

8

7

6

5

4

3

2

1

1. ALL RESISTANCE VALUES ARE IN OHMS, 0.1 WATT +/- 5%.

2. ALL CAPACITANCE VALUES ARE IN MICROFARADS.

3. ALL CRYSTALS & OSCILLATOR VALUES ARE IN HERTZ.

SCHEM,MLB,X425

08/06/2014 PROTO1A

Page

(.cma)

Contents

Sync

Date

1

MASTER

Table of Contents

05/30/2014

2

CLEAN\_X305

BOM Configuration

10/31/2012

3

J15\_MLB

BOM Configuration

10/31/2012

4

J15\_MLB

PD Parts

02/18/2014

5

CLEAN\_X305\_PEG

CPU DMI/PEG/FDI/RSVD

12/18/2012

6

J15\_REFERENCE

CPU Clock/Misc/JTAG/CFG

12/18/2012

7

J15\_REFERENCE

CPU DDR3 Interfaces

12/18/2012

8

J15\_REFERENCE

CPU Power

12/18/2012

9

J15\_REFERENCE

CPU Ground

12/18/2012

10

J15\_REFERENCE

CPU Decoupling

12/18/2012

11

J15\_REFERENCE

PCH RTC/HDA/JTAG/SATA/CLK

12/18/2012

12

J15\_REFERENCE

PCH DMI/FDI/PM/GFX/PCI

12/18/2012

13

J15\_REFERENCE

PCH PCI-E/USB

02/18/2014

14

CLEAN\_X305\_PEG

PCH GPIO/MISC/NCTF

12/18/2012

15

J15\_REFERENCE

PCH Power

12/18/2012

16

J15\_REFERENCE

PCH Grounds

12/18/2012

17

J15\_REFERENCE

PCH DECOUPLING

10/31/2012

18

J15\_MLB

CPU & PCH XDP

12/18/2012

19

J15\_REFERENCE

Chipset Support

01/14/2013

20

J15\_REFERENCE

Project Chipset Support

07/01/2014

21

CLEAN\_X305G

CPU Memory S3 Support

01/14/2014

22

CLEAN\_X305

DDR3 VREF MARGINING

10/31/2012

23

J15\_MLB

DDR3 SDRAM Bank A (1 OF 2)

10/31/2012

24

J15\_MLB

DDR3 SDRAM Bank A (2 OF 2)

10/31/2012

25

J15\_MLB

DDR3 SDRAM Bank B (1 OF 2)

10/31/2012

26

J15\_MLB

DDR3 SDRAM Bank B (2 OF 2)

10/31/2012

27

J15\_MLB

DDR3 Termination

01/14/2013

28

T29\_RR

Thunderbolt Host (1 of 2)

01/14/2013

29

T29\_RR

Thunderbolt Host (2 of 2)

06/24/2014

30

CLEAN\_X305

Thunderbolt Mobile Support

06/24/2014

31

CLEAN\_X305

Thunderbolt Connector A

06/24/2014

32

CLEAN\_X305

Thunderbolt Connector B

11/16/2012

33

J15\_REFERENCE

DDC Crossbar

01/15/2014

34

CLEAN\_X305

X87 CONNECTOR

02/18/2014

35

CLEAN\_X305\_PEG

SSD Connector

06/24/2014

36

CLEAN\_X305

Camera 1 of 2

06/24/2014

37

CLEAN\_X305

Camera 2 of 2

10/31/2012

38

J15\_MLB

USB 3.0 CONNECTORS

02/18/2014

39

CLEAN\_X305\_PEG

KEYBOARD/TRACKPAD (1 OF 2)

05/30/2014

40

CLEAN\_X305

KEYBOARD/TRACKPAD (2 OF 2)

01/15/2014

41

CLEAN\_X305

SMC

Page

(.cma)

Contents

Sync

Date

42

CLEAN\_X305

SMC Shared Support

05/30/2014

43

CLEAN\_X305

SMC Project Support

11/26/2012

44

CHANG\_J45

SMBus Connections

02/18/2014

45

CLEAN\_X305\_PEG

High Side Voltage and Current Sensing

02/18/2014

46

CLEAN\_X305\_PEG

Load Side Voltage and Current Sensing

01/14/2014

47

CLEAN\_X305

Debug Sensors

11/26/2012

48

CHANG\_J45

Thermal Sensors

10/31/2012

49

J15\_MLB

Fan Connectors

02/18/2014

50

CLEAN\_X305\_PEG

SPI Debug Connector

07/30/2013

51

JOE\_J45

AUDIO:CODEC, ANALOG

07/30/2013

52

JOE\_J45

AUDIO:CODEC, DIGITAL

07/30/2013

53

JOE\_J45

AUDIO: SPEAKER AMP

06/24/2014

54

CLEAN\_X305

AUDIO: JACK

06/24/2014

55

CLEAN\_X305

AUDIO: JACK TRANSLATORS

02/18/2014

56

CLEAN\_X305\_PEG

DC-In & Battery Connectors

01/15/2014

57

CLEAN\_X305

PBus Supply & Battery Charger

02/24/2014

58

CLEAN\_X305\_PEG

CPU VR12.5 VCC Regulator IC

10/31/2012

59

J15\_MLB

CPU VR12.5 VCC Power Stage

01/15/2014

60

CLEAN\_X305

1.35V DDR3L SUPPLY

02/18/2014

61

CLEAN\_X305\_PEG

5V / 3.3V Power Supply

02/18/2014

62

CLEAN\_X305\_PEG

1V05V POWER SUPPLY

02/19/2014

63

CLEAN\_X305\_PEG

LCD/KBD Backlight Driver

01/15/2014

64

CLEAN\_X305

Misc Power Supplies

05/30/2014

65

CLEAN\_X305

X249 Boost Power Supply

02/18/2014

66

CLEAN\_X305\_PEG

Power FETs

05/30/2014

67

CLEAN\_X305

Power Control 1/ENABLE

02/18/2014

68

CLEAN\_X305\_PEG

eDP Display Connector

01/14/2014

69

CLEAN\_X305G

RIO Connectors

05/30/2014

70

CLEAN\_X305

Power Aliases

10/31/2012

71

J15\_MLB

Signal Aliases

10/31/2012

72

J15\_MLB

Functional Test Points

10/31/2012

73

J15\_MLB

NC & No Test

12/10/2012

74

SIDLE\_J45

PCB Rule Definitions

02/18/2014

75

CLEAN\_X305\_PEG

CPU Constraints

12/10/2012

76

SIDLE\_J45

PCH Constraints 1

02/18/2014

77

CLEAN\_X305\_PEG

PCH Constraints 2

12/10/2012

78

SIDLE\_J45

Memory Constraints

12/10/2012

79

SIDLE\_J45

Thunderbolt Constraints

12/10/2012

80

SIDLE\_J45

Camera Constraints

12/10/2012

81

SIDLE\_J45

SMC Constraints

12/10/2012

82

SIDLE\_J45

Project Specific Constraints

REV

ECN

DESCRIPTION OF REVISION

CK APPD

DATE

<REV>

<ECN>

<ECO\_DESCRIPTION>

<ECODATE>

ALIASES

RESOLVED

Schematic / PCB #'s

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
051-00330	1	SCHEM,MLB,X305	SCH	CRITICAL	
820-00138	1	PCBF,MLB,X305	PCB	CRITICAL	

DRAWING

TITLE=MLB

ABBREV=ABBREV

LAST\_MODIFIED=Web Aug 6 13:00:04 2014

DRAWING TITLE

<PART\_DESCRIPTION>

Apple Inc.

NOTICE OF PROPRIETARY PROPERTY:  
THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC.  
THE POSSESSOR AGREES TO THE FOLLOWING:  
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE  
II NOT TO REPRODUCE OR COPY IT  
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART  
IV ALL RIGHTS RESERVED

DRAWING NUMBER

<SCH\_NUM>

REVISION

<E4LABEL>

BRANCH

<BRANCH>

PAGE

1 OF 118

SHEET

1 OF 82

8

7

6

5

4

3

2

1







8

7

6

5

4

3

2

1

Programmables - All builds

335S0915	1	IC,SERIAL SPI FLASH ROM,4MBIT,50MHZ,USON	U2890	CRITICAL	TBTROM:BLANK
341S00133	1	T29,FALCON RIDGE(VKXXX)PROTO 1A,X425	U2890	CRITICAL	TBTROM:PROG

SMC

338S1214	1	IC,SMC-B1,40MHZ/50DMIPS,SCPL FW,157BGA	U5000	CRITICAL	SMC_PROG:BLANK
341S00125	1	IC,SMC-B1,EXT (V2.24A31) PROTO 1A,X425	U5000	CRITICAL	SMC_PROG:BASE

EFI ROM

335S00007	1	IC,SERIAL FLASH,64MB,3V,NSON,6X5MM	U6100	CRITICAL	BOOTROM_BLANK:WIN
335S00006	1	IC,SERIAL FLASH,64MB,3V,NSON,6X5MM	U6100	CRITICAL	BOOTROM_BLANK:MAC
341S00131	1	IC,EFI ROM (VKXXX) PROTO 1A,X425	U6100	CRITICAL	BOOTROM_PROG:PROTO1A

Alternate Parts

PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
376S1053	376S0604		ALL	Diodes alt to Fairchild
128S0311	128S0329		ALL	NEC alt to Sanyo
138S0739	138S0706		ALL	Samsung alt to Murata
197S0481	197S0480		ALL	Spsoc Alt to NDK
197S0478	197S0479		ALL	NDK Alt to Spsoc
371S0713	371S0558		ALL	DDS alt to ST
152S0461	152S1645		ALL	Cyntec alt to Vishay
376S1080	376S0820		ALL	Diodes alt to On Semi
155S0667	155S00008		ALL	Panasonic alt to TDK
376S1217	376S0855		ALL	Toshiba alt to Diodes
376S1129	376S0855		ALL	NXP alt to Diodes
376S1089	376S1128		ALL	NXP alt to Diodes
128S0371	128S0376		ALL	Kemet alt to Sanyo
138S0803	138S0639		ALL	Samsung alt to Murata
138S0843	138S0674		ALL	Samsung alt to Murata
138S0846	138S0811		ALL	Samsung alt to Murata
127S0164	127S0162		ALL	Rohm alt to Vishay
138S0732	138S0715		ALL	Rohm alt to Vishay
128S0364	128S0264		ALL	Kemet alt to Sanyo
333S0704	333S0700		ALL	ELPIDA to HYNIX
311S0649	311S0541		ALL	ON alt to Toshiba
376S00014	376S0761		ALL	Toshiba alt to Vishay
740S00003	740S0135		ALL	ARM alt to Tyco
377S0155	377S00011		ALL	On Semi alt to Infineon
377S0184	377S00011		ALL	Infineon alt to Infineon

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

SYNC\_MASTER=J15\_MLB

SYNC\_DATE=10/31/2012

Apple Inc.

NOTICE OF PROPRIETARY PROPERTY:

THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:

I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE

II NOT TO REPRODUCE OR COPY IT

III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART

IV ALL RIGHTS RESERVED

DRAWING NUMBER

<SCH\_NUM>

REVISION

<E4LABEL>

BRANCH

<BRANCH>

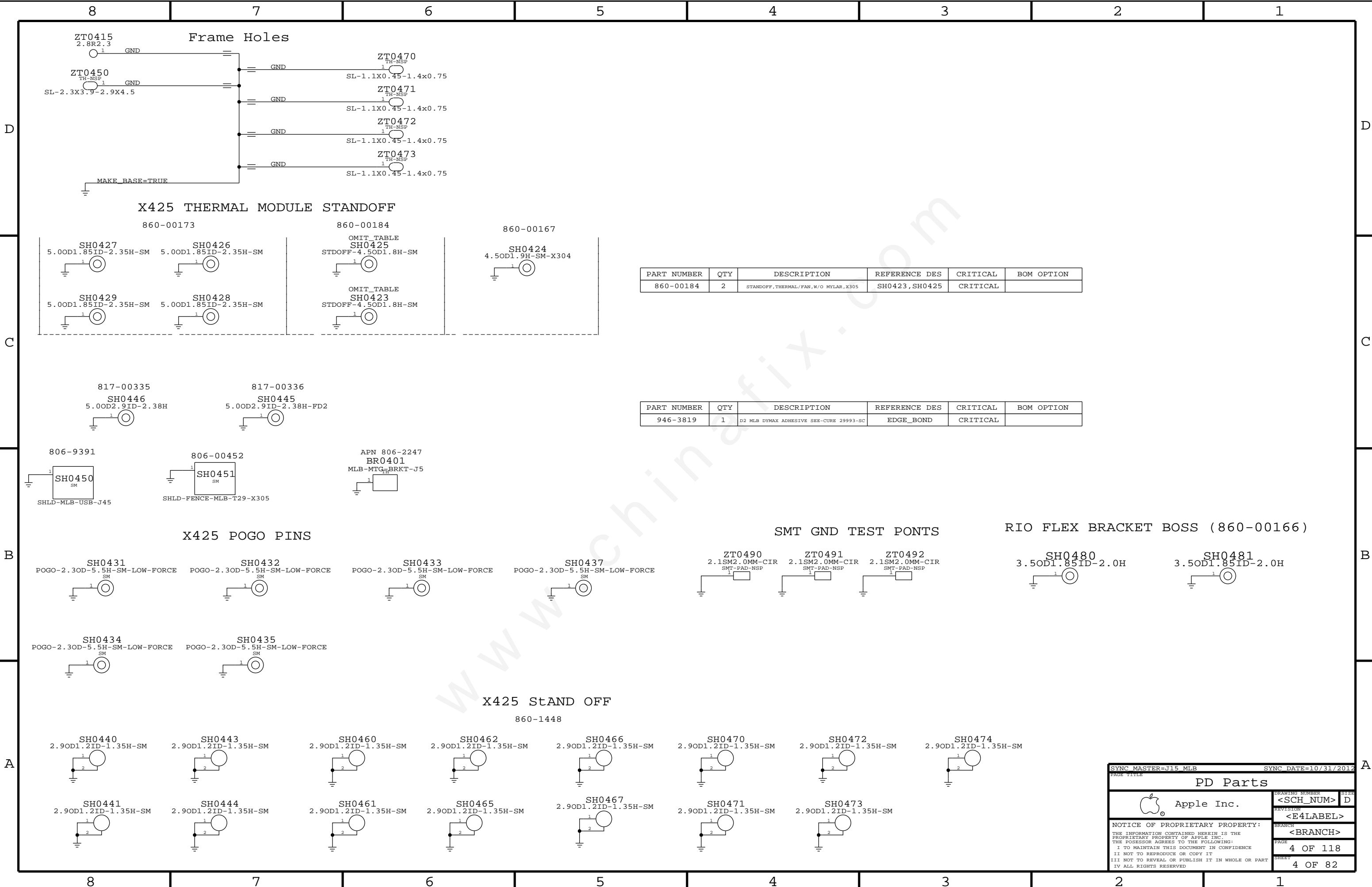
PAGE

3 OF 118

SHEET


3 OF 82



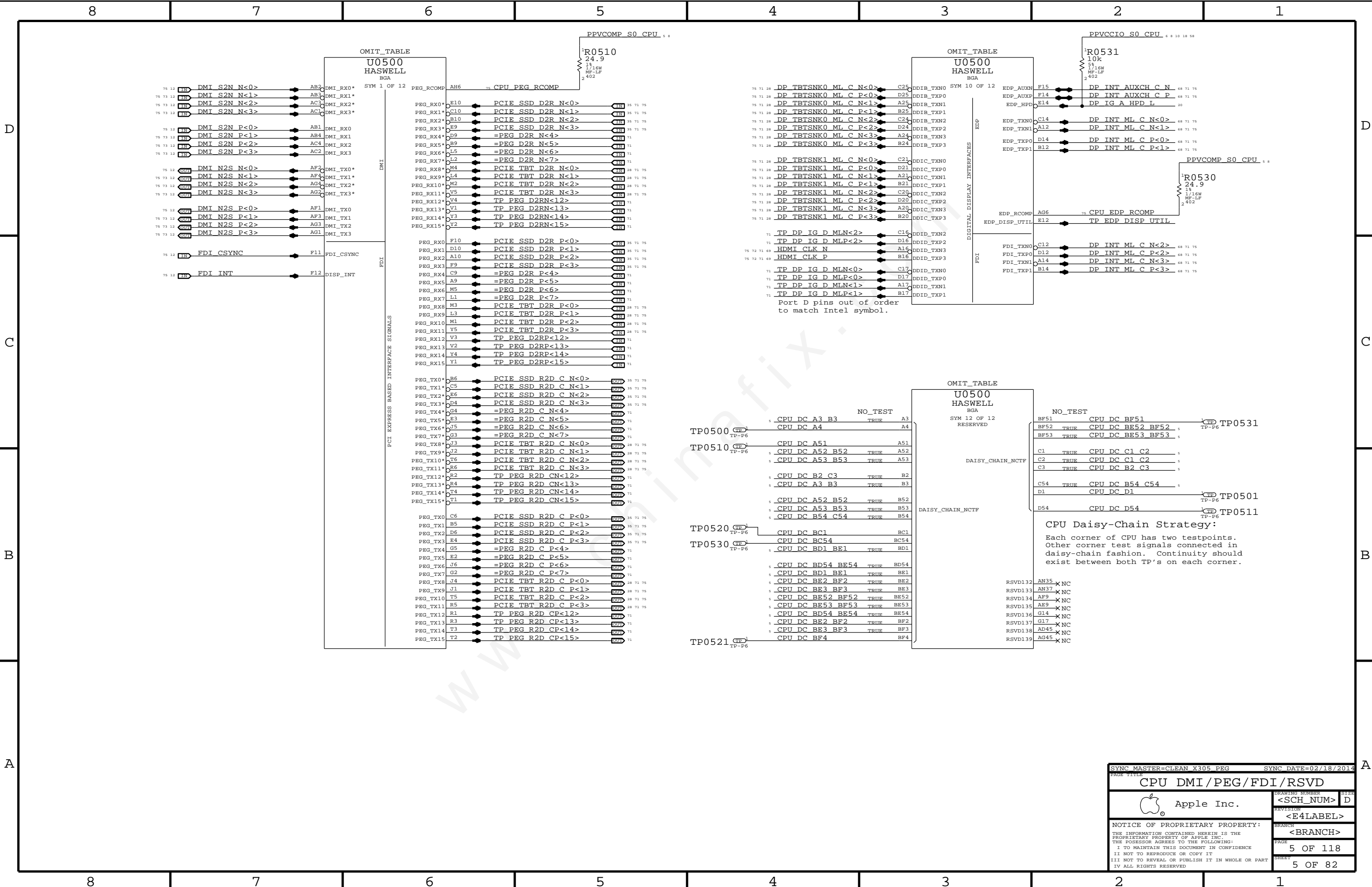


PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
860-00184	2	STANDOFF, THERMAL/FAN, W/O MYLAR, X305	SH0423, SH0425	CRITICAL	

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
946-3819	1	D2 MLB DYMAX ADHESIVE SEE-CURE 29993-SC	EDGE_BOND	CRITICAL	

SYNC MASTER=J15 MLB		SYNC DATE=10/31/2012	
PAGE TITLE			
PD Parts			
		DRAWING NUMBER	
Apple Inc.		<SCH_NUM>	
<p>NOTICE OF PROPRIETARY PROPERTY:</p> <p>THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:</p> <p>I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE</p> <p>II NOT TO REPRODUCE OR COPY IT</p> <p>III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART</p> <p>IV ALL RIGHTS RESERVED</p>		REVISION	
		<E4LABEL>	
		BRANCH	
		<BRANCH>	
		PAGE	
		4 OF 118	
		SHEET	
		4 OF 82	





D

C

B


A

D

C

B

A

SYNC MASTER=CLEAN X305 PEG		SYNC DATE=02/18/2014	
PAGE TITLE			
CPU DMI / PEG / FDI / RSVD			
 Apple Inc.		DRAWING NUMBER	SIZE
		<SCH_NUM>	D
NOTICE OF PROPRIETARY PROPERTY: THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING: I I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART IV ALL RIGHTS RESERVED		REVISION	
		<E4LABEL>	
		BRANCH	
		<BRANCH>	
		PAGE	5 OF 118
		SHEET	5 OF 82

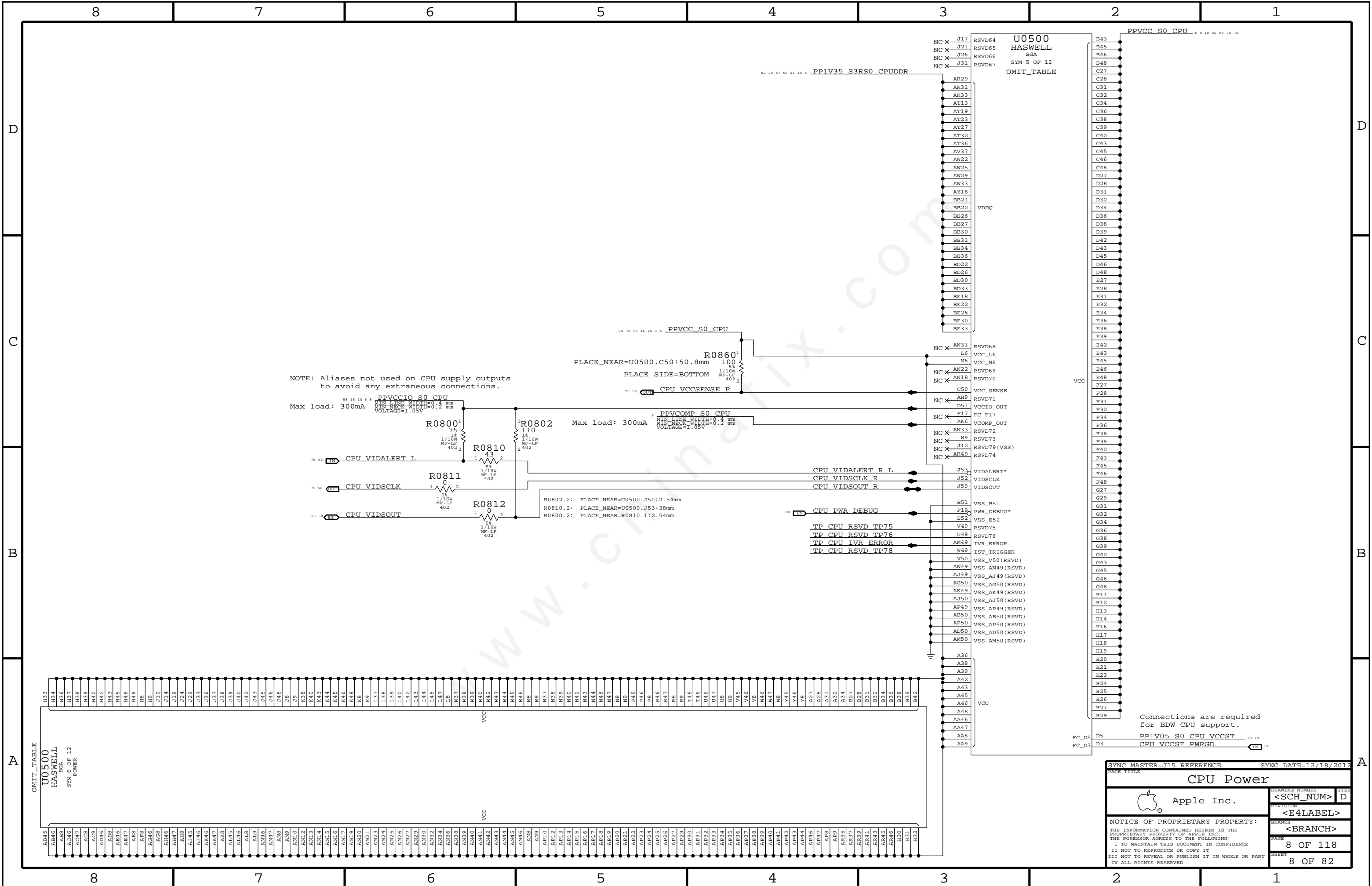












SYNC MASTER=J15 REFERENCE

SYNC DATE=12/18/2012

CPU Power

Apple Inc.

NOTICE OF PROPRIETARY PROPERTY:

THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:  
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE  
I NOT TO REPRODUCE OR COPY IT  
I NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART  
I ALL RIGHTS RESERVED

DRAWING NUMBER

<SCH\_NUM>

REVISION

<E4LABEL>

BRANCH

<BRANCH>

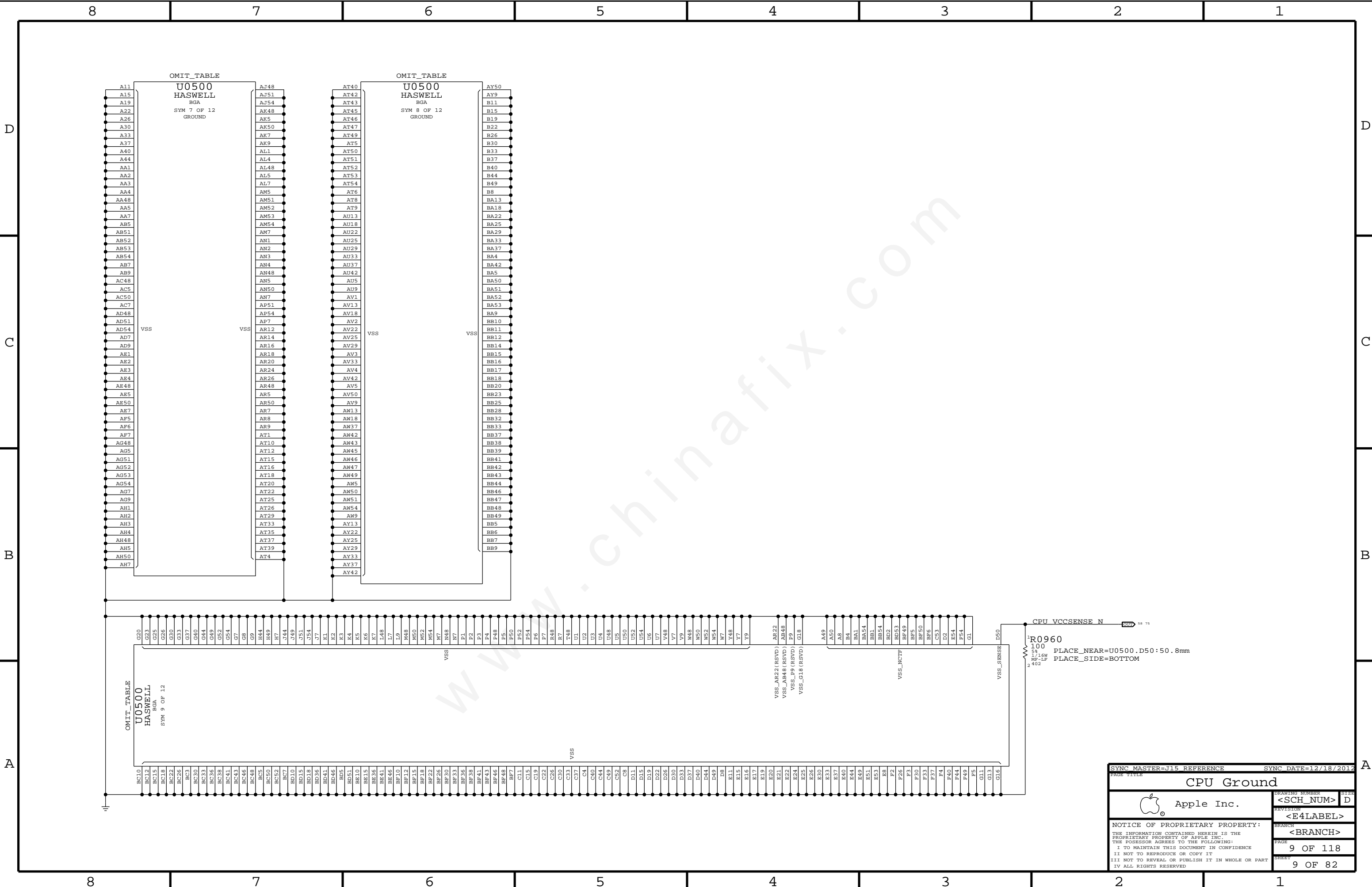
PAGE

8 OF 118

SHEET


8 OF 82





SYNC MASTER=J15 REFERENCE

SYNC DATE=12/18/2012

CPU Ground	
 Apple Inc.	DRAWING NUMBER <SCH_NUM>
NOTICE OF PROPRIETARY PROPERTY: THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING: I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART IV ALL RIGHTS RESERVED	REVISION <E4LABEL>
	BRANCH <BRANCH>
	PAGE 9 OF 118
	SHEET 9 OF 82





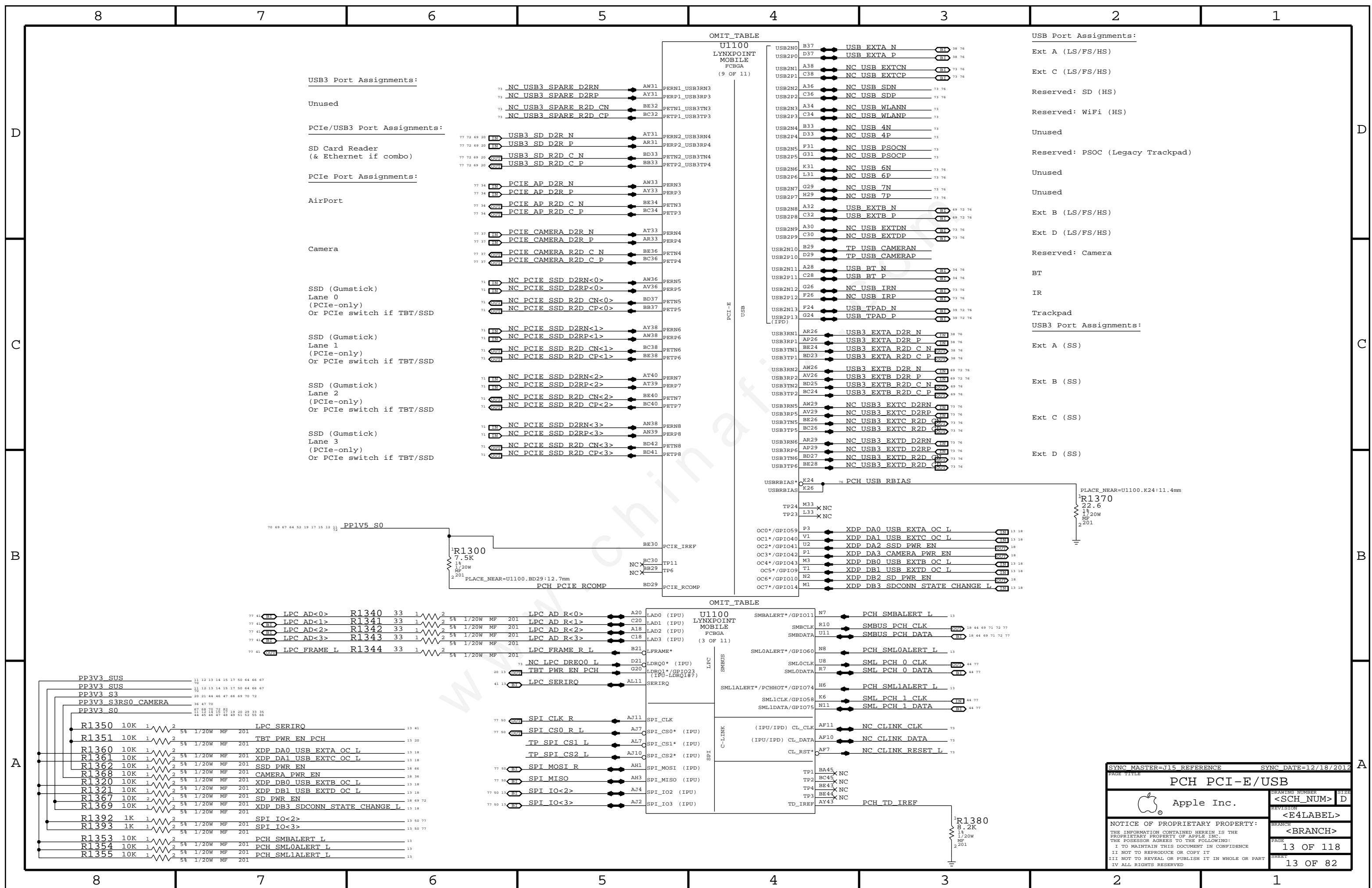










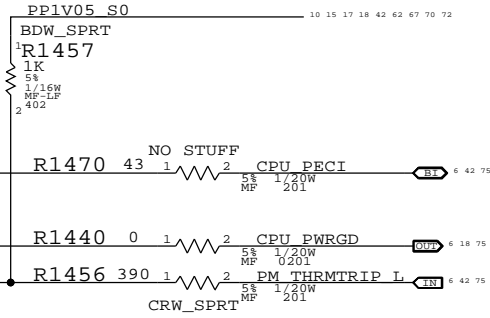






Pull-up/down on chipset support page (depends on TBT controller)  
Falcon Ridge: TBT\_CIO\_PLUG\_EVENT\_L, requires pull-up (S0), no isolation necessary.  
Cactus Ridge: TBT\_CIO\_PLUG\_EVENT, requires pull-down & isolation.

OMIT\_TABLE  
U1100  
LYNXPOINT  
MOBILE  
FCBGA  
(6 OF 11)



PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
117S0201	1	RES,MF,1A MAX,0.0 OHM,5%,0201,BLACK	R1456		BDW_SPRT

BOM GROUP	BOM OPTIONS
RAMCFG_SLOT	RAMCFG3:H, RAMCFG2:H, RAMCFG1:H, RAMCFG0:H

Systems with no chip-down memory should pull all 4 RAMCFG GPIOs high.  
Systems with chip-down memory should add pull-downs on another page and set straps per software.

NOTE: GPIO0 pull-up/down on project-specific page

NOTE: GPIO70 pull-up/down on project-specific page

SYNC MASTER=CLEAN\_X305\_PEG

SYNC DATE=02/18/2014

PCH GPIO/MISC/NCTF

Apple Inc.

THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:  
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE  
II NOT TO REPRODUCE OR COPY IT  
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART  
IV ALL RIGHTS RESERVED

DRAWING NUMBER

<SCH\_NUM>

REVISION

<E4LABEL>

BRANCH

<BRANCH>

PAGE

14 OF 118

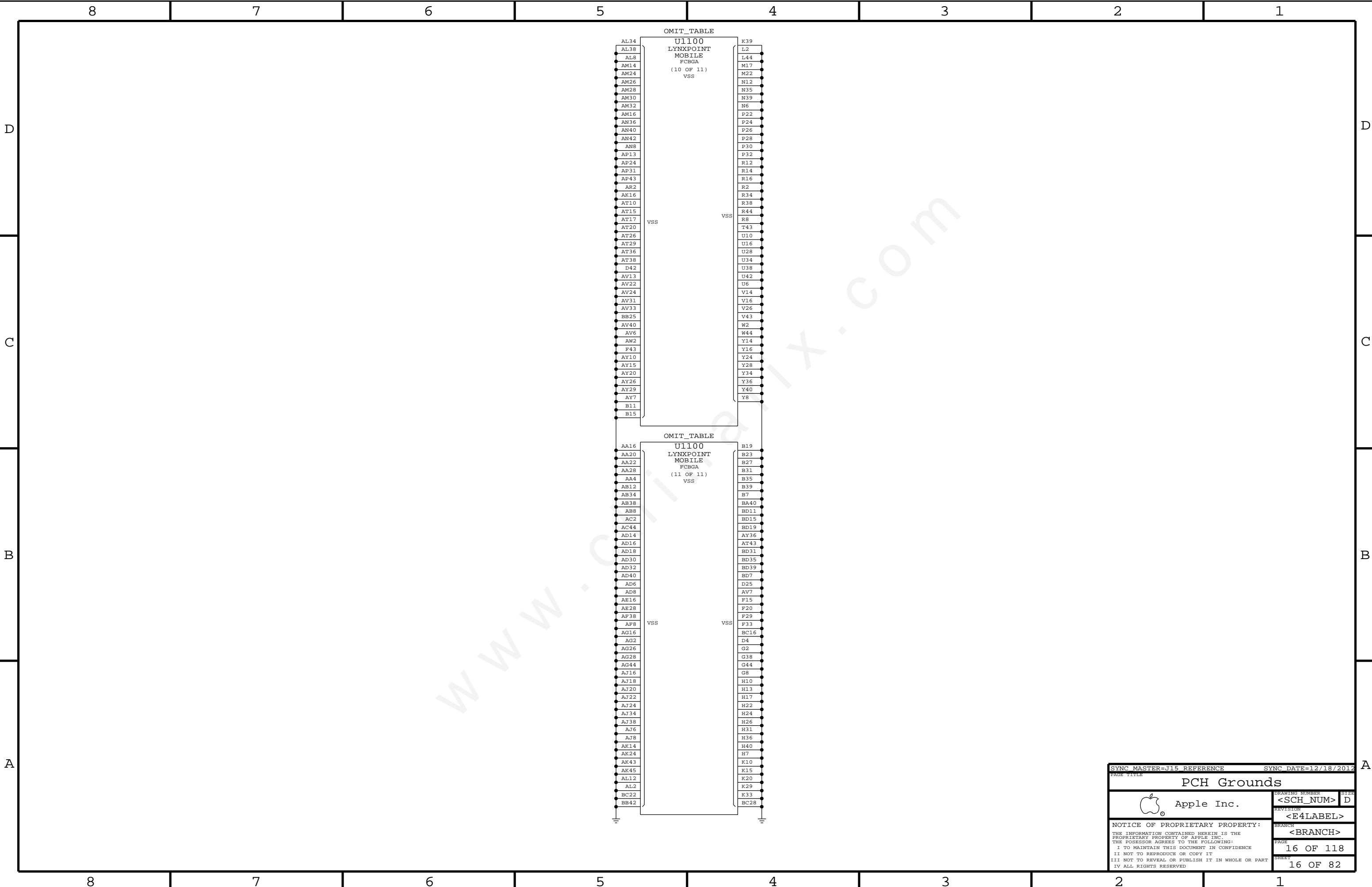
SHEET


14 OF 82



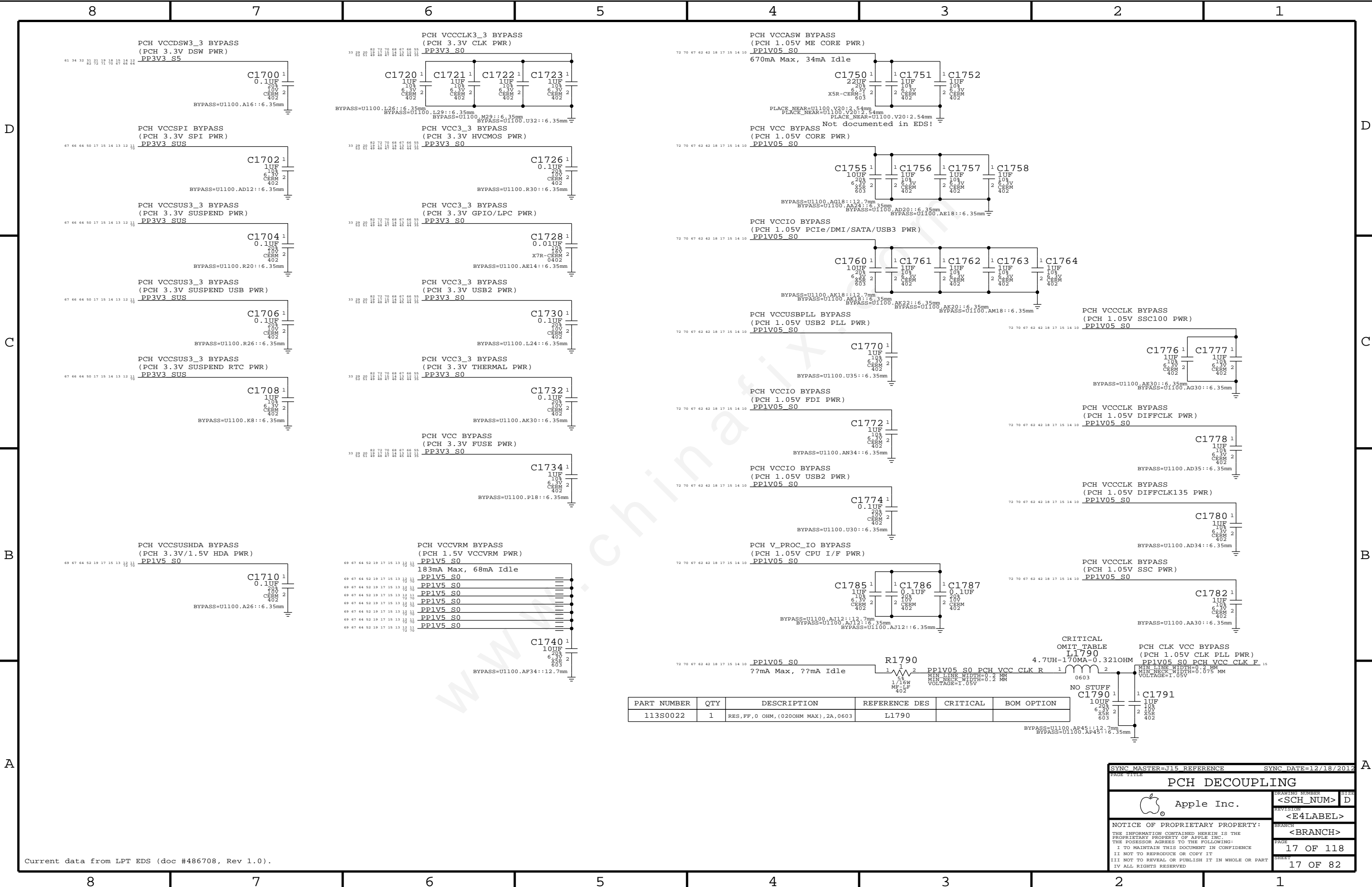







SYNC MASTER=J15 REFERENCE		SYNC DATE=12/18/2012	
PAGE TITLE			
PCH Grounds			
		Apple Inc.	
NOTICE OF PROPRIETARY PROPERTY:		DRAWING NUMBER	
THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:		<SCH_NUM>	
I I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE		SIZE	
II NOT TO REPRODUCE OR COPY IT		D	
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART		REVISION	
IV ALL RIGHTS RESERVED		<E4LABEL>	
		BRANCH	
		<BRANCH>	
		PAGE	
		16 OF 118	
		SHEET	
		16 OF 82	



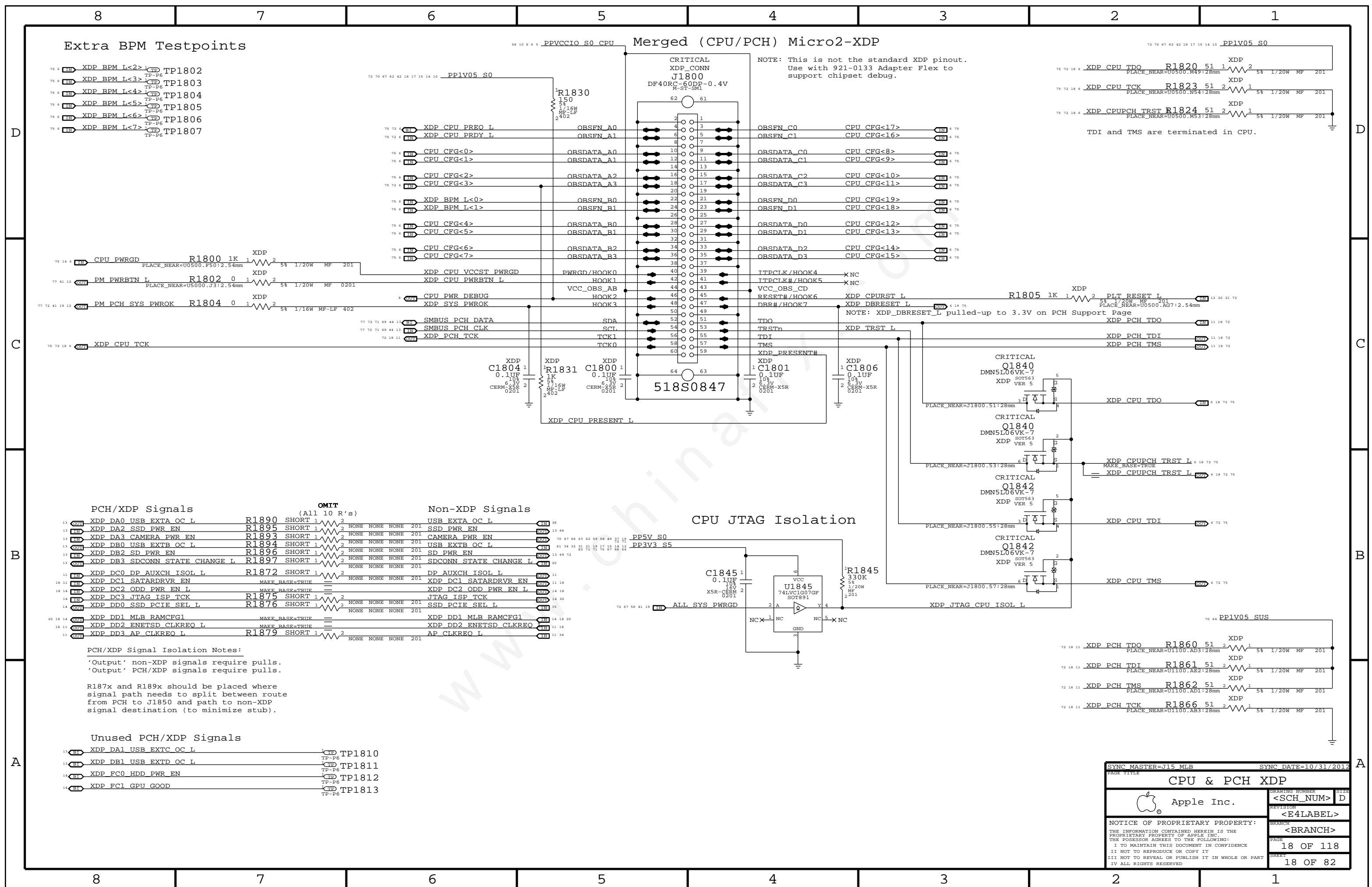


Current data from LPT EDS (doc #486708, Rev 1.0).

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
113S0022	1	RES,FF,0 OHM,(020OHM MAX),2A,0603	L1790		

SYNC MASTER=J15 REFERENCE		SYNC DATE=12/18/2012	
PAGE TITLE			
PCH DECOUPLING			
 Apple Inc.		DRAWING NUMBER	SIZE
		<SCH_NUM>	D
NOTICE OF PROPRIETARY PROPERTY: THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING: I I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART IV ALL RIGHTS RESERVED		REVISION	BRANCH
		<E4LABEL>	<BRANCH>
		PAGE	17 OF 118
		SHEET	17 OF 82



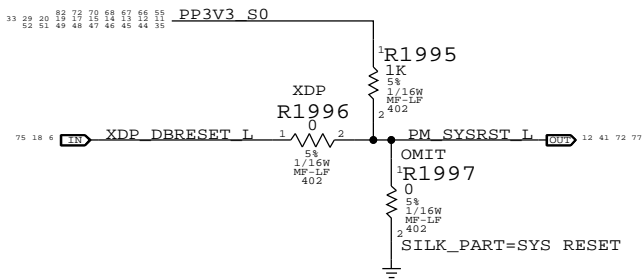




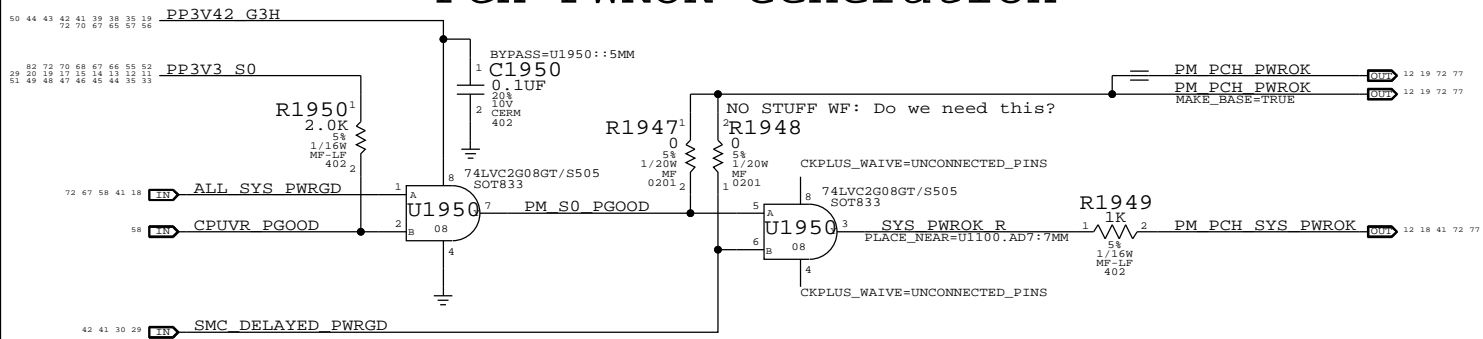
D

D

PCH Reset Button

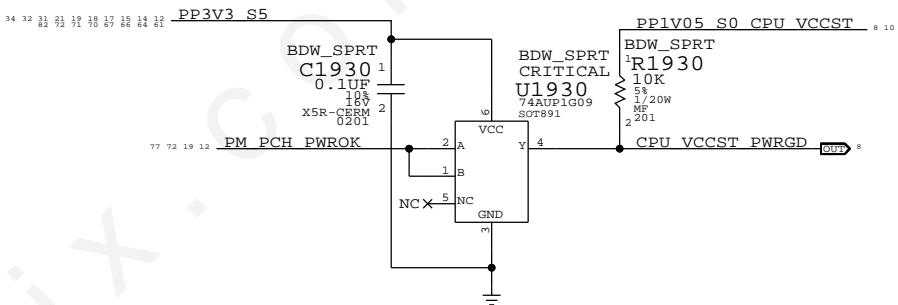


PCH PWROK Generation

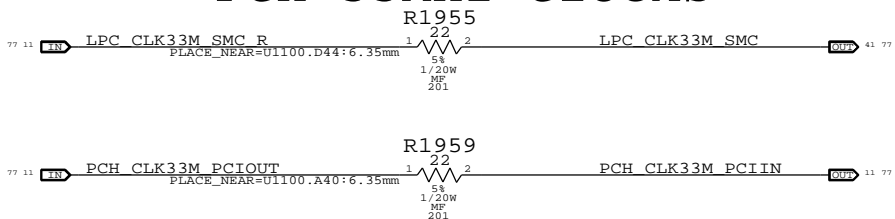


NOTE: ALL\_SYS\_PWRGD must remain low until at least 5ms after all rails are valid.

VCCST (1.05V S0) PWRGD



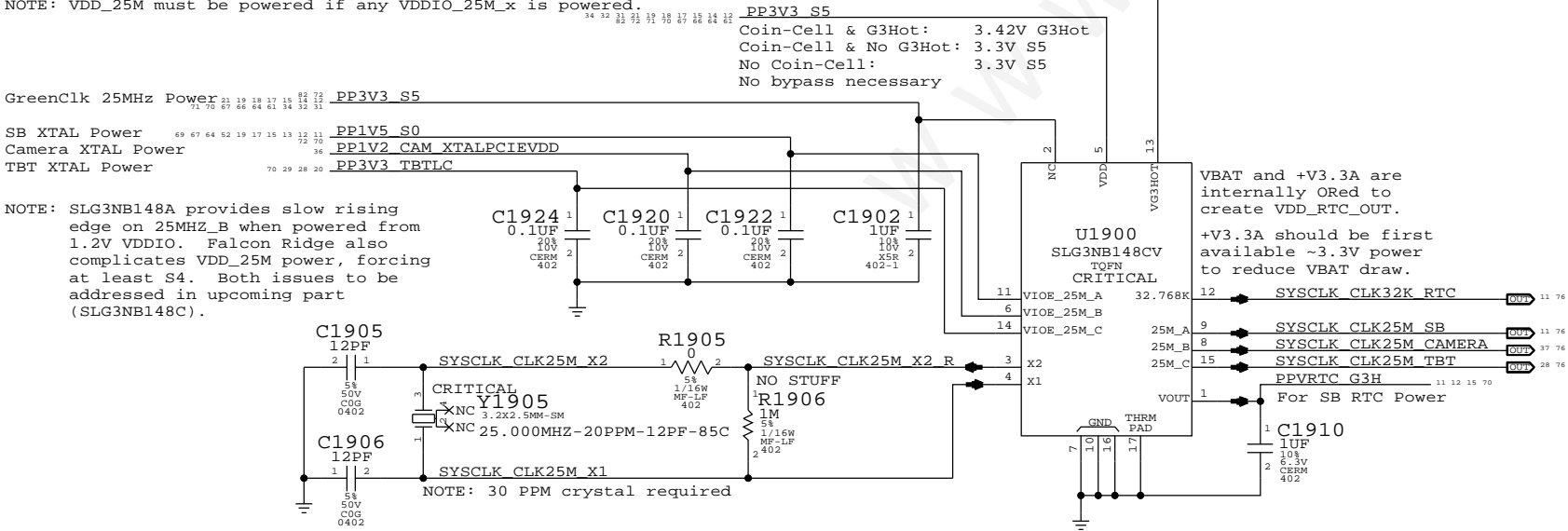
PCH 33MHz Clocks



System RTC Power Source & 32kHz / 25MHz Clock Generator

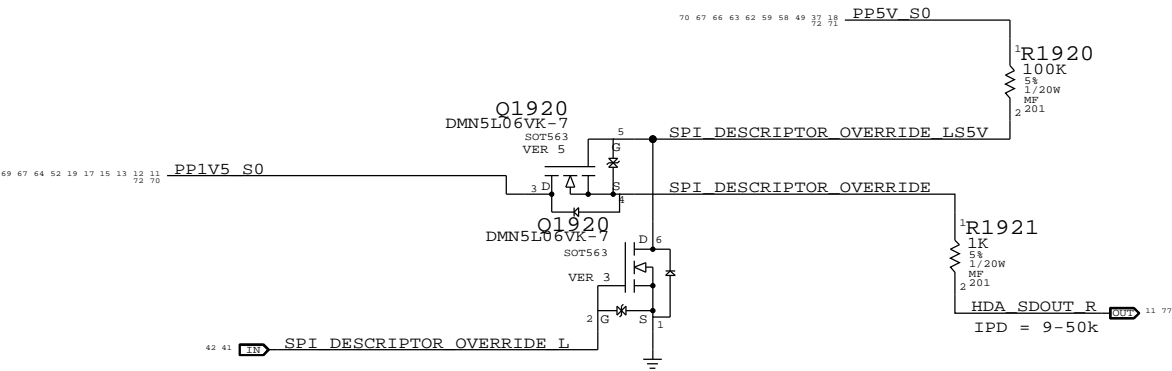
VDDIO\_25M\_A: SB power rail for XTAL circuit.  
VDDIO\_25M\_B: Camera power rail for XTAL circuit.  
VDDIO\_25M\_C: Thunderbolt power rail for XTAL circuit.

NOTE: VDD\_25M must be powered if any VDDIO\_25M\_x is powered.



PCH ME Disable Strap

PCH uses HDA\_SDO as a power-up strap. If low, ME functions normally. If high, ME is disabled. This allows for full re-flashing of SPI ROM. SMC controls strap enable to allow in-field control of strap setting. Q1920 & 5V pull-up allows circuit to work regardless of HDA voltage.



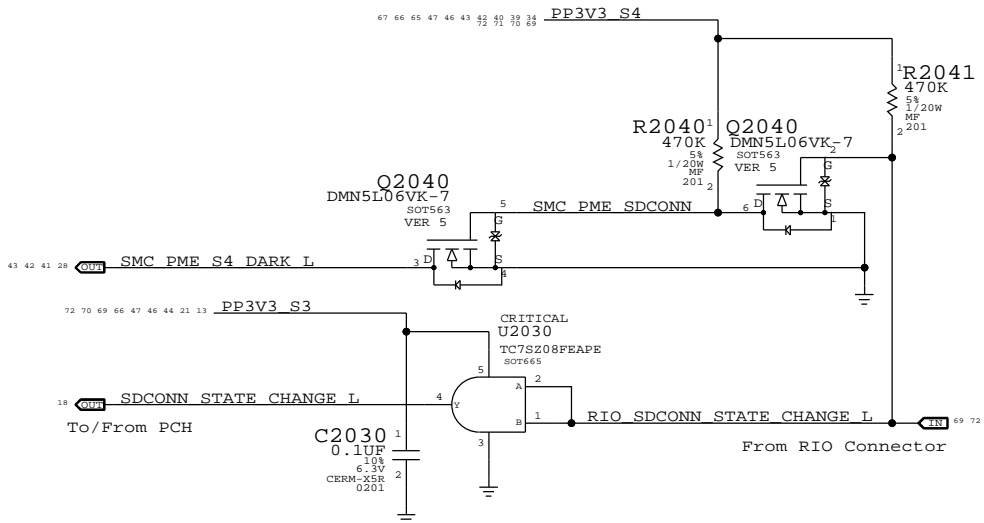
A

A

PAGE TITLE		PAGE TITLE	
Chipset Support		Chipset Support	
Apple Inc.		Apple Inc.	
NOTICE OF PROPRIETARY PROPERTY:		NOTICE OF PROPRIETARY PROPERTY:	
THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:		THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:	
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE		I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE	
II NOT TO REPRODUCE OR COPY IT		II NOT TO REPRODUCE OR COPY IT	
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART		III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART	
IV ALL RIGHTS RESERVED		IV ALL RIGHTS RESERVED	

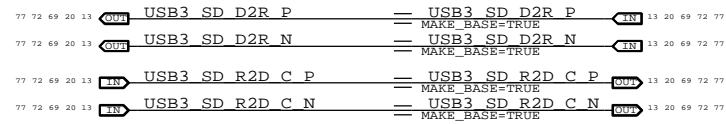


## RIO SD Card Reader Support



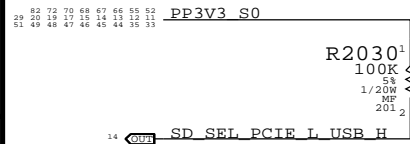
### Flexible I/O Aliases

SD Card Reader is always USB3 in this implementation.

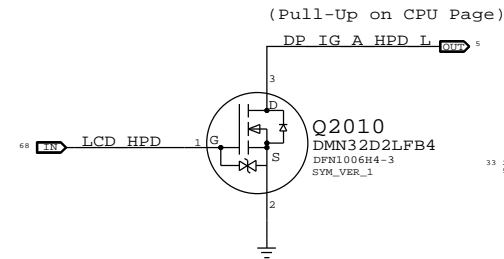


### Flexible I/O Configuration Strap

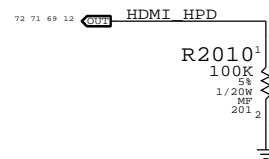
Must pull signal correctly even if always USB or PCIe



## LCD HPD Inverter

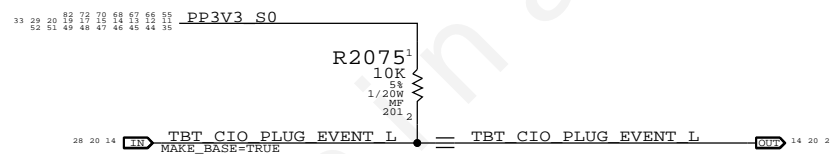


## HDMI HPD pull-down



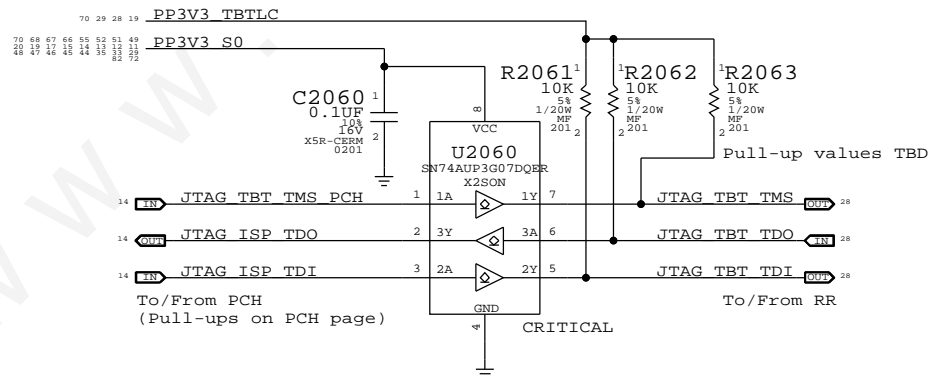
## Falcon Ridge Support

RR output is open-drain, no isolation necessary

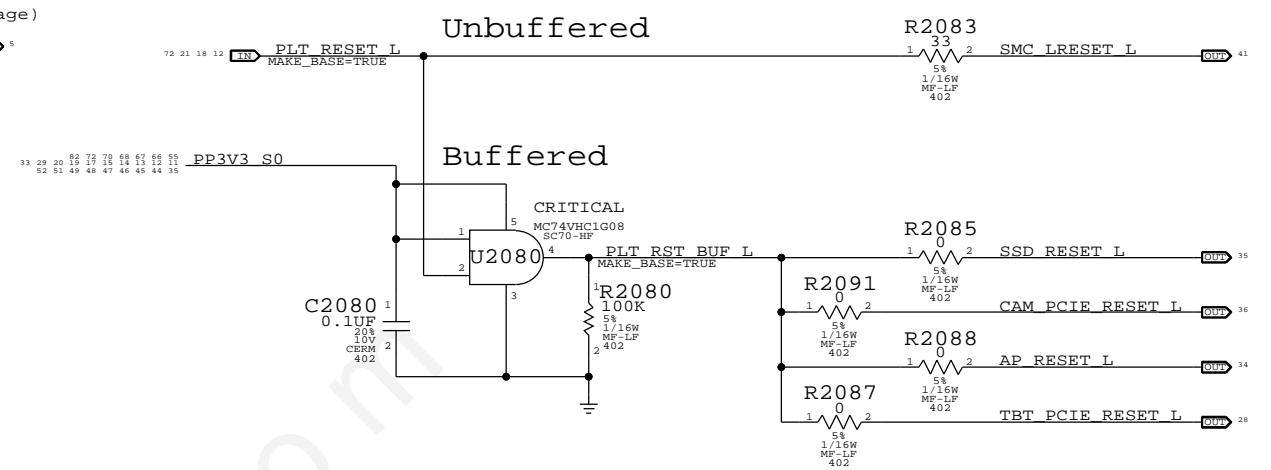


## Falcon Ridge JTAG Isolation

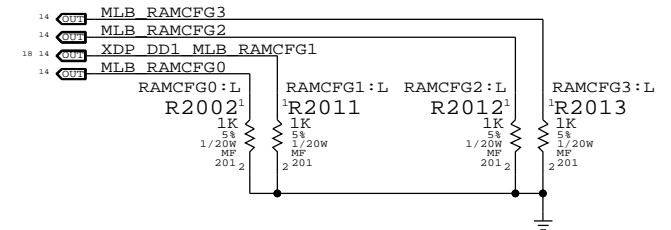
TBTLC can be on when S0 is off, and vice-versa  
Isolation ensures no leakage to RR or PCH  
U2060 supports I/O's powered when VCC=0V



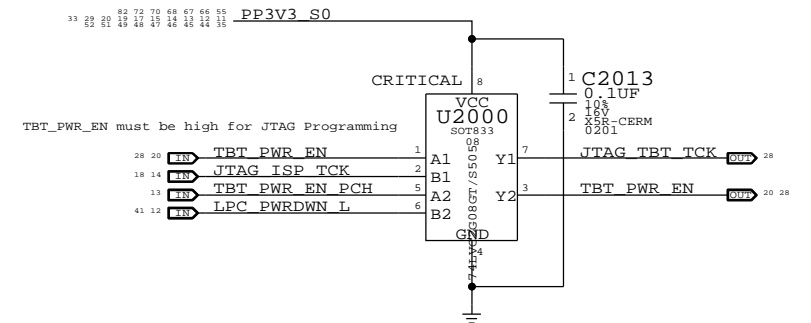
## Platform Reset Connections



## RAM Configuration Straps

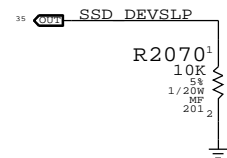



## GPIO Glitch Prevention



## GS3 Connector Support

DEVSLP not supported on LPT-H



SYNC MASTER=J15 REFERENCE		SYNC DATE=01/14/2013	
PAGE TITLE			
Project Chipset Support			
 Apple Inc.		DRAWING NUMBER	SIZE
		<SCH_NUM>	D
		REVISION	
		<E4LABEL>	
NOTICE OF PROPRIETARY PROPERTY:		BRANCH	
THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:		<BRANCH>	
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE		PAGE	20 OF 118
I NOT TO REPRODUCE OR COPY IT		SHEET	20 OF 82
I NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART			
ALL RIGHTS RESERVED			



The circuit below handles CPU and VTT power during S0->S3->S0 transitions, as well as isolating the CPU's SM\_DRAMRST# output from the SO-DIMMs when necessary.

ISOLATE\_CPU\_MEM\_L GPIO state during S3->S0 transitions determines behavior of signals.

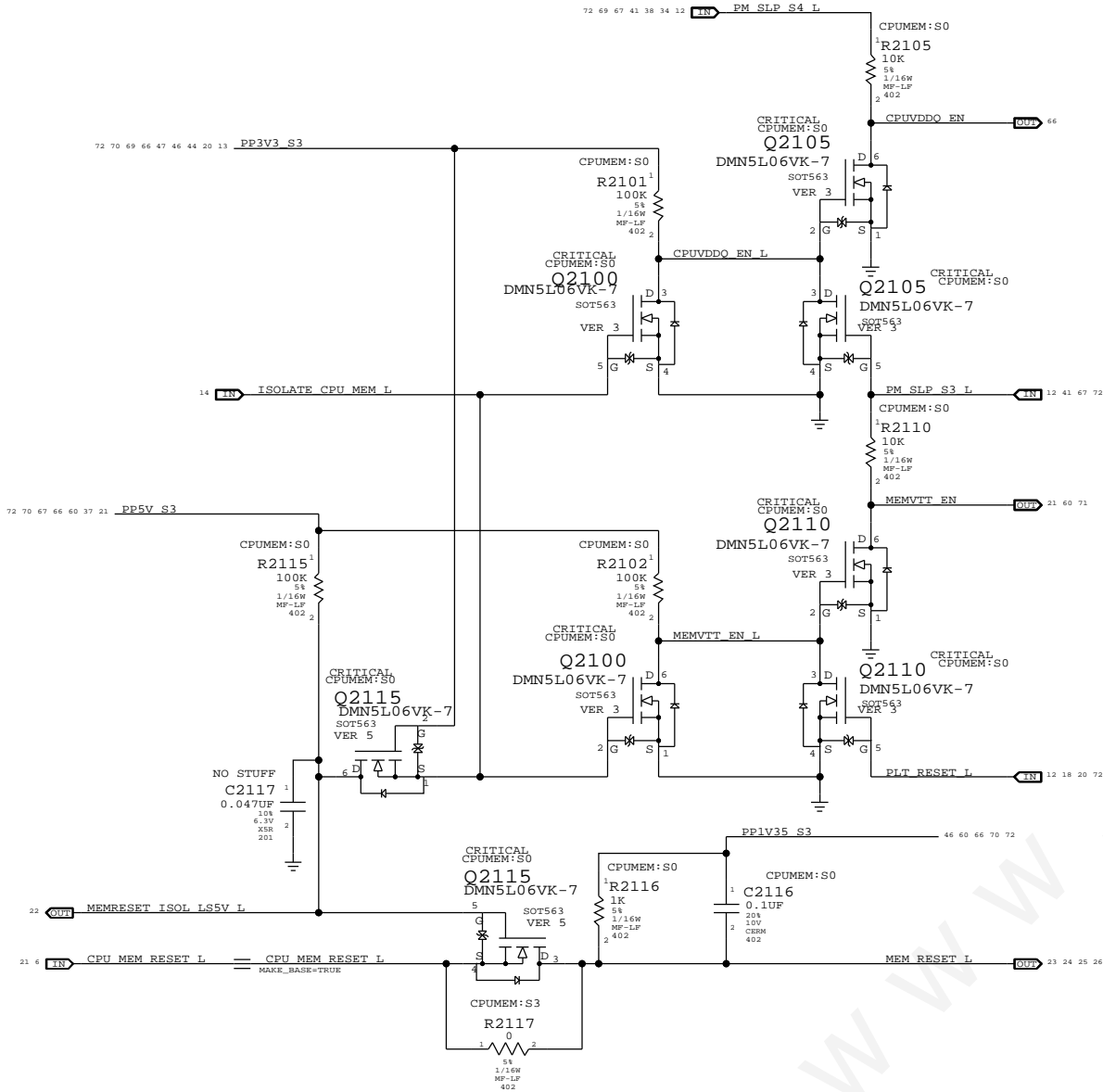
WHEN HIGH: CPU 1.5V remains powered in S3, VTT follows S0 rails, MEM\_RESET\_L not isolated.

WHEN LOW: CPU 1.5V follows S0 rails, VTT ensures clean CKE transition, MEM\_RESET\_L isolated.

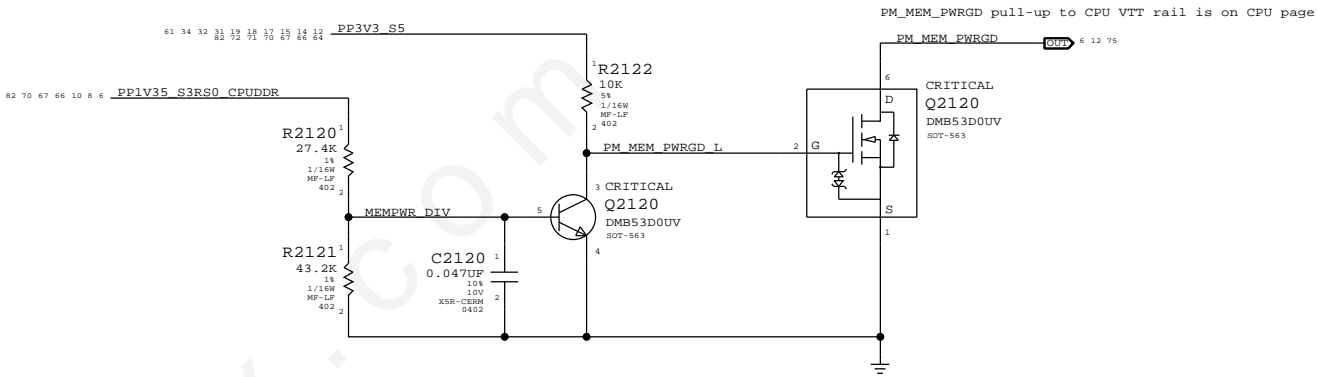
CPUVDDQ\_EN = (ISOLATE\_CPU\_MEM\_L + PM\_SLP\_S3\_L) \* PM\_SLP\_S4\_L

MEMVTT\_EN = (ISOLATE\_CPU\_MEM\_L + PLT\_RST\_L) \* PM\_SLP\_S3\_L

MEM\_RESET\_L = !ISOLATE\_CPU\_MEM\_L + CPU\_MEM\_RESET\_L

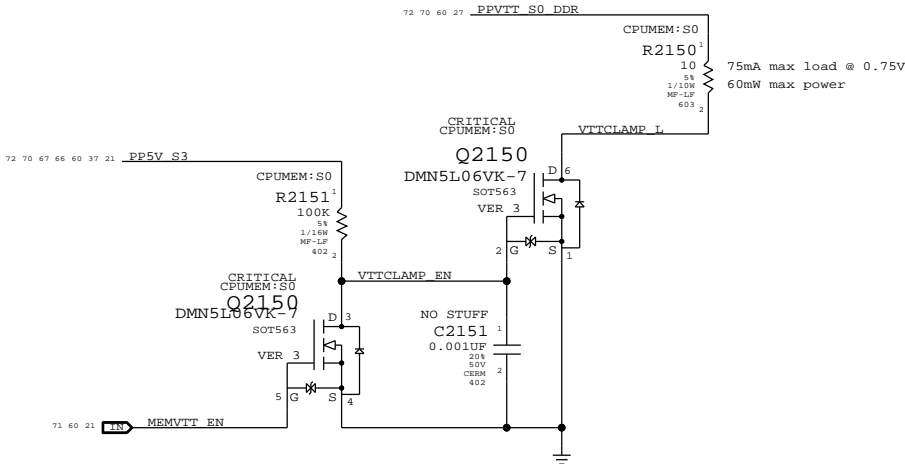


### MEM S0 "PGOOD" for CPU



### MEMVTT Clamp


Ensures CKE signals are held low in S3



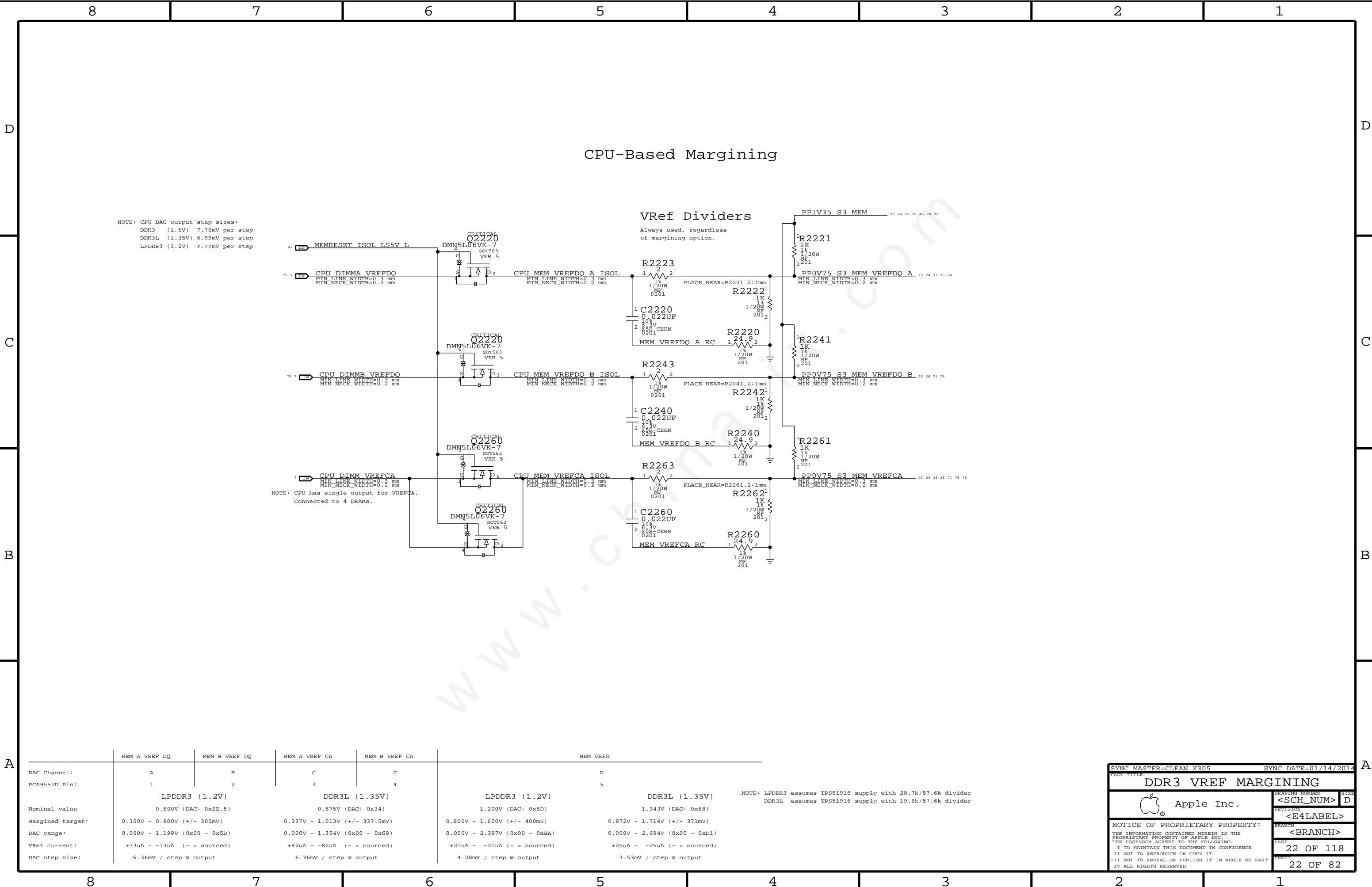
Step	ISOLATE_CPU_MEM_L	PLT_RESET_L	PM_SLP_S3_L	PM_SLP_S4_L	CPU_MEM_RESET_L	MEM_RESET_L	MEMVTT_EN	CPUVDDQ_EN
S0	0	1	1	1	1	CPU_MEM_RESET_L	1	1
1	1	0	1	1	1	1	1	1
2	0	0	1	1	1	1	0	1
3	0	0	0	1	X	1	0	0
4	0	0	1	1	X	1	0	1
5	0	1	1	1	0 (*)	1	1	1
6	0	1	1	1	1	1	1	1
S0	7	1	1	1	1	CPU_MEM_RESET_L	1	1

(\*) CPU\_MEM\_RESET\_L asserts due to loss of PM\_MEM\_PWRGD, must wait for software to clear before deasserting ISOLATE\_CPU\_MEM\_L GPIO.

NOTE: In the event of a S3->S5 transition ISOLATE\_CPU\_MEM\_L will still be asserted on next S5->S0 transition. Rails will power-up as if from S3, but MEM\_RESET\_L will not properly assert. Software must deassert ISOLATE\_CPU\_MEM\_L and then generate a valid reset cycle on CPU\_MEM\_RESET\_L.

SYNC MASTER=CLEAN X305G		SYNC DATE=07/01/2014	
PAGE TITLE			
CPU Memory S3 Support			
 Apple Inc.		DRAWING NUMBER	SIZE
		<SCH_NUM>	D
		REVISION	
		<E4LABEL>	
		BRANCH	<BRANCH>
NOTICE OF PROPRIETARY PROPERTY: THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING: I I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART IV ALL RIGHTS RESERVED			
		PAGE	21 OF 118
		SHEET	21 OF 82

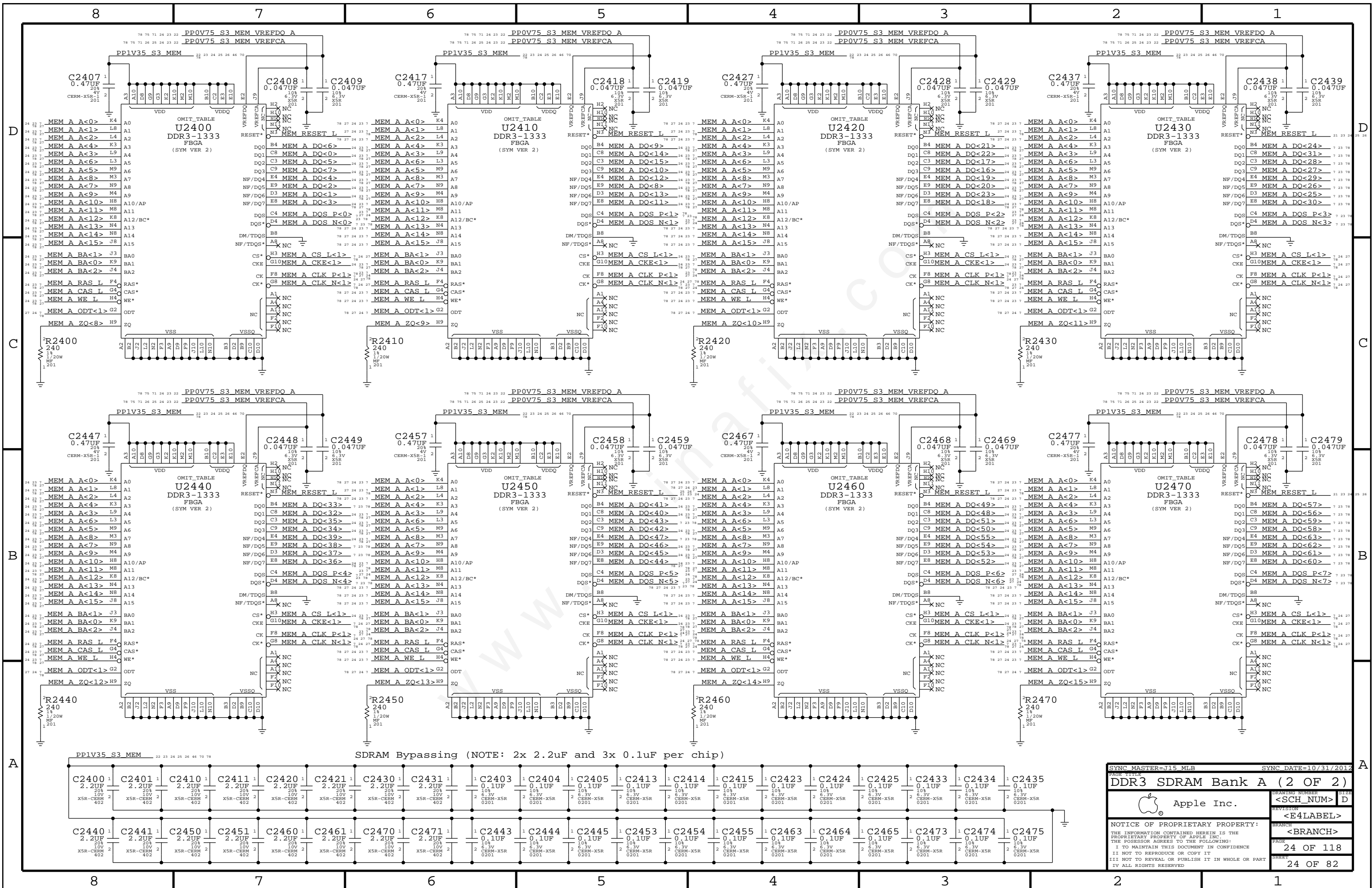











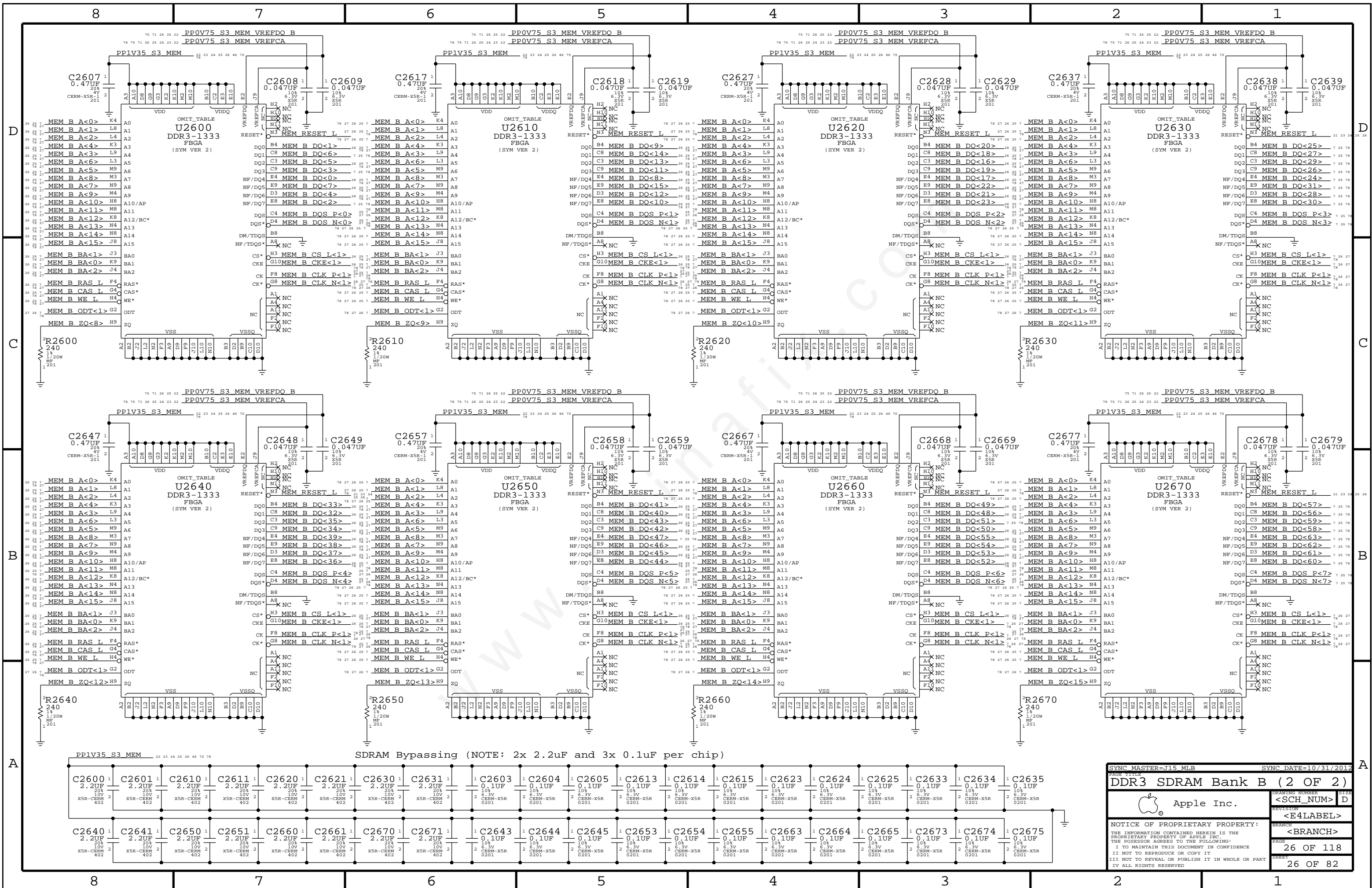



SYNC MASTER=J15 MLB		SYNC DATE=10/31/2012	
PAGE TITLE			
DDR3 SDRAM Bank A		(2 OF 2)	
 Apple Inc.		DRAWING NUMBER	SIZE
		<SCH_NUM>	D
		REVISION	
		<E4LABEL>	
		BRANCH	
		<BRANCH>	
		PAGE	24 OF 118
		SHEET	24 OF 82
NOTICE OF PROPRIETARY PROPERTY: THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING: I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART IV ALL RIGHTS RESERVED			



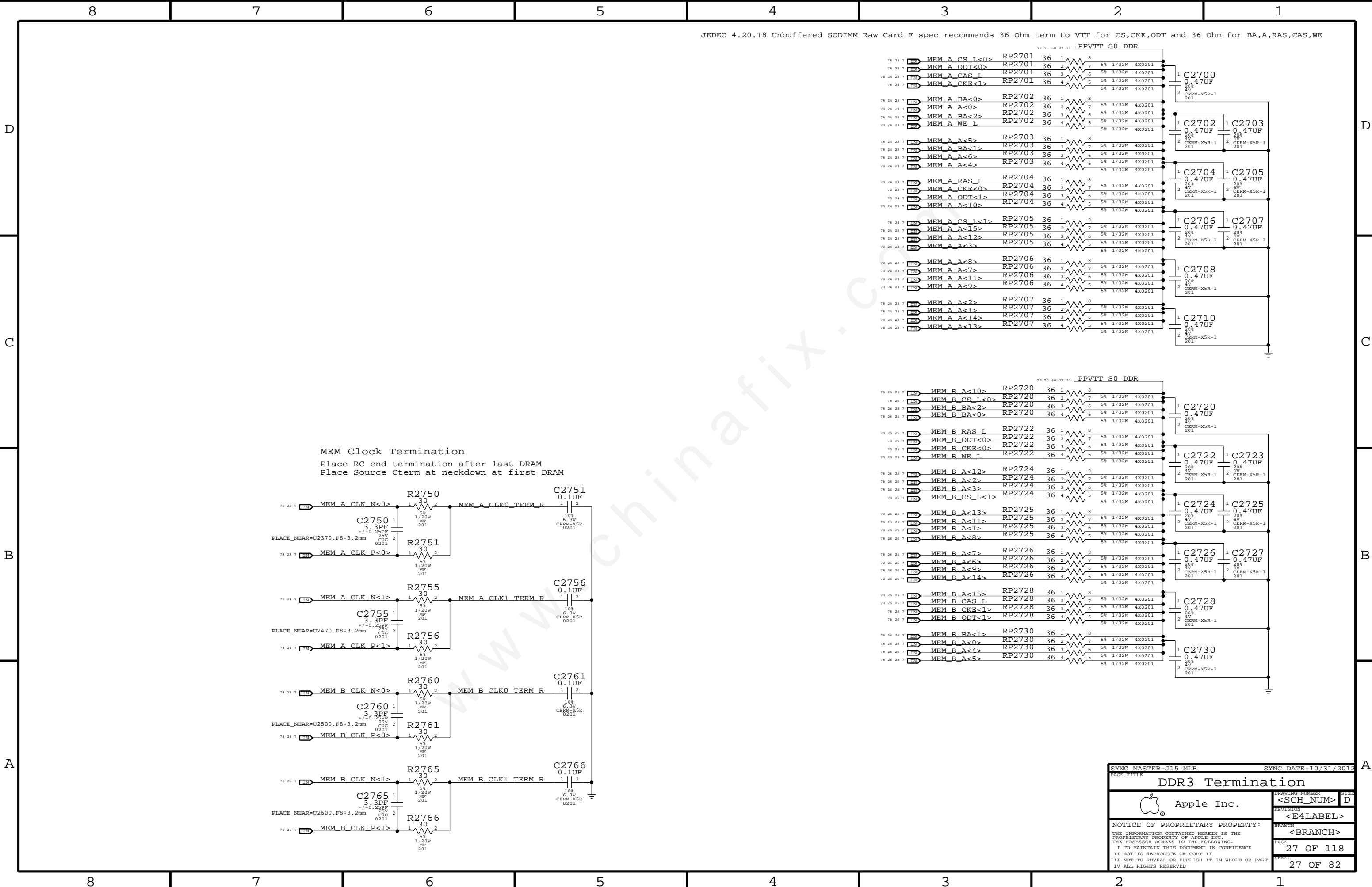




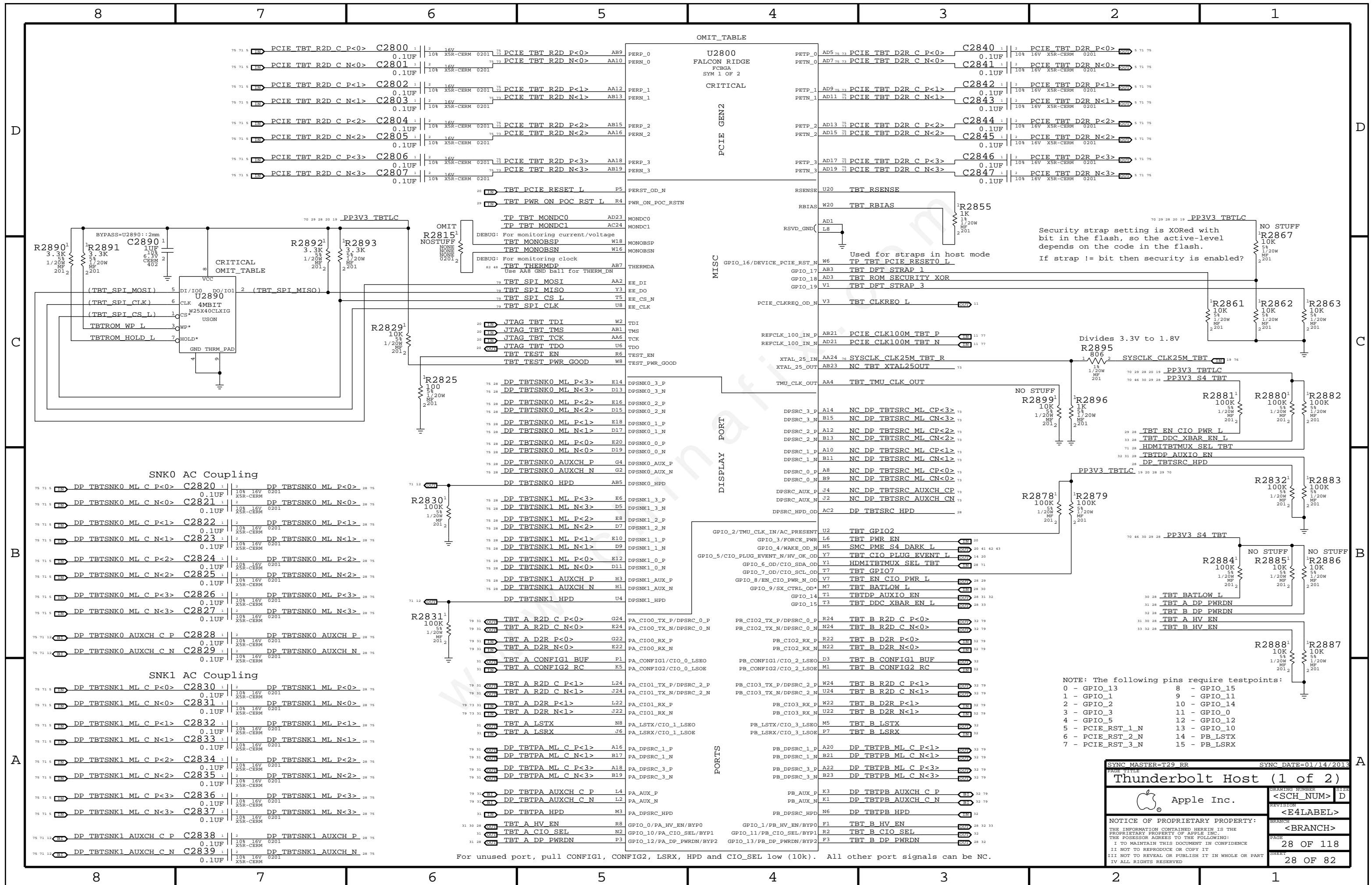


SYNC MASTER=J15 MLB		SYNC DATE=10/31/2012	
PAGE TITLE			
DDR3 SDRAM Bank B		( 2 OF 2 )	
 Apple Inc.		DRAWING NUMBER	SIZE
		<SCH_NUM>	D
		REVISION	
		<E4LABEL>	
NOTICE OF PROPRIETARY PROPERTY:		BRANCH	
THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC.		<BRANCH>	
THE POSSESSOR AGREES TO THE FOLLOWING:		PAGE	
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE		26 OF 118	
II NOT TO REPRODUCE OR COPY IT		SHEET	
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART		26 OF 82	
IV ALL RIGHTS RESERVED			

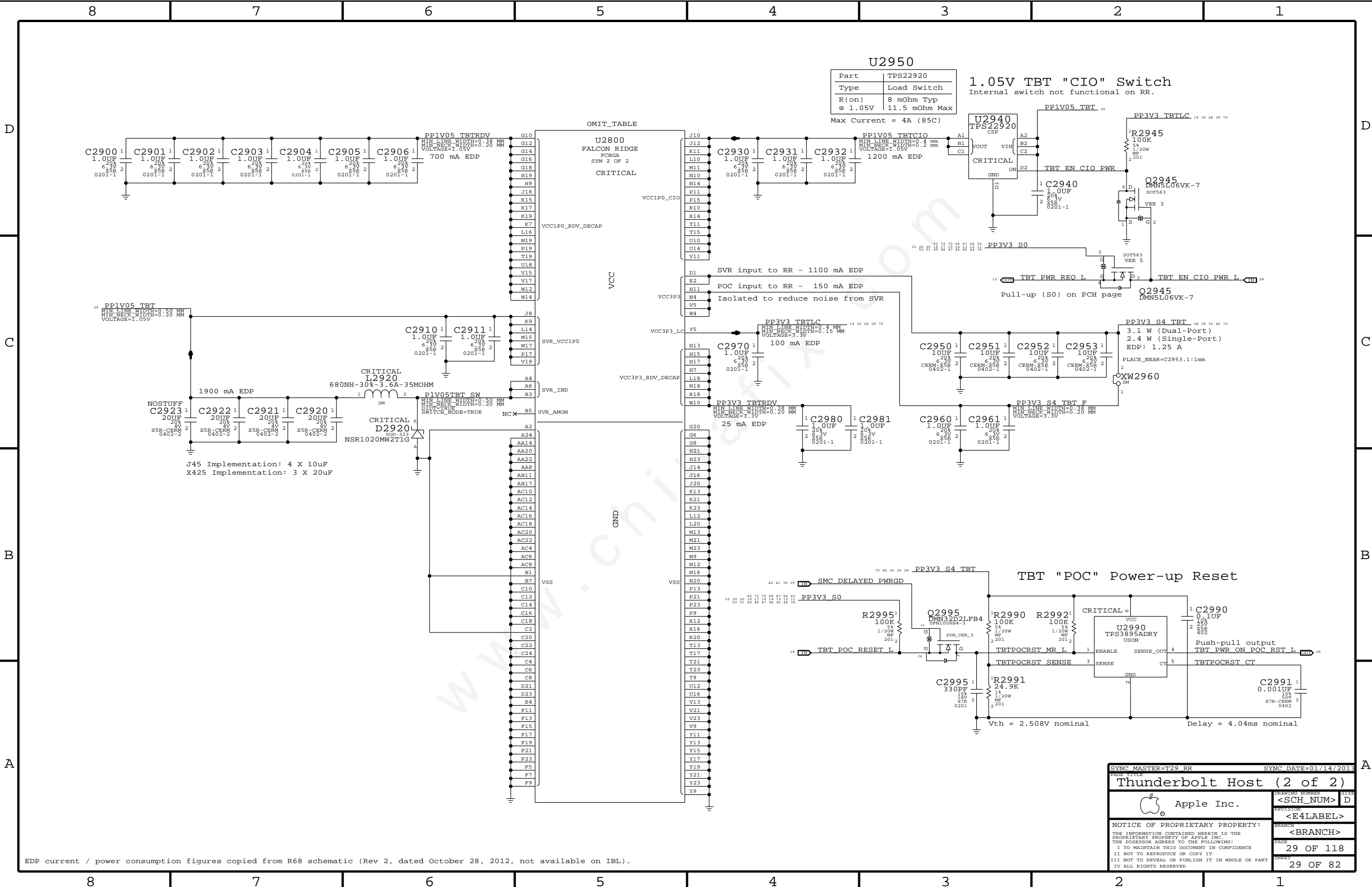













U2950	
Part	TPS22920
Type	Load Switch
R(on)	8 mOhm Typ
@ 1.05V	11.5 mOhm Max
Max Current = 4A (85C)	

1.05V TBT "CIO" Switch


Internal switch not functional on RR.

SYNC MASTER=T29 RR		SYNC DATE=01/14/2013	
PAGE TITLE			
Thunderbolt Host		(2 of 2)	
 Apple Inc.		DRAWING NUMBER	SIZE
		<SCH_NUM>	D
		REVISION	
		<E4LABEL>	
		BRANCH	
		<BRANCH>	
		PAGE	29 OF 118
		SHEET	29 OF 82

EDP current / power consumption figures copied from R68 schematic (Rev 2, dated October 28, 2012, not available on IBL).



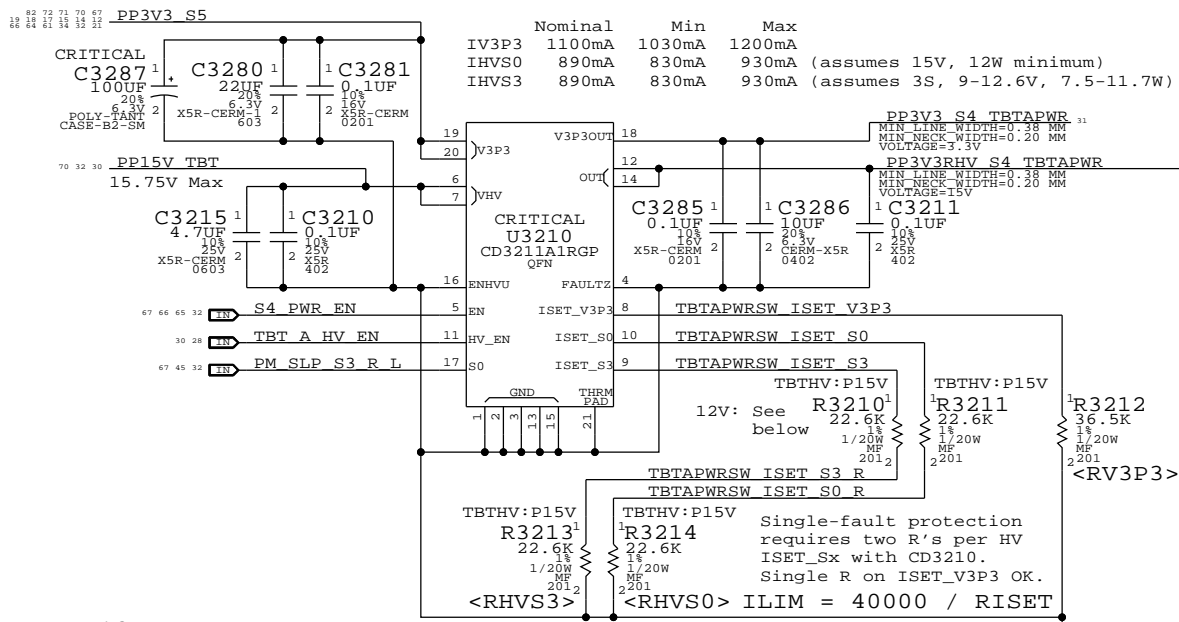
[illegible][illegible]

SYNCH MASTER=CLEAN X305		SYNCH DATE=06/24/2014	
PROJECT#			
Thunderbolt Mobile Support			
 Apple Inc.	DRAWING NUMBER	SIZE	
	<SCH_NUM>		D
	REVISION		
	<E4LABEL>		
NOTICE OF PROPRIETARY PROPERTY:		BRANCH	
THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING: I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE I NOT TO REPRODUCE OR COPY IT I'LL NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART I ALL RIGHTS RESERVED		<BRANCH>	
		PAGE	
		30 OF 118	
		SHEET	
		30 OF 82	



### 3.3V/HV Power MUX

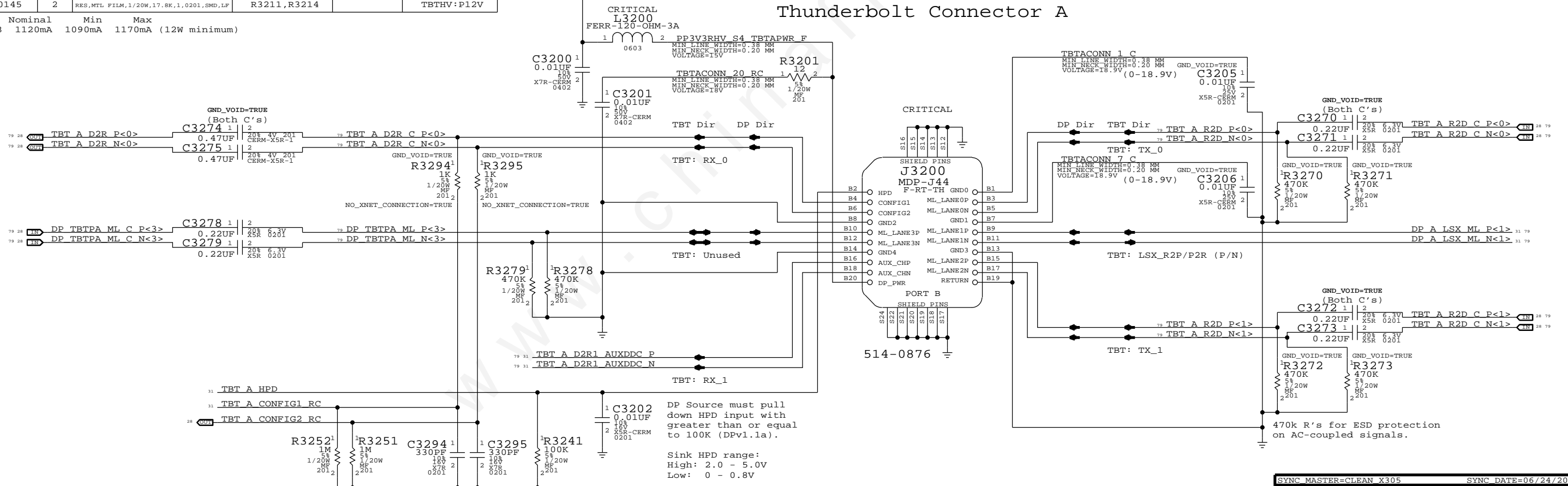
V3P3 must be S4 to support wake from Thunderbolt devices.




For 12V systems:

	Nominal	Min	Max
IHVS0/S3	1120mA	1090mA	1170mA (12W minimum)

### Thunderbolt Connector A



SYNC MASTER=CLEAN X305		SYNC DATE=06/24/2014	
PAGE TITLE			
Thunderbolt Connector A			
 Apple Inc.		DRAWING NUMBER	SIZE
		<SCH_NUM>	D
		REVISION	
		<E4LABEL>	
NOTICE OF PROPRIETARY PROPERTY:		BRANCH	
THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:		<BRANCH>	
I. NOT TO REPRODUCE OR COPY IT		PAGE	32 OF 118
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART		SHEET	31 OF 82
IV ALL RIGHTS RESERVED			



8	7	6	5	4	3	2	1
---	---	---	---	---	---	---	---


D



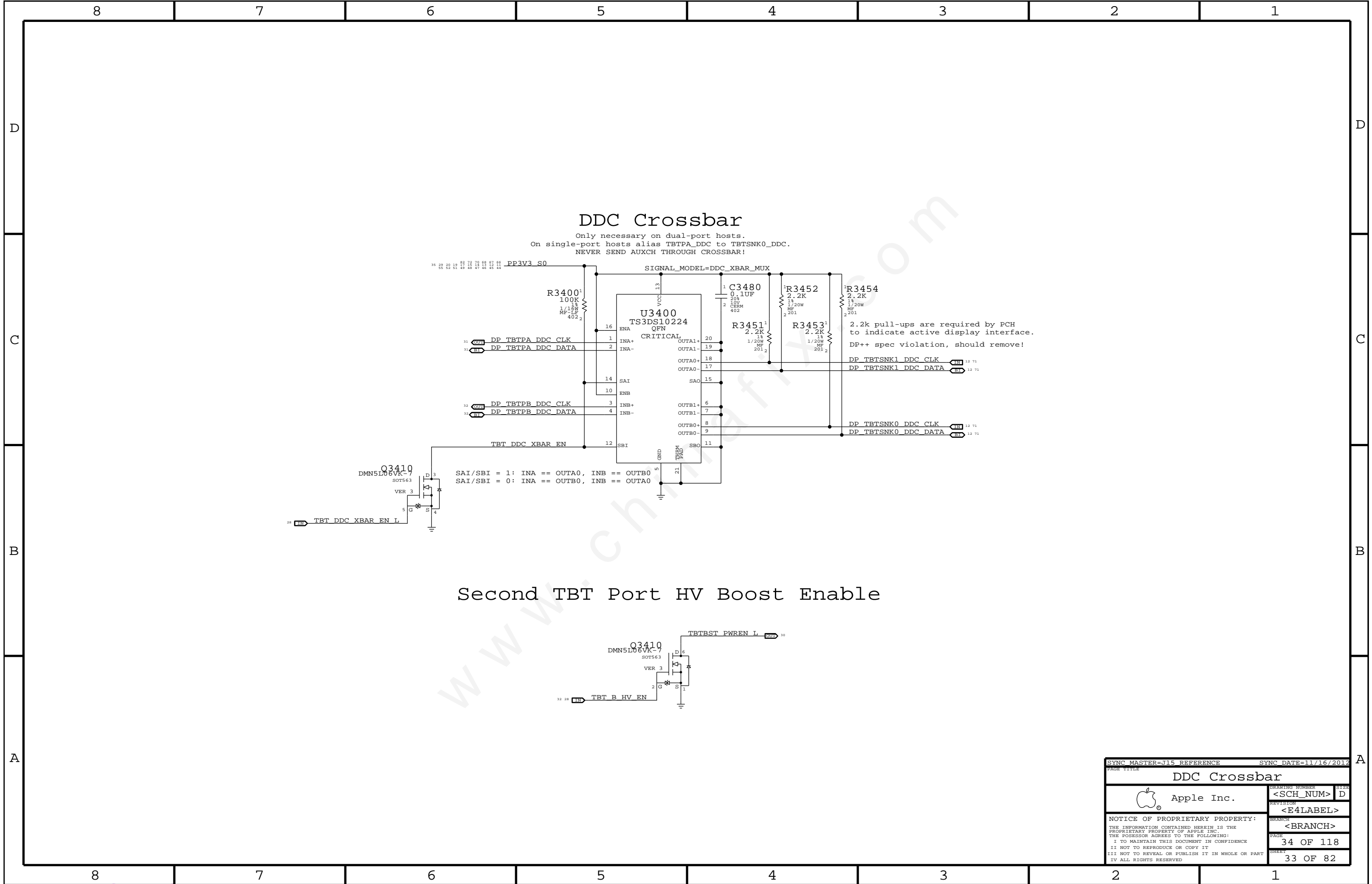
PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
118S0145	2	RES,MTL FILM,1/20W,17.8K,1,0201,SMD,LF	R3310,R3313		TBTHV:P12V
118S0145	2	RES,MTL FILM,1/20W,17.8K,1,0201,SMD,LF	R3311,R3314		TBTHV:P12V

B

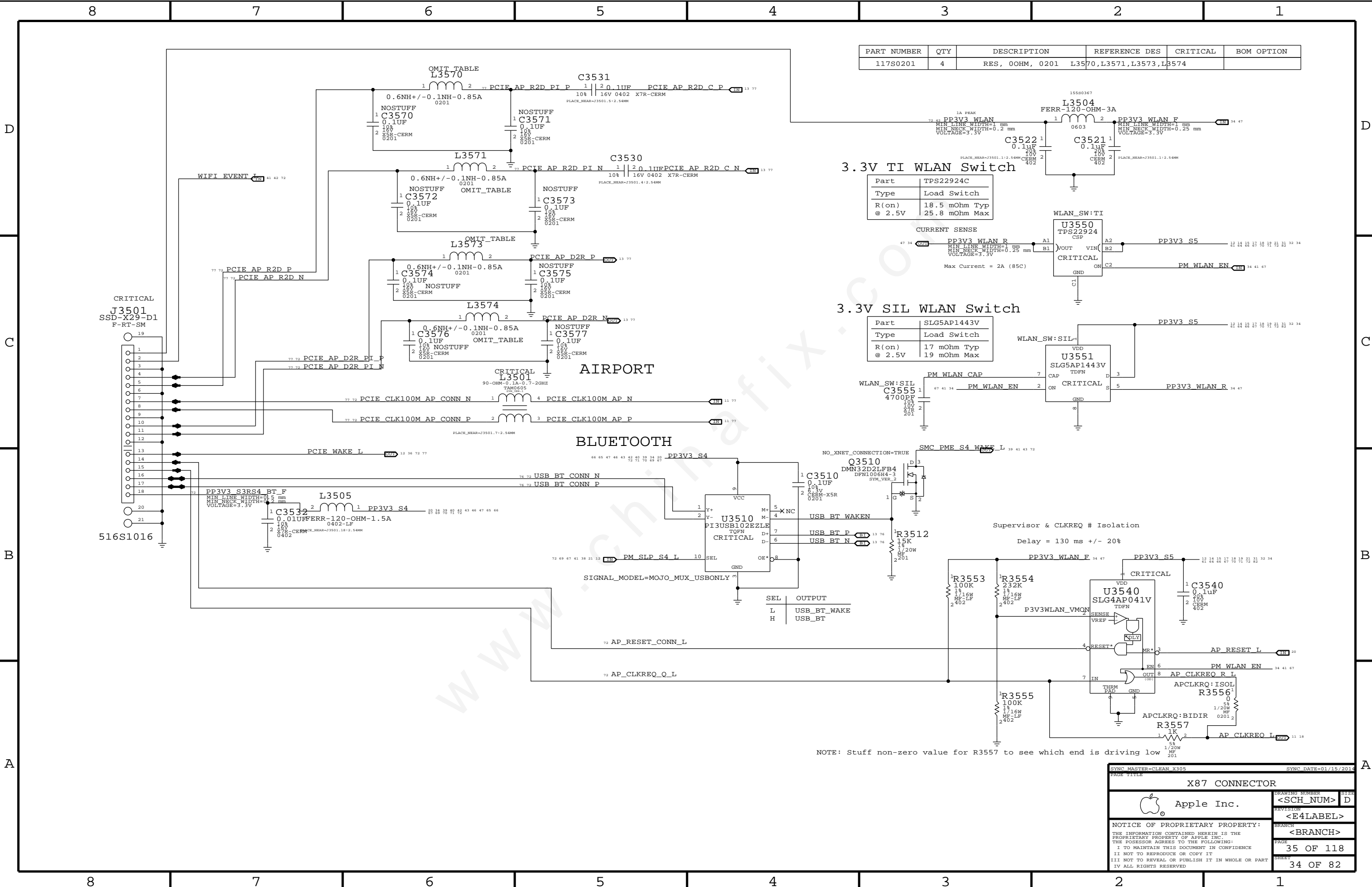


SYNC MASTER=CLEAN X305		SYNC DATE=06/24/2014	
PAGE TITLE		PAGE TOTAL	
Thunderbolt Connector B			
 Apple Inc.		DRAWING NUMBER <SCH_NUM>	
		SIZE D	
		REVISION <E4LABEL>	
NOTICE OF PROPRIETARY PROPERTY:		BRANCH <BRANCH>	
THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING: I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE I NOT TO REPRODUCE OR COPY IT I NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART I ALL RIGHTS RESERVED		PAGE 33 OF 118	
		SHEET 32 OF 82	









PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
117S0201	4	RES, 00HM, 0201	L3570,L3571,L3573,L3574		

### 3.3V TI WLAN Switch

Part	TPS22924C
Type	Load Switch
R(on)	18.5 mOhm Typ
@ 2.5V	25.8 mOhm Max

### 3.3V SIL WLAN Switch

Part	SLG5AP1443V
Type	Load Switch
R(on)	17 mOhm Typ
@ 2.5V	19 mOhm Max

X87 CONNECTOR	
Apple Inc.	
NOTICE OF PROPRIETARY PROPERTY:	
THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:	
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE	
II NOT TO REPRODUCE OR COPY IT	
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART	
IV ALL RIGHTS RESERVED	
DRAWING NUMBER	SIZE
<SCH_NUM>	D
REVISION	
<E4LABEL>	
BRANCH	
<BRANCH>	
PAGE	35 OF 118
SHEET	34 OF 82



D

C

B

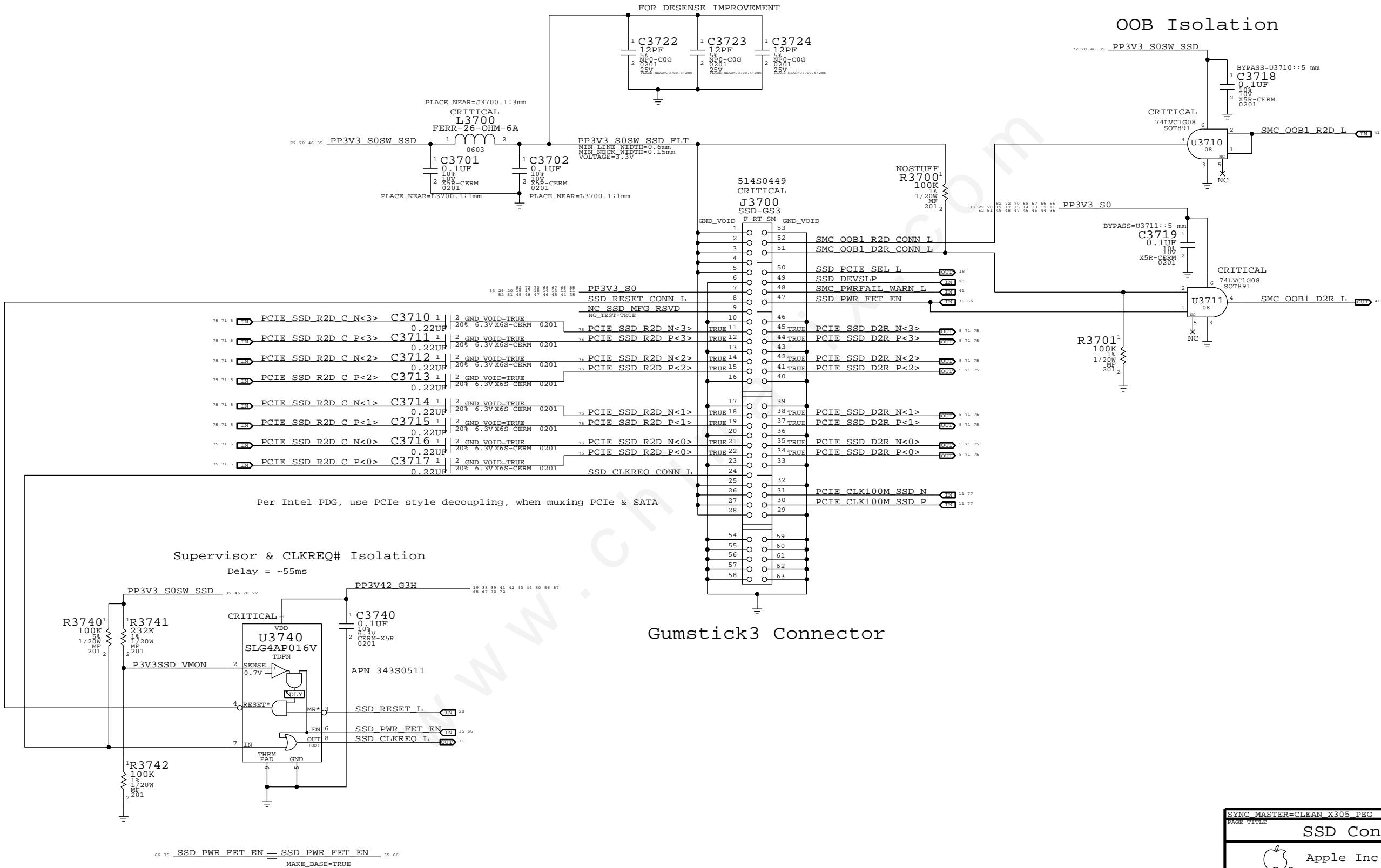
A


D

C

B

A

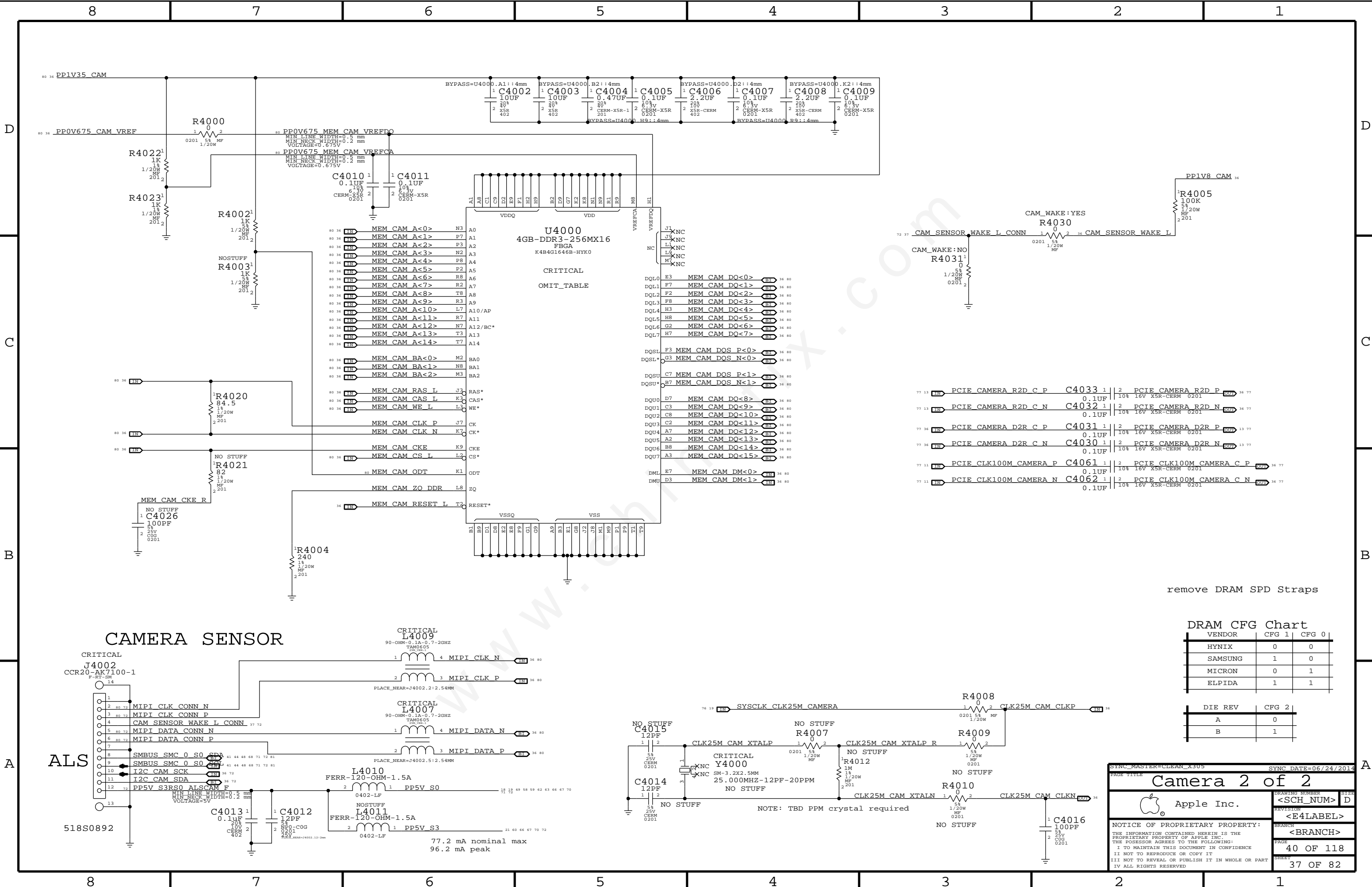


SYNC MASTER=CLEAN_X305_PEG		SYNC DATE=02/18/2014	
PAGE TITLE			
SSD Connector			
 Apple Inc.		DRAWING NUMBER	SIZE
		<SCH_NUM>	D
		REVISION	
		<E4LABEL>	
NOTICE OF PROPRIETARY PROPERTY: THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING: I I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART IV ALL RIGHTS RESERVED		BRANCH	
		<BRANCH>	
		PAGE	37 OF 118
		SHEET	35 OF 82









D

C

B

A

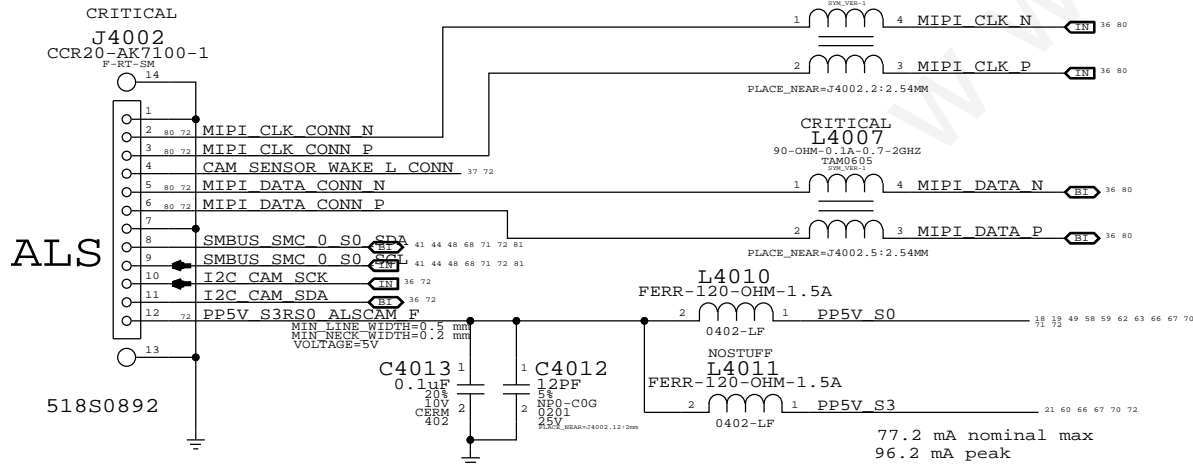
D

C

B

A

CAMERA SENSOR



remove DRAM SPD Straps

DRAM CFG Chart

VENDOR	CFG 1	CFG 0
HYNIX	0	0
SAMSUNG	1	0
MICRON	0	1
ELPIDA	1	1

DIE REV	CFG 2
A	0
B	1

Camera 2 of 2

Apple Inc.

NOTICE OF PROPRIETARY PROPERTY:  
THE INFORMATION CONTAINED HEREIN IS THE  
PROPRIETARY PROPERTY OF APPLE INC.  
THE POSSESSOR AGREES TO THE FOLLOWING:  
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE  
II NOT TO REPRODUCE OR COPY IT  
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART  
IV ALL RIGHTS RESERVED

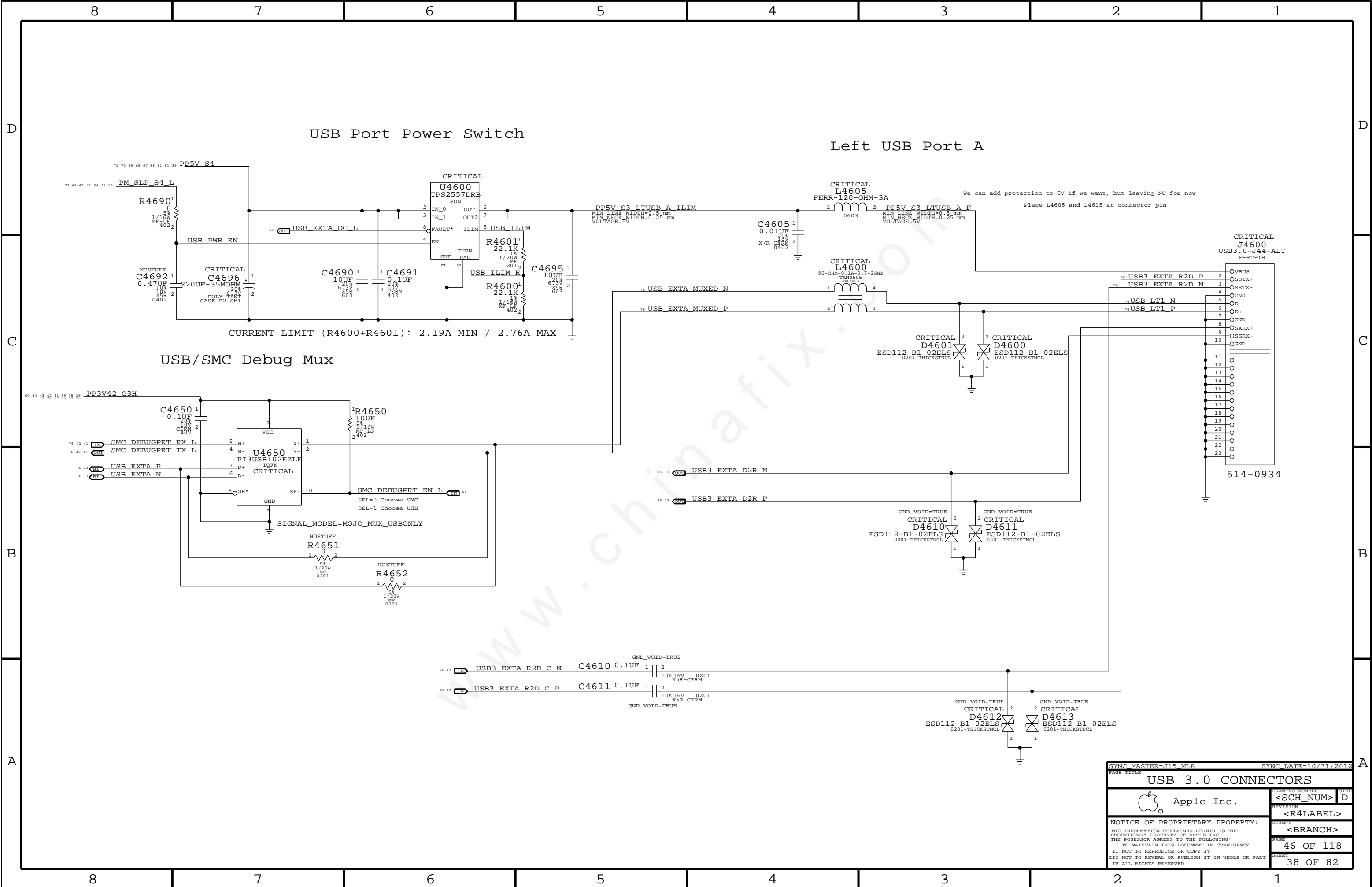
DRAWING NUMBER  
<SCH\_NUM> D

REVISION  
<E4LABEL>

PAGE  
40 OF 118

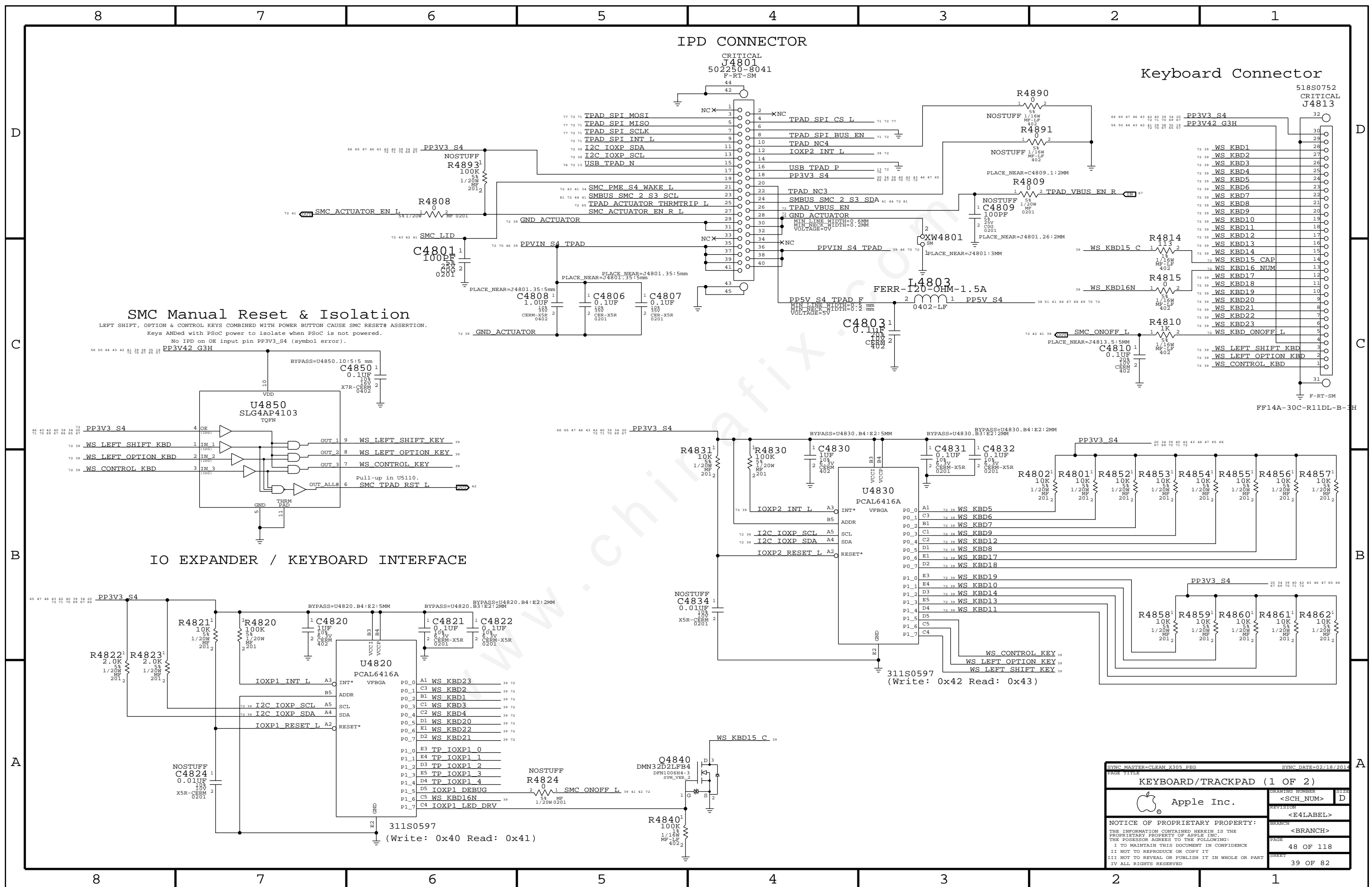
SHEET  
37 OF 82



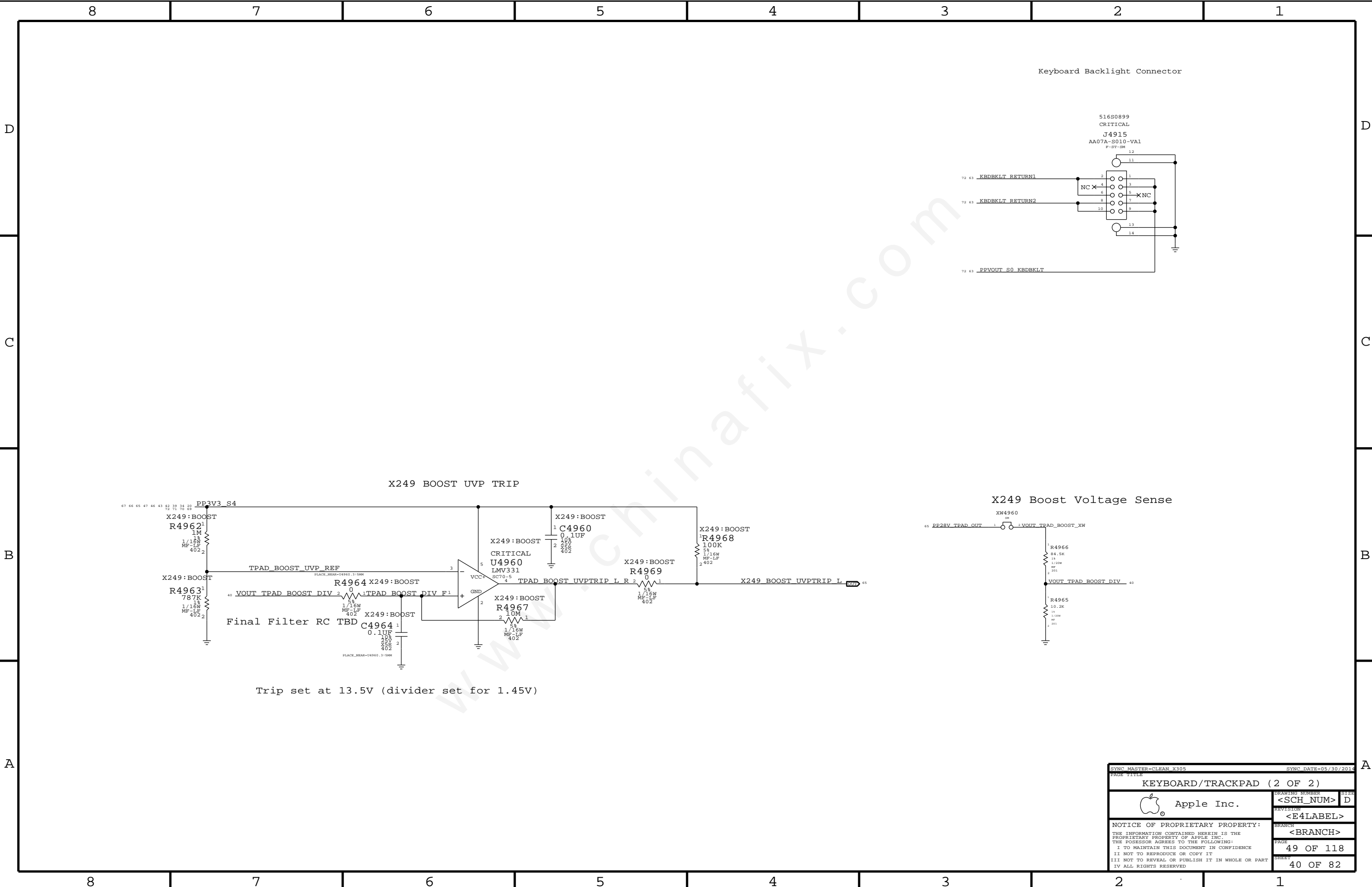


PAGE TITLE		PAGE TITLE	
USB 3.0 CONNECTORS		USB 3.0 CONNECTORS	
Apple Inc.		Apple Inc.	
NOTICE OF PROPRIETARY PROPERTY:		NOTICE OF PROPRIETARY PROPERTY:	
THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:		THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:	
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE		I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE	
II NOT TO REPRODUCE OR COPY IT		II NOT TO REPRODUCE OR COPY IT	
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART		III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART	
IV ALL RIGHTS RESERVED		IV ALL RIGHTS RESERVED	
DRAWING NUMBER		DRAWING NUMBER	
<SCH_NUM>		<SCH_NUM>	
REVISION		REVISION	
<E4LABEL>		<E4LABEL>	
BRANCH		BRANCH	
<BRANCH>		<BRANCH>	
PAGE		PAGE	
46 OF 118		46 OF 118	
SHEET		SHEET	
38 OF 82		38 OF 82	



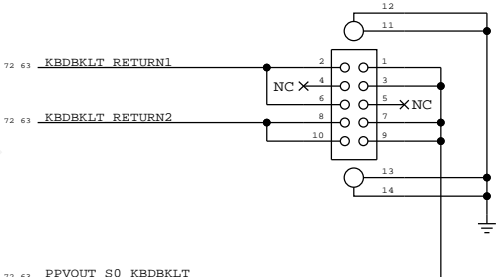




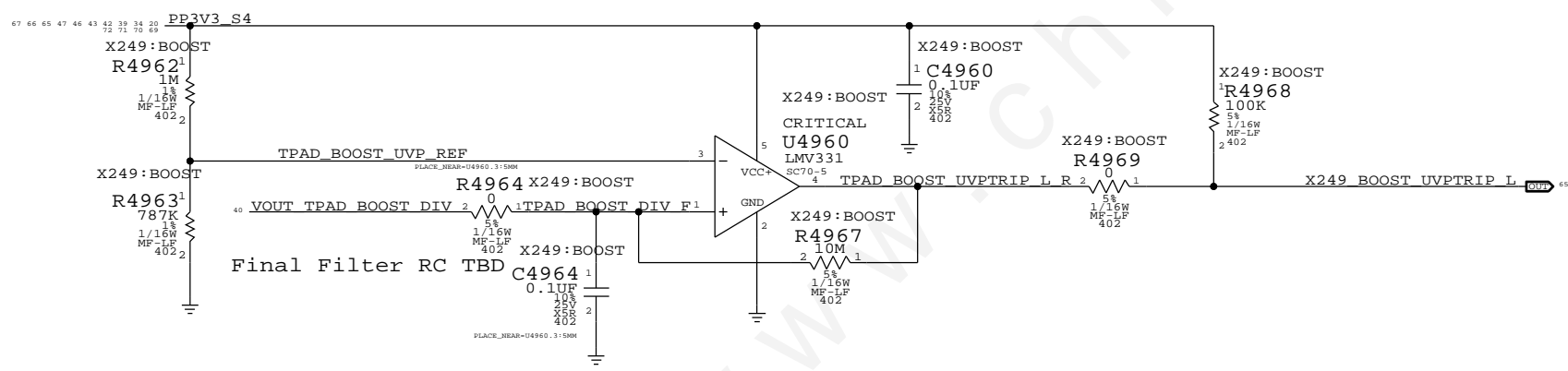


Keyboard Backlight Connector

51680899  
CRITICAL  
J4915  
AA07A-S010-VA1  
P=07-03M

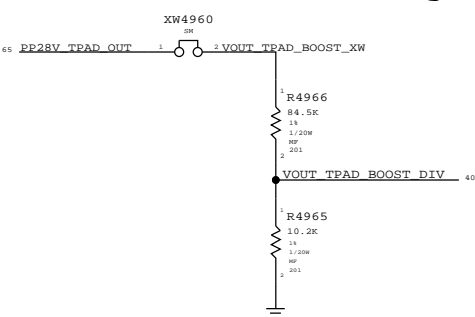



X249 BOOST UVP TRIP



Trip set at 13.5V (divider set for 1.45V)

X249 Boost Voltage Sense



SYNC MASTER=CLEAN X305		SYNC DATE=05/30/2014	
PAGE TITLE			
KEYBOARD/TRACKPAD ( 2 OF 2 )			
 Apple Inc.		DRAWING NUMBER	SIZE
		<SCH_NUM>	D
NOTICE OF PROPRIETARY PROPERTY: THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING: I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART IV ALL RIGHTS RESERVED		REVISION	
		<E4LABEL>	
		BRANCH	
		<BRANCH>	
		PAGE	49 OF 118
		SHEET	40 OF 82

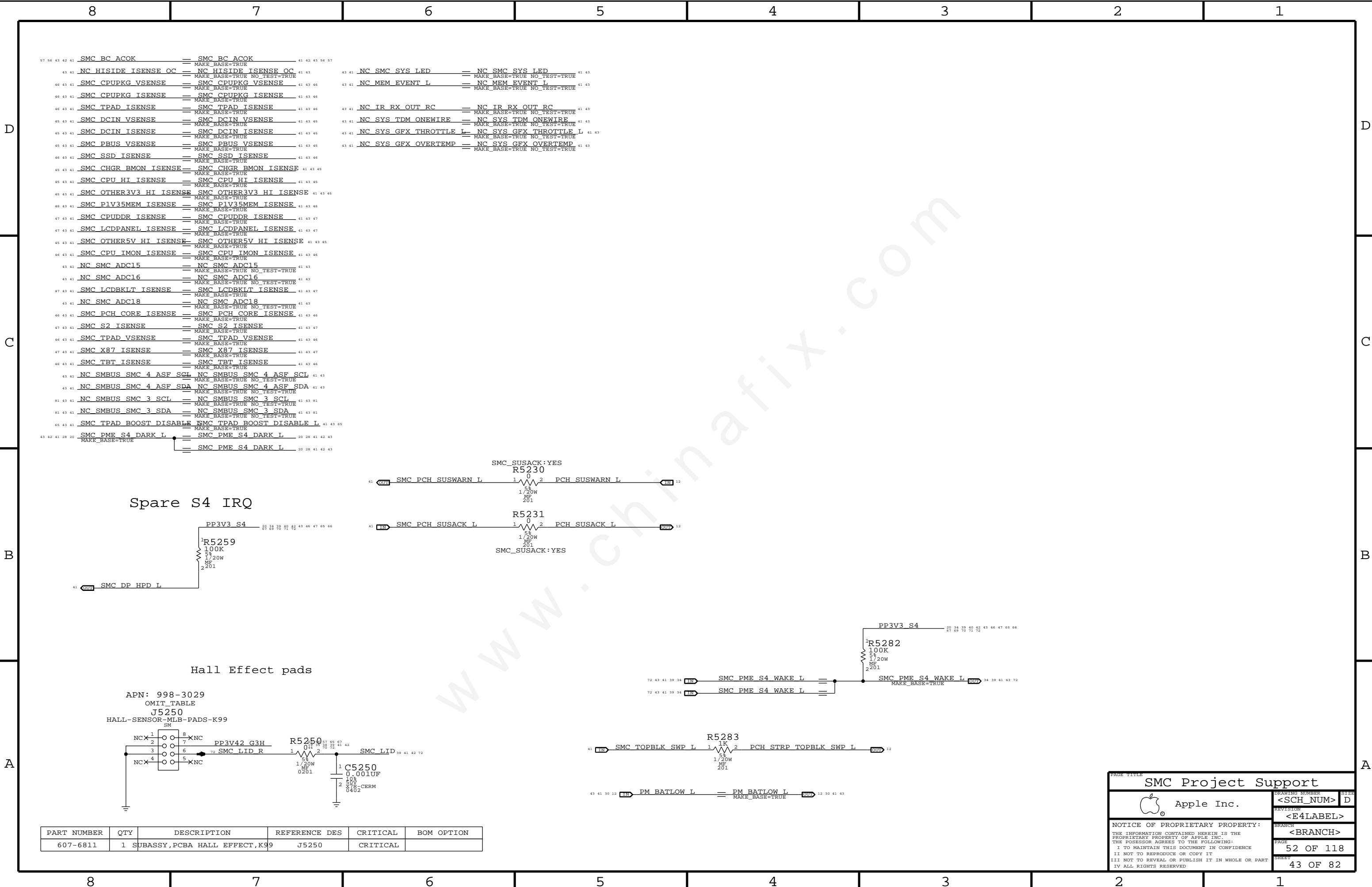













PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
607-6811	1	SUBASSY,PCBA HALL EFFECT,K99	J5250	CRITICAL	

SMC Project Support

 Apple Inc.

NOTICE OF PROPRIETARY PROPERTY:  
THE INFORMATION CONTAINED HEREIN IS THE  
PROPRIETARY PROPERTY OF APPLE INC.  
THE POSSESSOR AGREES TO THE FOLLOWING:  
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE  
II NOT TO REPRODUCE OR COPY IT  
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART  
IV ALL RIGHTS RESERVED

DRAWING NUMBER  
<SCH\_NUM>

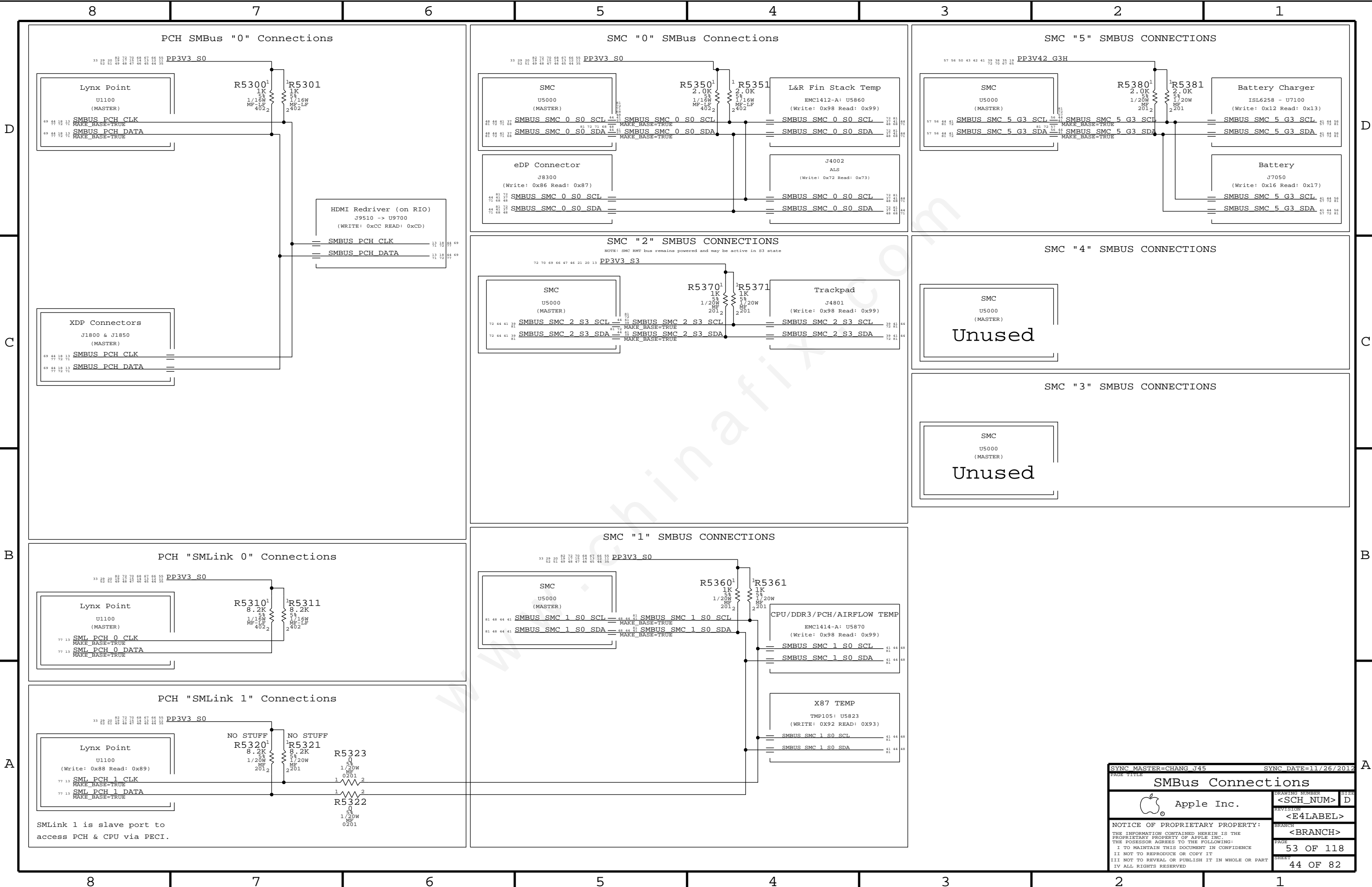
REVISION  
<E4LABEL>

BRANCH  
<BRANCH>

PAGE  
52 OF 118

SHEET  
43 OF 82





SYNC MASTER=CHANG J45

SYNC DATE=11/26/2012

SMBus Connections

Apple Inc.

THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:  
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE  
II NOT TO REPRODUCE OR COPY IT  
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART  
IV ALL RIGHTS RESERVED

DRAWING NUMBER

<SCH\_NUM>

REVISION

<E4LABEL>

BRANCH

<BRANCH>

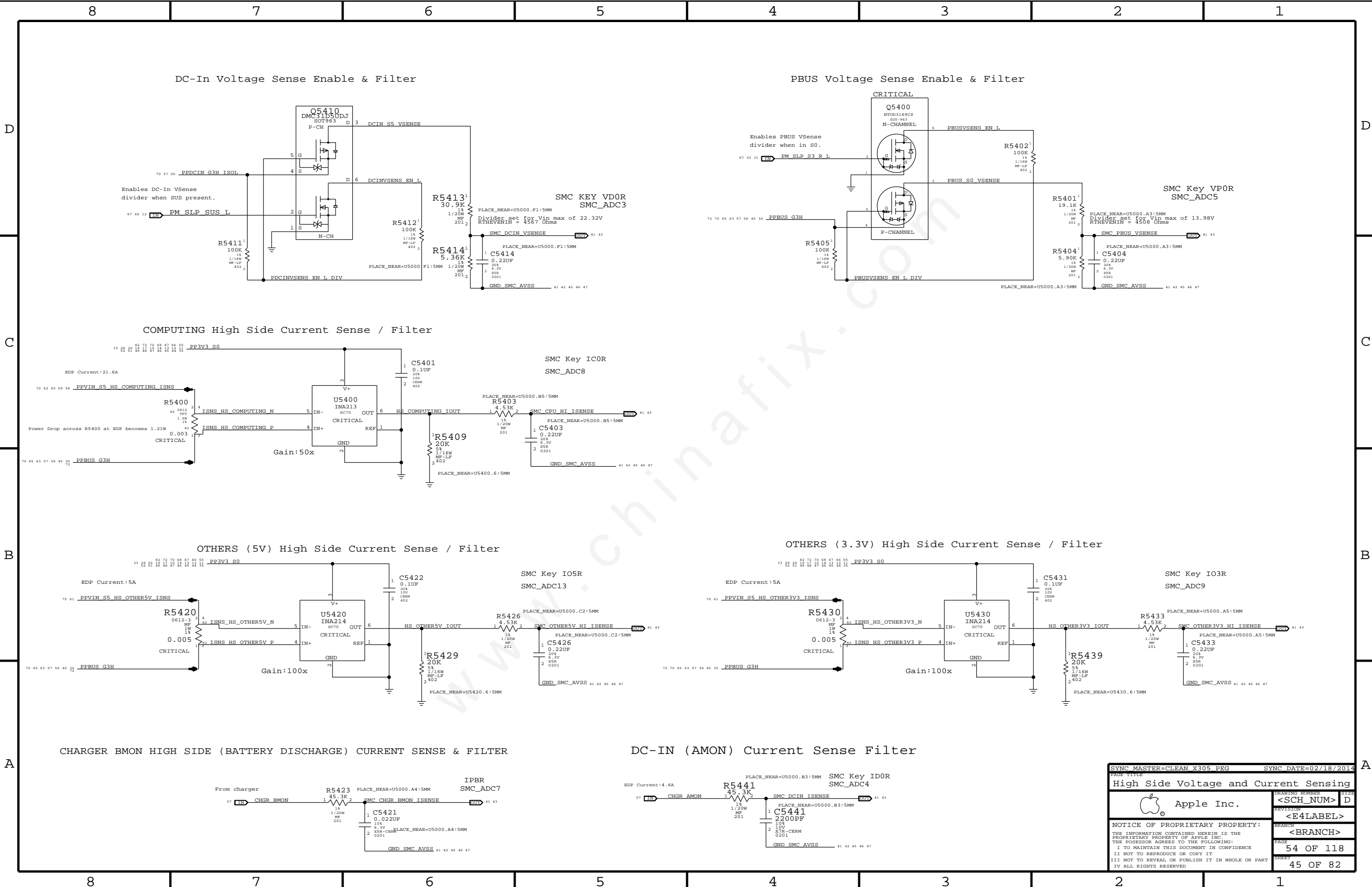
PAGE


53 OF 118

SHEET

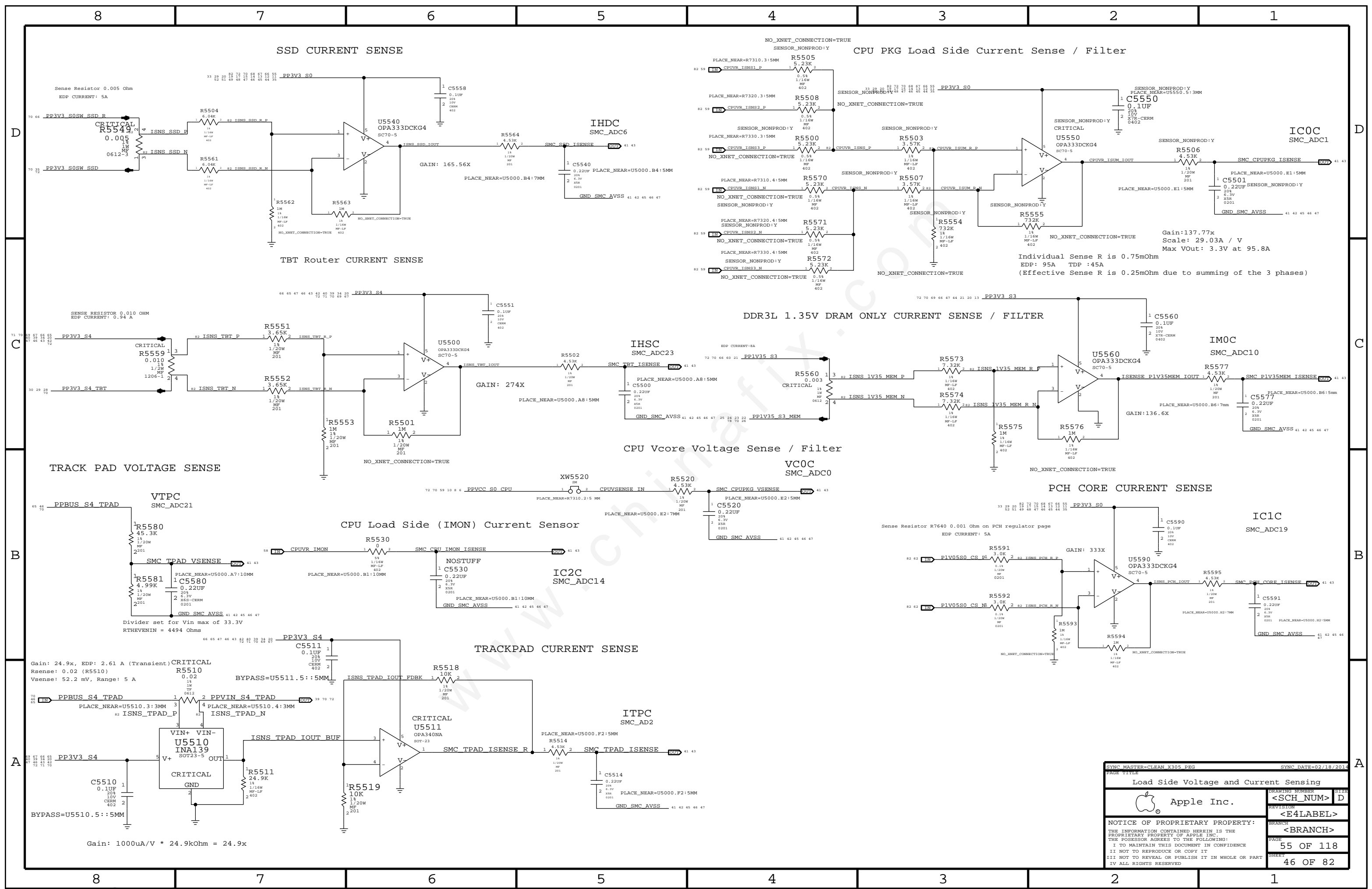
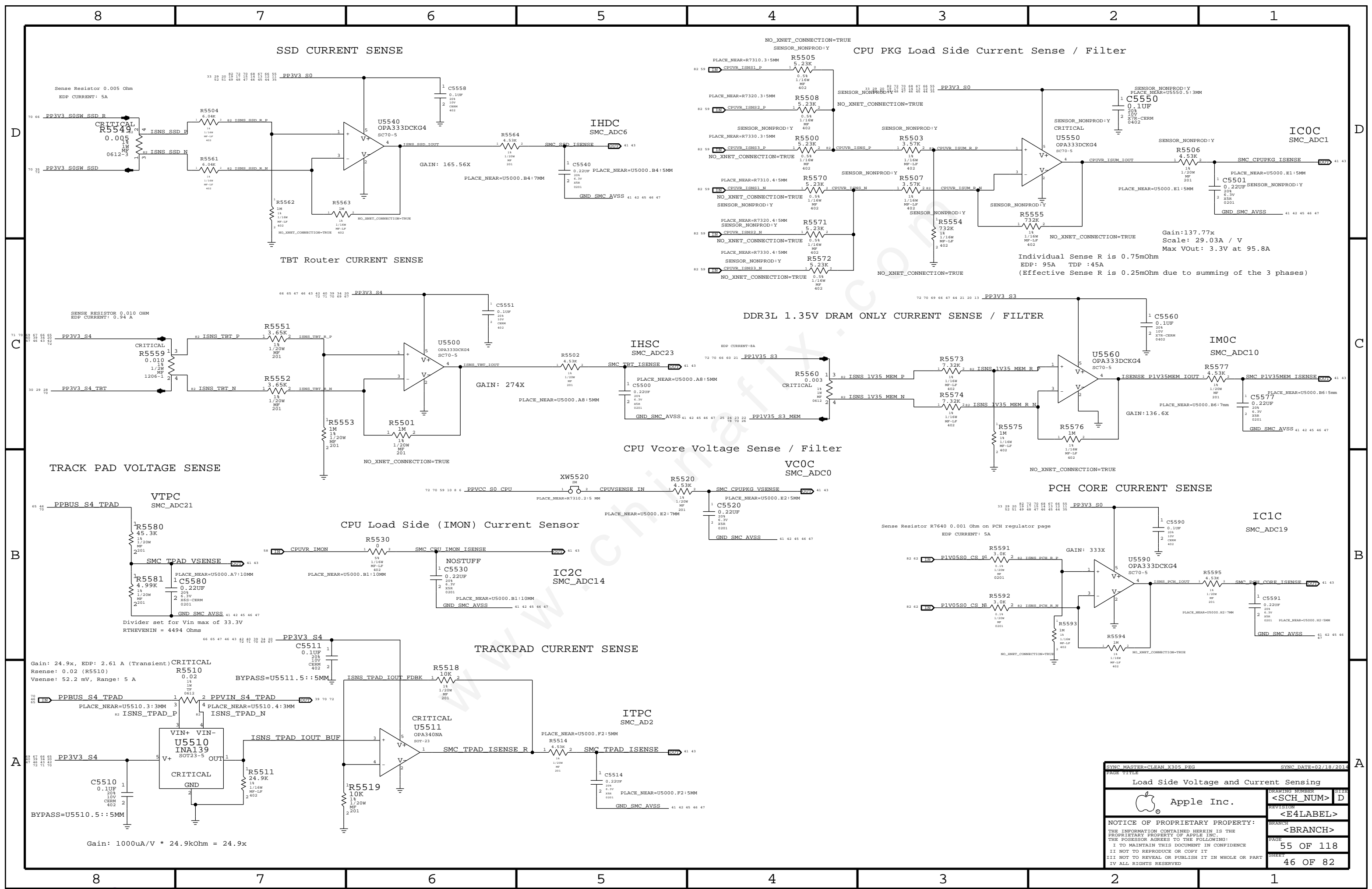
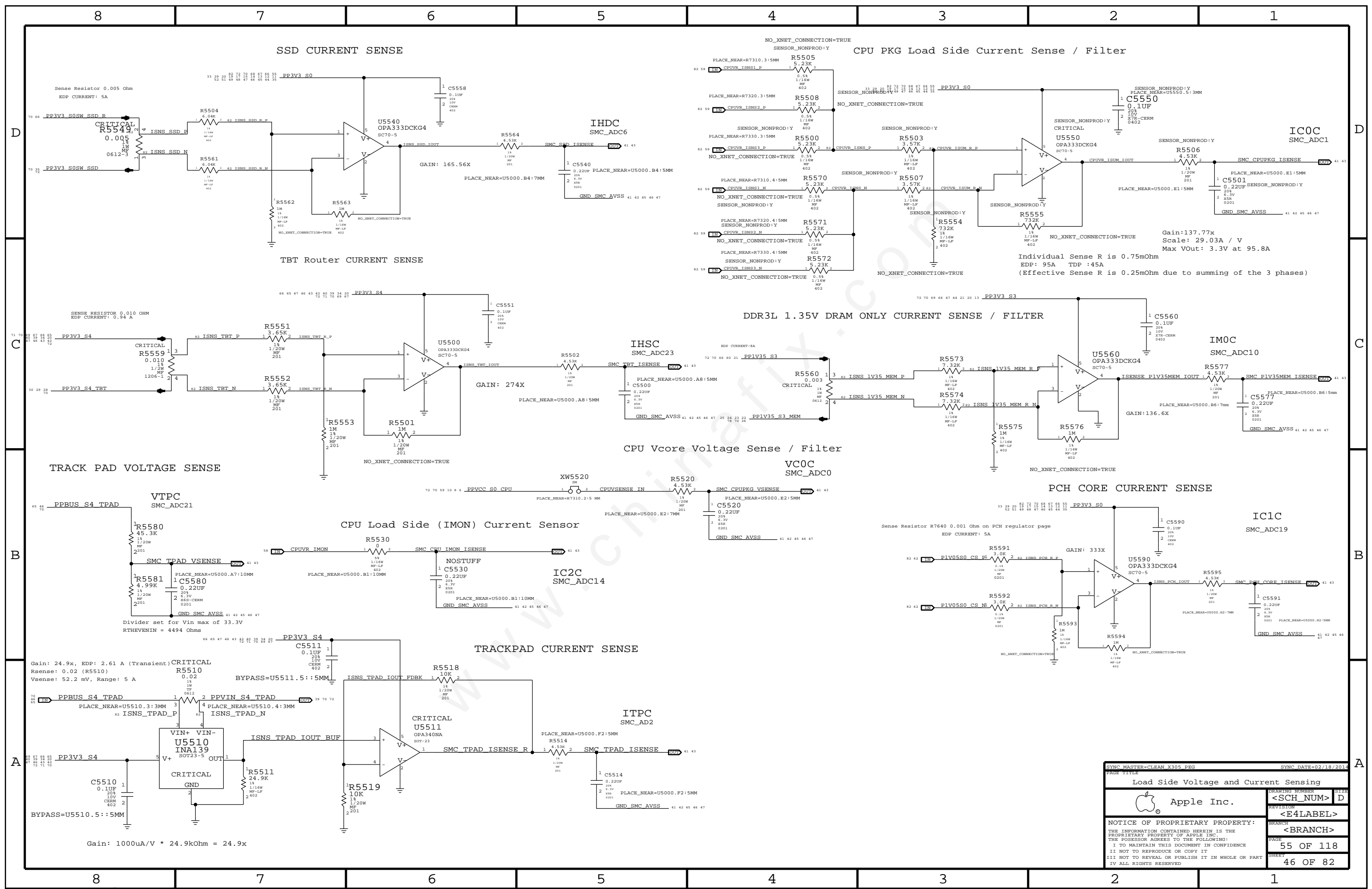
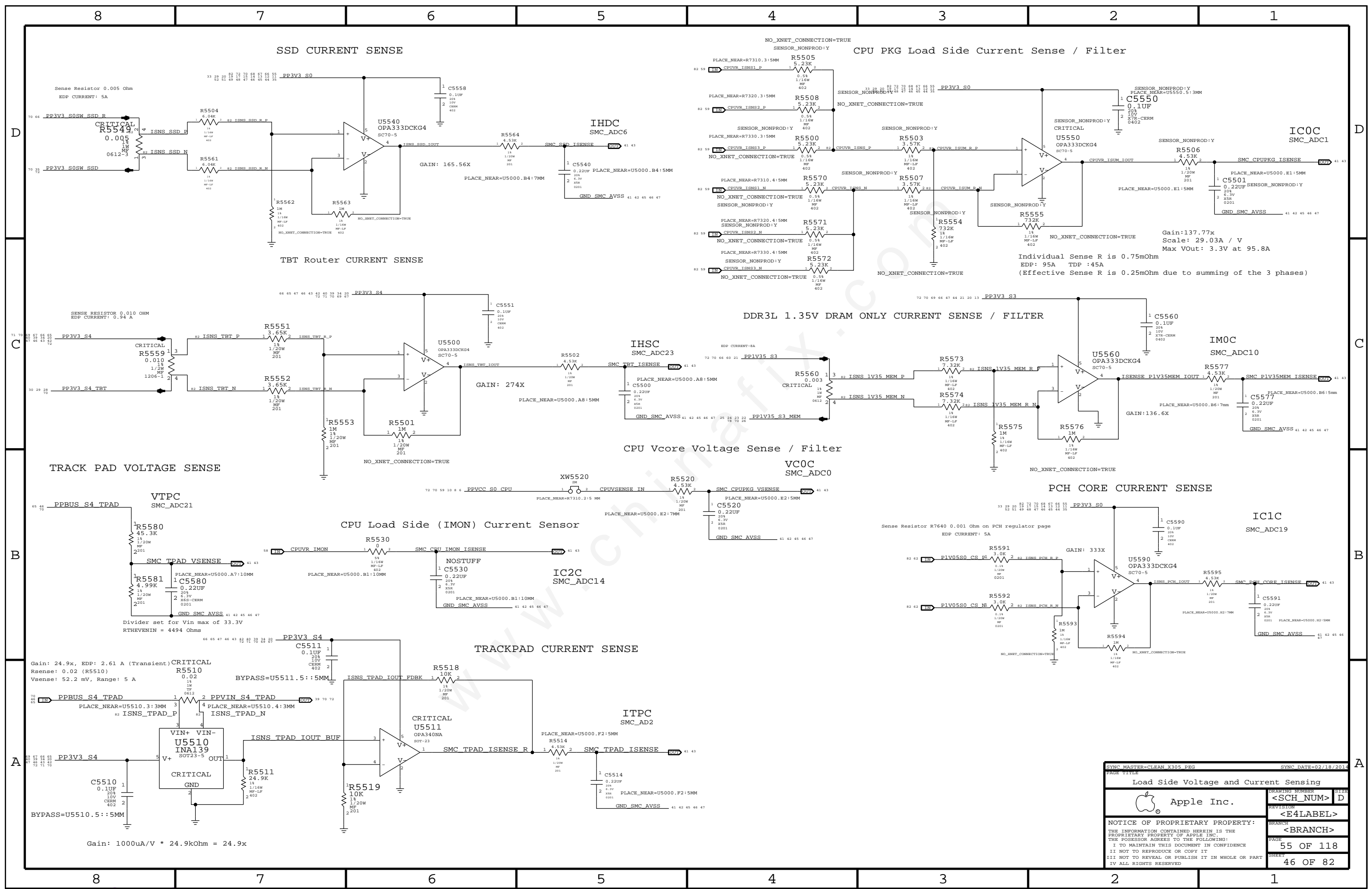
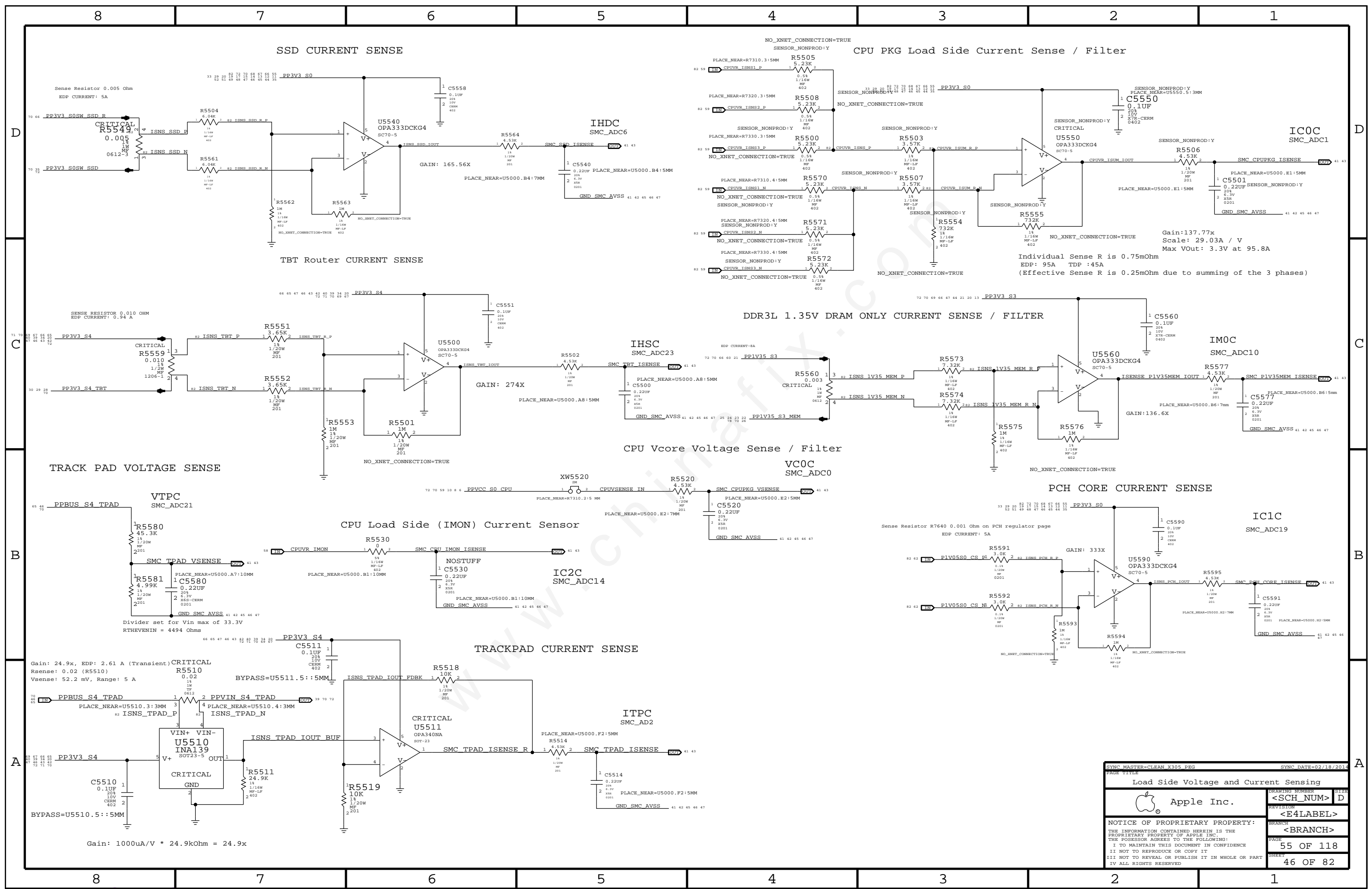
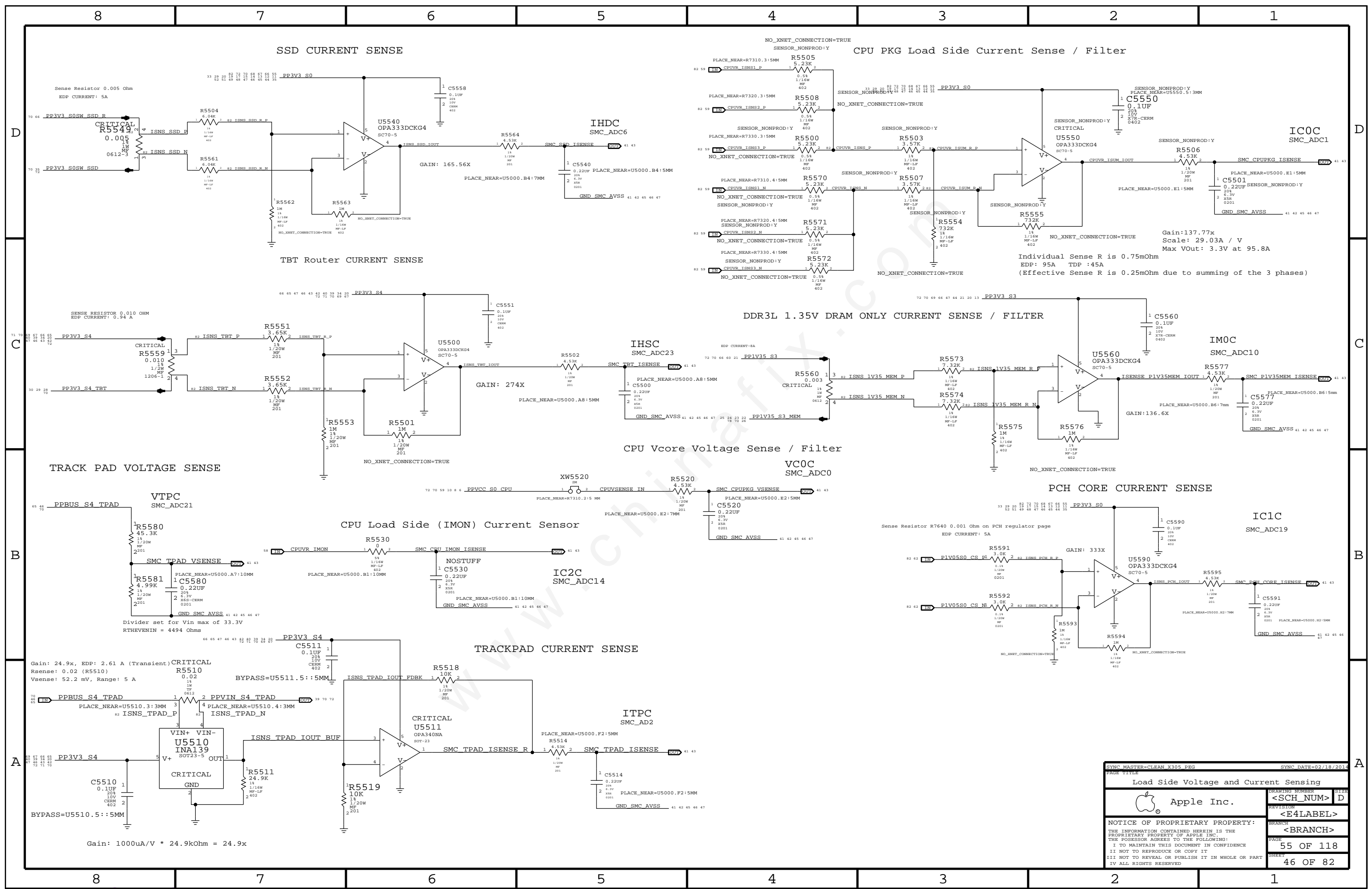
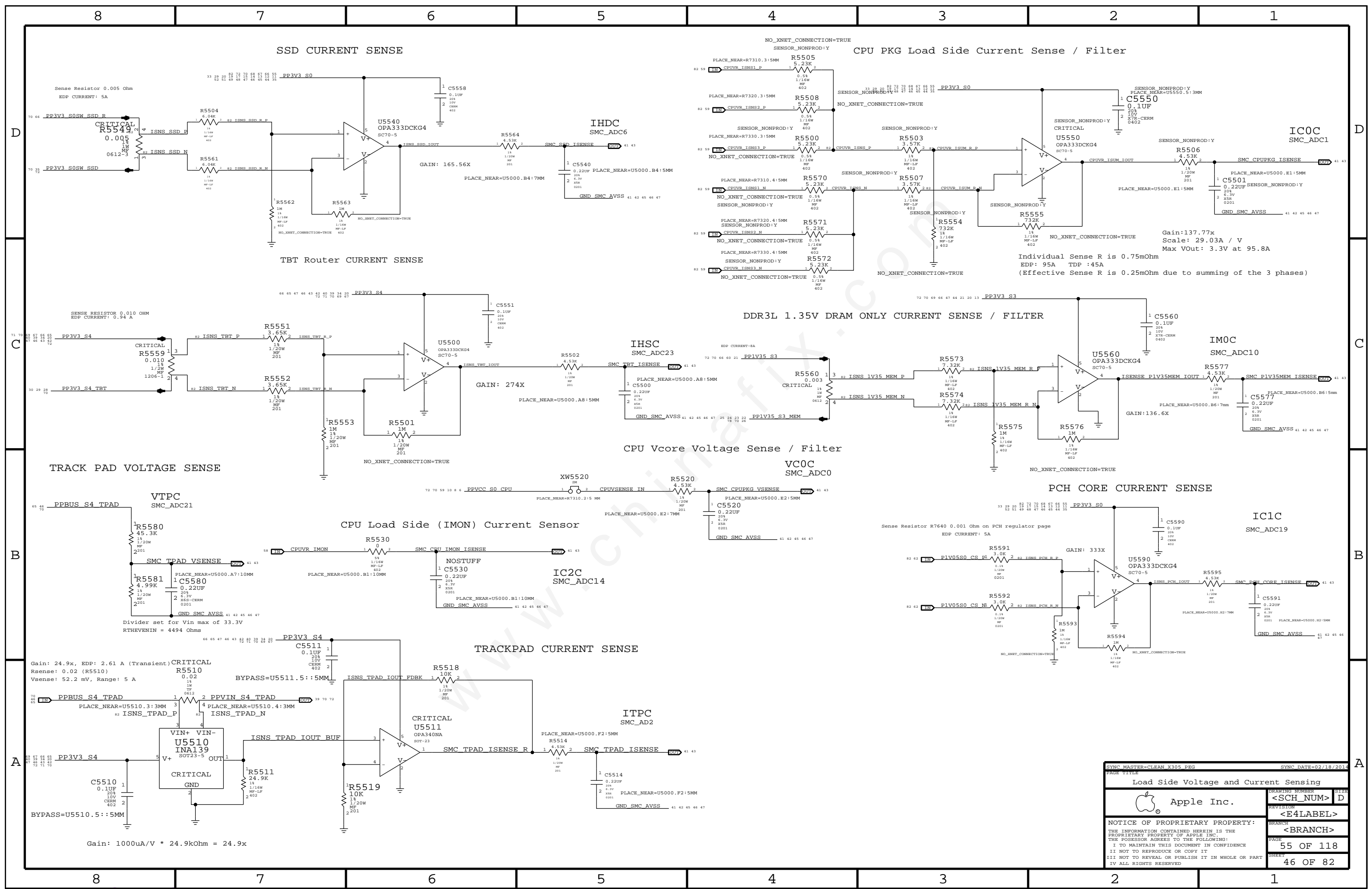
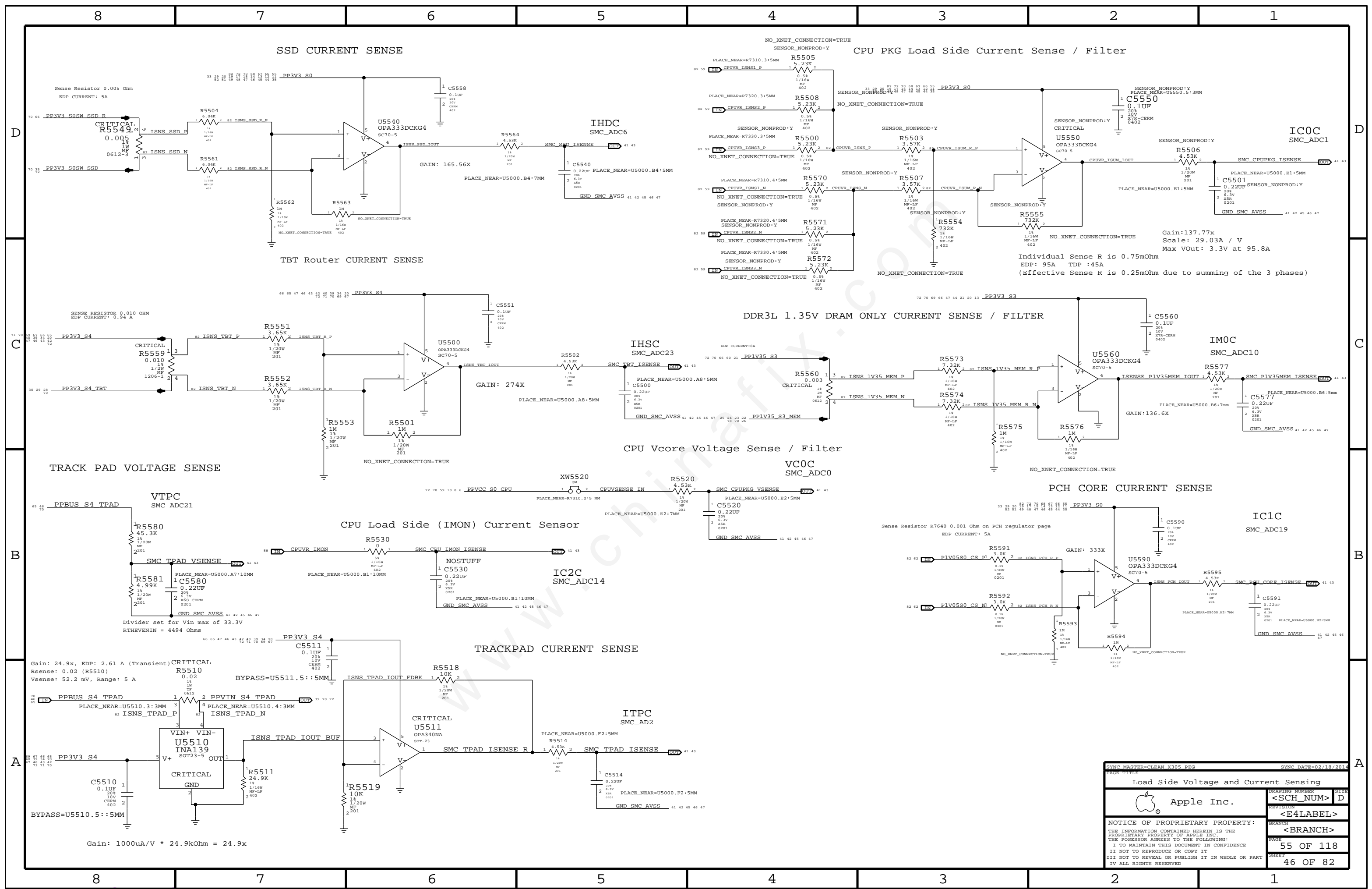
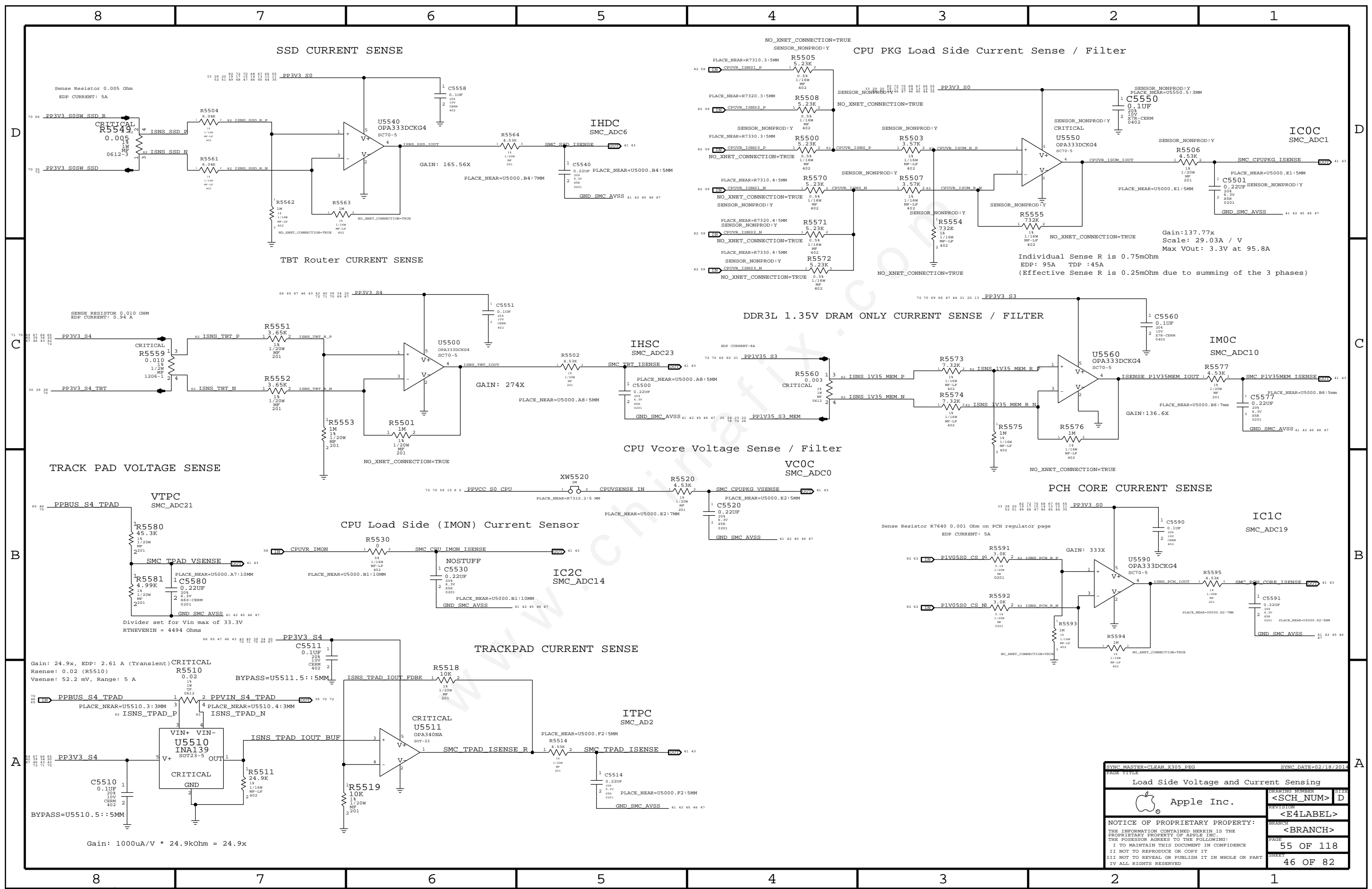
44 OF 82





SYNC MASTER=CLEAN X305 PEG		SYNC DATE=02/18/2014			
PAGE TITLE					
High Side Voltage and Current Sensing					
 Apple Inc.	DRAWING NUMBER		SIZE		
	<SCH_NUM>		D		
	REVISION		<E4LABEL>		
	BRANCH		<BRANCH>		
NOTICE OF PROPRIETARY PROPERTY: THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING: I I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART IV ALL RIGHTS RESERVED			PAGE		
			54 OF 118		
			SHEET		
			45 OF 82		

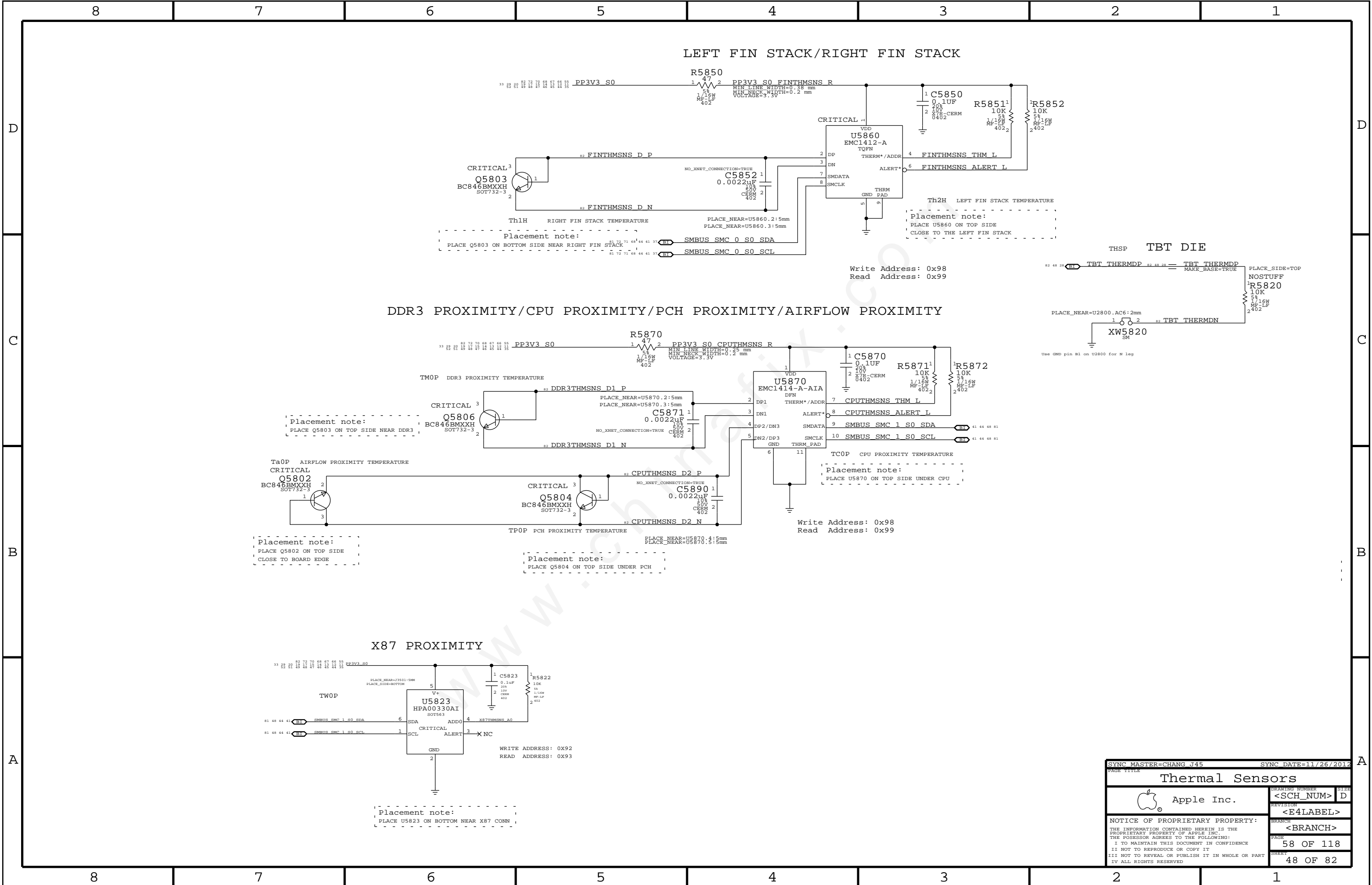







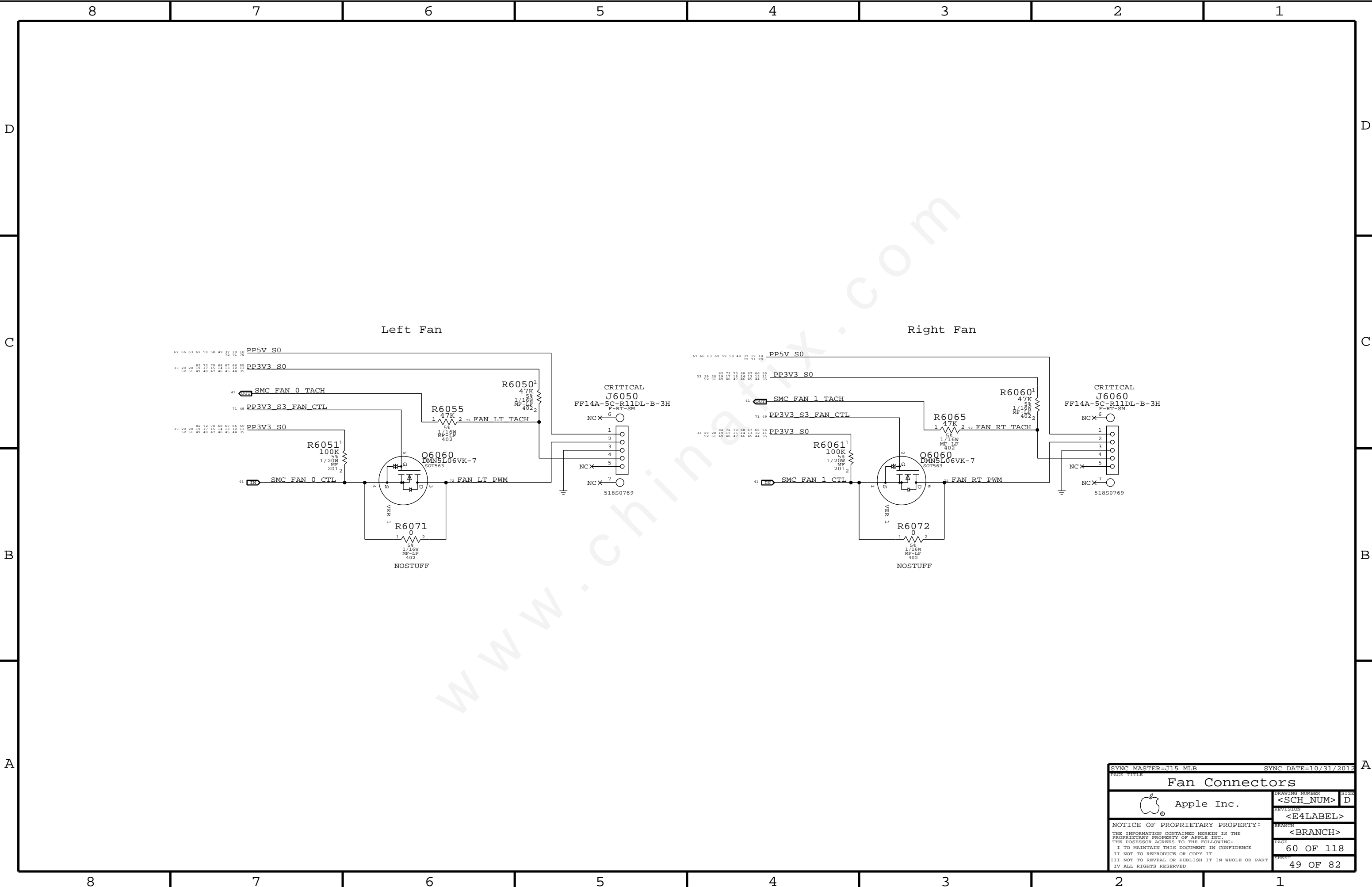




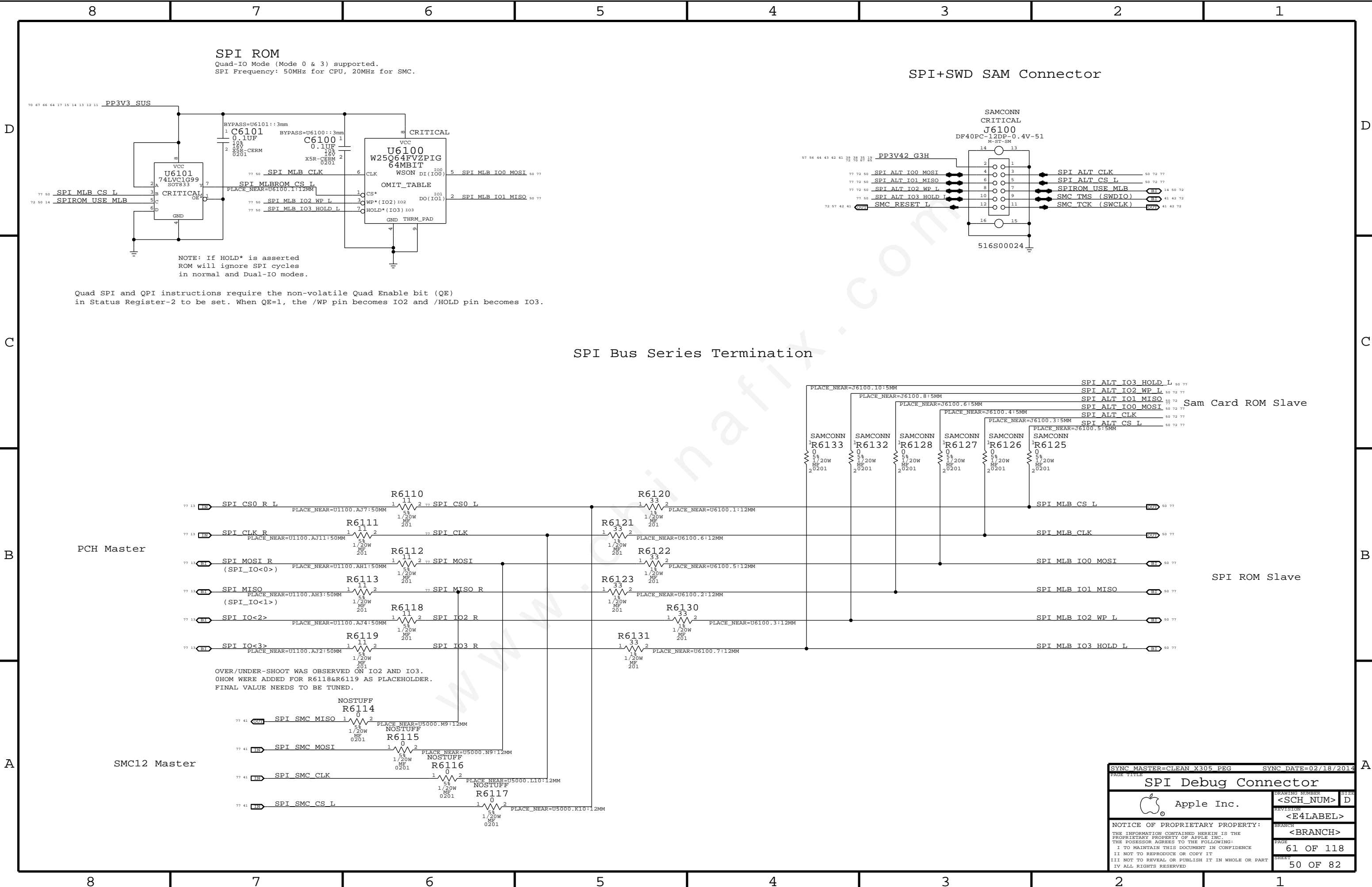


SYNC MASTER=CHANG J45		SYNC DATE=11/26/2012	
PAGE TITLE			
Thermal Sensors			
 Apple Inc.	DRAWING NUMBER	SIZE	
	<SCH_NUM>	D	
NOTICE OF PROPRIETARY PROPERTY: THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING: I I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART IV ALL RIGHTS RESERVED	REVISION	BRANCH	
	<E4LABEL>	<BRANCH>	
	PAGE	58 OF 118	
	SHEET	48 OF 82	

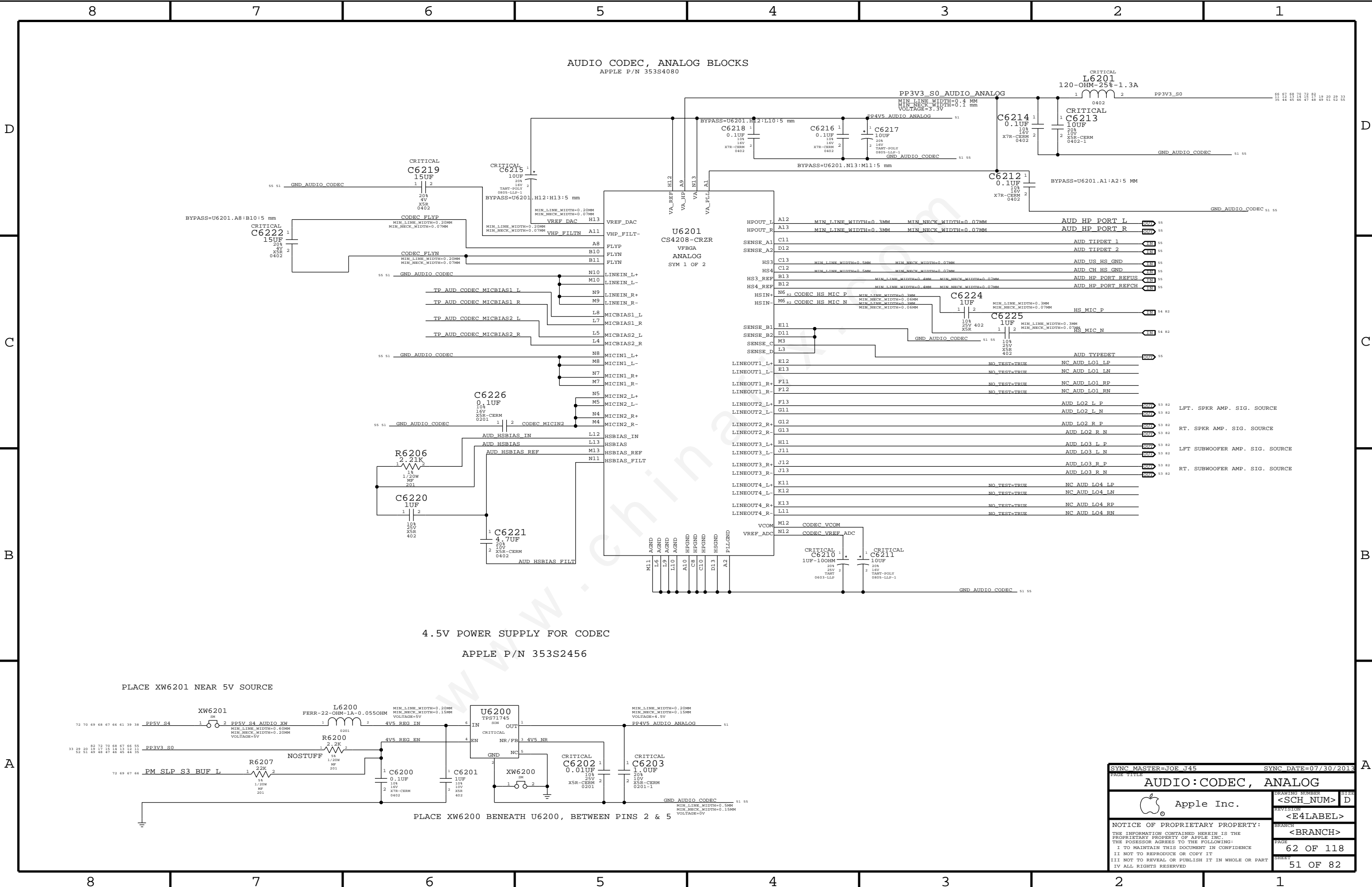







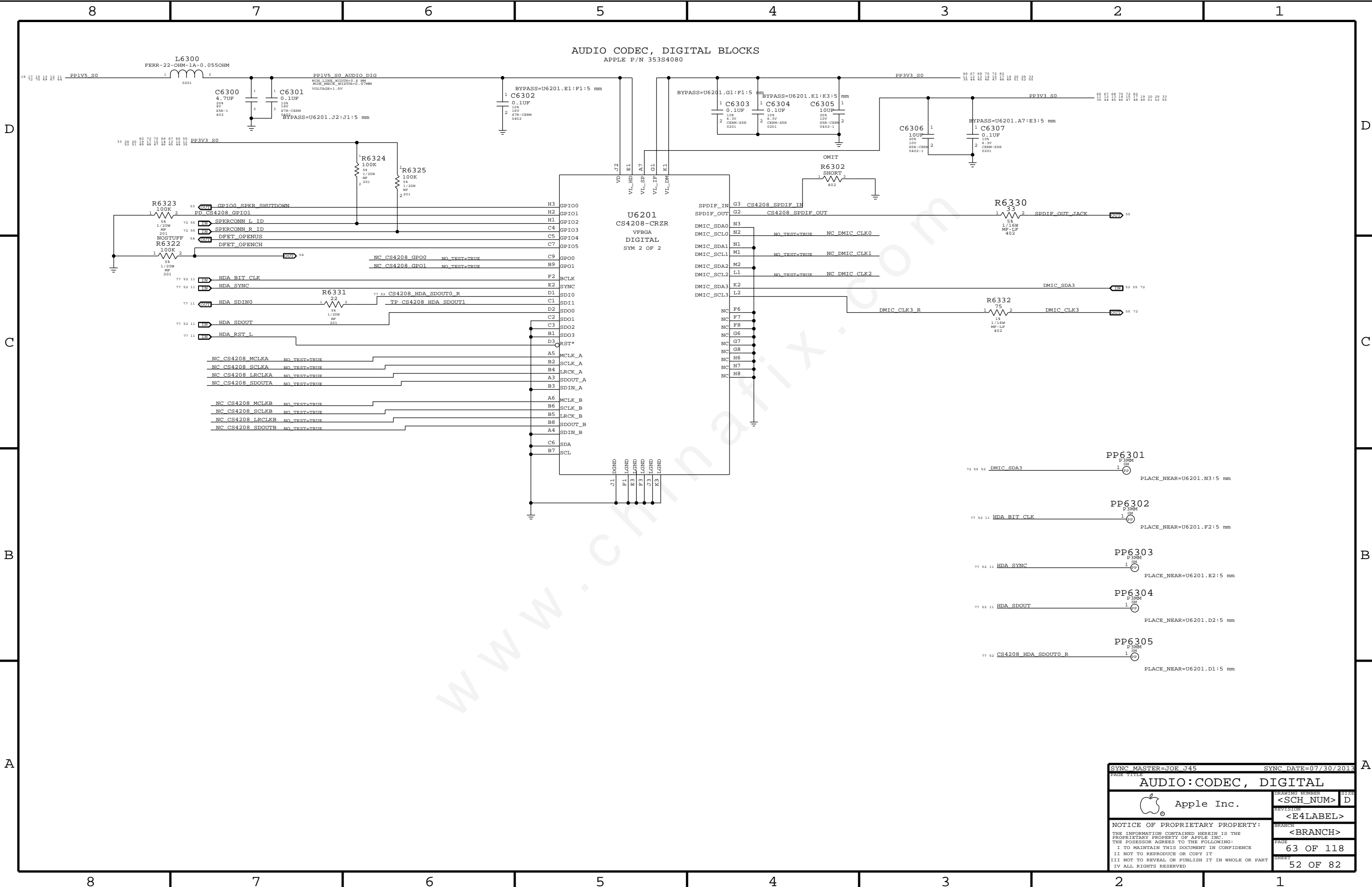







SYNC MASTER=JOE J45		SYNC DATE=07/30/2013	
PAGE TITLE			
AUDIO:CODEC, ANALOG		DRAWING NUMBER	
 Apple Inc.		<SCH_NUM>	SIZE
		D	
NOTICE OF PROPRIETARY PROPERTY: THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING: I I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART IV ALL RIGHTS RESERVED		REVISED FOR	
		<E4LABEL>	
		BRANCH	
		<BRANCH>	
		PAGE	
		62 OF 118	
		SHEET	
		51 OF 82	

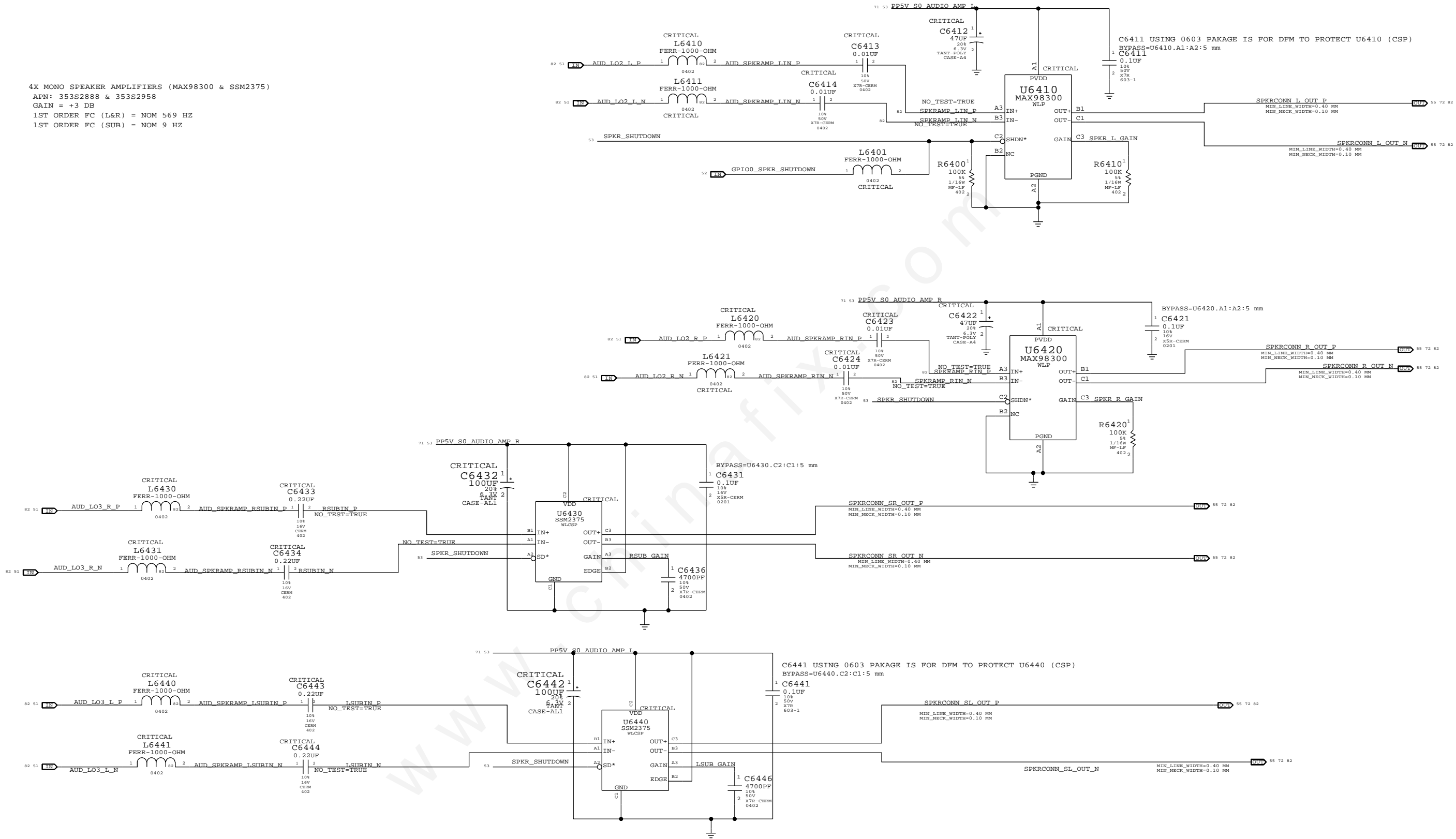





SYNC MASTER=JOE J45		SYNC DATE=07/30/2013	
PAGE TITLE			
AUDIO:CODEC, DIGITAL			
 Apple Inc.		DRAWING NUMBER	SIZE
		<SCH_NUM>	D
NOTICE OF PROPRIETARY PROPERTY: THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING: I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART IV ALL RIGHTS RESERVED		REVISION	
		<E4LABEL>	
		BRANCH	
		<BRANCH>	
		PAGE	63 OF 118
		SHEET	52 OF 82

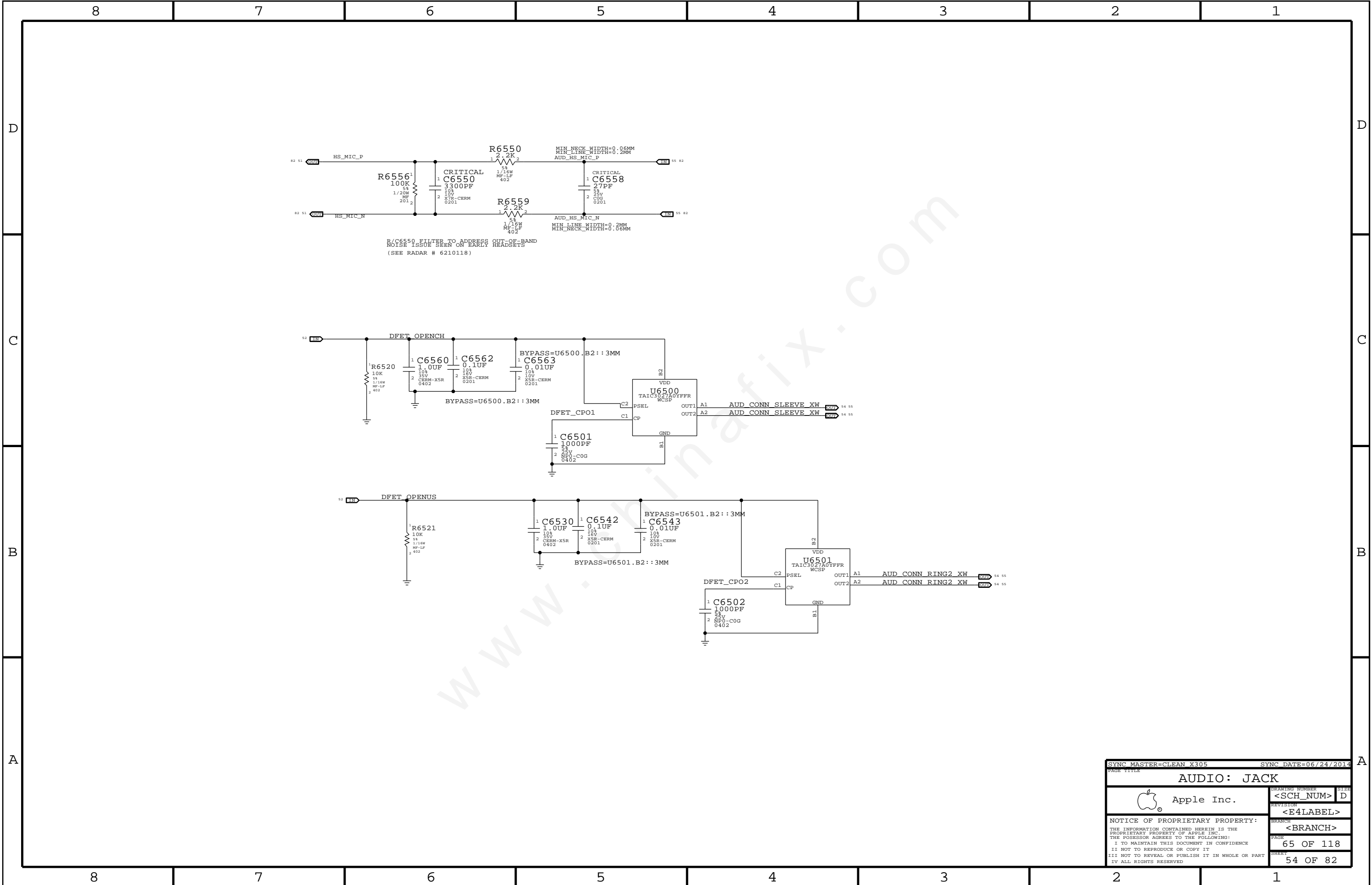


4X MONO SPEAKER AMPLIFIERS (MAX98300 & SSM2375)  
APN: 353S2888 & 353S2958  
GAIN = +3 DB  
1ST ORDER FC (L&R) = NOM 569 HZ  
1ST ORDER FC (SUB) = NOM 9 HZ




SYNC MASTER=JOE J45		SYNC DATE=07/30/2013	
PAGE TITLE			
AUDIO: SPEAKER AMP			
 Apple Inc.		DRAWING NUMBER	SIZE
		<SCH_NUM>	D
NOTICE OF PROPRIETARY PROPERTY: THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING: I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART IV ALL RIGHTS RESERVED		REVISION	
		<E4LABEL>	
		BRANCH	
		<BRANCH>	
		PAGE	64 OF 118
		SHEET	53 OF 82





D  
C  
B  
A

D  
C  
B  
A

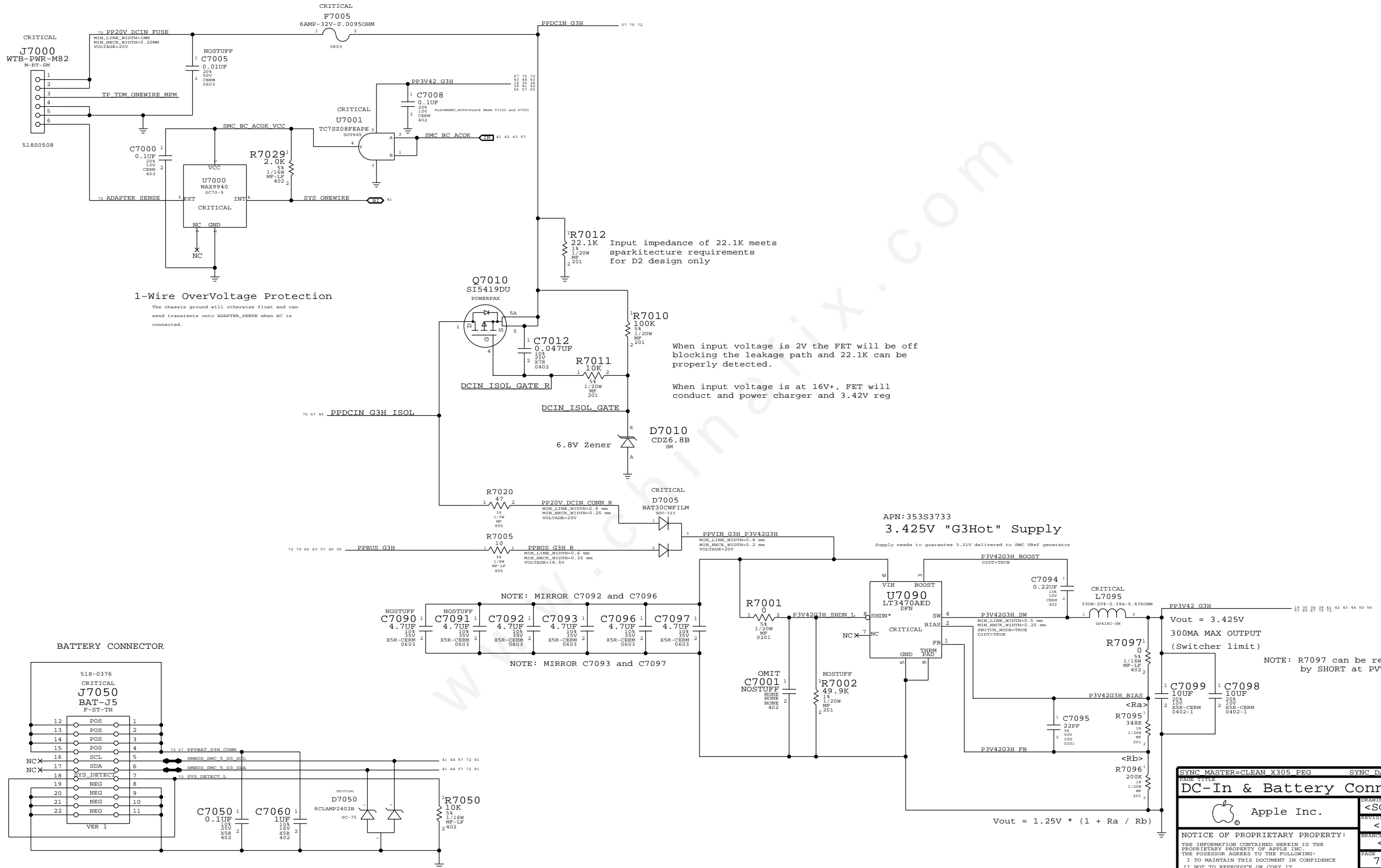
SYNC MASTER=CLEAN_X305		SYNC DATE=06/24/2014	
PAGE TITLE			
AUDIO: JACK			
 Apple Inc.	DRAWING NUMBER		SIZE
	<SCH_NUM>		D
	REVISION		
NOTICE OF PROPRIETARY PROPERTY: THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING: I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART IV ALL RIGHTS RESERVED	BRANCH		<BRANCH>
	PAGE		65 OF 118
	SHEET		54 OF 82







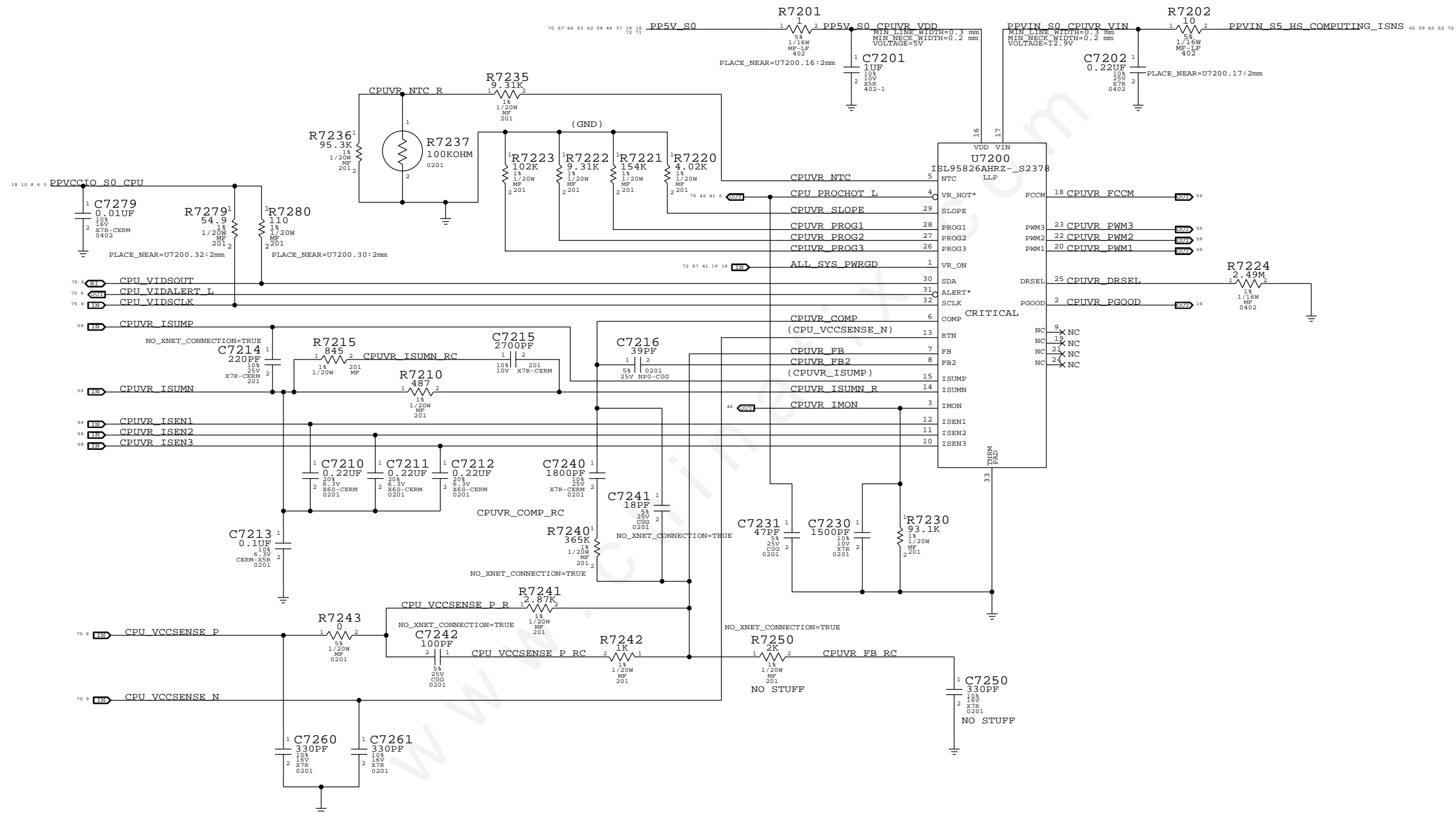
MagSafe DC Power Jack






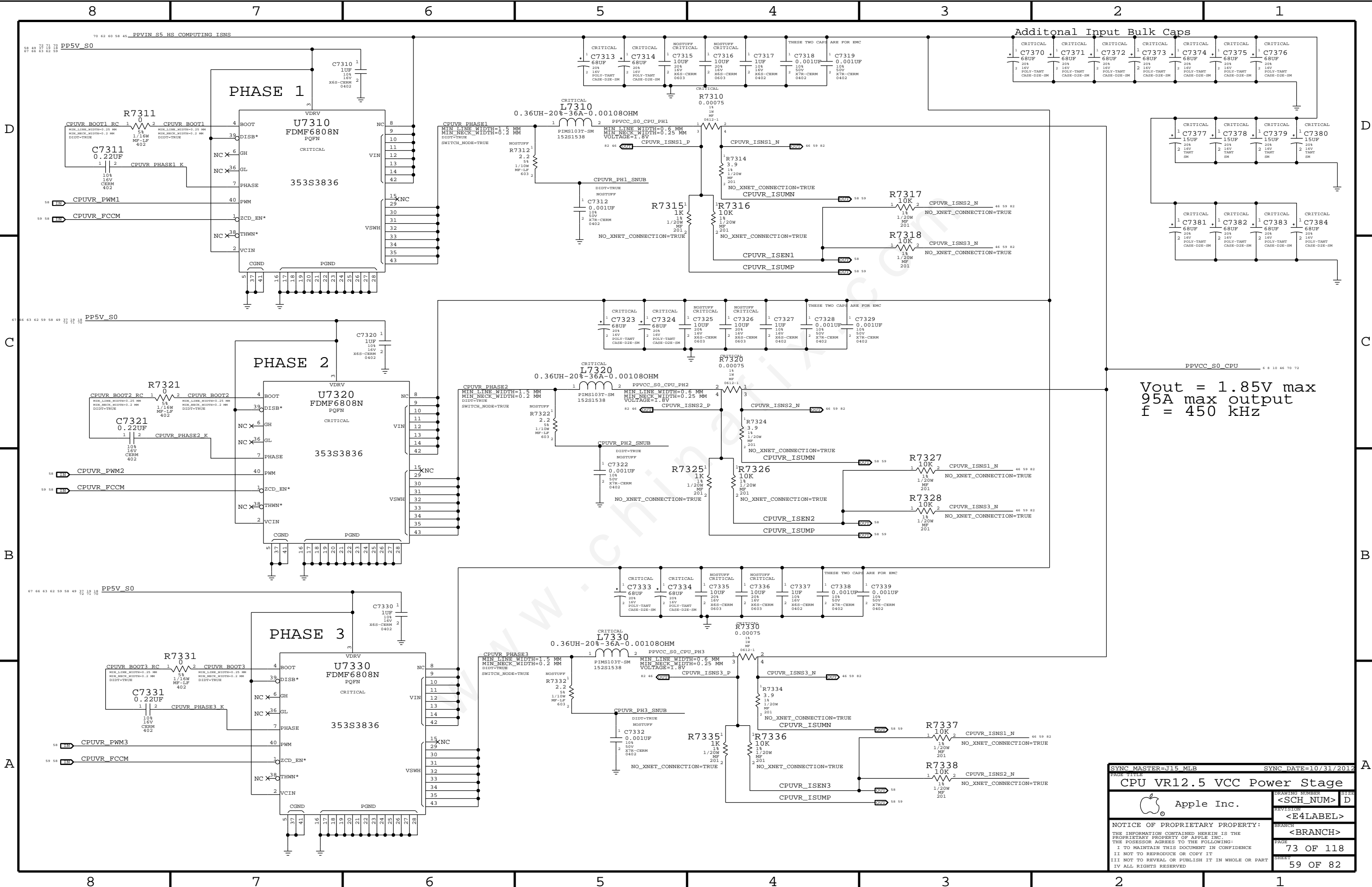







SYNC MASTER=CLEAN X305 PEG		SYNC DATE=02/24/2014	
PAGE TITLE			
CPU VR12.5 VCC Regulator IC			
 Apple Inc.		DRAWING NUMBER	SIZE
		<SCH_NUM>	D
		REVISION	
		<E4LABEL>	
NOTICE OF PROPRIETARY PROPERTY:			
THE INFORMATION CONTAINED HEREIN IS THE			
PROPRIETARY PROPERTY OF APPLE INC.			
THE POSSESSOR AGREES TO THE FOLLOWING:			
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE			
II NOT TO REPRODUCE OR COPY IT			
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART			
IV ALL RIGHTS RESERVED			
		BRANCH	
		<BRANCH>	
		PAGE	72 OF 118
		SHEET	58 OF 82





Vout = 1.85V max  
95A max output  
f = 450 kHz

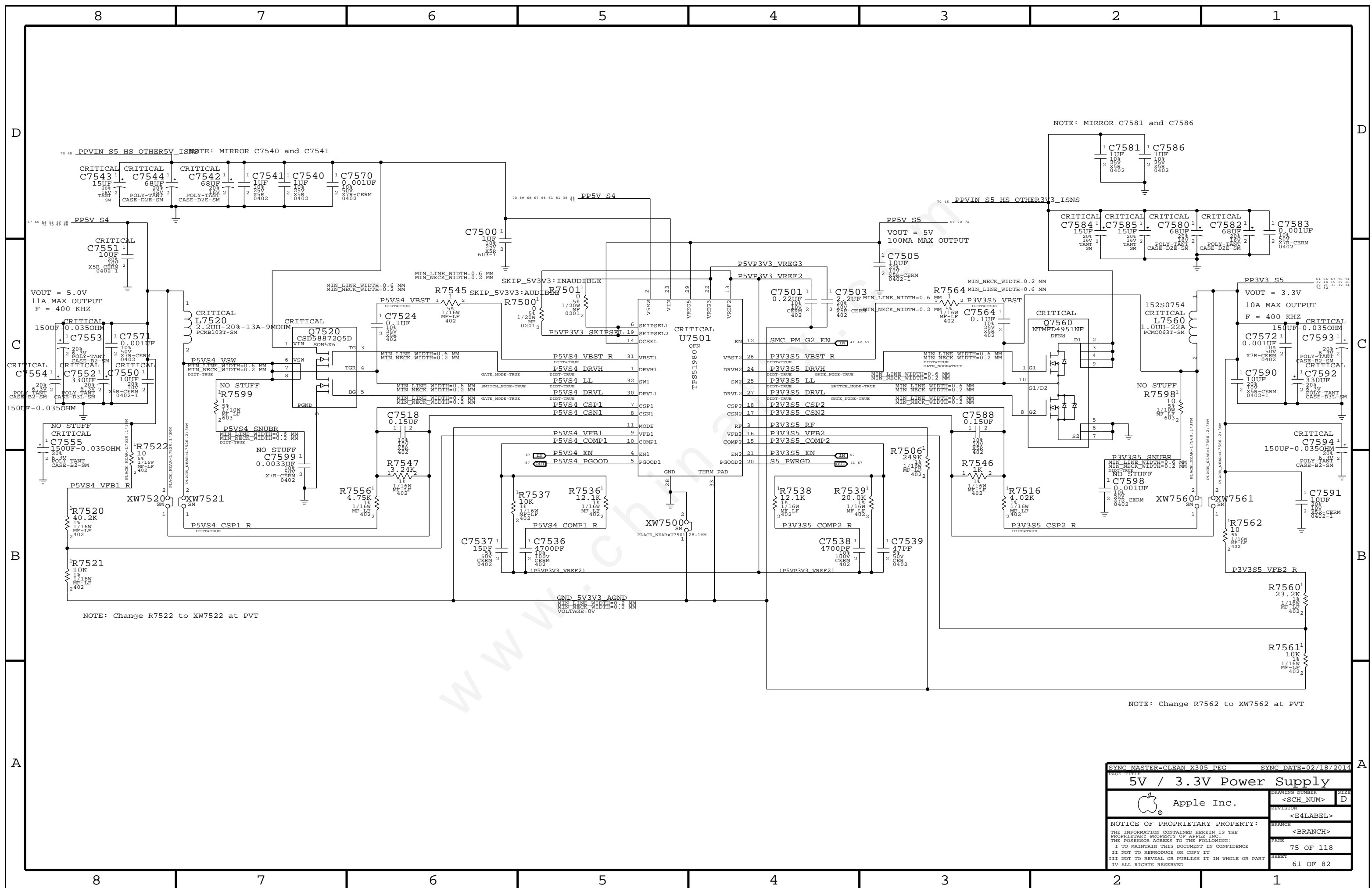
SYNC MASTER=J15 MLB		SYNC DATE=10/31/2012	
PAGE TITLE			
CPU VR12.5 VCC Power Stage			
		DRAWING NUMBER	
Apple Inc.		<SCH_NUM>	
		REVISION	
		<E4LABEL>	
NOTICE OF PROPRIETARY PROPERTY:		BRANCH	
THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:		<BRANCH>	
I I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE		PAGE	
II NOT TO REPRODUCE OR COPY IT		73 OF 118	
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART		SHEET	
IV ALL RIGHTS RESERVED		59 OF 82	



## D

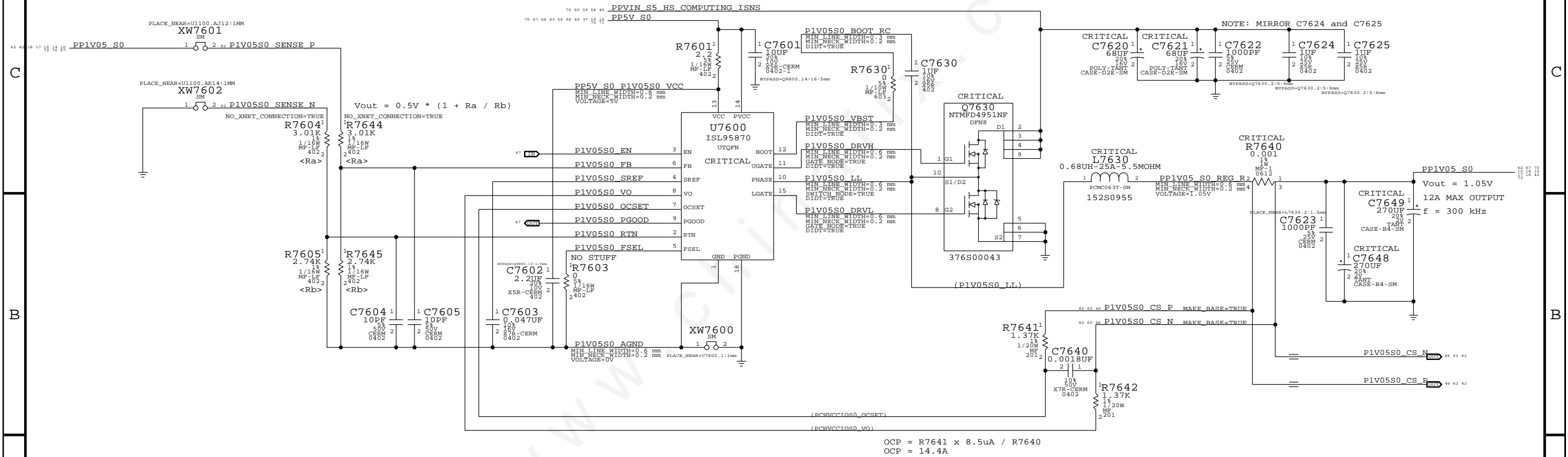
R








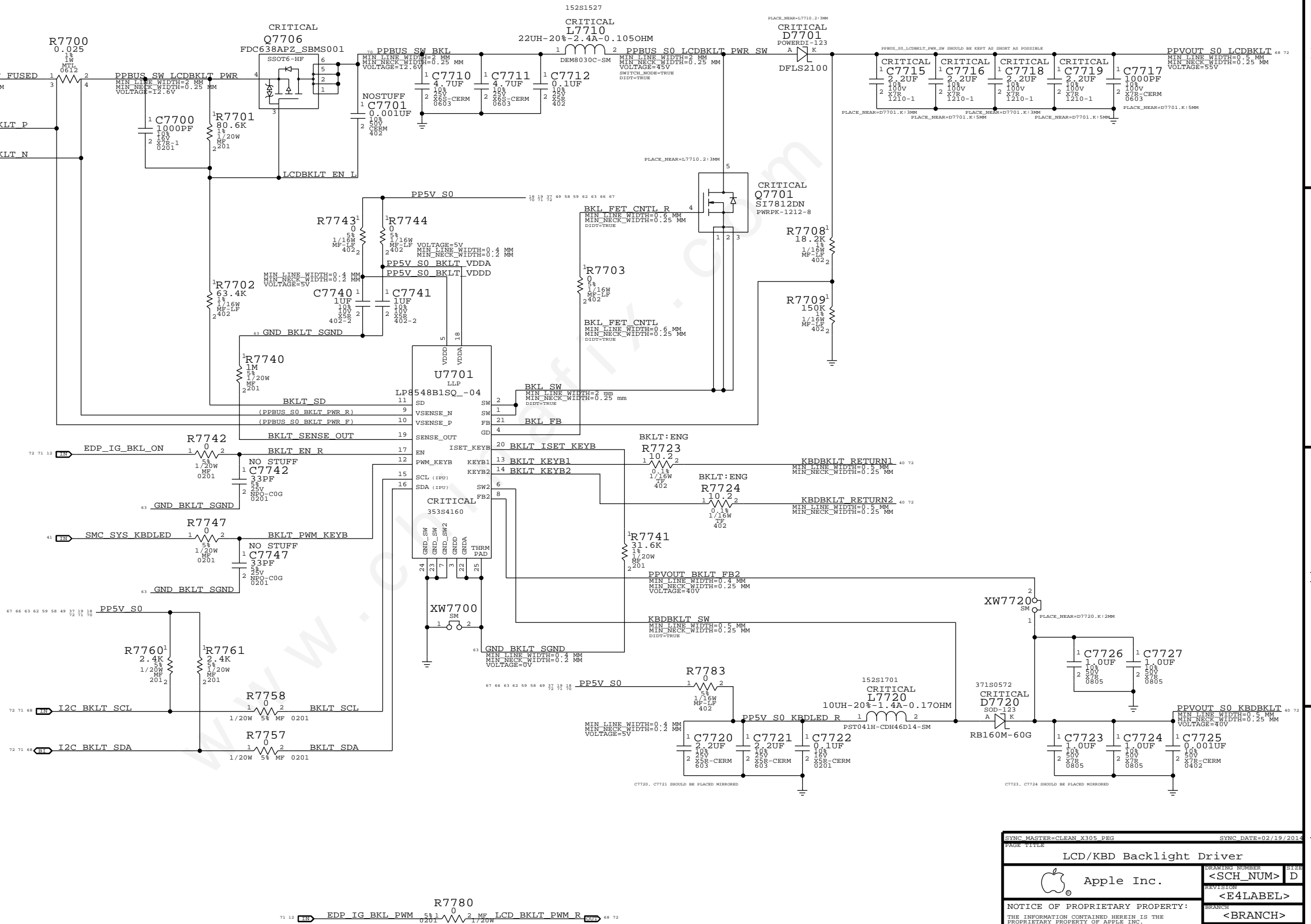
1V05 S0 REGULATOR




SYNC MASTER=CLEAN X305 PRG		SYNC DATE=02/18/2014		
PAGE TITLE				
1V05V POWER SUPPLY				
 Apple Inc.	DRAWING NUMBER		SIZE	
	<SCH_NUM>		D	
	REVISION		<E4LABEL>	
	BRANCH		<BRANCH>	
NOTICE OF PROPRIETARY PROPERTY:				
THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:				
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE				
II NOT TO REPRODUCE OR COPY IT				
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART				
IV ALL RIGHTS RESERVED				
PAGE		76 OF 118		
SHEET		62 OF 82		



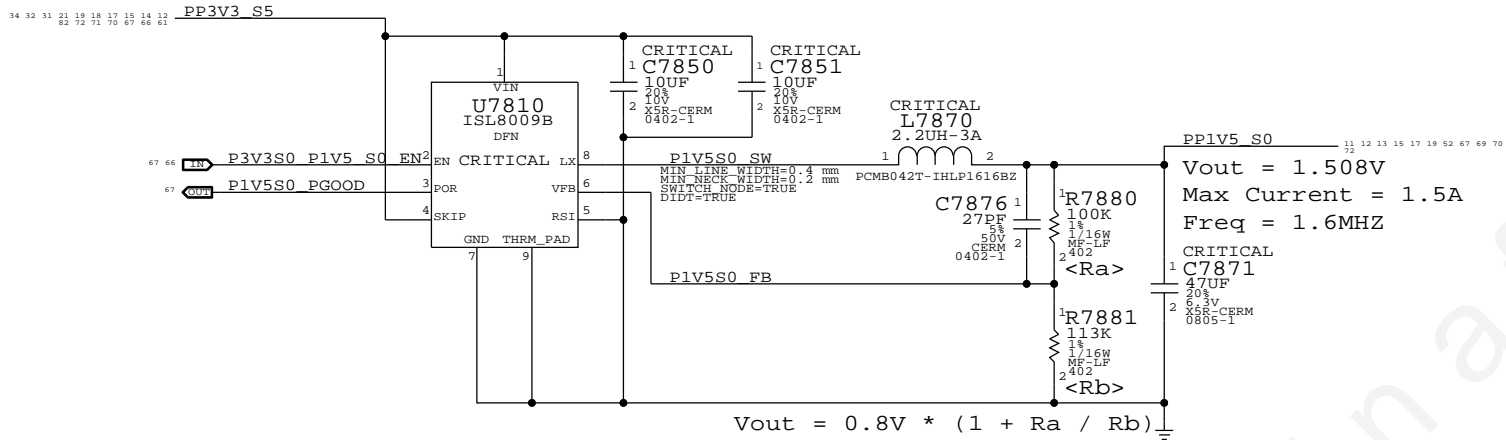
PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
116S0004	2	RES,MTL FILM, 0 OHM,1A MAX,0402,SMD	R7723,R7724		BKLT:PROD



SYNC MASTER=CLEAN X305 PEG		SYNC DATE=02/19/2014	
PAGE TITLE			
LCD/KBD Backlight Driver			
 Apple Inc.	DRAWING NUMBER		SIZE
	<SCH_NUM>		D
	REVISION		
	<E4LABEL>		
NOTICE OF PROPRIETARY PROPERTY:		BRANCH	<BRANCH>
THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:		PAGE	77 OF 118
I I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE			
II NOT TO REPRODUCE OR COPY IT			
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART		SHEET	63 OF 82
IV ALL RIGHTS RESERVED			

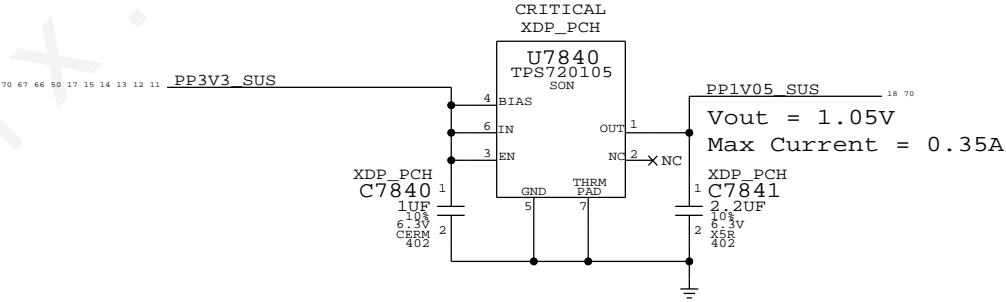



1.5V S0 Regulator



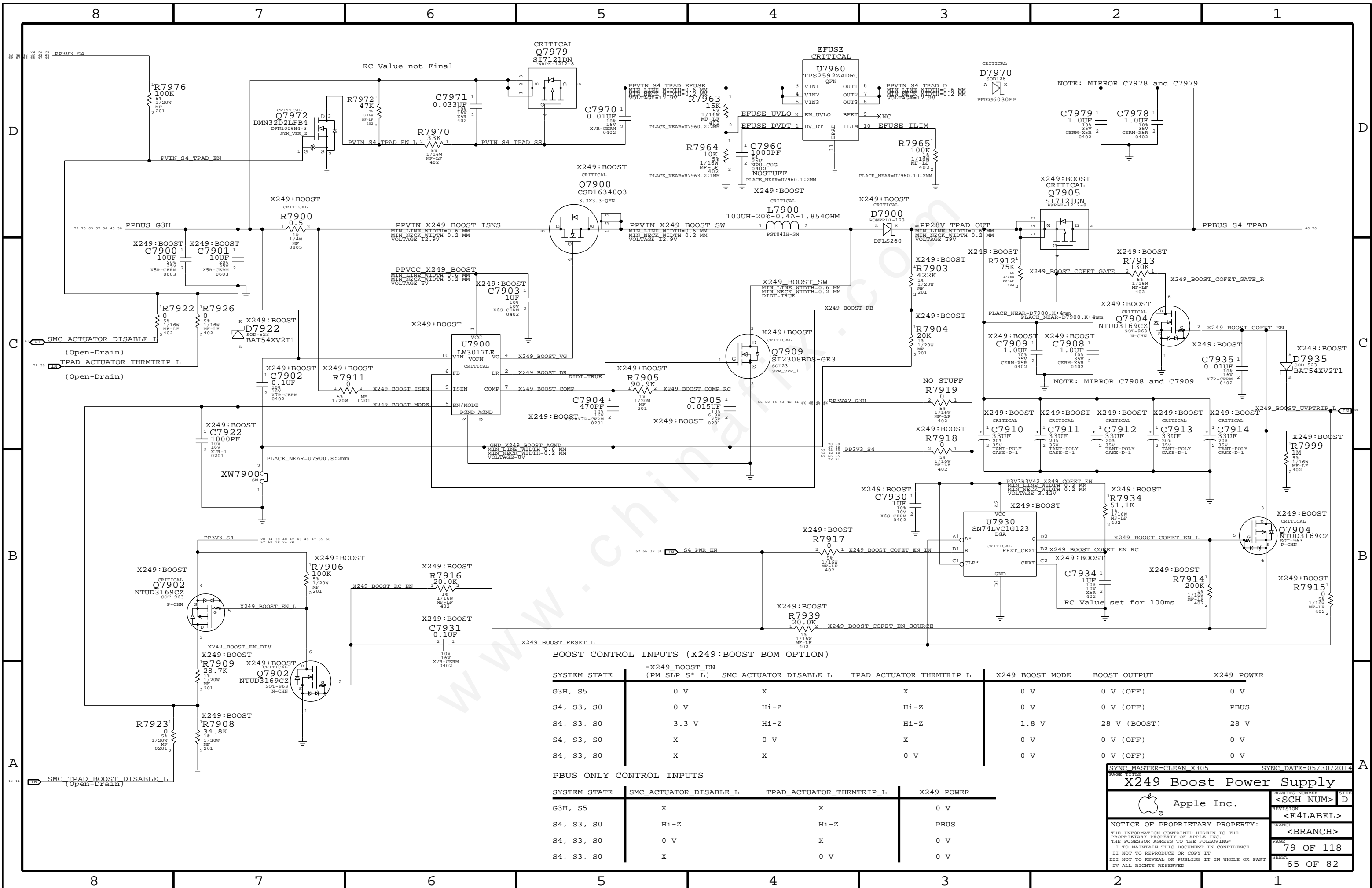
1.05V SUS LDO

Lynx Point-H requires JTAG pull-ups to be powered at 1.05V in SUS. Pull-ups (3) must be 51 ohms to support XDP (not required in production). 70mA is required to support pull-ups. Alternative is strong voltage dividers (200/100) to 3.3V SUS, which burns 100mW in all S-states.



SYNC MASTER=CLEAN X305		SYNC DATE=01/15/2014	
PAGE TITLE			
Misc Power Supplies		DRAWING NUMBER	
 Apple Inc.		<SCH_NUM> D	
		REVISION	
NOTICE OF PROPRIETARY PROPERTY: THE INFORMATION CONTAINED HEREIN IS THE PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING: I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART IV ALL RIGHTS RESERVED		<E4LABEL>	
		BRANCH	
		<BRANCH>	
		PAGE	
		78 OF 118	
		SHEET	
		64 OF 82	





BOOST CONTROL INPUTS (X249:BOOST BOM OPTION)						
SYSTEM STATE	=X249_BOOST_EN (PM_SLP_S*_L)	SMC_ACTUATOR_DISABLE_L	TPAD_ACTUATOR_THRMTRIP_L	X249_BOOST_MODE	BOOST OUTPUT	X249 POWER
G3H, S5	0 V	X	X	0 V	0 V (OFF)	0 V
S4, S3, S0	0 V	Hi-Z	Hi-Z	0 V	0 V (OFF)	PBUS
S4, S3, S0	3.3 V	Hi-Z	Hi-Z	1.8 V	28 V (BOOST)	28 V
S4, S3, S0	X	0 V	X	0 V	0 V (OFF)	0 V
S4, S3, S0	X	X	0 V	0 V	0 V (OFF)	0 V

PBUS ONLY CONTROL INPUTS			
SYSTEM STATE	SMC_ACTUATOR_DISABLE_L	TPAD_ACTUATOR_THRMTRIP_L	X249 POWER
G3H, S5	X	X	0 V
S4, S3, S0	Hi-Z	Hi-Z	PBUS
S4, S3, S0	0 V	X	0 V
S4, S3, S0	X	0 V	0 V

SYNC MASTER=CLEAN X305

SYNC DATE=05/30/2014

X249 Boost Power Supply

Apple Inc.

NOTICE OF PROPRIETARY PROPERTY:

THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:  
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE  
II NOT TO REPRODUCE OR COPY IT  
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART  
IV ALL RIGHTS RESERVED

DRAWING NUMBER

<SCH\_NUM>

REVISION

<E4LABEL>

BRANCH

<BRANCH>

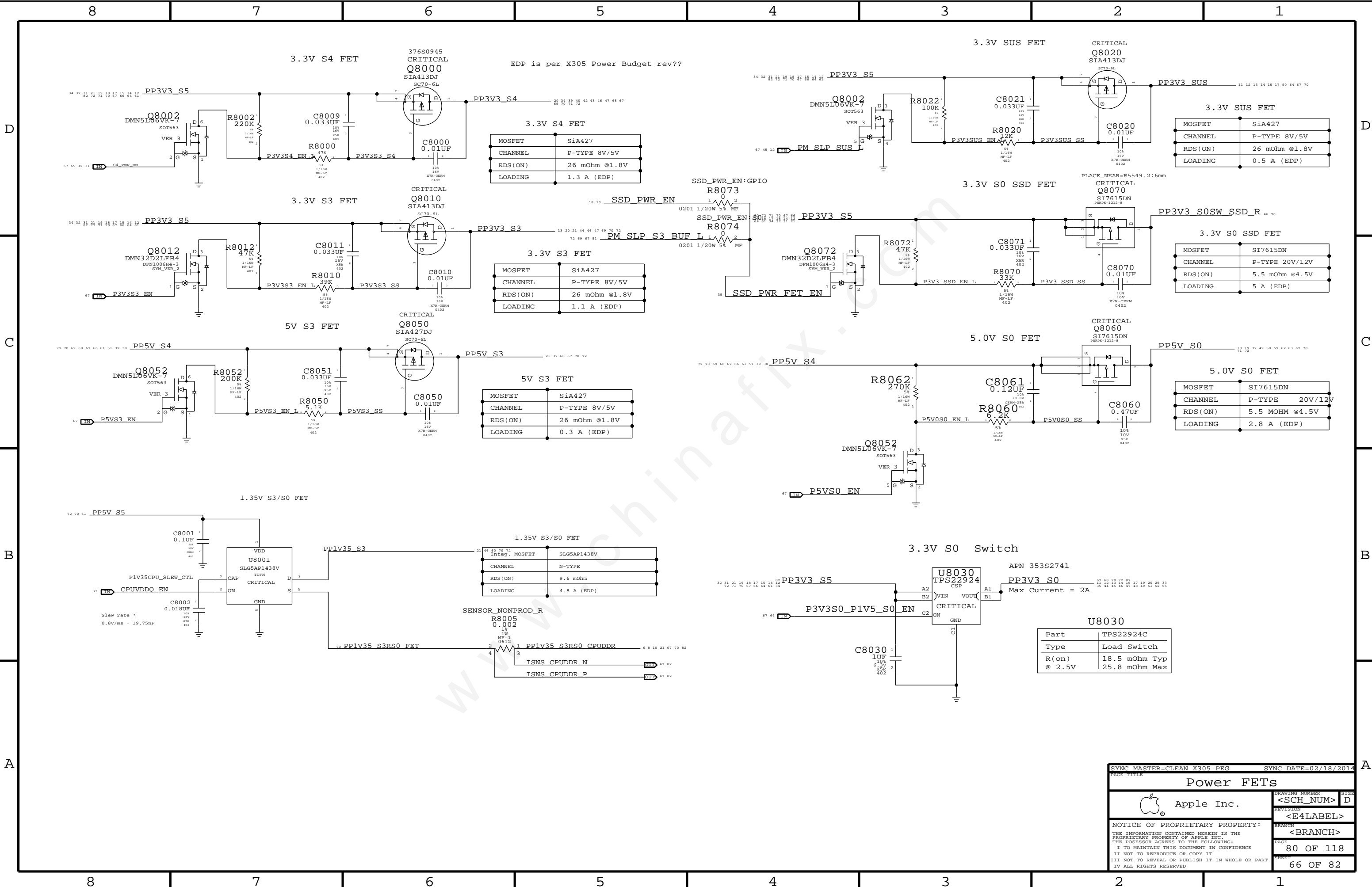
PAGE

79 OF 118

SHEET

65 OF 82





EDP is per X305 Power Budget rev??

MOSFET	SiA427
CHANNEL	P-TYPE 8V/5V
RDS(ON)	26 mOhm @1.8V
LOADING	1.3 A (EDP)

MOSFET	SiA427
CHANNEL	P-TYPE 8V/5V
RDS(ON)	26 mOhm @1.8V
LOADING	1.1 A (EDP)

MOSFET	SiA427
CHANNEL	P-TYPE 8V/5V
RDS(ON)	26 mOhm @1.8V
LOADING	0.3 A (EDP)

MOSFET	SLG5AP1438V
CHANNEL	N-TYPE
RDS(ON)	9.6 mOhm
LOADING	4.8 A (EDP)

ISNS CPUDDR N	47 82
ISNS CPUDDR P	47 82

MOSFET	SiA427
CHANNEL	P-TYPE 8V/5V
RDS(ON)	26 mOhm @1.8V
LOADING	0.5 A (EDP)

MOSFET	SI7615DN
CHANNEL	P-TYPE 20V/12V
RDS(ON)	5.5 mOhm @4.5V
LOADING	5 A (EDP)

MOSFET	SI7615DN
CHANNEL	P-TYPE 20V/12V
RDS(ON)	5.5 MOHM @4.5V
LOADING	2.8 A (EDP)

Part	TPS22924C
Type	Load Switch
R(on) @ 2.5V	18.5 mOhm Typ 25.8 mOhm Max

SYNC MASTER=CLEAN X305 PRG

SYNC DATE=02/18/2014

Power FETs

Apple Inc.

NOTICE OF PROPRIETARY PROPERTY:  
THE INFORMATION CONTAINED HEREIN IS THE  
PROPRIETARY PROPERTY OF APPLE INC.  
THE POSSESSOR AGREES TO THE FOLLOWING:  
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE  
II NOT TO REPRODUCE OR COPY IT  
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART  
IV ALL RIGHTS RESERVED

DRAWING NUMBER

<SCH\_NUM>

REVISION

<E4LABEL>

BRANCH

<BRANCH>

PAGE

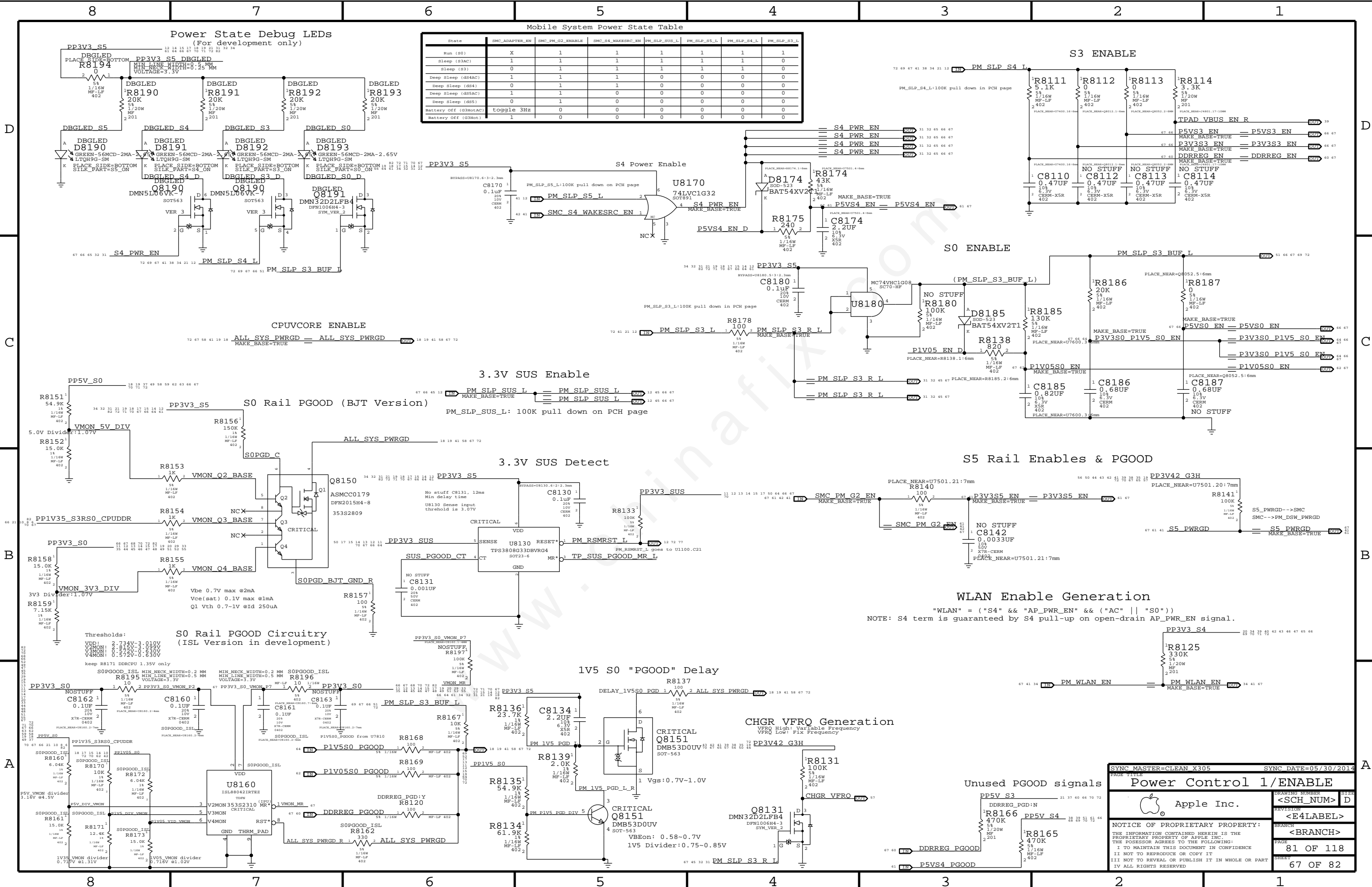
80 OF 118

SHEET

66 OF 82

WWW.AliSaler.Com





Mobile System Power State Table							
State	SMC_ADAPTER_EN	SMC_PM_G2_ENABLE	SMC_S4_WAKESRC_EN	PM_SLP_SUS_L	PM_SLP_S5_L	PM_SLP_S4_L	PM_SLP_S3_L
Run (S0)	X	1	1	1	1	1	1
Sleep (S3AC)	1	1	1	1	1	1	0
Sleep (S3)	0	1	1	1	1	1	0
Deep Sleep (dS4AC)	1	1	1	0	0	0	0
Deep Sleep (dS4)	0	1	1	0	0	0	0
Deep Sleep (dS5AC)	1	1	0	0	0	0	0
Deep Sleep (dS5)	0	1	0	0	0	0	0
Battery Off (G3HotAC)	toggle 3Hz	0	0	0	0	0	0
Battery Off (G3Hot)	1	0	0	0	0	0	0

CPUVCORE ENABLE  
ALL SYS\_PWRGD = ALL SYS\_PWRGD  
MAKE\_BASE=TRUE

3.3V SUS Enable  
PM\_SLP\_SUS\_L: 100K pull down on PCH page  
PM\_SLP\_SUS\_L: 100K pull down on PCH page

S0 Rail PGOOD Circuitry (ISL Version in development)  
VDD: 2.734V-3.010V  
V2MON: 2.815V-3.099V  
V3MON: 0.572V-0.630V  
V4MON: 0.572V-0.630V  
keep R8171 DDRCPU 1.35V only

WLAN Enable Generation  
"WLAN" = ("S4" && "AP\_PWR\_EN" && ("AC" || "S0"))  
NOTE: S4 term is guaranteed by S4 pull-up on open-drain AP\_PWR\_EN signal.

SYNC MASTER=CLEAN X305

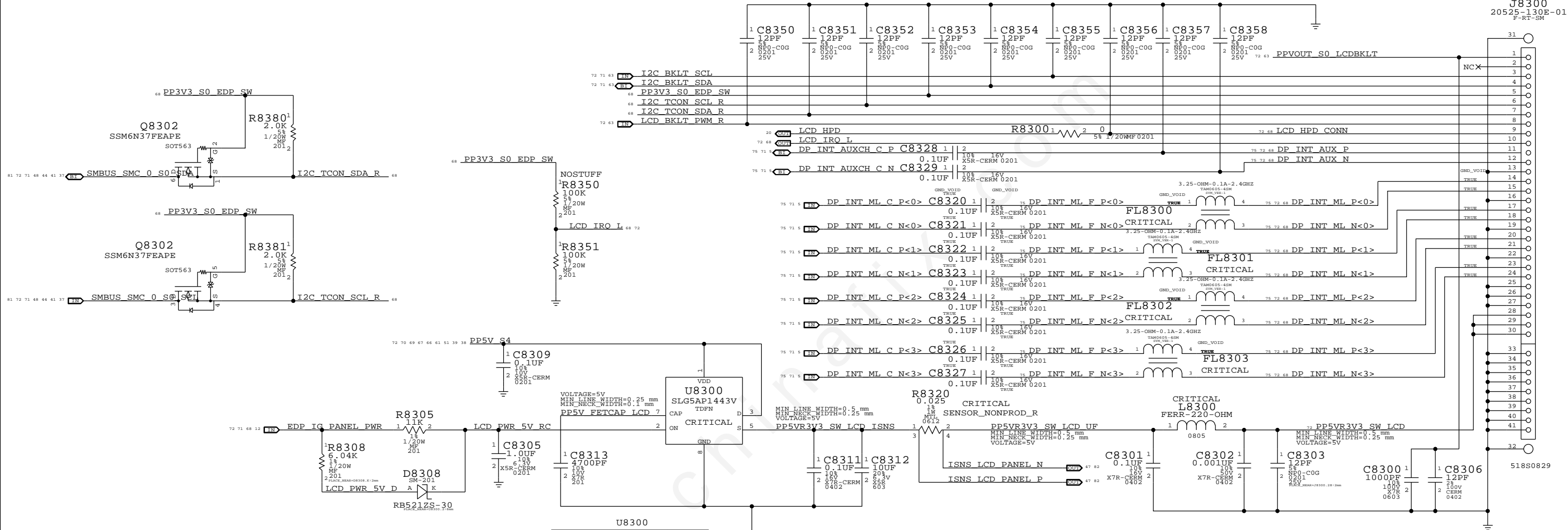
SYNC DATE=05/30/2014

Power Control 1/ENABLE		SIZE
Apple Inc.		<SCH_NUM> D
NOTICE OF PROPRIETARY PROPERTY:		REVISION
THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:		<E4LABEL>
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE		BRANCH
II NOT TO REPRODUCE OR COPY IT		81 OF 118
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART		67 OF 82
IV ALL RIGHTS RESERVED		



# LCD PANEL INTERFACE (eDP)

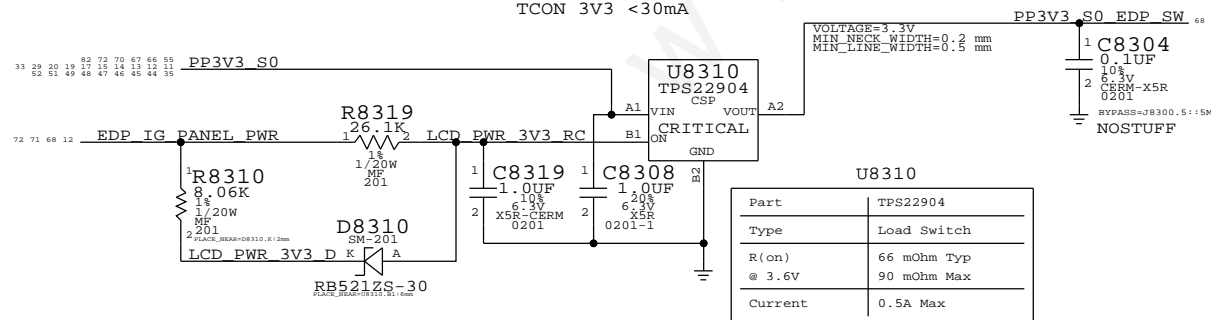
CRITICAL  
J8300  
20525-130E-01  
F-RT-SM



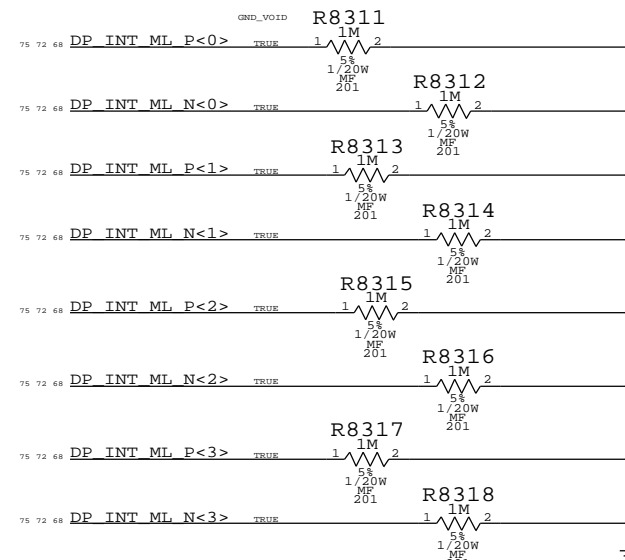
U8300	
Part	SLG5AP1443V
Type	Load Switch
R(on)	17 mOhm Typ
@100mA	19 mOhm Max
Current	2.5 A Max

## 3.3V TCON Switch

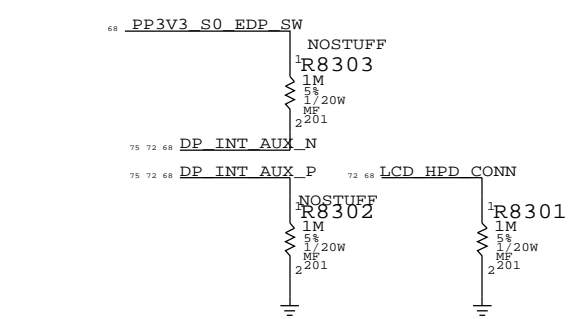
TCON 3V3 <30mA



U8310	
Part	TPS22904
Type	Load Switch
R(on)	66 mOhm Typ
@ 3.6V	90 mOhm Max
Current	0.5A Max

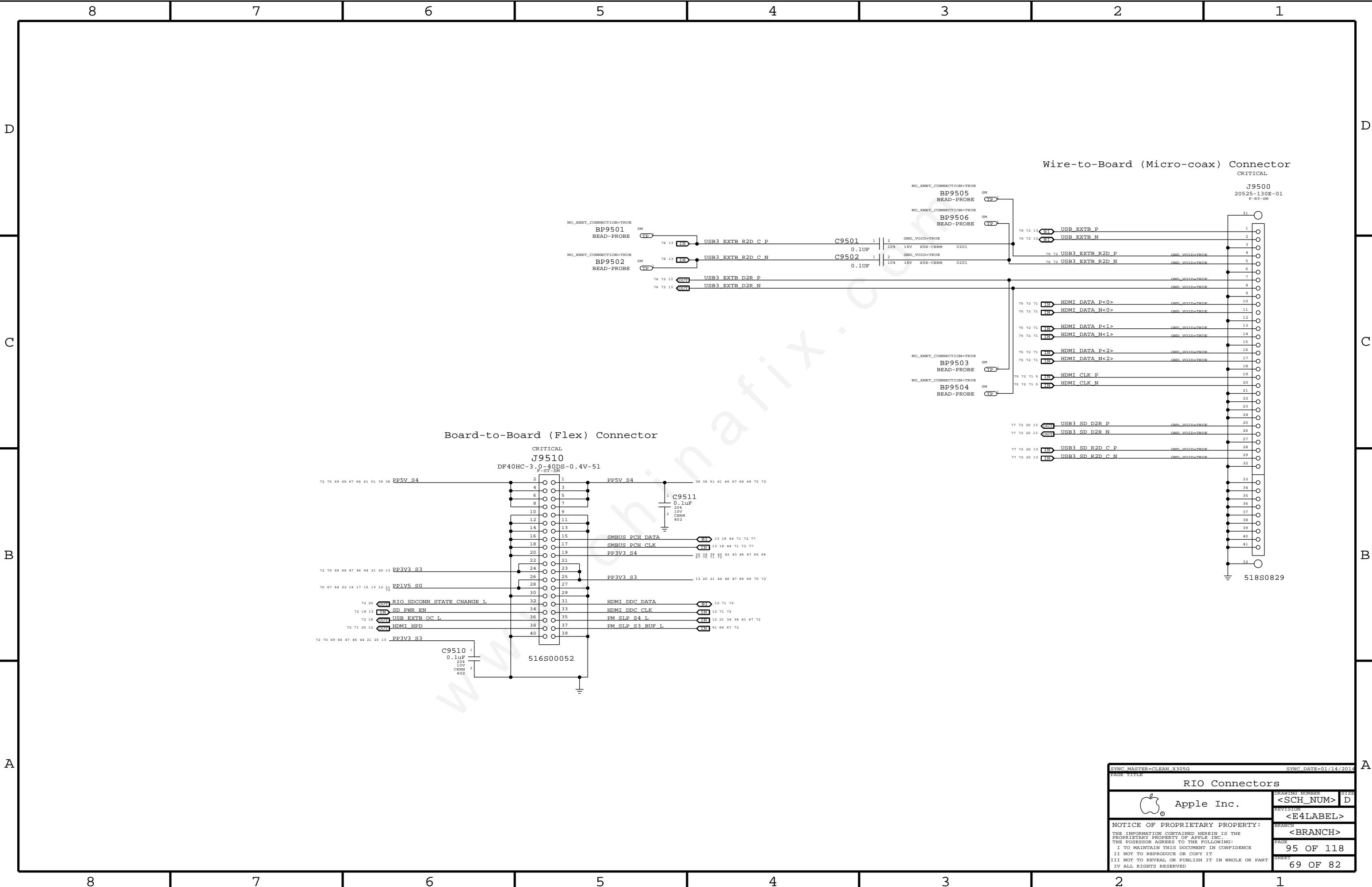



## LCD Panel HPD & AUX strapping



PAGE TITLE		PAGE TITLE	
eDP Display Connector		eDP Display Connector	
Apple Inc.		Apple Inc.	
NOTICE OF PROPRIETARY PROPERTY:		NOTICE OF PROPRIETARY PROPERTY:	
THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:		THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:	
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE		I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE	
II NOT TO REPRODUCE OR COPY IT		II NOT TO REPRODUCE OR COPY IT	
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART		III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART	
IV ALL RIGHTS RESERVED		IV ALL RIGHTS RESERVED	
DRAWING NUMBER		DRAWING NUMBER	
<SCH_NUM>		<SCH_NUM>	
REVISION		REVISION	
<E4LABEL>		<E4LABEL>	
BRANCH		BRANCH	
<BRANCH>		<BRANCH>	
PAGE		PAGE	
83 OF 118		83 OF 118	
SHEET		SHEET	
68 OF 82		68 OF 82	



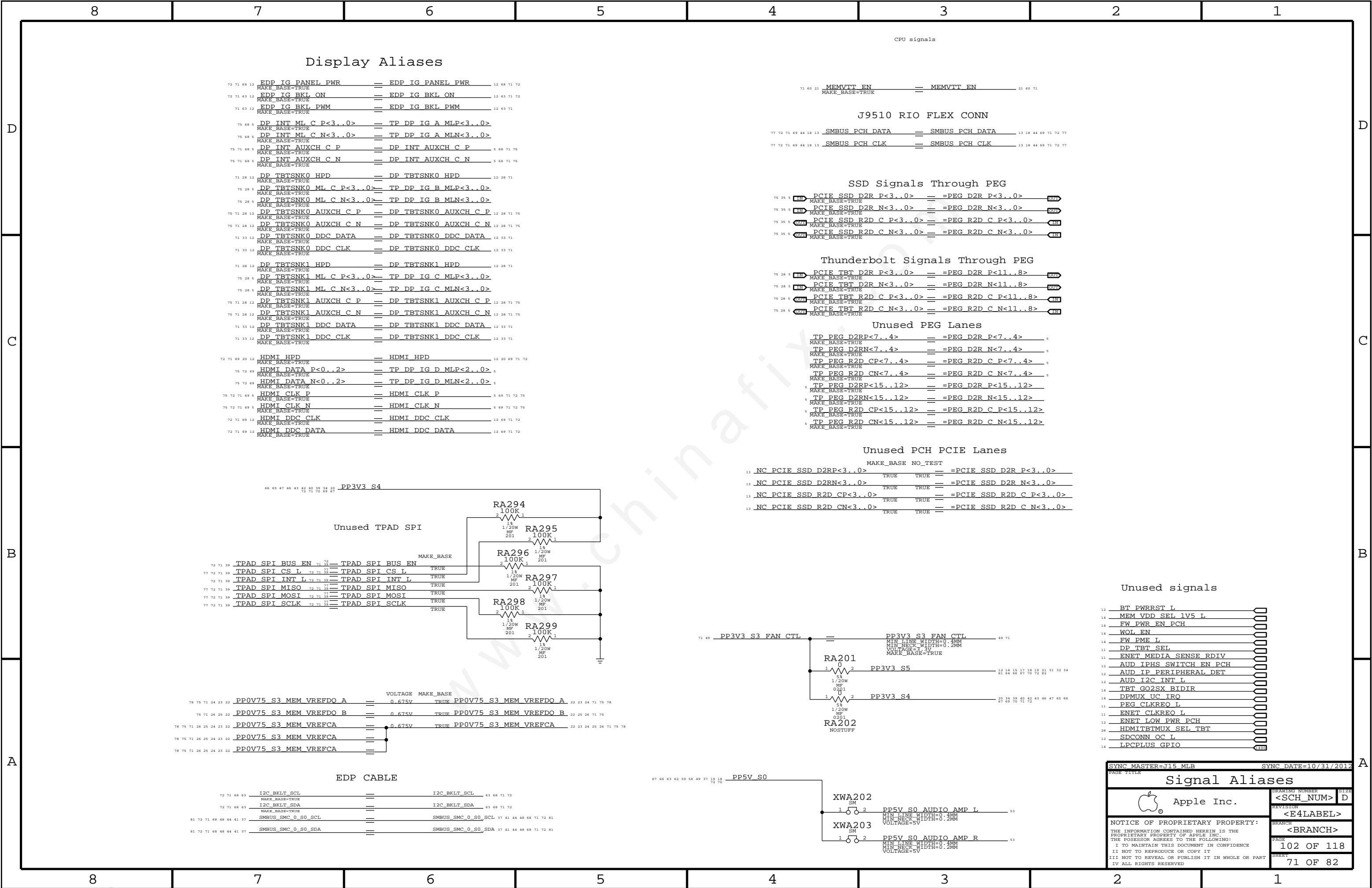


SYNC MASTER=CLEAN X305G		SYNC DATE=01/14/2014	
PAGE TITLE			
RIO Connectors			
	Apple Inc.	DRAWING NUMBER	SIZE
		<SCH_NUM>	D
		REVISION	
		<E4LABEL>	
NOTICE OF PROPRIETARY PROPERTY:		BRANCH	
THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:		<BRANCH>	
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE		PAGE	
II NOT TO REPRODUCE OR COPY IT		95	OF 118
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART		SHEET	
IV ALL RIGHTS RESERVED		69	OF 82











# Functional Test Points

FUNC_TEST J3501 - airport	
TRUE AP CLKREQ O L	34
TRUE AP RESET CONN L	34
TRUE PCIE AP D2R PI N	34 77
TRUE PCIE AP D2R PI P	34 77
TRUE PCIE AP R2D N	34 77
TRUE PCIE AP R2D P	34 77
TRUE PCIE CLK100M AP CONN N	34 77
TRUE PCIE CLK100M AP CONN P	34 77
TRUE PCIE WAKE L	12 34 36 77
TRUE PP3V3 S3RS4 BT F	34
TRUE PP3V3 WLAN	34 42
TRUE USB BT CONN N	34 76
TRUE USB BT CONN P	34 76
TRUE WIFI EVENT L	34 41 42
TRUE GND	4X

J4002 - Camera	
TRUE MIPI CLK CONN N	37 80
TRUE MIPI CLK CONN P	37 80
TRUE CAM SENSOR WAKE L CONN	37
TRUE MIPI DATA CONN N	37 80
TRUE MIPI DATA CONN P	37 80
TRUE SMBUS SMC 0 S0 SDA	37 41 44 48 68 71 72 81
TRUE SMBUS SMC 0 S0 SCL	37 41 44 48 68 71 72 81
TRUE I2C CAM SCK	36 37
TRUE I2C CAM SDA	36 37
TRUE PP5V S3RS0 ALSCAM F	37
TRUE GND	

J9500 - rio coax	
TRUE HDMI CLK N	5 69 71 75
TRUE HDMI CLK P	5 69 71 75
TRUE HDMI DATA N<0>	69 71 75
TRUE HDMI DATA N<1>	69 71 75
TRUE HDMI DATA N<2>	69 71 75
TRUE HDMI DATA P<0>	69 71 75
TRUE HDMI DATA P<1>	69 71 75
TRUE HDMI DATA P<2>	69 71 75

TRUE USB3 SD D2R N	13 20 69 77
TRUE USB3 SD D2R P	13 20 69 77
TRUE USB3 SD R2D C N	13 20 69 77
TRUE USB3 SD R2D C P	13 20 69 77
TRUE USB3 EXTB D2R N	13 69 76
TRUE USB3 EXTB D2R P	13 69 76
TRUE USB3 EXTB R2D N	69 76
TRUE USB3 EXTB R2D P	69 76
TRUE USB EXTB N	13 69 76
TRUE USB EXTB P	13 69 76
TRUE GND	19X

J9510 - rio flex	
TRUE SD PWR EN	13 18 69
TRUE HDMI DDC CLK	12 69 71
TRUE HDMI DDC DATA	12 69 71
TRUE HDMI HPD	12 20 69 71
TRUE SMBUS PCH CLK	13 18 44 69 71 77
TRUE SMBUS PCH DATA	13 18 44 69 71 77
TRUE PM SLP S3 BUF L	51 66 67 69
TRUE PM SLP S4 L	12 21 34 38 41 67 69
TRUE PP3V3 S3	3X13 20 21 44 46 47 66 69 70
TRUE PP3V3 S4	20 34 39 40 42 43 46 47 65 66
TRUE PP5V S4	5X18 39 51 61 66 67 68 69 70
TRUE RIO SDCONN STATE CHANGE L	20 69
TRUE USB EXTB OC L	18 69
TRUE GND	10X

J5150 - hall effect	
TRUE PP3V42 G3H	19 35 38 39 41 42 43 44 50 56
TRUE SMC LID R	43
TRUE GND	

J6050 - left fan	
TRUE FAN LT PWM	49
TRUE FAN LT TACH	49
TRUE PP5V S0	3X18 19 37 49 58 59 62 63 66
TRUE GND	5X

J6060 - right fan	
TRUE FAN RT PWM	49
TRUE FAN RT TACH	49
TRUE PP5V S0	3X18 19 37 49 58 59 62 63 66
TRUE GND	5X

FUNC_TEST J6100 - spi	
TRUE PP3V42 G3H	19 35 38 39 41 42 43 44 50 56
TRUE SMC RESET L	41 42 50 57
TRUE SMC TCK	41 42 50
TRUE SMC TMS	41 42 50
TRUE SPIROM USE MLB	14 50
TRUE SPI ALT CLK	50 77
TRUE SPI ALT CS L	50 77
TRUE SPI ALT IO0 MOSI	50 77
TRUE SPI ALT IO1 MISO	50 77
TRUE SPI ALT IO2 WP L	50 77
TRUE SPI ALT IO1 HOLD L	50 77
TRUE GND	2X

J4801 - ipd flex	
TRUE TPAD SPI INT L	39 71
TRUE TPAD SPI CS L	39 71 77
TRUE TPAD SPI MOSI	39 71 77
TRUE TPAD SPI MISO	39 71 77
TRUE TPAD SPI SCLK	39 71 77
TRUE TPAD SPI BUS EN	39 71
TRUE USB TPAD N	13 39 76
TRUE USB TPAD P	13 39 76
TRUE IOXP2 INT L	39
TRUE I2C IOXP SCL	39
TRUE I2C IOXP SDA	39
TRUE SMC PME S4 WAKE L	34 39 41 43
TRUE TPAD ACTUATOR THRMTrip L	39 65
TRUE TPAD VBUS EN	39
TRUE SMBUS SMC 2 S3 SCL	39 41 44 81
TRUE SMBUS SMC 2 S3 SDA	39 41 44 81
TRUE SMC LID	39 41 42 43
TRUE SMC ACTUATOR EN L	39 41
TRUE PPVIN S4 TPAD	4X39 46 70
TRUE GND ACTUATOR	4X39
TRUE PP3V3 S4	8X39 46 70 43 46 47 65 66
TRUE PP5V S4	39 39 51 61 66 67 68 69 70 72
TRUE GND	2X

J4813 - keyboard	
TRUE PP3V3 S4	20 34 39 40 42 43 46 47 65 66
TRUE PP3V42 G3H	19 35 38 39 41 42 43 44 50 56
TRUE WS CONTROL KBD	39
TRUE WS KBD1	39
TRUE WS KBD11	39
TRUE WS KBD12	39
TRUE WS KBD13	39
TRUE WS KBD14	39
TRUE WS KBD15 CAP	39
TRUE WS KBD16 NUM	39
TRUE WS KBD17	39
TRUE WS KBD18	39
TRUE WS KBD19	39
TRUE WS KBD2	39
TRUE WS KBD20	39
TRUE WS KBD21	39
TRUE WS KBD22	39
TRUE WS KBD23	39
TRUE WS KBD3	39
TRUE WS KBD4	39
TRUE WS KBD5	39
TRUE WS KBD6	39
TRUE WS KBD7	39
TRUE WS KBD8	39
TRUE WS KBD9	39
TRUE WS KBD ONOFF L	39
TRUE WS LEFT OPTION KBD	39
TRUE WS LEFT SHIFT KBD	39
TRUE GND	2X

J4915 - kbd bklt	
TRUE KBDKLT RETURN1	2X40 63
TRUE KBDKLT RETURN2	2X40 63
TRUE PPVOUT S0 KBDKLT	40 63
TRUE GND	4X

J6601 - mic	
TRUE DMIC CLK3	52 55
TRUE PP3V3 S0	55 67 68 70 72 82
TRUE DMIC SDA2	55
TRUE DMIC SDA3	52 55
TRUE GND	

J6602 - L speaker	
TRUE SPKRCONN L ID	52 55
TRUE SPKRCONN L OUT N	53 55 82
TRUE SPKRCONN L OUT P	53 55 82
TRUE SPKRCONN SL OUT N	53 55 82
TRUE SPKRCONN SL OUT P	53 55 82
TRUE GND	

J6603 - R speaker	
TRUE SPKRCONN R ID	52 55
TRUE SPKRCONN R OUT N	53 55 82
TRUE SPKRCONN R OUT P	53 55 82
TRUE SPKRCONN SR OUT N	53 55 82
TRUE SPKRCONN SR OUT P	53 55 82
TRUE GND	

J7000 - DC PWR	
TRUE ADAPTER SENSE	56
TRUE PP20V DCIN FUSE	2X16
TRUE GND	2X

J7050 - battery	
TRUE PPVBAT G3H CONN	8X16 57
TRUE SMBUS SMC 5 G3 SCL	41 44 56 57 81
TRUE SMBUS SMC 5 G3 SDA	41 44 56 57 81
TRUE SYS DETECT L	56
TRUE GND	8X

J8300 - eDP	
TRUE DP INT AUX N	68 75
TRUE DP INT AUX P	68 75
TRUE DP INT ML N<0>	68 75
TRUE DP INT ML N<1>	68 75
TRUE DP INT ML N<2>	68 75
TRUE DP INT ML N<3>	68 75
TRUE DP INT ML P<0>	68 75
TRUE DP INT ML P<1>	68 75
TRUE DP INT ML P<2>	68 75
TRUE DP INT ML P<3>	68 75
TRUE LCD IRO L	68
TRUE LCD HPD CONN	68
TRUE LCD BKLT PWM R	63 68
TRUE SMBUS SMC 0 S0 SDA	37 42 44 46 68 71 72 81
TRUE SMBUS SMC 0 S0 SCL	37 42 44 46 68 71 72 81
TRUE I2C BKLT SDA	63 68 71
TRUE I2C BKLT SCL	63 68 71
TRUE PP5VR3V3 SW LCD	3X68
TRUE PPVOUT S0 LCDBKLT	63 68
TRUE GND	16X

Power Rails	
TRUE PM SLP S3 L	12 21 41 67
TRUE PPVTT S0 DDR	21 27 69 70
TRUE PP3V3 S0	66 67 68 70 72 82
TRUE PP3V3 S3	35 44 45 46 47 48 49 51 52 55
TRUE PP3V3 S5	13 20 21 44 46 47 66 69 70 72
TRUE PP3V3 S5 AVREF SMC	8X13 21 44 46 47 66 69 70 72
TRUE PP3V42 G3H	41 42
TRUE PP5V S0	19 35 38 39 41 42 43 44 50 56
TRUE PP5V S3	19 35 38 39 41 42 43 44 50 56
TRUE PP5V S5	21 37 60 66 67 70
TRUE PPBUS G3H	61 66 70
TRUE PPDCIN G3H	56 57 70
TRUE PPVCC S0 CPU	6 8 10 46 59 70
TRUE PPVTDDR S3	60 70
TRUE PP3V3 S0SW SSD	35 46 70
TRUE PP1V5 S0	12 13 15 17 19 52 64 67 69
TRUE PP1V35 S3	21 46 60 66 70

FUNC_TEST XDP	
TRUE XDP CPU TCK	6 18 75
TRUE XDP PCH TCK	11 18
TRUE XDP CPU TDI	6 18 75
TRUE XDP CPU TDO	6 18 75
TRUE XDP CPUPCH TRST L	6 18 75
TRUE XDP CPU TMS	6 18 75
TRUE XDP PCH TMS	11 18
TRUE XDP PCH TDI	11 18
TRUE XDP PCH TDO	11 18
TRUE XDP CPU PREQ L	6 18 75
TRUE XDP CPU PRDY L	6 18 75
TRUE PM RSMRST L	12 67 77
TRUE PM PCH PWROK	12 19 77
TRUE PM SYSRST L	12 19 41 77
TRUE CPU CFG<3>	6 18 75
TRUE PP1V05 S0	10 14 15 17 18 42 62 67 70
TRUE GND	2X GND

FUNC_TEST Power Sequence	
TRUE SMC ONOFF L	39 41 42
TRUE PM DSW PWRGD	12 41 77
TRUE ALL SYS PWRGD	18 19 41 58 67
TRUE PM PCH SYS PWROK	12 18 19 41 77
TRUE PLT RESET L	12 18 20 21
TRUE EDP IG PANEL PWR	12 68 71
TRUE EDP IG BKL ON	12 63 71

SYNC MASTER=J15 MLB

SYNC DATE=10/31/2012

Functional Test Points

Apple Inc.

THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:  
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE  
I NOT TO REPRODUCE OR COPY IT  
I NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART  
IV ALL RIGHTS RESERVED

DRAWING NUMBER

<SCH\_NUM>

REVISION

<E4LABEL>

BRANCH

<BRANCH>

PAGE

104 OF 118

SHEET

72 OF 82



## NC NO\_TESTS

PCH										Thunderbolt										PLACEABLE BEAD-PROBES FOR TBT									
					NO_TEST	MAKE_BASE											NO_TEST	MAKE_BASE											
73	13	NC USB3 SPARE D2RN	==	TRUE	TRUE	NC USB3 SPARE D2RN	13	73	28	NC TBT XTAL25OUT	==	TRUE	TRUE	NC TBT XTAL25OUT	28	73													
73	13	NC USB3 SPARE D2RP	==	TRUE	TRUE	NC USB3 SPARE D2RP	13	73																					
73	13	NC USB3 SPARE R2D_CN	==	TRUE	TRUE	NC USB3 SPARE R2D_CN	13	73																					
73	13	NC USB3 SPARE R2D_CP	==	TRUE	TRUE	NC USB3 SPARE R2D_CP	13	73																					
76	73	NC USB3 EXTC D2RN	==	TRUE	TRUE	NC USB3 EXTC D2RN	13	73	76																				
76	73	NC USB3 EXTC D2RP	==	TRUE	TRUE	NC USB3 EXTC D2RP	13	73	76	TP DP TBTSRC ML CP<3..0>	==	TRUE	TRUE	NC DP TBTSRC ML CP<3..0>	28		73	31	28	TBT A D2R P<1>	1	TP	SM	BEAD-PROBE	BPA531	NO_XNET_CONNECTION=TRUE			
76	73	NC USB3 EXTC R2D_CN	==	TRUE	TRUE	NC USB3 EXTC R2D_CN	13	73	76	TP DP TBTSRC ML CN<3..0>	==	TRUE	TRUE	NC DP TBTSRC ML CN<3..0>	28		73	31	28	TBT A D2R N<1>	1	TP	SM	BEAD-PROBE	BPA532	NO_XNET_CONNECTION=TRUE			
76	73	NC USB3 EXTC R2D_CP	==	TRUE	TRUE	NC USB3 EXTC R2D_CP	13	73	76	NC DP TBTSRC AUXCH_CP	==	TRUE	TRUE	NC DP TBTSRC AUXCH_CP	28	73													
76	73	NC USB3 EXTD D2RN	==	TRUE	TRUE	NC USB3 EXTD D2RN	13	73	76	NC DP TBTSRC AUXCH_CN	==	TRUE	TRUE	NC DP TBTSRC AUXCH_CN	28	73													
76	73	NC USB3 EXTD D2RP	==	TRUE	TRUE	NC USB3 EXTD D2RP	13	73	76																				
76	73	NC USB3 EXTD R2D_CN	==	TRUE	TRUE	NC USB3 EXTD R2D_CN	13	73	76																				
76	73	NC USB3 EXTD R2D_CP	==	TRUE	TRUE	NC USB3 EXTD R2D_CP	13	73	76																				

73	NC_PCIE_ENET_D2RN	=	TRUE	TRUE	NC_PCIE_ENET_D2RN	73
73	NC_PCIE_ENET_D2RP	=	TRUE	TRUE	NC_PCIE_ENET_D2RP	73
73	NC_PCIE_ENET_R2D_CN	=	TRUE	TRUE	NC_PCIE_ENET_R2D_CN	73
73	NC_PCIE_ENET_R2D_CP	=	TRUE	TRUE	NC_PCIE_ENET_R2D_CP	73


[illegible]

76 73 13	NC USB EXTCN	==	TRUE	TRUE	NC USB EXTCN	13 73 76	13	NC USB 4N	==	TRUE	TRUE	NC USB 4N	13 73
76 73 13	NC USB EXTCP	==	TRUE	TRUE	NC USB EXTCP	13 73 76	13	NC USB 4P	==	TRUE	TRUE	NC USB 4P	13 73
76 73 13	NC USB SDN	==	TRUE	TRUE	NC USB SDN	13 73 76	13						
76 73 13	NC USB SDP	==	TRUE	TRUE	NC USB SDP	13 73 76							
73 13	NC USB WLANN	==	TRUE	TRUE	NC USB WLANN	13 73							
73 13	NC USB WLANP	==	TRUE	TRUE	NC USB WLANP	13 73							
76 73 13	NC USB 6N	==	TRUE	TRUE	NC USB 6N	13 73 76							
76 73 13	NC USB 6P	==	TRUE	TRUE	NC USB 6P	13 73 76							
76 73 13	NC USB 7N	==	TRUE	TRUE	NC USB 7N	13 73 76							
76 73 13	NC USB 7P	==	TRUE	TRUE	NC USB 7P	13 73 76							
76 73 13	NC USB EXTDN	==	TRUE	TRUE	NC USB EXTDN	13 73 76							
76 73 13	NC USB EXTDP	==	TRUE	TRUE	NC USB EXTDP	13 73 76							
73 13	NC USB PSOCN	==	TRUE	TRUE	NC USB PSOCN	13 73							
73 13	NC USB PSOCP	==	TRUE	TRUE	NC USB PSOCP	13 73							
76 73 13	NC USB IRN	==	TRUE	TRUE	NC USB IRN	13 73 76							
76 73 13	NC USB IRP	==	TRUE	TRUE	NC USB IRP	13 73 76							

75	73	11	NC	ITPXPDP	CLK100MN	==	TRUE	TRUE	NC	ITPXPDP	CLK100MN	11	73	75
75	73	11	NC	ITPXPDP	CLK100MP	==	TRUE	TRUE	NC	ITPXPDP	CLK100MP	11	73	75
75	73	12	NC	PCI	PME_L	==	TRUE	TRUE	NC	PCI	PME_L	12	73	
73	11		NC	PCI	CLK33M_OUT2	==	TRUE	TRUE	NC	PCI	CLK33M_OUT2	11	73	
73	11		NC	PCI	CLK33M_OUT3	==	TRUE	TRUE	NC	PCI	CLK33M_OUT3	11	73	
73	11		NC	HDA	SDIN1	==	TRUE	TRUE	NC	HDA	SDIN1	11	73	
73	11		NC	HDA	SDIN2	==	TRUE	TRUE	NC	HDA	SDIN2	11	73	
73	11		NC	HDA	SDIN3	==	TRUE	TRUE	NC	HDA	SDIN3	11	73	
73	13		NC	LPC	DREQ0_L	==	TRUE	TRUE	NC	LPC	DREQ0_L	13	73	
73	13		NC	CLINK	CLK	==	TRUE	TRUE	NC	CLINK	CLK	13	73	
73	13		NC	CLINK	DATA	==	TRUE	TRUE	NC	CLINK	DATA	13	73	
73	13		NC	CLINK	RESET_L	==	TRUE	TRUE	NC	CLINK	RESET_L	13	73	
77	73	11	NC	LPC	CLK33M_LPCPLUS_R	==	TRUE	TRUE	NC	LPC	CLK33M_LPCPLUS_R	11	73	77

<input type="checkbox"/>	TRUE	PCIE_TBT_R2D_P<3..0>	28	75
<input type="checkbox"/>	TRUE	PCIE_TBT_R2D_N<3..0>	28	75
<input type="checkbox"/>	TRUE	PCIE_TBT_D2R_C_P<3..0>	28	75
<input type="checkbox"/>	TRUE	PCIE_TBT_D2R_C_N<3..0>	28	75
<input checked="" type="checkbox"/>	TRUE	DMI_S2N_P<3..1>	5	12
<input checked="" type="checkbox"/>	TRUE	DMI_S2N_N<3..1>	5	12
<input checked="" type="checkbox"/>	TRUE	DMI_N2S_R<3..1>	5	12

76	73	NC USB SMCP	==	TRUE	TRUE	NC USB SMCP	73	76
76	73	NC USB SMCN	==	TRUE	TRUE	NC USB SMCN	73	76
73		NC SMC INTERFACE 2	==	TRUE	TRUE	NC SMC INTERFACE 2	73	

SYNCH MASTER-J15 MLB		SYNCH DATE=10/31/2012	
PAGE TITLE			
NC & No Test			
 Apple Inc.	DRAWING NUMBER	SIZE	
	<SCH_NUM>	D	
NOTICE OF PROPRIETARY PROPERTY: THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING: I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART IV ALL RIGHTS RESERVED	REVISION	<E4LABEL>	
	BRANCH	<BRANCH>	
	PAGE	105 OF 118	
	SHEET	73 OF 82	



8	7	6	5	4	3	2	1
X425 BOARD-SPECIFIC SPACING & PHYSICAL CONSTRAINTS							
BOARD LAYERS				BOARD AREAS		BOARD UNITS (MIL OR MM)	ALLEGRO VERSION
TOP, ISL2, ISL3, ISL4, ISL5, ISL6, ISL7, ISL8, ISL9, ISL10, ISL11, BOTTOM				NO_TYPE, BGA, P65BGA		MM	16.2
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
DEFAULT	*	Y	=45_OHM_SE	=45_OHM_SE	10 MM	0 MM	0 MM
STANDARD	*	Y	=DEFAULT	=DEFAULT	10 MM	=DEFAULT	=DEFAULT
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
50_OHM_SE	TOP, BOTTOM	Y	0.095 MM	0.095 MM			
50_OHM_SE	*	Y	0.066 MM	0.066 MM	=STANDARD	=STANDARD	=STANDARD
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
45_OHM_SE	TOP, BOTTOM	Y	0.116 MM	0.116 MM			
45_OHM_SE	*	Y	0.083 MM	0.083 MM	=STANDARD	=STANDARD	=STANDARD
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
40_OHM_SE	TOP, BOTTOM	Y	0.145 MM	0.095 MM			
40_OHM_SE	*	Y	0.102 MM	0.090 MM	=STANDARD	=STANDARD	=STANDARD
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
37_OHM_SE	TOP, BOTTOM	Y	0.165 MM	0.095 MM			
37_OHM_SE	*	Y	0.118 MM	0.090 MM	=STANDARD	=STANDARD	=STANDARD
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
27P4_OHM_SE	TOP, BOTTOM	Y	0.265 MM	0.095 MM			
27P4_OHM_SE	*	Y	0.186 MM	0.1 MM	=STANDARD	=STANDARD	=STANDARD
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
72_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD
72_OHM_DIFF	ISL3, ISL4, ISL9, ISL10	Y	0.105 MM	0.105 MM		0.120 MM	0.120 MM
72_OHM_DIFF	ISL2, ISL11	Y	0.105 MM	0.105 MM		0.120 MM	0.120 MM
72_OHM_DIFF	TOP, BOTTOM	Y	0.146 MM	0.146 MM		0.120 MM	0.120 MM
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
80_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD
80_OHM_DIFF	ISL3, ISL4, ISL9, ISL10	Y	0.092 MM	0.092 MM		0.120 MM	0.120 MM
80_OHM_DIFF	ISL2, ISL11	Y	0.092 MM	0.092 MM		0.120 MM	0.120 MM
80_OHM_DIFF	TOP, BOTTOM	Y	0.125 MM	0.125 MM		0.155 MM	0.155 MM
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
85_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD
85_OHM_DIFF	ISL3, ISL4, ISL9, ISL10	Y	0.080 MM	0.080 MM		0.120 MM	0.120 MM
85_OHM_DIFF	ISL2, ISL11	Y	0.080 MM	0.080 MM		0.120 MM	0.120 MM
85_OHM_DIFF	TOP, BOTTOM	Y	0.105 MM	0.105 MM		0.125 MM	0.125 MM
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
90_OHM_DIFF	*	N	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD
90_OHM_DIFF	ISL3, ISL4, ISL9, ISL10	Y	0.078 MM	0.078 MM		0.200 MM	0.200 MM
90_OHM_DIFF	ISL2, ISL11	Y	0.078 MM	0.078 MM		0.200 MM	0.200 MM
90_OHM_DIFF	TOP, BOTTOM	Y	0.101 MM	0.101 MM		0.180 MM	0.180 MM
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
1:1_DIFFPAIR	*	Y	=STANDARD	=STANDARD	=STANDARD	0.1 MM	0.1 MM

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
*	*	BGA	P072_SPACE
*	*	P65BGA	P075_SPACE

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
DEFAULT	*	0.1 MM	?
STANDARD	*	=DEFAULT	?
BGA_P1MM	*	0.1 MM	?
BGA_P2MM	*	0.2 MM	?
P072_SPACE	*	0.071 MM	?
P075_SPACE	*	0.075 MM	?

Stackup-Defined Spacing Rules

Note: Outer dielectric is 0.058 mm nominal,  
Inner dielectric is 0.053 mm nominal.

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
1:1_SPACING	*	0.1 MM	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
1x_DIELECTRIC	TOP, BOTTOM	0.058 MM	?
1x_DIELECTRIC	ISL3, ISL4, ISL9, ISL10	0.053 MM	?
1x_DIELECTRIC	ISL2, ISL5, ISL6, ISL7, ISL8, ISL11	0.101 MM	?


PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
P65_BGA	*	Y	0.071MM	0.071MM		0.075MM	0.126MM

NET_PHYSICAL_TYPE	AREA_TYPE	PHYSICAL_RULE_SET
*	P65BGA	P65_BGA

SYNC MASTER=SIDLE J45

SYNC DATE=12/10/2012

PCB Rule Definitions

 Apple Inc.

DRAWING NUMBER

<SCH\_NUM>

REVISION

<E4LABEL>

BRANCH

<BRANCH>

NOTICE OF PROPRIETARY PROPERTY:

THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:  
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE  
II NOT TO REPRODUCE OR COPY IT  
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART  
IV ALL RIGHTS RESERVED

PAGE

110 OF 118

SHEET

74 OF 82







SATA Interface Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
SATA_85D	*	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF
SATA_37SE	*	=37_OHM_SE	=37_OHM_SE	=37_OHM_SE	=37_OHM_SE	=37_OHM_SE	=37_OHM_SE
SATA_45SE	*	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
SATA_2SAME	*	=3X_DIELECTRIC	?
SATA_TXRX	*	=6X_DIELECTRIC	?
SATA_2OTHER	*	=4X_DIELECTRIC	?
SATA_RCOMP	*	=6X_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
SATA_2SAME	TOP,BOTTOM	=4X_DIELECTRIC	?
SATA_TXRX	TOP,BOTTOM	=10X_DIELECTRIC	?
SATA_2OTHER	TOP,BOTTOM	=6X_DIELECTRIC	?
SATA_RCOMP	TOP,BOTTOM	=10X_DIELECTRIC	?

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
SATA_*	=SAME	*	SATA_2SAME
SATA_R2D	SATA_D2R	*	SATA_TXRX
SATA_*	*	*	SATA_2OTHER

USB 2.0 Interface Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
PCH_USB_RBIAS	*	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD	=STANDARD
USB_85D	*	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
USB	*	=4X_DIELECTRIC	?
USB_RBIAS	*	=6X_DIELECTRIC	?
BT_WAKE	*	=4X_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
USB	TOP,BOTTOM	=6X_DIELECTRIC	?
USB_RBIAS	TOP,BOTTOM	=10X_DIELECTRIC	?
BT_WAKE	TOP,BOTTOM	=6X_DIELECTRIC	?

USB 3.0 INTERFACE CONSTRAINTS

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
USB3_85D	*	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
USB3_2SAME	*	=3X_DIELECTRIC	?
USB3_TXRX	*	=6X_DIELECTRIC	?
USB3_2OTHER	*	=4X_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
USB3_2SAME	TOP,BOTTOM	=4X_DIELECTRIC	?
USB3_TXRX	TOP,BOTTOM	=10X_DIELECTRIC	?
USB3_2OTHER	TOP,BOTTOM	=6X_DIELECTRIC	?

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
USB3_*	=SAME	*	USB3_2SAME
USB3_R2D	USB3_D2R	*	USB3_TXRX
USB3_*	*	*	USB3_2OTHER

System Clock Signal Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
CLK_SLOW_45S	*	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=STANDARD	=STANDARD
CLK_25M_45S	*	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=STANDARD	=STANDARD

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
CLK_SLOW	*	=4X_DIELECTRIC	?
CLK_25M	*	=5X_DIELECTRIC	?

NOTE: 25MHz system clocks very sensitive to noise.  
NOTE: Latest Intel DG calls out 50ohms SE for sys clocks

PCH Net Properties

NET_TYPE			
ELECTRICAL_CONSTRAINT_SET	PHYSICAL	SPACING	
SATA_85D	SATA_R5D	SATA_R2D	NC SATA A R2D CP 11 73
SATA_85D	SATA_85D	SATA_R2D	NC SATA A R2D CN 11 73
SATA_85D	SATA_D2R	SATA_D2R	NC SATA A D2RP 11 73
SATA_85D	SATA_D2R	SATA_D2R	NC SATA A D2RN 11 73
SATA_85D	SATA_R2D	SATA_R2D	NC SATA B R2D CP 11 73
SATA_85D	SATA_R2D	SATA_R2D	NC SATA B R2D CN 11 73
SATA_85D	SATA_D2R	SATA_D2R	NC SATA B D2RP 11 73
SATA_85D	SATA_D2R	SATA_D2R	NC SATA B D2RN 11 73
PCH_SATA_RCOMP	SATA_45SE	SATA_RCOMP	PCH SATA RCOMP 11
USB_EXTN	USB_85D	USB	USB EXTN P 13 38
USB_EXTN	USB_85D	USB	USB EXTN N 13 38
USB_EXTN	USB_85D	USB	USB EXTN MUXED P 38
USB_EXTN	USB_85D	USB	USB EXTN MUXED N 38
USB_EXTN	USB_85D	USB	USB LT1 P 38
USB_EXTN	USB_85D	USB	USB LT1 N 38
USB_NC	USB_85D	USB	NC USB EXTCP 13 73
USB_NC	USB_85D	USB	NC USB EXTCN 13 73
USB_NC	USB_85D	USB	NC USB SDP 13 73
USB_NC	USB_85D	USB	NC USB SDN 13 73
CPU_45S	CPU_45S	CPU_ITP	SMC DEBUGPRT RX L 38 41 42
CPU_45S	CPU_45S	CPU_ITP	SMC DEBUGPRT TX L 38 41 42
USB_SMC	USB_85D	USB	NC USB SMCN 73
USB_SMC	USB_85D	USB	NC USB SMCN 73
USB_NC	USB_85D	USB	NC USB 6P 13 73
USB_NC	USB_85D	USB	NC USB 6N 13 73
USB_NC	USB_85D	USB	NC USB 7P 13 73
USB_NC	USB_85D	USB	NC USB 7N 13 73
USB_EXTB	USB_85D	USB	USB EXTB P 13 69 72
USB_EXTB	USB_85D	USB	USB EXTB N 13 69 72
USB_NC	USB_85D	USB	NC USB EXTDN 13 73
USB_NC	USB_85D	USB	NC USB EXTDN 13 73
USB_BT	USB_85D	USB	USB BT P 13 34
USB_BT	USB_85D	USB	USB BT N 13 34
USB_BT	USB_85D	USB	USB BT CONN P 34 72
USB_BT	USB_85D	USB	USB BT CONN N 34 72
USB_NC	USB_85D	USB	NC USB IRP 13 73
USB_NC	USB_85D	USB	NC USB IRN 13 73
USB_TPAD	USB_85D	USB	USB TPAD P 13 39 72
USB_TPAD	USB_85D	USB	USB TPAD N 13 39 72
USB_TPAD	USB_85D	USB	USB TPAD R P
USB_TPAD	USB_85D	USB	USB TPAD R N
PCH_USB_RBIAS	PCH_USB_RBIAS	USB_RBIAS	PCH USB RBIAS 13
USB3_EXTN_RX	USB_85D	USB3_D2R	USB3 EXTN D2R P 13 38
USB3_EXTN_RX	USB_85D	USB3_D2R	USB3 EXTN D2R N 13 38
USB3_EXTN	USB_85D	USB3_D2R	USB3 EXTN D2R C P
USB3_EXTN	USB_85D	USB3_D2R	USB3 EXTN D2R C N
USB3_EXTN_TX	USB_85D	USB3_R2D	USB3 EXTN R2D P 38
USB3_EXTN_TX	USB_85D	USB3_R2D	USB3 EXTN R2D N 38
USB3_EXTN	USB_85D	USB3_R2D	USB3 EXTN R2D C P 13 38
USB3_EXTN	USB_85D	USB3_R2D	USB3 EXTN R2D C N 13 38
USB3_EXTB_RX	USB_85D	USB3_D2R	USB3 EXTB D2R P 13 69 72
USB3_EXTB_RX	USB_85D	USB3_D2R	USB3 EXTB D2R N 13 69 72
USB3_EXTB	USB_85D	USB3_D2R	USB3 EXTB D2R C P 69 72
USB3_EXTB	USB_85D	USB3_D2R	USB3 EXTB D2R C N 69 72
USB3_EXTB_TX	USB_85D	USB3_R2D	USB3 EXTB R2D P 13 69
USB3_EXTB_TX	USB_85D	USB3_R2D	USB3 EXTB R2D N 13 69
USB3_EXTB	USB_85D	USB3_R2D	USB3 EXTB R2D C P 13 69
USB3_EXTB	USB_85D	USB3_R2D	USB3 EXTB R2D C N 13 69
NC_USB3	USB_85D	USB3_D2R	NC USB3 EXTC D2RP 13 73
NC_USB3	USB_85D	USB3_D2R	NC USB3 EXTC D2RN 13 73
NC_USB3	USB_85D	USB3_R2D	NC USB3 EXTC R2D CP 13 73
NC_USB3	USB_85D	USB3_R2D	NC USB3 EXTC R2D CN 13 73
NC_USB3	USB_85D	USB3_D2R	NC USB3 EXTD D2RP 13 73
NC_USB3	USB_85D	USB3_D2R	NC USB3 EXTD D2RN 13 73
NC_USB3	USB_85D	USB3_R2D	NC USB3 EXTD R2D CP 13 73
NC_USB3	USB_85D	USB3_R2D	NC USB3 EXTD R2D CN 13 73

Clock Net Properties

NET_TYPE			
ELECTRICAL_CONSTRAINT_SET	PHYSICAL	SPACING	
SYSCLK_CLK32K_RTC	CLK_SLOW_45S	CLK_SLOW	SYSCLK CLK32K RTC 11 19
SYSCLK_CLK25M_SB	CLK_25M_45S	CLK_25M	SYSCLK CLK25M SB 11 19
SYSCLK_CLK25M_CAM	CLK_25M_45S	CLK_25M	SYSCLK CLK25M SB R 11
SYSCLK_CLK25M_CAM	CLK_25M_45S	CLK_25M	SYSCLK CLK25M CAMERA 19 37
SYSCLK_CLK25M_TBT	CLK_25M_45S	CLK_25M	SYSCLK CLK25M TBT 19 28
SYSCLK_CLK25M_TBT	CLK_25M_45S	CLK_25M	SYSCLK CLK25M TBT R 28

SYNC MASTER=SIDLE J45

SYNC DATE=12/10/2012

PCH Constraints 1

Apple Inc.

THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING:  
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE  
II NOT TO REPRODUCE OR COPY IT  
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART  
IV ALL RIGHTS RESERVED

DRAWING NUMBER

<SCH\_NUM>

REVISION

<E4LABEL>

BRANCH

<BRANCH>

PAGE

112 OF 118

SHEET

76 OF 82

WWW.AliSaler.Com







## Memory Bus Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP
MEM_37S	*	=37_OHM_SE	=37_OHM_SE	=37_OHM_SE	=37_OHM_SE	=STANDARD	=STANDARD
MEM_40S	*	=40_OHM_SE	=40_OHM_SE	=40_OHM_SE	=40_OHM_SE	=STANDARD	=STANDARD
MEM_72D	*	=72_OHM_DIFF	=72_OHM_DIFF	=72_OHM_DIFF	=72_OHM_DIFF	=72_OHM_DIFF	=72_OHM_DIFF
MEM_45S	*	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=STANDARD	=STANDARD
MEM_85D	*	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF

## Spacing Rule Sets

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
MEM_DATA2SELF	*	=2x_DIELECTRIC	?
MEM_DQS2OWNDATA	*	=2x_DIELECTRIC	?
MEM_CMD2CMD	*	=2x_DIELECTRIC	?
MEM_CMD2CTRL	*	=2x_DIELECTRIC	?
MEM_CTRL2CTRL	*	=2x_DIELECTRIC	?
MEM_CLK2CLK	*	=4x_DIELECTRIC	?
MEM_2OTHERMEM	*	=4x_DIELECTRIC	?
MEM_2PWR	*	=2x_DIELECTRIC	?
MEM_2GND	*	=2x_DIELECTRIC	?
MEM_2OTHER	*	=6x_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT
MEM_DATA2SELF	TOP,BOTTOM	=5x_DIELECTRIC	?
MEM_DQS2OWNDATA	TOP,BOTTOM	=5x_DIELECTRIC	?
MEM_CMD2CMD	TOP,BOTTOM	=5x_DIELECTRIC	?
MEM_CMD2CTRL	TOP,BOTTOM	=5x_DIELECTRIC	?
MEM_CTRL2CTRL	TOP,BOTTOM	=5x_DIELECTRIC	?
MEM_CLK2CLK	TOP,BOTTOM	=8x_DIELECTRIC	?
MEM_2OTHERMEM	TOP,BOTTOM	=8x_DIELECTRIC	?
MEM_2PWR	TOP,BOTTOM	=4x_DIELECTRIC	?
MEM_2GND	TOP,BOTTOM	=4x_DIELECTRIC	?
MEM_2OTHER	TOP,BOTTOM	=10x_DIELECTRIC	?

## Memory Bus Spacing Group Assignments

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
MEM_*_DATA_*	*	*	MEM_2OTHER
MEM_*_DQS_*	*	*	MEM_2OTHER
MEM_CMD	*	*	MEM_2OTHER
MEM_CTRL	*	*	MEM_2OTHER
MEM_CLK	*	*	MEM_2OTHER

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
MEM_*_DATA_*	=SAME	*	MEM_DATA2SELF

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
MEM_CMD	MEM_CMD	*	MEM_CMD2CMD
MEM_CMD	MEM_CTRL	*	MEM_CMD2CTRL
MEM_CTRL	MEM_CTRL	*	MEM_CTRL2CTRL
MEM_CLK	MEM_CLK	*	MEM_CLK2CLK
MEM_*	MEM_*	*	MEM_2OTHERMEM

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
MEM_A_DQS_0	MEM_A_DATA_0	*	MEM_DQS2OWNDATA
MEM_A_DQS_1	MEM_A_DATA_1	*	MEM_DQS2OWNDATA
MEM_A_DQS_2	MEM_A_DATA_2	*	MEM_DQS2OWNDATA
MEM_A_DQS_3	MEM_A_DATA_3	*	MEM_DQS2OWNDATA
MEM_A_DQS_4	MEM_A_DATA_4	*	MEM_DQS2OWNDATA
MEM_A_DQS_5	MEM_A_DATA_5	*	MEM_DQS2OWNDATA
MEM_A_DQS_6	MEM_A_DATA_6	*	MEM_DQS2OWNDATA
MEM_A_DQS_7	MEM_A_DATA_7	*	MEM_DQS2OWNDATA
MEM_B_DQS_0	MEM_B_DATA_0	*	MEM_DQS2OWNDATA
MEM_B_DQS_1	MEM_B_DATA_1	*	MEM_DQS2OWNDATA
MEM_B_DQS_2	MEM_B_DATA_2	*	MEM_DQS2OWNDATA
MEM_B_DQS_3	MEM_B_DATA_3	*	MEM_DQS2OWNDATA
MEM_B_DQS_4	MEM_B_DATA_4	*	MEM_DQS2OWNDATA
MEM_B_DQS_5	MEM_B_DATA_5	*	MEM_DQS2OWNDATA
MEM_B_DQS_6	MEM_B_DATA_6	*	MEM_DQS2OWNDATA
MEM_B_DQS_7	MEM_B_DATA_7	*	MEM_DQS2OWNDATA

### DDR3 (Memory Down):

DQ signals should be matched within 0.508mm of associated DQS pair  
DQS intra-pair matching should be within 0.127mm, no inter-pair matching requirement.  
DQS to clock matching should be within [CLK-139.73mm] and [CLK-30.48mm].  
CLK intra-pair matching should be within 0.127mm, inter-pair matching should be within 0.508mm.  
CONTROL signals should be matched within [CLK-2.54mm] to [CLK+0mm] of CLK pairs.  
A/BA/CMD signals should be matched within [CLK-2.54mm] to [CLK+2.54mm] of CLK pairs.  
DQ/DQS/A/BA/cmd signal spacing is 4x dielectric, CLK is 5x dielectric.  
Maximum length of any signal from die pad to first DRAM device is 139.7mm max, to last DRAM device is 194.31mm max.

SOURCE: Double checked with Doc#486985 Chief River SFF Platform DG: Memory Down  
SOURCE: Need to re-confirm CRW DG for memory down (Intel not yet provided)

## Memory to Power Spacing


NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
MEM_PWR	MEM_*	*	MEM_2PWR
MEM_PWR	*	*	DEFAULT

## Memory to GND Spacing

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
GND	MEM_*	*	MEM_2GND

## Memory Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE	
	PHYSICAL	SPACING
MEM_A_CLK0	MEM_72D	MEM_CLK
MEM_A_CLK0	MEM_72D	MEM_CLK
MEM_A_CLK1	MEM_72D	MEM_CLK
MEM_A_CLK1	MEM_72D	MEM_CLK
MEM_A_CNTRL0	MEM_40S	MEM_CTRL
MEM_A_CNTRL1	MEM_40S	MEM_CTRL
MEM_A_CNTRL0	MEM_40S	MEM_CTRL
MEM_A_CNTRL1	MEM_40S	MEM_CTRL
MEM_A_CNTRL0	MEM_40S	MEM_CTRL
MEM_A_CNTRL1	MEM_40S	MEM_CTRL
MEM_A_CNTRL0	MEM_40S	MEM_CTRL
MEM_A_CNTRL1	MEM_40S	MEM_CTRL
MEM_A_CMD	MEM_40S	MEM_CMD
MEM_A_CMD	MEM_40S	MEM_CMD
MEM_A_CMD	MEM_40S	MEM_CMD
MEM_A_CMD	MEM_40S	MEM_CMD
MEM_A_CMD	MEM_40S	MEM_CMD
MEM_A_DATA_0	MEM_45S	MEM_A_DATA_0
MEM_A_DATA_1	MEM_45S	MEM_A_DATA_1
MEM_A_DATA_2	MEM_45S	MEM_A_DATA_2
MEM_A_DATA_3	MEM_45S	MEM_A_DATA_3
MEM_A_DATA_4	MEM_45S	MEM_A_DATA_4
MEM_A_DATA_5	MEM_45S	MEM_A_DATA_5
MEM_A_DATA_6	MEM_45S	MEM_A_DATA_6
MEM_A_DATA_7	MEM_45S	MEM_A_DATA_7
MEM_A_DQS0	MEM_85D	MEM_A_DQS_0
MEM_A_DQS1	MEM_85D	MEM_A_DQS_1
MEM_A_DQS2	MEM_85D	MEM_A_DQS_2
MEM_A_DQS3	MEM_85D	MEM_A_DQS_3
MEM_A_DQS4	MEM_85D	MEM_A_DQS_4
MEM_A_DQS5	MEM_85D	MEM_A_DQS_5
MEM_A_DQS6	MEM_85D	MEM_A_DQS_6
MEM_A_DQS7	MEM_85D	MEM_A_DQS_7
MEM_B_CLK0	MEM_72D	MEM_CLK
MEM_B_CLK0	MEM_72D	MEM_CLK
MEM_B_CLK1	MEM_72D	MEM_CLK
MEM_B_CLK1	MEM_72D	MEM_CLK
MEM_B_CNTRL0	MEM_40S	MEM_CTRL
MEM_B_CNTRL1	MEM_40S	MEM_CTRL
MEM_B_CNTRL0	MEM_40S	MEM_CTRL
MEM_B_CNTRL1	MEM_40S	MEM_CTRL
MEM_B_CNTRL0	MEM_40S	MEM_CTRL
MEM_B_CNTRL1	MEM_40S	MEM_CTRL
MEM_B_CMD	MEM_40S	MEM_CMD
MEM_B_CMD	MEM_40S	MEM_CMD
MEM_B_CMD	MEM_40S	MEM_CMD
MEM_B_CMD	MEM_40S	MEM_CMD
MEM_B_DATA_0	MEM_45S	MEM_B_DATA_0
MEM_B_DATA_1	MEM_45S	MEM_B_DATA_1
MEM_B_DATA_2	MEM_45S	MEM_B_DATA_2
MEM_B_DATA_3	MEM_45S	MEM_B_DATA_3
MEM_B_DATA_4	MEM_45S	MEM_B_DATA_4
MEM_B_DATA_5	MEM_45S	MEM_B_DATA_5
MEM_B_DATA_6	MEM_45S	MEM_B_DATA_6
MEM_B_DATA_7	MEM_45S	MEM_B_DATA_7
MEM_B_DQS0	MEM_85D	MEM_B_DQS_0
MEM_B_DQS1	MEM_85D	MEM_B_DQS_1
MEM_B_DQS2	MEM_85D	MEM_B_DQS_2
MEM_B_DQS3	MEM_85D	MEM_B_DQS_3
MEM_B_DQS4	MEM_85D	MEM_B_DQS_4
MEM_B_DQS5	MEM_85D	MEM_B_DQS_5
MEM_B_DQS6	MEM_85D	MEM_B_DQS_6
MEM_B_DQS7	MEM_85D	MEM_B_DQS_7
MEM_PWR		MEM_PWR
MEM_PWR		MEM_PWR
MEM_PWR		MEM_PWR

SYNC MASTER=SIDLE J45		SYNC DATE=12/10/2012		
PAGE TITLE				
Memory Constraints				
	Apple Inc.		DRAWING NUMBER	SIZE
			<SCH_NUM>	D
		REVISION		
		<E4LABEL>		
NOTICE OF PROPRIETARY PROPERTY:		BRANCH		
THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING: I I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART IV ALL RIGHTS RESERVED		<BRANCH>		
		PAGE	114 OF 118	
		SHEET	78 OF 82	







### MIPI Interface Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW_ROUTE_ON_LAYER?	MINIMUM_LINE_WIDTH	MINIMUM_NECK_WIDTH	MAXIMUM_NECK_LENGTH	DIFFPAIR_PRIMARY_GAP	DIFFPAIR_NECK_GAP
MIPI_85D	*	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF

SPACING_RULE_SET	LAYER	LINE-TO-LINE_SPACING	WEIGHT
MIPI_2OTHER	*	=4X_DIELECTRIC	?
MIPI_2CLK	*	=6X_DIELECTRIC	?
MIPICLK_2OTHER	*	=7X_DIELECTRIC	?

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
MIPI_DATA	*	*	MIPI_2OTHER
MIPI_DATA	CLK_MIPI	*	MIPI_2CLK
CLK_MIPI	*	*	MIPICLK_2OTHER

### Memory Bus Constraints

PHYSICAL_RULE_SET	LAYER	ALLOW_ROUTE_ON_LAYER?	MINIMUM_LINE_WIDTH	MINIMUM_NECK_WIDTH	MAXIMUM_NECK_LENGTH	DIFFPAIR_PRIMARY_GAP	DIFFPAIR_NECK_GAP
S2_MEM_45S	*	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=45_OHM_SE	=STANDARD	=STANDARD
S2_MEM_85D	*	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF	=85_OHM_DIFF

### Spacing Rule Sets

SPACING_RULE_SET	LAYER	LINE-TO-LINE_SPACING	WEIGHT
S2_DATA2SELF	*	=2x_DIELECTRIC	?
S2_DQS2OWNDATA	*	=2x_DIELECTRIC	?
S2_CMD2CMD	*	=2x_DIELECTRIC	?
S2_CMD2CTRL	*	=2x_DIELECTRIC	?
S2_CTRL2CTRL	*	=2x_DIELECTRIC	?
S2_2OTHERMEM	*	=4x_DIELECTRIC	?
S2MEM_2PWR	*	=2x_DIELECTRIC	?
S2MEM_2GND	*	=2x_DIELECTRIC	?
S2MEM_2OTHER	*	=6x_DIELECTRIC	?

SPACING_RULE_SET	LAYER	LINE-TO-LINE_SPACING	WEIGHT
S2_DATA2SELF	TOP,BOTTOM	=4x_DIELECTRIC	?
S2_DQS2OWNDATA	TOP,BOTTOM	=4x_DIELECTRIC	?
S2_CMD2CMD	TOP,BOTTOM	=4x_DIELECTRIC	?
S2_CMD2CTRL	TOP,BOTTOM	=4x_DIELECTRIC	?
S2_CTRL2CTRL	TOP,BOTTOM	=4x_DIELECTRIC	?
S2_2OTHERMEM	TOP,BOTTOM	=6x_DIELECTRIC	?
S2MEM_2PWR	TOP,BOTTOM	=4x_DIELECTRIC	?
S2MEM_2GND	TOP,BOTTOM	=4x_DIELECTRIC	?
S2MEM_2OTHER	TOP,BOTTOM	=10x_DIELECTRIC	?

### Memory Bus Spacing Group Assignments

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
S2_MEM_DATA*	*	*	S2MEM_2OTHER
S2_MEM_DQS*	*	*	S2MEM_2OTHER
S2_MEM_CMD	*	*	S2MEM_2OTHER
S2_MEM_CTRL	*	*	S2MEM_2OTHER
S2_MEM_CLK	*	*	S2MEM_2OTHER
S2_MEM_DATA*	=SAME	*	S2_DATA2SELF
S2_MEM_CMD	S2_MEM_CMD	*	S2_CMD2CMD
S2_MEM_CMD	S2_MEM_CTRL	*	S2_CMD2CTRL
S2_MEM_CTRL	S2_MEM_CTRL	*	S2_CTRL2CTRL
S2_MEM_*	S2_MEM_*	*	S2_2OTHERMEM

NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
S2_MEM_DQS1	S2_MEM_DATA1	*	S2_DQS2OWNDATA
S2_MEM_DQS0	S2_MEM_DATA0	*	S2_DQS2OWNDATA

### Memory to Power Spacing


NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
S2_MEM_PWR	S2_MEM_*	*	S2MEM_2PWR
S2_MEM_PWR	*	*	DEFAULT

### Memory to GND Spacing

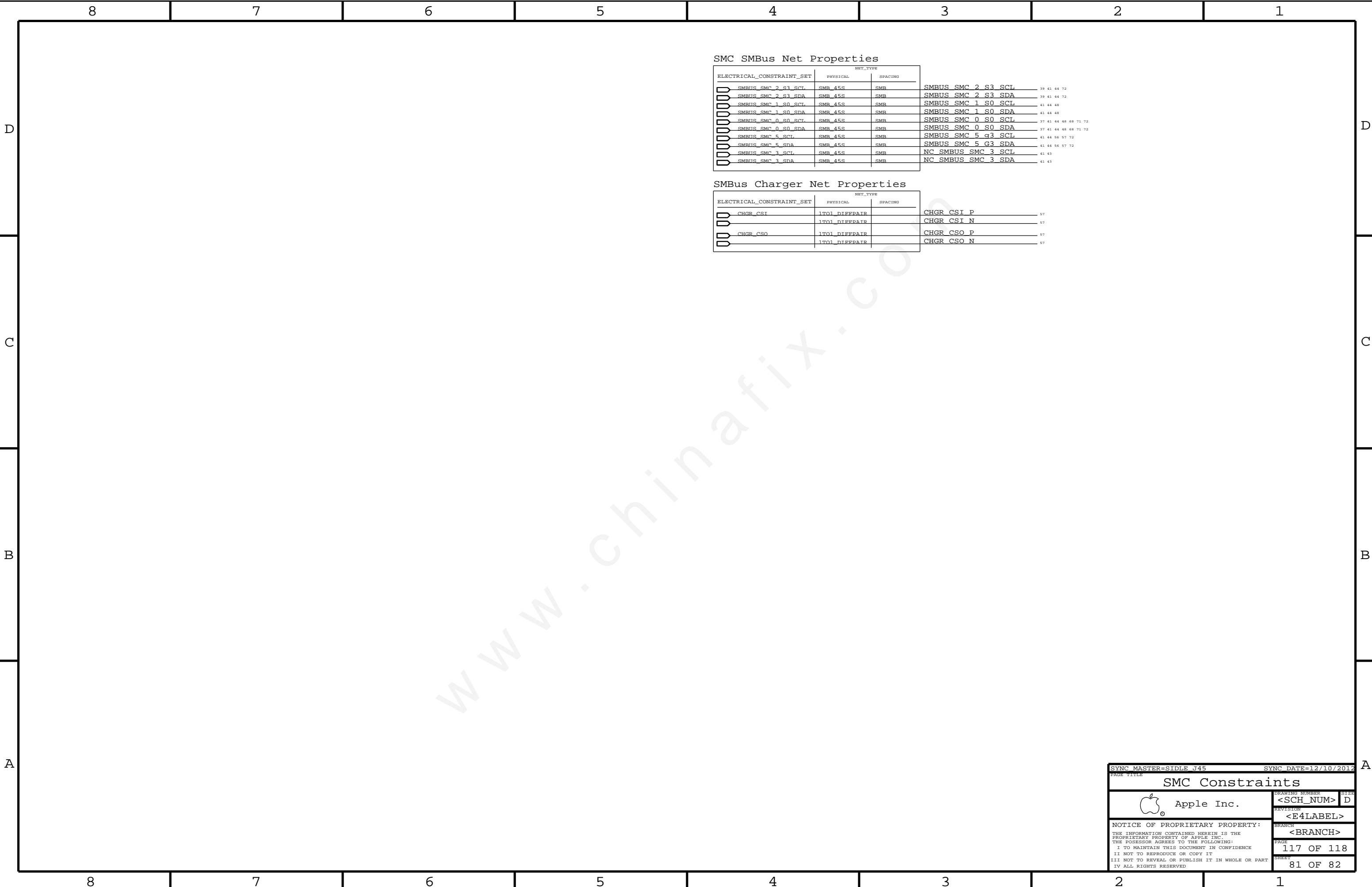
NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET
GND	S2_MEM_*	*	S2MEM_2GND

### Camera Net Properties











ELECTRICAL_CONSTRAINT_SET	NET_TYPE		
	PHYSICAL	SPACING	
S2_MEM_CLK	S2_MEM_85D	S2_MEM_CLK	MEM_CAM_CLK_P 36 37
S2_MEM_CLK	S2_MEM_85D	S2_MEM_CLK	MEM_CAM_CLK_N 36 37
S2_MEM_CNTRL	S2_MEM_45S	S2_MEM_CTRL	MEM_CAM_CKE 36 37
S2_MEM_CNTRL	S2_MEM_45S	S2_MEM_CTRL	MEM_CAM_CS_L 36 37
S2_MEM_CMD	S2_MEM_45S	S2_MEM_CTRL	MEM_CAM_ODT 37
S2_MEM_CMD	S2_MEM_45S	S2_MEM_CTRL	MEM_CAM_CAS_L 36 37
S2_MEM_CMD	S2_MEM_45S	S2_MEM_CTRL	MEM_CAM_RAS_L 36 37
S2_MEM_CMD	S2_MEM_45S	S2_MEM_CMD	MEM_CAM_WE_L 36 37
S2_MEM_CMD	S2_MEM_45S	S2_MEM_CMD	MEM_CAM_BA<0> 36 37
S2_MEM_CMD	S2_MEM_45S	S2_MEM_CMD	MEM_CAM_BA<1> 36 37
S2_MEM_CMD	S2_MEM_45S	S2_MEM_CMD	MEM_CAM_BA<2> 36 37
S2_MEM_DQS0	S2_MEM_85D	S2_MEM_DQS0	MEM_CAM_DQS_P<0> 36 37
S2_MEM_DQS0	S2_MEM_85D	S2_MEM_DQS0	MEM_CAM_DQS_N<0> 36 37
S2_MEM_DQS1	S2_MEM_85D	S2_MEM_DQS1	MEM_CAM_DQS_P<1> 36 37
S2_MEM_DQS1	S2_MEM_85D	S2_MEM_DQS1	MEM_CAM_DQS_N<1> 36 37
S2_MEM_DATA_0	S2_MEM_45S	S2_MEM_DATA0	MEM_CAM_DM<0> 36 37
S2_MEM_DATA_1	S2_MEM_45S	S2_MEM_DATA1	MEM_CAM_DM<1> 36 37
S2_MEM_A	S2_MEM_45S	S2_MEM_CMD	MEM_CAM_A<14..0> 36 37
S2_MEM_DATA_0	S2_MEM_45S	S2_MEM_DATA0	MEM_CAM_DQ<7..0> 36 37
S2_MEM_DATA_1	S2_MEM_45S	S2_MEM_DATA1	MEM_CAM_DQ<15..8> 36 37
MIPI_DATA_S2	MIPI_85D	MIPI_DATA	MIPI_DATA_P 36 37
MIPI_DATA_S2	MIPI_85D	MIPI_DATA	MIPI_DATA_N 36 37
MIPI_DATA_S2	MIPI_85D	MIPI_DATA	MIPI_DATA_CONN_P 37 72
MIPI_DATA_S2	MIPI_85D	MIPI_DATA	MIPI_DATA_CONN_N 37 72
MIPI_CLK_S2	MIPI_85D	CLK_MIPI	MIPI_CLK_P 36 37
MIPI_CLK_S2	MIPI_85D	CLK_MIPI	MIPI_CLK_N 36 37
MIPI_CLK_S2	MIPI_85D	CLK_MIPI	MIPI_CLK_CONN_P 37 72
MIPI_CLK_S2	MIPI_85D	CLK_MIPI	MIPI_CLK_CONN_N 37 72
		S2_MEM_PWR	PP1V35_CAM 36 37
		S2_MEM_PWR	PP0V675_CAM_VREF 36 37
		S2_MEM_PWR	PP0V675_MEM_CAM_VREFCA 37
		S2_MEM_PWR	PP0V675_MEM_CAM_VREFDQ 37

SYNC MASTER=SIDLE J45		SYNC DATE=12/10/2012	
PAGE TITLE			
Camera Constraints			
 Apple Inc.		DRAWING NUMBER	SIZE
		<SCH_NUM>	D
NOTICE OF PROPRIETARY PROPERTY: THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING: I I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART IV ALL RIGHTS RESERVED		REVISION	
		<E4LABEL>	
		BRANCH	
		<BRANCH>	
		PAGE	116 OF 118
		SHEET	80 OF 82









SMC SMBus Net Properties

ELECTRICAL_CONSTRAINT_SET	NET_TYPE			
	PHYSICAL	SPACING		
 SMBUS_SMC_2_S3_SCL	SMB_45S	SMB	SMBUS_SMC_2_S3_SCL	39 41 44 72
 SMBUS_SMC_2_S3_SDA	SMB_45S	SMB	SMBUS_SMC_2_S3_SDA	39 41 44 72
 SMBUS_SMC_1_S0_SCL	SMB_45S	SMB	SMBUS_SMC_1_S0_SCL	41 44 48
 SMBUS_SMC_1_S0_SDA	SMB_45S	SMB	SMBUS_SMC_1_S0_SDA	41 44 48
 SMBUS_SMC_0_S0_SCL	SMB_45S	SMB	SMBUS_SMC_0_S0_SCL	37 41 44 48 68 71 72
 SMBUS_SMC_0_S0_SDA	SMB_45S	SMB	SMBUS_SMC_0_S0_SDA	37 41 44 48 68 71 72
 SMBUS_SMC_5_SCL	SMB_45S	SMB	SMBUS_SMC_5_S3_SCL	41 44 56 57 72
 SMBUS_SMC_5_SDA	SMB_45S	SMB	SMBUS_SMC_5_G3_SDA	41 44 56 57 72
 SMBUS_SMC_3_SCL	SMB_45S	SMB	NC SMBUS_SMC_3_SCL	41 43
 SMBUS_SMC_3_SDA	SMB_45S	SMB	NC SMBUS_SMC_3_SDA	41 43

SMBus Charger Net Properties


ELECTRICAL_CONSTRAINT_SET	NET_TYPE			
	PHYSICAL	SPACING		
 CHGR_CSI	1T01_DIEFPAIR		CHGR_CSI_P	57
	1T01_DIEFPAIR		CHGR_CSI_N	57
 CHGR_CSO	1T01_DIEFPAIR		CHGR_CSO_P	57
	1T01_DIEFPAIR		CHGR_CSO_N	57

SYNC MASTER=SIDLE\_J45

SYNC DATE=12/10/2012

PAGE TITLE

SMC Constraints

 Apple Inc.

DRAWING NUMBER

<SCH\_NUM>

SIZE

D

NOTICE OF PROPRIETARY PROPERTY:  
THE INFORMATION CONTAINED HEREIN IS THE  
PROPRIETARY PROPERTY OF APPLE INC.  
THE POSSESSOR AGREES TO THE FOLLOWING:  
I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE  
II NOT TO REPRODUCE OR COPY IT  
III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART  
IV ALL RIGHTS RESERVED

REVISION

<E4LABEL>

BRANCH

<BRANCH>

PAGE

117 OF 118

SHEET

81 OF 82



8	7	6	5	4	3	2	1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
<table><tr><th>PHYSICAL_RULE_SET</th><th>LAYER</th><th>ALLOW ROUTE ON LAYER?</th><th>MINIMUM LINE WIDTH</th><th>MINIMUM NECK WIDTH</th><th>MAXIMUM NECK LENGTH</th><th>DIFFPAIR PRIMARY GAP</th><th>DIFFPAIR NECK GAP</th></tr><tr><td>SENSE_1T01_50S</td><td>*</td><td>+1:1_DIFFPAIR</td><td>+50_OHM_SE</td><td>+50_OHM_SE</td><td>+50_OHM_SE</td><td>+1:1_DIFFPAIR</td><td>+1:1_DIFFPAIR</td></tr><tr><td>THERM_1T01_50S</td><td>*</td><td>+1:1_DIFFPAIR</td><td>+50_OHM_SE</td><td>+50_OHM_SE</td><td>+50_OHM_SE</td><td>+1:1_DIFFPAIR</td><td>+1:1_DIFFPAIR</td></tr><tr><td>DIFFPAIR</td><td>*</td><td>+1:1_DIFFPAIR</td><td></td><td></td><td></td><td>+1:1_DIFFPAIR</td><td>+1:1_DIFFPAIR</td></tr><tr><td>AUDIODIFF</td><td>*</td><td>+1:1_DIFFPAIR</td><td>0.1 MM</td><td>0.1 MM</td><td>10 MM</td><td>0.1 MM</td><td>0.1 MM</td></tr><tr><td>THERM_45S_CPOVRISNS1</td><td>*</td><td>+1:1_DIFFPAIR</td><td>+45_OHM_SE</td><td>+45_OHM_SE</td><td>+45_OHM_SE</td><td>0.2 MM</td><td>0.2 MM</td></tr><tr><td>THERM_1T01_45S</td><td>*</td><td>+1:1_DIFFPAIR</td><td>+45_OHM_SE</td><td>+45_OHM_SE</td><td>+45_OHM_SE</td><td>+1:1_DIFFPAIR</td><td>+1:1_DIFFPAIR</td></tr><tr><td>SENSE_1T01_45S</td><td>*</td><td>+1:1_DIFFPAIR</td><td>+45_OHM_SE</td><td>+45_OHM_SE</td><td>+45_OHM_SE</td><td>+1:1_DIFFPAIR</td><td>+1:1_DIFFPAIR</td></tr></table>				PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP	SENSE_1T01_50S	*	+1:1_DIFFPAIR	+50_OHM_SE	+50_OHM_SE	+50_OHM_SE	+1:1_DIFFPAIR	+1:1_DIFFPAIR	THERM_1T01_50S	*	+1:1_DIFFPAIR	+50_OHM_SE	+50_OHM_SE	+50_OHM_SE	+1:1_DIFFPAIR	+1:1_DIFFPAIR	DIFFPAIR	*	+1:1_DIFFPAIR				+1:1_DIFFPAIR	+1:1_DIFFPAIR	AUDIODIFF	*	+1:1_DIFFPAIR	0.1 MM	0.1 MM	10 MM	0.1 MM	0.1 MM	THERM_45S_CPOVRISNS1	*	+1:1_DIFFPAIR	+45_OHM_SE	+45_OHM_SE	+45_OHM_SE	0.2 MM	0.2 MM	THERM_1T01_45S	*	+1:1_DIFFPAIR	+45_OHM_SE	+45_OHM_SE	+45_OHM_SE	+1:1_DIFFPAIR	+1:1_DIFFPAIR	SENSE_1T01_45S	*	+1:1_DIFFPAIR	+45_OHM_SE	+45_OHM_SE	+45_OHM_SE	+1:1_DIFFPAIR	+1:1_DIFFPAIR	<table><tr><th>SPACING_RULE_SET</th><th>LAYER</th><th>LINE-TO-LINE SPACING</th><th>WEIGHT</th></tr><tr><td>SENSE</td><td>*</td><td>+2X_DIELECTRIC</td><td>?</td></tr><tr><td>THERM</td><td>*</td><td>+2X_DIELECTRIC</td><td>?</td></tr><tr><td>AUDIO</td><td>*</td><td>+2X_DIELECTRIC</td><td>?</td></tr></table>				SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT	SENSE	*	+2X_DIELECTRIC	?	THERM	*	+2X_DIELECTRIC	?	AUDIO	*	+2X_DIELECTRIC	?	<table><tr><th>NET_SPACING_TYPE1</th><th>NET_SPACING_TYPE2</th><th>AREA_TYPE</th><th>SPACING_RULE_SET</th></tr><tr><td>CPU_COMP</td><td>GND</td><td>*</td><td>GND_P20M</td></tr><tr><td>CPU_VCCSENSE</td><td>GND</td><td>*</td><td>GND_P20M</td></tr></table>				NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET	CPU_COMP	GND	*	GND_P20M	CPU_VCCSENSE	GND	*	GND_P20M	<table><tr><th>NET_SPACING_TYPE1</th><th>NET_SPACING_TYPE2</th><th>AREA_TYPE</th><th>SPACING_RULE_SET</th></tr><tr><td>CLK_PCIE</td><td>GND</td><td>*</td><td>GND_P20M</td></tr><tr><td>GND</td><td>PCIE_*</td><td>*</td><td>GND_P20M</td></tr><tr><td>GND</td><td>SATA_*</td><td>*</td><td>GND_P20M</td></tr><tr><td>USB</td><td>GND</td><td>*</td><td>GND_P20M</td></tr><tr><td>CLK_PCIE</td><td>SB_POWER</td><td>*</td><td>PWR_P20M</td></tr><tr><td>SB_POWER</td><td>SATA_*</td><td>*</td><td>PWR_P20M</td></tr><tr><td>USB</td><td>SB_POWER</td><td>*</td><td>PWR_P20M</td></tr></table>				NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET	CLK_PCIE	GND	*	GND_P20M	GND	PCIE_*	*	GND_P20M	GND	SATA_*	*	GND_P20M	USB	GND	*	GND_P20M	CLK_PCIE	SB_POWER	*	PWR_P20M	SB_POWER	SATA_*	*	PWR_P20M	USB	SB_POWER	*	PWR_P20M	<table><tr><th>PHYSICAL_RULE_SET</th><th>LAYER</th><th>ALLOW ROUTE ON LAYER?</th><th>MINIMUM LINE WIDTH</th><th>MINIMUM NECK WIDTH</th><th>MAXIMUM NECK LENGTH</th><th>DIFFPAIR PRIMARY GAP</th><th>DIFFPAIR NECK GAP</th></tr><tr><td>MEM_40S</td><td>*</td><td>OVERWRITE</td><td>OVERWRITE</td><td>0.09 MM</td><td>100 MIL</td><td>OVERWRITE</td><td>OVERWRITE</td></tr><tr><td>MEM_72D</td><td>*</td><td>OVERWRITE</td><td>OVERWRITE</td><td>0.09 MM</td><td>100 MIL</td><td>OVERWRITE</td><td>OVERWRITE</td></tr><tr><td>MEM_37S</td><td>*</td><td>OVERWRITE</td><td>OVERWRITE</td><td>0.09 MM</td><td>100 MIL</td><td>OVERWRITE</td><td>OVERWRITE</td></tr><tr><td>MEM_85D</td><td>*</td><td>OVERWRITE</td><td>OVERWRITE</td><td>0.09 MM</td><td>100 MIL</td><td>OVERWRITE</td><td>OVERWRITE</td></tr><tr><td>PCIE_85D</td><td>*</td><td>OVERWRITE</td><td>OVERWRITE</td><td>0.09 MM</td><td>10 MM</td><td>OVERWRITE</td><td>OVERWRITE</td></tr><tr><td>USB_85D</td><td>TOP</td><td></td><td></td><td>0.1 MM</td><td>500 MIL</td><td></td><td></td></tr><tr><td>CPU_27P4S</td><td>BOTTOM</td><td></td><td></td><td>0.23 MM</td><td>100 MIL</td><td></td><td></td></tr><tr><td>USB3_85D</td><td>TOP</td><td></td><td></td><td>0.1 MM</td><td>500 MIL</td><td></td><td></td></tr><tr><td>USB3_85D</td><td>ISL10</td><td></td><td></td><td>0.075 MM</td><td></td><td></td><td>0.090 MM</td></tr><tr><td>DP_85D</td><td>ISL9</td><td></td><td></td><td>0.075 MM</td><td></td><td></td><td>0.090 MM</td></tr><tr><td>PCIE_85D</td><td>ISL10</td><td></td><td></td><td>0.075 MM</td><td></td><td></td><td>0.090 MM</td></tr></table>				PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP	MEM_40S	*	OVERWRITE	OVERWRITE	0.09 MM	100 MIL	OVERWRITE	OVERWRITE	MEM_72D	*	OVERWRITE	OVERWRITE	0.09 MM	100 MIL	OVERWRITE	OVERWRITE	MEM_37S	*	OVERWRITE	OVERWRITE	0.09 MM	100 MIL	OVERWRITE	OVERWRITE	MEM_85D	*	OVERWRITE	OVERWRITE	0.09 MM	100 MIL	OVERWRITE	OVERWRITE	PCIE_85D	*	OVERWRITE	OVERWRITE	0.09 MM	10 MM	OVERWRITE	OVERWRITE	USB_85D	TOP			0.1 MM	500 MIL			CPU_27P4S	BOTTOM			0.23 MM	100 MIL			USB3_85D	TOP			0.1 MM	500 MIL			USB3_85D	ISL10			0.075 MM			0.090 MM	DP_85D	ISL9			0.075 MM			0.090 MM	PCIE_85D	ISL10			0.075 MM			0.090 MM	<table><tr><th>NET_PHYSICAL_TYPE</th><th>AREA_TYPE</th><th>PHYSICAL_RULE_SET</th></tr><tr><td>1T01_DIFFPAIR</td><td>*</td><td>1:1_DIFFPAIR</td></tr></table>				NET_PHYSICAL_TYPE	AREA_TYPE	PHYSICAL_RULE_SET	1T01_DIFFPAIR	*	1:1_DIFFPAIR	<table><tr><th>NET_TYPE</th><th>PHYSICAL</th><th>SPACING</th></tr><tr><td>ISNS CPUDDR P</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>ISNS CPUDDR N</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>ISNS CPU DDR R P</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>ISNS CPU DDR R N</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>CPUTHMSNS D2 P</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>CPUTHMSNS D2 N</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>ISNS LCD PANEL P</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS LCD PANEL N</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>DDR3THMSNS D1 P</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>DDR3THMSNS D1 N</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>FINTHMSNS D P</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>FINTHMSNS D N</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>ISNS 1V35 MEM P</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS 1V35 MEM N</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS 1V35 MEM R P</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS 1V35 MEM R N</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS AIRPORT P</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS AIRPORT N</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS AIRPORT R P</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS AIRPORT R N</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS LCDBKLT P</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS LCDBKLT N</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS LCD PANEL P</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS LCD PANEL N</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS PCH P</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS PCH N</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS PCH R P</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS PCH R N</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS TPAD P</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS TPAD N</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS HS OTHER5V P</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS HS OTHER5V N</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS HS OTHER3V3 P</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS HS OTHER3V3 N</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS HS COMPUTING P</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS HS COMPUTING N</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>CPUVR ISNS P</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>CPUVR ISNS N</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>P1V05 GPU PEX IOVDD SNS P</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>P1V05 GPU PEX IOVDD SNS N</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>DIFFERENTIAL_PAIR</td><td></td><td></td></tr><tr><td>CPUVR ISNS1 P</td><td>THERM 45S CPUVRISNS1</td><td>THERM</td></tr><tr><td>CPUVR ISNS1 N</td><td>THERM 45S CPUVRISNS1</td><td>THERM</td></tr><tr><td>CPUVR ISNS2 P</td><td>THERM 45S CPUVRISNS1</td><td>THERM</td></tr><tr><td>CPUVR ISNS2 N</td><td>THERM 45S CPUVRISNS1</td><td>THERM</td></tr><tr><td>CPUVR ISNS3 P</td><td>THERM 45S CPUVRISNS1</td><td>THERM</td></tr><tr><td>CPUVR ISNS3 N</td><td>THERM 45S CPUVRISNS1</td><td>THERM</td></tr><tr><td>CPUVR ISNS3</td><td>THERM 45S CPUVRISNS</td><td>THERM</td></tr><tr><td>CPUVR ISNS3</td><td>THERM 45S CPUVRISNS</td><td>THERM</td></tr><tr><td>CPUVR ISUM R P</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>CPUVR ISUM R N</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>GFXIMVP ISNS1 P</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>GFXIMVP ISNS1 N</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>GFXIMVP ISNS1 P</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>GFXIMVP ISNS1 N</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>ISNS TBT N</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>ISNS TBT P</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>ISNS TBT R N</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>ISNS TBT R P</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>ISNS SSD P</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>ISNS SSD N</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>ISNS SSD R P</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>ISNS SSD R N</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>P1V05S0 CS P</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>P1V05S0 CS N</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>P1V05S0 SENSE P</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>P1V05S0 SENSE N</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>TBT THERMDP</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>TBT THERMDN</td><td>THERM 1T01_45S</td><td>THERM</td></tr><tr><td>CHGR CSI R P</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>CHGR CSI R N</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>CHGR CSO R P</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>CHGR CSO R N</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>ISNS S2 P</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS S2 N</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS S2 R P</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr><tr><td>ISNS S2 R N</td><td>SENSE 1T01_45S</td><td>SENSE</td></tr></table>				NET_TYPE	PHYSICAL	SPACING	ISNS CPUDDR P	THERM 1T01_45S	THERM	ISNS CPUDDR N	THERM 1T01_45S	THERM	ISNS CPU DDR R P	THERM 1T01_45S	THERM	ISNS CPU DDR R N	THERM 1T01_45S	THERM	CPUTHMSNS D2 P	THERM 1T01_45S	THERM	CPUTHMSNS D2 N	THERM 1T01_45S	THERM	ISNS LCD PANEL P	SENSE 1T01_45S	SENSE	ISNS LCD PANEL N	SENSE 1T01_45S	SENSE	DDR3THMSNS D1 P	THERM 1T01_45S	THERM	DDR3THMSNS D1 N	THERM 1T01_45S	THERM	FINTHMSNS D P	THERM 1T01_45S	THERM	FINTHMSNS D N	THERM 1T01_45S	THERM	ISNS 1V35 MEM P	SENSE 1T01_45S	SENSE	ISNS 1V35 MEM N	SENSE 1T01_45S	SENSE	ISNS 1V35 MEM R P	SENSE 1T01_45S	SENSE	ISNS 1V35 MEM R N	SENSE 1T01_45S	SENSE	ISNS AIRPORT P	SENSE 1T01_45S	SENSE	ISNS AIRPORT N	SENSE 1T01_45S	SENSE	ISNS AIRPORT R P	SENSE 1T01_45S	SENSE	ISNS AIRPORT R N	SENSE 1T01_45S	SENSE	ISNS LCDBKLT P	SENSE 1T01_45S	SENSE	ISNS LCDBKLT N	SENSE 1T01_45S	SENSE	ISNS LCD PANEL P	SENSE 1T01_45S	SENSE	ISNS LCD PANEL N	SENSE 1T01_45S	SENSE	ISNS PCH P	SENSE 1T01_45S	SENSE	ISNS PCH N	SENSE 1T01_45S	SENSE	ISNS PCH R P	SENSE 1T01_45S	SENSE	ISNS PCH R N	SENSE 1T01_45S	SENSE	ISNS TPAD P	SENSE 1T01_45S	SENSE	ISNS TPAD N	SENSE 1T01_45S	SENSE	ISNS HS OTHER5V P	SENSE 1T01_45S	SENSE	ISNS HS OTHER5V N	SENSE 1T01_45S	SENSE	ISNS HS OTHER3V3 P	SENSE 1T01_45S	SENSE	ISNS HS OTHER3V3 N	SENSE 1T01_45S	SENSE	ISNS HS COMPUTING P	SENSE 1T01_45S	SENSE	ISNS HS COMPUTING N	SENSE 1T01_45S	SENSE	CPUVR ISNS P	SENSE 1T01_45S	SENSE	CPUVR ISNS N	SENSE 1T01_45S	SENSE	P1V05 GPU PEX IOVDD SNS P	THERM 1T01_45S	THERM	P1V05 GPU PEX IOVDD SNS N	THERM 1T01_45S	THERM	DIFFERENTIAL_PAIR			CPUVR ISNS1 P	THERM 45S CPUVRISNS1	THERM	CPUVR ISNS1 N	THERM 45S CPUVRISNS1	THERM	CPUVR ISNS2 P	THERM 45S CPUVRISNS1	THERM	CPUVR ISNS2 N	THERM 45S CPUVRISNS1	THERM	CPUVR ISNS3 P	THERM 45S CPUVRISNS1	THERM	CPUVR ISNS3 N	THERM 45S CPUVRISNS1	THERM	CPUVR ISNS3	THERM 45S CPUVRISNS	THERM	CPUVR ISNS3	THERM 45S CPUVRISNS	THERM	CPUVR ISUM R P	THERM 1T01_45S	THERM	CPUVR ISUM R N	THERM 1T01_45S	THERM	GFXIMVP ISNS1 P	THERM 1T01_45S	THERM	GFXIMVP ISNS1 N	THERM 1T01_45S	THERM	GFXIMVP ISNS1 P	THERM 1T01_45S	THERM	GFXIMVP ISNS1 N	THERM 1T01_45S	THERM	ISNS TBT N	AUDIODIFF	AUDIO	ISNS TBT P	AUDIODIFF	AUDIO	ISNS TBT R N	AUDIODIFF	AUDIO	ISNS TBT R P	AUDIODIFF	AUDIO	ISNS SSD P	THERM 1T01_45S	THERM	ISNS SSD N	THERM 1T01_45S	THERM	ISNS SSD R P	THERM 1T01_45S	THERM	ISNS SSD R N	THERM 1T01_45S	THERM	P1V05S0 CS P	THERM 1T01_45S	THERM	P1V05S0 CS N	THERM 1T01_45S	THERM	P1V05S0 SENSE P	THERM 1T01_45S	THERM	P1V05S0 SENSE N	THERM 1T01_45S	THERM	TBT THERMDP	THERM 1T01_45S	THERM	TBT THERMDN	THERM 1T01_45S	THERM	CHGR CSI R P	AUDIODIFF	AUDIO	CHGR CSI R N	AUDIODIFF	AUDIO	CHGR CSO R P	AUDIODIFF	AUDIO	CHGR CSO R N	AUDIODIFF	AUDIO	ISNS S2 P	SENSE 1T01_45S	SENSE	ISNS S2 N	SENSE 1T01_45S	SENSE	ISNS S2 R P	SENSE 1T01_45S	SENSE	ISNS S2 R N	SENSE 1T01_45S	SENSE	<table><tr><th>NET_TYPE</th><th>PHYSICAL</th><th>SPACING</th></tr><tr><td>AUD SPKRAMP RSUBIN P</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>AUD SPKRAMP RSUBIN N</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>AUD SPKRAMP LSUBIN P</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>AUD SPKRAMP LSUBIN N</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>RSUBIN_P</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>RSUBIN N</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>LSUBIN P</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>LSUBIN N</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>AUD LO2 R P</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>AUD LO2 R N</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>AUD LO2 L P</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>AUD LO2 L N</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>AUD SPKRAMP RIN P</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>AUD SPKRAMP RIN N</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>AUD SPKRAMP LIN P</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>AUD SPKRAMP LIN N</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>SPKRAMP RIN P</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>SPKRAMP RIN N</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>SPKRAMP LIN P</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>SPKRAMP LIN N</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>SPKRCONN SL OUT P</td><td>DIFFPAIR</td><td>AUDIO</td></tr><tr><td>SPKRCONN SL OUT N</td><td>DIFFPAIR</td><td>AUDIO</td></tr><tr><td>SPKRCONN SR OUT P</td><td>DIFFPAIR</td><td>AUDIO</td></tr><tr><td>SPKRCONN SR OUT N</td><td>DIFFPAIR</td><td>AUDIO</td></tr><tr><td>SPKRCONN L OUT P</td><td>DIFFPAIR</td><td>AUDIO</td></tr><tr><td>SPKRCONN L OUT N</td><td>DIFFPAIR</td><td>AUDIO</td></tr><tr><td>SPKRCONN R OUT P</td><td>DIFFPAIR</td><td>AUDIO</td></tr><tr><td>SPKRCONN R OUT N</td><td>DIFFPAIR</td><td>AUDIO</td></tr><tr><td>AUD MIC IN1 R P</td><td>DIFFPAIR</td><td>AUDIO</td></tr><tr><td>AUD MIC IN1 R N</td><td>DIFFPAIR</td><td>AUDIO</td></tr><tr><td>CODEC HS MIC P</td><td>DIFFPAIR</td><td>AUDIO</td></tr><tr><td>CODEC HS MIC N</td><td>DIFFPAIR</td><td>AUDIO</td></tr><tr><td>AUD MIC IN1 L P</td><td>DIFFPAIR</td><td>AUDIO</td></tr><tr><td>AUD MIC IN1 L N</td><td>DIFFPAIR</td><td>AUDIO</td></tr><tr><td>AUD HS MIC P</td><td>DIFFPAIR</td><td>AUDIO</td></tr><tr><td>AUD HS MIC N</td><td>DIFFPAIR</td><td>AUDIO</td></tr><tr><td>HS MIC P</td><td>DIFFPAIR</td><td>AUDIO</td></tr><tr><td>HS MIC N</td><td>DIFFPAIR</td><td>AUDIO</td></tr><tr><td>AUD CONN HS MIC P</td><td>DIFFPAIR</td><td>AUDIO</td></tr><tr><td>AUD CONN HS MIC N</td><td>DIFFPAIR</td><td>AUDIO</td></tr><tr><td>AUD LO3 R P</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>AUD LO3 R N</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>AUD LO3 L P</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>AUD LO3 L N</td><td>AUDIODIFF</td><td>AUDIO</td></tr><tr><td>PP3V3 S5</td><td>SB_POWER</td><td></td></tr><tr><td>PP3V3 S0</td><td>SB_POWER</td><td></td></tr><tr><td>PP1V35 S3RS0 CPUDDR</td><td>SB_POWER</td><td></td></tr><tr><td>GND</td><td>GND</td><td></td></tr></table>				NET_TYPE	PHYSICAL	SPACING	AUD SPKRAMP RSUBIN P	AUDIODIFF	AUDIO	AUD SPKRAMP RSUBIN N	AUDIODIFF	AUDIO	AUD SPKRAMP LSUBIN P	AUDIODIFF	AUDIO	AUD SPKRAMP LSUBIN N	AUDIODIFF	AUDIO	RSUBIN_P	AUDIODIFF	AUDIO	RSUBIN N	AUDIODIFF	AUDIO	LSUBIN P	AUDIODIFF	AUDIO	LSUBIN N	AUDIODIFF	AUDIO	AUD LO2 R P	AUDIODIFF	AUDIO	AUD LO2 R N	AUDIODIFF	AUDIO	AUD LO2 L P	AUDIODIFF	AUDIO	AUD LO2 L N	AUDIODIFF	AUDIO	AUD SPKRAMP RIN P	AUDIODIFF	AUDIO	AUD SPKRAMP RIN N	AUDIODIFF	AUDIO	AUD SPKRAMP LIN P	AUDIODIFF	AUDIO	AUD SPKRAMP LIN N	AUDIODIFF	AUDIO	SPKRAMP RIN P	AUDIODIFF	AUDIO	SPKRAMP RIN N	AUDIODIFF	AUDIO	SPKRAMP LIN P	AUDIODIFF	AUDIO	SPKRAMP LIN N	AUDIODIFF	AUDIO	SPKRCONN SL OUT P	DIFFPAIR	AUDIO	SPKRCONN SL OUT N	DIFFPAIR	AUDIO	SPKRCONN SR OUT P	DIFFPAIR	AUDIO	SPKRCONN SR OUT N	DIFFPAIR	AUDIO	SPKRCONN L OUT P	DIFFPAIR	AUDIO	SPKRCONN L OUT N	DIFFPAIR	AUDIO	SPKRCONN R OUT P	DIFFPAIR	AUDIO	SPKRCONN R OUT N	DIFFPAIR	AUDIO	AUD MIC IN1 R P	DIFFPAIR	AUDIO	AUD MIC IN1 R N	DIFFPAIR	AUDIO	CODEC HS MIC P	DIFFPAIR	AUDIO	CODEC HS MIC N	DIFFPAIR	AUDIO	AUD MIC IN1 L P	DIFFPAIR	AUDIO	AUD MIC IN1 L N	DIFFPAIR	AUDIO	AUD HS MIC P	DIFFPAIR	AUDIO	AUD HS MIC N	DIFFPAIR	AUDIO	HS MIC P	DIFFPAIR	AUDIO	HS MIC N	DIFFPAIR	AUDIO	AUD CONN HS MIC P	DIFFPAIR	AUDIO	AUD CONN HS MIC N	DIFFPAIR	AUDIO	AUD LO3 R P	AUDIODIFF	AUDIO	AUD LO3 R N	AUDIODIFF	AUDIO	AUD LO3 L P	AUDIODIFF	AUDIO	AUD LO3 L N	AUDIODIFF	AUDIO	PP3V3 S5	SB_POWER		PP3V3 S0	SB_POWER		PP1V35 S3RS0 CPUDDR	SB_POWER		GND	GND	
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
SENSE_1T01_50S	*	+1:1_DIFFPAIR	+50_OHM_SE	+50_OHM_SE	+50_OHM_SE	+1:1_DIFFPAIR	+1:1_DIFFPAIR																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
THERM_1T01_50S	*	+1:1_DIFFPAIR	+50_OHM_SE	+50_OHM_SE	+50_OHM_SE	+1:1_DIFFPAIR	+1:1_DIFFPAIR																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
DIFFPAIR	*	+1:1_DIFFPAIR				+1:1_DIFFPAIR	+1:1_DIFFPAIR																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
AUDIODIFF	*	+1:1_DIFFPAIR	0.1 MM	0.1 MM	10 MM	0.1 MM	0.1 MM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
THERM_45S_CPOVRISNS1	*	+1:1_DIFFPAIR	+45_OHM_SE	+45_OHM_SE	+45_OHM_SE	0.2 MM	0.2 MM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
THERM_1T01_45S	*	+1:1_DIFFPAIR	+45_OHM_SE	+45_OHM_SE	+45_OHM_SE	+1:1_DIFFPAIR	+1:1_DIFFPAIR																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
SENSE_1T01_45S	*	+1:1_DIFFPAIR	+45_OHM_SE	+45_OHM_SE	+45_OHM_SE	+1:1_DIFFPAIR	+1:1_DIFFPAIR																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
SPACING_RULE_SET	LAYER	LINE-TO-LINE SPACING	WEIGHT																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
SENSE	*	+2X_DIELECTRIC	?																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
THERM	*	+2X_DIELECTRIC	?																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
AUDIO	*	+2X_DIELECTRIC	?																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
CPU_COMP	GND	*	GND_P20M																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
CPU_VCCSENSE	GND	*	GND_P20M																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
NET_SPACING_TYPE1	NET_SPACING_TYPE2	AREA_TYPE	SPACING_RULE_SET																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
CLK_PCIE	GND	*	GND_P20M																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
GND	PCIE_*	*	GND_P20M																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
GND	SATA_*	*	GND_P20M																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
USB	GND	*	GND_P20M																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
CLK_PCIE	SB_POWER	*	PWR_P20M																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
SB_POWER	SATA_*	*	PWR_P20M																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
USB	SB_POWER	*	PWR_P20M																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
PHYSICAL_RULE_SET	LAYER	ALLOW ROUTE ON LAYER?	MINIMUM LINE WIDTH	MINIMUM NECK WIDTH	MAXIMUM NECK LENGTH	DIFFPAIR PRIMARY GAP	DIFFPAIR NECK GAP																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
MEM_40S	*	OVERWRITE	OVERWRITE	0.09 MM	100 MIL	OVERWRITE	OVERWRITE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
MEM_72D	*	OVERWRITE	OVERWRITE	0.09 MM	100 MIL	OVERWRITE	OVERWRITE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
MEM_37S	*	OVERWRITE	OVERWRITE	0.09 MM	100 MIL	OVERWRITE	OVERWRITE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
MEM_85D	*	OVERWRITE	OVERWRITE	0.09 MM	100 MIL	OVERWRITE	OVERWRITE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
PCIE_85D	*	OVERWRITE	OVERWRITE	0.09 MM	10 MM	OVERWRITE	OVERWRITE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
USB_85D	TOP			0.1 MM	500 MIL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
CPU_27P4S	BOTTOM			0.23 MM	100 MIL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
USB3_85D	TOP			0.1 MM	500 MIL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
USB3_85D	ISL10			0.075 MM			0.090 MM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
DP_85D	ISL9			0.075 MM			0.090 MM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
PCIE_85D	ISL10			0.075 MM			0.090 MM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
NET_PHYSICAL_TYPE	AREA_TYPE	PHYSICAL_RULE_SET																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
1T01_DIFFPAIR	*	1:1_DIFFPAIR																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
NET_TYPE	PHYSICAL	SPACING																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS CPUDDR P	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS CPUDDR N	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS CPU DDR R P	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS CPU DDR R N	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
CPUTHMSNS D2 P	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
CPUTHMSNS D2 N	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS LCD PANEL P	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS LCD PANEL N	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
DDR3THMSNS D1 P	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
DDR3THMSNS D1 N	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
FINTHMSNS D P	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
FINTHMSNS D N	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS 1V35 MEM P	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS 1V35 MEM N	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS 1V35 MEM R P	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS 1V35 MEM R N	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS AIRPORT P	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS AIRPORT N	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS AIRPORT R P	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS AIRPORT R N	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS LCDBKLT P	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS LCDBKLT N	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS LCD PANEL P	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS LCD PANEL N	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS PCH P	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS PCH N	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS PCH R P	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS PCH R N	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS TPAD P	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS TPAD N	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS HS OTHER5V P	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS HS OTHER5V N	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS HS OTHER3V3 P	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS HS OTHER3V3 N	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS HS COMPUTING P	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS HS COMPUTING N	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
CPUVR ISNS P	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
CPUVR ISNS N	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
P1V05 GPU PEX IOVDD SNS P	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
P1V05 GPU PEX IOVDD SNS N	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
DIFFERENTIAL_PAIR																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
CPUVR ISNS1 P	THERM 45S CPUVRISNS1	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
CPUVR ISNS1 N	THERM 45S CPUVRISNS1	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
CPUVR ISNS2 P	THERM 45S CPUVRISNS1	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
CPUVR ISNS2 N	THERM 45S CPUVRISNS1	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
CPUVR ISNS3 P	THERM 45S CPUVRISNS1	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
CPUVR ISNS3 N	THERM 45S CPUVRISNS1	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
CPUVR ISNS3	THERM 45S CPUVRISNS	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
CPUVR ISNS3	THERM 45S CPUVRISNS	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
CPUVR ISUM R P	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
CPUVR ISUM R N	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
GFXIMVP ISNS1 P	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
GFXIMVP ISNS1 N	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
GFXIMVP ISNS1 P	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
GFXIMVP ISNS1 N	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS TBT N	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS TBT P	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS TBT R N	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS TBT R P	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS SSD P	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS SSD N	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS SSD R P	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS SSD R N	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
P1V05S0 CS P	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
P1V05S0 CS N	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
P1V05S0 SENSE P	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
P1V05S0 SENSE N	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
TBT THERMDP	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
TBT THERMDN	THERM 1T01_45S	THERM																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
CHGR CSI R P	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
CHGR CSI R N	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
CHGR CSO R P	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
CHGR CSO R N	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS S2 P	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS S2 N	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS S2 R P	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
ISNS S2 R N	SENSE 1T01_45S	SENSE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
NET_TYPE	PHYSICAL	SPACING																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD SPKRAMP RSUBIN P	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD SPKRAMP RSUBIN N	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD SPKRAMP LSUBIN P	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD SPKRAMP LSUBIN N	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
RSUBIN_P	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
RSUBIN N	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
LSUBIN P	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
LSUBIN N	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD LO2 R P	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD LO2 R N	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD LO2 L P	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD LO2 L N	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD SPKRAMP RIN P	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD SPKRAMP RIN N	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD SPKRAMP LIN P	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD SPKRAMP LIN N	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
SPKRAMP RIN P	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
SPKRAMP RIN N	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
SPKRAMP LIN P	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
SPKRAMP LIN N	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
SPKRCONN SL OUT P	DIFFPAIR	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
SPKRCONN SL OUT N	DIFFPAIR	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
SPKRCONN SR OUT P	DIFFPAIR	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
SPKRCONN SR OUT N	DIFFPAIR	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
SPKRCONN L OUT P	DIFFPAIR	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
SPKRCONN L OUT N	DIFFPAIR	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
SPKRCONN R OUT P	DIFFPAIR	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
SPKRCONN R OUT N	DIFFPAIR	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD MIC IN1 R P	DIFFPAIR	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD MIC IN1 R N	DIFFPAIR	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
CODEC HS MIC P	DIFFPAIR	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
CODEC HS MIC N	DIFFPAIR	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD MIC IN1 L P	DIFFPAIR	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD MIC IN1 L N	DIFFPAIR	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD HS MIC P	DIFFPAIR	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD HS MIC N	DIFFPAIR	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
HS MIC P	DIFFPAIR	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
HS MIC N	DIFFPAIR	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD CONN HS MIC P	DIFFPAIR	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD CONN HS MIC N	DIFFPAIR	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD LO3 R P	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD LO3 R N	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD LO3 L P	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
AUD LO3 L N	AUDIODIFF	AUDIO																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
PP3V3 S5	SB_POWER																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
PP3V3 S0	SB_POWER																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
PP1V35 S3RS0 CPUDDR	SB_POWER																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
GND	GND																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
<div>Project Specific Constraints</div> <div>Apple Inc.</div> <div>NOTICE OF PROPRIETARY PROPERTY: THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING: I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART IV ALL RIGHTS RESERVED</div>				<div>Project Specific Constraints</div> <div>Apple Inc.</div> <div>NOTICE OF PROPRIETARY PROPERTY: THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE INC. THE POSSESSOR AGREES TO THE FOLLOWING: I TO MAINTAIN THIS DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IT IN WHOLE OR PART IV ALL RIGHTS RESERVED</div>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
8	7	6	5	4	3	2	1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							