

8

7

6

5

4

3

2

1


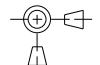
- 1. ALL RESISTANCE VALUES ARE IN OHMS, 0.1 WATT +/- 5%.
- 2. ALL CAPACITANCE VALUES ARE IN MICROFARADS.
- 3. ALL CRYSTALS & OSCILLATOR VALUES ARE IN HERTZ.

REV	ZONE	ECN	DESCRIPTION OF CHANGE	CK APPD DATE	ENG APPD DATE
02		384341	ENGINEERING RELEASED	06/03/05	?

PDF PAGE	CSA PAGE	CONTENTS
1	1	Table of Contents
2	2	
3	3	Block Diagram
4	5	Revision History
5	7	Functional Test Signals
6	11	Signal & Power Aliases
7	25	Non-Audio Connectors
8	100	BrownOdio Codec
9	101	Line In Filter
10	102	S/PDIF Receiver
11	104	Headphone Amp
12	105	MAX9715 Speaker Amps
13	106	Audio Connectors
14	107	Audio Power Supply
15	108	Cross Reference Page
16	109	Cross Reference Page

SCHEM, FLUTE, Q41C
06/03/2005
(EVT)

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	BOH OPTION
051-6850	1	SCHEM, FLUTE, Q41C	SC11	
820-1823	1	PCBP, FLUTE, Q41C	PCB1	

DIMENSIONS ARE IN MILLIMETERS		METRIC		 Apple Computer Inc.	
XX : _____	_____	DRAPFER	DESIGN CK	NOTICE OF PROPRIETARY PROPERTY THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING I TO MAINTAIN THE DOCUMENT IN CONFIDENCE II NOT TO REPRODUCE OR COPY IT III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART	
X.XX : _____	_____	ENG APPD	MFG APPD		
X.XXX : _____	_____	QA APPD	DESIGNER		
ANGLES : _____	_____	RELEASE	SCALE		
DO NOT SCALE DRAWING		SCALE NONE		SCHEM, FLUTE, Q41C DRAWING NUMBER 051-6850 REV. 02	
 THIRD ANGLE PROJECTION		MATERIAL/FINISH NOTED AS APPLICABLE			
				SHT 1 OF 109	

8

7

6

5

4

3

2

1

PCB SPECS

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

IMPEDANCE : 50 OHMS +/- 10%
 DIELECTRIC: FR-4
 LAYER COUNT: 12

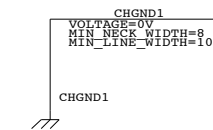
SEE PCB CAD FILES FOR MORE SPECIFIC INFO.

BOARD STACK-UP AND CONSTRUCTION

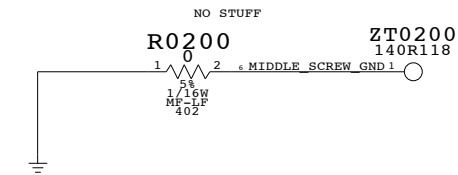
1	SIGNAL
2 PREPREG	GROUND
3 LAMINATE	SIGNAL
4 PREPREG	SIGNAL
5 LAMINATE	GROUND
6 PREPREG	CUT POWER PLANE
7 LAMINATE	CUT POWER PLANE
8 PREPREG	GROUND
9 LAMINATE	SIGNAL
10 PREPREG	SIGNAL
11 LAMINATE	GROUND
12 PREPREG	SIGNAL

BOARD HOLES

PAD ON SLOT IN BETWEEN J4 AND J5 (LAYER 1 AND LAYER 12)



PAD ON MIDDLE HOLE (LAYER 1 AND LAYER 12)



PCB BOARD STANDOFFS

BOARD INFORMATION

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

APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-6850	02
SCALE	SHT	OF	
NONE	2	109	

8

7

6

5

4

3

2

1

D

D

C

C

B

B

A

A

THIS PAGE INTENTIONALLY BLANK

Block Diagram

SYNC_MASTER=N/A SYNC_DATE=N/A

NOTICE OF PROPRIETARY PROPERTY

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

I TO MAINTAIN THE DOCUMENT IN CONFIDENCE

II NOT TO REPRODUCE OR COPY IT

III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART



APPLE COMPUTER INC.

SIZE	D	DRAWING NUMBER	051-6850	REV.	02
SCALE	NONE	SHT	3	OF	109

8

7

6

5

4

3

2

1

8

7

6

5

4

3

2

1

Revision History

D

D

C

C


B

B

A

A

02	
SYNC_MASTER=N/A	SYNC_DATE=N/A
NOTICE OF PROPRIETARY PROPERTY	
THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING	
I TO MAINTAIN THE DOCUMENT IN CONFIDENCE	
II NOT TO REPRODUCE OR COPY IT	
III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART	

 APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-6850	02
SCALE	SHT	OF	
NONE	5	109	

8

7

6

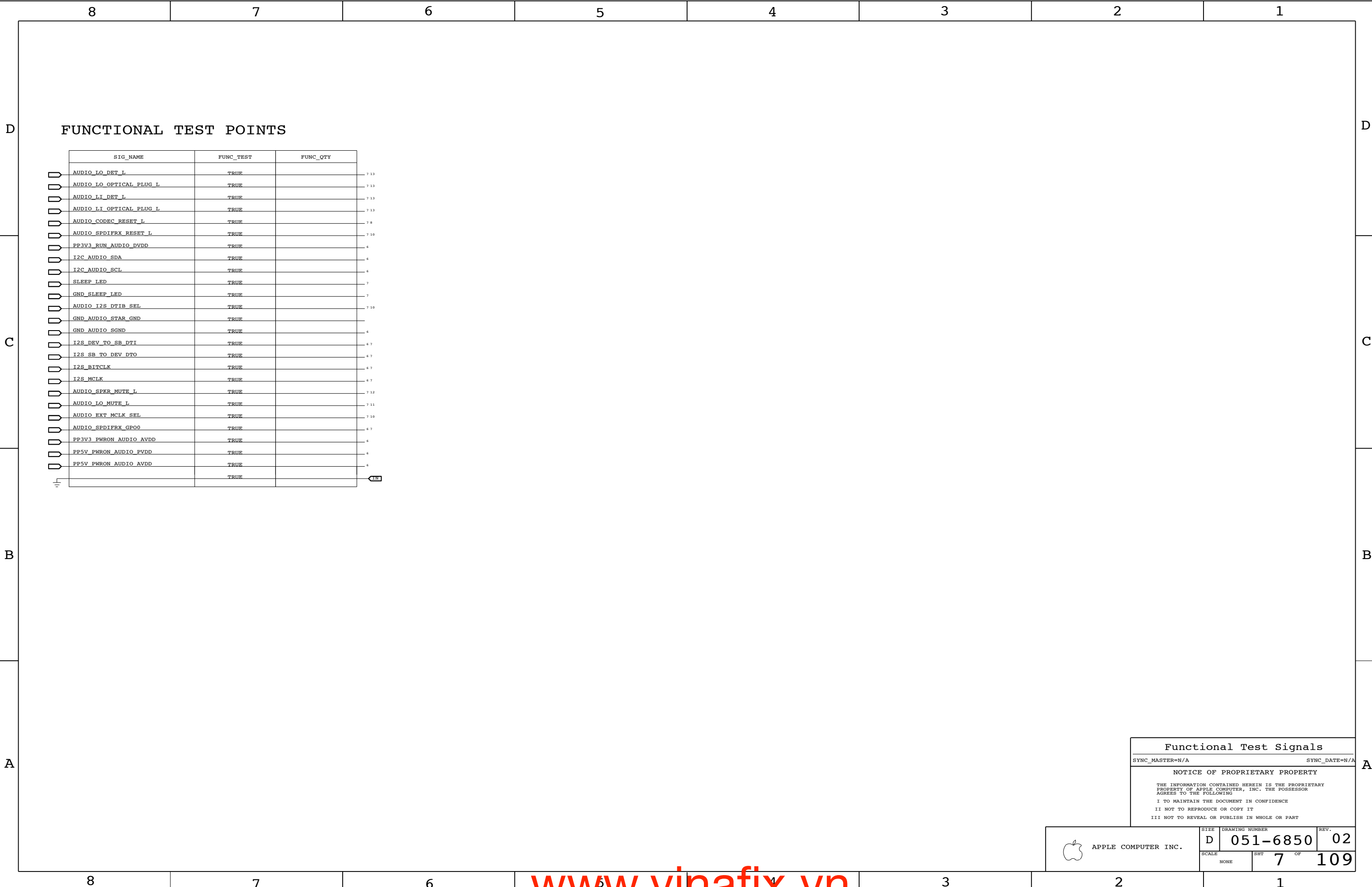
5

4

3

2

1



FUNCTIONAL TEST POINTS

SIG_NAME	FUNC_TEST	FUNC_QTY
AUDIO LO DET L	TRUE	7 13
AUDIO LO OPTICAL PLUG L	TRUE	7 13
AUDIO LI DET L	TRUE	7 13
AUDIO LI OPTICAL PLUG L	TRUE	7 13
AUDIO CODEC RESET L	TRUE	7 8
AUDIO SPDIFRX RESET L	TRUE	7 10
PP3V3_RUN_AUDIO_DVDD	TRUE	6
I2C_AUDIO_SDA	TRUE	6
I2C_AUDIO_SCL	TRUE	6
SLEEP_LED	TRUE	7
GND_SLEEP_LED	TRUE	7
AUDIO_I2S_DTIB_SEL	TRUE	7 10
GND_AUDIO_STAR_GND	TRUE	
GND_AUDIO_SGND	TRUE	6
I2S_DEV_TO_SB_DTI	TRUE	6 7
I2S_SB_TO_DEV DTO	TRUE	6 7
I2S_BITCLK	TRUE	6 7
I2S_MCLK	TRUE	6 7
AUDIO_SPKR_MUTE_L	TRUE	7 12
AUDIO_LO_MUTE_L	TRUE	7 13
AUDIO_EXT_MCLK_SEL	TRUE	7 10
AUDIO_SPDIFRX_GPO0	TRUE	6 7
PP3V3_PWRON_AUDIO_AVDD	TRUE	6
PP5V_PWRON_AUDIO_PVDD	TRUE	6
PP5V_PWRON_AUDIO_AVDD	TRUE	6
	TRUE	6

Functional Test Signals
 SYNC_MASTER=N/A SYNC_DATE=N/A
 NOTICE OF PROPRIETARY PROPERTY
 THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING
 I TO MAINTAIN THE DOCUMENT IN CONFIDENCE
 II NOT TO REPRODUCE OR COPY IT
 III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-6850	02
SCALE	NONE	SHT	7 OF 109

ELECTRICAL_CONSTRAINT_SET	NET_TYPE		DIFFERENTIAL_PAIR
	SPACING	PHYSICAL	
	12R	12R	I2S_SB_TO_DEV DTO 5 6 7
	12R	12R	I2S_DEV_TO_SB DTI 5 6 7
	12R	12R	I2S_MCLK 5 6 7
	12R	12R	I2S_BITCLK 5 6 7

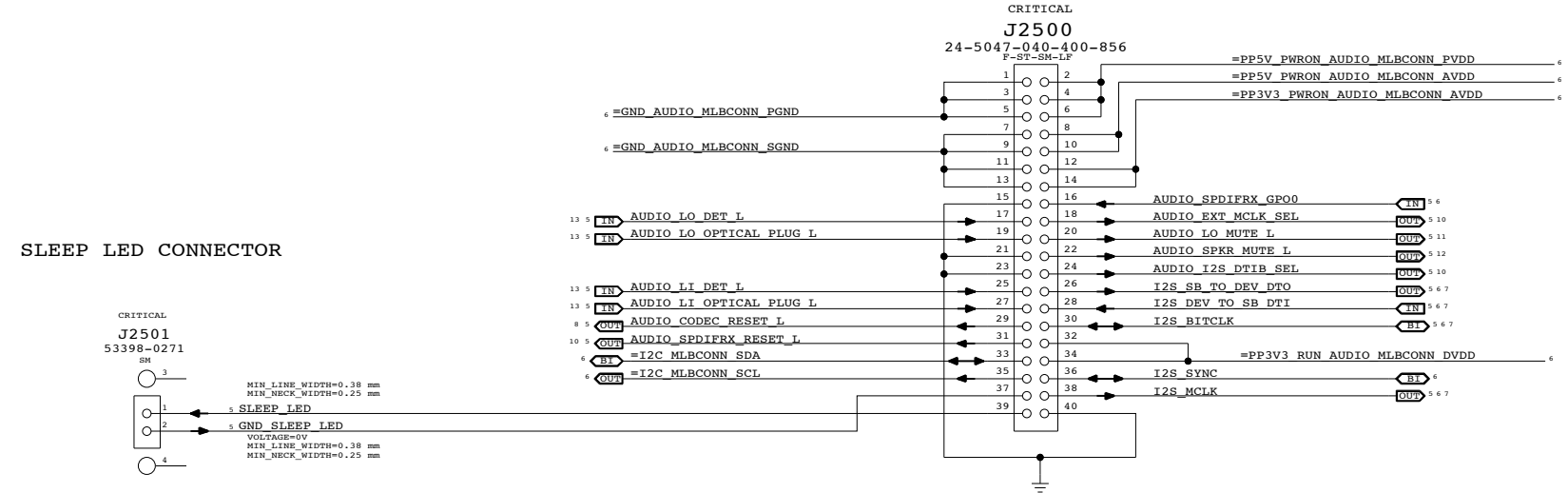
Page Notes

Power aliases required by this page:
 - =PP5V_PWRON_AUDIO_MLBCONN_PVDD
 - =PP5V_PWRON_AUDIO_MLBCONN_AVDD
 - =PP3V3_PWRON_AUDIO_MLBCONN_AVDD
 - =PP3V3_RUN_AUDIO_MLBCONN_DVDD
 - =GND_AUDIO_MLBCONN_SGND (GND for AVDD)
 - =GND_AUDIO_MLBCONN_PGND (GND for PVDD)

Signal aliases required by this page:
 - =I2C_MLBCONN_SCL
 - =I2C_MLBCONN_SDA

BOM options provided by this page:
 (NONE)

AUDIO CONNECTOR (TO MLB)



Non-Audio Connectors
 SYNC_MASTER=N/A SYNC_DATE=N/A

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

APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-6850	02
SCALE	SHT		OF
NONE	25		109

ELECTRICAL_CONSTRAINT_SET	NET_TYPE		DIFFERENTIAL_PAIR
	SPACING	PHYSICAL	
	128	128	

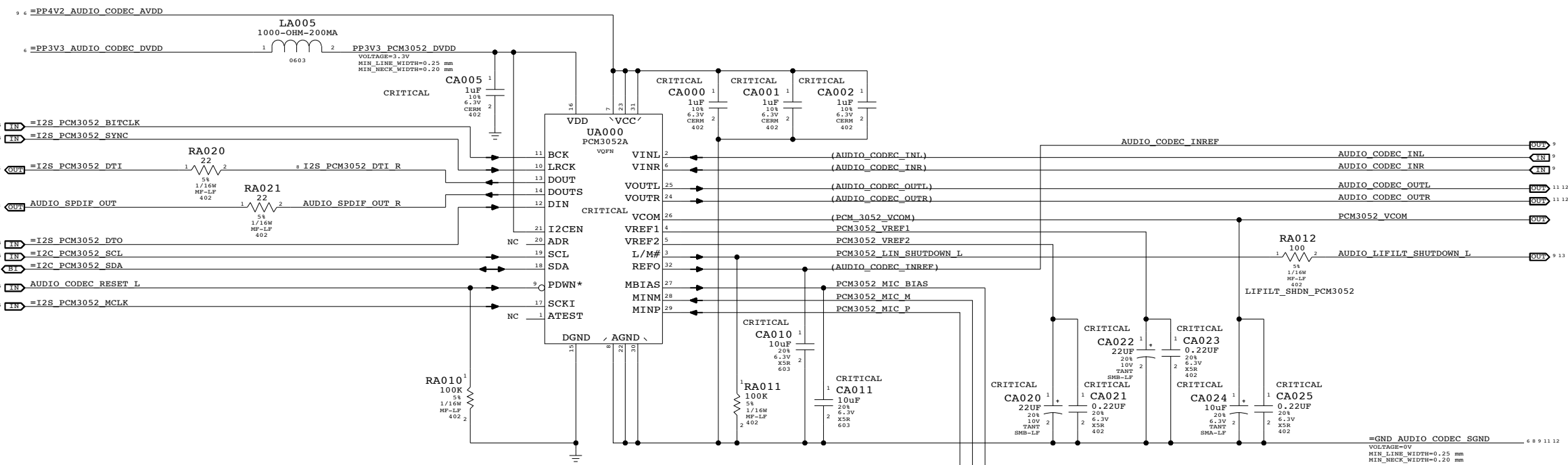
I2S_PCM3052_DTI_R

Page Notes

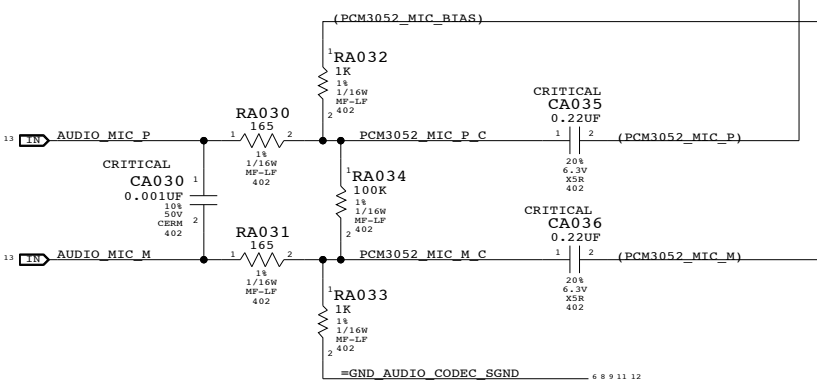
- Power aliases required by this page:
- PP4V2_AUDIO_CODEC_AVDD
 - PP3V3_AUDIO_CODEC_DVDD
 - GND_AUDIO_CODEC_SGND
- Signal aliases required by this page:
- I2C_PCM3052_SCL
 - I2C_PCM3052_SDA
 - I2S_PCM3052_DTI
 - I2S_PCM3052_DTO
 - I2S_PCM3052_MCLK
 - I2S_PCM3052_BITCLK
 - I2S_PCM3052_SYNC
- BOM options provided by this page:
(NONE)

BrownOdio CODEC (TI PCM3052A)

If 3052 uses I2S-a, ADR = NC or low, I2C Addr=8C
 If 3052 uses I2S-b, ADR = high, I2C Addr=8E



Microphone Interface



BrownOdio Codec	
SYNC_MASTER=SPDIF-AUDIO-Q16C	SYNC_DATE=06/03/2005
NOTICE OF PROPRIETARY PROPERTY	
THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING	
I TO MAINTAIN THE DOCUMENT IN CONFIDENCE	
II NOT TO REPRODUCE OR COPY IT	
III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART	

APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	NONE	051-6850	02
SCALE		SHT	
NONE		100 109	

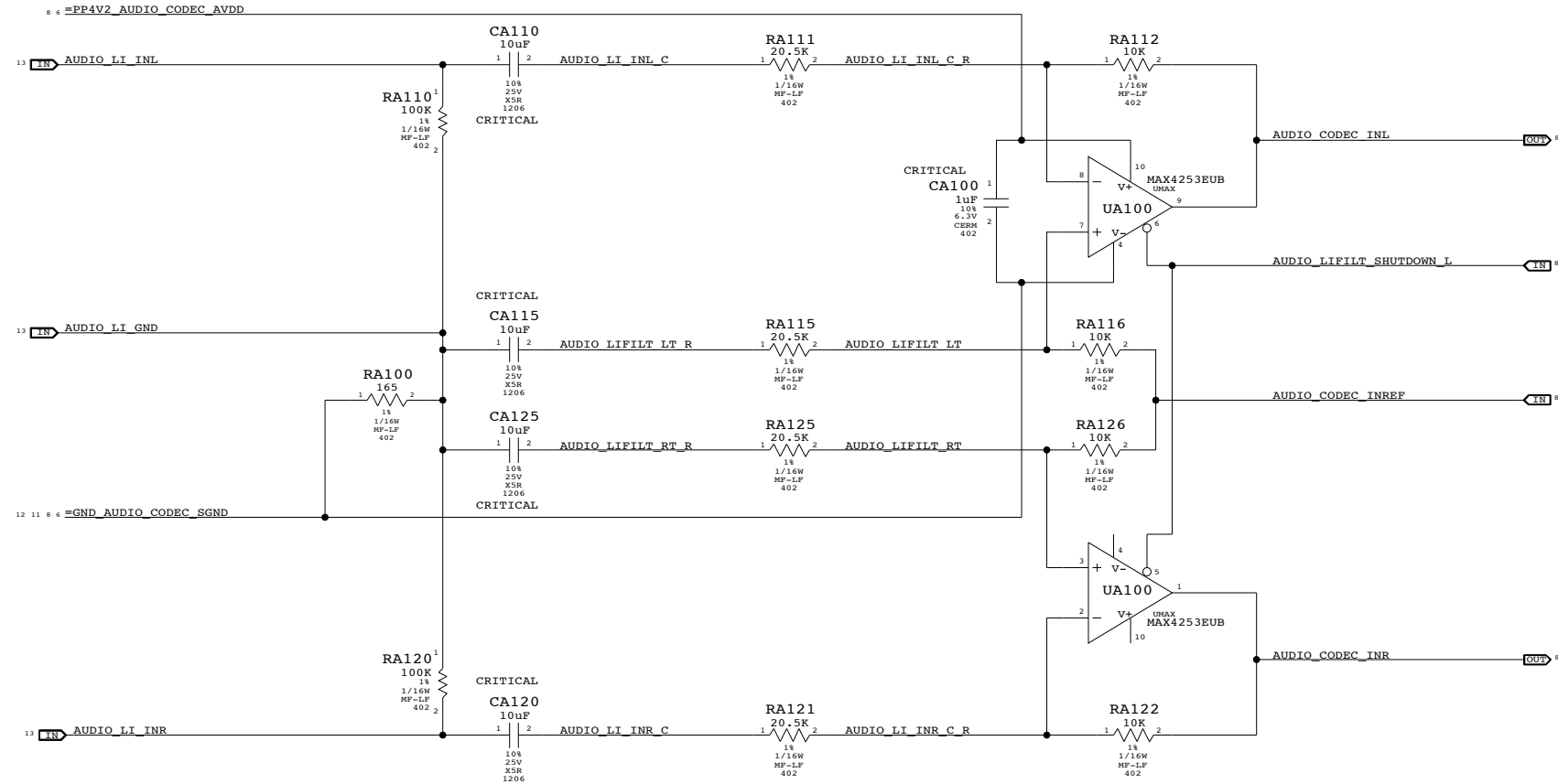
Page Notes

Power aliases required by this page:
 - =PP4V2_AUDIO_LIFILT_AVDD
 - =GND_AUDIO_CODEC_SGND

Signal aliases required by this page:
 (NONE)

BOM options provided by this page:
 (NONE)

Pseudo-Diff Line-In Filter
 Gain = -6.24dB Av = 0.49
 Fc = 0.78 Hz



Line In Filter

SYNC_MASTER=SPDIF-AUDIO-Q16C SYNC_DATE=06/03/2005

NOTICE OF PROPRIETARY PROPERTY

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

I TO MAINTAIN THE DOCUMENT IN CONFIDENCE
 II NOT TO REPRODUCE OR COPY IT
 III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	SCALE	101 109	02

ELECTRICAL_CONSTRAINT_SET	NET_TYPE	SPACING	PHYSICAL	DIFFERENTIAL_PAIR
	I2S_I2SMUX_MCLK_OUT_R	12R	12R	
	I2S_I2SMUX_DTI_OUT_R	12R	12R	
	I2S_CS8416_DTI_R	12R	12R	
	I2S_CS8416_RMCK_R	12R	12R	
	I2S_CS8416_BITCLK_R	12R	12R	
	I2S_CS8416_SYNC_R	12R	12R	
	I2S_CS8416_DTI	12R	12R	
	I2S_CS8416_RMCK	12R	12R	

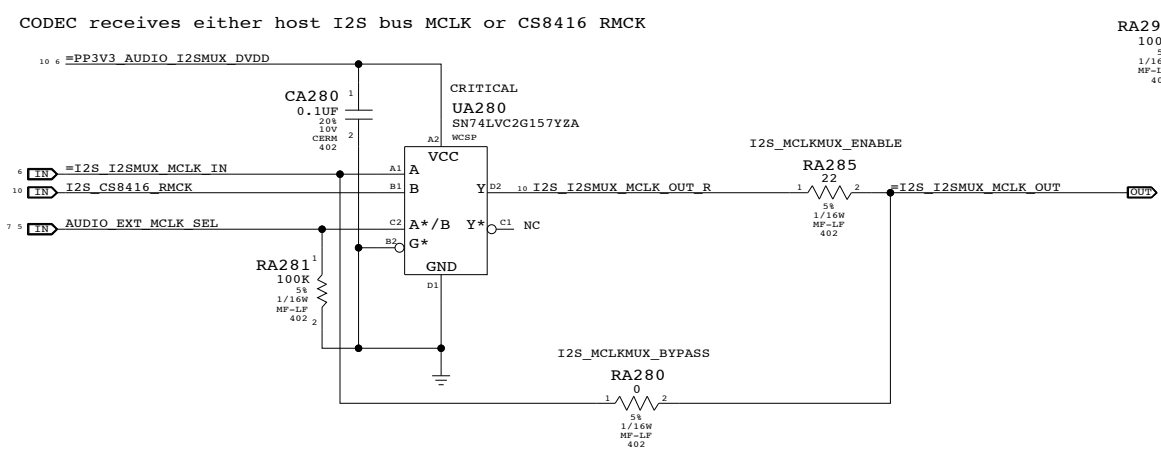
Page Notes

Power aliases required by this page:
 - =PP3V3_AUDIO_SPDIFRX_DVDD
 - =PP3V3_AUDIO_I2SMUX_DVDD

Signal aliases required by this page:
 - =I2C_CS8416_SCL
 - =I2C_CS8416_SDA
 - =I2S_CS8416_OMCK
 - =I2S_CS8416_BITCLK
 - =I2S_CS8416_SYNC
 - =I2S_I2SMUX_MCLK_IN
 - =I2S_I2SMUX_MCLK_OUT
 - =I2S_I2SMUX_DTI_IN
 - =I2S_I2SMUX_DTI_OUT
 - =CS8416_GPO0

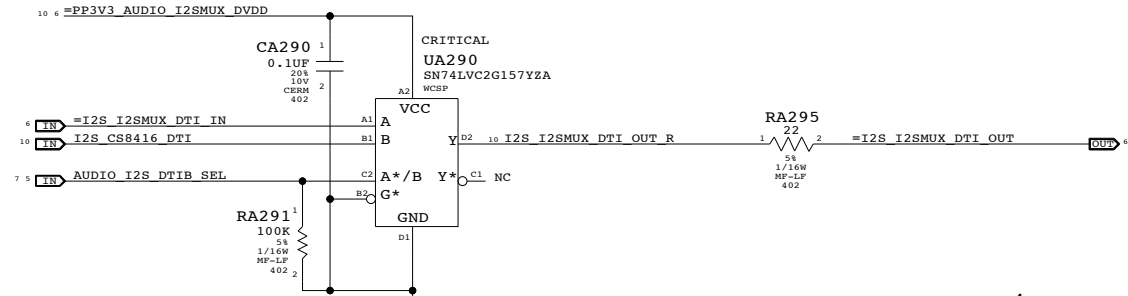
BOM options provided by this page:
 - CS8416_I2CADDR_0X22 / CS8416_I2CADDR_0X2A
 Selects between two I2C addresses for CS8416.
 - CS8416_RESET_ISOL / CS8416_RESET_NOISOL
 Stuffs or bypasses isolation circuit for CS8416 RESET input. This circuit protects the CS8416 from leakage on the RESET GPIO from I/O ASIC.
 - I2S_MCLKMUX_ENABLE / I2S_MCLKMUX_BYPASS
 Connects or bypasses I2S MCLK mux circuit. When enabled, I/O ASIC GPIO AUDIO_EXT_MCLK_SEL selects CS8416 MCLK output instead of I/O ASIC MCLK output to be used as input to CODEC circuit.
 - I2S_CLKSW_ENABLE / I2S_CLKSW_BYPASS
 Enable or disable UA270 tristate functionality for SYNC and BITCLK
 Allows for alternate method of removing CS4216 from the hostbus when SB I2S is in Master mode.

I2S Bus MCLK Mux



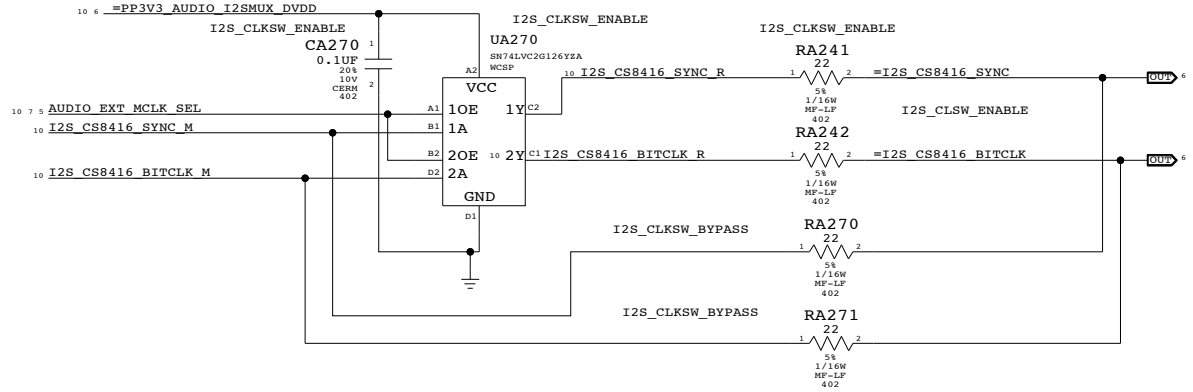
I2S Bus DTI Mux

Host bus receives either CODEC DTI or CS8416 DTI

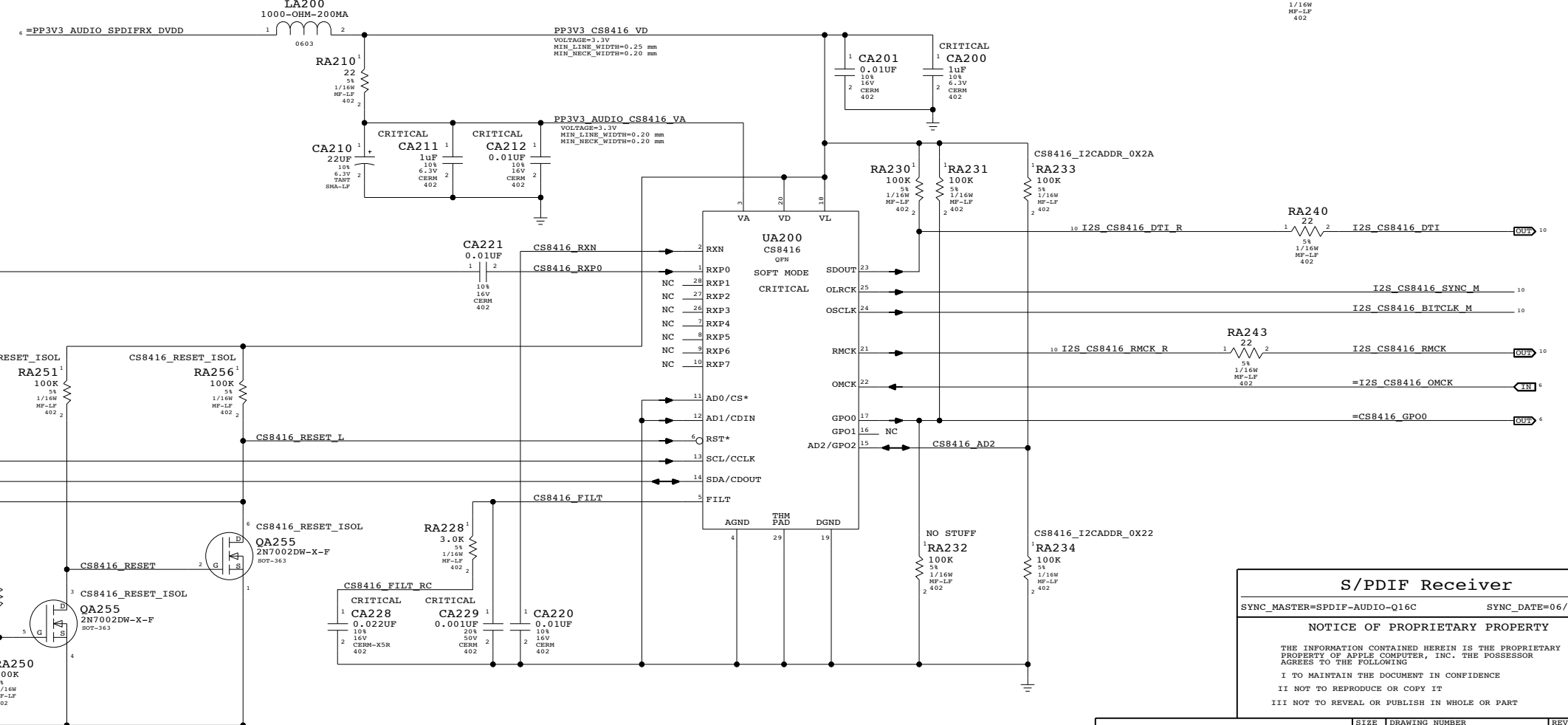


I2S Bus SYNC/BCLK Switch

Host bus SYNC/BITCLK direction switch



S/PDIF Receiver (CS8416)



I2C Address selection

i2s-a	AD2=0, AD1=0, AD0=0
i2s-b	AD2=0, AD1=0, AD0=1
i2s-c	AD2=0, AD1=1, AD0=0
i2s-d	AD2=0, AD1=1, AD0=1

CS8416 Pin To Supply Leakage Isolator

S/PDIF Receiver
 SYNC_MASTER=SPDIF-AUDIO-Q16C SYNC_DATE=06/03/2005

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

SIZE	DRAWING NUMBER	REV.
D	051-6850	02
SCALE	SHT	102 109
NONE		

ELECTRICAL_CONSTRAINT_SET	NET_TYPE		
	SPACING	PHYSICAL	DIFFERENTIAL_PAIR
	AUDIO	AUDIO	
	AUDIO	AUDIO	
	AUDIO	AUDIO	
	AUDIO	AUDIO	

AUDIO_HPAMP_OUTL_R	11
AUDIO_HPAMP_OUTR_R	11
AUDIO_HPAMP_OUTL	11 13
AUDIO_HPAMP_OUTR	11 13

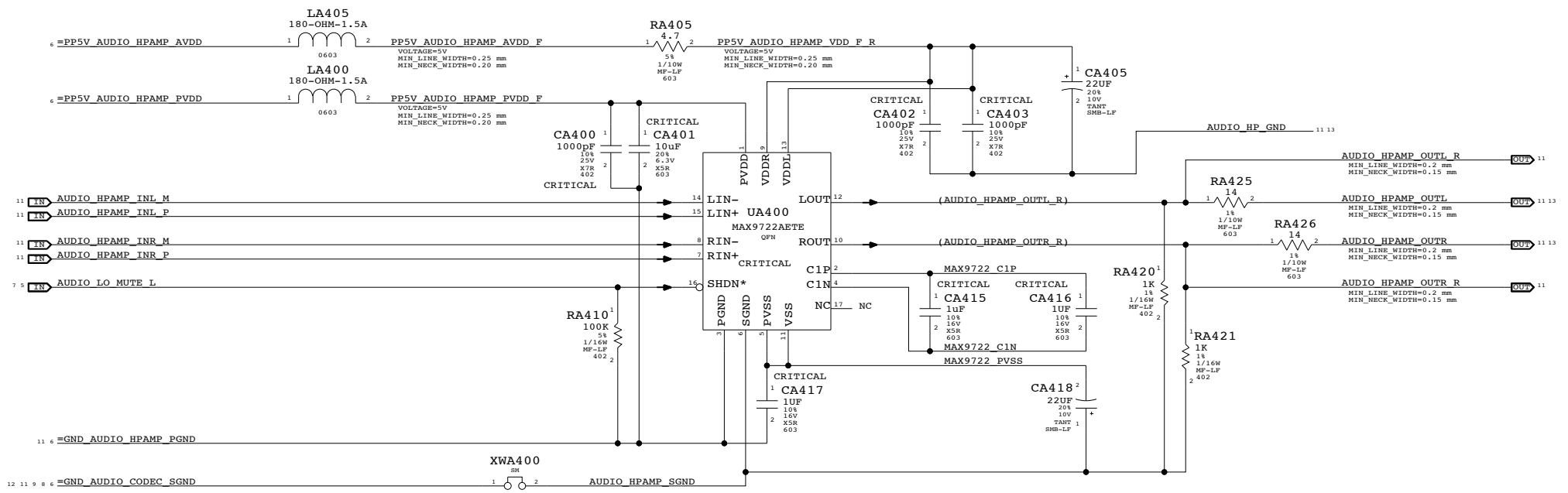
Page Notes

Power aliases required by this page:
 - =PP5V_AUDIO_HPAMP_AVDD
 - =PP5V_AUDIO_HPAMP_PVDD
 - =GND_AUDIO_HPAMP_PGND (GND for power)
 - =GND_AUDIO_HPAMP_SGND (GND for signal)
 - =GND_AUDIO_CODEC_SGND
 - =GND_AUDIO_HP_STAR_GND

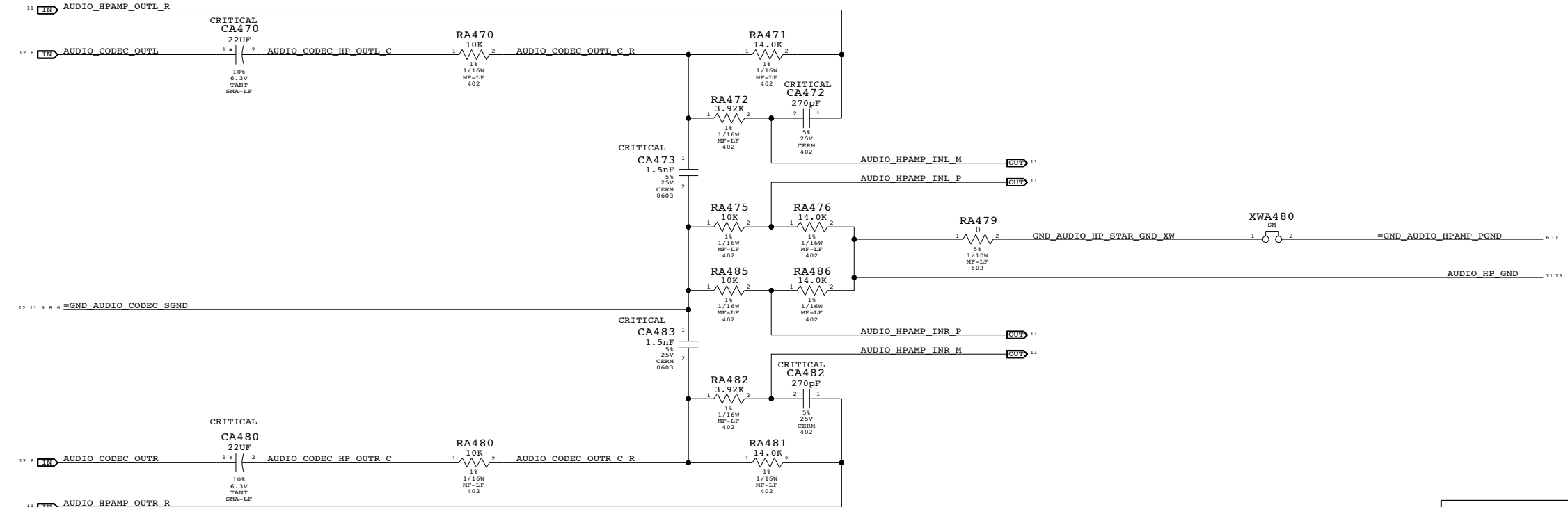
Signal aliases required by this page:
 (NONE)

BOM options provided by this page:
 (NONE)

Headphone Amplifier (MAX9722)



2nd Order DAC Filter



Headphone Amp		
SYNC_MASTER=SPDIF-AUDIO-Q41C	SYNC_DATE=06/03/2005	
NOTICE OF PROPRIETARY PROPERTY		
THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING		
I TO MAINTAIN THE DOCUMENT IN CONFIDENCE		
II NOT TO REPRODUCE OR COPY IT		
III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART		

APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-6850	02
SCALE	NONE	SHT	104 OF 109

Page Notes

Power aliases required by this page:
 - =PP5V_AUDIO_SPKRAMP_PVDD
 - =PP5V_AUDIO_SPKRAMP_AVDD
 - =GND_AUDIO_SPKRAMP_PGND (GND for power)
 - =GND_AUDIO_SPKRAMP_SGND (GND for signal)

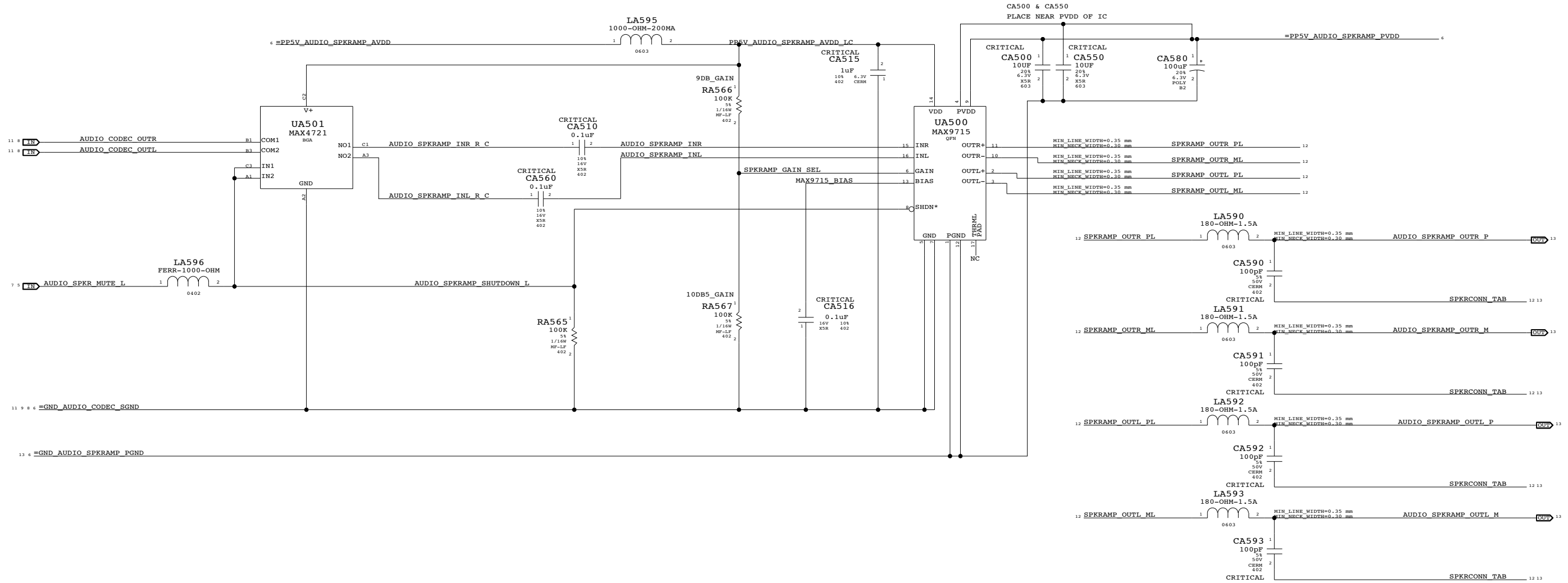
Signal aliases required by this page:
 (NONE)

BOM options provided by this page:
 - 10DB5_GAIN
 MAX9715 GAIN is set through this pin
 HIGH = 9dB
 LOW = 10.5dB

STEREO SPEAKER AMPLIFIERS

Gain = 10.5dB

118 < FC < 245Hz



MAX9715 Speaker Amps
 SYNC_MASTER=SPDIF-AUDIO-Q41C SYNC_DATE=06/03/2005

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

APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-6850	02
SCALE	NONE	SHT	105 109

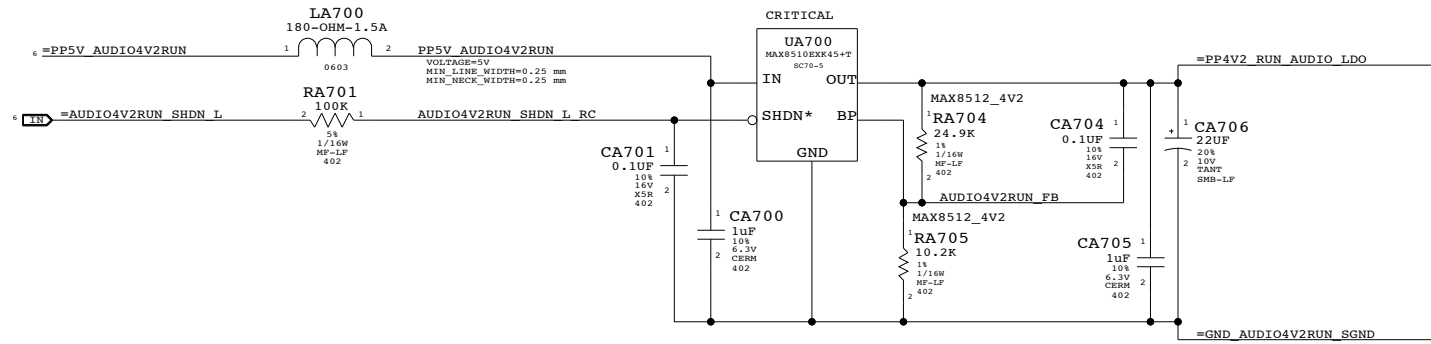
Page Notes

Power aliases required by this page:
 - =PP5V_AUDIO4V2RUN
 - =PP4V2_RUN_AUDIO_LDO
 - =GND_AUDIO4V2RUN_SGND

Signal aliases required by this page:
 - =AUDIO4V2RUN_SHDN_L

BOM options provided by this page:
 - MAX8512_4V2
 Used when MAX8512 is stuff at UA700
 MAX8512 is an adjustable regulator that needs RA704/705 to program Vout

Audio 4.5V LDO (CODEC)



UA700 to be verified and confirmed in proto
 Component option in order of preference
 -MAX8510EXK45-T(353S0960) 4.5V Fixed regulator
 -MAX8510EXK42-T (New part) 4.2V Fixed regulator
 -MAX8512EXK-T(353S1110) Adjustable regulator

Audio Power Supply
 SYNC_MASTER=SPDIF-AUDIO-Q16C SYNC_DATE=06/03/2005
 NOTICE OF PROPRIETARY PROPERTY
 THE INFORMATION CONTAINED HEREIN IS THE PROPRIETARY PROPERTY OF APPLE COMPUTER, INC. THE POSSESSOR AGREES TO THE FOLLOWING
 I TO MAINTAIN THE DOCUMENT IN CONFIDENCE
 II NOT TO REPRODUCE OR COPY IT
 III NOT TO REVEAL OR PUBLISH IN WHOLE OR PART

APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	051-6850	02
SCALE	SHT		
NONE	107		109

