

# M60 - EVT

05/12/06

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

REV	ZONE	ECN	DESCRIPTION OF CHANGE	CK APPD	ENG APPD
06		400374	ENGINEERING RELEASED	09/16/05	06/22/04

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96	JH	78 GPU - TMDS, INVERTER, EXT VGA
97	JH	79 GPU - EXTERNAL DISPLAY CONN'S

<p style="font-size: small;">DIMENSIONS ARE IN MILLIMETERS</p> <p>XX : _____</p> <p>X.XX : _____</p> <p>X.XXX : _____</p> <p>ANGLES : _____</p> <p style="text-align: center; font-size: x-small;">DO NOT SCALE DRAWING</p> <div style="text-align: center;"> <p style="font-size: x-small;">THIRD ANGLE PROJECTION</p> </div>	<p><b>METRIC</b></p>	<b>Apple Computer Inc.</b>
<p>DRAPTER</p> <p>ENG APPD</p> <p>QA APPD</p> <p>RELEASE</p>	<p>DESIGN CK</p> <p>MFG APPD</p> <p>DESIGNER</p> <p>SCALE</p>	<p><b>NOTICE OF PROPRIETARY PROPERTY</b></p> <p>THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING</p> <p>I TO MAINTAIN THE DOCUMENT IN CONFIDENCE</p> <p>II NOT TO REPRODUCE OR COPY IT</p> <p>III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART</p>
<p><b>SCH, MLB, M60</b></p>		<p><b>TITLE</b></p>
<p style="font-size: x-small;">MATERIAL/FINISH NOTED AS APPLICABLE</p>		<p><b>DRAWING NUMBER</b> 051-7124 <b>REV.</b> 13</p>
<p style="font-size: x-small;">SIZE D</p>		<p style="font-size: x-small;">SHT 1 OF 110</p>

D

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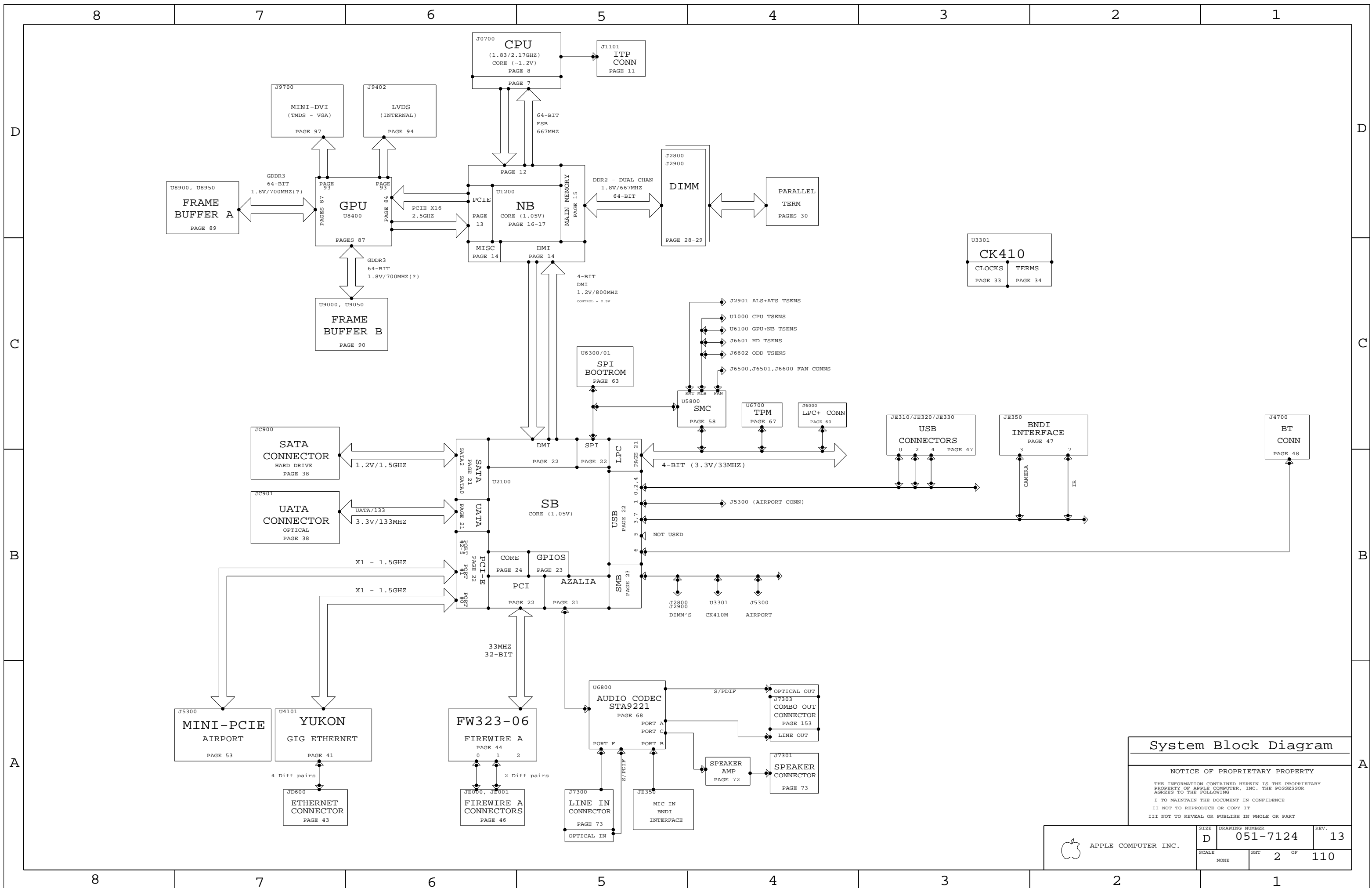
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### System Block Diagram

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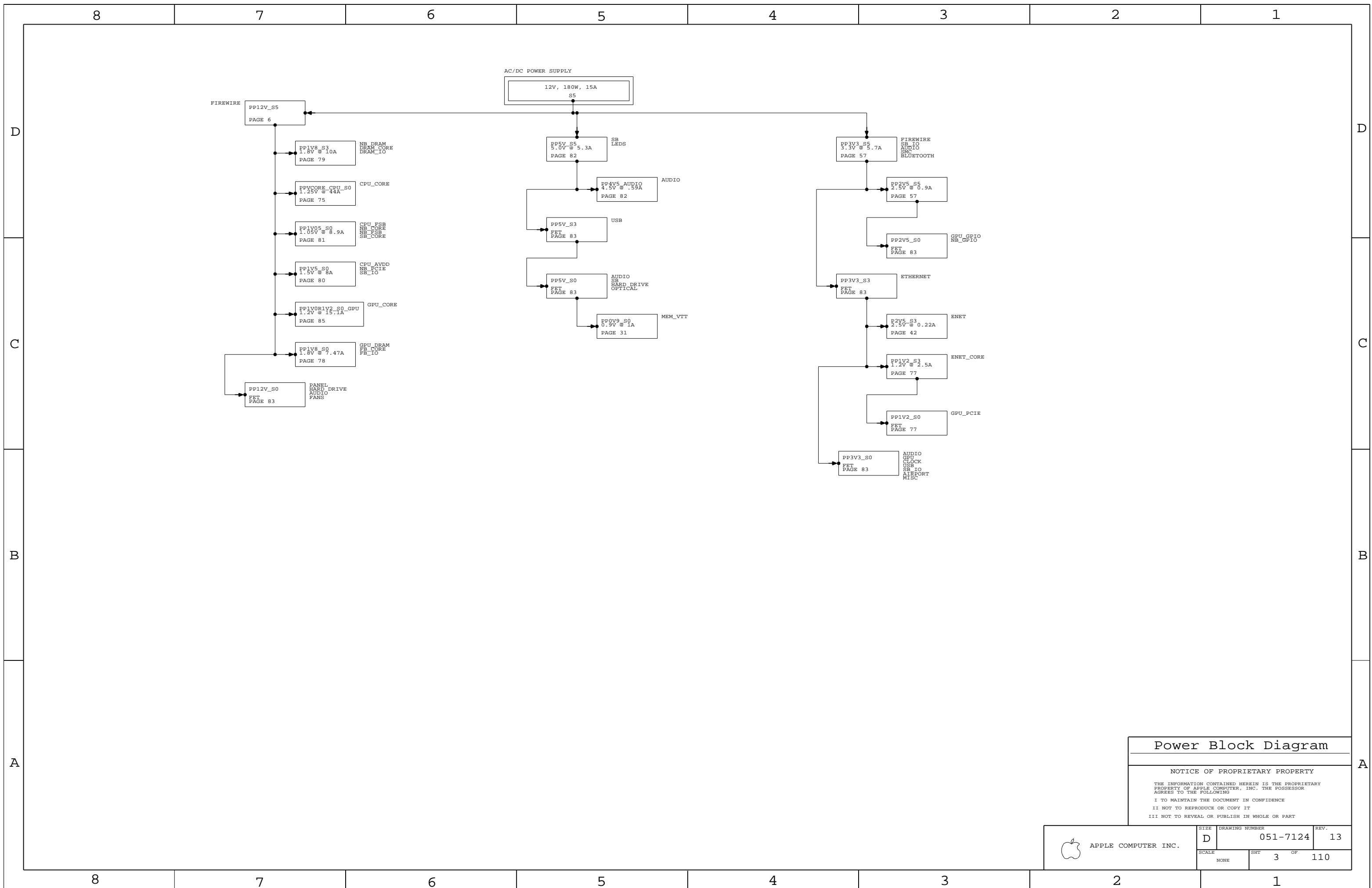
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NONE	2	110	



Power Block Diagram

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	D	051-7124	13
SCALE	SHT	OF	REV.
NONE	3	110	

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COMMON

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
511S0025	1	IC,CPU-SKT,479BGA	J0700	CRITICAL	
338S0328	1	IC,945PM,NORTHBRIDGE	U1200	CRITICAL	
343S0385	1	IC,SB,652BGA	U2100	CRITICAL	
338S0345	1	IC,ATI,M56D,GRAFIXCTLR,880BGA,LF	U8400	CRITICAL	
359S0101	1	IC,CY28445-5,CLK GEN,68PIN QFN	U3301	CRITICAL	
338S0270	1	IC,88E053,01GIBIT ENET XCVR,64P QFN,SMD	U4101	CRITICAL	
(335S0382) 341S1797	1	IC,ENET LAN ROM	U4102	CRITICAL	
338S0279	1	IC,FW32306,1394A LINK,TQFP	U4400	CRITICAL	

341S1789	1	IC,TPM,TSSOP,28P	U6700	CRITICAL	LEMENU
UNSCREENED P/N 353S1235 353S1465	1	IC,CPU VREG,IMVP,TWO PHASE	U7500	CRITICAL	

128S0078	2	CAP,EL,AL,330UF,20V,16V,10X12.7MM,SMD,LF	C7517,C7518	CRITICAL	
825-6447	1	MLB LABEL,48.0X4.8	X14	CRITICAL	

PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
-------------	---------------------------	------------	---------	-----------

126S0086	126S0078		C940 C1900,C1901 C1968	SANYO W6CE330F8 330UF 6.3V LF
128S0080	128S0078		C7517,C7518	SANYO 160VP330W 330UF 16V SMD LF
124-0338	124-0333			CAP,AL,EL,680UF,16V,RAD,10X12.5MM
138S0580	138S0552			22UF 0805
353S1321	353S1105		U7910	LM339
338S0344	338S0345		U8400	M56 B26 P - DIFF P/N
353S1461	353S1465		U7500	CPU REGULATOR - ISL9504

(341S1904 - DEV)  
 (341S1905 - PVT)  
 (335S0384 - BLNK)  
 (341S1903 - PROG)  
 (338S0274 - BLNK)

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
051-7124	1	PCB,SCHEM,MLB,M60	SCH1		20_INCH_LCD
820-2031	1	PCB,FAB,MLB,M60	MLB1		20_INCH_LCD
341T0036	1	EPI ROM,M60	U6301	CRITICAL	20_INCH_LCD
341T0035	1	IC,SMC,M60	U5800	CRITICAL	20_INCH_LCD
338S0315	1	IC,ATI,M56LP,GRAFIX CTLR,880BGA,LF	U8400	CRITICAL	GPU_B26_LP
114S0264	1	3.01K,1%,1/16W,402,MP-LF	R8522		GPU_VCORE_1P2V
337S3293	1	2.16GHZ MEROM	CPU	CRITICAL	2P16_CPU
337S3292	1	2.33GHZ MEROM	CPU	CRITICAL	2P33_CPU

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
333S0354	4	IC,SDRAM,GDDR3,8MX32,700MHZ,136FBGA	U8900,U8950,U9000,U9050	CRITICAL	ATI_FB_128M_SAMSUNG
333S0358	4	IC,SDRAM,GDDR3,8MX32,700MHZ,136FBGA	U8900,U8950,U9000,U9050	CRITICAL	ATI_FB_128M_HYNIX
333S0376	4	IC,SDRAM,GDDR3,8MX32,700MHZ,136FBGA	U8900,U8950,U9000,U9050	CRITICAL	ATI_FB_128M_INFINEON

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
333S0350	4	IC,SDRAM,GDDR3,16MX32,700MHZ,136FBGA	U8900,U8950,U9000,U9050	CRITICAL	ATI_FB_256M_SAMSUNG
333S0351	4	IC,SDRAM,GDDR3,16MX32,700MHZ,136FBGA	U8900,U8950,U9000,U9050	CRITICAL	ATI_FB_256M_HYNIX
333S0377	4	IC,SDRAM,GDDR3,16MX32,600MHZ,136FBGA	U8900,U8950,U9000,U9050	CRITICAL	ATI_FB_256M_INFINEON

Table Items

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SCALE	SHT	OF
NONE	4	110

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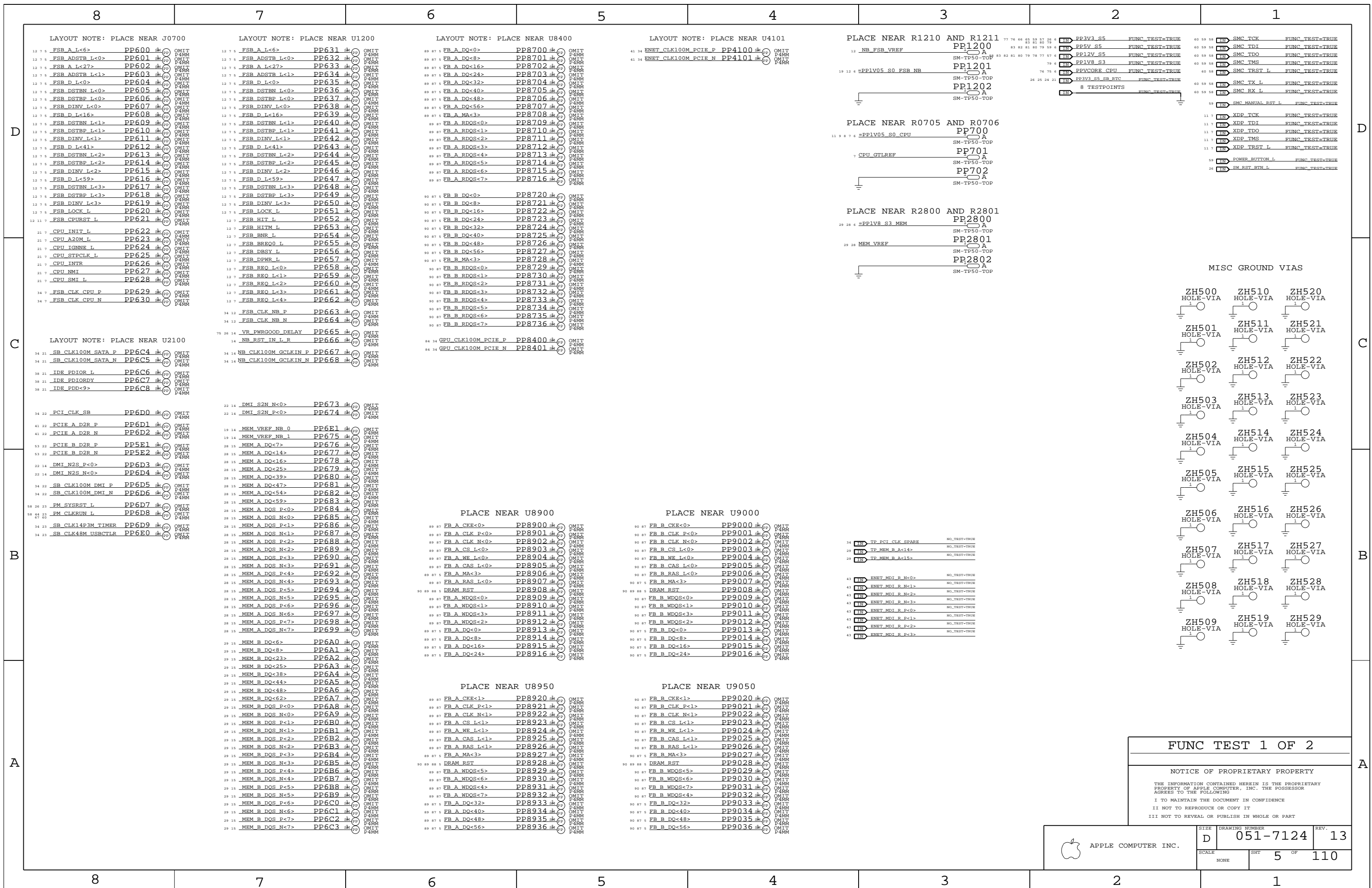
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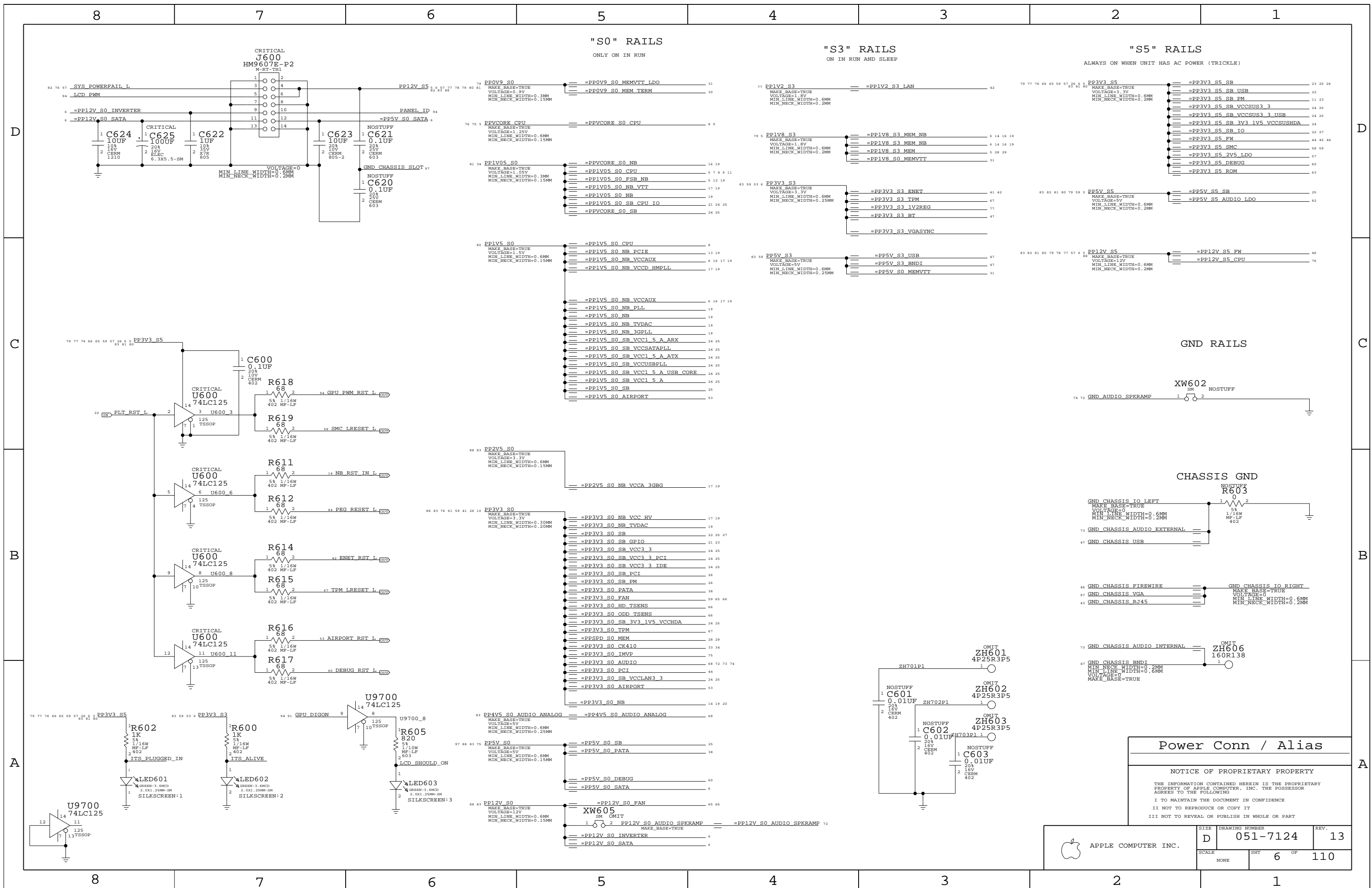


FUNC TEST 1 OF 2

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SCALE	SHEET	OF	
NONE	5	110	



"S0" RAILS

ONLY ON IN RUN

"S3" RAILS

ON IN RUN AND SLEEP

"S5" RAILS

ALWAYS ON WHEN UNIT HAS AC POWER (TRICKLE)

GND RAILS

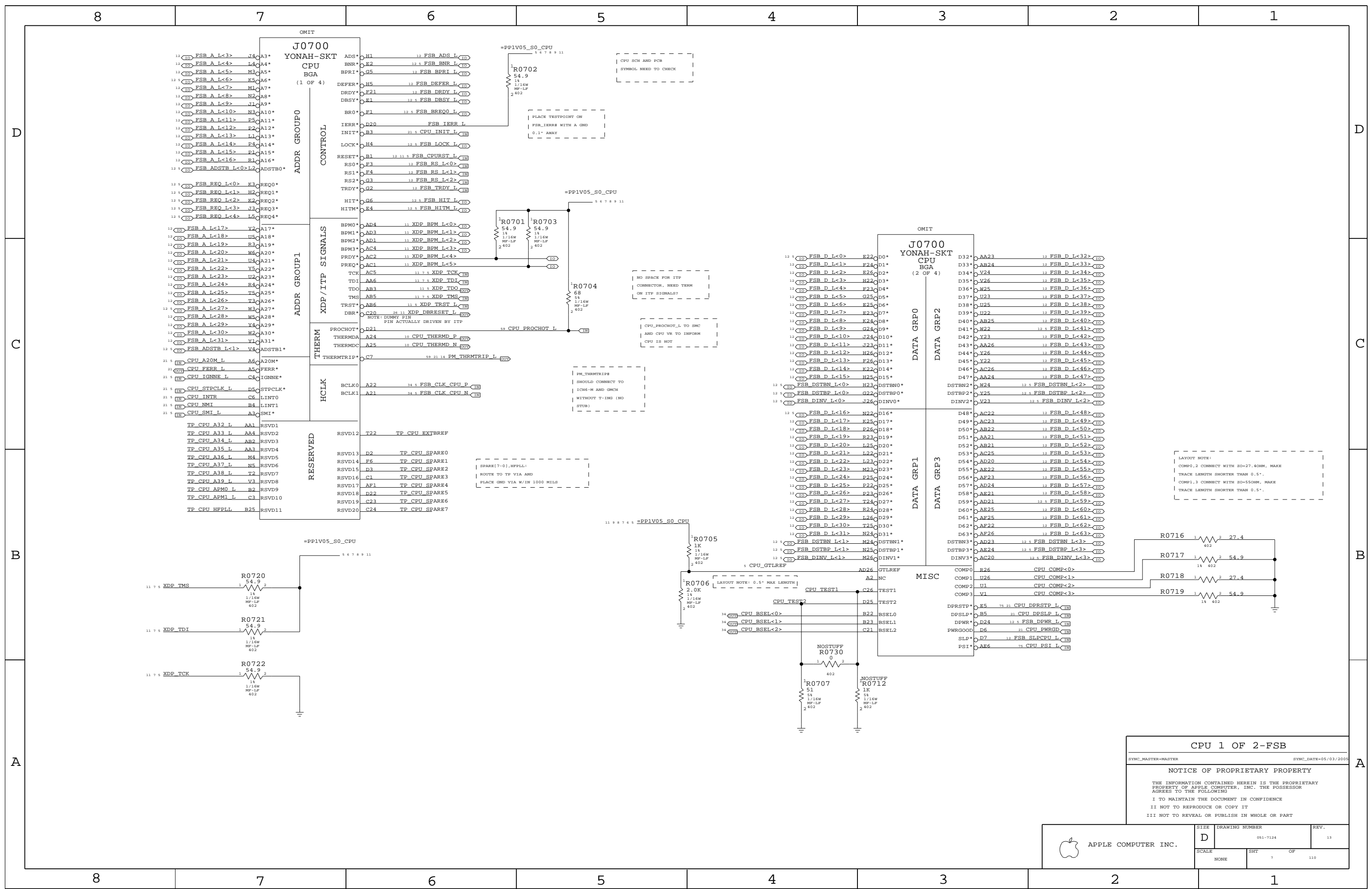
CHASSIS GND

Power Conn / Alias

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	SCALE NONE	SHEET 6 OF 110	



**CPU 1 OF 2-FSB**

SYNC\_MASTER=MASTER SYNC\_DATE=05/03/2005

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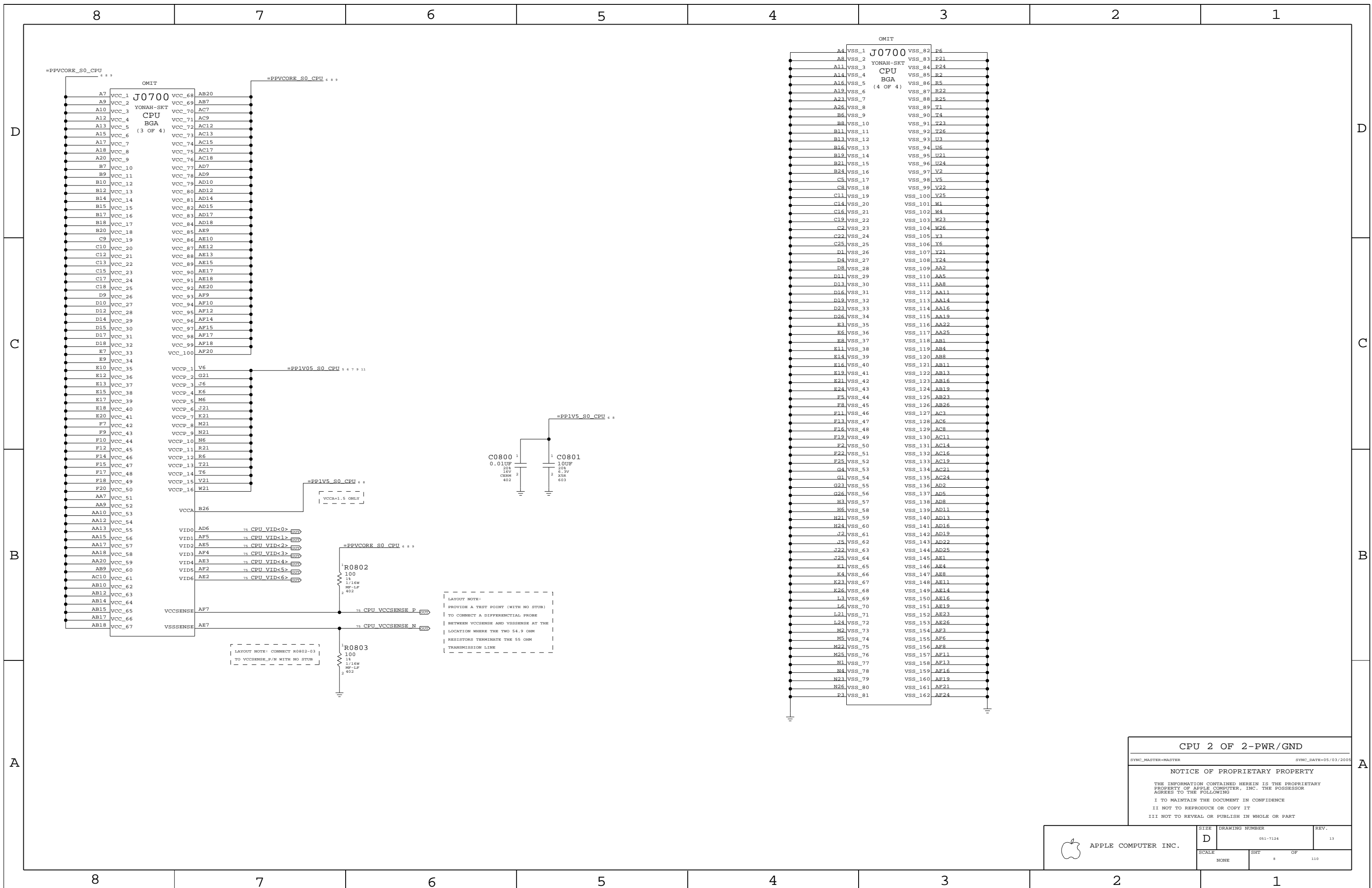
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NONE		7	110



**CPU 2 OF 2-PWR/GND**

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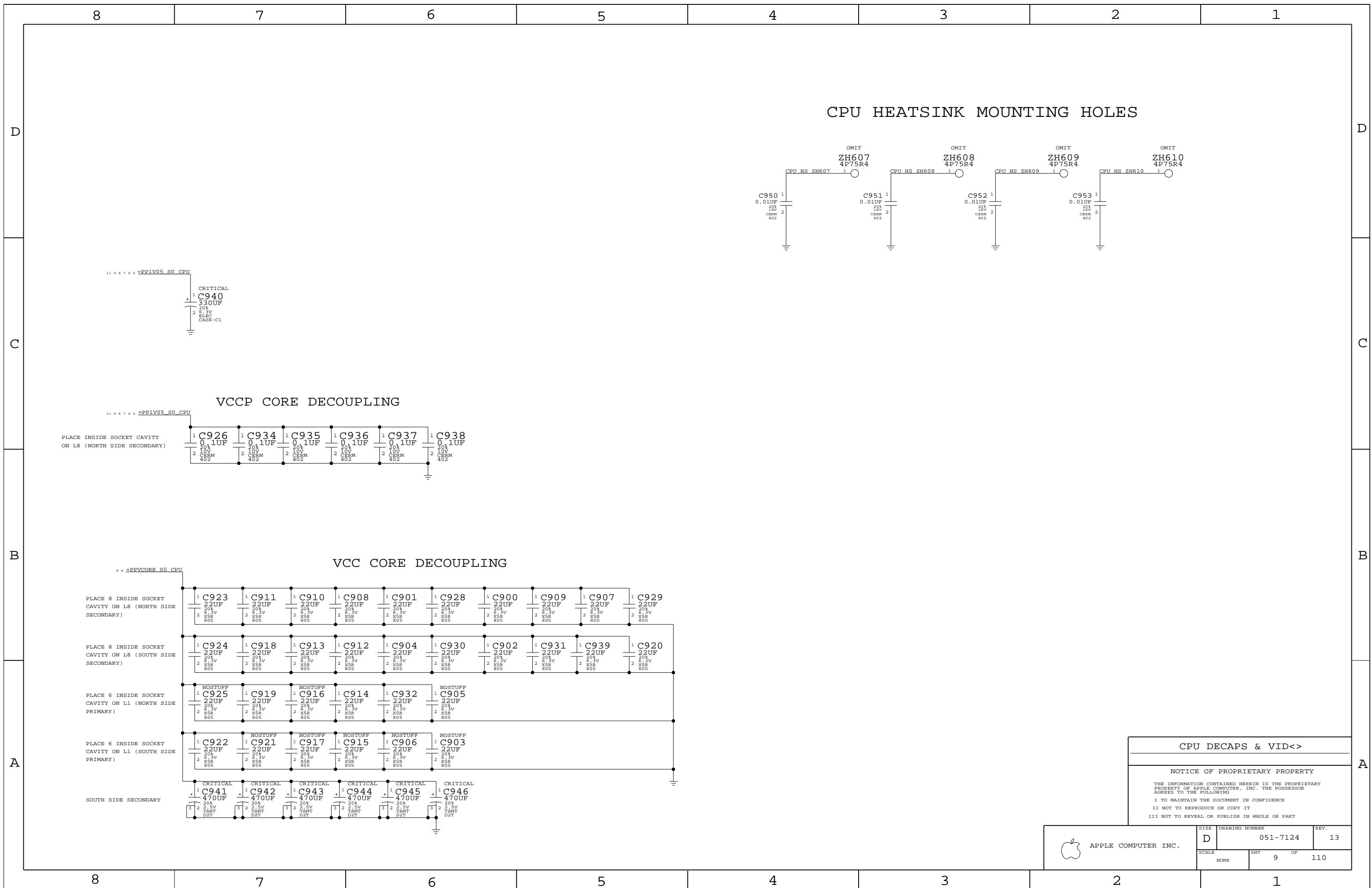
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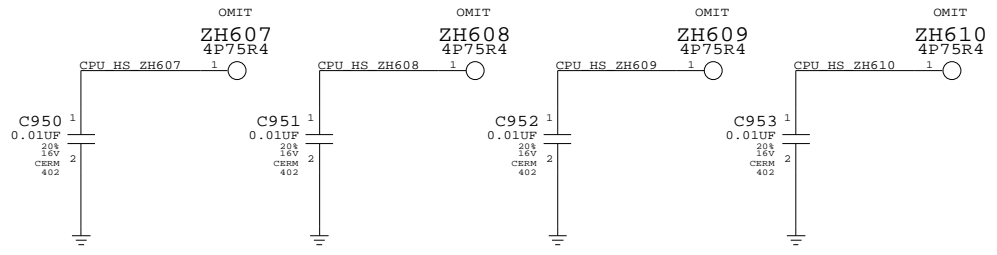
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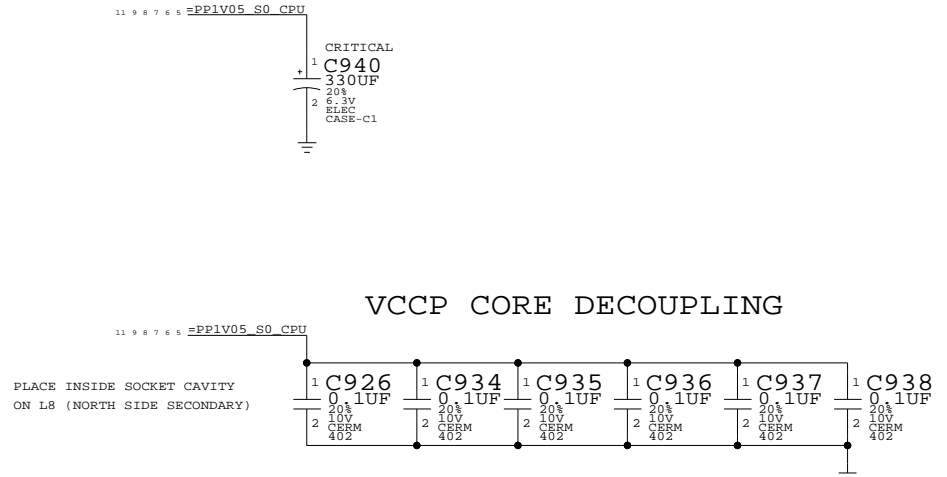




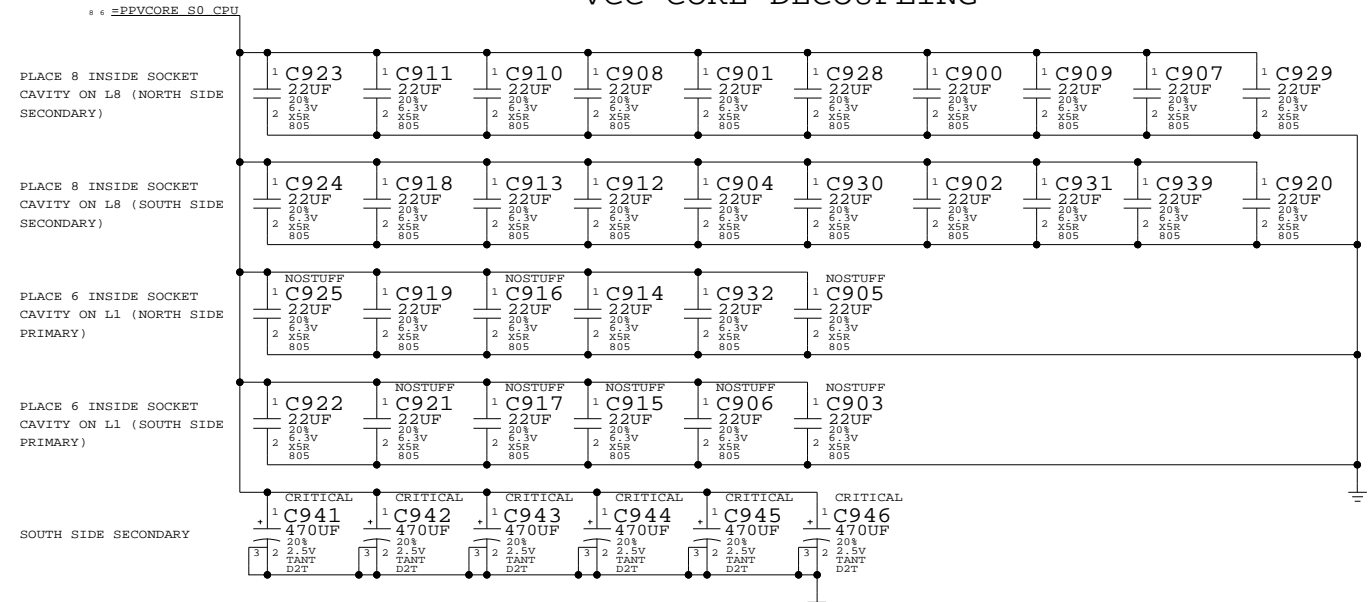
CPU HEATSINK MOUNTING HOLES



VCCP CORE DECOUPLING



VCC CORE DECOUPLING



CPU DECAPS & VID<>

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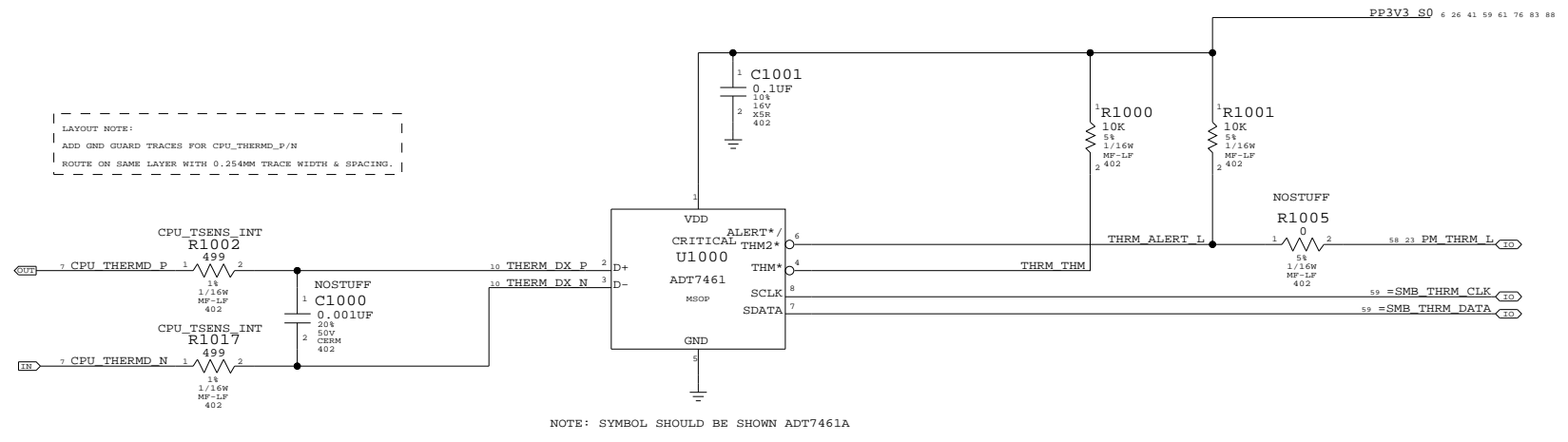
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SCALE	SHT	OF	REV.
NONE	9	110	

# CPU THERMAL SENSOR

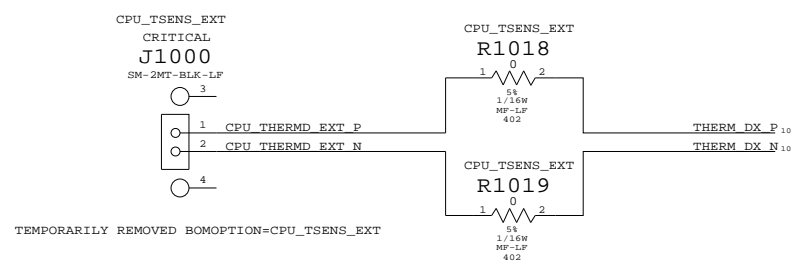
NOTE:  
IF CPU T DIODE TO BE READ IN OFF STATE,  
THEN THIS SHOULD BE S5

LAYOUT NOTE:  
ADD GND GUARD TRACKS FOR CPU\_THERMD\_P/N  
ROUTE ON SAME LAYER WITH 0.254MM TRACE WIDTH & SPACING.



NOTE: SYMBOL SHOULD BE SHOWN ADT7461A

LAYOUT NOTE:  
PLACE R1002 AND R1018 SUCH THAT THEY SHARE ONE PAD  
PLACE R1017 AND R1019 SUCH THAT THEY SHARE ONE PAD



TEMPORARILY REMOVED BOMOPTION=CPU\_TSENS\_EXT

## CPU TEMP SENSOR

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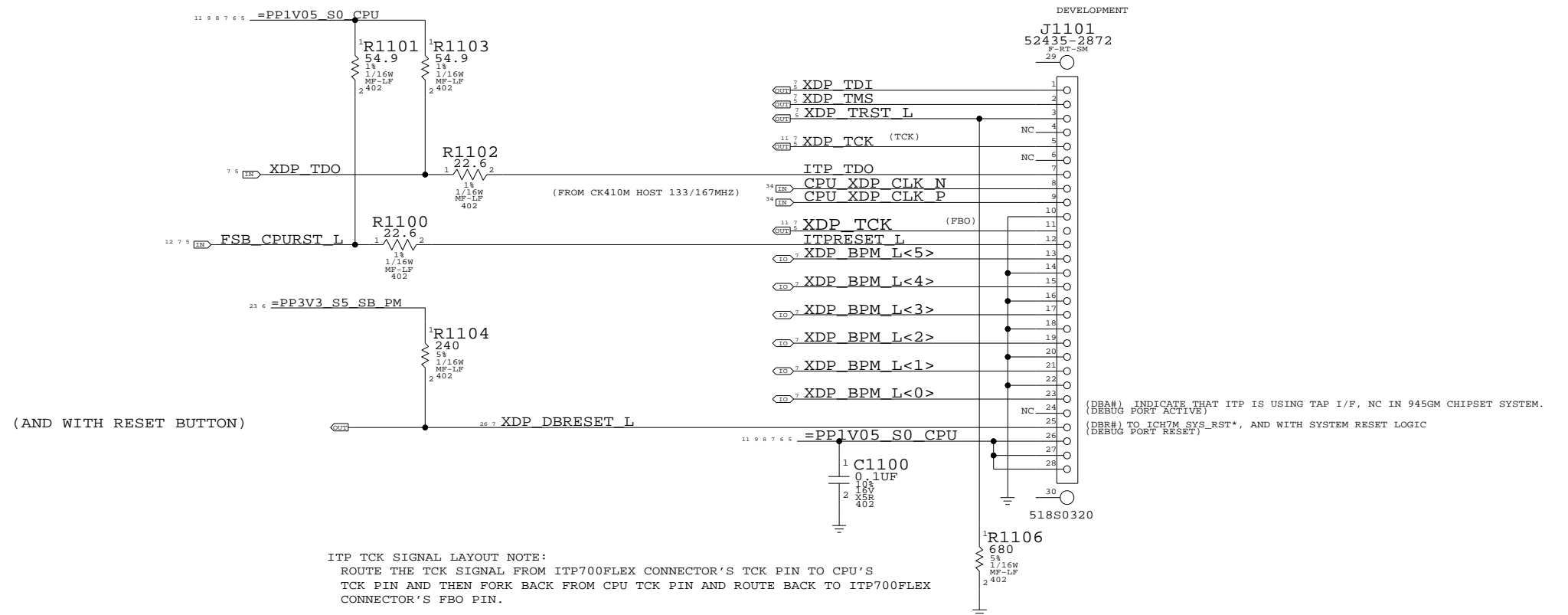
B

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# CPU ITP700FLEX DEBUG SUPPORT



**CPU ITP700FLEX DEBUG**  
 SYNC\_MASTER=MASTER SYNC\_DATE=5/23/05

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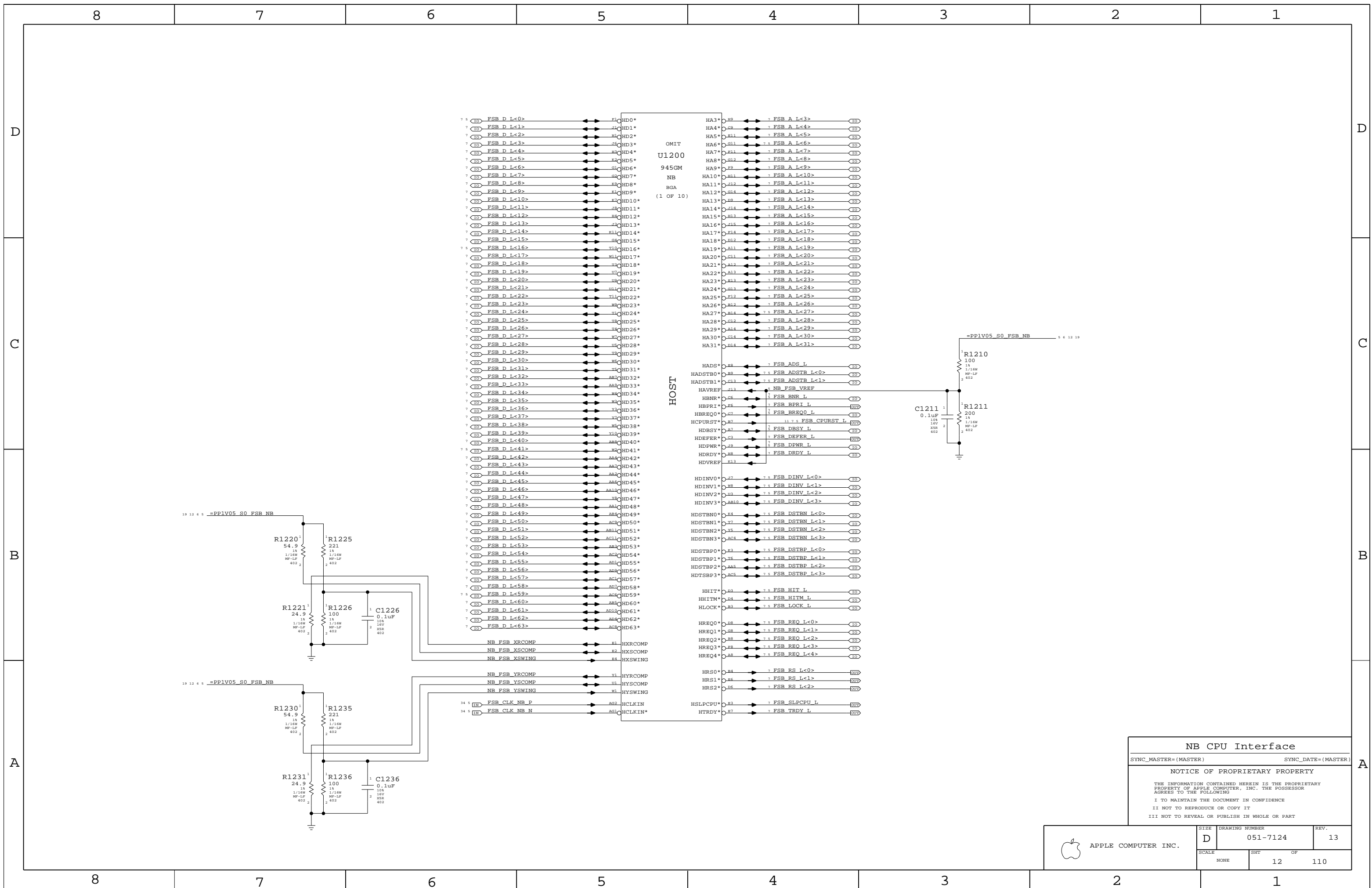
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**NB CPU Interface**

SYNC\_MASTER=(MASTER)      SYNC\_DATE=(MASTER)

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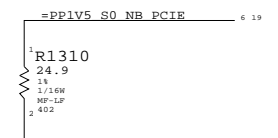
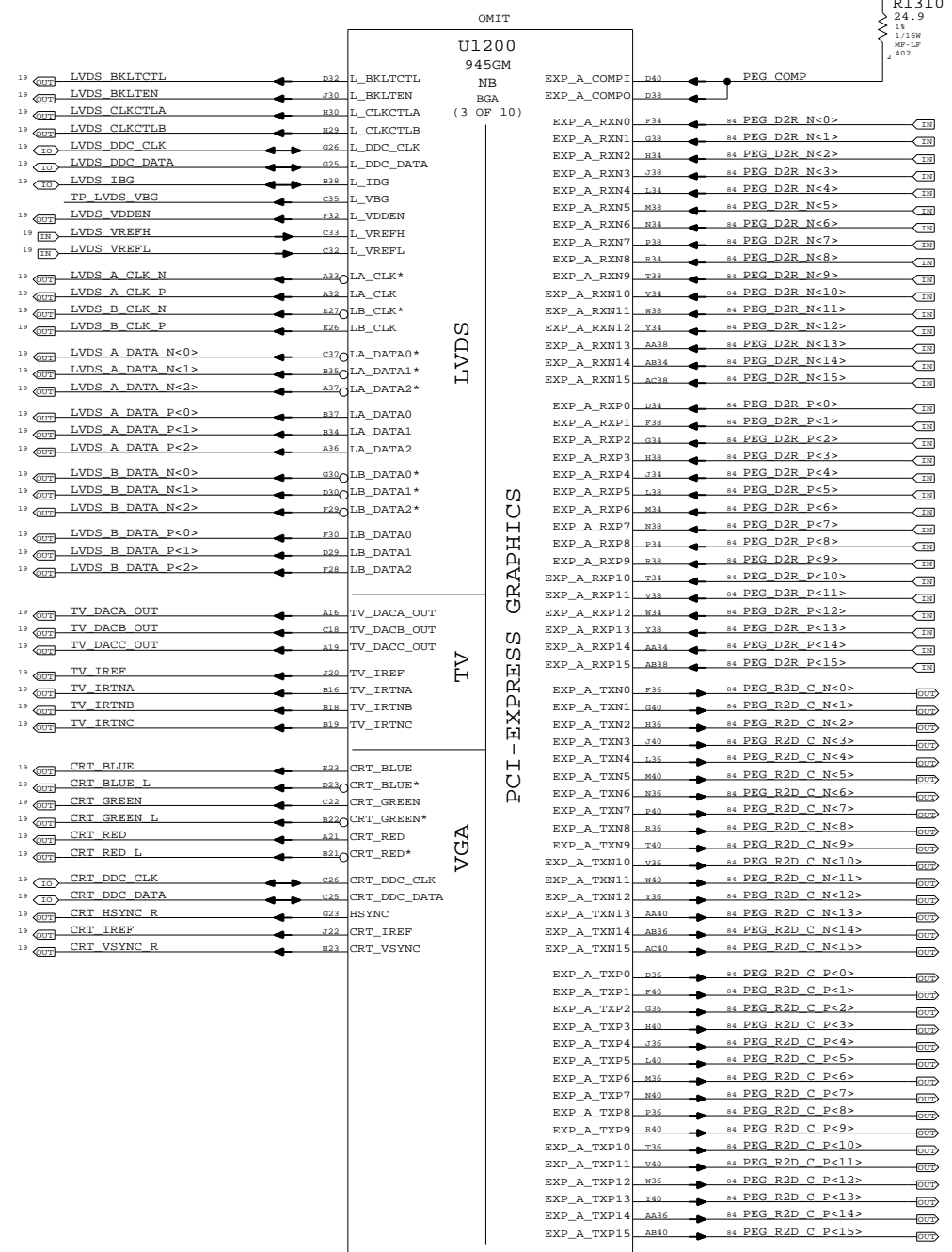
**LVDS Disable**  
 Can leave all signals NC if LVDS is not implemented  
 Tie VCC\_TXLVDS and VCCA\_LVDS to GND. If SDVO is used  
 VCCD\_LVDS must remain powered with proper decoupling.  
 Otherwise, tie VCCD\_LVDS to GND also.

**TV-Out Signal Usage:**  
 Composite: DACA only  
 S-Video: DACB & DACC only  
 Component: DACA, DACB & DACC

Unused DAC outputs must remain powered, but can omit  
 filtering components. Unused DAC outputs should  
 connect to GND through 75-ohm resistors.

**TV-Out Disable**  
 Tie DACx\_OUT, IRTNx, and IREF to 1.5V power rail.  
 Tie VCCD\_TVDAC, VCCD\_QTVDAC, VCCA\_TVDACx, and  
 VCCA\_TVVBG to 1.5V power rail. Tie VSSA\_TVVBG to GND.

**CRT Disable**  
 Tie R/R#/G/G#/B/B# and IREF to VCC Core rail, tie  
 HSYNC and VSYNC to GND. Tie VCCA\_CRTDAC to VCC Core  
 rail, and tie VSSA\_CRTDAC and VCC\_SYNC to GND.



SDVO Alternate Function

SDVO\_TVCLKIN#  
 SDVO\_INT#  
 SDVO\_FLDSTALL#

SDVO\_TVCLKIN  
 SDVO\_INT  
 SDVO\_FLDSTALL

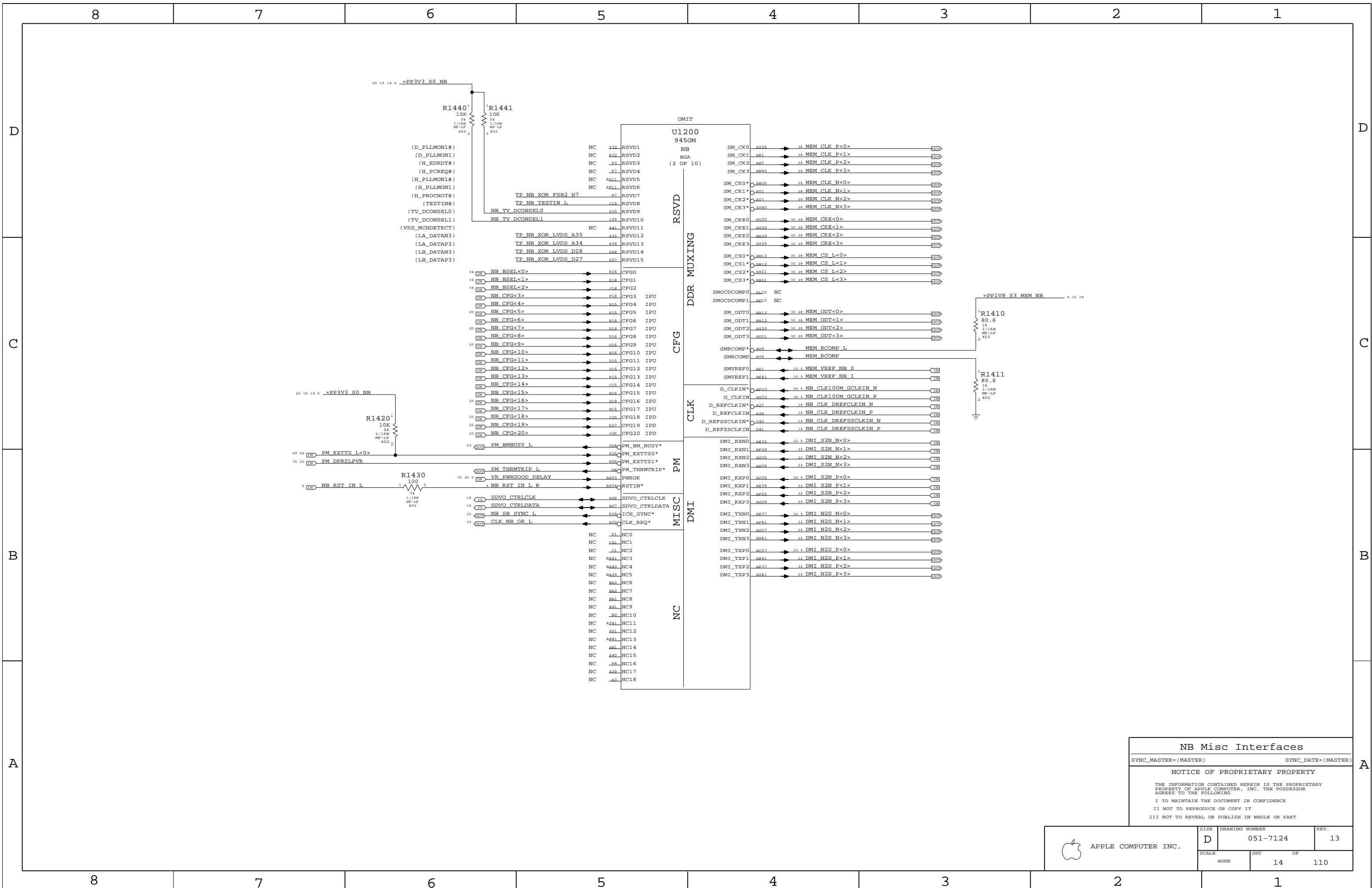
SDVOB\_RED#  
 SDVOB\_GREEN#  
 SDVOB\_BLUE#  
 SDVOB\_CLKN  
 SDVOC\_RED#  
 SDVOC\_GREEN#  
 SDVOC\_BLUE#  
 SDVOC\_CLKN

SDVOB\_RED  
 SDVOB\_GREEN  
 SDVOB\_BLUE  
 SDVOB\_CLKP  
 SDVOC\_RED  
 SDVOC\_GREEN  
 SDVOC\_BLUE  
 SDVOC\_CLKP

NB PEG / Video Interfaces  
 SYNC\_MASTER=(MASTER) SYNC\_DATE=(MASTER)

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SCALE	SHT OF		
NONE	13		110



**NB Misc Interfaces**

SYNC\_MASTER=(MASTER)      SYNC\_DATE=(MASTER)

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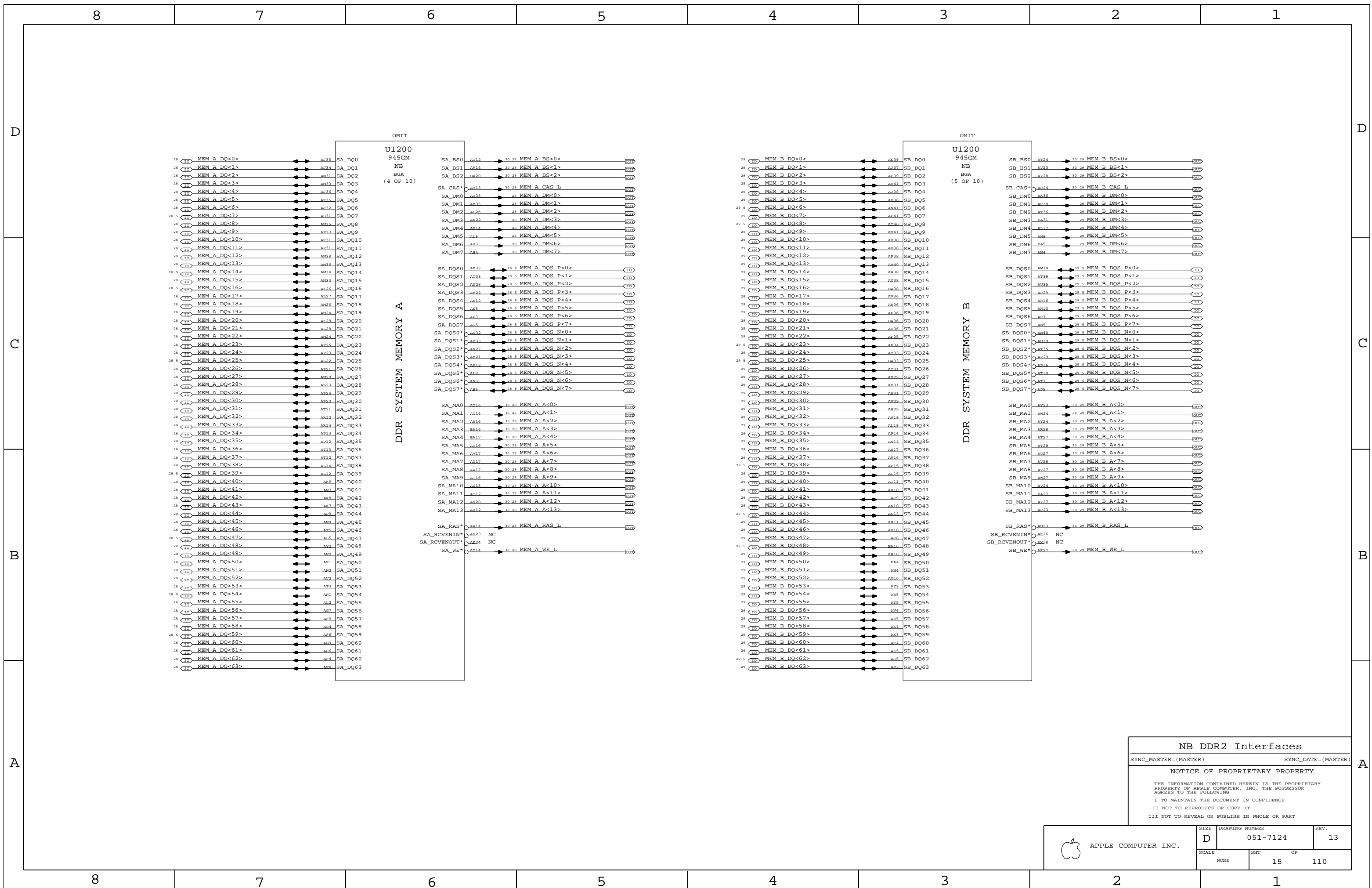
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	SCALE NONE	SHIT 14	OF 110



**NB DDR2 Interfaces**

SYNC\_MASTER=(MASTER)      SYNC\_DATE=(MASTER)

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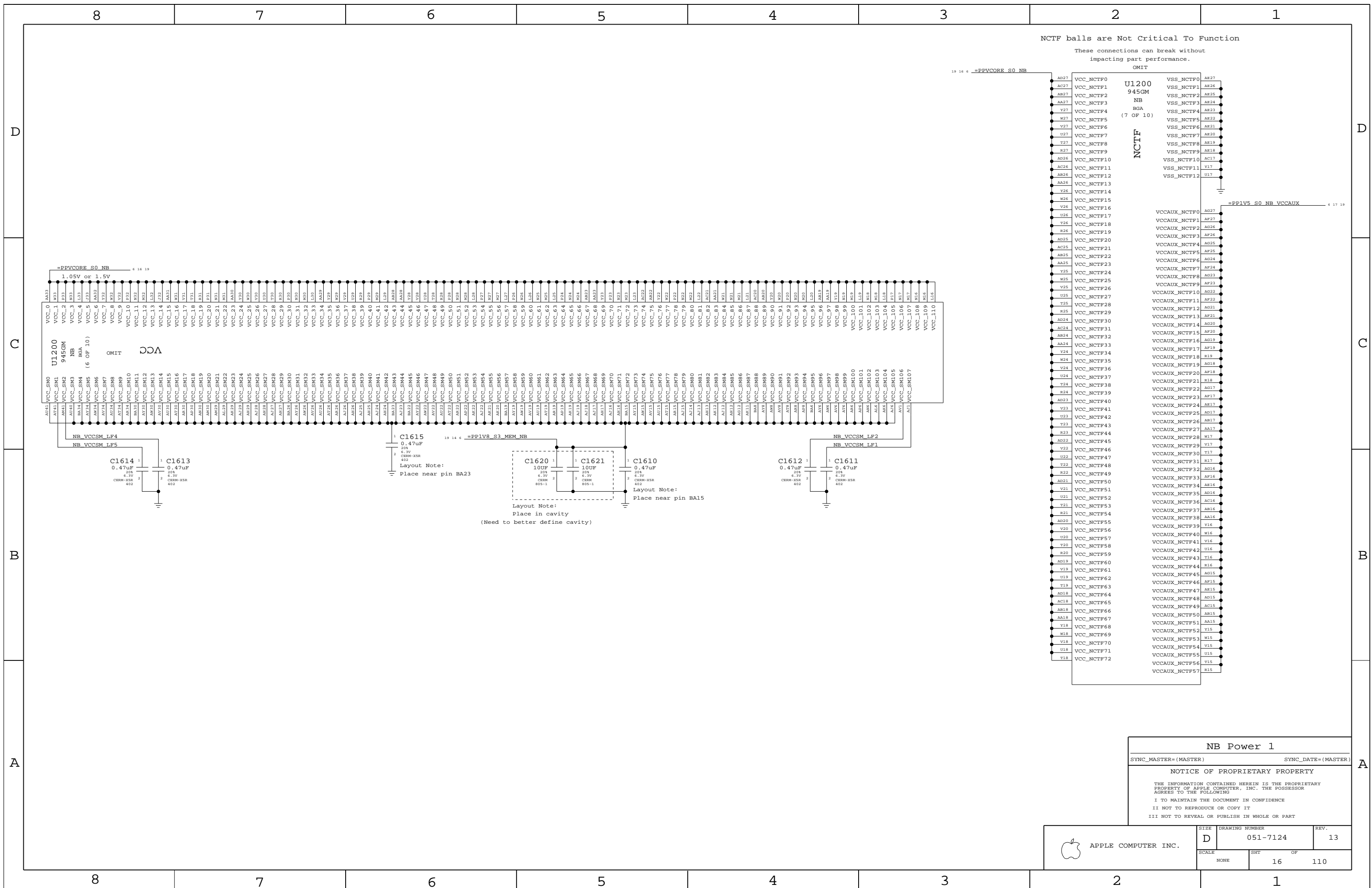
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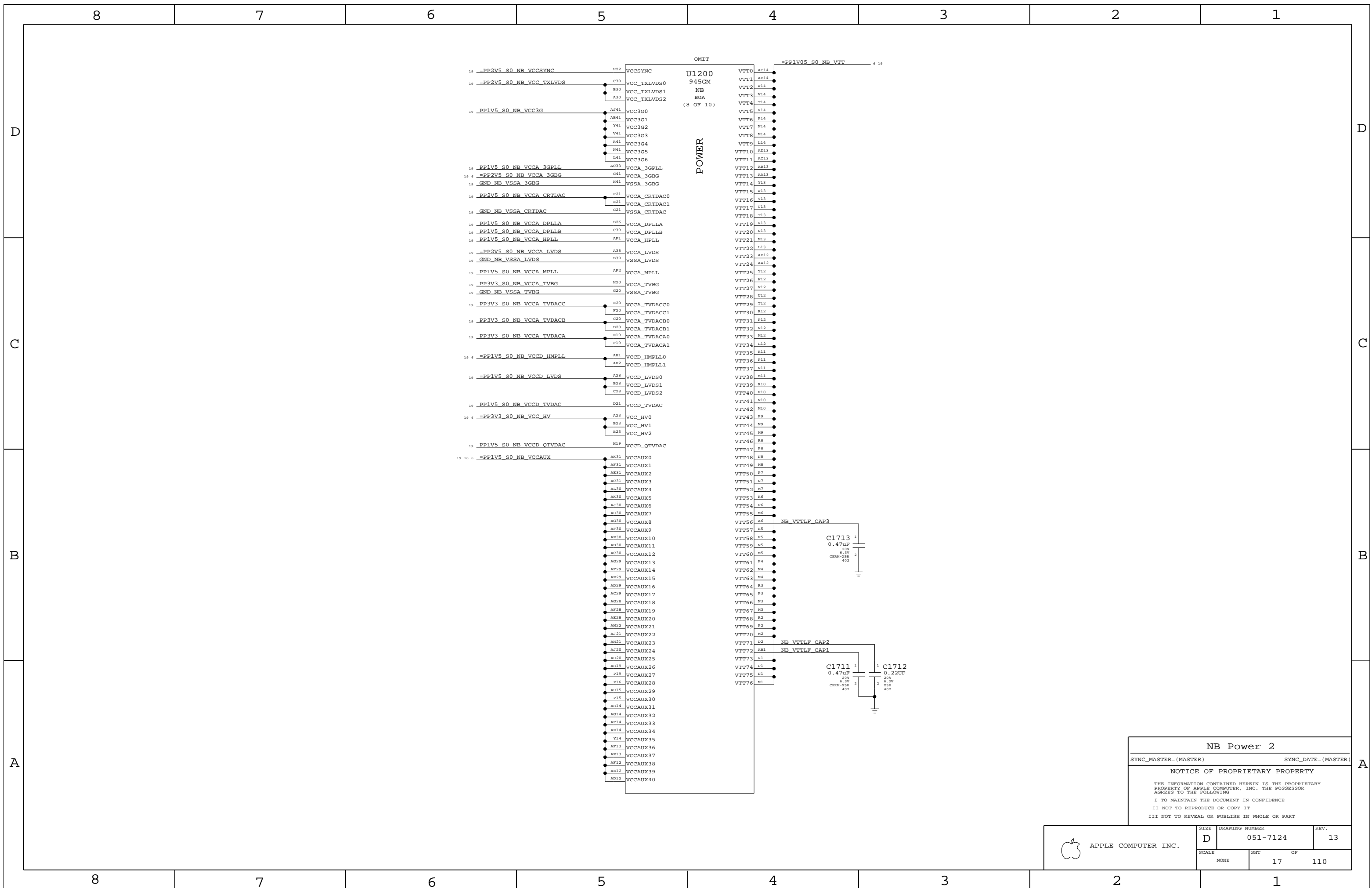
II NOT TO REPRODUCE OR COPY IT

III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE COMPUTER INC.	SIZE <b>D</b>	DRAWING NUMBER 051-7124	REV. 13
	SCALE NONE	SHEET 15	OF 110







**NB Power 2**

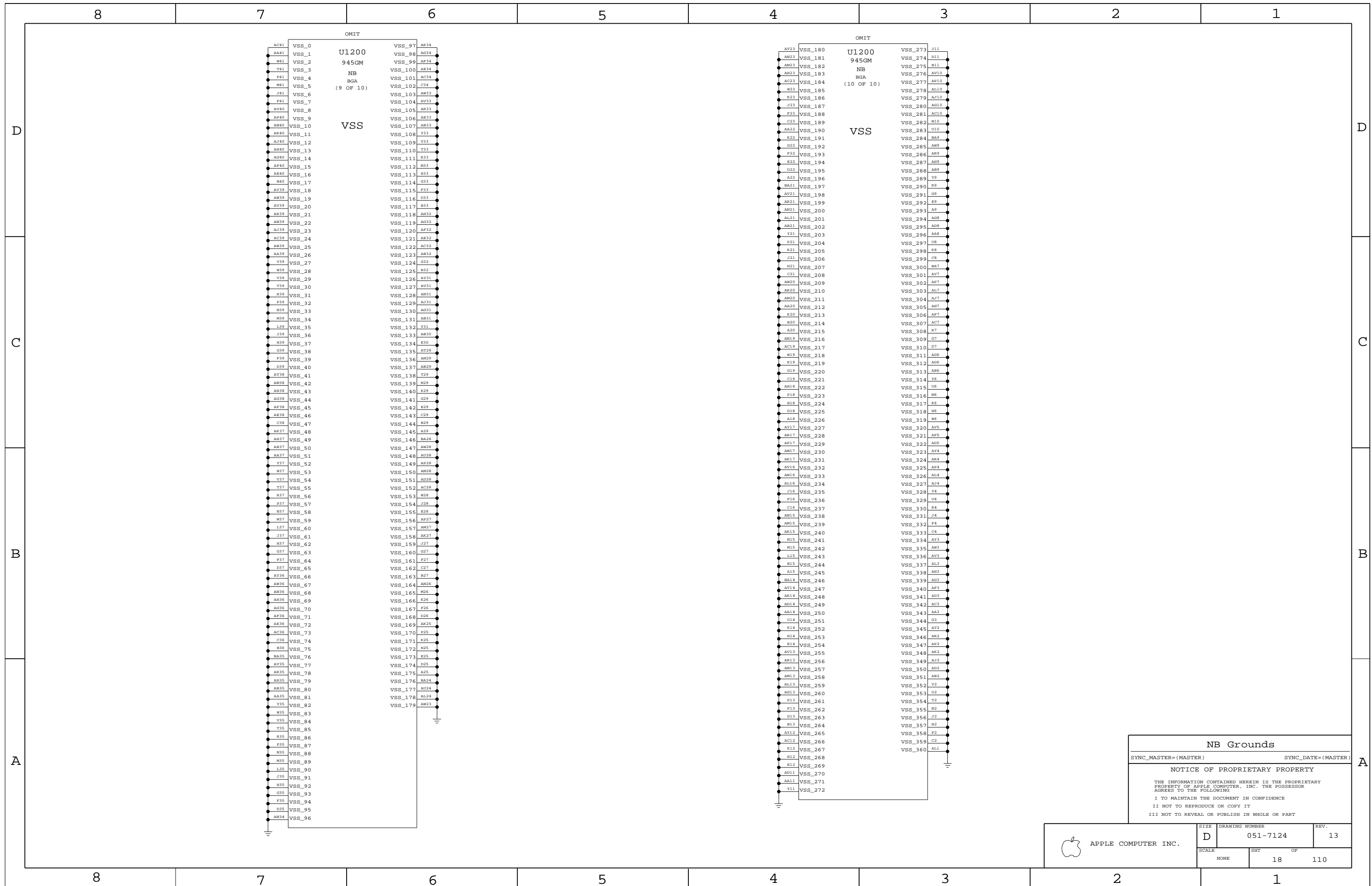
SYNC\_MASTER=(MASTER)      SYNC\_DATE=(MASTER)

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APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
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SCALE	SHT	OF	
NONE	17	110	



**NB Grounds**

SYNC\_MASTER=(MASTER) SYNC\_DATE=(MASTER)

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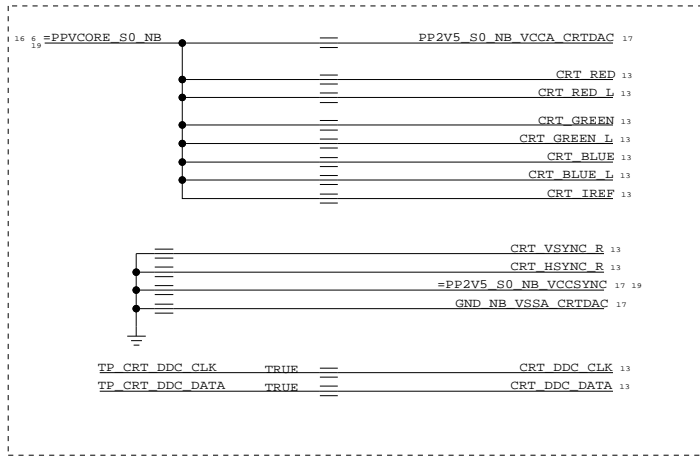
APPLE COMPUTER INC.	SIZE <b>D</b>	DRAWING NUMBER 051-7124	REV. 13
	SCALE NONE	SHEET 18	OF 110

### Power Interface

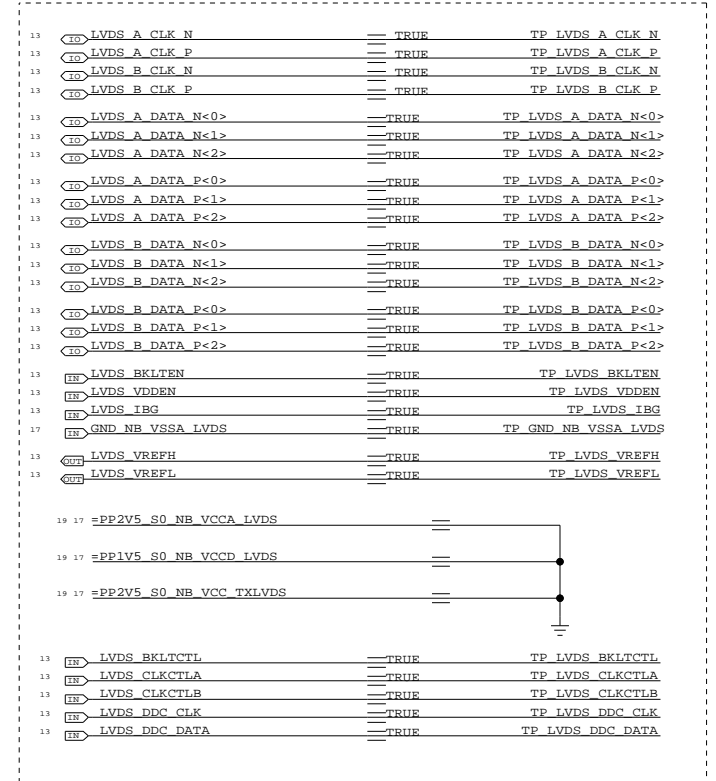
These are the power signals that leave the NB "block"

IN	=PP1V05_S0_FSB_NB	5 6 12
IN	=PPVCORE_S0_NB	6 16 19
IN	=PP1V05_S0_NB	6
IN	=PP1V05_S0_NB_VTT	6 17 19
IN	=PP1V5_S0_NB	6 19
IN	=PP1V5_S0_NB_PCIE	6 13
IN	=PP1V5_S0_NB_PLL	6 19
IN	=PP1V5_S0_NB_TVDAC	6 19
IN	=PP1V5_S0_NB_VCCD_HMPLL	6 19
IN	=PP1V5_S0_NB_VCCD_HMPLL	6 17
IN	=PP1V5_S0_NB_VCCD_LVDS	17 19
IN	=PP1V5_S0_NB_VCCAUX	6 16 17 19
IN	=PP1V8_S3_MEM_NB	6 14 16 19
IN	=PP2V5_S0_NB_VCCSYNCR	17 19
IN	=PP2V5_S0_NB_VCC_TXLVDS	17 19
IN	=PP2V5_S0_NB_VCCA_3GBG	6 17 19
IN	=PP2V5_S0_NB_VCCA_LVDS	17 19
IN	=PP3V3_S0_NB	6 14 20
IN	=PP3V3_S0_NB_TVDAC	6
IN	=PP3V3_S0_NB_VCC_HV	6 17 19

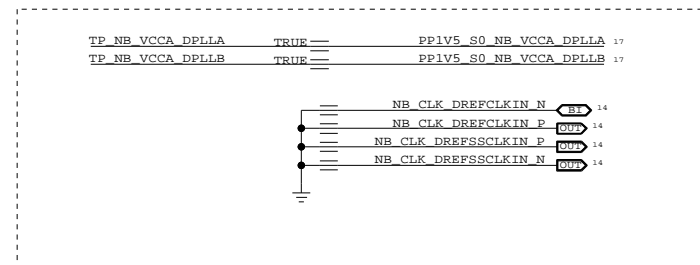
### TVOUT DISABLE



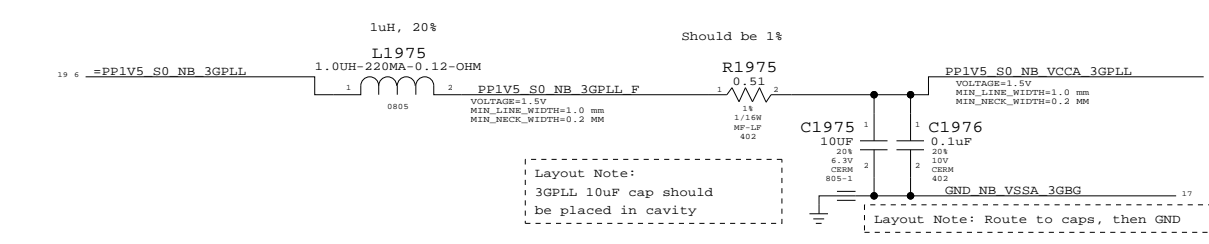
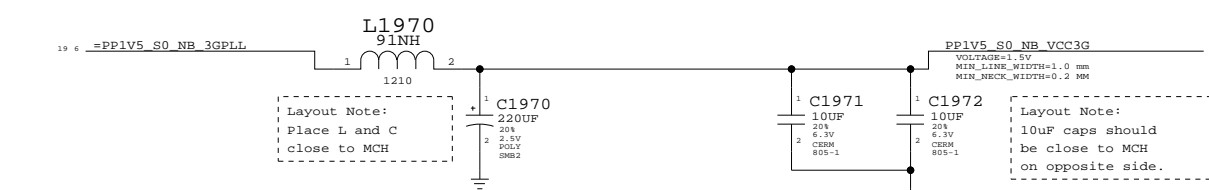
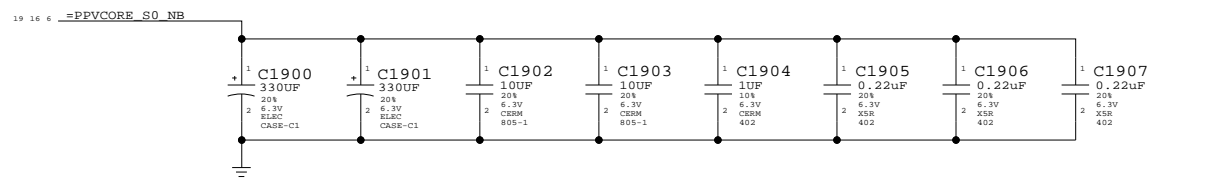
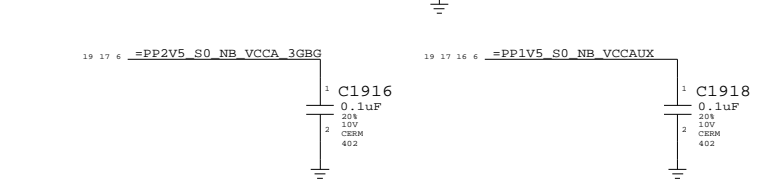
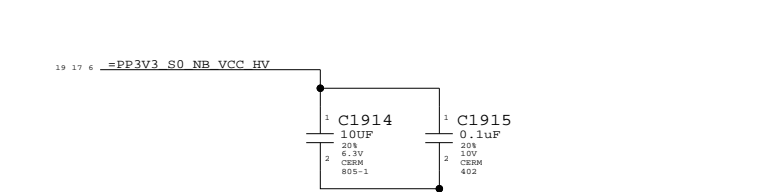
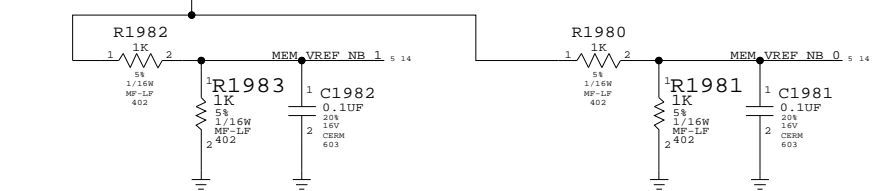
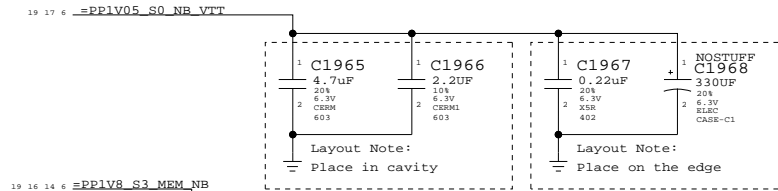
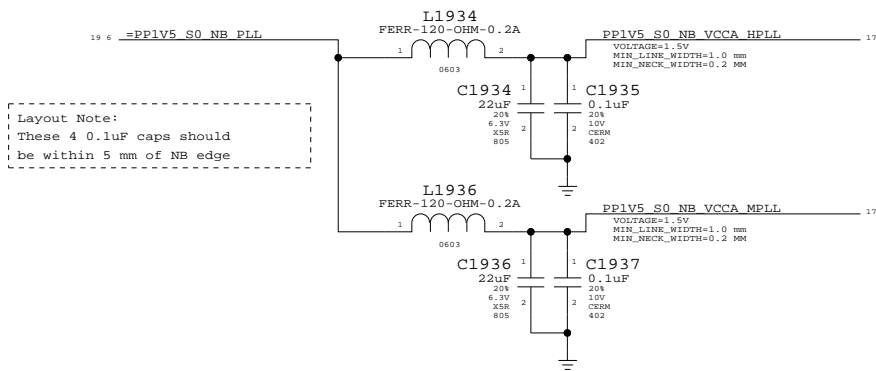
### LVDS DISABLE



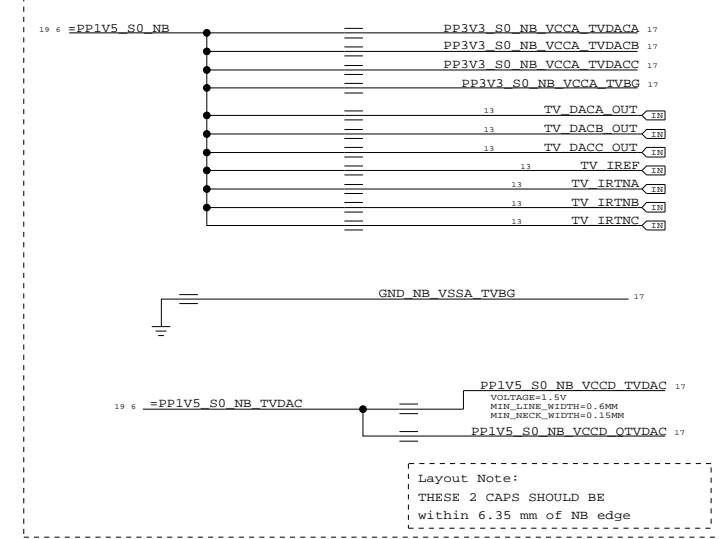
### DISPLAY DISABLE



Layout Note:  
These 4 0.1uF caps should be within 5 mm of NB edge

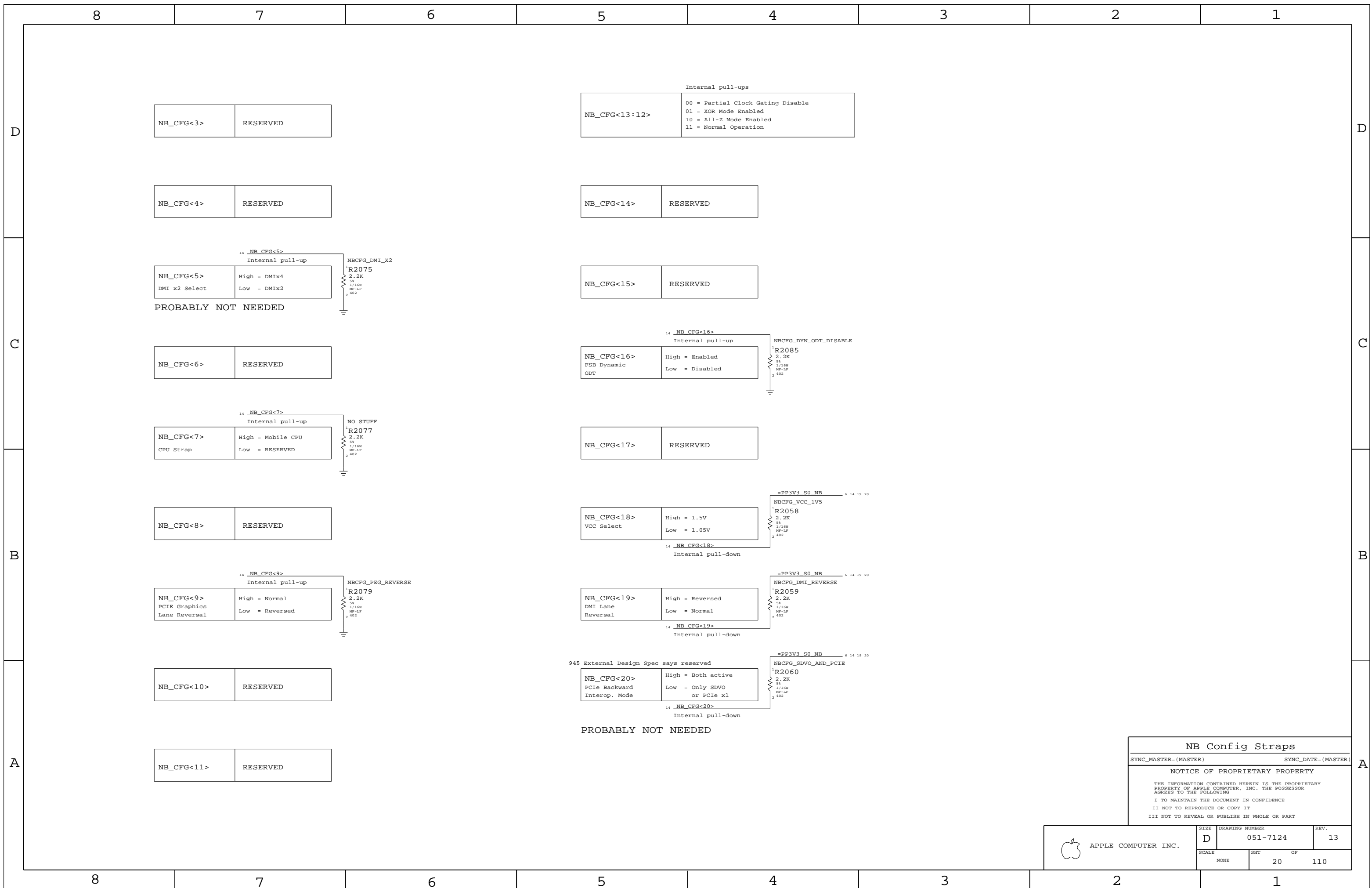


### TVOUT DISABLE



Layout Note:  
THESE 2 CAPS SHOULD BE WITHIN 6.35 mm OF NB EDGE

**NB (GM) Decoupling**  
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Internal pull-ups

NB_CFG<13:12>	00 = Partial Clock Gating Disable 01 = XOR Mode Enabled 10 = All-Z Mode Enabled 11 = Normal Operation
---------------	--

NB_CFG<3>	RESERVED
-----------	----------

NB_CFG<14>	RESERVED
------------	----------

NB_CFG<4>	RESERVED
-----------	----------

14 NB\_CFG<5>  
Internal pull-up

NB_CFG<5>	High = DMIX4 DMI x2 Select Low = DMIX2
-----------	--

PROBABLY NOT NEEDED

NB_CFG<15>	RESERVED
------------	----------

NB_CFG<6>	RESERVED
-----------	----------

14 NB\_CFG<16>  
Internal pull-up

NB_CFG<16>	High = Enabled FSB Dynamic ODT Low = Disabled
------------	--

14 NB\_CFG<7>  
Internal pull-up

NB_CFG<7>	High = Mobile CPU CPU Strap Low = RESERVED
-----------	--

NO STUFF

NB_CFG<17>	RESERVED
------------	----------

NB_CFG<8>	RESERVED
-----------	----------

14 NB\_CFG<18>  
Internal pull-down

NB_CFG<18>	High = 1.5V VCC Select Low = 1.05V
------------	--

14 NB\_CFG<9>  
Internal pull-up

NB_CFG<9>	High = Normal PCIe Graphics Lane Reversal Low = Reversed
-----------	---

14 NB\_CFG<19>  
Internal pull-down

NB_CFG<19>	High = Reversed DMI Lane Reversal Low = Normal
------------	---

NB_CFG<10>	RESERVED
------------	----------

945 External Design Spec says reserved

14 NB\_CFG<20>  
Internal pull-down

NB_CFG<20>	High = Both active PCIe Backward Interop. Mode Low = Only SDVO or PCIe x1
------------	---

NB_CFG<11>	RESERVED
------------	----------

PROBABLY NOT NEEDED

**NB Config Straps**

SYNC\_MASTER=(MASTER) SYNC\_DATE=(MASTER)

**NOTICE OF PROPRIETARY PROPERTY**

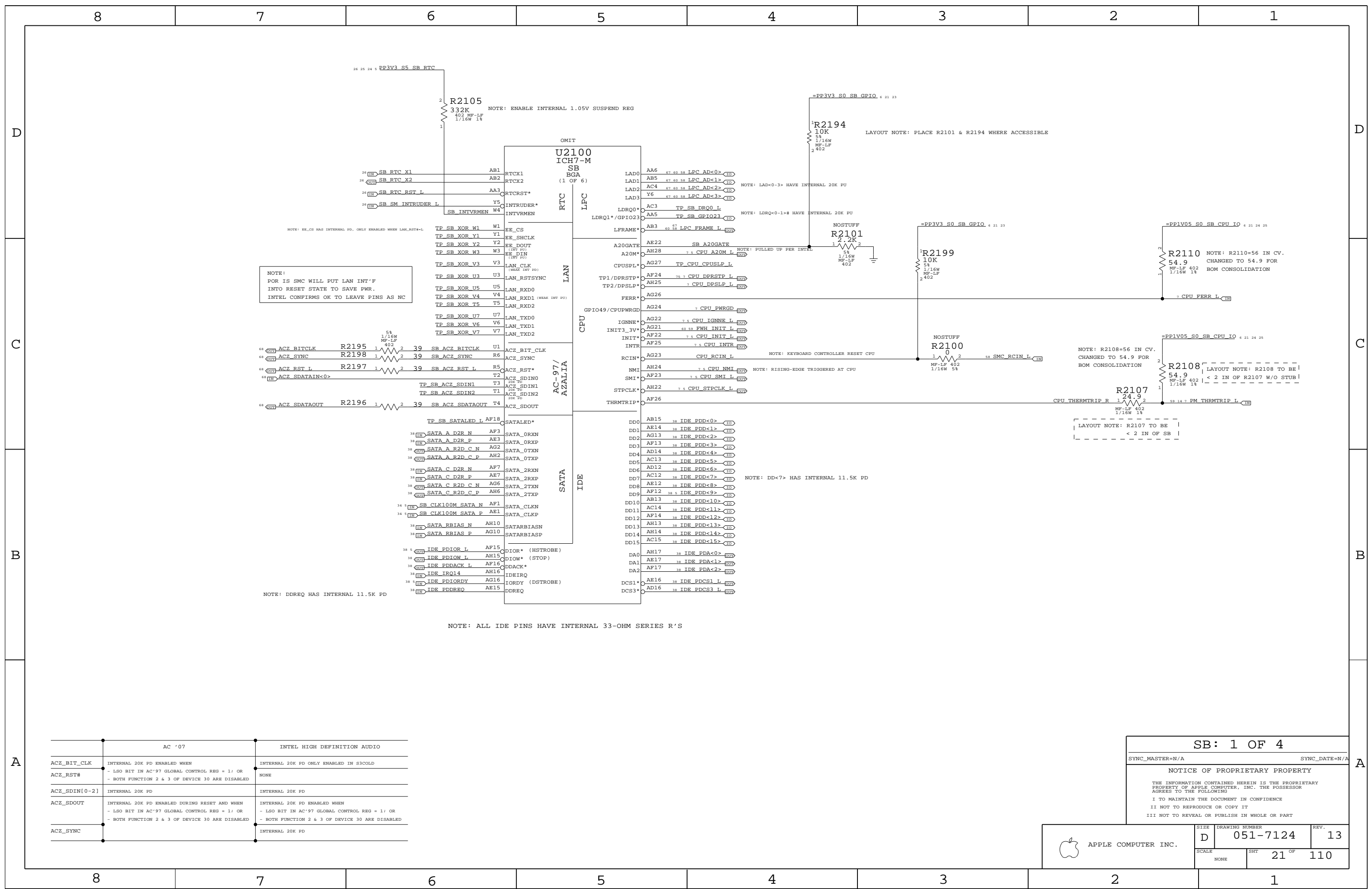
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	D	051-7124	13
SCALE	SHT	OF	
NONE	20	110	



NOTE:  
 POR IS SMC WILL PUT LAN INT'F  
 INTO RESET STATE TO SAVE PWR.  
 INTEL CONFIRMS OK TO LEAVE PINS AS NC

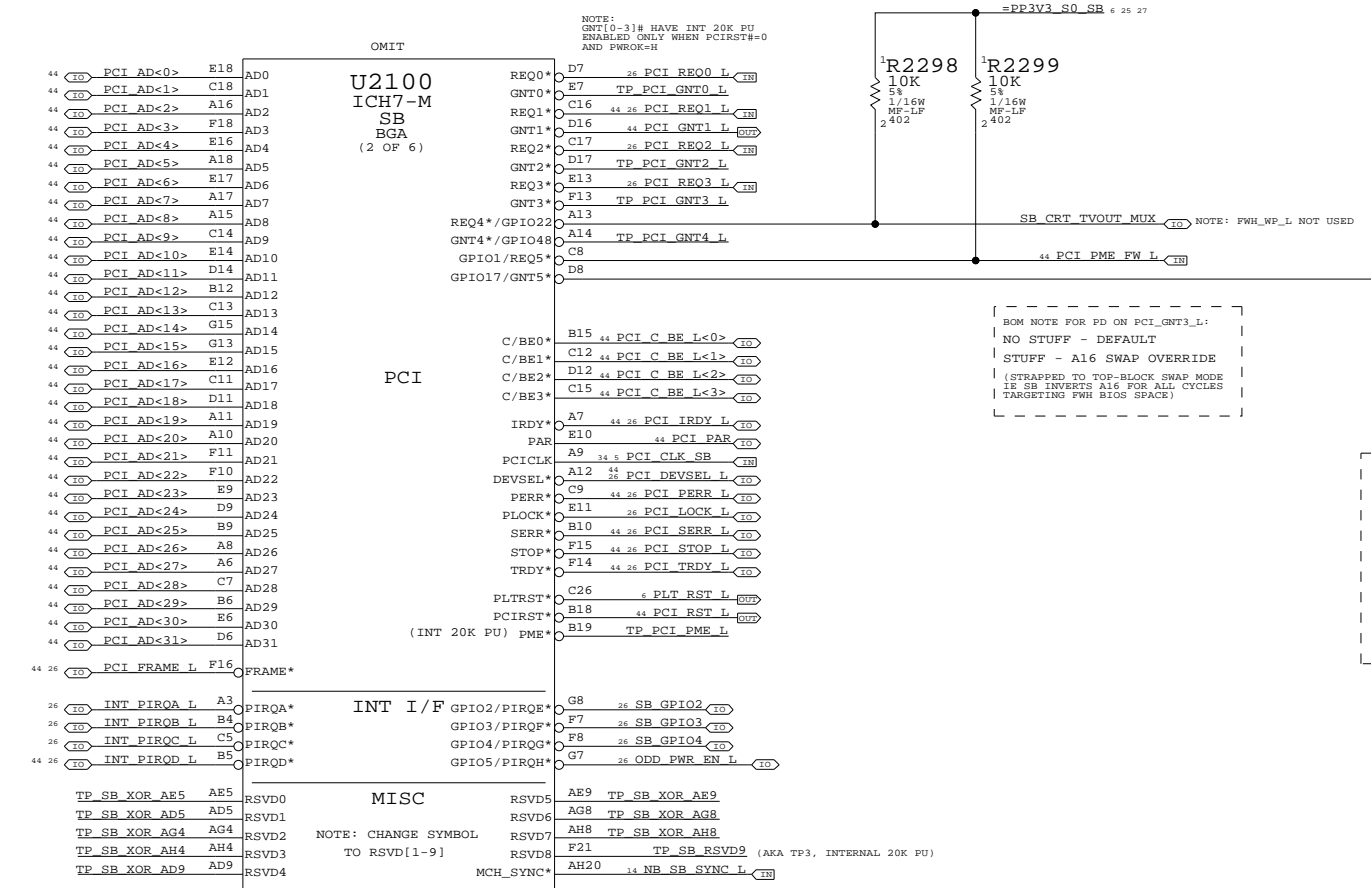
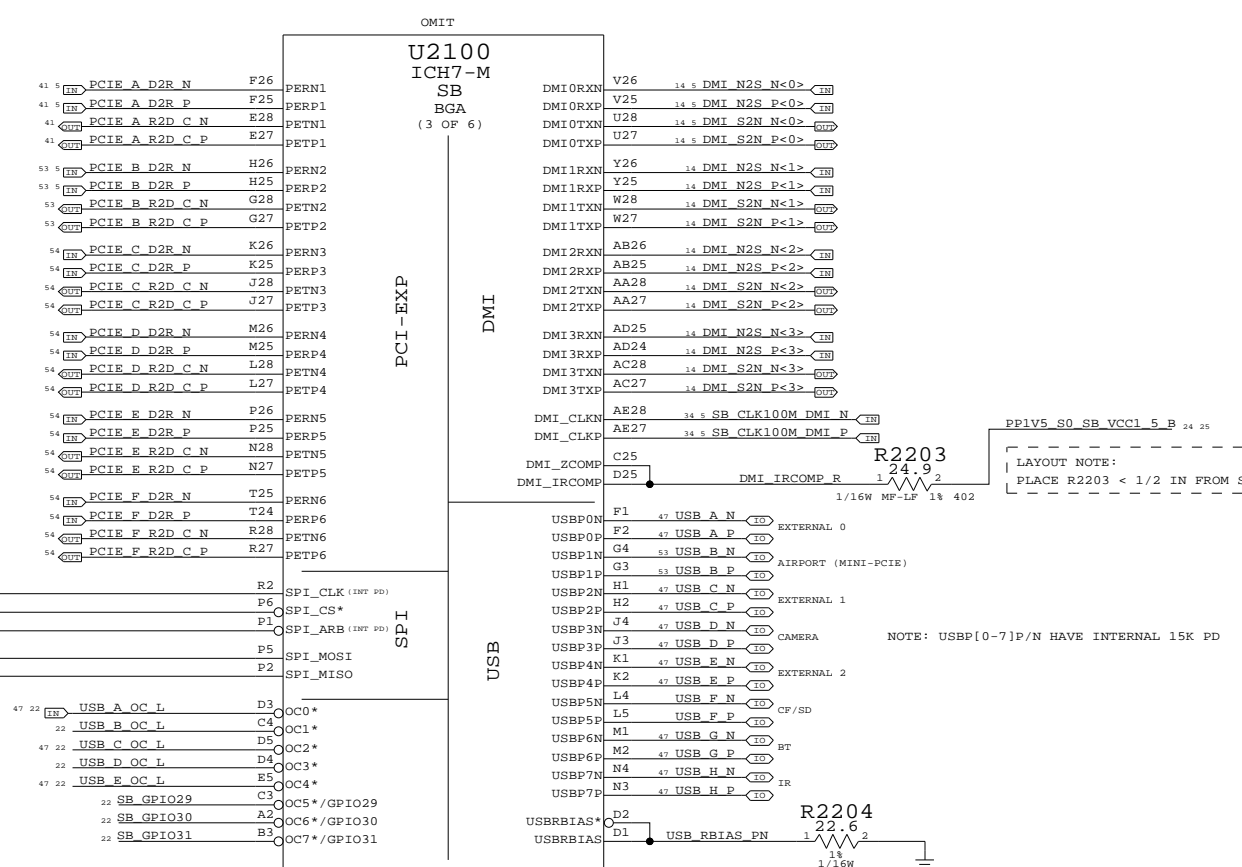
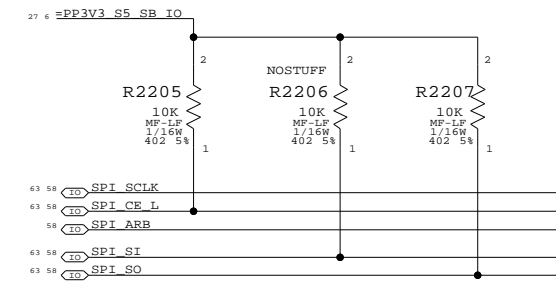
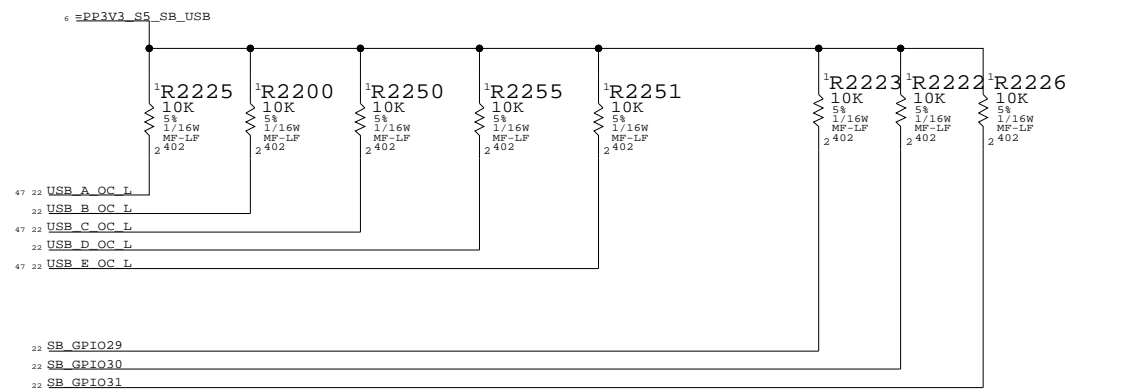
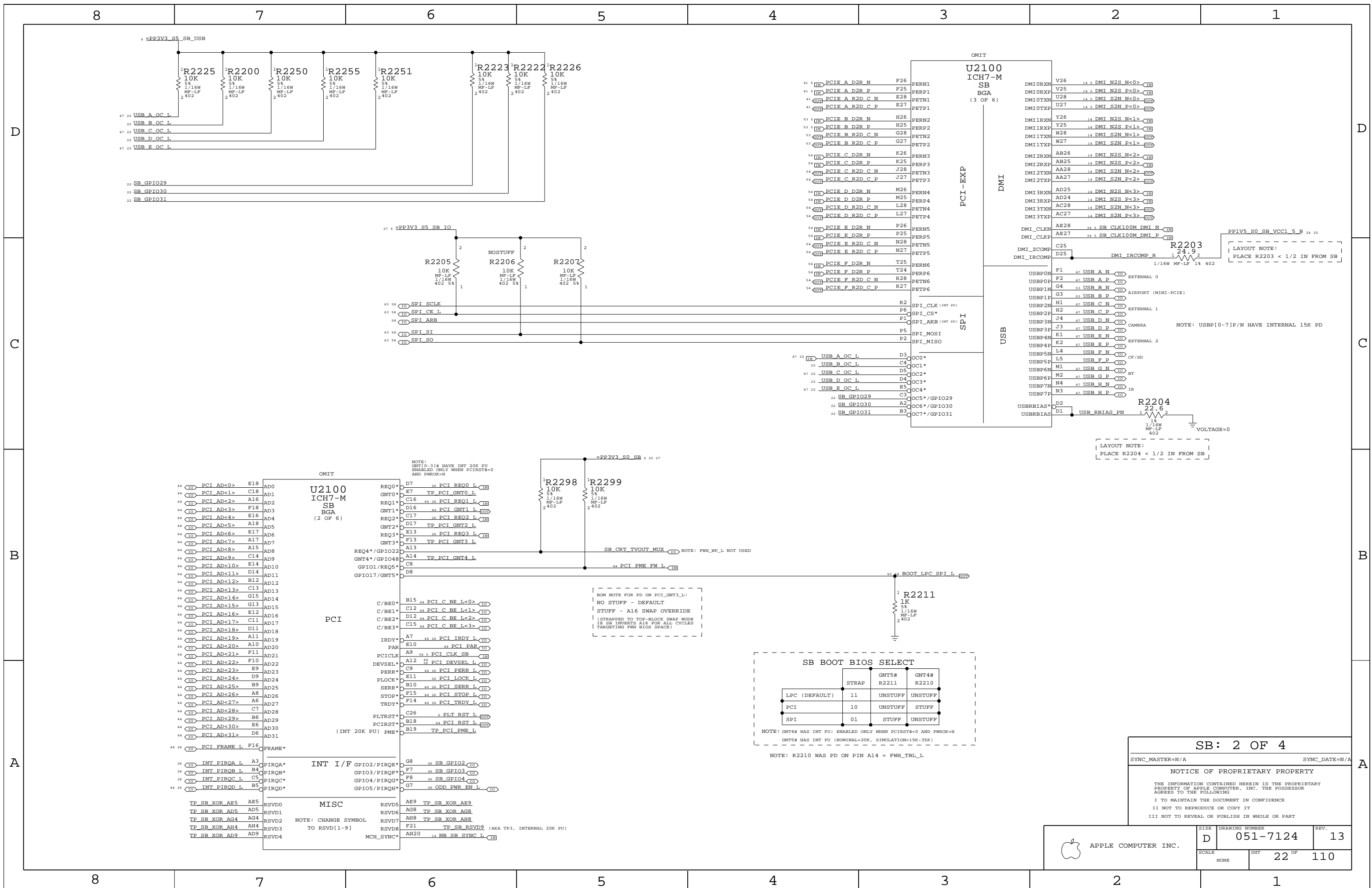
NOTE: DDREQ HAS INTERNAL 11.5K PD

NOTE: ALL IDE PINS HAVE INTERNAL 33-OHM SERIES R'S

AC '07	INTEL HIGH DEFINITION AUDIO
ACZ_BIT_CLK	INTERNAL 20K PD ENABLED WHEN - LSO BIT IN AC'97 GLOBAL CONTROL REG = 1; OR
ACZ_RST#	NONE
ACZ_SDIN[0-2]	INTERNAL 20K PD
ACZ_SDOUT	INTERNAL 20K PD ENABLED DURING RESET AND WHEN - LSO BIT IN AC'97 GLOBAL CONTROL REG = 1; OR - BOTH FUNCTION 2 & 3 OF DEVICE 30 ARE DISABLED
ACZ_SYNC	INTERNAL 20K PD

<b>SB: 1 OF 4</b>	
SYNC_MASTER=N/A	SYNC_DATE=N/A
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	D	051-7124	13
SCALE	SHT	21 OF 110	
NONE			



SB BOOT BIOS SELECT

	STRAP	GNT5# R2211	GNT4# R2210
LPC (DEFAULT)	11	UNSTUFF	UNSTUFF
PCI	10	UNSTUFF	STUFF
SPI	01	STUFF	UNSTUFF

NOTE: GNT4# HAS INT PU: ENABLED ONLY WHEN PCIRST# = 0 AND FWRQ# = H

NOTE: GNT5# HAS INT PU (NOMINAL = 20K, SIMULATION = 15K-35K)

SB: 2 OF 4

SYNC\_MASTER=N/A SYNC\_DATE=N/A

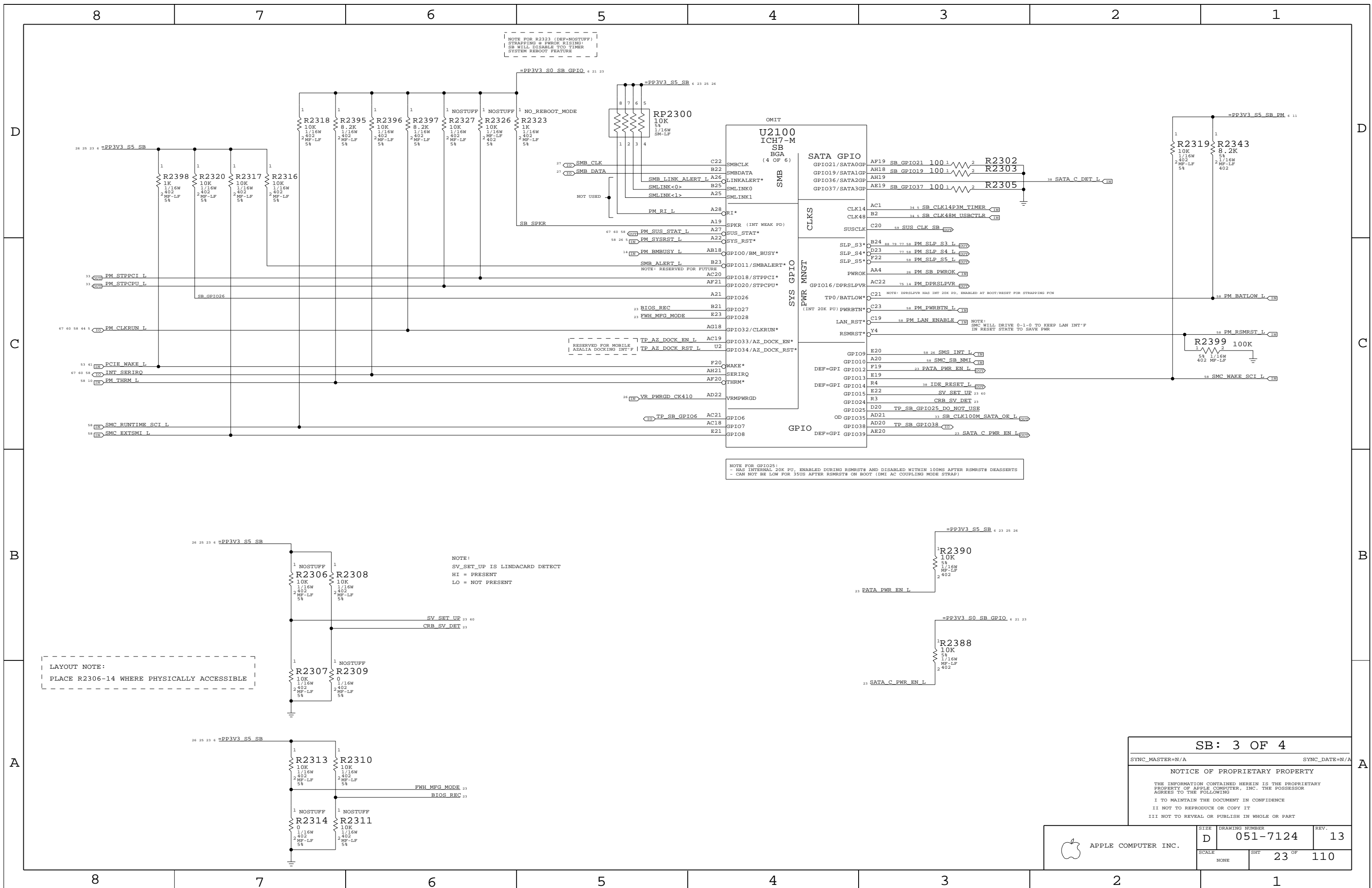
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NOTE FOR R2323 (DEF-NOSTUFF):  
STRAPPING & PWROK RISING:  
SB WILL DISABLE TCO TIMER  
SYSTEM REBOOT FEATURE

NOTE FOR GPIO25:  
- HAS INTERNAL 20K PU, ENABLED DURING RSMRST# AND DISABLED WITHIN 100MS AFTER RSMRST# DEASSERTS  
- CAN NOT BE LOW FOR 35US AFTER RSMRST# ON BOOT (DMI AC COUPLING MODE STRAP)

LAYOUT NOTE:  
PLACE R2306-14 WHERE PHYSICALLY ACCESSIBLE

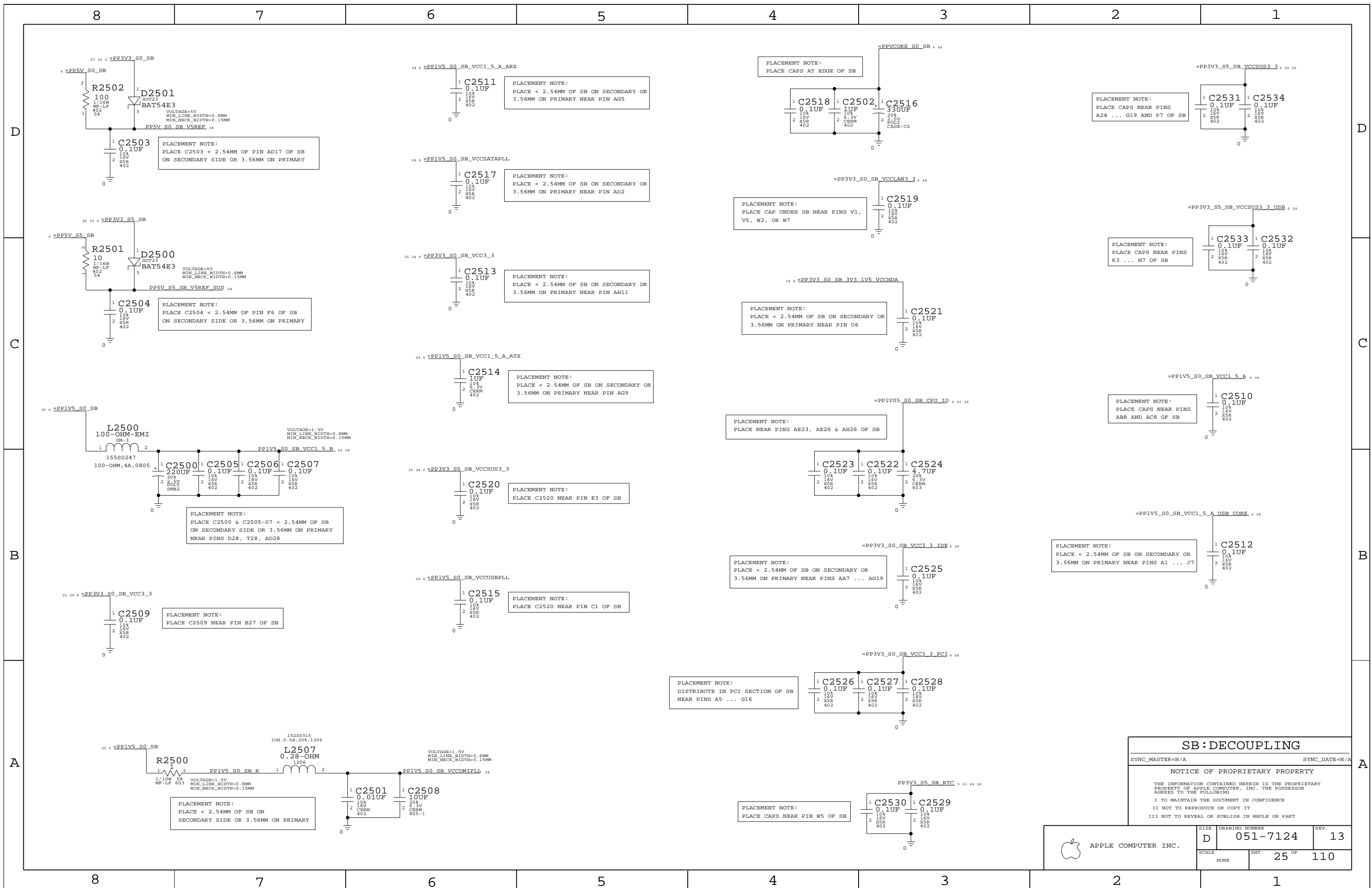
NOTE:  
SV\_SET\_UP IS LINDACARD DETECT  
HI = PRESENT  
LO = NOT PRESENT

SB: 3 OF 4  
SYNC\_MASTER=N/A SYNC\_DATE=N/A  
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APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7124	13
SCALE	NONE	SHT	23 OF 110







**SB: DECOUPLING**

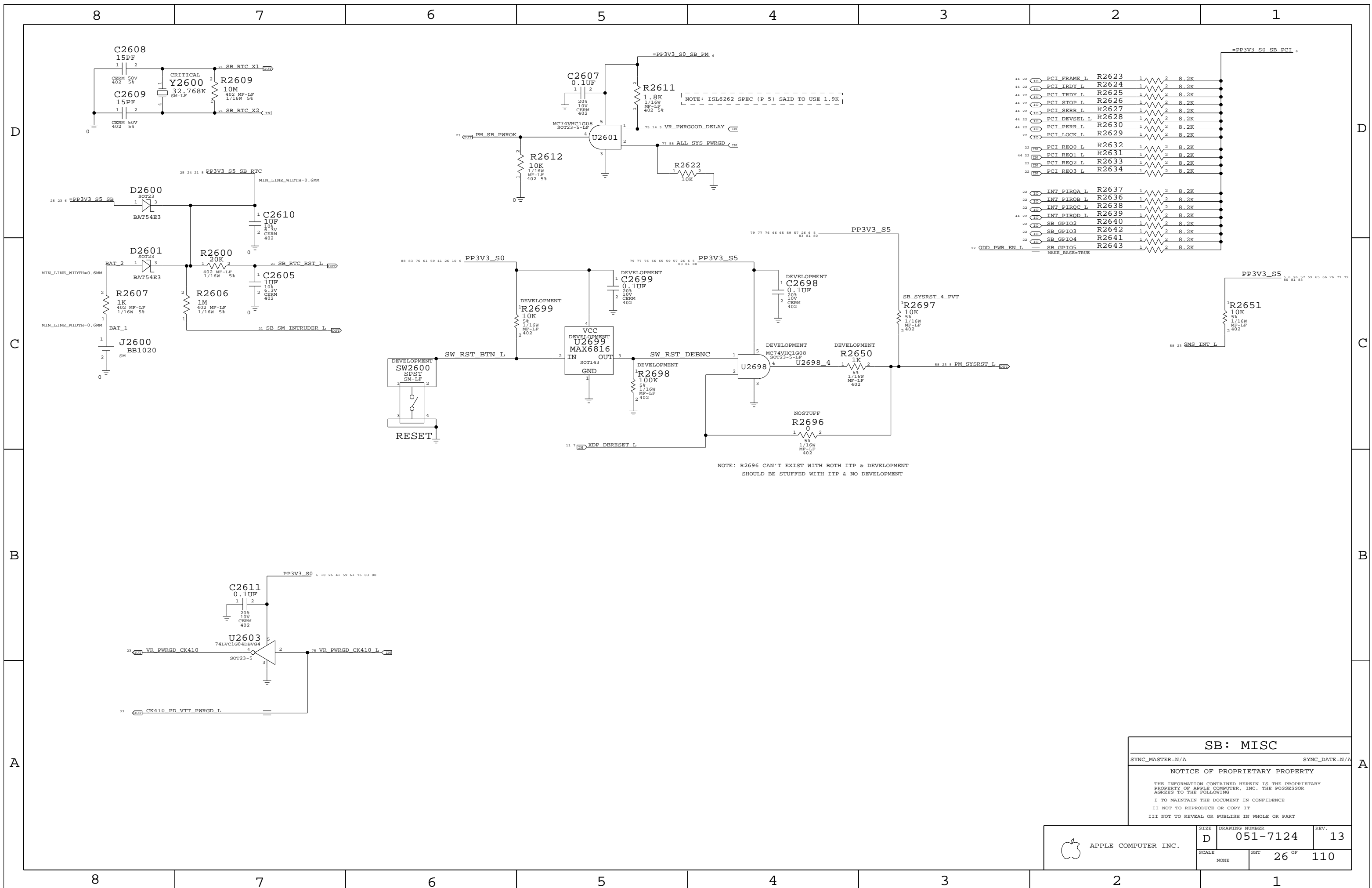
SYNC\_MASTER=N/A      SYNC\_DATE=N/A

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APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7124	13
SCALE	NONE	SHT	25 OF 110



**SB: MISC**

SYNC\_MASTER=N/A SYNC\_DATE=N/A

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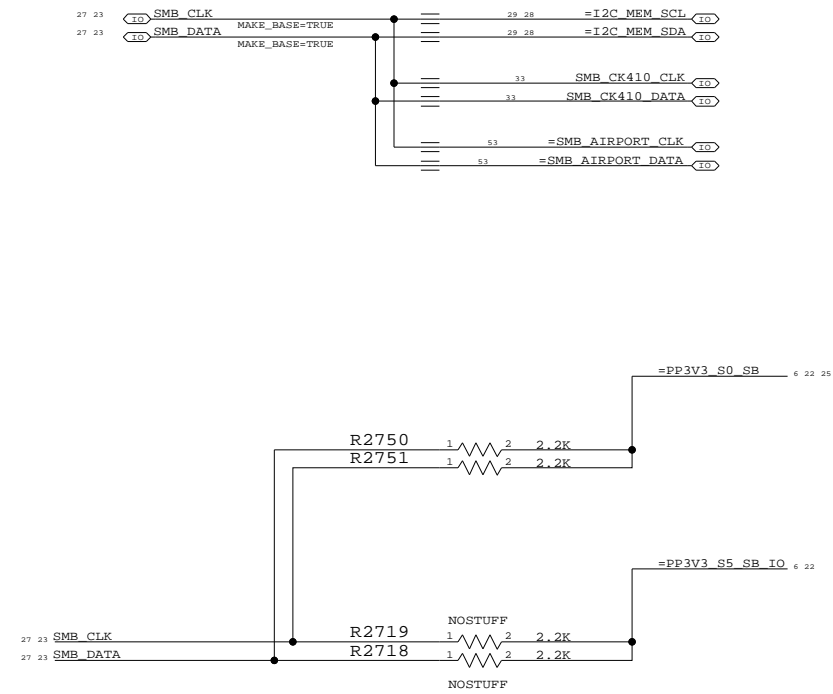
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APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7124	13
SCALE	SHT	26 OF	110
NONE			

# SB I2C BUSSES



## SB: SMB HUB

SYNC\_MASTER=N/A SYNC\_DATE=N/A

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 APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7124	13
SCALE	SHT	27 OF 110	
NONE			

# Page Notes

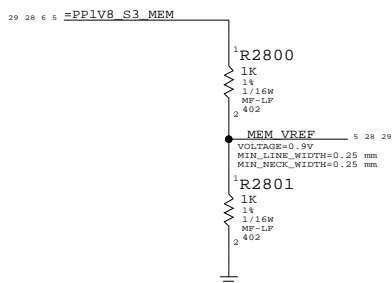
Power aliases required by this page:  
 - =PP1V8\_S3\_MEM  
 - =PPSPD\_S0\_MEM (2.5V - 3.3V)

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

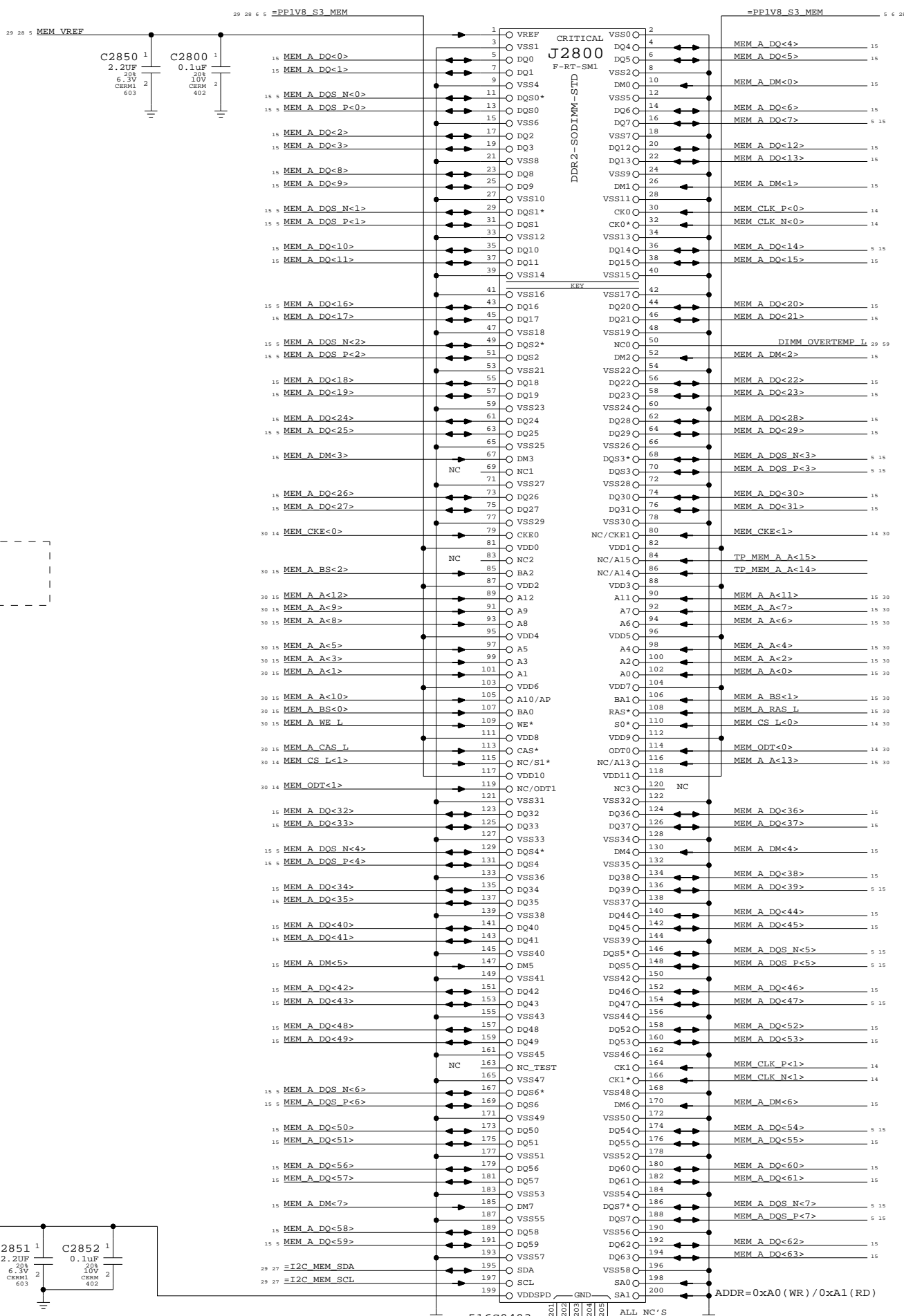
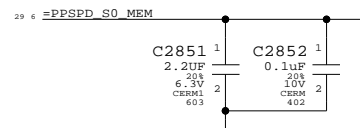
BOM options provided by this page:  
 (NONE)

## DDR2 VRef

One 0.1uF per connector

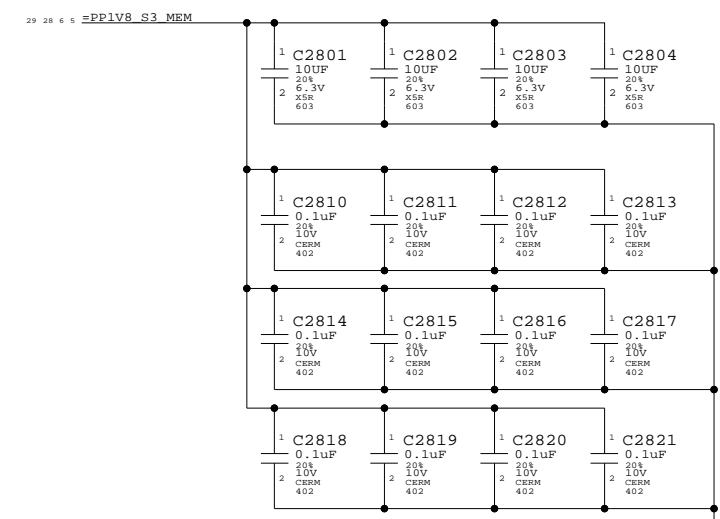


Yellow uses 10K divider and TLV2463 to drive MCH and DIMM connectors.  
 (See Capell Valley pg 47)



## DDR2 Bypass Caps

(For return current)



**DDR2 SO-DIMM Connector A**

SYNC\_MASTER=(MASTER) SYNC\_DATE=(MASTER)

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	D	051-7124	13
SCALE	SHT	OF	
NONE	28	110	

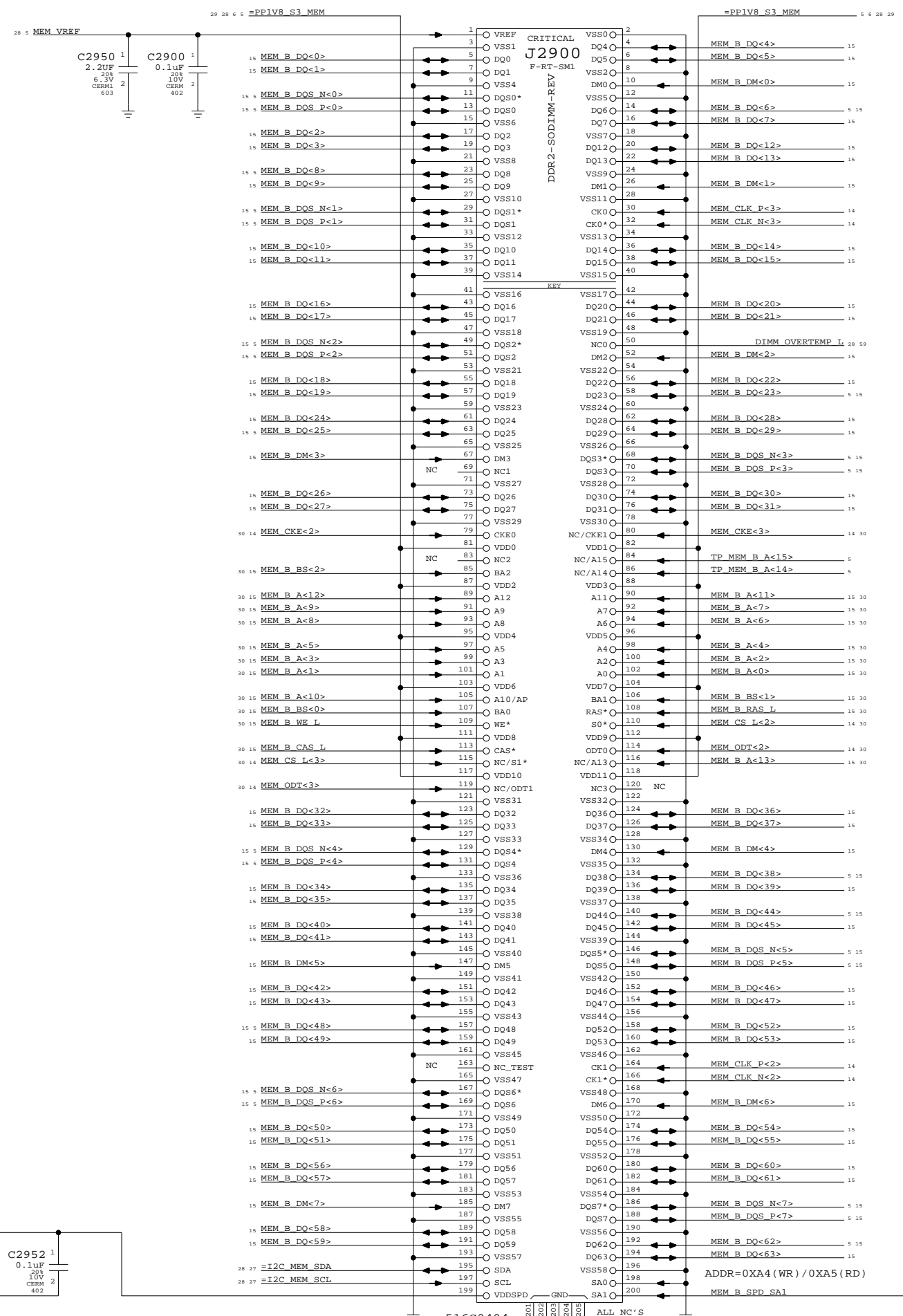
# Page Notes

Power aliases required by this page:  
 - =PP1V8\_S3\_MEM  
 - =PPSPD\_S0\_MEM (2.5V - 3.3V)

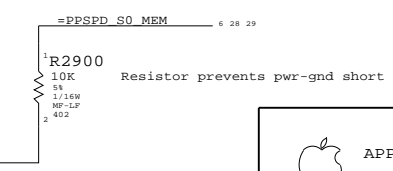
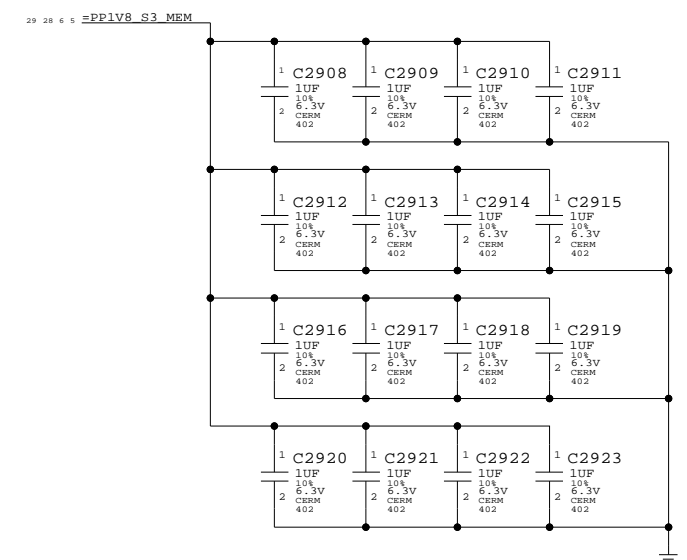
Signal aliases required by this page:  
 - =I2C\_MEM\_SCL  
 - =I2C\_MEM\_SDA

BOM options provided by this page:  
 (NONE)

NOTE: This page does not supply VREF.  
 The reference voltage must be provided by another page.



## DDR2 Bypass Caps (For return current)



DDR2 SO-DIMM Connector B		
SYNC_MASTER=(MASTER)	SYNC_DATE=(MASTER)	
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APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7124	13
SCALE	SHT	OF	
NONE	29	110	

8

7

6

5

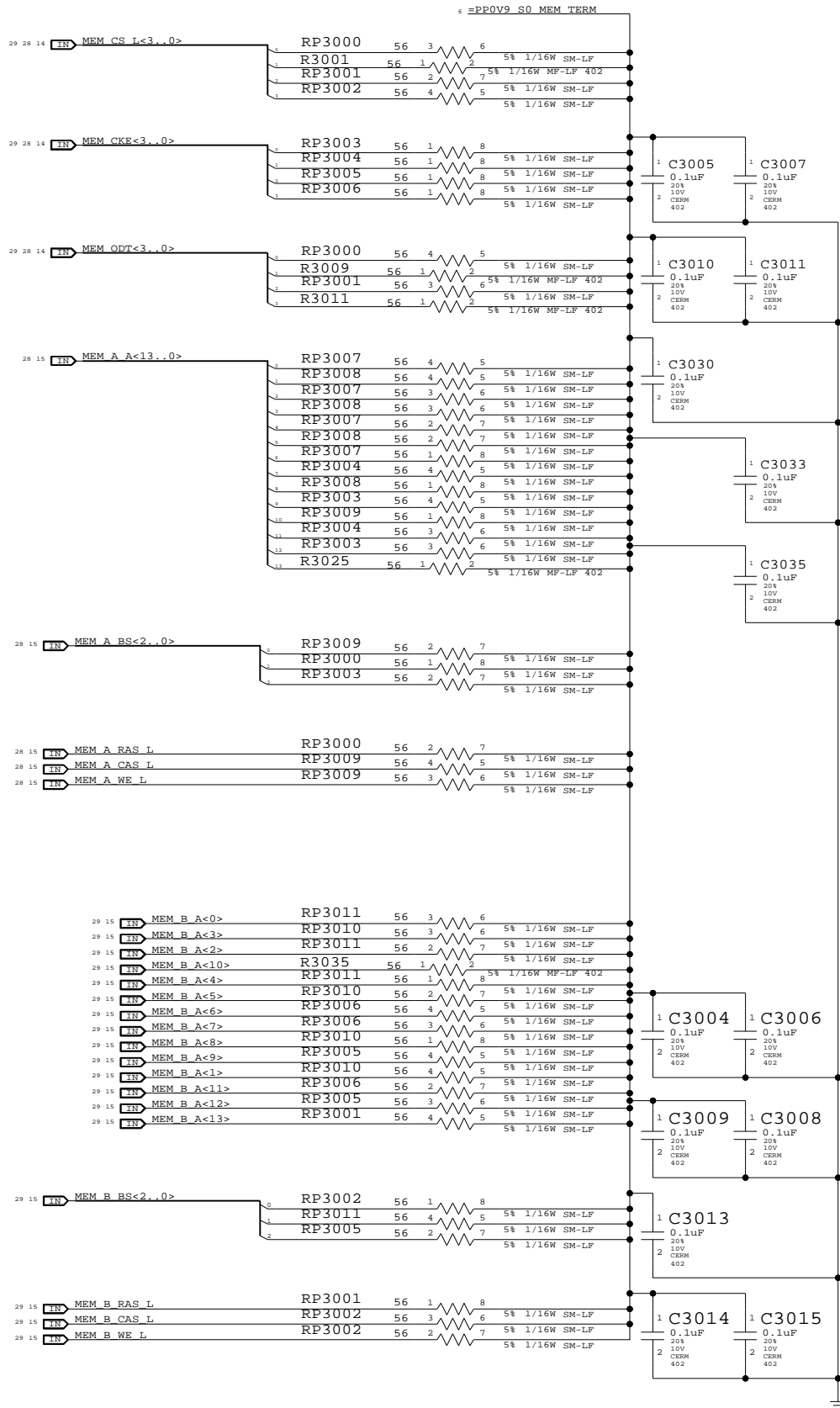
4

3

2

1

One cap for each side of every RPAK, one cap for every two discrete resistors  
BOMOPTION shown at the top of each group applies to every part below it



Memory Active Termination

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APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7124	13
SCALE	SHT	OF	
NONE	30	110	

8

7

6

5

4

3

2

1

Page Notes

Power aliases required by this page:  
 - =PP5V\_S0\_MEMVTT  
 - =PP1V8\_S0\_MEMVTT  
 - =PP0V9\_S0\_MEMVTT\_LDO

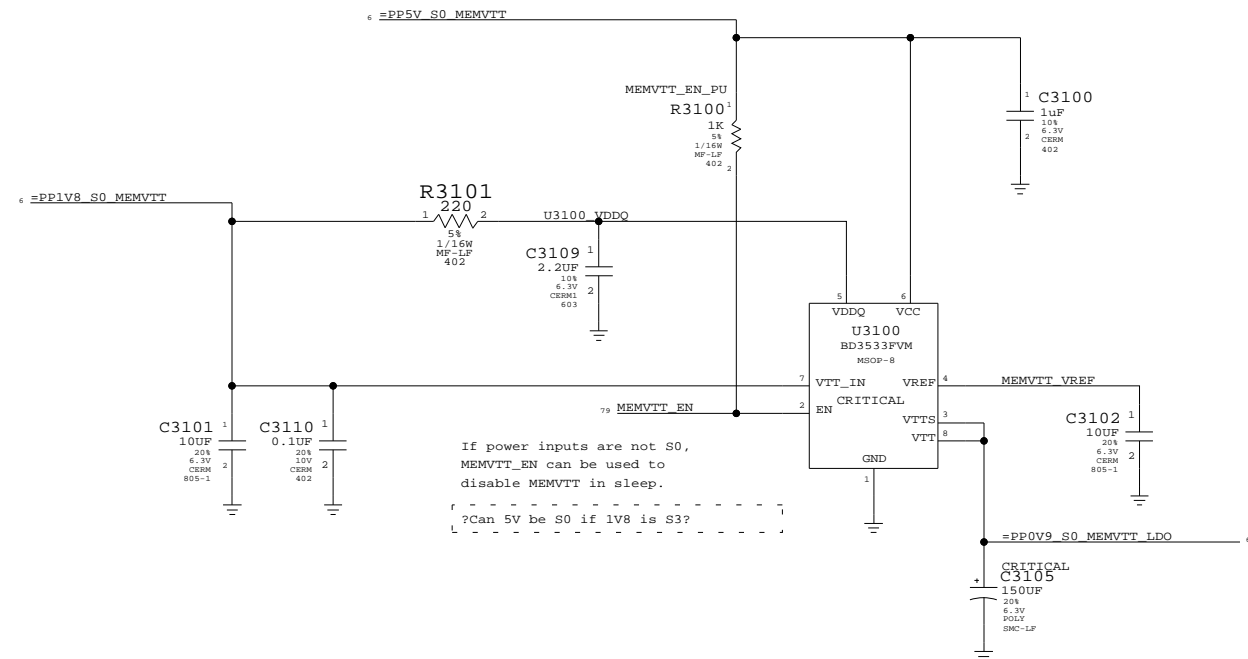
---

Signal aliases required by this page:  
 (NONE)

---

BOM options provided by this page:  
 (NONE)

DDR2 Vtt Regulator



Memory Vtt Supply

SYNC\_MASTER=(MASTER) SYNC\_DATE=(MASTER)

NOTICE OF PROPRIETARY PROPERTY

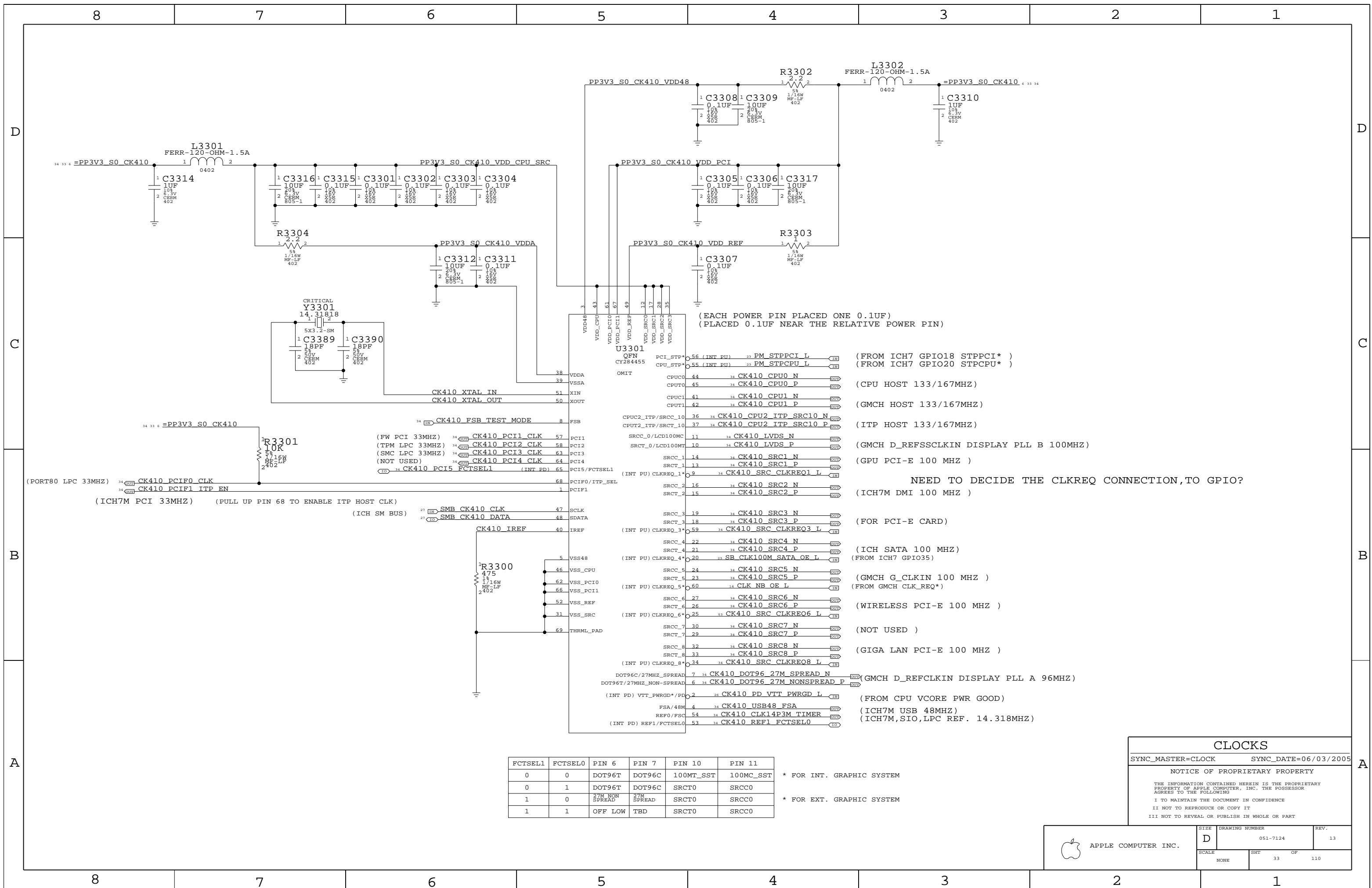
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	D	051-7124	13
SCALE	SHT	OF	
NONE	31	110	



- (EACH POWER PIN PLACED ONE 0.1UF)  
(PLACED 0.1UF NEAR THE RELATIVE POWER PIN)
- 56 (INT PU) PM\_STPPCI\_L (FROM ICH7 GPIO18 STPPCI\*)
  - 55 (INT PU) PM\_STPCPU\_L (FROM ICH7 GPIO20 STPCPU\*)
  - 44 CK410 CPU0\_N (CPU HOST 133/167MHZ)
  - 45 CK410 CPU0\_P
  - 41 CK410 CPU1\_N (GMCH HOST 133/167MHZ)
  - 42 CK410 CPU1\_P
  - 36 CK410 CPU2\_I TP\_SRC10\_N (ITP HOST 133/167MHZ)
  - 37 CK410 CPU2\_I TP\_SRC10\_P
  - 11 CK410 LVDS\_N (GMCH D\_REFSSCLKIN DISPLAY PLL B 100MHZ)
  - 10 CK410 LVDS\_P
  - 14 CK410 SRC1\_N (GPU PCI-E 100 MHZ)
  - 13 CK410 SRC1\_P
  - 9 CK410 SRC CLKREQ1\_L (NEED TO DECIDE THE CLKREQ CONNECTION, TO GPIO?)
  - 16 CK410 SRC2\_N (ICH7M DMI 100 MHZ)
  - 15 CK410 SRC2\_P
  - 19 CK410 SRC3\_N (FOR PCI-E CARD)
  - 18 CK410 SRC3\_P
  - 59 CK410 SRC CLKREQ3\_L
  - 22 CK410 SRC4\_N (ICH SATA 100 MHZ)
  - 21 CK410 SRC4\_P (FROM ICH7 GPIO35)
  - 20 SB\_CLK100M\_SATA\_OE\_L
  - 24 CK410 SRC5\_N (GMCH G\_CLKIN 100 MHZ)
  - 23 CK410 SRC5\_P (FROM GMCH CLK\_REQ\*)
  - 60 CLK\_NB\_OE\_L
  - 27 CK410 SRC6\_N (WIRELESS PCI-E 100 MHZ)
  - 26 CK410 SRC6\_P
  - 25 CK410 SRC CLKREQ6\_L
  - 30 CK410 SRC7\_N (NOT USED)
  - 29 CK410 SRC7\_P
  - 32 CK410 SRC8\_N (GIGA LAN PCI-E 100 MHZ)
  - 33 CK410 SRC8\_P
  - 34 CK410 SRC CLKREQ8\_L
  - 7 CK410 DOT96 27M SPREAD\_N (GMCH D\_REFCLKIN DISPLAY PLL A 96MHZ)
  - 6 CK410 DOT96 27M NONSPREAD\_P
  - 2 CK410 PD VTT\_PWRGD\*\_L (FROM CPU VCORE PWR GOOD)
  - 4 CK410 USB48\_FSA (ICH7M USB 48MHZ)
  - 54 CK410 CLK14P3M\_TIMER (ICH7M, SIO, LPC REF. 14.318MHZ)
  - 53 CK410 REF1\_FCTSEL0

FCTSEL1	FCTSEL0	PIN 6	PIN 7	PIN 10	PIN 11
0	0	DOT96T	DOT96C	100MT_SST	100MC_SST
0	1	DOT96T	DOT96C	SRCT0	SRCC0
1	0	27M NON SPREAD	27M SPREAD	SRCT0	SRCC0
1	1	OFF LOW	TBD	SRCT0	SRCC0

\* FOR INT. GRAPHIC SYSTEM  
\* FOR EXT. GRAPHIC SYSTEM

**CLOCKS**

SYNC\_MASTER=CLOCK      SYNC\_DATE=06/03/2005

NOTICE OF PROPRIETARY PROPERTY

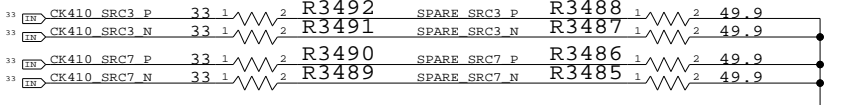
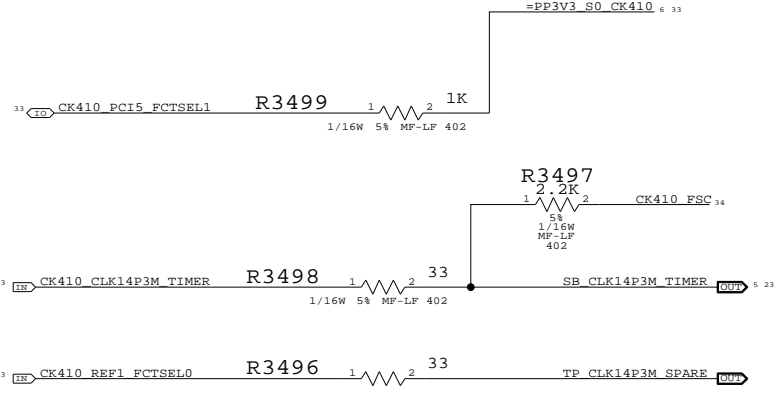
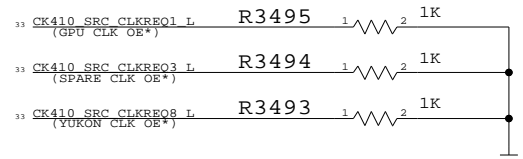
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	D	051-7124	13
SCALE	SHT	OF	110
NONE	33		

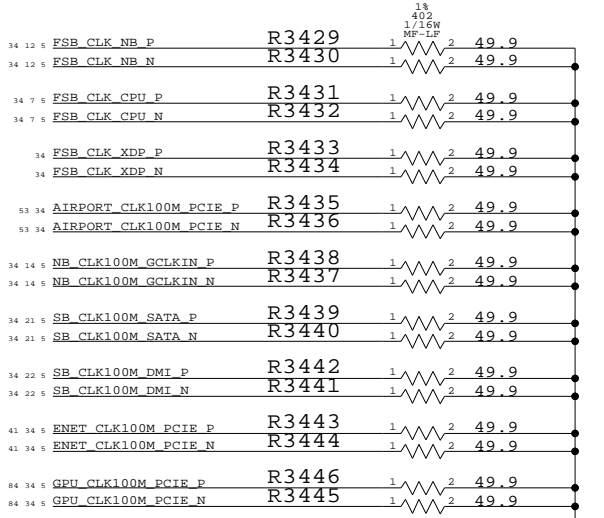
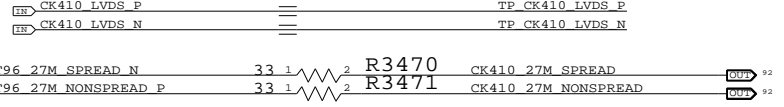
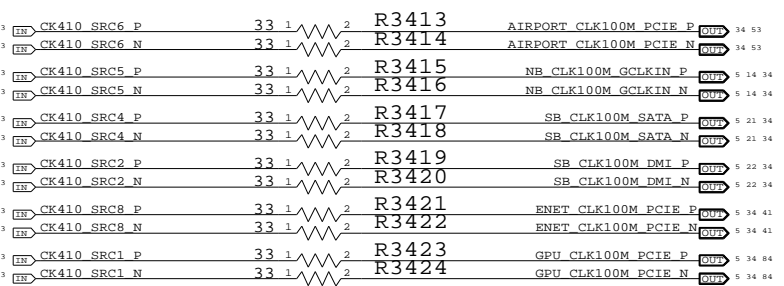
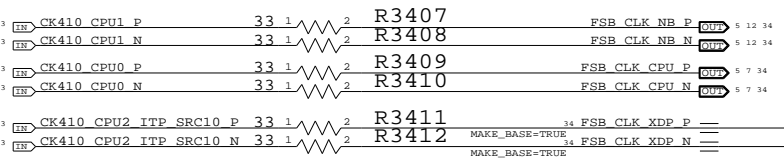
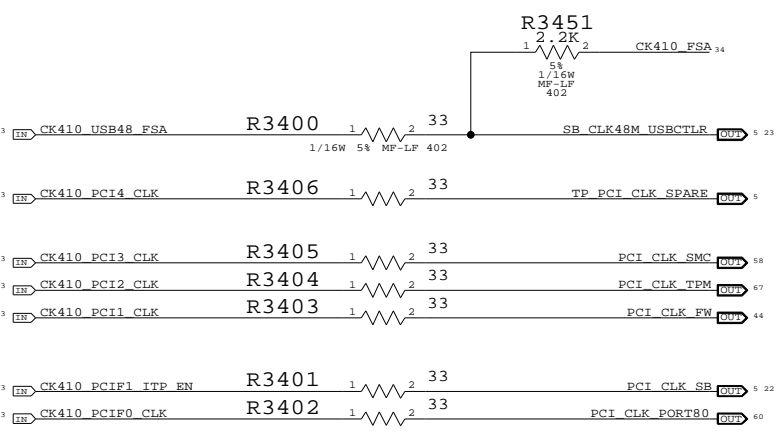
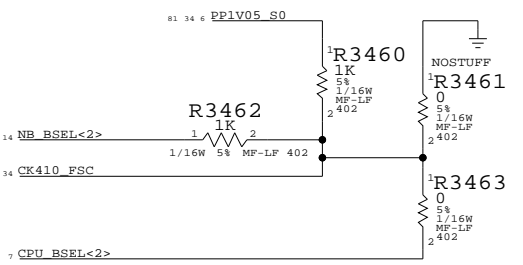
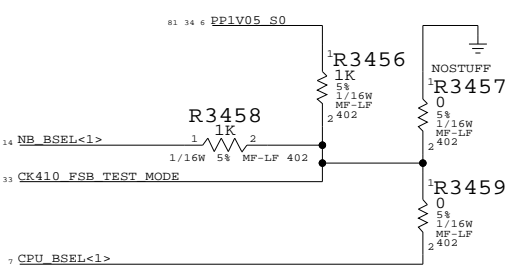
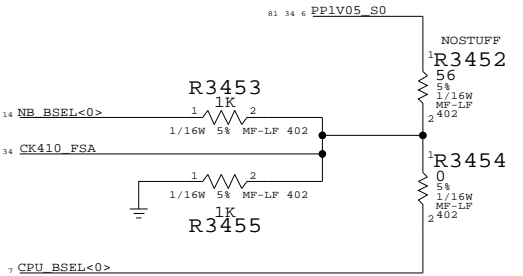


NOTE: USE THESE PULL-DOWNS IF NOT CONNECTED TO GPIO'S



FSB FREQUENCY SELECT:

	STUFF	NO STUFF
CPU DRIVEN	R3453 R3454 R3455	R3456 R3457
533MHZ (133MHZ CPU CLK)	R3452 R3454 R3455	R3456 R3457
667MHZ (166MHZ CPU CLK)	R3452 R3454 R3455	R3456 R3457



CLOCKS: TERMINATIONS

SYNC\_MASTER=N/A SYNC\_DATE=N/A

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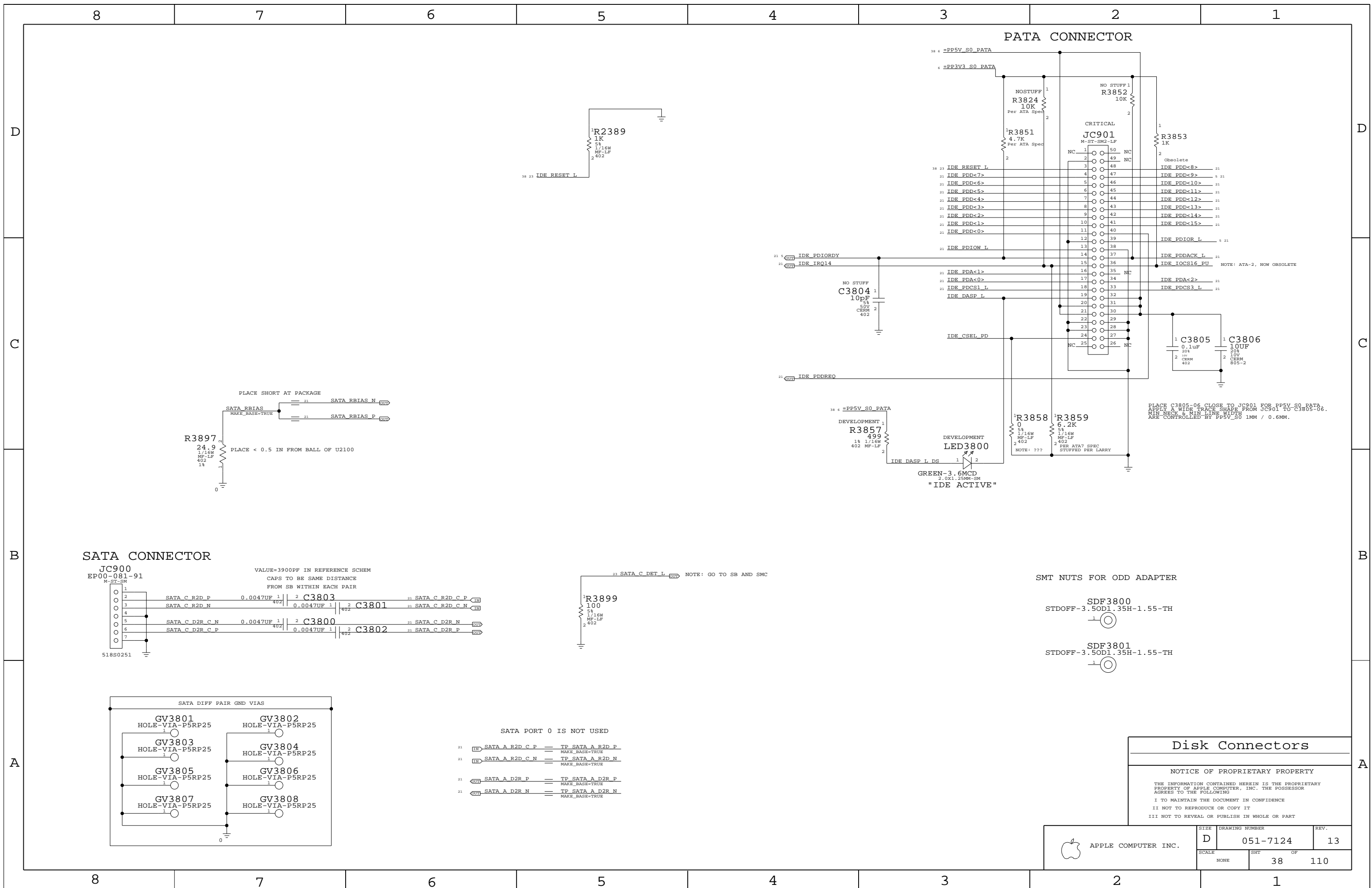
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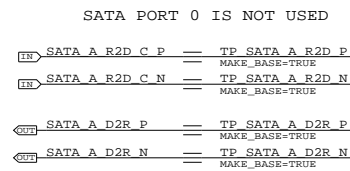
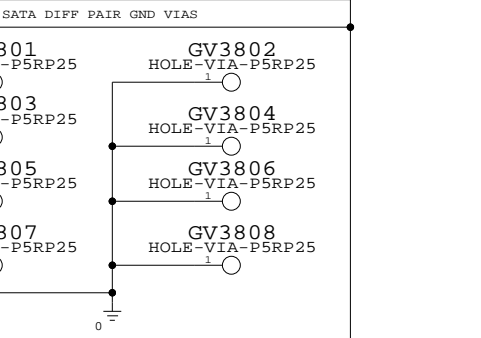
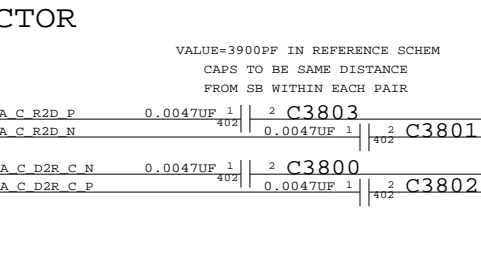
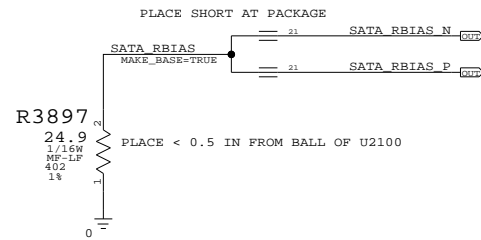
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	D	051-7124	13
SCALE	SHT	OF	110
NONE	34		



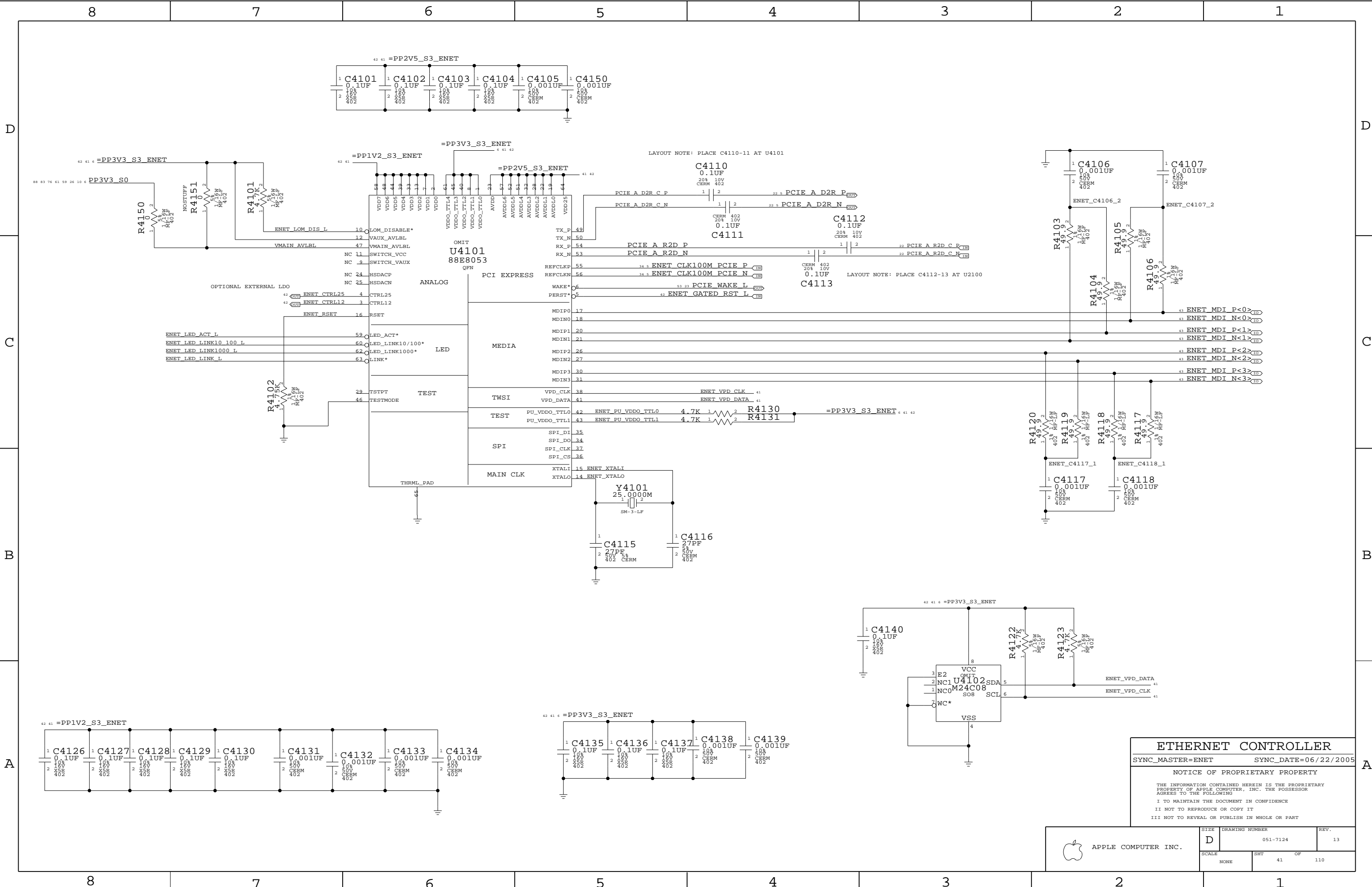
PATA CONNECTOR



Disk Connectors

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	D	051-7124	13
SCALE	SHT OF		
NONE	38		110



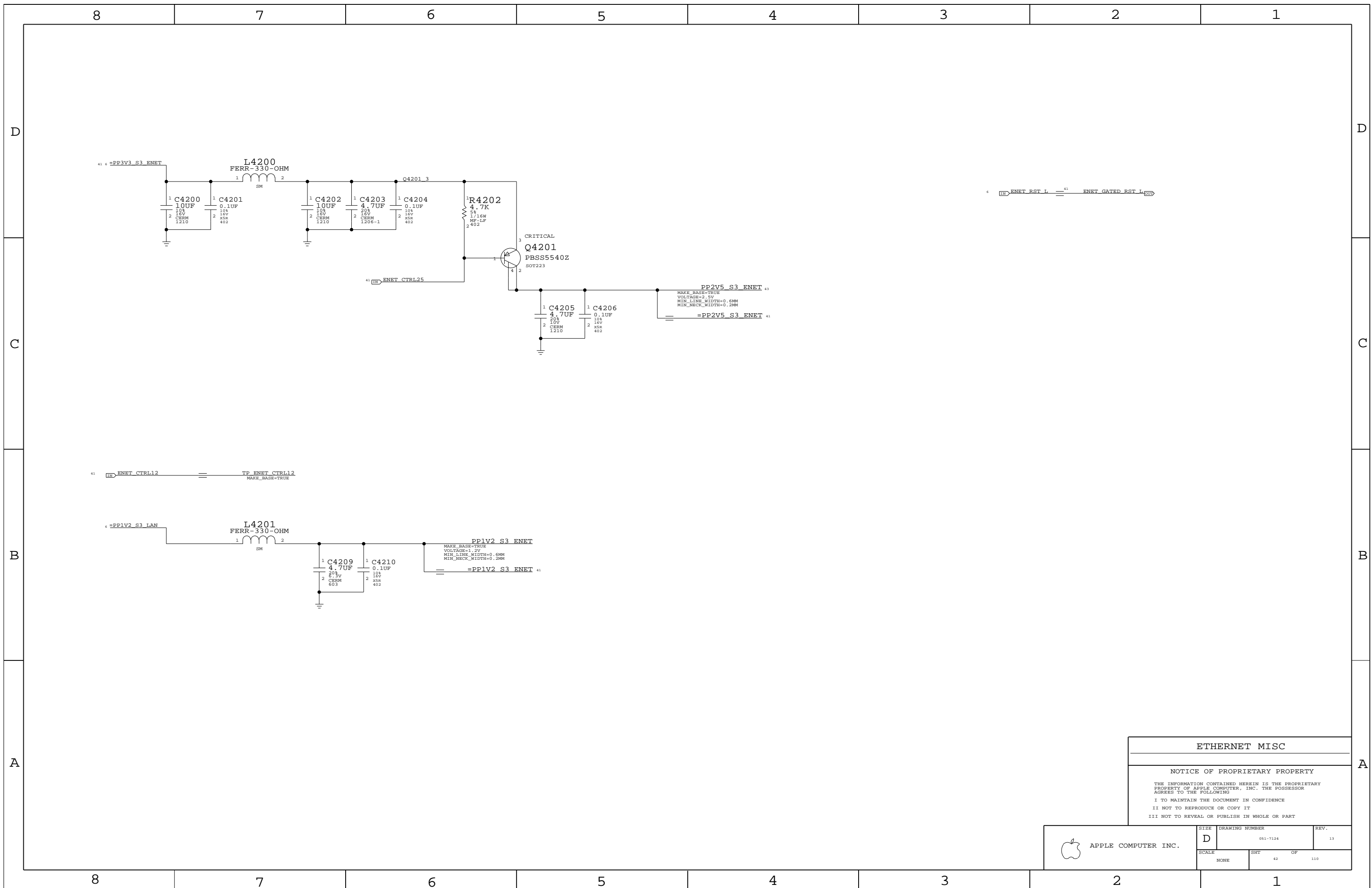
**ETHERNET CONTROLLER**

SYNC\_MASTER=ENET SYNC\_DATE=06/22/2005

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APPLE COMPUTER INC.	SIZE <b>D</b>	DRAWING NUMBER 051-7124	REV. 13
	SCALE NONE	SHEET 41	OF 110



**ETHERNET MISC**

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**NOTICE OF PROPRIETARY PROPERTY**

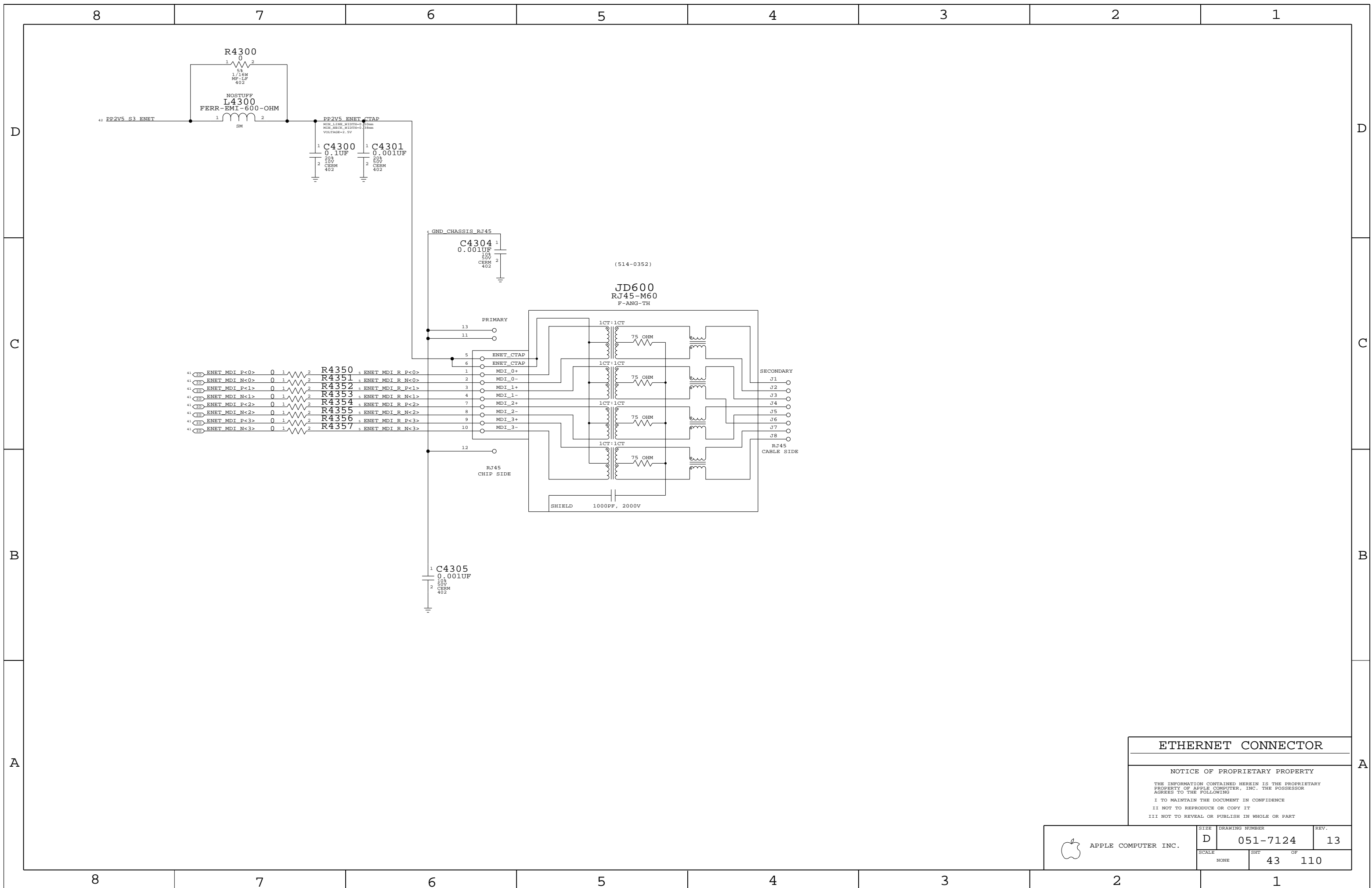
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	SCALE NONE	SHEET 42	OF 110



**ETHERNET CONNECTOR**

NOTICE OF PROPRIETARY PROPERTY

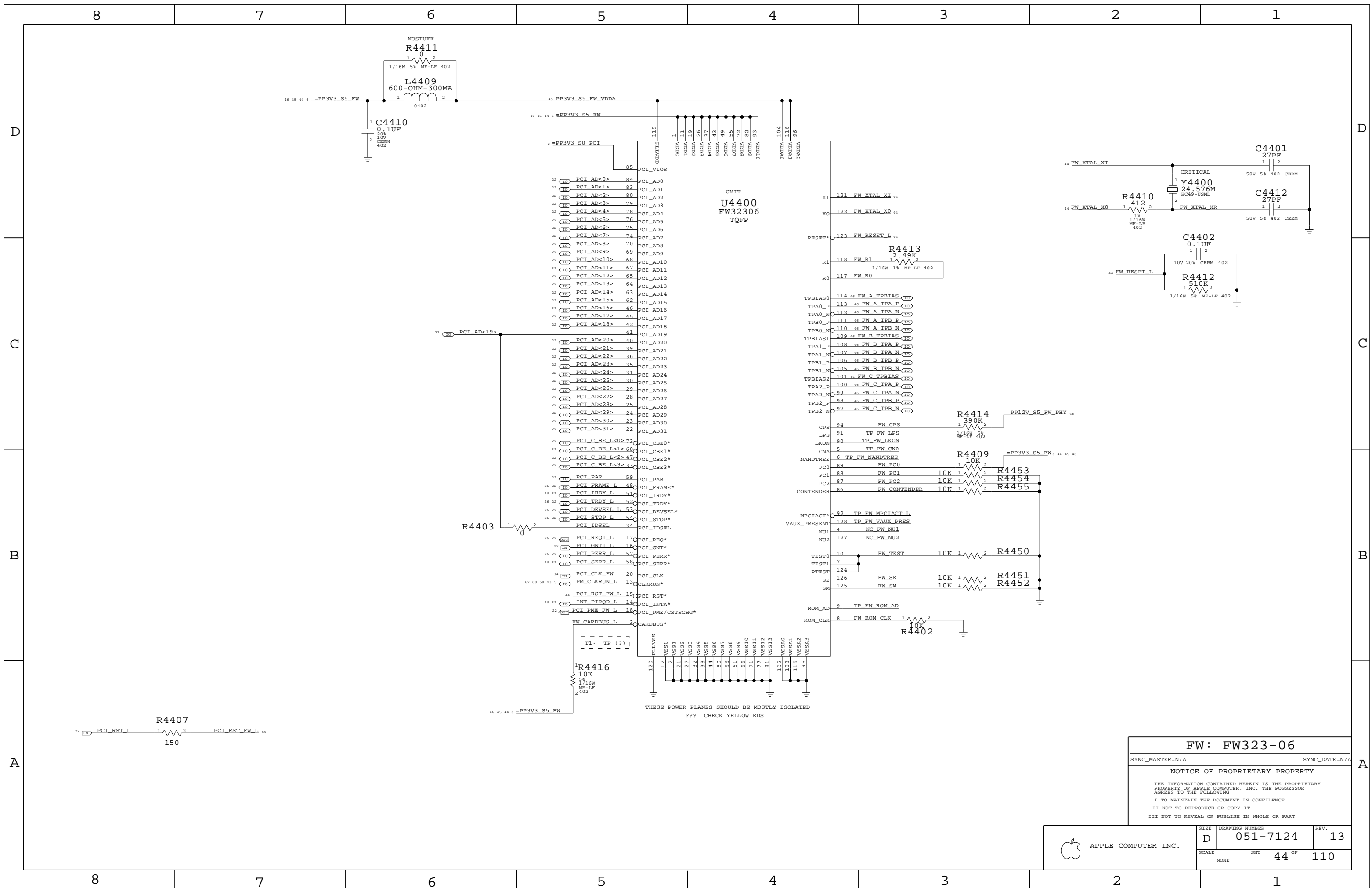
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	D	051-7124	13
SCALE		SHT	OF
NONE		43	110



**FW: FW323-06**

SYNC\_MASTER=N/A SYNC\_DATE=N/A

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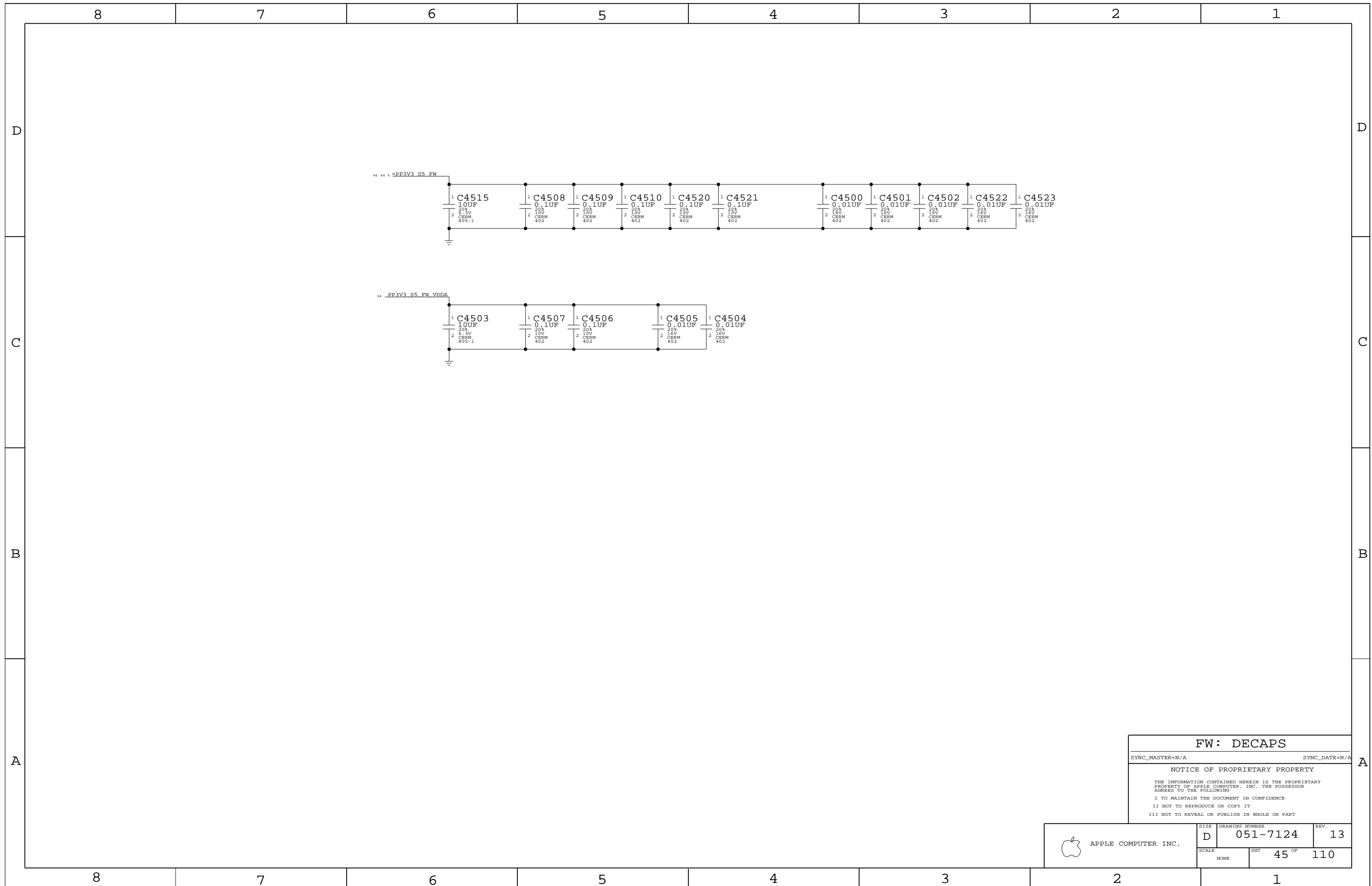
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	D	051-7124	13
SCALE	NONE	SHT	44 OF 110



**FW: DECAPS**

SYNC\_MASTER=N/A SYNC\_DATE=N/A

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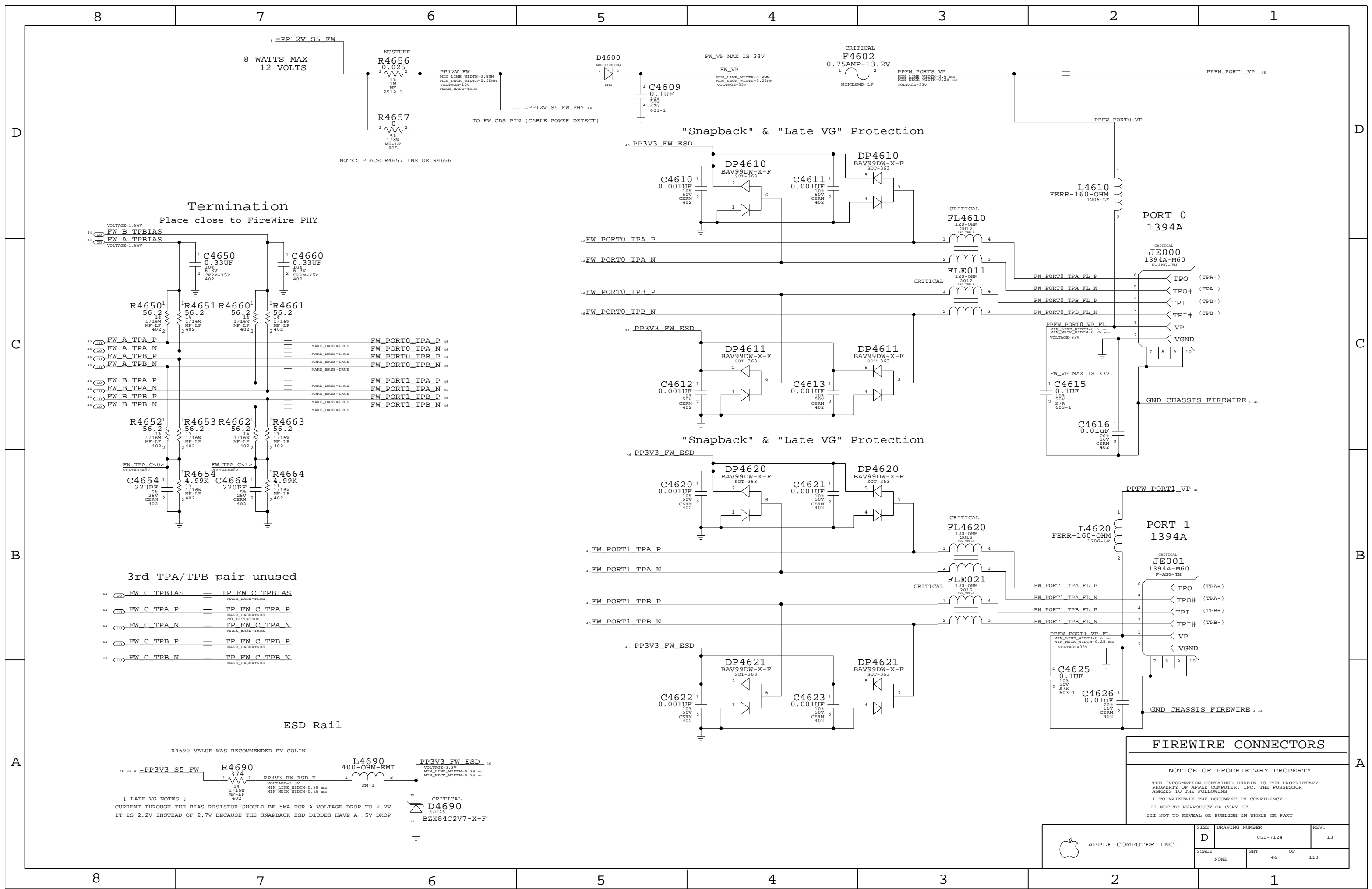
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	SCALE NONE	SHIT 45 OF 110	



**FIREWIRE CONNECTORS**

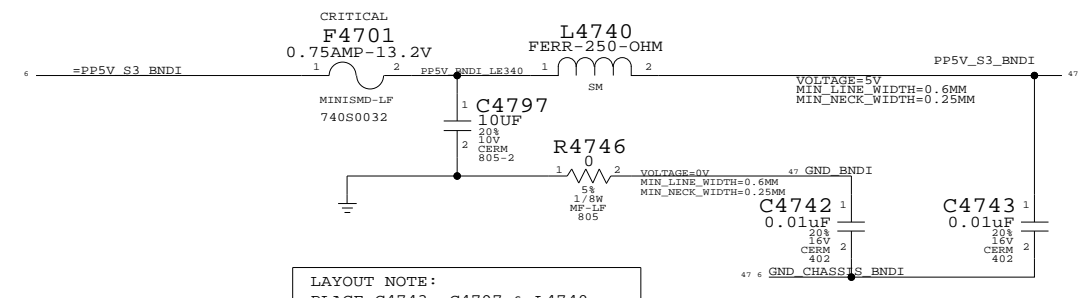
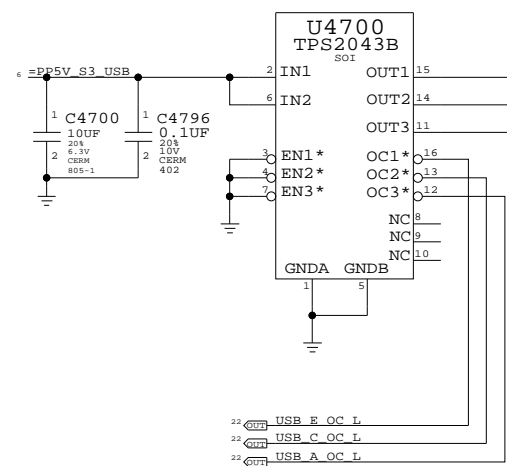
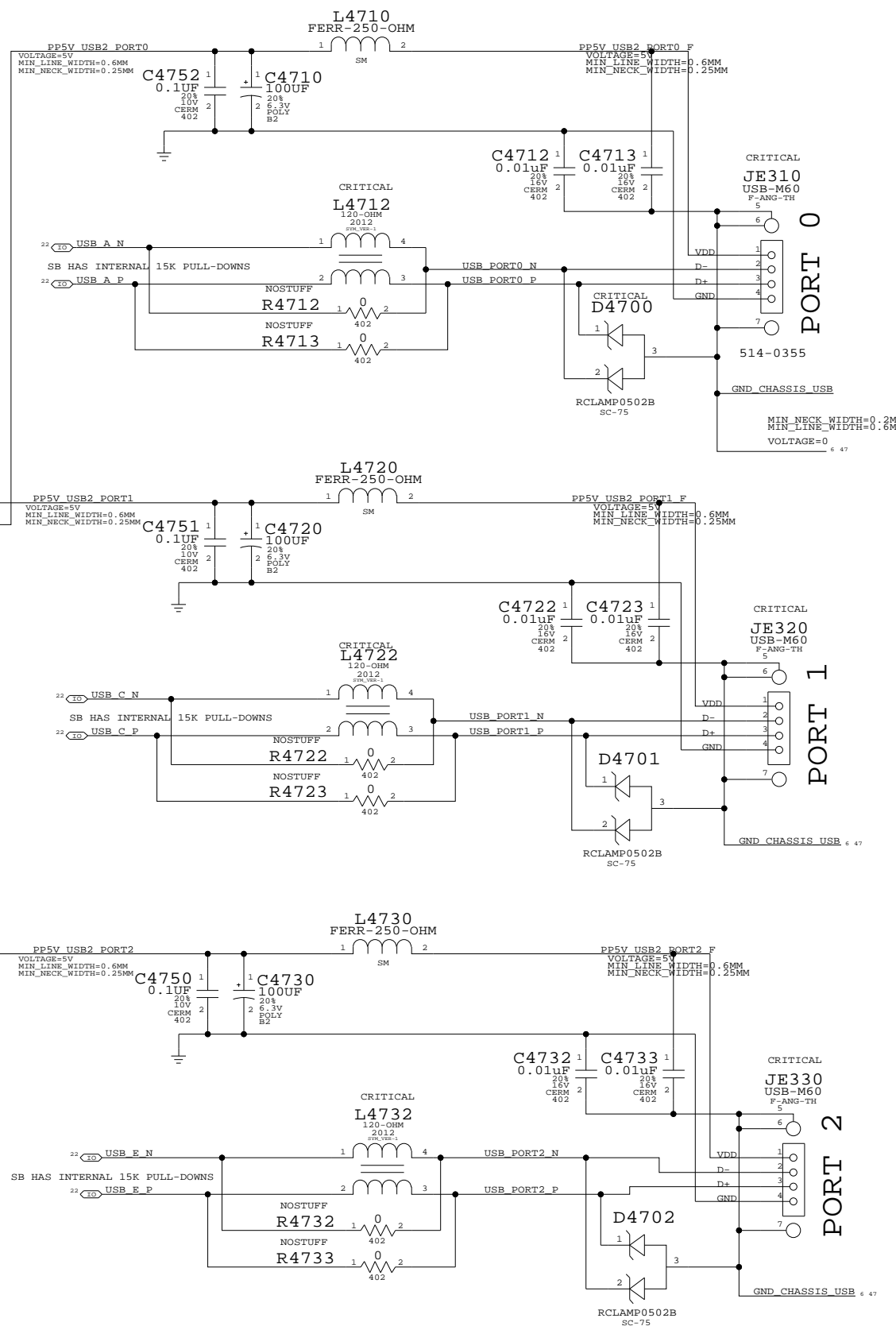
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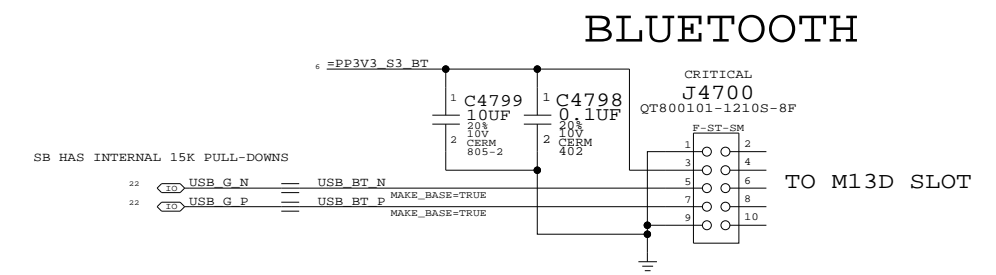
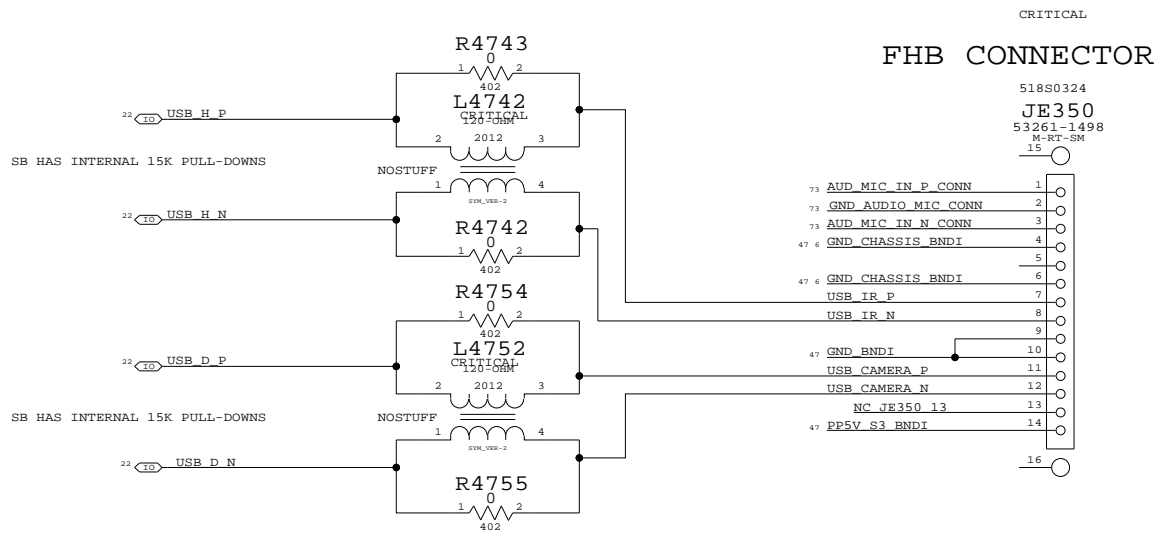
APPLE COMPUTER INC.	SIZE <b>D</b>	DRAWING NUMBER 051-7124	REV. 13
	SCALE NONE	SHEET 46	OF 110



# External USB Ports



LAYOUT NOTE:  
PLACE C4743, C4797 & L4740  
NEAR JE350 PIN 14 IN THE  
ORDER LISTED, AND NOT ON  
BOTH SIDES OF THE PIN.  
PLACE C4742 CLOSED TO JE350.



NOTE: STANDOFFS FOR J4700  
SDF4700  
STDOFF-40D4.5H-1.35-TH  
SDF4701  
STDOFF-40D4.5H-1.35-TH

**USB Device Interfaces**

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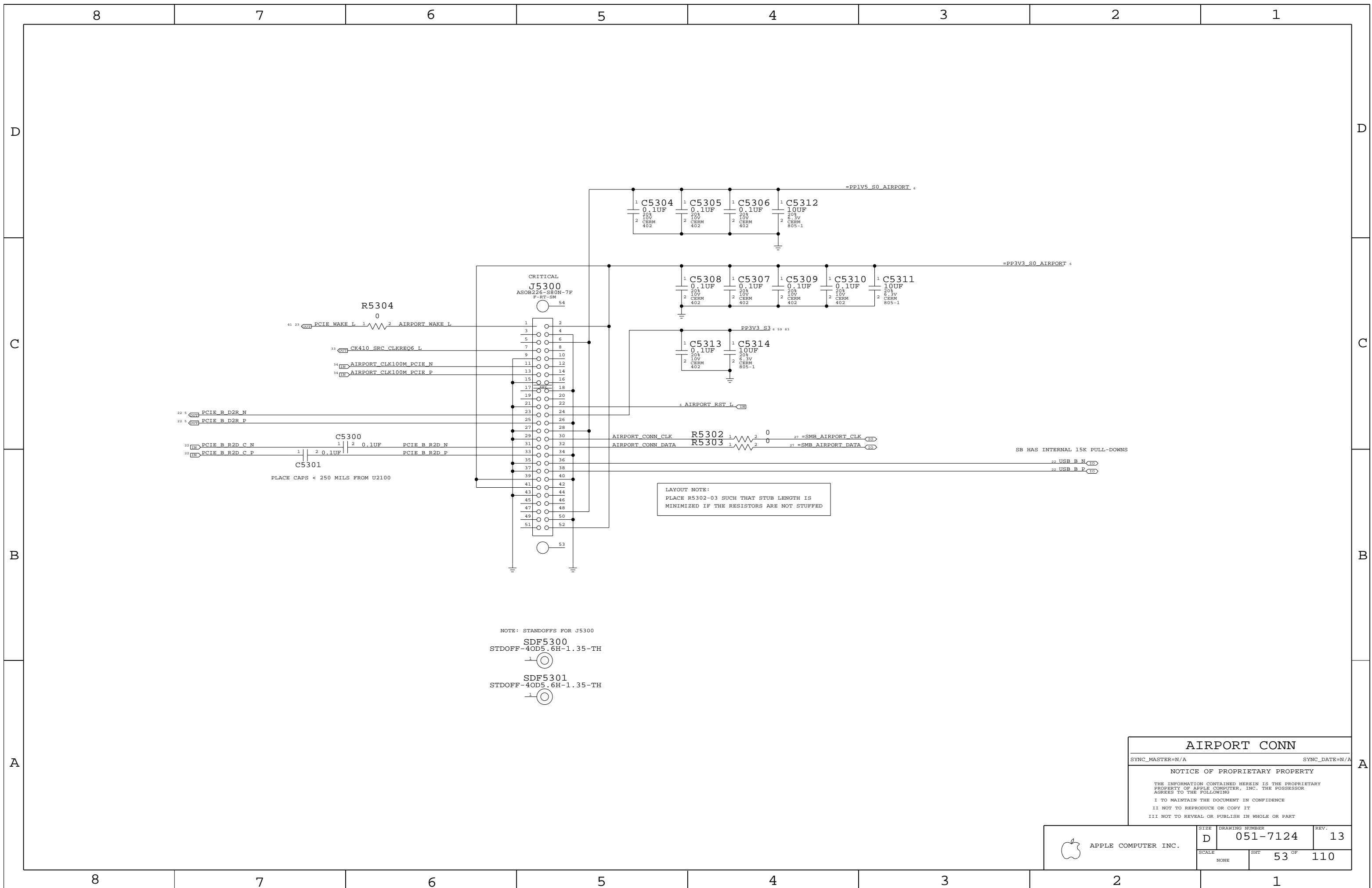
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PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
514-0355	3	USB RECEPTACLE, 4P, RIBLESS	JE310, JE320, JE330	CRITICAL	20_INCH_LCD

APPLE COMPUTER INC.	SCALE	DRAWING NUMBER		REV.
	NONE	D	051-7124	13
		SHT	OF	
		47	110	



LAYOUT NOTE:  
 PLACE R5302-03 SUCH THAT STUB LENGTH IS  
 MINIMIZED IF THE RESISTORS ARE NOT STUFFED

NOTE: STANDOFFS FOR J5300  
 SDF5300  
 STDOFF-40D5.6H-1.35-TH  
 SDF5301  
 STDOFF-40D5.6H-1.35-TH

SB HAS INTERNAL 15K PULL-DOWNS

**AIRPORT CONN**  
 SYNC\_MASTER=N/A SYNC\_DATE=N/A  
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APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7124	13
SCALE	SHT	REV.	
NONE	53 OF	110	

8

7

6

5

4

3

2

1

D

D

C

C

B

B

A

A

22  PCIE C R2D C N == TP PCIE C R2D C N  
MAKE\_BASE=TRUE

22  PCIE C R2D C P == TP PCIE C R2D C P  
MAKE\_BASE=TRUE

22  PCIE C D2R N == TP PCIE C D2R N  
MAKE\_BASE=TRUE

22  PCIE C D2R P == TP PCIE C D2R P  
MAKE\_BASE=TRUE

22  PCIE D R2D C N == TP PCIE D R2D C N  
MAKE\_BASE=TRUE

22  PCIE D R2D C P == TP PCIE D R2D C P  
MAKE\_BASE=TRUE

22  PCIE D D2R N == TP PCIE D D2R N  
MAKE\_BASE=TRUE

22  PCIE D D2R P == TP PCIE D D2R P  
MAKE\_BASE=TRUE

22  PCIE E R2D C N == TP PCIE E R2D C N  
MAKE\_BASE=TRUE

22  PCIE E R2D C P == TP PCIE E R2D C P  
MAKE\_BASE=TRUE

22  PCIE E D2R N == TP PCIE E D2R N  
MAKE\_BASE=TRUE

22  PCIE E D2R P == TP PCIE E D2R P  
MAKE\_BASE=TRUE

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MAKE\_BASE=TRUE

22  PCIE F R2D C P == TP PCIE F R2D C P  
MAKE\_BASE=TRUE

22  PCIE F D2R N == TP PCIE F D2R N  
MAKE\_BASE=TRUE

22  PCIE F D2R P == TP PCIE F D2R P  
MAKE\_BASE=TRUE

8

7

6

5

4

3

2

1

### PCIE UNUSED PORTS

SYNC\_MASTER=N/A SYNC\_DATE=N/A

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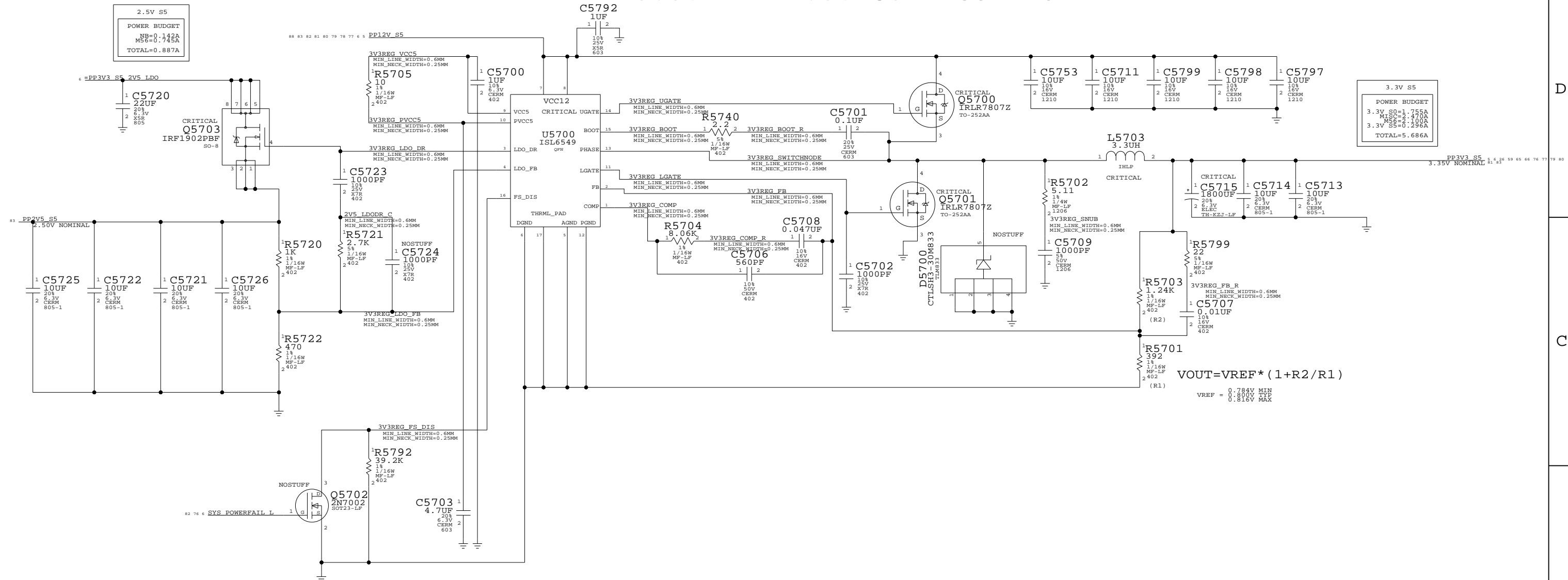
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APPLE COMPUTER INC.

SIZE	DRAWING NUMBER	REV.
D	051-7124	13
SCALE	SHT	OF
NONE	54	110

# 3.3V AND 2.5V S5 REGULATOR



**2.5V S5**  
 POWER BUDGET  
 NB=0.142A  
 MS6=0.745A  
 TOTAL=0.887A

**3.3V S5**  
 POWER BUDGET  
 3.3V S0=1.755A  
 MS0=2.470A  
 MS6=2.100A  
 TOTAL=5.686A

$$V_{OUT} = V_{REF} * (1 + R2/R1)$$

$V_{REF} = 0.784V \text{ MIN}$   
 $0.800V \text{ TYP}$   
 $0.816V \text{ MAX}$

**3.3V DC/DC 2.5V**

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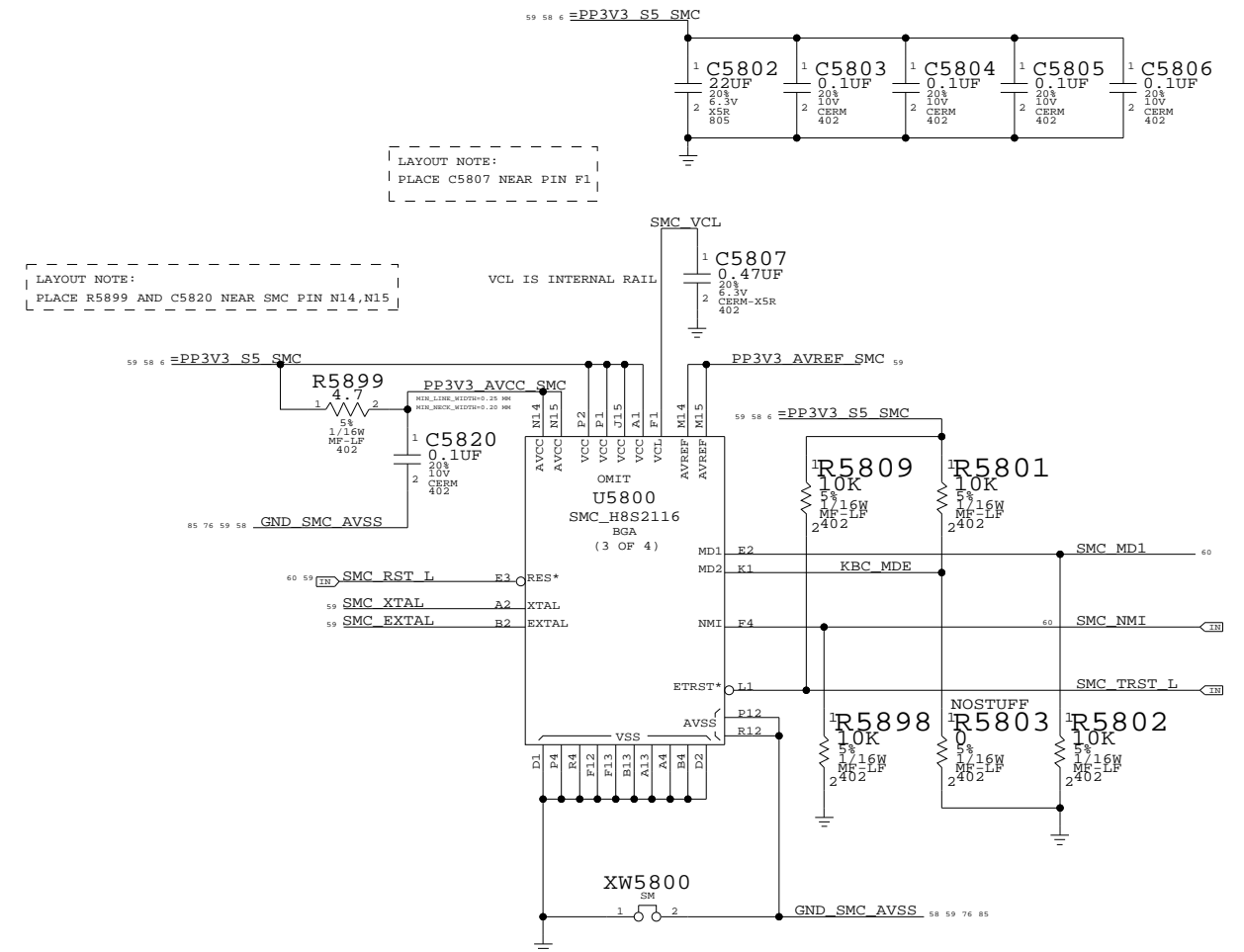
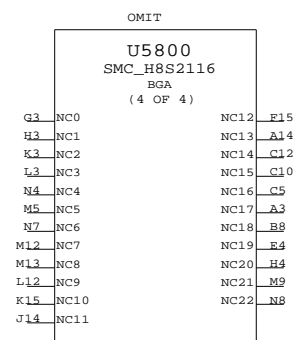
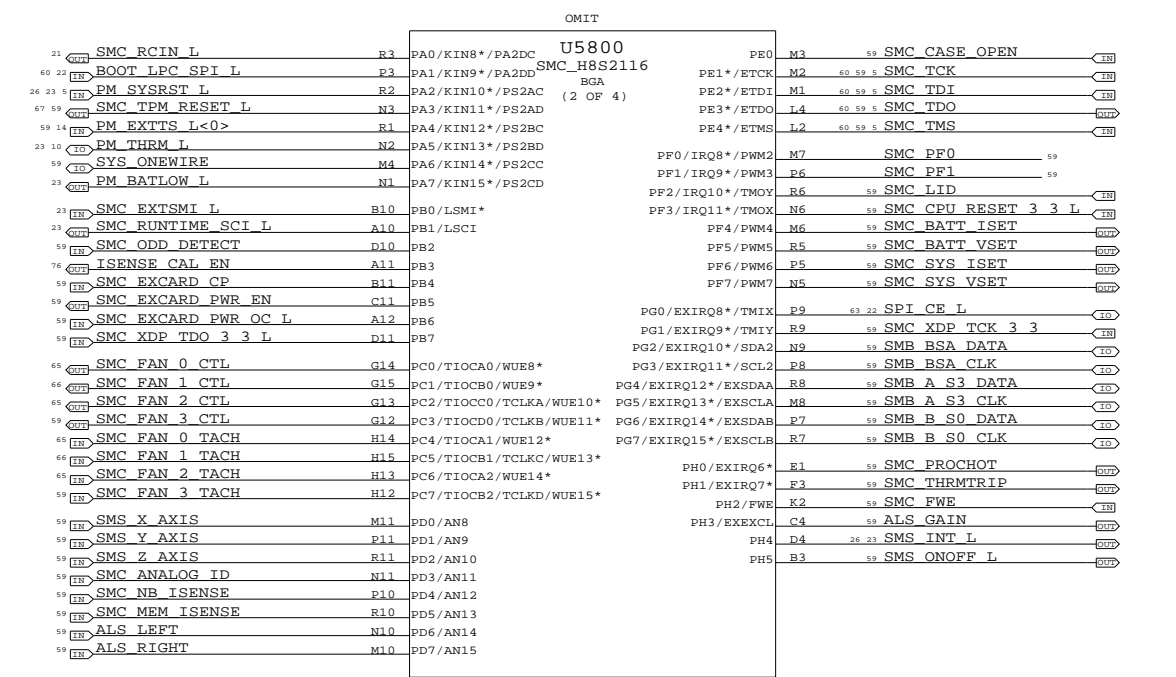
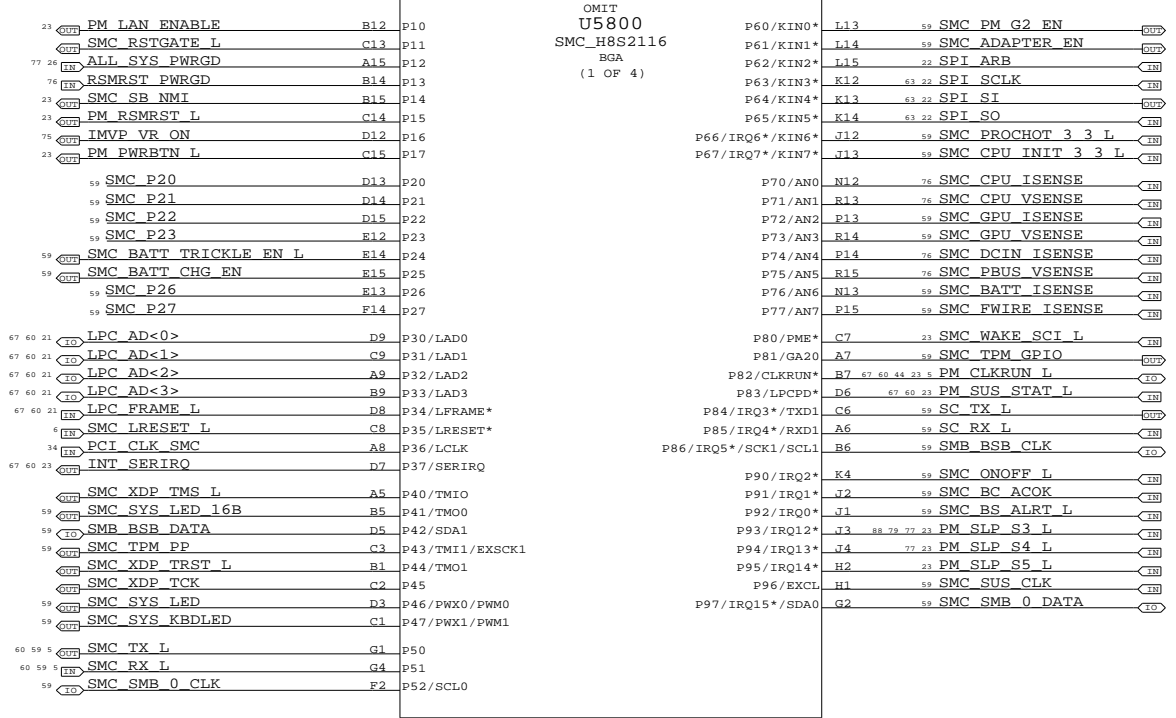
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	D	051-7124	13
SCALE	SHT	57 OF	110
NONE			

UNUSED PINS HAVE THE FORMAT SMC\_XXX WHERE XXX IS THE PORT NUMBER. THEY ARE SET BY SOFTWARE TO BE DRIVEN OUTPUTS ALWAYS SO THEY CAN BE LEFT NO-CONNECTED.



SMC

SYNC\_MASTER=N/A SYNC\_DATE=N/A

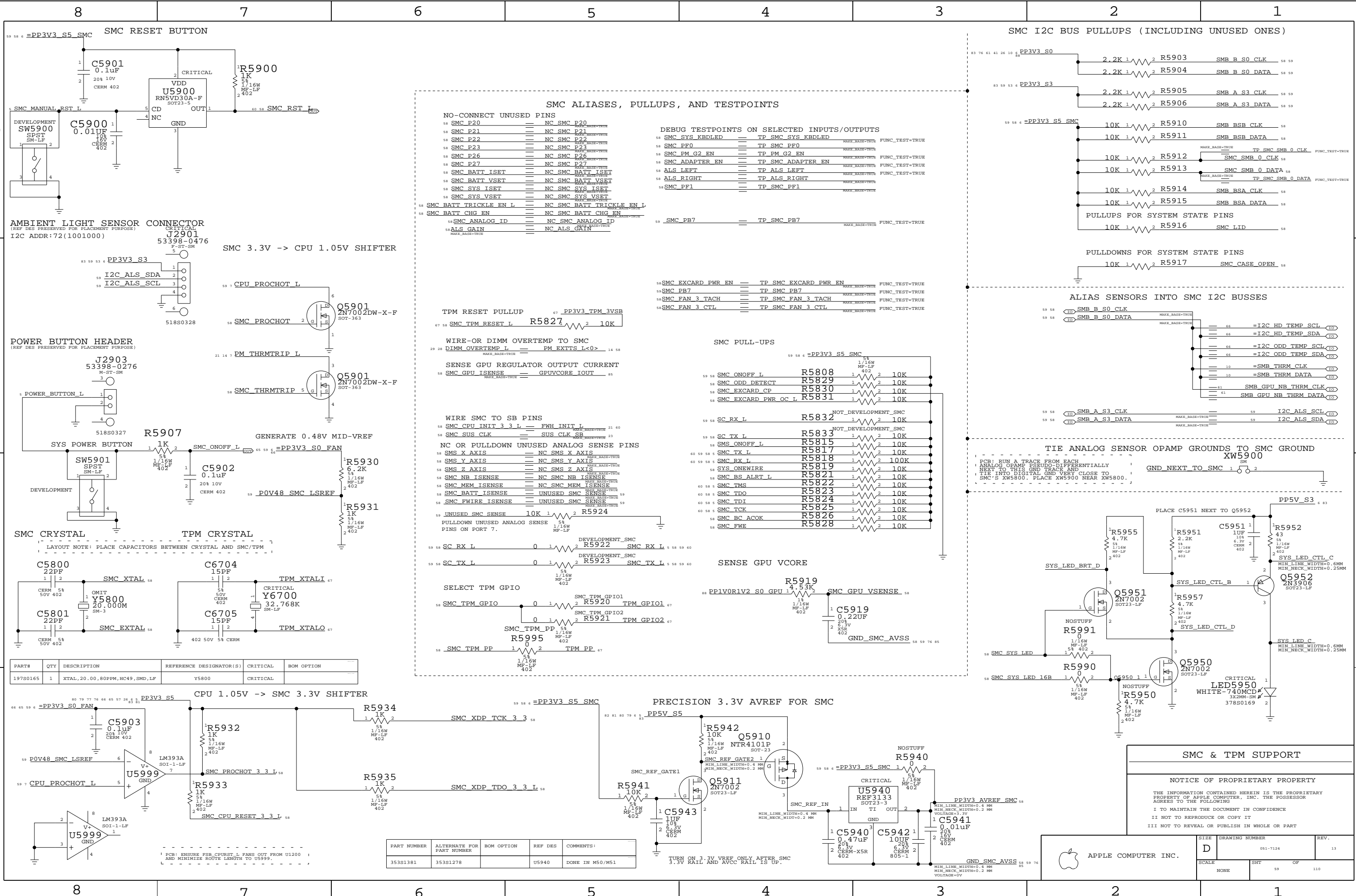
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### SMC ALIASES, PULLUPS, AND TESTPOINTS

NO-CONNECT UNUSED PINS		DEBUG TESTPOINTS ON SELECTED INPUTS/OUTPUTS	
58 SMC P20	== NC SMC P20	58 SMC SYS_KBDLED	== TP_SMC_SYS_KBDLED MAKE_BASE=TRUE FUNC_TEST=TRUE
58 SMC P21	== NC SMC P21	58 SMC PF0	== TP_SMC_PF0 MAKE_BASE=TRUE
58 SMC P22	== NC SMC P22	58 SMC PM_G2_EN	== TP_PM_G2_EN MAKE_BASE=TRUE FUNC_TEST=TRUE
58 SMC P23	== NC SMC P23	58 SMC_ADAPTER_EN	== TP_SMC_ADAPTER_EN MAKE_BASE=TRUE FUNC_TEST=TRUE
58 SMC P26	== NC SMC P26	58 ALS_LEFT	== TP_ALS_LEFT MAKE_BASE=TRUE FUNC_TEST=TRUE
58 SMC P27	== NC SMC P27	58 ALS_RIGHT	== TP_ALS_RIGHT MAKE_BASE=TRUE FUNC_TEST=TRUE
58 SMC_BATT_ISET	== NC SMC_BATT_ISET	58 SMC_PF1	== TP_SMC_PF1 MAKE_BASE=TRUE
58 SMC_BATT_VSET	== NC SMC_BATT_VSET		
58 SMC_SYS_ISET	== NC SMC_SYS_ISET		
58 SMC_SYS_VSET	== NC SMC_SYS_VSET		
58 SMC_BATT_TRICKLE_EN_L	== NC SMC_BATT_TRICKLE_EN_L	59 SMC_PB7	== TP_SMC_PB7 MAKE_BASE=TRUE FUNC_TEST=TRUE
58 SMC_BATT_CHG_EN	== NC SMC_BATT_CHG_EN		
58 SMC_ANALOG_ID	== NC SMC_ANALOG_ID		
58 ALS_GAIN	== NC ALS_GAIN		

### SMC PULL-UPS

58 SMC_ONOFF_L	R5808	10K
58 SMC_ODD_DETECT	R5829	10K
58 SMC_EXCARD_CP	R5830	10K
58 SMC_EXCARD_PWR_OC_L	R5831	10K
58 SC_RX_L	R5832	10K
58 SC_TX_L	R5833	10K
58 SMS_ONOFF_L	R5815	10K
58 SMC_TX_L	R5817	10K
58 SMC_RX_L	R5818	100K
58 SYS_ONEWIRE	R5819	10K
58 SMC_BS_ALERT_L	R5821	10K
58 SMC_TMS	R5822	10K
58 SMC_TDO	R5823	10K
58 SMC_TDI	R5824	10K
58 SMC_TCK	R5825	10K
58 SMC_BC_ACOK	R5826	10K
58 SMC_FWE	R5828	10K

### WIRE SMC TO SB PINS

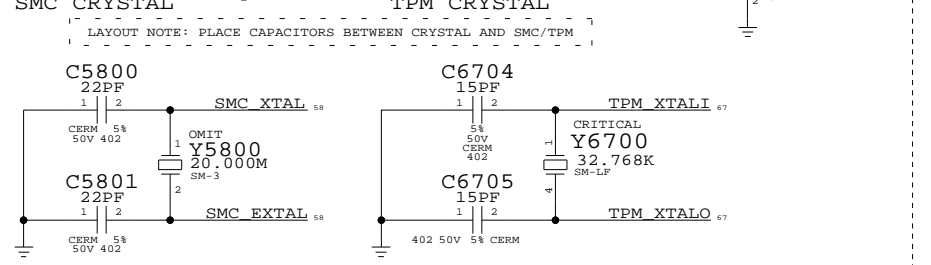
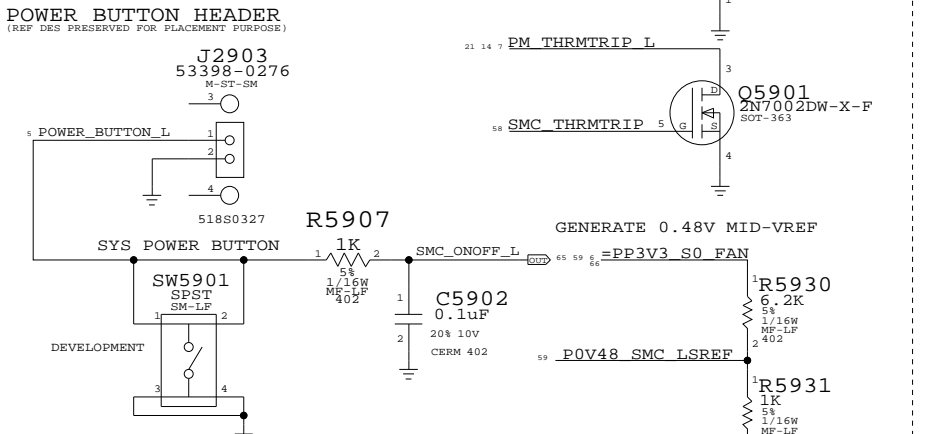
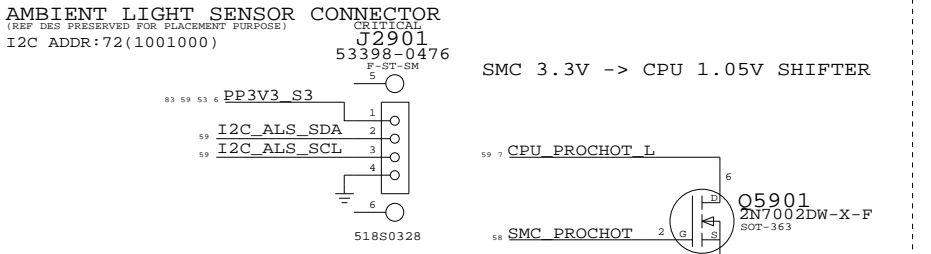
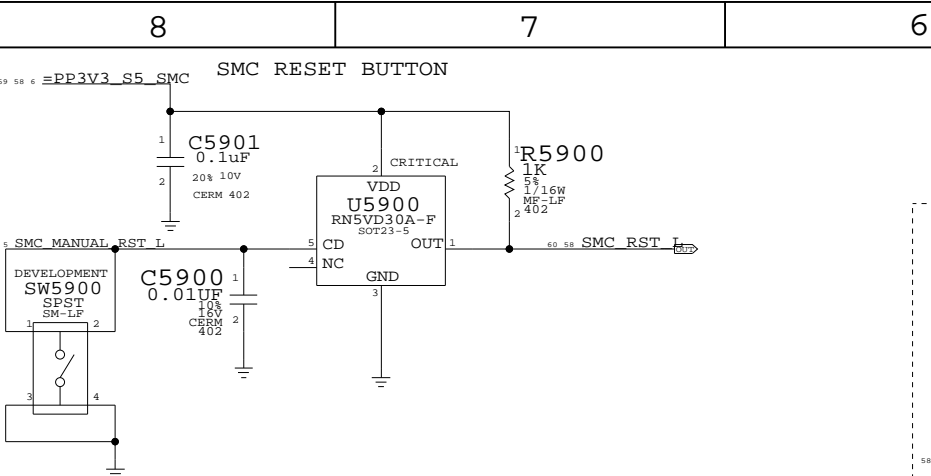
58 SMC_CPU_INIT_3_3_L	== FWH_INIT_L
58 SMC_SUS_CLK	== SUS_CLK_SB
58 SMC_TX_L	== SMC_TX_L
58 SMC_RX_L	== SMC_RX_L
58 SMC_TMS	== SMC_TMS
58 SMC_TDO	== SMC_TDO
58 SMC_TDI	== SMC_TDI
58 SMC_TCK	== SMC_TCK
58 SMC_BC_ACOK	== SMC_BC_ACOK
58 SMC_FWE	== SMC_FWE

### SELECT TPM GPIO

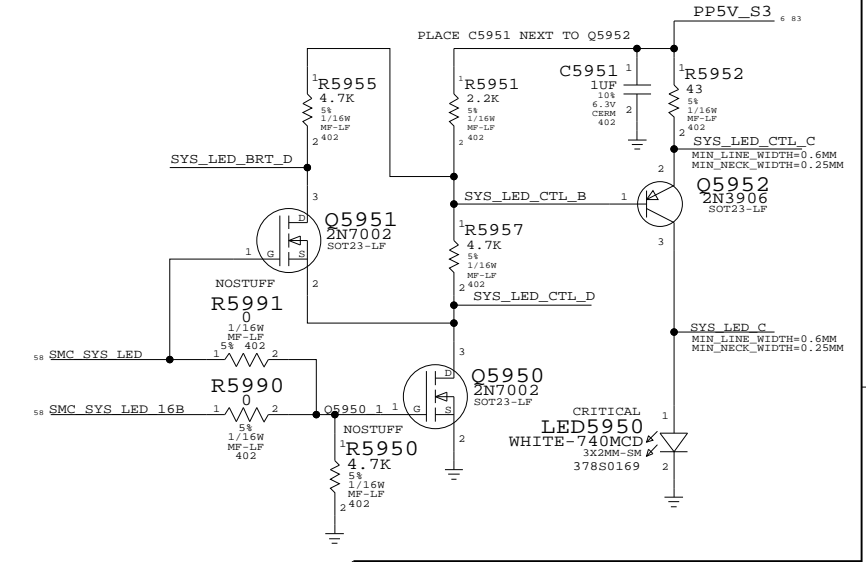
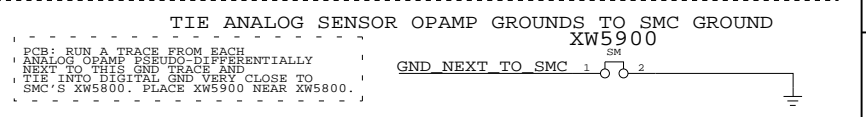
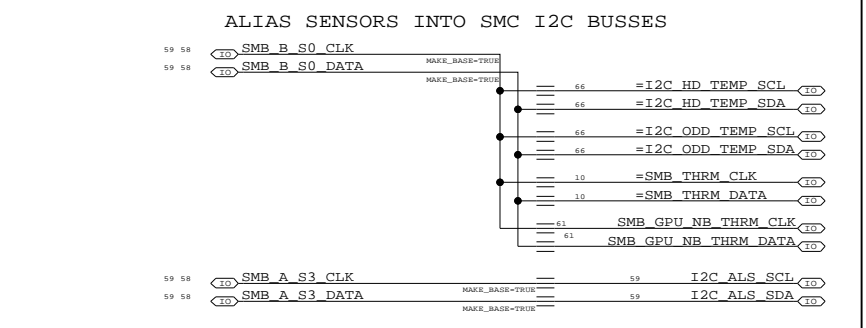
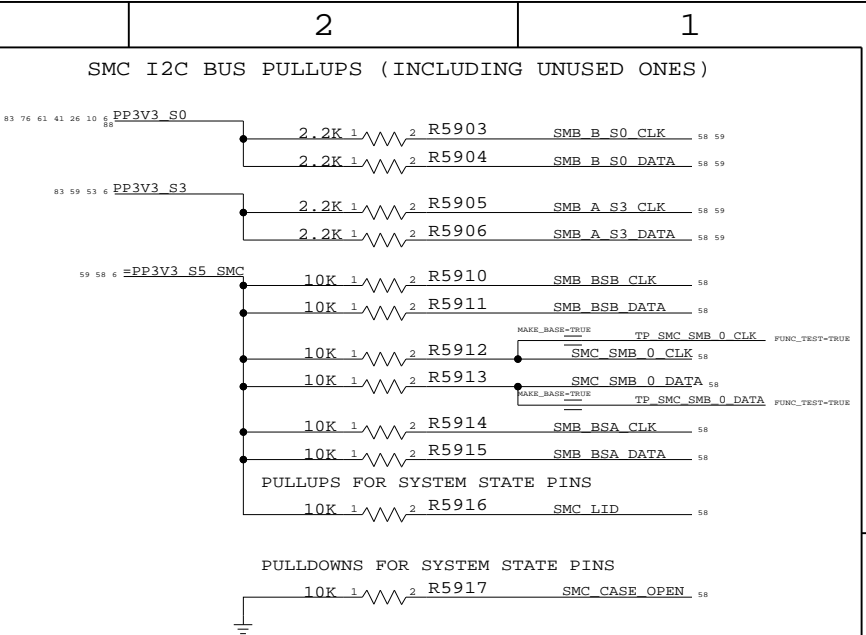
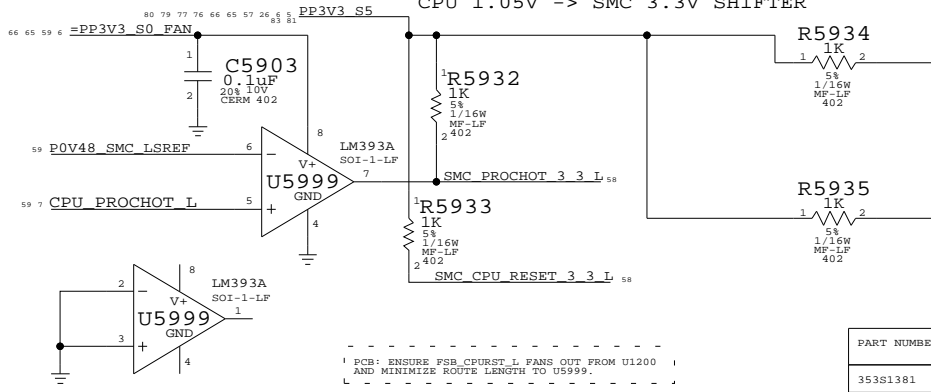
58 SMC_TPM_GPIO1	== SMC_TPM_GPIO1
58 SMC_TPM_GPIO2	== SMC_TPM_GPIO2
58 SMC_TPM_PP	== SMC_TPM_PP

### PRECISION 3.3V AVREF FOR SMC

58 SMC_REF_GATE1	== SMC_REF_GATE1
58 SMC_REF_GATE2	== SMC_REF_GATE2
58 SMC_REF_IN	== SMC_REF_IN



PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
19780165	1	XTAL, 20.00, 80PPM, HC49, SMD, LF	Y5800	CRITICAL	



PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS
353S1381	353S1278		U5940	DONE IN M50/M51

**SMC & TPM SUPPORT**

**NOTICE OF PROPRIETARY PROPERTY**

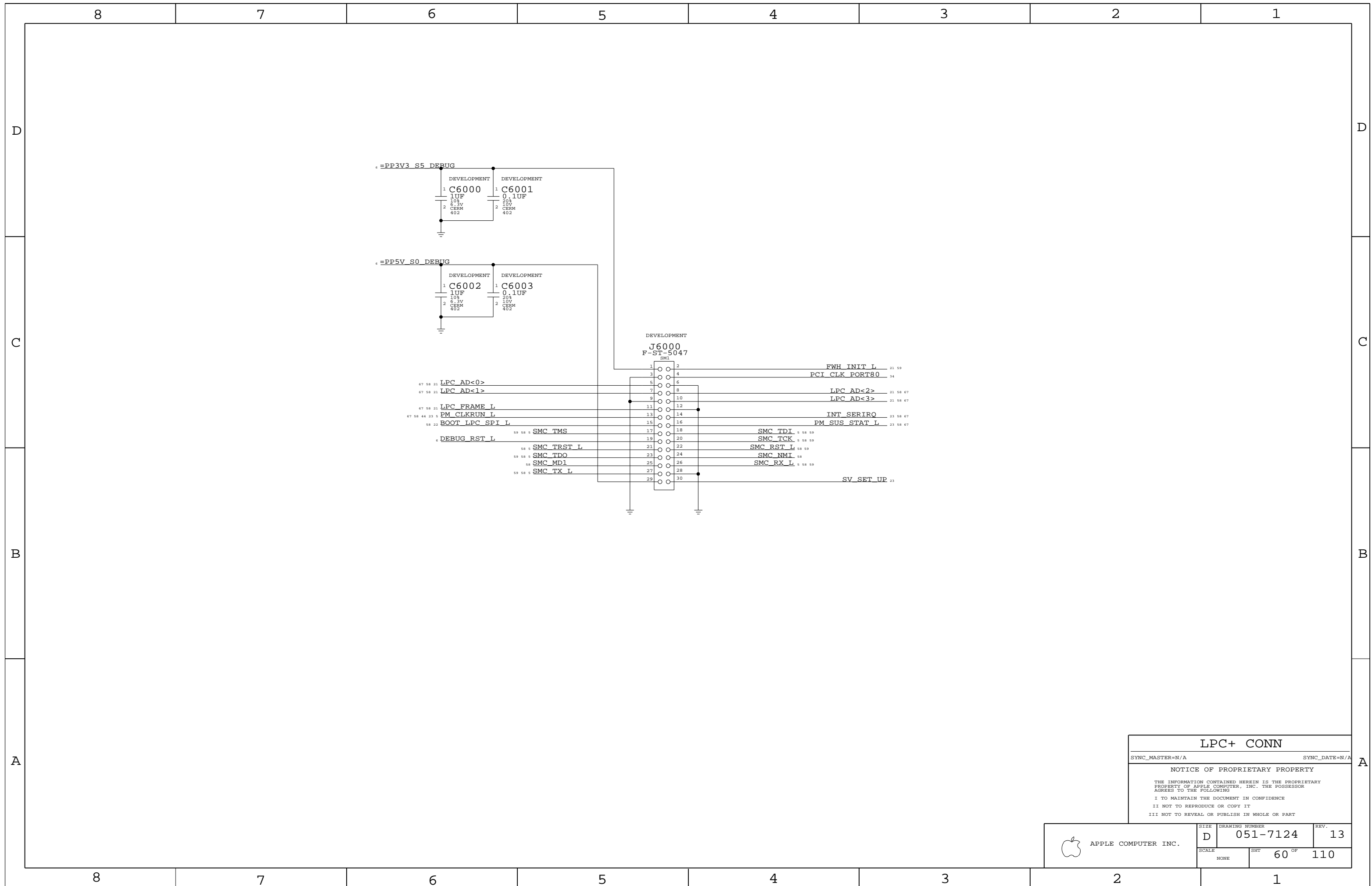
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APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7124	13
SCALE	SHT	OF	
NONE	59	110	



**LPC+ CONN**

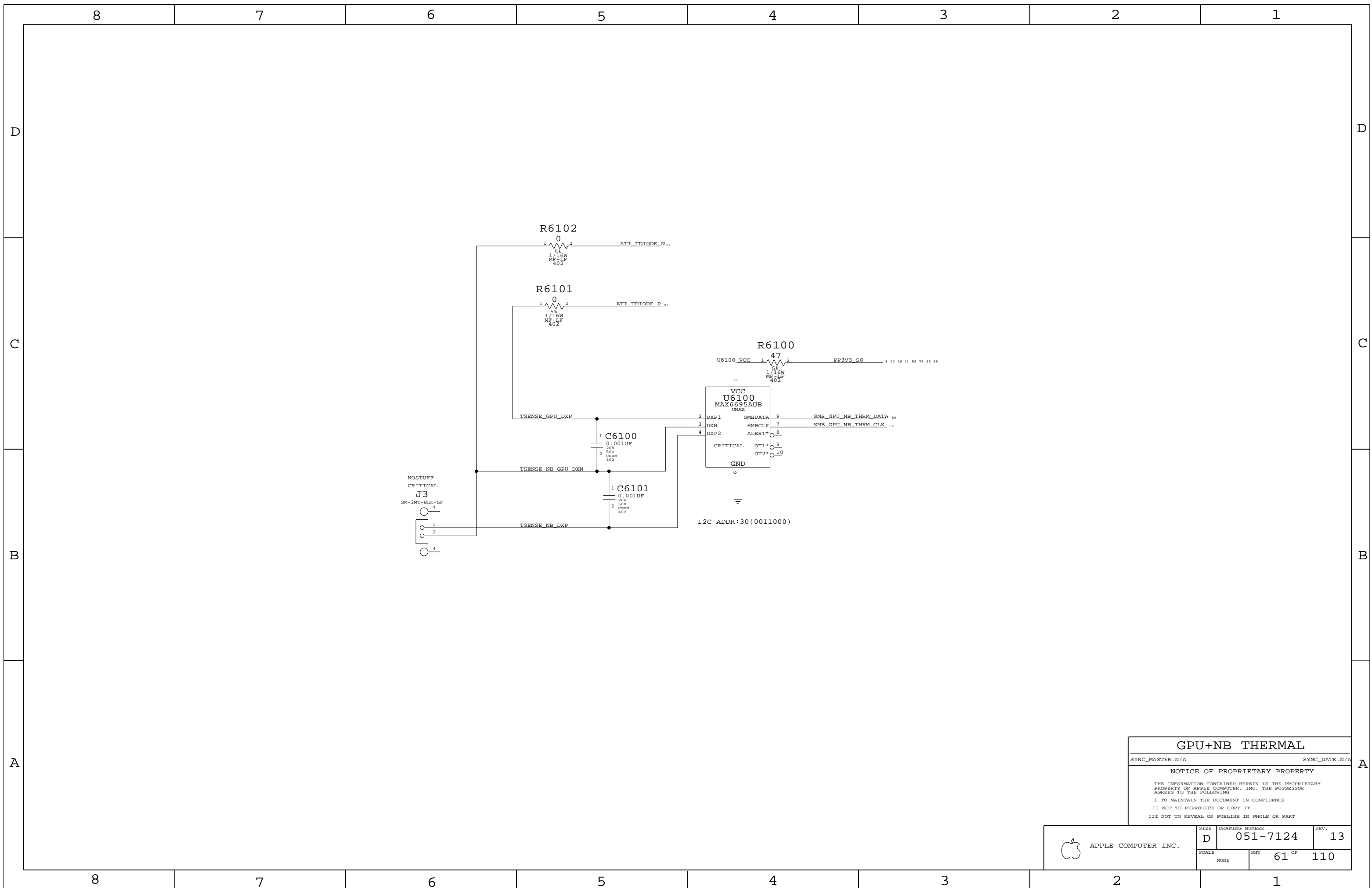
SYNC\_MASTER=N/A SYNC\_DATE=N/A

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APPLE COMPUTER INC.	SIZE <b>D</b>	DRAWING NUMBER <b>051-7124</b>	REV. <b>13</b>
	SCALE NONE	SHT 60 OF 110	



**GPU+NB THERMAL**

SYNC\_MASTER=N/A SYNC\_DATE=N/A

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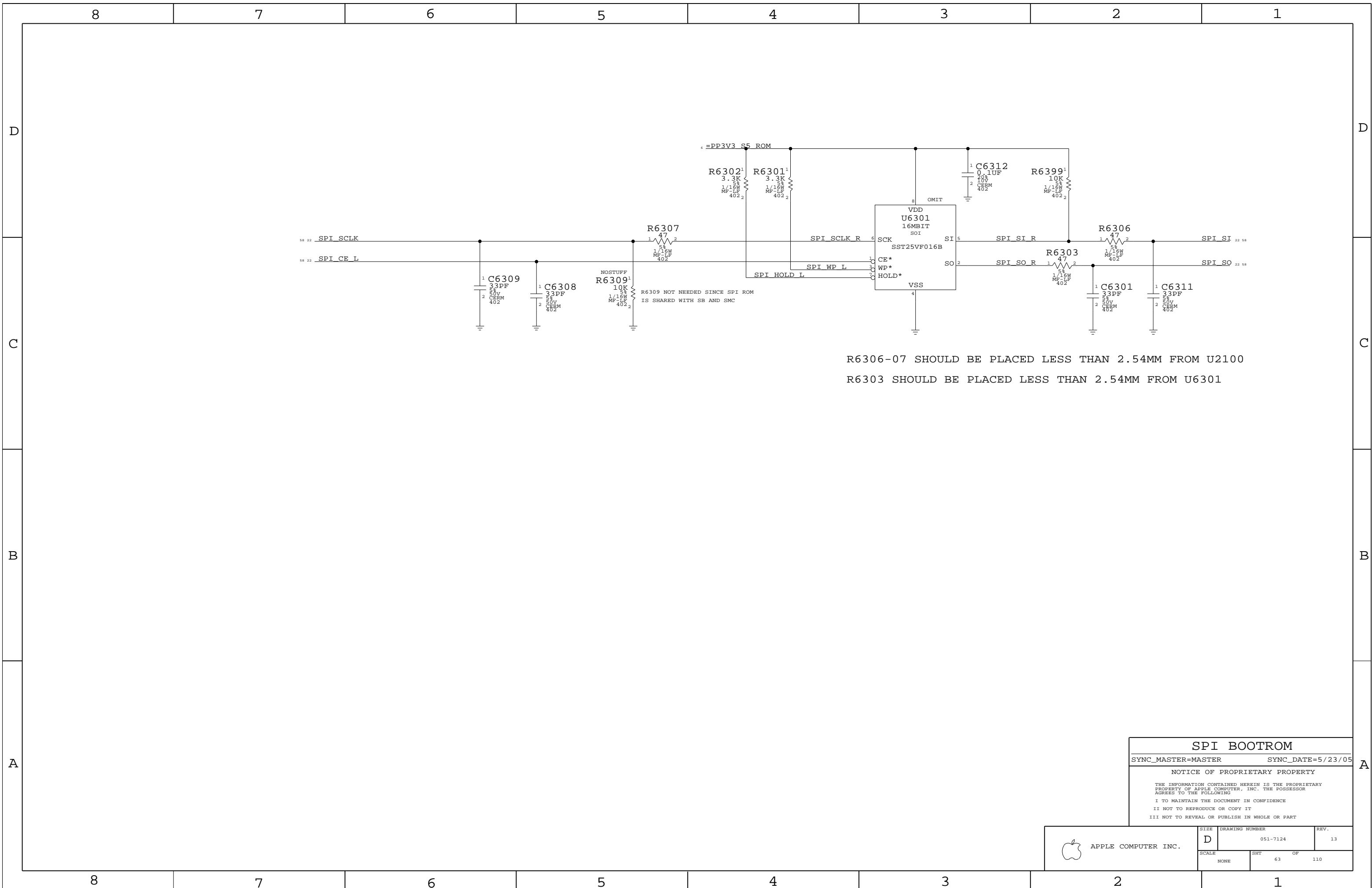
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II NOT TO REPRODUCE OR COPY IT

III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE COMPUTER INC.	SIZE <b>D</b>	DRAWING NUMBER <b>051-7124</b>	REV. <b>13</b>
	SCALE NONE	SHEETS 61 OF 110	



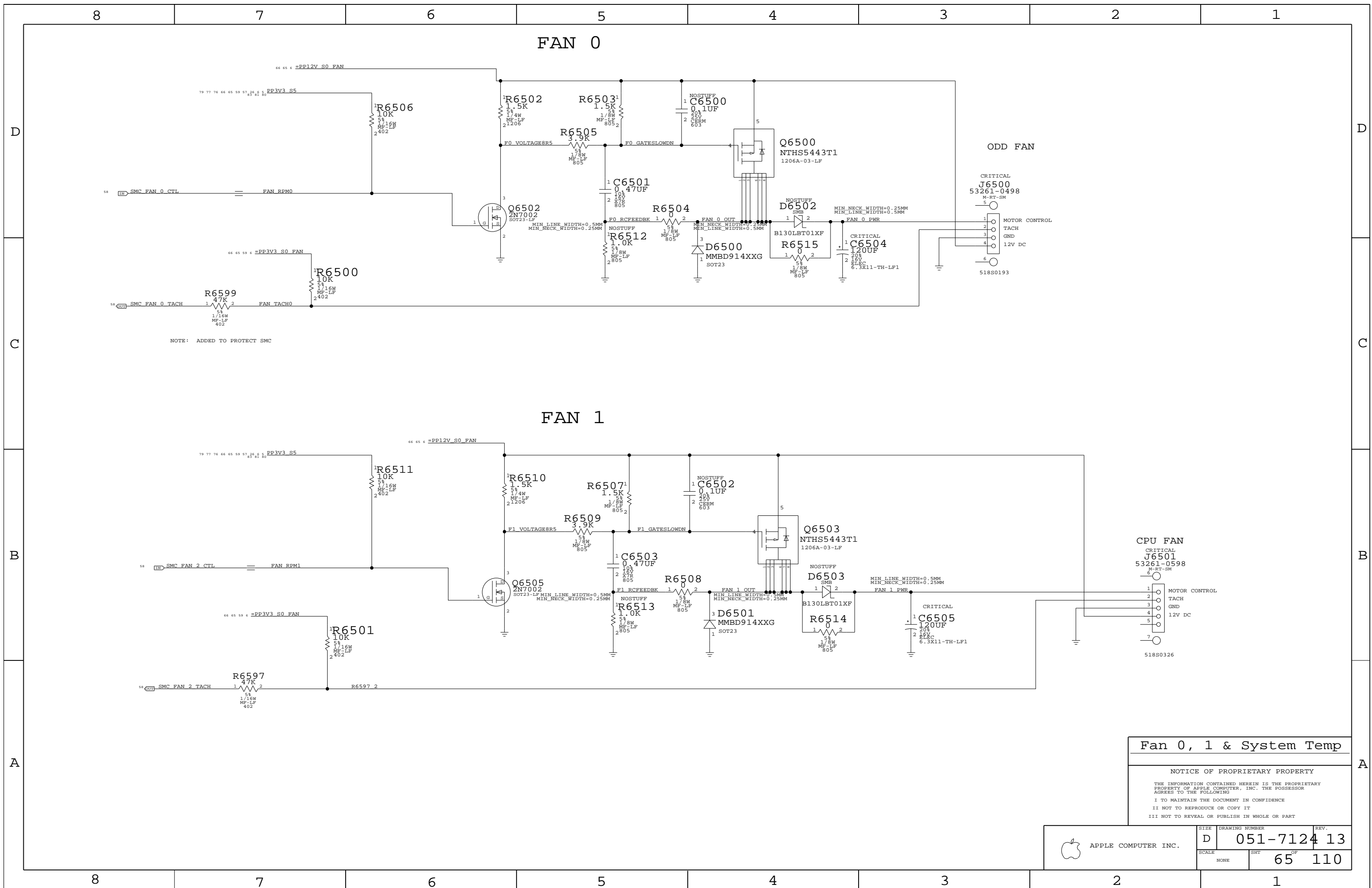


R6306-07 SHOULD BE PLACED LESS THAN 2.54MM FROM U2100  
 R6303 SHOULD BE PLACED LESS THAN 2.54MM FROM U6301

**SPI BOOTROM**  
 SYNC\_MASTER=MASTER      SYNC\_DATE=5/23/05

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APPLE COMPUTER INC.	SIZE <b>D</b>	DRAWING NUMBER 051-7124	REV. 13
	SCALE NONE	SHEET 63	OF 110

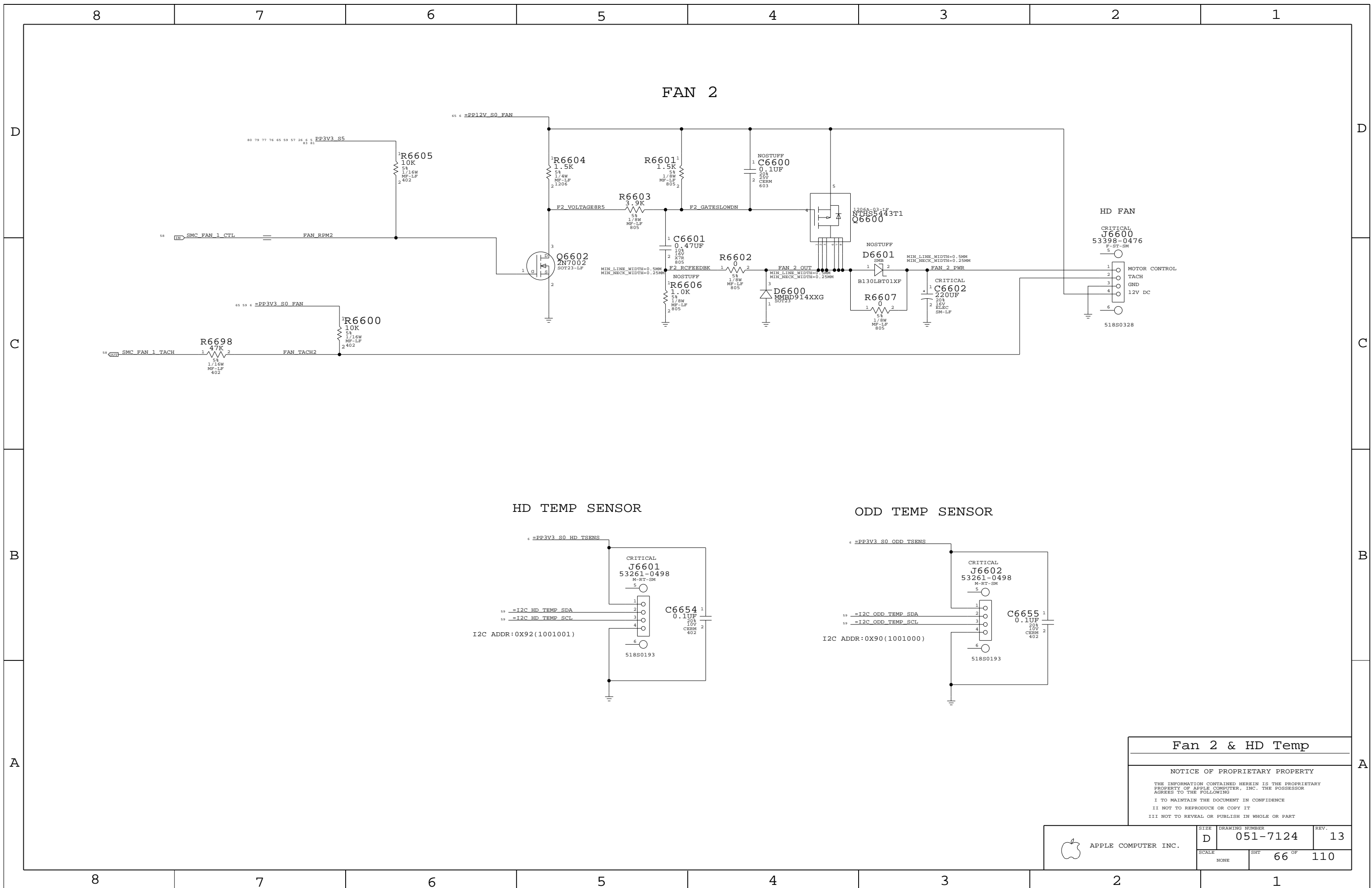


NOTE: ADDED TO PROTECT SMC

Fan 0, 1 & System Temp

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APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7124	13
SCALE	NONE	SHT	OF
		65	110



FAN 2

HD TEMP SENSOR

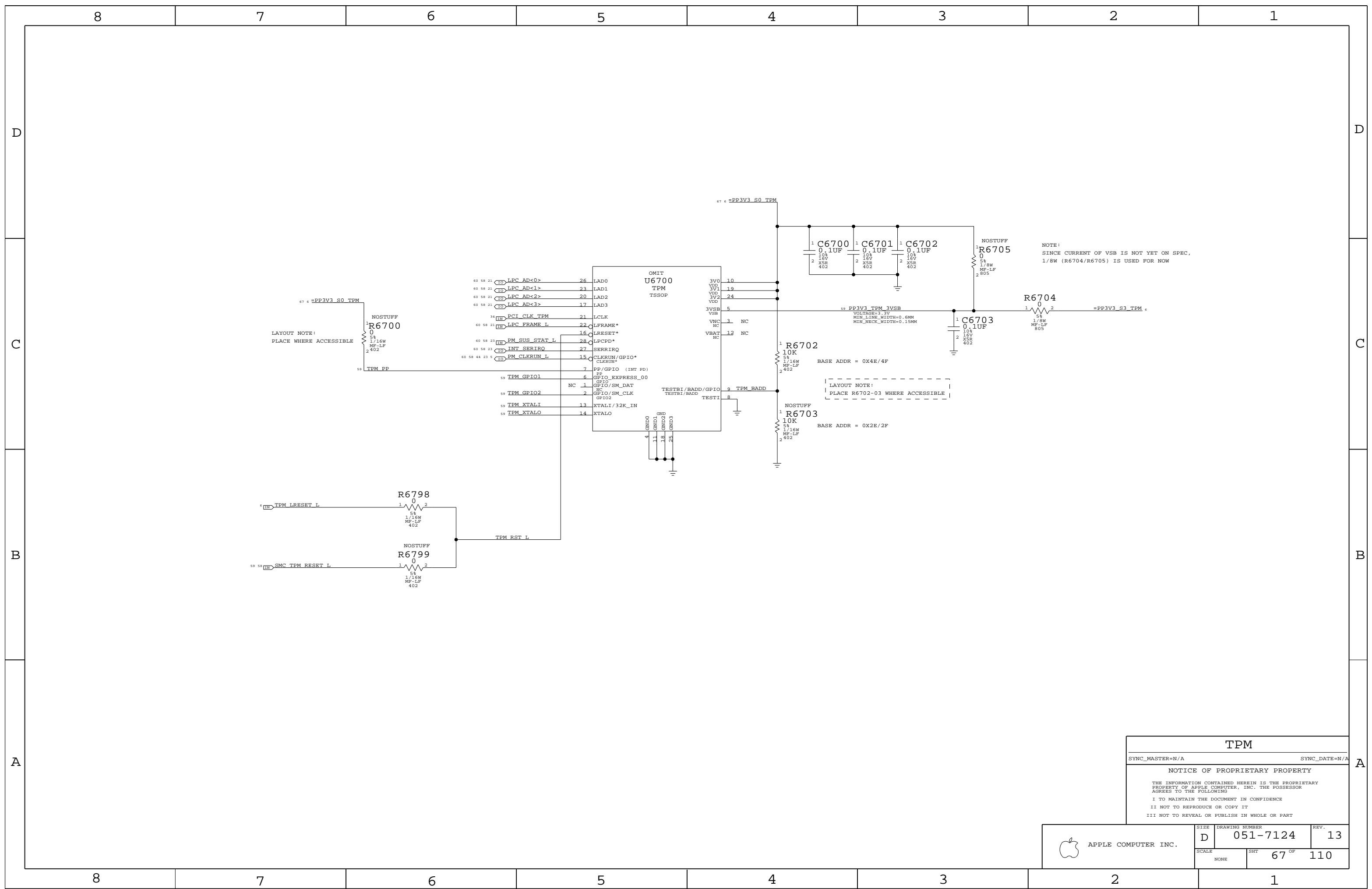
ODD TEMP SENSOR

Fan 2 & HD Temp

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APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7124	13
SCALE	SHT	OF	
NONE	66	110	



LAYOUT NOTE:  
PLACE WHERE ACCESSIBLE

LAYOUT NOTE:  
PLACE R6702-03 WHERE ACCESSIBLE

NOTE:  
SINCE CURRENT OF VSB IS NOT YET ON SPEC,  
1/8W (R6704/R6705) IS USED FOR NOW

**TPM**

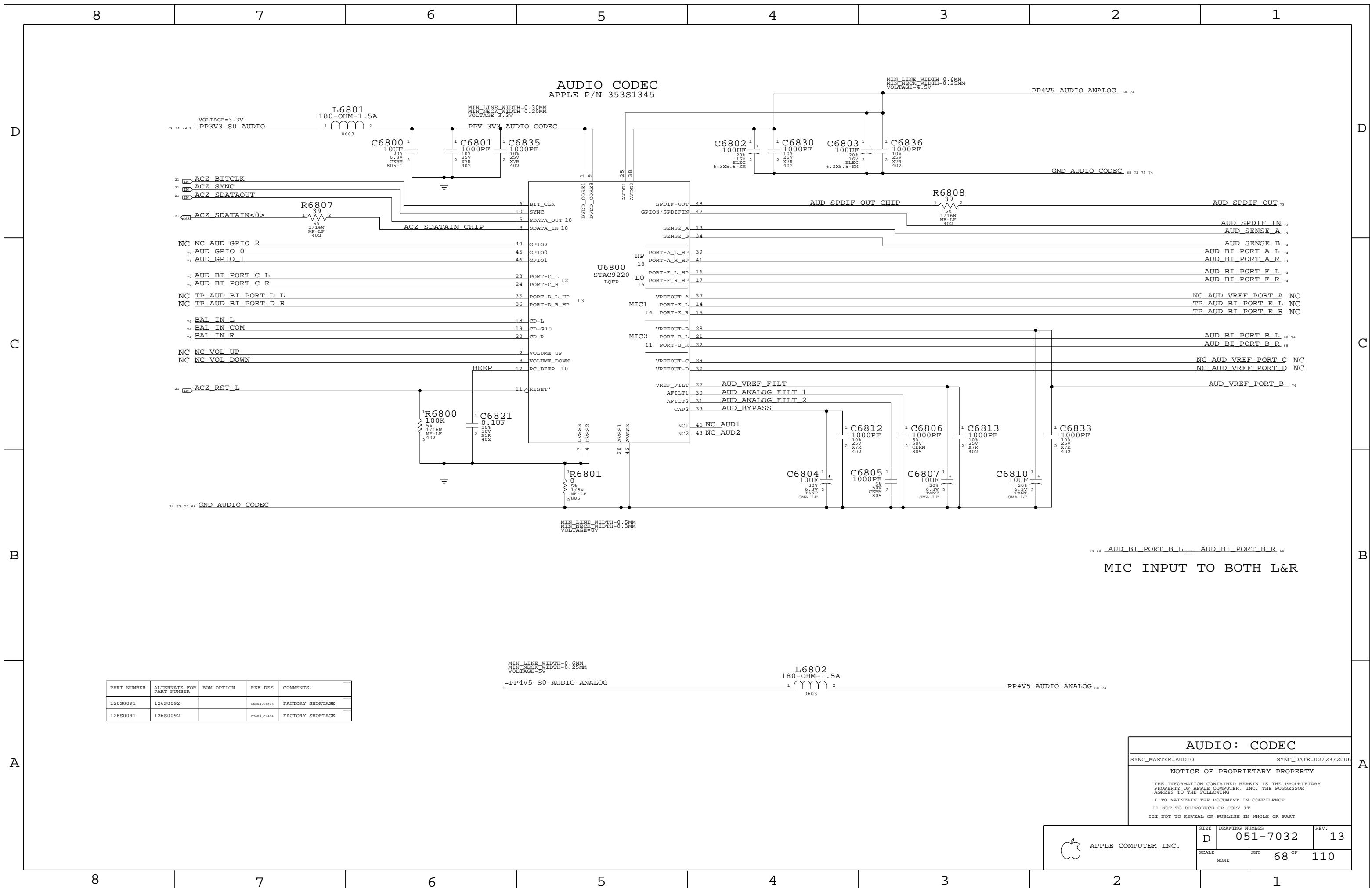
SYNC\_MASTER=N/A SYNC\_DATE=N/A

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APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7124	13
SCALE	SHT	67 OF	110
NONE			



PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
126S0091	126S0092		C802,C803	FACTORY SHORTAGE
126S0091	126S0092		C7403,C7404	FACTORY SHORTAGE

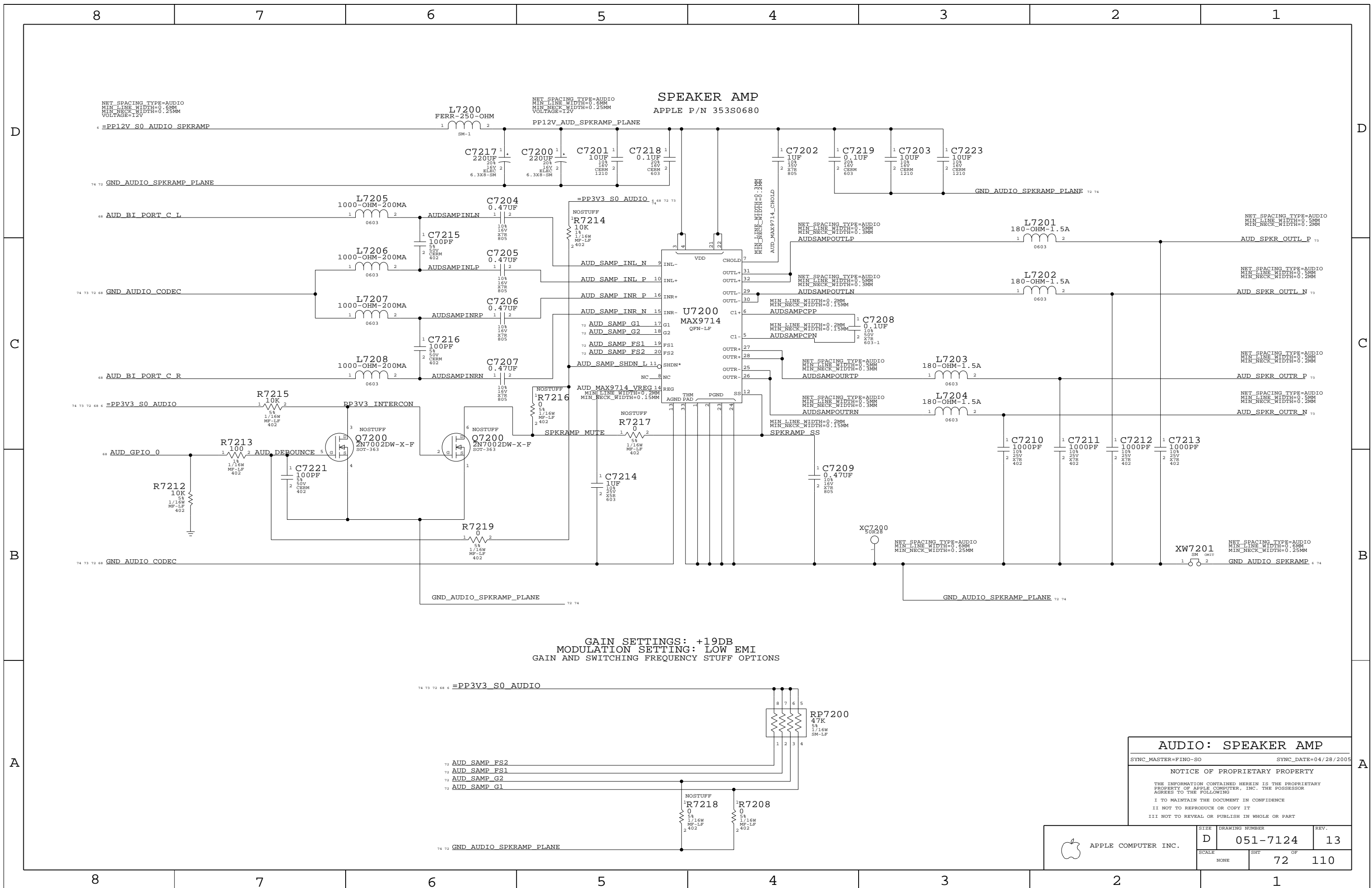
MIN LINE WIDTH=0.6MM  
 MIN NECK WIDTH=0.3MM  
 VOLTAGE=5V  
 =PP4V5\_S0\_AUDIO\_ANALOG

L6802  
 180-OHM-1.5A  
 0603

74 68 AUD BI PORT B L = AUD BI PORT B R 68  
 MIC INPUT TO BOTH L&R

AUDIO: CODEC				
SYNC_MASTER=AUDIO		SYNC_DATE=02/23/2006		
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III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART				

APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7032	13
SCALE	SHT	68 OF 110	
NONE			

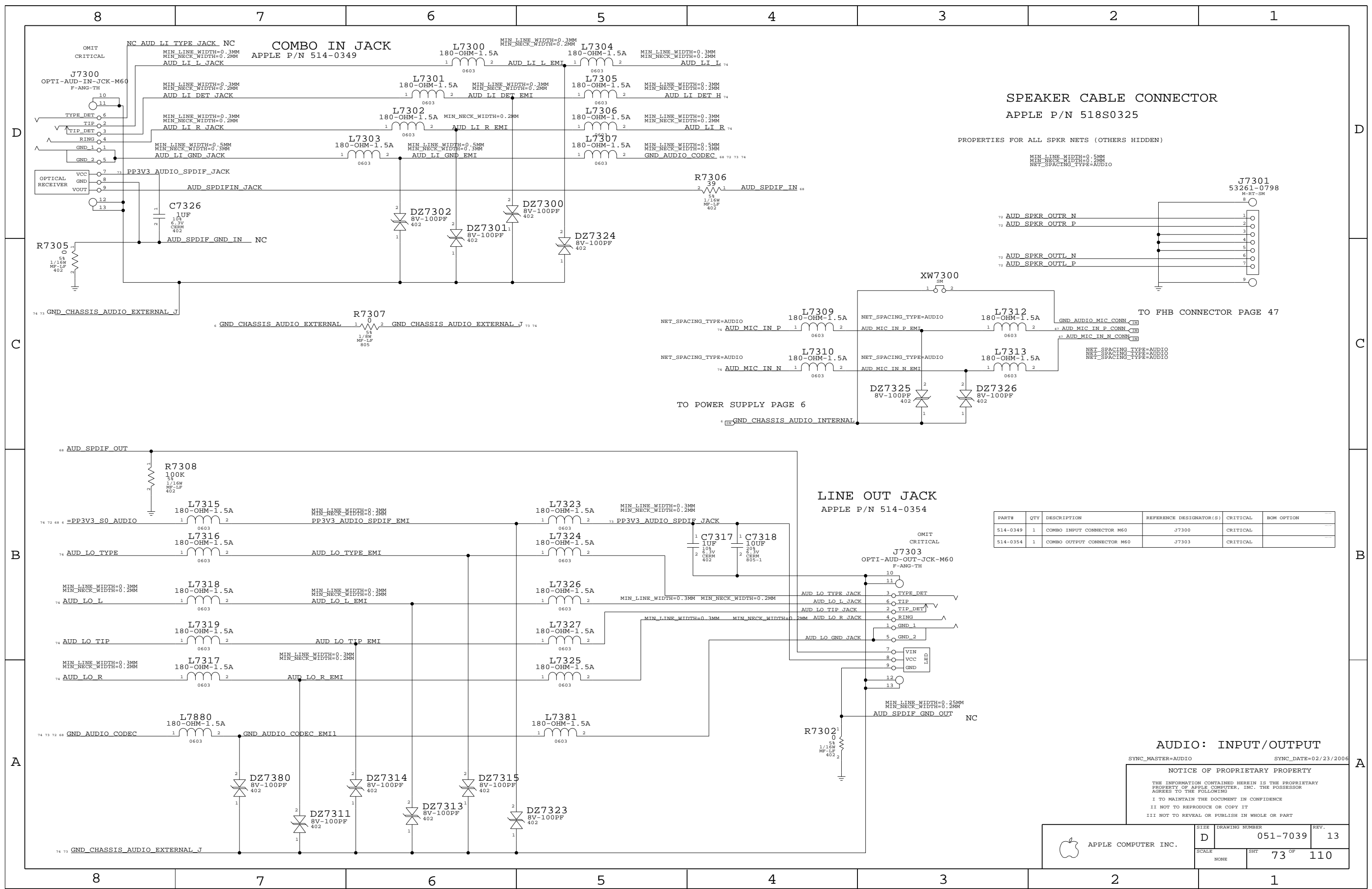


**SPEAKER AMP**  
APPLE P/N 353S0680

GAIN SETTINGS: +19DB  
MODULATION SETTING: LOW EMI  
GAIN AND SWITCHING FREQUENCY STUFF OPTIONS

**AUDIO: SPEAKER AMP**  
SYNC\_MASTER=FINO-SO SYNC\_DATE=04/28/2005  
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APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7124	13
SCALE	NONE	SHT OF	72 OF 110

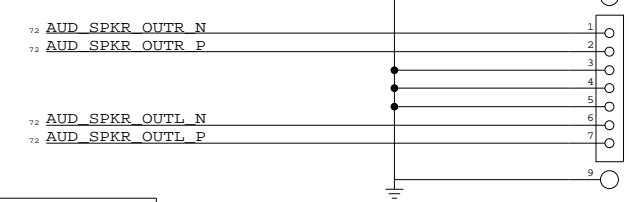


**SPEAKER CABLE CONNECTOR**  
APPLE P/N 518S0325

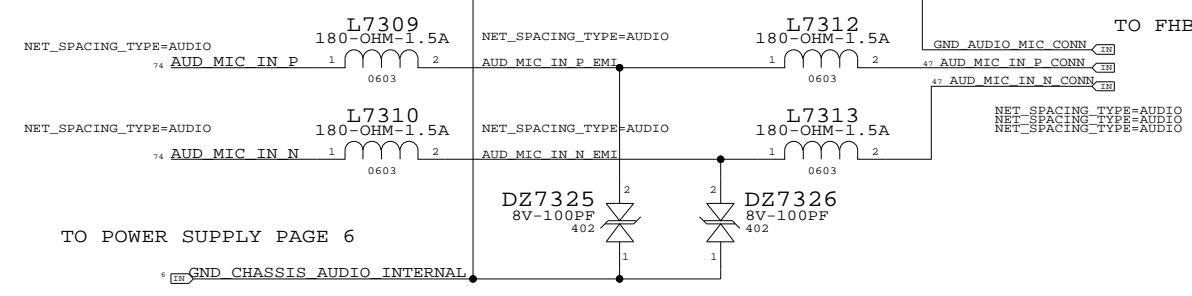
PROPERTIES FOR ALL SPKR NETS (OTHERS HIDDEN)

MIN LINE WIDTH=0.5MM  
MIN NECK WIDTH=0.2MM  
NET\_SPACING\_TYPE=AUDIO

J7301  
53261-0798  
MST-3M



TO FHB CONNECTOR PAGE 47



TO POWER SUPPLY PAGE 6

**LINE OUT JACK**  
APPLE P/N 514-0354

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
514-0349	1	COMBO INPUT CONNECTOR M60	J7300	CRITICAL	
514-0354	1	COMBO OUTPUT CONNECTOR M60	J7303	CRITICAL	

**AUDIO: INPUT/OUTPUT**

SYNC\_MASTER=AUDIO SYNC\_DATE=02/23/2006

**NOTICE OF PROPRIETARY PROPERTY**

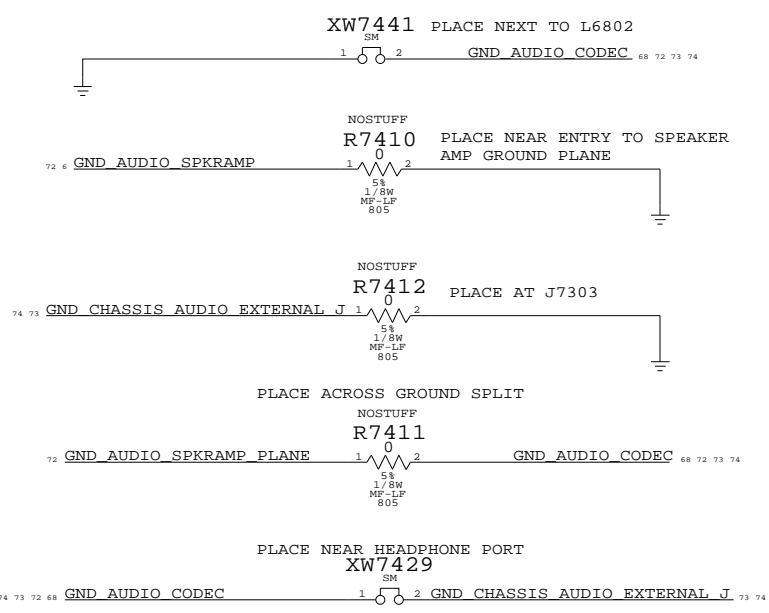
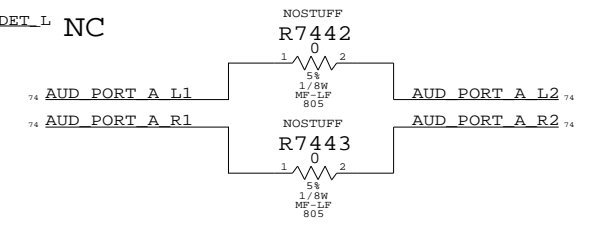
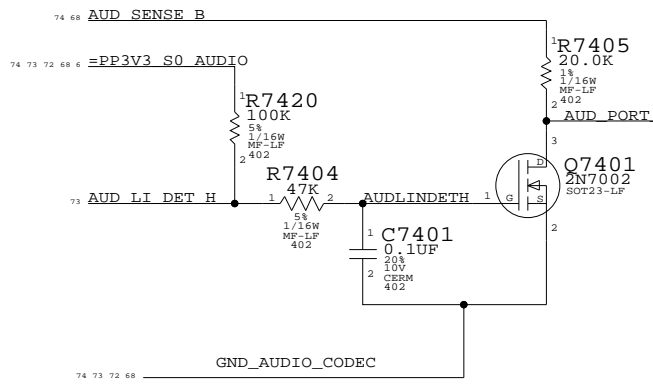
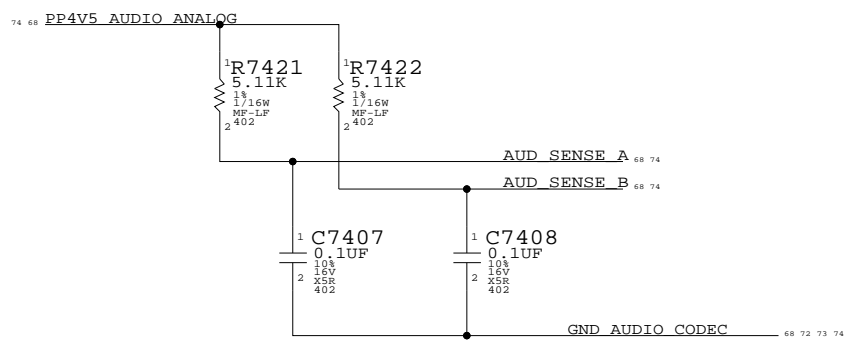
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APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7039	13
SCALE	SHT	73 OF	110
NONE			

PORT F (LI) PLUG DETECT

AUDIO GROUND RETURNS

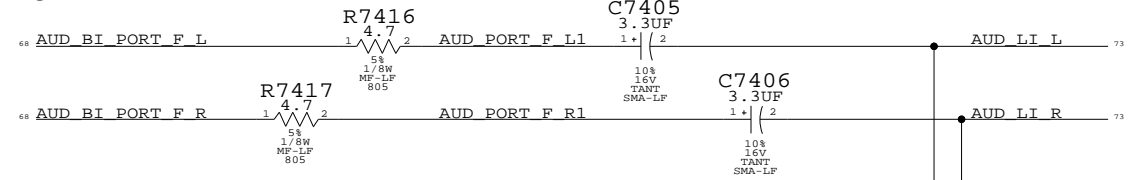
JACK SENSE PULL UPS (PLACE NEXT TO CODEC)



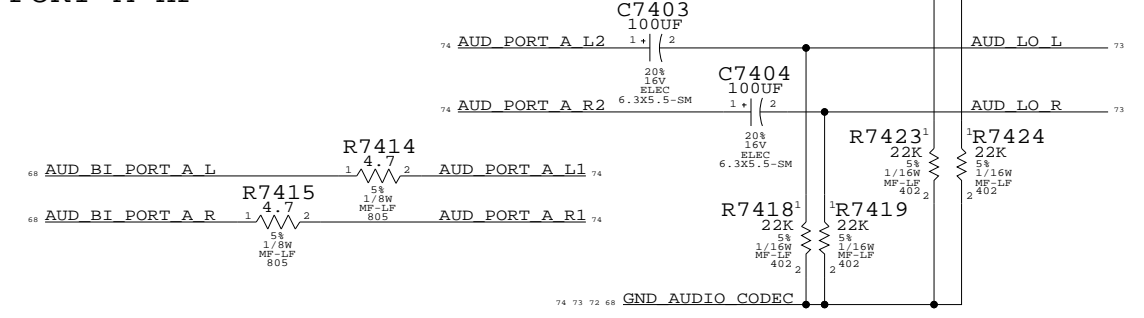
USED PORTS  
 PORT A HP  
 PORT B MIC IN VREF =80%  
 PORT C BI SPEAKERS  
 PORT F LI

UNUSED PORTS  
 PORT E DETECT DELEGATE  
 PORT D

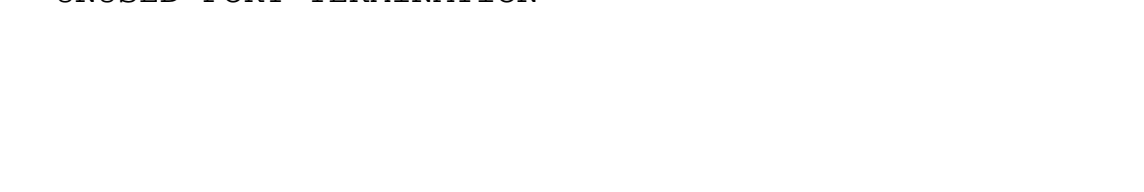
PORT F LI



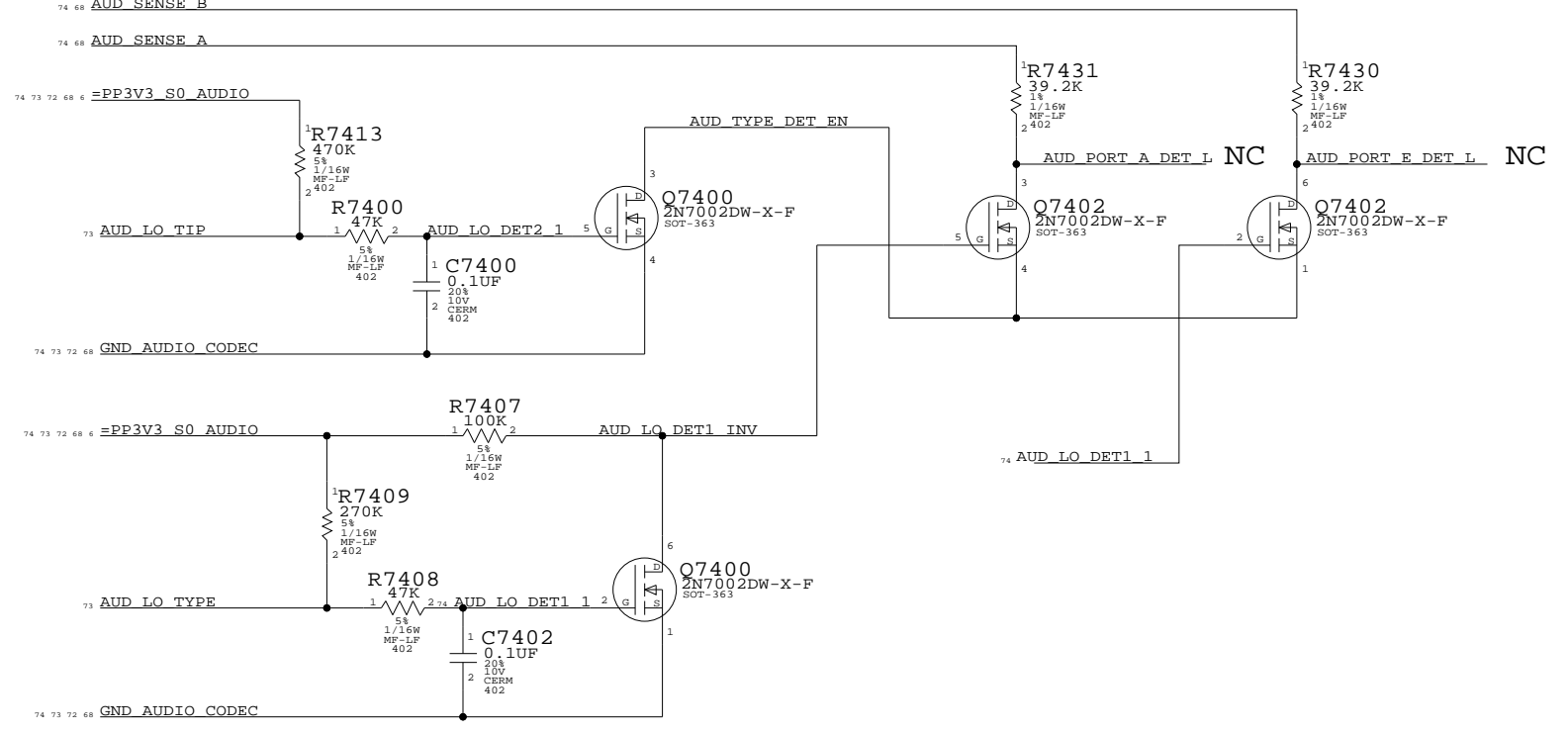
PORT A HP



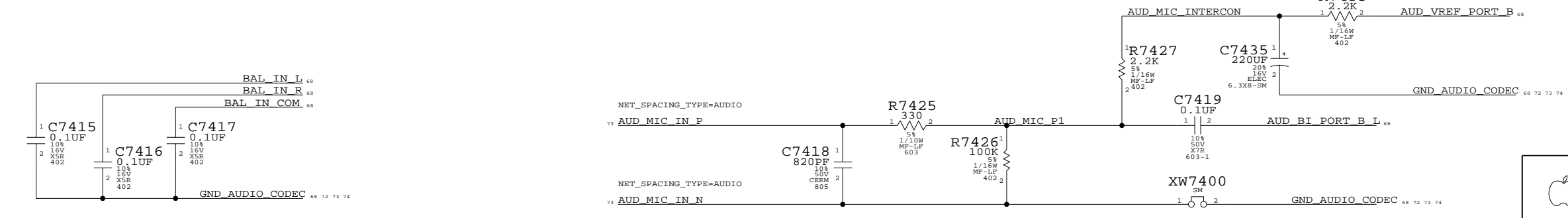
UNUSED PORT TERMINATION



PORT A/H (LO/DIG\_OUT) PLUG DETECT (E TELLS H TO COME ON)



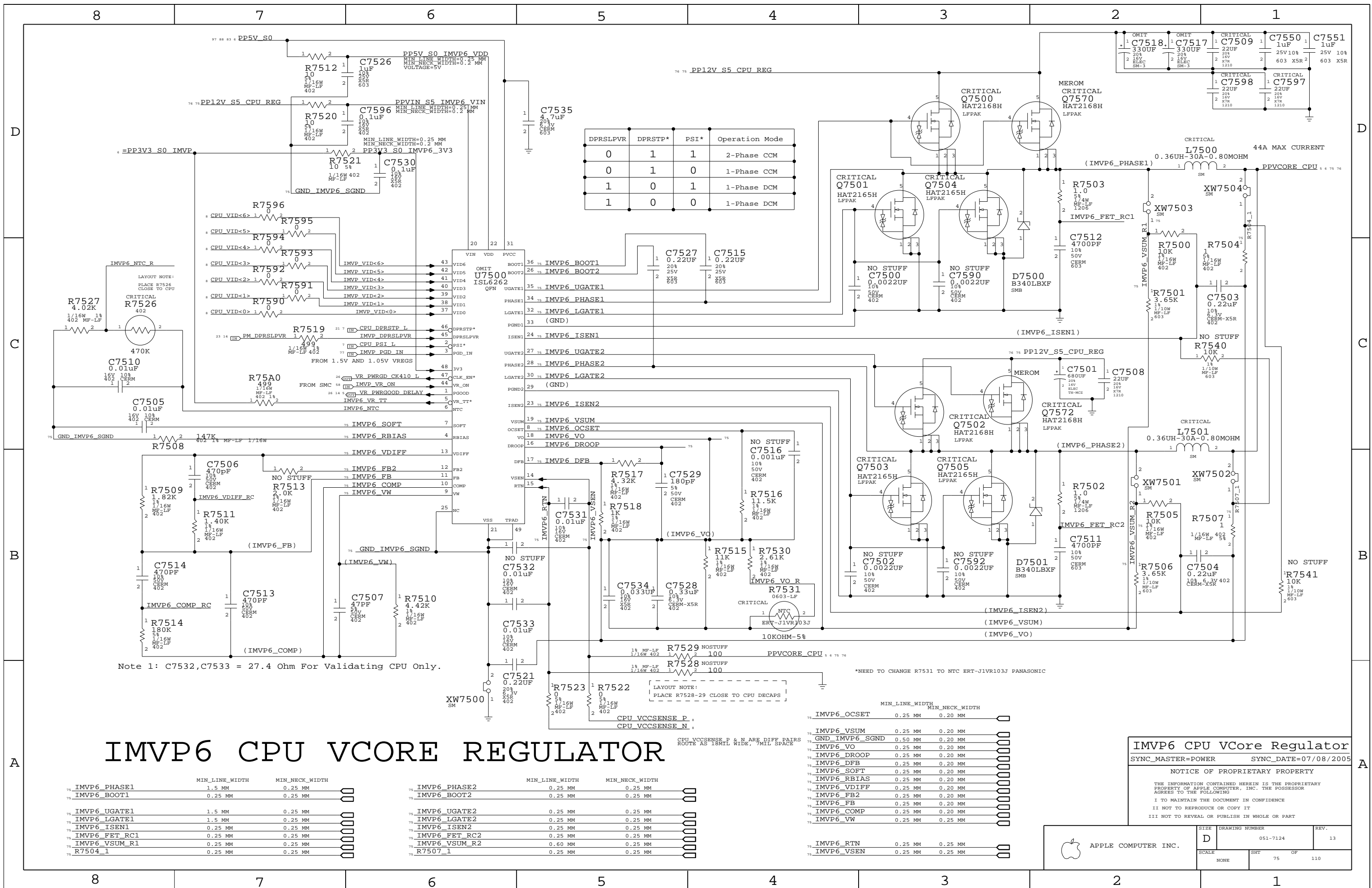
MICROPHONE IMPEDANCE MATCHING CIRCUIT



**AUDIO: JACK DETECT**  
 SYNC\_MASTER=AUDIO SYNC\_DATE=02/23/2006  
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	D	051-7032	13
SCALE	SHT	74 OF	110
NONE			





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

Signal	Value
C7527	0.22uF
C7515	0.22uF
C7516	0.001uF
C7517	4.32K
C7529	180pF
C7518	11.5K
C7531	0.01uF
C7532	0.01uF
C7533	0.01uF
C7534	0.033uF
C7528	0.33uF
C7530	2.61K
C7519	10K
C7520	0.0022uF
C7521	0.22uF
C7522	0.22uF
C7523	20uF
C7524	0.1uF
C7525	0.1uF
C7526	1uF
C7527	0.22uF
C7528	0.33uF
C7529	180pF
C7530	2.61K
C7531	0.01uF
C7532	0.01uF
C7533	0.01uF
C7534	0.033uF
C7535	4.7uF
C7500	680uF
C7501	22uF
C7502	0.0022uF
C7503	0.22uF
C7504	0.22uF
C7505	22uF
C7506	3.65K
C7507	47pF
C7508	22uF
C7509	22uF
C7510	4.42K
C7511	4700pF
C7512	4700pF
C7513	470pF
C7514	470pF
C7515	0.22uF
C7516	0.001uF
C7517	4.32K
C7518	11.5K
C7519	10K
C7520	0.0022uF
C7521	0.22uF
C7522	0.22uF
C7523	20uF
C7524	0.1uF
C7525	0.1uF
C7526	1uF
C7527	0.22uF
C7528	0.33uF
C7529	180pF
C7530	2.61K
C7531	0.01uF
C7532	0.01uF
C7533	0.01uF
C7534	0.033uF
C7535	4.7uF
C7500	680uF
C7501	22uF
C7502	0.0022uF
C7503	0.22uF
C7504	0.22uF
C7505	22uF
C7506	3.65K
C7507	47pF
C7508	22uF
C7509	22uF
C7510	4.42K
C7511	4700pF
C7512	4700pF
C7513	470pF
C7514	470pF
C7515	0.22uF
C7516	0.001uF
C7517	4.32K
C7518	11.5K
C7519	10K
C7520	0.0022uF
C7521	0.22uF
C7522	0.22uF
C7523	20uF
C7524	0.1uF
C7525	0.1uF
C7526	1uF
C7527	0.22uF
C7528	0.33uF
C7529	180pF
C7530	2.61K
C7531	0.01uF
C7532	0.01uF
C7533	0.01uF
C7534	0.033uF
C7535	4.7uF

# IMVP6 CPU VCore Regulator

Signal	MIN_LINE_WIDTH	MIN_NECK_WIDTH
IMVP6_PHASE1	1.5 MM	0.25 MM
IMVP6_BOOT1	0.25 MM	0.25 MM
IMVP6_UGATE1	1.5 MM	0.25 MM
IMVP6_LGATE1	1.5 MM	0.25 MM
IMVP6_ISEN1	0.25 MM	0.25 MM
IMVP6_FET_RC1	0.25 MM	0.25 MM
IMVP6_VSUM_R1	0.25 MM	0.25 MM
R7504_1	0.25 MM	0.25 MM

Signal	MIN_LINE_WIDTH	MIN_NECK_WIDTH
IMVP6_PHASE2	0.25 MM	0.25 MM
IMVP6_BOOT2	0.25 MM	0.25 MM
IMVP6_UGATE2	0.25 MM	0.25 MM
IMVP6_LGATE2	0.25 MM	0.25 MM
IMVP6_ISEN2	0.25 MM	0.25 MM
IMVP6_FET_RC2	0.25 MM	0.25 MM
IMVP6_VSUM_R2	0.60 MM	0.25 MM
R7507_1	0.25 MM	0.25 MM

Signal	MIN_LINE_WIDTH	MIN_NECK_WIDTH
IMVP6_OCSET	0.25 MM	0.20 MM
IMVP6_VSUM	0.25 MM	0.20 MM
GND_IMVP6_SGND	0.50 MM	0.20 MM
IMVP6_VO	0.25 MM	0.20 MM
IMVP6_DROOP	0.25 MM	0.20 MM
IMVP6_DFB	0.25 MM	0.20 MM
IMVP6_SOFT	0.25 MM	0.20 MM
IMVP6_RBIAS	0.25 MM	0.20 MM
IMVP6_VDIFF	0.25 MM	0.20 MM
IMVP6_FB2	0.25 MM	0.20 MM
IMVP6_FB	0.25 MM	0.20 MM
IMVP6_COMP	0.25 MM	0.20 MM
IMVP6_VW	0.25 MM	0.25 MM
IMVP6_RTIN	0.25 MM	0.25 MM
IMVP6_VSEN	0.25 MM	0.25 MM

IMVP6 CPU VCore Regulator  
 SYNC\_MASTER=POWER SYNC\_DATE=07/08/2005

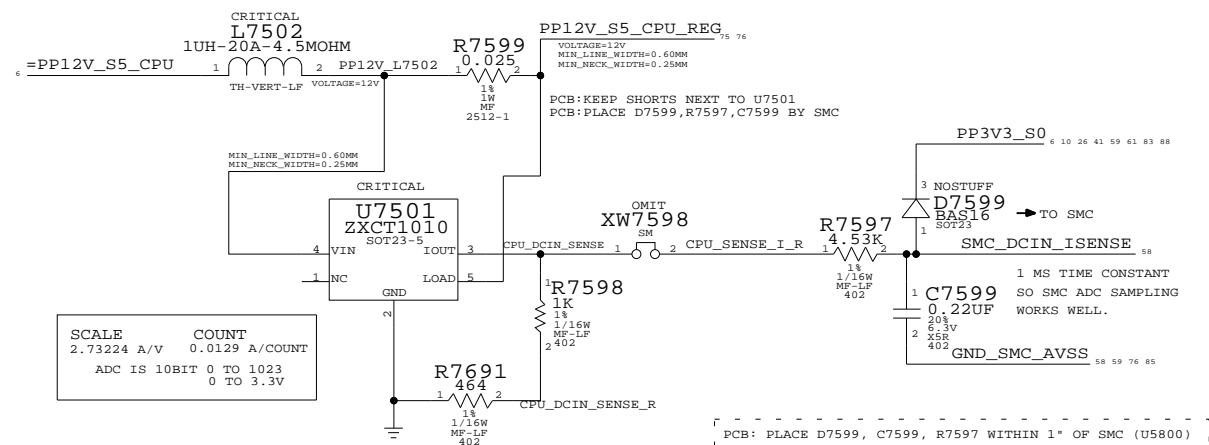
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SIZE	DRAWING NUMBER	REV.
D	051-7124	13
SCALE	SHEET	OF
NONE	75	110



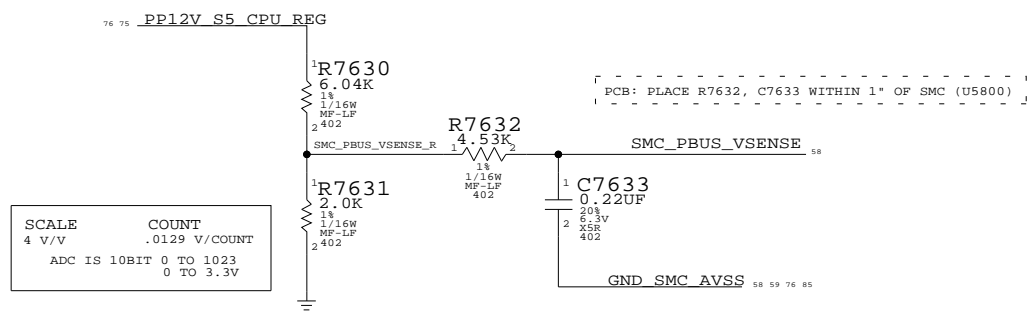
APPLE COMPUTER INC.

**PROCESSOR VCORE CURRENT SENSE**  
(USING 12V INPUT CURRENT TO DERIVE CPU CURRENT)



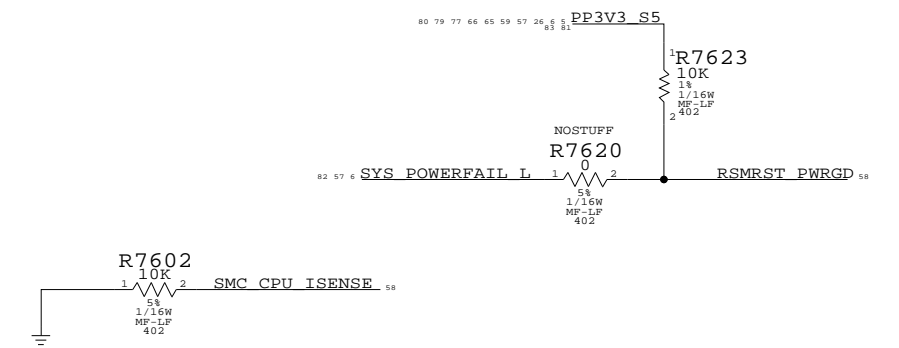
SCALE	COUNT
2.73224 A/V	0.0129 A/COUNT
ADC IS 10BIT 0 TO 1023	
0 TO 3.3V	

**PROCESSOR DCIN VOLTAGE SENSE**  
(SCALING 12V INPUT VOLTAGE TO SMC)

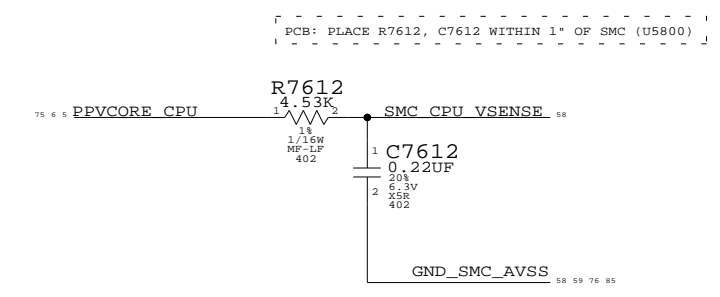


SCALE	COUNT
4 V/V	.0129 V/COUNT
ADC IS 10BIT 0 TO 1023	
0 TO 3.3V	

**SMC PWRGD PULLUP**

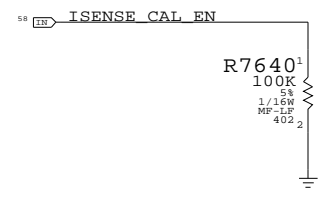


**PROCESSOR VCORE SENSE**



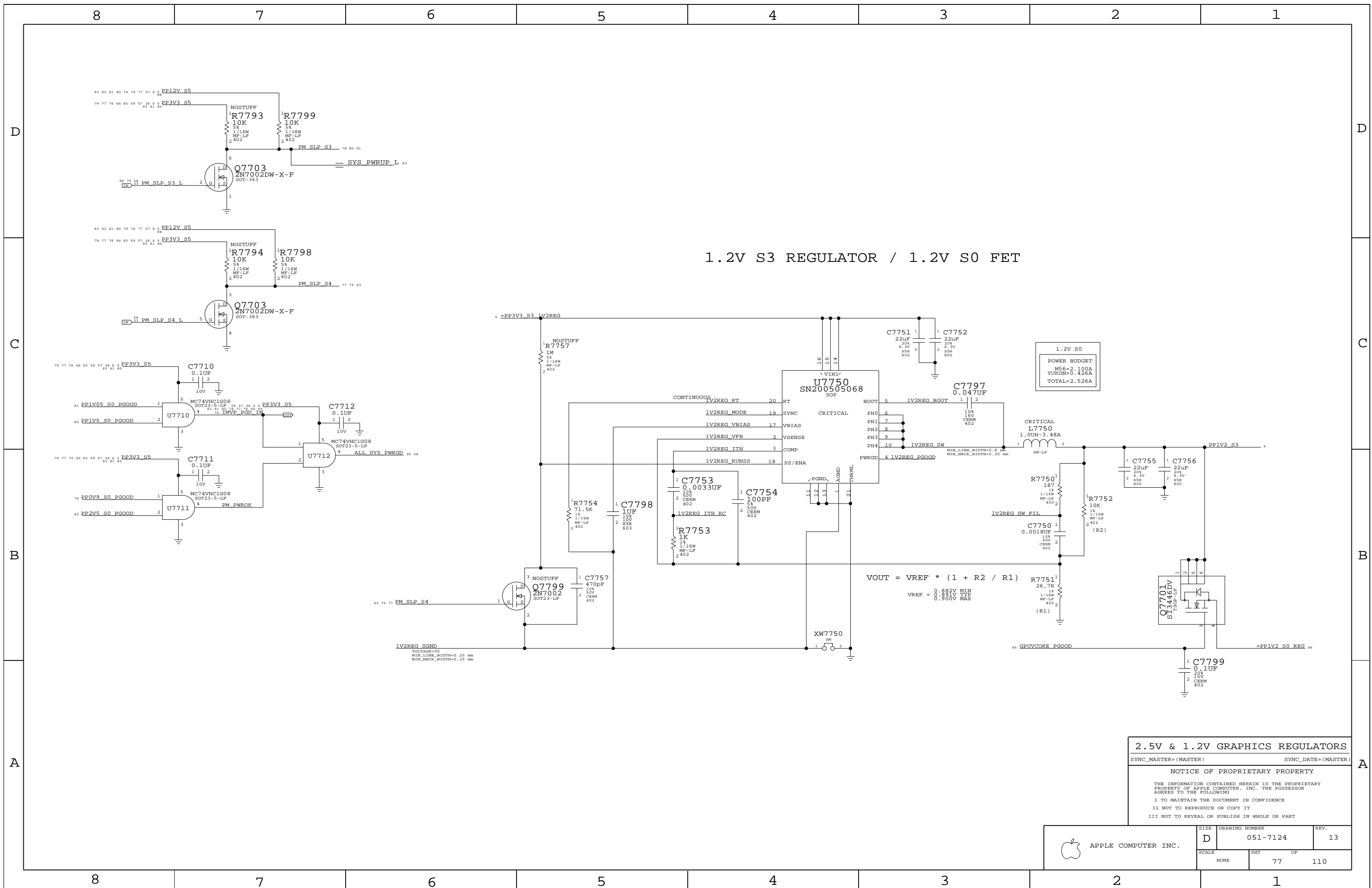
PCB: PLACE R7612, C7612 WITHIN 1" OF SMC (U5800)

**Current Sense Calibration Circuit**  
Switches in fixed load on power supplies to calibrate current sense circuits



**CPU SENSE CIRCUITRIES**  
SYNC\_MASTER=(MASTER) SYNC\_DATE=(MASTER)  
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	D	051-7124	13
SCALE	SHT	76 OF	110
NONE			



1.2V S3 REGULATOR / 1.2V S0 FET

1.2V S0	
POWER BUDGET	
M56=	2.100A
YUKON=	0.426A
TOTAL=	2.526A

$$V_{OUT} = V_{REF} * (1 + R2 / R1)$$

$$V_{REF} = 0.82V \text{ MIN}$$

$$0.82V \text{ TYP}$$

$$0.90V \text{ MAX}$$

2.5V & 1.2V GRAPHICS REGULATORS

SYNC\_MASTER=(MASTER) SYNC\_DATE=(MASTER)

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APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7124	13
SCALE	SHT	OF	
NONE	77	110	

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C

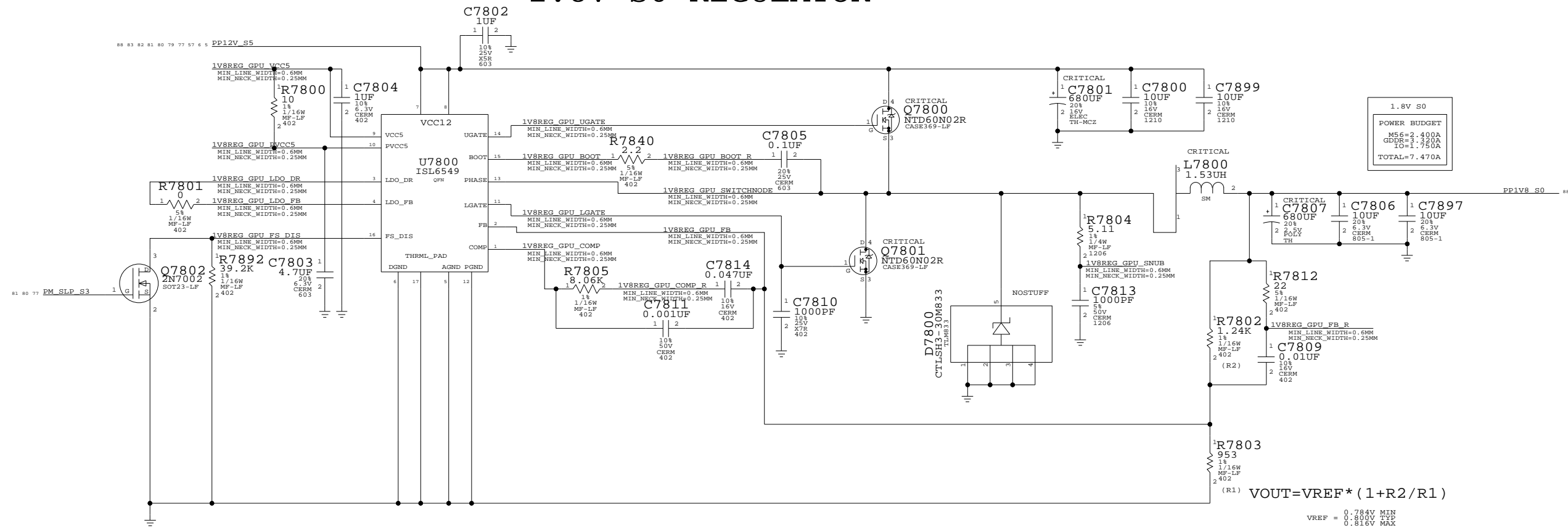
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A

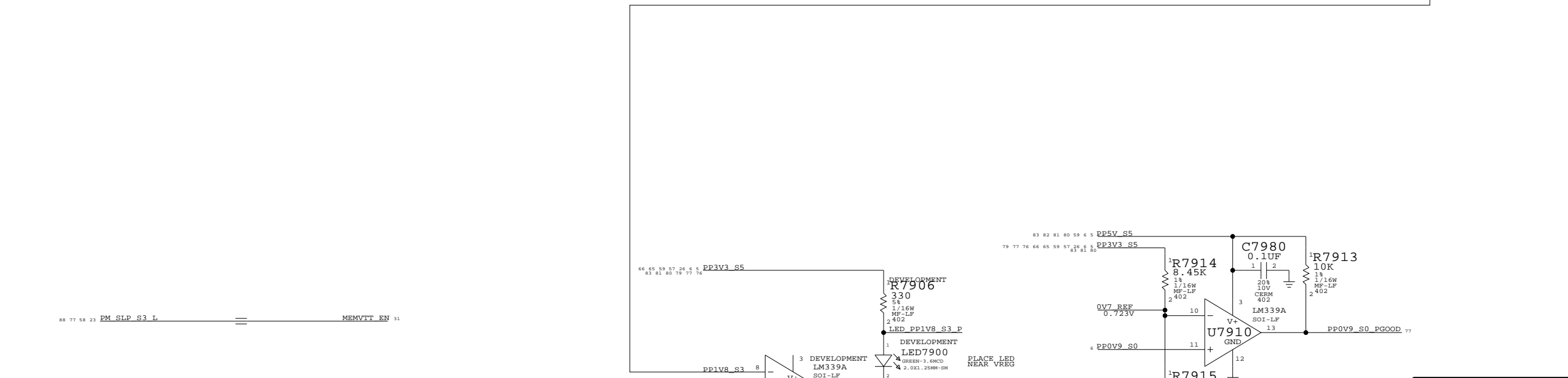
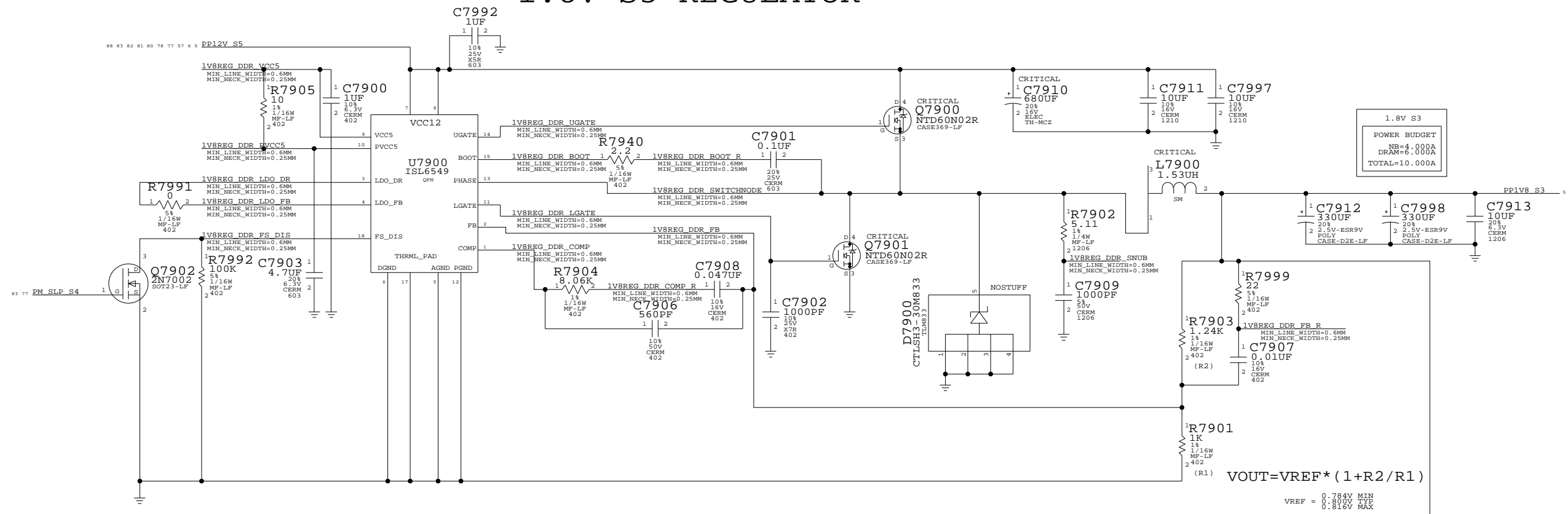
# 1.8V S0 REGULATOR



**1.8V GDDR REGULATOR**  
 SYNC\_MASTER=(MASTER) SYNC\_DATE=(MASTER)  
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APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7124	13
SCALE	SHT	78 OF 110	
NONE			

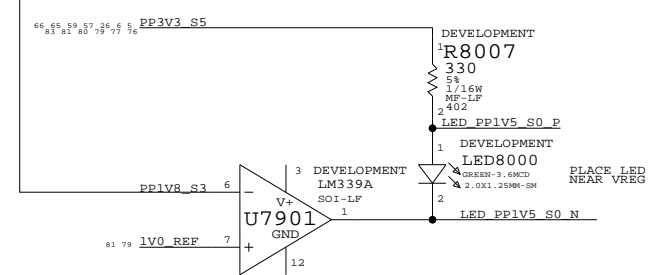
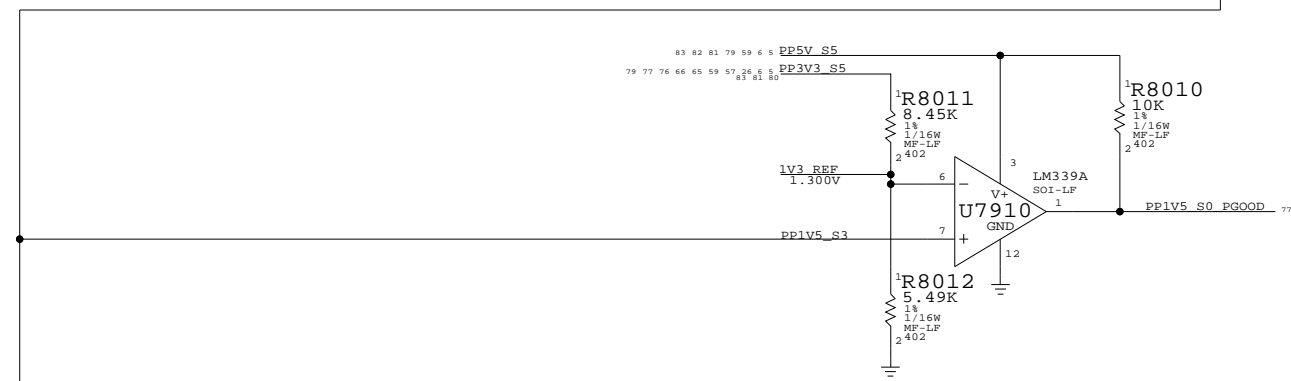
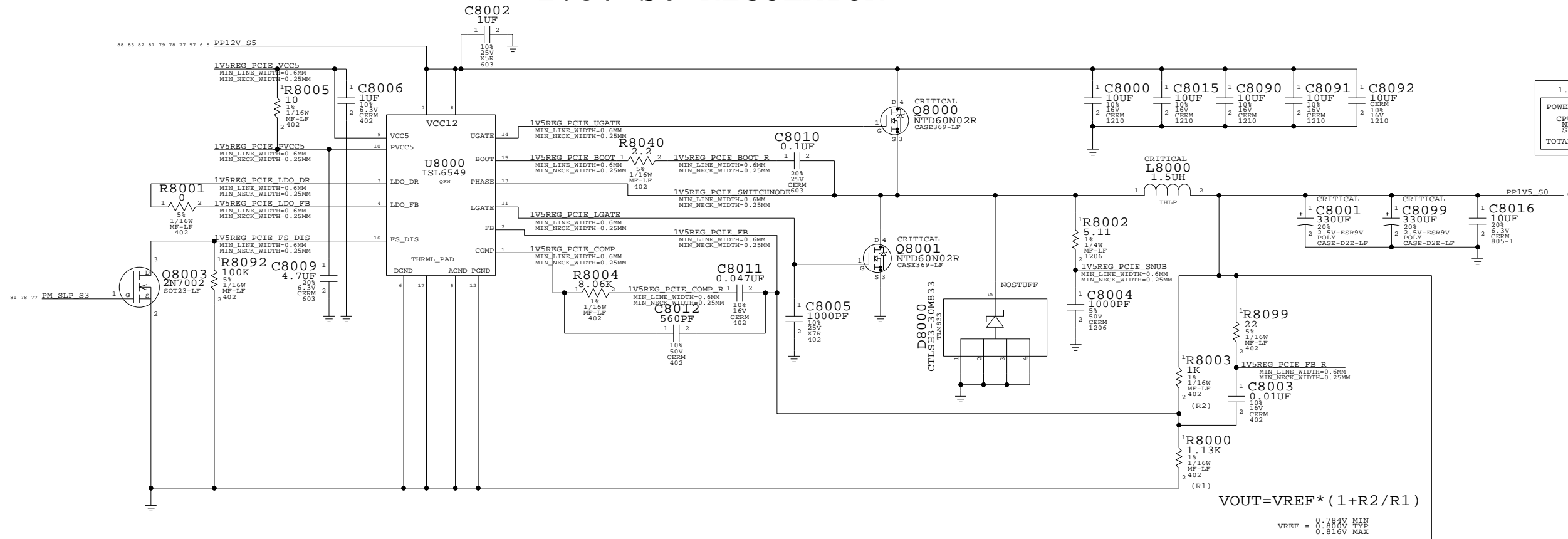
# 1.8V S3 REGULATOR



**1.8V Vreg**  
 SYNC\_MASTER=M23-PC SYNC\_DATE=04/12/2005  
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APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7124	13
SCALE	NONE	SHT	79 OF 110

# 1.5V S0 REGULATOR

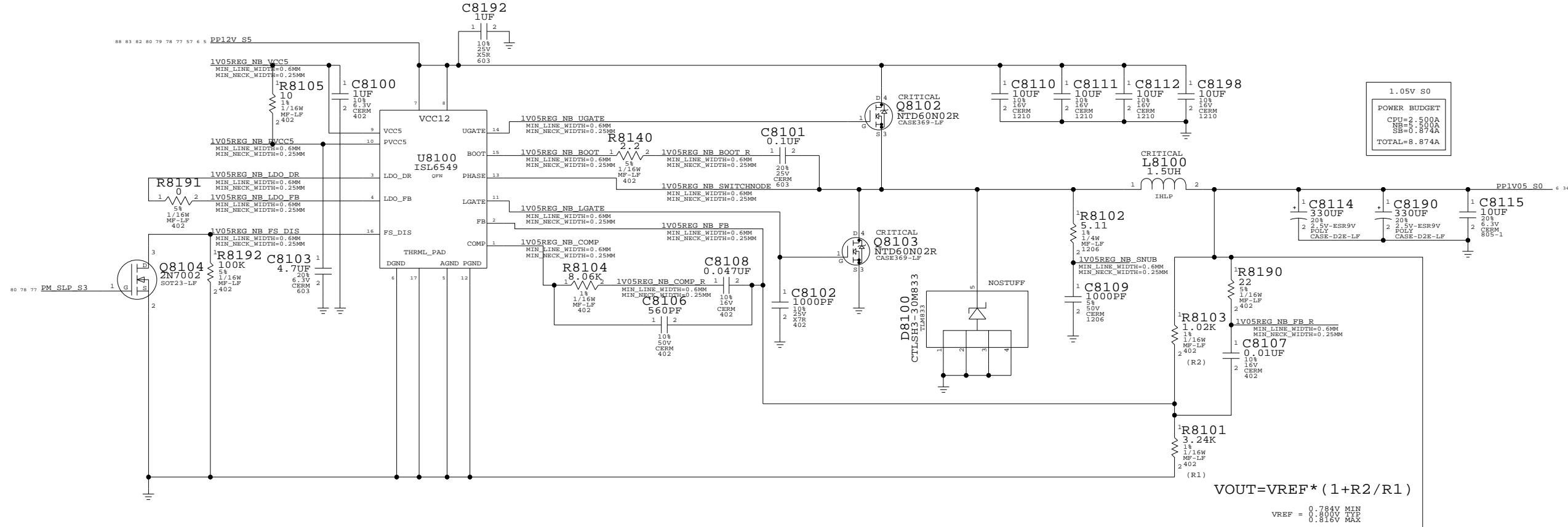


**1.5V Vreg**  
 SYNC\_MASTER=FINO-PC SYNC\_DATE=05/18/2005

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APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7124	13
SCALE	SHT	80 OF	110
NONE			

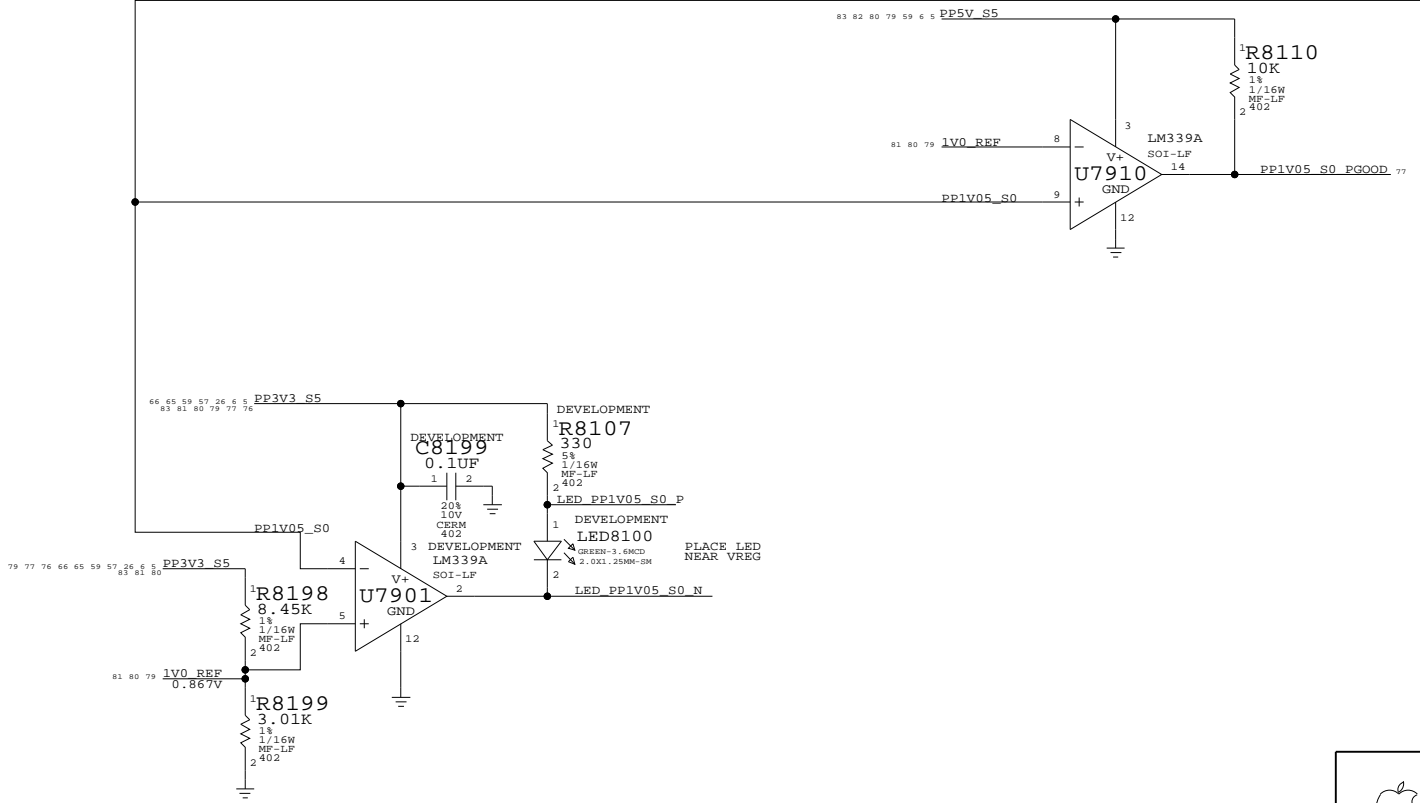
# 1.05V S0 REGULATOR



1.05V S0	
POWER BUDGET	
CPU=	2.500A
NB=	0.800A
SB=	0.874A
TOTAL=	8.874A

$$V_{OUT} = V_{REF} * (1 + R2/R1)$$

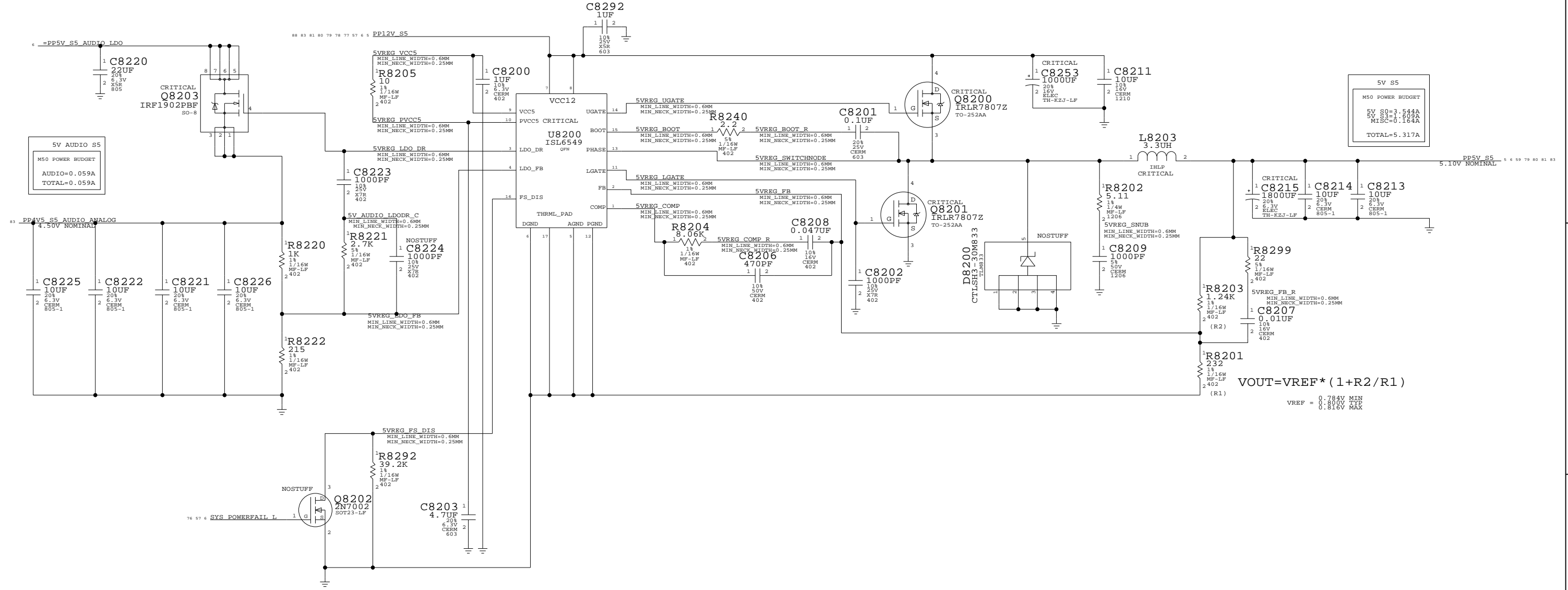
$V_{REF} = 0.784V \text{ MIN}$   
 $0.800V \text{ TYP}$   
 $0.816V \text{ MAX}$



1.05V VREG	
SYNC_MASTER=M38-RT	SYNC_DATE=05/18/2005
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APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7124	13
SCALE	SHT	81 OF	110
NONE			

# 5V S5 AND 5V AUDIO S5 REGULATOR



**5V DC/DC 4.5V**

SYNC\_MASTER=(MASTER)      SYNC\_DATE=(MASTER)

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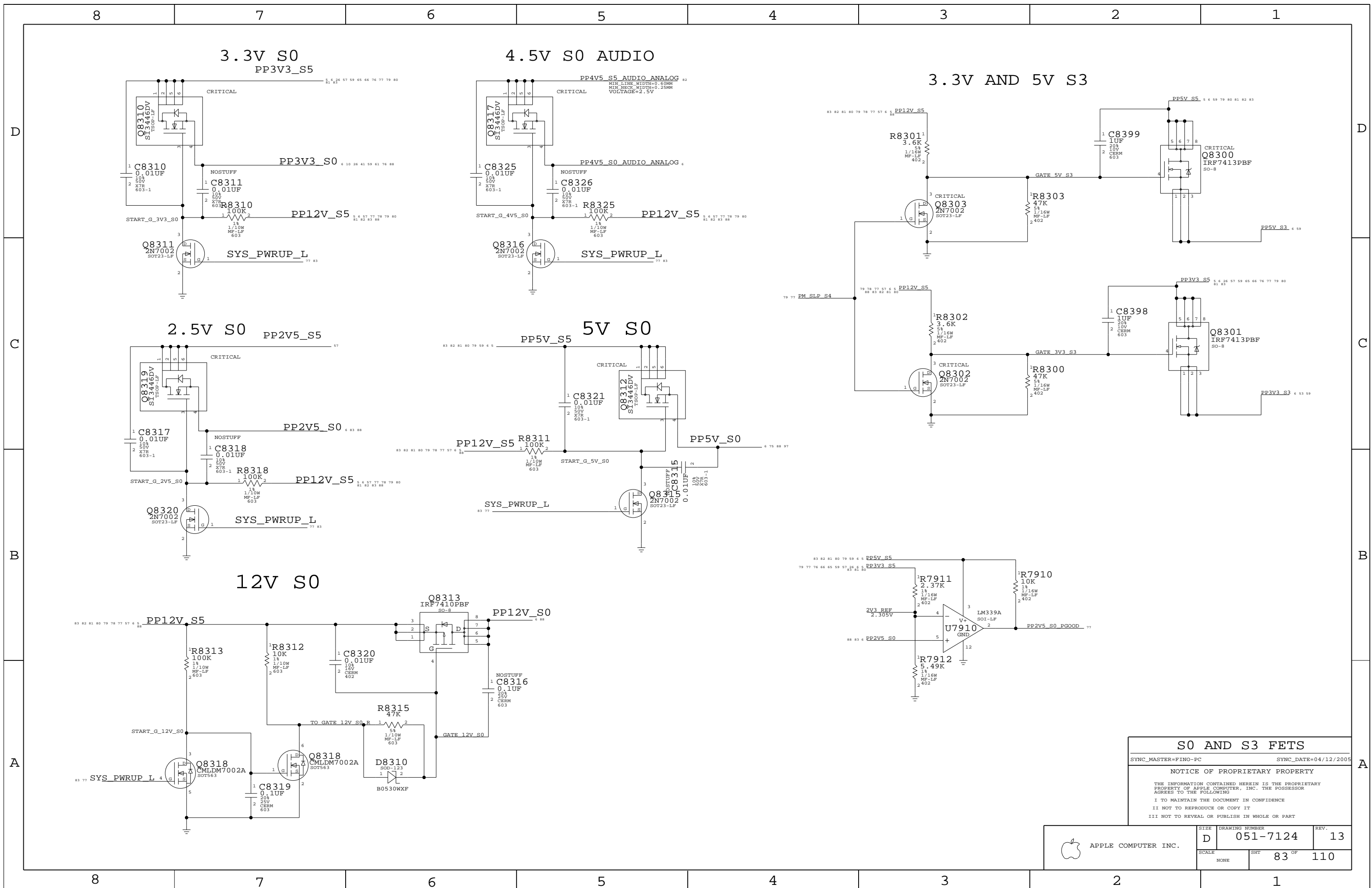
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III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE COMPUTER INC.	SIZE <b>D</b>	DRAWING NUMBER <b>051-7124</b>	REV. <b>13</b>
	SCALE NONE	SHEET <b>82</b> OF	TOTAL SHEETS <b>110</b>





**S0 AND S3 FETS**

SYNC\_MASTER=FINO-PC SYNC\_DATE=04/12/2005

**NOTICE OF PROPRIETARY PROPERTY**

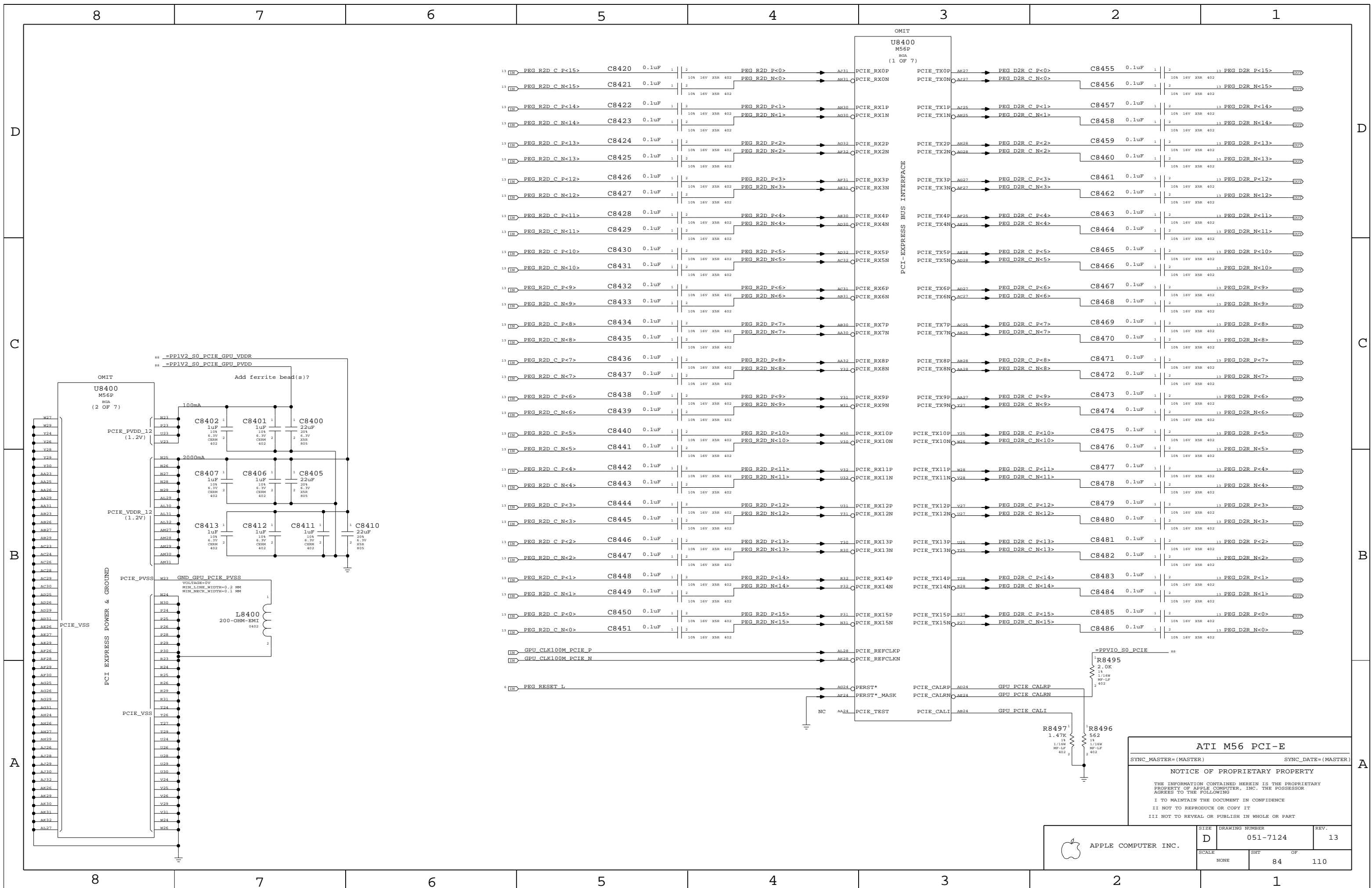
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APPLE COMPUTER INC.	SIZE <b>D</b>	DRAWING NUMBER <b>051-7124</b>	REV. <b>13</b>
	SCALE NONE	SHIT <b>83</b>	OF <b>110</b>



**ATI M56 PCI-E**

SYNC\_MASTER=(MASTER)      SYNC\_DATE=(MASTER)

**NOTICE OF PROPRIETARY PROPERTY**

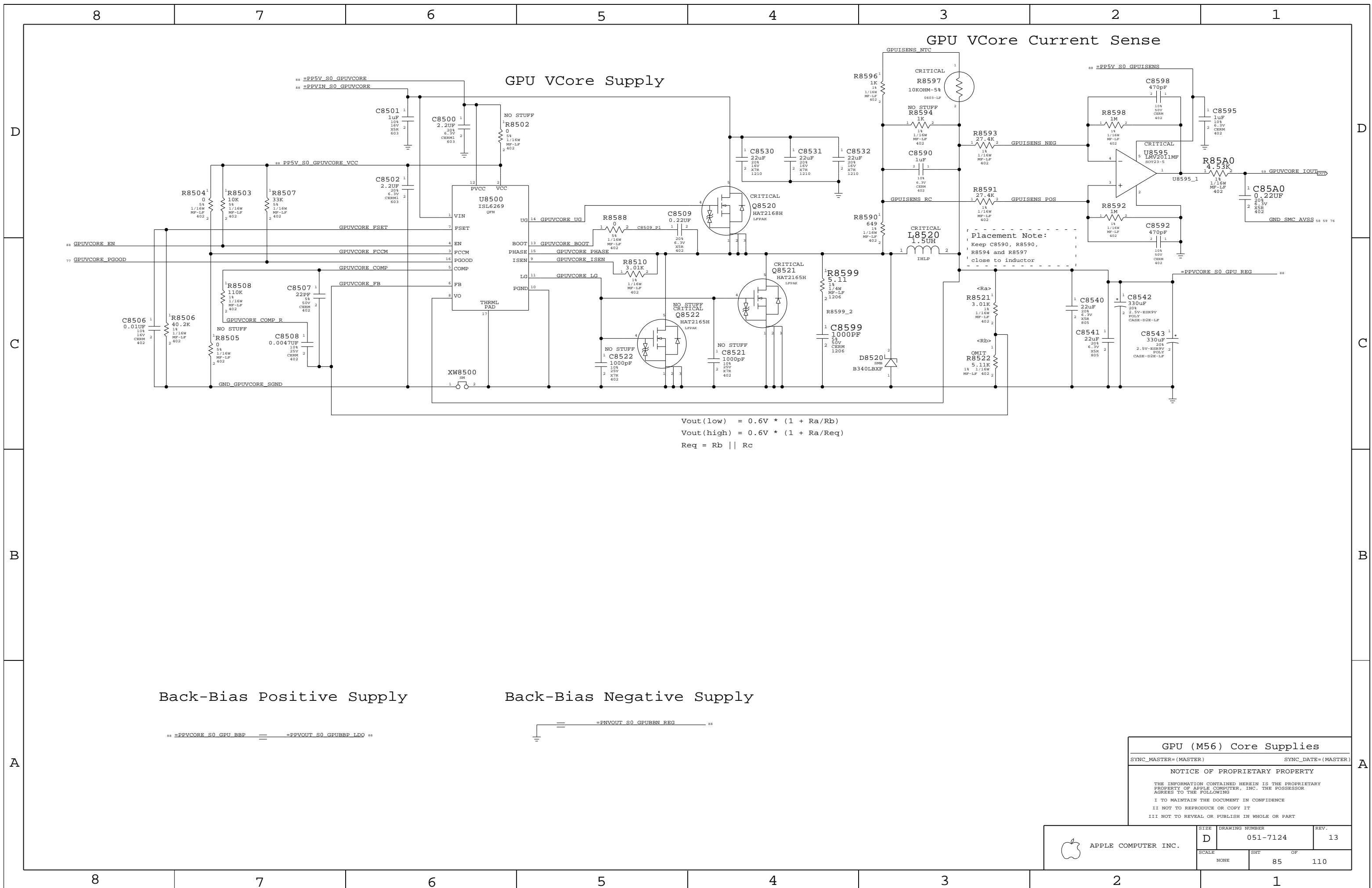
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 APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7124	13
SCALE	SHT	OF	
NONE	84	110	



GPU VCore Supply

GPU VCore Current Sense

Back-Bias Positive Supply

Back-Bias Negative Supply

$$V_{out}(low) = 0.6V * (1 + R_a/R_b)$$

$$V_{out}(high) = 0.6V * (1 + R_a/R_{eq})$$

$$R_{eq} = R_b || R_c$$

Placement Note:  
 Keep C8590, R8590,  
 R8594 and R8597  
 close to inductor

GPU (M56) Core Supplies  
 SYNC\_MASTER=(MASTER) SYNC\_DATE=(MASTER)  
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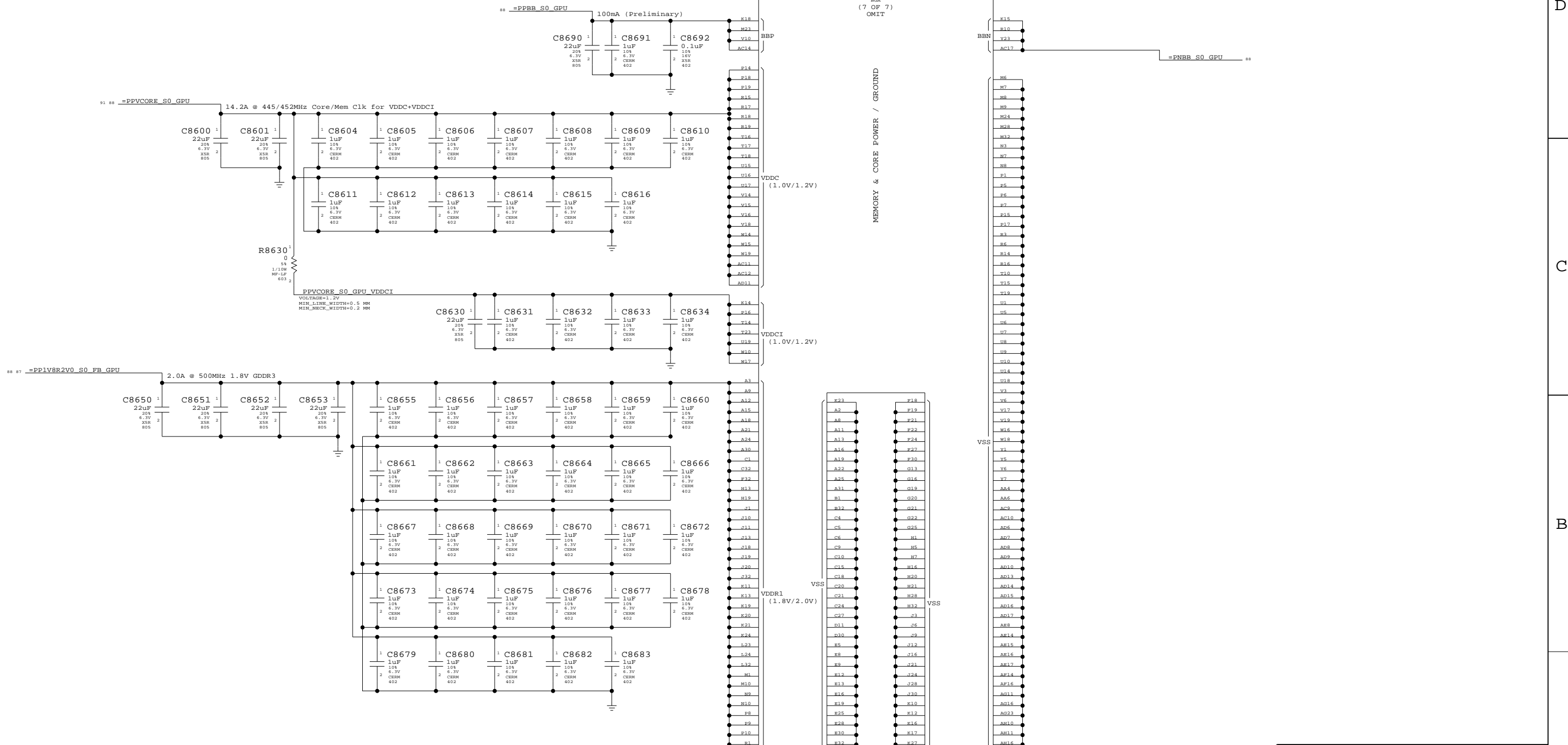
APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7124	13
SCALE	SHT	OF	
NONE	85	110	

Page Notes

Power aliases required by this page:  
 - =PP1V5\_GPU\_VDD15  
 - =PP1VR1V3\_GPU\_VCORE

Signal aliases required by this page:  
 (NONE)

BOM options provided by this page:  
 (NONE)



ATI M56 Core Power

SYNC\_MASTER=(MASTER) SYNC\_DATE=(MASTER)

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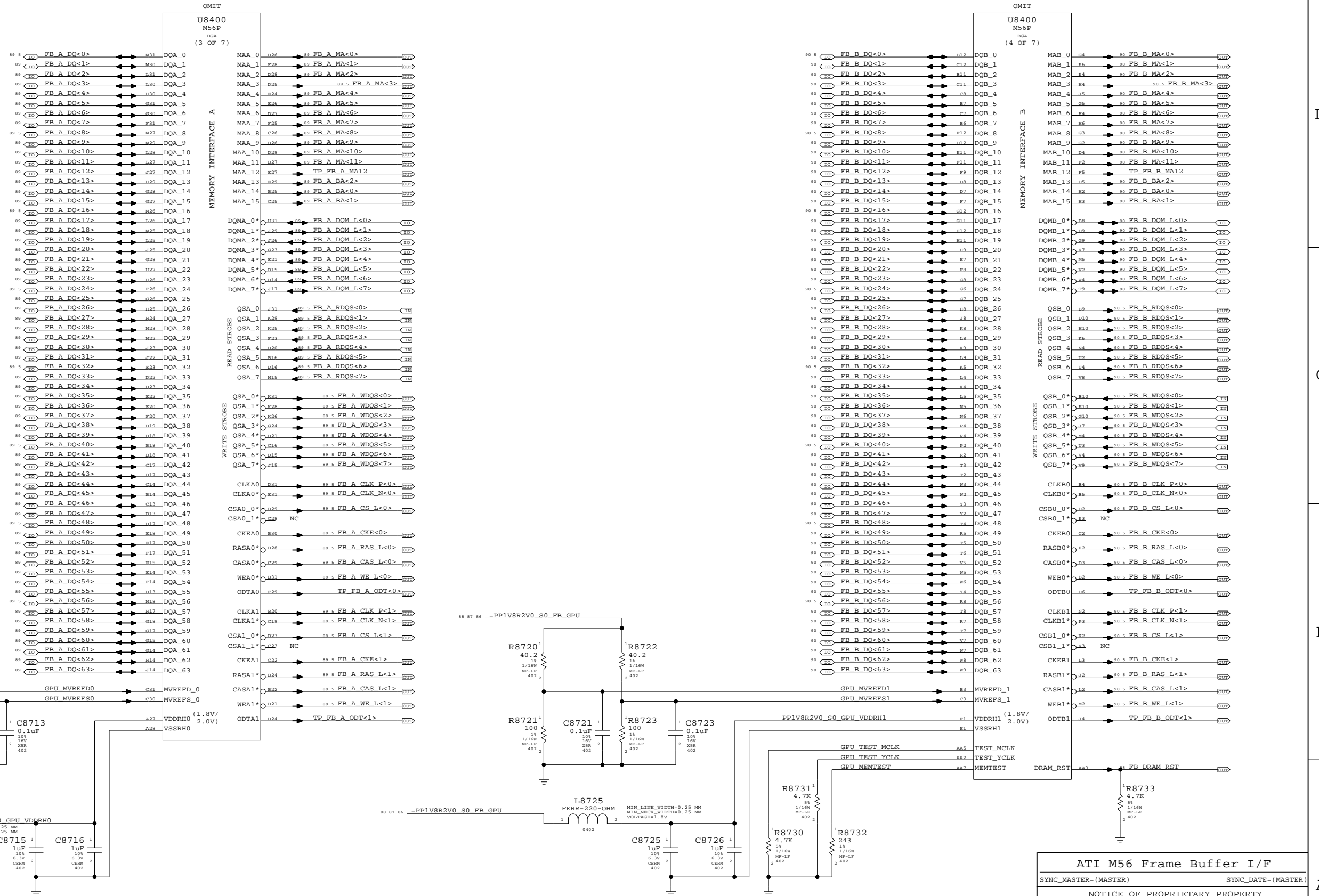
II NOT TO REPRODUCE OR COPY IT

III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7124	13
SCALE	SHT OF		
NONE	86 OF		110

Page Notes

Power aliases required by this page:
- =PP1V8R2V0\_S0\_FB\_GPU
Signal aliases required by this page:
(NONE)
BOM options provided by this page:
(NONE)



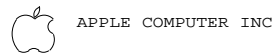
ATI M56 Frame Buffer I/F

SYNC\_MASTER=(MASTER) SYNC\_DATE=(MASTER)

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Table with columns: SIZE (D), DRAWING NUMBER (051-7124), REV. (13), SCALE (NONE), SHEET (87 OF 110).



8

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### "S0" GPU RAILS

ONLY ON IN RUN

59 EP1V0R1V2\_S0\_GPU  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=1.2V

85 PP5V\_S0\_GPUVCORE\_VCC  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=5V

PP1V2\_GPU\_IO\_S0  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=1.2V

PPBB\_S0\_GPU  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=1.2V

PPNB\_S0\_GPU  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.2MM  
 VOLTAGE=0

83 76 61 59 41 26 10 6 PP3V3\_S0  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=1.2V

83 6 PP2V5\_S0  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=1.2V

PP1V8R2V0\_S0\_FB\_GPU  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=1.8V

83 82 81 80 79 78 77 57 6 5 PP12V\_S5  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=1.2V

83 6 PP12V\_S0  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=1.2V

97 83 76 6 PP5V\_S0  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=5V

85 GPUVCORE\_EN  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=5V

87 FB\_DRAM\_RST  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=5V

### M56 GPIOs

94 91 GPU\_GPIO\_0  
 GPIO 0 = TRANSMITTER POWER SAVINGS ENABLE  
 INTERNAL PULL DOWN, ATI RECOMMENDS HIGH

91 GPU\_GPIO\_1  
 GPIO 1 = TRANSMITTER DE-EMPHASIS ENABLE  
 INTERNAL PULL DOWN, ATI RECOMMENDS HIGH

91 GPU\_GPIO\_2  
 GPIO 2 = TRANSMITTER DE-EMPHASIS ENABLE  
 INTERNAL PULL DOWN, ATI RECOMMENDS HIGH

91 GPU\_GPIO\_3  
 GPIO 3 = TRANSMITTER DE-EMPHASIS ENABLE  
 INTERNAL PULL DOWN, ATI RECOMMENDS HIGH

91 GPU\_GPIO\_4  
 GPIO 4 = DEBUG SIGNALS OUT

91 GPU\_GPIO\_5  
 GPIO 5 = TRANSMITTER DE-EMPHASIS ENABLE  
 INTERNAL PULL DOWN, ATI RECOMMENDS HIGH

91 GPU\_GPIO\_6  
 GPIO 6 = TRANSMITTER DE-EMPHASIS ENABLE  
 INTERNAL PULL DOWN, ATI RECOMMENDS HIGH

TP\_GPU\_GPIO\_7  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=5V

91 GPU\_GPIO\_8  
 GPIO 8 = TRANSMITTER DE-EMPHASIS ENABLE  
 INTERNAL PULL DOWN, ATI RECOMMENDS HIGH

NC\_GPU\_GPIO\_10  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=5V

91 GPU\_GPIO\_9  
 GPIO 9 = TRANSMITTER DE-EMPHASIS ENABLE  
 INTERNAL PULL DOWN, ATI RECOMMENDS HIGH

91 GPU\_GPIO\_13  
 GPIO 13 = TRANSMITTER DE-EMPHASIS ENABLE  
 INTERNAL PULL DOWN, ATI RECOMMENDS HIGH

91 GPU\_GPIO\_12  
 GPIO 12 = TRANSMITTER DE-EMPHASIS ENABLE  
 INTERNAL PULL DOWN, ATI RECOMMENDS HIGH

91 GPU\_GPIO\_11  
 GPIO 11 = TRANSMITTER DE-EMPHASIS ENABLE  
 INTERNAL PULL DOWN, ATI RECOMMENDS HIGH

GPIO 9,13,12,11 = ROM ID CFG  
 INTERNAL PULL DOWN  
 0010 = 256 M APERATURE SIZE

91 GPU\_GPIO\_24  
 GPIO 24 = TRANSMITTER DE-EMPHASIS ENABLE  
 INTERNAL PULL DOWN, ATI RECOMMENDS HIGH

91 GPU\_GPIO\_27  
 GPIO 27 = TRANSMITTER DE-EMPHASIS ENABLE  
 INTERNAL PULL DOWN, ATI RECOMMENDS HIGH

91 GPU\_GPIO\_28  
 GPIO 28 = TRANSMITTER DE-EMPHASIS ENABLE  
 INTERNAL PULL DOWN, ATI RECOMMENDS HIGH

91 GPU\_GPIO\_29  
 GPIO 29 = TRANSMITTER DE-EMPHASIS ENABLE  
 INTERNAL PULL DOWN, ATI RECOMMENDS HIGH

GPU\_VCORE\_LOW  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=5V

GPIO 15 = SWITCH CORE VOLTAGE HIGH TO LOW  
 EXTERNAL PULL DOWN RECOMMENDED

TP\_GPU\_GPIO\_14  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=5V

TP\_GPU\_GPIO\_17  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=5V

TP\_GPU\_VGA\_R  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=5V

TP\_GPU\_VGA\_G  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=5V

TP\_GPU\_VGA\_B  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=5V

TP\_GPU\_VGA\_HSYNC  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=5V

TP\_GPU\_VGA\_VSYNC  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=5V

TP\_GPU\_TV\_Y  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=5V

TP\_GPU\_TV\_COMP  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=5V

TP\_GPU\_TV\_C  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=5V

TP\_GPU\_DDC\_B\_CLK  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=5V

TP\_GPU\_DDC\_B\_DATA  
 MAKE\_BASE=TRUE  
 MIN\_LINE\_WIDTH=0.6MM  
 MIN\_NECK\_WIDTH=0.125MM  
 VOLTAGE=5V

### GPU MISC

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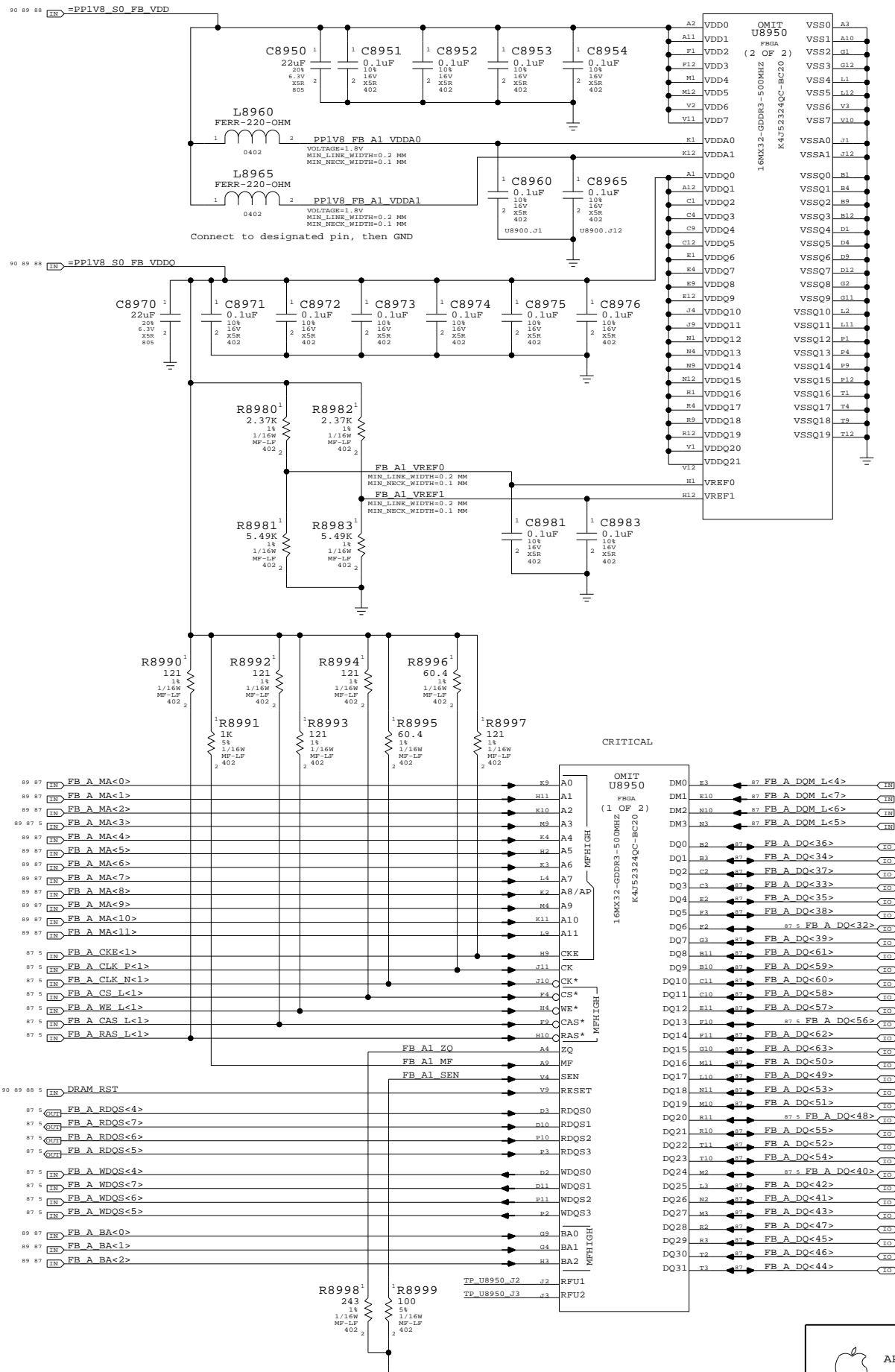
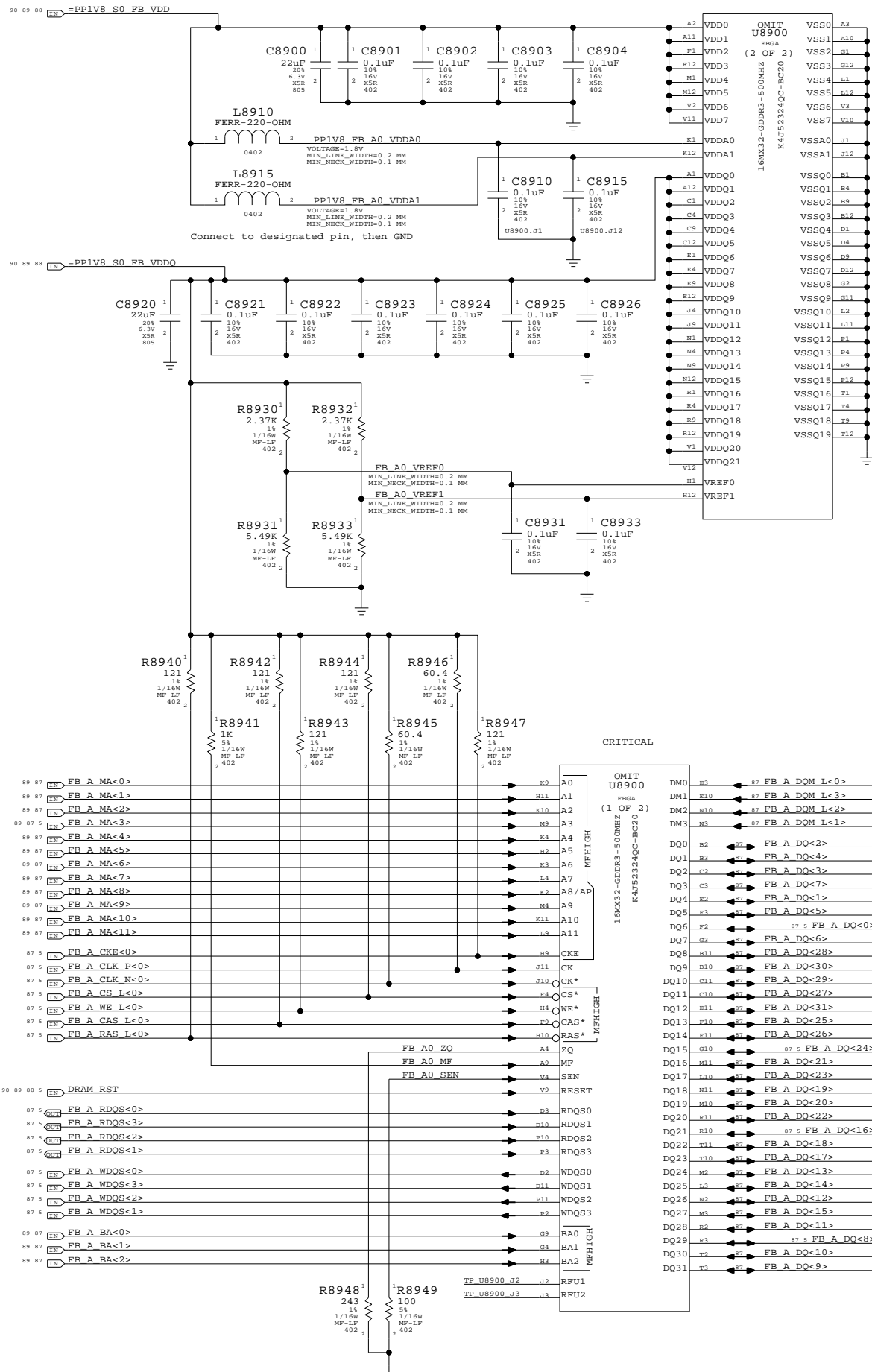
Power aliases required by this page:  
 - =PPIV8\_S0\_FB\_VDD  
 - =PPIV8\_S0\_FB\_VDDQ

Signal aliases required by this page:  
 (NONE)

BOM options provided by this page:  
 (NONE)

CRITICAL

CRITICAL



GDDR3 Frame Buffer A

SYNC\_MASTER=(MASTER) SYNC\_DATE=(MASTER)

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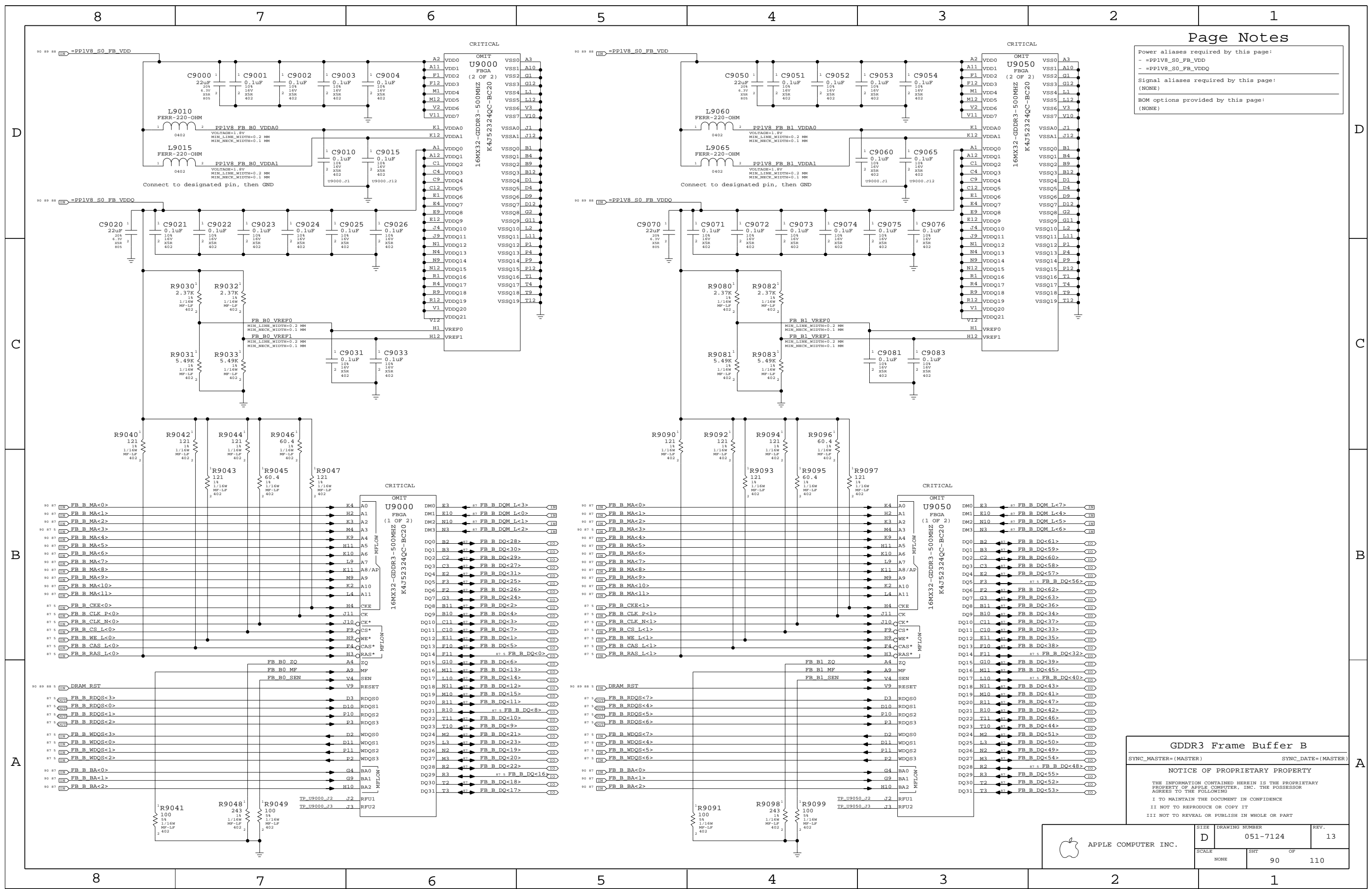
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Power aliases required by this page:  
 - =PPIV8\_S0\_FB\_VDD  
 - =PPIV8\_S0\_FB\_VDDQ

Signal aliases required by this page:  
 (NONE)

BOM options provided by this page:  
 (NONE)



**GDDR3 Frame Buffer B**

SYNC\_MASTER=(MASTER)      SYNC\_DATE=(MASTER)

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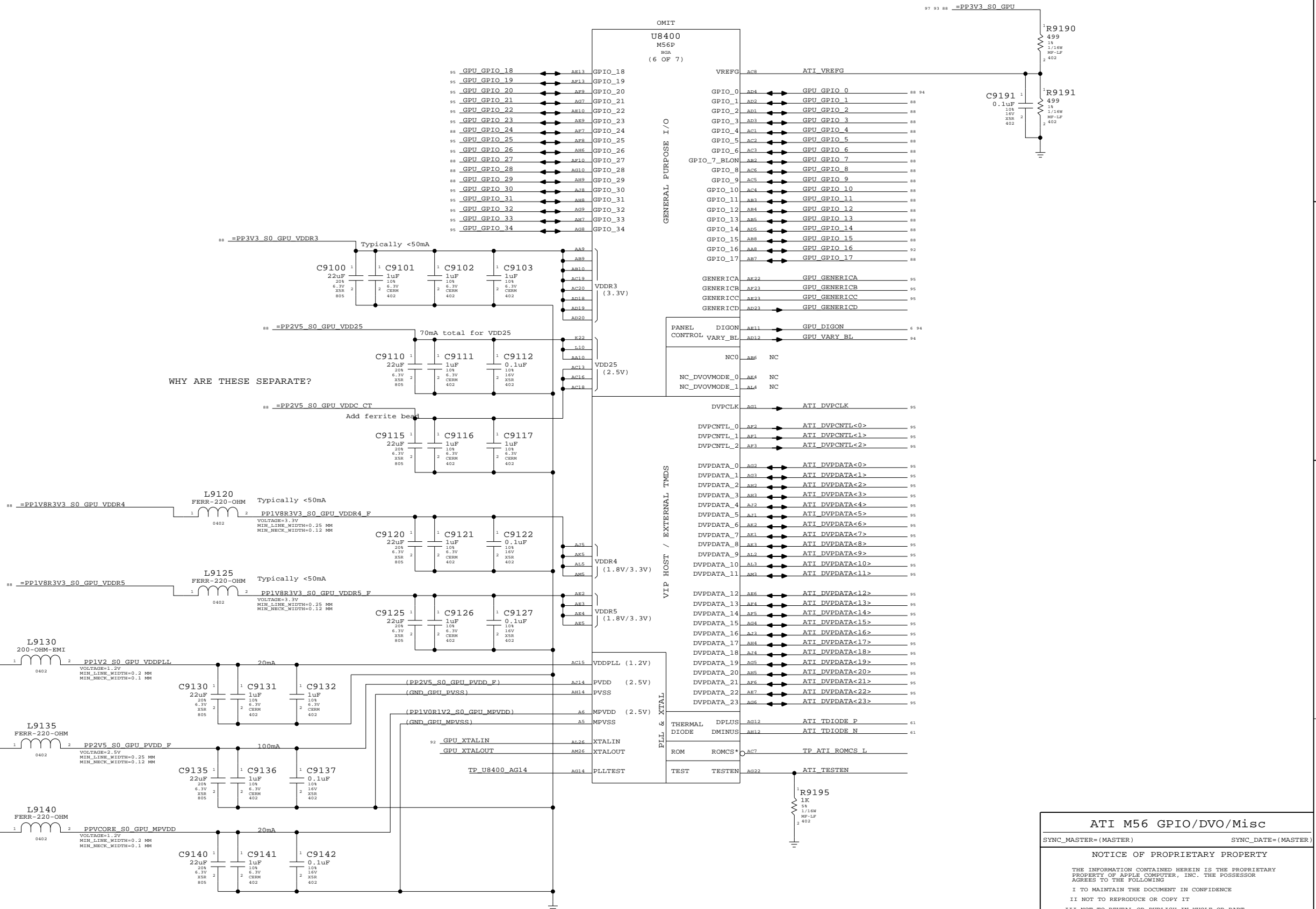
Power aliases required by this page:

- =PP3V3\_GPU\_GPIOS
- =PP2V5\_PVDD
- =PP1V8\_GPU\_LVDS\_PLL

Signal aliases required by this page:

- =I2C\_GPU\_TMDS\_SDA - I2C data line for external TMDS transmitters
- =I2C\_GPU\_TMDS\_SCL - I2C clock line for external TMDS transmitters

BOM options provided by this page:  
(NONE)



**ATI M56 GPIO/DVO/Misc**

SYNC\_MASTER=(MASTER)      SYNC\_DATE=(MASTER)

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	DRAWING NUMBER		REV.
	D	051-7124	13
SCALE		SHT	OF
NONE		91	110

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### Page Notes

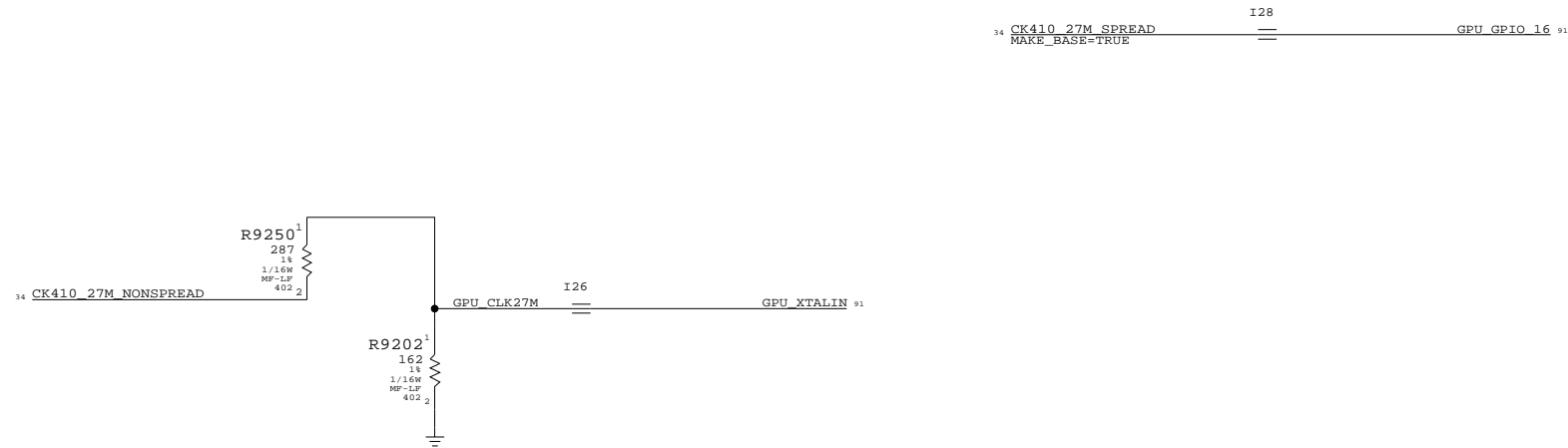
Power aliases required by this page:

- =PP3V3\_GPU\_CLOCKS      - =PP3V3\_GPU\_PWRSEQ
- =PPVIN\_GPU\_LVDDR\_LDO    - =PP2V5\_GPU\_PWRSEQ
- =PP2V5\_GPU\_LVDDR\_LDO    - =PP1V8\_GPU\_PWRSEQ
- =PP1V5\_GPU\_PWRSEQ

Signal aliases required by this page:  
(NONE)

BOM options provided by this page:

- GPU\_SS                      - GPU\_LVDDR\_2V8




### GPU CLOCKS

SYNC\_MASTER=BOZEMAN      SYNC\_DATE=05/21/2005

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 APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
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SCALE	SHT	OF	
NONE	92	110	

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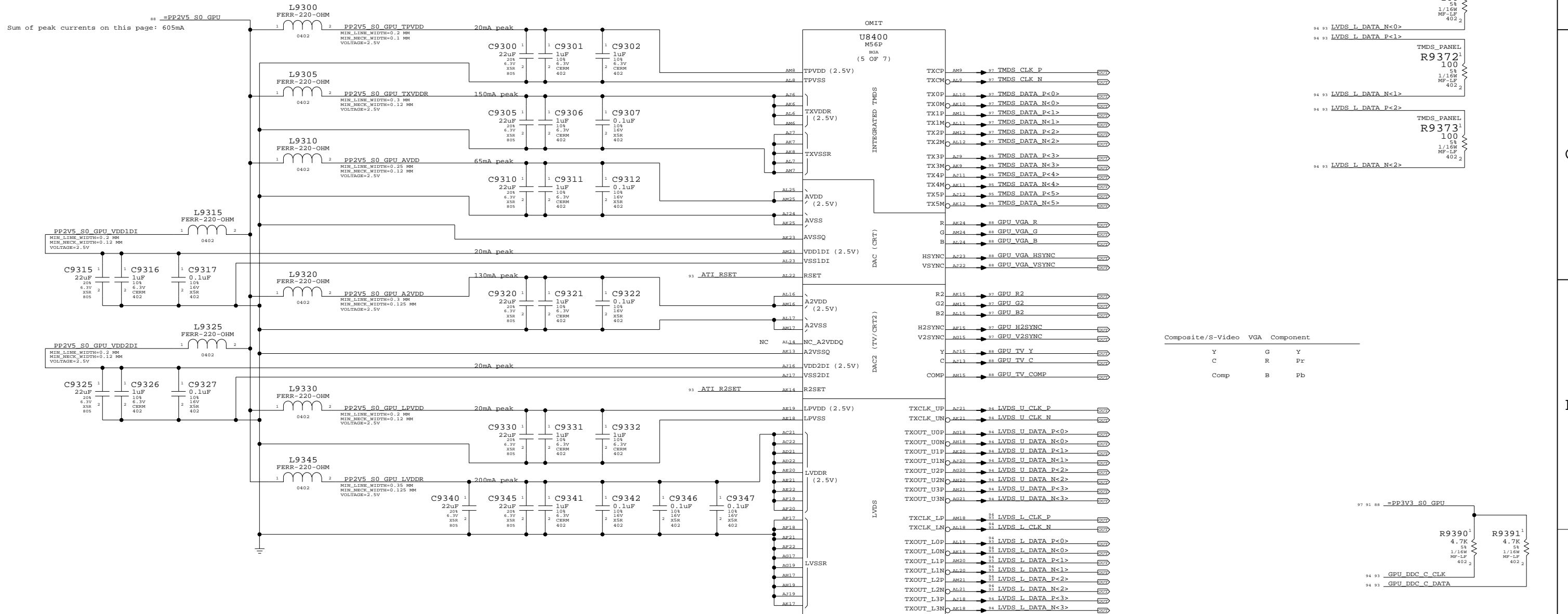
Page Notes

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 - =PP1V8R2V5\_S0\_GPU\_LVDDR

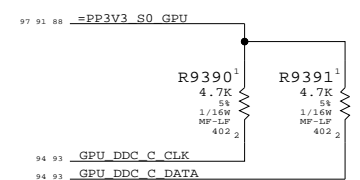
Signal aliases required by this page:  
 (NONE)

BOM options provided by this page:  
 (NONE)

TERMINATION FOR TMDS USAGE OF LVDS PINS  
 PLACE CLOSE TO GPU (U8400)



Composite/S-Video	VGA	Component
Y	G	Y
C	R	Pr
Comp	B	Pb



**ATI M56 Video Interfaces**

SYNC\_MASTER=(MASTER) SYNC\_DATE=(MASTER)

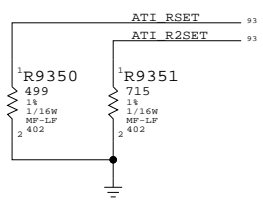
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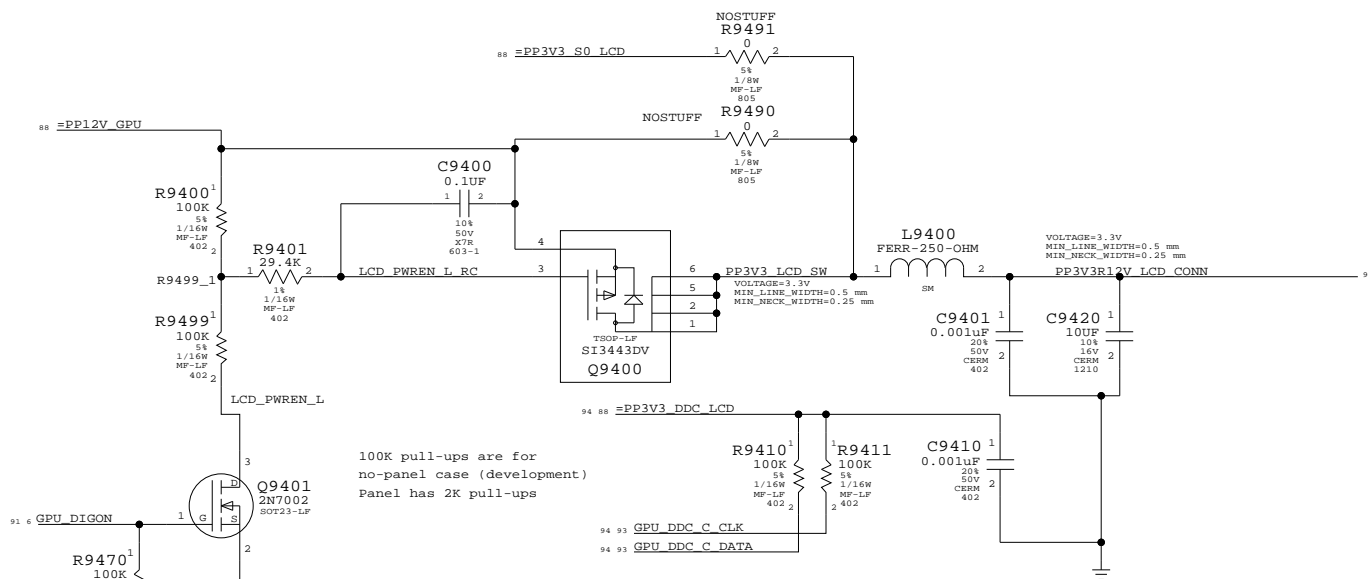
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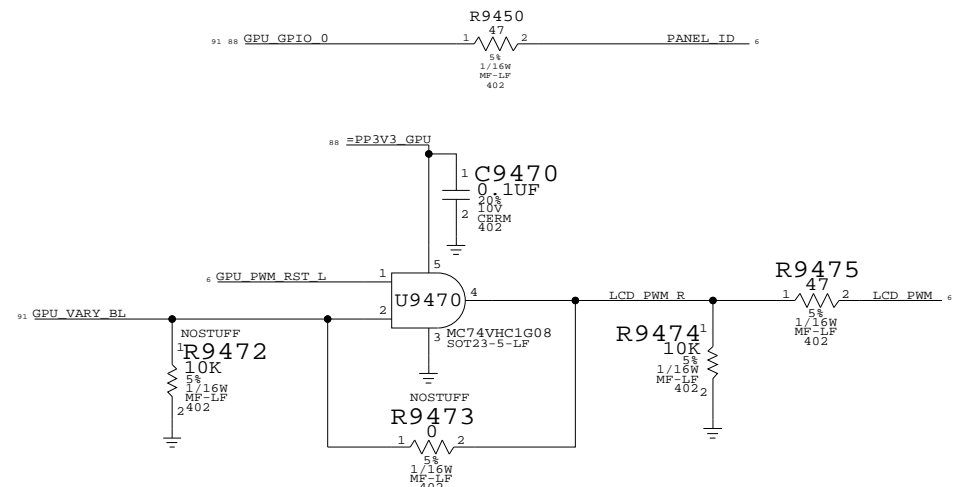
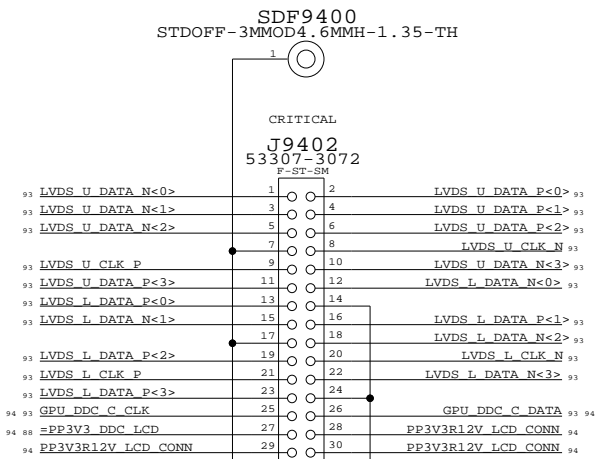
III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART



# LCD (LVDS) INTERFACE



100K pull-ups are for no-panel case (development)  
Panel has 2K pull-ups



Internal Display Conns  
 SYNC\_MASTER=BOZEMAN SYNC\_DATE=04/27/2005  
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	D	051-7124	13
SCALE	SHT	OF	
NONE	94	110	

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### M56 TPS


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NONE	95	110	

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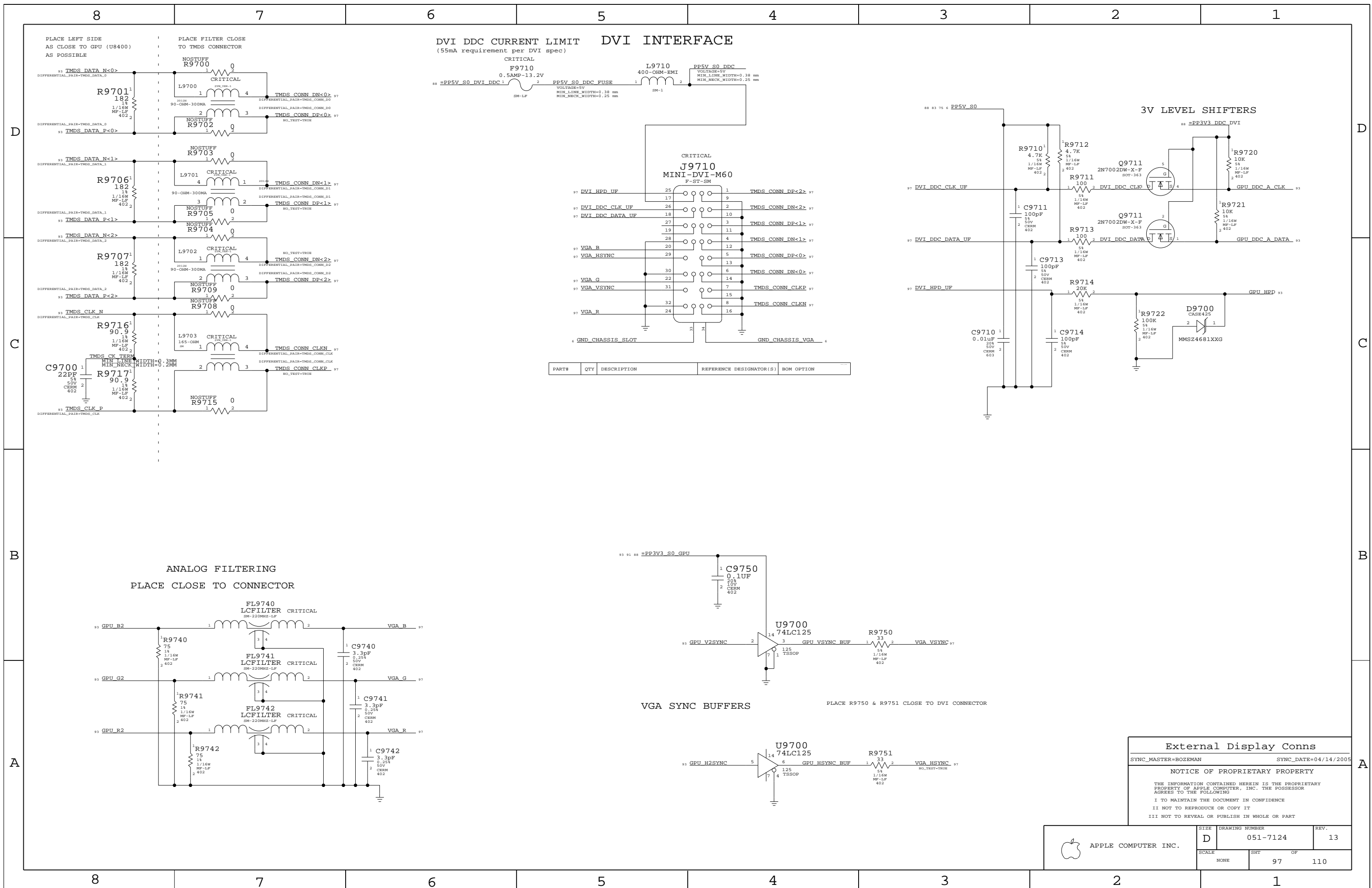
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DVI DDC CURRENT LIMIT DVI INTERFACE

(55mA requirement per DVI spec)

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	BOM OPTION

External Display Conns  
 SYNC\_MASTER=BOZEMAN SYNC\_DATE=04/14/2005  
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SCALE	SHT	OF	
NONE	97	110	











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C	C						
B	B						
A	A						
8	7	6	5	4	3	2	1



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