

8

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

REV	ZONE	ECN	DESCRIPTION OF CHANGE	CK APPD	ENG APPD
				DATE	DATE
A		554161	PRODUCTION RELEASED	12/18/07	?



SCHEM, LIO, M87, MBP15

12/18/07

PVT

PDF PAGE	CSA PAGE	CONTENTS	SYNC MASTER	DATE
1	1	Table of Contents		
2	2	Block Diagram		
3	4	BOM Configuration	(Master)	(Master)
4	9	Aliases	(Master)	(Master)
5	34	PCI-E MiniCard Connector	(Master)	(Master)
6	35	ExpressCard Connector	(Master)	(Master)
7	36	MLB I/O Board Connector	(Master)	(Master)
8	46	Left USB Port	(Master)	(Master)
9	57	Current & Thermal Sensors	(Master)	(Master)
10	62	AUDIO:CODEC	LENGO_M87_AUDIO	11/01/2007
11	65	AUDIO: HEADPHONE AMP	LENGO_M87_AUDIO	11/01/2007
12	66	AUDIO:SPEAKER AMP	LENGO_M87_AUDIO	11/01/2007
13	67	AUDIO: JACKS	LENGO_M87_AUDIO	11/01/2007
14	68	AUDIO: JACK TRANSLATORS	LENGO_M87_AUDIO	11/01/2007
15	69	DC-In & Battery Connectors	(Master)	(Master)
16	76	5V/3.3V SUPPLY	<MASTER>	<MASTER>
17	79	PBus Supply & Batt. Charger	(Master)	(Master)
18	90	Inverter Connector	SPLIT_INVERTER	12/06/2006
19	98	LCD Backlight Support	M88_MLB	07/05/2007
20	99	Cross Reference Page		
21	100	Cross Reference Page		
22	101	Cross Reference Page		
23	102	Cross Reference Page		

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
051-7447	1	SCHEM, DUBLIN, M87	SCH1	CRITICAL	
820-2273	1	PCBF, DUBLIN, M87	PCB1	CRITICAL	

<p>DIMENSIONS ARE IN MILLIMETERS</p> <p>XX : _____</p> <p>X.XX : _____</p> <p>X.XXX : _____</p> <p>ANGLES : _____</p> <p>DO NOT SCALE DRAWING</p> <p style="text-align: center;"></p> <p>THIRD ANGLE PROJECTION</p>	<p>METRIC</p>	 APPLE INC.												
<table border="1" style="width: 100%;"> <tr> <td>DRAPTER</td><td>DESIGN CK</td></tr> <tr> <td>ENG APPD</td><td>MFG APPD</td></tr> <tr> <td>QA APPD</td><td>DESIGNER</td></tr> <tr> <td>RELEASE</td><td>SCALE</td></tr> <tr> <td></td><td>NONE</td></tr> <tr> <td>MATERIAL/FINISH NOTED AS APPLICABLE</td><td>SIZE D</td></tr> </table>		DRAPTER	DESIGN CK	ENG APPD	MFG APPD	QA APPD	DESIGNER	RELEASE	SCALE		NONE	MATERIAL/FINISH NOTED AS APPLICABLE	SIZE D	<p>NOTICE OF PROPRIETARY PROPERTY</p> <p>THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING</p> <p>I TO MAINTAIN THE DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART</p> <p style="text-align: center;">SCHEM, DUBLIN, M87</p>
DRAPTER	DESIGN CK													
ENG APPD	MFG APPD													
QA APPD	DESIGNER													
RELEASE	SCALE													
	NONE													
MATERIAL/FINISH NOTED AS APPLICABLE	SIZE D													
		<p>DRAWING NUMBER 051-7447 REV. A</p> <p style="text-align: right; font-size: small;">SHT 1 OF 102</p>												

8

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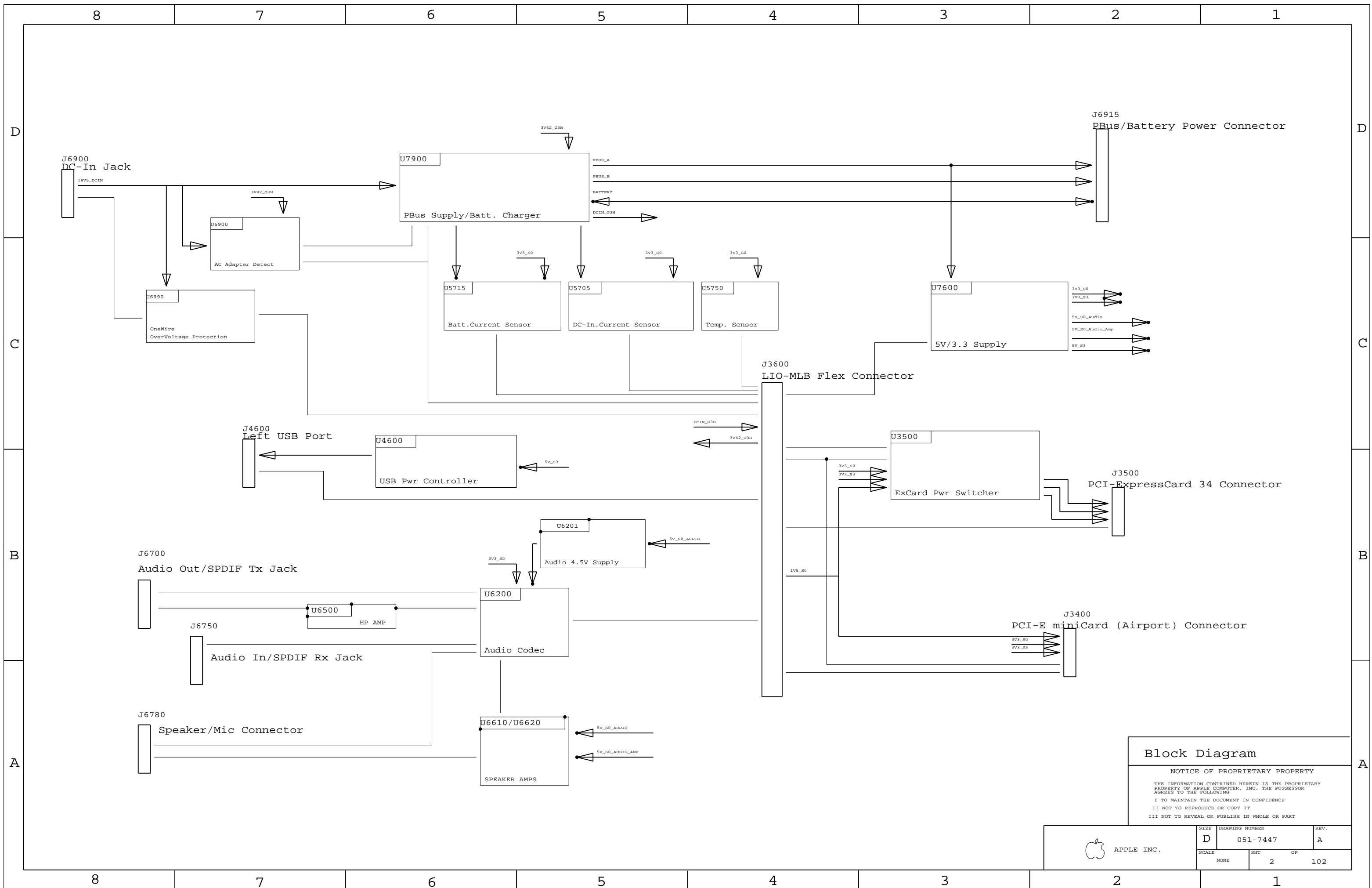
5

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1



Block Diagram

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APPLE INC.	SIZE D	DRAWING NUMBER 051-7447	REV. A
	SCALE NONE	SHEET 2	OF 102

8

7

6

5

4

3

2

1

BOM NUMBER	BOM NAME	BOM OPTIONS
630-9094	PCBA,DUBLIN,M87	ALTERNATE,COMMON,M87_COMMON,EEE_Z3M

BOM GROUP	BOM OPTIONS
M87_COMMON	BKLT_3V_SIG,COMBOJACK

Bar Code Label / EEE #'s

PART NUMBER	QTY	DESCRIPTION	REFERENCE DES	CRITICAL	BOM OPTION
000-0041	1	PLACEHOLDER FOR EEE/CCC INFO	[EEE:Z3M]	CRITICAL	EEE_Z3M

Alternate Parts

PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
37650448	37650445		ALL	SI7806ADM for F5M6296
12850081	12850061		ALL	150UF,6.3V,25MCRM,C2
12850093	12850092		ALL	33UF,16V,45MCRM,D2E
35351717	35351297		ALL	LM397,COMPARATOR
37650560	37650532		ALL	SI7905DN for SI7913DN

D

D

C

C


B

B

A

A

BOM Configuration	
SYNC_MASTER=(Master)	SYNC_DATE=(Master)
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 APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7447	A
SCALE	SHT	OF	
NONE	4	102	

8

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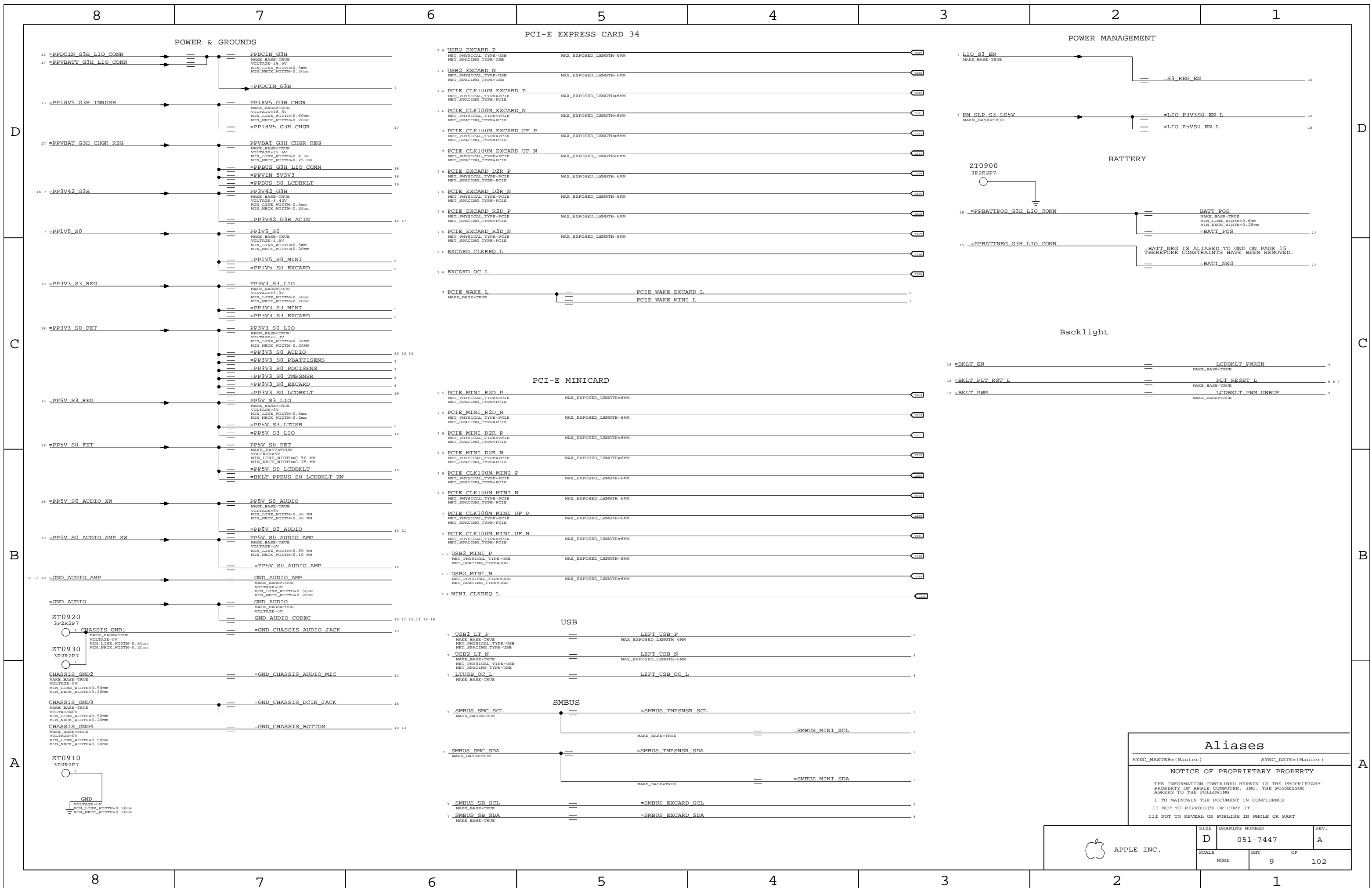
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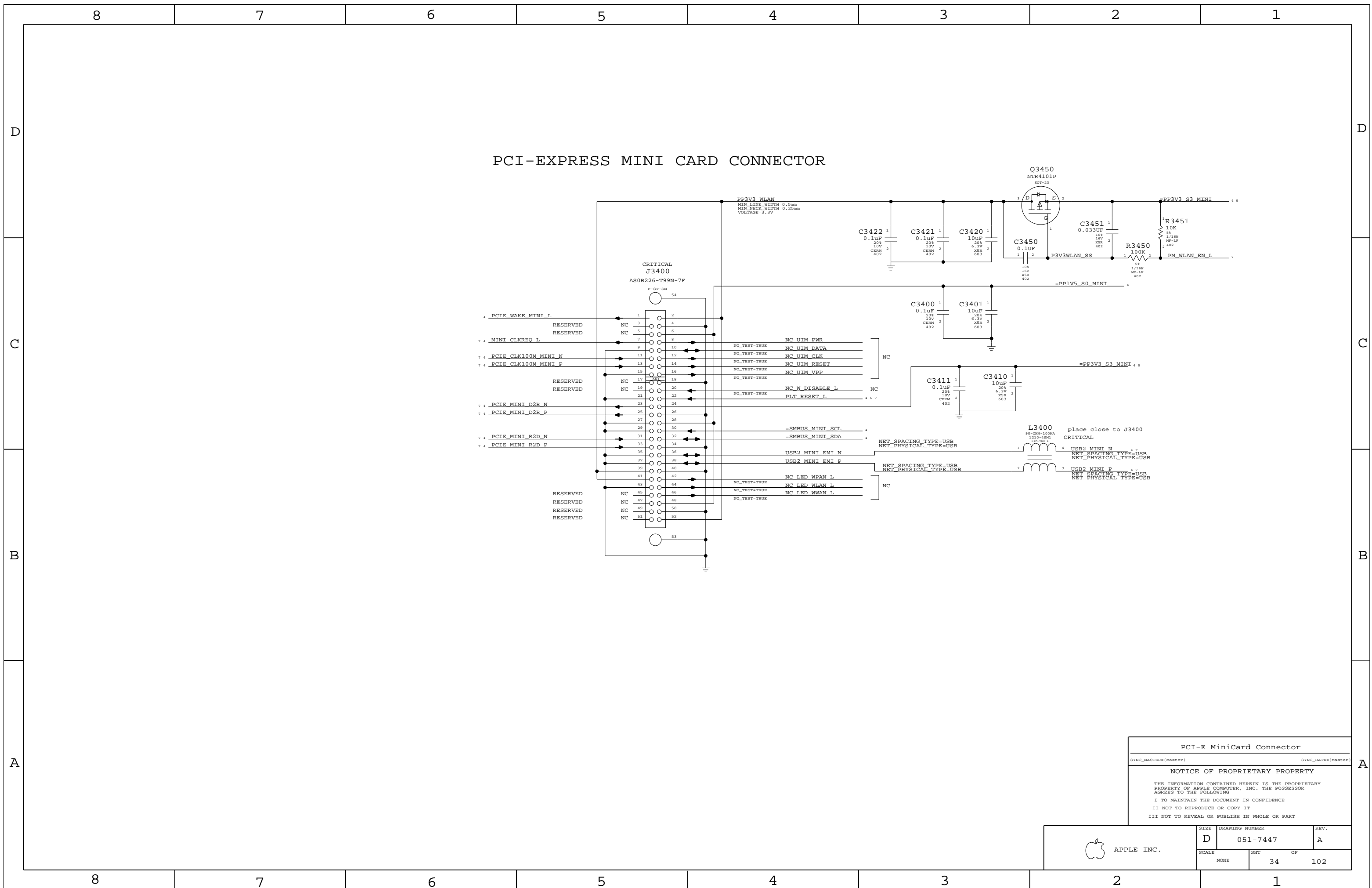
PCI-E MINICARD

USB

SMBUS

Aliases		
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 APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7447	A
SCALE	SHT	OF	
NONE	9	102	



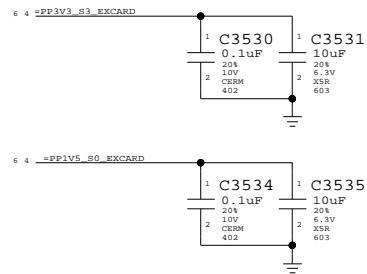
PCI-EXPRESS MINI CARD CONNECTOR

PCI-E MiniCard Connector
 SYNC_MASTER=(Master) SYNC_DATA=(Master)
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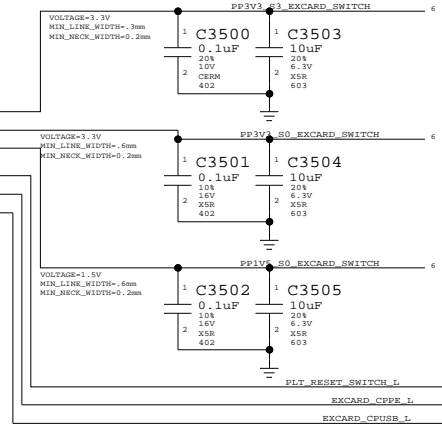
APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7447	A
SCALE	SHT OF		
NONE	34		102

EXPRESSCARD/34 TOP MOUNT CONNECTOR

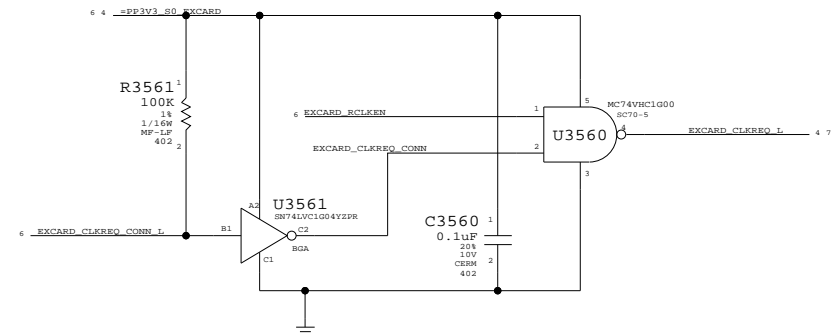
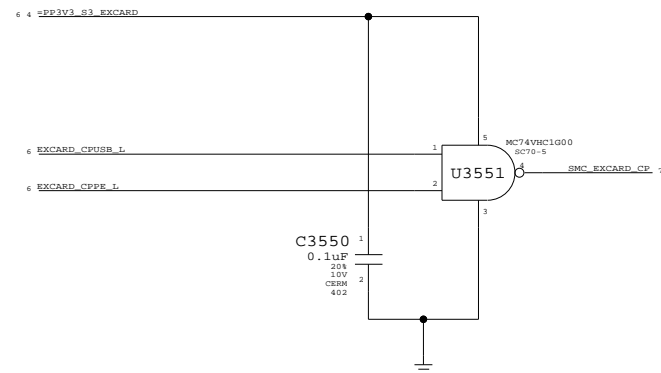
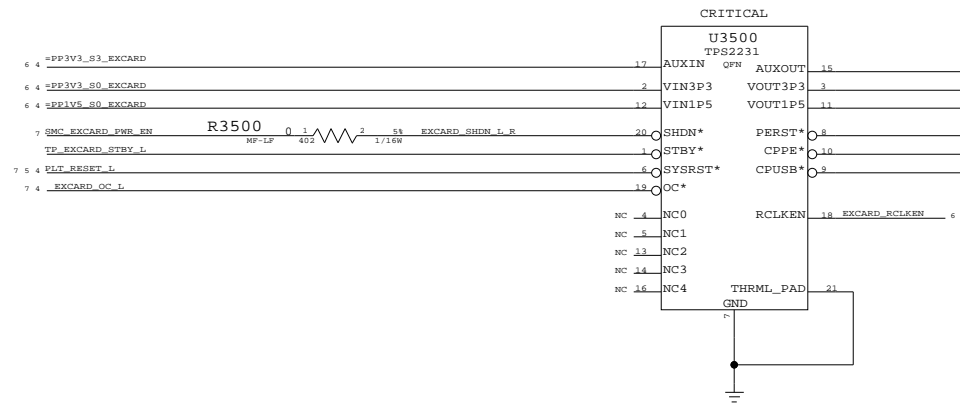
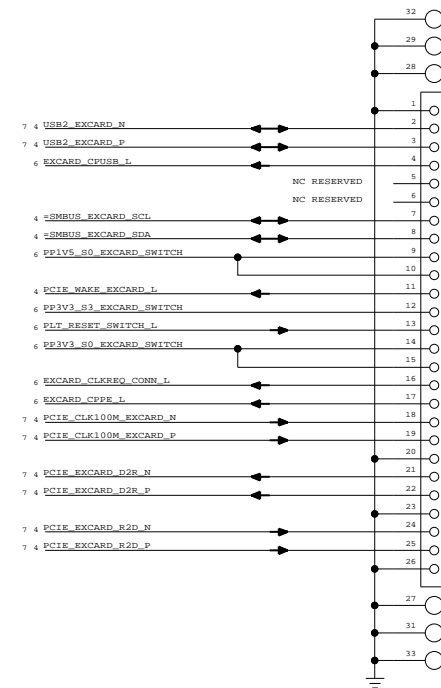
INPUT DECOUPLING



OUTPUT DECOUPLING

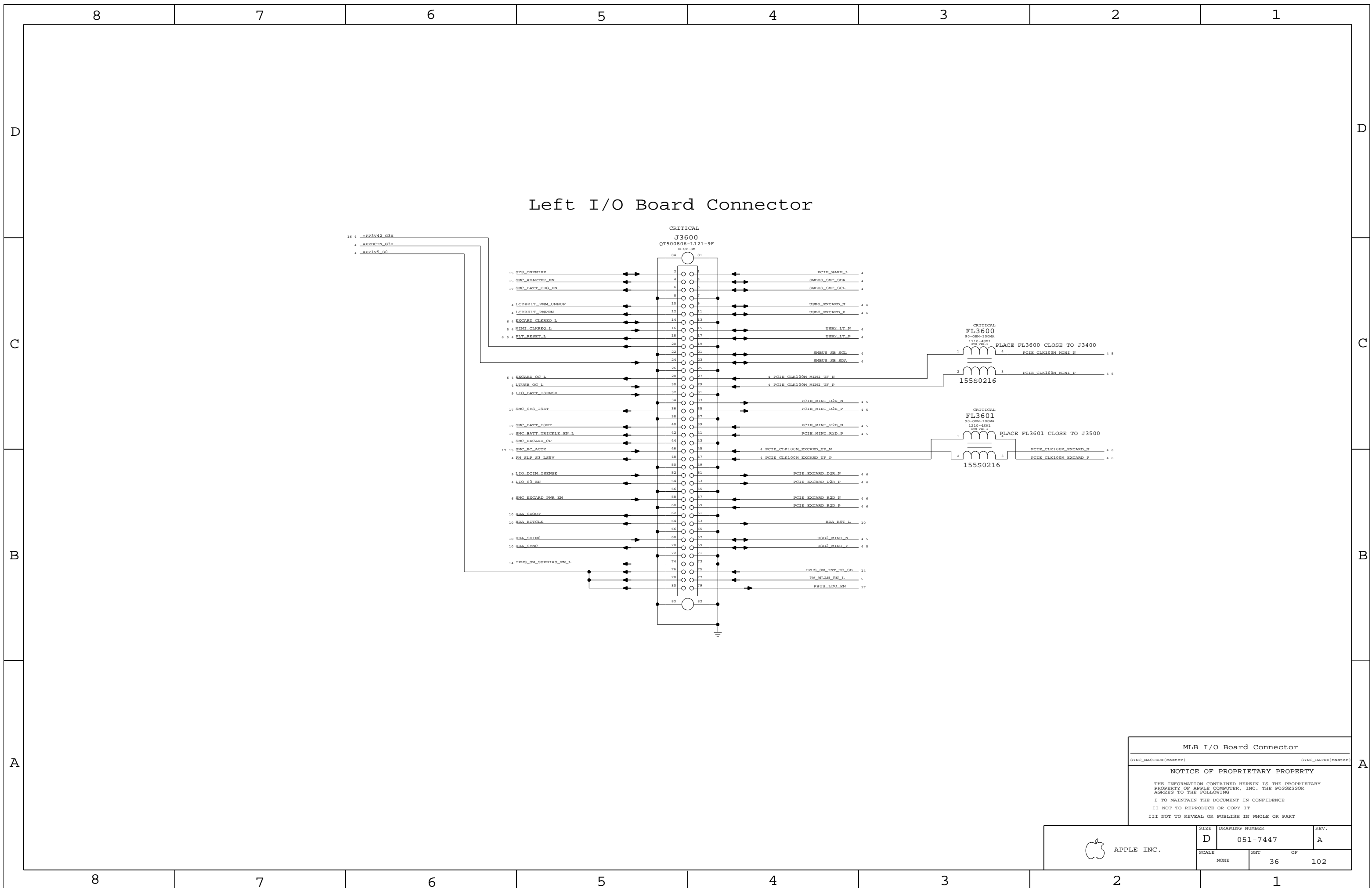


CARD CAGE CONNECTOR
CRITICAL
J3500
237-5300703903-2
P 01-08



ExpressCard Connector
SYNC_MASTER=(Master) SYNC_DATA=(Master)
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APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7447	A
SCALE	SHT OF		REV.
NONE	35		102



MLB I/O Board Connector

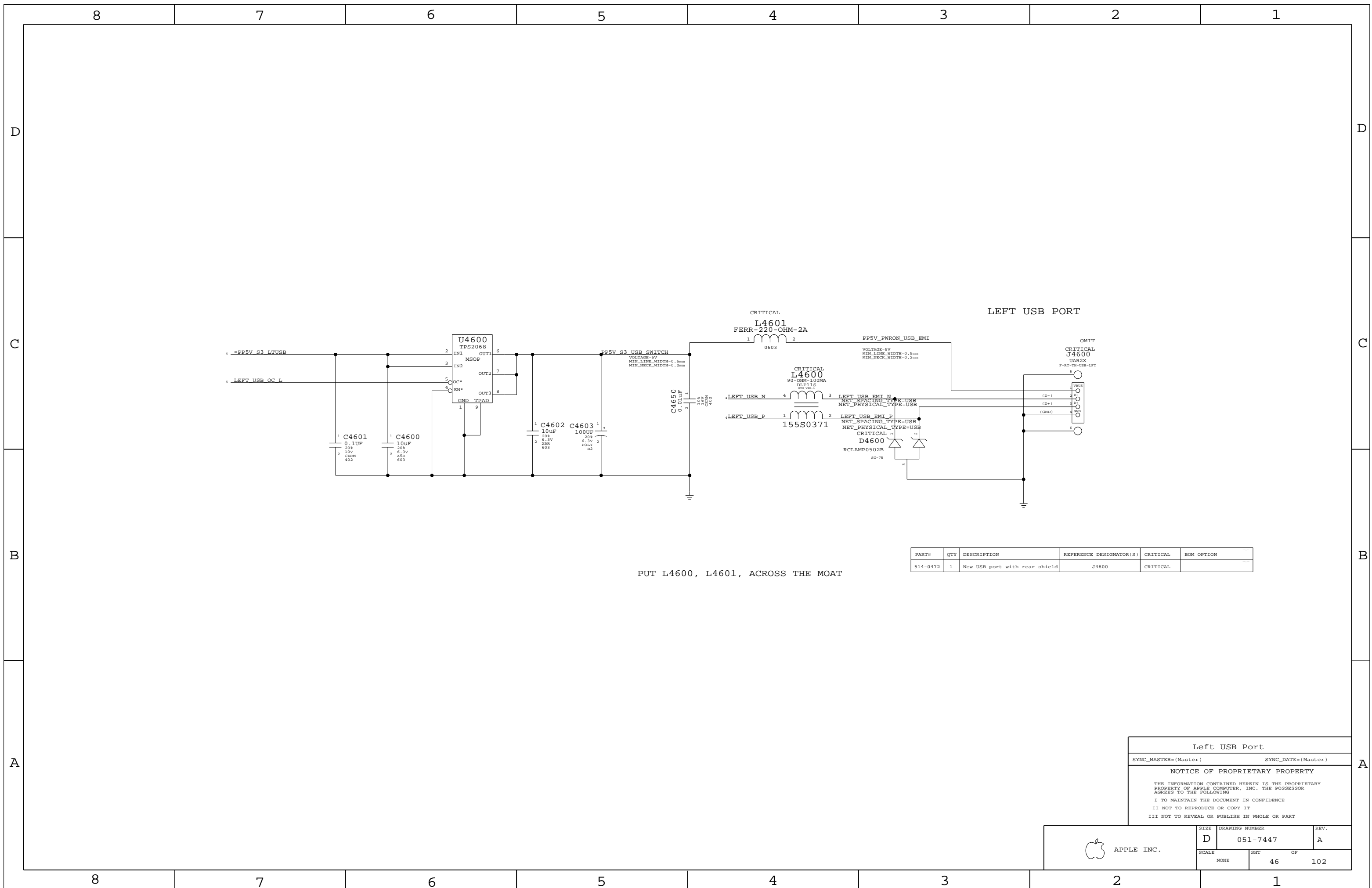
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	D	051-7447	A
SCALE	SHT OF		
NONE	36		102



PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
514-0472	1	New USB port with rear shield	J4600	CRITICAL	

PUT L4600, L4601, ACROSS THE MOAT

Left USB Port

SYNC_MASTER=(Master) SYNC_DATE=(Master)

NOTICE OF PROPRIETARY PROPERTY

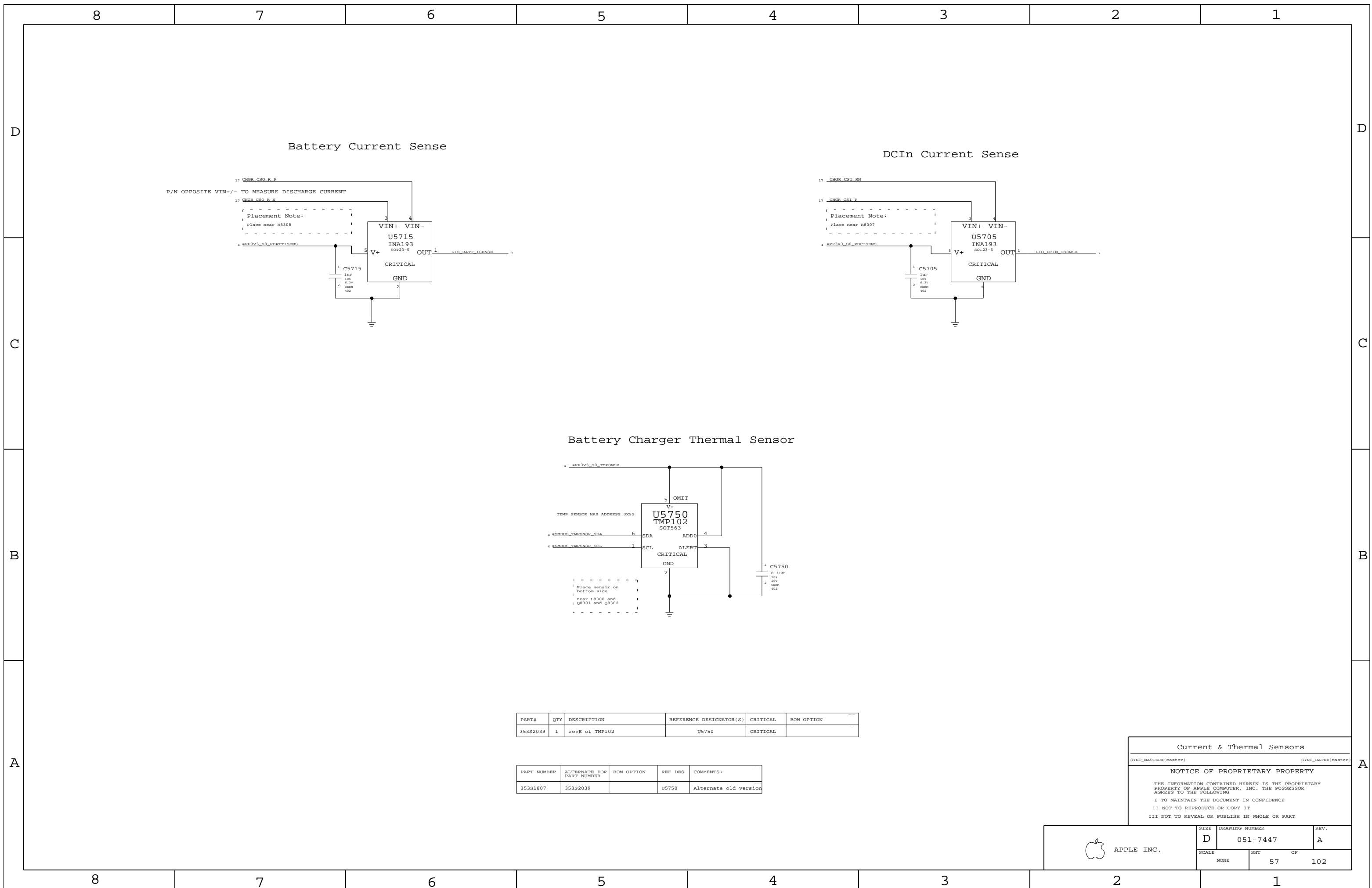
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APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7447	A
SCALE	SHT	OF	
NONE	46	102	



Battery Current Sense

DCIn Current Sense

Battery Charger Thermal Sensor

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
35382039	1	revE of TMP102	U5750	CRITICAL	

PART NUMBER	ALTERNATE FOR PART NUMBER	BOM OPTION	REF DES	COMMENTS:
35381807	35382039		U5750	Alternate old version

Current & Thermal Sensors

SYNC_MASTER=(Master) SYNC_DATE=(Master)

NOTICE OF PROPRIETARY PROPERTY

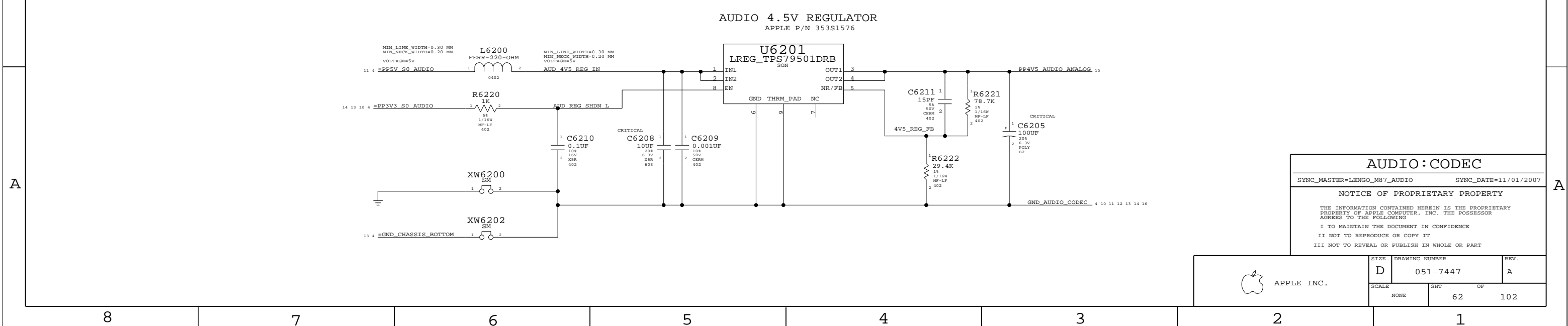
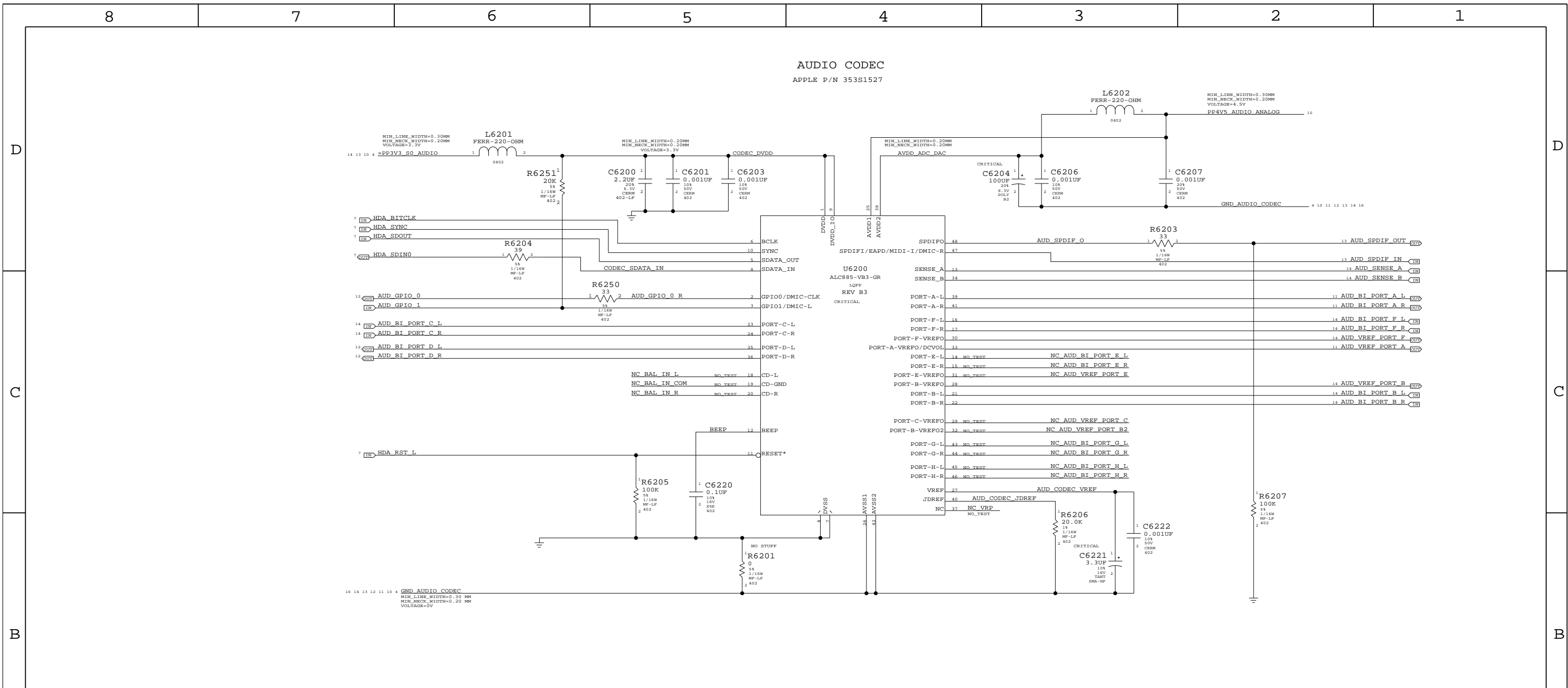
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APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7447	A
SCALE	SHT	OF	
NONE	57	102	



AUDIO:CODEC

SYNC_MASTER=LENGO_M87_AUDIO SYNC_DATE=11/01/2007

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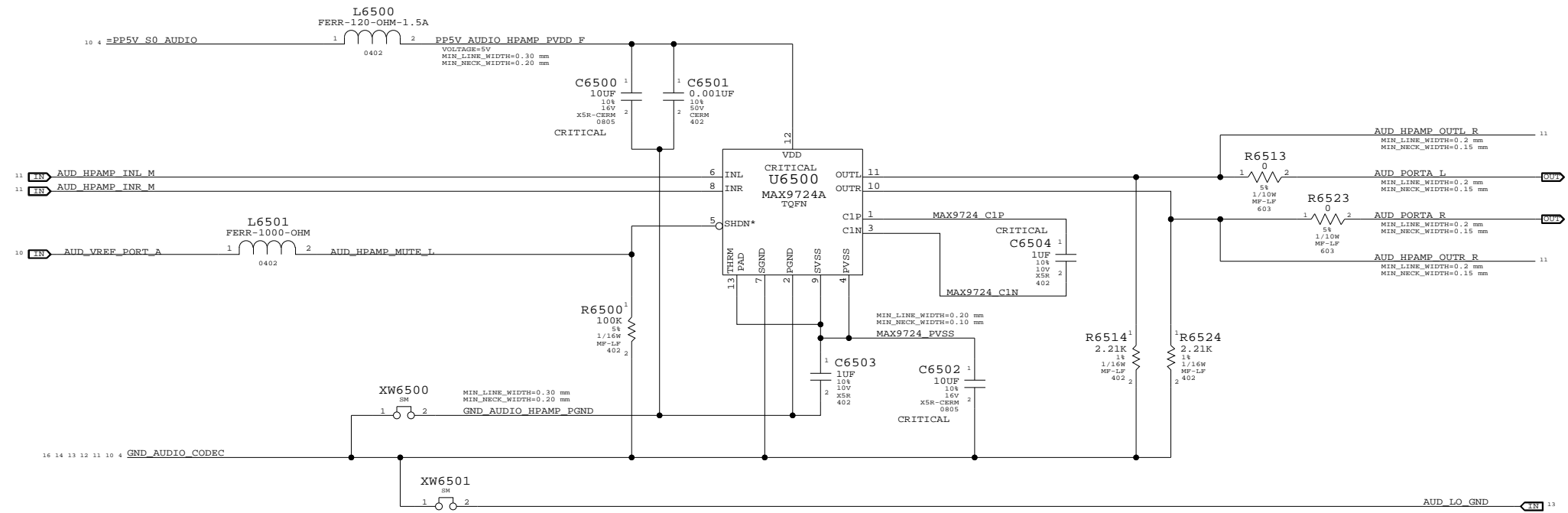
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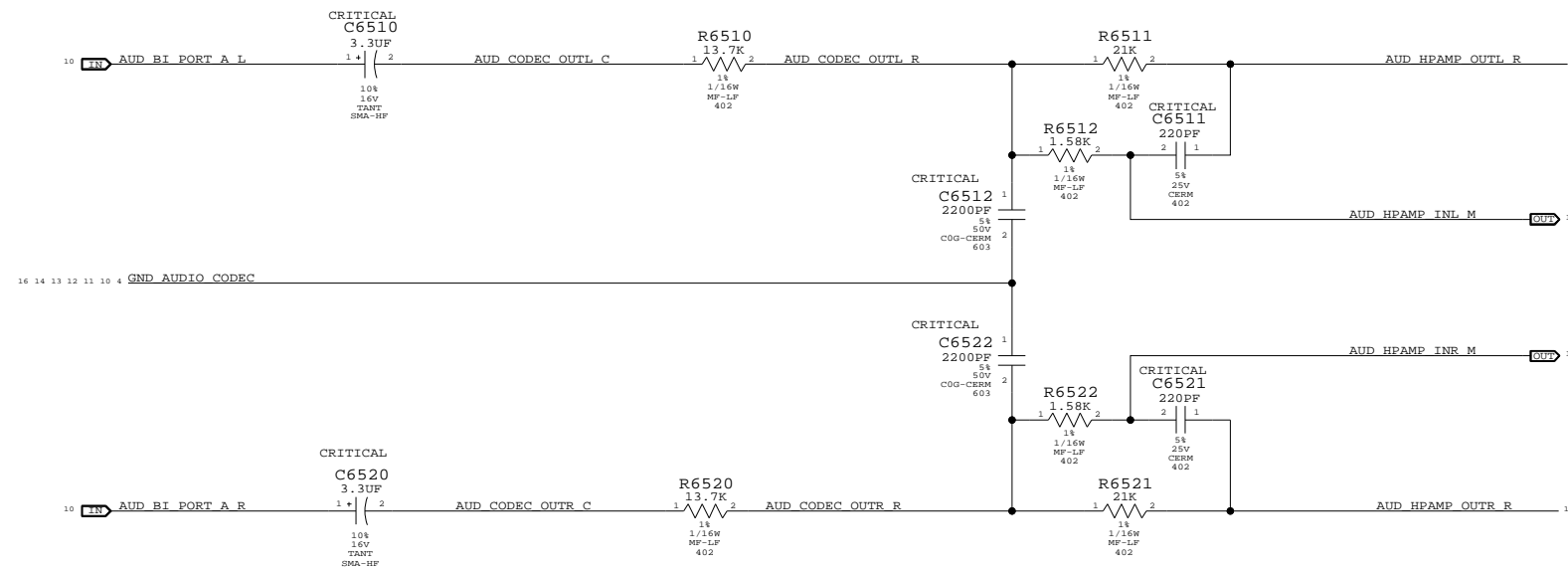
III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE INC.	SIZE D	DRAWING NUMBER 051-7447	REV. A
	SCALE NONE	SHEETS 62	OF 102

Headphone Amplifier (MAX9724A)
 APN: 353S1637
 VOLTAGE GAIN: 1.53



2nd Order DAC Filter
 HP: 3.52 HZ LP: 39 KHZ



AUDIO: HEADPHONE AMP
 SYNC_MASTER=LENGO_M87_AUDIO SYNC_DATE=11/01/2007
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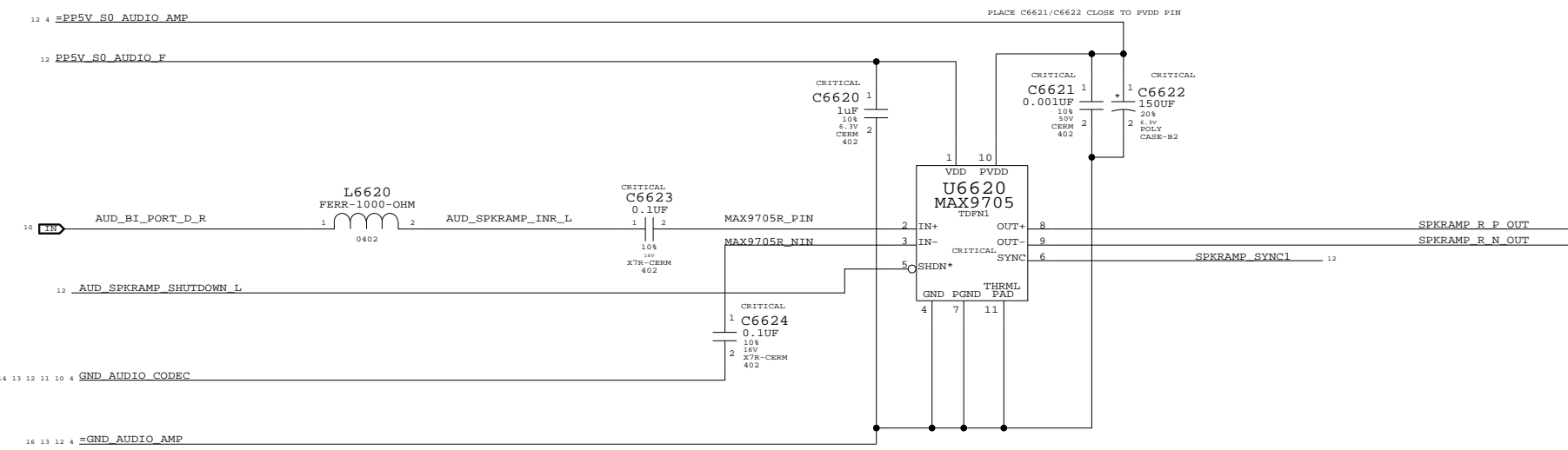
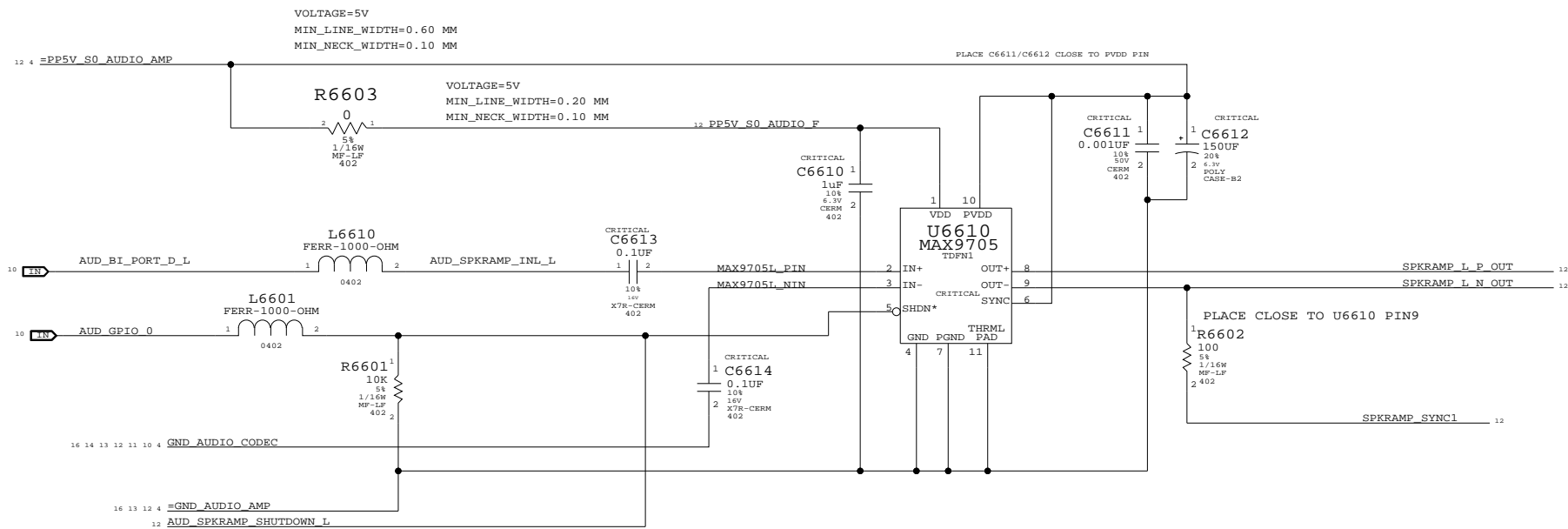
	SIZE	DRAWING NUMBER	REV.
	D	051-7447	A
SCALE	SHT	OF	
NONE	65	102	

2X MONO SPEAKER AMPLIFIERS (MAX9705B)

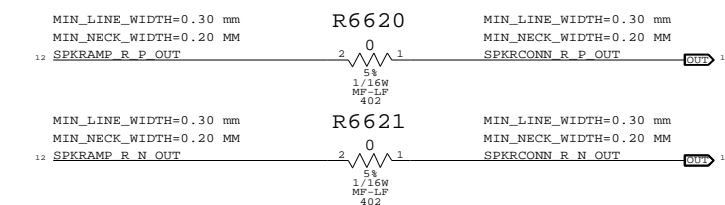
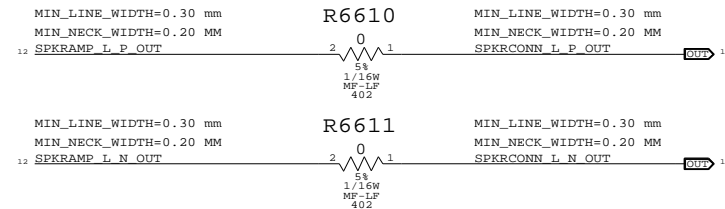
APN: 353S1595

GAIN = 12DB

79Hz < FC < 132Hz



FANCY SPEAKER TESTPOINTS



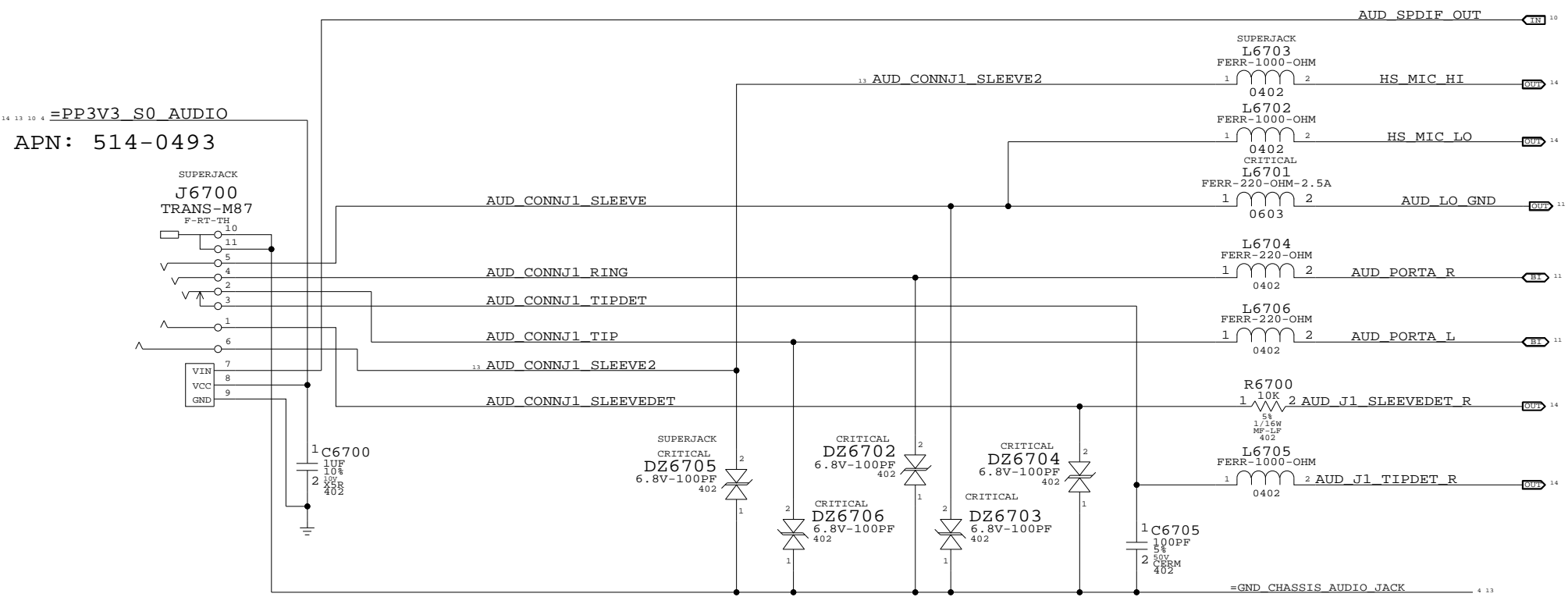
AUDIO: SPEAKER AMP
 SYNC_MASTER=LENGO_M87_AUDIO SYNC_DATE=11/01/2007

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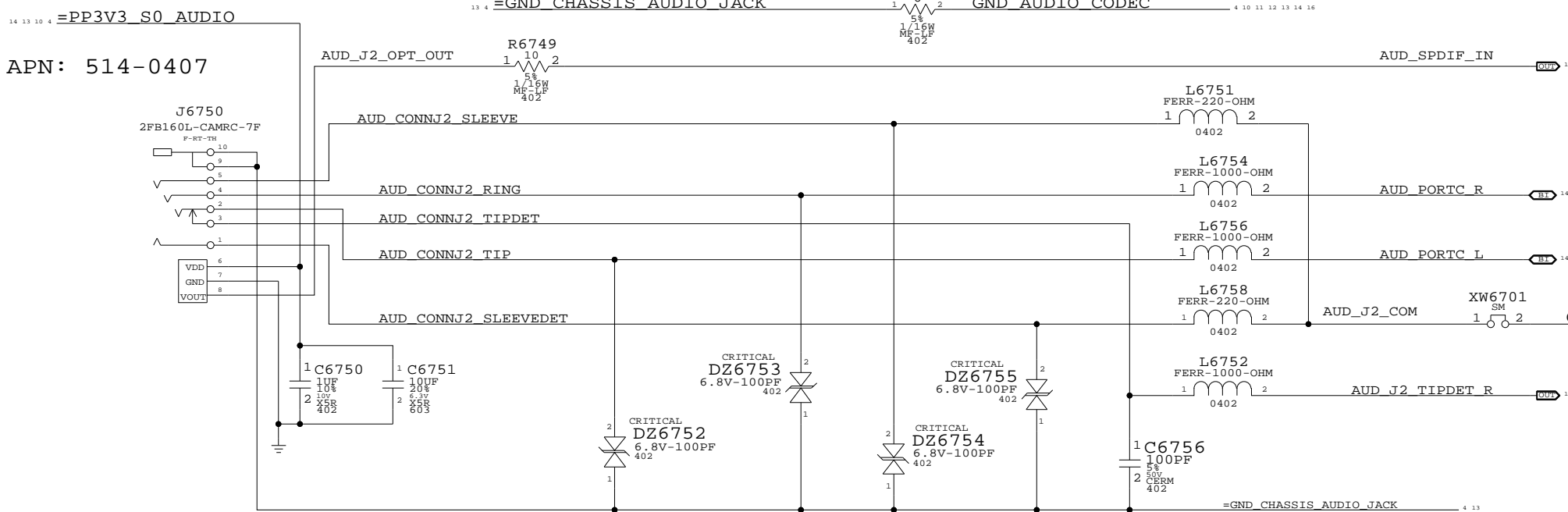
APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7447	A
SCALE	SHT	OF	
NONE	66		102

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
514-0406	1	CONN, RCPT, OPTICAL-COPPER	J6700	?	COMBOJACK

AUDIO JACK 1 LO/HP JACK, SPDIF TX

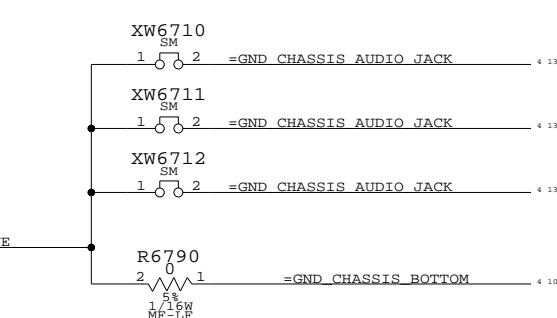
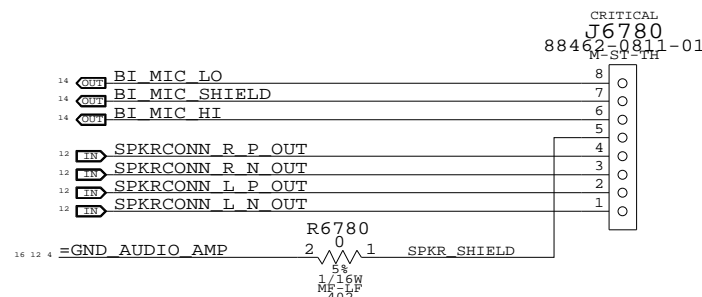


PLACE AT GROUND MOAT



AUDIO JACK 2 LINE IN JACK, SPDIF RX

SPEAKER/MIC CONNECTOR
APN: 518-0262



AUDIO: JACKS
 SYNC_MASTER=LENGO_M87_AUDIO SYNC_DATE=11/01/2007
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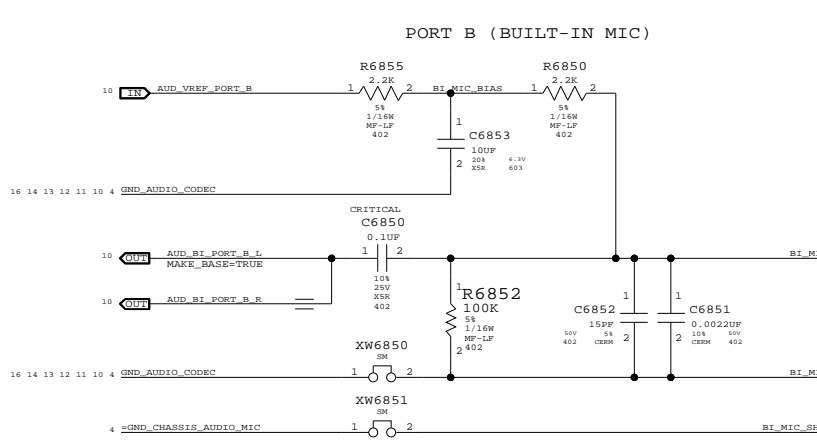
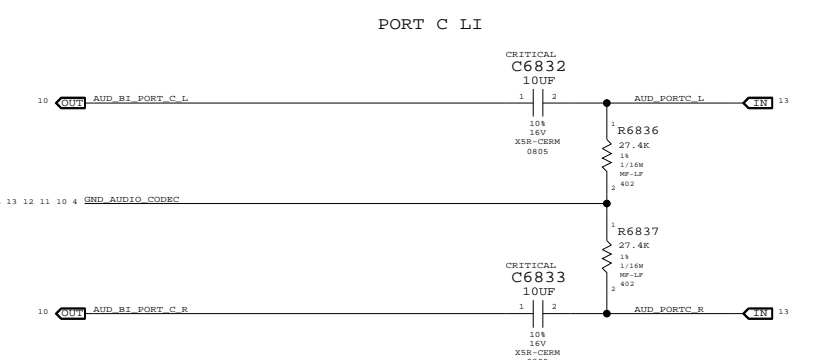
APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7447	A
SCALE	SHT	OF	
NONE	67	102	

CODEC OUTPUT SIGNAL PATHS

FUNCTION	VOLUME	CONVERTER	PIN COMPLEX	MUTE CONTROL	DET ASSIGNMENT
HP/LINE OUT	0X0D (15)	0X03 (3)	0X15 (21,A)	VREF_A	0X15 (21,A)
SPEAKER	0X26 (38)	0X25 (37)	0X14 (20,D)	GPIO_0	N/A
SPDIF OUT	N/A	0X06 (6)	0X1E (SPDIF OUT)	N/A	0X1B (27,E)

CODEC INPUT SIGNAL PATHS

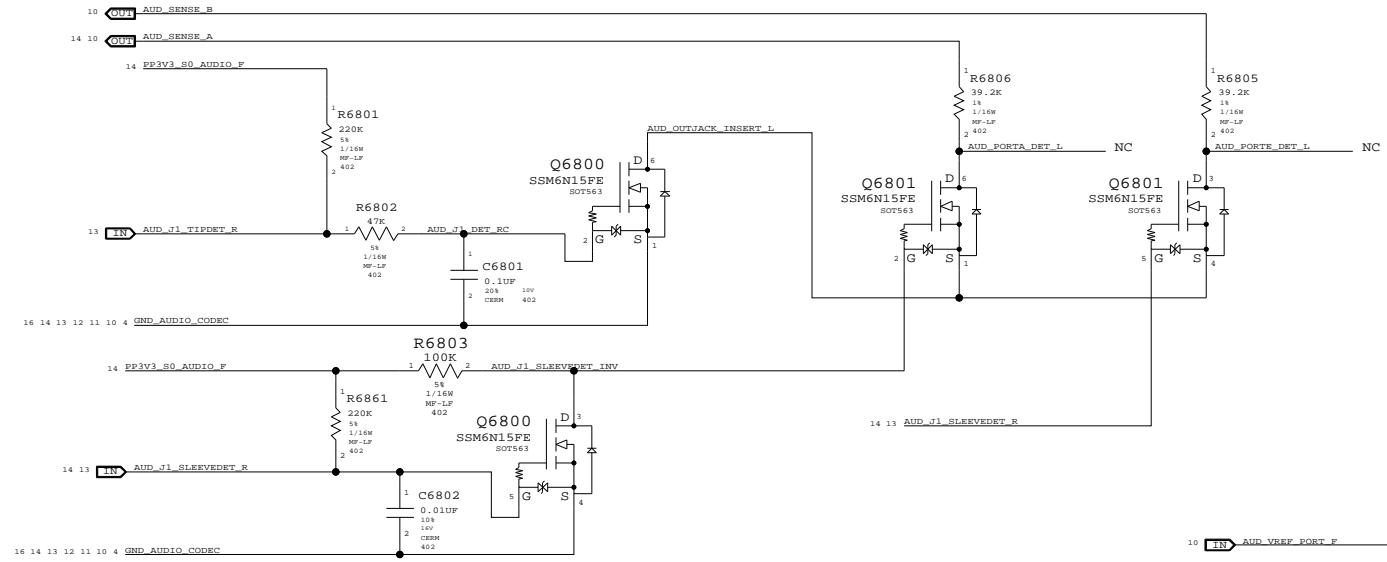
FUNCTION	MIXER (INPUT)	CONVERTER	PIN COMPLEX	VREF	DET ASSIGNMENT
LINE IN	0X23 (35)	0X08 (8)	0X1A (26,C)	N/A	0X1A (26,C)
SPDIF IN	N/A	0X0A (10)	0X1F (SPDIF IN)	N/A	N/A
MIC (BUILT IN)	0X24 (36)	0X07 (7)	0X18 (24,B)	B (80%)	N/A
MIC (HEADSET)	0X24 (36)	0X07 (7)	0X19 (25,F)	F (80%)	SOUTHBRIDGE



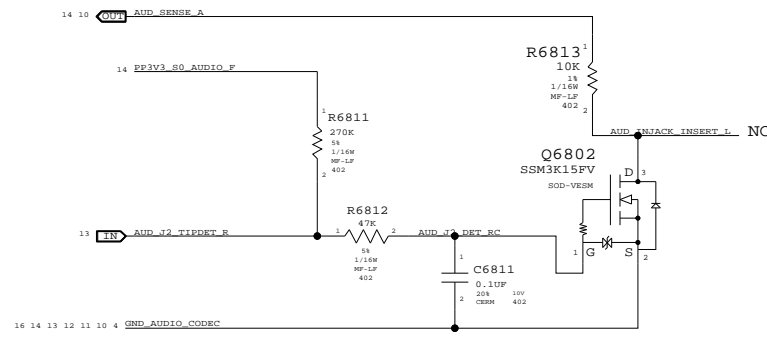
PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	CRITICAL	BOM OPTION
138S0578	1	1UF,10%,10V,XSR	C6842	CRITICAL	COMBOJACK
138S0578	1	1UF,10%,10V,XSR	C6840	CRITICAL	COMBOJACK

PORT A DETECT

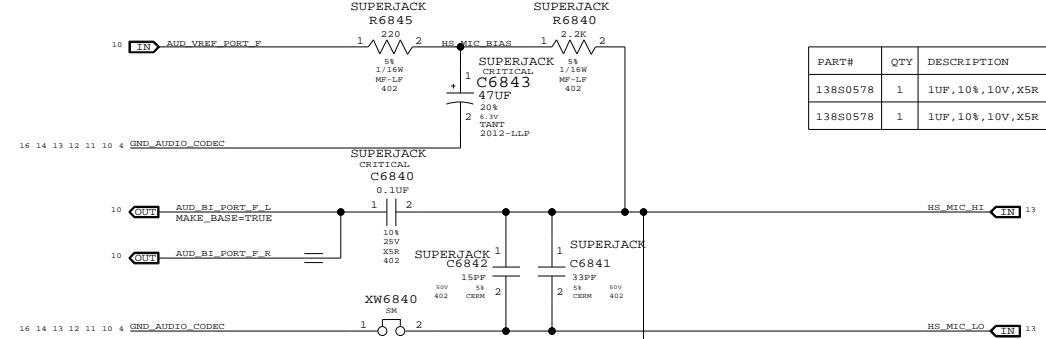
PORT E DETECT (SPDIF DELEGATE)



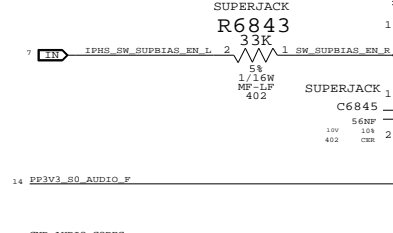
Line-in (PORT C) DETECT



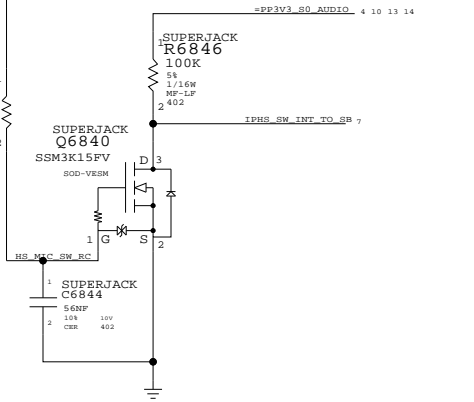
PORT F (HEADSET MIC)



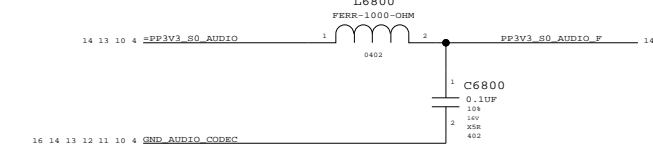
HEADSET MIC SUPPLEMENTARY BIAS



HEADSET SW INTERRUPT TO SOUTHBRIDGE



PLACE L6800/C6800 CLOSE TO Q6800/01/02



AUDIO: JACK TRANSLATORS

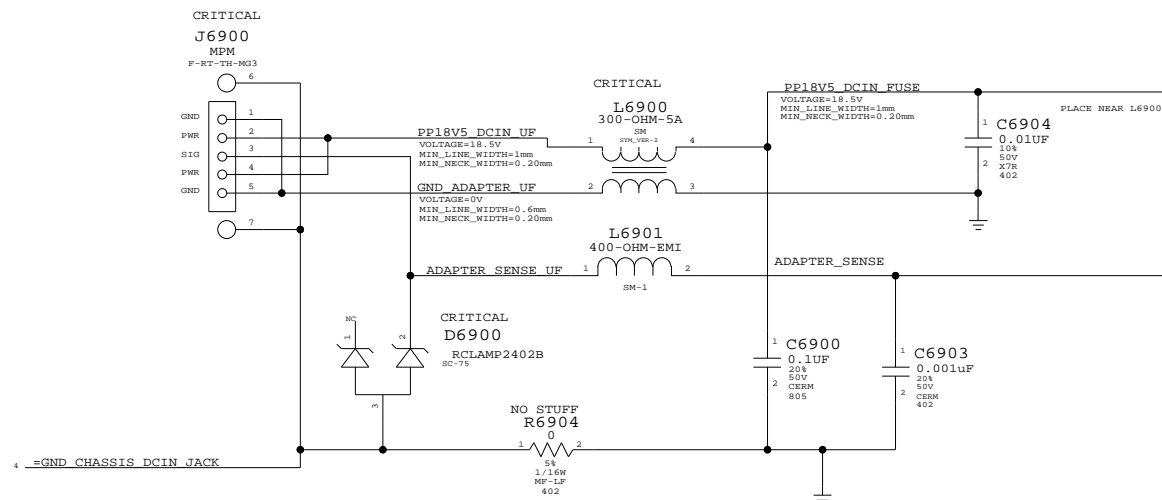
SYMC_MASTER=LE800_MPT_AUDIO SYMC_DATE=11/01/2007

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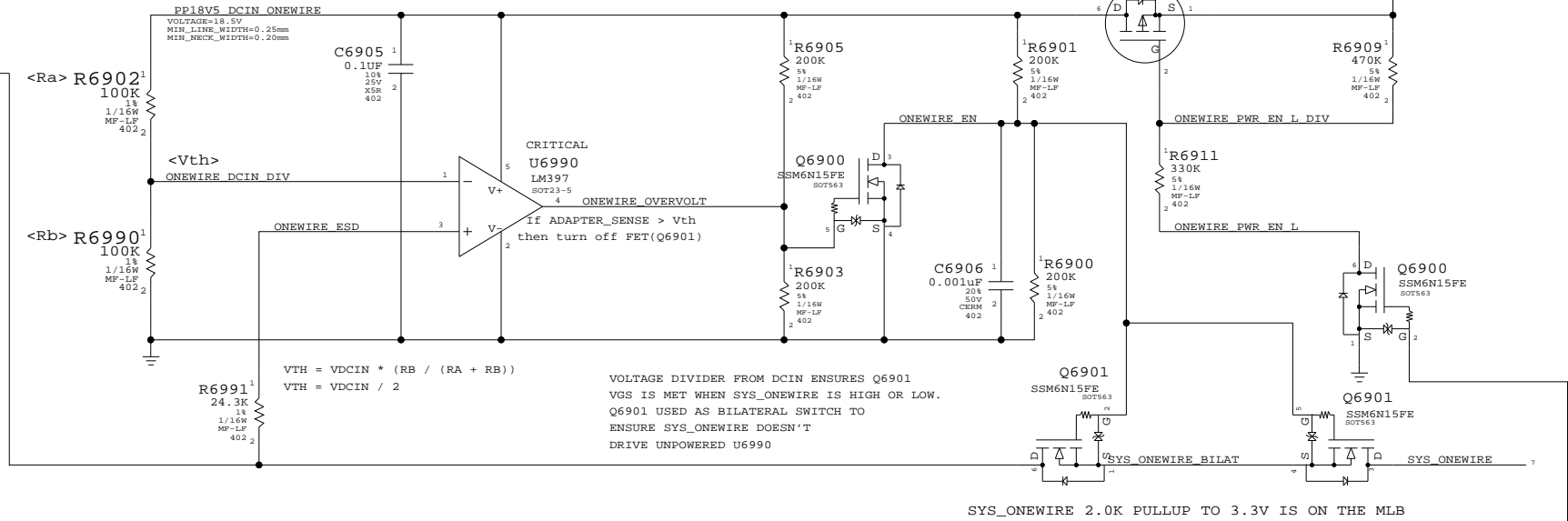
APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7447	A
SCALE	NONE	SHT	OF
		68	102

DC Power Jack

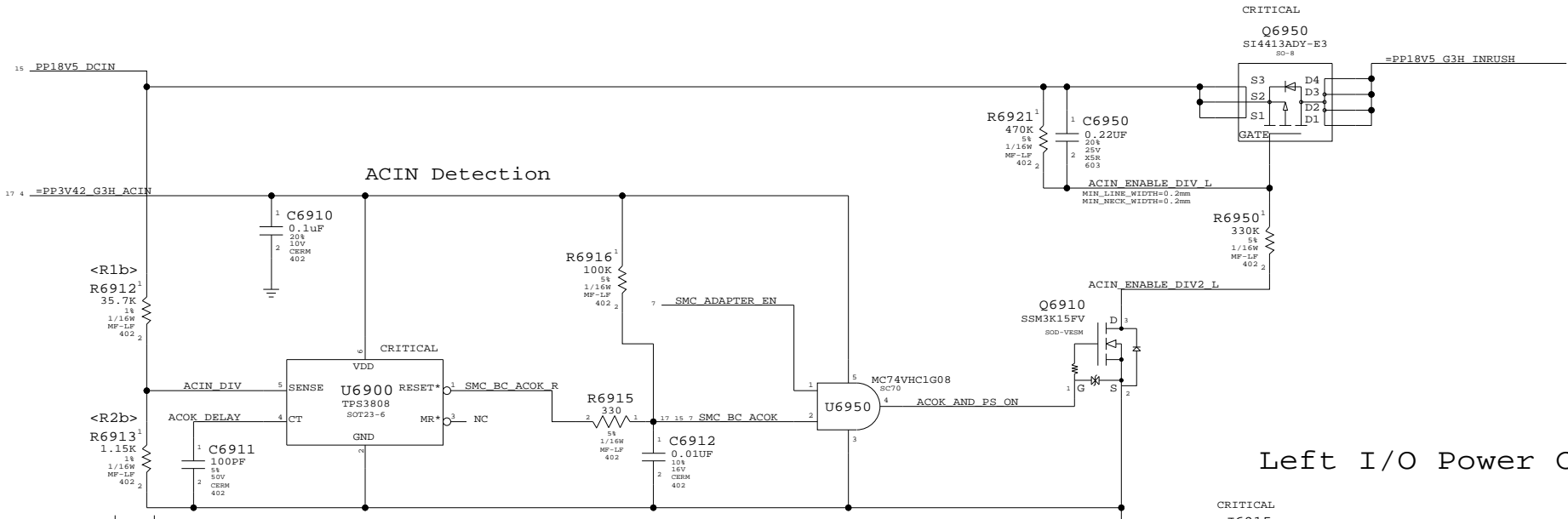


R6904 should be stuffed if GND_CHASSIS_DCIN_JACK does not have another connection to digital GND in the system, such as in an acrylic. The chassis ground will otherwise float and can send transients onto ADAPTER_SENSE when AC is connected.

1-Wire OverVoltage Protection



Inrush Limiter



System must provide 10K-70K impedance to A52 adapter for system load detection. REQ OF R6912 & R6913 IS 36.9K.

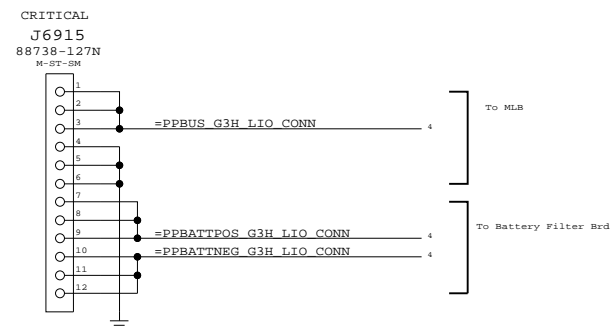
$$V_{th} = (V_{ref} / (R_{2b} / (R_{1b} + R_{2b})))$$

$$V_{REF} = 0.405V$$

$$V_{TH} = 13.0V$$

Assuming 1% variance for R6912-R6913 and 3.42V:
 Worst case Vth: min: 12.47V, max: 13.54V

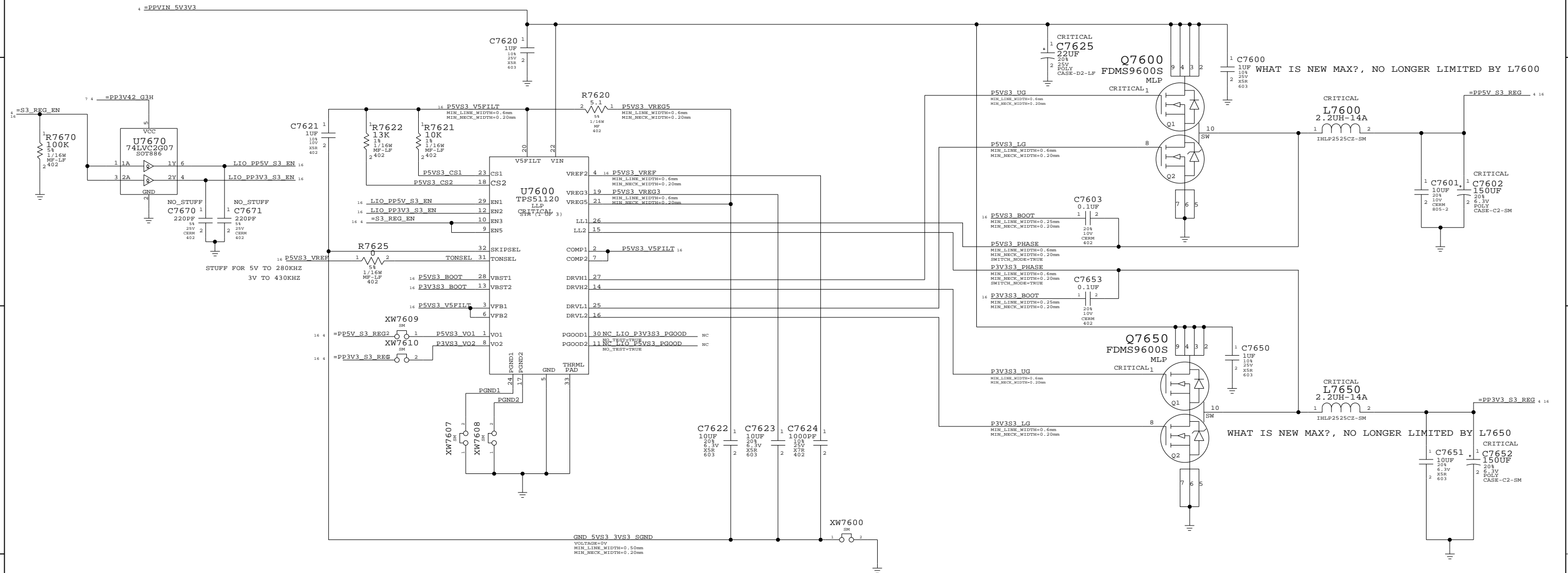
Left I/O Power Connector



DC-In & Battery Connectors		
SYNC_MASTER=(Master)		SYNC_DATA=(Master)
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APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7447	A
SCALE	SHT	OF	
NONE	69		102

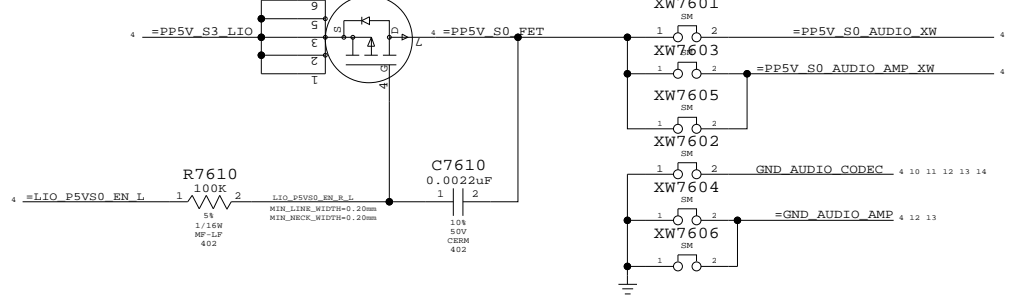
5V/3.3V POWER SUPPLY



5V S0 FET

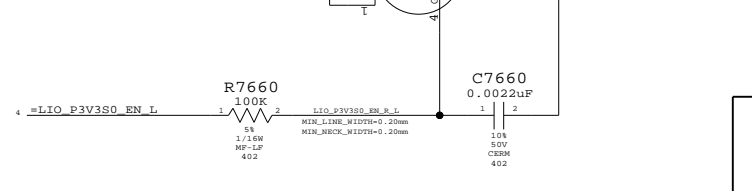
Q7610
FDC697P

PLACE XW7601 TO XW76010 CLOSE TO 5V SWITCHER AND S0 FET



3.3V S0 FET

Q7611
FDC697P



5V/3.3V SUPPLY

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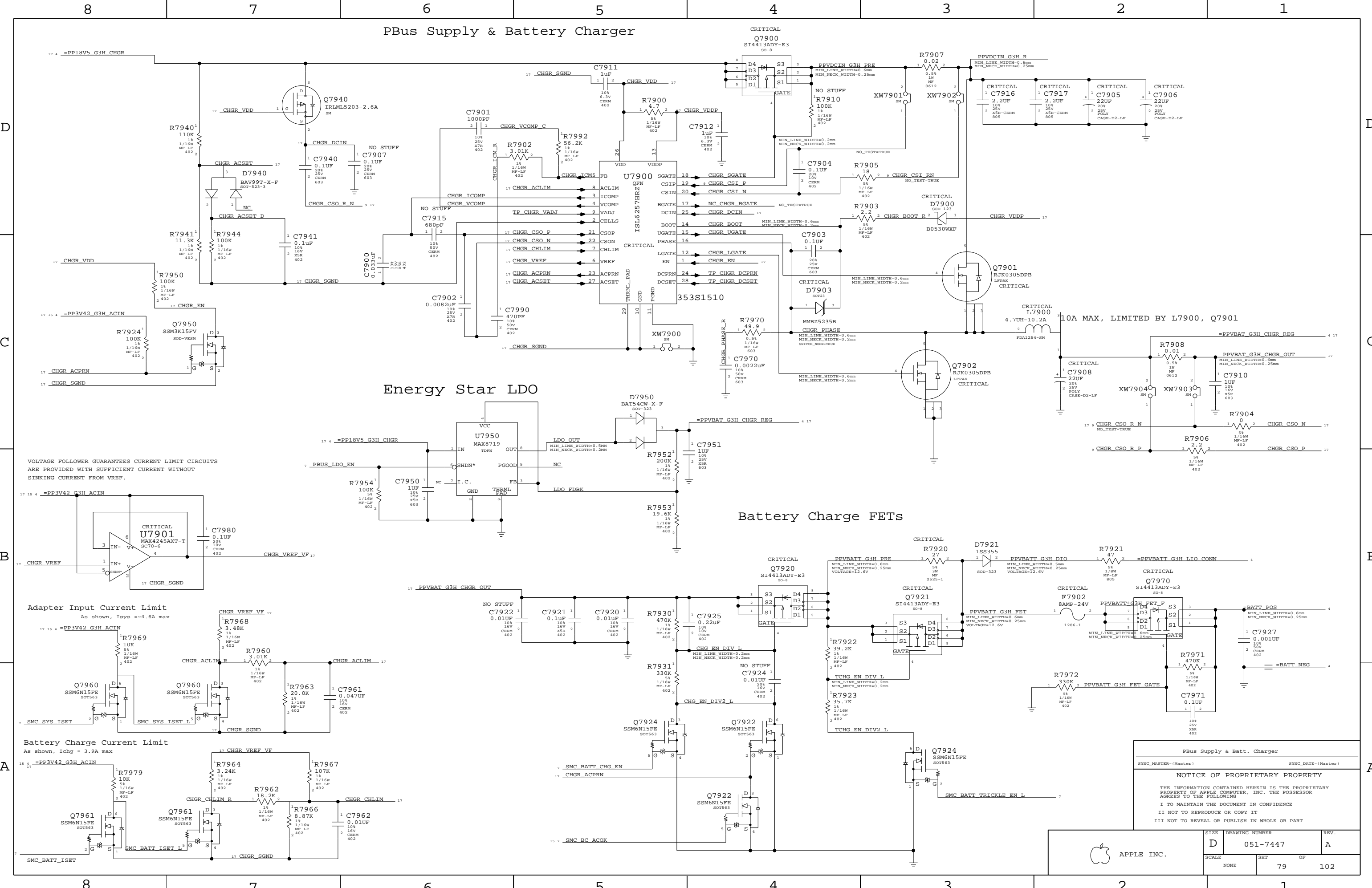
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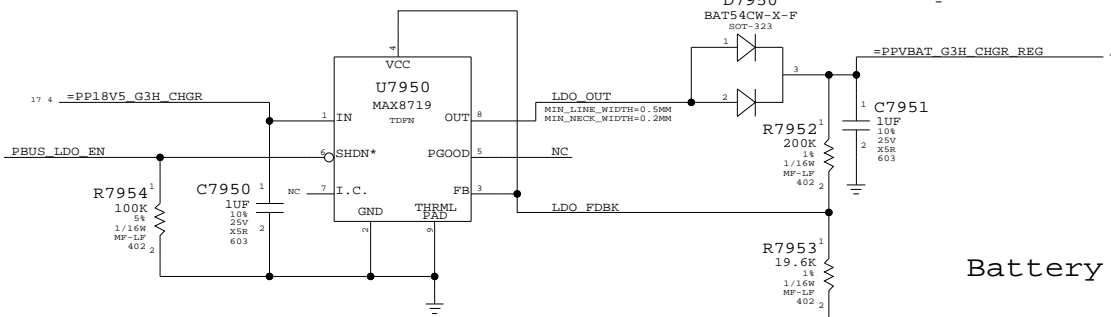
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APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7447	A
SCALE	SHT	OF	
NONE	76	102	

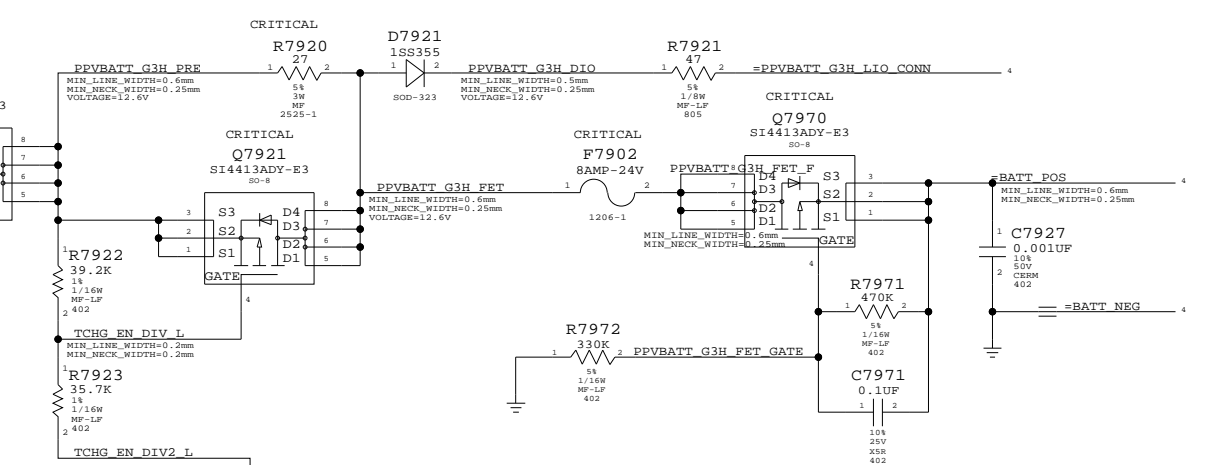
PBus Supply & Battery Charger



Energy Star LDO

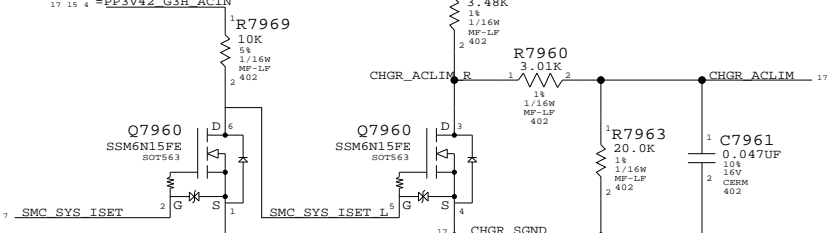


Battery Charge FETs



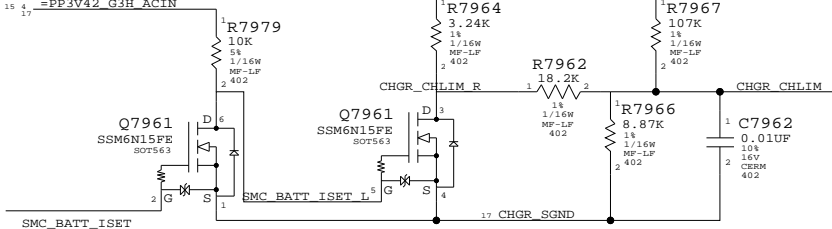
Adapter Input Current Limit

As shown, I_{sys} = -4.6A max



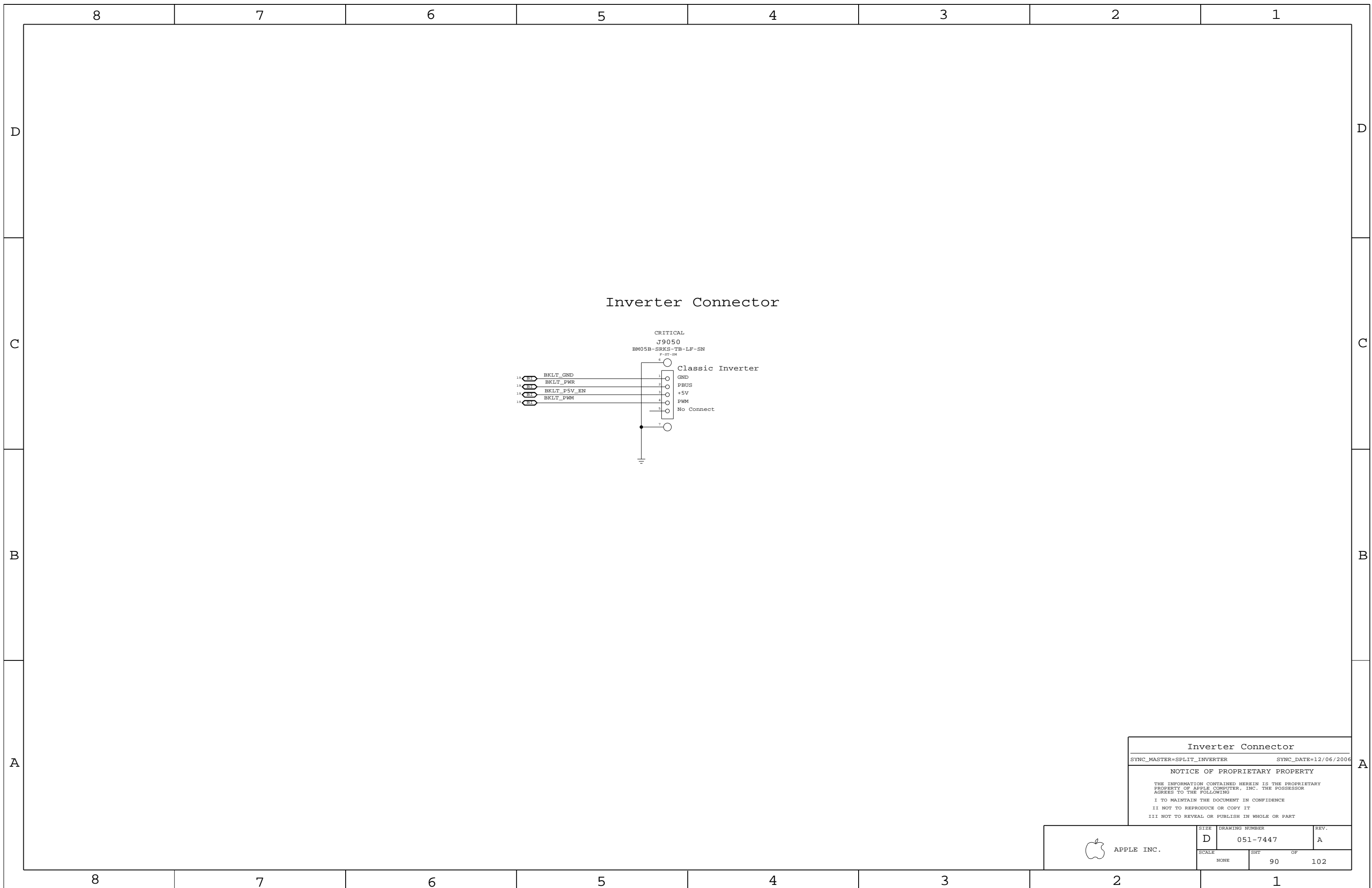
Battery Charge Current Limit

As shown, I_{chg} = 3.9A max

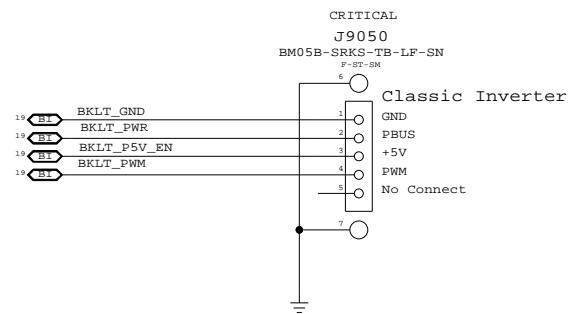


PBus Supply & Batt. Charger
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SCALE	SHEET	OF	
NONE	79	102	



Inverter Connector



Inverter Connector

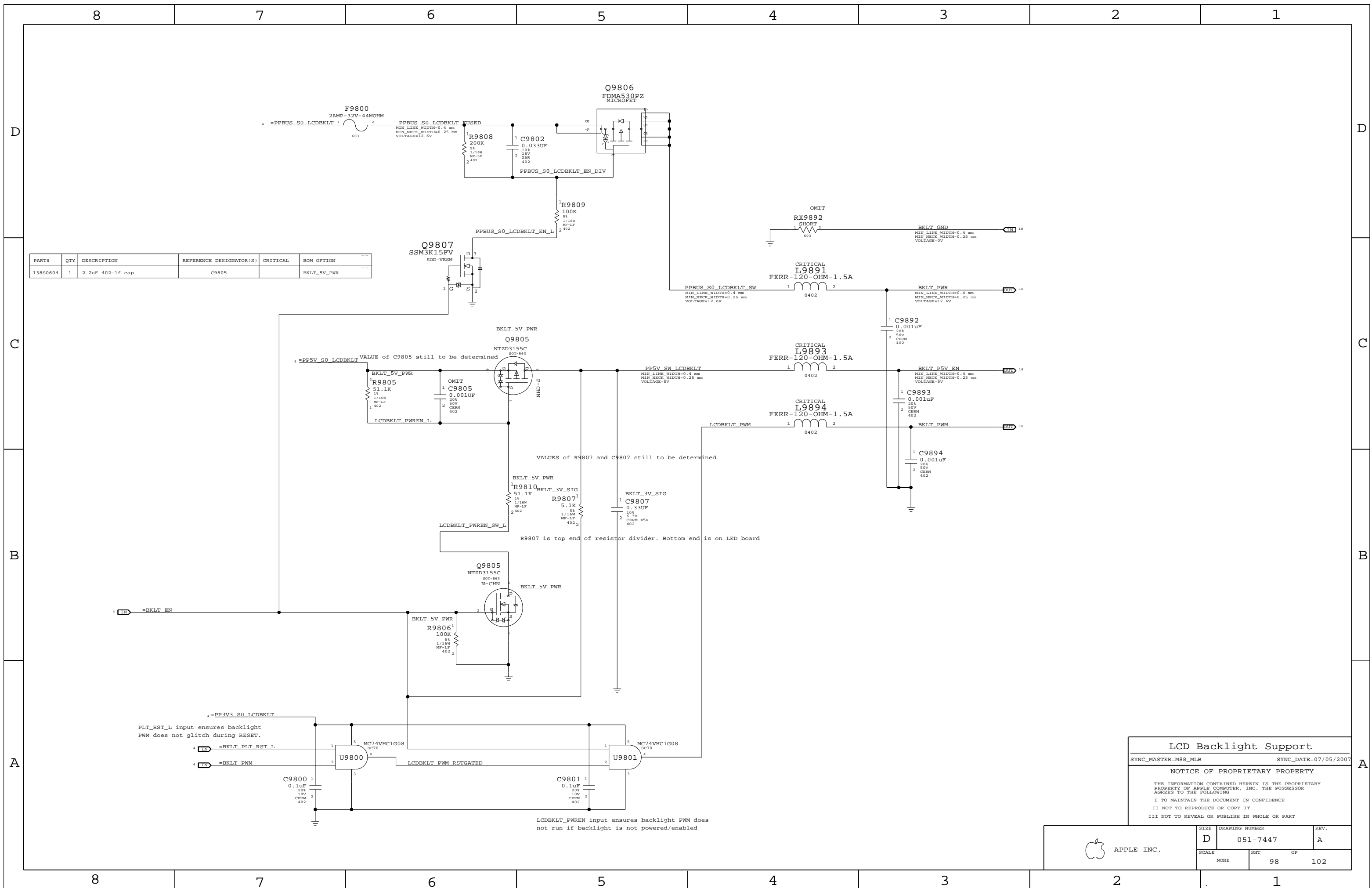
SYNC_MASTER=SPLIT_INVERTER SYNC_DATE=12/06/2006

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APPLE INC.	SIZE D	DRAWING NUMBER 051-7447	REV. A
	SCALE NONE	SHT 90	OF 102



LCD Backlight Support

SYNC_MASTER=M88_MLB SYNC_DATE=07/05/2007


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 APPLE INC.	SIZE	DRAWING NUMBER	REV.
	D	051-7447	A
SCALE	SHT	OF	
NONE	98	102	

