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

REV	ZONE	ECN	DESCRIPTION OF CHANGE	CK APPD / DATE	ENG APPD / DATE
A		625211	PRODUCTION RELEASED	08/29/08	?

M97 MLB SCHEMATIC

REFERENCED FROM T18
08/27/2008

PVT BUILD

Schematic / PCB #'s

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
051-7537	1	SCHEM,MLB,M97	SCH	CRITICAL	
820-2327	1	PCBF,MLB,M97	PCB	CRITICAL	

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

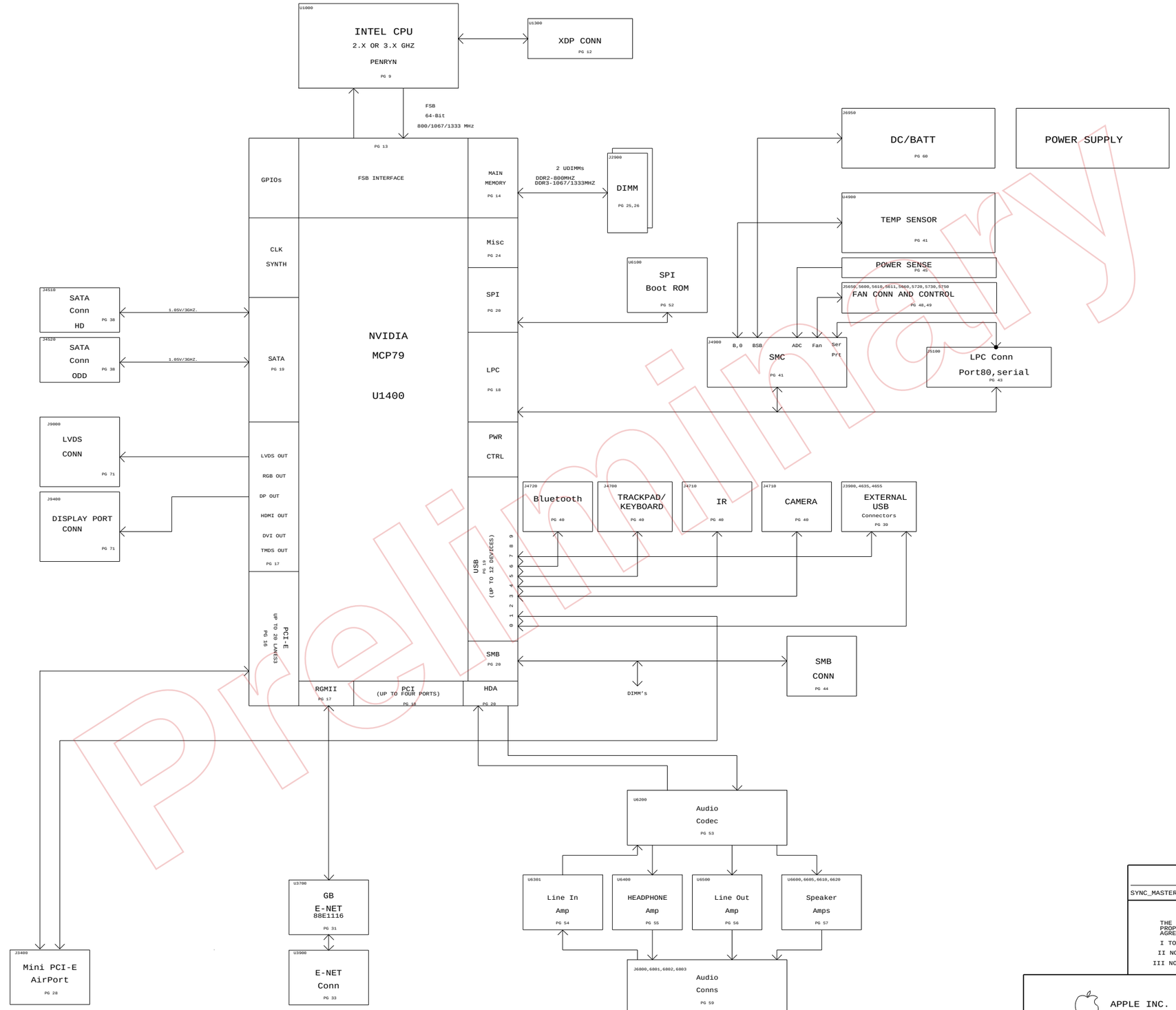
SIZE D

APPLE INC.

TITLE
SCHEM,MLB,M97

DRAWING NUMBER 051-7537 REV. A

SHT 1 OF 109



System Block Diagram

SYNC_MASTER=T18_MLB SYNC_DATE=12/12/2007

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A

SCALE	SHT	OF
NONE	2	109

M97 POWER SYSTEM ARCHITECTURE

D6905
D6905
PPVIN_G3H_P3V42G3H
PBUS_VSENSE
ENABLE
3.425V G3HOT
LT3470
U6990
VOUT
PP3V42_G3H_REG
SMC PWRGD
RN5VD30A-F
U5000
Q5315
7A FUSE
PPVBAT_G3H_CHGR_REG
PPBUS_G3H
CPUVTTS0_EN
(S0)
CPUVTT
(1.05V)
TPS51117
U7600
PPCPUVTT_S0_REG_R
(8A MAX CURRENT)
R5492
PPCPUVTT_S0
CPUVTTS0_PGOOD
AC
ADAPTER
IN
DCIN(16.5V)
6A FUSE
U7970
CHGR_EN
(S5)
ENABLES
VIN
VOUT
PBUS SUPPLY/
BATTERY CHARGER
ISL6258A
U7000
SMC_DCIN_ISENSE
U5403
SMC_BATT_ISENSE
J6950
3S2P
(9 TO 12.6V)
BATT_POS_F
Q7050
CHGR_BGATE
PPVBAT_G3H_CHGR_OUT
U5480
SMC_CPU_VSENSE
SMC_CPU_ISENSE
PPVCORE_CPU_S0_REG
(44A MAX CURRENT)
CPU VCORE
ISL9504B
U7400
IMVP_VR_ON
VR_ON
PGOOD
VR_PWRGOOD_DELAY
P1V05S0_EN
1.05V S0
FETS
(Q7951 TO Q7953)
PP1V05_S0_FET
MCP79
U2850
MCP_PS_PWRGD
PS_PWRGD
CPUPWRGD(GPIO49)
MCP79
U1400
PWRBTN*
PLTRST*
RSMRST*
CPU_RESET#
LPC_RESET_L
CPU_PWRGD
FSB_CPURST_L
CPU
PWRGOOD
RESET*
U1000
PPBUS_G3H
1.05V (S5)
TPS62510
U7750
PP1V05_S5_REG
4.6V AUDIO
MAX8902A
U6201
PP4V6_AUDIO_ANALOG
MCP79
PM_SLP_S4_L
SLP_S3#
U1400
PCI_RESET0#
P3V3S3_EN
DDRREG_EN
P5VLTS3_EN
SMC
U4900
P16
P60
SMC_PM_G2_EN
(S5)
RC DELAY
P1V05_S5_EN
P5VRTS0_EN_L
P3V3S5_EN_L
5V (RT)
3.3V
TPS51125
U7200
PGOOD1,2
VREG3
PP5VRT_S0_REG
(4A MAX CURRENT)
PP3V3_S5_REG
(4A MAX CURRENT)
Q7910
P3V3S3_EN
PP5VRT_S0
PP3V3_S5
PP3V3_S3_FET
Q7930
P3V3S0_EN
PP3V3_S0_FET
Q3810
P3V3ENET_EN_L
P3V3_ENET_FET
Q3801
PM_SLP_S3_L
PM_ENET_EN_L
Q3802
WOL_EN
SMC_ADAPTER_EN
GOSHAWK6P
U9701
BKLT_EN
ENA
PPVOUT_S0_LCDBKLT
1.2V YUKON
U3850
LTC34074
ENETADD_EN
P1V2ENET_EN
PPVOUT_ENET_AVDD_REG
(0.8A MAX CURRENT)
PP1V2_ENET_REG
(0.8A MAX CURRENT)
SMC
RSMRST_OUT(P15)
PWRGD(P12)→99ms DLY→
IMVP_VR_ON(P16)
RSMRST_IN(P13)
PWR_BUTTON(P90)
P17(BTN_OUT)
RST*
PM_RSMRST_L
IMVP_VR_ON
PLT_RST*
PM_PWRBTN_L
SMC_RESET_L
ALL_SYS_PWRGD
RSMRST_PWRGD
SMC_ONOFF_L
P5V3V3_PGOOD
MCPCORESO_PGOOD
CPUVTTS0_PGOOD
P5V_LT_S3_PGOOD
S0PGOOD_PWROK
SLP_S5_L
SLP_S4_L
SLP_S3_L
SLP_S5_L(P95)
SLP_S4_L(P94)
SLP_S3_L(P93)
U4900
S3 TO S0
FETS
(Q7901 & Q7971)
PP1V5_S0_FET
R5491
PP1V5_S0
1.8V LDO
TPS79918DRV
U7760
PP1V8_S0_REG
RST*
LTC2909
U7870
PP3V3_S0
PP1V5_S0
PP1V05_S0
PM_SLP_S3_L
=DDRREG_EN
=DDTVTT_EN
1.5V
S5
0.75V
S3
TPS51116
U7300
PP1V5_S3_REG
(12A MAX CURRENT)
PP0V75_S0_REG
(1A MAX CURRENT)
P1V8S0_EN
MCPDDR_EN
CPUVTTS0_EN
MCPCORES0_EN
P1V05S0_EN
(S0)
P3V3S0_EN
(S0)
PBUSVSENS_EN
(S0)
P5VRTS0_EN_L
(S0)
MCP_CORE
MCPCORES0_EN
P5VLTS3_EN
5V (LT)
ISL6236
U7500
PPVCORE_S0_MCP_REG_R
(25A MAX CURRENT)
R5490
PPVCORE_S0_MCP
PP5VLT_S3_REG
(7A MAX CURRENT)
PP5VLT_S3

Power Block Diagram

SYNC_MASTER=DRAGON SYNC_DATE=03/13/2008

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APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE	SHT	OF
NONE	3	109

BOM Variants

BOM NUMBER	BOM NAME	BOM OPTIONS
630-9554	PCBA,MLB,BETTER,M97	M97_COMMON,CPU_2_0GHZ,EEE_2KA
630-9314	PCBA,MLB,BEST,M97	M97_COMMON,CPU_2_4GHZ,EEE_1DJ

BOM Groups

BOM GROUP	BOM OPTIONS
M97_COMMON	COMMON,ALTERNATE,M97_MCP,M97_MISC,M97_DEBUG_PVT,M97_PROGPARTS
M97_MCP	MCP_B02,MCP_PROD,MEMRESET_HW,MEMRESET_MCP,BOOT_MODE_USER,MCPSEQ_SMC,MCP_CS1_NO
M97_MISC	ONEWIRE_PU,BKLT_PLL_NOT,DP_ESD,ENG_BMON,MIKEY
M97_PROGPARTS	BOOTROM_PROG,SMC_PROG,IR_PROG,WELLSPRING_PROG
M97_DEBUG_ENG	SMC_DEBUG_YES,XDP,XDP_CONN,LPCPLUS,VREFMRGN,TPAD_DEBUG
M97_DEBUG_PVT	SMC_DEBUG_YES,XDP,LPCPLUS,NO_VREFMRGN
M97_DEBUG_PROD	SMC_DEBUG_YES,XDP,LPCPLUS_NOT,NO_VREFMRGN

Module Parts

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
337S3622	1	PDC,QJGL,QS,2.0,25W,1066,M0,3M,BGA	U1000	CRITICAL	CPU_2_0GHZ_QS
337S3624	1	PDC,QDYD,QS,2.26,25W,1066,M0,3M,BGA	U1000	CRITICAL	CPU_2_26GHZ_QS
337S3625	1	PDC,QDYJ,QS,2.4,25W,1066,M0,3M,BGA	U1000	CRITICAL	CPU_2_4GHZ_QS
337S3646	1	PDC,SLG8E,PRQ,2.0,25W,1066,M0,3M,BGA	U1000	CRITICAL	CPU_2_0GHZ
337S3653	1	PDC,SL3BU,PRQ,2.26,25W,1066,C0,3M,BGA	U1000	CRITICAL	CPU_2_26GHZ
337S3639	1	PDC,SLB4N,PRQ,2.4,25W,1066,M0,3M,BGA	U1000	CRITICAL	CPU_2_4GHZ
338S0540	1	IC,GMCP,MCP79,35X35MM,BGA1437,A01	U1400	CRITICAL	MCP_A01
338S0591	1	IC,GMCP,MCP79,35X35MM,BGA1437,A01P	U1400	CRITICAL	MCP_A01P
338S0603	1	IC,GMCP,MCP79,35X35MM,BGA1437,A01Q	U1400	CRITICAL	MCP_A01Q
338S0600	1	IC,GMCP,MCP79,35X35MM,BGA1437,B01	U1400	CRITICAL	MCP_B01
338S0635	1	IC,GMCP,MCP79,35X35MM,BGA1437,B02	U1400	CRITICAL	MCP_B02
338S0570	1	IC,RTL8211CL,GIGE TRANSCEIVER,48P,TQFP	U3700	CRITICAL	

Programmable Parts

338S0563	1	IC,SMC,HS8/2117,9X9MM,TLP,HF	U4900	CRITICAL	SMC_BLANK
341S2287	1	IC,SMC,M97	U4900	CRITICAL	SMC_PROG
335S0610	1	IC,FLASH,SPI,32MBIT,3.3V,86MHZ,8-SOP	U6100	CRITICAL	BOOTROM_BLANK
341S2285	1	IC,PRGRM,EFI BOOTROM,UNLOCK,M97	U6100	CRITICAL	BOOTROM_PROG
338S0375	1	IC,CY7C63833,ENCORE II,USB CONTROLLER	U4800	CRITICAL	IR_BLANK
341S2093	1	IC,IR CONTROLLER,M97	U4800	CRITICAL	IR_PROG
337S2983	1	IC,PSOC+ W/ USB,56 PIN,MLF,CY8C24794	U5701	CRITICAL	WELLSPRING_BLANK
341S2348	1	IC,WELLSPRING CONTROLLER,M97	U5701	CRITICAL	WELLSPRING_PROG

Alternate Parts

PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
152S0778	152S0693		ALL	CYNTEC AS ALTERNATE
152S0796	152S0685		ALL	CYNTEC AS ALTERNATE
152S0694	152S0138		ALL	MAGLAYERS AS ALTERNATE
157S0058	157S0055		ALL	DELTA AS ALTERNATE
104S0018	104S0023		ALL	DALE/VISHAY AS ALTERNATE
128S0093	128S0218		ALL	KEMET AS ALTERNATE
152S0874	152S0516		ALL	MAGLAYERS AS ALTERNATE
152S0847	152S0586		ALL	MAGLAYERS AS ALTERNATE
514-0612	514-0607		ALL	FOXLINK AS ALTERNATE
514-0613	514-0608		ALL	FOXLINK AS ALTERNATE

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:2K9]	CRITICAL	EEE_2K9
826-4393	1	LBL,P/N LABEL,PCB,28MM X 6 MM	[EEE:2KA]	CRITICAL	EEE_2KA
826-4393	1	LBL,P/N LABEL,PCB,28MM X 6 MM	[EEE:1DJ]	CRITICAL	EEE_1DJ

M97 BOARD STACK-UP

Top	SIGNAL
2	GROUND
3	SIGNAL(High Speed)
4	SIGNAL(High Speed)
5	GROUND
6	POWER
7	POWER
8	GROUND
9	SIGNAL(High Speed)
10	SIGNAL(High Speed)
11	GROUND
BOTTOM	SIGNAL

BOM Configuration

SYNC_MASTER=M97_MLB

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 4 OF 109	

Revision History

A

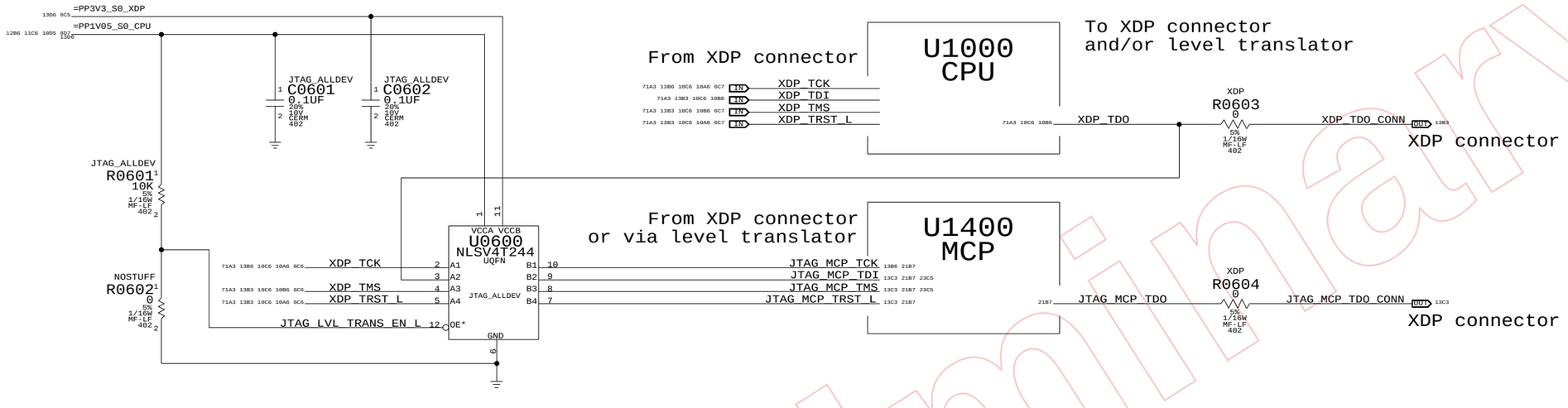
SYNC_MASTER=M97_MLB

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE	SHT	OF
NONE	5	109

NOTE: All page numbers are .csa, not PDF. See page 1 for .csa -> PDF mapping.

1.05V TO 3.3V LEVEL TRANSLATOR (M97: ON ICT FIXTURE)



JTAG Scan Chain

SYNC_MASTER=BEN SYNC_DATE=04/04/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A

SCALE	SHT	OF
NONE	6	109

Functional Test Points

Fan Connectors

J14	TRUE	PP5VRT_S0	(NEED 3 TP)	7D3 8D5
J15	TRUE	FAN_RT_PWM		46B4
J16	TRUE	FAN_RT_TACH		46C4

(NEED TO ADD 3 GND TP)

MIC FUNC_TEST

J23	TRUE	MIC_HI_CONN	54B1 54D2
J23	TRUE	MIC_LO_CONN	54B1 54D2
J23	TRUE	MIC_SHLD_CONN	54D2 55A6

SPEAKER FUNC_TEST

J42	TRUE	SPKRAMP_L_N_OUT	53A2 54C2
J42	TRUE	SPKRAMP_L_P_OUT	53B2 54C2
J42	TRUE	SPKRAMP_R_N_OUT	53C3 54C2
J42	TRUE	SPKRAMP_R_P_OUT	53C3 54C2
J42	TRUE	SPKRAMP_SUB_N_OUT	53B2 54C2
J42	TRUE	SPKRAMP_SUB_P_OUT	53B2 54C2

THERMAL FUNC_TEST

J43	TRUE	MCPTHMSNS_D2_P	45B5 77D3
J43	TRUE	MCPTHMSNS_D2_N	45B5 77D3

LVDS FUNC_TEST

J50	TRUE	PP3V3_LCDVDD_SW_F	7C3 66C2
J50	TRUE	PP3V3_S0_LCD_F	66C3
J50	TRUE	PPVOUT_S0_LCDBKLT	7C3 66B2 69B3 69C1
J48	TRUE	LVDS_IG_DDC_CLK	18A3 66C5
J50	TRUE	LVDS_IG_DDC_DATA	18A3 66B5
J60	TRUE	LVDS_IG_A_DATA_N<0>	18B3 66C2 73B3
J60	TRUE	LVDS_IG_A_DATA_P<0>	18B3 66C2 73B3
J60	TRUE	LVDS_IG_A_DATA_N<1>	18B3 66C2 73B3
J57	TRUE	LVDS_IG_A_DATA_P<1>	18B3 66C2 73B3
J55	TRUE	LVDS_IG_A_DATA_N<2>	18B3 66C2 73B3
J58	TRUE	LVDS_IG_A_DATA_P<2>	18B3 66C2 73B3
J58	TRUE	LVDS_IG_A_CLK_F_N	66B2 73B3
J58	TRUE	LVDS_IG_A_CLK_F_P	66B2 73B3
J53	TRUE	LED_RETURN_1	66B3 69C1
J53	TRUE	LED_RETURN_2	66B3 69B1
J44	TRUE	LED_RETURN_3	66B3 69B1
J44	TRUE	LED_RETURN_4	66B3 69B1
J44	TRUE	LED_RETURN_5	66B3 69B1
J44	TRUE	LED_RETURN_6	66B3 69B1

(NEED TO ADD 5 GND TP)

SATA ODD CONN

J26	TRUE	PP5V_SW_ODD	(NEED 4 TP) 7C3 36D3
J26	TRUE	SMC_ODD_DETECT	36B7 39B8
J26	TRUE	SATA_ODD_D2R_C_P	36B5 73A3
J26	TRUE	SATA_ODD_D2R_C_N	36B5 73A3
J26	TRUE	SATA_ODD_R2D_P	36B5 73A3
J26	TRUE	SATA_ODD_R2D_N	7C5 36B5 73A3

(NEED TO ADD 4 GND TP)

DC POWER CONN

J31	TRUE	PP18V5_DCIN_FUSE	(NEED 3 TP) 56D6
J30	TRUE	ADAPTER_SENSE	56D7

(NEED TO ADD 4 GND TP)

BATT POWER CONN

J30	TRUE	PPVBAT_G3H_CONN_F	(NEED 3 TP) 56A8
J30	TRUE	GND_BATT_CONN	(NEED 3 TP) 56A8
J22	TRUE	SMBUS_SMC_BSA_SCL	7A7 42C5 76D3
J22	TRUE	SMBUS_SMC_BSA_SCL	7A7 42C5 76D3
J20	TRUE	SMC_BS_ALRT_L	39C5 40B2 56A8

BATT SIGNAL CONN

J52	TRUE	PP3V42_G3H	(NEED 3 TP) 7B5 7C3 8D1
J52	TRUE	SMBUS_SMC_BSA_SCL	7A7 42C5 76D3
J52	TRUE	SMBUS_SMC_BSA_SCL	7A7 42C5 76D3
J52	TRUE	SMC_BIL_BUTTON_DB_L	56A5

(NEED TO ADD 3 GND TP)

FRONT FLEX CONN

J11	TRUE	PP3V42_G3H_LIDSWITCH_R	38B6
J11	TRUE	PP5V_S3_IR_R	38B6
J10	TRUE	IR_RX_OUT	38A4 38C4
J10	TRUE	SMC_LID_R	38B6
J10	TRUE	SYS_LED_ANODE_R	38B6

(NEED TO ADD 2 GND TP)

RIGHT CLUTCH CONN

J30	TRUE	PP5V_S3_BTCAMERA_F	31B7
J30	TRUE	PCIE_MINI_D2R_P	17B6 31C7 73D3
J30	TRUE	PCIE_MINI_D2R_N	17B6 31C7 73D3
J30	TRUE	PCIE_MINI_R2D_P	31C7 73D3
J30	TRUE	PCIE_MINI_R2D_N	31C7 73D3
J25	TRUE	PCIE_CLK100M_MINI_CONN_P	31C8 73D3
J25	TRUE	PCIE_CLK100M_MINI_CONN_N	31C8 73D3
J25	TRUE	USB_CAMERA_CONN_P	31B7 74C3
J25	TRUE	USB_CAMERA_CONN_N	31B7 74C3
J28	TRUE	PP5V_WLAN	7C3 31C5
J25	TRUE	PCIE_WAKE_L	17B6 23C5 31C7
J25	TRUE	SMBUS_SMC_A_S3_SCL	7B5 42D2 76D3
J25	TRUE	SMBUS_SMC_A_S3_SDA	7B5 42D2 76D3
J25	TRUE	CONN_USB2_BT_P	31B7 74B3
J25	TRUE	CONN_USB2_BT_N	31B7 74B3
J27	TRUE	MINI_CLKREQ_O_L	31C7
J28	TRUE	MINI_RESET_CONN_L	31A7

(NEED TO ADD 3 GND TP)

SATA HDD CONN

J31	TRUE	PP5V_S0_HDD_FLT	(NEED 4 TP) 7C3 36A7
J31	TRUE	SATA_HDD_R2D_P	36A7 73A3
J31	TRUE	SATA_HDD_R2D_N	36A7 73A3
J31	TRUE	SATA_HDD_D2R_C_P	36A7 73A3
J31	TRUE	SATA_HDD_D2R_C_N	36A7 73A3
J31	TRUE	SATA_ODD_R2D_N	7B7 36B5 73A3

(NEED TO ADD 4 GND TP)

IPD_FLEX_CONN

J37	TRUE	PP3V3_S3_LDO	7C3 48B4 48C3
J37	TRUE	PP18V5_S3	7C3 48C1 48D3
J37	TRUE	TPAD_GND_F	48B4 48C3 48C4 48C7
J37	TRUE	Z2_CS_L	47C8 48C3
J37	TRUE	Z2_DEBUG3	47C8 48C3
J37	TRUE	Z2_MOSI	47C8 48C3
J37	TRUE	Z2_MISO	47C8 48C3
J36	TRUE	Z2_SCLK	47C8 48C3
J36	TRUE	Z2_BOOST_EN	47C8 48C3
J36	TRUE	Z2_HOST_INTN	48C3 48C5
J36	TRUE	Z2_BOOT_CFG1	47D8 48C3
J36	TRUE	Z2_CLKIN	47C8 48C3
J36	TRUE	Z2_KEY_ACT_L	47B6 48C3
J36	TRUE	Z2_RESET	47C8 48C1
J36	TRUE	PSOC_MISO	47C8 48C1
J36	TRUE	PSOC_MOSI	47C8 48C1
J36	TRUE	PSOC_SCLK	47C8 48C1
J35	TRUE	SMBUS_SMC_A_S3_SDA	47C8 48C1
J35	TRUE	SMBUS_SMC_A_S3_SCL	47C8 48C1
J35	TRUE	PSOC_F_CS_L	47C8 48C1
J37	TRUE	PICKB_L	47D8 48C1

KEYBOARD CONN

J35	TRUE	PP3V3_S3	7D3 8D3
J35	TRUE	PP3V42_G3H	7A7 7C3 8D1
J34	TRUE	WS_KBD1	47C6 47D2
J34	TRUE	WS_KBD2	47C6 47D2
J34	TRUE	WS_KBD3	47C6 47D2
J34	TRUE	WS_KBD4	47C6 47D2
J34	TRUE	WS_KBD5	47C6 47D2
J34	TRUE	WS_KBD6	47C6 47D2
J34	TRUE	WS_KBD7	47C6 47D2
J34	TRUE	WS_KBD8	47C6 47D2
J34	TRUE	WS_KBD9	47C6 47D2
J34	TRUE	WS_KBD10	47C6 47D2
J34	TRUE	WS_KBD11	47C2 47C6
J32	TRUE	WS_KBD12	47C2 47C6
J32	TRUE	WS_KBD13	47C2 47C6
J32	TRUE	WS_KBD14	47C2 47C6
J34	TRUE	WS_KBD15_CAP	47C2
J34	TRUE	WS_KBD16_NUM	47C2
J34	TRUE	WS_KBD17	47C2 47C6
J33	TRUE	WS_KBD18	47C2 47D7
J33	TRUE	WS_KBD19	47C2 47D7
J33	TRUE	WS_KBD20	47C2 47D7
J33	TRUE	WS_KBD21	47C2 47D7
J33	TRUE	WS_KBD22	47C2 47D7
J33	TRUE	WS_KBD23	47C2 47D7
J33	TRUE	WS_KBD_ONOFF_L	47C2
J33	TRUE	WS_LEFT_SHIFT_KBD	47B3 47B5 47C2
J33	TRUE	WS_LEFT_OPTION_KBD	47B3 47B5 47C2
J33	TRUE	WS_CONTROL_KBD	47B3 47B5 47C2

(NEED TO ADD 1 GND TP)

KBD BACKLIGHT CONN

J35	TRUE	KBDLED_ANODE	48A4

(NEED TO ADD 2 GND TP)

DEBUG VOLTAGE

J37	TRUE	PPVCORE_S0_CPU	8D7
J38	TRUE	PPCPUVTT_S0	8D7
J38	TRUE	PPVCORE_S0_MCP	8C7
J38	TRUE	PP0V75_S0	8C7
J38	TRUE	PP1V05_S0	8C7
J38	TRUE	PP1V5_S0	8B7
J38	TRUE	PP1V8_S0	8B7
J37	TRUE	PP5VRT_S0	7D7 8D5
J37	TRUE	PP3V3_S0	8C5
J37	TRUE	PP1V5_S3	8D3
J37	TRUE	PP3V3_S3	7B5 8D3
J37	TRUE	PP5VLT_S3	8C3
J37	TRUE	PP1V1R1V05_S5	8B3
J37	TRUE	PP3V3_S5	8B3
J37	TRUE	PP3V42_G3H	7A7 7B5 8D1
J37	TRUE	PPBUS_G3H	8C1
J37	TRUE	PP3V3_ENET_PHY	8B1
J37	TRUE	PP1V2R1V05_ENET	8B1
J37	TRUE	PP3V3_G3_RTC	21C8 22A5 26D4
J32	TRUE	PP5V_WLAN	7D5 31C5
J31	TRUE	PP5V_SW_ODD	7B7 36D3
J30	TRUE	PP5V_S0_HDD_FLT	7C5 36A7
J30	TRUE	PP3V3_S5_AVREF_SMC	39D4 40B6
J38	TRUE	PP18V5_S3	7C5 48C1 48D3
J38	TRUE	PP3V3_S3_LDO	7C5 48B4 48C3
J38	TRUE	PP3V3_LCDVDD_SW_F	7C7 66C2
J38	TRUE	PPVOUT_S0_LCDBKLT	7C7 66B2 69B3 69C1
J38	TRUE	BKL_VREF_4V9	69A8 69B6 69C4 69C8
J38	TRUE	PP4V6_AUDIO_ANALOG	51A3 51D3 52D6
J38	TRUE	SMC_PM_G2_EN	39D5 64D8
J31	TRUE	PM_SLP_S4_L	21C3 39C5 48A2 64C8
J30	TRUE	PM_SLP_S3_L	21C3 34B7 39C5 41A5 64D5 68D8

(NEED TO ADD 4 GND TP)

FUNC TEST

SYNC_MASTER=M97_MLB

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 7 OF 109	

"S0,S0M" RAILS

60D1 =PPVCORE_S0_CPU_REG (CPU VCORE PWR)
- PPVCORE_S0_CPU — 7D3
  MIN_LINE_WIDTH=0.6 MM
  MIN_NECK_WIDTH=0.3 MM
  VOLTAGE=1.25V
  MAKE_BASE=TRUE
  - =PPVCORE_S0_CPU — 11B5 11D6 12D6
  - =PPVCORE_S0_CPU_VSENSE — 43D8

65A6 62C7 =PPCPUVTT_S0_REG
- PPCPUVTT_S0 — 7D3
  MIN_LINE_WIDTH=0.6 mm
  MIN_NECK_WIDTH=0.2 mm
  VOLTAGE=1.05V
  MAKE_BASE=TRUE
  - =PP1V05_S0_CPU — 6D8 10D5 11C6 12B6 13D6
  - =PP1V05_S0_MCP_FSB — 9C2 14A2 14B7 22D3 24C8
  - =PP1V05_S0_SMC_LS — 40D3

61C1 =PPMCPCORE_S0_REG
44D8 =PPVCORE_S0_MCP_REG_R (MCP VCORE REG. OUTPUT)
- PPVCORE_S0_MCP_R
  MIN_LINE_WIDTH=0.6 MM
  MIN_NECK_WIDTH=0.2 MM
  VOLTAGE=1.05V
  MAKE_BASE=TRUE
  - =PPVCORE_S0_MCP_VSENSE — 43D8

44D7 22D9 61B1 =PPVCORE_S0_MCP (MCP VCORE AFTER SENSE RES)
- PPVCORE_S0_MCP — 7D3
  MIN_LINE_WIDTH=0.6 MM
  MIN_NECK_WIDTH=0.2 MM
  VOLTAGE=1.05V
  MAKE_BASE=TRUE

59C8 =PP0V75_S0_REG
- PP0V75_S0 — 7D3
  MIN_LINE_WIDTH=0.4 mm
  MIN_NECK_WIDTH=0.2 mm
  VOLTAGE=0.75V
  MAKE_BASE=TRUE
  - =PPVTT_S0_VTTCLAMP — 65B3
  - =PP0V75_S0_MEM_VTT_A — 28A4
  - =PP0V75_S0_MEM_VTT_B — 29A4

65A5 =PP1V05_S0_FET
- PP1V05_S0 — 7D3
  MIN_LINE_WIDTH=0.6 MM
  MIN_NECK_WIDTH=0.2 MM
  VOLTAGE=1.1V
  MAKE_BASE=TRUE
  - =PP1V05_S0_MCP_PEX_DVDD — 8A8 24D8
  - =PP1V05_S0_MCP_AVDD_UF — 24D4
  - =PP1V05_S0_MCP_PLL_UF — 24C4
  - =PP1V05_S0_MCP_SATA_DVDD — 8A8 24D6
  - =PP1V05_S0_MCP_HDMI_VDD — 18A6 25D7
  - =PP1V05_S0_VMON — 64A8

65D1 =PP1V5_S0_FET
44C8 =PP1V5_S0_FET_R (DDR PWR REG. OUTPUT)
- PP1V5_S0_R
  MIN_LINE_WIDTH=0.5 mm
  MIN_NECK_WIDTH=0.2 mm
  VOLTAGE=1.5V
  MAKE_BASE=TRUE
  - =PP1V5_S0_CPU — 11B6 12B6
  - =PP1V5_S0_VMON — 64A8
  - =PP1V5_FC_CON — 32C3

44C7 =PP1V5_S0 (DDR PWR AFTER SENSE RES.)
- PP1V5_S0 — 7D3
  MIN_LINE_WIDTH=0.5 mm
  MIN_NECK_WIDTH=0.2 mm
  VOLTAGE=1.5V
  MAKE_BASE=TRUE
  - =PP1V8R1V5_S0_MCP_MEM — 16C3 16C7 24C8
  - =PP1V5_S0_MEM_MCP — 29B3

63C2 =PP1V8_S0_REG
- PP1V8_S0 — 7D3
  MIN_LINE_WIDTH=0.5 MM
  MIN_NECK_WIDTH=0.2 mm
  VOLTAGE=1.8V
  MAKE_BASE=TRUE
  - =PP3V3R1V8_S0_MCP_IFP_VDD — 18B6 25D7

58B8 =PP5VRT_S0_REG
- PP5VRT_S0 — 7D3 7D7
  MIN_LINE_WIDTH=0.6 mm
  MIN_NECK_WIDTH=0.2 mm
  VOLTAGE=5V
  MAKE_BASE=TRUE
  - =PP5V_S0_HDD — 36A5
  - =PP5V_S0_LPCPLUS — 41D5
  - =PP5V_S0_FAN_RT — 46C5
  - =PP5V_S0_CPU_IMVP — 60D8
  - =PP5V_S0_ODD — 36D5
  - =PP5V_S0_KBDLED — 48A5
  - =PP5V_S0_DP_AUX_MUX — 67B6
  - =PP5V_S0_CPUVTTS0 — 62C8

65C6 =PP3V3_S0_FET
- PP3V3_S0 — 7D3
  MIN_LINE_WIDTH=0.6 mm
  MIN_NECK_WIDTH=0.2 mm
  VOLTAGE=3.3V
  MAKE_BASE=TRUE
  - =PP3V3_S0_XDP — 6D8 13D6
  - =PP3V3_S0_MCP — 21C2 22B3 24B8
  - =PP3V3_S0_MCP_DAC_UF — 25D4
  - =PP3V3_S0_MCP_VPLL_UF — 25B7
  - =PP3V3_S0_ODD — 36B7 36D5
  - =PP3V3_S0_LPCPLUS — 41C3
  - =PP3V3_S0_SMBUS_SMC_0_S0 — 42D5
  - =PP3V3_S0_SMBUS_SMC_B_S0 — 42C3
  - =PP3V3_S0_SMBUS_MCP_0 — 42D8
  - =PP3V3_S0_FAN_RT — 46C5
  - =PP3V3_S0_AUDIO — 51A7 51D8 52D6 54D8 55B5
  - =PP3V3_S0_IMVP — 60D8
  - =PP3V3_S0_LCD — 66C5
  - =PP3V3_S0_MCP_GPIO — 18C1 19D1 21A4
  - =PP3V3_S0_HDCPROM — 25B8
  - =PP3V3_S0_MCP_PLL_UF — 24B6
  - =PP3V3R1V5_S0_MCP_HDA — 21D3 21D8 24A8
  - =PP3V3_S0_SMC — 40A1 40D2
  - =PP3V3_S0_MCPTHMSNS — 45C6
  - =PP3V3_S0_CPUTHMSNS — 45D6
  - =PP5VR3V3_S0_MCPCOREISNS — 44D7
  - =PP3V3_S0_DPCONN — 68A8 68B8
  - =PPSPD_S0_MEM_A — 28A8
  - =PPSPD_S0_MEM_B — 29A8
  - =PP3V3_S0_PWRCTL — 64A5
  - =PP3V3_S0_VMON — 64B8
  - =PP3V3_S0_MCPDDRISNS — 44C7
  - =PP3V3_S0_CPUVTTISNS — 44B7
  - =PPVIN_S0_P1V8S0 — 63C5
  - =PP3V3_FC_CON — 32C3
  - =PP3V3_S0_TPAD — 48A6
  - =PP3V3_S0_SMBUS_MCP_1 — 42C8

"S3" RAILS

59B1 =PP1V5_S3_REG
- PP1V5_S3 — 7D3
  MIN_LINE_WIDTH=0.6 mm
  MIN_NECK_WIDTH=0.2 mm
  VOLTAGE=1.5V
  MAKE_BASE=TRUE
  - =PP1V5_S3_P1V5S0FET — 65D3
  - =PP1V5_S3_MEM_A — 28D7
  - =PP1V5_S3_MEM_B — 29D7
  - =PP1V5_S3_MEMRESET — 30C6

65D6 =PP3V3_S3_FET
- PP3V3_S3 — 7B5 7D3
  MIN_LINE_WIDTH=0.6 mm
  MIN_NECK_WIDTH=0.2 mm
  VOLTAGE=3.3V
  MAKE_BASE=TRUE
  - =PP3V3_S3_SMBUS_SMC_A_S3 — 42D3
  - =PP3V3_S3_PDCISENS — 59B3
  - =PP3V3_S3_SMBUS_SMC_MGMT — 42B5
  - =PP3V3_S3_VREFMRGN — 27D8
  - =PP3V3_S3_WLAN — 31A6
  - =PP3V3_S3_MCP_GPIO — 21A3
  - =PP3V3_S3_TPAD — 47A6 47B5 47C5 47D2
  - =PP3V3_S3_SMS — 49B7 49D6

61C8 =PP5VLT_S3_REG
- PP5VLT_S3 — 7D3
  MIN_LINE_WIDTH=0.6 mm
  MIN_NECK_WIDTH=0.2 mm
  VOLTAGE=5V
  MAKE_BASE=TRUE
  - =PP5V_S3_EXTUSB — 37C7
  - =PP5V_S3_IR — 38B4 38D7
  - =PP5V_S3_BTCAMERA — 31B3
  - =PP5V_S3_VTTCLAMP — 65A3
  - =PP5V_S3_MCPDDRFET — 65D4
  - =PP5V_S3_SYSLED — 40B8
  - =PP5V_S3_TPAD — 48C8
  - =PP5V_S3_WLAN — 31C1
  - =PP5V_S3_1V5S30V75S0 — 59C5
  - =PP5V_S3_AUDIO — 51A7 55D4
  - =PP5V_S3_AUDIO_AMP — 53B8 53C8 53D8
  - =PP5V_S3_P1V05S0FET — 65B8

59D7 27D3 =PPVTT_S3_DDR_BUF
- PPVTT_S3_DDR_BUF
  MIN_LINE_WIDTH=0.3 MM
  MIN_NECK_WIDTH=0.2 MM
  VOLTAGE=0.75V
  MAKE_BASE=TRUE

"S5" RAILS

63B4 =PP1V05_S5_REG
- PP1V1R1V05_S5 — 7C3
  MIN_LINE_WIDTH=0.6 MM
  MIN_NECK_WIDTH=0.2 MM
  VOLTAGE=1.05V
  MAKE_BASE=TRUE
  - =PP1V05_S5_MCP_VDD_AUXC — 22A3 24C8
  - =PP1V05_ENET_P1V05ENETFET — 34C4
  - =PP1V05_S5_P1V05S0FET — 65B6

58B1 =PP3V3_S5_REG
- PP3V3_S5 — 7C3
  MIN_LINE_WIDTH=0.6 mm
  MIN_NECK_WIDTH=0.2 mm
  VOLTAGE=3.3V
  MAKE_BASE=TRUE
  - =PP3V3_S5_MCP_GPIO — 18C7 20C1
  - =PP3V3_S5_ROM — 41B5 41C7 50C6
  - =PP3V3_S5_LCD — 66C8
  - =PP3V3_S5_MCP — 22B3 24B8
  - =PP3V3_S5_MCPPWRGD — 26B8
  - =PP3V3_S5_SMBUS_MCP_1 — 42C7
  - =PP3V3_S5_MCP_A01 — 23C4 41B4
  - =PP3V3_S5_PWRCTL — 64B3 64C4
  - =PP3V3_S5_P1V05ENETFET — 34C5
  - =PP3V3_S5_P3V3S3FET — 65D8
  - =PP3V3_S5_P3V3S0FET — 65C8
  - =PP3V3_S5_P1V05S5 — 63B7
  - =PP3V3_S5_P1V05FET — 65A8
  - =PP3V3_S5_MEMRESET — 30C6
  - =PP3V3_S5_P3V3ENETFET — 34D5
  - =PP3V3_S5_DP_PORT_PWR — 68D8

"G3H" RAILS

56B4 =PP3V42_G3H_REG
- PP3V42_G3H — 7A7 7B5 7C3
  MIN_LINE_WIDTH=0.6 MM
  MIN_NECK_WIDTH=0.2 MM
  VOLTAGE=3.42V
  MAKE_BASE=TRUE
  - =PPVIN_S5_SMCVREF — 40B8
  - =PP3V42_G3H_SMBUS_SMC_BSA — 42C5
  - =PP3V42_G3H_PWRCTL — 64B3 64D3 64D8
  - =PP3V42_G3H_CHGR — 57A8 57C6 57D5
  - =PP3V42_G3H_SMCUSBMUX — 37B8
  - =PP3V42_G3H_LIDSWITCH — 38B4
  - =PP3V42_G3H_TPAD — 47B3 47B5 47C2 47C5
  - =PP3V42_G3H_BATT — 56A3 56B3
  - =PP3V3_S5_SMC — 39D4 40C1 40C7 40D8 49D7
  - =PP3V3_S5_LPCPLUS — 41B7 41C3 41C7 41D5
  - =PP3V42_G3H_RTC_D — 26D8
  - =PP3V42_G3H_BMON_ISNS — 44A8

56D1 56B8 =PP18V5_DCIN_CONN
- PP18V5_G3H
  MIN_LINE_WIDTH=0.6 MM
  MIN_NECK_WIDTH=0.3 MM
  VOLTAGE=18.5V
  MAKE_BASE=TRUE
  - =PP18V5_G3H_CHGR — 57D8

57C1 =PPBUS_G3H
- PPBUS_G3H — 7C3
  MIN_LINE_WIDTH=0.6 MM
  MIN_NECK_WIDTH=0.3 MM
  VOLTAGE=12.6V
  MAKE_BASE=TRUE
  - =PPBUS_S0_LCDBKLT — 70D8
  - =PPVIN_S0_MCPCORES0 — 61C3
  - =PPVIN_S0_MCPREG_VIN — 61C6
  - =PPVIN_S5_1V5S30V75S0 — 59C2
  - =PPVIN_S5_3V3S5 — 58B3
  - =PPVIN_S0_5VRTS0 — 58B6 58C6
  - =PPVIN_S3_5VLTS3 — 61D8
  - =PPBUS_G3HRS5 — 43B8
  - =PPCPUVCORE_VTT_ISNS_R — 44B8
    (BEFORE HIGH SIDE SENSING RES.)

44B7 =PPCPUVCORE_VTT_ISNS
(AFTER HIGH SIDE CPU VCORE & CPU VTT SENSING RES.)
- PPBUS_G3H_CPU_ISNS
  MIN_LINE_WIDTH=0.6 mm
  MIN_NECK_WIDTH=0.3 MM
  VOLTAGE=12.6V
  MAKE_BASE=TRUE
  - =PPVIN_S0_CPUVTTS0 — 62C6
  - =PPVIN_S5_CPU_IMVP — 60C2 60D4 68D8

"ENET" RAILS

34D2 =PP3V3_ENET_FET
- PP3V3_ENET_PHY — 7C3
  MIN_LINE_WIDTH=0.4 MM
  MIN_NECK_WIDTH=0.2 MM
  VOLTAGE=3.3V
  MAKE_BASE=TRUE
  - =PP3V3_ENET_MCP_RMGT — 18C7 18D3 24A6 24B6
  - =PP3V3_ENET_PHY — 33D7

34B2 =PP1V05_ENET_FET
- PP1V2R1V05_ENET — 7C3
  MIN_LINE_WIDTH=0.4 MM
  MIN_NECK_WIDTH=0.2 MM
  VOLTAGE=1.05V
  MAKE_BASE=TRUE
  - =PP1V05_ENET_MCP_PLL_MAC — 24A8
  - =PP1V05_ENET_MCP_RMGT — 18D3 24C6
  - =PP1V05_ENET_PHY — 33D2

PEX & SATA AVDD/DVDD aliases

24D1 PP1V05_S0_MCP_PEX_AVDD (MAKE_BASE=TRUE)
206 mA (A01)
- =PP1V05_S0_MCP_PEX_AVDD0 — 17B3
- =PP1V05_S0_MCP_PEX_AVDD1 — 17A3

206 mA (A01)

24D8 8B7 =PP1V05_S0_MCP_PEX_DVDD
206 mA (A01)
- =PP1V05_S0_MCP_PEX_DVDD0 — 17B6
- =PP1V05_S0_MCP_PEX_DVDD1 — 17A6

57 mA (A01)

24C2 PP1V05_S0_MCP_SATA_AVDD (MAKE_BASE=TRUE)
127 mA (A01)
- =PP1V05_S0_MCP_SATA_AVDD0 — 20B6
- =PP1V05_S0_MCP_SATA_AVDD1 — 20A6

127 mA (A01)

24D6 8B7 =PP1V05_S0_MCP_SATA_DVDD
127 mA (A01)
- =PP1V05_S0_MCP_SATA_DVDD0 — 20B6
- =PP1V05_S0_MCP_SATA_DVDD1 — 20B6

43 mA (A01)

Power Aliases

SYNC_MASTER=BEN

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 8 OF 109	

HEATSINK STANDOFFS

Z0902 STDOFF-4.50D.98H-1.1-3.48-TH — LEFT OF CPU

Z0901 STDOFF-4.50D.98H-1.1-3.48-TH — ABOVE CPU

Z0903 STDOFF-4.50D.98H-1.1-3.48-TH — BELOW MCP

Z0904 STDOFF-4.50D.98H-1.1-3.48-TH — BELOW CPU

FAN STANDOFF

Z0905 STDOFF-4.50D.98H-1.1-3.48-TH

MIN_LINE_WIDTH=0.6MM
MIN_NECK_WIDTH=0.2MM
VOLTAGE=0V

AUDIO CHASSIS GND

GND_CHASSIS_AUDIO MAKE_BASE=TRUE

OMIT Z0906 TH SL-3.10X2.70

548B 548A =GND_CHASSIS_AUDIO_JACK
55A4 54A3 =GND_CHASSIS_AUDIO_MIC

MLB MOUNTING SCREW HOLES

OMIT Z0908 3R2P5
OMIT Z0909 3R2P5
OMIT Z0910 3R2P5
OMIT Z0911 3R2P5
OMIT Z0912 3R2P5
OMIT Z0913 3R2P5

VENICE BOARD STANDOFFS

VENICE Z0914 STDOFF-4.0OD3.0H-TH
VENICE Z0915 STDOFF-4.0OD3.0H-TH
VENICE Z0916 STDOFF-4.0OD3.0H-TH

EMI IO POGO PINS

ZS0900 1.4DIA-SHORT-EMI-MLB-M97-M98 SM
ZS0901 1.4DIA-SHORT-EMI-MLB-M97-M98 SM
ZS0902 1.4DIA-SHORT-EMI-MLB-M97-M98 SM
ZS0903 1.4DIA-SHORT-EMI-MLB-M97-M98 SM

EMI POGO PINS

ZS0904 2.0DIA-TALL-EMI-MLB-M97-M98 SM
ZS0905 2.0DIA-TALL-EMI-MLB-M97-M98 SM
ZS0906 2.0DIA-TALL-EMI-MLB-M97-M98 SM
ZS0907 2.0DIA-TALL-EMI-MLB-M97-M98 SM

PCI-E ALIASES

UNUSED GPU LANES

17D6 17C6 =PEG_D2R_N<15:0> — NC_PEG_D2R_N<15:0> NO_TEST=TRUE MAKE_BASE=TRUE
17D6 17C6 =PEG_D2R_P<15:0> — NC_PEG_D2R_P<15:0> NO_TEST=TRUE MAKE_BASE=TRUE
17D3 17C3 =PEG_R2D_C_N<15:0> — NC_PEG_R2D_C_N<15:0> NO_TEST=TRUE MAKE_BASE=TRUE
17D3 17C3 =PEG_R2D_C_P<15:0> — NC_PEG_R2D_C_P<15:0> NO_TEST=TRUE MAKE_BASE=TRUE
17C6 PEG_PRSNT_L — TP_PEG_PRSNT_L MAKE_BASE=TRUE
17C3 PEG_CLK100M_P — TP_PEG_CLK100M_P MAKE_BASE=TRUE
17C3 PEG_CLK100M_N — TP_PEG_CLK100M_N MAKE_BASE=TRUE

UNUSED FW LANE

17B6 PCIE_FW_D2R_P — TP_PCIE_FW_D2R_P MAKE_BASE=TRUE
17B6 PCIE_FW_D2R_N — TP_PCIE_FW_D2R_N MAKE_BASE=TRUE
17B3 PCIE_FW_R2D_C_P — TP_PCIE_FW_R2D_C_P MAKE_BASE=TRUE
17B3 PCIE_FW_R2D_C_N — TP_PCIE_FW_R2D_C_N MAKE_BASE=TRUE
17C6 PCIE_FW_PRSNT_L — TP_PCIE_FW_PRSNT_L MAKE_BASE=TRUE
17C6 FW_CLKREQ_L — TP_FW_CLKREQ_L MAKE_BASE=TRUE
17C3 PCIE_CLK100M_FW_P — TP_PCIE_CLK100M_FW_P MAKE_BASE=TRUE
17C3 PCIE_CLK100M_FW_N — TP_PCIE_CLK100M_FW_N MAKE_BASE=TRUE

UNUSED EXPRESS CARD LANE

17B6 PCIE_EXCARD_D2R_P — TP_PCIE_EXCARD_D2R_P MAKE_BASE=TRUE
17B6 PCIE_EXCARD_D2R_N — TP_PCIE_EXCARD_D2R_N MAKE_BASE=TRUE
17B3 PCIE_EXCARD_R2D_C_P — TP_PCIE_EXCARD_R2D_C_P MAKE_BASE=TRUE
17B3 PCIE_EXCARD_R2D_C_N — TP_PCIE_EXCARD_R2D_C_N MAKE_BASE=TRUE
17C6 PCIE_EXCARD_PRSNT_L — TP_PCIE_EXCARD_PRSNT_L MAKE_BASE=TRUE
17C6 EXCARD_CLKREQ_L — TP_EXCARD_CLKREQ_L MAKE_BASE=TRUE
17C3 PCIE_CLK100M_EXCARD_P — TP_PCIE_CLK100M_EXCARD_P MAKE_BASE=TRUE
17C3 PCIE_CLK100M_EXCARD_N — TP_PCIE_CLK100M_EXCARD_N MAKE_BASE=TRUE

AIRPORT CARD PRESENT SIGNAL

31D7 17C6 PCIE_MINI_PRSNT_L — MAKE_BASE=TRUE

FOR VENICE CARD

17B6 TP_PE4_CLKREQ_L — FC_CLKREQ_L 32C5 MAKE_BASE=TRUE
17B6 TP_PE4_PRSNT_L — FC_PRSNT_L 32B3 MAKE_BASE=TRUE
17B3 TP_PCIE_CLK100M_PE4P — PCIE_CLK100M_FC_P 32C5 73D3 MAKE_BASE=TRUE
17B3 TP_PCIE_CLK100M_PE4N — PCIE_CLK100M_FC_N 32C5 73C3 MAKE_BASE=TRUE
17B6 TP_PCIE_PE4_D2RP — PCIE_FC_D2R_P 32B5 73D3 MAKE_BASE=TRUE
17B6 TP_PCIE_PE4_D2RN — PCIE_FC_D2R_N 32B5 73D3 MAKE_BASE=TRUE
17B3 TP_PCIE_PE4_R2D_CP — PCIE_FC_R2D_C_P 32C6 73D3 MAKE_BASE=TRUE
17B3 TP_PCIE_PE4_R2D_CN — PCIE_FC_R2D_C_N 32C6 73D3 MAKE_BASE=TRUE

USB ALIASES

UNUSED USB PORTS

20C3 USB_EXTC_P — TP_USB_EXTC_P MAKE_BASE=TRUE
20C3 USB_EXTC_N — TP_USB_EXTC_N MAKE_BASE=TRUE
20D3 USB_EXTD_P — TP_USB_EXTD_P MAKE_BASE=TRUE
20D3 USB_EXTD_N — TP_USB_EXTD_N MAKE_BASE=TRUE
20C3 USB_EXCARD_P — TP_USB_EXCARD_P MAKE_BASE=TRUE
20C3 USB_EXCARD_N — TP_USB_EXCARD_N MAKE_BASE=TRUE
20D3 USB_MINI_P — TP_USB_MINI_P MAKE_BASE=TRUE
20D3 USB_MINI_N — TP_USB_MINI_N MAKE_BASE=TRUE

DACS ALIASES

UNUSED CRT & TV-OUT INTERFACE

18C6 MCP_TV_DAC_RSET — NC_MCP_TV_DAC_RSET NO_TEST=TRUE MAKE_BASE=TRUE
18C6 MCP_TV_DAC_VREF — NC_MCP_TV_DAC_VREF NO_TEST=TRUE MAKE_BASE=TRUE
18C6 MCP_CLK27M_XTALIN — NC_MCP_CLK27M_XTALIN NO_TEST=TRUE MAKE_BASE=TRUE
18C6 MCP_CLK27M_XTALOUT — NC_MCP_CLK27M_XTALOUT NO_TEST=TRUE MAKE_BASE=TRUE
18C3 CRT_IG_R_C_PR — NC_CRT_IG_R_C_PR NO_TEST=TRUE MAKE_BASE=TRUE
18C3 CRT_IG_G_Y_Y — NC_CRT_IG_G_Y_Y NO_TEST=TRUE MAKE_BASE=TRUE
18C3 CRT_IG_B_COMP_PB — NC_CRT_IG_B_COMP_PB NO_TEST=TRUE MAKE_BASE=TRUE
18B3 CRT_IG_HSYNC — NC_CRT_IG_HSYNC NO_TEST=TRUE MAKE_BASE=TRUE
18B3 CRT_IG_VSYNC — NC_CRT_IG_VSYNC NO_TEST=TRUE MAKE_BASE=TRUE

LVDS ALIASES

UNUSED LVDS SIGNALS

18B3 LVDS_IG_A_DATA_P<3> — NC_LVDS_IG_A_DATA_P3 NO_TEST=TRUE MAKE_BASE=TRUE
18B3 LVDS_IG_A_DATA_N<3> — NC_LVDS_IG_A_DATA_N3 NO_TEST=TRUE MAKE_BASE=TRUE
18B3 LVDS_IG_B_CLK_P — NC_LVDS_IG_B_CLK_P NO_TEST=TRUE MAKE_BASE=TRUE
18B3 LVDS_IG_B_CLK_N — NC_LVDS_IG_B_CLK_N NO_TEST=TRUE MAKE_BASE=TRUE
18B3 LVDS_IG_B_DATA_P<3:0> — NC_LVDS_IG_B_DATA_P<3:0> NO_TEST=TRUE MAKE_BASE=TRUE
18B3 LVDS_IG_B_DATA_N<3:0> — NC_LVDS_IG_B_DATA_N<3:0> NO_TEST=TRUE MAKE_BASE=TRUE

MISC MCP79 ALIASES

14B6 CPU_PECI_MCP — TP_CPU_PECI_MCP
19B7 FW_PME_L — TP_FW_PME_L MAKE_BASE=TRUE
17B6 GMUX_JTAG_TCK_L — TP_GMUX_JTAG_TCK_L MAKE_BASE=TRUE
17B6 GMUX_JTAG_TDO — TP_GMUX_JTAG_TDO MAKE_BASE=TRUE
19D4 GMUX_JTAG_TDI — TP_GMUX_JTAG_TDI MAKE_BASE=TRUE
19D4 GMUX_JTAG_TMS — TP_GMUX_JTAG_TMS MAKE_BASE=TRUE

LAN ALIASES

18D6 =MCP_MII_RXER — MCP_MII_PD MAKE_BASE=TRUE
18C6 =MCP_MII_COL
18C6 =MCP_MII_CRS

R0930 4.7K 5% 1/16W MF-LF 402

DP HOTPLUG PULL-DOWN

1886 =DVI_HPD_GMUX_INT — HPLUG_DET2 MAKE_BASE=TRUE

R0940 20K 5% 1/16W MF-LF 402

SO-DIMM ALIASES

UNUSED ADDRESS PINS

28C5 MEM_A_A<15> — TP_MEM_A_A15 MAKE_BASE=TRUE
29C5 MEM_B_A<15> — TP_MEM_B_A15 MAKE_BASE=TRUE

ETHERNET ALIASES

34C5 =P3V3ENET_EN — PM_SLP_RMGT_L 21C3 MAKE_BASE=TRUE
34B5 =P1V05ENET_EN
33C2 =PP3V3_ENET_PHY_VDDREG — TP_PP3V3_ENET_PHY_VDDREG
33C2 =RTL8211_REGOUT — NC_RTL8211_REGOUT MAKE_BASE=TRUE
33C6 =RTL8211_ENSWREG MAKE_BASE=TRUE

CPU FSB FREQUENCY STRAPS

71C3 10B4 10A4 IN CPU_BSEL<0:2> — =MCP_BSEL<0:2> OUT 14A7 MAKE_BASE=TRUE

BSEL<2..0>	FSB MHZ
0 0 0	266
0 0 1	133
0 1 0	200
0 1 1	(166)
1 0 0	333
1 0 1	100
1 1 0	(400)
1 1 1	(RSVD)

Extra FSB Pull-ups

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

24C8 22D3 14B7 14A2 8D7 =PP1V05_S0_MCP_FSB

MCP_A01&MCP_A01P&MCP_A01Q

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

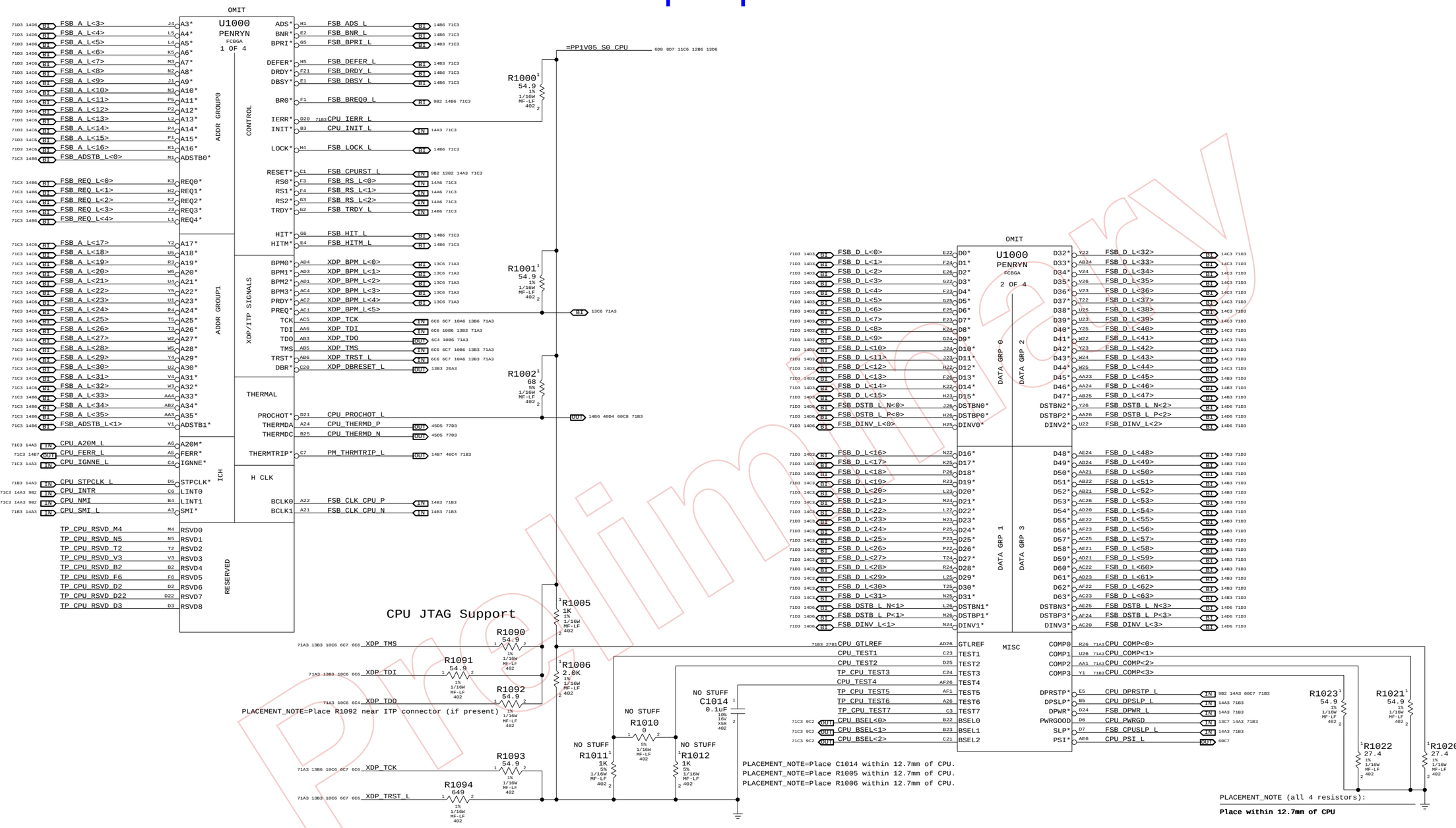
71B3 60C7 14A3 10B2 OUT CPU_DPRSTP_L
71C3 14B6 10D6 OUT FSB_BREQ0_L
71C3 14A3 13B2 10D6 OUT FSB_CPURST_L
71C3 14A3 10B8 OUT CPU_INTR
71C3 14A3 10B8 OUT CPU_NMI

SIGNAL ALIAS

SYNC_MASTER=M97_MLB

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 9 OF 109	



SYNC FROM T18
CHANGE CPU FROM SOCKET TO BGA SYMBOL

CPU FSB

SYNC_MASTER=T18_MLB SYNC_DATE=12/12/2007

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 10 OF 109	

(CPU CORE POWER)

=PPVCORE_S0_CPU 8D7 11B5 12D6

44 A (SV Design Target)
41 A (SV HFM)
30.4 A (SV LFM)
23 A (LV Design Target)

OMIT
U1000
PENRYN
FCBGA
3 OF 4

VCC

VCC

(CPU IO POWER 1.05V)

=PP1V05_S0_CPU 6D8 8D7 10D5 12B6 13D6

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

VCCP

(CPU INTERNAL PLL POWER 1.5V)

=PP1V5_S0_CPU 8B7 12B6

130 mA

(BR1#)

VCCA

VID0 CPU_VID<0> OUT 60C7 71A3
VID1 CPU_VID<1> OUT 60C7 71A3
VID2 CPU_VID<2> OUT 60C7 71A3
VID3 CPU_VID<3> OUT 60C7 71A3
VID4 CPU_VID<4> OUT 60C7 71A3
VID5 CPU_VID<5> OUT 60C7 71A3
VID6 CPU_VID<6> OUT 60C7 71A3

=PPVCORE_S0_CPU 8D7 11D6 12D6

R1100
100
1%
1/16W
MF-LF
402

VCCSENSE CPU_VCCSENSE_P OUT 60A5 71A3

PLACEMENT_NOTE=Place R1100 within 25.4mm of CPU, no stubs.
PLACEMENT_NOTE=Place R1101 within 25.4mm of CPU, no stubs.

VSSSENSE CPU_VCCSENSE_N OUT 60A5 71A3

R1101
100
1%
1/16W
MF-LF
402

OMIT
U1000
PENRYN
FCBGA
4 OF 4

VSS

VSS

(Socket-P KEY)

SYNC FROM T18
CHANGE CPU FROM SOCKET TO BGA SYMBOL

Current numbers from Merom for Santa Rosa EMTS, doc #20905.

CPU Power & Ground

SYNC_MASTER=T18_MLB SYNC_DATE=12/12/2007

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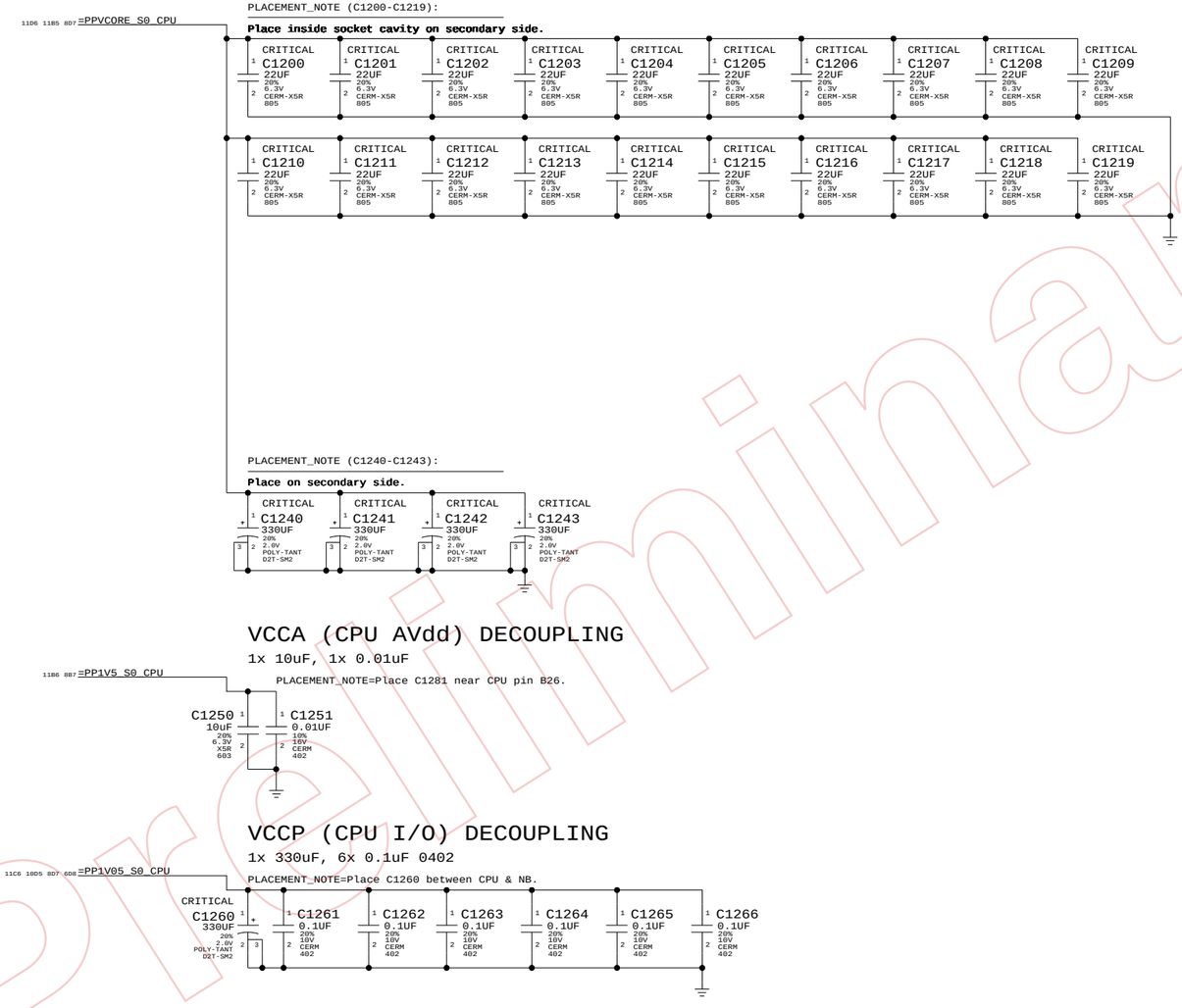
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 11 OF 109	

CPU VCore HF and Bulk Decoupling

4X 330UF. 20X 22UF 0805



VCCA (CPU AVdd) DECOUPLING

1x 10uF, 1x 0.01uF

VCCP (CPU I/O) DECOUPLING

1x 330uF, 6x 0.1uF 0402

SYNC FROM T18
REMOVE NO STUFF CAPS C1220 TO C1231
REMOVE C1244 & C1245
CHANGE C1240-C1243 AND C1260 FROM 128S0241(9 MILLI-OHM) TO 128S0231(6 MILLI-OHM)

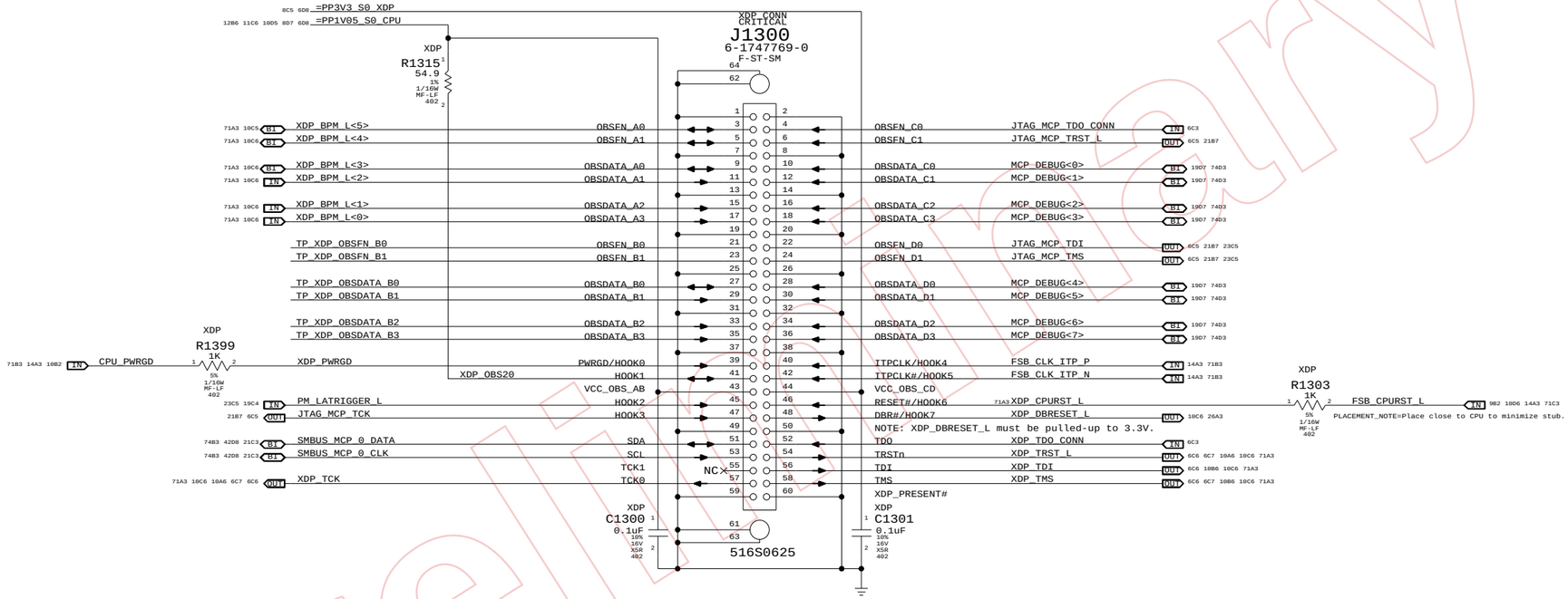
CPU Decoupling

SYNC_MASTER=RAYMOND SYNC_DATE=03/31/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 12 OF 109	

MCP79-specific pinout



SYNC FROM T18
CHANGE STANDARD XDP CONNECTOR TO SMALLER ONE 516S0625
RENAME JTAG_MCP_TDO TO JTAG_MCP_TDO_CONN
RENAME XDP_TDO TO XDP_TDO_CONN

eXtended Debug Port (XDP)

SYNC_MASTER=T18_MLB SYNC_DATE=12/12/2007

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 13 OF 109	

OMIT

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

FSB

71D3 10C4	BI	FSB_DSTB_L_P<0>	T40	CPU_DSTBP0#			
71D3 10C4	BI	FSB_DSTB_L_N<0>	U40	CPU_DSTBN0#			
71D3 10C4	BI	FSB_DINV_L<0>	V41	CPU_DBI0#			
71D3 10B4	BI	FSB_DSTB_L_P<1>	W39	CPU_DSTBP1#			
71D3 10B4	BI	FSB_DSTB_L_N<1>	W37	CPU_DSTBN1#			
71D3 10B4	BI	FSB_DINV_L<1>	V35	CPU_DBI1#			
71D3 10C2	BI	FSB_DSTB_L_P<2>	N37	CPU_DSTBP2#			
71D3 10C2	BI	FSB_DSTB_L_N<2>	L36	CPU_DSTBN2#			
71D3 10C2	BI	FSB_DINV_L<2>	N35	CPU_DBI2#			
71D3 10B2	BI	FSB_DSTB_L_P<3>	M39	CPU_DSTBP3#			
71D3 10B2	BI	FSB_DSTB_L_N<3>	M41	CPU_DSTBN3#			
71D3 10B2	BI	FSB_DINV_L<3>	J41	CPU_DBI3#			
71D3 10D8	BI	FSB_A_L<3>	AC34	CPU_A3#			
71D3 10D8	BI	FSB_A_L<4>	AE38	CPU_A4#			
71D3 10D8	BI	FSB_A_L<5>	AE34	CPU_A5#			
71D3 10D8	BI	FSB_A_L<6>	AC37	CPU_A6#			
71D3 10D8	BI	FSB_A_L<7>	AE37	CPU_A7#			
71D3 10D8	BI	FSB_A_L<8>	AE35	CPU_A8#			
71D3 10D8	BI	FSB_A_L<9>	AB35	CPU_A9#			
71D3 10D8	BI	FSB_A_L<10>	AF35	CPU_A10#			
71D3 10D8	BI	FSB_A_L<11>	AG35	CPU_A11#			
71D3 10D8	BI	FSB_A_L<12>	AG39	CPU_A12#			
71D3 10D8	BI	FSB_A_L<13>	AE33	CPU_A13#			
71D3 10D8	BI	FSB_A_L<14>	AG37	CPU_A14#			
71D3 10D8	BI	FSB_A_L<15>	AG38	CPU_A15#			
71D3 10D8	BI	FSB_A_L<16>	AG34	CPU_A16#			
71C3 10C8	BI	FSB_A_L<17>	AN38	CPU_A17#			
71C3 10C8	BI	FSB_A_L<18>	AL39	CPU_A18#			
71C3 10C8	BI	FSB_A_L<19>	AG33	CPU_A19#			
71C3 10C8	BI	FSB_A_L<20>	AL33	CPU_A20#			
71C3 10C8	BI	FSB_A_L<21>	AJ33	CPU_A21#			
71C3 10C8	BI	FSB_A_L<22>	AN36	CPU_A22#			
71C3 10C8	BI	FSB_A_L<23>	AJ35	CPU_A23#			
71C3 10C8	BI	FSB_A_L<24>	AJ37	CPU_A24#			
71C3 10C8	BI	FSB_A_L<25>	AJ36	CPU_A25#			
71C3 10C8	BI	FSB_A_L<26>	AJ38	CPU_A26#			
71C3 10C8	BI	FSB_A_L<27>	AL37	CPU_A27#			
71C3 10C8	BI	FSB_A_L<28>	AL34	CPU_A28#			
71C3 10C8	BI	FSB_A_L<29>	AN37	CPU_A29#			
71C3 10C8	BI	FSB_A_L<30>	AJ34	CPU_A30#			
71C3 10C8	BI	FSB_A_L<31>	AL38	CPU_A31#			
71C3 10C8	BI	FSB_A_L<32>	AL35	CPU_A32#			
71C3 10C8	BI	FSB_A_L<33>	AN34	CPU_A33#			
71C3 10C8	BI	FSB_A_L<34>	AR39	CPU_A34#			
71C3 10C8	BI	FSB_A_L<35>	AN35	CPU_A35#			
71C3 10D8	BI	FSB_ADSTB_L<0>	AE36	CPU_ADSTB0#			
71C3 10C8	BI	FSB_ADSTB_L<1>	AK35	CPU_ADSTB1#			
71C3 10D8	BI	FSB_REQ_L<0>	AC38	CPU_REQ0#			
71C3 10D8	BI	FSB_REQ_L<1>	AA33	CPU_REQ1#			
71C3 10D8	BI	FSB_REQ_L<2>	AC39	CPU_REQ2#			
71C3 10D8	BI	FSB_REQ_L<3>	AC33	CPU_REQ3#			
71C3 10D8	BI	FSB_REQ_L<4>	AC35	CPU_REQ4#			
71C3 10D6	BI	FSB_ADS_L	AD42	CPU_ADS#			
71C3 10D6	BI	FSB_BNR_L	AD43	CPU_BNR#			
71C3 10D6 98Z	BI	FSB_BREQ0_L	AE40	CPU_BR0#			
71C3		FSB_BREQ1_L	AL32	CPU_BR1#			
71C3 10D6	BI	FSB_DBSY_L	AD39	CPU_DBSY#			
71C3 10D6	BI	FSB_DRDY_L	AD41	CPU_DRDY#			
71C3 10C8	BI	FSB_HIT_L	AB42	CPU_HIT#			
71C3 10C8	BI	FSB_HITM_L	AD40	CPU_HITM#			
71C3 10D6	IN	FSB_LOCK_L	AC43	CPU_LOCK#			
71C3 10D6	OUT	FSB_TRDY_L	AE41	CPU_TRDY#			
9C4	OUT	CPU_PECI_MCP	E41	CPU_PECI			
71B3 60C8 40D4 10C5	OUT	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			
71C3 10D6	OUT	FSB_RS_L<0>	AC41	CPU_RS0#			
71C3 10D6	OUT	FSB_RS_L<1>	AB41	CPU_RS1#			
71C3 10D6	OUT	FSB_RS_L<2>	AC42	CPU_RS2#			
24C2	PP1V05_S0_MCP_PLL_FSB	270 mA (A01)	206 mA	AG27	+V_DLL_DLCELL_AVDD		
			20 mA	AH27	+V_PLL_MCLK		
			29 mA	AG28	+V_PLL_FSB		
			15 mA	AH28	+V_PLL_CPU		
71B3	MCP_BCLK_VML_COMP_VDD		AM39	BCLK_VML_COMP_VDD			
71B3	MCP_BCLK_VML_COMP_GND		AM40	BCLK_VML_COMP_GND			
71B3	MCP_CPU_COMP_VCC		AM43	CPU_COMP_VCC			
71B3	MCP_CPU_COMP_GND		AM42	CPU_COMP_GND			

CPU_D0#	Y43	FSB_D_L<0>	BI	10C4 71D3
CPU_D1#	W42	FSB_D_L<1>	BI	10C4 71D3
CPU_D2#	Y40	FSB_D_L<2>	BI	10C4 71D3
CPU_D3#	W41	FSB_D_L<3>	BI	10C4 71D3
CPU_D4#	Y39	FSB_D_L<4>	BI	10C4 71D3
CPU_D5#	V42	FSB_D_L<5>	BI	10C4 71D3
CPU_D6#	Y41	FSB_D_L<6>	BI	10C4 71D3
CPU_D7#	Y42	FSB_D_L<7>	BI	10C4 71D3
CPU_D8#	P42	FSB_D_L<8>	BI	10C4 71D3
CPU_D9#	U41	FSB_D_L<9>	BI	10C4 71D3
CPU_D10#	R42	FSB_D_L<10>	BI	10C4 71D3
CPU_D11#	T39	FSB_D_L<11>	BI	10C4 71D3
CPU_D12#	T42	FSB_D_L<12>	BI	10C4 71D3
CPU_D13#	T41	FSB_D_L<13>	BI	10C4 71D3
CPU_D14#	R41	FSB_D_L<14>	BI	10C4 71D3
CPU_D15#	T43	FSB_D_L<15>	BI	10C4 71D3
CPU_D16#	W35	FSB_D_L<16>	BI	10C4 71D3
CPU_D17#	AA37	FSB_D_L<17>	BI	10C4 71D3
CPU_D18#	W33	FSB_D_L<18>	BI	10C4 71D3
CPU_D19#	W34	FSB_D_L<19>	BI	10B4 71D3
CPU_D20#	AA36	FSB_D_L<20>	BI	10B4 71D3
CPU_D21#	AA34	FSB_D_L<21>	BI	10B4 71D3
CPU_D22#	AA38	FSB_D_L<22>	BI	10B4 71D3
CPU_D23#	AA35	FSB_D_L<23>	BI	10B4 71D3
CPU_D24#	U38	FSB_D_L<24>	BI	10B4 71D3
CPU_D25#	U36	FSB_D_L<25>	BI	10B4 71D3
CPU_D26#	U35	FSB_D_L<26>	BI	10B4 71D3
CPU_D27#	U33	FSB_D_L<27>	BI	10B4 71D3
CPU_D28#	U34	FSB_D_L<28>	BI	10B4 71D3
CPU_D29#	W38	FSB_D_L<29>	BI	10B4 71D3
CPU_D30#	R33	FSB_D_L<30>	BI	10B4 71D3
CPU_D31#	U37	FSB_D_L<31>	BI	10B4 71D3
CPU_D32#	N34	FSB_D_L<32>	BI	10C2 71D3
CPU_D33#	N33	FSB_D_L<33>	BI	10C2 71D3
CPU_D34#	R34	FSB_D_L<34>	BI	10C2 71D3
CPU_D35#	R35	FSB_D_L<35>	BI	10C2 71D3
CPU_D36#	P35	FSB_D_L<36>	BI	10C2 71D3
CPU_D37#	R39	FSB_D_L<37>	BI	10C2 71D3
CPU_D38#	R37	FSB_D_L<38>	BI	10C2 71D3
CPU_D39#	R38	FSB_D_L<39>	BI	10C2 71D3
CPU_D40#	L37	FSB_D_L<40>	BI	10C2 71D3
CPU_D41#	L39	FSB_D_L<41>	BI	10C2 71D3
CPU_D42#	L38	FSB_D_L<42>	BI	10C2 71D3
CPU_D43#	N36	FSB_D_L<43>	BI	10C2 71D3
CPU_D44#	N38	FSB_D_L<44>	BI	10C2 71D3
CPU_D45#	J39	FSB_D_L<45>	BI	10C2 71D3
CPU_D46#	J38	FSB_D_L<46>	BI	10C2 71D3
CPU_D47#	J37	FSB_D_L<47>	BI	10C2 71D3
CPU_D48#	L42	FSB_D_L<48>	BI	10C2 71D3
CPU_D49#	M42	FSB_D_L<49>	BI	10C2 71D3
CPU_D50#	P41	FSB_D_L<50>	BI	10C2 71D3
CPU_D51#	N41	FSB_D_L<51>	BI	10B2 71D3
CPU_D52#	N40	FSB_D_L<52>	BI	10B2 71D3
CPU_D53#	M40	FSB_D_L<53>	BI	10B2 71D3
CPU_D54#	H40	FSB_D_L<54>	BI	10B2 71D3
CPU_D55#	K42	FSB_D_L<55>	BI	10B2 71D3
CPU_D56#	H41	FSB_D_L<56>	BI	10B2 71D3
CPU_D57#	L41	FSB_D_L<57>	BI	10B2 71D3
CPU_D58#	H43	FSB_D_L<58>	BI	10B2 71D3
CPU_D59#	H42	FSB_D_L<59>	BI	10B2 71D3
CPU_D60#	K41	FSB_D_L<60>	BI	10B2 71D3
CPU_D61#	J40	FSB_D_L<61>	BI	10B2 71D3
CPU_D62#	H39	FSB_D_L<62>	BI	10B2 71D3
CPU_D63#	M43	FSB_D_L<63>	BI	10B2 71D3
CPU_BPRI#	AA41	FSB_BPRI_L	OUT	10D6 71C3
CPU_DEFER#	AA40	FSB_DEFER_L	OUT	10D6 71C3
BCLK_OUT_CPU_P	G42	FSB_CLK_CPU_P	OUT	10B6 71B3
BCLK_OUT_CPU_N	G41	FSB_CLK_CPU_N	OUT	10B6 71B3
BCLK_OUT_ITP_P	AL43	FSB_CLK_ITP_P	OUT	13C3 71B3
BCLK_OUT_ITP_N	AL42	FSB_CLK_ITP_N	OUT	13B3 71B3
BCLK_OUT_NB_P	AL41	71B3 FSB_CLK_MCP_P		
BCLK_OUT_NB_N	AK42	71B3 FSB_CLK_MCP_N		
BCLK_IN_N	AK41			
BCLK_IN_P	AJ40			
CPU_A20M#	AF41	CPU_A20M_L	OUT	10C8 71C3
CPU_IGNNE#	AH39	CPU_IGNNE_L	OUT	10C8 71C3
CPU_INIT#	AH42	CPU_INIT_L	OUT	10D6 71C3
CPU_INTR	AF42	CPU_INTR	OUT	98Z 10B8 71C3
CPU_NMI	AG41	CPU_NMI	OUT	98Z 10B8 71C3
CPU_SMI#	AH41	CPU_SMI_L	OUT	10B8 71B3
CPU_PWRGD	AH43	CPU_PWRGD		
CPU_RESET#	H38	FSB_CPURST_L	OUT	98Z 10D6 13B2 71C3
CPU_SLP#	AM33	FSB_CPUSLP_L	OUT	10A2 71B3
CPU_DPSLP#	AN33	CPU_DPSLP_L	OUT	10B2 71B3
CPU_DPWR#	AM32	FSB_DPWR_L	OUT	10B2 71B3
CPU_STPCLK#	AG42	CPU_STPCLK_L	OUT	10B8 71B3
CPU_DPRSTP#	AN32	CPU_DPRSTP_L	OUT	98Z 10B2 60C7 71B3

Loop-back clock for delay matching.

24C8 22D3 14A2 9C2 8D7 =PP1V05_S0_MCP_FSB

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

71B3 40C4 10C6 IN PM_THRMTRIP_L
71C3 10C8 IN CPU_FERR_L

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

9C1 IN =MCP_BSEL<2>
9C1 IN =MCP_BSEL<1>
9C1 IN =MCP_BSEL<0>

R1430 49.9 1% 1/16W MF-LF 402
R1435 49.9 1% 1/16W MF-LF 402
R1431 49.9 1% 1/16W MF-LF 402
R1436 49.9 1% 1/16W MF-LF 402

=PP1V05_S0_MCP_FSB 8D7 9C2 14B7 22D3 24C8
NO STUFF
R1440 150 5% 1/16W MF-LF 402
OUT 10B2 13C7 71B3

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MCP CPU Interface

SYNC_MASTER=T18_MLB SYNC_DATE=04/04/2008

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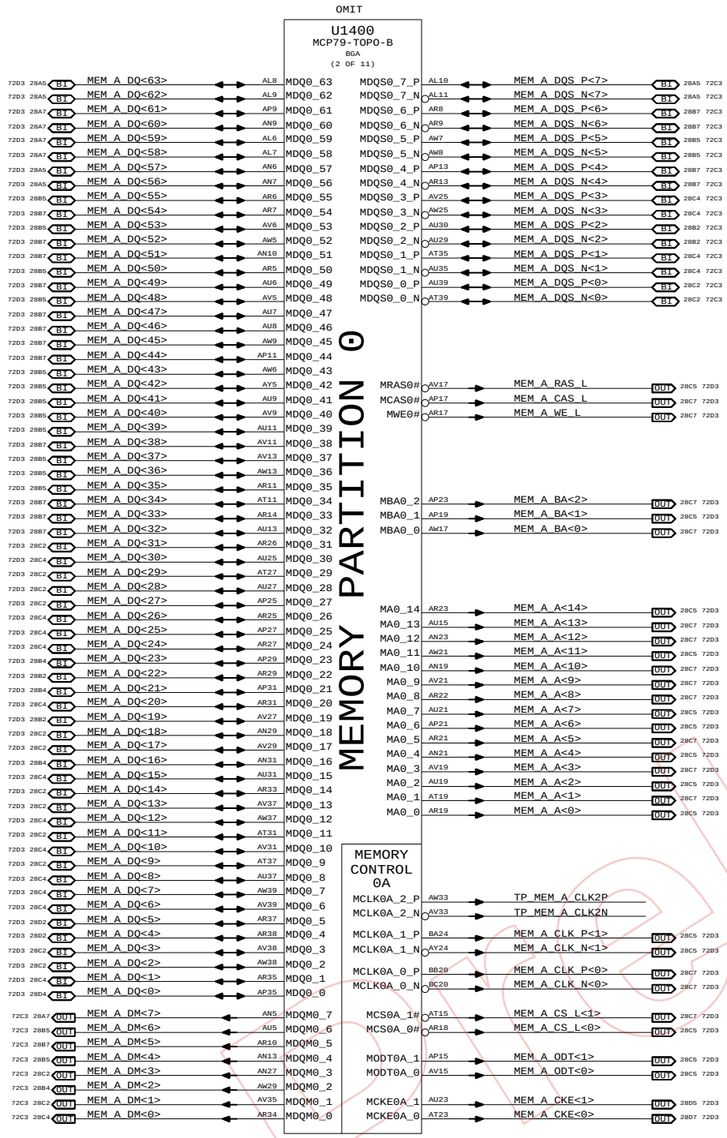
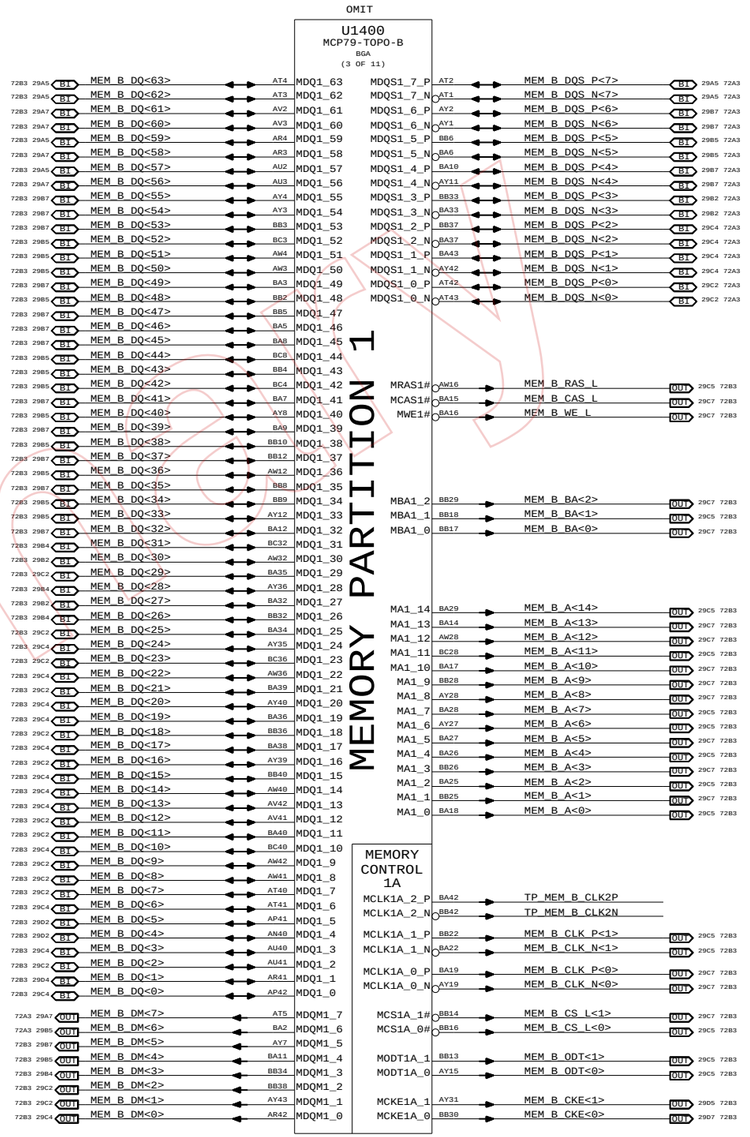
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE	SHT	OF
NONE	14	109





MCP Memory Interface

SYNC_MASTER=T18_MLB SYNC_DATE=04/04/2008

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D	051-7537	A
SCALE: NONE	SHT 15 OF 109	

OMIT

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

MEMORY CONTROL 0B

TP_MEM_A_CLK5P	AU33	MCLK0B_2_P
TP_MEM_A_CLK5N	AU34	MCLK0B_2_N
TP_MEM_A_CLK4P	BB24	MCLK0B_1_P
TP_MEM_A_CLK4N	BC24	MCLK0B_1_N
TP_MEM_A_CLK3P	BA21	MCLK0B_0_P
TP_MEM_A_CLK3N	BB21	MCLK0B_0_N
TP_MEM_A_CS_L<2>	AU17	MCS0B_0#
TP_MEM_A_CS_L<3>	AR15	MCS0B_1#
TP_MEM_A_ODT<2>	AN17	MODT0B_0
TP_MEM_A_ODT<3>	AN15	MODT0B_1
TP_MEM_A_CKE<2>	AV23	MCKE0B_0
TP_MEM_A_CKE<3>	AN25	MCKE0B_1

MEMORY CONTROL 1B

MCLK1B_2_P	BA41	TP_MEM_B_CLK5P
MCLK1B_2_N	BB41	TP_MEM_B_CLK5N
MCLK1B_1_P	AY23	TP_MEM_B_CLK4P
MCLK1B_1_N	BA23	TP_MEM_B_CLK4N
MCLK1B_0_P	BA20	TP_MEM_B_CLK3P
MCLK1B_0_N	AY20	TP_MEM_B_CLK3N
MCS1B_0#	BC16	TP_MEM_B_CS_L<2>
MCS1B_1#	BA13	TP_MEM_B_CS_L<3>
MODT1B_0	AY16	TP_MEM_B_ODT<2>
MODT1B_1	BC13	TP_MEM_B_ODT<3>
MCKE1B_0	BA30	TP_MEM_B_CKE<2>
MCKE1B_1	BA31	TP_MEM_B_CKE<3>

24C8 16C3 8B7 =PP1V8R1V5_S0_MCP_MEM

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

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

24B2 PP1V05_S0_MCP_PLL_CORE
87 mA (A01)

17 mA	T27	+V_PLL_XREF_XS
12 mA	U28	+V_PLL_DP
19 mA	U27	+V_PLL_CORE
39 mA	T28	+V_VPLL

MRESET0# AY32 → MCP_MEM_RESET_L → OUT 30B6
TP or NC for DDR2.

72A3 MCP_MEM_COMP_VDD AN41 MEM_COMP_VDD
72A3 MCP_MEM_COMP_GND AM41 MEM_COMP_GND

=PP1V8R1V5_S0_MCP_MEM
8B7 16C7 24C8
4771 mA (A01, DDR3)

+VDD_MEM1	AM17	GND1
+VDD_MEM2	AM19	GND2
+VDD_MEM3	AM21	GND3
+VDD_MEM4	AM23	GND4
+VDD_MEM5	AM25	GND5
+VDD_MEM6	AM27	GND6
+VDD_MEM7	AM29	GND7
+VDD_MEM8	AN16	GND8
+VDD_MEM9	BC29	GND9
+VDD_MEM10	AN20	GND10
+VDD_MEM11	AN24	GND11
+VDD_MEM12	AT17	GND12
+VDD_MEM13	AP16	GND13
+VDD_MEM14	AN22	GND14
+VDD_MEM15	AP20	GND15
+VDD_MEM16	AP24	GND16
+VDD_MEM17	AV16	GND17
+VDD_MEM18	AR16	GND18
+VDD_MEM19	AR20	GND19
+VDD_MEM20	AR24	GND20
+VDD_MEM21	AW15	GND21
+VDD_MEM22	AP22	GND22
+VDD_MEM23	AP18	GND23
+VDD_MEM24	AU16	GND24
+VDD_MEM25	AN18	GND25
+VDD_MEM26	AU24	GND26
+VDD_MEM27	AT21	GND27
+VDD_MEM28	AY29	GND28
+VDD_MEM29	AV24	GND29
+VDD_MEM30	AU20	GND30
+VDD_MEM31	AU22	GND31
+VDD_MEM32	AW27	GND32
+VDD_MEM33	BC17	GND33
+VDD_MEM34	AV20	GND34
+VDD_MEM35	AY17	GND35
+VDD_MEM36	AY18	GND36
+VDD_MEM37	AM15	GND37
+VDD_MEM38	AU18	GND38
+VDD_MEM39	AY25	GND39
+VDD_MEM40	AY26	GND40
+VDD_MEM41	AW19	GND41
+VDD_MEM42	AW24	GND42
+VDD_MEM43	BC25	GND43
+VDD_MEM44	AL30	GND44
+VDD_MEM45	AM31	GND45

GND55	T33	GND46
GND56	T34	GND47
GND57	T35	GND48
GND58	T37	GND49
GND59	T38	GND50
GND60	T7	GND51
GND61	T9	GND52
GND62	U18	GND53
GND63	U20	GND54
GND64	U22	

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MCP Memory Misc

SYNC_MASTER=T18_MLB SYNC_DATE=04/04/2008

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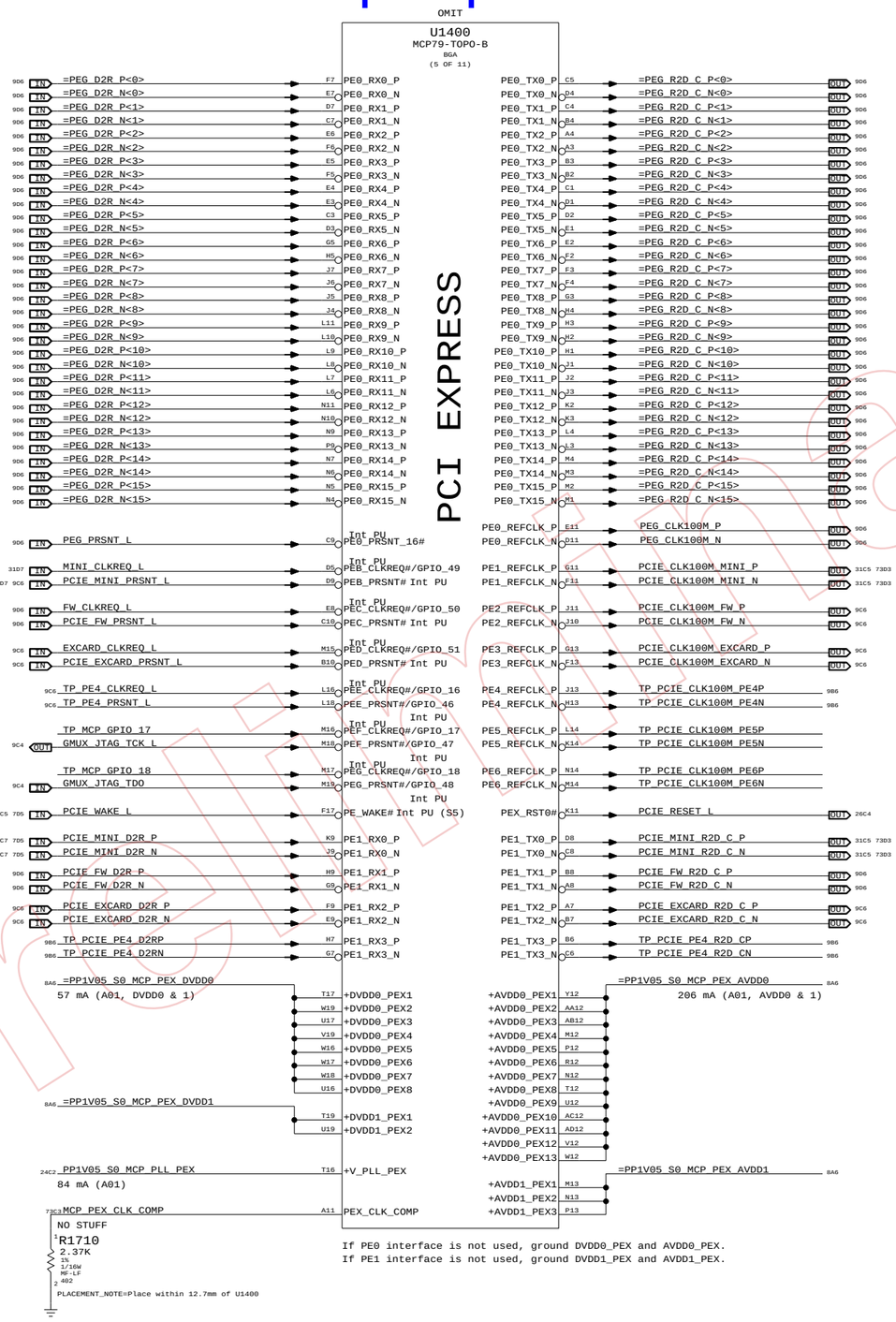
SCALE	SHT	OF
NONE	16	109



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=04/04/2008

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D	051-7537	A
SCALE: NONE	SHT 17 OF 109	

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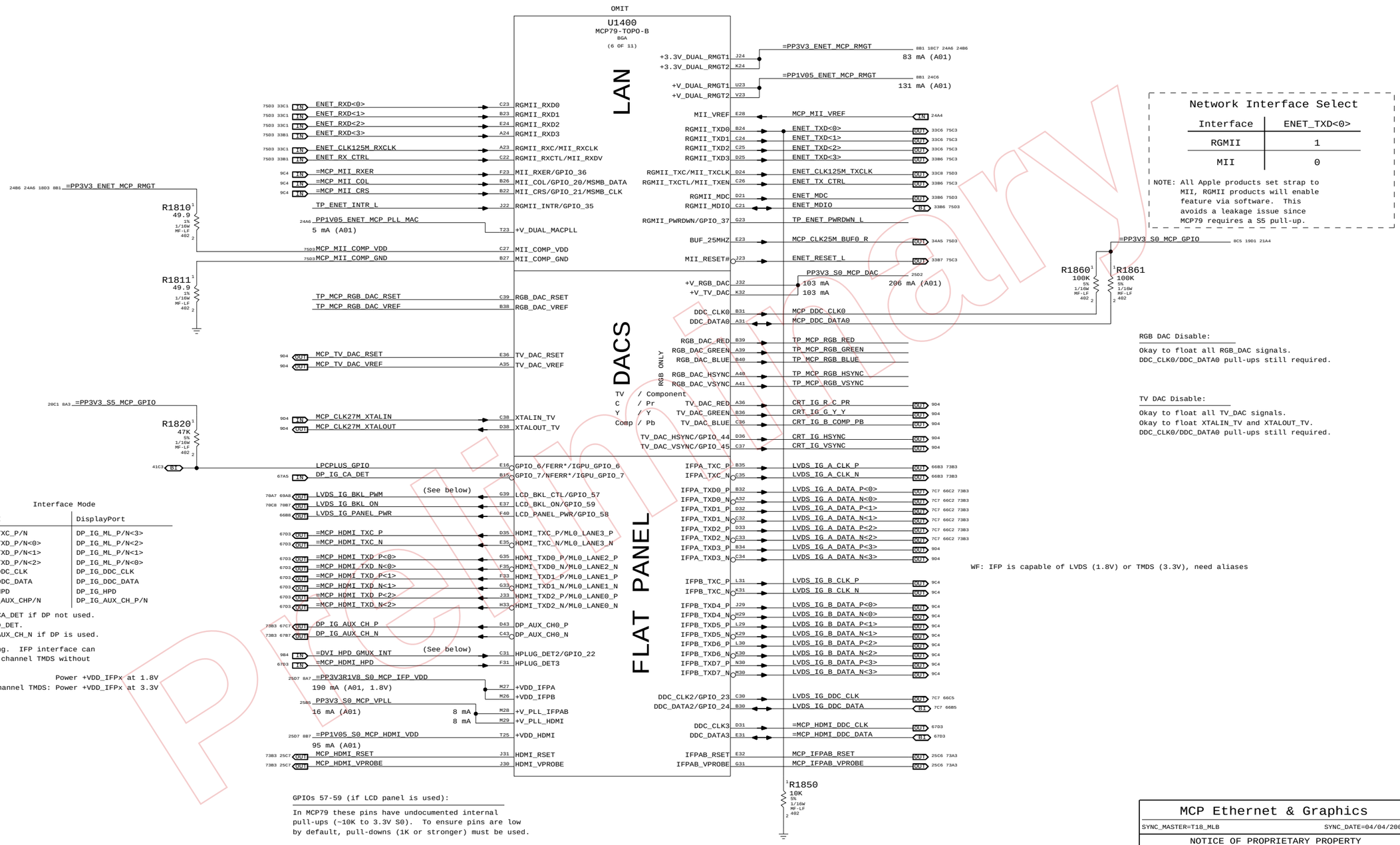

Network Interface Select

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.

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

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.

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MCP Ethernet & Graphics

SYNC_MASTER=T18_MLB SYNC_DATE=04/04/2008

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SCALE: NONE	SHT 18 OF 109	

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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	OUT 9C4
PCI_GNT3#/GPIO_39/RS232_RTS#	U11	GMUX_JTAG_TDI	OUT 9C4
PCI_GNT4#/GPIO_53/RS232_SOUT#	P3	MCP_RS232_SOUT_L	OUT 19D2
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 Int PU (S5)	T1	PM_LATRIGGER_L	OUT 13B6 23C5
PCI_RESET0#	R10	MEM_VTT_EN_R	OUT 26C4
PCI_RESET1#	R11	TP_PCI_RESET1_L	
PCI_CLK0	R6	TP_PCI_CLK0	
PCI_CLK1	R7	TP_PCI_CLK1	
PCI_CLK2	R8	74C3 PCI_CLK33M_MCP_R	
PCI_CLKIN	R9	74C3 PCI_CLK33M_MCP	

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

LPC

LPC_FRAME#	AD4	41C1 LPC_FRAME_R_L	R1960 22 5% 1/16W MF-LF 402	LPC_FRAME_L OUT 39C8 41D5 74C3
LPC_PWRDWN#/GPIO_54/EXT_NMI#	AE12	LPC_PWRDWN_L		OUT 39C5 41D3
LPC_RESET0#	AE5	LPC_RESET_L		OUT 26D4 74C3
LPC_AD0	AD3	LPC_AD_R<0>	R1950 22 5% 1/16W MF-LF 402	LPC_AD<0> BI 39C8 41D5 74C3
LPC_AD1	AD2	LPC_AD_R<1>	R1951 22 5% 1/16W MF-LF 402	LPC_AD<1> BI 39C8 41D5 74C3
LPC_AD2	AD1	LPC_AD_R<2>	R1952 22 5% 1/16W MF-LF 402	LPC_AD<2> BI 39C8 41D3 74C3
LPC_AD3	AD5	LPC_AD_R<3>	R1953 22 5% 1/16W MF-LF 402	LPC_AD<3> BI 39C8 41D3 74C3
LPC_CLK0	AE9	LPC_CLK33M_SMC_R		OUT 26C4 74C3

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

21A4 18C1 8C5 =PP3V3_S0_MCP_GPIO

19D4 MCP_RS232_SOUT_L	R1989	8.2K	5% 1/16W MF-LF 402
74D3 19D7 PCI_REQ0_L	R1990	8.2K	5% 1/16W MF-LF 402
74D3 19D7 PCI_REQ1_L	R1991	8.2K	5% 1/16W MF-LF 402
19D7 CRTMUX_SEL_TV_L	R1992	8.2K	5% 1/16W MF-LF 402
19D7 MCP_RS232_SIN_L	R1994	8.2K	5% 1/16W MF-LF 402

MCP PCI & LPC

SYNC_MASTER=T18_MLB SYNC_DATE=04/04/2008

APPLE INC.

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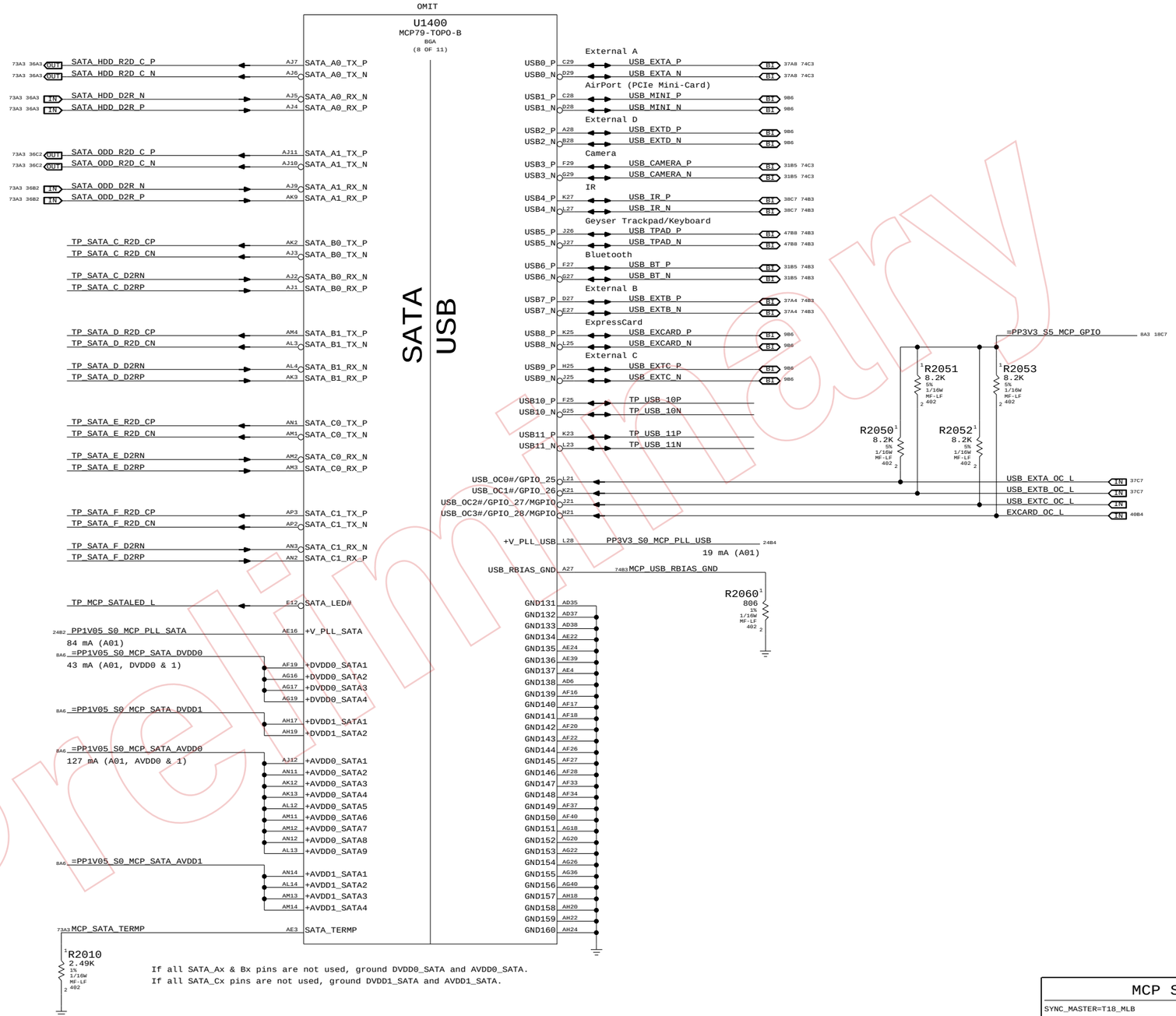
D	051-7537	A
SCALE: NONE	SHT 19 OF 109	



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.

MCP SATA & USB

SYNC_MASTER=T18_MLB SYNC_DATE=04/04/2008

APPLE INC.

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SCALE: NONE	SHT 20 OF 109	

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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)) → AE18 +V_PLL_NV_H (20 mA), AE17 +V_PLL_SP_SPREF (17 mA)

=PP3V3R1V5_S0_MCP_HDA (7 mA (A01)) → R2160 8.2K 5% 1/10W MF-LF 402 → +V_DUAL_HDA1 J16, +V_DUAL_HDA2 K16

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

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#
PM_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

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

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

HDA_DOCK_EN#/GPIO_4/PS2_MS_CLK	K17	MCP_GPIO_4	21A4
HDA_DOCK_RST#/GPIO_5/PS2_MS_DATA	L17	AUD_I2C_INT_L	IN 21A4 52C7
SLP_S3#	G17	PM_SLP_S3_L	OUT 7C3 34B7 39C5 41A5 64D5 68D8
SLP_RMGT#	J17	PM_SLP_RMGT_L	OUT 9D1
SLP_S5#	M17	PM_SLP_S4_L	OUT 7C3 39C5 40A2 64C8
THERM_DIODE_P	B11	MCP_THMDIODE_P	OUT 45C5 77D3
THERM_DIODE_N	C11	MCP_THMDIODE_N	OUT 45B5 77D3
MCP_VID0/GPIO_13	L20	MCP_VID<0>	OUT 21A3 61A8
MCP_VID1/GPIO_14	M20	MCP_VID<1>	OUT 21A3 61A8
MCP_VID2/GPIO_15	M21	MCP_VID<2>	OUT 21A3 61A8
SPKR	C13	MCP_SPKR	OUT 23B5
SMB_CLK0	L19	SMBUS_MCP_0_CLK	OUT 13B6 42D8 74B3
SMB_DATA0	K19	SMBUS_MCP_0_DATA	BI 13B6 42D8 74B3
SMB_CLK1/MSMB_CLK	G21	SMBUS_MCP_1_CLK	OUT 42C8 74B3
SMB_DATA1/MSMB_DATA	F21	SMBUS_MCP_1_DATA	BI 42C8 74B3
SMB_ALERT#/GPIO_64	M23	AP_PWR_EN	OUT 21A3 31D5 34C7
(MGPIO2) FANRPM0/GPIO_60	B12	MEM_EVENT_L	IN 21A4 28A5 29A5 39B8
FANCTL0/GPIO_61	A12	ODD_PWR_EN_L	OUT 36C6
(MGPIO3) FANRPM1/GPIO_63	D12	SMC_IG_THROTTLE_L	IN 21A4 40D4
FANCTL1/GPIO_62	C12	ARB_DETECT	21A4
CPUVDD_EN	D17	MCP_CPUVDD_EN	OUT 26A8
SPI_CS0/GPIO_10	C14	SPI_CS0_R_L	OUT 41B7 74A3
SPI_CLK/GPIO_11	D13	SPI_CLK_R	OUT 41A5 41C8 74A3
SPI_DI/GPIO_8	C15	SPI_MISO	IN 41A5 41B7 74A3
SPI_DO/GPIO_9	B14	SPI_MOSI_R	OUT 41A5 41C7 74A3
SUS_CLK/GPIO_34	B18	PM_CLK32K_SUSCLK_R	OUT 26B4 74A3
BUF_SIO_CLK	AE7	TP_MCP_BUF_SIO_CLK	
TEST_MODE_EN	K22	MCP_TEST_MODE_EN	
PKG_TEST	L22		

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

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

=PP3V3_S0_MCP_GPIO → R2140 10K, R2141 10K, R2142 10K, R2143 10K
MCP_GPIO_4
AUD_I2C_INT_L
MEM_EVENT_L
SMC_IG_THROTTLE_L
ARB_DETECT → R2147 100K

=PP3V3_S3_MCP_GPIO → R2154 100K → AP_PWR_EN

MCP_VID<0>, MCP_VID<1>, MCP_VID<2> → R2155 22K, R2156 22K, R2157 22K

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=06/26/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 21 OF 109	

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

61B1 44D7 24D8 8C8 =PPVCORE_S0_MCP
23065 mA (A01, 1.2V)
16996 mA (A01, 1.0V)

AA25	+VDD_CORE1	+VTT_CPU1	R32
AC23	+VDD_CORE2	+VTT_CPU2	AC32
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
AG3	+VDD_CORE55		
AG4	+VDD_CORE56		
AA21	+VDD_CORE57		
AG6	+VDD_CORE58		
AG7	+VDD_CORE59	+3.3V_1	AD10
AG8	+VDD_CORE60	+3.3V_2	AE8
AG9	+VDD_CORE61	+3.3V_3	AB10
AH1	+VDD_CORE62	+3.3V_4	AD9
AH10	+VDD_CORE63	+3.3V_5	Y10
AH11	+VDD_CORE64	+3.3V_6	AB11
W26	+VDD_CORE65	+3.3V_7	AA8
AH2	+VDD_CORE66	+3.3V_8	Y9
AA23	+VDD_CORE67		
W28	+VDD_CORE68		
AH25	+VDD_CORE69		
AH21	+VDD_CORE70	+3.3V_DUAL1	G18
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
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
		+VDD_AUXC2	U21
A20	+VBAT	+VDD_AUXC3	V21

=PP1V05_S0_MCP_FSB
1139 mA
BD7 9C2 14A2 14B7 24C8
1182 mA (A01)

=PP3V3_S0_MCP
8C5 21C2 24B8
450 mA (A01)

=PP3V3_S5_MCP
8A3 24B8
16 mA
266 mA (A01)

250 mA

=PP1V05_S5_MCP_VDD_AUXC
8B3 24C8
105 mA (A01)

26D4 21C8 7C3 PP3V3_G3_RTC
10 uA (G3)
80 uA (S0)

MCP Power & Ground

SYNC_MASTER=T18_MLB
SYNC_DATE=04/04/2008

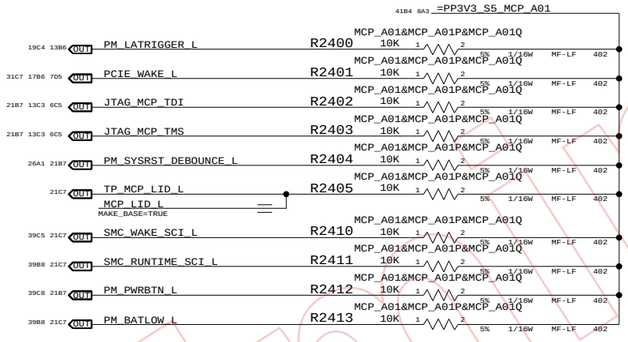
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 22 OF 109	

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.



MCP_SAFE_MODE SIGNAL TO SUPPORT ROM FAILURE OVERRIDE

RADAR 5925345

MCP79 A01 Silicon Support

SYNC_MASTER=T18_MLB SYNC_DATE=03/08/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE	SHT	OF
NONE	24	109

MCP Core Power

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

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)

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

=PP1V05_S0_MCP_FSB
1182 mA (A01)

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

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

=PP3V3_S0_MCP
450 mA (A01)

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

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

=PP3V3_S0_MCP_PLL_UF
19 mA (A01)

L2555 30-OHM-1.7A 0402

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

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

MCP 3.3V AUX/USB Power

=PP3V3_S5_MCP
266 mA (A01)

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

C2560 2.2UF 20% 6.3V CERM 402-LF

MCP 3.3V Ethernet Power

=PP3V3_ENET_MCP_RMGT
83 mA (A01)

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

C2564 2.2UF 20% 6.3V CERM 402-LF

MCP 3.3V/1.5V HDA Power

=PP3V3R1V5_S0_MCP_HDA
7 mA (A01)

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

C2562 2.2UF 20% 6.3V CERM 402-LF

MCP79 Ethernet VRef

=PP3V3_ENET_MCP_RMGT

R2591 1.47K 1% 1/16W MF-LF 402
R2590 1.47K 1% 1/16W MF-LF 402
MCP_MII_VREF (OUT)
C2591 0.1UF 20% 10V CERM 402

MCP 3.3V/1.5V PLL Power

=PP3V3R1V5_S0_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

=PP1V05_S0_MCP_AVDD_UF
333 mA (A01)

L2570 30-OHM-5A 0603

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)

PP1V05_S0_MCP_PEX_AVDD
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
206 mA (A01)

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

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

PP1V05_S0_MCP_SATA_AVDD
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
127 mA (A01)

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)

L2580 30-OHM-1.7A 0402

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 0.1UF 20% 10V CERM 402

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

MCP Standard Decoupling

SYNC_MASTER=T18_MLB
SYNC_DATE=04/04/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 25 OF 109	

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

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

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

18B6 8A7 =PP3V3R1V8_S0_MCP_IFP_VDD
190 mA (A01, 1.8V)

C2610 2.2UF 20% 6.3V CERM 402-LF

18A6 8B7 =PP1V05_S0_MCP_HDMI_VDD
95 mA (A01)

C2615 4.7UF 20% 4V X5R 402
C2616 0.1UF 20% 10V CERM 402

73B3 18A6 MCP_HDMI_RSET
73B3 18A6 MCP_HDMI_VPROBE

NO STUFF
C2620 0.1UF 20% 10V CERM 402
R2620 1K 1% 1/16W MF-LF 402

73A3 18A3 MCP_IFPAB_RSET
73A3 18A3 MCP_IFPAB_VPROBE

NO STUFF
C2630 0.1UF 20% 10V CERM 402
NO STUFF
R2630 1K 1% 1/16W MF-LF 402

WF: Checklist says 0-ohm resistor placeholder for ferrite bead.
NV: 1x 4.7uF 0603, 1x 0.1uF 0402 (4.8 uF)
Apple: ???

8C5 =PP3V3_S0_MCP_VPLL_UF
16 mA (A01)

L2640 30-OHM-1.7A 0402

PP3V3_S0_MCP_VPLL
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=3.3V
18A6
16 mA (A01)

C2640 4.7UF 20% 6.3V CERM 603
C2641 0.1uF 20% 10V CERM 402

8C5 =PP3V3_S0_MCP_DAC_UF
206 mA (A01)

NO STUFF
L2650 30-OHM-1.7A 0402

NV: 1x 4.7uF 0603, 2x 0.1uF 0402 (4.9 uF)
Apple: 2x 2.2uF 0402 (4.4 uF)

PP3V3_S0_MCP_DAC
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=3.3V
18C3
206 mA (A01)

NO STUFF
C2650 2.2UF 20% 6.3V CERM 402-LF
R2651 0 5% 1/16W MF-LF 402

HDCP ROM

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

88B5 =PP3V3_S0_HDCPROM

C2690 0.1UF 20% 10V CERM 402

NOSTUFF
U2695 AT24C08 SOIC
A0 A1 A2 GND
SDA =I2C_HDCPROM_SDA (IO) 42C6
SCL =I2C_HDCPROM_SCL (IN) 42C6
WP HDCPROM_WP 25A8

R2690 10K 5% 1/16W MF-LF 402

NOSTUFF
U2690 AT24C01B SOT23
25A7 HDCPROM_WP
WP SDA SCL GND

SYNC FROM T18
REMOVE MCP 27MHZ CRYSTAL CRICUIT SINCE NOT SUPPORTING TV-OUT
REMOVE DAC TERMINATIONS R2665,C2665 AND R2670 TO R2672
NOSTUFF PP3V3_S0_MCP_DAC RAIL COMPONENTS (L2650 AND C2650)
CHANGE C2651 TO R2651 TO GND PP3V3_S0_MCP_DAC

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

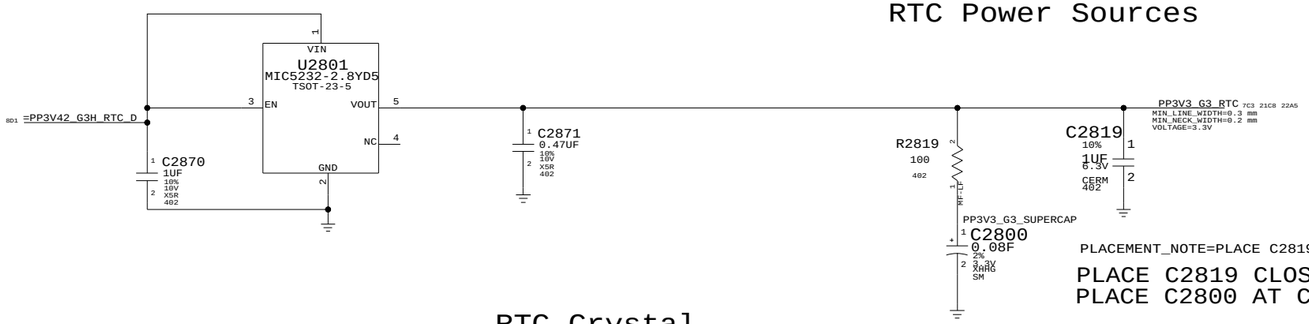
MCP Graphics Support

SYNC_MASTER=T18_MLB SYNC_DATE=12/12/2007

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 26 OF 109	

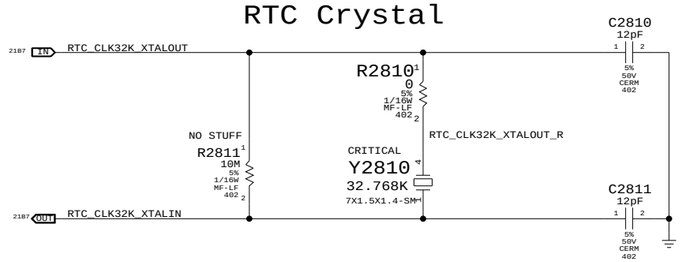
RTC Power Sources



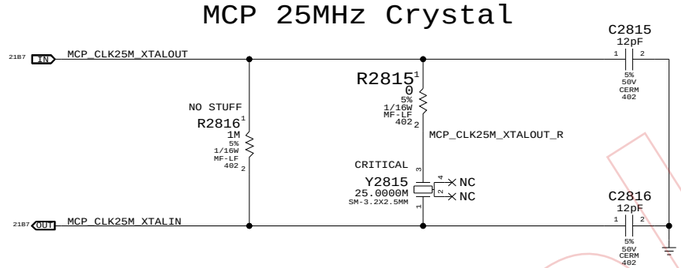
PLACEMENT_NOTE=PLACE C2819 CLOSE TO MCP79

PLACE C2819 CLOSE TO MCP79
PLACE C2800 AT COOLEST SPOT ON MLB

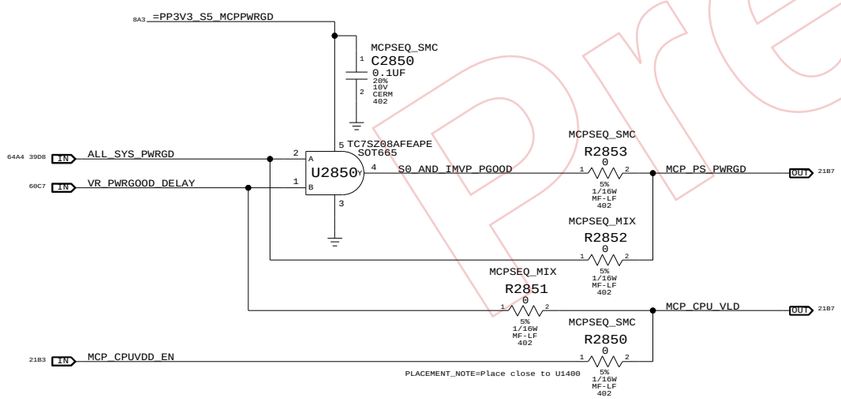
RTC Crystal



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.

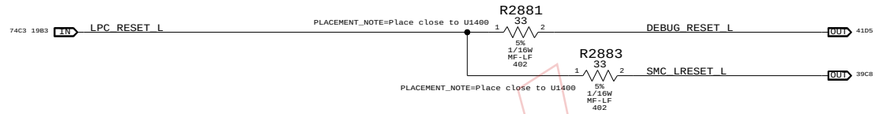
MCPSEQ_MIX is cross between MLB and internal power sequencing, which results in earlier ROMSIP and MCP FSB I/O interface initialization.

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).

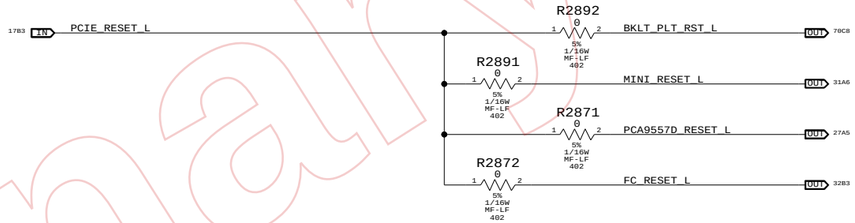
NOTE: If CPU_VLD deasserts during S0 MCP79 will take system to S5 immediately.

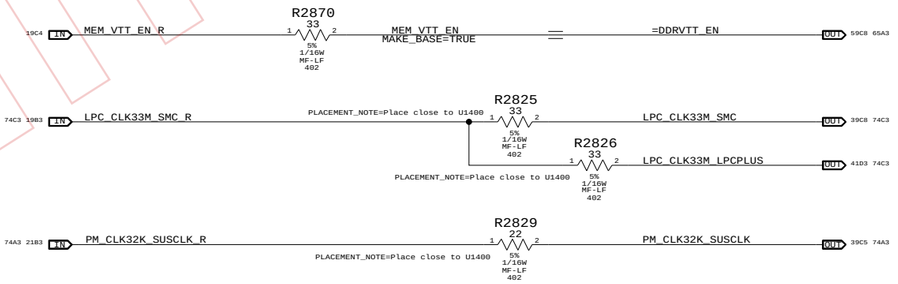
Platform Reset Connections

LPC Reset (Unbuffered)

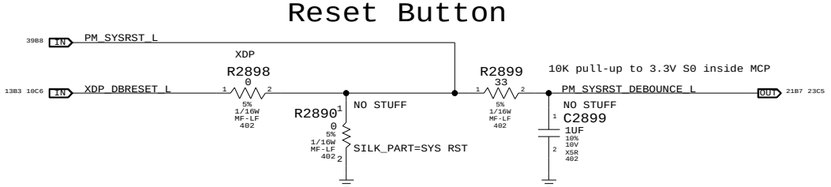


PCIE Reset (Unbuffered)





Reset Button



SYNC FROM T18
CHANGE RESET BUTTOM TO RESET PADS
REMOVE UNUSED PCIE RESET SIGNALS
REMOVE R2824 AND NET PCI_CLK33M_SLOT_A
CHANGE RTC COIN CELL TO LDO & SUPERCAP
ALIAS MEM_VTT_EN TO =DDRVTT_EN
CHANGE Y2810 AND U2850 TO SMALLER PARTS

SB Misc

SYNC_MASTER=RAYMOND SYNC_DATE=04/05/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 28 OF 109	

Page Notes

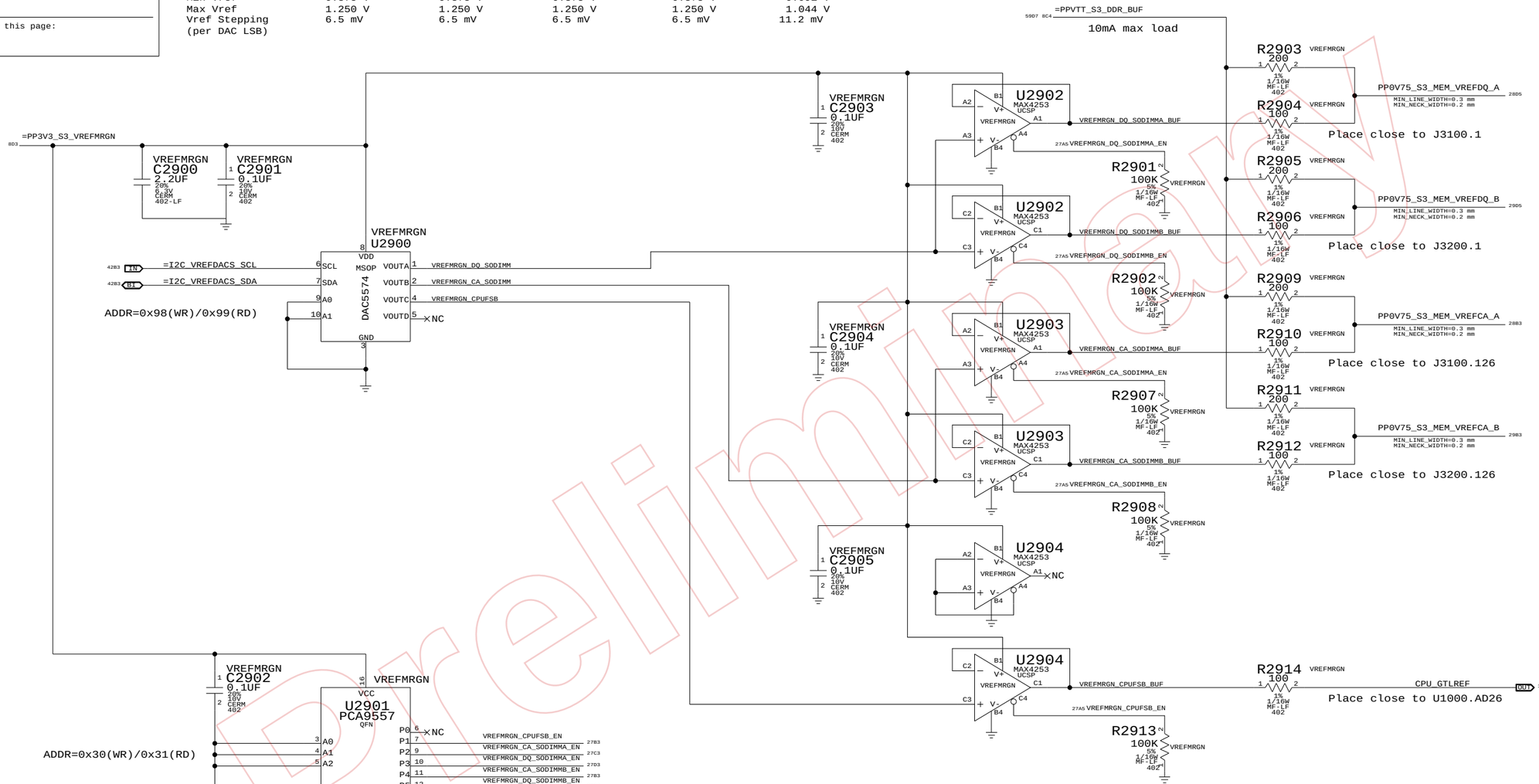
Power aliases required by this page:
- =PP3V3_S3_VREFMRGN
- =PP3V3_S5_VREFMRGN
- =PPVTT_S3_DDR_BUF

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

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

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



Required zero ohm resistors when no VREF margining circuit stuffed

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
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 Vref Margining

SYNC_MASTER=BEN SYNC_DATE=03/31/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 29 OF 109	

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)

DDR3 DECOUPLING AND GROUND RETURN CAPS (CONNECTOR SIDE)

8D3 =PP1V5_S3_MEM_A

C3100 10UF 20% 6.3V X5R 603
C3101 10UF 20% 6.3V X5R 603
C3110 0.1UF 20% 6.3V X5S-CERM 0204-1
C3111 0.1UF 20% 6.3V X5S-CERM 0204-1
C3112 0.1UF 20% 6.3V X5S-CERM 0204-1
C3113 0.1UF 20% 6.3V X5S-CERM 0204-1
C3114 0.1UF 20% 6.3V X5S-CERM 0204-1
C3115 0.1UF 20% 6.3V X5S-CERM 0204-1
C3116 0.1UF 20% 6.3V X5S-CERM 0204-1
C3117 0.1UF 20% 6.3V X5S-CERM 0204-1

27D1 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)

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

KEY

516-0201

SPD ADDR=0xA0(WR)/0xA1(RD)

8B5 =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

C3150 2.2UF 20% 6.3V CERM 402-LF
C3151 2.2UF 20% 6.3V CERM 402-LF

PP0V75_S3_MEM_VREFCA_A 27C1

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

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

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

KEY

516-0201

"Factory" (top) slot

DDR3 SO-DIMM Connector A

SYNC_MASTER=BEN SYNC_DATE=06/30/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 31 OF 109	

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)

DDR3 DECOUPLING AND GROUND RETURN CAPS (CONNECTOR SIDE)

=PP1V5_S3_MEM_B

C3200 10UF 20% 6.3V X5R 603
C3201 10UF 20% 6.3V X5R 603
C3210 0.1UF 20% 6.3V X6S-CERM 0204-1
C3211 0.1UF 20% 6.3V X6S-CERM 0204-1
C3212 0.1UF 20% 6.3V X6S-CERM 0204-1
C3213 0.1UF 20% 6.3V X6S-CERM 0204-1
C3214 0.1UF 20% 6.3V X6S-CERM 0204-1
C3215 0.1UF 20% 6.3V X6S-CERM 0204-1
C3216 0.1UF 20% 6.3V X6S-CERM 0204-1
C3217 0.1UF 20% 6.3V X6S-CERM 0204-1

PP0V75_S3_MEM_VREFDQ_B

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

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

KEY

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

516S0706
SPD ADDR=0xA2(WR)/0xA3(RD)

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

KEY

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

516S0706

PP0V75_S3_MEM_VREFCA_B

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

R3240 10K 5% 1/16W MF-LF 402
C3240 2.2UF 20% 6.3V CERM 402-LF
R3241 10K 5% 1/16W MF-LF 402

=PPSPD_S0_MEM_B

=PP0V75_S0_MEM_VTT_B

C3250 2.2UF 20% 6.3V CERM 402-LF
C3251 2.2UF 20% 6.3V CERM 402-LF

DDR3 GROUND RETURN CAPS (MCP SIDE)

=PP1V5_S0_MEM_MCP

C3222 0.1UF 20% 6.3V X6S-CERM 0204-1
C3223 0.1UF 20% 6.3V X6S-CERM 0204-1
C3224 0.1UF 20% 6.3V X6S-CERM 0204-1
C3225 0.1UF 20% 6.3V X6S-CERM 0204-1
C3226 0.1UF 20% 6.3V X6S-CERM 0204-1
C3227 0.1UF 20% 6.3V X6S-CERM 0204-1
C3228 0.1UF 20% 6.3V X6S-CERM 0204-1
C3229 0.1UF 20% 6.3V X6S-CERM 0204-1

"Expansion" (bottom) slot

DDR3 SO-DIMM Connector B

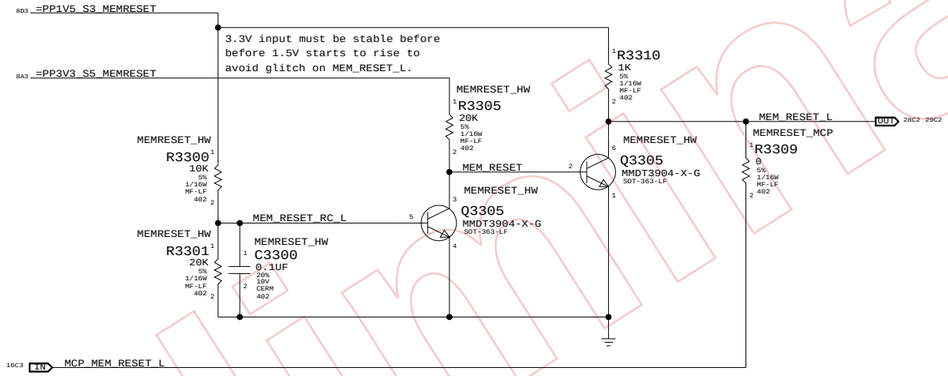
SYNC_MASTER=BEN SYNC_DATE=05/09/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 32 OF 109	

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=04/04/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 33 OF 109	

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

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_Q_L
PCIE_WAKE_L
NC
NC

PLACEMENT_NOTE=Place close to J3401.
C3431 0.1uF 10% 16V X5R 402
PCIE_MINI_R2D_C_P
PCIE_MINI_R2D_C_N
C3430 0.1uF 10% 16V X5R 402
PLACEMENT_NOTE=Place close to J3401.

AIRPORT

CRITICAL
L3401 90-OHM-100MA DLP11S
PCIE_CLK100M_MINI_P
PCIE_CLK100M_MINI_N
PLACEMENT_NOTE=Place close to J3401.

1000 mA peak
750 mA nominal max
PP5V_WLAN
MIN_LINE_WIDTH=1 mm
MIN_NECK_WIDTH=0.5 mm
VOLTAGE=5V

L3404 FERR-120-OHM-1.5A 0402-LF
C3422 0.1uF 20% 10V CERM 402
C3421 0.1uF 20% 10V CERM 402
C3420 10UF 20% 10V 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
P5VWLAN_SS
C3451 0.033UF 10% 16V X5R 402
R3450 100K 5% 1/16W MF-LF 402
R3451 10K 5% 1/16W MF-LF 402
=PP5V_S3_WLAN
MIN_LINE_WIDTH=1 mm
MIN_NECK_WIDTH=0.5 mm
VOLTAGE=5V
PM_WLAN_EN_L

ALS
CAMERA

PP5V_S3_BTCAMERA_F
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
CONN_USB2_BT_P
CONN_USB2_BT_N

275 mA peak
200 mA nominal max
L3405 FERR-120-OHM-1.5A 0402-LF
C3452 0.1uF 20% 10V CERM 402
=PP5V_S3_BTCAMERA
MIN_LINE_WIDTH=0.5 mm
MIN_NECK_WIDTH=0.25 mm
VOLTAGE=5V

CRITICAL
L3402 90-OHM DLP0NS
USB_CAMERA_P
USB_CAMERA_N
PLACEMENT_NOTE=Place close to J3401.

BLUETOOTH

CRITICAL
L3403 90-OHM DLP0NS
USB_BT_P
USB_BT_N
PLACEMENT_NOTE=Place close to J3401.

=PP3V3_S3_WLAN
PP5V_WLAN_F
U3402 74LVC1G17DRL SOT-553
TC7SZ08AFEAPE SOT665
U3401
MINI_RESET_CONN_L
WLAN_SMIT_BUF
WLAN_SMIT_RC
MINI_RESET_L
R3453 33K 5% 1/16W MF-LF 402
R3454 62K 5% 1/16W MF-LF 402
C3453 1UF 10% 6.3V CERM 402
NC
NC

Right Clutch Connector

SYNC_MASTER=YITE
SYNC_DATE=04/22/2008

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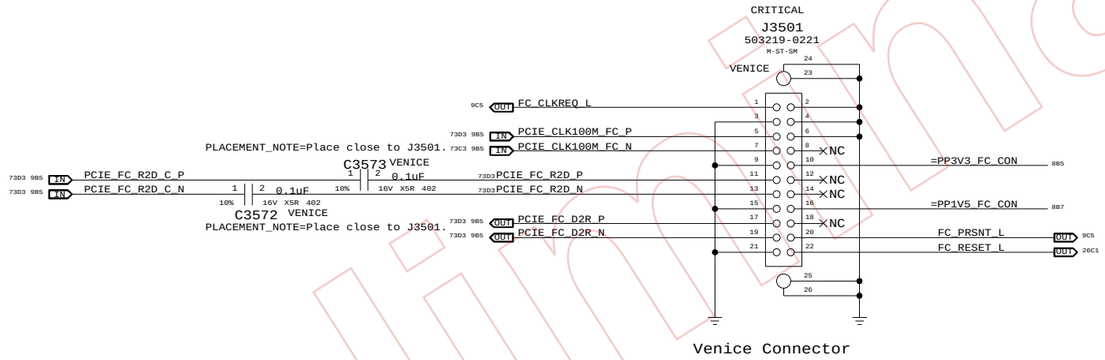
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 34 OF 109	



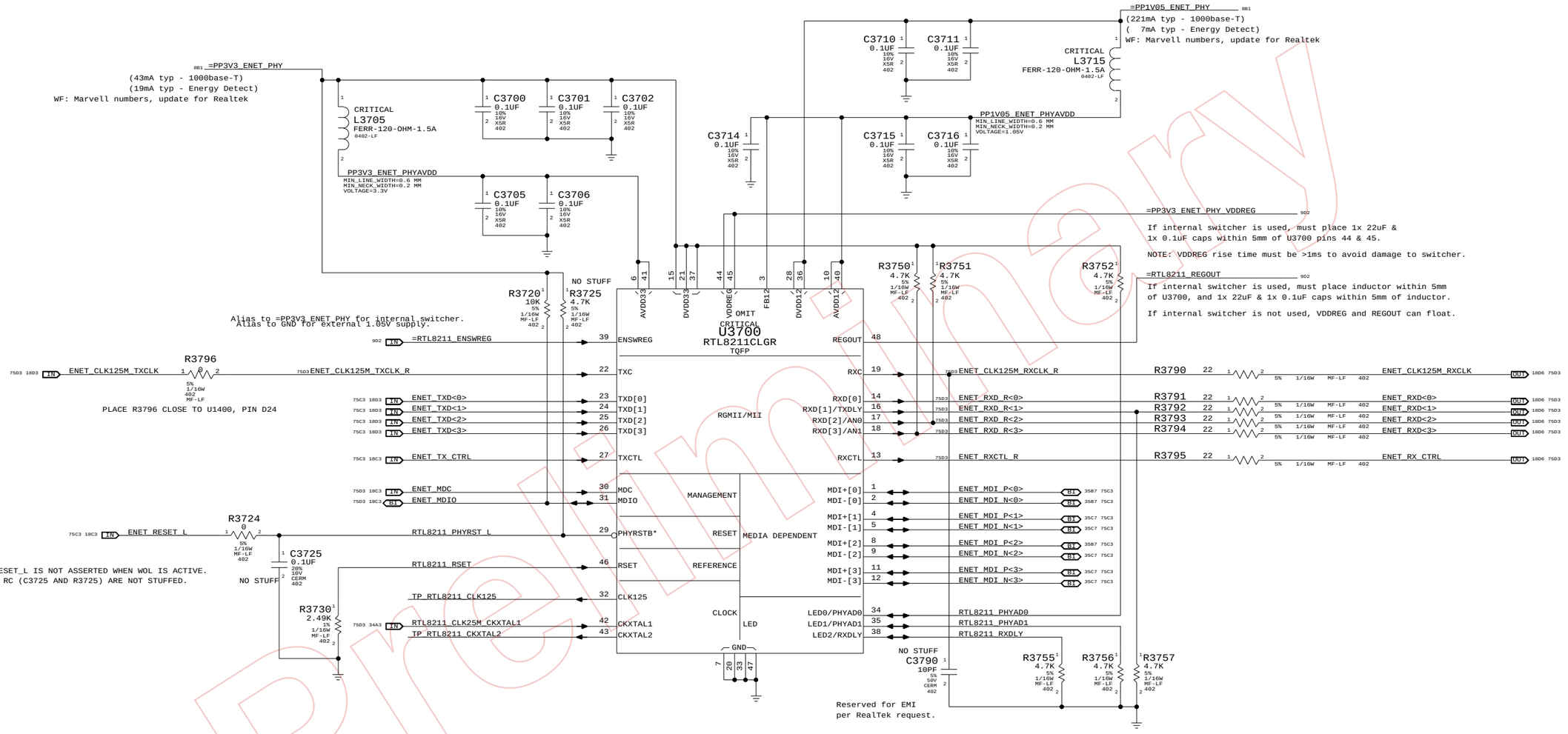
Venice Connector

VENICE CONNECTOR

SYNC_MASTER=YITE SYNC_DATE=03/13/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE	SHT	OF
NONE	35	109



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 SYNC_DATE=05/23/2008

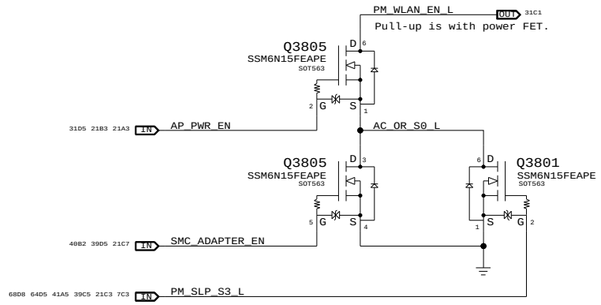
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 37 OF 109	

WLAN Enable Generation

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

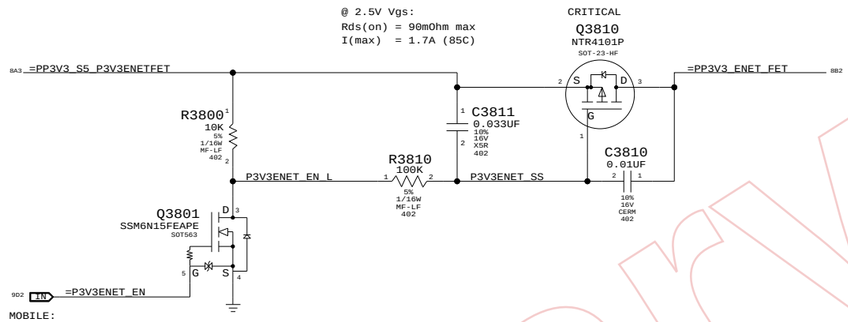
NOTE: S3 term is guaranteed by S3 pull-up on open-drain AP_PWR_EN signal.



3.3V ENET FET

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

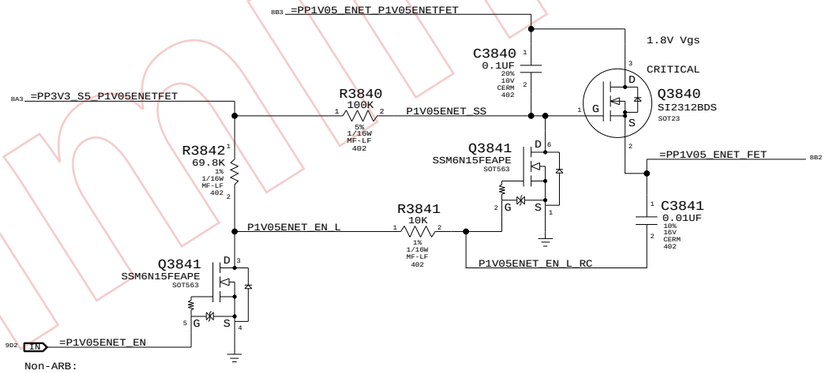
CRITICAL



MOBILE:

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

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

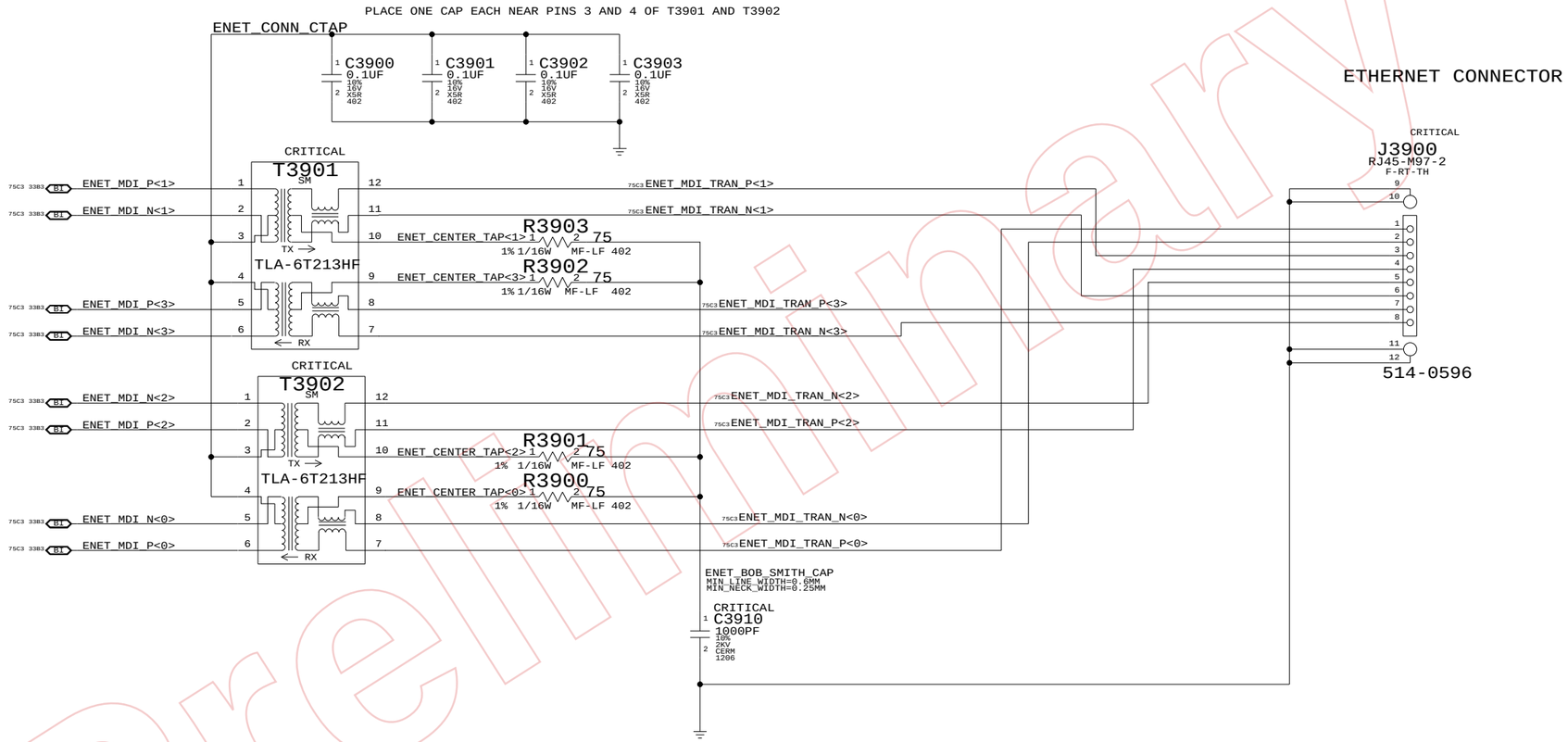
SYNC_MASTER=SUMA SYNC_DATE=07/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A

SCALE	SHT	OF
NONE	38	109

- COPY THIS PAGE FROM K36 CSA.39



ETHERNET CONNECTOR

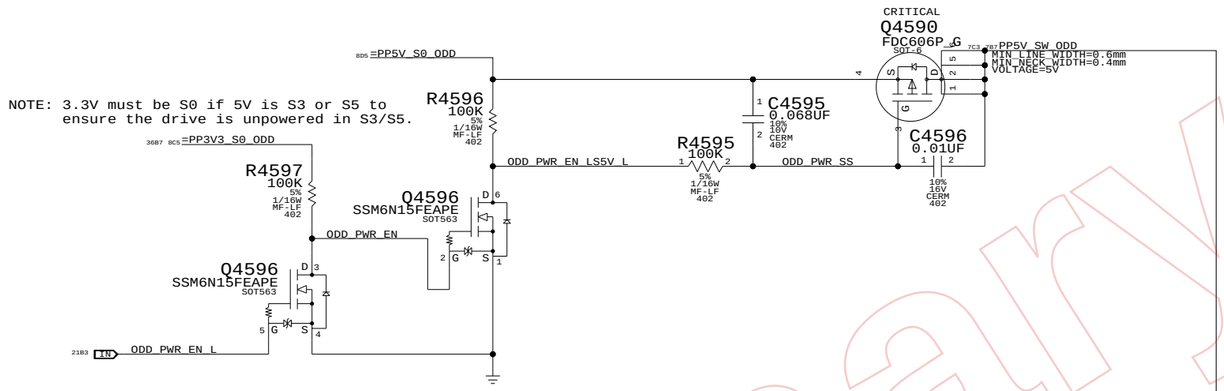
SYNC_MASTER=SUMA SYNC_DATE=04/04/2008

APPLE INC.

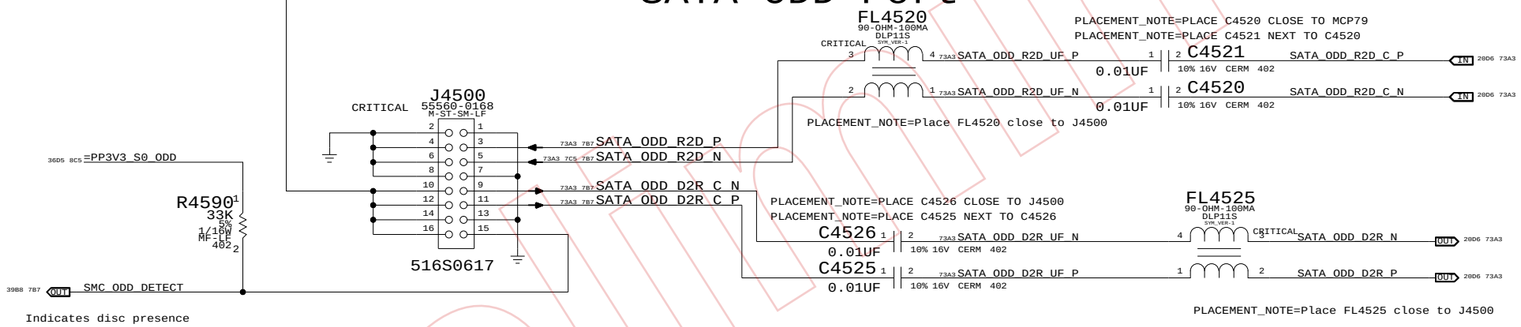
SIZE	DRAWING NUMBER	REV.
D	051-7537	A

SCALE	SHT	OF
NONE	39	109

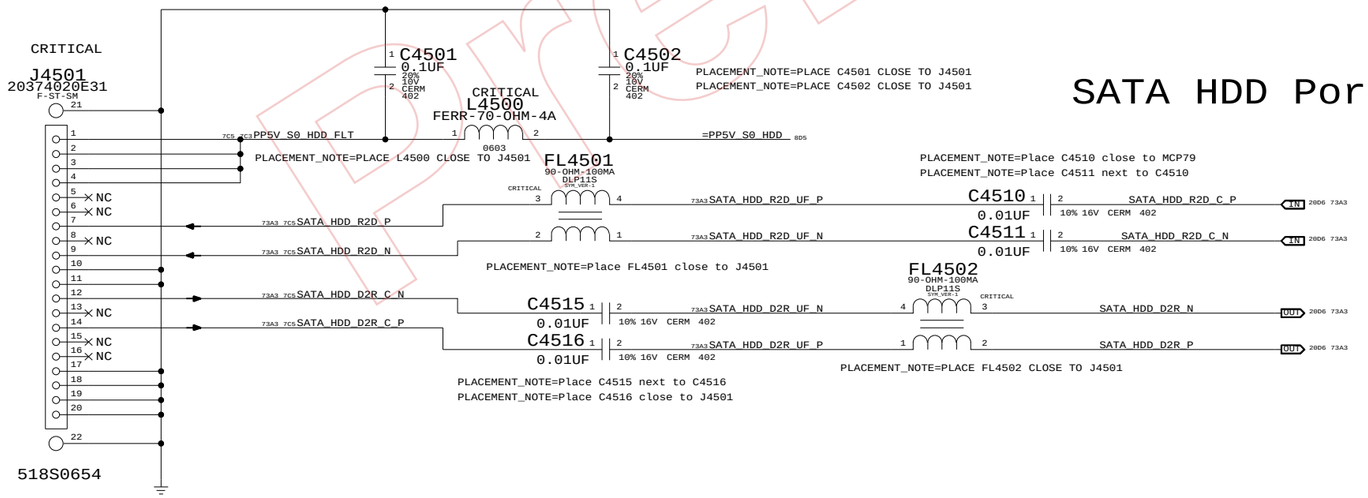
ODD Power Control



SATA ODD Port



SATA HDD Port



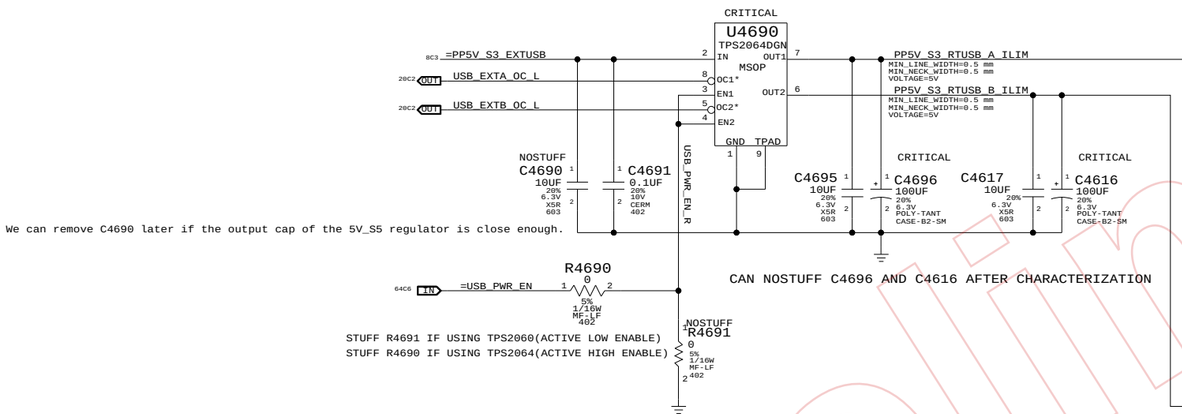
SATA Connectors

SYNC_MASTER=CHANGZHANG SYNC_DATE=04/14/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 45 OF 109	

Port Power Switch

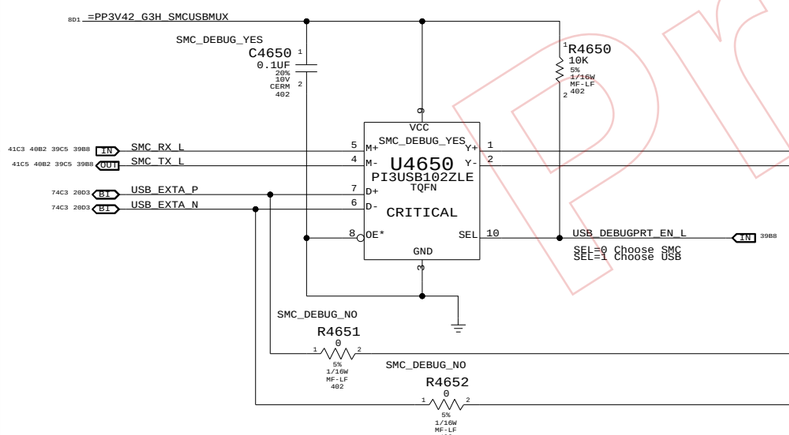


We can remove C4690 later if the output cap of the 5V_S5 regulator is close enough.

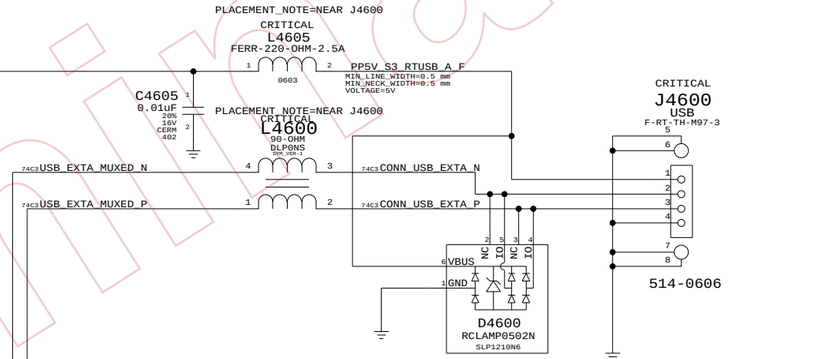
CAN NOSTUFF C4696 AND C4616 AFTER CHARACTERIZATION

STUFF R4691 IF USING TPS2060(ACTIVE LOW ENABLE)
STUFF R4690 IF USING TPS2064(ACTIVE HIGH ENABLE)

USB/SMC Debug Mux



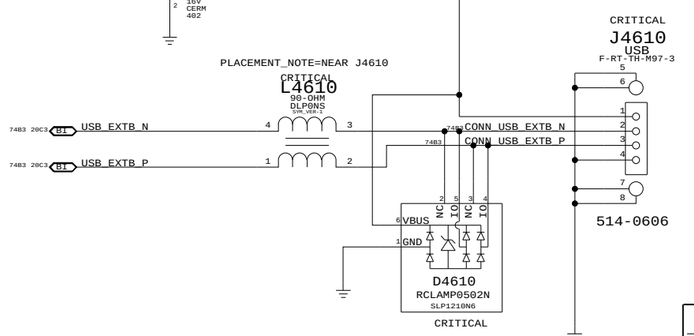
USB PORT A (FRONT PORT)



PLACEMENT_NOTE=NEAR J4610
CRITICAL
L4615
FERR-220-OHM-2.5A
0603
C4615
0.01uF
20%
16V
CERM
402
PP5V_S3_RTUSB_B_F
MIN_LINE_WIDTH=0.5 mm
MIN_NECK_WIDTH=0.5 mm
VOLTAGE=5V

We can add protection to 5V if we want, but leaving NC for now

Place L4600 and L4605 at connector pin



USB PORT B (BACK PORT)

External USB Connectors

SYNC_MASTER=YUAN.MA SYNC_DATE=01/18/2008

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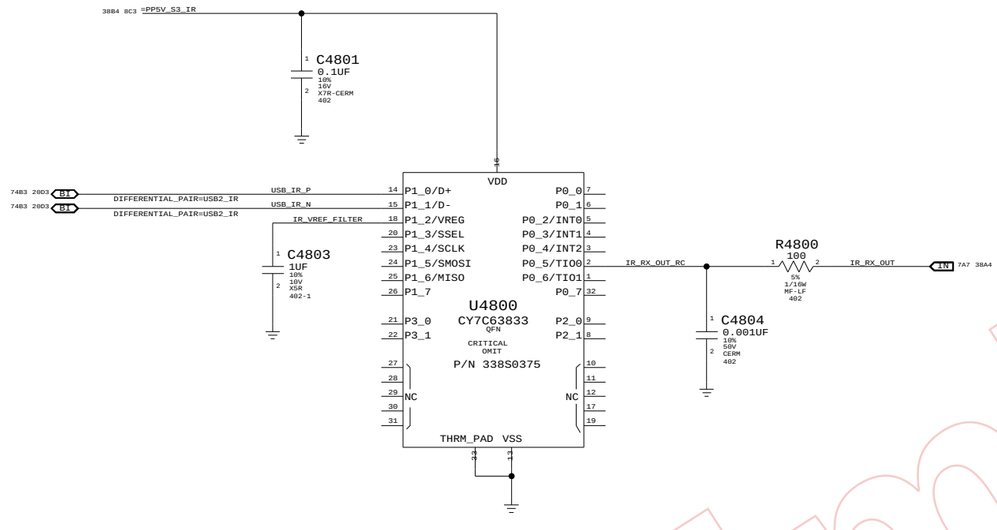
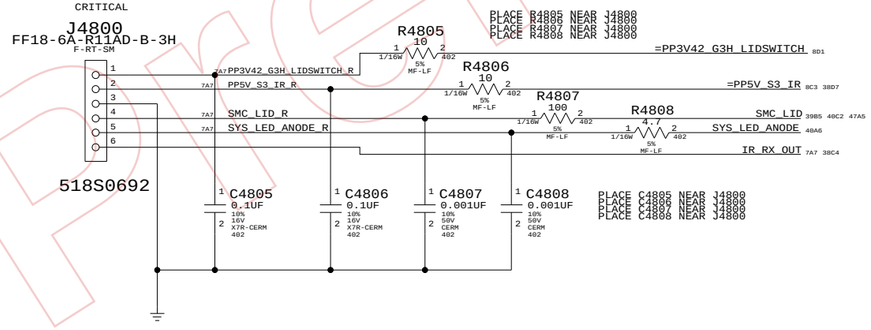
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A

SCALE	SHT	OF
NONE	46	109



CYPRESS 'ENCORE II' USB CONTROLLER



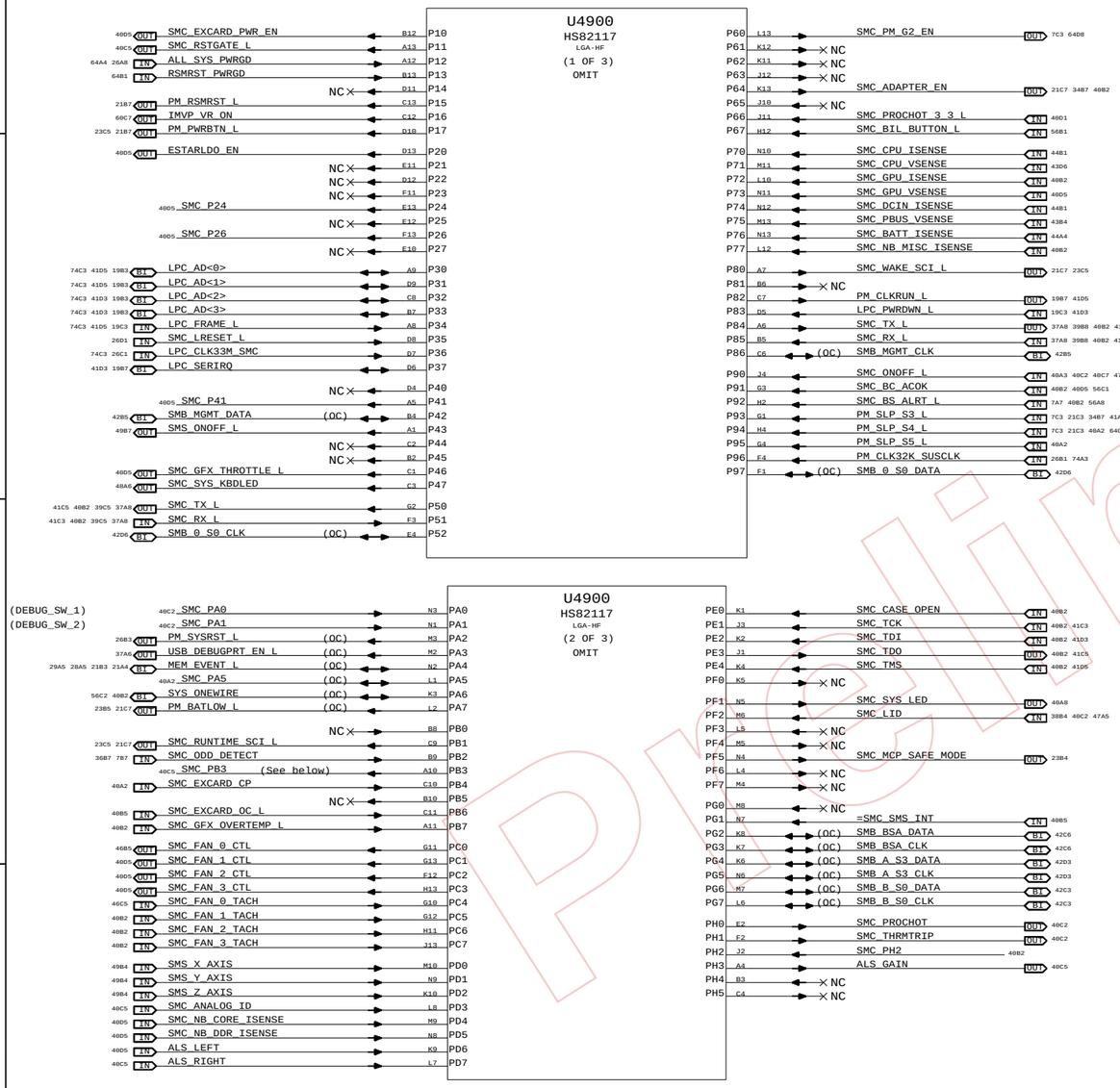
Front Flex Support

SYNC_MASTER=YUAN.MA SYNC_DATE=05/28/2008

APPLE INC.

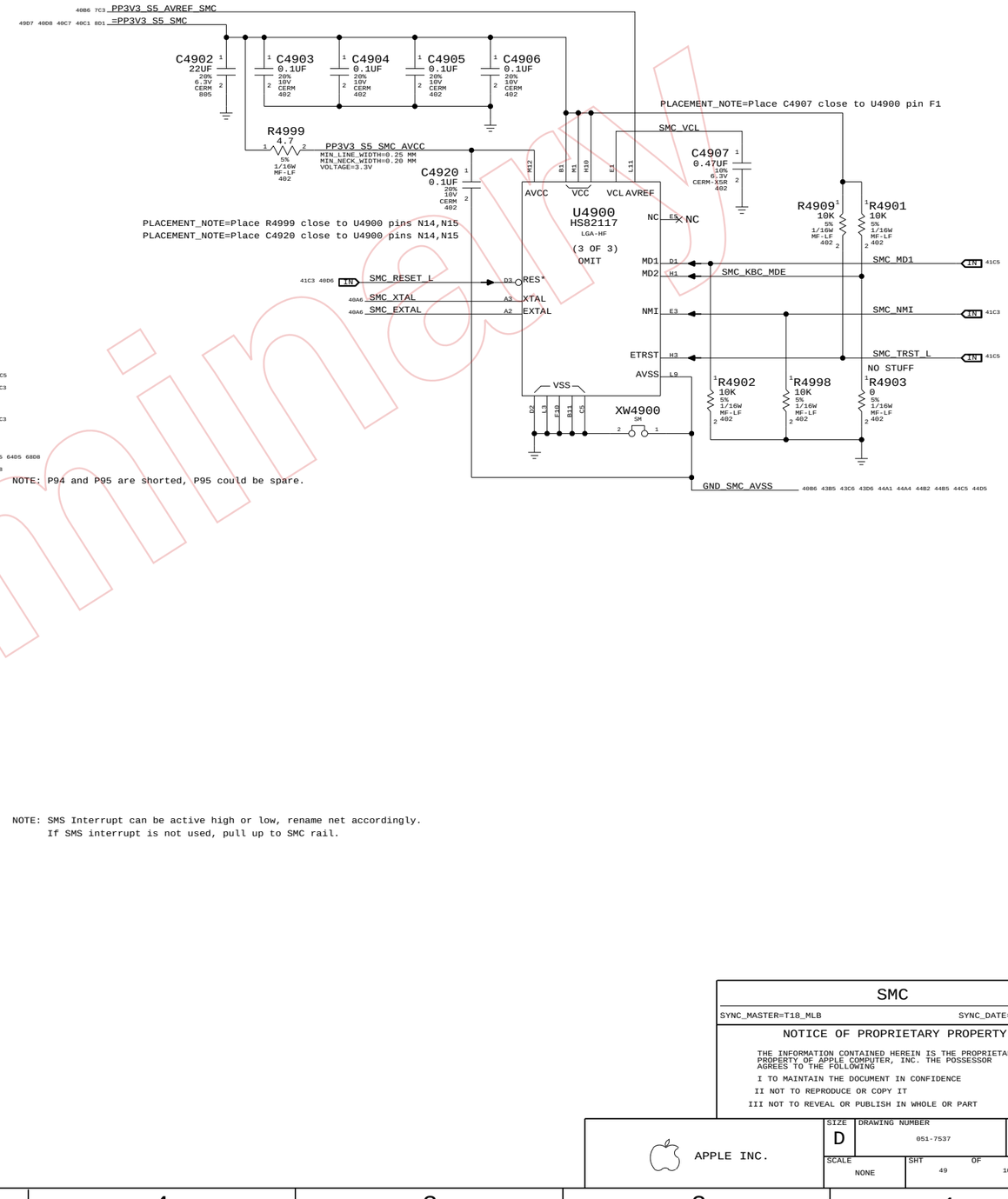
SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE	SHT	OF
NONE	48	109

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



SMC_PB3:

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



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.

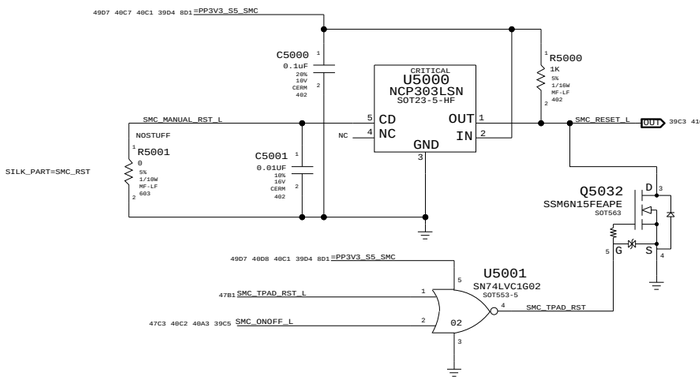
SMC

SYNC_MASTER=T18_MLB SYNC_DATE=06/26/2008

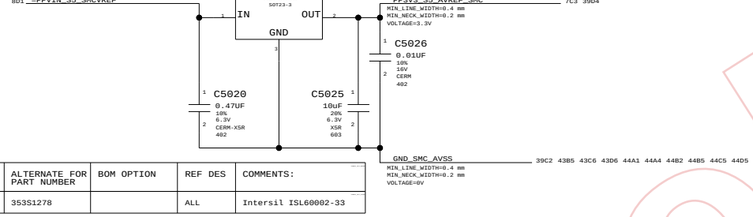
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 49 OF 109	

SMC Reset "Button" / Brownout Detect

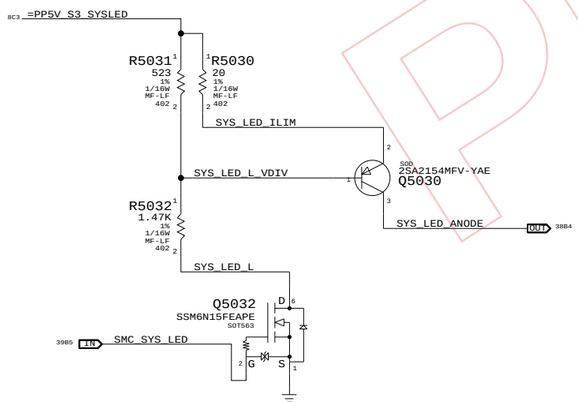


SMC AVREF Supply

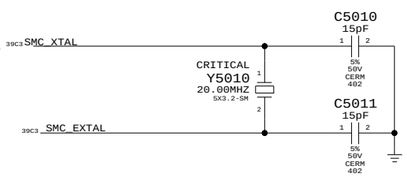


PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
353S1381	353S1278		ALL	Intersil ISL60002-33

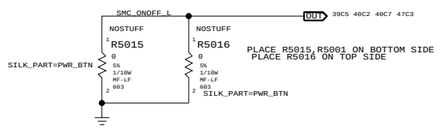
System (Sleep) LED Circuit



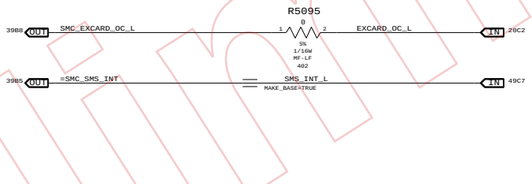
SMC Crystal Circuit



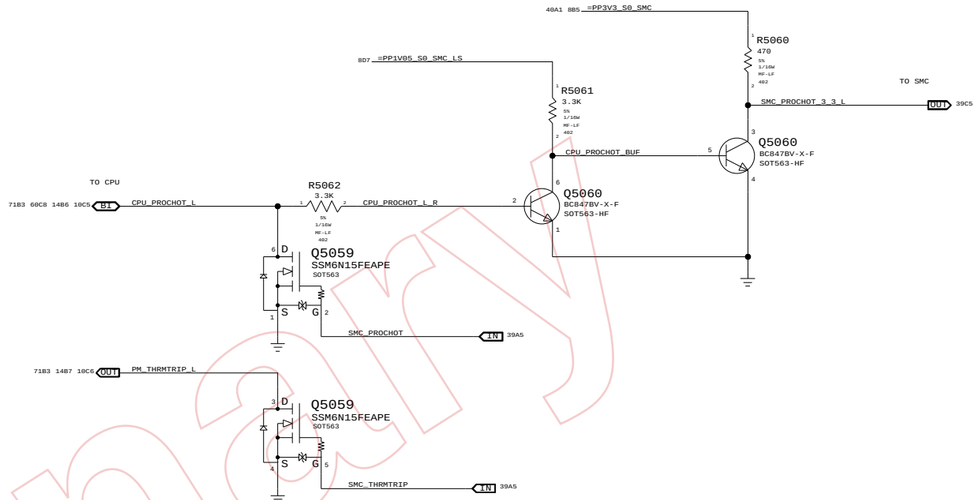
Debug Power "Button"

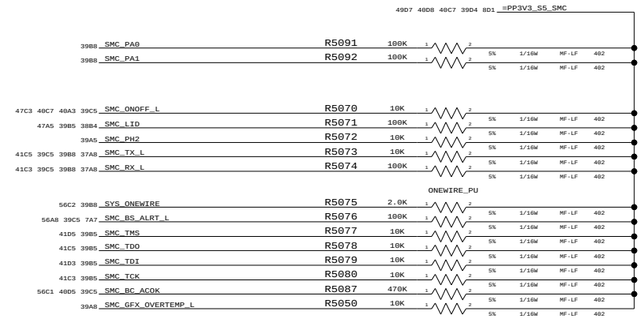


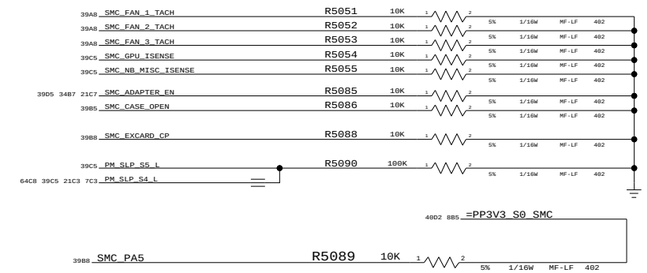
39A8	SMC_FAN_1_CTL	NC_SMC_FAN_1_CTL	MAKE_BASE=TRUE	
39A8	SMC_FAN_2_CTL	NC_SMC_FAN_2_CTL	MAKE_BASE=TRUE	
39A8	SMC_FAN_3_CTL	NC_SMC_FAN_3_CTL	MAKE_BASE=TRUE	
39B8	SMC_GFX_THROTTLE_L	SMC_TG_THROTTLE_L	MAKE_BASE=TRUE	21A4 21B3
39C8	ESTARLDO_EN	NC_ESTARLDO_EN	MAKE_BASE=TRUE	
56C1 40B2 39C5	SMC_BC_ACOK	=CHGR_ACOK	MAKE_BASE=TRUE	57B5
39C8	SMC_P24	TP_SMC_P24	MAKE_BASE=TRUE	
39C8	SMC_P26	SMC_BMON_MUX_SEL	MAKE_BASE=TRUE	44A5
39C8	SMC_P41	TP_SMC_P41	MAKE_BASE=TRUE	
39A8	SMC_NB_CORE_ISENSE	SMC_MCP_CORE_ISENSE	MAKE_BASE=TRUE	44D5
39A8	SMC_NB_DDR_ISENSE	SMC_MCP_DDR_ISENSE	MAKE_BASE=TRUE	44C5
39A8	ALS_LEFT	SMC_CPU_FSB_ISENSE	MAKE_BASE=TRUE	44B5
39C5	SMC_GPU_VSENSE	SMC_MCP_VSENSE	MAKE_BASE=TRUE	43D6
39D8	SMC_EXCARD_PWR_EN	TP_SMC_EXCARD_PWR_EN	MAKE_BASE=TRUE	
39D8	SMC_RSTGATE_L	TP_SMC_RSTGATE_L	MAKE_BASE=TRUE	
39B8	SMC_PB3	NC_SMC_PB3	MAKE_BASE=TRUE	
39A5	ALS_GAIN	NC_ALS_GAIN	MAKE_BASE=TRUE	
39A8	SMC_ANALOG_ID	NC_SMC_ANALOG_ID	MAKE_BASE=TRUE	
39A8	ALS_RIGHT	NC_ALS_RIGHT	MAKE_BASE=TRUE	



SMC FSB to 3.3V Level Shifting







SMC Support

SYNC_MASTER=YUAN.MA SYNC_DATE=05/28/2008

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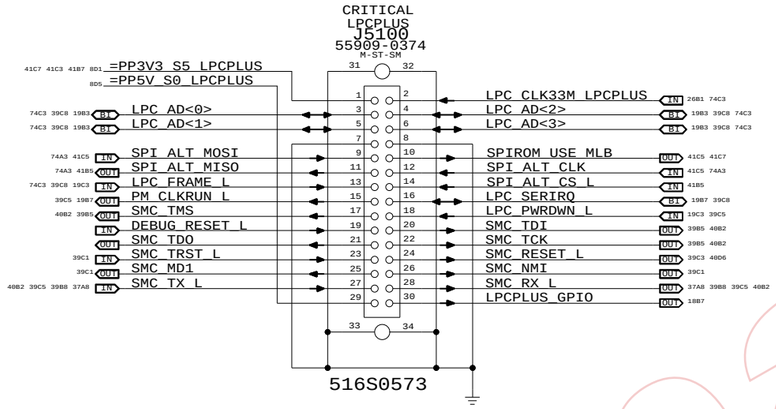
APPLE INC.

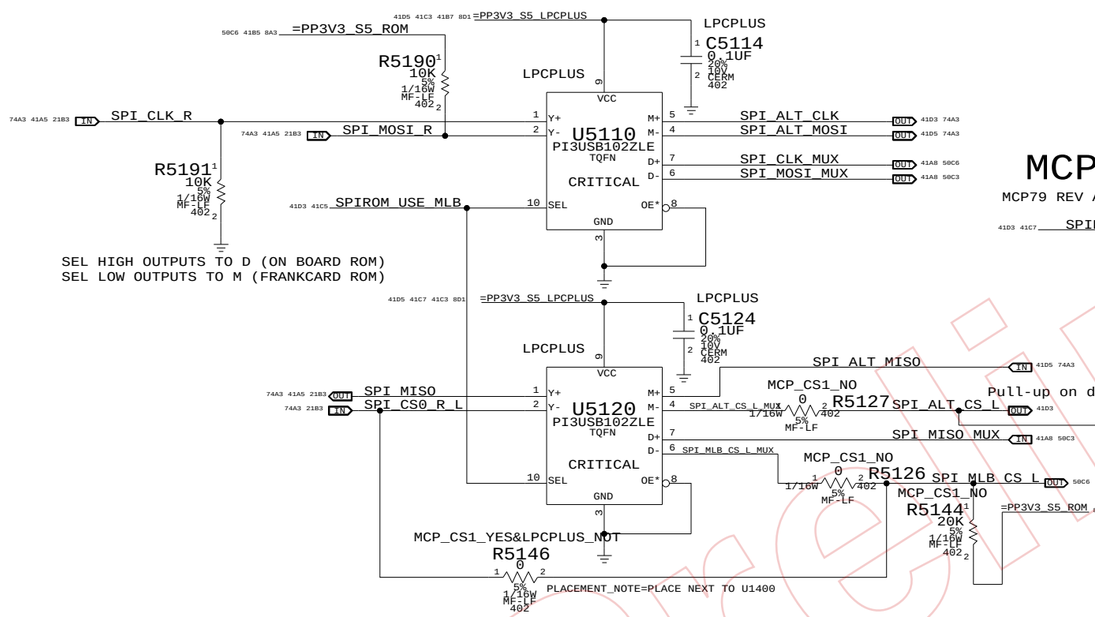
SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 50 OF 109	

LPC+SPI Connector

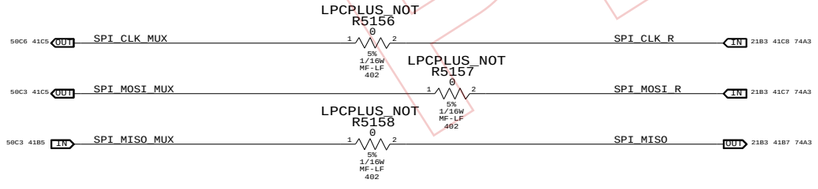


Alternate SPI ROM Support

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



SPI MUX BYPASS

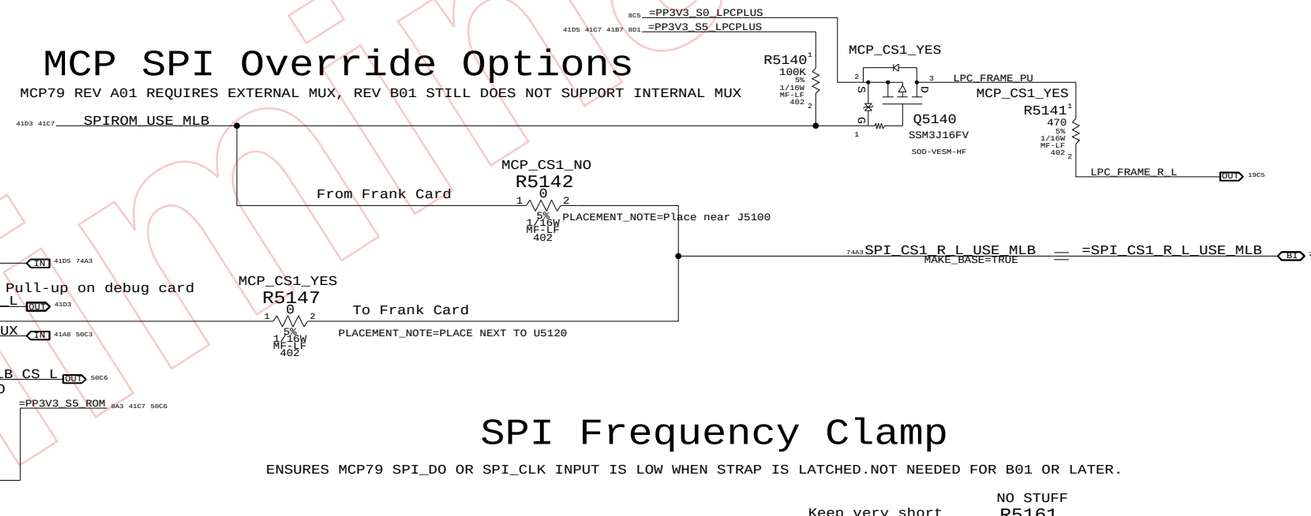


MCP79 Internal SPI MUX Support

NOT SUPPORTED IN REV A01 OR B01 MCP79 SILICON

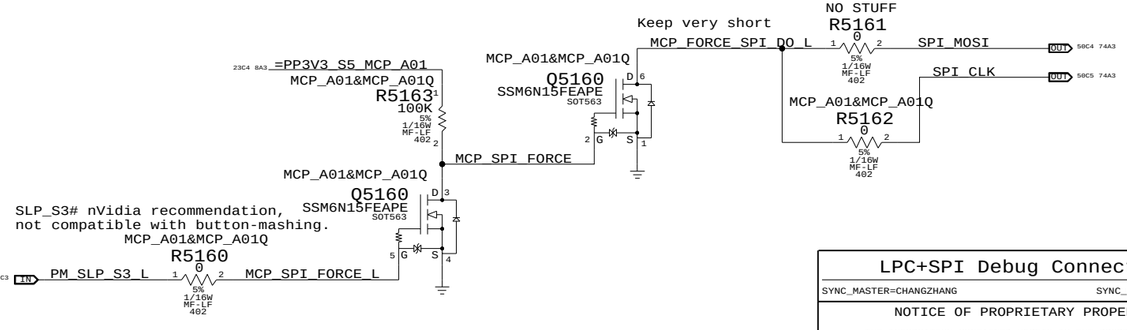
MCP SPI Override Options

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



SPI Frequency Clamp

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



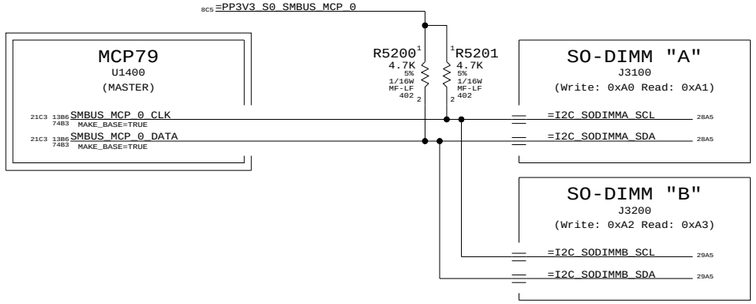
LPC+SPI Debug Connector

SYNC_MASTER=CHANGZHANG SYNC_DATE=05/09/2008

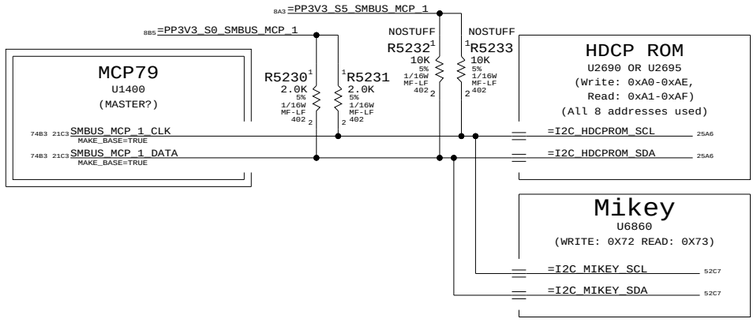
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 51 OF 109	

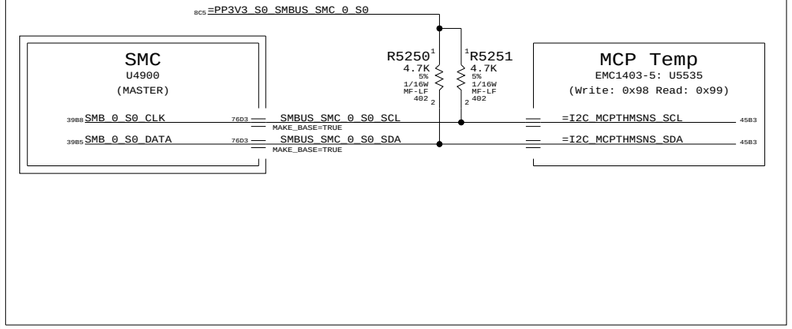
MCP79 SMBUS "0" CONNECTIONS



MCP79 SMBUS "1" CONNECTIONS

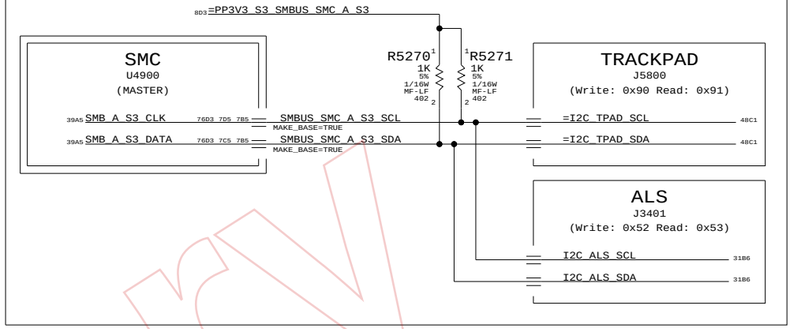


SMC "0" SMBus Connections

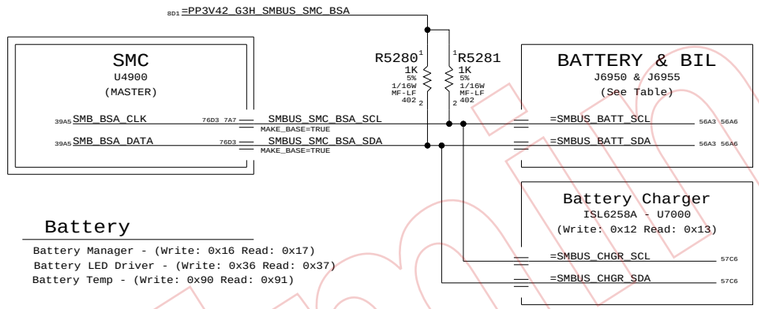


SMC "A" SMBus Connections

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



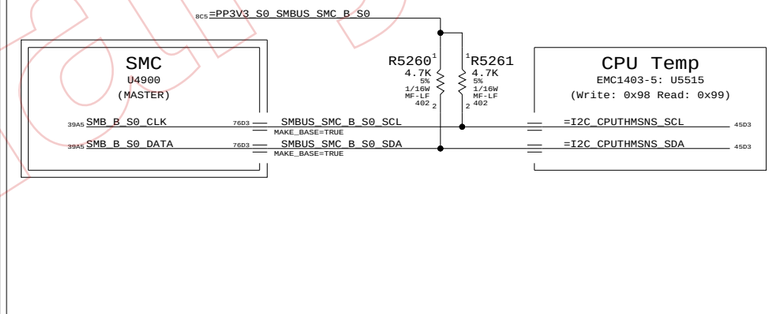
SMC "Battery A" SMBus Connections



Battery

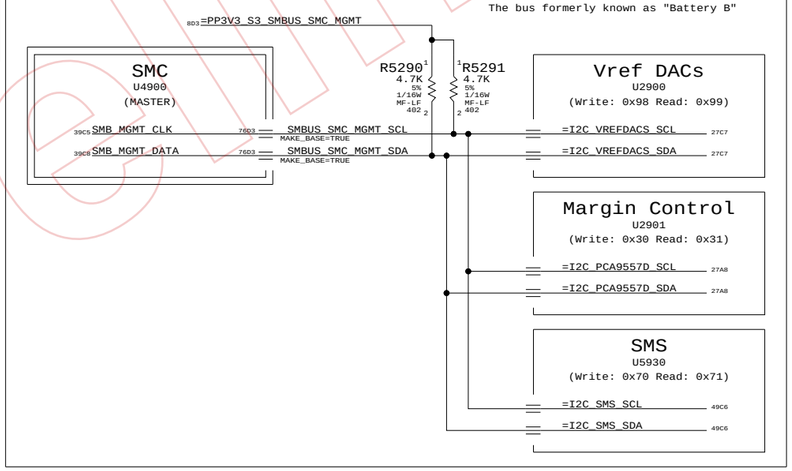
Battery Manager - (Write: 0x16 Read: 0x17)
Battery LED Driver - (Write: 0x36 Read: 0x37)
Battery Temp - (Write: 0x90 Read: 0x91)

SMC "B" SMBus Connections



SMC "Management" SMBus Connections

The bus formerly known as "Battery B"



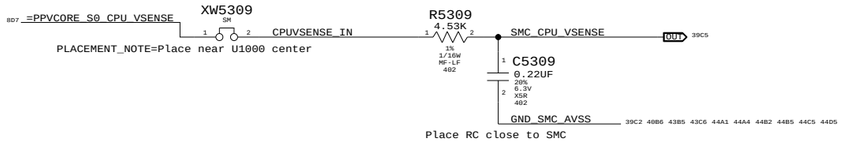
M97 SMBUS CONNECTIONS

SYNC_MASTER=BEN SYNC_DATE=04/21/2008

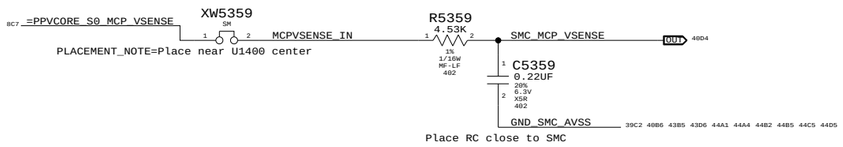
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE	SHT	OF
NONE	52	109

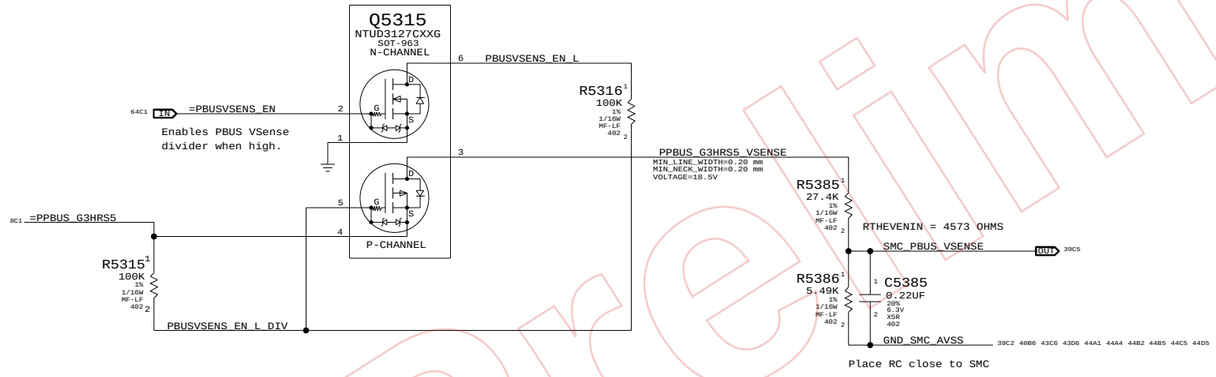
CPU Voltage Sense / Filter



MCP Voltage Sense / Filter



PBUS VOLTAGE SENSE ENABLE & FILTER



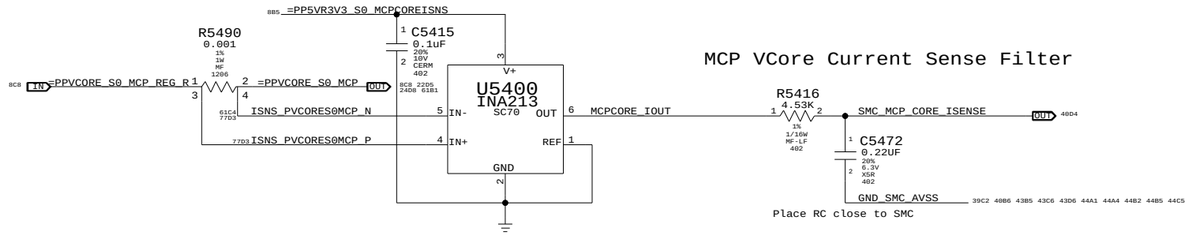
VOLTAGE SENSING

SYNC_MASTER=YUNWU SYNC_DATE=02/04/2008

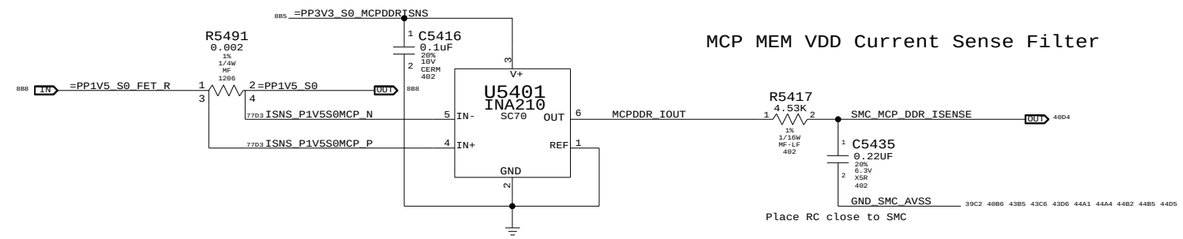
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 53 OF 109	

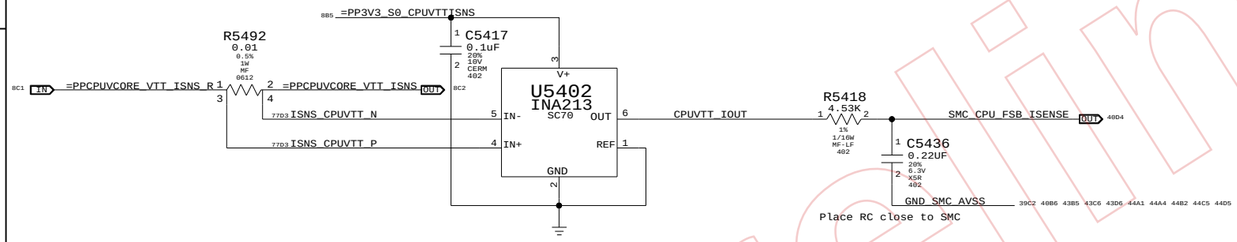
MCP VCore Current Sense



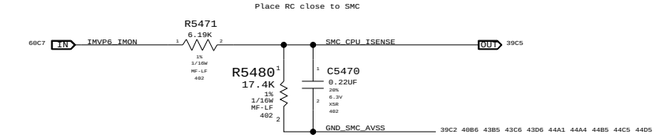
MCP MEM VDD Current Sense



CPU 1.05V AND CPU VCORE HIGH SIDE CURRENT SENSE

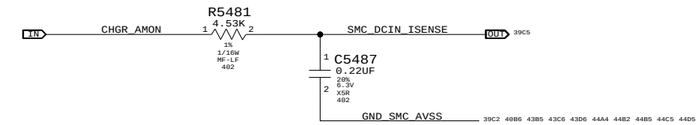


CPU VCore Load Side Current Sense / Filter



BMON CURRENT SENSE

DC-IN (AMON) CURRENT SENSE



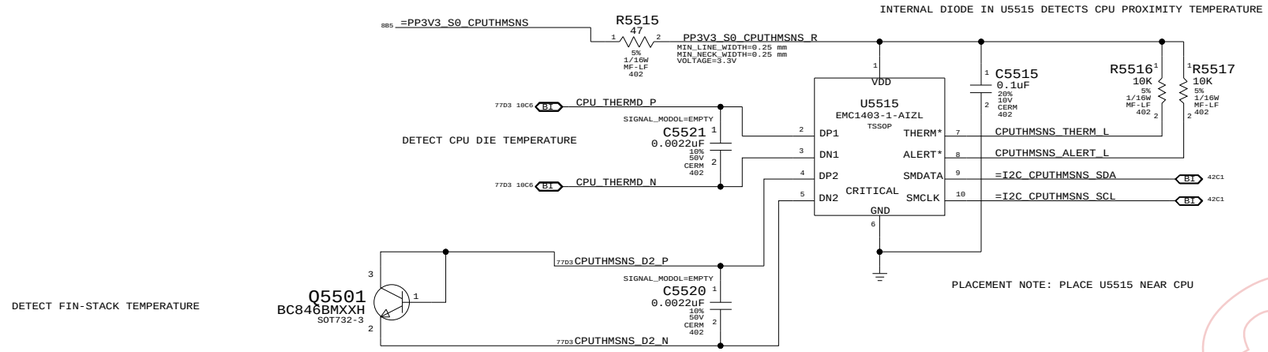
Current Sensing

SYNC_MASTER=YUNWU SYNC_DATE=04/07/2008

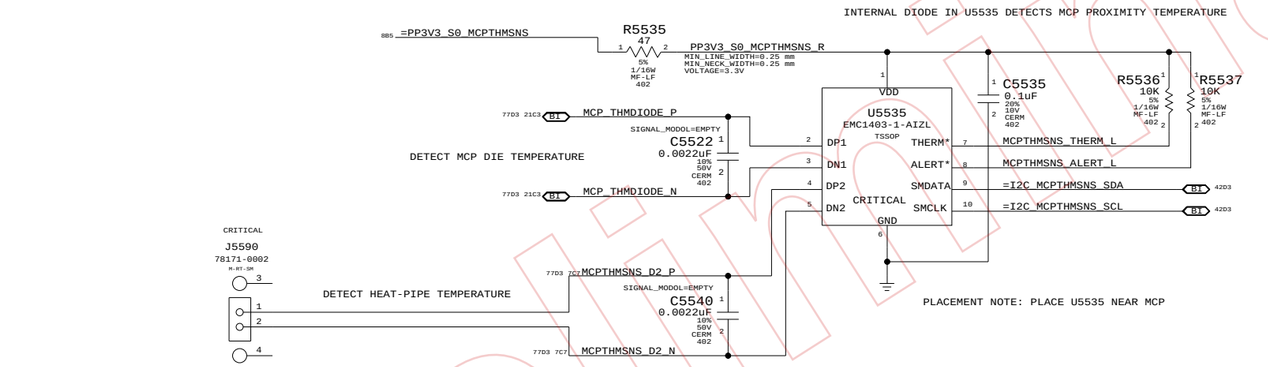
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 54 OF 109	

CPU T-Diode Thermal Sensor



MCP T-Diode Thermal Sensor



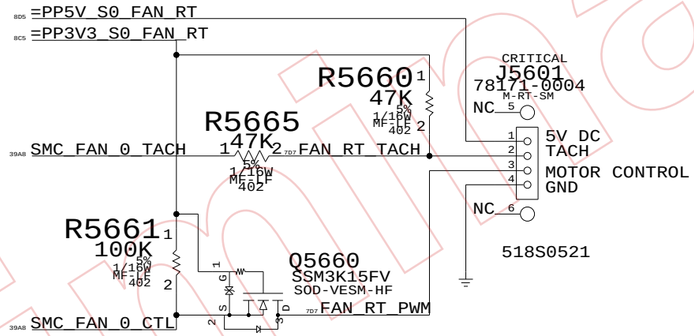
REPLACED 518S0521 WITH 518S0519

Thermal Sensors

SYNC_MASTER=YUNWU SYNC_DATE=03/20/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 55 OF 109	



Fan

SYNC_MASTER=CHANGZHANG SYNC_DATE=01/18/2008

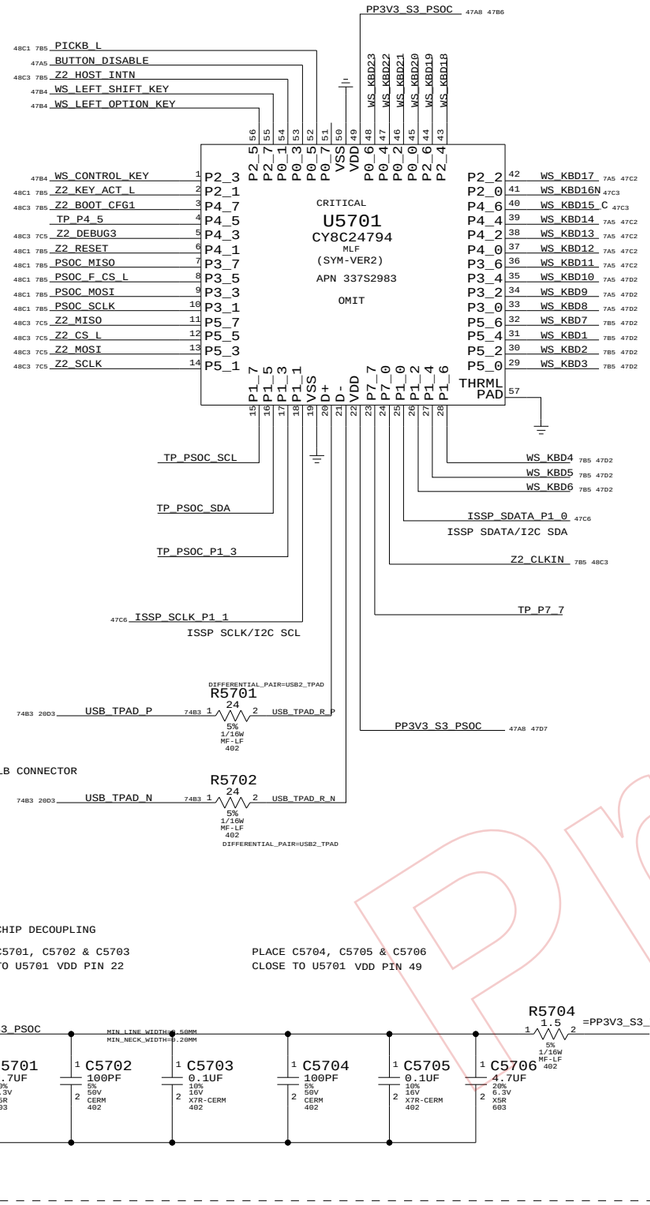
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE	SHT	OF
NONE	56	109

PSOC USB CONTROLLER

USB INTERFACES TO MLB
SPI HOST TO Z2

TRACKPAD PICK BUTTONS
KEYBOARD SCANNER



U5701 CHIP DECOUPLING

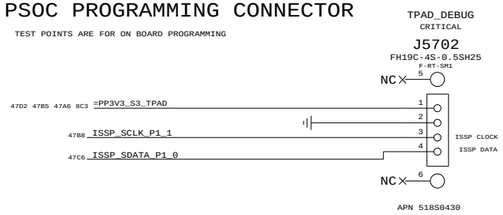
PLACE C5701, C5702 & C5703
CLOSE TO U5701 VDD PIN 22

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

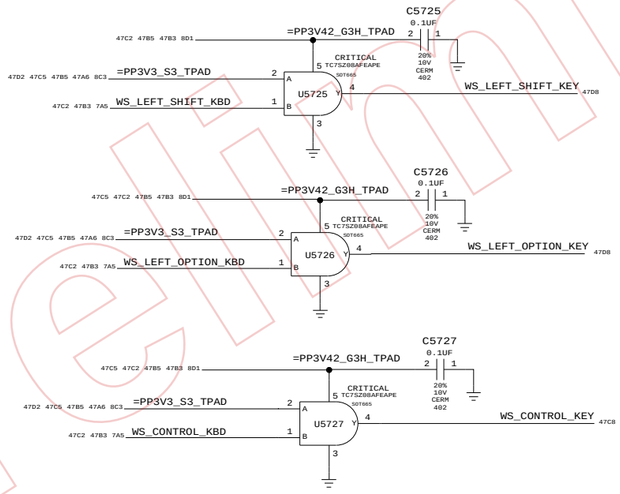
IC	PIN NAME	CURRENT	R_SNS	V_SNS	POWER
TMP102	V+	10UA	2.55 KOHM	0.0255 V	0.255E-6 W
		80UA		0.204 V	16.32E-6 W
3V3 LDO	VDD	60MA MAX	10 OHM	0.6 V	36E-3 W
	VOUT	60MA MAX	0.2 OHM	0.012 V	0.72E-3 W
PSOC	VDD	8MA (TYP)	1.5 OHM	0.012 V	96E-6 W
		14MA (MAX)		0.021 V	294E-6 W
18V BOOSTER	VIN	4MA (MAX)	4.7 OHM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

PSOC PROGRAMMING CONNECTOR

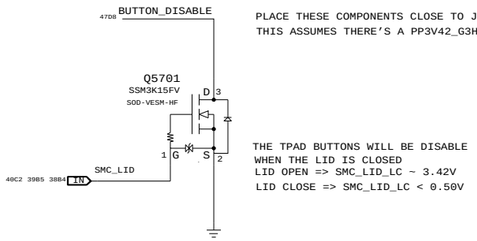
TEST POINTS ARE FOR ON BOARD PROGRAMMING



ISOLATION CIRCUIT



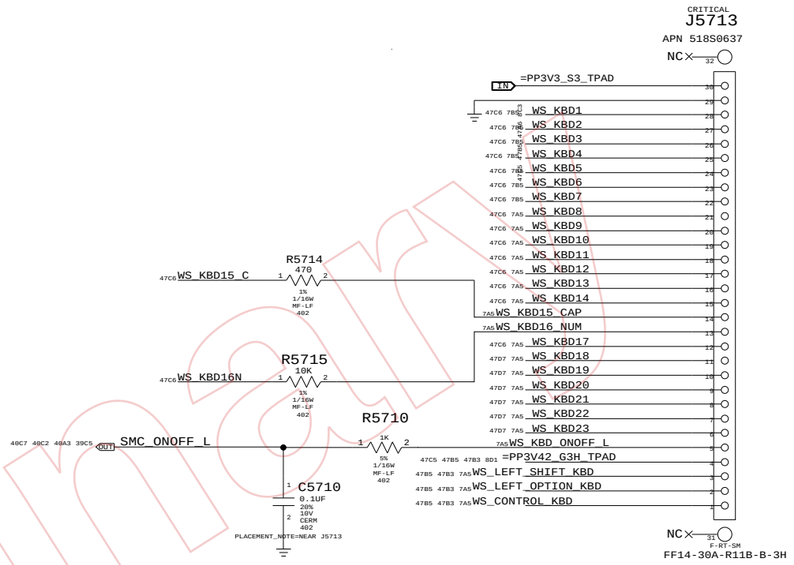
TPAD BUTTONS DISABLE



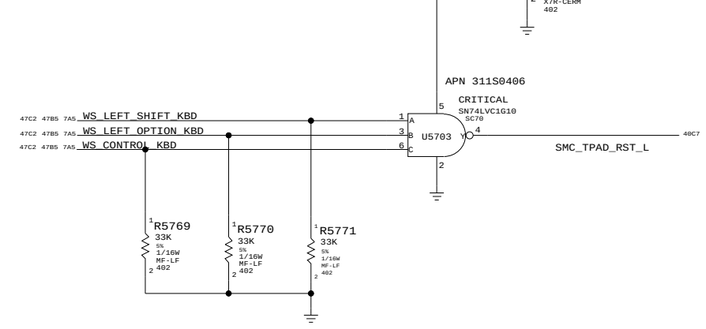
PLACE THESE COMPONENTS CLOSE TO J5800
THIS ASSUMES THERE'S A PP3V42_G3H PULL UP ON MLB

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



SMC_MANUAL_RESET LOGIC



WELLSPRING 1			
SYNC_MASTER=YUAN.MA	SYNC_DATE=04/22/2008		
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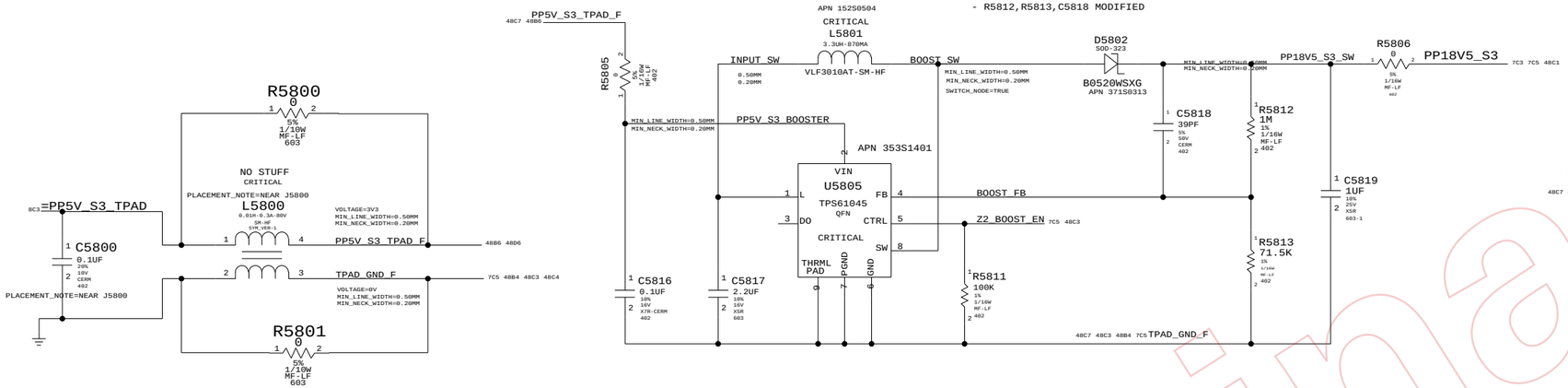
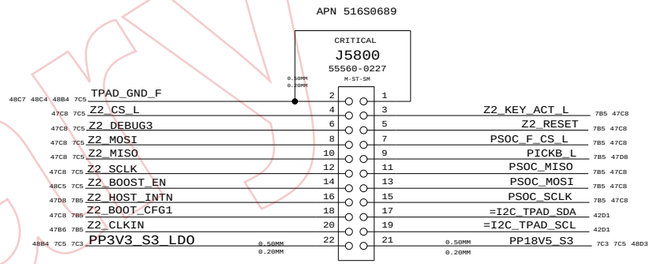
APPLE INC.	SIZE D	DRAWING NUMBER 051-7537	REV. A
	SCALE NONE	SHT 57 OF 109	

BOOSTER +18.5VDC FOR SENSORS

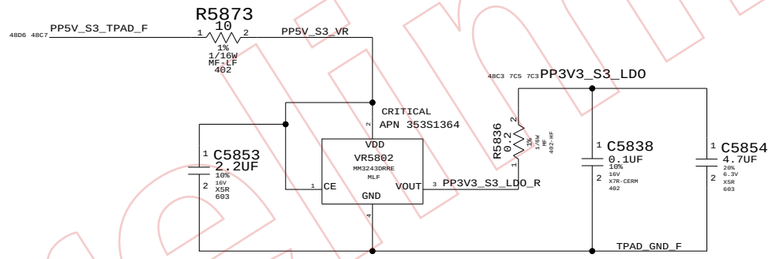
BOOSTER DESIGN CONSIDERATION:
- POWER CONSUMPTION
- DROOP LINE REGULATION
- RIPPLE TO MEET ERS
- 100-300 KHZ CLEAN SPECTRUM
- STARTUP TIME LESS THAN 2MS
- R5812,R5813,C5818 MODIFIED



IPD FLEX CONNECTOR



3V3 LDO FOR IPD



KEYBOARD BACKLIGHT DRIVNG AND DETECTION

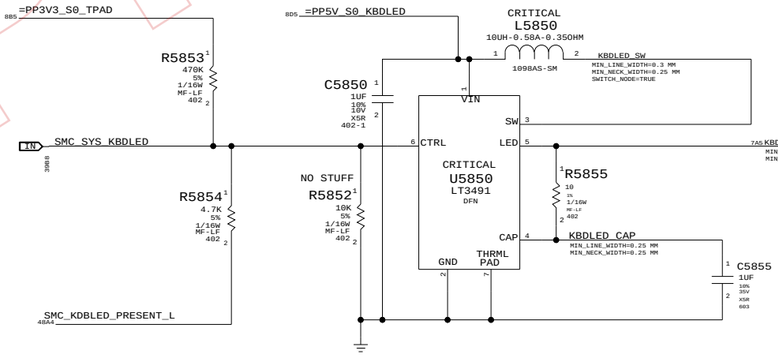
To detect Keyboard backlight, SMC will tristate SMC_SYS_KBDLED:

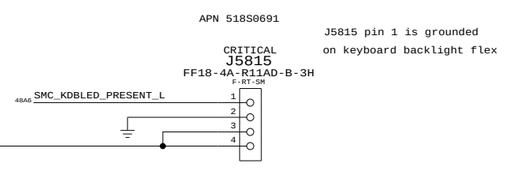
LOW = keyboard backlight present

HIGH= keyboard backlight not present

BOM OPTION: KBDLED_YES
TURNED ON FOR BEST MLB CONFIG

R5853 ALWAYS PRESENT





KBD BACKLIGHT CONNECTOR

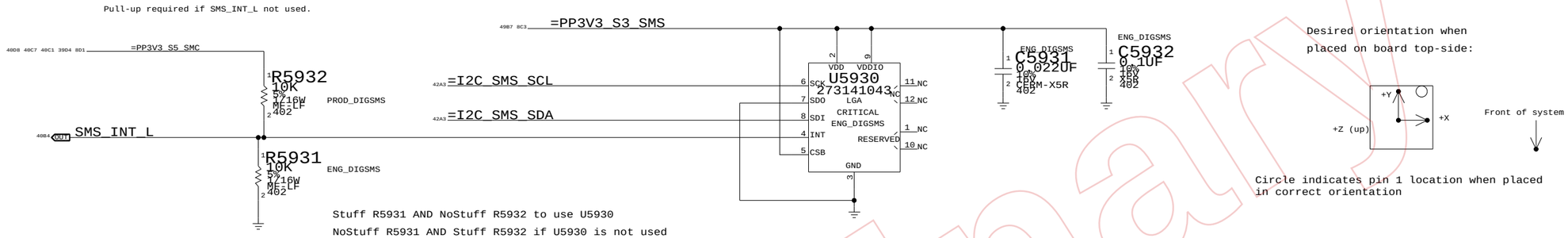
WELLSPRING 2

SYNC_MASTER=YUAN.MA SYNC_DATE=05/09/2008

APPLE INC.

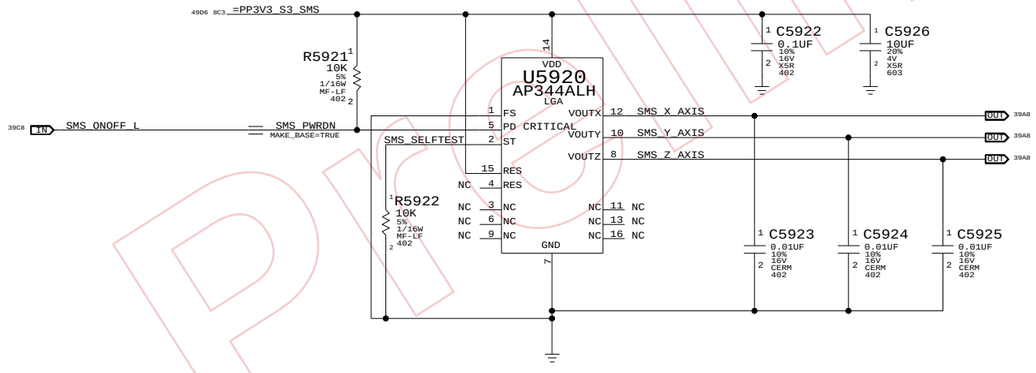
SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 58 OF 109	

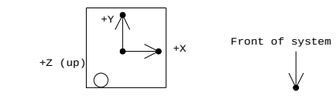
Digital SMS



Analog SMS

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



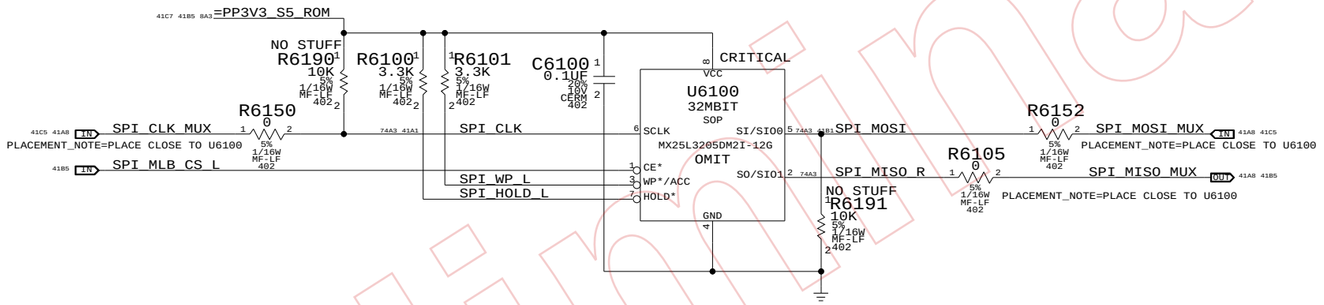


SMS

SYNC_MASTER=YUNWU SYNC_DATE=06/26/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 59 OF 109	



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=CHANGZHANG SYNC_DATE=05/02/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 61 OF 109	

AUDIO CODEC

APPLE P/N 353S1538

ALIAS OF PP3V3_SO, MIN_LINE_WIDTH=0.6MM, MIN_NECK_WIDTH=0.2MM

VOLTAGE=3.3V
=PP3V3_S0_AUDIO
CRITICAL L6201 FERR-220-OHM 0402
MIN_LINE_WIDTH=0.20MM MIN_NECK_WIDTH=0.20MM VOLTAGE=3.3V
CODEC_DVDD
C6200 1UF 10% 6.3V CERM 402
C6201 0.01UF 10% 25V X7R 402
C6203 0.01UF 10% 25V X7R 402
R6270 100K 5% 1/16W MF-LF 402

CRITICAL L6202 FERR-220-OHM 0402
MIN_LINE_WIDTH=0.30MM MIN_NECK_WIDTH=0.20MM VOLTAGE=4.6V
PP4V6_AUDIO_ANALOG
MIN_LINE_WIDTH=0.20MM MIN_NECK_WIDTH=0.20MM
AVDD_ADC_DAC
C6204 100UF 20% 6.3V TANT CASE-AL1
C6206 0.01UF 10% 25V X7R 402
C6205 100UF 20% 6.3V TANT CASE-AL1
C6207 0.01UF 10% 25V X7R 402
GND_AUDIO_CODEC

HDA_BIT_CLK
HDA_SYNC
HDA_SDOUT
HDA_SDIN0
R6204 22 5% 1/16W MF-LF 402
CODEC_SDATA_IN
HP AMP. SHDN CONTROL
AUD_GPIO_0
AUD_GPIO_1

CRITICAL U6200 ALC885Q-VB3-GR QFN REV B3

6	BCLK	
10	SYNC	
5	SDATA_OUT	
8	SDATA_IN	
2	GPIO0/DMIC-CLK	
3	GPIO1/DMIC-L	
48	SPDIFO	AUD_SPDIF_O
47	SPDIFI/EAPD/MIDI-I/DMIC-R	
13	SENSE_A	AUD_SENSE_A
34	SENSE_B	AUD_SENSE_B
39	PORT-A-L	AUD_BI_PORT_A_L
41	PORT-A-R	AUD_BI_PORT_A_R
16	PORT-F-L	AUD_BI_PORT_F_L
17	PORT-F-R	AUD_BI_PORT_F_R
30	PORT-F-VREFO	AUD_VREF_PORT_F
33	PORT-A-VREFO/DCVOL	NC_AUD_VREF_PORT_A
14	PORT-E-L	AUD_BI_PORT_E_L
15	PORT-E-R	
31	PORT-E-VREFO	NC_AUD_VREF_PORT_E
28	PORT-B-VREFO	AUD_VREF_PORT_B
21	PORT-B-L	AUD_BI_PORT_B_L
22	PORT-B-R	AUD_BI_PORT_B_R
29	PORT-C-VREFO	NC_AUD_VREF_PORT_C
32	PORT-B-VREFO2	NC_AUD_VREF_PORT_D
43	PORT-G-L	NC_AUD_BI_PORT_G_L
44	PORT-G-R	NC_AUD_BI_PORT_G_R
45	PORT-H-L	NC_AUD_BI_PORT_H_L
46	PORT-H-R	NC_AUD_BI_PORT_H_R
27	VREF	AUD_CODEC_VREF
40	JDREF	AUD_CODEC_JDREF
37	NC	NC_VRP
12	BEEP	BEEP
11	RESET*	HDA_RST_L
49	THRM_PAD	
4	DVSS	
7	DVSS	
26	AVSS1	
42	AVSS2	
1	DVDD	
9	DVDD_IO	
25	AVDD1	
38	AVDD2	

R6206 22 5% 1/16W MF-LF 402

PORT A = LINE INPUT
PORT F= MIC INPUT
PORT F VREF=MIC BIAS
PORT E = MIKEY MIC INPUT
SPKR. AMP. SHDN CONTROL
PORT B=L AND R SPKR AMP. SIGNAL SOURCE

R6209 100K 5% 1/16W MF-LF 402

PORT C RT=SUB. SPKR SIGNAL SOURCE
AUD_BI_PORT_C_R
AUD_BI_PORT_D_L
AUD_BI_PORT_D_R
PORT D=HP SIGNAL SOURCE
NC_AUD_BI_PORT_C_L NO_TEST
NC_BAL_IN_L NO_TEST
NC_BAL_IN_COM NO_TEST
NC_BAL_IN_R NO_TEST

R6203 100K 5% 1/16W MF-LF 402
C6208 0.1UF 10% 10V X5R 402
NO STUFF R6201 0 5% 1/16W MF-LF 402
R6205 20.0K 1% 1/16W MF-LF 402
C6210 3.3UF 10% 16V TANT SMA-HF
C6212 0.001UF 10% 50V CERM 402

GND_AUDIO_CODEC
MIN_LINE_WIDTH=0.30 MM
MIN_NECK_WIDTH=0.20 MM
VOLTAGE=0V

AUDIO 4.6V REGULATOR

APPLE P/N 353S1897

ALIAS OF PP5VLT_S3, MIN_LINE_WIDTH=0.60MM, MIN_NECK_WIDTH=0.20MM
VOLTAGE=5V
=PP5V_S3_AUDIO
CRITICAL L6200 FERR-220-OHM 0402
MIN_NECK_WIDTH=0.20MM MIN_LINE_WIDTH=0.30MM
PP5V_S3_AUDIO_F

=PP3V3_S0_AUDIO
R6202 1K 5% 1/16W MF-LF 402
PP4V6_ENABLE

CRITICAL U6201 MAX8902A TDFN
MAX8902_BP
C6220 0.1UF 10% 16V X5R 402
R6210 10K 5% 1/16W MF-LF 402
C6223 0.01UF 10% 25V X7R 402
CRITICAL C6221 10UF 20% 6.3V X5R 603
C6224 0.01UF 10% 50V X7R 603-1
CRITICAL C6222 10UF 20% 6.3V X5R 603
C6225 0.01UF 10% 25V X7R 402
PP4V6_AUDIO_ANALOG

GND_AUDIO_CODEC
XW6200 SM
PLACE XW6200 AND XW6201 NEAR U6201
XW6201 SM
STAR GND PT. FOR AUDIO SYSTEM
GND_SPKR_AMP

AUDIO: CODEC

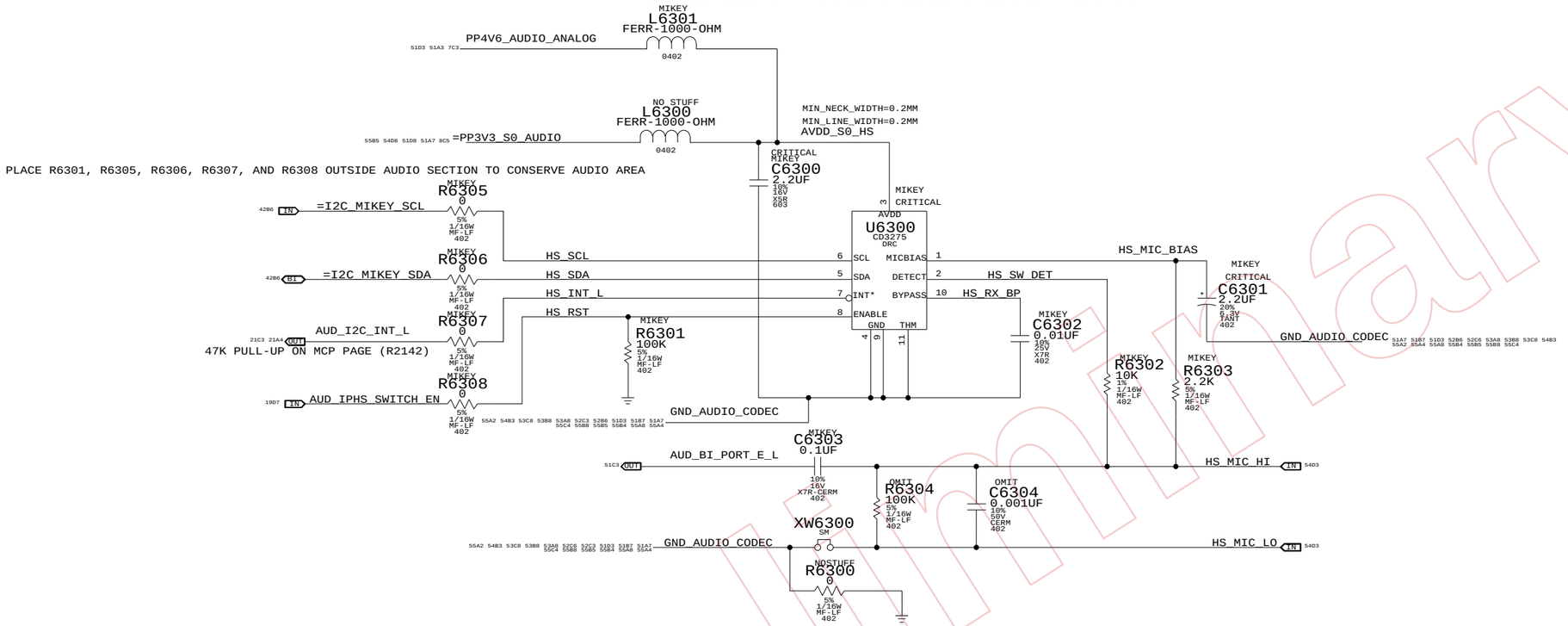
SYNC_MASTER=AUDIO SYNC_DATE=07/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A

SCALE	SHT	OF
NONE	62	109

MIKEY RECEIVER CKT



PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
116S0114	1	100K 5% 0402 RESISTOR	R6304	?	MIKEY
116S0004	1	0 OHMS 5% 0402 RESISTOR	R6304	?	NOMIKEY
132S0045	1	100PF 50V 10% 0402 CAPACITOR	C6304	?	MIKEY
116S0004	1	0 OHMS 5% 0402 RESISTOR	C6304	?	NOMIKEY

AUDIO: MIKEY

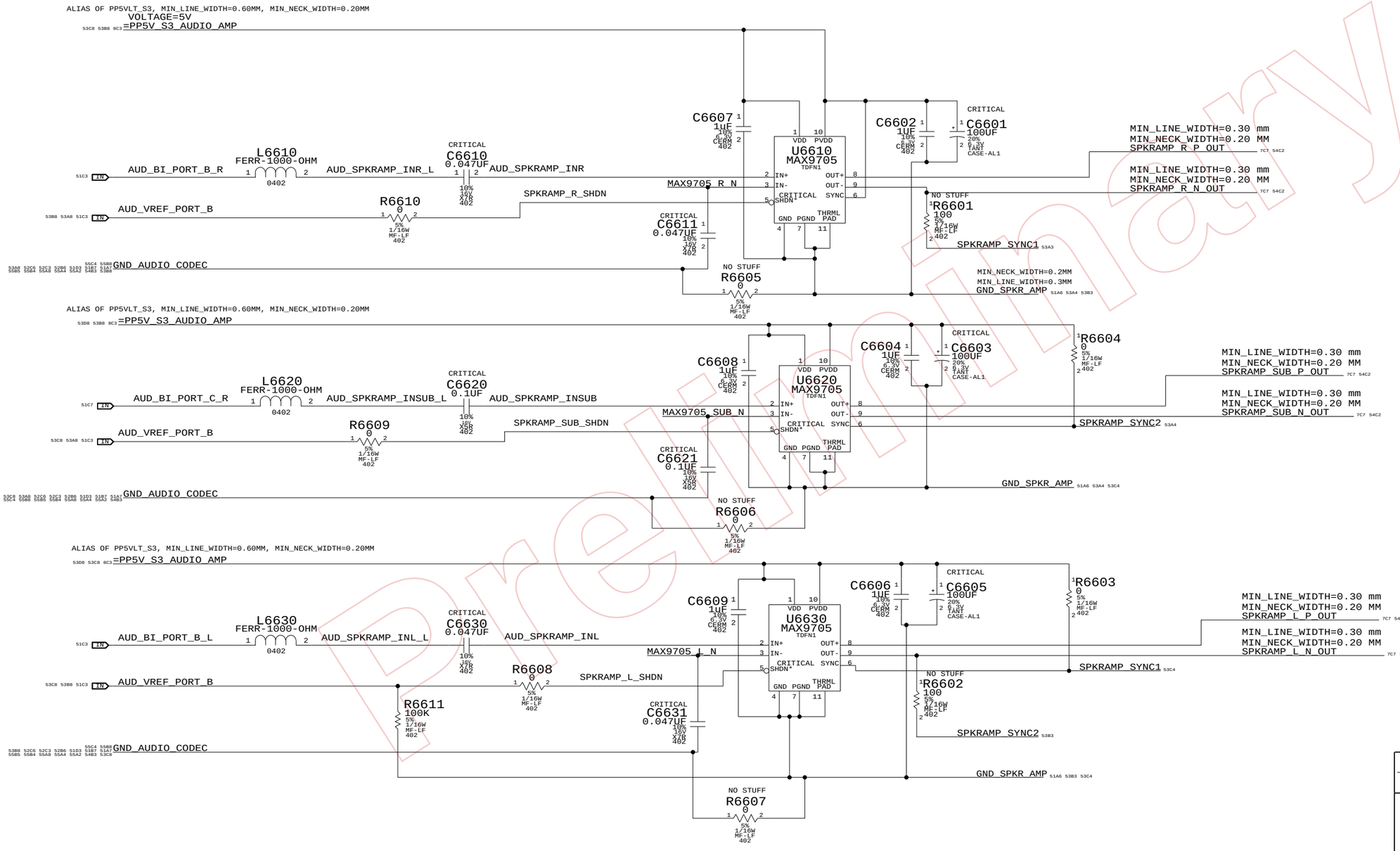
SYNC_MASTER=AUDIO SYNC_DATE=07/03/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 63 OF 109	

SATELLITE & SUB TWEETER AMPLIFIER APN:353S1595

SATELLITE	169 HZ < FC < 282 HZ
SUB	80 HZ < FC < 132 HZ
GAIN	12DB



AUDIO: SPEAKER AMP

SYNC_MASTER=AUDIO SYNC_DATE=07/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 66 OF 109	

AUDIO JACK 1: LO/HP CONNECTOR, SPDIF TX

=PP3V3_S0_AUDIO
R6790 0 5% 1/10W MF-LF 402
PP3V3_S0_AUDIO_SPDIF
AUD_CONNJ1_MIC
AUD_CONNJ1_SLEEVE
AUD_CONNJ1_TIPDET
AUD_CONNJ1_TIP
AUD_CONNJ1_RING
AUD_CONNJ1_SLEEVEDET
R6702 0 5% 1/10W MF-LF 402
R6703 0 5% 1/10W MF-LF 402
R6704 0 5% 1/10W MF-LF 402
R6705 0 5% 1/10W MF-LF 402
R6706 0 5% 1/10W MF-LF 402
R6707 0 5% 1/10W MF-LF 402
MIN_NECK_WIDTH=0.2MM
MIN_LINE_WIDTH=0.4MM
MIN_NECK_WIDTH=0.15MM
MIN_LINE_WIDTH=0.2MM
CRITICAL
J6700
AUDIO-JACK-TRANS-M97
F-RT-TH3
AUDIO
A - VIN
B - VCC
C - GND
OPERATING VOLTAGE 3.3
POF
SHELL
SHIELD PINS
APN:514-0607
C6700 1UF 10% 6.3V CERM 402
=GND_CHASSIS_AUDIO_JACK
CRITICAL DZ6706 6.8V-100PF 402
CRITICAL DZ6702 6.8V-100PF 402
CRITICAL DZ6703 6.8V-100PF 402
CRITICAL DZ6704 6.8V-100PF 402
CRITICAL DZ6705 6.8V-100PF 402
C6705 100PF 5% 50V CERM 402
NOSTUFF R6760 0 5% 1/16W MF-LF 402
CHASSIS GND BAND AID
AUD_CONNJ1_MIC_F
AUD_CONNJ1_SLEEVE_F
AUD_CONNJ1_TIPDET_F
AUD_CONNJ1_RING_F
AUD_CONNJ1_TIP_F
AUD_CONNJ1_SLEEVEDET_F
L6709 FERR-1000-OHM 0402
L6710 FERR-1000-OHM 0402
CRITICAL L6701 FERR-120-OHM-1.5A 0402-LF
L6704 FERR-1000-OHM 0402
L6706 FERR-1000-OHM 0402
R6700 10K 5% 1/16W MF-LF 402
R6701 4.7 5% 1/16W MF-LF 402
AUD_SPDIF_OUT
HS_MIC_HI
HS_MIC_LO
AUD_LO_AMP_OUTR
AUD_LO_AMP_OUTL
AUD_J1_SLEEVEDET_R
AUD_J1_TIPDET_R
MIN_NECK_WIDTH=0.2MM
MIN_LINE_WIDTH=0.4MM
AUD_J1_COM
XW6700 SM
AUD_LO_GND

MIC CONNECTOR

APN:518S0520

CRITICAL J6701 78171-0003 M-RT-SM
MIC_LO_CONN
MIC_HI_CONN
MIC_SHLD_CONN

SPEAKER CONNECTOR

APN:518S0519

CRITICAL J6702 78171-0002 M-RT-SM
SPKRAMP_L_P_OUT
SPKRAMP_L_N_OUT
SPKRAMP_SUB_P_OUT
C6760 100PF 5% 50V CERM 402
C6761 100PF 5% 50V CERM 402
C6762 100PF 5% 50V CERM 402
C6763 100PF 5% 50V CERM 402
CRITICAL J6703 78171-0004 M-RT-SM
SPKRAMP_SUB_N_OUT
SPKRAMP_R_P_OUT
SPKRAMP_R_N_OUT
APN:518S0521
C6760 - C6763 ARE FOR FILTERING POTENTIAL FSB NOISE COUPLED ON SPKR LINES

AUDIO JACK 2: LINE IN CONNECTOR, SPDIF RX

=PP3V3_S0_AUDIO_SPDIF
AUD_J2_OPT_OUT
R6749 22 5% 1/10W MF-LF 402
AUD_CONNJ2_SLEEVE
AUD_CONNJ2_TIPDET
AUD_CONNJ2_TIP
AUD_CONNJ2_RING
AUD_CONNJ2_SLEEVEDET
R6752 0 5% 1/16W MF-LF 402
R6753 0 5% 1/16W MF-LF 402
R6754 0 5% 1/16W MF-LF 402
R6755 0 5% 1/16W MF-LF 402
R6756 0 5% 1/16W MF-LF 402
CRITICAL
J6750
AUDIO-RCVR-M97
F-RT-TH3
AUDIO
A - VDD
B - GND
C - VOUT
OPERATING VOLTAGE 3.3
POF
SHELL
SHIELD PINS
APN:514-0608
C6750 1UF 10% 6.3V CERM 402
=GND_CHASSIS_AUDIO_JACK
CRITICAL DZ6752 6.8V-100PF 402
CRITICAL DZ6753 6.8V-100PF 402
CRITICAL DZ6754 6.8V-100PF 402
CRITICAL DZ6755 6.8V-100PF 402
C6756 100PF 5% 50V CERM 402
AUD_CONNJ2_SLEEVE_F
AUD_CONNJ2_TIPDET_F
AUD_CONNJ2_RING_F
AUD_CONNJ2_TIP_F
AUD_CONNJ2_SLEEVEDET_F
CRITICAL L6751 FERR-120-OHM-1.5A 0402-LF
L6754 FERR-1000-OHM 0402
L6756 FERR-1000-OHM 0402
R6750 10K 5% 1/16W MF-LF 402
R6751 4.7 5% 1/16W MF-LF 402
AUD_SPDIF_I
AUD_PORTA_R
AUD_PORTA_L
AUD_J2_TIPDET_R
XW6701 SM
AUD_J2_COM
GND_AUDIO_CODEC

MIC EMI FILTER

L6770 FERR-1000-OHM 0402
L6771 FERR-1000-OHM 0402
MIC_LO
MIC_LO_CONN_F
MIC_LO_CONN
L6772 FERR-1000-OHM 0402
L6773 FERR-1000-OHM 0402
MIC_HI
MIC_HI_CONN_F
MIC_HI_CONN
CRITICAL DZ6770 6.8V-100PF 402
CRITICAL DZ6771 6.8V-100PF 402
=GND_CHASSIS_AUDIO_MIC

AUDIO: JACK

SYNC_MASTER=AUDIO SYNC_DATE=07/01/2008

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APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 67 OF 109	

CODEC OUTPUT SIGNAL PATHS

FUNCTION	VOLUME	CONVERTER	PIN COMPLEX	MUTE CONTROL	DET ASSIGNMENT
HP OUT	0X0C (12)	0X02 (2)	0X14 (20,PORTD)	GPIO 0	0X14 (20,PORTD)
SAT SPKRS	0X0D (13)	0X03 (3)	0X18 (24,PORTB)	VREF_B(100%)	N/A
SUB SPKR	0X0F (15)	0X05 (5)	0X1A (26,PORTC)	VREF_B(100%)	N/A
SPDIF OUT	N/A	0X06 (6)	0X1E (30,SPDIF OUT)	N/A	0X16 (22, PORTG)

CODEC INPUT SIGNAL PATHS

FUNCTION	MIXER	VOLUME	MUTE CONTROL	CONVERTER	PIN COMPLEX	VREF	DET ASSIGNMENT
LINE IN	0X23 (35)	0X08 (8)	0X08 (8)	0X08 (8)	0X15 (21,PORTA)	N/A	0X15 (21,PORTA)
MIC IN	0X24 (36)	0X07 (7)	0X07 (7)	0X07 (7)	0X19 (25,PORTF)	VREF_F (80%)	N/A
SPDIF IN	N/A	N/A	N/A	0X0A (10)	0X1F (31,SPDIF IN)	N/A	N/A

HP/LO AMP
APN:353S1637
PORT D HP/LO

ALIAS OF PP5VLT_S3, MIN_LINE_WIDTH=0.60MM, MIN_NECK_WIDTH=0.20MM
=PP5V_S3_AUDIO
L6880 FERR-120-OHM-1.5A 0402-LF
MIN_NECK_WIDTH=0.2MM MIN_LINE_WIDTH=0.3MM
AUD_PP5V_F
C6880 0.1UF 10% 16V X7R-CERM 402
C6881 10UF 20% 6.3V X5R 603
U6801 MAX9724A TQFN CRITICAL
VDD, INL, INR, SHDN*, THRM PAD, SGND, PGND, SVSS, PVSS, OUTL, OUTR, C1P, C1N
AUD_LO_AMP_INL_M
AUD_LO_AMP_INR_M
AUD_GPIO_0
MAX9724_C1P
MAX9724_C1N
C6882 1UF 10% 16V X5R 402-1 CRITICAL
R6885 10K 5% 1/16W MF-LF 402
R6880 2.21K 1% 1/16W MF-LF 402
R6881 2.21K 1% 1/16W MF-LF 402
MIN_NECK_WIDTH=0.15MM MIN_LINE_WIDTH=0.2MM
AUD_LO_AMP_OUTL
AUD_LO_AMP_OUTR
MAX9724_SVSS
C6884 1UF 10% 16V X5R 402-1 CRITICAL
C6885 1UF 10% 16V X5R 402-1 CRITICAL
GND_AUDIO_CODEC
XW6880 SM PLACE CLOSE TO U6801
NO STUFF R6882 0 5% 1/16W MF-LF 402
MIN_NECK_WIDTH=0.2MM MIN_LINE_WIDTH=0.4MM
AUD_LO_GND

PORT D DETECT

AUD_SENSE_B
AUD_SENSE_A
PP3V3_S0_AUDIO_F
R6801 270K 5% 1/16W MF-LF 402
Q6800 SSM6N15FEAPE SOT563
AUD_OUTJACK_INSERT_L
R6802 47K 5% 1/16W MF-LF 402
AUD_J1_TIPDET_R
AUD_J1_DET_RC
C6801 0.1UF 10% 16V X5R 402
R6803 100K 5% 1/16W MF-LF 402
GND_AUDIO_CODEC
R6861 270K 5% 1/16W MF-LF 402
AUD_J1_SLEEVEDET_R
C6802 0.01UF 10% 16V CERM 402

PORT G DETECT(SPDIF DELEGATE)

R6806 5.11K 1% 1/16W MF-LF 402
AUD_PORTD_DET_L NC
R6805 10K 1% 1/16W MF-LF 402
AUD_PORTG_DET_L NC
Q6801 SSM6N15FEAPE SOT563
Q6801 SSM6N15FEAPE SOT563

PLACE L6800/C6800 CLOSE TO Q6800

L6800 FERR-1000-OHM 0402
=PP3V3_S0_AUDIO
PP3V3_S0_AUDIO_F
C6800 0.1UF 10% 16V X5R 402
GND_AUDIO_CODEC

MIC INPUT CIRCUITRY

R6850 6.81K 1/16W MF-LF 1%
VREF_PORT_F_R
R6855 2.2K 1/16W MF-LF 5%
AUD_VREF_PORT_F
C6853 10UF 20% 6.3V X5R 603 CRITICAL
GND_AUDIO_CODEC
MIC_HI
R6851 330 1/16W MF-LF 5%
MIC_IN
C6850 0.1UF 10% 16V X5R 402
AUD_BI_PORT_F_L
MAKE_BASE=TRUE
AUD_BI_PORT_F_R
C6851 680PF 10% 50V CERM 402 CRITICAL
R6852 100K 5% 1/16W MF-LF 402
C6852 100PF 5% 50V CERM 402 CRITICAL
NO STUFF
PLACE C6852 NEAR U6200
MIC_LO
XW6800 SM
GND_AUDIO_CODEC
NO STUFF R6853 0 5% 1/16W MF-LF 402
MIC_SHLD_CONN
R6854 0 5% 1/16W MF-LF 402
=GND_CHASSIS_AUDIO_MIC
NO STUFF R6856 0 5% 1/16W MF-LF 402

LINE-IN (PORT A) DETECT

AUD_SENSE_A
PP3V3_S0_AUDIO_F
R6813 39.2K 1% 1/16W MF-LF 402
R6811 270K 5% 1/16W MF-LF 402
AUD_INJACK_INSERT_L NC
Q6802 SSM3K15FV SOD-VESM-HF
R6812 47K 5% 1/16W MF-LF 402
AUD_J2_TIPDET_R
AUD_J2_DET_RC
C6811 0.1UF 10% 16V X5R 402
GND_AUDIO_CODEC

MAX9724 GAIN/FILTER COMPONENTS
AV_PB = -1 V/V, FC_HPF=5.28HZ, FC_LPF=34.45KHZ

C6888 220PF 5% 25V CERM 402 CRITICAL
R6884 21K 1% 1/16W MF-LF 402
AUD_BI_PORT_D_L
C6886 2.2UF 20% 6.3V TANT 402 CRITICAL
AUD_LO_AMP_INL_C
R6883 13.7K 1% 1/16W MF-LF 402
AUD_LO_AMP_INL_M
AUD_LO_AMP_OUTL
C6889 2.2UF 20% 6.3V TANT 402 CRITICAL
AUD_BI_PORT_D_R
AUD_LO_AMP_INR_C
R6886 13.7K 1% 1/16W MF-LF 402
AUD_LO_AMP_INR_M
AUD_LO_AMP_OUTR
R6888 21K 1% 1/16W MF-LF 402
C6891 220PF 5% 25V CERM 402 CRITICAL

PORT A LI

C6832 2.2UF 20% 6.3V TANT 402 CRITICAL
AUD_PORTA_L
AUD_BI_PORT_A_L
R6836 27.4K 1% 1/16W MF-LF 402
GND_AUDIO_CODEC
R6837 27.4K 1% 1/16W MF-LF 402
C6833 2.2UF 20% 6.3V TANT 402 CRITICAL
AUD_PORTA_R
AUD_BI_PORT_A_R

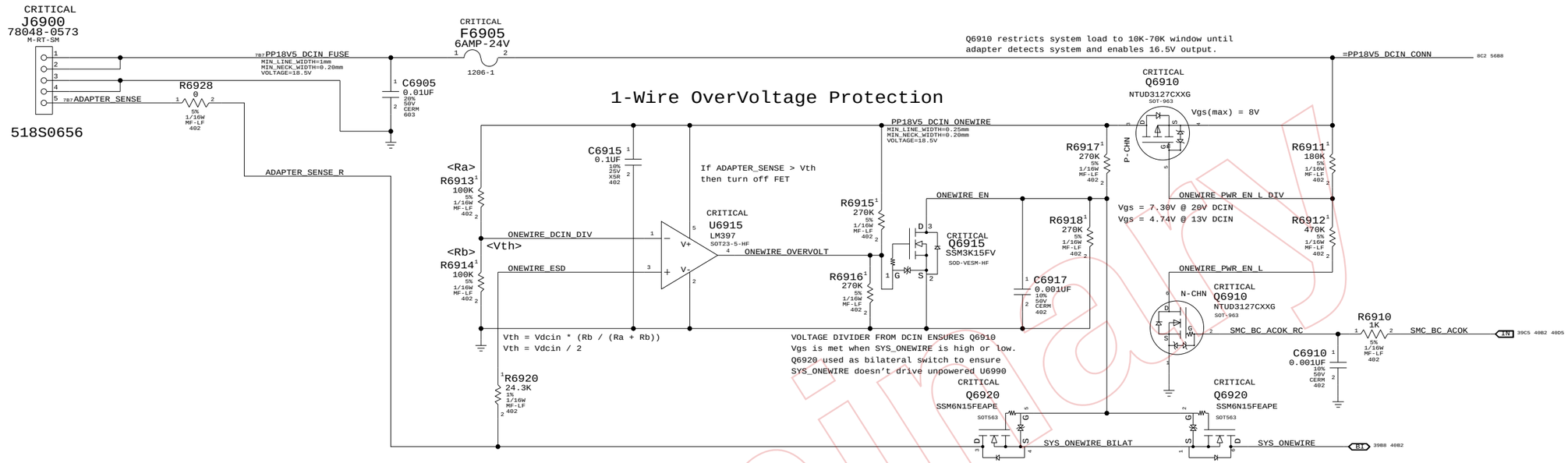
AUDIO: JACK TRANSLATORS

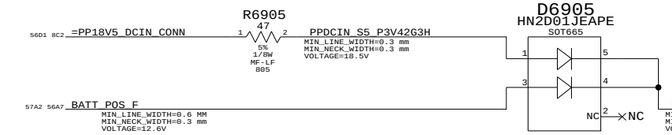
SYNC_MASTER=AUDIO
SYNC_DATE=07/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 68 OF 109	

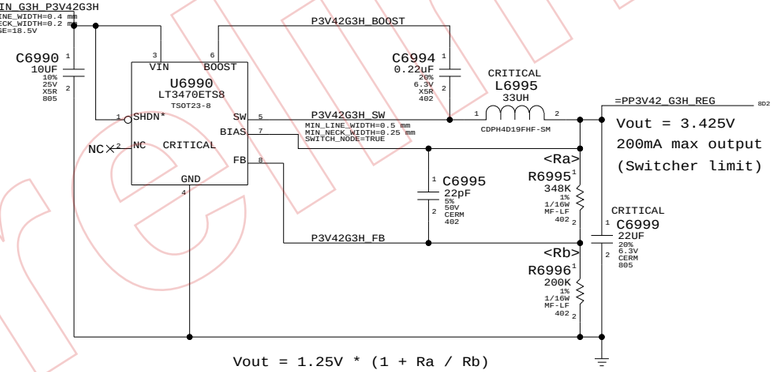
MagSafe DC Power Jack



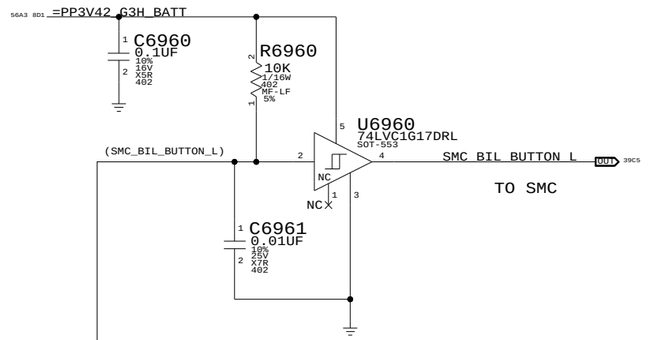


3.425V "G3Hot" Supply

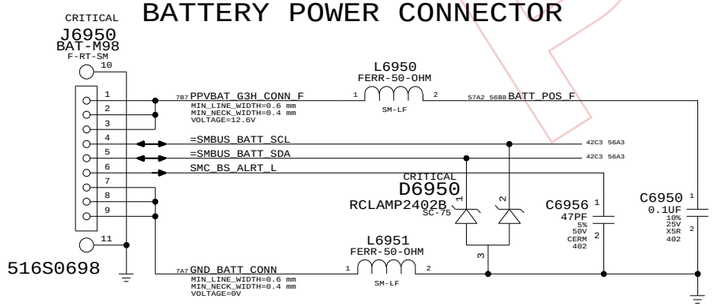
Supply needs to guarantee 3.31V delivered to SMC VRef generator



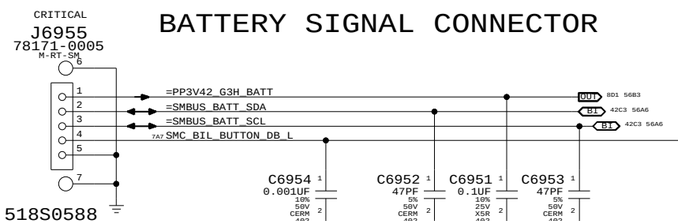
BIL BUTTON DEBOUNCE CIRCUIT



BATTERY POWER CONNECTOR



BATTERY SIGNAL CONNECTOR



DC-In & Battery Connectors

SYNC_MASTER=JACK SYNC_DATE=03/13/2008

NOTICE OF PROPRIETARY PROPERTY

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I TO MAINTAIN THE DOCUMENT IN CONFIDENCE

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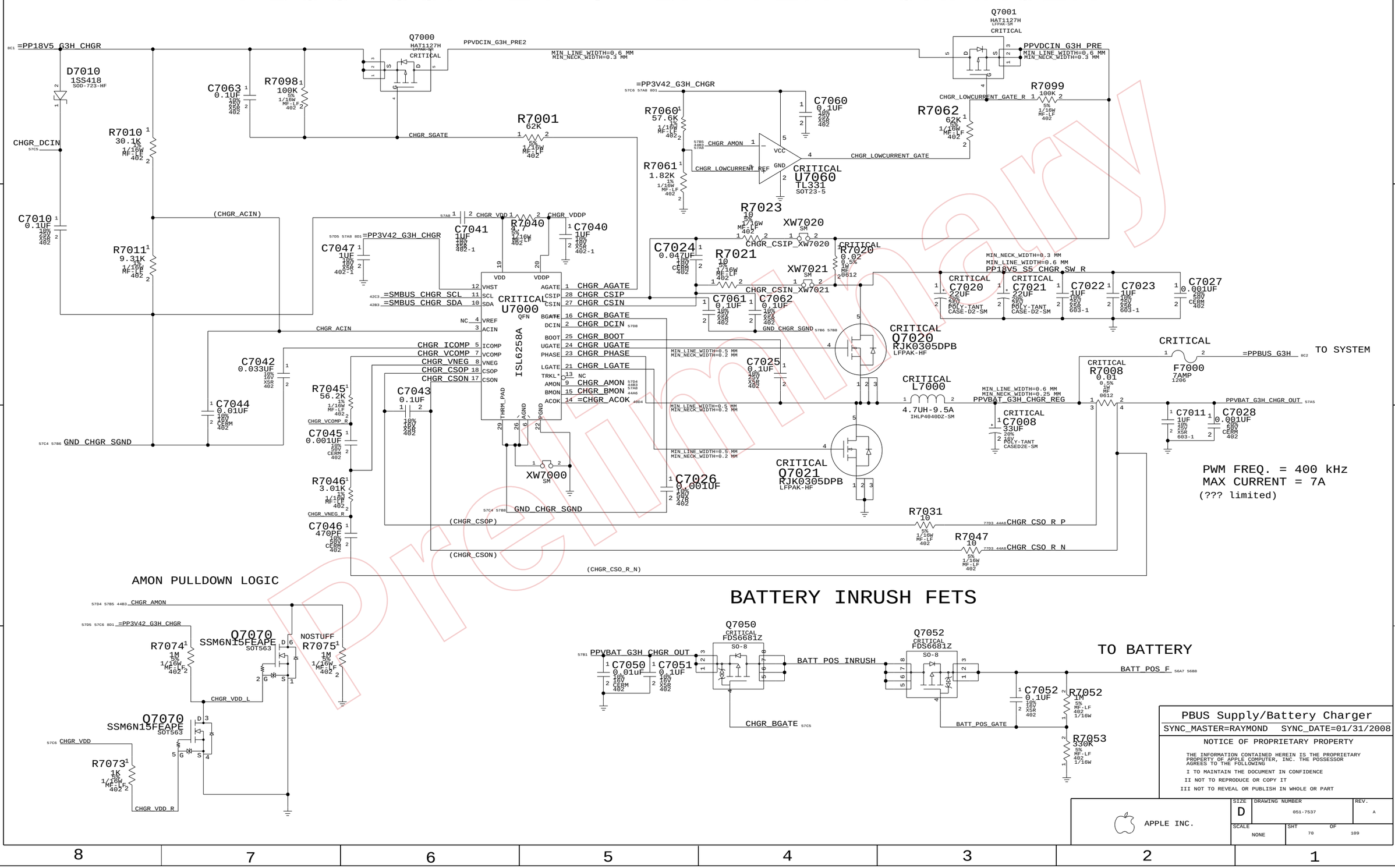
III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A

SCALE: NONE SHT 69 OF 109

PBUS SUPPLY / BATTERY CHARGER



AMON PULLDOWN LOGIC

BATTERY INRUSH FETS

PBUS Supply/Battery Charger		
SYNC_MASTER=RAYMOND	SYNC_DATE=01/31/2008	
NOTICE OF PROPRIETARY PROPERTY		
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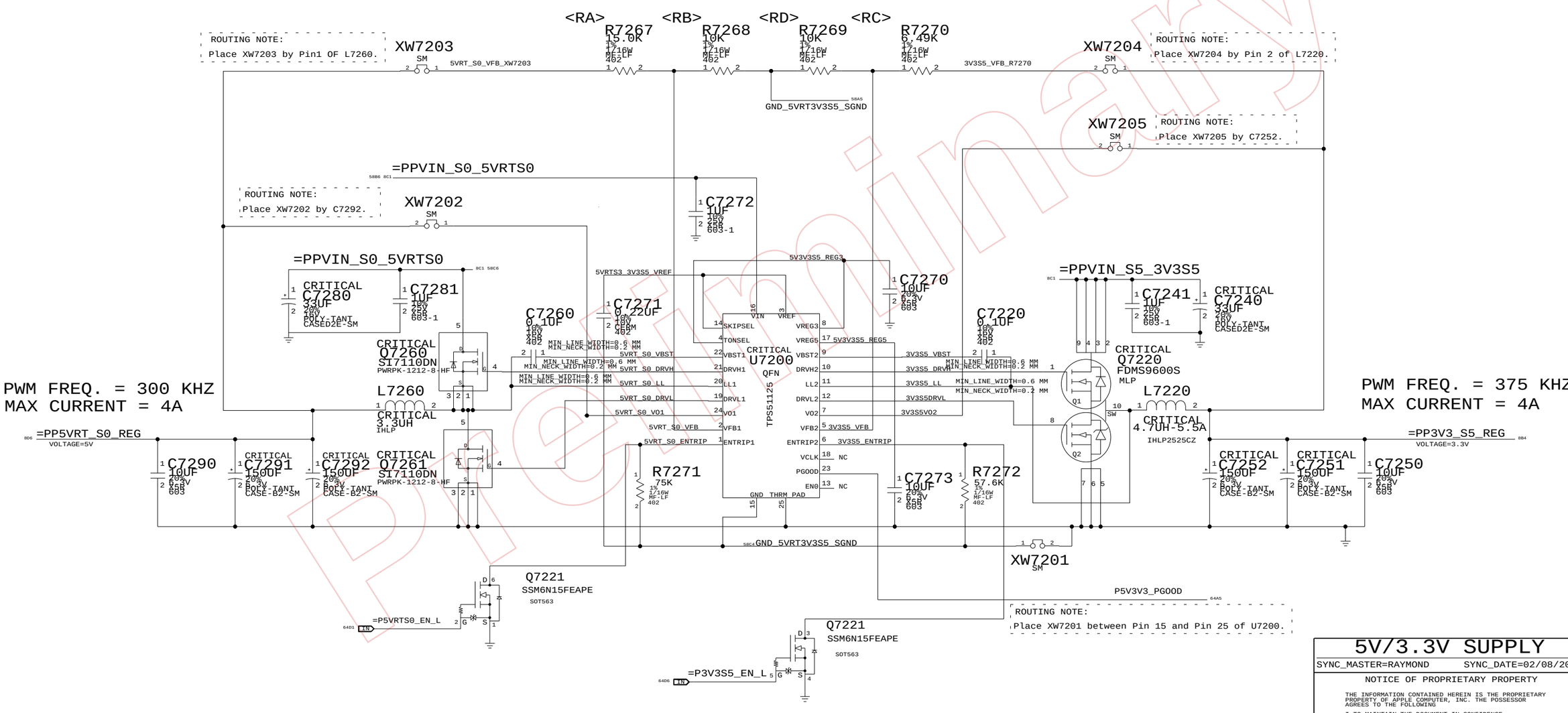
APPLE INC.	SIZE: D	DRAWING NUMBER: 051-7537
	REV: A	
	SCALE: NONE	SHT: 70 OF 109

5V_RT/3.3V POWER SUPPLY

VOUT = (2 * RA / RB) + 2

VOUT = (2 * RC / RD) + 2



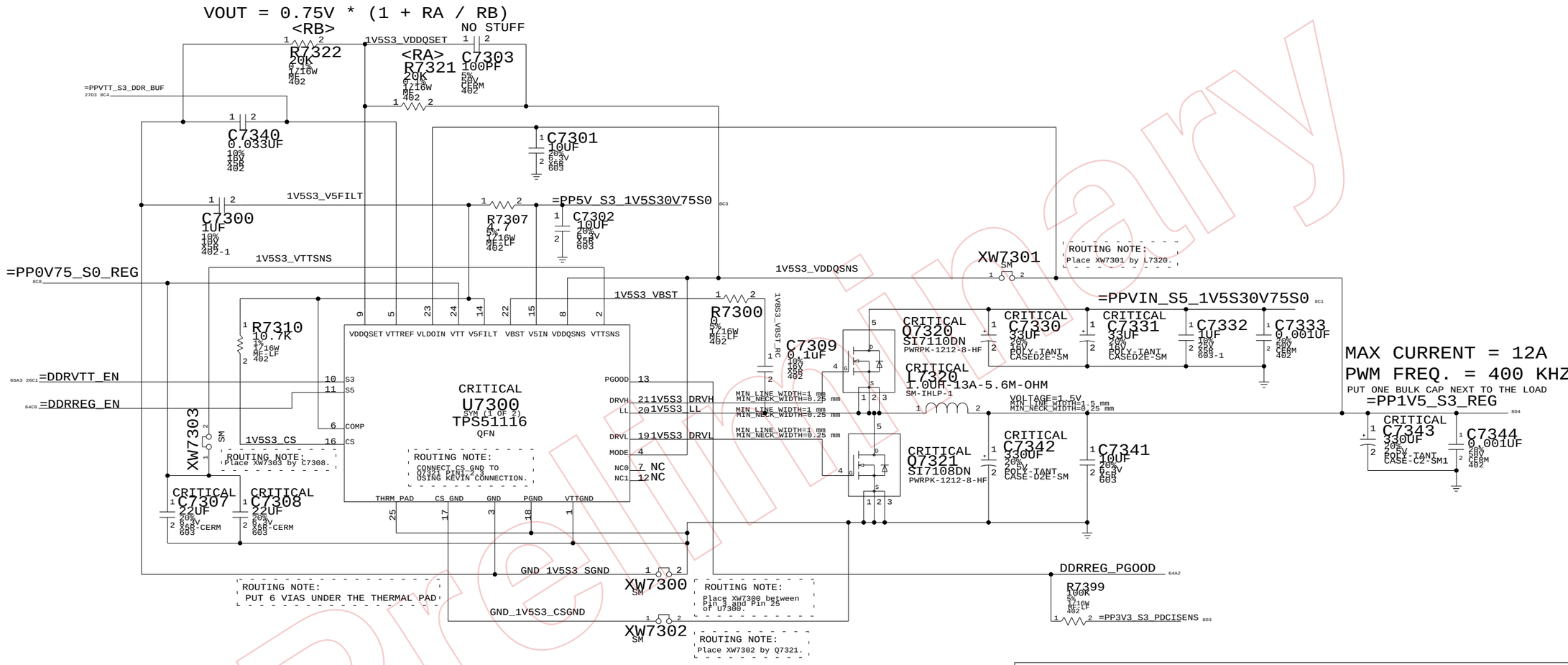
5V/3.3V SUPPLY

SYNC_MASTER=RAYMOND SYNC_DATE=02/08/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE	SHT	OF
NONE	72	109

1.5V/0.75V(DDR3) POWER SUPPLY



STATE	PM_SLP_S4_L	PM_SLP_S3_L	PP1V5_S3	PP0V75_S0
S0	HIGH	HIGH	1.5V	0.75V
S3	HIGH	LOW	1.5V	0.0V
S5/G3HOT	LOW	LOW	0.0V	0.0V

1.5V/0.75V DDR3 SUPPLY

SYNC_MASTER=RAYMOND SYNC_DATE=01/31/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A

SCALE: NONE SHT 73 OF 109

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

PWM FREQ. = 300 KHZ
MAX CURRENT = 44A
LOAD LINE SLOPE = -2.1 MV/A

NOTE 1: C7432,C7433 = 27.4 OHM FOR VALIDATING CPU ONLY.

R1100/R1101 **ON THE CPU PAGE** PROTECT THE IMVP6 IF THE CPU IS NOT INSTALLED

IMVP6 CPU VCORE REGULATOR

	MIN_LINE_WIDTH	MIN_NECK_WIDTH
IMVP6_PHASE1	1.5 MM	0.25 MM
IMVP6_BOOT1	0.25 MM	0.25 MM
IMVP6_UGATE1	1.5 MM	0.25 MM
IMVP6_LGATE1	1.5 MM	0.25 MM
IMVP6_ISEN1	0.25 MM	0.25 MM

	MIN_LINE_WIDTH	MIN_NECK_WIDTH
IMVP6_PHASE2	0.25 MM	0.25 MM
IMVP6_BOOT2	0.25 MM	0.25 MM
IMVP6_UGATE2	0.25 MM	0.25 MM
IMVP6_LGATE2	0.25 MM	0.25 MM
IMVP6_ISEN2	0.25 MM	0.25 MM

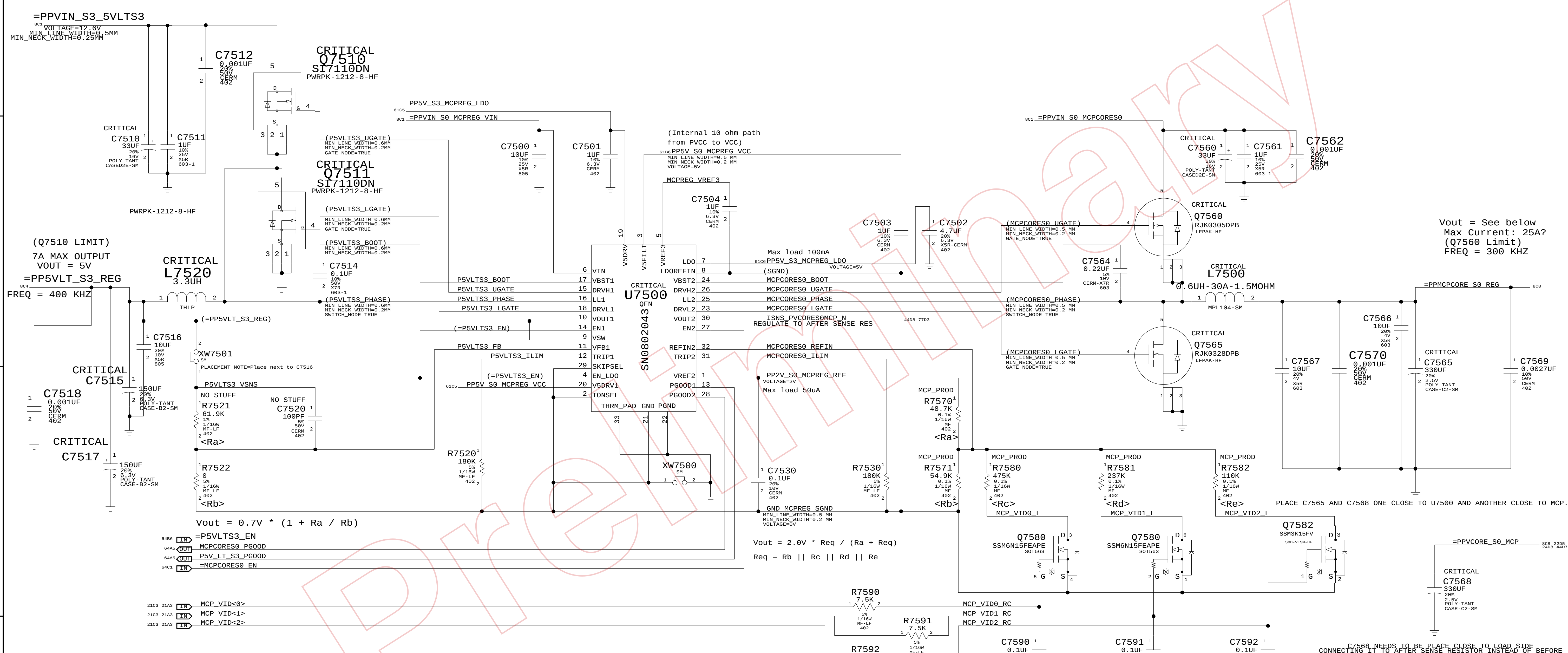
	MIN_LINE_WIDTH	MIN_NECK_WIDTH
IMVP6_OCSET	0.25 MM	0.20 MM
IMVP6_VSUM	0.25 MM	0.20 MM
GND_IMVP6_SGND	0.50 MM	0.20 MM
IMVP6_VO	0.25 MM	0.20 MM
IMVP6_DROOP	0.25 MM	0.20 MM
IMVP6_DFB	0.25 MM	0.20 MM
IMVP6_SOFT	0.25 MM	0.20 MM
IMVP6_RBIAS	0.25 MM	0.20 MM
IMVP6_VDIFF	0.25 MM	0.20 MM
IMVP6_FB2	0.25 MM	0.20 MM
IMVP6_FB	0.25 MM	0.20 MM
IMVP6_COMP	0.25 MM	0.20 MM
IMVP6_VW	0.25 MM	0.25 MM
IMVP6_RTN	0.25 MM	0.25 MM
IMVP6_VSEN	0.25 MM	0.25 MM

IMVP6 CPU VCore Regulator
SYNC_MASTER=RAYMOND SYNC_DATE=01/31/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 74 OF 109	

MCP VCORE/5V_S3 LEFT REGULATOR



MCP79 Rev A01 requires higher core & analog voltage

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
114S0383	1	RES,MTL FILM,1/16W,49.9K,1,0402,SMD,LF	R7570		MCP_A01
114S0401	1	RES,MTL FILM,1/16W,78.7K,1,0402,SMD,LF	R7571		MCP_A01
114S0484	1	RES,MTL FILM,1/16W,549K,1,0402,SMD,LF	R7580		MCP_A01
114S0454	1	RES,MTL FILM,1/16W,274K,1,0402,SMD,LF	R7581		MCP_A01
114S0423	1	RES,MTL FILM,1/16W,133K,1,0402,SMD,LF	R7582		MCP_A01
114S0373	1	RES,MTL FILM,1/16W,40.2K,1,0402,SMD,LF	R7570		MCP_A01P&MCP_A01Q
114S0404	1	RES,MTL FILM,1/16W,84.5K,1,0402,SMD,LF	R7571		MCP_A01P&MCP_A01Q
114S0458	1	RES,MTL FILM,1/16W,301K,1,0402,SMD,LF	R7580		MCP_A01P&MCP_A01Q
114S0447	1	RES,MTL FILM,1/16W,237K,1,0402,SMD,LF	R7581		MCP_A01P&MCP_A01Q
114S0411	1	RES,MTL FILM,1/16W,100K,1,0402,SMD,LF	R7582		MCP_A01P&MCP_A01Q

	Rev A01	Production	
VID<2:0>	Voltage	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

M97 DIFFERENCES FROM LAST SYNC ON 12/05/07 TO T18 MLB:
Added C7568 bulk cap on output.
Tied TON to REF.
Changed Q7510 to 376S0674.
C7500 changed to 138S0638.
L7560 changed from T18 MLB inductor to 152S0782.
Changed Q7565 to 376S0637.
Changed R7514 to 280K, R7564 to 180K.

MCP VCORE REGULATOR

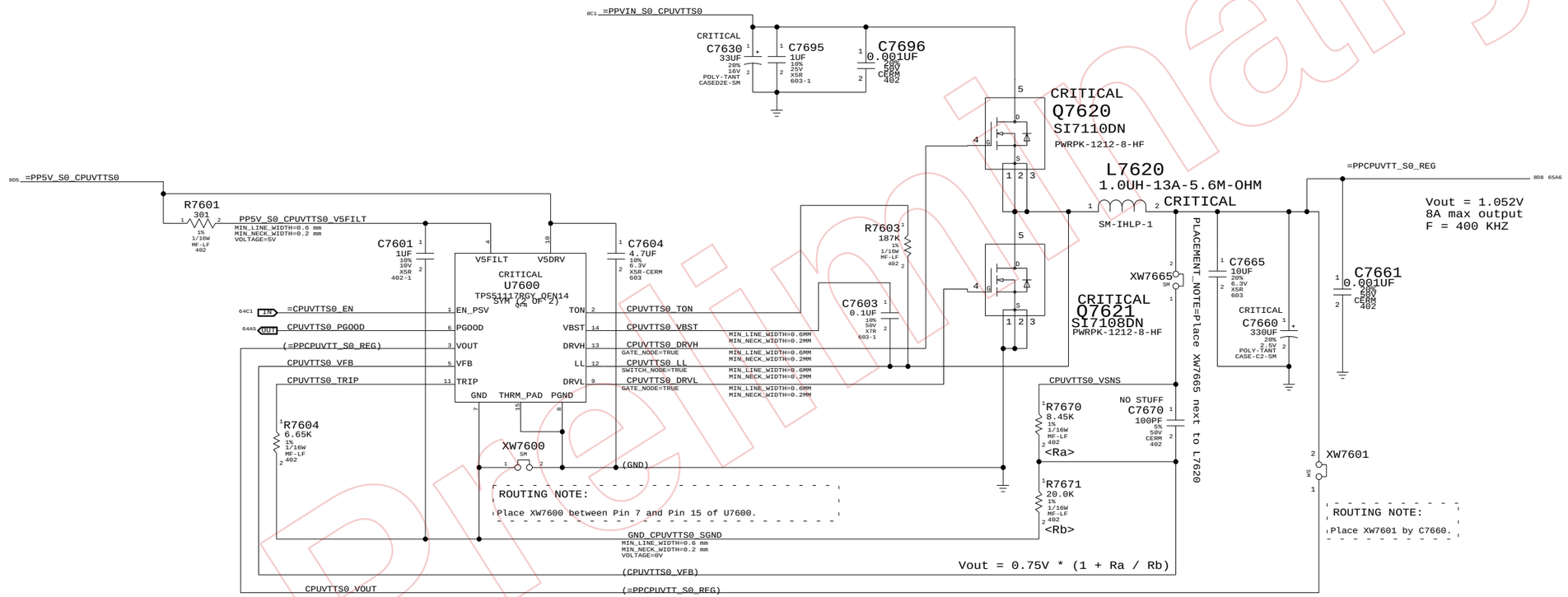
SYNC_MASTER=RAYMOND SYNC_DATE=01/31/2008

APPLE INC.

SIZE D | DRAWING NUMBER 051-7537 | REV. A

SCALE NONE | SHT 75 OF 109

CPUVTT POWER SUPPLY



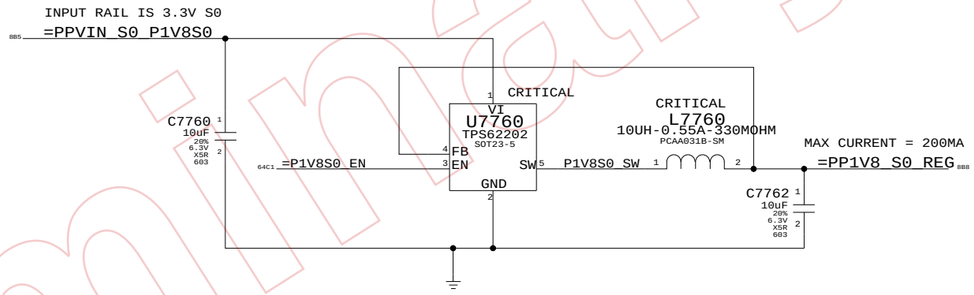
CPU VTT(1.05V) SUPPLY

SYNC_MASTER=RAYMOND SYNC_DATE=02/08/2008

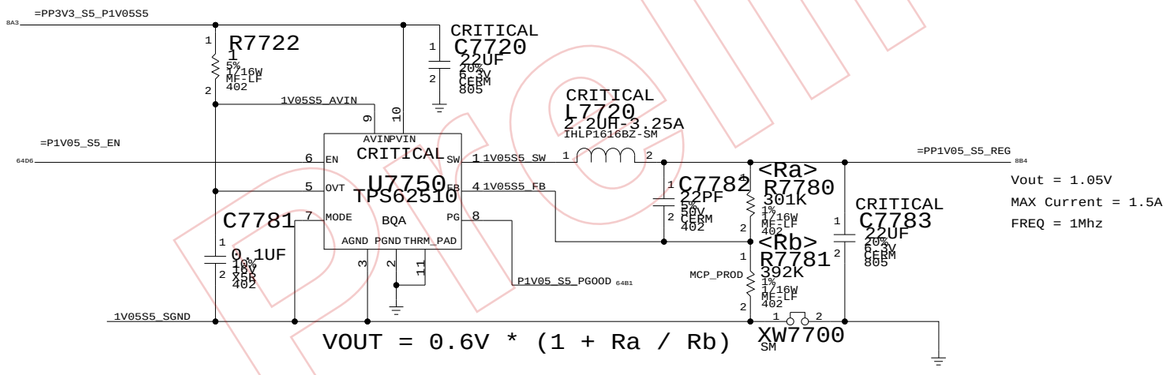
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 76 OF 109	

1.8V S0 SWITCHER



MCP 1.05V_S5 AUXC SUPPLY



Vout = 1.05V
MAX Current = 1.5A
FREQ = 1Mhz

MCP79 Rev A01 requires higher voltage

	PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
VOUT = 1.102V	114S0464	1	RES,MTL FILM,1/16W,348K,1%,0402,SMD,LF	R7781	MCP_A01&MCP_A01P&MCP_A01Q	

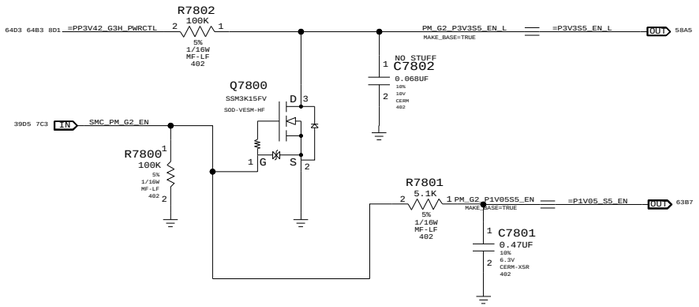
MISC POWER SUPPLIES

SYNC_MASTER=RAYMOND SYNC_DATE=01/23/2008

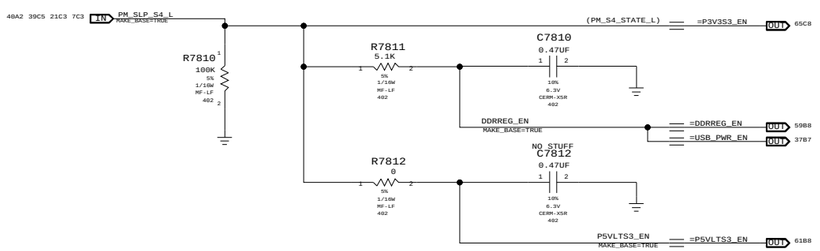
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 77 OF 109	

3.3V 1.05V S5 ENABLE



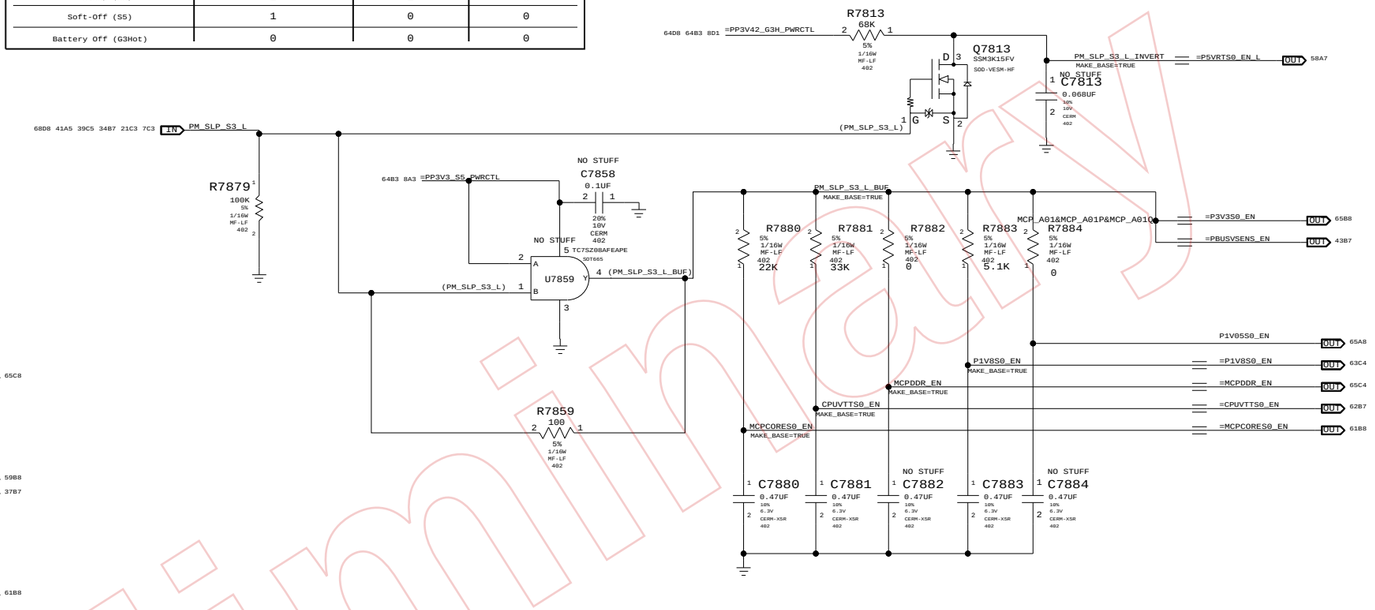
S3 ENABLE



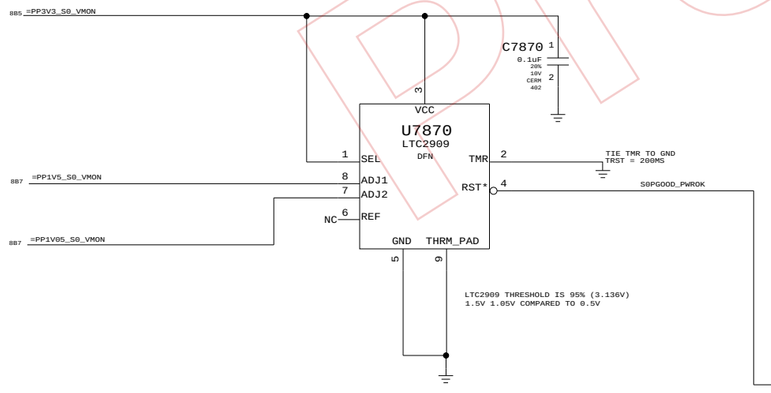
Power Control Signals

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

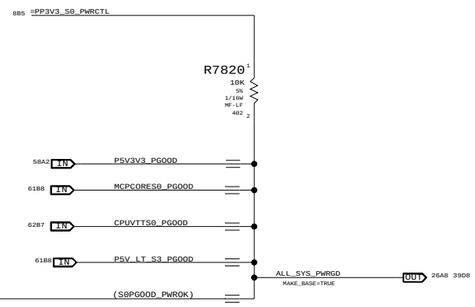
3.3V_S0, 1.8V_S0 ENABLE
MCPDDR, CPUVTT,MCPCORES0 ENABLE
1.5V S0 AND 1.05V S0 ENABLE



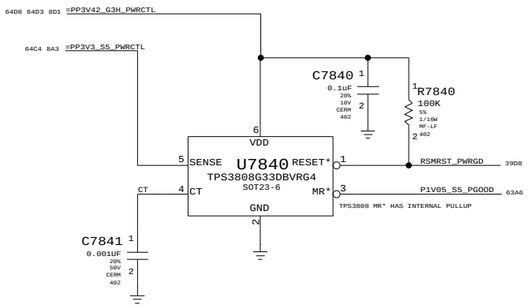
3.3V 1.05V AND 1.5V S0 RAILS MONITOR CIRCUIT



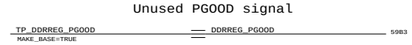
OTHER S0 RAILS PGOOD



VOLTAGE MONITOR



Unused PGOOD signal



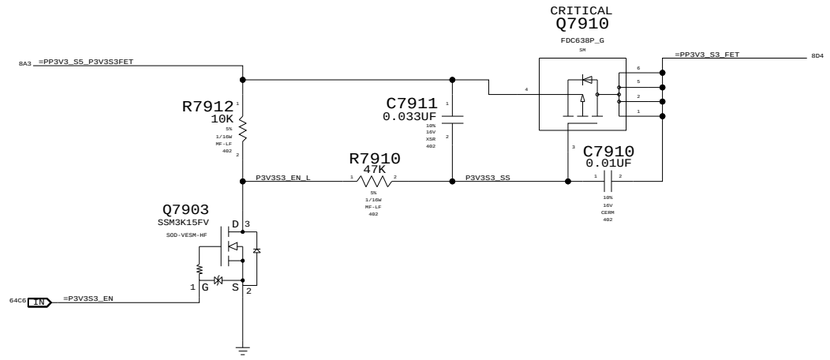
POWER SEQUENCING

SYNC_MASTER=YUAN.MA SYNC_DATE=04/22/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 78 OF 109	

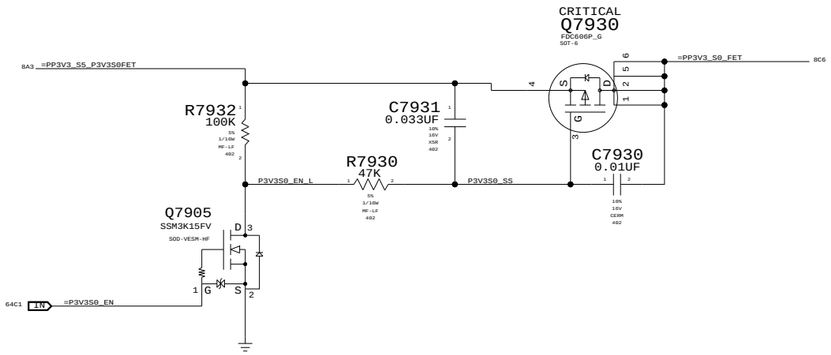
3.3V S3 FET



3.3V S3 FET

MOSFET	FDC638P
CHANNEL	P-TYPE
RDS(ON)	48 mOhm @4.5V
LOADING	0.182 A (EDP)

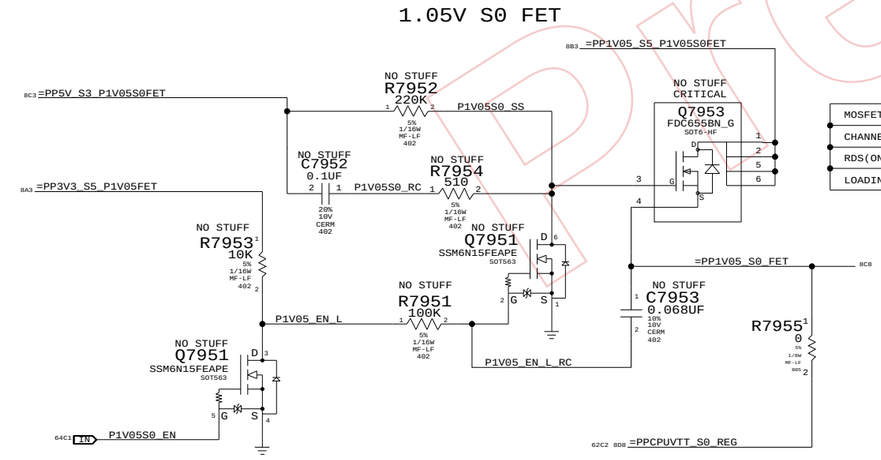
3.3V S0 FET



3.3V S0 FET

MOSFET	FDC606P
CHANNEL	P-TYPE
RDS(ON)	26 MOHM @4.5V
LOADING	1.431 A (EDP)

1.05V S0 FET

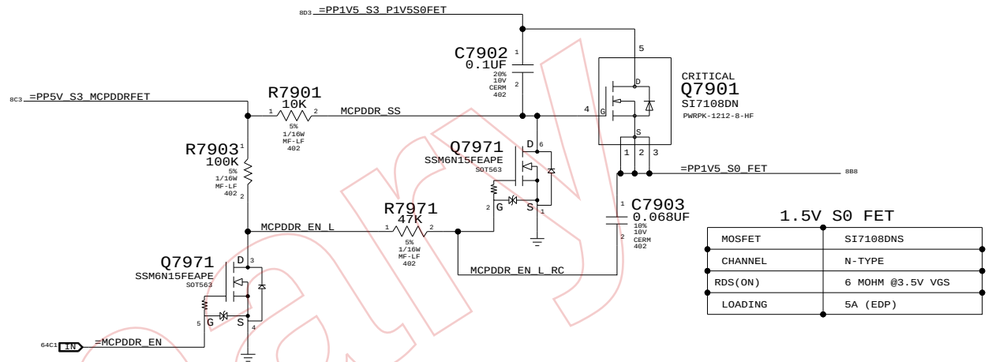


1.05V S0 FET

MOSFET	FDC655BN
CHANNEL	N-TYPE
RDS(ON)	30 MOHM @4.0V VGS
LOADING	1.1A (EDP)

1.5V S0 FET

(1.5V S0 FET FOR DDR3 MEM, MCP79 AND CPU)

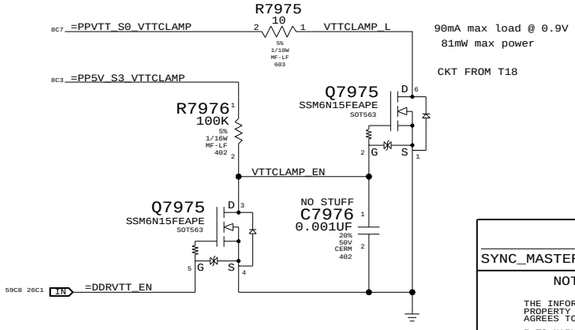


1.5V S0 FET

MOSFET	SI7108DNS
CHANNEL	N-TYPE
RDS(ON)	6 MOHM @3.5V VGS
LOADING	5A (EDP)

MCP79 DDRVTT FET

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



POWER FETS

SYNC_MASTER=YUAN.MA SYNC_DATE=04/04/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 79 OF 109	

LCD CONNECTOR

LVDS CONNECTOR:518S0650

8A3 =PP3V3_S5_LCD

R9002 100K 5% 1/16W MF-LF 402

R9023 10K 5% 1/16W MF-LF 402

LCDVDD_PWREN_L

Q9004 SSM3K15FV SOD-VESM-HF

18B6 LVDS_IG_PANEL_PWR

R9014 1K 5% 1/16W MF-LF 402

C9009 0.001UF 10% 50V CERM 402

LCDVDD_PWREN_L_R

C9013 0.0033UF 10% 50V CERM 402

CRITICAL
Q9003 FDC606P_G SOT-6

C9011 0.1UF 10% 16V X5R 402

C9012 10UF 20% 6.3V X5R 603

L9004 FERR-120-OHM-1.5A 0402-LF

PP3V3_LCDVDD_SW
MIN_NECK_WIDTH=0.20 MM
VOLTAGE=3.3V
MIN_LINE_WIDTH=0.30 MM

CRITICAL
L9008 120-OHM-0.3A-EMI 0402-LF

8C5 =PP3V3_S0_LCD

R9008 100K 5% 1/16W MF-LF 402

R9009 100K 5% 1/16W MF-LF 402

(LVDS DDC POWER)

18A3 7C7 LVDS_IG_DDC_CLK

18A3 7C7 LVDS_IG_DDC_DATA

C9015 0.001UF 10% 50V X7R 402

C9010 0.001UF 10% 50V X7R 402

7C7 7C3 PP3V3_LCDVDD_SW_F
MIN_NECK_WIDTH=0.20 MM VOLTAGE=3.3V MIN_LINE_WIDTH=0.30 MM

69C6 BKL_SYNC

7C7 PP3V3_S0_LCD_F
MIN_LINE_WIDTH=0.25 MM VOLTAGE=3.3V
MIN_NECK_WIDTH=0.20 MM

CRITICAL
J9000 20474-030E-11 F-RT-SM

18B3 7C7 7383 LVDS_IG_A_DATA_N<0>
18B3 7C7 7383 LVDS_IG_A_DATA_P<0>
18B3 7C7 7383 LVDS_IG_A_DATA_N<1>
7383 18B3 7C7 LVDS_IG_A_DATA_P<1>
7383 18B3 7C7 LVDS_IG_A_DATA_N<2>
7383 18B3 7C7 LVDS_IG_A_DATA_P<2>

CRITICAL
L9080 90-OHM-200MA AMC2012-SM

7383 18B3 7C7 LVDS_IG_A_CLK_F_N
7383 18B3 7C7 LVDS_IG_A_CLK_F_P
7383 18B3 LVDS_IG_A_CLK_N
7383 18B3 LVDS_IG_A_CLK_P

LVDS I/F

NC

69C1 69B3 7C7 7C3 PPVOUT_S0_LCDBKLT

LED BKLT I/F

NC

69C1 7B7 LED_RETURN_1
69B1 7B7 LED_RETURN_2
69B1 7B7 LED_RETURN_3
69B1 7B7 LED_RETURN_4
69B1 7B7 LED_RETURN_5
69B1 7B7 LED_RETURN_6

NC

LVDS CONNECTOR

SYNC_MASTER=NMARSTON SYNC_DATE=04/04/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 90 OF 109	

8	7	6	5	4	3	2	1

18B6 =MCP_HDMI_TXC_P
18B6 =MCP_HDMI_TXC_N
18B6 =MCP_HDMI_TXD_P<0>
18B6 =MCP_HDMI_TXD_N<0>
18B6 =MCP_HDMI_TXD_P<1>
18B6 =MCP_HDMI_TXD_N<1>
18B6 =MCP_HDMI_TXD_P<2>
18B6 =MCP_HDMI_TXD_N<2>
18B6 =MCP_HDMI_HPD
18A3 =MCP_HDMI_DDC_CLK
18A3 =MCP_HDMI_DDC_DATA

DP_ML_P<3> — 68C8 73C3 MAKE_BASE=TRUE
DP_ML_N<3> — 68C8 73B3 MAKE_BASE=TRUE
DP_ML_P<2> — 68C1 73C3 MAKE_BASE=TRUE
DP_ML_N<2> — 68B1 73B3 MAKE_BASE=TRUE
DP_ML_P<1> — 68C1 73C3 MAKE_BASE=TRUE
DP_ML_N<1> — 68C1 73B3 MAKE_BASE=TRUE
DP_ML_P<0> — 68C1 73C3 MAKE_BASE=TRUE
DP_ML_N<0> — 68C1 73B3 MAKE_BASE=TRUE
DP_HPD — 68A8 MAKE_BASE=TRUE
DP_IG_DDC_CLK — 67C8 MAKE_BASE=TRUE
DP_IG_DDC_DATA — 67C8 MAKE_BASE=TRUE

DP_AUX_CH_C_N — BI 68B8 73B3

R9300 33 5% 1/16W MF-LF 402
C9300 0.1UF 10% 16V X5R 402
DP_IG_DDC_DATA — BI 67D1
DP_AUX_CH_SW_N

DP_AUX_CH_C_P — BI 68C8 73B3

R9301 33 5% 1/16W MF-LF 402
C9301 0.1UF 10% 16V X5R 402
DP_IG_DDC_CLK — BI 67D1
DP_AUX_CH_SW_P

Display Port Interoperability spec says that sources or sinks which do both DP and DVI must depend on the external adapter for pull ups on DDC lines (since DP AUX CH has 100K pull up/down on the MLB)..

Q9300 SSM6N15FEAPE SOT563
Q9300 SSM6N15FEAPE SOT563

DP_IG_AUX_CH_P — BI 73B3 18B6
DP_IG_AUX_CH_N — BI 73B3 18B6

=PP5V_S0_DP_AUX_MUX — 80S

R9302 100K 5% 1/16W MF-LF 402
R9306 1K 5% 1/16W MF-LF 402

DDC_CA_DET_LS5V_L

Q9301 SSM3K15FV SOD-VESM-HF

DP_CA_DET — IN 68B8
DP_IG_CA_DET — OUT 18B6

DISPLAYPORT SUPPORT

SYNC_MASTER=AMASON SYNC_DATE=04/18/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 93 OF 109	

Port Power Switch

CRITICAL
U9480
TPS2051B
SOT23
=PP3V3_S5_DP_PORT_PWR
PM_SLP_S3_L
IN
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
L9400
FERR-120-OHM-3A
0603
PP3V3_S0_DPPWR
MIN_LINE_WIDTH=0.38 MM
MIN_NECK_WIDTH=0.20 MM
VOLTAGE=3.3V
C9400
0.01UF
C9480
10UF
C9481
0.1UF
NO STUFF
C9485
10UF
CRITICAL
C9486
22UF
R9420
100K

DP_ESD
CRITICAL
D9410
RCLAMP0524P
SLP2510P8
DP_ESD
CRITICAL
D9410
RCLAMP0524P
SLP2510P8

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

HDMI_CEC
R9425
1M

CRITICAL
J9400
DSPLYPRT-M97-2
F-RT-THSM
BOT ROW TH PINS
TOP ROW SM PINS
DP_HPD
DP_C_A_DET
HDMI_CEC
GND
ML_LANE3P
ML_LANE3N
GND
AUX_CHP
AUX_CHN
DP_PWR
GND
ML_LANE0P
ML_LANE0N
GND
ML_LANE1P
ML_LANE1N
GND
ML_LANE2P
ML_LANE2N
RETURN
SHIELD PINS
514-0610

R9403 0 NO STUFF
R9413 0 NO STUFF
5% 1/16W MF-LF 402
FL9403
12-OHM-100MA
TCM1210-4SM
DP_ML_P<3>
DP_ML_N<3>
C9414
C9415
0.1uF
DP_ML_C_P<3>
DP_ML_C_N<3>
DP_ML_CONN_P<3>
DP_ML_CONN_N<3>
DP_ML_CONN_P<1>
DP_ML_CONN_N<1>
DP_AUX_CH_C_P
DP_AUX_CH_C_N

FL9401
12-OHM-100MA
TCM1210-4SM
DP_ML_CONN_P<0>
DP_ML_CONN_N<0>
FL9400
12-OHM-100MA
TCM1210-4SM
DP_ML_C_P<0>
DP_ML_C_N<0>
C9410
C9411
DP_ML_C_P<1>
DP_ML_C_N<1>
C9412
C9413
0.1uF

FL9402
12-OHM-100MA
TCM1210-4SM
DP_ML_CONN_P<2>
DP_ML_CONN_N<2>
DP_ML_C_P<2>
DP_ML_C_N<2>
C9416
C9417
R9402 0 NO STUFF
R9432 0 NO STUFF
5% 1/16W MF-LF 402

DP_ESD
CRITICAL
D9411
RCLAMP0524P
SLP2510P8
DP_ESD
CRITICAL
D9411
RCLAMP0524P
SLP2510P8

=PP3V3_S0_DPCONN
R9443 100K
R9442 100K
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
R9422 1M
DP to DVI/HDMI Cable Adapter (CA) has 100k pull-up to DP_PWR.

DP_ESD
CRITICAL
D9400
RCLAMP0504F
SC70-6-1

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

=PP3V3_S0_DPCONN
R9445 10K
R9444 10K
DP_HPD
R9446 100K
MCP79 requires pull down HPD input with 100K if DP_HPD is used.
Q9441
2N7002DW-X-G
SOT-363
DP_HPD_L_Q
Q9441
2N7002DW-X-G
SOT-363
DP_HPD_Q
R9423 100K
DP Source must pull down HPD input with greater than or equal to 100K (DPv1.1a).

DisplayPort Connector

SYNC_MASTER=AMASON
SYNC_DATE=06/30/2008

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APPLE INC.
SIZE D
DRAWING NUMBER 051-7537
REV. A
SCALE NONE
SHT 94 OF 109

*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
R9701 100 1% 1/16W MF-LF 402
BKL_VIN
C9702 0.1UF 10% 25V X5R 402
D9701 POWERDI-123 DFLS1100 CRITICAL
Q9701 FDC5612 SSOT6
BOOST_FET_CNTL
C9709 4.7UF 10% 50V X7R-CERM 1206
C9710 4.7UF 10% 50V X7R-CERM 1206
PLACEMENT_NOTE=Place near Q9701
PLACEMENT_NOTE=Place near L9701
PLACEMENT_NOTE=Place near PPVOUT_S0_LCDBKLT_SW
PLACEMENT_NOTE=Place near C9709
PLACEMENT_NOTE=Place near C9710
PLACEMENT_NOTE=Place near J9000
XW9701 SM
GND_BKL_PWRGND
PLACEMENT_NOTE=Place near C9701
PLACEMENT_NOTE=Place near C9709 and Q9701
BOOST_SINK
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
*R9702 AND R9715 PIN 1 SHOULD BE PLACED NEAR C9709 PIN 2
C9712 47PF 5% 50V CERM 402 NOSTUFF
PPVOUT_S0_LCDBKLT

BKL_VREF_4V9
R9731 187K 1% 1/16W MF-LF 402
BKLT_EN
BKL_SYNC
BKLT_PLL
R9734 0 5% 1/16W MF-LF 402
BKL_VSYNC
R9707 3.01K 1% 1/16W MF-LF 402
C9703 1UF 10% 10V X5R 402-1
C9713 0.1UF 10% 25V X5R 402
R9705 100K 1% 1/16W MF-LF 402
R9706 10K 5% 1/16W MF-LF 402
PLACEMENT_NOTE=Away from Q9701
U9701 APP001A QFN
VIN
VREF
ENA
VSYNC
ISET
RT
SSTCMP
DIM
LPF
LRT
GNDA
THRM_PAD
DRV
ISWSEN
ISEN1
ISEN2
ISEN3
ISEN4
ISEN5
ISEN6
VSEN
BKL_ISET
BKL_RT
BKL_SSTCMP
BKL_DIM
BKL_LPF
BKL_LRT
BKL_ISEN1
BKL_ISEN2
BKL_ISEN3
BKL_ISEN4
BKL_ISEN5
BKL_ISEN6
CRITICAL
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_1
LED_RETURN_2
LED_RETURN_3
LED_RETURN_4
LED_RETURN_5
LED_RETURN_6

PLACEMENT_NOTE=Away from Q9701
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 NOSTUFF
BKL_SSTCMP_RC
C9705 0.1UF 20% 10V 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
BKL_VREF_4V9
R9713 0 5% 1/16W MF-LF 402
BKLT_PLL_NOT
R9714 10K 5% 1/16W MF-LF 402
C9707 2.2UF 20% 6.3V CERM 402-LF
R9727 15.0K 1% 1/16W MF-LF 402
BKL_LRT_RC
C9708 0.1UF 10% 25V X5R 402
GND_BKL_PWRGND
R9723 1.2M 1% 1/16W MF-LF 603
R9724 71.5K 1% 1/16W MF-LF 402
BKL_VSEN

CRITICAL Q9702 NTUD3127CXXG SOT-963 P-CHN
BKL_VREF_IN_4V9
R9700 100K 1% 1/16W MF-LF 402
R9710 10K 1% 1/16W MF-LF 402
BKL_PWR_EN_L
CRITICAL Q9702 NTUD3127CXXG SOT-963 N-CHN
LVDS_IG_BKL_PWM
R9711 30.1K 1% 1/16W MF-LF 402

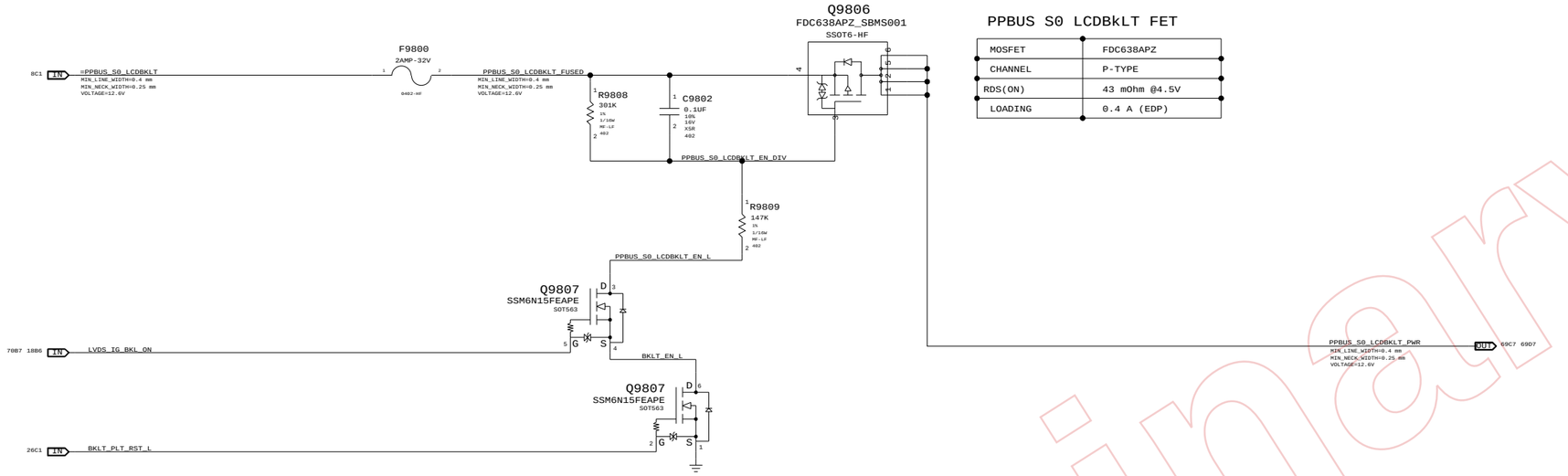
*R9707, R9708, R9709, R9713, R9714, R9727, AND R9729 SHOULD AWAY FROM BOOST CIRCUIT

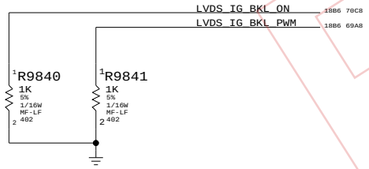
LCD BACKLIGHT DRIVER

SYNC_MASTER=YITE SYNC_DATE=08/12/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 97 OF 109	





LCD Backlight Support

SYNC_MASTER=YITE SYNC_DATE=06/30/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 98 OF 109	

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

	ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	SPACING		
FSB 4X Signal Groups	FSB_DATA_GROUP0	FSB_50S	FSB_DATA	FSB_D_L<15..0>	10C4 14D3
	FSB_DATA_GROUP0	FSB_50S	FSB_DATA	FSB_DINV_L<0>	10C4 14D6
	FSB_DSTB0	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_P<0>	10C4 14D6
	FSB_DSTB0	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_N<0>	10C4 14D6
	FSB_DATA_GROUP1	FSB_50S	FSB_DATA	FSB_D_L<31..16>	10B4 10C4 14C3 14D3
	FSB_DATA_GROUP1	FSB_50S	FSB_DATA	FSB_DINV_L<1>	10B4 14D6
	FSB_DSTB1	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_P<1>	10B4 14D6
	FSB_DSTB1	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_N<1>	10B4 14D6
	FSB_DATA_GROUP2	FSB_50S	FSB_DATA	FSB_D_L<47..32>	10C2 14B3 14C3
	FSB_DATA_GROUP2	FSB_50S	FSB_DATA	FSB_DINV_L<2>	10C2 14D6
	FSB_DSTB2	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_P<2>	10C2 14D6
	FSB_DSTB2	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_N<2>	10C2 14D6
	FSB_DATA_GROUP3	FSB_50S	FSB_DATA	FSB_D_L<63..48>	10B2 10C2 14B3
	FSB_DATA_GROUP3	FSB_50S	FSB_DATA	FSB_DINV_L<3>	10B2 14D6
	FSB_DSTB3	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_P<3>	10B2 14D6
	FSB_DSTB3	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_N<3>	10B2 14D6
FSB 2X Signals	FSB_ADDR_GROUP0	FSB_50S	FSB_ADDR	FSB_A_L<16..3>	10D8 14C6 14D6
	FSB_ADDR_GROUP0	FSB_50S	FSB_ADDR	FSB_REQ_L<4..0>	10D8 14B6
	FSB_ADSTB0	FSB_50S	FSB_ADSTB	FSB_ADSTB_L<0>	10D8 14B6
	FSB_ADDR_GROUP1	FSB_50S	FSB_ADDR	FSB_A_L<35..17>	10C8 14B6 14C6
	FSB_ADSTB1	FSB_50S	FSB_ADSTB	FSB_ADSTB_L<1>	10C8 14B6
FSB 1X Signals	FSB_1X	FSB_50S	FSB_1X	FSB_ADS_L	10D6 14B6
	FSB_BREQ0_L	FSB_50S	FSB_1X	FSB_BREQ0_L	9B2 10D6 14B6
	FSB_BREQ1_L	FSB_50S	FSB_1X	FSB_BREQ1_L	14B6
	FSB_1X	FSB_50S	FSB_1X	FSB_BNR_L	10D6 14B6
	FSB_1X	FSB_50S	FSB_1X	FSB_BPRI_L	10D6 14B3
	FSB_1X	FSB_50S	FSB_1X	FSB_DBSY_L	10D6 14B6
	FSB_1X	FSB_50S	FSB_1X	FSB_DEFER_L	10D8 14B3
	FSB_1X	FSB_50S	FSB_1X	FSB_DRDY_L	10D6 14B6
	FSB_1X	FSB_50S	FSB_1X	FSB_HIT_L	10C6 14B6
	FSB_1X	FSB_50S	FSB_1X	FSB_HITM_L	10C6 14B6
	FSB_1X	FSB_50S	FSB_1X	FSB_LOCK_L	10D6 14B6
	FSB_CPURST_L	FSB_50S	FSB_1X	FSB_CPURST_L	9B2 10D6 13B2 14A3
	FSB_1X	FSB_50S	FSB_1X	FSB_RS_L<2..0>	10D6 14A6
	FSB_1X	FSB_50S	FSB_1X	FSB_TRDY_L	10D6 14B6
	CPU_ASYNC	CPU_50S	CPU_AGTL	CPU_A20M_L	10C8 14A3
	CPU_BSEL	CPU_50S	CPU_AGTL	CPU_BSEL<2..0>	9C2 10A4 10B4
	CPU_FERR_L	CPU_50S	CPU_8MIL	CPU_FERR_L	10C8 14B7
	CPU_ASYNC	CPU_50S	CPU_AGTL	CPU_IGNNE_L	10C8 14A3
	CPU_INIT_L	CPU_50S	CPU_AGTL	CPU_INIT_L	10D6 14A3
	CPU_ASYNC_R	CPU_50S	CPU_AGTL	CPU_INTR	9B2 10B8 14A3
	CPU_ASYNC_R	CPU_50S	CPU_AGTL	CPU_NMI	9B2 10B8 14A3
	CPU_PROCHOT_L	CPU_50S	CPU_AGTL	CPU_PROCHOT_L	10C5 14B6 40D4 60C8
	CPU_PWRGD	CPU_50S	CPU_AGTL	CPU_PWRGD	10B2 13C7 14A3
	CPU_ASYNC	CPU_50S	CPU_AGTL	CPU_SMI_L	10B8 14A3
	CPU_ASYNC	CPU_50S	CPU_AGTL	CPU_STPCLK_L	10B8 14A3
	PM_THRMTRIP_L	CPU_50S	CPU_8MIL	PM_THRMTRIP_L	10C6 14B7 40C4
	FSB_CPUSLP_L	CPU_50S	CPU_AGTL	FSB_CPUSLP_L	10A2 14A3
	CPU_EROM_SB	CPU_50S	CPU_AGTL	CPU_DPSLP_L	10B2 14A3
	CPU_DPRSTP_L	CPU_50S	CPU_AGTL	CPU_DPRSTP_L	9B2 10B2 14A3 60C7
	CPU_ASYNC	CPU_50S	CPU_AGTL	FSB_DPWR_L	10B2 14A3
	MCP_CPU_COMP	MCP_50S	MCP_FSB_COMP	MCP_BCLK_VML_COMP_VDD	14A6
	MCP_CPU_COMP	MCP_50S	MCP_FSB_COMP	MCP_BCLK_VML_COMP_GND	14A6
	MCP_CPU_COMP	MCP_50S	MCP_FSB_COMP	MCP_CPU_COMP_VCC	14A6
	MCP_CPU_COMP	MCP_50S	MCP_FSB_COMP	MCP_CPU_COMP_GND	14A6
	FSB_CLK_CPU	CLK_FSB_100D	CLK_FSB	FSB_CLK_CPU_P	10B6 14B3
	FSB_CLK_CPU	CLK_FSB_100D	CLK_FSB	FSB_CLK_CPU_N	10B6 14B3
	FSB_CLK_ITP	CLK_FSB_100D	CLK_FSB	FSB_CLK_ITP_P	13C3 14A3
	FSB_CLK_ITP	CLK_FSB_100D	CLK_FSB	FSB_CLK_ITP_N	13B3 14A3
	FSB_CLK_MCP	CLK_FSB_100D	CLK_FSB	FSB_CLK_MCP_P	14A4
	FSB_CLK_MCP	CLK_FSB_100D	CLK_FSB	FSB_CLK_MCP_N	14A4
	CPU_IERR_L	CPU_50S		CPU_IERR_L	10D6
	PM_DPRSLPVR	CPU_50S	CPU_AGTL	PM_DPRSLPVR	21C7 60D8
	(See above)	CPU_50S	CPU_AGTL	IMVP_DPRSLPVR	60C7
	CPU_GTLREF	CPU_50S	CPU_GTLREF	CPU_GTLREF	10B4 27B1
	CPU_COMP	CPU_50S	CPU_COMP	CPU_COMP<3>	10B3
	CPU_COMP	CPU_27P4S	CPU_COMP	CPU_COMP<2>	10B3
	CPU_COMP	CPU_50S	CPU_COMP	CPU_COMP<1>	10B3
	CPU_COMP	CPU_27P4S	CPU_COMP	CPU_COMP<0>	10B3
	XDP_TDI	CPU_50S	CPU_ITP	XDP_TDI	6C6 10B6 10C6 13B3
	XDP_TDO	CPU_50S	CPU_ITP	XDP_TDO	6C4 10B6 10C6
	XDP_TMS	CPU_50S	CPU_ITP	XDP_TMS	6C6 6C7 10B6 10C6 13B3
	XDP_TCK	CPU_50S	CPU_ITP	XDP_TCK	6C6 6C7 10A6 10C6 13B6
	XDP_TRST_L	CPU_50S	CPU_ITP	XDP_TRST_L	6C6 6C7 10A6 10C6 13B3
	XDP_BPM_L	CPU_50S	CPU_ITP	XDP_BPM_L<4..0>	10C6 13C6
	XDP_BPM_L5	CPU_50S	CPU_ITP	XDP_BPM_L<5>	10C5 13C6
	(FSB_CPURST_L)	CPU_50S	CPU_ITP	XDP_CPURST_L	13B4
		CPU_50S	CPU_8MIL	CPU_VID<6..0>	11B6 60C7
		CPU_50S	CPU_8MIL	IMVP6_VID<6..0>	
	CPU_VCCSENSE	CPU_27P4S	CPU_VCCSENSE	CPU_VCCSENSE_P	11A5 60A5
	CPU_VCCSENSE	CPU_27P4S	CPU_VCCSENSE	CPU_VCCSENSE_N	11A5 60A5
	(CPU_VCCSENSE)	CPU_27P4S	CPU_VCCSENSE	IMVP6_VSEN_P	
	(CPU_VCCSENSE)	CPU_27P4S	CPU_VCCSENSE	IMVP6_VSEN_N	

CPU/FSB Constraints

SYNC_MASTER=T18_MLB SYNC_DATE=01/04/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 100 OF 109	

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>	15B5 28C5 28C7
MEM_A_CLK	MEM_70D_VDD	MEM_CLK	MEM_A_CLK_N<5..0>	15B5 28C5 28C7
MEM_A_CNTL	MEM_40S_VDD	MEM_CTRL	MEM_A_CKE<3..0>	15A5 28D5 28D7
MEM_A_CNTL	MEM_40S_VDD	MEM_CTRL	MEM_A_CS_L<3..0>	15B5 28C5 28C7
MEM_A_CNTL	MEM_40S_VDD	MEM_CTRL	MEM_A_ODT<3..0>	15A5 28C5
MEM_A_CMD	MEM_40S_VDD	MEM_CMD	MEM_A_A<14..0>	15B5 15C5 28C5 28C7
MEM_A_CMD	MEM_40S_VDD	MEM_CMD	MEM_A_BA<2..0>	15C5 28C5 28C7
MEM_A_CMD	MEM_40S_VDD	MEM_CMD	MEM_A_RAS_L	15C5 28C5
MEM_A_CMD	MEM_40S_VDD	MEM_CMD	MEM_A_CAS_L	15C5 28C7
MEM_A_CMD	MEM_40S_VDD	MEM_CMD	MEM_A_WE_L	15C5 28C7
MEM_A_DQ_BYTE0	MEM_40S	MEM_DATA	MEM_A_DQ<7..0>	15B7 28C2 28C4 28D2 28D4
MEM_A_DQ_BYTE1	MEM_40S	MEM_DATA	MEM_A_DQ<15..8>	15B7 28C2 28C4
MEM_A_DQ_BYTE2	MEM_40S	MEM_DATA	MEM_A_DQ<23..16>	15B7 15C7 28B2 28B4 28C2 28C4
MEM_A_DQ_BYTE3	MEM_40S	MEM_DATA	MEM_A_DQ<31..24>	15C7 28C2 28C4
MEM_A_DQ_BYTE4	MEM_40S	MEM_DATA	MEM_A_DQ<39..32>	15C7 28B5 28B7
MEM_A_DQ_BYTE5	MEM_40S	MEM_DATA	MEM_A_DQ<47..40>	15C7 28B5 28B7
MEM_A_DQ_BYTE6	MEM_40S	MEM_DATA	MEM_A_DQ<55..48>	15D7 28B5 28B7
MEM_A_DQ_BYTE7	MEM_40S	MEM_DATA	MEM_A_DQ<63..56>	15D7 28A5 28A7
MEM_A_DQ_BYTE0	MEM_40S	MEM_DATA	MEM_A_DM<0>	15A7 28C4
MEM_A_DQ_BYTE1	MEM_40S	MEM_DATA	MEM_A_DM<1>	15A7 28C2
MEM_A_DQ_BYTE2	MEM_40S	MEM_DATA	MEM_A_DM<2>	15A7 28B4
MEM_A_DQ_BYTE3	MEM_40S	MEM_DATA	MEM_A_DM<3>	15A7 28C2
MEM_A_DQ_BYTE4	MEM_40S	MEM_DATA	MEM_A_DM<4>	15A7 28B5
MEM_A_DQ_BYTE5	MEM_40S	MEM_DATA	MEM_A_DM<5>	15B7 28B7
MEM_A_DQ_BYTE6	MEM_40S	MEM_DATA	MEM_A_DM<6>	15B7 28B5
MEM_A_DQ_BYTE7	MEM_40S	MEM_DATA	MEM_A_DM<7>	15B7 28A7
MEM_A_DQS0	MEM_70D	MEM_DQS	MEM_A_DQS_P<0>	15D5 28C2
MEM_A_DQS0	MEM_70D	MEM_DQS	MEM_A_DQS_N<0>	15D5 28C2
MEM_A_DQS1	MEM_70D	MEM_DQS	MEM_A_DQS_P<1>	15D5 28C4
MEM_A_DQS1	MEM_70D	MEM_DQS	MEM_A_DQS_N<1>	15D5 28C4
MEM_A_DQS2	MEM_70D	MEM_DQS	MEM_A_DQS_P<2>	15D5 28B2
MEM_A_DQS2	MEM_70D	MEM_DQS	MEM_A_DQS_N<2>	15D5 28B2
MEM_A_DQS3	MEM_70D	MEM_DQS	MEM_A_DQS_P<3>	15D5 28C4
MEM_A_DQS3	MEM_70D	MEM_DQS	MEM_A_DQS_N<3>	15D5 28C4
MEM_A_DQS4	MEM_70D	MEM_DQS	MEM_A_DQS_P<4>	15D5 28B7
MEM_A_DQS4	MEM_70D	MEM_DQS	MEM_A_DQS_N<4>	15D5 28B7
MEM_A_DQS5	MEM_70D	MEM_DQS	MEM_A_DQS_P<5>	15D5 28B5
MEM_A_DQS5	MEM_70D	MEM_DQS	MEM_A_DQS_N<5>	15D5 28B5
MEM_A_DQS6	MEM_70D	MEM_DQS	MEM_A_DQS_P<6>	15D5 28B7
MEM_A_DQS6	MEM_70D	MEM_DQS	MEM_A_DQS_N<6>	15D5 28B7
MEM_A_DQS7	MEM_70D	MEM_DQS	MEM_A_DQS_P<7>	15D5 28A5
MEM_A_DQS7	MEM_70D	MEM_DQS	MEM_A_DQS_N<7>	15D5 28A5
MEM_B_CLK	MEM_70D_VDD	MEM_CLK	MEM_B_CLK_P<5..0>	15B1 29C5 29C7
MEM_B_CLK	MEM_70D_VDD	MEM_CLK	MEM_B_CLK_N<5..0>	15B1 29C5 29C7
MEM_B_CNTL	MEM_40S_VDD	MEM_CTRL	MEM_B_CKE<3..0>	15A1 29D5 29D7
MEM_B_CNTL	MEM_40S_VDD	MEM_CTRL	MEM_B_CS_L<3..0>	15B1 29C5 29C7
MEM_B_CNTL	MEM_40S_VDD	MEM_CTRL	MEM_B_ODT<3..0>	15A1 29C5
MEM_B_CMD	MEM_40S_VDD	MEM_CMD	MEM_B_A<14..0>	15B1 15C1 29C5 29C7
MEM_B_CMD	MEM_40S_VDD	MEM_CMD	MEM_B_BA<2..0>	15C1 29C5 29C7
MEM_B_CMD	MEM_40S_VDD	MEM_CMD	MEM_B_RAS_L	15C1 29C5
MEM_B_CMD	MEM_40S_VDD	MEM_CMD	MEM_B_CAS_L	15C1 29C7
MEM_B_CMD	MEM_40S_VDD	MEM_CMD	MEM_B_WE_L	15C1 29C7
MEM_B_DQ_BYTE0	MEM_40S	MEM_DATA	MEM_B_DQ<7..0>	15B3 29C2 29C4 29D2 29D4
MEM_B_DQ_BYTE1	MEM_40S	MEM_DATA	MEM_B_DQ<15..8>	15B3 29C2 29C4
MEM_B_DQ_BYTE2	MEM_40S	MEM_DATA	MEM_B_DQ<23..16>	15B3 15C3 29C2 29C4
MEM_B_DQ_BYTE3	MEM_40S	MEM_DATA	MEM_B_DQ<31..24>	15C3 29B2 29B4 29C2 29C4
MEM_B_DQ_BYTE4	MEM_40S	MEM_DATA	MEM_B_DQ<39..32>	15C3 29B5 29B7
MEM_B_DQ_BYTE5	MEM_40S	MEM_DATA	MEM_B_DQ<47..40>	15C3 29B5 29B7
MEM_B_DQ_BYTE6	MEM_40S	MEM_DATA	MEM_B_DQ<55..48>	15D3 29B5 29B7
MEM_B_DQ_BYTE7	MEM_40S	MEM_DATA	MEM_B_DQ<63..56>	15D3 29A5 29A7
MEM_B_DQ_BYTE0	MEM_40S	MEM_DATA	MEM_B_DM<0>	15A3 29C4
MEM_B_DQ_BYTE1	MEM_40S	MEM_DATA	MEM_B_DM<1>	15A3 29C2
MEM_B_DQ_BYTE2	MEM_40S	MEM_DATA	MEM_B_DM<2>	15A3 29C2
MEM_B_DQ_BYTE3	MEM_40S	MEM_DATA	MEM_B_DM<3>	15A3 29B4
MEM_B_DQ_BYTE4	MEM_40S	MEM_DATA	MEM_B_DM<4>	15A3 29B5
MEM_B_DQ_BYTE5	MEM_40S	MEM_DATA	MEM_B_DM<5>	15B3 29B7
MEM_B_DQ_BYTE6	MEM_40S	MEM_DATA	MEM_B_DM<6>	15B3 29B5
MEM_B_DQ_BYTE7	MEM_40S	MEM_DATA	MEM_B_DM<7>	15B3 29A7
MEM_B_DQS0	MEM_70D	MEM_DQS	MEM_B_DQS_P<0>	15D1 29C2
MEM_B_DQS0	MEM_70D	MEM_DQS	MEM_B_DQS_N<0>	15D1 29C2
MEM_B_DQS1	MEM_70D	MEM_DQS	MEM_B_DQS_P<1>	15D1 29C4
MEM_B_DQS1	MEM_70D	MEM_DQS	MEM_B_DQS_N<1>	15D1 29C4
MEM_B_DQS2	MEM_70D	MEM_DQS	MEM_B_DQS_P<2>	15D1 29C4
MEM_B_DQS2	MEM_70D	MEM_DQS	MEM_B_DQS_N<2>	15D1 29C4
MEM_B_DQS3	MEM_70D	MEM_DQS	MEM_B_DQS_P<3>	15D1 29B2
MEM_B_DQS3	MEM_70D	MEM_DQS	MEM_B_DQS_N<3>	15D1 29B2
MEM_B_DQS4	MEM_70D	MEM_DQS	MEM_B_DQS_P<4>	15D1 29B7
MEM_B_DQS4	MEM_70D	MEM_DQS	MEM_B_DQS_N<4>	15D1 29B7
MEM_B_DQS5	MEM_70D	MEM_DQS	MEM_B_DQS_P<5>	15D1 29B5
MEM_B_DQS5	MEM_70D	MEM_DQS	MEM_B_DQS_N<5>	15D1 29B5
MEM_B_DQS6	MEM_70D	MEM_DQS	MEM_B_DQS_P<6>	15D1 29B7
MEM_B_DQS6	MEM_70D	MEM_DQS	MEM_B_DQS_N<6>	15D1 29B7
MEM_B_DQS7	MEM_70D	MEM_DQS	MEM_B_DQS_P<7>	15D1 29A5
MEM_B_DQS7	MEM_70D	MEM_DQS	MEM_B_DQS_N<7>	15D1 29A5
MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP_VDD	16C6
MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP_GND	16C6

Memory Constraints

SYNC_MASTER=T18_MLB SYNC_DATE=01/04/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A

SCALE: NONE SHT: 101 OF: 109

PCI-Express

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
PCIE_90D	*	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF
CLK_PCIE_100D	*	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
PCIE	*	=3X_DIELECTRIC	?
CLK_PCIE	*	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

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
SATA_100D_HDD	*	=100_OHM_DIFF_HDD	=100_OHM_DIFF_HDD	=100_OHM_DIFF_HDD	=100_OHM_DIFF_HDD	=100_OHM_DIFF_HDD	=100_OHM_DIFF_HDD

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.

NET_TYPE				
ELECTRICAL_CONSTRAINT_SET	PHYSICAL	SPACING		
	PCIE_90D	PCIE	PCIE_MINI_R2D_P	7D5 31C7
	PCIE_90D	PCIE	PCIE_MINI_R2D_N	7D5 31C7
PCIE_MINI_R2D	PCIE_90D	PCIE	PCIE_MINI_R2D_C_P	17B3 31C5
	PCIE_90D	PCIE	PCIE_MINI_R2D_C_N	17B3 31C5
PCIE_MINI_D2R	PCIE_90D	PCIE	PCIE_MINI_D2R_P	7D5 17B6 31C7
	PCIE_90D	PCIE	PCIE_MINI_D2R_N	7D5 17B6 31C7
	PCIE_90D	PCIE	PCIE_FC_R2D_P	32C5
	PCIE_90D	PCIE	PCIE_FC_R2D_N	32C5
PCIE_FC_R2D	PCIE_90D	PCIE	PCIE_FC_R2D_C_P	9B5 32C6
	PCIE_90D	PCIE	PCIE_FC_R2D_C_N	9B5 32C6
PCIE_FC_D2R	PCIE_90D	PCIE	PCIE_FC_D2R_P	9B5 32B5
	PCIE_90D	PCIE	PCIE_FC_D2R_N	9B5 32B5
MCP_PE1_REFCLK	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_MINI_P	17C3 31C5
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_MINI_N	17C3 31C5
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_MINI_CONN_P	7D5 31C8
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_MINI_CONN_N	7D5 31C8
MCP_PE4_REFCLK	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_FC_P	9B5 32C5
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_FC_N	9B5 32C5
MCP_PEX_CLK_COMP		MCP_PEX_COMP	MCP_PEX_CLK_COMP	17A6
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_ML_P<3..0>	67D1 68C1 68C8
	DP_100D	DISPLAYPORT	DP_ML_C_P<3..0>	68C2 68C7
DP_ML	DP_100D	DISPLAYPORT	DP_ML_N<3..0>	67D1 68B1 68C1 68C8
	DP_100D	DISPLAYPORT	DP_ML_C_N<3..0>	68B2 68C2 68C7
DP_AUX_CH	DP_100D	DISPLAYPORT	DP_IG_AUX_CH_P	18B6 67C7
	DP_100D	DISPLAYPORT	DP_IG_AUX_CH_N	18B6 67B7
	DP_100D	DISPLAYPORT	DP_AUX_CH_SW_P	67C6
	DP_100D	DISPLAYPORT	DP_AUX_CH_SW_N	67C5
	DP_100D	DISPLAYPORT	DP_AUX_CH_C_P	67C4 68C8
	DP_100D	DISPLAYPORT	DP_AUX_CH_C_N	67D4 68B8
MCP_HDMI_RSET	MCP_DV_COMP		MCP_HDMI_RSET	18A6 25C7
MCP_HDMI_VPROBE	MCP_DV_COMP		MCP_HDMI_VPROBE	18A6 25C7
LVDS_IG_A_CLK	LVDS_100D	LVDS	LVDS_IG_A_CLK_P	18B3 66B3
	LVDS_100D	LVDS	LVDS_IG_A_CLK_F_P	7C7 66B2
LVDS_IG_A_CLK	LVDS_100D	LVDS	LVDS_IG_A_CLK_N	18B3 66B3
	LVDS_100D	LVDS	LVDS_IG_A_CLK_F_N	7C7 66B2
LVDS_IG_A_DATA	LVDS_100D	LVDS	LVDS_IG_A_DATA_P<2..0>	7C7 18B3 66C2
LVDS_IG_A_DATA	LVDS_100D	LVDS	LVDS_IG_A_DATA_N<2..0>	7C7 18B3 66C2
[103] DP_ML	DP_100D	DISPLAYPORT	DP_ML_CONN_P<3..0>	68C3 68C4 68C5
[103]	DP_100D	DISPLAYPORT	DP_ML_CONN_N<3..0>	68B3 68C3 68C4 68C5
MCP_IFPAB_RSET	MCP_DV_COMP		MCP_IFPAB_RSET	18A3 25C6
MCP_IFPAB_VPROBE			MCP_IFPAB_VPROBE	18A3 25C6
SATA_HDD_R2D	SATA_100D_HDD	SATA	SATA_HDD_R2D_C_P	20D6 36A3
	SATA_100D_HDD	SATA	SATA_HDD_R2D_C_N	20D6 36A3
	SATA_100D_HDD	SATA	SATA_HDD_R2D_P	7C5 36A7
	SATA_100D_HDD	SATA	SATA_HDD_R2D_N	7C5 36A7
	SATA_100D_HDD	SATA	SATA_HDD_R2D_UF_P	36A5
	SATA_100D_HDD	SATA	SATA_HDD_R2D_UF_N	36A5
SATA_HDD_D2R	SATA_100D_HDD	SATA	SATA_HDD_D2R_P	20D6 36A3
	SATA_100D_HDD	SATA	SATA_HDD_D2R_N	20D6 36A3
	SATA_100D_HDD	SATA	SATA_HDD_D2R_C_P	7C5 36A7
	SATA_100D_HDD	SATA	SATA_HDD_D2R_C_N	7C5 36A7
	SATA_100D_HDD	SATA	SATA_HDD_D2R_UF_P	36A5
	SATA_100D_HDD	SATA	SATA_HDD_D2R_UF_N	36A5
SATA_ODD_R2D	SATA_100D	SATA	SATA_ODD_R2D_C_P	20D6 36C2
	SATA_100D	SATA	SATA_ODD_R2D_C_N	20D6 36C2
	SATA_100D	SATA	SATA_ODD_R2D_P	7B7 36B5
	SATA_100D	SATA	SATA_ODD_R2D_N	7B7 7C5 36B5
	SATA_100D	SATA	SATA_ODD_R2D_UF_P	36C4
	SATA_100D	SATA	SATA_ODD_R2D_UF_N	36C4
SATA_ODD_D2R	SATA_100D	SATA	SATA_ODD_D2R_P	20D6 36B2
	SATA_100D	SATA	SATA_ODD_D2R_N	20D6 36B2
	SATA_100D	SATA	SATA_ODD_D2R_C_P	7B7 36B5
	SATA_100D	SATA	SATA_ODD_D2R_C_N	7B7 36B5
	SATA_100D	SATA	SATA_ODD_D2R_UF_P	36B4
	SATA_100D	SATA	SATA_ODD_D2R_UF_N	36B4
MCP_SATA_TERMP		SATA_TERMP	MCP_SATA_TERMP	20A6

MCP Constraints 1

SYNC_MASTER=T18_MLB SYNC_DATE=01/04/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 102 OF 109	

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	SPACING		
MCP_DEBUG	PCI_55S	PCI	MCP_DEBUG<7..0>	13C3 19D7
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_L	PCI_55S	PCI	PCI_REQ0_L	19D2 19D7
PCI_GNT0_L	PCI_55S	PCI	PCI_GNT0_L	
PCI_REQ1_L	PCI_55S	PCI	PCI_REQ1_L	19D2 19D7
PCI_GNT1_L	PCI_55S	PCI	PCI_GNT1_L	
PCI_INTW_L	PCI_55S	PCI	PCI_INTW_L	
PCI_INTX_L	PCI_55S	PCI	PCI_INTX_L	
PCI_INTY_L	PCI_55S	PCI	PCI_INTY_L	
PCI_INTZ_L	PCI_55S	PCI	PCI_INTZ_L	
MCP_PCI_CLK2	CLK_PCI_55S	CLK_PCI	PCI_CLK33M_MCP_R	19C5
	CLK_PCI_55S	CLK_PCI	PCI_CLK33M_MCP	19C5
LPC_AD	LPC_55S	LPC	LPC_AD<3..0>	19B3 39C8 41D3 41D5
LPC_FRAME_L	LPC_55S	LPC	LPC_FRAME_L	19C3 39C8 41D5
LPC_RESET_L	LPC_55S	LPC	LPC_RESET_L	19B3 26D4
MCP_LPC_CLK0	CLK_LPC_55S	CLK_LPC	LPC_CLK33M_SMC_R	19B3 26C4
	CLK_LPC_55S	CLK_LPC	LPC_CLK33M_SMC	26C1 39C8
	CLK_LPC_55S	CLK_LPC	LPC_CLK33M_LPCPLUS	26B1 41D3
USB_EXTA	USB_90D	USB	USB_EXTA_P	20D3 37A8
	USB_90D	USB	USB_EXTA_N	20D3 37A8
	USB_90D	USB	USB_EXTA_MUXED_P	37C4
	USB_90D	USB	USB_EXTA_MUXED_N	37C4
	USB_90D	USB	CONN_USB_EXTA_P	37C3
	USB_90D	USB	CONN_USB_EXTA_N	37C3
USB_CAMERA	USB_90D	USB	USB_CAMERA_P	20D3 31B5
	USB_90D	USB	USB_CAMERA_N	20D3 31B5
	USB_90D	USB	USB_CAMERA_CONN_P	7D5 31B7
	USB_90D	USB	USB_CAMERA_CONN_N	7D5 31B7
USB_BT	USB_90D	USB	USB_BT_P	20C3 31B5
	USB_90D	USB	USB_BT_N	20C3 31B5
	USB_90D	USB	CONN_USB2_BT_P	7C5 31B7
	USB_90D	USB	CONN_USB2_BT_N	7C5 31B7
USB_TPAD	USB_90D	USB	USB_TPAD_P	20D3 47B8
	USB_90D	USB	USB_TPAD_N	20D3 47B8
	USB_90D	USB	USB_TPAD_R_P	47B7
	USB_90D	USB	USB_TPAD_R_N	47B7
USB_IR	USB_90D	USB	USB_IR_P	20D3 38C7
	USB_90D	USB	USB_IR_N	20D3 38C7
USB_EXTB	USB_90D	USB	USB_EXTB_P	20C3 37A4
	USB_90D	USB	USB_EXTB_N	20C3 37A4
	USB_90D	USB	CONN_USB_EXTB_P	37A3
	USB_90D	USB	CONN_USB_EXTB_N	37A3
MCP_USB_RBIAS	MCP_USB_RBIAS		MCP_USB_RBIAS_GND	20B4
SMBUS_MCP_0_CLK	SMB_55S	SMB	SMBUS_MCP_0_CLK	13B6 21C3 42D8
SMBUS_MCP_0_DATA	SMB_55S	SMB	SMBUS_MCP_0_DATA	13B6 21C3 42D8
SMBUS_MCP_1_CLK	SMB_55S	SMB	SMBUS_MCP_1_CLK	21C3 42C8
SMBUS_MCP_1_DATA	SMB_55S	SMB	SMBUS_MCP_1_DATA	21C3 42C8
HDA_BIT_CLK	HDA_55S	HDA	HDA_BIT_CLK	21D2 51C7
	HDA_55S	HDA	HDA_BIT_CLK_R	21A7 21D4
HDA_SYNC	HDA_55S	HDA	HDA_SYNC	21C2 51C7
	HDA_55S	HDA	HDA_SYNC_R	21A7 21C4
HDA_RST_L	HDA_55S	HDA	HDA_RST_R_L	21A7 21D4
	HDA_55S	HDA	HDA_RST_L	21D2 51B7
HDA_SDIN0	HDA_55S	HDA	HDA_SDIN0	21D7 51C7
	HDA_55S	HDA	HDA_SDIN_CODEC	
HDA_SDOUT	HDA_55S	HDA	HDA_SDOUT	21D2 51C7
	HDA_55S	HDA	HDA_SDOUT_R	21A7 21D4
MCP_HDA_PULLDN_COMP		MCP_HDA_COMP	MCP_HDA_PULLDN_COMP	21C7
MCP_SUS_CLK	CLK_SLOW_55S	CLK_SLOW	PM_CLK32K_SUSCLK_R	21B3 26B4
	CLK_SLOW_55S	CLK_SLOW	PM_CLK32K_SUSCLK	26B1 39C5
SPI_CLK	SPI_55S	SPI	SPI_CLK_R	21B3 41A5 41C8
	SPI_55S	SPI	SPI_CLK	41A1 50C5
	SPI_55S	SPI	SPI_ALT_CLK	41C5 41D3
SPI_MOSI	SPI_55S	SPI	SPI_MOSI_R	21B3 41A5 41C7
	SPI_55S	SPI	SPI_MOSI	41B1 50C4
	SPI_55S	SPI	SPI_ALT_MOSI	41C5 41D5
SPI_MISO	SPI_55S	SPI	SPI_MISO	21B3 41A5 41B7
	SPI_55S	SPI	SPI_MISO_R	50C4
	SPI_55S	SPI	SPI_ALT_MISO	41B5 41D5
SPI_CS0	SPI_55S	SPI	SPI_CS0_R_L	21B3 41B7
	SPI_55S	SPI	SPI_CS0_L	
	SPI_55S	SPI	SPI_CS1_R_L	
	SPI_55S	SPI	SPI_CS1_R_L_USE_MLB	41B2

MCP Constraints 2

SYNC_MASTER=T18_MLB SYNC_DATE=12/14/2007

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A

SCALE: NONE SHT 103 OF 109

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

NET_TYPE				
ELECTRICAL_CONSTRAINT_SET	PHYSICAL	SPACING		
MCP_MII_COMP	MCP_MII_COMP		MCP_MII_COMP_VDD	18C6
MCP_MII_COMP	MCP_MII_COMP		MCP_MII_COMP_GND	18C6
MCP_CLK25M_BUF0	ENET_MII_55S	MCP_BUF0_CLK	MCP_CLK25M_BUF0_R	18C3 34A5
	ENET_MII_55S	MCP_BUF0_CLK	RTL8211_CLK25M_CKXTAL1	33B6 34A3
ENET_INTR_L	ENET_MII_55S	ENET_MII	ENET_INTR_L	
ENET_MDIO	ENET_MII_55S	ENET_MII	ENET_MDIO	18C3 33B6
ENET_MDC	ENET_MII_55S	ENET_MII	ENET_MDC	18C3 33B6
ENET_PWRDWN_L	ENET_MII_55S	ENET_MII	ENET_PWRDWN_L	
	ENET_MII_55S	ENET_MII	ENET_CLK125M_RXCLK_R	33C4
ENET_RXCLK	ENET_MII_55S	ENET_MII	ENET_CLK125M_RXCLK	18D6 33C1
	ENET_MII_55S	ENET_MII	ENET_RXD_R<3..0>	33B4 33C4
ENET_RXD	ENET_MII_55S	ENET_MII	ENET_RXD<0>	18D6 33C1
ENET_RXD_STRAP	ENET_MII_55S	ENET_MII	ENET_RXD<3..1>	18D6 33B1 33C1
ENET_RXD	ENET_MII_55S	ENET_MII	ENET_RX_CTRL	18D6 33B1
	ENET_MII_55S	ENET_MII	ENET_RXCTL_R	33B4
	ENET_MII_55S	ENET_MII	ENET_CLK125M_TXCLK_R	33C6
ENET_TXCLK	ENET_MII_55S	ENET_MII	ENET_CLK125M_TXCLK	18D3 33C8
ENET_TXD0	ENET_MII_55S	ENET_MII	ENET_TXD<0>	18D3 33C6
ENET_TXD	ENET_MII_55S	ENET_MII	ENET_TXD<3..1>	18D3 33B6 33C6
ENET_TXD	ENET_MII_55S	ENET_MII	ENET_TX_CTRL	18C3 33B6
	ENET_MII_55S	ENET_MII	ENET_RESET_L	18C3 33B7
ENET_MDI	ENET_MDI_100D	ENET_MDI	ENET_MDI_P<3..0>	33B3 35B7 35C7
	ENET_MDI_100D	ENET_MDI	ENET_MDI_N<3..0>	33B3 35B7 35C7
	ENET_MDI_100D	ENET_MDI	ENET_MDI_TRAN_P<3..0>	35B4 35C4 35C5
	ENET_MDI_100D	ENET_MDI	ENET_MDI_TRAN_N<3..0>	35B4 35C4 35C5

Ethernet Constraints

SYNC_MASTER=T18_MLB SYNC_DATE=03/19/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE: NONE	SHT 104 OF 109	

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_5S5	SMB	SMBUS_SMC_A_S3_SCL	7B5 7D5 42D2
SMBUS_SMC_A_S3_SDA	SMB_5S5	SMB	SMBUS_SMC_A_S3_SDA	7B5 7C5 42D2
SMBUS_SMC_B_S0_SCL	SMB_5S5	SMB	SMBUS_SMC_B_S0_SCL	42C2
SMBUS_SMC_B_S0_SDA	SMB_5S5	SMB	SMBUS_SMC_B_S0_SDA	42C2
SMBUS_SMC_0_S0_SCL	SMB_5S5	SMB	SMBUS_SMC_0_S0_SCL	42D5
SMBUS_SMC_0_S0_SDA	SMB_5S5	SMB	SMBUS_SMC_0_S0_SDA	42D5
SMBUS_SMC_BSA_SCL	SMB_5S5	SMB	SMBUS_SMC_BSA_SCL	7A7 42C5
SMBUS_SMC_BSA_SDA	SMB_5S5	SMB	SMBUS_SMC_BSA_SDA	42C5
SMBUS_SMC_MGMT_SCL	SMB_5S5	SMB	SMBUS_SMC_MGMT_SCL	42B5
SMBUS_SMC_MGMT_SDA	SMB_5S5	SMB	SMBUS_SMC_MGMT_SDA	42B5

SMBus Charger Net Properties

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

SMC Constraints

SYNC_MASTER=T18_MLB SYNC_DATE=01/04/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A

SCALE NONE SHT 106 OF 109

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

M97 SENSOR NET PROPERTIES

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
	DIFFPAIR		CHGR_CSO_R_P	44A8 57B3
	DIFFPAIR		CHGR_CSO_R_N	44A8 57B3
	DIFFPAIR		CPUTHMSNS_D2_P	45C5
	DIFFPAIR		CPUTHMSNS_D2_N	45C5
	DIFFPAIR		CPU_THERMD_P	10C6 45D5
	DIFFPAIR		CPU_THERMD_N	10C6 45D5
	DIFFPAIR		ISNS_CPUVTT_P	44B7
	DIFFPAIR		ISNS_CPUVTT_N	44B7
	DIFFPAIR		ISNS_P1V5S0MCP_P	44C7
	DIFFPAIR		ISNS_P1V5S0MCP_N	44C7
	DIFFPAIR		ISNS_PVCORES0MCP_P	44D8
	DIFFPAIR		ISNS_PVCORES0MCP_N	44D8 61C4
	DIFFPAIR		MCPTHMSNS_D2_P	7C7 45B5
	DIFFPAIR		MCPTHMSNS_D2_N	7C7 45B5
	DIFFPAIR		MCP_THMDIODE_P	21C3 45C5
	DIFFPAIR		MCP_THMDIODE_N	21C3 45B5

M97 SPECIAL CONSTRAINTS

SYNC_MASTER=M97_MLB

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A

SCALE	SHT	OF
NONE	107	109

M97 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_P1MM	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	0.100MM	30 MM	0 MM	0 MM
STANDARD	*	Y	=DEFAULT	=DEFAULT	12.7 MM	=DEFAULT	=DEFAULT

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
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	0.115 MM	0.115 MM			
50_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
40_OHM_SE	TOP,BOTTOM	Y	0.165 MM	0.100 MM			
40_OHM_SE	*	Y	0.126 MM	0.100 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	0.310 MM			
27P4_OHM_SE	*	Y	0.222 MM	0.222 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,ISL9,ISL10	Y	0.151 MM	0.100 MM	=STANDARD	0.224 MM	0.224 MM
70_OHM_DIFF	TOP,BOTTOM	Y	0.185 MM	0.100 MM		0.200 MM	0.200 MM

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
90_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD
90_OHM_DIFF	ISL3,ISL4,ISL9,ISL10	Y	0.095 MM	0.095 MM		0.234 MM	0.234 MM
90_OHM_DIFF	TOP,BOTTOM	Y	0.112 MM	0.112 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
100_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD
100_OHM_DIFF	ISL3,ISL4,ISL9,ISL10	Y	0.075 MM	0.075 MM		0.244 MM	0.244 MM
100_OHM_DIFF	TOP,BOTTOM	Y	0.091 MM	0.091 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_HDD	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD
100_OHM_DIFF_HDD	ISL3,ISL4,ISL9,ISL10	Y	0.083 MM	0.083 MM		0.400 MM	0.400 MM
100_OHM_DIFF_HDD	TOP,BOTTOM	Y	0.095 MM	0.095 MM		0.400 MM	0.400 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,ISL9,ISL10	Y	0.075 MM	0.075 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

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

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	?
2:1_SPACING	*	0.2 MM	?
2.5:1_SPACING	*	0.25 MM	?
3:1_SPACING	*	0.3 MM	?
4:1_SPACING	*	0.4 MM	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
2X_DIELECTRIC	TOP,BOTTOM	0.140 MM	?
3X_DIELECTRIC	TOP,BOTTOM	0.210 MM	?
4X_DIELECTRIC	TOP,BOTTOM	0.280 MM	?
5X_DIELECTRIC	TOP,BOTTOM	0.350 MM	?
2X_DIELECTRIC	-	0.126 MM	?
3X_DIELECTRIC	-	0.189 MM	?
4X_DIELECTRIC	-	0.252 MM	?
5X_DIELECTRIC	-	0.315 MM	?

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

NET_PHYSICAL_TYPE	AREA_TYPE	PHYSICAL_RULE_SET
MEM_40S	BGA_P1MM	STANDARD
MEM_40S_VDD	BGA_P1MM	STANDARD

M97 RULE DEFINITIONS

SYNC_MASTER=M97_MLB

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A

SCALE	SHT	OF
NONE	109	109