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.

DRAWING

REV	ZONE	ECN	DESCRIPTION OF CHANGE	CK APPD / DATE	ENG APPD / DATE
02		248015	ENGINEERING RELEASED	12/05/02	?

SCHEM,MLB,PB15

Fri Jan 23 20:30:40 2004

BOM OPTIONS (IN COMMON PARTS)

STUFF	NO STUFF
1_8V_MAXBUS	1_5V_MAXBUS
SSCG	NO_SSCG
5V_HD_LOGIC	3V_HD_LOGIC
NO_BBANG	BBANG
INT_2_5V_COLD	INT_2_5V_HOT
ATI_MEMIO_HI	ATI_MEMIO_LO
USB_MODEM	SOFT_MODEM
GPU_PWRMSR	INT_TMDS
GPU_SS	
VGA_BUFFER_RES	
EXT_TMDS	

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	BOM OPTION
051-6338	1	SCHEM,MLB,PB15	SCH1	
820-1441	1	PCBF,MLB,PB15	PCB1	
065-3951	1	CMNPRTS,MLB,PB15	DMS1	DMS630-4285&DMS630-4721
065-3952	1	SELPRTS,MLB,PB15,BTR	DMS2	DMS630-4285
065-4479	1	SELPRTS,MLB,PB15,BST	DMS3	DMS630-4721

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

THIRD ANGLE PROJECTION

METRIC

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

MATERIAL/FINISH NOTED AS APPLICABLE

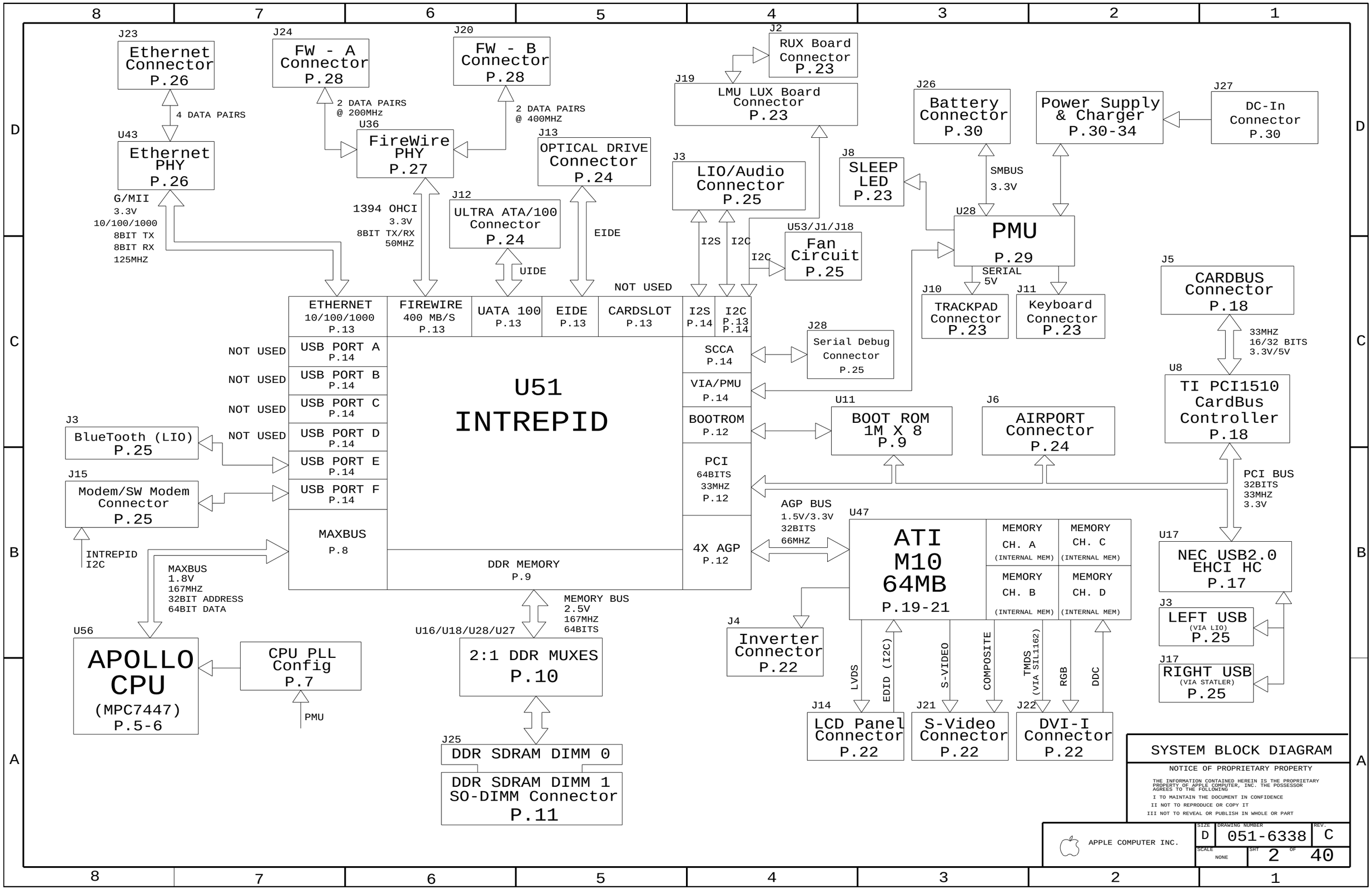
SIZE D

Apple Computer Inc.

TITLE
SCHEM,MLB,PB15"

DRAWING NUMBER 051-6338 REV. C

SHT 1 OF 40


U51
INTREPID
ETHERNET
10/100/1000
P.13
FIREWIRE
400 MB/S
P.13
UATA 100
P.13
EIDE
P.13
CARDSLOT
P.13
I2S
P.14
I2C
P.13
P.14
NOT USED
USB PORT A
P.14
USB PORT B
P.14
USB PORT C
P.14
USB PORT D
P.14
USB PORT E
P.14
USB PORT F
P.14
MAXBUS
P.8
SCCA
P.14
VIA/PMU
P.14
BOOTROM
P.12
PCI
64BITS
33MHZ
P.12
4X AGP
P.12
DDR MEMORY
P.9
J23
Ethernet Connector
P.26
4 DATA PAIRS
U43
Ethernet PHY
P.26
G/MII
3.3V
10/100/1000
8BIT TX
8BIT RX
125MHZ
J24
FW - A Connector
P.28
2 DATA PAIRS
@ 200MHz
U36
FireWire PHY
P.27
1394 OHCI
3.3V
8BIT TX/RX
50MHZ
J20
FW - B Connector
P.28
2 DATA PAIRS
@ 400MHZ
J13
OPTICAL DRIVE Connector
P.24
EIDE
J12
ULTRA ATA/100 Connector
P.24
UIDE
J2
RUX Board Connector
P.23
J19
LMU LUX Board Connector
P.23
J3
LIO/Audio Connector
P.25
I2S
I2C
I2C
U53/J1/J18
Fan Circuit
P.25
J8
SLEEP LED
P.23
J26
Battery Connector
P.30
Power Supply & Charger
P.30-34
J27
DC-In Connector
P.30
SMBUS
3.3V
U28
PMU
P.29
SERIAL
5V
J10
TRACKPAD Connector
P.23
J11
Keyboard Connector
P.23
J5
CARDBUS Connector
P.18
33MHZ
16/32 BITS
3.3V/5V
U8
TI PCI1510 CardBus Controller
P.18
PCI BUS
32BITS
33MHZ
3.3V
J28
Serial Debug Connector
P.25
U11
BOOT ROM
1M X 8
P.9
J6
AIRPORT Connector
P.24
J3
BlueTooth (LIO)
P.25
J15
Modem/SW Modem Connector
P.25
INTREPID
I2C
MAXBUS
1.8V
167MHZ
32BIT ADDRESS
64BIT DATA
U56
APOLLO CPU
(MPC7447)
P.5-6
CPU PLL Config
P.7
PMU
MEMORY BUS
2.5V
167MHZ
64BITS
U16/U18/U28/U27
2:1 DDR MUXES
P.10
J25
DDR SDRAM DIMM 0
DDR SDRAM DIMM 1
SO-DIMM Connector
P.11
AGP BUS
1.5V/3.3V
32BITS
66MHZ
U47
ATI M10 64MB
P.19-21
MEMORY CH. A
(INTERNAL MEM)
MEMORY CH. C
(INTERNAL MEM)
MEMORY CH. B
(INTERNAL MEM)
MEMORY CH. D
(INTERNAL MEM)
J4
Inverter Connector
P.22
LVDS
EDID (I2C)
S-VIDEO
COMPOSITE
TMDS
(VIA SIL1162)
RGB
DDC
J14
LCD Panel Connector
P.22
J21
S-Video Connector
P.22
J22
DVI-I Connector
P.22
U17
NEC USB2.0 EHCI HC
P.17
J3
LEFT USB
(VIA LIO)
P.25
J17
RIGHT USB
(VIA STATLER)
P.25
SYSTEM BLOCK DIAGRAM
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APPLE COMPUTER INC.
SIZE D
DRAWING NUMBER 051-6338
REV. C
SCALE NONE
SHT 2 OF 40

POWER SYSTEM ARCHITECTURE

AC ADAPTER IN PG 30

INRUSH LIMITER PG 30

+24V_PBUS

1V20_REF
>-13.44V TURNS-ON
<-13.44V SHUTS-OFF
PG 31

RUN/SS
BUCK REGULATOR (LTC1625) PG 31
VCC
AC: 12.8V
NO AC: BATTERY VOLTAGE 1625 NOT RUNNING
SHUTDOWN: RUNNING
SLEEP: RUNNING
RUN: RUNNING

+PBUS

14V_PBUS

+3V_PMU LDO PG 31

+BATT

+5V_MAIN

+3V_PMU

+4_6V_BU

RC AT 1M*0.047UF @ 24V
STARTS 2.0MSEC AFTER DCDC_EN_L BECOMES LOW

RUN/SS - 5V
TURNS ON AT >1V
<100UA ALLOWED
INTERNAL ZENER CLAMP TO 6V

MAIN 3V/5V DC/DC (LTC3707) PG 32
VCC
STBYMD
PGOOD
SHUTDOWN: STOPPED
SLEEP: RUNNING
RUN: RUNNING

INTERNAL ZENER CLAMP TO 6V
<100UA ALLOWED
TURNS ON AT >1V
RUN/SS - 3V

+5V_MAIN

3V_5V_OK

HOLDS BOTH RUN/SS AT GND WHEN IT'S CONNECTED TO GND

TURNS CONTROL TO RUN/SS WHEN IT'S OPEN

+3.3V_MAIN

RC AT 1M*0.1UF @ 24V
STARTS ~4.25MSEC AFTER DCDC_EN_L BECOMES LOW

NO INRUSH PROTECTION
WHEN ONLY BATTERY IS CONNECTED

+24V_PBUS

BACKUP BATTERY

14V_PBUS

14V CHARGES BACKUP BATTERY

24V IS OUTPUT ONLY FROM BACKUP BATTERY

CHARGER INPUT & BOOST OUTPUT PG 31

BACKUP BATTERY CIRCUIT CHARGES OFF +PBUS AND PREVENTS +PBUS AND +24V_PBUS FROM DROPPING BELOW 6V (UNTIL DRAINED)

BATTERY CHARGER (MAX1772) PG 30

+BATT

3S 2P 18650 CELLS

DC/DC (LTC3411) PG 34
SHUTDOWN: STOPPED
SLEEP: STOPPED
RUN: RUNNING

+1.8V_MAIN

MAXBUS

NO INRUSH PROTECTION
WHEN ONLY BATTERY IS CONNECTED

BATTERY VOLTAGE FEED-IN PATH PG 30

+PBUS

BACKLIGHT INVERTER

+5V_MAIN

VCC
MAIN 2.5V/1.5V DC/DC (MAX1715) PG 34
PGOOD
SHUTDOWN: STOPPED
SLEEP: RUNNING
RUN: RUNNING

TURNS ON OUTPUT @ 2.4V ON1/ON2

MAP31 DDR CORE
MAP31 DDR I/O
DDR POWER
+2.5V_MAIN

1_5V_2_5V_OK

+1.5V_MAIN

INTREPID CORE
AGP I/O

DCDC_EN_L

AFTER PMU IS UP AND RUNNING DCDC_EN_L WILL PULL ON1/ON2 LOW IN SHUTDOWN

DCDC_EN
SLEEP

MAXBUS SEQUENCING

+PBUS

+5V_MAIN

VCC
SHDN
DC/DC (MAX1717)
SHUTDOWN: STOPPED
SLEEP: STOPPED
RUN: RUNNING
PG 33

CPU_VCORE (+1.385V)

+PBUS

+5V_MAIN

VCC
EXT_VCC
DC/DC (LTC1778)
SHUTDOWN: STOPPED
SLEEP: D3COLD
RUN: RUNNING

TURNS ON AS LOW AS 0.8V/TYP 1.5V
INTERNAL 1.2UA CURRENT SOURCE

RUN/SS
PG 20

GPU_VCORE +1.2V

DCDC_EN
SLEEP

D3_COLD

GPU_VCORE SEQUENCING

1M & 0.1UF @14V, IT TAKES ~5.88MS TO START SWITCHER

1_5V_2_5V_OK

D3_HOT

DCDC_EN_L
D3_HOT

1_5V_2_5V_OK WILL NOT PULL LOW UNTIL +5V_MAIN TURNS ON

HOWEVER, 5V SHOULD TURN ON ~2.23MS AFTER DCDC_EN_L OR PMU_POWERUP_L BECOMES '1'; MUCH LESS THAN THE RC CHARGING AT INT_VCC (5V)

SHUT-DOWN RUN SLEEP RUN SHUT-DOWN

SLEEP
SLEEP_L_LS5
DCDC_EN
DCDC_EN_L
+5V_MAIN
+5V_SLEEP
+3V_MAIN
+3V_SLEEP
3V_5V_OK
+2_5V_MAIN
+2_5V_SLEEP
+1_5V_MAIN
+1_5V_SLEEP
1_5V_2_5V_OK (MAX1715 OUTPUT)
1_5V_2_5V_OK (AT LTC1778 RUN/SS)
GPU_VCORE (D3HOT)
GPU_VCORE (D3COLD)

~2.23MS
~7.36MS
2.4V - ??? MS
??? MS
??? MS
~8.2MS

POWER BLOCK DIAGRAM

APPLE COMPUTER INC.

SIZE D | DRAWING NUMBER 051-6338 | REV: C

SCALE NONE | SHT 3 OF 40

PCB SPECS

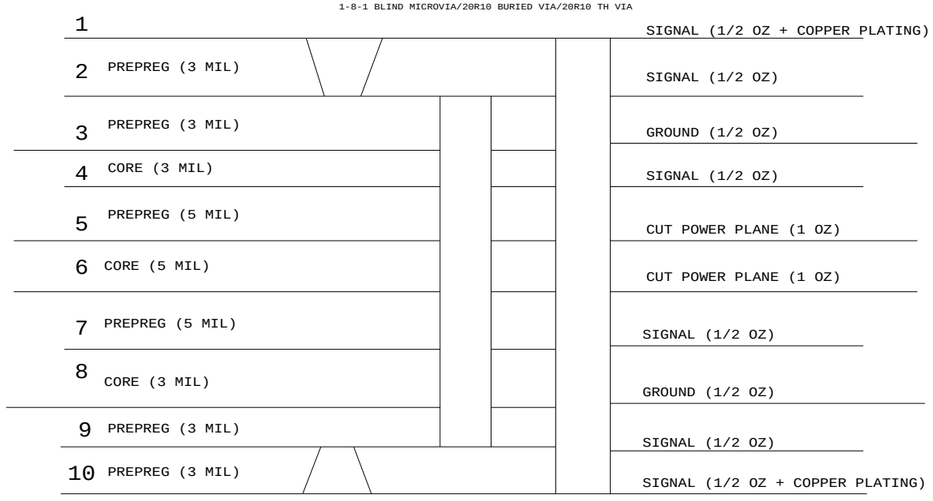
THICKNESS : 1.2 MM / 0.047 IN
1/2 OZ CU THICKNESS: 0.7 MILS
1.0 OZ CU THICKNESS: 1.4 MILS

IMPEDANCE : 50 OHMS +/- 10%
DIELECTRIC: FR-4
LAYER COUNT: 10
SIGNAL TRACE WIDTH: 4 MILS
SIGNAL TRACE SPACING: 4 MILS
PREPREG THICKNESS: 2-3 MILS

SEE PCB CAD FILES FOR MORE SPECIFIC INFO.

BOARD STACK-UP AND CONSTRUCTION

1-8-1 BLIND MICROVIA/20R10 BURIED VIA/20R10 TH VIA



BOARD HOLES

CHASSIS MOUNTS

ASICS HEATSINK MOUNTS

ZT7 HOLE-VIA-20R10 LEFT CPU
ZT21 HOLE-VIA-20R10 UPPER RT GPU
ZT58 HOLE-VIA-20R10 LWR CPU
ZT59 HOLE-VIA-20R10 LWR RT GPU

I/O AREA

ZT85 HOLE-VIA-20R10 DVI — CHGND2
ZT86 HOLE-VIA-20R10 DVI 1394 — CHGND1
ZT16 HOLE-VIA-20R10 BATT. CHRGR — CHGND5

INVERTER

SH1 OG-503040 SHLD-SM — CHGND3

MECH. HOLES

ZT74 HOLE-VIA-20R10
ZT36 HOLE-VIA-20R10 — ZT301_SPN NO_TEST=TRUE
ZT23 HOLE-VIA-20R10 — ZT302_SPN NO_TEST=TRUE
ZT42 HOLE-VIA-20R10 — ZT10_SPN NO_TEST=TRUE

GROUND VIAS

ZT76, ZT28, ZT72, ZT69, ZT68, ZT64, ZT61, ZT38, ZT39, ZT40, ZT41, ZT46, ZT71, ZT78, ZT80 — HOLE-VIA-20R10

ZT50, ZT51, ZT52, ZT53, ZT57, ZT60, ZT82, ZT22, ZT17, ZT35, ZT45, ZT79, ZT81, ZT83, ZT49 — HOLE-VIA-20R10

ZT48, ZT47, ZT54, ZT55, ZT56, ZT84, ZT5, ZT15, ZT44, ZT4, ZT8, ZT6, ZT32, ZT3, ZT10 — HOLE-VIA-20R10

ZT11, ZT34, ZT20, ZT43, ZT70, ZT2, ZT9, ZT75, ZT73, ZT63, ZT77, ZT66, ZT62, ZT65, ZT13 — HOLE-VIA-20R10

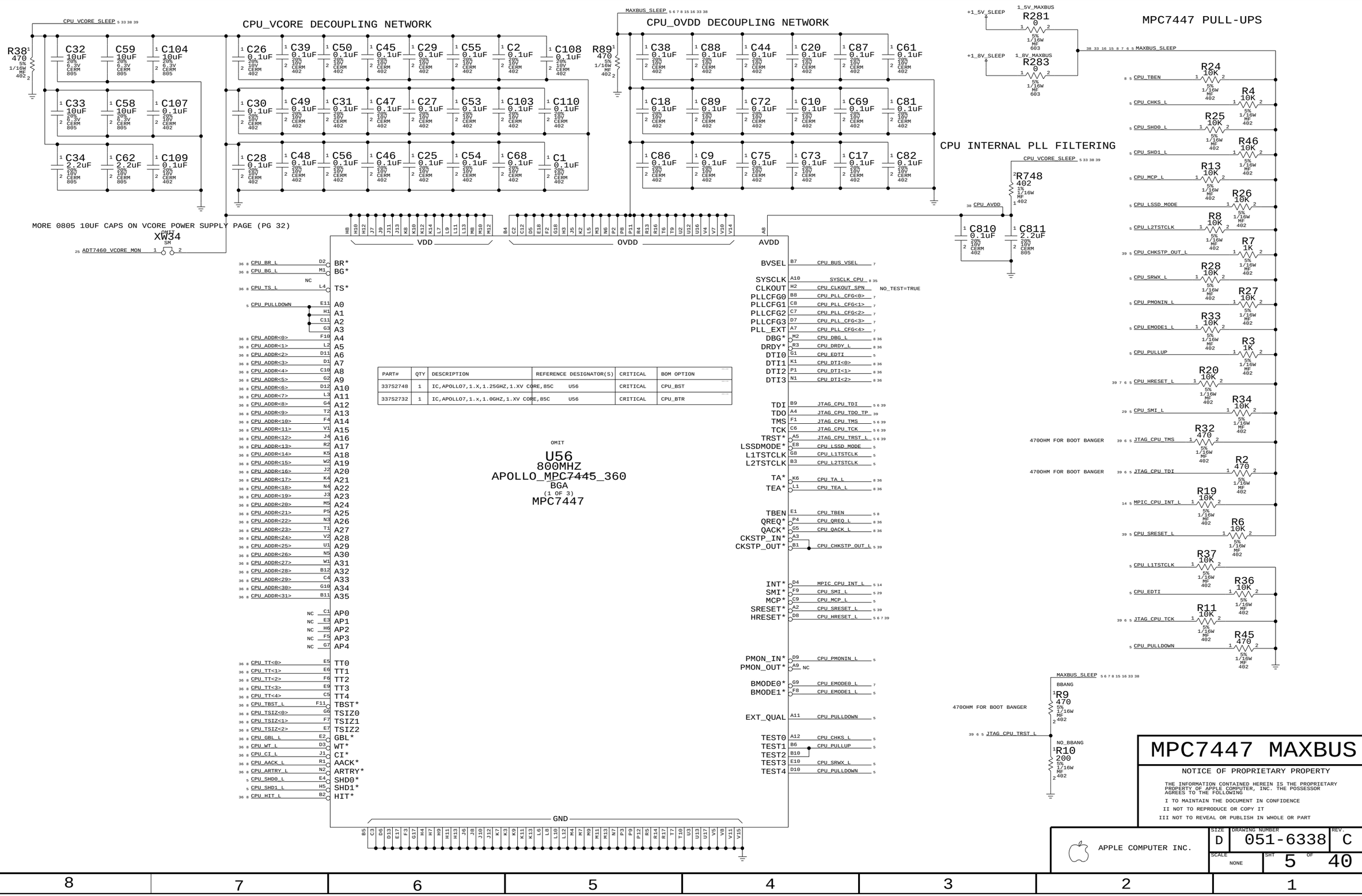
ZT25, ZT19, ZT24, ZT67, ZT37, ZT29, ZT31, ZT1, ZT14, ZT12, ZT27, ZT26, ZT30, ZT33, ZT18 — HOLE-VIA-20R10

BOARD INFORMATION

APPLE COMPUTER INC.

SIZE	DRAWING NUMBER	REV.
D	051-6338	C

SCALE	SHT	OF
NONE	4	40



PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
337S2748	1	IC,APOLLO7,1.X,1.25GHZ,1.XV CORE,85C	U56	CRITICAL	CPU_BST
337S2732	1	IC,APOLLO7,1.X,1.0GHZ,1.XV CORE,85C	U56	CRITICAL	CPU_BTR

MPC7447 MAXBUS

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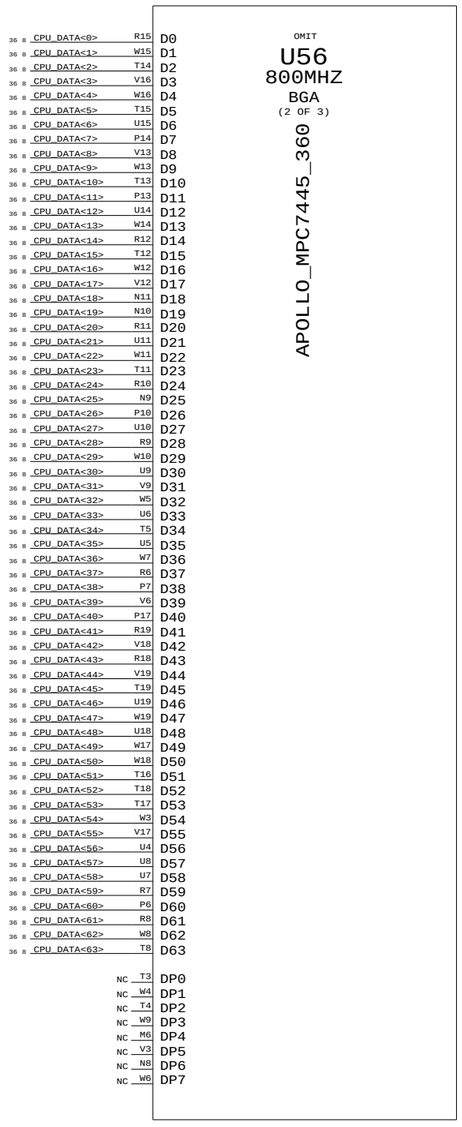
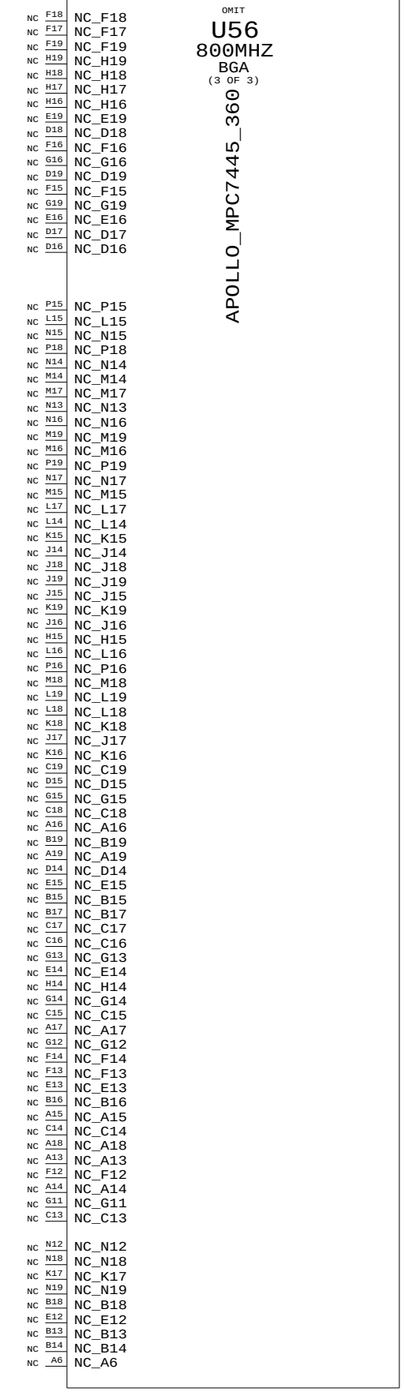
SIZE	DRAWING NUMBER	REV.
D	051-6338	C

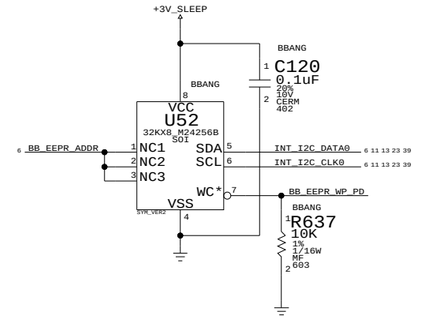
SCALE: NONE

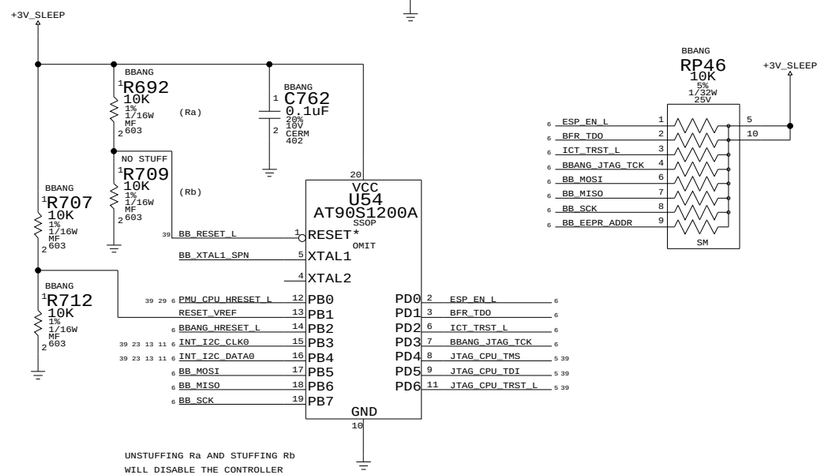
SHT 5 OF 40

BOOT BANGER - TWEAK PROCESSOR BITS AFTER POWER-ON



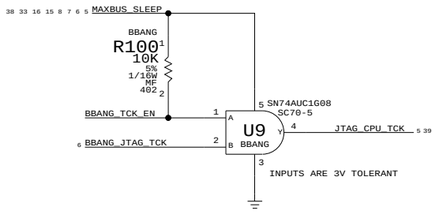


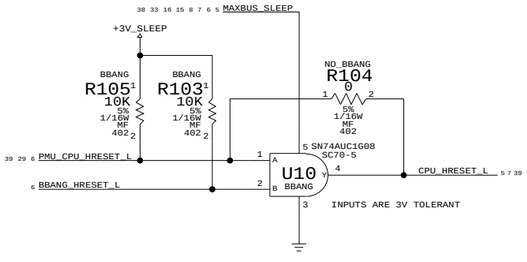




UNSTUFFING Ra AND STUFFING Rb
WILL DISABLE THE CONTROLLER

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	BOM OPTION
341S1135	1	800-8248 FW GT4 BBANGER MCU,PROGRAMMED W/ BBANGER	U54	BBANG





MPC7447/BBANG

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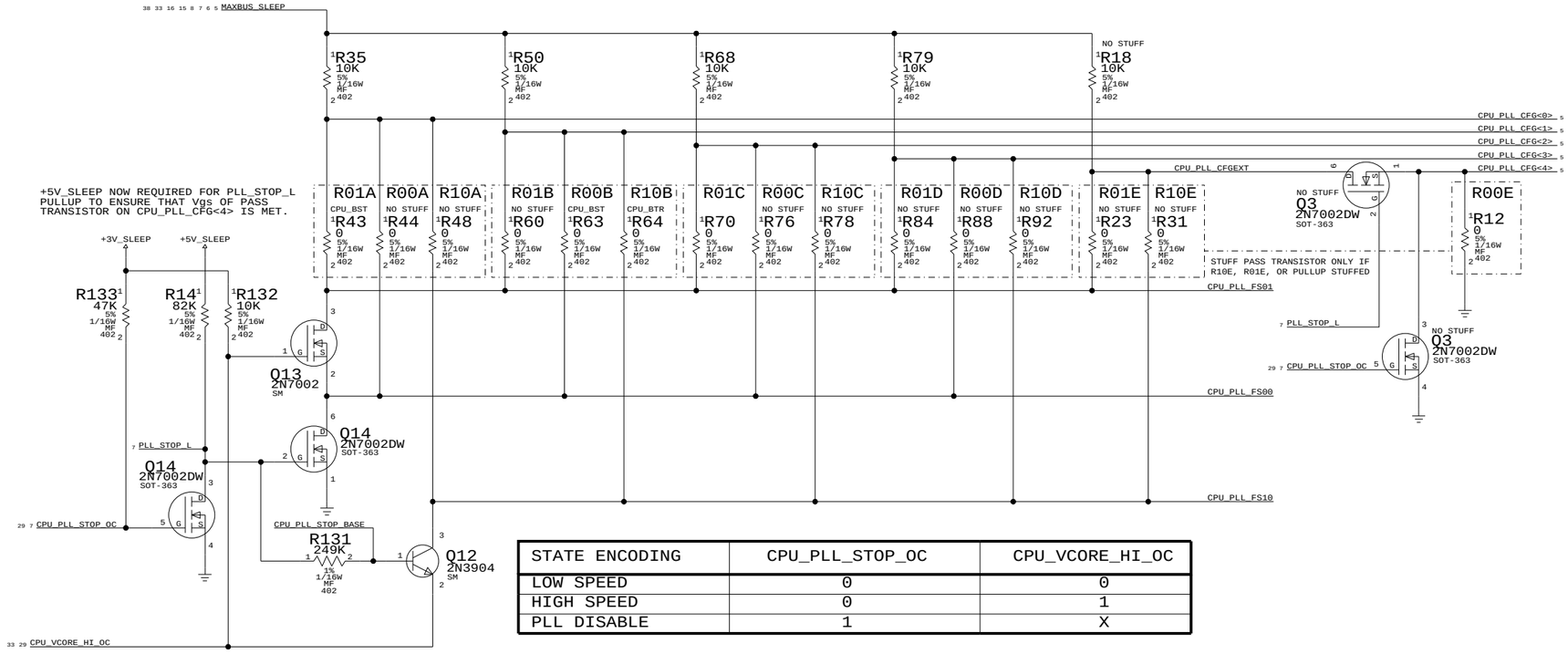
SIZE	DRAWING NUMBER	REV.
D	051-6338	C
SCALE: NONE	SHT 6 OF 40	

CPU PLL CONFIG CIRCUITRY



STATE ENCODING	CPU_PLL_STOP_OC	CPU_VCORE_HI_OC
LOW SPEED	0	0
HIGH SPEED	0	1
PLL DISABLE	1	X

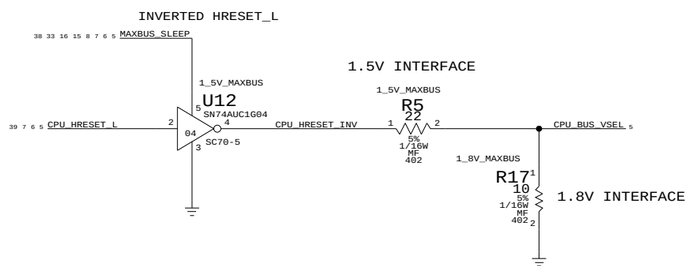
CPU FREQUENCY CONFIGURATION

APOLLO 7

MULTIPLIER (Bus-to-Core)	CORE FREQUENCY (AT BUS FREQUENCY) 167MHZ (MHZ)	133MHZ (MHZ)	CPU_PLL_CFG 4 0123 E ABCD HEX
0.0X	PLL OFF		0 1111 0F
1.0X	PLL BYPASS		0 0011 03
2.0X	333	267	0 0100 04
3.0X	500	400	0 1000 08
4.0X	667	533	0 1010 0A
5.0X	833	667	0 1011 0B
5.5X	917	733	0 1001 09
6.0X	1000	800	0 1101 0D
6.5X	1083	867	0 0101 05
7.0X	1167	933	0 0010 02
7.5X	1250	1000	0 0001 01
8.0X	1333	1067	0 1100 0C
8.5X	1417	1133	0 0110 06
9.0X	1500	1200	1 0111 17
9.5X	1583	1267	0 0111 07
10.0X	1667	1333	1 1010 1A
10.5X	1750	1400	1 1000 18
11.0X	1833	1467	1 1001 19
11.5X	1917	1533	0 0000 00
12.0X	2000	1600	1 1011 1B
12.5X	2083	1667	1 1111 1F
13.0X	2167	1733	1 0101 15
13.5X	2250	1800	0 1110 0E
14.0X	2333	1867	1 1100 1C
15.0X	2500	2000	1 0001 11
16.0X	2667	2133	1 1101 1D
17.0X	2833	2267	1 0000 10
18.0X	3000	2400	1 0010 12
20.0X	3333	2667	1 0011 13
21.0X	3500	2800	1 0100 14
24.0X	4000	3200	1 0110 16
28.0X	4667	3733	1 1110 1E

CPU CONFIGURATION

MAXBUS VSEL



DESKTOP HAD PROBLEM USING INVERTER TO INVERT HRESET_L NEED TO CHARACTERIZE

BUSTYPE SELECT

APOLLO ONLY SUPPORTS MAXBUS

SIGNAL	TIED	APPLICATION
CPU_EMODE0_L (PROCESSOR)	HIGH	60X BUS MODE
	CPU_HRESET_L	MAX BUS MODE
CPU_BUS_VSEL (PROCESSOR)	CPU_HRESET_L	2.5V INTERFACE
	LOW	1.8V INTERFACE
	CPU_HRESET_INV	1.5V INTERFACE

CPU CONFIGURATION

APPLE COMPUTER INC.

SIZE D | DRAWING NUMBER 051-6338 | REV: C

SCALE NONE | SHT 7 OF 40

INTREPID BOOT STRAPS

BIT 32 TO 39

38 33 16 15 8 7 6 5 MAXBUS_SLEEP

NO STUFF R640[1] 10K 5% 1/16W MF 402 2	NO STUFF R639[1] 10K 5% 1/16W MF 402 2	NO STUFF R638[1] 10K 5% 1/16W MF 402 2	NO STUFF R666[1] 10K 5% 1/16W MF 402 2					
36 8 6 CPU_DATA<32>	36 8 6 CPU_DATA<33>	36 8 6 CPU_DATA<34>	36 8 6 CPU_DATA<35>	36 8 6 CPU_DATA<36>	36 8 6 CPU_DATA<37>	36 8 6 CPU_DATA<38>	36 8 6 CPU_DATA<39>	
R622[1] 10K 5% 1/16W MF 402 2	R619[1] 10K 5% 1/16W MF 402 2	R618[1] 10K 5% 1/16W MF 402 2	R653[1] 10K 5% 1/16W MF 402 2	R621[1] 10K 5% 1/16W MF 402 2	R620[1] 10K 5% 1/16W MF 402 2	R652[1] 10K 5% 1/16W MF 402 2	R650[1] 10K 5% 1/16W MF 402 2	
0: CPU_TDO output (Reg) 1: TDI output (Weak)	0: Normal operation 1: AnalyzerClk_En_h Active	0: DDR_TRDEN Pull Down Active low 1: DDR_TRDEN Pull Up Active low	Spare	0: Enable Spread Spectrum PLL1 Active low 1: Disable Spread Spectrum PLL1	Spare	Spare	Spare	Spare

BIT 40 TO 47

38 33 16 15 8 7 6 5 MAXBUS_SLEEP

NO STUFF R641[1] 10K 5% 1/16W MF 402 2	SSCG R665[1] 10K 5% 1/16W MF 402 2	NO STUFF R664[1] 10K 5% 1/16W MF 402 2	NO_SSCG R693[1] 10K 5% 1/16W MF 402 2	NO STUFF R694[1] 10K 5% 1/16W MF 402 2	NO STUFF R699[1] 10K 5% 1/16W MF 402 2			
36 8 6 CPU_DATA<40>	36 8 6 CPU_DATA<41>	36 8 6 CPU_DATA<42>	36 8 6 CPU_DATA<43>	36 8 6 CPU_DATA<44>	36 8 6 CPU_DATA<45>	36 8 6 CPU_DATA<46>	36 8 6 CPU_DATA<47>	
R648[1] 10K 5% 1/16W MF 402 2	R677[1] 10K 5% 1/16W MF 402 2	R623[1] 10K 5% 1/16W MF 402 2	NO_SSCG R651[1] 10K 5% 1/16W MF 402 2	R649[1] 10K 5% 1/16W MF 402 2	SSCG R678[1] 10K 5% 1/16W MF 402 2	R679[1] 10K 5% 1/16W MF 402 2	R684[1] 10K 5% 1/16W MF 402 2	
Spare	Spare	BIT2	BIT1	BIT0	0: Internal Spread 1: Active	PCI1 Source Clock 1: PLL5 (no spread)	PCI0 Source Clock 1: PLL4 (no spread)	

PLL4MODESEL_NXT[2:0]
000: 166.4MHZ (2.5X)
001: 149.76MHZ
010: 133.12MHZ (2.0X)
011: 99.84MHZ (1.5X)
100: 83.20MHZ

MODE A (2.5X) IS FOR STATIC OPERATION
MODE C (2.0X) IS FOR CLOCK SLEW OPERATION

BIT 48 TO 55

38 33 16 15 8 7 6 5 MAXBUS_SLEEP

SSCG R696[1] 10K 5% 1/16W MF 402 2	SSCG R695[1] 10K 5% 1/16W MF 402 2	NO STUFF R667[1] 10K 5% 1/16W MF 402 2	NO STUFF R668[1] 10K 5% 1/16W MF 402 2	NO STUFF R643[1] 10K 5% 1/16W MF 402 2	NO STUFF R642[1] 10K 5% 1/16W MF 402 2	R698[1] 10K 5% 1/16W MF 402 2		
36 8 6 CPU_DATA<48>	36 8 6 CPU_DATA<49>	36 8 6 CPU_DATA<50>	36 8 6 CPU_DATA<51>	36 8 6 CPU_DATA<52>	36 8 6 CPU_DATA<53>	36 8 6 CPU_DATA<54>	36 8 6 CPU_DATA<55>	
NO_SSCG R681[1] 10K 5% 1/16W MF 402 2	NO_SSCG R680[1] 10K 5% 1/16W MF 402 2	NO STUFF R654[1] 10K 5% 1/16W MF 402 2	R655[1] 10K 5% 1/16W MF 402 2	R625[1] 10K 5% 1/16W MF 402 2	R624[1] 10K 5% 1/16W MF 402 2	NO STUFF R683[1] 10K 5% 1/16W MF 402 2	R626[1] 10K 5% 1/16W MF 402 2	
BUF_PCIE_CLK_OUTEnable_h 0: Always Active 1: Active	0: PLL5 1: External source	OBSOLETE (Should remain high) 0: BOOTROM on IDE/CardSlot 1: BOOTROM on PCI1	0: Enable 1394b workaround 1: TI PHY workaround	BIT2	BIT1	BIT0	Spare	

MaxBus output impedance
111: 28.6 ohm
011: 33.3 ohm
101: 40 ohm
001: 50 ohm
110: 66.6 ohm
010: 100 ohm
100: 200 ohm
000: 200 ohm

R159 4.7 5% 1/16W MF 402
38 14 12 +1_5V_INTREPID_PLL — 1 — 2 — 38 +1_5V_INTREPID_PLL7
C187 0.22uF 20% 6.3V CERM 402

H26 VDD15A_7 (PLL6)

U51 INTREPID-REV2.1 BGA

(1 OF 9) CRITCAL

36 8 5 CPU_BR_L	E29	BR	INPUT	
36 8 5 CPU_BG_L	E26	BG	NO BUS KEEPER	
36 8 5 CPU_TS_L	B27	TS	NO BUS KEEPER	
36 5 CPU_ADDR<0>	D24	A_0		
36 5 CPU_ADDR<1>	D25	A_1		
36 5 CPU_ADDR<2>	A27	A_2		
36 5 CPU_ADDR<3>	E24	A_3		
36 5 CPU_ADDR<4>	G23	A_4		
36 5 CPU_ADDR<5>	B26	A_5		
36 5 CPU_ADDR<6>	A26	A_6		
36 5 CPU_ADDR<7>	D23	A_7		
36 5 CPU_ADDR<8>	A25	A_8		
36 5 CPU_ADDR<9>	E23	A_9		
36 5 CPU_ADDR<10>	J22	A_10		
36 5 CPU_ADDR<11>	B25	A_11		
36 5 CPU_ADDR<12>	H22	A_12		
36 5 CPU_ADDR<13>	G22	A_13		
36 5 CPU_ADDR<14>	D22	A_14		
36 5 CPU_ADDR<15>	B24	A_15		
36 5 CPU_ADDR<16>	B23	A_16		
36 5 CPU_ADDR<17>	E22	A_17		
36 5 CPU_ADDR<18>	J21	A_18		
36 5 CPU_ADDR<19>	G21	A_19		
36 5 CPU_ADDR<20>	E21	A_20		
36 5 CPU_ADDR<21>	A24	A_21		
36 5 CPU_ADDR<22>	D21	A_22		
36 5 CPU_ADDR<23>	A23	A_23		
36 5 CPU_ADDR<24>	H20	A_24		
36 5 CPU_ADDR<25>	B22	A_25		
36 5 CPU_ADDR<26>	H21	A_26		
36 5 CPU_ADDR<27>	A22	A_27		
36 5 CPU_ADDR<28>	E20	A_28		
36 5 CPU_ADDR<29>	B21	A_29		
36 5 CPU_ADDR<30>	D20	A_30		
36 5 CPU_ADDR<31>	A21	A_31		
36 5 CPU_CI_L	G26	CI		
36 5 CPU_GBL_L	A29	GBL		
36 5 CPU_TBST_L	A28	TBST		
36 5 CPU_TSIZ<0>	G24	TSIZ_0		
36 5 CPU_TSIZ<1>	H24	TSIZ_1		
36 5 CPU_TSIZ<2>	D26	TSIZ_2		
36 5 CPU_TT<0>	E25	TT_0		
36 5 CPU_TT<1>	G25	TT_1		
36 5 CPU_TT<2>	B28	TT_2		
36 5 CPU_TT<3>	D27	TT_3		
36 5 CPU_TT<4>	J25	TT_4		
36 5 CPU_WT_L	D28	WT		
36 8 5 CPU_AACK_L	B29	AACK	NO BUS KEEPER - PU	
36 8 5 CPU_ARTRY_L	H23	ARTRY	NO BUS KEEPER - PU	
36 8 5 CPU_HIT_L	B31	HIT	INPUT - PU	
36 8 5 CPU_QREQ_L	A32	QREQ	INPUT - PD	
36 5 CPU_QACK_L	G27	QACK	NO BUS KEEPER - ?	
29 INT_SUSPEND_REQ_L	AK9	SUSPENDREQ		
29 INT_SUSPEND_ACK_L	AM8	SUSPENDACK		
		Vin = Intrepid Vcore (1.5V) Vout = MaxBus rail (1.8V)		
35 8 INT_CPUFB_IN	J24	CPU_FB_IN		
35 8 INT_CPUFB_OUT	H16	CPU_FB_OUT	NO BUS KEEPER - PU	
SYSCLK_LA_TP	G8	ANALYZER_CLK		
29 CPU_CLK_EN	AH9	STOPCPUCLK	INPUT - PU	
INTREPID_ACS_REF	H13	ACS_REF	NO BUS KEEPER - ?	
35 5 SYSCLK_CPU	35 SYSCLK_CPU_UF J15	CPU_CLK	NO BUS KEEPER - ?	
5 CPU_TBEN	A31	TBEN	NO BUS KEEPER - PU	
		INTREPID OUTPUTS HIGH BY DEFAULT		

MAXBUS INTERFACE

D_0	D10	CPU_DATA<0>	6 36
D_1	G12	CPU_DATA<1>	6 36
D_2	E11	CPU_DATA<2>	6 36
D_3	H11	CPU_DATA<3>	6 36
D_4	B9	CPU_DATA<4>	6 36
D_5	B8	CPU_DATA<5>	6 36
D_6	A9	CPU_DATA<6>	6 36
D_7	A8	CPU_DATA<7>	6 36
D_8	E12	CPU_DATA<8>	6 36
D_9	D11	CPU_DATA<9>	6 36
D_10	B10	CPU_DATA<10>	6 36
D_11	J13	CPU_DATA<11>	6 36
D_12	A10	CPU_DATA<12>	6 36
D_13	D12	CPU_DATA<13>	6 36
D_14	E13	CPU_DATA<14>	6 36
D_15	G13	CPU_DATA<15>	6 36
D_16	B11	CPU_DATA<16>	6 36
D_17	D13	CPU_DATA<17>	6 36
D_18	A11	CPU_DATA<18>	6 36
D_19	G14	CPU_DATA<19>	6 36
D_20	H14	CPU_DATA<20>	6 36
D_21	E14	CPU_DATA<21>	6 36
D_22	B12	CPU_DATA<22>	6 36
D_23	G15	CPU_DATA<23>	6 36
D_24	B13	CPU_DATA<24>	6 36
D_25	H15	CPU_DATA<25>	6 36
D_26	D14	CPU_DATA<26>	6 36
D_27	B14	CPU_DATA<27>	6 36
D_28	A12	CPU_DATA<28>	6 36
D_29	G16	CPU_DATA<29>	6 36
D_30	E15	CPU_DATA<30>	6 36
D_31	J16	CPU_DATA<31>	6 36
D_32	D15	CPU_DATA<32>	6 8 36
D_33	A14	CPU_DATA<33>	6 8 36
D_34	A13	CPU_DATA<34>	6 8 36
D_35	D16	CPU_DATA<35>	6 8 36
D_36	E16	CPU_DATA<36>	6 8 36
D_37	G17	CPU_DATA<37>	6 8 36
D_38	B15	CPU_DATA<38>	6 8 36
D_39	H17	CPU_DATA<39>	6 8 36
D_40	A15	CPU_DATA<40>	6 8 36
D_41	B16	CPU_DATA<41>	6 8 36
D_42	E17	CPU_DATA<42>	6 8 36
D_43	A16	CPU_DATA<43>	6 8 36
D_44	J18	CPU_DATA<44>	6 8 36
D_45	H18	CPU_DATA<45>	6 8 36
D_46	D17	CPU_DATA<46>	6 8 36
D_47	G18	CPU_DATA<47>	6 8 36
D_48	A17	CPU_DATA<48>	6 8 36
D_49	B17	CPU_DATA<49>	6 8 36
D_50	E18	CPU_DATA<50>	6 8 36
D_51	B18	CPU_DATA<51>	6 8 36
D_52	D18	CPU_DATA<52>	6 8 36
D_53	A18	CPU_DATA<53>	6 8 36
D_54	A19	CPU_DATA<54>	6 8 36
D_55	H19	CPU_DATA<55>	6 8 36
D_56	B19	CPU_DATA<56>	6 8 36
D_57	J19	CPU_DATA<57>	6 8 36
D_58	A20	CPU_DATA<58>	6 8 36
D_59	D19	CPU_DATA<59>	6 8 36
D_60	E19	CPU_DATA<60>	6 8 36
D_61	G19	CPU_DATA<61>	6 8 36
D_62	B20	CPU_DATA<62>	6 8 36
D_63	G20	CPU_DATA<63>	6 8 36
DBG	A30	CPU_DBG_L	5 8 36
DRDY	G28	CPU_DRDY_L	5 8 36
DTI_0	K25	CPU_DTI<0>	5 36
DTI_1	D29	CPU_DTI<1>	5 36
DTI_2	B30	CPU_DTI<2>	5 36
TA	E27	CPU_TA_L	5 8 36
TEA	E28	CPU_TEA_L	5 8 36

H25 VSSA_7 (PLL6)

FB BUFFER HAS 50 OHM OUTPUT IMPEDANCE

R169 511 1% 1/16W MF 402
R168 0 5% 1/16W MF 402
R161 1K 1% 1/16W MF 402

SHORT = 1" SHORTER THAN MATCHED LENGTH
LONG = 1" LONGER THAN MATCHED LENGTH

35 8 INT_CPUFB_OUT	R155 0 5% 1/16W MF 402	35 INT_CPUFB_OUT_SHORT	R140 0 5% 1/16W MF 402	35 INT_CPUFB_OUT_NORM	NO STUFF R128 0 5% 1/16W MF 402	35 INT_CPUFB_LONG	
35 8 INT_CPUFB_IN			NO STUFF R146[1] 0 5% 1/16W MF 402 2 / R147 0 5% 1/16W MF 402	35 INT_CPUFB_IN_NORM	R141[1] 0 5% 1/16W MF 402 2 / NO STUFF R136 0 5% 1/16W MF 402		

MAXBUS PULL-UPS

MAXBUS_SLEEP 5 6 7 8 15 16 33 38

36 8 5 CPU_TS_L	RP3 10K 5% 1/16W SM1 2 7							
36 8 5 CPU_TA_L	RP3 10K 5% 1/16W SM1 1 8							
36 8 5 CPU_ARTRY_L	RP3 10K 5% 1/16W SM1 4 5							
36 8 5 CPU_BR_L	RP2 10K 5% 1/16W SM1 1 8							
36 8 5 CPU_HIT_L	R152 10K 5% 1/16W MF 402 1 2							
36 8 5 CPU_DRDY_L	RP2 10K 5% 1/16W SM1 3 6							
36 8 5 CPU_TEA_L	RP2 10K 5% 1/16W SM1 4 5							
36 8 5 CPU_AACK_L	RP2 10K 5% 1/16W SM1 2 7							
36 8 5 CPU_DBG_L	R150 10K 5% 1/16W MF 402 1 2							
36 8 5 CPU_BG_L	RP3 10K 5% 1/16W SM1 3 6							
36 8 5 CPU_QREQ_L	R151 10K 5% 1/16W MF 402 1 2							

INTREPID BOOT STRAPS

BIT 56 TO 63

38 33 16 15 8 7 6 5 MAXBUS_SLEEP

NO STUFF R669[1] 10K 5% 1/16W MF 402 2	NO STUFF R645[1] 10K 5% 1/16W MF 402 2	NO STUFF R697[1] 10K 5% 1/16W MF 402 2	NO STUFF R670[1] 10K 5% 1/16W MF 402 2	R644[1] 10K 5% 1/16W MF 402 2	NO STUFF R646[1] 10K 5% 1/16W MF 402 2			
36 8 6 CPU_DATA<56>	36 8 6 CPU_DATA<57>	36 8 6 CPU_DATA<58>	36 8 6 CPU_DATA<59>	36 8 6 CPU_DATA<60>	36 8 6 CPU_DATA<61>	36 8 6 CPU_DATA<62>	36 8 6 CPU_DATA<63>	
R656[1] 10K 5% 1/16W MF 402 2	R685[1] 10K 5% 1/16W MF 402 2	R657[1] 10K 5% 1/16W MF 402 2	R628[1] 10K 5% 1/16W MF 402 2	R682[1] 10K 5% 1/16W MF 402 2	R658[1] 10K 5% 1/16W MF 402 2	NO STUFF R627[1] 10K 5% 1/16W MF 402 2	R629[1] 10K 5% 1/16W MF 402 2	
Spare	Spare	OBSOLETE ROM Overlay PCI1 0: 1 IDE / 2-3 PCI1 1: 0-1 IDE / 2-3 PCI1	PCI1_REQ2_L / PCI1_GNT2_L 0: REQ/GNT 1: GPIOs	PCI1_REQ1_L / PCI1_GNT1_L 0: REQ/GNT 1: GPIOs	PCI1_REQ0_L / PCI1_GNT0_L 0: REQ/GNT 1: GPIOs	Firewire PHY interface 0: A-Mode interface 1: B-Mode interface	Processor Bus Mode 0: 64x Bus (G5) 1: 72x Bus (G4)	

Intrepid MaxBus	
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SERIES RESISTORS FOR CLOCK/CONTROL SIGNALS

PINS ARE SWAPABLE FOR RPAKS

U51
INTREPID-REV2.1
BGA
(2 OF 9)
CRITICAL

DDR MEMORY INTERFACE

DDR_DATA_0	AK32	MEM_DATA<0>	DDR_A_0	H35 MEM_ADDR<0>
DDR_DATA_1	AK33	MEM_DATA<1>	DDR_A_1	G35 MEM_ADDR<1>
DDR_DATA_2	AK31	MEM_DATA<2>	DDR_A_2	G36 MEM_ADDR<2>
DDR_DATA_3	AK35	MEM_DATA<3>	DDR_A_3	F36 MEM_ADDR<3>
DDR_DATA_4	AK36	MEM_DATA<4>	DDR_A_4	F35 MEM_ADDR<4>
DDR_DATA_5	AJ32	MEM_DATA<5>	DDR_A_5	E35 MEM_ADDR<5>
DDR_DATA_6	AJ35	MEM_DATA<6>	DDR_A_6	E36 MEM_ADDR<6>
DDR_DATA_7	AJ36	MEM_DATA<7>	DDR_A_7	G32 MEM_ADDR<7>
DDR_DATA_8	AG33	MEM_DATA<8>	DDR_A_8	D36 MEM_ADDR<8>
DDR_DATA_9	AG35	MEM_DATA<9>	DDR_A_9	H36 MEM_ADDR<9>
DDR_DATA_10	AH35	MEM_DATA<10>	DDR_A_10	G33 MEM_ADDR<10>
DDR_DATA_11	AG36	MEM_DATA<11>	DDR_A_11	H33 MEM_ADDR<11>
DDR_DATA_12	AH36	MEM_DATA<12>	DDR_A_12	D35 MEM_ADDR<12>
DDR_DATA_13	AH32	MEM_DATA<13>	DDR_BA_0	L30 MEM_BA<0>
DDR_DATA_14	AG32	MEM_DATA<14>	DDR_BA_1	M29 MEM_BA<1>
DDR_DATA_15	AG31	MEM_DATA<15>	DDRCS_0	AN34 MEM_CS_L<0>
DDR_DATA_16	AE32	MEM_DATA<16>	DDRCS_1	AN36 MEM_CS_L<1>
DDR_DATA_17	AF35	MEM_DATA<17>	DDRCS_2	AL35 MEM_CS_L<2>
DDR_DATA_18	AF36	MEM_DATA<18>	DDRCS_3	AL33 MEM_CS_L<3>
DDR_DATA_19	AE36	MEM_DATA<19>	DDR_DQS_0	AJ31 MEM_DQS<0>
DDR_DATA_20	AE35	MEM_DATA<20>	DDR_DQS_1	AH31 MEM_DQS<1>
DDR_DATA_21	AE33	MEM_DATA<21>	DDR_DQS_2	AD32 MEM_DQS<2>
DDR_DATA_22	AD36	MEM_DATA<22>	DDR_DQS_3	AB30 MEM_DQS<3>
DDR_DATA_23	AD35	MEM_DATA<23>	DDR_DQS_4	V30 MEM_DQS<4>
DDR_DATA_24	AA36	MEM_DATA<24>	DDR_DQS_5	P32 MEM_DQS<5>
DDR_DATA_25	AA35	MEM_DATA<25>	DDR_DQS_6	N29 MEM_DQS<6>
DDR_DATA_26	AA33	MEM_DATA<26>	DDR_DQS_7	L32 MEM_DQS<7>
DDR_DATA_27	AB36	MEM_DATA<27>	DDR_DM_0	AJ33 MEM_DQM<0>
DDR_DATA_28	AB35	MEM_DATA<28>	DDR_DM_1	AH33 MEM_DQM<1>
DDR_DATA_29	AC36	MEM_DATA<29>	DDR_DM_2	AD33 MEM_DQM<2>
DDR_DATA_30	AA32	MEM_DATA<30>	DDR_DM_3	AC35 MEM_DQM<3>
DDR_DATA_31	AB33	MEM_DATA<31>	DDR_DM_4	T35 MEM_DQM<4>
DDR_DATA_32	V36	MEM_DATA<32>	DDR_DM_5	T33 MEM_DQM<5>
DDR_DATA_33	U33	MEM_DATA<33>	DDR_DM_6	N32 MEM_DQM<6>
DDR_DATA_34	U32	MEM_DATA<34>	DDR_DM_7	L33 MEM_DQM<7>
DDR_DATA_35	V35	MEM_DATA<35>	DDRRAS	L29 MEM_RAS_L
DDR_DATA_36	T36	MEM_DATA<36>	DDRCAS	H32 MEM_CAS_L
DDR_DATA_37	U36	MEM_DATA<37>	DDRWE	K30 MEM_WE_L
DDR_DATA_38	U35	MEM_DATA<38>	DDRCKE0	AN35 MEM_CKE<0>
DDR_DATA_39	T34	MEM_DATA<39>	DDRCKE1	AM35 MEM_CKE<1>
DDR_DATA_40	P33	MEM_DATA<40>	DDRCKE2	AM36 MEM_CKE<2>
DDR_DATA_41	R36	MEM_DATA<41>	DDRCKE3	AL36 MEM_CKE<3>
DDR_DATA_42	P35	MEM_DATA<42>	DDR_SELHI_0	AB32 MEM_MUXSEL_MSB_L_TP
DDR_DATA_43	P36	MEM_DATA<43>	DDR_SELHI_1	AE29 MEM_MUXSEL_MSB
DDR_DATA_44	R36	MEM_DATA<44>	DDR_SELLO_0	N30 MEM_MUXSEL_LSB_L_TP
DDR_DATA_45	R35	MEM_DATA<45>	DDR_SELLO_1	T32 MEM_MUXSEL_LSB
DDR_DATA_46	R33	MEM_DATA<46>	DDR_MCLK_0_P	Y32 SYSCLK_DDRCLK_A0_UF
DDR_DATA_47	R32	MEM_DATA<47>	DDR_MCLK_0_N	Y33 SYSCLK_DDRCLK_A0_L_UF
DDR_DATA_48	N35	MEM_DATA<48>	DDR_MCLK_1_P	Y35 SYSCLK_DDRCLK_A1_UF
DDR_DATA_49	M36	MEM_DATA<49>	DDR_MCLK_1_N	Y36 SYSCLK_DDRCLK_A1_L_UF
DDR_DATA_50	L35	MEM_DATA<50>	DDR_MCLK_2_P	Y30 INT_DDRCLK2_P_TP
DDR_DATA_51	M35	MEM_DATA<51>	DDR_MCLK_2_N	W30 INT_DDRCLK2_N_TP
DDR_DATA_52	M33	MEM_DATA<52>	DDR_MCLK_3_P	W32 SYSCLK_DDRCLK_B0_UF
DDR_DATA_53	L36	MEM_DATA<53>	DDR_MCLK_3_N	W33 SYSCLK_DDRCLK_B0_L_UF
DDR_DATA_54	N33	MEM_DATA<54>	DDR_MCLK_4_P	V33 SYSCLK_DDRCLK_B1_UF
DDR_DATA_55	M36	MEM_DATA<55>	DDR_MCLK_4_N	V32 SYSCLK_DDRCLK_B1_L_UF
DDR_DATA_56	J32	MEM_DATA<56>	DDR_MCLK_5_P	W35 INT_DDRCLK5_P_TP
DDR_DATA_57	J33	MEM_DATA<57>	DDR_MCLK_5_N	W36 INT_DDRCLK5_N_TP
DDR_DATA_58	J35	MEM_DATA<58>	DDR_REF	AA22 INT_MEM_REF_H
DDR_DATA_59	K32	MEM_DATA<59>	DDR_VREF_0	Y22 INT_MEM_VREF
DDR_DATA_60	K33	MEM_DATA<60>	DDR_VREF_1	T22
DDR_DATA_61	J36	MEM_DATA<61>		
DDR_DATA_62	K36	MEM_DATA<62>		
DDR_DATA_63	K35	MEM_DATA<63>		

'0' & '1' GO TO SLOT A
'2' & '3' GO TO SLOT B

'0' & '1' GO TO SLOT A
'2' & '3' GO TO SLOT B

'0'S ARE SAME POLARITY (ACTIVE-LO)
'1'S ARE SAME POLARITY (ACTIVE-HI)

R209 1K 1% 1/16W MF 402

MEM_VREF

+2.5V_INTREPID

R208 10K 1% 1/16W MF 402

R202 10K 1% 1/16W MF 402

C249 0.1uF 20% 10V CERM 402

INT_MEM_VREF

CLOCKS

SYSCLK_DDRCLK_A1_UF	RP20 22 4 5	SYSCLK_DDRCLK_A1	
SYSCLK_DDRCLK_A1_L_UF	RP20 22 3 6	SYSCLK_DDRCLK_A1_L	
SYSCLK_DDRCLK_A0_UF	RP22 22 1 8	SYSCLK_DDRCLK_A0	
SYSCLK_DDRCLK_A0_L_UF	RP22 22 2 7	SYSCLK_DDRCLK_A0_L	
SYSCLK_DDRCLK_B1_UF	RP20 22 2 7	SYSCLK_DDRCLK_B1	
SYSCLK_DDRCLK_B1_L_UF	RP20 22 1 8	SYSCLK_DDRCLK_B1_L	
SYSCLK_DDRCLK_B0_UF	RP22 22 3 6	SYSCLK_DDRCLK_B0	
SYSCLK_DDRCLK_B0_L_UF	RP22 22 4 5	SYSCLK_DDRCLK_B0_L	

CS

MEM_CS_L<0>	RP31 22 3 6	RAM_CS_L<0>
MEM_CS_L<1>	RP31 22 2 7	RAM_CS_L<1>
MEM_CS_L<2>	RP29 22 3 6	RAM_CS_L<2>
MEM_CS_L<3>	RP29 22 4 5	RAM_CS_L<3>

CKE

MEM_CKE<0>	RP31 22 1 8	RAM_CKE<0>
MEM_CKE<1>	RP31 22 4 5	RAM_CKE<1>
MEM_CKE<2>	RP29 22 1 8	RAM_CKE<2>
MEM_CKE<3>	RP29 22 2 7	RAM_CKE<3>

ADDR

MEM_ADDR<0>	RP14 22 3 6	RAM_ADDR<0>
MEM_ADDR<1>	RP12 22 2 7	RAM_ADDR<1>
MEM_ADDR<2>	RP12 22 1 8	RAM_ADDR<2>
MEM_ADDR<3>	RP12 22 4 5	RAM_ADDR<3>
MEM_ADDR<4>	RP12 22 3 6	RAM_ADDR<4>
MEM_ADDR<5>	RP9 22 2 7	RAM_ADDR<5>
MEM_ADDR<6>	RP9 22 1 8	RAM_ADDR<6>
MEM_ADDR<7>	RP14 22 2 7	RAM_ADDR<7>
MEM_ADDR<8>	RP9 22 4 5	RAM_ADDR<8>
MEM_ADDR<9>	RP14 22 4 5	RAM_ADDR<9>
MEM_ADDR<10>	RP14 22 1 8	RAM_ADDR<10>
MEM_ADDR<11>	RP17 22 4 5	RAM_ADDR<11>
MEM_ADDR<12>	RP9 22 3 6	RAM_ADDR<12>

BA

MEM_BA<0>	RP17 22 2 7	RAM_BA<0>
MEM_BA<1>	RP17 22 1 8	RAM_BA<1>

CNTL

MEM_WE_L	RP17 22 3 6	RAM_WE_L
MEM_CAS_L	R162 22 1 2	RAM_CAS_L
MEM_RAS_L	R176 22 1 2	RAM_RAS_L

All: 5% 1/16W SM1

1MB BOOT ROM

+3V_MAIN

C125 2.2uF 20% 10V CERM 805

C773 0.1uF 20% 10V CERM 402

C122 0.1uF 20% 10V CERM 402

U11
FEPR-1MX8
1MX8-3.3V
TSOP

VPP 11, VCC 30, 31

PCI_AD<0>	21	A0	DQ0 25 PCI_AD<24>
PCI_AD<1>	20	A1	DQ1 26 PCI_AD<25>
PCI_AD<2>	19	A2	DQ2 27 PCI_AD<26>
PCI_AD<3>	18	A3	DQ3 28 PCI_AD<27>
PCI_AD<4>	17	A4	DQ4 32 PCI_AD<28>
PCI_AD<5>	16	A5	DQ5 33 PCI_AD<29>
PCI_AD<6>	15	A6	DQ6 34 PCI_AD<30>
PCI_AD<7>	14	A7	DQ7 35 PCI_AD<31>
PCI_AD<8>	8	A8	
PCI_AD<9>	7	A9	
PCI_AD<10>	36	A10	
PCI_AD<11>	6	A11	
PCI_AD<12>	5	A12	
PCI_AD<13>	4	A13	
PCI_AD<14>	3	A14	
PCI_AD<15>	2	A15	
PCI_AD<16>	1	A16	
PCI_AD<17>	40	A17	
PCI_AD<18>	13	A18	
PCI_AD<19>	37	A19	
PCI_AD<20>	38	A20	
ROM_ONBOARD_CS_L	22	CE	
ROM_OE_L	24	OE	
ROM_RW_L	9	WE	
ROM_WP_L	12	WP	
INT_RESET_L	10	PWD	
	23, 39	GND	

+3V_MAIN

R691 10K 5% 1/16W MF 402

R112 10K 5% 1/16W MF 402

R674 1K 5% 1/16W MF 402

ROM_CS_L

OVERRIDE ROM MODULE
INTERCEPTS ROM CHIP SELECT

Weak pulldowns ensure CKEs stay low
after 2.5V I/O to Intrepid shuts off.

RAM_CKE<0>
RAM_CKE<1>
RAM_CKE<2>
RAM_CKE<3>

R247 10K 5% 1/16W MF 402 — INT_2_5V_COLD

R257 10K 5% 1/16W MF 402 — INT_2_5V_COLD

R260 10K 5% 1/16W MF 402 — INT_2_5V_COLD

R265 10K 5% 1/16W MF 402 — INT_2_5V_COLD

INT - DDR/BOOTROM

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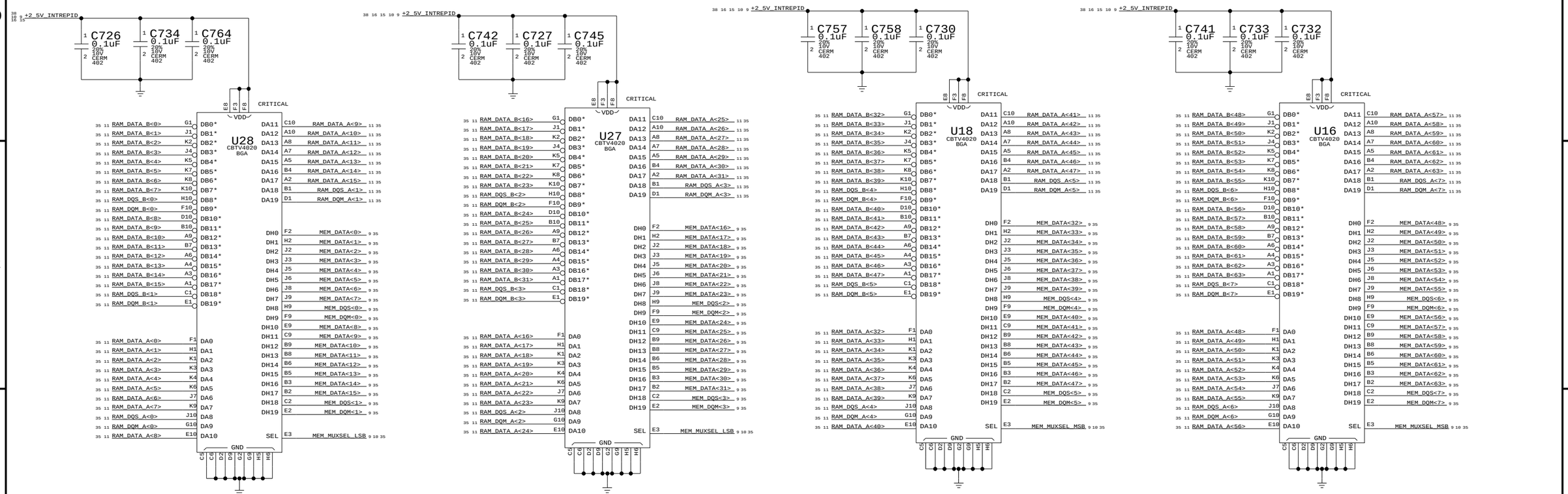
SIZE	DRAWING NUMBER	REV.
D	051-6338	C
SCALE: NONE	SHT 9 OF 40	



SEL = LOW; HOST = B PORT; A PORT = 100OHM TO GND
SEL = HIGH; HOST = A PORT; B PORT = 100OHM TO GND

16BIT 2:1 DDR MUXES

APPLE COMPUTER INC.

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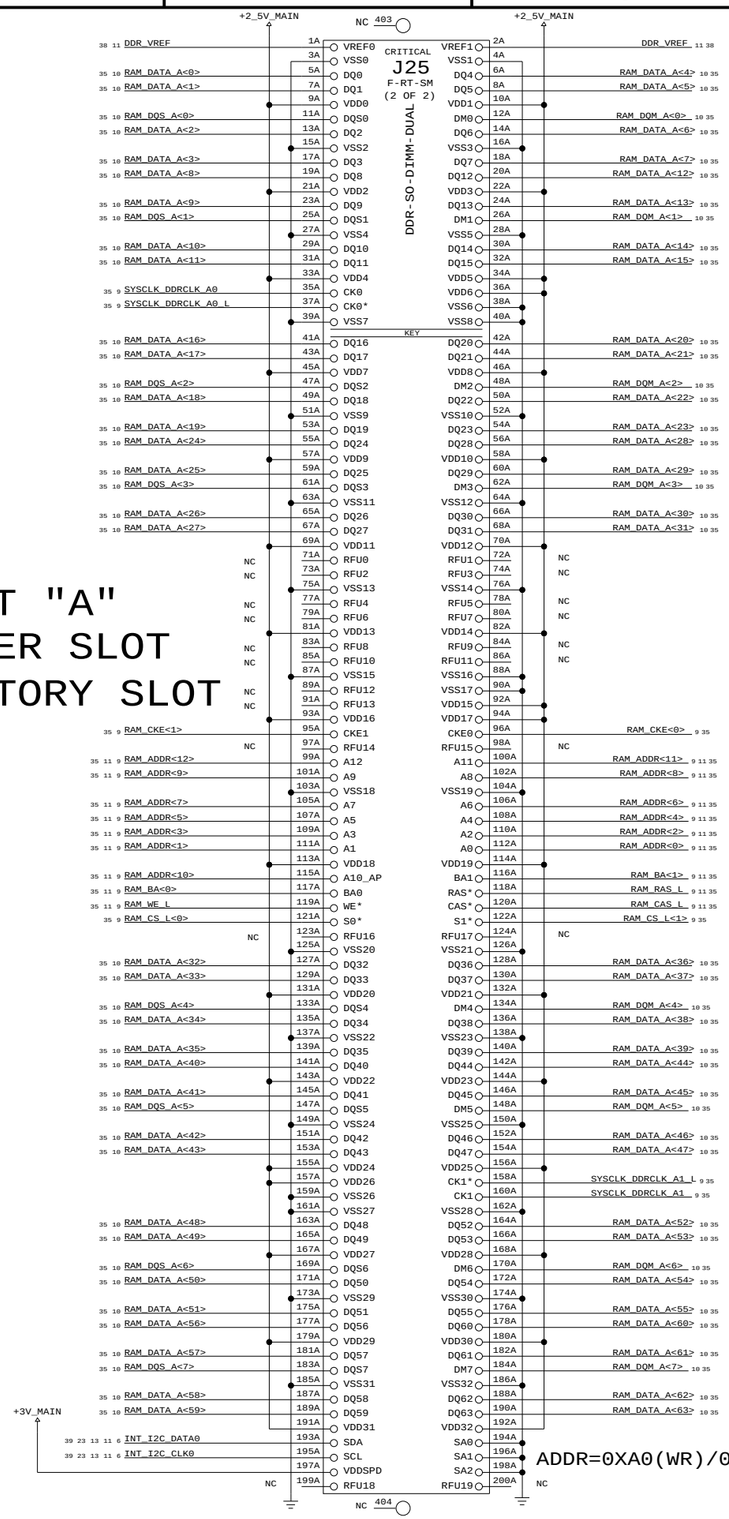
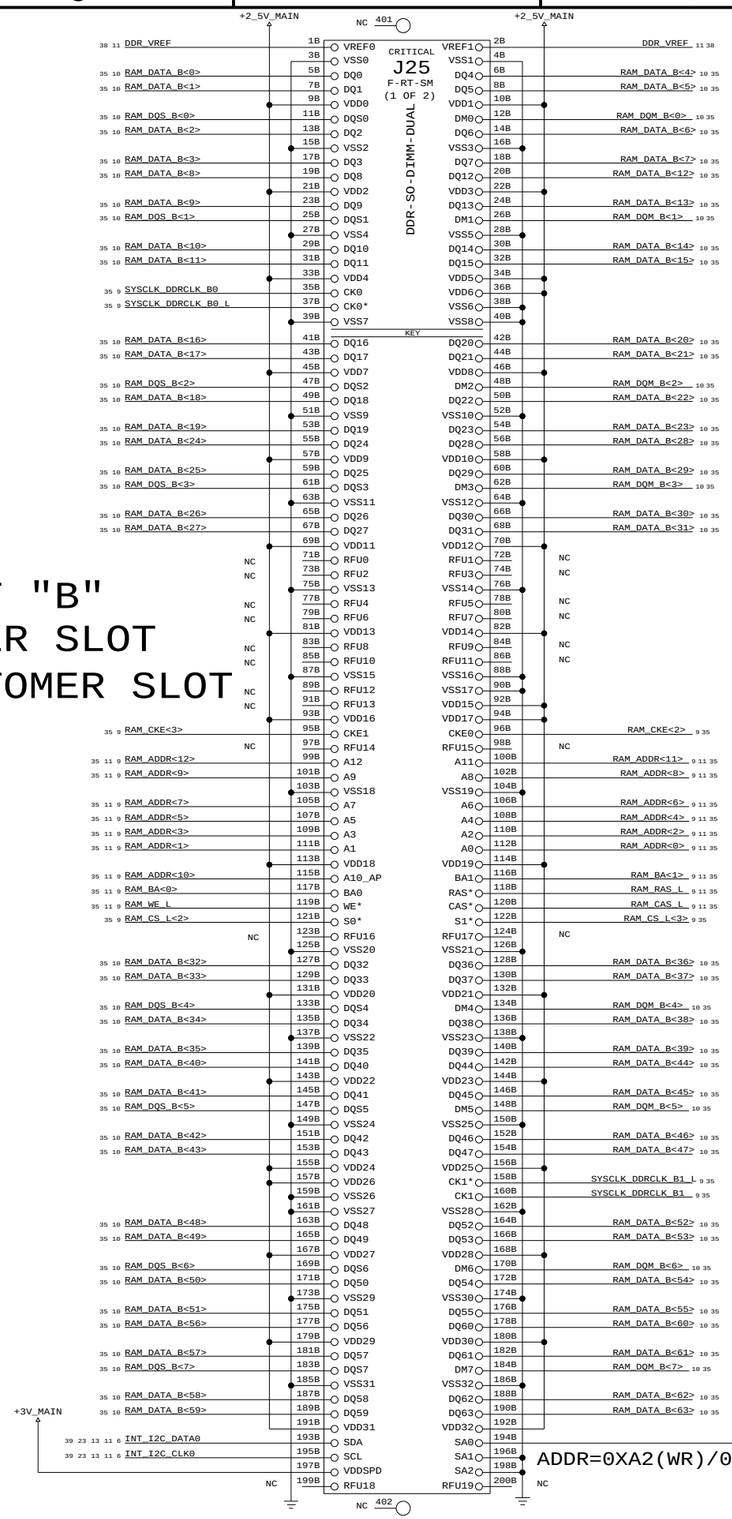
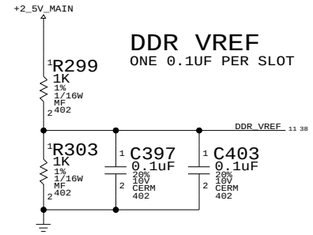
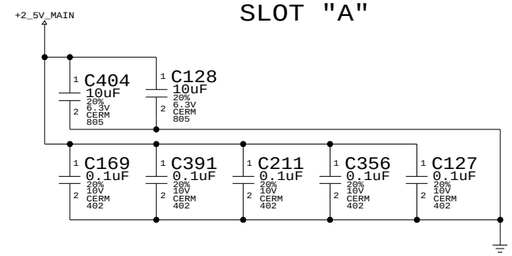
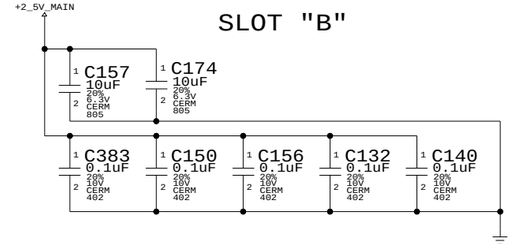




NOTE: The SODIMM connector footprint has a through-hole slot on the PCB for additional mounting







DDR SODIMM CONNS

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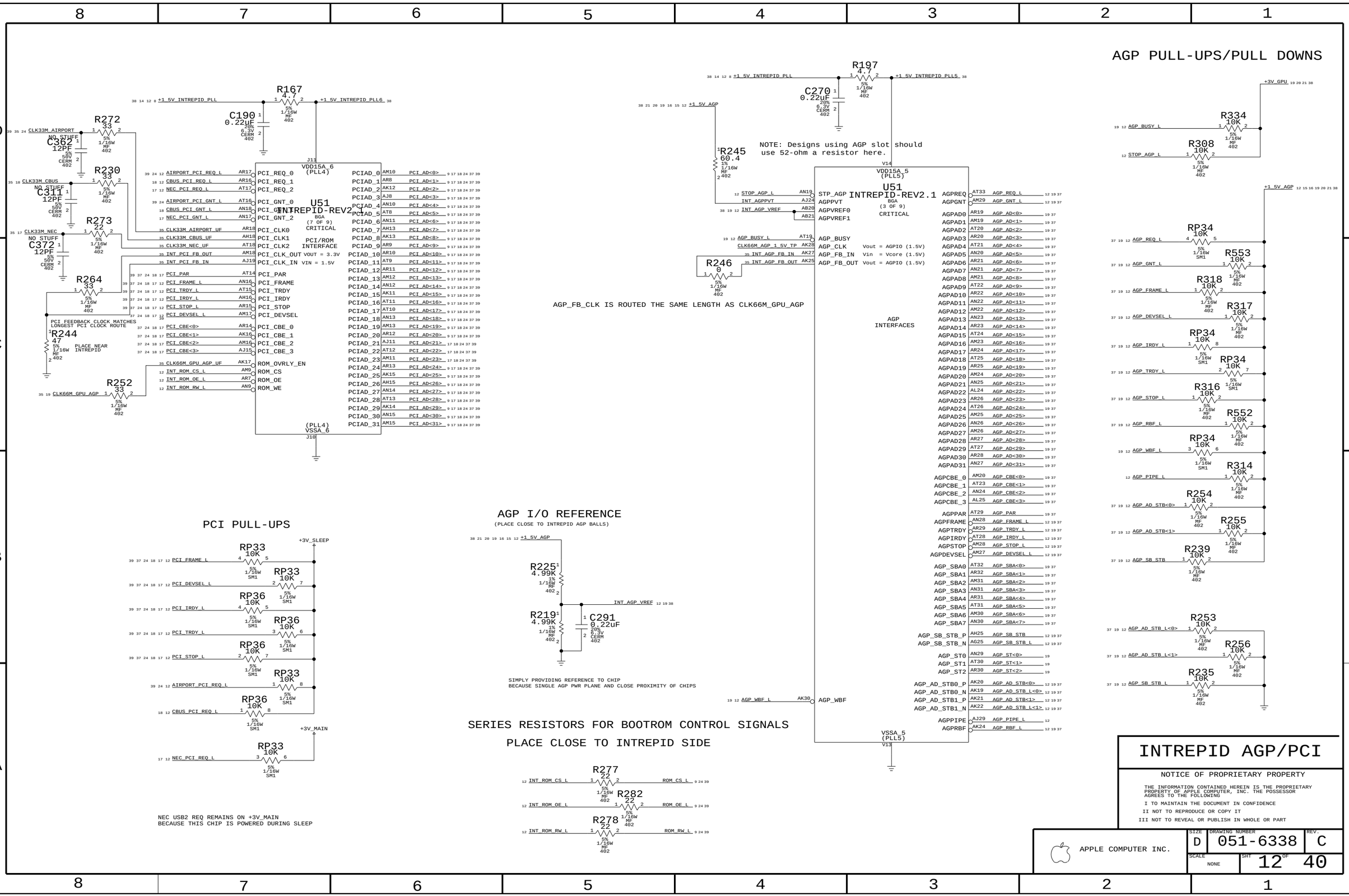
AGP PULL-UPS/PULL DOWNS
PCI PULL-UPS
AGP I/O REFERENCE
(PLACE CLOSE TO INTREPID AGP BALLS)
SERIES RESISTORS FOR BOOTROM CONTROL SIGNALS
PLACE CLOSE TO INTREPID SIDE
U51
INTREPID-REV2.1
BGA
(7 OF 9)
CRITICAL
PCI/ROM
INTERFACE
VDD15A_6
(PLL4)
(PLL4)
VSSA_6
J11
J10
VDD15A_5
(PLL5)
VSSA_5
(PLL5)
V14
V13
AGP
INTERFACES
NOTE: Designs using AGP slot should
use 52-ohm a resistor here.
AGP_FB_CLK IS ROUTED THE SAME LENGTH AS CLK66M_GPU_AGP
SIMPLY PROVIDING REFERENCE TO CHIP
BECAUSE SINGLE AGP PWR PLANE AND CLOSE PROXIMITY OF CHIPS
NEC USB2 REQ REMAINS ON +3V_MAIN
BECAUSE THIS CHIP IS POWERED DURING SLEEP
PCI FEEDBACK CLOCK MATCHES
LONGEST PCI CLOCK ROUTE
PLACE NEAR
INTREPID
INTREPID AGP/PCI
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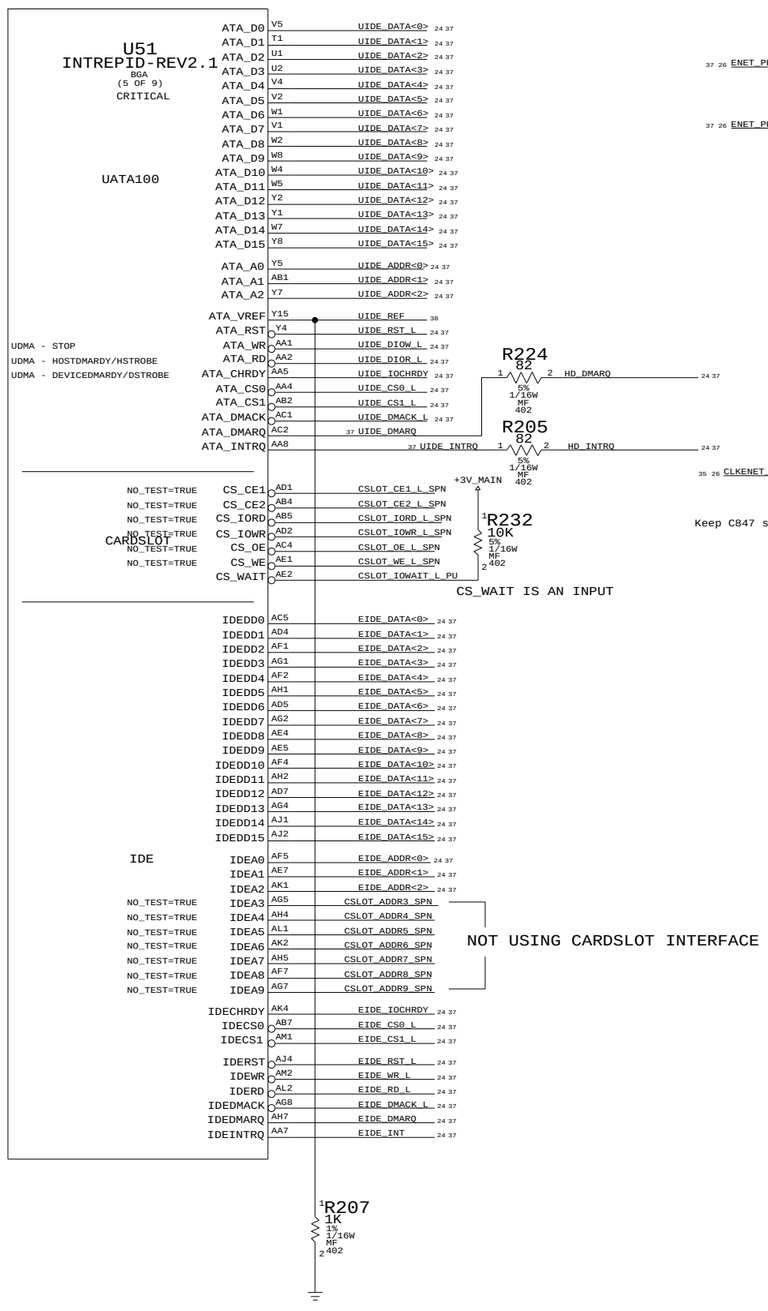
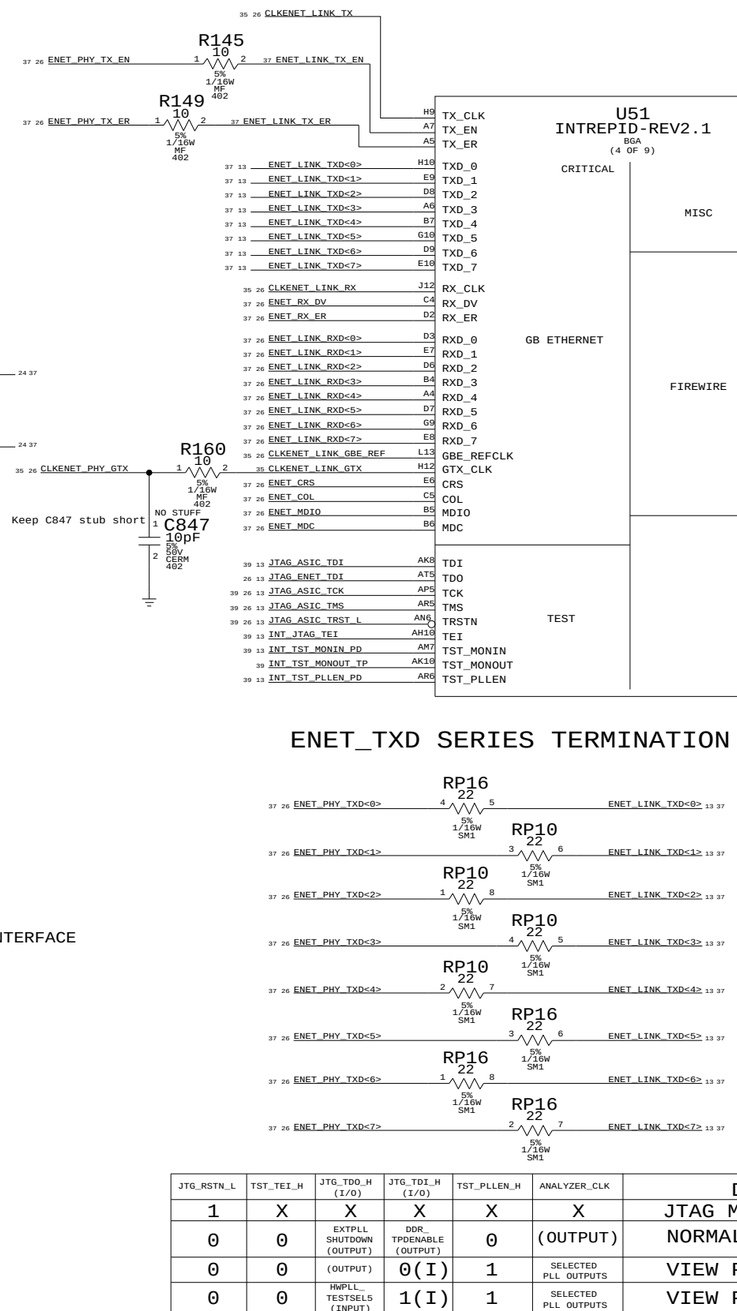
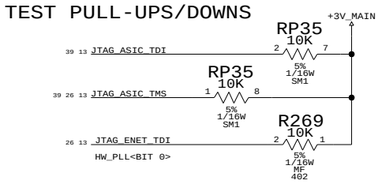
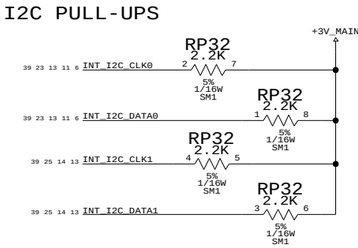
APPLE COMPUTER INC.
SIZE D
DRAWING NUMBER 051-6338
REV. C
SCALE NONE
SHT 12 OF 40









ENET_TXD SERIES TERMINATION

BUS / ADDR	I2C-0 (MAIN)	I2C-1 (MAIN)	I2C-2 (SLEEP)	PMU (SLEEP)
A0-WR A1-RD	RAM - LOWER J25 - PG 11	N/A	N/A	N/A
A2-WR A3-RD	RAM - UPPER J25 - PG 11	N/A	N/A	N/A
AC-WR AD-WR	N/A	N/A	DASH MODEM J14 - PG 25	N/A
AE-WR AF-RD	BOOTBANG EEPROM U51 - PG 6	N/A	N/A	N/A
84-WR 85-RD	LMU J3000 - PG 23 (LMU on RUX Brd.)	N/A	N/A	N/A
5C-WR 5D-RD	N/A	FAN CONTROLLER U52 - PG 25	N/A	N/A
6A-WR 6B-RD	N/A	N/A	SNAPPER SOUND J2 - PG 25	N/A
D2-WR D3-RD	N/A	CLOCK SLEW SSCG U30 - PG 14	N/A	N/A

ADDR LSB INDICATES READ ('1') OR WRITE ('0') MODES

JTG_RSTN_L	TST_TEI_H	JTG_TDO_H (I/O)	JTG_TDI_H (I/O)	TST_PLLEN_H	ANALYZER_CLK	DESCRIPTION
1	X	X	X	X	X	JTAG MODE
0	0	EXTPLL SHUTDOWN (OUTPUT)	DDR_ TPDENABLE (OUTPUT)	0	(OUTPUT)	NORMAL OPERATION
0	0	(OUTPUT)	0(I)	1	SELECTED PLL OUTPUTS	VIEW PLLS (SOFTWARE)
0	0	HWPLL_ TESTSEL5 (INPUT)	1(I)	1	SELECTED PLL OUTPUTS	VIEW PLLS (HARDWARE)
0	1	0(I)	0(I)	MEMWE	SYNC/MEM DATA BYPASS	ATPG NORMAL
0	1	0(I)	1(I)	0	X(I)	ATPG IDDQ
0	1	0(I)	1(I)	1	X(I)	TEST TRI-STATE
0	1	1(I)	0(I)	0	X(I)	FUNCTIONAL TEST WITHOUT POSTSCALAR BYPASS
0	1	1(I)	0(I)	1	X(I)	FUNCTIONAL TEST WITH POSTSCALAR BYPASS
0	1	1(I)	1(I)	X	X(I)	FUNCTIONAL TEST IDDQ

INT - ENET/FW/UATA EIDE/I2C

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USB PORT ASSIGNMENTS

PORT A - PORT D/UNUSED

R181 10K — USB_DAM
R183 10K — USB_DAP
R156 10K — USB_DBM
R157 10K — USB_DBP
R164 10K — USB_DCM
R165 10K — USB_DCP
R182 10K — USB_DDM
R180 10K — USB_DDP

PORT E/BLUETOOTH

R174 22 — USB_DEP ↔ BT_USB_DP
R179 22 — USB_DEM ↔ BT_USB_DM
R178 15K — BT_USB_DP
R175 15K — BT_USB_DM

PORT F/MODEM

R192 22 — USB_DFP ↔ MODEM_USB_DP
R188 22 — USB_DFM ↔ MODEM_USB_DM
R189 15K — MODEM_USB_DP
R193 15K — MODEM_USB_DM

PCI INTERRUPTS

R148 10K — CBUS_INT_L
R746 10K — AIRPORT_PCI_INT_L
R158 10K — NEC_PCI_INT_L

GPIO/EXTINT PULLUPS

R187 10K — USB_PWREN_EF_L
R191 10K — USB_OC_EF_L
RP11 10K — USB_OC_AB_L
RP11 10K — USB_PWREN_CD_L
RP8 10K — USB_PWREN_AB_L
RP11 10K — USB_OC_CD_L
RP8 10K — INT_EXTINT14_PU
RP5 10K — INT_EXTINT8_PU
RP6 10K — COMM_RING_DET_L
RP11 10K — INT_GPIO15_PU
RP6 10K — PMU_INT_NMI
RP6 10K — PMU_INT_L
R250 10K — PMU_REQ_L
RP7 10K — INT_GPIO12_PU
RP7 10K — INT_EXTINT13_PU
RP4 10K — INT_EXTINT16_PU
RP5 10K — INT_EXTINT11_PU
RP6 10K — INT_EXTINT10_PU
RP4 10K — INT_EXTINT12_PU
RP8 10K — INT_GPIO9_PU
RP8 10K — INT_GPIO1_PU
R153 10K — INT_EXTINT3_PU
RP15 10K (USB_MODEM) — INT_MOD_DTO_UF
RP15 10K (USB_MODEM) — INT_MOD_CLKOUT_UF
RP15 10K (USB_MODEM) — INT_MOD_DTI
RP15 10K (USB_MODEM) — INT_MOD_SYNC_UF
R206 10K (USB_MODEM) — INT_MOD_BITCLK_UF
R166 100K — SND_HW_RESET_L

U49 LT1962-ADJ MSOP

+2_5V_MAIN → R568 0 (NO STUFF) → IN
+1_8V_MAIN → R565 0 → IN
LTC1962_INT_VIN
C721 1uF 10V CERM 603
IN, NC, NC, SHDN
OUT → +1_5V_INTREPID_PLL → C392 0.01uF 16V CERM 402; R574 18.7K 1% 1/16W MF 402; C723 10uF 6.3V CERM 805 → -> 1.55V OUTPUT
ADJ → LTW1962_INT_ADJ → R567 68.1K 1% 1/16W MF 402
BYP → LTW1962_INT_BYP
GND

U51 INTREPID-REV2.1 BGA (6 OF 9) CRITICAL

+3V_MAIN → L13 FERR-EMI-100-OHM SM → +3V_INTREPID_USB
+1_5V_INTREPID_PLL1 … PLL8 ← R201 4.7, R243 4.7, R279 4.7, R280 4.7, R240 4.7
C387 0.22uF, C386 0.22uF, C388 0.22uF, C389 0.22uF, C337 0.22uF (6.3V CERM 402)
C235 0.01uF 16V CERM 402; C246 0.1uF 10V CERM 402; C256 10uF 6.3V CERM 805

PCI VDD15A_1 (PLL1) AA16 · PCI VDD15A_2 (PLL2) AJ12 · PCI VDD15A_3 (PLL3) AJ17 · PCI VDD15A_4 (PLL7) AJ18 · VDD15A_8 (PLL9) AG29
VDDU33_1 T8 · VDDU33_2 U8

GPIO0 VCORE A/B SEL
GPIO1 GENERAL PURPOSE I/O'S
GPIO2 GPIO3 GPIO4 GPIO5 GPIO6 GPIO9 GPIO11 GPIO12 GPIO15 GPIO16

CG_FSEL GS · INT_GPIO1_PU E1 · COMM_SHUTDOWN J7 · COMM_RESET_L F2 · FW_PHY_PD J8 · SND_HP_MUTE_L H5 · SND_AMP_MUTE_L L9 · INT_GPIO9_PU H4 · SND_HW_RESET_L J5 · INT_GPIO12_PU K8 · INT_GPIO15_PU F1 · INT_ENET_RST_L K7

EXTINT0 … EXTINT17 · CPU_INT — INTERRUPTS
COMM_RING_DET_L F33 · PMU_INT_L E34 · AGP_ATI_INT_L C33 · INT_EXTINT3_PU D34 · SND_LIN_SENSE_L B33 · ENET_ENERGY_DET A33 · AIRPORT_PCI_INT_L E31 · CBUS_INT_L G30 · INT_EXTINT8_PU D31 · PMU_INT_NMI C32 · INT_EXTINT10_PU B32 · INT_EXTINT11_PU E30 · INT_EXTINT12_PU J9 · INT_EXTINT13_PU F4 · INT_EXTINT14_PU D1 · SND_HP_SENSE_L E2 · INT_EXTINT16_PU H7 · NEC_PCI_INT_L G4 · MPIC_CPU_INT_L D30
POWERBOOK SPARE · CBUS_REG_L · CBUS_IREQ_L

PCIPME · PROCSLEEPREQ · PENDPROCINT

XTAL_IN · XTAL_OUT · STOPXTAL · WATCHDOG · BUF_REF_CLOCK_OUT · SS_REF_CLK_IN — CLOCKS
CLK18M_INT_XIN U4 · CLK18M_INT_XOUT V15 · SYSTEM_CLK_EN AN7 · INT_WATCHDOG_L AT7 · INT_REF_CLK_OUT_UF U15 · INT_REF_CLK_IN K9

SCCTXDA AF9 COMM_TXD_L · SCCRTSA AN3 COMM_RTS_L · SCCDTRA AF10 COMM_DTR_L · SCCRXDA AG11 COMM_RXD · SCCGPIOA AG9 COMM_GPIO_L · SCCTRXCA AT4 COMM_TRXC — VIA
SCCTXDB AR4 PMU_FROM_INT · SCCRTSB AL5 PMU_REQ_L · SCCRXDB AG10 PMU_TO_INT · SCCGPIOB AP4 PMU_ACK_L · SCCTRXCB AM5 PMU_CLK — MISO, REQ*, MOSI, ACK*, SCK

USB_VD0_P L8 USB_DAP · USB_VD0_N L7 USB_DAM · USB_VD1_P G2 USB_DBP · USB_VD1_N G1 USB_DBM
USB_PRTPWR0 J4 USB_PWREN_AB_L · USB_PWRFLT0 K4 USB_OC_AB_L · USB_VD2_P H2 USB_DCP · USB_VD2_N H1 USB_DCM · USB_VD3_P M7 USB_DDP · USB_VD3_N M8 USB_DDM — USB
USB_PRTPWR1 J2 USB_PWREN_CD_L · USB_PWRFLT1 J1 USB_OC_CD_L · USB_VD4_P K5 USB_DEP · USB_VD4_N L5 USB_DEM · USB_VD5_P P8 USB_DFP · USB_VD5_N N8 USB_DFM
USB_PRTPWR2 M5 USB_PWREN_EF_L · USB_PWRFLT2 N7 USB_OC_EF_L

AUD_DTO R4 INT_I2S0_SND_TO_DAC_UF · AUD_DTI R7 INT_I2S0_SND_FROM_ADC · AUD_SYNC T5 INT_I2S0_SND_LRCLK_UF · AUD_BITCLK P2 INT_I2S0_SND_SCLK_UF · AUD_CLKOUT R5 INT_I2S0_SND_MCLK_UF — AUDIO/I2S
MOD_DTO R2 INT_MOD_DTO_UF · MOD_DTI T4 INT_MOD_DTI · MOD_SYNC R1 INT_MOD_SYNC_UF · MOD_BITCLK V8 INT_MOD_BITCLK_UF · MOD_CLKOUT P1 INT_MOD_CLKOUT_UF — (SIGNAL FROM MODEM)

IICCLK_2 AL4 · IICDATA_2 AH8 — IIC
R258 1K, R241 1K (+3V_SLEEP) → INT_I2C_CLK2, INT_I2C_DATA2

VSSA1 (PLL1) AA15 · VSSA2 (PLL2) AJ13 · VSSA3 (PLL3) AJ16 · VSSA4 (PLL7) AK18 · VSSA_8 (PLL9) AH29 · VSSU_1 R9 · VSSU_2 R8

U31 CY28512D TSSOP

CRITICAL — INTERNAL 250K PULL-UP, OUTPUT IMPEDANCE ~18-20 OHMS
VDD0 1 · VDD1 10 · VDDA 12 · VDDC 5 · VDD2 18
CPU0 16 CG_CLKOUT 1 → R293 33 → INT_REF_CLK_IN
CLKIN 20 ← INT_REF_CLK_OUT
FSEL 3 ← CG_FSEL
SCLK 9 ← INT_I2C_CLK1
SDATA 8 ← INT_I2C_DATA1
ADDRSEL 14 ← CG_ADDRSEL — INTERNAL 250K PULL-DOWN
RESET* 17 ← CG_RESET_L
PD* 13 ← SYSTEM_CLK_EN
LOCK 2 → CG_LOCK — OPEN DRAIN OUTPUT
ODSEL 4 — INTERNAL 250K PULL-UP
VSS0 7 · VSS1 19 · VSSA 11 · VSSC 6 · VSSQ 15

R284 0 (SSCG) ← VCORE_VGATE
R296 10K (NO STUFF)
R142 0 (SSCG) ← VCORE_VGATE
R292 75 (SSCG) — PLACE NEAR INTREPID TO MINIMIZE OVERSHOOT

L15 / L14 400-OHM-EMI SM-1 (SSCG)

+3V_MAIN → L15 → +3V_CG_PLL_MAIN
+2_5V_MAIN → L14
MAIN_RESET_L
C400 0.1uF 10V CERM 402; C402 1uF 10V CERM 603; C399 0.1uF 10V CERM 402; C394 0.1uF 10V CERM 402
R286 0 (NO STUFF); R287 10K; R288 10K; R295 10K (NO STUFF)

J9 U.FL-R SMT F-ST-SM (NO STUFF)

CLK18M_INT_EXT → R134 0 (NO STUFF) → R113 51 (NO STUFF)
R144 10M (NO STUFF); R143 0
Y2 18.432M CRITICAL 8X4.5MM-SM → CLK18M_XTAL_IN
C152 22pF 50V CERM 402; C151 22pF 50V CERM 402
CRYSTAL LOAD CAPACITANCE IS 16PF

R218 0 — INT_REF_CLK_OUT → INT_REF_CLK_OUT_UF

R13 47 (SOFT_MODEM)

INT_I2S0_SND_TO_DAC · INT_I2S0_SND_LRCLK · INT_I2S0_SND_SCLK · INT_I2S0_SND_MCLK

RP47 47 (SOFT_MODEM)

INT_MOD_DTO · INT_MOD_SYNC · INT_MOD_BITCLK · INT_MOD_CLKOUT

HWPLL_TESTMUXSEL	SIGNAL NAME
5	MOD_BITCLK_B_H
4	MOD_CLKOUT_B_H
3	MOD_DTO_B_H
2	MOD_SYNC_B_H
1	MOD_DTI_B_H
0	JTG_TDO_H

PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
197S0004	197S0035		Y2	Alt. for Siward Part

PART #	QTY	DEVICE	PACKAGE	DESCRIPTION	VALUE	VOLT.	WATT.	TOL.	REFERENCE DESIGNATOR(S)	BOM OPTION
116S1104	1	RES	RES-0402-V2	RESISTOR	10K		1/16W	5%	R292	NO_SSCG

INT - USB/GPIOS/I2S

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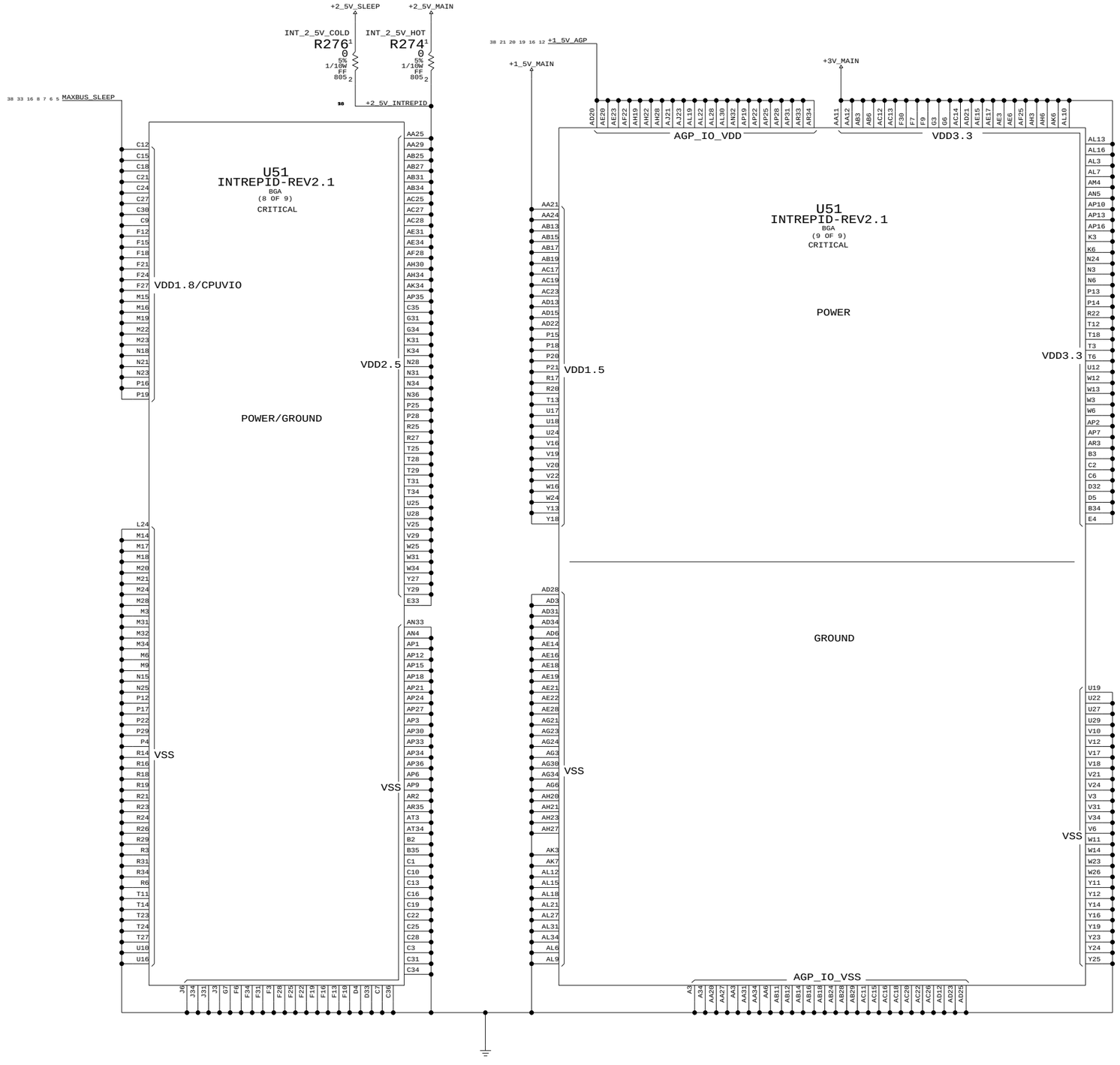

Intrepid Power

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SCALE: NONE	SHT 15 OF 40	

INTREPID MAXBUS DECOUPLING

24 Balls
4 X 10UF (0805)
28 X 0.22UF (0402)

33 15 8 7 6 5 38 MAXBUS_SLEEP

C148 10uF 20% 6.3V CERM 805 1 2
C142 10uF 20% 6.3V CERM 805 1 2
C144 10uF 20% 6.3V CERM 805 1 2
C146 10uF 20% 6.3V CERM 805 1 2

C182 0.22uF 20% 6.3V CERM 402 1 2
C178 0.22uF 20% 6.3V CERM 402 1 2
C141 0.22uF 20% 6.3V CERM 402 1 2
C145 0.22uF 20% 6.3V CERM 402 1 2
C214 0.22uF 20% 6.3V CERM 402 1 2
C163 0.22uF 20% 6.3V CERM 402 1 2
C164 0.22uF 20% 6.3V CERM 402 1 2
C225 0.22uF 20% 6.3V CERM 402 1 2
C160 0.22uF 20% 6.3V CERM 402 1 2
C159 0.22uF 20% 6.3V CERM 402 1 2
C204 0.22uF 20% 6.3V CERM 402 1 2
C166 0.22uF 20% 6.3V CERM 402 1 2
C205 0.22uF 20% 6.3V CERM 402 1 2
C223 0.22uF 20% 6.3V CERM 402 1 2
C229 0.22uF 20% 6.3V CERM 402 1 2
C181 0.22uF 20% 6.3V CERM 402 1 2
C207 0.22uF 20% 6.3V CERM 402 1 2
C208 0.22uF 20% 6.3V CERM 402 1 2
C183 0.22uF 20% 6.3V CERM 402 1 2
C180 0.22uF 20% 6.3V CERM 402 1 2
C165 0.22uF 20% 6.3V CERM 402 1 2
C206 0.22uF 20% 6.3V CERM 402 1 2
C147 0.22uF 20% 6.3V CERM 402 1 2
C149 0.22uF 20% 6.3V CERM 402 1 2
C179 0.22uF 20% 6.3V CERM 402 1 2
C162 0.22uF 20% 6.3V CERM 402 1 2
C161 0.22uF 20% 6.3V CERM 402 1 2
C213 0.22uF 20% 6.3V CERM 402 1 2

INTREPID CORE DECOUPLING

30 Balls
4 X 10UF (0805)
29 X 0.22UF (0402)

+1_5V_MAIN

C324 10uF 20% 6.3V CERM 805 1 2
C325 10uF 20% 6.3V CERM 805 1 2
C201 10uF 20% 6.3V CERM 805 1 2
C200 10uF 20% 6.3V CERM 805 1 2

C299 0.22uF 20% 6.3V CERM 402 1 2
C279 0.22uF 20% 6.3V CERM 402 1 2
C262 0.22uF 20% 6.3V CERM 402 1 2
C292 0.22uF 20% 6.3V CERM 402 1 2
C248 0.22uF 20% 6.3V CERM 402 1 2
C302 0.22uF 20% 6.3V CERM 402 1 2
C300 0.22uF 20% 6.3V CERM 402 1 2
C290 0.22uF 20% 6.3V CERM 402 1 2
C272 0.22uF 20% 6.3V CERM 402 1 2
C259 0.22uF 20% 6.3V CERM 402 1 2
C301 0.22uF 20% 6.3V CERM 402 1 2
C278 0.22uF 20% 6.3V CERM 402 1 2
C226 0.22uF 20% 6.3V CERM 402 1 2
C238 0.22uF 20% 6.3V CERM 402 1 2
C250 0.22uF 20% 6.3V CERM 402 1 2
C263 0.22uF 20% 6.3V CERM 402 1 2
C224 0.22uF 20% 6.3V CERM 402 1 2
C222 0.22uF 20% 6.3V CERM 402 1 2
C261 0.22uF 20% 6.3V CERM 402 1 2
C227 0.22uF 20% 6.3V CERM 402 1 2
C271 0.22uF 20% 6.3V CERM 402 1 2
C310 0.22uF 20% 6.3V CERM 402 1 2
C288 0.22uF 20% 6.3V CERM 402 1 2
C260 0.22uF 20% 6.3V CERM 402 1 2
C303 0.22uF 20% 6.3V CERM 402 1 2
C287 0.22uF 20% 6.3V CERM 402 1 2
C258 0.22uF 20% 6.3V CERM 402 1 2
C236 0.22uF 20% 6.3V CERM 402 1 2
C289 0.22uF 20% 6.3V CERM 402 1 2

INTREPID AGP I/O DECOUPLING

21 Balls
4 X 10UF (0805)
21 X 0.22UF (0402)

38 21 20 19 15 12 +1_5V_AGP

C381 10uF 20% 6.3V CERM 805 1 2
C380 10uF 20% 6.3V CERM 805 1 2
C382 10uF 20% 6.3V CERM 805 1 2
C379 10uF 20% 6.3V CERM 805 1 2

C367 0.22uF 20% 6.3V CERM 402 1 2
C319 0.22uF 20% 6.3V CERM 402 1 2
C330 0.22uF 20% 6.3V CERM 402 1 2
C363 0.22uF 20% 6.3V CERM 402 1 2
C366 0.22uF 20% 6.3V CERM 402 1 2
C332 0.22uF 20% 6.3V CERM 402 1 2
C361 0.22uF 20% 6.3V CERM 402 1 2
C320 0.22uF 20% 6.3V CERM 402 1 2
C328 0.22uF 20% 6.3V CERM 402 1 2
C364 0.22uF 20% 6.3V CERM 402 1 2
C365 0.22uF 20% 6.3V CERM 402 1 2
C329 0.22uF 20% 6.3V CERM 402 1 2
C345 0.22uF 20% 6.3V CERM 402 1 2
C346 0.22uF 20% 6.3V CERM 402 1 2
C373 0.22uF 20% 6.3V CERM 402 1 2
C344 0.22uF 20% 6.3V CERM 402 1 2
C331 0.22uF 20% 6.3V CERM 402 1 2
C312 0.22uF 20% 6.3V CERM 402 1 2
C354 0.22uF 20% 6.3V CERM 402 1 2
C347 0.22uF 20% 6.3V CERM 402 1 2
C321 0.22uF 20% 6.3V CERM 402 1 2

INTREPID 3.3V DECOUPLING

57 Balls
4 X 10UF (0805)
40 X 0.22UF (0402)

+3V_MAIN

C378 10uF 20% 6.3V CERM 805 1 2
C376 10uF 20% 6.3V CERM 805 1 2
C377 10uF 20% 6.3V CERM 805 1 2
C375 10uF 20% 6.3V CERM 805 1 2

C170 0.22uF 20% 6.3V CERM 402 1 2
C358 0.22uF 20% 6.3V CERM 402 1 2
C268 0.22uF 20% 6.3V CERM 402 1 2
C327 0.22uF 20% 6.3V CERM 402 1 2
C342 0.22uF 20% 6.3V CERM 402 1 2
C215 0.22uF 20% 6.3V CERM 402 1 2
C352 0.22uF 20% 6.3V CERM 402 1 2
C171 0.22uF 20% 6.3V CERM 402 1 2
C158 0.22uF 20% 6.3V CERM 402 1 2
C309 0.22uF 20% 6.3V CERM 402 1 2
C175 0.22uF 20% 6.3V CERM 402 1 2
C357 0.22uF 20% 6.3V CERM 402 1 2
C351 0.22uF 20% 6.3V CERM 402 1 2
C350 0.22uF 20% 6.3V CERM 402 1 2
C286 0.22uF 20% 6.3V CERM 402 1 2
C176 0.22uF 20% 6.3V CERM 402 1 2
C189 0.22uF 20% 6.3V CERM 402 1 2
C167 0.22uF 20% 6.3V CERM 402 1 2
C371 0.22uF 20% 6.3V CERM 402 1 2
C359 0.22uF 20% 6.3V CERM 402 1 2
C285 0.22uF 20% 6.3V CERM 402 1 2
C283 0.22uF 20% 6.3V CERM 402 1 2
C269 0.22uF 20% 6.3V CERM 402 1 2
C221 0.22uF 20% 6.3V CERM 402 1 2
C234 0.22uF 20% 6.3V CERM 402 1 2
C247 0.22uF 20% 6.3V CERM 402 1 2
C257 0.22uF 20% 6.3V CERM 402 1 2
C343 0.22uF 20% 6.3V CERM 402 1 2
C313 0.22uF 20% 6.3V CERM 402 1 2
C228 0.22uF 20% 6.3V CERM 402 1 2
C360 0.22uF 20% 6.3V CERM 402 1 2
C308 0.22uF 20% 6.3V CERM 402 1 2
C318 0.22uF 20% 6.3V CERM 402 1 2
C237 0.22uF 20% 6.3V CERM 402 1 2
C317 0.22uF 20% 6.3V CERM 402 1 2
C341 0.22uF 20% 6.3V CERM 402 1 2
C177 0.22uF 20% 6.3V CERM 402 1 2
C212 0.22uF 20% 6.3V CERM 402 1 2
C349 0.22uF 20% 6.3V CERM 402 1 2
C184 0.22uF 20% 6.3V CERM 402 1 2

INTREPID DDR DECOUPLING

44 Balls
4 X 10UF (0805)
46 X 0.22UF (0402)

38 15 10 9 +2_5V_INTREPID

C314 10uF 20% 6.3V CERM 805 1 2
C322 10uF 20% 6.3V CERM 805 1 2
C191 10uF 20% 6.3V CERM 805 1 2
C202 10uF 20% 6.3V CERM 805 1 2

C304 0.22uF 20% 6.3V CERM 402 1 2
C266 0.22uF 20% 6.3V CERM 402 1 2
C172 0.22uF 20% 6.3V CERM 402 1 2
C281 0.22uF 20% 6.3V CERM 402 1 2
C243 0.22uF 20% 6.3V CERM 402 1 2
C253 0.22uF 20% 6.3V CERM 402 1 2
C334 0.22uF 20% 6.3V CERM 402 1 2
C241 0.22uF 20% 6.3V CERM 402 1 2
C348 0.22uF 20% 6.3V CERM 402 1 2
C192 0.22uF 20% 6.3V CERM 402 1 2
C306 0.22uF 20% 6.3V CERM 402 1 2
C252 0.22uF 20% 6.3V CERM 402 1 2
C275 0.22uF 20% 6.3V CERM 402 1 2
C297 0.22uF 20% 6.3V CERM 402 1 2
C240 0.22uF 20% 6.3V CERM 402 1 2
C218 0.22uF 20% 6.3V CERM 402 1 2
C274 0.22uF 20% 6.3V CERM 402 1 2
C369 0.22uF 20% 6.3V CERM 402 1 2
C368 0.22uF 20% 6.3V CERM 402 1 2
C168 0.22uF 20% 6.3V CERM 402 1 2
C265 0.22uF 20% 6.3V CERM 402 1 2
C251 0.22uF 20% 6.3V CERM 402 1 2
C216 0.22uF 20% 6.3V CERM 402 1 2
C254 0.22uF 20% 6.3V CERM 402 1 2
C305 0.22uF 20% 6.3V CERM 402 1 2
C186 0.22uF 20% 6.3V CERM 402 1 2
C219 0.22uF 20% 6.3V CERM 402 1 2
C315 0.22uF 20% 6.3V CERM 402 1 2
C264 0.22uF 20% 6.3V CERM 402 1 2
C294 0.22uF 20% 6.3V CERM 402 1 2
C323 0.22uF 20% 6.3V CERM 402 1 2
C273 0.22uF 20% 6.3V CERM 402 1 2
C242 0.22uF 20% 6.3V CERM 402 1 2
C203 0.22uF 20% 6.3V CERM 402 1 2
C333 0.22uF 20% 6.3V CERM 402 1 2
C217 0.22uF 20% 6.3V CERM 402 1 2
C230 0.22uF 20% 6.3V CERM 402 1 2
C293 0.22uF 20% 6.3V CERM 402 1 2
C231 0.22uF 20% 6.3V CERM 402 1 2
C296 0.22uF 20% 6.3V CERM 402 1 2
C239 0.22uF 20% 6.3V CERM 402 1 2
C316 0.22uF 20% 6.3V CERM 402 1 2
C185 0.22uF 20% 6.3V CERM 402 1 2
C282 0.22uF 20% 6.3V CERM 402 1 2
C295 0.22uF 20% 6.3V CERM 402 1 2
C280 0.22uF 20% 6.3V CERM 402 1 2

INTREPID/MAIN 2.5V DECOUPLING

10 X 0.22UF (0402)

+2_5V_MAIN

C770 0.22uF 20% 6.3V CERM 402 1 2
C139 0.22uF 20% 6.3V CERM 402 1 2
C335 0.22uF 20% 6.3V CERM 402 1 2
C735 0.22uF 20% 6.3V CERM 402 1 2
C245 0.22uF 20% 6.3V CERM 402 1 2
C736 0.22uF 20% 6.3V CERM 402 1 2
C739 0.22uF 20% 6.3V CERM 402 1 2
C395 0.22uF 20% 6.3V CERM 402 1 2
C374 0.22uF 20% 6.3V CERM 402 1 2
C385 0.22uF 20% 6.3V CERM 402 1 2

Place these 2.5V Decoupling Caps near the Edge of +2.5V_MAIN and +2.5V_INTREPID split

Intrepid Decoupling

APPLE COMPUTER INC.

SIZE	DRAWING NUMBER	REV.
D	051-6338	C
SCALE: NONE	SHT 16 OF 40	

PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
197S0608	197S0038		Y1	Alt. for Siward Part

+3V_NEC_VDD 17 38

C749 0.1uF 20% 10V CERM 402
C746 0.1uF 20% 10V CERM 402
C761 0.1uF 20% 10V CERM 402
C750 0.1uF 20% 10V CERM 402
C756 0.1uF 20% 10V CERM 402
C748 0.1uF 20% 10V CERM 402
C769 0.1uF 20% 10V CERM 402
C752 0.1uF 20% 10V CERM 402
C747 0.1uF 20% 10V CERM 402
C197 10uF 20% 6.3V CERM 805
C765 0.1uF 20% 10V CERM 402
C768 0.1uF 20% 10V CERM 402

+3V_MAIN

L7 FERR-EMI-100-OHM SM

R172 0 5% 1/16W MF 603

38 NEC_AVDD

C760 0.1uF 20% 10V CERM 402
C751 0.1uF 20% 10V CERM 402
C173 10uF 20% 6.3V CERM 805

38 17 +3V_NEC_VDD

Y1's LOAD CAPACITANCE = 16 pF

CRITICAL
Y1 30.0000M 8X4.5MM-SM

C759 27pF 5% 50V CERM 402
C136 27pF 5% 50V CERM 402
R124 100 5% 1/16W MF 402

NEC_XT2_R

R613 36 1% 1/16W MF 402 — NEC_USB_DAM 25 37 39
R612 36 1% 1/16W MF 402 — NEC_USB_DAP 25 37 39
Low/Full/High Speed (External)
R609 36 1% 1/16W MF 402 — NEC_USB_DBM 25 37 39
R610 36 1% 1/16W MF 402 — NEC_USB_DBP 25 37 39
Low/Full/High Speed (External)

H3 M4 C8 P2 P3 P12 A13 A12 A3 E2 N8 L13 J13 H13 F13 D13 G12 H4 D7 — VDD
H10 H12 — AVDD

CRITICAL
U17
NEC_uPD720101_USB2
FBGA

39 37 24 18 12 9 PCI_AD<0>	M5	AD0	
39 37 24 18 12 9 PCI_AD<1>	P5	AD1	
39 37 24 18 12 9 PCI_AD<2>	N5	AD2	
39 37 24 18 12 9 PCI_AD<3>	P4	AD3	
39 37 24 18 12 9 PCI_AD<4>	N4	AD4	
39 37 24 18 12 9 PCI_AD<5>	M3	AD5	
39 37 24 18 12 9 PCI_AD<6>	N3	AD6	
39 37 24 18 12 9 PCI_AD<7>	M1	AD7	
39 37 24 18 12 9 PCI_AD<8>	L2	AD8	
39 37 24 18 12 9 PCI_AD<9>	L1	AD9	
39 37 24 18 12 9 PCI_AD<10>	K2	AD10	
39 37 24 18 12 9 PCI_AD<11>	L3	AD11	
39 37 24 18 12 9 PCI_AD<12>	K1	AD12	
39 37 24 18 12 9 PCI_AD<13>	K3	AD13	
39 37 24 18 12 9 PCI_AD<14>	J2	AD14	
39 37 24 18 12 9 PCI_AD<15>	J1	AD15	
39 37 24 18 12 9 PCI_AD<16>	F2	AD16	
39 37 24 18 12 9 PCI_AD<17>	E3	AD17	
39 37 24 18 12 9 PCI_AD<18>	E1	AD18	
39 37 24 18 12 9 PCI_AD<19>	D3	AD19	
39 37 24 18 12 9 PCI_AD<20>	D1	AD20	
39 37 24 18 12 PCI_AD<21>	D2	AD21	
39 37 24 18 12 PCI_AD<22>	C2	AD22	
39 37 24 18 12 PCI_AD<23>	C1	AD23	
39 37 24 18 12 9 PCI_AD<24>	B4	AD24	
39 37 24 18 12 9 PCI_AD<25>	A4	AD25	
39 37 24 18 12 9 PCI_AD<26>	B5	AD26	
39 37 24 18 12 9 PCI_AD<27>	C4	AD27	
39 37 24 18 12 9 PCI_AD<28>	A5	AD28	
39 37 24 18 12 9 PCI_AD<29>	C5	AD29	
39 37 24 18 12 9 PCI_AD<30>	B6	AD30	
39 37 24 18 12 9 PCI_AD<31>	A6	AD31	
37 24 18 12 PCI_CBE<0>	M2	CBE0	
37 24 18 12 PCI_CBE<1>	J3	CBE1	
37 24 18 12 PCI_CBE<2>	F1	CBE2	
37 24 18 12 PCI_CBE<3>	C3	CBE3	
39 37 24 18 12 PCI_PAR	J4	PAR	
39 37 24 18 12 PCI_FRAME_L	F3	FRAME	
39 37 24 18 12 PCI_IRDY_L	F4	IRDY	
39 37 24 18 12 PCI_TRDY_L	G1	TRDY	
39 37 24 18 12 PCI_STOP_L	G3	STOP	
NEC_IDSEL	B3	IDSEL	
39 37 24 18 12 PCI_DEVSEL_L	G2	DEVSEL	
12 NEC_PCI_REQ_L	C6	REQ	
12 NEC_PCI_GNT_L	D6	GNT	
18 PCI_PERR_L	H2	PERR	
18 PCI_SERR_L	H1	SERR	OD
NEC_PCI_INTA_L	C7	INTA	OD
NEC_PCI_INTB_L	B7	INTB	OD
NEC_PCI_INTC_L	A7	INTC	OD
35 12 CLK33M_NEC	A8	PCLK	
17 NEC_IO_RESET_L	B8	VBBRST	
NEC_CRUN_L	N6	CRUN	
17 NEC_PME_L	D9	PME	OD
17 NEC_MAIN_RESET_L	C9	VCCRST	
NEC_SMI_L_TP	L6	SMI	OD
17 NEC_LEGC	L7	LEGC	

R636 22 5% 1/16W MF 402

Series Rpaks required to facilitate NAND-tree testing

RP45 47 5% 1/16W SM1
14 NEC_PCI_INT_L

R617 4.7K 5% 1/16W MF 402

RP44 47 5% 1/16W SM1
29 26 23 IO_RESET_L — NEC_IO_RESET_L 17
39 29 24 14 PMU_PME_L — NEC_PME_L 17
39 29 24 19 18 14 MAIN_RESET_L — NEC_MAIN_RESET_L 17
17 NEC_LEGC

VSS
B1 N1 P10 N14 H14 B14 A2 B2 N2 N13 B13 M11 L12 H12 D12 G4 J11 F11 D8

XT1/SCLK	L9	NEC_XT1	
XT2	P8	NEC_XT2	
RSDM1	M14	NEC_USB_RSDM1	
DM1	M13	(NEC_USB_DAM)	
DP1	L14	(NEC_USB_DAP)	
RSDP1	K13	NEC_USB_RSDP1	
RSDM2	K14	NEC_USB_RSDM2	
DM2	K12	(NEC_USB_DBM)	
DP2	J14	(NEC_USB_DBP)	
RSDP2	J12	NEC_USB_RSDP2	
RSDM3	H11	NC	
DM3	G11		
DP3	G13		
RSDP3	G14	NC	
RSDM4	F12	NC	
DM4	F14		
DP4	E12		
RSDP4	E14	NC	
RSDM5	E13	NC	
DM5	D14		
DP5	C13		
RSDP5	C14	NC	
RREF	P11	NEC_RREF	
OCI1	B12	NEC_LUSB_OCI 17	
OCI2	B11	NEC_RUSB_OCI 17	
OCI3	B10	NEC_OCI<3>	
OCI4	A10	NEC_OCI<4>	
OCI5	B9	NEC_OCI<5>	
PPON1	C12 OUT	NEC_LUSB_PPON 25 39	
PPON2	A11 OUT	NEC_RUSB_PPON 25 39	
PPON3	C11 OUT	NEC_PPON3_TP	
PPON4	C10 OUT	NEC_PPON4_TP	
PPON5	A9 OUT	NEC_PPON5_TP	
NC1	P6	NEC_NC<1>	
NC2	M6	NEC_NC<2>	
NTEST1	M8 IPD	NC	
SMC	M7 IPD	NC	
TEB	N7 IPD	NC	
AMC	P7 IPD	NEC_AMC_TP	
TEST	L8 IPD	NC	
NANDTEST	M10	NEC_NANDTESTEN_TP	
SRCLK	M9	NC	
SRDTA	N9	NEC_NANDTESTOUT_TP	
SRMOD	P9 IPD	NC	
AVSS			
AVSS(R)	N11 P13 M12		

R614 9.09K 1% 1/16W MF 402 — Tie to GND (NEC_AVSS_F) at ball N11
NEC_AVSS_F 17

R798 0 5% 1/10W MF 603 — 17 NEC_AVSS_F

+3V_NEC_VDD 17 38

RP43 10K 5% 1/16W SM1
RP43 10K 5% 1/16W SM1
RP43 10K 5% 1/16W SM1
R606 10K 5% 1/16W MF 402
R615 1K 5% 1/16W MF 402
R632 1K 5% 1/16W MF 402

NEC documentation indicates that NCs must be tied high.

+3V_MAIN

R607 0 5% 1/16W MF 402
17 NEC_LUSB_OCI — NEC_LUSB_OCI_UF 25 39

R608 0 5% 1/16W MF 402
17 NEC_RUSB_OCI — NEC_RUSB_OCI_UF 25 39

NO STUFF C743 0.1uF 20% 10V CERM 402
NO STUFF C744 0.1uF 20% 10V CERM 402

USB 2.0

APPLE COMPUTER INC.

SIZE	DRAWING NUMBER	REV.
D	051-6338	C

SCALE NONE — SHT 17 OF 40

PCI1510 PULL-UPS

+3V_SLEEP

R718 10K 5% 1/16W MF 402 — PCI_PERR_L (17 18)

R714 10K 5% 1/16W MF 402 — PCI_SERR_L (17 18)

R722 10K 5% 1/16W MF 402 — CBUS_SUSPEND_PU (18)

+2_5V_SLEEP

C787 4.7uF 20% 6.3V CERM 805

C786 0.22uF 20% 6.3V CERM 402

C60 10uF 20% 6.3V CERM 805

C776 10uF 20% 6.3V CERM 805

C789 0.22uF 20% 6.3V CERM 402

C791 0.22uF 20% 6.3V CERM 402

C784 0.22uF 20% 6.3V CERM 402

C782 0.22uF 20% 6.3V CERM 402

C783 0.22uF 20% 6.3V CERM 402

C778 0.22uF 20% 6.3V CERM 402

C775 0.22uF 20% 6.3V CERM 402

R721 10K 5% 1/16W MF 402

A7 C13 D5 E1 M1 N7 N11 — VCC

NC H10 CLK_48_RSVD/NC

PCI1510_VR_EN_L D4 — VR_EN*

L8 VR_PORT

U8 PCI1510GGU BGA

CRITICAL

CLAMP FOR PC-CARD

CLAMP FOR PCI

PCI_AD<0>	N8	AD0
PCI_AD<1>	M7	AD1
PCI_AD<2>	L7	AD2
PCI_AD<3>	N6	AD3
PCI_AD<4>	K4	AD4
PCI_AD<5>	M6	AD5
PCI_AD<6>	L6	AD6
PCI_AD<7>	N5	AD7
PCI_AD<8>	N4	AD8
PCI_AD<9>	M2	AD9
PCI_AD<10>	M5	AD10
PCI_AD<11>	L4	AD11
PCI_AD<12>	N3	AD12
PCI_AD<13>	K5	AD13
PCI_AD<14>	L5	AD14
PCI_AD<15>	M4	AD15
PCI_AD<16>	J4	AD16
PCI_AD<17>	H1	AD17
PCI_AD<18>	H3	AD18
(PCI_AD<19>)	H2	AD19
PCI_AD<20>	G2	AD20
PCI_AD<21>	G4	AD21
PCI_AD<22>	F1	AD22
PCI_AD<23>	C3	AD23
PCI_AD<24>	F3	AD24
PCI_AD<25>	E2	AD25
PCI_AD<26>	F4	AD26
PCI_AD<27>	B1	AD27
PCI_AD<28>	D2	AD28
PCI_AD<29>	E4	AD29
PCI_AD<30>	D3	AD30
PCI_AD<31>	E3	AD31

PCI_CBE<0>	K6	C/BE0*
PCI_CBE<1>	M3	C/BE1*
PCI_CBE<2>	J2	C/BE2*
PCI_CBE<3>	A1	C/BE3*

PCI_PAR	N1	PAR
PCI_IRDY_L	K1	IRDY
PCI_SERR_L	L2	SERR
CBUS_PCI_IDSEL	F2	IDSEL
PCI_PERR_L	K3	PERR
PCI_FRAME_L	J1	FRAME
PCI_STOP_L	L1	STOP
PCI_TRDY_L	J3	TRDY
PCI_DEVSEL_L	K2	DEVSEL
CBUS_PCI_RESET_L	G3	PRST
CBUS_PCI_REQ_L	C2	REQ
CBUS_PCI_GNT_L	C1	GNT
CLK33M_CBUS	G1	PCLK

NC	M9	SPKROUT
NC	M8	RI_OUT/PME
CBUS_SUSPEND_PU	N10	SUSPEND
CBUS_INT_L	K7	MFUNC0
CBUS_MFUNC1_PD	N9	MFUNC1
CBUS_MFUNC2_PD	L9	MFUNC2
CBUS_MFUNC3_PD	K10	MFUNC3
CBUS_MFUNC4_PD	M10	MFUNC4
CBUS_MFUNC5_PD	N12	MFUNC5
CBUS_MFUNC6_PD	L10	MFUNC6
	L11	GRST

R723 47 5% 1/16W MF 402 — MAIN_RESET_L (29 24 19 17 14)

RP1 10K 5% 1/32W 25V SM

CBUS_MFUNC1_PD	6
CBUS_MFUNC2_PD	4
CBUS_MFUNC3_PD	7
CBUS_MFUNC4_PD	3
CBUS_MFUNC5_PD	9
CBUS_MFUNC6_PD	8
	2
	1

R719 22 5% 1/16W MF 402

GND: A2 A11 D1 F13 H4 K8 M13 N2

INTEGRATED PULL-UP

VCCCB	B11	
VCCP	L3	
VCCD0*	N13	CBUS_VCCD0_L
VCCD1*	L12	CBUS_VCCD1_L
VPPD0	K9	CBUS_VPPD0
VPPD1	M11	CBUS_VPPD1
CD1*/CCD1*	L13	CBUS_DET_1_L (18 39)
CD2*/CCD2*	B5	CBUS_DET_2_L (18 39)
IORD*/CAD13	F12	CBUS_IORD_L (18)
IOWR*/CAD15	C11	CBUS_IOWR_L (18)
OE*/CAD11	G10	CBUS_OE_L (18)
CE1*/CC/BE0*	H13	CBUS_CE1_L (18)
VS1*/CVS1	B2	CBUS_VS1 (18)
VS2*/CVS2	A9	CBUS_VS2 (18)
WE*/CGNT*	D13	CBUS_WE_L (18)
RDY/IREQ*/CINT*	A6	CBUS_READY (18)
RESET/CRST*	D8	CBUS_RESET_L (18)
REG*/CC/BE3*	A8	CBUS_REG_L (18)
BVD1/CSTSCHG/STSCHG*/RI*	C6	CBUS_BVD1_L (18)
BVD2/SPKR*/CAUDIO	D6	CBUS_BVD2_L (18)
WP/IOIS16*/CCLKRUN*	A5	CBUS_WP_L (18)
CE2/CAD10*	G13	CBUS_CE2_L (18)
INPACK/CREQ*	B8	CBUS_INPACK_L (18)
WAIT/CSERR*	B6	CBUS_WAIT_L (18)
A0/CAD26	C7	CBUS_ADDR<0> (18)
A1/CAD25	D7	CBUS_ADDR<1> (18)
A2/CAD24	B7	CBUS_ADDR<2> (18)
A3/CAD23	D10	CBUS_ADDR<3> (18)
A4/CAD22	B12	CBUS_ADDR<4> (18)
A5/CAD21	C8	CBUS_ADDR<5> (18)
A6/CAD20	C9	CBUS_ADDR<6> (18)
A7/CAD18	A12	CBUS_ADDR<7> (18)
A8/CC/BE1*	E11	CBUS_ADDR<8> (18)
A9/CAD14	F11	CBUS_ADDR<9> (18)
A10/CAD9	G11	CBUS_ADDR<10> (18)
A11/CAD12	G12	CBUS_ADDR<11> (18)
A12/CC/BE2*	D9	CBUS_ADDR<12> (18)
A13/CPAR	E12	CBUS_ADDR<13> (18)
A14/CPERR*	D12	CBUS_ADDR<14> (18)
A15/CIRDY*	C10	CBUS_ADDR<15> (18)
A16/CCLK	B13	CBUS_ADDR_16_UF
A17/CAD16	F10	CBUS_ADDR<17> (18)
A18/RSVD	E13	CBUS_ADDR<18> (18)
A19/CBLOCK*	A13	CBUS_ADDR<19> (18)
A20/CSTOP*	E10	CBUS_ADDR<20> (18)
A21/CDEVSEL*	D11	CBUS_ADDR<21> (18)
A22/CTRDY*	C12	CBUS_ADDR<22> (18)
A23/CFRAME*	A10	CBUS_ADDR<23> (18)
A24/CAD17	B10	CBUS_ADDR<24> (18)
A25/CAD19	B9	CBUS_ADDR<25> (18)
D0/CAD27	A4	CBUS_DATA<0> (18)
D1/CAD29	C4	CBUS_DATA<1> (18)
D2/RSVD	A3	CBUS_DATA<2> (18)
D3/CAD0	K11	CBUS_DATA<3> (18)
D4/CAD1	K12	CBUS_DATA<4> (18)
D5/CAD3	J13	CBUS_DATA<5> (18)
D6/CAD5	J10	CBUS_DATA<6> (18)
D7/CAD7	H12	CBUS_DATA<7> (18)
D8/CAD28	C5	CBUS_DATA<8> (18)
D9/CAD30	B4	CBUS_DATA<9> (18)
D10/CAD31	B3	CBUS_DATA<10> (18)
D11/CAD2	M12	CBUS_DATA<11> (18)
D12/CAD4	J11	CBUS_DATA<12> (18)
D13/CAD6	K13	CBUS_DATA<13> (18)
D14/RSVD	J12	CBUS_DATA<14> (18)
D15/CAD8	H11	CBUS_DATA<15> (18)

R724 47 5% 1/16W MF 402 — CBUS_ADDR<16> (18)

+3V_MAIN

+5V_MAIN

R726 0 5% 1/16W MF 402 — SLEEP_L_LS5 (26 34 29 33 32)

TPS2211_SHTDWN_L

U4 TPS2211 SSOI

NC	9	
V_12	5	AVPP
V_5_1	6	
V_5_2	3	AVCC0
V_3_1	4	AVCC1
V_3_2	1	AVCC2
VCCD0	2	
VCCD1	15	
VPPD0	14	
VPPD1	16	
SHTDWN	7	
GND		OC 8 NC
	10	+VPP_CBUS_SW (18 38)
	11	+VCC_CBUS_SW (18 38)
	12	
	13	

C40 0.1uF 20% 10V CERM 402

C37 0.1uF 20% 10V CERM 402

MAKE SURE VCC AND VPP ARE WIDE PLANE/TRACES TO MINIMIZE INDUCTANCE!

0.1UF ARE USED TO INCREASE ESD DISCHARGES OF UP TO 10KV

TI REFERENCE SCHEMATIC DID NOT HAVE BULK ON +VCC_CBUS_SW

C796 2.2uF 20% 10V CERM 805

C800 2.2uF 20% 10V CERM 805

PC CARD/CARDBUS CONNECTOR

CRITICAL

J5 QT500806-L111 M-ST-SM1

	2	1	CBUS_DATA<3> (18)
CBUS_DET_1_L (39 18)	4	3	CBUS_DATA<4> (18)
CBUS_DATA<11> (18)	6	5	CBUS_DATA<5> (18)
CBUS_DATA<12> (18)	8	7	CBUS_DATA<6> (18)
CBUS_DATA<13> (18)	10	9	
	12	11	CBUS_DATA<7> (18)
CBUS_DATA<14> (18)	14	13	CBUS_CE1_L (18)
CBUS_DATA<15> (18)	16	15	CBUS_ADDR<10> (18)
CBUS_CE2_L (18)	18	17	CBUS_OE_L (18)
CBUS_VS1 (18)	20	19	
	22	21	CBUS_ADDR<11> (18)
CBUS_IORD_L (18)	24	23	CBUS_ADDR<9> (18)
CBUS_IOWR_L (18)	26	25	CBUS_ADDR<8> (18)
CBUS_ADDR<17> (18)	28	27	CBUS_ADDR<13> (18)
CBUS_ADDR<18> (18)	30	29	
	32	31	CBUS_ADDR<14> (18)
CBUS_ADDR<19> (18)	34	33	CBUS_WE_L (18)
CBUS_ADDR<20> (18)	36	35	CBUS_READY (18)
CBUS_ADDR<21> (18)	38	37	+VCC_CBUS_SW (18 38)
+VCC_CBUS_SW (18 38)	40	39	
	42	41	+VPP_CBUS_SW (18 38)
+VPP_CBUS_SW (18 38)	44	43	CBUS_ADDR<16> (18)
CBUS_ADDR<22> (18)	46	45	CBUS_ADDR<15> (18)
CBUS_ADDR<23> (18)	48	47	CBUS_ADDR<12> (18)
CBUS_ADDR<24> (18)	50	49	
	52	51	CBUS_ADDR<7> (18)
CBUS_ADDR<25> (18)	54	53	CBUS_ADDR<6> (18)
CBUS_VS2 (18)	56	55	CBUS_ADDR<5> (18)
CBUS_RESET_L (18)	58	57	CBUS_ADDR<4> (18)
CBUS_WAIT_L (18)	60	59	
	62	61	CBUS_ADDR<3> (18)
CBUS_INPACK_L (18)	64	63	CBUS_ADDR<2> (18)
CBUS_REG_L (18)	66	65	CBUS_ADDR<1> (18)
CBUS_BVD2_L (18)	68	67	CBUS_ADDR<0> (18)
CBUS_BVD1_L (18)	70	69	
	72	71	CBUS_DATA<0> (18)
CBUS_DATA<8> (18)	74	73	CBUS_DATA<1> (18)
CBUS_DATA<9> (18)	76	75	CBUS_DATA<2> (18)
CBUS_DATA<10> (18)	78	77	CBUS_WP_L (18)
CBUS_DET_2_L (39 18)	80	79	

83 82

CARDBUS

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SIZE	DRAWING NUMBER	REV.
D	051-6338	C
SCALE: NONE	SHT 18 OF 40	

SIL1162 DVI-Compliant Transmitter

Ext. TMDS source termination

M10 AGP INTERFACE

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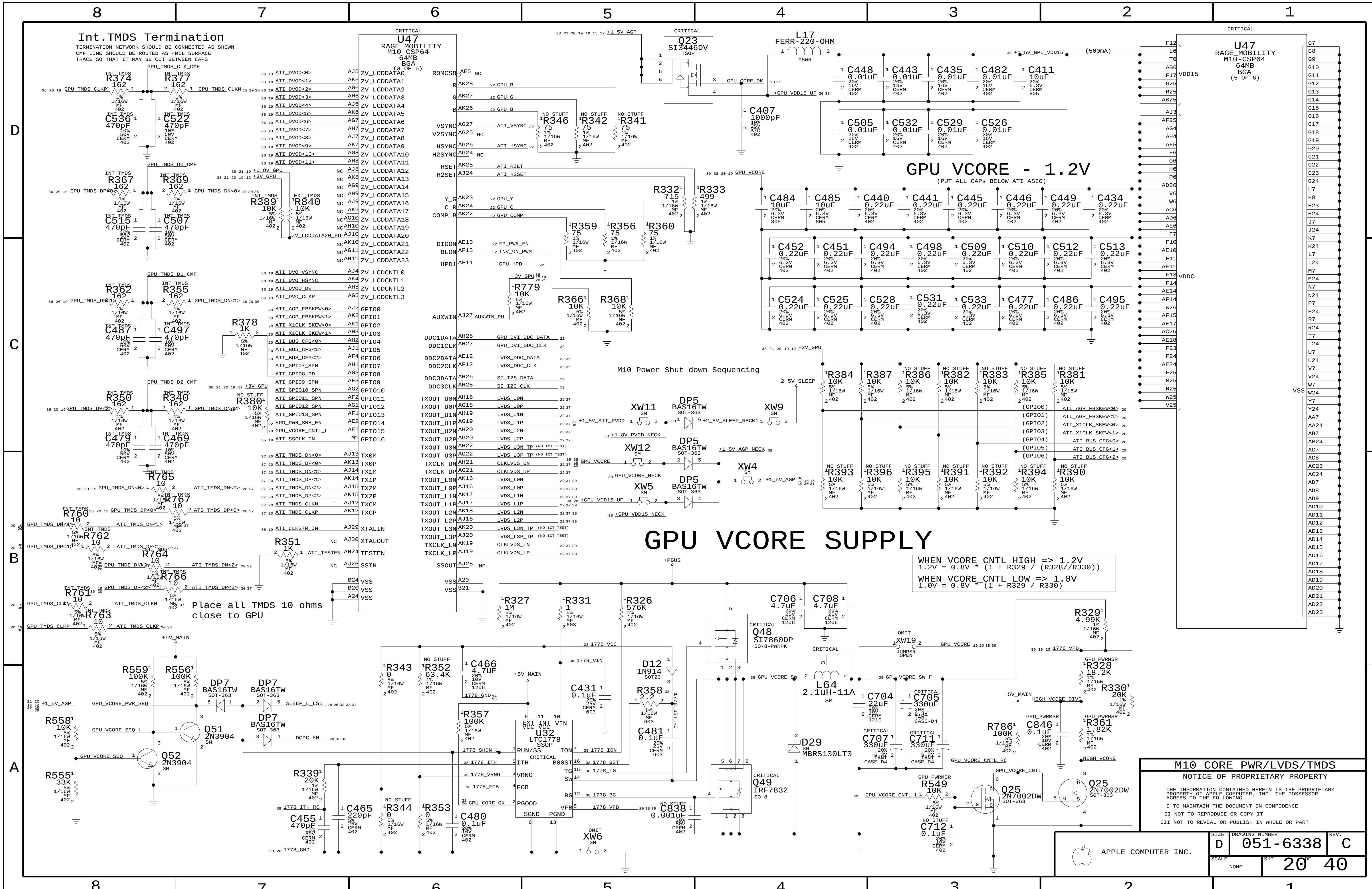
SIZE	DRAWING NUMBER	REV.
D	051-6338	C

SCALE: NONE — SHT 19 OF 40

PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
197S0318	197S0048		G1	Alt. for Siward Part


Int.TMDS Termination
TERMINATION NETWORK SHOULD BE CONNECTED AS SHOWN
CMF LINE SHOULD BE ROUTED AS 4MIL SURFACE
TRACE SO THAT IT MAY BE CUT BETWEEN CAPS
U47
RAGE_MOBILITY
M10-CSP64
64MB
BGA
(3 OF 6)
(5 OF 6)
GPU VCORE - 1.2V
(PUT ALL CAPs BELOW ATI ASIC)
M10 Power Shut down Sequencing
GPU VCORE SUPPLY
WHEN VCORE_CNTL HIGH => 1.2V
1.2V = 0.8V * (1 + R329 / (R328//R330))
WHEN VCORE_CNTL LOW => 1.0V
1.0V = 0.8V * (1 + R329 / R330)
Place all TMDS 10 ohms
close to GPU
Q23
SI3446DV
L17
FERR-220-OHM
U32
LTC1778
Q48
SI7860DP
Q49
IRF7832
L64
2.1uH-11A
D29
MBRS130LT3
Q25
2N7002DW
Q51
2N3904
Q52
2N3904
M10 CORE PWR/LVDS/TMDS
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APPLE COMPUTER INC.
SIZE D
DRAWING NUMBER 051-6338
REV. C
SCALE NONE
SHT 20 OF 40

GPU PLL - 1.8V

+2_5V_SLEEP → U34 MM1571J SOT-25A CRITICAL (150mA MAX)
C830 1uF 20% 10V CERM 603
GPU_CORE_OK
ATI_PVDD_BYP
C553 0.01uF 20% 10V CERM 402
1_8V_PVDD_STD
R787 0 5% 1/16W MF 402
+1_8V_ATI_PVDD → L20 FERR-220-OHM 0402 → +1_8V_GPU_PLL
C418 10uF 20% 6.3V CERM 805
C414 0.1uF 20% 10V CERM 402
C413 0.01uF 20% 16V CERM 402 (21mA)
C552 10uF 20% 6.3V CERM 805
+1_8V_GPU → L19 FERR-220-OHM 0402 → +1_8V_GPU_AVDD
C427 10uF 20% 6.3V CERM 805
C453 0.01uF 20% 16V CERM 402
C450 0.01uF 20% 16V CERM 402 (AVDD+VDDDI=75mA)

+2_5V_GPU → L23 FERR-220-OHM 0402 (140mA) → +2_5V_GPU_A2VDD
C459 10uF 20% 6.3V CERM 805
C460 0.01uF 20% 16V CERM 402
C461 0.01uF 20% 16V CERM 402

+1_8V_GPU → L21 FERR-220-OHM 0402 (2mA) → +1_8V_GPU_AVDDQ
C464 10uF 20% 6.3V CERM 805
C463 0.01uF 20% 16V CERM 402

+1_8V_GPU → L24 FERR-220-OHM 0402 (AVDD+VDDDI=75mA) → +1_8V_GPU_VDDDI
C478 10uF 20% 6.3V CERM 805
C462 0.01uF 20% 16V CERM 402
C454 0.01uF 20% 16V CERM 402

+2_5V_GPU → L28 FERR-220-OHM 0402 → +2_5V_GPU_MCLK
C511 10uF 20% 6.3V CERM 805
C527 0.01uF 20% 16V CERM 402
C472 0.01uF 20% 16V CERM 402

AGP 4X I/O - 1.5V

+1_5V_AGP → L18 FERR-10-OHM-500MA SM (20mA)
C438 0.1uF 20% 10V CERM 402
C444 0.1uF 20% 10V CERM 402
C423 0.1uF 20% 10V CERM 402
C424 0.1uF 20% 10V CERM 402
C422 10uF 20% 6.3V CERM 805
C439 0.01uF 20% 16V CERM 402
C447 0.01uF 20% 16V CERM 402
C425 0.01uF 20% 16V CERM 402
C417 0.01uF 20% 16V CERM 402

MEMORY CORE - 2.5V

+2_5V_GPU → L25 FERR-220-OHM 0805 (1800mA) → +2_5V_GPU_MEMCORE
C470 0.1uF 20% 10V CERM 402
C539 0.1uF 20% 10V CERM 402
C475 0.1uF 20% 10V CERM 402
C419 0.1uF 20% 10V CERM 402
C483 10uF 20% 6.3V CERM 805
C471 0.01uF 20% 16V CERM 402
C538 0.01uF 20% 16V CERM 402
C504 0.01uF 20% 16V CERM 402
C420 0.01uF 20% 16V CERM 402

LVDS PLL - 1.8V

+1_8V_ATI_PVDD → L32 FERR-220-OHM 0402 → +1_8V_GPU_PNLPLL (40mA)
C493 10uF 20% 6.3V CERM 805
C468 0.01uF 20% 16V CERM 402

MEMORY PLL - 1.8V

+1_8V_ATI_PVDD → L30 FERR-220-OHM 0402 → +1_8V_GPU_MEMPLL
C537 10uF 20% 6.3V CERM 805
C523 0.01uF 20% 16V CERM 402
+1_8V_GPU_TP_PLL
C831 10uF 20% 6.3V CERM 805
C832 0.01uF 20% 16V CERM 402

LVDS - 2.5V

+2_5V_GPU → L26 FERR-10-OHM-500MA SM (20mA)
C499 10uF 20% 6.3V CERM 805
C500 0.01uF 20% 16V CERM 402
C473 0.01uF 20% 16V CERM 402
+2_5V_GPU_PNLTO (350mA)

LVDS/TMDS - 1.8V

+1_8V_GPU → L29 FERR-220-OHM 0402 → +1_8V_GPU_PNLTO (180mA)
C514 10uF 20% 6.3V CERM 805
C492 0.1uF 20% 10V CERM 402
C496 0.1uF 20% 10V CERM 402
C489 0.1uF 20% 10V CERM 402
C491 0.1uF 20% 10V CERM 402
C501 0.01uF 20% 16V CERM 402
C506 0.01uF 20% 16V CERM 402

GPU POWER SOURCES - 1.5V, 1.8V, 2.5V & 3.3V

+1_5V_SLEEP → R275 0 5% 1/10W FF 805 → +1_5V_AGP — 1.5V
+1_8V_SLEEP → R363 0 5% 1/10W FF 805 → +1_8V_GPU — 1.8V
+1_8V_SLEEP, +2_5V_SLEEP → ATI_MEMIO_LO R312 0 5% 1/10W FF 805, ATI_MEMIO_HI R319 0 5% 1/10W FF 805 → GPU_MEM_IO — 1.8V / 2.5V
+2_5V_SLEEP → OMIT XW7 JUMPER OPEN → +2_5V_GPU — 2.5V
+3V_SLEEP → R379 0 5% 1/10W FF 805 → +3V_GPU — 3.3V

AK29 PVDD
AF23 AVDD0
AF24 AVDD1
AE21 A2VDD0
AF21 A2VDD1
AJ23 A2VDDQ
AH23 VDD1DI
AF20 VDD2DI
F19 VDDRH0
N6 VDDRH1
K25 L25 T25 Y28 K27 AA25 K26 L26 M26 N26 P26 R26 T26 U26 V26 Y26 AA26 AB26 AC26 VDDP
E5 E6 E12 E13 E18 E19 E20 E26 F26 VDDM
E7 H26 E9 E10 E11 E14 E15 E16 E17 E21 E22 E23 E24 E25 VDDR1
AK21 LPVDD
AK11 TPVDD
A7 MPVDD
AE16 LVDDR_18
AF16 LVDDR_18
AG16 LVDDR_25
AF17 LVDDR_25
AG12 TXVDDR0
AG13 TXVDDR1
AG14 TXVDDR2
AG15 TXVDDR3

CRITICAL
U47
RAGE MOBILITY M10-CSP64 64MB BGA (4 OF 6)

PVSS AK30
AVSSQ AF22
A2VSSQ AJ22
AVSSN0 AE22
AVSSN1 AE23
A2VSSN0 AE19
A2VSSN1 AE20
VSS1DI AG23
VSS2DI AF19
VSSRH0 F20
VSSRH1 M6
F5 G5 H5 J5 K5 L5 M5 N5 P5 R5 T5 U5 V5 W5 Y5 AA5 AB5 AC5 AD5 G26 K6 R6 Y6 AA6 F8 F9 F15 F16 F21 F22 H25 J25 J26 VDDR1
AF6 AE7 AF7 AE8 AF8 AE9 AF9 AF10 AD25 AE25 AE26 AF26 VDDR4 VDDR3
AJ21 LPVSS
AJ11 TPVSS
A6 MPVSS
AH16 LVSSR0
AG17 LVSSR1
AH17 LVSSR2
AF18 LVSSR3
AH12 DVOVMODE
AH13 TXVSSR1
AH14 TXVSSR2
AH15 TXVSSR3

MEMORY I/O

+2_5V_SLEEP → U60 MM1571J SOT-25A CRITICAL (150mA MAX)
C833 1uF 20% 10V CERM 603
GPU_CORE_OK
ATI_TPVDD_BYP
C834 0.01uF 20% 16V CERM 402
1_8V_TPVDD_STD
R788 0 5% 1/16W MF 402
+1_8V_ATI_TPVDD → L75 FERR-220-OHM 0402 → +1_8V_GPU_TP_PLL
C835 10uF 20% 6.3V CERM 805
GPU_MEM_IO → L31 FERR-220-OHM 0805
C551 10uF 20% 6.3V CERM 805
C421 0.1uF 20% 10V CERM 402
C456 0.1uF 20% 10V CERM 402
C488 0.1uF 20% 10V CERM 402
C517 0.1uF 20% 10V CERM 402 (1200mA)
GPU_MEM_IO_FLT
C546 0.1uF 20% 10V CERM 402
C545 0.1uF 20% 10V CERM 402
C544 0.1uF 20% 10V CERM 402
C543 0.1uF 20% 10V CERM 402
C541 0.1uF 20% 10V CERM 402
C436 0.1uF 20% 10V CERM 402
C437 0.1uF 20% 10V CERM 402
C540 0.1uF 20% 10V CERM 402
C547 0.1uF 20% 10V CERM 402
C542 0.01uF 20% 16V CERM 402

1.8V DVO POWER (EXT.TMDS)

+1_8V_GPU → EXT_TMDS L81 FERR-10-OHM-500MA SM
+1_8V_GPU_DVO
C535 10uF 20% 6.3V CERM 805
C519 0.1uF 20% 10V CERM 402
C534 0.1uF 20% 10V CERM 402
C521 0.1uF 20% 10V CERM 402
INT_TMDS R843 0 5% 1/16W MF 603 2
+3V_GPU → L33 FERR-10-OHM-500MA SM
+3V_GPU_FLT
C550 10uF 20% 6.3V CERM 805
C518 0.1uF 20% 10V CERM 402
C520 0.1uF 20% 10V CERM 402
C430 0.1uF 20% 10V CERM 402
C880 0.1uF 20% 10V CERM 402
C881 0.1uF 20% 10V CERM 402
C426 0.1uF 20% 10V CERM 402

3.3V IO SUPPLY
(Max Current varies, depends on usage)

+1_8V_GPU → EXT_TMDS R842 0 5% 1/16W MF 402 → ATI_DVOVMODE
INT_TMDS R841 0 5% 1/10W MF 402

M10 POWER

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SIZE	DRAWING NUMBER	REV.
D	051-6338	C
SCALE: NONE	SHT 21 OF 40	

EXTERNAL VIDEO (DVI) INTERFACE

VGA SYNC BUFFERS

+3V_MAIN

U40 74AHC1G32 SM

ATI_VSYNC → ATI_VSYNC_BUF → L38 OMIT FERR-60-OHM-0.1A 0402 → VGA_VSYNC 22 39

U39 74AHC1G32 SM

ATI_HSYNC → ATI_HSYNC_BUF → L36 OMIT FERR-60-OHM-0.1A 0402 → VGA_HSYNC 22 39

PLACE L1002 & L1003 CLOSE TO DVI CONNECTOR

TMDS FILTERING
PLACE CLOSE TO CONNECTOR

L45 90-OHM-300mA 2012H SYM_VER-1 (CRITICAL)
TMDS_DN<0> 39 37 19 → TMDS_CONN_DN<0>
TMDS_DP<0> 39 37 19 → TMDS_CONN_DP<0>

L47 90-OHM-300mA 2012H SYM_VER-1 (CRITICAL)
TMDS_DN<2> → TMDS_DN<2> 39 37 19

L46 90-OHM-300mA 2012H SYM_VER-1 (CRITICAL)
TMDS_DP<2> → TMDS_DP<2> 19 37 39
TMDS_DN<1> → TMDS_DN<1> 39 37 19
TMDS_DP<1> → TMDS_DP<1> 39 37 19

L37 370-OHM SM SYM_VER-1
TMDS_CLKP 37 19 → TMDS_CONN_CLKP 22 36 39
TMDS_CLKN 37 19 → TMDS_CONN_CLKN 22 36 39

ANALOG FILTERING
PLACE CLOSE TO CONNECTOR

L50 0.068uH SM: GPU_B 20 → GPU_B_FILTR → VGA_B 22 39
L49 0.068uH SM: GPU_G 20 → GPU_G_FILTR → VGA_G 22 39
L44 0.068uH SM
L43 0.068uH SM
L41 0.068uH SM: GPU_R 20 → GPU_R_FILTR → VGA_R 22 39
L40 0.068uH SM

C642 4.7pF 5% 50V CERM 402
C641 3.3pF 0.25% 50V CERM 402
R462 75 1% 1/16W MF 402
C635 4.7pF 5% 50V CERM 402
C634 3.3pF 0.25% 50V CERM 402
R458 75 1% 1/16W MF 402
C632 4.7pF 5% 50V CERM 402
C631 3.3pF 0.25% 50V CERM 402
R456 75 1% 1/16W MF 402

DVI DDC CURRENT LIMIT
(55mA requirement per DVI spec)

+5V_SLEEP → F2 0.5AMP-13.2V SM (CRITICAL) → +5V_DDC_SLEEP_UF 38 → L42 400-OHM-EMI SM-1 → +5V_DDC_SLEEP 22 38 39

Isolation required for DVI power switch

D19 MBR0530 SM: DDC_CLK_ISO

J22 QH1112 F-RT-TH (CRITICAL) CHGND1

TMDS_CONN_DN<2> TMDS_CONN_DN<1> TMDS_CONN_DP<2> TMDS_CONN_DP<1>
(TMDS_DN<5>) NC NC (TMDS_DP<5>)
(TMDS_DN<4>) (TMDS_DN<3>) (TMDS_DP<4>) (TMDS_DP<3>)
(+5V_DDC_SLEEP)
DVI_DDC_CLK_UF 39 22 → DVI_DDC_CLK
DVI_DDC_DATA_UF 39 → DVI_DDC_DATA
DVI_HPD_UF 39 22 → DVI_HPD
TMDS_CONN_CLKP 39 36 22 → VGA_VSYNC 22 39
TMDS_CONN_CLKN 39 36 22 → VGA_R 22 39
VGA_B 39 22 → VGA_G 22 39
VGA_HSYNC 39 22 → CHGND2

R476 4.7K 5% 1/16W MF 402
R478 4.7K 5% 1/16W MF 402
R479 100 5% 1/16W MF 402
R477 100 5% 1/16W MF 402
R469 100 5% 1/16W MF 402

C654 100pF 5% 25V CERM 201
C655 100pF 5% 25V CERM 201
C667 0.01uF 20% 50V CERM 603
C653 100pF 5% 25V CERM 201

PLACE NEAR C5A & C5B
R464 0 5% 1/16W MF 402
R463 0 5% 1/16W MF 402
PLACE NEAR 3, 11 & 19

CHGND1 CHGND2

3V LEVEL SHIFTERS

+3V_SLEEP

Q39 2N7002DW SOT-363 (DVI_DDC_CLK)
Q39 2N7002DW SOT-363 (DVI_DDC_DATA)
Q40 2N7002DW SOT-363 (DVI_HPD)

R480 10K 5% 1/16W MF 402 → GPU_DVI_DDC_CLK 20
R474 10K 5% 1/16W MF 402 → GPU_DVI_DDC_DATA 20
R481 100K 5% 1/16W MF 402 → GPU_HPD 20

NOTE: Pulldown for DVI_HPD provided by DVI power switch interface

DVI POWER SWITCH

Power key detect path when system is shutdown or asleep.. DDC_CLK is isolated from NV17M DURING SHUTDOWN. WHEN power key on remote device is pressed, +5V_will be driven into DDC_CLK. Since host rails will be low, TP6610 will turn on, driving SOFT_PWR_ON_L low. As host rails rise, TP6610 will turn off, as will remote device path into DDC_CLK. Isolation will be disabled as well.

Q38 TP6610 SM
DVI_DDC_CLK_UF 39 22 → DVI_TURN_ON → R473 680 5% 1/16W MF 402 → DVI_TURN_ON_1LIM → R460 10K 5% 1/16W MF 402 → DVI_TURN_ON_BASE → Q35 MMDT3904 SOT-363 → SOFT_PWR_ON_L 23 29 33 39
+5V_DDC_SLEEP 39 38 22
R459 330 5% 1/16W MF 402
Pulldown prevents 3904 from turning on when DVI monitor has active, self-powered DDC clock pullup.

Power key detect path when system is running. HPD normally driven to 3.3V. When power key on remote device pressed, HPD will be driven to 5V. COMPARATOR ENABLED BY NV17MAP GPIO.

+3V_SLEEP
R485 68.1K 1% 1/16W MF 402
C668 0.1uF 20% 10V CERM 402
U42 LMC7211 SM
DVI_HPD_UF 39 22 → R472 10K 1% 1/16W MF 402 → DVI_HPD_DIV
R484 100K 1% 1/16W MF 402
R482 10K 1% 1/16W MF 402
HPD_4V_REF
HPD_REF_EN_L
HPD_PWR_SNS_EN 20 → Q40 2N7002DW SOT-363
R483 470K 5% 1/16W MF 402
HPD_PWR_SW_BASE → R475 10K 5% 1/16W MF 402 → Q35 MMDT3904 SOT-363
HPD_PWR_SW → R470 330 5% 1/16W MF 402

LCD INTERFACE
LVDS INTERFACE

LCD POWER SWITCH

+3V_MAIN
R347 100K 5% 1/16W MF 402
C474 2200pF 5% 50V CERM 603
R354 100K 5% 1/16W MF 402
LCD_PWREN_L
LCD_DIGON_L
Q28 2N7002 SM
FP_PWR_EN 22 20 →
TS3P SI3443DV Q29
+3V_LCD_SW 38 → L27 FERR-250-OHM SM → +3V_LCD 39 38 (LVDS DDC POWER)
C503 0.001uF 20% 50V CERM 402
C548 0.001uF 20% 50V CERM 402
CHGND4

+3V_SLEEP
R543 100K 5% 1/10W MF 402
R544 100K 5% 1/16W MF 402
C701 0.001uF 20% 50V CERM 402
LVDS_DDC_CLK 20 22 39
LVDS_DDC_DATA 20 22 39

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

NO STUFF
C702 0.001uF 20% 50V CERM 402

J14 G-501973 F-RT-SM (CRITICAL)
LVDS_DDC_CLK 22 20 39
LVDS_DDC_DATA 22 20 39
LVDS_L0N 37 20 39
LVDS_L0P 37 20 39
LVDS_L1N 37 20 39
LVDS_L1P 37 20 39
LVDS_L2N 39 37 20
LVDS_L2P 39 37 20
CLKLVDS_LN 39 37 20
CLKLVDS_LP 39 37 20
LVDS_U0N 37 20 39
LVDS_U0P 37 20 39
LVDS_U1N 37 20 39
LVDS_U1P 37 20 39
LVDS_U2N 37 20 39
LVDS_U2P 37 20 39
CLKLVDS_UN 37 20
CLKLVDS_UP 37 20
NC
C549 0.001uF 20% 50V CERM 402

R753 0 5% 1/16W MF 402
C819 0.01uF 20% 50V CERM 603
CHGND3

INVERTER INTERFACE

+PBUS
L73 FERR-1K-OHM-EMI SM → +14V_INV 39 38
+5V_MAIN
Q76 FDG6324L SC70-6
+5V_INV_UF_SW 38 → L74 400-OHM-EMI SM-1 → +5V_INV_SW 39 38
R750 100K 5% 1/16W MF 402
FP_PWR_EN_L
FP_PWR_EN 22 20 →
Q76 FDG6324L SC70-6
C812 0.001uF 20% 50V CERM 402
C813 10uF 20% 6.3V CERM 805
CRITICAL J4 SM-2MT
C815 0.001uF 20% 50V CERM 402
L72 400-OHM-EMI SM-1 → BRIGHT_PWM 39
INV_GND 39
C816 0.001uF 20% 50V CERM 402
C19 0.001uF 20% 50V CERM 402
L1 FERR-250-OHM SM
CHGND3

+3V_MAIN
C22 0.1uF 20% 10V CERM 402
INV_ON_PWM 20 →
U2 NC7S32 SC70
BRIGHT_PWM_UF

INVERTER EXPECTS ACTIVE HIGH SIGNAL

S-VIDEO/COMP OUT INTERFACE

Place GND shorts at graphics controller

XW15 SM: GPU_TV_GND1 38 39 → TV_GND1 38 39
L54 FERR-10-OHM-500MA SM

GPU_Y 20 → L53 3.3uH 0603 → TV_C 39
GPU_C 20 → L57 3.3uH 0603 → TV_Y 39
GPU_COMP 20 → L55 3.3uH 0603 → TV_COMP 39

C657 0.01uF 20% 50V CERM 603
C663 560pF 10% 50V CERM 402
C656 560pF 10% 50V CERM 402
C661 560pF 10% 50V CERM 402
C660 560pF 10% 50V CERM 402
C664 560pF 10% 50V CERM 402
C658 560pF 10% 50V CERM 402

CRITICAL J21 MINIDIN RT-TH MH11773-WMR8A
CHGND1

XW14 SM: GPU_TV_GND2 38 → TV_GND2 38 39
L56 FERR-10-OHM-500MA SM
C659 0.01uF 20% 50V CERM 603

Place GND shorts at graphics controller

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
116S1331	2	DISCRETE,RES,33OHM,0402	L36,L38		VGA_BUFFER_RES

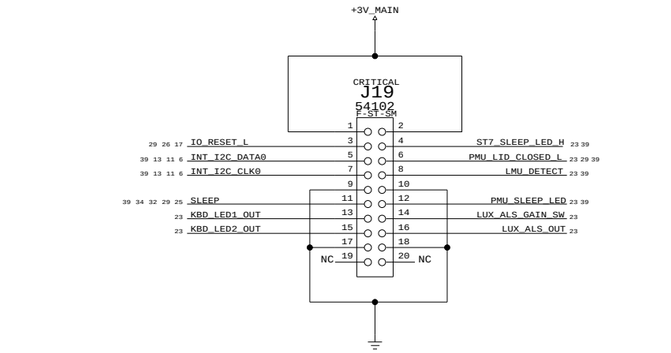
VIDEO CONNECTORS

APPLE COMPUTER INC.

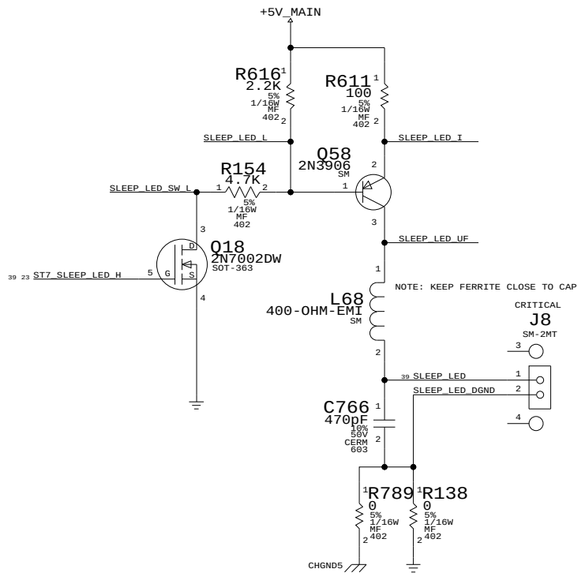
SIZE D | DRAWING NUMBER 051-6338 | REV: C

SCALE NONE | SHT 22 OF 40

LMU/RIGHT SENSOR CONNECTOR

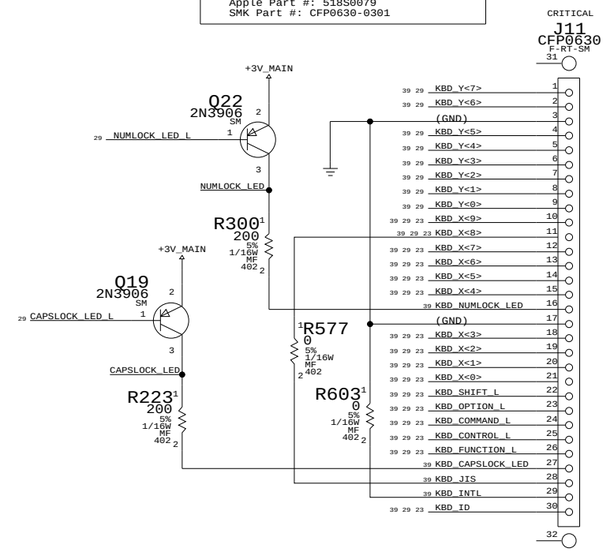


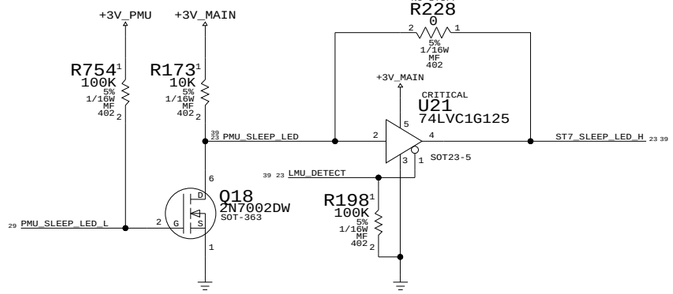
SLEEP LED



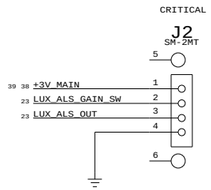
TOP CONTACT ZIF KEYBOARD CONN

CONN,TOP CONTACT ZIF,0.8MM PITCH,30P,SM
Apple Part #: 518S0079
SMK Part #: CFP0630-0301

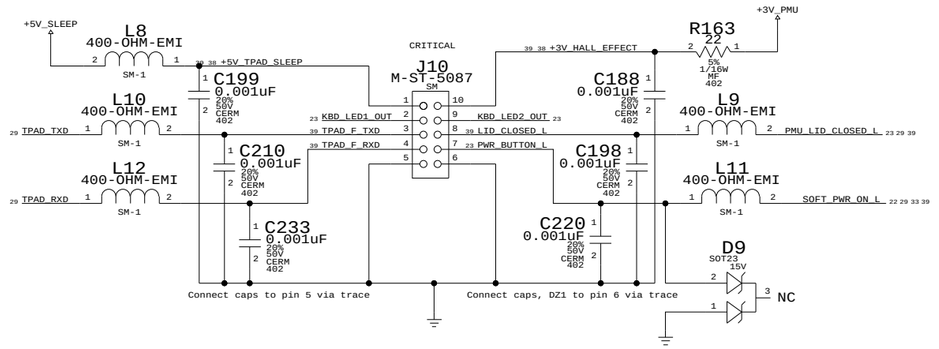




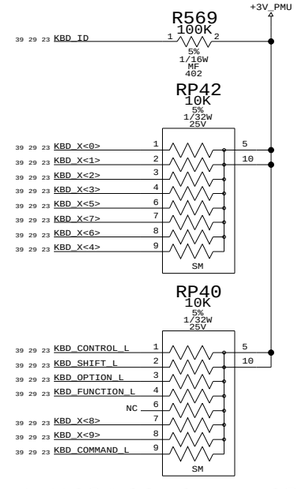
LEFT LIGHT SENSOR CONNECTOR



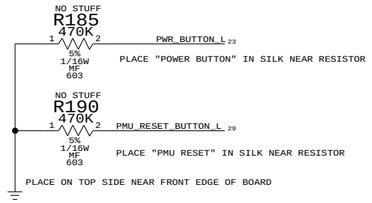
TRACKPAD/PWR BTN CONN



KEYBOARD PULLUPS



DEBUG HELPERS



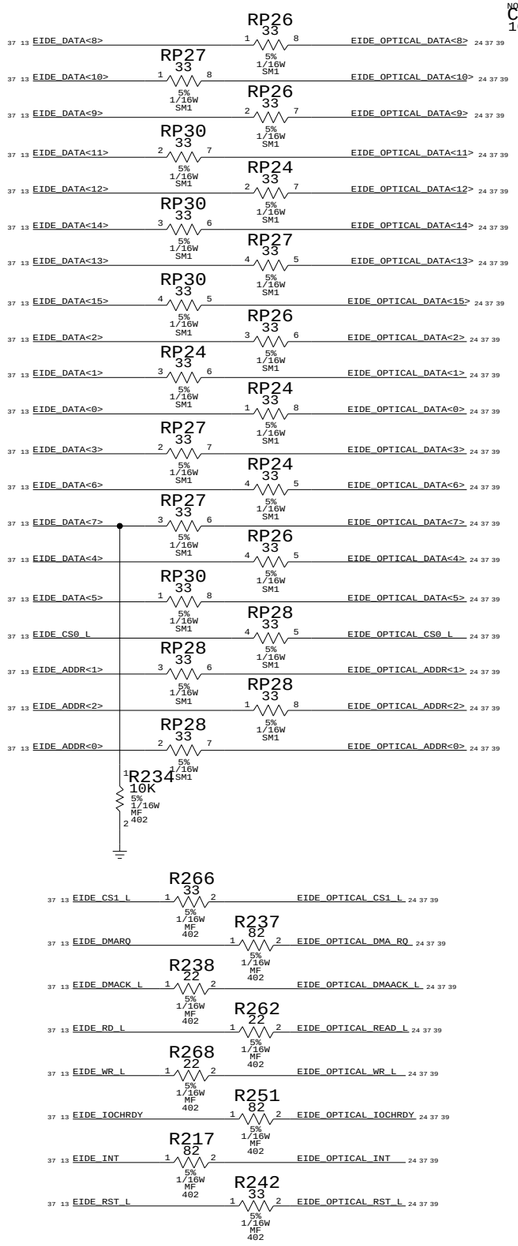
KEYBOARD/TPAD/SLEEP LED

APPLE COMPUTER INC.

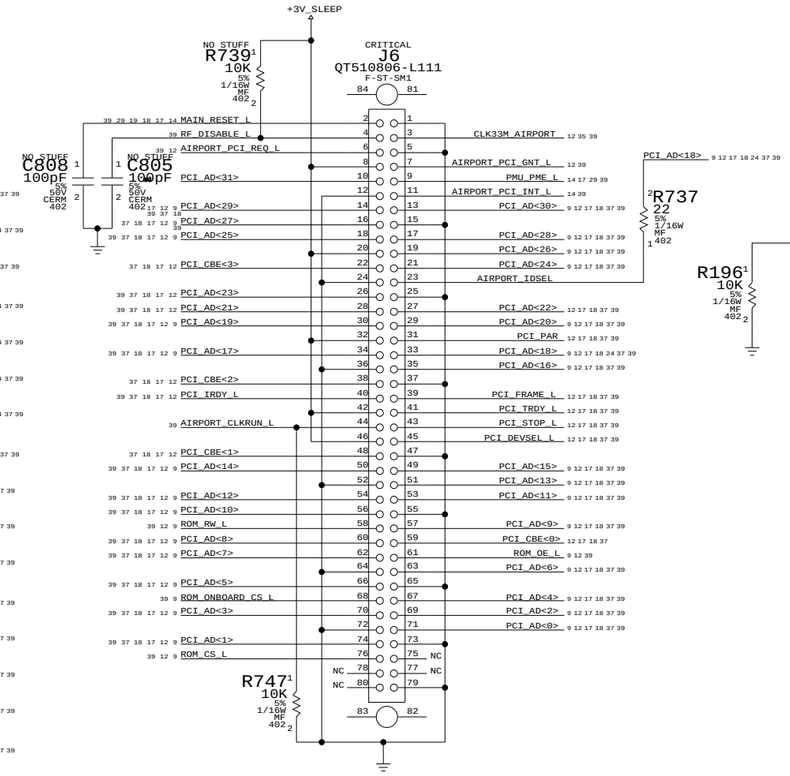
SIZE	DRAWING NUMBER	REV.
D	051-6338	C
SCALE: NONE	SHT 23 OF 40	

EIDE SERIES TERMINATION

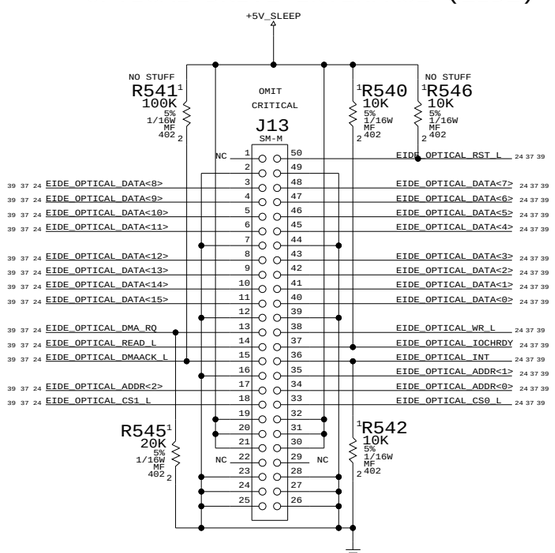
PLACE TERMINATORS NEAR INTREPID



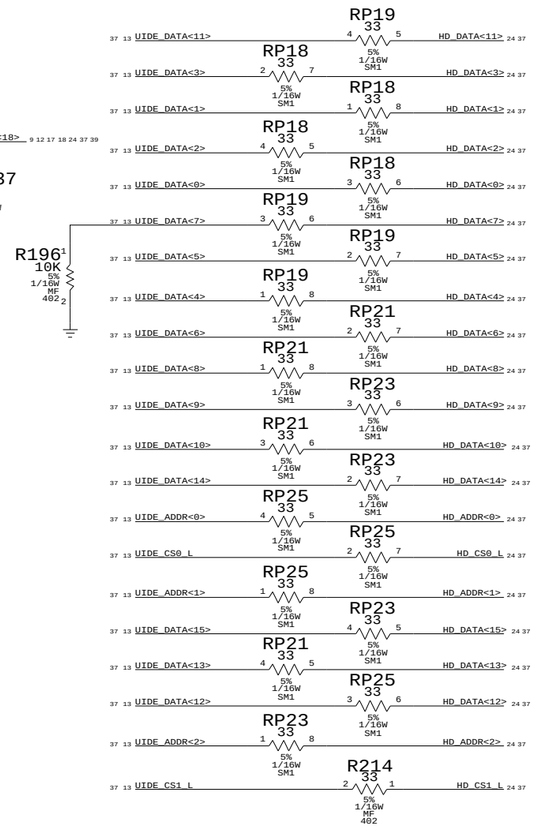
WIRELESS INTERFACE



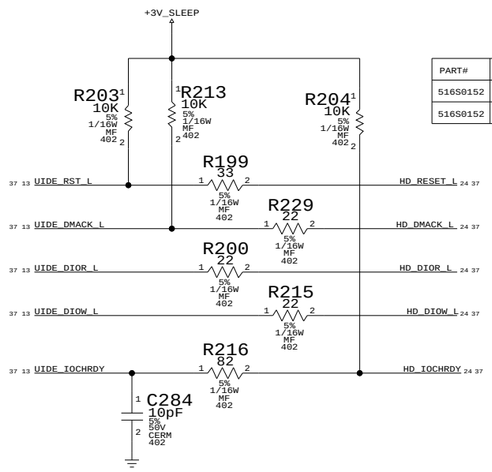
OPTICAL DRIVE INTERFACE (EIDE)



PLACE SERIES R CLOSE TO INTERPID

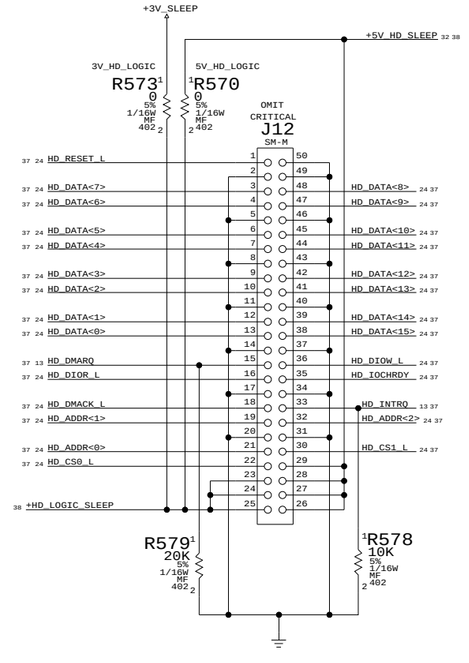


PLACE PULLUP RESISTORS CLOSE TO INTREPID



IOCHRDY - UATA100 REQUIRES PULL-UP TO 3.3V

HARD DRIVE INTERFACE (UATA100)



ANY SEQUENCING REQUIREMENT BETWEEN +5V_HD_SLEEP AND +3V_SLEEP

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
516S0152	1	CONN,PLUG,0.5MM PITCH,1.5MM STACK,50P,GOLD	J12	CRITICAL	?
516S0152	1	CONN,PLUG,0.5MM PITCH,1.5MM STACK,50P,GOLD	J13	CRITICAL	?

INTERNAL I/O CONNECTORS

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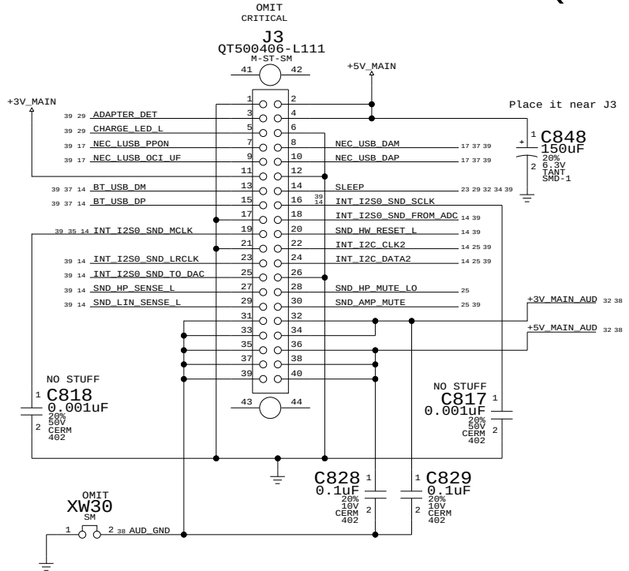
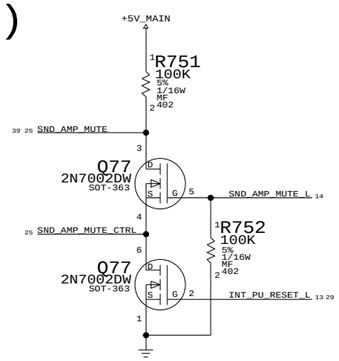
APPLE COMPUTER INC.

SIZE	DRAWING NUMBER	REV.
D	051-6338	C
SCALE: NONE	SHT 24 OF 40	

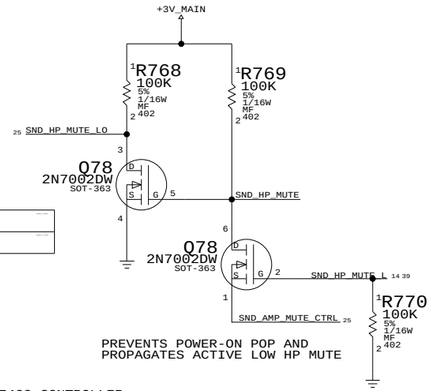
LEFT I/O & AUDIO BOARD (LIO)



PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
516S0154	1	CONN,PLUG,0.5MM PITCH,1.5MM STACK,40P,GOLD	J3	CRITICAL	?

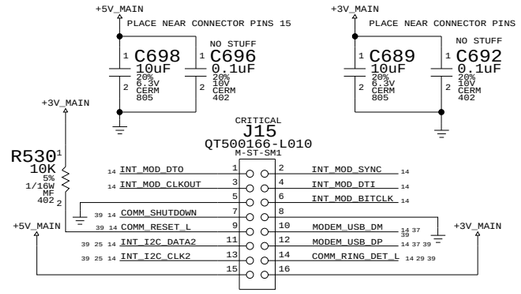


PREVENTS POWER-ON POP AND
GENERATES ACTIVE HIGH SPKR MUTE



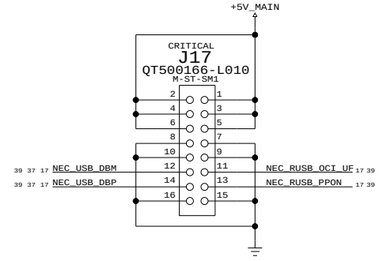
PREVENTS POWER-ON POP AND
PROPAGATES ACTIVE LOW HP MUTE

USB MODEM/SOFT MODEM

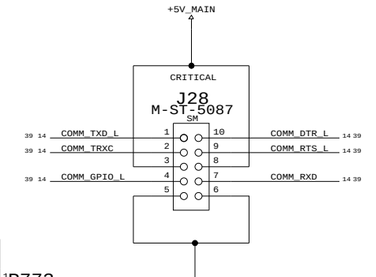


MODEM I2C ADDR ASSIGNED VIA FLEX CABLE

RIGHT USB BOARD

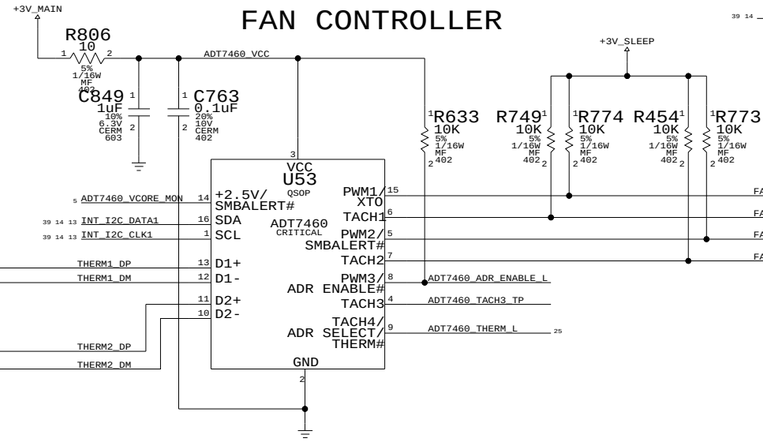


SERIAL DEBUG INTERFACE

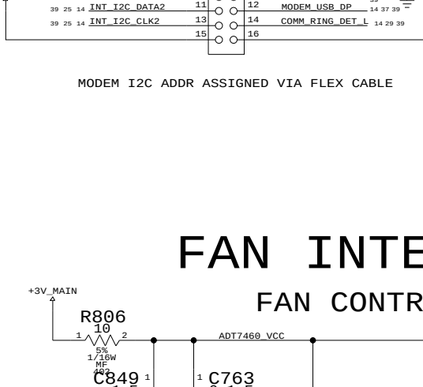


FAN INTERFACE

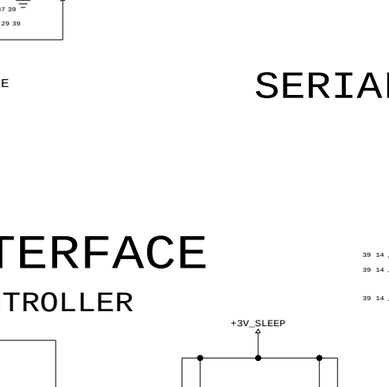
FAN CONTROLLER



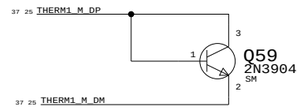
CPU FAN



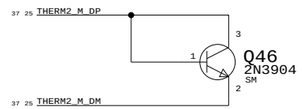
GPU FAN



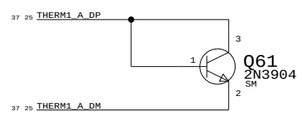
PLACE CLOSE TO CPU
MAIN1



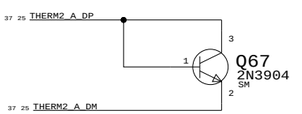
PLACE IN BETWEEN 3/5/1.5/2.5V PWR SUPPLY
MAIN2



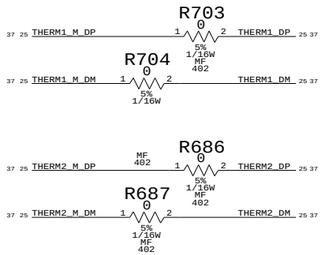
PLACE UNDERNEATH UPPER RAM
ALTERNATE1



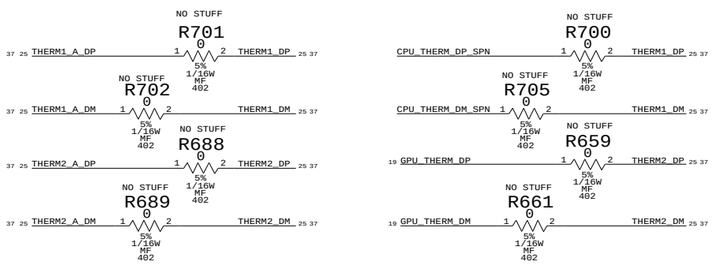
PLACE CLOSE TO BATTERY CHARGER/VCORE
ALTERNATE2



KEEP STUFFING RESISTORS CLOSE TO ADT7460 CONTROLLER



KEEP STUFFING RESISTORS CLOSE TO ADT7460 CONTROLLER



FAN/MODEM/SOUND/BACKUP BATT.

APPLE COMPUTER INC.

SIZE	DRAWING NUMBER	REV.
D	051-6338	C
SCALE: NONE	SHT 25 OF 40	

Ethernet routing priority:
1. Decoupling caps
2. TX SERIES TERMINATION - LOCATE NEAR LINK
3. RX SERIES TERMINATION - LOCATE NEAR PHY

All differential signals should be close, parallel, matched lengths, with minimum via count, and short if possible

Must maintain 50-ohms trace impedance on all MDI pairs and all RJ45 pairs

Sandwich each RJ54 pair between chassis grounds

+3V_MAIN

C680 10uF 20% 6.3V CERM 805

NO STUFF R513 0 5% 1/10W MF 402

3405_MODE

R507 0 5% 1/10W MF 402

U45 LTC3405 SOT23-6 CRITICAL
VIN, RUN, MODE, GND, SW, VFB

LTC3405_SW 38

CRITICAL L60 3.3uH SM1

+1.0V_MARVELL 38

R506 665K 1% 1/16W MF 402 R2A

C675 22pF 5% 50V CERM 402

R504 49.9K 1% 1/16W MF 402 R2B

C674 10uF 20% 6.3V CERM 805

3405_VFB

R503 182K 1% 1/16W MF 402 R1

VOUT = 0.8V*(1+R2EQV/R1)
R2EQV = R2A||R2B

PLACE ALL SERIES RES CLOSE TO PHY

R423 0 5% 1/16W MF 402 — 35 13 CLKENET_LINK_TX — 35 CLKENET_PHY_TX

R421 0 5% 1/16W MF 402 — 35 13 CLKENET_LINK_RX — 35 CLKENET_PHY_RX

R445 0 5% 1/16W MF 402 — 35 13 CLKENET_LINK_GBE_REF — 35 CLKENET_PHY_GBE_REF

NO STUFF C851 10pF 5% 50V CERM 402

C852 10pF 5% 50V CERM 402

Keep C851 & C852 Stubs short

CRITICAL U43 88E1111 BCC

TX_CLK	4	37 13 ENET_PHY_TXD<0> 11 TXD0
RX_CLK	2	37 13 ENET_PHY_TXD<1> 12 TXD1
125CLK	22	37 13 ENET_PHY_TXD<2> 14 TXD2
		37 13 ENET_PHY_TXD<3> 16 TXD3
		37 13 ENET_PHY_TXD<4> 17 TXD4
		37 13 ENET_PHY_TXD<5> 18 TXD5
		37 13 ENET_PHY_TXD<6> 19 TXD6
		37 13 ENET_PHY_TXD<7> 20 TXD7
		37 13 ENET_PHY_TX_EN 9 TX_EN
		37 13 ENET_PHY_TX_ER 7 TX_ER
		35 13 CLKENET_PHY_GTX 8 GTX_CLK
		37 13 ENET_LINK_RXD<0> 95 RXD0
		37 13 ENET_LINK_RXD<1> 92 RXD1
		37 13 ENET_LINK_RXD<2> 93 RXD2
		37 13 ENET_LINK_RXD<3> 91 RXD3
		37 13 ENET_LINK_RXD<4> 90 RXD4
		37 13 ENET_LINK_RXD<5> 89 RXD5
		37 13 ENET_LINK_RXD<6> 87 RXD6
		37 13 ENET_LINK_RXD<7> 86 RXD7
		37 13 ENET_RX_DV 94 RX_DV
		37 13 ENET_RX_ER 3 RX_ER
		37 13 ENET_CRS 84 CRS
		37 13 ENET_COL 83 COL
		37 13 ENET_MDC 25 MDC
		37 13 ENET_MDIO 24 MDIO
		14 ENET_ENERGY_DET 23 INT-/INT+
		ENET_RST_L 28 RESET
		ENET_COMA 27 COMA
		NC 82 S_IN+
		NC 81 S_IN-
		NC 77 S_OUT+
		NC 75 S_OUT-
		NC 79 S_CLK+
		NC 80 S_CLK-
		ENET_HSDACP 37 HSDAC+
		ENET_HSDACM 38 HSDAC-
		CLK25M_ENET_XIN 55 XTAL1
		CLK25M_ENET_XOUT 54 XTAL2
		ENET_VSSC 53 VSSC
		97 GND

CTRL10 51 NC

DVDD: 1, 6, 15, 57, 62, 67, 71, 85

C594 0.1uF 20% 10V CERM 402
C601 0.01uF 20% 10V CERM 402
C608 0.1uF 20% 10V CERM 402
C619 0.01uF 20% 10V CERM 402
C603 0.1uF 20% 10V CERM 402
C599 0.01uF 20% 10V CERM 402

PLACE CAPS (IN ORDER) ON PINS 1, 6, 10/15, 57/62, 67/71, 85

VDDO: 5, 21, 88, 96

C597 0.1uF 20% 10V CERM 402
C612 0.01uF 20% 10V CERM 402
C623 0.1uF 20% 10V CERM 402
C600 0.01uF 20% 10V CERM 402
C598 0.1uF 20% 10V CERM 402
C595 10uF 20% 6.3V CERM 805

38 26 +2_5V_MARVELL

PLACE CAPS (IN ORDER) ON PINS 5, 21/26, 48/52, 66/72, 88, 96

+2_5V_MAIN

R442 0 5% 1/16W MF 603

C646 0.1uF 20% 10V CERM 402
C648 0.1uF 20% 10V CERM 402
C645 0.1uF 20% 10V CERM 402
C647 0.1uF 20% 10V CERM 402

PLACE CAPS AT CONNECTOR PINS 5 & 6

VDDOH: 52, 66, 72

VDDOX: 26, 48

38 +2_5V_MARVELL_AVDD

L35 FERR-EMI-600-OHM SM

AVDD: 32, 35, 36, 40, 45, 78

C614 0.1uF 20% 10V CERM 402
C616 0.01uF 20% 10V CERM 402
C618 0.1uF 20% 10V CERM 402
C602 0.01uF 20% 10V CERM 402
C592 10uF 20% 6.3V CERM 805

PLACE CAPS (IN ORDER) ON PINS 32/35, 36/40, 45 & 78

MDI0+	29	39 37 MDI_P<0>
MDI0-	31	39 37 MDI_M<0>
MDI1+	33	39 37 MDI_P<1>
MDI1-	34	39 37 MDI_M<1>
MDI2+	39	39 37 MDI_P<2>
MDI2-	41	39 37 MDI_M<2>
MDI3+	42	39 37 MDI_P<3>
MDI3-	43	39 37 MDI_M<3>
LED_LINK10	76	LED_LINK10
LED_LINK100	74	LED_LINK100
LED_LINK1000	73 NC	
LED_DUPLEX	70 NC	
LED_RX	69	LED_RX_SPN
LED_TX	68 NC	
CONFIG0	65	(000)
CONFIG1	64	(000)
CONFIG2	63	(111)
CONFIG3	61	(110)
CONFIG4	60	(111)
CONFIG5	59	(101)
CONFIG6	58	(000)
TDI	44	JTAG_ENET_TDI 13
TDO	50	JTAG_ASIC_TDO_TP 39
TCK	49	JTAG_ASIC_TCK 13 39
TMS	46	JTAG_ASIC_TMS 13 39
TRST	47	JTAG_ASIC_TRST_L 13 39
RSET	30	ENET_RSET
SEL_OSC	56 NC	
SEL_2.5V	13	

SEE CONFIG TABLES (BELOW)

R433 49.9 1% 1/16W MF 402 — R434 49.9 1% 1/16W MF 402 — MDI0_PD — C622 0.01uF 20% 10V CERM 402
R435 49.9 1% 1/16W MF 402 — R436 49.9 1% 1/16W MF 402 — MDI1_PD — C613 0.01uF 20% 10V CERM 402
R437 49.9 1% 1/16W MF 402 — R438 49.9 1% 1/16W MF 402 — MDI2_PD — C615 0.01uF 20% 10V CERM 402
R439 49.9 1% 1/16W MF 402 — R440 49.9 1% 1/16W MF 402 — MDI3_PD — C617 0.01uF 20% 10V CERM 402

PLACE RESISTORS CLOSE TO PHY

CRITICAL J23 MJ-R0016 F-RT-TH

PRIMARY

13		
11		
5	ENET_CTAP	
6	ENET_CTAP	
1	MDI_0+	1CT:1CT, 75 OHM
2	MDI_0-	
3	MDI_1+	1CT:1CT, 75 OHM
4	MDI_1-	
7	MDI_2+	1CT:1CT, 75 OHM
8	MDI_2-	
9	MDI_3+	1CT:1CT, 75 OHM
10	MDI_3-	
12		
14		

RJ45 CHIP SIDE

CHGND1

SECONDARY: J1, J2, J3, J4, J5, J6, J7, J8

RJ45 CABLE SIDE

SHIELD — 1000PF, 2000V

D15 1N914 SOT23

14 INT_ENET_RST_L — 29 23 17 IO_RESET_L

Q32 2N7002DW SOT-363 — 30 29 28 AC_IN

Q32 2N7002DW SOT-363 — 34 33 32 20 18 SLEEP_L_LS5

C611 2.2uF 20% 10V CERM 805

PLACES PHY IN "COMA" MODE WHEN ASLEEP ON BATTERY (SAVES POWER)

38 26 +2_5V_MARVELL

R431 10K 5% 1/16W MF 402
R430 10K 5% 1/16W MF 402
R432 1.5K 5% 1/16W MF 402
R422 1K 5% 1/16W MF 402

NO STUFF R425 20K 5% 1/16W MF 402

R441 0 5% 1/16W MF 402

CRITICAL Y5 SM-3 25.0000M

CLK25M_XTAL_IN

C604 27pF 5% 50V CERM 402
C624 27pF 5% 50V CERM 402

PUT CRYSTAL CIRCUIT CLOSE TO PHY

Y6 LOAD CAPACITANCE IS 16PF

NO STUFF R424 49.9 1% 1/16W MF 402
NO STUFF R429 49.9 1% 1/16W MF 402
R428 10K 5% 1/16W MF 402
R427 4.99K 1% 1/16W MF 402

CONFIG DEFINITIONS	
PIN	BIT[2:0]
VDDO	111
LED_LINK10	110
LED_LINK100	101
LED_LINK1000	100
LED_DUPLEX	011
LED_RX	010
LED_TX	001
VSS	000

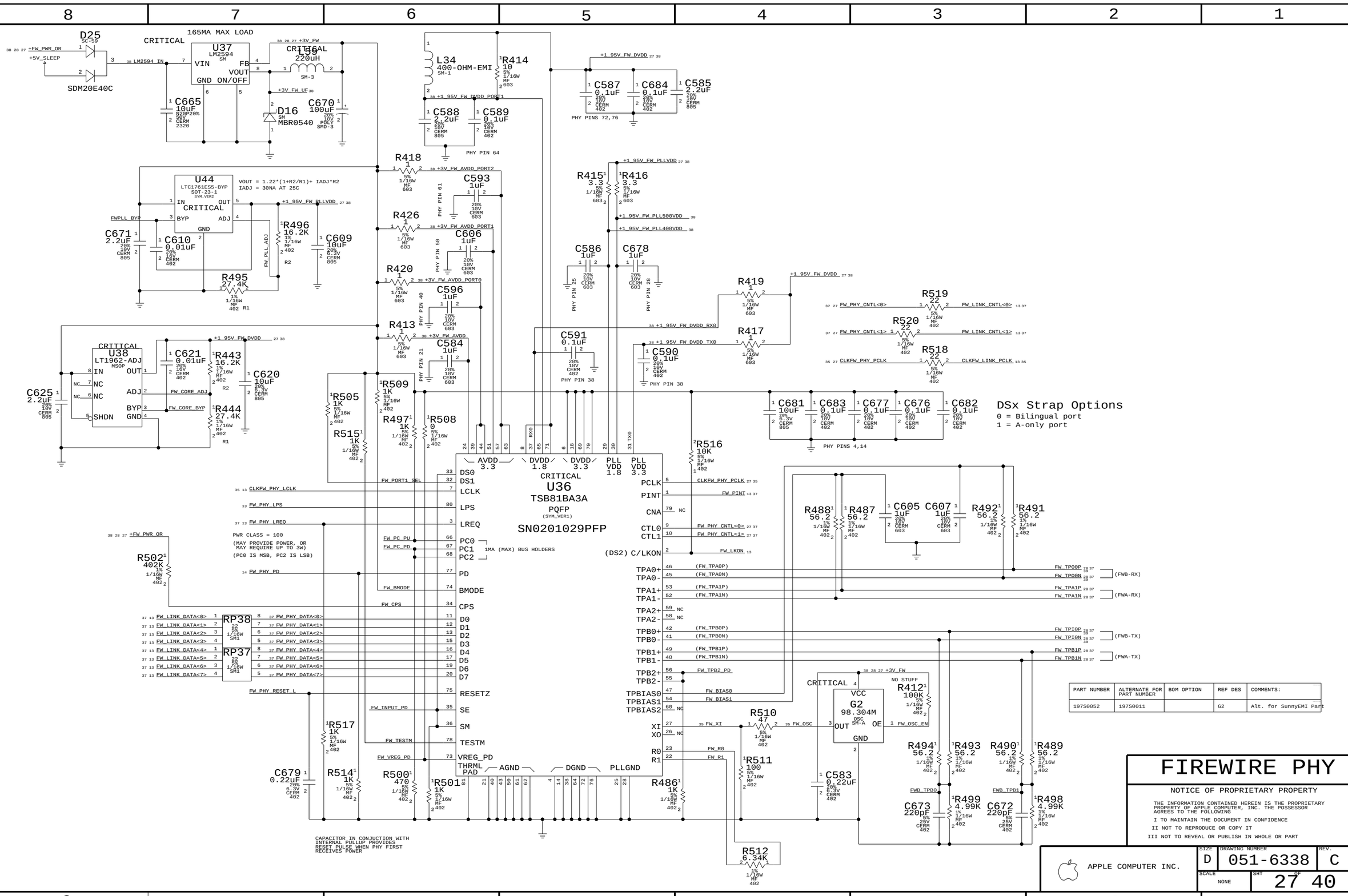
CONFIG INPUTS			
PIN	BIT[2]	BIT[1]	BIT[0]
CONFIG<0>	PHYADR[2]	PHYADR[1]	PHYADR[0]
CONFIG<1>	ENA_PAUSE	PHYADR[4]	PHYADR[3]
CONFIG<2>	ANEG[3]	ANEG[2]	ANEG[1]
CONFIG<3>	ANEG[0]	ENA_XC	DIS_125
CONFIG<4>	MODE[2]	MODE[1]	MODE[0]
CONFIG<5>	DIS_FC	DIS_SLEEP	MODE[3]
CONFIG<6>	SEL_BDT	INT_POL	75/50 OHM

MARVELL 88E1111

10/100/1000 ETHERNET

APPLE COMPUTER INC.

SIZE	DRAWING NUMBER	REV.
D	051-6338	C
SCALE: NONE	SHT 26 OF 40	


D25
SC-59
SDM20E40C
+FW_PWR_OR
+5V_SLEEP
165MA MAX LOAD
CRITICAL
U37
LM2594
SM
VIN
FB
VOUT
GND ON/OFF
LM2594_IN
+3V_FW
L35
220uH
SM-3
+3V_FW_UF
D16
SM
MBR0540
C665
10uF
C670
100uF
POLY
SMD-3
L34
400-OHM-EMI
SM-1
R414
10
C588
2.2uF
C589
0.1uF
PHY PIN 64
+1.95V_FW_DVDD
C587
0.1uF
C684
0.1uF
C585
2.2uF
PHY PINS 72,76
U44
LTC1761ES5-BYP
SOT-23-1
VOUT = 1.22*(1+R2/R1)+ IADJ*R2
IADJ = 30NA AT 25C
IN
OUT
BYP
ADJ
GND
FWPLL_BYP
+1.95V_FW_PLLVDD
R496
16.2K
R2
C671
2.2uF
C610
0.01uF
C609
10uF
FW_PLL_ADJ
R495
27.4K
R1
R418
C593
1uF
PHY PIN 61
R426
C606
1uF
PHY PIN 50
R420
C596
1uF
PHY PIN 40
R413
C584
1uF
PHY PIN 21
+3V_FW_AVDD_PORT2
+3V_FW_AVDD_PORT1
+3V_FW_AVDD_PORT0
+3V_FW_AVDD
R415
3.3
R416
3.3
+1.95V_FW_PLL500VDD
+1.95V_FW_PLL400VDD
C586
1uF
C678
1uF
PHY PIN 25
PHY PIN 28
R419
R417
+1.95V_FW_DVDD_RX0
+1.95V_FW_DVDD_TX0
C591
0.1uF
C590
0.1uF
PHY PIN 38
R519
22
R520
22
R518
22
FW_PHY_CNTL<0>
FW_PHY_CNTL<1>
CLKFW_PHY_PCLK
FW_LINK_CNTL<0>
FW_LINK_CNTL<1>
CLKFW_LINK_PCLK
CRITICAL
U38
LT1962-ADJ
MSOP
NC
SHDN
FW_CORE_ADJ
FW_CORE_BYP
C621
0.01uF
R443
16.2K
C620
10uF
C625
2.2uF
R444
27.4K
R505
1K
R509
1K
R497
1K
R508
0
R515
1K
C681
10uF
C683
0.1uF
C677
0.1uF
C676
0.1uF
C682
0.1uF
PHY PINS 4,14
DSx Strap Options
0 = Bilingual port
1 = A-only port
U36
TSB81BA3A
PQFP
(SYM_VER1)
SN0201029PFP
CRITICAL
AVDD 3.3
DVDD 1.8
DVDD 3.3
PLL VDD 1.8
PLL VDD 3.3
AGND
DGND
PLLGND
DS0
DS1
LCLK
LPS
LREQ
PC0
PC1
PC2
PD
BMODE
CPS
D0
D1
D2
D3
D4
D5
D6
D7
RESETZ
SE
SM
TESTM
VREG_PD
THRML PAD
PCLK
PINT
CNA
CTL0
CTL1
(DS2) C/LKON
TPA0+
TPA0-
TPA1+
TPA1-
TPA2+
TPA2-
TPB0+
TPB0-
TPB1+
TPB1-
TPB2+
TPB2-
TPBIAS0
TPBIAS1
TPBIAS2
XI
XO
R0
R1
FW_PORT1_SEL
CLKFW_PHY_LCLK
FW_PHY_LPS
FW_PHY_LREQ
FW_PC_PU
FW_PC_PD
FW_PHY_PD
FW_BMODE
FW_CPS
FW_PHY_RESET_L
FW_INPUT_PD
FW_TESTM
FW_VREG_PD
FW_PINT
FW_PHY_CNTL<0>
FW_PHY_CNTL<1>
FW_LKON
(FW_TPA0P)
(FW_TPA0N)
(FW_TPA1P)
(FW_TPA1N)
(FW_TPB0P)
(FW_TPB0N)
(FW_TPB1P)
(FW_TPB1N)
FW_TPB2_PD
FW_BIAS0
FW_BIAS1
FW_XI
FW_R0
FW_R1
1MA (MAX) BUS HOLDERS
PWR CLASS = 100
(MAY PROVIDE POWER, OR
MAY REQUIRE UP TO 3W)
(PC0 IS MSB, PC2 IS LSB)
R502
402K
RP38
22
RP37
22
FW_LINK_DATA<0>
FW_LINK_DATA<1>
FW_LINK_DATA<2>
FW_LINK_DATA<3>
FW_LINK_DATA<4>
FW_LINK_DATA<5>
FW_LINK_DATA<6>
FW_LINK_DATA<7>
FW_PHY_DATA<0>
FW_PHY_DATA<1>
FW_PHY_DATA<2>
FW_PHY_DATA<3>
FW_PHY_DATA<4>
FW_PHY_DATA<5>
FW_PHY_DATA<6>
FW_PHY_DATA<7>
R517
1K
R514
1K
R500
470
R501
1K
R486
1K
R516
10K
R510
47
R511
100
R512
6.34K
C679
0.22uF
C583
0.22uF
CAPACITOR IN CONJUCTION WITH
INTERNAL PULLUP PROVIDES
RESET PULSE WHEN PHY FIRST
RECEIVES POWER
CRITICAL
NO STUFF
VCC
G2
98.304M
OSC
SM-A
OUT
OE
GND
FW_OSC_EN
FW_OSC
+3V_FW
R412
100K
R488
56.2
R487
56.2
C605
1uF
C607
1uF
R492
56.2
R491
56.2
R494
56.2
R493
56.2
R490
56.2
R489
56.2
R499
4.99K
R498
4.99K
C673
220pF
C672
220pF
FWB_TPB0
FWB_TPB1
FW_TPO0P
FW_TPO0N
FW_TPA1P
FW_TPA1N
FW_TPI0P
FW_TPI0N
FW_TPB1P
FW_TPB1N
(FWB-RX)
(FWA-RX)
(FWB-TX)
(FWA-TX)
PART NUMBER | ALTERNATE FOR PART NUMBER | BOM OPTION | REF DES | COMMENTS:
197S0052 | 197S0011 | | G2 | Alt. for SunnyEMI Part
FIREWIRE PHY
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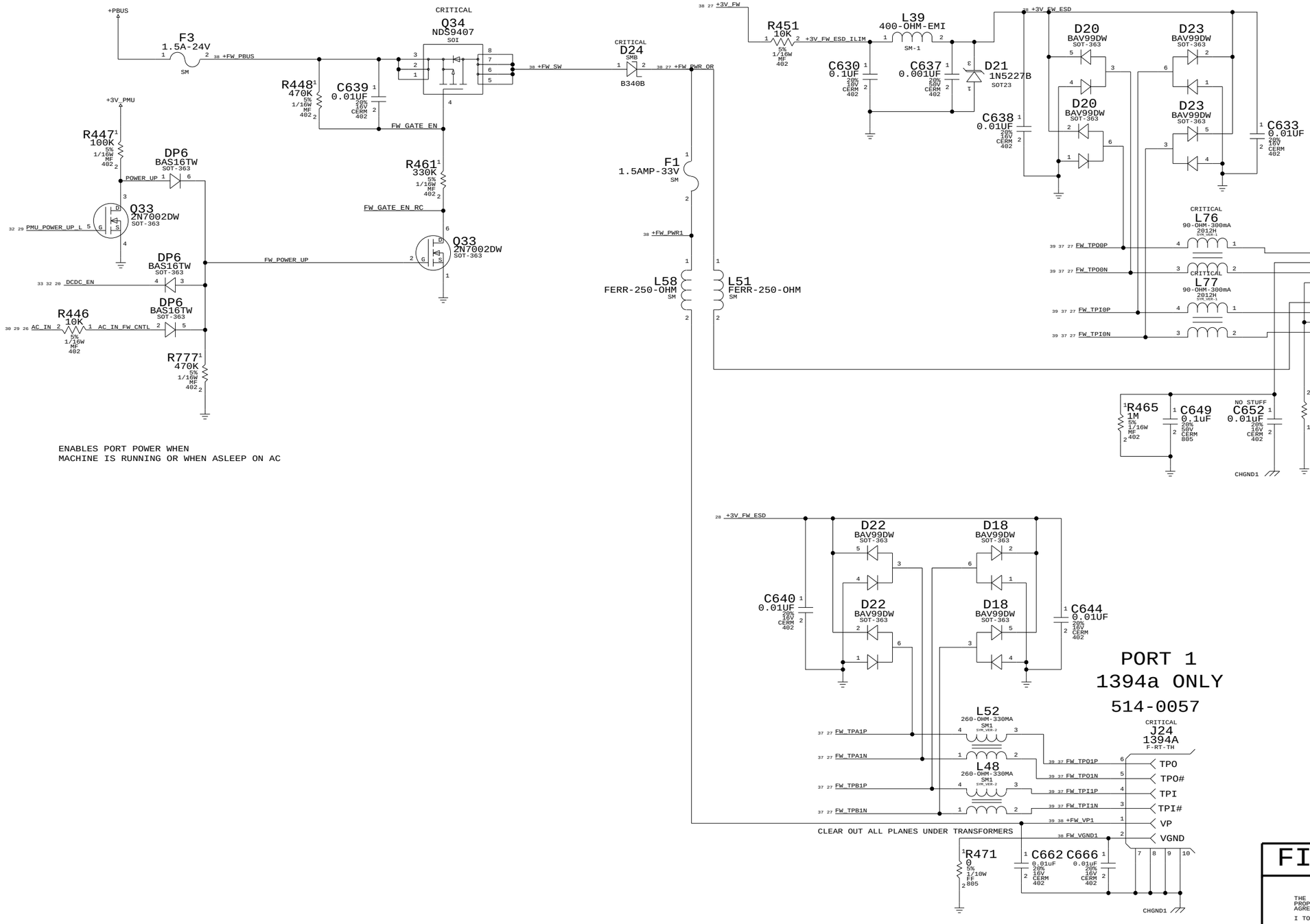
APPLE COMPUTER INC.
SIZE D
DRAWING NUMBER 051-6338
REV. C
SCALE NONE
SHT 27 OF 40

PORT POWER SWITCH



ENABLES PORT POWER WHEN
MACHINE IS RUNNING OR WHEN ASLEEP ON AC

PORT 0
1394a/b
(BILINGUAL)
514S0058

AREF NEEDS TO BE ISOLATED FROM
ALL LOCAL GROUNDS PER 1394B SPEC
SO WHEN A BILINGUAL DEVICE IS
PLUGGED TO A BETA-ONLY DEVICE,
THERE'S NO DC PATH BETWEEN THEM
(TO AVOID GROUND OFFSET ISSUE)

BREF SHOULD BE HARD CONNECTED TO
LOGIC GROUND FOR SPEED SIGNALING
AND CONNECTION DETECTION CURRENTS
PER 1394B V1.33

CLEAR OUT ALL PLANES UNDER TRANSFORMERS

PORT 1
1394a ONLY
514-0057

FIREWIRE PORTS

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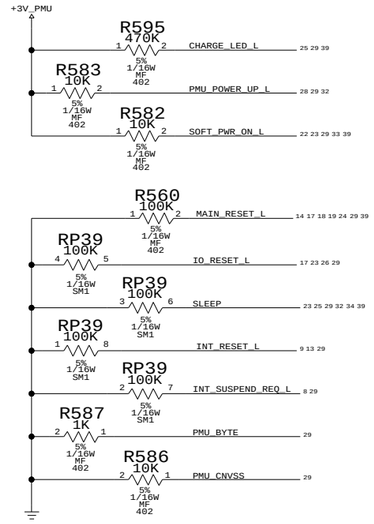
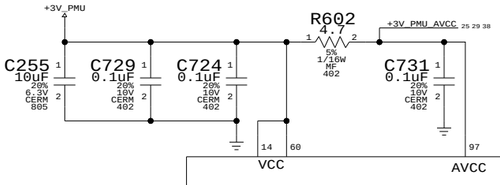
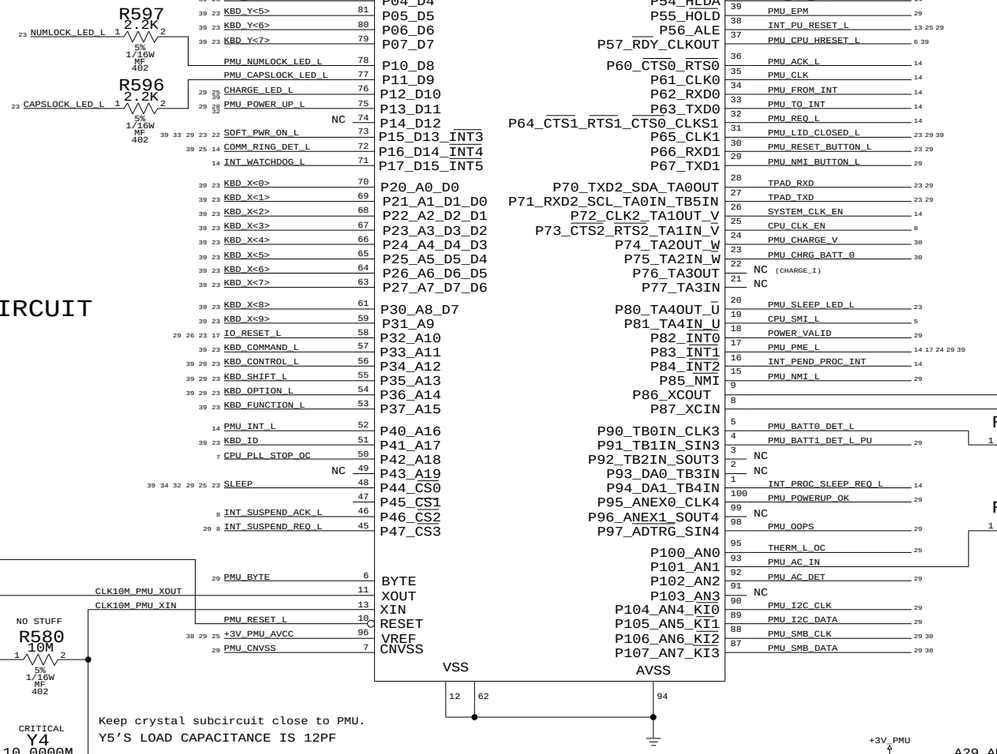
APPLE COMPUTER INC.

SIZE	DRAWING NUMBER	REV.
D	051-6338	C

SCALE	SHT OF
NONE	28 OF 40

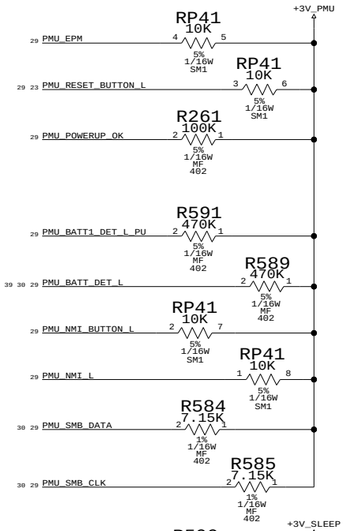




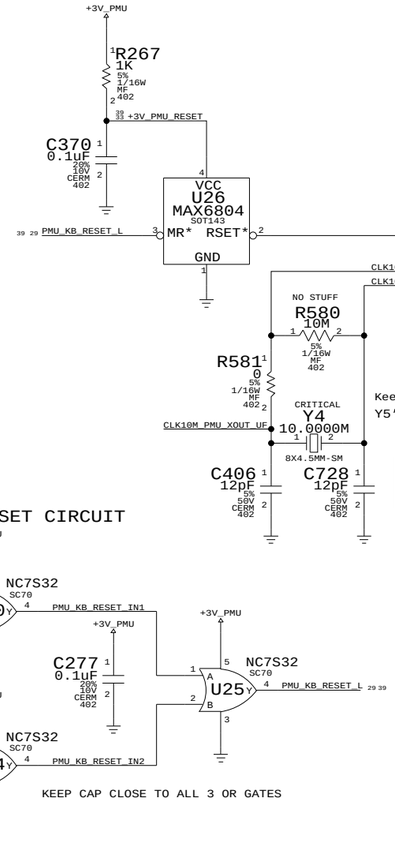


CPU_VCORE_HI_OC/PMU_AP should have a pulldown for coming out of reset. HLB will have a pull-up to +3V_MAIN or +3V_SLEEP, which will act as our pulldown since both are off during PMU reset.

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	BOM OPTION
341S1008	1	IC,PMU,V81B	U29	



UNDERVOLTAGE RESET CIRCUIT



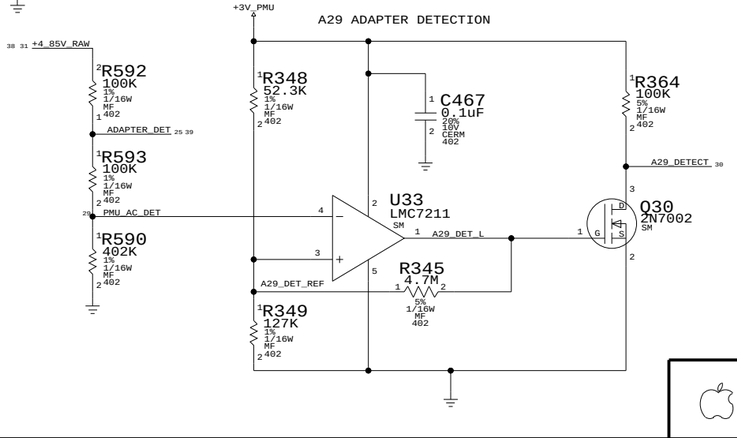
Keep crystal subcircuit close to PMU.
Y5'S LOAD CAPACITANCE IS 12PF

PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
197S0604	197S0041		Y4	Alt. for Siward Part

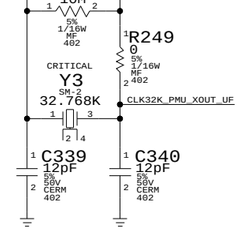
PMU KEYBOARD RESET CIRCUIT

KEEP CAP CLOSE TO ALL 3 OR GATES

ADAPTER IDs		
ADAPTER	ID RANGE	PIN VOLTAGE
Q11 (65W)	1.65-2.31V	2.007-2.066V
A29 (45W)	2.31-2.97V	2.558-2.661V
AIRLINE	0.33-0.99V	0.589-0.663V



Keep crystal subcircuit close to PMU.



Y3'S LOAD CAPACITANCE IS 12.5PF

PMU

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APPLE COMPUTER INC.

SIZE	DRAWING NUMBER	REV.
D	051-6338	C
SCALE: NONE	SHT 29 OF 40	

DC POWER INPUT

(POWER JACK, ETC. ON SEPARATE BOARD)

CRITICAL
J27
87438-0433
M-RT-SM

+ADAPTER

C35 0.1uF 10% 50V X7R 603

DC INRUSH LIMITER

Q68 SI4435DY SOI

R21 330K 5% 1/10W MF 402

C11 0.1uF 20% 50V CERM 805

GATE

AC_ENABLE_GATE

R51 20K 1% 1/16W MF 402

+3V_PMU

R40 97.6K 1% 1/16W MF 402

R16 100K 1% 1/10W MF 402

C801 0.01uF 20% 16V CERM 402

R15 10K 5% 1/16W MF 402

R29 470K 5% 1/16W MF 402

AC_ENABLE_L

38 31 1V20_REF

U1 LMC7211 SM

Q1 2N7002DW SOT-363

AC_DIV

AC_IN 26 28 29 30

R41 1M 5% 1/16W MF 402

AC_IN_L 30

R42 10K 1% 1/16W MF 402

R30 57.6K 1% 1/16W MF 402

Q1 2N7002DW SOT-363

R22 470K 5% 1/16W MF 402

GREATER THAN 13.1V DETECT

BACKFEED PROTECTION

Q69 SI4435DY SOI

38 +ADAPTER_SW

+ADAPTER_SENSE 38

BKFD_PROT_GATE

C803 0.1uF 20% 16V CERM 402

R732 47K 5% 1/16W MF 402

R734 68K 5% 1/16W MF 402

BKFD_PROT_EN_L

30 29 28 26 AC_IN

Q9 2N7002DW SOT-363

CRITICAL
U3 MAX4172 TSSOP

RS+ RS- PG OUT GND V+

NC NC NC1 NC2

C36 0.01uF 20% 50V CERM 603

+24V_PBUS

CRITICAL
R77 2.21K 0.1% 1/16W MF 603

MAX4172_OUT

PLACE U24 NEXT TO R382

+PBUS CURRENT LIMIT

R728 1K 1% 1/16W MF 402

IAC_RC_COMP

C798 0.1uF 20% 16V CERM 402

+3V_PMU

C794 0.1uF 20% 16V CERM 402

CRITICAL
R745 42.2K 0.1% 1/16W FF 603

IAC_FB

U55 LMC7111 SOT23-5

PLACE R383 CLOSE TO LTC1625

ROUTE LTC1625_ITH CAREFULLY

DP1 BAS16TW SOT-363

LTC1625_ITH

R119 150 1% 1/16W MF 402

1625_COMP 31

ADAPTER_I_REG

R727 10K 1% 1/16W MF 402

Place close to RS-

C826 0.01uF 20% 50V CERM 603

CURRENT_THRESHOLD

CRITICAL
R736 42.2K 0.1% 1/16W FF 603

CRITICAL
R738 82.5K 0.1% 1/16W FF 603

CRITICAL
R742 51.1K 0.1% 1/16W FF 603

A29_CURRENT_ADJ

Q2 2N7002DW SOT-363

R744 100K 5% 1/16W MF 402

OVER_18V_ADJ

Q74 2N7002DW SOT-363

30 29 A29_DETECT

AC_GTR_18V 5

Q74 2N7002DW SOT-363

30 1772_ACOK_L

C809 1uF 20% 16V CERM 603

BATTERY SWITCH-OVER CIRCUIT

+BATT

+24V_PBUS

F5 5AMP-125V SM-2

+PBUS

F4 5AMP-125V SM-2

38 +BATT_24V_FUSE

38 +BATT_14V_FUSE

CRITICAL
Q6 SI4435DY SOI

CRITICAL
Q7 SUD45P03 TO-252

R716 47K 5% 1/10W MF 402

R710 47K 5% 1/10W MF 402

BATT_24V_GATE

BATT_14V_GATE

R717 10K 5% 1/16W MF 402

R711 10K 5% 1/10W MF 402

BATT_24PBUS_EN

BATT_14PBUS_EN

DP1 BAS16TW SOT-363

30 AC_IN_L

DP1 BAS16TW SOT-363

R102 158K 1% 1/16W MF 402

Q9 2N7002DW SOT-363

AC_IN_L_RC

C118 10uF 20% 6.3V CERM 805

WHEN AC IS IN, P-CHANNEL FETS ARE QUICKLY (DIODE) TURNED OFF

WHEN AC IS NOT PLUGGED, P-CHANNEL FETS ARE ON

RC TIME IS 480K*10UF @ +3V_PMU

SWITCHER VOLTAGE CONTROL

PMU SELECTS BETWEEN TWO VOLTAGES

SWITCHER CURRENT CONTROL

CHARGE DISABLED BY PMU OR INPUT VOLTAGE <18V

CHARGE THROTTLED BY LOW BATTERY VOLTAGE

+3V_PMU

R73 27.4K 1% 1/16W MF 402

R62 10K 1% 1/16W MF 402

R58 10K 1% 1/16W MF 402

OD OUTPUT LOW - WHEN AC GREATER THAN 18V

R74 4.12K 1% 1/16W MF 402

R733 20K 1% 1/16W MF 402

R731 1K 1% 1/16W MF 402

BATT_LOW_L

BATTV_HIGH

R59 100K 5% 1/16W MF 402

Q4 2N7002DW SOT-363

R75 5.23K 1% 1/16W MF 402

BATTV_LOW

Q71 2N7002DW SOT-363

Q71 2N7002DW SOT-363

29 PMU_CHARGE_V

Q4 2N7002DW SOT-363

+3V_PMU

R741 100K 5% 1/16W MF 402

CHARGE_DISABLE

Q72 2N7002DW SOT-363

29 PMU_CHRG_BATT_0

Q72 2N7002DW SOT-363

$V_{BATT} = CELLS \times (4.096 + (0.4096 * V_{VCTL} / V_{REFIN}))$

For 4.15V cells, VCTL = 0.123 REFIN

For 4.20V cells, VCTL = 0.245 REFIN

$I_{CHG} = (0.2048/R_{62}) * (V_{ICTL} / V_{REFIN})$

R56 1K 1% 1/16W MF 402

R55 1K 1% 1/16W MF 402

C43 0.01uF 20% 16V CERM 402

C42 0.01uF 20% 16V CERM 402

1772_CCV_RC

R83 1K 1% 1/16W MF 402

C24 0.1uF 20% 10V CERM 402

38 1772_GND

1772_REF

C23 1uF 20% 10V CERM 603

R54 10K 1% 1/16W MF 402

1772_CLS

R53 4.12K 1% 1/16W MF 402

REF CLS GND

C41 1uF 20% 10V CERM 603

R94 100K 5% 1/16W MF 402

C98 0.1uF 20% 25V CERM 603

C99 0.1uF 20% 25V CERM 603

XW1 SM

NO STUFF

C853 1000pF 10% 16V X7R 402

R720 1 1% 1/16W MF 603

R713 1 1% 1/16W MF 603

+BATT_RSNS 38

R715 0.05 1% 1W MF 2512

CRITICAL
L70 10uH SM1

D36 SM MBRS140T3

CRITICAL
Q64 IRF7811W SO-8

+BATT_24V_FUSE 30 38

C780 4.7uF 20% 25V CERM 1206

C777 4.7uF 20% 25V CERM 1206

C795 4.7uF 20% 25V CERM 1206

C792 4.7uF 20% 25V CERM 1206

C790 4.7uF 20% 25V CERM 1206

C785 4.7uF 20% 25V CERM 1206

C779 33uF 20% 25V ELEC SM1

R57 100K 1% 1/16W MF 402

D4 1N914 SOT23

R49 12.7K 1% 1/16W MF 402

C67 1uF 20% 25V CERM 1210

CRITICAL
R61 0.025 1% 1W MF 2512

R82 4.7 5% 1/4W MF 402

R87 4.7 5% 1/4W MF 402

1772_CSSP 37

1772_CSSN 37

C71 0.47uF 20% 50V CERM 1206

C95 0.47uF 20% 50V CERM 1206

27 CSSP

26 CSSN

38 1772_DCIN

1772_ACIN

30 1772_ACOK_L

(+3V_PMU)

1772_VCTL

1772_ICTL

1772_ICHG

1772_IINP

1772_CCV

1772_CCI

1772_CCS

U6 MAX1772 QSOP

DCIN ACIN ACOK RFIN VCTL ICTL ICHG IINP CCV CCI CCS CSSP CSSN CELLS LDO DLOV BST DHI LX DLO PGND CSIP CSIN BATT

1772_CELLS

1772_DLOV

1772_BST

1772_DHI

38 1772_LX

1772_DLO

(GND)

37 1772_CSIP

37 1772_CSIN

CRITICAL

R725 33 5% 1/8W FF 1206

D6 1N914 SOT23

1772_BST_ESR

R52 100K 5% 1/16W MF 402

C97 0.1uF 20% 25V CERM 603

R96 4.7 5% 1/16W MF 603

C96 0.1uF 20% 50V CERM 805

CRITICAL
Q70 IRF7805 SM

C112 2.2uF 20% 50V CERM 1812

C117 2.2uF 20% 50V CERM 1812

C113 2.2uF 20% 50V CERM 1812

C115 2.2uF 20% 50V CERM 1812

C116 2.2uF 20% 50V CERM 1812

+24V_PBUS

R729 100K 1% 1/16W MF 402

R740 499K 1% 1/16W MF 402

BATT_DIV

1V65_REF

R730 100K 1% 1/16W MF 402

R735 100K 1% 1/16W MF 402

C807 0.047uF 10% 16V CERM 402

BATT_LOW 1

+3V_PMU

C799 0.1uF 20% 16V CERM 402

R47 6.34K 1% 1/16W MF 402

A29_CLS_ADJ

30 29 A29_DETECT

Q2 2N7002DW SOT-363

38 +BATT_VSNS

BATTERY CONNECTOR

CRITICAL
J26
87438-0833
M-RT-SM

39 38 +BATT_POS

(BATT_IN_PD)

39 BATT_CLK

39 BATT_DATA

PMU_BATT_DET_L 29 39

39 38 BATT_NEG

L5 FERR-EMI-100-OHM SM

L6 FERR-50-OHM SM

L4 FERR-EMI-100-OHM SM

PMU_SMB_CLK 29

L3 FERR-EMI-100-OHM SM

PMU_SMB_DATA 29

L2 FERR-50-OHM SM

+BATT

BATTERY CHARGER

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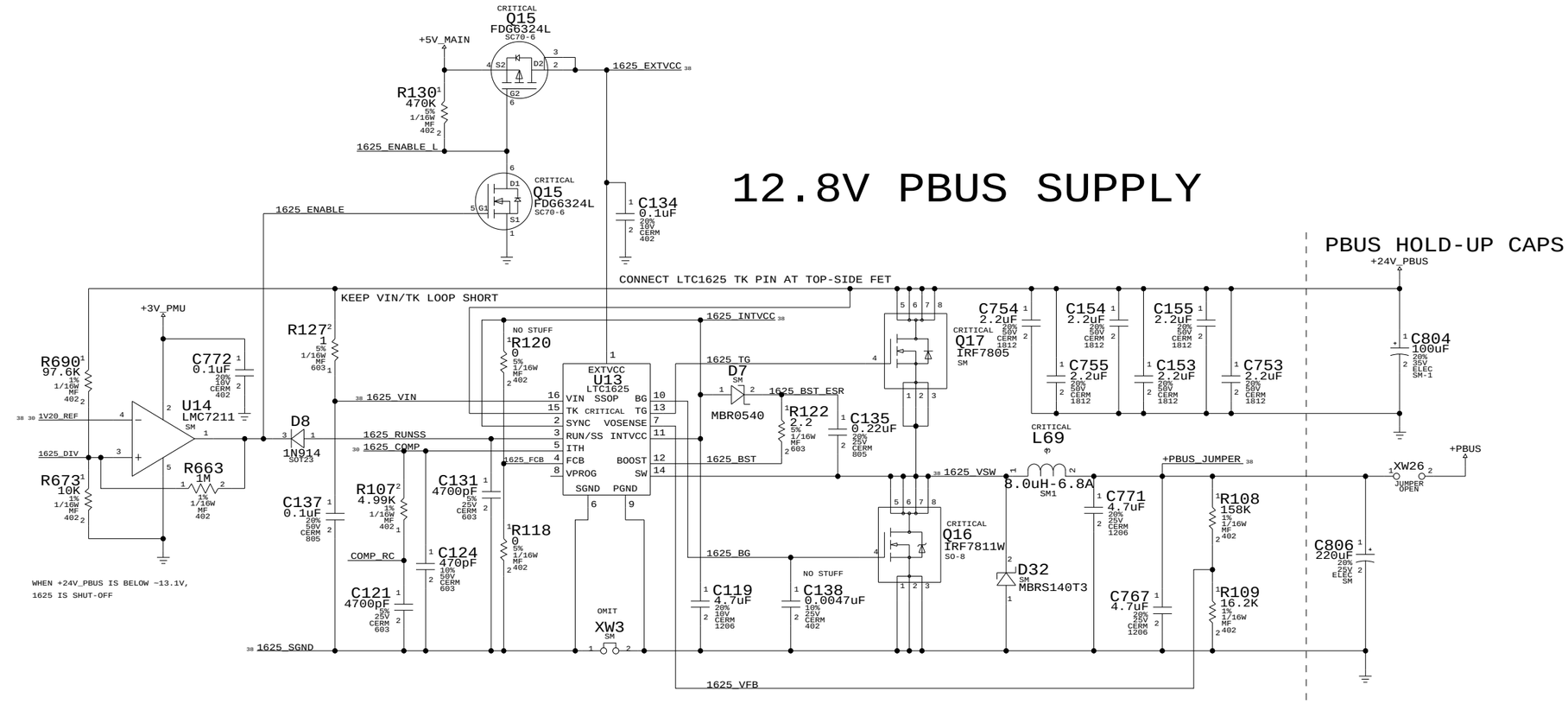
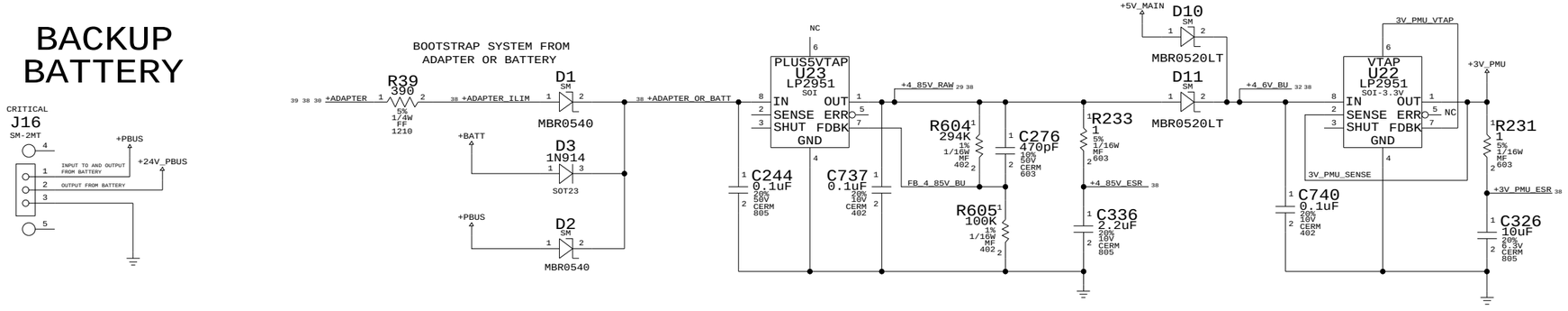
APPLE COMPUTER INC.

SIZE	DRAWING NUMBER	REV.
D	051-6338	C
SCALE: NONE	SHT 30 OF 40	

12.8V PBUS SUPPLY



PMU SUPPLY



BACKUP BATTERY

12.8V REGULATOR

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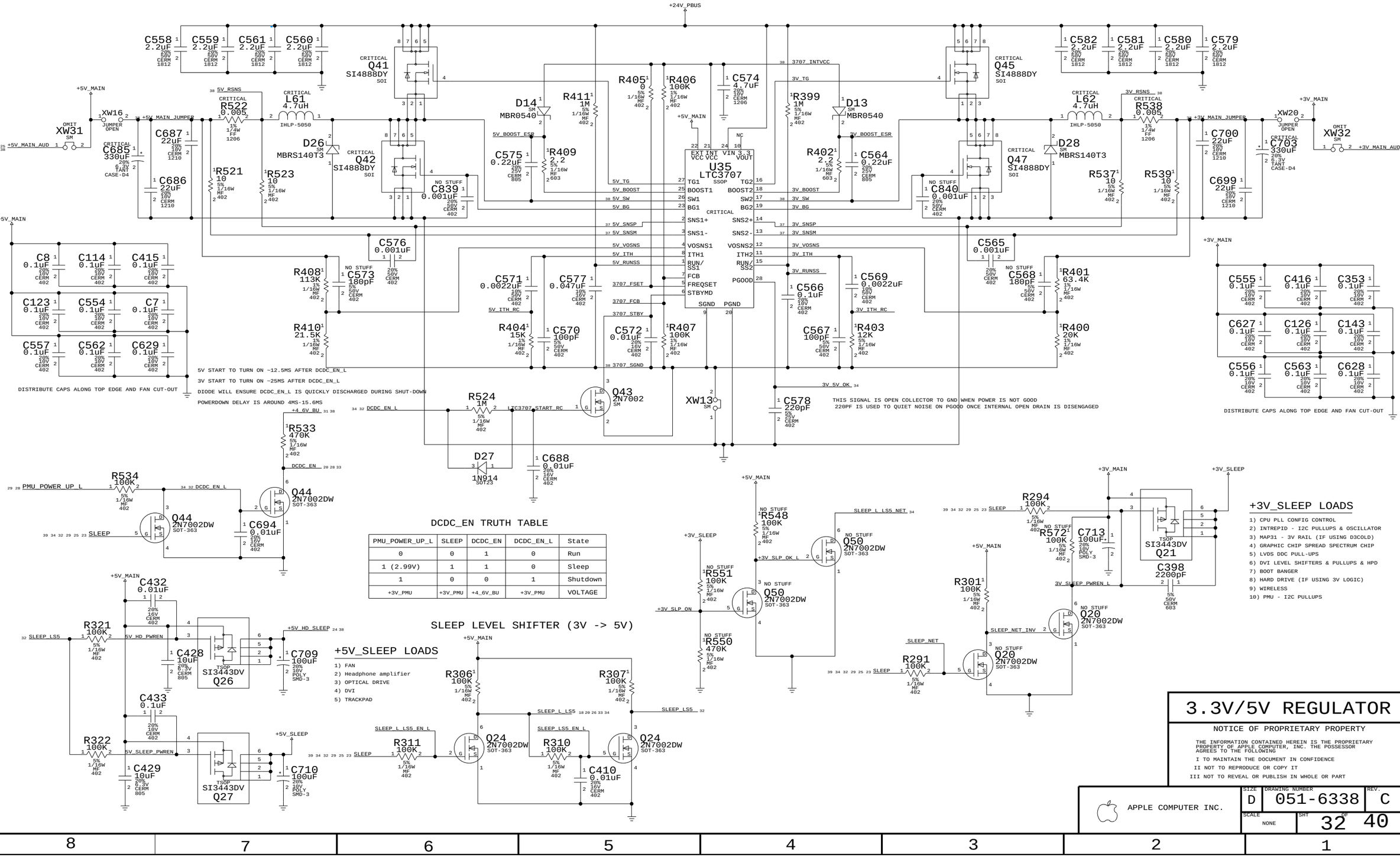
SIZE	DRAWING NUMBER	REV.
D	051-6338	C
SCALE: NONE	SHT 31 OF 40	

3.3V/5V MAIN SUPPLY



3.3V/5V REGULATOR

APPLE COMPUTER INC.

SIZE	DRAWING NUMBER	REV.
D	051-6338	C
SCALE: NONE	SHT 32 OF 40	

VCORE POWER SEQUENCING

CPU core follows CPU I/O voltage
(approx. 7ms delay)

1.175V->1.025V

1.300V->1.075V
1.225V->1.050V
(value without offset)

1.25Ghz
1.0Ghz

NOTE: When U15 MUX is removed => NO SW Support,
R794,R795,R796&R797 have to be stuffed

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
126S0036	7	CAP,AL,POLY,8.2uF,20%,16V,V CASE,SMD	C51,C52,C77,C78,C91,C92,C111	CRITICAL	

MAXBUS_SLEEP
CPU_VCORE_PWR_SEQ
CPU_VCORE_SEQ_L
CPU_VCORE_SEQ
SLEEP_L_LS5
DCDC_EN
CPU_VCORE_HI_OC
INT_GPIO1_PU

VCORE_SLOW<1>
VCORE_SLOW<2>
VCORE_SLOW<3>
VCORE_SLOW<4>
VCORE_FAST<1>
VCORE_FAST<2>
VCORE_FAST<3>
VCORE_FAST<4>
VCORE_MUX_SEL
VCORE_MUX_EN
VCORE_VID<1>
VCORE_VID<2>
VCORE_VID<3>
VCORE_VID<4>

SEL = 0; Y1=A1
SEL = 1; Y1=B1

Keep trace fat (40-100 mils) and short!!

PLACE C423 CLOSE TO PINS 15 & 13!!

VCORE_VCC
VCORE_SHDN_L
VCORE_ILIM
VCORE_AB_SEL
VCORE_REF
VCORE_TON
VCORE_CC
VCORE_GNDA
VCORE_VID<0>
VCORE_BOOST
VCORE_DH
VCORE_LX
VCORE_DL
VCORE_GND
VCORE_FB
VCORE_TIME
VCORE_VGATE
VGATE PULLUP PROVIDED BY INTREPID
(VCORE_VPLUS)
(VCORE_SNS)
(VCORE_GNDSNS)
VCORE_BST

Keep trace fat and short!!

Sense resistor R650 may not be needed!

VCORE_VSENSE
(VCORE=1.385V for EVTB)
CPU_VCORE_SLEEP

MAX1717 VID INPUTS ARE 3.3-5V TOLERANT

(For BEST config. R65 use 0-ohm RES,see BOM table)

Note:No stuff R67 to set skip mode of VCore

Connect MAX1717 GND pin 13
to GND at bottom-side FET

Keep trace fat and short!!

PLACE THIS SHORT AT
PIN OF 1000uF CAP
CLOSEST TO CPU

VCORE_GNDSNS
VCORE_SNS

GROUND SENSE VOLTAGE DIVIDER

This allows for an offset to the ground sense to adjust the output voltage.
VREF = 2.0V, HENCE VOFFSET = 2.0V * Rb / Ra) AND VCORE = VDAC + VOFFSET.
NOTE: Ra NO STUFFED FOR NO OFFSET CASE

(CPU Vcore value with offset)

1.25Ghz 1.335V->1.080V
1.0Ghz 1.235V->1.060V

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
116S1000	1	RES,MF,0 ohm,5%,1/16W,0402,SMD	R65	?	CPU_BST
114S3573	1	RES,MF,1/16W,3.57K ohm,1%,0402,SMD	R97	?	CPU_BST

(For BEST config. R97 use 3.57K-ohm RES,see BOM table)

ROUTE AS DIFFERENTIAL PAIR

OUTPUT VOLTAGE

V_{DAC} D4=0	V_{DAC} D4=1	D3	D2	D1	D0
2.00	1.275	0	0	0	0
1.95	1.250	0	0	0	1
1.90	1.225	0	0	1	0
1.85	1.200	0	0	1	1
1.80	1.175	0	1	0	0
1.75	1.150	0	1	0	1
1.70	1.125	0	1	1	0
1.65	1.100	0	1	1	1
1.60	1.075	1	0	0	0
1.55	1.050	1	0	0	1
1.50	1.025	1	0	1	0
1.45	1.000	1	0	1	1
1.40	0.975	1	1	0	0
1.35	0.950	1	1	0	1
1.30	0.925	1	1	1	0
NO CPU	NO CPU	1	1	1	1

FOR V-STEP:

D<4..0>	A/B_ = Hi/Fast	A/B_ = Lo/Slow
<= 1K PU	1	0
>= 100K PU	1	1
>= 100K PD	0	1
<= 1K PD	0	0

When A/B_ is high (fast): D4-D0 read as-is
When A/B_ is low (slow): <=1K-ohm -> 0
>=100K-ohm -> 1
If all pull-ups are >=100K and all
pull-downs are <=1K, $V_A = V_B$.

Fmax Test Connections

VCORE_GNDDIV_TEST
VCORE_GNDSNS_TEST
+3V_PMU_RESET
SOFT_PWR_ON_L
NC (RFU)
VCORE_D0
VCORE_D1
VCORE_D2
VCORE_D3
VCORE_D4

VCORE SUPPLY

APPLE COMPUTER INC.

SIZE	DRAWING NUMBER	REV.
D	051-6338	C
SCALE: NONE	SHT 33 OF 40	

1.5V/2.5V SWITCHER

+1_5V_SLEEP LOADS

1) AGP I/O - IF USING D3COLD
2) MAXBUS I/O - IF 1.5V INTERFACE

+1_5V_MAIN LOADS

1) INTREPID CORE

+2_5V_MAIN LOADS

1) MAP31 - FBCORE/FBIO IF USING D3HOT
2) GIGABIT ETHERNET - AVDDL
3) DDR SODIMMS - CORE/IO
4) DDR MUXES

M10 Power Shut down Sequencing

+2_5V_SLEEP LOADS

1) FBCORE/FBIO IF USING D3COLD

1.8V SWITCHER

+1_8V_MAIN LOADS

1) INTREPID PLLS

+1_8V_SLEEP LOADS

1) MPC7447 - MAXBUS I/O - IF 1.8V INTERFACE
2) CPU JTAG & MaxBus Pull-ups
3) CPU PLL Config Straps

1.5V/1.8V/2.5V SUPPLIES

APPLE COMPUTER INC.

SIZE	DRAWING NUMBER	REV.
D	051-6338	C
SCALE: NONE	SHT 34 OF 40	

DIGITAL SIGNALS

GROUP	SIG_NAME	PROPAGATION_DELAY	MAX_VIAS	MAX_EXPOSED_LENGTH	STUB_LENGTH	NET_SPACING_TYPE	NO_TEST	PULSE_PARAM
				STUB_LENGTH OF 200 MILS NEEDED WHEN WE CONVERT TO 14.2				
GROUP 0	MEM_DATA<7..0>	L:S:1602:1700	7	500	(200)			167 MHZ
	MEM_DQM<0>	L:S:1602 MIL:1700 MIL	7	500.0000	(200)			167.0 MHz:::
	MEM_DQS<0>	L:S:1602 MIL:1700 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DATA_A<7..0>	L:S:1903:2000	7	500	(200)	TOTAL LENGTH CONTROLLED BY SPREADSHEET		167 MHZ
	RAM_DQM_A<0>	L:S:1903 MIL:2000 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DQS_A<0>	L:S:1903 MIL:2000 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DATA_B<7..0>	L:S:2000:2100	7	500	(200)			167 MHZ
	RAM_DQM_B<0>	L:S:2000 MIL:2100 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DQS_B<0>	L:S:2000 MIL:2100 MIL	7	500.0000	(200)			167.0 MHz:::
GROUP 1	MEM_DATA<15..8>	L:S:1344:1660	7	500	(200)			167 MHZ
	MEM_DQM<1>	L:S:1344 MIL:1660 MIL	7	500.0000	(200)			167.0 MHz:::
	MEM_DQS<1>	L:S:1344 MIL:1660 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DATA_A<15..8>	L:S:1905:2000	7	500	(200)	TOTAL LENGTH CONTROLLED BY SPREADSHEET		167 MHZ
	RAM_DQM_A<1>	L:S:1905 MIL:2000 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DQS_A<1>	L:S:1905 MIL:2000 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DATA_B<15..8>	L:S:2004:2412	7	500	(200)			167 MHZ
	RAM_DQM_B<1>	L:S:2004 MIL:2412 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DQS_B<1>	L:S:2004 MIL:2412 MIL	7	500.0000	(200)			167.0 MHz:::
GROUP 2	MEM_DATA<23..16>	L:S:1435:1500	7	500	(200)	TOTAL LENGTH CONTROLLED BY SPREADSHEET		167 MHZ
	MEM_DQM<2>	L:S:1435 MIL:1500 MIL	7	500.0000	(200)			167.0 MHz:::
	MEM_DQS<2>	L:S:1435 MIL:1500 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DATA_A<23..16>	L:S:1707:1800	7	500	(200)			167 MHZ
	RAM_DQM_A<2>	L:S:1707 MIL:1800 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DQS_A<2>	L:S:1707 MIL:1800 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DATA_B<23..16>	L:S:1900:2000	7	500	(200)			167 MHZ
	RAM_DQM_B<2>	L:S:1900 MIL:2000 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DQS_B<2>	L:S:1900 MIL:2000 MIL	7	500.0000	(200)			167.0 MHz:::
GROUP 3	MEM_DATA<31..24>	L:S:1233:1485	7	500	(200)	TOTAL LENGTH CONTROLLED BY SPREADSHEET		167 MHZ
	MEM_DQM<3>	L:S:1233 MIL:1485 MIL	7	500.0000	(200)			167.0 MHz:::
	MEM_DQS<3>	L:S:1233 MIL:1485 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DATA_A<31..24>	L:S:1700:2165	7	500	(200)			167 MHZ
	RAM_DQM_A<3>	L:S:1700 MIL:2165 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DQS_A<3>	L:S:1700 MIL:2165 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DATA_B<25..24>	L:S:1907:2356	7	500	(200)			167 MHZ
	RAM_DATA_B<26>	L:S:1907 MIL:2356 MIL	7		(200)			167.0 MHz:::
	RAM_DATA_B<31..27>	L:S:1907:2356	7	500	(200)			167 MHZ
	RAM_DQM_B<3>	L:S:1907 MIL:2356 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DQS_B<3>	L:S:1907 MIL:2356 MIL	7	500.0000	(200)			167.0 MHz:::
GROUP 4	MEM_DATA<39..32>	L:S:1915:2000	7	500	(200)	TOTAL LENGTH CONTROLLED BY SPREADSHEET		167 MHZ
	MEM_DQM<4>	L:S:1915 MIL:2000 MIL	7	500.0000	(200)			167.0 MHz:::
	MEM_DQS<4>	L:S:1915 MIL:2000 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DATA_A<39..32>	L:S:1205:1387	7	500	(200)			167 MHZ
DDR RAM	RAM_DQM_A<4>	L:S:1205 MIL:1387 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DQS_A<4>	L:S:1205 MIL:1387 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DATA_B<39..32>	L:S:1404:1686	7	500	(200)			167 MHZ
	RAM_DQM_B<4>	L:S:1404 MIL:1686 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DQS_B<4>	L:S:1404 MIL:1686 MIL	7	500.0000	(200)			167.0 MHz:::
GROUP 5	MEM_DATA<47..40>	L:S:1719:1893	7	500	(200)			167 MHZ
	MEM_DQM<5>	L:S:1719 MIL:1893 MIL	7	500.0000	(200)			167.0 MHz:::
	MEM_DQS<5>	L:S:1719 MIL:1893 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DATA_A<47..40>	L:S:1607:1898	7	500	(200)	TOTAL LENGTH CONTROLLED BY SPREADSHEET		167 MHZ
	RAM_DQM_A<5>	L:S:1607 MIL:1898 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DQS_A<5>	L:S:1607 MIL:1898 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DATA_B<47..40>	L:S:1716:2102	7	500	(200)			167 MHZ
	RAM_DQM_B<5>	L:S:1716 MIL:2102 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DQS_B<5>	L:S:1716 MIL:2102 MIL	7	500.0000	(200)			167.0 MHz:::
GROUP 6	MEM_DATA<55..48>	L:S:2101:2170	7	500	(200)			167 MHZ
	MEM_DQM<6>	L:S:2101 MIL:2170 MIL	7	500.0000	(200)			167.0 MHz:::
	MEM_DQS<6>	L:S:2101 MIL:2170 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DATA_A<55..48>	L:S:1204:1357	7	500	(200)	TOTAL LENGTH CONTROLLED BY SPREADSHEET		167 MHZ
	RAM_DQM_A<6>	L:S:1204 MIL:1357 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DQS_A<6>	L:S:1204 MIL:1357 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DATA_B<55..48>	L:S:1400:1546	7	500	(200)			167 MHZ
	RAM_DQM_B<6>	L:S:1400 MIL:1546 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DQS_B<6>	L:S:1400 MIL:1546 MIL	7	500.0000	(200)			167.0 MHz:::
GROUP 7	MEM_DATA<63..56>	L:S:1903:2000	7	500	(200)			167 MHZ
	MEM_DQM<7>	L:S:1903 MIL:2000 MIL	7	500.0000	(200)			167.0 MHz:::
	MEM_DQS<7>	L:S:1903 MIL:2000 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DATA_A<63..56>	L:S:1611:1696	7	500	(200)	TOTAL LENGTH CONTROLLED BY SPREADSHEET		167 MHZ
	RAM_DQM_A<7>	L:S:1611 MIL:1696 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DQS_A<7>	L:S:1611 MIL:1696 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DATA_B<63..56>	L:S:1809:1887	7	500	(200)			167 MHZ
	RAM_DQM_B<7>	L:S:1809 MIL:1887 MIL	7	500.0000	(200)			167.0 MHz:::
	RAM_DQS_B<7>	L:S:1809 MIL:1887 MIL	7	500.0000	(200)			167.0 MHz:::
ADDR	MEM_ADDR<12..0>	L:S::500	4					83 MHZ
	RAM_ADDR<12..0>	L:S:2000:3000	10		(200)			
	MEM_BA<1..0>	L:S::500	4					
	RAM_BA<1..0>	L:S:2000:3300	8		(200)			
CONTROL	MEM_CS_L<3..0>	L:S::500	4					
	RAM_CS_L<3..0>	L:S:2500:3200	7		(200)			
	MEM_CKE<3..0>	L:S::500	4					
	RAM_CKE<3..0>	L:S:2500:3200	7		(200)			
	MEM_RAS_L	L:S::500 MIL	4					
	RAM_RAS_L	L:S:2000 MIL:4100 MIL	7		(200)			
	MEM_CAS_L	L:S::500 MIL	4					
	RAM_CAS_L	L:S:2000 MIL:4100 MIL	7		(200)			
	MEM_WE_L	L:S::500 MIL	4					
	RAM_WE_L	L:S:2000 MIL:3100 MIL	8		(200)			
	MEM_MUXSEL_MSB	L:S:1700 MIL:3000 MIL	8					
	MEM_MUXSEL_LSB	L:S:1700 MIL:3000 MIL	7					

PRIORITY: 2
PRIMARY LAYERS: 4,7
SECONDARY LAYERS: 2,9
GOAL: MINIMIZE
EXPOSED ROUTES
MINIMIZE VIAS

CLOCK LINE CONSTRAINTS

GROUP	SIG_NAME	PROPAGATION_DELAY	MATCHED_DELAY	MAX VIAS	MAX EXPOSED LENGTH	STUB_LENGTH	NET_SPACING_TYPE	PULSE PARAM
INTREPID CLOCKS	SYSCLK_CPU_UF	L:S::150 MIL					10 MIL SPACING	167.0 MHz:::
	SYSCLK_CPU	L:S:2650 MIL:2750 MIL		5	250.0000	(200)	10 MIL SPACING	167.0 MHz:::
	INT_CPUFB_OUT	L:S::150 MIL		5	250.0000		10 MIL SPACING	167.0 MHz:::
	INT_CPUFB_OUT_SHORT	L:S:700 MIL:850 MIL		5	250.0000		10 MIL SPACING	167.0 MHz:::
	INT_CPUFB_OUT_NORM	L:S:500 MIL:600 MIL		5	250.0000		10 MIL SPACING	167.0 MHz:::
	INT_CPUFB_IN_NORM	L:S:500 MIL:600 MIL		5	250.0000		10 MIL SPACING	167.0 MHz:::
	INT_CPUFB_LONG	L:S:1050 MIL:1150 MIL		5	250.0000		10 MIL SPACING	167.0 MHz:::
	INT_CPUFB_IN	L:S:700 MIL:800 MIL		5	250.0000	(200)	10 MIL SPACING	167.0 MHz:::
	SYSCLK_DDRCLK_A0_UF	L:S:300 MIL:3[illegible]	SYSCLK_DDRCLK_A0_UF:G:L:S:0 MIL:25 MIL			(200)	10 MIL SPACING	167.0 MHz:::
	SYSCLK_DDRCLK_A0_L_UF	L:S:300 MIL:3[illegible]	SYSCLK_DDRCLK_A0_UF:G:L:S:0 MIL:25 MIL			(200)	10 MIL SPACING	167.0 MHz:::
	SYSCLK_DDRCLK_A1_UF	L:S:300 MIL:3[illegible]	SYSCLK_DDRCLK_A1_UF:G:L:S:0 MIL:25 MIL			(200)	10 MIL SPACING	167.0 MHz:::
	SYSCLK_DDRCLK_A1_L_UF	L:S:300 MIL:3[illegible]	SYSCLK_DDRCLK_A1_UF:G:L:S:0 MIL:25 MIL			(200)	10 MIL SPACING	167.0 MHz:::
	SYSCLK_DDRCLK_B0_UF	L:S:300 MIL:3[illegible]	SYSCLK_DDRCLK_B0_UF:G:L:S:0 MIL:25 MIL			(200)	10 MIL SPACING	167.0 MHz:::
	SYSCLK_DDRCLK_B0_L_UF	L:S:300 MIL:3[illegible]	SYSCLK_DDRCLK_B0_UF:G:L:S:0 MIL:25 MIL			(200)	10 MIL SPACING	167.0 MHz:::
	SYSCLK_DDRCLK_B1_UF	L:S:300 MIL:3[illegible]	SYSCLK_DDRCLK_B1_UF:G:L:S:0 MIL:25 MIL			(200)	10 MIL SPACING	167.0 MHz:::
	SYSCLK_DDRCLK_B1_L_UF	L:S:300 MIL:3[illegible]	SYSCLK_DDRCLK_B1_UF:G:L:S:0 MIL:25 MIL			(200)	10 MIL SPACING	167.0 MHz:::
	SYSCLK_DDRCLK_A0	L:S:2900 MIL:3000 MIL	SYSCLK_DDRCLK_A0:G:L:S:0 MIL:25 MIL	7	250.0000	(200)	10 MIL SPACING	167.0 MHz:::
	SYSCLK_DDRCLK_A0_L	L:S:2900 MIL:3000 MIL	SYSCLK_DDRCLK_A0:G:L:S:0 MIL:25 MIL	7	250.0000	(200)	10 MIL SPACING	167.0 MHz:::
	SYSCLK_DDRCLK_A1	L:S:2900 MIL:3000 MIL	SYSCLK_DDRCLK_A1:G:L:S:0 MIL:25 MIL	7	250.0000	(200)	10 MIL SPACING	167.0 MHz:::
	SYSCLK_DDRCLK_A1_L	L:S:2900 MIL:3000 MIL	SYSCLK_DDRCLK_A1:G:L:S:0 MIL:25 MIL	7	250.0000	(200)	10 MIL SPACING	167.0 MHz:::
	SYSCLK_DDRCLK_B0	L:S:3100 MIL:3200 MIL	SYSCLK_DDRCLK_B0:G:L:S:0 MIL:25 MIL	7	250.0000	(200)	10 MIL SPACING	167.0 MHz:::
	SYSCLK_DDRCLK_B0_L	L:S:3100 MIL:3200 MIL	SYSCLK_DDRCLK_B0:G:L:S:0 MIL:25 MIL	7	250.0000	(200)	10 MIL SPACING	167.0 MHz:::
	SYSCLK_DDRCLK_B1	L:S:3100 MIL:3200 MIL	SYSCLK_DDRCLK_B1:G:L:S:0 MIL:25 MIL	7	250.0000	(200)	10 MIL SPACING	167.0 MHz:::
	SYSCLK_DDRCLK_B1_L	L:S:3100 MIL:3200 MIL	SYSCLK_DDRCLK_B1:G:L:S:0 MIL:25 MIL	7	250.0000	(200)	10 MIL SPACING	167.0 MHz:::
	INT_REF_CLK_OUT_UF	L:S::400 MIL				(200)	10 MIL SPACING	49.92 MHz:::
	INT_REF_CLK_OUT	L:S:1000 MIL:1150 MIL		5	250.0000	(200)	10 MIL SPACING	49.92 MHz:::
	INT_REF_CLK_IN	L:S:1900 MIL:2000 MIL		5	250.0000	(200)	10 MIL SPACING	167.0 MHz:::
	CLK66M_GPU_AGP_UF	L:S::150 MIL				(200)	10 MIL SPACING	66.00 MHz:::
	CLK66M_GPU_AGP	L:S:1800 MIL:1900 MIL		6	400.0000	(200)	10 MIL SPACING	66.00 MHz:::
	INT_AGP_FB_OUT	L:S::150 MIL				(200)	10 MIL SPACING	66.00 MHz:::
	INT_AGP_FB_IN	L:S:1450 MIL:1550 MIL		6	500.0000	(200)	10 MIL SPACING	66.00 MHz:::
	CLK33M_CBUS_UF	L:S::250 MIL				(200)	10 MIL SPACING	33.00 MHz:::
	CLK33M_CBUS	L:S:5000 MIL:6000 MIL		9	500.0000	(200)	10 MIL SPACING	33.00 MHz:::
	CLK33M_AIRPORT_UF	L:S::250 MIL				(200)	10 MIL SPACING	33.00 MHz:::
	CLK33M_AIRPORT	L:S:9500 MIL:10500 MIL		6	500.0000	(200)	10 MIL SPACING	33.00 MHz:::
	CLK33M_NEC_UF	L:S::250 MIL				(200)	10 MIL SPACING	33.00 MHz:::
	CLK33M_NEC	L:S:4000 MIL:6000 MIL		7	500.0000	(200)	10 MIL SPACING	33.00 MHz:::
	INT_PCI_FB_OUT	L:S::300 MIL				(200)	10 MIL SPACING	33.00 MHz:::
	INT_PCI_FB_IN	L:S:6500 MIL:7500 MIL		7	500.0000	(200)	10 MIL SPACING	33.00 MHz:::
M10 & OSC	ATI_CLK27M_OSC	L:S::400 MIL		5		(200)	10 MIL SPACING	
	ATI_CLK27M_OSC_SS	L:S::400 MIL		5		(200)	10 MIL SPACING	
	ATI_CLK27M_IN	L:S::200 MIL		5		(200)	10 MIL SPACING	
	ATI_SSCLK_UF	L:S::200 MIL		5		(200)	10 MIL SPACING	
	ATI_SSCLK_IN	L:S::1800 MIL		5	500.0000	(200)	10 MIL SPACING	
CRYSTALS	CLK18M_INT_XIN	L:S:1400 MIL:1500 MIL					10 MIL SPACING	
	CLK18M_INT_XOUT	L:S:1250 MIL:1350 MIL					10 MIL SPACING	
	CLK18M_XTAL_IN	L:S::300 MIL					10 MIL SPACING	
	CLK18M_INT_EXT	L:S::400 MIL					10 MIL SPACING	
SOUND	INT_I2S0_SND_MCLK			6	500.0000	(200)	10 MIL SPACING	
ETHERNET	CLKENET_PHY_RX	L:S::300 MIL				(200)		125.0 MHz:::
	CLKENET_LINK_RX	L:S:8000 MIL:9000 MIL		6	800.0000	(200)	10 MIL SPACING	125.0 MHz:::
	CLKENET_PHY_GBE_REF	L:S::300 MIL				(200)		125.0 MHz:::
	CLKENET_LINK_GBE_REF	L:S:8000 MIL:9000 MIL		6	500.0000	(200)	10 MIL SPACING	125.0 MHz:::
	CLKENET_PHY_TX	L:S::300 MIL				(200)		25.00 MHz:::
	CLKENET_LINK_TX	L:S:8000 MIL:9000 MIL		6	500.0000	(200)	10 MIL SPACING	25.00 MHz:::
	CLKENET_LINK_GTX	L:S::300 MIL				(200)		125.0 MHz:::
	CLKENET_PHY_GTX	L:S:8000 MIL:9000 MIL		6	600.0000	(200)	10 MIL SPACING	125.0 MHz:::
FIREWIRE	CLKFW_PHY_PCLK	L:S::300 MIL				(200)		49.15 MHz:::
	CLKFW_LINK_PCLK	L:S:7500 MIL:8000 MIL		5	500.0000	(200)	10 MIL SPACING	49.15 MHz:::
	CLKFW_PHY_LCLK	L:S:7500 MIL:8000 MIL		5	500.0000	(200)	10 MIL SPACING	49.15 MHz:::
	CLKFW_LINK_LCLK	L:S::300 MIL				(200)		49.15 MHz:::
	FW_XI	L:S::500 MIL				(200)	10 MIL SPACING	98.03 MHz:::
	FW_OSC	L:S::300 MIL				(200)	10 MIL SPACING	98.03 MHz:::

PRIORITY: 1
PRIMARY LAYERS: 4,7
SECONDARY LAYERS: 2,9
GOAL: MINIMIZE EXPOSURE ON LONG NETS

SIGNAL CONSTRAINTS - PAGE 1

APPLE COMPUTER INC.

SIZE D | DRAWING NUMBER 051-6338 | REV. C

SCALE NONE | SHT 35 OF 40

DIGITAL SIGNALS

GROUP	SIG_NAME	PROPAGATION_DELAY	MAX_VIAS	MAX_EXPOSED_LENGTH	STUB_LENGTH	NET_SPACING_TYPE	NO_TEST	PULSE_PARAM
MAXBUS	CPU_AACK_L	L:S:1500 MIL:2700 MIL	7		(250)			
	CPU_ADDR<0..31>	L:S:1500:3100	7		(250)		TRUE	83 MHZ
	CPU_ARTRY_L	L:S:1500 MIL:2700 MIL	7		(250)			
	CPU_BG_L	L:S:1500 MIL:2700 MIL	7		(250)			
	CPU_BR_L	L:S:1500 MIL:2700 MIL	7		(250)			
	CPU_CI_L	L:S:1500 MIL:2700 MIL	7		(250)			
	CPU_DATA<0..31>	L:S:1100:2700	7		(250)		TRUE	83 MHZ
	CPU_DATA<32..63>	L:S:1100:2700	8		(250)			83 MHZ
	CPU_DBG_L	L:S:1500 MIL:2700 MIL	7		(250)			
	CPU_DTI<0..2>	L:S:1500:2950	7		(250)			
	CPU_DRDY_L	L:S:1500 MIL:3200 MIL	7		(250)			
	CPU_GBL_L	L:S:1500 MIL:2700 MIL	7		(250)			
	CPU_HIT_L	L:S:1500 MIL:2800 MIL	7		(250)			
	CPU_QACK_L	L:S:1500 MIL:2700 MIL	7		(250)			
	CPU_QREQ_L	L:S:1500 MIL:2700 MIL	7		(250)			
	CPU_TA_L	L:S:1500 MIL:2700 MIL	7		(250)			
	CPU_TBST_L	L:S:1500 MIL:2700 MIL	7		(250)			
	CPU_TEA_L	L:S:1500 MIL:3000 MIL	7		(250)			
	CPU_TS_L	L:S:1500 MIL:2700 MIL	7		(250)			
	CPU_TSIZ<0..2>	L:S:1500:3500	7		(250)			
	CPU_TT<0..4>	L:S:1500:3400	7		(250)			
	CPU_WT_L	L:S:1500 MIL:3100 MIL	7		(250)			

STUB_LENGTH OF 250 MILS NEEDED WHEN DESIGN SWITCHED TO 14.2

PRIORITY: 4
PRIMARY LAYERS: 9
SECONDARY LAYERS: 4,7
GOAL: MINIMIZE TH VIAS

Temporary Area for TMDS/DVO signal constraints

ALL TMDS GROUP SIGNALS ROUTE AT LAYER 4 OR 7 AND HAVE SAME WIDTH SPACING RULE AS OTHER TMDS SIGNALES

T231	GPU_TMDS_CLKN	GPU_CLKTMDS	GPUTMDS:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	5	19	20
T233	GPU_TMDS_CLKP	GPU_CLKTMDS	GPUTMDS:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	5	19	20
T232	GPU_TMDS_DN<0>	GPU_TMDS_D0	GPUTMDS:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	8	19	20
T234	GPU_TMDS_DP<0>	GPU_TMDS_D0	GPUTMDS:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	8	19	20
T235	GPU_TMDS_DN<1>	GPU_TMDS_D1	GPUTMDS:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	8	19	20
T236	GPU_TMDS_DP<1>	GPU_TMDS_D1	GPUTMDS:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	8	19	20
T238	GPU_TMDS_DN<2>	GPU_TMDS_D2	GPUTMDS:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	8	19	20
T237	GPU_TMDS_DP<2>	GPU_TMDS_D2	GPUTMDS:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	8	19	20

T240	SI_TMDS_CLKN	SI_CLKTMDS	SITMDS:G:L:S:0 MIL:50 MIL	100 OHM SPACING	5	19	
T239	SI_TMDS_CLKP	SI_CLKTMDS	SITMDS:G:L:S:0 MIL:50 MIL	100 OHM SPACING	5	19	
T242	SI_TMDS_DN<0>	SI_TMDS_D0	SITMDS:G:L:S:0 MIL:50 MIL	100 OHM SPACING	8	19	
T241	SI_TMDS_DP<0>	SI_TMDS_D0	SITMDS:G:L:S:0 MIL:50 MIL	100 OHM SPACING	8	19	
T243	SI_TMDS_DN<1>	SI_TMDS_D1	SITMDS:G:L:S:0 MIL:50 MIL	100 OHM SPACING	8	19	
T245	SI_TMDS_DP<1>	SI_TMDS_D1	SITMDS:G:L:S:0 MIL:50 MIL	100 OHM SPACING	8	19	
T244	SI_TMDS_DN<2>	SI_TMDS_D2	SITMDS:G:L:S:0 MIL:50 MIL	100 OHM SPACING	8	19	
T246	SI_TMDS_DP<2>	SI_TMDS_D2	SITMDS:G:L:S:0 MIL:50 MIL	100 OHM SPACING	8	19	

ALL THE DVOD GROUP SIGNALS ROUTE AT LAYER 4 OR 7 AND ROUTE AS STANDARD 50OHM SIGNALS AT 4 MILS

T263	ATI_DVOD<11..0>	ATIDVOD:G:L:S:0 MIL:50 MIL	6	610		19	20
T265	ATI_DVOD_DE	ATIDVOD:G:L:S:0 MIL:50 MIL	6	610.0000		19	20
T264	ATI_DVO_HSYNC	ATIDVOD:G:L:S:0 MIL:50 MIL	6	610.0000		19	20
T267	ATI_DVO_VSYNC	ATIDVOD:G:L:S:0 MIL:50 MIL	6	610.0000		19	20
T266	ATI_DVO_CLKP	ATIDVOD:G:L:S:0 MIL:50 MIL	6	610.0000	165.0 MHz:::	19	20
T255	GPU_DVOD<11..0>	GPUDVOD:G:L:S:0 MIL:50 MIL	6	700		19	
T256	GPU_DVOD_DE	GPUDVOD:G:L:S:0 MIL:50 MIL	6	500.0000		19	
T260	GPU_DVO_HSYNC	GPUDVOD:G:L:S:0 MIL:50 MIL	6	500.0000		19	
T261	GPU_DVO_VSYNC	GPUDVOD:G:L:S:0 MIL:50 MIL	6	500.0000		19	
T262	GPU_DVO_CLKP	GPUDVOD:G:L:S:0 MIL:50 MIL	6	500.0000	165.0 MHz:::	19	

T268	TMDS_CONN_CLKN	CLKCONN_TMDS	TMDS_CONN:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	4	22	39
T269	TMDS_CONN_CLKP	CLKCONN_TMDS	TMDS_CONN:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	4	22	39
T271	TMDS_CONN_DN<0>	CONN_TMDS_D0	TMDS_CONN:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	4	22	
T270	TMDS_CONN_DP<0>	CONN_TMDS_D0	TMDS_CONN:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	4	22	
T272	TMDS_CONN_DN<1>	CONN_TMDS_D1	TMDS_CONN:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	4	22	
T273	TMDS_CONN_DP<1>	CONN_TMDS_D1	TMDS_CONN:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	4	22	
T274	TMDS_CONN_DN<2>	CONN_TMDS_D2	TMDS_CONN:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	4	22	
T275	TMDS_CONN_DP<2>	CONN_TMDS_D2	TMDS_CONN:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	4	22	

SIGNAL CONSTRAINTS - PAGE 1

APPLE COMPUTER INC.

SIZE	DRAWING NUMBER	REV.
D	051-6338	C

SCALE	SHT OF
NONE	36 40

Digital Signals (cont'd)

GROUP	SIG_NAME	PROPAGATION_DELAY	MAX_VIAS	MAX_EXPOSED_LENGTH	STUB_LENGTH	NET_SPACING_TYPE	NO_TEST	PULSE_PARAM	
AGP	AGP_AD<15..0>	L:S:1650:1450	7					66 MHZ	12 19
AGP BYTES 0-1	AGP_CBE<1..0>	L:S:1050:1450	7					66 MHZ	12 19
	AGP_AD_STB<0>	L:S:1050 MIL:1450 MIL			(250)	8 MIL SPACING		133.0 MHZ	12 19
AGP BYTES 2-3	AGP_AD_STB_L<0>	L:S:1050 MIL:1450 MIL			(250)	8 MIL SPACING		133.0 MHZ	12 19
	AGP_AD<31..16>	L:S:1050:1450	7					66 MHZ	12 19
	AGP_CBE<3..2>	L:S:1050:1450	7					66 MHZ	12 19
	AGP_AD_STB<1>	L:S:1050 MIL:1450 MIL			(250)	8 MIL SPACING		133.0 MHZ	12 19
	AGP_AD_STB_L<1>	L:S:1050 MIL:1450 MIL			(250)	8 MIL SPACING		133.0 MHZ	12 19
AGP SIDEBAND	AGP_SBA<7..0>	L:S:1050:1450	7					66 MHZ	12 19
	AGP_SB_STB	L:S:1050 MIL:1450 MIL			(350)	8 MIL SPACING		66.00 MHZ	12 19
	AGP_SB_STB_L	L:S:1050 MIL:1450 MIL			(350)	8 MIL SPACING		66.00 MHZ	12 19
AGP CONTROL	AGP_FRAME_L	L:S:1250 MIL:1950 MIL						66.00 MHZ	12 19
	AGP_IRDY_L	L:S:1250 MIL:1950 MIL						66.00 MHZ	12 19
	AGP_TRDY_L	L:S:1250 MIL:1950 MIL						66.00 MHZ	12 19
	AGP_DEVSEL_L	L:S:1250 MIL:1950 MIL						66.00 MHZ	12 19
	AGP_STOP_L	L:S:1250 MIL:1950 MIL						66.00 MHZ	12 19
	AGP_PAR	L:S:1250 MIL:1950 MIL						66.00 MHZ	12 19
	AGP_REQ_L	L:S:1250 MIL:1950 MIL						66.00 MHZ	12 19
	AGP_GNT_L	L:S:1250 MIL:1950 MIL						66.00 MHZ	12 19
	AGP_RBF_L	L:S:1250 MIL:1950 MIL						66.00 MHZ	12 19
PCI	PCI_AD<31..0>	L:S:6000:12500				MIN_DAISY_CHAIN		33 MHZ	9 12 17 18 24 39
	PCI_CBE<3..0>	L:S:6000:12500				MIN_DAISY_CHAIN		33 MHZ	12 17 18 24
	PCI_FRAME_L	L:S:6000 MIL:12500 MIL				MIN_DAISY_CHAIN		33.00 MHZ	12 17 18 24 39
	PCI_IRDY_L	L:S:6000 MIL:12500 MIL				MIN_DAISY_CHAIN		33.00 MHZ	12 17 18 24 39
	PCI_TRDY_L	L:S:6000 MIL:12500 MIL				MIN_DAISY_CHAIN		33.00 MHZ	12 17 18 24 39
	PCI_DEVSEL_L	L:S:6000 MIL:12500 MIL				MIN_DAISY_CHAIN		33.00 MHZ	12 17 18 24 39
	PCI_STOP_L	L:S:6000 MIL:12500 MIL				MIN_DAISY_CHAIN		33.00 MHZ	12 17 18 24 39
	PCI_PAR	L:S:6000 MIL:12500 MIL				MIN_DAISY_CHAIN		33.00 MHZ	12 17 18 24 39
ULTRA ATA-100	UIDE_DATA<15..8>	L:S::710			(200)			100 MHZ	13 24
	UIDE_DATA<7>	U51.V1:RP19.3::600 MIL			(200)			100.0 MHZ	13 24
	UIDE_DATA<6..0>	L:S::600			(200)			100 MHZ	13 24
	UIDE_ADDR<2..0>	L:S::650			(200)			100 MHZ	13 24
	UIDE_RST_L	L:S::400 MIL			(200)			100.0 MHZ	13 24
	UIDE_DIOW_L	L:S::400 MIL			(200)			100.0 MHZ	13 24
	UIDE_DIOR_L	L:S::600 MIL		10 MIL SPACING	(200)			100.0 MHZ	13 24
	UIDE_DMACK_L	L:S::400 MIL			(200)			100.0 MHZ	13 24
	UIDE_CS0_L	L:S::500 MIL			(200)			100.0 MHZ	13 24
	UIDE_CS1_L	L:S::500 MIL			(200)			100.0 MHZ	13 24
	UIDE_DMARQ	L:S::400 MIL			(200)			100.0 MHZ	13
	UIDE_IOCHRDY	L:S::600 MIL		10 MIL SPACING	(200)			100.0 MHZ	13 24
	UIDE_INTRQ	L:S::400 MIL			(200)			100.0 MHZ	13
	HD_DATA<15..0>	L:S:5000:6500	7		(200)			100 MHZ	24
	HD_ADDR<2..0>	L:S:5000:6500	7		(200)			100 MHZ	24
	HD_RESET_L	L:S:4000 MIL:6000 MIL			(200)			100.0 MHZ	24
	HD_DIOW_L	L:S:3000 MIL:5200 MIL			(200)			100.0 MHZ	24
	HD_DIOR_L	L:S:6100 MIL:6150 MIL		10 MIL SPACING	(200)			100.0 MHZ	24
	HD_DMACK_L	L:S:4500 MIL:6000 MIL			(200)			100.0 MHZ	24
	HD_CS0_L	L:S:3000 MIL:6000 MIL			(200)			100.0 MHZ	24
	HD_CS1_L	L:S:3000 MIL:6000 MIL			(200)			100.0 MHZ	24
	HD_DMARQ	L:S:4500 MIL:6000 MIL			(200)			100.0 MHZ	13 24
	HD_IOCHRDY	L:S:6200 MIL:6300 MIL		10 MIL SPACING	(200)			100.0 MHZ	24
	HD_INTRQ	L:S:3000 MIL:5000 MIL						100.0 MHZ	13 24
EIDE INTREPID	EIDE_DATA<15..0>	L:S::850						33 MHZ	13 24
	EIDE_ADDR<2..0>	L:S::850						33 MHZ	13 24
	EIDE_CS0_L	L:S::850 MIL						33.00 MHZ	13 24
	EIDE_CS1_L	L:S::850 MIL						33.00 MHZ	13 24
	EIDE_RD_L	L:S::500 MIL						33.00 MHZ	13 24
	EIDE_WR_L	L:S::500 MIL						33.00 MHZ	13 24
	EIDE_IOCHRDY	L:S::500 MIL						33.00 MHZ	13 24
	EIDE_INT	L:S::500 MIL						33.00 MHZ	13 24
	EIDE_RST_L	L:S::500 MIL						33.00 MHZ	13 24
	EIDE_DMACK_L	L:S::500 MIL						33.00 MHZ	13 24
	EIDE_DMARQ	L:S::500 MIL						33.00 MHZ	13 24
OPTICAL	EIDE_OPTICAL_DATA<15..0>	L:S:4000:6000						33 MHZ	24 39
	EIDE_OPTICAL_ADDR<2..0>	L:S:4000:6000						33 MHZ	24 39
	EIDE_OPTICAL_CS0_L	L:S:4500 MIL:6500 MIL						33.00 MHZ	24 39
	EIDE_OPTICAL_CS1_L	L:S:4500 MIL:6500 MIL						33.00 MHZ	24 39
	EIDE_OPTICAL_READ_L	L:S:4500 MIL:6500 MIL						33.00 MHZ	24 39
	EIDE_OPTICAL_WR_L	L:S:4500 MIL:6500 MIL						33.00 MHZ	24 39
	EIDE_OPTICAL_IOCHRDY	L:S:4500 MIL:6500 MIL						33.00 MHZ	24 39
	EIDE_OPTICAL_INT	L:S:5000 MIL:7000 MIL						33.00 MHZ	24 39
	EIDE_OPTICAL_RST_L	L:S:4500 MIL:6500 MIL						33.00 MHZ	24 39
	EIDE_OPTICAL_DMACK_L	L:S:4500 MIL:6500 MIL						33.00 MHZ	24 39
	EIDE_OPTICAL_DMA_RQ	L:S:4500 MIL:6500 MIL						33.00 MHZ	24 39
ETHERNET MII	ENET_LINK_RXD<7..0>	L:S:8000:9000	7	(400)		(400)			13 26
	ENET_RX_DV	L:S:8000 MIL:9000 MIL							13 26
	ENET_RX_ER	L:S:8000 MIL:9000 MIL							13 26
	ENET_PHY_TXD<7..0>	L:S:8000:9000	7	(400)		(400)			13 26
	ENET_LINK_TXD<7..0>	L:S::600							13
	ENET_PHY_TX_ER	L:S:8000 MIL:9000 MIL							13 26
	ENET_LINK_TX_ER	L:S::400 MIL							13
	ENET_PHY_TX_EN	L:S:8000 MIL:9000 MIL							13 26
	ENET_LINK_TX_EN	L:S::400 MIL							13
	ENET_MDIO	L:S:8000 MIL:9000 MIL							13 26
	ENET_MDC	L:S:8000 MIL:9000 MIL							13 26
	ENET_COL	L:S:8000 MIL:9000 MIL							13 26
	ENET_CRS	L:S:8000 MIL:9000 MIL							13 26
FIREWIRE MII	FW_LINK_DATA<7..0>	L:S:2700:3500	7	(400)		(400)			13 27
	FW_PHY_DATA<7..0>	L:S:4700:5500	7	(400)		(400)			27
	FW_LINK_CNTL<1..0>	L:S:9000:10000							13 27
	FW_PHY_CNTL<1..0>	L:S::300							27
	FW_LINK_LREQ	L:S::300 MIL							13
	FW_PHY_LREQ	L:S:8500 MIL:9500 MIL							13 27
	FW_PINT	L:S:8500 MIL:9500 MIL							13 27

PRIORITY: 4
PRIMARY LAYERS: 9
SECONDARY LAYERS: 4,7
GOAL: MINIMIZE TH VIAS

PRIORITY: 7
PRIMARY LAYERS: 4,7
SECONDARY LAYERS: 2,9

NEED TO MATCH DELAY TO 250

TOTAL UIDE+HD SKEW <500MIL

PRIORITY: 6
PRIMARY LAYERS: 4,7
SECONDARY LAYERS: 2,9

PRIORITY: 8
PRIMARY LAYERS: 4,7
SECONDARY LAYERS: 2,9

PRIORITY: 5
PRIMARY LAYERS: 4,7
SECONDARY LAYERS: 2,9

PRIORITY: 5
PRIMARY LAYERS: 4,7
SECONDARY LAYERS: 2,9

Differential Signals

GROUP	SIG_NAME	DIFFERENTIAL_PAIR	RELATIVE_PROPAGATION_DELAY	MAX_EXPOSED_LENGTH	NET_SPACING_TYPE	MAX_VIAS	
FIREWIRE Zo = 110	FW_TPI0N	FW_TPI0	FW_TPI0:G:L:S:0 MIL:5 MIL	500.0000	110 OHM SPACING		27 28 39
	FW_TPI0P	FW_TPI0	FW_TPI0:G:L:S:0 MIL:5 MIL	500.0000	110 OHM SPACING		27 28 39
	FW_TPO0N	FW_TPO0	FW_TPO0:G:L:S:0 MIL:5 MIL	500.0000	110 OHM SPACING		27 28 39
	FW_TPO0P	FW_TPO0	FW_TPO0:G:L:S:0 MIL:5 MIL	500.0000	110 OHM SPACING		27 28 39
	FW_TPBI0N	FW_TPBI0	FW_TPBI0:G:L:S:0 MIL:5 MIL	500.0000	110 OHM SPACING		28
	FW_TPBI0P	FW_TPBI0	FW_TPBI0:G:L:S:0 MIL:5 MIL	500.0000	110 OHM SPACING		28
	FW_TPAO0N	FW_TPAO0	FW_TPAO0:G:L:S:0 MIL:5 MIL	500.0000	110 OHM SPACING		28
	FW_TPAO0P	FW_TPAO0	FW_TPAO0:G:L:S:0 MIL:5 MIL	500.0000	110 OHM SPACING		28
	FW_TPA1N	FW_TPA1	FW_TPA1:G:L:S:0 MIL:4%	500.0000	110 OHM SPACING		27 28
	FW_TPA1P	FW_TPA1	FW_TPA1:G:L:S:0 MIL:4%	500.0000	110 OHM SPACING		27 28
	FW_TPB1N	FW_TPB1	FW_TPB1:G:L:S:0 MIL:4%	500.0000	110 OHM SPACING		27 28
	FW_TPB1P	FW_TPB1	FW_TPB1:G:L:S:0 MIL:4%	500.0000	110 OHM SPACING		27 28
	FW_TPI1N	FW_TPI1	FW_TPI1:G:L:S:0 MIL:4%	500.0000	110 OHM SPACING		28 39
	FW_TPI1P	FW_TPI1	FW_TPI1:G:L:S:0 MIL:4%	500.0000	110 OHM SPACING		28 39
	FW_TPO1N	FW_TPO1	FW_TPO1:G:L:S:0 MIL:4%	500.0000	110 OHM SPACING		28 39
	FW_TPO1P	FW_TPO1	FW_TPO1:G:L:S:0 MIL:4%	500.0000	110 OHM SPACING		28 39
ETHERNET Zo = 100	MDI_P<0>	ENET_MDI0	ENET_MDI0:G:U43.29:J23.1:0 MIL:100 MIL		ENET 10 MIL SPACING		26 39
	MDI_M<0>	ENET_MDI0	ENET_MDI0:G:U43.31:J23.2:0 MIL:100 MIL		ENET 10 MIL SPACING		26 39
	MDI_P<1>	ENET_MDI1	ENET_MDI1:G:U43.33:J23.3:0 MIL:100 MIL		ENET 10 MIL SPACING		26 39
	MDI_M<1>	ENET_MDI1	ENET_MDI1:G:U43.34:J23.4:0 MIL:100 MIL		ENET 10 MIL SPACING		26 39
	MDI_P<2>	ENET_MDI2	ENET_MDI2:G:U43.39:J23.7:0 MIL:100 MIL		ENET 10 MIL SPACING		26 39
	MDI_M<2>	ENET_MDI2	ENET_MDI2:G:U43.41:J23.8:0 MIL:100 MIL		ENET 10 MIL SPACING		26 39
	MDI_P<3>	ENET_MDI3	ENET_MDI3:G:U43.42:J23.9:0 MIL:100 MIL		ENET 10 MIL SPACING		26 39
	MDI_M<3>	ENET_MDI3	ENET_MDI3:G:U43.43:J23.10:0 MIL:100 MIL		ENET 10 MIL SPACING		26 39
LVDS Zo = 100 LOWER	CLKLVDS_LN	CLKLVDS_L	LVDS:G:L:S:0 MIL:110 MIL	500.0000	100 OHM SPACING	4	20 22 39
	CLKLVDS_LP	CLKLVDS_L	LVDS:G:L:S:0 MIL:110 MIL	500.0000	100 OHM SPACING	4	20 22 39
	LVDS_L0N	LVDS_L0	LVDS:G:L:S:0 MIL:110 MIL	500.0000	100 OHM SPACING		20 22 39
	LVDS_L0P	LVDS_L0	LVDS:G:L:S:0 MIL:110 MIL	500.0000	100 OHM SPACING		20 22 39
	LVDS_L1N	LVDS_L1	LVDS:G:L:S:0 MIL:110 MIL	500.0000	100 OHM SPACING		20 22 39
	LVDS_L1P	LVDS_L1	LVDS:G:L:S:0 MIL:110 MIL	500.0000	100 OHM SPACING		20 22 39
	LVDS_L2N	LVDS_L2	LVDS:G:L:S:0 MIL:110 MIL	500.0000	100 OHM SPACING		20 22 39
	LVDS_L2P	LVDS_L2	LVDS:G:L:S:0 MIL:110 MIL	500.0000	100 OHM SPACING		20 22 39
UPPER	CLKLVDS_UN	CLKLVDS_U	LVDS:G:L:S:0 MIL:110 MIL	500.0000	100 OHM SPACING	4	20 22
	CLKLVDS_UP	CLKLVDS_U	LVDS:G:L:S:0 MIL:110 MIL	500.0000	100 OHM SPACING	4	20 22
	LVDS_U0N	LVDS_U0	LVDS:G:L:S:0 MIL:110 MIL	500.0000	100 OHM SPACING		20 22
	LVDS_U0P	LVDS_U0	LVDS:G:L:S:0 MIL:110 MIL	500.0000	100 OHM SPACING		20 22
	LVDS_U1N	LVDS_U1	LVDS:G:L:S:0 MIL:110 MIL	500.0000	100 OHM SPACING		20 22
	LVDS_U1P	LVDS_U1	LVDS:G:L:S:0 MIL:110 MIL	500.0000	100 OHM SPACING		20 22
	LVDS_U2N	LVDS_U2	LVDS:G:L:S:0 MIL:110 MIL	500.0000	100 OHM SPACING		20 22
	LVDS_U2P	LVDS_U2	LVDS:G:L:S:0 MIL:110 MIL	500.0000	100 OHM SPACING		20 22
TMDS Zo = 100	TMDS_CLKN	CLKTMDS	TMDS:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	5	19 22
	TMDS_CLKP	CLKTMDS	TMDS:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	5	19 22
	TMDS_DN<0>	TMDS_D0	TMDS:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	8	19 22 39
	TMDS_DP<0>	TMDS_D0	TMDS:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	8	19 22 39
	TMDS_DN<1>	TMDS_D1	TMDS:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	8	19 22 39
	TMDS_DP<1>	TMDS_D1	TMDS:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	8	19 22 39
	TMDS_DN<2>	TMDS_D2	TMDS:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	8	19 22 39
	TMDS_DP<2>	TMDS_D2	TMDS:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	8	19 22 39
	ATI_TMDS_CLKN	ATI_CLKTMDS	ATITMDS:G:L:S:0 MIL:50 MIL	200.0000	100 OHM SPACING	5	20
	ATI_TMDS_CLKP	ATI_CLKTMDS	ATITMDS:G:L:S:0 MIL:50 MIL	200.0000	100 OHM SPACING	5	20
	ATI_TMDS_DN<0>	ATI_TMDS_D0	ATITMDS:G:L:S:0 MIL:50 MIL	200.0000	100 OHM SPACING	8	20
	ATI_TMDS_DP<0>	ATI_TMDS_D0	ATITMDS:G:L:S:0 MIL:50 MIL	200.0000	100 OHM SPACING	8	20
	ATI_TMDS_DN<1>	ATI_TMDS_D1	ATITMDS:G:L:S:0 MIL:50 MIL	200.0000	100 OHM SPACING	8	20
	ATI_TMDS_DP<1>	ATI_TMDS_D1	ATITMDS:G:L:S:0 MIL:50 MIL	200.0000	100 OHM SPACING	8	20
	ATI_TMDS_DN<2>	ATI_TMDS_D2	ATITMDS:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	8	20
USB 1.1 Zo = 90	ATI_TMDS_DP<2>	ATI_TMDS_D2	ATITMDS:G:L:S:0 MIL:50 MIL	500.0000	100 OHM SPACING	8	20
	USB_DEM	USB_DE	USB_DE:G:L:S:0 MIL:200 MIL		10 MIL SPACING		14
	USB_DEP	USB_DE	USB_DE:G:L:S:0 MIL:200 MIL		10 MIL SPACING		14
	USB_DFM	USB_DF	USB_DF:G:L:S:0 MIL:200 MIL		10 MIL SPACING		14
	USB_DFP	USB_DF	USB_DF:G:L:S:0 MIL:200 MIL		10 MIL SPACING		14
	BT_USB_DM	BT_USB_D	BT_USB:G:L:S:0 MIL:200 MIL		10 MIL SPACING		14 25 39
	BT_USB_DP	BT_USB_D	BT_USB:G:L:S:0 MIL:200 MIL		10 MIL SPACING		14 25 39
USB 2.0 Zo = 90	MODEM_USB_DM	MODEM_USB_D	MODEM_USB:G:L:S:0 MIL:200 MIL		10 MIL SPACING		14 25 39
	MODEM_USB_DP	MODEM_USB_D	MODEM_USB:G:L:S:0 MIL:200 MIL		10 MIL SPACING		14 25 39
	NEC_USB_DAM	USB_D1	USB_D1:G:L:S:0 MIL:20 MIL	500.0000	90 OHM SPACING		17 25 39
	NEC_USB_DAP	USB_D1	USB_D1:G:L:S:0 MIL:20 MIL	500.0000	90 OHM SPACING		17 25 39
	NEC_USB_DBM	USB_D2	USB_D2:G:L:S:0 MIL:20 MIL	500.0000	90 OHM SPACING		17 25 39
	NEC_USB_DBP	USB_D2	USB_D2:G:L:S:0 MIL:20 MIL	500.0000	90 OHM SPACING		17 25 39
POWER SUPPLIES	1772_CSSN	1772_CSS	1772_CSS:G:L:S:0 MIL:100 MIL				30
	1772_CSSP	1772_CSS	1772_CSS:G:L:S:0 MIL:100 MIL				30
	1772_CSIN	1772_CSI	1772_CSI:G:L:S:0 MIL:100 MIL				30
	1772_CSIP	1772_CSI	1772_CSI:G:L:S:0 MIL:100 MIL				30
	3V_SNSM	3V_SNS	3V_SNS:G:L:S:0 MIL:100 MIL				32
	3V_SNSP	3V_SNS	3V_SNS:G:L:S:0 MIL:100 MIL				32
	5V_SNSM	5V_SNS	5V_SNS:G:L:S:0 MIL:100 MIL				32
	5V_SNSP	5V_SNS	5V_SNS:G:L:S:0 MIL:100 MIL				32
THERMOSTAT	THERM1_DM		THERM1:G:L:S:0 MIL:100 MIL				25
	THERM1_DP		THERM1:G:L:S:0 MIL:100 MIL				25
	THERM2_DM		THERM2:G:L:S:0 MIL:100 MIL				25
	THERM2_DP		THERM2:G:L:S:0 MIL:100 MIL				25
	THERM1_M_DM	THERM1_MAIN	THERM1_MAIN:G:L:S:0 MIL:100 MIL				25
	THERM1_M_DP	THERM1_MAIN	THERM1_MAIN:G:L:S:0 MIL:100 MIL				25
	THERM2_M_DM	THERM2_MAIN	THERM2_MAIN:G:L:S:0 MIL:100 MIL				25
	THERM2_M_DP	THERM2_MAIN	THERM2_MAIN:G:L:S:0 MIL:100 MIL				25
	THERM1_A_DM	THERM1_ALT	THERM1_ALT:G:L:S:0 MIL:100 MIL				25
	THERM1_A_DP	THERM1_ALT	THERM1_ALT:G:L:S:0 MIL:100 MIL				25
	THERM2_A_DM	THERM2_ALT	THERM2_ALT:G:L:S:0 MIL:100 MIL				25
	THERM2_A_DP	THERM2_ALT	THERM2_ALT:G:L:S:0 MIL:100 MIL				25

PRIORITY: 3
PRIMARY LAYERS: 4,7 FOR CONTROLLED IMPEDANCE DIFF PAIRS
SECONDARY LAYERS: 2,9 FOR UNCONTROLLED IMPEDANCE DIFF PAIRS

LAYERS 4 OR 7
Er = 4.3 (DIELECTRIC CONSTANT)
W = 3MIL (TRACE WIDTH)
S = 11MIL (TRACE SEPERATION)
H = 16.8MIL (DIST BETW PLANES)
T = 0.6MIL (TRACE THICKNESS)

Zo(diff) = 106.2 OHMS
Zo(single) = 55.4 OHMS

Clear adjacent power plane!
Zo will be lower due to asymmetric stackup.

LAYERS 4 OR 7
Er = 4.3 (DIELECTRIC CONSTANT)
W = 3.1MIL (TRACE WIDTH)
S = 4.9MIL (TRACE SEPERATION)
H = 9.6MIL (DIST BETW PLANES)
T = 0.6MIL (TRACE THICKNESS)

Zo(diff) = 94 OHMS
Zo(single) = 50 OHMS

LAYERS 4 OR 7
Er = 4.3 (DIELECTRIC CONSTANT)
W = 3.6MIL (TRACE WIDTH)
S = 7MIL (TRACE SEPERATION)
H = 9.6MIL (DIST BETW PLANES)
T = 0.6MIL (TRACE THICKNESS)

Zo(diff) = 89.8 OHMS
Zo(single) = 46.6 OHMS

LAYERS 2 OR 9

SIGNAL CONSTRAINTS - PAGE 2

APPLE COMPUTER INC.

SIZE D | DRAWING NUMBER 051-6338 | REV. C

SCALE NONE | SHT 37 OF 40

POWER NET CONSTRAINTS

GROUP	SIG_NAME	VOLTAGE	MIN_LINE_WIDTH	MIN_NECK_WIDTH	
MAIN/SLEEP	+24V_PBUS	VOLTAGE=24V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	39
	+BATT	VOLTAGE=12.6V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	
	+PBUS	VOLTAGE=12.8V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	39
	+5V_MAIN	VOLTAGE=5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	39
	+5V_SLEEP	VOLTAGE=5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	39
	+3V_MAIN	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	23 39
	+3V_SLEEP	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=6	39
	+3V_PMU	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	39
	+2_5V_MAIN	VOLTAGE=2.5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	39
	+2_5V_SLEEP	VOLTAGE=2.5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	
	+1_8V_MAIN	VOLTAGE=1.8V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=6	39
	+1_8V_SLEEP	VOLTAGE=1.8V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	
	+1_5V_MAIN	VOLTAGE=1.5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	
	+1_5V_SLEEP	VOLTAGE=1.5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	
	+1_5V_LDO	VOLTAGE=1.5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	
	+1_5V_SLEEP_VIN	VOLTAGE=1.5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	
ADAPTER	+ADAPTER	VOLTAGE=24V	MIN_LINE_WIDTH=50	MIN_NECK_WIDTH=10	30 31 39
	1394 +ADAPTER_SW	VOLTAGE=24V	MIN_LINE_WIDTH=50	MIN_NECK_WIDTH=10	30 38
	+ADAPTER_SW	VOLTAGE=24V	MIN_LINE_WIDTH=50	MIN_NECK_WIDTH=10	30 38
	+ADAPTER_SENSE	VOLTAGE=24V	MIN_LINE_WIDTH=50	MIN_NECK_WIDTH=10	30
BATTERY CHARGER	+BATT_POS	VOLTAGE=16.8V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	30 39
	BATT_NEG	VOLTAGE=0V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	30 39
	1772_DCIN	VOLTAGE=24V	MIN_LINE_WIDTH=10		30
	1772_LX	VOLTAGE=12.6V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	30
	+BATT_14V_FUSE	VOLTAGE=12.6V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	30
	+BATT_24V_FUSE	VOLTAGE=12.6V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	30
	+BATT_RSNS	VOLTAGE=12.6V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	30
	+BATT_VSNS	VOLTAGE=12.6V	MIN_LINE_WIDTH=10	MIN_NECK_WIDTH=10	30
	1772_LDO	VOLTAGE=5.4V	MIN_LINE_WIDTH=10		30
	1772_DLOV	VOLTAGE=5.4V	MIN_LINE_WIDTH=10		30
	1772_GND	VOLTAGE=0V	MIN_LINE_WIDTH=10		30
PMU	+ADAPTER_ILIM	VOLTAGE=24V	MIN_LINE_WIDTH=10		31
	+ADAPTER_OR_BATT	VOLTAGE=24V	MIN_LINE_WIDTH=10		31
	+4_85V_RAW	VOLTAGE=4.85V	MIN_LINE_WIDTH=10		29 31
	+4_6V_BU	VOLTAGE=4.6V	MIN_LINE_WIDTH=10		31 32
	+4_85V_ESR	VOLTAGE=4.85V	MIN_LINE_WIDTH=10		31
	+3V_PMU_ESR	VOLTAGE=3.3V	MIN_LINE_WIDTH=10		31
	+3V_PMU_AVCC	VOLTAGE=3.3V	MIN_LINE_WIDTH=10		25 29
MISC HD	+5V_HD_SLEEP	VOLTAGE=5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	24 32
	+HD_LOGIC_SLEEP	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	24
TRACKPAD	+5V_TPAD_SLEEP	VOLTAGE=5V	MIN_LINE_WIDTH=10		23 39
HALL EFFECT	+3V_HALL_EFFECT	VOLTAGE=3.3V	MIN_LINE_WIDTH=10		23 39
VIDEO	+14V_INV	VOLTAGE=14V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	22 39
	+5V_INV_UF_SW	VOLTAGE=5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	22
	+5V_INV_SW	VOLTAGE=5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	22 39
	+5V_DDC_SLEEP	VOLTAGE=5V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10	22 39
	+5V_DDC_SLEEP_UF	VOLTAGE=5V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10	22
	+3V_LCD	VOLTAGE=3.3V	MIN_LINE_WIDTH=12	MIN_NECK_WIDTH=10	22 39
	+3V_LCD_SW	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	22
	GPU_TV_GND1	VOLTAGE=0V	MIN_LINE_WIDTH=25		22
	GPU_TV_GND2	VOLTAGE=0V	MIN_LINE_WIDTH=25		22
	TV_GND1	VOLTAGE=0V	MIN_LINE_WIDTH=25		22 39
	TV_GND2	VOLTAGE=0V	MIN_LINE_WIDTH=25		22 39
AUDIO	1387 +5V_MAIN_AUD	VOLTAGE=5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	25 32
	1388 +3V_MAIN_AUD	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	25 32
	1389 AUD_GND	VOLTAGE=0V	MIN_LINE_WIDTH=50		25
FAN	1400 +FAN_PWR	VOLTAGE=5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	25 39
	FAN1_GND	VOLTAGE=0V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	39
	FAN2_GND	VOLTAGE=0V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	39

I/O AREA	CHGND1	VOLTAGE=0V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=6	IN
INVERTER	CHGND2	VOLTAGE=0V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=12	IN
TRACKPAD	CHGND3	VOLTAGE=0V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=12	IN
LVDS	CHGND4	VOLTAGE=0V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=12	IN

ENET_CTAP_CHGND VOLTAGE=0V MIN_LINE_WIDTH=25 MIN_NECK_WIDTH=12

GROUP	SIG_NAME	VOLTAGE	MIN_LINE_WIDTH	MIN_NECK_WIDTH	
CPU	CPU_VCORE_SLEEP	VOLTAGE=1.4V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	5 33 39
	CPU_AVDD	VOLTAGE=1.4V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	5
	MAXBUS_SLEEP	VOLTAGE=1.8V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	5 6 7 8 15 16 33
DDR RAM	DDR_VREF	VOLTAGE=1.25V	MIN_LINE_WIDTH=10		11
INTREPID	1555 +2_5V_INTREPID	VOLTAGE=2.5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	9 10 15 16
	+3V_INTREPID_USB	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	14
PLLS	+1_5V_INTREPID_PLL	VOLTAGE=1.5V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10	8 12 14
	+1_5V_INTREPID_PLL1	VOLTAGE=1.5V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=6	14
	+1_5V_INTREPID_PLL2	VOLTAGE=1.5V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=6	14
	+1_5V_INTREPID_PLL3	VOLTAGE=1.5V	MIN_LINE_WIDTH=10	MIN_NECK_WIDTH=6	14
	+1_5V_INTREPID_PLL4	VOLTAGE=1.5V	MIN_LINE_WIDTH=10	MIN_NECK_WIDTH=6	14
	+1_5V_INTREPID_PLL5	VOLTAGE=1.5V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=6	12
	+1_5V_INTREPID_PLL6	VOLTAGE=1.5V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=6	12
	+1_5V_INTREPID_PLL7	VOLTAGE=1.5V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=6	8
	+1_5V_INTREPID_PLL8	VOLTAGE=1.5V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=6	14
REFERENCE	INT_MEM_VREF	VOLTAGE=1.25V	MIN_LINE_WIDTH=10		9
	INT_AGP_VREF	VOLTAGE=1.25V	MIN_LINE_WIDTH=10		12 19
	INT_MEM_REF_H	VOLTAGE=0V	MIN_LINE_WIDTH=10		9
	VIDE_REF	VOLTAGE=0V	MIN_LINE_WIDTH=8		13
AIRPORT	+3V_AIRPORT	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	39
CARDBUS	+VCC_CBUS_SW	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	18
	+VPP_CBUS_SW	VOLTAGE=5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	18
ATI M10	GPU_VCORE	VOLTAGE=1.2V	MIN_LINE_WIDTH=30	MIN_NECK_WIDTH=10	19 20 39
	+3V_GPU	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	12 19 20 21
	+3V_GPU_FLT	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	21
	+2_5V_GPU	VOLTAGE=2.5V	MIN_LINE_WIDTH=30	MIN_NECK_WIDTH=10	21
	GPU_MEM_IO	VOLTAGE=2.5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	19 21
	GPU_MEM_IO_FLT	VOLTAGE=2.5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	21
	+2_5V_GPU_MEMCORE	VOLTAGE=2.5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	21
	+1_8V_GPU	VOLTAGE=1.8V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	19 20 21
	+1_5V_AGP	VOLTAGE=1.5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	12 15 16 19 20 21
	+2_5V_GPU_PNLIO	VOLTAGE=2.5V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10	21
	+1_8V_ATI_PVDD	VOLTAGE=1.8V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10	20 21
	+1_5V_AGP_GPU	VOLTAGE=1.5V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10	21
	+1_5V_GPU_VDD15	VOLTAGE=1.5V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10	20
	+1_8V_GPU_PLL	VOLTAGE=1.8V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10	21
	+1_8V_GPU_VDDDI	VOLTAGE=1.8V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10	21
	GPU_VCORE_VDDCI	VOLTAGE=1.2V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10	19
	+2_5V_GPU_A2VDD	VOLTAGE=2.5V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10	21
	+1_8V_GPU_AVDD	VOLTAGE=1.8V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10	21
	+1_8V_GPU_PNLPLL	VOLTAGE=1.8V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10	21
	+1_8V_GPU_PNLIO	VOLTAGE=1.8V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10	21
	+2_5V_GPU_MCLK	VOLTAGE=2.5V	MIN_LINE_WIDTH=10	MIN_NECK_WIDTH=10	21
	+1_8V_GPU_AVDDQ	VOLTAGE=1.8V	MIN_LINE_WIDTH=10	MIN_NECK_WIDTH=10	21
	+1_8V_GPU_MEMPLL	VOLTAGE=1.8V	MIN_LINE_WIDTH=10	MIN_NECK_WIDTH=10	21
	+3V_ATI_OSC_SLEEP	VOLTAGE=3.3V	MIN_LINE_WIDTH=10	MIN_NECK_WIDTH=10	19
	+3V_ATI_SS	VOLTAGE=3.3V	MIN_LINE_WIDTH=10	MIN_NECK_WIDTH=10	19
	1546 +GPU_VDD15_UF	VOLTAGE=1.5V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10	20
	1547 +2_5V_SLEEP_NECK1	VOLTAGE=2.5V	MIN_LINE_WIDTH=10		20
	1548 +3V_SLEEP_NECK	VOLTAGE=3V	MIN_LINE_WIDTH=10		34
	1549 +1_5V_AGP_NECK	VOLTAGE=1.5V	MIN_LINE_WIDTH=10		20
	1550 +1_8V_PVDD_NECK	VOLTAGE=1.8V	MIN_LINE_WIDTH=10		20
	1551 GPU_VCORE_NECK	VOLTAGE=1.2V	MIN_LINE_WIDTH=10		20
	1552 +GPU_VDD15_NECK	VOLTAGE=1.5V	MIN_LINE_WIDTH=10		20
	1553 +2_5V_SLEEP_NECK2	VOLTAGE=2.5V	MIN_LINE_WIDTH=10		34
	1554 +1_8V_SLEEP_NECK	VOLTAGE=1.8V	MIN_LINE_WIDTH=10		34
	1555 +1_5V_SLEEP_NECK	VOLTAGE=1.5V	MIN_LINE_WIDTH=10		34
	1556 +1_8V_ATI_TPVDD	VOLTAGE=1.8V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10	21
	1561 +1_8V_GPU_TP_PLL	VOLTAGE=1.8V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10	21
ETHERNET 88E1111 NEC USB2.0	+2_5V_MARVELL	VOLTAGE=2.5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	26
	+2_5V_MARVELL_AVDD	VOLTAGE=2.5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	26
	+1_0V_MARVELL	VOLTAGE=1.0V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	26
	LTC3405_SW	VOLTAGE=1.0V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	26
	1510 +3V_NEC_VDD	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	17
	1511 NEC_AVDD	VOLTAGE=3.3V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10	17
FW	1512 LM2594_IN	VOLTAGE=33V	MIN_LINE_WIDTH=40	MIN_NECK_WIDTH=12	27
	1513 +FW_PBUS	VOLTAGE=12.8V	MIN_LINE_WIDTH=100	MIN_NECK_WIDTH=12	28
	+FW_SW	VOLTAGE=12.8V	MIN_LINE_WIDTH=100	MIN_NECK_WIDTH=12	28
	1545 +FW_AMP_SENSE	VOLTAGE=12.8V	MIN_LINE_WIDTH=100	MIN_NECK_WIDTH=12	
	+FW_PWR_OR	VOLTAGE=33V	MIN_LINE_WIDTH=100	MIN_NECK_WIDTH=12	27 28
	1516 +FW_PWR1	VOLTAGE=33V	MIN_LINE_WIDTH=100	MIN_NECK_WIDTH=12	28
	+FW_VP0	VOLTAGE=33V	MIN_LINE_WIDTH=100	MIN_NECK_WIDTH=12	28 39
	+FW_VP1	VOLTAGE=33V	MIN_LINE_WIDTH=100	MIN_NECK_WIDTH=12	28 39
	+3V_FW	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	27 28
	+3V_FW_UF	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	27
	+3V_FW_AVDD_PORT2	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	27
	+3V_FW_AVDD_PORT1	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	27
	+3V_FW_AVDD_PORT0	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	27
	+3V_FW_AVDD	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	27
	+1_95V_FW_DVDD	VOLTAGE=1.95V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	27
	+1_95V_FW_DVDD_RX0	VOLTAGE=1.95V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	27
	+1_95V_FW_DVDD_TX0	VOLTAGE=1.95V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	27
	+1_95V_FW_DVDD_PORT1	VOLTAGE=1.95V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	27
	+1_95V_FW_PLLVDD	VOLTAGE=1.95V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	27
	+1_95V_FW_PLL400VDD	VOLTAGE=1.95V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	27
	+1_95V_FW_PLL500VDD	VOLTAGE=1.95V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	27
	FW_VGND0	VOLTAGE=0V	MIN_LINE_WIDTH=100	MIN_NECK_WIDTH=12	28
	1514 FW_VGND1	VOLTAGE=0V	MIN_LINE_WIDTH=100	MIN_NECK_WIDTH=12	28
	1560 FW_VDD_ON	VOLTAGE=12.8V	MIN_LINE_WIDTH=100	MIN_NECK_WIDTH=12	

GROUP	SIG_NAME	VOLTAGE	MIN_LINE_WIDTH	MIN_NECK_WIDTH	
LTC1625 14V SWITCHER	1625_VIN	VOLTAGE=24V	MIN_LINE_WIDTH=10		31
	1625_VSW	VOLTAGE=14V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	31
	+PBUS_JUMPER	VOLTAGE=14V	MIN_LINE_WIDTH=10		31
	1625_EXTVCC	VOLTAGE=5V	MIN_LINE_WIDTH=10		31
	1625_INTVCC	VOLTAGE=5V	MIN_LINE_WIDTH=10		31
	1625_SGND	VOLTAGE=0V	MIN_LINE_WIDTH=10		31
	1V20_REF	VOLTAGE=1.2V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10	30 31
LTC3707 5V SWITCHER	3707_INTVCC	VOLTAGE=5V	MIN_LINE_WIDTH=10	MIN_NECK_WIDTH=10	32
	5V_SW	VOLTAGE=5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	32
	5V_RSNS	VOLTAGE=5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	32
	+5V_MAIN_JUMPER	VOLTAGE=5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	32
3V SWITCHER	3V_SW	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	32
	3V_RSNS	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	32
	+3V_MAIN_JUMPER	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	32
	3707_SGND	VOLTAGE=0V	MIN_LINE_WIDTH=10		32
MAX1715 2.5V SWITCHER	2_5V_LX	VOLTAGE=2.5V	MIN_LINE_WIDTH=50	MIN_NECK_WIDTH=10	34
	2_5V_LX_F	VOLTAGE=2.5V	MIN_LINE_WIDTH=50	MIN_NECK_WIDTH=10	34
	2_5V_BST	VOLTAGE=5V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10	34
	2_5V_BOOST	VOLTAGE=5V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10	34
	2_5V_DH	VOLTAGE=2.5V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10	34
	2_5V_DL	VOLTAGE=2.5V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10	34
1.65V SWITCHER	1_5V_FB	VOLTAGE=1.5V	MIN_LINE_WIDTH=8		34
	1_5V_LX	VOLTAGE=1.5V	MIN_LINE_WIDTH=50	MIN_NECK_WIDTH=10	34
	1_5V_LX_F	VOLTAGE=1.5V	MIN_LINE_WIDTH=50	MIN_NECK_WIDTH=10	34
	1_5V_BST	VOLTAGE=5V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10	34
	1_5V_BOOST	VOLTAGE=5V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10	34
	1_5V_DH	VOLTAGE=1.5V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10	34
	1_5V_DL	VOLTAGE=1.5V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10	34
CONTROL	1_5V_ILIM		MIN_LINE_WIDTH=8		34
	2_5V_ILIM		MIN_LINE_WIDTH=8		34
	MAX1715_TON		MIN_LINE_WIDTH=8		34
	MAX1715_SKIP		MIN_LINE_WIDTH=8		34
	MAX1715_REF	VOLTAGE=2.0V	MIN_LINE_WIDTH=8		34
	MAX1715_VCC	VOLTAGE=5V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10	34
	MAX1715_GND	VOLTAGE=0V	MIN_LINE_WIDTH=30	MIN_NECK_WIDTH=10	34
MAX1717	VCORE_VCC	VOLTAGE=5V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10	33
	VCORE_LX	VOLTAGE=1.4V	MIN_LINE_WIDTH=200	MIN_NECK_WIDTH=10	33
	VCORE_DH		MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10	33
	VCORE_DL		MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10	33
	VCORE_BOOST	VOLTAGE=5V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10	33
	VCORE_BST	VOLTAGE=5V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10	33
	VCORE_ILIM		MIN_LINE_WIDTH=8		33
	VCORE_REF		MIN_LINE_WIDTH=8		33
	VCORE_TON	VOLTAGE=5V	MIN_LINE_WIDTH=8		33
	VCORE_CC		MIN_LINE_WIDTH=8		33
	VCORE_FB	VOLTAGE=1.4V	MIN_LINE_WIDTH=8		33 39
	VCORE_TIME		MIN_LINE_WIDTH=8		33
	VCORE_VGATE		MIN_LINE_WIDTH=8		14 33
	VCORE_GND	VOLTAGE=0V	MIN_LINE_WIDTH=30		33
	VCORE_GNDSNS	VOLTAGE=0V	MIN_LINE_WIDTH=8		33
	VCORE_SNS	VOLTAGE=1.4V	MIN_LINE_WIDTH=8		33
	VCORE_GNDDIV	VOLTAGE=0V	MIN_LINE_WIDTH=8		33
	1310 VCORE_GNDA	VOLTAGE=0V	MIN_LINE_WIDTH=10		33
LTC1778	1778_VIN	VOLTAGE=14V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10	20
	1778_VCC	VOLTAGE=5V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10	20
	1778_GND	VOLTAGE=0V	MIN_LINE_WIDTH=30	MIN_NECK_WIDTH=10	20
	1778_BST	VOLTAGE=5V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10	20
	1778_BST_RC	VOLTAGE=5V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10	20
	1778_TG		MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10	20
	1778_BG		MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10	20
	GPU_VCORE_SW	VOLTAGE=1.2V	MIN_LINE_WIDTH=50	MIN_NECK_WIDTH=10	20
	GPU_VCORE_SW_F	VOLTAGE=1.2V	MIN_LINE_WIDTH=50	MIN_NECK_WIDTH=10	20
	1778_ION		MIN_LINE_WIDTH=8		20
	1778_ITH		MIN_LINE_WIDTH=8		20
	1778_ITH_RC		MIN_LINE_WIDTH=8		20
	1778_VFB		MIN_LINE_WIDTH=8		20 39
	1778_FCB		MIN_LINE_WIDTH=8		20
	1778_VRNG		MIN_LINE_WIDTH=8		20
LTC3411	LTC3411_VCC	VOLTAGE=3.3V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10	34
	LTC3411_GND	VOLTAGE=0V	MIN_LINE_WIDTH=30	MIN_NECK_WIDTH=10	34
	1_8V_SW	VOLTAGE=1.8V	MIN_LINE_WIDTH=30	MIN_NECK_WIDTH=10	34
	1_8V_SW_F	VOLTAGE=1.8V	MIN_LINE_WIDTH=30	MIN_NECK_WIDTH=10	34
	1_8V_VFB		MIN_LINE_WIDTH=8		34
	LTC3411_ITH_RC		MIN_LINE_WIDTH=8		34
	LTC3411_ITH		MIN_LINE_WIDTH=8		34
	LTC3411_SYNC		MIN_LINE_WIDTH=8		34
LTC1962 INT PLLS	LTC3411_SHDN		MIN_LINE_WIDTH=8		34
	LTC1962_INT_VIN		MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10	14

SIGNAL CONSTRAINTS - PAGE 3

APPLE COMPUTER INC.

SIZE	DRAWING NUMBER	REV.
D	051-6338	C
SCALE: NONE	SHT 38 OF 40	

FUNCTIONAL TEST POINTS

PROBES ARE ON BOTTOM SIDE. MINIMUM PAD/HOLE SIZE IS 25 MIL.

FUNC_TEST IS ONLY PROPERTY USED BY THE TOOLS. FUNC_QTY IS FOR REFERENCE AND LISTS THE NUMBER OF TEST POINTS ON THAT NET AND WITHIN THAT GROUP/CONNECTOR.
FUNC_DIST IS SIMILARLY USED TO DEFINE MAXIMUM DISTANCE FROM A CONNECTOR.

GROUP	SIG_NAME	FUNC_TEST	FUNC_QTY	FUNC_DIST	
SCAN/TEST	JTAG_ASIC_TMS	TRUE			13 26
	JTAG_ASIC_TDI	TRUE			13
	JTAG_ASIC_TDO_TP	TRUE			26
	JTAG_ASIC_TCK	TRUE			13 26
	JTAG_ASIC_TRST_L	TRUE			13 26
	CPU_CHKSTP_OUT_L	TRUE			5
	CPU_SRESET_L	TRUE			5
	CPU_HRESET_L	TRUE			5 6 7
	JTAG_CPU_TMS	TRUE			5 6
	JTAG_CPU_TDI	TRUE			5 6
	JTAG_CPU_TDO_TP	TRUE			5
	JTAG_CPU_TCK	TRUE			5 6
	JTAG_CPU_TRST_L	TRUE			5 6
	INT_JTAG_TEI	TRUE			13
	INT_TST_MONIN_PD	TRUE			13
	INT_TST_MONOUT_TP	TRUE			13
	INT_TST_PLLEN_PD	TRUE			13
INT I2C	INT_I2C_CLK0	TRUE			6 11 13 23
	INT_I2C_DATA0	TRUE			6 11 13 23
	INT_I2C_CLK1	TRUE			13 14 25
	INT_I2C_DATA1	TRUE			13 14 25
PWR/GND	+PBUS	TRUE			38
	+24V_PBUS	TRUE			38
	GPU_VCORE	TRUE			19 20 38
	1778_VFB	TRUE			20 38
	CPU_VCORE_SLEEP	TRUE			5 33 38
	VCORE_FB	TRUE			33 38
	+1_8V_MAIN	TRUE			38
	+2_5V_MAIN	TRUE			38
	+5V_MAIN	TRUE	2		38 39
	+5V_SLEEP	TRUE	2		38 39
	+3V_MAIN	TRUE	4		23 38
		TRUE		1000	IN
	+3V_PMU	TRUE			38
CARDBUS	CBUS_DET_1_L	TRUE		2000	18
	CBUS_DET_2_L	TRUE		2000	18
DVI	TMDS_DN<0..2>	TRUE		1000	19 22 37
	TMDS_DP<0..2>	TRUE		1000	19 22 37
	TMDS_CONN_CLKN	TRUE		1000	22 36
	TMDS_CONN_CLKP	TRUE		1000	22 36
	VGA_R	TRUE		1000	22
	VGA_G	TRUE		1000	22
	VGA_B	TRUE		1000	22
	VGA_HSYNC	TRUE		1000	22
	VGA_VSYNC	TRUE		1000	22
	DVI_DDC_CLK_UF	TRUE		1000	22
	DVI_DDC_DATA_UF	TRUE		1000	22
	DVI_HPD_UF	TRUE		1000	22
	+5V_DDC_SLEEP	TRUE		2000	22 38
CHGND1		TRUE	2	2000	IN
LVDS		TRUE	6	1000	IN
	LVDS_L0N	TRUE		1000	20 22 37
	LVDS_L0P	TRUE		1000	20 22 37
	LVDS_L1N	TRUE		1000	20 22 37
	LVDS_L1P	TRUE		1000	20 22 37
	LVDS_L2N	TRUE		1000	20 22 37
	LVDS_L2P	TRUE		1000	20 22 37
	CLKLVDS_LN	TRUE		1000	20 22 37
	CLKLVDS_LP	TRUE		1000	20 22 37
	LVDS_DDC_CLK	TRUE		1000	20 22
	LVDS_DDC_DATA	TRUE		1000	20 22
	+3V_LCD	TRUE	2	2000	22 38
	+3V_SLEEP	TRUE		2000	38 39
		TRUE	2	2000	IN
CHGND4		TRUE	6	1000	IN
INVERTER	+14V_INV	TRUE		2000	22 38
	+5V_INV_SW	TRUE		2000	22 38
	BRIGHT_PWM	TRUE		2000	22
	INV_GND	TRUE		2000	22
		TRUE		1000	IN
S-VIDEO	TV_C	TRUE		2000	22
	TV_Y	TRUE		2000	22
	TV_COMP	TRUE		2000	22
	TV_GND1	TRUE		2000	22 38
	TV_GND2	TRUE		2000	22 38
LIO	INT_I2S0_SND_TO_DAC	TRUE		1000	14 25
	INT_I2S0_SND_LRCLK	TRUE		1000	14 25
	INT_I2S0_SND_MCLK	TRUE		1000	14 25 35
	INT_I2S0_SND_SCLK	TRUE		1000	14 25
	INT_I2S0_SND_FROM_ADC	TRUE		1000	14 25
	SND_HP_MUTE_L	TRUE		1000	14 25
	SND_AMP_MUTE	TRUE		1000	25
	SND_HW_RESET_L	TRUE		1000	14 25
	SND_HP_SENSE_L	TRUE		1000	14 25
	SND_LIN_SENSE_L	TRUE		1000	14 25
	INT_I2C_CLK2	TRUE		1000	14 25
	INT_I2C_DATA2	TRUE		1000	14 25
	ADAPTER_DET	TRUE		1000	25 29
	CHARGE_LED_L	TRUE		1000	25 29
	NEC_LUSB_OCI_UF	TRUE		1000	17 25
	NEC_LUSB_PPON	TRUE		1000	17 25
	+5V_MAIN	TRUE	2	2000	38 39
	+5V_SLEEP	TRUE	2	3000	38 39
	+3V_SLEEP	TRUE		2000	38 39

GROUP	SIG_NAME	FUNC_TEST	FUNC_QTY	FUNC_DIST	
USB	NEC_USB_DAM	TRUE			17 25 37
	NEC_USB_DAP	TRUE			17 25 37
	NEC_USB_DBM	TRUE			17 25 37
	NEC_USB_DBP	TRUE			17 25 37
	BT_USB_DM	TRUE			14 25 37
	BT_USB_DP	TRUE			14 25 37
	MODEM_USB_DM	TRUE			14 25 37
	MODEM_USB_DP	TRUE			14 25 37
RT. USB	NEC_RUSB_PPON	TRUE			17 25
	NEC_RUSB_OCI_UF	TRUE			17 25
WIRELESS	PCI_AD<0..31>	TRUE		1000	9 12 17 18 24 37
	PCI_FRAME_L	TRUE		1000	12 17 18 24 37
	PCI_TRDY_L	TRUE		1000	12 17 18 24 37
	PCI_IRDY_L	TRUE		1000	12 17 18 24 37
	PCI_DEVSEL_L	TRUE		1000	12 17 18 24 37
	PCI_STOP_L	TRUE		1000	12 17 18 24 37
	PCI_PAR	TRUE		1000	12 17 18 24 37
	AIRPORT_PCI_REQ_L	TRUE		1000	12 24
	AIRPORT_PCI_GNT_L	TRUE		1000	12 24
	AIRPORT_PCI_INT_L	TRUE		1000	14 24
	MAIN_RESET_L	TRUE		1000	14 17 18 19 24 29
	CLK33M_AIRPORT	TRUE		1000	12 24 35
	PMU_PME_L	TRUE		1000	14 17 24 29
	ROM_ONBOARD_CS_L	TRUE		1000	9 24
	ROM_OE_L	TRUE		1000	9 12 24
	ROM_CS_L	TRUE		1000	9 12 24
	ROM_RW_L	TRUE		1000	9 12 24
	RF_DISABLE_L	TRUE		1000	24
	AIRPORT_CLKRUN_L	TRUE		1000	24
	+3V_AIRPORT	TRUE	4	2000	38
		TRUE	6	1000	IN
OPTICAL	EIDE_OPTICAL_DATA<0..15>	TRUE		2000	24 37
	EIDE_OPTICAL_DMA_RQ	TRUE		2000	24 37
	EIDE_OPTICAL_READ_L	TRUE		2000	24 37
	EIDE_OPTICAL_DMAACK_L	TRUE		2000	24 37
	EIDE_OPTICAL_ADDR<0..2>	TRUE		2000	24 37
	EIDE_OPTICAL_CS0_L	TRUE		2000	24 37
	EIDE_OPTICAL_CS1_L	TRUE		2000	24 37
	EIDE_OPTICAL_RST_L	TRUE		2000	24 37
	EIDE_OPTICAL_WR_L	TRUE		2000	24 37
	EIDE_OPTICAL_IOCHRDY	TRUE		2000	24 37
	EIDE_OPTICAL_INT	TRUE		2000	24 37
TRACKPAD	+5V_TPAD_SLEEP	TRUE		3000	23 38
	TPAD_F_TXD	TRUE		3000	23
	TPAD_F_RXD	TRUE		3000	23
	LID_CLOSED_L	TRUE		3000	23
	+3V_HALL_EFFECT	TRUE		3000	23 38
	SOFT_PWR_ON_L	TRUE		3000	22 23 29 33
MODEM/ SERIAL	COMM_RESET_L	TRUE		4000	14 25
	COMM_SHUTDOWN	TRUE		4000	14 25
	COMM_RING_DET_L	TRUE		4000	14 25 29
	COMM_TXD_L	TRUE		4000	14 25
	COMM_TRXC	TRUE		4000	14 25
	COMM_GPIO_L	TRUE		4000	14 25
	COMM_DTR_L	TRUE		4000	14 25
	COMM_RTS_L	TRUE		4000	14 25
	COMM_RXD	TRUE		4000	14 25
KEYBOARD	KBD_ID	TRUE		3000	23 29
	KBD_INTL	TRUE		3000	23
	KBD_JIS	TRUE		3000	23
	KBD_CAPSLOCK_LED	TRUE		3000	23
	KBD_NUMLOCK_LED	TRUE		3000	23
	KBD_FUNCTION_L	TRUE		3000	23 29
	KBD_COMMAND_L	TRUE		3000	23 29
	KBD_OPTION_L	TRUE		3000	23 29
	KBD_CONTROL_L	TRUE		3000	23 29
	KBD_SHIFT_L	TRUE		3000	23 29
	KBD_X<0..9>	TRUE		3000	23 29
	KBD_Y<0..7>	TRUE		3000	23 29
BATTERY	+BATT_POS	TRUE	(100 MIL PROBE PREFERRED)	1000	30 38
	BATT_NEG	TRUE	(100 MIL PROBE PREFERRED)	1000	30 38
	BATT_CLK	TRUE		1000	30
	BATT_DATA	TRUE		1000	30
	PMU_BATT_DET_L	TRUE		1000	29 30
FANS	+FAN_PWR	TRUE		3000	25 38
	FAN1_TACH	TRUE		3000	25
	FAN2_TACH	TRUE		3000	25
	FAN1_GND	TRUE		3000	38
	FAN2_GND	TRUE		3000	38
ETHERNET	MDI_P<0..3>	TRUE		1000	26 37
	MDI_M<0..3>	TRUE		1000	26 37
FIREWIRE	FW_TPO0P	TRUE		1000	27 28 37
	FW_TPO0N	TRUE		1000	27 28 37
	FW_TPO0R	TRUE		1000	28
	FW_TPI0P	TRUE		1000	27 28 37
	FW_TPI0N	TRUE		1000	27 28 37
	+FW_VP0	TRUE		1000	28 38
	FW_VGND	TRUE		1000	39

GROUP	SIG_NAME	FUNC_TEST	FUNC_QTY	FUNC_DIST	
FIREWIRE (CONT.)	FW_TPO1P	TRUE		1000	28 37
	FW_TPO1N	TRUE		1000	28 37
	FW_TPI1P	TRUE		1000	28 37
	FW_TPI1N	TRUE		1000	28 37
	+FW_VP1	TRUE		1000	28 38
	FW_VGND	TRUE		1000	39
DC PWR IN	+ADAPTER	TRUE	3 (100 MIL PROBE PREFERRED)	1000	30 31 38
LMU/ALS	ST7_SLEEP_LED_H	TRUE			23
	PMU_SLEEP_LED	TRUE			23
	PMU_LID_CLOSED_L	TRUE			23 29
	LMU_DETECT	TRUE			23
		TRUE	6	1000	IN
MISC.			(100 MIL PROBE PREFERRED)		
	SLEEP_LED	TRUE			23
	PMU_KB_RESET_L	TRUE			29
	SLEEP	TRUE			23 25 29 32 34
	PMU_CPU_HRESET_L	TRUE			6 29
	BB_RESET_L	TRUE			6
	+3V_PMU_RESET	TRUE			29 33

APPLE COMPUTER INC.

SIZE D | DRAWING NUMBER 051-6338 | REV. C

SCALE NONE | SHT 39 OF 40

REVISION HISTORY

Proto Release

7/22/02 - Initial acquisition of schematic (from 051-6278 Rev 01)
Added P59 SO-DIMM connector as placeholder (p.12)
Added P59 LVDS connector as placeholder (p.22)
Changed J9 to 10 pin Elco connector for modem (p.25)
Changed PBUS holdup caps to P59 electrolytic cans (p.30)

7/23/02 - Removed L3 (p.8)
Replaced processor with 360 pin Apollo (p.5,6)
7/24/02 - Added FETs between battery and PBUS rails for airline power (p.29)
8/10/02 - Added USB 2.0 (p.18)
8/20/02 - Removed spare pullup straps for Intrepid (p.9)
Removed USB overcurrent protection [to be placed on other boards] (p.18)
Changed right USB board connector to 16 pin Hirose connector (p.26)
Changed LIO board connector to 40 pin Molex connector (p.26)
Added 6 bypass caps to MAXBUS_SLEEP and CPU_VCORE_SLEEP (p.5)

8/26/02 - Removed 32 bypass caps for +3V_MAIN at Intrepid (p.16)
Removed 5 bypass caps for +2_5V_MAIN at Intrepid (p.16)
Removed 3 bypass caps for +1_5V_AGP at Intrepid (p.16)
Removed 4 bypass caps for MAXBUS_MAIN at Intrepid (p.16)

8/27/02 - Changed main battery connector to BP24067-R1, which is close to final (p.29)

8/29/02 - Added dedicated Boot Banger circuit (p.6)
Added 5 bypass caps to each SO-DIMM connector (p.11)
Added quad voltage circuit for bus slewing architecture (p.32)

8/30/02 - Changed to low profile 32.768kHz crystal for PMU (p.28)
Changed to Q11 adpater detection scheme (p.28)

9/03/02 - Corrected upper LVDS single pin nets (p.20)
Removed unintentional extra pulldown resistor at Intrepid (p.14)

9/17/02 - Numerous changes to stay in sync with P84 (all)

9/18/02 - Changed battery connector back to P84 part (p.29)
Added LMU circuitry to eliminate extra board (p.23)
Changed to P84 dual channel LVDS connector to reduce I2R cable losses(p.22)

9/19/02 - Removed unnecessary battery FETs [due to 3S only design] (p.29)
Modified chassis gnds on some components (all)
Removed LMU connector (p.23)
Corrected battery connector [same as P84] (p.29)
Removed P93 support (p.25)
Removed second fuse from FW ports [single fuse provides adequate power] (p.27)

9/23/02 - Replaced BCM5421 with Marvell 88E1111 (p.26)
Increased MAX_VIA_COUNT by two on most nets with this constraint for uVia (p.34,35)

9/27/02 - Corrected cpu, memory bus constraints to match manhattan lengths (p.34)
Swapped pins on L33, L35 for layout (p.31)
Changed Y6 to smaller form-factor crystal (p.26)
9/30/02 - Changed J19 (DC-in) to proper 4-pin connector (p.29)
Corrected holes and chassis gnds (p.4,all)

10/01/02 - Removed Intrepid 1.x specific circuitry (p.13)
10/03/02 - Numerous pin-swaps to accomodate board layout (all)
10/08/02 - Added page for functional test points (p.37)
10/09/02 - Changed 16 pin connectors (modem and right USB) to Foxconn parts (p.23)
10/10/02 - Clamped NEC NC pins high per documentation (p.17)
Added 10K pullup to CG_ADDRSEL and 10K pulldown to CG_FSEL on CY28512 (p.14)
Added SSCG/NO_SSCG stuffing options for CY28512 circuit (p.14)
Removed CPU_VGATE pullup to 5V to eliminate potential 3V/5V current path (p.32)
Removed Zebra 15/16 support per P84 (p.27)
Added second FW port power fuse (p.27)
Removed INT_CPUFB_IN cap per P84 (p.8)
Replaced IRF7822 FETs with IRF7811W in battery charger and 14V PBUS switchers (p.29,30)
Renamed optical interface for consistency (p.24,37)
Corrected PLL_CFG<4> for Apollo 7 [needs to always be zero] (p.5,7)
Removed temporary P84 constraints and finished up AGP clock changes (p.12,34)
Added stuffing options to power fans off 3V or 5V (p.25)
10/11/02 - Replaced DVI EMI caps with 0201 versions (p.22)
10/14/02 - Changed J18 to RJ45 with integrated magnetics (p.26)
10/15/02 - Moved FireWire connectors and port power switch to separate page (p.28)
Changed SMBus pullups to 7.15K, 1% as per iBooks/P84 [involved component net swaps] (p.29)
Added 0603 resistors as shorting pads for power up and reset (p.23)
Changed INT_MOD_SYNC, INT_MOD_DTI and INT_MOD_BITCLK to pulldowns per ERS [LA clk not used] (p.14)
Added damping resistor option to LMU crystal (p.23)
Changed INT_TST_PLLEN_PD to pulldown only [LA clk not used] (p.13)
Changed JTAG_ENET_TDI to pullup [LA clk not used] (p.13)
Removed FW_LKON from Intrepid EXTINT3 [no longer used], pullup added (p.14)
Changed BBANG_HRESET_L pullup to 3V_SLEEP (p.6)
Changed FW_PC_PD, FW_PC_PU resistors to 5% (p.27)
Added 1K pulldown and net FW_PD2 to FW PHY (p.27)
10/16/02 - Implemented new FW power switch and current limit (p.28)
Renamed +14V_PBUS to +PBUS (p.all)
Added A29 adapter detection circuit (p.29)
Added +PBUS current limiting circuit, removed battery charging current limit circuit (p.30)
Changed FW PHY pin DS1 to pullup to make Port 1 1394a only (p.27)
10/21/02 - Updated CY28512 clock chip to Rev B (p.14)
Changed keyboard ZIF to large SMK connector (p.23)
Added full support for non-zero CPU_PLL_CFG<4> in run state (p.7)
10/22/02 - Mirrored wireless connector for P50 flex (p.24)
10/23/02 - Changed LMU/sleep LED interface per p84 (p.23)
Changed LMU JTAG/I2C pinout/pullup/pulldown strategy per P84 (p.23)
Changed fan FETs to SI3446DV per P84 (p.25)
Pinned out audio connector (p.25)
Pinned out right USB connector (p.25)
Pinned out modem connector (p.25)
Added 2 functional test points to wireless connector (p.24,38)
Renamed FW low voltage power rails (p.27,37)
Renamed Vcore VID nets to be consistent with P84 (p.33)
Removed redundancy in DDR memory constraints (p.35)
10/24/02 - Changed FW DS2 strap to pullup to shut off port 2 (p.27)
Cleaned up CY28512B circuit as per P84 [powered off main, output divider and strap tweaks] (p.14)
Updated PCI clock series R values per P84 (p.12)
Changed power rail for ALS to +3V_MAIN per P84 (p.23)
Added 0 ohm short and bypass cap for GPU VDDDVO per P84 (p.21,37)
Split FW_VGND into FW_VGND0 and FW_VGND1 (p.28,37)
Added TP nets to GPU for XOR-tree testing (p.19-21)
Changed fan PWM output pullups to +3V_SLEEP to prevent pump-up (p.25)
10/28/02 - Added FW thermal pad ground hole back in (p.27)
Repinned LMU pulldown for layout (p.23)
10/30/02 - Changed fan power rails to common net (p.25)
10/31/02 - Removed MLB ALS (p.23)
Added wireless RF_DISABLE_L pullup and AIRPORT_CLKRUN_L pulldown (p.24)
11/05/02 - Added 6 decoupling caps to CPU_VCORE_SLEEP (p.5)
Broke out quad OR-gate to discrete components for better placement (p.22,29)
11/06/02 - Changed 10 uF FW current limit output cap to two 4.7 uF caps (p.28)
Added 3 decoupling caps to CPU_VCORE_SLEEP (p.5)
Added 9 decoupling caps to each of +5V_MAIN and +3V_MAIN (p.32)
Removed XW17, jumper for CPU_VCORE_SLEEP (p.33)
Added decoupling cap to PMU reset OR gates (p.29)
11/08/02 - Changed FireWire PHY to Z17 (p.27)
Added bulk caps to fan connectors (p.25)
Added alternate chassis gnd connection for sleep LED (p.23)
11/11/02 - Removed +3V_MAIN option for P50 card (p.24)
11/13/02 - Removed LMU and associated circuitry (p.23)
11/21/02 - Implemented D3cold for all PCI devices (p.12,14,18)
11/25/02 - Renamed all components (all pages)
11/26/02 - Removed chokes from 1394b data pairs (p.27,28)

EVT RELEASE

12/13/02 - Added 12 pF caps to source of 33MHz PCI clocks since they can not be buried (p.12)
Replaced ADM1031 with ADT7460 [I2C Address Change!] (p.25)
Added ADT7460 hookups to GPU thermal diode (p.21,25)
Added FireWire B ESD protection circuits (p.28)
12/16/02 - Removed hole from FireWire ground pad (p.27)
DDR memory connector renamed to J25 (p.11)
12/20/02 - Removed LT4210 from FireWire port power (p.28)
Added F10,F20 as placeholders and experiment guides (p.28)
Added diodes to OR +5V_SLEEP into FW PHY power supply (p.27)
12/26/02 - Updated CPU p/ns to production p/ns (p.5)
Removed RC glitch filter on CPU_DRDY_L (p.5,36)
Updated PCI source clock and internal spreading straps (p.8)
Changed BootROM PWD signal to INT_RESET_L per P84 (p.9)
Added CKE pulldowns per P84 (p.9)
Updated Ethernet series Rs per P84 [Clocks to 10 ohms, data to 22 ohms] (p.13)
Updated SSCG/NO_SSCG BOM options (p.14)
Renamed line-in and headphone sense lines to reflect active low signals (p.14,25.39)
Added 0 ohm Rs to make 2_5V Intrepid rail hot or cold (p.15.16,38)
NO STUFFed entire 1.5V LDO circuit (p.15)
Stuffed USB OCI RC filters for 0 time constant [due to new port current limiters] (p.17)
Renamed USB OCI/PPON signals for left/right ports (p.17,39)
Updated GPU VCore to stay in sync with P84 ["jitter" improvement] (p.20)
Added EMI caps to LVDS_DDC_CLK, INT_I2S0_SND_MCLK, INT_I2S0_SND_SCLK per P84 (p.22,25)
Added R800,R801 for eventual thermal diode in CPU (p.25)
Renamed R2000 to R799, R2001 to R802, R2002 to R803 (p.25)
Renamed F10 to F1, F20 to F2 [deleted old F1,F2] (p.28)
Added caps to FW ESD circuit that were missed (p.28)
Changed MAX4172 power source to save current on battery [per P84] (p.30)
Updated 1.5V/2.5V switcher BOM to stay in sync with P84 [FET change and current limits] (p.34)
Replaced all 132S1061 [1uF,0805,10V,20%] with 132S0046 [1uF,0603,10V,20%] (p.14,15,27,30,33,34)
Replaced all 138S0351 [1uF,0603,6.3V,10%] with 132S0046 [1uF,0603,10V,20%] (p.27,30)
01/02/03 - Updated FireWire fuse topology to that of P84 (p.28)
Updated system and power block diagrams (p.2,3)
01/03/03 - Corrected +2_5V_INTREPID connections to muxes and reference (p.9,10)
01/07/03 - Added NO_TEST nets to pads of DDR connector arms (p.11)
01/08/03 - Added 2N7002 circuits to ensure speakers are muted during power-up (p.25)
Changed R164 to 511 ohms to avoid low CPU clock amplitude (p.8)
01/09/03 - Added required pulldown to output of DVI HPD sense comparator (p.22)
Swapped R443 and R444 values to ensure Vgs < -4.5V (p.28)
Updated S-video filter values to those of P84 (p.22)
01/10/03 - ZT7,ZT23,ZT61,ZT76,ZT89,ZT87,ZT22,ZT38,ZT60,ZT42 & ZT17 are changed to HOLE-VIA-20R10 (p.4)
01/13/03 - Add L53, L54, L55 for TMDS Data<0:2> Diff Pair (p.22)
01/14/03 - Add C812 - C821 (Totol 10 0.22uF caps) for 2.5V Intrepid Decoupling (p.16)
Add C822 & C823 at Wireless Card connector MAIN_RESET_L & RF_DISABLE_L_SPN (p.24)
Change MATCHED_DELAY to 50 for all TMDS DIFF PAIR (p.37)
Change MATCHED_DELAY to 50 for all TMDS DIFF PAIR (p.37)
Add R810 & R811 for ALWAYS-ON FANs in Acrylic Build (p.25)
01/28/03 - Remove NV31/17 components (p.19-21)
Add M10 (p.19-21)
02/07/03 - Add Power Net Constraints for M10 (p.38)
Replace Singing PBus Cap C49,C50,C67,C68,C80,C81,C95,C96,C108,C109,C120,C121
with 126S0035 (or alt. 126S0036) (p.33)
02/11/03 - Add FW Power Net Constraints (p.38)
Change signal constraints for AGP signals (p.36)
Add LMU connector and components (p.23)
Edit I2C table for LMU (p.13)
Change R580 to 19.6K (p.14)
Connect Clock Slewing RESET# to MAIN_RESET_L (p.14)
Change Ferrite Bean of ATI power supply to correct values (p.21)
Remove C141 PBUS CAP (p.31)
02/12/03 - Change and Rotate Keyboard Connector (p.23)
Add ATI Power sequencing Circuit for M10 Power-up and Power-down (p.19-22, p.32-35)

EVT RELEASE (continue)

02/13/03 - Add C825 (p.30)
02/17/03 - Rename all Reference Designators

EVT ENCLOSURE RELEASE

03/13/03 - Change 3-P FAN connectors to 4-P (p.25)
Add PU at PMU_SLEEP_LED_L for LMU (p.23)
Change stuffing option for clock slewing & PLL5 (p.14)
Change ATI M10 GPIO8 to Pull-down (p.20)
Remove Memory MUX 0ohm Resistors (p.10)

03/28/03 - Due to MLB outline change at DVI connector, CHGND1 has to be splitted into
CHGND1 & CHGND2 (P 4 & 22)
Separate +3V and +5V traces running from 3/5V supply to 40Pin LIO connector (P 25 & 32)
R601 change from 100K to 4.7K (P 29)
Change airline detect to 13.1V or greater, R40 and R690 to 97.6K ohm (P 30 & 31)
Add C826 at U3 RS- pin (P 30)
Change D3 to 1N914 PN Junction Diode(P 31)

03/31/03 - Change AGPTEST Pull-up to 47ohm (it was 40ohm) (P 20)
Add circuits to prevent start-up Headphone POP (P 25)
Change all 1210 4.7uF to 1206 4.7uF Cap (138S0531) (various pages)
Modify FAN circuit to PWM active low signal (P25)

04/08/03 - Add SOFT MODEM support (P 14 & 25)
Add 10-Pin ELCO connector for Serial Debug Interface (P 25)
Change Q7 from SI4435DY to SUD45P03-10 (P 30)
Remove D34 RS3AB (P 30)

04/11/03 - Change FW Schottky Diode to a 3A part 371S0159 (P 28)
Change PBUS L69 and VCORE L71 Inductor (P 31 & 33)
Change C643 10uF Cap to 1206 package part (P 28)
Change all 6 VCORE Caps to 220uF Al Poly Cap 128S0024 (P 33)
Add Mitsumi MM1571J regulator to provide 1.8V TPVDD (P 21)
Change U34 to Mitsumi MM1571J part for ATI PLL 1.8V rail(P 21)

04/16/03 - Add FW Port ShutDown/PowerOn Circuit (P 28)
Change the I2C Pull-up for Sound/Modem to 1K ohm (P 14)

04/17/03 - Change 3V/5V inductors (152S0137) L61 & L62 (P 32)

04/21/03 - Add 12 ICT JTAG TEST PADs (P 39)

04/23/03 - Invert ATI GPIO15 signal, no stuff pull-up resistor (P 20)
Combine Q35 and Q36 into a Dual Package Part (P 22)
SWAP the ADT7460 Temperature Sense pair (P 25)
Change FW PHY to production part (P 26)

04/24/03 - Remove +3V_CBUS_SLEEP and U5, use +3V_SLEEP directly (P 14,18,24)
Add 0402 Res between ATI PVDD/TPVDD rail and 10uF caps for stability purpose (P 21)
Add 90ohm common mode choke at TMDS data <0..2> pairs (P 22)
Add Sense Resistor to Vcore power rail, remove one 220uF cap <back to EVTA design> (P 33)

04/25/03 - Change C826 to 0.01uF 50V Cap (P 30)

04/30/03 - No stuff R676 to prevent +3V rail leakage (P 33)

05/02/03 - L45,L46,L47 is using Common Mode Choke TDK ACM2012D Part, will replace with ACM2012H Part if available (P 22)

DVT RELEASE

05/21/03 - Swap +PBUS and +24V_PBUS at Backup Battery Connector - J16 (p.31)
05/27/03 - Change RP31 to 4.7K for I2C timing specification (p.13)
Change Q62 & Q65 to SI7860DP part (p.33)
Change Q60, Q63 & Q66 to IRF7832 part and split C102 into 3 10pF caps (p.33)
Enable VCore Burst(Skip) Mode by no stuffing R67 (p.33)
Enable 3V/5V Burst Mode by changing R406 & R407 to 100K ohm (p.32)
Change Q48 to SI7860DP part (p.20)
Change Q49 to IRF7832 part (p.20)
Enable GPUCore Burst Mode by changing R358 to 2.2 ohm, no stuffing R344 and stuffing R343 (p.20)
Reduce audible noise by changing L64 to 152S0139 (p.20)
Add C838, C840, C839, C844 & C845 10pF caps near the power switchers FETs (p.20, 32 & 34)
Change PWM_L Fan input (both L&R Fans) to +5V_SLEEP pull-up (p.25)
05/30/03 - Connect SLEEP_LED_DGND to digital ground instead of CHGND5 (p.23)
06/03/03 - Add CPU Core Voltage offset option circuit (p.33)
GPU Vcore on/off timimg (p.20)
06/05/03 - Change FW-B connector to 514S0058 with internal shield pins (p.28)
06/06/03 - Add four 0ohm jumper, in case there is no sw support for the multi-stage VCore (p.38)
Change the +2_5V_sleep FET to reduce Voltage drop on the rail (p.34)
06/12/03 - Change CBUS & USB2 REQ LINE Pullup to +3V_MAIN (p.12)
Add 0 ohm at USB AVSS GND (p.17)
Change TMDS common mode choke to TDK AMC2012-900H part (p.22)
Change HD_DMACK_L pullup R213 to 10K (p.24)
Add C847, C851 & C852 at ENET CLK for EMC (p.13 & 26)
Change Q34 to FDS3672 (p.28)
Change Q82 pin#4 connection to system digital GND (p.33)
Add C848 150uF cap at J3 for +5V_MAIN USB2 power (p.25)
Add C853 1000pF cap at Q64 (p.30)
Add RC at ADT7460 power rail for noise isolation (p.25)
Isolate THERM# signal at ADT7460 by using double inverters for THERM_L_OC (p.25)
Remove redundant pullup R601 for THERM_L_OC (p.29)
Remove SH2 EMI spring at CHGND5 (p.23)
Add additional PWR/GND pins at J17 for R-USB board (p.25)
06/13/03 - New SODIMM connector with 4 through-hole mounting pins (p.11)
Change CPU config stuffing option at R63 and R64 (p.7)
Stuff R288 for Cypress Clk chip (p.14)
Move CBUS_PCI_REQ_L back to +3V_SLEEP rail pull-up (p.12)
Change the TMDS Termination Resistor values to 162ohm (p.20)
Connect C847 at R160.1 (p.13)
Add 1000pF caps at ADT7460 D_plus/minus pairs (p.25)
Add SI1162 DVI transmitter to prevent leakage from DVI connector to the system (p.19&20)
06/16/03 - Replace C705,C707,C711,C703 & C685 with part 128S0025 (p.20&32)
Remove R271 0ohm resistor (p.34)
Edit Signal Constraints for TMDS routing and ENET routing (p.36&37)

DVT2 RELEASE

07/06/03 - Change R97 & R98 to 0402 package (p.33)
No Stuff R835 (p.19)
Change R198 to 100K ohm resistor (p.23)
Add Common Mode Choke L77 & L76 at FWB pairs (p.28)
Removed current monitoring IC for firewire port power (p.28)
Changed RP52,RP53,RP56,RP57 to 22ohm for EMI (p.19)

PRODUCTION RELEASE

07/28/03 - Change BOM option for C51,C52,C77,C78,C91,C92,C111 to 8.2uF Panasonic AL cap only (p. 34)
08/05/03 - Change +3V/5V ITH compensation and No-Stuff Feed Forward Caps (p. 32)
Change CPU VCORE setting for both BEST and BETTER configurations (p. 33)
08/07/03 - Change CPU VCORE setting for both BEST and BETTER configurations again (p. 33)

PRODUCTION RELEASE(Version C)

08/18/03 - Change CPU VCORE setting for BEST configuration to: 1.335V(High)->1.080V(Low) (p. 33)