 50V X7R 402

DP4310 BAV99DW-X-G SOT-363

C4310 0.01uF 10% 50V X7R 402

38 FW_PORT1_TPB_N

38 FW_PORT1_TPB_P

38 FW_PORT1_TPA_N

38 FW_PORT1_TPA_P

DP4311 BAV99DW-X-G SOT-363

C4312 0.01uF 10% 50V X7R 402

DP4311 BAV99DW-X-G SOT-363

C4313 0.01uF 10% 50V X7R 402

C4319 0.1uF 10% 50V X7R 603-1

R4319 1M 5% 1/16W MF-LF 402

PLACEMENT_NOTE=Place C4319 close to connector pin 5.

PORT 1

BILINGUAL

CRITICAL J4310 1394B-M97 F-RT-TH1

(FW_PORT1_BREF)

(GND_FW_PORT1_VG)

FW_PORT1_AREF

OUTPUT

INPUT

CABLE OUTER SHLD

CHASSIS GND

514S0605

AREF needs to be isolated from all local grounds per 1394b spec

When a bilingual device is connected to a beta-only device, there is no DC path between them (to avoid ground offset issue)

BREF should be hard-connected to logic ground for speed signaling and connection

Late-VG Protection Power

8 =PP3V3_FW_LATEVG

R4390 332 1% 1/16W MF-LF 402

PP2V4_FW_LATEVG MIN_LINE_WIDTH=0.38 mm MIN_NECK_WIDTH=0.25 mm VOLTAGE=2.4V 37 38

CRITICAL D4390 MMBZ5227BLT1H SOT23

ESD and late-VG rail for snap-back diodes (Common to all ports)

PP2V4_FWLATEVG needs to be biased to at least 2.1V for FW signal integrity and should be biased to 2.4V for margin
R4390 should be 390 Ohms max for a 3.3V rail

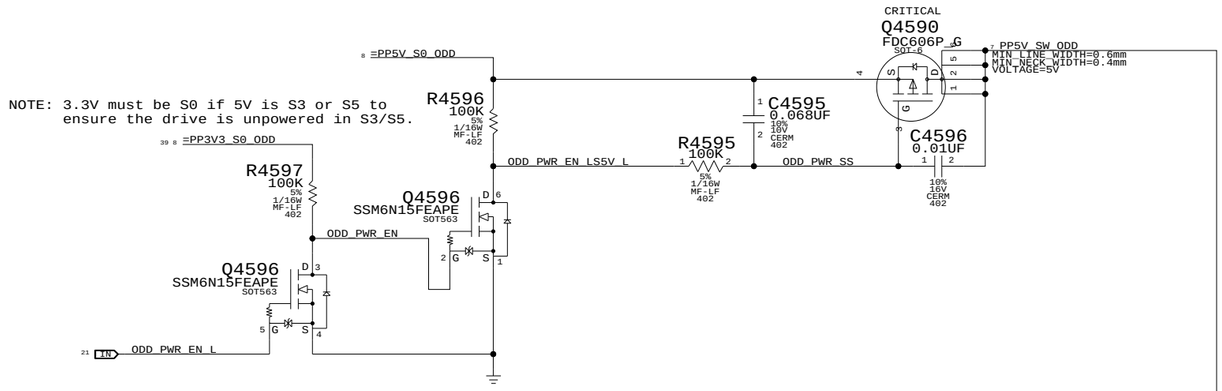
FireWire Ports

SYNC_MASTER=SENSOR SYNC_DATE=08/14/2008

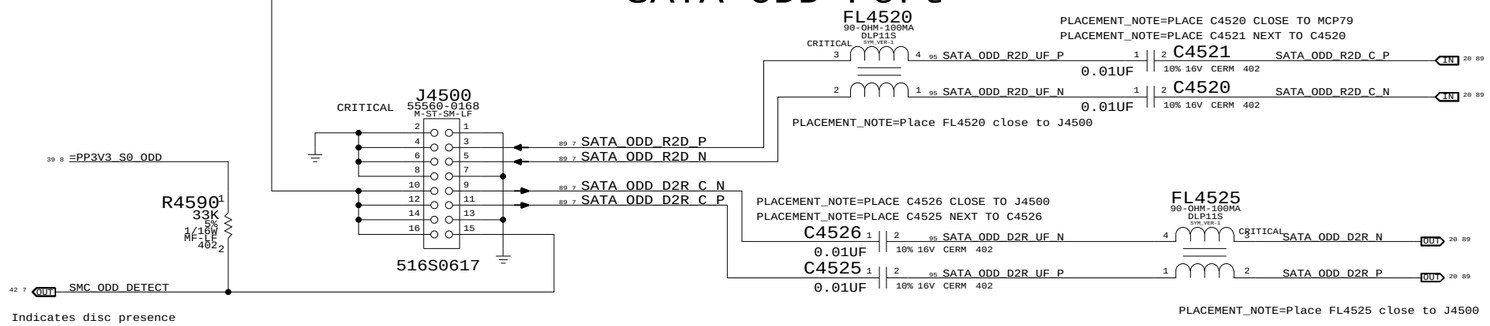
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 38 OF 96	

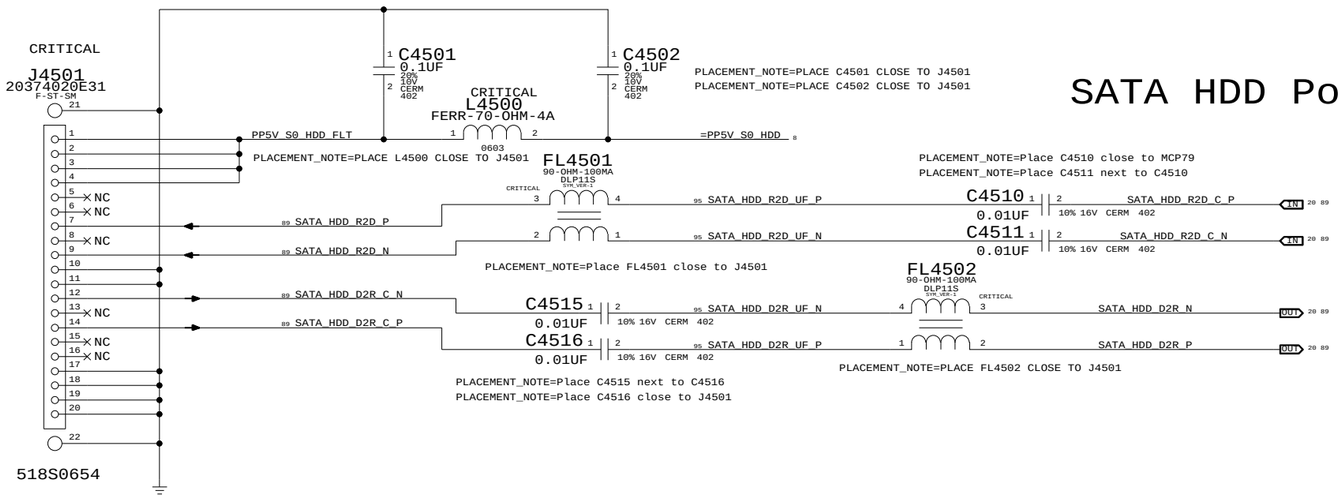
ODD Power Control



SATA ODD Port



SATA HDD Port



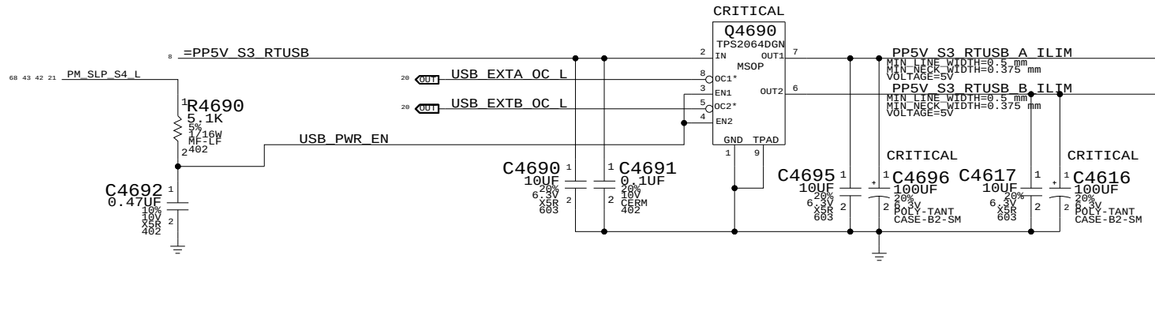
SATA Connectors

SYNC_MASTER=CHANG_M98_MLB SYNC_DATE=07/01/2008

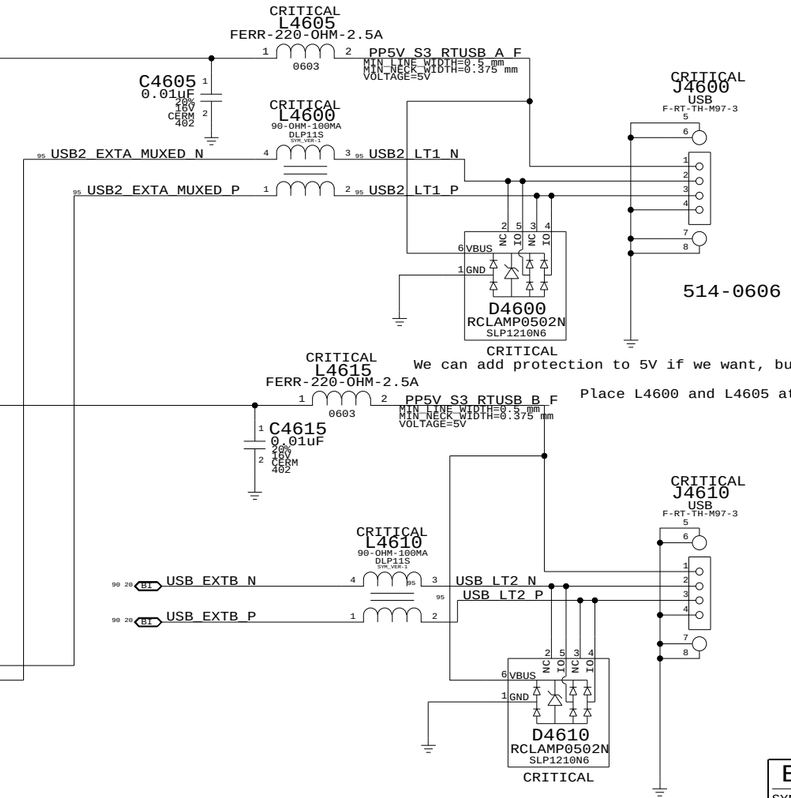
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 39 OF 96	

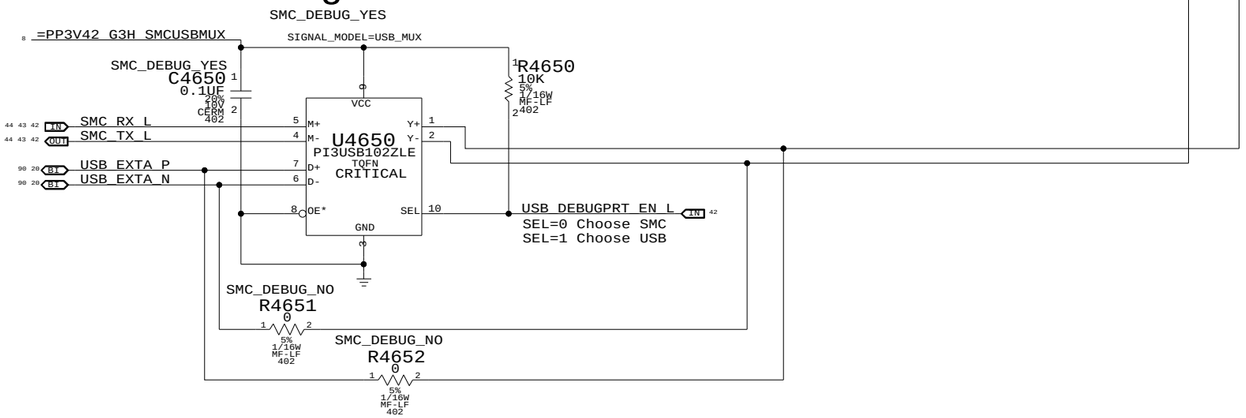
Port Power Switch



Left USB Port A



USB/SMC Debug Mux



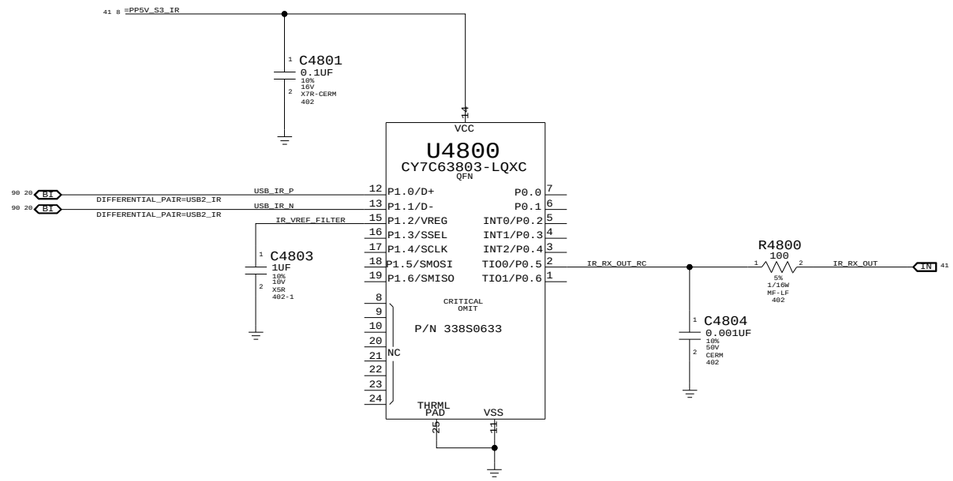
Left USB Port B

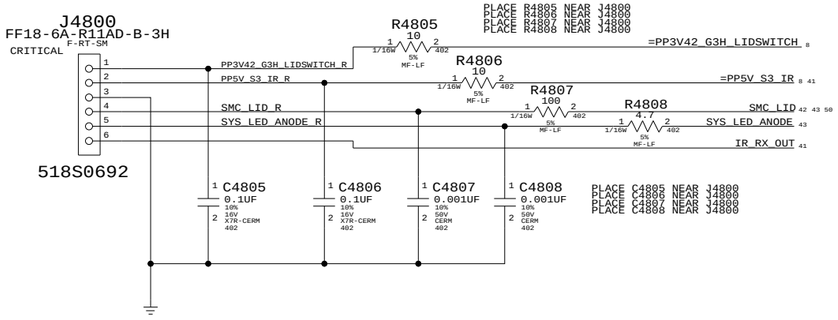
External USB Connectors

SYNC_MASTER=AMASON_M98_MLB SYNC_DATE=07/02/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 40 OF 96	





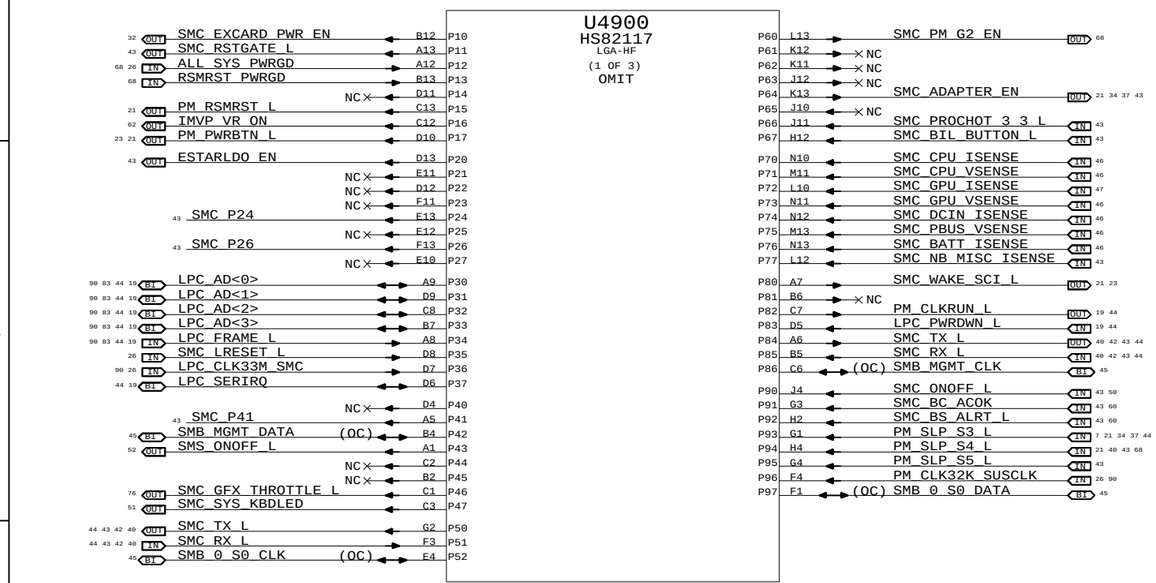
Front Flex Support

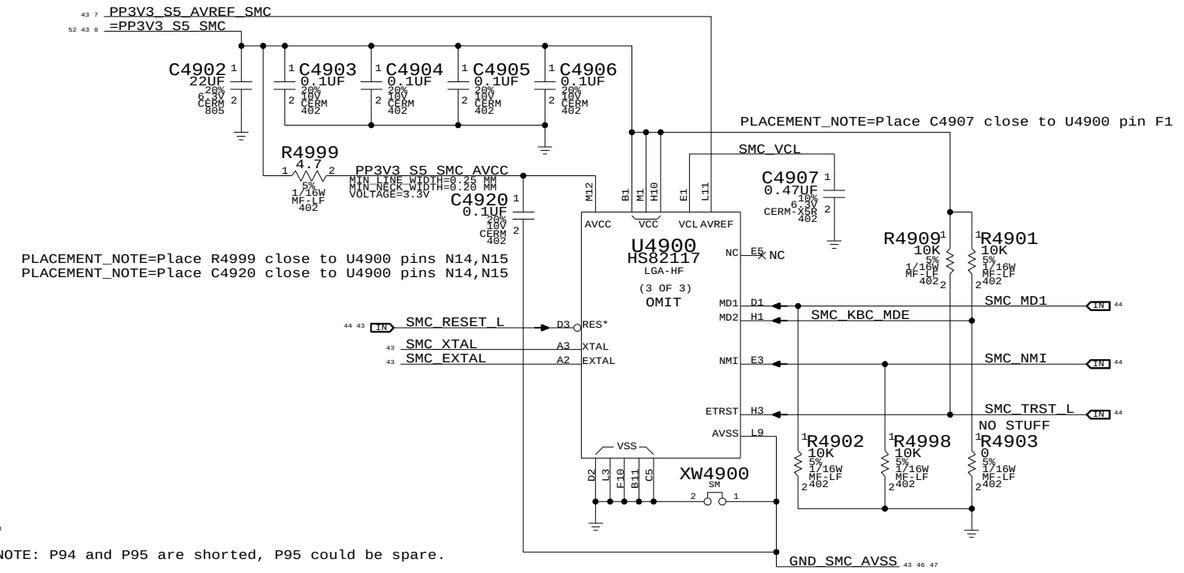
SYNC_MASTER=CHANG_M98_MLB SYNC_DATE=07/01/2008

APPLE INC.

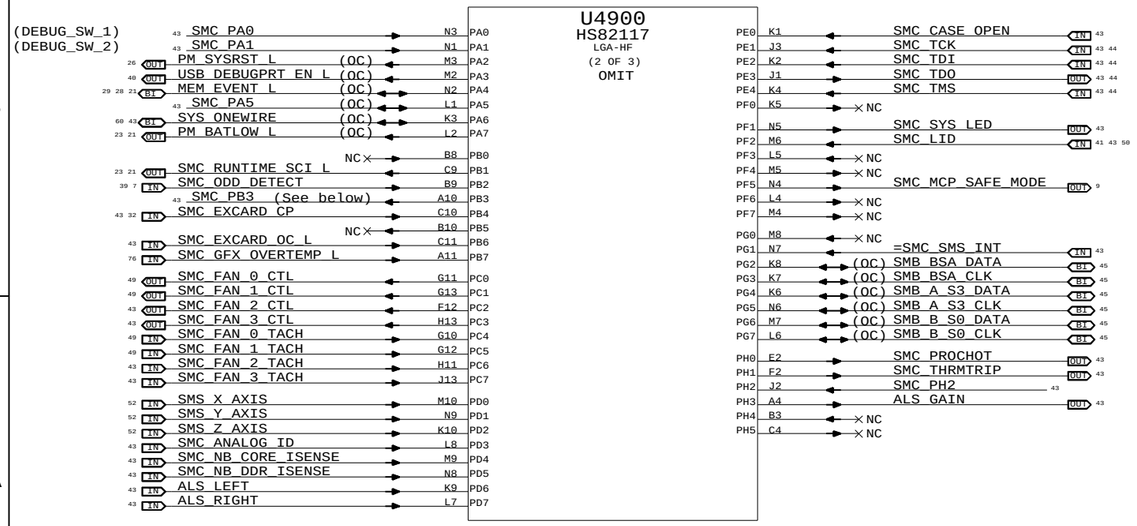
SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 41 OF 96	

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.



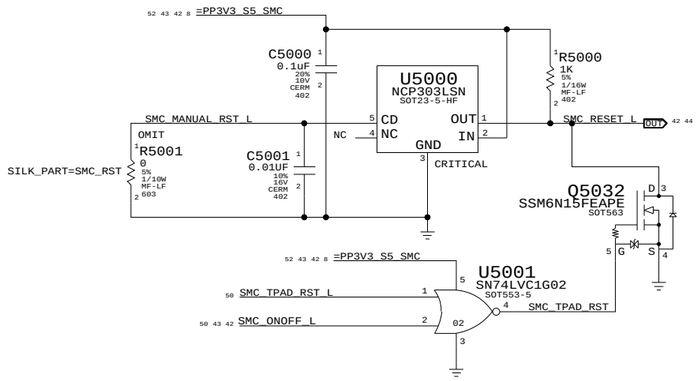
NOTE: SMS Interrupt can be active high or low, rename net accordingly.
If SMS interrupt is not used, pull up to SMC rail.

SMC_PB3:

SMC_IG_THROTTLE_L for MG systems.
Otherwise, TP/NC okay (was ISENSE_CAL_EN)

SMC			
SYNC_MASTER=T18_MLB	SYNC_DATE=06/18/2008		
NOTICE OF PROPRIETARY PROPERTY			
THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING I TO MAINTAIN THE DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART			
APPLE INC.	SIZE D	DRAWING NUMBER 051-7546	REV. A.0.0
	SCALE NONE	SHT 42 OF 96	

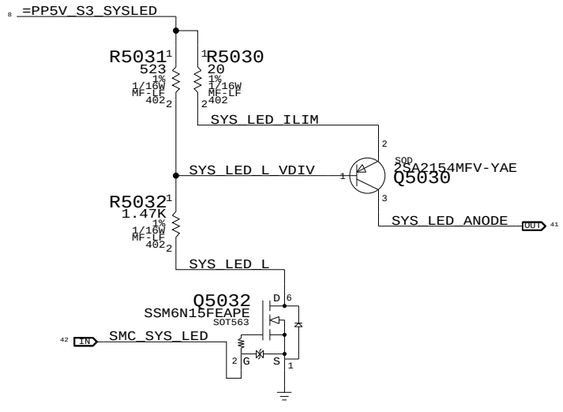
SMC Reset "Button" / Brownout Detect



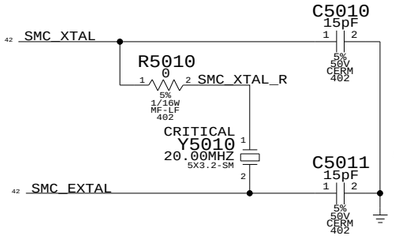
SMC AVREF Supply

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

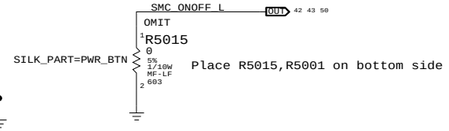
System (Sleep) LED Circuit

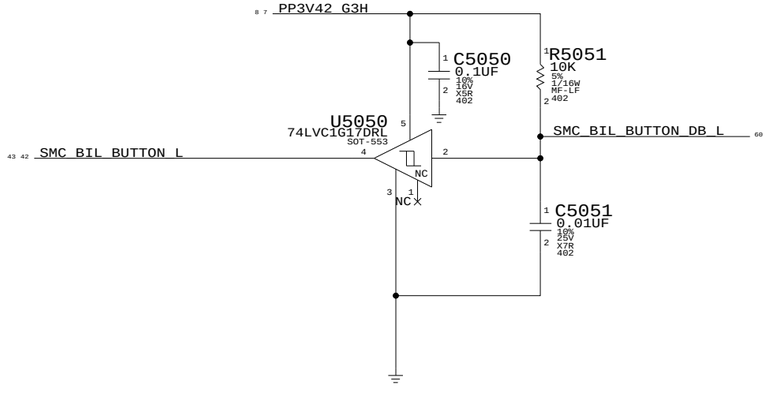


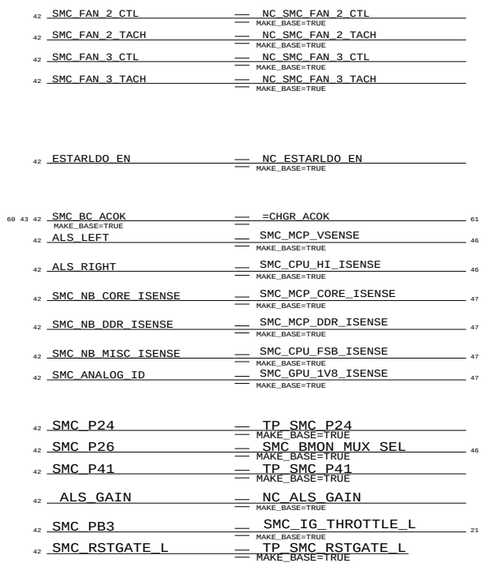
SMC Crystal Circuit



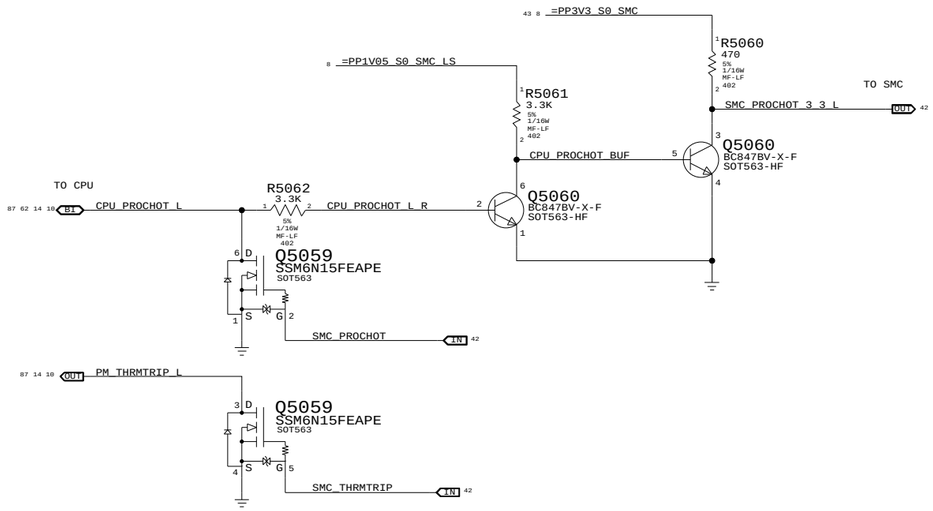
Debug Power "Button"

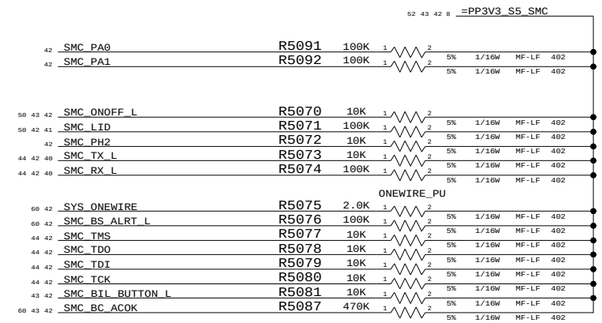


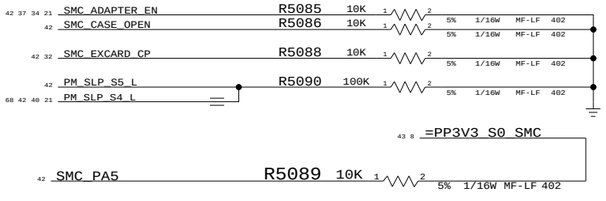




SMC FSB to 3.3V Level Shifting







SMC Support

SYNC_MASTER=AMASON_M98_MLB SYNC_DATE=06/18/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 43 OF 96	

LPC+SPI Connector

CRITICAL
LPCPLUS
J5100
55909-0374
M-ST-SM

516S0573

44 8	=PP3V3_S5_LPCPLUS	31	32		
8	=PP5V_S0_LPCPLUS				
		1	2	LPC_CLK33M_LPCPLUS	IN 26 90
90 83 42 19	BI LPC_AD<0>	3	4	LPC_AD<2>	BI 19 42 83 90
90 83 42 19	BI LPC_AD<1>	5	6	LPC_AD<3>	BI 19 42 83 90
		7	8		
44	IN SPI_ALT_MOSI	9	10	SPIROM_USE_MLB	OUT 44
44	OUT SPI_ALT_MISO	11	12	SPI_ALT_CLK	IN 44
90 83 42 19	IN LPC_FRAME_L	13	14	SPI_ALT_CS_L	IN 44
42 19	OUT PM_CLKRUN_L	15	16	LPC_SERIRQ	BI 19 42
43 42	OUT SMC_TMS	17	18	LPC_PWRDWN_L	IN 19 42
	IN DEBUG_RESET_L	19	20	SMC_TDI	OUT 42 43
	OUT SMC_TDO	21	22	SMC_TCK	OUT 42 43
42	IN SMC_TRST_L	23	24	SMC_RESET_L	OUT 42 43
42	OUT SMC_MD1	25	26	SMC_NMI	OUT 42
43 42 40	IN SMC_TX_L	27	28	SMC_RX_L	OUT 40 42 43
		29	30	LPCPLUS_GPIO	OUT 18
		33	34		

Alternate SPI ROM Support

MUX SEL CONTROLLED BY FRANKCARD SWITCH ONCE CS1 IS SUPPORTED IN MCP

53 44 8 =PP3V3_S5_ROM
R5190 10K 5% 1/16W MF-LF 402
44 8 =PP3V3_S5_LPCPLUS
LPCPLUS C5114 0.1UF 20% 10V CERM 402
LPCPLUS
U5110 PI3USB102ZLE TQFN CRITICAL
90 44 21 IN SPI_CLK_R
90 44 21 IN SPI_MOSI_R
R5191 10K 5% 1/16W MF-LF 402
SEL HIGH OUTPUTS TO D (ON BOARD ROM)
SEL LOW OUTPUTS TO M (FRANKCARD ROM)
44 SPIROM_USE_MLB
SPI_ALT_CLK OUT 44
SPI_ALT_MOSI OUT 44
SPI_CLK_MUX OUT 44 53
SPI_MOSI_MUX OUT 44 53
8 44 =PP3V3_S5_LPCPLUS
LPCPLUS C5124 0.1UF 20% 10V CERM 402
LPCPLUS
U5120 PI3USB102ZLE TQFN CRITICAL
90 44 21 OUT SPI_MISO
90 21 IN SPI_CS0_R_L
SPI_ALT_MISO IN 44
SPI_ALT_CS_L_MUX
SPI_MLB_CS_L_MUX
SPI_MISO_MUX IN 44 53
MCP_CS1_NO R5127 0 1/16W 5% MF-LF 402
MCP_CS1_NO R5126 0 1/16W 5% MF-LF 402
SPI_MLB_CS_L OUT 53
MCP_CS1_NO R5144 20K 5% 1/16W MF-LF 402
=PP3V3_S5_ROM 8 44 53
MCP_CS1_YES&LPCPLUS_NOT R5146 0 1/16W 5% MF-LF 402
PLACEMENT_NOTE=PLACE NEXT TO U1400
Pull-up on debug card

MCP79 Internal SPI MUX Support

NOT SUPPORTED IN REV A01 OR B01 MCP79 SILICON

MCP SPI Override Options

MCP79 REV A01 REQUIRES EXTERNAL MUX, REV B01 STILL DOES NOT SUPPORT INTERNAL MUX

8 =PP3V3_S0_LPCPLUS
44 8 =PP3V3_S5_LPCPLUS
R5140 100K 5% 1/16W MF-LF 402
MCP_CS1_YES
LPC_FRAME_PU
Q5140 SSM3J16FV SOD-VESM-HF
MCP_CS1_YES
R5141 470 5% 1/16W MF-LF 402
LPC_FRAME_R_L OUT 19
44 SPIROM_USE_MLB
From Frank Card
MCP_CS1_NO R5142 0 5% 1/16W MF-LF 402
PLACEMENT_NOTE=Place near J5100
SPI_CS1_R_L_USE_MLB
MAKE_BASE=TRUE
=SPI_CS1_R_L_USE_MLB BI 9 21
MCP_CS1_YES R5147 0 5% 1/16W MF-LF 402
To Frank Card
PLACEMENT_NOTE=PLACE NEXT TO U5120

SPI Frequency Clamp

ENSURES MCP79 SPI_DO OR SPI_CLK INPUT IS LOW WHEN STRAP IS LATCHED.NOT NEEDED FOR B01 OR LATER.

Keep very short
MCP_FORCE_SPI_DO_L
NO STUFF
R5161 0 5% 1/16W MF-LF 402
SPI_MOSI OUT 53 90
SPI_CLK OUT 53 90
23 8 =PP3V3_S5_MCP_A01
MCP_A01&MCP_A01Q R5163 100K 5% 1/16W MF-LF 402
MCP_A01&MCP_A01Q Q5160 SSM6N15FEAPE SOT563
MCP_A01&MCP_A01Q R5162 0 5% 1/16W MF-LF 402
MCP_SPI_FORCE
MCP_A01&MCP_A01Q Q5160 SSM6N15FEAPE SOT563
SLP_S3# nVidia recommendation, not compatible with button-mashing.
MCP_A01&MCP_A01Q R5160 0 5% 1/16W MF-LF 402
83 81 68 42 37 34 21 7 IN PM_SLP_S3_L
MCP_SPI_FORCE_L

SPI MUX BYPASS

LPCPLUS_NOT R5156 0 5% 1/16W MF-LF 402
53 44 OUT SPI_CLK_MUX
SPI_CLK_R IN 21 44 90
LPCPLUS_NOT R5157 0 5% 1/16W MF-LF 402
53 44 OUT SPI_MOSI_MUX
SPI_MOSI_R IN 21 44 90
LPCPLUS_NOT R5158 0 5% 1/16W MF-LF 402
53 44 IN SPI_MISO_MUX
SPI_MISO OUT 21 44 90

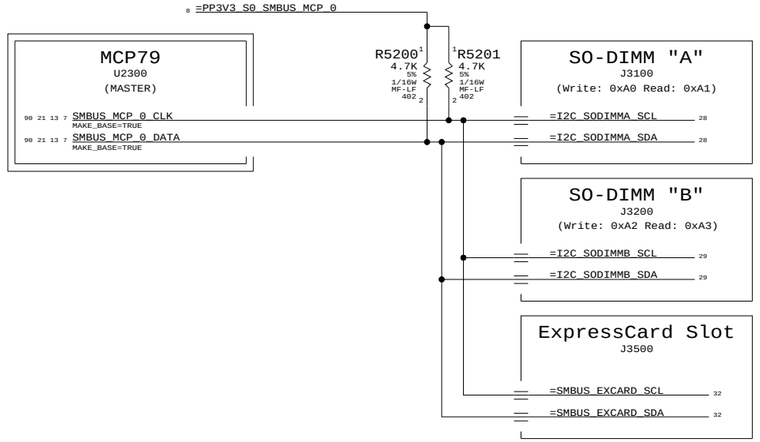
LPC+SPI Debug Connector

SYNC_MASTER=CHANG_M98_MLB SYNC_DATE=07/01/2008

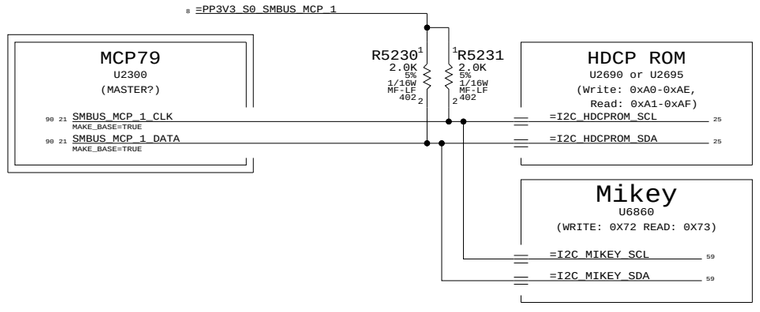
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 44 OF 96	

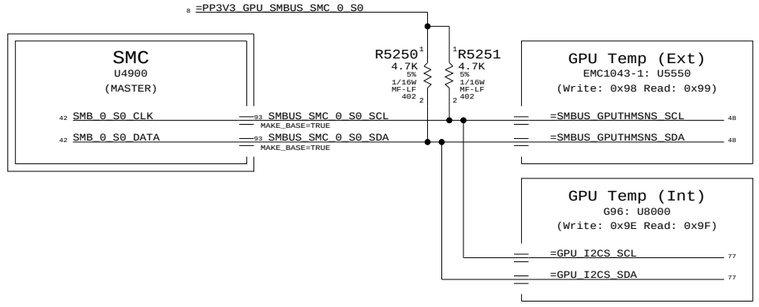
MCP79 SMBus "0" Connections



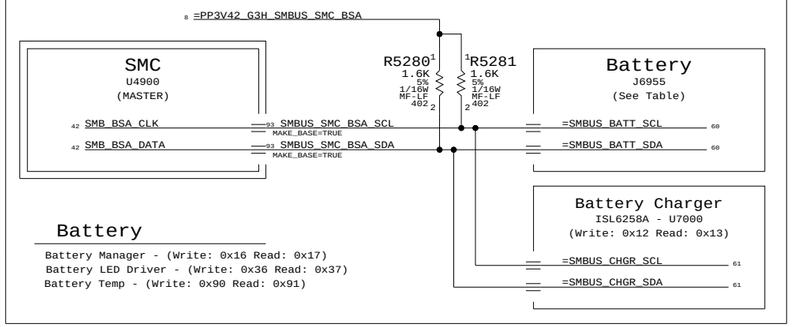
MCP79 SMBus "1" Connections



SMC "0" SMBus Connections



SMC "Battery A" SMBus Connections

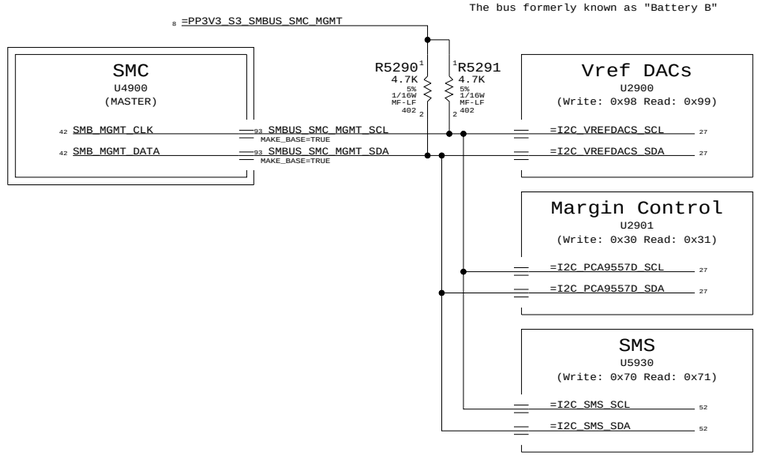


Battery

Battery Manager - (Write: 0x16 Read: 0x17)
Battery LED Driver - (Write: 0x36 Read: 0x37)
Battery Temp - (Write: 0x90 Read: 0x91)

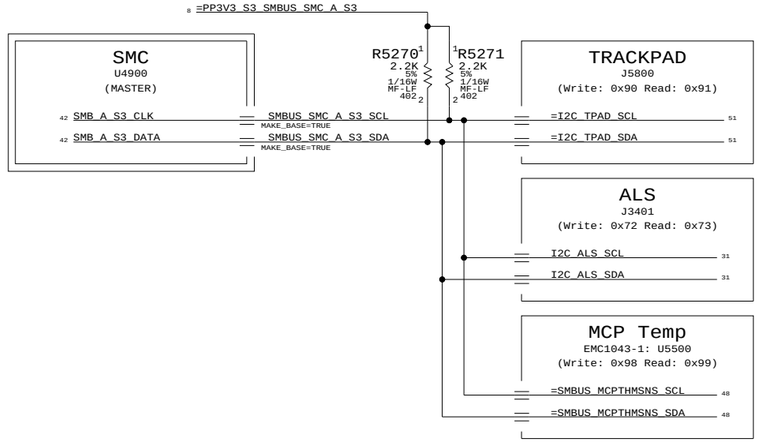
SMC "Management" SMBus Connections

The bus formerly known as "Battery B"

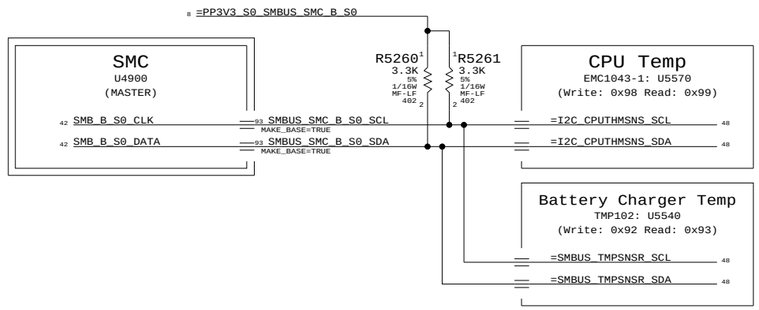


SMC "A" SMBus Connections

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



SMC "B" SMBus Connections



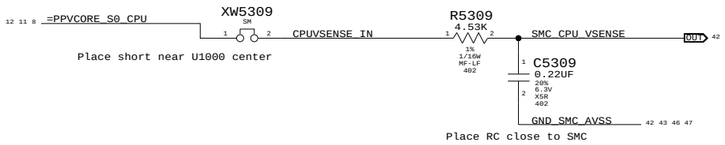
M98 SMBus Connections

SYNC_MASTER=DDR SYNC_DATE=07/22/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 45 OF 96	

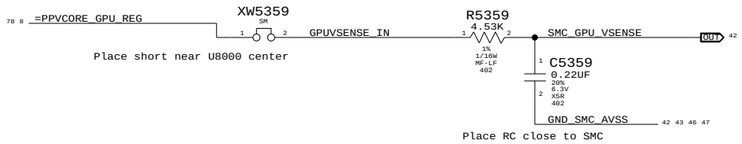
CPU Voltage Sense / Filter



Place short near U1000 center

Place RC close to SMC

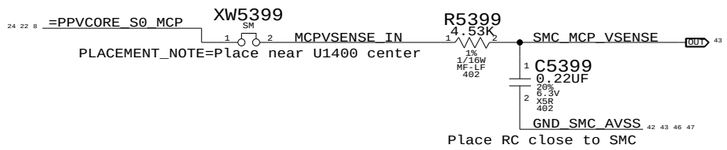
GPU Voltage Sense / Filter



Place short near U8000 center

Place RC close to SMC

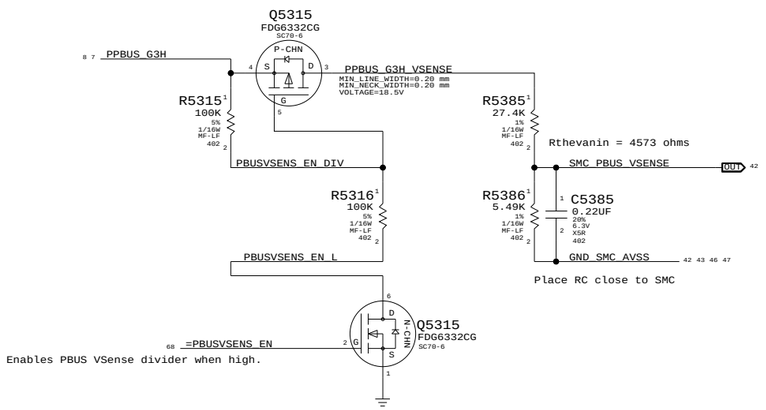
MCP Voltage Sense / Filter



PLACEMENT_NOTE=Place near U1400 center

Place RC close to SMC

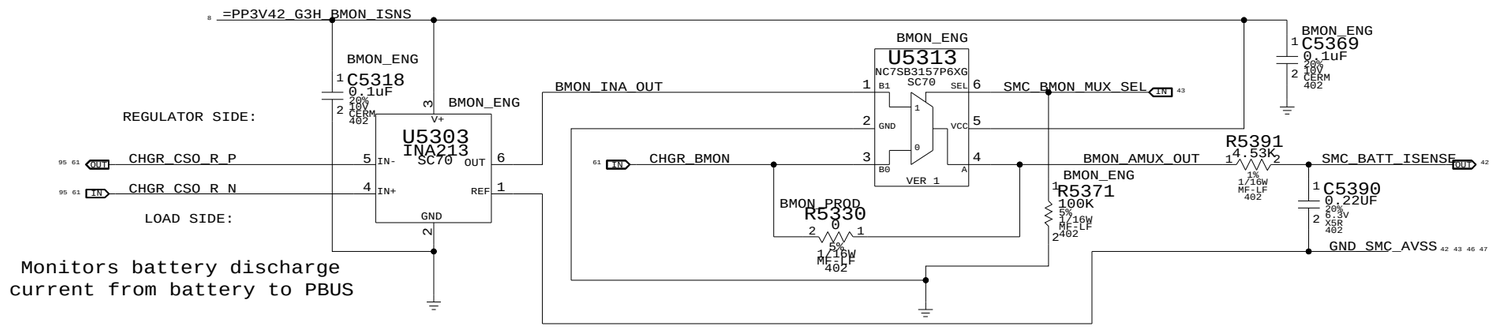
PBUS Voltage Sense & Filter



Place RC close to SMC

Enables PBUS VSense divider when high.

BMON Current Sense - Entire circuit must be near SMC (U4900)

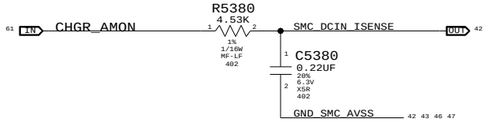


Monitors battery discharge current from battery to PBUS

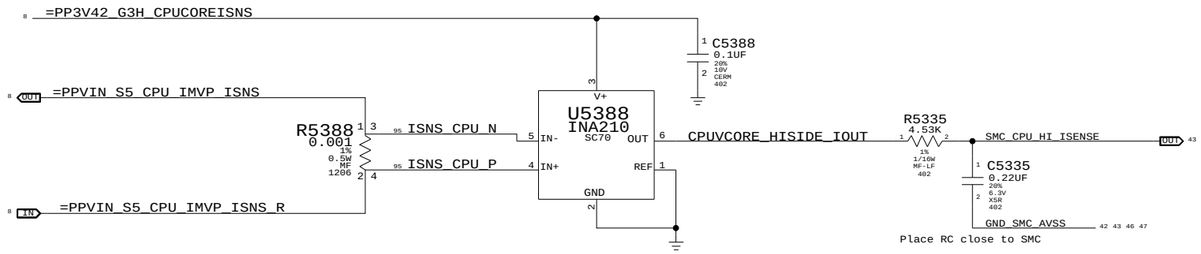
INA213 has gain of 50V/V

DCIN Current Sense Filter

Place RC close to SMC



CPU VCore High Side Current Sensor

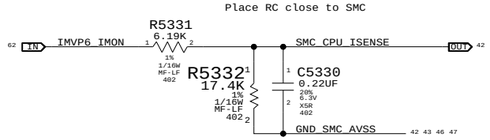


Place RC close to SMC

Consider INA211 (GAIN 500 version) since I=4.93 Amps across R5388

CPU VCore Load Side Current Sense / Filter

Place RC close to SMC



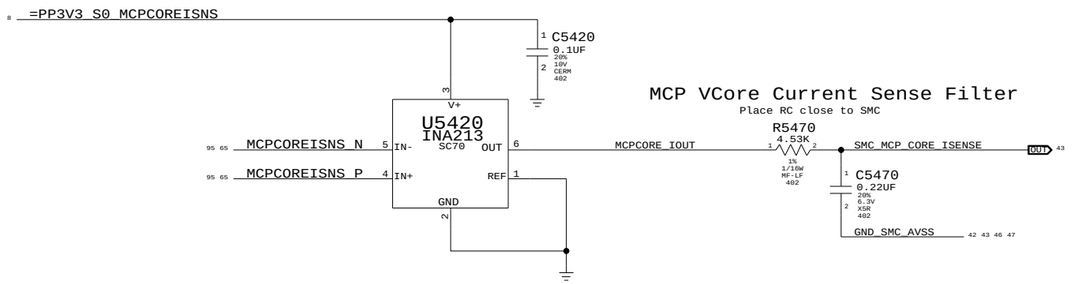
Current & Voltage Sensing

SYNC_MASTER=SENSOR SYNC_DATE=08/14/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 46 OF 96	

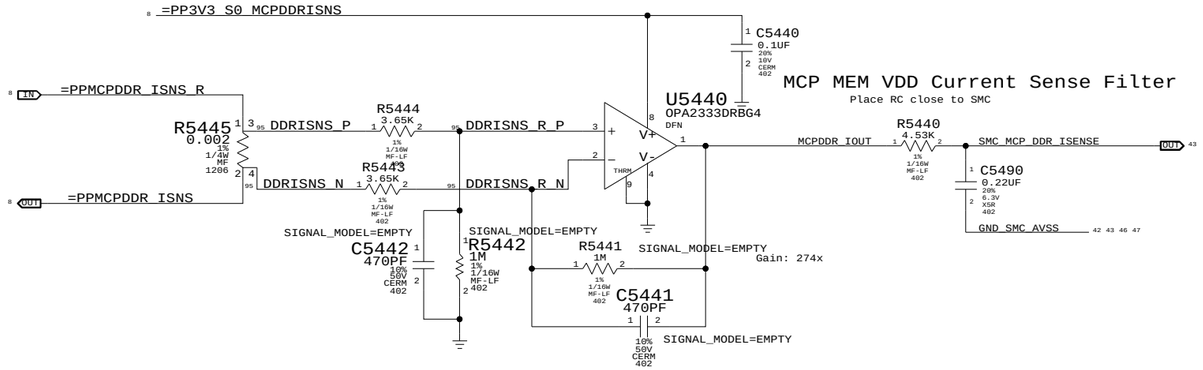
MCP VCore Current Sense



MCP VCore Current Sense Filter

Place RC close to SMC

MCP MEM VDD Current Sense



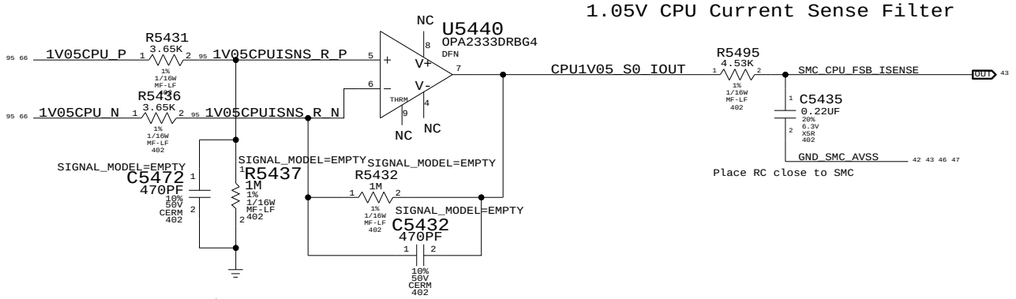
MCP MEM VDD Current Sense Filter

Place RC close to SMC

OPA2333s for proto are placeholders for OPA2330

MCP MEM VDD Current Sense and CPU FSB 1.05V Current Sense share dual package opamp U5440

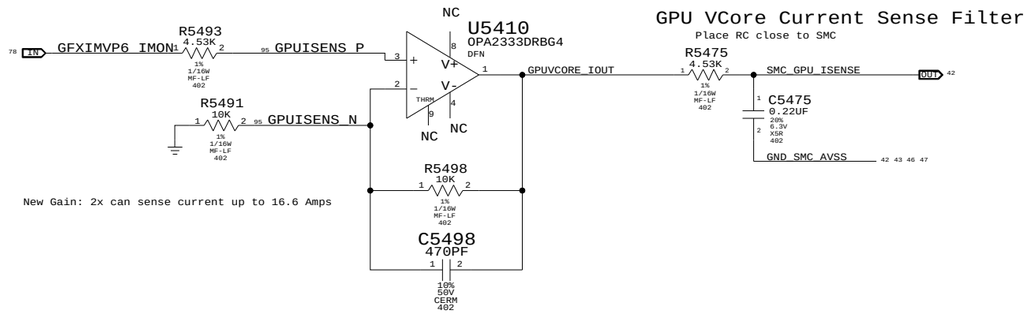
CPU FSB 1.05V Current Sense



1.05V CPU Current Sense Filter

Place RC close to SMC

GPU VCore Current Sense



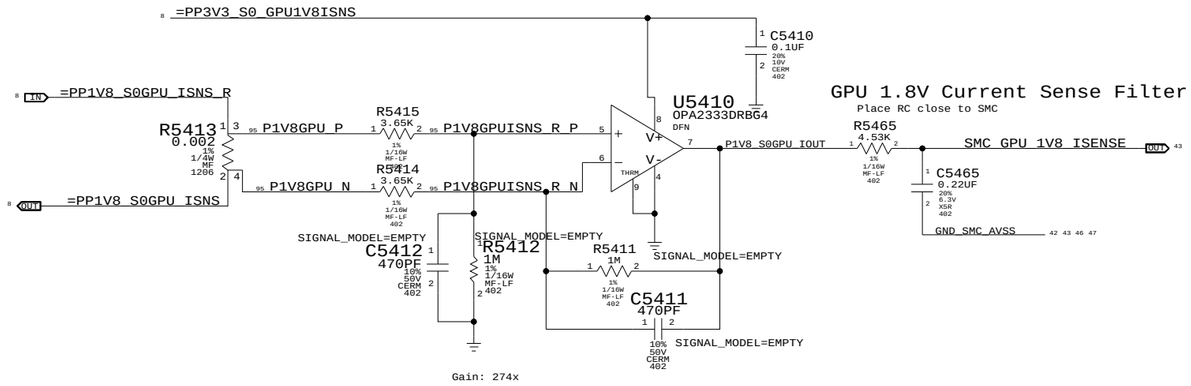
GPU VCore Current Sense Filter

Place RC close to SMC

New Gain: 2x can sense current up to 16.6 Amps

GPU VCore Current Sense and GPU 1.8V Current Sense share dual package opamp U5410

GPU 1.8V Current Sense



GPU 1.8V Current Sense Filter

Place RC close to SMC

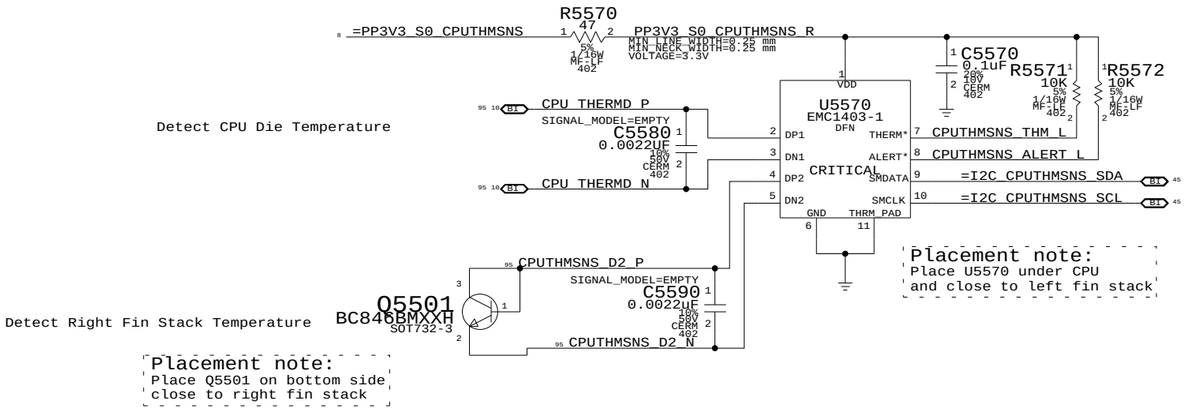
Current Sensing

SYNC_MASTER=SENSOR SYNC_DATE=08/14/2008

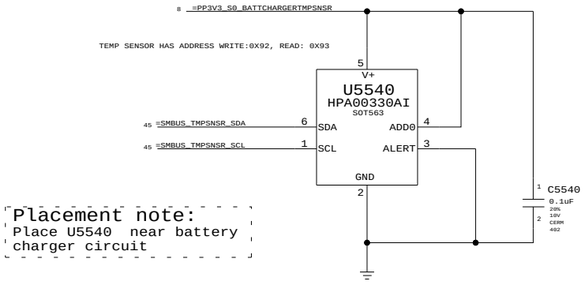
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE	SHT	OF
NONE	47	96

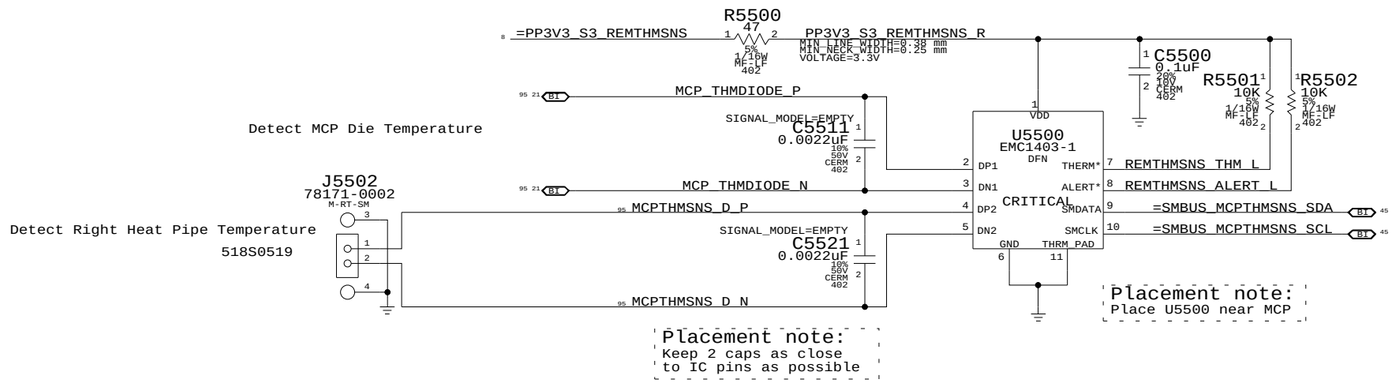
CPU Proximity/CPU Die/Right Fin Stack



Battery Charger Proximity

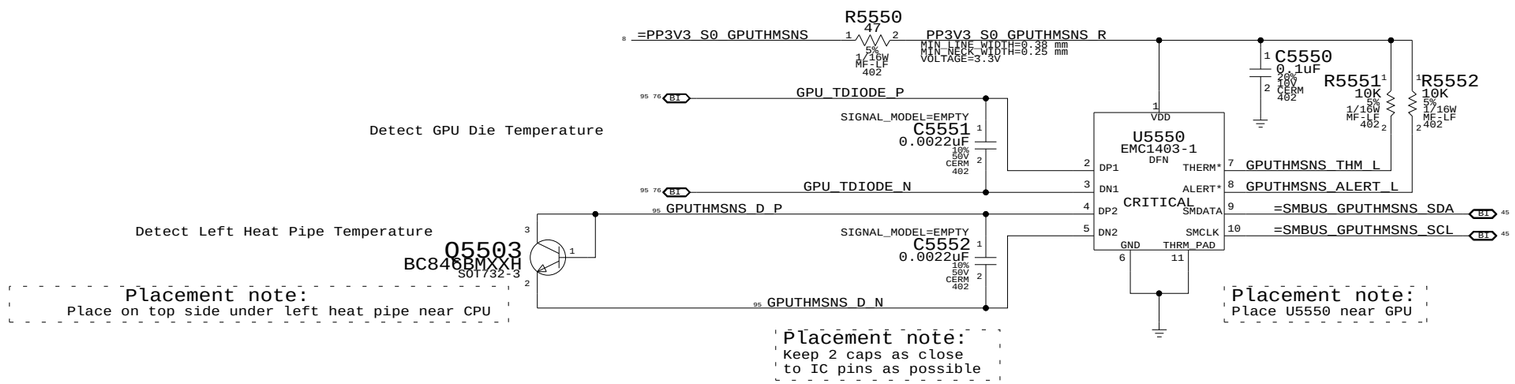


MCP Proximity/MCP Die/Right Heat Pipe



Note: EMC1403 can perform Beta
Compensation for External Diode 1 only

GPU Proximity/GPU Die/Left Heat Pipe



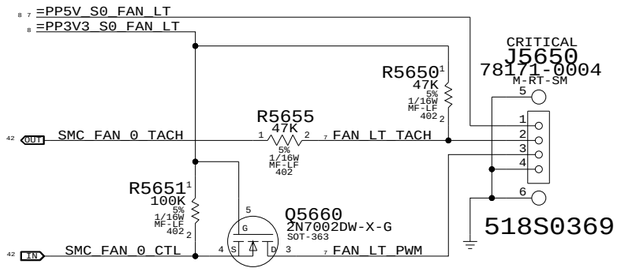
Thermal Sensors

SYNC_MASTER=SENSOR SYNC_DATE=08/14/2008

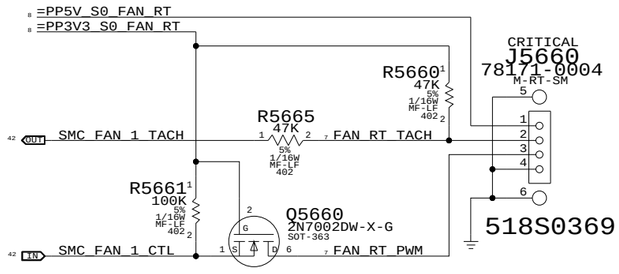
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 48 OF 96	

Left Fan



Right Fan



Fan Connectors

SYNC_MASTER=M87_MLB SYNC_DATE=10/17/2007

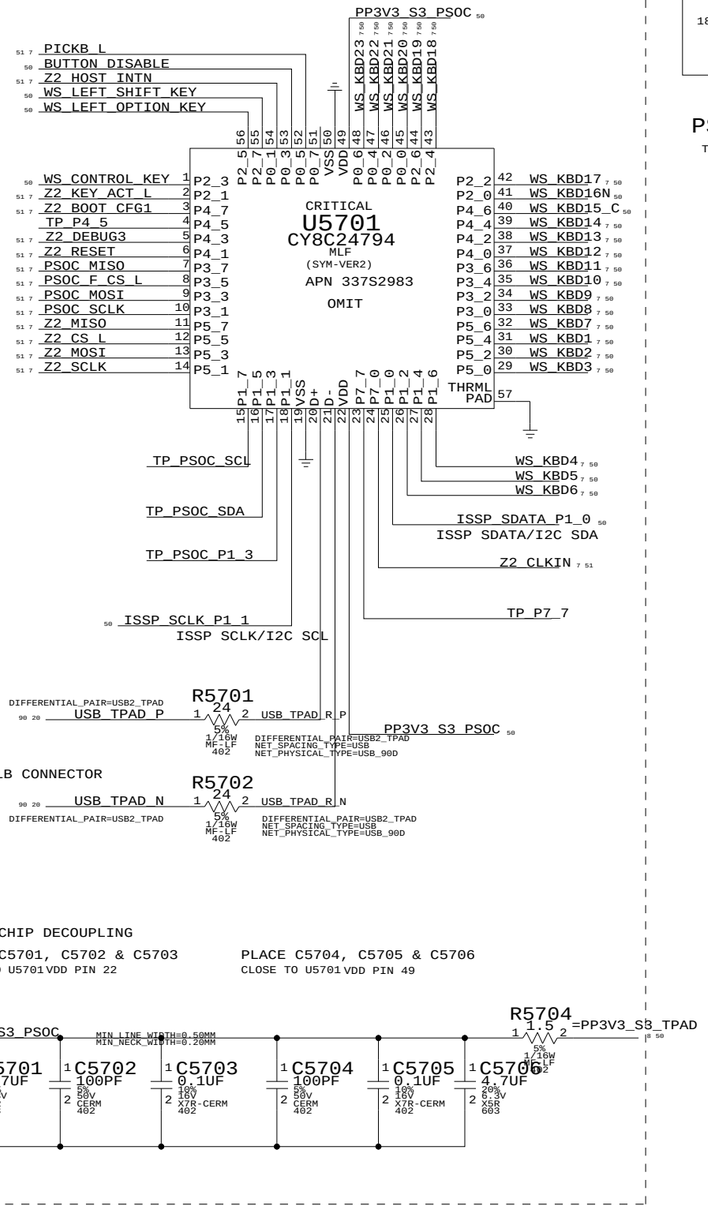
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 49 OF 96	

PSOC USB CONTROLLER

USB INTERFACES TO MLB
SPI HOST TO Z2

TRACKPAD PICK BUTTONS
KEYBOARD SCANNER



U5701 CHIP DECOUPLING

PLACE C5701, C5702 & C5703
CLOSE TO U5701 VDD PIN 22

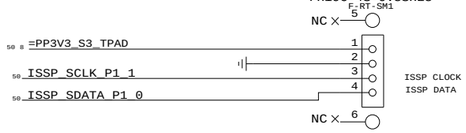
PLACE C5704, C5705 & C5706
CLOSE TO U5701 VDD PIN 49

IC	PIN NAME	CURRENT	R_SNS	V_SNS	POWER
TMP102	V+	10UA	2.55 KOHM	0.0255 V	0.255E-6 W
		80UA		0.204 V	16.32E-6 W
3V3 LDO	VDD	60MA MAX	10 OHM	0.6 V	36E-3 W
	VOUT	60MA MAX	0.2 OHM	0.012 V	0.72E-3 W
PSOC	VDD	8MA (TYP)	1.5 OHM	0.012 V	96E-6 W
		14MA (MAX)		0.021 V	294E-6 W
18V BOOSTER	VIN	4MA (MAX)	4.7 OHM	0.0188 V	75.2E-6 W

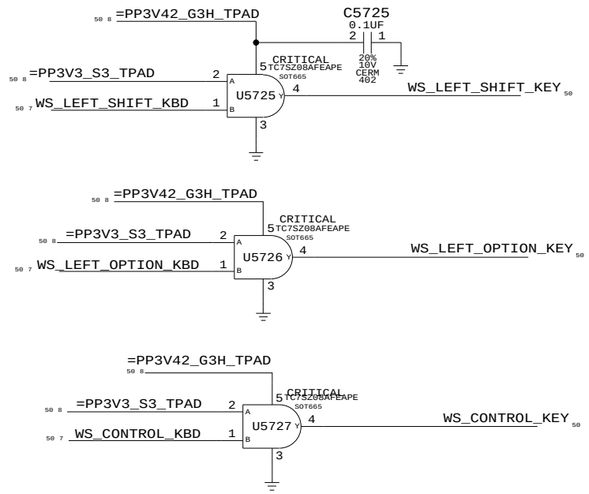
PSOC PROGRAMMING CONNECTOR

TEST POINTS ARE FOR ON BOARD PROGRAMMING

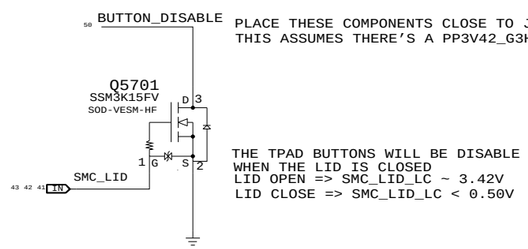
TPAD_DEBUG
APN 518S0430
J5702
FH19C-4S-0.5SH25
F-RT-SM1



ISOLATION CIRCUIT



TPAD BUTTONS DISABLE

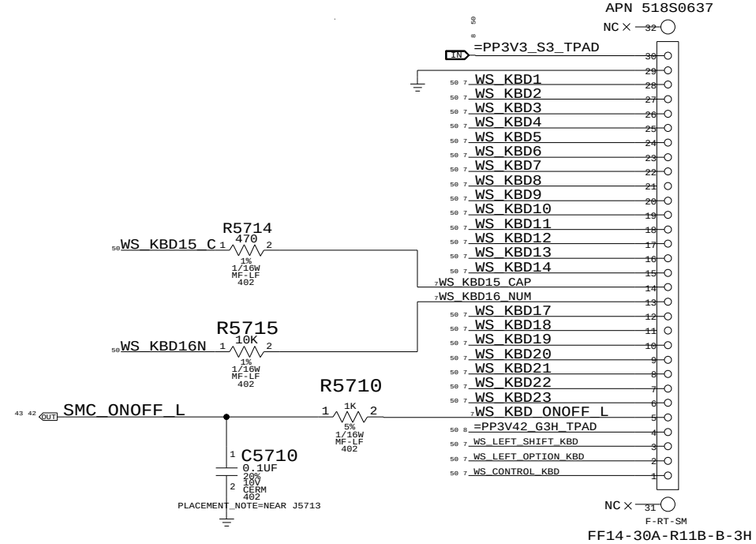


PLACE THESE COMPONENTS CLOSE TO J5800
THIS ASSUMES THERE'S A PP3V42_G3H PULL UP ON MLB

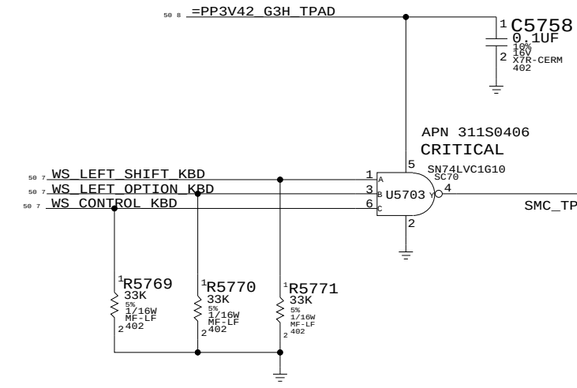
THE TPAD BUTTONS WILL BE DISABLE
WHEN THE LID IS CLOSED
LID OPEN => SMC_LID_LC ~ 3.42V
LID CLOSE => SMC_LID_LC < 0.50V

KEYBOARD CONNECTOR

J5713
APN 518S0637



SMC_MANUAL_RESET LOGIC

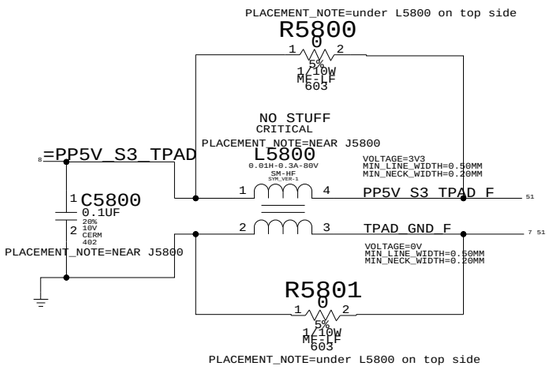


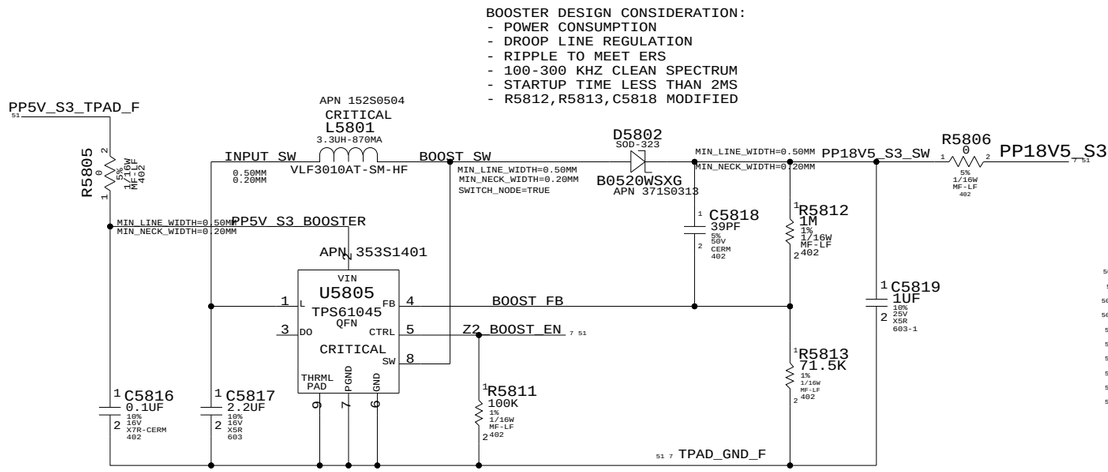
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 50 OF 96	

BOOSTER +18.5VDC FOR SENSORS

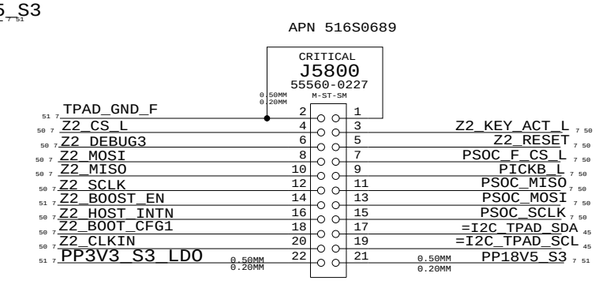
BOOSTER DESIGN CONSIDERATION:
- POWER CONSUMPTION
- DROOP LINE REGULATION
- RIPPLE TO MEET ERS
- 100-300 KHZ CLEAN SPECTRUM
- STARTUP TIME LESS THAN 2MS
- R5812,R5813,C5818 MODIFIED

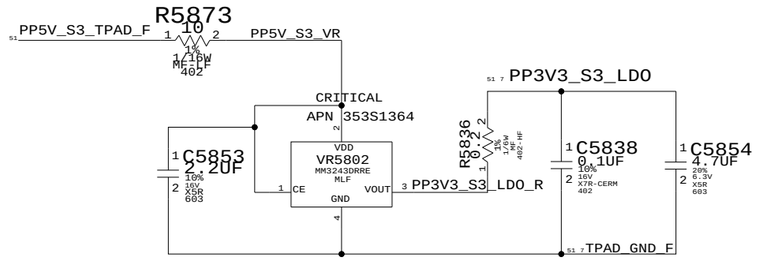




3V3 LDO FOR IPD

IPD FLEX CONNECTOR

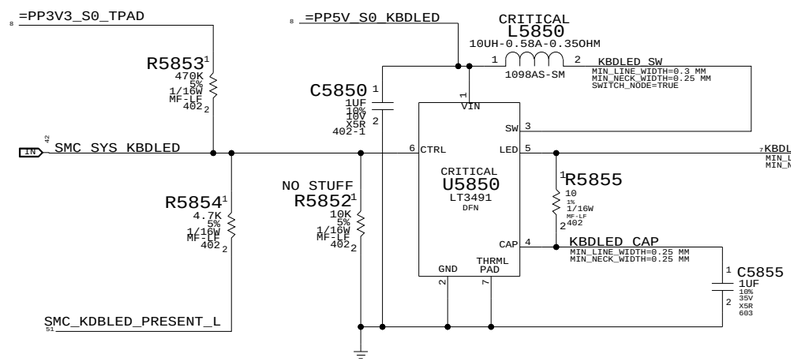


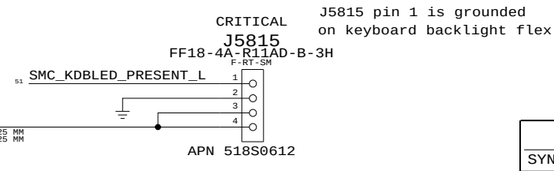


Keyboard LED Driver

To detect Keyboard backlight, SMC will tristate SMC_SYS_KBDLED:
LOW = keyboard backlight present
HIGH= keyboard backlight not present
BOM OPTION: KBDLED_YES

R5853 ALWAYS PRESENT





KBD BACKLIGHT CONNECTOR

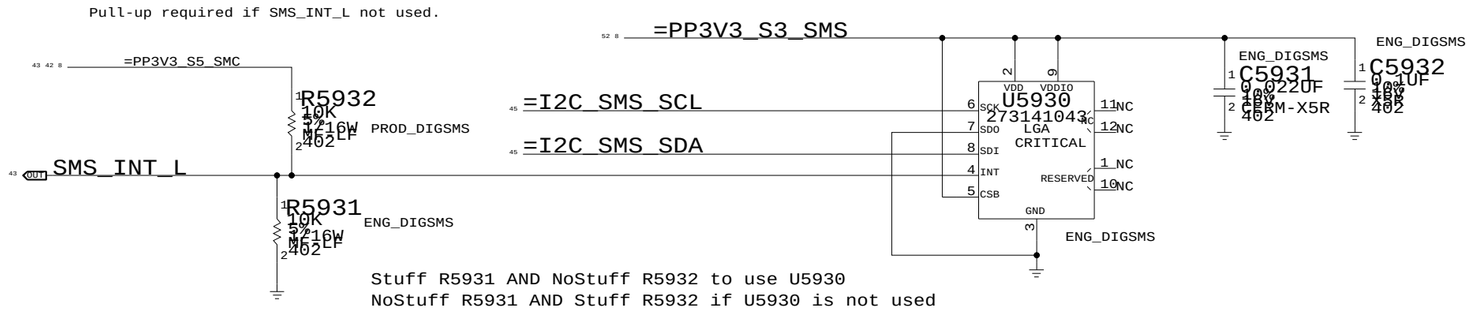
WELLSPRING 2

SYNC_MASTER=PWRSQNC SYNC_DATE=05/12/2008

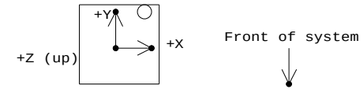
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 51 OF 96	

Digital SMS



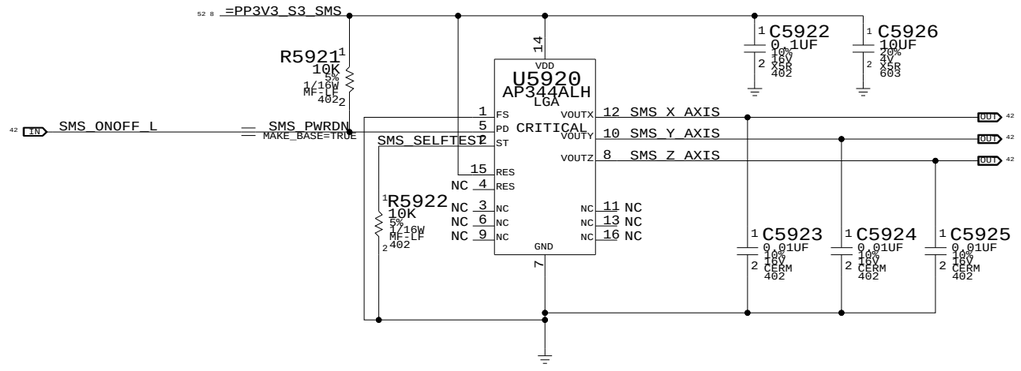
Desired orientation when placed on board top-side:



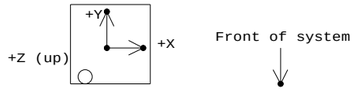
Circle indicates pin 1 location when placed in correct orientation

Analog SMS

R5921 PULLS UP SMS_PWRDN TO TURN OFF SMS WHEN PIN IS NOT BEING DRIVEN BY SMC



Desired orientation when placed on board top-side:



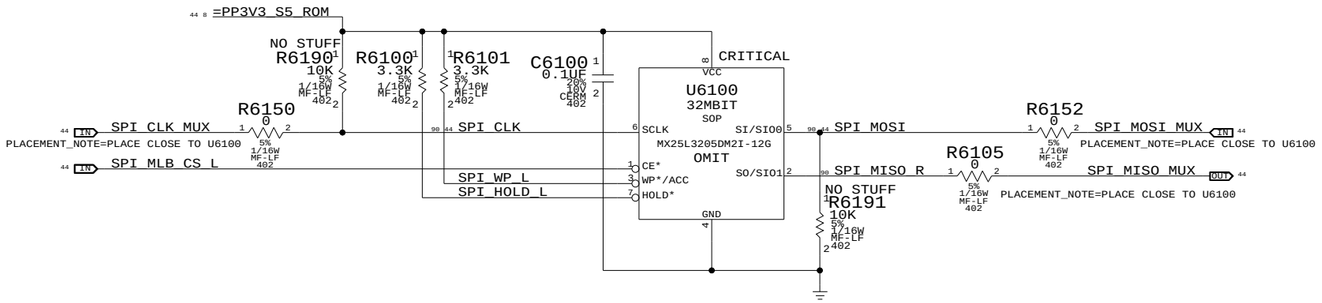
Circle indicates pin 1 location when placed in correct orientation

Sudden Motion Sensor (SMS)

SYNC_MASTER=SENSOR SYNC_DATE=08/14/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 52 OF 96	



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

25MHz is selected with R5190 and R5191
Any of the 4 frequencies can be selected
with R6190, R6191, R5190 and R5191

SPI ROM

SYNC_MASTER=CHANG_M98_MLB SYNC_DATE=07/01/2008

APPLE INC.

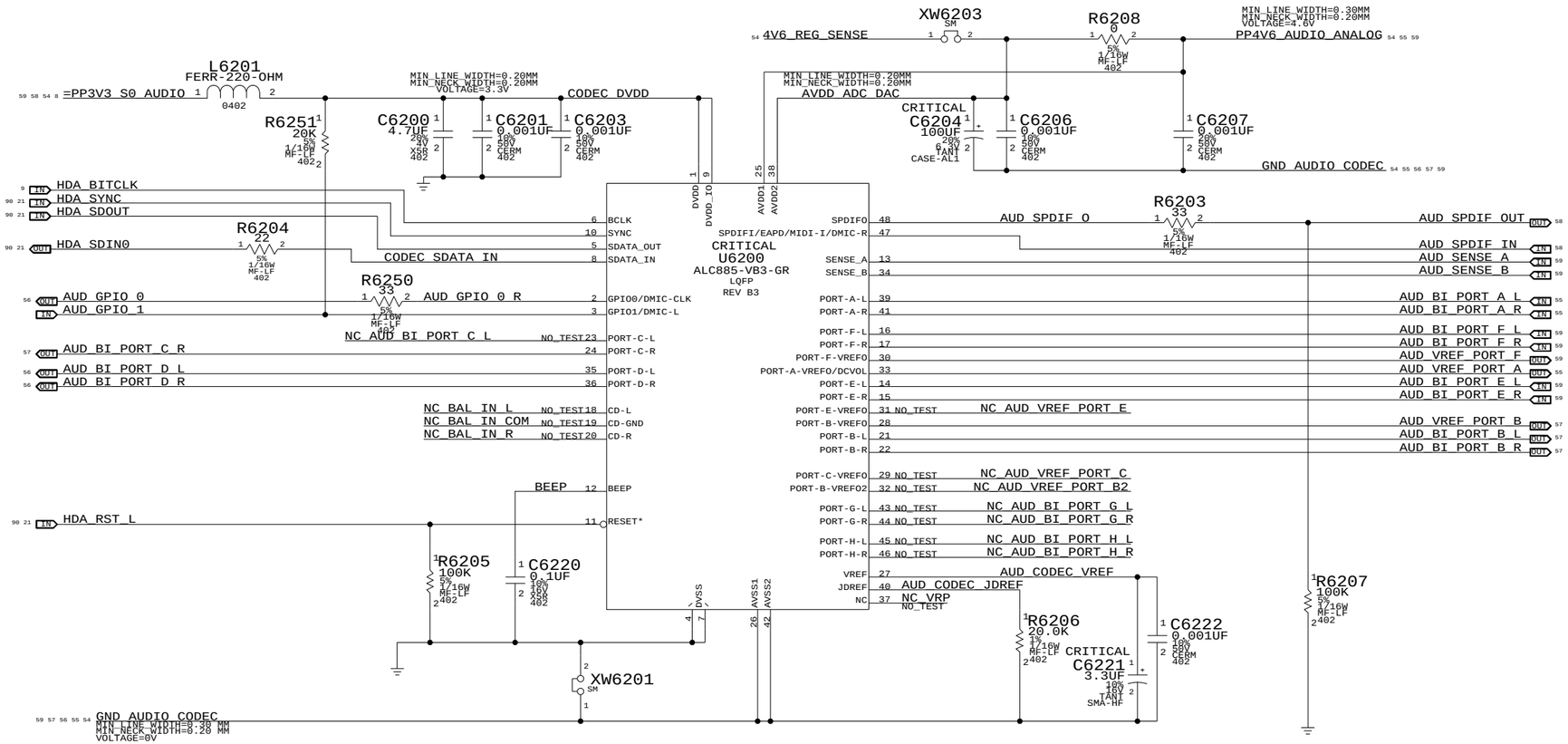
SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0

SCALE: NONE

SHT 53 OF 96

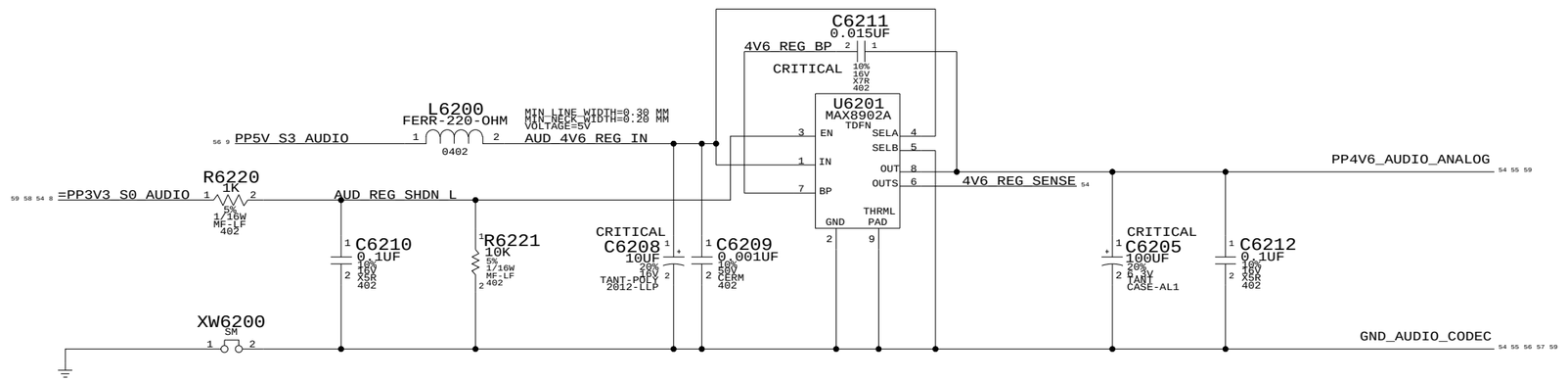
AUDIO CODEC

APPLE P/N 353S1527



AUDIO 4.6V REGULATOR

APPLE P/N 353S1897



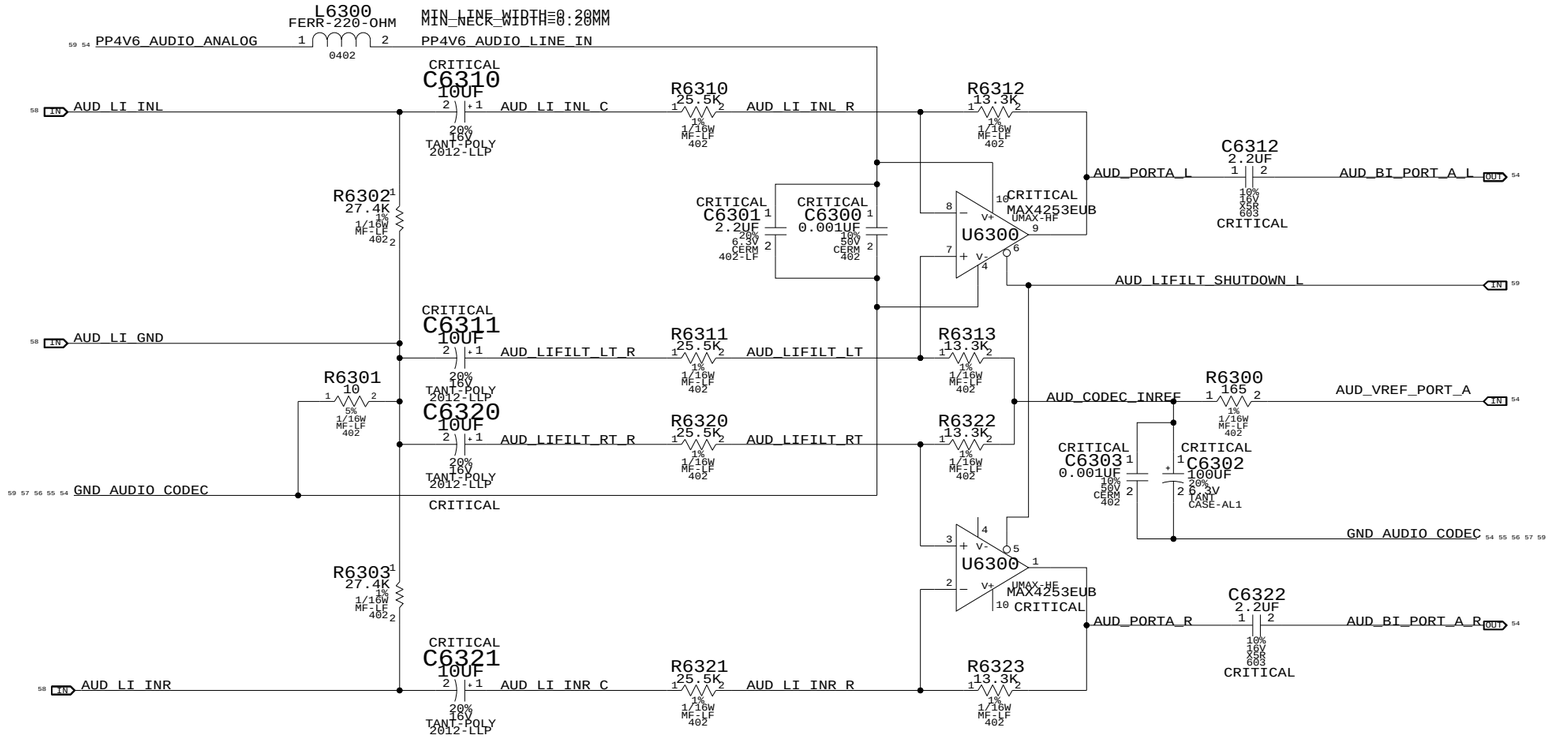
AUDIO:CODEC

SYNC_MASTER=AUDIO SYNC_DATE=07/09/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 54 OF 96	

Pseudo-Diff Line-In Filter
GAIN = -5.4DB AV = 0.52
FC = 1.8 HZ



AUDIO: LINE IN

SYNC_MASTER=AUDIO SYNC_DATE=07/09/2008

NOTICE OF PROPRIETARY PROPERTY

THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING

I TO MAINTAIN THE DOCUMENT IN CONFIDENCE

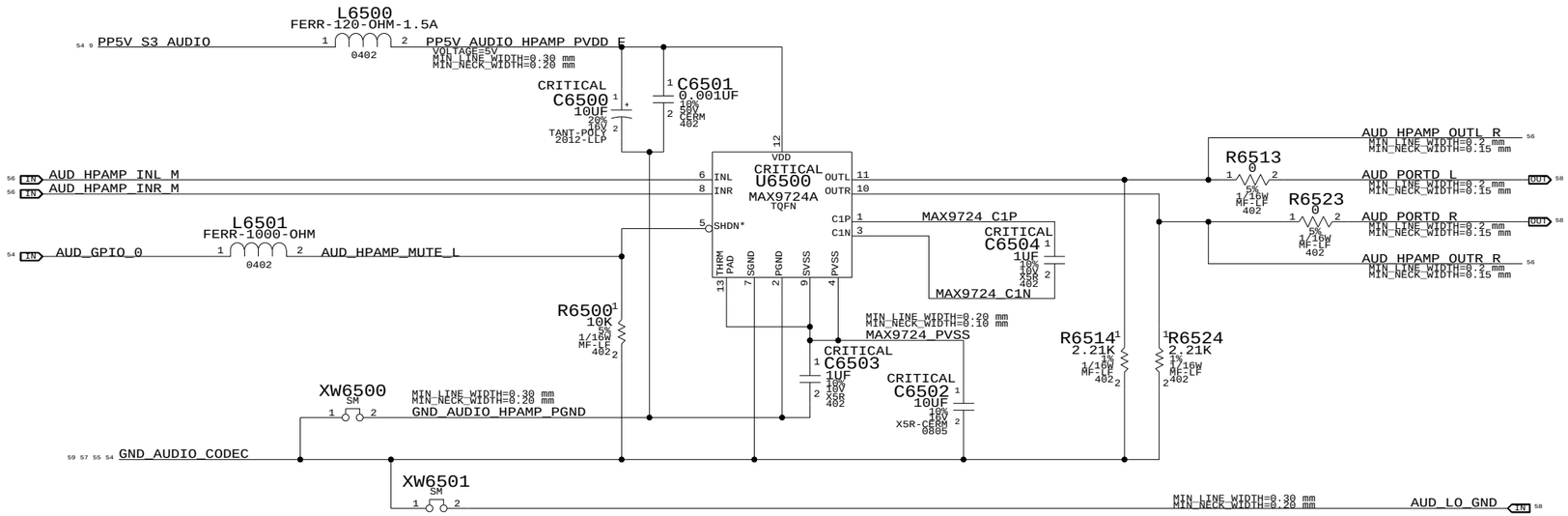
II NOT TO REPRODUCE OR COPY IT

III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE INC.

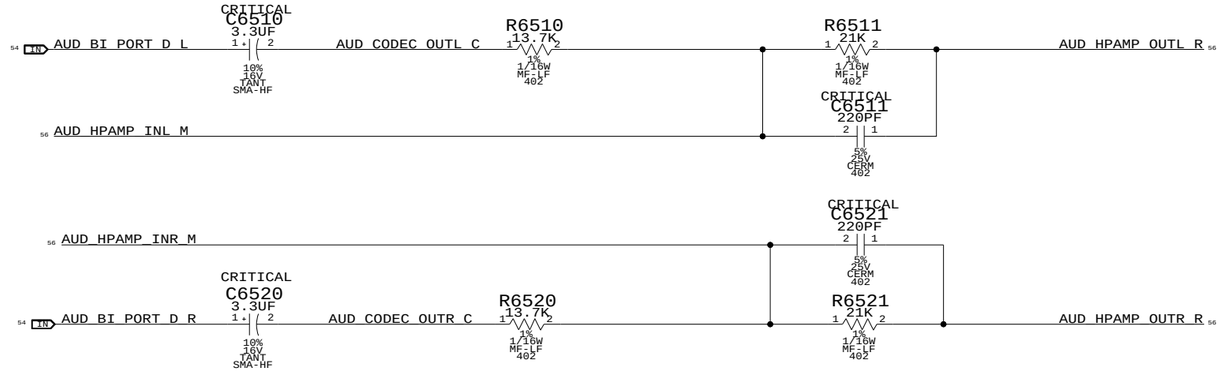
SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 55 OF 96	

Headphone Amplifier (MAX9724A)
APN:353S1637



1st Order DAC Filter

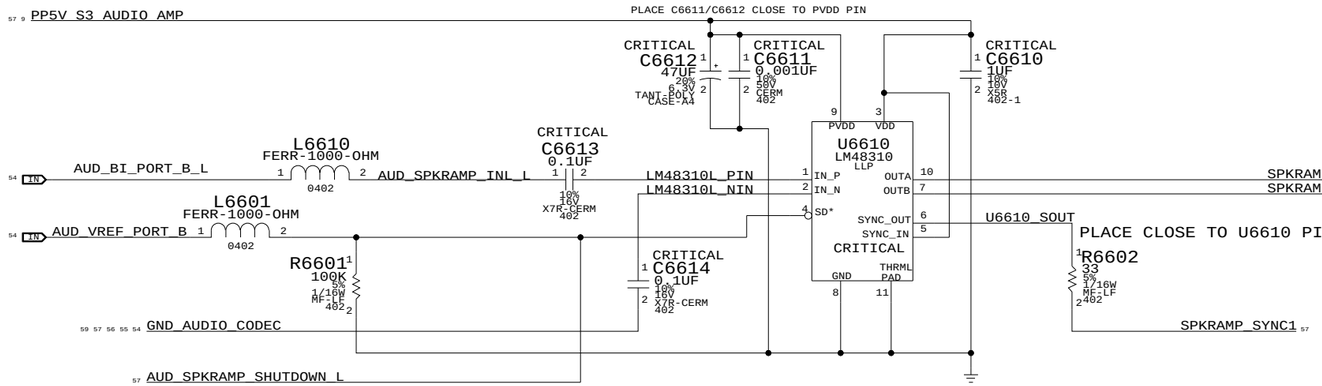
HP:3.52 HZ LP:34 KHZ
VOLTAGE GAIN:1.53



AUDIO: HEADPHONE AMP		
SYNC_MASTER=AUDIO	SYNC_DATE=07/09/2008	

APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7546	A.0.0
	SCALE: NONE	SHT 56 OF 96	

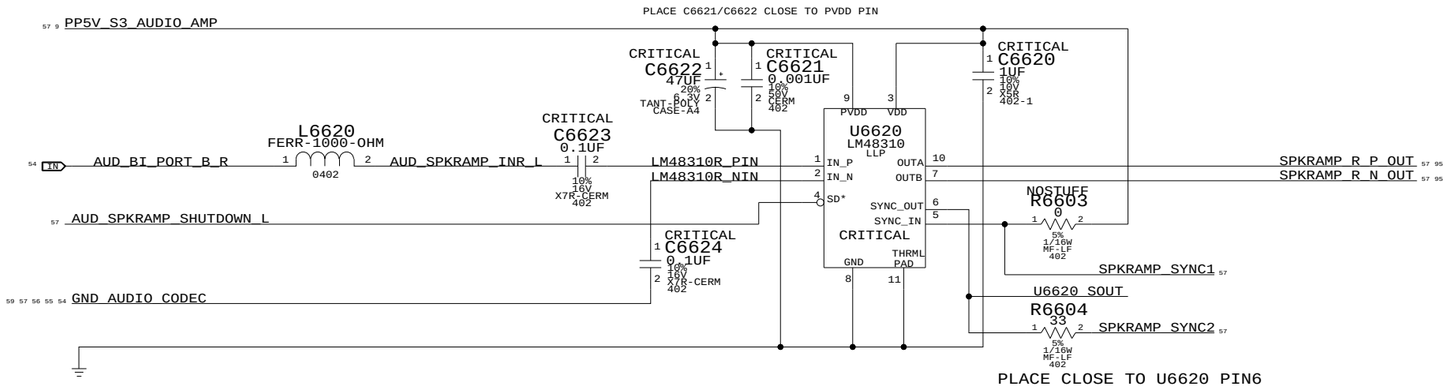
2X MONO SPEAKER AMPLIFIERS (LM48310)
APN: 353S1901
GAIN = 12DB
79Hz < FC (L&R) < 93Hz
53Hz < FC (SUB) < 62Hz



SPEAKER CHECKPOINTS

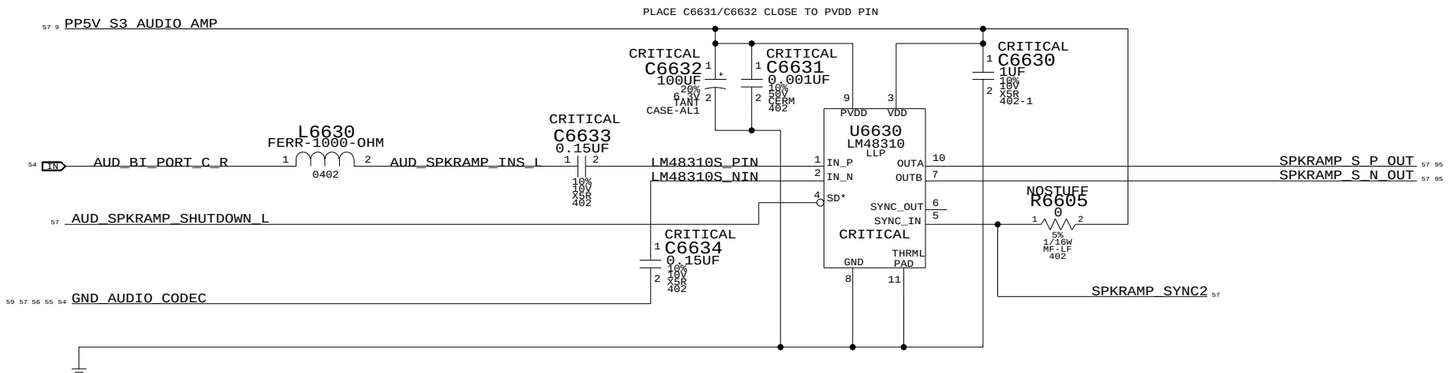
MIN_LINE_WIDTH=0.30 mm
MIN_NECK_WIDTH=0.20 MM
95 57 SPKRAMP_L_P_OUT — R6610 0 5% 1/16W MF-LF 402 — SPKRCONN_L_P_OUT OUT 7 58 95

MIN_LINE_WIDTH=0.30 mm
MIN_NECK_WIDTH=0.20 MM
95 57 SPKRAMP_L_N_OUT — R6611 0 5% 1/16W MF-LF 402 — SPKRCONN_L_N_OUT OUT 7 58 95



MIN_LINE_WIDTH=0.30 mm
MIN_NECK_WIDTH=0.20 MM
95 57 SPKRAMP_R_P_OUT — R6620 0 5% 1/16W MF-LF 402 — SPKRCONN_R_P_OUT OUT 7 58 95

MIN_LINE_WIDTH=0.30 mm
MIN_NECK_WIDTH=0.20 MM
95 57 SPKRAMP_R_N_OUT — R6621 0 5% 1/16W MF-LF 402 — SPKRCONN_R_N_OUT OUT 7 58 95



MIN_LINE_WIDTH=0.30 mm
MIN_NECK_WIDTH=0.20 MM
95 57 SPKRAMP_S_P_OUT — R6630 0 5% 1/16W MF-LF 402 — SPKRCONN_S_P_OUT OUT 7 58 95

MIN_LINE_WIDTH=0.30 mm
MIN_NECK_WIDTH=0.20 MM
95 57 SPKRAMP_S_N_OUT — R6631 0 5% 1/16W MF-LF 402 — SPKRCONN_S_N_OUT OUT 7 58 95

AUDIO:SPEAKER AMP

SYNC_MASTER=AUDIO SYNC_DATE=07/09/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 57 OF 96	

AUDIO JACK 1 LO/HP JACK, SPDIF TX

=PP3V3_S0_AUDIO

APN: 514-0607

CRITICAL
J6700
AUDIO-JACK-TRANS-M97
F-RT-TH3

AUDIO

A - VIN
B - VCC
C - GND

OPERATING VOLTAGE 3.3
POF

SHELL
SHIELD PINS

C6700 0.1UF 10% 10V X5R 402

C6701 2.2UF 20% 6.3V CERM 402-LF

AUD_CONNJ1_SLEEVE2 → R6713 0 → AUD_CONNJ1_SLEEVE2_F → L6703 FERR-1000-OHM 0402 → HS_MIC_HI (OUT)

AUD_CONNJ1_SLEEVE → R6711 0 → AUD_CONNJ1_SLEEVE_F → L6702 FERR-1000-OHM 0402 → HS_MIC_LO (OUT)

AUD_CONNJ1_RING → R6714 0 → AUD_CONNJ1_RING_F → CRITICAL L6701 FERR-220-OHM-2.5A 0603 → AUD_LO_GND (OUT)

AUD_CONNJ1_TIPDET → R6715 0 → AUD_CONNJ1_TIPDET_F → CRITICAL L6704 FERR-220-OHM 0402 → AUD_PORTD_R (BI)

AUD_CONNJ1_TIP → R6716 0 → AUD_CONNJ1_TIP_F → CRITICAL L6706 FERR-220-OHM 0402 → AUD_PORTD_L (BI)

AUD_CONNJ1_SLEEVEDET → R6710 0 → AUD_CONNJ1_SLEEVEDET_F → R6700 10K → AUD_J1_SLEEVEDET_R (OUT)

AUD_CONNJ1_TIPDET_F → L6705 FERR-1000-OHM 0402 → AUD_J1_TIPDET_R (OUT)

CRITICAL DZ6705 6.8V-100PF 402
CRITICAL DZ6702 6.8V-100PF 402
CRITICAL DZ6706 6.8V-100PF 402
CRITICAL DZ6704 6.8V-100PF 402
CRITICAL DZ6703 6.8V-100PF 402

C6705 100PF 5% 50V CERM 402

GND_CHASSIS_AUDIO_JACK

AUD_SPDIF_OUT (IN)

MIC CONNECTOR

APN: 518S0520

CRITICAL
J6780
78171-0003
M-RT-SM

BI_MIC_LO (OUT)
BI_MIC_SHIELD (OUT)
BI_MIC_HI (OUT)

SPEAKER CONNECTOR

APN: 518S0519

CRITICAL
J6781
78171-0002
M-RT-SM

SPKRCONN_L_P_OUT (IN)
SPKRCONN_L_N_OUT (IN)

CRITICAL
J6782
78171-0004
M-RT-SM

APN: 518S0521

SPKRCONN_S_P_OUT (IN)
SPKRCONN_S_N_OUT (IN)
SPKRCONN_R_P_OUT (IN)
SPKRCONN_R_N_OUT (IN)

NOSTUFF CRITICAL C6783 100PF 5% 50V CERM 402
NOSTUFF CRITICAL C6784 100PF 5% 50V CERM 402
NOSTUFF CRITICAL C6781 100PF 5% 50V CERM 402
NOSTUFF CRITICAL C6782 100PF 5% 50V CERM 402

RETURN FOR HF NOISE

R6701 0 1/16W MF-LF 402

GND_CHASSIS_AUDIO_JACK

=PP3V3_S0_AUDIO

APN: 514-0608

CRITICAL
J6750
AUDIO-RCVR-M97
F-RT-TH3

AUDIO

A - VDD
B - GND
C - VOUT

OPERATING VOLTAGE 3.3
POF

SHELL
SHIELD PINS

C6750 0.1UF 10% 10V X5R 402

AUD_J2_OPT_OUT → R6749 10 → AUD_SPDIF_IN (OUT)

AUD_CONNJ2_SLEEVE → R6761 0 → AUD_CONNJ2_SLEEVE_F → L6751 FERR-220-OHM 0402

AUD_CONNJ2_TIPDET → R6762 0 → AUD_CONNJ2_TIPDET_F → L6754 FERR-1000-OHM 0402 → AUD_LI_INR (BI)

AUD_CONNJ2_RING → R6764 0 → AUD_CONNJ2_RING_F → L6756 FERR-1000-OHM 0402 → AUD_LI_INL (BI)

AUD_CONNJ2_TIP → R6766 0 → AUD_CONNJ2_TIP_F → L6758 FERR-220-OHM 0402 → AUD_J2_COM → XW6701 SM → AUD_LI_GND

AUD_CONNJ2_SLEEVEDET → R6768 0 → AUD_CONNJ2_SLEEVEDET_F → L6752 FERR-1000-OHM 0402 → AUD_J2_TIPDET_R (OUT)

CRITICAL DZ6753 6.8V-100PF 402
CRITICAL DZ6755 6.8V-100PF 402
CRITICAL DZ6752 6.8V-100PF 402
CRITICAL DZ6754 6.8V-100PF 402

C6756 100PF 5% 50V CERM 402

GND_CHASSIS_AUDIO_JACK

AUDIO JACK 2 LINE IN JACK, SPDIF RX

AUDIO: JACKS

SYNC_MASTER=AUDIO SYNC_DATE=07/09/2008

NOTICE OF PROPRIETARY PROPERTY

THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING

I TO MAINTAIN THE DOCUMENT IN CONFIDENCE

II NOT TO REPRODUCE OR COPY IT

III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0

SCALE	SHT	OF
NONE	58	96

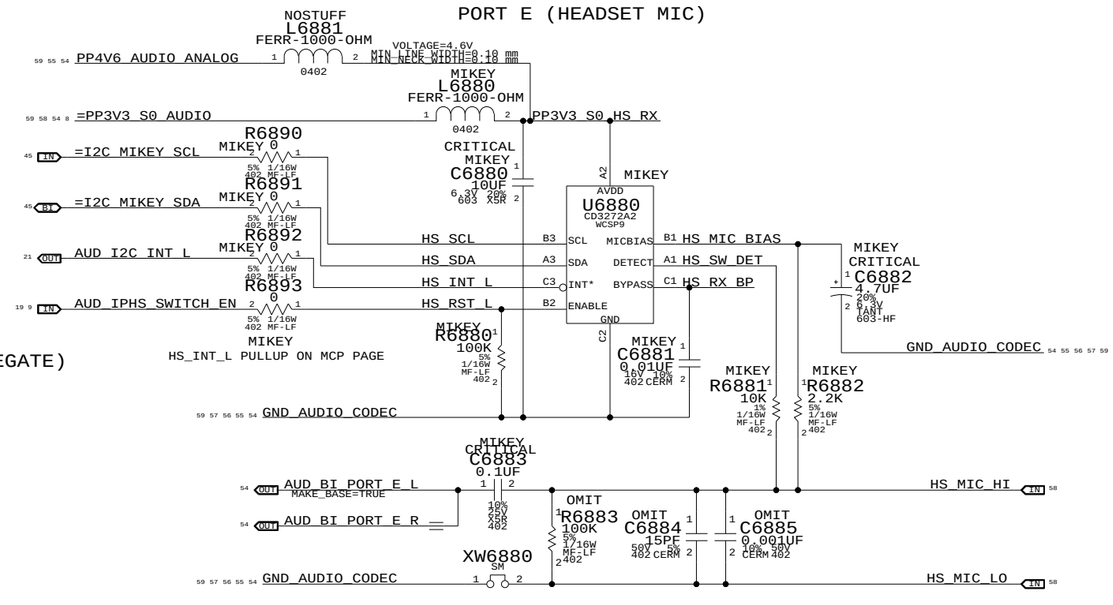
CODEC OUTPUT SIGNAL PATHS

FUNCTION	VOLUME	CONVERTER	MIXER(OUTPUT)	PIN COMPLEX	MUTE CONTROL	DET ASSIGNMENT
HP/LINE OUT	0X0C (12)	0X02 (2)	0X0C (12)	0X14 (20,D)	GPIO_0	0X14 (20,D)
SATELLITES	0X0D (13)	0X03 (3)	0X0D (13)	0X18 (24,B)	VREF_B (100%)	N/A
SUB	0X0F (15)	0X05 (05)	0X0F (15)	0X1A (26,C)	VREF_B (100%)	N/A
SPDIF OUT	N/A	0X06 (6)		0X1E (SPDIF OUT)	N/A	0X16 (22,G)

CODEC INPUT SIGNAL PATHS

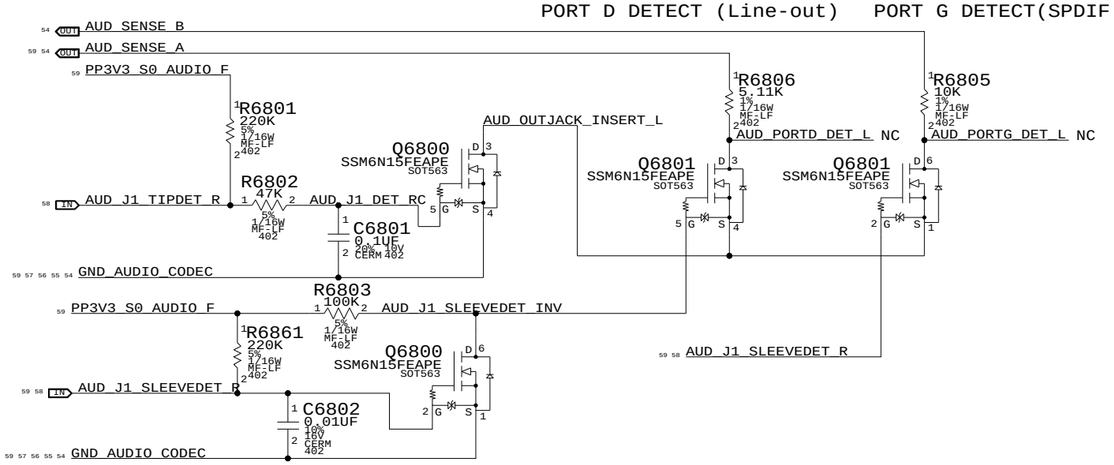
FUNCTION	MIXER(INPUT)	CONVERTER	PIN COMPLEX	VREF	DET ASSIGNMENT
LINE IN	0X23 (35)	0X08 (8)	0X15 (21,A)	VREF_A (50%)	0X15 (21,A)
SPDIF IN	N/A	0X0A (10)	0X1F (SPDIF IN)	N/A	N/A
BUILT-IN MIC	0X24 (36)	0X07 (7)	0X19 (25,F)	VREF_F (100%)	N/A
HEADSET MIC	0X24 (36)	0X07 (7)	0X1B (27,E)	MIKEY	MIKEY

PORT E (HEADSET MIC)



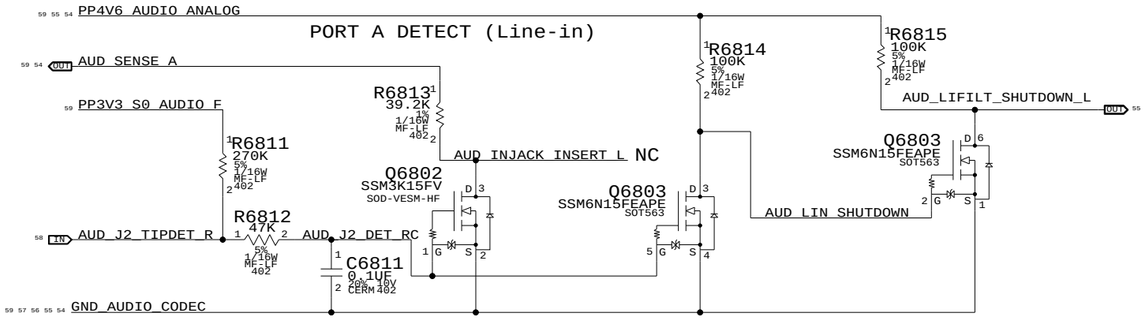
PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	BOM OPTION
116S0114	1	100K 5% 0402 RESISTOR	R6883	MIKEY
131S1513	1	15PF 5% 0402 CAPACITOR	C6884	MIKEY
132S0045	1	100PF 10% 0402 CAPACITOR	C6885	MIKEY
116S0004	1	0 OHMS 5% 0402 RESISTOR	R6883	NOMIKEY
116S0004	1	0 OHMS 5% 0402 RESISTOR	C6884	NOMIKEY
116S0004	1	0 OHMS 5% 0402 RESISTOR	C6885	NOMIKEY

PORT D DETECT (Line-out) PORT G DETECT(SPDIF DELEGATE)

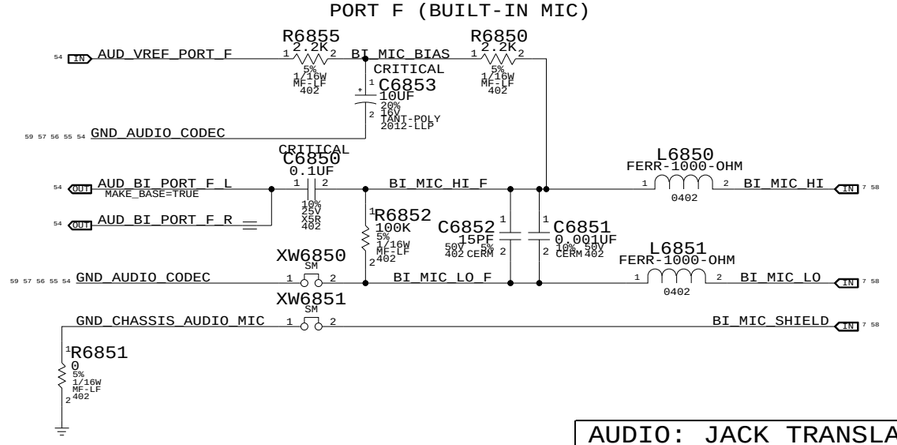


LINE_IN AMP SHUTDOWN CONTROL

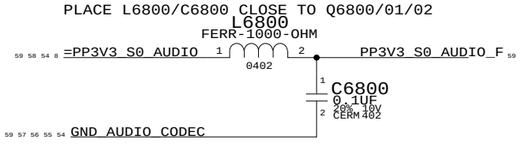
PORT A DETECT (Line-in)



PORT F (BUILT-IN MIC)



PLACE L6800/C6800 CLOSE TO Q6800/01/02



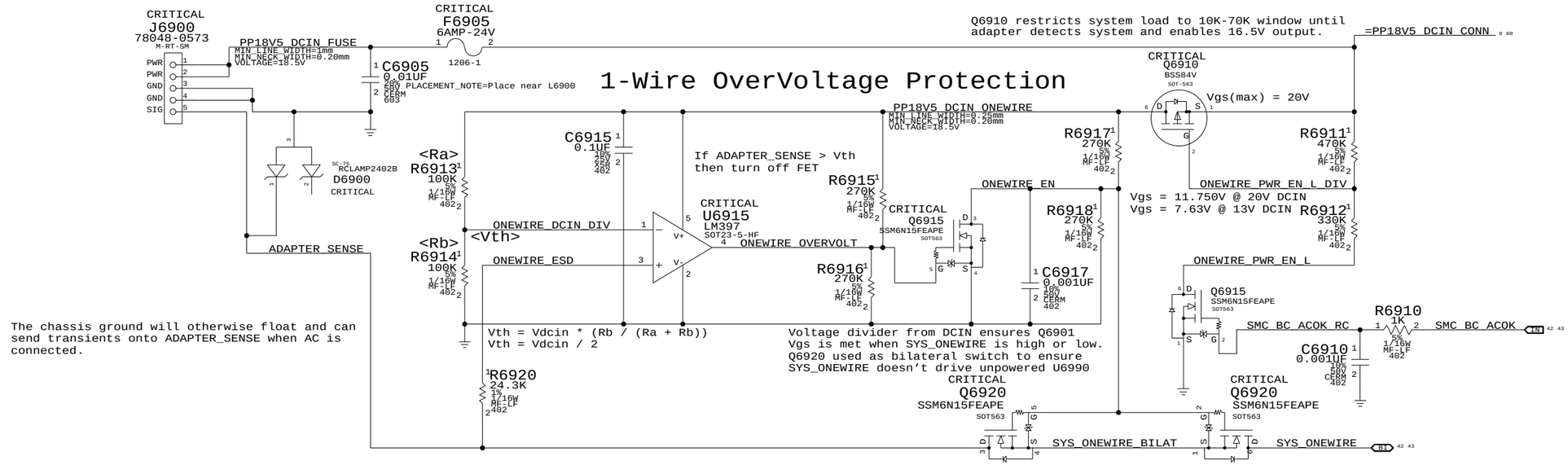
AUDIO: JACK TRANSLATORS

SYNC_MASTER=AUDIO SYNC_DATE=07/09/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 59 OF 96	

MagSafe DC Power Jack

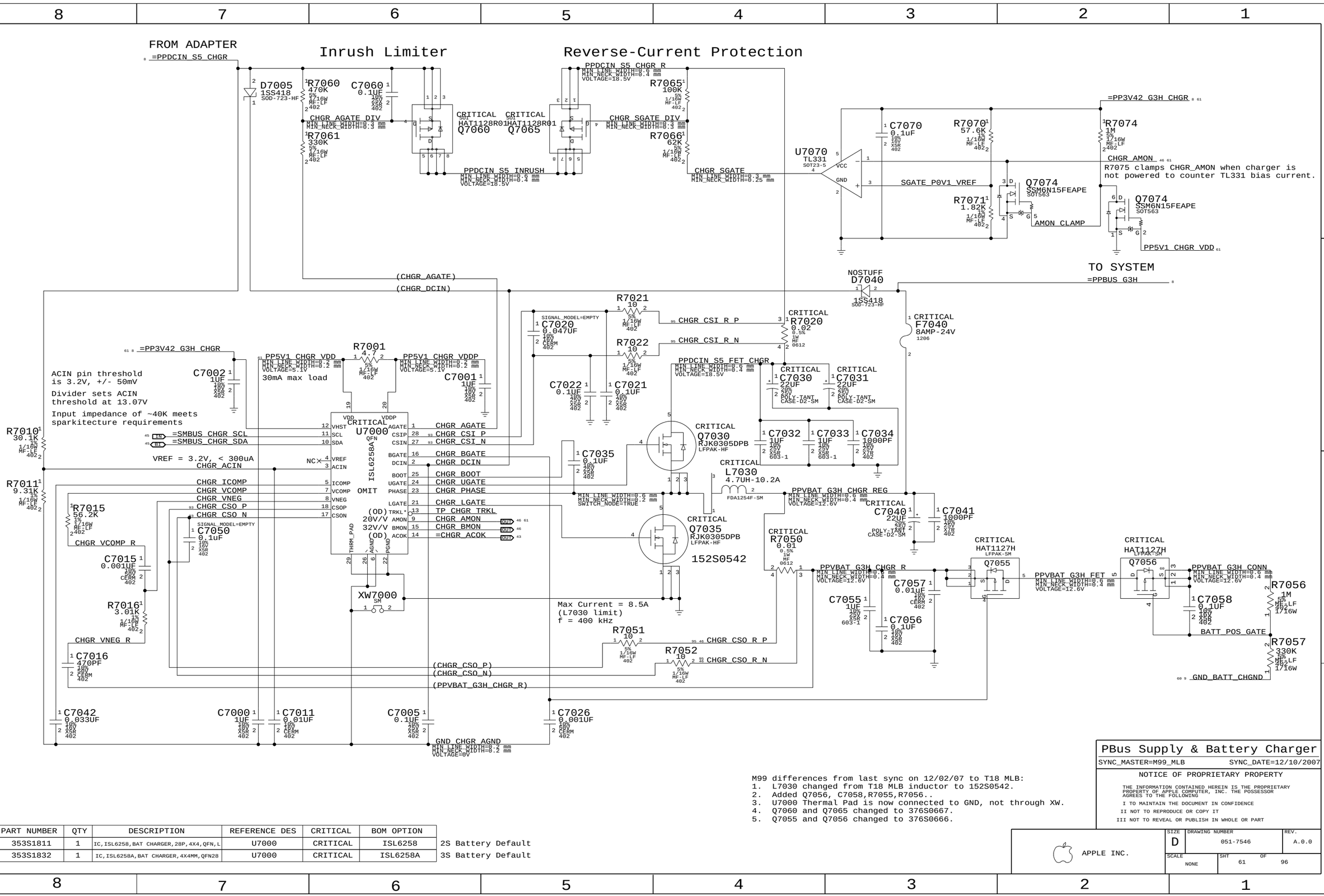


DC-In & Battery Connectors

SYNC_MASTER=T18_MLB SYNC_DATE=12/06/2007

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 60 OF 96	



PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION	
353S1811	1	IC,ISL6258,BAT CHARGER,28P,4X4,QFN,L	U7000	CRITICAL	ISL6258	2S Battery Default
353S1832	1	IC,ISL6258A,BAT CHARGER,4X4MM,QFN28	U7000	CRITICAL	ISL6258A	3S Battery Default

M99 differences from last sync on 12/02/07 to T18 MLB:
1. L7030 changed from T18 MLB inductor to 152S0542.
2. Added Q7056, C7058,R7055,R7056..
3. U7000 Thermal Pad is now connected to GND, not through XW.
4. Q7060 and Q7065 changed to 376S0667.
5. Q7055 and Q7056 changed to 376S0666.

PBus Supply & Battery Charger

SYNC_MASTER=M99_MLB SYNC_DATE=12/10/2007

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT: 61 OF 96	

DPRSLPVR	DPRSTP*	PSI*	Operation	Mode
0	1	1	2-Phase	CCM
0	1	0	1-Phase	CCM
1	0	1	1-Phase	DCM
1	0	0	1-Phase	DCM

Place R7131 Between L7100,L7101 and CPU

IMVP_VR_ON	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.20 MM	
IMVP6_OCSET	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.20 MM	
IMVP6_VO	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.20 MM	
IMVP6_DROOP	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.20 MM	
IMVP6_DFB	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.20 MM	
IMVP6_SOFT	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.20 MM	
IMVP6_RBIAS	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.20 MM	
IMVP6_VDIFF	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.20 MM	
IMVP6_FB2	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.20 MM	
IMVP6_FB	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.20 MM	
IMVP6_COMP	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.20 MM	
IMVP6_VW	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.20 MM	

IMVP6_PHASE1	MIN_LINE_WIDTH=1.5 MM	MIN_NECK_WIDTH=0.2 MM	
IMVP6_BOOT1	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.2 MM	
IMVP6_UGATE1	MIN_LINE_WIDTH=0.5 MM	MIN_NECK_WIDTH=0.2 MM	
IMVP6_LGATE1	MIN_LINE_WIDTH=0.5 MM	MIN_NECK_WIDTH=0.2 MM	
IMVP6_ISEN1	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.2 MM	
IMVP6_VSUM1	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.25 MM	
IMVP6_VO1	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.25 MM	
IMVP6_VSEN_P	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.2 MM	1849

IMVP6_PHASE2	MIN_LINE_WIDTH=1.5 MM	MIN_NECK_WIDTH=0.2 MM	
IMVP6_BOOT2	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.2 MM	
IMVP6_UGATE2	MIN_LINE_WIDTH=0.5 MM	MIN_NECK_WIDTH=0.2 MM	
IMVP6_LGATE2	MIN_LINE_WIDTH=0.5 MM	MIN_NECK_WIDTH=0.2 MM	
IMVP6_ISEN2	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.2 MM	
IMVP6_VSUM2	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.25 MM	
IMVP6_VO2	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.25 MM	
IMVP6_VSEN_N	MIN_LINE_WIDTH=0.25 MM	MIN_NECK_WIDTH=0.2 MM	1848

IMVP6 CPU VCore Regulator

SYNC_MASTER=M87_MLB SYNC_DATE=10/17/2007

NOTICE OF PROPRIETARY PROPERTY

THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING

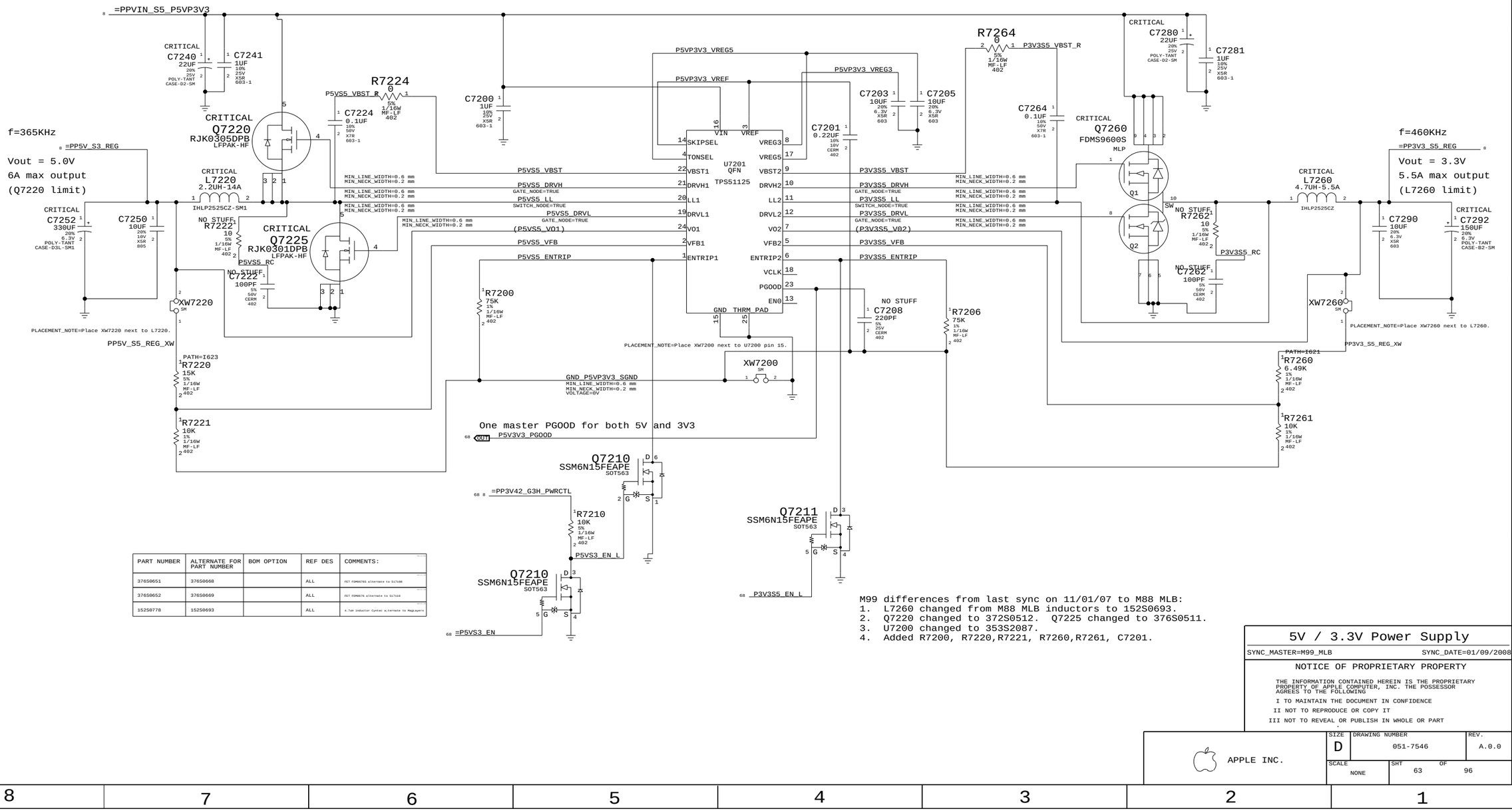
I TO MAINTAIN THE DOCUMENT IN CONFIDENCE

II NOT TO REPRODUCE OR COPY IT

III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 62 OF 96	



PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
376S0651	376S0668		ALL	FET FDMS8676S alternate to Si7540
376S0652	376S0669		ALL	FET FDMS8670 alternate to Si7510
152S0778	152S0693		ALL	4.7uH inductor Cyntec alternate to Magnalayers

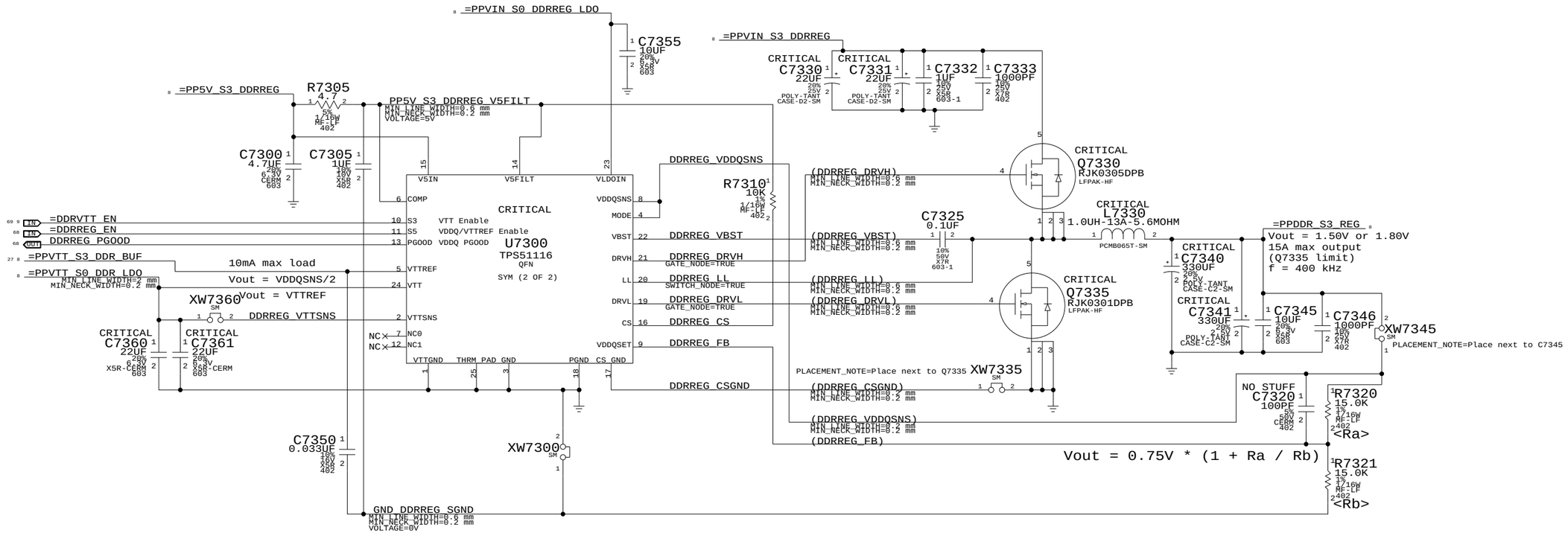
M99 differences from last sync on 11/01/07 to M88 MLB:
1. L7260 changed from M88 MLB inductors to 152S0693.
2. Q7220 changed to 372S0512. Q7225 changed to 376S0511.
3. U7200 changed to 353S2087.
4. Added R7200, R7220,R7221, R7260,R7261, C7201.

5V / 3.3V Power Supply

SYNC_MASTER=M99_MLB SYNC_DATE=01/09/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 63 OF 96	

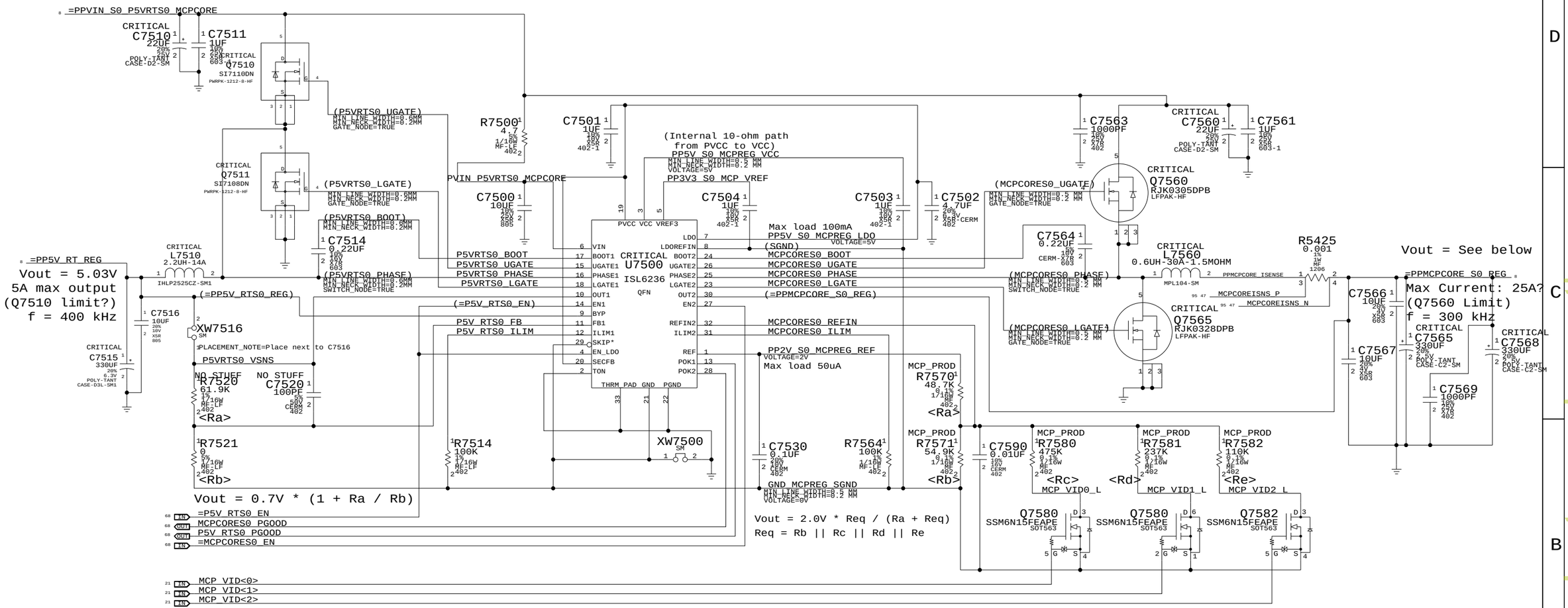


1.5V DDR3 Supply

SYNC_MASTER=M99_MLB SYNC_DATE=12/13/2007

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 64 OF 96	



MCP79 Rev A01 requires higher core & analog voltage

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
114S0382	1	RES,MTL FILM,1/16W,48.7K,1,0402,SMD,LF	R7570		MCP_A01
114S0400	1	RES,MTL FILM,1/16W,76.8K,1,0402,SMD,LF	R7571		MCP_A01
114S0482	1	RES,MTL FILM,1/16W,523K,1,0402,SMD,LF	R7580		MCP_A01
114S0453	1	RES,MTL FILM,1/16W,267K,1,0402,SMD,LF	R7581		MCP_A01
114S0422	1	RES,MTL FILM,1/16W,130K,1,0402,SMD,LF	R7582		MCP_A01
114S0373	1	RES,MTL FILM,1/16W,40.2K,1,0402,SMD,LF	R7570		MCP_A01Q
114S0404	1	RES,MTL FILM,1/16W,84.5K,1,0402,SMD,LF	R7571		MCP_A01Q
114S0458	1	RES,MTL FILM,1/16W,301K,1,0402,SMD,LF	R7580		MCP_A01Q
114S0447	1	RES,MTL FILM,1/16W,237K,1,0402,SMD,LF	R7581		MCP_A01Q
114S0411	1	RES,MTL FILM,1/16W,100K,1,0402,SMD,LF	R7582		MCP_A01Q

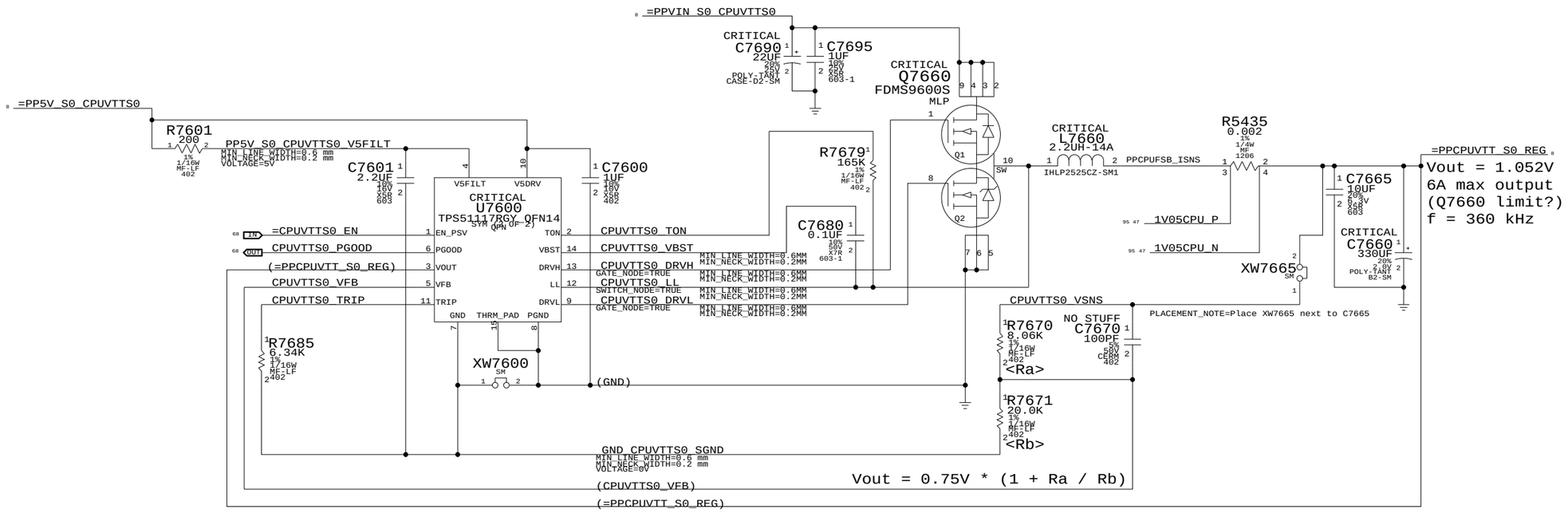
VID<2:0>	Rev A01 Voltage	Production Voltage	MCP Target
000	+1.224V	+1.060V	+1.05V
001	+1.159V	+0.994V	+1.00V
010	+1.101V	+0.937V	+0.95V
011	+1.049V	+0.885V	+0.90V
100	+0.995V	+0.830V	+0.85V
101	+0.952V	+0.789V	+0.80V
110	+0.913V	+0.752V	+0.75V
111	+0.876V	+0.719V	+0.70V

1.05V / MCP Core Regulator

SYNC_MASTER=M99_MLB SYNC_DATE=01/08/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 65 OF 96	



M99 differences from last sync on 12/03/07 to T18 MLB:
1. Tied THERMAL_PAD to PGND. GND and THERMAL_PAD disconnected.

CPU VTT Power Supply

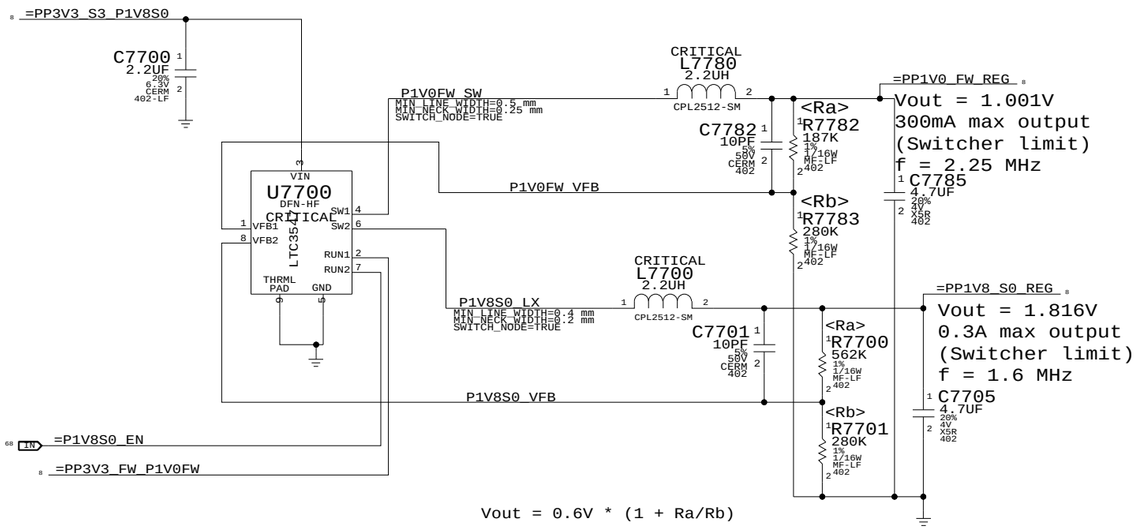
SYNC_MASTER=M99_MLB SYNC_DATE=12/14/2007

APPLE INC.

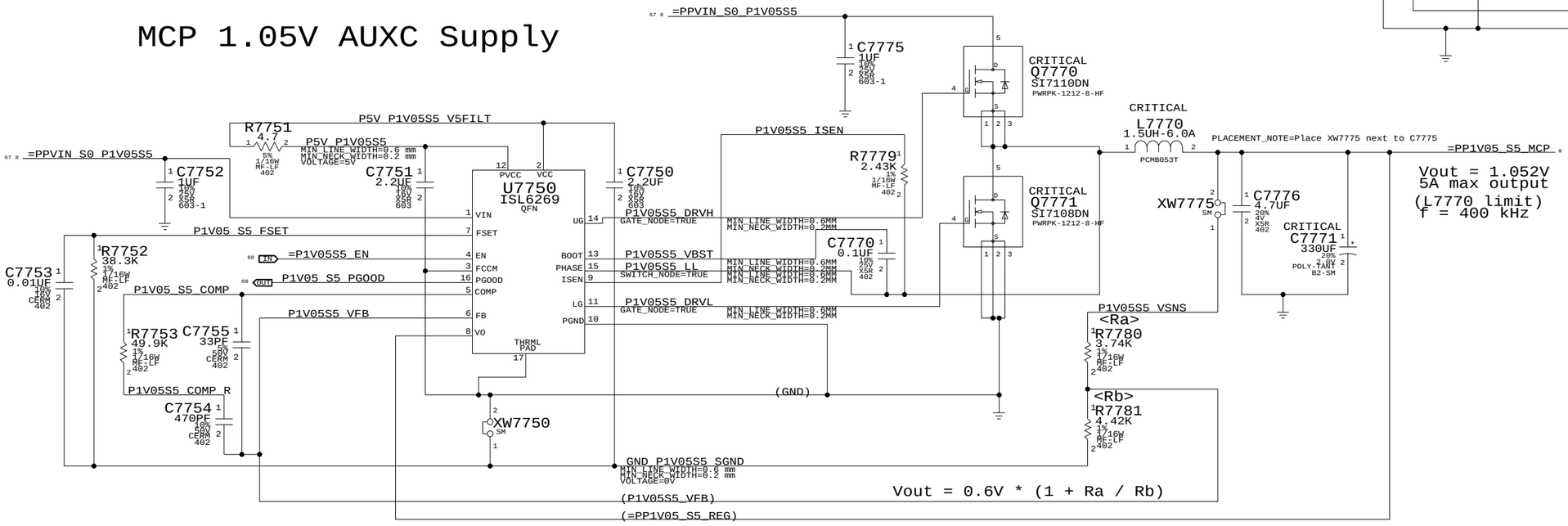
SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 66 OF 96	

1.8V S0 Switcher / 1.0VFW SWITCHER

S5 power required for output discharge feature

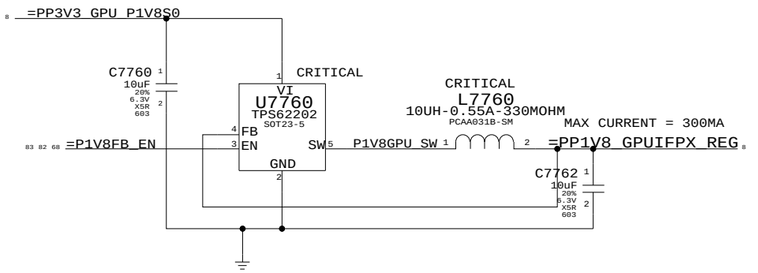


MCP 1.05V AUXC Supply



1.8V S0 Switcher

INPUT RAIL IS 3.3V S0



Misc Power Supplies

SYNC_MASTER=M99_MLB SYNC_DATE=12/14/2007

NOTICE OF PROPRIETARY PROPERTY

THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING

I TO MAINTAIN THE DOCUMENT IN CONFIDENCE

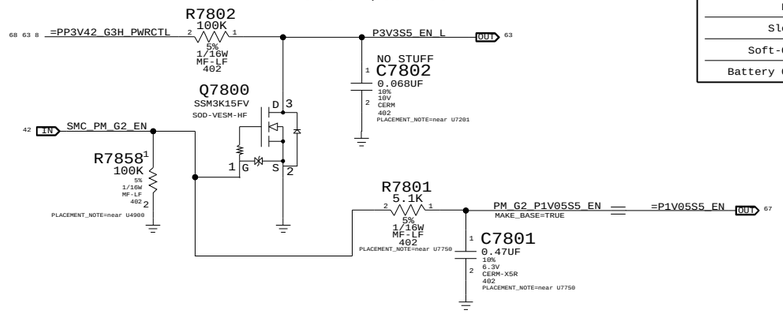
II NOT TO REPRODUCE OR COPY IT

III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE INC.

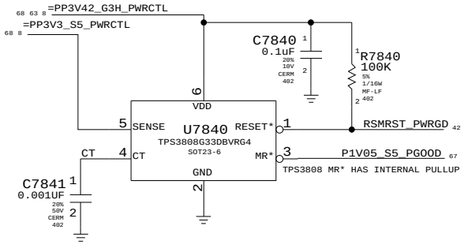
SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 67 OF 96	

3.3V 1,05V S5 ENABLE

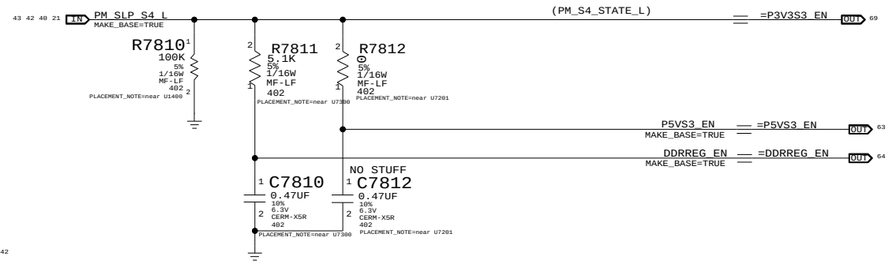


State	SMC_PM_G2_ENABLE	PM_SLP_S4_L	PM_SLP_S3_L
Run (S0)	1	1	1
Sleep (S3)	1	1	0
Soft-Off (S5)	1	0	0
Battery Off (G3Hot)	0	0	0

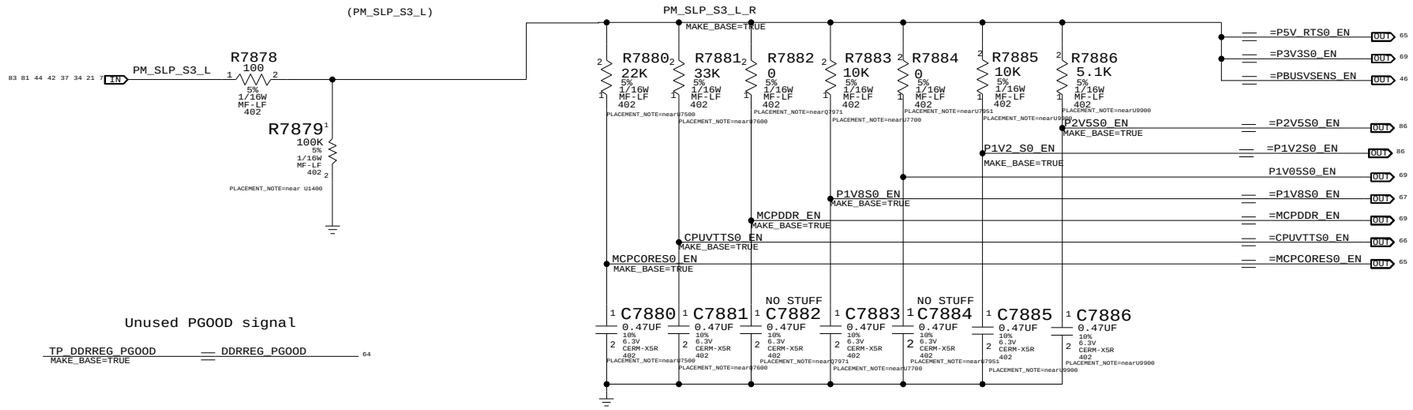
S5 rail PWRGD



3.3V,5V S3 ENABLE

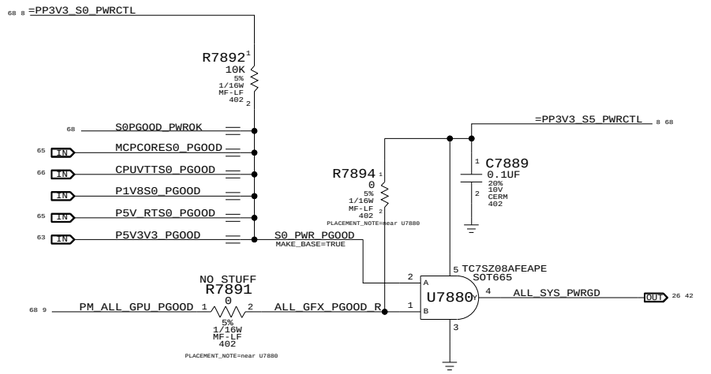


S0 ENABLE



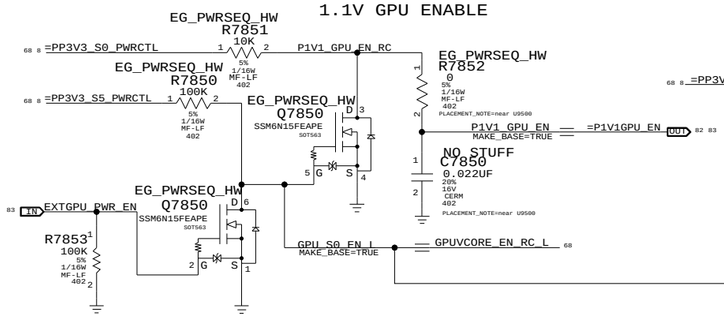
Other S0 RAILS

	PM_ALL_GFX_PGOOD
IG	high
EG	PM_ALL_GPU_PGOOD

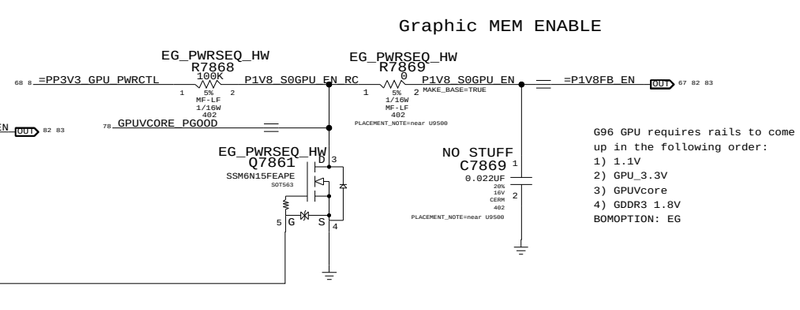


Unused PGOOD signal

1.1V GPU ENABLE

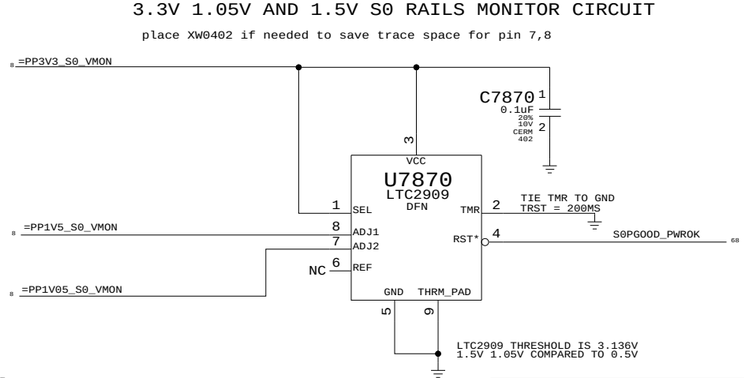


Graphic MEM ENABLE

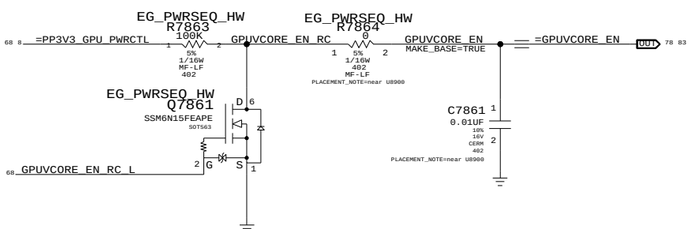


3.3V 1.05V AND 1.5V S0 RAILS MONITOR CIRCUIT

place XW0402 if needed to save trace space for pin 7,8



GPUVCORE ENABLE



EXT GPU PWRGD Pullup

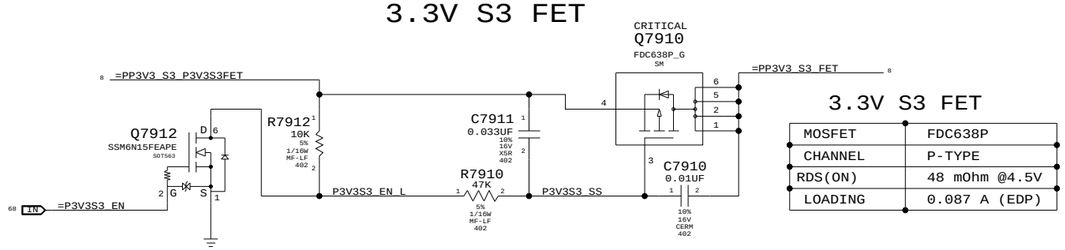
Power Control

SYNC_MASTER=PWRSQNC SYNC_DATE=05/12/2008

APPLE INC.

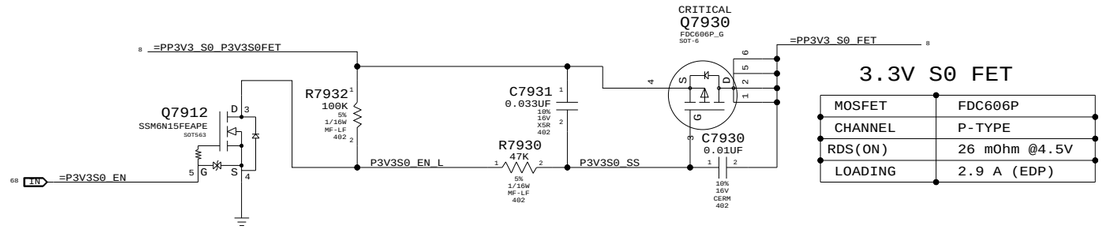
SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 68 OF 96	

3.3V S3 FET



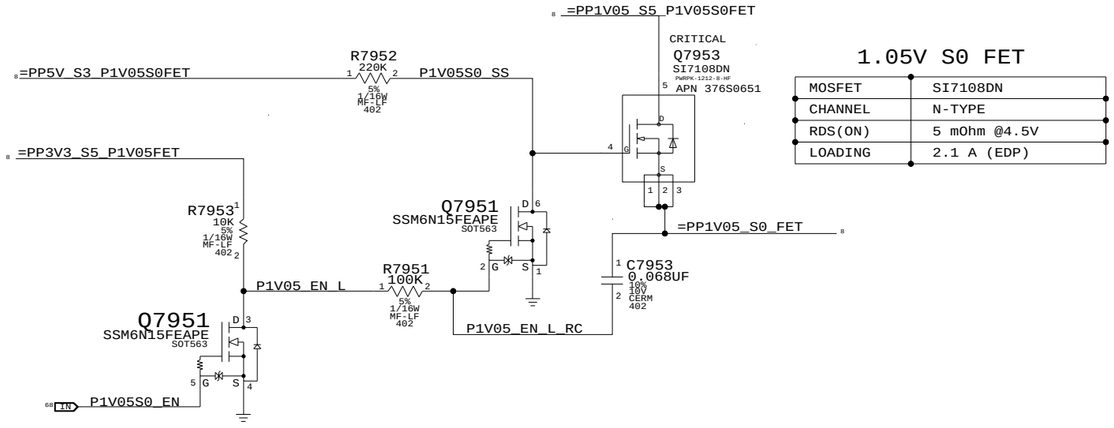
3.3V S3 FET	
MOSFET	FDC638P
CHANNEL	P-TYPE
RDS(ON)	48 mOhm @4.5V
LOADING	0.087 A (EDP)

3.3V S0 FET



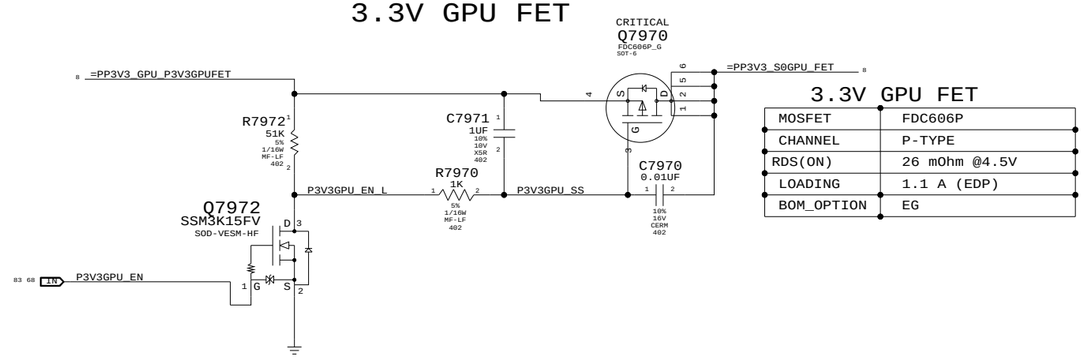
3.3V S0 FET	
MOSFET	FDC606P
CHANNEL	P-TYPE
RDS(ON)	26 mOhm @4.5V
LOADING	2.9 A (EDP)

1.05V S0 FET



1.05V S0 FET	
MOSFET	SI7108DN
CHANNEL	N-TYPE
RDS(ON)	5 mOhm @4.5V
LOADING	2.1 A (EDP)

3.3V GPU FET

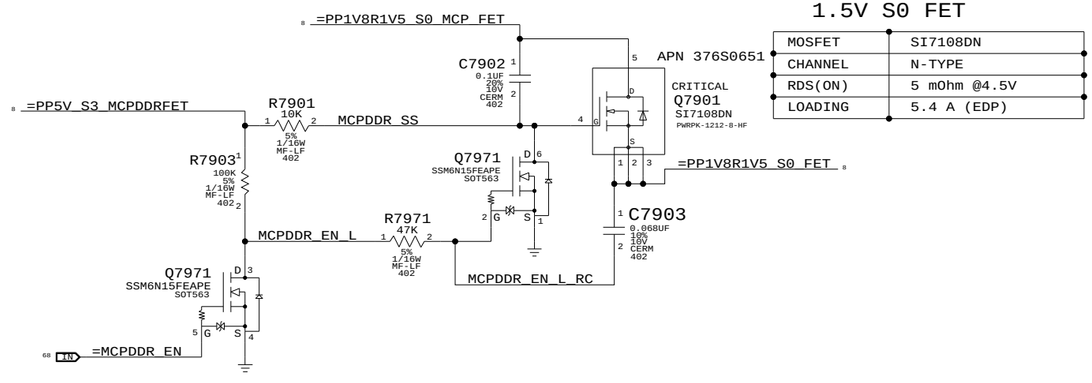


3.3V GPU FET	
MOSFET	FDC606P
CHANNEL	P-TYPE
RDS(ON)	26 mOhm @4.5V
LOADING	1.1 A (EDP)
BOM_OPTION	EG

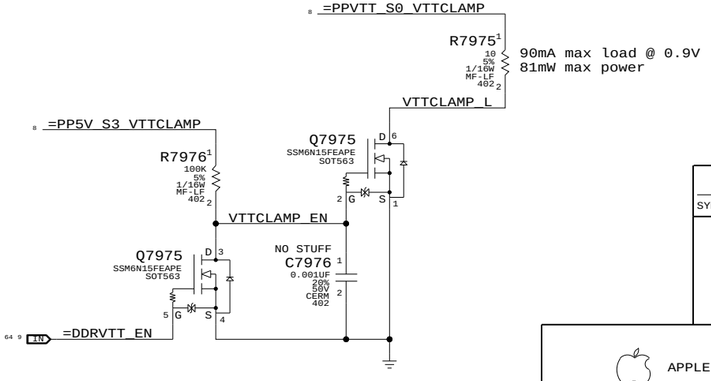
MCP79 DDR FETs

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.

1.5V S0 FET



1.5V S0 FET	
MOSFET	SI7108DN
CHANNEL	N-TYPE
RDS(ON)	5 mOhm @4.5V
LOADING	5.4 A (EDP)



Power FETs	
SYNC_MASTER=PWRSQNC	SYNC_DATE=05/12/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 69 OF 96	

Page Notes

Power aliases required by this page:
- =PP1V2_GPU_PEX_PLLXVDD
- =PP1V2_GPU_PEX_IOVDDQ
- =PP1V2_GPU_PEX_IOVDD

Signal aliases required by this page:
(NONE)

BOM options provided by this page:
(NONE)

8 =PP1V1_GPU_PEX_PLLXVDD
8 =PP1V1_GPU_PEX_IOVDDQ
8 =PP1V1_GPU_PEX_IOVDD

PEX 1.1V Current = 2A

250mA

C8002 1UF 10% 6.3V CERM 402
C8001 4.7UF 20% 6.3V CERM 603
C8000 22UF 20% 6.3V CERM-X5R 805
C8003 1UF 10% 6.3V CERM 402
C8004 0.1UF 20% 10V CERM 402
C8005 0.1UF 20% 10V CERM 402

1500mA

C8008 1UF 10% 6.3V CERM 402
C8007 4.7UF 20% 6.3V CERM 603
C8006 22UF 20% 6.3V CERM-X5R 805
C8009 1UF 10% 6.3V CERM 402
C8010 0.1UF 20% 10V CERM 402
C8011 0.1UF 20% 10V CERM 402

180mA

L8015 10NH-600MA 0603

PP1V1_GPU_PEX_PLLVDD_F
MIN_LINE_WIDTH=0.25 mm
MIN_NECK_WIDTH=0.25 mm
VOLTAGE=1.2V

C8017 0.1UF 20% 10V CERM 402
C8016 4.7UF 20% 6.3V CERM 603
C8015 4.7UF 20% 6.3V CERM 603

NC_GPU_DFM
NO_TEST=TRUE

OMIT

U8000 NB9P-GS BGA
SYMBOL 2 OF 9

H32	PEX_IOVDD1	AK16
M7	PEX_IOVDD2	AK17
P6	PEX_IOVDD3	AK21
P7	PEX_IOVDD4	AK24
R7	PEX_IOVDD5	AK27
U7		
V6		
AB7		
AD6	PEX_IOVDDQ1	AG11
AF6	PEX_IOVDDQ2	AG12
AG6	PEX_IOVDDQ3	AG13
AJ5	PEX_IOVDDQ4	AG15
D35	PEX_IOVDDQ5	AG16
AK15	PEX_IOVDDQ6	AG17
AL7	PEX_IOVDDQ7	AG18
E7	PEX_IOVDDQ8	AG22
E35	PEX_IOVDDQ9	AG23
F7	PEX_IOVDD10	AG24
A2	PEX_IOVDD11	AG25
	PEX_IOVDD12	AG26
	PEX_IOVDD13	AJ14
	PEX_IOVDD14	AJ15
	PEX_IOVDD15	AJ19
	PEX_IOVDD16	AJ21
	PEX_IOVDD17	AJ22
	PEX_IOVDD18	AJ24
	PEX_IOVDD19	AJ25
	PEX_IOVDD20	AJ27
	PEX_IOVDD21	AK18
	PEX_IOVDD22	AK20
	PEX_IOVDD23	AK23
	PEX_IOVDD24	AK26
	PEX_IOVDD25	AL16
	PEX_PLLVDD	AG14
	VDD_SENSE	AD20
	GND_SENSE	AD19

NC

VDD_SENSE → GPU_VDD_SENSE 78
GND_SENSE → GPU_GND_SENSE 78

OMIT

U8000 NB9P-GS BGA
SYMBOL 1 OF 9

PEG_R2D_C_P<0>	C8020 0.1uF	PEG_R2D_P<0> AP17 PEX_RX0
PEG_R2D_C_N<0>	C8021 0.1uF	PEG_R2D_N<0> AN17 PEX_RX0*
PEG_R2D_C_P<1>	C8022 0.1uF	PEG_R2D_P<1> AN19 PEX_RX1
PEG_R2D_C_N<1>	C8023 0.1uF	PEG_R2D_N<1> AP19 PEX_RX1*
PEG_R2D_C_P<2>	C8024 0.1uF	PEG_R2D_P<2> AR19 PEX_RX2
PEG_R2D_C_N<2>	C8025 0.1uF	PEG_R2D_N<2> AR20 PEX_RX2*
PEG_R2D_C_P<3>	C8026 0.1uF	PEG_R2D_P<3> AP20 PEX_RX3
PEG_R2D_C_N<3>	C8027 0.1uF	PEG_R2D_N<3> AN20 PEX_RX3*
PEG_R2D_C_P<4>	C8028 0.1uF	PEG_R2D_P<4> AN22 PEX_RX4
PEG_R2D_C_N<4>	C8029 0.1uF	PEG_R2D_N<4> AP22 PEX_RX4*
PEG_R2D_C_P<5>	C8030 0.1uF	PEG_R2D_P<5> AR22 PEX_RX5
PEG_R2D_C_N<5>	C8031 0.1uF	PEG_R2D_N<5> AR23 PEX_RX5*
PEG_R2D_C_P<6>	C8032 0.1uF	PEG_R2D_P<6> AP23 PEX_RX6
PEG_R2D_C_N<6>	C8033 0.1uF	PEG_R2D_N<6> AN23 PEX_RX6*
PEG_R2D_C_P<7>	C8034 0.1uF	PEG_R2D_P<7> AN25 PEX_RX7
PEG_R2D_C_N<7>	C8035 0.1uF	PEG_R2D_N<7> AP25 PEX_RX7*
PEG_R2D_C_P<8>	C8036 0.1uF	PEG_R2D_P<8> AR25 PEX_RX8
PEG_R2D_C_N<8>	C8037 0.1uF	PEG_R2D_N<8> AR26 PEX_RX8*
PEG_R2D_C_P<9>	C8038 0.1uF	PEG_R2D_P<9> AP26 PEX_RX9
PEG_R2D_C_N<9>	C8039 0.1uF	PEG_R2D_N<9> AN26 PEX_RX9*
PEG_R2D_C_P<10>	C8040 0.1uF	PEG_R2D_P<10> AN28 PEX_RX10
PEG_R2D_C_N<10>	C8041 0.1uF	PEG_R2D_N<10> AP28 PEX_RX10*
PEG_R2D_C_P<11>	C8042 0.1uF	PEG_R2D_P<11> AR28 PEX_RX11
PEG_R2D_C_N<11>	C8043 0.1uF	PEG_R2D_N<11> AR29 PEX_RX11*
PEG_R2D_C_P<12>	C8044 0.1uF	PEG_R2D_P<12> AP29 PEX_RX12
PEG_R2D_C_N<12>	C8045 0.1uF	PEG_R2D_N<12> AN29 PEX_RX12*
PEG_R2D_C_P<13>	C8046 0.1uF	PEG_R2D_P<13> AN31 PEX_RX13
PEG_R2D_C_N<13>	C8047 0.1uF	PEG_R2D_N<13> AP31 PEX_RX13*
PEG_R2D_C_P<14>	C8048 0.1uF	PEG_R2D_P<14> AR31 PEX_RX14
PEG_R2D_C_N<14>	C8049 0.1uF	PEG_R2D_N<14> AR32 PEX_RX14*
PEG_R2D_C_P<15>	C8050 0.1uF	PEG_R2D_P<15> AR34 PEX_RX15
PEG_R2D_C_N<15>	C8051 0.1uF	PEG_R2D_N<15> AP34 PEX_RX15*
PEG_CLK100M_P		AR16 PEX_REFCLK
PEG_CLK100M_N		AR17 PEX_REFCLK*
GPU_RESET_L	R8020 0 5% 1/10W MF-LF 402	GPU_RESET_R_L AM16 PEX_RST*
		TP_PEX_CLKREQ_L AR13 PEX_CLKREQ*

PEX_TX0	AL17	PEG_D2R_C_P<0> C8055 0.1uF PEG_D2R_P<0>
PEX_TX0*	AM17	PEG_D2R_C_N<0> C8056 0.1uF PEG_D2R_N<0>
PEX_TX1	AL18	PEG_D2R_C_P<1> C8057 0.1uF PEG_D2R_P<1>
PEX_TX1*	AM19	PEG_D2R_C_N<1> C8058 0.1uF PEG_D2R_N<1>
PEX_TX2	AL19	PEG_D2R_C_P<2> C8059 0.1uF PEG_D2R_P<2>
PEX_TX2*	AK19	PEG_D2R_C_N<2> C8060 0.1uF PEG_D2R_N<2>
PEX_TX3	AL20	PEG_D2R_C_P<3> C8061 0.1uF PEG_D2R_P<3>
PEX_TX3*	AM20	PEG_D2R_C_N<3> C8062 0.1uF PEG_D2R_N<3>
PEX_TX4	AM21	PEG_D2R_C_P<4> C8063 0.1uF PEG_D2R_P<4>
PEX_TX4*	AM22	PEG_D2R_C_N<4> C8064 0.1uF PEG_D2R_N<4>
PEX_TX5	AL22	PEG_D2R_C_P<5> C8065 0.1uF PEG_D2R_P<5>
PEX_TX5*	AK22	PEG_D2R_C_N<5> C8066 0.1uF PEG_D2R_N<5>
PEX_TX6	AL23	PEG_D2R_C_P<6> C8067 0.1uF PEG_D2R_P<6>
PEX_TX6*	AM23	PEG_D2R_C_N<6> C8068 0.1uF PEG_D2R_N<6>
PEX_TX7	AM24	PEG_D2R_C_P<7> C8069 0.1uF PEG_D2R_P<7>
PEX_TX7*	AM25	PEG_D2R_C_N<7> C8070 0.1uF PEG_D2R_N<7>
PEX_TX8	AL25	PEG_D2R_C_P<8> C8071 0.1uF PEG_D2R_P<8>
PEX_TX8*	AK25	PEG_D2R_C_N<8> C8072 0.1uF PEG_D2R_N<8>
PEX_TX9	AL26	PEG_D2R_C_P<9> C8073 0.1uF PEG_D2R_P<9>
PEX_TX9*	AM26	PEG_D2R_C_N<9> C8074 0.1uF PEG_D2R_N<9>
PEX_TX10	AM27	PEG_D2R_C_P<10> C8075 0.1uF PEG_D2R_P<10>
PEX_TX10*	AM28	PEG_D2R_C_N<10> C8076 0.1uF PEG_D2R_N<10>
PEX_TX11	AL28	PEG_D2R_C_P<11> C8077 0.1uF PEG_D2R_P<11>
PEX_TX11*	AK28	PEG_D2R_C_N<11> C8078 0.1uF PEG_D2R_N<11>
PEX_TX12	AK29	PEG_D2R_C_P<12> C8079 0.1uF PEG_D2R_P<12>
PEX_TX12*	AL29	PEG_D2R_C_N<12> C8080 0.1uF PEG_D2R_N<12>
PEX_TX13	AM29	PEG_D2R_C_P<13> C8081 0.1uF PEG_D2R_P<13>
PEX_TX13*	AM30	PEG_D2R_C_N<13> C8082 0.1uF PEG_D2R_N<13>
PEX_TX14	AM31	PEG_D2R_C_P<14> C8083 0.1uF PEG_D2R_P<14>
PEX_TX14*	AM32	PEG_D2R_C_N<14> C8084 0.1uF PEG_D2R_N<14>
PEX_TX15	AN32	PEG_D2R_C_P<15> C8085 0.1uF PEG_D2R_P<15>
PEX_TX15*	AP32	PEG_D2R_C_N<15> C8086 0.1uF PEG_D2R_N<15>
PEX_TSTCLK_OUT	AJ17	PEX_TSTCLK_P
PEX_TSTCLK_OUT*	AJ18	PEX_TSTCLK_N
PEX_TERMP	AG21	PEX_TERMP_PD R8050 2.49K 1% 1/10W MF-LF 402
PEX_RFU1	AG19	NC
PEX_RFU2	AG20	NC

R8060 200 1% 1/10W MF-LF 402

All C80xx 0.1uF 10% 16V X5R 402

NV G96 PCI-E	
SYNC_MASTER=MUXGFX	SYNC_DATE=07/10/2008

APPLE INC.	SIZE D	DRAWING NUMBER 051-7546	REV. A.0.0
	SCALE NONE	SHT 70 OF 96	

Page Notes

Power aliases required by this page:
- =PPVCORE_GPU
- =PP1V8_GPU_FBVDDQ

Signal aliases required by this page:
(NONE)

BOM options provided by this page:
(NONE)

=PPVCORE_GPU

???A @ ???/???MHz Core/Mem Clk for VDD

C8100 4.7UF 20% 6.3V X5R-CERM 402
C8101 4.7UF 20% 6.3V X5R-CERM 402
C8102 4.7UF 20% 6.3V X5R-CERM 402

C8103 0.47UF 10% 6.3V CERM-X5R 402
C8104 0.47UF 10% 6.3V CERM-X5R 402
C8105 0.47UF 10% 6.3V CERM-X5R 402
C8106 0.47UF 10% 6.3V CERM-X5R 402
C8107 0.47UF 10% 6.3V CERM-X5R 402

C8108 0.47UF 10% 6.3V CERM-X5R 402
C8109 0.47UF 10% 6.3V CERM-X5R 402
C8110 0.47UF 10% 6.3V CERM-X5R 402
C8111 0.47UF 10% 6.3V CERM-X5R 402
C8112 0.47UF 10% 6.3V CERM-X5R 402

C8113 0.1UF 20% 10V CERM 402
C8114 0.1UF 20% 10V CERM 402
C8115 0.1UF 20% 10V CERM 402
C8116 0.1UF 20% 10V CERM 402
C8117 0.1UF 20% 10V CERM 402

C8118 0.1UF 20% 10V CERM 402
C8119 0.1UF 20% 10V CERM 402
C8120 0.1UF 20% 10V CERM 402
C8121 0.1UF 20% 10V CERM 402
C8122 0.1UF 20% 10V CERM 402

OMIT

U8000
NB9P-GS
BGA
SYMBOL 9 OF 9

L11 L12 L13 L14 L15 L16 L17 L18 L19 L20 L21 L22 L23 L24 L25 M12 M14 M16 M18 M20 M22 M24 P11 P13 P15 P17 P19 P21 P23 P25 R11 R12 R13 R14 R15 R16 R17 R18 R19 R20 R21 R22 R23 R24 R25 T12 T14 T16 T18 T20 T22 T24 V11 V13 V15 V17

VDD

V19 V21 V23 V25 W11 W12 W13 W14 W15 W16 W17 W18 W19 AD24 W21 W22 W23 W24 W25 Y12 Y14 Y16 Y18 Y20 Y22 Y24 AB11 AB13 AB15 AB17 AB19 AB21 AB23 AB25 AC11 AC12 AC13 AC14 AC15 AC16 AC17 AC18 AC19 AC20 AC21 AC22 AC23 AC24 AC25 AD12 AD14 AD16 AD18 AD22 W20

VDD

U8000
NB9P-GS
BGA
SYMBOL 8 OF 9

B3 B6 B9 B12 B15 B21 B24 B27 B30 B33 C2 C34 E6 E9 E12 E15 E18 E24 E27 E30 F2 F5 F31 F34 J2 J5 J31 J34 L9 M2 M5 M11 M13 M15 M17 M19 M21 M23 M25 M31 M34 N11 N12 N13 N14 N15 N16 N17 N18 N19 N20 N21 N22 N23 N24 N25 P12 P14 P16 P18 P20 P22 P24 R2 R5 R31 R34 T11 T13 T15 T17 T19 T21 T23 T25 U11 U12 U13 U14 U15 U16 U17 U18 U19 U20 U21 U22 U23 U24 U25 V2 V5 V9 V12 V14 V16

GND

V18 V20 V22 V24 V31 Y11 Y13 Y15 Y17 Y19 Y21 Y23 Y25 AA2 AA5 AA11 AA12 AA13 AA14 AA15 AA16 AA17 AA18 AA19 AA20 AA21 AA22 AA23 AA24 AA25 AA34 AB12 AB14 AB16 AB18 AB20 AB22 AB24 AC9 AD2 AD5 AD11 AD13 AD15 AD17 AD21 AD23 AD25 AD31 AD34 AE11 AE12 AE13 AE14 AE15 AE16 AE17 AE18 AE19 AE20 AE21 AE22 AE23 AE24 AE25 AG2 AG5 AG31 AG34 AK2 AK5 AP33 AK31 AK34 AL6 AL9 AL12 AL15 AL18 AL21 AL24 AL27 AL30 AN2 AN34 AP3 AP6 AP9 AP12 AP15 AP18 AP21 AP24 AP27 AP30

GND

=PP1V8_GPU_FBVDDQ

Nvidia PRD for GB-128 uses 4x4.7uF, 8x0.47uF, 16x0.1uF

???A @ ???MHz 1.8V GDDR3

C8150 4.7UF 20% 6.3V CERM 603
C8151 4.7UF 20% 6.3V CERM 603

C8156 0.1UF 20% 10V CERM 402
C8157 0.1UF 20% 10V CERM 402
C8158 0.1UF 20% 10V CERM 402
C8159 0.1UF 20% 10V CERM 402
C8160 0.47UF 10% 6.3V CERM-X5R 402
C8161 0.47UF 10% 6.3V CERM-X5R 402

C8162 0.1UF 20% 10V CERM 402
C8163 0.1UF 20% 10V CERM 402
C8164 0.1UF 20% 10V CERM 402
C8165 0.1UF 20% 10V CERM 402
C8166 0.47UF 10% 6.3V CERM-X5R 402
C8167 0.47UF 10% 6.3V CERM-X5R 402

C8168 0.47UF 10% 6.3V CERM-X5R 402
C8169 0.47UF 10% 6.3V CERM-X5R 402
C8170 0.47UF 10% 6.3V CERM-X5R 402
C8171 0.47UF 10% 6.3V CERM-X5R 402

OMIT

U8000
NB9P-GS
BGA
SYMBOL 7 OF 9

B18 J17 U27 AB27 AB29 AC27 AD27 AE27 AJ28 E21 G8 G9 G17 G18 G22 H29 J14 J15 J16

FBVDDQ

J20 J21 J22 J23 J24 J29 N27 P27 R27 T27 U29 V27 V29 V34 W27 Y27 AA27 AA29 AA31

FBVDDQ

NV G96 Core/FB Power

SYNC_MASTER=MUXGFX SYNC_DATE=07/10/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 71 OF 96	

Page Notes

Power aliases required by this page:
- =PP1V2_GPU_FBPLLAVDD
- =PP1V8_GPU_FBIO

Signal aliases required by this page:
(NONE)

BOM options provided by this page:
(NONE)

OMIT
U8000
NB9P-GS
BGA
SYMBOL 3 OF 9

OMIT
U8000
NB9P-GS
BGA
SYMBOL 4 OF 9

PLACEMENT_NOTE=Place close to U8000.

PLACEMENT_NOTE=Place close to U8000.

PLACEMENT_NOTE=Place close to U8000.

GPU_FB_VREF_UNTERM_L
MIN_LINE_WIDTH=0.25 mm
MIN_NECK_WIDTH=0.25 mm

PP1V1_GPU_FBPLLAVDD_F
MIN_LINE_WIDTH=0.2 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.1V

NV G96 Frame Buffer I/F

SYNC_MASTER=MUXGFX SYNC_DATE=07/10/2008

NOTICE OF PROPRIETARY PROPERTY

THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING

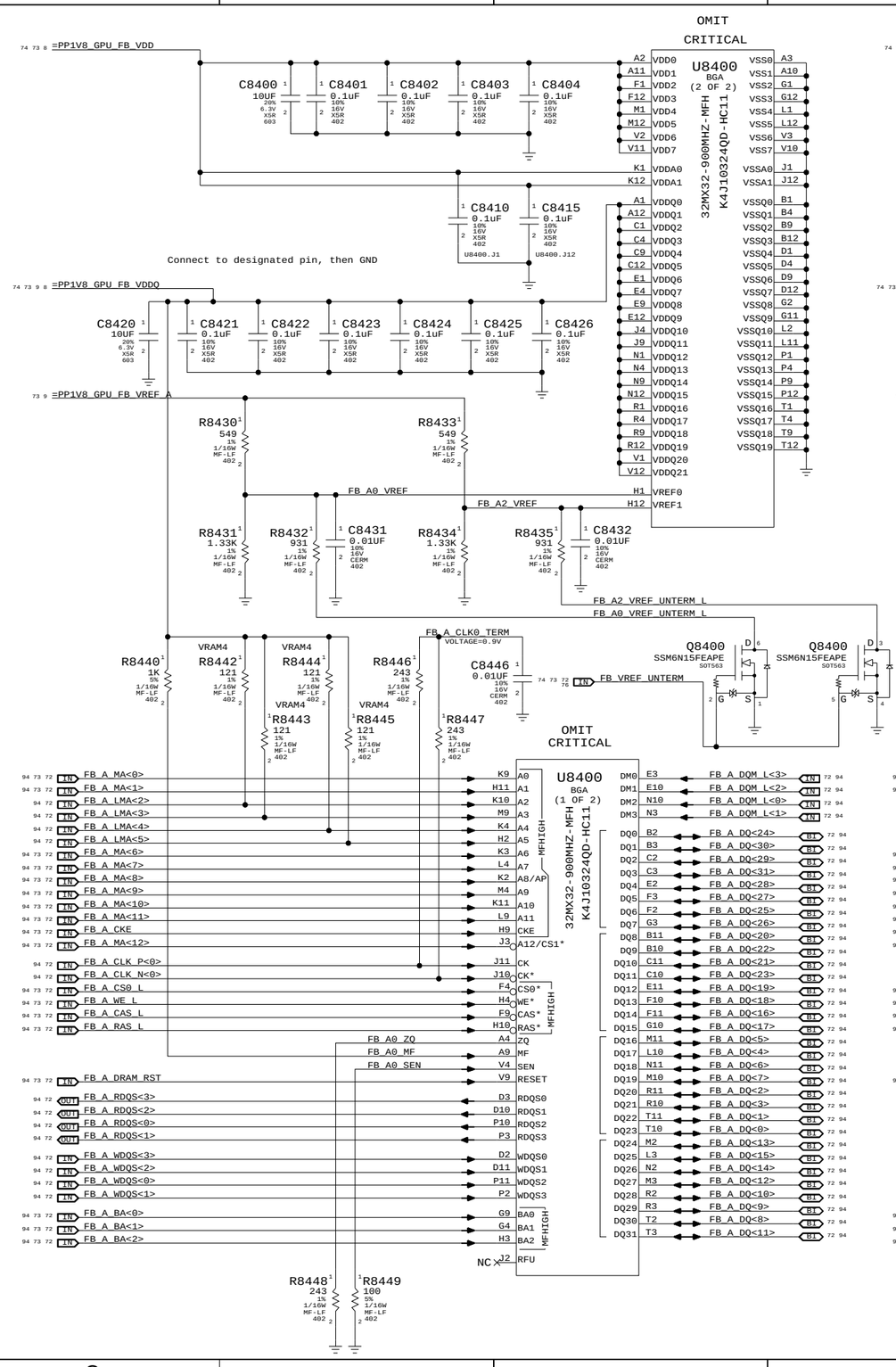
I TO MAINTAIN THE DOCUMENT IN CONFIDENCE

II NOT TO REPRODUCE OR COPY IT

III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 72 OF 96	



Page Notes

Power aliases required by this page:
- =PP1V8_S0_FB_VDD
- =PP1V8_S0_FB_VREFA

Signal aliases required by this page:
(NONE)

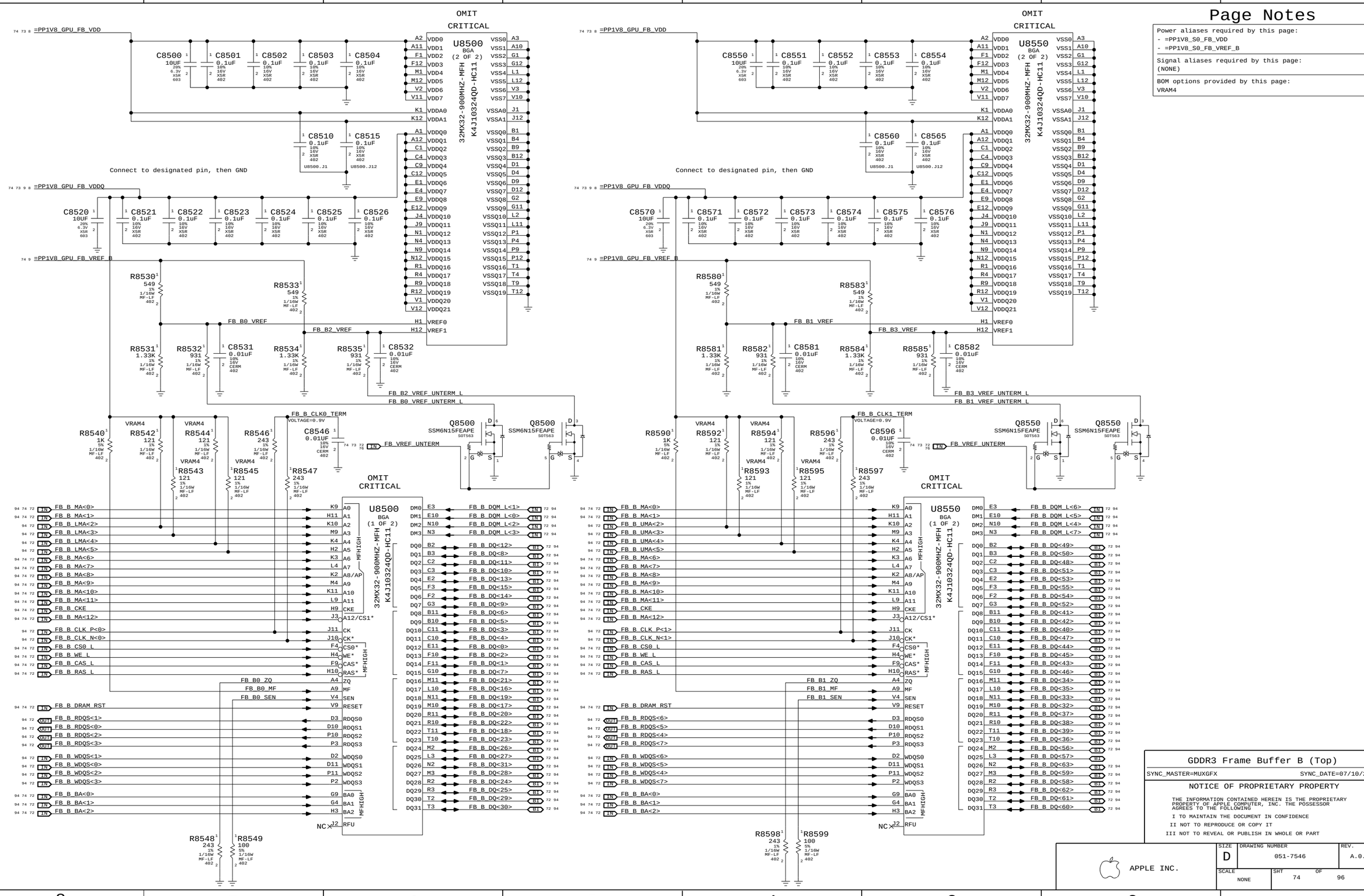
BOM options provided by this page:
VRAM4

GDDR3 Frame Buffer A (Top)

SYNC_MASTER=MUXGFX SYNC_DATE=07/10/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 73 OF 96	



Page Notes

Power aliases required by this page:
- =PP1V8_S0_FB_VDD
- =PP1V8_S0_FB_VREF_B

Signal aliases required by this page:
(NONE)

BOM options provided by this page:
VRAM4

GDDR3 Frame Buffer B (Top)

SYNC_MASTER=MUXGFX SYNC_DATE=07/10/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 74 OF 96	

Page Notes

Power aliases required by this page:
- =PP3V3_GPU_VDD33
- =PP3V3_GPI_MIO
- =PP1V2_GPU_PLLVDD
- =PP1V2_GPU_H_PLLVDD
- =PP1V2_GPU_VID_PLLVDD

Signal aliases required by this page:
(NONE)

BOM options provided by this page:
(NONE)

110mA
=PP3V3_GPU_VDD33

OMIT
U8000
NB9P-GS
BGA
SYMBOL 6 OF 9

C8690 0.022UF 10% 16V CERM-X5R 402
C8692 0.022UF 10% 16V CERM-X5R 402
C8694 0.1UF 20% 10V CERM 402
C8696 0.47UF 10% 6.3V CERM-X5R 402
C8698 1UF 10% 6.3V CERM 402
C8691 0.022UF 10% 16V CERM-X5R 402
C8693 0.022UF 10% 16V CERM-X5R 402
C8695 0.1UF 20% 10V CERM 402
C8697 0.47UF 10% 6.3V CERM-X5R 402

J9 VDD33_1
J10 VDD33_2
J11 VDD33_3
J12 VDD33_4
J13 VDD33_5

=PP3V3_GPU_VDD33
Typically <??mA
C8600 0.47UF 10% 6.3V CERM-X5R 402
C8601 0.47UF 10% 6.3V CERM-X5R 402
C8602 0.47UF 10% 6.3V CERM-X5R 402

NC J25 RFU0
NC J26 RFU1
AK14 RFU0_GND
K9 RFU1_GND

GPU_ROM_CS_L → C3 ROM_CS*
GPU_ROM_SCLK → D4 ROM_SCLK
GPU_ROM_SI → D3 ROM_SI
GPU_ROM_SO → C4 ROM_SO

R8696 40.2K 1% 1/16W MF-LF 402
R8697 40.2K 1% 1/16W MF-LF 402
GPU_STRAP_REF_3V3_PD → N9 STRAP_REF_3V3
GPU_STRAP_REF_MIOB_PD → M9 STRAP_REF_MIOB (IPD)

=PP3V3_GPU_MIO
P9 MIOA_VDDQ_1
R9 MIOA_VDDQ_2
T9 MIOA_VDDQ_3
U9 MIOA_VDDQ_4
AA9 MIOB_VDDQ_1
AB9 MIOB_VDDQ_2
W9 MIOB_VDDQ_3
Y9 MIOB_VDDQ_4

C8610 1UF 10% 6.3V CERM 402
C8611 1UF 10% 6.3V CERM 402

=PP3V3_GPU_MIO
R8620 49.9 1% 1/16W MF-LF 402
R8621 49.9 1% 1/16W MF-LF 402
GPU_MIOA_PD_VDDQ
GPU_MIOB_PD_VDDQ
GPU_MIOA_PU_GND
GPU_MIOB_PU_GND
R8622 49.9 1% 1/16W MF-LF 402
R8623 49.9 1% 1/16W MF-LF 402

R8616 10K 5% 1/16W MF-LF 402
R8618 10K 5% 1/16W MF-LF 402
R8617 10K 5% 1/16W MF-LF 402
C8617 0.1uF 10% 16V X5R 402
R8619 10K 5% 1/16W MF-LF 402
C8619 0.1uF 10% 16V X5R 402
R8660 10K 5% 1/16W MF-LF 402

GPU_TESTMODE_PD → AP35 TESTMODE
GPU_MIOA_VREF → N5 MIOA_VREF
GPU_MIOB_VREF → AF1 MIOB_VREF
GPU_MIOA_PD_VDDQ, GPU_MIOA_PU_GND → U5 MIOA_CAL_PD_VDDQ, T5 MIOA_CAL_PU_GND
GPU_MIOB_PD_VDDQ → AA7 MIOB_CAL_PD_VDDQ
GPU_MIOB_PU_GND → AA6 MIOB_CAL_PU_GND

=PP1V1_GPU_PLLVDD
L8630 FERR-220-OHM 0402
PP1V1_GPU_PLLVDD_F
MIN_LINE_WIDTH=0.2 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.2V
65mA
C8633 4.7UF 20% 6.3V CERM 603
C8630 4.7UF 20% 6.3V CERM 603
C8631 0.1uF 10% 16V X5R 402

=PP1V1_GPU_H_PLLVDD
L8635 FERR-220-OHM 0402
PP1V1_GPU_H_PLLVDD_F
MIN_LINE_WIDTH=0.2 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.2V
25mA
C8637 4.7UF 20% 6.3V CERM 603
C8635 4.7UF 20% 6.3V CERM 603
C8636 0.1uF 10% 16V X5R 402

=PP1V1_GPU_VID_PLLVDD
L8640 FERR-220-OHM 0402
PP1V1_GPU_VID_PLLVDD_F
MIN_LINE_WIDTH=0.2 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.2V
50mA
C8643 4.7UF 20% 6.3V CERM 603
C8640 4.7UF 20% 6.3V CERM 603
C8641 0.1uF 10% 16V X5R 402

AF9 SP_PLLVDD
AE9 PLLVDD
AD9 VID_PLLVDD

GPU_XTALIN → B1 XTAL_IN
GPU_XTALOUT → B2 XTAL_OUT
GPU_XTALOUTBUFF → D1 XTAL_OUTBUFF
GPU_XTALSSIN → D2 XTAL_SSIN

GPIO0	K1	GPU_GPIO_0	B3
GPIO1	K2	GPU_GPIO_1	B3
GPIO2	K3	GPU_GPIO_2	B3
GPIO3	H3	GPU_GPIO_3	B3
GPIO4	H2	GPU_GPIO_4	B3
GPIO5	H1	GPU_GPIO_5	B3
GPIO6	H4	GPU_GPIO_6	B3
GPIO7	H5	GPU_GPIO_7	B3
GPIO8	H6	GPU_GPIO_8	B3
GPIO9	J7	GPU_GPIO_9	B3
GPIO10	K4	GPU_GPIO_10	B3
GPIO11	K5	GPU_GPIO_11	B3
GPIO12	H7	GPU_GPIO_12	B3
GPIO13	J4	GPU_GPIO_13	B3
GPIO14	J6	GPU_GPIO_14	B3
GPIO15	L1	GPU_GPIO_15	B3
GPIO16	L2	GPU_GPIO_16	B3
GPIO17	L4	GPU_GPIO_17	B3
GPIO18	M4	GPU_GPIO_18	B3
GPIO19	L7	GPU_GPIO_19	B3
GPIO20	L5	GPU_GPIO_20	B3
GPIO21	K6	GPU_GPIO_21	B3
GPIO22	L6	GPU_GPIO_22	B3
GPIO23	M6	GPU_GPIO_23	B3
HDA_SDI	C7	GPU_HDA_SDI	OUT
HDA_SDO	B7	GPU_HDA_SDO	OUT
HDA_SYNC	A7	GPU_HDA_SYNC	OUT
HDA_BCLK	D7	GPU_HDA_BCLK	OUT
HDA_RST*	D6	GPU_HDA_RST_L	OUT
SPDIF	A5	GPU_SPDIF	IN
BUFRST*	A4	TP_GPU_BUFRST_L	OUT
JTAG_TCK	AP14	GPU_JTAG_TCK	IN
JTAG_TDI	AN14	GPU_JTAG_TDI	IN
JTAG_TDO	AN16	GPU_JTAG_TDO	OUT
JTAG_TMS	AR14	GPU_JTAG_TMS	IN
JTAG_TRST*	AP16	GPU_JTAG_TRST_L	IN
MIOA_CLKIN	N4	GPU_MIOA_CLKIN	IN
MIOA_CLKOUT	R4	GPU_MIOA_CLKOUT_P	B3
MIOA_CLKOUT*	T4	GPU_MIOA_CLKOUT_N	B3
MIOA_CTL3	P5	GPU_MIOA_CTL3	B3
MIOA_DE	N2	GPU_MIOA_DE	B3
MIOA_D0	N1	GPU_MIOA_D<0>	B3
MIOA_D1	P4	GPU_MIOA_D<1>	B3
MIOA_D2	P1	GPU_MIOA_D<2>	B3
MIOA_D3	P2	GPU_MIOA_D<3>	B3
MIOA_D4	P3	GPU_MIOA_D<4>	B3
MIOA_D5	T3	GPU_MIOA_D<5>	B3
MIOA_D6	T2	GPU_MIOA_D<6>	B3
MIOA_D7	T1	GPU_MIOA_D<7>	B3
MIOA_D8	U4	GPU_MIOA_D<8>	B3
MIOA_D9	U1	GPU_MIOA_D<9>	B3
MIOA_D10	U2	GPU_MIOA_D<10>	B3
MIOA_D11	U3	GPU_MIOA_D<11>	B3
MIOA_D12	R6	GPU_MIOA_D<12>	B3
MIOA_D13	T6	GPU_MIOA_D<13>	B3
MIOA_D14	N6	GPU_MIOA_D<14>	B3
MIOA_HSYNC	N3	GPU_MIOA_HSYNC	B3
MIOA_VSYNC	L3	GPU_MIOA_VSYNC	B3
MIOB_CLKIN	AE1	GPU_MIOB_CLKIN	IN
MIOB_CLKOUT	V4	GPU_MIOB_CLKOUT_P	B3
MIOB_CLKOUT*	W4	GPU_MIOB_CLKOUT_N	B3
MIOB_CTL3	W3	GPU_MIOB_CTL3	B3
MIOB_DE	Y5	GPU_MIOB_DE	B3
MIOB_D0	Y1	GPU_MIOB_D<0>	B3
MIOB_D1	Y2	GPU_MIOB_D<1>	B3
MIOB_D2	Y3	GPU_MIOB_D<2>	B3
MIOB_D3	AB3	GPU_MIOB_D<3>	B3
MIOB_D4	AB2	GPU_MIOB_D<4>	B3
MIOB_D5	AB1	GPU_MIOB_D<5>	B3
MIOB_D6	AC4	GPU_MIOB_D<6>	B3
MIOB_D7	AC1	GPU_MIOB_D<7>	B3
MIOB_D8	AC2	GPU_MIOB_D<8>	B3
MIOB_D9	AC3	GPU_MIOB_D<9>	B3
MIOB_D10	AE3	GPU_MIOB_D<10>	B3
MIOB_D11	AE2	GPU_MIOB_D<11>	B3
MIOB_D12	U6	GPU_MIOB_D<12>	B3
MIOB_D13	W6	GPU_MIOB_D<13>	B3
MIOB_D14	Y6	GPU_MIOB_D<14>	B3
MIOB_D15	W5	GPU_STRAP<0>	B3
MIOB_D16	W7	GPU_STRAP<1>	B3
MIOB_D17	V7	GPU_STRAP<2>	B3
MIOB_HSYNC	W1	GPU_MIOB_HSYNC	B3
MIOB_VSYNC	W2	GPU_MIOB_VSYNC	B3
THERMDP	B5	GPU_THERMD_P	IN
THERMDN	B4	GPU_THERMD_N	OUT
PGOOD_OUT*	C5	TP_GPU_PGOOD_OUT_L	OUT

NV G96 GPIO/MIO/Misc

SYNC_MASTER=MUXGFX SYNC_DATE=07/10/2008

NOTICE OF PROPRIETARY PROPERTY

THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING

I TO MAINTAIN THE DOCUMENT IN CONFIDENCE
II NOT TO REPRODUCE OR COPY IT
III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 75 OF 96	

GPIOs

	Native Func		
GPU_GPIO_0	GP	NC_GPU_GPIO_0	MAKE_BASE=TRUE
GPU_GPIO_1	HPDC	DP_EG_HPD	IN 80
GPU_GPIO_2	LCD0_BL_PWM	TP_LVDS_EG_BKL_PWM	MAKE_BASE=TRUE
GPU_GPIO_3	LCD0_VDD	EG_LCD_PWR_EN	MAKE_BASE=TRUE 76 83
GPU_GPIO_4	LCD0_BL_EN	EG_BKLT_EN	MAKE_BASE=TRUE 76 83
GPU_GPIO_5	VID0	TP_GPU_GSTATE<0>	MAKE_BASE=TRUE
GPU_GPIO_6	VID1	TP_GPU_GSTATE<1>	MAKE_BASE=TRUE
GPU_GPIO_7	VID2/MEM_VID	GPIO7_FBVDD_ALTVO	MAKE_BASE=TRUE 76 82
GPU_GPIO_8	THERM	SMC_GFX_OVERTEMP_R_L	MAKE_BASE=TRUE 76
GPU_GPIO_9	FAN_PWM	SMC_GFX_THROTTLE_R_L	MAKE_BASE=TRUE 76
GPU_GPIO_10	MEM_VREF	FB_VREF_UNTERM	MAKE_BASE=TRUE 72 73 74 76
GPU_GPIO_11	SLI_SYNC	GPU_VCORE_VID0	MAKE_BASE=TRUE OUT 78
GPU_GPIO_12	AC_DET	GPU_VCORE_VID1	MAKE_BASE=TRUE OUT 78
GPU_GPIO_13	PWR_CTL0	GPU_VCORE_VID2	MAKE_BASE=TRUE OUT 78
GPU_GPIO_14	PWR_CTL1	TP_GPU_VCORE_VID3	MAKE_BASE=TRUE

GPIOs

	Native Func		
GPU_GPIO_15	HPDE	NC_GPU_GPIO_15	MAKE_BASE=TRUE
GPU_GPIO_16	DVI_MODE0	EG_DP_CA_DET	76
GPU_GPIO_17	HDMI_DETECT0	NC_GPU_GPIO_17	MAKE_BASE=TRUE
GPU_GPIO_18	DVI_MODE1	NC_GPU_GPIO_18	MAKE_BASE=TRUE
GPU_GPIO_19	HDMI_DETECT1	NC_GPU_GPIO_19	MAKE_BASE=TRUE
GPU_GPIO_20	HPDD	NC_GPU_GPIO_20	MAKE_BASE=TRUE
GPU_GPIO_21	HPDF	NC_GPU_GPIO_21	MAKE_BASE=TRUE
GPU_GPIO_22	SWAPRDY_A	NC_GPU_GPIO_22	MAKE_BASE=TRUE
GPU_GPIO_23	GP	NC_GPU_GPIO_23	MAKE_BASE=TRUE NO_TEST=TRUE

Renamed signals

GPU_XTALOUT	MAKE_BASE=TRUE	GPU_XTALOUT
GPU_CLK27M	MAKE_BASE=TRUE	GPU_XTALIN
GPU_CLK27M_SS	MAKE_BASE=TRUE	GPU_XTALSSIN
GPU_TDIODE_P	MAKE_BASE=TRUE	GPU_THERMD_P
GPU_TDIODE_N	MAKE_BASE=TRUE	GPU_THERMD_N
LVDS_EG_DDC_CLK	MAKE_BASE=TRUE	GPU_I2CA_SCL
LVDS_EG_DDC_DATA	MAKE_BASE=TRUE	GPU_I2CA_SDA
DP_EG_DDC_CLK	MAKE_BASE=TRUE	GPU_I2CB_SCL
DP_EG_DDC_DATA	MAKE_BASE=TRUE	GPU_I2CB_SDA

Unused signals

NC_GPU_SPDIF	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_SPDIF
NC_CPU_HDA_SDI	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_HDA_SDI
NC_CPU_HDA_SD0	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_HDA_SDO
NC_CPU_HDA_SYNC	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_HDA_SYNC
NC_CPU_HDA_BCLK	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_HDA_BCLK
NC_CPU_HDA_RST_L	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_HDA_RST_L
NC_FBA_MA<13>	MAKE_BASE=TRUE NO_TEST=TRUE	FB_A_MA<13>
NC_FBB_MA<13>	MAKE_BASE=TRUE NO_TEST=TRUE	FB_B_MA<13>
NC_FBA_CMD28	MAKE_BASE=TRUE NO_TEST=TRUE	TP_FBA_CMD28
NC_FBC_CMD28	MAKE_BASE=TRUE NO_TEST=TRUE	TP_FBC_CMD28
NC_FBA_CMD29	MAKE_BASE=TRUE NO_TEST=TRUE	TP_FBA_CMD29
NC_FBC_CMD29	MAKE_BASE=TRUE NO_TEST=TRUE	TP_FBC_CMD29
NC_FBA_CMD30	MAKE_BASE=TRUE NO_TEST=TRUE	TP_FBA_CMD30
NC_FBC_CMD30	MAKE_BASE=TRUE NO_TEST=TRUE	TP_FBC_CMD30
NC_GPU_ROM_CS_L	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_ROM_CS_L
NC_FB_A_CS1_L	MAKE_BASE=TRUE NO_TEST=TRUE	FB_A_CS1_L
NC_FB_B_CS1_L	MAKE_BASE=TRUE NO_TEST=TRUE	FB_B_CS1_L

Unused I2C Buses

NC_GPU_I2CC_SCL	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_I2CC_SCL
NC_GPU_I2CC_SDA	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_I2CC_SDA
NC_GPU_I2CD_SCL	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_I2CD_SCL
NC_GPU_I2CD_SDA	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_I2CD_SDA
NC_GPU_I2CE_SCL	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_I2CE_SCL
NC_GPU_I2CE_SDA	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_I2CE_SDA
NC_GPU_I2CH_SCL	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_I2CH_SDA
NC_GPU_I2CH_SDA	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_I2CH_SCL

I2CS ties into SMBus connection page
(I2CS requires pullups even if not used)

TP_LVDS_EG_B_CLK_P	MAKE_BASE=TRUE	LVDS_EG_B_CLK_P
TP_LVDS_EG_B_CLK_N	MAKE_BASE=TRUE	LVDS_EG_B_CLK_N
NC_LVDS_EG_A_DATA_P<3>	MAKE_BASE=TRUE NO_TEST=TRUE	LVDS_EG_A_DATA_P<3>
NC_LVDS_EG_A_DATA_N<3>	MAKE_BASE=TRUE NO_TEST=TRUE	LVDS_EG_A_DATA_N<3>
NC_LVDS_EG_B_DATA_P<3>	MAKE_BASE=TRUE NO_TEST=TRUE	LVDS_EG_B_DATA_P<3>
NC_LVDS_EG_B_DATA_N<3>	MAKE_BASE=TRUE NO_TEST=TRUE	LVDS_EG_B_DATA_N<3>

G96 MIOA_DE and MIOA_D<9..0> are used as Debug Port.

NC_GPU_MIOA_CLKOUT_P	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_MIOA_CLKOUT_P
NC_GPU_MIOA_CLKOUT_N	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_MIOA_CLKOUT_N
NC_GPU_MIOA_CTL3	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_MIOA_CTL3
TP_GPU_MIOA_DE	MAKE_BASE=TRUE	GPU_MIOA_DE
TP_GPU_MIOA_D<9..0>	MAKE_BASE=TRUE	GPU_MIOA_D<9..0>
NC_GPU_MIOA_CLKIN	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_MIOA_CLKIN
NC_GPU_MIOA_D<14..10>	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_MIOA_D<14..10>
NC_GPU_MIOA_HSYNC	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_MIOA_HSYNC
NC_GPU_MIOA_VSYNC	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_MIOA_VSYNC
NC_GPU_MIOB_CLKIN	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_MIOB_CLKIN
NC_GPU_MIOB_CLKOUT_P	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_MIOB_CLKOUT_P
NC_GPU_MIOB_CLKOUT_N	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_MIOB_CLKOUT_N
NC_GPU_MIOB_CTL3	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_MIOB_CTL3
NC_GPU_MIOB_DE	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_MIOB_DE
NC_GPU_MIOB_D<14..0>	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_MIOB_D<14..0>
NC_GPU_MIOB_VSYNC	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_MIOB_VSYNC
NC_GPU_MIOB_HSYNC	MAKE_BASE=TRUE NO_TEST=TRUE	GPU_MIOB_HSYNC

Config Straps

=PP3V3_GPU_MIO

	OMIT	NO STUFF	NO STUFF
	R8707[1] 2.0K 5% 1/16W MF-LF 402	R8709[1] 4.99K 1% 1/16W MF-LF 402	R8711[1] 4.99K 1% 1/16W MF-LF 402
GPU_ROM_SI	OUT		
GPU_ROM_SO	IN		
GPU_ROM_SCLK	IN		
	OMIT	NO STUFF	
	R8708[1] 45.3K 1% 1/16W MF-LF 402	R8710[1] 2.0K 1% 1/16W MF-LF 402	R8712[1] 15.0K 1% 1/16W MF-LF 402

Physical Strapping Pin	Strapping Bit 3	Strapping Bit 2	Strapping Bit 1	Strapping Bit 0
ROM_SO	XCLK_277	TVMODE[2]	TVMODE[1]	TVMODE[0]
ROM_SCLK	PCI_DEVID[4]	SUB_VENDOR	SLOT_CLK_CFG	PEX_PLLEN_TERM100
ROM_SI	RAMCFG[3]	RAMCFG[2]	RAMCFG[1]	RAMCFG[0]
STRAP 2	PCI_DEVID[3]	PCI_DEVID[2]	PCI_DEVID[1]	PCI_DEVID[0]
STRAP 1	3GIO_PADCFG[3]	3GIO_PADCFG[2]	3GIO_PADCFG[1]	3GIO_PADCFG[0]
STRAP 0	USER[3]	USER[2]	USER[1]	USER[0]

Strap S1/S2 Bit[3:0]	PU/PD	Rval
0 0000	PD	5k
1 0001	PD	10k
2 0010	PD	15k
3 0011	PD	20k
4 0100	PD	25k
5 0101	PD	30k
6 0110	PD	35k
7 0111	PD	45k

Strap S1/S2 Bit[3:0]	PU/PD	Rval
8 1000	PU	5k
9 1001	PU	10k
A 1010	PU	15k
B 1011	PU	20k
C 1100	PU	25k
D 1101	PU	30k
E 1110	PU	35k
F 1111	PU	45k

=PP3V3_GPU_MIO

		NO STUFF	NO STUFF
		R8703[1] 10K 1% 1/16W MF-LF 402	R8705[1] 10K 1% 1/16W MF-LF 402
GPU_STRAP<0>	BI		
GPU_STRAP<1>	BI		
GPU_STRAP<2>	BI		
	NO STUFF		
	R8702[1] 2.0K 5% 1/16W MF-LF 402	R8704[1] 10K 1% 1/16W MF-LF 402	R8706[1] 45.3K 1% 1/16W MF-LF 402

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
114S0378	1	RES,MTL FILM,1/16W,45.3K,1,0402,SMD,LF	R8708		VRAM_512_SAMSUNG
114S0361	1	RES,MTL FILM,1/16W,30.1K,1,0402,SMD,LF	R8708		VRAM_512_QIMONDA
114S0343	1	RES,MTL FILM,1/16W,20.0K,1,0402,SMD,LF	R8708		VRAM_256_SAMSUNG
114S0331	1	RES,MTL FILM,1/16W,15.0K,1,0402,SMD,LF	R8708		VRAM_256_HYNIX
114S0378	1	RES,MTL FILM,1/16W,45.3K,1,0402,SMD,LF	R8707		VRAM_1024_SAMSUNG
114S0361	1	RES,MTL FILM,1/16W,30.1K,1,0402,SMD,LF	R8707		VRAM_1024_QIMONDA

G96 HDCP ROM APN is 341S2272, blank device is 335S0574.

GPU 27MHz Crystal

R8783 0 5% 1/16W MF-LF 402
GPU_CLK27M (IN) — NO STUFF R8782[1] 10M 5% 1/16W MF-LF 402 — GPU_CLK27M_XTALOUT_R
GPU_XTALOUT (OUT)
CRITICAL Y8780 27MHz SM-2 (NC / NC)
C8780 12pF 5% 50V CERM 402
C8781 12pF 5% 50V CERM 402

Unused Clocks

GPU_XTALSSIN
GPU_XTALOUTBUFF
GPU_SS_INT
R8780[1] 10K 5% 1/16W MF-LF 402
R8781[1] 10K 5% 1/16W MF-LF 402

=PP3V3_S0_DDC_LCD
=PP3V3_GPU_VDD33

R8750[1] 4.7K	R8751[1] 4.7K	R8752[1] 4.7K	R8753[1] 4.7K	5% 1/16W MF-LF 402
DP_EG_DDC_CLK	IN			
DP_EG_DDC_DATA	BI			
DP_IG_DDC_CLK	IN			
DP_IG_DDC_DATA	BI			

=PP3V3_GPU_VDD33

R8796[1] 2.2K 5% 1/16W MF-LF 402
R8797[1] 2.2K 5% 1/16W MF-LF 402

SMC_GFX_OVERTEMP_R_L	R8798 0 5% 1/16W MF-LF 402	SMC_GFX_OVERTEMP_L	OUT 42
SMC_GFX_THROTTLE_R_L	R8799 0 5% 1/16W MF-LF 402	SMC_GFX_THROTTLE_L	OUT 42
		EG_LCD_PWR_EN	OUT 76 83
		EG_BKLT_EN	OUT 76 83
		GPIO7_FBVDD_ALTVO	OUT 76 82
		FB_VREF_UNTERM	OUT 72 73 74 76

R8792[1] 1K 5% 1/16W MF-LF 402
R8793[1] 1K 5% 1/16W MF-LF 402
R8794[1] 1K 5% 1/16W MF-LF 402
NO STUFF R8795[1] 1K 5% 1/16W MF-LF 402

=PP3V3_GPU_VDD33

DP_CA_DET_EG_FET
R8742[1] 100K 1% 1/16W MF-LF 402
DP_CA_DET_EG_FET Q8742 SOD-VESM-HF SSM3K15FV
EG_DP_CA_DET — DP_CA_DET (IN 80 81 83)
R8743 0 5% 1/16W MF-LF 402 — DP_CA_DET_EG (IN 83)
DP_CA_DET_EG_PLD

Isolation FETs for DP MUX inputs

G96 GPIOs & Straps

SYNC_MASTER=MUXGFX SYNC_DATE=07/09/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 76 OF 96	

Page Notes

Power aliases required by this page:
- =PP1V8_GPU_IFPX
- =PP3V3_GPU_IFPCD_IOVDD

Signal aliases required by this page:
(NONE)

BOM options provided by this page:
(NONE)

Sum of peak currents: 240mA

=PP1V8_GPU_IFPX

L8800 FERR-220-OHM 0402
C8800 4.7UF 20% 6.3V CERM 603
C8801 0.1UF 20% 10V CERM 402
C8803 0.1UF 20% 10V CERM 402
?mA peak per diff pair
?mA peak for all pairs
Place at AG9
Place at AG10

PP1V8_GPU_IFPAB_IOVDD_F
MIN_LINE_WIDTH=0.4 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.8V

L8805 FERR-220-OHM 0402
C8805 4.7UF 20% 6.3V CERM 603
C8806 0.1UF 20% 10V CERM 402
80mA peak
PP1V8_GPU_IFPAB_PLLVDD_F
MIN_LINE_WIDTH=0.3 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.8V

GPU_IFPEF_RSET 77
GPU_IFPCD_RSET 77
GPU_IFPAB_RSET 77

R8855 1K 1% 1/16W MF-LF 402
R8850 1K 1% 1/16W MF-LF 402
R8851 1K 1% 1/16W MF-LF 402

=PP1V1_GPU_IFPCD_IOVDD

L8810 FERR-220-OHM 0402
C8810 4.7UF 20% 6.3V CERM 603
C8811 0.1UF 20% 10V CERM 402
C8813 0.1UF 20% 10V CERM 402
?mA peak per diff pair
?mA peak for all pairs
Place at AJ8
Place at AK8

PP1V1_GPU_IFPCD_IOVDD_F 77
MIN_LINE_WIDTH=0.4 mm
MIN_NECK_WIDTH=0.1 mm
VOLTAGE=1.1V

I2CS must be pulled up if not used
I2CS addr fixed at 0x9E,0x9F

L8815 FERR-220-OHM 0402
C8815 4.7UF 20% 6.3V CERM 603
C8816 0.1UF 20% 10V CERM 402
160mA peak

PP1V8_GPU_IFPCD_PLLVDD_F 77
MIN_LINE_WIDTH=0.3 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.8V

I2CS must be pulled up if not used.
I2CS addr fixed at 0x9E,0x9F

PP1V1_GPU_IFPEF_IOVDD_F 77
PP1V8_GPU_IFPEF_PLLVDD_F 77

Power inputs must be pulled down if not used

R8856 10K 5% 1/16W MF-LF 402
R8857 10K 5% 1/16W MF-LF 402

OMIT

U8000
NB9P-GS
BGA
SYMBOL 5 OF 9

AG9	IFPA_IOVDD	IFPA_TXC	AM11
AG10	IFPB_IOVDD	IFPA_TXC*	AM12
AJ8	IFPC_IOVDD	IFPA_TXD0	AM8
AK8	IFPD_IOVDD	IFPA_TXD0*	AL8
AE7	IFPE_IOVDD	IFPA_TXD1	AM10
AD7	IFPF_IOVDD	IFPA_TXD1*	AM9
AK9	IFPAB_PLLVDD	IFPA_TXD2	AK10
AJ11	IFPAB_RSET	IFPA_TXD2*	AL10
AJ9	IFPCD_PLLVDD	IFPA_TXD3	AK11
AK7	IFPCD_RSET	IFPA_TXD3*	AL11
AJ6	IFPEF_PLLVDD	IFPB_TXC	AP13
AL1	IFPEF_RSET	IFPB_TXC*	AN13
		IFPB_TXD4	AN8
		IFPB_TXD4*	AP8
		IFPB_TXD5	AP10
		IFPB_TXD5*	AN10
		IFPB_TXD6	AR11
		IFPB_TXD6*	AR10
		IFPB_TXD7	AN11
		IFPB_TXD7*	AP11
		IFPC_AUX	AP2
		IFPC_AUX*	AN3
		IFPC_L0	AM7
		IFPC_L0*	AM6
		IFPC_L1	AL5
		IFPC_L1*	AM5
		IFPC_L2	AM3
		IFPC_L2*	AM4
		IFPC_L3	AP1
		IFPC_L3*	AR2
		IFPD_AUX	AP4 NC
		IFPD_AUX*	AN4 NC
		IFPD_L0	AR8 NC
		IFPD_L0*	AR7 NC
		IFPD_L1	AP7 NC
		IFPD_L1*	AN7 NC
		IFPD_L2	AN5 NC
		IFPD_L2*	AP5 NC
		IFPD_L3	AR5 NC
		IFPD_L3*	AR4 NC
		IFPE_AUX	AE4 NC
		IFPE_AUX*	AD4 NC
		IFPE_L0	AH6 NC
		IFPE_L0*	AH5 NC
		IFPE_L1	AH4 NC
		IFPE_L1*	AG4 NC
		IFPE_L2	AF4 NC
		IFPE_L2*	AF5 NC
		IFPE_L3	AE5 NC
		IFPE_L3*	AE6 NC
		IFPF_AUX	AF3 NC
		IFPF_AUX*	AF2 NC
		IFPF_L0	AL2 NC
		IFPF_L0*	AL3 NC
		IFPF_L1	AJ2 NC
		IFPF_L1*	AJ3 NC
		IFPF_L2	AJ1 NC
		IFPF_L2*	AH1 NC
		IFPF_L3	AF1 NC
		IFPF_L3*	AF3 NC
AJ12	DACA_VDD	DACA_RED	AM15 NC
		DACA_GREEN	AM14 NC
		DACA_BLUE	AL14 NC
AK12	DACA_VREF	DACA_HSYNC	AM13 NC
AC13	DACA_RSET	DACA_VSYNC	AL13 NC
AC6	DACB_VDD	DACB_RED	AA4 NC
		DACB_GREEN	AB4 NC
AC5	DACB_VREF	DACB_BLUE	Y4 NC
AB6	DACB_RSET	DACB_CSYNC	AB5 NC
AG7	DACC_VDD	DACC_RED	AK4 NC
		DACC_GREEN	AL4 NC
AK6	DACC_VREF	DACC_BLUE	AJ4 NC
AK7	DACC_RSET	DACC_HSYNC	AN1 NC
		DACC_VSYNC	AM2 NC

GPU_DACA_VDD
GPU_DACB_VDD
GPU_DACC_VDD

R8852 10K 5% 1/16W MF-LF 402
R8853 10K 5% 1/16W MF-LF 402
R8854 10K 5% 1/16W MF-LF 402

76 B1	GPU_I2CA_SCL	G1	I2CA_SCL
76 B1	GPU_I2CA_SDA	G4	I2CA_SDA
76 B1	GPU_I2CC_SCL	E3	I2CC_SCL
76 B1	GPU_I2CC_SDA	E4	I2CC_SDA
45 B1	=GPU_I2CS_SCL	E2	I2CS_SCL
45 B1	=GPU_I2CS_SDA	E1	I2CS_SDA
76 B1	GPU_I2CH_SCL	F6	I2CH_SCL
76 B1	GPU_I2CH_SDA	G6	I2CH_SDA
76 B1	GPU_I2CB_SCL	G3	I2CB_SCL
76 B1	GPU_I2CB_SDA	G2	I2CB_SDA
76 B1	GPU_I2CD_SCL	F4	I2CD_SCL
76 B1	GPU_I2CD_SDA	G5	I2CD_SDA
76 B1	GPU_I2CE_SCL	D5	I2CE_SCL
76 B1	GPU_I2CE_SDA	E5	I2CE_SDA

R8861 1K 5% 1/16W MF-LF 402
R8860 1K 5% 1/16W MF-LF 402
NO STUFF

NV G96 Video Interfaces

SYNC_MASTER=MUXGFX SYNC_DATE=07/10/2008

NOTICE OF PROPRIETARY PROPERTY

THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING

I TO MAINTAIN THE DOCUMENT IN CONFIDENCE

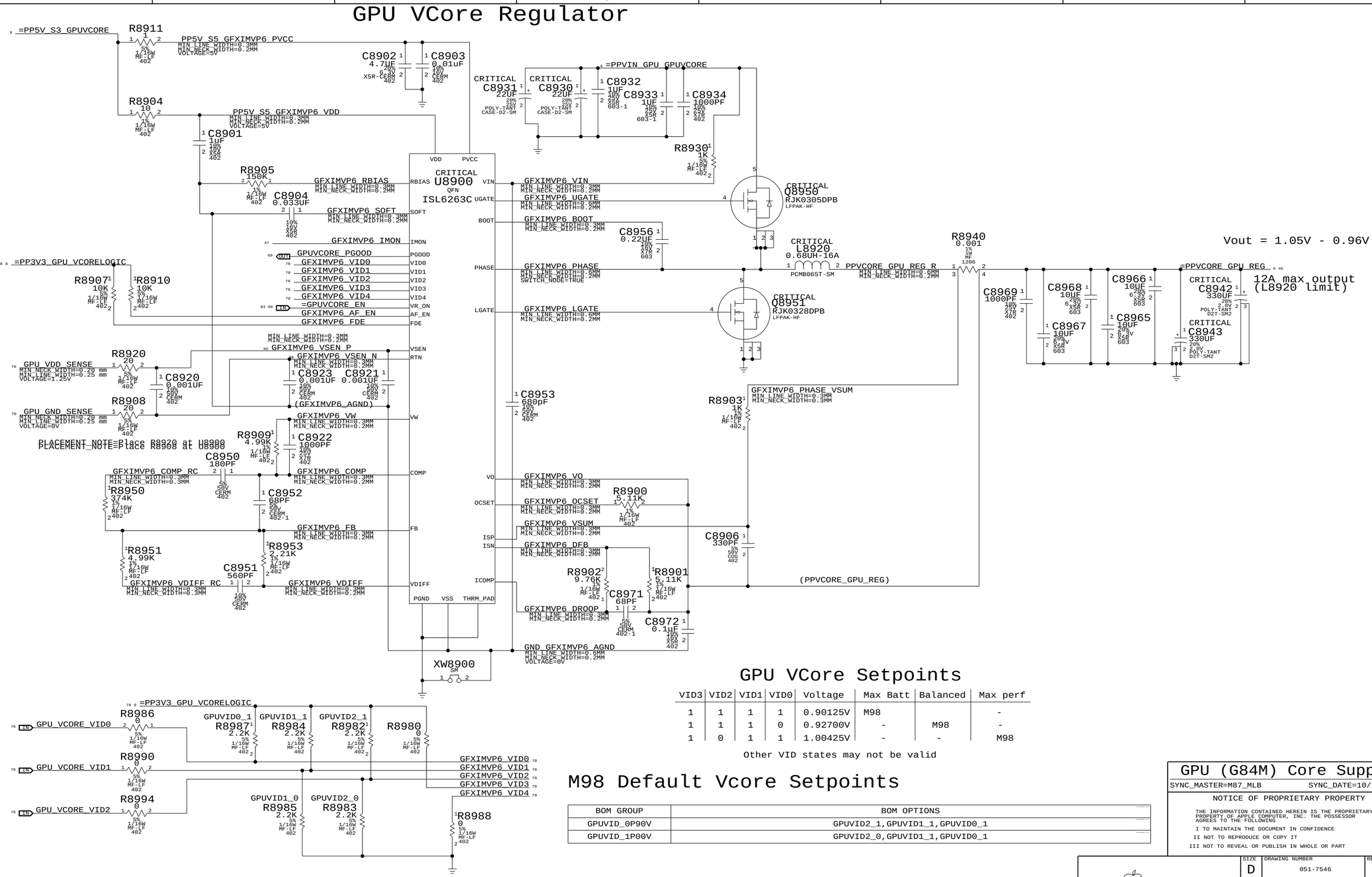
II NOT TO REPRODUCE OR COPY IT

III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 77 OF 96	

GPU VCore Regulator



GPU VCore Setpoints

VID3	VID2	VID1	VID0	Voltage	Max Batt	Balanced	Max perf
1	1	1	1	0.90125V	M98		-
1	1	1	0	0.92700V	-	M98	-
1	0	1	1	1.00425V	-	-	M98

Other VID states may not be valid

M98 Default Vcore Setpoints

BOM GROUP	BOM OPTIONS
GPUVID_0P90V	GPUVID2_1,GPUVID1_1,GPUVID0_1
GPUVID_1P00V	GPUVID2_0,GPUVID1_1,GPUVID0_1

GPU (G84M) Core Supply

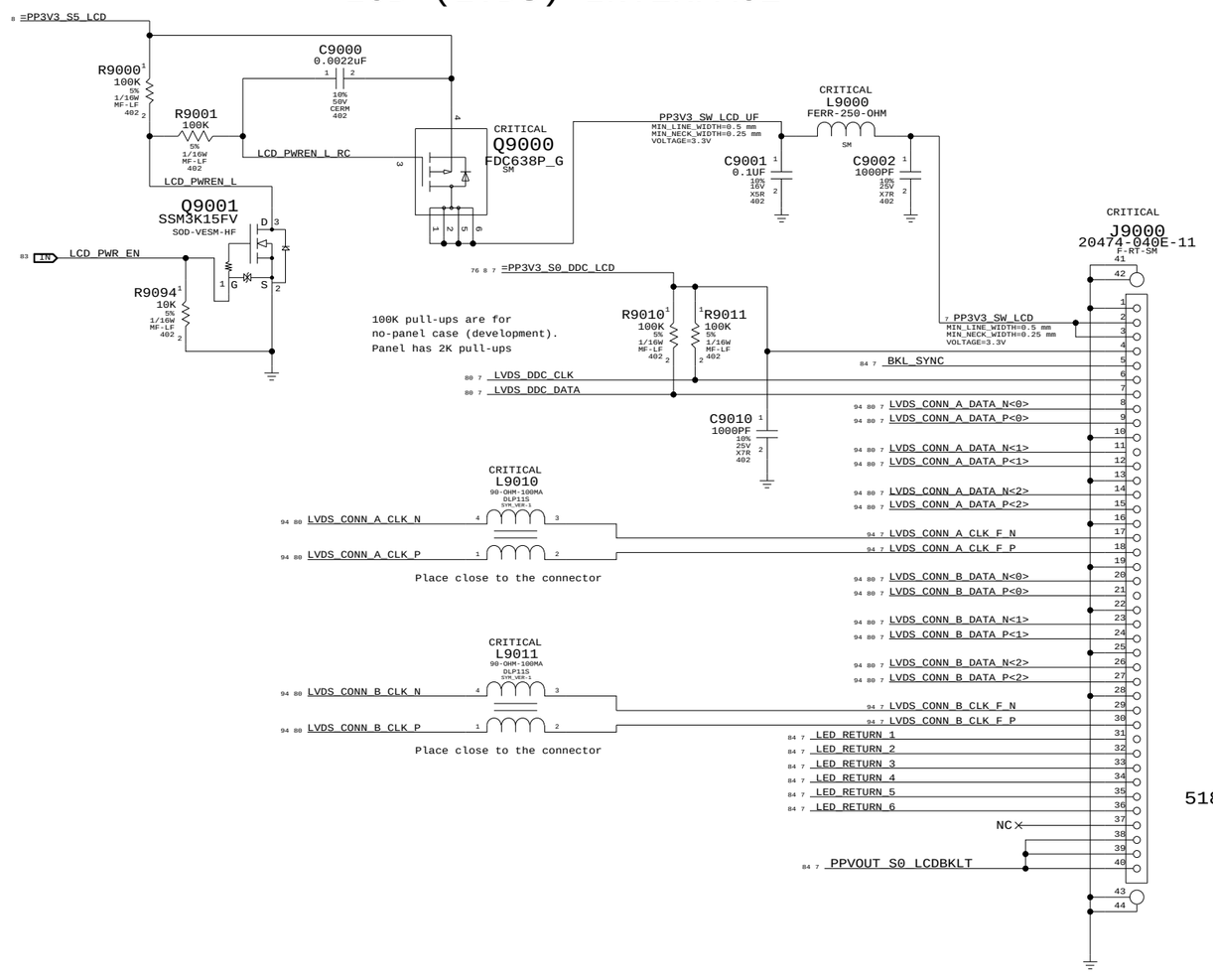
SYNC_MASTER=M87_MLB SYNC_DATE=10/17/2007

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0

SCALE: NONE SHT 78 OF 96

LCD (LVDS) INTERFACE



518S0651

LVDS Display Connector

SYNC_MASTER=MUXGFX SYNC_DATE=02/25/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 79 OF 96	

LVDS Transmitter Termination

All emulated LVDS outputs require this termination

PLACEMENT_NOTE=Place at U9200 (All 24 resistors)

LVDS_A_CLK_P	R9320 270 1% 1/10W MF-LF 402	LVDS_CONN_A_CLK_P	
	R9321 133 1% 1/16W MF-LF 402 SIGNAL_MODEL=EMPTY		
LVDS_A_CLK_N	R9322 270 1% 1/10W MF-LF 402	LVDS_CONN_A_CLK_N	
LVDS_A_DATA_P<0>	R9325 270 1% 1/10W MF-LF 402	LVDS_CONN_A_DATA_P<0>	
	R9326 133 1% 1/16W MF-LF 402 SIGNAL_MODEL=EMPTY		
LVDS_A_DATA_N<0>	R9327 270 1% 1/10W MF-LF 402	LVDS_CONN_A_DATA_N<0>	
LVDS_A_DATA_P<1>	R9330 270 1% 1/10W MF-LF 402	LVDS_CONN_A_DATA_P<1>	
	R9331 133 1% 1/16W MF-LF 402 SIGNAL_MODEL=EMPTY		
LVDS_A_DATA_N<1>	R9332 270 1% 1/10W MF-LF 402	LVDS_CONN_A_DATA_N<1>	
LVDS_A_DATA_P<2>	R9335 270 1% 1/10W MF-LF 402	LVDS_CONN_A_DATA_P<2>	
	R9336 133 1% 1/16W MF-LF 402 SIGNAL_MODEL=EMPTY		
LVDS_A_DATA_N<2>	R9337 270 1% 1/10W MF-LF 402	LVDS_CONN_A_DATA_N<2>	
LVDS_B_CLK_P	R9340 270 1% 1/10W MF-LF 402	LVDS_CONN_B_CLK_P	
	R9341 133 1% 1/16W MF-LF 402 SIGNAL_MODEL=EMPTY		
LVDS_B_CLK_N	R9342 270 1% 1/10W MF-LF 402	LVDS_CONN_B_CLK_N	
LVDS_B_DATA_P<0>	R9345 270 1% 1/10W MF-LF 402	LVDS_CONN_B_DATA_P<0>	
	R9346 133 1% 1/16W MF-LF 402 SIGNAL_MODEL=EMPTY		
LVDS_B_DATA_N<0>	R9347 270 1% 1/10W MF-LF 402	LVDS_CONN_B_DATA_N<0>	
LVDS_B_DATA_P<1>	R9350 270 1% 1/10W MF-LF 402	LVDS_CONN_B_DATA_P<1>	
	R9351 133 1% 1/16W MF-LF 402 SIGNAL_MODEL=EMPTY		
LVDS_B_DATA_N<1>	R9352 270 1% 1/10W MF-LF 402	LVDS_CONN_B_DATA_N<1>	
LVDS_B_DATA_P<2>	R9355 270 1% 1/10W MF-LF 402	LVDS_CONN_B_DATA_P<2>	
	R9356 133 1% 1/16W MF-LF 402 SIGNAL_MODEL=EMPTY		
LVDS_B_DATA_N<2>	R9357 270 1% 1/10W MF-LF 402	LVDS_CONN_B_DATA_N<2>	

DisplayPort Mux

=PP3V3_S0_DPMUX

MUXGFX U9320 CBTL06141EE BGA CRITICAL SIGNAL_MODEL=DPMUX

DP_IG_ML_P<0>	B4 DIN1_0+	DOUT_0+ B2	DP_ML_P<0>
DP_IG_ML_N<0>	A4 DIN1_0-	DOUT_0- B1	DP_ML_N<0>
DP_IG_ML_P<1>	B5 DIN1_1+	DOUT_1+ D2	DP_ML_P<1>
DP_IG_ML_N<1>	A5 DIN1_1-	DOUT_1- D1	DP_ML_N<1>
DP_IG_ML_P<2>	B6 DIN1_2+	DOUT_2+ E2	DP_ML_P<2>
DP_IG_ML_N<2>	A6 DIN1_2-	DOUT_2- E1	DP_ML_N<2>
DP_IG_ML_P<3>	A8 DIN1_3+	DOUT_3+ F2	DP_ML_P<3>
DP_IG_ML_N<3>	A9 DIN1_3-	DOUT_3- F1	DP_ML_N<3>
DP_IG_AUX_CH_P	H9 DAUX1+	AUX+ H2	DP_AUX_CH_C_P
DP_IG_AUX_CH_N	J9 DAUX1-	AUX- H1	DP_AUX_CH_C_N
DP_IG_DDC_CLK	H8 DDC_CLK1		
DP_IG_DDC_DATA	J8 DDC_DAT1		
DP_IG_HPD	J2 HPD_1		
DP_EG_ML_P<0>	B8 DIN2_0+		
DP_EG_ML_N<0>	B9 DIN2_0-		
DP_EG_ML_P<1>	D8 DIN2_1+		
DP_EG_ML_N<1>	D9 DIN2_1-		
DP_EG_ML_P<2>	E8 DIN2_2+		
DP_EG_ML_N<2>	E9 DIN2_2-		
DP_EG_ML_P<3>	F8 DIN2_3+		
DP_EG_ML_N<3>	F9 DIN2_3-		
DP_EG_AUX_CH_P	H6 DAUX2+		
DP_EG_AUX_CH_N	J6 DAUX2-		
DP_EG_DDC_CLK	H5 DDC_CLK2		
DP_EG_DDC_DATA	J5 DDC_DAT2		
DP_EG_HPD	H3 HPD_2		
DP_MUX_SEL_EG	A1 GPU_SEL	DDC_AUX_SEL C2	DP_CA_DET
DP_MUX_XSD_L	B7 XSD*	TST0 G2	

MUXGFX C9320 0.1UF 20% 16V CERM 402

MUXGFX C9321 0.1UF 20% 16V CERM 402

C9330 0.1uF 10% 16V X5R 402 DP_IG_AUX_CH_C_P

C9331 0.1uF 10% 16V X5R 402 DP_IG_AUX_CH_C_N

C9335 0.1uF 10% 16V X5R 402 DP_EG_AUX_CH_C_P

C9336 0.1uF 10% 16V X5R 402 DP_EG_AUX_CH_C_N

R9306 1K 5% 1/16W MF-LF 402 — DP_IG_AUX_CH_N

R9304 100K 5% 1/16W MF-LF 402 — DP_IG_HPD

R9305 100K 5% 1/16W MF-LF 402 — DP_EG_HPD

DP_MUX_SEL_EG

DP_MUX_XSD_L

DPMUX_EN_HPD R9301 10K 1% 1/10W MF-LF 402; C9301 1UF 10% 6.3V CERM-X5R 402

GND: B3 C8 G8 H4 H7

=PP3V3_S0_DPMUX

DPMUX_EN_S0&DPMUX_EN_PLD R9302 10K 1% 1/10W MF-LF 402

DPMUX_EN_PLD R9303 0 5% 1/16W MF-LF 402

DP_MUX_EN

DP_HOTPLUG_DET MAKE_BASE=TRUE

DP_IG_CA_DET

LO=PORT1 HI=PORT2

LO=AUX_CH HI=DDC

PLACEMENT_NOTE=Place at U9320 MUXGFX

R9307 1K 5% 1/16W MF-LF 402 — HPDIN J1 — DP_HPD_R — DP_HPD

DP_CA_DET MAKE_BASE=TRUE

LVDS DDC MUX

=PP3V3_GPU_LVDS_DDC

R9370 20K 5% 1/16W MF-LF 402

R9371 20K 5% 1/16W MF-LF 402

=PP3V3_S0_LVDSDDCMUX

C9370 0.1UF 20% 16V CERM 402

R9372 20K 5% 1/16W MF-LF 402

R9373 20K 5% 1/16W MF-LF 402

U9370 QFN1 SN74LV4066A

VCC 14; GND_THRM 7 15

LVDS_DDC_SEL_EG	C1 13	A1 1	LVDS_EG_DDC_CLK
LVDS_DDC_SEL_IG	C2 5	A2 4	LVDS_IG_DDC_CLK
		B2 3	LVDS_DDC_CLK
	C3 6	A3 8	LVDS_EG_DDC_DATA
		B3 9	
	C4 12	A4 11	LVDS_IG_DDC_DATA
		B4 10	LVDS_DDC_DATA

Muxed Graphics Support

SYNC_MASTER=MUXGFX SYNC_DATE=07/10/2008

NOTICE OF PROPRIETARY PROPERTY

THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING

I TO MAINTAIN THE DOCUMENT IN CONFIDENCE

II NOT TO REPRODUCE OR COPY IT

III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 80 OF 96	

Port Power Switch

CRITICAL
U9480
TPS2051B
SOT23
=PP3V3_S5_DP_PORT_PWR
PM_SLP_S3_L
IN
OUT
EN
OC*
GND
TP_DPPWR_OC_L
PP3V3_S0_DPILIM
MIN_LINE_WIDTH=0.38 MM
MIN_NECK_WIDTH=0.20 MM
VOLTAGE=3.3V
C9480 10UF 20% 6.3V X5R 603
C9481 0.1UF 20% 10V CERM 402
C9485 0.1UF 20% 10V CERM 402
CRITICAL
C9486 22UF 20% 6.3V X5R-CERM 603

L9400
FERR-120-OHM-3A
0603
C9400 0.01UF 20% 50V CERM 603
PP3V3_S0_DPPWR
MIN_LINE_WIDTH=0.38 MM
MIN_NECK_WIDTH=0.20 MM
VOLTAGE=3.3V

R9420 100K 5% 1/10W MF-LF 402

DP_ESD CRITICAL D9410 RCLAMP0524P SLP2510P8
DP_ESD CRITICAL D9410 RCLAMP0524P SLP2510P8

R9400 0 NO STUFF 5% 1/16W MF-LF 402
R9430 0 NO STUFF 5% 1/16W MF-LF 402
R9401 0 NO STUFF 5% 1/16W MF-LF 402
R9431 0 NO STUFF 5% 1/16W MF-LF 402

HDMI_CEC

R9403 0 NO STUFF 5% 1/16W MF-LF 402
R9413 0 NO STUFF 5% 1/16W MF-LF 402

R9425 1M 5% 1/16W MF-LF 402

FL9403 12-OHM-100MA TCM1210-4SM
FL9401 12-OHM-100MA TCM1210-4SM
FL9400 12-OHM-100MA TCM1210-4SM
FL9402 12-OHM-100MA TCM1210-4SM

DP_ML_P<3> C9414 0.1uF 10% 16V X5R 402 DP_ML_C_P<3>
DP_ML_N<3> C9415 0.1uF 10% 16V X5R 402 DP_ML_C_N<3>
DP_AUX_CH_C_P
DP_AUX_CH_C_N

CRITICAL
J9400
DSPLYPRT-M97-2
F-RT-THSM

BOT ROW TH PINS		TOP ROW SM PINS
2	DP_HPD	1 GND
4	DP_C_A_DET	3 ML_LANE0P
6	HDMI_CEC	5 ML_LANE0N
8	GND	7 GND
10	ML_LANE3P	9 ML_LANE1P
12	ML_LANE3N	11 ML_LANE1N
14	GND	13 GND
16	AUX_CHP	15 ML_LANE2P
18	AUX_CHN	17 ML_LANE2N
20	DP_PWR	19 RETURN

SHIELD PINS 22 21

DP_ML_CONN_P<3>
DP_ML_CONN_N<3>
DP_ML_CONN_P<0>
DP_ML_CONN_N<0>
DP_ML_CONN_P<1>
DP_ML_CONN_N<1>
DP_ML_CONN_P<2>
DP_ML_CONN_N<2>

DP_ML_C_P<0> C9410 0.1uF 10% 16V X5R 402 DP_ML_P<0>
DP_ML_C_N<0> C9411 0.1uF 10% 16V X5R 402 DP_ML_N<0>
DP_ML_C_P<1> C9412 0.1uF 10% 16V X5R 402 DP_ML_P<1>
DP_ML_C_N<1> C9413 0.1uF 10% 16V X5R 402 DP_ML_N<1>
DP_ML_C_P<2> C9416 0.1uF 10% 16V X5R 402 DP_ML_P<2>
DP_ML_C_N<2> C9417 0.1uF 10% 16V X5R 402 DP_ML_N<2>

R9402 0 NO STUFF 5% 1/16W MF-LF 402
R9432 0 NO STUFF 5% 1/16W MF-LF 402

=PP3V3_S0_DPCONN

R9443 100K 5% 1/16W MF-LF 402
R9442 100K 5% 1/16W MF-LF 402
DP_CA_DET
Q9440 2N7002DW-X-G SOT-363
DP_CA_DET_L_Q
Q9440 2N7002DW-X-G SOT-363
DP_CA_DET_Q

R9421 100K 5% 1/16W MF-LF 402

DP_ESD CRITICAL D9411 RCLAMP0524P SLP2510P8

DP_ESD CRITICAL D9400 RCLAMP0504F SC70-6-1

R9422 1M 5% 1/16W MF-LF 402

DP to DVI/HDMI Cable Adapter (CA) has 100k pull-up to DP_PWR.

Q9440 must have Drain to Gate leakage of <500nA and Gate to Source resistance of >5MOhm

DP_ESD CRITICAL D9411 RCLAMP0524P SLP2510P8

=PP3V3_S0_DPCONN

R9445 10K 5% 1/16W MF-LF 402
R9444 10K 5% 1/16W MF-LF 402
DP_HPD
Q9441 2N7002DW-X-G SOT-363
DP_HPD_L_Q
Q9441 2N7002DW-X-G SOT-363
DP_HPD_Q

R9423 100K 5% 1/16W MF-LF 402

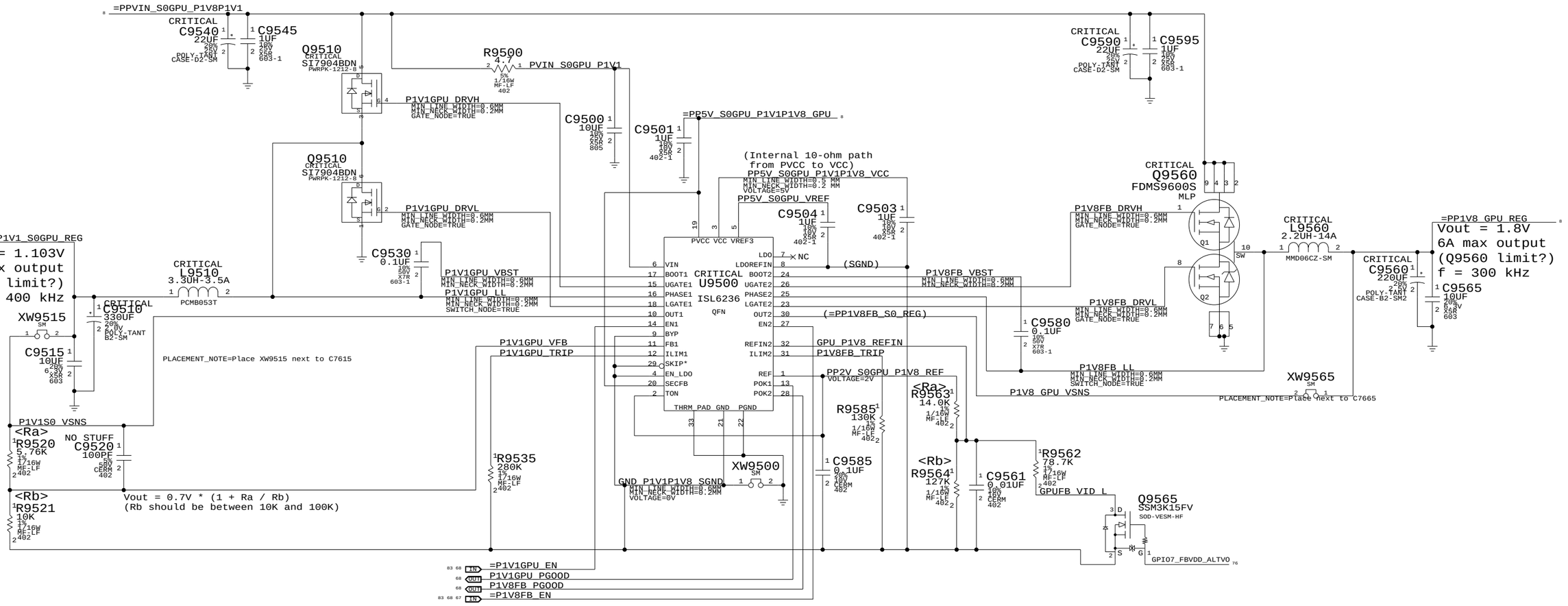
DP Source must pull down HPD input with greater than or equal to 100K (DPv1.1a).

DisplayPort Connector

SYNC_MASTER=MUXGFX SYNC_DATE=07/10/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 81 OF 96	



1.1V / 1V8 FB Power Supply

SYNC_MASTER=MUXGFX SYNC_DATE=07/10/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 82 OF 96	

GMUX CPLD

=PP3V3_S0_GMUX
C9610 0.1UF 20% 10V CERM 402
C9621 0.1UF 20% 10V CERM 402
C9622 0.1UF 20% 10V CERM 402
C9623 0.1UF 20% 10V CERM 402
C9624 0.1UF 20% 10V CERM 402
C9625 0.1UF 20% 10V CERM 402
C9626 0.1UF 20% 10V CERM 402
C9628 0.1UF 20% 10V CERM 402
C9629 0.1UF 20% 10V CERM 402
C9630 0.1UF 20% 10V CERM 402

=PP2V5_S0_GMUX
C9611 0.1UF 20% 10V CERM 402
C9612 0.1UF 20% 10V CERM 402
C9613 0.1UF 20% 10V CERM 402
C9614 0.1UF 20% 10V CERM 402
C9615 0.1UF 20% 10V CERM 402
C9616 0.1UF 20% 10V CERM 402
C9617 0.1UF 20% 10V CERM 402

=PP1V2_S0_GMUX
C9600 4.7UF 20% 10V X5R 402
C9604 0.1UF 20% 10V CERM 402
C9605 0.1UF 20% 10V CERM 402
C9606 0.1UF 20% 10V CERM 402
C9607 0.1UF 20% 10V CERM 402
C9608 0.1UF 20% 10V CERM 402
C9609 0.1UF 20% 10V CERM 402

=PP3V3_S0_GMUX
L9631 FERR-220-OHM 0402
PP3V3_S0_ULC_F MIN_LINE_WIDTH=0.2 mm MIN_NECK_WIDTH=0.2 mm VOLTAGE=3.3V
C9631 0.1UF 20% 10V CERM 402
L9627 FERR-220-OHM 0402
PP3V3_S0_LRC_F MIN_LINE_WIDTH=0.2 mm MIN_NECK_WIDTH=0.2 mm VOLTAGE=3.3V
C9627 0.1UF 20% 10V CERM 402

VCC: B11 C4 J3 J13 N11 P8
VCCAUX: C11 J2 J14 M8
VCCIO6 B5, VCCIO1 B7, VCCIO2 A12, VCCIO3 C14, VCCIO4 F13, VCCIO5 M12, VCCIO6 M9, VCCIO7 M3, N5, M1, C3, F2, K12
VCCJ A4
ULC_VCCPLL P11
LRC_VCCPLL

R9640 10K 1% 1/16W MF-LF 402
R9645 10K 1% 1/16W MF-LF 402
NO STUFF R9641 10K 1% 1/16W MF-LF 402
NO STUFF R9646 10K 1% 1/16W MF-LF 402

JTAG_GMUX_TCK	K14	TCK	
JTAG_GMUX_TDI	L13	TDI	IN
JTAG_GMUX_TDO	K13	TDO	OUT
JTAG_GMUX_TMS	L12	TMS	IN
GMUX_TOE	K2	TOE	
GMUX_CFG0	K1	CFG0	
LCD_BKLT_EN	P2	PB2A	OUT
LCD_BKLT_PWM	N2	PB2B	OUT
LVDS_DDC_SEL_EG	P4	PB14A	OUT
LVDS_DDC_SEL_IG	N4	PB14B	OUT
DP_MUX_EN	N3	PB15A (OD)	OUT
DP_MUX_SEL_EG	M4	PB15B	OUT
EG_RESET_L	P5	PB16A	OUT
EG_RAIL1_EN	M5	PB16B	OUT
EG_RAIL2_EN	P6	PB17A	OUT
EG_RAIL3_EN	M6	PB17B	OUT
EG_RAIL4_EN	P7	PB18A	OUT
EG_CLKREQ_OUT_L	M7	PB18B (OD)	OUT
DP_CA_DET_EG	N7	PB19A	OUT
LCD_PWR_EN	N8	PB19B	OUT
LPC_AD<0>	P9	PB20A	BI
LPC_AD<1>	N9	PB20B	BI
LPC_AD<2>	P10	PB30A	BI
LPC_AD<3>	M10	PB30B	BI
LPC_FRAME_L	P12	PB31A	BI
LPC_RESET_L	P13	PB31B	IN
LPC_CLK33M_GMUX	N12	PB32A	IN
GMUX_INT	P14	PB32B	OUT
LVDS_IG_B_DATA_P<2>	B1	PL2A	IN
LVDS_IG_B_DATA_N<2>	B2	PL2B	IN
TP_GMUX_PL10A	C2	PL10A	
TP_GMUX_PL10B	D3	PL10B	
LVDS_IG_A_DATA_P<0>	D1	PL11A	IN
LVDS_IG_A_DATA_N<0>	E1	PL11B	IN
LVDS_IG_A_DATA_P<1>	D2	PL12A	IN
LVDS_IG_A_DATA_N<1>	E3	PL12B	IN
LVDS_IG_A_DATA_P<2>	F1	PL13A	IN
LVDS_IG_A_DATA_N<2>	G1	PL13B	IN
LVDS_IG_B_DATA_P<0>	F3	PL14A	IN
LVDS_IG_B_DATA_N<0>	G2	PL14B	IN
LVDS_IG_B_DATA_P<1>	H2	PL15A	IN
LVDS_IG_B_DATA_N<1>	G3	PL15B	IN
LVDS_IG_A_CLK_P	H1	PL16A	IN
LVDS_IG_A_CLK_N	H3	PL16B	IN
LVDS_MUX_SEL_EG	L1	PL18A	OUT
TP_GMUX_PL18B_VSYNC	L3	PL18B	
=GMUX_PCIE_RESET_L	K3	PL19A	IN
GMUX_PM_SLP_S3_L	L2	PL19B	IN
ALL_EG_PGOOD	N1	PL32A	IN
EG_CLKREQ_IN_L	P1	PL32B	IN

BANK5, BANK4, BANK7, BANK6

NO STUFF R9647 10K 1% 1/16W MF-LF 402

(Tie/strap low if EGPU doesn't provide CLKREQ_L output, provide pullup to GPU rail if using CLKREQ_L output from EGPU)

OMIT CRITICAL
U9600 XP28 CSBGA-HF

GND: J1 B8 C6 C12 C13 C15 H14 N10 N6 P3 M2 C1 E2 B4 M11
GNDIO0 B8, GNDIO1 C6, GNDIO2 C12, GNDIO3 C13, GNDIO4 H14, GNDIO5 N10, GNDIO6 N6, GNDIO7 P3
ULC_GNDPLL M2
LRC_GNDPLL C1

PT2A	A2	LVDS_B_DATA_P<0>	OUT
PT2B	A3	LVDS_B_DATA_N<0>	OUT
PT3A	A1	LVDS_B_DATA_P<1>	OUT
PT3B	B3	LVDS_B_DATA_N<1>	OUT
PT4A	C5	LVDS_B_DATA_P<2>	OUT
PT4B	A5	LVDS_B_DATA_N<2>	OUT
PT14A	B6	EG_PWRSEQ_EN	IN
PT14B	C7	GMUX_DEBUG_RESET_L	IN
PT15A	A6	LVDS_A_CLK_P	OUT
PT15B	A7	LVDS_A_CLK_N	OUT
PT16A	C8	LVDS_B_CLK_P	OUT
PT16B	C9	LVDS_B_CLK_N	OUT
PT17A	A8	LVDS_A_DATA_P<0>	OUT
PT17B	B9	LVDS_A_DATA_N<0>	OUT
PT18A	A9	LVDS_A_DATA_P<1>	OUT
PT18B	C10	LVDS_A_DATA_N<1>	OUT
PT19A	B10	LVDS_A_DATA_P<2>	OUT
PT19B	A10	LVDS_A_DATA_N<2>	OUT
PT20A	A11	TP_GMUX_PT20A	
PT20B	B12	TP_GMUX_PT20B	
PT32A	B13	TP_GMUX_PT32A	
PT32B	A13	TP_GMUX_PT32B	
PR2A	A14	DP_CA_DET	IN
PR2B	B14	DP_HOTPLUG_DET	IN
PR10A	D12	LVDS_EG_A_DATA_P<0>	IN
PR10B	D13	LVDS_EG_A_DATA_N<0>	IN
PR11A	D14	LVDS_EG_A_DATA_P<1>	IN
PR11B	E14	LVDS_EG_A_DATA_N<1>	IN
PR12A	E12	LVDS_EG_A_DATA_P<2>	IN
PR12B	F12	LVDS_EG_A_DATA_N<2>	IN
PR13A	F14	LVDS_EG_B_DATA_P<0>	IN
PR13B	G14	LVDS_EG_B_DATA_N<0>	IN
PR14A	G12	LVDS_EG_B_DATA_P<1>	IN
PR14B	G13	LVDS_EG_B_DATA_N<1>	IN
PR15A	H13	LVDS_EG_B_DATA_P<2>	IN
PR15B	H12	LVDS_EG_B_DATA_N<2>	IN
PR16A	H14	LVDS_EG_A_CLK_P	IN
PR16B	J12	LVDS_EG_A_CLK_N	IN
PR18A	L14	IG_LCD_PWR_EN	IN
PR18B	M13	EG_LCD_PWR_EN	IN
PR30A	N14	IG_BKLT_EN	IN
PR30B	N13	EG_BKLT_EN	IN

BANK0, BANK1, BANK2, BANK3

PM_SLP_S3_L Isolation

=PP3V3_S0_GMUX
Q9670 SSM6N15FEAPE SOT563
R9670 10K 1% 1/16W MF-LF 402
PM_SLP_S3_L
GMUX_PM_SLP_S3_L
MAKE_BASE=TRUE
EG_PWRSEQ_EN

GMUX_JTAG_TCK Inversion

JTAG_GMUX_TCK
Q9670 SSM6N15FEAPE SOT563
GMUX_JTAG_TCK_L

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
336S0027	1	IC,XP2-8,HF,CPLD,BLANK	U9600	CRITICAL	GMUX_8K_BLANK
341S2350	1	IC,CPLD,LATTICE,132CSBGA,M98	U9600	CRITICAL	GMUX_PROG

LVDS Receiver Termination

PLACEMENT_NOTE=Place at U9200 (All 14 resistors)

LVDS_IG_A_CLK_P	R9650	100		LVDS_IG_A_CLK_N
LVDS_IG_A_DATA_P<0>	R9651	100		LVDS_IG_A_DATA_N<0>
LVDS_IG_A_DATA_P<1>	R9652	100		LVDS_IG_A_DATA_N<1>
LVDS_IG_A_DATA_P<2>	R9653	100		LVDS_IG_A_DATA_N<2>
LVDS_IG_B_DATA_P<0>	R9654	100		LVDS_IG_B_DATA_N<0>
LVDS_IG_B_DATA_P<1>	R9655	100		LVDS_IG_B_DATA_N<1>
LVDS_IG_B_DATA_P<2>	R9656	100		LVDS_IG_B_DATA_N<2>
LVDS_EG_A_CLK_P	R9660	100		LVDS_EG_A_CLK_N
LVDS_EG_A_DATA_P<0>	R9661	100		LVDS_EG_A_DATA_N<0>
LVDS_EG_A_DATA_P<1>	R9662	100		LVDS_EG_A_DATA_N<1>
LVDS_EG_A_DATA_P<2>	R9663	100		LVDS_EG_A_DATA_N<2>
LVDS_EG_B_DATA_P<0>	R9664	100		LVDS_EG_B_DATA_N<0>
LVDS_EG_B_DATA_P<1>	R9665	100		LVDS_EG_B_DATA_N<1>
LVDS_EG_B_DATA_P<2>	R9666	100		LVDS_EG_B_DATA_N<2>

All: 1% 1/16W MF-LF 402

Required Pullups

SIGNAL_MODEL=EMPTY

=PP3V3_S0_GMUX
GMUX_DEBUG_RESET_L — R9680 1K — 5% 1/16W MF-LF 402
JTAG_GMUX_TCK — R9690 4.7K — 5% 1/16W MF-LF 402
EG_CLKREQ_OUT_L — R9695 10K — 5% 1/16W MF-LF 402

NO STUFF R9679 10K 1% 1/16W MF-LF 402
SILK_PART=GMUX_RST
PLACEMENT_NOTE=Place on top side at U9200

Required Pulldowns

DP_MUX_SEL_EG	R9681	10K	
LVDS_DDC_SEL_IG	R9682	10K	
LVDS_DDC_SEL_EG	R9683	10K	

All: 5% 1/16W MF-LF 402

(Use open-drain PGOOD output to hold off the start of the GPU PWRSEQ until the first GPU rail's source is valid)

NO STUFF

EG_RESET_L	R9691	100K	
GMUX_INT	R9692	20K	
LCD_BKLT_PWM	R9693	100K	
EG_CLKREQ_IN_L	R9694	100K	

All: 5% 1/16W MF-LF 402

EG_PWRSEQ_HW
R9630 0 5% 1/16W MF-LF 402 — EXTGPU_PWR_EN OUT 68

EG_PWRSEQ_GMUX
EG_RAIL1_EN — R9631 0 5% 1/16W MF-LF 402 — =P1V1GPU_EN OUT 68 82

EG_PWRSEQ_GMUX
EG_RAIL2_EN — R9632 0 5% 1/16W MF-LF 402 — P3V3GPU_EN OUT 68 69

EG_PWRSEQ_GMUX
EG_RAIL3_EN — R9633 0 5% 1/16W MF-LF 402 — =GPUVCORE_EN OUT 68 78

EG_PWRSEQ_GMUX
EG_RAIL4_EN — R9634 0 5% 1/16W MF-LF 402 — =P1V8FB_EN OUT 67 68 82

The MAKE BASE properties for these signals are on the POWER CONTROL page.

NO STUFF C9691 0.1UF 20% 10V CERM 402
NO STUFF C9693 0.1UF 20% 10V CERM 402
NO STUFF C9692 0.1UF 20% 10V CERM 402
NO STUFF C9694 0.1UF 20% 10V CERM 402

Graphics MUX (GMUX)

SYNC_MASTER=MUXGFX SYNC_DATE=07/10/2008

NOTICE OF PROPRIETARY PROPERTY

THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING

I TO MAINTAIN THE DOCUMENT IN CONFIDENCE

II NOT TO REPRODUCE OR COPY IT

III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 83 OF 96	

*Q9701, D9701, C9709, C9710, L9701, R9702, AND R9715 SHOULD ALL BE PLACED NEAR EACHOTHER.
*BOOST_FET_CNTL AND PPVOUT_S0_LCDBKLT_SW SHOULD BE KEPT AS SHORT AS POSSIBLE.

PPBUS_S0_LCDBKLT_PWR
R9730 0.1 1% 1/16W MF 402-HF
PPVIN_S0_LCDBKLT_BUF
CRITICAL L9701 22UH-2.5A IHLP2525CZ-SM
PPVOUT_S0_LCDBKLT_SW
D9701 DX022-SM STPS1H100MF
PLACEMENT_NOTE=Place near Q9701
PLACEMENT_NOTE=Place near C9710
PLACEMENT_NOTE=Place near J9000
CRITICAL C9701 10UF 20% 25V X5R 805
PLACEMENT_NOTE=Place near L9701
R9701 100 1% 1/16W MF-LF 402
PLACEMENT_NOTE=Place near PPVOUT_S0_LCDBKLT_SW
Q9701 FDC5612 SSOT6
BOOST_FET_CNTL
BKL_VIN
C9702 0.1UF 10% 25V X5R 402
CRITICAL C9709 2.2UF 10% 100V X7R 1210
CRITICAL C9710 2.2UF 10% 100V X7R 1210
4 PLACEMENT_NOTE=Place near C9709
XW9701 SM
GND_BKL_PWRGND_1
PLACEMENT_NOTE=Place near C9701
GND_BKL_PWRGND
BOOST_SINK
GND_BKL_PWRGND
PLACEMENT_NOTE=Place near C9709 and Q9701
R9704 100 1% 1/16W MF-LF 402
R9702 0.4 1% 1/16W MF 402
R9715 0.4 1% 1/16W MF 402
XW9702 SM
GND_BKL_PWRGND_X
BKL_VREF_4V9
R9731 187K 1% 1/16W MF-LF 402
PPBUS_S0_LCDBKLT_PWR
BKLT_EN
BKL_SYNC
BKLT_PLL
R9734 0 5% 1/16W MF 402
BKL_VSYNC
R9707 3.01K 1% 1/16W MF-LF 402
C9703 1UF 10% 10V X5R 402
C9713 0.1UF 10% 25V X5R 402
R9705 100K 1% 1/16W MF-LF 402
R9706 10K 1% 1/16W MF-LF 402
U9701 QFN GOSHAWK6P
*R9702 AND R9715 PIN 1 SHOULD BE PLACED NEAR C9709 PIN 2
C9712 47PF 5% 50V CERM 402 NOSTUFF
PPVOUT_S0_LCDBKLT
PLACEMENT_NOTE=Away from Q9701
BKL_ISET
PLACEMENT_NOTE=Away from Q9701
BKL_RT
PLACEMENT_NOTE=Away from Q9701
BKL_SSTCMP
BKL_DIM
BKL_LPF
BKL_LRT
BKL_ISWSEN
BKL_ISEN1
BKL_ISEN2
BKL_ISEN3
BKL_ISEN4
BKL_ISEN5
BKL_ISEN6
R9717 10.2 0.1% 1/16W TF 402
R9718 10.2 0.1% 1/16W TF 402
R9719 10.2 0.1% 1/16W TF 402
R9720 10.2 0.1% 1/16W TF 402
R9721 10.2 0.1% 1/16W TF 402
R9722 10.2 0.1% 1/16W TF 402
LED_RETURN_6
LED_RETURN_5
LED_RETURN_4
LED_RETURN_3
LED_RETURN_2
LED_RETURN_1
R9708 100K 1% 1/16W MF-LF 402
R9709 1K 1% 1/16W MF-LF 402
R9703 2.0M 5% 1/16W MF-LF 402
BKL_SSTCMP_RC
C9705 0.01UF 20% 16V CERM 402
BKLT_PWM_RC
R9733 0 5% 1/16W MF-LF 402
C9706 0.0022UF 10% 50V CERM 402 NOSTUFF
C9714 1UF 10% 10V X5R 402 NOSTUFF
GNDA
THRM_PAD
R9713 0 5% 1/16W MF 402
PLACEMENT_NOTE=Away from Q9701
BKLT_PLL_NOT
R9714 10K 5% 1/16W MF 402
C9707 2.2UF 20% 6.3V CERM 402-LF
BKLT_LRT_RC
C9708 0.1UF 10% 25V X5R 402
R9727 75K 1% 1/16W MF-LF 402
PLACEMENT_NOTE=Away from Q9701
GND_BKL_PWRGND
CRITICAL Q9702 NTUD3127CXXG SOT-963
BKL_VREF_4V9
BKL_VREF_IN_4V9
P-CHN
R9700 100K 1% 1/16W MF-LF 402
R9710 10K 1% 1/16W MF-LF 402
BKL_PWR_EN_L
CRITICAL Q9702 N-CHN NTUD3127CXXG SOT-963
LCD_BKLT_PWM
R9711 30.1K 1% 1/16W MF-LF 402
PPVOUT_S0_LCDBKLT
R9723 1.2M 1% 1/16W MF-LF 603
BKL_VSEN
R9724 71.5K 1% 1/16W MF-LF 402

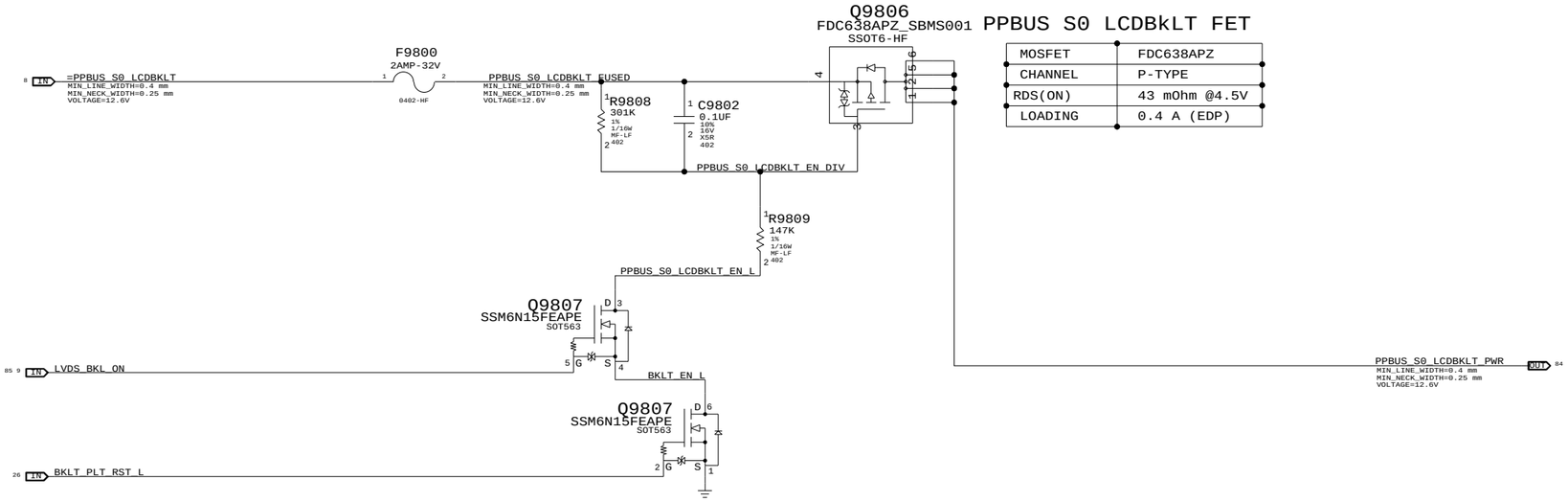
*R9707, R9708, R9709, R9713, R9714, R9727, AND R9729 SHOULD AWAY FROM BOOST CIRCUIT

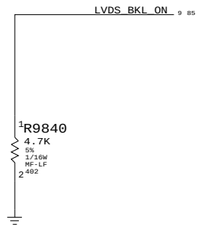
LCD BACKLIGHT DRIVER

SYNC_MASTER=YITE_M98_MLB SYNC_DATE=07/02/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 84 OF 96	





8	7	6	5	4	3	2	1	

LCD Backlight Support

SYNC_MASTER=YITE_M98_MLB SYNC_DATE=07/02/2008

NOTICE OF PROPRIETARY PROPERTY

THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING

I TO MAINTAIN THE DOCUMENT IN CONFIDENCE

II NOT TO REPRODUCE OR COPY IT

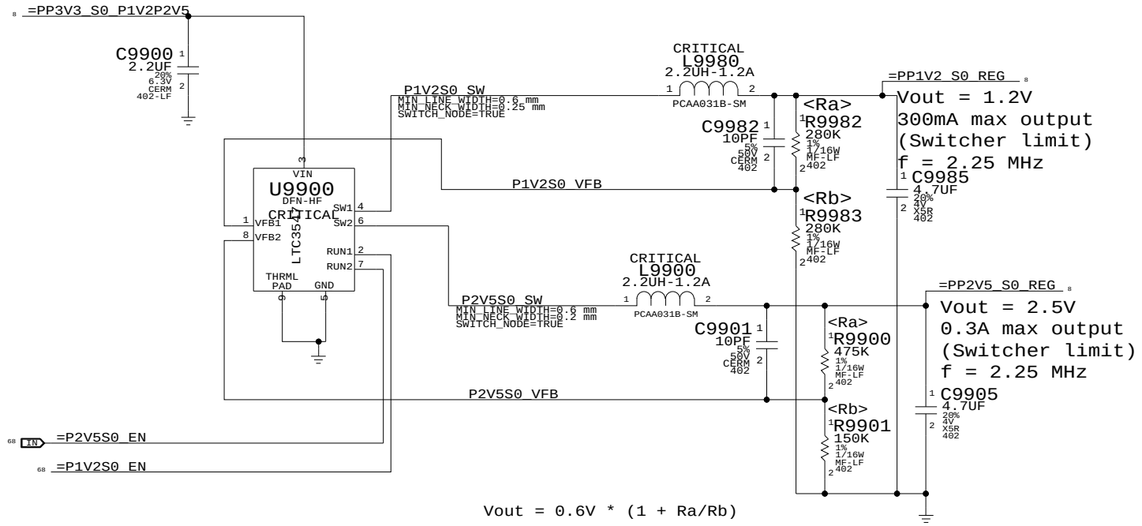
III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0

SCALE	SHT	OF
NONE	85	96

2.5V/1.2V S3 Switcher



Misc Power Supplies

SYNC_MASTER=MUXGFX SYNC_DATE=02/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 86 OF 96	

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_DSTB_50S	*	=50_OHM_SE	=50_OHM_SE	=50_OHM_SE	=50_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 4x/2x/1x FSB signals with impedance requirements are 50-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 +/- 300 ps.
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 recommends each strobe/signal group is routed on the same layer.
Intel Design Guide recommends 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	7 MIL	7 MIL

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

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

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

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

Most CPU signals with impedance requirements are 55-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	*	8 MIL	?

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

	NET_TYPE		
	ELECTRICAL_CONSTRAINT_SET	PHYSICAL	SPACING	
FSB 4X Signal Groups	FSB_DATA_GROUP0	FSB_50S	FSB_DATA	FSB_D_L<15..0> 7 10 14
	FSB_DATA_GROUP0	FSB_50S	FSB_DATA	FSB_DINV_L<0> 7 10 14
	FSB_DSTB0	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_P<0> 7 10 14
	FSB_DSTB0	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_N<0> 7 10 14
	FSB_DATA_GROUP1	FSB_50S	FSB_DATA	FSB_D_L<31..16> 7 10 14
	FSB_DATA_GROUP1	FSB_50S	FSB_DATA	FSB_DINV_L<1> 7 10 14
	FSB_DSTB1	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_P<1> 7 10 14
	FSB_DSTB1	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_N<1> 7 10 14
	FSB_DATA_GROUP2	FSB_50S	FSB_DATA	FSB_D_L<47..32> 7 10 14
	FSB_DATA_GROUP2	FSB_50S	FSB_DATA	FSB_DINV_L<2> 7 10 14
	FSB_DSTB2	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_P<2> 7 10 14
	FSB_DSTB2	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_N<2> 7 10 14
	FSB_DATA_GROUP3	FSB_50S	FSB_DATA	FSB_D_L<63..48> 7 10 14
	FSB_DATA_GROUP3	FSB_50S	FSB_DATA	FSB_DINV_L<3> 7 10 14
	FSB_DSTB3	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_P<3> 7 10 14
	FSB_DSTB3	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_N<3> 7 10 14
FSB 2X Signals	FSB_ADDR_GROUP0	FSB_50S	FSB_ADDR	FSB_A_L<16..3> 7 10 14
	FSB_ADDR_GROUP0	FSB_50S	FSB_ADDR	FSB_REQ_L<4..0> 7 10 14
	FSB_ADSTB0	FSB_50S	FSB_ADSTB	FSB_ADSTB_L<0> 7 10 14
	FSB_ADDR_GROUP1	FSB_50S	FSB_ADDR	FSB_A_L<35..17> 7 10 14
	FSB_ADSTB1	FSB_50S	FSB_ADSTB	FSB_ADSTB_L<1> 7 10 14
FSB 1X Signals	FSB_1X	FSB_50S	FSB_1X	FSB_ADS_L 7 10 14
	FSB_BREQ0_L	FSB_50S	FSB_1X	FSB_BREQ0_L 9 10 14
	FSB_BREQ1_L	FSB_50S	FSB_1X	FSB_BREQ1_L 14
	FSB_1X	FSB_50S	FSB_1X	FSB_BNR_L 10 14
	FSB_1X	FSB_50S	FSB_1X	FSB_BPRI_L 10 14
	FSB_1X	FSB_50S	FSB_1X	FSB_DBSY_L 10 14
	FSB_1X	FSB_50S	FSB_1X	FSB_DEFER_L 10 14
	FSB_1X	FSB_50S	FSB_1X	FSB_DRDY_L 10 14
	FSB_1X	FSB_50S	FSB_1X	FSB_HIT_L 7 10 14
	FSB_1X	FSB_50S	FSB_1X	FSB_HITM_L 7 10 14
	FSB_1X	FSB_50S	FSB_1X	FSB_LOCK_L 7 10 14
	FSB_CPURST_L	FSB_50S	FSB_1X	FSB_CPURST_L 9 10 13 14
	FSB_1X	FSB_50S	FSB_1X	FSB_RS_L<2..0> 10 14
	FSB_1X	FSB_50S	FSB_1X	FSB_TRDY_L 10 14
	CPU_ASYNC	CPU_50S	CPU_AGTL	CPU_A20M_L 10 14
	CPU_BSEL	CPU_50S	CPU_AGTL	CPU_BSEL<2..0> 9 10
	CPU_FERR_L	CPU_50S	CPU_8MIL	CPU_FERR_L 10 14
	CPU_ASYNC	CPU_50S	CPU_AGTL	CPU_IGNNE_L 10 14
	CPU_INIT_L	CPU_50S	CPU_AGTL	CPU_INIT_L 10 14
	CPU_ASYNC_R	CPU_50S	CPU_AGTL	CPU_INTR 9 10 14
	CPU_ASYNC_R	CPU_50S	CPU_AGTL	CPU_NMI 9 10 14
	CPU_PROCHOT_L	CPU_50S	CPU_AGTL	CPU_PROCHOT_L 10 14 43 62
	CPU_PWRGD	CPU_50S	CPU_AGTL	CPU_PWRGD 10 13 14
	CPU_ASYNC	CPU_50S	CPU_AGTL	CPU_SMI_L 10 14
	CPU_ASYNC	CPU_50S	CPU_AGTL	CPU_STPCLK_L 10 14
	PM_THRMTRIP_L	CPU_50S	CPU_8MIL	PM_THRMTRIP_L 10 14 43
	FSB_CPUSLP_L	CPU_50S	CPU_AGTL	FSB_CPUSLP_L 10 14
	CPU_FROM_SB	CPU_50S	CPU_AGTL	CPU_DPSLP_L 10 14
	CPU_DPRSTP_L	CPU_50S	CPU_AGTL	CPU_DPRSTP_L 9 10 14 62
	CPU_ASYNC	CPU_50S	CPU_AGTL	FSB_DPWR_L 10 14
	MCP_CPU_COMP	MCP_50S	MCP_FSB_COMP	MCP_BCLK_VML_COMP_VDD 14
	MCP_CPU_COMP	MCP_50S	MCP_FSB_COMP	MCP_BCLK_VML_COMP_GND 14
	MCP_CPU_COMP	MCP_50S	MCP_FSB_COMP	MCP_CPU_COMP_VCC 14
	MCP_CPU_COMP	MCP_50S	MCP_FSB_COMP	MCP_CPU_COMP_GND 14
	FSB_CLK_CPU	CLK_FSB_100D	CLK_FSB	FSB_CLK_CPU_P 10 14
	FSB_CLK_CPU	CLK_FSB_100D	CLK_FSB	FSB_CLK_CPU_N 10 14
	FSB_CLK_ITP	CLK_FSB_100D	CLK_FSB	FSB_CLK_ITP_P 13 14
	FSB_CLK_ITP	CLK_FSB_100D	CLK_FSB	FSB_CLK_ITP_N 13 14
	FSB_CLK_MCP	CLK_FSB_100D	CLK_FSB	FSB_CLK_MCP_P 14
	FSB_CLK_MCP	CLK_FSB_100D	CLK_FSB	FSB_CLK_MCP_N 14
	CPU_IERR_L	CPU_50S		CPU_IERR_L 10
	PM_DPRSLPVR	CPU_50S	CPU_AGTL	PM_DPRSLPVR 21 62
	(See above)	CPU_50S	CPU_AGTL	IMVP_DPRSLPVR 62
	CPU_GTLREF	CPU_50S	CPU_GTLREF	CPU_GTLREF 10 27
	CPU_COMP	CPU_50S	CPU_COMP	CPU_COMP<3> 10
	CPU_COMP	CPU_27P4S	CPU_COMP	CPU_COMP<2> 10
	CPU_COMP	CPU_50S	CPU_COMP	CPU_COMP<1> 10
	CPU_COMP	CPU_27P4S	CPU_COMP	CPU_COMP<0> 10
	XDP_TDI	CPU_50S	CPU_ITP	XDP_TDI 6 10 13
	XDP_TDO	CPU_50S	CPU_ITP	XDP_TDO 6 10
	XDP_TMS	CPU_50S	CPU_ITP	XDP_TMS 6 10 13
	XDP_TCK	CPU_50S	CPU_ITP	XDP_TCK 6 10 13
	XDP_TRST_L	CPU_50S	CPU_ITP	XDP_TRST_L 6 10 13
	XDP_BPM_L	CPU_50S	CPU_ITP	XDP_BPM_L<4..0> 10 13
	XDP_BPM_L5	CPU_50S	CPU_ITP	XDP_BPM_L<5> 10 13
	(FSB_CPURST_L)	CPU_50S	CPU_ITP	XDP_CPURST_L 13
		CPU_50S	CPU_8MIL	CPU_VID<6..0> 9 11
		CPU_50S	CPU_8MIL	IMVP6_VID<6..0> 9 62
	CPU_VCCSENSE	CPU_27P4S	CPU_VCCSENSE	CPU_VCCSENSE_P 11 62
	CPU_VCCSENSE	CPU_27P4S	CPU_VCCSENSE	CPU_VCCSENSE_N 11 62
	(CPU_VCCSENSE)	CPU_27P4S	CPU_VCCSENSE	IMVP6_VSEN_P 62
	(CPU_VCCSENSE)	CPU_27P4S	CPU_VCCSENSE	IMVP6_VSEN_N 62

CPU/FSB Constraints

SYNC_MASTER=MUXGFX SYNC_DATE=02/18/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 87 OF 96	

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	*	25 MIL	?

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	7 MIL	7 MIL	=STANDARD	=STANDARD	=STANDARD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
MCP_MEM_COMP	*	8 MIL	?

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_A_CLK	MEM_70D_VDD	MEM_CLK	MEM_A_CLK_P<5..0>	15 28
MEM_A_CLK	MEM_70D_VDD	MEM_CLK	MEM_A_CLK_N<5..0>	15 28
MEM_A_CNTL	MEM_40S_VDD	MEM_CTRL	MEM_A_CKE<3..0>	15 28
MEM_A_CNTL	MEM_40S_VDD	MEM_CTRL	MEM_A_CS_L<3..0>	15 28
MEM_A_CNTL	MEM_40S_VDD	MEM_CTRL	MEM_A_ODT<3..0>	15 28
MEM_A_CMD	MEM_40S_VDD	MEM_CMD	MEM_A_A<14..0>	15 28
MEM_A_CMD	MEM_40S_VDD	MEM_CMD	MEM_A_BA<2..0>	15 28
MEM_A_CMD	MEM_40S_VDD	MEM_CMD	MEM_A_RAS_L	15 28
MEM_A_CMD	MEM_40S_VDD	MEM_CMD	MEM_A_CAS_L	15 28
MEM_A_CMD	MEM_40S_VDD	MEM_CMD	MEM_A_WE_L	15 28
MEM_A_DQ_BYTE0	MEM_40S	MEM_DATA	MEM_A_DQ<7..0>	15 28
MEM_A_DQ_BYTE1	MEM_40S	MEM_DATA	MEM_A_DQ<15..8>	15 28
MEM_A_DQ_BYTE2	MEM_40S	MEM_DATA	MEM_A_DQ<23..16>	15 28
MEM_A_DQ_BYTE3	MEM_40S	MEM_DATA	MEM_A_DQ<31..24>	15 28
MEM_A_DQ_BYTE4	MEM_40S	MEM_DATA	MEM_A_DQ<39..32>	15 28
MEM_A_DQ_BYTE5	MEM_40S	MEM_DATA	MEM_A_DQ<47..40>	15 28
MEM_A_DQ_BYTE6	MEM_40S	MEM_DATA	MEM_A_DQ<55..48>	15 28
MEM_A_DQ_BYTE7	MEM_40S	MEM_DATA	MEM_A_DQ<63..56>	15 28
MEM_A_DQ_BYTE0	MEM_40S	MEM_DATA	MEM_A_DM<0>	15 28
MEM_A_DQ_BYTE1	MEM_40S	MEM_DATA	MEM_A_DM<1>	15 28
MEM_A_DQ_BYTE2	MEM_40S	MEM_DATA	MEM_A_DM<2>	15 28
MEM_A_DQ_BYTE3	MEM_40S	MEM_DATA	MEM_A_DM<3>	15 28
MEM_A_DQ_BYTE4	MEM_40S	MEM_DATA	MEM_A_DM<4>	15 28
MEM_A_DQ_BYTE5	MEM_40S	MEM_DATA	MEM_A_DM<5>	15 28
MEM_A_DQ_BYTE6	MEM_40S	MEM_DATA	MEM_A_DM<6>	15 28
MEM_A_DQ_BYTE7	MEM_40S	MEM_DATA	MEM_A_DM<7>	15 28
MEM_A_DQS0	MEM_70D	MEM_DQS	MEM_A_DQS_P<0>	15 28
MEM_A_DQS0	MEM_70D	MEM_DQS	MEM_A_DQS_N<0>	15 28
MEM_A_DQS1	MEM_70D	MEM_DQS	MEM_A_DQS_P<1>	15 28
MEM_A_DQS1	MEM_70D	MEM_DQS	MEM_A_DQS_N<1>	15 28
MEM_A_DQS2	MEM_70D	MEM_DQS	MEM_A_DQS_P<2>	15 28
MEM_A_DQS2	MEM_70D	MEM_DQS	MEM_A_DQS_N<2>	15 28
MEM_A_DQS3	MEM_70D	MEM_DQS	MEM_A_DQS_P<3>	15 28
MEM_A_DQS3	MEM_70D	MEM_DQS	MEM_A_DQS_N<3>	15 28
MEM_A_DQS4	MEM_70D	MEM_DQS	MEM_A_DQS_P<4>	15 28
MEM_A_DQS4	MEM_70D	MEM_DQS	MEM_A_DQS_N<4>	15 28
MEM_A_DQS5	MEM_70D	MEM_DQS	MEM_A_DQS_P<5>	15 28
MEM_A_DQS5	MEM_70D	MEM_DQS	MEM_A_DQS_N<5>	15 28
MEM_A_DQS6	MEM_70D	MEM_DQS	MEM_A_DQS_P<6>	15 28
MEM_A_DQS6	MEM_70D	MEM_DQS	MEM_A_DQS_N<6>	15 28
MEM_A_DQS7	MEM_70D	MEM_DQS	MEM_A_DQS_P<7>	15 28
MEM_A_DQS7	MEM_70D	MEM_DQS	MEM_A_DQS_N<7>	15 28
MEM_B_CLK	MEM_70D_VDD	MEM_CLK	MEM_B_CLK_P<5..0>	15 29
MEM_B_CLK	MEM_70D_VDD	MEM_CLK	MEM_B_CLK_N<5..0>	15 29
MEM_B_CNTL	MEM_40S_VDD	MEM_CTRL	MEM_B_CKE<3..0>	15 29
MEM_B_CNTL	MEM_40S_VDD	MEM_CTRL	MEM_B_CS_L<3..0>	15 29
MEM_B_CNTL	MEM_40S_VDD	MEM_CTRL	MEM_B_ODT<3..0>	15 29
MEM_B_CMD	MEM_40S_VDD	MEM_CMD	MEM_B_A<14..0>	15 29
MEM_B_CMD	MEM_40S_VDD	MEM_CMD	MEM_B_BA<2..0>	15 29
MEM_B_CMD	MEM_40S_VDD	MEM_CMD	MEM_B_RAS_L	15 29
MEM_B_CMD	MEM_40S_VDD	MEM_CMD	MEM_B_CAS_L	15 29
MEM_B_CMD	MEM_40S_VDD	MEM_CMD	MEM_B_WE_L	15 29
MEM_B_DQ_BYTE0	MEM_40S	MEM_DATA	MEM_B_DQ<7..0>	15 29
MEM_B_DQ_BYTE1	MEM_40S	MEM_DATA	MEM_B_DQ<15..8>	15 29
MEM_B_DQ_BYTE2	MEM_40S	MEM_DATA	MEM_B_DQ<23..16>	15 29
MEM_B_DQ_BYTE3	MEM_40S	MEM_DATA	MEM_B_DQ<31..24>	15 29
MEM_B_DQ_BYTE4	MEM_40S	MEM_DATA	MEM_B_DQ<39..32>	15 29
MEM_B_DQ_BYTE5	MEM_40S	MEM_DATA	MEM_B_DQ<47..40>	15 29
MEM_B_DQ_BYTE6	MEM_40S	MEM_DATA	MEM_B_DQ<55..48>	15 29
MEM_B_DQ_BYTE7	MEM_40S	MEM_DATA	MEM_B_DQ<63..56>	15 29
MEM_B_DQ_BYTE0	MEM_40S	MEM_DATA	MEM_B_DM<0>	15 29
MEM_B_DQ_BYTE1	MEM_40S	MEM_DATA	MEM_B_DM<1>	15 29
MEM_B_DQ_BYTE2	MEM_40S	MEM_DATA	MEM_B_DM<2>	15 29
MEM_B_DQ_BYTE3	MEM_40S	MEM_DATA	MEM_B_DM<3>	15 29
MEM_B_DQ_BYTE4	MEM_40S	MEM_DATA	MEM_B_DM<4>	15 29
MEM_B_DQ_BYTE5	MEM_40S	MEM_DATA	MEM_B_DM<5>	15 29
MEM_B_DQ_BYTE6	MEM_40S	MEM_DATA	MEM_B_DM<6>	15 29
MEM_B_DQ_BYTE7	MEM_40S	MEM_DATA	MEM_B_DM<7>	15 29
MEM_B_DQS0	MEM_70D	MEM_DQS	MEM_B_DQS_P<0>	15 29
MEM_B_DQS0	MEM_70D	MEM_DQS	MEM_B_DQS_N<0>	15 29
MEM_B_DQS1	MEM_70D	MEM_DQS	MEM_B_DQS_P<1>	15 29
MEM_B_DQS1	MEM_70D	MEM_DQS	MEM_B_DQS_N<1>	15 29
MEM_B_DQS2	MEM_70D	MEM_DQS	MEM_B_DQS_P<2>	15 29
MEM_B_DQS2	MEM_70D	MEM_DQS	MEM_B_DQS_N<2>	15 29
MEM_B_DQS3	MEM_70D	MEM_DQS	MEM_B_DQS_P<3>	15 29
MEM_B_DQS3	MEM_70D	MEM_DQS	MEM_B_DQS_N<3>	15 29
MEM_B_DQS4	MEM_70D	MEM_DQS	MEM_B_DQS_P<4>	15 29
MEM_B_DQS4	MEM_70D	MEM_DQS	MEM_B_DQS_N<4>	15 29
MEM_B_DQS5	MEM_70D	MEM_DQS	MEM_B_DQS_P<5>	15 29
MEM_B_DQS5	MEM_70D	MEM_DQS	MEM_B_DQS_N<5>	15 29
MEM_B_DQS6	MEM_70D	MEM_DQS	MEM_B_DQS_P<6>	15 29
MEM_B_DQS6	MEM_70D	MEM_DQS	MEM_B_DQS_N<6>	15 29
MEM_B_DQS7	MEM_70D	MEM_DQS	MEM_B_DQS_P<7>	15 29
MEM_B_DQS7	MEM_70D	MEM_DQS	MEM_B_DQS_N<7>	15 29
MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP_VDD	16
MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP_GND	16

Memory Constraints

SYNC_MASTER=MUXGFX SYNC_DATE=02/18/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 88 OF 96	

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	13.1 MM	=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	*	20 MIL	?
MCP_PEX_COMP	*	8 MIL	?

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

SOURCE: MCP79 Interface DG (DG-03328-001_v0D), Section 2.4

Analog 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
CRT_50S	*	=50_OHM_SE	=50_OHM_SE	=50_OHM_SE	=50_OHM_SE	=STANDARD	=STANDARD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
CRT	*	=4:1_SPACING	?
CRT_2CRT	*	=STANDARD	?
CRT_2CLK	*	50 MIL	?
CRT_2SWITCHER	*	250 MIL	?
CRT_SYNC	*	16 MIL	?
MCP_DAC_COMP	*	=2:1_SPACING	?

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
CRT	CRT	*	CRT_2CRT

CRT signal single-ended impedence varies by location:
- 37.5-ohm from MCP to first termination resistor.
- 50-ohm from first to second termination resistor.
- 75-ohm from output of three-pole filter to connector (if possible).

R/G/B signals should be matched as close as possible and < 10 inches.
SOURCE: MCP79 Interface DG (DG-03328-001_v0D), Sections 2.5.1 & 2.5.2.

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	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF
LVDS_100D	*	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF
MCP_DV_COMP	*	Y	20 MIL	20 MIL	=STANDARD	=STANDARD	=STANDARD

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

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

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.

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	*	8 MIL	?

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_90D	PCIE	PEG_R2D_P<15..0>	70
	PCIE_90D	PCIE	PEG_R2D_N<15..0>	70
PEG_R2D	PCIE_90D	PCIE	PEG_R2D_C_P<15..0>	9 70
	PCIE_90D	PCIE	PEG_R2D_C_N<15..0>	9 70
PEG_D2R	PCIE_90D	PCIE	PEG_D2R_P<15..0>	9 70
	PCIE_90D	PCIE	PEG_D2R_N<15..0>	9 70
	PCIE_90D	PCIE	PEG_D2R_C_P<15..0>	70
	PCIE_90D	PCIE	PEG_D2R_C_N<15..0>	70
	PCIE_90D	PCIE	PCIE_MINI_R2D_P	31 95
	PCIE_90D	PCIE	PCIE_MINI_R2D_N	31 95
PCIE_MINI_R2D	PCIE_90D	PCIE	PCIE_MINI_R2D_C_P	17 31
	PCIE_90D	PCIE	PCIE_MINI_R2D_C_N	17 31
PCIE_MINI_D2R	PCIE_90D	PCIE	PCIE_MINI_D2R_P	17 31
	PCIE_90D	PCIE	PCIE_MINI_D2R_N	17 31
	PCIE_90D	PCIE	PCIE_FW_R2D_P	36
	PCIE_90D	PCIE	PCIE_FW_R2D_N	36
PCIE_FW_R2D	PCIE_90D	PCIE	PCIE_FW_R2D_C_P	17 36
	PCIE_90D	PCIE	PCIE_FW_R2D_C_N	17 36
PCIE_FW_D2R	PCIE_90D	PCIE	PCIE_FW_D2R_P	17 36
	PCIE_90D	PCIE	PCIE_FW_D2R_N	17 36
	PCIE_90D	PCIE	PCIE_FW_D2R_C_P	36
	PCIE_90D	PCIE	PCIE_FW_D2R_C_N	36
	PCIE_90D	PCIE	PCIE_EXCARD_R2D_P	7 32 95
	PCIE_90D	PCIE	PCIE_EXCARD_R2D_N	7 32 95
PCIE_EXCARD_R2D	PCIE_90D	PCIE	PCIE_EXCARD_R2D_C_P	17 32
	PCIE_90D	PCIE	PCIE_EXCARD_R2D_C_N	17 32
PCIE_EXCARD_D2R	PCIE_90D	PCIE	PCIE_EXCARD_D2R_P	7 17 32
	PCIE_90D	PCIE	PCIE_EXCARD_D2R_N	7 17 32
MCP_PE0_REFCLK	CLK_PCIE_100D	CLK_PCIE	PEG_CLK100M_P	17 70
	CLK_PCIE_100D	CLK_PCIE	PEG_CLK100M_N	17 70
MCP_PE1_REFCLK	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_MINI_P	17 31
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_MINI_N	17 31
MCP_PE2_REFCLK	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_FW_P	17 36
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_FW_N	17 36
MCP_PE3_REFCLK	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_EXCARD_P	17 32
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_EXCARD_N	17 32
MCP_PEX_CLK_COMP		MCP_PEX_COMP	MCP_PEX_CLK_COMP	17
CRT_RED	CRT_50S	CRT	CRT_IG_R_C_PR	18 25
CRT_GREEN	CRT_50S	CRT	CRT_IG_G_Y_Y	18 25
CRT_BLUE	CRT_50S	CRT	CRT_IG_B_COMP_PB	18 25
CRT_SYNC	CRT_50S	CRT_SYNC	CRT_IG_HSYNC	18 25
CRT_SYNC	CRT_50S	CRT_SYNC	CRT_IG_VSYNC	18 25
MCP_DAC_RSET		MCP_DAC_COMP	MCP_TV_DAC_RSET	18 25
MCP_DAC_VREF		MCP_DAC_COMP	MCP_TV_DAC_VREF	18 25
TMDS_IG_TXC	DP_100D	DISPLAYPORT	TMDS_IG_TXC_P	
TMDS_IG_TXC	DP_100D	DISPLAYPORT	TMDS_IG_TXC_N	
TMDS_IG_TXD	DP_100D	DISPLAYPORT	TMDS_IG_TXD_P<2..0>	
TMDS_IG_TXD	DP_100D	DISPLAYPORT	TMDS_IG_TXD_N<2..0>	
DP_ML	DP_100D	DISPLAYPORT	DP_IG_ML_P<3..0>	9 80
DP_ML	DP_100D	DISPLAYPORT	DP_IG_ML_N<3..0>	9 80
DP_AUX_CH	DP_100D	DISPLAYPORT	DP_IG_AUX_CH_P	18 80
DP_AUX_CH	DP_100D	DISPLAYPORT	DP_IG_AUX_CH_N	18 80
MCP_HDMI_RSET	MCP_DV_COMP		MCP_HDMI_RSET	18 25
MCP_HDMI_VPROBE	MCP_DV_COMP		MCP_HDMI_VPROBE	18 25
LVDS_IG_A_CLK	LVDS_100D	LVDS	LVDS_IG_A_CLK_P	18 83
LVDS_IG_A_CLK	LVDS_100D	LVDS	LVDS_IG_A_CLK_N	18 83
LVDS_IG_A_DATA	LVDS_100D	LVDS	LVDS_IG_A_DATA_P<2..0>	18 83
LVDS_IG_A_DATA	LVDS_100D	LVDS	LVDS_IG_A_DATA_N<2..0>	18 83
LVDS_IG_A_DATA3	LVDS_100D	LVDS	LVDS_IG_A_DATA_P<3>	9 18
LVDS_IG_A_DATA3	LVDS_100D	LVDS	LVDS_IG_A_DATA_N<3>	9 18
LVDS_IG_B_CLK	LVDS_100D	LVDS	LVDS_IG_B_CLK_P	9 18
LVDS_IG_B_CLK	LVDS_100D	LVDS	LVDS_IG_B_CLK_N	9 18
LVDS_IG_B_DATA	LVDS_100D	LVDS	LVDS_IG_B_DATA_P<2..0>	18 83
LVDS_IG_B_DATA	LVDS_100D	LVDS	LVDS_IG_B_DATA_N<2..0>	18 83
LVDS_IG_B_DATA3	LVDS_100D	LVDS	LVDS_IG_B_DATA_P<3>	9 18
LVDS_IG_B_DATA3	LVDS_100D	LVDS	LVDS_IG_B_DATA_N<3>	9 18
MCP_IFPAB_RSET	MCP_DV_COMP		MCP_IFPAB_RSET	18 25
MCP_IFPAB_VPROBE			MCP_IFPAB_VPROBE	18 25
SATA_HDD_R2D	SATA_100D	SATA	SATA_HDD_R2D_C_P	20 39
	SATA_100D	SATA	SATA_HDD_R2D_C_N	20 39
	SATA_100D	SATA	SATA_HDD_R2D_P	39
	SATA_100D	SATA	SATA_HDD_R2D_N	39
SATA_HDD_D2R	SATA_100D	SATA	SATA_HDD_D2R_P	20 39
	SATA_100D	SATA	SATA_HDD_D2R_N	20 39
	SATA_100D	SATA	SATA_HDD_D2R_C_P	39
	SATA_100D	SATA	SATA_HDD_D2R_C_N	39
SATA_ODD_R2D	SATA_100D	SATA	SATA_ODD_R2D_C_P	20 39
	SATA_100D	SATA	SATA_ODD_R2D_C_N	20 39
	SATA_100D	SATA	SATA_ODD_R2D_P	7 39
	SATA_100D	SATA	SATA_ODD_R2D_N	7 39
SATA_ODD_D2R	SATA_100D	SATA	SATA_ODD_D2R_P	20 39
	SATA_100D	SATA	SATA_ODD_D2R_N	20 39
	SATA_100D	SATA	SATA_ODD_D2R_C_P	7 39
	SATA_100D	SATA	SATA_ODD_D2R_C_N	7 39
MCP_SATA_TERMP		SATA_TERMP	MCP_SATA_TERMP	20

MCP Constraints 1

SYNC_MASTER=MUXGFX SYNC_DATE=02/18/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0

SCALE: NONE SHT 89 OF 96

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	*	8 MIL	?

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	*	6 MIL	?
CLK_LPC	*	8 MIL	?

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	8 MIL	8 MIL	=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	*	8 MIL	?

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

SIO Signal Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
CLK_SLOW_55S	*	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=STANDARD	=STANDARD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
CLK_SLOW	*	8 MIL	?

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	*	8 MIL	?

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

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
MCP_DEBUG	PCI_55S	PCI	MCP_DEBUG<7..0>	13 19
PCI_AD	PCI_55S	PCI	PCI_AD<23..8>	
PCI_AD24	PCI_55S	PCI	PCI_AD<24>	
PCI_AD	PCI_55S	PCI	PCI_AD<31..25>	
PCI_AD	PCI_55S	PCI	PCI_PAR	
PCI_C_BE_L	PCI_55S	PCI	PCI_C_BE_L<3..0>	
PCI_CNTL	PCI_55S	PCI	PCI_IRDY_L	
PCI_CNTL	PCI_55S	PCI	PCI_DEVSEL_L	
PCI_CNTL	PCI_55S	PCI	PCI_PERR_L	
PCI_CNTL	PCI_55S	PCI	PCI_SERR_L	
PCI_CNTL	PCI_55S	PCI	PCI_STOP_L	
PCI_CNTL	PCI_55S	PCI	PCI_TRDY_L	
PCI_CNTL	PCI_55S	PCI	PCI_FRAME_L	
PCI_REQ0_I	PCI_55S	PCI	PCI_REQ0_L	19
PCI_GNT0_I	PCI_55S	PCI	PCI_GNT0_L	
PCI_REQ1_L	PCI_55S	PCI	PCI_REQ1_L	19
PCI_GNT1_I	PCI_55S	PCI	PCI_GNT1_L	
PCI_INTW_I	PCI_55S	PCI	PCI_INTW_L	
PCI_INTX_L	PCI_55S	PCI	PCI_INTX_L	
PCI_INTY_I	PCI_55S	PCI	PCI_INTY_L	
PCI_INTZ_I	PCI_55S	PCI	PCI_INTZ_L	
MCP_PCI_CLK2	CLK_PCI_55S	CLK_PCI	PCI_CLK33M_MCP_R	19
	CLK_PCI_55S	CLK_PCI	PCI_CLK33M_MCP	19
LPC_AD	LPC_55S	LPC	LPC_AD<3..0>	19 42 44 83
LPC_FRAME_L	LPC_55S	LPC	LPC_FRAME_L	19 42 44 83
LPC_RESET_L	LPC_55S	LPC	LPC_RESET_L	19 26 83
MCP_LPC_CLK0	CLK_LPC_55S	CLK_LPC	LPC_CLK33M_SMC_R	19 26
	CLK_LPC_55S	CLK_LPC	LPC_CLK33M_SMC	26 42
	CLK_LPC_55S	CLK_LPC	LPC_CLK33M_LPCPLUS	26 44
USB_EXTA	USB_90D	USB	USB_EXTA_P	20 40
	USB_90D	USB	USB_EXTA_N	20 40
	USB_90D	USB	USB_EXTA_MUXED_P	
	USB_90D	USB	USB_EXTA_MUXED_N	
USB_MINI	USB_90D	USB	USB_MINI_P	9 20
	USB_90D	USB	USB_MINI_N	9 20
USB_EXTD	USB_90D	USB	USB_EXTD_P	9 20
	USB_90D	USB	USB_EXTD_N	9 20
USB_CAMERA	USB_90D	USB	USB_CAMERA_P	20 31
	USB_90D	USB	USB_CAMERA_N	20 31
USB_BT	USB_90D	USB	USB_BT_P	20 31
	USB_90D	USB	USB_BT_N	20 31
USB_TPAD	USB_90D	USB	USB_TPAD_P	20 50
	USB_90D	USB	USB_TPAD_N	20 50
USB_IR	USB_90D	USB	USB_IR_P	20 41
	USB_90D	USB	USB_IR_N	20 41
USB_EXTB	USB_90D	USB	USB_EXTB_P	20 40
	USB_90D	USB	USB_EXTB_N	20 40
USB_EXCARD	USB_90D	USB	USB_EXCARD_P	20 32
	USB_90D	USB	USB_EXCARD_N	20 32
USB_EXTC	USB_90D	USB	USB_EXTC_P	9 20
	USB_90D	USB	USB_EXTC_N	9 20
MCP_USB_RBIAS	MCP_USB_RBIAS		MCP_USB_RBIAS_GND	20
SMBUS_MCP_0_CLK	SMB_55S	SMB	SMBUS_MCP_0_CLK	7 13 21 45
SMBUS_MCP_0_DATA	SMB_55S	SMB	SMBUS_MCP_0_DATA	7 13 21 45
SMBUS_MCP_1_CLK	SMB_55S	SMB	SMBUS_MCP_1_CLK	21 45
SMBUS_MCP_1_DATA	SMB_55S	SMB	SMBUS_MCP_1_DATA	21 45
HDA_BIT_CLK	HDA_55S	HDA	HDA_BIT_CLK	9 21
	HDA_55S	HDA	HDA_BIT_CLK_R	21
HDA_SYNC	HDA_55S	HDA	HDA_SYNC	21 54
	HDA_55S	HDA	HDA_SYNC_R	21
HDA_RST_L	HDA_55S	HDA	HDA_RST_R_L	21
	HDA_55S	HDA	HDA_RST_L	21 54
HDA_SDIN0	HDA_55S	HDA	HDA_SDIN0	21 54
	HDA_55S	HDA	HDA_SDIN_CODEC	
HDA_SDOUT	HDA_55S	HDA	HDA_SDOUT	21 54
	HDA_55S	HDA	HDA_SDOUT_R	21
MCP_HDA_PULLDN_COMP		MCP_HDA_COMP	MCP_HDA_PULLDN_COMP	21
MCP_SUS_CLK	CLK_SLOW_55S	CLK_SLOW	PM_CLK32K_SUSCLK_R	21 26
	CLK_SLOW_55S	CLK_SLOW	PM_CLK32K_SUSCLK	26 42
SPI_CLK	SPI_55S	SPI	SPI_CLK_R	21 44
	SPI_55S	SPI	SPI_CLK	44 53
SPI_MOSI	SPI_55S	SPI	SPI_MOSI_R	21 44
	SPI_55S	SPI	SPI_MOSI	44 53
SPI_MISO	SPI_55S	SPI	SPI_MISO	21 44
	SPI_55S	SPI	SPI_MISO_R	53
SPI_CS0	SPI_55S	SPI	SPI_CS0_R_L	21 44
	SPI_55S	SPI	SPI_CS0_L	

MCP Constraints 2

SYNC_MASTER=MUXGFX SYNC_DATE=02/18/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT: 90 OF 96	

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	7.5 MIL	7.5 MIL	=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	*	12 MIL	?

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

88E1116R (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	*	25 MIL	?

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		MCP_MII_COMP_VDD	18
MCP_MII_COMP	MCP_MII_COMP		MCP_MII_COMP_GND	18
MCP_CLK25M_BUF0	ENET_MII_55S	MCP_BUF0_CLK	MCP_CLK25M_BUF0_R	18 34
	ENET_MII_55S	MCP_BUF0_CLK	RTL8211_CLK25M_CKXTAL1	33 34
ENET_INTR_L	ENET_MII_55S	ENET_MII	ENET_INTR_L	
ENET_MDIO	ENET_MII_55S	ENET_MII	ENET_MDIO	18 33
ENET_MDC	ENET_MII_55S	ENET_MII	ENET_MDC	18 33
ENET_PWRDWN_L	ENET_MII_55S	ENET_MII	ENET_PWRDWN_L	
	ENET_MII_55S	ENET_MII	ENET_CLK125M_RXCLK_R	33
ENET_RXCLK	ENET_MII_55S	ENET_MII	ENET_CLK125M_RXCLK	18 33
	ENET_MII_55S	ENET_MII	ENET_RXD_R<3..0>	33
ENET_RXD	ENET_MII_55S	ENET_MII	ENET_RXD<0>	18 33
ENET_RXD_STRAP	ENET_MII_55S	ENET_MII	ENET_RXD<3..1>	18 33
ENET_RXD	ENET_MII_55S	ENET_MII	ENET_RX_CTRL	18 33
ENET_TXCLK	ENET_MII_55S	ENET_MII	ENET_CLK125M_TXCLK	18 33
ENET_TXD0	ENET_MII_55S	ENET_MII	ENET_TXD<0>	18 33
ENET_TXD	ENET_MII_55S	ENET_MII	ENET_TXD<3..1>	18 33
ENET_TXD	ENET_MII_55S	ENET_MII	ENET_TX_CTRL	18 33
	ENET_MII_55S	ENET_MII	ENET_RESET_L	18 33
ENET_MDI	ENET_MDI_100D	ENET_MDI	ENET_MDI_P<3..0>	33 35
	ENET_MDI_100D	ENET_MDI	ENET_MDI_N<3..0>	33 35

Ethernet Constraints

SYNC_MASTER=MUXGFX SYNC_DATE=02/18/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 91 OF 96	

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

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING
FW_P0_TPA	FW_110D	FW_TP
FW_P0_TPA	FW_110D	FW_TP
FW_P0_TPB	FW_110D	FW_TP
FW_P0_TPB	FW_110D	FW_TP
FW_P1_TPA	FW_110D	FW_TP
FW_P1_TPA	FW_110D	FW_TP
FW_P1_TPB	FW_110D	FW_TP
FW_P1_TPB	FW_110D	FW_TP

Port 2 Not Used

FW_P0_TPA_P 36 38
FW_P0_TPA_N 36 38
FW_P0_TPB_P 36 38
FW_P0_TPB_N 36 38
FW_P1_TPA_P 36 38
FW_P1_TPA_N 36 38
FW_P1_TPB_P 36 38
FW_P1_TPB_N 36 38

FireWire Constraints

SYNC_MASTER=MUXGFX SYNC_DATE=02/18/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0

SCALE	SHT	OF
NONE	92	96

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
1TO1_DIFFPAIR	*	=STANDARD	=STANDARD	=STANDARD	=STANDARD	0.1 MM	0.1 MM

SMC SMBus Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	SPACING	
SMBUS_SMC_A_S3_SCL	SMB_55S	SMB	SMBUS_SMC_A_S3_SCL 7 45
SMBUS_SMC_A_S3_SDA	SMB_55S	SMB	SMBUS_SMC_A_S3_SDA 7 45
SMBUS_SMC_B_S0_SCL	SMB_55S	SMB	SMBUS_SMC_B_S0_SCL 45
SMBUS_SMC_B_S0_SDA	SMB_55S	SMB	SMBUS_SMC_B_S0_SDA 45
SMBUS_SMC_0_S0_SCL	SMB_55S	SMB	SMBUS_SMC_0_S0_SCL 45
SMBUS_SMC_0_S0_SDA	SMB_55S	SMB	SMBUS_SMC_0_S0_SDA 45
SMBUS_SMC_BSA_SCL	SMB_55S	SMB	SMBUS_SMC_BSA_SCL 45
SMBUS_SMC_BSA_SDA	SMB_55S	SMB	SMBUS_SMC_BSA_SDA 45
SMBUS_SMC_MGMT_SCL	SMB_55S	SMB	SMBUS_SMC_MGMT_SCL 45
SMBUS_SMC_MGMT_SDA	SMB_55S	SMB	SMBUS_SMC_MGMT_SDA 45

SMBus Charger Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	SPACING	
CHGR_CSI	1TO1_DIFFPAIR		CHGR_CSI_P 61
	1TO1_DIFFPAIR		CHGR_CSI_N 61
CHGR_CSO	1TO1_DIFFPAIR		CHGR_CSO_P 61
	1TO1_DIFFPAIR		CHGR_CSO_N 61

SMC Constraints

SYNC_MASTER=MUXGFX SYNC_DATE=02/18/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE NONE	SHT 93 OF 96	

GDDR3 Frame Buffer Signal Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
GDDR3_40R55SE	*	=55_OHM_SE	=40_OHM_SE	0.095 MM	12.7 MM	=STANDARD	=STANDARD
GDDR3_40SE	*	=40_OHM_SE	=40_OHM_SE	0.095 MM	=40_OHM_SE	=STANDARD	=STANDARD
GDDR3_80D	*	=80_OHM_DIFF	=80_OHM_DIFF	0.095 MM	=80_OHM_DIFF	=80_OHM_DIFF	=80_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
GDDR3_CLK	*	=2.5:1_SPACING	?
GDDR3_CMD	*	=2.5:1_SPACING	?
GDDR3_DATA	*	=2.5:1_SPACING	?
GDDR3_DQS	*	=2.5:1_SPACING	?

From T18 MXM:
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	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF
LVDS_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
DISPLAYPORT	*	=3x_DIELECTRIC	?
LVDS	*	=3x_DIELECTRIC	?

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

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.

MUXGFX Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE: PHYSICAL	NET_TYPE: SPACING		
LVDS_A_CLK	LVDS_100D	LVDS	LVDS_A_CLK_P	80 83
LVDS_A_CLK	LVDS_100D	LVDS	LVDS_A_CLK_N	80 83
LVDS_A_DATA	LVDS_100D	LVDS	LVDS_A_DATA_P<2..0>	80 83
LVDS_A_DATA	LVDS_100D	LVDS	LVDS_A_DATA_N<2..0>	80 83
LVDS_B_CLK	LVDS_100D	LVDS	LVDS_B_CLK_P	80 83
LVDS_B_CLK	LVDS_100D	LVDS	LVDS_B_CLK_N	80 83
LVDS_B_DATA	LVDS_100D	LVDS	LVDS_B_DATA_P<2..0>	80 83
LVDS_B_DATA	LVDS_100D	LVDS	LVDS_B_DATA_N<2..0>	80 83
	LVDS_100D	LVDS	LVDS_CONN_A_CLK_F_P	7 79
	LVDS_100D	LVDS	LVDS_CONN_A_CLK_F_N	7 79
	LVDS_100D	LVDS	LVDS_CONN_B_CLK_F_P	7 79
	LVDS_100D	LVDS	LVDS_CONN_B_CLK_F_N	7 79
	LVDS_100D	LVDS	LVDS_CONN_A_CLK_P	79 80
	LVDS_100D	LVDS	LVDS_CONN_A_CLK_N	79 80
	LVDS_100D	LVDS	LVDS_CONN_A_DATA_P<2..0>	7 79 80
	LVDS_100D	LVDS	LVDS_CONN_A_DATA_N<2..0>	7 79 80
	LVDS_100D	LVDS	LVDS_CONN_B_CLK_P	79 80
	LVDS_100D	LVDS	LVDS_CONN_B_CLK_N	79 80
	LVDS_100D	LVDS	LVDS_CONN_B_DATA_P<2..0>	7 79 80
	LVDS_100D	LVDS	LVDS_CONN_B_DATA_N<2..0>	7 79 80
DP_ML	DP_100D	DISPLAYPORT	DP_ML_C_P<3..0>	81
DP_ML	DP_100D	DISPLAYPORT	DP_ML_C_N<3..0>	81
DP_ML	DP_100D	DISPLAYPORT	**DP_ML_P<3..0>**	80 81
DP_ML	DP_100D	DISPLAYPORT	**DP_ML_N<3..0>**	80 81
DP_ML	DP_100D	DISPLAYPORT	DP_ML_CONN_P<3..0>	81
DP_ML	DP_100D	DISPLAYPORT	DP_ML_CONN_N<3..0>	81
DP_AUX_CH	DP_100D	DISPLAYPORT	DP_AUX_CH_C_P	80 81
DP_AUX_CH	DP_100D	DISPLAYPORT	DP_AUX_CH_C_N	80 81

GDDR3 FB A/B Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE: PHYSICAL	NET_TYPE: SPACING		
FB_A_CLK_P	GDDR3_80D	GDDR3_CLK	FB_A_CLK_P<0>	72 73
	GDDR3_80D	GDDR3_CLK	FB_A_CLK_N<0>	72 73
FB_B_CLK_P	GDDR3_80D	GDDR3_CLK	FB_A_CLK_P<1>	72 73
	GDDR3_80D	GDDR3_CLK	FB_A_CLK_N<1>	72 73
FB_AB_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_A_MA<1..0>	72 73
FB_AB_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_A_MA<12..6>	72 73
FB_AB_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_A_BA<2..0>	72 73
FB_AB_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_A_RAS_L	72 73
FB_AB_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_A_CAS_L	72 73
FB_AB_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_A_WE_L	72 73
FB_AB_CMD_PD	GDDR3_40R55SE	GDDR3_CMD	FB_A_CKE	72 73
FB_AB_CS0	GDDR3_40R55SE	GDDR3_CMD	FB_A_CS0_L	72 73
FB_AB_CMD_PD	GDDR3_40R55SE	GDDR3_CMD	FB_A_DRAM_RST	72 73
FB_A_CMD	GDDR3_40SE	GDDR3_CMD	FB_A_LMA<5..2>	72 73
FB_B_CMD	GDDR3_40SE	GDDR3_CMD	FB_A_UMA<5..2>	72 73
FB_A_WDQS0	GDDR3_40SE	GDDR3_DQS	FB_A_WDQS<0>	72 73
FB_A_WDQS1	GDDR3_40SE	GDDR3_DQS	FB_A_WDQS<1>	72 73
FB_A_WDQS2	GDDR3_40SE	GDDR3_DQS	FB_A_WDQS<2>	72 73
FB_A_WDQS3	GDDR3_40SE	GDDR3_DQS	FB_A_WDQS<3>	72 73
FB_A_RDQS0	GDDR3_40SE	GDDR3_DQS	FB_A_RDQS<0>	72 73
FB_A_RDQS1	GDDR3_40SE	GDDR3_DQS	FB_A_RDQS<1>	72 73
FB_A_RDQS2	GDDR3_40SE	GDDR3_DQS	FB_A_RDQS<2>	72 73
FB_A_RDQS3	GDDR3_40SE	GDDR3_DQS	FB_A_RDQS<3>	72 73
FB_A_DQ_BYTE0	GDDR3_40SE	GDDR3_DATA	FB_A_DQ<7..0>	72 73
FB_A_DQ_BYTE1	GDDR3_40SE	GDDR3_DATA	FB_A_DQ<15..8>	72 73
FB_A_DQ_BYTE2	GDDR3_40SE	GDDR3_DATA	FB_A_DQ<23..16>	72 73
FB_A_DQ_BYTE3	GDDR3_40SE	GDDR3_DATA	FB_A_DQ<31..24>	72 73
FB_A_DQM0	GDDR3_40SE	GDDR3_DATA	FB_A_DQM_L<0>	72 73
FB_A_DQM1	GDDR3_40SE	GDDR3_DATA	FB_A_DQM_L<1>	72 73
FB_A_DQM2	GDDR3_40SE	GDDR3_DATA	FB_A_DQM_L<2>	72 73
FB_A_DQM3	GDDR3_40SE	GDDR3_DATA	FB_A_DQM_L<3>	72 73
FB_B_WDQS0	GDDR3_40SE	GDDR3_DQS	FB_A_WDQS<4>	72 73
FB_B_WDQS1	GDDR3_40SE	GDDR3_DQS	FB_A_WDQS<5>	72 73
FB_B_WDQS2	GDDR3_40SE	GDDR3_DQS	FB_A_WDQS<6>	72 73
FB_B_WDQS3	GDDR3_40SE	GDDR3_DQS	FB_A_WDQS<7>	72 73
FB_B_RDQS0	GDDR3_40SE	GDDR3_DQS	FB_A_RDQS<4>	72 73
FB_B_RDQS1	GDDR3_40SE	GDDR3_DQS	FB_A_RDQS<5>	72 73
FB_B_RDQS2	GDDR3_40SE	GDDR3_DQS	FB_A_RDQS<6>	72 73
FB_B_RDQS3	GDDR3_40SE	GDDR3_DQS	FB_A_RDQS<7>	72 73
FB_B_DQ_BYTE0	GDDR3_40SE	GDDR3_DATA	FB_A_DQ<39..32>	72 73
FB_B_DQ_BYTE1	GDDR3_40SE	GDDR3_DATA	FB_A_DQ<47..40>	72 73
FB_B_DQ_BYTE2	GDDR3_40SE	GDDR3_DATA	FB_A_DQ<55..48>	72 73
FB_B_DQ_BYTE3	GDDR3_40SE	GDDR3_DATA	FB_A_DQ<63..56>	72 73
FB_B_DQM0	GDDR3_40SE	GDDR3_DATA	FB_A_DQM_L<4>	72 73
FB_B_DQM1	GDDR3_40SE	GDDR3_DATA	FB_A_DQM_L<5>	72 73
FB_B_DQM2	GDDR3_40SE	GDDR3_DATA	FB_A_DQM_L<6>	72 73
FB_B_DQM3	GDDR3_40SE	GDDR3_DATA	FB_A_DQM_L<7>	72 73

G96 Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE: PHYSICAL	NET_TYPE: SPACING		
(CK505_DOT96)	CLK_SLOW_555	CLK_SLOW	GPU_CLK27M	76
CK505_CLK27M55	CLK_SLOW_555	CLK_SLOW	GPU_CLK27M_SS	76
LVDS_EG_A_CLK	LVDS_100D	LVDS	LVDS_EG_A_CLK_P	77 83
LVDS_EG_A_CLK	LVDS_100D	LVDS	LVDS_EG_A_CLK_N	77 83
LVDS_EG_A_DATA	LVDS_100D	LVDS	LVDS_EG_A_DATA_P<2..0>	77 83
LVDS_EG_A_DATA	LVDS_100D	LVDS	LVDS_EG_A_DATA_N<2..0>	77 83
LVDS_EG_B_DATA	LVDS_100D	LVDS	LVDS_EG_B_DATA_P<2..0>	77 83
LVDS_EG_B_DATA	LVDS_100D	LVDS	LVDS_EG_B_DATA_N<2..0>	77 83
DP_ML	DP_100D	DISPLAYPORT	**DP_EG_ML_P<3..0>**	77 80
DP_ML	DP_100D	DISPLAYPORT	**DP_EG_ML_N<3..0>**	77 80
DP_AUX_CH	DP_100D	DISPLAYPORT	DP_EG_AUX_CH_P	77 80
DP_AUX_CH	DP_100D	DISPLAYPORT	DP_EG_AUX_CH_N	77 80
	DP_100D	DISPLAYPORT	DP_EG_AUX_CH_C_P	80
	DP_100D	DISPLAYPORT	DP_EG_AUX_CH_C_N	80

GDDR3 FB C/D Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE: PHYSICAL	NET_TYPE: SPACING		
FB_C_CLK_P	GDDR3_80D	GDDR3_CLK	FB_B_CLK_P<0>	72 74
	GDDR3_80D	GDDR3_CLK	FB_B_CLK_N<0>	72 74
FB_D_CLK_P	GDDR3_80D	GDDR3_CLK	FB_B_CLK_P<1>	72 74
	GDDR3_80D	GDDR3_CLK	FB_B_CLK_N<1>	72 74
FB_CD_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_B_MA<1..0>	72 74
FB_CD_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_B_MA<12..6>	72 74
FB_CD_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_B_BA<2..0>	72 74
FB_CD_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_B_RAS_L	72 74
FB_CD_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_B_CAS_L	72 74
FB_CD_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_B_WE_L	72 74
FB_CD_CMD_PD	GDDR3_40R55SE	GDDR3_CMD	FB_B_CKE	72 74
FB_CD_CS0	GDDR3_40R55SE	GDDR3_CMD	FB_B_CS0_L	72 74
FB_CD_CMD_PD	GDDR3_40R55SE	GDDR3_CMD	FB_B_DRAM_RST	72 74
FB_C_CMD	GDDR3_40SE	GDDR3_CMD	FB_B_LMA<5..2>	72 74
FB_D_CMD	GDDR3_40SE	GDDR3_CMD	FB_B_UMA<5..2>	72 74
FB_C_WDQS0	GDDR3_40SE	GDDR3_DQS	FB_B_WDQS<0>	72 74
FB_C_WDQS1	GDDR3_40SE	GDDR3_DQS	FB_B_WDQS<1>	72 74
FB_C_WDQS2	GDDR3_40SE	GDDR3_DQS	FB_B_WDQS<2>	72 74
FB_C_WDQS3	GDDR3_40SE	GDDR3_DQS	FB_B_WDQS<3>	72 74
FB_C_RDQS0	GDDR3_40SE	GDDR3_DQS	FB_B_RDQS<0>	72 74
FB_C_RDQS1	GDDR3_40SE	GDDR3_DQS	FB_B_RDQS<1>	72 74
FB_C_RDQS2	GDDR3_40SE	GDDR3_DQS	FB_B_RDQS<2>	72 74
FB_C_RDQS3	GDDR3_40SE	GDDR3_DQS	FB_B_RDQS<3>	72 74
FB_C_DQ_BYTE0	GDDR3_40SE	GDDR3_DATA	FB_B_DQ<7..0>	72 74
FB_C_DQ_BYTE1	GDDR3_40SE	GDDR3_DATA	FB_B_DQ<15..8>	72 74
FB_C_DQ_BYTE2	GDDR3_40SE	GDDR3_DATA	FB_B_DQ<23..16>	72 74
FB_C_DQ_BYTE3	GDDR3_40SE	GDDR3_DATA	FB_B_DQ<31..24>	72 74
FB_C_DQM0	GDDR3_40SE	GDDR3_DATA	FB_B_DQM_L<0>	72 74
FB_C_DQM1	GDDR3_40SE	GDDR3_DATA	FB_B_DQM_L<1>	72 74
FB_C_DQM2	GDDR3_40SE	GDDR3_DATA	FB_B_DQM_L<2>	72 74
FB_C_DQM3	GDDR3_40SE	GDDR3_DATA	FB_B_DQM_L<3>	72 74
FB_D_WDQS0	GDDR3_40SE	GDDR3_DQS	FB_B_WDQS<4>	72 74
FB_D_WDQS1	GDDR3_40SE	GDDR3_DQS	FB_B_WDQS<5>	72 74
FB_D_WDQS2	GDDR3_40SE	GDDR3_DQS	FB_B_WDQS<6>	72 74
FB_D_WDQS3	GDDR3_40SE	GDDR3_DQS	FB_B_WDQS<7>	72 74
FB_D_RDQS0	GDDR3_40SE	GDDR3_DQS	FB_B_RDQS<4>	72 74
FB_D_RDQS1	GDDR3_40SE	GDDR3_DQS	FB_B_RDQS<5>	72 74
FB_D_RDQS2	GDDR3_40SE	GDDR3_DQS	FB_B_RDQS<6>	72 74
FB_D_RDQS3	GDDR3_40SE	GDDR3_DQS	FB_B_RDQS<7>	72 74
FB_D_DQ_BYTE0	GDDR3_40SE	GDDR3_DATA	FB_B_DQ<39..32>	72 74
FB_D_DQ_BYTE1	GDDR3_40SE	GDDR3_DATA	FB_B_DQ<47..40>	72 74
FB_D_DQ_BYTE2	GDDR3_40SE	GDDR3_DATA	FB_B_DQ<55..48>	72 74
FB_D_DQ_BYTE3	GDDR3_40SE	GDDR3_DATA	FB_B_DQ<63..56>	72 74
FB_D_DQM0	GDDR3_40SE	GDDR3_DATA	FB_B_DQM_L<4>	72 74
FB_D_DQM1	GDDR3_40SE	GDDR3_DATA	FB_B_DQM_L<5>	72 74
FB_D_DQM2	GDDR3_40SE	GDDR3_DATA	FB_B_DQM_L<6>	72 74
FB_D_DQM3	GDDR3_40SE	GDDR3_DATA	FB_B_DQM_L<7>	72 74

GPU (G96) Constraints

SYNC_MASTER=MUXGFX SYNC_DATE=02/18/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0

SCALE: NONE SHT: 94 OF: 96

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
SENSE_1TO1_55S	*	=1:1_DIFFPAIR	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=1:1_DIFFPAIR	=1:1_DIFFPAIR
THERM_1TO1_55S	*	=1:1_DIFFPAIR	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=1:1_DIFFPAIR	=1:1_DIFFPAIR
DIFFPAIR	*	=1:1_DIFFPAIR			=1:1_DIFFPAIR	=1:1_DIFFPAIR	=1:1_DIFFPAIR

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
SENSE	*	=2:1_SPACING	?
THERM	*	=2:1_SPACING	?
AUDIO	*	=2:1_SPACING	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
ENETCONN	*	25 MILS	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
GND	*	=STANDARD	?
PP1V8_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

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
CLK_PCIE	SB_POWER	*	PWR_P2MM
SATA	SB_POWER	*	PWR_P2MM
USB	SB_POWER	*	PWR_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	FSB_DSTB	*	GND_P2MM

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
ENET_MDI	GND	*	GND_P2MM

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
LVDS	GND	*	GND_P2MM

Memory Constraint Relaxations

Allow 0.127 mm necks for >0.127 mm lines for GMCH fanout.

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
MEM_70D	BOTTOM			0.127 MM	6.35 MM		

Graphics ,SATA Constraint Relaxations

Alternate diffpair width/gap through BGA fanout areas (95-ohm diff)

NET_PHYSICAL_TYPE	AREA_TYPE	PHYSICAL_RULE_SET
LVDS_100D	BGA	100_DIFF_BGA
DP_100D	BGA	100_DIFF_BGA
SATA_100D	BGA	100_DIFF_BGA

M99 Specific Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING	
	ENET_MDI_100D	ENETCONN	ENETCONN_P<3..0> 35
	ENET_MDI_100D	ENETCONN	ENETCONN_N<3..0> 35
U14D	SATA_100D	SATA	SATA_ODD_R2D_UF_P 39
U14F	SATA_100D	SATA	SATA_ODD_R2D_UF_N 39
U14H	SATA_100D	SATA	SATA_ODD_D2R_UF_P 39
U14J	SATA_100D	SATA	SATA_ODD_D2R_UF_N 39
U14K	SATA_100D	SATA	SATA_HDD_D2R_UF_P 39
U14M	SATA_100D	SATA	SATA_HDD_D2R_UF_N 39
U14P	SATA_100D	SATA	SATA_HDD_R2D_UF_P 39
U13P	SATA_100D	SATA	SATA_HDD_R2D_UF_N 39
SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	GFXIMVP6_VSEN_P 78
	SENSE_1TO1_55S	SENSE	GFXIMVP6_VSEN_N 78
SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	MCPCOREISNS_P 47 65
	SENSE_1TO1_55S	SENSE	MCPCOREISNS_N 47 65
CPUTHMSNS_D2_DP	THERM_1TO1_55S	THERM	CPUTHMSNS_D2_P 48
	THERM_1TO1_55S	THERM	CPUTHMSNS_D2_N 48
CPU_THERMD_DP	THERM_1TO1_55S	THERM	CPU_THERMD_P 10 48
	THERM_1TO1_55S	THERM	CPU_THERMD_N 10 48
GPUTHMSNS_D_DP	THERM_1TO1_55S	THERM	GPUTHMSNS_D_P 48
	THERM_1TO1_55S	THERM	GPUTHMSNS_D_N 48
GPU_THERMD_DP	THERM_1TO1_55S	THERM	GPU_TDIODE_P 48 76
	THERM_1TO1_55S	THERM	GPU_TDIODE_N 48 76
MCPTHMSNS_D_DP	THERM_1TO1_55S	THERM	MCPTHMSNS_D_P 48
	THERM_1TO1_55S	THERM	MCPTHMSNS_D_N 48
MCP_THERMD_DP	THERM_1TO1_55S	THERM	MCP_THMDIODE_P 21 48
	THERM_1TO1_55S	THERM	MCP_THMDIODE_N 21 48
SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	1V05CPUISNS_R_P 47
	SENSE_1TO1_55S	SENSE	1V05CPUISNS_R_N 47
SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	DDRISNS_R_P 47
	SENSE_1TO1_55S	SENSE	DDRISNS_R_N 47
SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	GPUISENS_P 47
	SENSE_1TO1_55S	SENSE	GPUISENS_N 47
SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	1V05CPU_P 47 66
	SENSE_1TO1_55S	SENSE	1V05CPU_N 47 66
SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	DDRISNS_P 47
	SENSE_1TO1_55S	SENSE	DDRISNS_N 47
SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	P1V8GPU_P 47
	SENSE_1TO1_55S	SENSE	P1V8GPU_N 47
SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	ISNS_CPU_P 46
	SENSE_1TO1_55S	SENSE	ISNS_CPU_N 46
		GND	GND
		SB_POWER	PP3V3_S5 7 8
		SB_POWER	PP3V3_S0 7 8
		SB_POWER	PP1V5_S0
SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	P1V8GPUISNS_P
	SENSE_1TO1_55S	SENSE	P1V8GPUISNS_N
SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	P1V8GPUISNS_R_P 47
	SENSE_1TO1_55S	SENSE	P1V8GPUISNS_R_N 47

M99 Specific Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING	
(PCIE_EXCARD)	PCIE_90D	PCIE	PCIE_EXCARD_R2D_P 7 32 89
(PCIE_EXCARD)	PCIE_90D	PCIE	PCIE_EXCARD_R2D_N 7 32 89
(PCIE_MINI)	PCIE_90D	PCIE	PCIE_MINI_R2D_P 31 89
(PCIE_MINI)	PCIE_90D	PCIE	PCIE_MINI_R2D_N 31 89
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_MINI_CONN_P 31
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_MINI_CONN_N 31
	1TO1_DIFFPAIR		CHGR_CSI_R_P 61
	1TO1_DIFFPAIR		CHGR_CSI_R_N 61
	1TO1_DIFFPAIR		CHGR_CSO_R_P 46 61
	1TO1_DIFFPAIR		CHGR_CSO_R_N 46 61
(USB_EXTA)	USB_90D	USB	USB2_EXTA_MUXED_P 40
(USB_EXTA)	USB_90D	USB	USB2_EXTA_MUXED_N 40
(USB_EXTA)	USB_90D	USB	USB2_LT1_P 40
(USB_EXTA)	USB_90D	USB	USB2_LT1_N 40
(USB_EXTD)	USB_90D	USB	CONN_TPAD_USB_P
(USB_EXTD)	USB_90D	USB	CONN_TPAD_USB_N
(USB_CAMERA)	USB_90D	USB	USB_CAMERA_CONN_P 31
(USB_CAMERA)	USB_90D	USB	USB_CAMERA_CONN_N 31
	USB_90D	USB	CONN_USB2_BT_P 31
	USB_90D	USB	CONN_USB2_BT_N 31
	USB_90D	USB	USB_LT2_P 40
	USB_90D	USB	USB_LT2_N 40
	USB_90D	USB	USB2_EXCARD_CONN_P 7 32
	USB_90D	USB	USB2_EXCARD_CONN_N 7 32
	DP_100D	DISPLAYPORT	DP_IG_AUX_CH_C_P 80
	DP_100D	DISPLAYPORT	DP_IG_AUX_CH_C_N 80
MCP_PE4_REFCLK	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_FC_P 9 32
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_FC_N 9 32
PCIE_FC_R2D	PCIE_90D	PCIE	PCIE_FC_R2D_C_P 9 32
	PCIE_90D	PCIE	PCIE_FC_R2D_C_N 9 32
PCIE_FC_D2R	PCIE_90D	PCIE	PCIE_FC_D2R_P 9 32
	PCIE_90D	PCIE	PCIE_FC_D2R_N 9 32
	PCIE_90D	PCIE	PCIE_FC_R2D_P 32
	PCIE_90D	PCIE	PCIE_FC_R2D_N 32
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_EXCARD_CONN_N 7 32
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_EXCARD_CONN_P 7 32
SPK_OUT	DIFFPAIR	AUDIO	SPKRCONN_L_P_OUT 7 57 58
	DIFFPAIR	AUDIO	SPKRCONN_L_N_OUT 7 57 58
SPK_OUT	DIFFPAIR	AUDIO	SPKRCONN_S_P_OUT 7 57 58
	DIFFPAIR	AUDIO	SPKRCONN_S_N_OUT 7 57 58
SPK_OUT	DIFFPAIR	AUDIO	SPKRCONN_R_P_OUT 7 57 58
	DIFFPAIR	AUDIO	SPKRCONN_R_N_OUT 7 57 58
	DIFFPAIR	AUDIO	SPKRAMP_L_P_OUT 57
	DIFFPAIR	AUDIO	SPKRAMP_L_N_OUT 57
	DIFFPAIR	AUDIO	SPKRAMP_R_P_OUT 57
	DIFFPAIR	AUDIO	SPKRAMP_R_N_OUT 57
	DIFFPAIR	AUDIO	SPKRAMP_S_P_OUT 57
	DIFFPAIR	AUDIO	SPKRAMP_S_N_OUT 57

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 OVERRIDE	* OVERRIDE	OVERRIDE	OVERRIDE	0.09 MM OVERRIDE	5.8 MM OVERRIDE	OVERRIDE	OVERRIDE
MEM_40S_VDD OVERRIDE	* OVERRIDE	OVERRIDE	OVERRIDE	0.09 MM OVERRIDE	5.8 MM OVERRIDE	OVERRIDE	OVERRIDE
MEM_70D OVERRIDE	* OVERRIDE	OVERRIDE	OVERRIDE	0.09 MM OVERRIDE	5.8 MM OVERRIDE	OVERRIDE	OVERRIDE
MEM_70D_VDD OVERRIDE	* OVERRIDE	OVERRIDE	OVERRIDE	0.09 MM OVERRIDE	100 MIL OVERRIDE	OVERRIDE	OVERRIDE
PCIE_90D OVERRIDE	* OVERRIDE	OVERRIDE	OVERRIDE	0.09 MM OVERRIDE	100 MIL OVERRIDE	OVERRIDE	OVERRIDE
USB_90D OVERRIDE	TOP OVERRIDE	OVERRIDE	OVERRIDE	0.09 MM OVERRIDE	500 MIL OVERRIDE	OVERRIDE	OVERRIDE
MCP_DV_COMP OVERRIDE	TOP OVERRIDE	OVERRIDE	OVERRIDE	0.1 MM OVERRIDE	500 MIL OVERRIDE	OVERRIDE	OVERRIDE
MCP_MEM_COMP OVERRIDE	TOP OVERRIDE	OVERRIDE	OVERRIDE	0.1 MM OVERRIDE	500 MIL OVERRIDE	OVERRIDE	OVERRIDE
MCP_MII_COMP OVERRIDE	TOP OVERRIDE	OVERRIDE	OVERRIDE	0.1 MM OVERRIDE	500 MIL OVERRIDE	OVERRIDE	OVERRIDE
MCP_USB_RBIAS OVERRIDE	TOP OVERRIDE	OVERRIDE	OVERRIDE	0.1 MM OVERRIDE	500 MIL OVERRIDE	OVERRIDE	OVERRIDE
MCP_DV_COMP OVERRIDE	* OVERRIDE	OVERRIDE	OVERRIDE	0.25 MM OVERRIDE	250 MIL OVERRIDE	OVERRIDE	OVERRIDE
CPU_27P4S OVERRIDE	BOTTOM OVERRIDE	OVERRIDE	OVERRIDE	0.23 MM OVERRIDE	100 MIL OVERRIDE	OVERRIDE	OVERRIDE

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 OVERRIDE	ISL4,ISL9 OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE
MEM_40S_VDD OVERRIDE	ISL3,ISL10 OVERRIDE	N OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE
MEM_70D OVERRIDE	ISL4,ISL9 OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE
MEM_70D_VDD OVERRIDE	ISL3,ISL10 OVERRIDE	N OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE

Ground-referenced memory signals (DQ,DQM,DQS) MAY route on ISL9 (VDD-referenced plane)but not next to VDD island.
Forces power-referenced memory signals (CLK,ADDR,CTRL) to not route on ISL3, ISL4 & ISL10(GND-referenced planes).

Project Specific Constraints

SYNC_MASTER=MUXGFX SYNC_DATE=02/21/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0
SCALE: NONE	SHT 95 OF 96	

M99 Board-Specific Spacing & Physical Constraints

BOARD LAYERS	BOARD AREAS	BOARD UNITS (MIL or MM)	ALLEGRO VERSION
TOP,ISL2,ISL3,ISL4,ISL5,ISL6,ISL7,ISL8,ISL9,ISL10,ISL11,BOTTOM	NO_TYPE,BGA	MM	15.5.1

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	14 MM	0 MM	0 MM
STANDARD	*	Y	=DEFAULT	=DEFAULT	10 MM	=DEFAULT	=DEFAULT

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
55_OHM_SE	TOP,BOTTOM	Y	0.090 MM	0.090 MM			
55_OHM_SE	*	Y	0.076 MM	0.076 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	0.110 MM	0.095 MM			
50_OHM_SE	*	Y	0.090 MM	0.090 MM	=STANDARD	=STANDARD	=STANDARD

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
40_OHM_SE	TOP,BOTTOM	Y	0.165 MM	0.095 MM			
40_OHM_SE	*	Y	0.135 MM	0.135 MM	=STANDARD	=STANDARD	=STANDARD

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
27P4_OHM_SE	TOP,BOTTOM	Y	0.310 MM	0.095 MM			
27P4_OHM_SE	*	Y	0.250 MM	0.250 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,ISL4	Y	0.160 MM	0.160 MM		0.175 MM	0.175 MM
70_OHM_DIFF	ISL9,ISL10	Y	0.160 MM	0.160 MM		0.175 MM	0.175 MM
70_OHM_DIFF	ISL2,ISL11	Y	0.170 MM	0.170 MM		0.150 MM	0.150 MM
70_OHM_DIFF	TOP,BOTTOM	Y	0.170 MM	0.095 MM		0.150 MM	0.150 MM

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
80_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD
80_OHM_DIFF	ISL3,ISL4	Y	0.125 MM	0.125 MM		0.180 MM	0.180 MM
80_OHM_DIFF	ISL9,ISL10	Y	0.125 MM	0.125 MM		0.180 MM	0.180 MM
80_OHM_DIFF	ISL2,ISL11	Y	0.140 MM	0.140 MM		0.190 MM	0.190 MM
80_OHM_DIFF	TOP,BOTTOM	Y	0.140 MM	0.095 MM		0.190 MM	0.190 MM

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
90_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD
90_OHM_DIFF	ISL3,ISL4	Y	0.102 MM	0.102 MM		0.220 MM	0.220 MM
90_OHM_DIFF	ISL9,ISL10	Y	0.102 MM	0.102 MM		0.220 MM	0.220 MM
90_OHM_DIFF	ISL2,ISL11	Y	0.115 MM	0.115 MM		0.230 MM	0.230 MM
90_OHM_DIFF	TOP,BOTTOM	Y	0.115 MM	0.095 MM		0.230 MM	0.230 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,ISL4	Y	0.080 MM	0.080 MM		0.200 MM	0.200 MM
100_OHM_DIFF	ISL9,ISL10	Y	0.080 MM	0.080 MM		0.200 MM	0.200 MM
100_OHM_DIFF	ISL2,ISL11	Y	0.089 MM	0.089 MM		0.220 MM	0.220 MM
100_OHM_DIFF	TOP,BOTTOM	Y	0.089 MM	0.089 MM		0.220 MM	0.220 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	ISL3,ISL4	Y	0.077 MM	0.077 MM		0.330 MM	0.330 MM
110_OHM_DIFF	ISL9,ISL10	Y	0.077 MM	0.077 MM		0.330 MM	0.330 MM
110_OHM_DIFF	ISL2,ISL11	Y	0.077 MM	0.077 MM		0.330 MM	0.330 MM
110_OHM_DIFF	TOP,BOTTOM	Y	0.077 MM	0.077 MM		0.330 MM	0.330 MM

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
DEFAULT	*	0.1 MM	?
STANDARD	*	=DEFAULT	?
BGA_P1MM	*	=DEFAULT	?
BGA_P2MM	*	=DEFAULT	?
BGA_P3MM	*	=DEFAULT	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
1.5:1_SPACING	*	0.15 MM	?
1.8:1_SPACING	*	0.18 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	?

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
*	*	BGA	BGA_P1MM
MEM_CLK	*	BGA	BGA_P2MM
CLK_FSB	*	BGA	BGA_P2MM
CLK_PCIE	*	BGA	BGA_P2MM
CLK_SLOW	*	BGA	BGA_P2MM
FSB_DSTB	FSB_DSTB	BGA	BGA_P3MM

NOTE:From T18 MLB, changed to reflect M99 stackup.

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
2X_DIELECTRIC	*	0.140 MM	?
3X_DIELECTRIC	*	0.210 MM	?
4X_DIELECTRIC	*	0.280 MM	?
5X_DIELECTRIC	*	0.350 MM	?

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

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
100_DIFF_BGA	*	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF
100_DIFF_BGA	ISL3,ISL4	Y	0.075 MM	0.075 MM		0.125 MM	0.125 MM
100_DIFF_BGA	ISL9,ISL10	Y	0.075 MM	0.075 MM		0.125 MM	0.125 MM

NOTE: 100_DIFF_BGA is 100-ohms differential impedance on outer layers and 95-ohms on inner layers.

PCB Rule Definitions

SYNC_MASTER=M99_MLB SYNC_DATE=01/22/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7546	A.0.0

SCALE NONE SHT 96 OF 96