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

SCHEM,CANNAREGIO,K20,DVT1

12/12/08

REV	ZONE	ECN	DESCRIPTION OF CHANGE	CK APPD / DATE	ENG APPD / DATE
31		657084	ENGINEERING RELEASED	12/12/08	?

Schematic / PCB #'s

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
051-7656	1	SCHEM,CANNAREGIO,K20	SCH	CRITICAL	
820-2390	1	PCBF,CANNAREGIO,K20	PCB	CRITICAL	

DRAWING
TITLE=MLB
ABBREV=DRAWING
LAST_MODIFIED=Fri Dec 12 16:50:42 2008

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

THIRD ANGLE PROJECTION

METRIC

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

MATERIAL/FINISH NOTED AS APPLICABLE

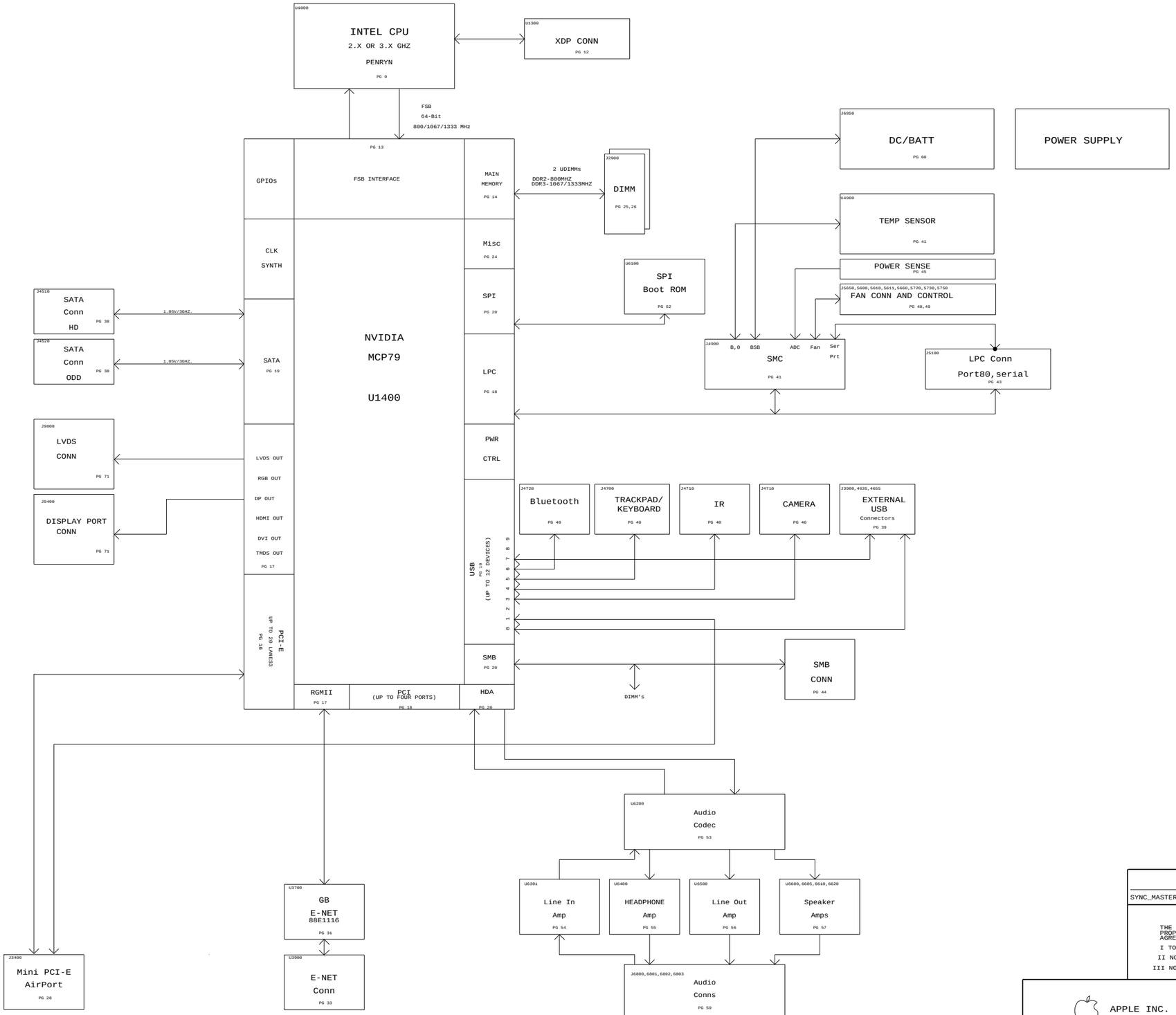
SIZE D

APPLE INC.

TITLE
SCHEM,CANNAREGIO,K20

DRAWING NUMBER 051-7656 REV. 31

SHT 1 OF 123



System Block Diagram

SYNC_MASTER=M98_MLB SYNC_DATE=04/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE	SHT	OF
NONE	2	123

K20 POWER SYSTEM ARCHITECTURE

J6900 AC ADAPTER IN
DCIN(16.5V)
F6905 6A FUSE
SMC_DCIN_ISENSE
R7020
U7000 ISL6258A PBUS SUPPLY/ BATTERY CHARGER (PAGE 60)
PPVBAT_G3H_CHGR_REG
R7050 U5303 SMC_BATT_ISENSE
PPDCIN_G3H
R6905
D6905
D6905
PPVIN_G3H_P3V42G3H
PPBUS_G3H_VSENSE
Q5315
F7040
F7041 8A FUSE
PPBUS_G3H
ENABLE 3.425V G3HOT LT3470A U6990 (PAGE 59)
PP3V42_G3H
SMC PWRGD NCP303LSN U5000 (PAGE 42)
SMC_RESET_L
MIC5232-2.8YD5 U2801 (PAGE 25)
PP3V3_G3_RTC
SMC_TPAD_RST_L
SMC_ONOFF_L
U5001

J6950
2S4P (6 TO 8.4V)
PPVBATT_G3H_CONN
Q7056 BATT_POS_GATE
Q7055 CHGR_BGATE
PPVBAT_G3H_CHGR_R

GPU VCORE ISL6263C U8900 (PAGE 77)
GPUVCORE_EN
GPUVCORE_PGOOD
U5410
SMC_GPU_ISENSE
SMC_GPU_VSENSE
PPVCORE_GPU
CPUVTTS0_EN
1.05V SC417 U7600 (PAGE 65)
R7650
PPCPUVTT_S0
SMC_CPU_FSB_ISENSE
CPUVTTS0_PGOOD

SMC_CPU_HI_ISENSE
R5388
CPU VCORE ISL9504B U7100 (PAGE 61)
U7100
SMC_CPU_ISENSE
SMC_CPU_VSENSE
PPVCORE_S0_CPU
IMVP_VR_ON
VR_PWRGOOD_DELAY

MCP79 U1400 (PAGE 14~22)
PWRBTN#
RSTBTN#
PWRGD_SB
CPU_RESET#
CPU_PWRGD
PS_PWRGD
MCP_PS_PWRGD
U2850
FSB_CPURST_L
CPU_PWRGD

CPU U1000 (PAGE 10,11)
PWRGOOD
RESET*

MCPCORES0_EN
PM_SLP_S3_L_R
MCP_CORE ISL6236 U7500 (PAGE 64)
R7505
SMC_MCP_VSENSE
PPVCORE_S0_MCP
SMC_MCP_CORE_ISENSE
PP5V_S0
P5V_RTS0_PGOOD
MCPCORES0_PGOOD

GMUX U9600 XP28 (PAGE 84)
EG_RAIL1_EN — P1V1GPU_EN
EG_RAIL2_EN — P3V3GPU_EN
EG_RAIL3_EN — GPUVCORE_EN
EG_RAIL4_EN — P1V8_S0GPU_EN
PM_ALL_GPU_PGOOD

SMC U4900 (PAGE 42)
P60
SMC_PM_G2_EN
RC DELAY — P3V3S5_EN
RC DELAY — PM_G2_P1V05S5_EN

P1V1_GPU_EN
P1V8_S0GPU_EN
ISL6236 U9500 (PAGE 83)
1.103V(L/H)
1.8V(R/H)
PP1V1_S0GPU
R5413
PP1V8_S0GPU_ISNS
SMC_GPU_1V8_ISENSE
P1V1GPU_PGOOD
PM_ALL_GPU_PGOOD

DDRREG_EN
MEM_VTT_EN
TPS51116 U7300 (PAGE 63)
S5 1.5V
S3 0.75V
PP1V8R1V5_S3
PP0V9R0V75_S0_DDRVTT
Q7901
R5445
SMC_MCP_DDR_ISENSE
PPMCPDDR_ISNS
PP1V8R1V5_S0
MCPDDR_EN

P1V2_S0_EN
P2V5S0_EN
LTC3547 U9900 (PAGE 87)
PP1V2_S0
PP2V5_S0

MCP79 U1400 (PAGE 14~22)
SLP_RMGT#(J17)
PCI_RESET0#(R10)
SLP_S5#(H17)
SLP_S3#(G17)
PM_SLP_RMGT_L
MEM_VTT_EN
R2870
DDRREG_EN
P5VS3_EN
PM_SLP_S4_L
PM_SLP_S3_L
R7878
PM_SLP_S3_L_R
RC DELAY — P1V8S0_EN
RC DELAY — MCPDDR_EN
RC DELAY — CPUVTTS0_EN
RC DELAY — MCPCORES0_EN
RC DELAY — P1V05S0_EN
RC DELAY — P1V2_S0_EN
RC DELAY — P2V5S0_EN

P5VS3_EN
P3V3S5_EN
5V (L/H)
3.3V (R/H)
TPS51220 U7201 (PAGE 62)
PGOOD1,2
PP5V_S3
PP3V3_S5
P5V3V3_PGOOD

BKLT_PLT_RST_L && LCD_BKLT_EN
APP001 U9701 (PAGE 85~86)
PPVOUT_S0_LCDBKLT

Q4260
LTC1872 U7790 (PAGE 66)
PP10V_FW
FW_PORTPWR_EN&&(SMC_ADAPTER_EN||PM_SLP_S3_L)

1.05V AUX ISL6269 U7750 (PAGE 66)
PM_G2_P1V05S5_EN
PP1V2R1V05_S5
P1V05_S5_PGOOD
Q7953
PP1V05_S0
P1V05S0_EN
Q3840
PP1V2R1V05_ENET
PM_SLP_RMGT_L

Q7910
Q7930
Q7970
Q3810
PP3V3_S3
PP3V3_S0
PP3V3_S0GPU
P3V3GPU_EN
P3V3_ENET_PHY
PM_SLP_S4_L
PM_SLP_S3_L

R0940
P1V0FW_EN
P1V8S0_EN
LTC3547 U7700 (PAGE 66)
PP1V0_FW
PP1V8_S0
P1V8_S0GPU_EN
TPS62202 U7760 (PAGE 66)
PP1V8_GPUIFPX

U7880
PP3V3_S5
R7894
PM_ALL_GPU_PGOOD
ALL_SYS_PWRGD
RSMRST_PWRGD
SMC_ONOFF_L
P5V3V3_PGOOD
P5V_RTS0_PGOOD
MCPCORES0_PGOOD
CPUVTTS0_PGOOD
S0PGOOD_PWROK

SMC
RSMRST_OUT(P15)
99ms DLY
IMVP_VR_ON(P16)
PWRGD(P12)
RSMRST_IN(P13)
PWR_BUTTON(P90)
P17(8TN_OUT)
RES*
SYSRST(PA2)
PM_RSMRST_L
IMVP_VR_ON
PM_SYSRST_L
PM_PWRBTN_L
SMC_RESET_L
SLP_S5_L(P95)
SLP_S4_L(P94)
SLP_S3_L(P93)
U4900 (PAGE 42)

PP3V42_G3H
U7840 TPS3808G (PAGE 67)
S5 PWRGD
SENSE
VDD
RESET*
MR*
RSMRST_PWRGD
PP3V3_S5
P1V05_S5_PGOOD

PP3V3_S0
U7870 LTC2909 (PAGE 67)
VCC
ADJ1
ADJ2
RST*
PP1V05_S0
TRST = 200mS

Power Block Diagram

SYNC_MASTER=RXU_K20 SYNC_DATE=07/24/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 3 OF 123	

Proto:

See earlier schematics for info about proto changes

Pre-EVT:

See earlier schematics for info about Pre-EVT changes

EVT:

10/29/08
csa. 5 Added BKLT_PLL_NOT BOM option K20_COMMON2 BOM group. This stuffs R9713.
csa. 68 Changed net name on input to U6860 from PP3V3_S0_AUDIO to =PP3V3_S0_AUDIO.
See <rdar://problem/6327731> K20 PreEVT: iPhone headset detection test fail
csa. 97 Changed R9707 to 2.87K per <rdar://problem/6327135> Change R9707 to 2.87k, 1% resistor
10/29/08
csa. 9 Changed SH0924 to 870-1698 tall emi pogo pin.
11/5/08
    csa. 4 Updated Revision History.
csa. 8 Tied =PP3V3_FW_FWPHY and =PP3V3_FW_P1V0FW aliases to PP3V3_S0.
csa. 9 Removed R0942 and R0943 which were for selecting from S0 or S3 for =PP3V3_FW_FWPHY.
Removed R0940 and R0941 which were for selecting from S0 or S3 for =PP3V3_FW_P1V0FW.
Tied =PP3V3_S3_GMUX alias to PP3V3_S3.
csa. 75 Changed U7500 from 353S2312 Intersil ISL6236 to 353S2203 TI SN0802043.
Changed TONSEL from GND to PP5V_S0_MCPREG_VCC. This changes output frequencies to 200/300KHz for 5V/MCPCore.
Added C7562 330uF cap on =PPMCPCORE_S0_REG.
Changed snubber resistors R7598 and R7599 to 1/6W 0402, APN 114S0548.
csa. 87 Changed pulldown values to 10K on GPIO7_FBVDDQ_ALTVO, R8794.
Changed pulldowns R8792 and R8793 from 1K to 4.7K for power consumption.
csa. 90 Removed R9094. Replaced by R9678 on csa. 96 to tie to GMUX_S3_PD_GND.
csa. 96 Added Q9607 dual FET for disabling GMUX power sequence enable configuration pulldowns during S0.
Moved R9094 to R9678 and tied to GMUX_S3_PD_GND.
csa. 97 Changed R9707 to 2.67K 1%. This gives 22.5mA on LED current.
11/10/08
csa. 68 Changed R6885 from 0 ohms to 2.2K.
Changed C6885 from 470 pF to 0.0082 uF.
csa. 87 Changed R8792 and R8793 from 4.7K to 10K pulldowns on EG_LCD_PWR_EN and EG_BKLT_EN.
csa. 96 Changed R9678 pulldown on LCD_PWR_EN from 10K to 4.7K.
Removed BOM options on FET circuit for GMUX_S3_PD_GND.
Added R9684 NO STUFF 0 ohms to tie ALL_SYS_PWRGD to Q9607.
11/11/08
csa. 8 removed =PP3V3_S3_P1V0FW and =PP3V3_S3_BKL_VDDIO
csa. 41 changed R4160 from 274K to 200K <rdar://6292976>
csa. 68 changed R6885 from 0 ohm to 2.2K for Mic LPF
csa. 75 NO STUFF R7598, C7598, R7599, C7599 (snubbers)
csa. 87 changed R8795 from 1K to 10K pull down
csa. 96 NO STUFF R9677, C9695, STUFF R9684
11/12/08
csa. 5 removed MCP79 B01 from Module Parts table and added B03
csa. 39 added Bom table for J3900 (514-0636)
csa. 46 added Bom table for J4600, J4610 (514-0638)
csa. 94 added Bom table for J9400 (514-0637)
csa. 123 added Bom table for JC320 (514-0638)
11/13/08
csa. 1 change title to DVT
csa. 32 Added alternate table for J3200 (516S0709, Molex DIMM connector)
11/19/08
csa. 5 changed MCP79 B03 to 338S0710; change to binned G96 338S0714;
       added PROD_DIGSMS and TPDT_DEBOUNCE to BOM groups
csa. 68 added bom option TPDT_BYPASS to R6865; TPDT_DEBOUNCE to U6860,C6861,R6860,R6862
csa. 97 changed Q9701 to 376S0757 <radr://6383480>
11/25/08
csa. 5 changed BOM option MCP_B02 to MCP_B03; added BOM option GMUX_1V8
added Mag Layer alternate 155S0457 to Murata 155S0329
csa. 93 added BOM table for 16 LVDS termination resistors to select GMUX_2V5 or GMUX_1V8
added BOM option GMUX_2V5 to 8 parallel resistors so they'll be NO STUFFed for GMUX_1V8
csa. 97 reverted Q9701 to 376S0678 due to parts availability
csa. 99 added BOM table for R9900 to select either 2.5V output or 1.8V output

DVT:

12/02/08
Start of PVT.
csa. 5 removed JTAG_ALLDEV bom option to remove U0600, R0601, C0601, C0602
      added 516-0213 (Molex TH SODIMM CONN) as alternate to 516-0201 (Foxconn)
      added GMUX_JTAG_CONN bom option to the bom table
csa. 6 added GMUX_JTAG_CONN bom option to J0600
csa. 99 moved OMIT from R9900 to R9901 to select either 150K (GMUX_2V5) or 237K (GMUX_1V8)
12/03/08
csa. 32 removed redundant alternate table for J3200
csa. 97 Per radar 6383480, Change the FET Q9701 from APN: 376S0678 to 376S0757
diode D9701 from APN: 371S0551 to 371S0572
12/09/08
csa. 1 changed title to DVT(1)
csa. 26 NO STUFF C2690, R2690
csa. 32 Refreshed symbol for J3200 for update to BGA SODIMM conn.
csa. 54 changed R5498 to 4.02K for 1.4x gain and R5493 to 2.87K <rdar://6423810>
csa. 89 changed L8920 to 152S0955 (25A Isat); R8900 to 7.15K for 24.6A OCP <rdar://6423810>

12/12/08
csa. 1 changed title to DVT1
csa. 4 removed pre-EVT check in notes from Rev. History
csa. 99 changed text note to reflect 2.5V to 1.8V GMUX rail change

31

SYNC_MASTER=NA SYNC_DATE=NA

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 4 OF 123	

BOM Variants

BOM NUMBER	BOM NAME	BOM OPTIONS
630-9728	PCBA,BEST,2.66,512SAM_VRAM,K20	K20_COMMON,EEE_4CM,CPU_2_66GHZ,FB_512_SAMSUNG
630-9727	PCBA,BEST,2.66,512QIM_VRAM,K20	K20_COMMON,EEE_4CH,CPU_2_66GHZ,FB_512_QIMONDA
630-9730	PCBA,BEST,2.93,512SAM_VRAM,K20	K20_COMMON,EEE_4CQ,CPU_2_93GHZ,FB_512_SAMSUNG
630-9729	PCBA,BEST,2.93,512QIM_VRAM,K20	K20_COMMON,EEE_4CP,CPU_2_93GHZ,FB_512_QIMONDA

K20 BOM GROUPS

BOM GROUP	BOM OPTIONS
K20_COMMON	ALTERNATE,COMMON,K20_COMMON1,K20_COMMON2,K20_DEBUG,K20_PROGPARTS
K20_COMMON1	ONEWIRE_PU,ISL6258,MEMRESET_HW,MEMRESET_MCP,MCP_B03,MCP_PROD,MCPSEQ_SMC,BMON_ENG,MCP_CS1_NO,FW_LVG_NEW,PROD_DIGSMS,TPDT_DEBOUNCE
K20_COMMON2	BOOT_MODE_USER,GPUVID_1P00V,MUXGFX,DPMUX_EN_S0,DP_ESD,EG_PWRSEQ_GMUX,DP_CA_DET_EG_PLD,BKLT_PLL_NOT,GMUX_1V8
K20_DEBUG	SMC_DEBUG_YES,XDP,XDP_CONN,LPCPLUS,VREFMRGN,TPAD_DEBUG,GMUX_JTAG_CONN
K20_PROGPARTS	GMUX_PROG,BOOTROM_PROG,SMC_PROG,TPAD_PROG

BOM GROUP	BOM OPTIONS
FB_1024_SAMSUNG	VRAM8,VRAM_1024_SAMSUNG
FB_1024_QIMONDA	VRAM8,VRAM_1024_QIMONDA
FB_512_SAMSUNG	VRAM4,VRAM_512_SAMSUNG
FB_512_QIMONDA	VRAM4,VRAM_512_QIMONDA

Bar Code Labels / EEE #'s

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
826-4393	1	LBL,P/N LABEL,PCB,28MM X 6 MM	[EEE:4CH]	CRITICAL	EEE_4CH
826-4393	1	LBL,P/N LABEL,PCB,28MM X 6 MM	[EEE:4CM]	CRITICAL	EEE_4CM
826-4393	1	LBL,P/N LABEL,PCB,28MM X 6 MM	[EEE:4CP]	CRITICAL	EEE_4CP
826-4393	1	LBL,P/N LABEL,PCB,28MM X 6 MM	[EEE:4CQ]	CRITICAL	EEE_4CQ

Alternate Parts

PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
152S0476	152S0276		ALL	Inductor alternate
353S1681	353S1294		ALL	TI alt to National
138S0603	138S0602		ALL	Murata alt to Samsung
152S0684	152S0368		ALL	Maglayers alt to Dale/Vishay
104S0023	104S0018		ALL	Cyntec alt to sense resistor
104S0024	104S0017		ALL	Panasonic alt to FW resistor
341S2367	341S2366		ALL	Macronix alt to SST
152S0876	152S0782		ALL	Maglayer alt to Delta
157S0058	157S0055		ALL	Delta alt to TDK Magnetics
514-0612	514-0607		ALL	FOXLINK ALT TO FOXCONN XCVR
514-0613	514-0608		ALL	FOXLINK ALT TO FOXCONN RCVR
152S0684	152S0421		ALL	MAG LAYERS ALT TO VISHAY
152S0896	152S0518		ALL	MAG LAYERS ALT TO CYNTEC
152S0915	152S0796		ALL	MAG LAYERS ALT TO CYNTEC
516S0709	516S0706		ALL	MOLEX ALT TO FOXCONN
155S0457	155S0329		ALL	MAG LAYERS ALT TO MURATA
516-0213	516-0201		ALL	MOLEX ALT TO FOXCONN

Module Parts

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
337S3645	1	IC,PDC,QXXX,Q5,2.66,25W,1066,E0,6M,BGA	U1000	CRITICAL	CPU_2_66GHZ
337S3644	1	IC,PDC,QXXX,Q5,2.86,35W,1066,E0,6M,BGA	U1000	CRITICAL	CPU_2_86GHZ
338S0714	1	IC,ASSP,GPU,NV G96-GS,LOWLKG,BGA969,LF	U8000	CRITICAL	
338S0694	1	IC,RTL8251CA-VB-GR,GIGE TRANSCEIVER,48P LQFP	U3700	CRITICAL	
338S0654	1	IC,FW643-E,1394B PHY/OHCI LINK/PCI-E,12	U4100	CRITICAL	
338S0710	1	IC,MCP79XT-B3,35X35MM,BGA1437	U1400	CRITICAL	MCP_B03
338S0563	1	IC,SMC,HS8/2117,9MMX9MM,TLP	U4900	CRITICAL	SMC_BLANK
341S2355	1	IC,SMC,DEVELOPMENT,K20	U4900	CRITICAL	SMC_PROG
335S0610	1	IC,FLASH,SPI,32MBIT,3.3V,86MHZ,8-SOP	U6100	CRITICAL	BOOTROM_BLANK
341S2356	1	IC,EFI ROM,DEVELOPMENT,K20	U6100	CRITICAL	BOOTROM_PROG
341S2384	1	IR,ENCORE II, CY7C63833-LFXC	U4800	CRITICAL	
338S0603	1	IC,GMCP,MCP79-A01Q,35x35MM,BGA1437	U1400	CRITICAL	MCP_A01Q
341S2383	1	IC,PSOC +W/USB,56PIN,MLF,M98	U5701	CRITICAL	TPAD_PROG
337S3643	1	IC,PDC,QXXX,Q5,2.93,35W,1066,E0,6M,BGA	U1000	CRITICAL	CPU_2_93GHZ
337S3640	1	IC,PDC,SL3BX,PMQ,2.53,35W,1066,C0,6M,BGA	U1000	CRITICAL	CPU_2_53GHZ
337S3641	1	IC,PDC,SL843.PMQ,2.80,35W,1066,E0,6M,BGA	U1000	CRITICAL	CPU_2_80GHZ
338S0635	1	IC,GMCP,MCP79-B02,35x35MM,BGA1437	U1400	CRITICAL	MCP_B02
333S0481	4	IC,SGRAM,GDDR3,32MX32,800MHZ,136 FBGA	U8400,U8450,U8500,U8550	CRITICAL	VRAM_512_SAMSUNG
333S0472	4	IC,SGRAM,GDDR3,32MX32,900MHZ,136 FBGA	U8400,U8450,U8500,U8550	CRITICAL	VRAM_512_QIMONDA
333S0481	8	IC,SGRAM,GDDR3,32MX32,800MHZ,136 FBGA	U8400,U8410,U8500,U8510,U8100,U8110,U8300,U8250	CRITICAL	VRAM_1024_SAMSUNG
333S0472	8	IC,SGRAM,GDDR3,32MX32,900MHZ,136 FBGA	U8400,U8410,U8500,U8510,U8100,U8110,U8300,U8250	CRITICAL	VRAM_1024_QIMONDA

BOM Configuration

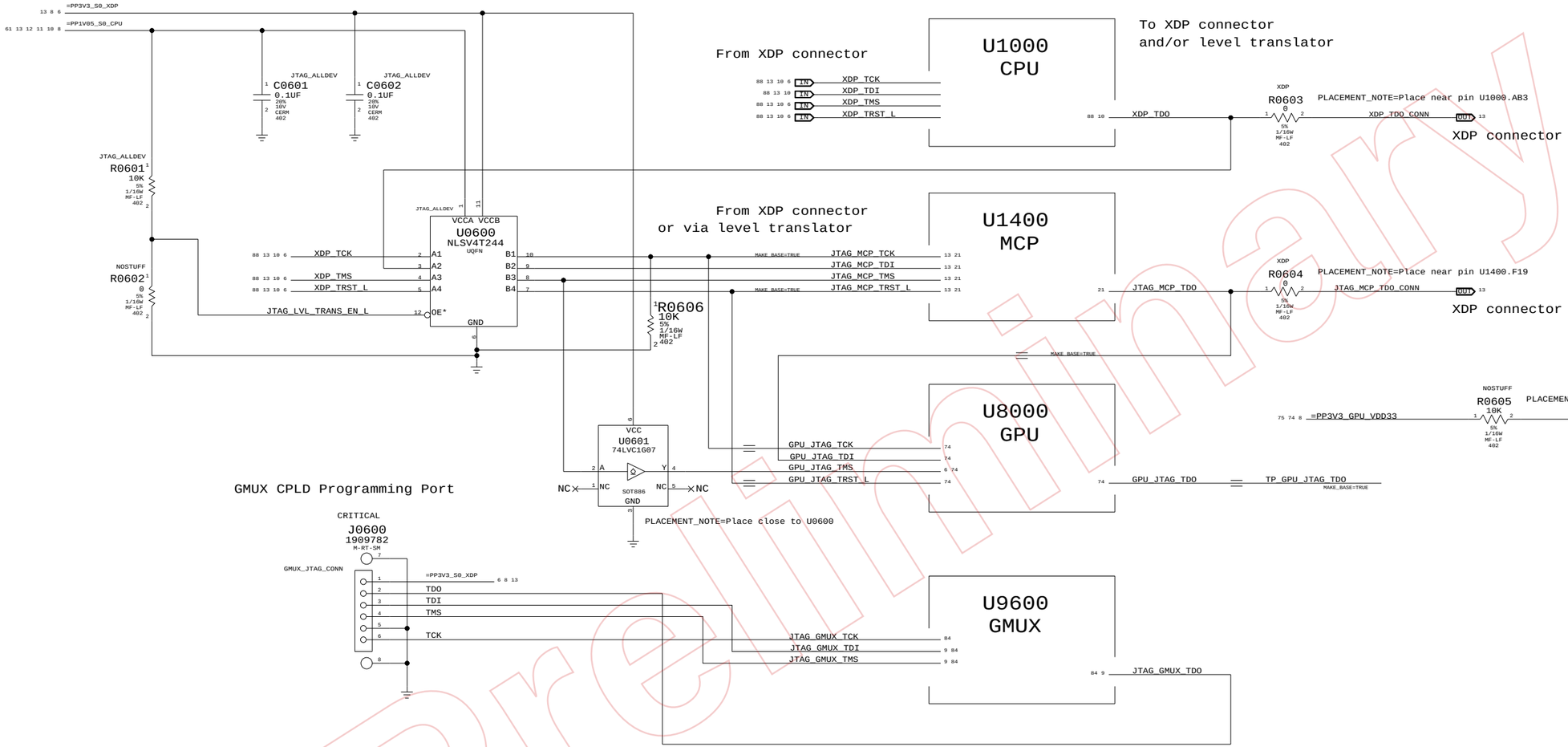
SYNC_MASTER=K20_MLB SYNC_DATE=04/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31

SCALE NONE SHT 5 OF 123

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



JTAG Scan Chain

SYNC_MASTER=BEN_K20 SYNC_DATE=07/11/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 6 OF 123	

Functional Test Points

FUNC_TEST

J5650 (LEFT FAN CONN)

- =PP5V_S0_FAN_LT
- FAN_LT_PWM
- FAN_LT_TACH

3 TPs per Fan

J5660 (RIGHT FAN CONN)

- FAN_RT_PWM
- FAN_RT_TACH
- GND

5 TPs per Fan

J6780 (MIC CONN)

- BI_MIC_LO
- BI_MIC_SHIELD
- BI_MIC_HI

J6781 (LEFT SPEAKER)

- SPKRAMP_L1_OUT_P
- SPKRAMP_L1_OUT_N
- SPKRAMP_L2_OUT_P
- SPKRAMP_L2_OUT_N

J6782 (RIGHT & SUB SPEAKER)

- SPKRAMP_LFE_OUT_P
- SPKRAMP_LFE_OUT_N
- SPKRAMP_R1_OUT_P
- SPKRAMP_R1_OUT_N
- SPKRAMP_R2_OUT_P
- SPKRAMP_R2_OUT_N

J9000 (LVDS CONN)

- BKL_SYNC
- PP3V3_SW_LCD
- =PP3V3_S0_DDC_LCD
- PPVOUT_S0_LCDBKLT
- LVDS_DDC_CLK
- LVDS_DDC_DATA
- LVDS_CONN_A_DATA_P<0>
- LVDS_CONN_A_DATA_N<0>
- LVDS_CONN_A_DATA_P<1>
- LVDS_CONN_A_DATA_N<1>
- LVDS_CONN_A_DATA_P<2>
- LVDS_CONN_A_DATA_N<2>
- LVDS_CONN_A_CLK_F_P
- LVDS_CONN_A_CLK_F_N
- LVDS_CONN_B_DATA_P<0>
- LVDS_CONN_B_DATA_N<0>
- LVDS_CONN_B_DATA_P<1>
- LVDS_CONN_B_DATA_N<1>
- LVDS_CONN_B_DATA_P<2>
- LVDS_CONN_B_DATA_N<2>
- LVDS_CONN_B_CLK_F_P
- LVDS_CONN_B_CLK_F_N
- LED_RETURN_1
- LED_RETURN_2
- LED_RETURN_3
- LED_RETURN_4
- LED_RETURN_5
- LED_RETURN_6
- GND

2 TP needed

4 TPs

J4500 (SATA ODD CONN)

- PP5V_SW_ODD
- SMC_ODD_DETECT
- SATA_ODD_D2R_C_P
- SATA_ODD_D2R_C_N
- SATA_ODD_R2D_P
- SATA_ODD_R2D_N
- GND

3 TPs

5 TPs

J4501 (SATA HDD CONN)

- PP5V_S0_HDD_FLT
- SATA_HDD_R2D_P
- SATA_HDD_R2D_N
- SATA_HDD_D2R_C_N
- SATA_HDD_D2R_C_P
- GND

J5815 (KBD BACKLIGHT CONN)

- KBDLED_ANODE
- SMC_KBDLED_PRESENT_L
- GND

FUNC_TEST

- GND
- GND

6 TPs

USB PORTS

- PP5V_S3_RTUSB_A_F
- USB2_LT1_N
- USB2_LT1_P
- GND
- PP5V_S3_RTUSB_B_F
- USB_LT2_N
- USB_LT2_P
- GND
- PP5V_S3_RTUSB_C_F
- USB_LT3_N
- USB_LT3_P
- GND

J3401 (AIRPORT/BT/CAMERA CONN)

- 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
- MINI_RESET_CONN_L
- PP5V_WLAN
- PP5V_S3_BTCAMERA_F
- SMBUS_SMC_A_S3_SDA
- SMBUS_SMC_A_S3_SCL
- USB_CAMERA_CONN_P
- USB_CAMERA_CONN_N
- CONN_USB2_BT_P
- CONN_USB2_BT_N

J3500 (EXPRESS CARD CONN)

- PP1V5_S0_EXCARD_SWITCH
- PCIE_WAKE_L
- SMBUS_MCP_0_CLK
- SMBUS_MCP_0_DATA
- PP3V3_S0_EXCARD_SWITCH
- PP3V3_S3_EXCARD_SWITCH
- USB2_EXCARD_CONN_N
- USB2_EXCARD_CONN_P
- EXCARD_CPUSB_L
- EXCARD_CLKREQ_CONN_L
- EXCARD_CPPE_L
- PLT_RESET_SWITCH_L
- PCIE_EXCARD_D2R_P
- PCIE_EXCARD_D2R_N
- PCIE_EXCARD_R2D_P
- PCIE_EXCARD_R2D_N
- PCIE_CLK100M_EXCARD_CONN_P
- PCIE_CLK100M_EXCARD_CONN_N

J5800 (IPD FLEX CONN)

- PP3V3_S3_LDO
- PP18V5_S3
- TPAD_GND_F
- Z2_CS_L
- Z2_DEBUG3
- Z2_MISO
- Z2_MOSI
- Z2_BOOST_EN
- Z2_BOOT_CFG1
- Z2_CLKIN
- Z2_KEY_ACT_L
- Z2_RESET
- PSOC_F_CS_L
- PICKB_L
- PSOC_MISO
- PSOC_MOSI
- PSOC_SCLK
- SMBUS_SMC_A_S3_SCL
- SMBUS_SMC_A_S3_SDA

J6900 (DC POWER CONN)

- ADAPTER_SENSE
- PP18V5_DCIN_FUSE
- GND

J6950 (MAIN BATT CONN)

- PPVBAT_G3H_CONN_F
- SMBUS_SMC_BSA_SCL
- SMBUS_SMC_BSA_SDA
- SMC_BS_ALRT_L
- GND

J6995 (BAT LED CONN)

- PP3V42_G3H
- SMBUS_SMC_BSA_SDA
- SMBUS_SMC_BSA_SCL
- SMC_BIL_BUTTON_DB_L
- GND

J5713 (KEY BOARD CONN)

- PP3V3_S3
- PP3V42_G3H
- WS_KBD1
- WS_KBD2
- WS_KBD3
- WS_KBD4
- WS_KBD5
- WS_KBD6
- WS_KBD7
- WS_KBD8
- WS_KBD9
- WS_KBD10
- WS_KBD11
- WS_KBD12
- WS_KBD13
- WS_KBD14
- WS_KBD15_CAP
- WS_KBD16_NUM
- WS_KBD17
- WS_KBD18
- WS_KBD19
- WS_KBD20
- WS_KBD21
- WS_KBD22
- WS_KBD23
- WS_KBD_ONOFF_L
- WS_LEFT_SHIFT_KBD
- WS_LEFT_OPTION_KBD
- WS_CONTROL_KBD

J4800 (FRONT CABLE CONN)

- PP3V42_G3H_LIDSWITCH_R
- PP5V_S3_IR_R
- SMC_LID_R
- IR_RX_OUT
- SYS_LED_ANODE
- GND

J5502 (SENSOR CONN)

- MCPTHMSNS_D_P
- MCPTHMSNS_D_N

POWER RAILS

FUNC_TEST

- PM_SLP_S3_L
- PPBUS_G3H
- PPBUS_CPU_IMVP_ISNS
- PP3V42_G3H
- PP5V_S3
- PP5V_S0
- PPVCORE_S0_CPU
- PPVCORE_S0_MCP
- PP3V3_S5
- PP3V3_S3
- PP3V3_S0
- PP2V5_S0
- PP1V2_S0
- PP1V8_S0
- PP1V8R1V5_S3
- PP1V8R1V5_S0
- PP1V2R1V05_S5
- PPMCPDDR_ISNS
- PP1V05_S0
- PP1V2R1V05_S5
- PPCPUVTT_S0
- PP0V9R0V75_S0_DDRVTT
- PP1V2R1V05_ENET
- PP3V3_ENET_PHY
- PPVP_FW
- PP1V0_FW
- PP3V3_S0GPU
- PP1V1_S0GPU
- PP1V8_S0GPU_ISNS
- PPVCORE_GPU
- PP1V8_S0GPU_ISNS_R
- PP3V3_S5_AVREF_SMC
- PP18V5_S3
- PPDCIN_G3H
- PPVCORE_S0_MCP
- PPMCPDDR_ISNS
- PPVTTDDR_S3
- PP1V8_GPUIFPX

FUNC_TEST

- SYS_LED_ANODE_R
- LPC_CLK33M_LPCPLUS
- LPC_AD<0..3>
- SPI_ALT_MOSI
- SPI_ALT_MISO
- LPC_FRAME_L
- PM_CLKRUN_L
- SMC_TMS
- DEBUG_RESET_L
- SMC_TDO
- SMC_TRST_L
- SMC_MD1
- SMC_TX_L
- SPIROM_USE_MLB
- SPI_ALT_CLK
- SPI_ALT_CS_L
- LPC_SERIRQ
- LPC_PWRDWN_L
- SMC_TDI
- SMC_TCK
- SMC_RESET_L
- SMC_NMI
- SMC_RX_L
- LPCPLUS_GPIO
- ISSP_SCLK_P1_1
- ISSP_SDATA_P1_0
- SMC_ONOFF_L
- PM_SYSRST_L
- BKL_FB
- BKL_GD
- BKL_SW
- BKLT_EN
- BKL_SCL
- BKL_SDA
- LCD_BKLT_PWM

ICT Test Points

CPU FSB NO_TESTs

NO_TEST

- FSB_A_L<31..3>
- FSB_ADS_L
- FSB_ADSTB_L<1..0>
- FSB_D_L<63..0>
- FSB_DBSY_L
- FSB_DINV_L<3..0>
- FSB_DRDY_L
- FSB_DSTB_L_N<3..0>
- FSB_DSTB_L_P<3..0>
- FSB_HIT_L
- FSB_HITM_L
- FSB_LOCK_L
- FSB_REQ_L<4..0>

FB NO_TESTs

NO_TEST

- FB_A_DQ<63..0>
- FB_B_DQ<63..0>
- FB_B_BA<1>
- FB_B_CAS_L
- FB_B_CS0_L
- FB_B_MA<11>

LVDS NO_TESTs

NO_TEST

- LVDS_A_DATA_N<0>
- LVDS_A_DATA_P<0>
- LVDS_B_CLK_P
- LVDS_B_DATA_N<0>
- LVDS_B_DATA_P<0>
- LVDS_EG_A_DATA_N<2>

NC NO_TESTs

NO_TEST

- TP_PCI_AD<31..8> — NC_PCI_AD<31..8>
- TP_PCI_C_BE_L<3..0> — NC_PCI_C_BE_L<3..0>
- TP_PCI_CLK0 — NC_PCI_CLK0
- TP_PCI_CLK1 — NC_PCI_CLK1
- TP_PCI_DEVSEL_L — NC_PCI_DEVSEL_L
- TP_PCI_FRAME_L — NC_PCI_FRAME_L
- TP_PCI_GNT0_L — NC_PCI_GNT0_L
- TP_PCI_GNT1_L — NC_PCI_GNT1_L
- TP_PCI_INTW_L — NC_PCI_INTW_L
- TP_PCI_INTX_L — NC_PCI_INTX_L
- TP_PCI_INTY_L — NC_PCI_INTY_L
- TP_PCI_INTZ_L — NC_PCI_INTZ_L
- TP_PCI_IRDY_L — NC_PCI_IRDY_L
- TP_PCI_PAR — NC_PCI_PAR
- TP_PCI_PERR_L — NC_PCI_PERR_L
- TP_PCI_RESET1_L — NC_PCI_RESET1_L
- TP_PCI_SERR_L — NC_PCI_SERR_L
- TP_PCI_STOP_L — NC_PCI_STOP_L
- TP_PCI_TRDY_L — NC_PCI_TRDY_L
- TP_PCIE_CLK100M_PE4P — NC_PCIE_CLK100M_PE4P
- TP_PCIE_CLK100M_PE5N — NC_PCIE_CLK100M_PE5N
- TP_PCIE_CLK100M_PE5P — NC_PCIE_CLK100M_PE5P
- TP_PCIE_CLK100M_PE6N — NC_PCIE_CLK100M_PE6N
- TP_PCIE_CLK100M_PE6P — NC_PCIE_CLK100M_PE6P
- TP_PCIE_PE4_D2RN — NC_PCIE_PE4_D2RN
- TP_PCIE_PE4_D2RP — NC_PCIE_PE4_D2RP
- TP_PE4_CLKREQ_L — NC_PE4_CLKREQ_L
- TP_PEX_CLKREQ_L — NC_PEX_CLKREQ_L
- TP_PSOC_P1_3 — NC_PSOC_P1_3
- TP_SATA_C_D2RN — NC_SATA_C_D2RN
- TP_SATA_C_D2RP — NC_SATA_C_D2RP
- TP_SATA_C_R2D_CN — NC_SATA_C_R2D_CN
- TP_SATA_C_R2D_CP — NC_SATA_C_R2D_CP
- TP_SATA_D_D2RN — NC_SATA_D_D2RN
- TP_SATA_D_D2RP — NC_SATA_D_D2RP
- TP_SATA_D_R2D_CN — NC_SATA_D_R2D_CN
- TP_SATA_D_R2D_CP — NC_SATA_D_R2D_CP
- TP_SATA_E_D2RN — NC_SATA_E_D2RN
- TP_SATA_E_D2RP — NC_SATA_E_D2RP
- TP_SATA_E_R2D_CN — NC_SATA_E_R2D_CN
- TP_SATA_E_R2D_CP — NC_SATA_E_R2D_CP
- TP_SATA_F_D2RN — NC_SATA_F_D2RN
- TP_SATA_F_D2RP — NC_SATA_F_D2RP
- TP_SATA_F_R2D_CN — NC_SATA_F_R2D_CN
- TP_SATA_F_R2D_CP — NC_SATA_F_R2D_CP
- TP_SB_A20GATE — NC_SB_A20GATE
- TP_SMC_P41 — NC_SMC_P41
- TP_USB_10P — NC_USB_10P
- TP_USB_11N — NC_USB_11N
- TP_USB_11P — NC_USB_11P
- TP_USB_EXTDN — NC_USB_EXTDN
- TP_USB_EXTDP — NC_USB_EXTDP
- TP_USB_MININ — NC_USB_MININ
- TP_USB_MINIP — NC_USB_MINIP
- TP_XDP_OBSDATA_B2 — NC_XDP_OBSDATA_B2
- TP_XDP_OBSDATA_B3 — NC_XDP_OBSDATA_B3

NC NO_TESTs

NO_TEST

- NC_SMC_FAN_3_TACH
- NC_SMC_FAN_3_CTL
- NC_SMC_FAN_2_TACH
- NC_SMC_FAN_2_CTL
- NC_FW2_TPBP
- NC_FW2_TPBN
- NC_FW2_TPBIAS
- NC_FW2_TPAP
- NC_FW2_TPAN
- NC_FW0_TPBP
- NC_FW0_TPBN
- NC_FW0_TPAP
- NC_ESTARLDO_EN
- NC_ALS_GAIN

NC NO_TESTs

NO_TEST

- TP_CPU_PECI_MCP — NC_CPU_PECI_MCP
- TP_CPU_TEST3 — NC_CPU_TEST3
- TP_ENET_INTR_L — NC_ENET_INTR_L
- TP_ENET_PWRDWN_L — NC_ENET_PWRDWN_L
- TP_FW643_AVREG — NC_FW643_AVREG
- TP_FW643_TDI — NC_FW643_TDI
- TP_MEM_A_A<15> — NC_MEM_A_A<15>
- TP_MEM_A_CKE<2> — NC_MEM_A_CKE<2>
- TP_MEM_A_CKE<3> — NC_MEM_A_CKE<3>
- TP_MEM_A_CLK2N — NC_MEM_A_CLK2N
- TP_MEM_A_CLK2P — NC_MEM_A_CLK2P
- TP_MEM_A_CLK3N — NC_MEM_A_CLK3N
- TP_MEM_A_CLK3P — NC_MEM_A_CLK3P
- TP_MEM_A_CLK4N — NC_MEM_A_CLK4N
- TP_MEM_A_CLK4P — NC_MEM_A_CLK4P
- TP_MEM_A_CLK5N — NC_MEM_A_CLK5N
- TP_MEM_A_CLK5P — NC_MEM_A_CLK5P
- TP_MEM_A_CS_L<2> — NC_MEM_A_CS_L<2>
- TP_MEM_A_CS_L<3> — NC_MEM_A_CS_L<3>
- TP_MEM_A_ODT<2> — NC_MEM_A_ODT<2>
- TP_MEM_A_ODT<3> — NC_MEM_A_ODT<3>
- TP_MEM_B_A<15> — NC_MEM_B_A<15>
- TP_MEM_B_CKE<2> — NC_MEM_B_CKE<2>
- TP_MEM_B_CLK2P — NC_MEM_B_CLK2P
- TP_MEM_B_CLK3N — NC_MEM_B_CLK3N
- TP_MEM_B_CLK3P — NC_MEM_B_CLK3P
- TP_MEM_B_CLK4N — NC_MEM_B_CLK4N
- TP_MEM_B_CLK4P — NC_MEM_B_CLK4P
- TP_MEM_B_CLK5N — NC_MEM_B_CLK5N
- TP_MEM_B_CLK5P — NC_MEM_B_CLK5P
- TP_MEM_B_CS_L<2> — NC_MEM_B_CS_L<2>
- TP_MEM_B_CS_L<3> — NC_MEM_B_CS_L<3>
- TP_MEM_B_ODT<2> — NC_MEM_B_ODT<2>
- TP_MEM_B_ODT<3> — NC_MEM_B_ODT<3>
- TP_MLB_RAM_SIZE — NC_MLB_RAM_SIZE
- TP_MLB_RAM_VENDOR — NC_MLB_RAM_VENDOR
- TP_GPU_BUFRST_L — NC_GPU_BUFRST_L
- TP_GPU_GSTATE<0> — NC_GPU_GSTATE<0>
- TP_GPU_GSTATE<1> — NC_GPU_GSTATE<1>
- TP_GPU_MIOA_D<9..0> — NC_GPU_MIOA_D<9..0>
- TP_GPU_MIOA_DE — NC_GPU_MIOA_DE
- TP_GPU_PGOOD_OUT_L — NC_GPU_PGOOD_OUT_L
- TP_GPU_VCORE_VID3 — NC_GPU_VCORE_VID3
- TP_LPC_DRQ0_L — NC_LPC_DRQ0_L
- TP_LVDS_EG_B_CLK_N — NC_LVDS_EG_B_CLK_N
- TP_LVDS_EG_B_CLK_P — NC_LVDS_EG_B_CLK_P
- TP_LVDS_EG_BKL_PWM — NC_LVDS_EG_BKL_PWM
- TP_LVDS_IG_B_CLKN — NC_LVDS_IG_B_CLKN
- TP_LVDS_IG_B_CLKP — NC_LVDS_IG_B_CLKP
- TP_LVDS_IG_BKL_PWM — NC_LVDS_IG_BKL_PWM
- TP_MCP_BUF_SIO_CLK — NC_MCP_BUF_SIO_CLK
- TP_MCP_GPIO_18 — NC_MCP_GPIO_18
- TP_MCP_KBDRSTIN_L — NC_MCP_KBDRSTIN_L
- TP_MCP_SATALED_L — NC_MCP_SATALED_L

(MAKE_BASE=TRUE)

Functional / ICT Test

SYNC_MASTER=K20_MLB SYNC_DATE=09/24/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE NONE	SHT 7	OF 123

"G3Hot" (Always-Present) Rails

60 =PPBUS_G3H
PPBUS_G3H
MIN_LINE_WIDTH=0.4 mm
MIN_NECK_WIDTH=0.25 mm
VOLTAGE=6V
MAKE_BASE=TRUE
7 45
=PPVIN_S5_P5VP3V3 62
=PPVIN_S0_CPUVTTS0 65
=PPBUS_S0_LCDBKLT 86
=PPVIN_GPU_GPUVCORE 77
=PPVIN_S5_CPU_IMVP_ISNS_R 45
=PPVIN_S0_P5VRTS0_MCPCORE 64
=PPVIN_S3_DDRREG 63
=PPVIN_S0GPU_P1V8P1V1 83
=PPVBAT_G3H_P3V42G3H 59
=PPVIN_S0_P1V05S5 66
=PPVIN_S0_KBDLED 50
=PPVIN_S5_FWPWRSW 36
=PPVIN_S5_BKL

45 =PPVIN_S5_CPU_IMVP_ISNS
PPBUS_CPU_IMVP_ISNS
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.25 MM
VOLTAGE=6V
MAKE_BASE=TRUE
7
=PPVIN_S5_CPU_IMVP 61

59 =PP18V5_DCIN_CONN
PPDCIN_G3H
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.25 MM
VOLTAGE=18.5V
MAKE_BASE=TRUE
7
=PPDCIN_S5_CHGR 60

59 =PP3V42_G3H_REG
PP3V42_G3H
MIN_LINE_WIDTH=0.3 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=3.42V
MAKE_BASE=TRUE
7 42
=PP3V42_G3H_SMCUSBMUX 39
=PP3V42_G3H_SMBUS_SMC_BSA 44
=PP3V42_G3H_LIDSWITCH 40
=PP3V3_S5_SMC 41 42 51
=PP3V3_S5_LPCPLUS 43
=PPVIN_S5_SMCVREF 42
=PP3V42_G3H_PWRCTL 67
=PP3V42_G3H_CHGR 60
=PP3V3_S5_RTC_D 25
=PP3V42_G3H_BATT 59
=PP3V42_G3H_TPAD 49
=PP3V42_G3H_BMON_ISNS 45
=PP3V42_G3H_CPUCOREISNS 45

5V Rails

62 =PP5V_S3_REG
PP5V_S3
MIN_LINE_WIDTH=0.5 mm
MIN_NECK_WIDTH=0.25 mm
VOLTAGE=5V
MAKE_BASE=TRUE
7
=PP5V_S3_SYSLED 42
=PP5V_S3_BTCAMERA 30
=PP5V_S3_WLAN 30
=PP5V_S3_IR 40
=PP5V_S3_DDRREG 63
=PP5V_S3_GPUVCORE 77
=PP5V_S3_RTUSB 39 98
=PP5V_S3_TPAD 50
=PP5V_S3_P1V05S0FET 68
=PP5V_S3_MCPDDRFET 68
=PP5V_S3_VTTCLAMP 68
=PP5V_S3_AUDIO_PWR 9

64 =PP5V_S0_REG
PP5V_S0
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.25 MM
VOLTAGE=5V
MAKE_BASE=TRUE
7
=PP5V_S0_FAN_LT 7 48
=PP5V_S0_FAN_RT 48
=PP5V_S0_CPU_IMVP 61
=PP5V_S0_CPUVTTS0 65
=PP5V_S0GPU_P1V1P1V8_GPU 83
=PP5V_S0_LPCPLUS 43
=PP5V_S0_ODD 38
=PP5V_S0_HDD 38

Chipset "VCore" Rails

61 =PPVCORE_S0_CPU_REG
PPVCORE_S0_CPU
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.25 MM
VOLTAGE=1.25V
MAKE_BASE=TRUE
7
=PPVCORE_S0_CPU 11 12 45

64 =PPMCPCORE_S0_REG
PPVCORE_S0_MCP
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
MAKE_BASE=TRUE
7
=PPVCORE_S0_MCP 22 23 45

3.3V-2.5V Rails

62 =PP3V3_S5_REG
PP3V3_S5
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=3.3V
MAKE_BASE=TRUE
7 96
=PP3V3_S5_ROM 43 52
=PP3V3_S5_MEMRESET 29
=PP3V3_S3_P3V3S3FET 68
=PP3V3_S0_LCD 78
=PP3V3_S0_P3V3S0FET 68
=PP3V3_GPU_P3V3GPUFET 68
=PP3V3_S5_PWRCTL 67
=PP3V3_S5_P1V05FET 68
=PP3V3_S5_MCP 22 23
=PP3V3_S5_MCP_GPIO 18 20
=PP3V3_FW_LATEVG_ACTIVE 36
=PP3V3_S5_MCPPWRGD 25
=PP3V3_FW_LATEVG 37
=PP3V3_S5_P1V05ENETFET 33
=PP3V3_S5_P3V3ENETFET 33
=PP3V3_S5_DP_PORT_PWR 82

68 =PP3V3_S3_FET
PP3V3_S3
MIN_LINE_WIDTH=0.5 mm
MIN_NECK_WIDTH=0.25 mm
VOLTAGE=3.3V
MAKE_BASE=TRUE
7
=PP3V3_S3_GMUX 84
=PP3V3_S3_BT 30
=PP3V3_S3_P1V8S0 66
=PP3V3_S3_SMBUS_SMC_A_S3 44
=PP3V3_S3_SMS 8 51
=PP3V3_S3_TPAD 49
=PP3V3_S3_SMS 8 51
=PP3V3_S3_WLAN 30
=PP3V3_S3_MCP_GPIO 21
=PP3V3_S3_VREFMRGN 26
=PP3V3_S3_SMBUS_SMC_MGMT 44
=PP3V3_S3_EXCARD 31
=PP3V3_S3_P1V5EXPS0 66

68 =PP3V3_S0_FET
PP3V3_S0
MIN_LINE_WIDTH=0.3 MM
MIN_NECK_WIDTH=0.20MM
VOLTAGE=3.3V
MAKE_BASE=TRUE
7 9 96
=PP3V3_S0_LPCPLUS 43
=PP3V3_S0_SMC 42
=PP3V3_S0_SMBUS_SMC_B_S0 44
=PP3V3_S0_MCPDDRISNS 46
=PP3V3_S0_GPU1V8ISNS 46
=PP3V3_S0_CPUTHMSNS 47
=PP3V3_S0_GPUTHMSNS 47
=PP3V3_S0_FAN_LT 48
=PP3V3_S0_FAN_RT 48
=PP3V3_S0_IMVP 61
=PP3V3_S0_PWRCTL 67
=PP3V3_S0_DDC_LCD 7 75 78
=PP3V3_S0_XDP 6 8 13
=PP3V3_S0_MCPCOREISNS 46
=PP3V3_S0_XDP 6 8 13
=PPSPD_S0_MEM_A 27
=PPSPD_S0_MEM_B 28
=PP3V3_S0_SMBUS_MCP_0 44
=PP3V3_S0_GMUX 84
=PP3V3_S0_DPMUX 81
=PP3V3_S0_DPCONN 82
=PP3V3_S0_P1V2P2V5 87
=PP3V3_S0_MCP_GPIO 18 19 21
=PP3V3_S0_HDCPROM 24
=PP3V3R1V5_S0_MCP_HDA 21 23
=PP3V3_S0_MCP_PLL_UF 23
=PP3V3_S0_MCP_VPLL_UF 24
=PP3V3_S0_MCP_DAC_UF 24
=PP3V3_S0_MCP 21 22 23
=PP3V3_S0_AUDIO 53 57 58
=PP3V3_S0_ODD 38
=PP3V3_S0_VMON 67
=PP3V3_S0_SMBUS_MCP_1 44
=PP3V3_S0_REMTHMSNS 47
=PP3V3_S0_EXCARD 31
=PP3V3_S0_LVDSDDCMUX 81
=PP3V3_S0_BATTCHARGERTMPSNSR 47
=PP3V3_GPU_SMBUS_SMC_0_S0 44
=PP3V3_S0_TPAD 50
=PP3V3_S0_MCP_PLL_VLDO 66
=PP3V3_FW_FWPHY 35 37
=PP3V3_FW_P1V0FW 66

87 =PP2V5_S0_REG
PP2V5_S0
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=2.5V
MAKE_BASE=TRUE
7
=PP2V5_S0_GMUX 84

87 =PP1V2_S0_REG
PP1V2_S0
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.2V
MAKE_BASE=TRUE
7
=PP1V2_S0_GMUX 84

1.8V/DDR 1.5V Rails

66 =PP1V8_S0_REG
500 mA max supply
PP1V8_S0
MIN_LINE_WIDTH=0.5 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.8V
MAKE_BASE=TRUE
7
190 mA =PP3V3R1V8_S0_MCP_IFP_VDD 18 24
=PP1V8_S0_MCP_PLL_VLDO 66

63 =PPDDR_S3_REG
PP1V8R1V5_S3
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.5V
MAKE_BASE=TRUE
7
=PP1V8R1V5_S0_MCP_FET 68
=PPVIN_S0_DDRREG_LDO 63
=PP1V5_S3_MEM_A 27
=PP1V5_S3_MEM_B 28
=PP1V5_S3_MEMRESET 29

68 =PP1V8R1V5_S0_FET
PP1V8R1V5_S0
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2MM
VOLTAGE=1.5V
MAKE_BASE=TRUE
7
4771 mA =PPMCPDDR_ISNS_R 46
130 mA =PP1V5_S0_CPU 11 12
500 mA
=PP1V5_S0_VMON 67

66 =PP1V5_EXP_S0
PP1V5_EXP_S0
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.5V
MAKE_BASE=TRUE
=PP1V5_S0_EXCARD 31

23 16 =PP1V8R1V5_S0_MCP_MEM
PPMCPDDR_ISNS
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.8V
MAKE_BASE=TRUE
7
=PP1V5_S0_MEM_A 27
=PP1V5_S0_MEM_B 28
=PPMCPDDR_ISNS 46

68 66 =PP1V05_S0_FET
PP1V05_S0
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
MAKE_BASE=TRUE
7
1034 mA =PP1V05_S0_MCP_AVDD_UF 23
=PP1V05_S0_MCP_PEX_DVDD 8 23
=PP1V05_S0_MCP_SATA_DVDD 8 23
=PP1V05_S0_MCP_HDMI_VDD 18 24
=PP1V05_S0_VMON 67
=PP1V05_S0_MCP_PLL_PEX_UF 23

PP1V05_S0_MCP_PLL_UF
MAKE_BASE=TRUE
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
=PP1V05_S0_MCP_PLL_UF 23 66

23 8 =PP1V05_S0_MCP_PEX_DVDD
=PP1V05_S0_MCP_PEX_DVDD0 17
=PP1V05_S0_MCP_PEX_DVDD1 17

23 PP1V05_S0_MCP_PEX_AVDD
MAKE_BASE=TRUE
=PP1V05_S0_MCP_PEX_AVDD0 17
=PP1V05_S0_MCP_PEX_AVDD1 17

23 8 =PP1V05_S0_MCP_SATA_DVDD
=PP1V05_S0_MCP_SATA_DVDD0 20

23 PP1V05_S0_MCP_SATA_AVDD
MAKE_BASE=TRUE
=PP1V05_S0_MCP_SATA_AVDD0 20

66 =PP1V05_S5_MCP
(1.1V for A01)
PP1V2R1V05_S5
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
MAKE_BASE=TRUE
7
241 mA max load
105 mA/241 mA =PP1V05_S5_MCP_VDD_AUXC 22 23
139 mA/ 0 mA =PP1V05_ENET_P1V05ENETFET 33
=PP1V05_S5_P1V05S0FET 68

65 =PPCPUVTT_S0_REG
PPCPUVTT_S0
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
MAKE_BASE=TRUE
7
5300 mA
4500 mA =PP1V05_S0_CPU 6 10 11 12 13 61
=PP1V05_S0_SMC_LS 42
1182 mA =PP1V05_S0_MCP_FSB 9 14 22 23

63 26 =PPVTT_S3_DDR_BUF
PPVTTDDR_S3
MIN_LINE_WIDTH=0.3 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=0.75V
MAKE_BASE=TRUE
7

63 =PPVTT_S0_DDR_LDO
PP0V9R0V75_S0_DDRVTT
MIN_LINE_WIDTH=2 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=0.9V
MAKE_BASE=TRUE
7
=PP0V75_S0_MEM_VTT_A 27
=PP0V75_S0_MEM_VTT_B 28
=PPVTT_S0_VTTCLAMP 68
OR 0.75V

ENET Rails

33 =PP1V05_ENET_FET
PP1V2R1V05_ENET
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
MAKE_BASE=TRUE
7
=PP1V05_ENET_MCP_PLL_MAC 23
=PP1V05_ENET_MCP_RMGT 18 23
=PP1V05_ENET_PHY 32

33 =PP3V3_ENET_FET
PP3V3_ENET_PHY
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=3.3V
MAKE_BASE=TRUE
7
=PP3V3_ENET_MCP_RMGT 18 23
=PP3V3_ENET_PHY 32

"FW" (FireWire) Rails

36 =PPVOUT_FW_FWPWRSW
PPBUS_FW_FWBOOST
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.25 MM
VOLTAGE=6V
MAKE_BASE=TRUE
=PPVIN_PFWBOOST 66

66 =PFWBOOST_REG
PP10V_FW
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.25 MM
VOLTAGE=10V
MAKE_BASE=TRUE
=PPBOOST_FW_FWPWRSW_F 36

36 =PPBOOST_S5_FW_FET
PPVP_FW
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=10V
MAKE_BASE=TRUE
7
=PPVP_FW_PORT1 37
=PPVP_FW_PHY_CPS_FET 37

66 =PP1V0_FW_REG
PP1V0_FW
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.0V
MAKE_BASE=TRUE
7
=PP1V0_FW_FWPHY 35

"GPU" Rails

68 =PP3V3_S0GPU_FET
PP3V3_S0GPU
MIN_LINE_WIDTH=0.3 MM
MIN_NECK_WIDTH=0.20MM
VOLTAGE=3.3V
MAKE_BASE=TRUE
7
=PP3V3_GPU_VDD33 6 74 75
=PP3V3_GPU_MIO 74 75
=PP3V3_GPU_LVDS_DDC 81
=PP3V3_GPU_PWRCTL 67
=PP3V3_GPU_VCORELOGIC 77
=PP3V3_GPU_P1V8S0 66

83 =PP1V1_S0GPU_REG
PP1V1_S0GPU
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.1V
MAKE_BASE=TRUE
7
=PP1V1_GPU_PEX_IOVDDQ 69
=PP1V1_GPU_PEX_IOVDD 69
=PP1V1_GPU_PEX_PLLXVDD 69
=PP1V1_GPU_PLLVDD 74
=PP1V1_GPU_H_PLLVDD 74
=PP1V1_GPU_VID_PLLVDD 74
=PP1V1_GPU_FBPLLAVDD 71
=PP1V1_GPU_IFPCD_IOVDD 76

66 =PP1V8_GPUIFPX_REG
PP1V8_GPUIFPX
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.15 MM
VOLTAGE=1.8V
MAKE_BASE=TRUE
7
=PP1V8_GPU_IFPX 76

46 =PP1V8_S0GPU_ISNS
PP1V8_S0GPU_ISNS
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.8V
MAKE_BASE=TRUE
7
=PP1V8_GPU_FB_VDD 72 73 79 80
=PP1V8_GPU_FB_VDDQ 9 72 73 79 80
=PP1V8_GPU_FBVDDQ 70
=PP1V8_GPU_FBIO 71

77 45 =PPVCORE_GPU_REG
PPVCORE_GPU
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.2V
MAKE_BASE=TRUE
7
=PPVCORE_GPU 70

83 =PP1V8_GPU_REG
PP1V8_S0GPU_ISNS_R
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.25V
MAKE_BASE=TRUE
7
=PP1V8_S0GPU_ISNS_R 46

Power Aliases

SYNC_MASTER=RXU_K20 SYNC_DATE=05/07/2008

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Thermal Module Holes

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

Frame Holes

ZT0915 3R2P5 — GND_BATT_CHGND
ZT0945 3R2P5 — GND_CHASSIS_USB
ZT0932 3R2P5 — GND_CHASSIS_RIGHTHS
ZT0960 3R2P5 — GND_CHASSIS_SATA
ZT0971 3R2P5 — GND_CHASSIS_TPAD
ZT0965 3R2P5 — GND_CHASSIS_CLUTCH
ZT0940 3R2P5 — GND_CHASSIS_LVDS
ZT0970 3R2P5 — GND_CHASSIS_DIMM

Extra FSB Pull-ups

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

23 22 14 8 =PP1V05_S0_MCP_FSB

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

88 61 14 10 OUT CPU_DPRSTP_L
88 14 10 OUT FSB_BREQ0_L
88 14 13 10 OUT FSB_CPURST_L
88 14 10 OUT CPU_INTR
88 14 10 OUT CPU_NMI

Bosses for Flex Protector Bracket

ZT0931 STDOFF-4.0OD3.0H-SM
ZT0934 STDOFF-4.0OD3.0H-SM
ZT0957 4.0OD1.65H-M1.6X0.35
ZT0958 4.0OD1.65H-M1.6X0.35
ZT0988 STDOFF-4.50D.98H-1.1-3.48-TH
ZT0989 STDOFF-4.50D.98H-1.1-3.48-TH
ZT0991 STDOFF-4.50D.98H-1.1-3.48-TH

R0900 10 1% 1/16W MF-LF 402
80 79 73 72 8 =PP1V8_GPU_FB_VDDQ — GPU_FB_A_VREF_DIV (MAKE_BASE=TRUE) 26 — =PP1V8_GPU_FB_VREF_A 72
R0901 10 1% 1/16W MF-LF 402
GPU_FB_B_VREF_DIV (MAKE_BASE=TRUE) 26 — =PP1V8_GPU_FB_VREF_B 73

SH0902 2.0DIA-TALL-EMI-MLB-M97-M98 SM
SH0900 2.0DIA-TALL-EMI-MLB-M97-M98 SM
SH0903 2.0DIA-TALL-EMI-MLB-M97-M98 SM
SH0901 2.0DIA-TALL-EMI-MLB-M97-M98 SM
SH0920 1.4DIA-SHORT-EMI-MLB-M97-M98 SM
SH0911 1.4DIA-SHORT-EMI-MLB-M97-M98 SM
SH0910 1.4DIA-SHORT-EMI-MLB-M97-M98 SM
SH0913 1.4DIA-SHORT-EMI-MLB-M97-M98 SM
SH0912 1.4DIA-SHORT-EMI-MLB-M97-M98 SM
SH0914 1.4DIA-SHORT-EMI-MLB-M97-M98 SM
SH0923 1.4DIA-SHORT-EMI-MLB-M97-M98 SM
SH0924 2.0DIA-TALL-EMI-MLB-M97-M98 SM
SH0916 2.0DIA-TALL-EMI-MLB-M97-M98 SM
SH0917 2.0DIA-TALL-EMI-MLB-M97-M98 SM
SH0918 2.0DIA-TALL-EMI-MLB-M97-M98 SM
SH0919 2.0DIA-TALL-EMI-MLB-M97-M98 SM
SH0930 2.0DIA-TALL-EMI-MLB-M97-M98 SM
SH0921 2.0DIA-TALL-EMI-MLB-M97-M98 SM
SH0931 2.0DIA-TALL-EMI-MLB-M97-M98 SM
SH0922 2.0DIA-TALL-EMI-MLB-M97-M98 SM
SH0932 2.0DIA-TALL-EMI-MLB-M97-M98 SM
SH0934 2.0DIA-TALL-EMI-MLB-M97-M98 SM
SH0933 2.0DIA-TALL-EMI-MLB-M97-M98 SM
SH0935 2.0DIA-TALL-EMI-MLB-M97-M98 SM

CPU signals

TP_IMVP6_CLKEN_L — VR_PWRGD_CLKEN_L 61
88 11 CPU_VID<0..6> — IMVP6_VID<0..6> 61 88
88 10 CPU_BSEL<0..2> — =MCP_BSEL<0..2> 14
25 MEM_VTT_EN — =DDRVTT_EN 63 68
TP_SPI_CS1_R_L_USE_MLB — =SPI_CS1_R_L_USE_MLB 21 43

GPU signals

90 69 PEG_D2R_P<0..15> — =PEG_D2R_P<0..15> 17
90 69 PEG_D2R_N<0..15> — =PEG_D2R_N<0..15> 17
90 69 PEG_R2D_C_P<0..15> — =PEG_R2D_C_P<0..15> 17
90 69 PEG_R2D_C_N<0..15> — =PEG_R2D_C_N<0..15> 17

84 LCD_BKLT_EN — LVDS_BKL_ON 86
90 81 DP_IG_ML_P<3> — =MCP_HDMI_TXC_P 18
90 81 DP_IG_ML_N<3> — =MCP_HDMI_TXC_N 18
90 81 DP_IG_ML_P<2..0> — =MCP_HDMI_TXD_P<0..2> 18
90 81 DP_IG_ML_N<2..0> — =MCP_HDMI_TXD_N<0..2> 18
81 75 DP_IG_DDC_CLK — =MCP_HDMI_DDC_CLK 18
81 75 DP_IG_DDC_DATA — =MCP_HDMI_DDC_DATA 18
85 DP_IG_HPD — =MCP_HDMI_HPD 18

GMUX ALIASES

67 PM_ALL_GPU_PGOOD — ALL_EG_PGOOD 84
TP_LVDS_MUX_SEL_EG — LVDS_MUX_SEL_EG 84
84 EG_RESET_L — GPU_RESET_L 69

84 6 JTAG_GMUX_TDI — GMUX_JTAG_TDI 19
84 6 JTAG_GMUX_TMS — GMUX_JTAG_TMS 19
84 6 JTAG_GMUX_TDO — GMUX_JTAG_TDO 17
84 GMUX_INT — =DVI_HPD_GMUX_INT 18
18 LVDS_IG_BKL_ON — IG_BKLT_EN 84
18 LVDS_IG_PANEL_PWR — IG_LCD_PWR_EN 84

=PP1V05_S0_MCP_SATA_DVDD1 20
=PP1V05_S0_MCP_SATA_AVDD1 20

66 =P1V5_EXP_S0_EN — PP3V3_S0 7 8 96

MCP_MII_PD — =MCP_MII_RXER 18 — =MCP_MII_CRS 18 — =MCP_MII_COL 18
R0930 47K 5% 1/16W MF-LF 402
Digital Ground
GND MIN_LINE_WIDTH=0.6MM MIN_NECK_WIDTH=0.2MM VOLTAGE=0V

7 TP_USB_EXTDP — USB_EXTD_P 20 91
7 TP_USB_EXTDN — USB_EXTD_N 20 91
7 TP_USB_MINIP — USB_MINI_P 20 91
7 TP_USB_MININ — USB_MINI_N 20 91
7 TP_MEM_A_A<15> — MEM_A_A<15> 27
7 TP_MEM_B_A<15> — MEM_B_A<15> 28
7 TP_CPU_PECI_MCP — CPU_PECI_MCP 14

7 TP_LVDS_IG_B_CLKP — LVDS_IG_B_CLK_P 18 90
7 TP_LVDS_IG_B_CLKN — LVDS_IG_B_CLK_N 18 90
7 TP_LVDS_IG_BKL_PWM — LVDS_IG_BKL_PWM 18

NC_LVDS_IG_A_DATAP<3> (NO_TEST=TRUE) — LVDS_IG_A_DATA_P<3> 18 90
NC_LVDS_IG_A_DATAN<3> (NO_TEST=TRUE) — LVDS_IG_A_DATA_N<3> 18 90
NC_LVDS_IG_B_DATAP<3> (NO_TEST=TRUE) — LVDS_IG_B_DATA_P<3> 18 90
NC_LVDS_IG_B_DATAN<3> (NO_TEST=TRUE) — LVDS_IG_B_DATA_N<3> 18 90

AUDIO ALIASES

53 HDA_BITCLK — HDA_BIT_CLK 21 91
8 =PP5V_S3_AUDIO_PWR
XW0900 SM: 2 — 1 PP5V_S3_AUDIO 53 55 (MIN_LINE_WIDTH=0.5 mm, MIN_NECK_WIDTH=0.25 mm, VOLTAGE=5V)
XW0901 SM: 2 — 1 PP5V_S3_AUDIO_AMP 56 (MIN_LINE_WIDTH=0.5 mm, MIN_NECK_WIDTH=0.25 mm, VOLTAGE=5V)
R0902 10K 5% 1/16W MF-LF 402
AUD_IPHS_SWITCH_EN (MAKE_BASE=TRUE) 19 58

R0903 0 5% 1/16W MF-LF 402
21 MCP_SPKR — SMC_MCP_SAFE_MODE 41

ETHERNET ALIASES

33 =P3V3ENET_EN — PM_SLP_RMGT_L (MAKE_BASE=TRUE) 21
33 =P1V05ENET_EN
32 =PP3V3_ENET_PHY_VDDREG — TP_PP3V3_ENET_PHY_VDDREG (MAKE_BASE=TRUE)
32 =RTL8211_REGOUT — NC_RTL8211_REGOUT (MAKE_BASE=TRUE)
=RTL8211_ENSWREG 32

MCP79 PCIe PRSNT# Straps

R0925 0 5% 1/16W MF-LF 402
PCIE_FW_PRSNT_L (MAKE_BASE=TRUE) OUT 17
NO STUFF
R0927 0 5% 1/16W MF-LF 402
PEG_PRSNT_L (MAKE_BASE=TRUE) OUT 17
R0926 0 5% 1/16W MF-LF 402
EG_CLKREQ_OUT_L IN 84

Signal Aliases

SYNC_MASTER=K20_MLB SYNC_DATE=09/24/2008

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SCALE NONE | SHT 9 OF 123

OMIT

U1000
PENRYN
FCBGA
1 OF 4

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

REQ_L<0> K3 REQ0*
FSB_REQ_L<1> M2 REQ1*
FSB_REQ_L<2> K2 REQ2*
FSB_REQ_L<3> J3 REQ3*
FSB_REQ_L<4> L1 REQ4*

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

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

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

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

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

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

H CLK
BCLK0 A22 FSB_CLK_CPU_P
BCLK1 A21 FSB_CLK_CPU_N

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

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

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

XDP_TMS R1020 54.9
XDP_TDI R1021 54.9
XDP_TDO R1024 54.9
=PP1V05_S0_CPU
PLACEMENT_NOTE=Place R1024 near ITP connector (if present)
XDP_TCK R1022 54.9
XDP_TRST_L R1023 649
1% 1/16W MF-LF 402

OMIT

U1000
PENRYN
FCBGA
2 OF 4

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

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

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

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

MISC
GTLREF AD26 0.5" MAX LENGTH FOR CPU_GTLREF
TEST1 C23 CPU_TEST1
TEST2 D25 CPU_TEST2
TEST3 C24 TP_CPU_TEST3
TEST4 AF26 CPU_TEST4
TEST5 AF1 TP_CPU_TEST5
TEST6 A26 TP_CPU_TEST6
TEST7 C3 TP_CPU_TEST7
BSEL0 B22 CPU_BSEL<0>
BSEL1 B23 CPU_BSEL<1>
BSEL2 C21 CPU_BSEL<2>
COMP0 R26 CPU_COMP<0>
COMP1 U26 CPU_COMP<1>
COMP2 AA1 CPU_COMP<2>
COMP3 Y1 CPU_COMP<3>
DPRSTP* E5 CPU_DPRSTP_L
DPSLP* B5 CPU_DPSLP_L
DPWR* D24 FSB_DPWR_L
PWRGOOD D6 CPU_PWRGD
SLP* D7 FSB_CPUSLP_L
PSI* AE6 CPU_PSI_L

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

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

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

CPU FSB

SYNC_MASTER=M98_MLB SYNC_DATE=04/01/2008

APPLE INC.

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(CPU CORE POWER)

=PPVCORE_S0_CPU 8 11 12 45

Standard Voltage:

44.0 A (Design Target)

41.0 A (HFM)
30.4 A (LFM)
25.5 A (SuperLFM)

27.4 A (Auto-Halt/Stop-Grant HFM)
17.0 A (Auto-Halt/Stop-Grant SuperLFM)

27.4 A (Sleep HFM)
16.8 A (Sleep SuperLFM)

25.0 A (Deep Sleep HFM)
16.0 A (Deep Sleep SuperLFM)

11.5 A (Deeper Sleep)

9.4 A (Enhanced Deeper Sleep)

Low Voltage:

23.0 A (Design Target)

21.0 A (HFM)
18.7 A (LFM)
TBD A (SuperLFM)

TBD A (Auto-Halt/Stop-Grant HFM)
TBD A (Auto-Halt/Stop-Grant SuperLFM)

TBD A (Sleep HFM)
TBD A (Sleep SuperLFM)

TBD A (Deep Sleep HFM)
TBD A (Deep Sleep SuperLFM)

TBD A (Deeper Sleep)

TBD A (Enhanced Deeper Sleep)

Ultra Low Voltage:

17.0 A (Design Target)

TBD A (HFM)
TBD A (LFM)

TBD A (Auto-Halt/Stop-Grant HFM)
TBD A (Auto-Halt/Stop-Grant LFM)

TBD A (Sleep HFM)
TBD A (Sleep LFM)

TBD A (Deep Sleep HFM)
TBD A (Deep Sleep LFM)

TBD A (Deeper Sleep)

TBD A (Enhanced Deeper Sleep)

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

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

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

(CPU IO POWER 1.05V)

=PP1V05_S0_CPU 6 8 10 12 13 61

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

(CPU INTERNAL PLL POWER 1.5V)

=PP1V5_S0_CPU 8 12

130 mA

VCCA: B26, C26

VID0	AD6	CPU_VID<0>	OUT 9 88
VID1	AF5	CPU_VID<1>	OUT 9 88
VID2	AE5	CPU_VID<2>	OUT 9 88
VID3	AF4	CPU_VID<3>	OUT 9 88
VID4	AE3	CPU_VID<4>	OUT 9 88
VID5	AF3	CPU_VID<5>	OUT 9 88
VID6	AE2	CPU_VID<6>	OUT 9 88
VCCSENSE	AF7	CPU_VCCSENSE_P	OUT 61 88
VSSSENSE	AE7	CPU_VCCSENSE_N	OUT 61 88

=PPVCORE_S0_CPU 8 11 12 45

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

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

OMIT
U1000
PENRYN
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VSS: A4, A8, A11, A14, A16, A19, A23, AF2, B6, B8, B11, B13, B16, B19, B21, B24, C5, C8, C11, C14, C16, C19, C2, C22, C25, D1, D4, D8, D11, D13, D16, D19, D23, D26, E3, E6, E8, E11, E14, E16, E19, E21, E24, F5, F8, F11, F13, F16, F19, F2, F22, F25, G4, G1, G23, G26, H3, H6, H21, H24, J2, J5, J22, J25, K1, K4, K23, K26, L3, L6, L21, L24, M2, M5, M22, M25, N1, N4, N23, N26, P3, B1

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

CPU Power & Ground

SYNC_MASTER=M98_MLB SYNC_DATE=04/01/2008

APPLE INC.

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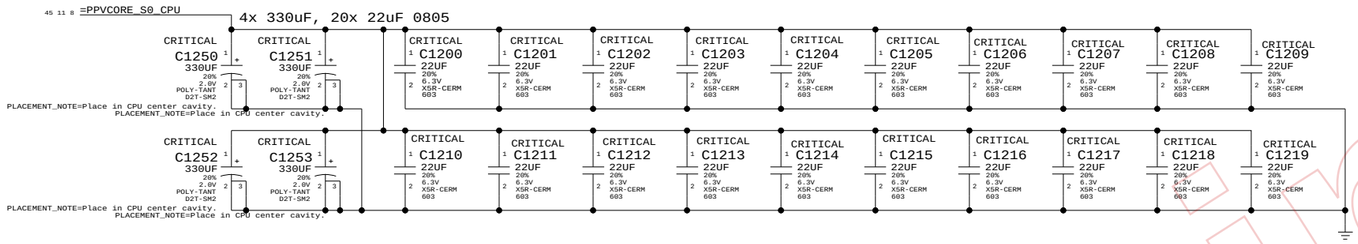
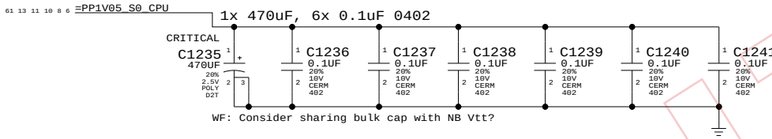
D	051-7656	31
SCALE: NONE	SHT 11 OF 123	

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

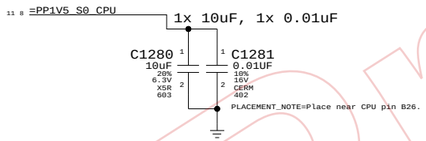
CPU VCORE HF AND BULK DECOUPLING



VCCP (CPU I/O) DECOUPLING



VCCA (CPU AVdd) DECOUPLING



CPU Decoupling & VID

SYNC_MASTER=M98_MLB SYNC_DATE=04/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
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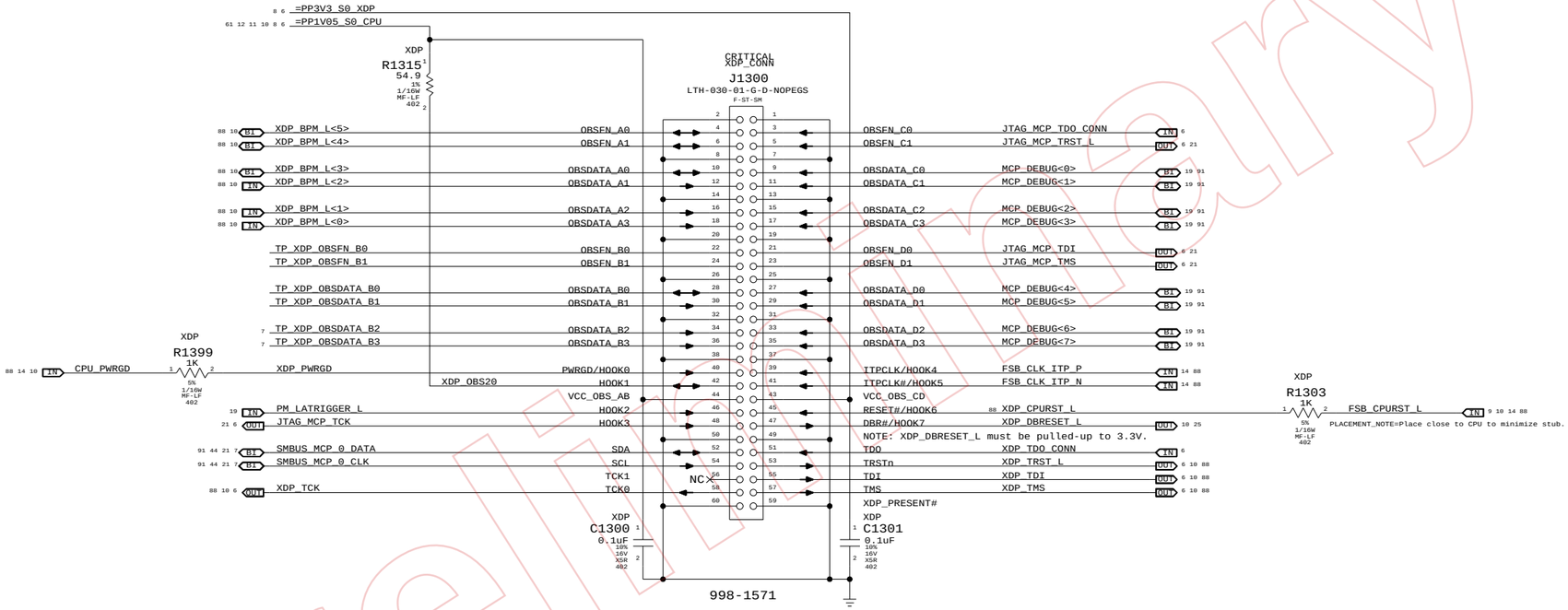
Mini-XDP Connector

NOTE: This is not the standard XDP pinout.

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

MCP79-specific pinout



eXtended Debug Port(MiniXDP)

SYNC_MASTER=M98_MLB SYNC_DATE=04/01/2008

APPLE INC.

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D	051-7656	31
SCALE: NONE	SHT 13 OF 123	

OMIT

U1400
MCP79-TOPO-B
BGA
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FSB

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

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

Loop-back clock for delay matching.

=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

PM_THRMTRIP_L

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

=MCP_BSEL<2>

=MCP_BSEL<1>

=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

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

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

MCP CPU Interface

SYNC_MASTER=T18_MLB

SYNC_DATE=06/06/2008

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APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 14 OF 123	


OMIT
U1400
MCP79-TOPO-B
BGA
(2 OF 11)
MEMORY PARTITION 0
MEMORY CONTROL 0A
MEM_A_DQ<63> AL8 MDQ0_63
MEM_A_DQ<62> AL9 MDQ0_62
MEM_A_DQ<61> AP9 MDQ0_61
MEM_A_DQ<60> AN9 MDQ0_60
MEM_A_DQ<59> AL6 MDQ0_59
MEM_A_DQ<58> AL7 MDQ0_58
MEM_A_DQ<57> AN6 MDQ0_57
MEM_A_DQ<56> AN7 MDQ0_56
MEM_A_DQ<55> AR6 MDQ0_55
MEM_A_DQ<54> AR7 MDQ0_54
MEM_A_DQ<53> AV6 MDQ0_53
MEM_A_DQ<52> AW5 MDQ0_52
MEM_A_DQ<51> AN10 MDQ0_51
MEM_A_DQ<50> AR5 MDQ0_50
MEM_A_DQ<49> AU6 MDQ0_49
MEM_A_DQ<48> AV5 MDQ0_48
MEM_A_DQ<47> AU7 MDQ0_47
MEM_A_DQ<46> AU8 MDQ0_46
MEM_A_DQ<45> AW9 MDQ0_45
MEM_A_DQ<44> AP11 MDQ0_44
MEM_A_DQ<43> AW6 MDQ0_43
MEM_A_DQ<42> AY5 MDQ0_42
MEM_A_DQ<41> AU9 MDQ0_41
MEM_A_DQ<40> AV9 MDQ0_40
MEM_A_DQ<39> AU11 MDQ0_39
MEM_A_DQ<38> AV11 MDQ0_38
MEM_A_DQ<37> AV13 MDQ0_37
MEM_A_DQ<36> AW13 MDQ0_36
MEM_A_DQ<35> AR11 MDQ0_35
MEM_A_DQ<34> AT11 MDQ0_34
MEM_A_DQ<33> AR14 MDQ0_33
MEM_A_DQ<32> AU13 MDQ0_32
MEM_A_DQ<31> AR26 MDQ0_31
MEM_A_DQ<30> AU25 MDQ0_30
MEM_A_DQ<29> AT27 MDQ0_29
MEM_A_DQ<28> AU27 MDQ0_28
MEM_A_DQ<27> AP25 MDQ0_27
MEM_A_DQ<26> AR25 MDQ0_26
MEM_A_DQ<25> AP27 MDQ0_25
MEM_A_DQ<24> AR27 MDQ0_24
MEM_A_DQ<23> AP29 MDQ0_23
MEM_A_DQ<22> AR29 MDQ0_22
MEM_A_DQ<21> AP31 MDQ0_21
MEM_A_DQ<20> AR31 MDQ0_20
MEM_A_DQ<19> AV27 MDQ0_19
MEM_A_DQ<18> AN29 MDQ0_18
MEM_A_DQ<17> AV29 MDQ0_17
MEM_A_DQ<16> AN31 MDQ0_16
MEM_A_DQ<15> AU31 MDQ0_15
MEM_A_DQ<14> AR33 MDQ0_14
MEM_A_DQ<13> AV37 MDQ0_13
MEM_A_DQ<12> AW37 MDQ0_12
MEM_A_DQ<11> AT31 MDQ0_11
MEM_A_DQ<10> AV31 MDQ0_10
MEM_A_DQ<9> AT37 MDQ0_9
MEM_A_DQ<8> AU37 MDQ0_8
MEM_A_DQ<7> AW39 MDQ0_7
MEM_A_DQ<6> AV39 MDQ0_6
MEM_A_DQ<5> AR37 MDQ0_5
MEM_A_DQ<4> AR38 MDQ0_4
MEM_A_DQ<3> AV38 MDQ0_3
MEM_A_DQ<2> AW38 MDQ0_2
MEM_A_DQ<1> AR35 MDQ0_1
MEM_A_DQ<0> AP35 MDQ0_0
MEM_A_DM<7> AN5 MDQM0_7
MEM_A_DM<6> AU5 MDQM0_6
MEM_A_DM<5> AR10 MDQM0_5
MEM_A_DM<4> AN13 MDQM0_4
MEM_A_DM<3> AN27 MDQM0_3
MEM_A_DM<2> AW29 MDQM0_2
MEM_A_DM<1> AV35 MDQM0_1
MEM_A_DM<0> AR34 MDQM0_0
MDQS0_7_P AL10 MEM_A_DQS_P<7>
MDQS0_7_N AL11 MEM_A_DQS_N<7>
MDQS0_6_P AR8 MEM_A_DQS_P<6>
MDQS0_6_N AR9 MEM_A_DQS_N<6>
MDQS0_5_P AW7 MEM_A_DQS_P<5>
MDQS0_5_N AW8 MEM_A_DQS_N<5>
MDQS0_4_P AP13 MEM_A_DQS_P<4>
MDQS0_4_N AR13 MEM_A_DQS_N<4>
MDQS0_3_P AV25 MEM_A_DQS_P<3>
MDQS0_3_N AW25 MEM_A_DQS_N<3>
MDQS0_2_P AU30 MEM_A_DQS_P<2>
MDQS0_2_N AU29 MEM_A_DQS_N<2>
MDQS0_1_P AT35 MEM_A_DQS_P<1>
MDQS0_1_N AU35 MEM_A_DQS_N<1>
MDQS0_0_P AU39 MEM_A_DQS_P<0>
MDQS0_0_N AT39 MEM_A_DQS_N<0>
MRAS0# AV17 MEM_A_RAS_L
MCAS0# AP17 MEM_A_CAS_L
MWE0# AR17 MEM_A_WE_L
MBA0_2 AP23 MEM_A_BA<2>
MBA0_1 AP19 MEM_A_BA<1>
MBA0_0 AW17 MEM_A_BA<0>
MA0_14 AR23 MEM_A_A<14>
MA0_13 AU15 MEM_A_A<13>
MA0_12 AN23 MEM_A_A<12>
MA0_11 AW21 MEM_A_A<11>
MA0_10 AN19 MEM_A_A<10>
MA0_9 AV21 MEM_A_A<9>
MA0_8 AR22 MEM_A_A<8>
MA0_7 AU21 MEM_A_A<7>
MA0_6 AP21 MEM_A_A<6>
MA0_5 AR21 MEM_A_A<5>
MA0_4 AN21 MEM_A_A<4>
MA0_3 AV19 MEM_A_A<3>
MA0_2 AU19 MEM_A_A<2>
MA0_1 AT19 MEM_A_A<1>
MA0_0 AR19 MEM_A_A<0>
MCLK0A_2_P AW33 TP_MEM_A_CLK2P
MCLK0A_2_N AV33 TP_MEM_A_CLK2N
MCLK0A_1_P BA24 MEM_A_CLK_P<1>
MCLK0A_1_N AY24 MEM_A_CLK_N<1>
MCLK0A_0_P BB20 MEM_A_CLK_P<0>
MCLK0A_0_N BC20 MEM_A_CLK_N<0>
MCS0A_1# AT15 MEM_A_CS_L<1>
MCS0A_0# AR18 MEM_A_CS_L<0>
MODT0A_1 AP15 MEM_A_ODT<1>
MODT0A_0 AV15 MEM_A_ODT<0>
MCKE0A_1 AU23 MEM_A_CKE<1>
MCKE0A_0 AT23 MEM_A_CKE<0>
OMIT
U1400
MCP79-TOPO-B
BGA
(3 OF 11)
MEMORY PARTITION 1
MEMORY CONTROL 1A
MEM_B_DQ<63> AT4 MDQ1_63
MEM_B_DQ<62> AT3 MDQ1_62
MEM_B_DQ<61> AV2 MDQ1_61
MEM_B_DQ<60> AV3 MDQ1_60
MEM_B_DQ<59> AR4 MDQ1_59
MEM_B_DQ<58> AR3 MDQ1_58
MEM_B_DQ<57> AU2 MDQ1_57
MEM_B_DQ<56> AU3 MDQ1_56
MEM_B_DQ<55> AY4 MDQ1_55
MEM_B_DQ<54> AY3 MDQ1_54
MEM_B_DQ<53> BB3 MDQ1_53
MEM_B_DQ<52> BC3 MDQ1_52
MEM_B_DQ<51> AW4 MDQ1_51
MEM_B_DQ<50> AW3 MDQ1_50
MEM_B_DQ<49> BA3 MDQ1_49
MEM_B_DQ<48> BB2 MDQ1_48
MEM_B_DQ<47> BB5 MDQ1_47
MEM_B_DQ<46> BA5 MDQ1_46
MEM_B_DQ<45> BA8 MDQ1_45
MEM_B_DQ<44> BC8 MDQ1_44
MEM_B_DQ<43> BB4 MDQ1_43
MEM_B_DQ<42> BC4 MDQ1_42
MEM_B_DQ<41> BA7 MDQ1_41
MEM_B_DQ<40> AY8 MDQ1_40
MEM_B_DQ<39> BA9 MDQ1_39
MEM_B_DQ<38> BB10 MDQ1_38
MEM_B_DQ<37> BB12 MDQ1_37
MEM_B_DQ<36> AW12 MDQ1_36
MEM_B_DQ<35> BB8 MDQ1_35
MEM_B_DQ<34> BB9 MDQ1_34
MEM_B_DQ<33> AY12 MDQ1_33
MEM_B_DQ<32> BA12 MDQ1_32
MEM_B_DQ<31> BC32 MDQ1_31
MEM_B_DQ<30> AW32 MDQ1_30
MEM_B_DQ<29> BA35 MDQ1_29
MEM_B_DQ<28> AY36 MDQ1_28
MEM_B_DQ<27> BA32 MDQ1_27
MEM_B_DQ<26> BB32 MDQ1_26
MEM_B_DQ<25> BA34 MDQ1_25
MEM_B_DQ<24> AY35 MDQ1_24
MEM_B_DQ<23> BC36 MDQ1_23
MEM_B_DQ<22> AW36 MDQ1_22
MEM_B_DQ<21> BA39 MDQ1_21
MEM_B_DQ<20> AY40 MDQ1_20
MEM_B_DQ<19> BA36 MDQ1_19
MEM_B_DQ<18> BB36 MDQ1_18
MEM_B_DQ<17> BA38 MDQ1_17
MEM_B_DQ<16> AY39 MDQ1_16
MEM_B_DQ<15> BB40 MDQ1_15
MEM_B_DQ<14> AW40 MDQ1_14
MEM_B_DQ<13> AV42 MDQ1_13
MEM_B_DQ<12> AV41 MDQ1_12
MEM_B_DQ<11> BA40 MDQ1_11
MEM_B_DQ<10> BC40 MDQ1_10
MEM_B_DQ<9> AW42 MDQ1_9
MEM_B_DQ<8> AW41 MDQ1_8
MEM_B_DQ<7> AT40 MDQ1_7
MEM_B_DQ<6> AT41 MDQ1_6
MEM_B_DQ<5> AP41 MDQ1_5
MEM_B_DQ<4> AN40 MDQ1_4
MEM_B_DQ<3> AU40 MDQ1_3
MEM_B_DQ<2> AU41 MDQ1_2
MEM_B_DQ<1> AR41 MDQ1_1
MEM_B_DQ<0> AP42 MDQ1_0
MEM_B_DM<7> AT5 MDQM1_7
MEM_B_DM<6> BA2 MDQM1_6
MEM_B_DM<5> AY7 MDQM1_5
MEM_B_DM<4> BA11 MDQM1_4
MEM_B_DM<3> BB34 MDQM1_3
MEM_B_DM<2> BB38 MDQM1_2
MEM_B_DM<1> AY43 MDQM1_1
MEM_B_DM<0> AR42 MDQM1_0
MDQS1_7_P AT2 MEM_B_DQS_P<7>
MDQS1_7_N AT1 MEM_B_DQS_N<7>
MDQS1_6_P AY2 MEM_B_DQS_P<6>
MDQS1_6_N AY1 MEM_B_DQS_N<6>
MDQS1_5_P BB6 MEM_B_DQS_P<5>
MDQS1_5_N BA6 MEM_B_DQS_N<5>
MDQS1_4_P BA10 MEM_B_DQS_P<4>
MDQS1_4_N AY11 MEM_B_DQS_N<4>
MDQS1_3_P BB33 MEM_B_DQS_P<3>
MDQS1_3_N BA33 MEM_B_DQS_N<3>
MDQS1_2_P BB37 MEM_B_DQS_P<2>
MDQS1_2_N BA37 MEM_B_DQS_N<2>
MDQS1_1_P BA43 MEM_B_DQS_P<1>
MDQS1_1_N AY42 MEM_B_DQS_N<1>
MDQS1_0_P AT42 MEM_B_DQS_P<0>
MDQS1_0_N AT43 MEM_B_DQS_N<0>
MRAS1# AW16 MEM_B_RAS_L
MCAS1# BA15 MEM_B_CAS_L
MWE1# BA16 MEM_B_WE_L
MBA1_2 BB29 MEM_B_BA<2>
MBA1_1 BB18 MEM_B_BA<1>
MBA1_0 BB17 MEM_B_BA<0>
MA1_14 BA29 MEM_B_A<14>
MA1_13 BA14 MEM_B_A<13>
MA1_12 AW28 MEM_B_A<12>
MA1_11 BC28 MEM_B_A<11>
MA1_10 BA17 MEM_B_A<10>
MA1_9 BB28 MEM_B_A<9>
MA1_8 AY28 MEM_B_A<8>
MA1_7 BA28 MEM_B_A<7>
MA1_6 AY27 MEM_B_A<6>
MA1_5 BA27 MEM_B_A<5>
MA1_4 BA26 MEM_B_A<4>
MA1_3 BB26 MEM_B_A<3>
MA1_2 BA25 MEM_B_A<2>
MA1_1 BB25 MEM_B_A<1>
MA1_0 BA18 MEM_B_A<0>
MCLK1A_2_P BA42 TP_MEM_B_CLK2P
MCLK1A_2_N BB42 TP_MEM_B_CLK2N
MCLK1A_1_P BB22 MEM_B_CLK_P<1>
MCLK1A_1_N BA22 MEM_B_CLK_N<1>
MCLK1A_0_P BA19 MEM_B_CLK_P<0>
MCLK1A_0_N AY19 MEM_B_CLK_N<0>
MCS1A_1# BB14 MEM_B_CS_L<1>
MCS1A_0# BB16 MEM_B_CS_L<0>
MODT1A_1 BB13 MEM_B_ODT<1>
MODT1A_0 AY15 MEM_B_ODT<0>
MCKE1A_1 AY31 MEM_B_CKE<1>
MCKE1A_0 BB30 MEM_B_CKE<0>
MCP Memory Interface
SYNC_MASTER=T18_MLB
SYNC_DATE=06/06/2008
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SIZE D
DRAWING NUMBER 051-7656
REV. 31
SCALE NONE
SHT 15 OF 123

OMIT

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

MEMORY CONTROL 0B

7 TP_MEM_A_CLK5P	AU33	MCLK0B_2_P
7 TP_MEM_A_CLK5N	AU34	MCLK0B_2_N
7 TP_MEM_A_CLK4P	BB24	MCLK0B_1_P
7 TP_MEM_A_CLK4N	BC24	MCLK0B_1_N
7 TP_MEM_A_CLK3P	BA21	MCLK0B_0_P
7 TP_MEM_A_CLK3N	BB21	MCLK0B_0_N
7 TP_MEM_A_CS_L<2>	AU17	MCS0B_0#
7 TP_MEM_A_CS_L<3>	AR17	MCS0B_1#
7 TP_MEM_A_ODT<2>	AN17	MODT0B_0
7 TP_MEM_A_ODT<3>	AN15	MODT0B_1
7 TP_MEM_A_CKE<2>	AV23	MCKE0B_0
7 TP_MEM_A_CKE<3>	AN25	MCKE0B_1

MEMORY CONTROL 1B

MCLK1B_2_P	BA41	TP_MEM_B_CLK5P 7
MCLK1B_2_N	BB41	TP_MEM_B_CLK5N 7
MCLK1B_1_P	AY23	TP_MEM_B_CLK4P 7
MCLK1B_1_N	BA23	TP_MEM_B_CLK4N 7
MCLK1B_0_P	BA20	TP_MEM_B_CLK3P 7
MCLK1B_0_N	AY20	TP_MEM_B_CLK3N 7
MCS1B_0#	BC16	TP_MEM_B_CS_L<2> 7
MCS1B_1#	BA13	TP_MEM_B_CS_L<3> 7
MODT1B_0	AY16	TP_MEM_B_ODT<2> 7
MODT1B_1	BC13	TP_MEM_B_ODT<3> 7
MCKE1B_0	BA30	TP_MEM_B_CKE<2> 7
MCKE1B_1	BA31	TP_MEM_B_CKE<3>

23 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 29
TP or NC for DDR2.

23 16 8 =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

89 MCP_MEM_COMP_VDD	AN41	MEM_COMP_VDD
89 MCP_MEM_COMP_GND	AM41	MEM_COMP_GND

=PP1V8R1V5_S0_MCP_MEM 8 16 23
4771 mA (A01, DDR3)

+VDD_MEM1	AM17	GND1 AA22
+VDD_MEM2	AM19	GND2 AP12
+VDD_MEM3	AM21	GND3 G30
+VDD_MEM4	AM23	GND4 P10
+VDD_MEM5	AM25	GND5 T10
+VDD_MEM6	AM27	GND6 T6
+VDD_MEM7	AM29	GND7 V10
+VDD_MEM8	AN16	GND8 V34
+VDD_MEM9	BC29	GND9 W5
+VDD_MEM10	AN20	GND10 AA39
+VDD_MEM11	AN24	GND11 AB22
+VDD_MEM12	AT17	GND12 AB7
+VDD_MEM13	AP16	GND13 AD22
+VDD_MEM14	AN22	GND14 AE26
+VDD_MEM15	AP20	GND15 AF24
+VDD_MEM16	AP24	GND16 AG24
+VDD_MEM17	AV16	GND17 AH35
+VDD_MEM18	AR16	GND18 AK7
+VDD_MEM19	AR20	GND19 AM28
+VDD_MEM20	AR24	GND20 AT25
+VDD_MEM21	AW15	GND21 AP30
+VDD_MEM22	AP22	GND22 AR36
+VDD_MEM23	AP18	GND23 AU10
+VDD_MEM24	AU16	GND24 F28
+VDD_MEM25	AN18	GND25 BC21
+VDD_MEM26	AU24	GND26 AY9
+VDD_MEM27	AT21	GND27 BC9
+VDD_MEM28	AY29	GND28 D34
+VDD_MEM29	AV24	GND29 F24
+VDD_MEM30	AU20	GND30 G32
+VDD_MEM31	AU22	GND31 H31
+VDD_MEM32	AW27	GND32 K7
+VDD_MEM33	BC17	GND33 M38
+VDD_MEM34	AV20	GND34 M5
+VDD_MEM35	AY17	GND35 M6
+VDD_MEM36	AY18	GND36 M7
+VDD_MEM37	AM15	GND37 M9
+VDD_MEM38	AU18	GND38 N39
+VDD_MEM39	AY25	GND39 N8
+VDD_MEM40	AY26	GND40 P33
+VDD_MEM41	AW19	GND41 P34
+VDD_MEM42	AW24	GND42 P37
+VDD_MEM43	BC25	GND43 P4
+VDD_MEM44	AL30	GND44 P40
+VDD_MEM45	AM31	GND45 P7
		GND46 R36
		GND47 R40
		GND48 R43
		GND49 R5
		GND50 T18
		GND51 T20
		GND52 AK11
		GND53 T24
		GND54 T26
		GND55 T33
		GND56 T34
		GND57 T35
		GND58 T37
		GND59 T38
		GND60 T7
		GND61 T9
		GND62 U18
		GND63 U20
		GND64 U22

MCP Memory Misc

SYNC_MASTER=T18_MLB SYNC_DATE=06/06/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE NONE	SHT 16 OF 123	

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

OMIT

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

PCI EXPRESS

9	IN	=PEG_D2R_P<0>	F7	PE0_RX0_P	PE0_TX0_P	C5	=PEG_R2D_C_P<0>
9	IN	=PEG_D2R_N<0>	E7	PE0_RX0_N	PE0_TX0_N	D4	=PEG_R2D_C_N<0>
9	IN	=PEG_D2R_P<1>	D7	PE0_RX1_P	PE0_TX1_P	C4	=PEG_R2D_C_P<1>
9	IN	=PEG_D2R_N<1>	C7	PE0_RX1_N	PE0_TX1_N	B4	=PEG_R2D_C_N<1>
9	IN	=PEG_D2R_P<2>	E6	PE0_RX2_P	PE0_TX2_P	A4	=PEG_R2D_C_P<2>
9	IN	=PEG_D2R_N<2>	F6	PE0_RX2_N	PE0_TX2_N	A3	=PEG_R2D_C_N<2>
9	IN	=PEG_D2R_P<3>	E5	PE0_RX3_P	PE0_TX3_P	B3	=PEG_R2D_C_P<3>
9	IN	=PEG_D2R_N<3>	F5	PE0_RX3_N	PE0_TX3_N	B2	=PEG_R2D_C_N<3>
9	IN	=PEG_D2R_P<4>	E4	PE0_RX4_P	PE0_TX4_P	C1	=PEG_R2D_C_P<4>
9	IN	=PEG_D2R_N<4>	E3	PE0_RX4_N	PE0_TX4_N	D1	=PEG_R2D_C_N<4>
9	IN	=PEG_D2R_P<5>	C3	PE0_RX5_P	PE0_TX5_P	D2	=PEG_R2D_C_P<5>
9	IN	=PEG_D2R_N<5>	D3	PE0_RX5_N	PE0_TX5_N	E1	=PEG_R2D_C_N<5>
9	IN	=PEG_D2R_P<6>	G5	PE0_RX6_P	PE0_TX6_P	E2	=PEG_R2D_C_P<6>
9	IN	=PEG_D2R_N<6>	H5	PE0_RX6_N	PE0_TX6_N	F2	=PEG_R2D_C_N<6>
9	IN	=PEG_D2R_P<7>	J7	PE0_RX7_P	PE0_TX7_P	F3	=PEG_R2D_C_P<7>
9	IN	=PEG_D2R_N<7>	J6	PE0_RX7_N	PE0_TX7_N	F4	=PEG_R2D_C_N<7>
9	IN	=PEG_D2R_P<8>	J5	PE0_RX8_P	PE0_TX8_P	G3	=PEG_R2D_C_P<8>
9	IN	=PEG_D2R_N<8>	J4	PE0_RX8_N	PE0_TX8_N	H4	=PEG_R2D_C_N<8>
9	IN	=PEG_D2R_P<9>	L11	PE0_RX9_P	PE0_TX9_P	H3	=PEG_R2D_C_P<9>
9	IN	=PEG_D2R_N<9>	L10	PE0_RX9_N	PE0_TX9_N	H2	=PEG_R2D_C_N<9>
9	IN	=PEG_D2R_P<10>	L9	PE0_RX10_P	PE0_TX10_P	H1	=PEG_R2D_C_P<10>
9	IN	=PEG_D2R_N<10>	L8	PE0_RX10_N	PE0_TX10_N	J1	=PEG_R2D_C_N<10>
9	IN	=PEG_D2R_P<11>	L7	PE0_RX11_P	PE0_TX11_P	J2	=PEG_R2D_C_P<11>
9	IN	=PEG_D2R_N<11>	L6	PE0_RX11_N	PE0_TX11_N	J3	=PEG_R2D_C_N<11>
9	IN	=PEG_D2R_P<12>	N11	PE0_RX12_P	PE0_TX12_P	K2	=PEG_R2D_C_P<12>
9	IN	=PEG_D2R_N<12>	N10	PE0_RX12_N	PE0_TX12_N	K3	=PEG_R2D_C_N<12>
9	IN	=PEG_D2R_P<13>	N9	PE0_RX13_P	PE0_TX13_P	L4	=PEG_R2D_C_P<13>
9	IN	=PEG_D2R_N<13>	P8	PE0_RX13_N	PE0_TX13_N	L3	=PEG_R2D_C_N<13>
9	IN	=PEG_D2R_P<14>	N7	PE0_RX14_P	PE0_TX14_P	M4	=PEG_R2D_C_P<14>
9	IN	=PEG_D2R_N<14>	N6	PE0_RX14_N	PE0_TX14_N	M3	=PEG_R2D_C_N<14>
9	IN	=PEG_D2R_P<15>	N5	PE0_RX15_P	PE0_TX15_P	M2	=PEG_R2D_C_P<15>
9	IN	=PEG_D2R_N<15>	N4	PE0_RX15_N	PE0_TX15_N	M1	=PEG_R2D_C_N<15>

9	IN	PEG_PRSNT_L	C9	PE0_PRSNT_16# Int PU	PE0_REFCLK_P	E11	PEG_CLK100M_P 69 90
					PE0_REFCLK_N	D11	PEG_CLK100M_N 69 90
30	IN	MINI_CLKREQ_L	D5	PEB_CLKREQ#/GPIO_49 Int PU	PE1_REFCLK_P	G11	PCIE_CLK100M_MINI_P 30 90
30	IN	PCIE_MINI_PRSNT_L	D9	PEB_PRSNT# Int PU	PE1_REFCLK_N	F11	PCIE_CLK100M_MINI_N 30 90
35	IN	FW_CLKREQ_L	E8	PEC_CLKREQ#/GPIO_50 Int PU	PE2_REFCLK_P	J11	PCIE_CLK100M_FW_P 35 90
9	IN	PCIE_FW_PRSNT_L	C10	PEC_PRSNT# Int PU	PE2_REFCLK_N	J10	PCIE_CLK100M_FW_N 35 90
31	IN	EXCARD_CLKREQ_L	M15	PED_CLKREQ#/GPIO_51 Int PU	PE3_REFCLK_P	G13	PCIE_CLK100M_EXCARD_P 31 90
31	IN	PCIE_EXCARD_PRSNT_L	B10	PED_PRSNT# Int PU	PE3_REFCLK_N	F13	PCIE_CLK100M_EXCARD_N 31 90
7		TP_PE4_CLKREQ_L	L16	PEE_CLKREQ#/GPIO_16 Int PU	PE4_REFCLK_P	J13	TP_PCIE_CLK100M_PE4P 7
		TP_PE4_PRSNT_L	L18	PEE_PRSNT#/GPIO_46 Int PU	PE4_REFCLK_N	H13	TP_PCIE_CLK100M_PE4N
58	IN	AUD_IP_PERIPHERAL_DET	M16	PEF_CLKREQ#/GPIO_17 Int PU	PE5_REFCLK_P	L14	TP_PCIE_CLK100M_PE5P 7
84	OUT	GMUX_JTAG_TCK_L	M18	PEF_PRSNT#/GPIO_47 Int PU	PE5_REFCLK_N	K14	TP_PCIE_CLK100M_PE5N 7
7		TP_MCP_GPIO_18	M17	PEG_CLKREQ#/GPIO_18 Int PU	PE6_REFCLK_P	N14	TP_PCIE_CLK100M_PE6P 7
9	IN	GMUX_JTAG_TDO	M19	PEG_PRSNT#/GPIO_48 Int PU	PE6_REFCLK_N	M14	TP_PCIE_CLK100M_PE6N 7
31 30 7	IN	PCIE_WAKE_L	F17	PE_WAKE# Int PU (S5)	PEX_RST0#	K11	PCIE_RESET_L 25
90 30 7	IN	PCIE_MINI_D2R_P	K9	PE1_RX0_P	PE1_TX0_P	D8	PCIE_MINI_R2D_C_P 30 90
90 30 7	IN	PCIE_MINI_D2R_N	J9	PE1_RX0_N	PE1_TX0_N	C8	PCIE_MINI_R2D_C_N 30 90
90 35	IN	PCIE_FW_D2R_P	H9	PE1_RX1_P	PE1_TX1_P	B8	PCIE_FW_R2D_C_P 35 90
90 35	IN	PCIE_FW_D2R_N	G9	PE1_RX1_N	PE1_TX1_N	A8	PCIE_FW_R2D_C_N 35 90
90 31 7	IN	PCIE_EXCARD_D2R_P	F9	PE1_RX2_P	PE1_TX2_P	A7	PCIE_EXCARD_R2D_C_P 31 90
90 31 7	IN	PCIE_EXCARD_D2R_N	E9	PE1_RX2_N	PE1_TX2_N	B7	PCIE_EXCARD_R2D_C_N 31 90
7		TP_PCIE_PE4_D2RP	H7	PE1_RX3_P	PE1_TX3_P	B6	TP_PCIE_PE4_R2D_CP
7		TP_PCIE_PE4_D2RN	G7	PE1_RX3_N	PE1_TX3_N	C6	TP_PCIE_PE4_R2D_CN

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

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

8 =PP1V05_S0_MCP_PEX_DVDD1

+DVDD1_PEX1	T19
+DVDD1_PEX2	U19

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

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

8 =PP1V05_S0_MCP_PEX_AVDD1

+AVDD1_PEX1	M13
+AVDD1_PEX2	N13
+AVDD1_PEX3	P13

23 PP1V05_S0_MCP_PLL_PEX T16 +V_PLL_PEX
84 mA (A01)

90 MCP_PEX_CLK_COMP A11 PEX_CLK_COMP
NO STUFF
1 R1710
2.37K
1% 1/16W MF-LF
402
2
PLACEMENT_NOTE=Place within 12.7mm of U1400

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

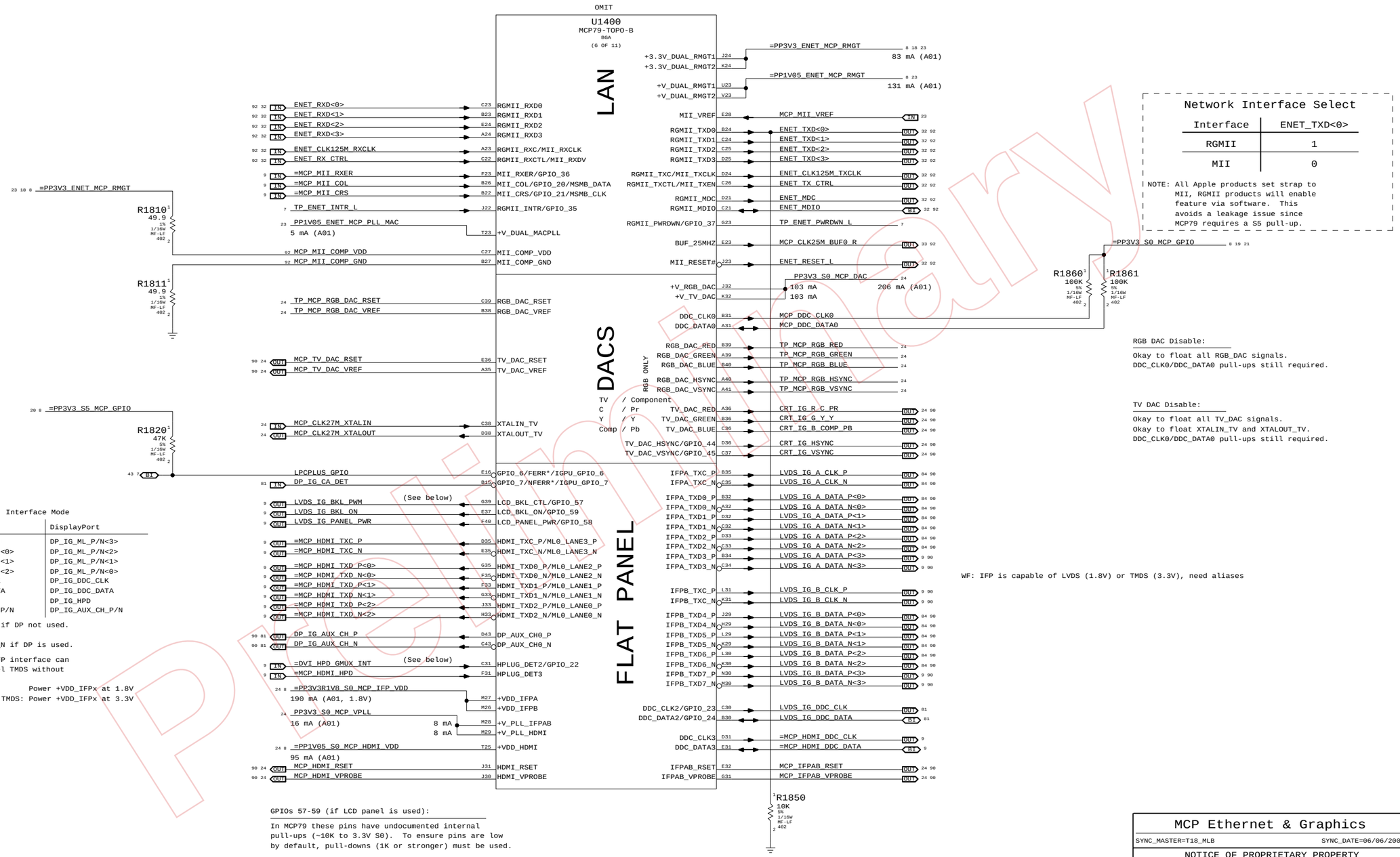
MCP PCIe Interfaces

SYNC_MASTER=T18_MLB SYNC_DATE=06/06/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 17 OF 123	

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


OMIT
U1400
MCP79-TOPO-B
BGA
(6 OF 11)
LAN
DACS
FLAT PANEL
RGB ONLY
TV / Component
C / Pr
Y / Y
Comp / Pb
(See below)
(See below)
=PP3V3_ENET_MCP_RMGT
83 mA (A01)
=PP1V05_ENET_MCP_RMGT
131 mA (A01)
ENET_RXD<0>
ENET_RXD<1>
ENET_RXD<2>
ENET_RXD<3>
ENET_CLK125M_RXCLK
ENET_RX_CTRL
=MCP_MII_RXER
=MCP_MII_COL
=MCP_MII_CRS
TP_ENET_INTR_L
=PP3V3_ENET_MCP_RMGT
R1810
49.9
1%
1/16W
MF-LF
402
R1811
49.9
1%
1/16W
MF-LF
402
PP1V05_ENET_MCP_PLL_MAC
5 mA (A01)
MCP_MII_COMP_VDD
MCP_MII_COMP_GND
TP_MCP_RGB_DAC_RSET
TP_MCP_RGB_DAC_VREF
MCP_TV_DAC_RSET
MCP_TV_DAC_VREF
=PP3V3_S5_MCP_GPIO
R1820
47K
5%
1/16W
MF-LF
402
MCP_CLK27M_XTALIN
MCP_CLK27M_XTALOUT
LPCPLUS_GPIO
DP_IG_CA_DET
LVDS_IG_BKL_PWM
LVDS_IG_BKL_ON
LVDS_IG_PANEL_PWR
=MCP_HDMI_TXC_P
=MCP_HDMI_TXC_N
=MCP_HDMI_TXD_P<0>
=MCP_HDMI_TXD_N<0>
=MCP_HDMI_TXD_P<1>
=MCP_HDMI_TXD_N<1>
=MCP_HDMI_TXD_P<2>
=MCP_HDMI_TXD_N<2>
DP_IG_AUX_CH_P
DP_IG_AUX_CH_N
=DVI_HPD_GMUX_INT
=MCP_HDMI_HPD
=PP3V3R1V8_S0_MCP_IFP_VDD
190 mA (A01, 1.8V)
PP3V3_S0_MCP_VPLL
16 mA (A01)
8 mA
8 mA
=PP1V05_S0_MCP_HDMI_VDD
95 mA (A01)
MCP_HDMI_RSET
MCP_HDMI_VPROBE
RGMII_RXD0
RGMII_RXD1
RGMII_RXD2
RGMII_RXD3
RGMII_RXC/MII_RXCLK
RGMII_RXCTL/MII_RXDV
MII_RXER/GPIO_36
MII_COL/GPIO_20/MSMB_DATA
MII_CRS/GPIO_21/MSMB_CLK
RGMII_INTR/GPIO_35
+V_DUAL_MACPLL
MII_COMP_VDD
MII_COMP_GND
RGB_DAC_RSET
RGB_DAC_VREF
TV_DAC_RSET
TV_DAC_VREF
XTALIN_TV
XTALOUT_TV
GPIO_6/FERR*/IGPU_GPIO_6
GPIO_7/NFERR*/IGPU_GPIO_7
LCD_BKL_CTL/GPIO_57
LCD_BKL_ON/GPIO_59
LCD_PANEL_PWR/GPIO_58
HDMI_TXC_P/ML0_LANE3_P
HDMI_TXC_N/ML0_LANE3_N
HDMI_TXD0_P/ML0_LANE2_P
HDMI_TXD0_N/ML0_LANE2_N
HDMI_TXD1_P/ML0_LANE1_P
HDMI_TXD1_N/ML0_LANE1_N
HDMI_TXD2_P/ML0_LANE0_P
HDMI_TXD2_N/ML0_LANE0_N
DP_AUX_CH0_P
DP_AUX_CH0_N
HPLUG_DET2/GPIO_22
HPLUG_DET3
+VDD_IFPA
+VDD_IFPB
+V_PLL_IFPAB
+V_PLL_HDMI
+VDD_HDMI
HDMI_RSET
HDMI_VPROBE
+3.3V_DUAL_RMGT1
+3.3V_DUAL_RMGT2
+V_DUAL_RMGT1
+V_DUAL_RMGT2
MII_VREF
RGMII_TXD0
RGMII_TXD1
RGMII_TXD2
RGMII_TXD3
RGMII_TXC/MII_TXCLK
RGMII_TXCTL/MII_TXEN
RGMII_MDC
RGMII_MDIO
RGMII_PWRDWN/GPIO_37
BUF_25MHZ
MII_RESET#
+V_RGB_DAC
+V_TV_DAC
103 mA
103 mA
206 mA (A01)
DDC_CLK0
DDC_DATA0
RGB_DAC_RED
RGB_DAC_GREEN
RGB_DAC_BLUE
RGB_DAC_HSYNC
RGB_DAC_VSYNC
TV_DAC_RED
TV_DAC_GREEN
TV_DAC_BLUE
TV_DAC_HSYNC/GPIO_44
TV_DAC_VSYNC/GPIO_45
IFPA_TXC_P
IFPA_TXC_N
IFPA_TXD0_P
IFPA_TXD0_N
IFPA_TXD1_P
IFPA_TXD1_N
IFPA_TXD2_P
IFPA_TXD2_N
IFPA_TXD3_P
IFPA_TXD3_N
IFPB_TXC_P
IFPB_TXC_N
IFPB_TXD4_P
IFPB_TXD4_N
IFPB_TXD5_P
IFPB_TXD5_N
IFPB_TXD6_P
IFPB_TXD6_N
IFPB_TXD7_P
IFPB_TXD7_N
DDC_CLK2/GPIO_23
DDC_DATA2/GPIO_24
DDC_CLK3
DDC_DATA3
IFPAB_RSET
IFPAB_VPROBE
ENET_TXD<0>
ENET_TXD<1>
ENET_TXD<2>
ENET_TXD<3>
ENET_CLK125M_TXCLK
ENET_TX_CTRL
ENET_MDC
ENET_MDIO
TP_ENET_PWRDWN_L
MCP_CLK25M_BUF0_R
ENET_RESET_L
PP3V3_S0_MCP_DAC
MCP_DDC_CLK0
MCP_DDC_DATA0
TP_MCP_RGB_RED
TP_MCP_RGB_GREEN
TP_MCP_RGB_BLUE
TP_MCP_RGB_HSYNC
TP_MCP_RGB_VSYNC
CRT_IG_R_C_PR
CRT_IG_G_Y_Y
CRT_IG_B_COMP_PB
CRT_IG_HSYNC
CRT_IG_VSYNC
LVDS_IG_A_CLK_P
LVDS_IG_A_CLK_N
LVDS_IG_A_DATA_P<0>
LVDS_IG_A_DATA_N<0>
LVDS_IG_A_DATA_P<1>
LVDS_IG_A_DATA_N<1>
LVDS_IG_A_DATA_P<2>
LVDS_IG_A_DATA_N<2>
LVDS_IG_A_DATA_P<3>
LVDS_IG_A_DATA_N<3>
LVDS_IG_B_CLK_P
LVDS_IG_B_CLK_N
LVDS_IG_B_DATA_P<0>
LVDS_IG_B_DATA_N<0>
LVDS_IG_B_DATA_P<1>
LVDS_IG_B_DATA_N<1>
LVDS_IG_B_DATA_P<2>
LVDS_IG_B_DATA_N<2>
LVDS_IG_B_DATA_P<3>
LVDS_IG_B_DATA_N<3>
LVDS_IG_DDC_CLK
LVDS_IG_DDC_DATA
=MCP_HDMI_DDC_CLK
=MCP_HDMI_DDC_DATA
MCP_IFPAB_RSET
MCP_IFPAB_VPROBE
R1850
10K
5%
1/16W
MF-LF
402
=PP3V3_S0_MCP_GPIO
R1860
100K
5%
1/16W
MF-LF
402
R1861
100K
5%
1/16W
MF-LF
402
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.
MCP Ethernet & Graphics
SYNC_MASTER=T18_MLB
SYNC_DATE=06/06/2008
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SHT 18 OF 123
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OMIT

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

PCI

91 19	PCI_REQ0_L	T2	PCI_REQ0#		
91 19	PCI_REQ1_L	V9	PCI_REQ1#/FANRPM2		
19	OUT CRTMUX_SEL_TV_L	T3	PCI_REQ2#/GPIO_40/RS232_DSR#	PCI_GNT2#/GPIO_41/RS232_DTR#	R4 GMUX_JTAG_TMS OUT 9
58 9	OUT AUD_IPHS_SWITCH_EN	U9	PCI_REQ3#/GPIO_38/RS232_CTS#	PCI_GNT3#/GPIO_39/RS232_RTS#	U11 GMUX_JTAG_TDI OUT 9
19	IN MCP_RS232_SIN_L	T4	PCI_REQ4#/GPIO_52/RS232_SIN#	PCI_GNT4#/GPIO_53/RS232_SOUT#	P3 MCP_RS232_SOUT_L OUT 19
91 13	BI MCP_DEBUG<0>	AC3	PCI_AD0	PCI_CBE0#	AA3 TP_PCI_C_BE_L<0> 7
91 13	BI MCP_DEBUG<1>	AE10	PCI_AD1	PCI_CBE1#	AA6 TP_PCI_C_BE_L<1> 7
91 13	BI MCP_DEBUG<2>	AC4	PCI_AD2	PCI_CBE2#	AA11 TP_PCI_C_BE_L<2> 7
91 13	BI MCP_DEBUG<3>	AE11	PCI_AD3	PCI_CBE3#	W10 TP_PCI_C_BE_L<3> 7
91 13	BI MCP_DEBUG<4>	AB3	PCI_AD4		
91 13	BI MCP_DEBUG<5>	AC6	PCI_AD5	PCI_DEVSEL#	AA9 TP_PCI_DEVSEL_L 7
91 13	BI MCP_DEBUG<6>	AB2	PCI_AD6	PCI_FRAME#	Y4 TP_PCI_FRAME_L 7
91 13	BI MCP_DEBUG<7>	AC7	PCI_AD7	PCI_IRDY#	AA10 TP_PCI_IRDY_L 7
7	TP_PCI_AD<8>	AC8	PCI_AD8	PCI_PAR	Y1 TP_PCI_PAR 7
7	TP_PCI_AD<9>	AA2	PCI_AD9	PCI_PERR#/GPIO_43/RS232_DCD#	AB9 TP_PCI_PERR_L 7
7	TP_PCI_AD<10>	AC9	PCI_AD10	PCI_SERR#	AA7 TP_PCI_SERR_L 7
7	TP_PCI_AD<11>	AC10	PCI_AD11	PCI_STOP#	Y2 TP_PCI_STOP_L 7
7	TP_PCI_AD<12>	AC11	PCI_AD12	PCI_PME#/GPIO_30 Int PU (S5)	T1 PM_LATRIGGER_L OUT 13
7	TP_PCI_AD<13>	AA1	PCI_AD13		
7	TP_PCI_AD<14>	AA5	PCI_AD14		
7	TP_PCI_AD<15>	Y5	PCI_AD15		
7	TP_PCI_AD<16>	W3	PCI_AD16	PCI_RESET0#	R10 MEM_VTT_EN_R OUT 25
7	TP_PCI_AD<17>	W6	PCI_AD17	PCI_RESET1#	R11 TP_PCI_RESET1_L 7
7	TP_PCI_AD<18>	W4	PCI_AD18		
7	TP_PCI_AD<19>	W7	PCI_AD19		
7	TP_PCI_AD<20>	V3	PCI_AD20	PCI_CLK0	R6 TP_PCI_CLK0 7
7	TP_PCI_AD<21>	W8	PCI_AD21	PCI_CLK1	R7 TP_PCI_CLK1 7
7	TP_PCI_AD<22>	V2	PCI_AD22	PCI_CLK2	R8 91 PCI_CLK33M_MCP_R
7	TP_PCI_AD<23>	W9	PCI_AD23		
7	TP_PCI_AD<24>	U3	PCI_AD24		
7	TP_PCI_AD<25>	W11	PCI_AD25		
7	TP_PCI_AD<26>	U2	PCI_AD26		
7	TP_PCI_AD<27>	U5	PCI_AD27		
7	TP_PCI_AD<28>	U1	PCI_AD28		
7	TP_PCI_AD<29>	U6	PCI_AD29		
7	TP_PCI_AD<30>	T5	PCI_AD30		
7	TP_PCI_AD<31>	U7	PCI_AD31		
7	TP_PCI_INTW_L	P2	PCI_INTW#		
7	TP_PCI_INTX_L	N3	PCI_INTX#		
7	TP_PCI_INTY_L	N2	PCI_INTY#		
7	TP_PCI_INTZ_L	N1	PCI_INTZ#		
7	TP_PCI_TRDY_L	Y3	PCI_TRDY#		
43 41 7	IN PM_CLKRUN_L	AD11	PCI_CLKRUN#/GPIO_42		
35	IN FW_PME_L	AE2	PCI_DRQ1#/GPIO_19 Int PU		
7	TP_LPC_DRQ0_L	AE1	LPC_DRQ0# Int PU		
43 41 7	BI LPC_SERIRQ	AE6	LPC_SERIRQ Int PU		

PCI_CLKIN R9 ← 91 PCI_CLK33M_MCP

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

LPC

LPC_FRAME#	AD4	3	LPC_FRAME_R_L	R1960 22 5% 1/16W MF-LF 402	LPC_FRAME_L OUT 7 41 43 84 91
LPC_PWRDWN#/GPIO_54/EXT_NMI#	AE12		LPC_PWRDWN_L		OUT 7 41 43
LPC_RESET0#	AE5		LPC_RESET_L		OUT 25 84 91
LPC_AD0	AD3		LPC_AD_R<0>	R1950 22 5% 1/16W MF-LF 402	LPC_AD<0> BI 7 41 43 84 91
LPC_AD1	AD2		LPC_AD_R<1>	R1951 22 5% 1/16W MF-LF 402	LPC_AD<1> BI 7 41 43 84 91
LPC_AD2	AD1		LPC_AD_R<2>	R1952 22 5% 1/16W MF-LF 402	LPC_AD<2> BI 7 41 43 84 91
LPC_AD3	AD5		LPC_AD_R<3>	R1953 22 5% 1/16W MF-LF 402	LPC_AD<3> BI 7 41 43 84 91
LPC_CLK0	AE9		LPC_CLK33M_SMC_R		OUT 25 91

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

GND

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

21 18 8 =PP3V3_S0_MCP_GPIO

19	MCP_RS232_SOUT_L	R1989	8.2K	5% 1/16W MF-LF 402
91 19	PCI_REQ0_L	R1990	8.2K	5% 1/16W MF-LF 402
91 19	PCI_REQ1_L	R1991	8.2K	5% 1/16W MF-LF 402
19	CRTMUX_SEL_TV_L	R1992	8.2K	5% 1/16W MF-LF 402
19	MCP_RS232_SIN_L	R1994	8.2K	5% 1/16W MF-LF 402

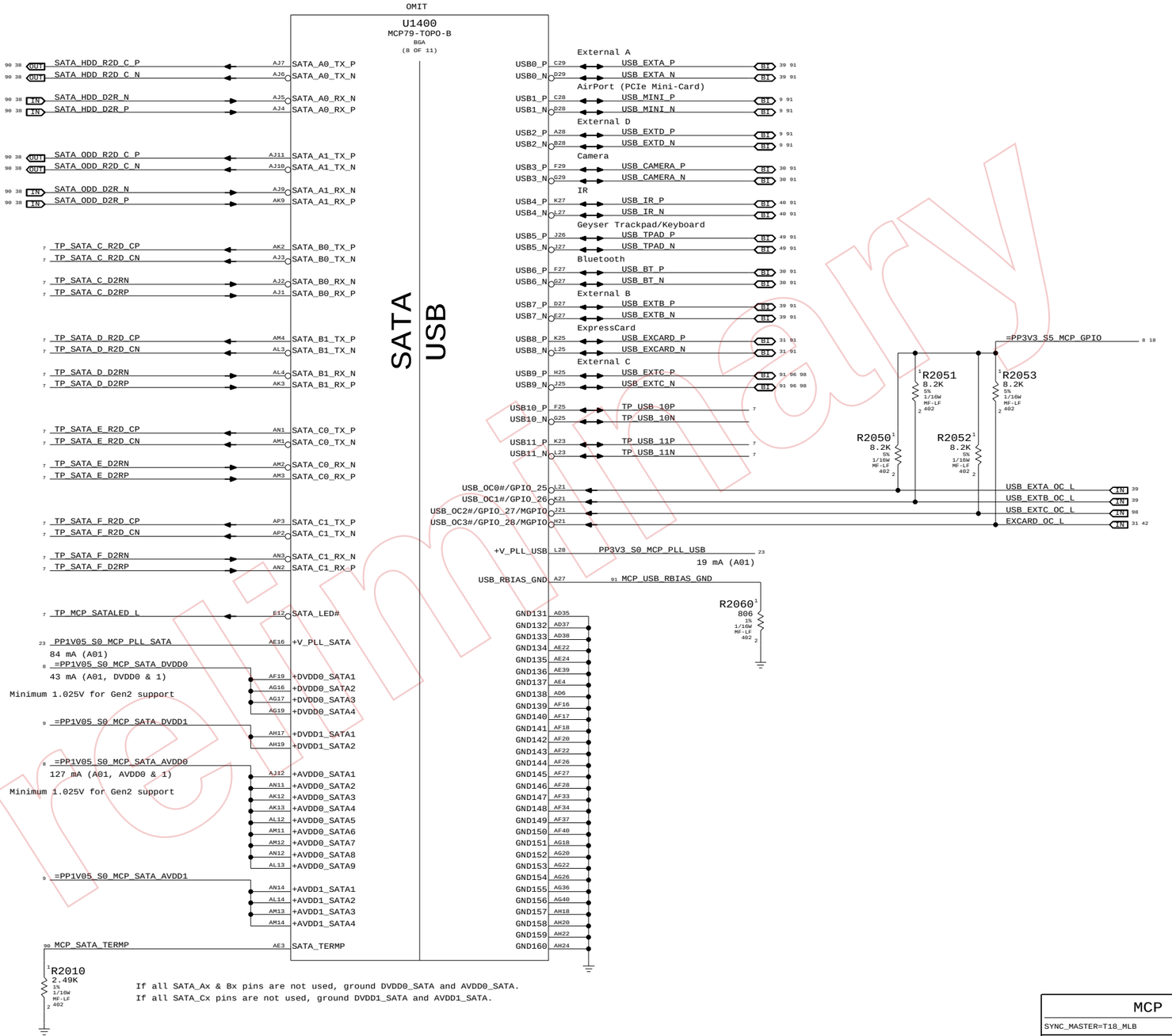
MCP PCI & LPC

SYNC_MASTER=T18_MLB SYNC_DATE=06/06/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31

SCALE NONE SHT 19 OF 123



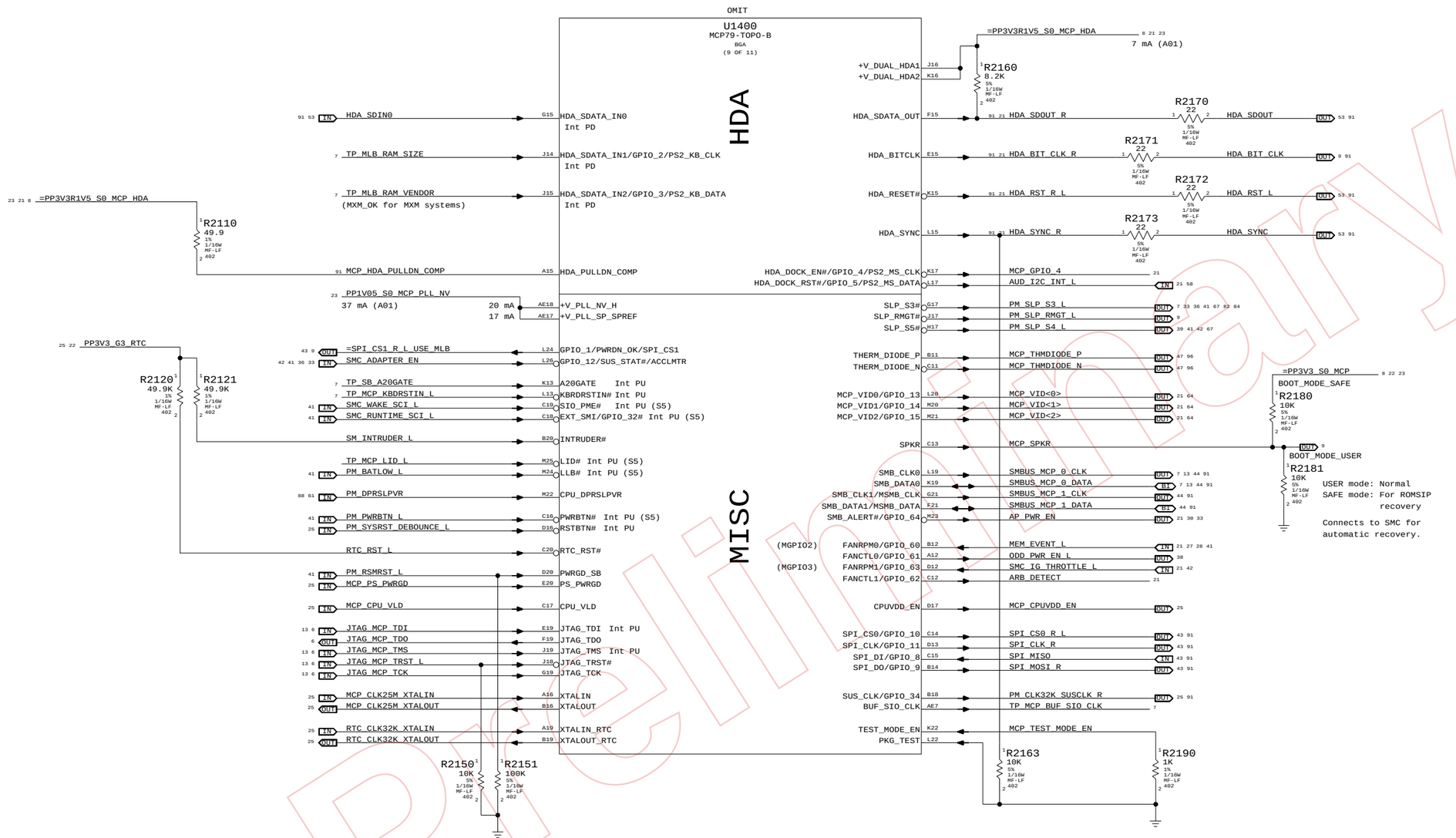
MCP SATA & USB

SYNC_MASTER=T18_MLB SYNC_DATE=06/06/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 20 OF 123	

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



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

45 23 8 =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		
AG8	+VDD_CORE60		
AG9	+VDD_CORE61		
AH1	+VDD_CORE62		
AH10	+VDD_CORE63		
AH11	+VDD_CORE64		
W26	+VDD_CORE65		
AH2	+VDD_CORE66		
AA23	+VDD_CORE67		
W28	+VDD_CORE68		
AH25	+VDD_CORE69		
AH21	+VDD_CORE70	+3.V_DUAL1	G18
AH3	+VDD_CORE71	+3.V_DUAL2	H19
AH4	+VDD_CORE72	+3.V_DUAL3	J20
AH5	+VDD_CORE73	+3.V_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
8 9 14 23
1139 mA
1182 mA (A01)

=PP3V3_S0_MCP
8 21 23
450 mA (A01)

=PP3V3_S5_MCP
8 23
16 mA
266 mA (A01)

250 mA

=PP1V05_S5_MCP_VDD_AUXC
8 23
105 mA (A01)

25 21 PP3V3_G3_RTC
10 uA (G3)
80 uA (S0)

43 mA

MCP Power & Ground

SYNC_MASTER=T18_MLB
SYNC_DATE=06/06/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 22 OF 123	

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

MCP Core Power

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

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

(No IG vs. EG data)

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

MCP PCIE (DVDD) Power

=PP1V05_S0_MCP_PEX_DVDD
57 mA (A01)

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

MCP SATA (DVDD) Power

=PP1V05_S0_MCP_SATA_DVDD
43 mA (A01)

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

MCP 1.05V AUX Power

=PP1V05_S5_MCP_VDD_AUXC
105 mA (A01)

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

MCP 1.05V RMGT Power

=PP1V05_ENET_MCP_RMGT
131 mA (A01)

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

MCP FSB (VTT) Power

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

=PP1V05_S0_MCP_FSB
1182 mA (A01)

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

MCP Memory Power

=PP1V8R1V5_S0_MCP_MEM
4771 mA (A01, DDR3)

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

MCP 3.3V Power

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

=PP3V3_S0_MCP
450 mA (A01)

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

MCP 3.3V AUX/USB Power

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

=PP3V3_S5_MCP
266 mA (A01)

C2560 2.2UF 20% 6.3V CERM 402-LF

MCP 3.3V/1.5V HDA Power

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

=PP3V3R1V5_S0_MCP_HDA
7 mA (A01)

C2562 2.2UF 20% 6.3V CERM 402-LF

L2555

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

=PP3V3_S0_MCP_PLL_UF
19 mA (A01)

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

C2555 2.2UF 20% 6.3V CERM 402-LF

MCP 3.3V Ethernet Power

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

=PP3V3_ENET_MCP_RMGT
83 mA (A01)

C2564 2.2UF 20% 6.3V CERM 402-LF

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

L2595

=PP1V05_ENET_MCP_PLL_MAC
5 mA (A01)

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

C2595 4.7UF 20% 4V X5R 402
C2596 2.2UF 20% 6.3V CERM 402-LF

L2570

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_AVDD_UF
333 mA (A01)

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

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

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

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

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

L2582

=PP1V05_S0_MCP_PLL_PEX_UF

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 2.2UF 20% 6.3V CERM 402-LF

R2580

=PP1V05_S0_MCP_PLL_UF
562 mA (A01)

R2580 0.2 1% 1/5W MF 402-HF
PP1V05_S0_MCP_PLL_FSB
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
270 mA (A01)

C2580 4.7UF 20% 4V X5R 402
C2581 2.2UF 10% 16V X5R 603

L2584

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 2.2UF 20% 6.3V CERM 402-LF

L2586

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 2.2UF 20% 6.3V CERM 402-LF

L2588

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 2.2UF 20% 6.3V CERM 402-LF
C2590 0.1UF 20% 10V CERM 402

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

MCP Standard Decoupling

SYNC_MASTER=M98_MLB
SYNC_DATE=04/01/2008

APPLE INC.

SIZE D | DRAWING NUMBER 051-7656 | REV. 31
SCALE NONE | SHT 25 OF 123

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)

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

C2610 1 2 2.2UF 20% 6.3V CERM 402-LF

18 8 =PP1V05_S0_MCP_HDMI_VDD
95 mA (A01)

C2615 4.7UF 20% 4V X5R 402
C2616 2.2UF 20% 6.3V CERM 402-LF

90 18 MCP_HDMI_RSET
90 18 MCP_HDMI_VPROBE

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

90 18 MCP_IFPAB_RSET
90 18 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: ???

8 =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
18
16 mA (A01)

C2640 4.7UF 20% 6.3V CERM 603
C2641 2.2UF 20% 6.3V CERM 402-LF

8 =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
18
206 mA (A01)

NO STUFF C2650 2.2UF 20% 6.3V CERM 402-LF
R2651 0 5% 1/10W MF-LF 402

18 TP_MCP_RGB_RED — NC_MCP_RGB_RED (MAKE_BASE=TRUE, NO_TEST=TRUE)
18 TP_MCP_RGB_GREEN — NC_MCP_RGB_GREEN (MAKE_BASE=TRUE, NO_TEST=TRUE)
18 TP_MCP_RGB_BLUE — NC_MCP_RGB_BLUE (MAKE_BASE=TRUE, NO_TEST=TRUE)
18 TP_MCP_RGB_HSYNC — NC_MCP_RGB_HSYNC (MAKE_BASE=TRUE, NO_TEST=TRUE)
18 TP_MCP_RGB_VSYNC — NC_MCP_RGB_VSYNC (MAKE_BASE=TRUE, NO_TEST=TRUE)
90 18 CRT_IG_R_C_PR — NC_CRT_IG_R_C_PR (MAKE_BASE=TRUE, NO_TEST=TRUE)
90 18 CRT_IG_G_Y_Y — NC_CRT_IG_G_Y_Y (MAKE_BASE=TRUE, NO_TEST=TRUE)
90 18 CRT_IG_B_COMP_PB — NC_CRT_IG_B_COMP_PB (MAKE_BASE=TRUE, NO_TEST=TRUE)
90 18 CRT_IG_HSYNC — NC_CRT_IG_HSYNC (MAKE_BASE=TRUE, NO_TEST=TRUE)
90 18 CRT_IG_VSYNC — NC_CRT_IG_VSYNC (MAKE_BASE=TRUE, NO_TEST=TRUE)
18 TP_MCP_RGB_DAC_RSET — NC_MCP_RGB_DAC_RSET (MAKE_BASE=TRUE, NO_TEST=TRUE)
18 TP_MCP_RGB_DAC_VREF — NC_MCP_RGB_DAC_VREF (MAKE_BASE=TRUE, NO_TEST=TRUE)
90 18 MCP_TV_DAC_RSET — NC_MCP_TV_DAC_RSET (MAKE_BASE=TRUE, NO_TEST=TRUE)
90 18 MCP_TV_DAC_VREF — NC_MCP_TV_DAC_VREF (MAKE_BASE=TRUE, NO_TEST=TRUE)
18 MCP_CLK27M_XTALIN — NC_MCP_CLK27M_XTALIN (MAKE_BASE=TRUE, NO_TEST=TRUE)
18 MCP_CLK27M_XTALOUT — NC_MCP_CLK27M_XTALOUT (MAKE_BASE=TRUE, NO_TEST=TRUE)

HDCP ROM

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

8 =PP3V3_S0_HDCPROM

C2690 0.1UF 20% 10V CERM 402 — NO STUFF
NO STUFF
R2690 10K 5% 1/16W MF-LF 402 — NO STUFF

U2695 AT24C08 SOIC
VCC 8
A0 1
A1 2
A2 3
GND 4
SDA 5 — =I2C_HDCPROM_SDA — B 44
SCL 6 — =I2C_HDCPROM_SCL — IN 44
WP 7 — HDCPROM_WP

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

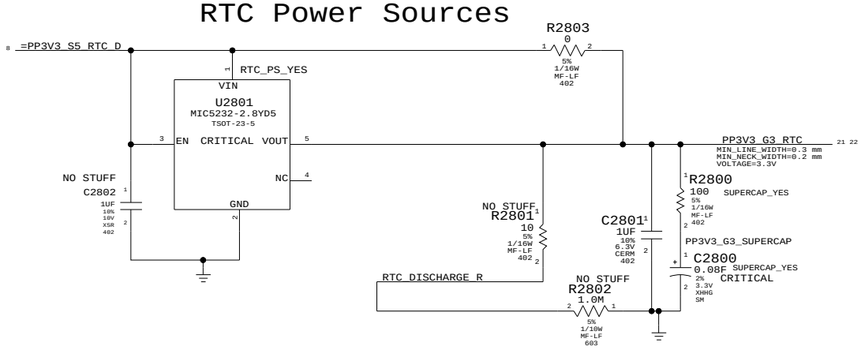
MCP Graphics Support

SYNC_MASTER=M98_MLB SYNC_DATE=04/01/2008

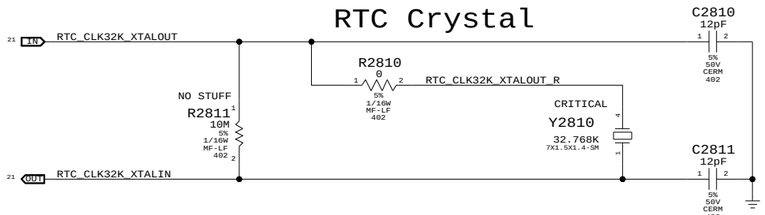
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 26 OF 123	

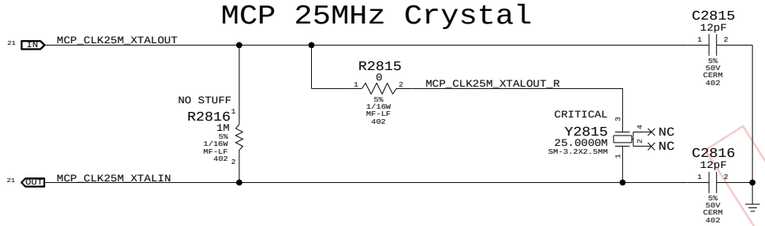
RTC Power Sources



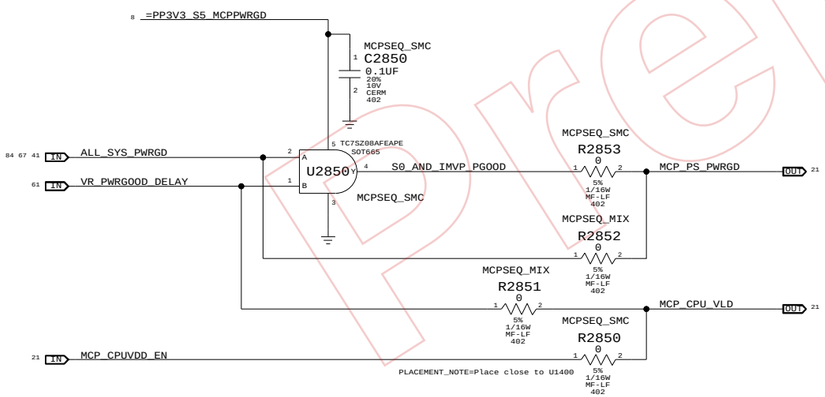
RTC Crystal



MCP 25MHz Crystal



MCP S0 PWRGD & CPU_VLD



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

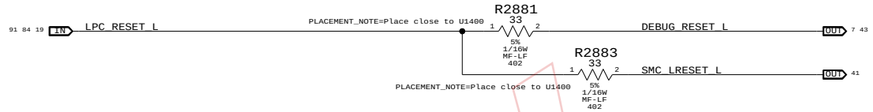
MCPSEQ_MIX is cross between MLB and internal power sequencing, which results in earlier ROMSIP and MCP FSB I/O interface initialization.

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

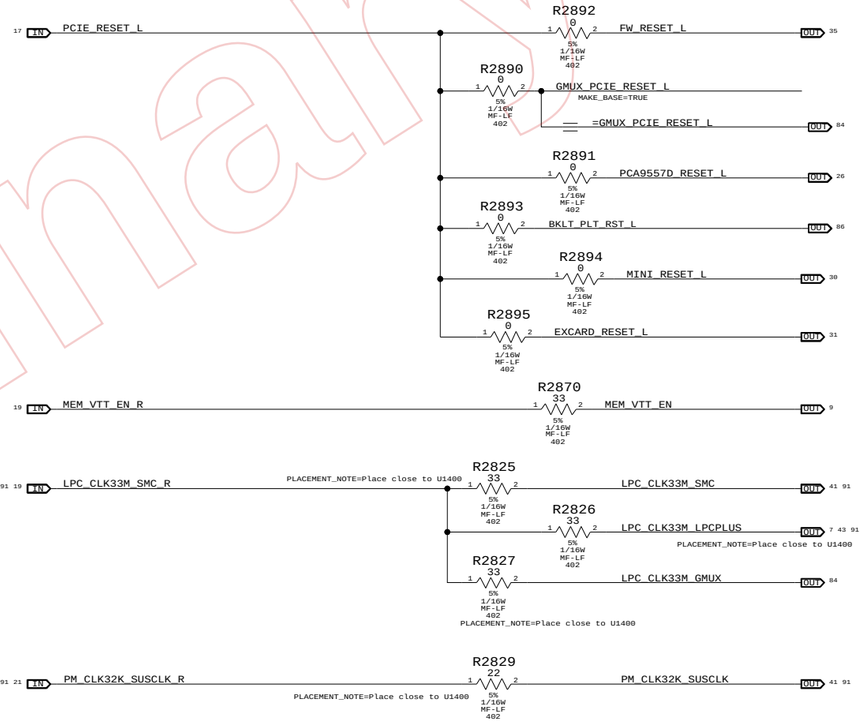
NOTE: If CPU_VLD deasserts during S0 MCP79 will take system to S5 immediately.

Platform Reset Connections

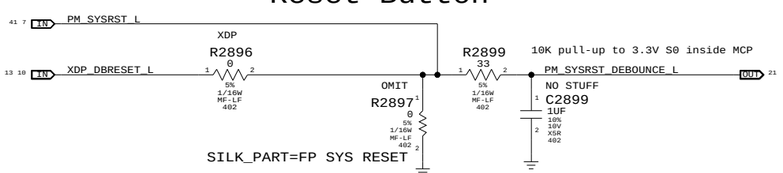
LPC Reset (Unbuffered)



PCIE Reset (Unbuffered)



Reset Button



SB Misc

SYNC_MASTER=M98_MLB SYNC_DATE=05/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31

SCALE	SHT	OF
NONE	28	123

Page Notes

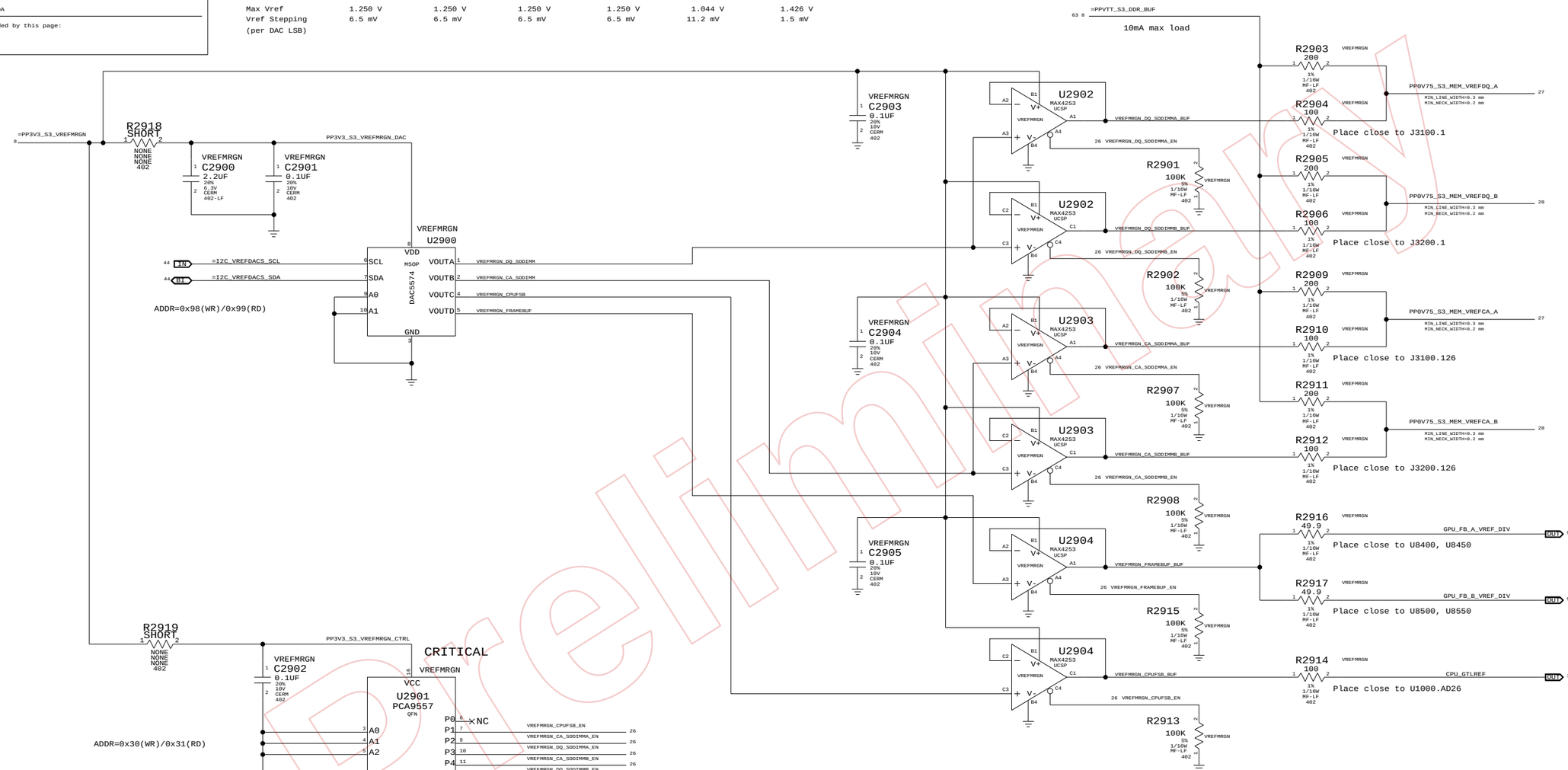
Power aliases required by this page:
- =PP3V3_S3_VREFMRGN
- =PP3V3_S5_VREFMRGN
- =PPVTT_S3_DDR_BUF

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 A	MEM A VREF CA B	MEM B VREF DQ A	MEM B VREF CA B	CPU FSB VREF C	FRAME BUFFER VREF D
Min DAC code	0x00	0x00	0x00	0x00	0x00	0x00
Max DAC code	0x87	0x87	0x87	0x87	0x55	0xFF
Max sink I	-3.75 mA	-3.75 mA	-3.75 mA	-3.75 mA	-0.91 mA	-59.04 mA
Max source I	5 mA	5 mA	5 mA	5 mA	0.52 mA	51.15 mA
Nominal Vref	0.75 V	0.75 V	0.75 V	0.75 V	0.70 V	1.248 V
Min Vref	0.375 V	0.375 V	0.375 V	0.375 V	0.091 V	1.042 V
Max Vref	1.250 V	1.250 V	1.250 V	1.250 V	1.044 V	1.426 V
Vref Stepping (per DAC LSB)	6.5 mV	6.5 mV	6.5 mV	6.5 mV	11.2 mV	1.5 mV

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



Required zero ohm resistors when no VREF margining circuit stuffed

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

FSB/DDR3/FRAMEBUF Vref Margining

SYNC_MASTER=BEN_K20 SYNC_DATE=10/15/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31

SCALE: NONE SHT 29 OF 123

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 PLANE STITCHING CAPS (SPACE EVENLY ACROSS PLANE SPLIT)

8 =PP1V5_S0_MEM_A
8 =PP1V5_S3_MEM_A

C3100 10UF 20% 6.3V X5R 603
C3101 10UF 20% 6.3V X5R 603
C3110 C3111 C3112 C3113 C3114 C3115 C3116 C3117 C3118 C3119 C3120 C3121 C3122 C3123
0.1UF 20% 10V CERM 402

26 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)

KEY

		MEM_A_CKE<0>	IN	73	CKE0	CKE1	74	MEM_A_CKE<1>	IN	15 89
				75	VDD	VDD	76			
				77	NC	A15	78	MEM_A_A<15>	IN	9
		MEM_A_BA<2>	IN	79	BA2	A14	80	MEM_A_A<14>	IN	15 89
				81	VDD	VDD	82			
		MEM_A_A<12>	IN	83	A12/BC*	A11	84	MEM_A_A<11>	IN	15 89
		MEM_A_A<9>	IN	85	A9	A7	86	MEM_A_A<7>	IN	15 89
				87	VDD	VDD	88			
		MEM_A_A<8>	IN	89	A8	A6	90	MEM_A_A<6>	IN	15 89
		MEM_A_A<5>	IN	91	A5	A4	92	MEM_A_A<4>	IN	15 89
				93	VDD	VDD	94			
		MEM_A_A<3>	IN	95	A3	A2	96	MEM_A_A<2>	IN	15 89
		MEM_A_A<1>	IN	97	A1	A0	98	MEM_A_A<0>	IN	15 89
				99	VDD	VDD	100			
		MEM_A_CLK_P<0>	IN	101	CK0	CK1	102	MEM_A_CLK_P<1>	IN	15 89
		MEM_A_CLK_N<0>	IN	103	CK0*	CK1*	104	MEM_A_CLK_N<1>	IN	15 89
				105	VDD	VDD	106			
		MEM_A_A<10>	IN	107	A10/AP	BA1	108	MEM_A_BA<1>	IN	15 89
		MEM_A_BA<0>	IN	109	BA0	RAS*	110	MEM_A_RAS_L	IN	15 89
				111	VDD	VDD	112			
		MEM_A_WE_L	IN	113	WE*	S0*	114	MEM_A_CS_L<0>	IN	15 89
		MEM_A_CAS_L	IN	115	CAS*	ODT0	116	MEM_A_ODT<0>	IN	15 89
				117	VDD	VDD	118			
		MEM_A_A<13>	IN	119	A13	ODT1	120	MEM_A_ODT<1>	IN	15 89
		MEM_A_CS_L<1>	IN	121	S1*	NC	122			
				123	VDD	VDD	124			
NC				125	TEST	VREFCA	126			
				127	VSS	VSS	128			
		MEM_A_DQ<33>	BI	129	DQ32	DQ36	130	MEM_A_DQ<36>	BI	15 89
		MEM_A_DQ<32>	BI	131	DQ33	DQ37	132	MEM_A_DQ<37>	BI	15 89
				133	VSS	VSS	134			
		MEM_A_DQS_N<4>	BI	135	DQS4*	DM4	136	MEM_A_DM<4>	IN	15 89
		MEM_A_DQS_P<4>	BI	137	DQS4	VSS	138			
				139	VSS	DQ38	140	MEM_A_DQ<38>	BI	15 89
		MEM_A_DQ<34>	BI	141	DQ34	DQ39	142	MEM_A_DQ<39>	BI	15 89
		MEM_A_DQ<35>	BI	143	DQ35	VSS	144			
				145	VSS	DQ44	146	MEM_A_DQ<47>	BI	15 89
		MEM_A_DQ<44>	BI	147	DQ40	DQ45	148	MEM_A_DQ<40>	BI	15 89
		MEM_A_DQ<41>	BI	149	DQ41	VSS	150			
				151	VSS	DQS5*	152	MEM_A_DQS_N<5>	BI	15 89
		MEM_A_DM<5>	IN	153	DM5	DQS5	154	MEM_A_DQS_P<5>	BI	15 89
				155	VSS	VSS	156			
		MEM_A_DQ<45>	BI	157	DQ42	DQ46	158	MEM_A_DQ<46>	BI	15 89
		MEM_A_DQ<42>	BI	159	DQ43	DQ47	160	MEM_A_DQ<43>	BI	15 89
				161	VSS	VSS	162			
		MEM_A_DQ<52>	BI	163	DQ48	DQ52	164	MEM_A_DQ<48>	BI	15 89
		MEM_A_DQ<51>	BI	165	DQ49	DQ53	166	MEM_A_DQ<53>	BI	15 89
				167	VSS	VSS	168			
		MEM_A_DQS_N<6>	BI	169	DQS6*	DM6	170	MEM_A_DM<6>	IN	15 89
		MEM_A_DQS_P<6>	BI	171	DQS6	VSS	172			
				173	VSS	DQ54	174	MEM_A_DQ<50>	BI	15 89
		MEM_A_DQ<55>	BI	175	DQ50	DQ55	176	MEM_A_DQ<49>	BI	15 89
		MEM_A_DQ<54>	BI	177	DQ51	VSS	178			
				179	VSS	DQ60	180	MEM_A_DQ<57>	BI	15 89
		MEM_A_DQ<61>	BI	181	DQ56	DQ61	182	MEM_A_DQ<56>	BI	15 89
		MEM_A_DQ<60>	BI	183	DQ57	VSS	184			
				185	VSS	DQS7*	186	MEM_A_DQS_N<7>	BI	15 89
		MEM_A_DM<7>	IN	187	DM7	DQS7	188	MEM_A_DQS_P<7>	BI	15 89
				189	VSS	VSS	190			
		MEM_A_DQ<58>	BI	191	DQ58	DQ62	192	MEM_A_DQ<62>	BI	15 89
		MEM_A_DQ<59>	BI	193	DQ59	DQ63	194	MEM_A_DQ<63>	BI	15 89
				195	VSS	VSS	196			
		MEM_A_SA<0>		197	SA0	EVENT*	198	MEM_EVENT_L	OUT	21 28 41
				199	VDDSPD	SDA	200	=I2C_SODIMMA_SDA	BI	44
		MEM_A_SA<1>		201	SA1	SCL	202	=I2C_SODIMMA_SCL	IN	44
				203	VTT	VTT	204	=PP0V75_S0_MEM_VTT_A		8

516-0201
SPD ADDR=0xA0(WR)/0xA1(RD)

8 =PPSPD_S0_MEM_A
C3140 2.2UF 20% 6.3V CERM 402-LF
R3140 10K 5% 1/16W MF-LF 402
R3141 10K 5% 1/16W MF-LF 402

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

CRITICAL

			1	VREFDQ	VSS	2			
		MEM_A_DQ<0>	BI	3	VSS	DQ4	4	MEM_A_DQ<4>	BI	15 89
		MEM_A_DQ<1>	BI	5	DQ0	DQ5	6	MEM_A_DQ<5>	BI	15 89
			7	DQ1	VSS	8			
		MEM_A_DM<0>	IN	9	VSS	DQS0*	10	MEM_A_DQS_N<0>	BI	15 89
			11	DM0	DQS0	12	MEM_A_DQS_P<0>	BI	15 89
			13	VSS	VSS	14			
		MEM_A_DQ<3>	BI	15	DQ2	DQ6	16	MEM_A_DQ<6>	BI	15 89
		MEM_A_DQ<2>	BI	17	DQ3	DQ7	18	MEM_A_DQ<7>	BI	15 89
			19	VSS	VSS	20			
		MEM_A_DQ<9>	BI	21	DQ8	DQ12	22	MEM_A_DQ<8>	BI	15 89
		MEM_A_DQ<13>	BI	23	DQ9	DQ13	24	MEM_A_DQ<12>	BI	15 89
			25	VSS	VSS	26			
		MEM_A_DQS_N<1>	BI	27	DQS1*	DM1	28	MEM_A_DM<1>	IN	15 89
		MEM_A_DQS_P<1>	BI	29	DQS1	RESET*	30	MEM_RESET_L	IN	28 29
			31	VSS	VSS	32			
		MEM_A_DQ<11>	BI	33	DQ10	DQ14	34	MEM_A_DQ<15>	BI	15 89
		MEM_A_DQ<14>	BI	35	DQ11	DQ15	36	MEM_A_DQ<10>	BI	15 89
			37	VSS	VSS	38			
		MEM_A_DQ<16>	BI	39	DQ16	DQ20	40	MEM_A_DQ<21>	BI	15 89
		MEM_A_DQ<18>	BI	41	DQ17	DQ21	42	MEM_A_DQ<20>	BI	15 89
			43	VSS	VSS	44			
		MEM_A_DQS_N<2>	BI	45	DQS2*	DM2	46	MEM_A_DM<2>	IN	15 89
		MEM_A_DQS_P<2>	BI	47	DQS2	VSS	48			
			49	VSS	DQ22	50	MEM_A_DQ<17>	BI	15 89
		MEM_A_DQ<23>	BI	51	DQ18	DQ23	52	MEM_A_DQ<22>	BI	15 89
		MEM_A_DQ<19>	BI	53	DQ19	VSS	54			
			55	VSS	DQ28	56	MEM_A_DQ<29>	BI	15 89
		MEM_A_DQ<24>	BI	57	DQ24	DQ29	58	MEM_A_DQ<28>	BI	15 89
		MEM_A_DQ<30>	BI	59	DQ25	VSS	60			
			61	VSS	DQS3*	62	MEM_A_DQS_N<3>	BI	15 89
		MEM_A_DM<3>	IN	63	DM3	DQS3	64	MEM_A_DQS_P<3>	BI	15 89
			65	VSS	VSS	66			
		MEM_A_DQ<27>	BI	67	DQ26	DQ30	68	MEM_A_DQ<26>	BI	15 89
		MEM_A_DQ<25>	BI	69	DQ27	DQ31	70	MEM_A_DQ<31>	BI	15 89
			71	VSS	VSS	72			

KEY

516-0201

26 PP0V75_S3_MEM_VREFCA_A
C3135 2.2UF 20% 6.3V CERM 402-LF
C3136 0.1UF 20% 10V CERM 402

"Factory" (top) slot

DDR3 SO-DIMM Connector A

SYNC_MASTER=BEN_K20 SYNC_DATE=06/10/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE	SHT	OF
NONE	31	123

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 PLANE STITCHING CAPS (SPACE EVENLY ACROSS PLANE SPLIT)

8 =PP1V5_S0_MEM_B
8 =PP1V5_S3_MEM_B

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

C3200 10UF 20% 6.3V X5R 603
C3201 10UF 20% 6.3V X5R 603

26 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

73	CKE0	CKE1	74	MEM_B_CKE<1>	IN 15 89
75	VDD	VDD	76		
77	NC	A15	78	MEM_B_A<15>	IN 9
79	BA2	A14	80	MEM_B_A<14>	IN 15 89
81	VDD	VDD	82		
83	A12/BC*	A11	84	MEM_B_A<11>	IN 15 89
85	A9	A7	86	MEM_B_A<7>	IN 15 89
87	VDD	VDD	88		
89	A8	A6	90	MEM_B_A<6>	IN 15 89
91	A5	A4	92	MEM_B_A<4>	IN 15 89
93	VDD	VDD	94		
95	A3	A2	96	MEM_B_A<2>	IN 15 89
97	A1	A0	98	MEM_B_A<0>	IN 15 89
99	VDD	VDD	100		
101	CK0	CK1	102	MEM_B_CLK_P<1>	IN 15 89
103	CK0*	CK1*	104	MEM_B_CLK_N<1>	IN 15 89
105	VDD	VDD	106		
107	A10/AP	BA1	108	MEM_B_BA<1>	IN 15 89
109	BA0	RAS*	110	MEM_B_RAS_L	IN 15 89
111	VDD	VDD	112		
113	WE*	S0*	114	MEM_B_CS_L<0>	IN 15 89
115	CAS*	ODT0	116	MEM_B_ODT<0>	IN 15 89
117	VDD	VDD	118		
119	A13	ODT1	120	MEM_B_ODT<1>	IN 15 89
121	S1*	NC	122		
123	VDD	VDD	124		
125	TEST	VREFCA	126		
127	VSS	VSS	128		
129	DQ32	DQ36	130	MEM_B_DQ<33>	BI 15 89
131	DQ33	DQ37	132	MEM_B_DQ<36>	BI 15 89
133	VSS	VSS	134		
135	DQS4*	DM4	136	MEM_B_DM<4>	IN 15 89
137	DQS4	VSS	138		
139	VSS	DQ38	140	MEM_B_DQ<38>	BI 15 89
141	DQ34	DQ39	142	MEM_B_DQ<39>	BI 15 89
143	DQ35	VSS	144		
145	VSS	DQ44	146	MEM_B_DQ<44>	BI 15 89
147	DQ40	DQ45	148	MEM_B_DQ<45>	BI 15 89
149	DQ41	VSS	150		
151	VSS	DQS5*	152	MEM_B_DQS_N<5>	BI 15 89
153	DM5	DQS5	154	MEM_B_DQS_P<5>	BI 15 89
155	VSS	VSS	156		
157	DQ42	DQ46	158	MEM_B_DQ<47>	BI 15 89
159	DQ43	DQ47	160	MEM_B_DQ<46>	BI 15 89
161	VSS	VSS	162		
163	DQ48	DQ52	164	MEM_B_DQ<48>	BI 15 89
165	DQ49	DQ53	166	MEM_B_DQ<54>	BI 15 89
167	VSS	VSS	168		
169	DQS6*	DM6	170	MEM_B_DM<6>	IN 15 89
171	DQS6	VSS	172		
173	VSS	DQ54	174	MEM_B_DQ<53>	BI 15 89
175	DQ50	DQ55	176	MEM_B_DQ<50>	BI 15 89
177	DQ51	VSS	178		
179	VSS	DQ60	180	MEM_B_DQ<60>	BI 15 89
181	DQ56	DQ61	182	MEM_B_DQ<61>	BI 15 89
183	DQ57	VSS	184		
185	VSS	DQS7*	186	MEM_B_DQS_N<7>	BI 15 89
187	DM7	DQS7	188	MEM_B_DQS_P<7>	BI 15 89
189	VSS	VSS	190		
191	DQ58	DQ62	192	MEM_B_DQ<58>	BI 15 89
193	DQ59	DQ63	194	MEM_B_DQ<62>	BI 15 89
195	VSS	VSS	196		
197	SA0	EVENT*	198	MEM_EVENT_L	OUT 21 27 41
199	VDDSPD	SDA	200	=I2C_SODIMMB_SDA	BI 44
201	SA1	SCL	202	=I2C_SODIMMB_SCL	IN 44
203	VTT	VTT	204	=PP0V75_S0_MEM_VTT_B	8
205	MTG PIN	MTG PIN	206		
207	MTG PIN	MTG PIN	208		
209	MTG PIN	MTG PIN	210		
211	MTG PIN	MTG PIN	212		

MTG PINS

516s0706

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

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

8 =PPSPD_S0_MEM_B

MEM_B_SA<0>
MEM_B_SA<1>

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

KEY

1	VREFDQ	VSS	2		
3	VSS	DQ4	4	MEM_B_DQ<4>	BI 15 89
5	DQ0	DQ5	6	MEM_B_DQ<5>	BI 15 89
7	DQ1	VSS	8		
9	VSS	DQS0*	10	MEM_B_DQS_N<0>	BI 15 89
11	DM0	DQS0	12	MEM_B_DQS_P<0>	BI 15 89
13	VSS	VSS	14		
15	DQ2	DQ6	16	MEM_B_DQ<6>	BI 15 89
17	DQ3	DQ7	18	MEM_B_DQ<7>	BI 15 89
19	VSS	VSS	20		
21	DQ8	DQ12	22	MEM_B_DQ<29>	BI 15 89
23	DQ9	DQ13	24	MEM_B_DQ<25>	BI 15 89
25	VSS	VSS	26		
27	DQS1*	DM1	28	MEM_B_DM<3>	IN 15 89
29	DQS1	RESET*	30	MEM_RESET_L	IN 27 29
31	VSS	VSS	32		
33	DQ10	DQ14	34	MEM_B_DQ<26>	BI 15 89
35	DQ11	DQ15	36	MEM_B_DQ<27>	BI 15 89
37	VSS	VSS	38		
39	DQ16	DQ20	40	MEM_B_DQ<13>	BI 15 89
41	DQ17	DQ21	42	MEM_B_DQ<12>	BI 15 89
43	VSS	VSS	44		
45	DQS2*	DM2	46	MEM_B_DM<1>	IN 15 89
47	DQS2	VSS	48		
49	VSS	DQ22	50	MEM_B_DQ<14>	BI 15 89
51	DQ18	DQ23	52	MEM_B_DQ<11>	BI 15 89
53	DQ19	VSS	54		
55	VSS	DQ28	56	MEM_B_DQ<20>	BI 15 89
57	DQ24	DQ29	58	MEM_B_DQ<16>	BI 15 89
59	DQ25	VSS	60		
61	VSS	DQS3*	62	MEM_B_DQS_N<2>	BI 15 89
63	DM3	DQS3	64	MEM_B_DQS_P<2>	BI 15 89
65	VSS	VSS	66		
67	DQ26	DQ30	68	MEM_B_DQ<19>	BI 15 89
69	DQ27	DQ31	70	MEM_B_DQ<23>	BI 15 89
71	VSS	VSS	72		

516s0706

89 15	BI	MEM_B_DQ<0>
89 15	BI	MEM_B_DQ<1>
89 15	IN	MEM_B_DM<0>
89 15	BI	MEM_B_DQ<2>
89 15	BI	MEM_B_DQ<3>
89 15	BI	MEM_B_DQ<28>
89 15	BI	MEM_B_DQ<24>
89 15	BI	MEM_B_DQS_N<3>
89 15	BI	MEM_B_DQS_P<3>
89 15	BI	MEM_B_DQ<31>
89 15	BI	MEM_B_DQ<30>
89 15	BI	MEM_B_DQ<9>
89 15	BI	MEM_B_DQ<8>
89 15	BI	MEM_B_DQS_N<1>
89 15	BI	MEM_B_DQS_P<1>
89 15	BI	MEM_B_DQ<15>
89 15	BI	MEM_B_DQ<10>
89 15	BI	MEM_B_DQ<21>
89 15	BI	MEM_B_DQ<17>
89 15	IN	MEM_B_DM<2>
89 15	BI	MEM_B_DQ<18>
89 15	BI	MEM_B_DQ<22>

PP0V75_S3_MEM_VREFCA_B 26

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

"Expansion" (bottom) slot

DDR3 SO-DIMM Connector B

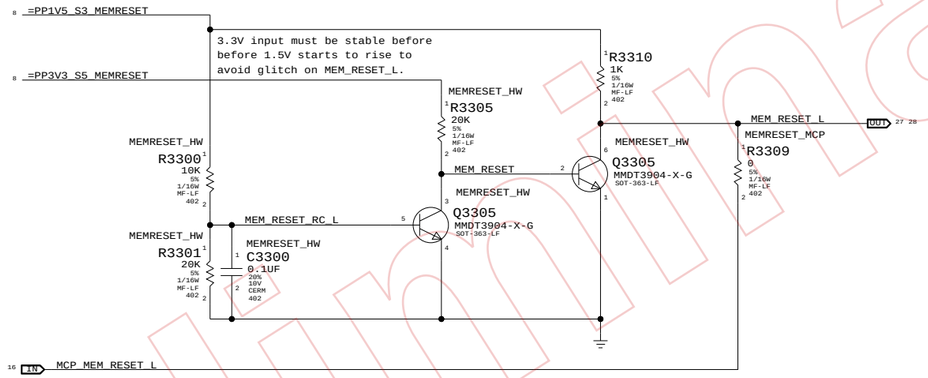
SYNC_MASTER=BEN_K20 SYNC_DATE=07/14/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE	SHT 32 OF 123	
NONE		

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.

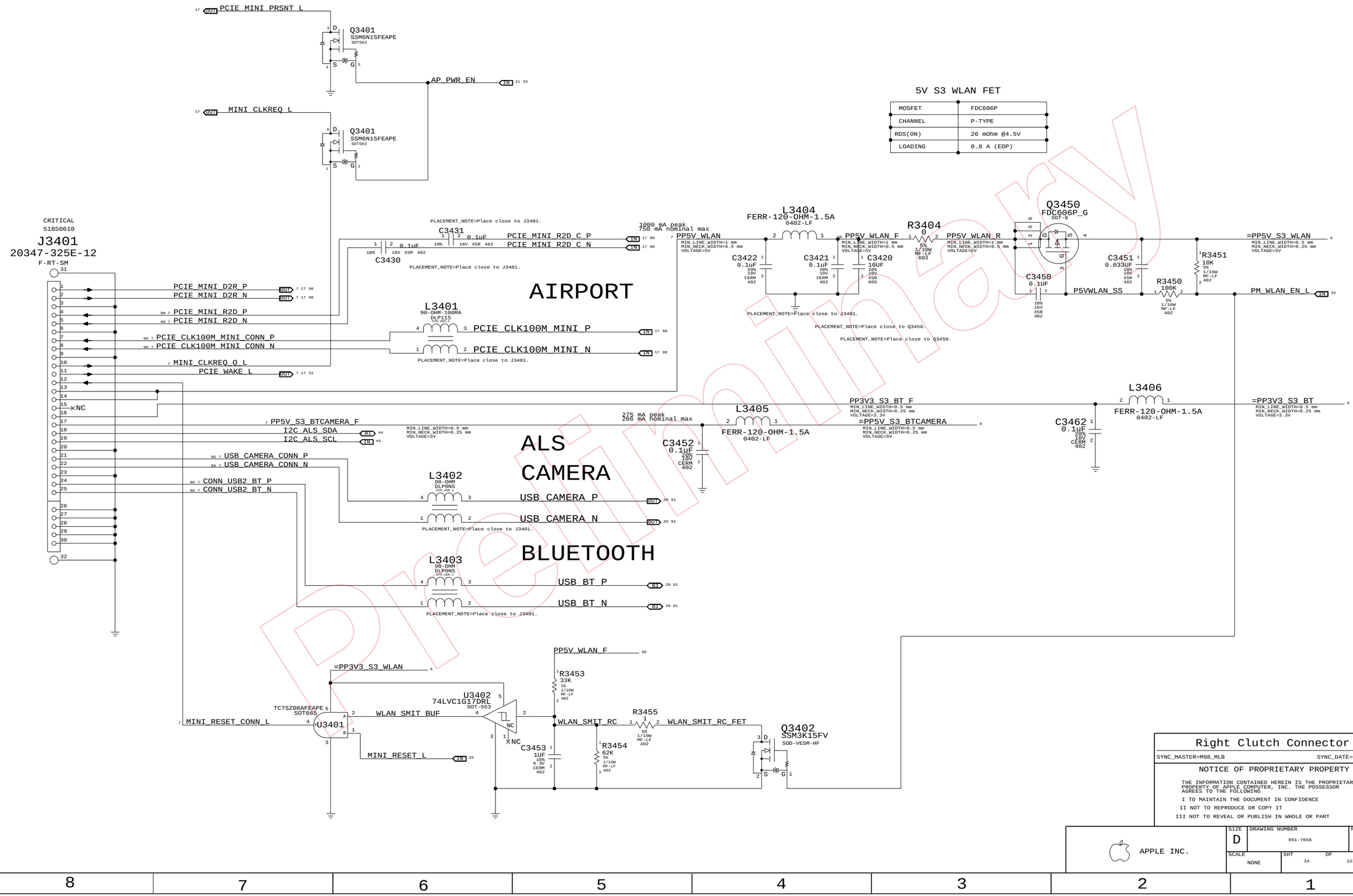


DDR3 Support

SYNC_MASTER=M98_MLB SYNC_DATE=04/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE	SHT	OF
NONE	33	123


PCIE MINI PRSNT L
Q3401
SSM6N15FEAPE
SOT563
AP PWR EN
MINI CLKREQ L
Q3401
SSM6N15FEAPE
SOT563
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 O L
PCIE WAKE L
NC
PCIE MINI R2D C P
PCIE MINI R2D C N
C3431
0.1uF
C3430
0.1uF
PLACEMENT_NOTE=Place close to J3401.
1000 mA peak
750 mA nominal max
PP5V WLAN
L3404
FERR-120-OHM-1.5A
0402-LF
C3422
0.1uF
C3421
0.1uF
C3420
10UF
R3404
0
5%
1/10W
MF-LF
603
PP5V WLAN F
PP5V WLAN R
Q3450
FDC606P_G
SOT-6
C3450
0.1UF
P5VWLAN SS
C3451
0.033UF
R3450
100K
R3451
10K
=PP5V S3 WLAN
PM WLAN EN L
PLACEMENT_NOTE=Place close to Q3450.
AIRPORT
L3401
90-OHM-100MA
DLP11S
PCIE CLK100M MINI P
PCIE CLK100M MINI N
PLACEMENT_NOTE=Place close to J3401.
5V S3 WLAN FET
MOSFET | FDC606P
CHANNEL | P-TYPE
RDS(ON) | 26 mOhm @4.5V
LOADING | 0.8 A (EDP)
L3406
FERR-120-OHM-1.5A
0402-LF
=PP3V3 S3 BT
PP3V3 S3 BT F
=PP5V S3 BTCAMERA
L3405
FERR-120-OHM-1.5A
0402-LF
275 mA peak
206 mA nominal max
C3452
0.1uF
C3462
0.1uF
PP5V S3 BTCAMERA F
I2C ALS SDA
I2C ALS SCL
ALS
CAMERA
USB CAMERA P
USB CAMERA N
L3402
90-OHM
DLP0NS
BLUETOOTH
USB BT P
USB BT N
L3403
90-OHM
DLP0NS
=PP3V3 S3 WLAN
PP5V WLAN F
U3402
74LVC1G17DRL
SOT-553
TC7SZ08AFEAPE
SOT665
U3401
MINI RESET CONN L
MINI RESET L
WLAN SMIT BUF
WLAN SMIT RC
WLAN SMIT RC FET
R3453
33K
R3455
1
R3454
62K
C3453
1UF
Q3402
SSM3K15FV
SOD-VESM-HF
Right Clutch Connector
SYNC_MASTER=M98_MLB
SYNC_DATE=05/01/2008
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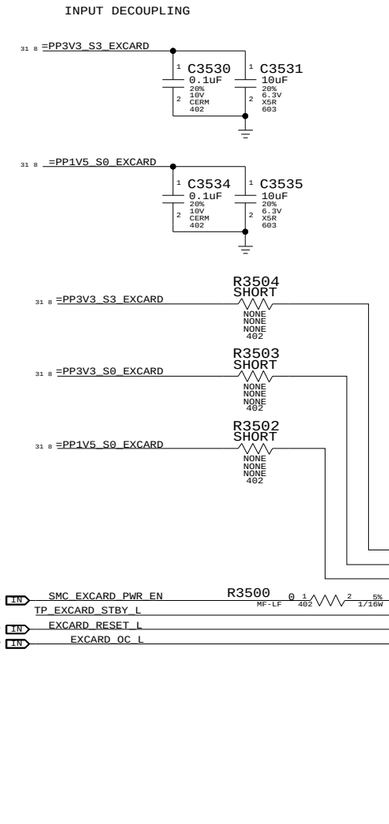
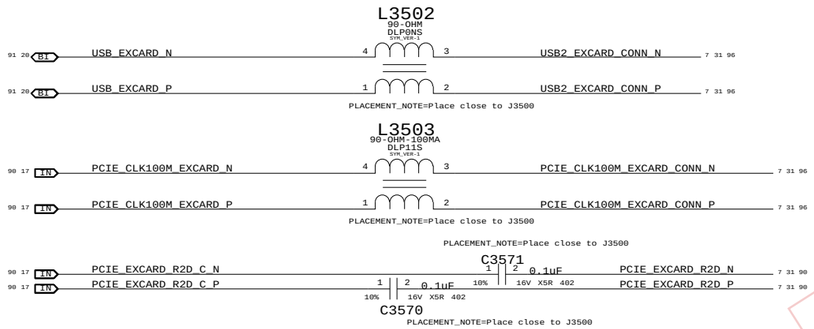
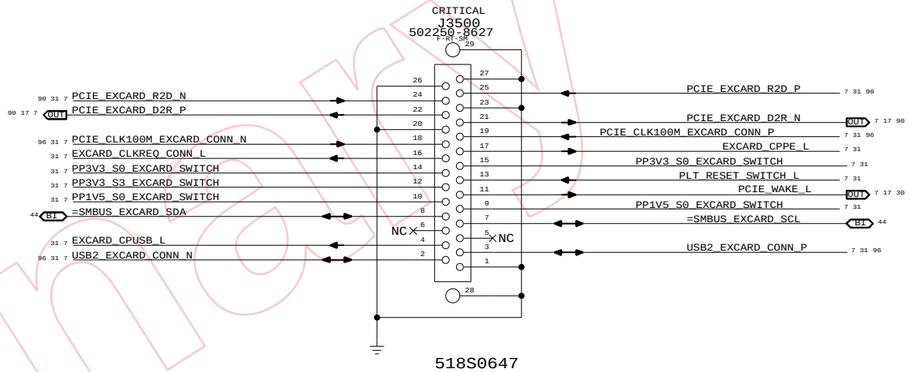
APPLE INC.
SIZE D
DRAWING NUMBER 051-7656
REV. 31
SCALE NONE
SHT 34 OF 123

EXPRESSCARD/34 FLEX CONNECTOR





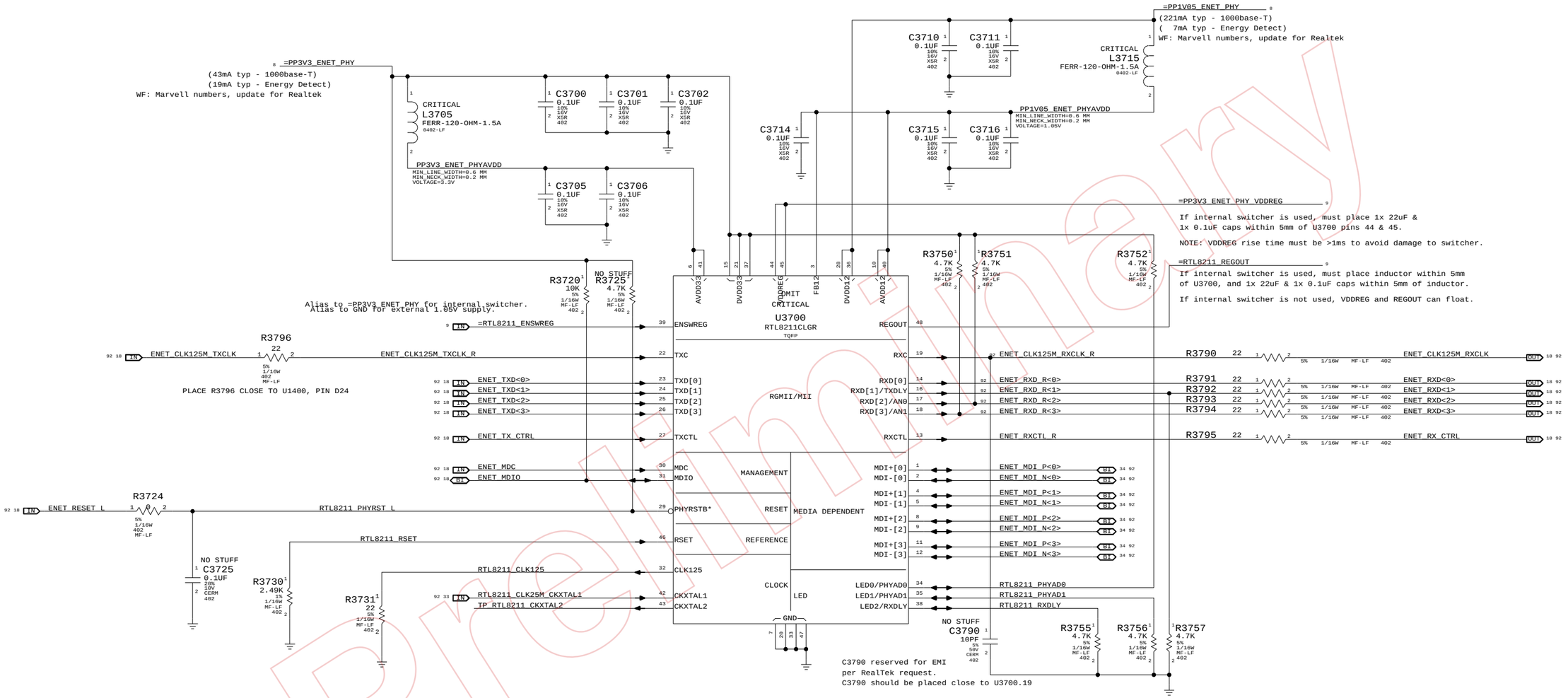


ExpressCard Connector

SYNC_MASTER=BEN_K20 SYNC_DATE=10/15/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 35 OF 123	



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_K20 SYNC_DATE=07/22/2008

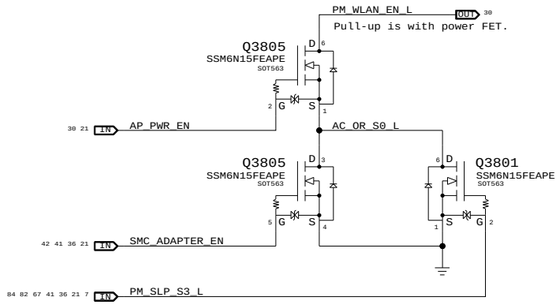
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 37 OF 123	

WLAN Enable Generation

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

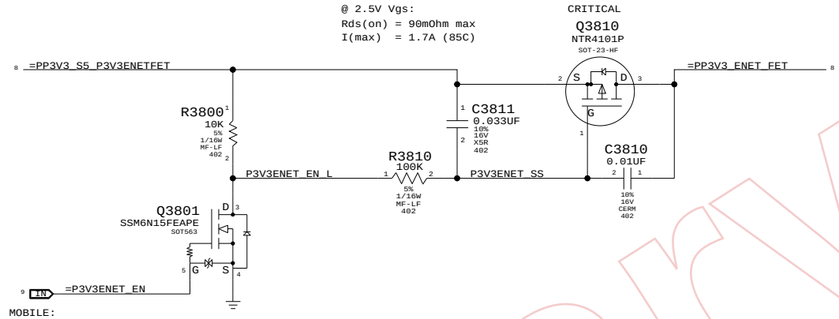
NOTE: S3 term is guaranteed by S3 pull-up on open-drain AP_PWR_EN signal.



3.3V ENET FET

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

CRITICAL



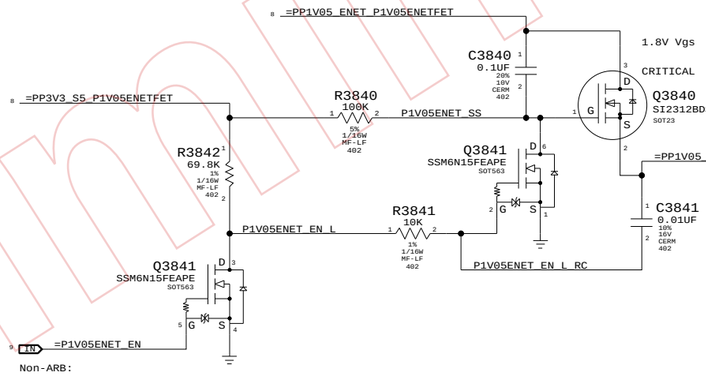
MOBILE:

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

1.05V ENET FET

1.8V Vgs

CRITICAL



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.

Ethernet & AirPort Support

SYNC_MASTER=SUMA_K20 SYNC_DATE=07/15/2008

APPLE INC.

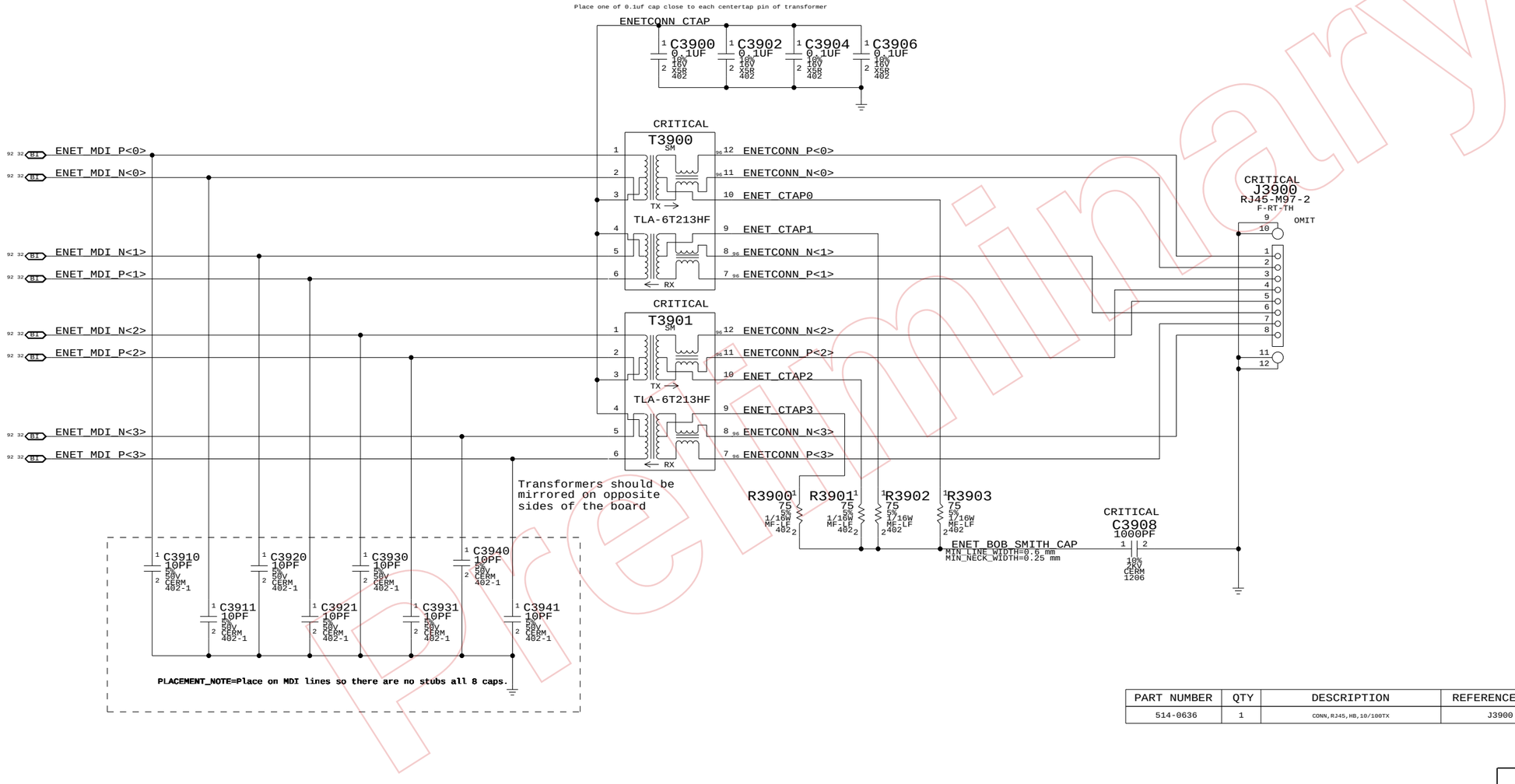
SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 38 OF 123	

Page Notes

Power aliases required by this page:
(NONE)

Signal aliases required by this page:
(NONE)

BOM options provided by this page:
(NONE)



PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
514-0636	1	CONN,RJ45,HB,10/100TX	J3900	CRITICAL	

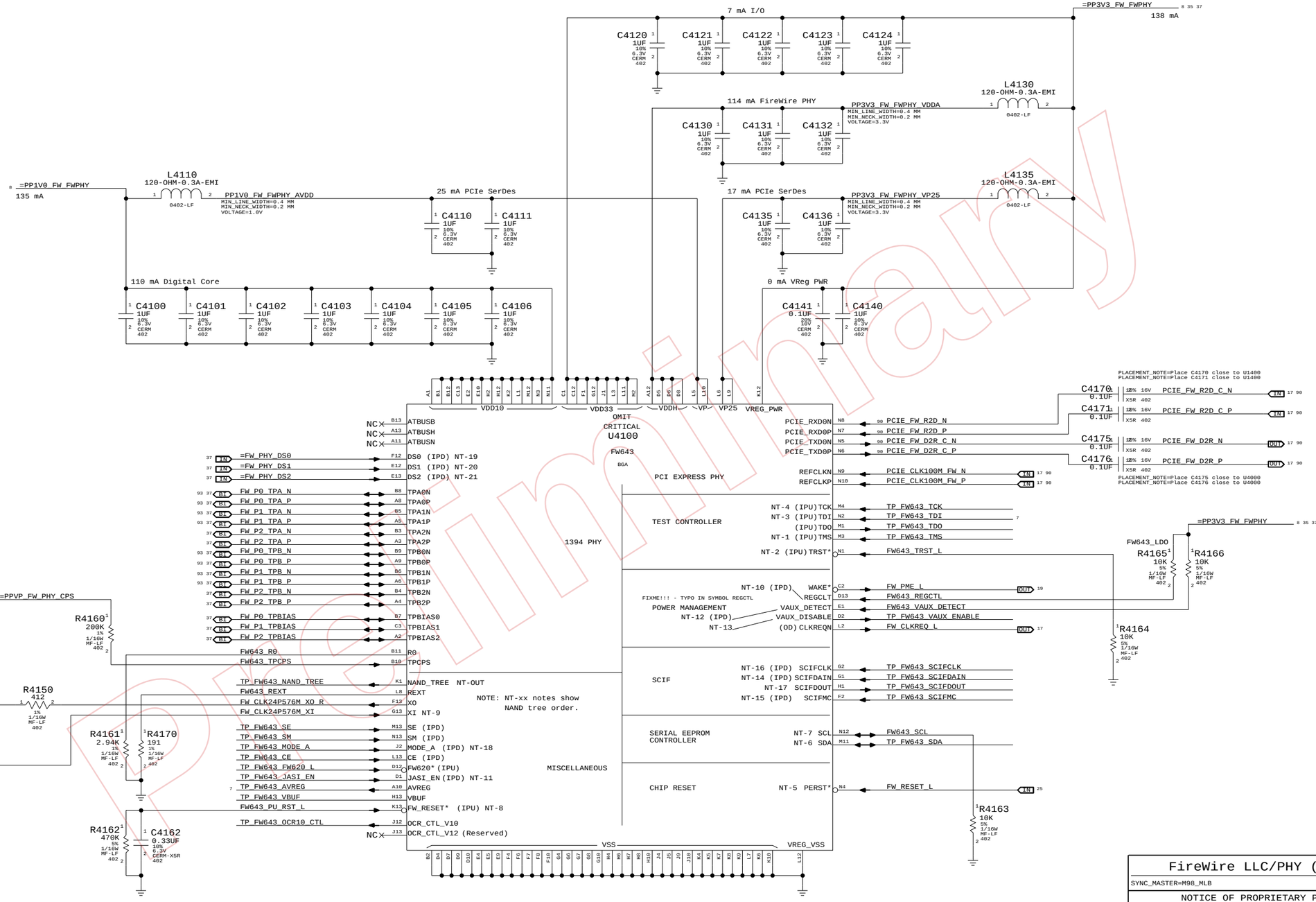
Ethernet Connector

SYNC_MASTER=SUMA_K20 SYNC_DATE=07/15/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31

SCALE	SHT	OF
NONE	39	123



FireWire LLC/PHY (FW643)

SYNC_MASTER=M98_MLB SYNC_DATE=04/01/2008

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APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 41 OF 123	

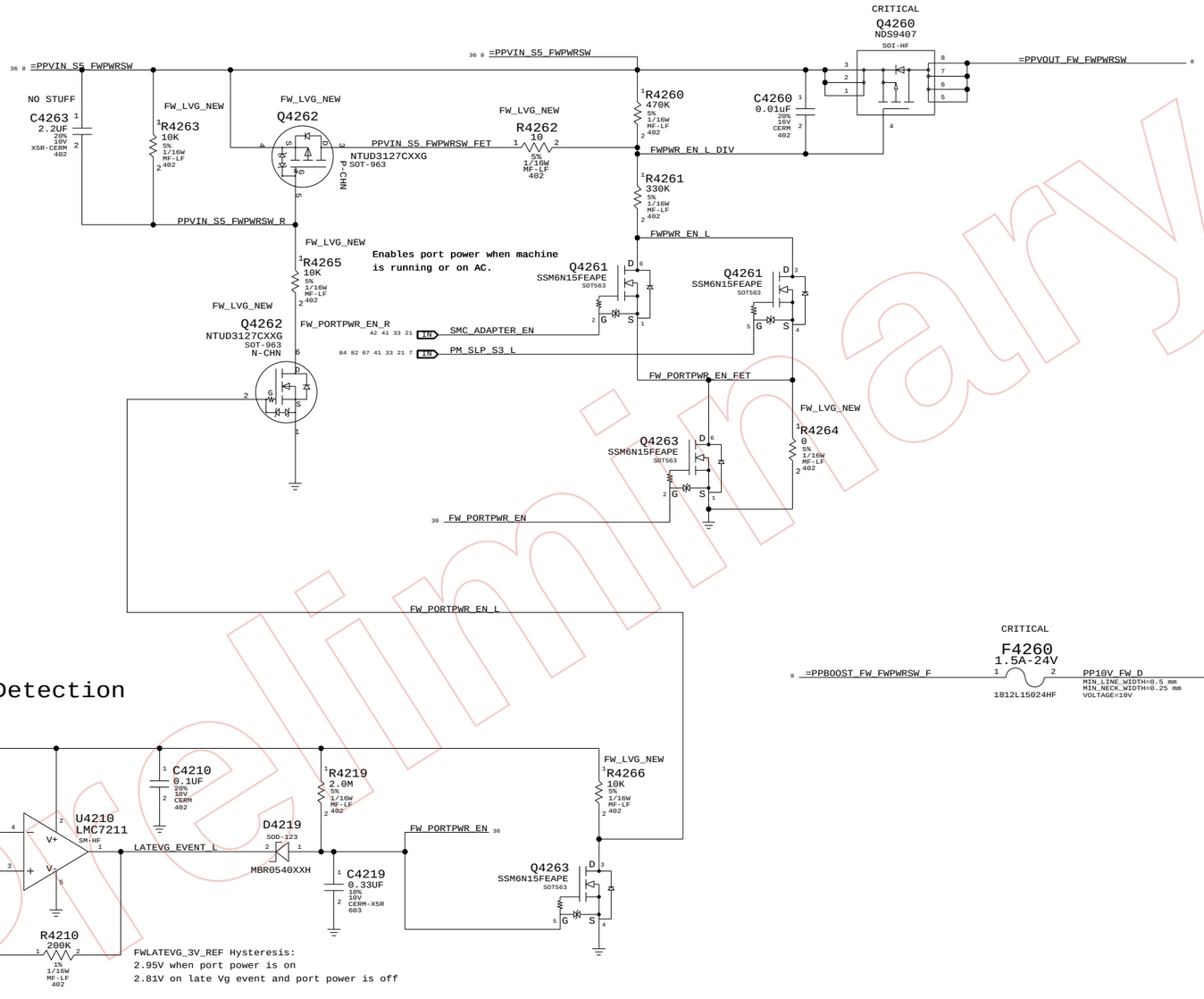
Page Notes

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

Signal aliases required by this page:
(NONE)

BOM options provided by this page:
- FW_PORT_FAULT_PU

FireWire Port Power Switch



Late-VG Event Detection

FireWire Port Power		
SYNC_MASTER=YWU_K20	SYNC_DATE=05/28/2008	

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 42 OF 123	

Page Notes

Power aliases required by this page:

- =PPVP_FW_PORT1
- =PP3V3_FW_LATEVG

- =GND_CHASSIS_FW_PORT1
- =GND_CHASSIS_FW_EMI_R

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

BOM options provided by this page:
(NONE)

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

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

FireWire PHY Config Straps

Configures PHY for:

- 1-port Portable Power Class (0)

- Port "1" Bilingual (1394B)

37 35 8 =PP3V3_FW_FWPHY

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

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

FWPHY_DS0 (MAKE_BASE=TRUE) — =FW_PHY_DS0 35
FWPHY_DS2 (MAKE_BASE=TRUE) — =FW_PHY_DS2 35
FWPHY_DS1 (MAKE_BASE=TRUE) — =FW_PHY_DS1 35

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

35 FW_P0_TPBIAS — NC_FW0_TPBIAS MAKE_BASE=TRUE
35 FW_P2_TPBIAS — NC_FW2_TPBIAS MAKE_BASE=TRUE 7
93 35 FW_P0_TPA_N — NC_FW0_TPAN MAKE_BASE=TRUE
93 35 FW_P0_TPA_P — NC_FW0_TPAP MAKE_BASE=TRUE 7
35 FW_P2_TPA_N — NC_FW2_TPAN MAKE_BASE=TRUE 7
35 FW_P2_TPA_P — NC_FW2_TPAP MAKE_BASE=TRUE 7

93 35 FW_P0_TPB_N — NC_FW0_TPBN MAKE_BASE=TRUE 7
93 35 FW_P0_TPB_P — NC_FW0_TPBP MAKE_BASE=TRUE 7
35 FW_P2_TPB_N — NC_FW2_TPBN MAKE_BASE=TRUE 7
35 FW_P2_TPB_P — NC_FW2_TPBP MAKE_BASE=TRUE 7

Termination

Place close to FireWire PHY

35 FW_P1_TPBIAS

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

C4360 0.33UF 10% 6.3V CERM-X5R 402

SIGNAL_MODEL=EMPTY
SIGNAL_MODEL=EMPTY
R4360 56.2 1% 1/16W MF-LF 402
R4361 56.2 1% 1/16W MF-LF 402

93 35 FW_P1_TPA_P — FW_PORT1_TPA_P MAKE_BASE=TRUE 37
93 35 FW_P1_TPA_N — FW_PORT1_TPA_N MAKE_BASE=TRUE 37
93 35 FW_P1_TPB_P — FW_PORT1_TPB_P MAKE_BASE=TRUE 37
93 35 FW_P1_TPB_N — FW_PORT1_TPB_N MAKE_BASE=TRUE 37

SIGNAL_MODEL=EMPTY
SIGNAL_MODEL=EMPTY
R4362 56.2 1% 1/16W MF-LF 402
R4363 56.2 1% 1/16W MF-LF 402

FW_PORT1_TPB_C

C4364 220pF 5% 25V CERM 402

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

8 =PPVP_FW_PHY_CPS_FET

R4311 470K 5% 1/16W MF-LF 402

Q4300 (SYM_VER_2) BSS8402DW

PPVP_FW_CPS (MIN_LINE_WIDTH=0.4 MM, MIN_NECK_WIDTH=0.2 MM, VOLTAGE=10V) — MAKE_BASE=TRUE — =PPVP_FW_PHY_CPS 35

CPS_EN_L_DIV

R4312 330K 5% 1/16W MF-LF 402

CPS_EN_L

Q4300 BSS8402DW SOT-363 (SYM-VER1)

37 35 8 =PP3V3_FW_FWPHY

"Snapback" & "Late VG" Protection

37 36 PP2V4_FW_LATEVG

DP4310 BAV99DW-X-G SOT-363
DP4311 BAV99DW-X-G SOT-363

C4311 0.01uF 10% 50V X7R 402
C4310 0.01uF 10% 50V X7R 402
C4312 0.01uF 10% 50V X7R 402
C4313 0.01uF 10% 50V X7R 402

37 FW_PORT1_TPB_N
37 FW_PORT1_TPB_P
37 FW_PORT1_TPA_N
37 FW_PORT1_TPA_P

C4319 0.1uF 10% 50V X7R 603-1

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

PLACEMENT_NOTE=Place C4319 close to connector pin 5.

Cable Power

8 =PPVP_FW_PORT1

CRITICAL
L4310 FERR-250-OHM SM

Note: Trace PPVP_FW_PORT1 must handle up to 5A

PPVP_FW_PORT1_F (MIN_LINE_WIDTH=0.5 mm, MIN_NECK_WIDTH=0.25 mm, VOLTAGE=33V)

C4314 0.01UF 10% 50V X7R 402

PORT 1

BILINGUAL

CRITICAL
J4310 1394B-M97 F-RT-TH

1	TPB-	TPB(R)	TPB-
9			TPB<R>
2	TPB+	VP	TPB+
8			VP
7	NC	SC/NC	NC
6			VG
3	TPA-	VG	TPA-
5			TPA<R>
4	TPA+	TPA(R)	TPA+
10			
11	CHASSIS GND		
12			
13			

OUTPUT
INPUT

(FW_PORT1_BREF)
(GND_FW_PORT1_VG)
FW_PORT1_AREF

514S0605

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

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

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

Late-VG Protection Power

8 =PP3V3_FW_LATEVG

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

PP2V4_FW_LATEVG (MIN_LINE_WIDTH=0.38 mm, MIN_NECK_WIDTH=0.25 mm, VOLTAGE=2.4V) 36 37

CRITICAL
D4390 MMBZ5227BLT1H SOT23

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

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

FireWire Ports

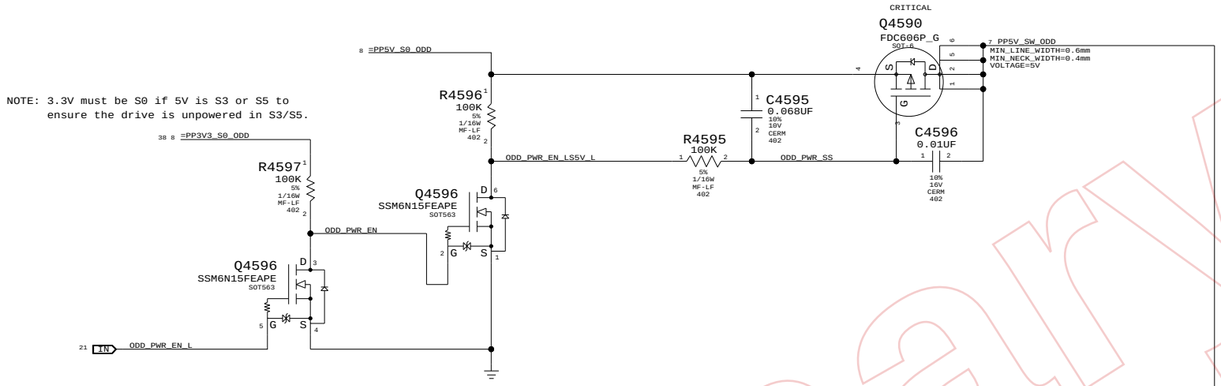
SYNC_MASTER=M98_MLB SYNC_DATE=07/14/2008

APPLE INC.

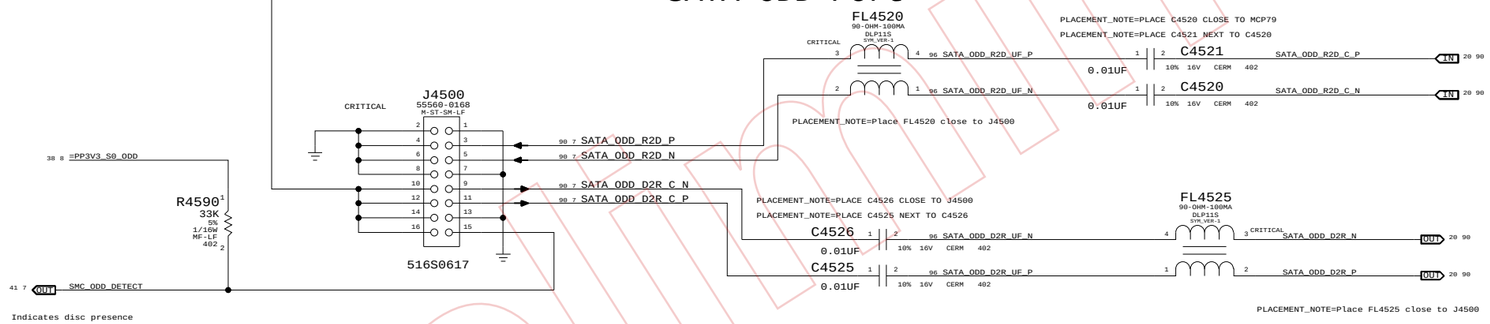
SIZE	DRAWING NUMBER	REV.
D	051-7656	31

SCALE: NONE SHT 43 OF 123

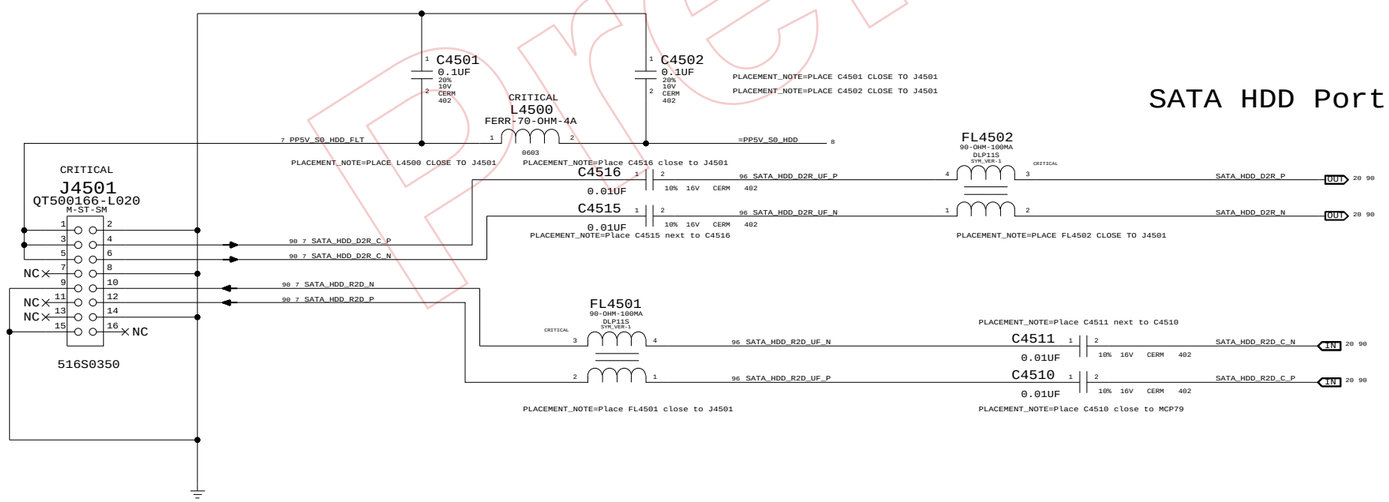
ODD Power Control



SATA ODD Port



SATA HDD Port



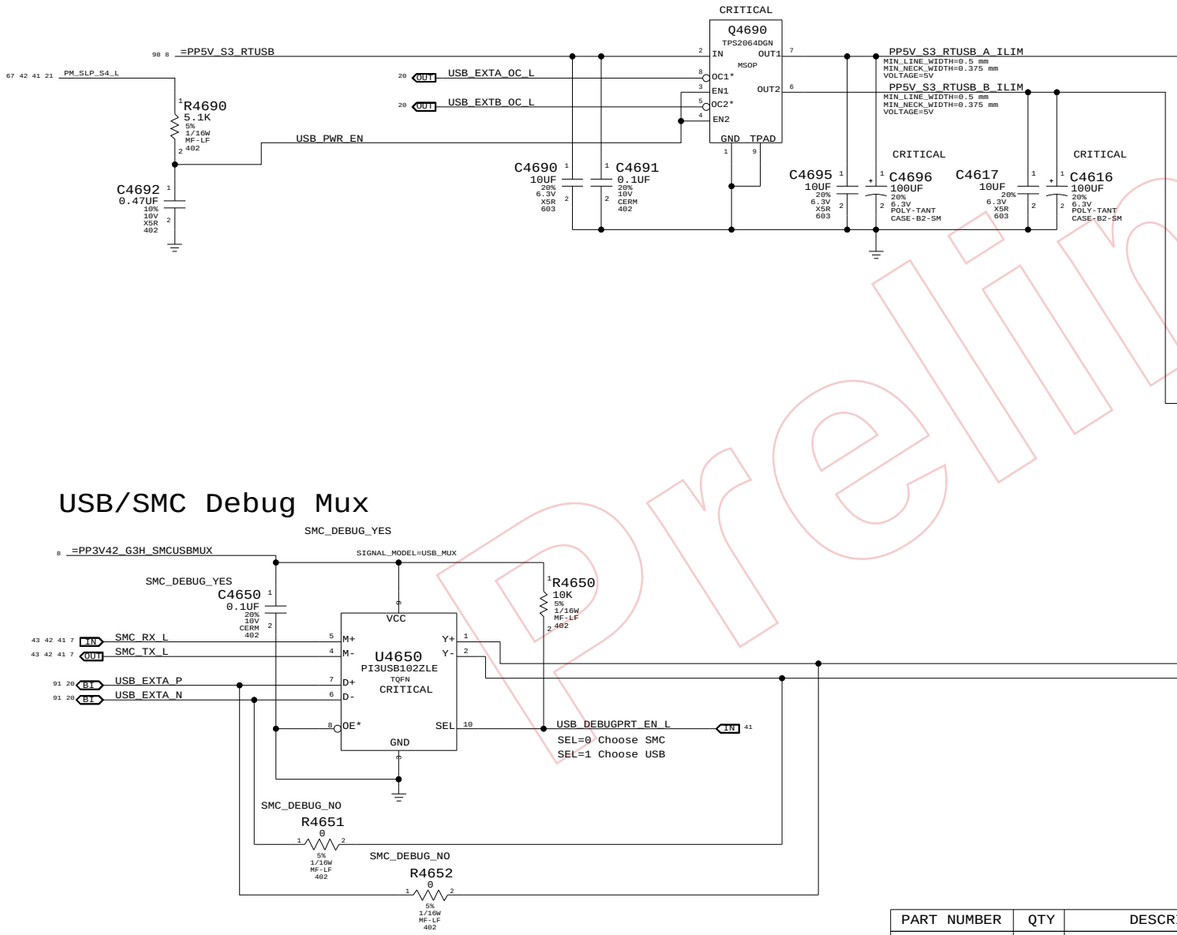
SATA Connectors

SYNC_MASTER=M98_MLB SYNC_DATE=05/01/2008

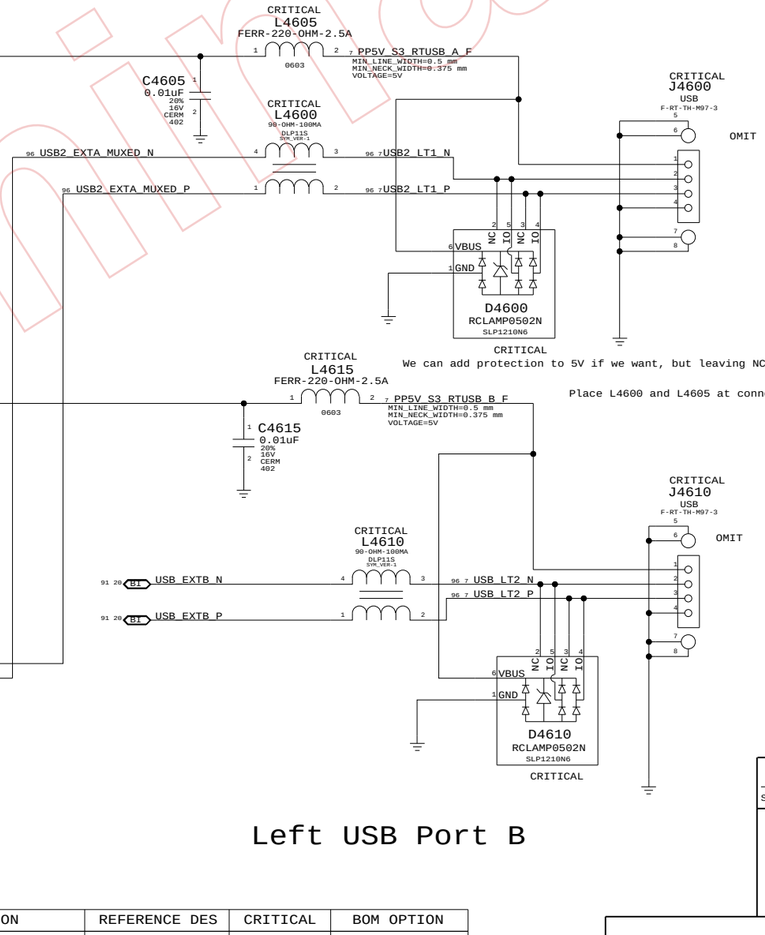
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 45 OF 123	

Port Power Switch



Left USB Port A



USB/SMC Debug Mux

Left USB Port B

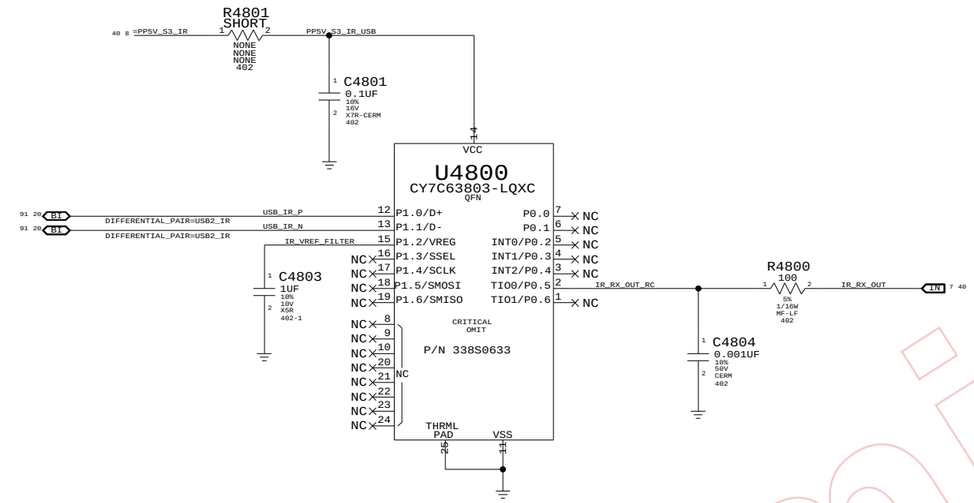
PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
514-0638	2	CONN,RCPT,USB,HB,4P	J4600, J4610	CRITICAL	

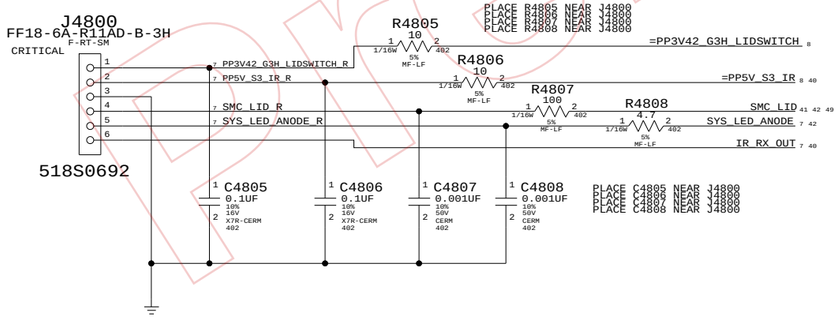
External USB Connectors

SYNC_MASTER=M98_MLB SYNC_DATE=07/14/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 46 OF 123	





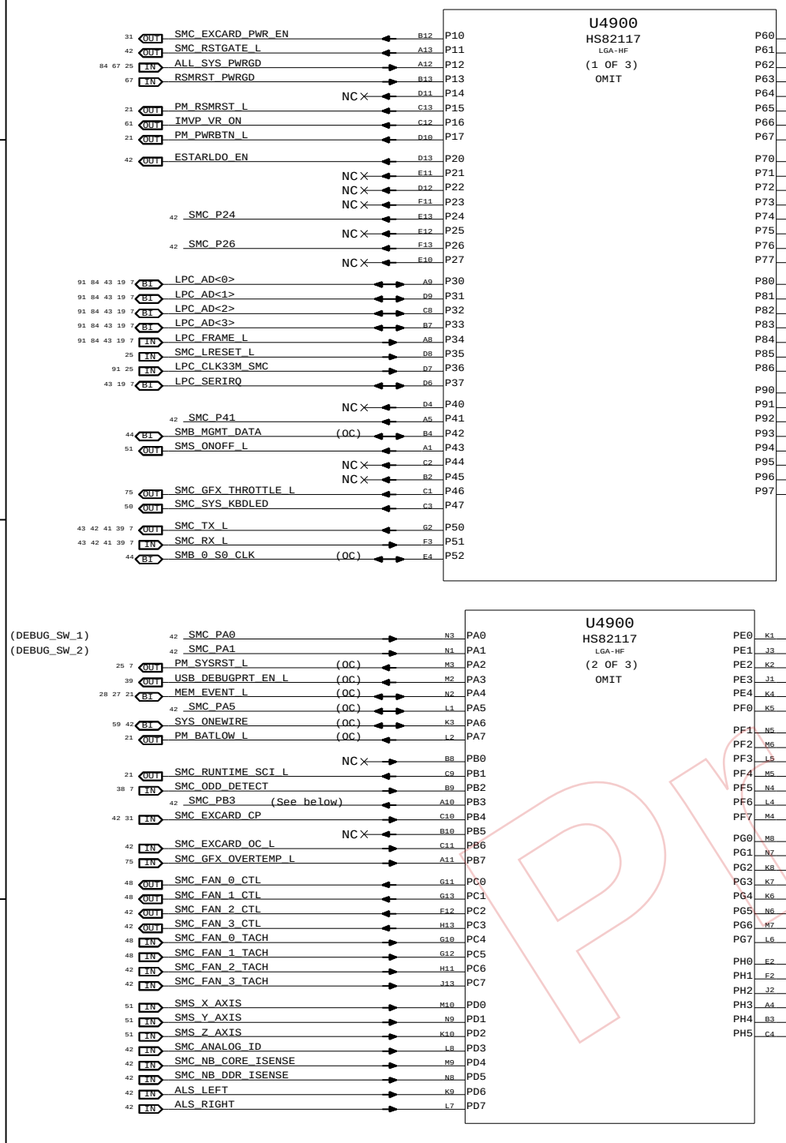
Front Flex Support

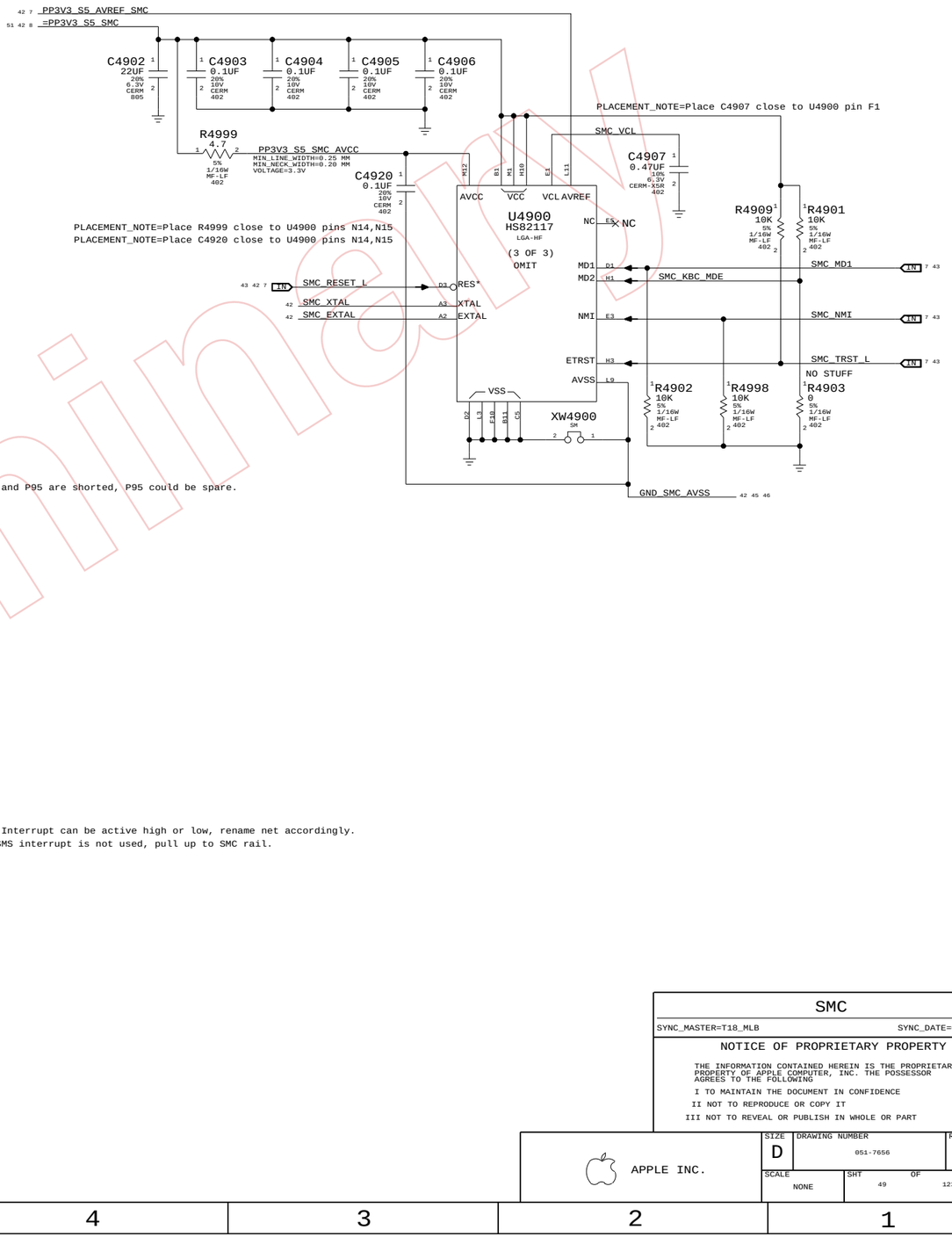
SYNC_MASTER=CHANG_K20 SYNC_DATE=07/18/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE	SHT	OF
NONE	48	123

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





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

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

SMC_PB3:

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

SMC

SYNC_MASTER=T18_MLB SYNC_DATE=06/06/2008

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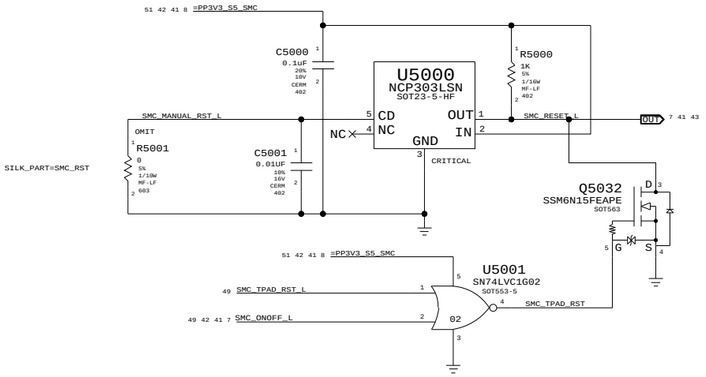
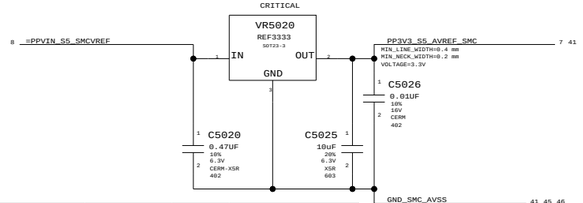
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE	SHT	OF
NONE	49	123

SMC Reset "Button" / Brownout Detect

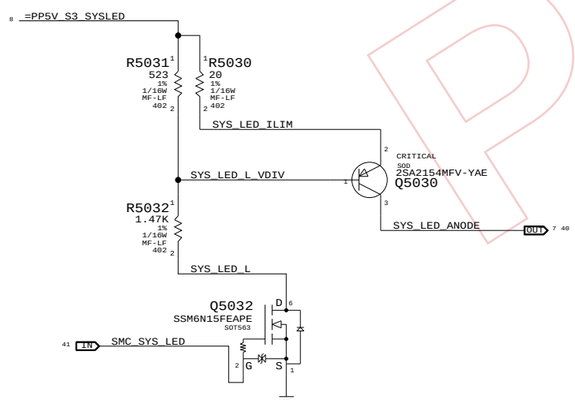


SMC AVREF Supply



PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
353S1381	353S1912		ALL	Intersil ISL60002-33

System (Sleep) LED Circuit



41 SMC_FAN_2_CTL — NC_SMC_FAN_2_CTL 7 (MAKE_BASE=TRUE)
41 SMC_FAN_2_TACH — NC_SMC_FAN_2_TACH 7 (MAKE_BASE=TRUE)
41 SMC_FAN_3_CTL — NC_SMC_FAN_3_CTL 7 (MAKE_BASE=TRUE)
41 SMC_FAN_3_TACH — NC_SMC_FAN_3_TACH 7 (MAKE_BASE=TRUE)

41 ESTARLDO_EN — NC_ESTARLDO_EN 7 (MAKE_BASE=TRUE)

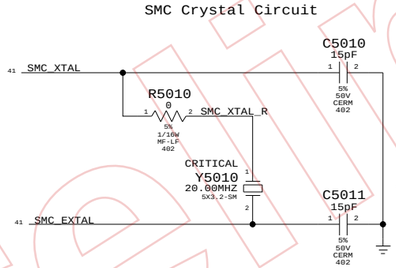
59 42 41 SMC_BC_ACOK (MAKE_BASE=TRUE) — =CHGR_ACOK 60
41 ALS_LEFT — SMC_MCP_VSENSE 45 (MAKE_BASE=TRUE)
41 ALS_RIGHT — SMC_CPU_HI_ISENSE 45 (MAKE_BASE=TRUE)
41 SMC_NB_CORE_ISENSE — SMC_MCP_CORE_ISENSE 46 (MAKE_BASE=TRUE)
41 SMC_NB_DDR_ISENSE — SMC_MCP_DDR_ISENSE 46 (MAKE_BASE=TRUE)
41 SMC_NB_MISC_ISENSE — SMC_CPU_FSB_ISENSE 46 (MAKE_BASE=TRUE)
41 SMC_ANALOG_ID — SMC_GPU_1V8_ISENSE 46 (MAKE_BASE=TRUE)

41 SMC_P24 — TP_SMC_P24 (MAKE_BASE=TRUE)
41 SMC_P26 — SMC_BMON_MUX_SEL 45 (MAKE_BASE=TRUE)
41 SMC_P41 — TP_SMC_P41 7 (MAKE_BASE=TRUE)
41 ALS_GAIN — NC_ALS_GAIN 7 (MAKE_BASE=TRUE)
41 SMC_PB3 — SMC_IG_THROTTLE_L 21 (MAKE_BASE=TRUE)
41 SMC_RSTGATE_L — TP_SMC_RSTGATE_L (MAKE_BASE=TRUE)

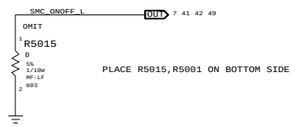
R5095 0 5% 1/16W MF-LF 402
41 OUT SMC_EXCARD_OC_L — EXCARD_OC_L IN 20 31

51 SMS_INT_L (MAKE_BASE=TRUE) — =SMC_SMS_INT 41

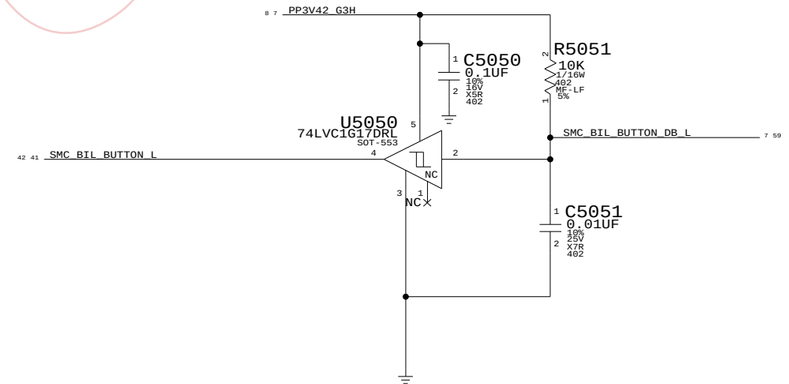
SMC Crystal Circuit



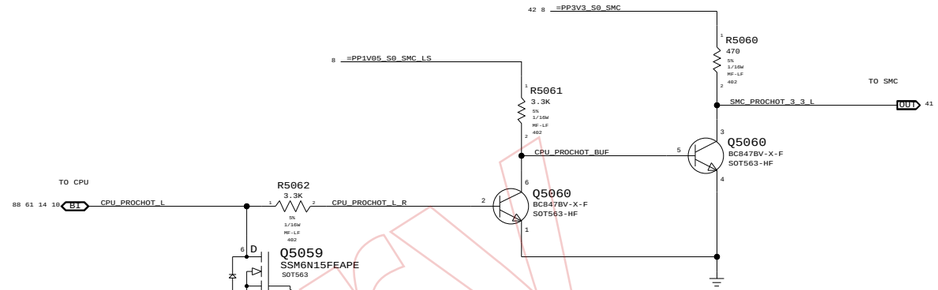
Debug Power "Button"

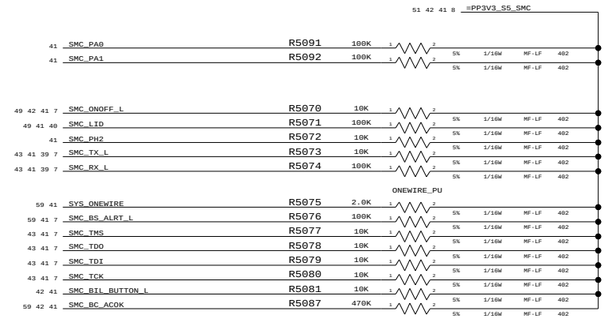


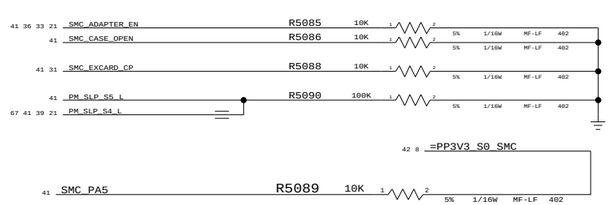
PLACE R5015,R5001 ON BOTTOM SIDE



SMC FSB to 3.3V Level Shifting







SMC Support

SYNC_MASTER=M98_MLB SYNC_DATE=05/01/2008

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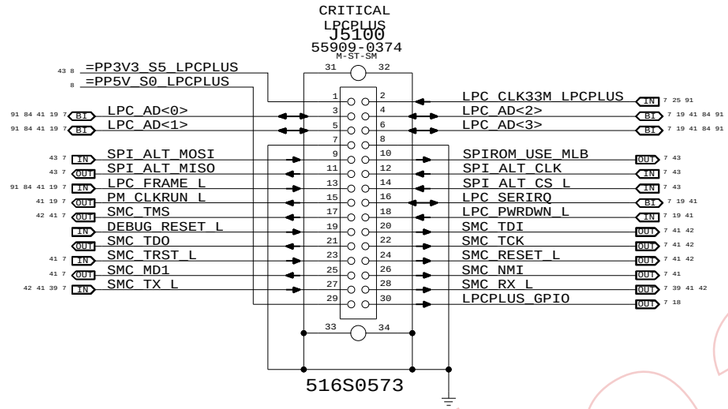
APPLE INC.

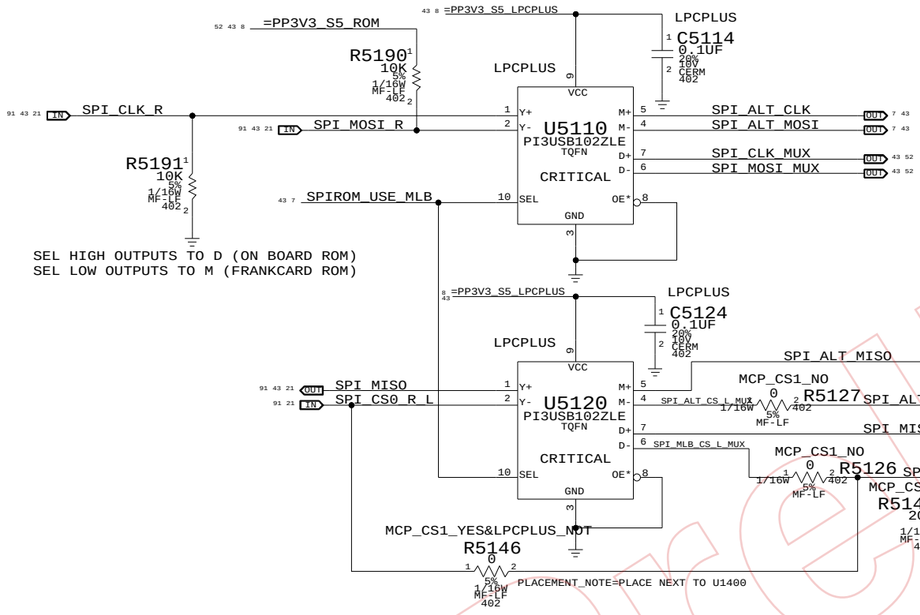
SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 50 OF 123	

LPC+SPI Connector



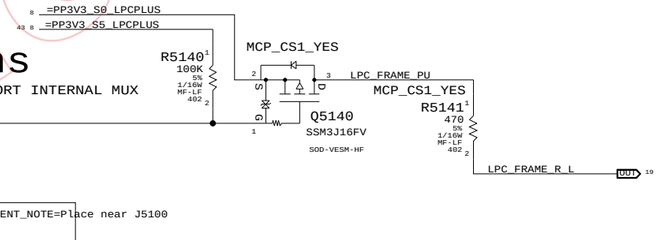
Alternate SPI ROM Support

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



MCP79 Internal SPI MUX Support

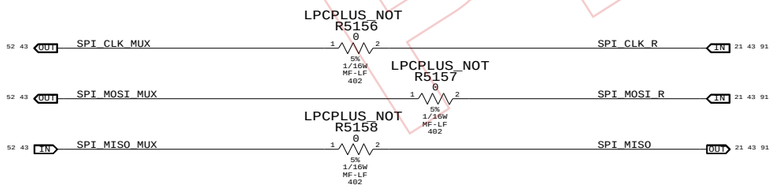
NOT SUPPORTED IN REV A01 OR B01 MCP79 SILICON



MCP SPI Override Options

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

SPI MUX BYPASS



LPC+SPI Debug Connector

SYNC_MASTER=CHANG_K20 SYNC_DATE=05/28/2008

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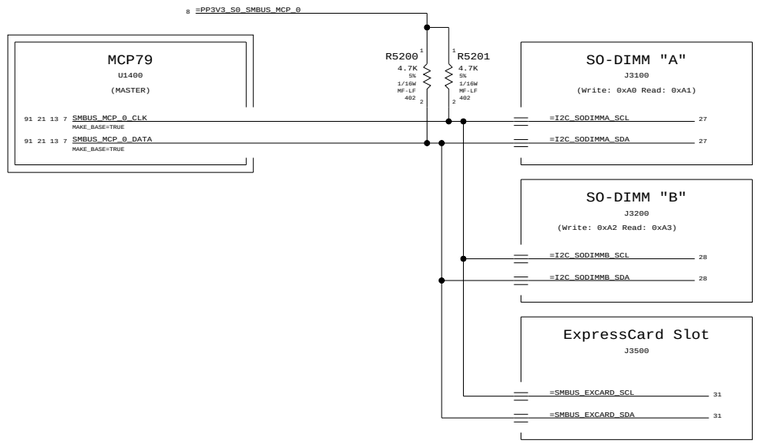
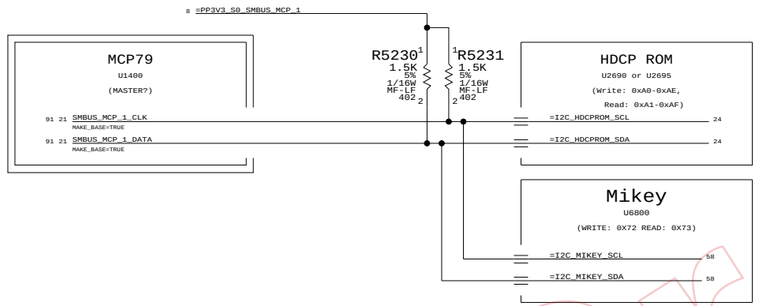
SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 51 OF 123	

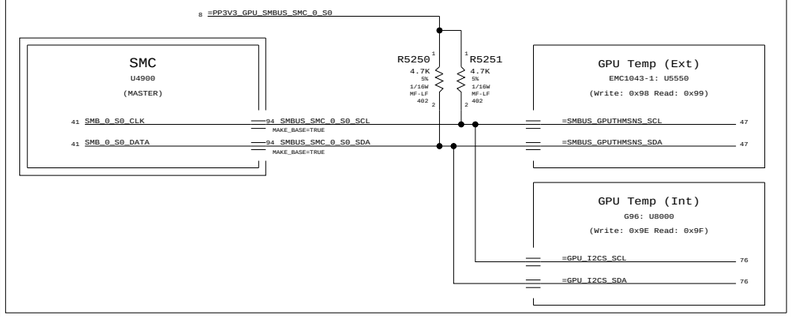
MCP79 SMBus "0" Connections



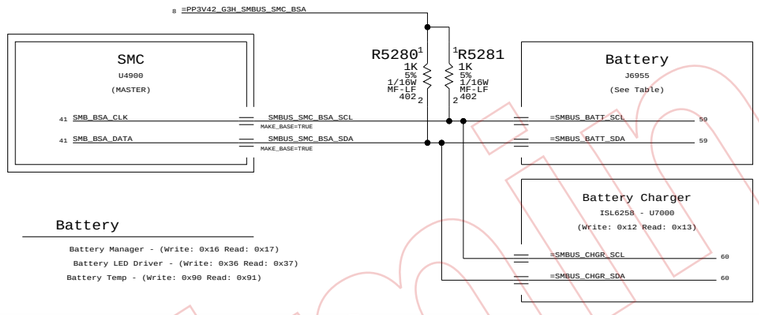
MCP79 SMBus "1" Connections



SMC "0" SMBus Connections

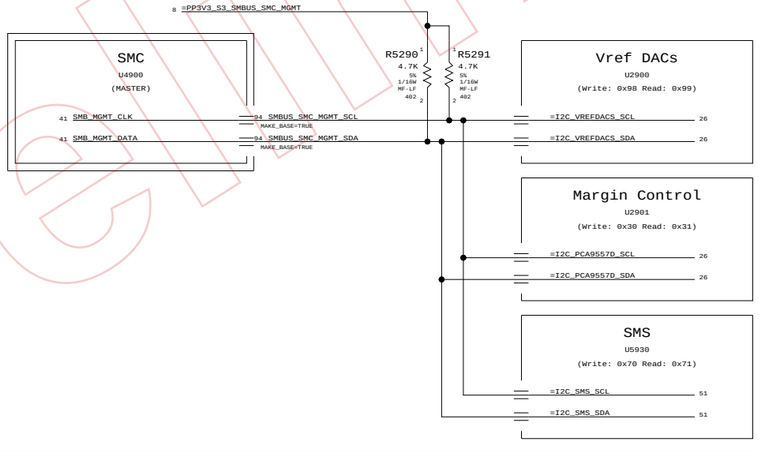


SMC "Battery A" SMBus Connections



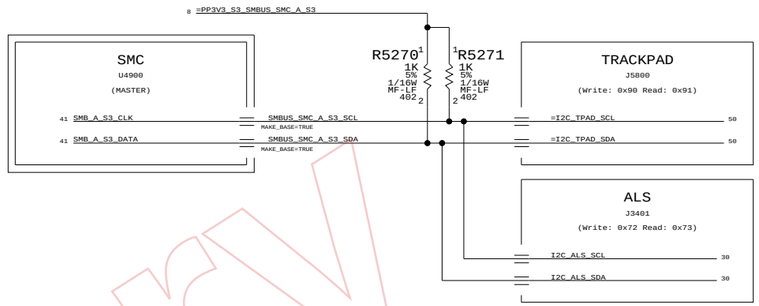
SMC "Management" SMBus Connections

The bus formerly known as "Battery B"

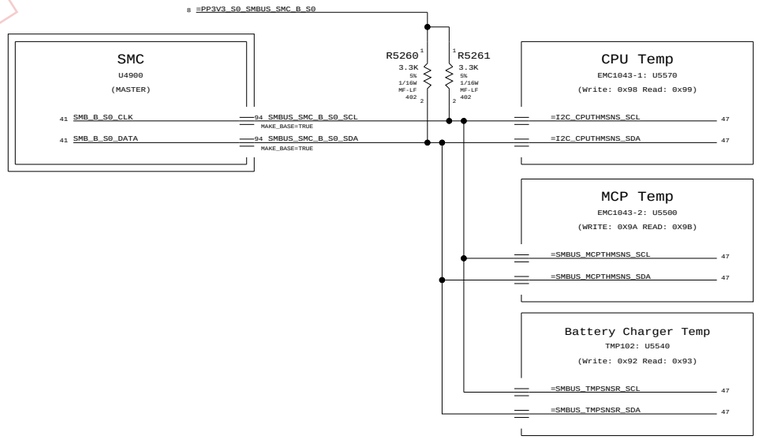


SMC "A" SMBus Connections

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



SMC "B" SMBus Connections



K20 SMBUS CONNECTIONS

SYNC_MASTER=BEN_K20 SYNC_DATE=07/22/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE	SHT	OF
NONE	52	123

CPU Voltage Sense / Filter

12 11 8 =PPVCORE_S0_CPU — XW5309 (SM) — CPUVSENSE_IN — R5309 4.53K 1% 1/16W MF-LF 402 — SMC_CPU_VSENSE OUT 41

Place short near U1000 center

C5309 0.22UF 20% 6.3V X5R 402 — GND_SMC_AVSS 41 42 45 46

Place RC close to SMC

GPU Voltage Sense / Filter

77 8 =PPVCORE_GPU_REG — XW5359 (SM) — GPUVSENSE_IN — R5359 4.53K 1% 1/16W MF-LF 402 — SMC_GPU_VSENSE OUT 41

Place short near U8000 center

C5359 0.22UF 20% 6.3V X5R 402 — GND_SMC_AVSS 41 42 45 46

Place RC close to SMC

MCP Voltage Sense / Filter

23 22 8 =PPVCORE_S0_MCP — XW5399 (SM) — MCPVSENSE_IN — R5399 4.53K 1% 1/16W MF-LF 402 — SMC_MCP_VSENSE OUT 42

PLACEMENT_NOTE=Place near U1400 center

C5399 0.22UF 20% 6.3V X5R 402 — GND_SMC_AVSS 41 42 45 46

Place RC close to SMC

PBUS Voltage Sense & Filter

Q5315 FDG6332CG SC70-6 P-CHN

8 7 PPBUS_G3H — R5315 100K 1% 1/16W MF-LF 402 — PBUSVSENS_EN_DIV

PPBUS_G3H_VSENSE
MIN_LINE_WIDTH=0.20 mm
MIN_NECK_WIDTH=0.20 mm
VOLTAGE=18.5V

R5385 12.7K 1% 1/16W MF-LF 402 — SMC_PBUS_VSENSE OUT 41

Rthevenin = 4504 ohms

R5316 100K 5% 1/16W MF-LF 402 — PBUSVSENS_EN_L

R5386 6.98K 1% 1/16W MF-LF 402 — C5385 0.22UF 20% 6.3V X5R 402 — GND_SMC_AVSS 41 42 45 46

Place RC close to SMC

Q5315 FDG6332CG SC70-6 N-CHN

67 PBUSVSENS_EN — Enables PBUS VSense divider when high.

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

8 =PP3V42_G3H_BMON_ISNS

REGULATOR SIDE:

C5318 0.1UF 20% 10V CERM 402 — BMON_ENG

U5303 INA214 SC70 — V+ — IN- — IN+ — OUT — REF — GND

96 60 CHGR_CSO_R_P (OUT) — 96 60 CHGR_CSO_R_N (IN)

LOAD SIDE:

Monitors battery discharge current from battery to PBUS

BMON_INA_OUT

U5313 NC7SB3157P6X SC70 — VER 1

SMC_BMON_MUX_SEL (IN 42)

60 CHGR_BMON (IN)

BMON_PROD R5330 0 5% 1/16W MF-LF 402

BMON_ENG R5371 100K 5% 1/16W MF-LF 402

BMON_AMUX_OUT — R5391 4.53K 1% 1/16W MF-LF 402 — SMC_BATT_ISENSE OUT 41

C5390 0.22UF 20% 6.3V X5R 402 — GND_SMC_AVSS 41 42 45 46

BMON_ENG C5369 0.1uF 20% 10V CERM 402

INA214 has gain of 100V/V
U5303 only senses current up to 6.6A

DCIN Current Sense Filter

Place RC close to SMC

60 CHGR_AMON (IN) — R5380 4.53K 1% 1/16W MF-LF 402 — SMC_DCIN_ISENSE OUT 41

C5380 0.22UF 20% 6.3V X5R 402 — GND_SMC_AVSS 41 42 45 46

CPU VCore High Side Current Sensor

8 =PP3V42_G3H_CPUCOREISNS — C5388 0.1UF 20% 10V CERM 402

8 (OUT) =PPVIN_S5_CPU_IMVP_ISNS — R5388 0.001 1% 1W MF 1206 — 96 ISNS_CPU_N — 96 ISNS_CPU_P

8 (IN) =PPVIN_S5_CPU_IMVP_ISNS_R

U5388 INA210 SC70 — V+ — IN- — IN+ — OUT — REF — GND

CPUVCORE_HISIDE_IOUT — R5335 4.53K 1% 1/16W MF-LF 402 — SMC_CPU_HI_ISENSE OUT 42

C5335 0.22UF 20% 6.3V X5R 402 — GND_SMC_AVSS 41 42 45 46

Place RC close to SMC

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

CPU VCore Load Side Current Sense / Filter

Place RC close to SMC

61 IMVP6_IMON (IN) — R5331 6.19K 1% 1/16W MF-LF 402 — SMC_CPU_ISENSE OUT 41

R5332 17.4K 1% 1/16W MF-LF 402 — C5330 0.22UF 20% 6.3V X5R 402 — GND_SMC_AVSS 41 42 45 46

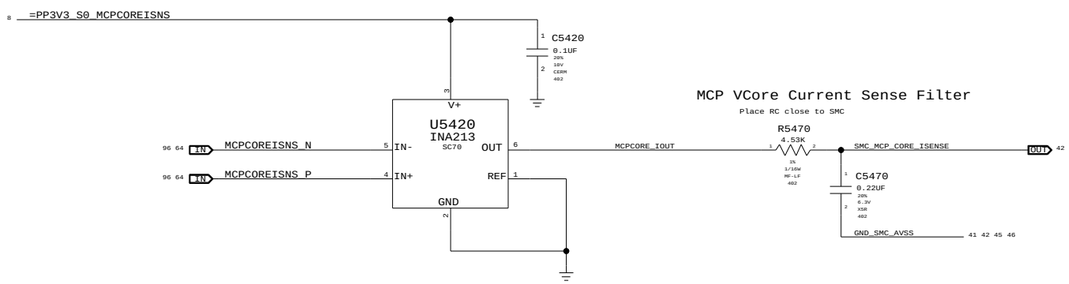
Current & Voltage Sensing

SYNC_MASTER=YWU_K20 SYNC_DATE=08/20/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT: 53	OF: 123

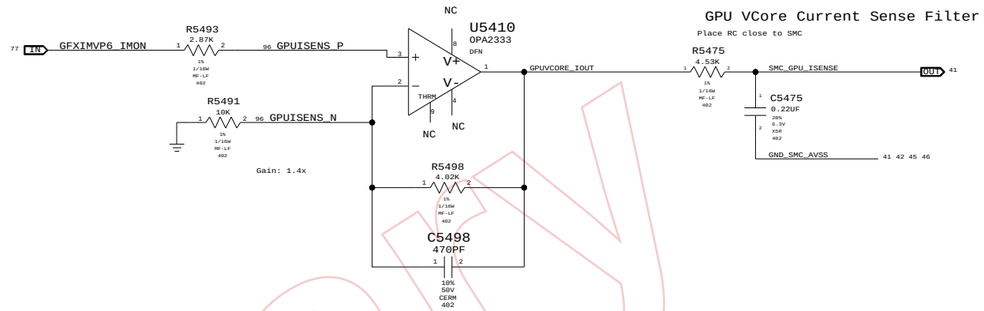
MCP VCore Current Sense



MCP VCore Current Sense Filter

Place RC close to SMC

GPU VCore Current Sense

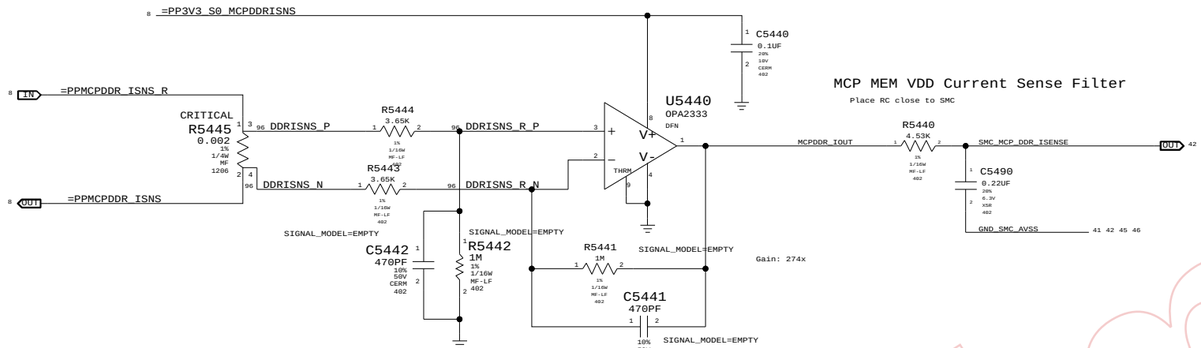


GPU VCore Current Sense Filter

Place RC close to SMC

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

MCP MEM VDD Current Sense



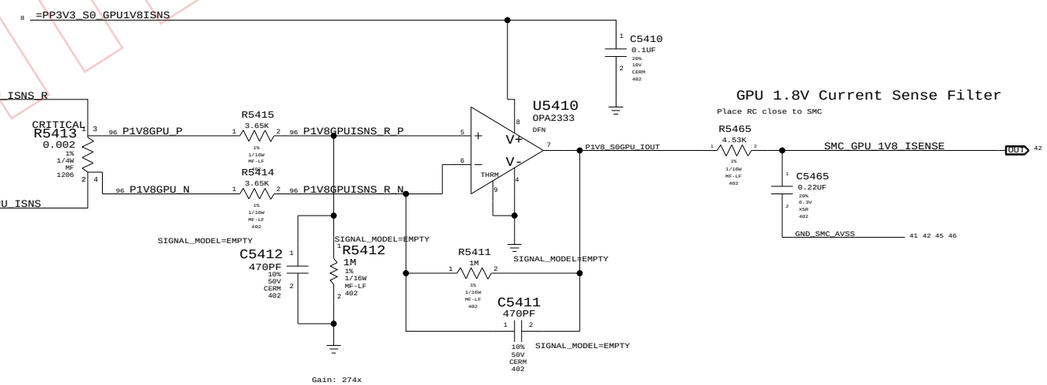
MCP MEM VDD Current Sense Filter

Place RC close to SMC

OPA2333s for proto are placeholders for OPA2330

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

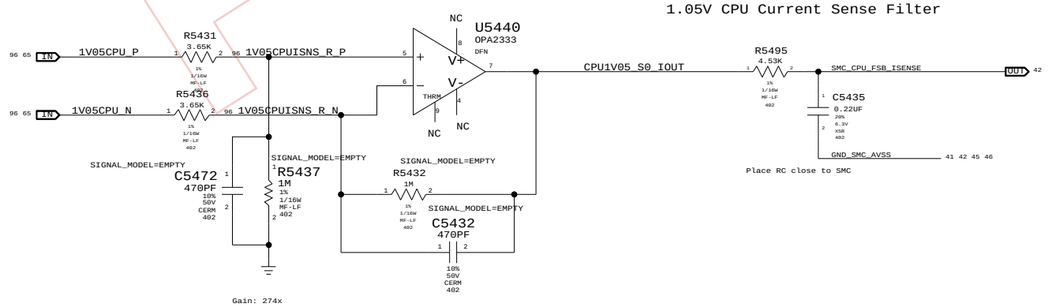
GPU 1.8V Current Sense



GPU 1.8V Current Sense Filter

Place RC close to SMC

CPU FSB 1.05V Current Sense



1.05V CPU Current Sense Filter

Place RC close to SMC

Current Sensing

SYNC_MASTER=YWU_K20 SYNC_DATE=08/12/2008

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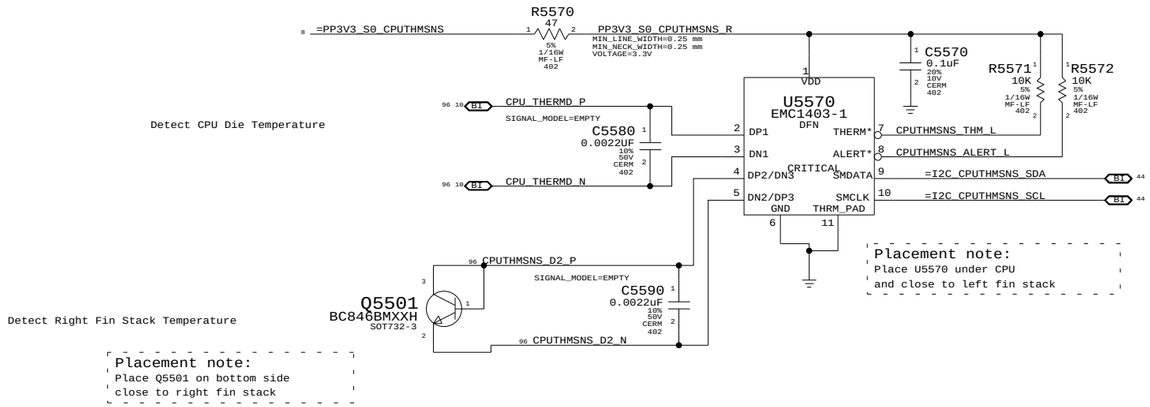
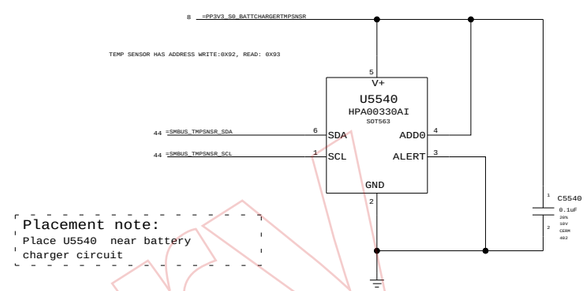
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE	SHT	OF
NONE	54	123

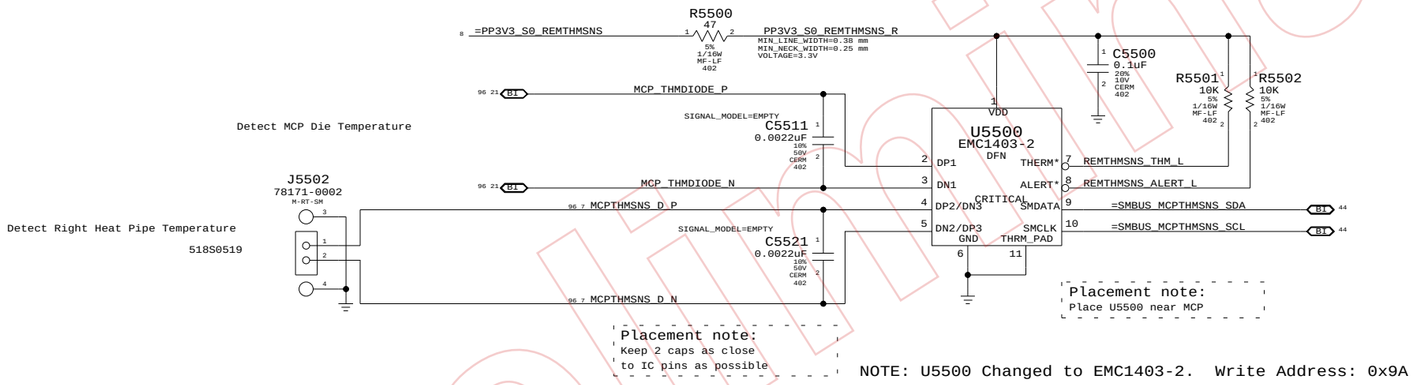
CPU Proximity/CPU Die/Right Fin Stack



Battery Charger Proximity



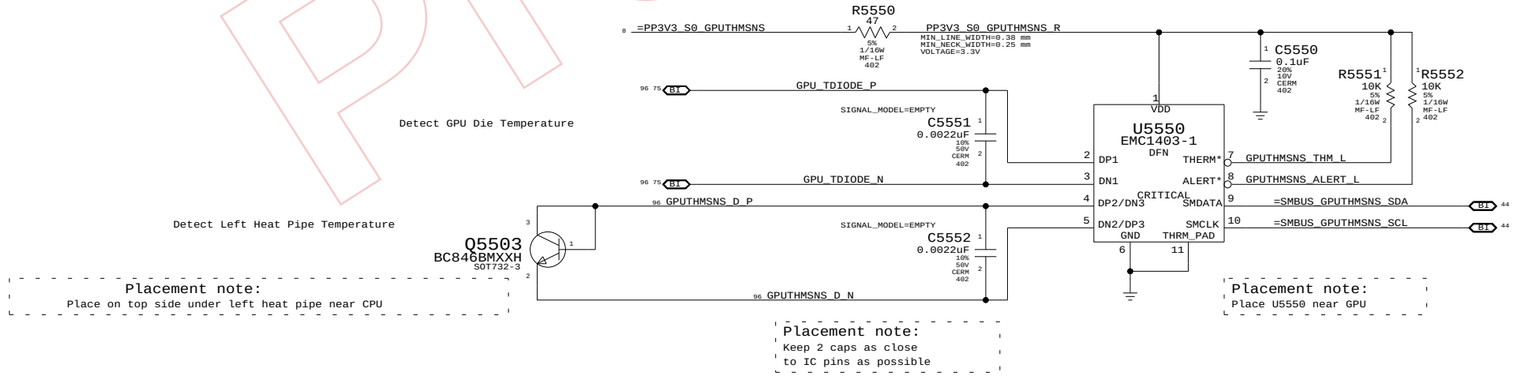
MCP Proximity/MCP Die/Right Heat Pipe



NOTE: U5500 Changed to EMC1403-2. Write Address: 0x9A

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

GPU Proximity/GPU Die/Left Heat Pipe



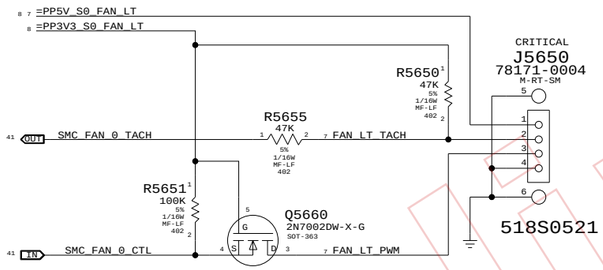
Thermal Sensors

SYNC_MASTER=YWU_K20 SYNC_DATE=05/28/2008

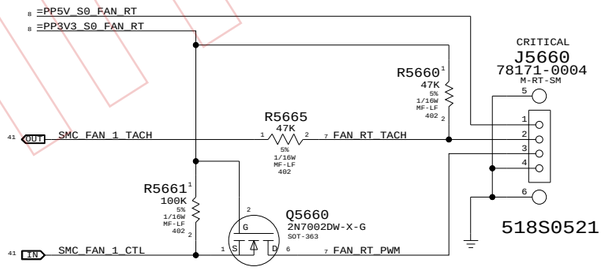
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 55 OF 123	

Left Fan



Right Fan



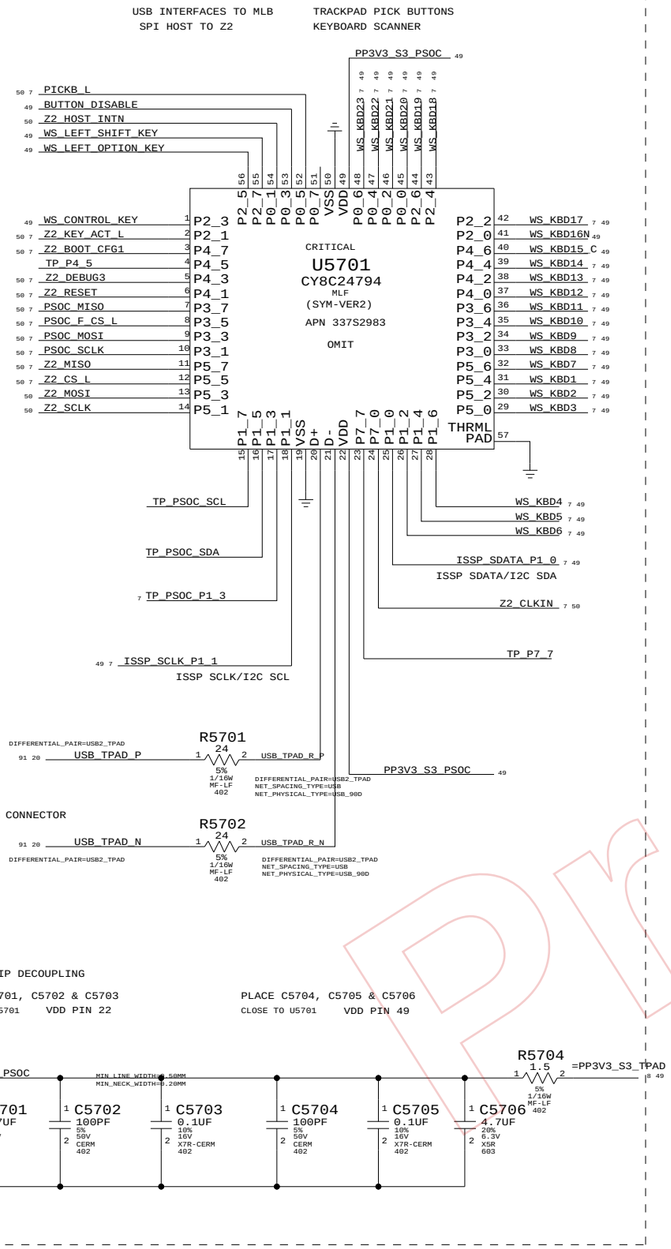
Fan Connectors

SYNC_MASTER=M98_MLB SYNC_DATE=04/01/2008

APPLE INC.

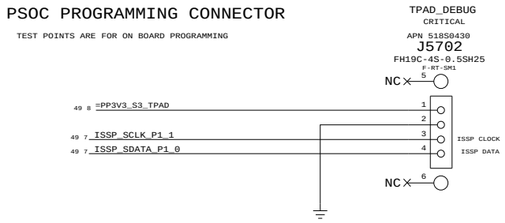
SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE	SHT	OF
NONE	56	123

PSOC USB CONTROLLER

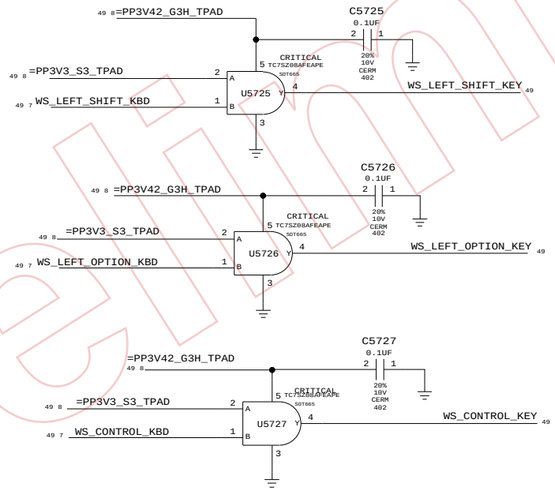


IC	PIN NAME	CURRENT	R_SNS	V_SNS	POWER
TMP102	V+	10UA	2.55 KOHM	0.0255 V	0.255E-6 W
		80UA		0.204 V	16.32E-6 W
3V3 LDO	VDD	60MA MAX	10 OHM	0.6 V	36E-3 W
	VOUT	60MA MAX	0.2 OHM	0.012 V	0.72E-3 W
PSOC	VDD	8MA (TYP)	1.5 OHM	0.012 V	96E-6 W
		14MA (MAX)		0.021 V	294E-6 W
18V BOOSTER	VIN	4MA (MAX)	4.7 OHM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

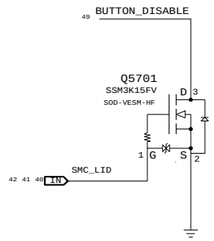
PSOC PROGRAMMING CONNECTOR



ISOLATION CIRCUIT



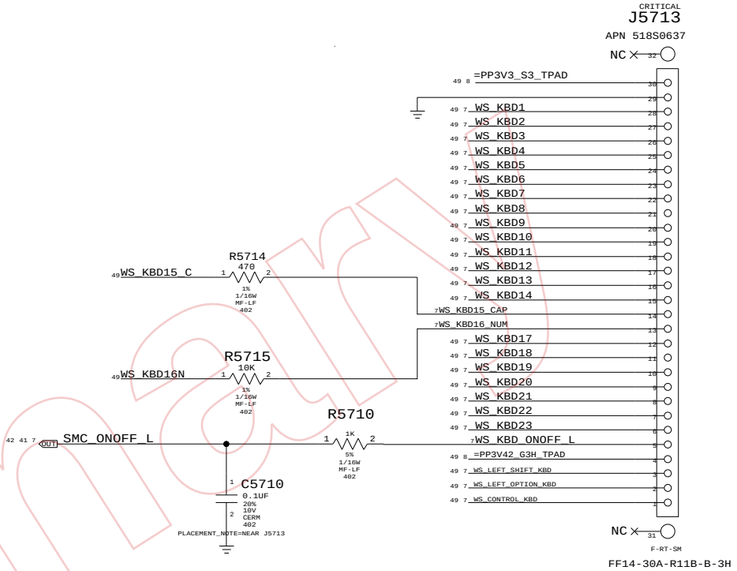
TPAD BUTTONS DISABLE



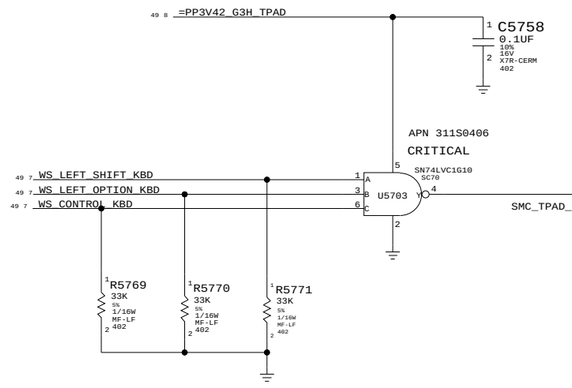
PLACE THESE COMPONENTS CLOSE TO J5800
THIS ASSUMES THERE'S A PP3V42_G3H PULL UP ON MLB

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

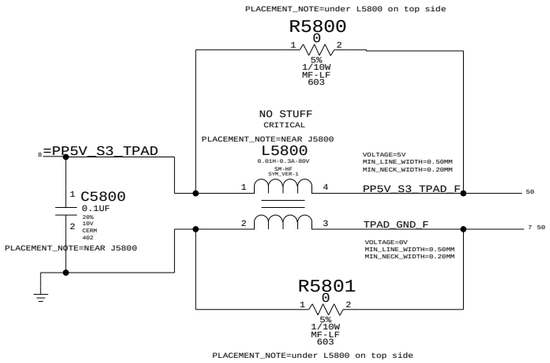


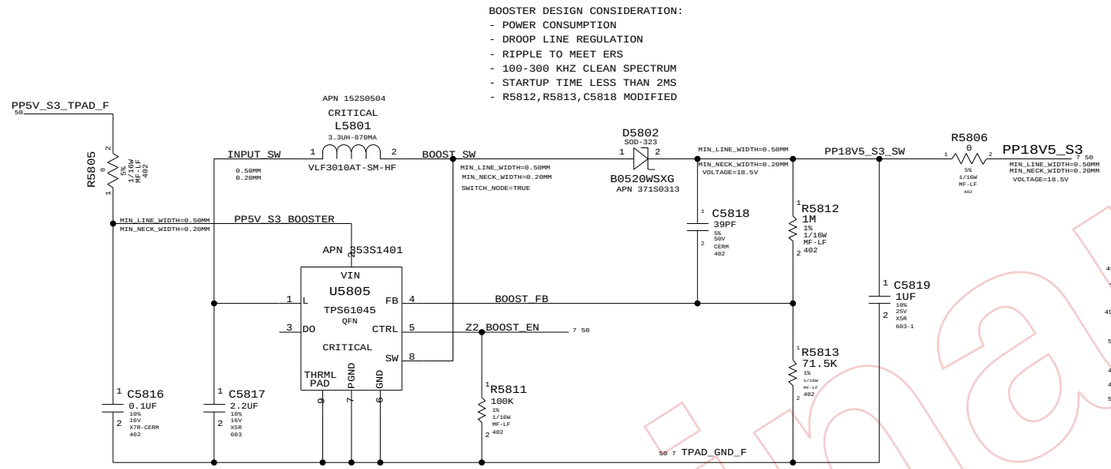
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE	SHT	OF
NONE	57	123

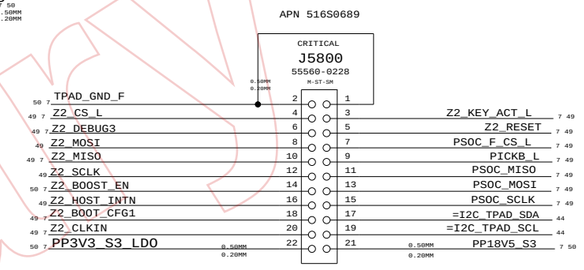
BOOSTER +18.5VDC FOR SENSORS

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

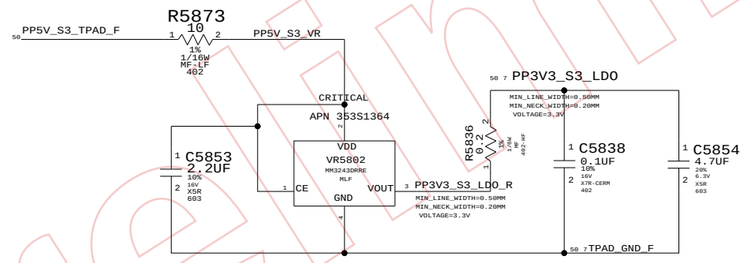




IPD FLEX CONNECTOR



3V3 LDO FOR IPD



Keyboard LED Driver

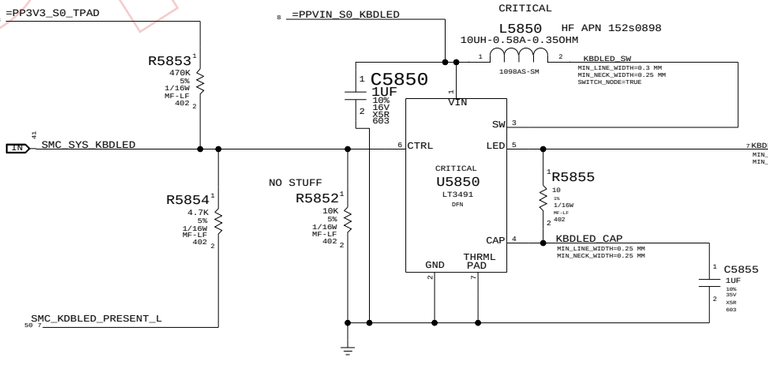
To detect Keyboard backlight, SMC will tristate SMC_SYS_KBDLED:

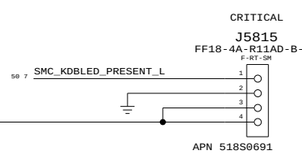
LOW = keyboard backlight present

HIGH= keyboard backlight not present

BOM OPTION: KBDLED_YES

R5853 ALWAYS PRESENT





J5815 pin 1 is grounded on keyboard backlight flex

KBD BACKLIGHT CONNECTOR

WELLSPRING 2

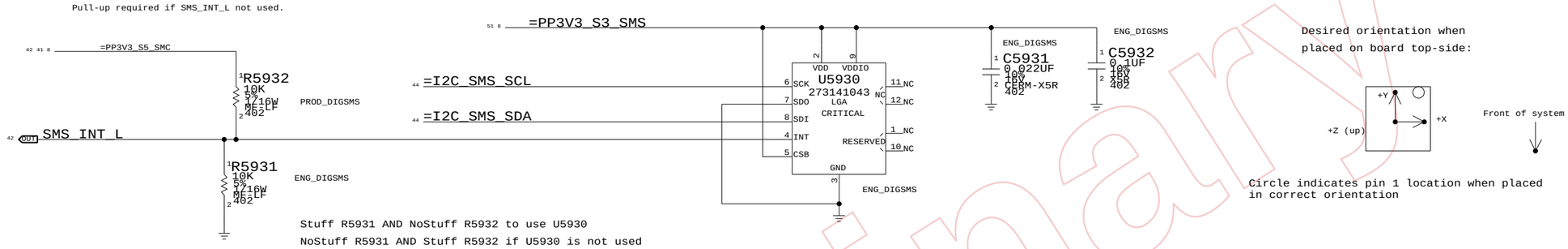
SYNC_MASTER=K20_MLB SYNC_DATE=09/24/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE	SHT	OF
NONE	58	123

Digital SMS

Pull-up required if SMS_INT_L not used.

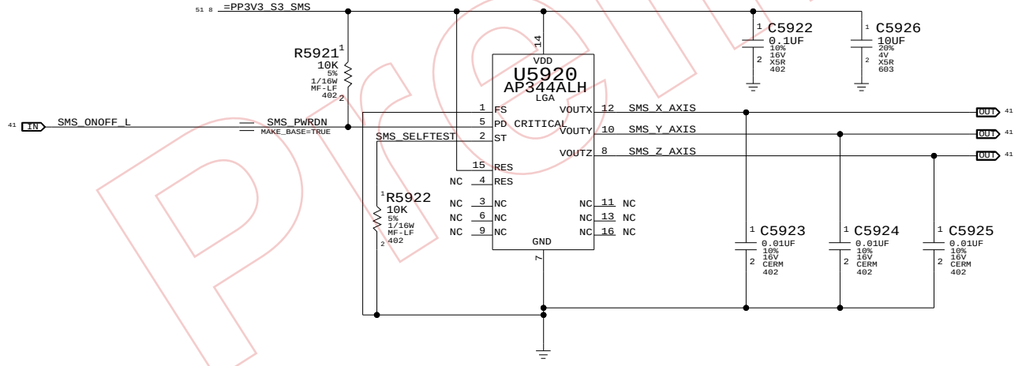


Desired orientation when placed on board top-side:

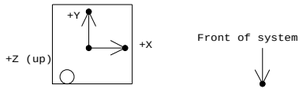
Circle indicates pin 1 location when placed in correct orientation

Analog SMS

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



Desired orientation when placed on board top-side:



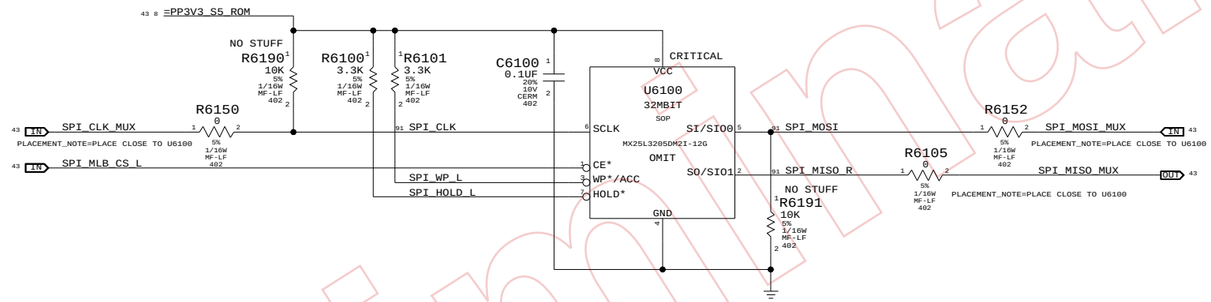
Circle indicates pin 1 location when placed in correct orientation

Sudden Motion Sensor (SMS)

SYNC_MASTER=YWU_K20 SYNC_DATE=06/17/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 59 OF 123	



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=M98_MLB SYNC_DATE=05/01/2008

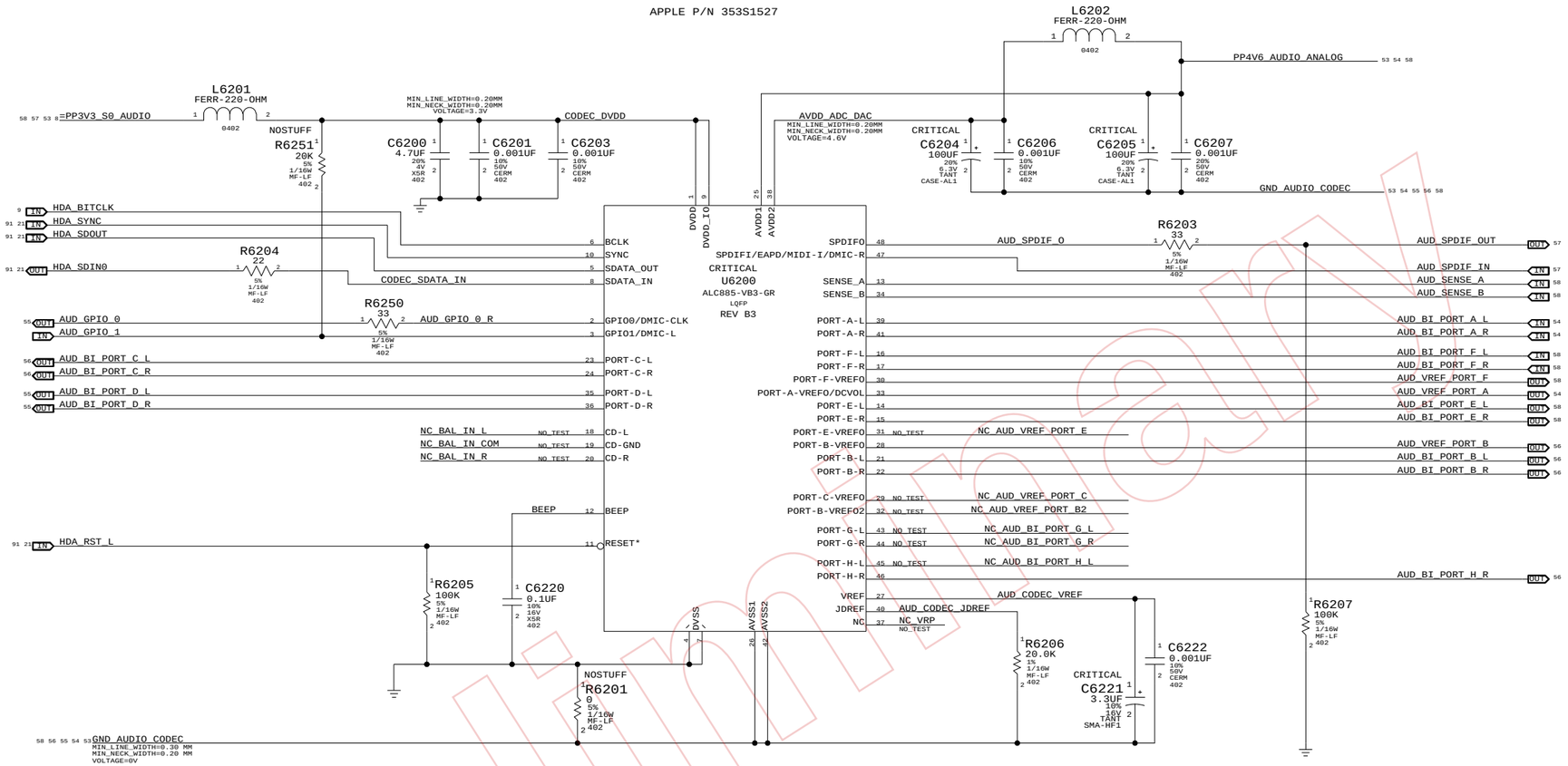
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31

SCALE	SHT	OF
NONE	61	123

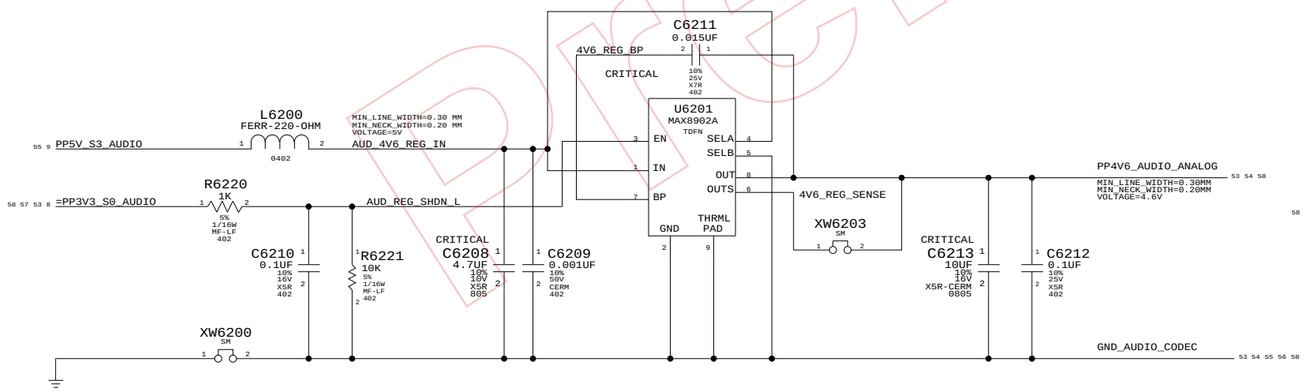
AUDIO CODEC

APPLE P/N 353S1527



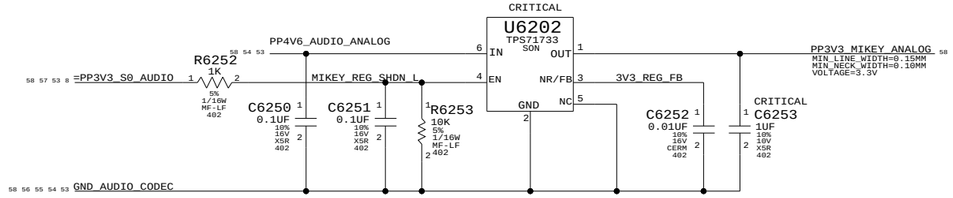
AUDIO 4.6 V REGULATOR

APPLE P/N 353S1897



MIKEY 3.3 V REGULATOR

APPLE P/N 353S1860



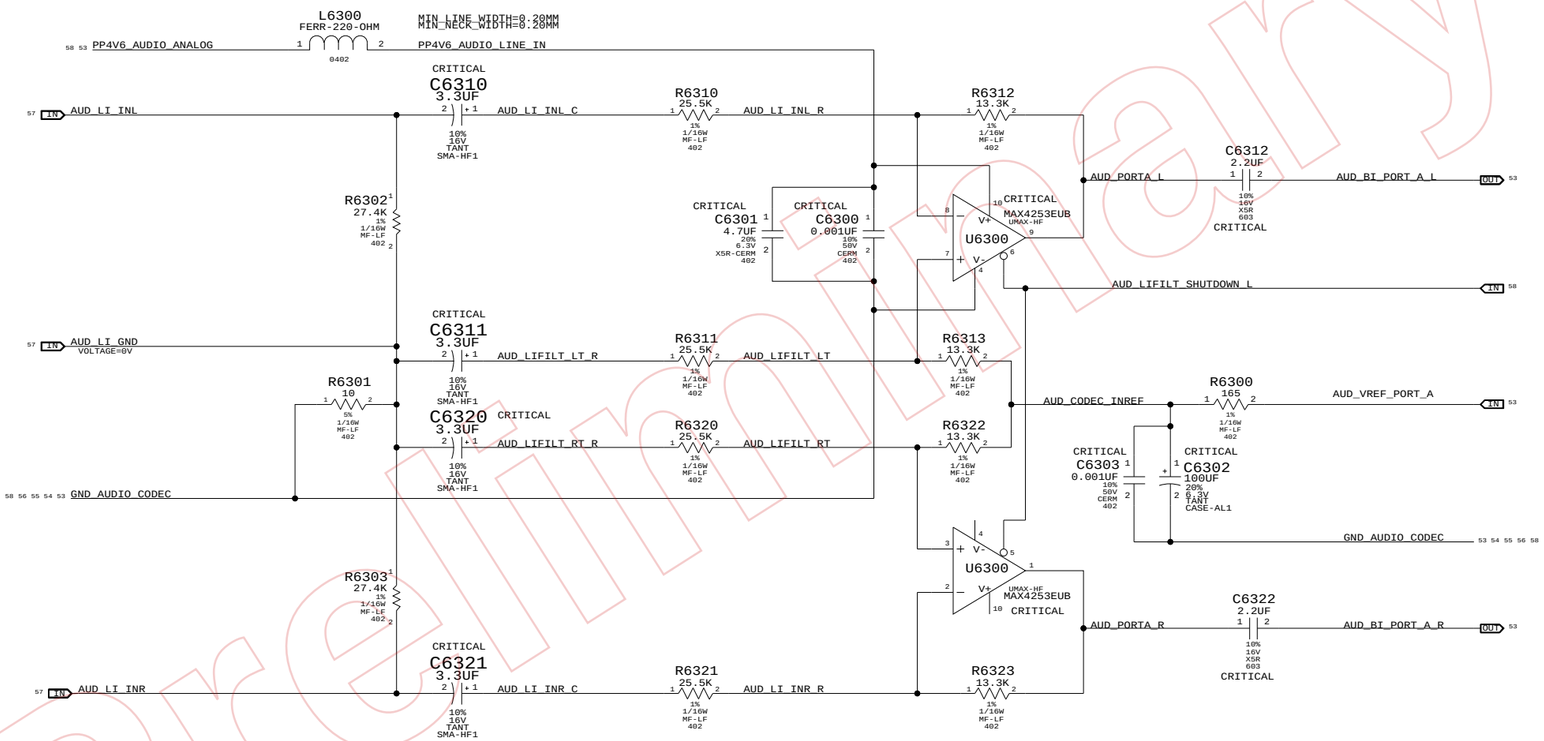
AUDIO:CODEC

SYNC_MASTER=AUDIO_K20 SYNC_DATE=09/29/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 62 OF 123	

Pseudo-Diff Line-In Filter
GAIN = -5.4 DB AV = 0.52
FC = 1.89 HZ



AUDIO: LINE IN

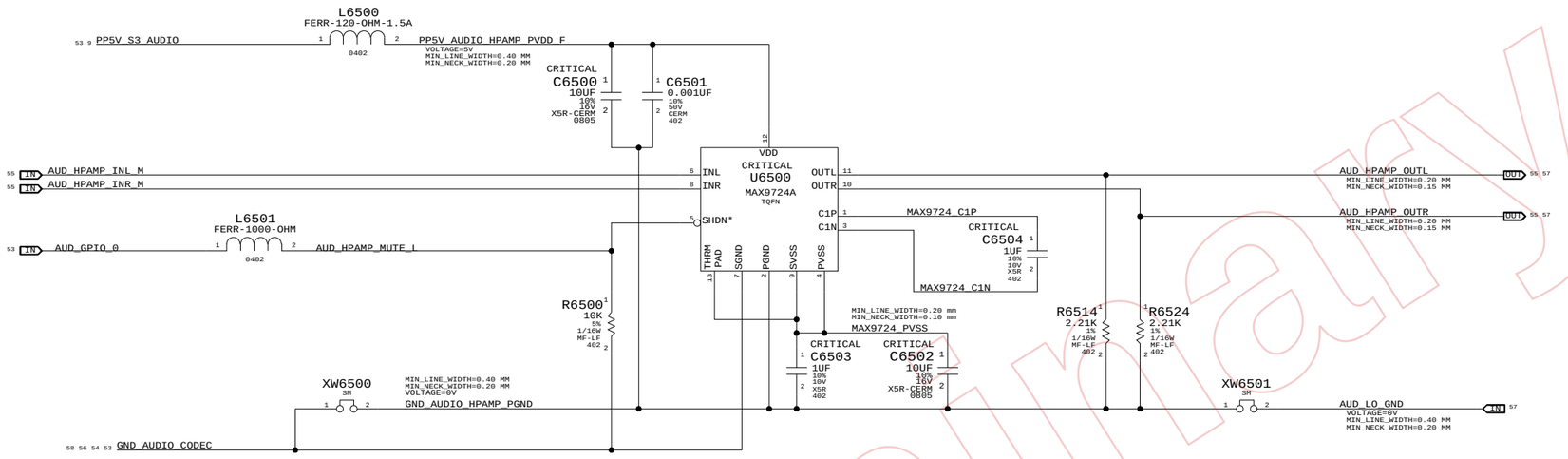
SYNC_MASTER=AUDIO_K20 SYNC_DATE=09/29/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 63 OF 123	

Headphone Amplifier (MAX9724A)

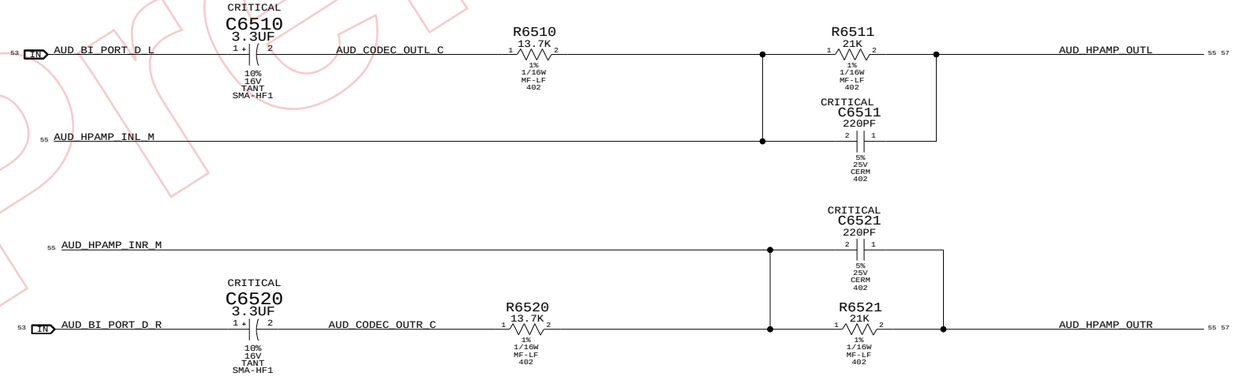
APN:353S1637



1st Order DAC Filter

HP:3.52 HZ LP:34 KHZ

VOLTAGE GAIN:1.53



AUDIO: HEADPHONE AMP

SYNC_MASTER=AUDIO_K20 SYNC_DATE=09/29/2008

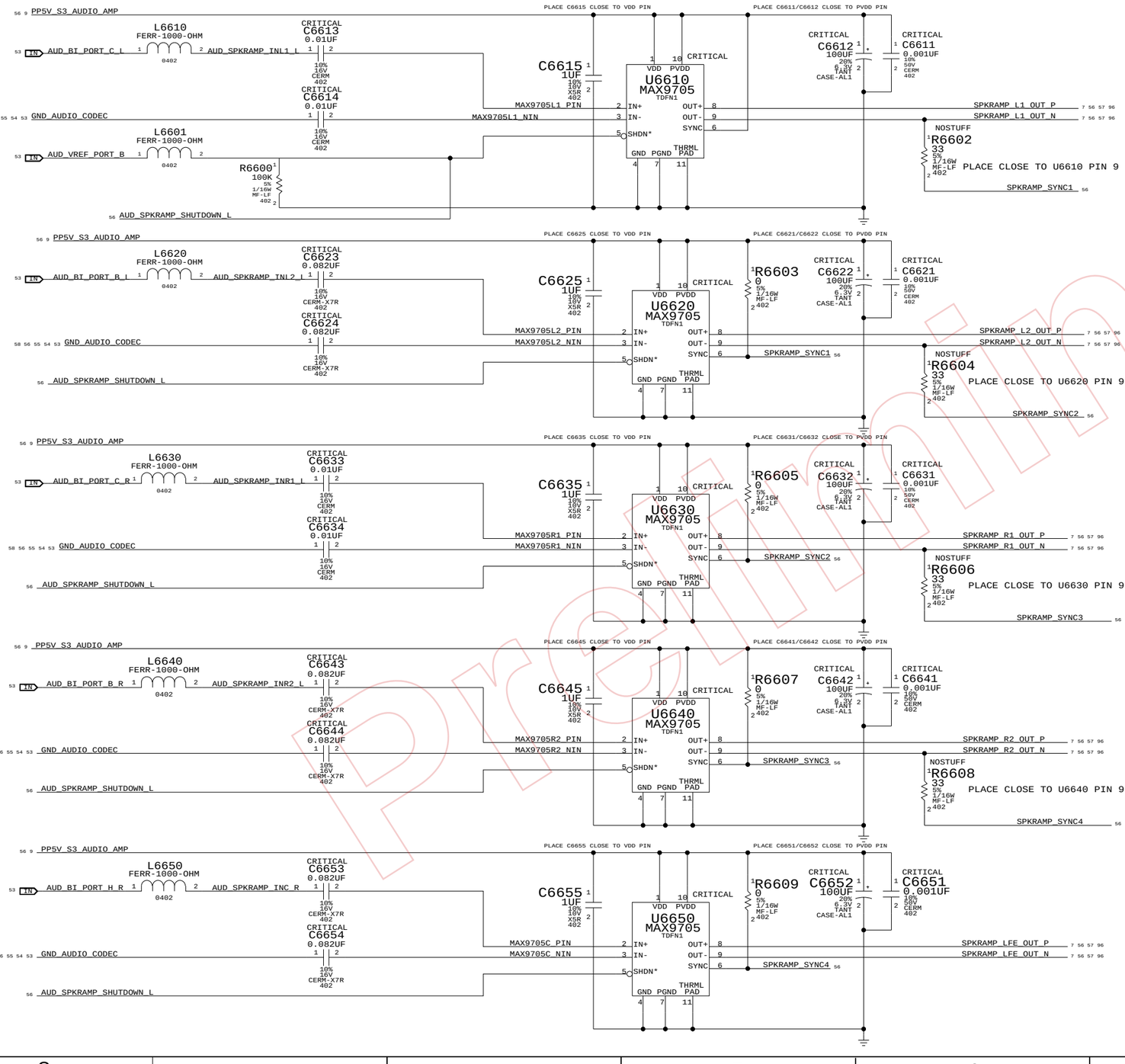
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 65 OF 123	

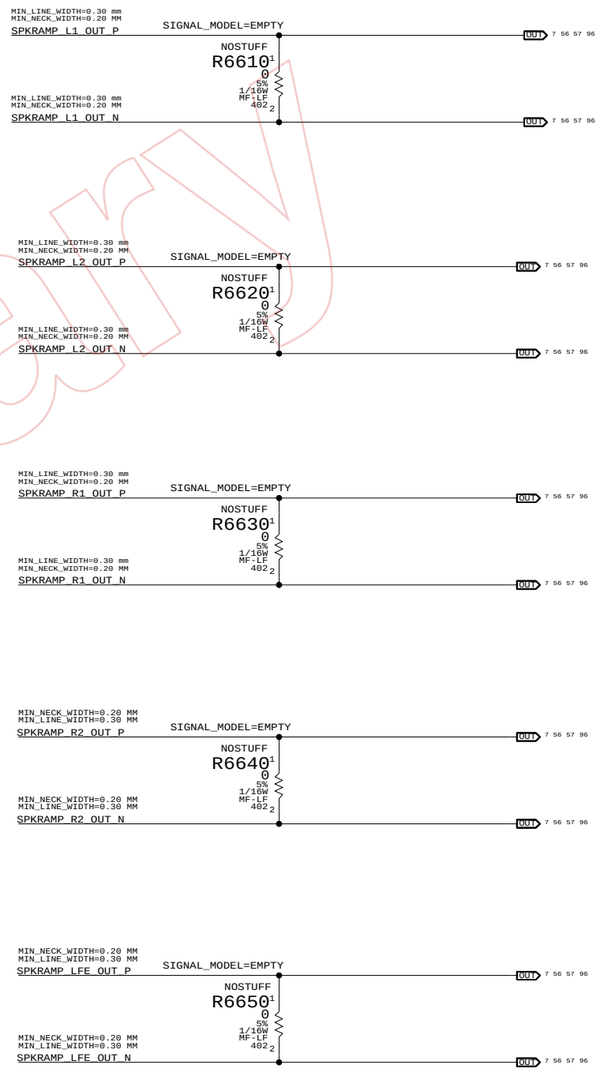
4X MONO SPEAKER AMPLIFIERS (MAX9705)

APN: 353S1595
GAIN = 12 DB

FC (SPEAKERS L1/R1) = ~796 HZ
FC (SPEAKERS L2/R2/LFE) = ~97 HZ



SPEAKER CHECKPOINTS



AUDIO:SPEAKER AMP

SYNC_MASTER=AUDIO_K20 SYNC_DATE=09/29/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE	SHT	OF
NONE	66	123

AUDIO JACK 1 LO/HP JACK, SPDIF TX

=PP3V3_S0_AUDIO

APN: 514-0632

CRITICAL
J6700
SPDIF-TX-K20
F-RT-TH

AUDIO

A - VIN
B - VCC
C - GND

OPERATING VOLTAGE 3.3
POF

SHELL
SHIELD PINS

C6700 0.1UF 10% 16V X5R 402
C6701 2.2UF 20% 6.3V CERM 402-LF

AUD_CONNJ1_SLEEVE2 → R6713 0 5% 1/16W MF-LF 402 → AUD_CONNJ1_SLEEVE2_F → L6703 FERR-1000-OHM 0402 → HS_MIC_HI OUT 58

AUD_CONNJ1_SLEEVE → R6711 0 5% 1/16W MF-LF 603 → AUD_CONNJ1_SLEEVE_F → L6702 FERR-1000-OHM 0402 → HS_MIC_LO OUT 58

AUD_CONNJ1_RING → R6714 0 5% 1/16W MF-LF 402 → AUD_CONNJ1_RING_F → L6701 CRITICAL FERR-220-OHM-2.5A 0603 → AUD_LO_GND OUT 55

AUD_CONNJ1_TIPDET → R6715 0 5% 1/16W MF-LF 402 → AUD_CONNJ1_TIPDET_F → L6704 CRITICAL FERR-220-OHM 0402 → AUD_HPAMP_OUTR BI 55

AUD_CONNJ1_TIP → R6716 0 5% 1/16W MF-LF 402 → AUD_CONNJ1_TIP_F → L6705 FERR-1000-OHM 0402 → AUD_J1_TIPDET_R OUT 58

AUD_CONNJ1_SLEEVEDET → R6710 0 5% 1/16W MF-LF 402 → AUD_CONNJ1_SLEEVEDET_F → L6706 CRITICAL FERR-220-OHM 0402 → AUD_HPAMP_OUTL BI 55

AUD_CONNJ1_SLEEVEDET_F → R6700 10K 5% 1/16W MF-LF 402 → AUD_J1_SLEEVEDET_R OUT 58

AUD_SPDIF_OUT IN 53

CRITICAL DZ6700 6.8V-100PF 402
CRITICAL DZ6701 6.8V-100PF 402
CRITICAL DZ6702 6.8V-100PF 402
CRITICAL DZ6703 6.8V-100PF 402
CRITICAL DZ6704 6.8V-100PF 402

NOSTUFF C6710 100PF 5% 50V CERM 402
NOSTUFF C6711 100PF 5% 50V CERM 402
NOSTUFF C6712 100PF 5% 50V CERM 402
C6713 100PF 5% 50V CERM 402
NOSTUFF C6714 100PF 5% 50V CERM 402
NOSTUFF C6715 100PF 5% 50V CERM 402

GND_CHASSIS_AUDIO_JACK 57

MIC CONNECTOR
APN: 518S0520

CRITICAL
J6780
78171-0003
M-RT-SM

BI_MIC_LO OUT 58 7
BI_MIC_SHIELD OUT 58 7
BI_MIC_HI OUT 58 7

SPEAKER CONNECTORS
APN: 518S0521

CRITICAL
J6781
78171-0004
M-RT-SM

SPKRAMP_L2_OUT_P IN 96 56 7
SPKRAMP_L2_OUT_N IN 96 56 7
SPKRAMP_L1_OUT_P IN 96 56 7
SPKRAMP_L1_OUT_N IN 96 56 7

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

APN: 518S0672

CRITICAL
J6782
78171-6006
M-RT-SM

SPKRAMP_R2_OUT_P IN 96 56 7
SPKRAMP_R2_OUT_N IN 96 56 7
SPKRAMP_R1_OUT_P IN 96 56 7
SPKRAMP_R1_OUT_N IN 96 56 7
SPKRAMP_LFE_OUT_P IN 96 56 7
SPKRAMP_LFE_OUT_N IN 96 56 7

NOSTUFF C6785 100PF 5% 50V CERM 402
NOSTUFF C6786 100PF 5% 50V CERM 402
NOSTUFF C6787 100PF 5% 50V CERM 402
NOSTUFF C6788 100PF 5% 50V CERM 402
NOSTUFF C6789 100PF 5% 50V CERM 402
NOSTUFF C6790 100PF 5% 50V CERM 402

AUDIO JACK 2 LINE IN JACK, SPDIF RX

=PP3V3_S0_AUDIO

APN: 514-0633

CRITICAL
J6750
SPDIF-RX-K20
F-RT-TH

AUDIO

A - VDD
B - GND
C - VOUT

OPERATING VOLTAGE 3.3
POF

SHELL
SHIELD PINS

C6750 0.1UF 10% 16V X5R 402

AUD_J2_OPT_OUT → R6749 10 5% 1/16W MF-LF 402 → AUD_SPDIF_IN OUT 53

AUD_CONNJ2_SLEEVE → R6761 0 5% 1/16W MF-LF 402 → AUD_CONNJ2_SLEEVE_F → L6751 FERR-220-OHM 0402

AUD_CONNJ2_TIPDET → R6762 0 5% 1/16W MF-LF 402 → AUD_CONNJ2_TIPDET_F → L6752 FERR-1000-OHM 0402 → AUD_J2_TIPDET_R OUT 58

AUD_CONNJ2_RING → R6764 0 5% 1/16W MF-LF 402 → AUD_CONNJ2_RING_F → L6754 FERR-1000-OHM 0402 → AUD_LI_INR BI 54

AUD_CONNJ2_TIP → R6766 0 5% 1/16W MF-LF 402 → AUD_CONNJ2_TIP_F → L6756 FERR-1000-OHM 0402 → AUD_LI_INL BI 54

AUD_CONNJ2_SLEEVEDET → R6768 0 5% 1/16W MF-LF 402 → AUD_CONNJ2_SLEEVEDET_F → L6758 FERR-220-OHM 0402 → AUD_J2_COM → XW6701 SM → AUD_LI_GND 54

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

NOSTUFF C6761 100PF 5% 50V CERM 402
C6762 100PF 5% 50V CERM 402
NOSTUFF C6763 100PF 5% 50V CERM 402
NOSTUFF C6764 100PF 5% 50V CERM 402
NOSTUFF C6765 100PF 5% 50V CERM 402

GND_CHASSIS_AUDIO_JACK 57

RETURN FOR HF NOISE

GND_CHASSIS_AUDIO_JACK 57 → R6701 0 5% 1/16W MF-LF 402

AUDIO: JACKS

SYNC_MASTER=AUDIO_K20 SYNC_DATE=09/29/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 67 OF 123	

CODEC OUTPUT SIGNAL PATHS

FUNCTION	VOLUME	CONVERTER	MIXER(OUTPUT)	PIN COMPLEX	MUTE CONTROL	DET ASSIGNMENT
HP/LINE OUT	0X0C (12)	0X02 (2)	0X0C (12)	0X14 (20,D)	GPIO_0	0X14 (20,D)
SPEAKERS L1/R1	0X0F (15)	0X05 (5)	0X0F (15)	0X1A (26,C)	VREF_B (100%)	N/A
SPEAKERS L2/R2	0X0D (13)	0X03 (3)	0X0D (13)	0X18 (24,B)	VREF_B (100%)	N/A
SPEAKER LFE	0X0E (14)	0X04 (4)	0X0E (14)	0X17 (23,H)	VREF_B (100%)	N/A
SPDIF OUT	N/A	0X06 (6)	N/A	0x1E (SPDIF OUT)	N/A	0X16 (22,G)

CODEC INPUT SIGNAL PATHS

FUNCTION	MIXER(INPUT)	CONVERTER	PIN COMPLEX	VREF	DET ASSIGNMENT
LINE IN	0X23 (35)	0X08 (8)	0X15 (21,A)	VREF_A (50%)	0X15 (21,A)
SPDIF IN	N/A	0X0A (10)	0x1F (SPDIF IN)	N/A	N/A
MIC	0X24 (36)	0X07 (7)	0X19 (25,F)	VREF_F (100%)	N/A
HEADSET MIC	0X24 (36)	0X07 (7)	0X1B (27,E)	MIKEY	MIKEY

PORT D DETECT (Line-out)

PORT G DETECT (SPDIF DELEGATE)

PORT A DETECT (Line-in)

LINE_IN AMP SHUTDOWN CONTROL

PORT F (BUILT-IN MIC)

TIPDET DEBOUNCE CIRCUIT

PLACE L6800/C6800 CLOSE TO Q6800/01/02

AUDIO: JACK TRANSLATORS

SYNC_MASTER=AUDIO_K20 SYNC_DATE=09/29/2008

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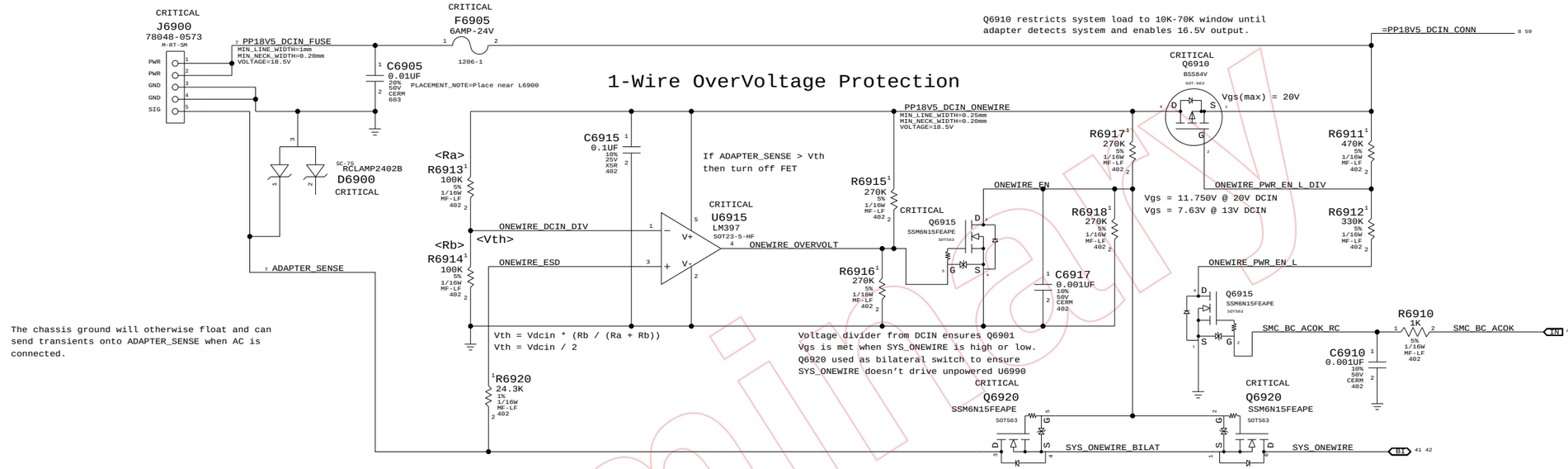
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 68 OF 123	

MagSafe DC Power Jack



DC-In & Battery Connectors

SYNC_MASTER=RXU_K20 SYNC_DATE=05/21/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 69 OF 123	

FROM ADAPTER

=PPDCIN_S5_CHGR

Inrush Limiter

R7060 470K 1% 1/16W MF-LF 402

C7060 0.1UF 10% 25V X5R 402

CHGR_AGATE_DIV
MIN_LINE_WIDTH=0.3 mm
MIN_NECK_WIDTH=0.3 mm

R7061 332K 1% 1/16W MF-LF 402

CRITICAL
Q7060
HAT1128R01
SO1

PPDCIN_S5_INRUSH
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.4 mm
VOLTAGE=18.5V

Reverse-Current Protection

PPDCIN_S5_CHGR_R
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.4 mm
VOLTAGE=18.5V

CRITICAL
Q7065
HAT1128R01
SO1

R7065 100K 5% 1/16W MF-LF 402

CHGR_SGATE_DIV
MIN_LINE_WIDTH=0.3 mm
MIN_NECK_WIDTH=0.3 mm

R7066 62K 5% 1/16W MF-LF 402

CHGR_SGATE
MIN_LINE_WIDTH=0.3 mm
MIN_NECK_WIDTH=0.25 mm

U7070 TL331 SOT23-5
VCC
GND
SGATE_P0V1_VREF

C7070 0.1uF 10% 16V X5R 402

R7070 57.6K 1% 1/16W MF-LF 402

R7071 1.82K 1% 1/16W MF-LF 402

Q7074 SSM6N15FEAPE SOT563

AMON_CLAMP

=PP3V42_G3H_CHGR

R7074 1M 5% 1/16W MF-LF 402

CHGR_AMON

R7075 clamps CHGR_AMON when charger is not powered to counter TL331 bias current.

Q7074 SSM6N15FEAPE SOT563

PP5V1_CHGR_VDD

(CHGR_AGATE)

(CHGR_DCIN)

CRITICAL
D7005
BAT30CWFILM
SOT-323

=PP3V42_G3H_CHGR

ACIN pin threshold is 3.2V, +/- 50mV

Divider sets ACIN threshold at 13.07V

Input impedance of ~40K meets sparkitecture requirements

C7002 1UF 10% 10V X5R 402

R7001 4.7 5% 1/16W MF-LF 402

PP5V1_CHGR_VDD
MIN_LINE_WIDTH=0.2 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=5.1V

30mA max load

C7001 1UF 10% 10V X5R 402

R7010 30.1K 1% 1/16W MF-LF 402

R7011 9.31K 1% 1/16W MF-LF 402

R7015 56.2K 1% 1/16W MF-LF 402

CHGR_VCOMP_R

C7015 0.001UF 10% 50V CERM 402

R7016 3.01K 1% 1/16W MF-LF 402

CHGR_VNEG_R

C7016 470PF 10% 50V CERM 402

CRITICAL
U7000
ISL6258A
QFN

VDD VDDP

VHST
SCL
SDA
VREF
ACIN
ICOMP
VCOMP
VNEG
CSOP
CSON
AGATE
CSIP
CSIN
BGATE
DCIN
BOOT
UGATE
PHASE
LGATE
TRKL*
AMON
BMON
ACOK
THRM_PAD
AGND
PGND

=SMBUS_CHGR_SCL
=SMBUS_CHGR_SDA

VREF = 3.2V, < 300uA

CHGR_ACIN
CHGR_ICOMP
CHGR_VCOMP
CHGR_VNEG
CHGR_CSO_P
CHGR_CSO_N

SIGNAL_MODEL=EMPTY
C7050 0.1uF 10% 16V X5R 402

NC

OMIT

CHGR_AGATE
CHGR_CSI_P
CHGR_CSI_N
CHGR_BGATE
CHGR_DCIN
CHGR_BOOT
CHGR_UGATE
CHGR_PHASE
CHGR_LGATE
TP_CHGR_TRKL
CHGR_AMON
CHGR_BMON
=CHGR_ACOK

XW7000 SM

C7042 0.033UF 10% 16V X5R 402

C7000 1UF 10% 10V X5R 402

C7011 0.01UF 10% 16V CERM 402

C7005 0.1UF 10% 25V X5R 402

C7026 0.001UF 10% 50V CERM 402

GND_CHGR_AGND
MIN_LINE_WIDTH=0.2 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=0V

SIGNAL_MODEL=EMPTY
C7020 0.047UF 10% 10V CERM 402

R7021 10 5% 1/16W MF-LF 402

CHGR_CSI_R_P

R7022 10 5% 1/16W MF-LF 402

CHGR_CSI_R_N

CRITICAL
R7020 0.02 0.5% 1W MF 0612

C7022 0.1UF 10% 25V X5R 402

C7021 0.1UF 10% 25V X5R 402

C7035 0.22UF 10% 16V CERM 402

GND_CHGR_AGND

PPDCIN_S5_FET_CHGR
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.4 mm
VOLTAGE=18.5V

CRITICAL
Q7030
RJK0305DPB
LFPAK-HF

152S0542

CRITICAL
Q7031
RJK0305DPB
LFPAK-HF

152S0542

CRITICAL
Q7036
RJK0305DPB
LFPAK-HF

152S0542

CRITICAL
C7030 22UF 20% 25V POLY-TANT CASE-D2-SM

CRITICAL
C7031 22UF 20% 25V POLY-TANT CASE-D2-SM

CRITICAL
C7036 22UF 20% 25V POLY-TANT CASE-D2-SM

CRITICAL
C7037 22UF 20% 25V POLY-TANT CASE-D2-SM

C7032 1UF 10% 25V X5R 603-1

C7033 1UF 10% 25V X5R 603-1

C7034 0.001UF 10% 50V X7R 402

CRITICAL
L7030
2.2UH-20A-5.5M-OHM
SM

CRITICAL
L7031
2.2UH-20A-5.5M-OHM
SM

PPVBAT_G3H_CHGR_REG
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.4 mm
VOLTAGE=12.6V

PPVBAT_G3H_CHGR_REG_L
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.4 mm
VOLTAGE=12.6V

CRITICAL
C7043 33UF 20% 16V POLY-TANT CASED2E-SM

CRITICAL
C7040 33UF 20% 16V POLY-TANT CASED2E-SM

C7041 0.001UF 10% 50V X7R 402

=PPBUS_G3H

TO SYSTEM

CRITICAL
F7040 8AMP-24V 1206

CRITICAL
F7041 8AMP-24V 1206

CRITICAL
HAT1127H
LFPAK-SM
Q7057

CRITICAL
HAT1127H
LFPAK-SM
Q7058

MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.4 mm
VOLTAGE=12.6V

CRITICAL
HAT1127H
LFPAK-SM
Q7055

CRITICAL
HAT1127H
LFPAK-SM
Q7056

PPVBAT_G3H_FET
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.4 mm
VOLTAGE=12.6V

PPVBAT_G3H_CONN
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.4 mm
VOLTAGE=12.6V

C7058 1UF 10% 16V X5R 402-1

BATT_POS_GATE

R7056 1M 5% MF-LF 402 1/16W

R7057 20K 5% MF-LF 402 1/16W

GND_BATT_CHGND

Max Current = 8.5A
(L7030 limit)
f = 400 kHz

R7051 10 5% 1/16W MF-LF 402

CHGR_CSO_R_P

R7052 10 5% 1/16W MF-LF 402

CHGR_CSO_R_N

(CHGR_CSO_P)
(CHGR_CSO_N)
(PPVBAT_G3H_CHGR_R)

CRITICAL
R7050 0.005 1% 1W MF 0612

C7055 1UF 10% 25V X5R 603-1

C7056 0.1UF 10% 16V X5R 402

C7057 0.01UF 10% 16V CERM 402

R7099 10 5% 1/10W MF-LF 603

NO STUFF

C7099 0.001UF 10% 50V X7R 402

CHGR_PHASE_RC

M99 differences from last sync on 12/02/07 to T18 MLB:

1. L7030 changed from T18 MLB inductor to 152S0542.
2. Added Q7056, C7058,R7055,R7056..
3. U7000 Thermal Pad is now connected to GND, not through XW.
4. Q7060 and Q7065 changed to 376S0667.
5. Q7055 and Q7056 changed to 376S0666.

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION	
353S1938	1	IC,ISL6258,BAT CHARGER,28P,4X4,QFN,L	U7000	CRITICAL	ISL6258	2S Battery Default
353S1832	1	IC,ISL6258A,BAT CHARGER,4X4MM,QFN28	U7000	CRITICAL	ISL6258A	3S Battery Default

PBus Supply & Battery Charger

SYNC_MASTER=RXU_K20 SYNC_DATE=05/21/2008

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APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 70 OF 123	

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

These caps are for Q7100

These caps are for Q7102

LAYOUT NOTE:
Place R7126 in hot
spot of reg circuit.

Place R7131 Between L7100,L7101 and CPU

IMVP6 CPU VCore Regulator

SYNC_MASTER=RXU_K20 SYNC_DATE=05/21/2008

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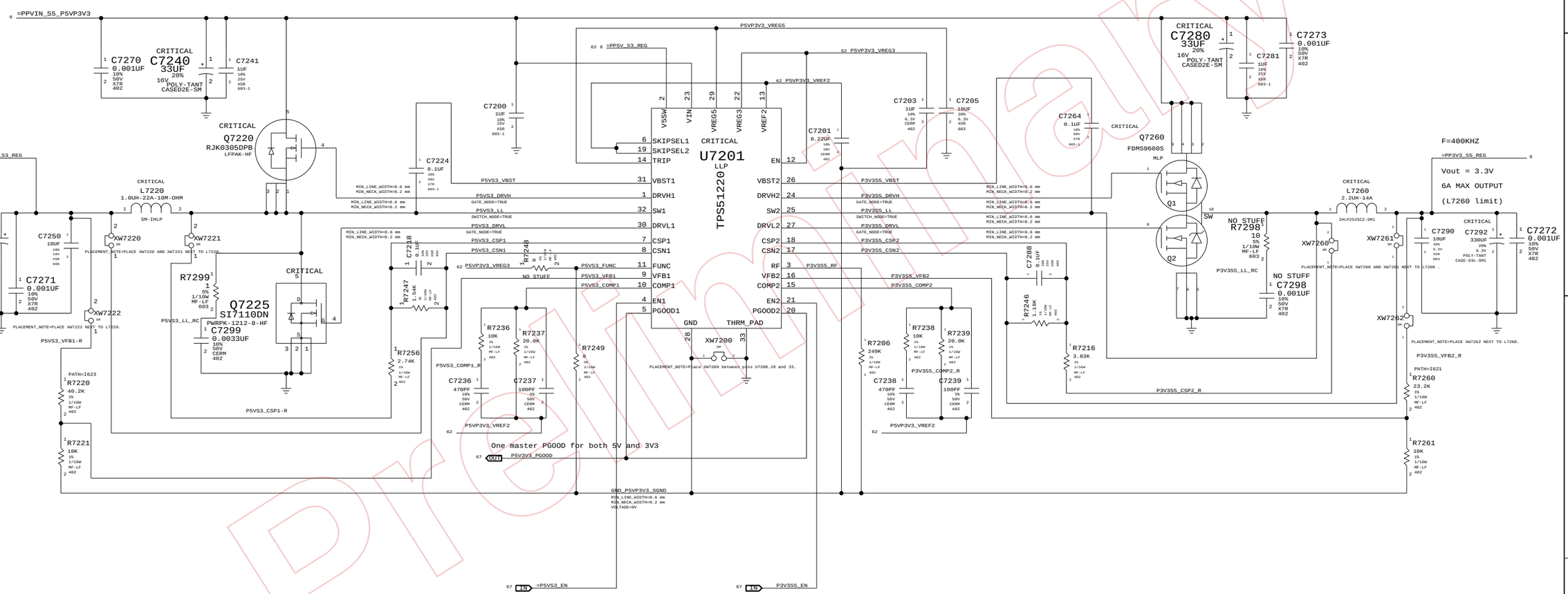
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE	SHT	OF
NONE	71	123



5V / 3.3V Power Supply

SYNC_MASTER=RXU_K20 SYNC_DATE=05/21/2008

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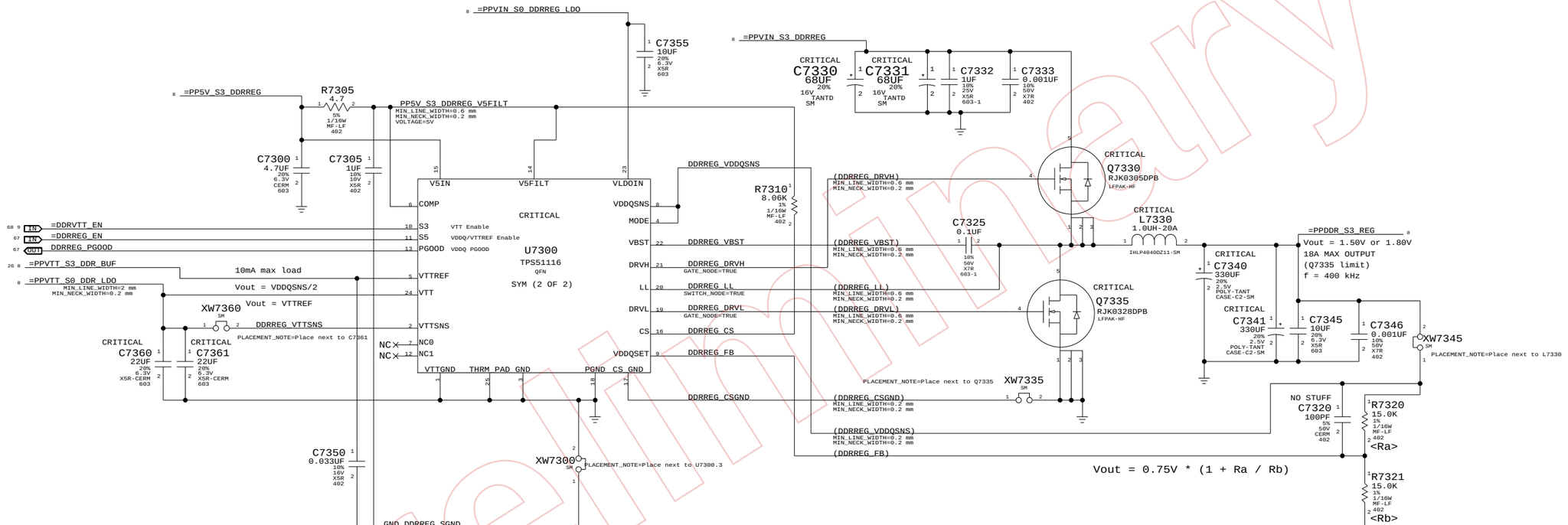
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 72 OF 123	

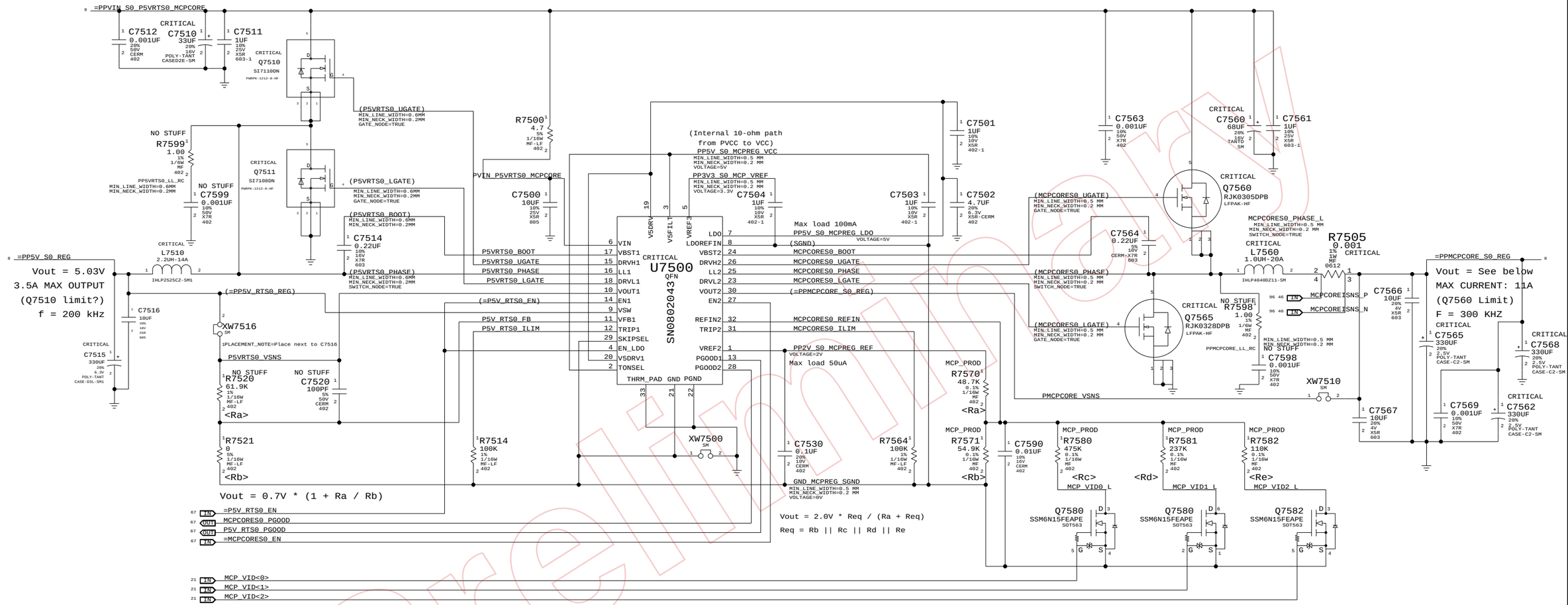


1.5V DDR3 Supply

SYNC_MASTER=RXU_K20 SYNC_DATE=05/21/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 73 OF 123	



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

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

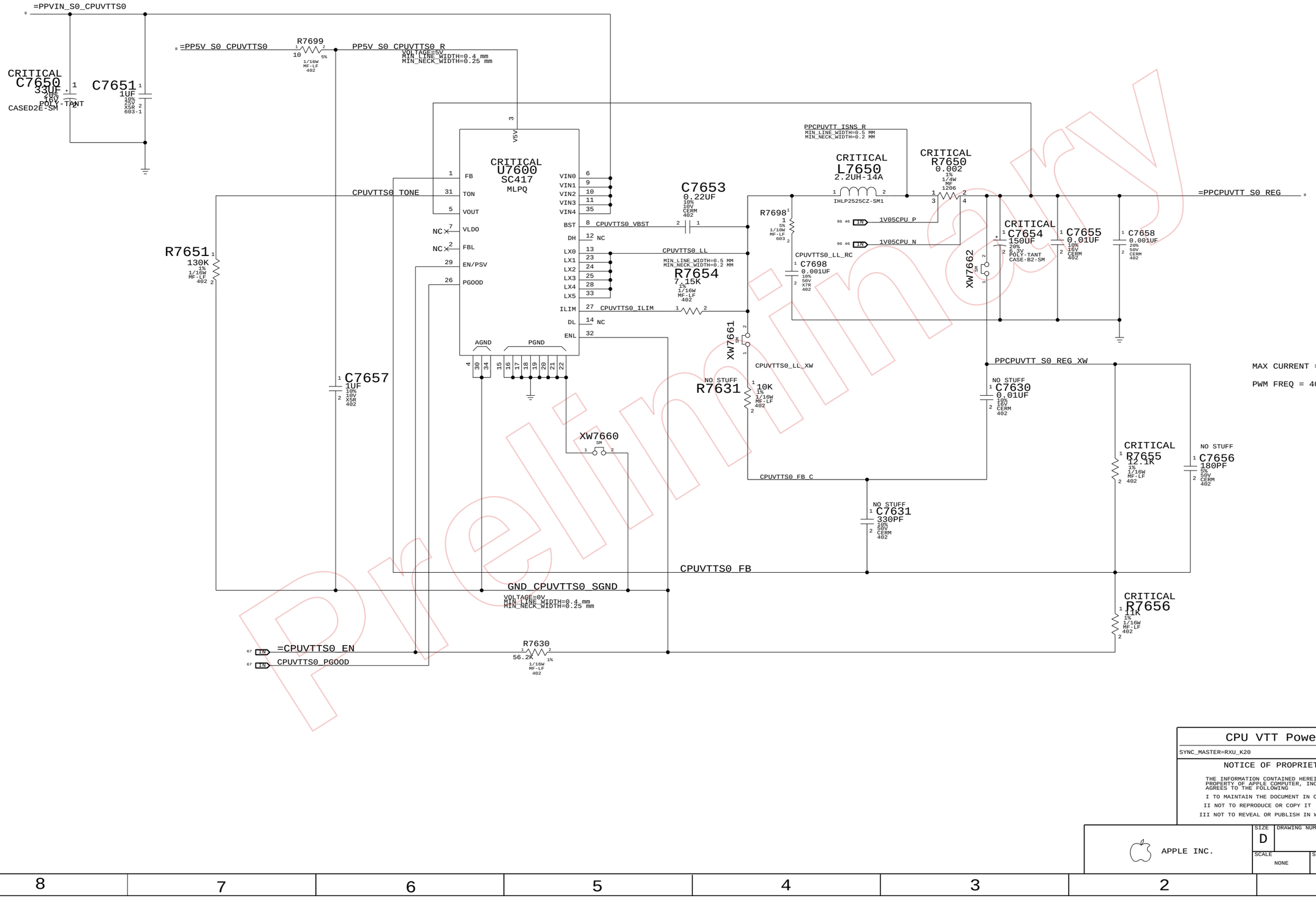
5V_S0 / MCP CORE REGULATOR

SYNC_MASTER=RXU_K20 SYNC_DATE=05/21/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31

SCALE NONE SHT 75 OF 123



CPU VTT Power Supply

SYNC_MASTER=RXU_K20 SYNC_DATE=05/21/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE	SHT	OF
NONE	76	123

1.8V S0 Switcher / 1.0VFW SWITCHER

S5 power required for output discharge feature

=PP3V3_S3_P1V8S0

C7700 2.2UF 20% 6.3V CERM 402-LF

CRITICAL L7780 2.2UH-1.2A PCAA031B-SM

P1V0FW_SW MIN_LINE_WIDTH=0.5 mm MIN_NECK_WIDTH=0.25 mm SWITCH_NODE=TRUE

C7782 10PF 5% 50V CERM 402

<Ra> R7782 187K 1% 1/16W MF-LF 402

<Rb> R7783 280K 1% 1/16W MF-LF 402

=PP1V0_FW_REG

Vout = 1.001V
300mA max output
(Switcher limit)
f = 2.25 MHz

C7785 4.7UF 20% 4V X5R 402

P1V0FW_VFB

U7700 DFN-HF CRITICAL LTC3541

VIN VFB1 VFB2 SW1 SW2 RUN1 RUN2 THRML PAD GND

P1V8S0_LX MIN_LINE_WIDTH=0.4 mm MIN_NECK_WIDTH=0.2 mm SWITCH_NODE=TRUE

CRITICAL L7700 2.2UH-1.2A PCAA031B-SM

C7701 10PF 5% 50V CERM 402

<Ra> R7700 562K 1% 1/16W MF-LF 402

<Rb> R7701 280K 1% 1/16W MF-LF 402

=PP1V8_S0_REG

VOUT = 1.804V
0.3A max output
(Switcher limit)
F = 2.25 MHZ

C7705 4.7UF 20% 4V X5R 402

P1V8S0_VFB

67 EN =P1V8S0_EN

=PP3V3_FW_P1V0FW

Vout = 0.6V * (1 + Ra/Rb)

MCP79 PLL VLDO

=PP3V3_S0_MCP_PLL_VLDO

R7743 100 5% 1/16W MF-LF 402

=PP3V3_S0_MCP_PLL_VLDO_BIAS

C7740 1UF 10% 6.3V CERM 402

U7740 LTC3025 DFN

BIAS CRITICAL IN SHDN* GND OUT ADJ THRML PAD

=PP1V8_S0_MCP_PLL_VLDO

C7741 1UF 10% 6.3V CERM 402

68 =PP1V05_S0_FET

NO STUFF
R7742 0 5% 1/16W MF-LF 402

MAX CURRENT = 300MA

=PP1V05_S0_MCP_PLL_UF

Vout = 1.052V

<Ra> R7740 66.5K 1% 1/16W MF-LF 402

<Rb> R7741 40.2K 1% 1/16W MF-LF 402

P1V05_S0_MCP_PLL_UF_ADJ

C7742 1UF 10% 6.3V CERM 402

FW BOOST POWER

=PPVIN_PFWBOOST

R7790 0.02 0.5% 1W MF 0612

C7790 10UF 10% 16V X5R 1206

PFWBOOST_SW MIN_LINE_WIDTH=0.5 mm MIN_NECK_WIDTH=0.25 mm SWITCH_NODE=TRUE

CRITICAL L7795 4.7UH-10A PCMC063T-SM

PFWBOOST_BOOST MIN_LINE_WIDTH=0.5 mm MIN_NECK_WIDTH=0.25 mm

CRITICAL U7790 LTC1872 SOT23-6

VIN ITH/RUN SENSE- VFB NGATE GND

PFWBOOST_ITH

R7797 38.3K 1% 1/16W MF-LF 402

PFWBOOST_ITH_R

C7797 0.001UF 10% 50V CERM 402

PFWBOOST_SENSE

PFWBOOST_NGATE

PFWBOOST_FB

CRITICAL D7790 D0222-SM STPS1L30MF

CRITICAL Q7790 SUPERSOT-8 FDC796NG

C7795 33PF 5% 50V CERM 402

<Ra> R7795 1.00M 1% 1/4W MF-LF 1206

<Rb> R7796 86.6K 1% 1/16W MF-LF 402

C7794 1UF 10% 16V X5R 402

=PFWBOOST_REG

VOUT = 10V
?MA MAX OUTPUT
F=550KHZ?

C7799 33UF 20% 16V POLY-TANT CASED2E-SM

C7798 33UF 20% 16V POLY-TANT CASED2E-SM

VOUT = 0.8V * (1 + RA / RB)

EXPRESSCARD 1.5V_S0 SUPPLY

=PP3V3_S3_P1V5EXPS0

R7712 1 5% 1/16W MF-LF 402

CRITICAL C7710 22UF 20% 6.3V CERM 805

P1V5EXPS0_AVIN

CRITICAL L7710 2.2UH-1.2A PCAA031B-SM

=P1V5_EXP_S0_EN

CRITICAL U7710 TPS62510 BQA

AVIN PVIN EN OVT MODE SW FB PG AGND PGND THRM_PAD

P1V5EXPS0_SW

P1V5EXPS0_FB

C7711 0.1UF 10% 10V CERM 402

C7712 22PF 5% 50V CERM 402

<Ra> R7710 150K 1% 1/16W MF-LF 402

<Rb> R7711 100K 1% 1/16W MF-LF 402

CRITICAL C7713 22UF 20% 6.3V CERM 805

=PP1V5_EXP_S0

Vout = 1.5V
MAX Current = 1.2A
FREQ = 1Mhz

TP_P1V5_EXP_S0_PGOOD

P1V5EXPS0_SGND

XW7710 SM

VOUT = 0.6V * (1 + Ra / Rb)

1.8V S0 Switcher

INPUT RAIL IS 3.3V S0

=PP3V3_GPU_P1V8S0

C7760 10uF 20% 6.3V X5R 603

VI U7760 TPS62202 SOT23-5 CRITICAL FB EN SW GND

84 83 67 =P1V8FB_EN

CRITICAL L7760 10UH-0.55A-330MOHM PCAA031B-SM

P1V8GPU_SW

MAX CURRENT = 300MA

=PP1V8_GPUIPX_REG

C7762 10uF 20% 6.3V X5R 603

MCP 1.05V AUXC Supply

=PPVIN_S0_P1V05S5

C7752 1UF 10% 25V X5R 603-1

P5V_P1V05S5_V5FILT

R7751 4.7 5% 1/16W MF-LF 402

P5V_P1V05S5 MIN_LINE_WIDTH=0.6 mm MIN_NECK_WIDTH=0.2 mm VOLTAGE=5V

C7751 4.7UF 20% 6.3V CERM 603

U7750 ISL6269 QFN CRITICAL

PVCC VCC VIN FSET EN FCCM PGOOD COMP FB VO UG BOOT PHASE ISEN LG PGND THRML PAD

C7750 2.2UF 10% 16V X5R 603

P1V05S5_DRVH GATE_NODE=TRUE

P1V05S5_VBST

P1V05S5_LL SWITCH_NODE=TRUE

P1V05S5_DRVL GATE_NODE=TRUE

MIN_LINE_WIDTH=0.6MM MIN_NECK_WIDTH=0.2MM

P1V05S5_ISEN

R7779 2.0K 1% 1/16W MF-LF 402

C7770 0.22UF 10% 10V CERM 402

CRITICAL Q7770 SI7110DN PWRPK-1212-8-HF

CRITICAL Q7771 SI7108DN PWRPK-1212-8-HF

CRITICAL L7770 2.2UH-8.0A PCMB065T-SM

PLACEMENT_NOTE=Place XW7775 next to C7775

=PP1V05_S5_MCP

Vout = 1.052V
5A max output
(L7770 limit)
f = 400 kHz

XW7775 SM

C7776 4.7UF 20% 4V X5R 402

CRITICAL C7771 330UF 20% 2.0V POLY-TANT B2-SM

P1V05S5_VSNS

<Ra> R7780 3.74K 1% 1/16W MF-LF 402

<Rb> R7781 4.42K 1% 1/16W MF-LF 402

C7753 0.01UF 10% 16V CERM 402

R7752 38.3K 1% 1/16W MF-LF 402

R7753 100K 1% 1/16W MF-LF 402

C7755 22PF 5% 50V CERM 402

C7754 470PF 10% 50V CERM 402

P1V05_S5_FSET

P1V05_S5_COMP

P1V05S5_VFB

P1V05S5_COMP_R

=P1V05S5_EN

P1V05_S5_PGOOD

XW7750 SM

(GND)

GND_P1V05S5_SGND MIN_LINE_WIDTH=0.6 mm MIN_NECK_WIDTH=0.2 mm VOLTAGE=0V

(P1V05S5_VFB)

(=PP1V05_S5_REG)

Vout = 0.6V * (1 + Ra / Rb)

Misc Power Supplies

SYNC_MASTER=RXU_K20 SYNC_DATE=05/21/2008

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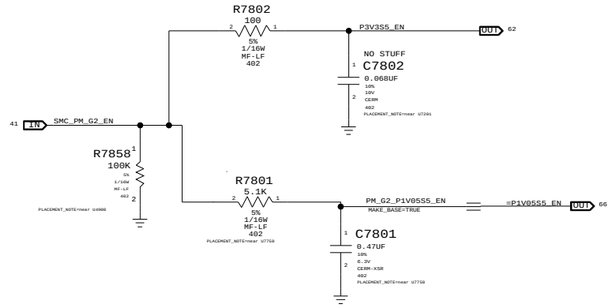
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31

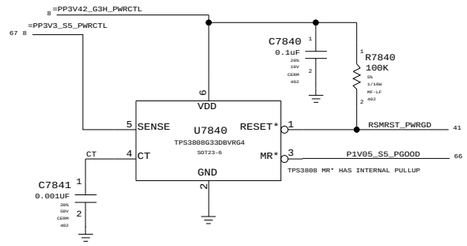
SCALE: NONE SHT 77 OF 123

3.3V 1,05V S5 ENABLE

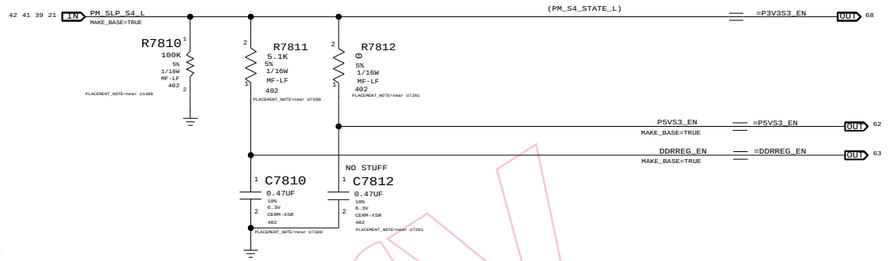


State	SMC_PM_G2_ENABLE	PM_SLP_S4_L	PM_SLP_S3_L
Run (S0)	1	1	1
Sleep (S3)	1	1	0
Soft-Off (S5)	1	0	0
Battery Off (G3Hot)	0	0	0

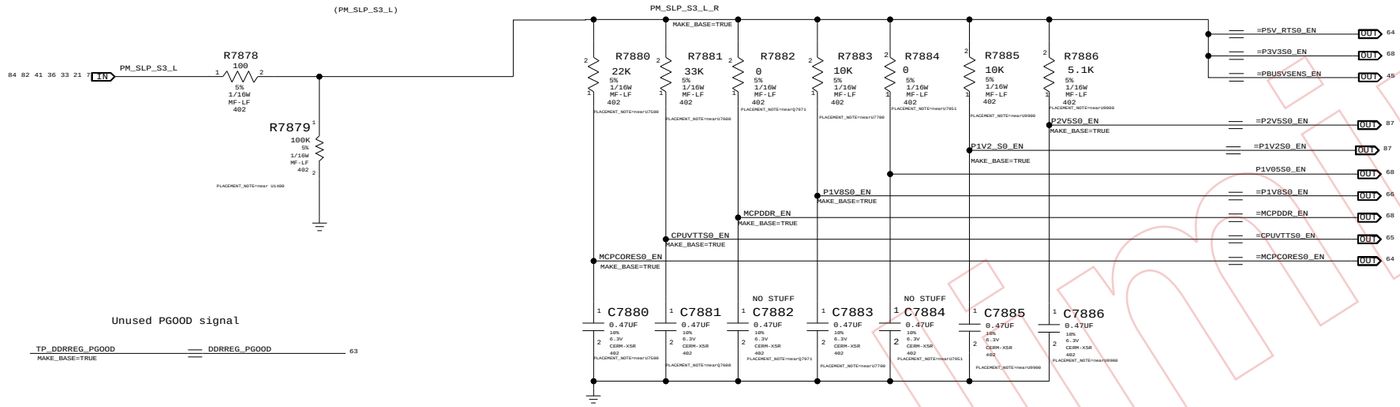
S5 rail PWRGD



3.3V,5V S3 ENABLE

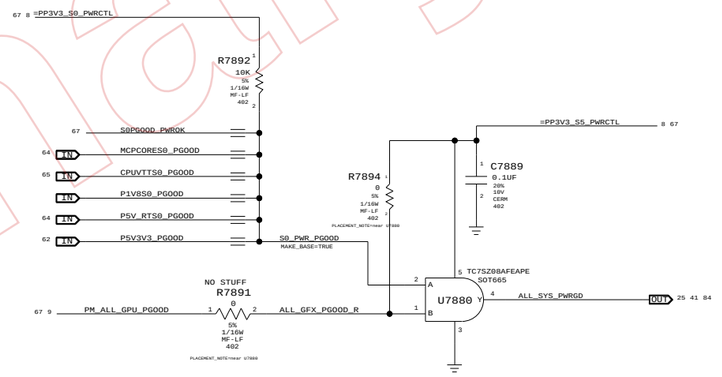


S0 ENABLE



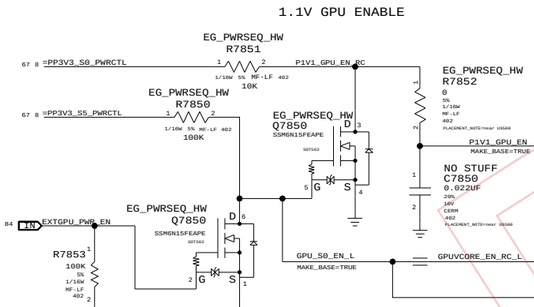
Other S0 RAILS

	PM_ALL_GFX_PGOOD
IG	high
EG	PM_ALL_GPU_PGOOD

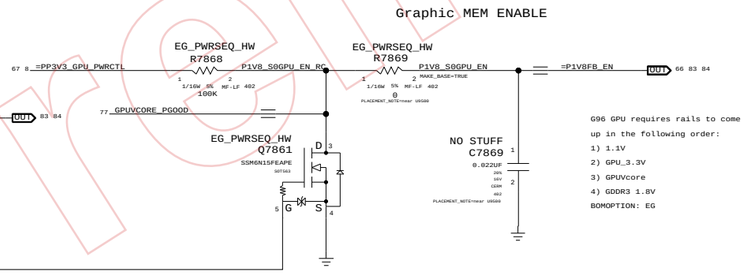


Unused PGOOD signal

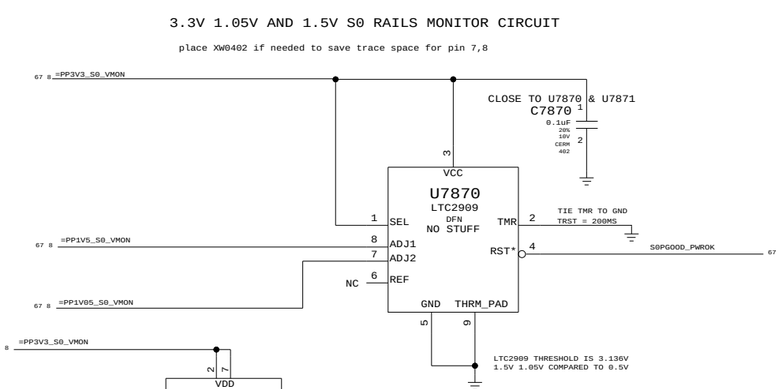
1.1V GPU ENABLE



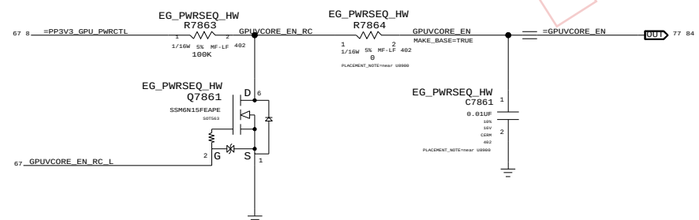
Graphic MEM ENABLE



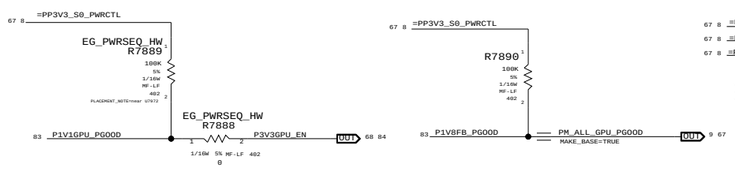
3.3V 1.05V AND 1.5V S0 RAILS MONITOR CIRCUIT



GPUVCORE ENABLE



EXT GPU PWRGD Pullup



U7871 IS TO REPLACE U7870

Power Control		
SYNC_MASTER=YMA_K20	SYNC_DATE=09/09/2008	
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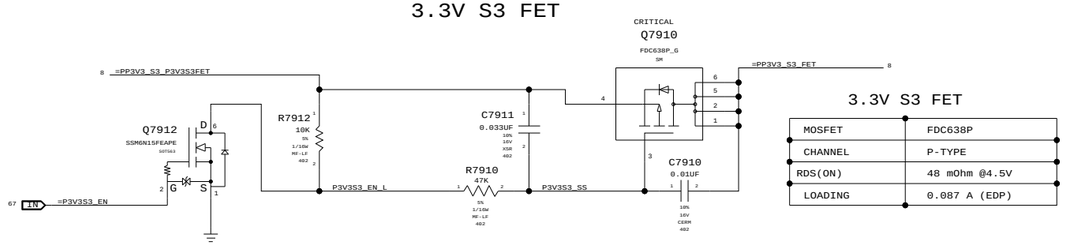
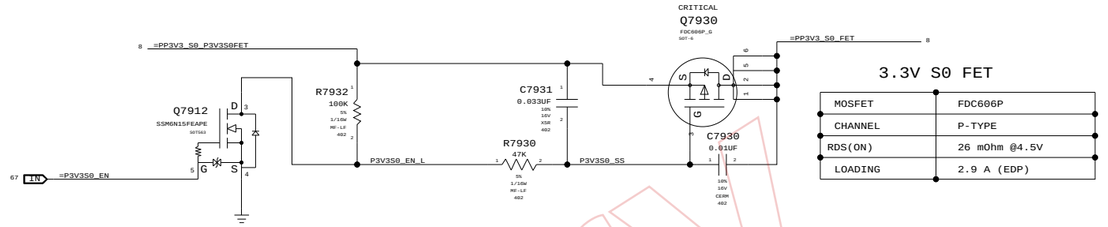
APPLE INC.	SIZE D	DRAWING NUMBER 051-7656 / REV. 31
	SCALE NONE	SHT 78 OF 123

3.3V S3 FET



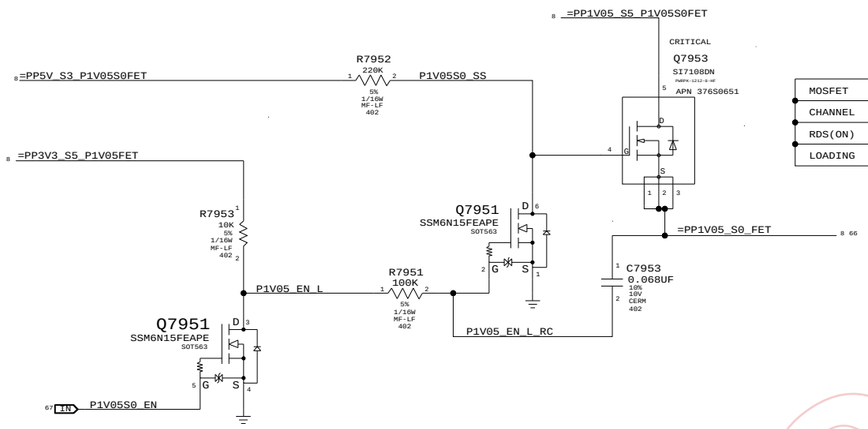
3.3V S3 FET	
MOSFET	FDC638P
CHANNEL	P-TYPE
RDS(ON)	48 mOhm @4.5V
LOADING	0.087 A (EDP)

3.3V S0 FET



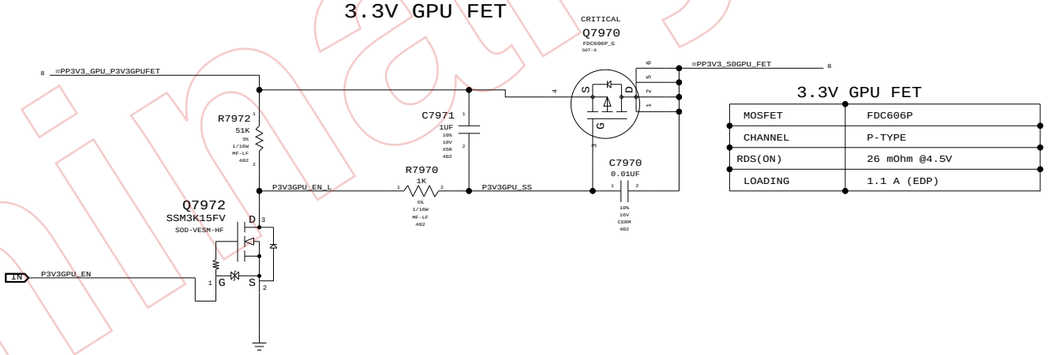
3.3V S0 FET	
MOSFET	FDC606P
CHANNEL	P-TYPE
RDS(ON)	26 mOhm @4.5V
LOADING	2.9 A (EDP)

1.05V S0 FET



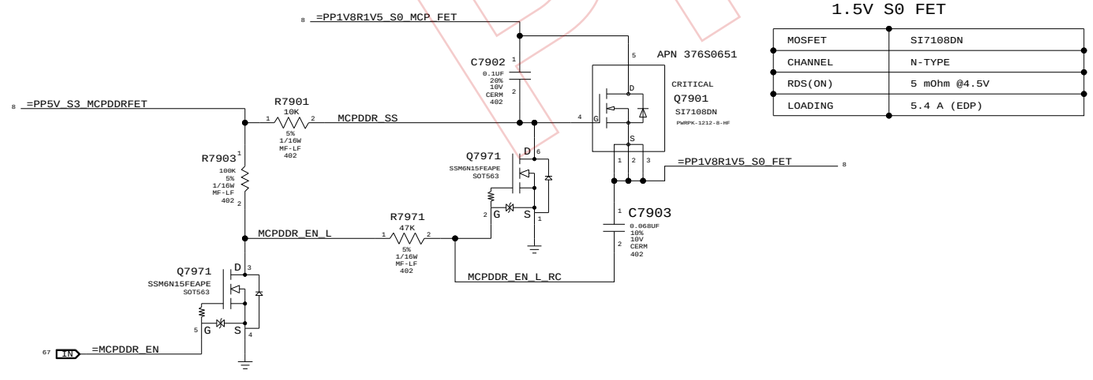
1.05V S0 FET	
MOSFET	SI7108DN
CHANNEL	N-TYPE
RDS(ON)	5 mOhm @4.5V
LOADING	5.1 A (EDP)

3.3V GPU FET



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

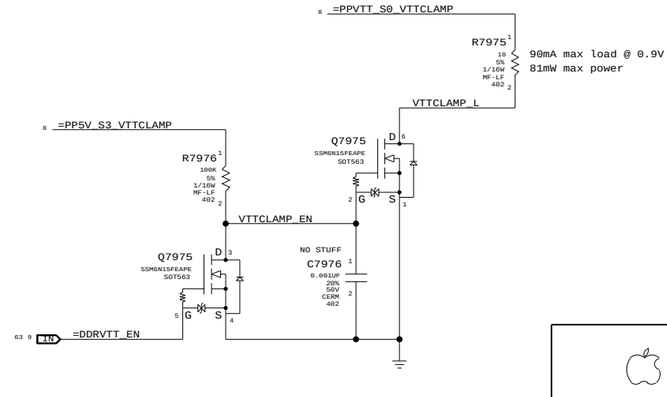
1.5V S0 FET



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

MCP79 DDR FETs

MCP79 DDR pad leakage is high enough that nVidia recommends unpowering during sleep. In order to support unpowering rail, hardware must guarantee MEM_CKE signals are low before rail is turned off, and remains low until after rail turns back on or DIMMs will exit self-refresh prematurely. MEM_VTT_EN output from MCP79 used to enable clamp on VTT rail, which pulls all CKE signals low through VTT termination resistors.



Power FETs

SYNC_MASTER=YMA_K20 SYNC_DATE=05/19/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 79 OF 123	

Page Notes

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

Signal aliases required by this page:
(NONE)

BOM options provided by this page:
(NONE)

8 =PP1V1_GPU_PEX_PLLXVDD
8 =PP1V1_GPU_PEX_IOVDDQ
8 =PP1V1_GPU_PEX_IOVDD

PEX 1.1V Current = 2A

250mA
C8002 1UF 10% 6.3V CERM 402
C8001 4.7UF 20% 6.3V CERM 603
C8000 22UF 20% 6.3V CERM-X5R 805
C8003 1UF 10% 6.3V CERM 402
C8004 0.1UF 20% 10V CERM 402
C8005 0.1UF 20% 10V CERM 402

1500mA
C8008 1UF 10% 6.3V CERM 402
C8007 4.7UF 20% 6.3V CERM 603
C8006 22UF 20% 6.3V CERM-X5R 805
C8009 1UF 10% 6.3V CERM 402
C8010 0.1UF 20% 10V CERM 402
C8011 0.1UF 20% 10V CERM 402

180mA
L8015 10NH-600MA 0603
PP1V1_GPU_PEX_PLLVDD_F
MIN_LINE_WIDTH=0.25 mm
MIN_NECK_WIDTH=0.25 mm
VOLTAGE=1.2V
C8017 0.1UF 20% 10V CERM 402
C8016 4.7UF 20% 6.3V CERM 603
C8015 4.7UF 20% 6.3V CERM 603

NC_GPU_DFM
NO_TEST=TRUE

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NB9P-GS
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NC	H32	
NC	R7	
	P6	
NC	P7	
NC	R7	
NC	U7	
NC	V6	
NC	AB7	
NC	AB6	
NC	AG6	
NC	AJ5	
NC	D35	
NC	K15	
NC	AL7	
NC	E7	
NC	E35	
NC	E7	
NC	A2	
	PEX_IOVDD1	AK16
	PEX_IOVDD2	AK17
	PEX_IOVDD3	AK21
	PEX_IOVDD4	AK24
	PEX_IOVDD5	AK27
NC		
	PEX_IOVDDQ1	AG11
	PEX_IOVDDQ2	AG12
	PEX_IOVDDQ3	AG13
	PEX_IOVDDQ4	AG15
	PEX_IOVDDQ5	AG16
	PEX_IOVDDQ6	AG17
	PEX_IOVDDQ7	AG18
	PEX_IOVDDQ8	AG22
	PEX_IOVDDQ9	AG23
	PEX_IOVDDQ10	AG24
	PEX_IOVDDQ11	AG25
	PEX_IOVDDQ12	AG26
	PEX_IOVDDQ13	AJ14
	PEX_IOVDDQ14	AJ15
	PEX_IOVDDQ15	AJ19
	PEX_IOVDDQ16	AJ21
	PEX_IOVDDQ17	AJ22
	PEX_IOVDDQ18	AJ24
	PEX_IOVDDQ19	AJ25
	PEX_IOVDDQ20	AJ27
	PEX_IOVDDQ21	AK18
	PEX_IOVDDQ22	AK20
	PEX_IOVDDQ23	AK23
	PEX_IOVDDQ24	AK26
	PEX_IOVDDQ25	AL16
	PEX_PLLVDD	AG14
	VDD_SENSE	AD20
	GND_SENSE	AD19

VDD_SENSE → GPU_VDD_SENSE 77
GND_SENSE → GPU_GND_SENSE 77

90 9 IN	PEG_R2D_C_P<0>	C8020 0.1uF	90	PEG_R2D_P<0>	AP17 PEX_RX0
90 9 IN	PEG_R2D_C_N<0>	C8021 0.1uF	90	PEG_R2D_N<0>	AN17 PEX_RX0*
90 9 IN	PEG_R2D_C_P<1>	C8022 0.1uF	90	PEG_R2D_P<1>	AN19 PEX_RX1
90 9 IN	PEG_R2D_C_N<1>	C8023 0.1uF	90	PEG_R2D_N<1>	AP19 PEX_RX1*
90 9 IN	PEG_R2D_C_P<2>	C8024 0.1uF	90	PEG_R2D_P<2>	AR19 PEX_RX2
90 9 IN	PEG_R2D_C_N<2>	C8025 0.1uF	90	PEG_R2D_N<2>	AR20 PEX_RX2*
90 9 IN	PEG_R2D_C_P<3>	C8026 0.1uF	90	PEG_R2D_P<3>	AP20 PEX_RX3
90 9 IN	PEG_R2D_C_N<3>	C8027 0.1uF	90	PEG_R2D_N<3>	AN20 PEX_RX3*
90 9 IN	PEG_R2D_C_P<4>	C8028 0.1uF	90	PEG_R2D_P<4>	AN22 PEX_RX4
90 9 IN	PEG_R2D_C_N<4>	C8029 0.1uF	90	PEG_R2D_N<4>	AP22 PEX_RX4*
90 9 IN	PEG_R2D_C_P<5>	C8030 0.1uF	90	PEG_R2D_P<5>	AR22 PEX_RX5
90 9 IN	PEG_R2D_C_N<5>	C8031 0.1uF	90	PEG_R2D_N<5>	AR23 PEX_RX5*
90 9 IN	PEG_R2D_C_P<6>	C8032 0.1uF	90	PEG_R2D_P<6>	AP23 PEX_RX6
90 9 IN	PEG_R2D_C_N<6>	C8033 0.1uF	90	PEG_R2D_N<6>	AN23 PEX_RX6*
90 9 IN	PEG_R2D_C_P<7>	C8034 0.1uF	90	PEG_R2D_P<7>	AN25 PEX_RX7
90 9 IN	PEG_R2D_C_N<7>	C8035 0.1uF	90	PEG_R2D_N<7>	AP25 PEX_RX7*
90 9 IN	PEG_R2D_C_P<8>	C8036 0.1uF	90	PEG_R2D_P<8>	AR25 PEX_RX8
90 9 IN	PEG_R2D_C_N<8>	C8037 0.1uF	90	PEG_R2D_N<8>	AR26 PEX_RX8*
90 9 IN	PEG_R2D_C_P<9>	C8038 0.1uF	90	PEG_R2D_P<9>	AP26 PEX_RX9
90 9 IN	PEG_R2D_C_N<9>	C8039 0.1uF	90	PEG_R2D_N<9>	AN26 PEX_RX9*
90 9 IN	PEG_R2D_C_P<10>	C8040 0.1uF	90	PEG_R2D_P<10>	AN28 PEX_RX10
90 9 IN	PEG_R2D_C_N<10>	C8041 0.1uF	90	PEG_R2D_N<10>	AP28 PEX_RX10*
90 9 IN	PEG_R2D_C_P<11>	C8042 0.1uF	90	PEG_R2D_P<11>	AR28 PEX_RX11
90 9 IN	PEG_R2D_C_N<11>	C8043 0.1uF	90	PEG_R2D_N<11>	AR29 PEX_RX11*
90 9 IN	PEG_R2D_C_P<12>	C8044 0.1uF	90	PEG_R2D_P<12>	AP29 PEX_RX12
90 9 IN	PEG_R2D_C_N<12>	C8045 0.1uF	90	PEG_R2D_N<12>	AN29 PEX_RX12*
90 9 IN	PEG_R2D_C_P<13>	C8046 0.1uF	90	PEG_R2D_P<13>	AN31 PEX_RX13
90 9 IN	PEG_R2D_C_N<13>	C8047 0.1uF	90	PEG_R2D_N<13>	AP31 PEX_RX13*
90 9 IN	PEG_R2D_C_P<14>	C8048 0.1uF	90	PEG_R2D_P<14>	AR31 PEX_RX14
90 9 IN	PEG_R2D_C_N<14>	C8049 0.1uF	90	PEG_R2D_N<14>	AR32 PEX_RX14*
90 9 IN	PEG_R2D_C_P<15>	C8050 0.1uF	90	PEG_R2D_P<15>	AR34 PEX_RX15
90 9 IN	PEG_R2D_C_N<15>	C8051 0.1uF	90	PEG_R2D_N<15>	AP34 PEX_RX15*

All RX caps: 10% 16V X5R 402

90 17 IN	PEG_CLK100M_P		AR16 PEX_REFCLK
90 17 IN	PEG_CLK100M_N		AR17 PEX_REFCLK*
9 IN	GPU_RESET_L	R8020 0 5% 1/10W MF-LF 402	AM16 PEX_RST*
7	TP_PEX_CLKREQ_L		AR13 PEX_CLKREQ*

OMIT
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BGA
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PEX_TX0	AL17	90	PEG_D2R_C_P<0>	C8055 0.1uF	PEG_D2R_P<0> OUT 9 90
PEX_TX0*	AM17	90	PEG_D2R_C_N<0>	C8056 0.1uF	PEG_D2R_N<0> OUT 9 90
PEX_TX1	AM18	90	PEG_D2R_C_P<1>	C8057 0.1uF	PEG_D2R_P<1> OUT 9 90
PEX_TX1*	AM19	90	PEG_D2R_C_N<1>	C8058 0.1uF	PEG_D2R_N<1> OUT 9 90
PEX_TX2	AL19	90	PEG_D2R_C_P<2>	C8059 0.1uF	PEG_D2R_P<2> OUT 9 90
PEX_TX2*	AK19	90	PEG_D2R_C_N<2>	C8060 0.1uF	PEG_D2R_N<2> OUT 9 90
PEX_TX3	AL20	90	PEG_D2R_C_P<3>	C8061 0.1uF	PEG_D2R_P<3> OUT 9 90
PEX_TX3*	AM20	90	PEG_D2R_C_N<3>	C8062 0.1uF	PEG_D2R_N<3> OUT 9 90
PEX_TX4	AM21	90	PEG_D2R_C_P<4>	C8063 0.1uF	PEG_D2R_P<4> OUT 9 90
PEX_TX4*	AM22	90	PEG_D2R_C_N<4>	C8064 0.1uF	PEG_D2R_N<4> OUT 9 90
PEX_TX5	AL22	90	PEG_D2R_C_P<5>	C8065 0.1uF	PEG_D2R_P<5> OUT 9 90
PEX_TX5*	AK22	90	PEG_D2R_C_N<5>	C8066 0.1uF	PEG_D2R_N<5> OUT 9 90
PEX_TX6	AL23	90	PEG_D2R_C_P<6>	C8067 0.1uF	PEG_D2R_P<6> OUT 9 90
PEX_TX6*	AM23	90	PEG_D2R_C_N<6>	C8068 0.1uF	PEG_D2R_N<6> OUT 9 90
PEX_TX7	AM24	90	PEG_D2R_C_P<7>	C8069 0.1uF	PEG_D2R_P<7> OUT 9 90
PEX_TX7*	AM25	90	PEG_D2R_C_N<7>	C8070 0.1uF	PEG_D2R_N<7> OUT 9 90
PEX_TX8	AL25	90	PEG_D2R_C_P<8>	C8071 0.1uF	PEG_D2R_P<8> OUT 9 90
PEX_TX8*	AK25	90	PEG_D2R_C_N<8>	C8072 0.1uF	PEG_D2R_N<8> OUT 9 90
PEX_TX9	AL26	90	PEG_D2R_C_P<9>	C8073 0.1uF	PEG_D2R_P<9> OUT 9 90
PEX_TX9*	AM26	90	PEG_D2R_C_N<9>	C8074 0.1uF	PEG_D2R_N<9> OUT 9 90
PEX_TX10	AM27	90	PEG_D2R_C_P<10>	C8075 0.1uF	PEG_D2R_P<10> OUT 9 90
PEX_TX10*	AM28	90	PEG_D2R_C_N<10>	C8076 0.1uF	PEG_D2R_N<10> OUT 9 90
PEX_TX11	AL28	90	PEG_D2R_C_P<11>	C8077 0.1uF	PEG_D2R_P<11> OUT 9 90
PEX_TX11*	AK28	90	PEG_D2R_C_N<11>	C8078 0.1uF	PEG_D2R_N<11> OUT 9 90
PEX_TX12	AK29	90	PEG_D2R_C_P<12>	C8079 0.1uF	PEG_D2R_P<12> OUT 9 90
PEX_TX12*	AL29	90	PEG_D2R_C_N<12>	C8080 0.1uF	PEG_D2R_N<12> OUT 9 90
PEX_TX13	AM29	90	PEG_D2R_C_P<13>	C8081 0.1uF	PEG_D2R_P<13> OUT 9 90
PEX_TX13*	AM30	90	PEG_D2R_C_N<13>	C8082 0.1uF	PEG_D2R_N<13> OUT 9 90
PEX_TX14	AM31	90	PEG_D2R_C_P<14>	C8083 0.1uF	PEG_D2R_P<14> OUT 9 90
PEX_TX14*	AM32	90	PEG_D2R_C_N<14>	C8084 0.1uF	PEG_D2R_N<14> OUT 9 90
PEX_TX15	AN32	90	PEG_D2R_C_P<15>	C8085 0.1uF	PEG_D2R_P<15> OUT 9 90
PEX_TX15*	AP32	90	PEG_D2R_C_N<15>	C8086 0.1uF	PEG_D2R_N<15> OUT 9 90

All TX caps: 10% 16V X5R 402

PEX_TSTCLK_OUT	AJ17	PEX_TSTCLK_P	R8060 200 1% 1/10W MF-LF 402
PEX_TSTCLK_OUT*	AJ18	PEX_TSTCLK_N	
PEX_TERMP	AG21	PEX_TERMP_PD	R8050 2.49K 1% 1/10W MF-LF 402
PEX_RFU1	AG19	NC	
PEX_RFU2	AG20	NC	

NV G96 PCI-E

SYNC_MASTER=M98_MLB SYNC_DATE=04/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 80 OF 123	

Page Notes

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

Signal aliases required by this page:
(NONE)

BOM options provided by this page:
(NONE)

=PPVCORE_GPU

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

C8100 4.7UF 20% 6.3V X5R-CERM 402
C8101 4.7UF 20% 6.3V X5R-CERM 402
C8102 4.7UF 20% 6.3V X5R-CERM 402
C8103 0.47UF 10% 6.3V CERM-X5R 402
C8104 0.47UF 10% 6.3V CERM-X5R 402
C8105 0.47UF 10% 6.3V CERM-X5R 402
C8106 0.47UF 10% 6.3V CERM-X5R 402
C8107 0.47UF 10% 6.3V CERM-X5R 402
C8108 0.47UF 10% 6.3V CERM-X5R 402
C8109 0.47UF 10% 6.3V CERM-X5R 402
C8110 0.47UF 10% 6.3V CERM-X5R 402
C8111 0.47UF 10% 6.3V CERM-X5R 402
C8112 0.47UF 10% 6.3V CERM-X5R 402
C8113 0.1UF 20% 10V CERM 402
C8114 0.1UF 20% 10V CERM 402
C8115 0.1UF 20% 10V CERM 402
C8116 0.1UF 20% 10V CERM 402
C8117 0.1UF 20% 10V CERM 402
C8118 0.1UF 20% 10V CERM 402
C8119 0.1UF 20% 10V CERM 402
C8120 0.1UF 20% 10V CERM 402
C8121 0.1UF 20% 10V CERM 402
C8122 0.1UF 20% 10V CERM 402

OMIT

U8000
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BGA
SYMBOL 9 OF 9

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

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

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SYMBOL 8 OF 9

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

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

=PP1V8_GPU_FBVDDQ

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

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

C8150 4.7UF 20% 6.3V CERM 603
C8151 4.7UF 20% 6.3V CERM 603
C8156 0.1UF 20% 10V CERM 402
C8157 0.1UF 20% 10V CERM 402
C8158 0.1UF 20% 10V CERM 402
C8159 0.1UF 20% 10V CERM 402
C8160 0.47UF 10% 6.3V CERM-X5R 402
C8161 0.47UF 10% 6.3V CERM-X5R 402
C8162 0.1UF 20% 10V CERM 402
C8163 0.1UF 20% 10V CERM 402
C8164 0.1UF 20% 10V CERM 402
C8165 0.1UF 20% 10V CERM 402
C8166 0.47UF 10% 6.3V CERM-X5R 402
C8167 0.47UF 10% 6.3V CERM-X5R 402
C8168 0.47UF 10% 6.3V CERM-X5R 402
C8169 0.47UF 10% 6.3V CERM-X5R 402
C8170 0.47UF 10% 6.3V CERM-X5R 402
C8171 0.47UF 10% 6.3V CERM-X5R 402

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NB9P-GS
BGA
SYMBOL 7 OF 9

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

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

NV G96 CORE/FB POWER

SYNC_MASTER=M98_MLB SYNC_DATE=04/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 81 OF 123	

Page Notes

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

Signal aliases required by this page:
(NONE)

BOM options provided by this page:
(NONE)

OMIT

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NB9P-GS
BGA
SYMBOL 3 OF 9

OMIT

U8000
NB9P-GS
BGA
SYMBOL 4 OF 9

PLACEMENT_NOTE=Place close to U8000.

PLACEMENT_NOTE=Place close to U8000.

PLACEMENT_NOTE=Place close to U8000.

NO STUFF
Q8295
SSM6N15FEAPE
SOT563

NV G96 FRAME BUFFER I/F

SYNC_MASTER=K20_MLB
SYNC_DATE=09/24/2008

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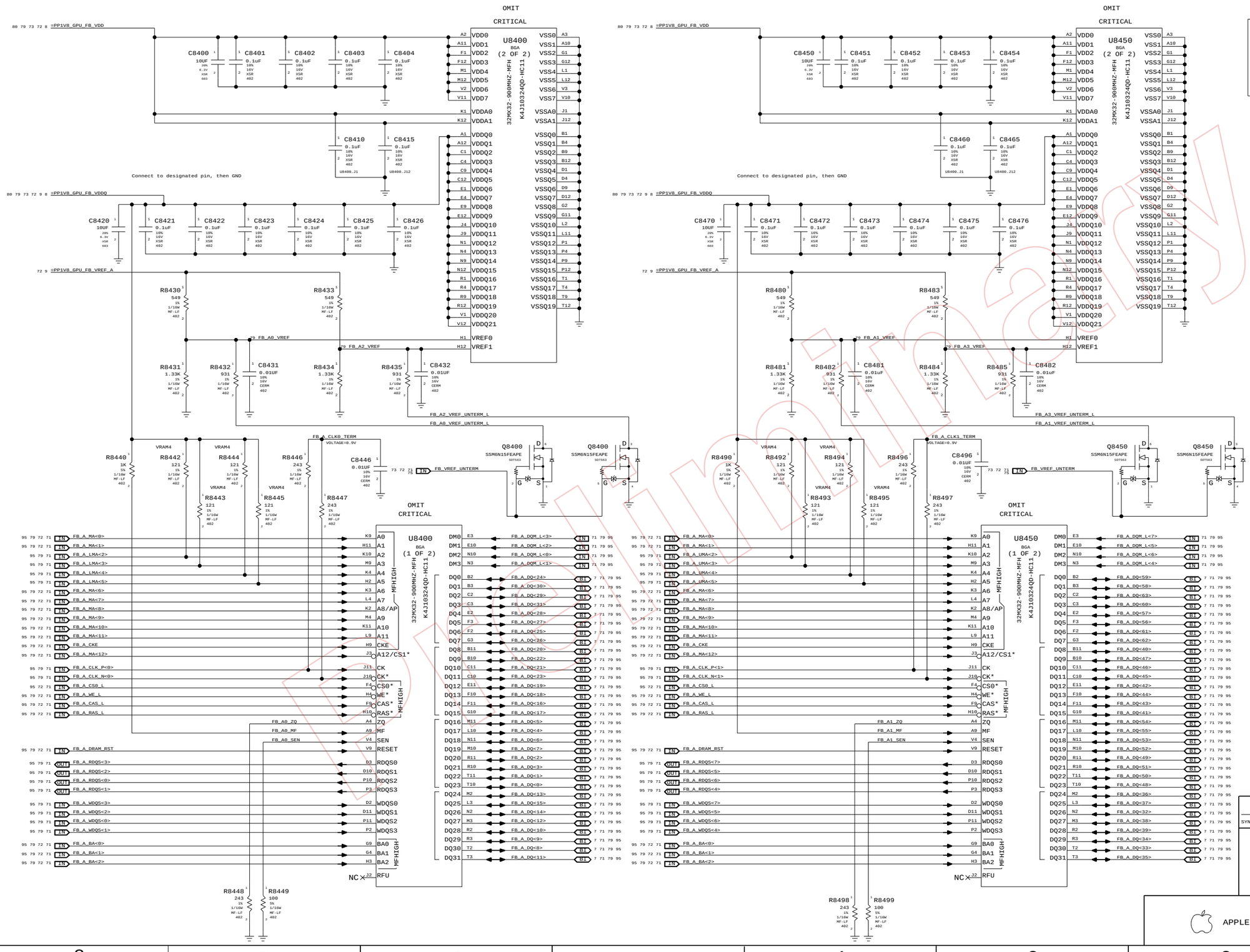
SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE	SHT	OF
NONE	82	123


OMIT
CRITICAL
U8400
BGA
(2 OF 2)
32MX32-900MHZ-MFH
K4J10324QD-HC11
U8450
(1 OF 2)
Connect to designated pin, then GND
=PP1V8_GPU_FB_VDD
=PP1V8_GPU_FB_VDDQ
=PP1V8_GPU_FB_VREF_A
C8400
C8401
C8402
C8403
C8404
C8410
C8415
C8420
C8421
C8422
C8423
C8424
C8425
C8426
C8450
C8451
C8452
C8453
C8454
C8460
C8465
C8470
C8471
C8472
C8473
C8474
C8475
C8476
R8430
R8431
R8432
R8433
R8434
R8435
R8480
R8481
R8482
R8483
R8484
R8485
C8431
C8432
C8481
C8482
FB_A0_VREF
FB_A2_VREF
FB_A1_VREF
FB_A3_VREF
FB_A0_VREF_UNTERM_L
FB_A2_VREF_UNTERM_L
FB_A1_VREF_UNTERM_L
FB_A3_VREF_UNTERM_L
FB_A_CLK0_TERM
FB_A_CLK1_TERM
VOLTAGE=0.9V
C8446
C8496
FB_VREF_UNTERM
Q8400
Q8450
SSM6N15FEAPE
R8440
R8442
R8444
R8446
R8447
R8443
R8445
R8490
R8492
R8494
R8496
R8497
R8493
R8495
VRAM4
OMIT
CRITICAL
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FB_A_MA<2>
FB_A_MA<3>
FB_A_MA<4>
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FB_A_MA<11>
FB_A_CKE
FB_A_MA<12>
FB_A_CLK_P<0>
FB_A_CLK_N<0>
FB_A_CS0_L
FB_A_WE_L
FB_A_CAS_L
FB_A_RAS_L
FB_A_UMA<2>
FB_A_UMA<3>
FB_A_UMA<4>
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FB_A_CLK_N<1>
FB_A_DRAM_RST
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FB_A1_ZQ
FB_A1_MF
FB_A1_SEN
MFHIGH
FB_A_DQM_L<3>
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FB_A_DQ<8>
FB_A_DQ<11>
R8448
R8449
R8498
R8499
NC
RFU
Page Notes
Power aliases required by this page:
- =PP1V8_S0_FB_VDD
- =PP1V8_S0_FB_VREFA
Signal aliases required by this page:
(NONE)
BOM options provided by this page:
VRAM4
GDDR3 Frame Buffer A (Bottom)
SYNC_MASTER=M98_MLB
SYNC_DATE=04/01/2008
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APPLE INC.
SIZE
D
DRAWING NUMBER
051-7656
REV.
31
SCALE
NONE
SHT
84
OF
123

Page Notes

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

Signal aliases required by this page:
(NONE)

BOM options provided by this page:
VRAM4

OMIT
CRITICAL

U8500
BGA
(2 OF 2)
32MX32-900MHZ-MFH
K4J10324QD-HC11

U8550
BGA
(2 OF 2)
32MX32-900MHZ-MFH
K4J10324QD-HC11

Connect to designated pin, then GND

GDDR3 Frame Buffer B (Bottom)	
SYNC_MASTER=M98_MLB	SYNC_DATE=04/01/2008

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APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE	SHT	OF
NONE	85	123

Page Notes

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

Signal aliases required by this page:
(NONE)

BOM options provided by this page:
(NONE)

110mA
75 74 8 6 =PP3V3_GPU_VDD33

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

75 74 8 6 =PP3V3_GPU_VDD33
Typically <??mA
C8600 0.47UF 10% 6.3V CERM-X5R 402
C8601 0.47UF 10% 6.3V CERM-X5R 402
C8602 0.47UF 10% 6.3V CERM-X5R 402

OMIT

U8000
NB9P-GS
BGA
SYMBOL 6 OF 9

J9	VDD33_1		
J10	VDD33_2		
J11	VDD33_3		
J12	VDD33_4		
J13	VDD33_5		
J25	RFU0	NC	
J26	RFU1	NC	
AK14	RFU0_GND		
K9	RFU1_GND		
C3	ROM_CS*	75	GPU_ROM_CS_L
D4	ROM_SCLK	75	GPU_ROM_SCLK
D3	ROM_SI	75	GPU_ROM_SI
C4	ROM_SO	75	GPU_ROM_SO
N9	STRAP_REF_3V3		GPU_STRAP_REF_3V3_PD
M9	STRAP_REF_MIOB (IPD)		GPU_STRAP_REF_MIOB_PD
P9	MIOA_VDDQ_1		
R9	MIOA_VDDQ_2		
T9	MIOA_VDDQ_3		
U9	MIOA_VDDQ_4		
AA9	MIOB_VDDQ_1		
AB9	MIOB_VDDQ_2		
W9	MIOB_VDDQ_3		
Y9	MIOB_VDDQ_4		
AP35	TESTMODE		GPU_TESTMODE_PD
N5	MIOA_VREF		GPU_MIOA_VREF
AF1	MIOB_VREF		GPU_MIOB_VREF
U5	MIOA_CAL_PD_VDDQ	74	GPU_MIOA_PD_VDDQ
T5	MIOA_CAL_PU_GND	74	GPU_MIOA_PU_GND
AA7	MIOB_CAL_PD_VDDQ	74	GPU_MIOB_PD_VDDQ
AA6	MIOB_CAL_PU_GND	74	GPU_MIOB_PU_GND
AF9	SP_PLLVDD		
AE9	PLLVDD		
AD9	VID_PLLVDD		
B1	XTAL_IN	75 IN	GPU_XTALIN
B2	XTAL_OUT	75 OUT	GPU_XTALOUT
D1	XTAL_OUTBUFF	75 OUT	GPU_XTALOUTBUFF
D2	XTAL_SSIN	75 IN	GPU_XTALSSIN

GPIO0	K1	GPU_GPIO_0	75
GPIO1	K2	GPU_GPIO_1	75
GPIO2	K3	GPU_GPIO_2	75
GPIO3	H3	GPU_GPIO_3	75
GPIO4	H2	GPU_GPIO_4	75
GPIO5	H1	GPU_GPIO_5	75
GPIO6	H4	GPU_GPIO_6	75
GPIO7	H5	GPU_GPIO_7	75
GPIO8	H6	GPU_GPIO_8	75
GPIO9	J7	GPU_GPIO_9	75
GPIO10	K4	GPU_GPIO_10	75
GPIO11	K5	GPU_GPIO_11	75
GPIO12	H7	GPU_GPIO_12	75
GPIO13	J4	GPU_GPIO_13	75
GPIO14	J6	GPU_GPIO_14	75
GPIO15	L1	GPU_GPIO_15	75
GPIO16	L2	GPU_GPIO_16	75
GPIO17	L4	GPU_GPIO_17	75
GPIO18	M4	GPU_GPIO_18	75
GPIO19	L7	GPU_GPIO_19	75
GPIO20	L5	GPU_GPIO_20	75
GPIO21	K6	GPU_GPIO_21	75
GPIO22	L6	GPU_GPIO_22	75
GPIO23	M6	GPU_GPIO_23	75
HDA_SDI	C7	GPU_HDA_SDI	75
HDA_SDO	B7	GPU_HDA_SDO	75
HDA_SYNC	A7	GPU_HDA_SYNC	75
HDA_BCLK	D7	GPU_HDA_BCLK	75
HDA_RST*	D6	GPU_HDA_RST_L	75
SPDIF	A5	GPU_SPDIF	75
BUFRST*	A4	TP_GPU_BUFRST_L	7
JTAG_TCK	AP14	GPU_JTAG_TCK	6
JTAG_TDI	AN14	GPU_JTAG_TDI	6
JTAG_TDO	AN16	GPU_JTAG_TDO	6
JTAG_TMS	AR14	GPU_JTAG_TMS	6
JTAG_TRST*	AP16	GPU_JTAG_TRST_L	6
MIOA_CLKIN	N4	GPU_MIOA_CLKIN	75
MIOA_CLKOUT	R4	GPU_MIOA_CLKOUT_P	75
MIOA_CLKOUT*	T4	GPU_MIOA_CLKOUT_N	75
MIOA_CTL3	P5	GPU_MIOA_CTL3	75
MIOA_DE	N2	GPU_MIOA_DE	75
MIOA_D0	N1	GPU_MIOA_D<0>	75
MIOA_D1	P4	GPU_MIOA_D<1>	75
MIOA_D2	P1	GPU_MIOA_D<2>	75
MIOA_D3	P2	GPU_MIOA_D<3>	75
MIOA_D4	P3	GPU_MIOA_D<4>	75
MIOA_D5	T3	GPU_MIOA_D<5>	75
MIOA_D6	T2	GPU_MIOA_D<6>	75
MIOA_D7	T1	GPU_MIOA_D<7>	75
MIOA_D8	U4	GPU_MIOA_D<8>	75
MIOA_D9	U1	GPU_MIOA_D<9>	75
MIOA_D10	U2	GPU_MIOA_D<10>	75
MIOA_D11	U3	GPU_MIOA_D<11>	75
MIOA_D12	R6	GPU_MIOA_D<12>	75
MIOA_D13	T6	GPU_MIOA_D<13>	75
MIOA_D14	N6	GPU_MIOA_D<14>	75
MIOA_HSYNC	N3	GPU_MIOA_HSYNC	75
MIOA_VSYNC	L3	GPU_MIOA_VSYNC	75
MIOB_CLKIN	AE1	GPU_MIOB_CLKIN	75
MIOB_CLKOUT	V4	GPU_MIOB_CLKOUT_P	75
MIOB_CLKOUT*	W4	GPU_MIOB_CLKOUT_N	75
MIOB_CTL3	W3	GPU_MIOB_CTL3	75
MIOB_DE	Y5	GPU_MIOB_DE	75
MIOB_D0	Y1	GPU_MIOB_D<0>	75
MIOB_D1	Y2	GPU_MIOB_D<1>	75
MIOB_D2	Y3	GPU_MIOB_D<2>	75
MIOB_D3	AB3	GPU_MIOB_D<3>	75
MIOB_D4	AB2	GPU_MIOB_D<4>	75
MIOB_D5	AB1	GPU_MIOB_D<5>	75
MIOB_D6	AC4	GPU_MIOB_D<6>	75
MIOB_D7	AC1	GPU_MIOB_D<7>	75
MIOB_D8	AC2	GPU_MIOB_D<8>	75
MIOB_D9	AC3	GPU_MIOB_D<9>	75
MIOB_D10	AE3	GPU_MIOB_D<10>	75
MIOB_D11	AE2	GPU_MIOB_D<11>	75
MIOB_D12	U6	GPU_MIOB_D<12>	75
MIOB_D13	W6	GPU_MIOB_D<13>	75
MIOB_D14	Y6	GPU_MIOB_D<14>	75
MIOB_D15	W5	GPU_STRAP<0>	75
MIOB_D16	W7	GPU_STRAP<1>	75
MIOB_D17	V7	GPU_STRAP<2>	75
MIOB_HSYNC	W1	GPU_MIOB_HSYNC	75
MIOB_VSYNC	W2	GPU_MIOB_VSYNC	75
THERMDP	B5	GPU_THERMD_P	75
THERMDN	B4	GPU_THERMD_N	75
PGOOD_OUT*	C5	TP_GPU_PGOOD_OUT_L	7

R8696 40.2K 1% 1/16W MF-LF 402
R8697 40.2K 1% 1/16W MF-LF 402

75 74 8 =PP3V3_GPU_MIO
75 74 8 =PP3V3_GPU_MIO

R8620 49.9 1% 1/16W MF-LF 402
R8621 49.9 1% 1/16W MF-LF 402
GPU_MIOA_PD_VDDQ 74
GPU_MIOB_PD_VDDQ 74
GPU_MIOA_PU_GND 74
GPU_MIOB_PU_GND 74
R8622 49.9 1% 1/16W MF-LF 402
R8623 49.9 1% 1/16W MF-LF 402

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

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

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

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

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

NV G96 GPIO/MIO/MISC

SYNC_MASTER=K20_MLB SYNC_DATE=09/24/2008

APPLE INC.

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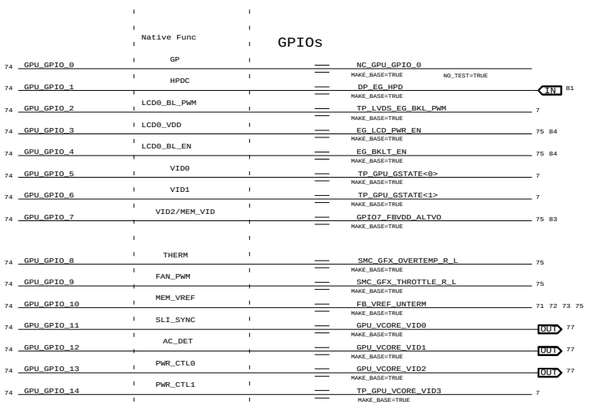
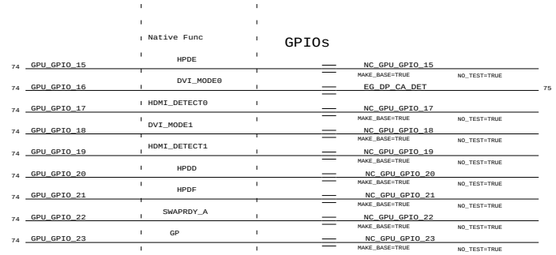
D	051-7656	31
SCALE: NONE	SHT 86 OF 123	

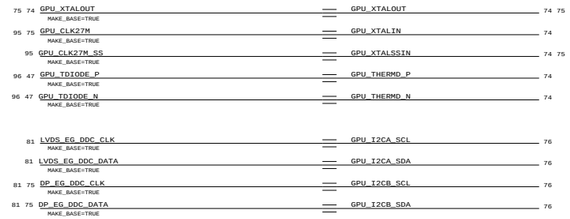
GPIOs



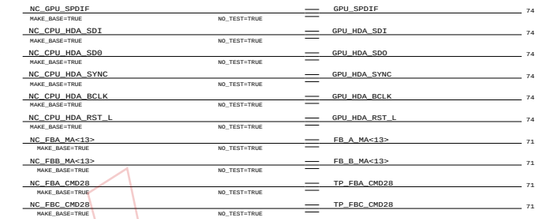
GPIOs



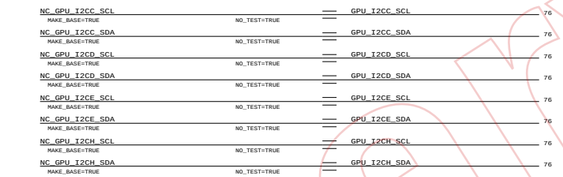
Renamed signals

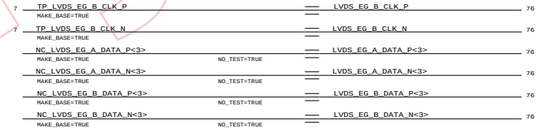


Unused signals

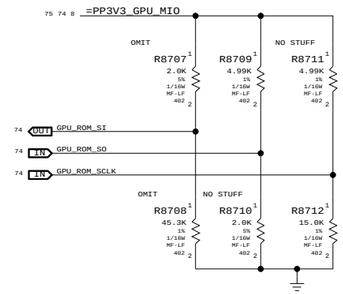


Unused I2C Buses





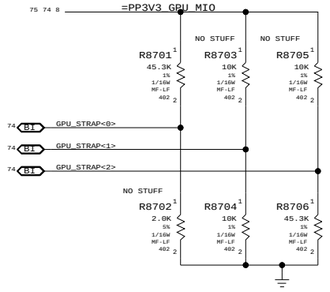
Config Straps



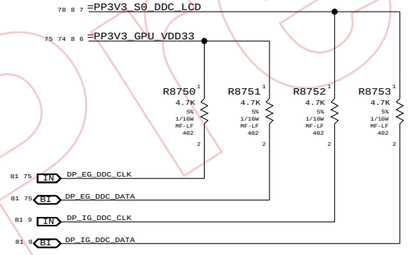
Physical Strapping Pin	Strapping Bit 3	Strapping Bit 2	Strapping Bit 1	Strapping Bit 0
ROM_SO	XCLK_277	TVMODE[2]	TVMODE[1]	TVMODE[0]
ROM_SCLK	PCI_DEVID[4]	SUB_VENDOR	SLOT_CLK_CFG	PEX_PLLEN_TERM100
ROM_SI	RAMCFG[3]	RAMCFG[2]	RAMCFG[1]	RAMCFG[0]
STRAP 2	PCI_DEVID[3]	PCI_DEVID[2]	PCI_DEVID[1]	PCI_DEVID[0]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

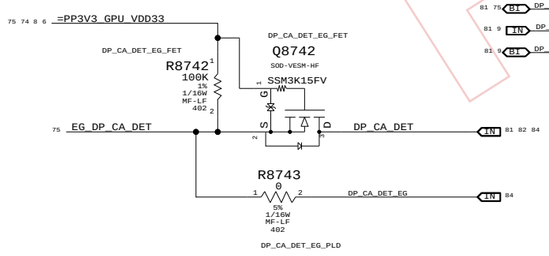
Strap S1/S2 Bit[3:0] PU/PD Rval
0 0000 PD 5k
1 0001 PD 10k
2 0010 PD 15k
3 0011 PD 20k
4 0100 PD 25k
5 0101 PD 30k
6 0110 PD 35k
7 0111 PD 45k

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



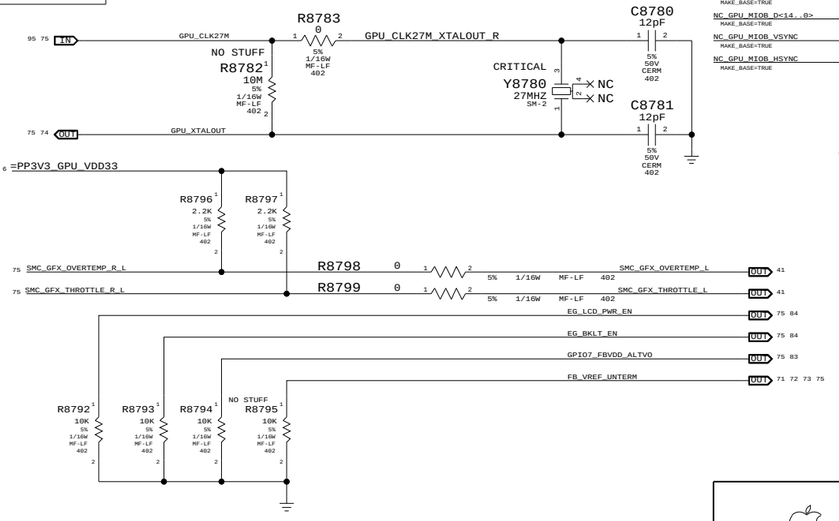
PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
114S0378	1	RES,MTL F1LM,1/16W,45.3K,1,0402,SMD,LF	R8708		VRAM_512_SAMSUNG
114S0361	1	RES,MTL F1LM,1/16W,30.1K,1,0402,SMD,LF	R8708		VRAM_512_QIMONDA
114S0343	1	RES,MTL F1LM,1/16W,29.0K,1,0402,SMD,LF	R8708		VRAM_256_SAMSUNG
114S0331	1	RES,MTL F1LM,1/16W,15.0K,1,0402,SMD,LF	R8708		VRAM_256_HYNIX
114S0378	1	RES,MTL F1LM,1/16W,45.3K,1,0402,SMD,LF	R8707		VRAM_1024_SAMSUNG
114S0361	1	RES,MTL F1LM,1/16W,30.1K,1,0402,SMD,LF	R8707		VRAM_1024_QIMONDA



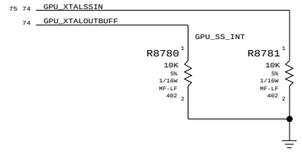


Isolation FETs for DP MUX inputs

GPU 27MHz Crystal



Unused Clocks



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

G96 GPIOs & Straps

SYNC_MASTER=M98_MLB SYNC_DATE=05/12/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 87 OF 123	

Page Notes

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

Signal aliases required by this page:
(NONE)

BOM options provided by this page:
(NONE)

Sum of peak currents: 240mA

=PP1V8_GPU_IFPX

CRITICAL
L8800
FERR-220-OHM
0402

?mA peak per diff pair
?mA peak for all pairs

C8800 4.7UF 20% 6.3V CERM 603
C8801 0.1UF 20% 10V CERM 402
C8803 0.1UF 20% 10V CERM 402

Place at AG9
Place at AG10

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

CRITICAL
L8805
FERR-220-OHM
0402

80mA peak

C8805 4.7UF 20% 6.3V CERM 603
C8806 0.1UF 20% 10V CERM 402

PP1V8_GPU_IFPAB_PLLVDD_F
MIN_LINE_WIDTH=0.3 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.8V

GPU_IFPEF_RSET 76
GPU_IFPCD_RSET 76
GPU_IFPAB_RSET 76

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

CRITICAL
L8810
FERR-220-OHM
0402

=PP1V1_GPU_IFPCD_IOVDD

?mA peak per diff pair
?mA peak for all pairs

C8810 4.7UF 20% 6.3V CERM 603
C8811 0.1UF 20% 10V CERM 402
C8813 0.1UF 20% 10V CERM 402

Place at AJ8
Place at AK8

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

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

CRITICAL
L8815
FERR-220-OHM
0402

160mA peak

C8815 4.7UF 20% 6.3V CERM 603
C8816 0.1UF 20% 10V CERM 402

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

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

PP1V1_GPU_IFPEF_IOVDD_F 76
PP1V8_GPU_IFPEF_PLLVDD_F 76

Power inputs must be pulled down if not used

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

OMIT

U8000
NB9P-GS
BGA
SYMBOL 5 OF 9

AG9	IFPA_IOVDD	IFPA_TXC	AM11
AG10	IFPB_IOVDD	IFPA_TXC*	AM12
AJ8	IFPC_IOVDD	IFPA_TXD0	AM8
AK8	IFPD_IOVDD	IFPA_TXD0*	AL8
AE7	IFPE_IOVDD	IFPA_TXD1	AM10
AD7	IFPF_IOVDD	IFPA_TXD1*	AM9
AK9	IFPAB_PLLVDD	IFPA_TXD2	AK10
AJ11	IFPAB_RSET	IFPA_TXD2*	AL10
AJ9	IFPCD_PLLVDD	IFPA_TXD3	AK11
AK7	IFPCD_RSET	IFPA_TXD3*	AL11
AJ6	IFPEF_PLLVDD	IFPB_TXC	AP13
AL1	IFPEF_RSET	IFPB_TXC*	AN13
		IFPB_TXD4	AN8
		IFPB_TXD4*	AP8
		IFPB_TXD5	AP10
		IFPB_TXD5*	AN10
		IFPB_TXD6	AR11
		IFPB_TXD6*	AR10
		IFPB_TXD7	AN11
		IFPB_TXD7*	AP11
G1	I2CA_SCL	IFPC_AUX	AP2
G4	I2CA_SDA	IFPC_AUX*	AN3
E3	I2CC_SCL	IFPC_L0	AM7
E4	I2CC_SDA	IFPC_L0*	AM6
		IFPC_L1	AL5
		IFPC_L1*	AM5
		IFPC_L2	AM3
		IFPC_L2*	AM4
		IFPC_L3	AP1
		IFPC_L3*	AR2
E2	I2CS_SCL	IFPD_AUX	AP4
E1	I2CS_SDA	IFPD_AUX*	AN4
F6	I2CH_SCL	IFPD_L0	AR8
G6	I2CH_SDA	IFPD_L0*	AR7
		IFPD_L1	AK5
		IFPD_L1*	AK4
		IFPD_L2	AN5
		IFPD_L2*	AP5
		IFPD_L3	AR5
		IFPD_L3*	AR4
G3	I2CB_SCL	IFPE_AUX	AE4
G2	I2CB_SDA	IFPE_AUX*	AD4
F4	I2CD_SCL	IFPE_L0	AH6
G5	I2CD_SDA	IFPE_L0*	AH5
		IFPE_L1	AH4
		IFPE_L1*	AG4
		IFPE_L2	AF4
		IFPE_L2*	AF5
		IFPE_L3	AE6
		IFPE_L3*	AE5
D5	I2CE_SCL	IFPF_AUX	AF3
E5	I2CE_SDA	IFPF_AUX*	AF2
		IFPF_L0	AL2
		IFPF_L0*	AL3
		IFPF_L1	AJ3
		IFPF_L1*	AJ4
		IFPF_L2	AJ5
		IFPF_L2*	AH3
		IFPF_L3	AH2
		IFPF_L3*	AH1
AJ12	DACA_VDD	DACA_RED	AM15
AK12	DACA_VREF	DACA_GREEN	AM14
AK13	DACA_RSET	DACA_BLUE	AL13
AC6	DACB_VDD	DACA_HSYNC	AM13
AC5	DACB_VREF	DACA_VSYNC	AL12
AD6	DACB_RSET	DACB_RED	AA4
AG7	DACC_VDD	DACB_GREEN	AB4
AK6	DACC_VREF	DACB_BLUE	Y4
AK7	DACC_RSET	DACB_CSYNC	AB5
		DACC_RED	AK2
		DACC_GREEN	AL4
		DACC_BLUE	AJ2
		DACC_HSYNC	AM1
		DACC_VSYNC	AK3

LVDS_EG_A_CLK_P
LVDS_EG_A_CLK_N
LVDS_EG_A_DATA_P<0>
LVDS_EG_A_DATA_N<0>
LVDS_EG_A_DATA_P<1>
LVDS_EG_A_DATA_N<1>
LVDS_EG_A_DATA_P<2>
LVDS_EG_A_DATA_N<2>
LVDS_EG_A_DATA_P<3>
LVDS_EG_A_DATA_N<3>
LVDS_EG_B_CLK_P
LVDS_EG_B_CLK_N
LVDS_EG_B_DATA_P<0>
LVDS_EG_B_DATA_N<0>
LVDS_EG_B_DATA_P<1>
LVDS_EG_B_DATA_N<1>
LVDS_EG_B_DATA_P<2>
LVDS_EG_B_DATA_N<2>
LVDS_EG_B_DATA_P<3>
LVDS_EG_B_DATA_N<3>
DP_EG_AUX_CH_P
DP_EG_AUX_CH_N
DP_EG_ML_P<0>
DP_EG_ML_N<0>
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DP_EG_ML_P<2>
DP_EG_ML_N<2>
DP_EG_ML_P<3>
DP_EG_ML_N<3>

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

GPU_DACA_VDD
GPU_DACB_VDD
GPU_DACC_VDD

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

NV G96 Video Interfaces

SYNC_MASTER=K20_MLB SYNC_DATE=09/24/2008

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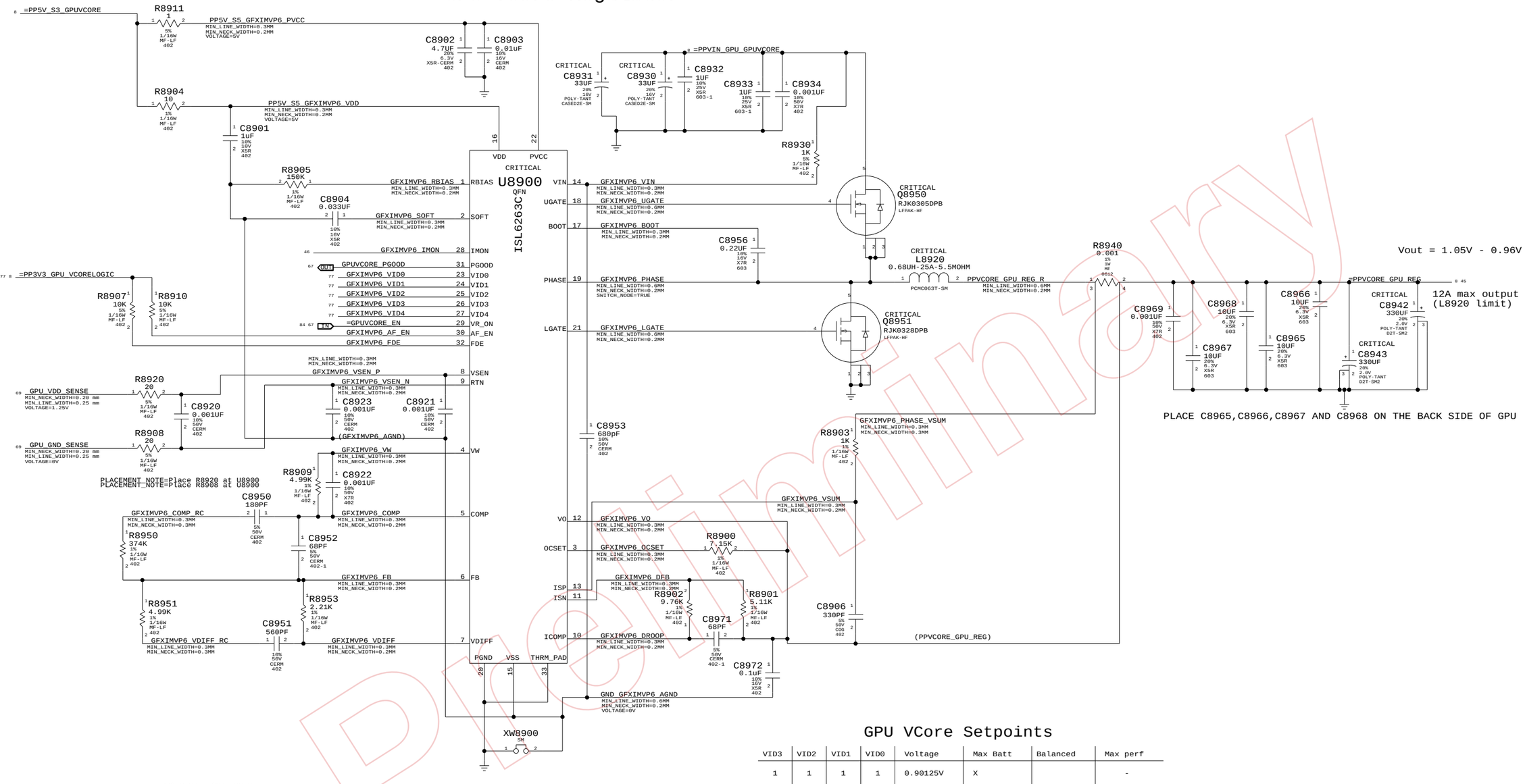
SCALE: NONE SHT 88 OF 123

GPU VCore Regulator



GPU VCore Setpoints

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

Other VID states may not be valid

Default Vcore Setpoints

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

GPU (G96) CORE SUPPLY

SYNC_MASTER=RXU_K20 SYNC_DATE=05/21/2008

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APPLE INC.

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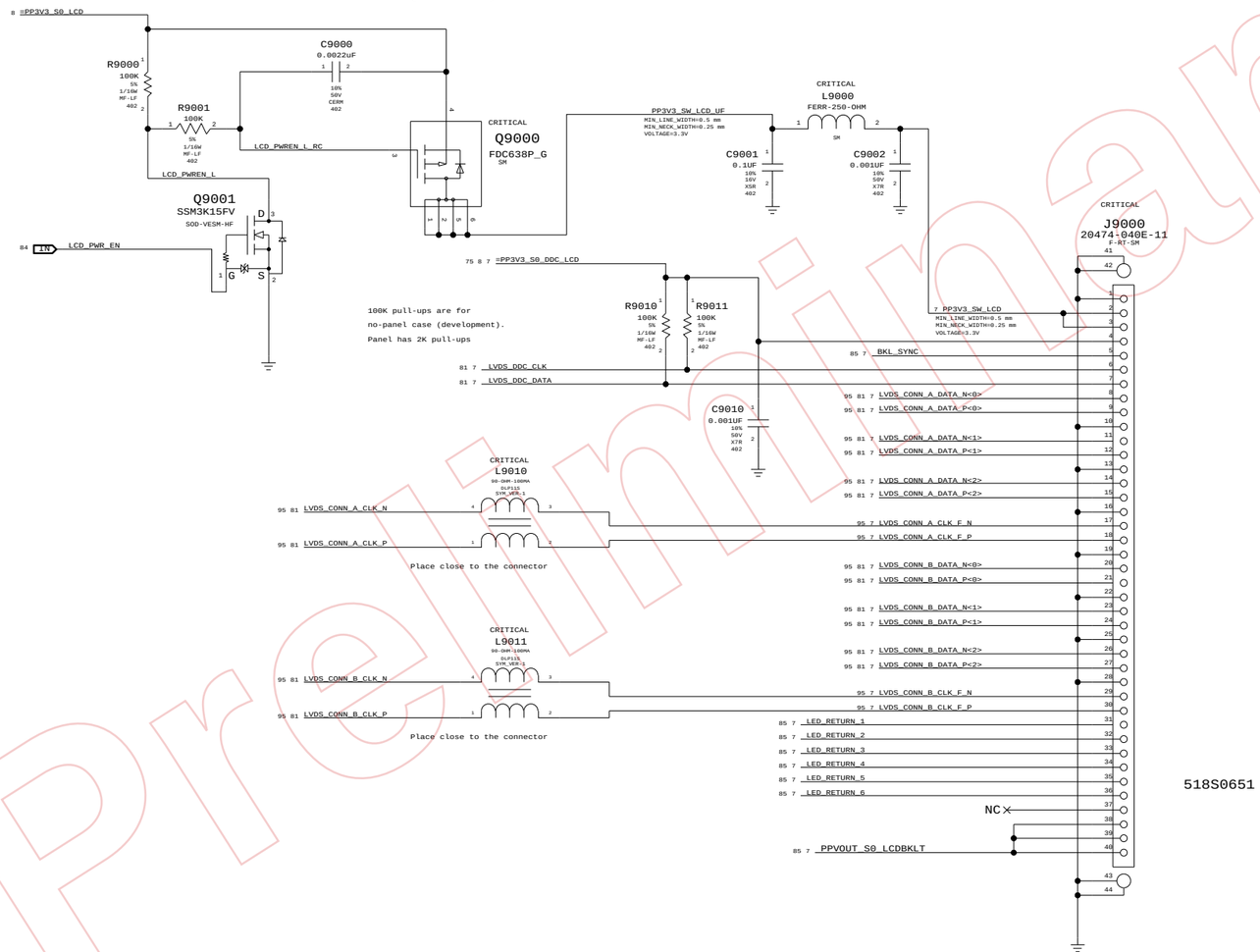
D	051-7656	31

SCALE NONE SHT 89 OF 123

LCD (LVDS) INTERFACE



518S0651

LVDS Display Connector

SYNC_MASTER=M98_MLB SYNC_DATE=07/14/2008

APPLE INC.

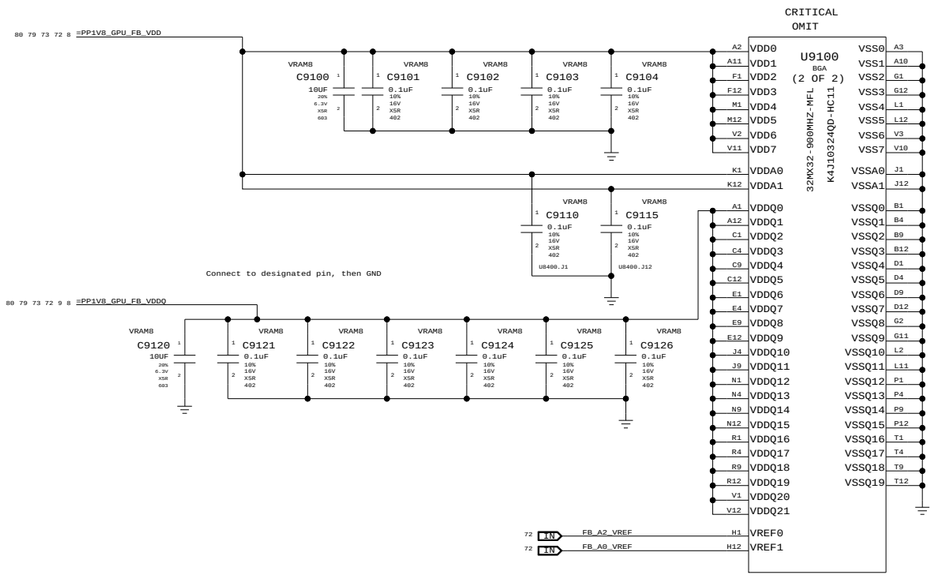
SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE	SHT	OF
NONE	90	123

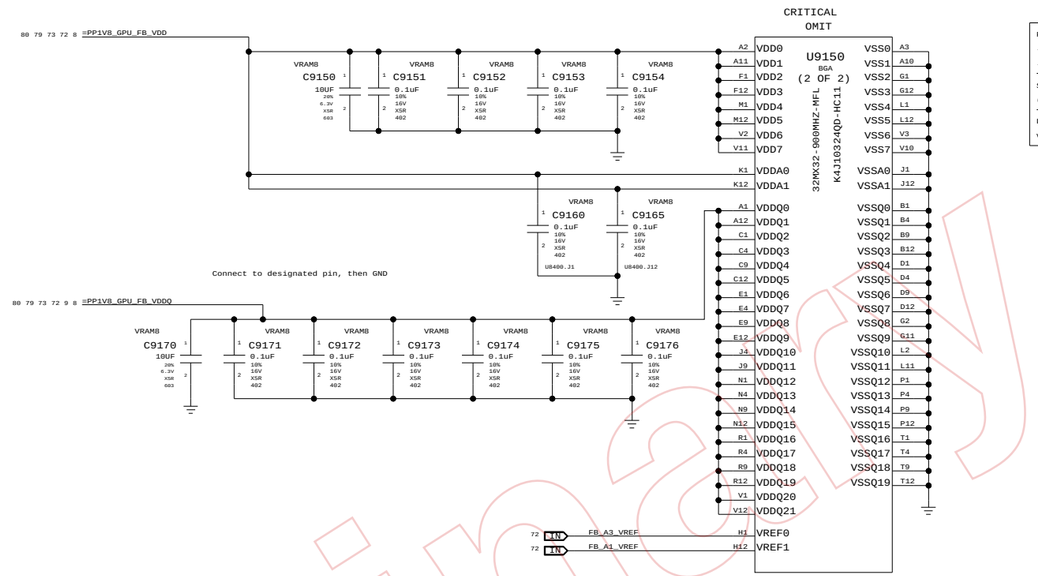
Page Notes

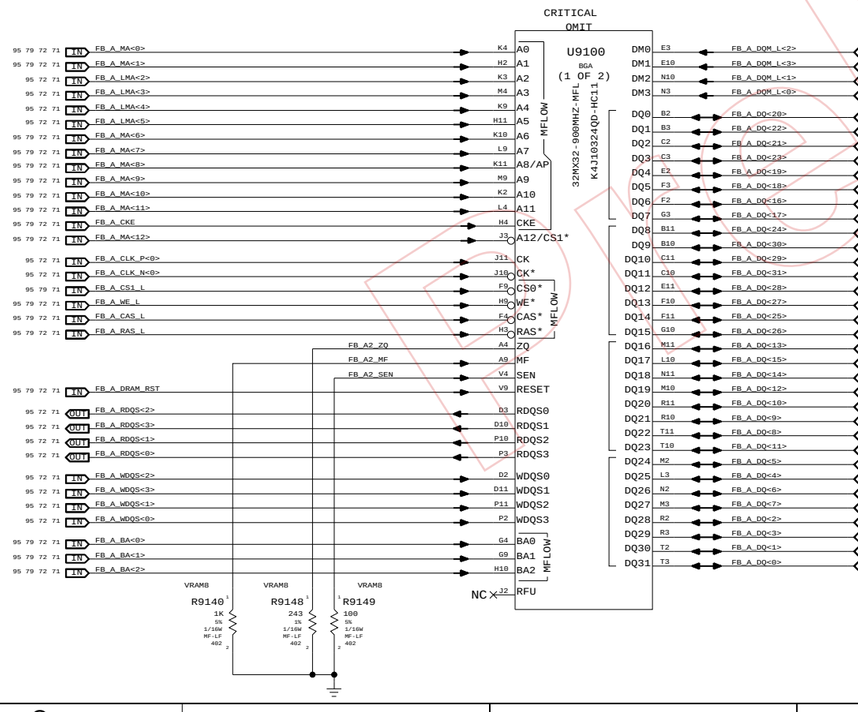
Power aliases required by this page:
- =PP1V8_S0_FB_VDD
- =PP1V8_S0_FB_VDDQ

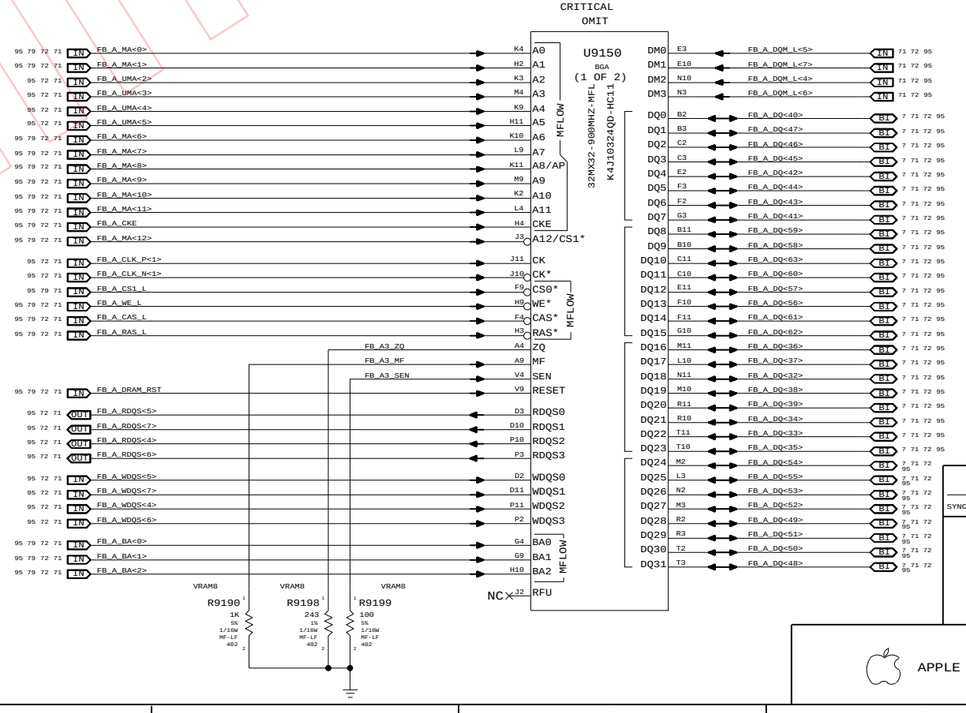
Signal aliases required by this page:
(NONE)

BOM options provided by this page:
VRAM8









GDDR3 Frame Buffer A (Top)

SYNC_MASTER=M99_MLB SYNC_DATE=04/04/2008

APPLE INC.

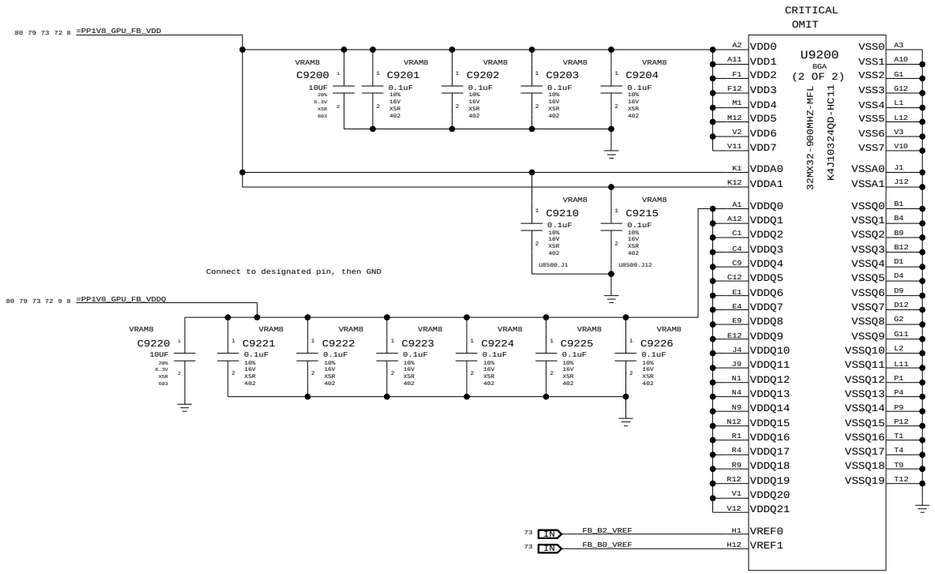
SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 91 OF 123	

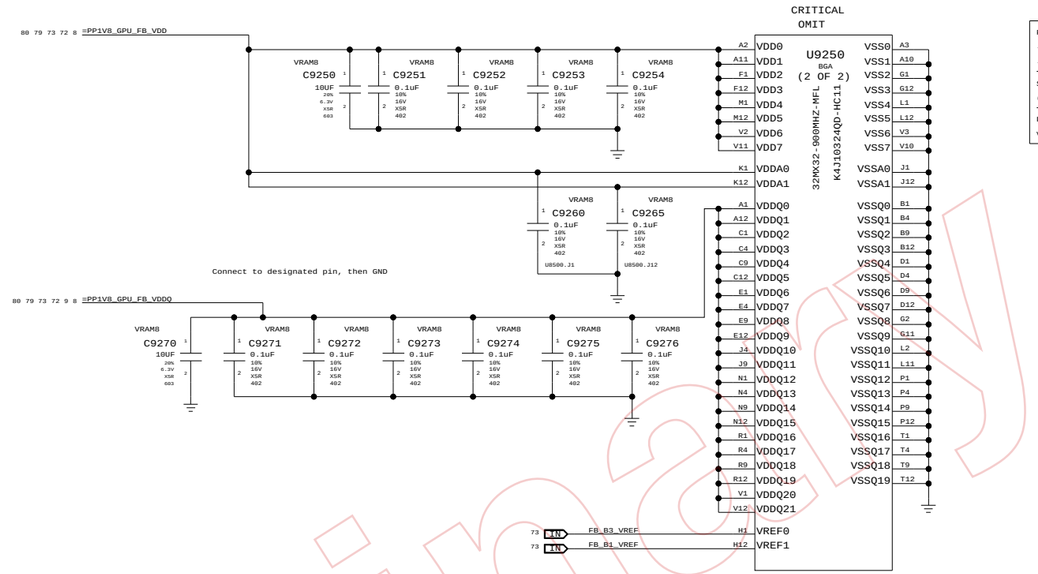
Page Notes

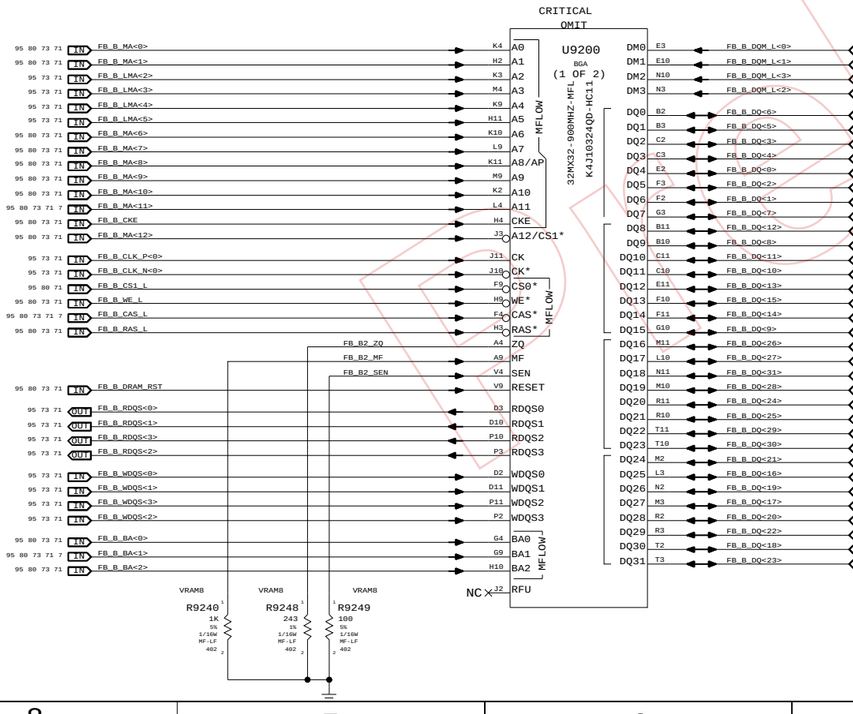
Power aliases required by this page:
- =PP1V8_S0_FB_VDD
- =PP1V8_S0_FB_VDDQ

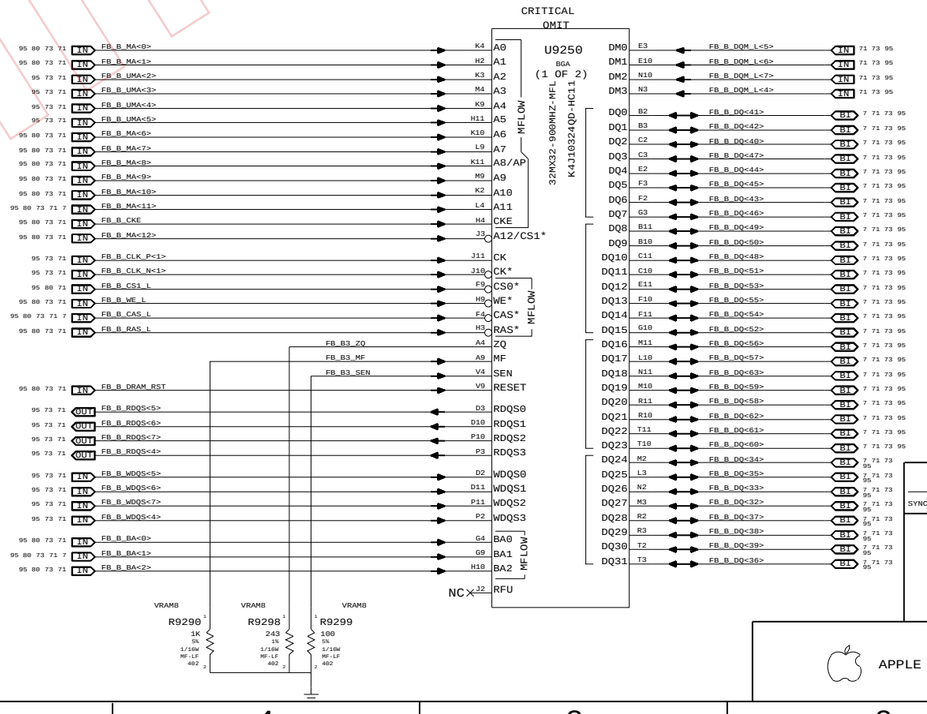
Signal aliases required by this page:
(NONE)

BOM options provided by this page:
VRAM8









GDDR3 Frame Buffer B (Top)

SYNC_MASTER=M88_MLB SYNC_DATE=11/01/2007

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 92 OF 123	

LVDS Transmitter Termination

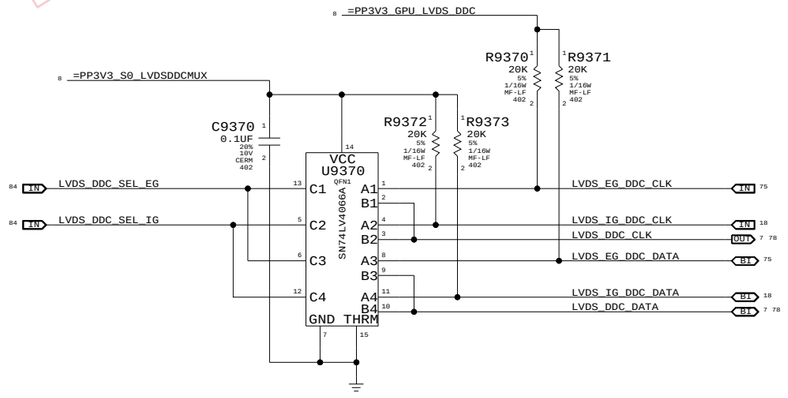
All emulated LVDS outputs require this termination

PLACEMENT_NOTE=Place at U9600 (All 24 resistors)

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
114S0517	16	RES,MTL FILM,270 OHM,1%,1/16W,0402,SMD,L			GMUX_2V5
114S0174	16	RES,MTL FILM,1/16W,357 OHM,1,0402,SMD,LF			GMUX_1V8

DisplayPort Mux

LVDS DDC MUX



Muxed Graphics Support

SYNC_MASTER=M98_MLB SYNC_DATE=05/01/2008

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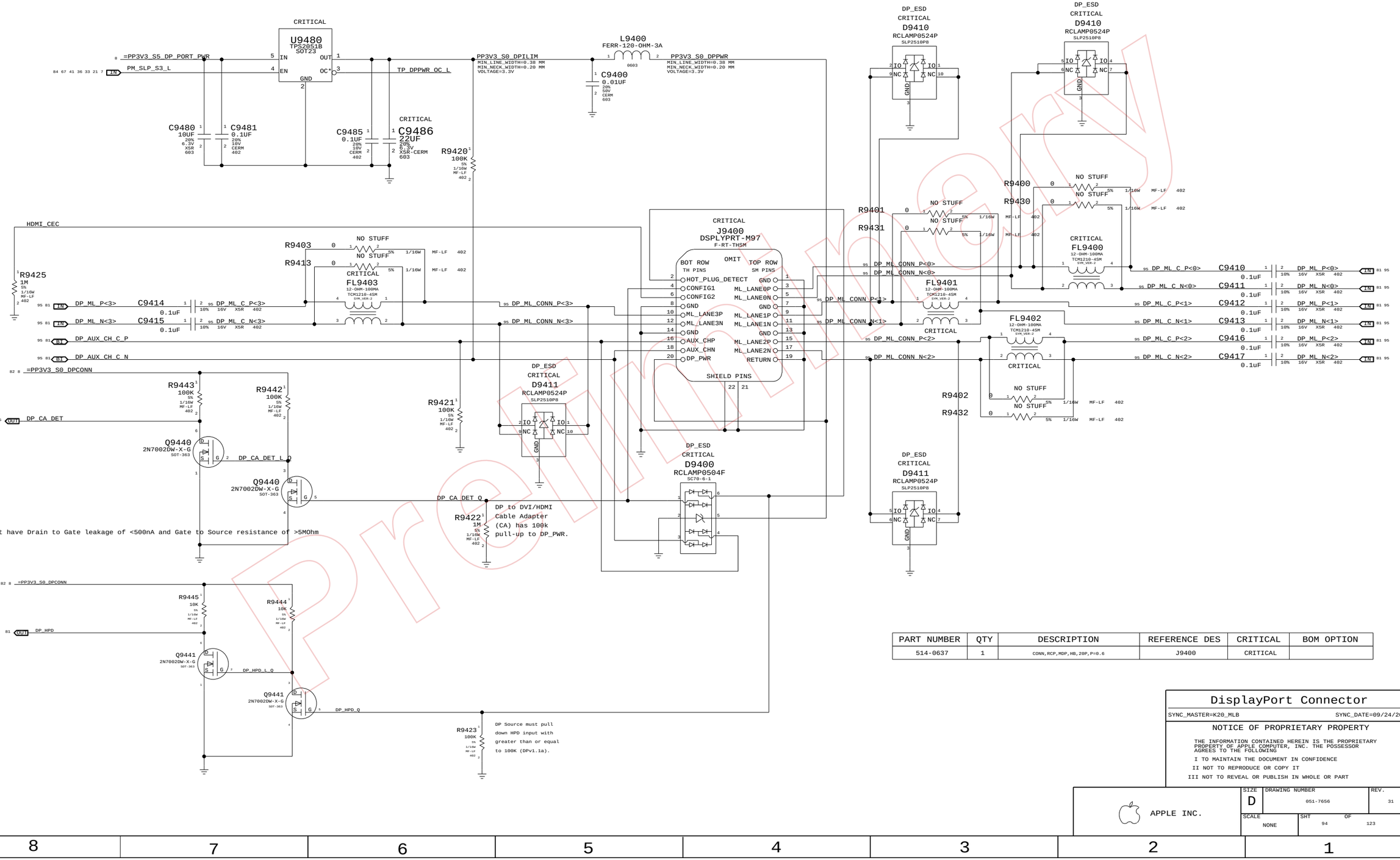
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 93 OF 123	

Port Power Switch



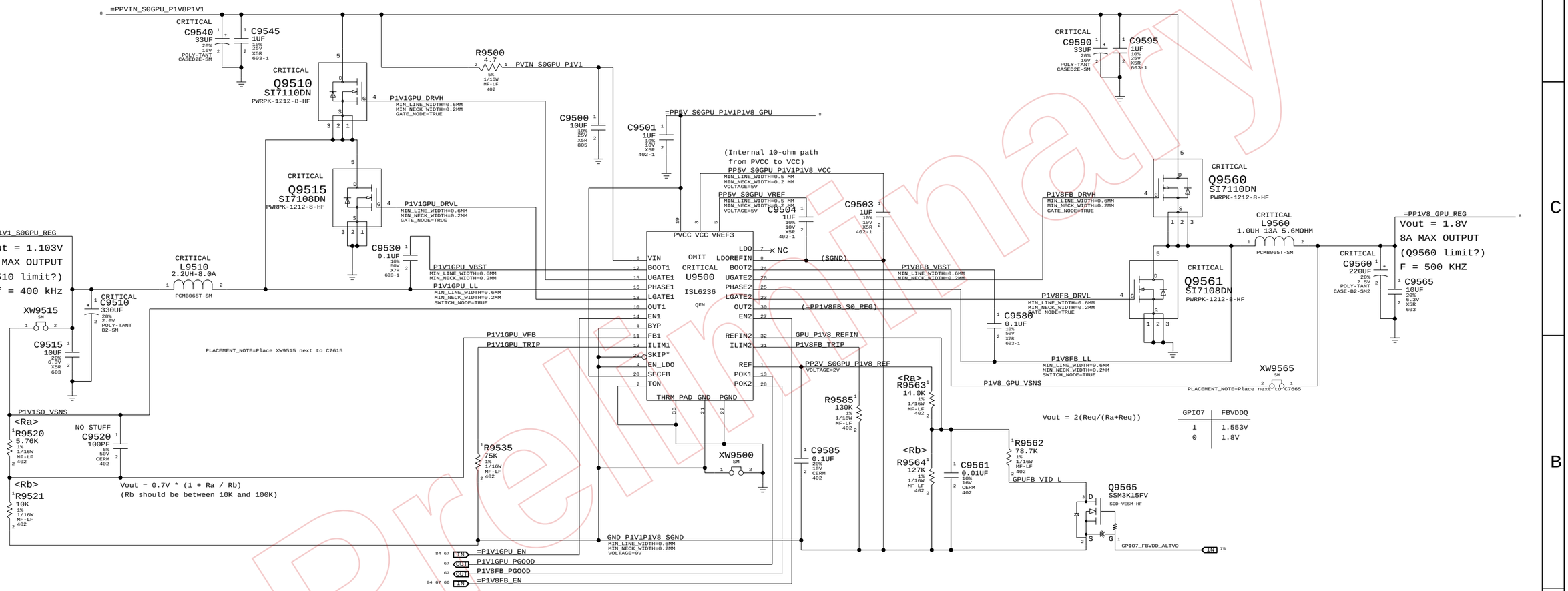
PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
514-0637	1	CONN,RCP,MDP,HB,20P,P=0.6	J9400	CRITICAL	

DisplayPort Connector

SYNC_MASTER=K20_MLB SYNC_DATE=09/24/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 94 OF 123	



PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
353S2312	1	IC,ISL6236,DUAL PWM CNTRL,QFN32	U9500	CRITICAL	

1.1V / 1V8 FB Power Supply

SYNC_MASTER=RXU_K20 SYNC_DATE=05/21/2008

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APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31

SCALE NONE SHT 95 OF 123

GMUX CPLD

=PP3V3_S0_GMUX
C9610 0.1UF 20% 10V CERM 402
C9621 0.1UF 20% 10V CERM 402
C9622 0.1UF 20% 10V CERM 402
C9623 0.1UF 20% 10V CERM 402
C9624 0.1UF 20% 10V CERM 402
C9625 0.1UF 20% 10V CERM 402
C9626 0.1UF 20% 10V CERM 402
C9627 0.1UF 20% 10V CERM 402
C9628 0.1UF 20% 10V CERM 402
C9629 0.1UF 20% 10V CERM 402

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

=PP1V2_S0_GMUX
C9600 4.7UF 20% 4V X5R 402
C9604 0.1UF 20% 10V CERM 402
C9605 0.1UF 20% 10V CERM 402
C9606 0.1UF 20% 10V CERM 402
C9607 0.1UF 20% 10V CERM 402
C9608 0.1UF 20% 10V CERM 402
C9609 0.1UF 20% 10V CERM 402

=PP3V3_S0_GMUX
R9640 10K 1% 1/16W MF-LF 402
R9645 10K 1% 1/16W MF-LF 402

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

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

PP3V3_S0_GMUX_ULC_VCCPLL
MIN_LINE_WIDTH=0.4 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=3.3V
L9621 FERR-220-OHM 0402
C9631 0.1UF 20% 10V CERM 402

PP3V3_S0_GMUX_LRC_VCCPLL
MIN_LINE_WIDTH=0.4 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=3.3V
L9620 FERR-220-OHM 0402
C9630 0.1UF 20% 10V CERM 402

VCC: C4, J3, J13, N11, P8
VCCAUX: C11, J2, J14, M8
VCCIO0: B11
VCCIO1: B5
VCCIO2: B7
VCCIO3: A12
VCCIO4: C14
VCCIO5: F13
VCCIO6: M12
VCCIO7: M9, M3, N5, M1, C3, F2
VCCJ: K12
ULC_VCCPLL: A4
LRC_VCCPLL: P11

OMIT
CRITICAL

U9600
XP28
CSBGA-HF

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

BANK5: PB2A, PB2B, PB14A, PB14B, PB15A, PB15B, PB16A, PB16B, PB17A, PB17B, PB18A, PB18B, PB19A, PB19B
BANK4: PB20A, PB20B, PB30A, PB30B, PB31A, PB31B, PB32A, PB32B
BANK7: PL2A, PL2B, PL10A, PL10B, PL11A, PL11B, PL12A, PL12B, PL13A, PL13B, PL14A, PL14B, PL15A, PL15B, PL16A, PL16B
BANK6: PL18A, PL18B, PL19A, PL19B, PL32A, PL32B

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

GND: J1, B9, C6, F12, G13, E13, M14, N10, P3, M2, C1, E2, B4, M11
GNDIO0, GNDIO1, GNDIO2, GNDIO3, GNDIO4, GNDIO5, GNDIO6, GNDIO7, ULC_GNDPLL, LRC_GNDPLL

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

BANK0: PT2A, PT2B, PT3A, PT3B, PT4A, PT4B, PT14A, PT14B, PT15A, PT15B, PT16A, PT16B, PT17A, PT17B, PT18A, PT18B, PT19A, PT19B
BANK1: PT20A, PT20B, PT32A, PT32B
BANK2: PR2A, PR2B, PR10A, PR10B, PR11A, PR11B, PR12A, PR12B, PR13A, PR13B, PR14A, PR14B, PR15A, PR15B, PR16A, PR16B
BANK3: PR18A, PR18B, PR30A, PR30B

GMUX_JTAG_TCK Inversion

JTAG_GMUX_TCK
Q9670 SSM6N15FEAPE SOT563
SILK_PART=GMUX_RST
NO STUFF
R9679 10K 1% 1/16W MF-LF 402
PLACEMENT_NOTE=Place on top side at U9600
GMUX_JTAG_TCK_L

PM_SLP_S3_L Isolation

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

NO STUFF
R9677 10K 1% 1/16W MF-LF 402
=PP3V3_S0_GMUX
GMUX_S0_PD_DIS_RC
NO STUFF
C9695 1UF 10% 6.3V CERM 402
R9684 0 5% 1/16W MF-LF 402
ALL_SYS_PWRGD

=PP3V3_S3_GMUX
R9676 100K 5% 1/16W MF-LF 402
GMUX_S3_PD_EN
Q9607 SSM6N15FEAPE SOT563
Q9607 SSM6N15FEAPE SOT563
GMUX_S3_PD_GND
NO STUFF
R9675 0 5% 1/16W MF-LF 402

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
336S0027	1	IC,XP2-8,HF,CPLD,BLANK	U9600	CRITICAL	GMUX_BK_BLANK
341S2354	1	IC,CPLD,LATTICE,132CSBGA,K20	U9600	CRITICAL	GMUX_PROG

LVDS Receiver Termination

PLACEMENT_NOTE=Place at U9600 (All 14 resistors)

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

SIGNAL_MODEL=EMPTY

Required Pullups

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

Required Pulldowns

DP_MUX_SEL_EG R9681 10K
LVDS_DDC_SEL_IG R9682 10K
LVDS_DDC_SEL_EG R9683 10K
NO STUFF
EG_RESET_L R9691 100K
GMUX_INT R9692 20K
LCD_BKLT_PWM R9693 100K
EG_CLKREQ_IN_L R9694 100K
5% 1/16W MF-LF 402

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

EG_PWRSEQ_HW R9630 0
EG_PWRSEQ_GMUX R9631 0
EG_PWRSEQ_GMUX R9632 0
EG_PWRSEQ_GMUX R9633 0
EG_PWRSEQ_GMUX R9634 0
5% 1/16W MF-LF 402

EG_RAIL1_EN → EXTGPU_PWR_EN (OUT 67)
EG_RAIL2_EN → =P1V1GPU_EN (OUT 67 83)
EG_RAIL3_EN → P3V3GPU_EN (OUT 67 68)
EG_RAIL4_EN → GPUVCORE_EN (OUT 67 77)
=P1V8FB_EN (OUT 66 67 83)

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

LCD_PWR_EN
R9678 4.7K 5% 1/16W MF-LF 402
EG_PWRSEQ_GMUX R9671 4.7K 5% 1/16W MF-LF 402
EG_PWRSEQ_GMUX R9672 4.7K 5% 1/16W MF-LF 402
EG_PWRSEQ_GMUX R9673 4.7K 5% 1/16W MF-LF 402
EG_PWRSEQ_GMUX R9674 4.7K 5% 1/16W MF-LF 402
EG_PWRSEQ_GMUX
GMUX_S3_PD_GND
NO STUFF C9691 0.1UF 20% 10V CERM 402
NO STUFF C9692 0.1UF 20% 10V CERM 402
NO STUFF C9693 0.1UF 20% 10V CERM 402
NO STUFF C9694 0.1UF 20% 10V CERM 402

Graphics MUX (GMUX)

SYNC_MASTER=T18_MXMGMUX SYNC_DATE=02/13/2008

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SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 96 OF 123	

*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 5% 1/10W MF-LF 603
PPVIN_S0_LCDBKLT_BUF
CRITICAL L9701 22UH-2.5A IHLP2525CZ-SM
PPVOUT_S0_LCDBKLT_SW
R9701 49.9 1% 1/16W MF-LF 402
PLACEMENT_NOTE=L9701 PLACE NEAR Q9701
CRITICAL C9701 10UF 10% 25V X5R 805
PLACEMENT_NOTE=C9701 PLACE NEAR L9701
XW9701 SM
GND_BKL_PWRGND
PLACEMENT_NOTE=XW9701 PLACE NEAR C9701
C9702 0.1UF 10% 25V X5R 402
BKL_VIN
BOOST_FET_CNTL
CRITICAL Q9701 SI7308DN PWRPK-1212-8
PLACEMENT_NOTE=D9701 PLACE NEAR Q9701
D9701 SOD-123 RB160M-60G CRITICAL
PLACEMENT_NOTE=C9709 PLACE NEAR C9710
PLACEMENT_NOTE=C9710 PLACE NEAR J9000
CRITICAL C9709 2.2UF 10% 100V X7R 1210
CRITICAL C9710 2.2UF 10% 100V X7R 1210
BOOST_SINK
GND_BKL_PWRGND
PLACEMENT_NOTE=R9715 PLACE NEAR C9709 AND Q9701
R9704 100 1% 1/16W MF-LF 402
R9702 0.4 1% 1/6W MF 402
R9715 0.4 1% 1/6W MF 402
XW9702 SM
GND_BKL_PWRGND_X
PLACEMENT_NOTE=R9702 PLACE NEAR C9709 AND Q9701
*R9702 AND R9715 PIN 1 SHOULD BE PLACED NEAR C9709 PIN 2
C9712 47PF 5% 50V CERM 402 NO STUFF
PPVOUT_S0_LCDBKLT

BKL_VREF_4V9
R9731 187K 1% 1/16W MF-LF 402
PPBUS_S0_LCDBKLT_PWR
BKLT_EN
BKL_SYNC
BKLT_PLL
R9734 0 5% 1/16W MF-LF 402
BKL_VSYNC
R9706 10K 5% 1/16W MF-LF 402
R9707 2.67K 1% 1/16W MF-LF 402
C9703 1UF 10% 25V X5R 402
C9713 0.1UF 10% 25V X5R 402
R9705 100K 1% 1/16W MF-LF 402
PLACEMENT_NOTE=R9707 AWAY FROM Q9701
OMIT
CRITICAL
U9700 APP001 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
BOOST_SINK_R
BKL_ISEN1
BKL_ISEN2
BKL_ISEN3
BKL_ISEN4
BKL_ISEN5
BKL_ISEN6
NO STUFF
R9717 10.2 0.1% 1/16W TF 402
LED_RETURN_6
R9718 10.2 0.1% 1/16W TF 402
LED_RETURN_5
R9719 10.2 0.1% 1/16W TF 402
LED_RETURN_4
R9720 10.2 0.1% 1/16W TF 402
LED_RETURN_3
R9721 10.2 0.1% 1/16W TF 402
LED_RETURN_2
R9722 10.2 0.1% 1/16W TF 402
LED_RETURN_1
PLACEMENT_NOTE=R9708 AWAY FROM Q9701
PLACEMENT_NOTE=R9709 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 NO STUFF
BKL_SSTCMP_RC
C9705 0.1UF 20% 10V CERM 402
BKLT_PWM_RC
R9733 4.7K 5% 1/16W MF-LF 402
C9706 0.0022UF 10% 50V CERM 402
C9714 1UF 10% 10V X5R 402
PLACEMENT_NOTE=R9714 AWAY FROM Q9701
R9713 0 5% 1/16W MF-LF 402
PLACEMENT_NOTE=R9713 AWAY FROM Q9701
BKLT_PLL_NOT
R9714 10K 5% 1/16W MF-LF 402
C9707 2.2UF 20% 6.3V CERM 402-LF
C9708 0.1UF 10% 25V X5R 402
BKL_LRT_RC
R9727 75K 1% 1/16W MF-LF 402
PLACEMENT_NOTE=R9727 AWAY FROM Q9701
GND_BKL_PWRGND
THRESHOLD=2.5V
BKL_VSEN
50.4*R9724/(R9723+R9724)=2.4V
R9723 1.2M 1% 1/10W MF-LF 603
R9724 60.4K 1% 1/16W MF-LF 402

CRITICAL Q9702 NTUD3127CXXG SOT-963 P-CHN
BKL_VREF_4V9
BKL_VREF_IN_4V9
R9700 10K 1% 1/16W MF-LF 402
BKL_PWR_EN
CRITICAL Q9702 NTUD3127CXXG SOT-963 N-CHN
LCD_BKLT_PWM
R9710 4.02K 1% 1/16W MF-LF 402
R9711 8.06K 1% 1/16W MF-LF 402

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

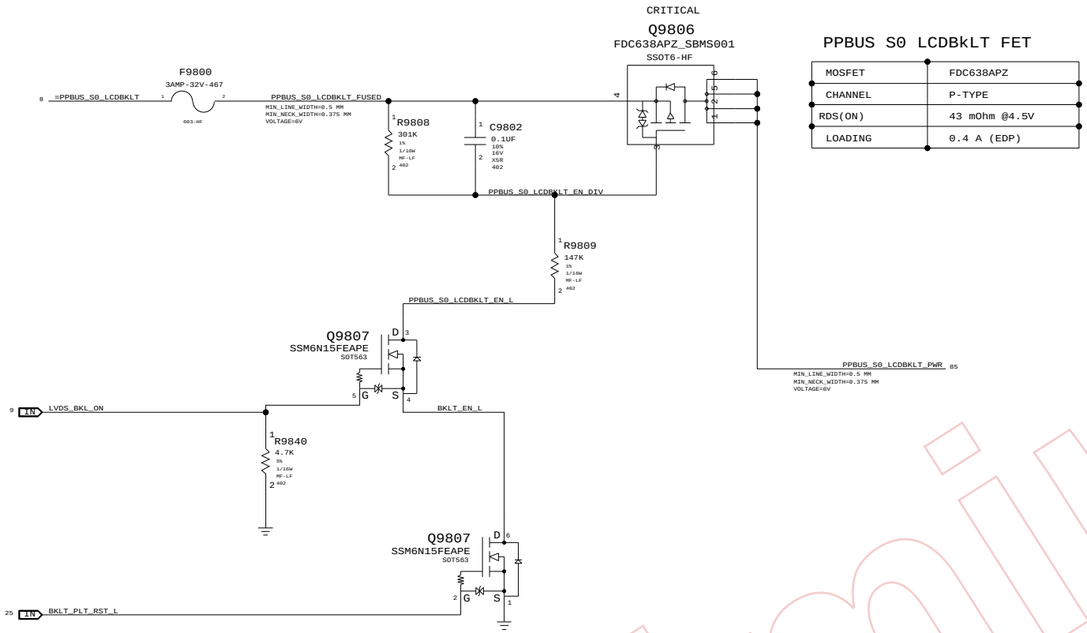
PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
353S2413	1	IC,APP001A,WHT LED BKLGHT CTR,SCRN,QFN20	U9700	CRITICAL	

LCD BACKLIGHT DRIVER

SYNC_MASTER=KIRAN_K20
SYNC_DATE=12/03/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 97 OF 123	



PPBUS S0 LCDBkLT FET

MOSFET	FDC638APZ
CHANNEL	P-TYPE
RDS(ON)	43 mOhm @4.5V
LOADING	0.4 A (EDP)

LCD Backlight Support

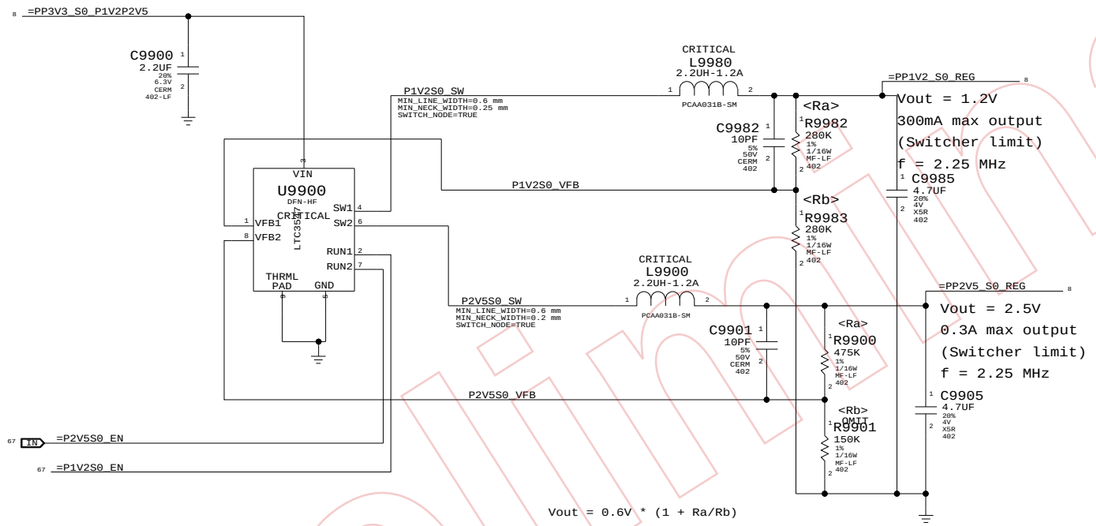
SYNC_MASTER=YLEE_K20 SYNC_DATE=07/18/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31

SCALE	SHT	OF
NONE	98	123

GMUX 1.8V/1.2V S0 Switcher



PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
114S0428	1	RES,MTL FILM,1/16W,150K,1,0402,SMD,LF	R9901		GMUX_2V5
114S0447	1	RES,MTL FILM,1/16W,237K,1,0402,SMD,LF	R9901		GMUX_1V8

Misc Power Supplies

SYNC_MASTER=RXU_K20 SYNC_DATE=05/07/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31

SCALE	SHT	OF
NONE	99	123

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>	7 10 14
	FSB_DATA_GROUP0	FSB_50S	FSB_DATA	FSB_DINV_L<0>	7 10 14
	FSB_DSTB0	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_P<0>	7 10 14
	FSB_DSTB0	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_N<0>	7 10 14
	FSB_DATA_GROUP1	FSB_50S	FSB_DATA	FSB_D_L<31..16>	7 10 14
	FSB_DATA_GROUP1	FSB_50S	FSB_DATA	FSB_DINV_L<1>	7 10 14
	FSB_DSTB1	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_P<1>	7 10 14
	FSB_DSTB1	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_N<1>	7 10 14
	FSB_DATA_GROUP2	FSB_50S	FSB_DATA	FSB_D_L<47..32>	7 10 14
	FSB_DATA_GROUP2	FSB_50S	FSB_DATA	FSB_DINV_L<2>	7 10 14
	FSB_DSTB2	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_P<2>	7 10 14
	FSB_DSTB2	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_N<2>	7 10 14
	FSB_DATA_GROUP3	FSB_50S	FSB_DATA	FSB_D_L<63..48>	7 10 14
	FSB_DATA_GROUP3	FSB_50S	FSB_DATA	FSB_DINV_L<3>	7 10 14
	FSB_DSTB3	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_P<3>	7 10 14
	FSB_DSTB3	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_N<3>	7 10 14
FSB 2X Signals	FSB_ADDR_GROUP0	FSB_50S	FSB_ADDR	FSB_A_L<16..3>	7 10 14
	FSB_ADDR_GROUP0	FSB_50S	FSB_ADDR	FSB_REQ_L<4..0>	7 10 14
	FSB_ADSTB0	FSB_50S	FSB_ADSTB	FSB_ADSTB_L<0>	7 10 14
	FSB_ADDR_GROUP1	FSB_50S	FSB_ADDR	FSB_A_L<35..17>	7 10 14
	FSB_ADSTB1	FSB_50S	FSB_ADSTB	FSB_ADSTB_L<1>	7 10 14
FSB 1X Signals	FSB_1X	FSB_50S	FSB_1X	FSB_ADS_L	7 10 14
	FSB_BREQ0_L	FSB_50S	FSB_1X	FSB_BREQ0_L	9 10 14
	FSB_BREQ1_L	FSB_50S	FSB_1X	FSB_BREQ1_L	14
	FSB_1X	FSB_50S	FSB_1X	FSB_BNR_L	10 14
	FSB_1X	FSB_50S	FSB_1X	FSB_BPRI_L	10 14
	FSB_1X	FSB_50S	FSB_1X	FSB_DBSY_L	7 10 14
	FSB_1X	FSB_50S	FSB_1X	FSB_DEFER_L	10 14
	FSB_1X	FSB_50S	FSB_1X	FSB_DRDY_L	7 10 14
	FSB_1X	FSB_50S	FSB_1X	FSB_HIT_L	7 10 14
	FSB_1X	FSB_50S	FSB_1X	FSB_HITM_L	7 10 14
	FSB_1X	FSB_50S	FSB_1X	FSB_LOCK_L	7 10 14
	FSB_CPURST_L	FSB_50S	FSB_1X	FSB_CPURST_L	9 10 13 14
	FSB_1X	FSB_50S	FSB_1X	FSB_RS_L<2..0>	10 14
	FSB_1X	FSB_50S	FSB_1X	FSB_TRDY_L	10 14
	CPU_ASYNC	CPU_50S	CPU_AGTL	CPU_A20M_L	10 14
	CPU_BSEL	CPU_50S	CPU_AGTL	CPU_BSEL<2..0>	9 10
	CPU_FERR_L	CPU_50S	CPU_8MIL	CPU_FERR_L	10 14
	CPU_ASYNC	CPU_50S	CPU_AGTL	CPU_IGNNE_L	10 14
	CPU_INIT_L	CPU_50S	CPU_AGTL	CPU_INIT_L	10 14
	CPU_ASYNC_R	CPU_50S	CPU_AGTL	CPU_INTR	9 10 14
	CPU_ASYNC_R	CPU_50S	CPU_AGTL	CPU_NMI	9 10 14
	CPU_PROCHOT_L	CPU_50S	CPU_AGTL	CPU_PROCHOT_L	10 14 42 61
	CPU_PWRGD	CPU_50S	CPU_AGTL	CPU_PWRGD	10 13 14
	CPU_ASYNC	CPU_50S	CPU_AGTL	CPU_SMI_L	10 14
	CPU_ASYNC	CPU_50S	CPU_AGTL	CPU_STPCLK_L	10 14
	PM_THRMTRIP_L	CPU_50S	CPU_8MIL	PM_THRMTRIP_L	10 14 42
	FSB_CPUSLP_L	CPU_50S	CPU_AGTL	FSB_CPUSLP_L	10 14
	CPU_FROM_SB	CPU_50S	CPU_AGTL	CPU_DPSLP_L	10 14
	CPU_DPRSTP_L	CPU_50S	CPU_AGTL	CPU_DPRSTP_L	9 10 14 61
	CPU_ASYNC	CPU_50S	CPU_AGTL	FSB_DPWR_L	10 14
	MCP_CPU_COMP	MCP_50S	MCP_FSB_COMP	MCP_BCLK_VML_COMP_VDD	14
	MCP_CPU_COMP	MCP_50S	MCP_FSB_COMP	MCP_BCLK_VML_COMP_GND	14
	MCP_CPU_COMP	MCP_50S	MCP_FSB_COMP	MCP_CPU_COMP_VCC	14
	MCP_CPU_COMP	MCP_50S	MCP_FSB_COMP	MCP_CPU_COMP_GND	14
	FSB_CLK_CPU	CLK_FSB_100D	CLK_FSB	FSB_CLK_CPU_P	10 14
	FSB_CLK_CPU	CLK_FSB_100D	CLK_FSB	FSB_CLK_CPU_N	10 14
	FSB_CLK_ITP	CLK_FSB_100D	CLK_FSB	FSB_CLK_ITP_P	13 14
	FSB_CLK_ITP	CLK_FSB_100D	CLK_FSB	FSB_CLK_ITP_N	13 14
	FSB_CLK_MCP	CLK_FSB_100D	CLK_FSB	FSB_CLK_MCP_P	14
	FSB_CLK_MCP	CLK_FSB_100D	CLK_FSB	FSB_CLK_MCP_N	14
	CPU_IERR_L	CPU_50S		CPU_IERR_L	10
	PM_DPRSLPVR	CPU_50S	CPU_AGTL	PM_DPRSLPVR	21 61
	(See above)	CPU_50S	CPU_AGTL	IMVP_DPRSLPVR	61
	CPU_GTLREF	CPU_50S	CPU_GTLREF	CPU_GTLREF	10 26
	CPU_COMP	CPU_50S	CPU_COMP	CPU_COMP<3>	10
	CPU_COMP	CPU_27P4S	CPU_COMP	CPU_COMP<2>	10
	CPU_COMP	CPU_50S	CPU_COMP	CPU_COMP<1>	10
	CPU_COMP	CPU_27P4S	CPU_COMP	CPU_COMP<0>	10
	XDP_TDI	CPU_50S	CPU_ITP	XDP_TDI	6 10 13
	XDP_TDO	CPU_50S	CPU_ITP	XDP_TDO	6 10
	XDP_TMS	CPU_50S	CPU_ITP	XDP_TMS	6 10 13
	XDP_TCK	CPU_50S	CPU_ITP	XDP_TCK	6 10 13
	XDP_TRST_L	CPU_50S	CPU_ITP	XDP_TRST_L	6 10 13
	XDP_BPM_L	CPU_50S	CPU_ITP	XDP_BPM_L<4..0>	10 13
	XDP_BPM_L5	CPU_50S	CPU_ITP	XDP_BPM_L<5>	10 13
	(FSB_CPURST_L)	CPU_50S	CPU_ITP	XDP_CPURST_L	13
		CPU_50S	CPU_8MIL	CPU_VID<6..0>	9 11
		CPU_50S	CPU_8MIL	IMVP6_VID<6..0>	9 61
	CPU_VCCSENSE	CPU_27P4S	CPU_VCCSENSE	CPU_VCCSENSE_P	11 61
	CPU_VCCSENSE	CPU_27P4S	CPU_VCCSENSE	CPU_VCCSENSE_N	11 61
	(CPU_VCCSENSE)	CPU_27P4S	CPU_VCCSENSE	IMVP6_VSEN_P	61
	(CPU_VCCSENSE)	CPU_27P4S	CPU_VCCSENSE	IMVP6_VSEN_N	61

CPU/FSB Constraints

SYNC_MASTER=M98_MLB SYNC_DATE=04/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 100 OF 123	

Memory Bus Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
MEM_40S	*	=40_OHM_SE	=40_OHM_SE	=40_OHM_SE	=40_OHM_SE	=STANDARD	=STANDARD
MEM_40S_VDD	*	=40_OHM_SE	=40_OHM_SE	=40_OHM_SE	=40_OHM_SE	=STANDARD	=STANDARD
MEM_70D	*	=70_OHM_DIFF	=70_OHM_DIFF	=70_OHM_DIFF	=70_OHM_DIFF	=70_OHM_DIFF	=70_OHM_DIFF
MEM_70D_VDD	*	=70_OHM_DIFF	=70_OHM_DIFF	=70_OHM_DIFF	=70_OHM_DIFF	=70_OHM_DIFF	=70_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
MEM_CLK2MEM	*	=4:1_SPACING	?
MEM_CTRL2CTRL	*	=2:1_SPACING	?
MEM_CTRL2MEM	*	=2.5:1_SPACING	?
MEM_CMD2CMD	*	=1.5:1_SPACING	?
MEM_CMD2MEM	*	=3:1_SPACING	?
MEM_DATA2DATA	*	=1.5:1_SPACING	?
MEM_DATA2MEM	*	=3:1_SPACING	?
MEM_DQS2MEM	*	=3:1_SPACING	?
MEM_2OTHER	*	25 MIL	?

Memory Bus Spacing Group Assignments

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

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

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

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

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

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

Need to support MEM_*-style wildcards!

DDR2:

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

DDR3:

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

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

MCP MEM COMP Signal Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
MCP_MEM_COMP	*	Y	7 MIL	7 MIL	=STANDARD	=STANDARD	=STANDARD

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

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

Memory Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
MEM_A_CLK	MEM_70D_VDD	MEM_CLK	MEM_A_CLK_P<5..0>	15 27
MEM_A_CLK	MEM_70D_VDD	MEM_CLK	MEM_A_CLK_N<5..0>	15 27
MEM_A_CNTL	MEM_40S_VDD	MEM_CTRL	MEM_A_CKE<3..0>	15 27
MEM_A_CNTL	MEM_40S_VDD	MEM_CTRL	MEM_A_CS_L<3..0>	15 27
MEM_A_CNTL	MEM_40S_VDD	MEM_CTRL	MEM_A_ODT<3..0>	15 27
MEM_A_CMD	MEM_40S_VDD	MEM_CMD	MEM_A_A<14..0>	15 27
MEM_A_CMD	MEM_40S_VDD	MEM_CMD	MEM_A_BA<2..0>	15 27
MEM_A_CMD	MEM_40S_VDD	MEM_CMD	MEM_A_RAS_L	15 27
MEM_A_CMD	MEM_40S_VDD	MEM_CMD	MEM_A_CAS_L	15 27
MEM_A_CMD	MEM_40S_VDD	MEM_CMD	MEM_A_WE_L	15 27
MEM_A_DQ_BYTE0	MEM_40S	MEM_DATA	MEM_A_DQ<7..0>	15 27
MEM_A_DQ_BYTE1	MEM_40S	MEM_DATA	MEM_A_DQ<15..8>	15 27
MEM_A_DQ_BYTE2	MEM_40S	MEM_DATA	MEM_A_DQ<23..16>	15 27
MEM_A_DQ_BYTE3	MEM_40S	MEM_DATA	MEM_A_DQ<31..24>	15 27
MEM_A_DQ_BYTE4	MEM_40S	MEM_DATA	MEM_A_DQ<39..32>	15 27
MEM_A_DQ_BYTE5	MEM_40S	MEM_DATA	MEM_A_DQ<47..40>	15 27
MEM_A_DQ_BYTE6	MEM_40S	MEM_DATA	MEM_A_DQ<55..48>	15 27
MEM_A_DQ_BYTE7	MEM_40S	MEM_DATA	MEM_A_DQ<63..56>	15 27
MEM_A_DQ_BYTE0	MEM_40S	MEM_DATA	MEM_A_DM<0>	15 27
MEM_A_DQ_BYTE1	MEM_40S	MEM_DATA	MEM_A_DM<1>	15 27
MEM_A_DQ_BYTE2	MEM_40S	MEM_DATA	MEM_A_DM<2>	15 27
MEM_A_DQ_BYTE3	MEM_40S	MEM_DATA	MEM_A_DM<3>	15 27
MEM_A_DQ_BYTE4	MEM_40S	MEM_DATA	MEM_A_DM<4>	15 27
MEM_A_DQ_BYTE5	MEM_40S	MEM_DATA	MEM_A_DM<5>	15 27
MEM_A_DQ_BYTE6	MEM_40S	MEM_DATA	MEM_A_DM<6>	15 27
MEM_A_DQ_BYTE7	MEM_40S	MEM_DATA	MEM_A_DM<7>	15 27
MEM_A_DQS0	MEM_70D	MEM_DQS	MEM_A_DQS_P<0>	15 27
MEM_A_DQS0	MEM_70D	MEM_DQS	MEM_A_DQS_N<0>	15 27
MEM_A_DQS1	MEM_70D	MEM_DQS	MEM_A_DQS_P<1>	15 27
MEM_A_DQS1	MEM_70D	MEM_DQS	MEM_A_DQS_N<1>	15 27
MEM_A_DQS2	MEM_70D	MEM_DQS	MEM_A_DQS_P<2>	15 27
MEM_A_DQS2	MEM_70D	MEM_DQS	MEM_A_DQS_N<2>	15 27
MEM_A_DQS3	MEM_70D	MEM_DQS	MEM_A_DQS_P<3>	15 27
MEM_A_DQS3	MEM_70D	MEM_DQS	MEM_A_DQS_N<3>	15 27
MEM_A_DQS4	MEM_70D	MEM_DQS	MEM_A_DQS_P<4>	15 27
MEM_A_DQS4	MEM_70D	MEM_DQS	MEM_A_DQS_N<4>	15 27
MEM_A_DQS5	MEM_70D	MEM_DQS	MEM_A_DQS_P<5>	15 27
MEM_A_DQS5	MEM_70D	MEM_DQS	MEM_A_DQS_N<5>	15 27
MEM_A_DQS6	MEM_70D	MEM_DQS	MEM_A_DQS_P<6>	15 27
MEM_A_DQS6	MEM_70D	MEM_DQS	MEM_A_DQS_N<6>	15 27
MEM_A_DQS7	MEM_70D	MEM_DQS	MEM_A_DQS_P<7>	15 27
MEM_A_DQS7	MEM_70D	MEM_DQS	MEM_A_DQS_N<7>	15 27
MEM_B_CLK	MEM_70D_VDD	MEM_CLK	MEM_B_CLK_P<5..0>	15 28
MEM_B_CLK	MEM_70D_VDD	MEM_CLK	MEM_B_CLK_N<5..0>	15 28
MEM_B_CNTL	MEM_40S_VDD	MEM_CTRL	MEM_B_CKE<3..0>	15 28
MEM_B_CNTL	MEM_40S_VDD	MEM_CTRL	MEM_B_CS_L<3..0>	15 28
MEM_B_CNTL	MEM_40S_VDD	MEM_CTRL	MEM_B_ODT<3..0>	15 28
MEM_B_CMD	MEM_40S_VDD	MEM_CMD	MEM_B_A<14..0>	15 28
MEM_B_CMD	MEM_40S_VDD	MEM_CMD	MEM_B_BA<2..0>	15 28
MEM_B_CMD	MEM_40S_VDD	MEM_CMD	MEM_B_RAS_L	15 28
MEM_B_CMD	MEM_40S_VDD	MEM_CMD	MEM_B_CAS_L	15 28
MEM_B_CMD	MEM_40S_VDD	MEM_CMD	MEM_B_WE_L	15 28
MEM_B_DQ_BYTE0	MEM_40S	MEM_DATA	MEM_B_DQ<7..0>	15 28
MEM_B_DQ_BYTE1	MEM_40S	MEM_DATA	MEM_B_DQ<15..8>	15 28
MEM_B_DQ_BYTE2	MEM_40S	MEM_DATA	MEM_B_DQ<23..16>	15 28
MEM_B_DQ_BYTE3	MEM_40S	MEM_DATA	MEM_B_DQ<31..24>	15 28
MEM_B_DQ_BYTE4	MEM_40S	MEM_DATA	MEM_B_DQ<39..32>	15 28
MEM_B_DQ_BYTE5	MEM_40S	MEM_DATA	MEM_B_DQ<47..40>	15 28
MEM_B_DQ_BYTE6	MEM_40S	MEM_DATA	MEM_B_DQ<55..48>	15 28
MEM_B_DQ_BYTE7	MEM_40S	MEM_DATA	MEM_B_DQ<63..56>	15 28
MEM_B_DQ_BYTE0	MEM_40S	MEM_DATA	MEM_B_DM<0>	15 28
MEM_B_DQ_BYTE1	MEM_40S	MEM_DATA	MEM_B_DM<1>	15 28
MEM_B_DQ_BYTE2	MEM_40S	MEM_DATA	MEM_B_DM<2>	15 28
MEM_B_DQ_BYTE3	MEM_40S	MEM_DATA	MEM_B_DM<3>	15 28
MEM_B_DQ_BYTE4	MEM_40S	MEM_DATA	MEM_B_DM<4>	15 28
MEM_B_DQ_BYTE5	MEM_40S	MEM_DATA	MEM_B_DM<5>	15 28
MEM_B_DQ_BYTE6	MEM_40S	MEM_DATA	MEM_B_DM<6>	15 28
MEM_B_DQ_BYTE7	MEM_40S	MEM_DATA	MEM_B_DM<7>	15 28
MEM_B_DQS0	MEM_70D	MEM_DQS	MEM_B_DQS_P<0>	15 28
MEM_B_DQS0	MEM_70D	MEM_DQS	MEM_B_DQS_N<0>	15 28
MEM_B_DQS1	MEM_70D	MEM_DQS	MEM_B_DQS_P<1>	15 28
MEM_B_DQS1	MEM_70D	MEM_DQS	MEM_B_DQS_N<1>	15 28
MEM_B_DQS2	MEM_70D	MEM_DQS	MEM_B_DQS_P<2>	15 28
MEM_B_DQS2	MEM_70D	MEM_DQS	MEM_B_DQS_N<2>	15 28
MEM_B_DQS3	MEM_70D	MEM_DQS	MEM_B_DQS_P<3>	15 28
MEM_B_DQS3	MEM_70D	MEM_DQS	MEM_B_DQS_N<3>	15 28
MEM_B_DQS4	MEM_70D	MEM_DQS	MEM_B_DQS_P<4>	15 28
MEM_B_DQS4	MEM_70D	MEM_DQS	MEM_B_DQS_N<4>	15 28
MEM_B_DQS5	MEM_70D	MEM_DQS	MEM_B_DQS_P<5>	15 28
MEM_B_DQS5	MEM_70D	MEM_DQS	MEM_B_DQS_N<5>	15 28
MEM_B_DQS6	MEM_70D	MEM_DQS	MEM_B_DQS_P<6>	15 28
MEM_B_DQS6	MEM_70D	MEM_DQS	MEM_B_DQS_N<6>	15 28
MEM_B_DQS7	MEM_70D	MEM_DQS	MEM_B_DQS_P<7>	15 28
MEM_B_DQS7	MEM_70D	MEM_DQS	MEM_B_DQS_N<7>	15 28
MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP_VDD	16
MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP_GND	16

Memory Constraints

SYNC_MASTER=M98_MLB SYNC_DATE=04/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31

SCALE: NONE SHT 101 OF 123

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

Analog Video Signal Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
CRT_50S	*	=50_OHM_SE	=50_OHM_SE	=50_OHM_SE	=50_OHM_SE	=STANDARD	=STANDARD

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

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
CRT	CRT	*	CRT_2CRT

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

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

Digital Video Signal Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
DP_100D	*	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF
LVDS_100D	*	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF
MCP_DV_COMP	*	Y	20 MIL	20 MIL	=STANDARD	=STANDARD	=STANDARD

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

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

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

SATA Interface Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
SATA_100D	*	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
SATA	*	=4x_DIELECTRIC	?
SATA_TERMP	*	8 MIL	?

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

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

NET_TYPE ELECTRICAL_CONSTRAINT_SET	PHYSICAL	SPACING		
	PCIE_90D	PCIE	PEG_R2D_P<15..0>	69
	PCIE_90D	PCIE	PEG_R2D_N<15..0>	69
PEG_R2D	PCIE_90D	PCIE	PEG_R2D_C_P<15..0>	9 69
	PCIE_90D	PCIE	PEG_R2D_C_N<15..0>	9 69
PEG_D2R	PCIE_90D	PCIE	PEG_D2R_P<15..0>	9 69
	PCIE_90D	PCIE	PEG_D2R_N<15..0>	9 69
	PCIE_90D	PCIE	PEG_D2R_C_P<15..0>	69
	PCIE_90D	PCIE	PEG_D2R_C_N<15..0>	69
	PCIE_90D	PCIE	PCIE_MINI_R2D_P	7 30
	PCIE_90D	PCIE	PCIE_MINI_R2D_N	7 30
PCIE_MINI_R2D	PCIE_90D	PCIE	PCIE_MINI_R2D_C_P	17 30
	PCIE_90D	PCIE	PCIE_MINI_R2D_C_N	17 30
PCIE_MINI_D2R	PCIE_90D	PCIE	PCIE_MINI_D2R_P	7 17 30
	PCIE_90D	PCIE	PCIE_MINI_D2R_N	7 17 30
	PCIE_90D	PCIE	PCIE_FW_R2D_P	35
	PCIE_90D	PCIE	PCIE_FW_R2D_N	35
PCIE_FW_R2D	PCIE_90D	PCIE	PCIE_FW_R2D_C_P	17 35
	PCIE_90D	PCIE	PCIE_FW_R2D_C_N	17 35
PCIE_FW_D2R	PCIE_90D	PCIE	PCIE_FW_D2R_P	17 35
	PCIE_90D	PCIE	PCIE_FW_D2R_N	17 35
	PCIE_90D	PCIE	PCIE_FW_D2R_C_P	35
	PCIE_90D	PCIE	PCIE_FW_D2R_C_N	35
	PCIE_90D	PCIE	PCIE_EXCARD_R2D_P	7 31
	PCIE_90D	PCIE	PCIE_EXCARD_R2D_N	7 31
PCIE_EXCARD_R2D	PCIE_90D	PCIE	PCIE_EXCARD_R2D_C_P	17 31
	PCIE_90D	PCIE	PCIE_EXCARD_R2D_C_N	17 31
PCIE_EXCARD_D2R	PCIE_90D	PCIE	PCIE_EXCARD_D2R_P	7 17 31
	PCIE_90D	PCIE	PCIE_EXCARD_D2R_N	7 17 31
MCP_PE0_REFCLK	CLK_PCIE_100D	CLK_PCIE	PEG_CLK100M_P	17 69
	CLK_PCIE_100D	CLK_PCIE	PEG_CLK100M_N	17 69
MCP_PE1_REFCLK	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_MINI_P	17 30
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_MINI_N	17 30
MCP_PE2_REFCLK	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_FW_P	17 35
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_FW_N	17 35
MCP_PE3_REFCLK	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_EXCARD_P	17 31
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_EXCARD_N	17 31
MCP_PEX_CLK_COMP		MCP_PEX_COMP	MCP_PEX_CLK_COMP	17
CRT_RED	CRT_50S	CRT	CRT_IG_R_C_PR	18 24
CRT_GREEN	CRT_50S	CRT	CRT_IG_G_Y_Y	18 24
CRT_BLUE	CRT_50S	CRT	CRT_IG_B_COMP_PB	18 24
CRT_SYNC	CRT_50S	CRT_SYNC	CRT_IG_HSYNC	18 24
CRT_SYNC	CRT_50S	CRT_SYNC	CRT_IG_VSYNC	18 24
MCP_DAC_RSET		MCP_DAC_COMP	MCP_TV_DAC_RSET	18 24
MCP_DAC_VREF		MCP_DAC_COMP	MCP_TV_DAC_VREF	18 24
TMDS_IG_TXC	DP_100D	DISPLAYPORT	TMDS_IG_TXC_P	
TMDS_IG_TXC	DP_100D	DISPLAYPORT	TMDS_IG_TXC_N	
TMDS_IG_TXD	DP_100D	DISPLAYPORT	TMDS_IG_TXD_P<2..0>	
TMDS_IG_TXD	DP_100D	DISPLAYPORT	TMDS_IG_TXD_N<2..0>	
DP_ML	DP_100D	DISPLAYPORT	DP_IG_ML_P<3..0>	9 81
DP_ML	DP_100D	DISPLAYPORT	DP_IG_ML_N<3..0>	9 81
DP_AUX_CH	DP_100D	DISPLAYPORT	DP_IG_AUX_CH_P	18 81
DP_AUX_CH	DP_100D	DISPLAYPORT	DP_IG_AUX_CH_N	18 81
MCP_HDMI_RSET	MCP_DV_COMP		MCP_HDMI_RSET	18 24
MCP_HDMI_VPROBE	MCP_DV_COMP		MCP_HDMI_VPROBE	18 24
LVDS_IG_A_CLK	LVDS_100D	LVDS	LVDS_IG_A_CLK_P	18 84
LVDS_IG_A_CLK	LVDS_100D	LVDS	LVDS_IG_A_CLK_N	18 84
LVDS_IG_A_DATA	LVDS_100D	LVDS	LVDS_IG_A_DATA_P<2..0>	18 84
LVDS_IG_A_DATA	LVDS_100D	LVDS	LVDS_IG_A_DATA_N<2..0>	18 84
LVDS_IG_A_DATA3	LVDS_100D	LVDS	LVDS_IG_A_DATA_P<3>	9 18
LVDS_IG_A_DATA3	LVDS_100D	LVDS	LVDS_IG_A_DATA_N<3>	9 18
LVDS_IG_B_CLK	LVDS_100D	LVDS	LVDS_IG_B_CLK_P	9 18
LVDS_IG_B_CLK	LVDS_100D	LVDS	LVDS_IG_B_CLK_N	9 18
LVDS_IG_B_DATA	LVDS_100D	LVDS	LVDS_IG_B_DATA_P<2..0>	18 84
LVDS_IG_B_DATA	LVDS_100D	LVDS	LVDS_IG_B_DATA_N<2..0>	18 84
LVDS_IG_B_DATA3	LVDS_100D	LVDS	LVDS_IG_B_DATA_P<3>	9 18
LVDS_IG_B_DATA3	LVDS_100D	LVDS	LVDS_IG_B_DATA_N<3>	9 18
MCP_IFPAB_RSET	MCP_DV_COMP		MCP_IFPAB_RSET	18 24
MCP_IFPAB_VPROBE			MCP_IFPAB_VPROBE	18 24
SATA_HDD_R2D	SATA_100D	SATA	SATA_HDD_R2D_C_P	20 38
	SATA_100D	SATA	SATA_HDD_R2D_C_N	20 38
	SATA_100D	SATA	SATA_HDD_R2D_P	7 38
	SATA_100D	SATA	SATA_HDD_R2D_N	7 38
SATA_HDD_D2R	SATA_100D	SATA	SATA_HDD_D2R_P	20 38
	SATA_100D	SATA	SATA_HDD_D2R_N	20 38
	SATA_100D	SATA	SATA_HDD_D2R_C_P	7 38
	SATA_100D	SATA	SATA_HDD_D2R_C_N	7 38
SATA_ODD_R2D	SATA_100D	SATA	SATA_ODD_R2D_C_P	20 38
	SATA_100D	SATA	SATA_ODD_R2D_C_N	20 38
	SATA_100D	SATA	SATA_ODD_R2D_P	7 38
	SATA_100D	SATA	SATA_ODD_R2D_N	7 38
SATA_ODD_D2R	SATA_100D	SATA	SATA_ODD_D2R_P	20 38
	SATA_100D	SATA	SATA_ODD_D2R_N	20 38
	SATA_100D	SATA	SATA_ODD_D2R_C_P	7 38
	SATA_100D	SATA	SATA_ODD_D2R_C_N	7 38
MCP_SATA_TERMP		SATA_TERMP	MCP_SATA_TERMP	20

MCP Constraints 1

SYNC_MASTER=M98_MLB SYNC_DATE=04/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31

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PCI Bus Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
PCI_55S	*	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=STANDARD	=STANDARD
CLK_PCI_55S	*	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=STANDARD	=STANDARD

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

NET_TYPE			
ELECTRICAL_CONSTRAINT_SET	PHYSICAL	SPACING	
MCP_DEBUG	PCI_55S	PCI	MCP_DEBUG<7..0> 13 19
PCI_AD	PCI_55S	PCI	PCI_AD<23..8>
PCI_AD24	PCI_55S	PCI	PCI_AD<24>
PCI_AD	PCI_55S	PCI	PCI_AD<31..25>
PCI_AD	PCI_55S	PCI	PCI_PAR
PCI_C_BE_L	PCI_55S	PCI	PCI_C_BE_L<3..0>
PCI_CNTL	PCI_55S	PCI	PCI_IRDY_L
PCI_CNTL	PCI_55S	PCI	PCI_DEVSEL_L
PCI_CNTL	PCI_55S	PCI	PCI_PERR_L
PCI_CNTL	PCI_55S	PCI	PCI_SERR_L
PCI_CNTL	PCI_55S	PCI	PCI_STOP_L
PCI_CNTL	PCI_55S	PCI	PCI_TRDY_L
PCI_CNTL	PCI_55S	PCI	PCI_FRAME_L
PCI_REQ0_L	PCI_55S	PCI	PCI_REQ0_L 19
PCI_GNT0_L	PCI_55S	PCI	PCI_GNT0_L
PCI_REQ1_L	PCI_55S	PCI	PCI_REQ1_L 19
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 19
	CLK_PCI_55S	CLK_PCI	PCI_CLK33M_MCP 19
LPC_AD	LPC_55S	LPC	LPC_AD<3..0> 7 19 41 43 84
LPC_FRAME_L	LPC_55S	LPC	LPC_FRAME_L 7 19 41 43 84
LPC_RESET_L	LPC_55S	LPC	LPC_RESET_L 19 25 84
MCP_LPC_CLK0	CLK_LPC_55S	CLK_LPC	LPC_CLK33M_SMC_R 19 25
	CLK_LPC_55S	CLK_LPC	LPC_CLK33M_SMC 25 41
	CLK_LPC_55S	CLK_LPC	LPC_CLK33M_LPCPLUS 7 25 43
USB_EXTA	USB_90D	USB	USB_EXTA_P 20 39
	USB_90D	USB	USB_EXTA_N 20 39
	USB_90D	USB	USB_EXTA_MUXED_P
	USB_90D	USB	USB_EXTA_MUXED_N
USB_MINI	USB_90D	USB	USB_MINI_P 9 20
	USB_90D	USB	USB_MINI_N 9 20
USB_EXTD	USB_90D	USB	USB_EXTD_P 9 20
	USB_90D	USB	USB_EXTD_N 9 20
USB_CAMERA	USB_90D	USB	USB_CAMERA_P 20 30
	USB_90D	USB	USB_CAMERA_N 20 30
USB_BT	USB_90D	USB	USB_BT_P 20 30
	USB_90D	USB	USB_BT_N 20 30
USB_TPAD	USB_90D	USB	USB_TPAD_P 20 49
	USB_90D	USB	USB_TPAD_N 20 49
USB_IR	USB_90D	USB	USB_IR_P 20 40
	USB_90D	USB	USB_IR_N 20 40
USB_EXTB	USB_90D	USB	USB_EXTB_P 20 39
	USB_90D	USB	USB_EXTB_N 20 39
USB_EXCARD	USB_90D	USB	USB_EXCARD_P 20 31
	USB_90D	USB	USB_EXCARD_N 20 31
USB_EXTC	USB_90D	USB	USB_EXTC_P 20 96 98
	USB_90D	USB	USB_EXTC_N 20 96 98
MCP_USB_RBIAS	MCP_USB_RBIAS		MCP_USB_RBIAS_GND 20
SMBUS_MCP_0_CLK	SMB_55S	SMB	SMBUS_MCP_0_CLK 7 13 21 44
SMBUS_MCP_0_DATA	SMB_55S	SMB	SMBUS_MCP_0_DATA 7 13 21 44
SMBUS_MCP_1_CLK	SMB_55S	SMB	SMBUS_MCP_1_CLK 21 44
SMBUS_MCP_1_DATA	SMB_55S	SMB	SMBUS_MCP_1_DATA 21 44
HDA_BIT_CLK	HDA_55S	HDA	HDA_BIT_CLK 9 21
	HDA_55S	HDA	HDA_BIT_CLK_R 21
HDA_SYNC	HDA_55S	HDA	HDA_SYNC 21 53
	HDA_55S	HDA	HDA_SYNC_R 21
HDA_RST_L	HDA_55S	HDA	HDA_RST_R_L 21
	HDA_55S	HDA	HDA_RST_L 21 53
HDA_SDIN0	HDA_55S	HDA	HDA_SDIN0 21 53
	HDA_55S	HDA	HDA_SDIN_CODEC
HDA_SDOUT	HDA_55S	HDA	HDA_SDOUT 21 53
	HDA_55S	HDA	HDA_SDOUT_R 21
MCP_HDA_PULLDN_COMP		MCP_HDA_COMP	MCP_HDA_PULLDN_COMP 21
MCP_SUS_CLK	CLK_SLOW_55S	CLK_SLOW	PM_CLK32K_SUSCLK_R 21 25
	CLK_SLOW_55S	CLK_SLOW	PM_CLK32K_SUSCLK 25 41
SPI_CLK	SPI_55S	SPI	SPI_CLK_R 21 43
	SPI_55S	SPI	SPI_CLK 52
SPI_MOSI	SPI_55S	SPI	SPI_MOSI_R 21 43
	SPI_55S	SPI	SPI_MOSI 52
SPI_MISO	SPI_55S	SPI	SPI_MISO 21 43
	SPI_55S	SPI	SPI_MISO_R 52
SPI_CS0	SPI_55S	SPI	SPI_CS0_R_L 21 43
	SPI_55S	SPI	SPI_CS0_L

MCP Constraints 2

SYNC_MASTER=M98_MLB SYNC_DATE=04/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31

SCALE: NONE SHT 103 OF 123

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	18
MCP_MII_COMP	MCP_MII_COMP		MCP_MII_COMP_GND	18
MCP_CLK25M_BUF0	ENET_MII_55S	MCP_BUF0_CLK	MCP_CLK25M_BUF0_R	18 33
	ENET_MII_55S	MCP_BUF0_CLK	RTL8211_CLK25M_CKXTAL1	32 33
ENET_INTR_L	ENET_MII_55S	ENET_MII	ENET_INTR_L	
ENET_MDIO	ENET_MII_55S	ENET_MII	ENET_MDIO	18 32
ENET_MDC	ENET_MII_55S	ENET_MII	ENET_MDC	18 32
ENET_PWRDWN_L	ENET_MII_55S	ENET_MII	ENET_PWRDWN_L	
	ENET_MII_55S	ENET_MII	ENET_CLK125M_RXCLK_R	32
ENET_RXCLK	ENET_MII_55S	ENET_MII	ENET_CLK125M_RXCLK	18 32
	ENET_MII_55S	ENET_MII	ENET_RXD_R<3..0>	32
ENET_RXD	ENET_MII_55S	ENET_MII	ENET_RXD<0>	18 32
ENET_RXD_STRAP	ENET_MII_55S	ENET_MII	ENET_RXD<3..1>	18 32
ENET_RXD	ENET_MII_55S	ENET_MII	ENET_RX_CTRL	18 32
ENET_TXCLK	ENET_MII_55S	ENET_MII	ENET_CLK125M_TXCLK	18 32
ENET_TXD0	ENET_MII_55S	ENET_MII	ENET_TXD<0>	18 32
ENET_TXD	ENET_MII_55S	ENET_MII	ENET_TXD<3..1>	18 32
ENET_TXD	ENET_MII_55S	ENET_MII	ENET_TX_CTRL	18 32
	ENET_MII_55S	ENET_MII	ENET_RESET_L	18 32
ENET_MDI	ENET_MDI_100D	ENET_MDI	ENET_MDI_P<3..0>	32 34
	ENET_MDI_100D	ENET_MDI	ENET_MDI_N<3..0>	32 34

Ethernet Constraints

SYNC_MASTER=M98_MLB SYNC_DATE=04/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE	SHT	OF
NONE	104	123

FireWire Interface Constraints

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

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

FireWire Net Properties

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

Port 2 Not Used

FW_P0_TPA_P 35 37
FW_P0_TPA_N 35 37
FW_P0_TPB_P 35 37
FW_P0_TPB_N 35 37
FW_P1_TPA_P 35 37
FW_P1_TPA_N 35 37
FW_P1_TPB_P 35 37
FW_P1_TPB_N 35 37

FireWire Constraints

SYNC_MASTER=M98_MLB SYNC_DATE=04/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31

SCALE	SHT	OF
NONE	105	123

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	NET_TYPE: SPACING		
SMBUS_SMC_A_S3_SCL	SMB_5S	SMB	SMBUS_SMC_A_S3_SCL	7 44
SMBUS_SMC_A_S3_SDA	SMB_5S	SMB	SMBUS_SMC_A_S3_SDA	7 44
SMBUS_SMC_B_S0_SCL	SMB_5S	SMB	SMBUS_SMC_B_S0_SCL	44
SMBUS_SMC_B_S0_SDA	SMB_5S	SMB	SMBUS_SMC_B_S0_SDA	44
SMBUS_SMC_0_S0_SCL	SMB_5S	SMB	SMBUS_SMC_0_S0_SCL	44
SMBUS_SMC_0_S0_SDA	SMB_5S	SMB	SMBUS_SMC_0_S0_SDA	44
SMBUS_SMC_BSA_SCL	SMB_5S	SMB	SMBUS_SMC_BSA_SCL	7 44
SMBUS_SMC_BSA_SDA	SMB_5S	SMB	SMBUS_SMC_BSA_SDA	7 44
SMBUS_SMC_MGMT_SCL	SMB_5S	SMB	SMBUS_SMC_MGMT_SCL	44
SMBUS_SMC_MGMT_SDA	SMB_5S	SMB	SMBUS_SMC_MGMT_SDA	44

SMBus Charger Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE: PHYSICAL	NET_TYPE: SPACING		
CHGR_CSI	1TO1_DIFFPAIR		CHGR_CSI_P	60
	1TO1_DIFFPAIR		CHGR_CSI_N	60
CHGR_CSO	1TO1_DIFFPAIR		CHGR_CSO_P	60
	1TO1_DIFFPAIR		CHGR_CSO_N	60

SMC Constraints

SYNC_MASTER=M98_MLB SYNC_DATE=04/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31

SCALE	SHT	OF
NONE	106	123

GDDR3 Frame Buffer Signal Constraints

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

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

From T18 MXM:

Digital Video Signal Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
DP_100D	*	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF
LVDS_100D	*	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF

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

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

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

MUXGFX Net Properties

ELECTRICAL_CONSTRAINT_SET	PHYSICAL	SPACING		
	NET_TYPE			
LVDS_A_CLK	LVDS_100D	LVDS	LVDS_A_CLK_P	81 84
LVDS_A_CLK	LVDS_100D	LVDS	LVDS_A_CLK_N	81 84
LVDS_A_DATA	LVDS_100D	LVDS	LVDS_A_DATA_P<2..0>	7 81 84
LVDS_A_DATA	LVDS_100D	LVDS	LVDS_A_DATA_N<2..0>	7 81 84
LVDS_B_CLK	LVDS_100D	LVDS	LVDS_B_CLK_P	7 81 84
LVDS_B_CLK	LVDS_100D	LVDS	LVDS_B_CLK_N	81 84
LVDS_B_DATA	LVDS_100D	LVDS	LVDS_B_DATA_P<2..0>	7 81 84
LVDS_B_DATA	LVDS_100D	LVDS	LVDS_B_DATA_N<2..0>	7 81 84
	LVDS_100D	LVDS	LVDS_CONN_A_CLK_F_P	7 78
	LVDS_100D	LVDS	LVDS_CONN_A_CLK_F_N	7 78
	LVDS_100D	LVDS	LVDS_CONN_B_CLK_F_P	7 78
	LVDS_100D	LVDS	LVDS_CONN_B_CLK_F_N	7 78
	LVDS_100D	LVDS	LVDS_CONN_A_CLK_P	78 81
	LVDS_100D	LVDS	LVDS_CONN_A_CLK_N	78 81
	LVDS_100D	LVDS	LVDS_CONN_A_DATA_P<2..0>	7 78 81
	LVDS_100D	LVDS	LVDS_CONN_A_DATA_N<2..0>	7 78 81
	LVDS_100D	LVDS	LVDS_CONN_B_CLK_P	78 81
	LVDS_100D	LVDS	LVDS_CONN_B_CLK_N	78 81
	LVDS_100D	LVDS	LVDS_CONN_B_DATA_P<2..0>	7 78 81
	LVDS_100D	LVDS	LVDS_CONN_B_DATA_N<2..0>	7 78 81
DP_ML	DP_100D	DISPLAYPORT	DP_ML_C_P<3..0>	82
DP_ML	DP_100D	DISPLAYPORT	DP_ML_C_N<3..0>	82
DP_ML	DP_100D	DISPLAYPORT	**DP_ML_P<3..0>**	81 82
	DP_100D	DISPLAYPORT	**DP_ML_N<3..0>**	81 82
DP_ML	DP_100D	DISPLAYPORT	DP_ML_CONN_P<3..0>	82
	DP_100D	DISPLAYPORT	DP_ML_CONN_N<3..0>	82
DP_AUX_CH	DP_100D	DISPLAYPORT	DP_AUX_CH_C_P	81 82
DP_AUX_CH	DP_100D	DISPLAYPORT	DP_AUX_CH_C_N	81 82

GDDR3 FB A/B Net Properties

ELECTRICAL_CONSTRAINT_SET	PHYSICAL	SPACING		
	NET_TYPE			
FB_A_CLK_P	GDDR3_80D	GDDR3_CLK	FB_A_CLK_P<0>	71 72 79
	GDDR3_80D	GDDR3_CLK	FB_A_CLK_N<0>	71 72 79
FB_B_CLK_P	GDDR3_80D	GDDR3_CLK	FB_A_CLK_P<1>	71 72 79
	GDDR3_80D	GDDR3_CLK	FB_A_CLK_N<1>	71 72 79
FB_AB_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_A_MA<1..0>	71 72 79
FB_AB_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_A_MA<12..6>	7 71 72 79
FB_AB_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_A_BA<2..0>	7 71 72 79
FB_AB_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_A_RAS_L	71 72 79
FB_AB_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_A_CAS_L	71 72 79
FB_AB_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_A_WE_L	71 72 79
FB_AB_CMD_EO	GDDR3_40R55SE	GDDR3_CMD	FB_A_CKE	71 72 79
FB_AB_CS0	GDDR3_40R55SE	GDDR3_CMD	FB_A_CS0_L	71 72
FB_AB_CMD_EO	GDDR3_40R55SE	GDDR3_CMD	FB_A_DRAM_RST	71 72 79
FB_A_CMD	GDDR3_40SE	GDDR3_CMD	FB_A_LMA<5..2>	71 72 79
FB_B_CMD	GDDR3_40SE	GDDR3_CMD	FB_A_UMA<5..2>	71 72 79
FB_A_WDQS0	GDDR3_40SE	GDDR3_DQS	FB_A_WDQS<0>	71 72 79
FB_A_WDQS1	GDDR3_40SE	GDDR3_DQS	FB_A_WDQS<1>	71 72 79
FB_A_WDQS2	GDDR3_40SE	GDDR3_DQS	FB_A_WDQS<2>	71 72 79
FB_A_WDQS3	GDDR3_40SE	GDDR3_DQS	FB_A_WDQS<3>	71 72 79
FB_A_RDQS0	GDDR3_40SE	GDDR3_DQS	FB_A_RDQS<0>	71 72 79
FB_A_RDQS1	GDDR3_40SE	GDDR3_DQS	FB_A_RDQS<1>	71 72 79
FB_A_RDQS2	GDDR3_40SE	GDDR3_DQS	FB_A_RDQS<2>	71 72 79
FB_A_RDQS3	GDDR3_40SE	GDDR3_DQS	FB_A_RDQS<3>	71 72 79
FB_A_DQ_BYTE0	GDDR3_40SE	GDDR3_DATA	FB_A_DQ<7..0>	7 71 72 79
FB_A_DQ_BYTE1	GDDR3_40SE	GDDR3_DATA	FB_A_DQ<15..8>	7 71 72 79
FB_A_DQ_BYTE2	GDDR3_40SE	GDDR3_DATA	FB_A_DQ<23..16>	7 71 72 79
FB_A_DQ_BYTE3	GDDR3_40SE	GDDR3_DATA	FB_A_DQ<31..24>	7 71 72 79
FB_A_DQM0	GDDR3_40SE	GDDR3_DATA	FB_A_DQM_L<0>	71 72 79
FB_A_DQM1	GDDR3_40SE	GDDR3_DATA	FB_A_DQM_L<1>	71 72 79
FB_A_DQM2	GDDR3_40SE	GDDR3_DATA	FB_A_DQM_L<2>	71 72 79
FB_A_DQM3	GDDR3_40SE	GDDR3_DATA	FB_A_DQM_L<3>	71 72 79
FB_B_WDQS0	GDDR3_40SE	GDDR3_DQS	FB_A_WDQS<4>	71 72 79
FB_B_WDQS1	GDDR3_40SE	GDDR3_DQS	FB_A_WDQS<5>	71 72 79
FB_B_WDQS2	GDDR3_40SE	GDDR3_DQS	FB_A_WDQS<6>	71 72 79
FB_B_WDQS3	GDDR3_40SE	GDDR3_DQS	FB_A_WDQS<7>	71 72 79
FB_B_RDQS0	GDDR3_40SE	GDDR3_DQS	FB_A_RDQS<4>	71 72 79
FB_B_RDQS1	GDDR3_40SE	GDDR3_DQS	FB_A_RDQS<5>	71 72 79
FB_B_RDQS2	GDDR3_40SE	GDDR3_DQS	FB_A_RDQS<6>	71 72 79
FB_B_RDQS3	GDDR3_40SE	GDDR3_DQS	FB_A_RDQS<7>	71 72 79
FB_B_DQ_BYTE0	GDDR3_40SE	GDDR3_DATA	FB_A_DQ<39..32>	7 71 72 79
FB_B_DQ_BYTE1	GDDR3_40SE	GDDR3_DATA	FB_A_DQ<47..40>	7 71 72 79
FB_B_DQ_BYTE2	GDDR3_40SE	GDDR3_DATA	FB_A_DQ<55..48>	7 71 72 79
FB_B_DQ_BYTE3	GDDR3_40SE	GDDR3_DATA	FB_A_DQ<63..56>	7 71 72 79
FB_B_DQM0	GDDR3_40SE	GDDR3_DATA	FB_A_DQM_L<4>	71 72 79
FB_B_DQM1	GDDR3_40SE	GDDR3_DATA	FB_A_DQM_L<5>	71 72 79
FB_B_DQM2	GDDR3_40SE	GDDR3_DATA	FB_A_DQM_L<6>	71 72 79
FB_B_DQM3	GDDR3_40SE	GDDR3_DATA	FB_A_DQM_L<7>	71 72 79
FB_AB_CS1	GDDR3_40R55SE	GDDR3_CMD	FB_A_CS1_L	71 79

G96 Net Properties

ELECTRICAL_CONSTRAINT_SET	PHYSICAL	SPACING		
	NET_TYPE			
(CK505_DOT96)	CLK_SLOW_555	CLK_SLOW	GPU_CLK27M	75
CK505_CLK27M55	CLK_SLOW_555	CLK_SLOW	GPU_CLK27M_SS	75
LVDS_EG_A_CLK	LVDS_100D	LVDS	LVDS_EG_A_CLK_P	76 84
LVDS_EG_A_CLK	LVDS_100D	LVDS	LVDS_EG_A_CLK_N	76 84
LVDS_EG_A_DATA	LVDS_100D	LVDS	LVDS_EG_A_DATA_P<2..0>	76 84
LVDS_EG_A_DATA	LVDS_100D	LVDS	LVDS_EG_A_DATA_N<2..0>	7 76 84
LVDS_EG_B_DATA	LVDS_100D	LVDS	LVDS_EG_B_DATA_P<2..0>	76 84
LVDS_EG_B_DATA	LVDS_100D	LVDS	LVDS_EG_B_DATA_N<2..0>	76 84
DP_ML	DP_100D	DISPLAYPORT	**DP_EG_ML_P<3..0>**	76 81
DP_ML	DP_100D	DISPLAYPORT	**DP_EG_ML_N<3..0>**	76 81
DP_AUX_CH	DP_100D	DISPLAYPORT	DP_EG_AUX_CH_P	76 81
DP_AUX_CH	DP_100D	DISPLAYPORT	DP_EG_AUX_CH_N	76 81
	DP_100D	DISPLAYPORT	DP_EG_AUX_CH_C_P	81
	DP_100D	DISPLAYPORT	DP_EG_AUX_CH_C_N	81

GDDR3 FB C/D Net Properties

ELECTRICAL_CONSTRAINT_SET	PHYSICAL	SPACING		
	NET_TYPE			
FB_C_CLK_P	GDDR3_80D	GDDR3_CLK	FB_B_CLK_P<0>	71 73 80
	GDDR3_80D	GDDR3_CLK	FB_B_CLK_N<0>	71 73 80
FB_D_CLK_P	GDDR3_80D	GDDR3_CLK	FB_B_CLK_P<1>	71 73 80
	GDDR3_80D	GDDR3_CLK	FB_B_CLK_N<1>	71 73 80
FB_CD_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_B_MA<1..0>	71 73 80
FB_CD_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_B_MA<12..6>	7 71 73 80
FB_CD_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_B_BA<2..0>	7 71 73 80
FB_CD_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_B_RAS_L	71 73 80
FB_CD_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_B_CAS_L	7 71 73 80
FB_CD_CMD	GDDR3_40R55SE	GDDR3_CMD	FB_B_WE_L	71 73 80
FB_CD_CMD_EO	GDDR3_40R55SE	GDDR3_CMD	FB_B_CKE	71 73 80
FB_CD_CS0	GDDR3_40R55SE	GDDR3_CMD	FB_B_CS0_L	7 71 73
FB_CD_CMD_EO	GDDR3_40R55SE	GDDR3_CMD	FB_B_DRAM_RST	71 73 80
FB_C_CMD	GDDR3_40SE	GDDR3_CMD	FB_B_LMA<5..2>	71 73 80
FB_D_CMD	GDDR3_40SE	GDDR3_CMD	FB_B_UMA<5..2>	71 73 80
FB_C_WDQS0	GDDR3_40SE	GDDR3_DQS	FB_B_WDQS<0>	71 73 80
FB_C_WDQS1	GDDR3_40SE	GDDR3_DQS	FB_B_WDQS<1>	71 73 80
FB_C_WDQS2	GDDR3_40SE	GDDR3_DQS	FB_B_WDQS<2>	71 73 80
FB_C_WDQS3	GDDR3_40SE	GDDR3_DQS	FB_B_WDQS<3>	71 73 80
FB_C_RDQS0	GDDR3_40SE	GDDR3_DQS	FB_B_RDQS<0>	71 73 80
FB_C_RDQS1	GDDR3_40SE	GDDR3_DQS	FB_B_RDQS<1>	71 73 80
FB_C_RDQS2	GDDR3_40SE	GDDR3_DQS	FB_B_RDQS<2>	71 73 80
FB_C_RDQS3	GDDR3_40SE	GDDR3_DQS	FB_B_RDQS<3>	71 73 80
FB_C_DQ_BYTE0	GDDR3_40SE	GDDR3_DATA	FB_B_DQ<7..0>	7 71 73 80
FB_C_DQ_BYTE1	GDDR3_40SE	GDDR3_DATA	FB_B_DQ<15..8>	7 71 73 80
FB_C_DQ_BYTE2	GDDR3_40SE	GDDR3_DATA	FB_B_DQ<23..16>	7 71 73 80
FB_C_DQ_BYTE3	GDDR3_40SE	GDDR3_DATA	FB_B_DQ<31..24>	7 71 73 80
FB_C_DQM0	GDDR3_40SE	GDDR3_DATA	FB_B_DQM_L<0>	71 73 80
FB_C_DQM1	GDDR3_40SE	GDDR3_DATA	FB_B_DQM_L<1>	71 73 80
FB_C_DQM2	GDDR3_40SE	GDDR3_DATA	FB_B_DQM_L<2>	71 73 80
FB_C_DQM3	GDDR3_40SE	GDDR3_DATA	FB_B_DQM_L<3>	71 73 80
FB_D_WDQS0	GDDR3_40SE	GDDR3_DQS	FB_B_WDQS<4>	71 73 80
FB_D_WDQS1	GDDR3_40SE	GDDR3_DQS	FB_B_WDQS<5>	71 73 80
FB_D_WDQS2	GDDR3_40SE	GDDR3_DQS	FB_B_WDQS<6>	71 73 80
FB_D_WDQS3	GDDR3_40SE	GDDR3_DQS	FB_B_WDQS<7>	71 73 80
FB_D_RDQS0	GDDR3_40SE	GDDR3_DQS	FB_B_RDQS<4>	71 73 80
FB_D_RDQS1	GDDR3_40SE	GDDR3_DQS	FB_B_RDQS<5>	71 73 80
FB_D_RDQS2	GDDR3_40SE	GDDR3_DQS	FB_B_RDQS<6>	71 73 80
FB_D_RDQS3	GDDR3_40SE	GDDR3_DQS	FB_B_RDQS<7>	71 73 80
FB_D_DQ_BYTE0	GDDR3_40SE	GDDR3_DATA	FB_B_DQ<39..32>	7 71 73 80
FB_D_DQ_BYTE1	GDDR3_40SE	GDDR3_DATA	FB_B_DQ<47..40>	7 71 73 80
FB_D_DQ_BYTE2	GDDR3_40SE	GDDR3_DATA	FB_B_DQ<55..48>	7 71 73 80
FB_D_DQ_BYTE3	GDDR3_40SE	GDDR3_DATA	FB_B_DQ<63..56>	7 71 73 80
FB_D_DQM0	GDDR3_40SE	GDDR3_DATA	FB_B_DQM_L<4>	71 73 80
FB_D_DQM1	GDDR3_40SE	GDDR3_DATA	FB_B_DQM_L<5>	71 73 80
FB_D_DQM2	GDDR3_40SE	GDDR3_DATA	FB_B_DQM_L<6>	71 73 80
FB_D_DQM3	GDDR3_40SE	GDDR3_DATA	FB_B_DQM_L<7>	71 73 80
FB_CD_CS1	GDDR3_40R55SE	GDDR3_CMD	FB_B_CS1_L	71 80

GPU (G96) Constraints

SYNC_MASTER=M98_MLB SYNC_DATE=05/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE: NONE	SHT 107 OF 123	

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

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

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

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
GND	*	=STANDARD	?
PP1V8_MEM	*	=STANDARD	?

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

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
MEM_CLK	GND	*	GND_P2MM
MEM_CMD	GND	*	GND_P2MM
MEM_CTRL	GND	*	GND_P2MM
MEM_DATA	GND	*	GND_P2MM
MEM_DQS	GND	*	GND_P2MM

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

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
ENET_MDI	GND	*	GND_P2MM

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
CLK_PCIE	GND	*	GND_P2MM
PCIE	GND	*	GND_P2MM
SATA	GND	*	GND_P2MM
USB	GND	*	GND_P2MM
CLK_PCIE	SB_POWER	*	PWR_P2MM
SATA	SB_POWER	*	PWR_P2MM
USB	SB_POWER	*	PWR_P2MM

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
LVDS	GND	*	GND_P2MM

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
MEM_40S OVERRIDE	* OVERRIDE	OVERRIDE	OVERRIDE	0.09 MM OVERRIDE	100 MIL OVERRIDE	OVERRIDE	OVERRIDE
MEM_40S_VDD OVERRIDE	* OVERRIDE	OVERRIDE	OVERRIDE	0.09 MM OVERRIDE	100 MIL OVERRIDE	OVERRIDE	OVERRIDE
MEM_70D OVERRIDE	* OVERRIDE	OVERRIDE	OVERRIDE	0.09 MM OVERRIDE	100 MIL OVERRIDE	OVERRIDE	OVERRIDE
MEM_70D_VDD OVERRIDE	* OVERRIDE	OVERRIDE	OVERRIDE	0.09 MM OVERRIDE	100 MIL OVERRIDE	OVERRIDE	OVERRIDE
PCIE_90D OVERRIDE	* OVERRIDE	OVERRIDE	OVERRIDE	0.09 MM OVERRIDE	100 MIL OVERRIDE	OVERRIDE	OVERRIDE
USB_90D OVERRIDE	TOP OVERRIDE	OVERRIDE	OVERRIDE	0.1 MM OVERRIDE	500 MIL OVERRIDE	OVERRIDE	OVERRIDE
MCP_DV_COMP OVERRIDE	TOP OVERRIDE	OVERRIDE	OVERRIDE	0.1 MM OVERRIDE	500 MIL OVERRIDE	OVERRIDE	OVERRIDE
MCP_MEM_COMP OVERRIDE	TOP OVERRIDE	OVERRIDE	OVERRIDE	0.1 MM OVERRIDE	500 MIL OVERRIDE	OVERRIDE	OVERRIDE
MCP_MII_COMP OVERRIDE	TOP OVERRIDE	OVERRIDE	OVERRIDE	0.1 MM OVERRIDE	500 MIL OVERRIDE	OVERRIDE	OVERRIDE
MCP_USB_RBIAS OVERRIDE	TOP OVERRIDE	OVERRIDE	OVERRIDE	0.1 MM OVERRIDE	500 MIL OVERRIDE	OVERRIDE	OVERRIDE
MCP_DV_COMP OVERRIDE	* OVERRIDE	OVERRIDE	OVERRIDE	0.25 MM OVERRIDE	250 MIL OVERRIDE	OVERRIDE	OVERRIDE
CPU_27P4S OVERRIDE	BOTTOM OVERRIDE	OVERRIDE	OVERRIDE	0.23 MM OVERRIDE	100 MIL OVERRIDE	OVERRIDE	OVERRIDE

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
MEM_40S OVERRIDE	ISL4,ISL9 OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE
MEM_40S_VDD OVERRIDE	ISL3,ISL10 OVERRIDE	N OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE
MEM_70D OVERRIDE	ISL4,ISL9 OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE
MEM_70D_VDD OVERRIDE	ISL3,ISL10 OVERRIDE	N OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE	OVERRIDE

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

Graphics ,SATA Constraint Relaxations

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

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

FLASH 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
FLSH_55S	*	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=STANDARD	=STANDARD

Memory Constraint Relaxations

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

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

M99 Specific Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
	ENET_MDI_100D	ENETCONN	ENETCONN_P<3..0>	34
	ENET_MDI_100D	ENETCONN	ENETCONN_N<3..0>	34
1146	SATA_100D	SATA	SATA_ODD_R2D_UF_P	38
1145	SATA_100D	SATA	SATA_ODD_R2D_UF_N	38
1144	SATA_100D	SATA	SATA_ODD_D2R_UF_P	38
1142	SATA_100D	SATA	SATA_ODD_D2R_UF_N	38
1143	SATA_100D	SATA	SATA_HDD_D2R_UF_P	38
1140	SATA_100D	SATA	SATA_HDD_D2R_UF_N	38
1141	SATA_100D	SATA	SATA_HDD_R2D_UF_P	38
1139	SATA_100D	SATA	SATA_HDD_R2D_UF_N	38
SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	MCPCOREISNS_P	46 64
SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	MCPCOREISNS_N	46 64
1124 CPUTHMSNS_D2_DP	THERM_1TO1_55S	THERM	CPUTHMSNS_D2_P	47
1125	THERM_1TO1_55S	THERM	CPUTHMSNS_D2_N	47
1127 CPU_THERMD_DP	THERM_1TO1_55S	THERM	CPU_THERMD_P	10 47
1126	THERM_1TO1_55S	THERM	CPU_THERMD_N	10 47
1129 GPUTHMSNS_D_DP	THERM_1TO1_55S	THERM	GPUTHMSNS_D_P	47
1128	THERM_1TO1_55S	THERM	GPUTHMSNS_D_N	47
1131 GPU_THERMD_DP	THERM_1TO1_55S	THERM	GPU_TDIODE_P	47 75
1130	THERM_1TO1_55S	THERM	GPU_TDIODE_N	47 75
1138 MCPTHMSNS_D_DP	THERM_1TO1_55S	THERM	MCPTHMSNS_D_P	7 47
1137	THERM_1TO1_55S	THERM	MCPTHMSNS_D_N	7 47
1135 MCP_THERMD_DP	THERM_1TO1_55S	THERM	MCP_THMDIODE_P	21 47
1136	THERM_1TO1_55S	THERM	MCP_THMDIODE_N	21 47
1158 SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	1V05CPUISNS_R_P	46
1157	SENSE_1TO1_55S	SENSE	1V05CPUISNS_R_N	46
1155 SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	DDRISNS_R_P	46
1154	SENSE_1TO1_55S	SENSE	DDRISNS_R_N	46
1153 SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	GPUISENS_P	46
1152	SENSE_1TO1_55S	SENSE	GPUISENS_N	46
1151 SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	1V05CPU_P	46 65
1150	SENSE_1TO1_55S	SENSE	1V05CPU_N	46 65
1149 SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	DDRISNS_P	46
1148	SENSE_1TO1_55S	SENSE	DDRISNS_N	46
1150 SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	P1V8GPU_P	46
1147	SENSE_1TO1_55S	SENSE	P1V8GPU_N	46
1186 SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	ISNS_CPU_P	45
1185	SENSE_1TO1_55S	SENSE	ISNS_CPU_N	45
		GND	GND	
	SB_POWER		PP3V3_S5	7 8
	SB_POWER		PP3V3_S0	7 8 9
	SB_POWER		PP1V5_S0	
1182 SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	P1V8GPUISNS_P	
1181	SENSE_1TO1_55S	SENSE	P1V8GPUISNS_N	
1180 SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	P1V8GPUISNS_R_P	46
1179	SENSE_1TO1_55S	SENSE	P1V8GPUISNS_R_N	46
1240 ASIC_CNTRLMEM1	FLSH_55S		NF_CLE_R	96
1241 ASIC_CNTRLMEM1	FLSH_55S		NF_ALE_R	96
1244 ASIC_CNTRLMEM1	FLSH_55S		NF_CE0_L_R	96
1243 ASIC_CNTRLMEM1	FLSH_55S		NF_CE1_L_R	96
1242 ASIC_CNTRLMEM1	FLSH_55S		NF_RE0_L_R	96
1247 ASIC_CNTRLMEM1	FLSH_55S		NF_WE0_L_R	96
1230 ASIC_CNTRLMEM2	FLSH_55S		NF_CLE_R	96
1240 ASIC_CNTRLMEM2	FLSH_55S		NF_ALE_R	96
1231 ASIC_CNTRLMEM2	FLSH_55S		NF_CE0_L_R	96
1237 ASIC_CNTRLMEM2	FLSH_55S		NF_CE1_L_R	96
1232 ASIC_CNTRLMEM2	FLSH_55S		NF_RE0_L_R	96
1235 ASIC_CNTRLMEM2	FLSH_55S		NF_WE0_L_R	96
1233 ASIC_CNTRLMEM3	FLSH_55S		NF_CLE	96
1238 ASIC_CNTRLMEM3	FLSH_55S		NF_ALE	96
1232 ASIC_CNTRLMEM3	FLSH_55S		NF_CE0_L	96
1231 ASIC_CNTRLMEM3	FLSH_55S		NF_CE1_L	96
1236 ASIC_CNTRLMEM3	FLSH_55S		NF_RE0_L	96
1229 ASIC_CNTRLMEM3	FLSH_55S		NF_WE0_L	96
1221 ASIC_CNTRLMEM2	FLSH_55S		NF_CLE	96
1227 ASIC_CNTRLMEM2	FLSH_55S		NF_ALE	96
1220 ASIC_CNTRLMEM2	FLSH_55S		NF_CE0_L	96
1224 ASIC_CNTRLMEM2	FLSH_55S		NF_CE1_L	96
1222 ASIC_CNTRLMEM2	FLSH_55S		NF_RE0_L	96
1223 ASIC_CNTRLMEM2	FLSH_55S		NF_WE0_L	96

M99 Specific Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
1189	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_MINI_CONN_P	7 30
1190	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_MINI_CONN_N	7 30
1188	1TO1_DIFFPAIR		CHGR_CSI_R_P	60
1187	1TO1_DIFFPAIR		CHGR_CSI_R_N	60
1192	1TO1_DIFFPAIR		CHGR_CSO_R_P	45 60
1191	1TO1_DIFFPAIR		CHGR_CSO_R_N	45 60
1182 (USB_EXTA)	USB_90D	USB	USB2_EXTA_MUXED_P	39
1181 (USB_EXTA)	USB_90D	USB	USB2_EXTA_MUXED_N	39
1172 (USB_EXTA)	USB_90D	USB	USB2_LT1_P	7 39
1180 (USB_EXTA)	USB_90D	USB	USB2_LT1_N	7 39
1177 (USB_EXTD)	USB_90D	USB	CONN_TPAD_USB_P	
1178 (USB_EXTD)	USB_90D	USB	CONN_TPAD_USB_N	
1176 (USB_CAMERA)	USB_90D	USB	USB_CAMERA_CONN_P	7 30
1175 (USB_CAMERA)	USB_90D	USB	USB_CAMERA_CONN_N	7 30
1174	USB_90D	USB	CONN_USB2_BT_P	7 30
1173	USB_90D	USB	CONN_USB2_BT_N	7 30
1171	USB_90D	USB	USB_LT2_P	7 39
1170	USB_90D	USB	USB_LT2_N	7 39
1169	USB_90D	USB	USB2_EXCARD_CONN_P	7 31
1168	USB_90D	USB	USB2_EXCARD_CONN_N	7 31
1195	DP_100D	DISPLAYPORT	DP_IG_AUX_CH_C_P	81
1194	DP_100D	DISPLAYPORT	DP_IG_AUX_CH_C_N	81
1197 MCP_PE4_REFCLK	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_FC_P	
1198	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_FC_N	
1200 PCIE_FC_R2D	PCIE_90D	PCIE	PCIE_FC_R2D_C_P	
1199	PCIE_90D	PCIE	PCIE_FC_R2D_C_N	
1202 PCIE_FC_D2R	PCIE_90D	PCIE	PCIE_FC_D2R_P	
1201	PCIE_90D	PCIE	PCIE_FC_D2R_N	
1204	PCIE_90D	PCIE	PCIE_FC_R2D_P	
1203	PCIE_90D	PCIE	PCIE_FC_R2D_N	
1193	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_EXCARD_CONN_N	7 31
1192	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_EXCARD_CONN_P	7 31
1158 SPK_OUT	DIFFPAIR	AUDIO	SPKRAMP_L1_OUT_P	7 56 57
1157	DIFFPAIR	AUDIO	SPKRAMP_L1_OUT_N	7 56 57
1161 SPK_OUT	DIFFPAIR	AUDIO	SPKRAMP_L2_OUT_P	7 56 57
1160	DIFFPAIR	AUDIO	SPKRAMP_L2_OUT_N	7 56 57
1159 SPK_OUT	DIFFPAIR	AUDIO	SPKRAMP_R1_OUT_P	7 56 57
1162	DIFFPAIR	AUDIO	SPKRAMP_R1_OUT_N	7 56 57
1206 SPK_OUT	DIFFPAIR	AUDIO	SPKRAMP_R2_OUT_P	7 56 57
1205	DIFFPAIR	AUDIO	SPKRAMP_R2_OUT_N	7 56 57
1247 SPK_OUT	DIFFPAIR	AUDIO	SPKRAMP_LFE_OUT_P	7 56 57
1248	DIFFPAIR	AUDIO	SPKRAMP_LFE_OUT_N	7 56 57
1210	USB_90D	USB	USB_EXTC_P	20 91 98
1209	USB_90D	USB	USB_EXTC_N	20 91 98
1215	USB_90D	USB	USB_LT3_P	7 98
1213	USB_90D	USB	USB_LT3_N	7 98

Project Specific Constraints

SYNC_MASTER=M98_MLB SYNC_DATE=04/01/2008

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31
SCALE NONE	SHT 108 OF 123	

M99 Board-Specific Spacing & Physical Constraints

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

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
DEFAULT	*	Y	=50_OHM_SE	=50_OHM_SE	10 MM	0 MM	0 MM
STANDARD	*	Y	=DEFAULT	=DEFAULT	10 MM	=DEFAULT	=DEFAULT

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

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

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

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
27P4_OHM_SE	TOP,BOTTOM	Y	0.310 MM	0.095 MM			
27P4_OHM_SE	*	Y	0.250 MM	0.250 MM	=STANDARD	=STANDARD	=STANDARD

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
70_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD
70_OHM_DIFF	ISL3,ISL4	Y	0.160 MM	0.160 MM		0.175 MM	0.175 MM
70_OHM_DIFF	ISL9,ISL10	Y	0.160 MM	0.160 MM		0.175 MM	0.175 MM
70_OHM_DIFF	ISL2,ISL11	Y	0.170 MM	0.170 MM		0.150 MM	0.150 MM
70_OHM_DIFF	TOP,BOTTOM	Y	0.170 MM	0.095 MM		0.150 MM	0.150 MM

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

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

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

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
110_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD
110_OHM_DIFF	ISL3,ISL4	Y	0.077 MM	0.077 MM		0.330 MM	0.330 MM
110_OHM_DIFF	ISL9,ISL10	Y	0.077 MM	0.077 MM		0.330 MM	0.330 MM
110_OHM_DIFF	ISL2,ISL11	Y	0.077 MM	0.077 MM		0.330 MM	0.330 MM
110_OHM_DIFF	TOP,BOTTOM	Y	0.077 MM	0.077 MM		0.330 MM	0.330 MM

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

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
1.5:1_SPACING	*	0.15 MM	?
1.8:1_SPACING	*	0.18 MM	?
2:1_SPACING	*	0.2 MM	?
2.5:1_SPACING	*	0.25 MM	?
3:1_SPACING	*	0.3 MM	?
4:1_SPACING	*	0.4 MM	?

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

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

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

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

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

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

PCB Rule Definitions

SYNC_MASTER=M98_MLB SYNC_DATE=04/01/2008

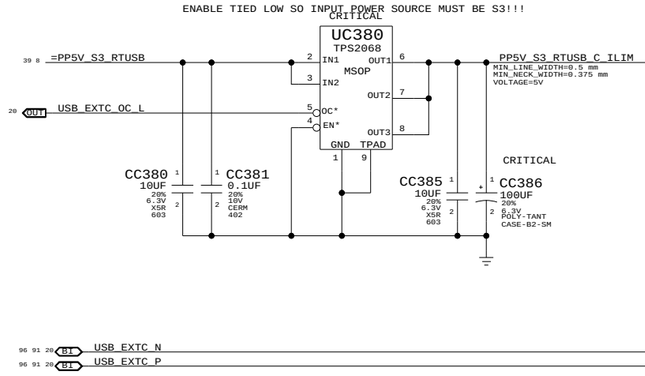
APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31

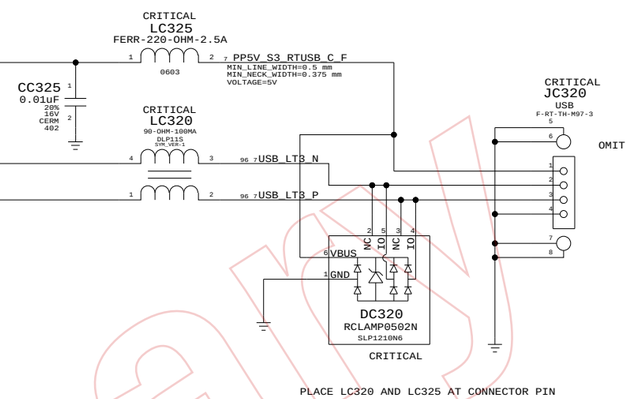
SCALE NONE SHT 109 OF 123

Port Power Switch

ENABLE TIED LOW SO INPUT POWER SOURCE MUST BE S3!!!



LEFT USB PORT C



PLACE LC320 AND LC325 AT CONNECTOR PIN

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
514-0638	1	CONN,RCPT,USB,HB,4P	JC320	CRITICAL	

PROJECT SPECIFIC CONNS

SYNC_MASTER=N/A SYNC_DATE=N/A

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7656	31

SCALE	SHT	OF
NONE	123	123