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

REV	ECN	DESCRIPTION OF REVISION	CK APPD / DATE
			2010-03-18

SCHEM,MLB_LDO,K6

PVT, 3/18/10

Schematic / PCB #'s

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
051-8563	1	SCHEM,MLB_LDO,K6	SCH	CRITICAL	
820-2879	1	PCBF,MLB_LDO,K6	PCB	CRITICAL	

DRAWING
TITLE=MLB LAST_MODIFIED=Thu Mar 18 17:53:39 2010
ABBREV=DRAWING

DRAWING TITLE: SCHEM,MLB_LDO,K6

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D
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BRANCH:
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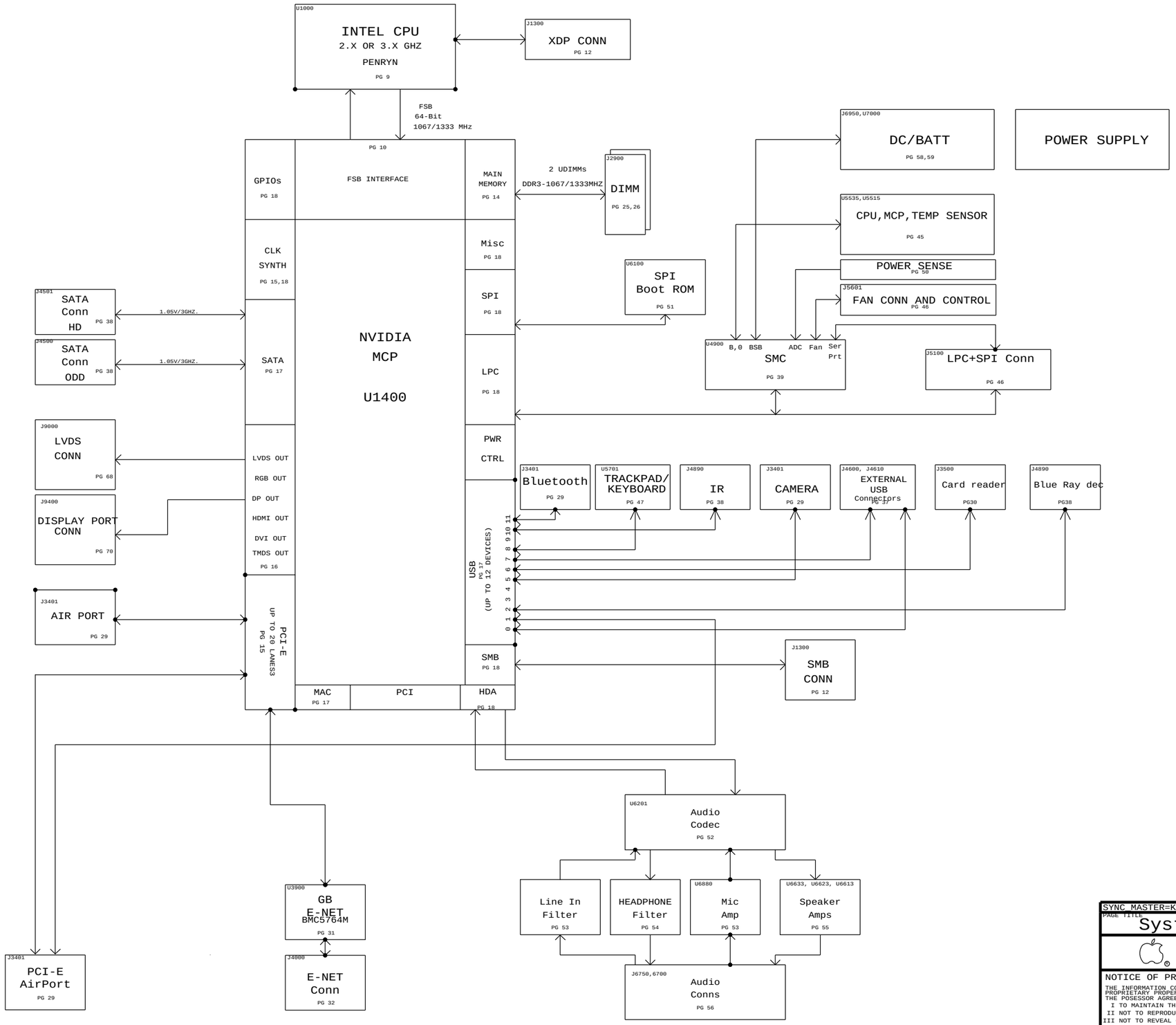

SYNC_MASTER=K69_MLB SYNC_DATE=08/19/2009

PAGE TITLE
System Block Diagram

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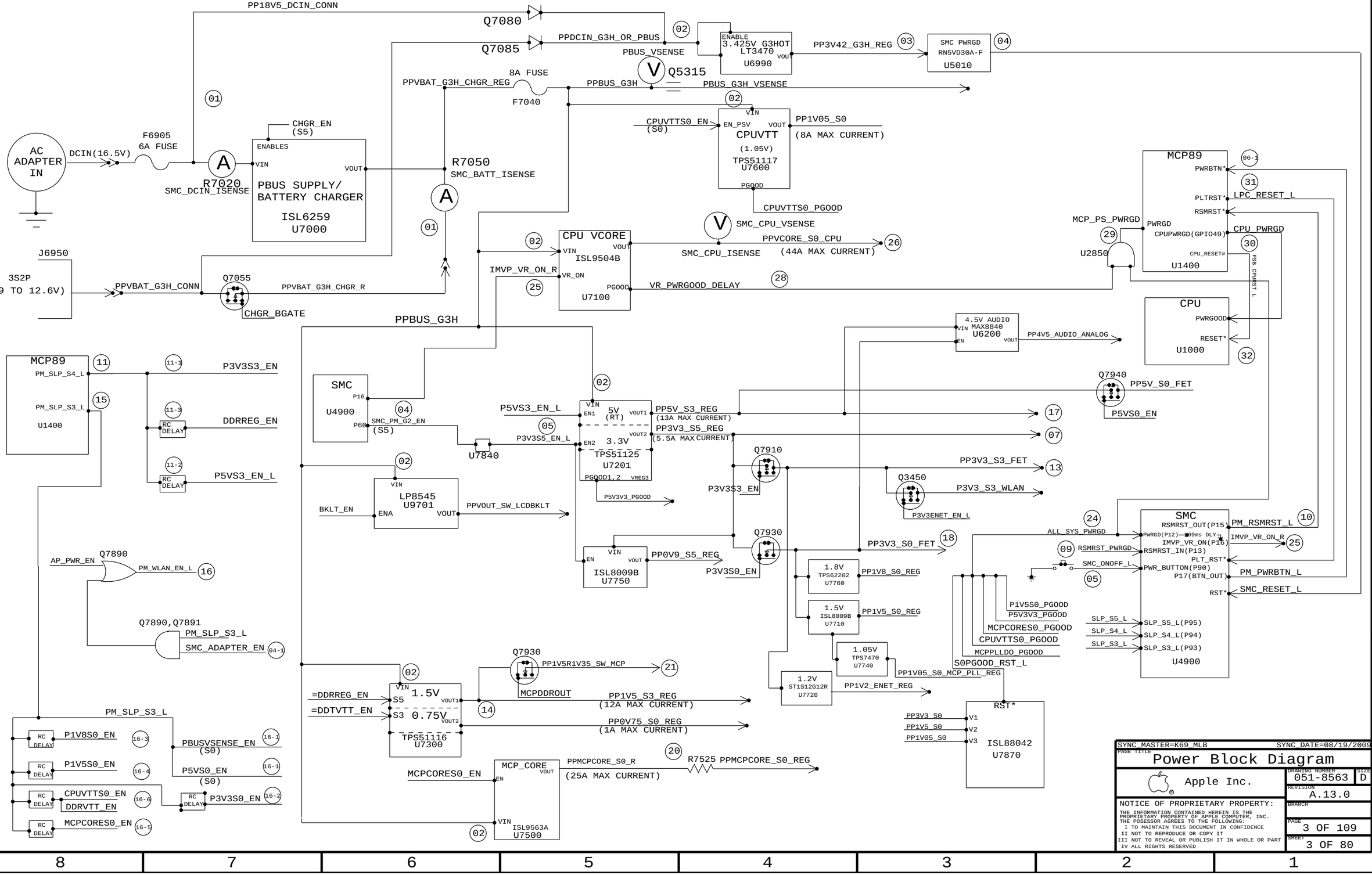
K6 POWER SYSTEM ARCHITECTURE



SYNC_MASTER=K69_MLB	SYNC_DATE=08/19/2009
PAGE TITLE: Power Block Diagram	
Apple Inc.	DRAWING NUMBER: 051-8563 SIZE: D
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BOM Variants

BOM NUMBER	BOM NAME	BOM OPTIONS
639-1120	PCBA,MLB_LDO,BETTER,K6	K6_COMMON,CPU:2.4GHZ,MCP89M:A02,EEEE:DD24
639-1119	PCBA,MLB_LDO,BEST,K6	K6_COMMON,CPU:2.66GHZ,MCP89M:A02,EEEE:DD23
085-1634	K6 MLB_LDO DEVELOPMENT BOM	K6_DEVEL:PVT

BOM Groups

BOM GROUP	BOM OPTIONS
K6_COMMON	COMMON,ALTERNATE,K6_MISC,K6_DEBUG:PROD,KB_BL,K6_PROGPARTS,RDRV:NO,SPI:25MHZ,CPU_CAP:15
K6_MISC	DP_ESD,MIKEY,BCM5764M,GL137,ENET_ESD,VFRQ:SLPS3,LVDDR3:YES,MCPPLL_R:REG,S0PGOOD_BJT,BOOST_VOL:LOW,HDA:1.5V
K6_PROGPARTS	BOOTROM:UNLOCKED,SMC:PROG,IR:PROG,WELLSPRING:PROG
K6_DEVEL:ENG	BKLT:ENG,BMON:ENG,XDP_CONN,LPCPLUS,VREFMRGN:YES,EFI_DEBUG,S0PGOOD_ISL,RDRV:IN_DEVEL
K6_DEVEL:PVT	LPCPLUS,XDP_CONN
K6_DEBUG:ENG	DEVEL_BOM,SMC_DEBUG:YES,XDP
K6_DEBUG:PVT	DEVEL_BOM,BKLT:PROD,BMON:PROD,SMC_DEBUG:YES,XDP,VREFMRGN:NO
K6_DEBUG:PROD	BKLT:PROD,BMON:PROD,SMC_DEBUG:YES,XDP,VREFMRGN:NO,LPCPLUS,MCPHVDD:P2V5,LDO:FIXED,HTOL_SENSE:YES

Module Parts

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
337S3769	1	PDC,SLGVT,PRQ,2.26,25W,1066,R0,3M,BGA,P7550	U1000	CRITICAL	CPU:2.26GHZ
337S3680	1	PDC,LGDZ,PRQ,2.40,25W,1066,R0,3M,BGA	U1000	CRITICAL	CPU:2.4GHZ
337S3756	1	PDC,SLGFG,PRQ,2.53,25W,1066,R0,3M,BGA	U1000	CRITICAL	CPU:2.53GHZ
337S3761	1	PDC,SLGLA,PRQ,2.66,25W,1066,E0,3M,BGA	U1000	CRITICAL	CPU:2.66GHZ
337S3797	1	IC,MCP89M-A01,31X31MM,BGA1168	U1400	CRITICAL	MCP89M:A01
337S3866	1	IC,MCP89M-A01,31X31MM,BGA1168	U1400	CRITICAL	MCP89M:A02
341S2731	1	IC,1MBIT,SPI FLASH,K17/18	U3990	CRITICAL	BCM5764M
343S0493	1	IC,ASIC,BCM5764M,ENET CONTROLLER, 8x8, 64QFN	U3900	CRITICAL	BCM5764M
338S0753	1	IC,FW643-E2,1394B PHY/OHCI LINK/PCI-E,12	U4100	CRITICAL	
353S2896	1	IC,LP8545,LED BKLT CTRLR,LLP24	U9701	CRITICAL	

Programmable Parts

338S0563	1	IC,SMC,HS8/2117,9X9MM,TLP,HF	U4900	CRITICAL	SMC:BLANK
341T0240	1	SMC EXTERNAL,K6	U4900	CRITICAL	SMC:PROG
335S0610	1	IC,FLASH,SPI,32MBIT,3.3V,86MHZ,8-SOP	U6100	CRITICAL	BOOTROM:BLANK
341T0238	1	EFI UNLOCKED,K6/K69	U6100	CRITICAL	BOOTROM:UNLOCKED
341S2589	1	IC,EFI,LOCKED,K6	U6100	CRITICAL	BOOTROM:LOCKED
338S0633	1	IC,CYPRS,CY7C63803-LQXC,4X4MM,USB,24-QFN	U4800	CRITICAL	IR:BLANK
341S2384	1	IC,ENCORE II,CY7C63803-LQXC	U4800	CRITICAL	IR:PROG
337S2983	1	IC,PSOC+ W/ USB,56 PIN,MLF,CY8C24794	U5701	CRITICAL	WELLSPRING:BLANK
341S2616	1	IC,TP PSOC,K17,K18	U5701	CRITICAL	WELLSPRING:PROG

Alternate Parts

PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
152S0693	152S0778		ALL	CYNTEC AS ALTERNATE
152S0796	152S0685		ALL	CYNTEC 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
152S1025	152S1024		ALL	TOKO AS ALTERNATE
337S3769	337S3704		ALL	INTEL P7550 CPU AS ALTERNATE
152S1135	152S0586		ALL	TOKO AS ALTERNATE
516-0213	516-0201		ALL	MOLEX AS ALTERNATE
516S0790	516S0706		ALL	MOLEX AS ALTERNATE
376S0699	376S0360		ALL	SSMGP15FE AS ALTERNATE

DEVELOPMENT BOM

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
085-1634	1	K6 MLB_LDO DEVELOPMENT BOM	DEVEL	CRITICAL	DEVEL_BOM

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	[EEEE_DD23]	CRITICAL	EEEE:DD23
826-4393	1	LBL,P/N LABEL,PCB,28MM X 6 MM	[EEEE_DD24]	CRITICAL	EEEE:DD24

K6 BOARD STACK-UP

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

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BOM Configuration

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Revision History

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

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Functional Test Points

Fan Connectors

	TRUE	PP5V_S0	(NEED 2 TP) 6 7 65
	TRUE	FAN_RT_PWM	46
	TRUE	FAN_RT_TACH	46

(NEED TO ADD 3 GND TP)

MIC FUNC_TEST

	TRUE	BI_MIC_LO	55 56
	TRUE	BI_MIC_HI	55 56
	TRUE	BI_MIC_SHIELD	55 56

SPEAKER FUNC_TEST

	TRUE	SPKRAMP_L_N_OUT	54 55
	TRUE	SPKRAMP_L_P_OUT	54 55
	TRUE	SPKRAMP_R_N_OUT	54 55
	TRUE	SPKRAMP_R_P_OUT	54 55
	TRUE	SPKRAMP_SUB_N_OUT	54 55
	TRUE	SPKRAMP_SUB_P_OUT	54 55

LVDS FUNC_TEST

	TRUE	PP3V3_LCDVDD_SW_F	6 67
	TRUE	PP3V3_S0_LCD_F	6 67
	TRUE	PPVOUT_SW_LCDBKLT	67 70
	TRUE	BKL_VSYNC	67 70
	TRUE	LVDS_DDC_CLK	8 67
	TRUE	LVDS_DDC_DATA	8 67
	TRUE	LVDS_IG_A_DATA_N<0>	8 67 74
	TRUE	LVDS_IG_A_DATA_P<0>	8 67 74
	TRUE	LVDS_IG_A_DATA_N<1>	8 67 74
	TRUE	LVDS_IG_A_DATA_P<1>	8 67 74
	TRUE	LVDS_IG_A_DATA_N<2>	8 67 74
	TRUE	LVDS_IG_A_DATA_P<2>	8 67 74
	TRUE	LVDS_CONN_A_CLK_F_N	67 79
	TRUE	LVDS_CONN_A_CLK_F_P	67 79
	TRUE	LED_RETURN_1	67 70
	TRUE	BKL_ISEN2	70
	TRUE	BKL_ISEN3	70
	TRUE	LED_RETURN_4	67 70
	TRUE	LED_RETURN_5	67 70
	TRUE	LED_RETURN_6	67 70

(NEED TO ADD 5 GND TP)

SATA ODD CONN

	TRUE	PP5V_SW_ODD	(NEED 4 TP) 6 8
	TRUE	SMC_ODD_DETECT	36 39
	TRUE	SATA_ODD_D2R_UF_P	36 79
	TRUE	SATA_ODD_D2R_UF_N	36 79
	TRUE	SATA_ODD_R2D_P	36 74
	TRUE	SATA_ODD_R2D_N	36 74

(NEED TO ADD 4 GND TP)

SATA HDD/IR/SIL

	TRUE	PP5V_S0_HDD_FLT	(NEED 3 TP) 6 36
	TRUE	SATA_HDD_R2D_P	36 74
	TRUE	SATA_HDD_R2D_N	36 74
	TRUE	SATA_HDD_D2R_C_P	36 74
	TRUE	SATA_HDD_D2R_C_N	36 74
	TRUE	SYS_LED_ANODE_R	36
	TRUE	IR_RX_OUT	36 38
	TRUE	PP5V_S3_IR_R	36

(NEED TO ADD 5 GND TP)

BATT POWER CONN

	TRUE	SMBUS_SMC_BSA_SCL	6 42 78
	TRUE	SMBUS_SMC_BSA_SDA	6 42 78
	TRUE	SYS_DETECT_L	57
	TRUE	PPVBAT_G3H_CONN	(NEED 3 TP) 57 58

(NEED TO ADD 4 GND TP)

BIL CONN

	TRUE	PP3V42_G3H	6 7
	TRUE	SMBUS_SMC_BSA_SCL	6 42 78
	TRUE	SMBUS_SMC_BSA_SDA	6 42 78
	TRUE	SMC_BIL_BUTTON_L	39 40 57
	TRUE	SMC_LID_R	57

(NEED TO ADD 4 GND TP)

RIGHT CLUTCH CONN

	TRUE	PP5V_S3_BTCAMERA_F	29
	TRUE	PCIE_AP_D2R_P	15 29 74
	TRUE	PCIE_AP_D2R_N	15 29 74
	TRUE	PCIE_AP_R2D_P	29 74
	TRUE	PCIE_AP_R2D_N	29 74
	TRUE	PCIE_CLK100M_AP_CONN_P	29 79
	TRUE	PCIE_CLK100M_AP_CONN_N	29 79
	TRUE	USB_CAMERA_CONN_P	29 79
	TRUE	USB_CAMERA_CONN_N	29 79
	TRUE	PP5V_WLAN	(NEED 2 TP) 6 29
	TRUE	PCIE_WAKE_L	15 24 29
	TRUE	SMBUS_SMC_A_S3_SCL	6 42 78
	TRUE	SMBUS_SMC_A_S3_SDA	6 42 78
	TRUE	USB_BT_CONN_P	29 79
	TRUE	USB_BT_CONN_N	29 79
	TRUE	AP_CLKREQ_Q_L	29
	TRUE	AP_RESET_CONN_L	29

(NEED TO ADD 6 GND TP)

IPD_FLEX_CONN

	TRUE	PP3V3_S3	6 7
	TRUE	PP18V5_S3	6 48
	TRUE	Z2_CS_L	47 48
	TRUE	Z2_DEBUG3	47 48
	TRUE	Z2_MOSI	47 48
	TRUE	Z2_MISO	47 48
	TRUE	Z2_SCLK	47 48
	TRUE	Z2_BOOST_EN	48
	TRUE	Z2_HOST_INTN	47 48
	TRUE	Z2_CLKIN	47 48
	TRUE	Z2_KEY_ACT_L	47 48
	TRUE	Z2_RESET	47 48
	TRUE	PSOC_MISO	47 48
	TRUE	PSOC_MOSI	47 48
	TRUE	PSOC_SCLK	47 48
	TRUE	SMBUS_SMC_A_S3_SDA	6 42 78
	TRUE	SMBUS_SMC_A_S3_SCL	6 42 78
	TRUE	PSOC_F_CS_L	47 48
	TRUE	PICKB_L	47 48

(NEED TO ADD 2 GND TP)

KEYBOARD CONN

	TRUE	PP3V3_S3	6 7
	TRUE	PP3V42_G3H	6 7
	TRUE	WS_KBD1	47
	TRUE	WS_KBD2	47
	TRUE	WS_KBD3	47
	TRUE	WS_KBD4	47
	TRUE	WS_KBD5	47
	TRUE	WS_KBD6	47
	TRUE	WS_KBD7	47
	TRUE	WS_KBD8	47
	TRUE	WS_KBD9	47
	TRUE	WS_KBD10	47
	TRUE	WS_KBD11	47
	TRUE	WS_KBD12	47
	TRUE	WS_KBD13	47
	TRUE	WS_KBD14	47
	TRUE	WS_KBD15_CAP	47
	TRUE	WS_KBD16_NUM	47
	TRUE	WS_KBD17	47
	TRUE	WS_KBD18	47
	TRUE	WS_KBD19	47
	TRUE	WS_KBD20	47
	TRUE	WS_KBD21	47
	TRUE	WS_KBD22	47
	TRUE	WS_KBD23	47
	TRUE	WS_KBD_ONOFF_L	47
	TRUE	WS_LEFT_SHIFT_KBD	47
	TRUE	WS_LEFT_OPTION_KBD	47
	TRUE	WS_CONTROL_KBD	47

(NEED TO ADD 2 GND TP)

KBD BACKLIGHT CONN

	TRUE	KBDLED_ANODE	48
	TRUE	SMC_KDBLED_PRESENT_L	48

(NEED TO ADD 1 GND TP)

T57 CONN

	TRUE	PP5V_S3	6 7
	TRUE	PP3V3_S3	6 7
	TRUE	T57_PWR_EN	18
	TRUE	T57_RESET	18
	TRUE	USB_T57_N	38 75
	TRUE	USB_T57_P	38 75

(NEED TO ADD 5 GND TP)

DEBUG VOLTAGE

	TRUE	PPVCORE_S0_CPU	7 43
	TRUE	PPVCORE_S0_MCP	7 43
	TRUE	PP1V2_ENET	7
	TRUE	PP1V05_S0	7 65
	TRUE	PP1V5_S0	7 65 79
	TRUE	PP1V8_S0	7
	TRUE	PP3V3_S0	7 65 79
	TRUE	PP5V_S0	6 7 65
	TRUE	PP3V3_S3	6 7
	TRUE	PP5V_S3	6 7
	TRUE	PP0V9_S5	7
	TRUE	PP3V3_S5	7 65 79
	TRUE	PP3V42_G3H	6 7
	TRUE	PPBUS_G3H	7 43
	TRUE	PP3V3_ENET	7
	TRUE	PP5V_WLAN	6 29
	TRUE	PP5V_SW_ODD	6 8
	TRUE	PP5V_S0_HDD_FLT	6 36
	TRUE	PP18V5_S3	6 48
	TRUE	PP3V3_S0_LCD_F	6 67
	TRUE	PP3V3_LCDVDD_SW_F	6 67
	TRUE	PP4V5_AUDIO_ANALOG	51
	TRUE	PP1V5R1V35_S3	7 79
	TRUE	SMC_PM_G2_EN	39 65
	TRUE	PM_SLP_S4_L	18 39 40 65
	TRUE	PM_SLP_S3_L	18 39 65 69

(NEED TO ADD 6 GND TP)

SPI DEBUG CONN

	TRUE	PP3V42_G3H	6 7
	TRUE	SPI_CS0_L	41 75
	TRUE	SPI_CLK	41 75
	TRUE	SPI_MOSI	41 75
	TRUE	SPI_MISO	18 41 75
	TRUE	SPIROM_USE_MLB	18 41 50

DC POWER CONN

(NEED 3 TP)

	TRUE	PP18V5_DCIN_FUSE	57
	TRUE	ADAPTER_SENSE	57

(NEED TO ADD 4 GND TP)

FSB SIGNALS WITH NOTEST

	NO_TEST=TRUE	FSB_A_L<35..3>	9 13 72
	NO_TEST=TRUE	FSB_ADS_L	9 13 72
	NO_TEST=TRUE	FSB_ADSTB_L<1..0>	9 13 72
	NO_TEST=TRUE	FSB_D_L<63..0>	9 13 72
	NO_TEST=TRUE	FSB_DINV_L<3..0>	9 13 72
	NO_TEST=TRUE	FSB_DSTB_L_N<3..0>	9 13 72
	NO_TEST=TRUE	FSB_DSTB_L_P<3..0>	9 13 72
	NO_TEST=TRUE	FSB_HIT_L	9 13 72
	NO_TEST=TRUE	FSB_HITM_L	9 13 72
	NO_TEST=TRUE	FSB_LOCK_L	9 13 72
	NO_TEST=TRUE	FSB_REQ_L<4..0>	9 13 72

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FUNC TEST

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"S0,S0M" RAILS

61 =PPVCORE_S0_CPU_REG (CPU VCORE PWR) — PPVCORE_S0_CPU 6 43
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.3 MM
VOLTAGE=1.25V
MAKE_BASE=TRUE
=PPVCORE_S0_CPU 10 11

63 =PPCPUVTT_S0_REG — PP1V05_S0 6 65
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.05V
MAKE_BASE=TRUE
=PP1V05_S0_CPU 9 10 11 12 61
=PP1V05_S0_MCP_FSB 13 19 22
=PP1V05_S0_MCP_AVDD_UF 22
=PP1V05_S0_MCP_SATA_DVDD 19 22
=PP1V05_S0_MCP_PLL_UF_R 64
=PP1V05_FW_P1V0FWFET 34
=PP1V05_S0_FWPWRCTL 34
=PP1V05_SW_MCP_FSB 19 22
=PP1V05_S0_MCP_PE_DVDD 7 22
=PP1V05_S0_MCP_M2CLK_DLL 14 22
=PP1V05_S0_MCP_PLL_IFP 16 23
=PP1V05_S0_MCP_DP0_VDD 16 23

62 =PPMCPCORE_S0_REG (MCP VCORE AFTER SENSE RES) — PPVCORE_S0_MCP 6 43
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
MAKE_BASE=TRUE
=PPVCORE_S0_MCP 19 22
=PPVCORE_S0_MCPGFXFET 21

LVDDR VRef/VTT (0.75V/0.675V) Rails

60 =PPVTT_S0_DDR_LDO — PPDDRVTT_S0
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=0.75V
MAKE_BASE=TRUE
=PPDDRVTT_S0_MEM_A 25
=PPDDRVTT_S0_MEM_B 26

60 28 =PPVTT_S3_DDR_BUF — PPDDRVREF_S3
MIN_LINE_WIDTH=0.3 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=0.75V
MAKE_BASE=TRUE

64 =PP1V5_S0_REG — PP1V5_S0 6 65 79
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.5V
MAKE_BASE=TRUE
=PP1V5_S0_CPU 10 11
=PP1V5_S0_SATARDRVR 36
=PP1V5_S0_MCP_PLL_VLDO 51
=PP1V8R1V5_S0_AUDIO 8
=PP1V5_S0_MCP_HDA_R 8
=PP1V5_S0_AUDIO_R

64 =PP1V8_S0_REG — PP1V8_S0 6
MIN_LINE_WIDTH=0.5 MM
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.8V
MAKE_BASE=TRUE
=PP3V3R1V8_S0_MCP_IFP_VDD 16 23
=PP1V8_S0_AUDIO

64 =PP1V05_S0_MCP_PLL_OR — PP1V05_S0_MCP_PLL_UF
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.05V
MAKE_BASE=TRUE
=PP1V05_S0_MCP_PLL_UF 22

UNUSED MCP PE0[3:0] AVDD/DVDD

19 =PP1V05_S0_MCP_PE_DVDD0
19 =PP1V05_S0_MCP_PE_AVDD0
(SINCE PE0[3:0] IS NOT USED ON K6)

(CONNECTS TO MCP BALLS) 19 =PP1V05_S0_MCP_PE_DVDD1 — =PP1V05_S0_MCP_PE_DVDD 7 22 (CONNECTS TO THE DECAPS)
(CONNECTS TO MCP BALLS) 19 =PP1V05_S0_MCP_PE_AVDD1 — PP1V05_S0_MCP_PE_AVDD 22 (CONNECTS TO THE DECAPS)
MAKE_BASE=TRUE

66 =PP5V_S0_FET — PP5V_S0
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=5V
MAKE_BASE=TRUE
=PP5V_S0_HDD 36
=PP5V_S0_LPCPLUS 41
=PP5V_S0_FAN_RT 46
=PP5V_S0_CPU_IMVP 61
=PP5V_S0_KBDLED 48
=PP5VR3V3_S0_DPCADET 69
=PP5V_S0_CPUVTTS0 63
=PP5V_S0_BKL 70
=PP5V_S0_MCPREG 62
=PP5V_S0_MCPFSBFET 21

66 =PP3V3_S0_FET — PP3V3_S0
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=3.3V
MAKE_BASE=TRUE
=PP3V3_S0_XDP 12
=PP3V3_S0_MCP 19 22
=PP3V3_S0_P1V5S0 64
=PP3V3_S0_DEBUGROM 41
=PP3V3_S0_ODD 36
=PP3V3_S0_SMBUS_SMC_0_S0 42
=PP3V3_S0_SMBUS_SMC_B_S0 42
=PP3V3_S0_SMBUS_MCP_0 42
=PP3V3_S0_FAN_RT 46
=PP3V3_S0_AUDIO 51 55 56
=PP3V3_S0_IMVP 61
=PP3V3_S0_LCD 67
=PP3V3_S0_MCP_GPIO 16 17 18
=PP3V3_S0_MCP_PLL_UF 22
=PP3V3_S0_MCP_HVDD 19 22
=PP3V3_S0_SMC 40
=PP3V3_S0_MCPTHMSNS 45
=PP3V3_S0_CPUTHMSNS 45
=PP3V3_S0_DPCONN 69
=PPSPD_S0_MEM_A 25
=PPSPD_S0_MEM_B 26
=PP3V3_S0_PWRCTL 65
=PP3V3_S0_ENETPHY 31
=PP3V3_S0_CPUVTTISNS 44
=PP3V3_S0_TPAD 48
=PP3V3_S0_SMBUS_MCP_1 42
=PP3V3_S0_P1V8S0 64
=PP3V3_S0_BKL_VDDIO 70
=PP3V3_S0_MCPDDRISNS 44
=PP3V3_S0_MCP_PLL_VLDO 44
=PP3V3_S0_FWPWRCTL 34
=PP3V3_S0_FWLATEVG 34 35
=PP3V3_S0_SDCONN 30
=PP3V3_S0_MCPCOREISNS 44
=PP3V3_S0_MCP_HDA_R 8
=PP3V3_S0_AUDIO_R 8
=PP3V3_S0_OPA333 22

"ENET" RAILS

8 =PP3V3_ENET_FET_R — PP3V3_ENET 6
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=3.3V
MAKE_BASE=TRUE
400mA
=PP3V3_ENET_MCP_RMGT 17 19 22
300mA =PP3V3_ENET_MCP_PLL_MAC 22
~100mA =PP3V3_ENET_PHY 24 31 64
=PP3V3_ENET_PWRCTL 65

(BCM5764M)
64 =PP1V2_ENET_REG — PP1V2_ENET 6
MIN_LINE_WIDTH=0.4 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.2V
MAKE_BASE=TRUE
700 mA max output
64 =PP1V2_ENET_PHY_REG (BCM57765) ~400mA — =PP1V2_ENET_PHY 31

66 =PP0V9_ENET_FET — PP0V9_ENET
MIN_LINE_WIDTH=0.4 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=0.9V
MAKE_BASE=TRUE
=PP0V9_ENET_MCP_RMGT 19 22

"S3" RAILS

LVDDR (1.5V/1.35V) Rails

60 =PPDDR_S3_REG — PP1V5R1V35_S3 6 79
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=1.5V (OR 1.35V)
MAKE_BASE=TRUE
=PPLVDDR_S3_MEM_A 25
=PPLVDDR_S3_MEM_B 26
0 mA =PP1V5R1V35_S3_MCP_MEM 14
4250 mA =PP1V5R1V35_S0_MCPDDRFET 20
=PPVIN_S0_DDRREG_LDO 60

66 =PP3V3_S3_FET — PP3V3_S3 6
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=3.3V
MAKE_BASE=TRUE
=PP3V3_S3_SMBUS_SMC_A_S3 42
=PP3V3_S3_PDCISENS 60
=PP3V3_S3_VREFMRGN 28
=PP3V3_S3_WLAN 29
=PP3V3_S3_MCP_GPIO 18
=PP3V3_S3_TPAD 47 48
=PP3V3_S3_SMS 49
=PP3V3_S3_CARDREADER 30
=PP3V3_S3_T57 38
=PP3V3_ENET_P1V2ENET 64

59 =PP5V_S3_REG — PP5V_S3 6
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=5V
MAKE_BASE=TRUE
=PP5V_S3_RTUSB 37
=PP5V_S3_IR 36 38
=PP5V_S3_MCPDDRFET 20
=PP5V_S3_SYSLED 40
=PP5V_S3_TPAD 48
=PP5V_S3_WLAN 29
=PP5V_S3_DDRREG 60
=PP5V_S3_AUDIO 51 53 55
=PP5V_S3_AUDIO_AMP 54
=PP5V_S3_P5VS0FET 66
=PP5V_S0_ODD 36
=PP5V_S3_BTCAMERA 29
=PP5V_S3_T57 38

"S5" RAILS

59 =PP3V3_S5_REG — PP3V3_S5 6 65 79
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=3.3V
MAKE_BASE=TRUE
=PP3V3_S5_MCP_GPIO 17 18
=PP3V3_S5_ROM 50
=PP3V3_S5_LCD 67
=PP3V3_S5_MCP 19 22
=PP3V3_S5_MCPPWRGD 24
=PP3V3_S5_P3V3S3FET 66
=PP3V3_S5_P3V3S0FET 66
=PP3V3_S5_P3V3ENETFET 66
=PP3V3_S5_DP_PORT_PWR 69
=PP3V3_S5_P0V9S5 64
=PP3V3_FW_P3V3FWFET 34
=PP3V3_S5_P0V9ENETFET 66
=PP3V3_S5_VMON 65
=PP3V3_S5_SMBUS_SMC_MGMT 42

0.9V Rails

64 =PP0V9_S5_REG — PP0V9_S5
MIN_LINE_WIDTH=0.4 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=0.9V
MAKE_BASE=TRUE
105 mA/241 mA =PP0V9_S5_MCP_VDD_AUXC 19 22
139 mA/ 0 mA =PP0V9_ENET_P0V9ENETFET 66

"G3H" RAILS

57 =PP3V42_G3H_REG — PP3V42_G3H 6
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=3.42V
MAKE_BASE=TRUE
=PPVIN_S5_SMCVREF 40
=PP3V42_G3H_SMBUS_SMC_BSA 42
=PP3V42_G3H_PWRCTL 65
=PP3V42_G3H_CHGR 58 65
=PP3V42_G3H_SMCUSBMUX 37
=PP3V42_G3H_TPAD 47
=PP3V42_G3H_BATT 57
=PP3V3_S5_SMC 39 40
=PP3V3_S5_LPCPLUS 41
=PP3V42_G3H_BMON_ISNS 44
J1086 =PP3V42_G3H_ONEWIRE 57
PP3V3_G3_RTC 18 19 22
=PP3V42_G3H_OPA330 22

57 =PP18V5_DCIN_CONN — PPDCIN_S5_S5
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.3 MM
VOLTAGE=18.5V
MAKE_BASE=TRUE
=PPDCIN_S5_CHGR 58

58 =PPBUS_G3H — PPBUS_G3H 6 43
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.3 MM
VOLTAGE=12.6V
MAKE_BASE=TRUE
=PPBUS_S0_LCDBKLT 71
=PPVIN_S0_MCPCORE 62
=PPVIN_S3_DDRREG 60
=PPVIN_S5_3V3S5 59
=PPVIN_S3_5VS3 59
=PPBUS_S5_FWPWRSW 34
=PPBUS_S5_CPUREGS_ISNS_R 44
(BEFORE HIGH SIDE SENSING RES.)

44 =PPBUS_S5_CPUREGS_ISNS (AFTER HIGH SIDE CPU VCORE & CPU VTT SENSING RES.) — PPBUS_S5_IMVP_VTT_ISNS
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.3 MM
VOLTAGE=12.6V
MAKE_BASE=TRUE
=PPVIN_S0_CPUVTTS0 63
=PPVIN_S5_CPU_IMVP 61

"FIREWIRE" RAILS

34 =PP3V3_FW_FET — PP3V3_FW
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=3.3V
MAKE_BASE=TRUE
=PP3V3_FW_FWPHY 33 34 35

34 =PPBUS_FW_FET — PPVP_FW
MIN_LINE_WIDTH=0.4 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=12.6V
MAKE_BASE=TRUE
=PPVP_FW_PORT1 35
=PPVP_FW_PHY_CPS_FET 35

34 =PP1V0_FW_FET_R — PP1V05_FW
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
MAKE_BASE=TRUE
=PP1V0_FW_FWPHY 33 34

SYNC_MASTER=K24_MLB SYNC_DATE=07/22/2009
PAGE TITLE
Power Aliases

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HEATSINK STANDOFFS

Z0902
STDOFF-4.5OD.98H-1.1-3.48-TH
LEFT OF CPU

Z0901
STDOFF-4.5OD.98H-1.1-3.48-TH
ABOVE CPU

Z0903
STDOFF-4.5OD.98H-1.1-3.48-TH
BELOW MCP

Z0904
STDOFF-4.5OD.98H-1.1-3.48-TH
BELOW CPU

FAN STANDOFF

Z0905
STDOFF-4.5OD.98H-1.1-3.48-TH
MIN_LINE_WIDTH=0.6MM
MIN_NECK_WIDTH=0.2MM
VOLTAGE=0V

MLB MOUNTING (TO C. BRACKET) SCREW HOLES

OMIT Z0906 3R2P5
OMIT Z0907 3R2P5

MLB MOUNTING (TO TOPCASE) SCREW HOLES

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

EMI IO (SHORT) POGO PINS

ZS0900 1.4DIA-SHORT-EMI-MLB-K19-K24 SM
ZS0901 1.4DIA-SHORT-EMI-MLB-K19-K24 SM
ZS0902 1.4DIA-SHORT-EMI-MLB-K19-K24 SM
ZS0903 1.4DIA-SHORT-EMI-MLB-K19-K24 SM
ZS0908 1.4DIA-SHORT-EMI-MLB-K19-K24 SM
ZS0909 1.4DIA-SHORT-EMI-MLB-K19-K24 SM

EMI TALL POGO PINS

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

PCI-E ALIASES

UNUSED GPU LANES

15	=PEG_D2R_N<3:0>	NC_PEG_D2R_N<3:0>	NO_TEST=TRUE, MAKE_BASE=TRUE
15	=PEG_D2R_P<3:0>	NC_PEG_D2R_P<3:0>	NO_TEST=TRUE, MAKE_BASE=TRUE
15	=PEG_R2D_C_N<3:0>	NC_PEG_R2D_C_N<3:0>	NO_TEST=TRUE, MAKE_BASE=TRUE
15	=PEG_R2D_C_P<3:0>	NC_PEG_R2D_C_P<3:0>	NO_TEST=TRUE, MAKE_BASE=TRUE
74 15	PEG_CLK100M_P	TP_PEG_CLK100M_P	MAKE_BASE=TRUE
74 15	PEG_CLK100M_N	TP_PEG_CLK100M_N	MAKE_BASE=TRUE
15	PEG_CLKREQ_L	TP_PEG_CLKREQ_L	MAKE_BASE=TRUE

USB ALIASES

UNUSED USB PORTS

75 17	USB_EXTC_P	TP_USB_EXTCP	MAKE_BASE=TRUE
75 17	USB_EXTC_N	TP_USB_EXTCN	MAKE_BASE=TRUE
75 17	USB_EXTD_P	TP_USB_EXTDP	MAKE_BASE=TRUE
75 17	USB_EXTD_N	TP_USB_EXTDN	MAKE_BASE=TRUE
75 17	USB_WM_P	TP_USB_WMP	MAKE_BASE=TRUE
75 17	USB_WM_N	TP_USB_WMN	MAKE_BASE=TRUE
75 17	USB_MINI_P	TP_USB_MINIP	MAKE_BASE=TRUE
75 17	USB_MINI_N	TP_USB_MININ	MAKE_BASE=TRUE

ETHERNET ALIASES

PLACE_NEAR=U7980.A1:5MM
R0911 0 5% 1/10W MF-LF 402
PP3V3_ENET_FET — 1 — 2 — =PP3V3_ENET_FET_R (OUT 7)
66 =PP3V3_ENET_FET
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=3.3V
MAKE_BASE=TRUE

ENET_RXD_PD (MAKE_BASE=TRUE) — ENET_RXD<0> (OUT 17 76)
ENET_RXD<1> (OUT 17 76)
ENET_RXD<2> (OUT 17 76)
ENET_RXD<3> (OUT 17 76)
ENET_RXCLK_PD (MAKE_BASE=TRUE) — ENET_CLK125M_RXCLK (OUT 17 76)
ENET_RX_CTRL (OUT 17 76)
ENET_MDIO (BI 17 76)
MCP_RGMII_VREF (OUT 17)
ENET_LOW_PWR (OUT 18 31)

R0980 10K 5% 1/16W MF-LF 402
R0981 10K 5% 1/16W MF-LF 402
R0982 10K 5% 1/16W MF-LF 402
R0983 10K 5% 1/16W MF-LF 402
R0984 10K 5% 1/16W MF-LF 402
NO STUFF
R0986 10K 5% 1/16W MF-LF 402

DACS ALIASES

UNUSED CRT & TV-OUT INTERFACE

74	MCP_TV_DAC_RSET	NC_MCP_TV_DAC_RSET	NO_TEST=TRUE, MAKE_BASE=TRUE
74	MCP_TV_DAC_VREF	NC_MCP_TV_DAC_VREF	NO_TEST=TRUE, MAKE_BASE=TRUE
	MCP_CLK27M_XTALIN	NC_MCP_CLK27M_XTALIN	NO_TEST=TRUE, MAKE_BASE=TRUE
	MCP_CLK27M_XTALOUT	NC_MCP_CLK27M_XTALOUT	NO_TEST=TRUE, MAKE_BASE=TRUE
74	CRT_IG_R_C_PR	NC_CRT_IG_R_C_PR	NO_TEST=TRUE, MAKE_BASE=TRUE
74	CRT_IG_G_Y_Y	NC_CRT_IG_G_Y_Y	NO_TEST=TRUE, MAKE_BASE=TRUE
74	CRT_IG_B_COMP_PB	NC_CRT_IG_B_COMP_PB	NO_TEST=TRUE, MAKE_BASE=TRUE
74	CRT_IG_HSYNC	NC_CRT_IG_HSYNC	NO_TEST=TRUE, MAKE_BASE=TRUE
74	CRT_IG_VSYNC	NC_CRT_IG_VSYNC	NO_TEST=TRUE, MAKE_BASE=TRUE

LVDS ALIASES

16	=MCP_IFPA_TXC_P	LVDS_IG_A_CLK_P	67 74
16	=MCP_IFPA_TXC_N	LVDS_IG_A_CLK_N	MAKE_BASE=TRUE, 67 74
16	=MCP_IFPA_TXD_P<0..2>	LVDS_IG_A_DATA_P<0..2>	MAKE_BASE=TRUE, 6 67 74
16	=MCP_IFPA_TXD_N<0..2>	LVDS_IG_A_DATA_N<0..2>	MAKE_BASE=TRUE, 6 67 74
16	=MCP_IFPA_TXD_P<3>	NC_LVDS_IG_A_DATAP<3>	NO_TEST=TRUE, MAKE_BASE=TRUE
16	=MCP_IFPA_TXD_N<3>	NC_LVDS_IG_A_DATAN<3>	NO_TEST=TRUE, MAKE_BASE=TRUE
16	=MCP_IFPB_TXC_P	NC_LVDS_IG_B_CLKP	NO_TEST=TRUE, MAKE_BASE=TRUE
16	=MCP_IFPB_TXC_N	NC_LVDS_IG_B_CLKN	NO_TEST=TRUE, MAKE_BASE=TRUE
16	=MCP_IFPB_TXD_P<0..3>	NC_LVDS_IG_B_DATAP<0..3>	NO_TEST=TRUE, MAKE_BASE=TRUE
16	=MCP_IFPB_TXD_N<0..3>	NC_LVDS_IG_B_DATAN<0..3>	NO_TEST=TRUE, MAKE_BASE=TRUE
16	LCD_IG_BKLT_PWM	LCD_BKLT_PWM	70
16	LCD_IG_BKLT_EN	LCD_BKLT_EN	MAKE_BASE=TRUE, 71
16	=MCP_IFPAB_DDC_CLK	LVDS_DDC_CLK	MAKE_BASE=TRUE, 6 67
16	=MCP_IFPAB_DDC_DATA	LVDS_DDC_DATA	MAKE_BASE=TRUE, 6 67

DISPLAY PORT ALIASES

16	DP_IG_ML0_P<0..3>	74	DP_IG_ML_P<0..3>	DP_EXT_ML_P<0..3> MAKE_BASE=TRUE 69 79
16	DP_IG_ML0_N<0..3>	74	DP_IG_ML_N<0..3>	DP_EXT_ML_N<0..3> MAKE_BASE=TRUE 69 79
16	DP_IG_HPD0		DP_EXT_HPD	69
16	DP_IG_AUX_CH0_P		DP_IG_AUX_CH_P	MAKE_BASE=TRUE 68 74
16	DP_IG_AUX_CH0_N		DP_IG_AUX_CH_N	MAKE_BASE=TRUE 68 74
68	DP_AUX_CH_C_N		DP_EXT_AUX_CH_C_N	MAKE_BASE=TRUE 69 79
68	DP_AUX_CH_C_P		DP_EXT_AUX_CH_C_P	MAKE_BASE=TRUE 69 79
68	DP_CA_DET		DP_EXT_CA_DET	MAKE_BASE=TRUE 69
16	DP_IG_ML1_P<0..3>		TP_DP_IG_ML1P<0..3>	MAKE_BASE=TRUE
16	DP_IG_ML1_N<0..3>		TP_DP_IG_ML1N<0..3>	MAKE_BASE=TRUE
16	DP_IG_AUX_CH1_P		TP_DP_IG_AUX_CH1P	MAKE_BASE=TRUE
16	DP_IG_AUX_CH1_N		TP_DP_IG_AUX_CH1N	MAKE_BASE=TRUE
16	DP_IG_HPD1		R0920 100K 5% 1/16W MF-LF 402	

AUDIO ALIASES

7	=PP1V5_S0_AUDIO_R	HDA:1.5V R0912 0	PP3V3R1V5_S0_AUDIO
7	=PP3V3_S0_AUDIO_R	HDA:3.3V R0913 0	=PP3V3R1V5_S0_AUDIO 51
7	=PP1V5_S0_MCP_HDA_R	HDA:1.5V R0914 0	PP3V3R1V5_S0_MCP_HDA
7	=PP3V3_S0_MCP_HDA_R	HDA:3.3V R0915 0	=PP3V3R1V5_S0_MCP_HDA 18 22

MAKE_BASE=TRUE MIN_LINE_WIDTH=0.6mm VOLTAGE=1.5V MIN_NECK_WIDTH=0.2mm
402 5%1/16W MF-LF

CPU ALIASES

72 9	CPU_BSEL<0:2>	=MCP_BSEL<0:2>	13 BSEL<2..0>
13	CPU_PECI_MCP	TP_CPU_PECI_MCP	MAKE_BASE=TRUE

BSEL<2..0>	FSB MHZ
0 0 0	266
0 0 1	133
0 1 0	200
0 1 1	(166)
1 0 0	333
1 0 1	100
1 1 0	(400)
1 1 1	(RSV0)

MCP89 ALIASES

16	TP_MCP_RGB_RED	NC_MCP_RGB_RED	MAKE_BASE=TRUE, NO_TEST=TRUE
16	TP_MCP_RGB_GREEN	NC_MCP_RGB_GREEN	MAKE_BASE=TRUE, NO_TEST=TRUE
16	TP_MCP_RGB_BLUE	NC_MCP_RGB_BLUE	MAKE_BASE=TRUE, NO_TEST=TRUE
16	TP_MCP_RGB_HSYNC	NC_MCP_RGB_HSYNC	MAKE_BASE=TRUE, NO_TEST=TRUE
16	TP_MCP_RGB_VSYNC	NC_MCP_RGB_VSYNC	MAKE_BASE=TRUE, NO_TEST=TRUE
16	TP_MCP_RGB_DAC_RSET	NC_MCP_RGB_DAC_RSET	MAKE_BASE=TRUE, NO_TEST=TRUE
16	TP_MCP_RGB_DAC_VREF	NC_MCP_RGB_DAC_VREF	MAKE_BASE=TRUE, NO_TEST=TRUE

5V ODD ALIASES

6 PP5V_SW_ODD — =PP5V_SW_ODD 36
=PP5V_SW_ODD_FET 36
MAKE_BASE=TRUE
MIN_LINE_WIDTH=0.6 MM
MIN_NECK_WIDTH=0.4 MM
VOLTAGE=5V

BACKLIGHT CONTROLLER ALIASES

71 70 PPBUS_SW_LCDBKLT_PWR — R0910 0 5% 1/16W MF-LF 402 — PLACE_NEAR=L9701.1:5MM PPBUS_SW_BKL
MIN_LINE_WIDTH=0.5 MM
MIN_NECK_WIDTH=0.375 MM
VOLTAGE=12.6V
MAKE_BASE=TRUE
=PPBUS_SW_BKL 70

CHARGER SIGNAL

58 =CHGR_ACOK (IN) — SMC_BC_ACOK (OUT 39 40 57)
MAKE_BASE=TRUE

MCPCOREISNS SIGNAL

62 MCPCORES0_VO — MCPCOREISNS_N — =MCPCOREISNS_N 44
62 MCPCORES0_ISP_R — MCPCOREISNS_P — =MCPCOREISNS_P 44
MAKE_BASE=TRUE

SYNC_MASTER=K24_MLB
PAGE TITLE: SIGNAL ALIAS
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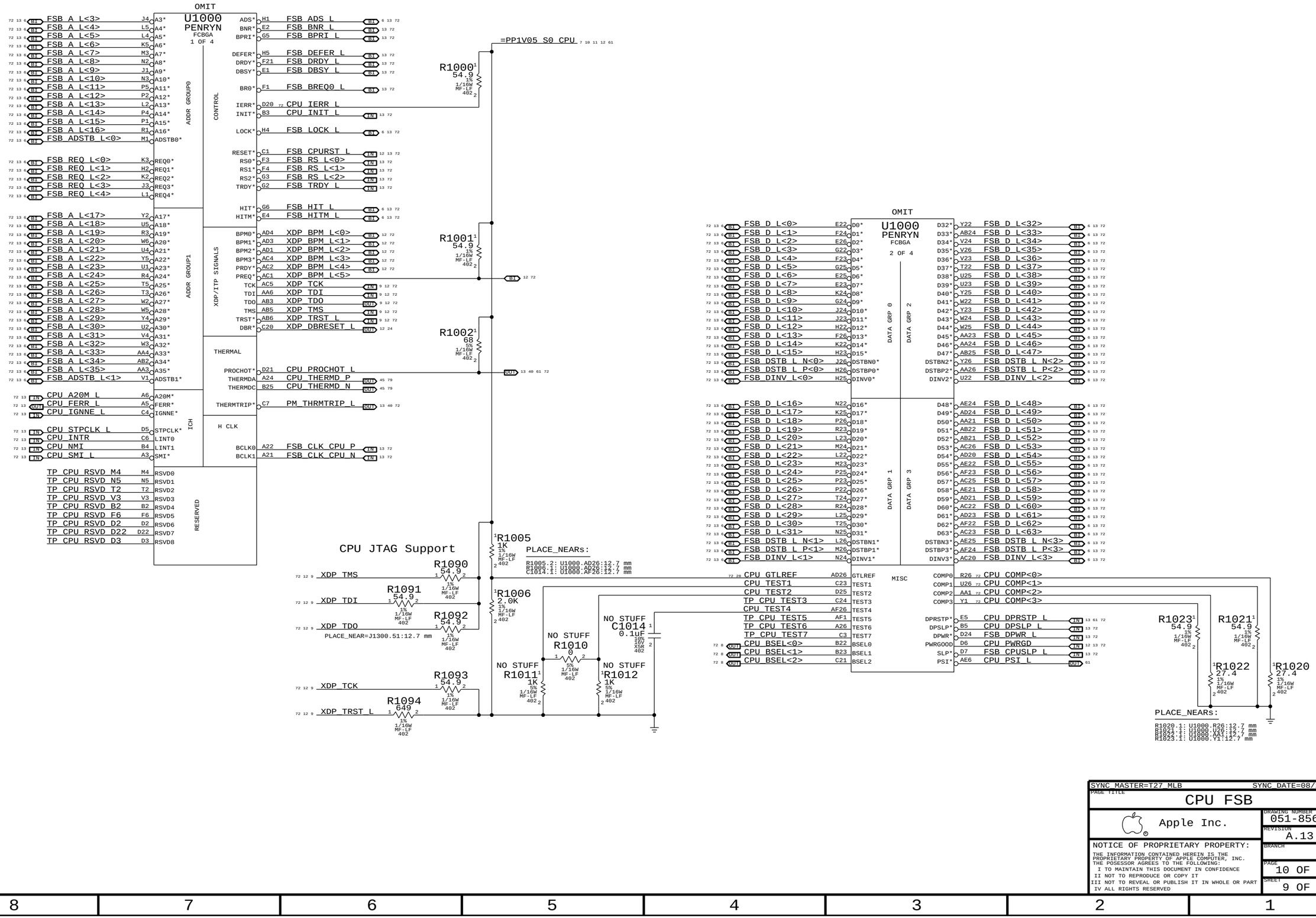

SYNC_MASTER=T27_MLB SYNC_DATE=08/27/2009

PAGE TITLE: CPU FSB

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REVISION: A.13.0

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(CPU CORE POWER)

=PPVCORE_S0_CPU 7 10 11

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

OMIT
U1000
PENRYN
FCBGA
3 OF 4

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

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

(CPU IO POWER 1.05V)

=PP1V05_S0_CPU 7 9 11 12 61

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

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

(CPU INTERNAL PLL POWER 1.5V)

=PP1V5_S0_CPU 7 11

130 mA

(BR1#)

VCCA: B26 C26

VID0	AD6	CPU_VID<0>	OUT 61 72
VID1	AF5	CPU_VID<1>	OUT 61 72
VID2	AE5	CPU_VID<2>	OUT 61 72
VID3	AF4	CPU_VID<3>	OUT 61 72
VID4	AE3	CPU_VID<4>	OUT 61 72
VID5	AF3	CPU_VID<5>	OUT 61 72
VID6	AE2	CPU_VID<6>	OUT 61 72

=PPVCORE_S0_CPU 7 10 11

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

VCCSENSE: AF7 CPU_VCCSENSE_P OUT 61 72

PLACE_NEAR=U1000.AF7:25.4 mm

PLACE_NEAR=U1000.AE7:25.4 mm

VSSSENSE: AE7 CPU_VCCSENSE_N OUT 61 72

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

OMIT
U1000
PENRYN
FCBGA
4 OF 4

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

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

(Socket-P KEY)

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

SYNC MASTER=T27_MLB SYNC DATE=07/20/2006

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CPU Power & Ground

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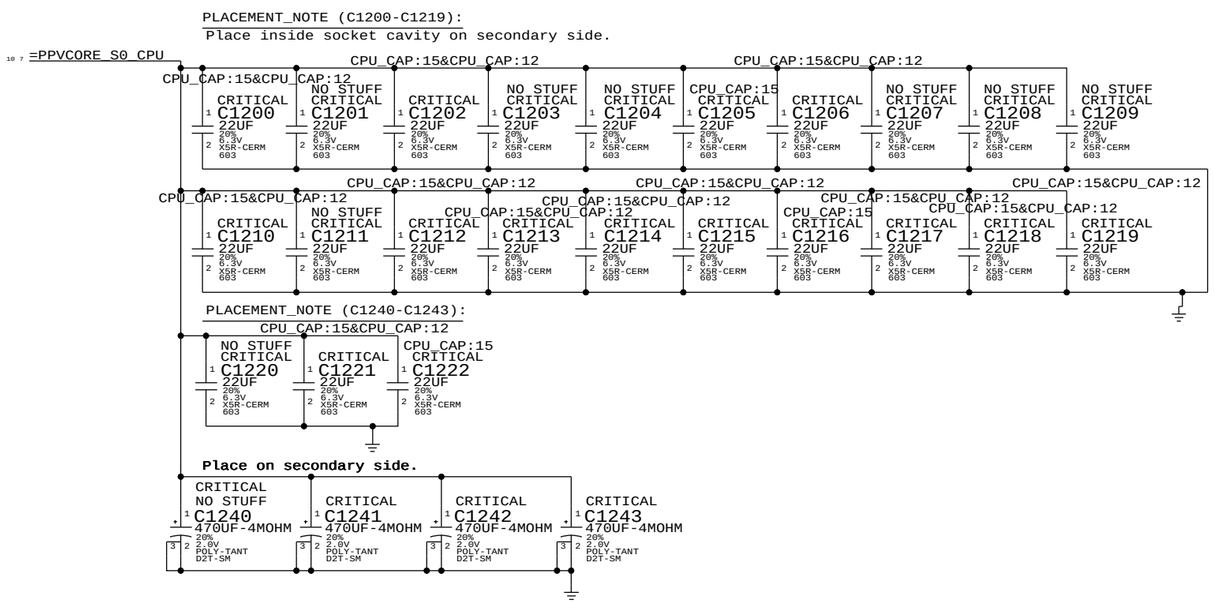
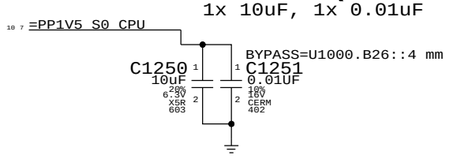
CPU VCore HF and Bulk Decoupling

4X 330UF. 20X 22UF 0805



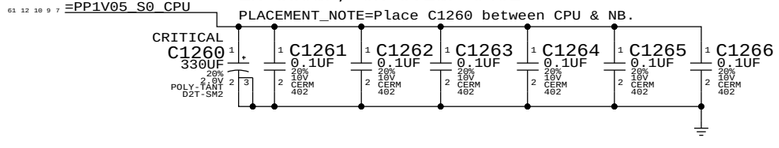
VCCA (CPU AVdd) DECOUPLING

1x 10uF, 1x 0.01uF



VCCP (CPU I/O) DECOUPLING

1x 330uF, 6x 0.1uF 0402



SYNC_MASTER=T27_MLB SYNC_DATE=11/23/2009

PAGE TITLE: CPU Decoupling

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D

REVISION: A.13.0

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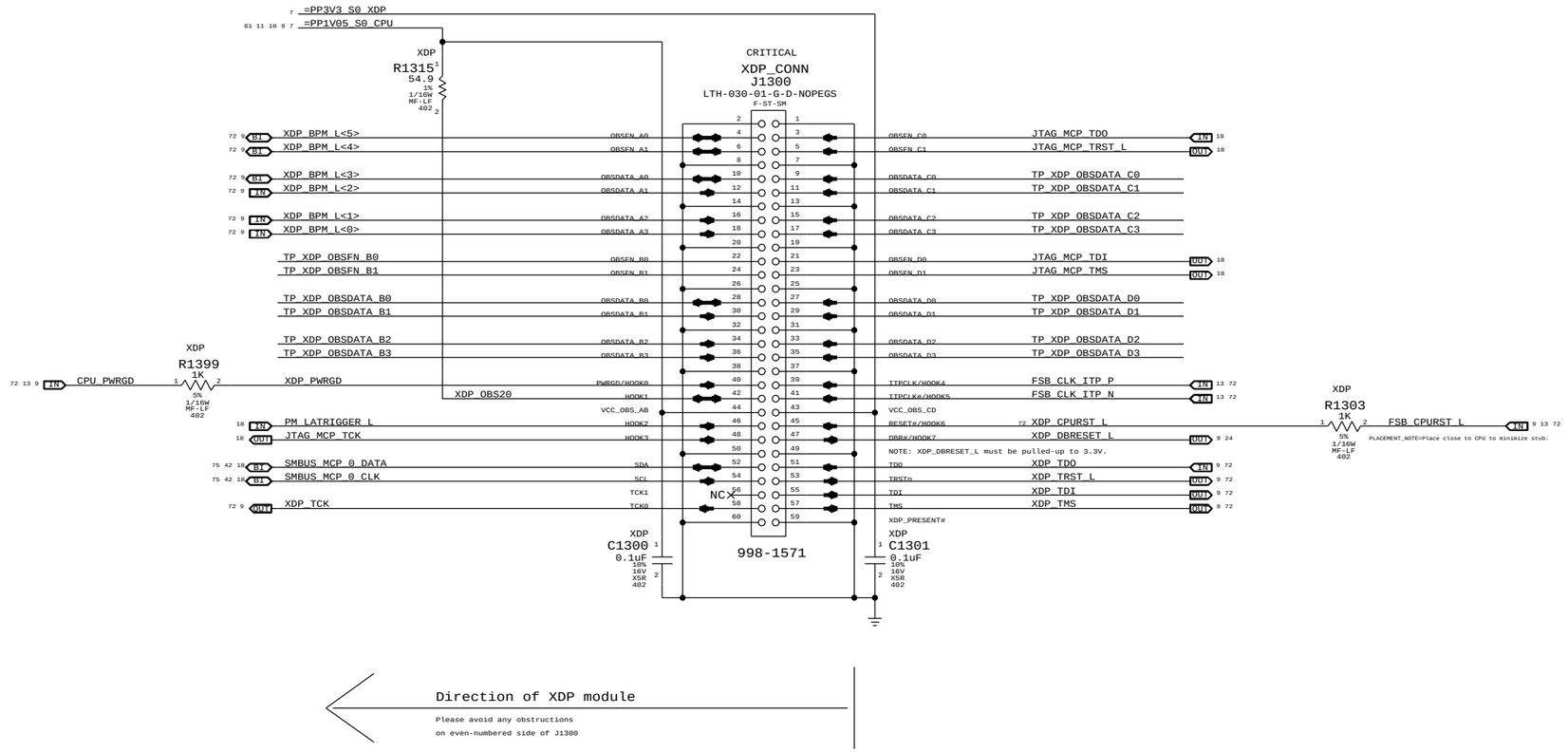
SHEET: 11 OF 80

Mini-XDP Connector

NOTE: This is not the standard XDP pinout.

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

MCP89-specific pinout



SYNC_MASTER=T27_MLB SYNC_DATE=07/28/2009

PAGE TITLE: eXtended Debug Port (mini-XDP)

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D

REVISION: A.13.0

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FSB

FSB_DSTB_L_P<0>	K34	CPU_DSTBP0*	
FSB_DSTB_L_N<0>	K35	CPU_DSTBN0*	
FSB_DINV_L<0>	L37	CPU_DBI0*	
FSB_DSTB_L_P<1>	T31	CPU_DSTBP1*	
FSB_DSTB_L_N<1>	T30	CPU_DSTBN1*	
FSB_DINV_L<1>	P28	CPU_DBI1*	
FSB_DSTB_L_P<2>	K33	CPU_DSTBP2*	
FSB_DSTB_L_N<2>	K32	CPU_DSTBN2*	
FSB_DINV_L<2>	N35	CPU_DBI2*	
FSB_DSTB_L_P<3>	C36	CPU_DSTBP3*	
FSB_DSTB_L_N<3>	D36	CPU_DSTBN3*	
FSB_DINV_L<3>	A35	CPU_DBI3*	
FSB_A_L<3>	U38	CPU_A3*	
FSB_A_L<4>	U34	CPU_A4*	
FSB_A_L<5>	U35	CPU_A5*	
FSB_A_L<6>	T34	CPU_A6*	
FSB_A_L<7>	W37	CPU_A7*	
FSB_A_L<8>	W38	CPU_A8*	
FSB_A_L<9>	T37	CPU_A9*	
FSB_A_L<10>	Y38	CPU_A10*	
FSB_A_L<11>	W35	CPU_A11*	
FSB_A_L<12>	Y36	CPU_A12*	
FSB_A_L<13>	U33	CPU_A13*	
FSB_A_L<14>	W34	CPU_A14*	
FSB_A_L<15>	Y37	CPU_A15*	
FSB_A_L<16>	Y35	CPU_A16*	
FSB_A_L<17>	AF38	CPU_A17*	
FSB_A_L<18>	AB35	CPU_A18*	
FSB_A_L<19>	Y34	CPU_A19*	
FSB_A_L<20>	AE38	CPU_A20*	
FSB_A_L<21>	AC36	CPU_A21*	
FSB_A_L<22>	AF36	CPU_A22*	
FSB_A_L<23>	AC38	CPU_A23*	
FSB_A_L<24>	AB36	CPU_A24*	
FSB_A_L<25>	AB38	CPU_A25*	
FSB_A_L<26>	AB37	CPU_A26*	
FSB_A_L<27>	AC34	CPU_A27*	
FSB_A_L<28>	AE36	CPU_A28*	
FSB_A_L<29>	AF37	CPU_A29*	
FSB_A_L<30>	AC37	CPU_A30*	
FSB_A_L<31>	AC35	CPU_A31*	
FSB_A_L<32>	AE37	CPU_A32*	
FSB_A_L<33>	AE35	CPU_A33*	
FSB_A_L<34>	AE33	CPU_A34*	
FSB_A_L<35>	AE34	CPU_A35*	
FSB_ADSTB_L<0>	W36	CPU_ADSTB0*	
FSB_ADSTB_L<1>	AB34	CPU_ADSTB1*	
FSB_REQ_L<0>	U36	CPU_REQ0*	
FSB_REQ_L<1>	T36	CPU_REQ1*	
FSB_REQ_L<2>	U37	CPU_REQ2*	
FSB_REQ_L<3>	T38	CPU_REQ3*	
FSB_REQ_L<4>	T35	CPU_REQ4*	
FSB_ADS_L	AE31	CPU_ADS*	
FSB_BNR_L	AE32	CPU_BNR*	
FSB_BREQ0_L	AE30	CPU_BR0*	
FSB_DBSY_L	AE29	CPU_DBSY*	
FSB_DRDY_L	U29	CPU_DRDY*	
FSB_HIT_L	W32	CPU_HIT*	
FSB_HITM_L	AB31	CPU_HITM*	
FSB_LOCK_L	AC32	CPU_LOCK*	
FSB_TRDY_L	AC29	CPU_TRDY*	
CPU_PECI_MCP	AH34	CPU_PECI	
CPU_PROCHOT_L	U28	CPU_PROCHOT*	
	W33	CPU_THERMTRIP*	
	AB32	CPU_FERR*	
	B34	CPU_BSEL2	
	C34	CPU_BSEL1	
	A34	CPU_BSEL0	
FSB_RS_L<0>	AB29	CPU_RS0*	
FSB_RS_L<1>	AC33	CPU_RS1*	
FSB_RS_L<2>	AC31	CPU_RS2*	
MCP_BCLK_VML_COMP_VDD	AH37	BCLK_VML_COMP_VDD	
MCP_BCLK_VML_COMP_GND	AH38	BCLK_VML_COMP_GND	
MCP_CPU_COMP_VCC	AH36	CPU_COMP_VCC	
MCP_CPU_COMP_GND	AH35	CPU_COMP_GND	

CPU_D0*	N38	FSB_D_L<0>	
CPU_D1*	N36	FSB_D_L<1>	
CPU_D2*	P36	FSB_D_L<2>	
CPU_D3*	L36	FSB_D_L<3>	
CPU_D4*	N34	FSB_D_L<4>	
CPU_D5*	L35	FSB_D_L<5>	
CPU_D6*	P37	FSB_D_L<6>	
CPU_D7*	P38	FSB_D_L<7>	
CPU_D8*	N36	FSB_D_L<8>	
CPU_D9*	L34	FSB_D_L<9>	
CPU_D10*	K37	FSB_D_L<10>	
CPU_D11*	K36	FSB_D_L<11>	
CPU_D12*	K38	FSB_D_L<12>	
CPU_D13*	N37	FSB_D_L<13>	
CPU_D14*	H37	FSB_D_L<14>	
CPU_D15*	L38	FSB_D_L<15>	
CPU_D16*	N28	FSB_D_L<16>	
CPU_D17*	U30	FSB_D_L<17>	
CPU_D18*	N29	FSB_D_L<18>	
CPU_D19*	P34	FSB_D_L<19>	
CPU_D20*	T29	FSB_D_L<20>	
CPU_D21*	T32	FSB_D_L<21>	
CPU_D22*	U32	FSB_D_L<22>	
CPU_D23*	T33	FSB_D_L<23>	
CPU_D24*	P31	FSB_D_L<24>	
CPU_D25*	P30	FSB_D_L<25>	
CPU_D26*	N30	FSB_D_L<26>	
CPU_D27*	P33	FSB_D_L<27>	
CPU_D28*	N31	FSB_D_L<28>	
CPU_D29*	T28	FSB_D_L<29>	
CPU_D30*	P35	FSB_D_L<30>	
CPU_D31*	P29	FSB_D_L<31>	
CPU_D32*	H33	FSB_D_L<32>	
CPU_D33*	G34	FSB_D_L<33>	
CPU_D34*	L30	FSB_D_L<34>	
CPU_D35*	L31	FSB_D_L<35>	
CPU_D36*	L33	FSB_D_L<36>	
CPU_D37*	P32	FSB_D_L<37>	
CPU_D38*	N32	FSB_D_L<38>	
CPU_D39*	N33	FSB_D_L<39>	
CPU_D40*	H35	FSB_D_L<40>	
CPU_D41*	K31	FSB_D_L<41>	
CPU_D42*	H34	FSB_D_L<42>	
CPU_D43*	K30	FSB_D_L<43>	
CPU_D44*	L32	FSB_D_L<44>	
CPU_D45*	G33	FSB_D_L<45>	
CPU_D46*	H32	FSB_D_L<46>	
CPU_D47*	G35	FSB_D_L<47>	
CPU_D48*	C37	FSB_D_L<48>	
CPU_D49*	D37	FSB_D_L<49>	
CPU_D50*	H38	FSB_D_L<50>	
CPU_D51*	G38	FSB_D_L<51>	
CPU_D52*	G37	FSB_D_L<52>	
CPU_D53*	G36	FSB_D_L<53>	
CPU_D54*	B35	FSB_D_L<54>	
CPU_D55*	E35	FSB_D_L<55>	
CPU_D56*	B36	FSB_D_L<56>	
CPU_D57*	E36	FSB_D_L<57>	
CPU_D58*	C35	FSB_D_L<58>	
CPU_D59*	D34	FSB_D_L<59>	
CPU_D60*	E38	FSB_D_L<60>	
CPU_D61*	D38	FSB_D_L<61>	
CPU_D62*	E34	FSB_D_L<62>	
CPU_D63*	E37	FSB_D_L<63>	
CPU_BPRI*	Y31	FSB_BPRI_L	
CPU_DEFER*	Y30	FSB_DEFER_L	
BCLK_OUT_CPU_N	AF32	FSB_CLK_CPU_N	
BCLK_OUT_CPU_P	AF33	FSB_CLK_CPU_P	
BCLK_OUT_ITP_N	AF35	FSB_CLK_ITP_N	
BCLK_OUT_ITP_P	AF34	FSB_CLK_ITP_P	
BCLK_OUT_NB_N	AF28	FSB_CLK_MCP_N	
BCLK_OUT_NB_P	AF29	FSB_CLK_MCP_P	
BCLK_IN_P	AF30		
BCLK_IN_N	AF31		
CPU_A20M*	W30	CPU_A20M_L	
CPU_IGNNE*	AB30	CPU_IGNNE_L	
CPU_INIT*	AB28	CPU_INIT_L	
CPU_INTR	W31	CPU_INTR	
CPU_NMI	AC30	CPU_NMI	
CPU_SMI*	AC28	CPU_SMI_L	
CPU_PWRGD	Y32	CPU_PWRGD	
CPU_RESET*	AE28	FSB_CPURST_L	
CPU_DPRSLPVR	G1	PM_DPRSLPVR	
CPU_SLP*	Y33	FSB_CPUSLP_L	
CPU_DPSLP*	AB33	CPU_DPSLP_L	
CPU_DPWR*	U31	FSB_DPWR_L	
CPU_STPCLK*	Y29	CPU_STPCLK_L	
CPU_DPRSTP*	W29	CPU_DPRSTP_L	

=PP1V05_S0_MCP_FSB

R1410 54.9 1% 1/16W MF-LF 402
R1415 62 5% 1/16W MF-LF 402
R1430 49.9 1% 1/16W MF-LF 402
R1435 49.9 1% 1/16W MF-LF 402
R1431 49.9 1% 1/16W MF-LF 402
R1436 49.9 1% 1/16W MF-LF 402

PM_THRMTRIP_L
CPU_FERR_L
=MCP_BSEL<2>
=MCP_BSEL<1>
=MCP_BSEL<0>

Loop-back clock for delay matching.

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

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PAGE TITLE
MCP CPU Interface

Apple Inc.

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MEMORY PARTITION 0

MEM_A_DQ<63>	AP5	MDQ0_63	
MEM_A_DQ<62>	AP7	MDQ0_62	
MEM_A_DQ<61>	AR8	MDQ0_61	
MEM_A_DQ<60>	AP8	MDQ0_60	
MEM_A_DQ<59>	AR4	MDQ0_59	
MEM_A_DQ<58>	AR5	MDQ0_58	
MEM_A_DQ<57>	AM8	MDQ0_57	
MEM_A_DQ<56>	AN8	MDQ0_56	
MEM_A_DQ<55>	AK11	MDQ0_55	
MEM_A_DQ<54>	AL11	MDQ0_54	
MEM_A_DQ<53>	AH13	MDQ0_53	
MEM_A_DQ<52>	AH14	MDQ0_52	
MEM_A_DQ<51>	AL10	MDQ0_51	
MEM_A_DQ<50>	AK10	MDQ0_50	
MEM_A_DQ<49>	AN11	MDQ0_49	
MEM_A_DQ<48>	AJ13	MDQ0_48	
MEM_A_DQ<47>	AK13	MDQ0_47	
MEM_A_DQ<46>	AK14	MDQ0_46	
MEM_A_DQ<45>	AJ16	MDQ0_45	
MEM_A_DQ<44>	AH16	MDQ0_44	
MEM_A_DQ<43>	AJ14	MDQ0_43	
MEM_A_DQ<42>	AL13	MDQ0_42	
MEM_A_DQ<41>	AM14	MDQ0_41	
MEM_A_DQ<40>	AN14	MDQ0_40	
MEM_A_DQ<39>	AK17	MDQ0_39	
MEM_A_DQ<38>	AL17	MDQ0_38	
MEM_A_DQ<37>	AN17	MDQ0_37	
MEM_A_DQ<36>	AJ19	MDQ0_36	
MEM_A_DQ<35>	AH17	MDQ0_35	
MEM_A_DQ<34>	AJ17	MDQ0_34	
MEM_A_DQ<33>	AM16	MDQ0_33	
MEM_A_DQ<32>	AM17	MDQ0_32	
MEM_A_DQ<31>	AN26	MDQ0_31	
MEM_A_DQ<30>	AH29	MDQ0_30	
MEM_A_DQ<29>	AK29	MDQ0_29	
MEM_A_DQ<28>	AL29	MDQ0_28	
MEM_A_DQ<27>	AM25	MDQ0_27	
MEM_A_DQ<26>	AM26	MDQ0_26	
MEM_A_DQ<25>	AL28	MDQ0_25	
MEM_A_DQ<24>	AK28	MDQ0_24	
MEM_A_DQ<23>	AM28	MDQ0_23	
MEM_A_DQ<22>	AP29	MDQ0_22	
MEM_A_DQ<21>	AL31	MDQ0_21	
MEM_A_DQ<20>	AN32	MDQ0_20	
MEM_A_DQ<19>	AP28	MDQ0_19	
MEM_A_DQ<18>	AN28	MDQ0_18	
MEM_A_DQ<17>	AN31	MDQ0_17	
MEM_A_DQ<16>	AM31	MDQ0_16	
MEM_A_DQ<15>	AR34	MDQ0_15	
MEM_A_DQ<14>	AM32	MDQ0_14	
MEM_A_DQ<13>	AL33	MDQ0_13	
MEM_A_DQ<12>	AL35	MDQ0_12	
MEM_A_DQ<11>	AP32	MDQ0_11	
MEM_A_DQ<10>	AP33	MDQ0_10	
MEM_A_DQ<9>	AM35	MDQ0_9	
MEM_A_DQ<8>	AL32	MDQ0_8	
MEM_A_DQ<7>	AJ35	MDQ0_7	
MEM_A_DQ<6>	AJ31	MDQ0_6	
MEM_A_DQ<5>	AH32	MDQ0_5	
MEM_A_DQ<4>	AH33	MDQ0_4	
MEM_A_DQ<3>	AJ34	MDQ0_3	
MEM_A_DQ<2>	AL34	MDQ0_2	
MEM_A_DQ<1>	AJ33	MDQ0_1	
MEM_A_DQ<0>	AJ32	MDQ0_0	
MEM_A_DM<7>	AR7	MDQM0_7	
MEM_A_DM<6>	AM11	MDQM0_6	
MEM_A_DM<5>	AL14	MDQM0_5	
MEM_A_DM<4>	AN16	MDQM0_4	
MEM_A_DM<3>	AJ29	MDQM0_3	
MEM_A_DM<2>	AP31	MDQM0_2	
MEM_A_DM<1>	AM34	MDQM0_1	
MEM_A_DM<0>	AJ30	MDQM0_0	

MDQS0_7_P	AN7	MEM_A_DQS_P<7>	
MDQS0_7_N	AM7	MEM_A_DQS_N<7>	
MDQS0_6_P	AN10	MEM_A_DQS_P<6>	
MDQS0_6_N	AM10	MEM_A_DQS_N<6>	
MDQS0_5_P	AN13	MEM_A_DQS_P<5>	
MDQS0_5_N	AM13	MEM_A_DQS_N<5>	
MDQS0_4_P	AL16	MEM_A_DQS_P<4>	
MDQS0_4_N	AK16	MEM_A_DQS_N<4>	
MDQS0_3_P	AH28	MEM_A_DQS_P<3>	
MDQS0_3_N	AJ28	MEM_A_DQS_N<3>	
MDQS0_2_P	AM29	MEM_A_DQS_P<2>	
MDQS0_2_N	AN29	MEM_A_DQS_N<2>	
MDQS0_1_P	AP34	MEM_A_DQS_P<1>	
MDQS0_1_N	AP35	MEM_A_DQS_N<1>	
MDQS0_0_P	AH31	MEM_A_DQS_P<0>	
MDQS0_0_N	AG31	MEM_A_DQS_N<0>	

MRAS0*	AN19	MEM_A_RAS_L	
MCAS0*	AL19	MEM_A_CAS_L	
MWE0*	AL20	MEM_A_WE_L	
MBA0_2	AL25	MEM_A_BA<2>	
MBA0_1	AN20	MEM_A_BA<1>	
MBA0_0	AM19	MEM_A_BA<0>	
MA0_15	AK26	MEM_A_A<15>	
MA0_14	AK25	MEM_A_A<14>	
MA0_13	AJ20	MEM_A_A<13>	
MA0_12	AJ26	MEM_A_A<12>	
MA0_11	AH25	MEM_A_A<11>	
MA0_10	AM20	MEM_A_A<10>	
MA0_9	AH26	MEM_A_A<9>	
MA0_8	AN23	MEM_A_A<8>	
MA0_7	AJ25	MEM_A_A<7>	
MA0_6	AM22	MEM_A_A<6>	
MA0_5	AM23	MEM_A_A<5>	
MA0_4	AN22	MEM_A_A<4>	
MA0_3	AL23	MEM_A_A<3>	
MA0_2	AK22	MEM_A_A<2>	
MA0_1	AK23	MEM_A_A<1>	
MA0_0	AL22	MEM_A_A<0>	

=PP1V05_S0_MCP_M2CLK_DLL — 550 mA

+VIO_M2CLK_DLL_1	AF24	
+VIO_M2CLK_DLL_2	AG25	

PP1V05_S0_MCP_PLL_FSBMEM — 20 mA / 70 mA

+VIO_PLL_MEM_1	AF25	
+VIO_PLL_MEM_2	AG26	
+VIO_PLL_FSB_1	AF26	25 mA
+VIO_PLL_FSB_2	AG28	
+VIO_PLL_CPU_1	AC26	25 mA
+VIO_PLL_CPU_2	AD26	
+VIO_PLL_CPU_3	AE26	
+VIO_PLL_CPU_4	AF27	

MCLK0A_1_P	AH23	MEM_A_CLK_P<1>	
MCLK0A_1_N	AJ23	MEM_A_CLK_N<1>	
MCLK0A_0_P	AJ22	MEM_A_CLK_P<0>	
MCLK0A_0_N	AH22	MEM_A_CLK_N<0>	
MCS0A_1*	AH19	MEM_A_CS_L<1>	
MCS0A_0*	AK20	MEM_A_CS_L<0>	
MODT0A_1	AH20	MEM_A_ODT<1>	
MODT0A_0	AK19	MEM_A_ODT<0>	
MCKE0A_1	AL26	MEM_A_CKE<1>	
MCKE0A_0	AN25	MEM_A_CKE<0>	

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MEMORY PARTITION 1

MEM_B_DQ<63>	AP1	MDQ1_63	
MEM_B_DQ<62>	AR3	MDQ1_62	
MEM_B_DQ<61>	AV4	MDQ1_61	
MEM_B_DQ<60>	AU4	MDQ1_60	
MEM_B_DQ<59>	AP3	MDQ1_59	
MEM_B_DQ<58>	AP2	MDQ1_58	
MEM_B_DQ<57>	AU3	MDQ1_57	
MEM_B_DQ<56>	AT4	MDQ1_56	
MEM_B_DQ<55>	AT5	MDQ1_55	
MEM_B_DQ<54>	AT7	MDQ1_54	
MEM_B_DQ<53>	AU8	MDQ1_53	
MEM_B_DQ<52>	AR10	MDQ1_52	
MEM_B_DQ<51>	AV5	MDQ1_51	
MEM_B_DQ<50>	AU5	MDQ1_50	
MEM_B_DQ<49>	AP10	MDQ1_49	
MEM_B_DQ<48>	AT8	MDQ1_48	
MEM_B_DQ<47>	AT10	MDQ1_47	
MEM_B_DQ<46>	AU10	MDQ1_46	
MEM_B_DQ<45>	AR13	MDQ1_45	
MEM_B_DQ<44>	AR14	MDQ1_44	
MEM_B_DQ<43>	AR11	MDQ1_43	
MEM_B_DQ<42>	AP11	MDQ1_42	
MEM_B_DQ<41>	AT11	MDQ1_41	
MEM_B_DQ<40>	AP13	MDQ1_40	
MEM_B_DQ<39>	AV14	MDQ1_39	
MEM_B_DQ<38>	AU14	MDQ1_38	
MEM_B_DQ<37>	AR17	MDQ1_37	
MEM_B_DQ<36>	AP17	MDQ1_36	
MEM_B_DQ<35>	AP14	MDQ1_35	
MEM_B_DQ<34>	AT13	MDQ1_34	
MEM_B_DQ<33>	AP16	MDQ1_33	
MEM_B_DQ<32>	AR16	MDQ1_32	
MEM_B_DQ<31>	AU26	MDQ1_31	
MEM_B_DQ<30>	AT26	MDQ1_30	
MEM_B_DQ<29>	AU29	MDQ1_29	
MEM_B_DQ<28>	AT29	MDQ1_28	
MEM_B_DQ<27>	AV25	MDQ1_27	
MEM_B_DQ<26>	AV26	MDQ1_26	
MEM_B_DQ<25>	AV28	MDQ1_25	
MEM_B_DQ<24>	AV29	MDQ1_24	
MEM_B_DQ<23>	AT31	MDQ1_23	
MEM_B_DQ<22>	AR32	MDQ1_22	
MEM_B_DQ<21>	AT34	MDQ1_21	
MEM_B_DQ<20>	AU34	MDQ1_20	
MEM_B_DQ<19>	AR29	MDQ1_19	
MEM_B_DQ<18>	AR31	MDQ1_18	
MEM_B_DQ<17>	AU32	MDQ1_17	
MEM_B_DQ<16>	AT32	MDQ1_16	
MEM_B_DQ<15>	AV35	MDQ1_15	
MEM_B_DQ<14>	AT35	MDQ1_14	
MEM_B_DQ<13>	AR37	MDQ1_13	
MEM_B_DQ<12>	AP38	MDQ1_12	
MEM_B_DQ<11>	AV34	MDQ1_11	
MEM_B_DQ<10>	AU35	MDQ1_10	
MEM_B_DQ<9>	AR36	MDQ1_9	
MEM_B_DQ<8>	AR38	MDQ1_8	
MEM_B_DQ<7>	AM36	MDQ1_7	
MEM_B_DQ<6>	AM37	MDQ1_6	
MEM_B_DQ<5>	AJ36	MDQ1_5	
MEM_B_DQ<4>	AL36	MDQ1_4	
MEM_B_DQ<3>	AP37	MDQ1_3	
MEM_B_DQ<2>	AP36	MDQ1_2	
MEM_B_DQ<1>	AJ38	MDQ1_1	
MEM_B_DQ<0>	AJ37	MDQ1_0	
MEM_B_DM<7>	AT2	MDQM1_7	
MEM_B_DM<6>	AU7	MDQM1_6	
MEM_B_DM<5>	AV10	MDQM1_5	
MEM_B_DM<4>	AT14	MDQM1_4	
MEM_B_DM<3>	AR28	MDQM1_3	
MEM_B_DM<2>	AV32	MDQM1_2	
MEM_B_DM<1>	AT37	MDQM1_1	
MEM_B_DM<0>	AM38	MDQM1_0	

MDQS1_7_P	AR2	MEM_B_DQS_P<7>	
MDQS1_7_N	AR1	MEM_B_DQS_N<7>	
MDQS1_6_P	AV7	MEM_B_DQS_P<6>	
MDQS1_6_N	AV8	MEM_B_DQS_N<6>	
MDQS1_5_P	AU11	MEM_B_DQS_P<5>	
MDQS1_5_N	AV11	MEM_B_DQS_N<5>	
MDQS1_4_P	AU13	MEM_B_DQS_P<4>	
MDQS1_4_N	AV13	MEM_B_DQS_N<4>	
MDQS1_3_P	AT28	MEM_B_DQS_P<3>	
MDQS1_3_N	AU28	MEM_B_DQS_N<3>	
MDQS1_2_P	AU31	MEM_B_DQS_P<2>	
MDQS1_2_N	AV31	MEM_B_DQS_N<2>	
MDQS1_1_P	AU36	MEM_B_DQS_P<1>	
MDQS1_1_N	AT36	MEM_B_DQS_N<1>	
MDQS1_0_P	AL38	MEM_B_DQS_P<0>	
MDQS1_0_N	AL37	MEM_B_DQS_N<0>	

MRAS1*	AR19	MEM_B_RAS_L	
MCAS1*	AU17	MEM_B_CAS_L	
MWE1*	AT17	MEM_B_WE_L	
MBA1_2	AR25	MEM_B_BA<2>	
MBA1_1	AT19	MEM_B_BA<1>	
MBA1_0	AR20	MEM_B_BA<0>	
MA1_15	AP26	MEM_B_A<15>	
MA1_14	AR26	MEM_B_A<14>	
MA1_13	AV16	MEM_B_A<13>	
MA1_12	AP25	MEM_B_A<12>	
MA1_11	AT23	MEM_B_A<11>	
MA1_10	AP20	MEM_B_A<10>	
MA1_9	AU23	MEM_B_A<9>	
MA1_8	AV22	MEM_B_A<8>	
MA1_7	AV23	MEM_B_A<7>	
MA1_6	AT22	MEM_B_A<6>	
MA1_5	AU22	MEM_B_A<5>	
MA1_4	AP23	MEM_B_A<4>	
MA1_3	AR23	MEM_B_A<3>	
MA1_2	AP22	MEM_B_A<2>	
MA1_1	AR22	MEM_B_A<1>	
MA1_0	AT20	MEM_B_A<0>	

=PP1V5R1V35_S3_MCP_MEM

R1520 1K 5% 1/16W MF-LF 402

MRESET0*	AP4	MEM_RESET_L	
MCLK1A_1_P	AU20	MEM_B_CLK_P<1>	
MCLK1A_1_N	AV20	MEM_B_CLK_N<1>	
MCLK1A_0_P	AU19	MEM_B_CLK_P<0>	
MCLK1A_0_N	AV19	MEM_B_CLK_N<0>	
MCS1A_1*	AU16	MEM_B_CS_L<1>	
MCS1A_0*	AP19	MEM_B_CS_L<0>	
MODT1A_1	AT16	MEM_B_ODT<1>	
MODT1A_0	AV17	MEM_B_ODT<0>	
MCKE1A_1	AU25	MEM_B_CKE<1>	
MCKE1A_0	AT25	MEM_B_CKE<0>	

=PP1V5R1V35_SW_MCP_MEM

R1510 40.2 1% 1/16W MF-LF 402

R1511 40.2 1% 1/16W MF-LF 402

MCP_MEM_COMP_GND	AG23	MEM_COMP_GND
MCP_MEM_COMP_VDD	AG22	MEM_COMP_VDD

Current numbers from MCP89 A01 Bring-Up Support document (MCP80_TDP_EDP_Bringup_Targets_Apple.pdf, dated August 5, 2009). K6/K69 EDP currents used.

SYNC_MASTER=T27_MLB SYNC_DATE=08/06/2009

PAGE TITLE: MCP Memory Interface

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D

REVISION: A.13.0

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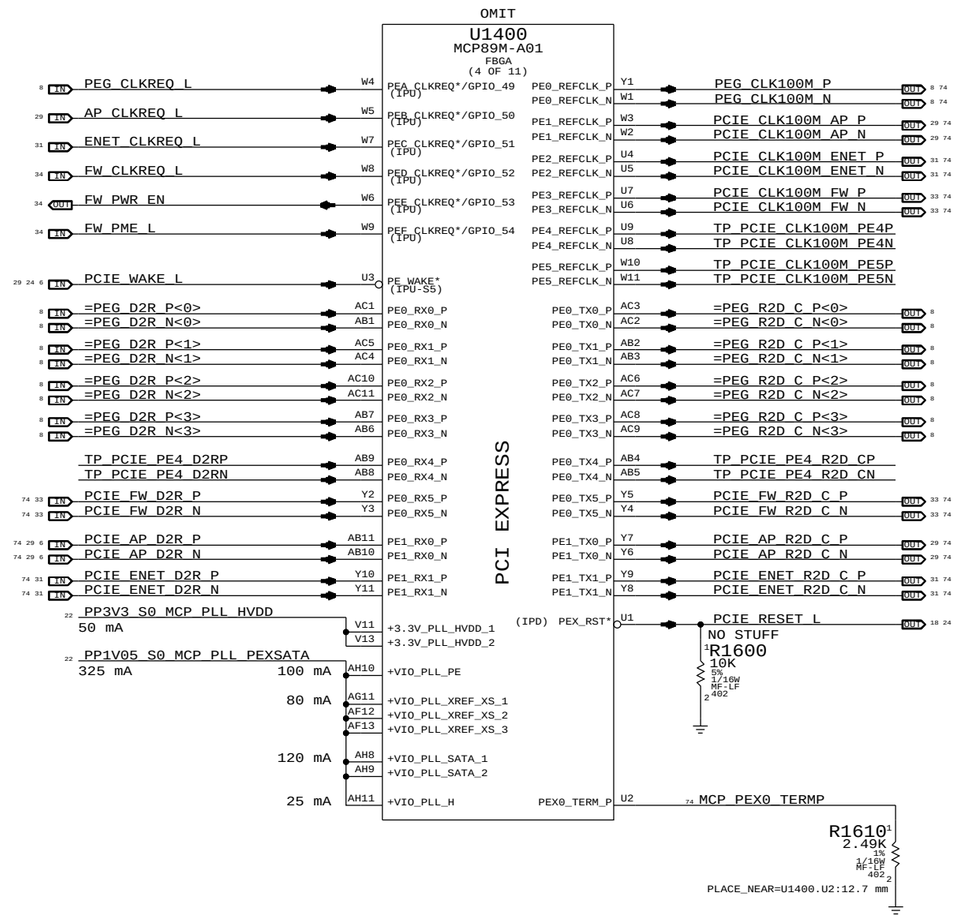

PE0 ports are Gen2-capable. 4 RCs: 4x, x2, x1, x1
PE1 ports are Gen1-only. 2 RCs: x1, x1

If PE0[3:0] are not used,
+VIO_PE_AVDD0 and +VIO_PE_DVDD0 can be GND

If PE0[4:5] and PE1[0:1] are not used,
+VIO_PE_AVDD1 and +VIO_PE_DVDD1 can be GND

Current numbers from MCP89 A01 Bring-Up Support document (MCP89_TDP_EDP_Bringup_Targets_Apple.pdf, dated August 5, 2009). K6/K69 EDP currents used.

SYNC_MASTER=T27_MLB SYNC_DATE=11/05/2009

PAGE TITLE
MCP PCIe Interfaces

Apple Inc.

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U1400
MCP89M-A01
FBGA
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RGB

23	PP3V3_S0_MCP_DAC	140 mA	B29	+3.3V_RGBDAC			
					DDC_CLK0/GPIO_38	F29	AUD_IP_PERIPHERAL_DET (IN) 16 56
					DDC_DATA0/GPIO_39	H25	MIKEY_MIC_LOAD_DET (IN) 16
8	TP_MCP_RGB_DAC_RSET		C29	RGB_DAC_RSET			
8	TP_MCP_RGB_DAC_VREF		D29	RGB_DAC_VREF			
					RGB_DAC_RED	C31	TP_MCP_RGB_RED 8
					RGB_DAC_GREEN	B31	TP_MCP_RGB_GREEN 8
					RGB_DAC_BLUE	A31	TP_MCP_RGB_BLUE 8
					RGB_DAC_HSYNC	D31	TP_MCP_RGB_HSYNC 8
					RGB_DAC_VSYNC	E31	TP_MCP_RGB_VSYNC 8

FLAT PANEL

8	DP_IG_ML0_P<3>		D26	DP0_3_P/TMDS0_TXC_P	IFPA_TXC_P	K22	=MCP_IFPA_TXC_P (OUT) 8
8	DP_IG_ML0_N<3>		E26	DP0_3_N/TMDS0_TXC_N	IFPA_TXC_N	L22	=MCP_IFPA_TXC_N (OUT) 8
8	DP_IG_ML0_P<2>		G26	DP0_2_P/TMDS0_TX0_P	IFPA_TXD0_P	C22	=MCP_IFPA_TXD_P<0> (OUT) 8
8	DP_IG_ML0_N<2>		F26	DP0_2_N/TMDS0_TX0_N	IFPA_TXD0_N	B22	=MCP_IFPA_TXD_N<0> (OUT) 8
8	DP_IG_ML0_P<1>		F25	DP0_1_P/TMDS0_TX1_P	IFPA_TXD1_P	E22	=MCP_IFPA_TXD_P<1> (OUT) 8
8	DP_IG_ML0_N<1>		G25	DP0_1_N/TMDS0_TX1_N	IFPA_TXD1_N	D22	=MCP_IFPA_TXD_N<1> (OUT) 8
8	DP_IG_ML0_P<0>		E25	DP0_0_P/TMDS0_TX2_P	IFPA_TXD2_P	F22	=MCP_IFPA_TXD_P<2> (OUT) 8
8	DP_IG_ML0_N<0>		D25	DP0_0_N/TMDS0_TX2_N	IFPA_TXD2_N	G22	=MCP_IFPA_TXD_N<2> (OUT) 8
8	DP_IG_ML1_P<3>		F28	DP1_3_P/TMDS0B_TXC_P	IFPA_TXD3_P	H22	=MCP_IFPA_TXD_P<3> (OUT) 8
8	DP_IG_ML1_N<3>		G28	DP1_3_N/TMDS0B_TXC_N	IFPA_TXD3_N	J22	=MCP_IFPA_TXD_N<3> (OUT) 8
8	DP_IG_ML1_P<2>		E28	DP1_2_P/TMDS0_TX3_P	IFPB_TXC_P	B23	=MCP_IFPB_TXC_P (OUT) 8
8	DP_IG_ML1_N<2>		D28	DP1_2_N/TMDS0_TX3_N	IFPB_TXC_N	C23	=MCP_IFPB_TXC_N (OUT) 8
8	DP_IG_ML1_P<1>		A28	DP1_1_P/TMDS0_TX4_P	IFPB_TXD4_P	L23	=MCP_IFPB_TXD_P<0> (OUT) 8
8	DP_IG_ML1_N<1>		A29	DP1_1_N/TMDS0_TX4_N	IFPB_TXD4_N	K23	=MCP_IFPB_TXD_N<0> (OUT) 8
8	DP_IG_ML1_P<0>		C28	DP1_0_P/TMDS0_TX5_P	IFPB_TXD5_P	J23	=MCP_IFPB_TXD_P<1> (OUT) 8
8	DP_IG_ML1_N<0>		B28	DP1_0_N/TMDS0_TX5_N	IFPB_TXD5_N	H23	=MCP_IFPB_TXD_N<1> (OUT) 8
					IFPB_TXD6_P	G23	=MCP_IFPB_TXD_P<2> (OUT) 8
					IFPB_TXD6_N	F23	=MCP_IFPB_TXD_N<2> (OUT) 8
					IFPB_TXD7_P	D23	=MCP_IFPB_TXD_P<3> (OUT) 8
					IFPB_TXD7_N	E23	=MCP_IFPB_TXD_N<3> (OUT) 8
8	DP_IG_HPD0		H26	HPLUG_DET0/GPIO_20			
8	DP_IG_HPD1		J26	HPLUG_DET1/GPIO_21			
36 16	SATARDRVR_A_EN		J25	HPLUG_DET2/GPIO_22			
16 8	DP_IG_AUX_CH0_P		L28	DDC_CLK2/DP_AUX_CH0_P	DDC_CLK1/GPIO_40	J28	=MCP_IFPAB_DDC_CLK (OUT) 8
16 8	DP_IG_AUX_CH0_N		K28	DDC_DATA2/DP_AUX_CH0_N	DDC_DATA1/GPIO_41	G29	=MCP_IFPAB_DDC_DATA (BI) 8
8	DP_IG_AUX_CH1_P		K25	DDC_CLK3/DP_AUX_CH1_P			
8	DP_IG_AUX_CH1_N		K26	DDC_DATA3/DP_AUX_CH1_N			

(GMUX_INT)

					LCD_BKL_CTL/GPIO_57	A25	LCD_IG_BKLT_PWM (OUT) 8
					LCD_BKL_ON/GPIO_59	B25	LCD_IG_BKLT_EN (OUT) 8
					LCD_PANEL_PWR/GPIO_58	C25	LCD_IG_PWR_EN (OUT) 67

22	PP3V3_S0_MCP_PLL_DP_USB						
	210 mA	180 mA	M23	+3.3V_PLL_DP0_1			
			N22	+3.3V_PLL_DP0_2			
		30 mA	N21	+3.3V_PLL_USB_1			
			M22	+3.3V_PLL_USB_2			
23 7	=PP1V05_S0_MCP_PLL_IFP						
	60 mA		N23	+VIO_PLL_IFPAB_1			
			L24	+VIO_PLL_IFPAB_2			
22	PP1V05_S0_MCP_PLL_CORE						
	160 mA	40 mA	M25	+VIO_PLL_CORE_LEG			
		60 mA	N25	+VIO_PLL_SPPLL0_1			
			L26	+VIO_PLL_SPPLL0_2			
		40 mA	M26	+VIO_PLL_V			
		20 mA	N24	+VIO_PLL_NV_1			
			L25	+VIO_PLL_NV_2			
23 7	=PP3V3R1V8_S0_MCP_IFP_VDD						
	180 mA		A22	+VDD_IFPA			
			A23	+VDD_IFPB			
23 7	=PP1V05_S0_MCP_DP0_VDD						
	160 mA		A26	+VIO_DP0_1			
			B26	+VIO_DP0_2			
			C26	+VIO_DP0_3			

					IFPAB_VPROBE	L20	MCP_IFPAB_VPROBE (OUT) 23 74
					IFPAB_RSET	K20	MCP_IFPAB_RSET (OUT) 23 74
					TMDS0_VPROBE	H28	MCP_TMDS0_VPROBE (OUT) 23 74
					TMDS0_RSET	F31	MCP_TMDS0_RSET (OUT) 23 74

NOTE: 100K pull-downs required if HPLUG_DET0/HPLUG_DET1 are not used.

RGB DAC Disable:

Okay to float all RGB_DAC signals.
DDC_CLK0/DDC_DATA0 pull-ups still required (or use as GPIOs).
Connect +3.3V_RGBDAC pin to GND.

NOTE: No Composite/S-Video/Component Video support on MCP89

Interface Mode

MCP Signal	TMDS/HDMI	LVDS
=MCP_IFPA_TXC_P/N	TMDS_IG_TXC_P/N	LVDS_IG_A_CLK_P/N
=MCP_IFPA_TXD_P/N<0>	TMDS_IG_TXD_P/N<0>	LVDS_IG_A_DATA_P/N<0>
=MCP_IFPA_TXD_P/N<1>	TMDS_IG_TXD_P/N<1>	LVDS_IG_A_DATA_P/N<1>
=MCP_IFPA_TXD_P/N<2>	TMDS_IG_TXD_P/N<2>	LVDS_IG_A_DATA_P/N<2>
=MCP_IFPA_TXD_P/N<3>	(UNUSED)	LVDS_IG_A_DATA_P/N<3>
=MCP_IFPB_TXC_P/N	(UNUSED)	LVDS_IG_B_CLK_P/N
=MCP_IFPB_TXD_P/N<0>	TMDS_IG_TXD_P/N<3>	LVDS_IG_B_DATA_P/N<0>
=MCP_IFPB_TXD_P/N<1>	TMDS_IG_TXD_P/N<4>	LVDS_IG_B_DATA_P/N<1>
=MCP_IFPB_TXD_P/N<2>	TMDS_IG_TXD_P/N<5>	LVDS_IG_B_DATA_P/N<2>
=MCP_IFPB_TXD_P/N<3>	(UNUSED)	LVDS_IG_B_DATA_P/N<3>
=MCP_IFPAB_DDC_CLK	TMDS_IG_DDC_CLK	LVDS_IG_DDC_CLK
=MCP_IFPAB_DDC_DATA	TMDS_IG_DDC_DATA	LVDS_IG_DDC_DATA

LVDS: Power +VDD_IFPx at 1.8V
TMDS: Power +VDD_IFPx at 3.3V

DDC Mode Pull-downs

NOTE: DP_AUX_CH1 also requires pull-downs if used for dual-mode DisplayPort (DP++). If unused no pulls are necessary, if used for TMDS/HDMI only then only pull-ups are necessary.

R1710	100K	5% 1/16W MF-LF 402	DP_IG_AUX_CH0_P	8 16
R1711	100K	5% 1/16W MF-LF 402	DP_IG_AUX_CH0_N	8 16

GPIO Pull-Ups

=PP3V3_S0_MCP_GPIO 7 17 18

R1780	10K	5% 1/16W MF-LF 402	SATARDRVR_A_EN	16 36
R1781	10K	5% 1/16W MF-LF 402	AUD_IP_PERIPHERAL_DET	16 56
R1782	10K	5% 1/16W MF-LF 402	MIKEY_MIC_LOAD_DET	16

Current numbers from MCP89 A01 Bring-Up Support document (MCP89_TDP_EDP_Bringup_Targets_Apple.pdf, dated August 5, 2009). K6/K69 EDP currents used.

SYNC_MASTER=T27_MLB SYNC_DATE=11/05/2009

PAGE TITLE: MCP Graphics

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D
REVISION: A.13.0
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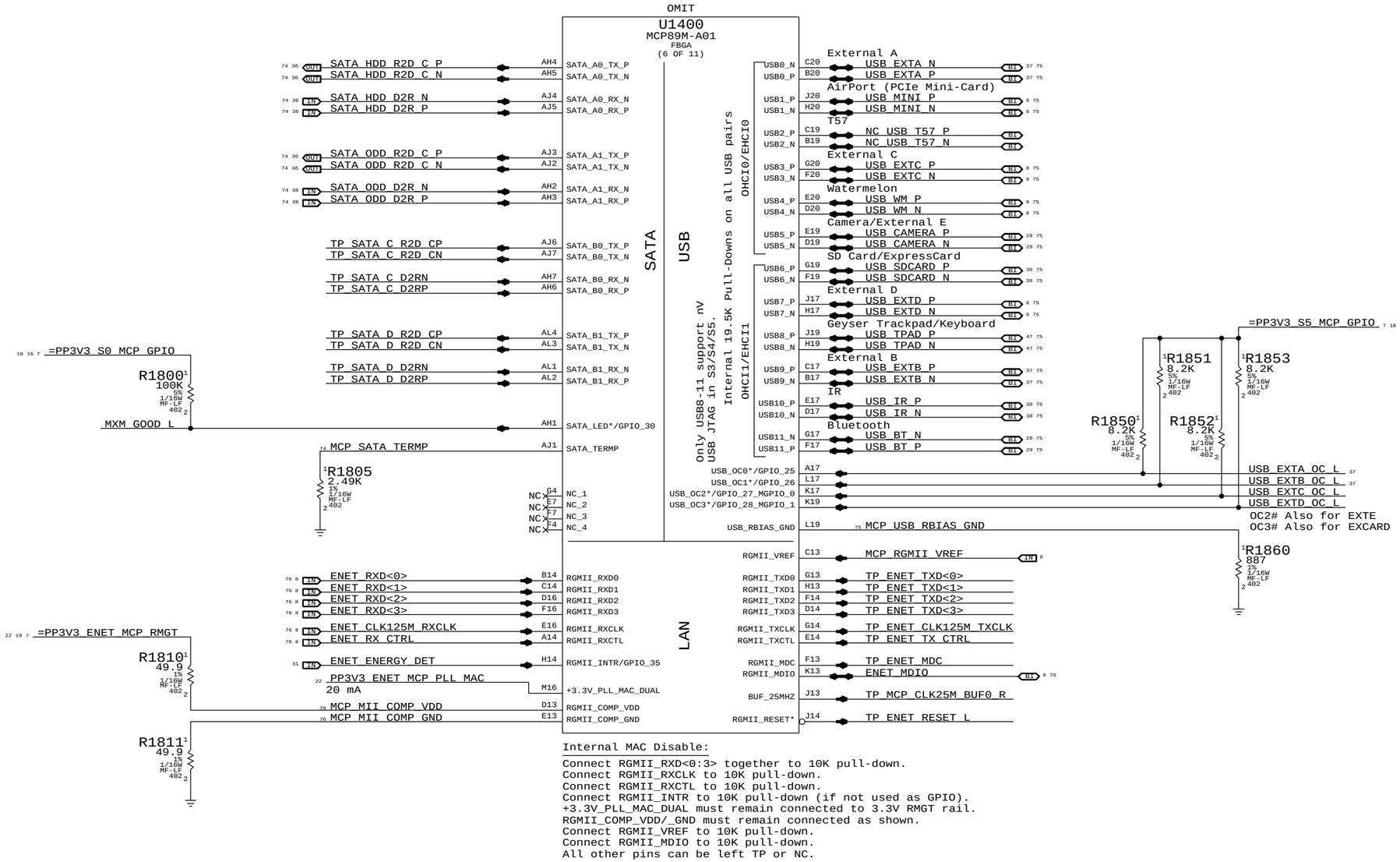

Internal MAC Disable:

Connect RGMII_RXD<0:3> together to 10K pull-down.
Connect RGMII_RXCLK to 10K pull-down.
Connect RGMII_RXCTL to 10K pull-down.
Connect RGMII_INTR to 10K pull-down (if not used as GPIO).
+3.3V_PLL_MAC_DUAL must remain connected to 3.3V RMGT rail.
RGMII_COMP_VDD/_GND must remain connected as shown.
Connect RGMII_VREF to 10K pull-down.
Connect RGMII_MDIO to 10K pull-down.
All other pins can be left TP or NC.

Current numbers from MCP89 A01 Bring-Up Support document (MCP89_TDP_EDP_Bringup_Targets_Apple.pdf, dated August 5, 2009). K6/K69 EDP currents used.

SYNC_MASTER=T27_MLB SYNC_DATE=11/23/2009

PAGE TITLE
MCP SATA, USB & Ethernet

Apple Inc.

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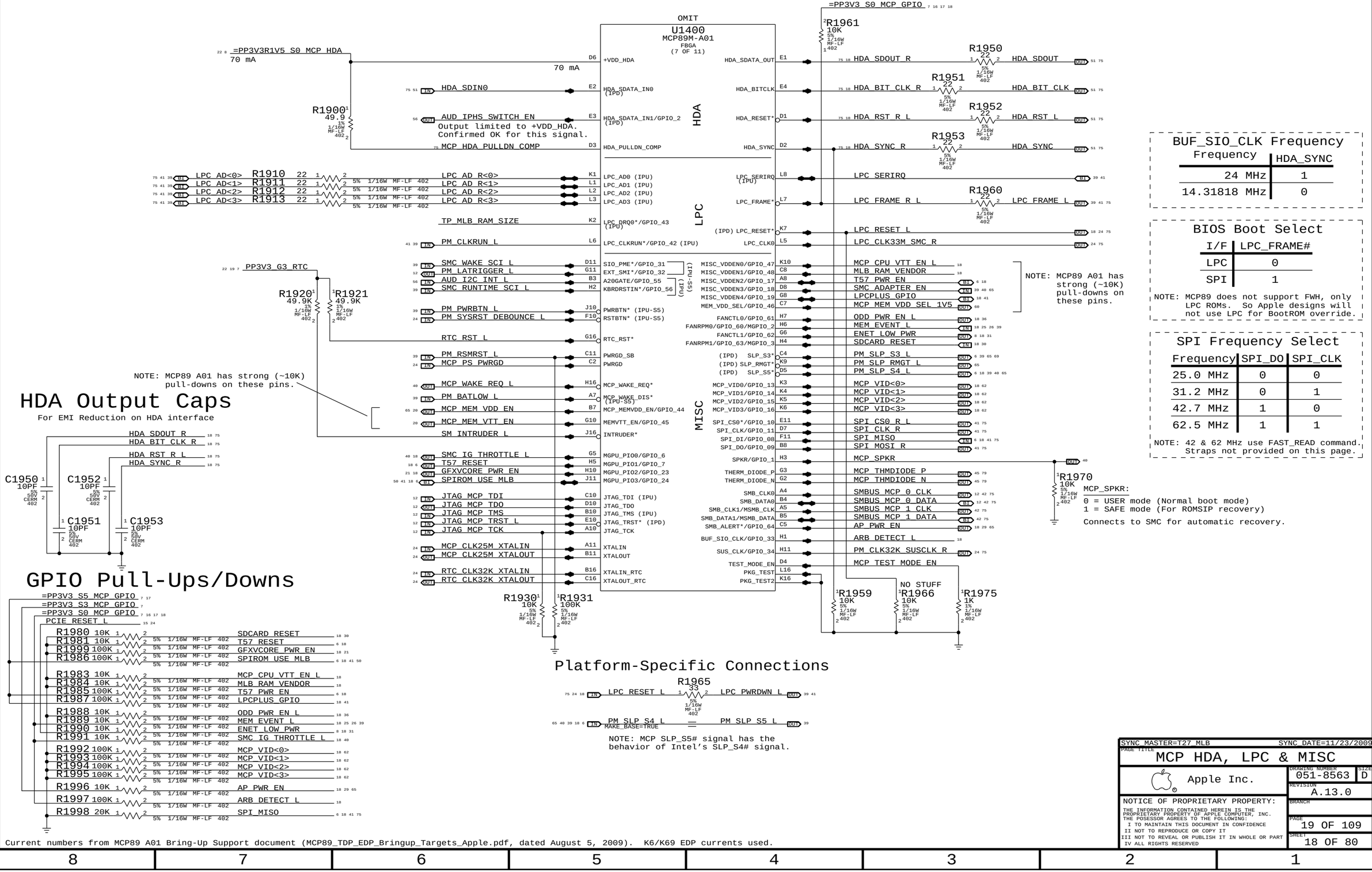
OMIT
U1400
MCP89M-A01
FBGA
(7 OF 11)
HDA
LPC
MISC
=PP3V3R1V5_S0_MCP_HDA
70 mA
70 mA
+VDD_HDA
HDA_SDIN0
HDA_SDATA_IN0 (IPD)
AUD_IPHS_SWITCH_EN
HDA_SDATA_IN1/GPIO_2 (IPD)
Output limited to +VDD_HDA.
Confirmed OK for this signal.
MCP_HDA_PULLDN_COMP
HDA_PULLDN_COMP
HDA_SDATA_OUT
HDA_BITCLK
HDA_RESET*
HDA_SYNC
=PP3V3_S0_MCP_GPIO
R1961 10K
R1950 22
R1951 22
R1952 22
R1953 22
HDA_SDOUT_R
HDA_BIT_CLK_R
HDA_RST_R_L
HDA_SYNC_R
HDA_SDOUT
HDA_BIT_CLK
HDA_RST_L
HDA_SYNC
R1900 49.9
LPC_AD<0>
LPC_AD<1>
LPC_AD<2>
LPC_AD<3>
R1910 22
R1911 22
R1912 22
R1913 22
LPC_AD_R<0>
LPC_AD_R<1>
LPC_AD_R<2>
LPC_AD_R<3>
LPC_AD0 (IPU)
LPC_AD1 (IPU)
LPC_AD2 (IPU)
LPC_AD3 (IPU)
TP_MLB_RAM_SIZE
LPC_DRQ0*/GPIO_43 (IPU)
PM_CLKRUN_L
LPC_CLKRUN*/GPIO_42 (IPU)
LPC_SERIRQ (IPU)
LPC_FRAME*
LPC_RESET*
LPC_CLK0
LPC_SERIRQ
LPC_FRAME_R_L
LPC_FRAME_L
LPC_RESET_L
LPC_CLK33M_SMC_R
R1960 22
PP3V3_G3_RTC
R1920 49.9K
R1921 49.9K
SMC_WAKE_SCI_L
PM_LATRIGGER_L
AUD_I2C_INT_L
SMC_RUNTIME_SCI_L
SIO_PME*/GPIO_31
EXT_SMI*/GPIO_32
A20GATE/GPIO_55
KBRDRSTIN*/GPIO_56
PM_PWRBTN_L
PM_SYSRST_DEBOUNCE_L
PWRBTN* (IPU-S5)
RSTBTN* (IPU-S5)
RTC_RST_L
RTC_RST*
PM_RSMRST_L
MCP_PS_PWRGD
SLP_SUS*/GPIO_61 (IPU-SS)
PWRGD_SB
PWRGD
MCP_WAKE_REQ_L
PM_BATLOW_L
MCP_MEM_VDD_EN
MCP_MEM_VTT_EN
SM_INTRUDER_L
MCP_WAKE_REQ*
MCP_WAKE_DIS* (IPU-S5)
MCP_MEMVDD_EN/GPIO_44
MEMVTT_EN/GPIO_45
INTRUDER*
SMC_IG_THROTTLE_L
T57_RESET
GFXVCORE_PWR_EN
SPIROM_USE_MLB
MGPU_PIO0/GPIO_6
MGPU_PIO1/GPIO_7
MGPU_PIO2/GPIO_23
MGPU_PIO3/GPIO_24
JTAG_MCP_TDI
JTAG_MCP_TDO
JTAG_MCP_TMS
JTAG_MCP_TRST_L
JTAG_MCP_TCK
JTAG_TDI (IPU)
JTAG_TDO
JTAG_TMS (IPU)
JTAG_TRST* (IPD)
JTAG_TCK
MCP_CLK25M_XTALIN
MCP_CLK25M_XTALOUT
XTALIN
XTALOUT
RTC_CLK32K_XTALIN
RTC_CLK32K_XTALOUT
XTALIN_RTC
XTALOUT_RTC
MISC_VDDEN0/GPIO_47
MISC_VDDEN1/GPIO_48
MISC_VDDEN2/GPIO_17
MISC_VDDEN3/GPIO_18
MISC_VDDEN4/GPIO_19
MEM_VDD_SEL/GPIO_46
MCP_CPU_VTT_EN_L
MLB_RAM_VENDOR
T57_PWR_EN
SMC_ADAPTER_EN
LPCPLUS_GPIO
MCP_MEM_VDD_SEL_1V5
NOTE: MCP89 A01 has strong (~10K) pull-downs on these pins.
FANCTL0/GPIO_61
FANRPM0/GPIO_60/MGPIO_2
FANCTL1/GPIO_62
FANRPM1/GPIO_63/MGPIO_3
ODD_PWR_EN_L
MEM_EVENT_L
ENET_LOW_PWR
SDCARD_RESET
SLP_S3*
SLP_RMGT*
SLP_S5*
PM_SLP_S3_L
PM_SLP_RMGT_L
PM_SLP_S4_L
MCP_VID0/GPIO_13
MCP_VID1/GPIO_14
MCP_VID2/GPIO_15
MCP_VID3/GPIO_16
MCP_VID<0>
MCP_VID<1>
MCP_VID<2>
MCP_VID<3>
SPI_CS0*/GPIO_10
SPI_CLK/GPIO_11
SPI_DI/GPIO_08
SPI_DO/GPIO_09
SPI_CS0_R_L
SPI_CLK_R
SPI_MISO
SPI_MOSI_R
SPKR/GPIO_1
MCP_SPKR
THERM_DIODE_P
THERM_DIODE_N
MCP_THMDIODE_P
MCP_THMDIODE_N
SMB_CLK0
SMB_DATA0
SMB_CLK1/MSMB_CLK
SMB_DATA1/MSMB_DATA
SMB_ALERT*/GPIO_64
SMBUS_MCP_0_CLK
SMBUS_MCP_0_DATA
SMBUS_MCP_1_CLK
SMBUS_MCP_1_DATA
AP_PWR_EN
BUF_SIO_CLK/GPIO_33
ARB_DETECT_L
SUS_CLK/GPIO_34
PM_CLK32K_SUSCLK_R
TEST_MODE_EN
PKG_TEST
PKG_TEST2
MCP_TEST_MODE_EN
R1930 10K
R1931 100K
R1959 10K
NO STUFF
R1966 10K
R1975 1K
R1970 10K
MCP_SPKR:
0 = USER mode (Normal boot mode)
1 = SAFE mode (For ROMSIP recovery)
Connects to SMC for automatic recovery.
HDA Output Caps
For EMI Reduction on HDA interface
C1950 10PF
C1952 10PF
C1951 10PF
C1953 10PF
GPIO Pull-Ups/Downs
=PP3V3_S5_MCP_GPIO
=PP3V3_S3_MCP_GPIO
=PP3V3_S0_MCP_GPIO
PCIE_RESET_L
R1980 10K SDCARD_RESET
R1981 10K T57_RESET
R1999 100K GFXVCORE_PWR_EN
R1986 100K SPIROM_USE_MLB
R1983 10K MCP_CPU_VTT_EN_L
R1984 10K MLB_RAM_VENDOR
R1985 100K T57_PWR_EN
R1987 100K LPCPLUS_GPIO
R1988 10K ODD_PWR_EN_L
R1989 100K MEM_EVENT_L
R1990 10K ENET_LOW_PWR
R1991 10K SMC_IG_THROTTLE_L
R1992 100K MCP_VID<0>
R1993 100K MCP_VID<1>
R1994 100K MCP_VID<2>
R1995 100K MCP_VID<3>
R1996 10K AP_PWR_EN
R1997 100K ARB_DETECT_L
R1998 20K SPI_MISO
Platform-Specific Connections
R1965 33
LPC_RESET_L
LPC_PWRDWN_L
PM_SLP_S4_L
PM_SLP_S5_L
MAKE_BASE=TRUE
NOTE: MCP_SLP_S5# signal has the behavior of Intel's SLP_S4# signal.
BUF_SIO_CLK Frequency
Frequency | HDA_SYNC
24 MHz | 1
14.31818 MHz | 0
BIOS Boot Select
I/F | LPC_FRAME#
LPC | 0
SPI | 1
NOTE: MCP89 does not support FWH, only LPC ROMs. So Apple designs will not use LPC for BootROM override.
SPI Frequency Select
Frequency | SPI_DO | SPI_CLK
25.0 MHz | 0 | 0
31.2 MHz | 0 | 1
42.7 MHz | 1 | 0
62.5 MHz | 1 | 1
NOTE: 42 & 62 MHz use FAST_READ command. Straps not provided on this page.
Current numbers from MCP89 A01 Bring-Up Support document (MCP89_TDP_EDP_Bringup_Targets_Apple.pdf, dated August 5, 2009). K6/K69 EDP currents used.
SYNC_MASTER=T27_MLB
SYNC_DATE=11/23/2009
PAGE TITLE
MCP HDA, LPC & MISC
Apple Inc.
DRAWING NUMBER 051-8563
SIZE D
REVISION A.13.0
BRANCH
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SHEET 18 OF 80
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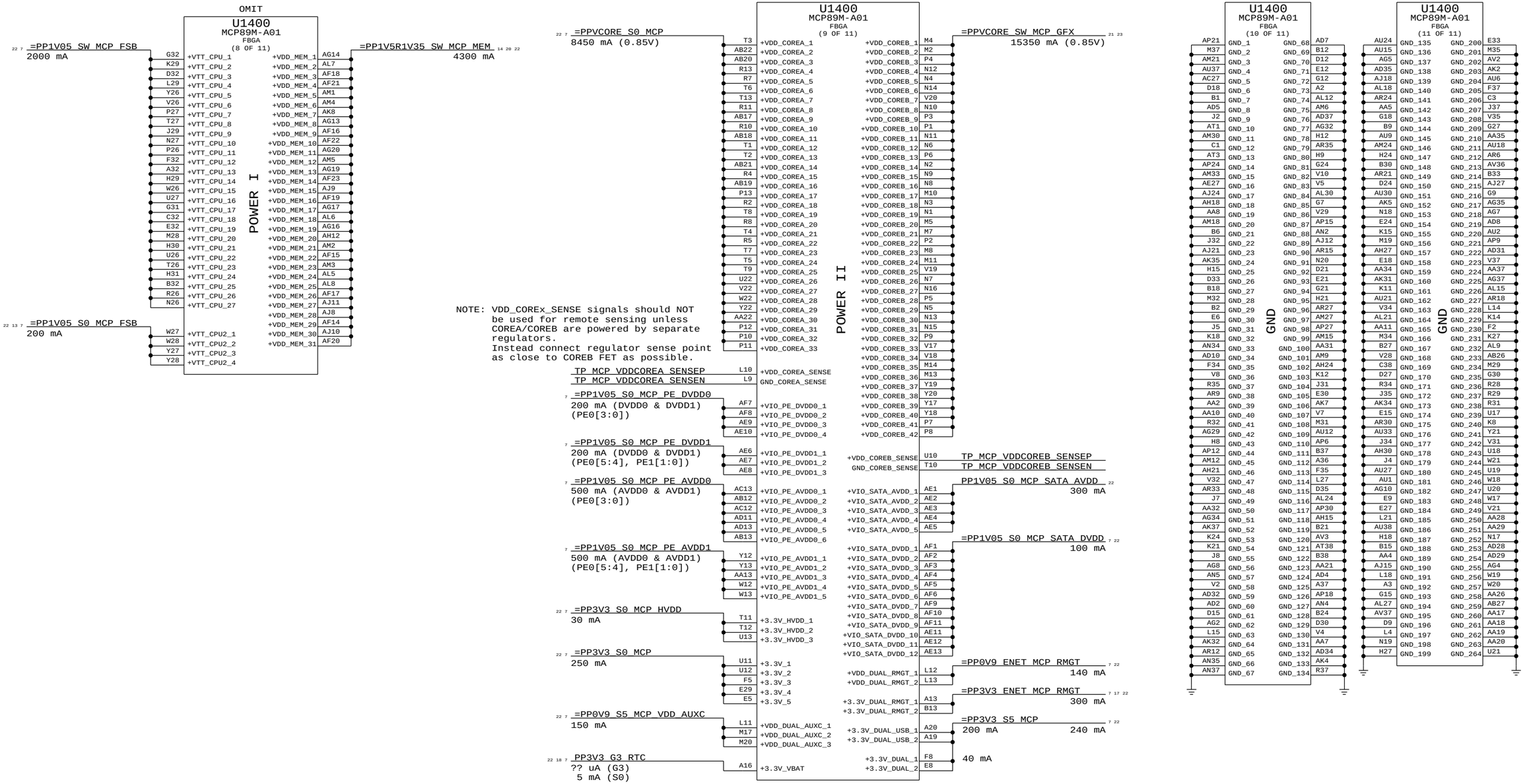
NOTE: "SW" rails are dynamically switched in the S0 state as needed, controlled by MCP89 GPIOs.



Current numbers from MCP89 A01 Bring-Up Support document (MCP80_TDP_EDP_Bringup_Targets_Apple.pdf, dated August 5, 2009). K6/K69 EDP currents used.

SYNC_MASTER=T27_MLB SYNC_DATE=08/06/2009

PAGE TITLE: MCP Power & Ground

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D
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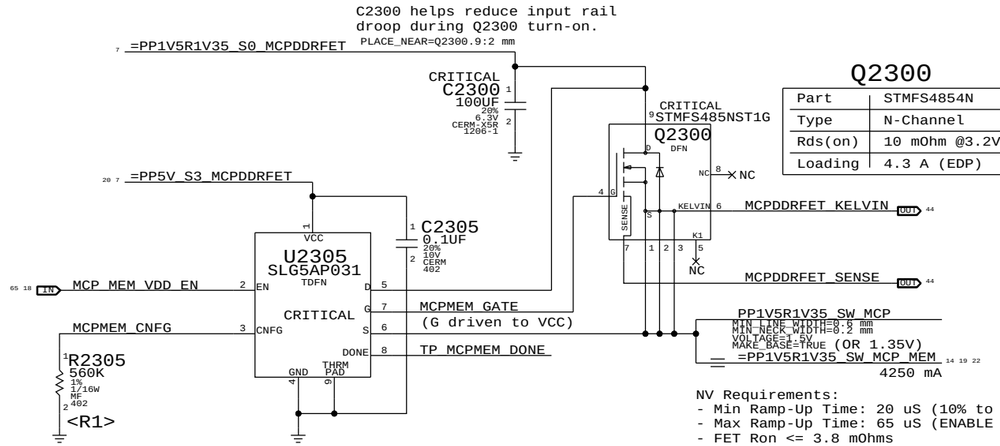
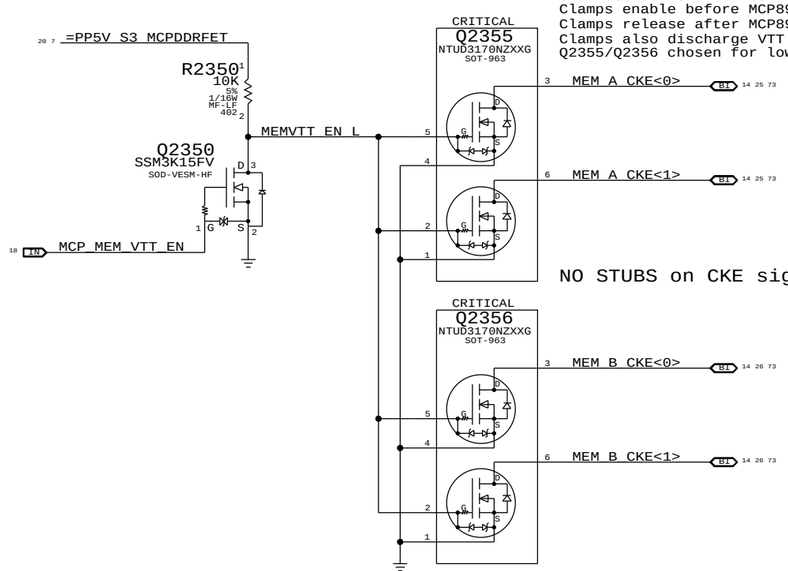


Q2300

Part	STMFS4854N
Type	N-Channel
Rds(on)	10 mOhm @3.2V
Loading	4.3 A (EDP)

DIMM CKE Clamps

CKE must be held low to keep memory in self-refresh.
Clamps enable before MCP89 MEMVDD rail switched off.
Clamps release after MCP89 MEMVDD is up and CKEs are driven by MCP89.
Clamps also discharge VTT rail via termination resistor on each CKE signal on DIMM.
Q2355/Q2356 chosen for low output capacitance.



SYNC_MASTER=T27_MLB SYNC_DATE=11/23/2009

PAGE TITLE: MCP89 Memory Rail Gating

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D

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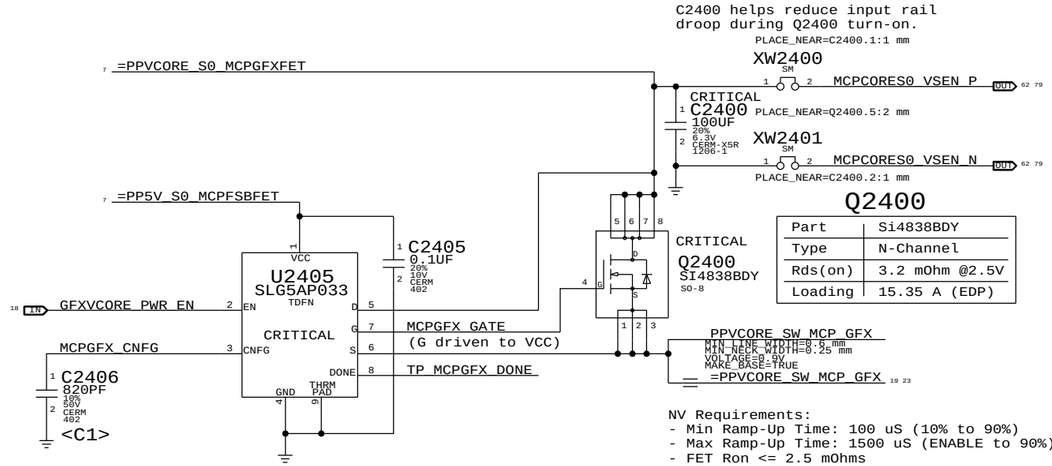

Part	Si4838BDY
Type	N-Channel
Rds(on)	3.2 mOhm @2.5V
Loading	15.35 A (EDP)

Approx. Ramp Time (EN to 1V, uS): 43.9 + 0.6943 * C1(pF)

NV Requirements:
- Min Ramp-Up Time: 100 uS (10% to 90%)
- Max Ramp-Up Time: 1500 uS (ENABLE to 90%)
- FET Ron <= 2.5 mOhms

NOTE: nVidia recommends Infineon BSC020N03MS for Q2400.

Gated Rail Savings: 860mW

SYNC_MASTER=T27_MLB SYNC_DATE=11/23/2009

PAGE TITLE
MCP89 GFX Core Rail Gating

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MCP Non-GFX Core Power

=PPVCORE_S0_MCP

8450 mA (0.85V)

C2500 10UF 20% 6.3V X5R 603-1
C2501 4.7UF 20% 4V X5R 402
C2502 1UF 10% 10V X5R 402-1
C2503 0.22UF 20% 6.3V X5R 402
C2504 0.1UF 20% 10V CERM 402
C2505 0.1UF 20% 10V CERM 402
C2506 0.1UF 20% 10V CERM 402
C2507 0.1UF 20% 10V CERM 402
C2508 0.1UF 20% 10V CERM 402

MCP Memory Power

=PP1V5R1V35_SW_MCP_MEM

4300 mA (1.5V)

C2510 4.7UF 20% 4V X5R 402
C2511 0.1UF 20% 10V CERM 402
C2512 0.1UF 20% 10V CERM 402
C2513 0.1UF 20% 10V CERM 402
C2514 0.1UF 20% 10V CERM 402
C2515 0.1UF 20% 10V CERM 402
C2516 0.1UF 20% 10V CERM 402
C2517 0.1UF 20% 10V CERM 402
C2518 0.1UF 20% 10V CERM 402
C2519 0.1UF 20% 10V CERM 402

MCP CPU FSB (VTT) Power

=PP1V05_SW_MCP_FSB

2000 mA

C2520 10UF 20% 6.3V X5R 603-1
C2521 4.7UF 20% 4V X5R 402
C2522 1UF 10% 10V X5R 402-1
C2523 1UF 10% 10V X5R 402-1

MCP S0 FSB (VTT) Power

=PP1V05_S0_MCP_FSB

200 mA

C2524 4.7UF 20% 4V X5R 402
C2525 1UF 10% 10V X5R 402-1

MCP 0.9V AUX Core Power

=PP0V9_S5_MCP_VDD_AUXC

150 mA

C2526 0.1UF 20% 10V CERM 402
C2527 0.1UF 20% 10V CERM 402

MCP 0.9V MAC/SMU Power

=PP0V9_ENET_MCP_RMGT

140 mA

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

MCP 1.05V PCIE Digital Power

=PP1V05_S0_MCP_PE_DVDD

200 mA

C2530 4.7UF 20% 4V X5R 402
C2531 1UF 10% 10V X5R 402-1
C2532 1UF 10% 10V X5R 402-1
C2533 0.1UF 20% 10V CERM 402
C2534 0.1UF 20% 10V CERM 402
C2535 0.1UF 20% 10V CERM 402

MCP 1.05V SATA Digital Power

=PP1V05_S0_MCP_SATA_DVDD

100 mA

C2536 4.7UF 20% 4V X5R 402
C2537 0.1UF 20% 10V CERM 402

MCP 1.05V Memory DLL Power

=PP1V05_S0_MCP_M2CLK_DLL

550 mA

C2540 4.7UF 20% 4V X5R 402

MCP 3.3V PCIe/SATA I/O PLL Power

=PP3V3_S0_MCP_HVDD

30 mA

C2541 4.7UF 20% 6.3V CERM 603
C2542 0.1UF 20% 10V CERM 402

MCP 3.3V I/O Power

=PP3V3_S0_MCP

250 mA

C2543 4.7UF 20% 6.3V CERM 603
C2544 0.1UF 20% 10V CERM 402
C2545 0.1UF 20% 10V CERM 402
C2546 0.1UF 20% 10V CERM 402
C2547 0.1UF 20% 10V CERM 402

MCP 3.3V/1.5V HDA Power

=PP3V3R1V5_S0_MCP_HDA

70 mA

C2548 4.7UF 20% 6.3V CERM 603
C2549 0.1UF 20% 10V CERM 402

MCP 3.3V AUX/USB Power

=PP3V3_S5_MCP

240 mA

C2550 4.7UF 20% 6.3V CERM 603
C2551 0.1UF 20% 10V CERM 402

MCP 2.0V-3.3V RTC Power

=PP3V3_G3_RTC

? uA (G3)
5 mA (S0)

C2552 4.7UF 20% 6.3V CERM 603

MCP 3.3V MAC/SMU Power

=PP3V3_ENET_MCP_RMGT

300 mA

C2553 4.7UF 20% 6.3V CERM 603
C2554 0.1UF 20% 10V CERM 402

MCP 3.3V MAC PLL Power

=PP3V3_ENET_MCP_PLL_MAC

20 mA

CRITICAL
L2555 FERR-240-OHM-200MA 0402

PP3V3_ENET_MCP_PLL_MAC
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=3.3V
20 mA

C2555 4.7UF 20% 6.3V CERM 603
C2556 0.1UF 20% 10V CERM 402

MCP 1.05V PCIe Analog Power

=PP1V05_S0_MCP_AVDD_UF

800 mA

L2560 30-OHM-5A 0603

PP1V05_S0_MCP_PE_AVDD
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
500 mA

C2560 10UF 20% 6.3V X5R 603-1
C2561 4.7UF 20% 4V X5R 402
C2562 1UF 10% 10V X5R 402-1
C2563 1UF 10% 10V X5R 402-1
C2564 0.1UF 20% 10V CERM 402
C2565 0.1UF 20% 10V CERM 402
C2566 0.1UF 20% 10V CERM 402

MCP 1.05V SATA Analog Power

L2567 30-OHM-5A 0603

PP1V05_S0_MCP_SATA_AVDD
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
300 mA

C2567 10UF 20% 6.3V X5R 603-1
C2568 4.7UF 20% 4V X5R 402
C2569 0.1UF 20% 10V CERM 402

MCP 1.05V CPU/FSB/MEM PLL Power

=PP1V05_S0_MCP_PLL_UF

555 mA

CRITICAL
L2570 220-OHM-2.2A 0603

PP1V05_S0_MCP_PLL_FSBMEM
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
70 mA

C2570 4.7UF 20% 4V X5R 402
PLACE_NEAR=R2570.1:50 mil
R2570 0.33 5% 1/16W MF 0402
GND_MCP_PLL_FSB
MIN_LINE_WIDTH=0.25 MM
MIN_NECK_WIDTH=0.25 MM
VOLTAGE=0V
C2571 0.1UF 20% 10V CERM 402
C2572 0.1UF 20% 10V CERM 402
C2573 0.1UF 20% 10V CERM 402

MCP 1.05V PCIe/SATA PLL Power

L2575 220-OHM-2.2A 0603

PP1V05_S0_MCP_PLL_PEXSATA
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
325 mA

C2575 4.7UF 20% 4V X5R 402
PLACE_NEAR=R2575.1:50 mil
C2576 0.1UF 20% 10V CERM 402
C2577 0.1UF 20% 10V CERM 402
C2578 0.1UF 20% 10V CERM 402
C2579 0.1UF 20% 10V CERM 402

MCP 1.05V Core/Misc PLL Power

CRITICAL
L2580 220-OHM-2.2A 0603

PP1V05_S0_MCP_PLL_CORE
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=1.05V
160 mA

C2580 4.7UF 20% 4V X5R 402
PLACE_NEAR=R2580.1:50 mil
C2581 0.1UF 20% 10V CERM 402
C2582 0.1UF 20% 10V CERM 402
C2583 0.1UF 20% 10V CERM 402
C2584 0.1UF 20% 10V CERM 402

=PP3V42_G3H_OPA330

HTOL_SENSE:YES
C2599 0.1UF 20% 10V CERM 402

HTOL_SENSE:YES
R2597 1K 1% 1/16W MF-LF 402

SMC_N_MIRROR

SC70-5 OPA330 U2593 CRITICAL

HTOL_SENSE:YES SOT-563-HF NTZD3152P Q2592 CRITICAL

HTOL_SENSE:YES CRITICAL U2594 OPA330 SC70-5

PLACEMENT_NOTES:
Place close to SMC
(For R and C)

HTOL_SENSE:YES
R2598 4.53K 1% 1/16W MF-LF 402

SMC_NB_MISC_ISENSE
MUX
HTOL_SENSE:YES
C2598 0.22UF 20% 6.3V X5R 402
GND_SMC_AVSS

=PP3V3_S0_MCP_PLL_UF

260 mA

MCPHVDD:P2V5
R2592 10K 5% 1/16W MF-LF 402
C2593 1UF 10% 10V X5R 402

MCPHVDD:P3V3
R2593 0 5% 1/16W MF-LF 402

PP3V3_S0_LDO_R
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=3.3V

CRITICAL
OMIT_TABLE
U2592 MIC5365-2.5V SC70

VIN VOUT EN NC GND LDO_ADJ

LDO:ADJ
R2594 10K 5% 1/16W MF-LF 402
LDO:ADJ
R2591 10K 5% 1/16W MF-LF 402

MCP_PLL_LDO_EN

CRITICAL
L2595 220-OHM-2.2A 0603

=PP3V3_S0_OPA333

HTOL_SENSE:YES
R2596 1K 1% 1/16W MF-LF 402

CRITICAL
Q2591 NTZD3152P SOT-563-HF

HTOL_SENSE:YES

MCPHVDD:P2V5
C2592 1UF 10% 10V X5R 402

SMC_P10
HTOL_SENSE:YES
R2599 100K 5% 1/16W MF-LF 402

HTOL_SENSE:YES
C2594 0.1UF 20% 10V CERM 402

HTOL_SENSE:YES
R2590 100K 1% 1/16W MF-LF 402

SMC_2_FOLLOW

SMC_N_FOLLOW

CRITICAL
L2590 FERR-240-OHM-200MA 0402

PP3V3_S0_MCP_HVDD
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=3.3V

C2590 4.7UF 20% 6.3V CERM 603
C2591 0.1UF 20% 10V CERM 402

MCP 3.3V PLL Power

PP3V3_S0_MCP_PLL_HVDD
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=3.3V
50 mA

MCP 3.3V DP & USB PLL Power

PP3V3_S0_MCP_PLL_DP_USB
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=3.3V
210 mA

C2595 4.7UF 20% 6.3V CERM 603
PLACE_NEAR=R2595.1:50 mil
R2595 0.33 5% 1/16W MF 0402
GND_MCP_PLL_DP_USB
MIN_LINE_WIDTH=0.25 MM
MIN_NECK_WIDTH=0.25 MM
VOLTAGE=0V
C2596 0.1UF 20% 10V CERM 402
C2597 0.1UF 20% 10V CERM 402

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
353S2971	1	IC,LDO,MIC5365,2.5V,150MA,2%,SC70-5,HFLF	U2592	CRITICAL	LDO:FIXED
353S2979	1	IC,LDO,TPS717,ADJ,150MA,3%,SC70,HFLF	U2592	CRITICAL	LDO:ADJ
116S0004	1	RES,0402,0,5%,1/16W	R2596	CRITICAL	HTOL_SENSE:NO

Current numbers from MCP89 A01 Bring-Up Support document (MCP80_TDP_EDP_Bringup_Targets_Apple.pdf, dated August 5, 2009). K6/K69 EDP currents used.

SYNC_MASTER=T27_MLB SYNC_DATE=08/15/2009

PAGE TITLE
MCP Standard Decoupling

Apple Inc.

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MCP GFX Core Power

=PPVCORE_SW_MCP_GFX
15350 mA (0.85V)

C2600 10UF 20% 6.3V X5R 603-1
C2601 4.7UF 20% 4V X5R 402
C2602 1UF 10% 10V X5R 402-1
C2603 1UF 10% 10V X5R 402-1
C2604 0.22UF 20% 6.3V X5R 402
C2605 0.22UF 20% 6.3V X5R 402
C2606 0.1UF 20% 10V CERM 402
C2607 0.1UF 20% 10V CERM 402
C2608 0.1UF 20% 10V CERM 402
C2609 0.1UF 20% 10V CERM 402
C2610 0.1UF 20% 10V CERM 402
C2611 0.1UF 20% 10V CERM 402
C2612 0.1UF 20% 10V CERM 402

MCP 3.3V RGBDAC Power

GND_MCP_DAC_P3V3 = PP3V3_S0_MCP_DAC
MIN_LINE_WIDTH=0.4 MM
MIN_NECK_WIDTH=0.2 MM
VOLTAGE=0V
MAKE_BASE=TRUE
140 mA

R2670 0 5% 1/16W MF-LF 402

If RGBDAC is used, requires ferrite (155S0382) plus 1x 4.7uF 0603 & 1x 0.1uF 0402 cap.

If RGBDAC is not used, tie to GND.

MCP 3.3V/1.8V IFP Interface Power

=PP3V3R1V8_S0_MCP_IFP_VDD
180 mA (1.8V LVDS)

C2620 4.7UF 20% 6.3V CERM 603
C2621 0.1UF 20% 10V CERM 402

MCP 1.05V IFP PLL Power

=PP1V05_S0_MCP_PLL_IFP
60 mA

C2630 4.7UF 20% 4V X5R 402
C2631 0.1UF 20% 10V CERM 402

MCP 1.05V DisplayPort Power

=PP1V05_S0_MCP_DP0_VDD
160 mA

C2640 4.7UF 20% 4V X5R 402
C2641 0.1UF 20% 10V CERM 402

MCP_TMDS0_RSET
MCP_TMDS0_VPROBE
NO STUFF
C2650 0.1UF 20% 10V CERM 402
R2650 1K 1% 1/16W MF-LF 402

MCP_IFPAB_RSET
MCP_IFPAB_VPROBE
NO STUFF
C2655 0.1UF 20% 10V CERM 402
NO STUFF
R2655 1K 1% 1/16W MF-LF 402

Current numbers from MCP89 A01 Bring-Up Support document (MCP80_TDP_EDP_Bringup_Targets_Apple.pdf, dated August 5, 2009). K6/K69 EDP currents used.

SYNC_MASTER=T27_MLB SYNC_DATE=08/06/2009

PAGE TITLE: MCP Graphics Support

Apple Inc.

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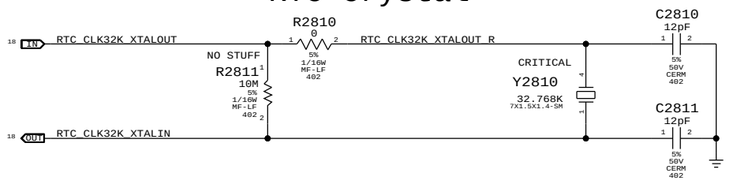
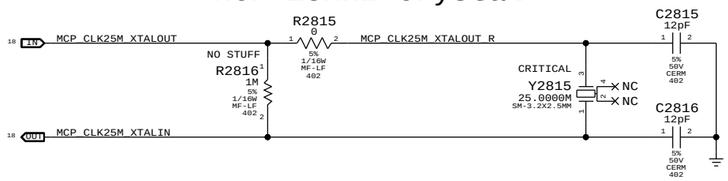
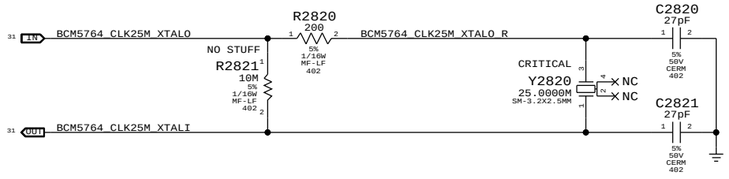
RTC Crystal



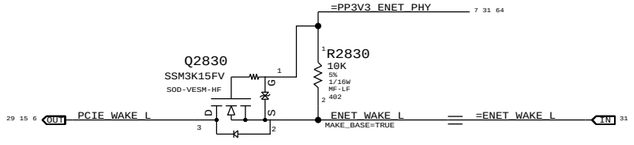
MCP 25MHz Crystal



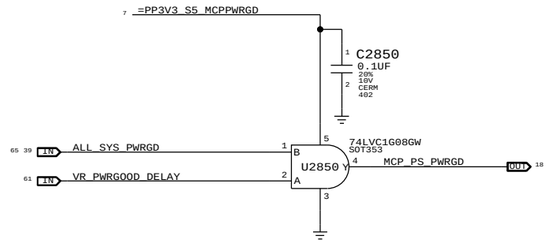
Caesar II (ENET) 25MHz Crystal



Ethernet WAKE# Isolation

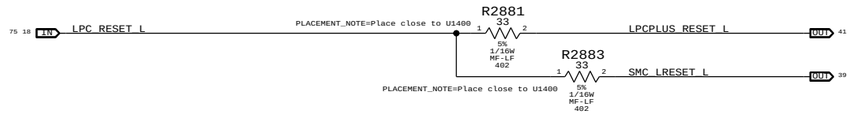


MCP S0 PWRGD & CPU_VLD

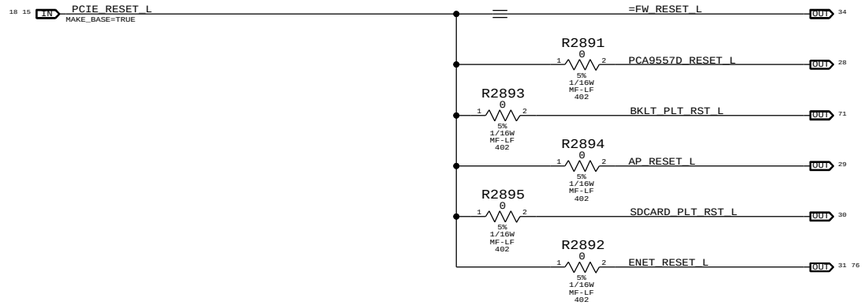


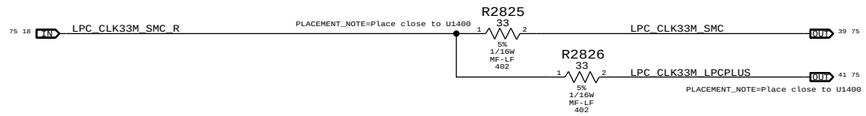
Platform Reset Connections

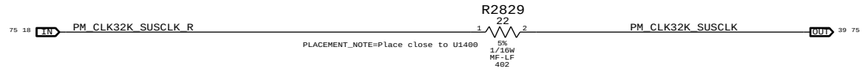
LPC Reset (Unbuffered)



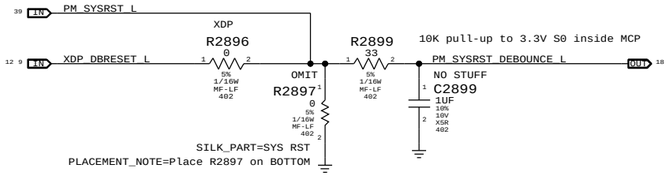
PCIE Reset (Unbuffered)







System Reset Circuit



SYNC_MASTER=T27_MLB SYNC_DATE=07/28/2009

PAGE TITLE: SB Misc

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D

REVISION: A.13.0

BRANCH:

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Page Notes

Power aliases required by this page:
- =PPLVDDR_S3_MEM_A
- =PPDDRVTT_S0_MEM_A
- =PPSPD_S0_MEM_A (2.5 - 3.3V)

Signal aliases required by this page:
- =I2C_SODIMMA_SCL
- =I2C_SODIMMA_SDA

BOM options provided by this page:
(NONE)

DDR3 Plane Stitching Caps (Space evenly across plane split)

=PPLVDDR_S3_MEM_A

C2900 10UF 20% 6.3V XSR 603
C2901 10UF 20% 6.3V XSR 603
C2910 0.1UF 20% 10V CERM 402
C2911 0.1UF 20% 10V CERM 402
C2912 0.1UF 20% 10V CERM 402
C2913 0.1UF 20% 10V CERM 402
C2914 0.1UF 20% 10V CERM 402
C2915 0.1UF 20% 10V CERM 402
C2916 0.1UF 20% 10V CERM 402
C2917 0.1UF 20% 10V CERM 402
C2918 0.1UF 20% 10V CERM 402
C2919 0.1UF 20% 10V CERM 402
C2920 0.1UF 20% 10V CERM 402
C2921 0.1UF 20% 10V CERM 402
C2922 0.1UF 20% 10V CERM 402
C2923 0.1UF 20% 10V CERM 402

=PPDDRVTT_S0_MEM_A

DDR3-SODIMM-DUAL-M97-3 (SYMBOL 2 OF 2)

KEY

	CKE0		CKE1		
	VDD		VDD		
NCX	NC		A15	MEM_A_A<15>	IN
MEM_A_BA<2>	BA2		A14	MEM_A_A<14>	IN
	VDD		VDD		
MEM_A_A<12>	A12/BC*		A11	MEM_A_A<11>	IN
MEM_A_A<9>	A9		A7	MEM_A_A<7>	IN
	VDD		VDD		
MEM_A_A<8>	A8		A6	MEM_A_A<6>	IN
MEM_A_A<5>	A5		A4	MEM_A_A<4>	IN
	VDD		VDD		
MEM_A_A<3>	A3		A2	MEM_A_A<2>	IN
MEM_A_A<1>	A1		A0	MEM_A_A<0>	IN
	VDD		VDD		
MEM_A_CLK_P<0>	CK0		CK1	MEM_A_CLK_P<1>	IN
MEM_A_CLK_N<0>	CK0*		CK1*	MEM_A_CLK_N<1>	IN
	VDD		VDD		
MEM_A_A<10>	A10/AP		BA1	MEM_A_BA<1>	IN
MEM_A_BA<0>	BA0		RAS*	MEM_A_RAS_L	IN
	VDD		VDD		
MEM_A_WE_L	WE*		S0*	MEM_A_CS_L<0>	IN
MEM_A_CAS_L	CAS*		ODT0	MEM_A_ODT<0>	IN
	VDD		VDD		
MEM_A_A<13>	A13		ODT1	MEM_A_ODT<1>	IN
MEM_A_CS_L<1>	S1*		NC	NC	
	VDD		VDD		
NCX	TEST		VREFCA	PPVREF_S3_MEM_VREFCA_A	28
	VSS		VSS		
=MEM_A_DQ<32>	DQ32		DQ36	=MEM_A_DQ<36>	B1
=MEM_A_DQ<33>	DQ33		DQ37	=MEM_A_DQ<37>	B1
	VSS		VSS		
=MEM_A_DQS_N<4>	DQS4*		DM4	=MEM_A_DM<4>	IN
=MEM_A_DQS_P<4>	DQS4		VSS		
	VSS		DQ38	=MEM_A_DQ<38>	B1
=MEM_A_DQ<34>	DQ34		DQ39	=MEM_A_DQ<39>	B1
=MEM_A_DQ<35>	DQ35		VSS		
	VSS		DQ44	=MEM_A_DQ<44>	B1
=MEM_A_DQ<40>	DQ40		DQ45	=MEM_A_DQ<45>	B1
=MEM_A_DQ<41>	DQ41		VSS		
	VSS		DQS5*	=MEM_A_DQS_N<5>	B1
=MEM_A_DM<5>	DM5		DQS5	=MEM_A_DQS_P<5>	B1
	VSS		VSS		
=MEM_A_DQ<42>	DQ42		DQ46	=MEM_A_DQ<46>	B1
=MEM_A_DQ<43>	DQ43		DQ47	=MEM_A_DQ<47>	B1
	VSS		VSS		
=MEM_A_DQ<48>	DQ48		DQ52	=MEM_A_DQ<52>	B1
=MEM_A_DQ<49>	DQ49		DQ53	=MEM_A_DQ<53>	B1
	VSS		VSS		
=MEM_A_DQS_N<6>	DQS6*		DM6	=MEM_A_DM<6>	IN
=MEM_A_DQS_P<6>	DQS6		VSS		
	VSS		DQ54	=MEM_A_DQ<54>	B1
=MEM_A_DQ<50>	DQ50		DQ55	=MEM_A_DQ<55>	B1
=MEM_A_DQ<51>	DQ51		VSS		
	VSS		DQ60	=MEM_A_DQ<60>	B1
=MEM_A_DQ<56>	DQ56		DQ61	=MEM_A_DQ<61>	B1
=MEM_A_DQ<57>	DQ57		VSS		
	VSS		DQS7*	=MEM_A_DQS_N<7>	B1
=MEM_A_DM<7>	DM7		DQS7	=MEM_A_DQS_P<7>	B1
	VSS		VSS		
=MEM_A_DQ<58>	DQ58		DQ62	=MEM_A_DQ<62>	B1
=MEM_A_DQ<59>	DQ59		DQ63	=MEM_A_DQ<63>	B1
	VSS		VSS		
MEM_A_SA<0>	SA0		EVENT*	MEM_EVENT_L	OUT
	VDDSPD		SDA	=I2C_SODIMMA_SDA	B1
MEM_A_SA<1>	SA1		SCL	=I2C_SODIMMA_SCL	IN
	VTT		VTT		

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=PPSPD_S0_MEM_A

C2940 2.2UF 20% 6.3V CERM 402-LF
R2940 10K 5% 1/16W MF-LF 402
R2941 10K 5% 1/16W MF-LF 402

SPD Addr: 0xA0(Wr)/0xA1(Rd)

PPVREF_S3_MEM_VREFCA_A

C2936 0.1UF 20% 10V CERM 402
C2935 2.2UF 20% 6.3V CERM 402-LF

PPVREF_S3_MEM_VREFDQ_A

C2930 2.2UF 20% 6.3V CERM 402-LF
C2931 0.1UF 20% 10V CERM 402

"Factory" (top) slot

DDR3-SODIMM-DUAL-M97-2 (SYMBOL 1 OF 2)

CRITICAL J2900 F-RT-THB

KEY

	VREFDQ		VSS		
	VSS		DQ4	=MEM_A_DQ<4>	B1
=MEM_A_DQ<0>	DQ0		DQ5	=MEM_A_DQ<5>	B1
=MEM_A_DQ<1>	DQ1		VSS		
	VSS		DQS0*	=MEM_A_DQS_N<0>	B1
=MEM_A_DM<0>	DM0		DQS0	=MEM_A_DQS_P<0>	B1
	VSS		VSS		
=MEM_A_DQ<2>	DQ2		DQ6	=MEM_A_DQ<6>	B1
=MEM_A_DQ<3>	DQ3		DQ7	=MEM_A_DQ<7>	B1
	VSS		VSS		
=MEM_A_DQ<8>	DQ8		DQ12	=MEM_A_DQ<12>	B1
=MEM_A_DQ<9>	DQ9		DQ13	=MEM_A_DQ<13>	B1
	VSS		VSS		
=MEM_A_DQS_N<1>	DQS1*		DM1	=MEM_A_DM<1>	IN
=MEM_A_DQS_P<1>	DQS1		RESET*	MEM_RESET_L	IN
	VSS		VSS		
=MEM_A_DQ<10>	DQ10		DQ14	=MEM_A_DQ<14>	B1
=MEM_A_DQ<11>	DQ11		DQ15	=MEM_A_DQ<15>	B1
	VSS		VSS		
=MEM_A_DQ<16>	DQ16		DQ20	=MEM_A_DQ<20>	B1
=MEM_A_DQ<17>	DQ17		DQ21	=MEM_A_DQ<21>	B1
	VSS		VSS		
=MEM_A_DQS_N<2>	DQS2*		DM2	=MEM_A_DM<2>	IN
=MEM_A_DQS_P<2>	DQS2		VSS		
	VSS		DQ22	=MEM_A_DQ<22>	B1
=MEM_A_DQ<18>	DQ18		DQ23	=MEM_A_DQ<23>	B1
=MEM_A_DQ<19>	DQ19		VSS		
	VSS		DQ28	=MEM_A_DQ<28>	B1
=MEM_A_DQ<24>	DQ24		DQ29	=MEM_A_DQ<29>	B1
=MEM_A_DQ<25>	DQ25		VSS		
	VSS		DQS3*	=MEM_A_DQS_N<3>	B1
=MEM_A_DM<3>	DM3		DQS3	=MEM_A_DQS_P<3>	B1
	VSS		VSS		
=MEM_A_DQ<26>	DQ26		DQ30	=MEM_A_DQ<30>	B1
=MEM_A_DQ<27>	DQ27		DQ31	=MEM_A_DQ<31>	B1
	VSS		VSS		

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SYNC_MASTER=T27_MLB	SYNC_DATE=07/28/2009
PAGE TITLE	DDR3 SO-DIMM Connector A
Apple Inc.	DRAWING NUMBER 051-8563 SIZE D
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Page Notes

Power aliases required by this page:
- =PPLVDDR_S3_MEM_B
- =PPDDRVTT_S0_MEM_B
- =PPSPD_S0_MEM_B (2.5 - 3.3V)

Signal aliases required by this page:
- =I2C_SODIMMB_SCL
- =I2C_SODIMMB_SDA

BOM options provided by this page:
(NONE)

DDR3 Plane Stitching Caps (Space evenly across plane split)

=PPLVDDR_S3_MEM_B

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

=PPDDRVTT_S0_MEM_B

"Expansion" (bottom) slot

=PPVREF_S3_MEM_VREFDQ_B

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

CRITICAL J3100 F-RT-BGA3 DDR3-SODIMM (2 OF 2)

MEM_B_CKE<0>	CKE0	CKE1	MEM_B_CKE<1>
NCX	VDD	VDD	
NC	CRITICAL	A15	MEM_B_A<15>
MEM_B_BA<2>	BA2	A14	MEM_B_A<14>
	VDD	VDD	
MEM_B_A<12>	A12/BC*	A11	MEM_B_A<11>
MEM_B_A<9>	A9	A7	MEM_B_A<7>
	VDD	VDD	
MEM_B_A<8>	A8	A6	MEM_B_A<6>
MEM_B_A<5>	A5	A4	MEM_B_A<4>
	VDD	VDD	
MEM_B_A<3>	A3	A2	MEM_B_A<2>
MEM_B_A<1>	A1	A0	MEM_B_A<0>
	VDD	VDD	
MEM_B_CLK_P<0>	CK0	CK1	MEM_B_CLK_P<1>
MEM_B_CLK_N<0>	CK0*	CK1*	MEM_B_CLK_N<1>
	VDD	VDD	
MEM_B_A<10>	A10/AP	BA1	MEM_B_BA<1>
MEM_B_BA<0>	BA0	RAS*	MEM_B_RAS_L
	VDD	VDD	
MEM_B_WE_L	WE*	S0*	MEM_B_CS_L<0>
MEM_B_CAS_L	CAS*	ODT0	MEM_B_ODT<0>
	VDD	VDD	
MEM_B_A<13>	A13	ODT1	MEM_B_ODT<1>
MEM_B_CS_L<1>	S1*	NC	
	VDD	VDD	
NCX	TEST	VREFCA	PPVREF_S3_MEM_VREFCA_B
	VSS	VSS	
=MEM_B_DQ<32>	DQ32	DQ36	=MEM_B_DQ<36>
=MEM_B_DQ<33>	DQ33	DQ37	=MEM_B_DQ<37>
	VSS	VSS	
=MEM_B_DQS_N<4>	DQS4*	DM4	=MEM_B_DM<4>
=MEM_B_DQS_P<4>	DQS4	VSS	
	VSS	DQ38	=MEM_B_DQ<38>
=MEM_B_DQ<34>	DQ34	DQ39	=MEM_B_DQ<39>
=MEM_B_DQ<35>	DQ35	VSS	
	VSS	DQ44	=MEM_B_DQ<44>
=MEM_B_DQ<40>	DQ40	DQ45	=MEM_B_DQ<45>
=MEM_B_DQ<41>	DQ41	VSS	
	VSS	DQS5*	=MEM_B_DQS_N<5>
=MEM_B_DM<5>	DM5	DQS5	=MEM_B_DQS_P<5>
	VSS	VSS	
=MEM_B_DQ<42>	DQ42	DQ46	=MEM_B_DQ<46>
=MEM_B_DQ<43>	DQ43	DQ47	=MEM_B_DQ<47>
	VSS	VSS	
=MEM_B_DQ<48>	DQ48	DQ52	=MEM_B_DQ<52>
=MEM_B_DQ<49>	DQ49	DQ53	=MEM_B_DQ<53>
	VSS	VSS	
=MEM_B_DQS_N<6>	DQS6*	DM6	=MEM_B_DM<6>
=MEM_B_DQS_P<6>	DQS6	VSS	
	VSS	DQ54	=MEM_B_DQ<54>
=MEM_B_DQ<50>	DQ50	DQ55	=MEM_B_DQ<55>
=MEM_B_DQ<51>	DQ51	VSS	
	VSS	DQ60	=MEM_B_DQ<60>
=MEM_B_DQ<56>	DQ56	DQ61	=MEM_B_DQ<61>
=MEM_B_DQ<57>	DQ57	VSS	
	VSS	DQS7*	=MEM_B_DQS_N<7>
=MEM_B_DM<7>	DM7	DQS7	=MEM_B_DQS_P<7>
	VSS	VSS	
=MEM_B_DQ<58>	DQ58	DQ62	=MEM_B_DQ<62>
=MEM_B_DQ<59>	DQ59	DQ63	=MEM_B_DQ<63>
	VSS	VSS	
MEM_B_SA<0>	SA0	EVENT*	MEM_EVENT_L
	VDDSPD	SDA	=I2C_SODIMMB_SDA
MEM_B_SA<1>	SA1	SCL	=I2C_SODIMMB_SCL
	VTT	VTT	
	MTG PINS		
	MTG PIN	MTG PIN	
	MTG PIN	MTG PIN	
	MTG PIN	MTG PIN	
	MTG PIN	MTG PIN	

516s0706

=PPVREF_S3_MEM_VREFCA_B

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

=PPSPD_S0_MEM_B

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

SPD Addr: 0xA2(Wr)/0xA3(Rd)

CRITICAL J3100 F-RT-BGA3 DDR3-SODIMM (1 OF 2)

	VREFDQ	VSS	
=MEM_B_DQ<0>	VSS	DQ4	=MEM_B_DQ<4>
=MEM_B_DQ<1>	DQ0	DQ5	=MEM_B_DQ<5>
	DQ1	VSS	
=MEM_B_DM<0>	VSS	DQS0*	=MEM_B_DQS_N<0>
	DM0	DQS0	=MEM_B_DQS_P<0>
	VSS	VSS	
=MEM_B_DQ<2>	DQ2	DQ6	=MEM_B_DQ<6>
=MEM_B_DQ<3>	DQ3	DQ7	=MEM_B_DQ<7>
	VSS	VSS	
=MEM_B_DQ<8>	DQ8	DQ12	=MEM_B_DQ<12>
=MEM_B_DQ<9>	DQ9	DQ13	=MEM_B_DQ<13>
	VSS	VSS	
=MEM_B_DQS_N<1>	DQS1*	DM1	=MEM_B_DM<1>
=MEM_B_DQS_P<1>	DQS1	RESET*	MEM_RESET_L
	VSS	VSS	
=MEM_B_DQ<10>	DQ10	DQ14	=MEM_B_DQ<14>
=MEM_B_DQ<11>	DQ11	DQ15	=MEM_B_DQ<15>
	VSS	VSS	
=MEM_B_DQ<16>	DQ16	DQ20	=MEM_B_DQ<20>
=MEM_B_DQ<17>	DQ17	DQ21	=MEM_B_DQ<21>
	VSS	VSS	
=MEM_B_DQS_N<2>	DQS2*	DM2	=MEM_B_DM<2>
=MEM_B_DQS_P<2>	DQS2	VSS	
	VSS	DQ22	=MEM_B_DQ<22>
=MEM_B_DQ<18>	DQ18	DQ23	=MEM_B_DQ<23>
=MEM_B_DQ<19>	DQ19	VSS	
	VSS	DQ28	=MEM_B_DQ<28>
=MEM_B_DQ<24>	DQ24	DQ29	=MEM_B_DQ<29>
=MEM_B_DQ<25>	DQ25	VSS	
	VSS	DQS3*	=MEM_B_DQS_N<3>
=MEM_B_DM<3>	DM3	DQS3	=MEM_B_DQS_P<3>
	VSS	VSS	
=MEM_B_DQ<26>	DQ26	DQ30	=MEM_B_DQ<30>
=MEM_B_DQ<27>	DQ27	DQ31	=MEM_B_DQ<31>
	VSS	VSS	
	KEY		

516s0706

SYNC_MASTER=T27_MLB	SYNC_DATE=07/28/2009
PAGE TITLE	DDR3 SO-DIMM Connector B
Apple Inc.	DRAWING NUMBER 051-8563
	SIZE D
	REVISION A.13.0
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MCP CHANNEL A DQS 0 -> DIMM A DQS 0

MEM_A_DQ<0>	MAKE_BASE=TRUE	=MEM_A_DQ<7>	25
MEM_A_DQ<1>	MAKE_BASE=TRUE	=MEM_A_DQ<2>	25
MEM_A_DQ<2>	MAKE_BASE=TRUE	=MEM_A_DQ<3>	25
MEM_A_DQ<3>	MAKE_BASE=TRUE	=MEM_A_DQ<5>	25
MEM_A_DQ<4>	MAKE_BASE=TRUE	=MEM_A_DQ<1>	25
MEM_A_DQ<5>	MAKE_BASE=TRUE	=MEM_A_DQ<0>	25
MEM_A_DQ<6>	MAKE_BASE=TRUE	=MEM_A_DQ<6>	25
MEM_A_DQ<7>	MAKE_BASE=TRUE	=MEM_A_DQ<4>	25
MEM_A_DM<0>	MAKE_BASE=TRUE	=MEM_A_DM<0>	25
MEM_A_DQS_N<0>	MAKE_BASE=TRUE	=MEM_A_DQS_N<0>	25
MEM_A_DQS_P<0>	MAKE_BASE=TRUE	=MEM_A_DQS_P<0>	25

MCP CHANNEL A DQS 1 -> DIMM A DQS 1

MEM_A_DQ<8>	MAKE_BASE=TRUE	=MEM_A_DQ<8>	25
MEM_A_DQ<9>	MAKE_BASE=TRUE	=MEM_A_DQ<9>	25
MEM_A_DQ<10>	MAKE_BASE=TRUE	=MEM_A_DQ<14>	25
MEM_A_DQ<11>	MAKE_BASE=TRUE	=MEM_A_DQ<10>	25
MEM_A_DQ<12>	MAKE_BASE=TRUE	=MEM_A_DQ<13>	25
MEM_A_DQ<13>	MAKE_BASE=TRUE	=MEM_A_DQ<12>	25
MEM_A_DQ<14>	MAKE_BASE=TRUE	=MEM_A_DQ<15>	25
MEM_A_DQ<15>	MAKE_BASE=TRUE	=MEM_A_DQ<11>	25
MEM_A_DM<1>	MAKE_BASE=TRUE	=MEM_A_DM<1>	25
MEM_A_DQS_N<1>	MAKE_BASE=TRUE	=MEM_A_DQS_N<1>	25
MEM_A_DQS_P<1>	MAKE_BASE=TRUE	=MEM_A_DQS_P<1>	25

MCP CHANNEL A DQS 2 -> DIMM A DQS 2

MEM_A_DQ<16>	MAKE_BASE=TRUE	=MEM_A_DQ<17>	25
MEM_A_DQ<17>	MAKE_BASE=TRUE	=MEM_A_DQ<20>	25
MEM_A_DQ<18>	MAKE_BASE=TRUE	=MEM_A_DQ<18>	25
MEM_A_DQ<19>	MAKE_BASE=TRUE	=MEM_A_DQ<19>	25
MEM_A_DQ<20>	MAKE_BASE=TRUE	=MEM_A_DQ<21>	25
MEM_A_DQ<21>	MAKE_BASE=TRUE	=MEM_A_DQ<16>	25
MEM_A_DQ<22>	MAKE_BASE=TRUE	=MEM_A_DQ<23>	25
MEM_A_DQ<23>	MAKE_BASE=TRUE	=MEM_A_DQ<22>	25
MEM_A_DM<2>	MAKE_BASE=TRUE	=MEM_A_DM<2>	25
MEM_A_DQS_N<2>	MAKE_BASE=TRUE	=MEM_A_DQS_N<2>	25
MEM_A_DQS_P<2>	MAKE_BASE=TRUE	=MEM_A_DQS_P<2>	25

MCP CHANNEL A DQS 3 -> DIMM A DQS 3

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

MCP CHANNEL A DQS 4 -> DIMM A DQS 4

MEM_A_DQ<32>	MAKE_BASE=TRUE	=MEM_A_DQ<38>	25
MEM_A_DQ<33>	MAKE_BASE=TRUE	=MEM_A_DQ<39>	25
MEM_A_DQ<34>	MAKE_BASE=TRUE	=MEM_A_DQ<35>	25
MEM_A_DQ<35>	MAKE_BASE=TRUE	=MEM_A_DQ<32>	25
MEM_A_DQ<36>	MAKE_BASE=TRUE	=MEM_A_DQ<36>	25
MEM_A_DQ<37>	MAKE_BASE=TRUE	=MEM_A_DQ<34>	25
MEM_A_DQ<38>	MAKE_BASE=TRUE	=MEM_A_DQ<33>	25
MEM_A_DQ<39>	MAKE_BASE=TRUE	=MEM_A_DQ<37>	25
MEM_A_DM<4>	MAKE_BASE=TRUE	=MEM_A_DM<4>	25
MEM_A_DQS_N<4>	MAKE_BASE=TRUE	=MEM_A_DQS_N<4>	25
MEM_A_DQS_P<4>	MAKE_BASE=TRUE	=MEM_A_DQS_P<4>	25

MCP CHANNEL A DQS 5 -> DIMM A DQS 5

MEM_A_DQ<40>	MAKE_BASE=TRUE	=MEM_A_DQ<44>	25
MEM_A_DQ<41>	MAKE_BASE=TRUE	=MEM_A_DQ<45>	25
MEM_A_DQ<42>	MAKE_BASE=TRUE	=MEM_A_DQ<47>	25
MEM_A_DQ<43>	MAKE_BASE=TRUE	=MEM_A_DQ<43>	25
MEM_A_DQ<44>	MAKE_BASE=TRUE	=MEM_A_DQ<42>	25
MEM_A_DQ<45>	MAKE_BASE=TRUE	=MEM_A_DQ<40>	25
MEM_A_DQ<46>	MAKE_BASE=TRUE	=MEM_A_DQ<41>	25
MEM_A_DQ<47>	MAKE_BASE=TRUE	=MEM_A_DQ<46>	25
MEM_A_DM<5>	MAKE_BASE=TRUE	=MEM_A_DM<5>	25
MEM_A_DQS_N<5>	MAKE_BASE=TRUE	=MEM_A_DQS_N<5>	25
MEM_A_DQS_P<5>	MAKE_BASE=TRUE	=MEM_A_DQS_P<5>	25

MCP CHANNEL A DQS 6 -> DIMM A DQS 6

MEM_A_DQ<48>	MAKE_BASE=TRUE	=MEM_A_DQ<51>	25
MEM_A_DQ<49>	MAKE_BASE=TRUE	=MEM_A_DQ<53>	25
MEM_A_DQ<50>	MAKE_BASE=TRUE	=MEM_A_DQ<50>	25
MEM_A_DQ<51>	MAKE_BASE=TRUE	=MEM_A_DQ<54>	25
MEM_A_DQ<52>	MAKE_BASE=TRUE	=MEM_A_DQ<48>	25
MEM_A_DQ<53>	MAKE_BASE=TRUE	=MEM_A_DQ<49>	25
MEM_A_DQ<54>	MAKE_BASE=TRUE	=MEM_A_DQ<55>	25
MEM_A_DQ<55>	MAKE_BASE=TRUE	=MEM_A_DQ<52>	25
MEM_A_DM<6>	MAKE_BASE=TRUE	=MEM_A_DM<6>	25
MEM_A_DQS_N<6>	MAKE_BASE=TRUE	=MEM_A_DQS_N<6>	25
MEM_A_DQS_P<6>	MAKE_BASE=TRUE	=MEM_A_DQS_P<6>	25

MCP CHANNEL A DQS 7 -> DIMM A DQS 7

MEM_A_DQ<56>	MAKE_BASE=TRUE	=MEM_A_DQ<56>	25
MEM_A_DQ<57>	MAKE_BASE=TRUE	=MEM_A_DQ<61>	25
MEM_A_DQ<58>	MAKE_BASE=TRUE	=MEM_A_DQ<62>	25
MEM_A_DQ<59>	MAKE_BASE=TRUE	=MEM_A_DQ<59>	25
MEM_A_DQ<60>	MAKE_BASE=TRUE	=MEM_A_DQ<57>	25
MEM_A_DQ<61>	MAKE_BASE=TRUE	=MEM_A_DQ<60>	25
MEM_A_DQ<62>	MAKE_BASE=TRUE	=MEM_A_DQ<63>	25
MEM_A_DQ<63>	MAKE_BASE=TRUE	=MEM_A_DQ<58>	25
MEM_A_DM<7>	MAKE_BASE=TRUE	=MEM_A_DM<7>	25
MEM_A_DQS_N<7>	MAKE_BASE=TRUE	=MEM_A_DQS_N<7>	25
MEM_A_DQS_P<7>	MAKE_BASE=TRUE	=MEM_A_DQS_P<7>	25

MCP CHANNEL B DQS 0 -> DIMM B DQS 0

MEM_B_DQ<0>	MAKE_BASE=TRUE	=MEM_B_DQ<5>	26
MEM_B_DQ<1>	MAKE_BASE=TRUE	=MEM_B_DQ<4>	26
MEM_B_DQ<2>	MAKE_BASE=TRUE	=MEM_B_DQ<3>	26
MEM_B_DQ<3>	MAKE_BASE=TRUE	=MEM_B_DQ<7>	26
MEM_B_DQ<4>	MAKE_BASE=TRUE	=MEM_B_DQ<1>	26
MEM_B_DQ<5>	MAKE_BASE=TRUE	=MEM_B_DQ<0>	26
MEM_B_DQ<6>	MAKE_BASE=TRUE	=MEM_B_DQ<6>	26
MEM_B_DQ<7>	MAKE_BASE=TRUE	=MEM_B_DQ<2>	26
MEM_B_DM<0>	MAKE_BASE=TRUE	=MEM_B_DM<0>	26
MEM_B_DQS_N<0>	MAKE_BASE=TRUE	=MEM_B_DQS_N<0>	26
MEM_B_DQS_P<0>	MAKE_BASE=TRUE	=MEM_B_DQS_P<0>	26

MCP CHANNEL B DQS 1 -> DIMM B DQS 2

MEM_B_DQ<8>	MAKE_BASE=TRUE	=MEM_B_DQ<21>	26
MEM_B_DQ<9>	MAKE_BASE=TRUE	=MEM_B_DQ<20>	26
MEM_B_DQ<10>	MAKE_BASE=TRUE	=MEM_B_DQ<18>	26
MEM_B_DQ<11>	MAKE_BASE=TRUE	=MEM_B_DQ<19>	26
MEM_B_DQ<12>	MAKE_BASE=TRUE	=MEM_B_DQ<16>	26
MEM_B_DQ<13>	MAKE_BASE=TRUE	=MEM_B_DQ<17>	26
MEM_B_DQ<14>	MAKE_BASE=TRUE	=MEM_B_DQ<22>	26
MEM_B_DQ<15>	MAKE_BASE=TRUE	=MEM_B_DQ<23>	26
MEM_B_DM<1>	MAKE_BASE=TRUE	=MEM_B_DM<2>	26
MEM_B_DQS_N<1>	MAKE_BASE=TRUE	=MEM_B_DQS_N<2>	26
MEM_B_DQS_P<1>	MAKE_BASE=TRUE	=MEM_B_DQS_P<2>	26

MCP CHANNEL B DQS 2 -> DIMM B DQS 1

MEM_B_DQ<16>	MAKE_BASE=TRUE	=MEM_B_DQ<14>	26
MEM_B_DQ<17>	MAKE_BASE=TRUE	=MEM_B_DQ<11>	26
MEM_B_DQ<18>	MAKE_BASE=TRUE	=MEM_B_DQ<12>	26
MEM_B_DQ<19>	MAKE_BASE=TRUE	=MEM_B_DQ<8>	26
MEM_B_DQ<20>	MAKE_BASE=TRUE	=MEM_B_DQ<10>	26
MEM_B_DQ<21>	MAKE_BASE=TRUE	=MEM_B_DQ<15>	26
MEM_B_DQ<22>	MAKE_BASE=TRUE	=MEM_B_DQ<13>	26
MEM_B_DQ<23>	MAKE_BASE=TRUE	=MEM_B_DQ<9>	26
MEM_B_DM<2>	MAKE_BASE=TRUE	=MEM_B_DM<1>	26
MEM_B_DQS_N<2>	MAKE_BASE=TRUE	=MEM_B_DQS_N<1>	26
MEM_B_DQS_P<2>	MAKE_BASE=TRUE	=MEM_B_DQS_P<1>	26

MCP CHANNEL B DQS 3 -> DIMM B DQS 3

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

MCP CHANNEL B DQS 4 -> DIMM B DQS 4

MEM_B_DQ<32>	MAKE_BASE=TRUE	=MEM_B_DQ<32>	26
MEM_B_DQ<33>	MAKE_BASE=TRUE	=MEM_B_DQ<37>	26
MEM_B_DQ<34>	MAKE_BASE=TRUE	=MEM_B_DQ<34>	26
MEM_B_DQ<35>	MAKE_BASE=TRUE	=MEM_B_DQ<35>	26
MEM_B_DQ<36>	MAKE_BASE=TRUE	=MEM_B_DQ<36>	26
MEM_B_DQ<37>	MAKE_BASE=TRUE	=MEM_B_DQ<33>	26
MEM_B_DQ<38>	MAKE_BASE=TRUE	=MEM_B_DQ<39>	26
MEM_B_DQ<39>	MAKE_BASE=TRUE	=MEM_B_DQ<38>	26
MEM_B_DM<4>	MAKE_BASE=TRUE	=MEM_B_DM<4>	26
MEM_B_DQS_N<4>	MAKE_BASE=TRUE	=MEM_B_DQS_N<4>	26
MEM_B_DQS_P<4>	MAKE_BASE=TRUE	=MEM_B_DQS_P<4>	26

MCP CHANNEL B DQS 5 -> DIMM B DQS 5

MEM_B_DQ<40>	MAKE_BASE=TRUE	=MEM_B_DQ<42>	26
MEM_B_DQ<41>	MAKE_BASE=TRUE	=MEM_B_DQ<44>	26
MEM_B_DQ<42>	MAKE_BASE=TRUE	=MEM_B_DQ<41>	26
MEM_B_DQ<43>	MAKE_BASE=TRUE	=MEM_B_DQ<40>	26
MEM_B_DQ<44>	MAKE_BASE=TRUE	=MEM_B_DQ<47>	26
MEM_B_DQ<45>	MAKE_BASE=TRUE	=MEM_B_DQ<45>	26
MEM_B_DQ<46>	MAKE_BASE=TRUE	=MEM_B_DQ<46>	26
MEM_B_DQ<47>	MAKE_BASE=TRUE	=MEM_B_DQ<43>	26
MEM_B_DM<5>	MAKE_BASE=TRUE	=MEM_B_DM<5>	26
MEM_B_DQS_N<5>	MAKE_BASE=TRUE	=MEM_B_DQS_N<5>	26
MEM_B_DQS_P<5>	MAKE_BASE=TRUE	=MEM_B_DQS_P<5>	26

MCP CHANNEL B DQS 6 -> DIMM B DQS 6

MEM_B_DQ<48>	MAKE_BASE=TRUE	=MEM_B_DQ<49>	26
MEM_B_DQ<49>	MAKE_BASE=TRUE	=MEM_B_DQ<53>	26
MEM_B_DQ<50>	MAKE_BASE=TRUE	=MEM_B_DQ<50>	26
MEM_B_DQ<51>	MAKE_BASE=TRUE	=MEM_B_DQ<51>	26
MEM_B_DQ<52>	MAKE_BASE=TRUE	=MEM_B_DQ<52>	26
MEM_B_DQ<53>	MAKE_BASE=TRUE	=MEM_B_DQ<48>	26
MEM_B_DQ<54>	MAKE_BASE=TRUE	=MEM_B_DQ<55>	26
MEM_B_DQ<55>	MAKE_BASE=TRUE	=MEM_B_DQ<54>	26
MEM_B_DM<6>	MAKE_BASE=TRUE	=MEM_B_DM<6>	26
MEM_B_DQS_N<6>	MAKE_BASE=TRUE	=MEM_B_DQS_N<6>	26
MEM_B_DQS_P<6>	MAKE_BASE=TRUE	=MEM_B_DQS_P<6>	26

MCP CHANNEL B DQS 7 -> DIMM B DQS 7

MEM_B_DQ<56>	MAKE_BASE=TRUE	=MEM_B_DQ<62>	26
MEM_B_DQ<57>	MAKE_BASE=TRUE	=MEM_B_DQ<63>	26
MEM_B_DQ<58>	MAKE_BASE=TRUE	=MEM_B_DQ<56>	26
MEM_B_DQ<59>	MAKE_BASE=TRUE	=MEM_B_DQ<60>	26
MEM_B_DQ<60>	MAKE_BASE=TRUE	=MEM_B_DQ<59>	26
MEM_B_DQ<61>	MAKE_BASE=TRUE	=MEM_B_DQ<58>	26
MEM_B_DQ<62>	MAKE_BASE=TRUE	=MEM_B_DQ<57>	26
MEM_B_DQ<63>	MAKE_BASE=TRUE	=MEM_B_DQ<61>	26
MEM_B_DM<7>	MAKE_BASE=TRUE	=MEM_B_DM<7>	26
MEM_B_DQS_N<7>	MAKE_BASE=TRUE	=MEM_B_DQS_N<7>	26
MEM_B_DQS_P<7>	MAKE_BASE=TRUE	=MEM_B_DQS_P<7>	26

SYNC_MASTER=K18_MLB SYNC_DATE=06/19/2009

PAGE TITLE: DDR3 BYTE/BIT SWAPS-K6

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D

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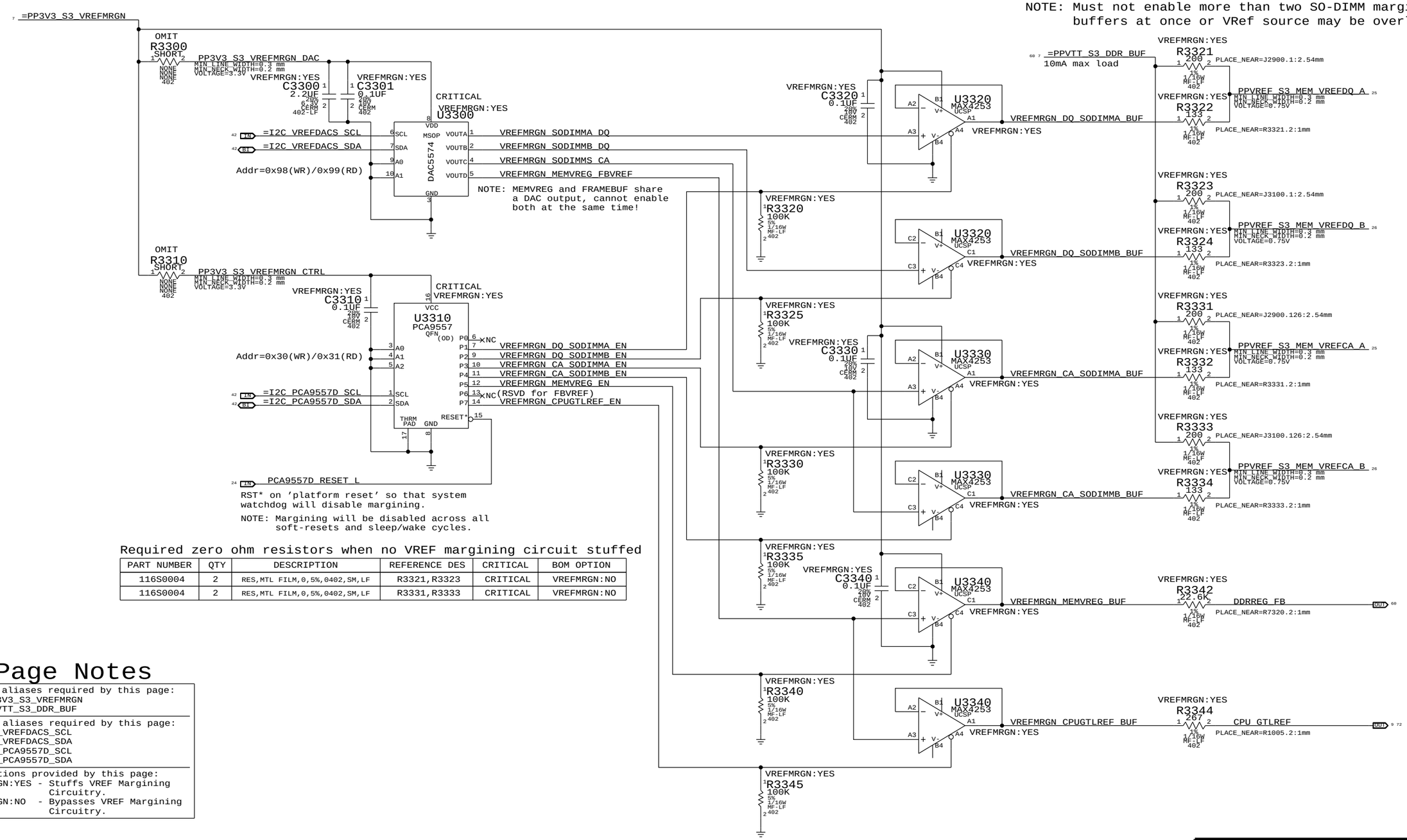

Required zero ohm resistors when no VREF margining circuit stuffed

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
116S0004	2	RES,MTL FILM,0,5%,0402,SM,LF	R3321,R3323	CRITICAL	VREFMRGN:NO
116S0004	2	RES,MTL FILM,0,5%,0402,SM,LF	R3331,R3333	CRITICAL	VREFMRGN:NO

Page Notes

Power aliases required by this page:
- =PP3V3_S3_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:YES - Stuffs VREF Margining Circuitry.
VREFMRGN:NO - Bypasses VREF Margining Circuitry.

	MEM A VREF DQ	MEM B VREF DQ	MEM A VREF CA	MEM B VREF CA	MEM VREG	CPU GTLREF (FSB)
DAC Channel:	A	B	C	C	D	D
PCA9557D Pin:	1	2	3	4	5	7
Nominal value	0.75V (DAC: 0x3A)				1.5V (DAC: 0x3A)	0.7V (DAC: 0x8B)
Margined target:	0.300V - 1.200V (+/- 450mV)				1.998V - 1.002V (+/- 498mV)	0.200V - 1.050V (+/- 500mV)
DAC range:	0.000V - 1.501V (0x00 - 0x74)				0.000V - 1.501V (0x00 - 0x74)	0.000V - 1.191V (0x00 - 0x5C)
VRef current:	+3.4mA - -3.4mA (- = sourced)				+33uA - -33uA (- = sourced)	+750uA - -528uA (- = sourced)
DAC step size:	7.69mV / step @ output				8.59mV / step @ output	9.24mV / step @ output

SYNC_MASTER=T27_MLB SYNC_DATE=09/29/2009
PAGE TITLE
FSB/DDR3 Vref Margining

Apple Inc.

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

PCIE_AP_D2R_P
PCIE_AP_D2R_N
PCIE_AP_R2D_P
PCIE_AP_R2D_N
PCIE_CLK100M_AP_CONN_P
PCIE_CLK100M_AP_CONN_N
(AP_CLKREQ_Q_L)
PCIE_WAKE_L
(AP_RESET_CONN_L)
NC
NC

PLACEMENT_NOTE=Place close to J3401.

C3431 0.1uF 10% 16V X5R 402
C3430 0.1uF 10% 16V X5R 402

PCIE_AP_R2D_C_P
PCIE_AP_R2D_C_N

PLACEMENT_NOTE=Place close to J3401.

AIRPORT

CRITICAL
L3401
90-OHM-100MA
DLP11S
SYM_VER_1

PCIE_CLK100M_AP_P
PCIE_CLK100M_AP_N

PLACEMENT_NOTE=Place close to J3401.

1000 mA peak
750 mA nominal max

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

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

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

PLACEMENT_NOTE=Place close to J3401.

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

PLACEMENT_NOTE=Place close to Q3450.

CRITICAL
Q3450
TPCP8102
23V1K-SM

C3450 0.1UF 10% 16V X5R 402
C3451 0.033UF 10% 16V X5R 402
R3450 33K 5% 1/16W MF-LF 402
R3451 10K 5% 1/16W MF-LF 402

P5VWLAN_SS

PLACEMENT_NOTE=Place close to Q3450.

=PP5V_S3_WLAN
PM_WLAN_EN_L

5V S3 WLAN FET

MOSFET	TPCP8102
CHANNEL	P-TYPE
RDS(ON)	26 mOhm @4.5V
LOADING	0.8 A (EDP)

PP5V_S3_BTCAMERA_F
I2C_ALS_SDA
I2C_ALS_SCL
USB_CAMERA_CONN_P
USB_CAMERA_CONN_N
USB_BT_CONN_P
USB_BT_CONN_N

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

ALS
CAMERA

275 mA peak
200 mA nominal max

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

C3452 0.1uF 20% 10V CERM 402

=PP5V_S3_BTCAMERA

CRITICAL
L3402
90-OHM
DLP0NS
SYM_VER_2

USB_CAMERA_P
USB_CAMERA_N

PLACEMENT_NOTE=Place close to J3401.

BLUETOOTH

CRITICAL
L3403
90-OHM
DLP0NS
SYM_VER_2

USB_BT_P
USB_BT_N

PLACEMENT_NOTE=Place close to J3401.

Supervisor & CLKREQ# Isolation

PP5V_WLAN_F

WF: Need pull-up?

R3440 100K 5% 1/16W MF-LF 402
R3453 392K 1% 1/16W MF-LF 402
R3454 97.6K 1% 1/16W MF-LF 402

P3V3WLAN_VMON

CRITICAL
U3440
SLG4AP016V
TDFN

SENSE
0.7V
DLY
RESET*
MR*
EN
OUT
IN
THRM PAD
GND
VDD

DLY = 60 ms +/- 20%

AP_RESET_CONN_L
AP_CLKREQ_Q_L
AP_RESET_L
AP_PWR_EN
AP_CLKREQ_L

=PP3V3_S3_WLAN

C3440 0.1uF 20% 10V CERM 402

SYNC_MASTER=T27_MLB
SYNC_DATE=07/28/2009

PAGE TITLE
RIGHT CLUTCH CONNECTOR

Apple Inc.

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Caesar IV Support

=PP3V3_S3_CARDREADER
GL137 R3511 0 5% 1/16W MF-LF 402

PP3V3_S3_CARDREADER_DVDD
MIN_LINE_WIDTH=0.40MM
MIN_NECK_WIDTH=0.20MM
VOLTAGE=3.3V
BYPASS=U3500.15:16:5 mm
BYPASS=U3500.26:27:5 mm
BYPASS=U3500.35:34:5 mm
GL137 C3500 10UF 20% 6.3V XSR 603
GL137 C3501 0.1UF 20% 10V CERM 402
GL137 C3502 0.1UF 20% 10V CERM 402
GL137 C3503 0.1UF 20% 10V CERM 402
GL137 L3500 0.22UH 0805-1

PP3V3_S3_CARDREADER_AVDD
MIN_LINE_WIDTH=0.40MM
MIN_NECK_WIDTH=0.20MM
VOLTAGE=3.3V
BYPASS=U3500.6:5:5 mm
BYPASS=U3500.11:12:5 mm
GL137 C3514 10UF 20% 6.3V XSR 603
GL137 C3504 0.1UF 20% 10V CERM 402
GL137 C3508 0.1UF 20% 10V CERM 402

BYPASS=U3500.4:5:5 mm
PP1V8_S3_CARDREADER
MIN_LINE_WIDTH=0.30MM
MIN_NECK_WIDTH=0.20MM
VOLTAGE=1.8V
GL137 C3506 0.1UF 20% 10V CERM 402

GL137 R3507 10K 5% 1/16W MF-LF 402
NO STUFF R3508 10K 5% 1/16W MF-LF 402
NO STUFF R3509 10K 5% 1/16W MF-LF 402
GL137 R3510 10K 5% 1/16W MF-LF 402

NO STUFF R3503 1M 5% 1/16W MF-LF 402
CRITICAL GL137 Y3500 12.000M-100PPM 8X4.5X1.4-SM
GL137 C3511 33PF 5% 50V CERM 402
GL137 C3512 33PF 5% 50V CERM 402

GL137 R3506 715 1% 1/16W MF-LF 402
GL137 R3502 0 5% 1/16W MF-LF 402

GL137 C3513 0.1UF 20% 10V CERM 402

GL137 Q3500 SSM6N15FEAPE SOT563
SDCARD_RESET
SDCARD_PLT_RST
GL137 Q3500 SSM6N15FEAPE SOT563
SDCARD_PLT_RST_L

U3500 GL137A LQFP
CRITICAL GL137

VDD18	4		
AVDD	6		
DVDD	11		
VDD3V	15		
PMOS	26		
NC	35		
	25		
	36		
USB_SDCARD_N	7	DM	
USB_SDCARD_P	8	DP	
GL137_GPIO1	48	GPIO1	
GL137_GPIO2	47	GPIO2	
	46	GPIO3	NC
	19	SK	NC
	20	CS	NC
	21	DO	NC
	22	DI (IPD)	NC
GL137_CLK12M_X1	13	X1	
GL137_CLK12M_X2	14	X2	
GL137_RREF	10	RREF	
GL137_TESTMOD	17	TESTMOD (IPD)	
GL137_RESET_L	18	EXTRSTZ* (IPU)	
D0	40		
D1	43		
D2	37		
D3	29		
D4	28		
D5	30		
D6	32		
D7	38		
CLK	39	SD_CLK_R	
(IPD) SD_WP	3		
(IPD) SD_CMD	41		
(IPU) PDMOD	2	GL137_PDMOD	
(IPU) SD_CDZ	23		
(IPU) XD_CDZ	1		NC
XD_CE	31		NC
(IPD) XD_WEZ	42		NC
(IPD) XD_RBZ	44		NC
(IPD) XD_WPZ	45		NC
(IPU) MS_INS	24		NC
(IPD) MS_BS	33		NC
GND	5, 9, 12, 16, 27, 34		

PDMOD: POWER DOWN MODES
NC = DISABLE (DEFAULT)
10K LOW = POWER SAVING MODE ENABLE
10K HIGH = REMOTE WAKE UP ENABLE

SDCONN_DATA<0> R3550 0 BCM57765 5% 1/16W MF-LF 402 SD_D<0>
SDCONN_DATA<1> R3551 0 BCM57765 5% 1/16W MF-LF 402 SD_D<1>
SDCONN_DATA<2> R3552 0 BCM57765 5% 1/16W MF-LF 402 SD_D<2>
SDCONN_DATA<3> R3553 0 BCM57765 5% 1/16W MF-LF 402 SD_D<3>
SDCONN_DATA<4..7> SD_D<4..7> MAKE_BASE=TRUE
SDCONN_CLK R3554 0 BCM57765 5% 1/16W MF-LF 402 SD_CLK
SDCONN_CMD R3556 0 BCM57765 5% 1/16W MF-LF402 SD_CMD MAKE_BASE=TRUE
SDCONN_WP SD_WP MAKE_BASE=TRUE
SDCONN_CD SD_CD_L MAKE_BASE=TRUE

=PP3V3_S0_SDCONN
R3555 0 BCM57765 5% 1/10W MF-LF 603

Keep this net short!
PP3V3_SW_SD_PWR
MIN_LINE_WIDTH=0.40 MM
MIN_NECK_WIDTH=0.20 MM
VOLTAGE=3.3V
MAKE_BASE=TRUE
MAX CURRENT = 800 MA

GL137 R3512 10K 5% 1/16W MF-LF 402
C3507 2.2UF 20% 6.3V CERM1 603
C3505 0.1UF 20% 10V CERM 402
R3505 39K 5% 1/16W MF-LF 402

NO STUFF R3513 10K 5% 1/16W MF-LF 402
GL137 R3504 0 5% 1/16W MF-LF 402
NO STUFF C3515 10PF 5% 50V CERM 402-1

CRITICAL J3500 SD-CARD-K19-K24 F-RT-TH

3	VSS	
6	VSS	
5	CLK	SD_CLK
2	CMD	SD_CMD
7	DAT0	SD_D<0>
8	DAT1	SD_D<1>
9	DAT2	SD_D<2>
1	CD/DAT3	SD_D<3>
10	DAT4	SD_D<4>
11	DAT5	SD_D<5>
12	DAT6	SD_D<6>
13	DAT7	SD_D<7>
14	CARD_DETECT_SW	
15	CARD_DETECT_GND	
16	WRITE_PROTECT_SW	SD_WP
4	VDD	
17	SHLD_PIN	SD_CD_L
18	SHLD_PIN	
19	SHLD_PIN	
20	SHLD_PIN	

516-0225

ADDED SERIES RESISTOR TO SD_CMD, MAX CURRENT NUMBER CHANGED TO 800MA

SYNC_MASTER=T27_MLB SYNC_DATE=09/30/2009
PAGE TITLE: SecureDigital Card Reader
Apple Inc.
DRAWING NUMBER: 051-8563 SIZE: D
REVISION: A.13.0
BRANCH:
PAGE: 35 OF 109
SHEET: 30 OF 80

BCM57765 SR pins are internal 1.2V switching regulator.
If unused: Okay to float all 4 pins. (Broadcom not so sure now)
If used: VDD/VDDP connect to =PP3V3_ENET_PHY (add bypassing), LX connects to inductor, VFB to =PP1V2_ENET_PHY

64 31 24 7 =PP3V3_ENET_PHY
86mA (1000base-T, Caesar II)

CRITICAL L3900 FERR-600-OHM-0.5A
PP3V3_ENET_PHY_XTALVDDH
MIN_LINE_WIDTH=0.4 mm MIN_NECK_WIDTH=0.2 mm VOLTAGE=3.3V

BCM57765 R3915 0 5% 1/16W MF-LF 402

BCM57765 R3900 0 5% 1/16W MF-LF 402

C3900 0.1UF 10% 16V X7R-CERM 402

CRITICAL L3905 FERR-600-OHM-0.5A
PP3V3_ENET_PHY_BIASVDDH
MIN_LINE_WIDTH=0.4 mm MIN_NECK_WIDTH=0.2 mm VOLTAGE=3.3V

C3905 0.1UF 10% 16V X7R-CERM 402

CRITICAL L3910 FERR-600-OHM-0.5A
PP3V3_ENET_PHY_AVDDH
MIN_LINE_WIDTH=0.4 mm MIN_NECK_WIDTH=0.2 mm VOLTAGE=3.3V

R3910 4.7K 5% 1/10W MF-LF 402

C3910 0.1UF 10% 16V X7R-CERM 402

C3911 0.1UF 10% 16V X7R-CERM 402

TP_BCM57765_SR_VDDP
BCM57765_SR_VDD
BCM57765_VDDO_PIN20
MIN_LINE_WIDTH=0.4 mm MIN_NECK_WIDTH=0.2 mm VOLTAGE=3.3V
BCM57765_XTALVDDH
MIN_LINE_WIDTH=0.4 mm MIN_NECK_WIDTH=0.2 mm VOLTAGE=3.3V

BCM57765_SR_LX
BCM57765_SR_VFB

CRITICAL L3920 FERR-600-OHM-0.5A =PP1V2_ENET_PHY
396mA (1000base-T, Caesar II)
PP1V2_ENET_PHY_AVDDL
MIN_LINE_WIDTH=0.4 mm MIN_NECK_WIDTH=0.2 mm VOLTAGE=1.2V

C3921 0.1UF 10% 16V X7R-CERM 402

C3920 4.7UF 10% 6.3V X5R-CERM 603

CRITICAL L3925 FERR-600-OHM-0.5A
PP1V2_ENET_PHY_PCIEPLL
MIN_LINE_WIDTH=0.4 mm MIN_NECK_WIDTH=0.2 mm VOLTAGE=1.2V

C3926 0.1UF 10% 16V X7R-CERM 402

C3925 4.7UF 10% 6.3V X5R-CERM 603

CRITICAL L3930 FERR-600-OHM-0.5A
PP1V2_ENET_PHY_GPHYPLL
MIN_LINE_WIDTH=0.4 mm MIN_NECK_WIDTH=0.2 mm VOLTAGE=1.2V

C3931 0.1UF 10% 16V X7R-CERM 402

C3930 4.7UF 10% 6.3V X5R-CERM 603

C3936 0.1UF 10% 16V X7R-CERM 402

C3935 10UF 10% 6.3V X5R 805

BCM57765 R3940 4.7K 5% 1/16W MF-LF 402

BCM57765 R3941 4.7K 5% 1/16W MF-LF 402

C3915 4.7UF 10% 6.3V X5R-CERM 603

C3916 0.1UF 10% 16V X7R-CERM 402

42 AVDDH 48 AVDDH 37 BIASVDDH 17 VDDC 7 VDDIO 20 XTALVDDH 56 VDDIO 62 VDDIO 14 VDDC 15 REGCTL12 16 VDDIO 13 WAKE* 39 AVDDL 45 AVDDL 51 29 PCIE_PLLVDDL 32 GPHY_PLLVDDL 36 VDDC 35 VDDC 61 VDDC

CRITICAL OMIT
U3900
BCM5764M
QFN-8X8
VERSION 2

31 7 =PP3V3_S0_ENETPHY

BCM57765 R3942 1K 5% 1/16W MF-LF 402

C3950 0.1uF 10% 16V X5R 402
74 15 OUT PCIE_ENET_D2R_N

C3951 0.1uF 10% 16V X5R 402
74 15 OUT PCIE_ENET_D2R_P

C3955 0.1uF 10% 16V X5R 402
74 15 IN PCIE_ENET_R2D_C_P

C3956 0.1uF 10% 16V X5R 402
74 15 IN PCIE_ENET_R2D_C_N

BCM57765 R3943 0 5% 1/16W MF-LF 402
31 24 OUT =ENET_WAKE_L
(See note)

WAKE#

Must isolate from PCIe WAKE# if PHY is powered-down in S3/S5. Standard N-channel FET isolation suggested. If PHY is always powered then alias =ENET_WAKE_L to PCIE_WAKE_L.

31 BCM57765_VMAIN_PRSNT → 58 SMB_DATA (IPD)
74 PCIE_ENET_D2R_C_N → 27 PCIE_TXD_N
74 PCIE_ENET_D2R_C_P → 28 PCIE_TXD_P
74 PCIE_ENET_R2D_P → 33 PCIE_RXD_P
74 PCIE_ENET_R2D_N → 34 PCIE_RXD_N
74 15 IN PCIE_CLK100M_ENET_P → 31 PCIE_REFCLK_P
74 15 IN PCIE_CLK100M_ENET_N → 30 PCIE_REFCLK_N
76 24 IN ENET_RESET_L → 11 PERST* (IPD)
15 OUT ENET_CLKREQ_L → 12 CLKREQ* (OD)
BCM57765_WAKE_L → 3 LINKLED* (OD)
18 8 IN ENET_LOW_PWR → 4 LOW_PWR (IPD)
31 BCM57765_SMB_CLK → 6 VDDC
BCM57765_SMB_DATA → 10 UART_MODE (IPD-BCM5764M)
31 BCM5764_SCLK → 66 SCLK
31 BCM5764_MISO → 64 SI
31 BCM5764_MOSI → 65 SO
31 BCM5764_CS_L → 63 CS* (IPD)
TP_BCM5764_SPD100LED_L → 2 SPD100LED*
TP_BCM5764_TRAFFICLED_L → 67 TRAFFICLED*
24 IN BCM5764_CLK25M_XTALI → 18 XTALI
24 OUT BCM5764_CLK25M_XTALO → 19 XTALO
BCM5764_RDAC → 38 RDAC

BCM57765 R3965 1.24K 1% 1/16W MF-LF 402

THRM_PAD 69

TRD0_P 40 ENET_MDI_P<0> 32 76
TRD0_N 41 ENET_MDI_N<0> 32 76
TRD1_P 44 ENET_MDI_P<1> 32 76
TRD1_N 43 ENET_MDI_N<1> 32 76
TRD2_P 46 ENET_MDI_P<2> 32 76
TRD2_N 47 ENET_MDI_N<2> 32 76
TRD3_P 50 ENET_MDI_P<3> 32 76
TRD3_N 49 ENET_MDI_N<3> 32 76

CR_BUS_PWR is not for SD Card power, just decoupling for BCM57765 CR I/Os.

BCM57765 C3970 4.7UF 10% 6.3V X5R-CERM 603
BCM57765 C3971 0.1UF 10% 16V X7R-CERM 402
BCM57765 C3972 0.1UF 10% 16V X7R-CERM 402

(IPD) GPIO_0/SERIAL_DO 5 NC
GPIO_1/SERIAL_DI 8
PP3V3R1V8_SW_SD_VIO
MIN_LINE_WIDTH=0.3 mm MIN_NECK_WIDTH=0.2 mm VOLTAGE=3.3V
GPIO_2 9 BCM57765_MEDIA_SENSE R3972 0 5% 1/16W MF-LF 402 ENET_ENERGY_DET OUT 17 31
NC 1 BCM57765_SD_DETECT R3973 0 5% 1/16W MF-LF 402 SDCONN_CD IN 30
PCIE_VDDL 26 31 BCM57765_CR_CMD R3974 0 5% 1/16W MF-LF 402 SDCONN_CMD IN 30 76
PLACE_NEAR=L3999.1:1 mm
DC0 21 SDCONN_CLK OUT 30 76
DC4 25 SDCONN_DATA<0> B3 30 76
DC3 24 SDCONN_DATA<1> B3 30 76
DC2 23 SDCONN_DATA<2> B3 30 76
DC1 22 SDCONN_DATA<3> B3 30 76
NC 52 76 BCM57765_CR_DATA<4> R3975 0 5% 1/16W MF-LF 402 SDCONN_DATA<4> B3 30 76
VMAIN_PRSNT 53 76 31 BCM57765_CR_DATA<5> R3976 0 5% 1/16W MF-LF 402 SDCONN_DATA<5> B3 30 76
VAUX_PRSNT 54 76 31 BCM57765_CR_DATA<6> R3977 0 5% 1/16W MF-LF 402 SDCONN_DATA<6> B3 30 76
VDDC 55 76 31 BCM57765_CR_DATA<7> R3978 0 5% 1/16W MF-LF 402 SDCONN_DATA<7> B3 30 76
SMB_CLK 59 BCM57765_CE_L_MS_INS_L 31
ENERGY_DET 60 BCM57765_CR_LED 31
DC5 57 SDCONN_WP IN 30
SPD1000LED* 68 TP_BCM57765_XD_DET

BCM57765
All resistors above BOMOPTIONed BCM57765
BCM57765 supports both active-levels for WP.

PHY Non-Volatile Memory

ROM contains MAC address, PCIe config info as well as code for Bonjour proxy. Required for proper PHY operation. (Required ROM size TBD)

64 31 24 7 =PP3V3_ENET_PHY

U3990 AT45DB011D SOIC-8S1 OMIT
VCC 6 SCK 2 SI 1 CS* 4 WP* 5 RESET* 3 SO 8 GND 7

C3990 0.1UF 10% 16V X5R-CERM 402

31 BCM5764_SCLK → SCK
31 BCM5764_CS_L → CS*
SI ← BCM5764_MOSI 31
SO → BCM5764_MISO 31

BCM57765 R3990 4.7K 5% 1/16W MF-LF 402
BCM5764M R3997 4.7K 5% 1/16W MF-LF 402

NOTE: Pull-down on SO plus internal pull-ups on other 3 SPI pins configures BCM57765 for the Atmel AT45DB011D (1Mbit) ROM. If a different ROM is used then the straps must change.
NOTE: BCM5764M requires SI pull-down instead of SO.

BCM5764M Support

All parts below BOMOPTIONed BCM5764M

BCM5764M pin-function

60-ENERGY_DET	31 BCM57765_CR_LED	R3980	0	5% 1/16W MF-LF 402	ENET_ENERGY_DET	17 31
13-WAKE*	64 31 BCM57765_SR_VFB	R3981	0	5% 1/16W MF-LF 402	=ENET_WAKE_L (See note)	24 31
53-VMAIN_PRSNT	76 31 BCM57765_CR_DATA<5>	R3982	1K	5% 1/16W MF-LF 402	=PP3V3_S0_ENETPHY	7 31
59-SMB_CLK	31 BCM57765_CE_L_MS_INS_L	R3983	4.7K	5% 1/16W MF-LF 402	=PP3V3_ENET_PHY	7 24 31 64
58-SMB_DATA	31 BCM57765_VMAIN_PRSNT	R3984	4.7K	5% 1/16W MF-LF 402		
54-VAUX_PRSNT	76 31 BCM57765_CR_DATA<6>	R3985	1K	5% 1/16W MF-LF 402		
16-VDDIO	64 31 BCM57765_SR_LX	R3986	0	5% 1/16W MF-LF 402		
20-XTALVDDH	31 BCM57765_VDDO_PIN20	R3987	0	5% 1/16W MF-LF 402	PP3V3_ENET_PHY_XTALVDDH	31
55-VDDC	76 31 BCM57765_CR_DATA<7>	R3988	0	5% 1/16W MF-LF 402	=PP1V2_ENET_PHY	7 31
17-VDDC	31 BCM57765_XTALVDDH	R3989	0	5% 1/16W MF-LF 402		
14-VDDC	64 31 BCM57765_SR_VDD	R3998	0	5% 1/16W MF-LF 402		
06-VDDC	31 BCM57765_SMB_CLK	R3999	0	5% 1/16W MF-LF 402		

L3999 FERR-600-OHM-0.5A SM CRITICAL

26-PCIE_VDDL 76 31 BCM57765_CR_CMD PLACE_NEAR=U3900.26:2 mm

Keep net short, with no stubs.

BCM5764M C3999 0.1UF 10% 16V X7R-CERM 402 PLACE_NEAR=U3900.26:1 mm
BCM5764M C3998 4.7UF 10% 6.3V X5R-CERM 603 PLACE_NEAR=L3999.1:1 mm

SYNC_MASTER=T27_MLB SYNC_DATE=08/20/2009

PAGE TITLE
Ethernet PHY (Caesar II/IV)

Apple Inc.

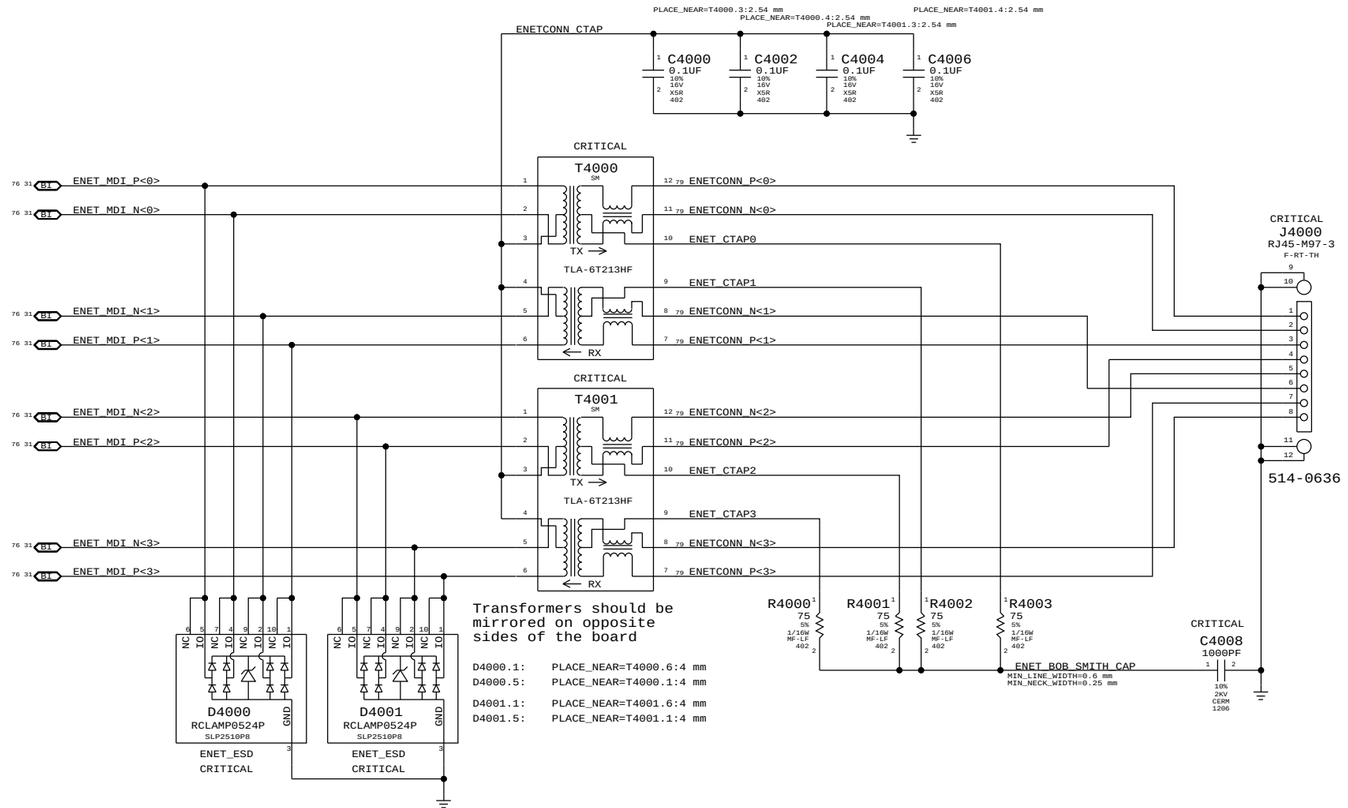
DRAWING NUMBER 051-8563 SIZE D
REVISION A.13.0
BRANCH
PAGE 39 OF 109
SHEET 31 OF 80

Page Notes

Power aliases required by this page:
(NONE)

Signal aliases required by this page:
(NONE)

BOM options provided by this page:
(NONE)



SYNC MASTER=T27_MLB SYNC DATE=07/28/2009

PAGE TITLE

Ethernet Connector

Apple Inc.

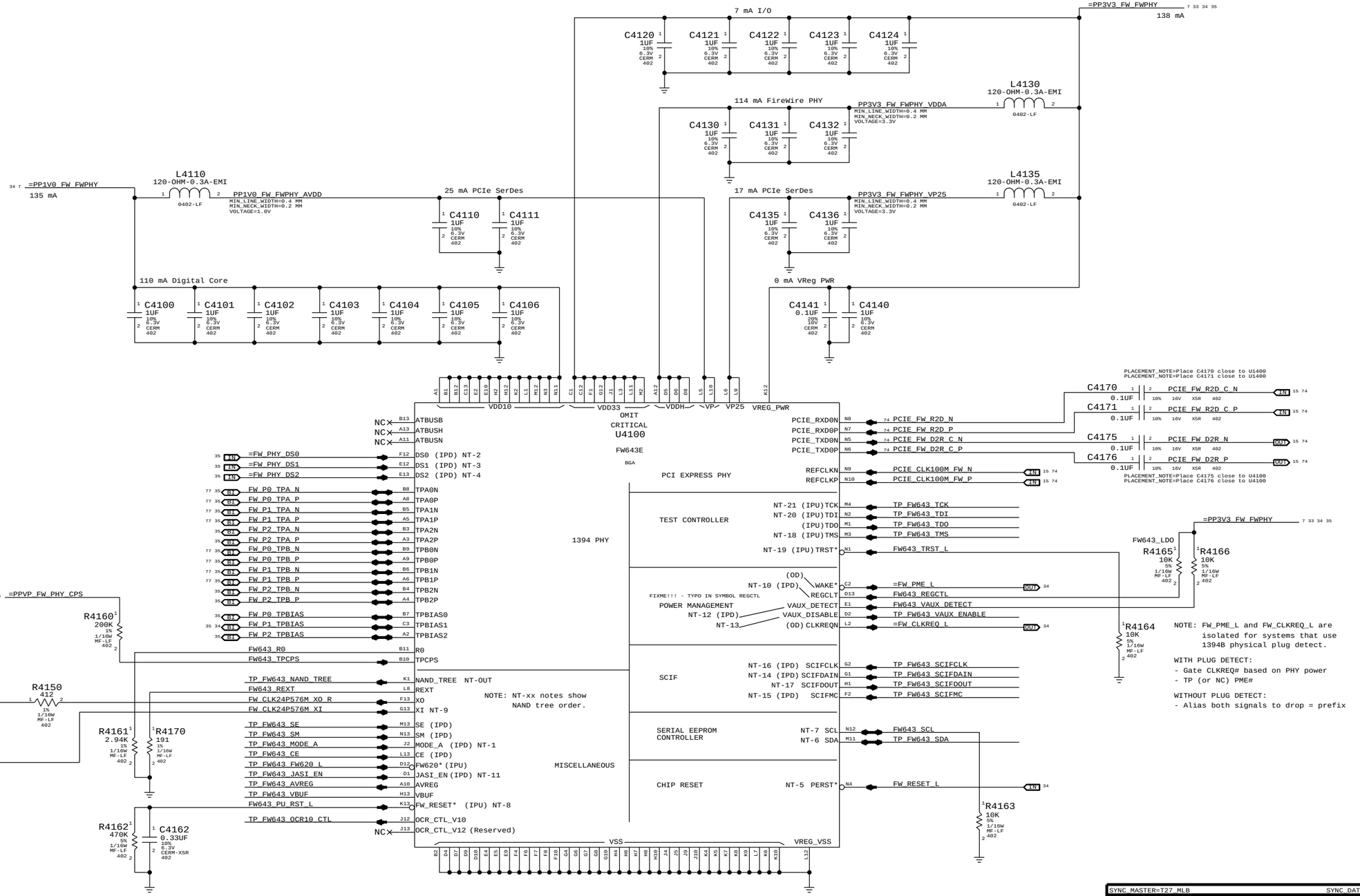
DRAWING NUMBER 051-8563 SIZE D

REVISION A.13.0

BRANCH

PAGE 40 OF 109

SHEET 32 OF 80



SYNC MASTER=T27_MLB
SYNC_DATE=07/20/2005

PAGE TITLE

FireWire LLC/PHY (FW643E)

Apple Inc.

DRAWING NUMBER 051-8563
SIZE D
REVISION A.13.0
BRANCH
PAGE 41 OF 109
SHEET 33 OF 80

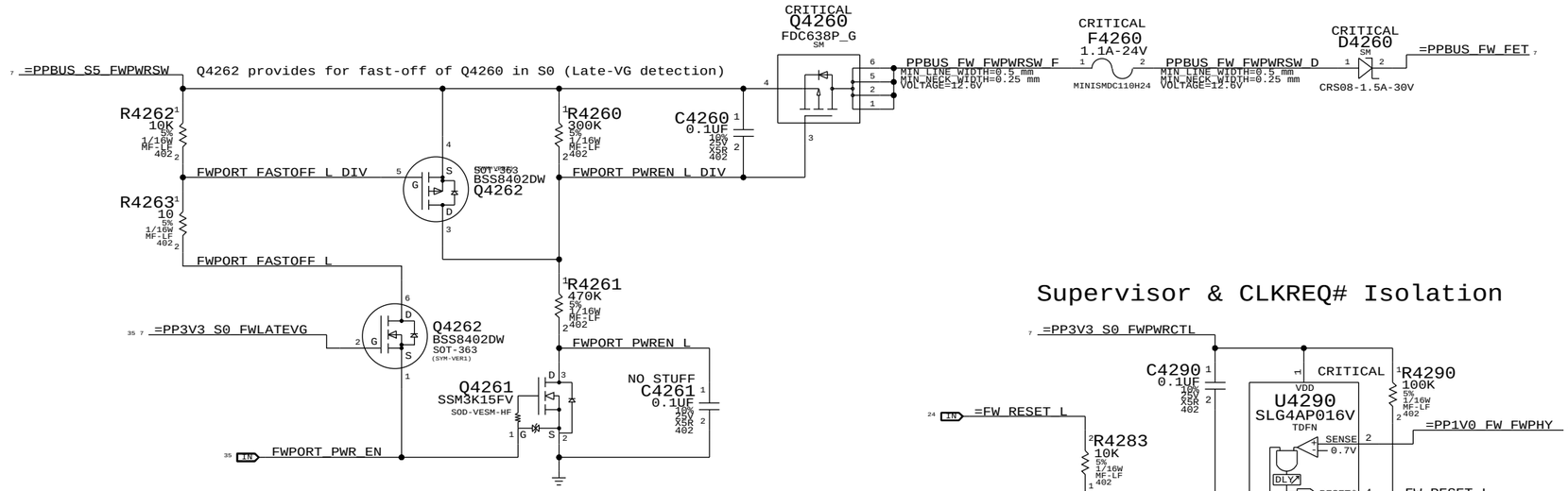
Page Notes

Power aliases required by this page:
- =PPBUS_S5_FWPWRSW (FW VP FET Input)
- =PPBUS_FW_FET (FW VP FET Output)
- =PP3V3_FW_P3V3FWFET (3.3V FET Input)
- =PP3V3_FW_FET (3.3V FET Output)
- =PP3V3_FW_FWPHY (PHY 3.3V Power)
- =PP3V3_S0_FWLATEVG
- =PP3V3_S0_FWPWRCTL
- =PP1V05_S0_FWPWRCTL (5KPD Bias Rail)
- =PP1V05_FW_P1V0FWFET (1.0V FET Input)
- =PP1V0_FW_FET_R (1.0V FET Output)
- =PP1V0_FW_FWPHY (PHY 1.0V)

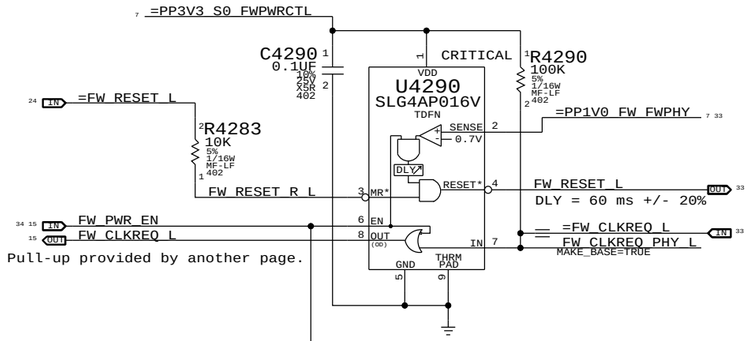
Signal aliases required by this page:
- =FW_CLKREQ_L
- =FW_PME_L

BOM options provided by this page:
(NONE)

FireWire Port Power Switch

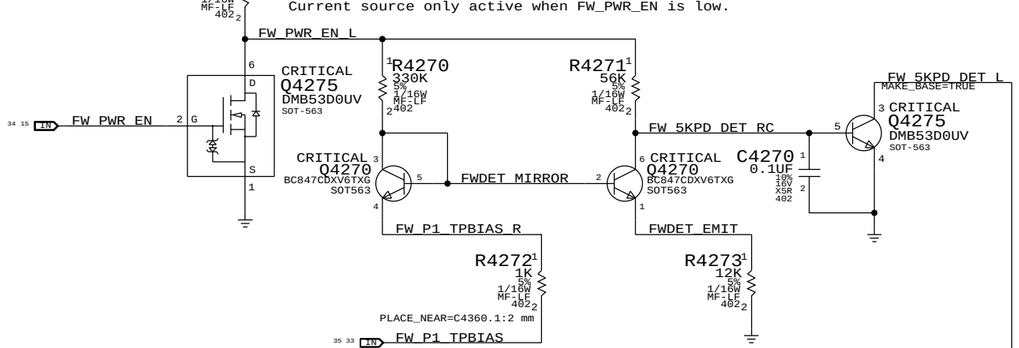


Supervisor & CLKREQ# Isolation



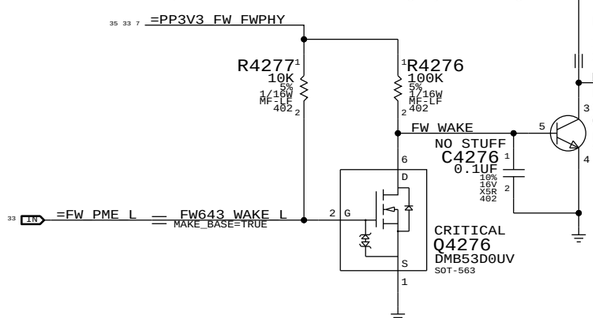
FireWire Port 5K Pull-Down Detect

All FireWire devices require 5K pull-down on TPB pair.
Host can detect as load on TPBIAS signal.
Current source only active when FW_PWR_EN is low.



FireWire PHY WAKE# Support

When PHY is powered, FW_5KPD_DET_L acts as legacy PME# signal.

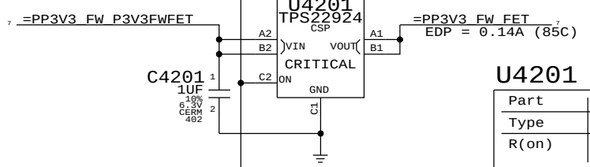


Dual-purpose output:

1) 5K Pull-down Detect when FW_PWR_EN is low.
2) FW643 WAKE# (PME#) when PHY is powered.

Pull-up provided on another page.

3.3V FW Switch

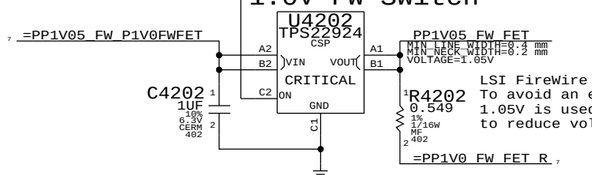


U4201 & U4202

Part	TPS22924C
Type	Load Switch
R(on)	18 mOhm Typ 50 mOhm Max

Max Output: 2A

1.0V FW Switch



LSI FireWire PHY requires 1.0V.
To avoid an extra power supply,
1.05V is used with a series R
to reduce voltage.

TEXT NOTE FOR 3.3V RAIL CURRENT CHANGED TO EDP NUMBER.

SYNC_MASTER=T27_MLB SYNC_DATE=12/15/2009

PAGE TITLE
FireWire Port & PHY Power

Apple Inc.

DRAWING NUMBER 051-8563 SIZE D
REVISION A.13.0
BRANCH
PAGE 42 OF 109
SHEET 34 OF 80

Page Notes

Power aliases required by this page:
- =PPVP_FW_PORT1
- =PPVP_FW_PHY_CPS_FET (From Port)
- =PPVP_FW_PHY_CPS (To PHY)
- =PP3V3_FW_FWPHY
- =PP3V3_S0_FWLATEVG

Signal aliases required by this page:
- =FW_PHY_DS0
- =FW_PHY_DS1
- =FW_PHY_DS2

NOTE: This page is expected to contain the necessary aliases to map the FireWire TPA/TPB pairs to their appropriate connectors and/or to properly terminate unused signals.

BOM options provided by this page:
(NONE)

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

FW643 TPCPS Leakage Protection

FW643 has internal leakage path from TPCPS pin to VDD33.
FET blocks current to TPCPS until VDD33 is powered.

=PPVP_FW_PHY_CPS_FET
From Port
R4311 470K 5% 1/16W MF-LF 402
Q4300 BSS8402DW (SYM-VER2)
PPVP_FW_PHY_CPS
MIN_LINE_WIDTH=0.4 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=12.6V
MAKE_BASE=TRUE
=PPVP_FW_PHY_CPS
To FW643
CPS_EN_L_DIV
R4312 330K 5% 1/16W MF-LF 402
CPS_EN_L
=PP3V3_FW_FWPHY
Q4300 BSS8402DW SOT-363 (SYM-VER1)

Unused FireWire Ports

Disabled per LSI instructions
(All unused port signals TP/NC)

FW_P0_TPBIAS	NC_FW0_TPBIAS	MAKE_BASE=TRUE, NO_TEST=TRUE
FW_P0_TPA_P	NC_FW0_TPAP	MAKE_BASE=TRUE, NO_TEST=TRUE
FW_P0_TPA_N	NC_FW0_TPAN	MAKE_BASE=TRUE, NO_TEST=TRUE
FW_P0_TPB_P	NC_FW0_TPBP	MAKE_BASE=TRUE, NO_TEST=TRUE
FW_P0_TPB_N	NC_FW0_TPBN	MAKE_BASE=TRUE, NO_TEST=TRUE
FW_P2_TPBIAS	NC_FW2_TPBIAS	MAKE_BASE=TRUE, NO_TEST=TRUE
FW_P2_TPA_P	NC_FW2_TPAP	MAKE_BASE=TRUE, NO_TEST=TRUE
FW_P2_TPA_N	NC_FW2_TPAN	MAKE_BASE=TRUE, NO_TEST=TRUE
FW_P2_TPB_P	NC_FW2_TPBP	MAKE_BASE=TRUE, NO_TEST=TRUE
FW_P2_TPB_N	NC_FW2_TPBN	MAKE_BASE=TRUE, NO_TEST=TRUE

FireWire PHY Config Straps

Configures PHY for:
- Port "1" Bilingual (1394B)

=PP3V3_FW_FWPHY
R4382 10K 1% 1/16W MF-LF 402
R4380 10K 1% 1/16W MF-LF 402
FWPHY_DS0 MAKE_BASE=TRUE =FW_PHY_DS0
FWPHY_DS1 MAKE_BASE=TRUE =FW_PHY_DS1
FWPHY_DS2 MAKE_BASE=TRUE =FW_PHY_DS2
R4381 10K 1% 1/16W MF-LF 402

Termination

Place close to FireWire PHY

FW_P1_TPBIAS
C4360 0.33UF 10% 6.3V CERM-X5R 402
SIGNAL_MODEL=EMPTY
R4360 56.2 1% 1/16W MF-LF 402
R4361 56.2 1% 1/16W MF-LF 402
FW_P1_TPA_P
FW_P1_TPA_N
FW_P1_TPB_P
FW_P1_TPB_N
FW_PORT1_TPA_P MAKE_BASE=TRUE
FW_PORT1_TPA_N MAKE_BASE=TRUE
FW_PORT1_TPB_P MAKE_BASE=TRUE
FW_PORT1_TPB_N MAKE_BASE=TRUE
R4362 56.2 1% 1/16W MF-LF 402
R4363 56.2 1% 1/16W MF-LF 402
FW_PORT1_TPB_C
C4364 220pF 5% 25V CERM 402
R4364 4.99K 1% 1/16W MF-LF 402

"Snapback" & "Late VG" Protection

=PP3V3_S0_FWLATEVG
PLACE_NEAR=U4350.1:2 mm
C4350 0.1UF 10% 10V X5R 402
U4350 TPD4S1394 LLP
VCC
VCLMP
FWPWR_EN
GND
D1+
D1-
D2+
D2-
TP_FWLATEVG_VCLMP
FWPORT_PWR_EN
R4350 100K 5% 1/16W MF-LF 402
CRITICAL
(PINS 5/6 AND 7/8 ARE SWAPPED FOR BETTER ROUTING)
(FW_PORT1_TPA_P)
(FW_PORT1_TPA_N)
(FW_PORT1_TPB_P)
(FW_PORT1_TPB_N)

Cable Power

Note: Trace PPVP_FW_PORT1 must handle up to 5A

=PPVP_FW_PORT1
CRITICAL
L4310 FERR-250-OHM SM
PPVP_FW_PORT1_F
MIN_LINE_WIDTH=0.5 mm
MIN_NECK_WIDTH=0.25 mm
VOLTAGE=33V
C4314 0.01UF 10% 50V X7R 402
C4319 0.1uF 10% 50V X7R 603-1
PLACE_NOTE=J4310.5:2 mm
R4319 1M 5% 1/16W MF-LF 402

PORT 1

BILINGUAL
CRITICAL
J4310 1394B-M97 F-RT-TH
(FW_PORT1_TPB_N)
(FW_PORT1_BREF)
(FW_PORT1_TPB_P)
(GND)
(FW_PORT1_TPA_N)
FW_PORT1_AREF
(FW_PORT1_TPA_P)
TPB-
TPB+
NC
SC/NC
TPA-
TPA+
VG
TPB(R)
VP
TPA(R)
OUTPUT
INPUT
CHASSIS GND
514S0605

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

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

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

CANNOT SYNC THIS PAGE FROM T27, TPA AND TPB FOR U4350 IS SWAPPED

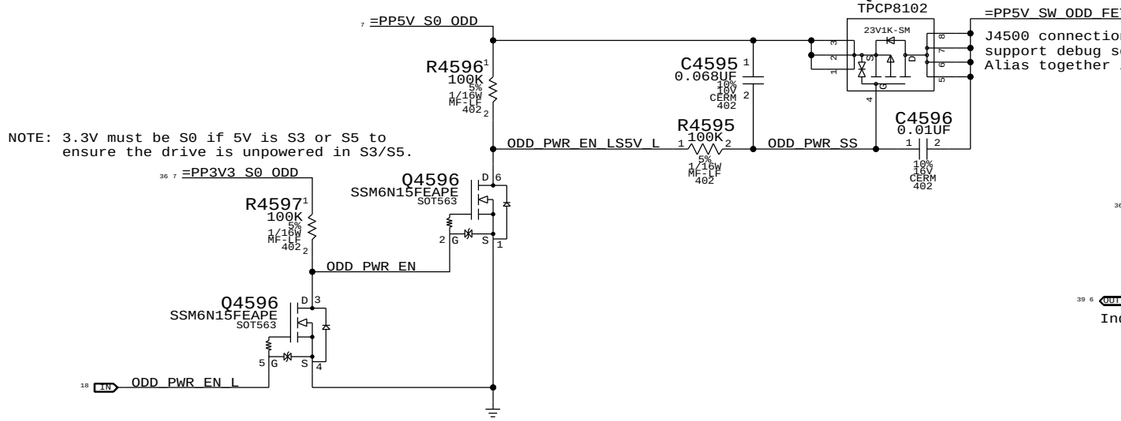
SYNC_MASTER=T27_MLB SYNC_DATE=07/28/2009

PAGE TITLE: FireWire Connector

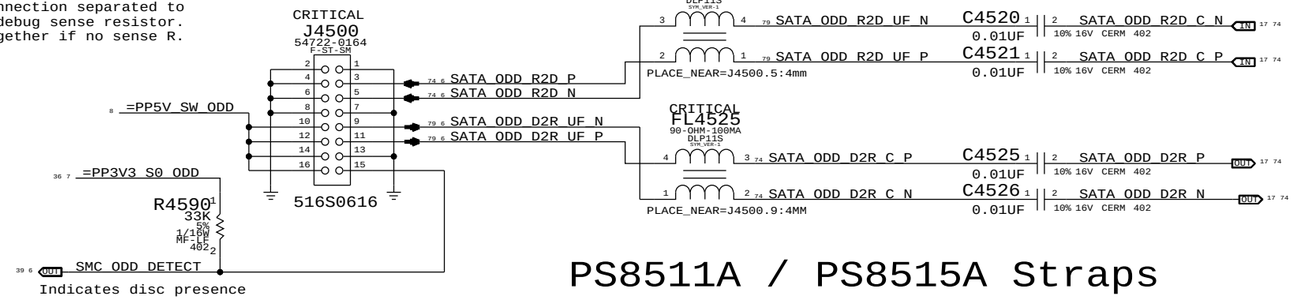
Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D
REVISION: A.13.0
BRANCH:
PAGE: 43 OF 109
SHEET: 35 OF 80

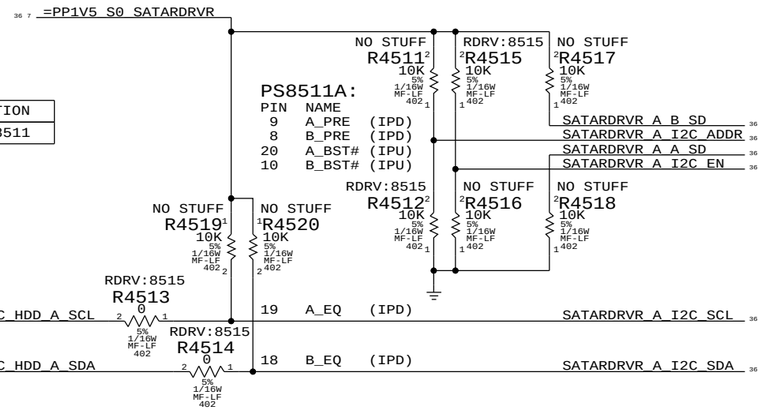
ODD Power Control



SATA ODD Port



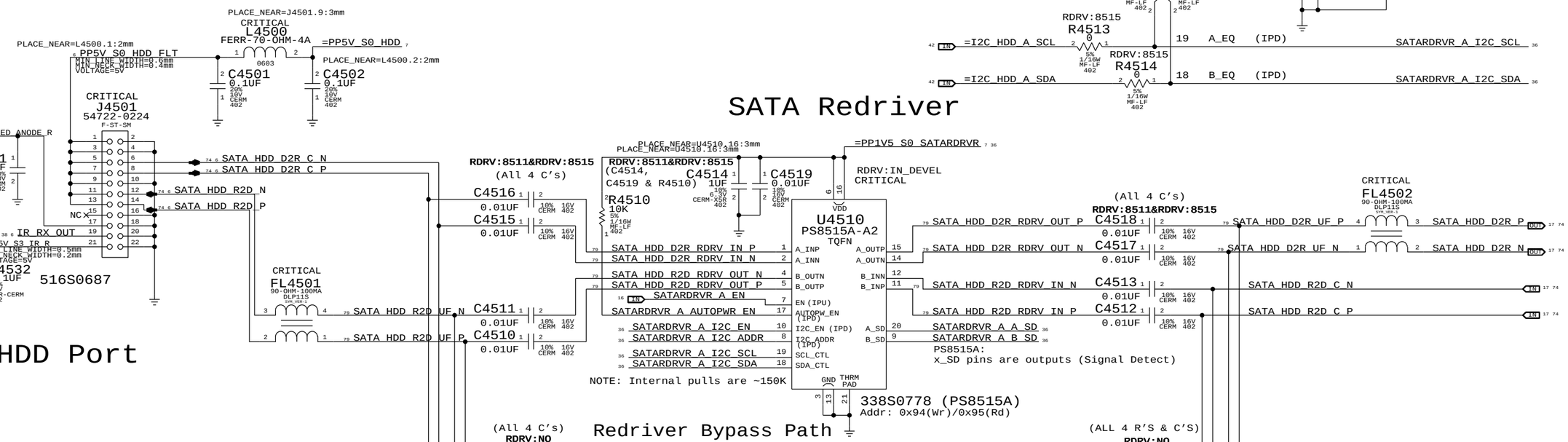
PS8511A / PS8515A Straps



PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
338S0769	1	SATA 3GB/S REDRIVER, LOW POWER	U4510	CRITICAL	RDRV:8511

BOMOPTIONs:
- RDRV:8511 stuffs PS8511A & associated parts (STRAPS TBD!!!)
- RDRV:8515 stuffs PS8515A & associated parts
- RDRV:NO stuffs bypass path (neither IC or associated parts stuffed)

SATA Redriver



SATA HDD Port

Redriver Bypass Path

U4510 ADD NO STUFF IN PRODUCTION!!!!

J5401 PINOUTS ARE DIFFERENT FOR K6, DO NOT SYNC THIS PAGE FROM T27 DIRECTLY

SYNC_MASTER=T27_MLB SYNC_DATE=08/06/2009

PAGE TITLE: SATA Connectors

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D

REVISION: A.13.0

BRANCH:

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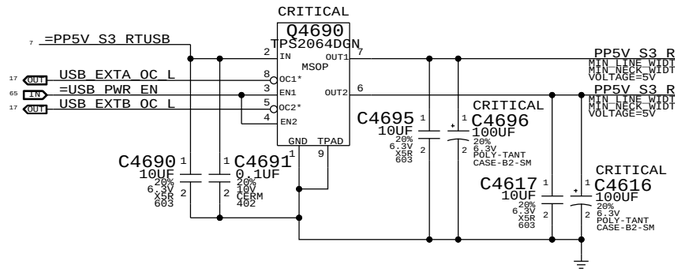
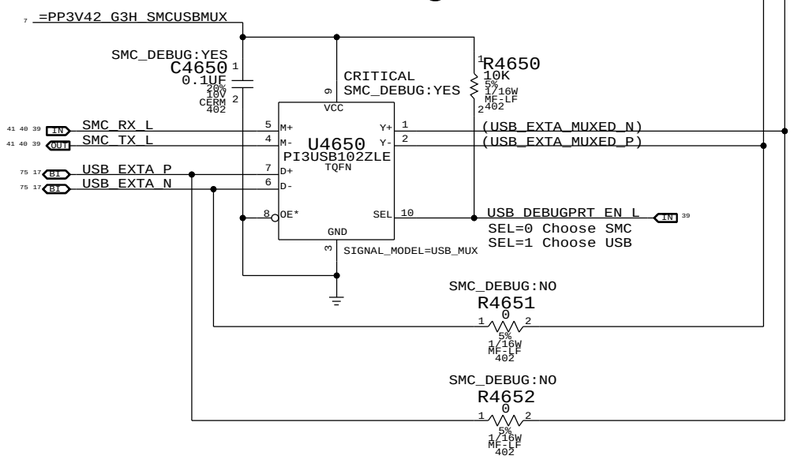
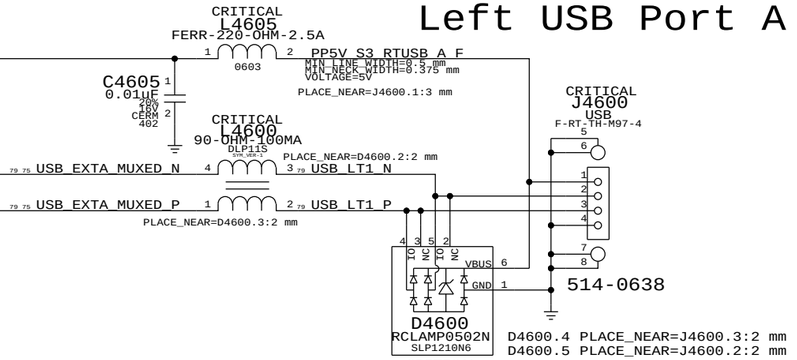
Port Power Switch



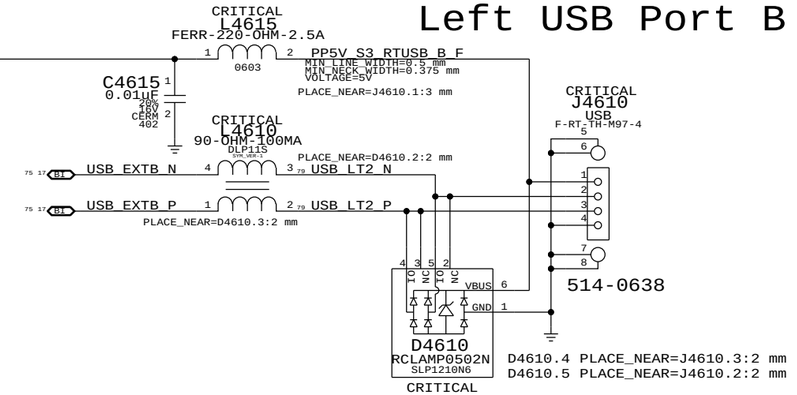
USB/SMC Debug Mux



Left USB Port A



Left USB Port B



SYNC_MASTER=T27_MLB SYNC_DATE=08/27/2009

PAGE TITLE
External USB Connectors

Apple Inc.

DRAWING NUMBER 051-8563 SIZE D

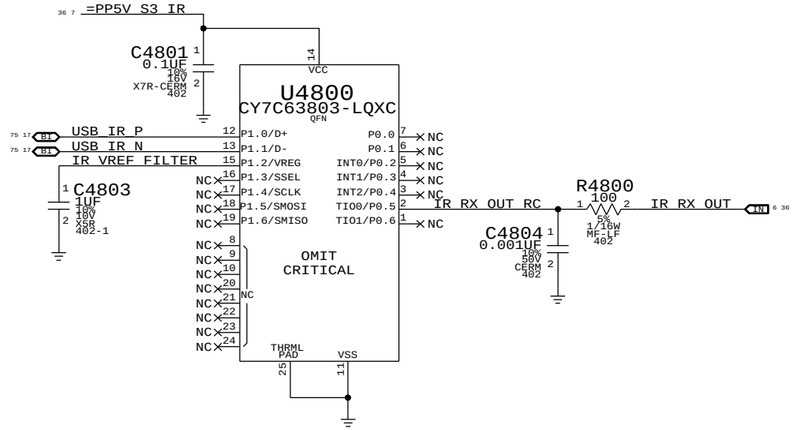
REVISION A.13.0

BRANCH

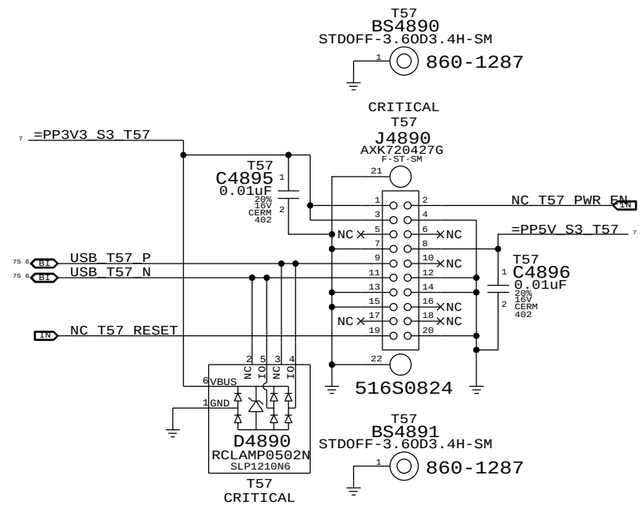
PAGE 46 OF 109

SHEET 37 OF 80

IR Support



T57 Connector



K6 NOTES : D4890 CONNECTION IS DIFFERENT,CANNOT DIRECTLY SYNC FROM T27

SYNC MASTER=T27_MLB SYNC DATE=08/27/2009

PAGE TITLE: Internal USB Support

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D

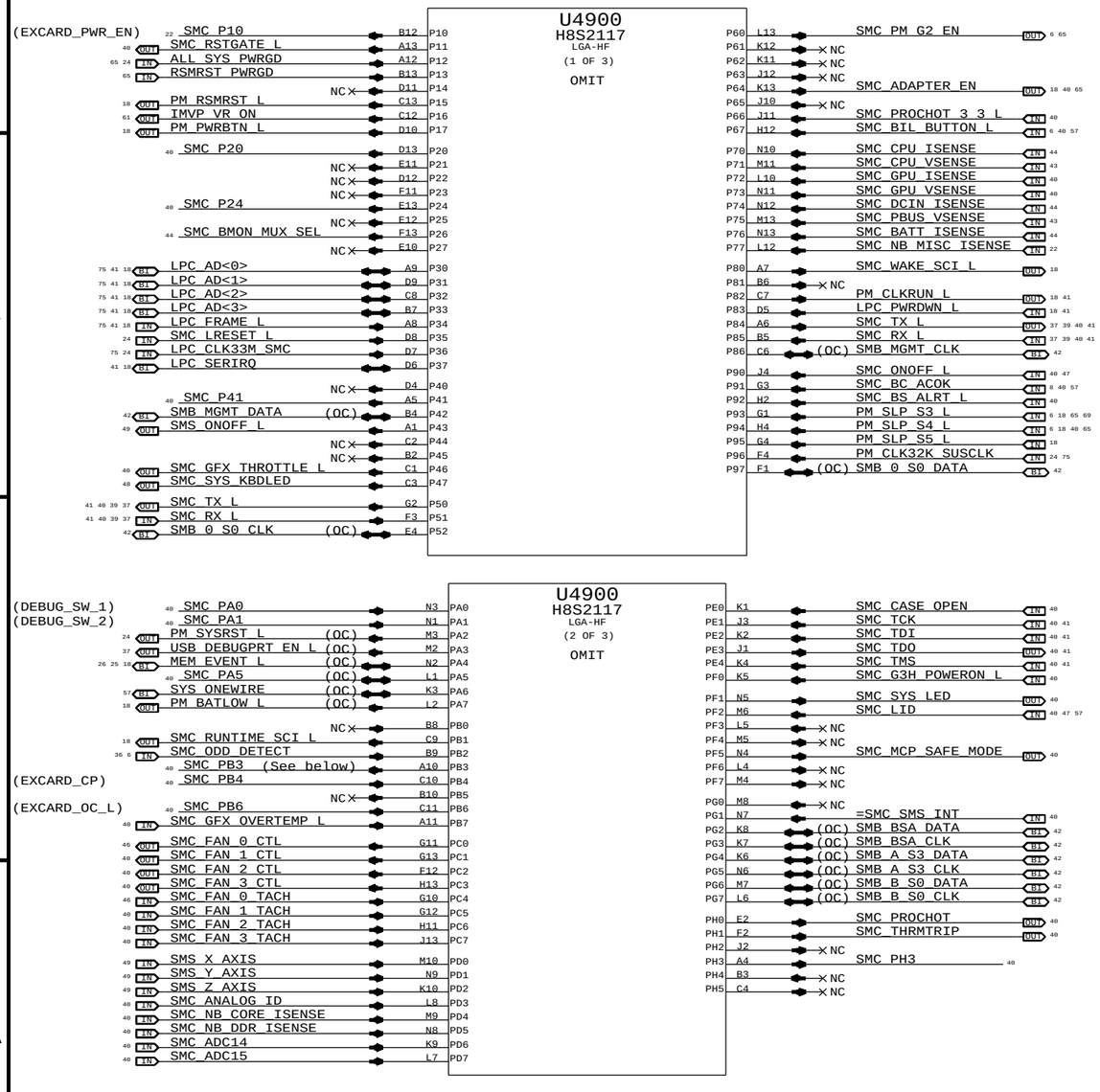
REVISION: A.13.0

BRANCH:

PAGE: 48 OF 109

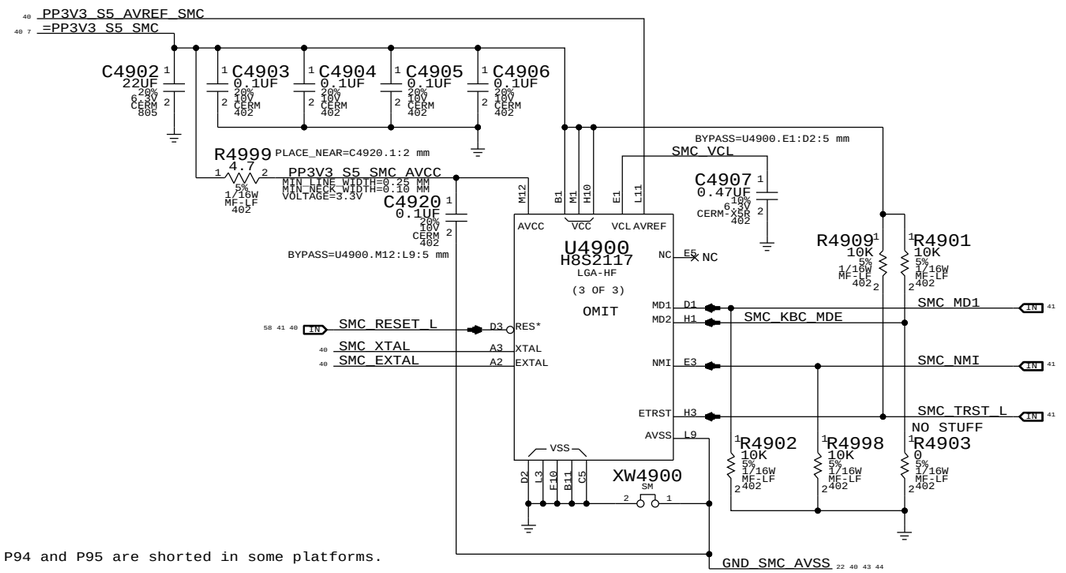
SHEET: 38 OF 80

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.



NOTE: P94 and P95 are shorted in some platforms.

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

H8S2117-R:
(SMC_PECI)
(SMC_PECI_VREF)
(SMC_PECI_VSTP)

SYNC_MASTER=T27_MLB SYNC_DATE=09/02/2009

PAGE TITLE: SMC

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D
REVISION: A.13.0
BRANCH:
PAGE: 49 OF 109
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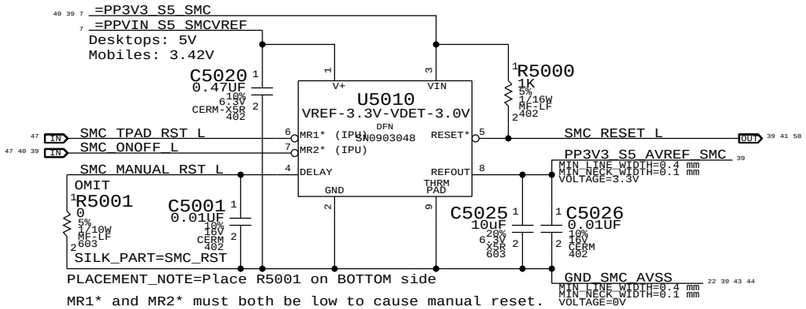
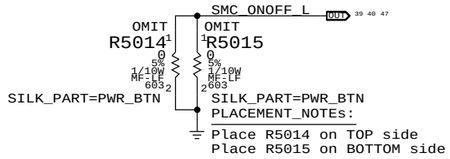
SMC Reset "Button", Supervisor & AVREF Supply



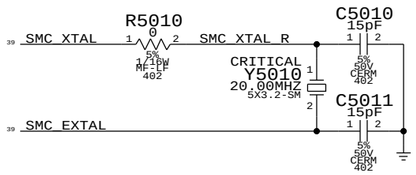
MR1* and MR2* must both be low to cause manual reset.
Used on mobiles to support SMC reset via keyboard.

NOTE: Internal pull-ups are to VIN, not V+.

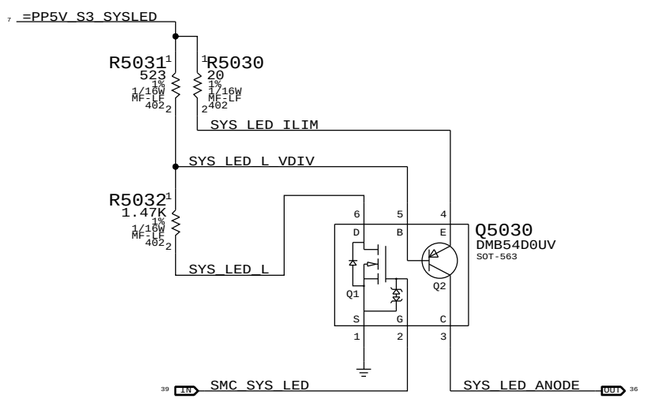
Debug Power "Buttons"



SMC Crystal Circuit



System (Sleep) LED Circuit



SMC Aliases

SMC_MCP_VSENSE (MAKE_BASE=TRUE)	=	SMC_ADC14
SMC_CPU_FSB_ISENSE (MAKE_BASE=TRUE)	=	SMC_ADC15
SMC_MCP_CORE_ISENSE (MAKE_BASE=TRUE)	=	SMC_NB_CORE_ISENSE
SMC_MCP_DDR_ISENSE (MAKE_BASE=TRUE)	=	SMC_NB_DDR_ISENSE
TP_SMC_GPU_1V8_ISENSE (MAKE_BASE=TRUE)	=	SMC_ANALOG_ID
TP_SMC_GPU_ISENSE (MAKE_BASE=TRUE)	=	SMC_GPU_ISENSE
TP_SMC_GPU_VSENSE (MAKE_BASE=TRUE)	=	SMC_GPU_VSENSE
SMC_GFX_THROTTLE_L	=	SMC_IG_THROTTLE_L (MAKE_BASE=TRUE)
SMS_INT_L (MAKE_BASE=TRUE)	=	=SMC_SMS_INT
MCP_WAKE_REQ_L	=	SMC_G3H_POWERON_L (MAKE_BASE=TRUE)

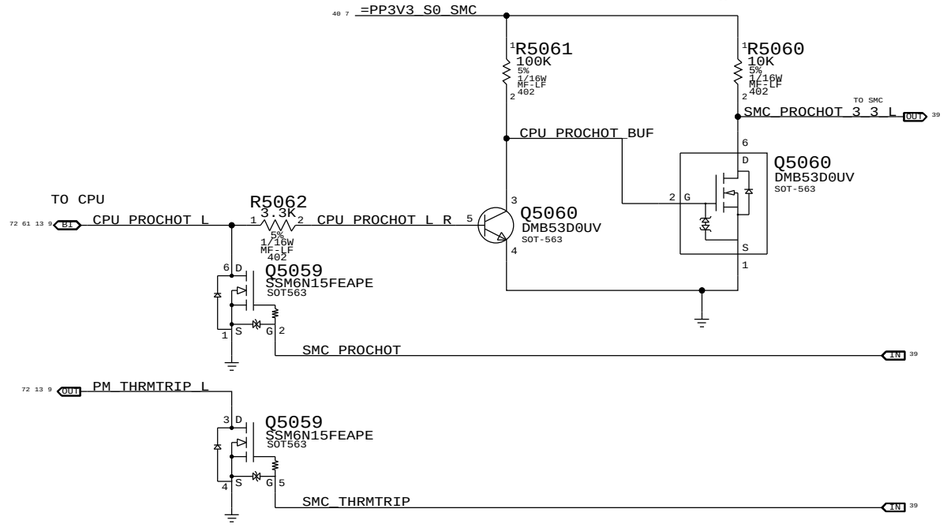
R5096 0 5% 1/16W MF-LF 402

SMC_MCP_SAFE_MODE — MCP_SPKR

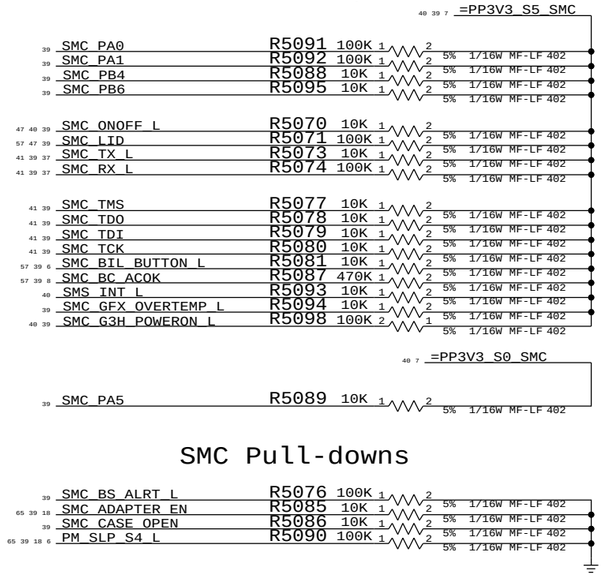
Unused Pins

SMC_FAN_1_CTL	=	TP_SMC_FAN_1_CTL (MAKE_BASE=TRUE)
TP_SMC_FAN_1_TACH (MAKE_BASE=TRUE)	=	SMC_FAN_1_TACH
SMC_FAN_2_CTL	=	NC_SMC_FAN_2_CTL (MAKE_BASE=TRUE, NO_TEST=TRUE)
NC_SMC_FAN_2_TACH (MAKE_BASE=TRUE, NO_TEST=TRUE)	=	SMC_FAN_2_TACH
SMC_FAN_3_CTL	=	NC_SMC_FAN_3_CTL (MAKE_BASE=TRUE, NO_TEST=TRUE)
NC_SMC_FAN_3_TACH (MAKE_BASE=TRUE, NO_TEST=TRUE)	=	SMC_FAN_3_TACH
SMC_RSTGATE_L	=	TP_SMC_RSTGATE_L (MAKE_BASE=TRUE)
SMC_P20	=	TP_SMC_P20 (MAKE_BASE=TRUE)
SMC_P24	=	TP_SMC_P24 (MAKE_BASE=TRUE)
SMC_P41	=	TP_SMC_P41 (MAKE_BASE=TRUE)
SMC_PB3	=	TP_SMC_PB3 (MAKE_BASE=TRUE)
SMC_PH3	=	TP_SMC_PH3 (MAKE_BASE=TRUE)

SMC FSB to 3.3V Level Shifting



SMC Pull-ups



SMC Pull-downs

SYNC_MASTER=T27_MLB SYNC_DATE=09/02/2009

PAGE TITLE: SMC Support

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D
REVISION: A.13.0
BRANCH:
PAGE: 50 OF 109
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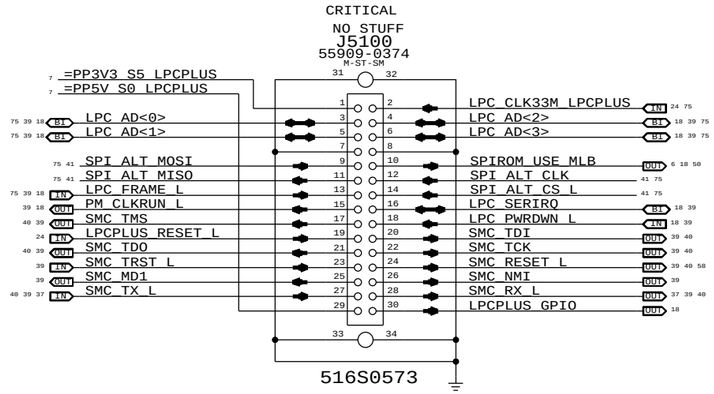
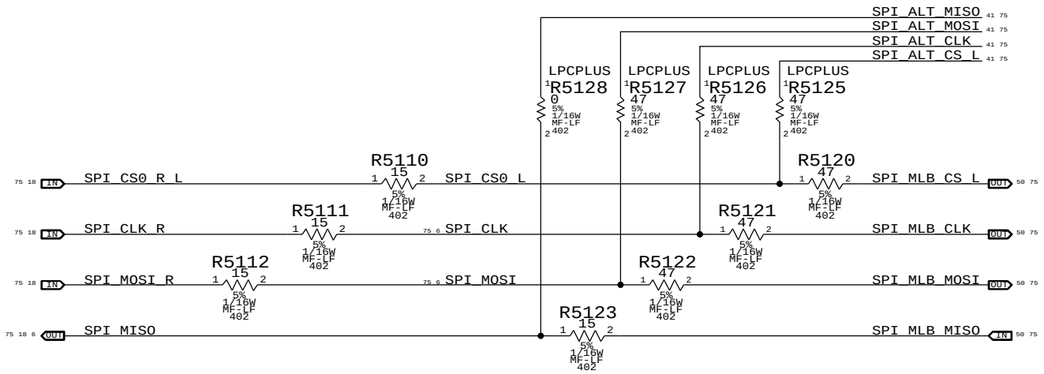
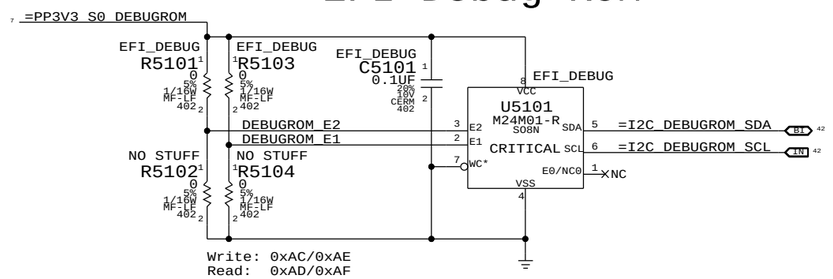
LPC+SPI Connector



SPI Bus Series Termination



EFI Debug ROM



SYNC_MASTER=T27_MLB SYNC_DATE=08/27/2009

PAGE TITLE: LPC+SPI Debug Connector

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D

REVISION: A.13.0

BRANCH:

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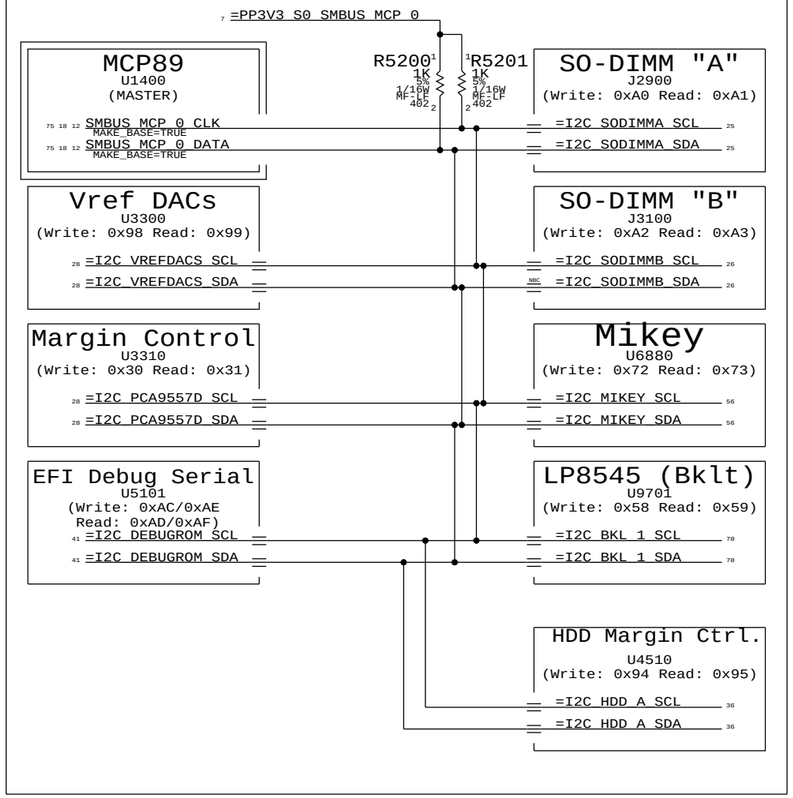
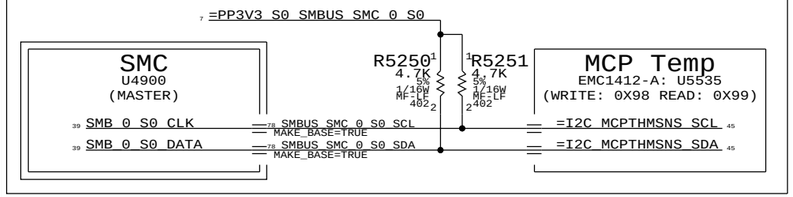
MCP89 SMBus "0" Connections

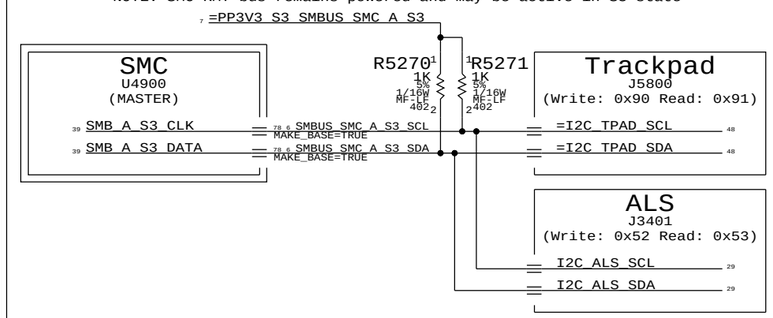


SMC "0" SMBus Connections

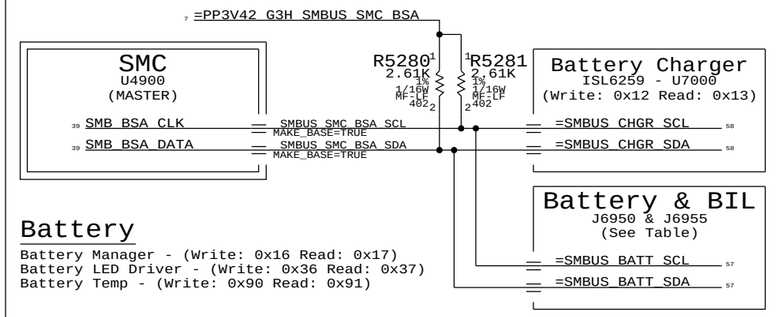


SMC "A" SMBus Connections

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



SMC "Battery A" SMBus Connections

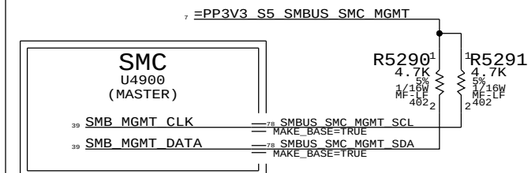


Battery

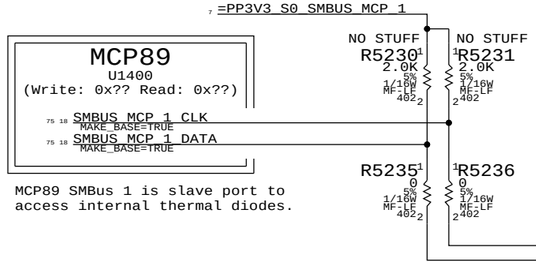
Battery Manager - (Write: 0x16 Read: 0x17)
Battery LED Driver - (Write: 0x36 Read: 0x37)
Battery Temp - (Write: 0x90 Read: 0x91)

SMC "Management" SMBus Connections

The bus formerly known as "Battery B"

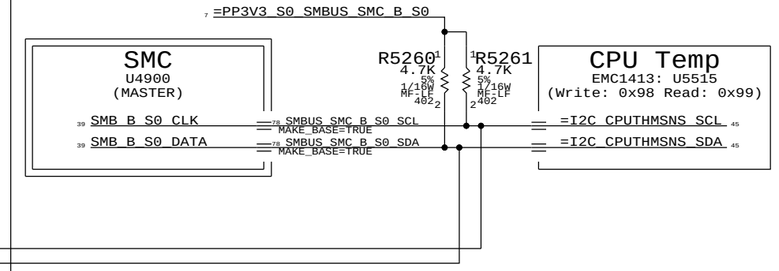


MCP89 SMBus "1" Connections



MCP89 SMBus 1 is slave port to access internal thermal diodes.

SMC "B" SMBus Connections



NOTE:

R5280/81 WAS 2K ON K24, VALUE NEEDS TO BE CHECKED
R5290/91 (VREF DAC, MARGIN CONTROL)WAS 4.7K ON K24, VALUE NEEDS TO BE CHECKED

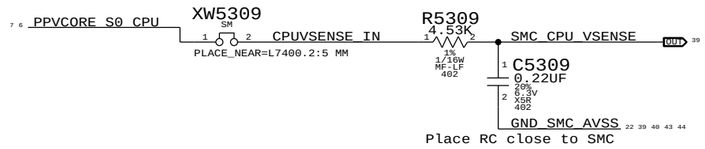
SYNC_MASTER=T27_MLB SYNC_DATE=08/21/2009

PAGE TITLE: K6 SMBUS CONNECTIONS

Apple Inc.

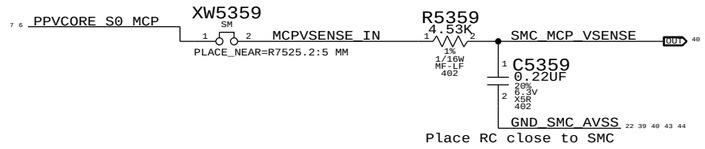
DRAWING NUMBER: 051-8563 SIZE: D
REVISION: A.13.0
BRANCH:
PAGE: 52 OF 109
SHEET: 42 OF 80

CPU Voltage Sense / Filter



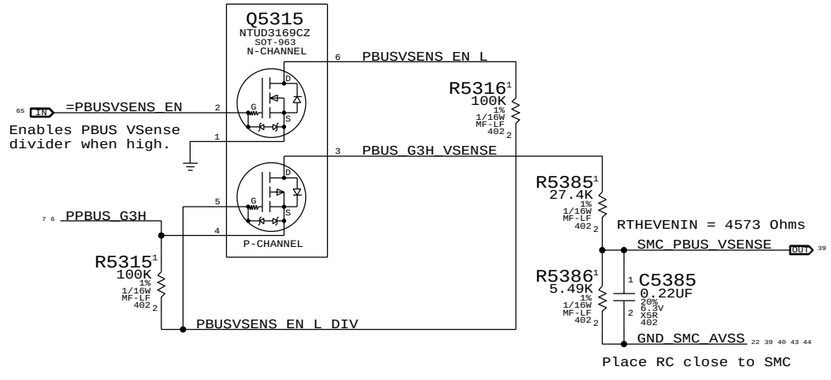
Place RC close to SMC

MCP Voltage Sense / Filter



Place RC close to SMC

PBUS Voltage Sense Enable & Filter



Place RC close to SMC

SYNC_MASTER=T27_MLB SYNC_DATE=08/27/2009

PAGE TITLE: Voltage Sensing

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D

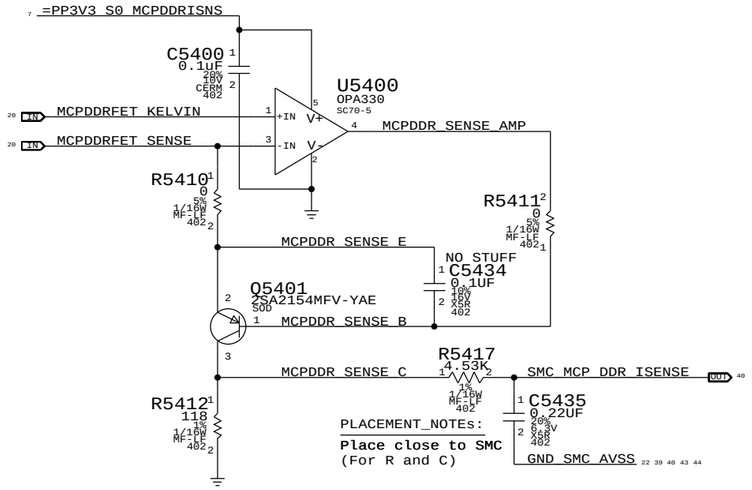
REVISION: A.13.0

BRANCH:

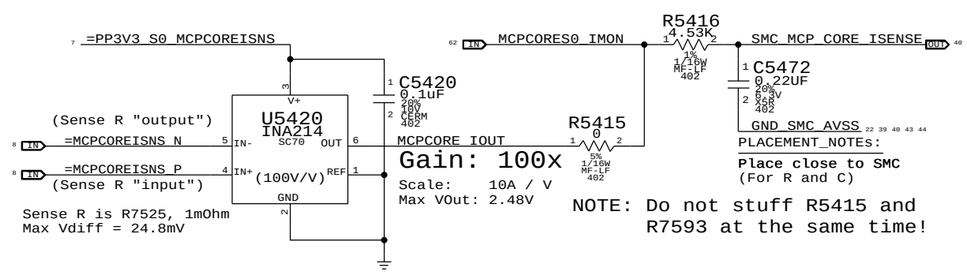
PAGE: 53 OF 109

SHEET: 43 OF 80

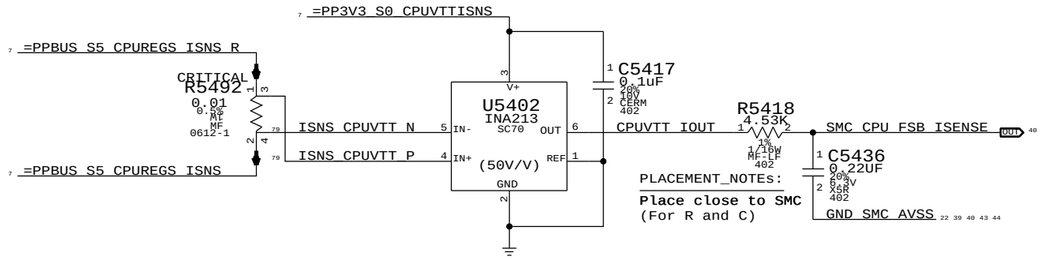
MCP MEM VDD Current Sense / Filter



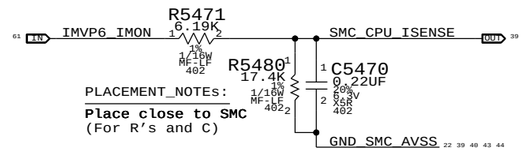
MCP VCore Current Sense Filter



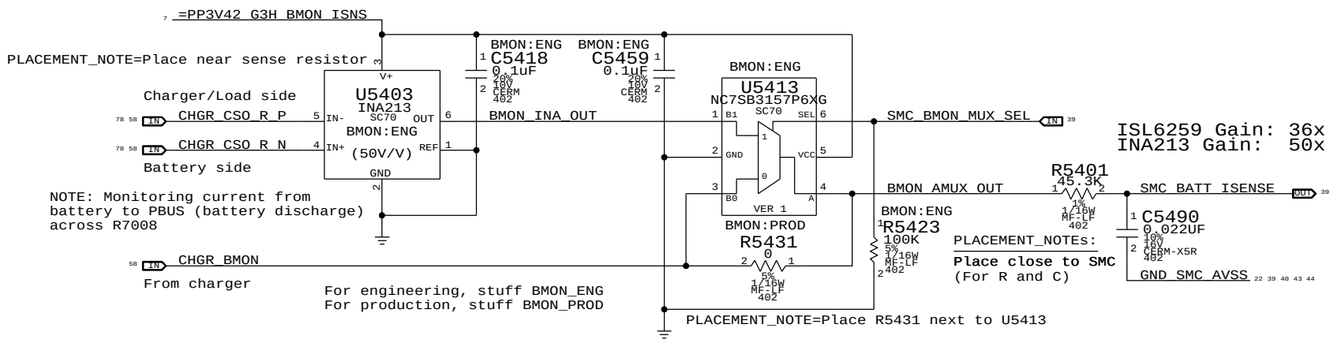
MCP/CPU 1.05V AND CPU VCore High-Side Current Sense / Filter



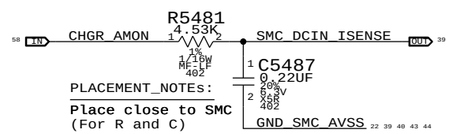
CPU VCore Load Side Current Sense / Filter



Battery (BMON) Current Sense, MUX & Filter



DC-IN (AMON) Current Sense Filter



SYNC_MASTER=T27_MLB SYNC_DATE=09/30/2009

PAGE TITLE: Current Sensing

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D

REVISION: A.13.0

BRANCH:

PAGE: 54 OF 109

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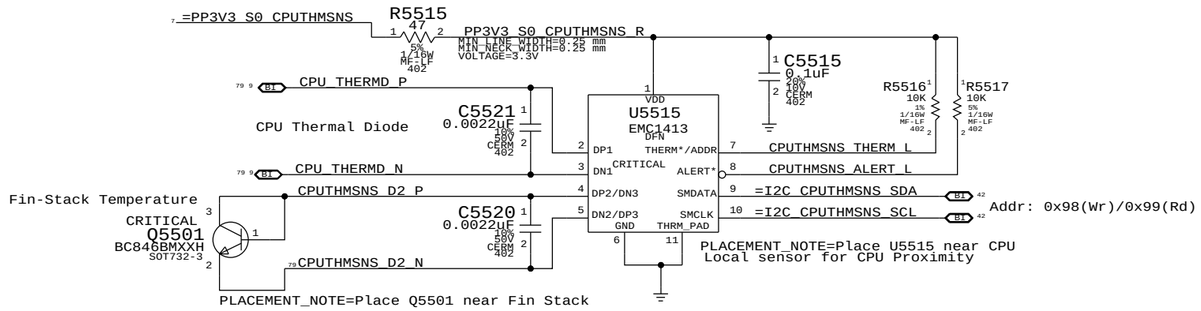
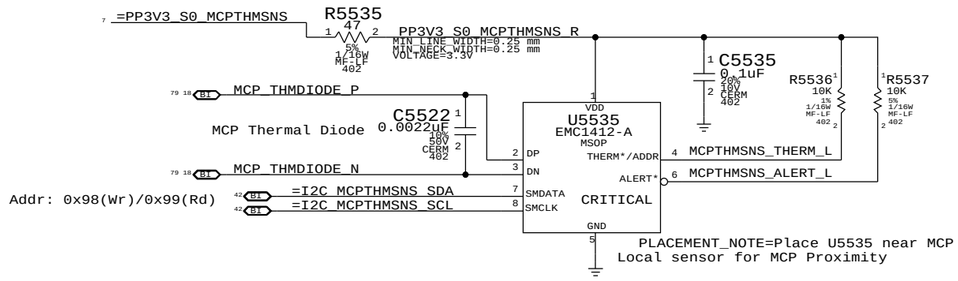
CPU T-Diode Thermal Sensor



MCP T-Diode Thermal Sensor



SYNC_MASTER=T27_MLB SYNC_DATE=08/27/2009

PAGE TITLE: Thermal Sensors

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D

REVISION: A.13.0

BRANCH:

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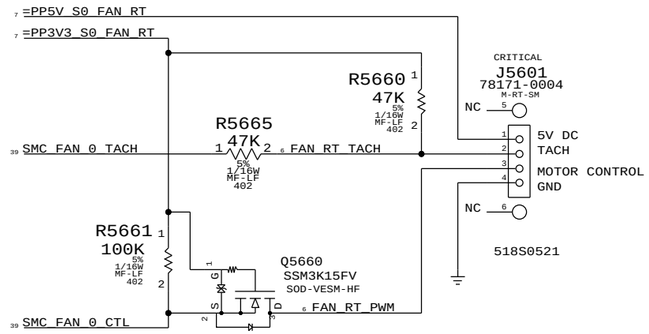
SHEET: 45 OF 80



SYNC_MASTER=K24_MLB SYNC_DATE=07/20/2009

PAGE TITLE

Fan

Apple Inc.

DRAWING NUMBER 051-8563 SIZE D

REVISION A.13.0

BRANCH

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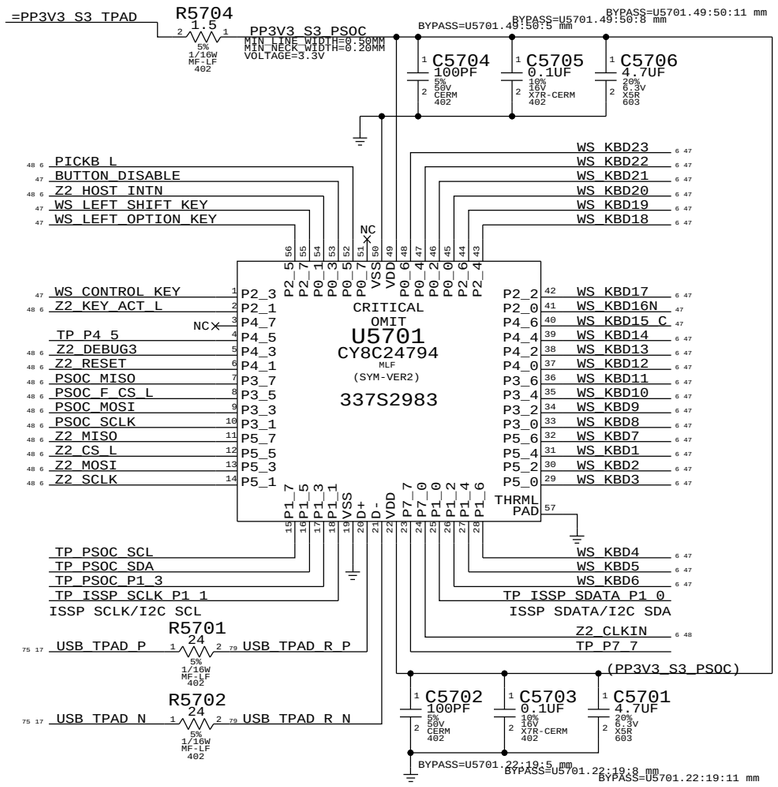
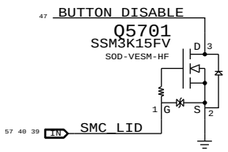
SHEET 46 OF 80

PSOC USB CONTROLLER

- USB INTERFACES TO MLB
- SPI HOST TO Z2
- TRACKPAD PICK BUTTONS
- KEYBOARD SCANNER



TPAD Buttons Disable

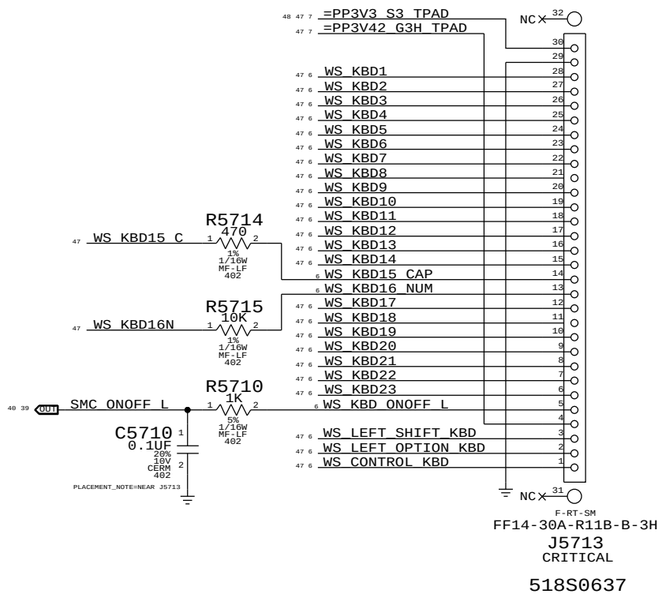


PLACE THESE COMPONENTS CLOSE TO J5800
THIS ASSUMES THERE'S A PP3V42_G3H PULL UP ON MLB

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

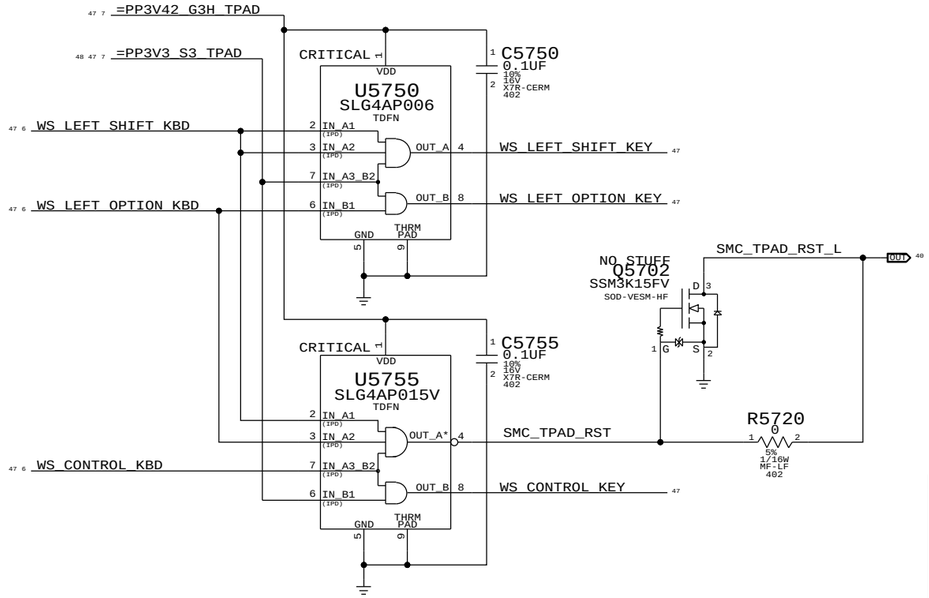
IC	PIN NAME	CURRENT	R_SNS	V_SNS	POWER
TMP102	V+	10UA	2.55 KOHM	0.0255 V	0.255E-6 W
		80UA		0.204 V	16.32E-6 W
3V3 LDO	VDD	60MA (MAX)	10 OHM	0.6 V	36E-3 W
	VOUT	60MA (MAX)	0.2 OHM	0.012 V	0.72E-3 W
PSOC	VDD	8MA (TYP)	1.5 OHM	0.012 V	96E-6 W
		14MA (MAX)		0.021 V	294E-6 W
18V BOOSTER	VIN	4MA (MAX)	4.7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

Keyboard Connector



SMC Manual Reset & Isolation

Left shift, option & control keys combined with power button cause SMC RESET# assertion.
Keys ANDed with PSOC power to isolate when PSOC is not powered.



SYNC_MASTER=T27_MLB SYNC_DATE=08/15/2009

PAGE TITLE: WELLSPRING 1

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D
REVISION: A.13.0
BRANCH:
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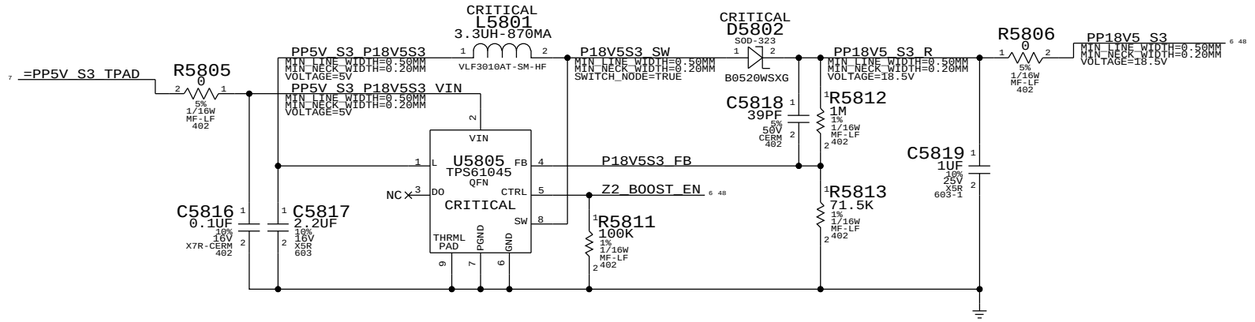
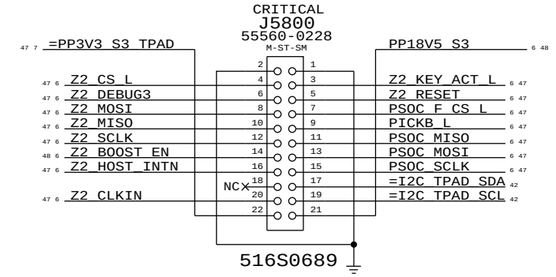
BOOSTER +18.5VDC FOR SENSORS

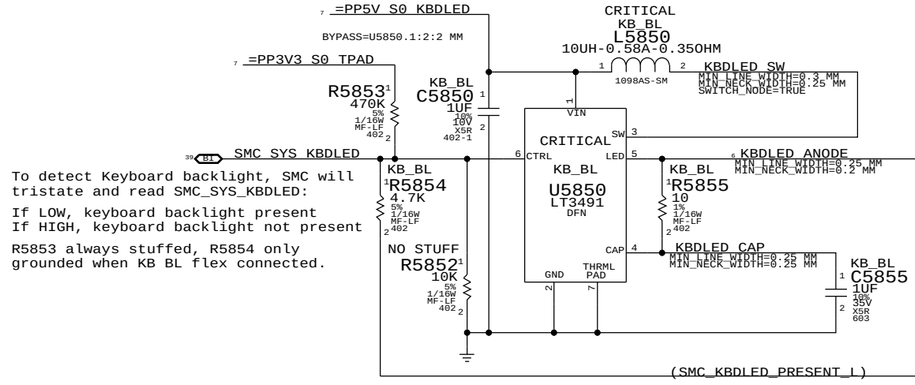
BOOSTER DESIGN CONSIDERATION:
- POWER CONSUMPTION
- DROOP LINE REGULATION
- RIPPLE TO MEET ERS
- 100-300 KHZ CLEAN SPECTRUM
- STARTUP TIME LESS THAN 2MS
- R5812,R5813,C5818 MODIFIED



IPD Flex Connector



Keyboard Backlight Driver & Detection

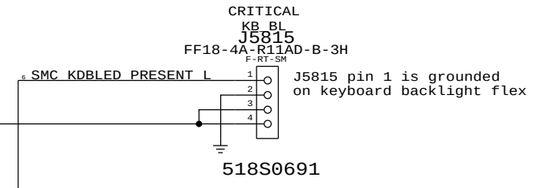


To detect Keyboard backlight, SMC will tristate and read SMC_SYS_KBDLED:

If LOW, keyboard backlight present
If HIGH, keyboard backlight not present

R5853 always stuffed, R5854 only grounded when KB BL flex connected.

Keyboard Backlight Connector



K6 NOTES : C5850 HAS BYPASS PROPERTY, SHOULD BE ADDED INCASE THIS PAGE IS SYNC'ED FROM T27

SYNC_MASTER=T27_MLB SYNC_DATE=08/03/2009

PAGE TITLE: WELLSPRING 2

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D
REVISION: A.13.0
BRANCH:
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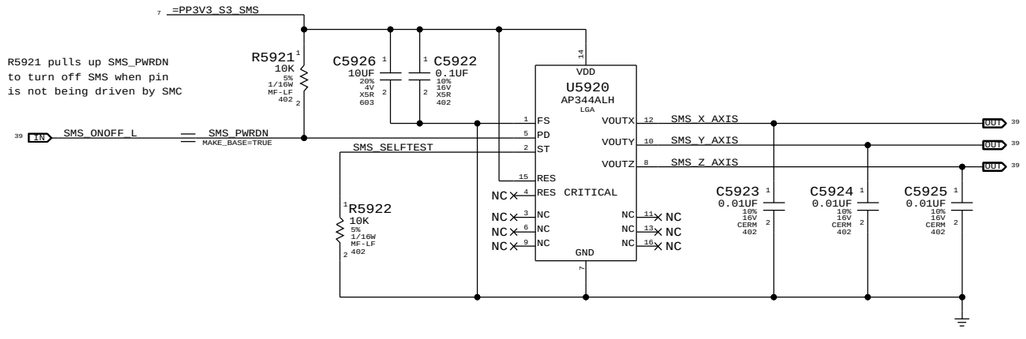
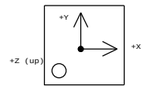
Analog SMS



Desired orientation when placed on board top-side:



Front of system

Circle indicates pin 1 location when placed in correct orientation

SYNC_MASTER=T27_MLB SYNC_DATE=07/20/2009

PAGE TITLE

Sudden Motion Sensor (SMS)

Apple Inc.

DRAWING NUMBER 051-8563 SIZE D

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BRANCH

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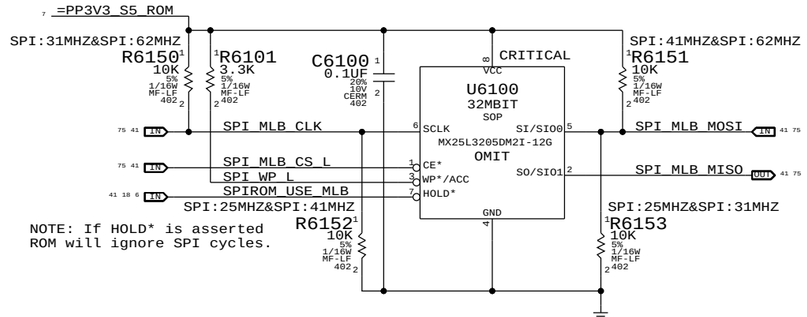

MCP89 SPI Frequency Select

Frequency	SPI_MOSI	SPI_CLK
25.0 MHz	0	0
31.2 MHz	0	1
41.7 MHz	1	0
62.5 MHz	1	1

NOTE: 42 & 62 MHz use FAST_READ command.

SYNC_MASTER=T27_MLB SYNC_DATE=10/21/2009

PAGE TITLE
SPI ROM

Apple Inc.

DRAWING NUMBER 051-8563 SIZE D
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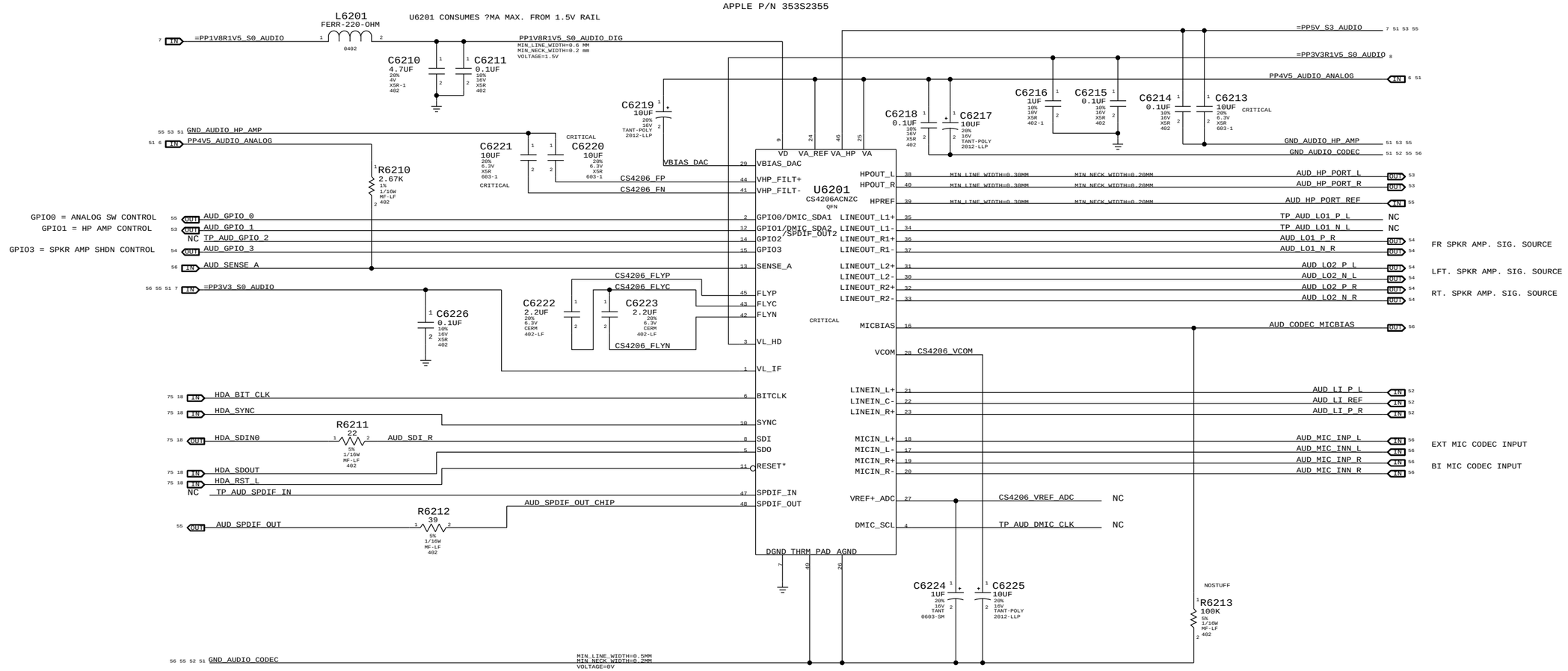
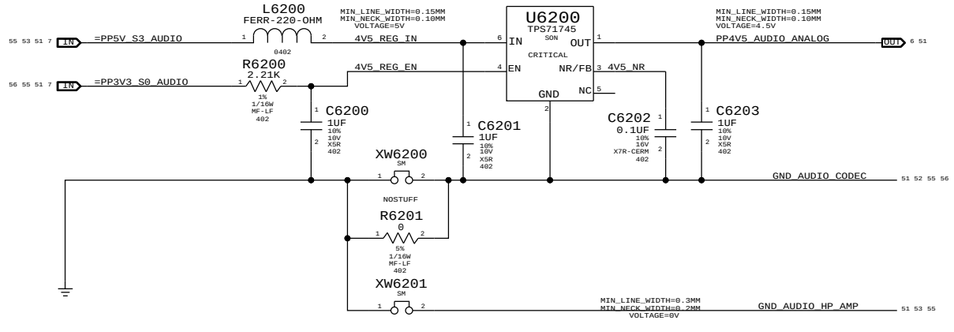
AUDIO CODEC

APPLE P/N 353S2355



4.5V POWER SUPPLY FOR CODEC

APPLE P/N 353S2456



NOTES ON CODEC I/O

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

SYNC_MASTER=AUDIO
SYNC_DATE=08/31/2009

PAGE TITLE

AUDIO: CODEC/REGULATOR

Apple Inc.

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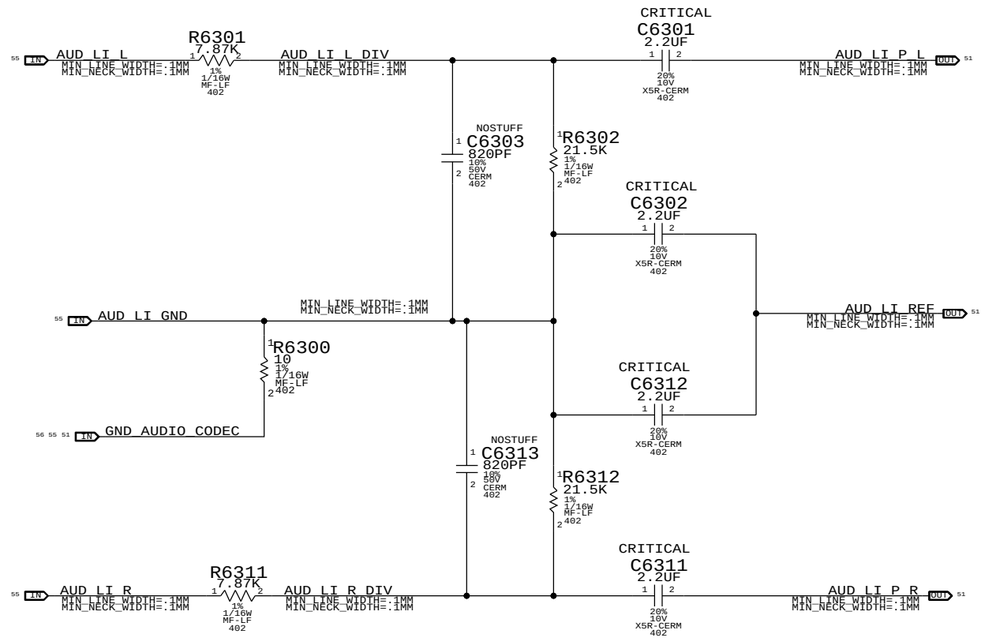
LINE INPUT VOLTAGE DIVIDER

CODEC RIN = 20K OHMS
NET RIN = 10.36K OHMS (INCLUDING PULL-DOWNS AT ANALOG SWITCH COM PINS)
FC_HP = 3.6 HZ
FC_LP = 43KHZ
VIN = 2VRMS, CODEC VIN = 1.14 VRMS



PAGE TITLE
AUDIO: LINE INPUT FILTER

Apple Inc.

DRAWING NUMBER 051-8563 | SIZE D
REVISION A.13.0
BRANCH
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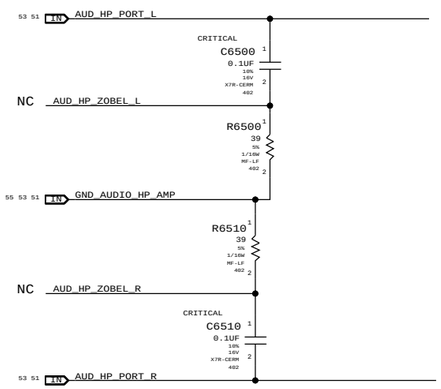
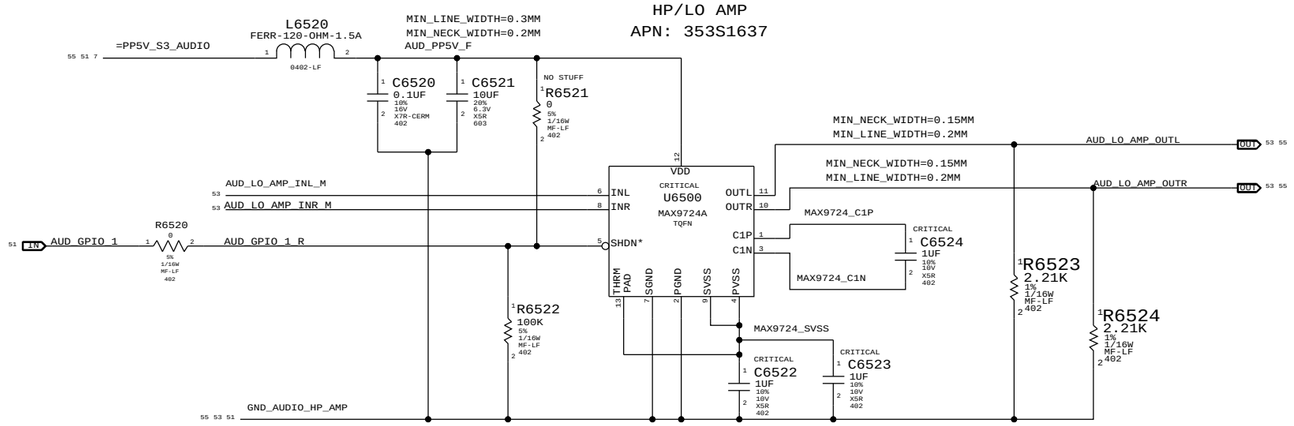
SHEET 52 OF 80

ZOBEL NETWORK & 1ST ORDER DAC FILTER PLACEHOLDER



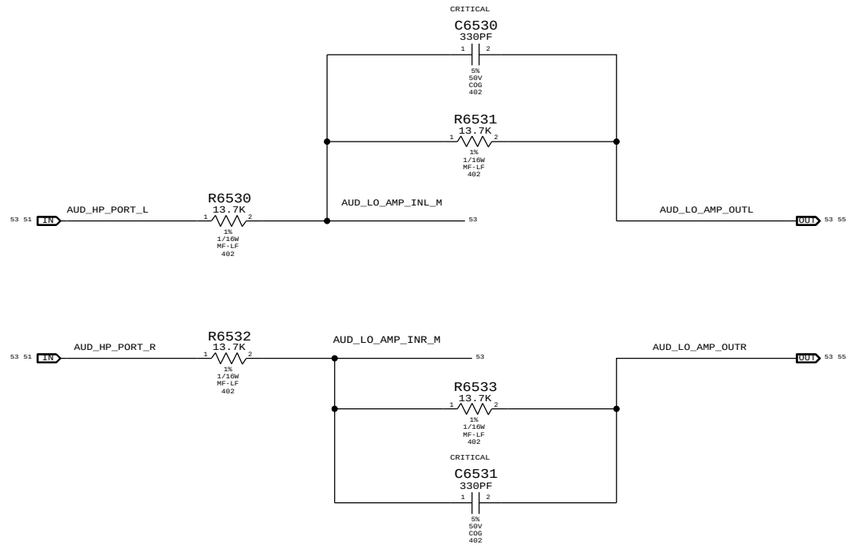
FOR PROTO2, STUFF R6521 AND NO STUFF R6520 AND R6522 UNTIL
RE-TASKABLE IO SW SUPPORT AVAILABLE (FORCES IO INTO OUTPUT MODE).

HP/LO AMP
APN: 353S1637



MAX9724 GAIN/FILTER COMPONENTS

AV_PB = -1V/V, FC_LPF = 35.2KHZ



SYNC_MASTER=AUDIO SYNC_DATE=07/17/2009

PAGE TITLE

AUDIO: HEADPHONE FILTER

Apple Inc.

DRAWING NUMBER 051-8563 SIZE D

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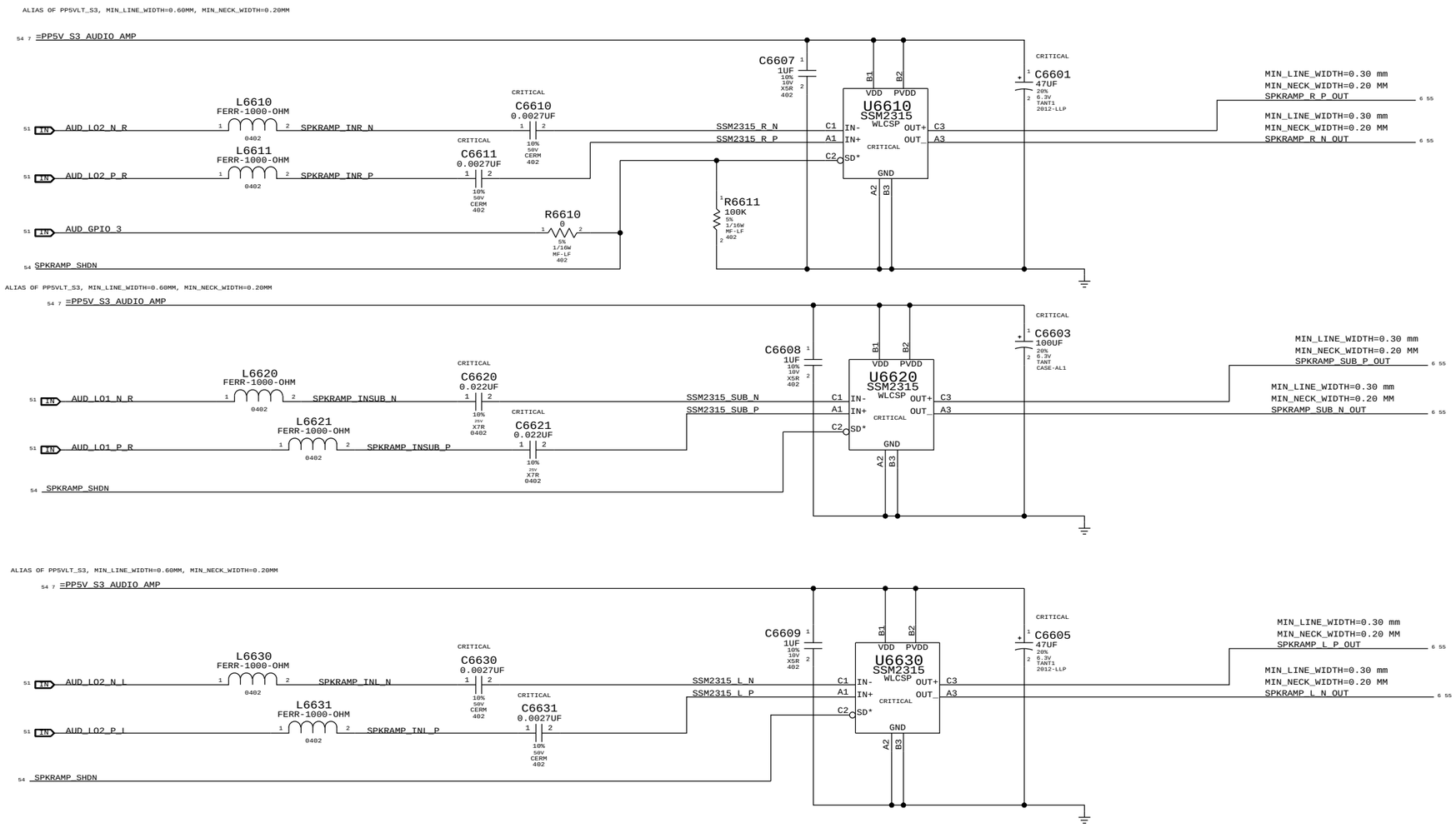
SATELLITE & SUB TWEETER AMPLIFIER

APN:353S2524

SATELLITE	169 HZ < FC < 282 HZ
SUB	80 HZ < FC < 132 HZ
GAIN	6DB



SYNC_MASTER=AUDIO SYNC_DATE=07/17/2008

PAGE TITLE

AUDIO: SPEAKER AMP

Apple Inc.

DRAWING NUMBER 051-8563 SIZE D

REVISION A.13.0

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AUDIO JACK: LI/LO/HP CONNECTOR, SPDIF TX

AUD_SPDIF_OUT OUT 51

56 51 7 =PP3V3_S0_AUDIO

L6701
FERR-1000-OHM
0402
HS_MIC_HI OUT 56

L6702
FERR-1000-OHM
0402
HS_MIC_LO OUT 56

APN:514-0671
J6700
SPDIF-TXRX-K24
F-RT-TH
CRITICAL

MIC 6
DETECT 5
SWITCH 2
LEFT 1
RIGHT 3
GND 4
AUDIO

AUD_CONNJ1_MIC
MIN_LINE_WIDTH=0.4MM
MIN_NECK_WIDTH=0.2MM
AUD_CONNJ1_SLEEVE
AUD_CONNJ1_SLEEVEDET
AUD_CONNJ1_TIPDET
AUD_CONNJ1_TIP
AUD_CONNJ1_RING

CRITICAL
L6703
FERR-120-OHM-1.5A
0402-LF
MIN_LINE_WIDTH=0.4MM
MIN_NECK_WIDTH=0.2MM
AUD_CONN_GND

XW6702 SM
1 2 AUD_HP_PORT_REF OUT 51
XW6700 SM
1 2 GND_AUDIO_HP_AMP 51 53
XW6701 SM
1 2 AUD_LI_GND 52
(AUD_CONN_GND) 55

CRITICAL
L6704
FERR-220-OHM
0402
AUD_CONN_L BI 55

CRITICAL
L6705
FERR-220-OHM
0402
AUD_CONN_R BI 55

A - VIN 7
B - VCC 8
C - GND 9
OPERATING VOLTAGE 3.3
POF

SHELL
SHIELD PINS
10 11 12 13

C6700
1UF
10%
6.3V
CERM
402

R6700
10K
5%
1/16W
MF-LF
402
AUD_J1_SLEEVEDET_R OUT 56

R6701
4.7
5%
1/16W
MF-LF
402
AUD_J1_TIPDET_R OUT 56

CRITICAL
DZ6705
6.8V-100PF
402

CRITICAL
DZ6703
6.8V-100PF
402

CRITICAL
DZ6701
6.8V-100PF
402

CRITICAL
DZ6704
6.8V-100PF
402

CRITICAL
DZ6700
6.8V-100PF
402

C6701
100PF
5%
50V
CERM
402

GND_CHASSIS_AUDIO_JACK
VOLTAGE=0V
MIN_LINE_WIDTH=0.3MM
MIN_NECK_WIDTH=0.1MM

CHASSIS GND STITCHES
XW6710 SM
XW6711 SM
R6760
0
5%
1/16W
MF-LF
402

MIC CONNECTOR

APN:518S0520

CRITICAL
J6701
78171-0003
M-RT-SM

56 6 BI_MIC_LO
56 6 BI_MIC_SHIELD
56 6 BI_MIC_HI

SPEAKER CONNECTOR

APN:518S0519

CRITICAL
J6702
78171-0002
M-RT-SM

54 6 IN SPKRAMP_L_P_OUT
54 6 IN SPKRAMP_L_N_OUT

54 6 IN SPKRAMP_SUB_P_OUT
NO STUFF
C6760
33PF
5%
50V
CERM
402

CRITICAL
J6703
78171-0004
M-RT-SM

NO STUFF
C6761
33PF
5%
50V
CERM
402

54 6 IN SPKRAMP_SUB_N_OUT
54 6 IN SPKRAMP_R_P_OUT

NO STUFF
C6762
33PF
5%
50V
CERM
402

NO STUFF
C6763
33PF
5%
50V
CERM
402

54 6 IN SPKRAMP_R_N_OUT

APN:518S0521

C6760 - C6763 ARE FOR FILTERING POTENTIAL FSB NOISE COUPLED ON SPKR LINES

53 51 7 =PP5V_S3_AUDIO

R6716
0
5%
1/16W
MF-LF
402
53 OUT AUD_LO_AMP_OUTL
AUD_LO_AMP_OUTL_SWITCH

R6717
0
5%
1/16W
MF-LF
402
53 OUT AUD_LO_AMP_OUTR
AUD_LO_AMP_OUTR_SWITCH

R6718
0
5%
1/16W
MF-LF
402
52 IN AUD_LI_L
AUD_LI_L_SWITCH

R6719
0
5%
1/16W
MF-LF
402
52 IN AUD_LI_R
AUD_LI_R_SWITCH

AUD_GPIO_0 51 IN

C6710
10UF
10%
10V
X5R
402

APN: 353S2803

U6700
MAX14560EWC+
WLP
CRITICAL

A3 VCC
C4 NC1
C1 NC2
A4 NO1
A1 NO2
C2 CB
A2 NEG
B4 COM1
B1 COM2
B2 EN*
B3 GND
C3

SWITCH_CP

C6711
0.0033UF
10%
50V
CERM
402

MIN_LINE_WIDTH=0.2MM
MIN_NECK_WIDTH=0.15MM
AUD_CONN_L BI 55

R6712
24K
5%
1/16W
MF-LF
402

MIN_LINE_WIDTH=0.2MM
MIN_NECK_WIDTH=0.15MM
AUD_CONN_R BI 55

R6713
24K
5%
1/16W
MF-LF
402

R6721
100K
5%
1/16W
MF-LF
402

R6715
0
5%
1/16W
MF-LF
402
55 AUD_CONN_GND
AUD_SWITCH_GND
MIN_LINE_WIDTH=0.4MM
MIN_NECK_WIDTH=0.2MM
VOLTAGE=0V

GND STUFFING OPTIONS FOR CMOS SWITCH

R6714
0
5%
1/16W
MF-LF
402
56 52 51 GND_AUDIO_CODEC

NOSTUFF
R6727
0
5%
1/16W
MF-LF
402

ANALOG AUDIO IO SWITCH

GPIO0 = 0 AND GPIO1 = 1 --> HP PATH SELECTED
GPIO0 = 1 AND GPIO1 = 0 --> LI PATH SELECTED

SYNC_MASTER=AUDIO SYNC_DATE=08/25/2009

PAGE TITLE
AUDIO: JACK

Apple Inc.

DRAWING NUMBER 051-8563
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CODEC OUTPUT SIGNAL PATHS

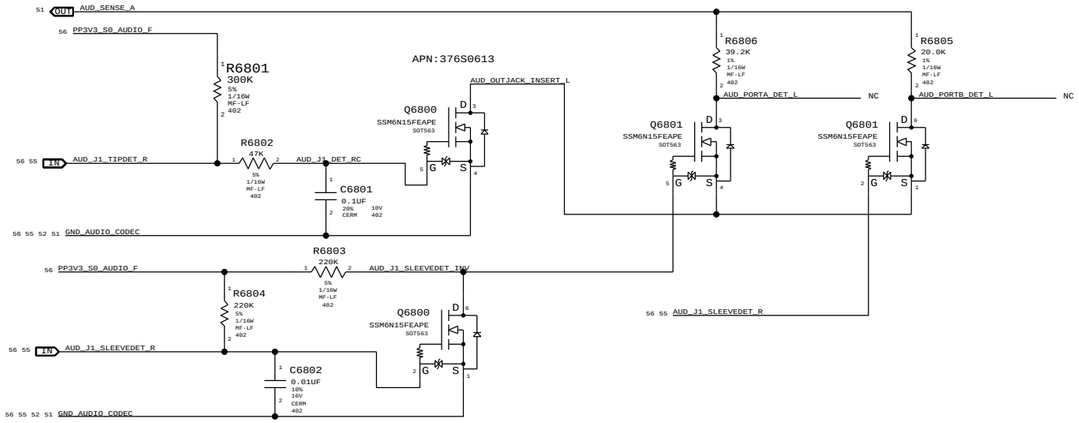
FUNCTION	VOLUME	CONVERTER	PIN COMPLEX	MUTE CONTROL	DET ASSIGNMENT
HP/LINE OUT	0X02 (2)	0X02 (2)	0X09 (9,A)	GPIO_0 AND GPIO_1	0X09 (A)
LINE IN	0X05 (5)	0X05 (5)	0X0C (12)	GPIO_0 AND GPIO_1	0X09 (A)AND UI ELEMENT
SATELLITES	0X04 (4)	0X04 (4)	0X0B (11)	GPIO_3	N/A
SUB	0X03 (3)	0X03 (03)	0X0A (10)	GPIO_3	N/A
SPDIF OUT	N/A	0X08 (8)	0X10 (16)	N/A	0X0D (B)

CODEC INPUT SIGNAL PATHS

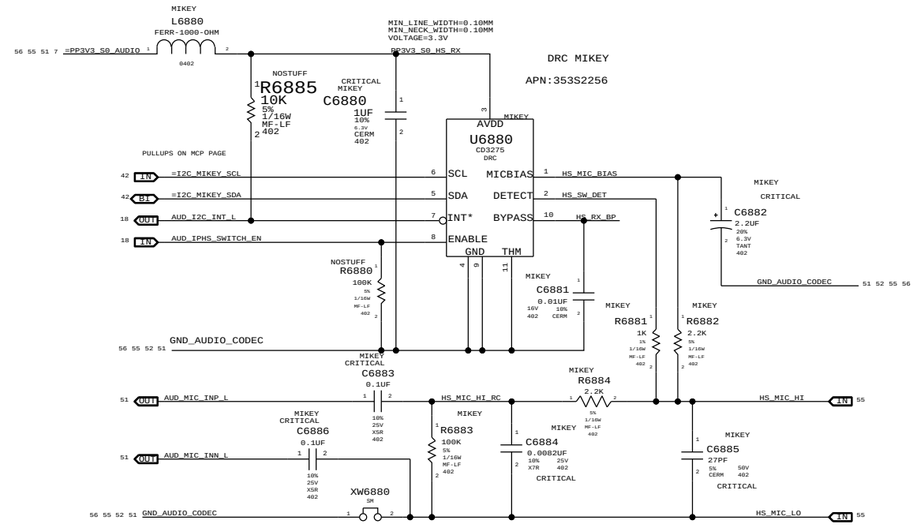
FUNCTION	CONVERTER	PIN COMPLEX	VREF	DET ASSIGNMENT
BUILT-IN MIC	0X06 (6)	0X0D (13,B,RIGHT)	MIC_BIAS (80%)	N/A
HEADSET MIC	0X06 (6)	0X0D (13,V22,B,LEFT)	MIKEY	MIKEY

PORT A DETECT (HEADPHONES)

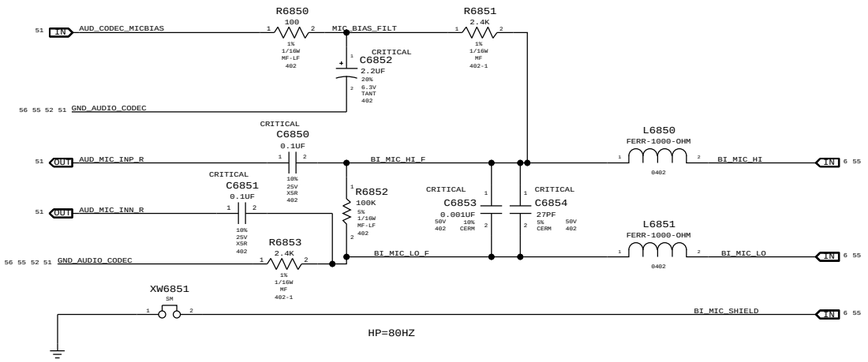
PORT B DETECT(SPDIF DELEGATE)



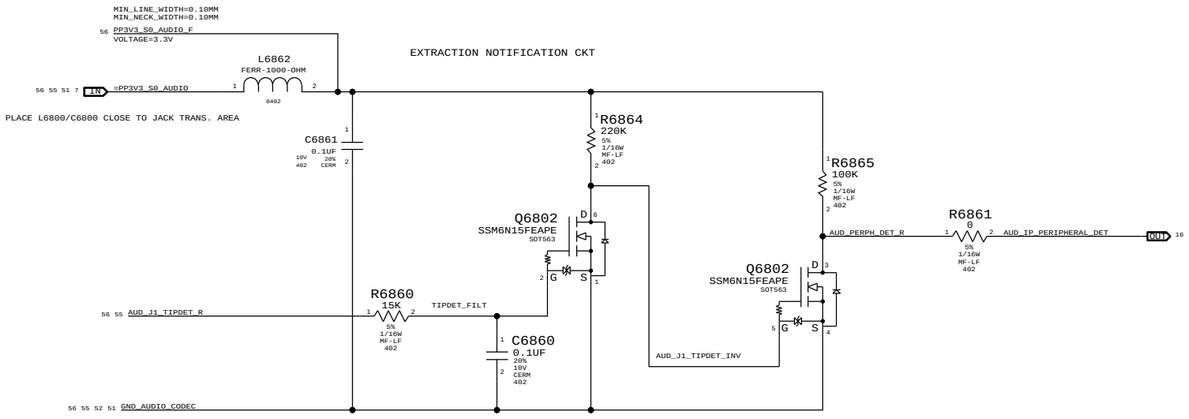
PORT B LEFT(HEADSET MIC)
HP=80HZ, LP=8.82KHZ



PORT B RIGHT(BUILT-IN MIC)

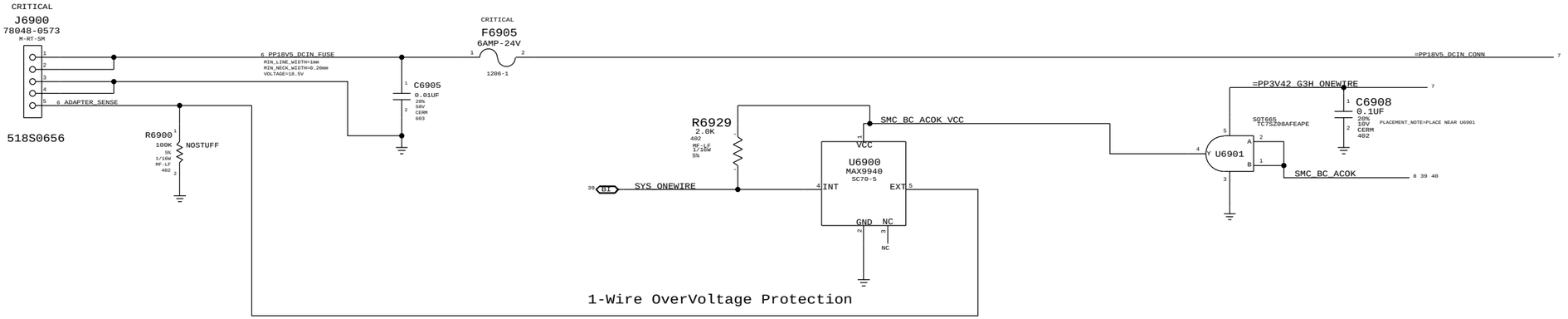


EXTRACTION NOTIFICATION CKT



SYNC_MASTER=AUDIO	SYNC_DATE=08/27/2009
PAGE TITLE: AUDIO: JACK TRANSLATORS	
Apple Inc.	DRAWING NUMBER 051-8563 SIZE D
	REVISION A.13.0
	BRANCH
	PAGE 68 OF 109
	SHEET 56 OF 80

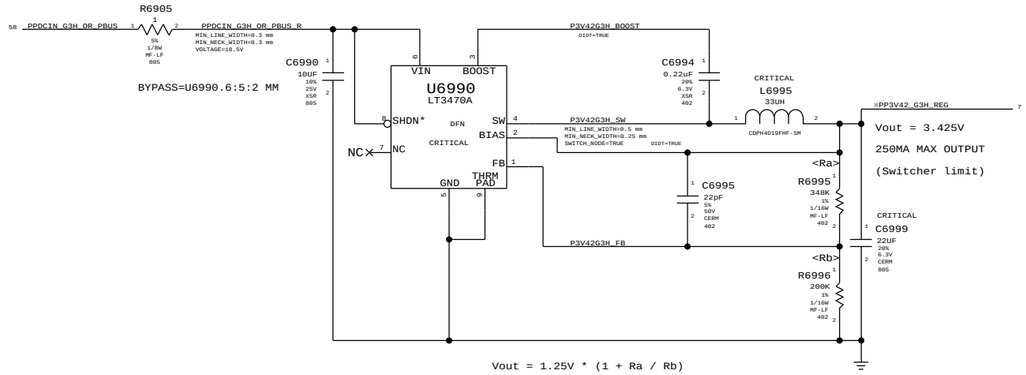
MagSafe DC Power Jack



1-Wire OverVoltage Protection

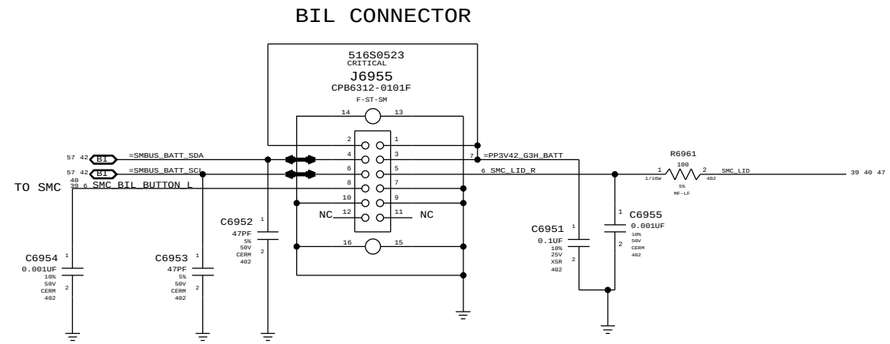
3.425V "G3Hot" Supply

Supply needs to guarantee 3.31V delivered to SMC VRef generator

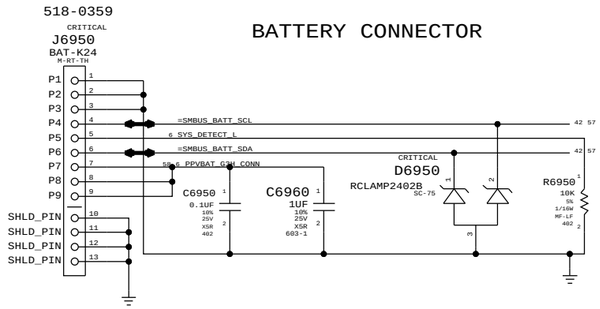


Vout = 1.25V * (1 + Ra / Rb)

BIL CONNECTOR



BATTERY CONNECTOR



SYNC_MASTER=K24_MLB	SYNC_DATE=07/20/2009
PAGE TITLE	DC-In & Battery Connectors
Apple Inc.	DRAWING NUMBER 051-8563 · SIZE D
	REVISION A.13.0
	BRANCH
	PAGE 69 OF 109
	SHEET 57 OF 80

Reverse-Current Protection

This node is powered through body diodes:
* DCIN through Q7080.
* PBUS through Q7085, Charger TOP FETs and Q7055.

Inrush Limiter

FROM ADAPTER

=PPDCIN_S5_CHGR

Q7080 SI7149DP SO-8 CRITICAL

PPDCIN_G3H_OR_PBUS
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.4 mm
VOLTAGE=18.5V

Q7085 SI7149DP SO-8 CRITICAL

PPDCIN_G3H_INRUSH
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.4 mm
VOLTAGE=18.5V

R7080 100K 5% 1/16W MF-LF 402

C7085 0.1UF 10% 25V X5R 402

R7085 470K 1% 1/16W MF-LF 402

CHGR_SGATE_DIV
MIN_LINE_WIDTH=0.3 mm
MIN_NECK_WIDTH=0.3 mm

CHGR_AGATE_DIV
MIN_LINE_WIDTH=0.3 mm
MIN_NECK_WIDTH=0.3 mm

R7081 62K 5% 1/16W MF-LF 402

R7086 332K 1% 1/16W MF-LF 402

CRITICAL
D7005 BAT30CWFILM SOT-323

(CHGR_SGATE)
MIN_LINE_WIDTH=0.3 mm
MIN_NECK_WIDTH=0.3 mm

(CHGR_AGATE)
MIN_NECK_WIDTH=0.3 mm

R7005 20 5% 1/16W MF-LF 402

CHGR_DCIN_D_R

(CHGR_DCIN)

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

Divider sets ACIN threshold at 13.55V

Input impedance of ~40K meets sparkitecture requirements

30mA max load

PP5V1_CHGR_VDD
MIN_LINE_WIDTH=0.2 mm
MIN_NECK_WIDTH=0.1 mm
VOLTAGE=5.1V

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

PP5V1_CHGR_VDDP
MIN_LINE_WIDTH=0.2 mm
MIN_NECK_WIDTH=0.2 mm
VOLTAGE=5.1V

C7001 1UF 10% 10V X5R 402

=PP3V42_G3H_CHGR

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

C7002 1UF 10% 10V X5R 402

GND_CHGR_AGND

NO STUFF R7002 100K 5% 1/16W MF-LF 402

R7000 0 5% 1/16W MF-LF 402

R7012 1K 1% 1/16W MF-LF 402

SMC_RESET_L

CHGR_RST_L

Float CELL for 1S

NO STUFF R7013 1K 1% 1/16W MF-LF 402

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

R7015 226K 5% 1/16W MF-LF 402

C7050 1UF 10% 16V X5R 402

C7015 470PF 10% 50V CERM 402

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

C7016 470PF 10% 50V CERM 402

C7042 0.033UF 10% 16V X5R 402

C7011 0.01UF 10% 16V CERM 402

C7000 1UF 10% 10V X5R 402-1

C7005 0.22UF 20% 25V X5R 603

C7026 0.001UF 10% 50V CERM 402

U7000 ISL6259 TQFN

12	VHST	DCIN	2
13	SMB_RST_N	SGATE	26
11	SCL	AGATE	1
10	SDA	CSIP	28
4	VFRQ	CSIN	27
6	CELL	BOOT	25
3	ACIN	UGATE	24
5	ICOMP	PHASE	23
7	VCOMP	LGATE	21
8	VNEG	BGATE	16
18	CSOP	AMON	9
17	CSON	BMON	15
		(OD) ACOK	14

3% TOLERANCE

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

(AGND) THRM_PAD 29

PGND 22

353S2929

XW7000 SM

PLACE_NEAR=U7000.29:1mm
PLACE_NEAR=U7000.22:1mm

(GND)

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

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

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

CHGR_CSI_R_P

CHGR_CSI_R_N

C7020 0.047UF 10% 10V CERM 402

C7022 0.1UF 10% 25V X5R 402

C7021 0.1UF 10% 25V X5R 402

CRITICAL
R7020 0.020 0.5% 1W MF-LF 0612

PPDCIN_G3H_CHGR
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.4 mm
VOLTAGE=18.5V

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

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

C7035 1UF 10% 25V X5R 603-1

C7036 1UF 10% 25V X5R 603-1

C7037 0.001UF 10% 50V X7R 402

Max Current = 8A

f = 400 kHz

C7025 0.22UF 10% 10V CERM 402

CRITICAL
Q7030 RJK0332DPB-01 LFPAK-SM

CRITICAL
L7030 4.7UH-9.5A IHLP4040DZ-SM

MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.2 mm
SWITCH_NODE=TRUE
DIDT=TRUE

CRITICAL
F7040 8AMP-24V 1206

TO SYSTEM

=PPBUS_G3H

NO STUFF R7039 180 5% 1/10W MF-LF 603

CHGR_PHASE_RC

CRITICAL
Q7035 RJK0305DPB LFPAK-HF

NO STUFF C7039 470PF 10% 50V CERM 402

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

CRITICAL C7040 22UF 20% 25V POLY-TANT CASE-D2-SM

C7045 0.001UF 10% 50V X7R 402

R7050 0.01 0.5% 1W MF 0612-1

PPVBAT_G3H_CHGR_R
MIN_LINE_WIDTH=0.6 mm
MIN_NECK_WIDTH=0.4 mm
VOLTAGE=12.6V

CRITICAL
Q7055 SI7137DP SO-8

TO/FROM BATTERY

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

R7051 2.2 5% 1/10W MF-LF 402 CHGR_CSO_R_P

R7052 0 5% 1/10W MF-LF 402 CHGR_CSO_R_N

(CHGR_CSO_P)

(CHGR_CSO_N)

(PPVBAT_G3H_CHGR_R)

(CHGR_BGATE)

* R7051 HAS 2.2OHM TO COMPENSATE UNVALANCED VOLTAGE DUE TO DIFFERENT CURRENT ON _P AND _N. (FROM INTERSIL)

K6 NOTES : L7030 CHANGED BACK TO K24 IND DUE TO LAYOUT

SYNC_MASTER=T27_MLB SYNC_DATE=07/29/2008

PAGE TITLE: PBus Supply & Battery Charger

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D

REVISION: A.13.0

BRANCH:

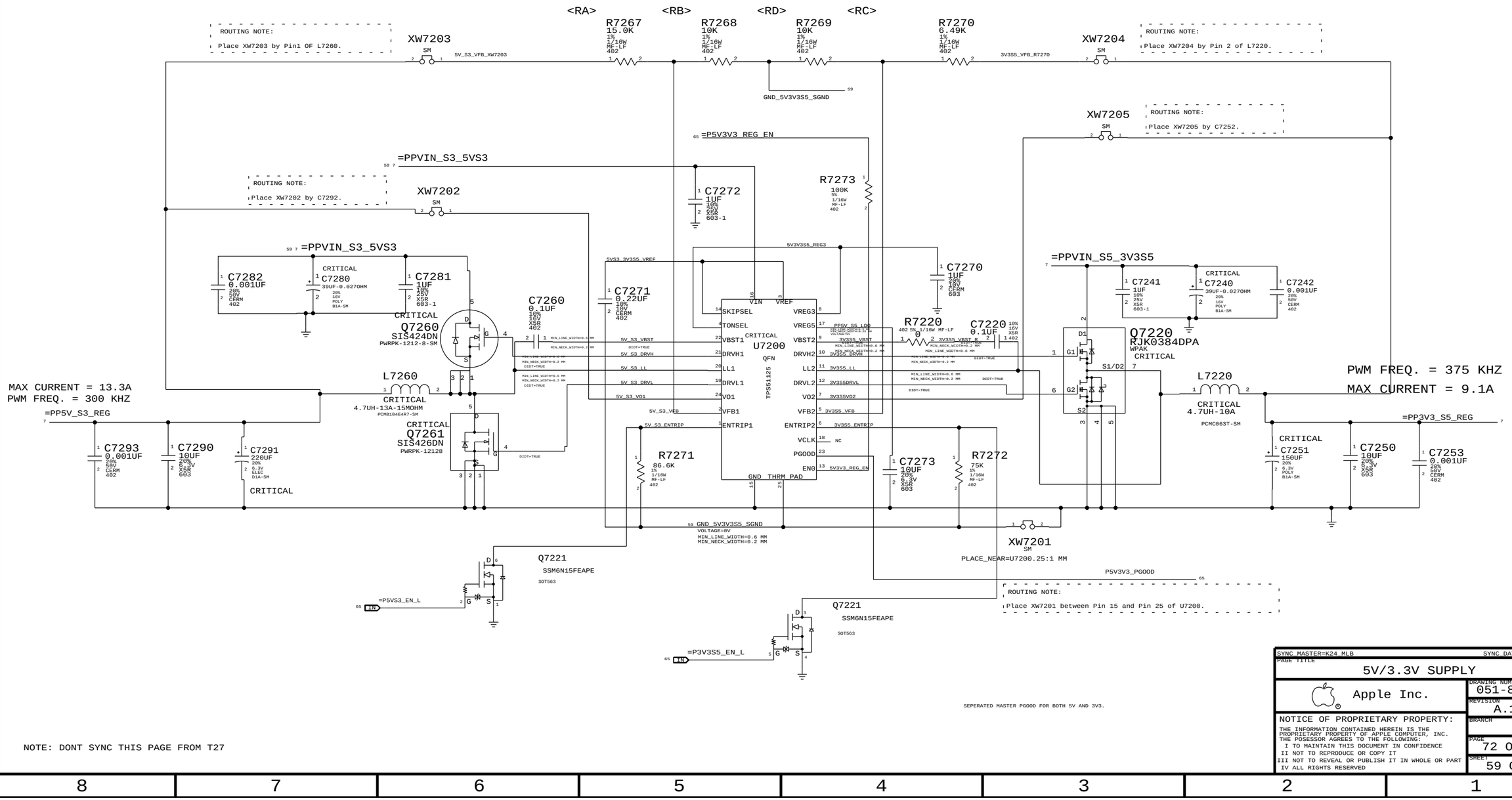
PAGE: 70 OF 109

SHEET: 58 OF 80

5V_S3/3.3V_S5 POWER SUPPLY

VOUT = (2 * RA / RB) + 2

VOUT = (2 * RC / RD) + 2



NOTE: DONT SYNC THIS PAGE FROM T27

SYNC MASTER=K24_MLB SYNC DATE=07/20/2009

PAGE TITLE

5V/3.3V SUPPLY

Apple Inc.

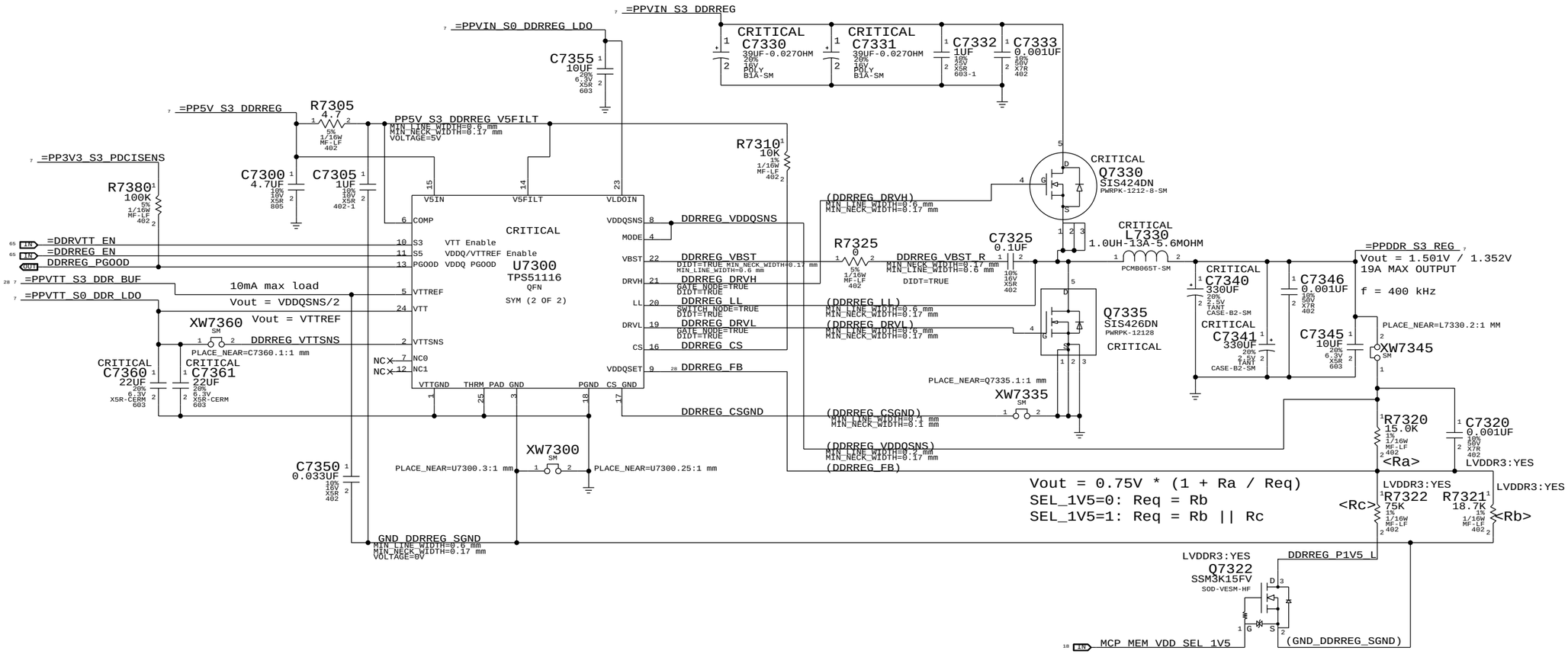
DRAWING NUMBER 051-8563 SIZE D

REVISION A.13.0

BRANCH

PAGE 72 OF 109

SHEET 59 OF 80



Use LVDDR3 for 1.5V/1.35V support or LVDDR3_NOT for fixed 1.5V operation.

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
114S0331	1	RES,15K,1%,1/16W,MF-LF,0402	R7321		LVDDR3:NO

NOTE: DONT SYNC THIS PAGE FROM T27. C7330 AND C7331 IS CHANGED TO OSCON CAPS

SYNC_MASTER=T27_MLB SYNC_DATE=08/06/2009

PAGE TITLE: 1.5V/1.35V LVDDR3 Supply

Apple Inc.

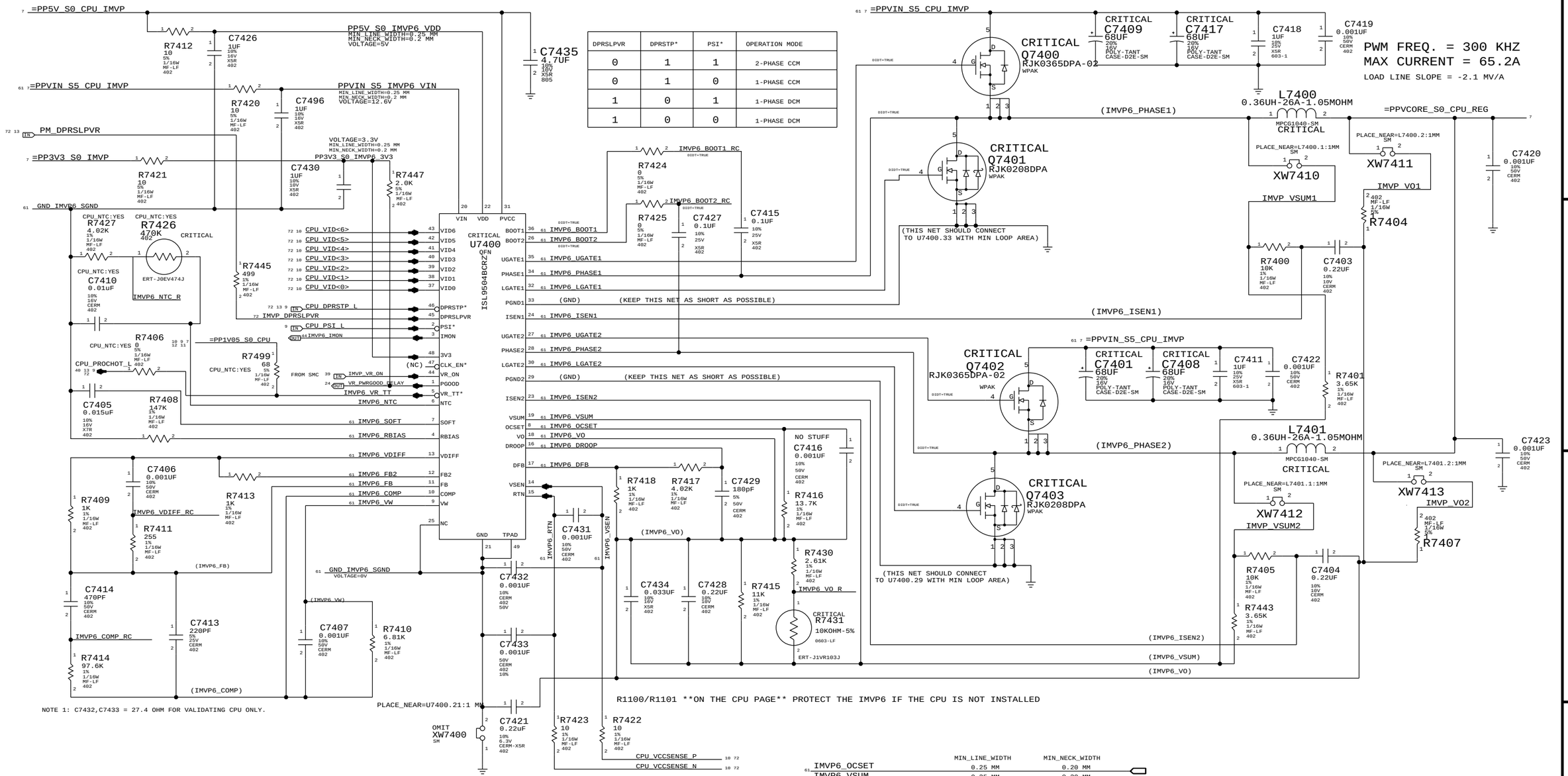
DRAWING NUMBER: 051-8563 SIZE: D

REVISION: A.13.0

BRANCH:

PAGE: 73 OF 109

SHEET: 60 OF 80



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

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

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

IMVP6 CPU VCORE REGULATOR

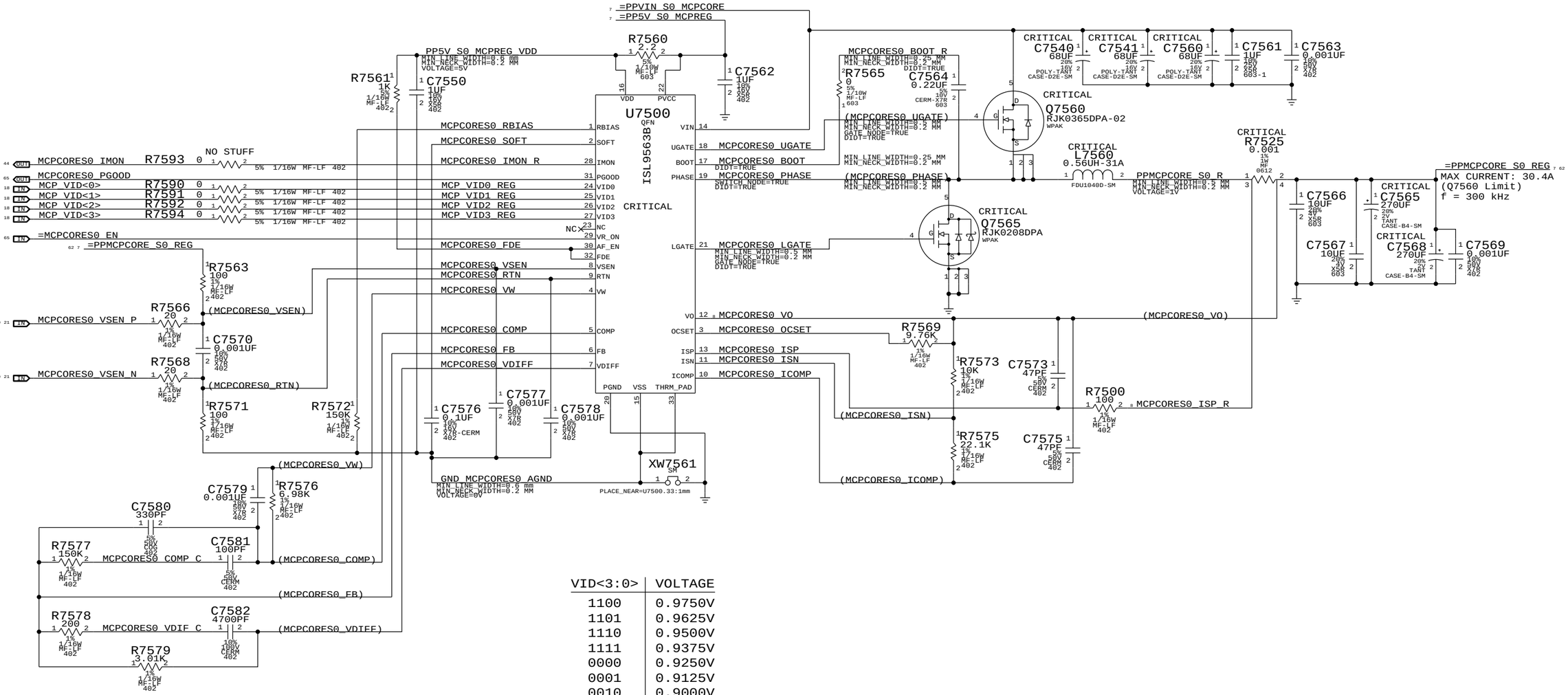
	MIN_LINE_WIDTH	MIN_NECK_WIDTH
IMVP6_PHASE1	1.5 MM	0.25 MM
IMVP6_BOOT1	0.25 MM	0.25 MM
IMVP6_UGATE1	1.5 MM	0.25 MM
IMVP6_LGATE1	1.5 MM	0.25 MM
IMVP6_ISEN1	0.25 MM	0.20 MM

	MIN_LINE_WIDTH	MIN_NECK_WIDTH
IMVP6_PHASE2	0.25 MM	0.25 MM
IMVP6_BOOT2	0.25 MM	0.20 MM
IMVP6_UGATE2	0.25 MM	0.25 MM
IMVP6_LGATE2	0.25 MM	0.25 MM
IMVP6_ISEN2	0.25 MM	0.20 MM

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

K6 NOTES : Q7400-Q7403 CHANGED BACK TO K24 FETS DUE TO LAYOUT
K6 NOTES : BOM OPTION ADDED TO NTC

SYNC_MASTER=K24_MLB
SYNC_DATE=07/20/2009
PAGE TITLE: IMVP6 CPU VCore Regulator
Apple Inc.
DRAWING NUMBER: 051-8563
SIZE: D
REVISION: A.13.0
BRANCH:
PAGE: 74 OF 109
SHEET: 61 OF 80



VID<3:0>	VOLTAGE
1100	0.9750V
1101	0.9625V
1110	0.9500V
1111	0.9375V
0000	0.9250V
0001	0.9125V
0010	0.9000V
0011	0.8875V
0100	0.8750V
0101	0.8625V
0110	0.8500V
0111	0.8375V
1000	0.8250V
1001	0.8125V
1010	0.8000V
1011	0.7875V

K6 NOTES : XOR AND INVERTER IS REMOVED, CANNOT SYNC THIS PAGE FROM T27

SYNC_MASTER=T27_MLB SYNC_DATE=08/18/2009

PAGE TITLE: MCP VCore Regulator

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D

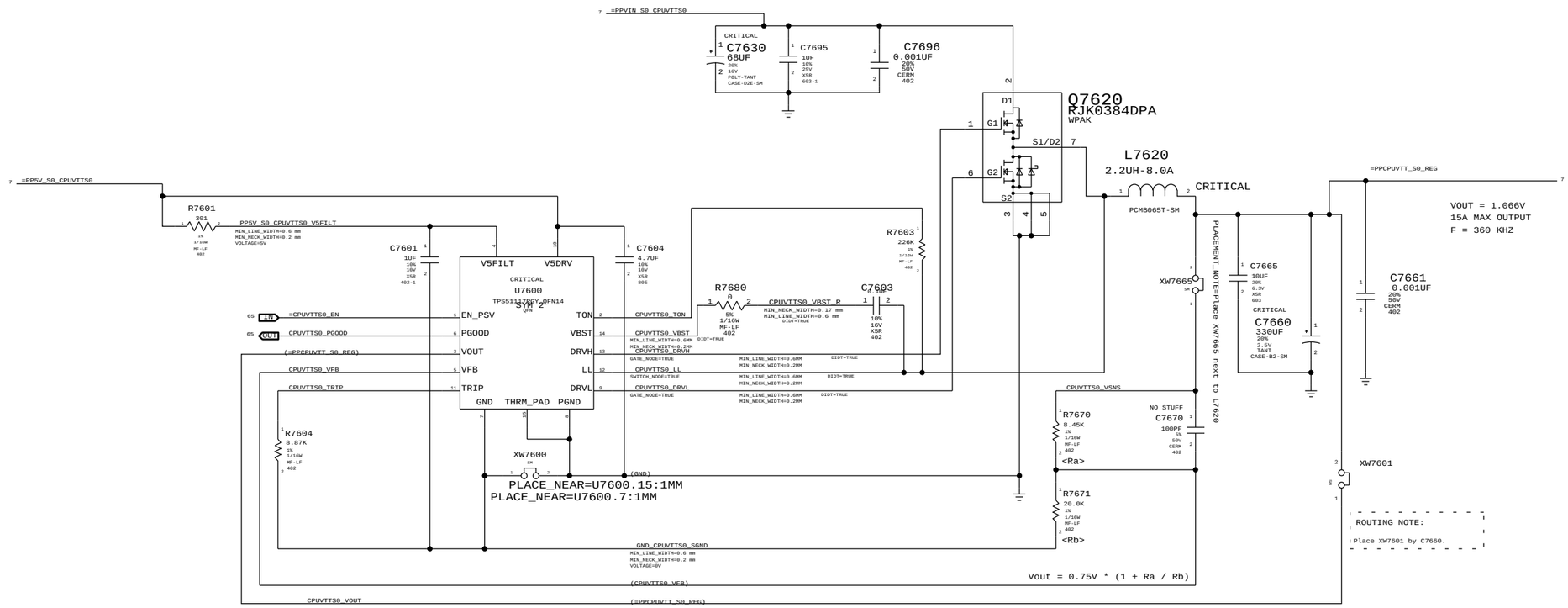
REVISION: A.13.0

BRANCH:

PAGE: 75 OF 109

SHEET: 62 OF 80

CPUVTT POWER SUPPLY



K6 NOTES : Q7620 CHANGED BACK TO K24 FETS DUE TO LAYOUT

SYNC_MASTER=K24_MLB SYNC_DATE=07/20/2009

PAGE TITLE

CPU VTT(1.05V) SUPPLY

Apple Inc.

DRAWING NUMBER 051-8563 SIZE D

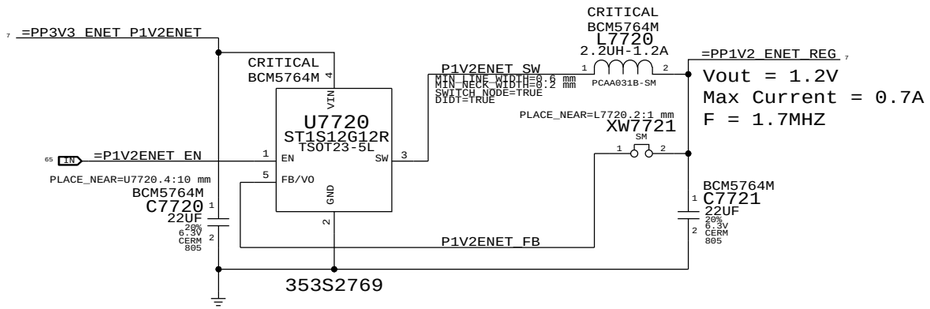
REVISION A.13.0

BRANCH

PAGE 76 OF 109

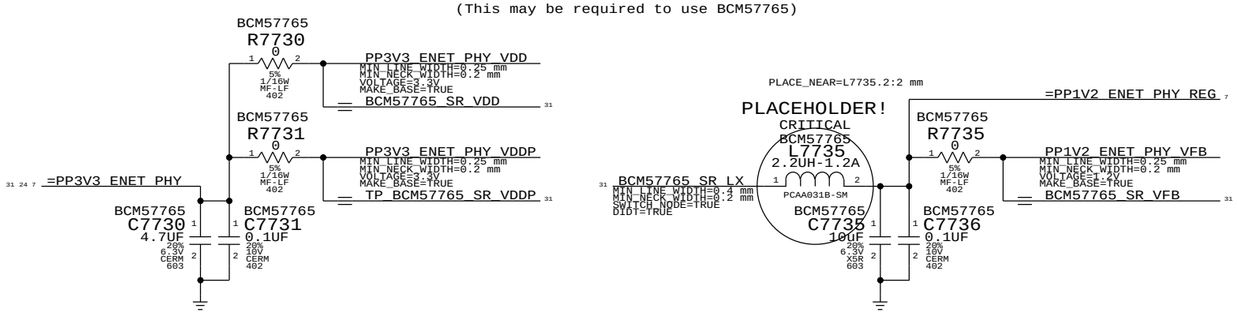
SHEET 63 OF 80

1.2V ENET Switcher

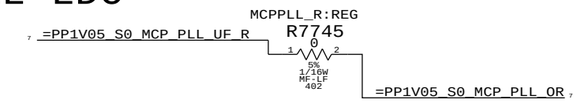


BCM57765 Internal Switcher Support

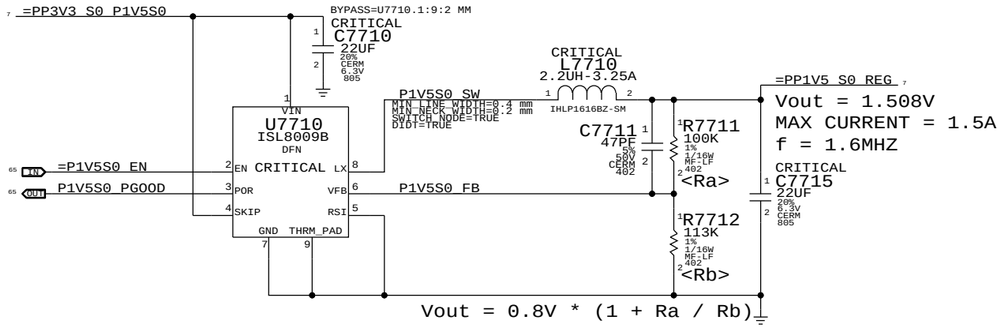
(This may be required to use BCM57765)



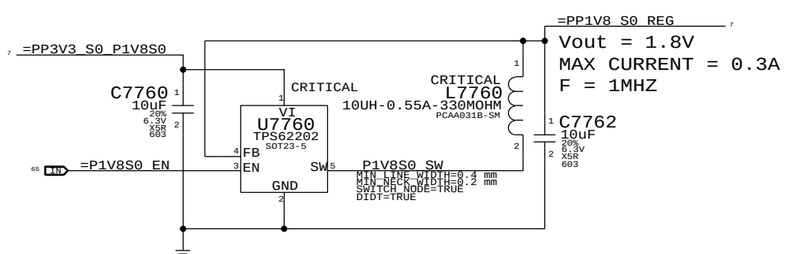
1.05V S0 MCP PLL LDO



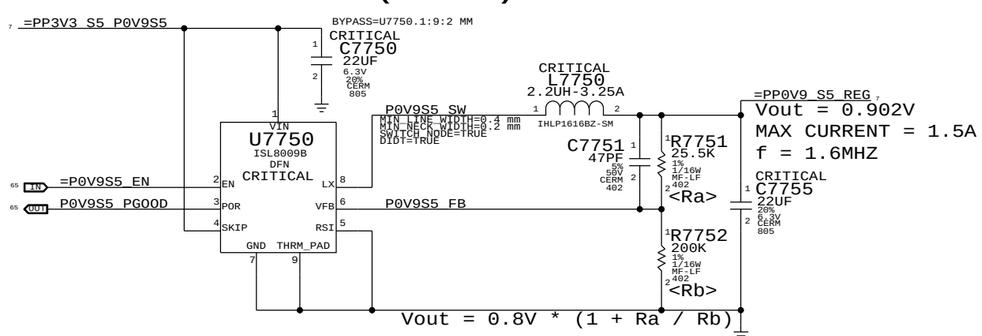
1.5V S0 Regulator



1.8V S0 Switcher



MCP 0.9V S5 (AUXC) Switcher



BOMOPTIONs:

MCPPLL_R:LDO - 1.05V S0 USED FOR MCP PLL LDO POWER.
MCPPLL_LDO - STUFFS U7740 AND RELATED CIRCUITRY.
TO USE U7740, MCPPLL_R:LDO AND MCPPLL_LDO MUST BE ACTIVE.
TO USE 1.05V S0, MCPPLL_R:REG MUST BE ACTIVE, MCPPLL_LDO CAN BE ACTIVE, MCPPLL_R:LDO MUST BE INACTIVE.

K6 NOTES : C7710 AND C7750 HAS BYPASS PROPERTY, SHOULD BE ADDED INCASE THIS PAGE IS SYNC'ED FROM T27

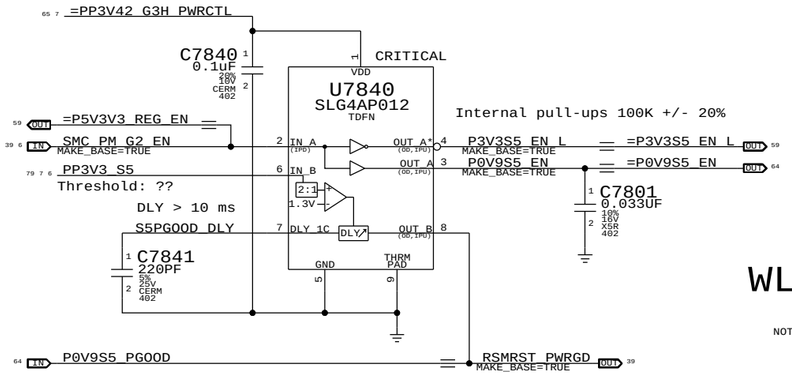
SYNC_MASTER=T27_MLB SYNC_DATE=09/30/2009

PAGE TITLE: Misc Power Supplies

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D
REVISION: A.13.0
BRANCH:
PAGE: 77 OF 109
SHEET: 64 OF 80

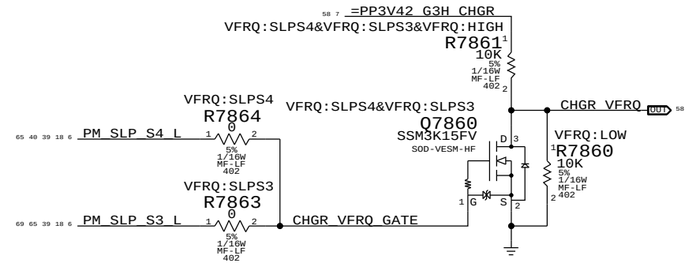
S5 Rail Enables & PGOOD



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

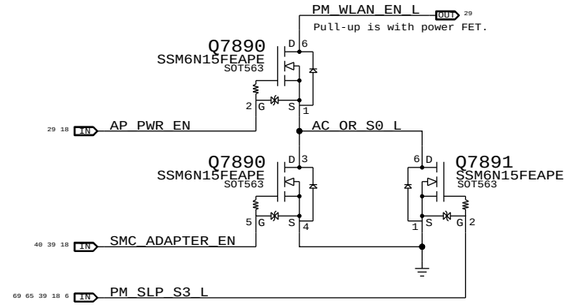
ISL6259 Frequency Select



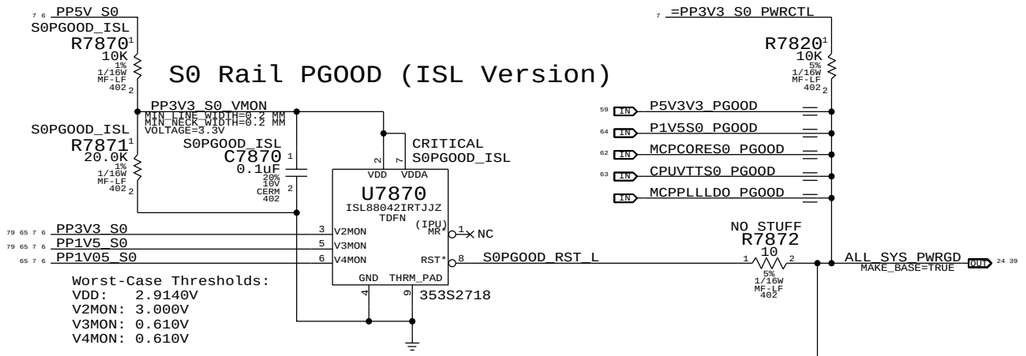
WLAN Enable Generation

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

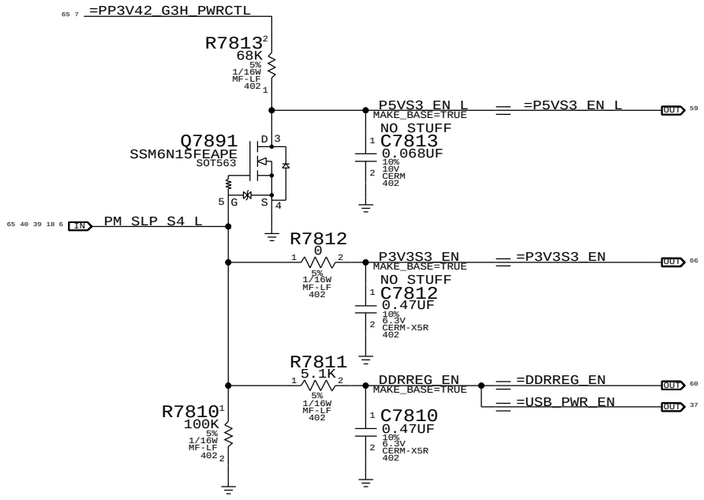
NOTE: S3 term is guaranteed by S3 pull-up on open-drain AP_PWR_EN signal.



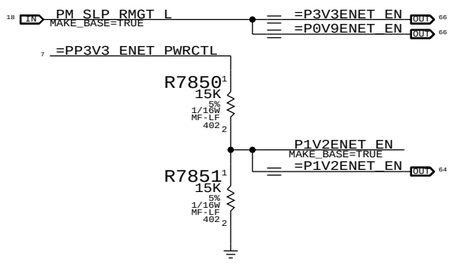
S0 Rail PGOOD Circuitry



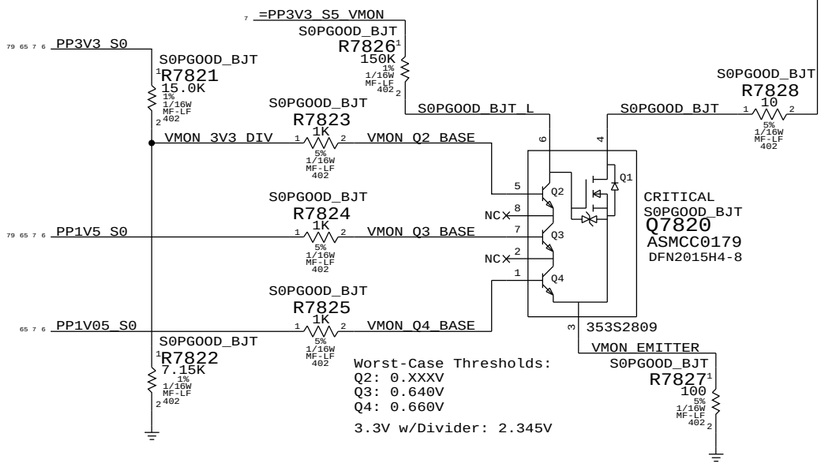
S3 Rail Enables



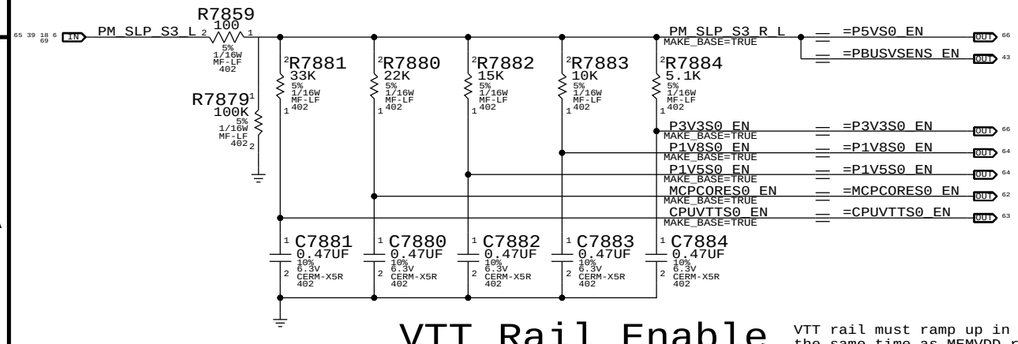
ENET Rail Enables



S0 Rail PGOOD (BJT Version)



S0 Rail Enables



VTT Rail Enable

VTT rail must ramp up in about the same time as MEMVDD rail (Q2300).

K6 HAS A PULL UP ON DDRREG_PGOOD. REMOVED ALIAS TO TP SIGNAL

SYNC_MASTER=T27_MLB SYNC_DATE=11/24/2009

PAGE TITLE: Power Sequencing

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D

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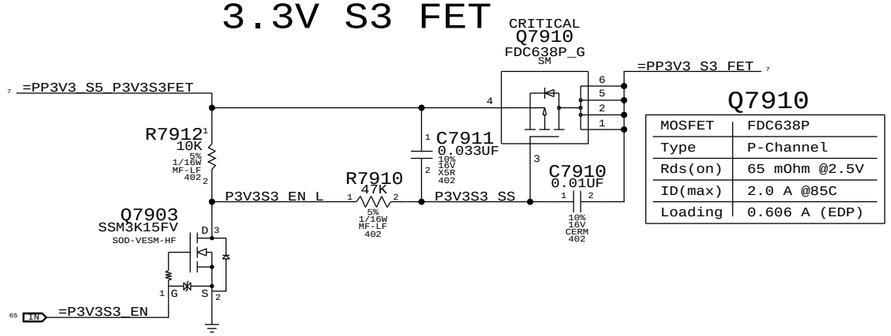
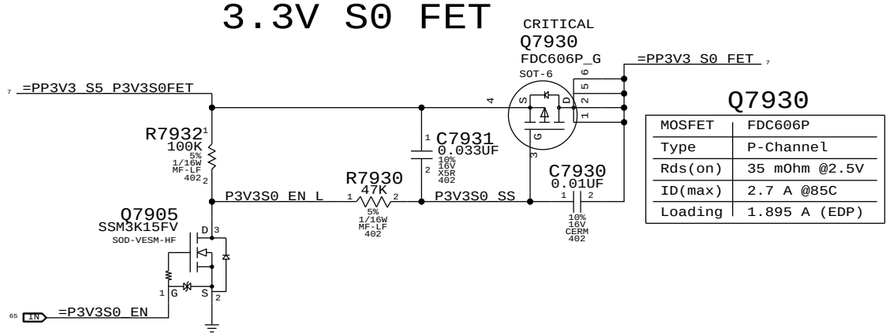
3.3V S3 FET



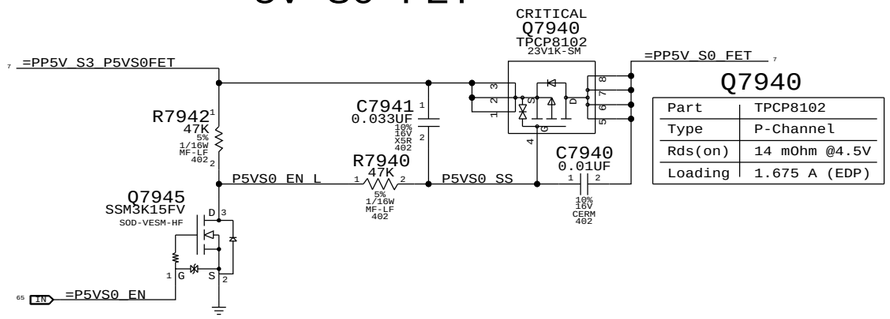
Q7910	
MOSFET	FDC638P
Type	P-Channel
Rds(on)	65 mOhm @2.5V
ID(max)	2.0 A @85C
Loading	0.606 A (EDP)

3.3V S0 FET



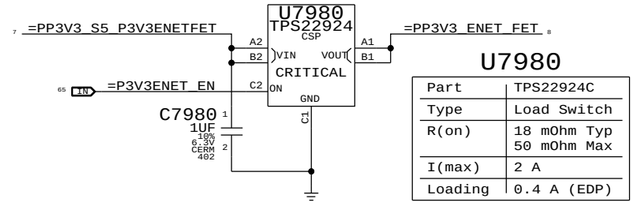
Q7930	
MOSFET	FDC606P
Type	P-Channel
Rds(on)	35 mOhm @2.5V
ID(max)	2.7 A @85C
Loading	1.895 A (EDP)

5V S0 FET



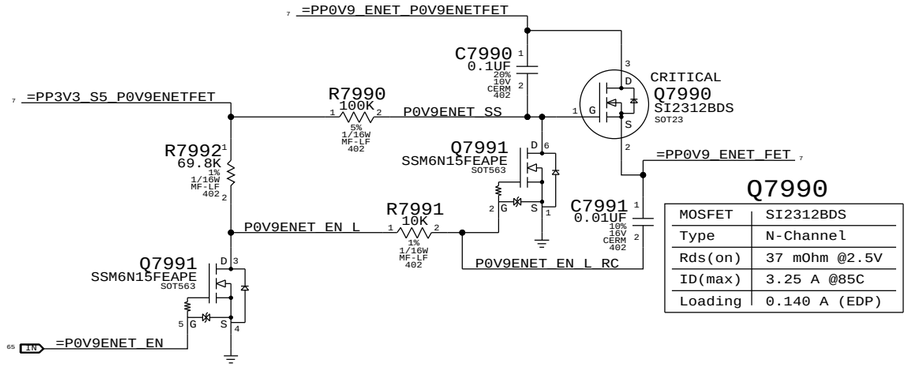
Q7940	
Part	TPCP8102
Type	P-Channel
Rds(on)	14 mOhm @4.5V
Loading	1.675 A (EDP)

3.3V ENET Switch



U7980	
Part	TPS22924C
Type	Load Switch
R(on)	18 mOhm Typ 50 mOhm Max
I(max)	2 A
Loading	0.4 A (EDP)

0.9V ENET FET



Q7990	
MOSFET	SI2312BDS
Type	N-Channel
Rds(on)	37 mOhm @2.5V
ID(max)	3.25 A @85C
Loading	0.140 A (EDP)

SYNC_MASTER=T27_MLB SYNC_DATE=08/27/2009

PAGE TITLE: Power FETs

Apple Inc.

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LCD CONNECTOR

LVDS CONNECTOR:518S0650

FOUR GROUNDING VIAS SHOULD BE DISTRIBUTED
ALONG THE GROUND SHAPE THAT BOUND THE CONNECTOR BODY

16 LCD_IG_PWR_EN

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

7 =PP3V3_S5_LCD

CRITICAL
U9000 FPF1009 MFET-2X2-8IN
1 ON
2 VIN_1
3 VIN_2
VOUT_1 4
VOUT_2 5
GND 6
THRM PAD 7

C9009 0.1UF 10% 16V X5R 402

C9011 0.1UF 10% 16V X5R 402

C9012 10UF 20% 6.3V X5R 603

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

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

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

MIN_LINE_WIDTH=0.25 MM
MIN_NECK_WIDTH=0.20 MM

6 PP3V3_S0_LCD_F
VOLTAGE=3.3V

C9015 0.001UF 10% 50V X7R 402

C9010 0.001UF 10% 50V X7R 402

MIN_NECK_WIDTH=0.20 MM

6 PP3V3_LCDVDD_SW_F
VOLTAGE=3.3V MIN_LINE_WIDTH=0.30 MM

7 =PP3V3_S0_LCD

(LVDS DDC POWER)

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

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

8 6 LVDS_DDC_CLK
8 6 LVDS_DDC_DATA

CRITICAL
L9080 90-OHM-200MA AMC2012-SM

74 8 LVDS_IG_A_CLK_N
74 8 LVDS_IG_A_CLK_P

79 6 LVDS_CONN_A_CLK_F_N
79 6 LVDS_CONN_A_CLK_F_P

70 6 PPVOUT_SW_LCDBKLT

C9020 0.001UF 10% 50V X7R 402

70 6 BKL_VSYNC

74 8 6 LVDS_IG_A_DATA_N<0>
74 8 6 LVDS_IG_A_DATA_P<0>
74 8 6 LVDS_IG_A_DATA_N<1>
74 8 6 LVDS_IG_A_DATA_P<1>
74 8 6 LVDS_IG_A_DATA_N<2>
74 8 6 LVDS_IG_A_DATA_P<2>

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

LVDS I/F

NC
NC
NC

LED BKLT I/F

70 6 LED_RETURN_1
70 LED_RETURN_2
70 LED_RETURN_3
70 6 LED_RETURN_4
70 6 LED_RETURN_5
70 6 LED_RETURN_6

SYNC_MASTER=K24_MLB SYNC_DATE=07/20/2009

PAGE TITLE: LVDS CONNECTOR

Apple Inc.

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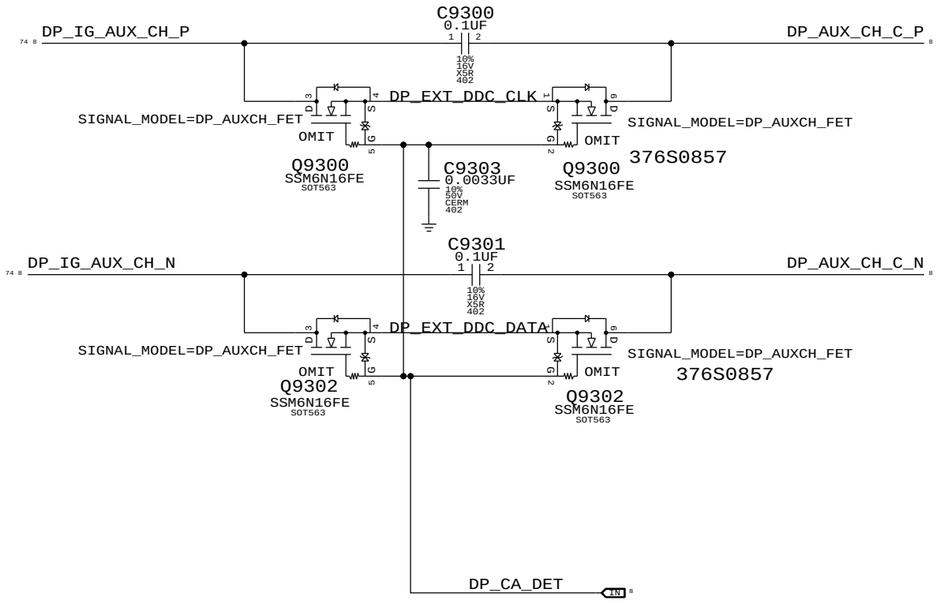

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
376S0859	2	XSTR,FT,N-CH,DUAL,SOT-563	Q9300,Q9302	CRITICAL	

SYNC_MASTER=K69_MLB SYNC_DATE=08/12/2009

PAGE TITLE
DISPLAYPORT SUPPORT

Apple Inc.

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Port Power Switch

CRITICAL
U9480
TPS2051B
SOT23
=PP3V3_S5_DP_PORT_PWR
PM_SLP_S3_L
IN
EN
OUT
OC*
GND
TP_DPPWR_OC_L
PP3V3_S0_DPILIM
MIN_LINE_WIDTH=0.50 MM
MIN_NECK_WIDTH=0.20 MM
VOLTAGE=3.3V
L9400
FERR-120-OHM-3A
0603
PP3V3_S0_DPPWR
MIN_LINE_WIDTH=0.50 MM
MIN_NECK_WIDTH=0.20 MM
VOLTAGE=3.3V
C9400
0.01UF
20%
16V
CERM
402
CRITICAL
C9480
22UF
20%
6.3V
X5R-CERM-1
603
C9481
0.1UF
20%
10V
CERM
402
CRITICAL
C9487
100UF
20%
6.3V
POLY-TANT
CASE-B2-SM
C9485
0.1UF
20%
10V
CERM
402
C9486
10UF
20%
6.3V
X5R
603

DP_ESD
CRITICAL
D9410
RCLAMP0524P
SLP2510P8
IO
NC
GND

DP_ESD
CRITICAL
D9410
RCLAMP0524P
SLP2510P8
IO
NC
GND

R9420
100K
5%
1/16W
MF-LF
402
HDMI_CEC
R9425
1M
5%
1/16W
MF-LF
402

CRITICAL
J9400
DSPLYPRT-M97-1
F-RT-THSM
BOT ROW TH PINS
TOP ROW SM PINS
HOT_PLUG_DETECT
CONFIG1
CONFIG2
GND
ML_LANE3P
ML_LANE3N
GND
AUX_CHP
AUX_CHN
DP_PWR
GND
ML_LANE0P
ML_LANE0N
GND
ML_LANE1P
ML_LANE1N
GND
ML_LANE2P
ML_LANE2N
RETURN
SHIELD PINS
514-0637

DP_EXT_ML_F_P<0>
DP_EXT_ML_F_N<0>
DP_EXT_ML_F_P<3>
DP_EXT_ML_F_N<3>
DP_EXT_ML_F_P<1>
DP_EXT_ML_F_N<1>
DP_EXT_ML_F_P<2>
DP_EXT_ML_F_N<2>

FL9400
12-OHM-100MA
TCM1210-4SM
SYM_VER-2
FL9401
12-OHM-100MA
TCM1210-4SM
SYM_VER-2
FL9402
12-OHM-100MA
TCM1210-4SM
SYM_VER-2
FL9403
12-OHM-100MA
TCM1210-4SM
SYM_VER-2

DP_EXT_ML_P<3> C9414 0.1uF DP_EXT_ML_C_P<3>
DP_EXT_ML_N<3> C9415 0.1uF DP_EXT_ML_C_N<3>
DP_EXT_ML_C_P<0> C9410 0.1uF DP_EXT_ML_P<0>
DP_EXT_ML_C_N<0> C9411 0.1uF DP_EXT_ML_N<0>
DP_EXT_ML_C_P<1> C9412 0.1uF DP_EXT_ML_P<1>
DP_EXT_ML_C_N<1> C9413 0.1uF DP_EXT_ML_N<1>
DP_EXT_ML_C_P<2> C9416 0.1uF DP_EXT_ML_P<2>
DP_EXT_ML_C_N<2> C9417 0.1uF DP_EXT_ML_N<2>

DP_EXT_AUX_CH_C_P
DP_EXT_AUX_CH_C_N

=PP3V3_S0_DPCONN
=PP5VR3V3_S0_DPCADET

R9443
100K
5%
1/16W
MF-LF
402
R9442
100K
5%
1/16W
MF-LF
402
DP_EXT_CA_DET
Q9446
2N7002DW-X-G
SOT-363
DP_CA_DET_Q_L
Q9440
2N7002DW-X-G
SOT-363
DP_CA_DET_Q
R9422
1M
5%
1/16W
MF-LF
402
DP to DVI/HDMI Cable Adapter (CA) has 100k pull-up to DP_PWR.
Q9440 must have Drain to Gate leakage of <500nA and Gate to Source resistance of >5MOhm

DP_ESD
CRITICAL
D9411
RCLAMP0524P
SLP2510P8
IO
NC
GND

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

DP_ESD
CRITICAL
D9400
RCLAMP0504F
SC70-6-1

DP_ESD
CRITICAL
D9411
RCLAMP0524P
SLP2510P8
IO
NC
GND

=PP3V3_S0_DPCONN
R9445
10K
5%
1/16W
MF-LF
402
R9444
10K
5%
1/16W
MF-LF
402
DP_EXT_HPD
Q9441
2N7002DW-X-G
SOT-363
DP_HPD_Q_L
Q9441
2N7002DW-X-G
SOT-363
DP_HPD_Q
R9423
100K
5%
1/16W
MF-LF
402
DP Source must pull down HPD input with greater than or equal to 100K (DPv1.1a).

SYNC_MASTER=K24_MLB
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DisplayPort Connector
Apple Inc.
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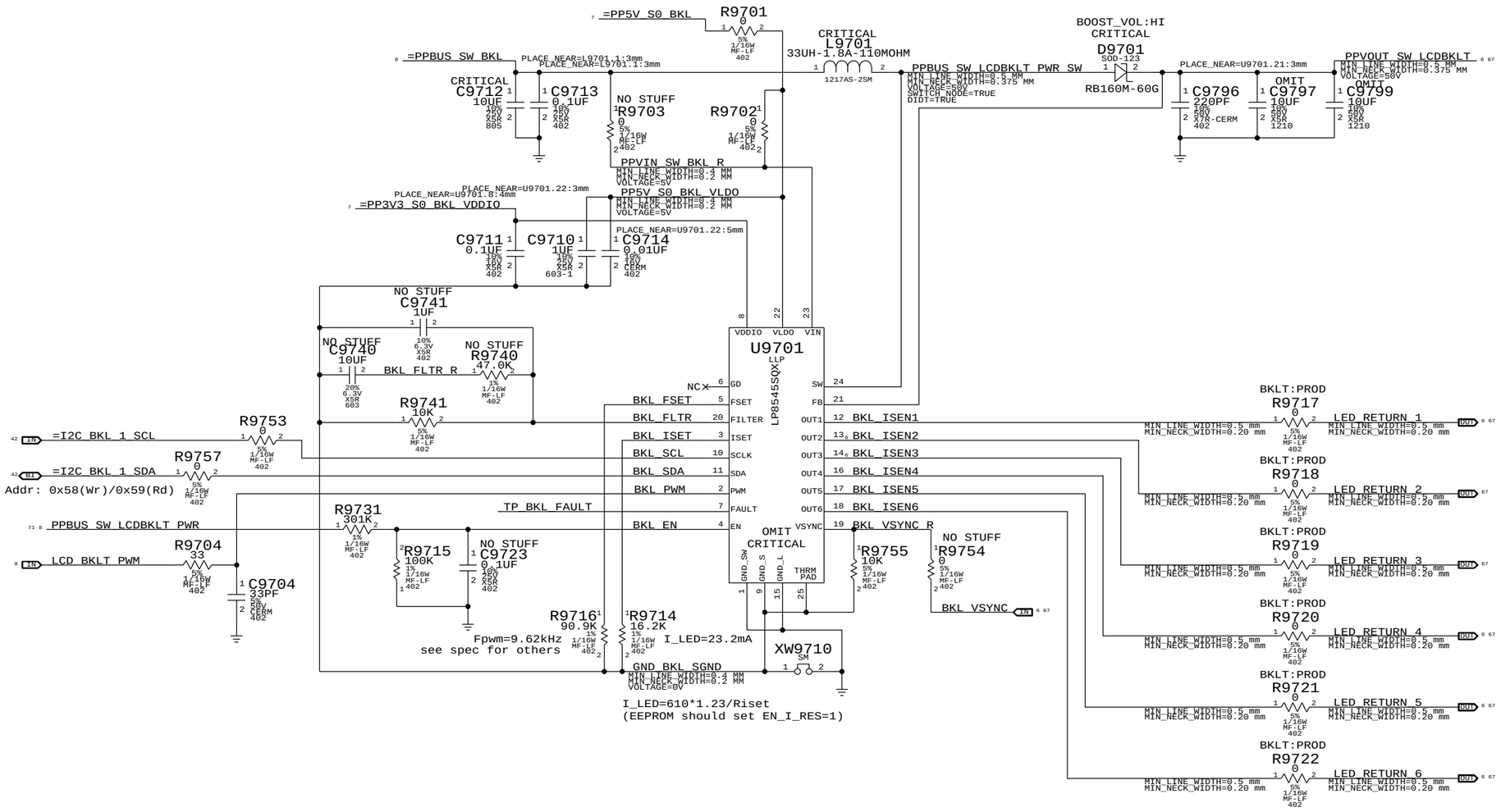
*L9701, D9701, C9796, C9797, C9799, C9712 AND C9713 SHOULD ALL BE PLACED NEAR EACHOTHER.
*PPBUS_SW_LCDBKLT_PWR_SW SHOULD BE KEPT AS SHORT AS POSSIBLE.
*LCD_BKLT_PWM SHOULD BE AWAY FROM BOOST CIRCUIT



FOR LP8543:
STUFF R9741
NO STUFF R9740, C9740, C9741, R9754

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
103S0198	3	RES,THIN FLIM,1/16W,10.2 OHM,0.1,0402,SM	R9717,R9718,R9719		BKLT:ENG
103S0198	3	RES,THIN FLIM,1/16W,10.2 OHM,0.1,0402,SM	R9720,R9721,R9722		BKLT:ENG
371S0580	1	SCHOTTKY BARRIER DIODE RB160M-40	D9701		BOOST_VOL:LOW
138S0673	2	CAP, 50V, 1210, X5R, 10UF+/-10%	C9797,C9799	CRITICAL	

10.2 ohm resistors for current measurement on LED strings.

SYNC_MASTER=K69_MLB SYNC_DATE=08/27/2009

PAGE TITLE
LCD Backlight Driver

Apple Inc.

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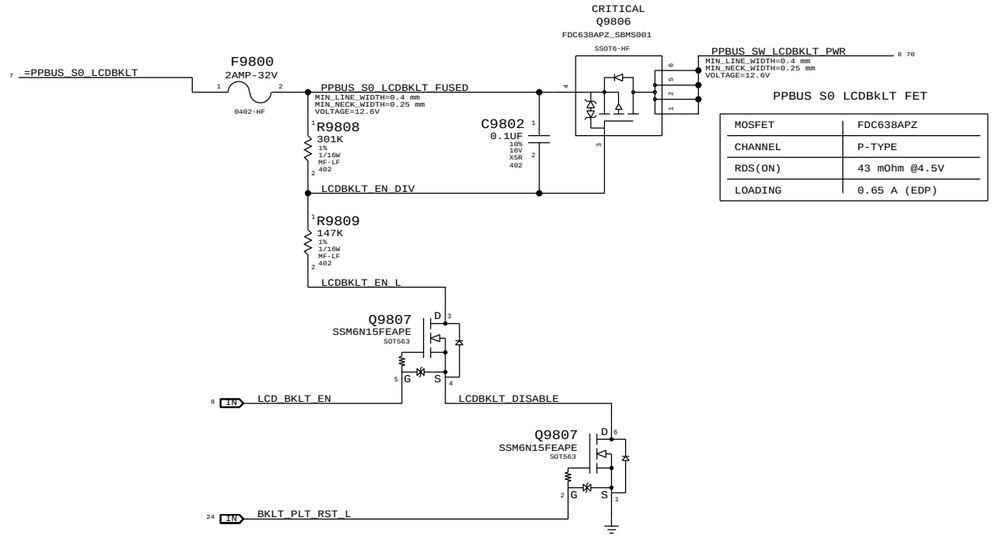

PPBUS S0 LCDBkLT FET

MOSFET	FDC638APZ
CHANNEL	P-TYPE
RDS(ON)	43 mOhm @4.5V
LOADING	0.65 A (EDP)

SYNC_MASTER=T27_MLB SYNC_DATE=07/28/2009

PAGE TITLE

LCD Backlight Support

Apple Inc.

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FSB (Front-Side Bus) Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
FSB_50S	*	=50_OHM_SE	=50_OHM_SE	=50_OHM_SE	=50_OHM_SE	=STANDARD	=STANDARD
FSB_DSTB_50S	*	=50_OHM_SE	=50_OHM_SE	=50_OHM_SE	=50_OHM_SE	=1:1_DIFFPAIR	=1:1_DIFFPAIR

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

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

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

FSB 4X signals / groups shown in signal table on right.
Signals within each 4x group should be matched within 5 ps of strobe.
DSTB# complementary pairs should be matched within 1 ps of each other, all DSTB#s matched to +/- 135 ps.
Spacing is 2x dielectric between DATA#, DINV# signals, with 3x dielectric spacing to the DSTB#s.

FSB 2X signals / groups shown in signal table on right.
Signals within each 2x group should be matched within 20 ps. ADTSB#s should be matched +/- 270 ps.
Spacing is 1x dielectric between ADDR#, REQ# signals, with 2x dielectric spacing to ADSTB#.

FSB 1X signals shown in signal table on right.

Intel Design Guide recommends FSB signals be routed only on internal layers.

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

SOURCE: MCP89 Interface DG (DG-04625-001_v0.9), Section 2.1
SOURCE: Santa Rosa Platform DG, Rev 1.5 (#22294), Sections 4.2 & 4.3

CPU Signal Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
CPU_50S	*	=50_OHM_SE	=50_OHM_SE	=50_OHM_SE	=50_OHM_SE	=STANDARD	=STANDARD
CPU_27P4S	*	=27P4_OHM_SE	=27P4_OHM_SE	=27P4_OHM_SE	=27P4_OHM_SE	7 MIL	7 MIL

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

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

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

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

Most CPU signals with impedance requirements are 55-ohm single-ended.
Some signals require 27.4-ohm single-ended impedance.

SOURCE: MCP89 Interface DG (DG-04625-001_v0.9), Section 2.1
SOURCE: Santa Rosa Platform DG, Rev 0.9 (#20517), Sections 4.4 & 5.8.2.4

MCP FSB COMP Signal Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
MCP_50S	*	=50_OHM_SE	=50_OHM_SE	=50_OHM_SE	=50_OHM_SE	=STANDARD	=STANDARD

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

SOURCE: MCP89 Interface DG (DG-04625-001_v0.9), Section 2.1.4

FSB Clock Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
CLK_FSB_100D	*	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF

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

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

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

CPU / FSB Net Properties

	ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
FSB 4X Signal Groups	FSB_DATA_GROUP0	FSB_50S	FSB_DATA	FSB_D_L<15..0>	6 9 13
	FSB_DATA_GROUP0	FSB_50S	FSB_DATA	FSB_DINV_L<0>	6 9 13
	FSB_DSTB0	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_P<0>	6 9 13
	FSB_DSTB0	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_N<0>	6 9 13
	FSB_DATA_GROUP1	FSB_50S	FSB_DATA	FSB_D_L<31..16>	6 9 13
	FSB_DATA_GROUP1	FSB_50S	FSB_DATA	FSB_DINV_L<1>	6 9 13
	FSB_DSTB1	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_P<1>	6 9 13
	FSB_DSTB1	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_N<1>	6 9 13
	FSB_DATA_GROUP2	FSB_50S	FSB_DATA	FSB_D_L<47..32>	6 9 13
	FSB_DATA_GROUP2	FSB_50S	FSB_DATA	FSB_DINV_L<2>	6 9 13
	FSB_DSTB2	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_P<2>	6 9 13
	FSB_DSTB2	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_N<2>	6 9 13
	FSB_DATA_GROUP3	FSB_50S	FSB_DATA	FSB_D_L<63..48>	6 9 13
	FSB_DATA_GROUP3	FSB_50S	FSB_DATA	FSB_DINV_L<3>	6 9 13
	FSB_DSTB3	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_P<3>	6 9 13
	FSB_DSTB3	FSB_DSTB_50S	FSB_DSTB	FSB_DSTB_L_N<3>	6 9 13
FSB 2X Signals	FSB_ADDR_GROUP0	FSB_50S	FSB_ADDR	FSB_A_L<16..3>	6 9 13
	FSB_ADDR_GROUP0	FSB_50S	FSB_ADDR	FSB_REQ_L<4..0>	6 9 13
	FSB_ADSTB0	FSB_50S	FSB_ADSTB	FSB_ADSTB_L<0>	6 9 13
	FSB_ADDR_GROUP1	FSB_50S	FSB_ADDR	FSB_A_L<35..17>	6 9 13
	FSB_ADSTB1	FSB_50S	FSB_ADSTB	FSB_ADSTB_L<1>	6 9 13
FSB 1X Signals	FSB_1X	FSB_50S	FSB_1X	FSB_ADS_L	6 9 13
	FSB_BREQ0_L	FSB_50S	FSB_1X	FSB_BREQ0_L	9 13
	FSB_1X	FSB_50S	FSB_1X	FSB_BNR_L	9 13
	FSB_1X	FSB_50S	FSB_1X	FSB_BPRI_L	9 13
	FSB_1X	FSB_50S	FSB_1X	FSB_DBSY_L	9 13
	FSB_1X	FSB_50S	FSB_1X	FSB_DEFER_L	9 13
	FSB_1X	FSB_50S	FSB_1X	FSB_DRDY_L	9 13
	FSB_1X	FSB_50S	FSB_1X	FSB_HIT_L	6 9 13
	FSB_1X	FSB_50S	FSB_1X	FSB_HITM_L	6 9 13
	FSB_1X	FSB_50S	FSB_1X	FSB_LOCK_L	6 9 13
	FSB_CPURST_L	FSB_50S	FSB_1X	FSB_CPURST_L	9 12 13
	FSB_1X	FSB_50S	FSB_1X	FSB_RS_L<2..0>	9 13
	FSB_1X	FSB_50S	FSB_1X	FSB_TRDY_L	9 13
	CPU_ASYNC	CPU_50S	CPU_AGTL	CPU_A20M_L	9 13
	CPU_BSEL	CPU_50S	CPU_AGTL	CPU_BSEL<2..0>	8 9
	CPU_FERR_L	CPU_50S	CPU_8MIL	CPU_FERR_L	9 13
	CPU_ASYNC	CPU_50S	CPU_AGTL	CPU_IGNNE_L	9 13
	CPU_INIT_L	CPU_50S	CPU_AGTL	CPU_INIT_L	9 13
	CPU_ASYNC_R	CPU_50S	CPU_AGTL	CPU_INTR	9 13
	CPU_ASYNC_R	CPU_50S	CPU_AGTL	CPU_NMI	9 13
	CPU_PROCHOT_L	CPU_50S	CPU_AGTL	CPU_PROCHOT_L	9 13 40 61
	CPU_PWRGD	CPU_50S	CPU_AGTL	CPU_PWRGD	9 12 13
	CPU_ASYNC	CPU_50S	CPU_AGTL	CPU_SMI_L	9 13
	CPU_ASYNC	CPU_50S	CPU_AGTL	CPU_STPCLK_L	9 13
	PM_THRMTRIP_L	CPU_50S	CPU_8MIL	PM_THRMTRIP_L	9 13 40
	FSB_CPUSLP_L	CPU_50S	CPU_AGTL	FSB_CPUSLP_L	9 13
	CPU_FROM_SB	CPU_50S	CPU_AGTL	CPU_DPSLP_L	9 13
	CPU_DPRSTP_L	CPU_50S	CPU_AGTL	CPU_DPRSTP_L	9 13 61
	CPU_ASYNC	CPU_50S	CPU_AGTL	FSB_DPWR_L	9 13
	FSB_CLK_CPU	CLK_FSB_100D	CLK_FSB	FSB_CLK_CPU_P	9 13
	FSB_CLK_CPU	CLK_FSB_100D	CLK_FSB	FSB_CLK_CPU_N	9 13
	FSB_CLK_ITP	CLK_FSB_100D	CLK_FSB	FSB_CLK_ITP_P	12 13
	FSB_CLK_ITP	CLK_FSB_100D	CLK_FSB	FSB_CLK_ITP_N	12 13
	FSB_CLK_MCP	CLK_FSB_100D	CLK_FSB	FSB_CLK_MCP_P	13
	FSB_CLK_MCP	CLK_FSB_100D	CLK_FSB	FSB_CLK_MCP_N	13
	CPU_IERR_L	CPU_50S		CPU_IERR_L	9
	PM_DPRSLPVR	CPU_50S	CPU_AGTL	PM_DPRSLPVR	13 61
	(See above)	CPU_50S	CPU_AGTL	IMVP_DPRSLPVR	61
	MCP_CPU_COMP	MCP_50S	MCP_FSB_COMP	MCP_BCLK_VML_COMP_VDD	13
	MCP_CPU_COMP	MCP_50S	MCP_FSB_COMP	MCP_BCLK_VML_COMP_GND	13
	MCP_CPU_COMP	MCP_50S	MCP_FSB_COMP	MCP_CPU_COMP_VCC	13
	MCP_CPU_COMP	MCP_50S	MCP_FSB_COMP	MCP_CPU_COMP_GND	13
	CPU_GTLREF	CPU_50S	CPU_GTLREF	CPU_GTLREF	9 28
	CPU_COMP	CPU_50S	CPU_COMP	CPU_COMP<3>	9
	CPU_COMP	CPU_27P4S	CPU_COMP	CPU_COMP<2>	9
	CPU_COMP	CPU_50S	CPU_COMP	CPU_COMP<1>	9
	CPU_COMP	CPU_27P4S	CPU_COMP	CPU_COMP<0>	9
	XDP_TDI	CPU_50S	CPU_ITP	XDP_TDI	9 12
	XDP_TDO	CPU_50S	CPU_ITP	XDP_TDO	9 12
	XDP_TMS	CPU_50S	CPU_ITP	XDP_TMS	9 12
	XDP_TCK	CPU_50S	CPU_ITP	XDP_TCK	9 12
	XDP_TRST_L	CPU_50S	CPU_ITP	XDP_TRST_L	9 12
	XDP_BPM_L	CPU_50S	CPU_ITP	XDP_BPM_L<4..0>	9 12
	XDP_BPM_L5	CPU_50S	CPU_ITP	XDP_BPM_L<5>	9 12
	(FSB_CPURST_L)	CPU_50S	CPU_ITP	XDP_CPURST_L	12
		CPU_50S	CPU_8MIL	CPU_VID<6..0>	10 61
		CPU_50S	CPU_8MIL	IMVP6_VID<6..0>	
	CPU_VCCSENSE	CPU_27P4S	CPU_VCCSENSE	CPU_VCCSENSE_P	10 61
	CPU_VCCSENSE	CPU_27P4S	CPU_VCCSENSE	CPU_VCCSENSE_N	10 61
	(CPU_VCCSENSE)	CPU_27P4S	CPU_VCCSENSE	IMVP6_VSEN_P	
	(CPU_VCCSENSE)	CPU_27P4S	CPU_VCCSENSE	IMVP6_VSEN_N	

SYNC_MASTER=T27_MLB SYNC_DATE=08/03/2009

PAGE TITLE: CPU/FSB Constraints

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D
REVISION: A.13.0
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Memory Bus Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
MEM_40S	*	=40_OHM_SE	=40_OHM_SE	=40_OHM_SE	=40_OHM_SE	=STANDARD	=STANDARD
MEM_70D	*	=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	?	NV DG says 3x inner, 4x outer
MEM_CTRL2CTRL	*	=2:1_SPACING	?	NV DG says 2x inner, 4x outer
MEM_CTRL2MEM	*	=2.5:1_SPACING	?	NV DG says 2x inner, 4x outer
MEM_CMD2CMD	*	=1.5:1_SPACING	?	NV DG says 2x inner, 4x outer
MEM_CMD2MEM	*	=3:1_SPACING	?	NV DG says 2x inner, 4x outer
MEM_DATA2DATA	*	=1.5:1_SPACING	?	NV DG says 2x inner, 4x outer
MEM_DATA2MEM	*	=3:1_SPACING	?	NV DG says 2x inner, 4x outer
MEM_DQS2MEM	*	=3:1_SPACING	?	NV DG says 4x inner, 5x outer
MEM_2OTHER	*	25 MIL	?	

Memory Bus Spacing Group Assignments

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

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

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

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

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

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

Need to support MEM_*-style wildcards!

DDR3:
DQ signals should be matched within 5 ps of associated DQS pair.
DQS intra-pair matching should be within 1 ps, inter-pair matching shoulw be within 360 ps
No DQS to clock matching requirement.
CLK intra-pair matching should be within 1 ps, inter-pair matching should be within 2 ps.
CMD/CTRL signals should be matched within 150 ps.
All memory signals maximum length is 1.030 ps.

SOURCE: MCP89 Interface DG (DG-04625-001_v0.9), Section 2.2.3
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	*	=40_OHM_SE	=40_OHM_SE	=40_OHM_SE	=40_OHM_SE	=STANDARD	=STANDARD

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

SOURCE: MCP89 Interface DG (DG-04625-001_v0.9), Section 2.2.2

MEM_A/B_CKE EC SET NAME IS CHANGED ON K6, CANNOT SYNC THIS PAGE FROM T27

Memory Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
MEM_A_CLK	MEM_70D	MEM_CLK	MEM_A_CLK_P<5..0>	14 25
MEM_A_CLK	MEM_70D	MEM_CLK	MEM_A_CLK_N<5..0>	14 25
MEM_A_CKE	MEM_40S	MEM_CTRL	MEM_A_CKE<3..0>	14 20 25
MEM_A_CNTL	MEM_40S	MEM_CTRL	MEM_A_CS_L<3..0>	14 25
MEM_A_CNTL	MEM_40S	MEM_CTRL	MEM_A_ODT<3..0>	14 25
MEM_A_CMD	MEM_40S	MEM_CMD	MEM_A_A<15..0>	14 25
MEM_A_CMD	MEM_40S	MEM_CMD	MEM_A_BA<2..0>	14 25
MEM_A_CMD	MEM_40S	MEM_CMD	MEM_A_RAS_L	14 25
MEM_A_CMD	MEM_40S	MEM_CMD	MEM_A_CAS_L	14 25
MEM_A_CMD	MEM_40S	MEM_CMD	MEM_A_WE_L	14 25
MEM_A_DQ_BYTE0	MEM_40S	MEM_DATA	MEM_A_DQ<7..0>	14 27
MEM_A_DQ_BYTE1	MEM_40S	MEM_DATA	MEM_A_DQ<15..8>	14 27
MEM_A_DQ_BYTE2	MEM_40S	MEM_DATA	MEM_A_DQ<23..16>	14 27
MEM_A_DQ_BYTE3	MEM_40S	MEM_DATA	MEM_A_DQ<31..24>	14 27
MEM_A_DQ_BYTE4	MEM_40S	MEM_DATA	MEM_A_DQ<39..32>	14 27
MEM_A_DQ_BYTE5	MEM_40S	MEM_DATA	MEM_A_DQ<47..40>	14 27
MEM_A_DQ_BYTE6	MEM_40S	MEM_DATA	MEM_A_DQ<55..48>	14 27
MEM_A_DQ_BYTE7	MEM_40S	MEM_DATA	MEM_A_DQ<63..56>	14 27
MEM_A_DQ_BYTE0	MEM_40S	MEM_DATA	MEM_A_DM<0>	14 27
MEM_A_DQ_BYTE1	MEM_40S	MEM_DATA	MEM_A_DM<1>	14 27
MEM_A_DQ_BYTE2	MEM_40S	MEM_DATA	MEM_A_DM<2>	14 27
MEM_A_DQ_BYTE3	MEM_40S	MEM_DATA	MEM_A_DM<3>	14 27
MEM_A_DQ_BYTE4	MEM_40S	MEM_DATA	MEM_A_DM<4>	14 27
MEM_A_DQ_BYTE5	MEM_40S	MEM_DATA	MEM_A_DM<5>	14 27
MEM_A_DQ_BYTE6	MEM_40S	MEM_DATA	MEM_A_DM<6>	14 27
MEM_A_DQ_BYTE7	MEM_40S	MEM_DATA	MEM_A_DM<7>	14 27
MEM_A_DQS0	MEM_70D	MEM_DQS	MEM_A_DQS_P<0>	14 27
MEM_A_DQS0	MEM_70D	MEM_DQS	MEM_A_DQS_N<0>	14 27
MEM_A_DQS1	MEM_70D	MEM_DQS	MEM_A_DQS_P<1>	14 27
MEM_A_DQS1	MEM_70D	MEM_DQS	MEM_A_DQS_N<1>	14 27
MEM_A_DQS2	MEM_70D	MEM_DQS	MEM_A_DQS_P<2>	14 27
MEM_A_DQS2	MEM_70D	MEM_DQS	MEM_A_DQS_N<2>	14 27
MEM_A_DQS3	MEM_70D	MEM_DQS	MEM_A_DQS_P<3>	14 27
MEM_A_DQS3	MEM_70D	MEM_DQS	MEM_A_DQS_N<3>	14 27
MEM_A_DQS4	MEM_70D	MEM_DQS	MEM_A_DQS_P<4>	14 27
MEM_A_DQS4	MEM_70D	MEM_DQS	MEM_A_DQS_N<4>	14 27
MEM_A_DQS5	MEM_70D	MEM_DQS	MEM_A_DQS_P<5>	14 27
MEM_A_DQS5	MEM_70D	MEM_DQS	MEM_A_DQS_N<5>	14 27
MEM_A_DQS6	MEM_70D	MEM_DQS	MEM_A_DQS_P<6>	14 27
MEM_A_DQS6	MEM_70D	MEM_DQS	MEM_A_DQS_N<6>	14 27
MEM_A_DQS7	MEM_70D	MEM_DQS	MEM_A_DQS_P<7>	14 27
MEM_A_DQS7	MEM_70D	MEM_DQS	MEM_A_DQS_N<7>	14 27
MEM_B_CLK	MEM_70D	MEM_CLK	MEM_B_CLK_P<5..0>	14 26
MEM_B_CLK	MEM_70D	MEM_CLK	MEM_B_CLK_N<5..0>	14 26
MEM_B_CKE	MEM_40S	MEM_CTRL	MEM_B_CKE<3..0>	14 20 26
MEM_B_CNTL	MEM_40S	MEM_CTRL	MEM_B_CS_L<3..0>	14 26
MEM_B_CNTL	MEM_40S	MEM_CTRL	MEM_B_ODT<3..0>	14 26
MEM_B_CMD	MEM_40S	MEM_CMD	MEM_B_A<15..0>	14 26
MEM_B_CMD	MEM_40S	MEM_CMD	MEM_B_BA<2..0>	14 26
MEM_B_CMD	MEM_40S	MEM_CMD	MEM_B_RAS_L	14 26
MEM_B_CMD	MEM_40S	MEM_CMD	MEM_B_CAS_L	14 26
MEM_B_CMD	MEM_40S	MEM_CMD	MEM_B_WE_L	14 26
MEM_B_DQ_BYTE0	MEM_40S	MEM_DATA	MEM_B_DQ<7..0>	14 27
MEM_B_DQ_BYTE1	MEM_40S	MEM_DATA	MEM_B_DQ<15..8>	14 27
MEM_B_DQ_BYTE2	MEM_40S	MEM_DATA	MEM_B_DQ<23..16>	14 27
MEM_B_DQ_BYTE3	MEM_40S	MEM_DATA	MEM_B_DQ<31..24>	14 27
MEM_B_DQ_BYTE4	MEM_40S	MEM_DATA	MEM_B_DQ<39..32>	14 27
MEM_B_DQ_BYTE5	MEM_40S	MEM_DATA	MEM_B_DQ<47..40>	14 27
MEM_B_DQ_BYTE6	MEM_40S	MEM_DATA	MEM_B_DQ<55..48>	14 27
MEM_B_DQ_BYTE7	MEM_40S	MEM_DATA	MEM_B_DQ<63..56>	14 27
MEM_B_DQ_BYTE0	MEM_40S	MEM_DATA	MEM_B_DM<0>	14 27
MEM_B_DQ_BYTE1	MEM_40S	MEM_DATA	MEM_B_DM<1>	14 27
MEM_B_DQ_BYTE2	MEM_40S	MEM_DATA	MEM_B_DM<2>	14 27
MEM_B_DQ_BYTE3	MEM_40S	MEM_DATA	MEM_B_DM<3>	14 27
MEM_B_DQ_BYTE4	MEM_40S	MEM_DATA	MEM_B_DM<4>	14 27
MEM_B_DQ_BYTE5	MEM_40S	MEM_DATA	MEM_B_DM<5>	14 27
MEM_B_DQ_BYTE6	MEM_40S	MEM_DATA	MEM_B_DM<6>	14 27
MEM_B_DQ_BYTE7	MEM_40S	MEM_DATA	MEM_B_DM<7>	14 27
MEM_B_DQS0	MEM_70D	MEM_DQS	MEM_B_DQS_P<0>	14 27
MEM_B_DQS0	MEM_70D	MEM_DQS	MEM_B_DQS_N<0>	14 27
MEM_B_DQS1	MEM_70D	MEM_DQS	MEM_B_DQS_P<1>	14 27
MEM_B_DQS1	MEM_70D	MEM_DQS	MEM_B_DQS_N<1>	14 27
MEM_B_DQS2	MEM_70D	MEM_DQS	MEM_B_DQS_P<2>	14 27
MEM_B_DQS2	MEM_70D	MEM_DQS	MEM_B_DQS_N<2>	14 27
MEM_B_DQS3	MEM_70D	MEM_DQS	MEM_B_DQS_P<3>	14 27
MEM_B_DQS3	MEM_70D	MEM_DQS	MEM_B_DQS_N<3>	14 27
MEM_B_DQS4	MEM_70D	MEM_DQS	MEM_B_DQS_P<4>	14 27
MEM_B_DQS4	MEM_70D	MEM_DQS	MEM_B_DQS_N<4>	14 27
MEM_B_DQS5	MEM_70D	MEM_DQS	MEM_B_DQS_P<5>	14 27
MEM_B_DQS5	MEM_70D	MEM_DQS	MEM_B_DQS_N<5>	14 27
MEM_B_DQS6	MEM_70D	MEM_DQS	MEM_B_DQS_P<6>	14 27
MEM_B_DQS6	MEM_70D	MEM_DQS	MEM_B_DQS_N<6>	14 27
MEM_B_DQS7	MEM_70D	MEM_DQS	MEM_B_DQS_P<7>	14 27
MEM_B_DQS7	MEM_70D	MEM_DQS	MEM_B_DQS_N<7>	14 27
MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP_VDD	14
MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP	MCP_MEM_COMP_GND	14

SYNC_MASTER=T27 MLB SYNC_DATE=08/03/2009

PAGE TITLE: Memory Constraints

Apple Inc.

DRAWING NUMBER: 051-8563 SIZE: D
REVISION: A.13.0
BRANCH:
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PCI-Express

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

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
PCIE	*	=3X_DIELECTRIC	?
CLK_PCIE	*	20 MIL	?
MCP_PEX_COMP	*	8 MIL	?

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

SOURCE: MCP89 Interface DG (DG-04625-001_v0.9), Section 2.3

NEED PCIe Gen1/Gen2 notes!

Analog Video Signal Constraints

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

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
CRT	*	20 MIL	?
CRT_2CRT	*	15 MIL	?
CRT_2CLK	*	50 MIL	?
CRT_2SWITCHER	*	250 MIL	?
CRT_SYNC	*	=4x_DIELECTRIC	?
MCP_DAC_COMP	*	=2x_DIELECTRIC	?

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
CRT	CRT	*	CRT_2CRT

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

R/G/B signals should be matched as close as possible and < 10 inches.
SOURCE: MCP89 Interface DG (DG-04625-001_v0.9), Section 2.4.1.

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_90D	*	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF
LVDS_100D	*	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF	=100_OHM_DIFF
MCP_DV_COMP	*	Y	20 MIL	20 MIL	=STANDARD	=STANDARD	=STANDARD

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

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

LVDS intra-pair matching should be 5 mils. Pairs should be matched within 100 mils.
NOTE: NV DG recommends 90 ohm differential for LVDS, but cable/display assume 100 ohm.
DisplayPort/TMDS intra-pair matching should be 5 ps. Inter-pair matching should be within 100 ps.
DisplayPort AUX CH intra-pair matching should be 5 ps. No relationship to other signals.
Max trace length: LVDS 10 inches, DP 8.5 inches.
SOURCE: MCP89 Interface DG (DG-04625-001_v0.9), Section 2.4.2

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_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
SATA	*	=3x_DIELECTRIC	?
SATA_TERMP	*	8 MIL	?

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

SATA intra-pair matching should be 1 ps.
Max trace length: 12 inches for SATA Gen1/Gen2, TBD for SATA Gen3.
SOURCE: MCP89 Interface DG (DG-04625-001_v0.9), Section 2.6

MCP89 Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
	PCIE_90D	PCIE	PEG_R2D_P<15..0>	
	PCIE_90D	PCIE	PEG_R2D_N<15..0>	
PEG_R2D	PCIE_90D	PCIE	PEG_R2D_C_P<15..0>	
	PCIE_90D	PCIE	PEG_R2D_C_N<15..0>	
PEG_D2R	PCIE_90D	PCIE	PEG_D2R_P<15..0>	
	PCIE_90D	PCIE	PEG_D2R_N<15..0>	
	PCIE_90D	PCIE	PEG_D2R_C_P<15..0>	
	PCIE_90D	PCIE	PEG_D2R_C_N<15..0>	
	PCIE_90D	PCIE	PCIE_AP_R2D_P	6 29
	PCIE_90D	PCIE	PCIE_AP_R2D_N	6 29
PCIE_AP_R2D	PCIE_90D	PCIE	PCIE_AP_R2D_C_P	15 29
	PCIE_90D	PCIE	PCIE_AP_R2D_C_N	15 29
PCIE_AP_D2R	PCIE_90D	PCIE	PCIE_AP_D2R_P	6 15 29
	PCIE_90D	PCIE	PCIE_AP_D2R_N	6 15 29
	PCIE_90D	PCIE	PCIE_ENET_R2D_P	31
	PCIE_90D	PCIE	PCIE_ENET_R2D_N	31
PCIE_ENET_R2D	PCIE_90D	PCIE	PCIE_ENET_R2D_C_P	15 31
	PCIE_90D	PCIE	PCIE_ENET_R2D_C_N	15 31
PCIE_ENET_D2R	PCIE_90D	PCIE	PCIE_ENET_D2R_P	15 31
	PCIE_90D	PCIE	PCIE_ENET_D2R_N	15 31
	PCIE_90D	PCIE	PCIE_ENET_D2R_C_P	31
	PCIE_90D	PCIE	PCIE_ENET_D2R_C_N	31
	PCIE_90D	PCIE	PCIE_FW_R2D_P	33
	PCIE_90D	PCIE	PCIE_FW_R2D_N	33
PCIE_FW_R2D	PCIE_90D	PCIE	PCIE_FW_R2D_C_P	15 33
	PCIE_90D	PCIE	PCIE_FW_R2D_C_N	15 33
PCIE_FW_D2R	PCIE_90D	PCIE	PCIE_FW_D2R_P	15 33
	PCIE_90D	PCIE	PCIE_FW_D2R_N	15 33
	PCIE_90D	PCIE	PCIE_FW_D2R_C_P	33
	PCIE_90D	PCIE	PCIE_FW_D2R_C_N	33
MCP_PE0_REFCLK	CLK_PCIE_100D	CLK_PCIE	PEG_CLK100M_P	8 15
	CLK_PCIE_100D	CLK_PCIE	PEG_CLK100M_N	8 15
MCP_PE1_REFCLK	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_AP_P	15 29
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_AP_N	15 29
MCP_PE2_REFCLK	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_ENET_P	15 31
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_ENET_N	15 31
MCP_PE3_REFCLK	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_FW_P	15 33
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_FW_N	15 33
MCP_PEX_CLK_COMP		MCP_PEX_COMP	MCP_PEX0_TERMP	15
CRT_RED	CRT_50S	CRT	CRT_IG_R_C_PR	8
CRT_GREEN	CRT_50S	CRT	CRT_IG_G_Y_Y	8
CRT_BLUE	CRT_50S	CRT	CRT_IG_B_COMP_PB	8
CRT_SYNC	CRT_50S	CRT_SYNC	CRT_IG_HSYNC	8
CRT_SYNC	CRT_50S	CRT_SYNC	CRT_IG_VSYNC	8
MCP_DAC_RSET		MCP_DAC_COMP	MCP_TV_DAC_RSET	8
MCP_DAC_VREF		MCP_DAC_COMP	MCP_TV_DAC_VREF	8
TMDS_IG_TXC	DP_90D	DISPLAYPORT	TMDS_IG_TXC_P	
TMDS_IG_TXC	DP_90D	DISPLAYPORT	TMDS_IG_TXC_N	
TMDS_IG_TXD	DP_90D	DISPLAYPORT	TMDS_IG_TXD_P<5..0>	
TMDS_IG_TXD	DP_90D	DISPLAYPORT	TMDS_IG_TXD_N<5..0>	
DP_EXT_ML	DP_90D	DISPLAYPORT	DP_IG_ML_P<3..0>	8
DP_EXT_ML	DP_90D	DISPLAYPORT	DP_IG_ML_N<3..0>	8
DP_EXT_AUX_CH	DP_90D	DISPLAYPORT	DP_IG_AUX_CH_P	8 68
DP_EXT_AUX_CH	DP_90D	DISPLAYPORT	DP_IG_AUX_CH_N	8 68
MCP_TMDS0_RSET	MCP_DV_COMP		MCP_TMDS0_RSET	16 23
MCP_TMDS0_VPROBE			MCP_TMDS0_VPROBE	16 23
LVDS_IG_A_CLK	LVDS_100D	LVDS	LVDS_IG_A_CLK_P	8 67
LVDS_IG_A_CLK	LVDS_100D	LVDS	LVDS_IG_A_CLK_N	8 67
LVDS_IG_A_DATA	LVDS_100D	LVDS	LVDS_IG_A_DATA_P<2..0>	6 8 67
LVDS_IG_A_DATA	LVDS_100D	LVDS	LVDS_IG_A_DATA_N<2..0>	6 8 67
LVDS_IG_A_DATA3	LVDS_100D	LVDS	LVDS_IG_A_DATA_P<3>	
LVDS_IG_A_DATA3	LVDS_100D	LVDS	LVDS_IG_A_DATA_N<3>	
LVDS_IG_B_CLK	LVDS_100D	LVDS	LVDS_IG_B_CLK_P	
LVDS_IG_B_CLK	LVDS_100D	LVDS	LVDS_IG_B_CLK_N	
LVDS_IG_B_DATA	LVDS_100D	LVDS	LVDS_IG_B_DATA_P<2..0>	
LVDS_IG_B_DATA	LVDS_100D	LVDS	LVDS_IG_B_DATA_N<2..0>	
LVDS_IG_B_DATA3	LVDS_100D	LVDS	LVDS_IG_B_DATA_P<3>	
LVDS_IG_B_DATA3	LVDS_100D	LVDS	LVDS_IG_B_DATA_N<3>	
MCP_IFPAB_RSET	MCP_DV_COMP		MCP_IFPAB_RSET	16 23
MCP_IFPAB_VPROBE			MCP_IFPAB_VPROBE	16 23
SATA_HDD_R2D	SATA_90D	SATA	SATA_HDD_R2D_C_P	17 36
	SATA_90D	SATA	SATA_HDD_R2D_C_N	17 36
	SATA_90D	SATA	SATA_HDD_R2D_P	6 36
	SATA_90D	SATA	SATA_HDD_R2D_N	6 36
SATA_HDD_D2R	SATA_90D	SATA	SATA_HDD_D2R_P	17 36
	SATA_90D	SATA	SATA_HDD_D2R_N	17 36
	SATA_90D	SATA	SATA_HDD_D2R_C_P	6 36
	SATA_90D	SATA	SATA_HDD_D2R_C_N	6 36
SATA_ODD_R2D	SATA_90D	SATA	SATA_ODD_R2D_C_P	17 36
	SATA_90D	SATA	SATA_ODD_R2D_C_N	17 36
	SATA_90D	SATA	SATA_ODD_R2D_P	6 36
	SATA_90D	SATA	SATA_ODD_R2D_N	6 36
SATA_ODD_D2R	SATA_90D	SATA	SATA_ODD_D2R_P	17 36
	SATA_90D	SATA	SATA_ODD_D2R_N	17 36
	SATA_90D	SATA	SATA_ODD_D2R_C_P	36
	SATA_90D	SATA	SATA_ODD_D2R_C_N	36
MCP_SATA_TERMP		SATA_TERMP	MCP_SATA_TERMP	17

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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	*	=1.5x_DIELECTRIC	?
CLK_LPC	*	=2x_DIELECTRIC	?

SOURCE: MCP89 Interface DG (DG-04625-001_v0.9), Section 2.7

USB 2.0 Interface Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
MCP_USB_RBIAS	*	=STANDARD	8 MIL	8 MIL	=STANDARD	=STANDARD	=STANDARD
USB_90D	*	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF	=90_OHM_DIFF

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

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

SOURCE: MCP89 Interface DG (DG-04625-001_v0.9), Section 2.8

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: MCP89 Interface DG (DG-04625-001_v0.9), Section 2.9

HD Audio Interface Constraints

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

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

SOURCE: MCP89 Interface DG (DG-04625-001_v0.9), Section 2.10

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	*	=1.5x_DIELECTRIC	?

SOURCE: MCP89 Interface DG (DG-04625-001_v0.9), Section 2.11

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	*	=1.5x_DIELECTRIC	?

SOURCE: MCP89 Interface DG (DG-04625-001_v0.9), Section 2.12

MCP89 Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
LPC_AD	LPC_55S	LPC	LPC AD<3..0>	18 39 41
LPC_FRAME_L	LPC_55S	LPC	LPC FRAME L	18 39 41
LPC_RESET_L	LPC_55S	LPC	LPC RESET L	18 24
MCP_LPC_CLK0	CLK_LPC_55S	CLK_LPC	LPC CLK33M SMC R	18 24
	CLK_LPC_55S	CLK_LPC	LPC CLK33M SMC	24 39
	CLK_LPC_55S	CLK_LPC	LPC CLK33M LPCPLUS	24 41
USB_EXTA	USB_90D	USB	USB EXTA P	17 37
	USB_90D	USB	USB EXTA N	17 37
	USB_90D	USB	USB EXTA MUXED P	37 79
	USB_90D	USB	USB EXTA MUXED N	37 79
USB_MINI	USB_90D	USB	USB MINI P	8 17
	USB_90D	USB	USB MINI N	8 17
USB_EXTD	USB_90D	USB	USB EXTD P	8 17
	USB_90D	USB	USB EXTD N	8 17
USB_CAMERA	USB_90D	USB	USB CAMERA P	17 29
	USB_90D	USB	USB CAMERA N	17 29
USB_BT	USB_90D	USB	USB BT P	17 29
	USB_90D	USB	USB BT N	17 29
USB_TPAD	USB_90D	USB	USB TPAD P	17 47
	USB_90D	USB	USB TPAD N	17 47
USB_IR	USB_90D	USB	USB IR P	17 38
	USB_90D	USB	USB IR N	17 38
USB_EXTB	USB_90D	USB	USB EXTB P	17 37
	USB_90D	USB	USB EXTB N	17 37
USB_T57	USB_90D	USB	USB T57 P	6 38
	USB_90D	USB	USB T57 N	6 38
USB_EXTC	USB_90D	USB	USB EXTC P	8 17
	USB_90D	USB	USB EXTC N	8 17
USB_SDCARD	USB_90D	USB	USB SDCARD P	17 30
	USB_90D	USB	USB SDCARD N	17 30
USB_WM	USB_90D	USB	USB WM P	8 17
	USB_90D	USB	USB WM N	8 17
MCP_USB_RBIAS	MCP_USB_RBIAS		MCP USB RBIAS GND	17
SMBUS_MCP_0_CLK	SMB_55S	SMB	SMBUS MCP 0 CLK	12 18 42
SMBUS_MCP_0_DATA	SMB_55S	SMB	SMBUS MCP 0 DATA	12 18 42
(SMBUS_SMC_MGMT_SCL)	SMB_55S	SMB	SMBUS MCP 1 CLK	18 42
(SMBUS_SMC_MGMT_SDA)	SMB_55S	SMB	SMBUS MCP 1 DATA	18 42
HDA_BIT_CLK	HDA_55S	HDA	HDA BIT CLK	18 51
	HDA_55S	HDA	HDA BIT CLK R	18
HDA_SYNC	HDA_55S	HDA	HDA SYNC	18 51
	HDA_55S	HDA	HDA SYNC R	18
HDA_RST_L	HDA_55S	HDA	HDA RST R L	18
	HDA_55S	HDA	HDA RST L	18 51
HDA_SDIN0	HDA_55S	HDA	HDA SDIN0	18 51
	HDA_55S	HDA	HDA SDIN CODEC	
HDA_SDOUT	HDA_55S	HDA	HDA SDOUT	18 51
	HDA_55S	HDA	HDA SDOUT R	18
MCP_HDA_PULLDN_COMP		MCP_HDA_COMP	MCP HDA PULLDN COMP	18
MCP_SUS_CLK	CLK_SLOW_55S	CLK_SLOW	PM CLK32K SUSCLK R	18 24
	CLK_SLOW_55S	CLK_SLOW	PM CLK32K SUSCLK	24 39
SPI_CLK	SPI_55S	SPI	SPI CLK R	18 41
	SPI_55S	SPI	SPI CLK	6 41
SPI_MOSI	SPI_55S	SPI	SPI MOSI R	18 41
	SPI_55S	SPI	SPI MOSI	6 41
SPI_MISO	SPI_55S	SPI	SPI MISO	6 18 41
SPI_CS0	SPI_55S	SPI	SPI CS0 R L	18 41
	SPI_55S	SPI	SPI CS0 L	6 41
	SPI_55S	SPI	SPI MLB CLK	41 50
	SPI_55S	SPI	SPI MLB MOSI	41 50
	SPI_55S	SPI	SPI MLB MISO	41 50
	SPI_55S	SPI	SPI MLB CS L	41 50
	SPI_55S	SPI	SPI ALT CLK	41
	SPI_55S	SPI	SPI ALT MOSI	41
	SPI_55S	SPI	SPI ALT MISO	41
	SPI_55S	SPI	SPI ALT CS L	41

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MCP RGMII (Ethernet) Constraints

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

SD Card 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
SD_55S	*	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=STANDARD	=STANDARD

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

RGMII Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	SPACING		
MCP_MII_COMP	MCP_MII_COMP		MCP_MII_COMP_VDD	17
MCP_MII_COMP	MCP_MII_COMP		MCP_MII_COMP_GND	17
MCP_CLK25M_BUF0	ENET_MII_55S	MCP_BUF0_CLK	MCP_CLK25M_BUF0_R	
	ENET_MII_55S	MCP_BUF0_CLK	RTL8211_CLK25M_CKXTAL1	
ENET_INTR_L	ENET_MII_55S	ENET_MII	ENET_INTR_L	
ENET_MDIO	ENET_MII_55S	ENET_MII	ENET_MDIO	8 17
ENET_MDC	ENET_MII_55S	ENET_MII	ENET_MDC	
ENET_PWRDWN_L	ENET_MII_55S	ENET_MII	ENET_PWRDWN_L	
ENET_RXCLK	ENET_MII_55S	ENET_MII	ENET_CLK125M_RXCLK_R	
	ENET_MII_55S	ENET_MII	ENET_CLK125M_RXCLK	8 17
	ENET_MII_55S	ENET_MII	ENET_RXD_R<3..0>	
ENET_RXD_STRAP	ENET_MII_55S	ENET_MII	ENET_RXD<0>	8 17
ENET_RXD_STRAP	ENET_MII_55S	ENET_MII	ENET_RXD<3..1>	8 17
ENET_RXD	ENET_MII_55S	ENET_MII	ENET_RX_CTRL	8 17
ENET_TXCLK	ENET_MII_55S	ENET_MII	ENET_CLK125M_TXCLK	
ENET_TXD	ENET_MII_55S	ENET_MII	ENET_TXD<0>	
ENET_TXD	ENET_MII_55S	ENET_MII	ENET_TXD<3..1>	
ENET_TXD	ENET_MII_55S	ENET_MII	ENET_TX_CTRL	
	ENET_MII_55S	ENET_MII	ENET_RESET_L	24 31

Ethernet Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	SPACING		
ENET_MDI	ENET_MDI_100D	ENET_MDI	ENET_MDI_P<3..0>	31 32
	ENET_MDI_100D	ENET_MDI	ENET_MDI_N<3..0>	31 32

SD Card Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	SPACING		
SD_DATA	SD_55S	SD_INTERFACE	SD_D<4..0>	30
	SD_55S	SD_INTERFACE	SDCONN_DATA<4..0>	30 31
	SD_55S	SD_INTERFACE	BCM57765_CR_DATA<4>	31
SD_DATA_R	SD_55S	SD_INTERFACE	SD_D<7..5>	30
	SD_55S	SD_INTERFACE	SDCONN_DATA<7..5>	30 31
	SD_55S	SD_INTERFACE	BCM57765_CR_DATA<7..5>	31
SD_CLK	SD_55S	SD_INTERFACE	SD_CLK	30
	SD_55S	SD_INTERFACE	SD_CLK_R	30
	SD_55S	SD_INTERFACE	SDCONN_CLK	30 31
SD_CMD	SD_55S	SD_INTERFACE	SD_CMD	30
	SD_55S	SD_INTERFACE	SDCONN_CMD	30 31
	SD_55S	SD_INTERFACE	BCM57765_CR_CMD	31

NOTE: SD_D<7..5> are different to support BCM5764M/BCM57765 co-layout.

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FireWire Interface Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
FW_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
FW_TP	*	=3:1_SPACING	?

FireWire Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE: PHYSICAL	NET_TYPE: SPACING
FW_P0_TPA	FW_100D	FW_TP
FW_P0_TPA	FW_100D	FW_TP
FW_P0_TPB	FW_100D	FW_TP
FW_P0_TPB	FW_100D	FW_TP
FW_P1_TPA	FW_100D	FW_TP
FW_P1_TPA	FW_100D	FW_TP
FW_P1_TPB	FW_100D	FW_TP
FW_P1_TPB	FW_100D	FW_TP

Port 2 Not Used

FW_P0_TPA_P 33 35
FW_P0_TPA_N 33 35
FW_P0_TPB_P 33 35
FW_P0_TPB_N 33 35
FW_P1_TPA_P 33 35
FW_P1_TPA_N 33 35
FW_P1_TPB_P 33 35
FW_P1_TPB_N 33 35

CANNOT SYNC THIS PAGE FROM T27, FW CONSTRAINTS CHANGED TO 100OHM DIFF

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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	NET_TYPE SPACING		
SMBUS_SMC_A_S3_SCL	SMB_5SS	SMB	SMBUS_SMC_A_S3_SCL	6 42
SMBUS_SMC_A_S3_SDA	SMB_5SS	SMB	SMBUS_SMC_A_S3_SDA	6 42
SMBUS_SMC_B_S0_SCL	SMB_5SS	SMB	SMBUS_SMC_B_S0_SCL	42
SMBUS_SMC_B_S0_SDA	SMB_5SS	SMB	SMBUS_SMC_B_S0_SDA	42
SMBUS_SMC_0_S0_SCL	SMB_5SS	SMB	SMBUS_SMC_0_S0_SCL	42
SMBUS_SMC_0_S0_SDA	SMB_5SS	SMB	SMBUS_SMC_0_S0_SDA	42
SMBUS_SMC_BSA_SCL	SMB_5SS	SMB	SMBUS_SMC_BSA_SCL	6 42
SMBUS_SMC_BSA_SDA	SMB_5SS	SMB	SMBUS_SMC_BSA_SDA	6 42
SMBUS_SMC_MGMT_SCL	SMB_5SS	SMB	SMBUS_SMC_MGMT_SCL	42
SMBUS_SMC_MGMT_SDA	SMB_5SS	SMB	SMBUS_SMC_MGMT_SDA	42

SMBus Charger Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
CHGR_CSI	1TO1_DIFFPAIR		CHGR_CSI_P	58
	1TO1_DIFFPAIR		CHGR_CSI_N	58
	1TO1_DIFFPAIR		CHGR_CSI_R_P	58
	1TO1_DIFFPAIR		CHGR_CSI_R_N	58
CHGR_CSO	1TO1_DIFFPAIR		CHGR_CSO_P	58
	1TO1_DIFFPAIR		CHGR_CSO_N	58
	1TO1_DIFFPAIR		CHGR_CSO_R_P	44 58
	1TO1_DIFFPAIR		CHGR_CSO_R_N	44 58

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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
SENSE_1TO1_55S	*	=1:1_DIFFPAIR	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=1:1_DIFFPAIR	=1:1_DIFFPAIR
THERM_1TO1_55S	*	=1:1_DIFFPAIR	=55_OHM_SE	=55_OHM_SE	=55_OHM_SE	=1:1_DIFFPAIR	=1:1_DIFFPAIR
DIFFPAIR	*	=1:1_DIFFPAIR			=1:1_DIFFPAIR	=1:1_DIFFPAIR	=1:1_DIFFPAIR

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

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

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

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

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

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
MEM_CLK	MEM_POWER	*	PWR_P2MM
MEM_CMD	MEM_POWER	*	PWR_P2MM
MEM_CTRL	MEM_POWER	*	PWR_P2MM
MEM_DATA	MEM_POWER	*	PWR_P2MM
MEM_DQS	MEM_POWER	*	PWR_P2MM

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

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

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
LVDS	GND	*	GND_P2MM

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
ENET_MDI	GND	*	GND_P2MM

MCP Fanout Constraint Relaxations

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
MEM_40S OVERRIDE	* OVERRIDE	OVERRIDE	OVERRIDE	0.09 MM OVERRIDE	5.8 MM OVERRIDE	OVERRIDE	OVERRIDE
MCP_DV_COMP OVERRIDE	TOP OVERRIDE	OVERRIDE	OVERRIDE	0.1 MM OVERRIDE	500 MIL OVERRIDE	OVERRIDE	OVERRIDE
MCP_MEM_COMP OVERRIDE	TOP OVERRIDE	OVERRIDE	OVERRIDE	0.1 MM OVERRIDE	500 MIL OVERRIDE	OVERRIDE	OVERRIDE
MCP_MII_COMP OVERRIDE	TOP OVERRIDE	OVERRIDE	OVERRIDE	0.1 MM OVERRIDE	500 MIL OVERRIDE	OVERRIDE	OVERRIDE
MCP_USB_RBIAS OVERRIDE	TOP OVERRIDE	OVERRIDE	OVERRIDE	0.1 MM OVERRIDE	500 MIL OVERRIDE	OVERRIDE	OVERRIDE
MCP_DV_COMP OVERRIDE	* OVERRIDE	OVERRIDE	OVERRIDE	0.25 MM OVERRIDE	250 MIL OVERRIDE	OVERRIDE	OVERRIDE

Misc Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
(PCIE_AP)	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_AP_CONN_P	6 29
	CLK_PCIE_100D	CLK_PCIE	PCIE_CLK100M_AP_CONN_N	6 29
(USB_EXTA)	USB_90D	USB	USB_EXTA_MUXED_P	37 75
(USB_EXTA)	USB_90D	USB	USB_EXTA_MUXED_N	37 75
(USB_EXTA)	USB_90D	USB	USB_LT1_P	37
(USB_EXTA)	USB_90D	USB	USB_LT1_N	37
(USB_TPAD)	USB_90D	USB	USB_TPAD_R_P	47
(USB_TPAD)	USB_90D	USB	USB_TPAD_R_N	47
(USB_CAMERA)	USB_90D	USB	USB_CAMERA_CONN_P	6 29
(USB_CAMERA)	USB_90D	USB	USB_CAMERA_CONN_N	6 29
	USB_90D	USB	USB_BT_CONN_P	6 29
	USB_90D	USB	USB_BT_CONN_N	6 29
	USB_90D	USB	USB_LT2_P	37
	USB_90D	USB	USB_LT2_N	37
	ENET_MDI_100D	ENETCONN	ENETCONN_P<3..0>	32
	ENET_MDI_100D	ENETCONN	ENETCONN_N<3..0>	32
	SATA_90D	SATA	SATA_ODD_R2D_UF_P	36
	SATA_90D	SATA	SATA_ODD_R2D_UF_N	36
	SATA_90D	SATA	SATA_ODD_D2R_UF_P	6 36
	SATA_90D	SATA	SATA_ODD_D2R_UF_N	6 36
	SATA_90D	SATA	SATA_HDD_D2R_UF_P	36
	SATA_90D	SATA	SATA_HDD_D2R_UF_N	36
	SATA_90D	SATA	SATA_HDD_R2D_UF_P	36
	SATA_90D	SATA	SATA_HDD_R2D_UF_N	36
	SATA_90D	SATA	SATA_HDD_D2R_RDRV_IN_P	36
	SATA_90D	SATA	SATA_HDD_D2R_RDRV_IN_N	36
	SATA_90D	SATA	SATA_HDD_R2D_RDRV_IN_P	36
	SATA_90D	SATA	SATA_HDD_R2D_RDRV_IN_N	36
	SATA_90D	SATA	SATA_HDD_D2R_RDRV_OUT_P	36
	SATA_90D	SATA	SATA_HDD_D2R_RDRV_OUT_N	36
	SATA_90D	SATA	SATA_HDD_R2D_RDRV_OUT_P	36
	SATA_90D	SATA	SATA_HDD_R2D_RDRV_OUT_N	36
	SATA_90D	SATA	SATA_HDD_D2R_NORDRV_P	36
	SATA_90D	SATA	SATA_HDD_D2R_NORDRV_N	36
	SATA_90D	SATA	SATA_HDD_R2D_NORDRV_P	36
	SATA_90D	SATA	SATA_HDD_R2D_NORDRV_N	36

Graphics Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
	LVDS_100D	LVDS	LVDS_CONN_A_CLK_P	
	LVDS_100D	LVDS	LVDS_CONN_A_CLK_N	
	LVDS_100D	LVDS	LVDS_CONN_A_CLK_F_P	6 67
	LVDS_100D	LVDS	LVDS_CONN_A_CLK_F_N	6 67
	LVDS_100D	LVDS	LVDS_CONN_A_DATA_P<2..0>	
	LVDS_100D	LVDS	LVDS_CONN_A_DATA_N<2..0>	
	LVDS_100D	LVDS	LVDS_CONN_B_CLK_P	
	LVDS_100D	LVDS	LVDS_CONN_B_CLK_N	
	LVDS_100D	LVDS	LVDS_CONN_B_CLK_F_P	
	LVDS_100D	LVDS	LVDS_CONN_B_CLK_F_N	
	LVDS_100D	LVDS	LVDS_CONN_B_DATA_P<2..0>	
	LVDS_100D	LVDS	LVDS_CONN_B_DATA_N<2..0>	
(DP_EXT_ML)	DP_90D	DISPLAYPORT	DP_EXT_ML_P<3..0>	8 69
	DP_90D	DISPLAYPORT	DP_EXT_ML_N<3..0>	8 69
	DP_90D	DISPLAYPORT	DP_EXT_ML_C_P<3..0>	69
	DP_90D	DISPLAYPORT	DP_EXT_ML_C_N<3..0>	69
	DP_90D	DISPLAYPORT	DP_EXT_ML_F_P<3..0>	69
	DP_90D	DISPLAYPORT	DP_EXT_ML_F_N<3..0>	69
(DP_EXT_AUX_CH)	DP_90D	DISPLAYPORT	DP_EXT_AUX_CH_C_P	8 69
	DP_90D	DISPLAYPORT	DP_EXT_AUX_CH_C_N	8 69
	DP_90D	DISPLAYPORT	DP_AUX_CH_SW_P	
	DP_90D	DISPLAYPORT	DP_AUX_CH_SW_N	

Power Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
CPUTHMSNS_D2	THERM_1TO1_55S	THERM	CPUTHMSNS_D2_P	45
	THERM_1TO1_55S	THERM	CPUTHMSNS_D2_N	45
CPU_THERMD	THERM_1TO1_55S	THERM	CPU_THERMD_P	9 45
	THERM_1TO1_55S	THERM	CPU_THERMD_N	9 45
MCPTHMSNS_D2	THERM_1TO1_55S	THERM	MCPTHMSNS_D2_P	
	THERM_1TO1_55S	THERM	MCPTHMSNS_D2_N	
MCP_THMDIODE	THERM_1TO1_55S	THERM	MCP_THMDIODE_P	18 45
	THERM_1TO1_55S	THERM	MCP_THMDIODE_N	18 45
SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	ISNS_1V5_S3_P	
	SENSE_1TO1_55S	SENSE	ISNS_1V5_S3_N	
	SENSE_1TO1_55S	SENSE	ISNS_1V5_S3_R_P	
	SENSE_1TO1_55S	SENSE	ISNS_1V5_S3_R_N	
SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	ISNS_AIRPORT_P	
	SENSE_1TO1_55S	SENSE	ISNS_AIRPORT_N	
	SENSE_1TO1_55S	SENSE	ISNS_AIRPORT_R_P	
	SENSE_1TO1_55S	SENSE	ISNS_AIRPORT_R_N	
SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	ISNS_HDD_P	
	SENSE_1TO1_55S	SENSE	ISNS_HDD_N	
	SENSE_1TO1_55S	SENSE	ISNS_HDD_R_P	
	SENSE_1TO1_55S	SENSE	ISNS_HDD_R_N	
SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	ISNS_LCDBKLT_P	
	SENSE_1TO1_55S	SENSE	ISNS_LCDBKLT_N	
	SENSE_1TO1_55S	SENSE	ISNS_LCDBKLT_R_P	
	SENSE_1TO1_55S	SENSE	ISNS_LCDBKLT_R_N	
SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	ISNS_ODD_P	
	SENSE_1TO1_55S	SENSE	ISNS_ODD_N	
	SENSE_1TO1_55S	SENSE	ISNS_ODD_R_P	
	SENSE_1TO1_55S	SENSE	ISNS_ODD_R_N	
SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	ISNS_CPUVTT_P	44
	SENSE_1TO1_55S	SENSE	ISNS_CPUVTT_N	44
SENSE_DIFFPAIR	SENSE_1TO1_55S	SENSE	MCPCORES0_VSEN_P	21 62
	SENSE_1TO1_55S	SENSE	MCPCORES0_VSEN_N	21 62
PZ77		MEM_POWER	PP1V5R1V35_S3	6 7
		SB_POWER	PP3V3_S5	6 7 65
		SB_POWER	PP3V3_S0	6 7 65
		SB_POWER	PP1V5_S0	6 7 65
		GND	GND	

Audio Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE PHYSICAL	NET_TYPE SPACING		
	DIFFPAIR	AUDIO	AUD_SPKRAMP_LIN_P	
	DIFFPAIR	AUDIO	AUD_SPKRAMP_LIN_N	
	DIFFPAIR	AUDIO	AUD_SPKRAMP_SUBIN_P	
	DIFFPAIR	AUDIO	AUD_SPKRAMP_SUBIN_N	
	DIFFPAIR	AUDIO	AUD_SPKRAMP_RIN_P	
	DIFFPAIR	AUDIO	AUD_SPKRAMP_RIN_N	
	DIFFPAIR	AUDIO	SSM2315L_P	
	DIFFPAIR	AUDIO	SSM2315L_N	
	DIFFPAIR	AUDIO	SSM2315S_P	
	DIFFPAIR	AUDIO	SSM2315S_N	
	DIFFPAIR	AUDIO	SSM2315R_P	
	DIFFPAIR	AUDIO	SSM2315R_N	
SPK_OUT	DIFFPAIR	AUDIO	SPKRCONN_L_OUT_P	
	DIFFPAIR	AUDIO	SPKRCONN_L_OUT_N	
SPK_OUT	DIFFPAIR	AUDIO	SPKRCONN_S_OUT_P	
	DIFFPAIR	AUDIO	SPKRCONN_S_OUT_N	
SPK_OUT	DIFFPAIR	AUDIO	SPKRCONN_R_OUT_P	
	DIFFPAIR	AUDIO	SPKRCONN_R_OUT_N	
	DIFFPAIR	AUDIO	BI_MIC_P	
	DIFFPAIR	AUDIO	BI_MIC_N	
	DIFFPAIR	AUDIO	HS_MIC_P	
	DIFFPAIR	AUDIO	HS_MIC_N	

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K6/K69 Board-Specific Physical & Spacing Constraints

BOARD LAYERS	BOARD AREAS	BOARD UNITS (MIL or MM)	ALLEGRO VERSION
TOP,ISL2,ISL3,ISL4,ISL5,ISL6,ISL7,ISL8,ISL9,ISL10,ISL11,BOTTOM	NO_TYPE,BGA	MM	15.2

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	0.080 MM	12.7 MM	0 MM	0 MM
STANDARD	*	Y	=DEFAULT	=DEFAULT	12.7 MM	=DEFAULT	=DEFAULT

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

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
50_OHM_SE	TOP,BOTTOM	Y	0.115 MM	0.115 MM			
50_OHM_SE	*	Y	0.076 MM	0.076 MM	=STANDARD	=STANDARD	=STANDARD

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
40_OHM_SE	TOP,BOTTOM	Y	0.165 MM	0.100 MM			
40_OHM_SE	*	Y	0.126 MM	0.100 MM	=STANDARD	=STANDARD	=STANDARD

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
27P4_OHM_SE	TOP,BOTTOM	Y	0.310 MM	0.310 MM			
27P4_OHM_SE	*	Y	0.222 MM	0.222 MM	=STANDARD	=STANDARD	=STANDARD

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
70_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD
70_OHM_DIFF	ISL3,ISL4,ISL9,ISL10	Y	0.151 MM	0.109 MM	=STANDARD	0.224 MM	0.090 MM
70_OHM_DIFF	TOP,BOTTOM	Y	0.185 MM	0.185 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
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	*	0.1 MM	?
BGA_P2MM	*	0.2 MM	?
BGA_P3MM	*	0.3 MM	?

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
1.5X_DIELECTRIC	TOP,BOTTOM	0.105 MM	?
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	?
1.5X_DIELECTRIC	*	0.095 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	BGA_P1MM
MEM_CLK	*	BGA	BGA_P2MM
CLK_FSB	*	BGA	BGA_P2MM
CLK_LPC	*	BGA	BGA_P2MM
CLK_PCIE	*	BGA	BGA_P2MM
CLK_SLOW	*	BGA	BGA_P2MM
FSB_DSTB	FSB_DSTB	BGA	BGA_P3MM

NET_PHYSICAL_TYPE	AREA_TYPE	PHYSICAL_RULE_SET
MEM_40S	BGA	STANDARD

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