

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.

# M97 MLB SCHEMATIC

REFERENCED FROM T18  
08/27/2008

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

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12	CPU Decoupling	RAYMOND	03/31/2008
13	eXtended Debug Port (XDP)	T18_MLB	12/12/2007
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15	MCP Memory Interface	T18_MLB	04/04/2008
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19	MCP PCI & LPC	T18_MLB	04/04/2008
20	MCP SATA & USB	T18_MLB	04/04/2008
21	MCP HDA & MISC	T18_MLB	06/26/2008
22	MCP Power & Ground	T18_MLB	04/04/2008
23	MCP79 A01 Silicon Support	T18_MLB	03/08/2008
24	MCP Standard Decoupling	T18_MLB	04/04/2008
25	MCP Graphics Support	T18_MLB	12/12/2007
26	SB Misc	RAYMOND	04/05/2008
27	FSB/DDR3 Vref Margining	BEN	03/31/2008
28	DDR3 SO-DIMM Connector A	BEN	06/30/2008
29	DDR3 SO-DIMM Connector B	BEN	05/09/2008
30	DDR3 Support	T18_MLB	04/04/2008
31	Right Clutch Connector	YITE	04/22/2008
32	VENICE CONNECTOR	YITE	03/13/2008
33	Ethernet PHY (RTL8211CL)	SUMA	05/23/2008
34	Ethernet & AirPort Support	SUMA	07/01/2008
35	ETHERNET CONNECTOR	SUMA	04/04/2008

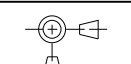
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53	AUDIO: SPEAKER AMP	AUDIO	07/01/2008
54	AUDIO: JACK	AUDIO	07/01/2008
55	AUDIO: JACK TRANSLATORS	AUDIO	07/01/2008
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59	1.5V/0.75V DDR3 SUPPLY	RAYMOND	01/31/2008
60	IMVP6 CPU VCore Regulator	RAYMOND	01/31/2008
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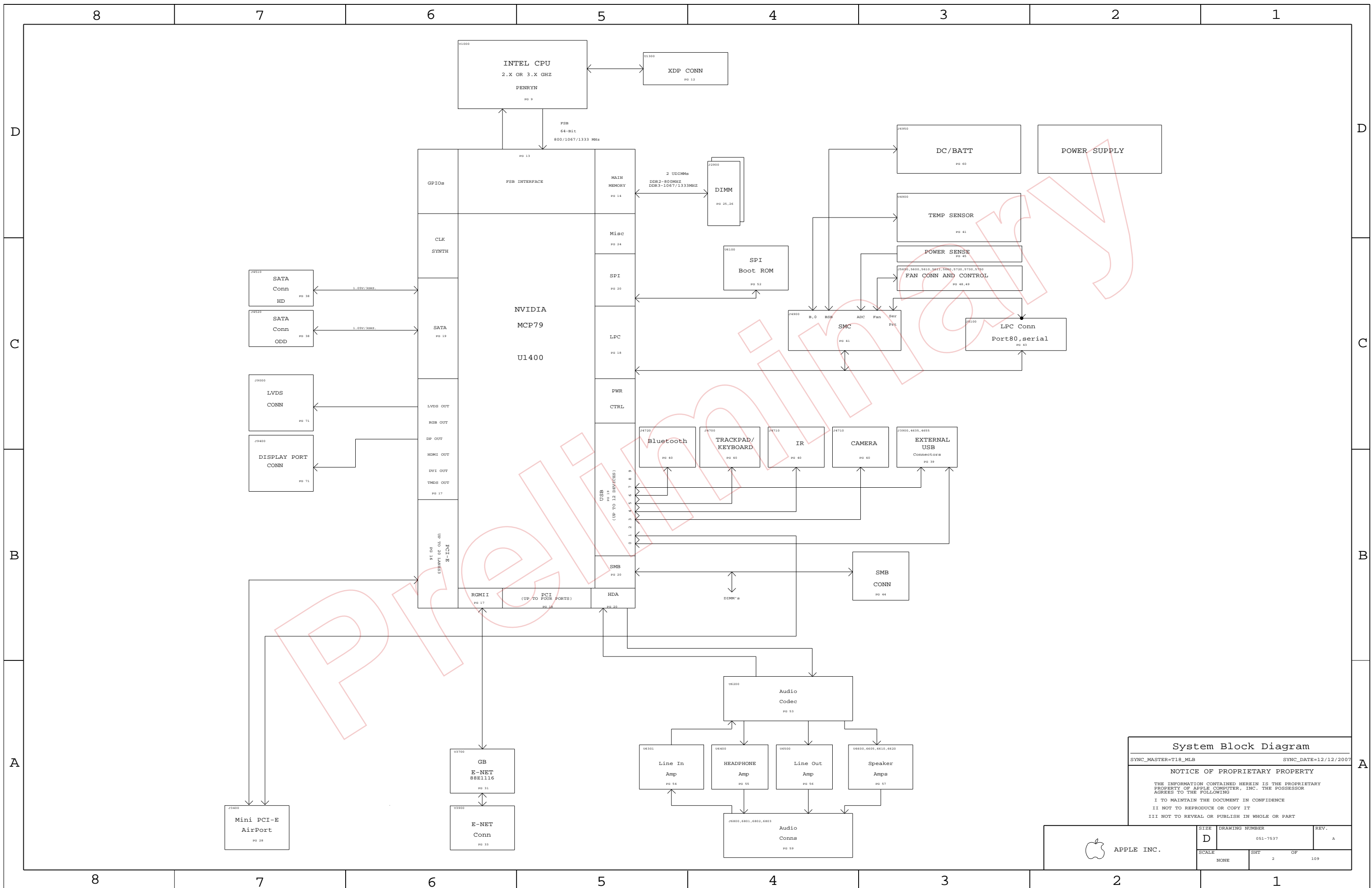
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PVT BUILD

Schematic / PCB #'s

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

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X.XX :	_____	ENG APPD	MFG APPD		
X.XXX :	_____	QA APPD	DESIGNER		
ANGLES :	_____	RELEASE	SCALE		
DO NOT SCALE DRAWING		NONE		TITLE	
 THIRD ANGLE PROJECTION		MATERIAL/FINISH NOTED AS APPLICABLE		SIZE D	DRAWING NUMBER
				051-7537	REV. A
				SHT 1 OF 109	



**System Block Diagram**

SYNC\_MASTER=T18\_MLB SYNC\_DATE=12/12/2007

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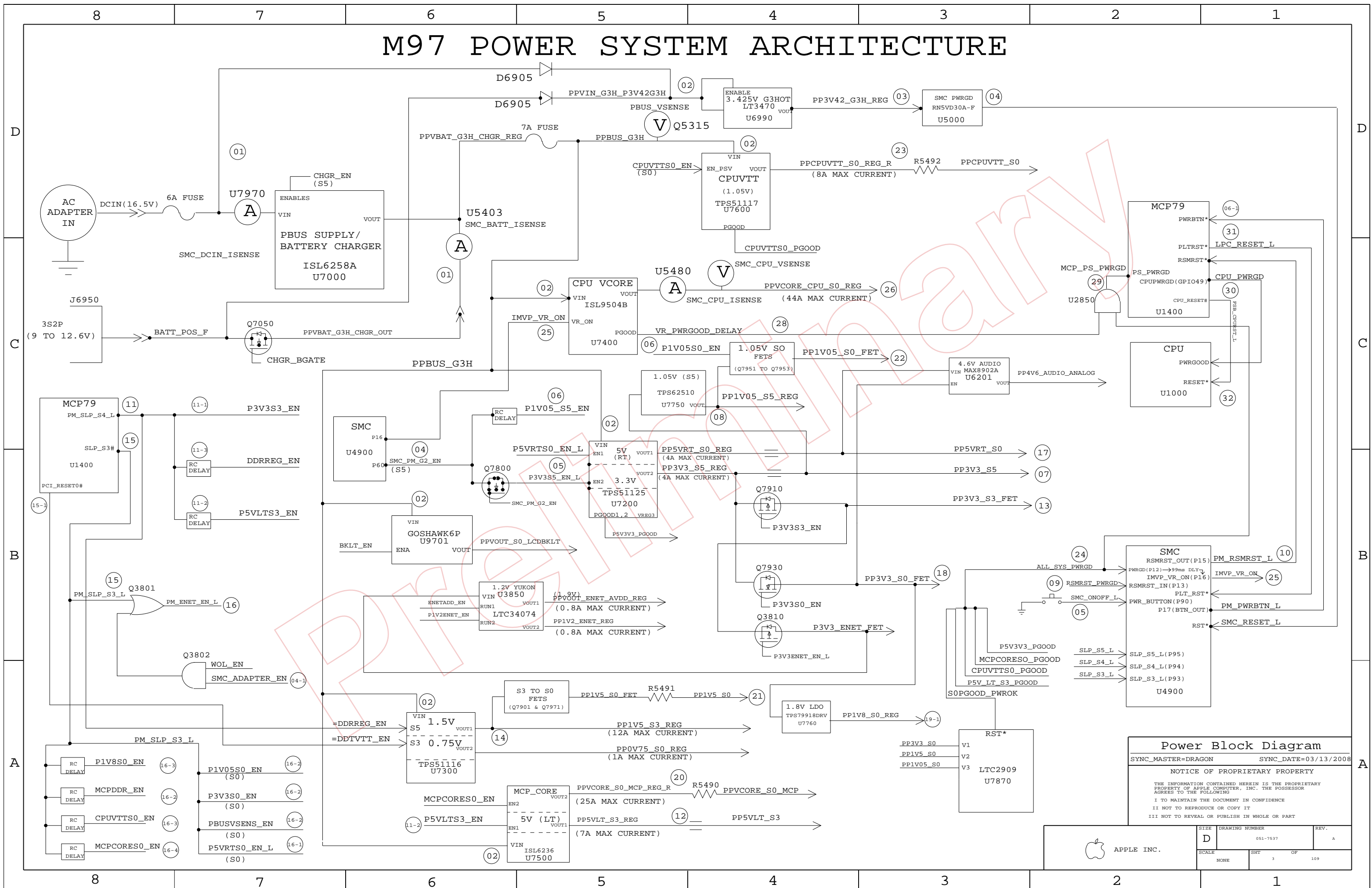
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# M97 POWER SYSTEM ARCHITECTURE



**Power Block Diagram**  
 SYNC\_MASTER=DRAGON SYNC\_DATE=03/13/2008

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APPLE INC.	SIZE	DRAWING NUMBER	REV.
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NONE	3		

BOM Variants

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

Bar Code Labels / EEE #'s

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
826-4393	1	LBL,P/N LABEL,PCB,28MM X 6 MM	[EEE:2K9]	CRITICAL	EEE_2K9
826-4393	1	LBL,P/N LABEL,PCB,28MM X 6 MM	[EEE:2KA]	CRITICAL	EEE_2KA
826-4393	1	LBL,P/N LABEL,PCB,28MM X 6 MM	[EEE:1DJ]	CRITICAL	EEE_1DJ

BOM Groups

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

Module Parts

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

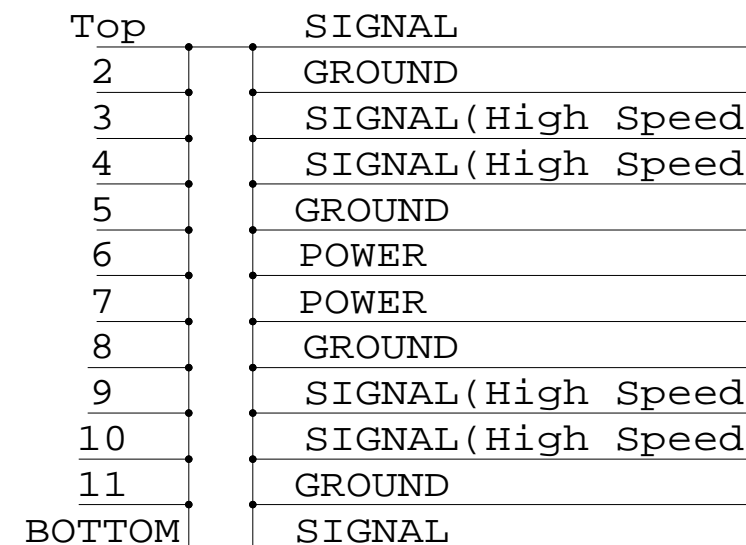
Programmable Parts

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
338S0563	1	IC,SMC,H88/2117,9X9MM,TLP,HP	U4900	CRITICAL	SMC_BLANK
341S2287	1	IC,SMC,M97	U4900	CRITICAL	SMC_PROG
335S0610	1	IC,FLASH,SP1,32MBIT,3.3V,86MHZ,8-SOP	U6100	CRITICAL	BOOTROM_BLANK
341S2285	1	IC,PRGRM,EFI,BOOTROM,UNLOCK,M97	U6100	CRITICAL	BOOTROM_PROG
338S0375	1	IC,CY7C63833,ENCORE II,USB CONTROLLER	U4800	CRITICAL	IR_BLANK
341S2093	1	IC,IR CONTROLLER,M97	U4800	CRITICAL	IR_PROG
337S2983	1	IC,PSOC+ W/ USB,56 PIN,MLP,CY8C24794	U5701	CRITICAL	WELLSPRING_BLANK
341S2348	1	IC,WELLSPRING CONTROLLER,M97	U5701	CRITICAL	WELLSPRING_PROG

Alternate Parts

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

M97 BOARD STACK-UP



BOM Configuration

SYNC\_MASTER=M97\_MLB

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D	051-7537	A
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NONE	4	109

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Revision History

Preliminary

D

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SYNC\_MASTER=M97\_MLB

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	D	051-7537	A
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NONE	5	109	

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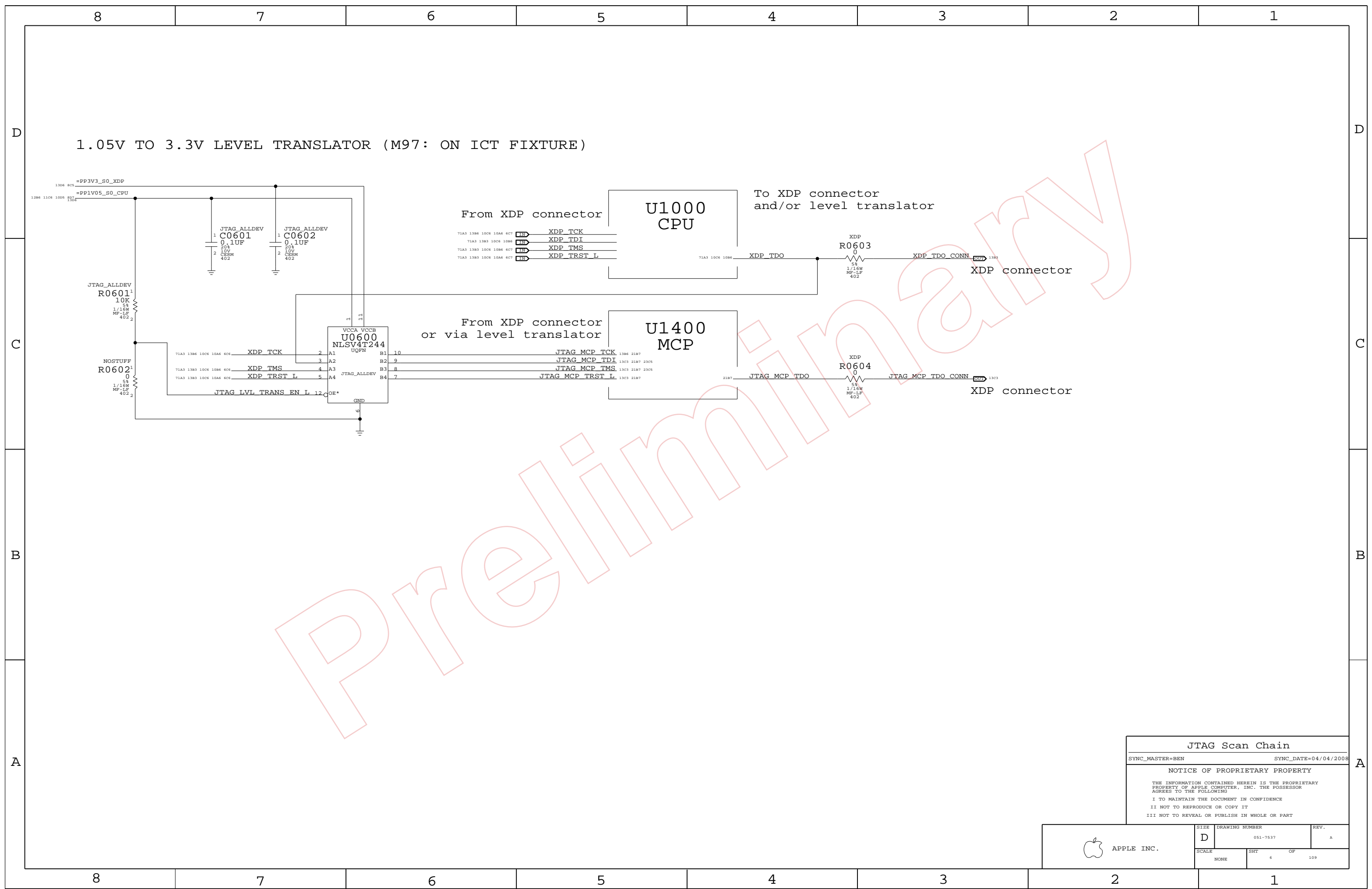
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Preliminary

**JTAG Scan Chain**

SYNC\_MASTER=BEN SYNC\_DATE=04/04/2008

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APPLE INC.	SIZE: <b>D</b>	DRAWING NUMBER: 051-7537	REV.: A
	SCALE: NONE	SHEET: 6 OF 109	

# Functional Test Points

8 7 6 5 4 3 2 1

## Fan Connectors

8180	TRUE	PP5VRT_S0	(NEED 3 TP)	703 805
8181	TRUE	FAN_RT_PWM		4684
8182	TRUE	FAN_RT_TACH		46C4

(NEED TO ADD 3 GND TP)

## MIC FUNC\_TEST

8231	TRUE	MIC_HI_CONN		5481 54D2
8232	TRUE	MIC_LO_CONN		5481 54D2
8233	TRUE	MIC_SHLD_CONN		54D2 55A6

## SPEAKER FUNC\_TEST

8290	TRUE	SPKRAMP_L_N_OUT		53A2 54C2
8291	TRUE	SPKRAMP_L_P_OUT		53B2 54C2
8292	TRUE	SPKRAMP_R_N_OUT		53C3 54C2
8293	TRUE	SPKRAMP_R_P_OUT		53C3 54C2
8294	TRUE	SPKRAMP_SUB_N_OUT		53B2 54C2
8295	TRUE	SPKRAMP_SUB_P_OUT		53B2 54C2

## THERMAL FUNC\_TEST

8260	TRUE	MCPTHMSNS_D2_P		4585 77D3
8261	TRUE	MCPTHMSNS_D2_N		4585 77D3

## LVDS FUNC\_TEST

8250	TRUE	PP3V3_LCDVDD_SW_F		7C3 66C2
8251	TRUE	PP3V3_S0_LCD_F		66C3
8252	TRUE	PPVOUT_S0_LCDBKLT		7C3 68B2 69B3 69C1
8253	TRUE	LVDS_IG_DDC_CLK		18A3 66C5
8254	TRUE	LVDS_IG_DDC_DATA		18A3 66B5
8255	TRUE	LVDS_IG_A_DATA_N<0>		18B3 66C2 73B3
8256	TRUE	LVDS_IG_A_DATA_P<0>		18B3 66C2 73B3
8257	TRUE	LVDS_IG_A_DATA_N<1>		18B3 66C2 73B3
8258	TRUE	LVDS_IG_A_DATA_P<1>		18B3 66C2 73B3
8259	TRUE	LVDS_IG_A_DATA_N<2>		18B3 66C2 73B3
8260	TRUE	LVDS_IG_A_DATA_P<2>		18B3 66C2 73B3
8261	TRUE	LVDS_IG_A_CLK_F_N		66B2 73B3
8262	TRUE	LVDS_IG_A_CLK_F_P		66B2 73B3
8263	TRUE	LED_RETURN_1		66B3 69C1
8264	TRUE	LED_RETURN_2		66B3 69B1
8265	TRUE	LED_RETURN_3		66B3 69B1
8266	TRUE	LED_RETURN_4		66B3 69B1
8267	TRUE	LED_RETURN_5		66B3 69B1
8268	TRUE	LED_RETURN_6		66B3 69B1

(NEED TO ADD 5 GND TP)

## SATA ODD CONN

8240	TRUE	PP5V_SW_ODD	(NEED 4 TP)	7C3 36D3
8241	TRUE	SMC_ODD_DETECT		36B7 39B8
8242	TRUE	SATA_ODD_D2R_C_P		36B5 73A3
8243	TRUE	SATA_ODD_D2R_C_N		36B5 73A3
8244	TRUE	SATA_ODD_R2D_P		36B5 73A3
8245	TRUE	SATA_ODD_R2D_N		7C5 36B5 73A3

(NEED TO ADD 4 GND TP)

## DC POWER CONN

8230	TRUE	PP18V5_DCIN_FUSE	(NEED 3 TP)	56D6
8231	TRUE	ADAPTER_SENSE		56D7

(NEED TO ADD 4 GND TP)

## BATT POWER CONN

8280	TRUE	PPVBAT_G3H_CONN_F	(NEED 3 TP)	56A8
8281	TRUE	GND_BATT_CONN	(NEED 3 TP)	56A8
8282	TRUE	SMBUS_SMC_BSA_SCL		7A7 42C5 76D3
8283	TRUE	SMBUS_SMC_BSA_SCL		7A7 42C5 76D3
8284	TRUE	SMC_BS_ALERT_L		39C5 40B2 56A8

## BATT SIGNAL CONN

8290	TRUE	PP3V42_G3H	(NEED 3 TP)	785 7C3 8D3
8291	TRUE	SMBUS_SMC_BSA_SCL		7A7 42C5 76D3
8292	TRUE	SMBUS_SMC_BSA_SCL		7A7 42C5 76D3
8293	TRUE	SMC_BIL_BUTTON_DB_L		56A5

(NEED TO ADD 3 GND TP)

## FRONT FLEX CONN

8180	TRUE	PP3V42_G3H_LIDSWITCH_R		38B6
8181	TRUE	PP5V_S3_IR_R		38B6
8182	TRUE	IR_RX_OUT		38A4 38C4
8183	TRUE	SMC_LID_R		38B6
8184	TRUE	SYS_LED_ANODE_R		38B6

(NEED TO ADD 2 GND TP)

## RIGHT CLUTCH CONN

8190	TRUE	PP5V_S3_BTCAMERA_F		31A7
8191	TRUE	PCIE_MINI_D2R_P		1785 31C7 73D3
8192	TRUE	PCIE_MINI_D2R_N		1785 31C7 73D3
8193	TRUE	PCIE_MINI_R2D_P		31C7 73D3
8194	TRUE	PCIE_MINI_R2D_N		31C7 73D3
8195	TRUE	PCIE_CLK100M_MINI_CONN_P		31C8 73D3
8196	TRUE	PCIE_CLK100M_MINI_CONN_N		31C8 73D3
8197	TRUE	USB_CAMERA_CONN_P		31B7 74C3
8198	TRUE	USB_CAMERA_CONN_N		31B7 74C3
8199	TRUE	PP5V_WLAN		7C3 31C5
8200	TRUE	PCIE_WAKE_L		1785 31C5 31C7
8201	TRUE	SMBUS_SMC_A_S3_SCL		785 42D2 76D3
8202	TRUE	SMBUS_SMC_A_S3_SDA		785 42D2 76D3
8203	TRUE	CONN_USB2_BT_P		31B7 74B3
8204	TRUE	CONN_USB2_BT_N		31B7 74B3
8205	TRUE	MINI_CLKREQ_O_L		31C7
8206	TRUE	MINI_RESET_CONN_L		31A7

(NEED TO ADD 3 GND TP)

## SATA HDD CONN

8210	TRUE	PP5V_S0_HDD_FLT	(NEED 4 TP)	7C3 36A7
8211	TRUE	SATA_HDD_R2D_P		36A7 73A3
8212	TRUE	SATA_HDD_R2D_N		36A7 73A3
8213	TRUE	SATA_HDD_D2R_C_P		36A7 73A3
8214	TRUE	SATA_HDD_D2R_C_N		36A7 73A3
8215	TRUE	SATA_ODD_R2D_N		7C5 36B5 73A3

(NEED TO ADD 4 GND TP)

## IPD\_FLEX\_CONN

8220	TRUE	PP3V3_S3_LDO		7C3 48B4 48C3
8221	TRUE	PP18V5_S3		7C3 48C1 48D3
8222	TRUE	TPAD_GND_F		48B4 48C3 48C4 48C7
8223	TRUE	Z2_CS_L		47C8 48C3
8224	TRUE	Z2_DEBUG3		47C8 48C3
8225	TRUE	Z2_MOSI		47C8 48C3
8226	TRUE	Z2_MISO		47C8 48C3
8227	TRUE	Z2_SCLK		47C8 48C3
8228	TRUE	Z2_BOOST_EN		48C3 48C5
8229	TRUE	Z2_HOST_INTN		47D8 48C3
8230	TRUE	Z2_BOOT_CFG1		47C8 48C3
8231	TRUE	Z2_CLKIN		47B6 48C3
8232	TRUE	Z2_KEY_ACT_L		47C8 48C1
8233	TRUE	Z2_RESET		47C8 48C1
8234	TRUE	PSOC_MISO		47C8 48C3
8235	TRUE	PSOC_MOSI		47C8 48C1
8236	TRUE	PSOC_SCLK		47C8 48C1
8237	TRUE	SMBUS_SMC_A_S3_SDA		7C5 42D2 76D3
8238	TRUE	SMBUS_SMC_A_S3_SCL		7C5 42D2 76D3
8239	TRUE	PSOC_F_CS_L		47C8 48C1
8240	TRUE	PICKB_L		47D8 48C1

## KEYBOARD CONN

8180	TRUE	PP3V3_S3		7C3 8D3
8181	TRUE	PP3V42_G3H		7A7 7C3 8D3
8182	TRUE	WS_KBD1		47C6 47D2
8183	TRUE	WS_KBD2		47C6 47D2
8184	TRUE	WS_KBD3		47C6 47D2
8185	TRUE	WS_KBD4		47C6 47D2
8186	TRUE	WS_KBD5		47C6 47D2
8187	TRUE	WS_KBD6		47C6 47D2
8188	TRUE	WS_KBD7		47C6 47D2
8189	TRUE	WS_KBD8		47C6 47D2
8190	TRUE	WS_KBD9		47C6 47D2
8191	TRUE	WS_KBD10		47C6 47D2
8192	TRUE	WS_KBD11		47C3 47C6
8193	TRUE	WS_KBD12		47C2 47C6
8194	TRUE	WS_KBD13		47C2 47C6
8195	TRUE	WS_KBD14		47C2 47C6
8196	TRUE	WS_KBD15_CAP		47C2
8197	TRUE	WS_KBD16_NUM		47C2
8198	TRUE	WS_KBD17		47C2 47C6
8199	TRUE	WS_KBD18		47C2 47D7
8200	TRUE	WS_KBD19		47C2 47D7
8201	TRUE	WS_KBD20		47C2 47D7
8202	TRUE	WS_KBD21		47C2 47D7
8203	TRUE	WS_KBD22		47C2 47D7
8204	TRUE	WS_KBD23		47C2 47D7
8205	TRUE	WS_KBD_ONOFF_L		47C2
8206	TRUE	WS_LEFT_SHIFT_KBD		47B3 47B5 47C2
8207	TRUE	WS_LEFT_OPTION_KBD		47B3 47B5 47C2
8208	TRUE	WS_CONTROL_KBD		47B3 47B5 47C2

(NEED TO ADD 1 GND TP)

## KBD BACKLIGHT CONN

8210	TRUE	KBDLED_ANODE		48A6
------	------	--------------	--	------

(NEED TO ADD 2 GND TP)

## DEBUG VOLTAGE

8270	TRUE	PPVCORE_S0_CPU		8D7
8271	TRUE	PPCPUVT_S0		8D7
8272	TRUE	PPVCORE_S0_MCP		8C7
8273	TRUE	PP0V75_S0		8C7
8274	TRUE	PP1V05_S0		8C7
8275	TRUE	PP1V5_S0		8B7
8276	TRUE	PP1V8_S0		8B7
8277	TRUE	PP5VRT_S0		7D7 8D6
8278	TRUE	PP3V3_S0		8C5
8279	TRUE	PP1V5_S3		8D3
8280	TRUE	PP3V3_S3		785 8D3
8281	TRUE	PP5VLT_S3		8C3
8282	TRUE	PP1V1R1V05_S5		8B3
8283	TRUE	PP3V3_S5		8B3
8284	TRUE	PP3V42_G3H		7A7 7B5 8D1
8285	TRUE	PPBUS_G3H		8C1
8286	TRUE	PP3V3_ENET_PHY		8B1
8287	TRUE	PP1V2R1V05_ENET		8B1
8288	TRUE	PP3V3_G3_RTC		21C8 22A5 26D4
8289	TRUE	PP5V_WLAN		7C5 31C5
8290	TRUE	PP5V_SW_ODD		7B7 36D3
8291	TRUE	PP5V_S0_HDD_FLT		7C5 36A7
8292	TRUE	PP3V3_S5_AVREF_SMC		39D4 40B6
8293	TRUE	PP18V5_S3		7C5 48C1 48D3
8294	TRUE	PP3V3_S3_LDO		7C5 48B4 48C3
8295	TRUE	PP3V3_LCDVDD_SW_F		7C7 66C2
8296	TRUE	PPVOUT_S0_LCDBKLT		7C7 68B2 69B3 69C1
8297	TRUE	BKL_VREF_4V9		69A8 69B6 69C4 69C8
8298	TRUE	PP4V6_AUDIO_ANALOG		51A3 51D3 52D6
8299	TRUE	SMC_PM_G2_EN		39D5 64D8
8300	TRUE	PM_SLP_S4_L		21C3 39C5 40A2 64C8
8301	TRUE	PM_SLP_S3_L		21C3 34B7 39C5 41A5 64D5 68D8

(NEED TO ADD 4 GND TP)

## FUNC TEST

SYNC\_MASTER=M97\_MLB

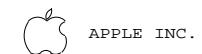
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APPLE INC.

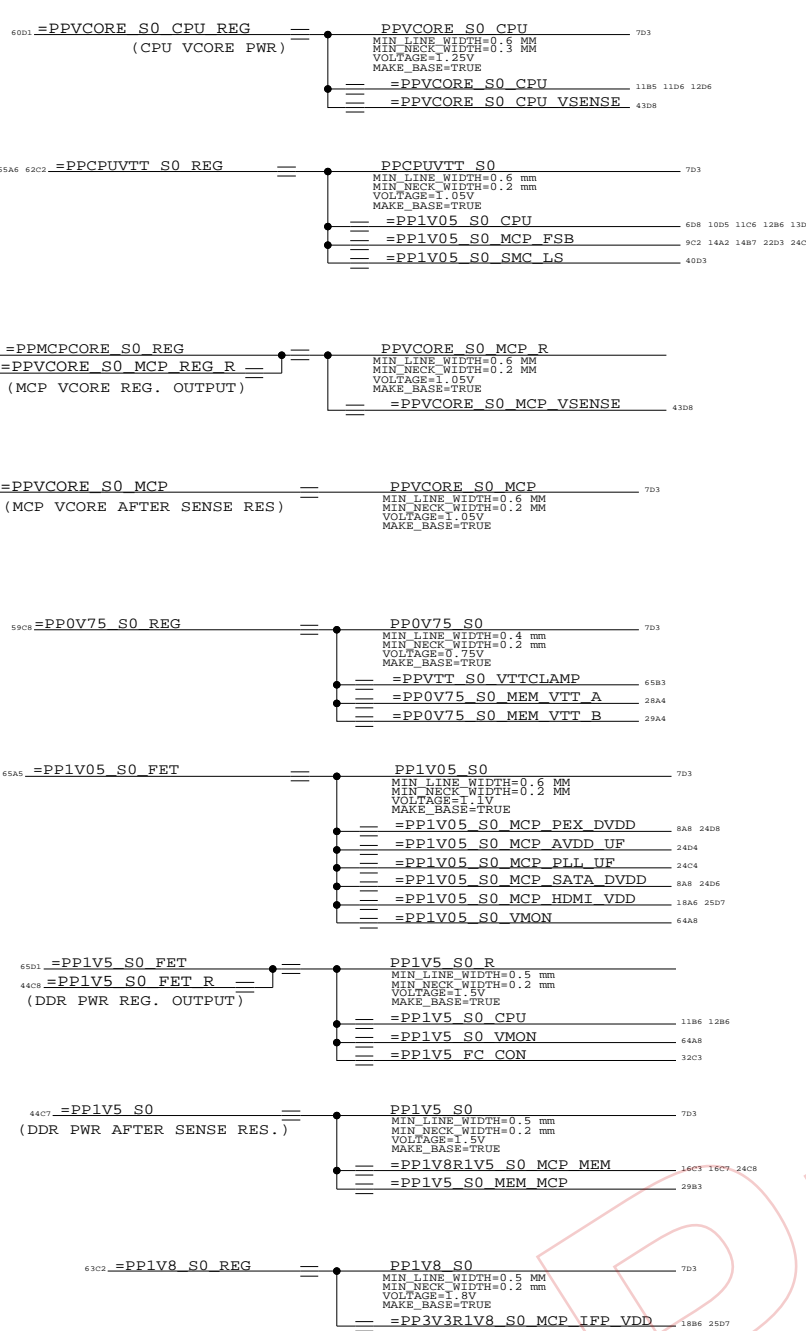
SIZE DRAWING NUMBER REV.

D 051-7537 A

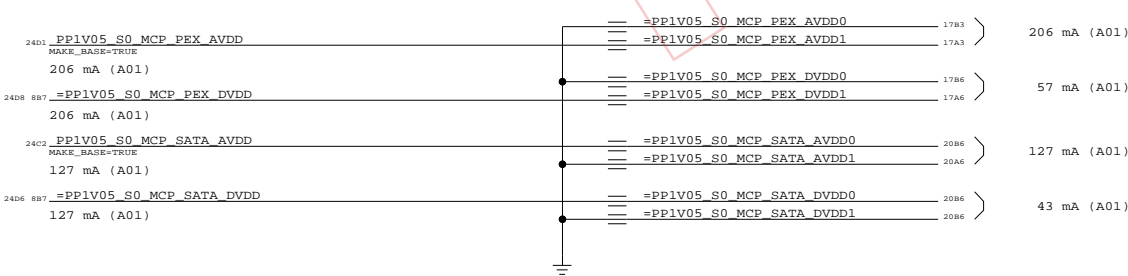
SCALE NONE SHIT 7 OF 109

8 7 6 5 4 3 2 1

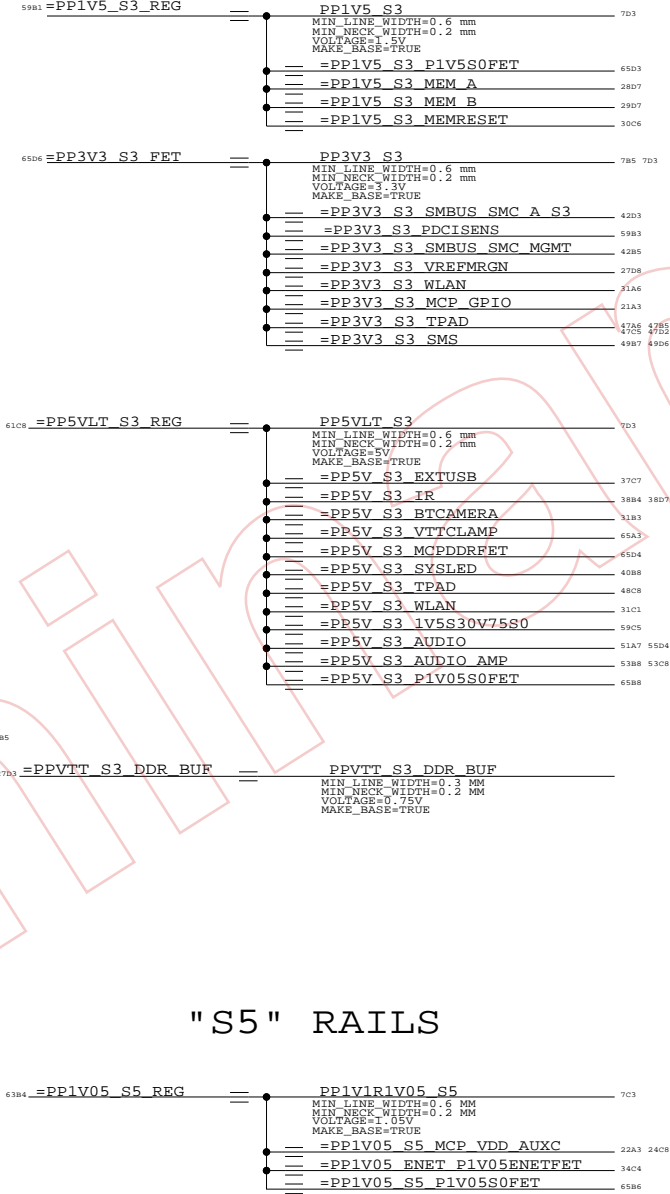
### "S0,S0M" RAILS



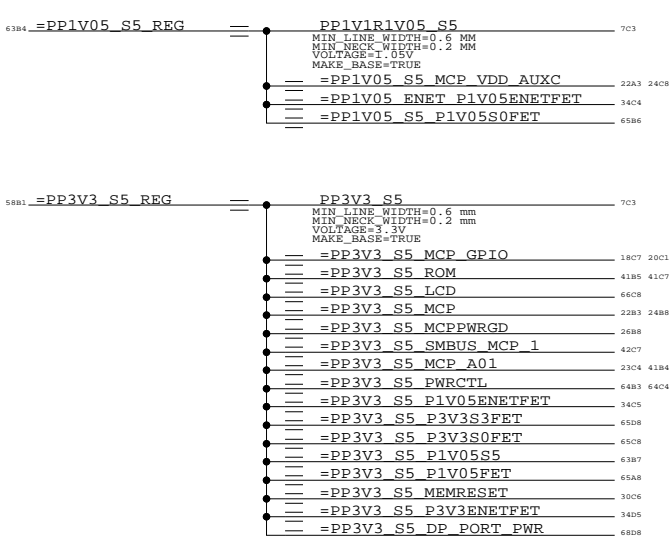
### PEX & SATA AVDD/DVDD aliases



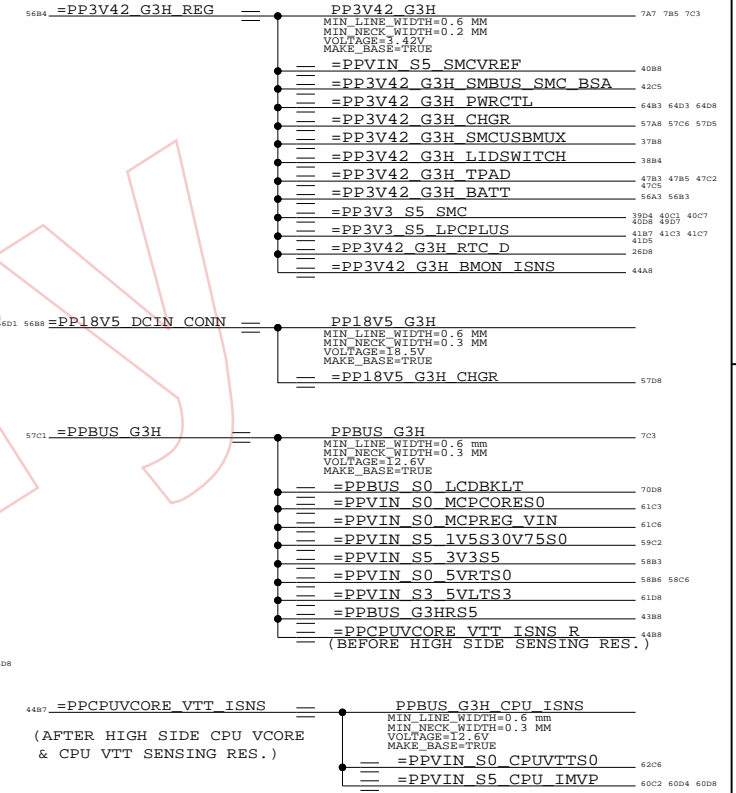
### "S3" RAILS



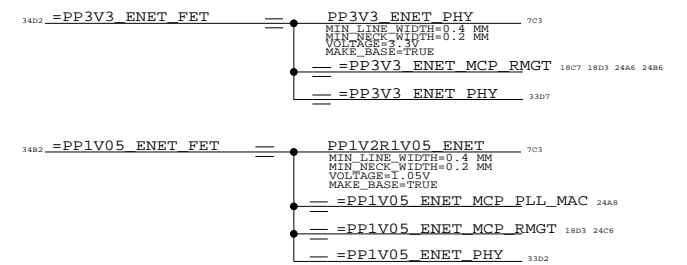
### "S5" RAILS



### "G3H" RAILS



### "ENET" RAILS



**Power Aliases**

SYNC\_MASTER=BEN

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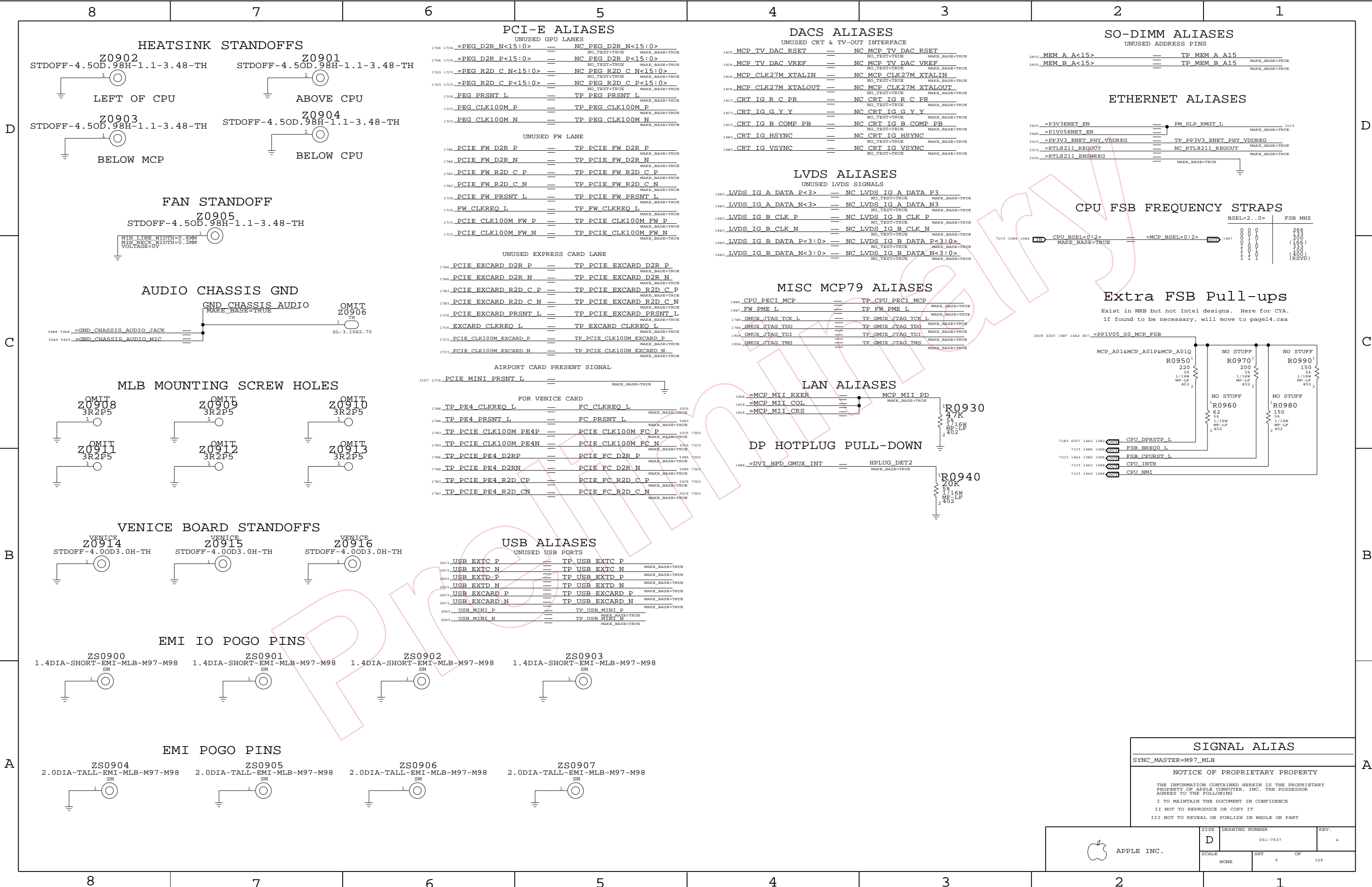
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**PCI-E ALIASES**

UNUSED GPU LANES

1706	=PEG D2R N<15:0>	==	NC PEG D2R N<15:0>	MAKE_BASE=TRUE
1706	=PEG D2R P<15:0>	==	NC PEG D2R P<15:0>	MAKE_BASE=TRUE
1703	=PEG R2D C N<15:0>	==	NC PEG R2D C N<15:0>	MAKE_BASE=TRUE
1703	=PEG R2D C P<15:0>	==	NC PEG R2D C P<15:0>	MAKE_BASE=TRUE
1706	PEG PRSNT L	==	TP PEG PRSNT L	MAKE_BASE=TRUE
1703	PEG CLK100M P	==	TP PEG CLK100M P	MAKE_BASE=TRUE
1703	PEG CLK100M N	==	TP PEG CLK100M N	MAKE_BASE=TRUE

UNUSED FW LANE

1786	PCIE FW D2R P	==	TP PCIE FW D2R P	MAKE_BASE=TRUE
1786	PCIE FW D2R N	==	TP PCIE FW D2R N	MAKE_BASE=TRUE
1783	PCIE FW R2D C P	==	TP PCIE FW R2D C P	MAKE_BASE=TRUE
1783	PCIE FW R2D C N	==	TP PCIE FW R2D C N	MAKE_BASE=TRUE
1706	PCIE FW PRSNT L	==	TP PCIE FW PRSNT L	MAKE_BASE=TRUE
1706	FW CLKREQ L	==	TP FW CLKREQ L	MAKE_BASE=TRUE
1703	PCIE CLK100M FW P	==	TP PCIE CLK100M FW P	MAKE_BASE=TRUE
1703	PCIE CLK100M FW N	==	TP PCIE CLK100M FW N	MAKE_BASE=TRUE

UNUSED EXPRESS CARD LANE

1784	PCIE EXCARD D2R P	==	TP PCIE EXCARD D2R P	MAKE_BASE=TRUE
1784	PCIE EXCARD D2R N	==	TP PCIE EXCARD D2R N	MAKE_BASE=TRUE
1783	PCIE EXCARD R2D C P	==	TP PCIE EXCARD R2D C P	MAKE_BASE=TRUE
1783	PCIE EXCARD R2D C N	==	TP PCIE EXCARD R2D C N	MAKE_BASE=TRUE
1706	PCIE EXCARD PRSNT L	==	TP PCIE EXCARD PRSNT L	MAKE_BASE=TRUE
1706	EXCARD CLKREQ L	==	TP EXCARD CLKREQ L	MAKE_BASE=TRUE
1703	PCIE CLK100M EXCARD P	==	TP PCIE CLK100M EXCARD P	MAKE_BASE=TRUE
1703	PCIE CLK100M EXCARD N	==	TP PCIE CLK100M EXCARD N	MAKE_BASE=TRUE

AIRPORT CARD PRESENT SIGNAL

3107	PCIE MINI PRSNT L	==	MAKE_BASE=TRUE	
------	-------------------	----	----------------	--

**DACS ALIASES**

UNUSED CRT & TV-OUT INTERFACE

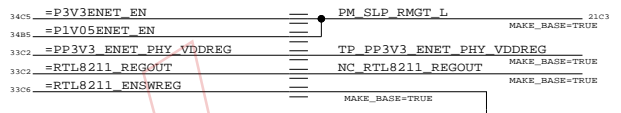
1806	MCP TV DAC RSET	==	NC MCP TV DAC RSET	MAKE_BASE=TRUE
1806	MCP TV DAC VREF	==	NC MCP TV DAC VREF	MAKE_BASE=TRUE
1806	MCP CLK27M XTALIN	==	NC MCP CLK27M XTALIN	MAKE_BASE=TRUE
1806	MCP CLK27M XTALOUT	==	NC MCP CLK27M XTALOUT	MAKE_BASE=TRUE
1803	CRT IG R C PR	==	NC CRT IG R C PR	MAKE_BASE=TRUE
1803	CRT IG G Y Y	==	NC CRT IG G Y Y	MAKE_BASE=TRUE
1803	CRT IG B COMP PB	==	NC CRT IG B COMP PB	MAKE_BASE=TRUE
1883	CRT IG HSYNC	==	NC CRT IG HSYNC	MAKE_BASE=TRUE
1883	CRT IG VSYNC	==	NC CRT IG VSYNC	MAKE_BASE=TRUE

**SO-DIMM ALIASES**

UNUSED ADDRESS PINS

2805	MEM A A<15>	==	TP MEM A A15	MAKE_BASE=TRUE
2905	MEM B A<15>	==	TP MEM B A15	MAKE_BASE=TRUE

**ETHERNET ALIASES**

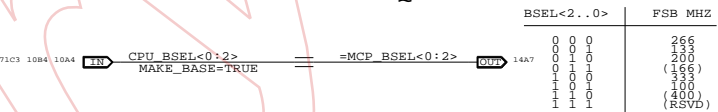


**LVDS ALIASES**

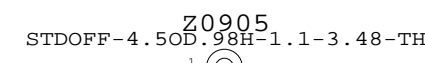
UNUSED LVDS SIGNALS

1883	LVDS IG A DATA P<3>	==	NC LVDS IG A DATA P3	MAKE_BASE=TRUE
1883	LVDS IG A DATA N<3>	==	NC LVDS IG A DATA N3	MAKE_BASE=TRUE
1883	LVDS IG B CLK P	==	NC LVDS IG B CLK P	MAKE_BASE=TRUE
1883	LVDS IG B CLK N	==	NC LVDS IG B CLK N	MAKE_BASE=TRUE
1883	LVDS IG B DATA P<3:0>	==	NC LVDS IG B DATA P<3:0>	MAKE_BASE=TRUE
1883	LVDS IG B DATA N<3:0>	==	NC LVDS IG B DATA N<3:0>	MAKE_BASE=TRUE

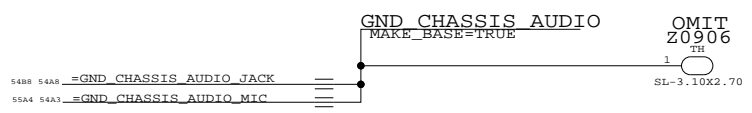
**CPU FSB FREQUENCY STRAPS**



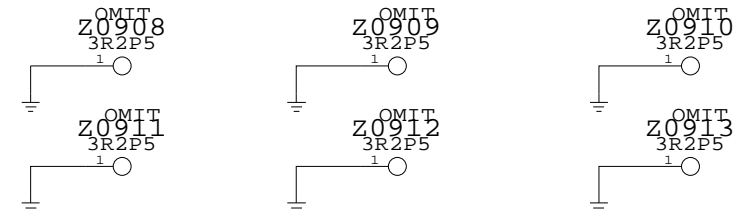
**FAN STANDOFF**



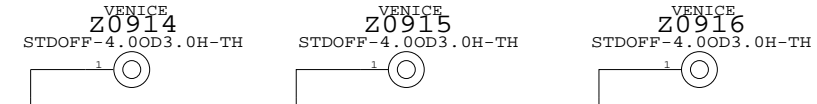
**AUDIO CHASSIS GND**



**MLB MOUNTING SCREW HOLES**



**VENICE BOARD STANDOFFS**

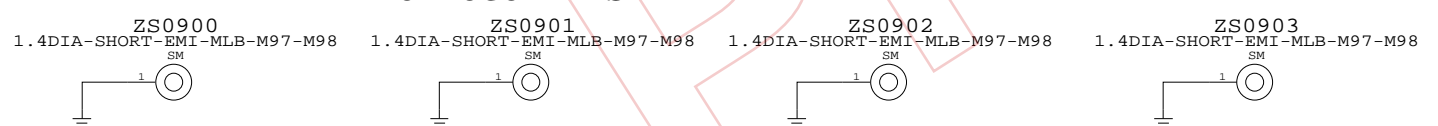


**USB ALIASES**

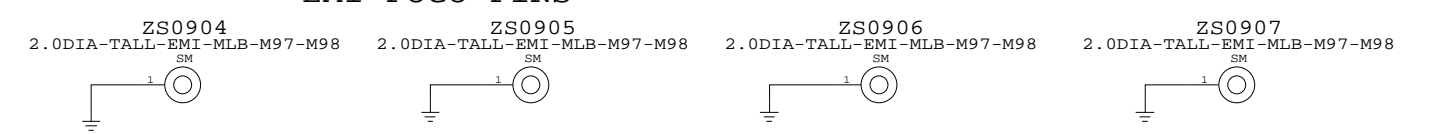
UNUSED USB PORTS

2003	USB_EXTC_P	==	TP_USB_EXTC_P	MAKE_BASE=TRUE
2003	USB_EXTC_N	==	TP_USB_EXTC_N	MAKE_BASE=TRUE
2003	USB_EXTD_P	==	TP_USB_EXTD_P	MAKE_BASE=TRUE
2003	USB_EXTD_N	==	TP_USB_EXTD_N	MAKE_BASE=TRUE
2003	USB_EXCARD_P	==	TP_USB_EXCARD_P	MAKE_BASE=TRUE
2003	USB_EXCARD_N	==	TP_USB_EXCARD_N	MAKE_BASE=TRUE
2003	USB_MINI_P	==	TP_USB_MINI_P	MAKE_BASE=TRUE
2003	USB_MINI_N	==	TP_USB_MINI_N	MAKE_BASE=TRUE

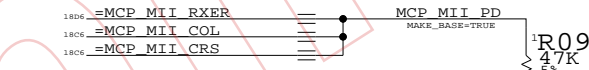
**EMI IO POGO PINS**



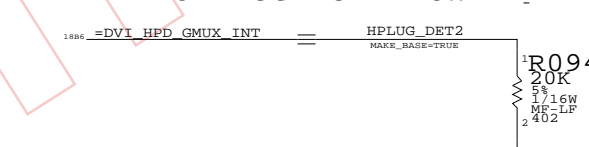
**EMI POGO PINS**



**LAN ALIASES**

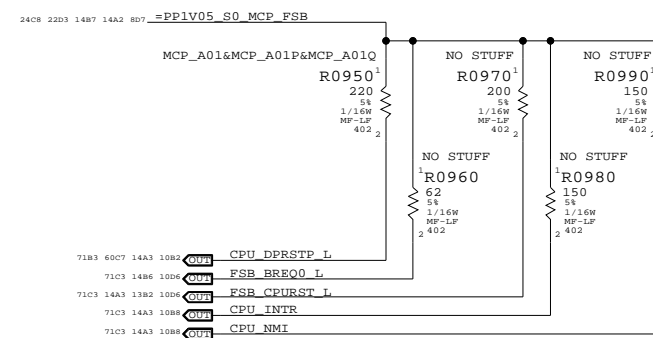


**DP HOTPLUG PULL-DOWN**



**Extra FSB Pull-ups**

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



**SIGNAL ALIAS**

SYNC\_MASTER=M97\_MLB

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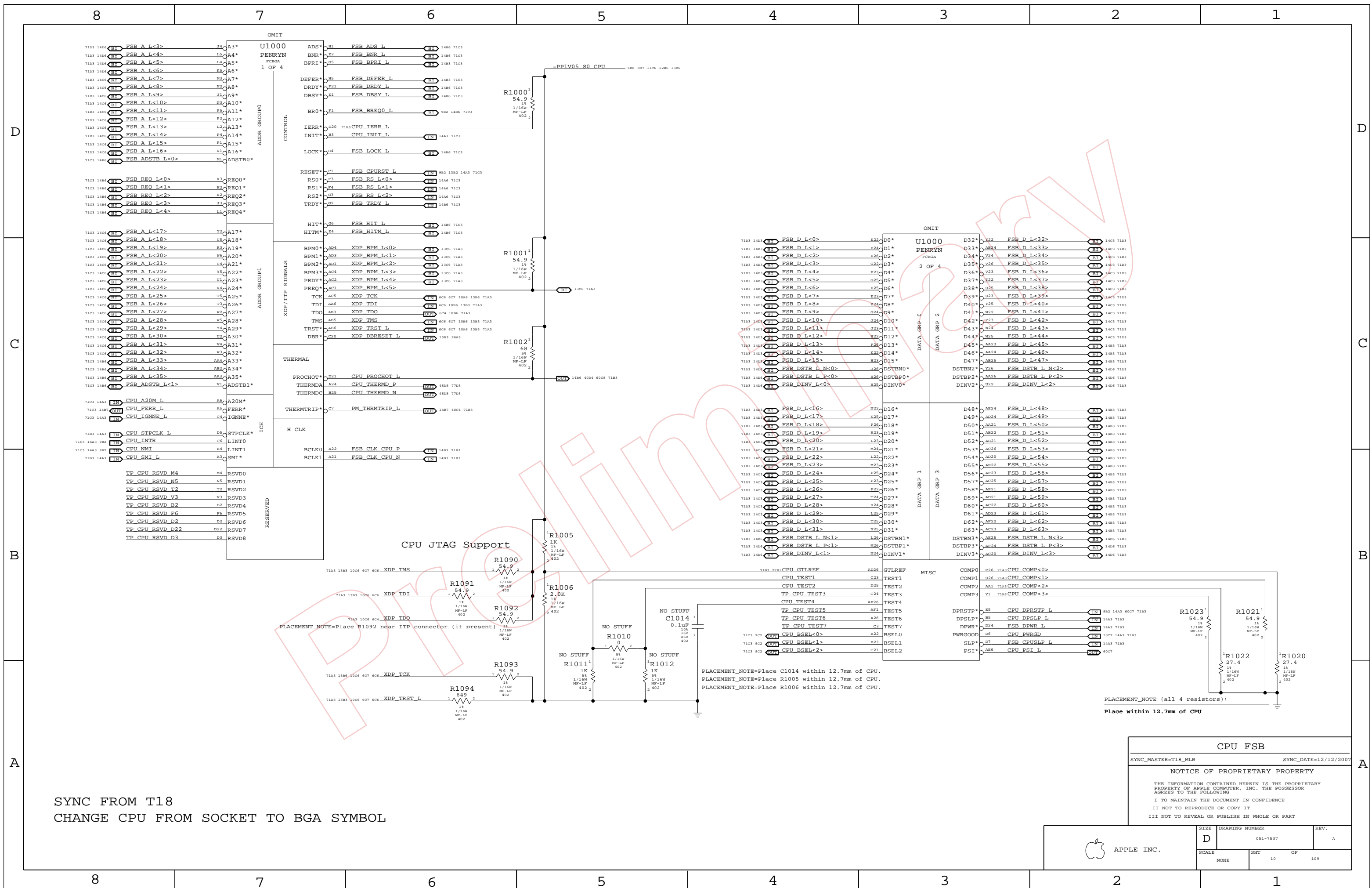
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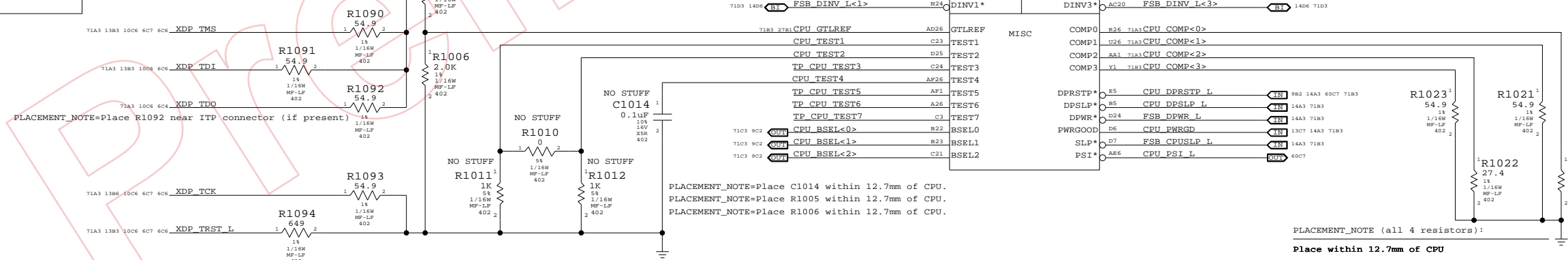
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III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

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



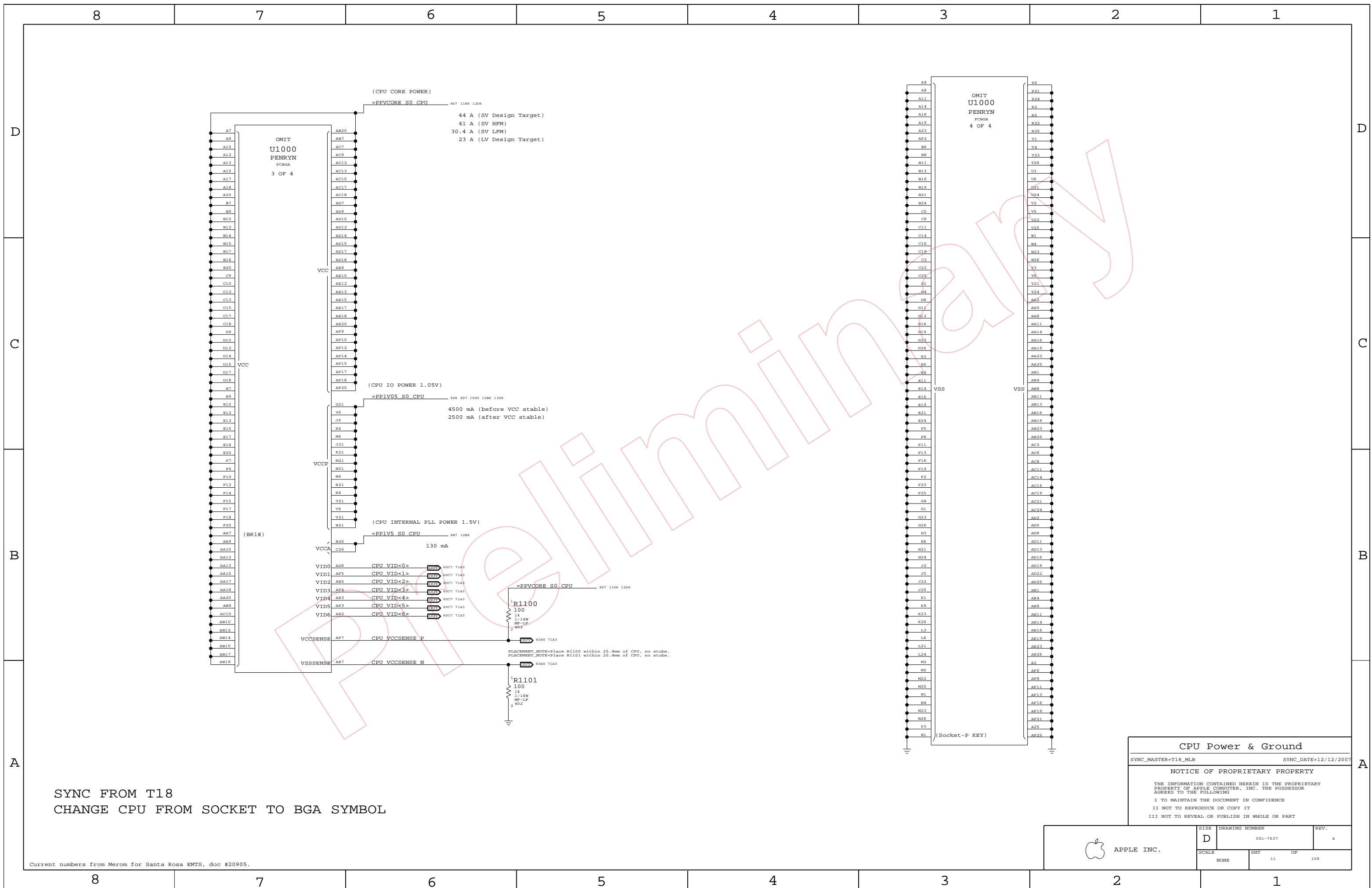
**CPU JTAG Support**



SYNC FROM T18  
CHANGE CPU FROM SOCKET TO BGA SYMBOL

**CPU FSB**  
 SYNC\_MASTER=T18\_MLB SYNC\_DATE=12/12/2007  
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	D	051-7537	A
SCALE	SHT	OF	109
NONE	10		



SYNC FROM T18  
 CHANGE CPU FROM SOCKET TO BGA SYMBOL

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

**CPU Power & Ground**

SYNC\_MASTER=T18\_MLB SYNC\_DATE=12/12/2007

**NOTICE OF PROPRIETARY PROPERTY**

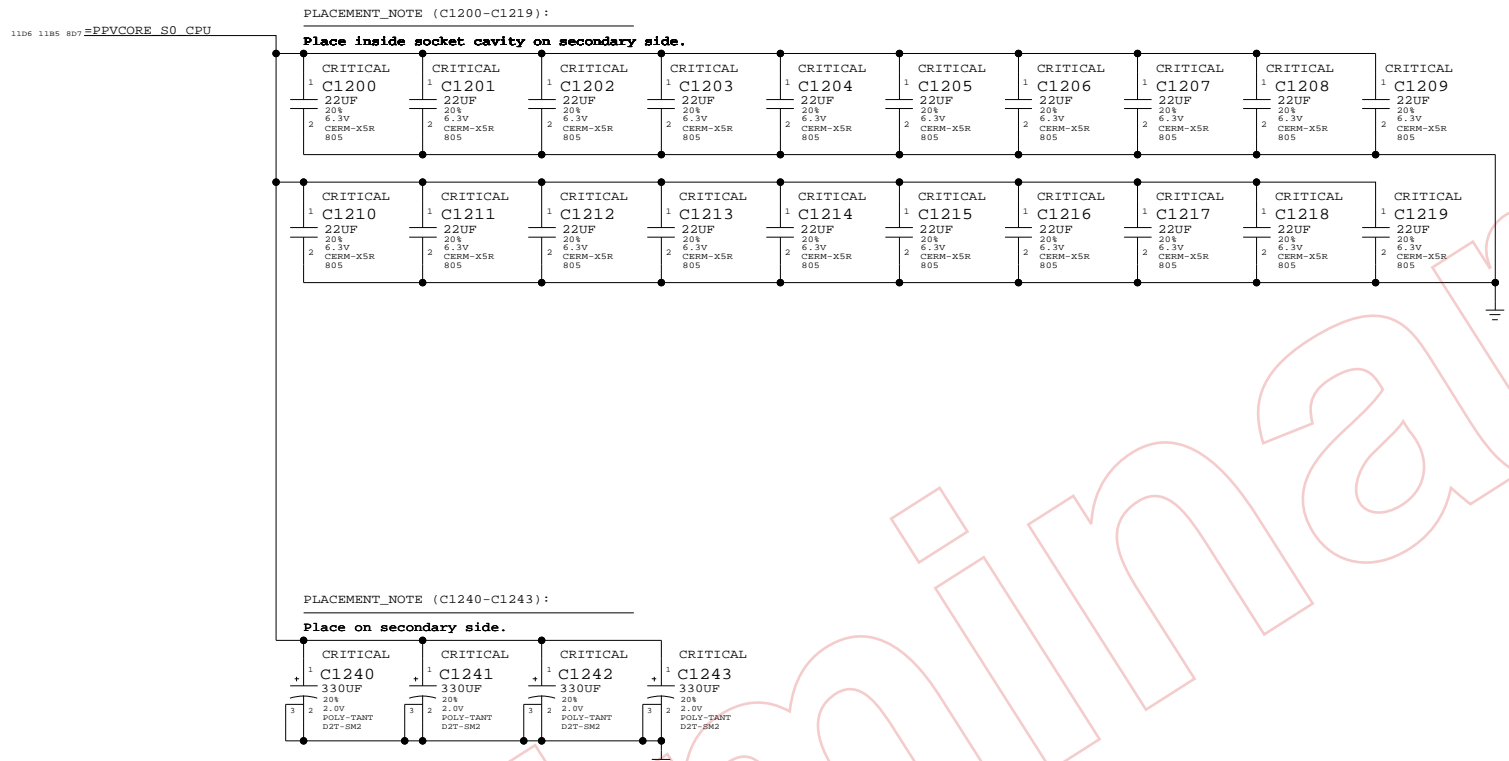
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APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT	OF	109
NONE	11		

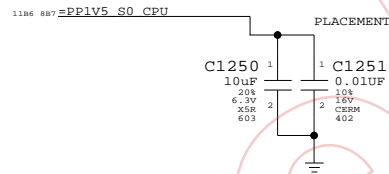
### CPU VCore HF and Bulk Decoupling

4X 330UF, 20X 22UF 0805



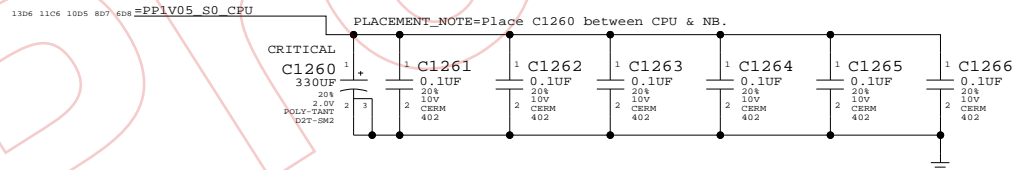
### VCCA (CPU AVdd) DECOUPLING

1x 10uF, 1x 0.01uF



### VCCP (CPU I/O) DECOUPLING

1x 330uF, 6x 0.1uF 0402

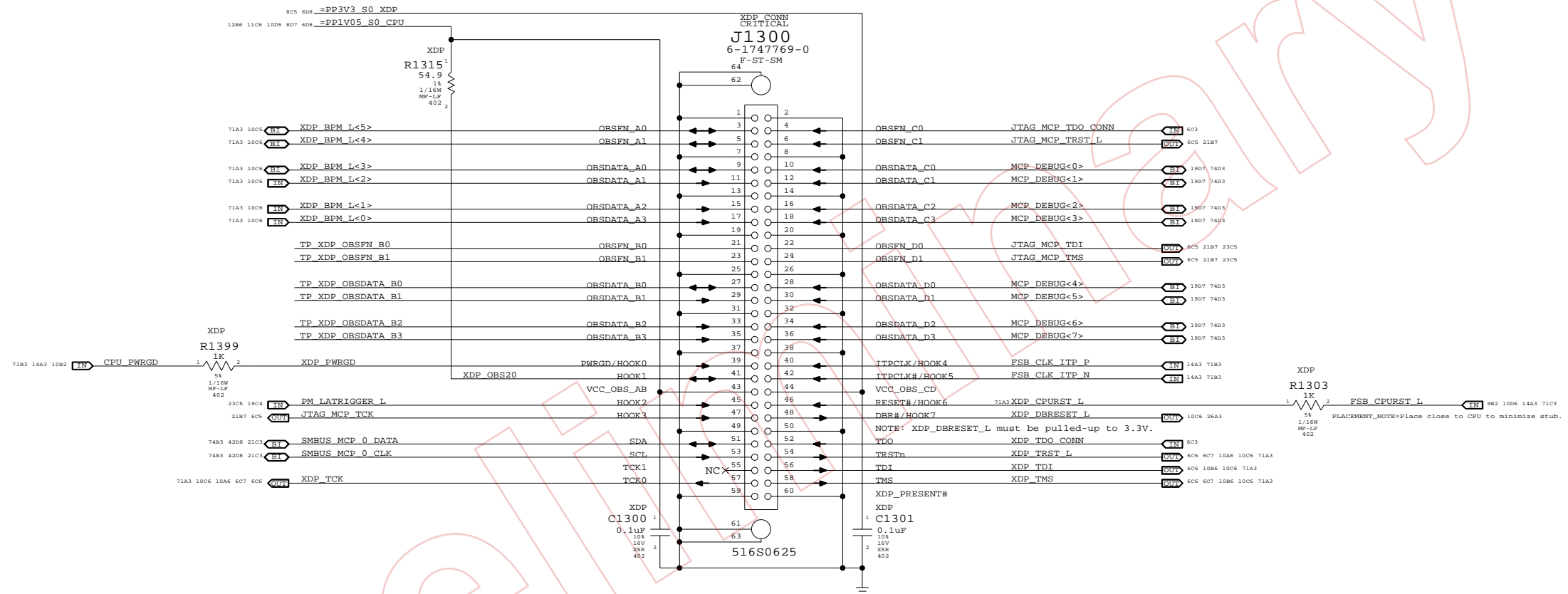


SYNC FROM T18  
 REMOVE NO STUFF CAPS C1220 TO C1231  
 REMOVE C1244 & C1245  
 CHANGE C1240-C1243 AND C1260 FROM 128S0241(9 MILLI-OHM) TO 128S0231(6 MILLI-OHM)

CPU Decoupling		
SYNC_MASTER=RAYMOND	SYNC_DATE=03/31/2008	
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APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT	OF	109
NONE	12		

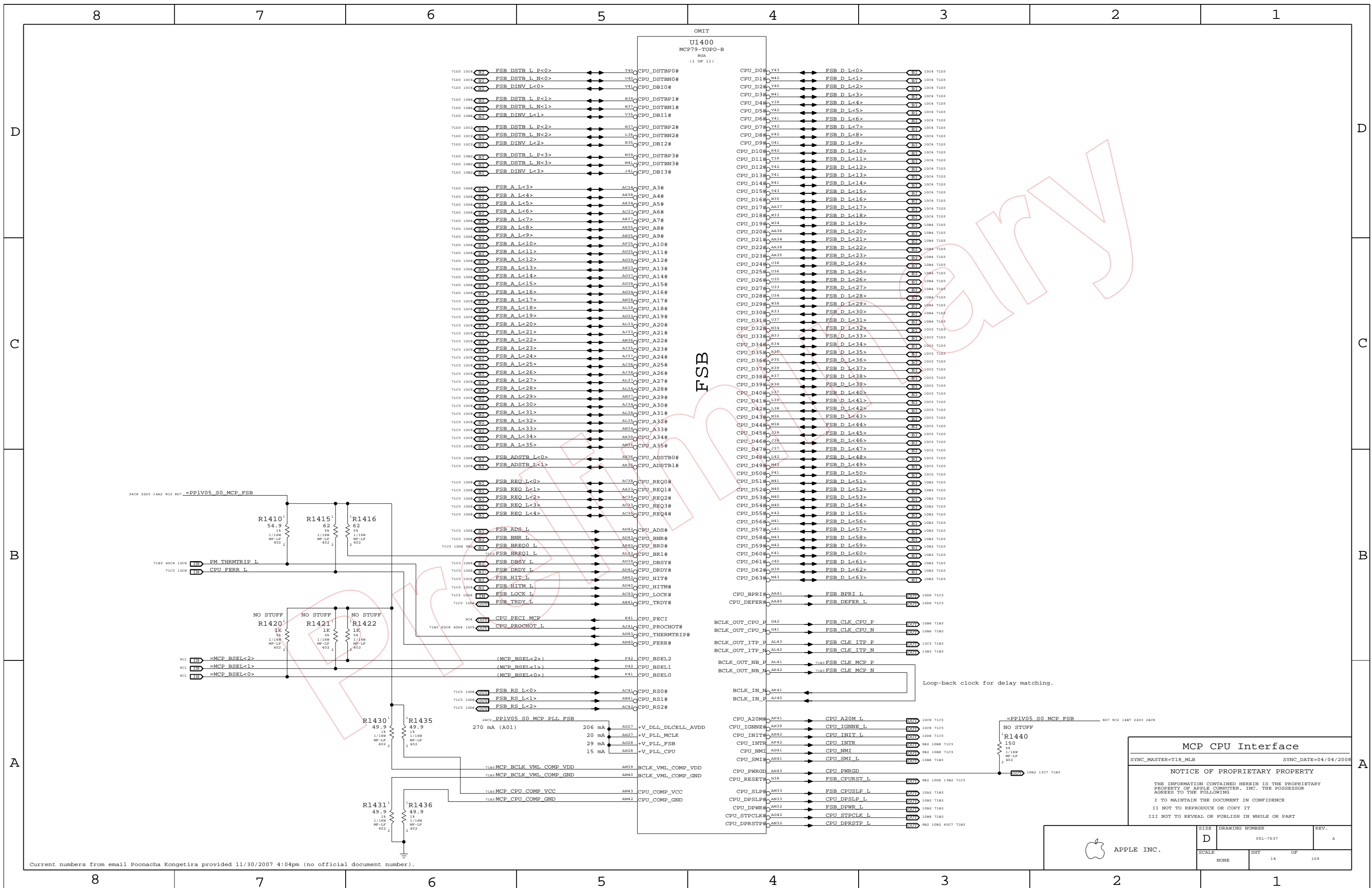
### MCP79-specific pinout



SYNC FROM T18  
 CHANGE STANDARD XDP CONNECTOR TO SMALLER ONE 516S0625  
 RENAME JTAG\_MCP\_TDO TO JTAG\_MCP\_TDO\_CONN  
 RENAME XDP\_TDO TO XDP\_TDO\_CONN

eXtended Debug Port (XDP)  
 SYNC\_MASTER=T18\_MLB SYNC\_DATE=12/12/2007  
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APPLE INC.	SIZE <b>D</b>	DRAWING NUMBER 051-7537	REV. A
	SCALE NONE	SHEETS 13	OF 109



**MCP CPU Interface**

SYNC\_MASTER=TI8\_MLB SYNC\_DATE=04/04/2008

**NOTICE OF PROPRIETARY PROPERTY**

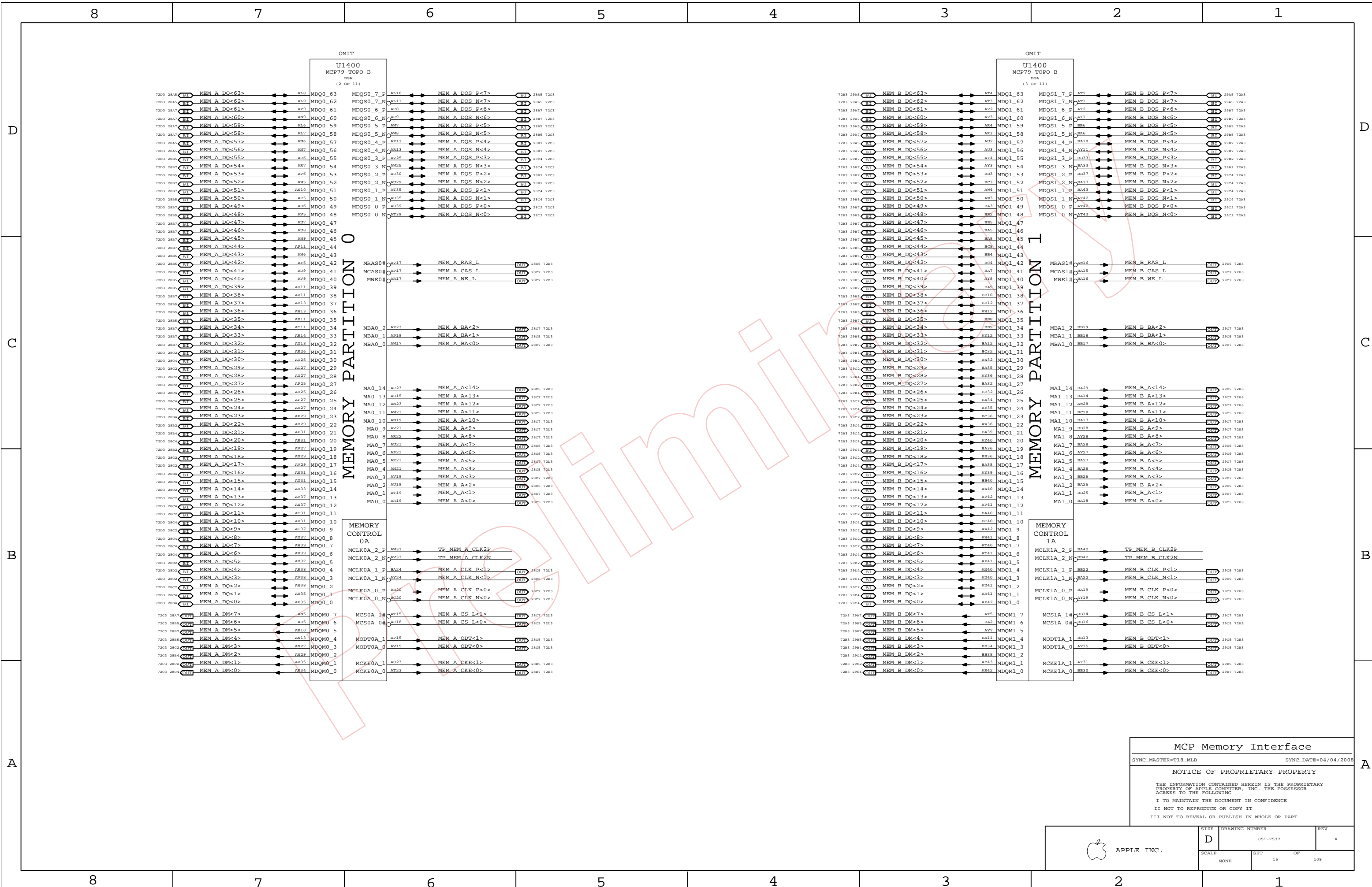
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	SCALE	DRAWING NUMBER	REV.
	NONE	D 051-7537	A
	SHT	OF	
	14	109	



**MCP Memory Interface**

SYNC\_MASTER=T18\_MLB SYNC\_DATE=04/04/2008

**NOTICE OF PROPRIETARY PROPERTY**

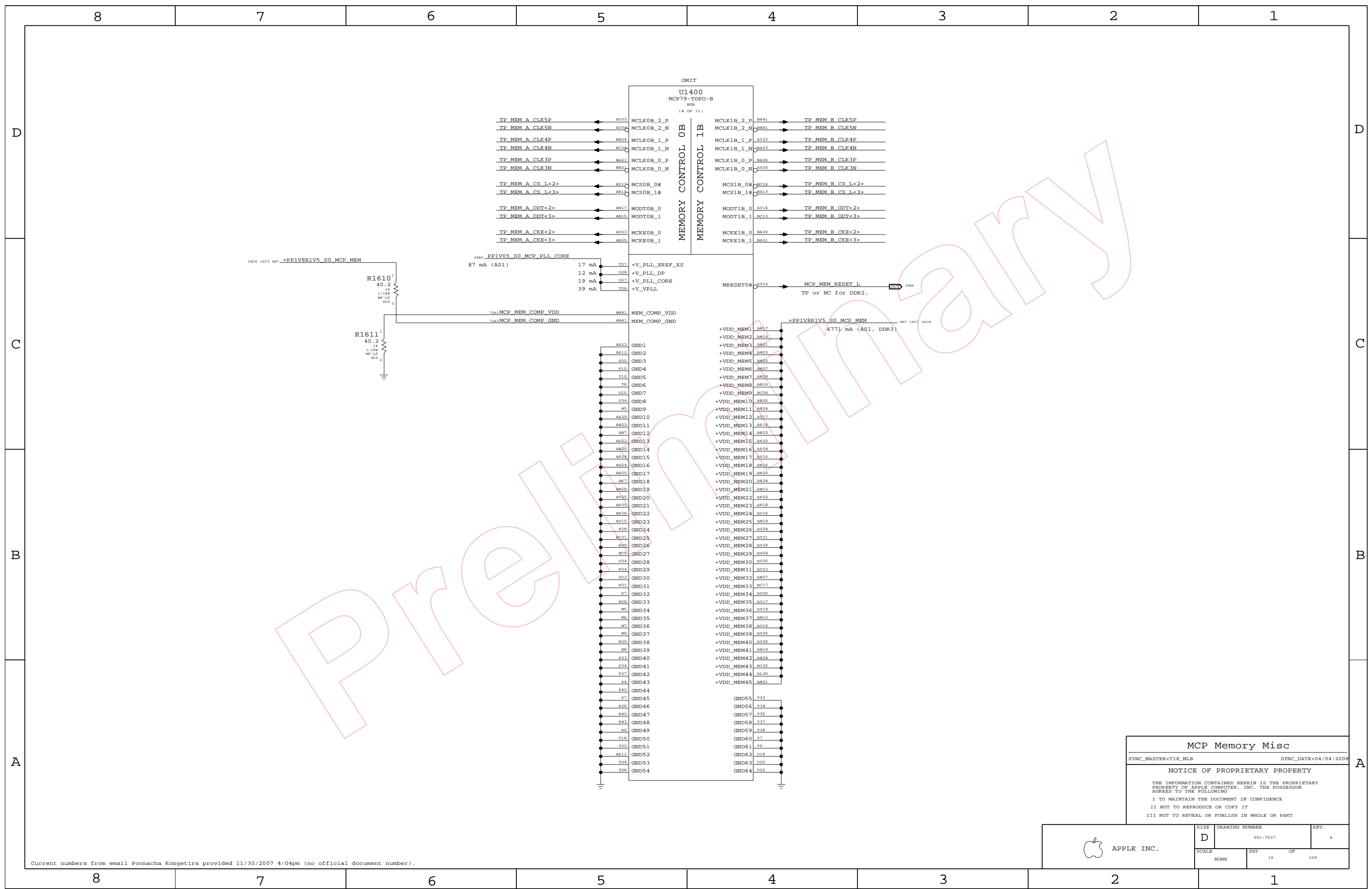
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APPLE INC.	SIZE <b>D</b>	DRAWING NUMBER 051-7537	REV. A
	SCALE NONE	SHEET 15	OF 109



**MCP Memory Misc**

SYNC\_MASTER=T18\_MLB SYNC\_DATE=04/04/2008

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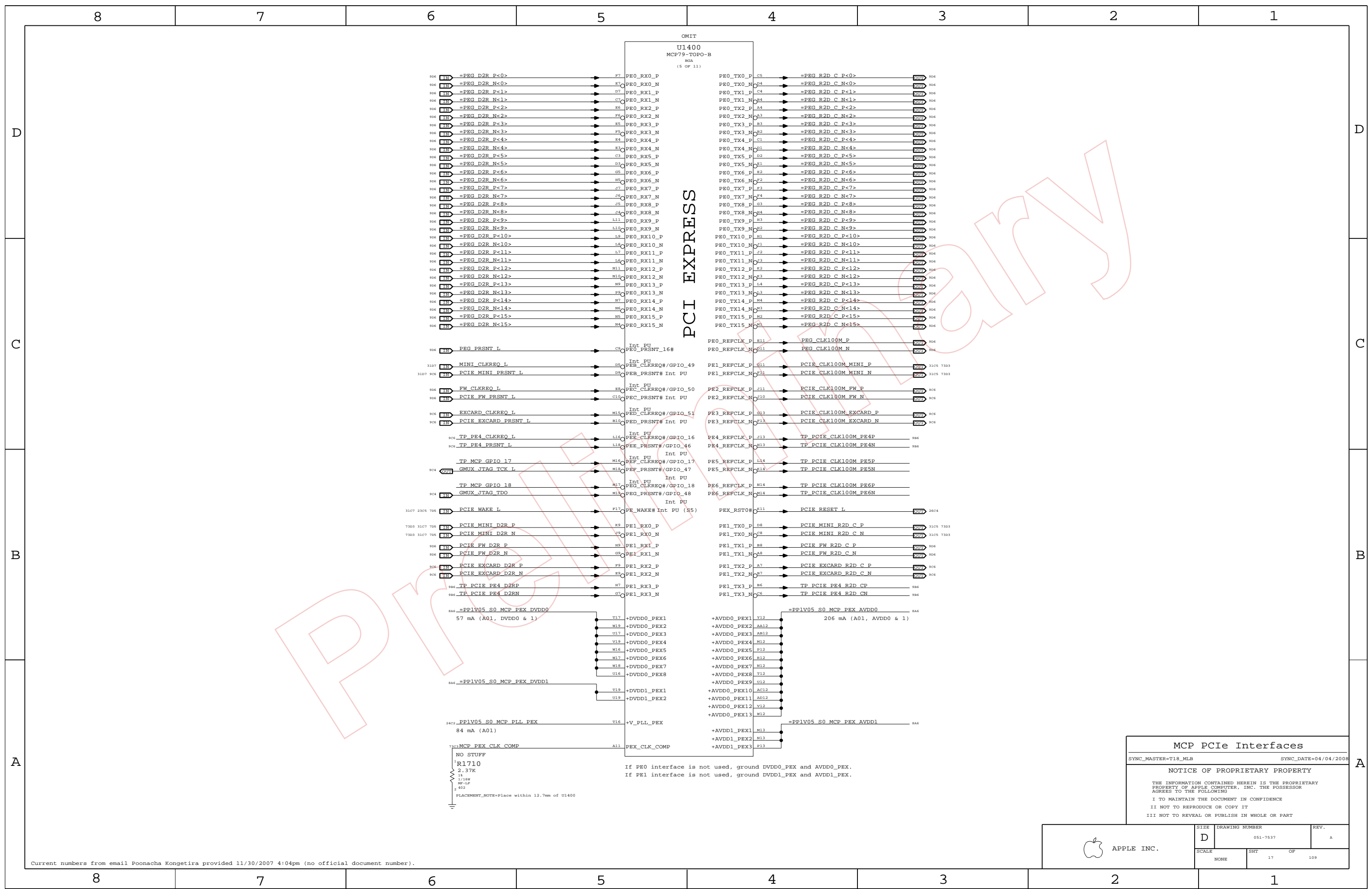
II NOT TO REPRODUCE OR COPY IT

III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE INC.	SIZE <b>D</b>	DRAWING NUMBER 051-7537	REV. A
	SCALE NONE	SHEET 16	OF 109

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





PCI EXPRESS

**MCP PCIe Interfaces**

SYNC\_MASTER=TI8\_MLB      SYNC\_DATE=04/04/2008

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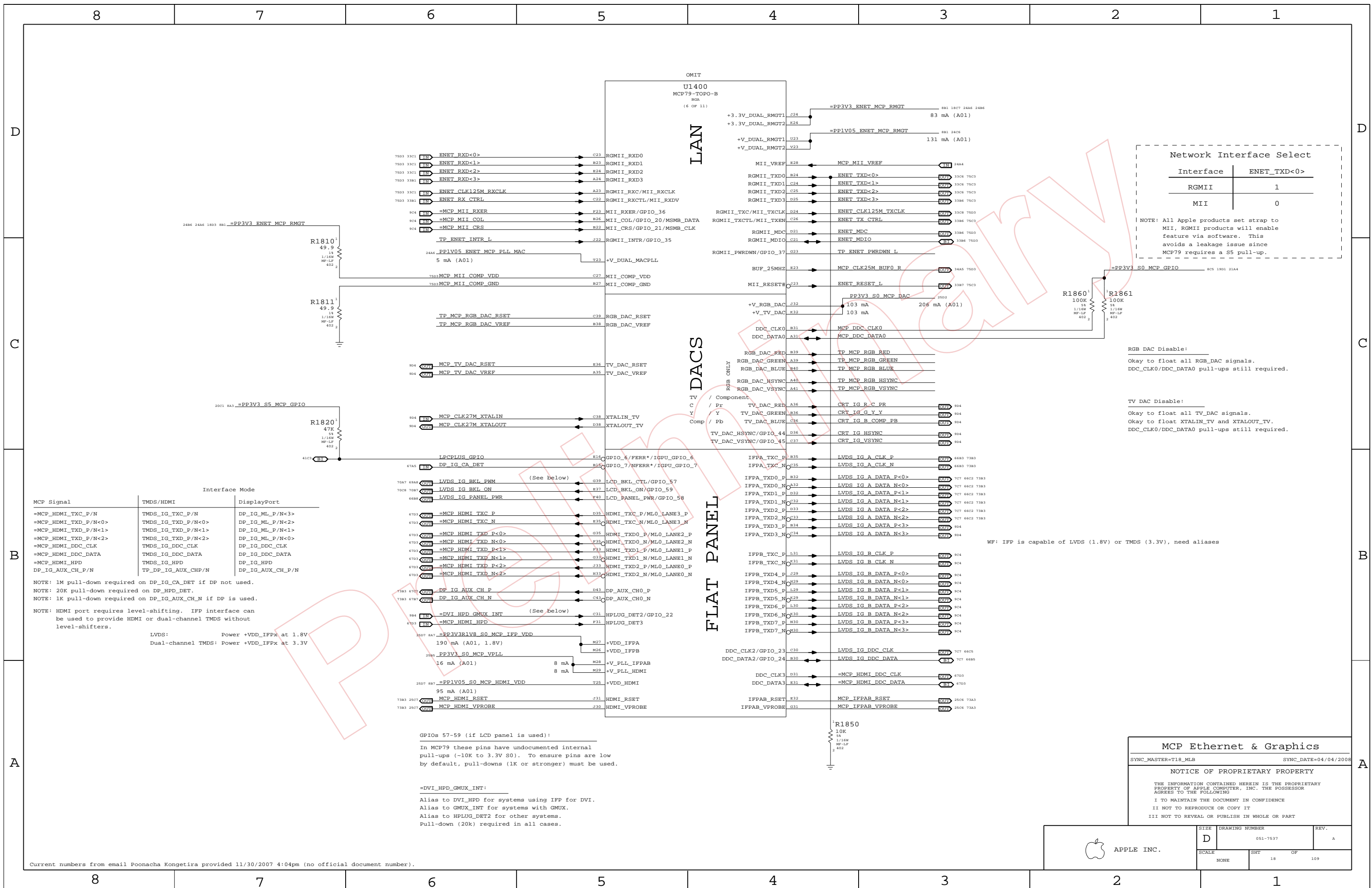
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III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE INC.	SIZE <b>D</b>	DRAWING NUMBER 051-7537	REV. A
	SCALE NONE	SHEET 17	OF 109

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



Network Interface Select	
Interface	ENET_TXD<0>
RGMII	1
MII	0

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

RGB DAC Disable: \_\_\_\_\_  
 Okay to float all RGB\_DAC signals.  
 DDC\_CLK0/DDC\_DATA0 pull-ups still required.

TV DAC Disable: \_\_\_\_\_  
 Okay to float all TV\_DAC signals.  
 DDC\_CLK0/DDC\_DATA0 pull-ups still required.

MCP Signal	Interface Mode	
	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_CH_P/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\_IPFX at 1.8V  
 Dual-channel TMDS: Power +VDD\_IPFX 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=04/04/2008

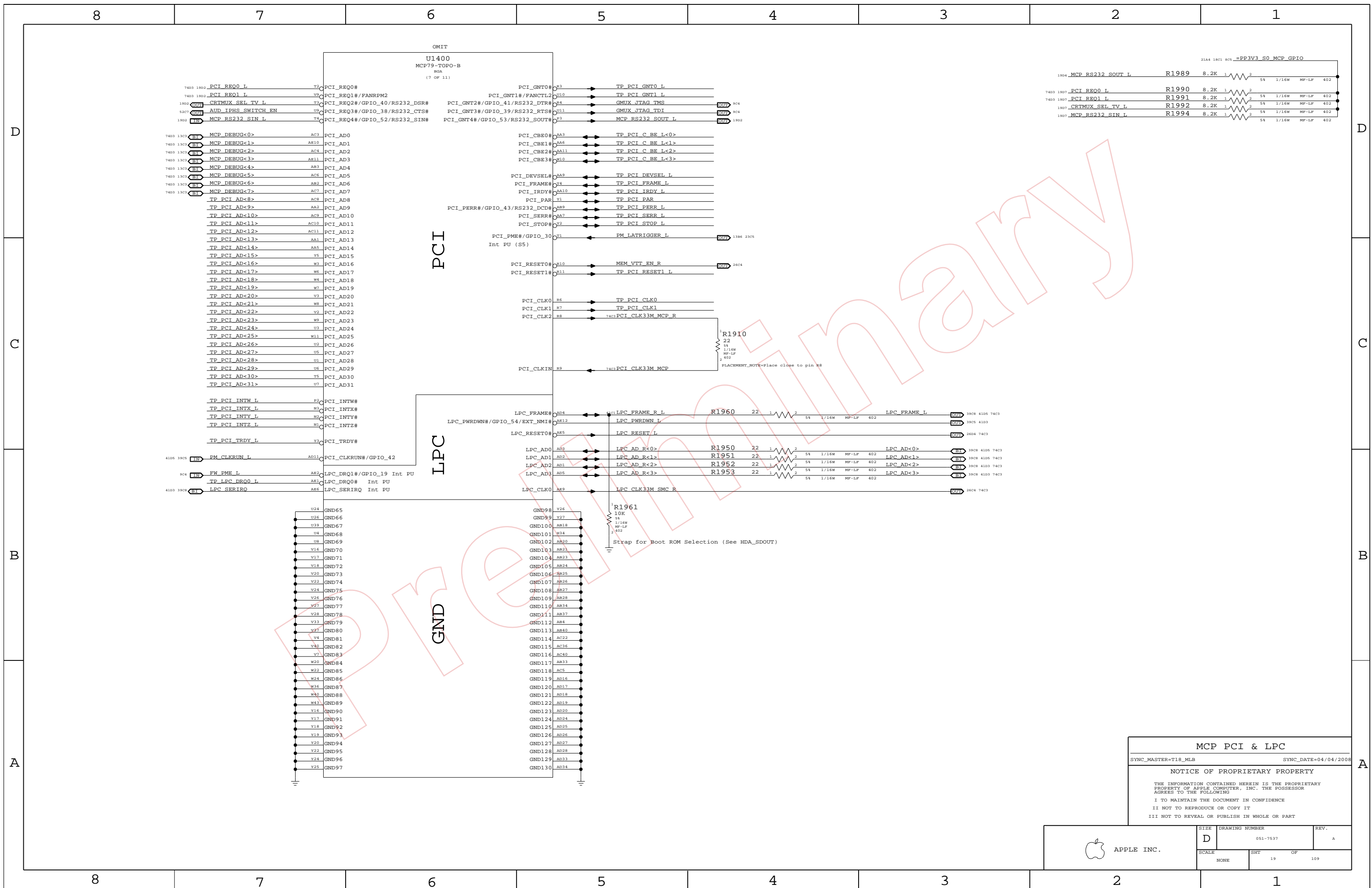
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APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE	SHT	OF
NONE	18	109



**MCP PCI & LPC**

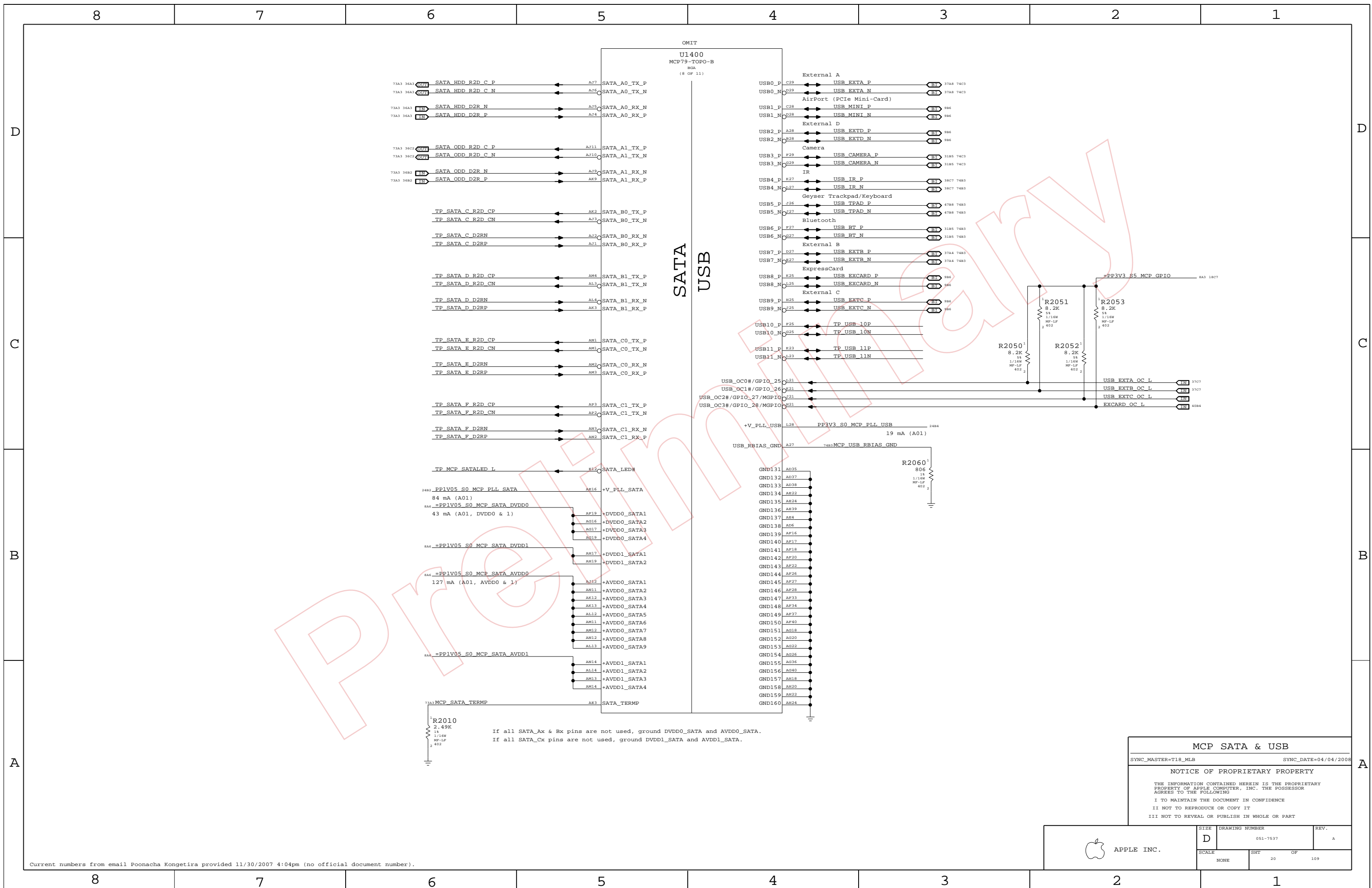
SYNC\_MASTER=T18\_MLB SYNC\_DATE=04/04/2008

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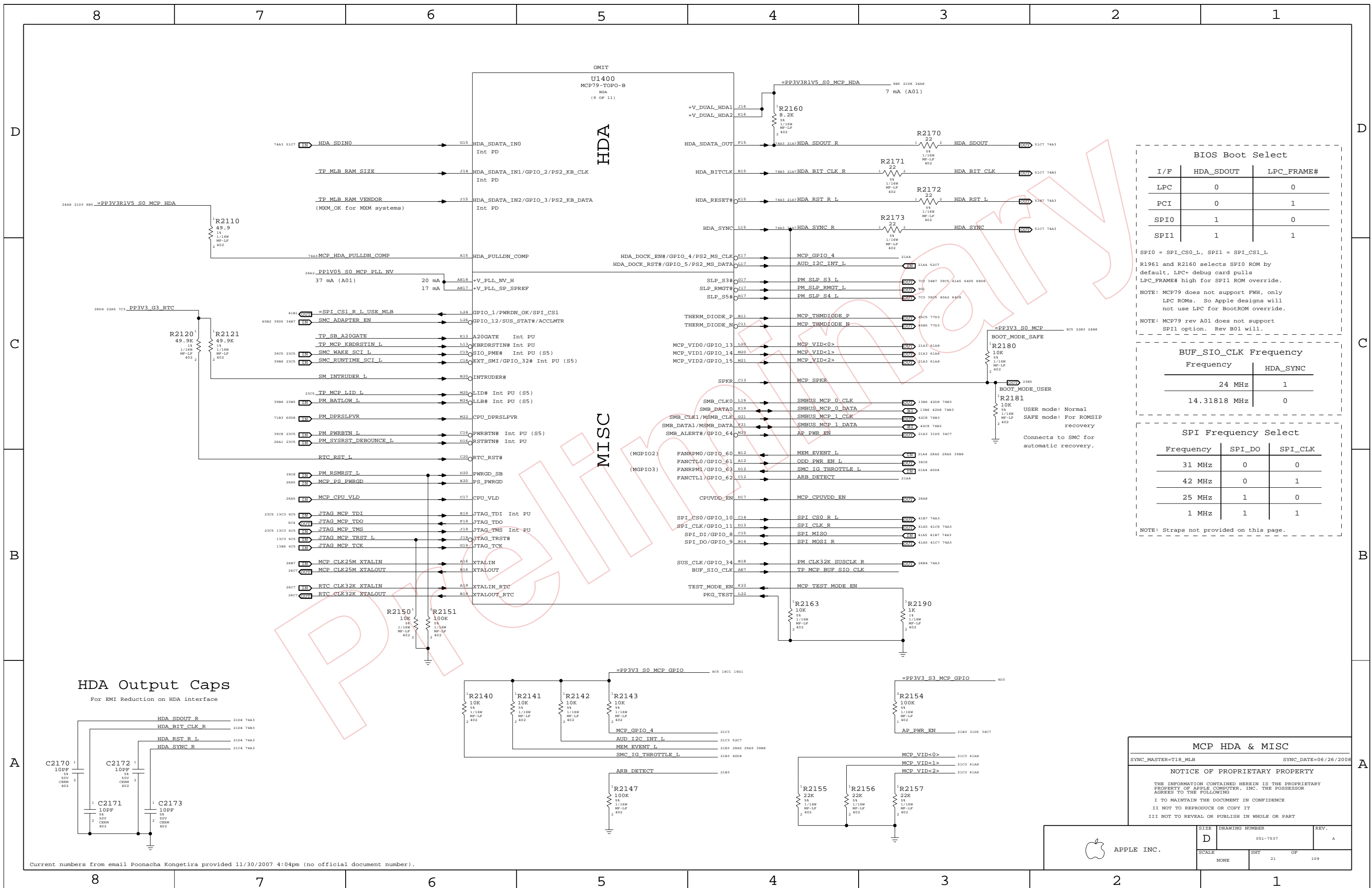
APPLE INC.	SIZE <b>D</b>	DRAWING NUMBER 051-7537	REV. A
	SCALE NONE	SHEET 19	OF 109



If all SATA\_Ax & Bx pins are not used, ground DVDD0\_SATA and AVDD0\_SATA.  
 If all SATA\_Cx pins are not used, ground DVDD1\_SATA and AVDD1\_SATA.

MCP SATA & USB			
SYNC_MASTER=T18_MLB	SYNC_DATE=04/04/2008		
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APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT	OF	109
NONE	20		



BIOS Boot Select

I/F	HDA_SDOUT	LPC_FRAME#
LPC	0	0
PCI	0	1
SPI0	1	0
SPI1	1	1

SPI0 = SPI\_CS0\_L, SPI1 = SPI\_CS1\_L  
 R1961 and R2160 selects SPI0 ROM by default, LPC+ debug card pulls LPC\_FRAME# high for SPI1 ROM override.  
 NOTE: MCP79 does not support FWB, only LPC ROMs. So Apple designs will not use LPC for BootROM override.  
 NOTE: MCP79 rev A01 does not support SPI1 option. Rev B01 will.

BUF\_SIO\_CLK Frequency

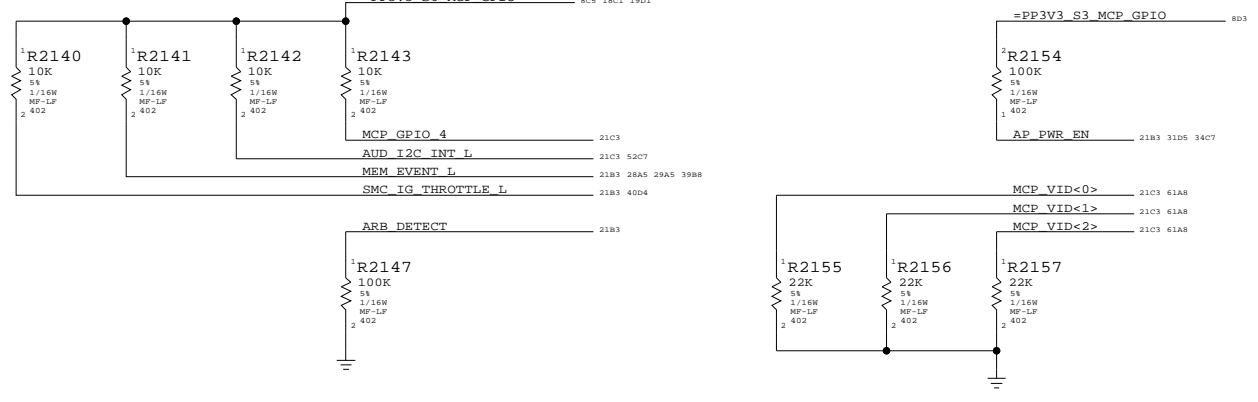
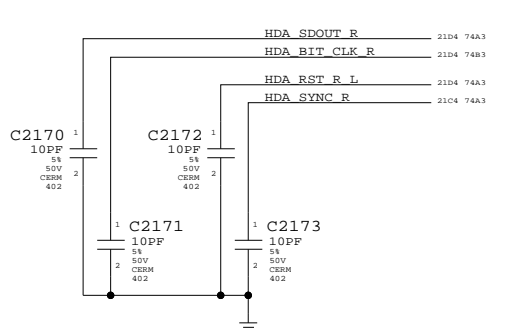
Frequency	HDA_SYNC
24 MHz	1
14.31818 MHz	0

SPI Frequency Select

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

NOTE: Straps not provided on this page.

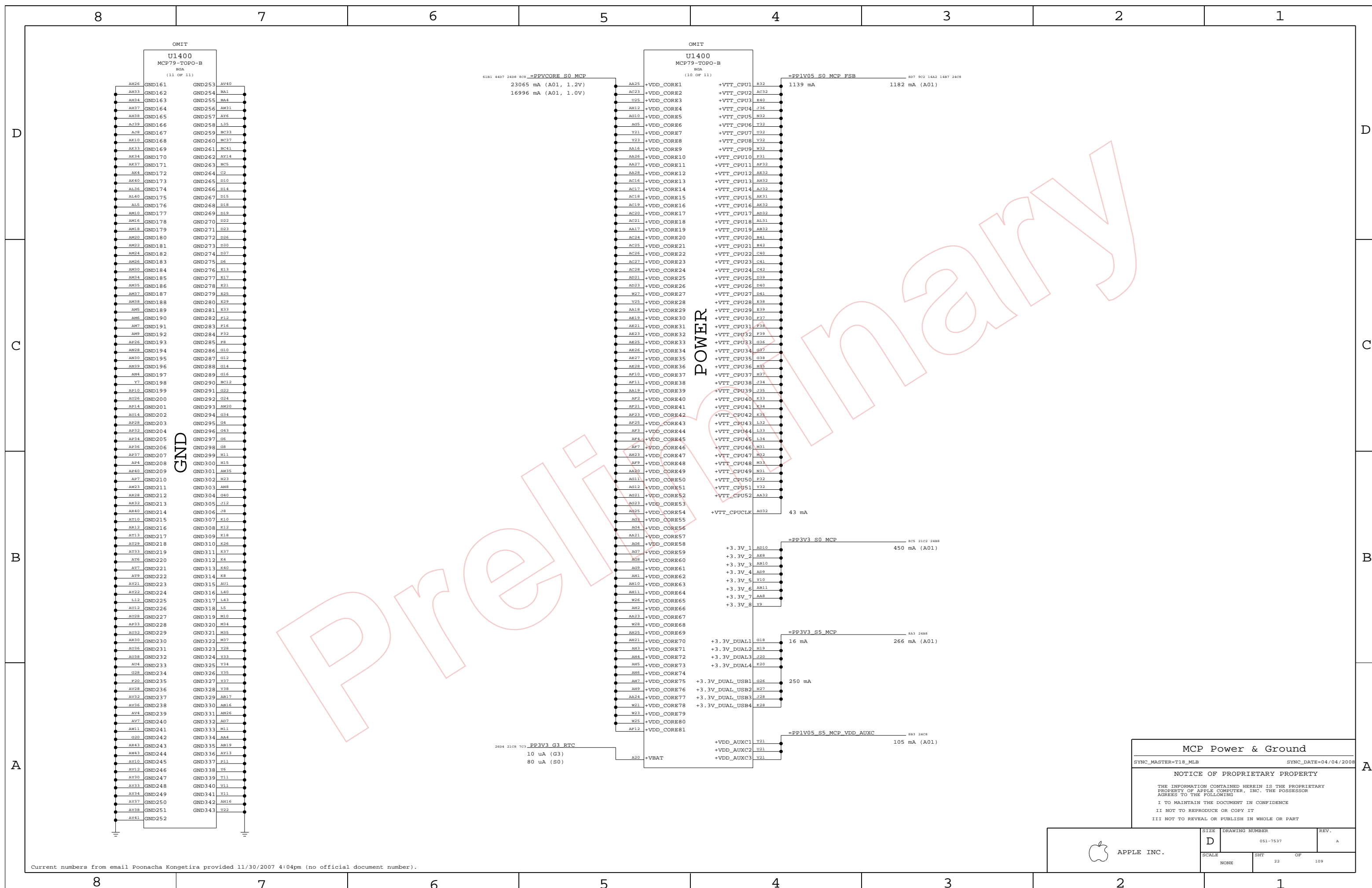
HDA Output Caps  
 For EMI Reduction on HDA interface



MCP HDA & MISC  
 SYNC\_MASTER=T18\_MLB SYNC\_DATE=06/26/2008  
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APPLE INC.  
 DRAWING NUMBER: 051-7537  
 SCALE: NONE SHEET: 21 OF 109

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



**MCP Power & Ground**  
 SYNC\_MASTER=T18\_MLB SYNC\_DATE=04/04/2008

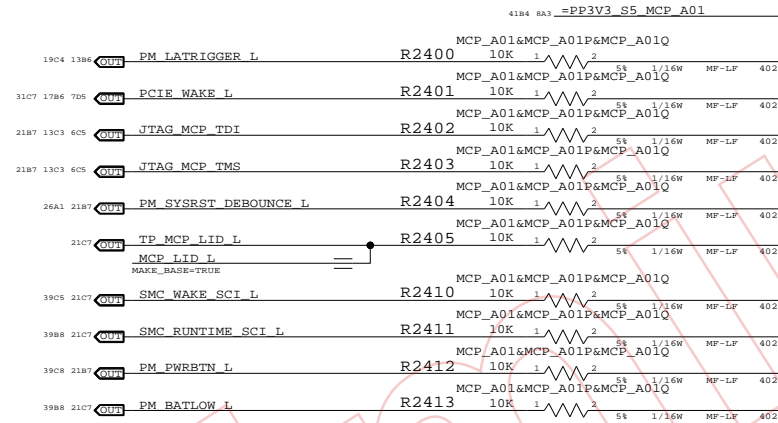
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	D	051-7537	A
SCALE	SHT	OF	109
NONE	22		

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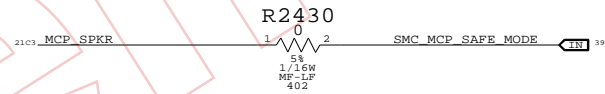
### 3.3V Interface Pull-ups

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



### MCP\_SAFE\_MODE SIGNAL TO SUPPORT ROM FAILURE OVERRIDE

RADAR 5925345



PRELIMINARY

#### MCP79 A01 Silicon Support

SYNC\_MASTER=T18\_MLB SYNC\_DATE=03/08/2008

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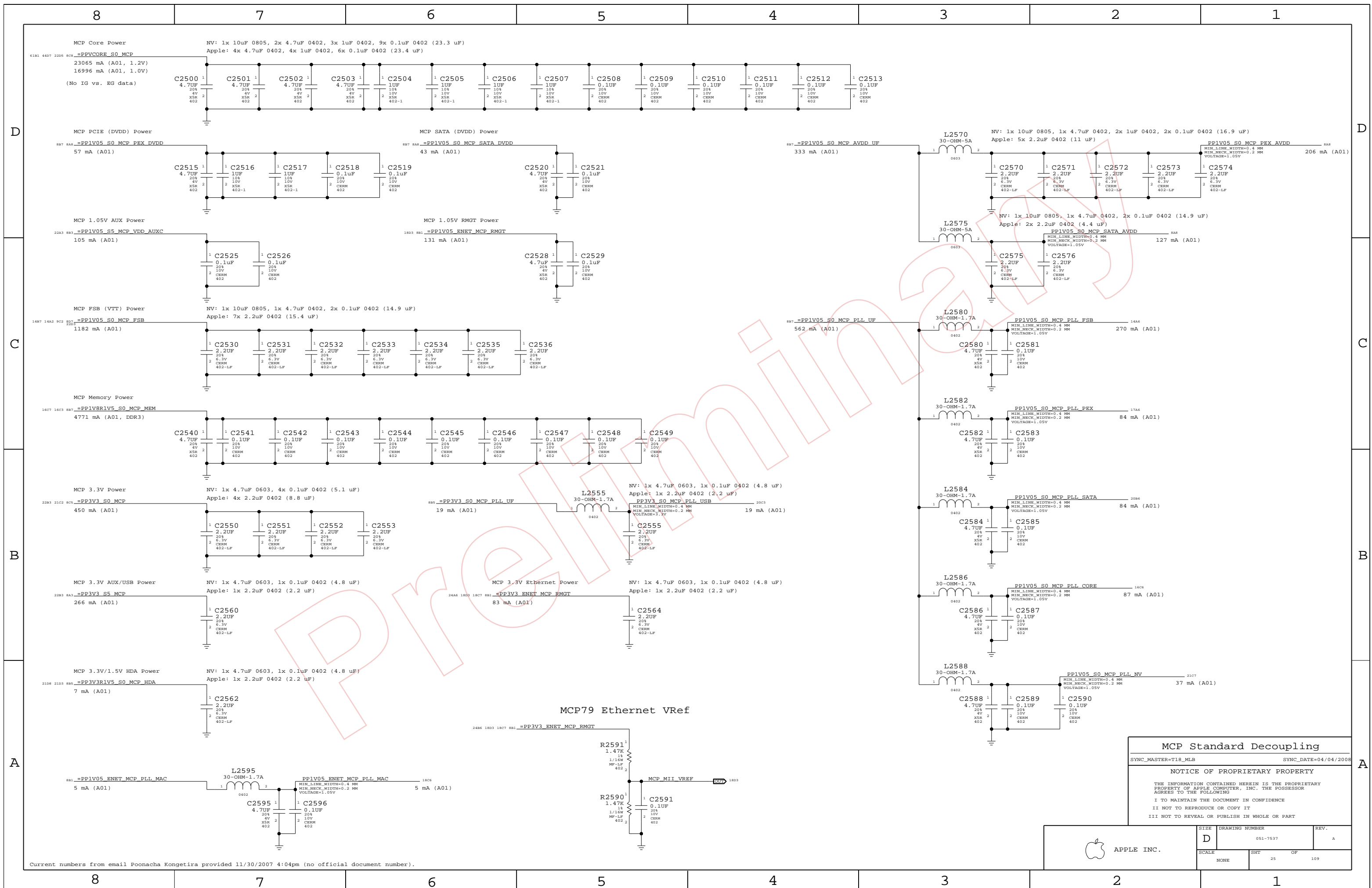
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SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE	SHT	OF
NONE	24	109



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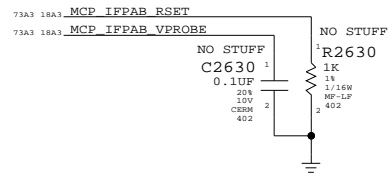
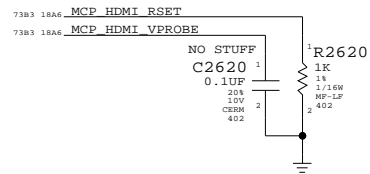
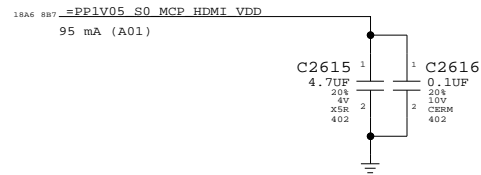
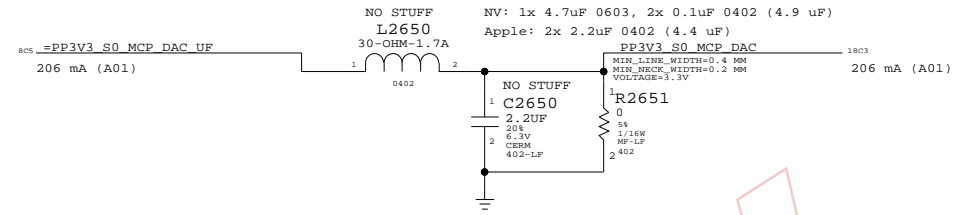
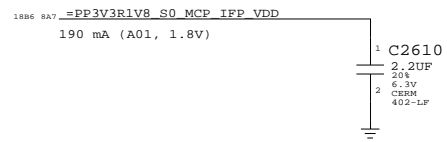
**MCP Standard Decoupling**  
 SYNC\_MASTER=T18\_MLB SYNC\_DATE=04/04/2008  
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	D	051-7537	A
SCALE	SHEET	OF	
NONE	25	109	



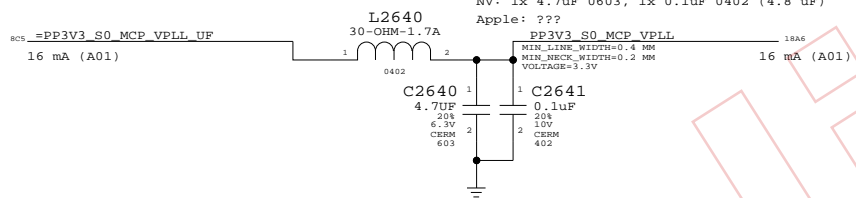
WF: Checklist says 0-ohm resistor placeholder for ferrite bead.

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



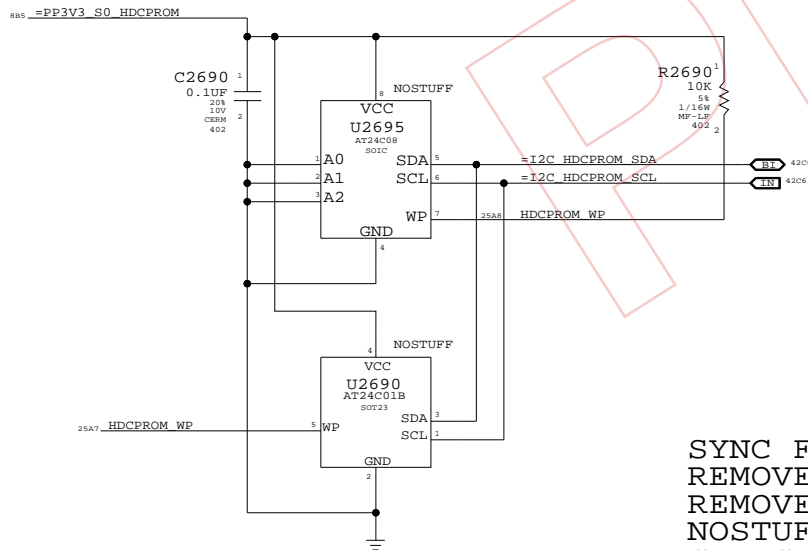
WF: Checklist says 0-ohm resistor placeholder for ferrite bead.

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



### HDCP ROM

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



SYNC FROM T18  
REMOVE MCP 27MHZ CRYSTAL CRICUIT SINCE NOT SUPPORTING TV-OUT  
REMOVE DAC TERMINATIONS R2665,C2665 AND R2670 TO R2672  
NOSTUFF PP3V3\_S0\_MCP\_DAC RAIL COMPONENTS (L2650 AND C2650)  
CHANGE C2651 TO R2651 TO GND PP3V3\_S0\_MCP\_DAC

D

C

B

A

D

C

B

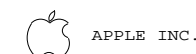
A

### MCP Graphics Support

SYNC\_MASTER=T18\_MLB SYNC\_DATE=12/12/2007

#### NOTICE OF PROPRIETARY PROPERTY

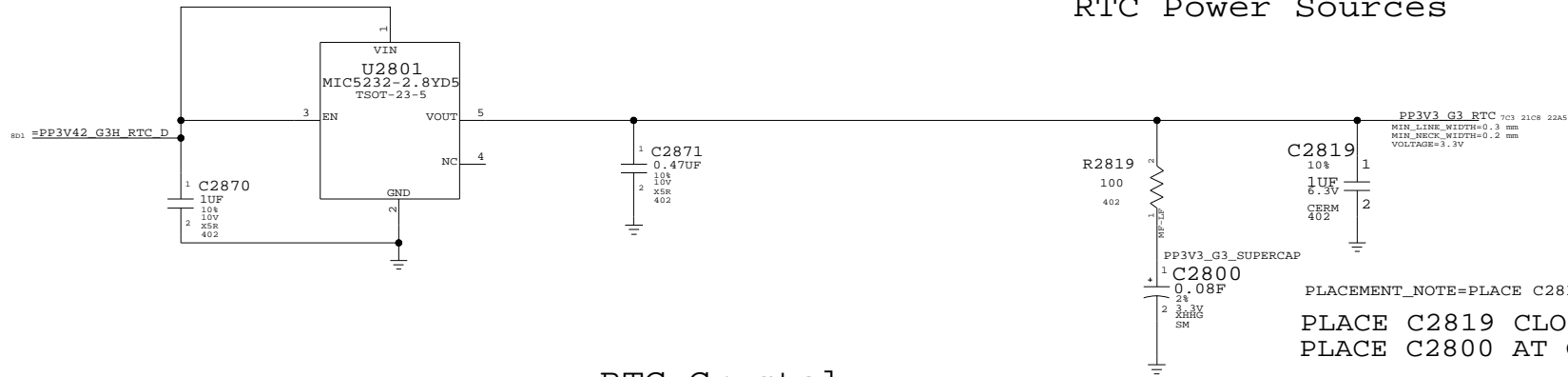
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APPLE INC.

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

RTC Power Sources

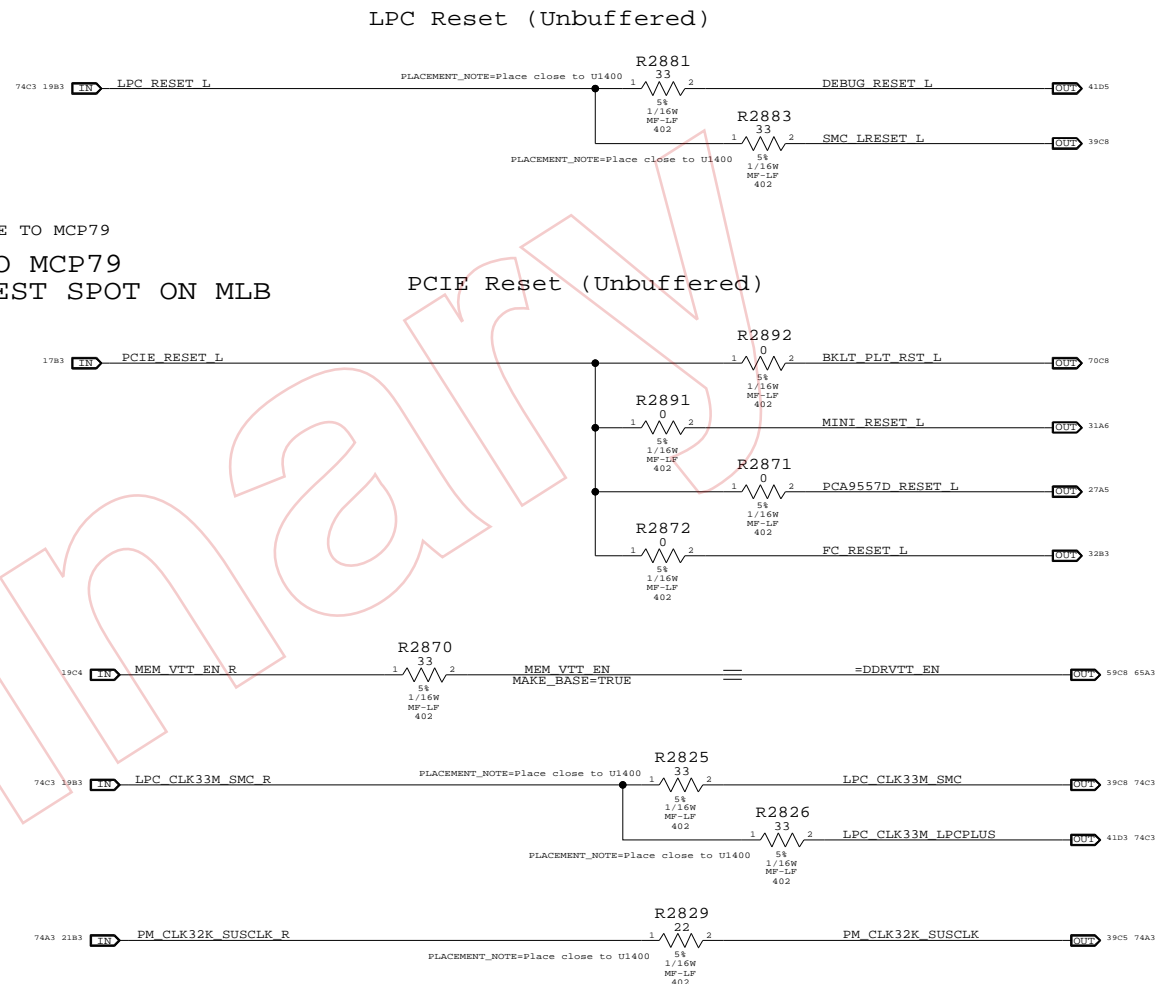


PP3V3\_G3\_RTC 703 2108 22A5  
 MIN\_LINE\_WIDTH=0.3 mm  
 MIN\_PACE\_WIDTH=0.2 mm  
 VOLTAGE=3.3V

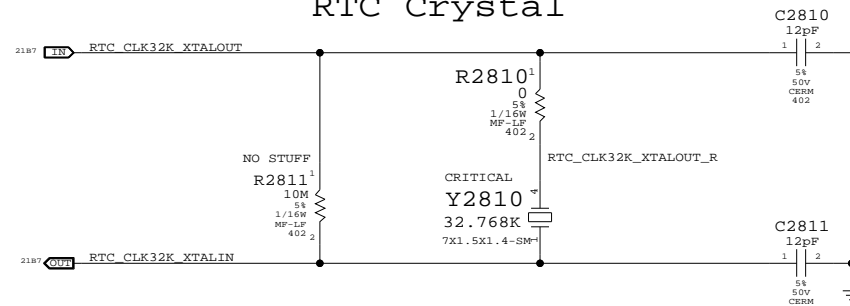
PP3V3\_G3\_SUPERCAP  
 C2800  
 0.08F  
 2%  
 3.3V  
 SM

PLACEMENT\_NOTE=PLACE C2819 CLOSE TO MCP79  
 PLACE C2819 CLOSE TO MCP79  
 PLACE C2800 AT COOLEST SPOT ON MLB

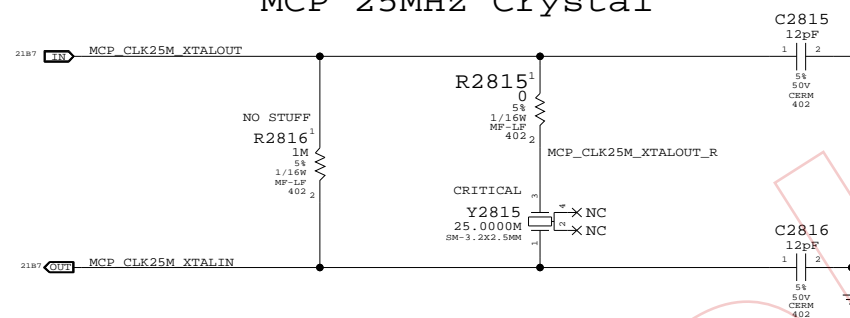
Platform Reset Connections



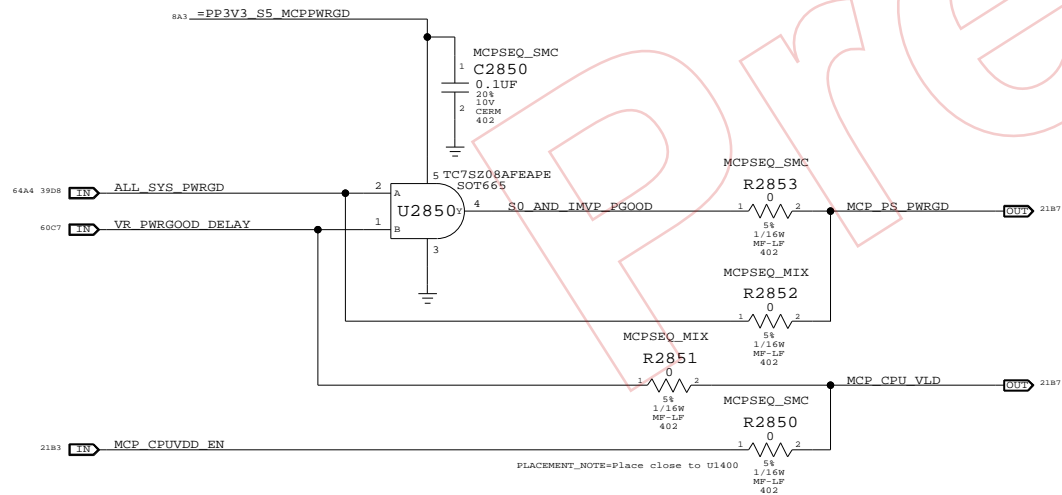
RTC Crystal



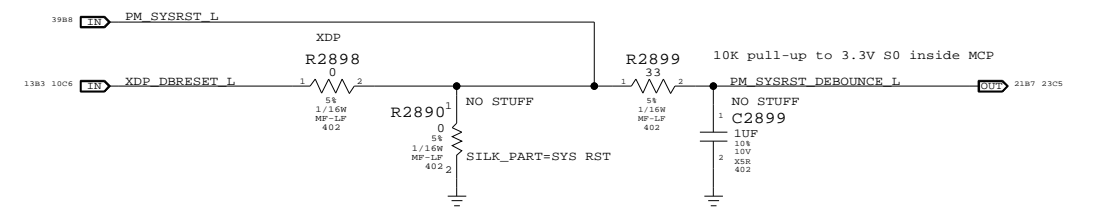
MCP 25MHz Crystal



MCP S0 PWRGD & CPU\_VLD



Reset Button



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 IMPV\_VR\_ON plus IMPV6 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.

SYNC FROM T18  
 CHANGE RESET BUTTON TO RESET PADS  
 REMOVE UNUSED PCIE RESET SIGNALS  
 REMOVE R2824 AND NET PCI\_CLK33M\_SLOT\_A  
 CHANGE RTC COIN CELL TO LDO & SUPERCAP  
 ALIAS MEM\_VTT\_EN TO =DDRVTT\_EN  
 CHANGE Y2810 AND U2850 TO SMALLER PARTS

SB Misc  
 SYNC\_MASTER=RAYMOND SYNC\_DATE=04/05/2008  
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	D	051-7537	A
SCALE	SHT	OF	109
NONE	28		

# Page Notes

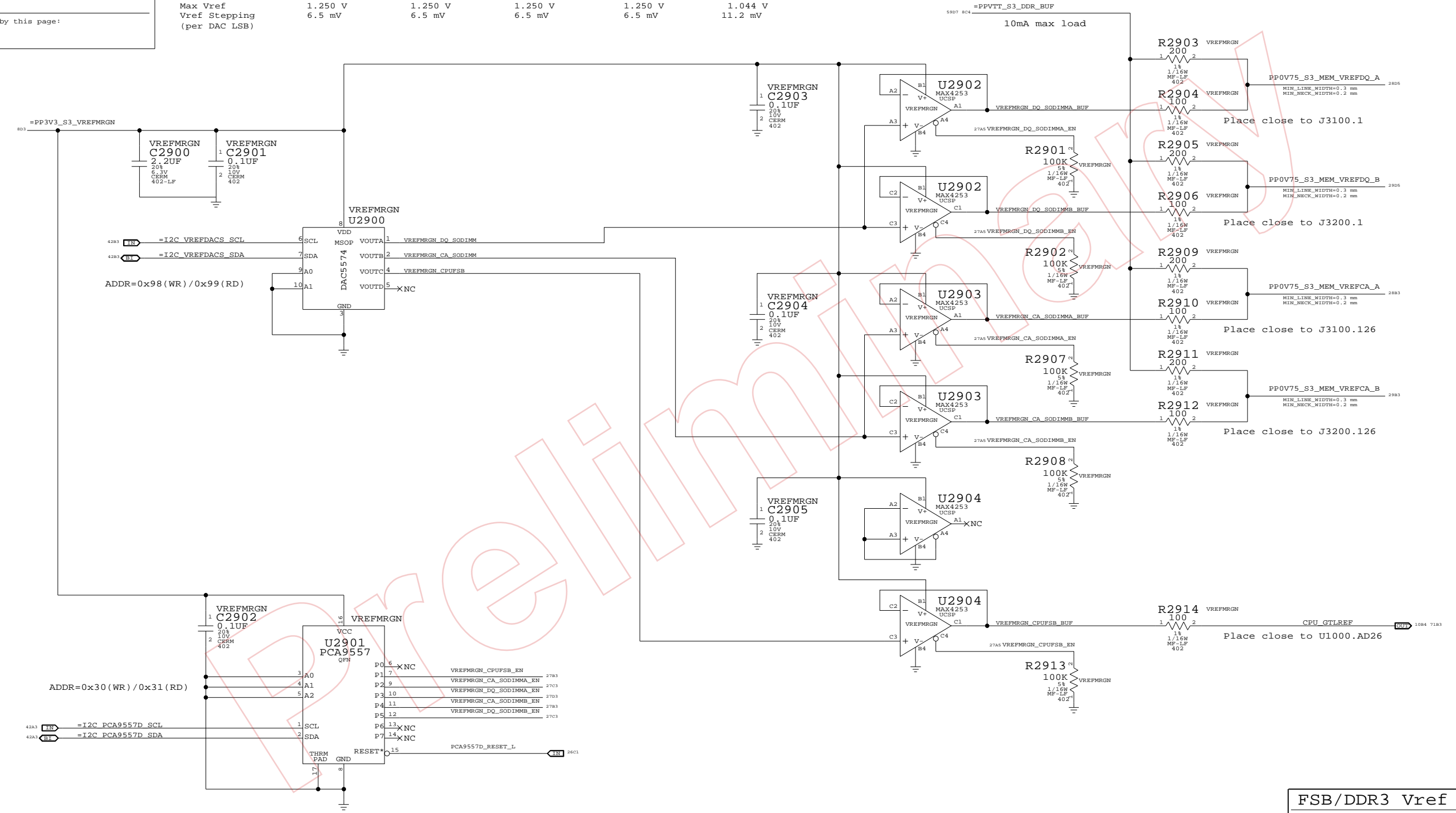
Power aliases required by this page:  
 - =PP3V3\_S3\_VREFMRGN  
 - =PP3V3\_S5\_VREFMRGN  
 - =PPVTT\_S3\_DDR\_BUF

Signal aliases required by this page:  
 - =I2C\_VREFDACS\_SCL  
 - =I2C\_VREFDACS\_SDA  
 - =I2C\_PCA9557D\_SCL  
 - =I2C\_PCA9557D\_SDA

BOM options provided by this page:  
 VREFMRGN  
 NO\_VREFMRGN

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

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



Required zero ohm resistors when no VREF margining circuit stuffed

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

## FSB/DDR3 Vref Margining

SYNC\_MASTER=BEN SYNC\_DATE=03/31/2008

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D	051-7537	A
SCALE	SHT	OF
NONE	29	109

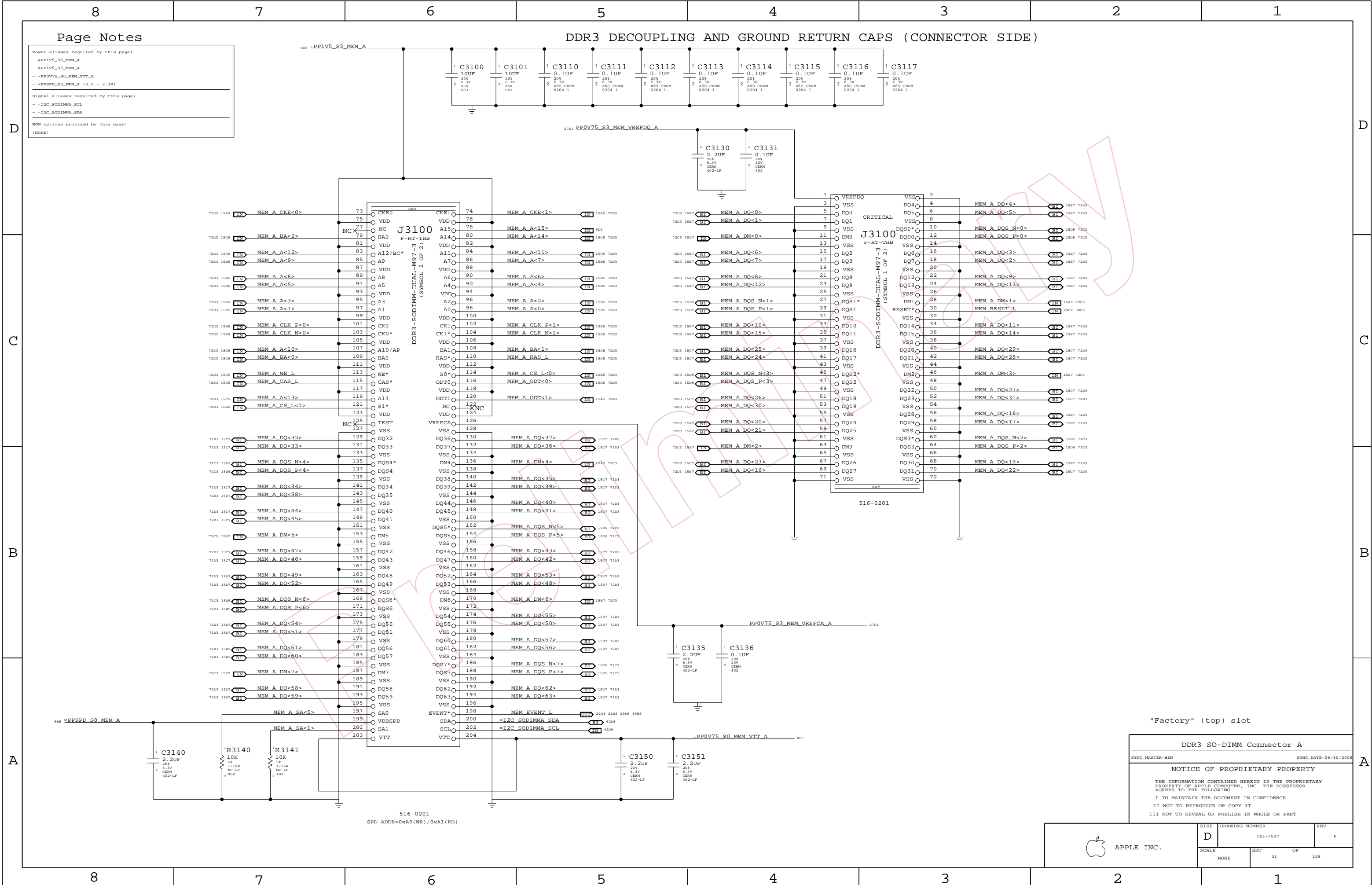
Page Notes

Power aliases required by this page:  
 - =PP1V5\_S0\_MEM\_A  
 - =PP1V5\_S3\_MEM\_A  
 - =PP0V75\_S0\_MEM\_VTT\_A  
 - =PPSPD\_S0\_MEM\_A (2.5 - 3.3V)

Signal aliases required by this page:  
 - =I2C\_SODIMMA\_SCL  
 - =I2C\_SODIMMA\_SDA

BOM options provided by this page:  
 (NONE)

DDR3 DECOUPLING AND GROUND RETURN CAPS (CONNECTOR SIDE)



"Factory" (top) slot

DDR3 SO-DIMM Connector A

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	D	051-7537	A
SCALE	NONE	SHT	OF 109
		31	

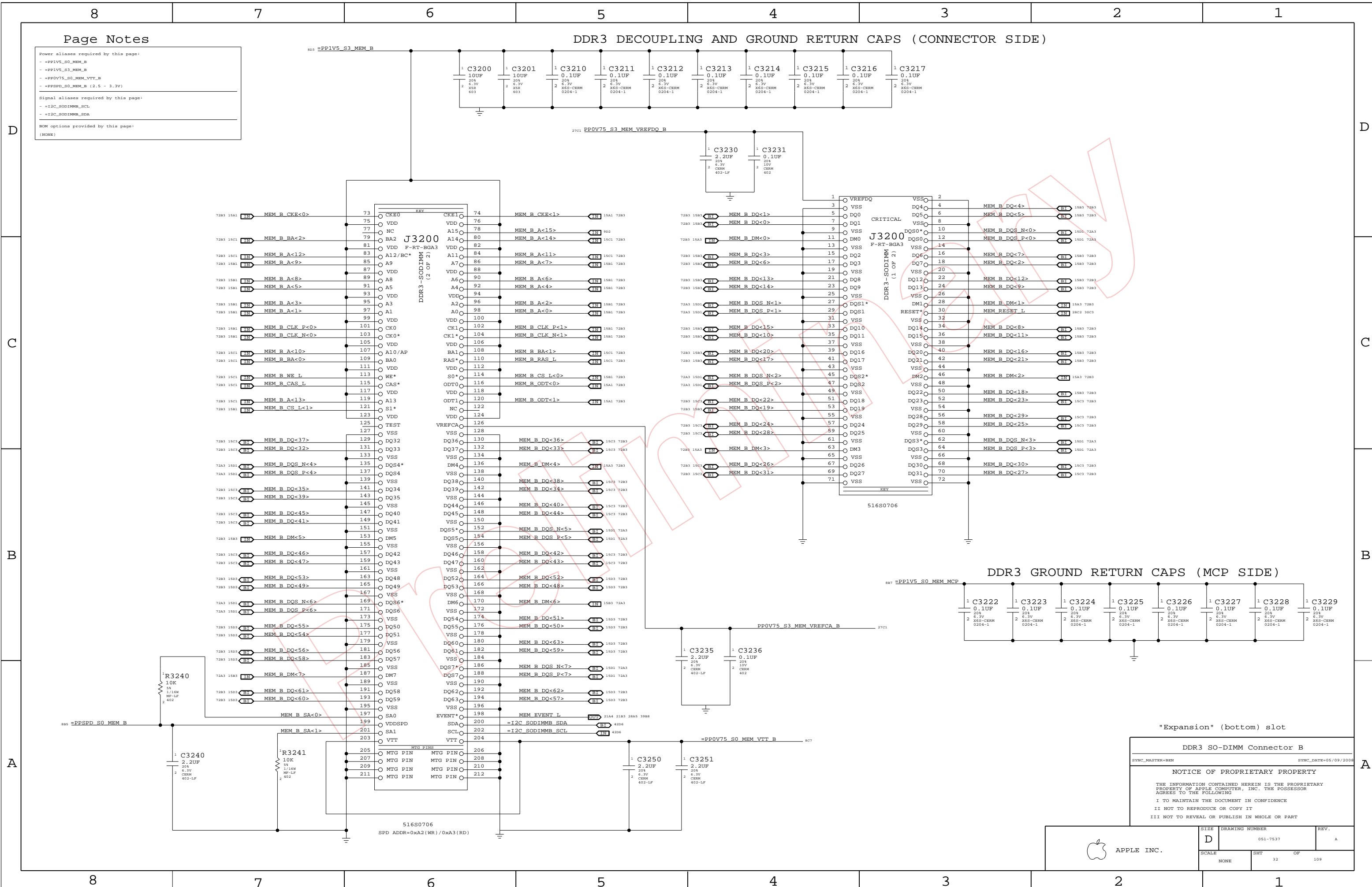
Page Notes

Power aliases required by this page:  
 - =PP1V5\_S0\_MEM\_B  
 - =PP1V5\_S3\_MEM\_B  
 - =PP0V75\_S0\_MEM\_VTT\_B  
 - =PPSPD\_S0\_MEM\_B (2.5 - 3.3V)

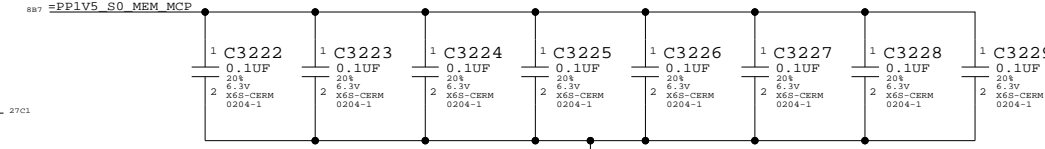
Signal aliases required by this page:  
 - =I2C\_SODIMMB\_SCL  
 - =I2C\_SODIMMB\_SDA

BOM options provided by this page:  
 (NONE)

DDR3 DECOUPLING AND GROUND RETURN CAPS (CONNECTOR SIDE)



DDR3 GROUND RETURN CAPS (MCP SIDE)



"Expansion" (bottom) slot

DDR3 SO-DIMM Connector B  
 SYNC\_MASTER=BNB SYNC\_DATE=05/09/2008

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

8

7

6

5

4

3

2

1

D

D

C

C

B

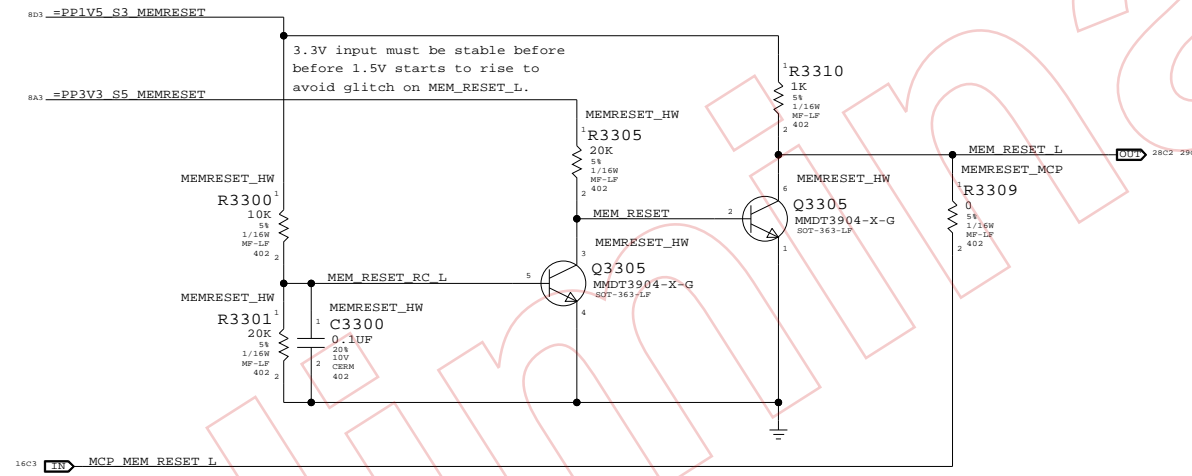
B

A

A

### 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.



Pre-release

#### DDR3 Support

SYNC\_MASTER=T18\_MLB SYNC\_DATE=04/04/2008

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

8

7

6

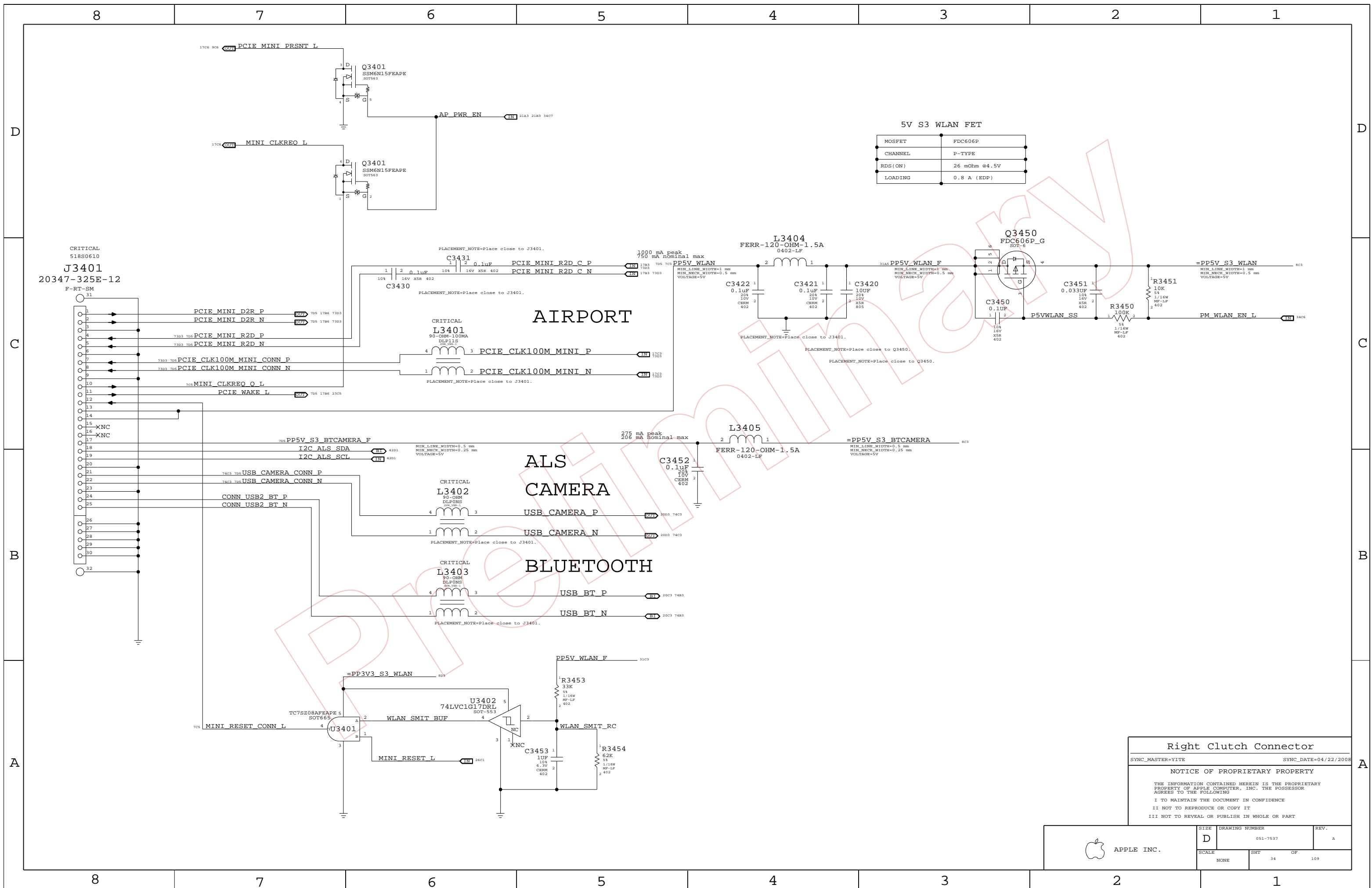
5

4

3

2

1



5V S3 WLAN FET

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

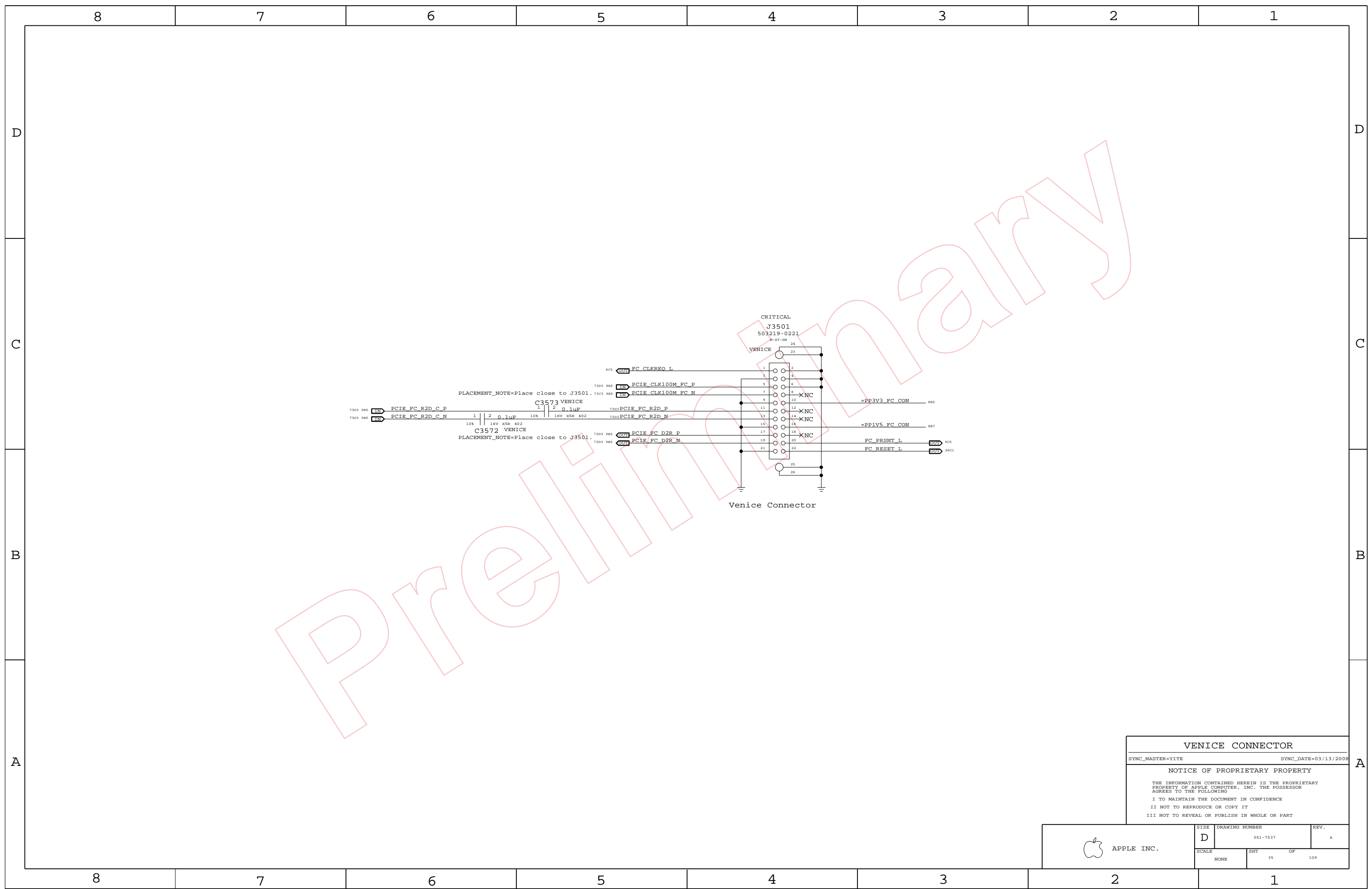
**AIRPORT**

**ALS CAMERA**

**BLUETOOTH**

**Right Clutch Connector**  
 SYNC\_MASTER=YITE SYNC\_DATE=04/22/2008  
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	D	051-7537	A
SCALE	SHT	OF	REV.
NONE	34	109	



Pre-release material

**VENICE CONNECTOR**

SYNC\_MASTER=YITE      SYNC\_DATE=03/13/2008

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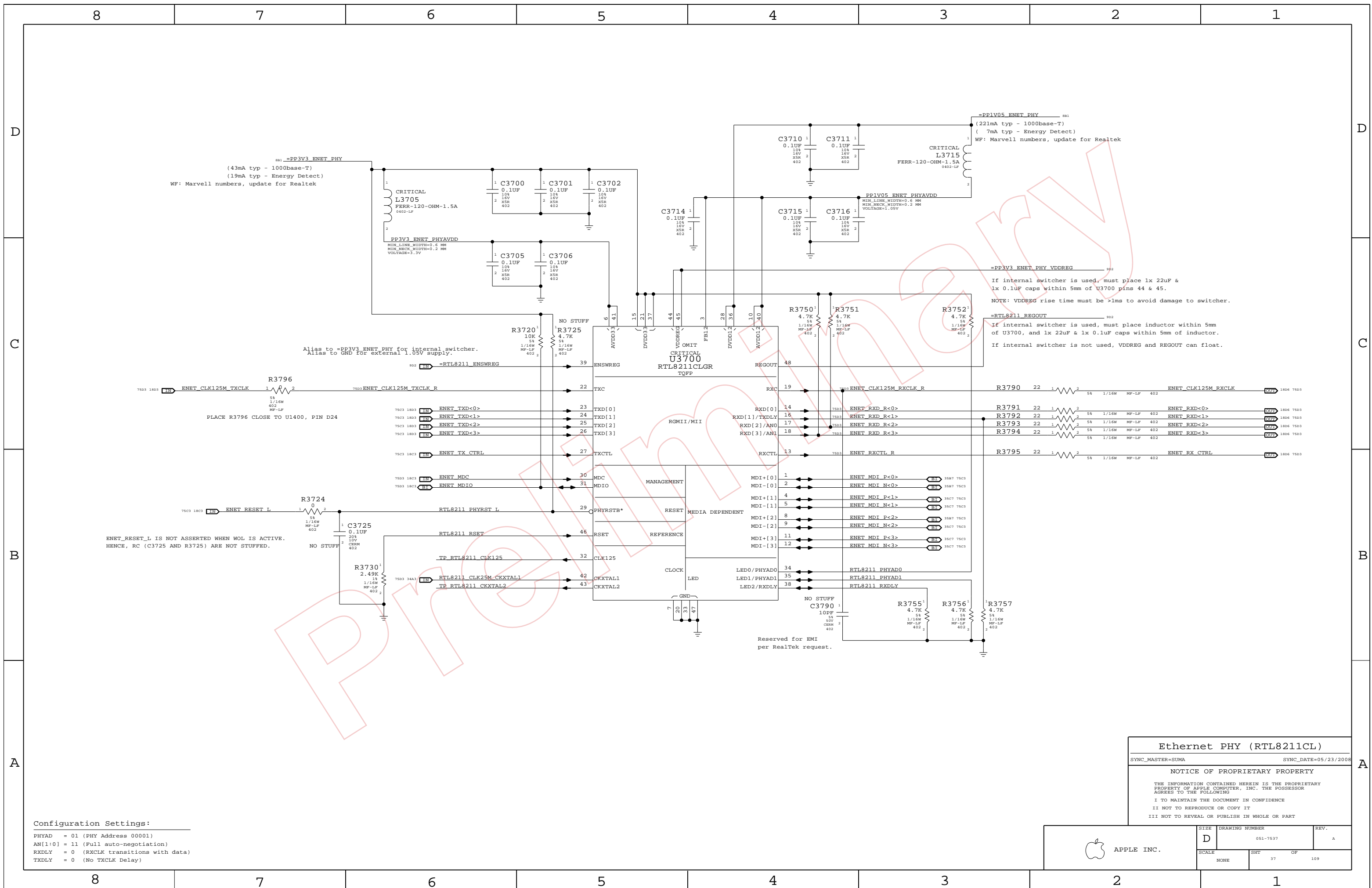
II NOT TO REPRODUCE OR COPY IT

III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

	SCALE	SHEET	OF	REV.
	NONE	35	109	A

SIZE	DRAWING NUMBER	REV.
D	051-7537	A





881: =PP3V3\_ENET\_PHY  
 (43mA typ - 1000base-T)  
 (19mA typ - Energy Detect)  
 WF: Marvell numbers, update for Realtek

=PP1V05\_ENET\_PHY 881:  
 (221mA typ - 1000base-T)  
 ( 7mA typ - Energy Detect)  
 WF: Marvell numbers, update for Realtek

Alias to =PP3V3\_ENET\_PHY for internal switcher.  
 Alias to GND for external 1.05V supply.

=PP3V3\_ENET\_PHY\_VDDREG 882:  
 If internal switcher is used, must place 1x 22uF &  
 1x 0.1uF caps within 5mm of U3700 pins 44 & 45.  
 NOTE: VDDREG rise time must be >1ms to avoid damage to switcher.

=RTL8211\_REGOUT 882:  
 If internal switcher is used, must place inductor within 5mm  
 of U3700, and 1x 22uF & 1x 0.1uF caps within 5mm of inductor.  
 If internal switcher is not used, VDDREG and REGOUT can float.

PLACE R3796 CLOSE TO U1400, PIN D24

ENET\_RESET\_L IS NOT ASSERTED WHEN WOL IS ACTIVE.  
 HENCE, RC (C3725 AND R3725) ARE NOT STUFFED.

Reserved for EMI  
 per Realtek request.

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

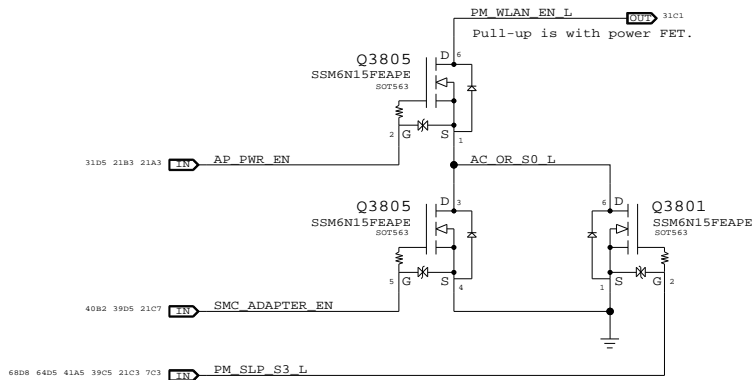
**Ethernet PHY (RTL8211CL)**  
 SYNC\_MASTER=SUMA SYNC\_DATE=05/23/2008  
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APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT	OF	109
NONE	37		

### WLAN Enable Generation

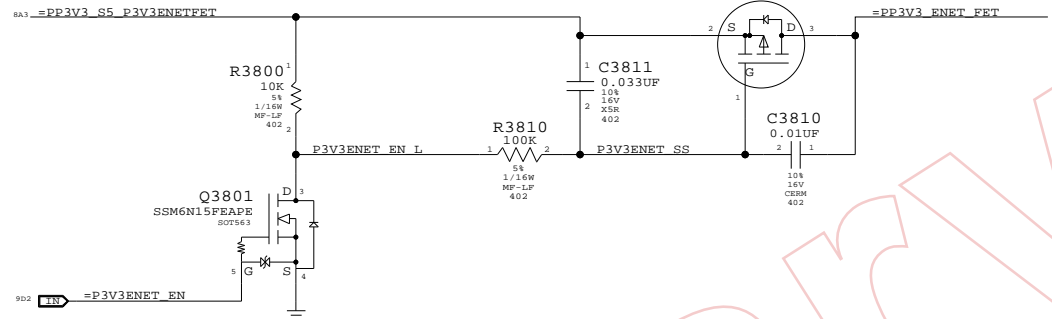
"WLAN" = ("S3" && "AP\_PWR\_EN" && ("AC" || "S0"))

NOTE: S3 term is guaranteed by S3 pull-up on open-drain AP\_PWR\_EN signal.



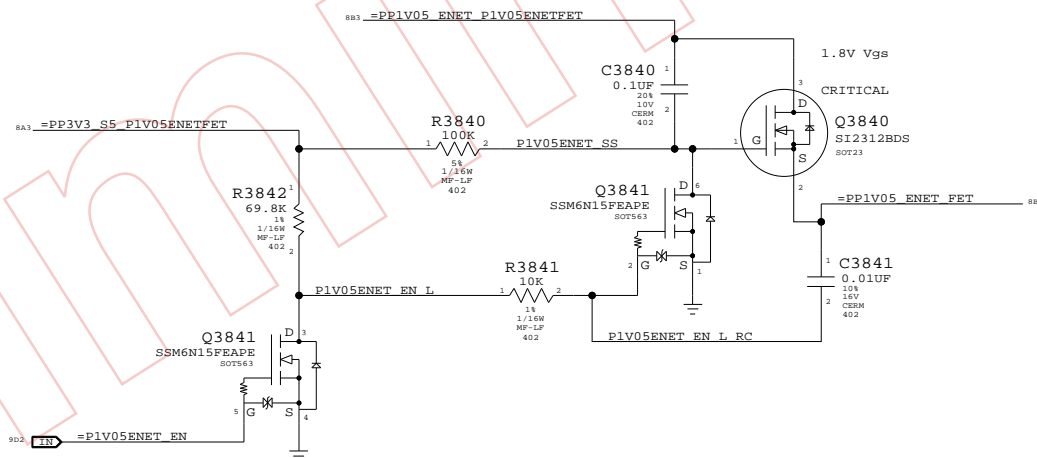
### 3.3V ENET FET

@ 2.5V Vgs: CRITICAL  
Q3810  
NTR4101P  
SOT-23-HP



MOBILE:  
Recommend aliasing PM\_SLP\_RMGT\_L and =P3V3ENET\_EN. Nets separated on ARB for alternate power options.

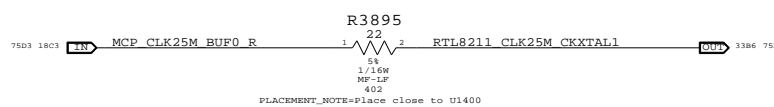
### 1.05V ENET FET



Non-ARB:  
Recommend aliasing PM\_SLP\_RMGT\_L and =P1V05ENET\_EN. Nets separated on ARB for alternate power options.

### RTL8211 25MHz Clock

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



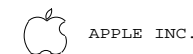
PLACEMENT\_NOTE=Place close to U1400

### Ethernet & AirPort Support

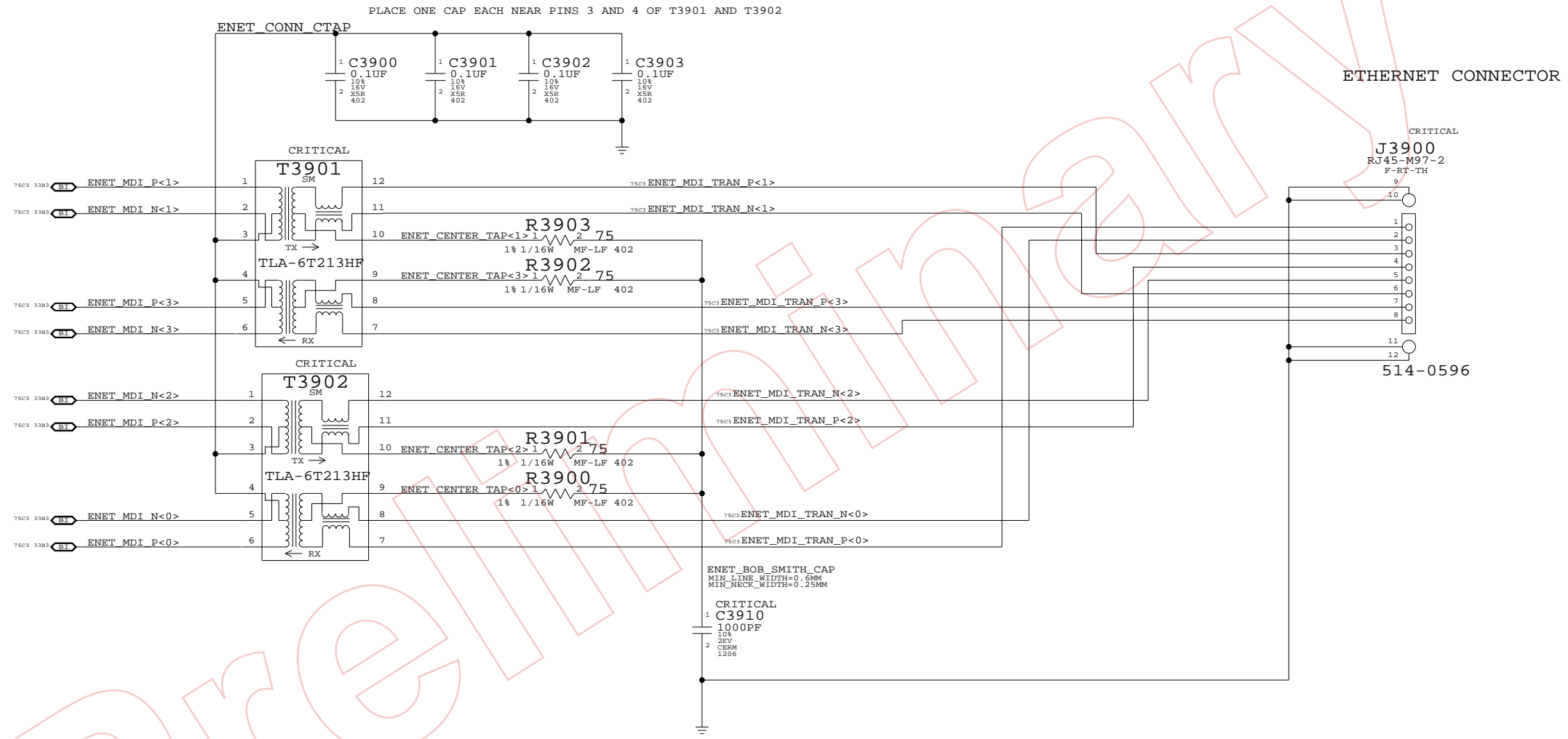
SYNC\_MASTER=SUMA SYNC\_DATE=07/01/2008

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SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE	SHT	OF
NONE	38	109



ETHERNET CONNECTOR

SYNC\_MASTER=SUMA SYNC\_DATE=04/04/2008

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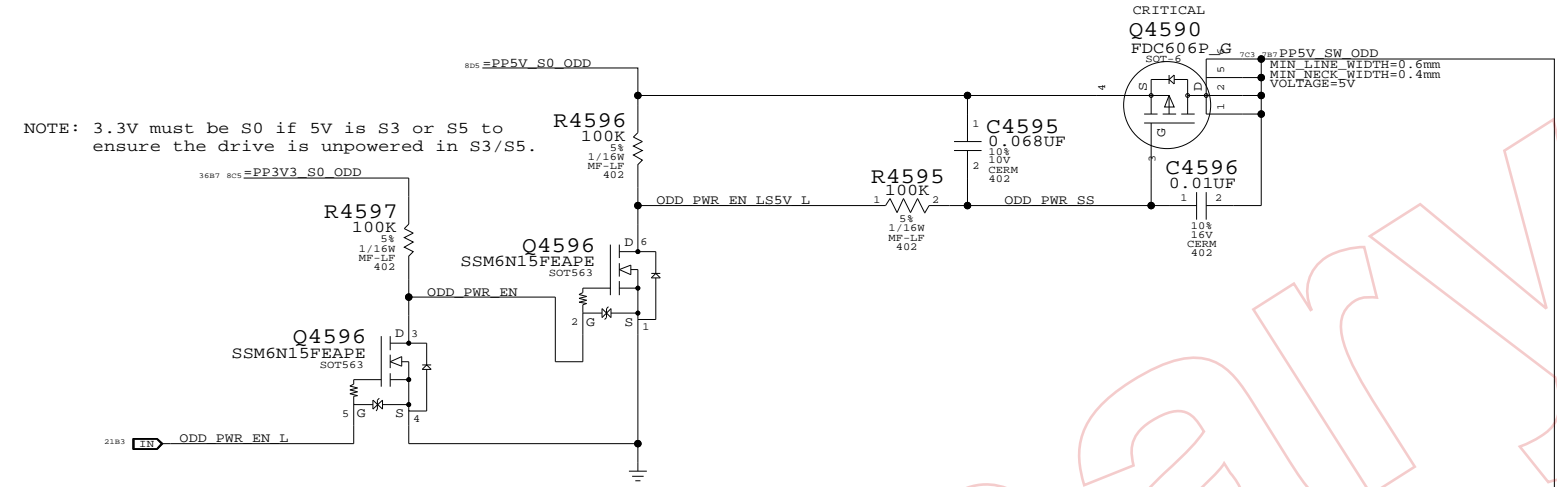
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II NOT TO REPRODUCE OR COPY IT

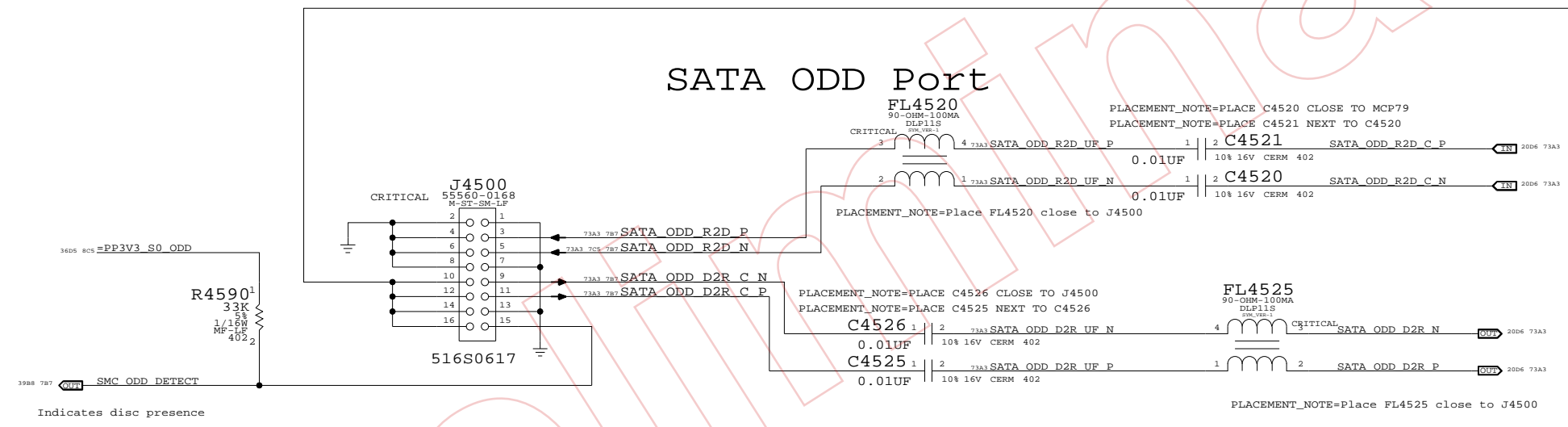
III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT	OF	
NONE	39	109	

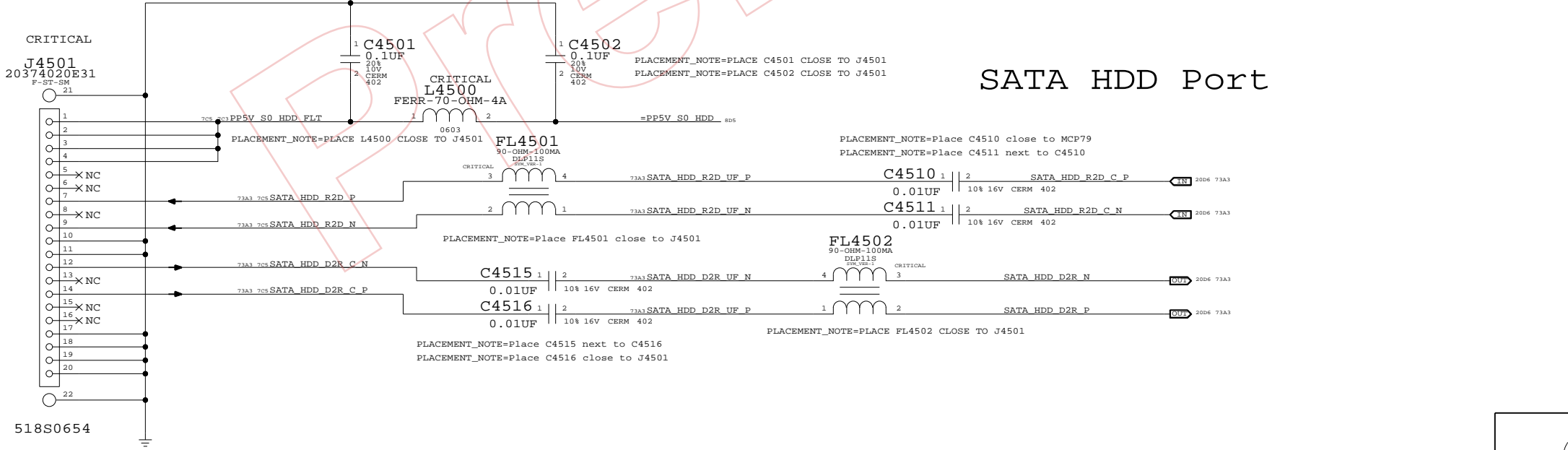
### ODD Power Control



### SATA ODD Port



### SATA HDD Port



SATA Connectors		
SYNC_MASTER=CHANGZHANG	SYNC_DATE=04/14/2008	
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 APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT	OF	REV.
NONE	45	109	

D

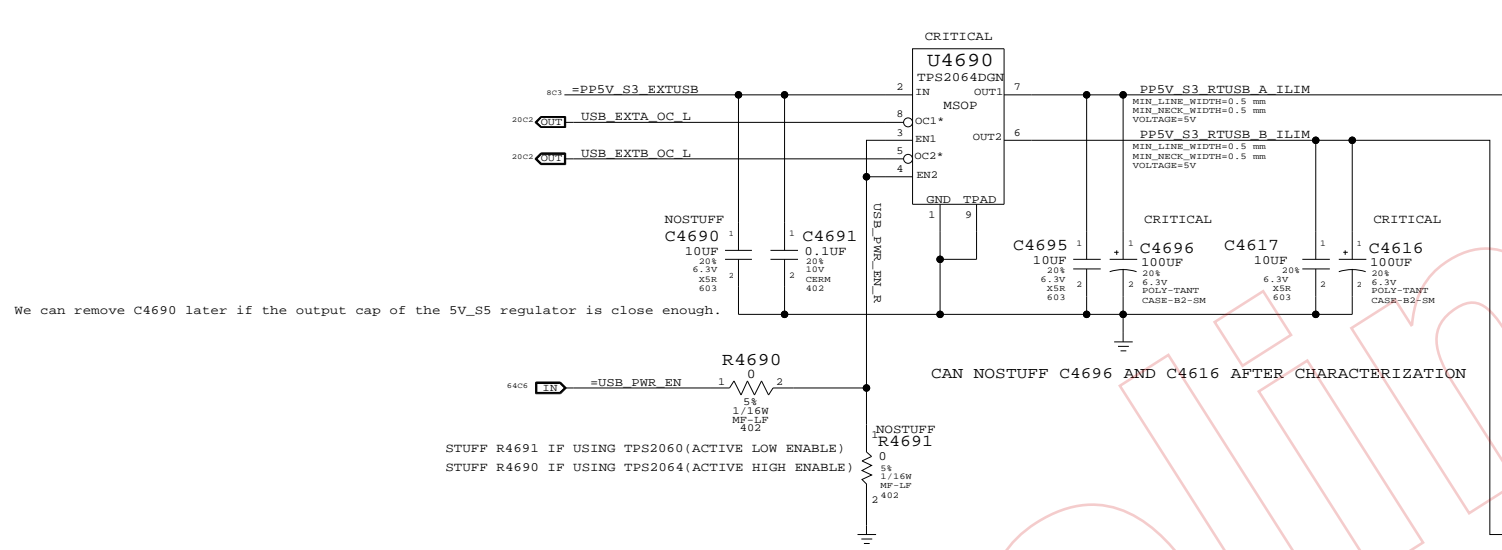
C

B

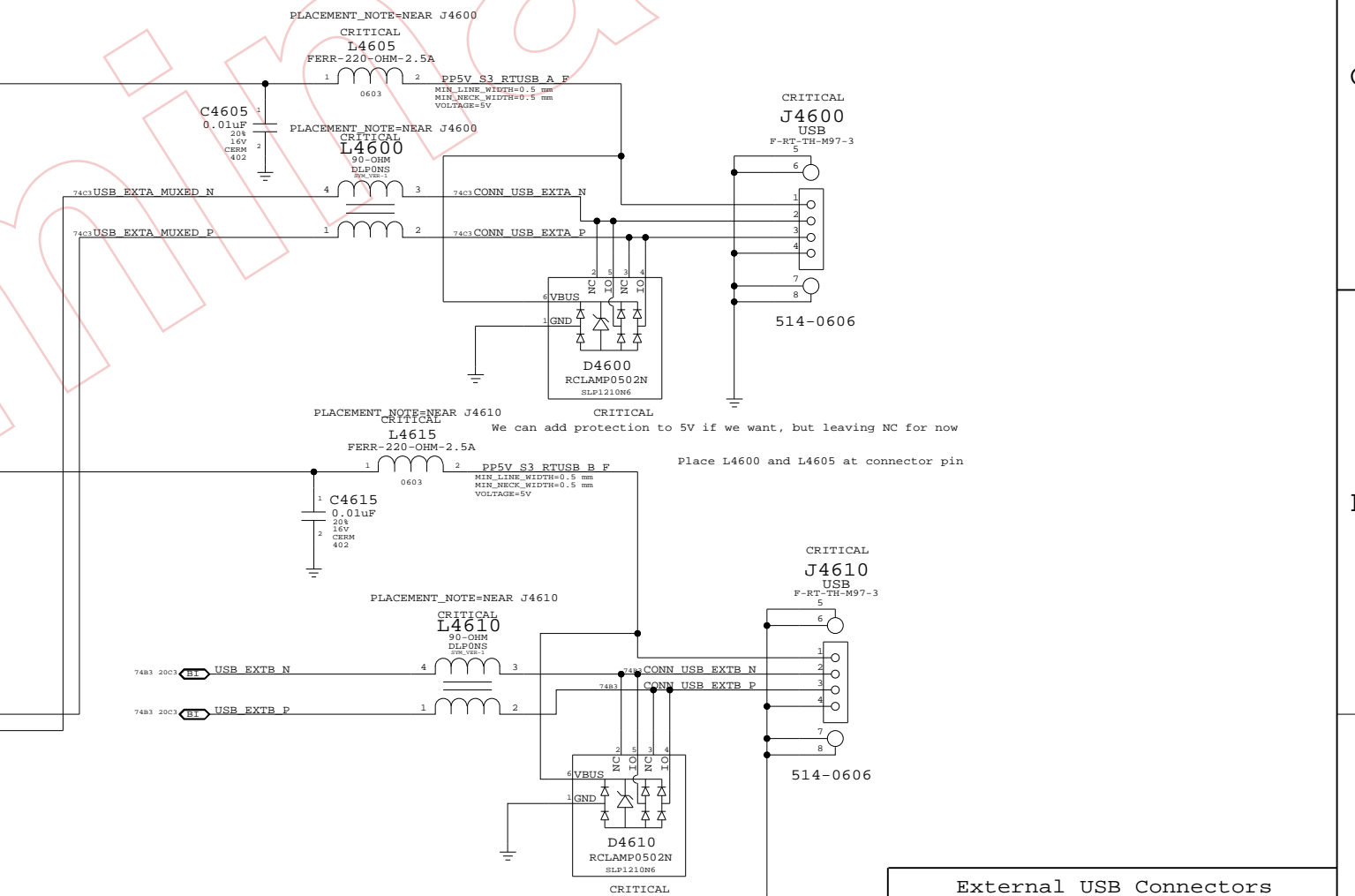
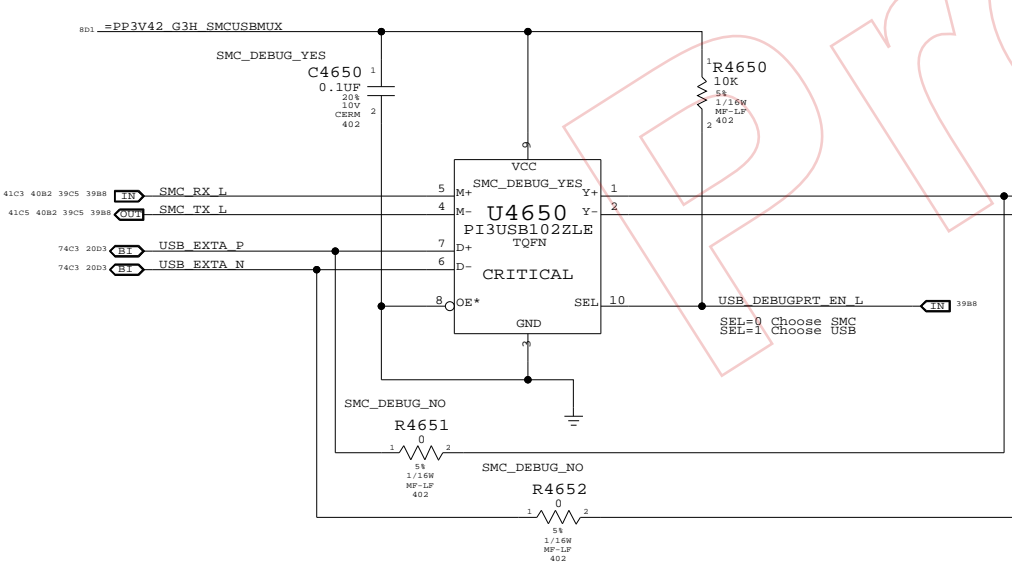
A

Port Power Switch

USB PORT A (FRONT PORT)



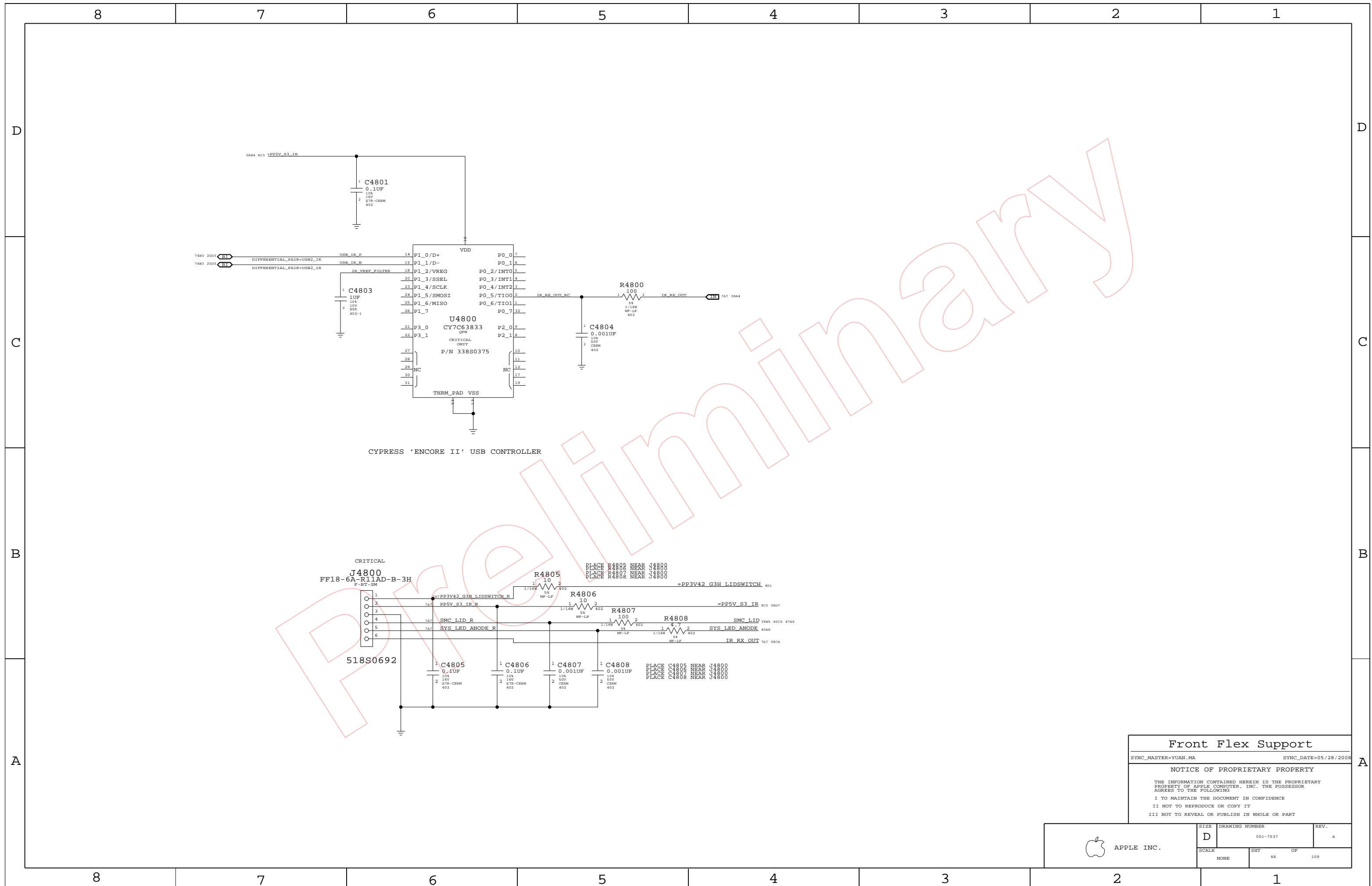
USB/SMC Debug Mux



USB PORT B (BACK PORT)

**External USB Connectors**  
 SYNC\_MASTER=YUAN.MA SYNC\_DATE=01/18/2008  
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APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT		OF
NONE	46		109



Front Flex Support

SYNC\_MASTER=YUAN.MA SYNC\_DATE=05/28/2008

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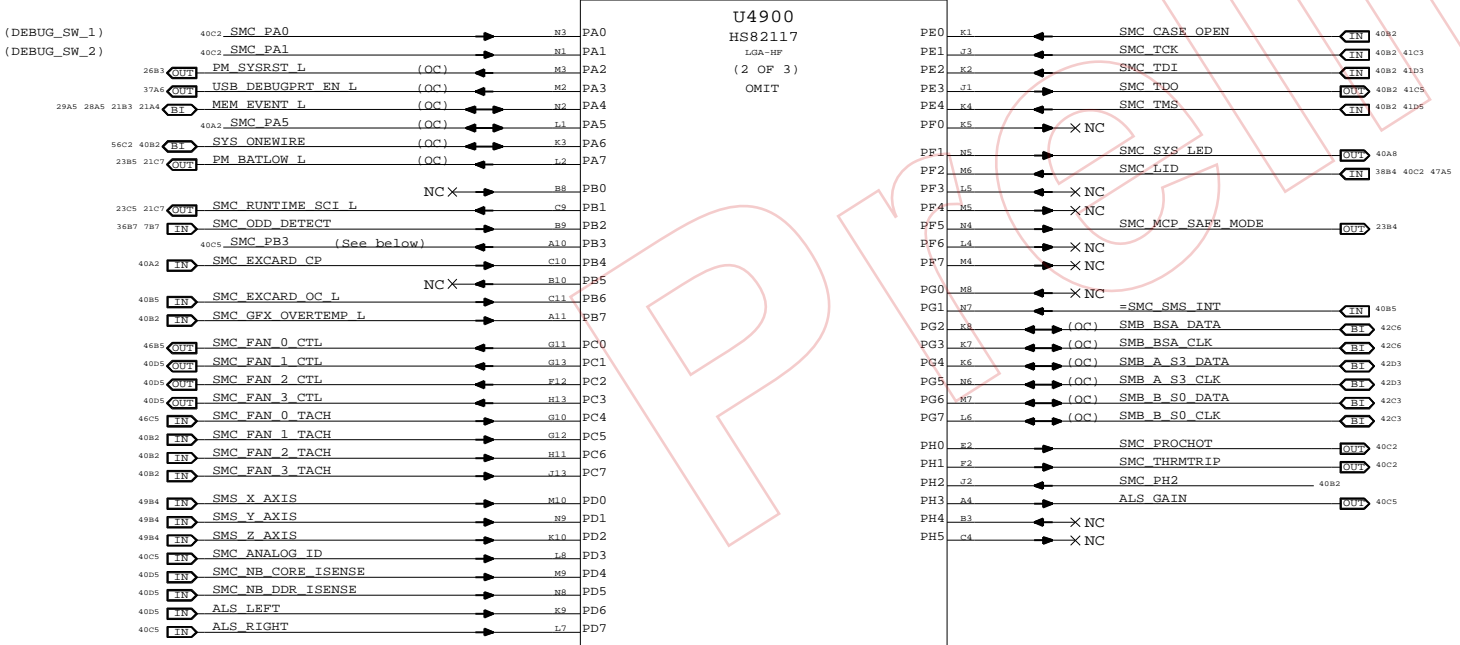
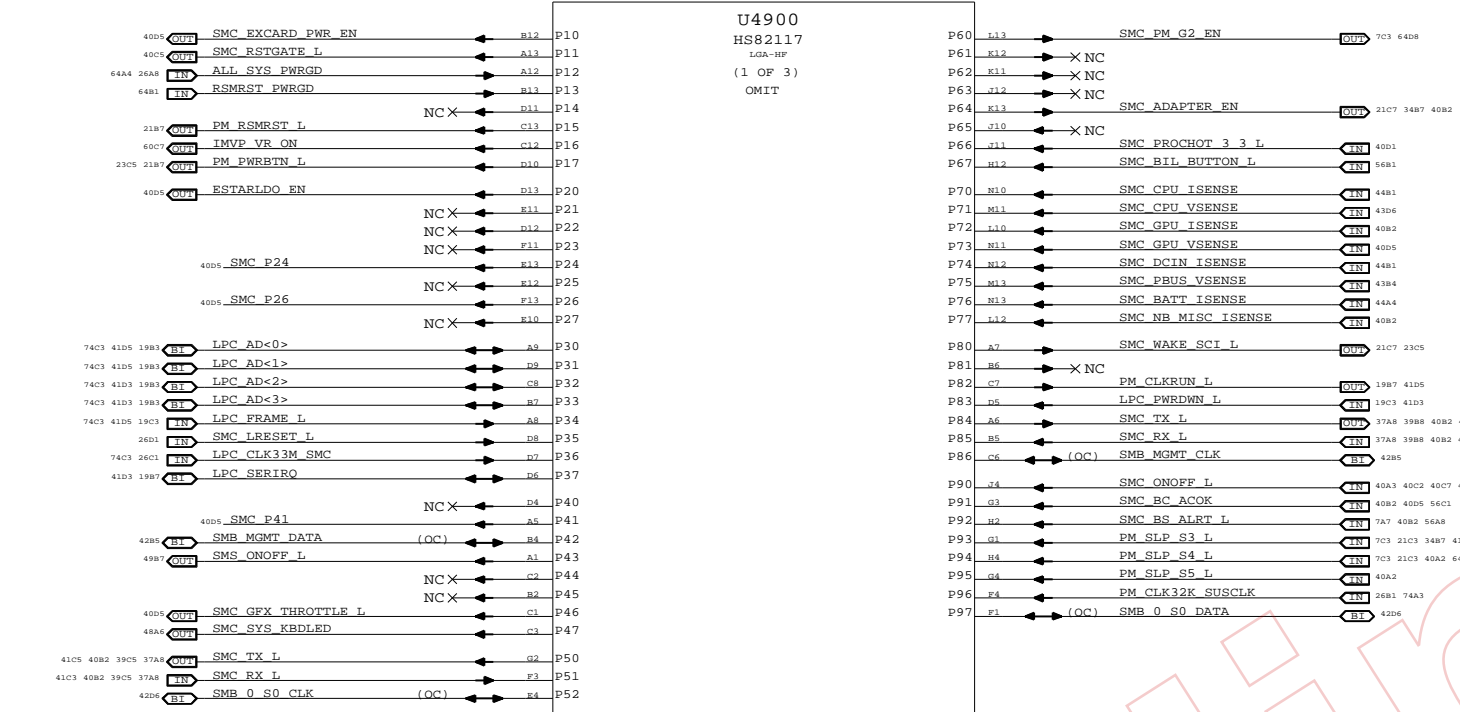
I TO MAINTAIN THE DOCUMENT IN CONFIDENCE

II NOT TO REPRODUCE OR COPY IT

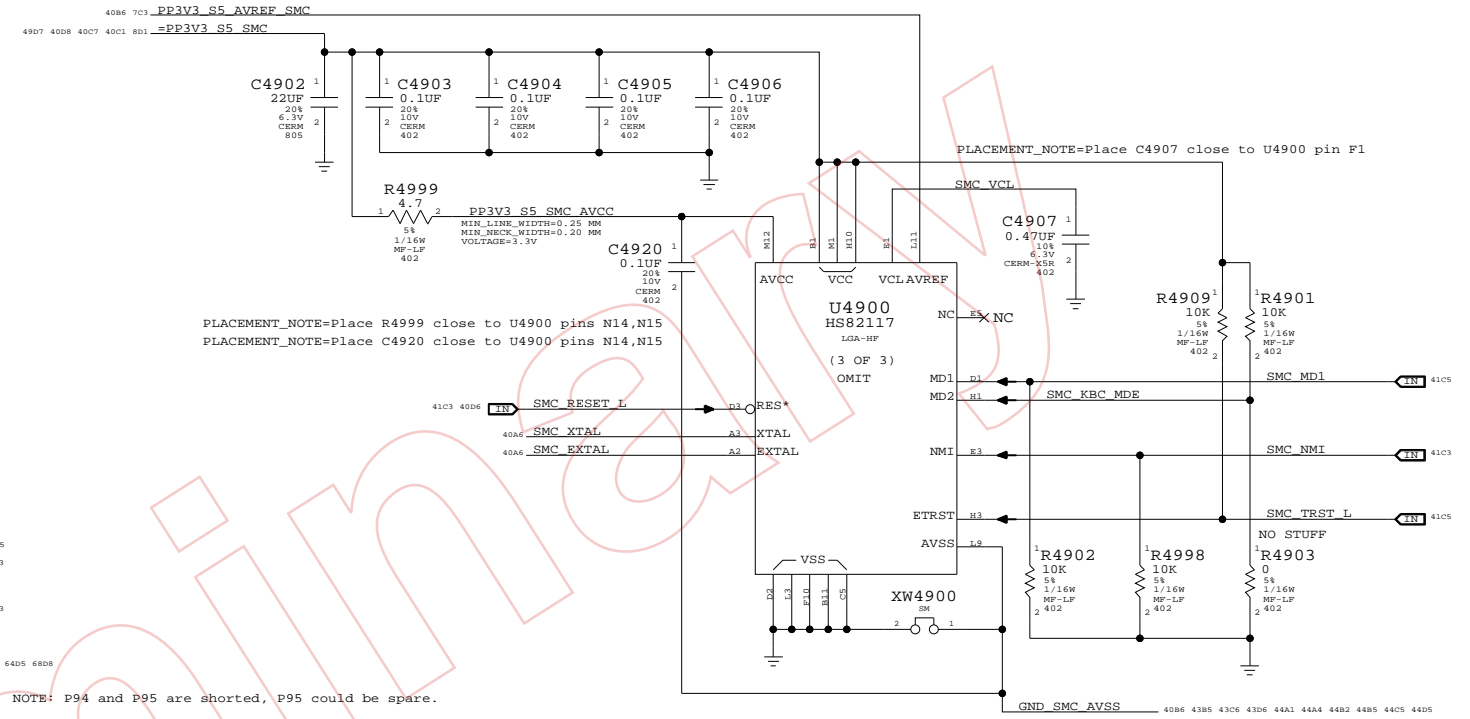
III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

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

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



SMC\_PB3:  
SMC\_IG\_THROTTLE\_L for MG systems.  
Otherwise, TP/NC okay (was ISENSE\_CAL\_EN)



SMC

SYNC\_MASTER=T18\_MLB SYNC\_DATE=06/26/2008

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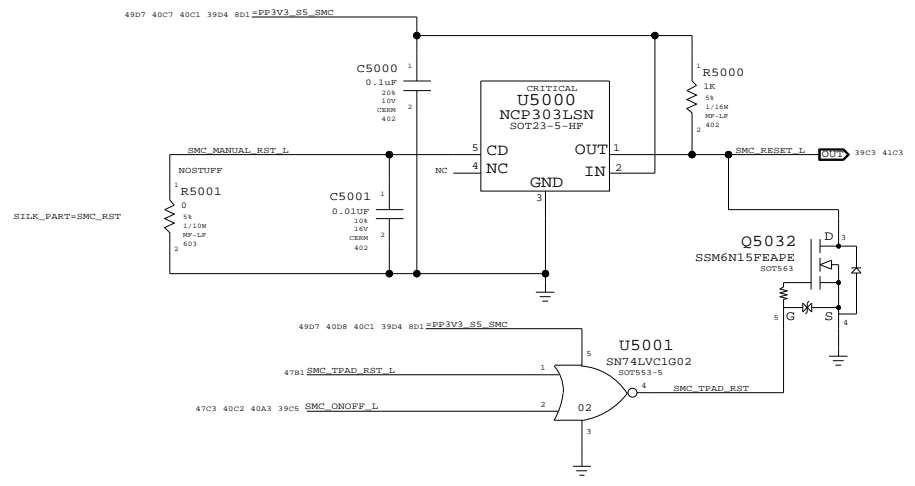
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II NOT TO REPRODUCE OR COPY IT

III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

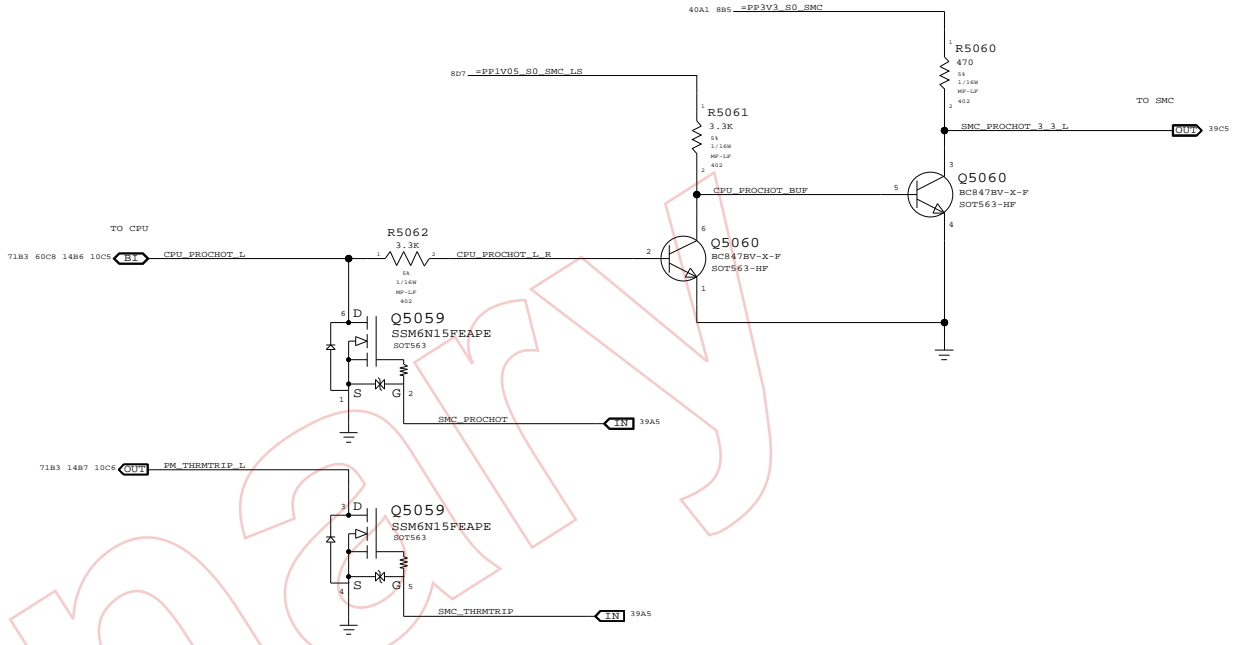
APPLE INC.		SCALE	DRAWING NUMBER	REV.	
D		NONE	051-7537	A	
		SHT	49	OF	109

SMC Reset "Button" / Brownout Detect

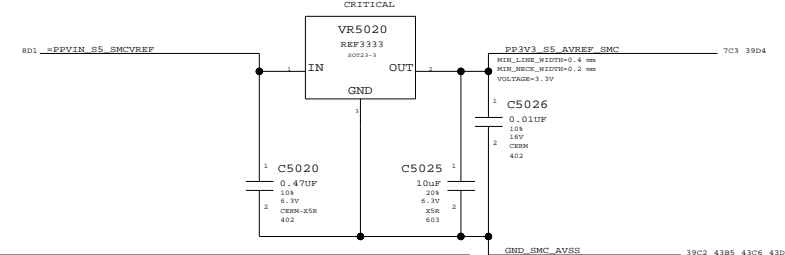


39A8	SMC_FAN_1_CTL	NC	SMC_FAN_1_CTL
39A8	SMC_FAN_2_CTL	NC	SMC_FAN_2_CTL
39A8	SMC_FAN_3_CTL	NC	SMC_FAN_3_CTL
39B8	SMC_GPU_THROTTLE_L	SMC_GPU_THROTTLE_L	21A4 21B3
39C8	ESTARLDO_EN	NC	ESTARLDO_EN
56C1 40B2 39C5	SMC_BC_ACLK	CHGR_ACLK	57B5
39C8	SMC_P24	TP	SMC_P24
39C8	SMC_P26	SMC_RMON_MUX_SEL	44A5
39C8	SMC_P41	TP	SMC_P41
39A8	SMC_NB_CORE_ISENSE	SMC_MCP_CORE_ISENSE	44D5
39A8	SMC_NB_DDR_ISENSE	SMC_MCP_DDR_ISENSE	44C5
39A8	ALS_LEFT	SMC_CPU_FSB_ISENSE	44B5
39C5	SMC_GPU_VSENSE	SMC_MCP_VSENSE	43D6
39D8	SMC_EXCARD_PWR_EN	TP	SMC_EXCARD_PWR_EN
39D8	SMC_RSTGATE_L	TP	SMC_RSTGATE_L
39B8	SMC_PB3	NC	SMC_PB3
39A5	ALS_GAIN	NC	ALS_GAIN
39A8	SMC_ANALOG_ID	NC	SMC_ANALOG_ID
39A8	ALS_RIGHT	NC	ALS_RIGHT

SMC FSB to 3.3V Level Shifting

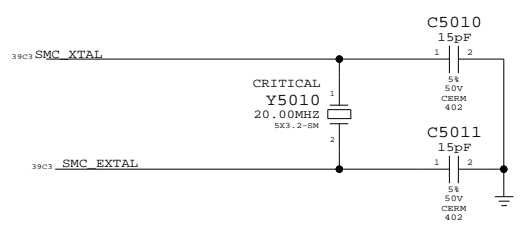


SMC AVREF Supply

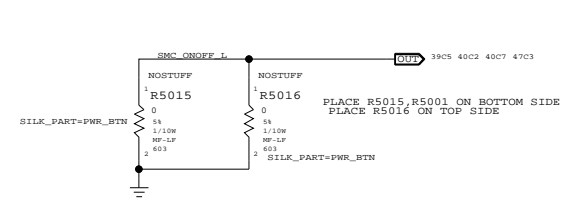


PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
35381381	35381278		ALL	Interim ISL60002-33

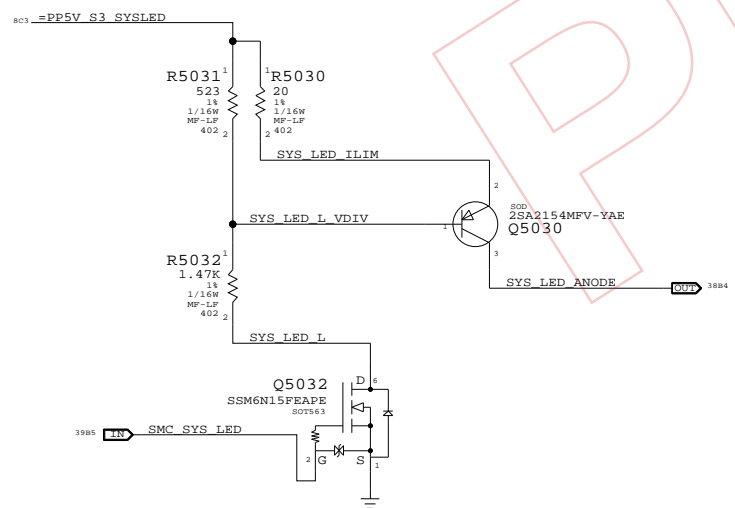
SMC Crystal Circuit



Debug Power "Button"



System (Sleep) LED Circuit



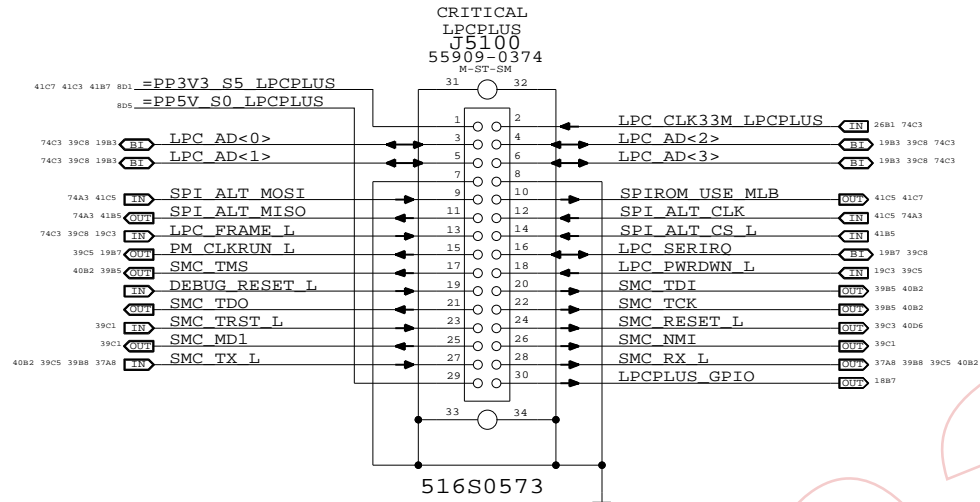
39B8	SMC_PA0	R5091	100K	5A	1/16W	MP-LP	402
39B8	SMC_PA1	R5092	100K	5A	1/16W	MP-LP	402
47C3 40C7 40A3 39C5	SMC_ONOFF_L	R5070	10K	5A	1/16W	MP-LP	402
47A5 39B5 38B4	SMC_LID	R5071	100K	5A	1/16W	MP-LP	402
39A5	SMC_PH2	R5072	10K	5A	1/16W	MP-LP	402
41C5 39C5 39A8 37A8	SMC_TX_L	R5073	10K	5A	1/16W	MP-LP	402
41C3 39C5 39A8 37A8	SMC_RX_L	R5074	100K	5A	1/16W	MP-LP	402
ONENWIRE_PU							
56C2 39B8	SYS_ONENWIRE	R5075	2.0K	5A	1/16W	MP-LP	402
56A8 39C5 7A7	SMC_BS_ALERT_L	R5076	100K	5A	1/16W	MP-LP	402
41D5 39B5	SMC_TMS	R5077	10K	5A	1/16W	MP-LP	402
41C5 39B5	SMC_TDO	R5078	10K	5A	1/16W	MP-LP	402
41D3 39B5	SMC_TDI	R5079	10K	5A	1/16W	MP-LP	402
41C3 39B5	SMC_TCK	R5080	10K	5A	1/16W	MP-LP	402
56C1 40D5 39C5	SMC_BC_ACLK	R5087	470K	5A	1/16W	MP-LP	402
39A8	SMC_GPU_OVERTEMP_L	R5050	10K	5A	1/16W	MP-LP	402
39A8	SMC_FAN_1_TACH	R5051	10K	5A	1/16W	MP-LP	402
39A8	SMC_FAN_2_TACH	R5052	10K	5A	1/16W	MP-LP	402
39A8	SMC_FAN_3_TACH	R5053	10K	5A	1/16W	MP-LP	402
39C5	SMC_GPU_ISENSE	R5054	10K	5A	1/16W	MP-LP	402
39C5	SMC_NB_MISC_ISENSE	R5055	10K	5A	1/16W	MP-LP	402
39D5 34B7 21C7	SMC_ADAPTER_EN	R5085	10K	5A	1/16W	MP-LP	402
39B5	SMC_CASE_OPEN	R5086	10K	5A	1/16W	MP-LP	402
39B8	SMC_EXCARD_CP	R5088	10K	5A	1/16W	MP-LP	402
39C5	PM_SLP_B5_L	R5090	100K	5A	1/16W	MP-LP	402
64C8 39C5 21C3 7C3	PM_SLP_B4_L	R5089	10K	5A	1/16W	MP-LP	402

SMC Support  
 SYNC\_MASTER=YUAN.MA SYNC\_DATE=05/28/2008  
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APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT	OF	109
NONE	50		

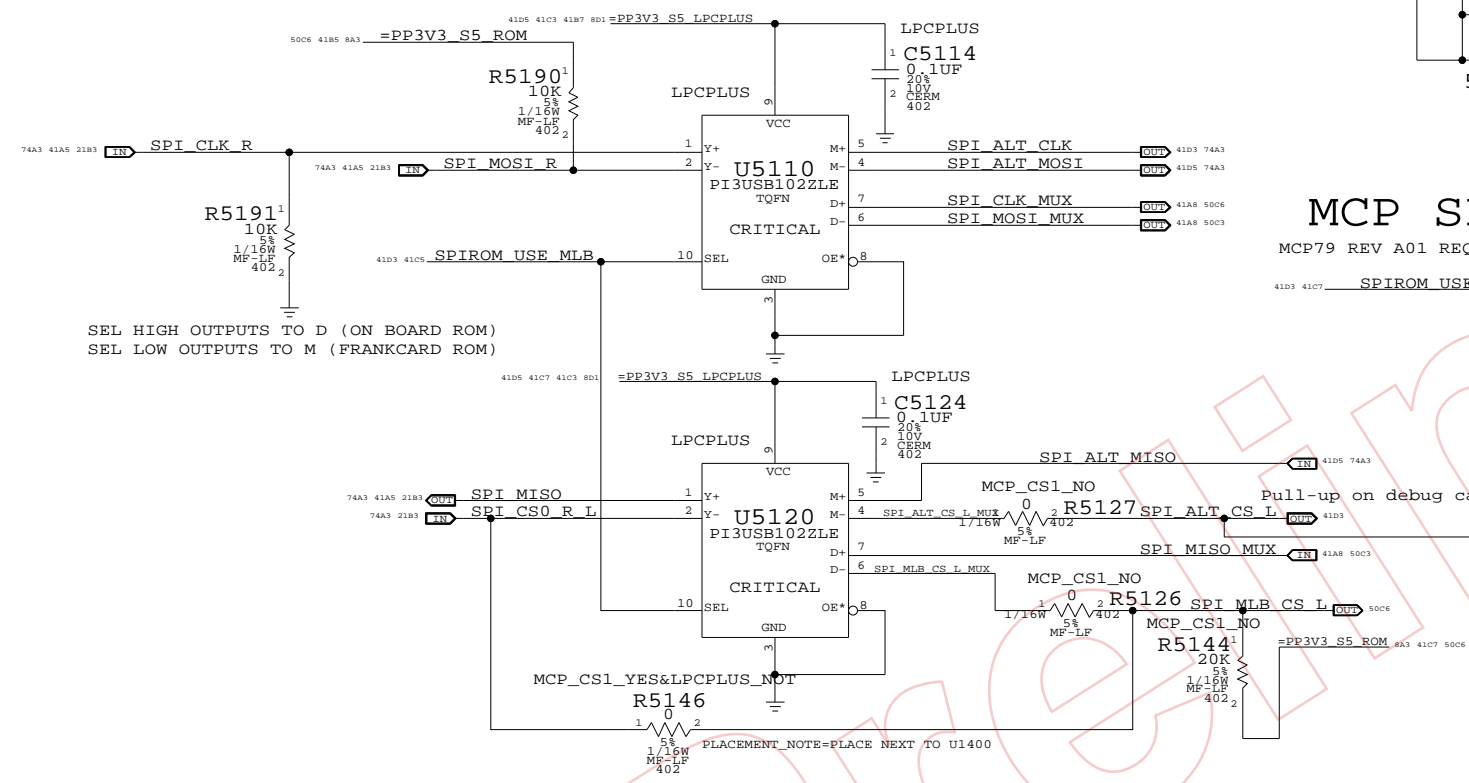


# LPC+SPI Connector



## Alternate SPI ROM Support

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

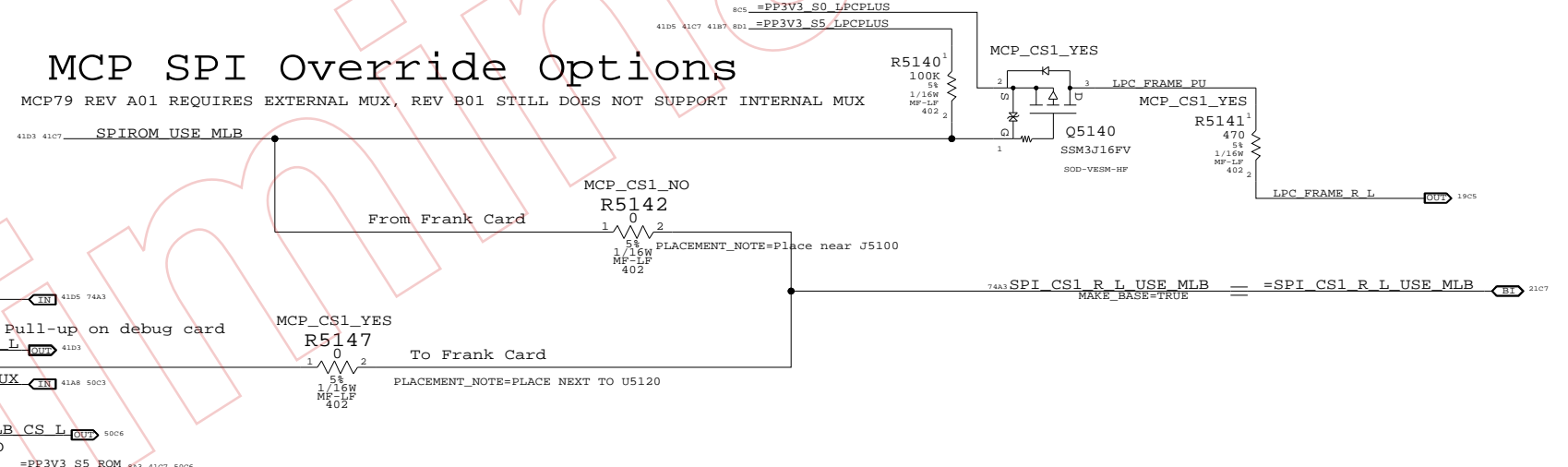


## MCP79 Internal SPI MUX Support

NOT SUPPORTED IN REV A01 OR B01 MCP79 SILICON

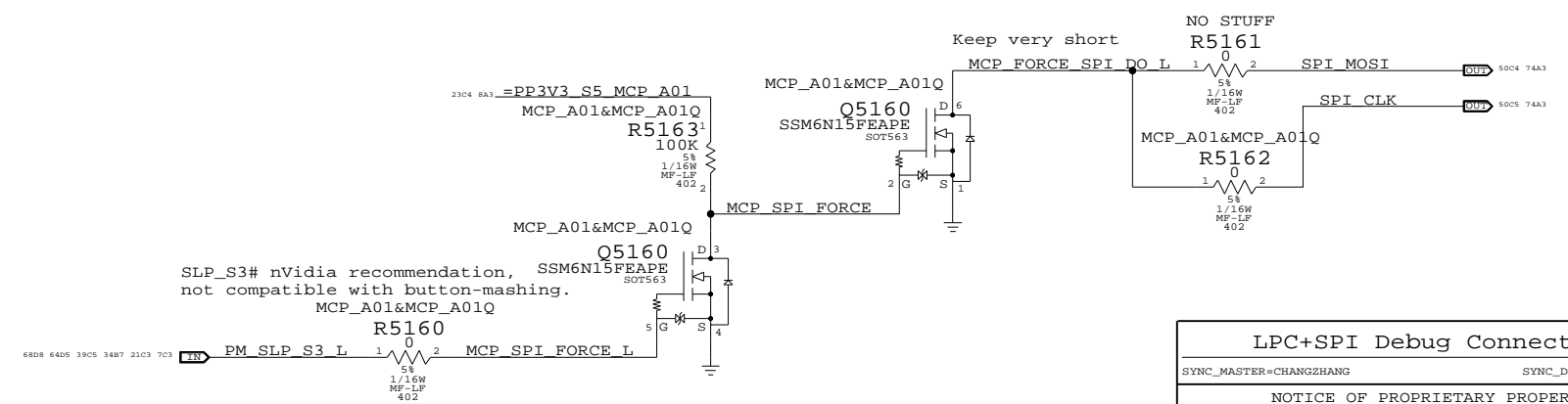
## MCP SPI Override Options

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

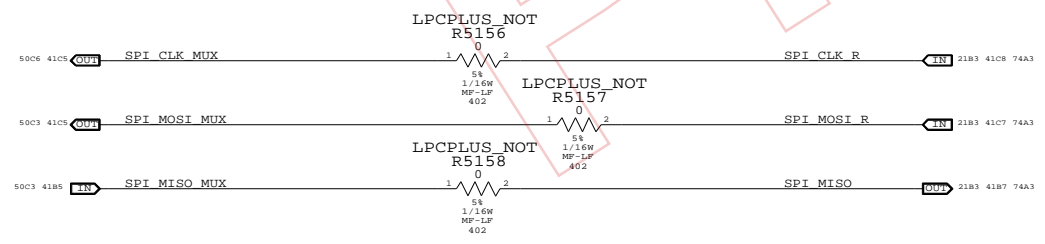


## SPI Frequency Clamp

ENSURES MCP79 SPI\_DO OR SPI\_CLK INPUT IS LOW WHEN STRAP IS LATCHED. NOT NEEDED FOR B01 OR LATER.



## SPI MUX BYPASS



## LPC+SPI Debug Connector

SYNC\_MASTER=CHANGZHANG SYNC\_DATE=05/09/2008

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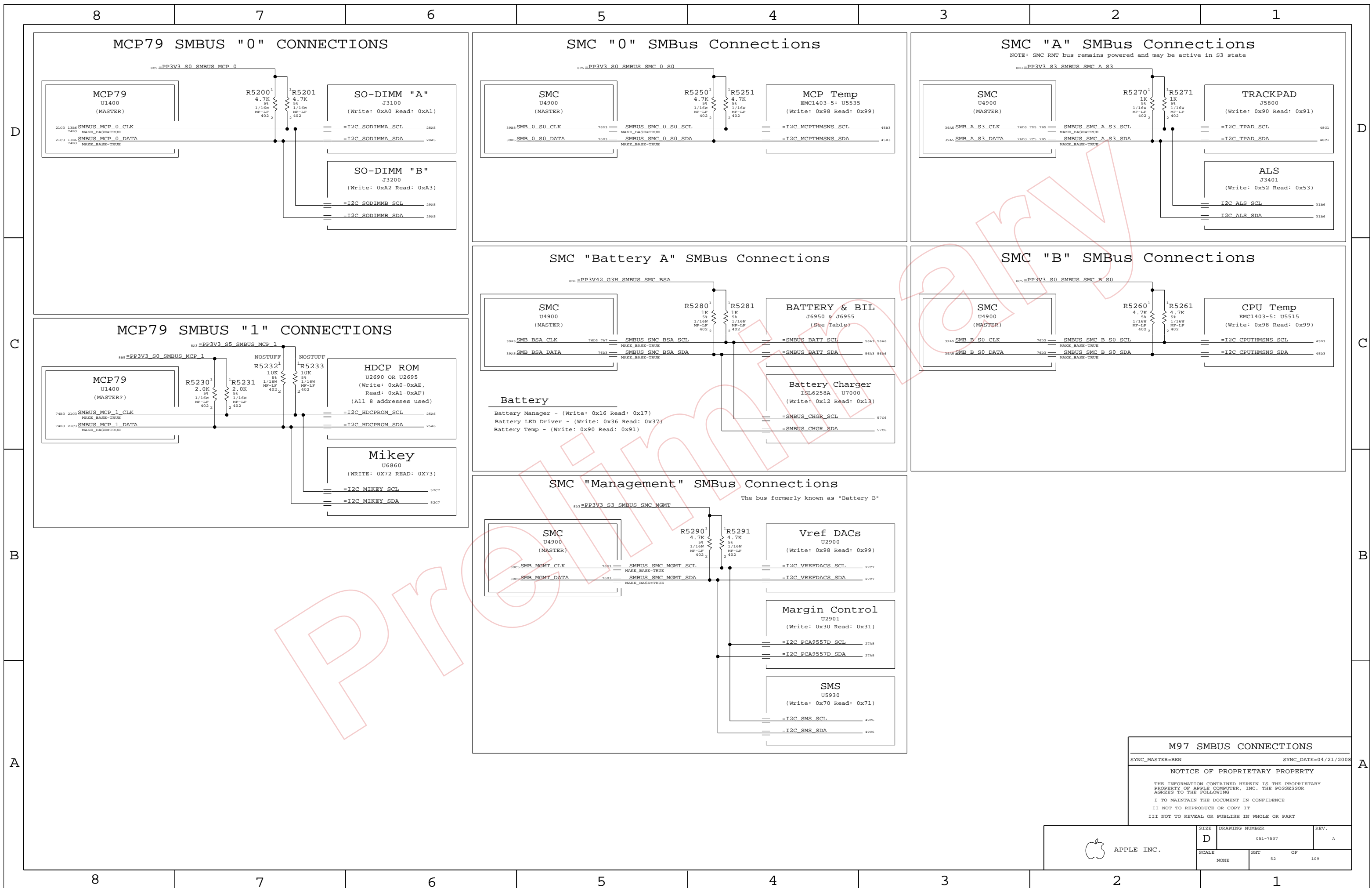
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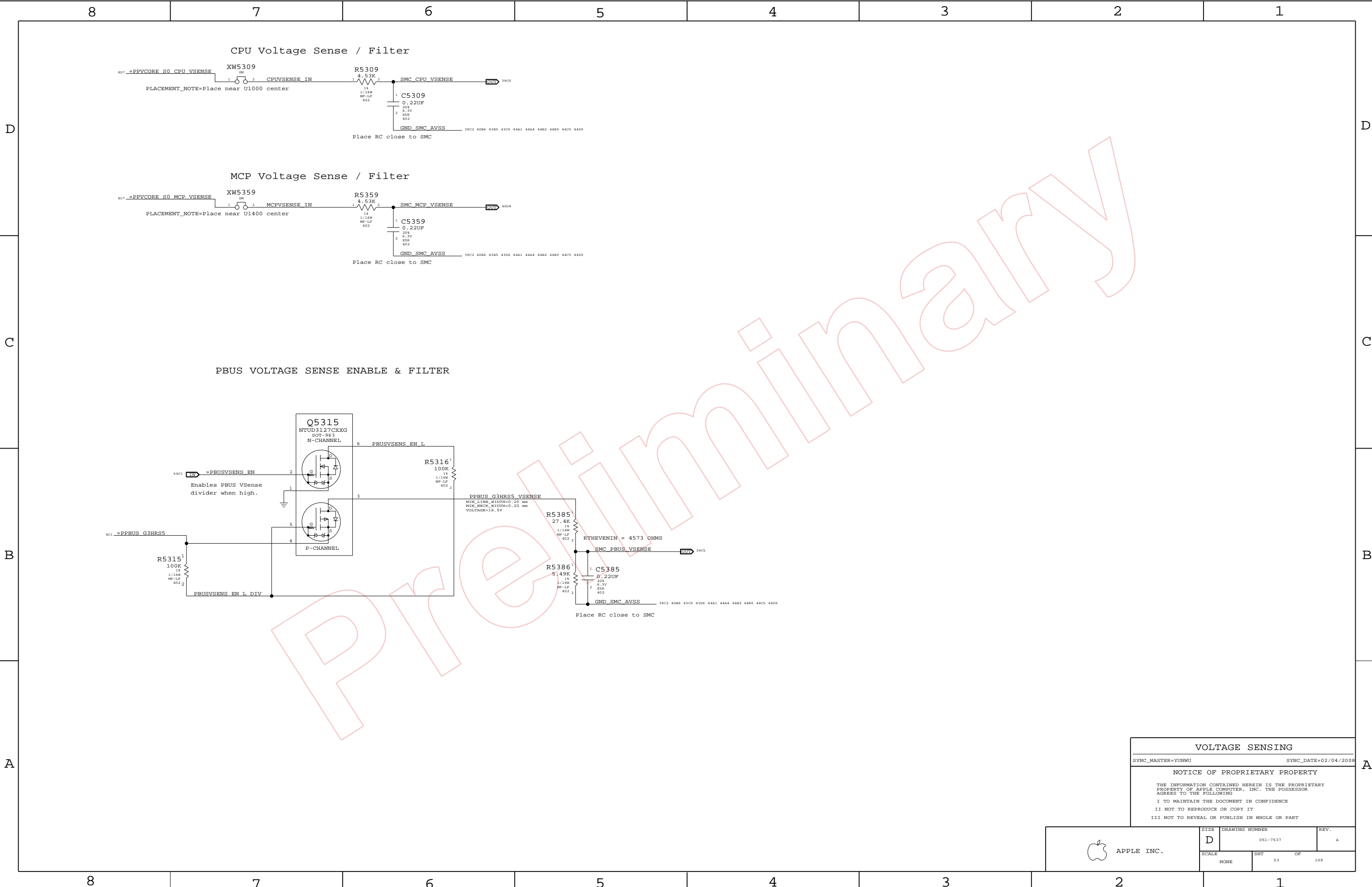
III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

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



**M97 SMBUS CONNECTIONS**  
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APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT	OF	109
NONE	52		



**VOLTAGE SENSING**

SYNC\_MASTER=YUNWU SYNC\_DATE=02/04/2008

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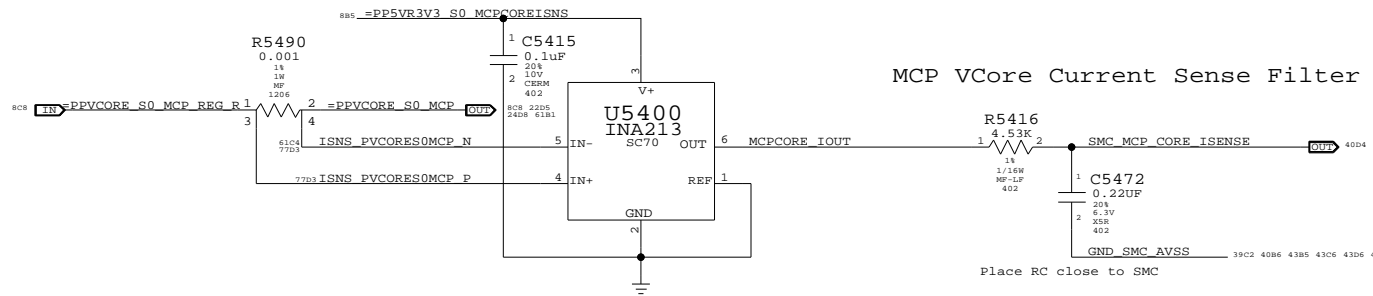
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III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

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

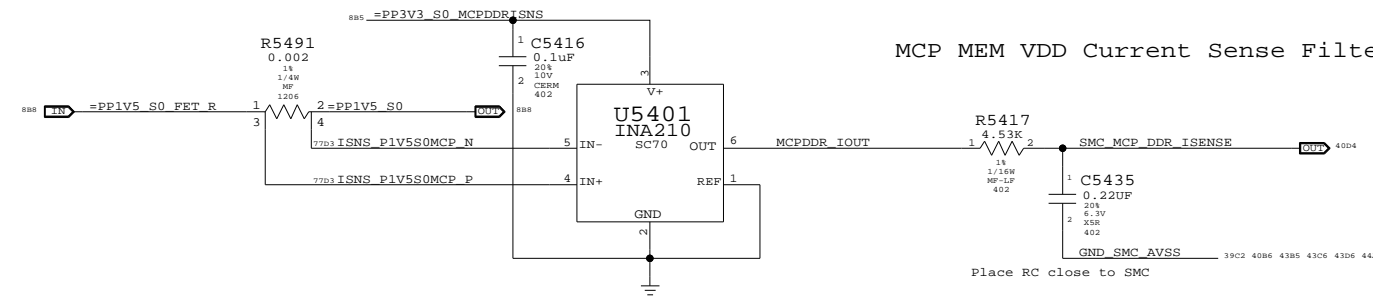
MCP VCore Current Sense



MCP VCore Current Sense Filter

Place RC close to SMC

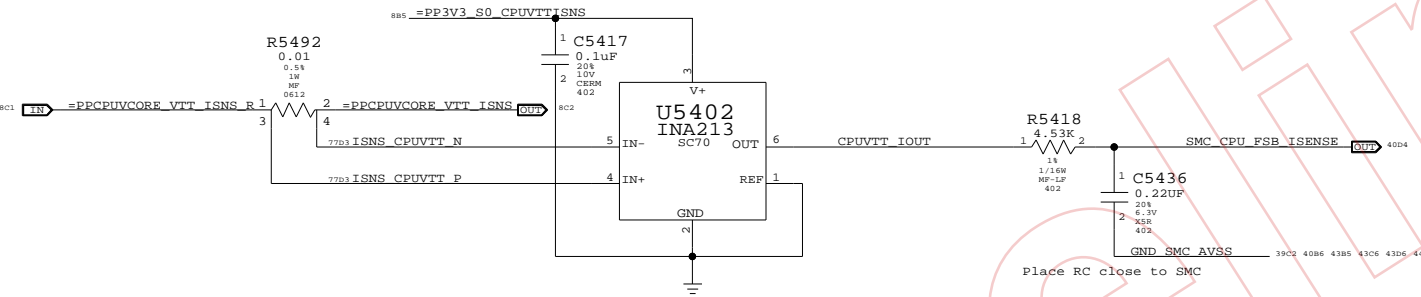
MCP MEM VDD Current Sense



MCP MEM VDD Current Sense Filter

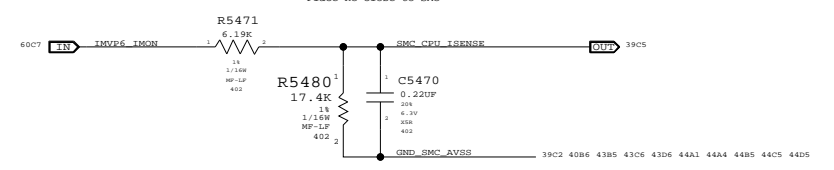
Place RC close to SMC

CPU 1.05V AND CPU VCore HIGH SIDE CURRENT SENSE



Place RC close to SMC

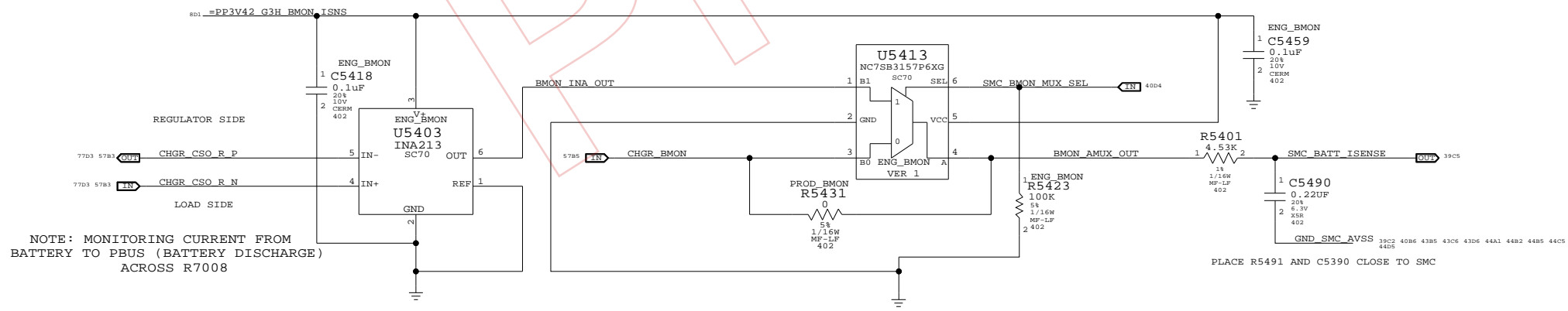
CPU VCore Load Side Current Sense / Filter



Place RC close to SMC

BMON CURRENT SENSE

PLACE U5413, R5423, R5431, C5459 NEAR SMC (U4900)



PLACE R5491 AND C5390 CLOSE TO SMC

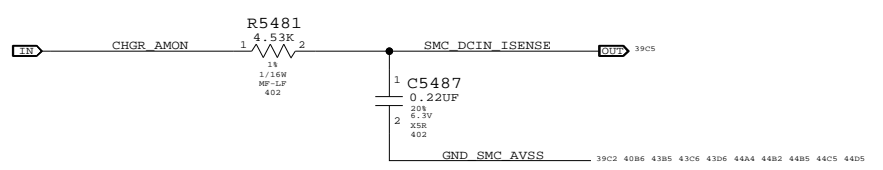
NOTE: MONITORING CURRENT FROM BATTERY TO PBUS (BATTERY DISCHARGE) ACROSS R7008

INA213 has gain of 50V/V

PLACE U5403 AND C5418 NEAR R7008

For engineering, stuff U5313 and unstuff R5330  
For production, stuff R5330 and unstuff U5313

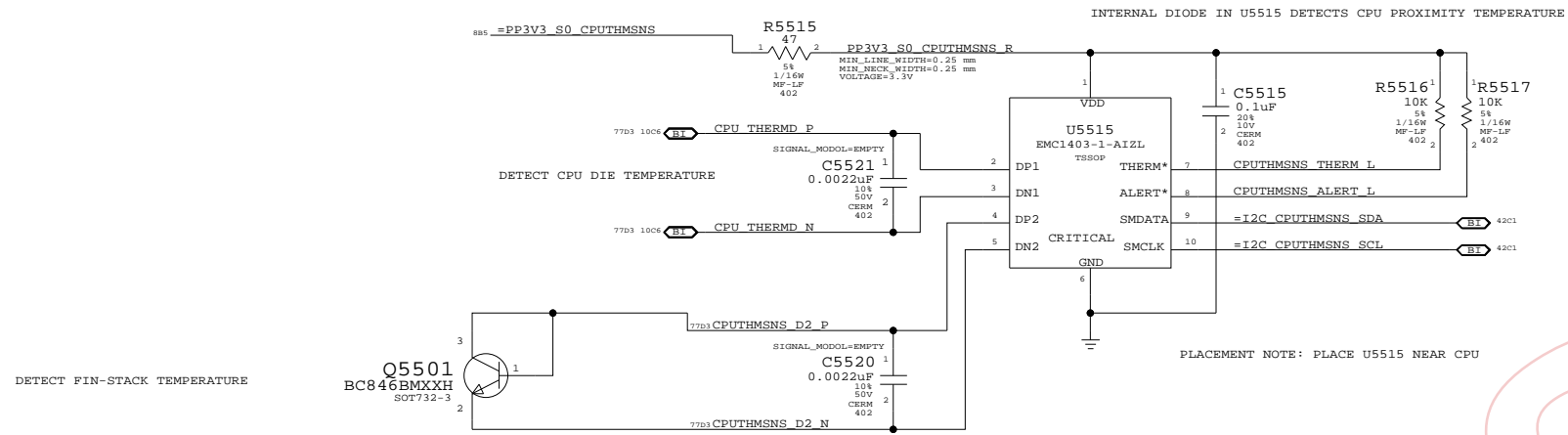
DC-IN (AMON) CURRENT SENSE



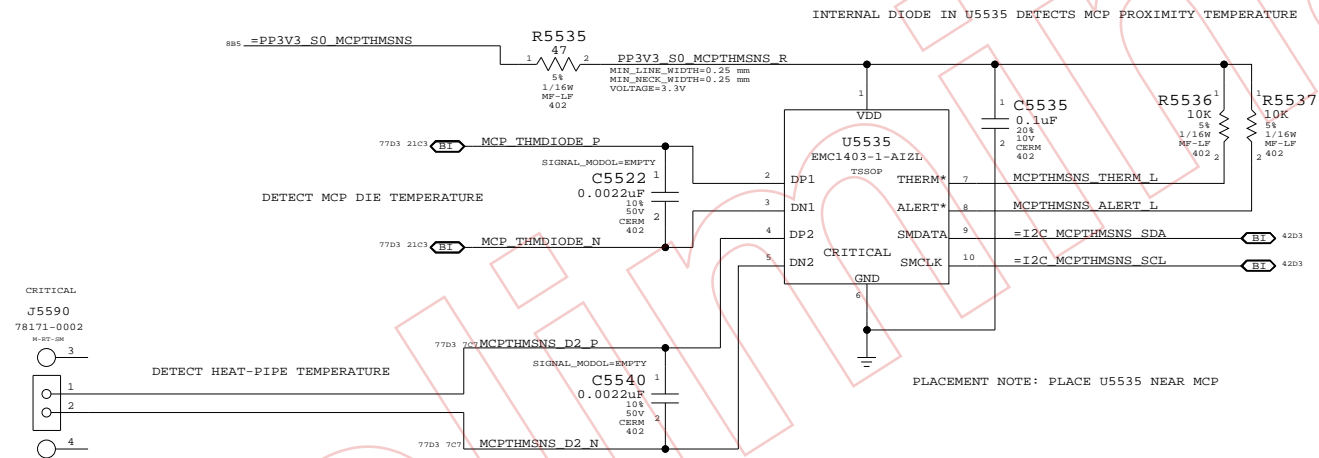
Current Sensing		
SYNC_MASTER=YUNWU	SYNC_DATE=04/07/2008	
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APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT	OF	109
NONE	54		

### CPU T-Diode Thermal Sensor



### MCP T-Diode Thermal Sensor



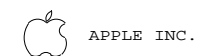
REPLACED 518S0521 WITH 518S0519

#### Thermal Sensors

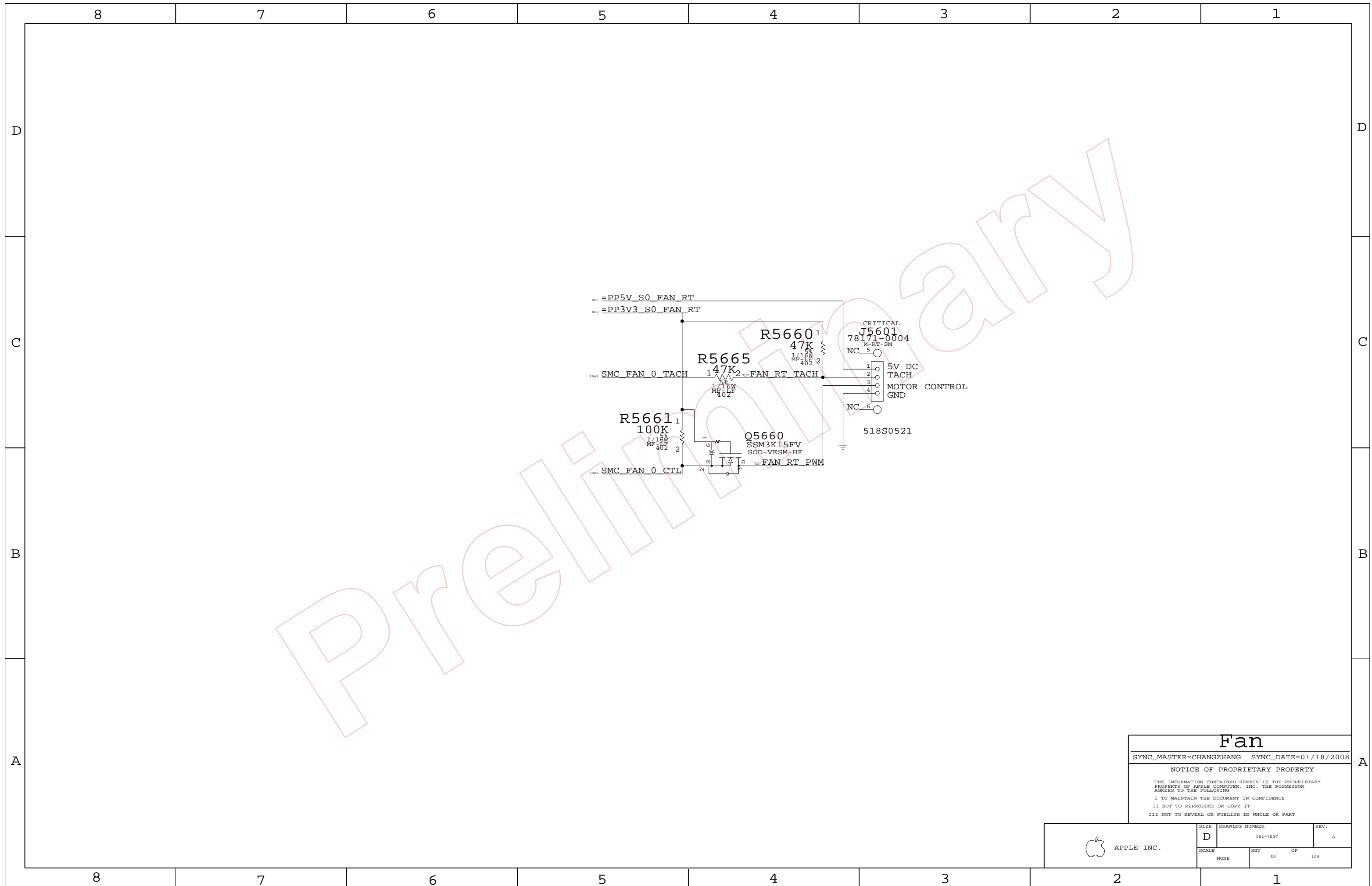
SYNC\_MASTER=YUNWU SYNC\_DATE=03/20/2008

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



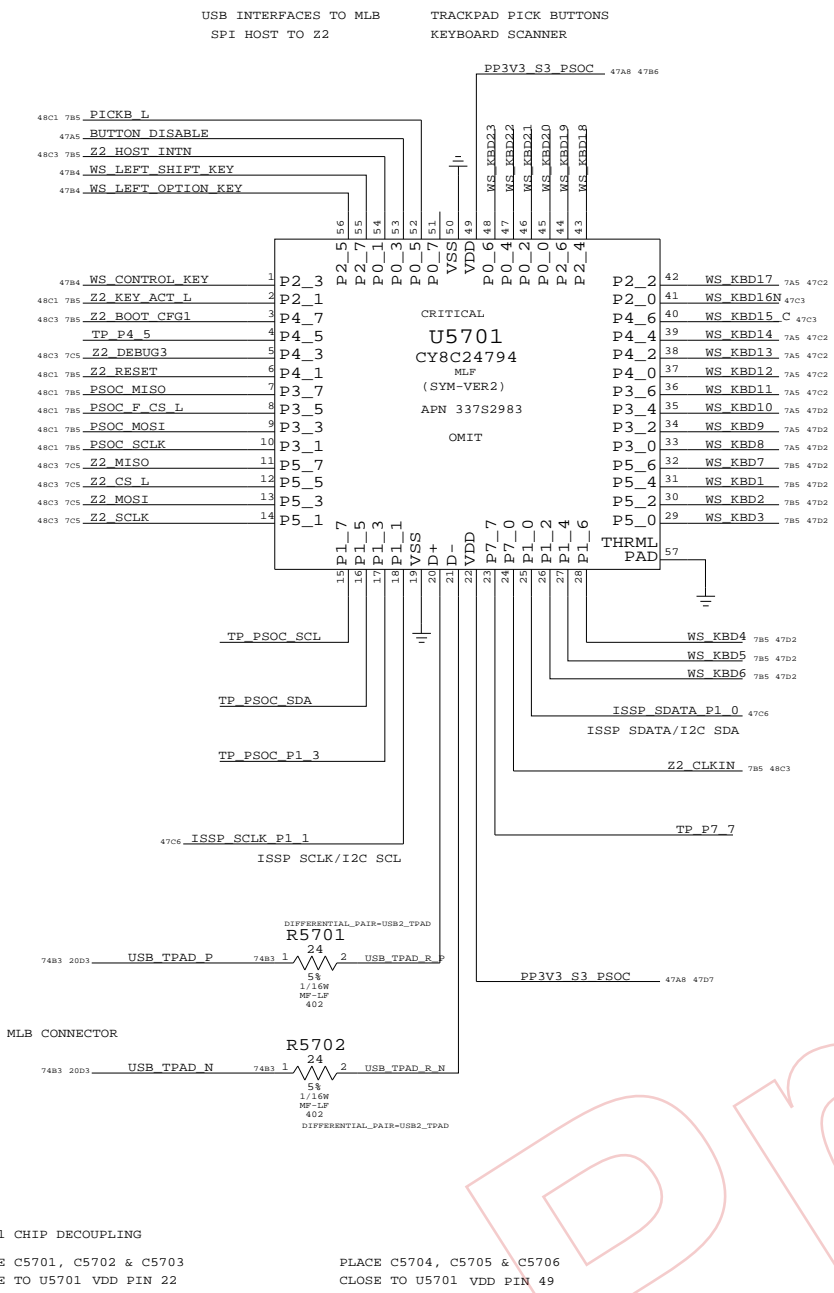
Preliminary

**F'an**

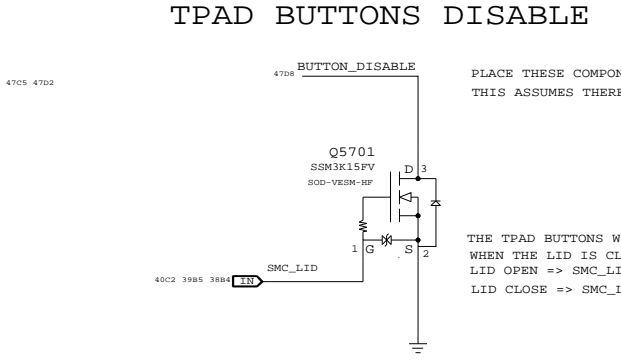
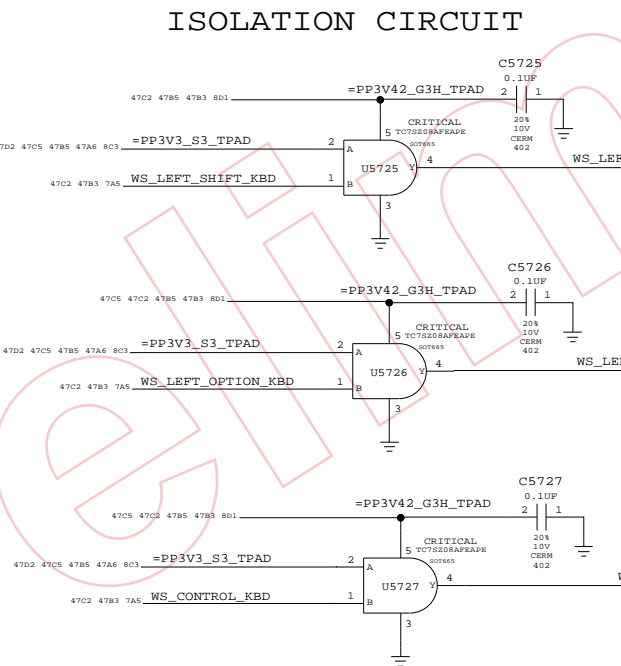
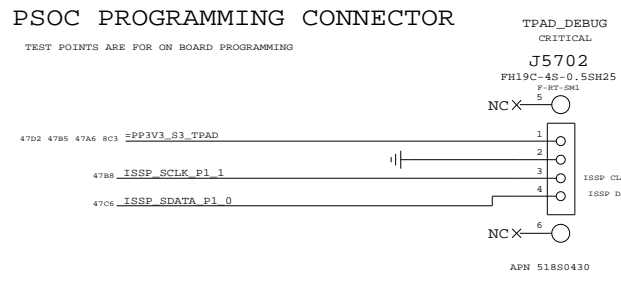
SYNC\_MASTER=CHANGZHANG SYNC\_DATE=01/18/2008  
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APPLE INC.	SIZE <b>D</b>	DRAWING NUMBER 051-7537	REV. A
	SCALE NONE	SHEET 56	OF 109

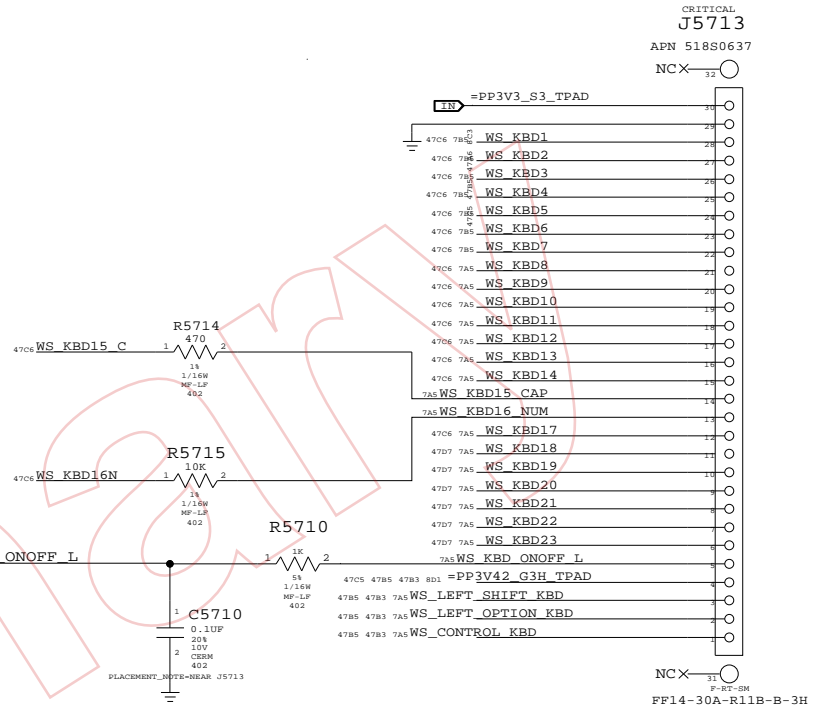
### PSOC USB CONTROLLER



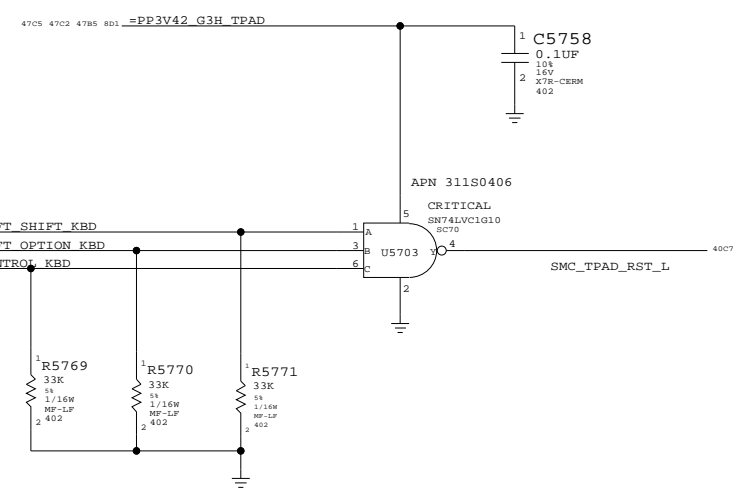
IC	PIN NAME	CURRENT	R_SMS	V_SMS	POWER
TMP102	V+	100A	2.55 KOHM	0.0255 V	0.255E-6 W
3V3 LDO	VDD	60MA MAX	10 OHM	0.6 V	16.32E-3 W
PSOC	VOUT	60MA MAX	0.2 OHM	0.012 V	0.72E-3 W
	VDD	8MA (TVP)	1.5 OHM	0.012 V	96E-6 W
		14MA (MAX)		0.021 V	294E-6 W
1.8V BOOSTER	VIN	48A (MAX)	4.7 OHM	0.0188 V	75.2E-6 W



### KEYBOARD CONNECTOR



### SMC\_MANUAL\_RESET LOGIC



**WELLSPRING 1**

SYNC\_MASTER=YUAN.MA SYNC\_DATE=04/22/2008

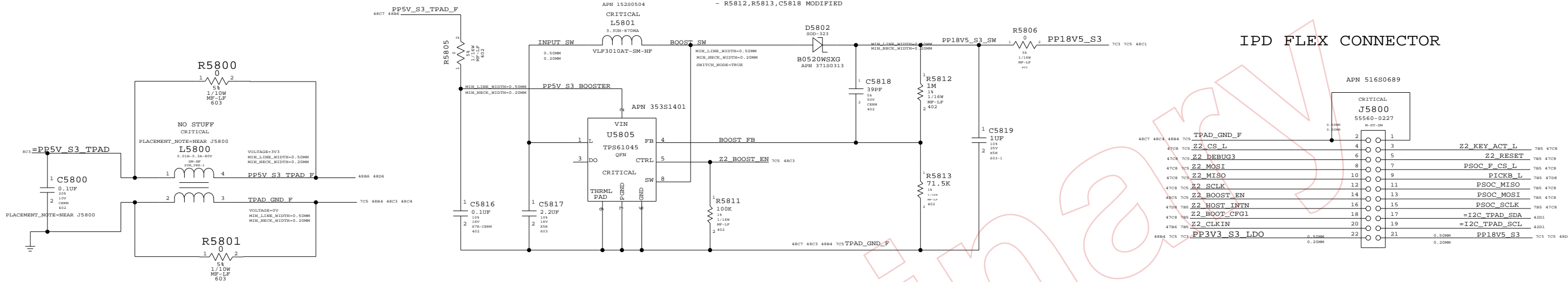
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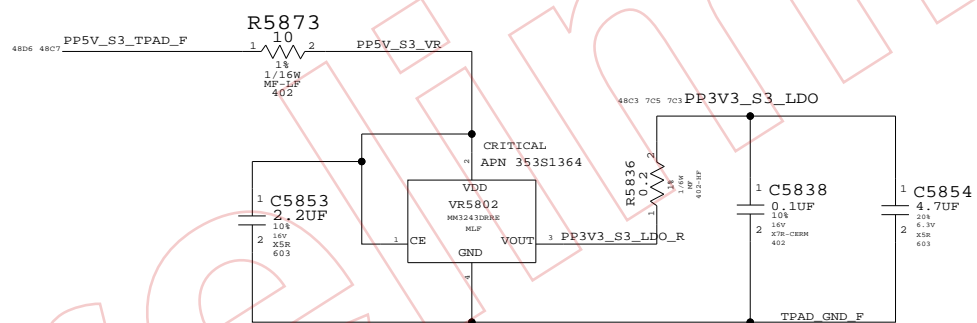
I TO MAINTAIN THE DOCUMENT IN CONFIDENCE  
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### BOOSTER +18.5VDC FOR SENSORS

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

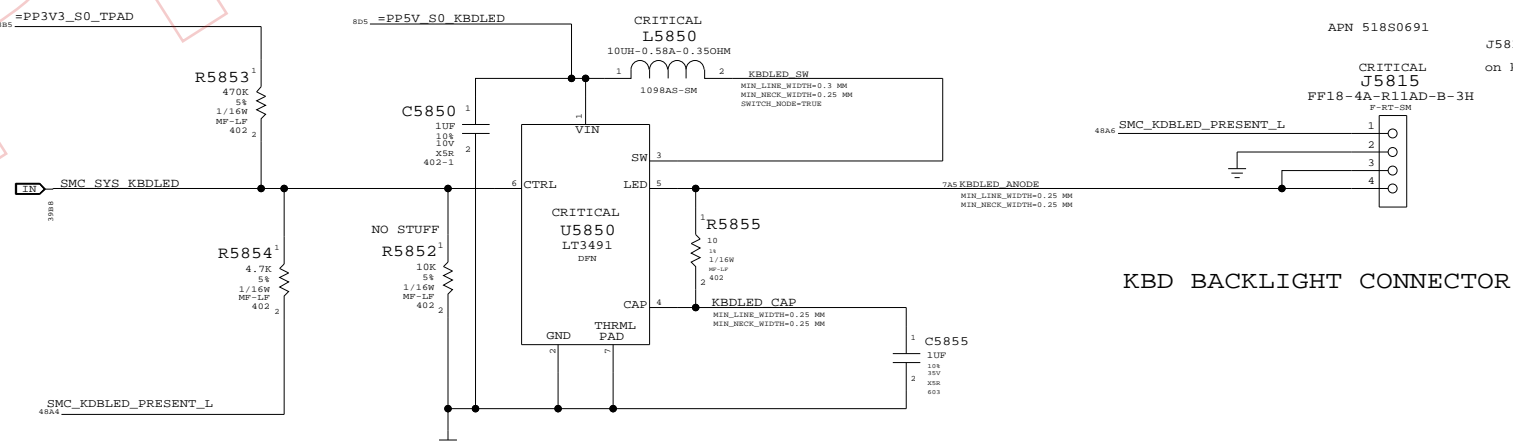


### 3V3 LDO FOR IPD



### KEYBOARD BACKLIGHT DRIVING AND DETECTION

To detect Keyboard backlight, SMC will tristate SMC\_SYS\_KBDLED:  
 LOW = keyboard backlight present  
 HIGH = keyboard backlight not present  
 BOM OPTION: KBDLED\_YES  
 TURNED ON FOR BEST MLB CONFIG  
 R5853 ALWAYS PRESENT



### KBD BACKLIGHT CONNECTOR

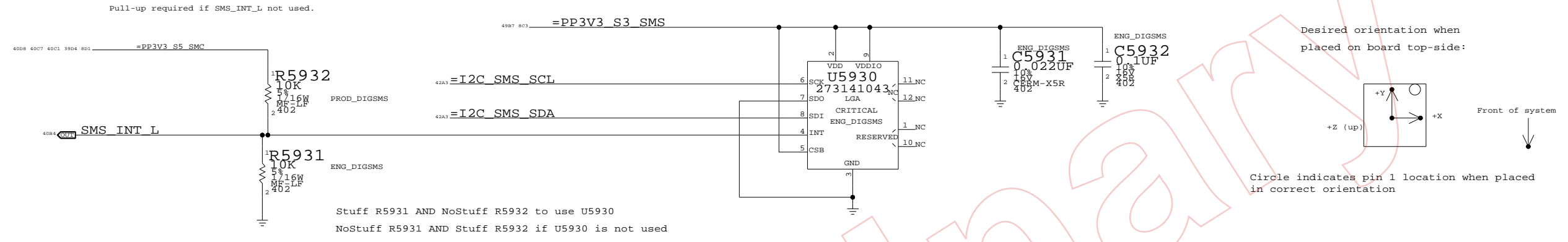
J5815 pin 1 is grounded on keyboard backlight flex

<b>WELLSPRING 2</b>	
SYNC_MASTER=YUAN.MA	SYNC_DATE=05/09/2008
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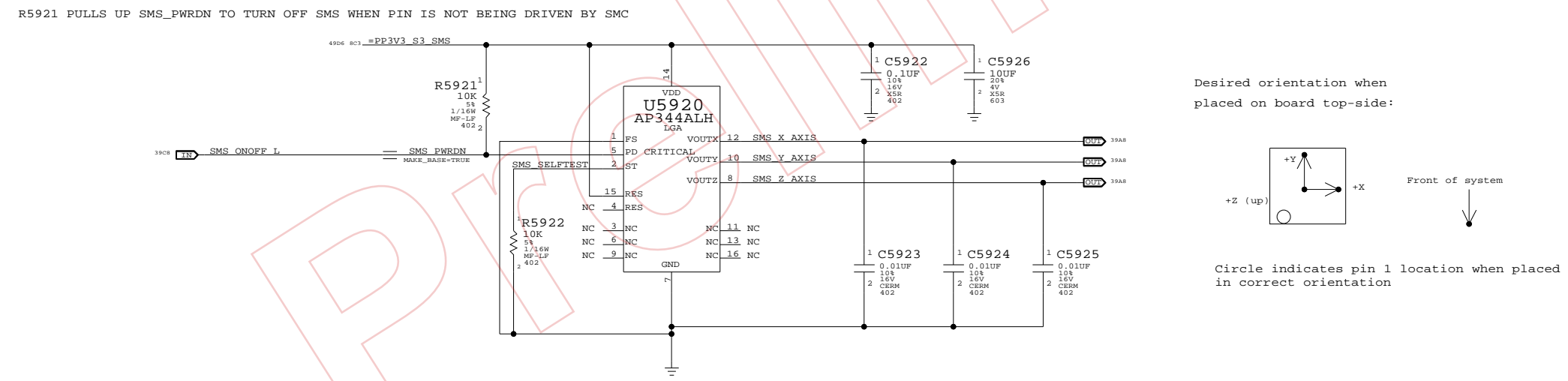
APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT	OF	109
NONE	58		



## Digital SMS



## Analog SMS



**SMS**

SYNC\_MASTER=YUNWU      SYNC\_DATE=06/26/2008

NOTICE OF PROPRIETARY PROPERTY

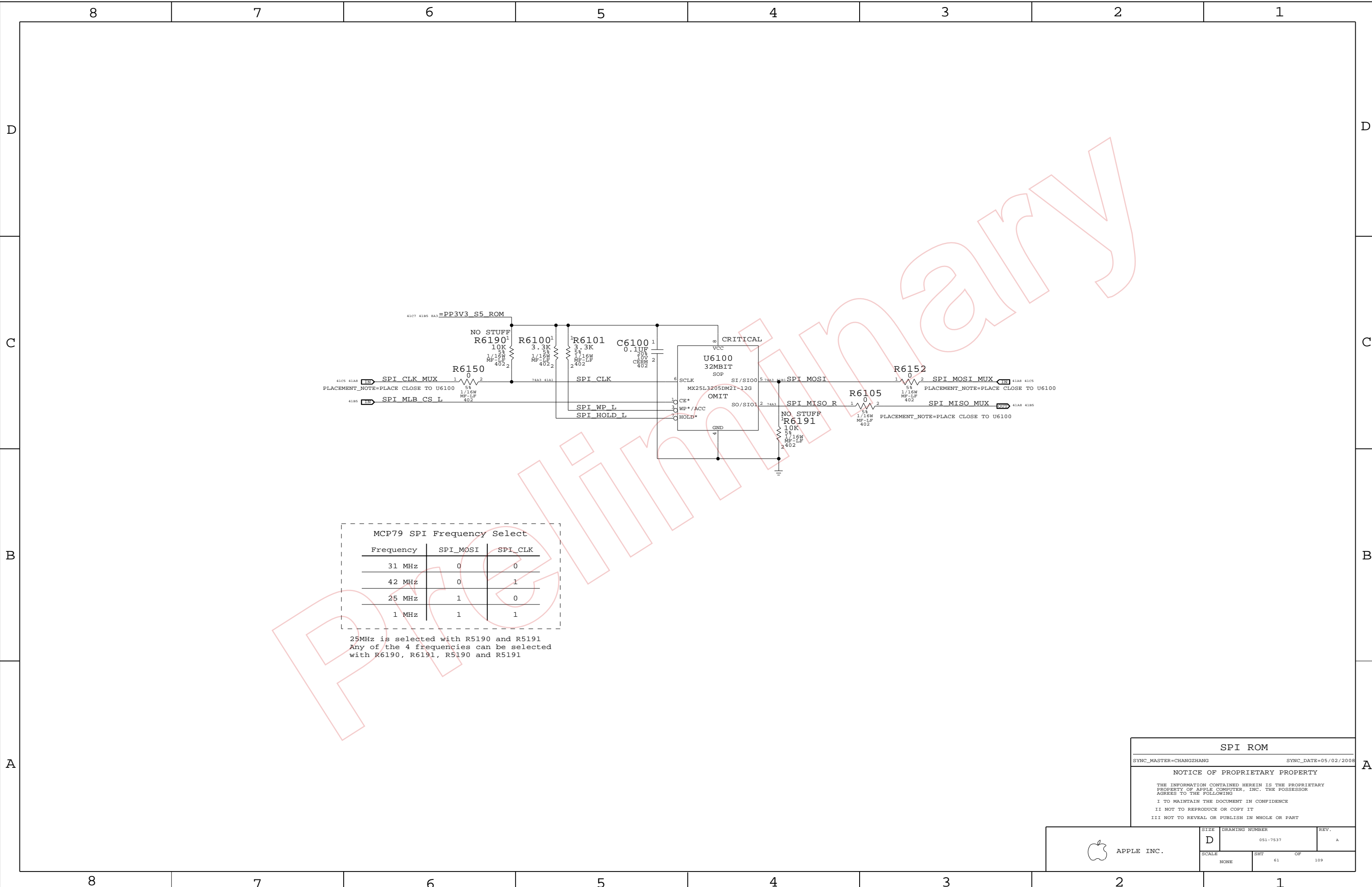
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III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

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



MCP79 SPI Frequency Select

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

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

**SPI ROM**

SYNC\_MASTER=CHANGZHANG      SYNC\_DATE=05/02/2008

**NOTICE OF PROPRIETARY PROPERTY**

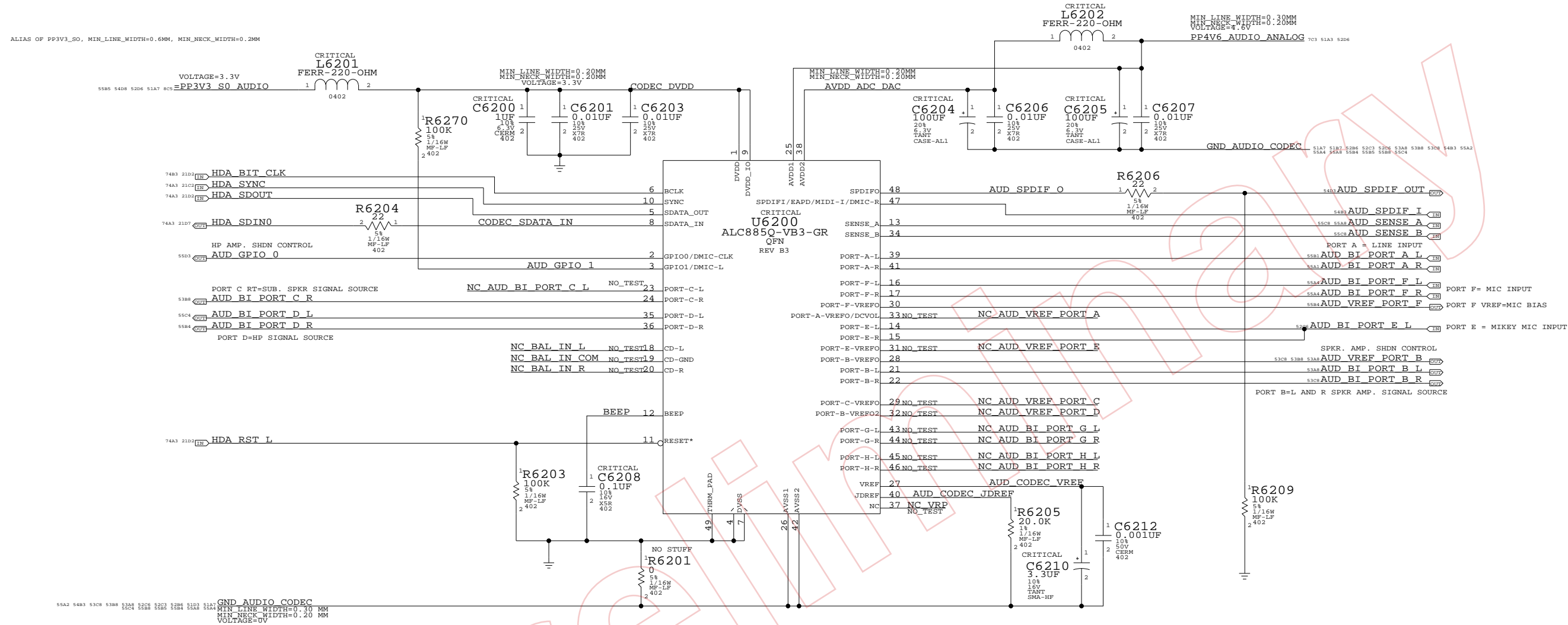
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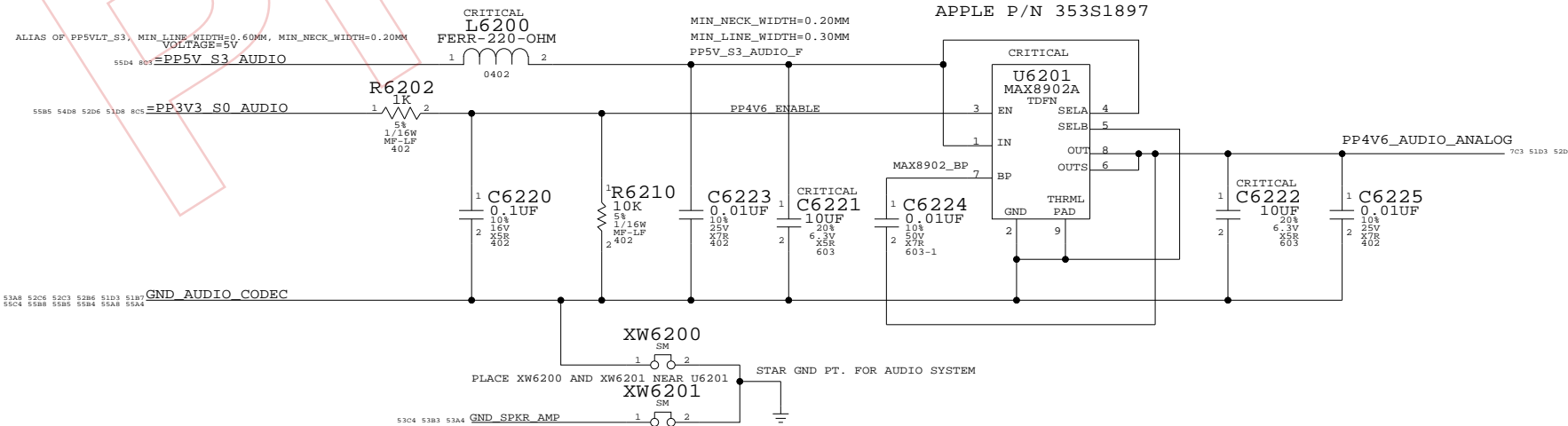
	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT	OF	109
NONE	61		

AUDIO CODEC  
APPLE P/N 353S1538

ALIAS OF PP3V3\_S0, MIN\_LINE\_WIDTH=0.6MM, MIN\_NECK\_WIDTH=0.2MM



AUDIO 4.6V REGULATOR  
APPLE P/N 353S1897



**AUDIO: CODEC**

SYNC\_MASTER=AUDIO SYNC\_DATE=07/01/2008

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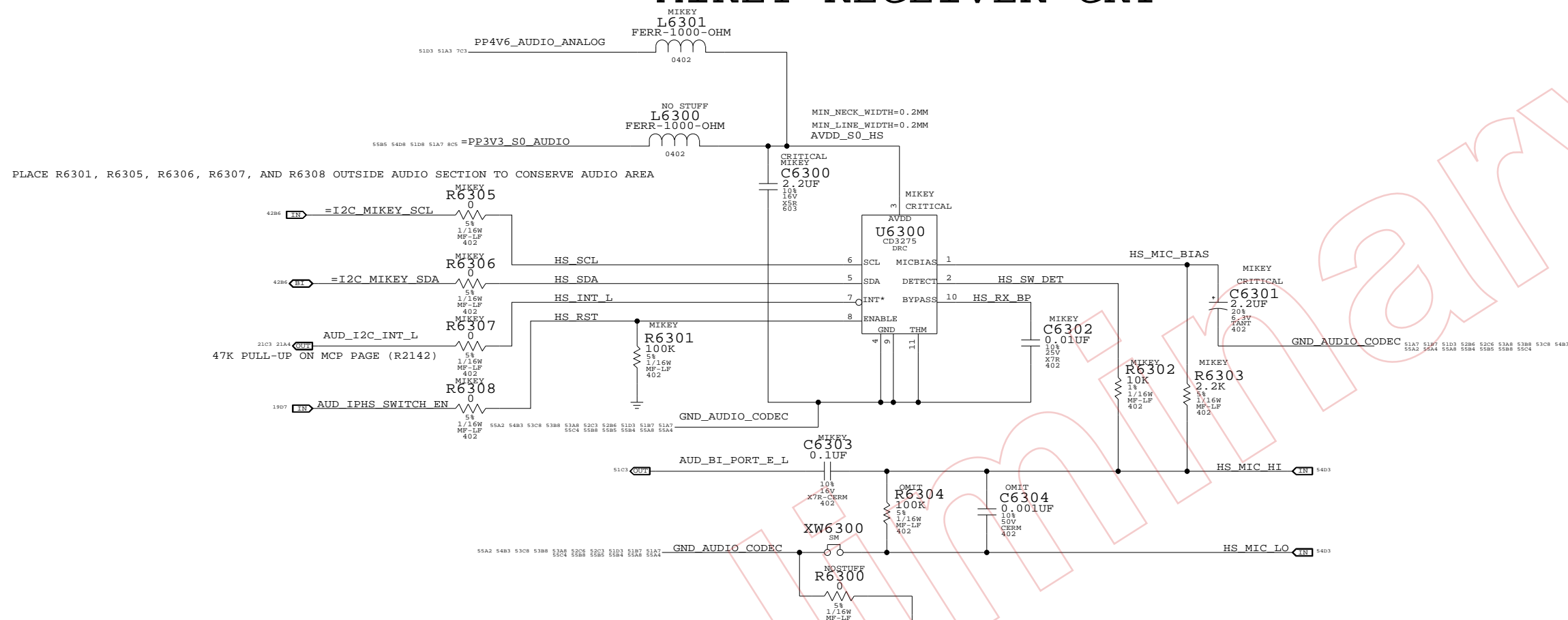
I TO MAINTAIN THE DOCUMENT IN CONFIDENCE

II NOT TO REPRODUCE OR COPY IT

III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

 APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT	OF	109
NONE	62		

# MIKEY RECEIVER CKT



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

**AUDIO: MIKEY**

SYNC\_MASTER=AUDIO      SYNC\_DATE=07/03/2008

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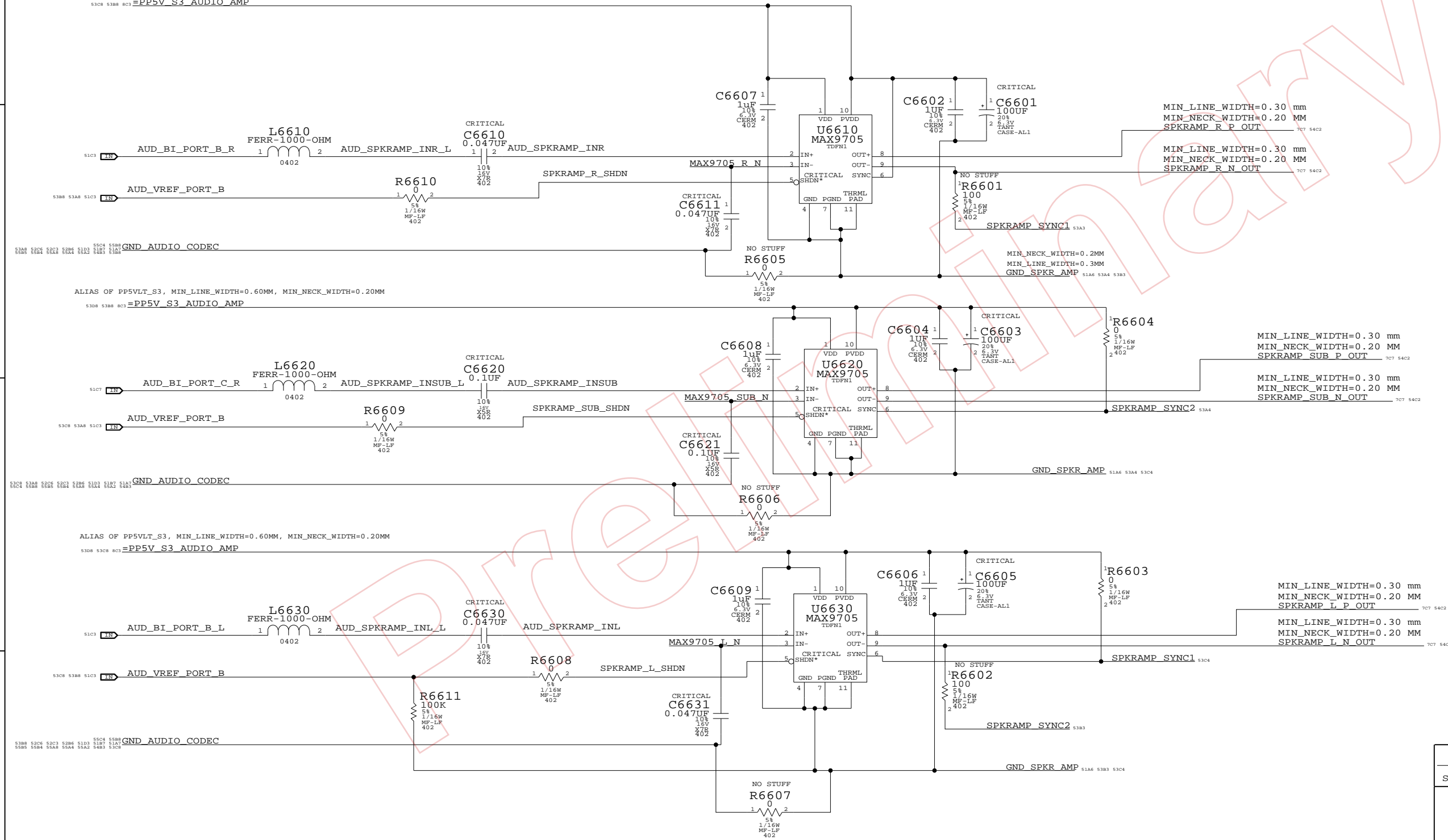
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APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT	OF	
NONE	63	109	

SATELLITE & SUB TWEETER AMPLIFIER APN:353S1595

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

ALIAS OF PP5VLT\_S3, MIN\_LINE\_WIDTH=0.60MM, MIN\_NECK\_WIDTH=0.20MM  
 VOLTAGE=5V  
 5308 5388 RC1=PP5V\_S3\_AUDIO\_AMP



**AUDIO: SPEAKER AMP**  
 SYNC\_MASTER=AUDIO SYNC\_DATE=07/01/2008  
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APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT	OF	109
NONE	66		

AUDIO JACK 1: LO/HP CONNECTOR, SPDIF TX

MIC CONNECTOR  
APN: 518S0520

SPEAKER CONNECTOR  
APN: 518S0519

APN: 518S0521

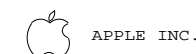
MIC EMI FILTER

AUDIO: JACK

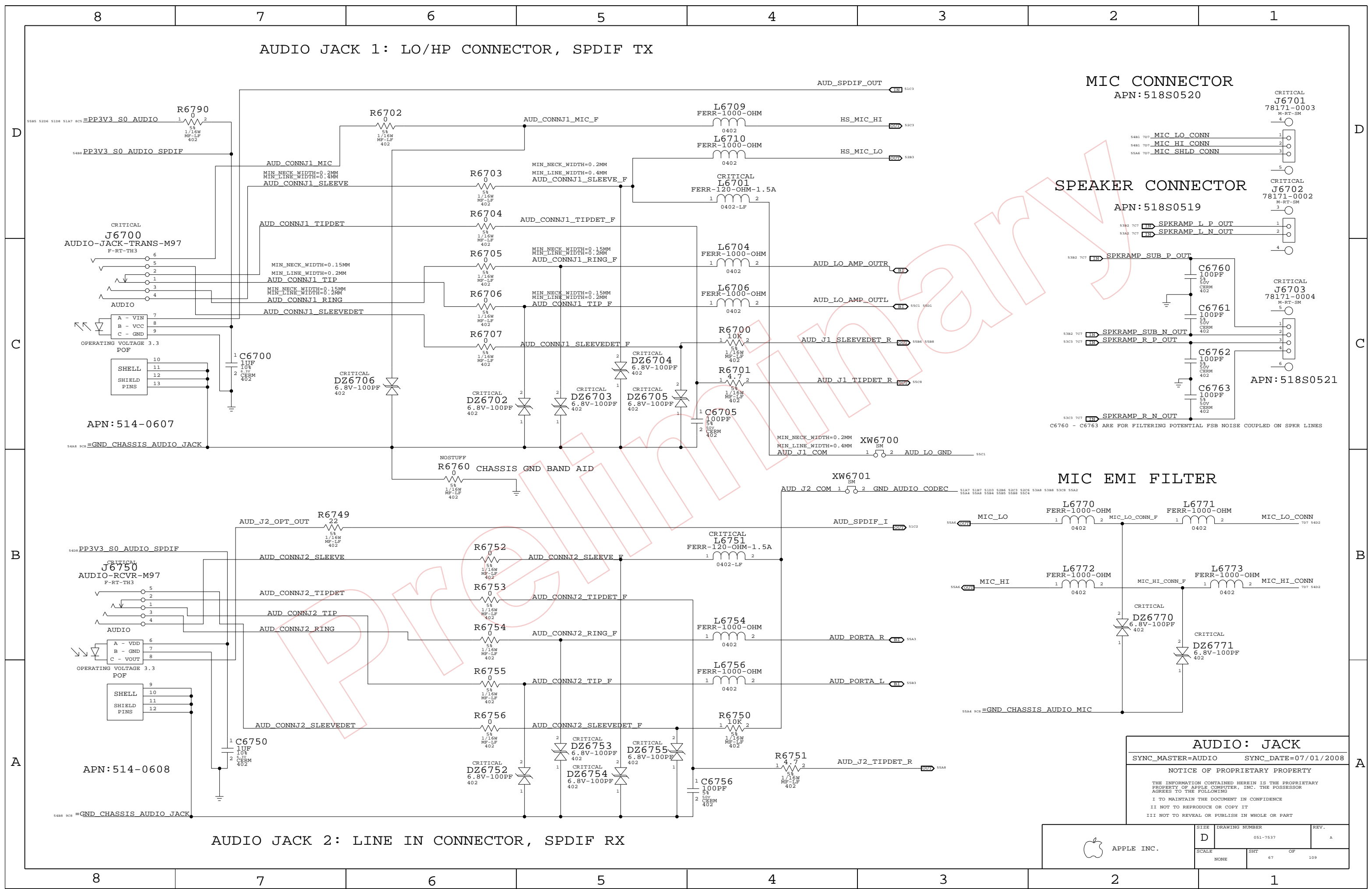
SYNC\_MASTER=AUDIO SYNC\_DATE=07/01/2008

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



8 7 6 5 4 3 2 1

D  
C  
B  
A

D  
C  
B  
A

8 7 6 5 4 3 2 1

AUDIO JACK 2: LINE IN CONNECTOR, SPDIF RX

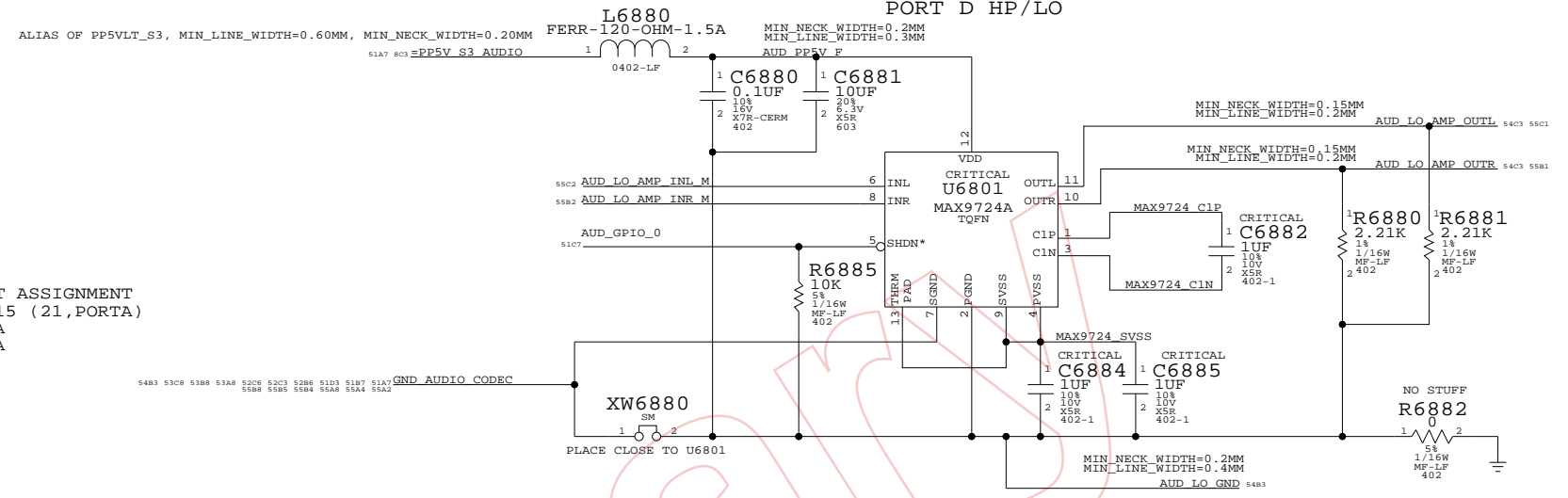
HP/LO AMP  
APN:353S1637  
PORT D HP/LO

CODEC OUTPUT SIGNAL PATHS

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

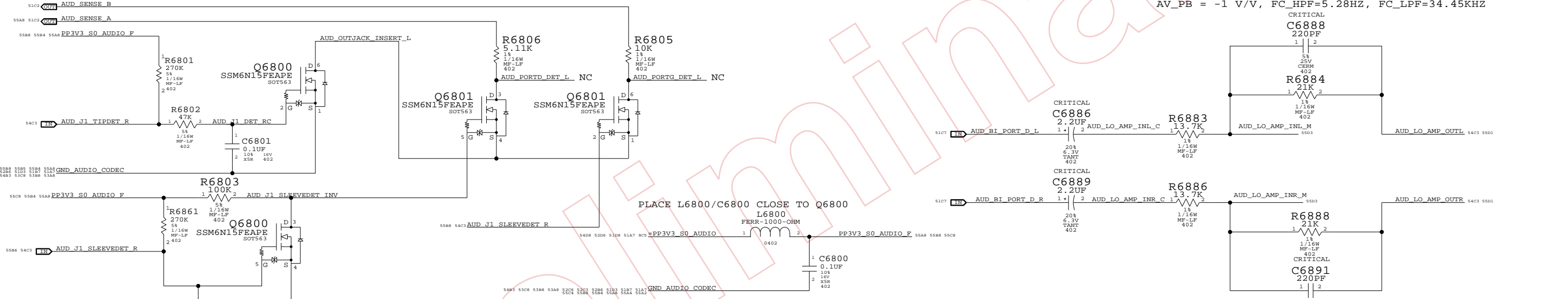
CODEC INPUT SIGNAL PATHS

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



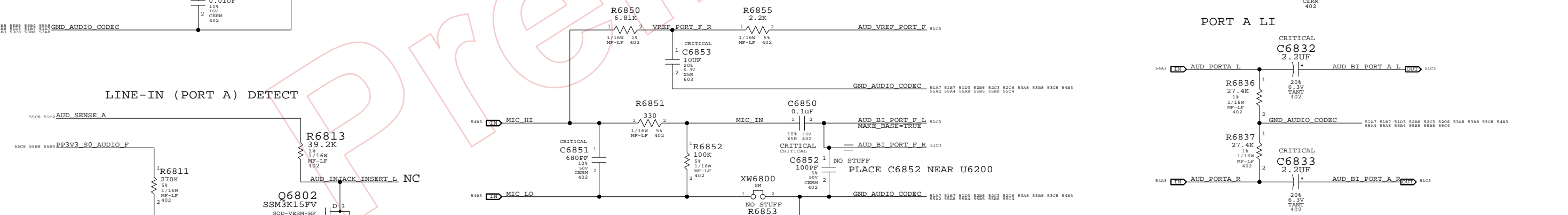
PORT D DETECT PORT G DETECT (SPDIF DELEGATE)

MAX9724 GAIN/FILTER COMPONENTS  
AV\_PB = -1 V/V, FC\_HPF=5.28HZ, FC\_LPF=34.45KHZ

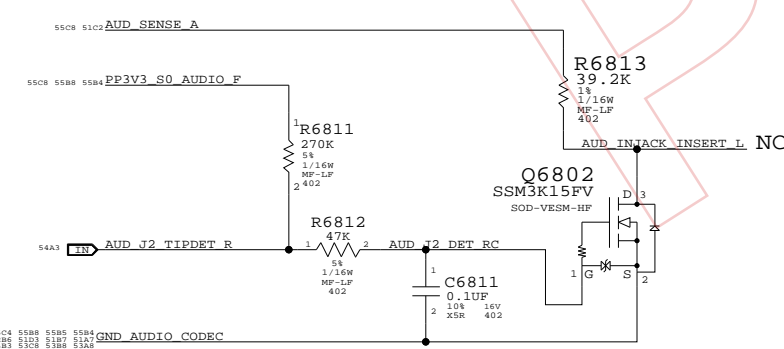


MIC INPUT CIRCUITRY

PORT A LI



LINE-IN (PORT A) DETECT



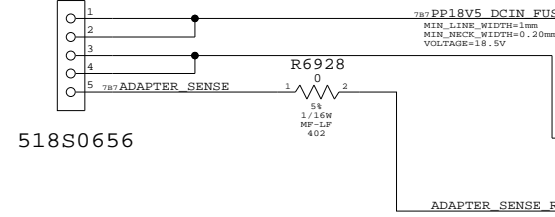
**AUDIO: JACK TRANSLATORS**  
SYNC\_MASTER=AUDIO SYNC\_DATE=07/01/2008

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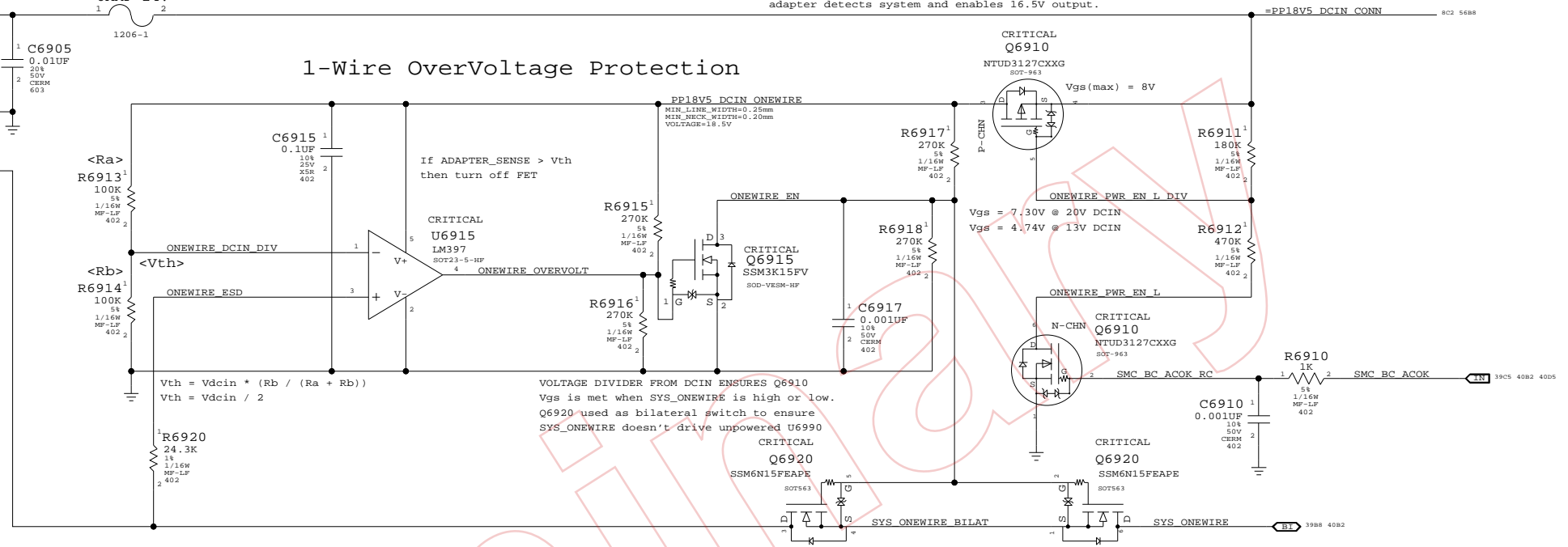
APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT	OF	109
NONE	68		

# MagSafe DC Power Jack

CRITICAL  
J6900  
78048-0573  
M-RT-SM



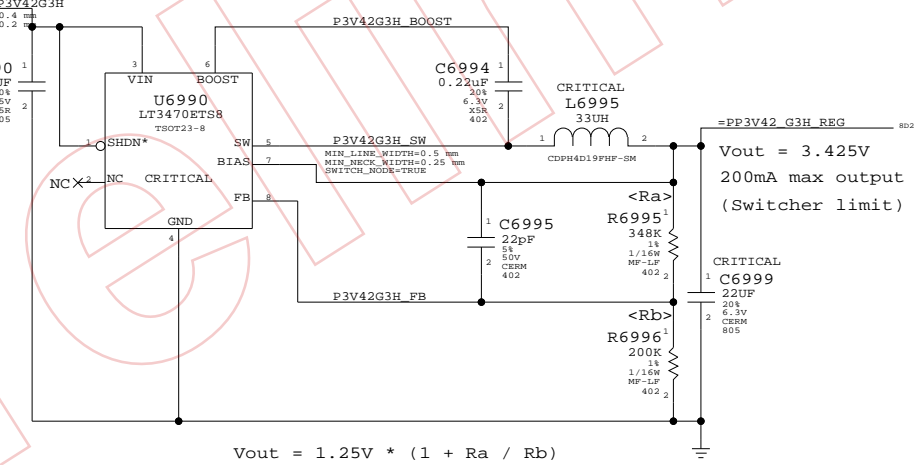
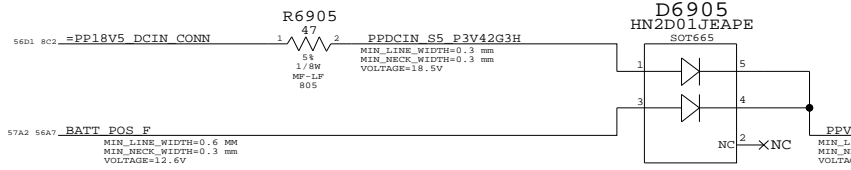
CRITICAL  
F6905  
6AMP-24V  
1206-1



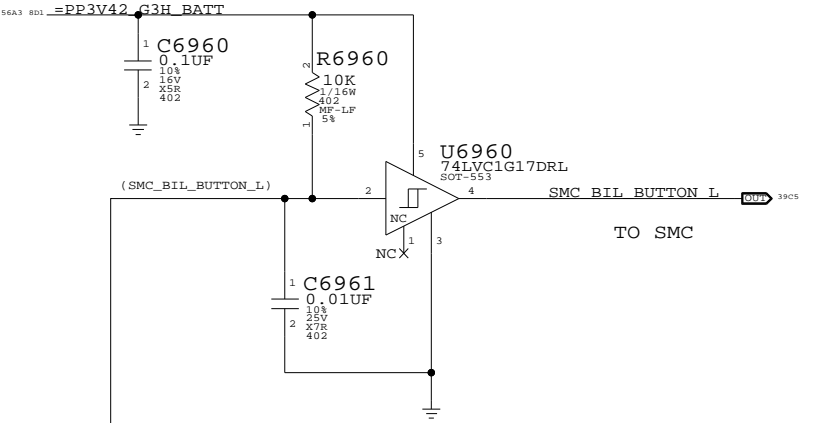
Q6910 restricts system load to 10K-70K window until adapter detects system and enables 16.5V output.

## 3.425V "G3Hot" Supply

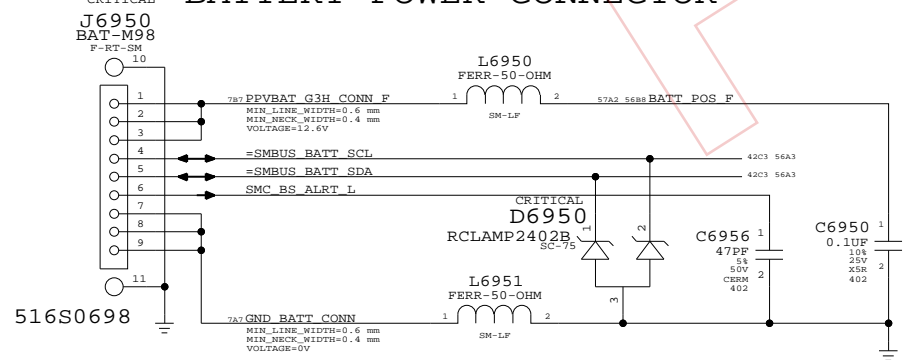
Supply needs to guarantee 3.31V delivered to SMC VRef generator



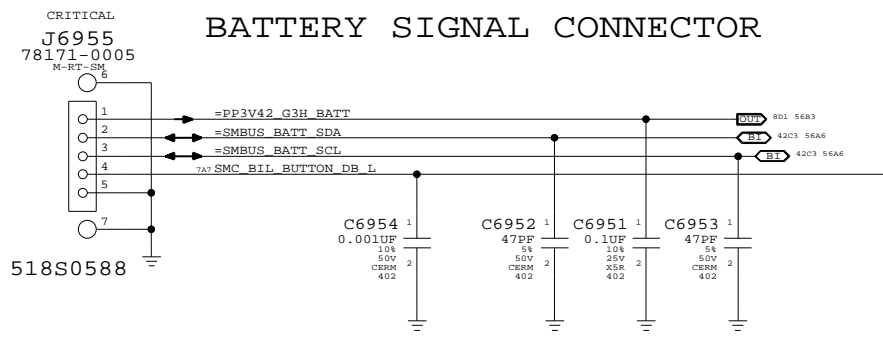
## BIL BUTTON DEBOUNCE CIRCUIT



## BATTERY POWER CONNECTOR



## BATTERY SIGNAL CONNECTOR



DC-In & Battery Connectors

SYNC\_MASTER=JACK SYNC\_DATE=03/13/2008

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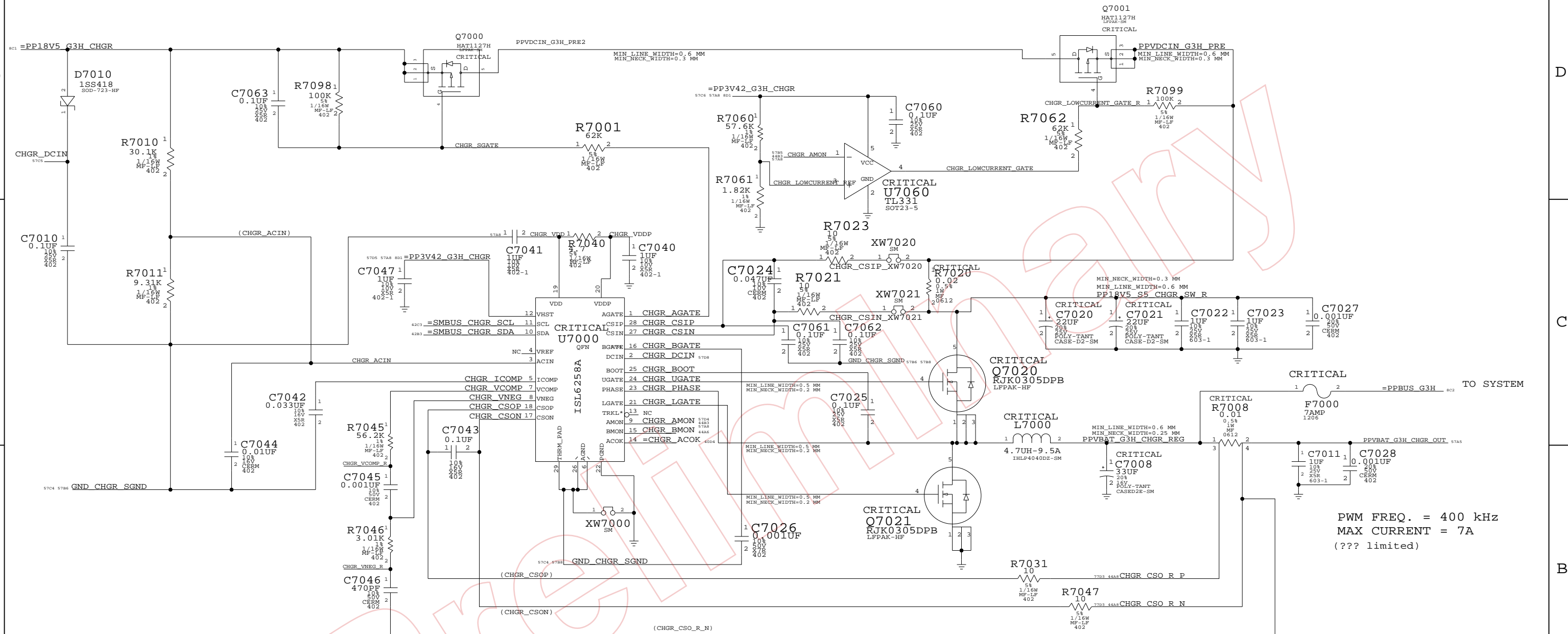
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III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

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



# PBUS SUPPLY / BATTERY CHARGER



**PBUS Supply/Battery Charger**  
 SYNC\_MASTER=RAYMOND SYNC\_DATE=01/31/2008

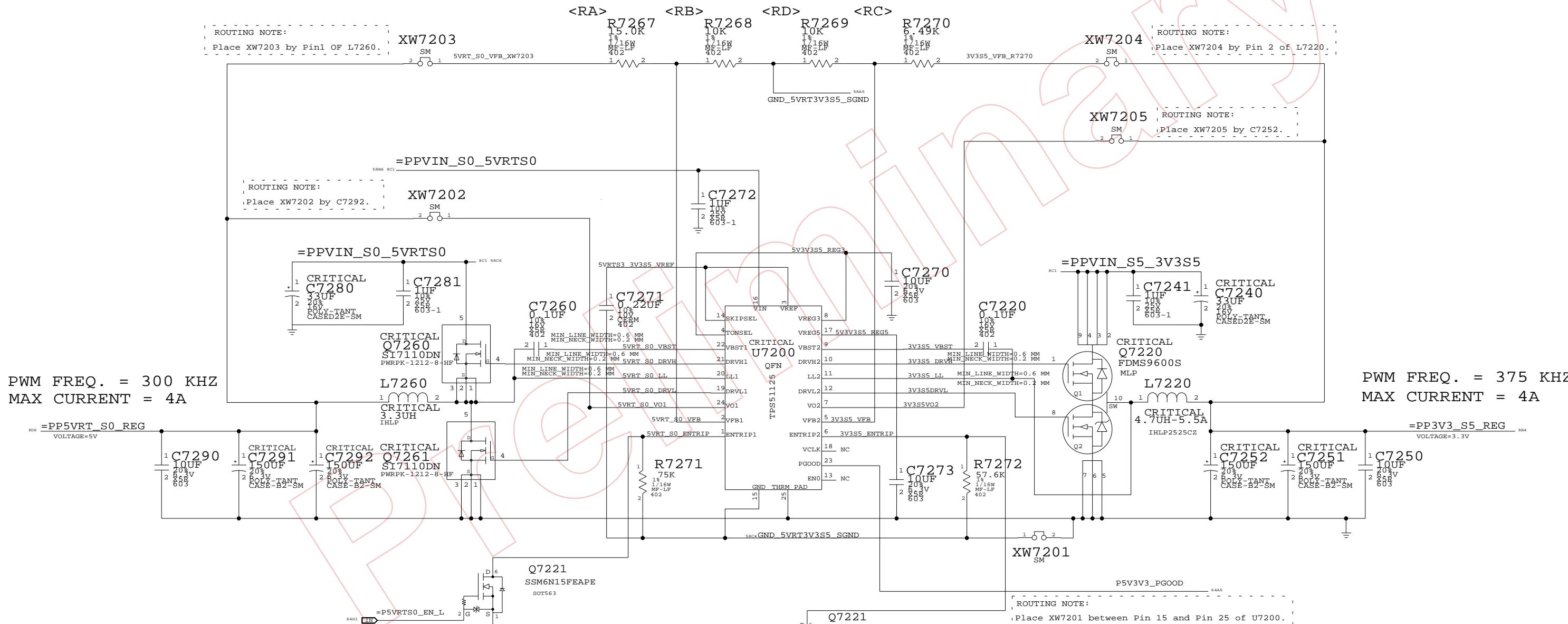
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	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT	OF	109
NONE	70		

# 5V\_RT/3.3V POWER SUPPLY

$$V_{OUT} = (2 * RA / RB) + 2$$

$$V_{OUT} = (2 * RC / RD) + 2$$



PWM FREQ. = 300 KHZ  
MAX CURRENT = 4A

PWM FREQ. = 375 KHZ  
MAX CURRENT = 4A

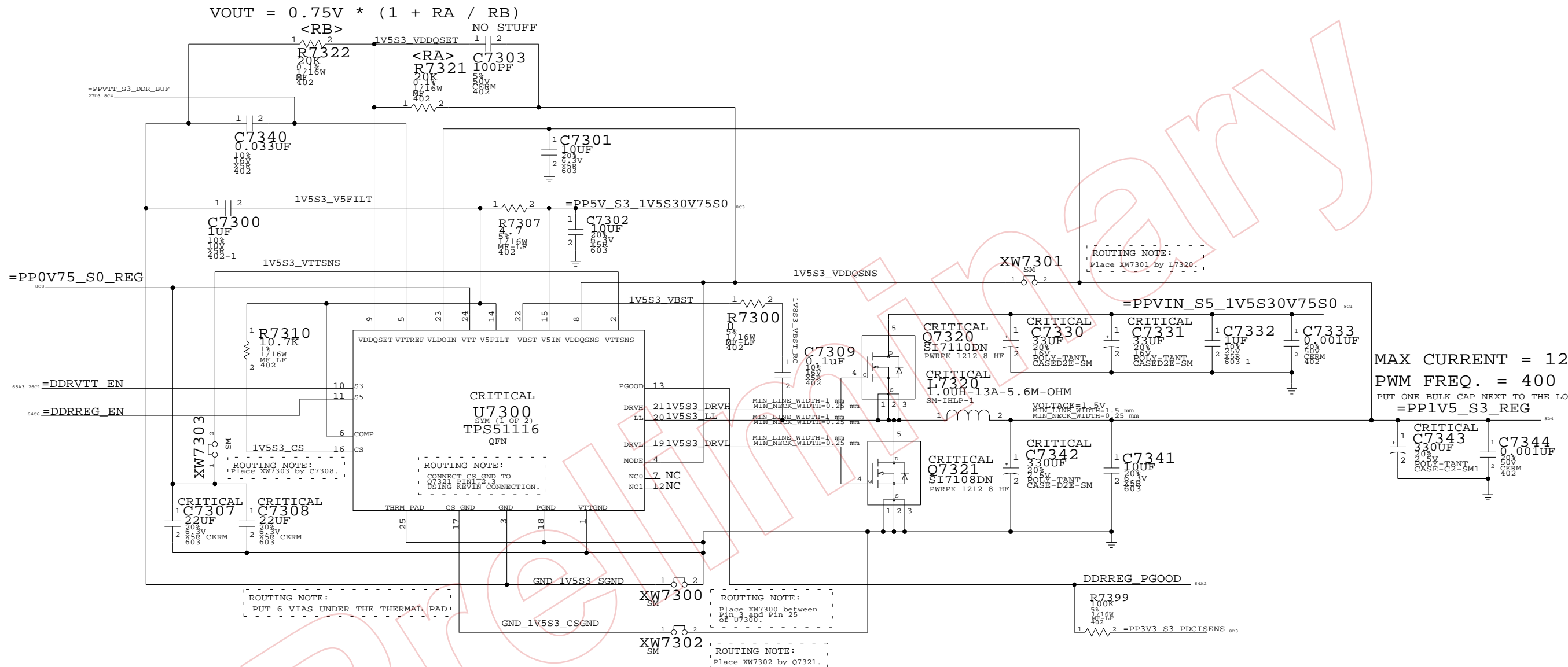
ROUTING NOTE:  
Place XW7201 between Pin 15 and Pin 25 of U7200.

SEPARATED MASTER PGOOD FOR BOTH 5V AND 3V3.

**5V/3.3V SUPPLY**  
 SYNC\_MASTER=RAYMOND    SYNC\_DATE=02/08/2008  
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APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT	OF	109
NONE	72		

# 1.5V/0.75V (DDR3) POWER SUPPLY



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

1.5V/0.75V DDR3 SUPPLY  
 SYNC\_MASTER=RAYMOND SYNC\_DATE=01/31/2008

NOTICE OF PROPRIETARY PROPERTY

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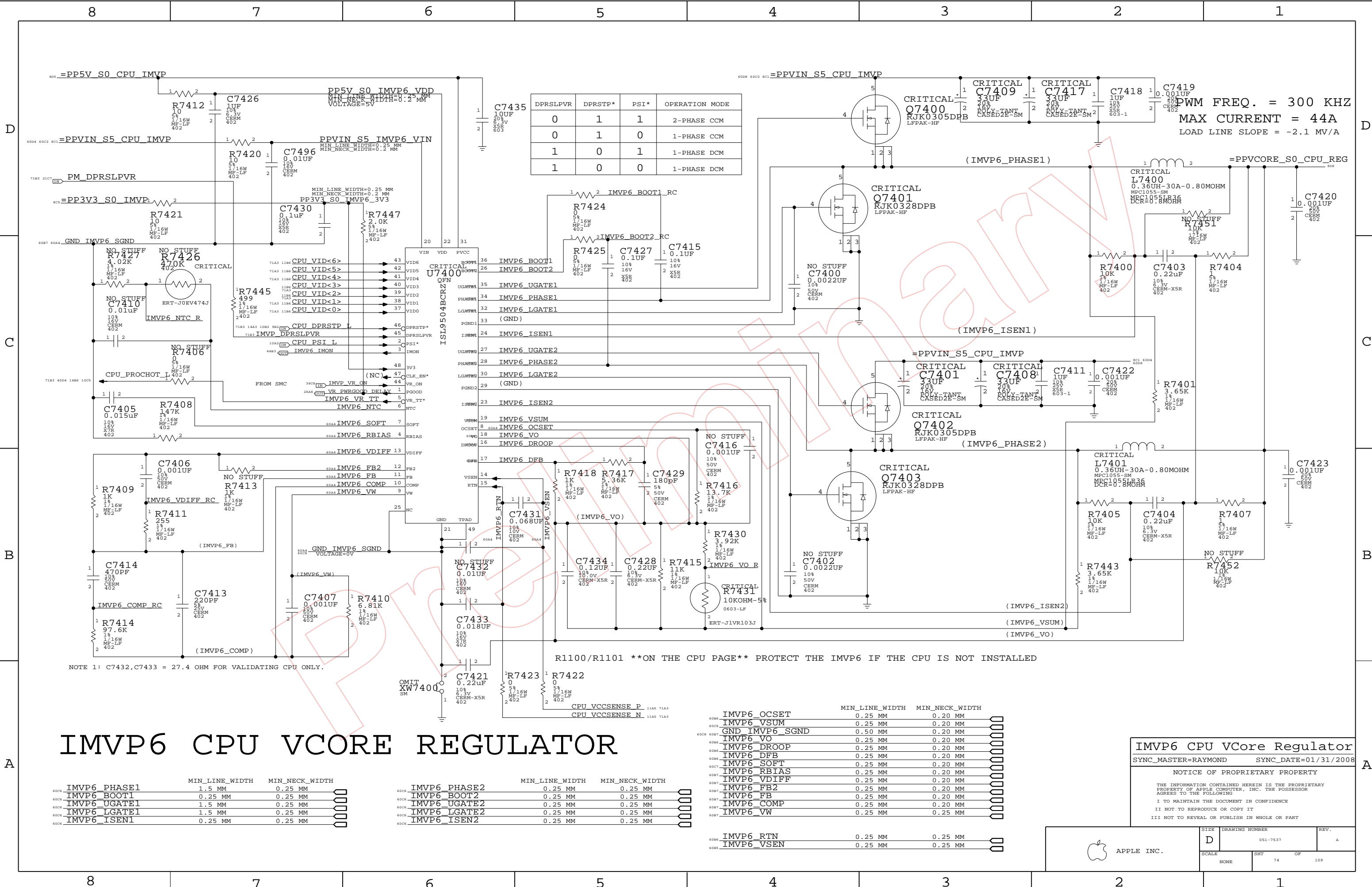
I TO MAINTAIN THE DOCUMENT IN CONFIDENCE

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III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE INC.

SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE	SHT	OF
NONE	73	109



DPRSPLVR	DPRSTP*	PSI*	OPERATION MODE
0	1	1	2-PHASE CCM
0	1	0	1-PHASE CCM
1	0	1	1-PHASE DCM
1	0	0	1-PHASE DCM

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

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

# IMVP6 CPU VCore Regulator

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

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

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

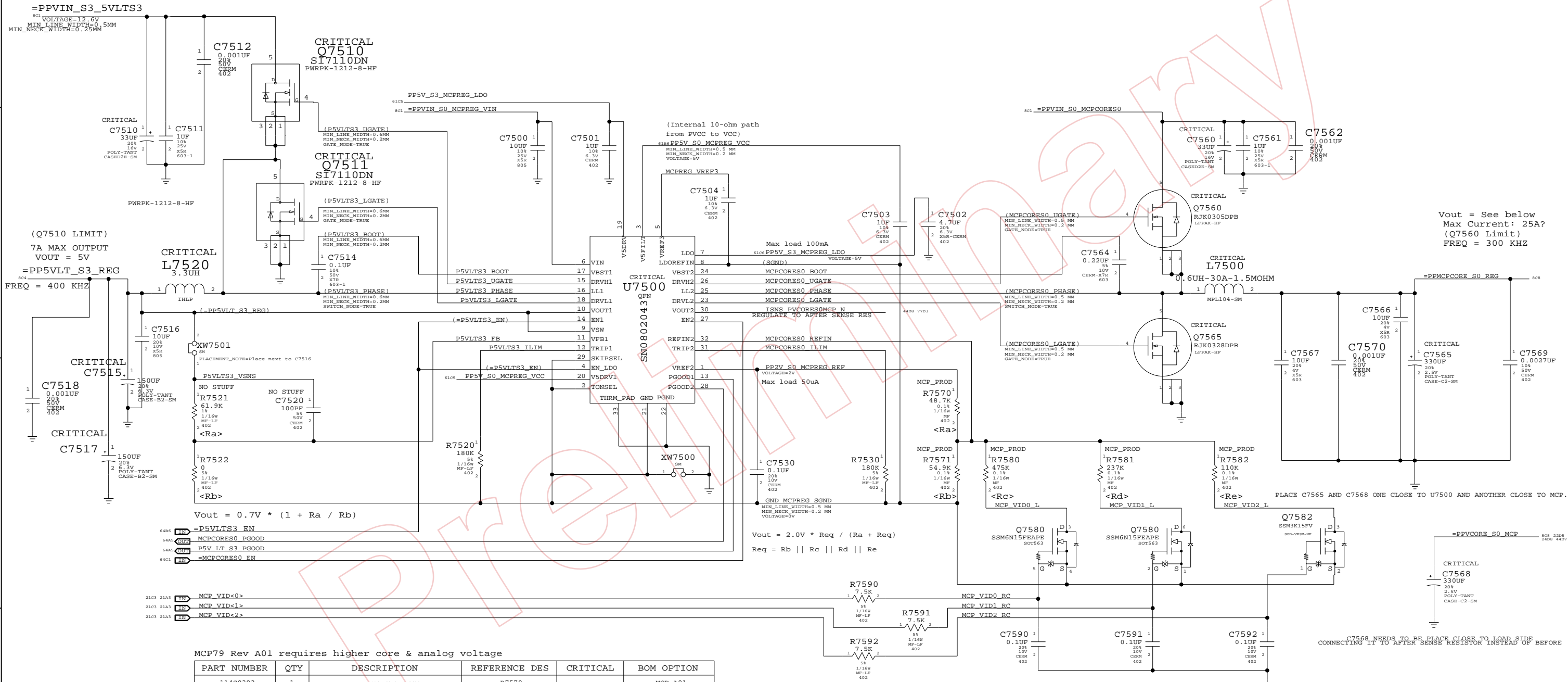
IMVP6 CPU VCore Regulator  
 SYNC\_MASTER=RAYMOND SYNC\_DATE=01/31/2008

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APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHEET	OF	
NONE	74	109	

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

# MCP VCORE / 5V\_S3 LEFT REGULATOR



MCP79 Rev A01 requires higher core & analog voltage

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
114S0383	1	RES.MTL.FILM,1/16W,49.9K,1,0402,SMD,LP	R7570		MCP_A01
114S0401	1	RES.MTL.FILM,1/16W,76.7K,1,0402,SMD,LP	R7571		MCP_A01
114S0484	1	RES.MTL.FILM,1/16W,549K,1,0402,SMD,LP	R7580		MCP_A01
114S0454	1	RES.MTL.FILM,1/16W,274K,1,0402,SMD,LP	R7581		MCP_A01
114S0423	1	RES.MTL.FILM,1/16W,133K,1,0402,SMD,LP	R7582		MCP_A01
114S0373	1	RES.MTL.FILM,1/16W,40.2K,1,0402,SMD,LP	R7570		MCP_A01P&MCP_A01Q
114S0404	1	RES.MTL.FILM,1/16W,84.5K,1,0402,SMD,LP	R7571		MCP_A01P&MCP_A01Q
114S0458	1	RES.MTL.FILM,1/16W,301K,1,0402,SMD,LP	R7580		MCP_A01P&MCP_A01Q
114S0447	1	RES.MTL.FILM,1/16W,237K,1,0402,SMD,LP	R7581		MCP_A01P&MCP_A01Q
114S0411	1	RES.MTL.FILM,1/16W,100K,1,0402,SMD,LP	R7582		MCP_A01P&MCP_A01Q

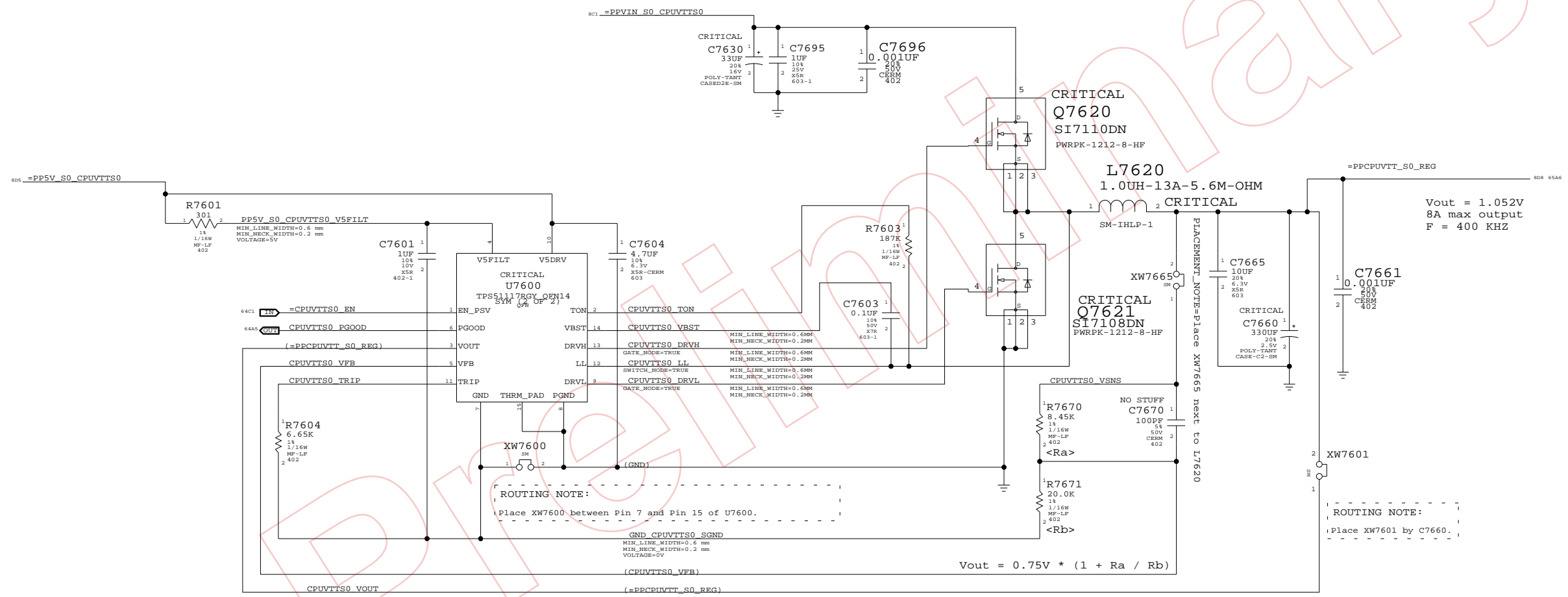
Rev A01 Production

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

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

**MCP VCORE REGULATOR**  
 SYNC\_MASTER=RAYMOND SYNC\_DATE=01/31/2008  
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# CPUVTT POWER SUPPLY

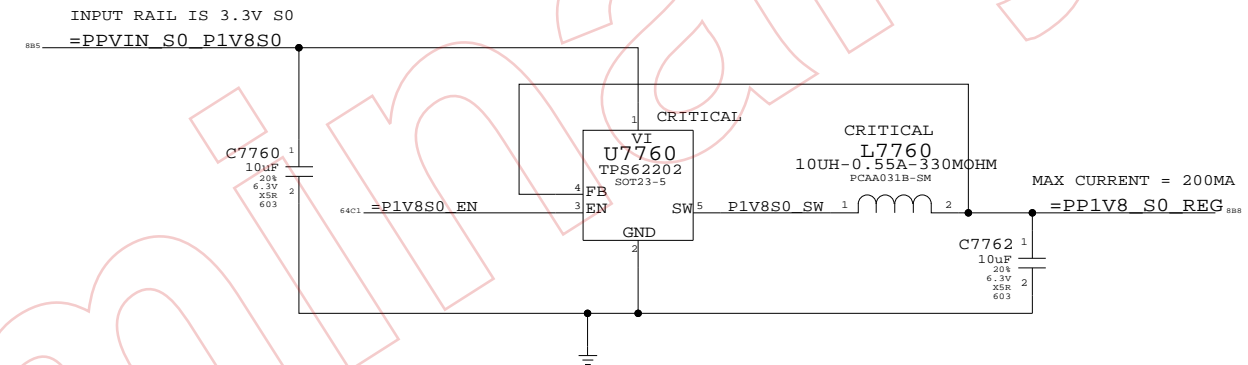


**CPU VTT(1.05V) SUPPLY**  
 SYNC\_MASTER=RAYMOND SYNC\_DATE=02/08/2008

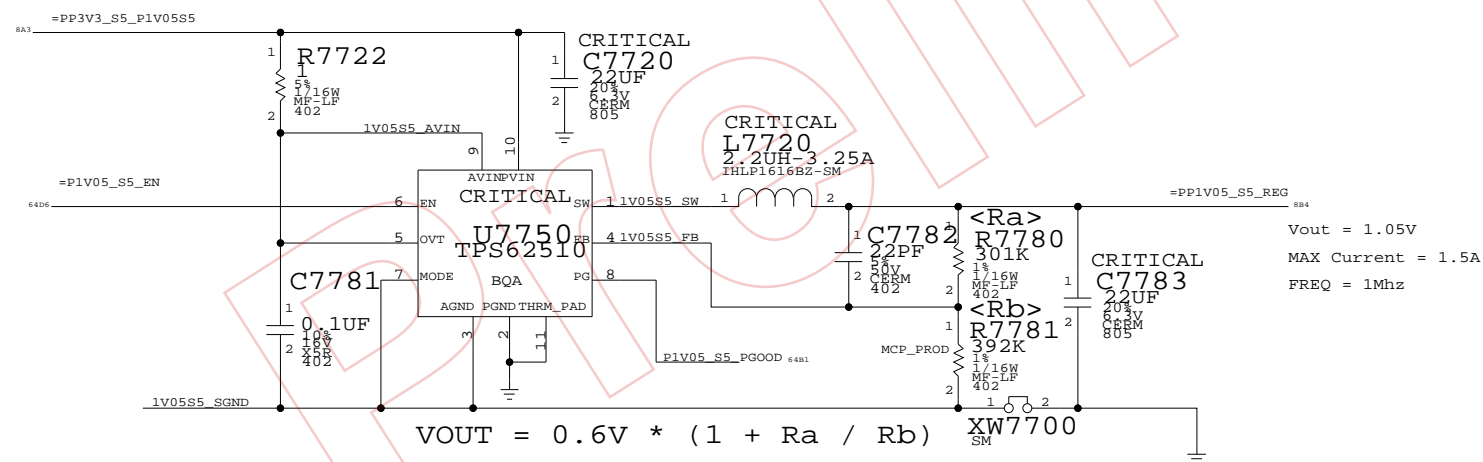
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APPLE INC.	SIZE <b>D</b>	DRAWING NUMBER 051-7537	REV. A
	SCALE NONE	SHEET 76	OF 109

# 1.8V S0 SWITCHER



## MCP 1.05V\_S5 AUXC SUPPLY



MCP79 Rev A01 requires higher voltage

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

VOUT = 1.102V

### MISC POWER SUPPLIES

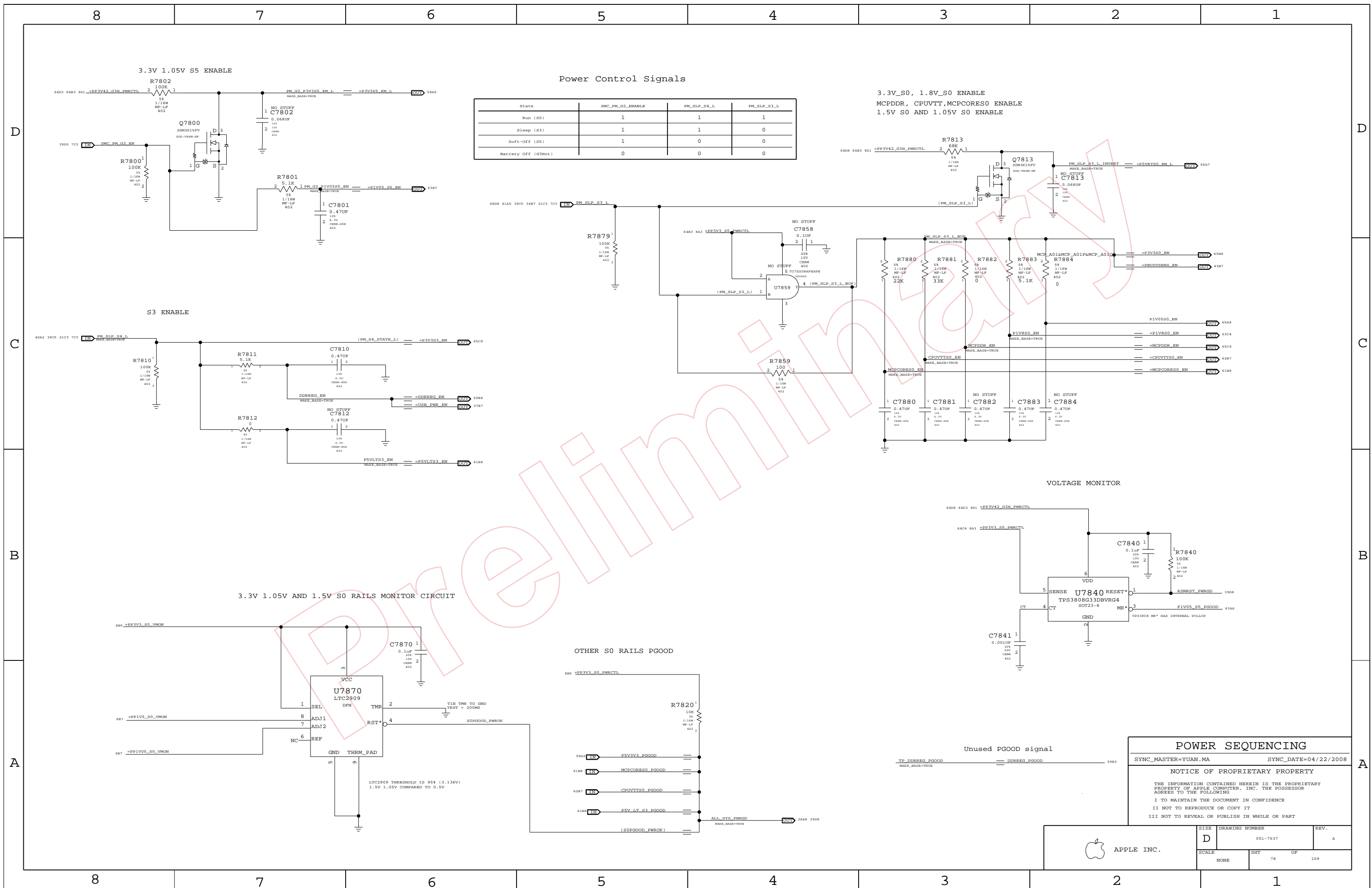
SYNC\_MASTER=RAYMOND SYNC\_DATE=01/23/2008

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

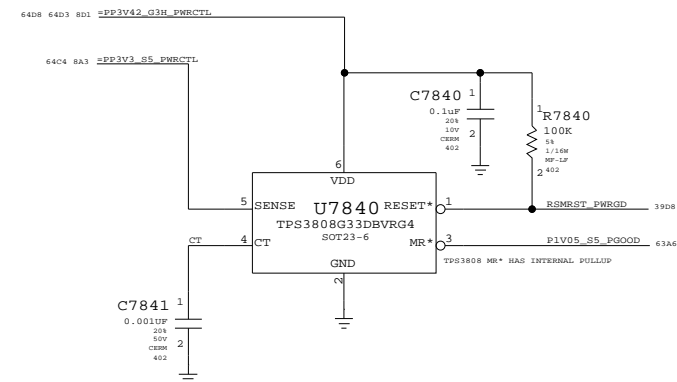


Power Control Signals

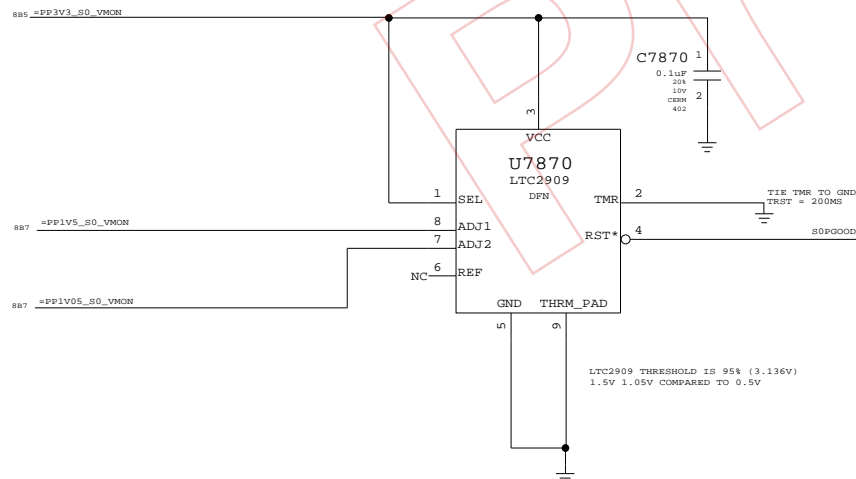
State	SMC_PM_G2_ENABLE	PM_SLP_S4_L	PM_SLP_S3_L
Run (S0)	1	1	1
Sleep (S3)	1	1	0
Soft-Off (S5)	1	0	0
Battery Off (G3Hot)	0	0	0

3.3V\_S0, 1.8V\_S0 ENABLE  
MCPDDR, CPUVTT, MCPCORES0 ENABLE  
1.5V S0 AND 1.05V S0 ENABLE

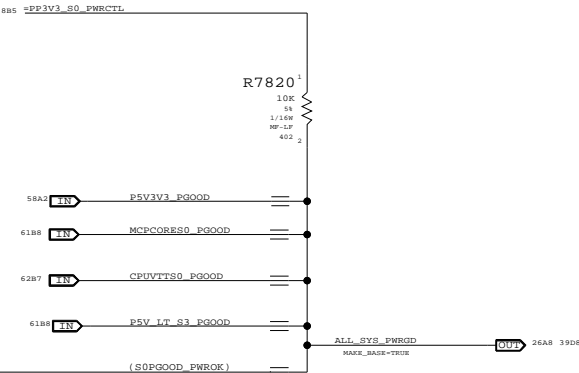
VOLTAGE MONITOR



3.3V 1.05V AND 1.5V S0 RAILS MONITOR CIRCUIT



OTHER S0 RAILS PGOOD



POWER SEQUENCING

SYNC\_MASTER=YUAN.MA SYNC\_DATE=04/22/2008

NOTICE OF PROPRIETARY PROPERTY

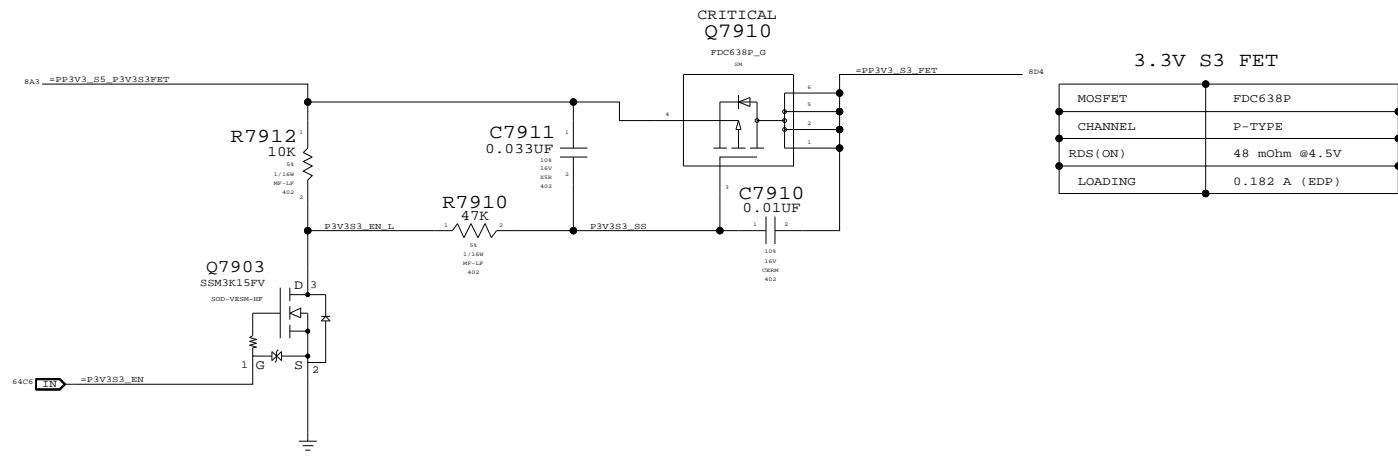
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SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE	SHT	OF
NONE	78	109



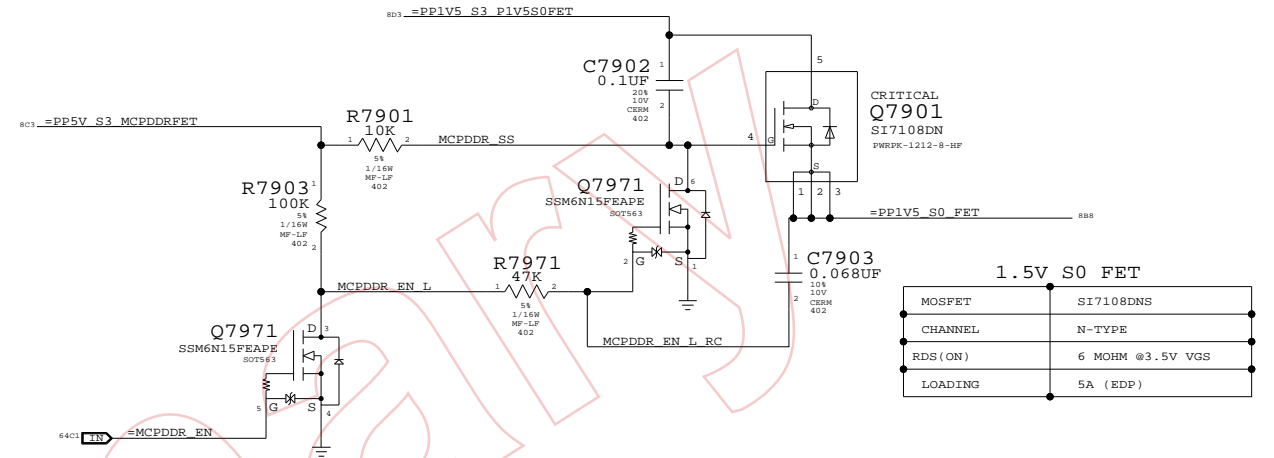
3.3V S3 FET



3.3V S3 FET	
MOSFET	FDC638P
CHANNEL	P-TYPE
RDS(ON)	48 mOhm @4.5V
LOADING	0.182 A (EDP)

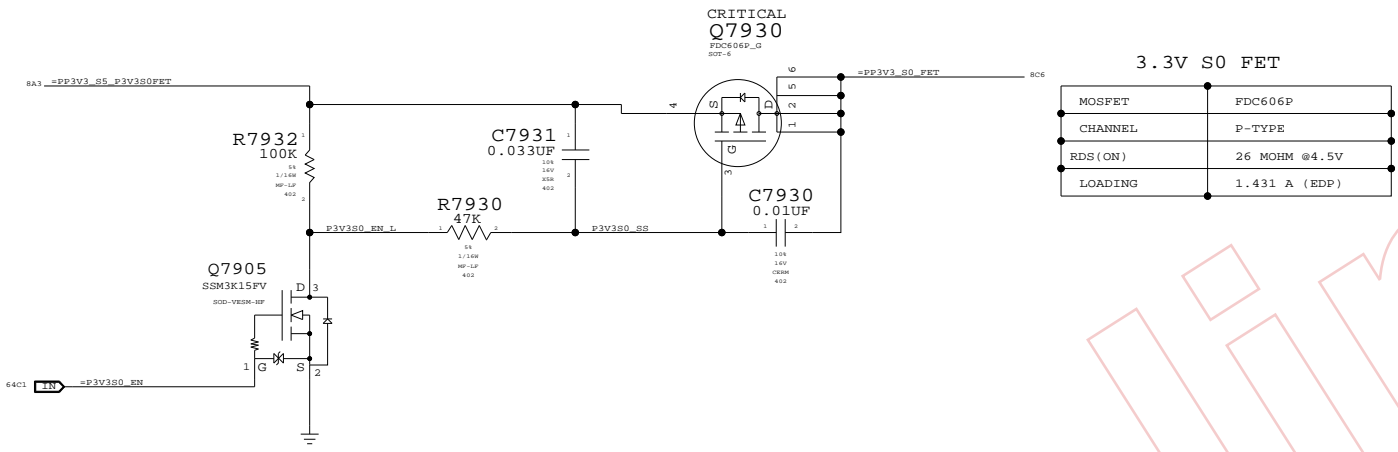
1.5V S0 FET

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



1.5V S0 FET	
MOSFET	SI7108DNS
CHANNEL	N-TYPE
RDS(ON)	6 MOHM @3.5V VGS
LOADING	5A (EDP)

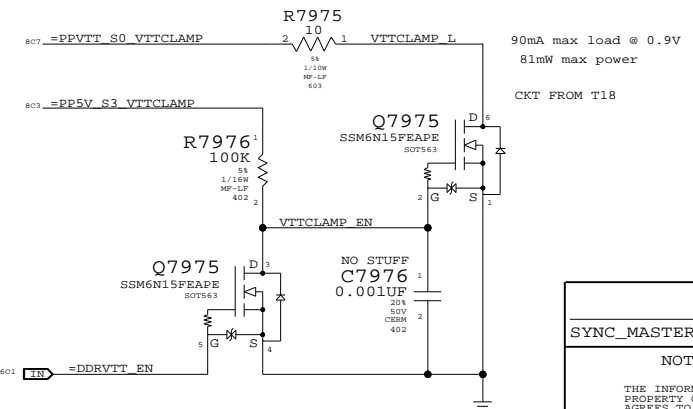
3.3V S0 FET



3.3V S0 FET	
MOSFET	FDC606P
CHANNEL	P-TYPE
RDS(ON)	26 MOHM @4.5V
LOADING	1.431 A (EDP)

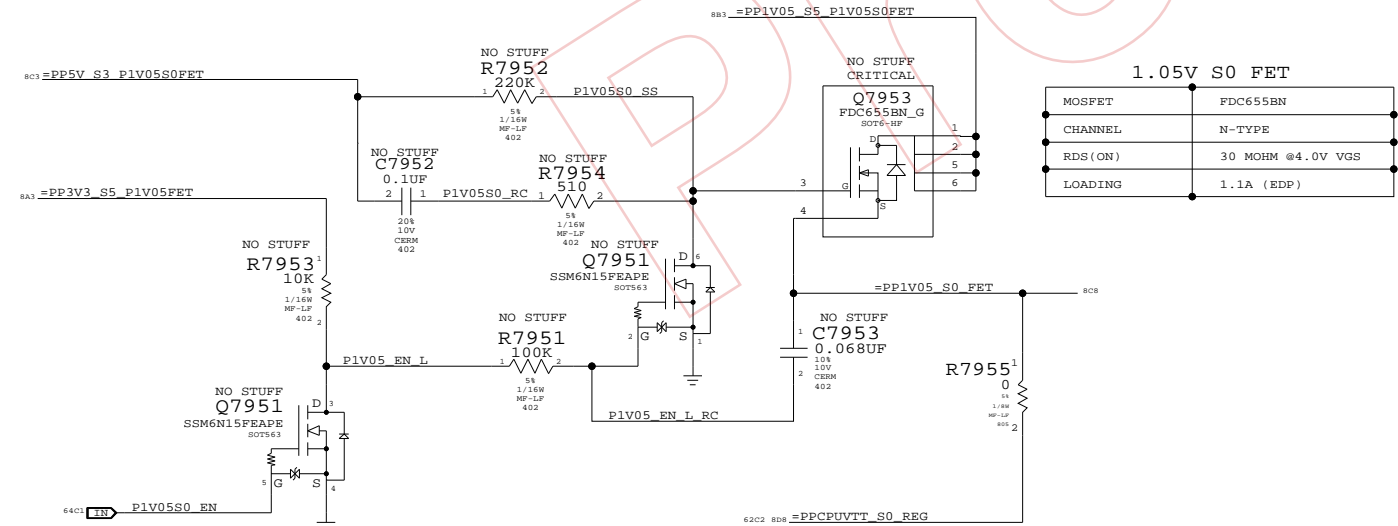
MCP79 DDRVTT FET

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

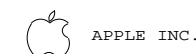


POWER FETS	
SYNC_MASTER=YUAN.MA	SYNC_DATE=04/04/2008
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1.05V S0 FET

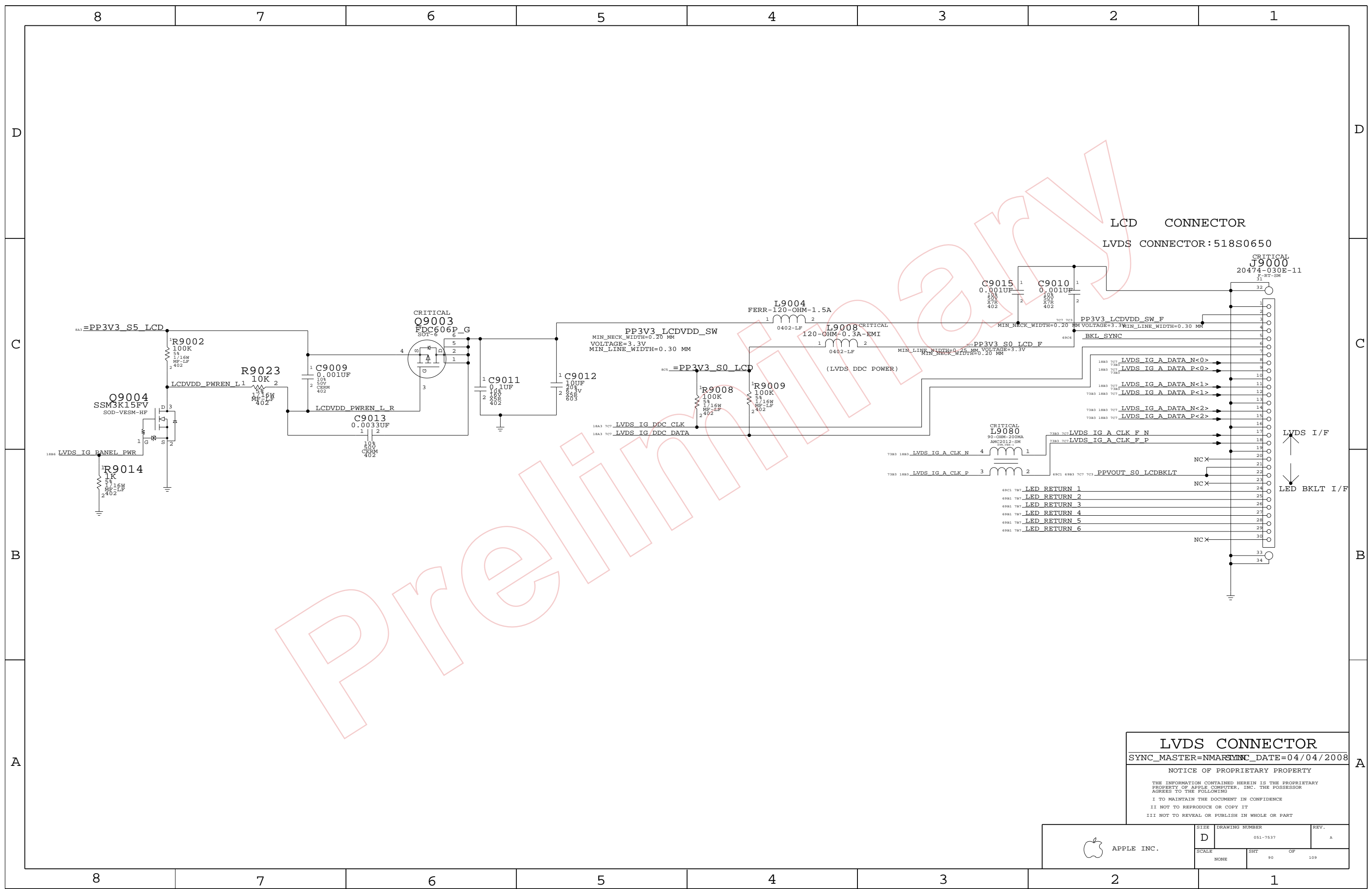


1.05V S0 FET	
MOSFET	FDC655BN
CHANNEL	N-TYPE
RDS(ON)	30 MOHM @4.0V VGS
LOADING	1.1A (EDP)



APPLE INC.

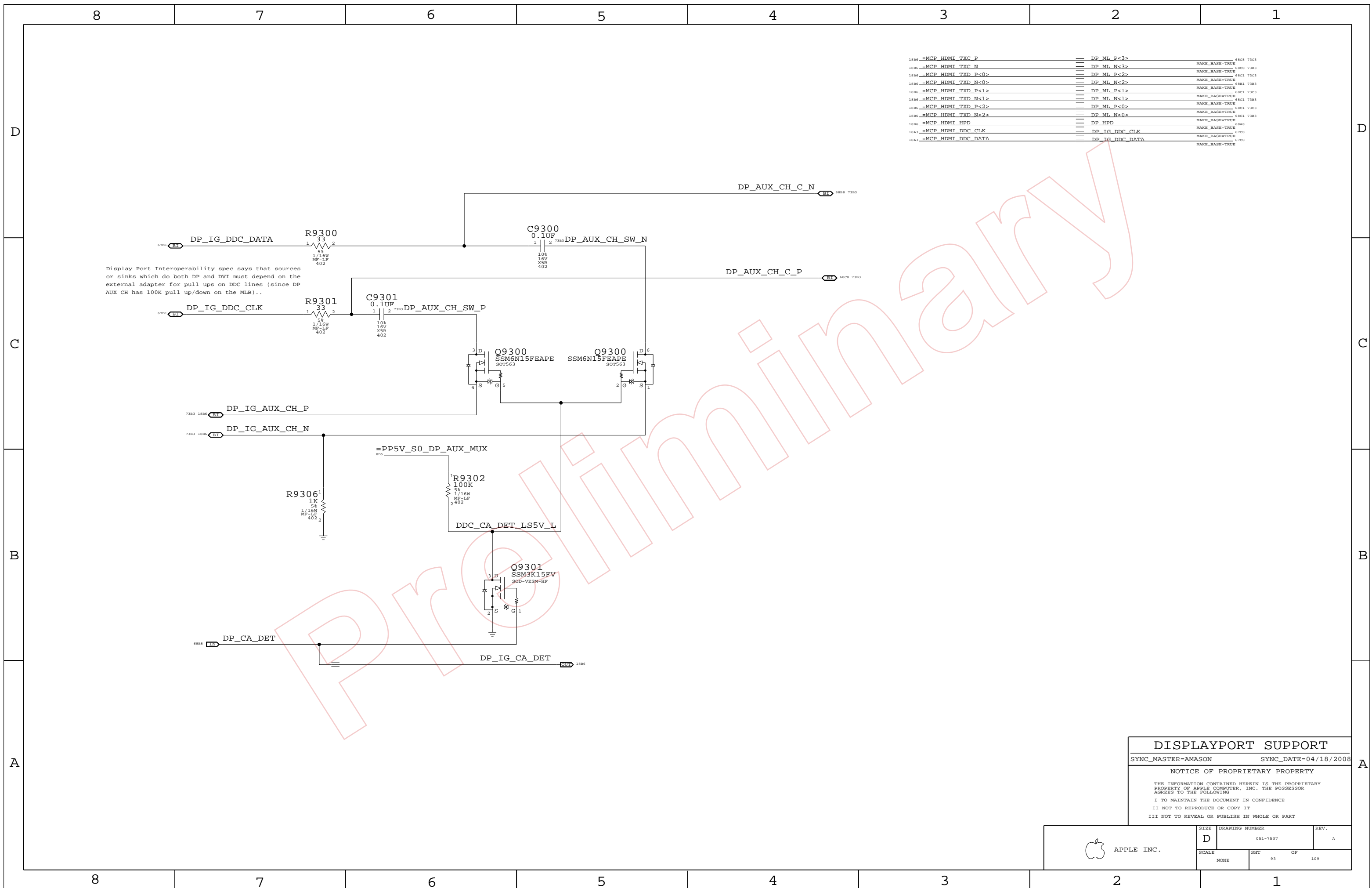
SIZE	DRAWING NUMBER	REV.
D	051-7537	A
SCALE	SHT	OF
NONE	79	109



LCD CONNECTOR  
LVDS CONNECTOR: 518S0650

**LVDS CONNECTOR**  
 SYNC\_MASTER=NMARSYNC\_DATE=04/04/2008  
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 APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT	OF	REV.
NONE	90	109	



1886	=MCP_HDMI_TXC_P	DP_ML_P<3>	68C8_73B3
1886	=MCP_HDMI_TXC_N	DP_ML_N<3>	MAKE_BASE=TRUE 68C8_73B3
1886	=MCP_HDMI_TXD_P<0>	DP_ML_P<2>	MAKE_BASE=TRUE 68C1_73B3
1886	=MCP_HDMI_TXD_N<0>	DP_ML_N<2>	MAKE_BASE=TRUE 68A1_73B3
1886	=MCP_HDMI_TXD_P<1>	DP_ML_P<1>	MAKE_BASE=TRUE 68C1_73C3
1886	=MCP_HDMI_TXD_N<1>	DP_ML_N<1>	MAKE_BASE=TRUE 68C1_73B3
1886	=MCP_HDMI_TXD_P<2>	DP_ML_P<0>	MAKE_BASE=TRUE 68C1_73C3
1886	=MCP_HDMI_TXD_N<2>	DP_ML_N<0>	MAKE_BASE=TRUE 68C1_73B3
1886	=MCP_HDMI_HPD	DP_HPD	MAKE_BASE=TRUE 68A8
18A1	=MCP_HDMI_DDC_CLK	DP_IG_DDC_CLK	MAKE_BASE=TRUE 67C8
18A1	=MCP_HDMI_DDC_DATA	DP_IG_DDC_DATA	MAKE_BASE=TRUE 67C8

**DISPLAYPORT SUPPORT**

SYNC\_MASTER=AMASON      SYNC\_DATE=04/18/2008

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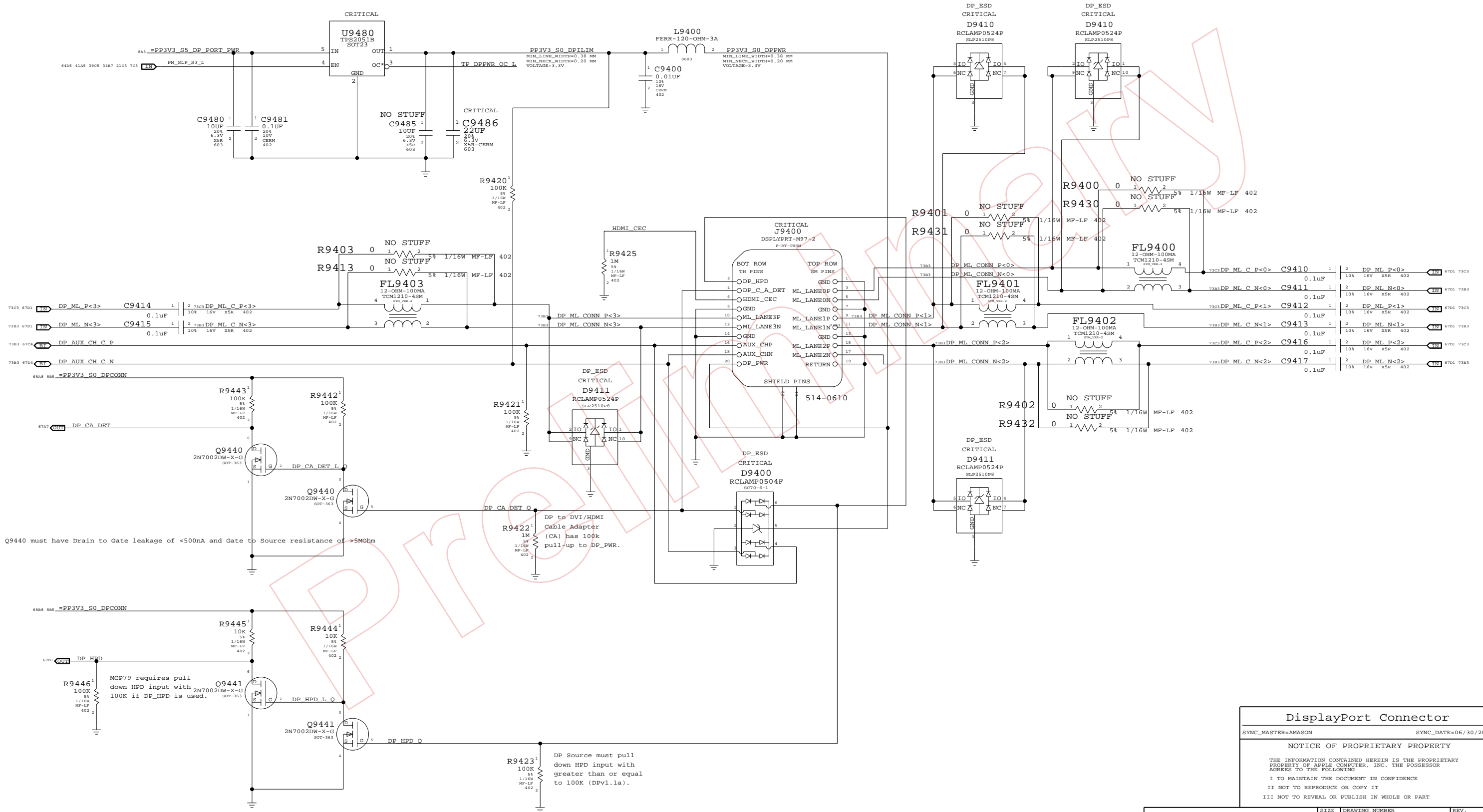
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 APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT	OF	109
NONE	93		

# Port Power Switch



**DisplayPort Connector**

SYNC\_MASTER=AMASON      SYNC\_DATE=06/30/2008

**NOTICE OF PROPRIETARY PROPERTY**

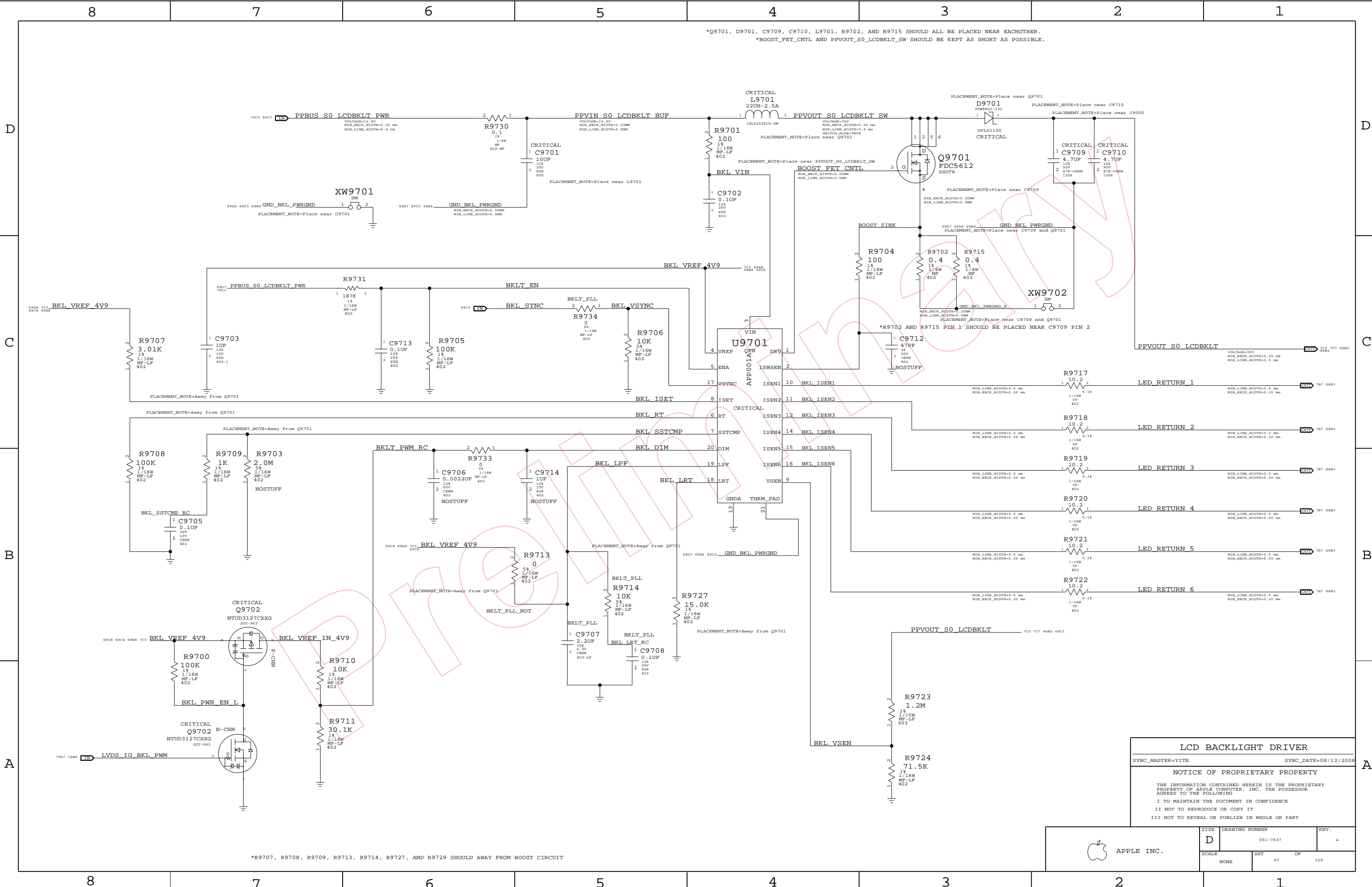
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APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT	OF	109
NONE	94		

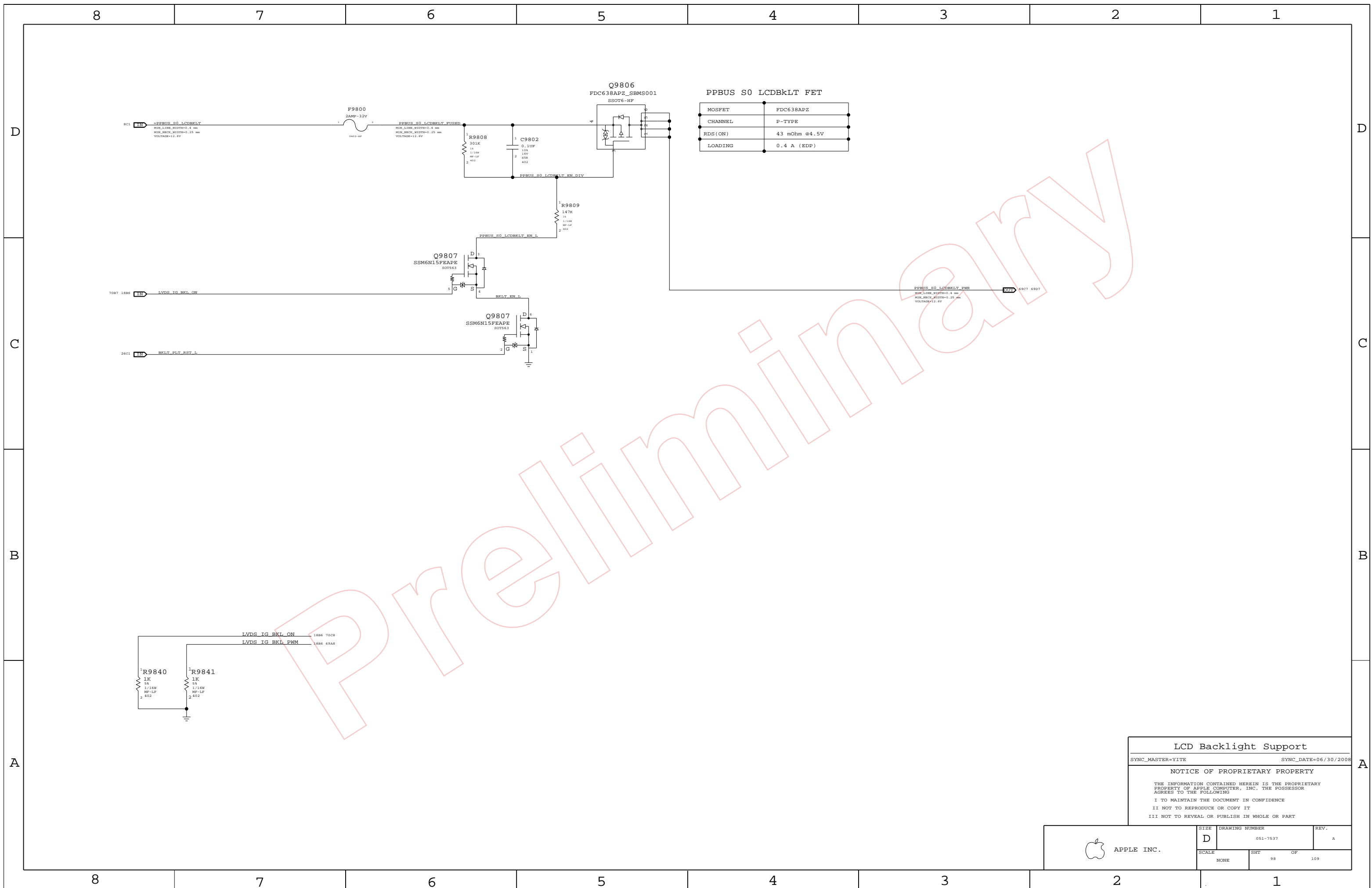


\*Q9701, D9701, C9709, C9710, L9701, R9702, AND R9715 SHOULD ALL BE PLACED NEAR EACHOTHER.  
 \*BOOST\_FET\_CNTL AND PPVOUT\_S0\_LCDBKLT\_SW SHOULD BE KEPT AS SHORT AS POSSIBLE.

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

**LCD BACKLIGHT DRIVER**  
 SYNC\_MASTER=VITE SYNC\_DATE=08/12/2008  
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APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7537	A
SCALE	SHT	OF	109
NONE	97		



**LCD Backlight Support**

SYNC\_MASTER=VITE SYNC\_DATE=06/30/2008

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III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

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



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
MEM_CMD	MEM_CMD	*	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
MEM_CTRL	MEM_CTRL	*	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
MEM_DATA	MEM_DATA	*	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
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
MEM_2OTHER	*	*	MEM_2OTHER
MEM_2OTHER	*	*	MEM_2OTHER
MEM_2OTHER	*	*	MEM_2OTHER
MEM_2OTHER	*	*	MEM_2OTHER
MEM_2OTHER	*	*	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 should 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	PHYSICAL	NET_TYPE	SPACING	
MEM_A_CLK	MEM_70D_VDD	MEM_CLK		MEM A CLK P<5..0> 1585 2805 2807
MEM_A_CLK	MEM_70D_VDD	MEM_CLK		MEM A CLK N<5..0> 1585 2805 2807
MEM_A_CTRL	MEM_40S_VDD	MEM_CTRL		MEM A CKE<3..0> 1585 2805 2807
MEM_A_CTRL	MEM_40S_VDD	MEM_CTRL		MEM A CS L<3..0> 1585 2805 2807
MEM_A_CTRL	MEM_40S_VDD	MEM_CTRL		MEM A ODT<3..0> 1585 2805
MEM_A_CMD	MEM_40S_VDD	MEM_CMD		MEM A A<14..0> 1585 1505 2805 2807
MEM_A_CMD	MEM_40S_VDD	MEM_CMD		MEM A BA<2..0> 1505 2805 2807
MEM_A_CMD	MEM_40S_VDD	MEM_CMD		MEM A RAS L 1505 2805
MEM_A_CMD	MEM_40S_VDD	MEM_CMD		MEM A CAS L 1505 2807
MEM_A_CMD	MEM_40S_VDD	MEM_CMD		MEM A WE L 1505 2807
MEM_A_DQ_BYTE0	MEM_40S	MEM_DATA		MEM A DQ<7..0> 1587 2802 2804 2802 2804
MEM_A_DQ_BYTE1	MEM_40S	MEM_DATA		MEM A DQ<15..8> 1587 2802 2804
MEM_A_DQ_BYTE2	MEM_40S	MEM_DATA		MEM A DQ<23..16> 1587 1507 2882 2884 2802 2804
MEM_A_DQ_BYTE3	MEM_40S	MEM_DATA		MEM A DQ<31..24> 1507 2802 2804
MEM_A_DQ_BYTE4	MEM_40S	MEM_DATA		MEM A DQ<39..32> 1507 2886 2887
MEM_A_DQ_BYTE5	MEM_40S	MEM_DATA		MEM A DQ<47..40> 1507 2886 2887
MEM_A_DQ_BYTE6	MEM_40S	MEM_DATA		MEM A DQ<55..48> 1507 2886 2887
MEM_A_DQ_BYTE7	MEM_40S	MEM_DATA		MEM A DQ<63..56> 1507 2886 2887
MEM_A_DQ_BYTE0	MEM_40S	MEM_DATA		MEM A DM<0> 1587 2804
MEM_A_DQ_BYTE1	MEM_40S	MEM_DATA		MEM A DM<1> 1587 2802
MEM_A_DQ_BYTE2	MEM_40S	MEM_DATA		MEM A DM<2> 1587 2884
MEM_A_DQ_BYTE3	MEM_40S	MEM_DATA		MEM A DM<3> 1587 2802
MEM_A_DQ_BYTE4	MEM_40S	MEM_DATA		MEM A DM<4> 1587 2886
MEM_A_DQ_BYTE5	MEM_40S	MEM_DATA		MEM A DM<5> 1587 2887
MEM_A_DQ_BYTE6	MEM_40S	MEM_DATA		MEM A DM<6> 1587 2886
MEM_A_DQ_BYTE7	MEM_40S	MEM_DATA		MEM A DM<7> 1587 2887
MEM_A_DQS0	MEM_70D	MEM_DQS		MEM A DQS P<0> 1505 2802
MEM_A_DQS0	MEM_70D	MEM_DQS		MEM A DQS N<0> 1505 2802
MEM_A_DQS1	MEM_70D	MEM_DQS		MEM A DQS P<1> 1505 2804
MEM_A_DQS1	MEM_70D	MEM_DQS		MEM A DQS N<1> 1505 2804
MEM_A_DQS2	MEM_70D	MEM_DQS		MEM A DQS P<2> 1505 2882
MEM_A_DQS2	MEM_70D	MEM_DQS		MEM A DQS N<2> 1505 2882
MEM_A_DQS3	MEM_70D	MEM_DQS		MEM A DQS P<3> 1505 2804
MEM_A_DQS3	MEM_70D	MEM_DQS		MEM A DQS N<3> 1505 2804
MEM_A_DQS4	MEM_70D	MEM_DQS		MEM A DQS P<4> 1505 2887
MEM_A_DQS4	MEM_70D	MEM_DQS		MEM A DQS N<4> 1505 2887
MEM_A_DQS5	MEM_70D	MEM_DQS		MEM A DQS P<5> 1505 2886
MEM_A_DQS5	MEM_70D	MEM_DQS		MEM A DQS N<5> 1505 2886
MEM_A_DQS6	MEM_70D	MEM_DQS		MEM A DQS P<6> 1505 2887
MEM_A_DQS6	MEM_70D	MEM_DQS		MEM A DQS N<6> 1505 2887
MEM_A_DQS7	MEM_70D	MEM_DQS		MEM A DQS P<7> 1505 2886
MEM_A_DQS7	MEM_70D	MEM_DQS		MEM A DQS N<7> 1505 2886
MEM_B_CLK	MEM_70D_VDD	MEM_CLK		MEM B CLK P<5..0> 1581 2905 2907
MEM_B_CLK	MEM_70D_VDD	MEM_CLK		MEM B CLK N<5..0> 1581 2905 2907
MEM_B_CTRL	MEM_40S_VDD	MEM_CTRL		MEM B CKE<3..0> 1581 2905 2907
MEM_B_CTRL	MEM_40S_VDD	MEM_CTRL		MEM B CS L<3..0> 1581 2905 2907
MEM_B_CTRL	MEM_40S_VDD	MEM_CTRL		MEM B ODT<3..0> 1581 2905
MEM_B_CMD	MEM_40S_VDD	MEM_CMD		MEM B A<14..0> 1581 1501 2905 2907
MEM_B_CMD	MEM_40S_VDD	MEM_CMD		MEM B BA<2..0> 1501 2905 2907
MEM_B_CMD	MEM_40S_VDD	MEM_CMD		MEM B RAS L 1501 2905
MEM_B_CMD	MEM_40S_VDD	MEM_CMD		MEM B CAS L 1501 2907
MEM_B_CMD	MEM_40S_VDD	MEM_CMD		MEM B WE L 1501 2907
MEM_B_DQ_BYTE0	MEM_40S	MEM_DATA		MEM B DQ<7..0> 1583 2902 2904 2902 2904
MEM_B_DQ_BYTE1	MEM_40S	MEM_DATA		MEM B DQ<15..8> 1583 2902 2904
MEM_B_DQ_BYTE2	MEM_40S	MEM_DATA		MEM B DQ<23..16> 1583 1503 2902 2904
MEM_B_DQ_BYTE3	MEM_40S	MEM_DATA		MEM B DQ<31..24> 1503 2982 2984 2902 2904
MEM_B_DQ_BYTE4	MEM_40S	MEM_DATA		MEM B DQ<39..32> 1503 2986 2987
MEM_B_DQ_BYTE5	MEM_40S	MEM_DATA		MEM B DQ<47..40> 1503 2986 2987
MEM_B_DQ_BYTE6	MEM_40S	MEM_DATA		MEM B DQ<55..48> 1503 2986 2987
MEM_B_DQ_BYTE7	MEM_40S	MEM_DATA		MEM B DQ<63..56> 1503 2986 2987
MEM_B_DQ_BYTE0	MEM_40S	MEM_DATA		MEM B DM<0> 1583 2904
MEM_B_DQ_BYTE1	MEM_40S	MEM_DATA		MEM B DM<1> 1583 2902
MEM_B_DQ_BYTE2	MEM_40S	MEM_DATA		MEM B DM<2> 1583 2902
MEM_B_DQ_BYTE3	MEM_40S	MEM_DATA		MEM B DM<3> 1583 2984
MEM_B_DQ_BYTE4	MEM_40S	MEM_DATA		MEM B DM<4> 1583 2986
MEM_B_DQ_BYTE5	MEM_40S	MEM_DATA		MEM B DM<5> 1583 2987
MEM_B_DQ_BYTE6	MEM_40S	MEM_DATA		MEM B DM<6> 1583 2986
MEM_B_DQ_BYTE7	MEM_40S	MEM_DATA		MEM B DM<7> 1583 2987
MEM_B_DQS0	MEM_70D	MEM_DQS		MEM B DQS P<0> 1501 2902
MEM_B_DQS0	MEM_70D	MEM_DQS		MEM B DQS N<0> 1501 2902
MEM_B_DQS1	MEM_70D	MEM_DQS		MEM B DQS P<1> 1501 2904
MEM_B_DQS1	MEM_70D	MEM_DQS		MEM B DQS N<1> 1501 2904
MEM_B_DQS2	MEM_70D	MEM_DQS		MEM B DQS P<2> 1501 2904
MEM_B_DQS2	MEM_70D	MEM_DQS		MEM B DQS N<2> 1501 2904
MEM_B_DQS3	MEM_70D	MEM_DQS		MEM B DQS P<3> 1501 2982
MEM_B_DQS3	MEM_70D	MEM_DQS		MEM B DQS N<3> 1501 2982
MEM_B_DQS4	MEM_70D	MEM_DQS		MEM B DQS P<4> 1501 2987
MEM_B_DQS4	MEM_70D	MEM_DQS		MEM B DQS N<4> 1501 2987
MEM_B_DQS5	MEM_70D	MEM_DQS		MEM B DQS P<5> 1501 2986
MEM_B_DQS5	MEM_70D	MEM_DQS		MEM B DQS N<5> 1501 2986
MEM_B_DQS6	MEM_70D	MEM_DQS		MEM B DQS P<6> 1501 2987
MEM_B_DQS6	MEM_70D	MEM_DQS		MEM B DQS N<6> 1501 2987
MEM_B_DQS7	MEM_70D	MEM_DQS		MEM B DQS P<7> 1501 2986
MEM_B_DQS7	MEM_70D	MEM_DQS		MEM B DQS N<7> 1501 2986
MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP_VDD	1606
MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP_GND	1606

**Memory Constraints**

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PCI-Express

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
PCI_E_90D	*	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF
CLK_PCI_E_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
PCI_E	*	=3X_DIELECTRIC	?
CLK_PCI_E	*	20 MIL	?
MCP_PEX_COMP	*	8 MIL	?

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

Digital Video Signal Constraints

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

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

LVDS intra-pair matching should be 5 mils. Pairs should be within 100 mils of clock length.  
 DisplayPort/TMDS intra-pair matching should be 5 ps. Inter-pair matching should be within 150 ps.  
 DisplayPort AUX CH intra-pair matching should be 5 ps. No relationship to other signals.  
 Max length of LVDS/DisplayPort/TMDS traces: 12 inches.

SOURCE: MCP79 Interface DG (DG-03328-001\_v0D), Sections 2.5.3 & 2.5.4.

SATA Interface Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
SATA_100D	*	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF
SATA_100D_HDD	*	=100_OHM_DIFF_HDD	=100_OHM_DIFF_HDD	=100_OHM_DIFF_HDD	=100_OHM_DIFF_HDD	=100_OHM_DIFF_HDD	=100_OHM_DIFF_HDD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
SATA	*	=4X_DIELECTRIC	?
SATA_TERM	*	8 MIL	?

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

ELECTRICAL_CONSTRAINT_SET	NET_TYPE			
	PHYSICAL	SPACING		
PCI_E_90D	PCI_E_90D	PCI_E	PCI_E MINI R2D P	706 3107
	PCI_E_90D	PCI_E	PCI_E MINI R2D N	706 3107
	PCI_E_90D	PCI_E	PCI_E MINI R2D C P	1783 3105
	PCI_E_90D	PCI_E	PCI_E MINI R2D C N	1783 3105
	PCI_E_90D	PCI_E	PCI_E MINI D2R P	706 1786 3107
	PCI_E_90D	PCI_E	PCI_E MINI D2R N	706 1786 3107
	PCI_E_90D	PCI_E	PCI_E FC R2D P	3205
	PCI_E_90D	PCI_E	PCI_E FC R2D N	3205
	PCI_E_90D	PCI_E	PCI_E FC R2D C P	986 3206
	PCI_E_90D	PCI_E	PCI_E FC R2D C N	986 3206
	PCI_E_90D	PCI_E	PCI_E FC D2R P	986 3285
	PCI_E_90D	PCI_E	PCI_E FC D2R N	986 3285
CLK_PCI_E_100D	CLK_PCI_E_100D	CLK_PCI_E	PCI_E CLK100M MINI P	1703 3105
	CLK_PCI_E_100D	CLK_PCI_E	PCI_E CLK100M MINI N	1703 3105
	CLK_PCI_E_100D	CLK_PCI_E	PCI_E CLK100M MINI CONN P	706 3108
	CLK_PCI_E_100D	CLK_PCI_E	PCI_E CLK100M MINI CONN N	706 3108
MCP_PEX_CLK_COMP	CLK_PCI_E_100D	CLK_PCI_E	PCI_E CLK100M FC P	986 3205
	CLK_PCI_E_100D	CLK_PCI_E	PCI_E CLK100M FC N	986 3205
MCP_PEX_CLK_COMP	MCP_PEX_COMP	MCP_PEX_CLK_COMP	17A6	
TMDS_IG_TXC	TMDS_IG_TXC	DISPLAYPORT	TMDS IG TXC P	
	TMDS_IG_TXC	DISPLAYPORT	TMDS IG TXC N	
	TMDS_IG_TXD	DISPLAYPORT	TMDS IG TXD P<2..0>	
	TMDS_IG_TXD	DISPLAYPORT	TMDS IG TXD N<2..0>	
	DP_ML	DISPLAYPORT	DP ML P<3..0>	6701 68C1 68C8
	DP_ML	DISPLAYPORT	DP ML C P<3..0>	6802 68C7
	DP_ML	DISPLAYPORT	DP ML N<3..0>	6701 68A1 68C1 68C8
	DP_ML	DISPLAYPORT	DP ML C N<3..0>	68B2 68C2 68C7
	DP_IG_AUX_CH	DISPLAYPORT	DP IG AUX CH P	1886 6707
	DP_IG_AUX_CH	DISPLAYPORT	DP IG AUX CH N	1886 6787
	DP_AUX_CH_SW	DISPLAYPORT	DP_AUX_CH_SW P	6706
	DP_AUX_CH_SW	DISPLAYPORT	DP_AUX_CH_SW N	6705
DP_AUX_CH_C	DISPLAYPORT	DP_AUX_CH_C P	6704 6808	
DP_AUX_CH_C	DISPLAYPORT	DP_AUX_CH_C N	6704 6888	
MCP_HDMI_RSET	MCP_DV_COMP	MCP_HDMI_RSET	18A6 25C7	
MCP_HDMI_VPROBE	MCP_DV_COMP	MCP_HDMI_VPROBE	18A6 25C7	
LVDS_IG_A_CLK	LVDS	LVDS IG A CLK P	18B3 66B3	
LVDS_IG_A_CLK	LVDS	LVDS IG A CLK F P	707 66B2	
LVDS_IG_A_CLK	LVDS	LVDS IG A CLK N	18B3 66B3	
LVDS_IG_A_CLK	LVDS	LVDS IG A CLK F N	707 66B2	
LVDS_IG_A_DATA	LVDS	LVDS IG A DATA P<2..0>	707 18B3 66C2	
LVDS_IG_A_DATA	LVDS	LVDS IG A DATA N<2..0>	707 18B3 66C2	
DP_ML	DISPLAYPORT	DP ML CONN P<3..0>	6803 68C4 68C5	
DP_ML	DISPLAYPORT	DP ML CONN N<3..0>	68B3 68C3 68C4 68C5	
MCP_IFFAB_RSET	MCP_DV_COMP	MCP_IFFAB_RSET	18A3 2506	
MCP_IFFAB_VPROBE	MCP_DV_COMP	MCP_IFFAB_VPROBE	18A3 2506	
SATA_HDD_R2D	SATA	SATA HDD R2D C P	2006 36A3	
SATA_HDD_R2D	SATA	SATA HDD R2D C N	2006 36A3	
SATA_HDD_R2D	SATA	SATA HDD R2D P	705 36A7	
SATA_HDD_R2D	SATA	SATA HDD R2D N	705 36A7	
SATA_HDD_R2D	SATA	SATA HDD R2D UF P	36A5	
SATA_HDD_R2D	SATA	SATA HDD R2D UF N	36A5	
SATA_HDD_D2R	SATA	SATA HDD D2R P	2006 36A3	
SATA_HDD_D2R	SATA	SATA HDD D2R N	2006 36A3	
SATA_HDD_D2R	SATA	SATA HDD D2R C P	705 36A7	
SATA_HDD_D2R	SATA	SATA HDD D2R C N	705 36A7	
SATA_HDD_D2R	SATA	SATA HDD D2R UF P	36A5	
SATA_HDD_D2R	SATA	SATA HDD D2R UF N	36A5	
SATA_ODD_R2D	SATA	SATA ODD R2D C P	2006 36C2	
SATA_ODD_R2D	SATA	SATA ODD R2D C N	2006 36C2	
SATA_ODD_R2D	SATA	SATA ODD R2D P	787 36B5	
SATA_ODD_R2D	SATA	SATA ODD R2D N	787 705 36B5	
SATA_ODD_R2D	SATA	SATA ODD R2D UF P	36C4	
SATA_ODD_R2D	SATA	SATA ODD R2D UF N	36C4	
SATA_ODD_D2R	SATA	SATA ODD D2R P	2006 36B2	
SATA_ODD_D2R	SATA	SATA ODD D2R N	2006 36B2	
SATA_ODD_D2R	SATA	SATA ODD D2R C P	787 36B5	
SATA_ODD_D2R	SATA	SATA ODD D2R C N	787 36B5	
SATA_ODD_D2R	SATA	SATA ODD D2R UF P	36B4	
SATA_ODD_D2R	SATA	SATA ODD D2R UF N	36B4	
MCP_SATA_TERM	SATA_TERM	MCP_SATA_TERM	20A6	

**MCP Constraints 1**

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	D	051-7537	A
SCALE	SHT	OF	
NONE	102	109	

### PCI Bus Constraints

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

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
PCI	*	=STANDARD	?
CLK_PCI	*	8 MIL	?

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

### LPC Bus Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
LPC_55S	*	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=STANDARD	=STANDARD
CLK_LPC_55S	*	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=STANDARD	=STANDARD

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

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

### USB 2.0 Interface Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
MCP_USB_BIAS	*	=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	SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
USB	*	=2x_DIELECTRIC	?	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.

### HDA Audio Interface Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
HDA_55S	*	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=STANDARD	=STANDARD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
HDA	*	=2x_DIELECTRIC	?
MCP_HDA_COMP	*	8 MIL	?

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

### SIO Signal Constraints

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

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

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

### SPI Interface Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
SPI_55S	*	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=STANDARD	=STANDARD

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

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

ELECTRICAL_CONSTRAINT_SET	PHYSICAL	NET_TYPE	SPACING	
MCP_DEBUG	PCI_55S	PCI		MCP_DEBUG<7..0> 1303 1907
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_CNTR_L	PCI_55S	PCI		PCI_TRDY_L
PCI_CNTR_L	PCI_55S	PCI		PCI_DEVSEL_L
PCI_CNTR_L	PCI_55S	PCI		PCI_PERR_L
PCI_CNTR_L	PCI_55S	PCI		PCI_SERR_L
PCI_CNTR_L	PCI_55S	PCI		PCI_STOP_L
PCI_CNTR_L	PCI_55S	PCI		PCI_TRDY_L
PCI_CNTR_L	PCI_55S	PCI		PCI_FRAME_L
PCI_BE00_I	PCI_55S	PCI		PCI_BE00_I
PCI_CNTR0_I	PCI_55S	PCI		PCI_CNTR0_I
PCI_BE01_I	PCI_55S	PCI		PCI_BE01_I
PCI_CNTR1_I	PCI_55S	PCI		PCI_CNTR1_I
PCI_INTX_I	PCI_55S	PCI		PCI_INTX_I
PCI_INTX_I	PCI_55S	PCI		PCI_INTX_L
PCI_INTY_I	PCI_55S	PCI		PCI_INTY_I
PCI_INTZ_I	PCI_55S	PCI		PCI_INTZ_I
MCP_PCI_CLK2	CLK_PCI_55S	CLK_PCI		PCI_CLK33M MCP_R 1905
	CLK_PCI_55S	CLK_PCI		PCI_CLK33M MCP 1905
LPC_AD	LPC_55S	LPC		LPC_AD<3..0>
LPC_FRAME_L	LPC_55S	LPC		LPC_FRAME_L 1983 3908 41D3 41D5
LPC_RESET_I	LPC_55S	LPC		LPC_RESET_L 1903 3908 41D5
				1983 26D4
MCP_LPC_CLK0	CLK_LPC_55S	CLK_LPC		LPC_CLK33M SMC_R 1983 26C4
	CLK_LPC_55S	CLK_LPC		LPC_CLK33M SMC 26C1 390C
	CLK_LPC_55S	CLK_LPC		LPC_CLK33M LPCPLUS 26B1 41D3
USB_EXTN_P	USB_90D	USB		USB_EXTN_P 2003 37A8
USB_EXTN_N	USB_90D	USB		USB_EXTN_N 2003 37A8
USB_EXTN_MUXED_P	USB_90D	USB		USB_EXTN_MUXED_P 37C4
USB_EXTN_MUXED_N	USB_90D	USB		USB_EXTN_MUXED_N 37C4
CONN_USB_EXTN_P	USB_90D	USB		CONN_USB_EXTN_P 37C3
CONN_USB_EXTN_N	USB_90D	USB		CONN_USB_EXTN_N 37C3
USB_CAMERA_P	USB_90D	USB		USB_CAMERA_P 2003 31B5
USB_CAMERA_N	USB_90D	USB		USB_CAMERA_N 2003 31B5
USB_CAMERA_CONN_P	USB_90D	USB		USB_CAMERA_CONN_P 705 31B7
USB_CAMERA_CONN_N	USB_90D	USB		USB_CAMERA_CONN_N 705 31B7
USB_BT_P	USB_90D	USB		USB_BT_P 2003 31B8
USB_BT_N	USB_90D	USB		USB_BT_N 2003 31B8
CONN_USB2_BT_P	USB_90D	USB		CONN_USB2_BT_P 705 31B7
CONN_USB2_BT_N	USB_90D	USB		CONN_USB2_BT_N 705 31B7
USB_TPAD_P	USB_90D	USB		USB_TPAD_P 2003 4788
USB_TPAD_N	USB_90D	USB		USB_TPAD_N 2003 4788
USB_TPAD_R_P	USB_90D	USB		USB_TPAD_R_P 4787
USB_TPAD_R_N	USB_90D	USB		USB_TPAD_R_N 4787
USB_IR_P	USB_90D	USB		USB_IR_P 2003 38C7
USB_IR_N	USB_90D	USB		USB_IR_N 2003 38C7
USB_EXTB_P	USB_90D	USB		USB_EXTB_P 2003 37A4
USB_EXTB_N	USB_90D	USB		USB_EXTB_N 2003 37A4
CONN_USB_EXTB_P	USB_90D	USB		CONN_USB_EXTB_P 37A3
CONN_USB_EXTB_N	USB_90D	USB		CONN_USB_EXTB_N 37A3
MCP_USB_BIAS	MCP_USB_BIAS			MCP_USB_BIAS_GND 2084
SMBUS_MCP_0_CLK	SMB_55S	SMB		SMBUS_MCP_0_CLK 1386 21C3 42D8
SMBUS_MCP_0_DATA	SMB_55S	SMB		SMBUS_MCP_0_DATA 1386 21C3 42D8
SMBUS_MCP_1_CLK	SMB_55S	SMB		SMBUS_MCP_1_CLK 21C3 42C8
SMBUS_MCP_1_DATA	SMB_55S	SMB		SMBUS_MCP_1_DATA 21C3 42C8
HDA_BIT_CLK	HDA_55S	HDA		HDA_BIT_CLK 2102 51C7
HDA_BIT_CLK_R	HDA_55S	HDA		HDA_BIT_CLK_R 21A7 21D4
HDA_SYNC	HDA_55S	HDA		HDA_SYNC 21C3 51C7
HDA_SYNC_R	HDA_55S	HDA		HDA_SYNC_R 21A7 21C4
HDA_RST_I	HDA_55S	HDA		HDA_RST_I 21A7 21D4
HDA_RST_L	HDA_55S	HDA		HDA_RST_L 2102 51B7
HDA_SDIN	HDA_55S	HDA		HDA_SDIN 2107 51C7
HDA_SDIN_CODECD	HDA_55S	HDA		HDA_SDIN_CODECD 2102 51C7
HDA_SDOUT	HDA_55S	HDA		HDA_SDOUT 2102 51C7
HDA_SDOUT_R	HDA_55S	HDA		HDA_SDOUT_R 21A7 21D4
MCP_HDA_PULLDN_COMP	MCP_HDA_COMP			MCP_HDA_PULLDN_COMP 21C7
MCP_SUS_CLK	CLK_SLOW_55S	CLK_SLOW		PM_CLK32K_SUSCLK_R 2183 2684
	CLK_SLOW_55S	CLK_SLOW		PM_CLK32K_SUSCLK 26B1 39C5
SPI_CLK	SPI_55S	SPI		SPI_CLK_R 2183 41A5 41C8
SPI_CLK	SPI_55S	SPI		SPI_CLK 41A1 50C5
SPI_ALT_CLK	SPI_55S	SPI		SPI_ALT_CLK 41C5 41D3
SPI_MOSI_R	SPI_55S	SPI		SPI_MOSI_R 2183 41A5 41C7
SPI_MOSI	SPI_55S	SPI		SPI_MOSI 41A1 50C4
SPI_MISO	SPI_55S	SPI		SPI_MISO 2183 41A5 41B7
SPI_MISO_R	SPI_55S	SPI		SPI_MISO_R 50C4
SPI_ALT_MISO	SPI_55S	SPI		SPI_ALT_MISO 41B5 41D5
SPI_CS0_R_L	SPI_55S	SPI		SPI_CS0_R_L 2183 41B7
SPI_CS0_L	SPI_55S	SPI		SPI_CS0_L
SPI_CS1_R_L	SPI_55S	SPI		SPI_CS1_R_L
SPI_CS1_R_L_USE_MLB	SPI_55S	SPI		SPI_CS1_R_L_USE_MLB 41B2

### MCP Constraints 2

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MCP RGMI (Ethernet) Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
MCP_MII_COMP	*	=STANDARD	7.5 MIL	7.5 MIL	=STANDARD	=STANDARD	=STANDARD
ENET_MII_55S	*	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=STANDARD	=STANDARD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
MCP_BUF0_CLK	*	=3:1_SPACING	?
ENET_MII	*	12 MIL	?

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

88E1116R (Ethernet PHY) Constraints

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

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
ENET_MDI	*	25 MIL	?

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

ELECTRICAL_CONSTRAINT_SET	NET_TYPE		MCP	PART
	PHYSICAL	SPACING		
MCP_MII_COMP	MCP_MII_COMP		MCP_MII_COMP_VDD	1806
MCP_MII_COMP	MCP_MII_COMP		MCP_MII_COMP_GND	1806
MCP_CLK25M_BUF0	ENET_MII_55S	MCP_BUF0_CLK	MCP_CLK25M_BUF0_R	1803 3445
MCP_CLK25M_BUF0	ENET_MII_55S	MCP_BUF0_CLK	RTL8211_CLK25M_CKXTAL1	3386 3443
ENET_INTR_L	ENET_MII_55S	ENET_MII	ENET_INTR_L	
ENET_MDIO	ENET_MII_55S	ENET_MII	ENET_MDIO	1803 3386
ENET_MDC	ENET_MII_55S	ENET_MII	ENET_MDC	1803 3386
ENET_PWRDWN_L	ENET_MII_55S	ENET_MII	ENET_PWRDWN_L	
ENET_CLK125M_RXCLK_R	ENET_MII_55S	ENET_MII	ENET_CLK125M_RXCLK_R	3304
ENET_CLK125M_RXCLK	ENET_MII_55S	ENET_MII	ENET_CLK125M_RXCLK	1806 3301
ENET_RXD_R<3..0>	ENET_MII_55S	ENET_MII	ENET_RXD_R<3..0>	3384 3304
ENET_RXD<0>	ENET_MII_55S	ENET_MII	ENET_RXD<0>	1806 3301
ENET_RXD<3..1>	ENET_MII_55S	ENET_MII	ENET_RXD<3..1>	1806 3381 3301
ENET_RX_CTRL	ENET_MII_55S	ENET_MII	ENET_RX_CTRL	1806 3381
ENET_RXCTL_R	ENET_MII_55S	ENET_MII	ENET_RXCTL_R	3384
ENET_CLK125M_TXCLK_R	ENET_MII_55S	ENET_MII	ENET_CLK125M_TXCLK_R	3306
ENET_CLK125M_TXCLK	ENET_MII_55S	ENET_MII	ENET_CLK125M_TXCLK	1803 3308
ENET_TXD<0>	ENET_MII_55S	ENET_MII	ENET_TXD<0>	1803 3306
ENET_TXD<3..1>	ENET_MII_55S	ENET_MII	ENET_TXD<3..1>	1803 3386 3306
ENET_TX_CTRL	ENET_MII_55S	ENET_MII	ENET_TX_CTRL	1803 3386
ENET_RESET_L	ENET_MII_55S	ENET_MII	ENET_RESET_L	1803 3387
ENET_MDI_P<3..0>	ENET_MDI_100D	ENET_MDI	ENET_MDI_P<3..0>	3383 3587 3507
ENET_MDI_N<3..0>	ENET_MDI_100D	ENET_MDI	ENET_MDI_N<3..0>	3383 3587 3507
ENET_MDI_TRAN_P<3..0>	ENET_MDI_100D	ENET_MDI	ENET_MDI_TRAN_P<3..0>	3584 3504 3505
ENET_MDI_TRAN_N<3..0>	ENET_MDI_100D	ENET_MDI	ENET_MDI_TRAN_N<3..0>	3584 3504 3505

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<b>Ethernet Constraints</b>	
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PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
1TO1_DIFFPAIR	*	=STANDARD	=STANDARD	=STANDARD	=STANDARD	0.1 MM	0.1 MM

### SMC SMBus Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE			
	PHYSICAL	SPACING		
SMBUS_SMC_A_S3_SCL	SMB 55G	SMB	SMBUS_SMC_A_S3_SCL	785 7D5 42D2
SMBUS_SMC_A_S3_SDA	SMB 55G	SMB	SMBUS_SMC_A_S3_SDA	785 7C5 42D2
SMBUS_SMC_B_S0_SCL	SMB 55G	SMB	SMBUS_SMC_B_S0_SCL	42C2
SMBUS_SMC_B_S0_SDA	SMB 55G	SMB	SMBUS_SMC_B_S0_SDA	42C2
SMBUS_SMC_O_S0_SCL	SMB 55G	SMB	SMBUS_SMC_O_S0_SCL	42D5
SMBUS_SMC_O_S0_SDA	SMB 55G	SMB	SMBUS_SMC_O_S0_SDA	42D5
SMBUS_SMC_BSA_SCL	SMB 55G	SMB	SMBUS_SMC_BSA_SCL	7A7 42C5
SMBUS_SMC_BSA_SDA	SMB 55G	SMB	SMBUS_SMC_BSA_SDA	42C5
SMBUS_SMC_MGMT_SCL	SMB 55G	SMB	SMBUS_SMC_MGMT_SCL	42B5
SMBUS_SMC_MGMT_SDA	SMB 55G	SMB	SMBUS_SMC_MGMT_SDA	42B5

### SMBus Charger Net Properties

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

Preliminary

### SMC Constraints

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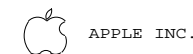
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PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
DIFFPAIR	*	=STANDARD	=STANDARD	=STANDARD	=STANDARD	0.1 MM	0.1 MM

M97 SENSOR NET PROPERTIES

ELECTRICAL_CONSTRAINT_SET	NET_TYPE			
	PHYSICAL	SPACING		
DIFFPAIR	CHGR_CSO_R_P		44A8	5783
DIFFPAIR	CHGR_CSO_R_N		44A8	5783
DIFFPAIR	CPUTHMSNS_D2_P		4505	
DIFFPAIR	CPUTHMSNS_D2_N		4505	
DIFFPAIR	CPU_THERMD_P		10C6	4505
DIFFPAIR	CPU_THERMD_N		10C6	4505
DIFFPAIR	ISNS_CPUVTT_P		44B7	
DIFFPAIR	ISNS_CPUVTT_N		44B7	
DIFFPAIR	ISNS_P1VSS0MCP_P		44C7	
DIFFPAIR	ISNS_P1VSS0MCP_N		44C7	
DIFFPAIR	ISNS_PVCORES0MCP_P		44D8	
DIFFPAIR	ISNS_PVCORES0MCP_N		44D8	61C4
DIFFPAIR	MCP_THMSNS_D2_P		7C7	45B5
DIFFPAIR	MCP_THMSNS_D2_N		7C7	45B5
DIFFPAIR	MCP_THMDIODE_P		21C3	45C5
DIFFPAIR	MCP_THMDIODE_N		21C3	45B5

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M97 SPECIAL CONSTRAINTS

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M97 BOARD-SPECIFIC SPACING & PHYSICAL CONSTRAINTS

BOARD LAYERS			BOARD AREAS				BOARD UNITS (MIL OR MM)	ALLEGRO VERSION
TOP, ISL2, ISL3, ISL4, ISL5, ISL6, ISL7, ISL8, ISL9, ISL10, ISL11, BOTTOM			NO_TYPE, BGA_P1MM				MM	15.5.1
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP	
DEFAULT	*	Y	=50_OHM_SE	0.100MM	30 MM	0 MM	0 MM	
STANDARD	*	Y	=DEFAULT	=DEFAULT	12.7 MM	=DEFAULT	=DEFAULT	
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP	
55_OHM_SE	TOP, BOTTOM	Y	0.090 MM	0.090 MM				
55_OHM_SE	*	Y	0.076 MM	0.076 MM	=STANDARD	=STANDARD	=STANDARD	
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP	
50_OHM_SE	TOP, BOTTOM	Y	0.115 MM	0.115 MM				
50_OHM_SE	*	Y	0.076 MM	0.076 MM	=STANDARD	=STANDARD	=STANDARD	
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP	
40_OHM_SE	TOP, BOTTOM	Y	0.165 MM	0.100 MM				
40_OHM_SE	*	Y	0.126 MM	0.100 MM	=STANDARD	=STANDARD	=STANDARD	
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP	
27F4_OHM_SE	TOP, BOTTOM	Y	0.310 MM	0.310 MM				
27F4_OHM_SE	*	Y	0.222 MM	0.222 MM	=STANDARD	=STANDARD	=STANDARD	
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP	
70_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD	
70_OHM_DIFF	ISL3, ISL4, ISL9, ISL10	Y	0.151 MM	0.100 MM	=STANDARD	0.224 MM	0.224 MM	
70_OHM_DIFF	TOP, BOTTOM	Y	0.185 MM	0.100 MM		0.200 MM	0.200 MM	
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP	
90_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD	
90_OHM_DIFF	ISL3, ISL4, ISL9, ISL10	Y	0.095 MM	0.095 MM		0.234 MM	0.234 MM	
90_OHM_DIFF	TOP, BOTTOM	Y	0.112 MM	0.112 MM		0.220 MM	0.220 MM	
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP	
100_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD	
100_OHM_DIFF	ISL3, ISL4, ISL9, ISL10	Y	0.075 MM	0.075 MM		0.244 MM	0.244 MM	
100_OHM_DIFF	TOP, BOTTOM	Y	0.091 MM	0.091 MM		0.230 MM	0.230 MM	
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP	
100_OHM_DIFF_HDD	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD	
100_OHM_DIFF_HDD	ISL3, ISL4, ISL9, ISL10	Y	0.083 MM	0.083 MM		0.400 MM	0.400 MM	
100_OHM_DIFF_HDD	TOP, BOTTOM	Y	0.095 MM	0.095 MM		0.400 MM	0.400 MM	
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP	
110_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD	
110_OHM_DIFF	ISL3, ISL4, ISL9, ISL10	Y	0.075 MM	0.075 MM		0.330 MM	0.330 MM	
110_OHM_DIFF	TOP, BOTTOM	Y	0.077 MM	0.077 MM		0.330 MM	0.330 MM	
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP	
1:1_DIFFPAIR	*	Y	=STANDARD	=STANDARD	=STANDARD	0.1 MM	0.1 MM	

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

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

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

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

NET_PHYSICAL_TYPE	AREA_TYPE	PHYSICAL_RULE_SET
MEM_40S	BGA_P1MM	STANDARD
MEM_40S_VDD	BGA_P1MM	STANDARD

M97 RULE DEFINITIONS

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