

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
01		?	?	?	?

## SCHEM, SOUND, PB 17 "

### 2/4/03

PAGE	CONTENTS
1	TITLE PAGE AND CONTENTS
2	PCB NOTES AND HOLES
3	SNAPPER (AUDIO) CONTROL INTERFACE
4	SPEAKER AMP
5	HEADPHONE & MICROPHONE AMP
6	LINE-IN AMP
7	SIGNAL CONSTRAINTS
8	SIGNAL LOCATIONS
9	PART LOCATIONS

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	BOM OPTION
051-6428	1	SCHEM,SOUND,PB 17 INCH	SCH1	
820-1373	1	PCBF,SOUND,PB 17 INCH	PCB1	

DIMENSIONS ARE IN MILLIMETERS		<b>METRIC</b>		 Apple Computer Inc.	
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X.XX :	_____				
X.XXX :	_____				
ANGLES :	_____				
DO NOT SCALE DRAWING		DRAFTER / DESIGN CK / ENG APPD / MFG APPD / QA APPD / DESIGNER / RELEASE / SCALE /	<b>SCHEM, TUBA, P84</b>		
 THIRD ANGLE PROJECTION		MATERIAL / FINISH NOTED AS APPLICABLE	SIZE <b>D</b>	DRAWING NUMBER <b>405599</b>	REV. <b>AA</b>
			SHT 1 OF 9		

# 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  
 SIGNAL TRACE WIDTH: 4 MILS  
 SIGNAL TRACE SPACING: 4 MILS  
 PREPREG THICKNESS: 2-3 MILS

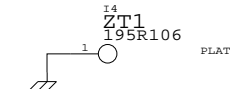
SEE PCB CAD FILES FOR MORE SPECIFIC INFO.

## BOARD STACK-UP AND CONSTRUCTION

20R10 TH VIA OR VIA IN PAD

1	SIGNAL (1/3 OZ + COPPER PLATING)
2	PREPREG (3MIL) GROUND (1/2 OZ)
3	LAMINATE (4MIL) SIGNAL (1/2 OZ)
4	PREPREG (3MIL) SIGNAL (1/2 OZ)
5	LAMINATE (4MIL) GROUND (1/2 OZ)
6	PREPREG (2MIL) CUT POWER PLANE(1 OZ)
7	LAMINATE (3MIL) CUT POWER PLANE(1 OZ)
8	PREPREG (2MIL) GROUND (1/2 OZ)
9	LAMINATE (4MIL) SIGNAL (1/2 OZ)
10	PREPREG (3MIL) SIGNAL (1/2 OZ)
11	LAMINATE (4MIL) GROUND (1/2 OZ)
12	PREPREG (3MIL) SIGNAL (1/3 OZ + COPPER PLATING)

## BOARD HOLES



## PCB BOARD STANDOFFS

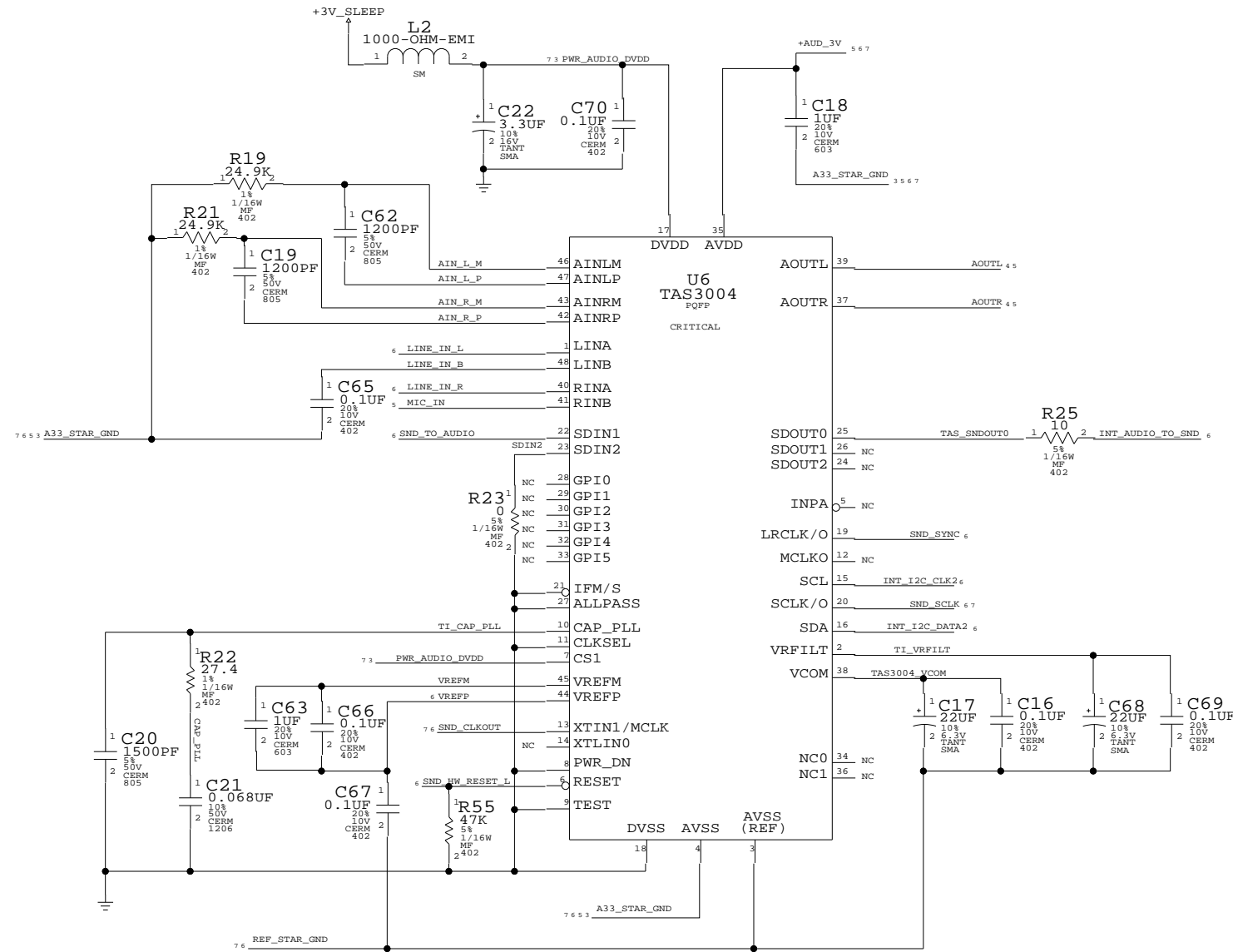
### BOARD INFORMATION

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	SCALE NONE	SHT 2	OF 9

# SNAPPER (AUDIO CODEC W/ EQ)

PLACE THESE CAPS NEAR TAS3004



## SNAPPER CONTROL

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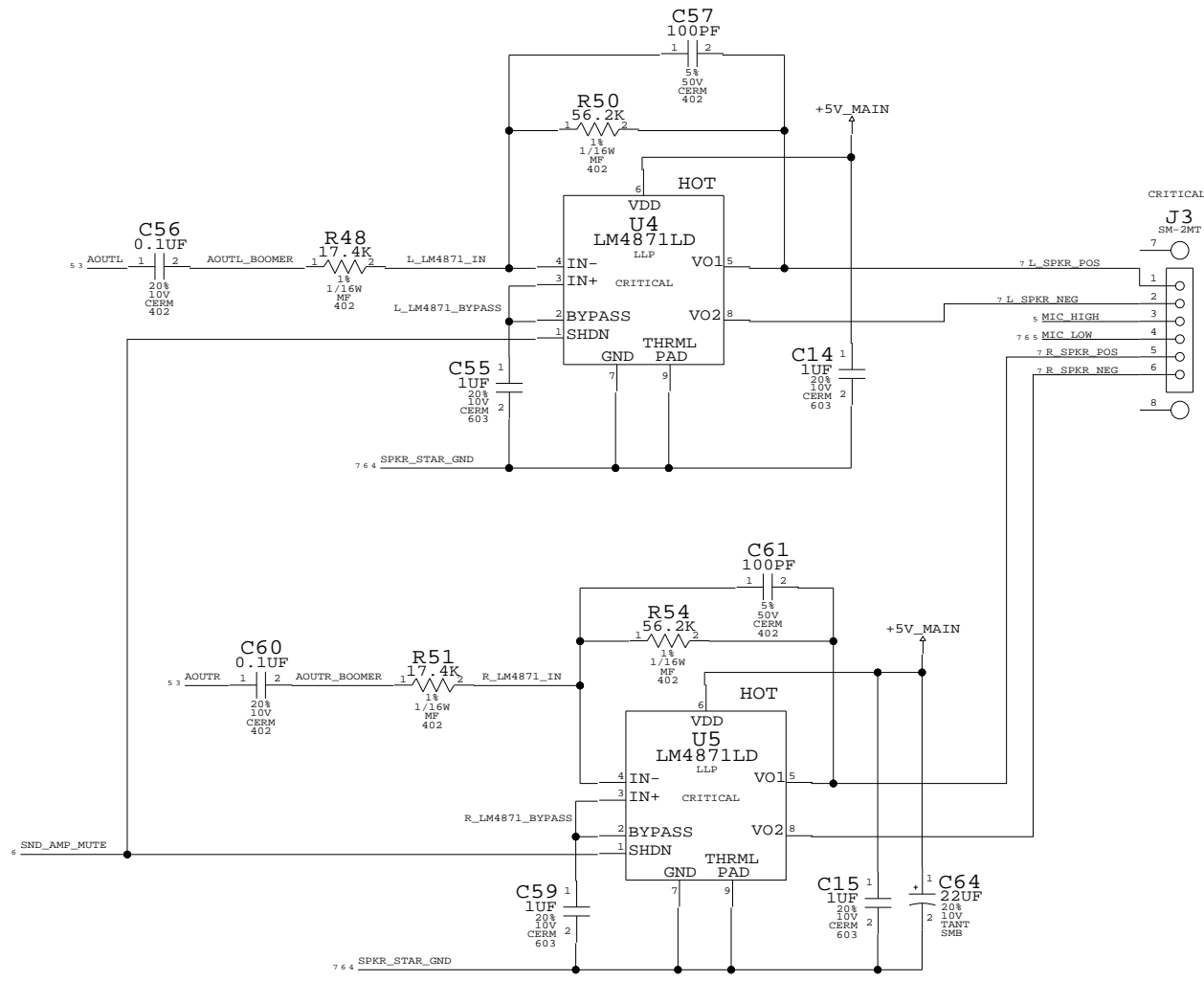
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SIZE	DRAWING NUMBER	REV.
D	405599	AA
SCALE	SHT	OF
NONE	3	9

# BOOMER SPEAKER AMP



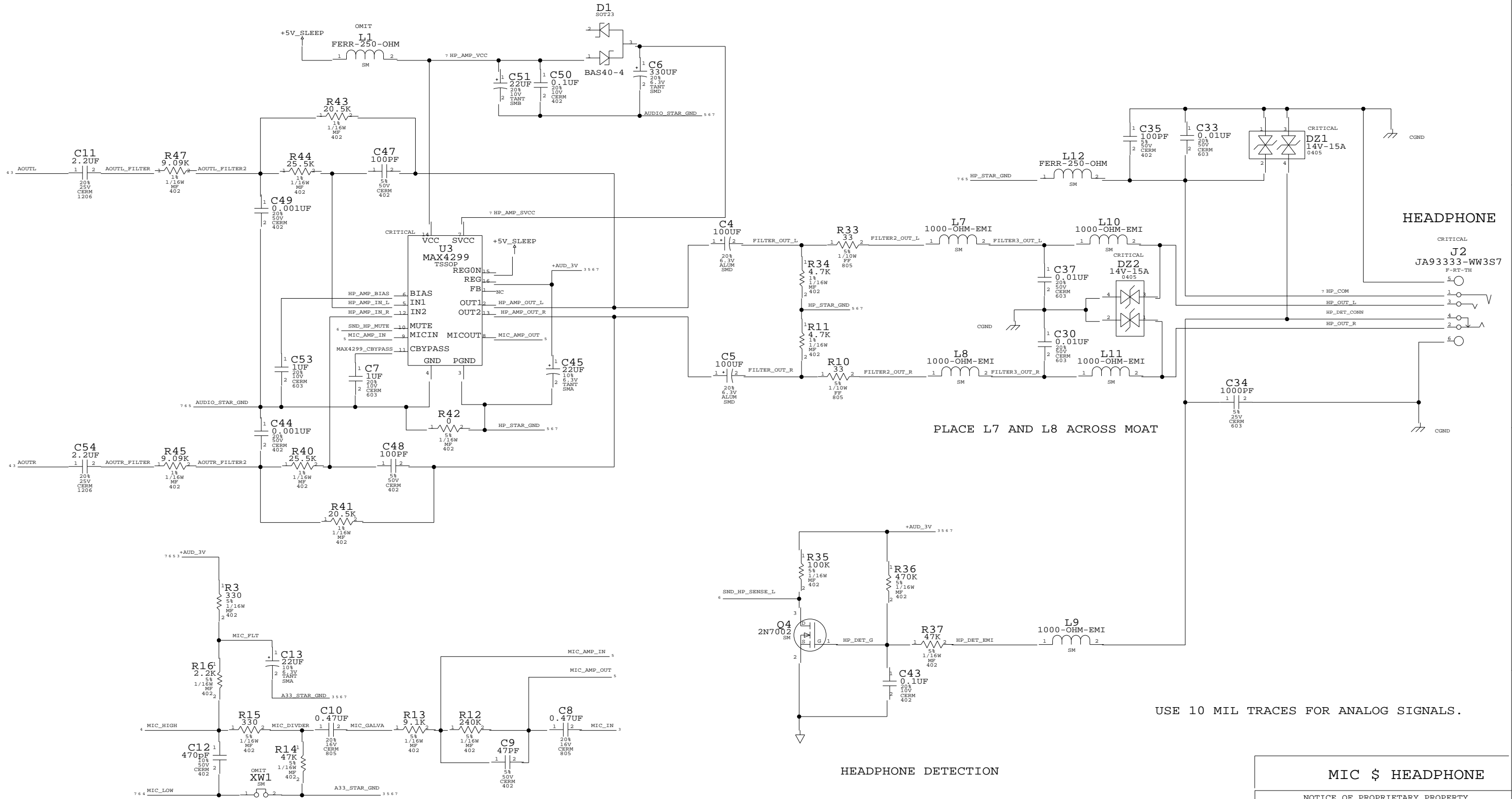
PLACE C64 CLOSE TO PIN 6 AT U4 AND U5

## SPEAKERS

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	SIZE	DRAWING NUMBER	REV.
	D	405599	AA
SCALE	SHT	OF	
NONE	4	9	

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	BOM OPTION
10683920	1	RES, FF, 3.92 OHM, 1%, 0.1W, SMD	L1	?



MICROPHONE

HEADPHONE DETECTION

HEADPHONE

USE 10 MIL TRACES FOR ANALOG SIGNALS.

MIC & HEADPHONE

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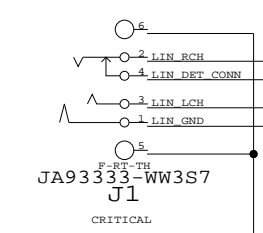
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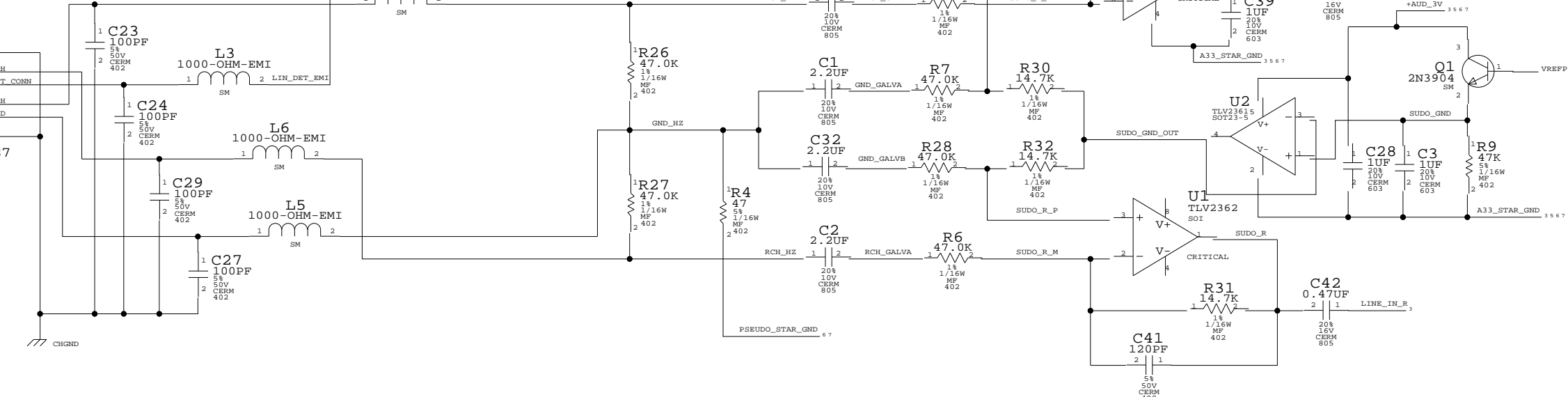
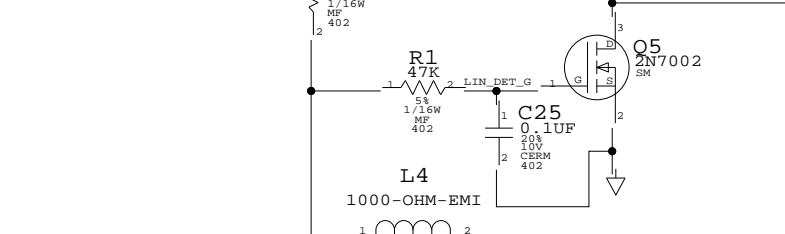
APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	405599	AA
SCALE	SHT	OF	
NONE	5	9	

# LINE IN AMPLIFIER

## LINE IN CONNECTOR

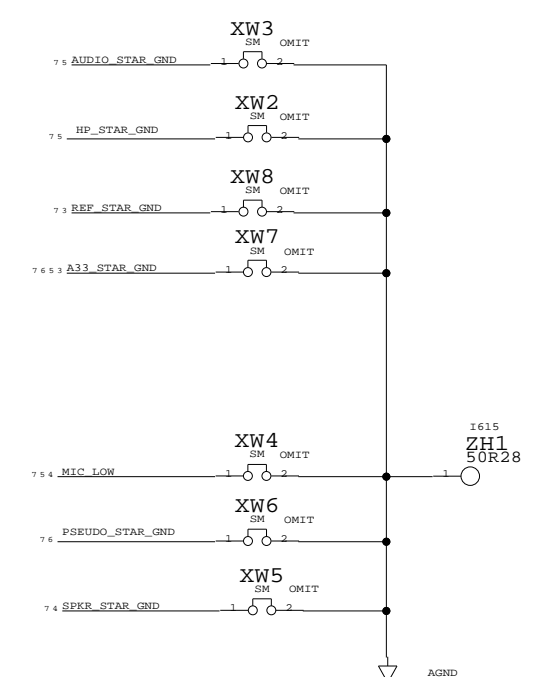


## LINE-IN DETECTION

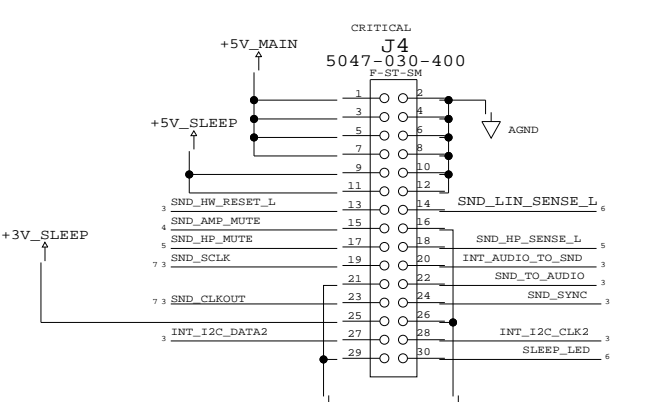


USE 10 MIL TRACES FOR ANALOG SIGNALS.

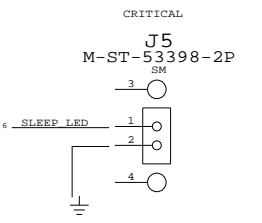
## AUDIO STAR GROUND



## SOUND BOARD CONNECTOR



## SLEEP LED CONNECTOR



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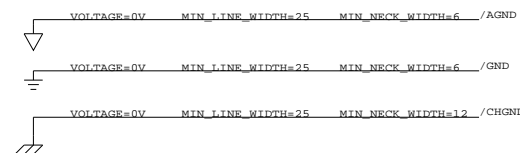
APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
	D	405599	AA
SCALE	SHT	OF	
NONE	6	9	

GROUP	SIG_NAME	VOLTAGE	MIN_LINE_WIDTH	MIN_NECK_WIDTH
AUDIO	L_SPKR_POS		MIN_LINE_WIDTH=10	MIN_NECK_WIDTH=10
	L_SPKR_NEG		MIN_LINE_WIDTH=10	MIN_NECK_WIDTH=10
	R_SPKR_POS		MIN_LINE_WIDTH=10	MIN_NECK_WIDTH=10
	R_SPKR_NEG		MIN_LINE_WIDTH=10	MIN_NECK_WIDTH=10
	HP_COM		MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10
	+3V_SLEEP	VOLTAGE=3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10
	+5V_MAIN	VOLTAGE=5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10
	+5V_SLEEP	VOLTAGE=5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10
	+AUD_3V	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10
	PWR_AUDIO_DVDD	VOLTAGE=3.3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10
HP_AMP_VCC	VOLTAGE=5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	
HP_AMP_SVCC	VOLTAGE=5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	
L_IM4871_FILTER	VOLTAGE=5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	
R_IM4871_FILTER	VOLTAGE=5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	
A33_STAR_GND	VOLTAGE=0V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	
REF_STAR_GND	VOLTAGE=0V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	
MIC_LOW	VOLTAGE=0V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	
SPKR_STAR_GND	VOLTAGE=0V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	
AUDIO_STAR_GND	VOLTAGE=0V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	
HP_STAR_GND	VOLTAGE=0V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	
PSEUDO_STAR_GND	VOLTAGE=0V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	

REVISION HISTORY

- RELEASED FOR EVT
  - REPLACED LINE-OUT CONNECTOR WITH LINE CONNECTOR
  - REPINED OUT THE 30-PIN CONNECTOR
- RELEASED FOR DVT
  - CHANGED LINE-IN AND LINE-OUT SENSE TO ACTIVE LOW
  - CORRECTED NET NAME, I.E. +AUD\_3V
  - ADDED OP-AMP IN LINE-IN CIRCUIT
  - SWAPPED RIGHT AND LEFT CHANNEL ON LINE-IN AND LINE-OUT CONNECTOR
  - REPINED OUT 30-PIN CONNECTOR
  - FIXED OVER\_SENSITIVE TO 60 HZ NOISE FOR LINE-IN CIRCUIT
  - CHANGED OP-AMP GAIN FOR SPEAKER
- RELEASED FOR EVT
  - CORRECTED U2 POWER/GND PINS
  - CHANGED MUTE POLARITIES ON SPEAKER AND HEADPHONE AMP
  - REDUCED TURN-ON POP (R55/R59)

SIG_NAME	MIN_LINE_WIDTH	NET_SPACING_TYPE
SND_CLKOUT		NET_SPACING_TYPE=10
SND_SCLK		NET_SPACING_TYPE=10



SIGNAL CONSTRAINTS

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	D	405599	AA
SCALE	SHT	OF	
NONE	7	9	

\*\*\* Signal Cross-Reference \*\*\*  
 --- for the entire design ---

```

+3V_SLEEP      7D4
+3V_WAKE      7D4
+3V_SLEEP      7D4
+3V_SLEEP      7D4
+AUD_3V       3D5 5B4 5B7 5C5 6D2 6D3 6D5 7D4
/AGND         7A4
/CMDN         7A4
/GND          7A4
A13_STAR_GND  3A6 3C5 3C8 5A6 5A7 6B8 6C2 6C3 7C4
AIR_L_M       3C6
AIR_L_P       3C6
AIR_R_M       3C6
AIR_R_P       3C6
AOUTL         3C5 4D6 5C8
AOUTL_BOOMER  4D6
AOUTL_FILTER  5C8
AOUTL_FILTER2 5C7
AOUTR         3C5 4C6 5B8
AOUTR_BOOMER  4C6
AOUTR_FILTER  5B8
AOUTR_FILTER2 5B7
AUDIO_STAR_GND 5B7 5D5 6B8 7C4
CQJ_PLL       3B9
FILTER_OUT_L  5C4
FILTER_OUT_R  5C4
FILTER_OUT_L  5C3
FILTER_OUT_R  5C3
FILTER_OUT_L  5C4
FILTER_OUT_R  5C4
GND_GALVA     6C5
GND_GALVB     6C5
GND_HZ        6C5
GND_HZ        6C5
HP_AMP_BIAS   5C7
HP_AMP_IN_L   5C7
HP_AMP_IN_R   5C7
HP_AMP_OUT_L  5C6
HP_AMP_OUT_R  5C6
HP_AMP_SVCC   5C6 7C4
HP_AMP_VCC    5D6 7D4
HP_COM        5C2 7D4
HP_DET_CONN   5C2
HP_DET_EN1    5B3
HP_DET_G      5B4
HP_OUT_L      5C2
HP_OUT_R      5C2
HP_STAR_GND   5B6 5C3 5C4 6B8 7C4
INT_AUDIO_PLL_GND 3C5 6A4
INT_I2C_CLK2  3B5 6A4
INT_I2C_DATA2 3B5 6A5
LCH_GALVA     6D5
LCH_HZ        6D5
LINE_IN_B     3C7
LINE_IN_L     3C7 6D3
LINE_IN_R     3C7 6C3
LIN_DET_CONN  6C8
LIN_DET_EN1   6C7
LIN_DET_G     6D6
LIN_GND       6C8
LIN_LCH       6C8
LIN_RCH       6C8
L_M4871_BYPASS 4C5
L_M4871_FILTER 7C4
L_M4871_IN     4D5
L_SPEK_HED    4C4 7D4
L_SPEK_POS    4D4 7D4
MAX4399_CBYPASS 5C7
MIC_AMP_IN    5A5 5C7
MIC_AMP_OUT   5A5 5C6
MIC_DIVIDER   5A7
MIC_FLT       5B7
MIC_GALVA     5A7
MIC_HIGH      4C4 5A8
MIC_IN        3C7 5A5
MIC_LOW       4C4 5A5 6A8 7C4
PSEUDO_STAR_GND 6A8 6C5 7C4
PWR_AUDIO_DVDD 3B7 3D6 7D4
RCH_GALVA     6C5
RCH_HZ        6C5
REF_STAR_GND  3A7 6B8 7C4
R_M4871_BYPASS 4B5
R_M4871_FILTER 7C4
R_M4871_IN     4C5
R_SPEK_HED    4C4 7D4
R_SPEK_POS    4C4 7D4
SDIN2         3C6
SLEEP_LED     6A3 6A4
SND_AMP_MUTE  4B6 6A5
SND_CLKOUT    3B6 6A5 7B4
SND_HP_MUTE   5C7 6A5
SND_HP_SENSE_L 5B5 6A4
SND_HW_RESET_L 3B6 6A5
SND_LIN_SENSE_L 6A4 6D5
SND_SCLK      3B5 6A5 7B4
SND_SYNC      3B5 6A4
SND_TO_AUDIO  3C7 6A4
SPKR_STAR_GND 4B6 4C6 6A8 7C4
SUDD_GND      6C3
SUDD_GND_OUT  6C4
SUDD_L        6D3
SUDD_L_M      6D4
SUDD_L_P      6D4
SUDD_R        6C3
SUDD_R_M      6C4
SUDD_R_P      6C4
TAS3004_VCOM  3B5
TI_CQJ_PLL    3B6
TI_VRFILT     3B5
VREFPH        3B6
VREFP         3B6 6C2
  
```

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	SCALE NONE	SHT <b>8</b> OF <b>9</b>	



\*\*\* Unit Cross-Reference \*\*\*  
 --- for the entire design ---

C1	CAP	6C5
C2	CAP	6C5
C3	CAP	6C3
C4	CAP_P	5C5
C5	CAP_P	5C5
C6	CAP_P	3C5
C7	CAP	5C6
C8	CAP	5A5
C9	CAP	5A6
C10	CAP	5A7
C11	CAP	5D8
C12	CAP	5A7
C13	CAP_P	5A7
C14	CAP	4C4
C15	CAP	4B4
C16	CAP	3B5
C17	CAP_P	3B5
C18	CAP	3C5
C19	CAP	3C7
C20	CAP	3B7
C21	CAP	3B7
C22	CAP_P	3C6
C23	CAP	6D7
C24	CAP	6C7
C25	CAP	6D6
C26	CAP	6D6
C27	CAP	6C7
C28	CAP	6C3
C29	CAP	6C7
C30	CAP	6C3
C32	CAP	6C5
C33	CAP	5D2
C34	CAP	5C2
C35	CAP	5D3
C37	CAP	5C3
C38	CAP	6D4
C39	CAP	6D3
C40	CAP	6D3
C41	CAP	6C4
C42	CAP	6C3
C43	CAP	5A4
C44	CAP	5B7
C45	CAP_P	5C5
C47	CAP	5D6
C48	CAP	5B6
C49	CAP	5C7
C50	CAP	5D6
C51	CAP_P	5D6
C53	CAP	5C7
C54	CAP	5B8
C55	CAP	4C5
C56	CAP	4D6
C57	CAP	4D5
C59	CAP	4B5
C60	CAP	4C6
C61	CAP	4C4
C62	CAP	3C7
C63	CAP	3B7
C64	CAP_P	4B4
C65	CAP	3C7
C66	CAP	3B7
C67	CAP	3B7
C68	CAP_P	3B4
C69	CAP	3B4
C70	CAP	3C6
D1	DIODE_SCHOT_3P	5D5
D21	SWPPR_TRANSIENT_4P1	5D2
D22	SWPPR_TRANSIENT_4P1	5C3
J1	CON_F48T_S2MT_TH3	6C8
J2	CON_F48T_S2MT_TH3	5C1
J3	CON_W68T_3M2B	4D3
J4	CON_F30ST_D_5M	6B4
J5	CON_W68T_S2MT_5M	6A3
L1	IND	3D6
L2	IND	3D6
L3	IND	6C7
L4	IND	6D6
L5	IND	6C7
L6	IND	6C7
L7	IND	5C3
L8	IND	5C3
L9	IND	5B3
L10	IND	5C3
L11	IND	5C3
L12	IND	6D3
Q1	TRIA_2B3P04	6C2
Q4	TRIA_2B7002	5B4
Q5	TRIA_2B7002	6D6
R1	RES	6D6
R2	RES	6D6
R3	RES	5B7
R4	RES	6C5
R6	RES	6C4
R7	RES	6C4
R8	RES	6D4
R9	RES	6C2
R10	RES	5C4
R11	RES	5C4
R12	RES	5A6
R13	RES	5A6
R14	RES	5A7
R15	RES	5A7
R16	RES	5A7
R19	RES	3C7
R21	RES	3C7
R22	RES	3B7
R23	RES	3B6
R25	RES	3C5
R26	RES	6C5
R27	RES	6C5
R28	RES	6C4
R29	RES	6D3
R30	RES	6C4
R31	RES	6C3
R32	RES	6C4
R33	RES	5C4
R34	RES	5C4
R35	RES	5B4
R36	RES	5B4
R37	RES	5B4
R38	RES	6D6
R40	RES	5B7
R41	RES	5B7
R42	RES	5B6
R43	RES	5D7
R44	RES	5D7
R45	RES	5B7
R47	RES	5D7
R48	RES	4D6
R50	RES	4D5
R51	RES	4C5
R54	RES	4C5
R55	RES	3B6
U1	OPAMP_TLV2162	6C3 6D3
U2	OPAMP_TLV2161	6C3
U3	MAX4299	5C6
U4	AUDIO_IAM4871LD	4D5
U5	AUDIO_IAM4871LD	4C5
U6	TAB3004	3C6
XW1	SHORT	5A7
XW2	SHORT	6B8
XW3	SHORT	6B8
XW4	SHORT	6A8
XW5	SHORT	6A8
XW6	SHORT	6A8
XW7	SHORT	6B8
XW8	SHORT	6B8
ZH1	MTHOLE	6A7
ZT1	MTHOLE	5D2

D  
C  
B  
A

D  
C  
B  
A

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SCALE	SHT	OF	
NONE	9	9	