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
C		292875	PRODUCTION RELEASED	09/09/03?	

SCHEM,SOUND,PB17"

9/9/03

PAGE CONTENTS

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	BOM OPTION
051-6456	1	SCHEM,SOUND,PB17 INCH	SCH1	
820-1523	1	PCBF,SOUND,PB17 INCH	PCB1	

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

THIRD ANGLE PROJECTION

METRIC

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

MATERIAL/FINISH NOTED AS APPLICABLE

SIZE D

Apple Computer Inc.

TITLE
SCHEM,SOUND,PB17 INCH

DRAWING NUMBER 051-6456 REV. C

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

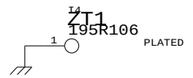
SEE PCB CAD FILES FOR MORE SPECIFIC INFO.

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

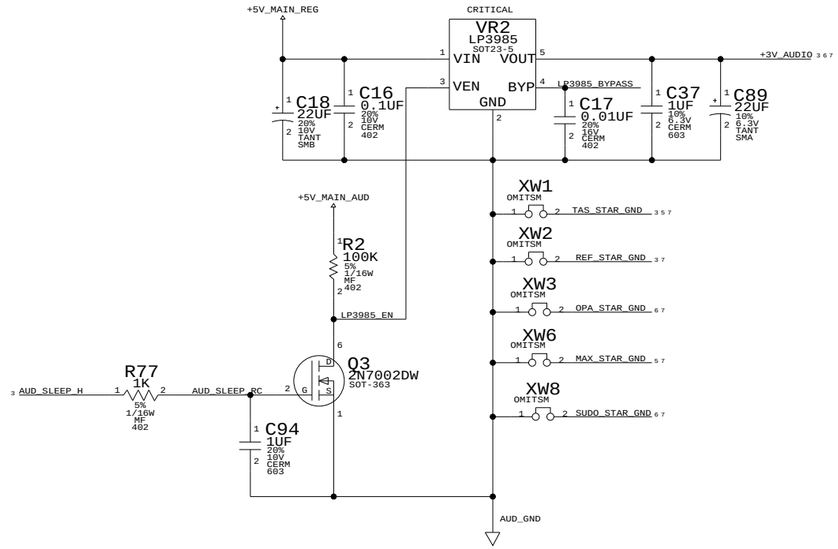
BOARD INFORMATION

APPLE COMPUTER INC.

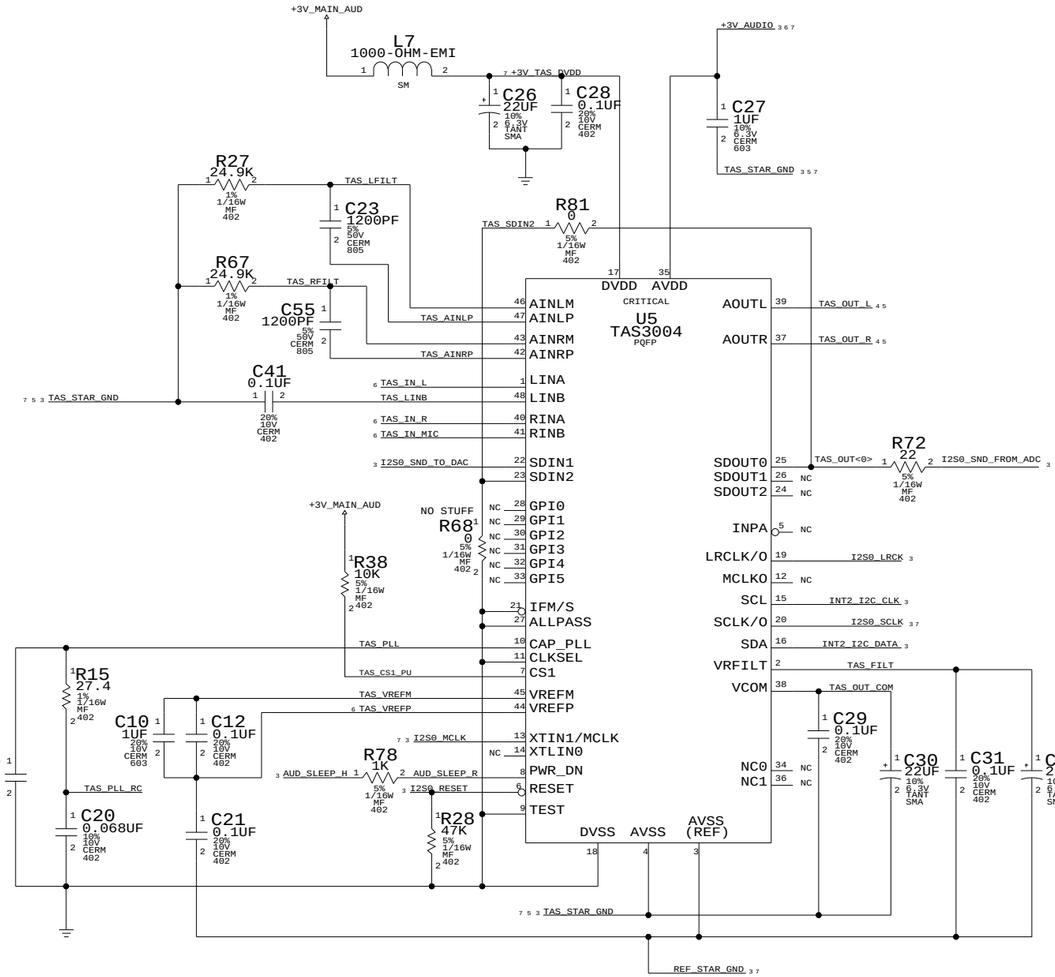
SIZE	DRAWING NUMBER	REV.
D	051-6456	C

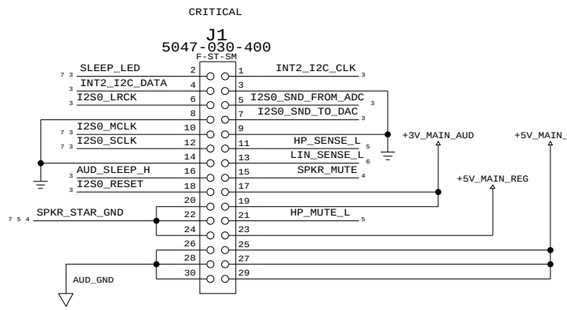
SCALE NONE | SHT 2 OF 9

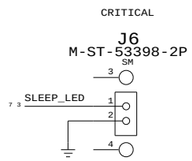
3V AUDIO POWER SUPPLY



SNAPPER CONTROL INTERFACE







SNAPPER (AUDIO) CONTROL INTERFACE

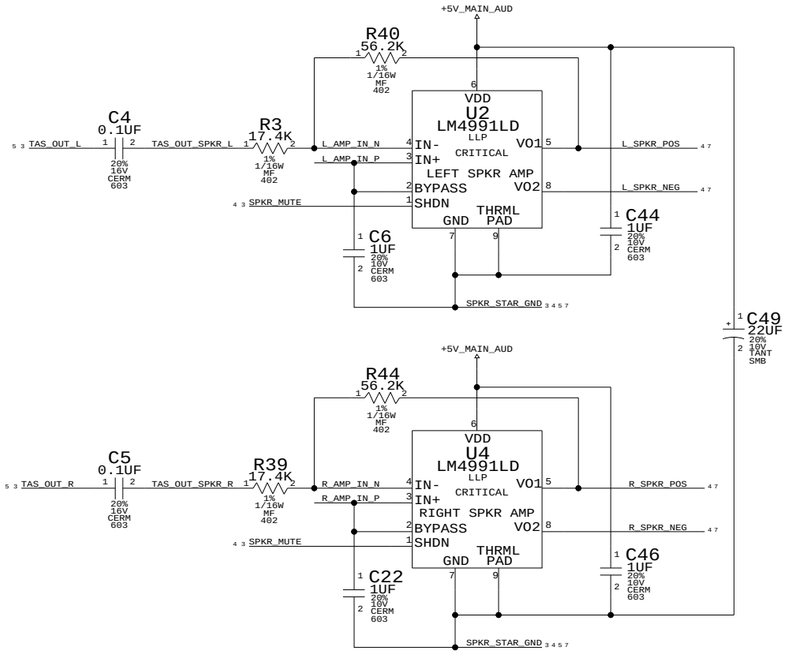
APPLE COMPUTER INC.

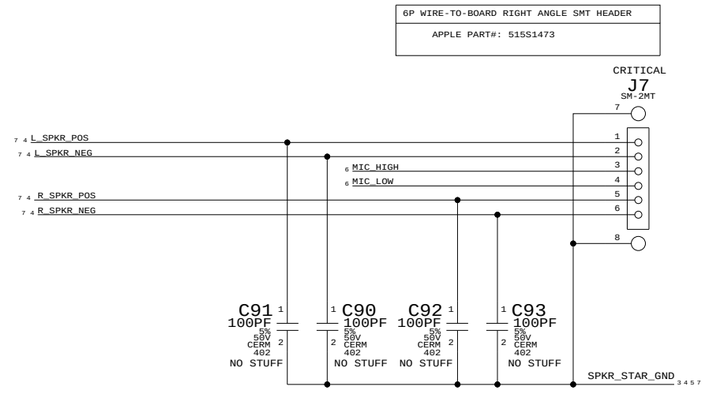
SIZE	DRAWING NUMBER	REV.
D	051-6456	C

SCALE: NONE

SHT 3 OF 9

SPEAKER DRIVER





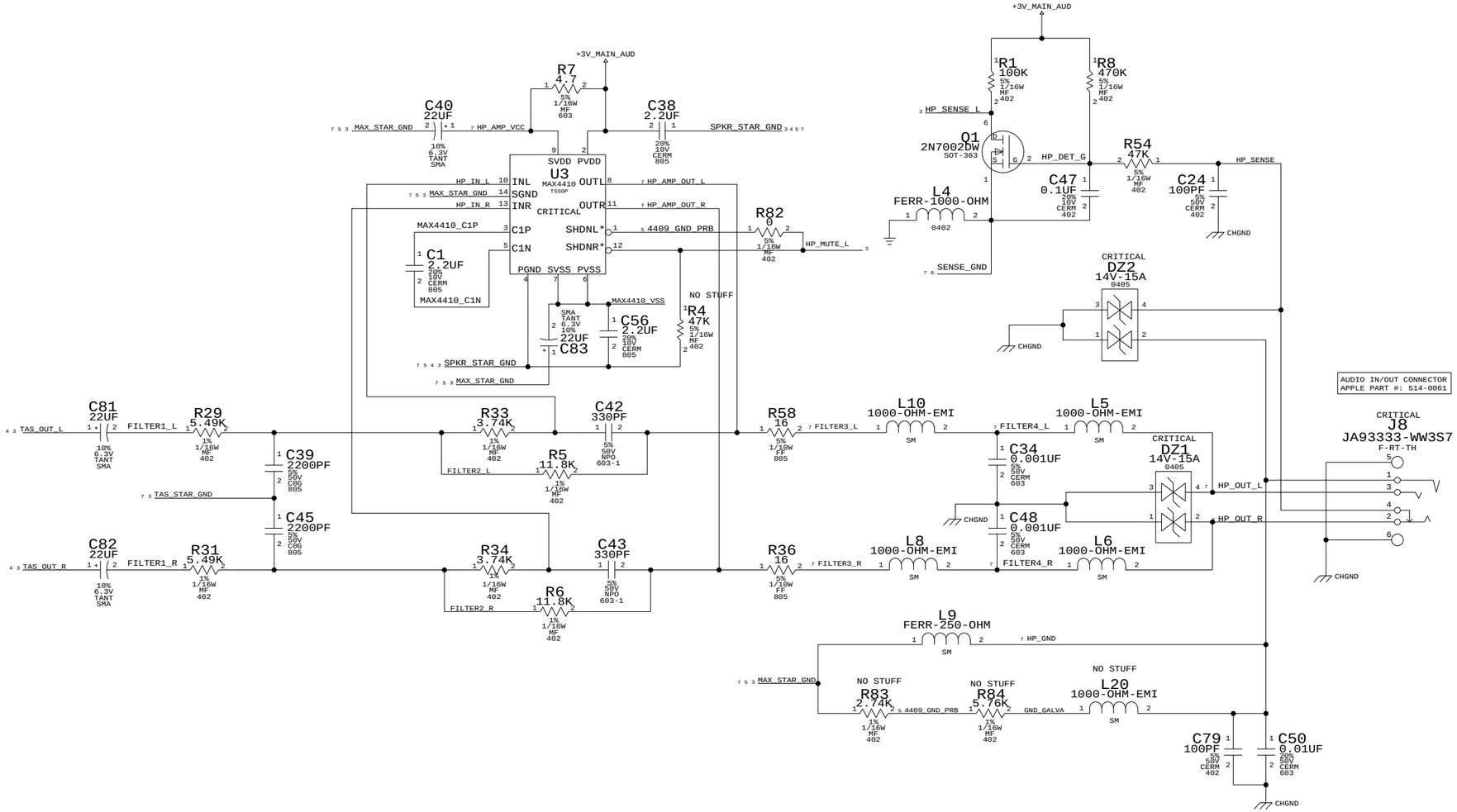
SPEAKER DRIVER

APPLE COMPUTER INC.

SIZE	DRAWING NUMBER	REV.
D	051-6456	C

SCALE	SHT	OF
NONE	4	9

HEADPHONE DRIVER



HEADPHONE DRIVER

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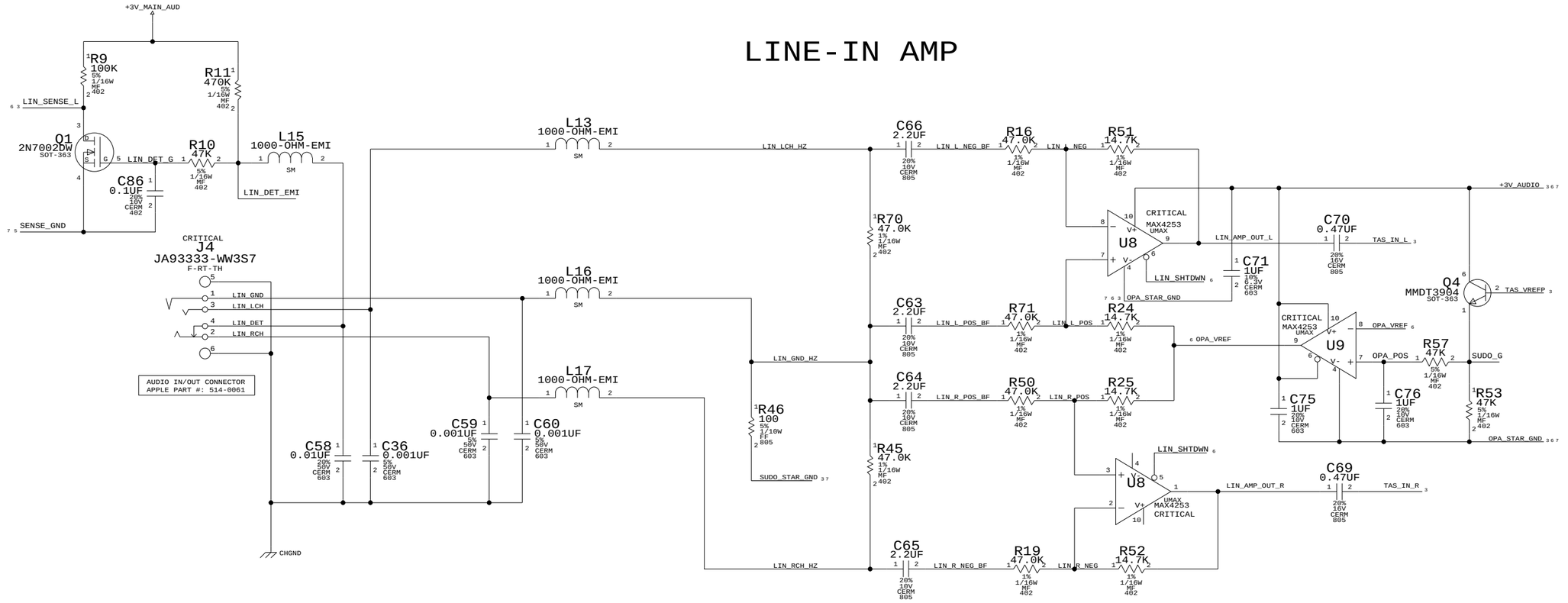
APPLE COMPUTER INC.

SIZE	DRAWING NUMBER	REV.
D	051-6456	C

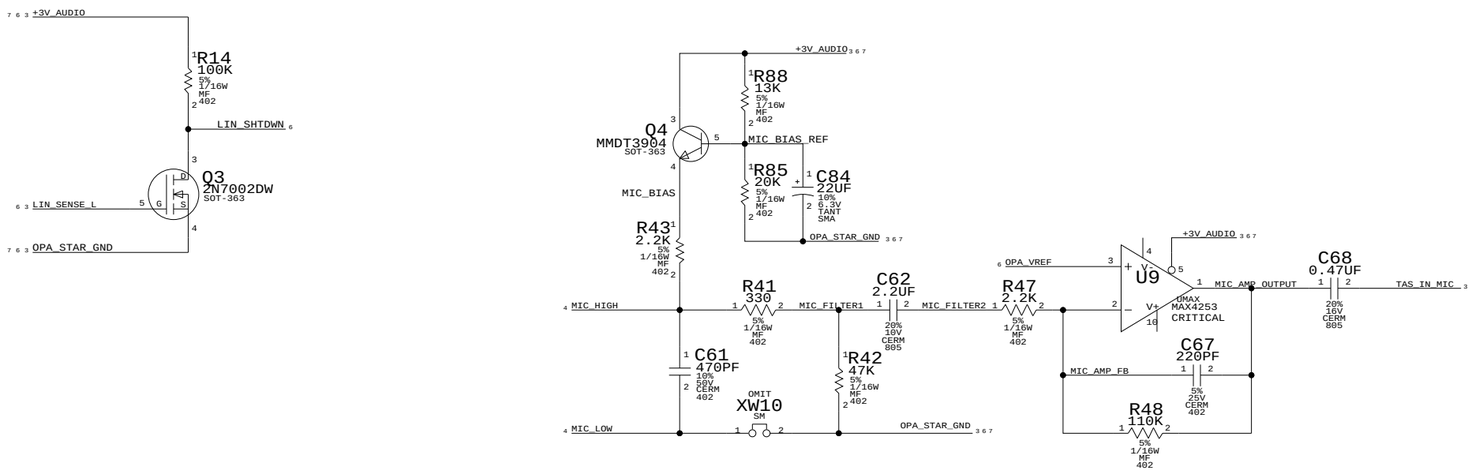
SCALE: NONE

SHT 5 OF 9

LINE-IN AMP



MICROPHONE AMP



MICROPHONE AMP. & LINE-IN AMP.

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APPLE COMPUTER INC.

SIZE	DRAWING NUMBER	REV.
D	051-6456	C
SCALE: NONE	SHT 6 OF 9	

SIGNAL CONSTRAINTS

SIGNAL NAME	DIFF_PAIR	MATCHED_DELAY	MIN_LINE_WIDTH	NET_SPACING_TYPE
I2S0_MCLK	N/A	N/A	N/A	10 MIL SPACING
I2S0_SCLK	N/A	N/A	N/A	10 MIL SPACING
HP_AMP_OUT_R			MIN_LINE_WIDTH=10	10 MIL SPACING
HP_AMP_OUT_L			MIN_LINE_WIDTH=10	10 MIL SPACING
FILTER3_R			MIN_LINE_WIDTH=10	10 MIL SPACING
FILTER3_L			MIN_LINE_WIDTH=10	10 MIL SPACING
FILTER4_R			MIN_LINE_WIDTH=10	10 MIL SPACING
FILTER4_L			MIN_LINE_WIDTH=10	10 MIL SPACING
HP_OUT_R			MIN_LINE_WIDTH=10	10 MIL SPACING
HP_OUT_L			MIN_LINE_WIDTH=10	10 MIL SPACING

POWER NET CONSTRAINTS

GROUP	SIG_NAME	VOLTAGE	MIN_LINE_WIDTH	MIN_NECK_WIDTH
MAIN/SLEEP	+5V_MAIN_AUD	VOLTAGE=5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10
	I359 +5V_MAIN_REG	VOLTAGE=5V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10
	+3V_MAIN_AUD	VOLTAGE=3.3V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10
	+3V_TAS_DVDD	VOLTAGE=3.3V	MIN_LINE_WIDTH=10	MIN_NECK_WIDTH=10 3
	+3V_AUDIO	VOLTAGE=3.3V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10 3 6
	I357 HP_AMP_VCC	VOLTAGE=3.3V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10 5
AUDIO	I356 HP_GND	VOLTAGE=0V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10 5
	TAS_STAR_GND	VOLTAGE=0V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10 3 5
	REF_STAR_GND	VOLTAGE=0V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10 3
	OPA_STAR_GND	VOLTAGE=0V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10 3 6
	PMP_STAR_GND	VOLTAGE=0V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10
	MAX_STAR_GND	VOLTAGE=0V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10 3 5
	SUDO_STAR_GND	VOLTAGE=0V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10 3 6
	SPKR_STAR_GND	VOLTAGE=0V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10 3 4 5
	I360 SENSE_GND	VOLTAGE=0V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10 5 6
	L_SPKR_POS		MIN_LINE_WIDTH=20	4
	L_SPKR_NEG		MIN_LINE_WIDTH=20	4
	R_SPKR_POS		MIN_LINE_WIDTH=20	4
	R_SPKR_NEG		MIN_LINE_WIDTH=20	4
	SLEEP_LED		MIN_LINE_WIDTH=20	3

AUDIO-IN/LINE-OUT

AUD_GND	VOLTAGE=0V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10 IN
	VOLTAGE=0V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=6 IN
CHGND	VOLTAGE=0V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=12 IN

CHANGES FROM EVT TO EVT2

1. TIED C90 TO L_SPKR_NEG
2. TIED HP_OUT_L TO PIN3 AND HP_SENSE TO PIN4 AT J8.
3. NO STUFF R4
4. CHANGED C20 FROM 0.01 UF TO 0.068UF
5. CHANGED C39 AND C45 TO 2200PF, 50V, NPO, 0805
   CHANGED R5 AND R6 TO 11.8K, 1%, 0402
   CHANGED C81 AND C82 TO 22 UF, 6.3V, 10%, SMA
6. EMI CHANGES --
   ADDED L4, L5 AND L6
   CHANGED TO 0.01 UF AT C34, C48 AND C50
   CHANGED TO 0.01 UF AT C36, C58, C59 AND C60
   NO STUFF L20

CHANGES FROM EVT2/DVT TO PVT/ RAMP

1. CHANGED R40 AND R44 FROM 86.6K TO 56.2K
   CHANGED R3 AND R39 FROM 26.7K TO 17.4K
2. SWAPPED R39 AND C5
   SWAPPED R3 AND C4
3. ADDED CONSTRAINTS FOR HEADPHONE OUTPUT SIGNALS
4. CHANGED C17 TO 402 16V 0.01UF TO REMOVE OEM NPO PART
5. CHANGED L4 TO 0402
6. CHANGED CONSTRAINTS
7. CHANGED C36, C59 AND C60 FROM 0.01UF TO 0.001UF TO IMPROVE LINE-IN SNR
8. CHANGED C34 AND C48 FROM 0.01UF TO 0.001UF TO IMPROVE HEADPHONE SNR
9. CHANGED R7 FROM 113S0016 (OEM) TO 113S1470 (APPLE, 1/10W)
10. CHANGED C42 AND C43 FROM 131S0012 (OEM) TO 131S0095 (APPLE)

SIGNAL & POWER CONSTRAINTS

APPLE COMPUTER INC.

SIZE	DRAWING NUMBER	REV.
D	051-6456	C

SCALE: NONE SHT 7 OF 9

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

```
+3V_AUDIO          3D2< 3D5< 6A3<> 6B5<> 6B7< 6D1<> 7D2>
+3V_MAIN_AUD       7D2>
+3V_TAS_DVDD       3D3< 7D2>
+5V_MAIN_AUD       7D2>
+5V_MAIN_REG       7D2>
4409_GND_PRB       5B4< 5C5<
AUD_SLEEP_H        3A8<> 3B4< 3C8<
AUD_SLEEP_R        3B4<
AUD_SLEEP_RC       3C7<>
FILTER1_L          5C7<
FILTER1_R          5B7<
FILTER2_L          5B6<
FILTER2_R          5B6<
FILTER3_L          5C5< 7D5>
FILTER3_R          5B5< 7D6>
FILTER4_L          5C4< 7D5>
FILTER4_R          5B4< 7D5>
GND_GALVA          5B4<
HP_AMP_OUT_L       5C5<> 7D6>
HP_AMP_OUT_R       5C5<> 7D6>
HP_AMP_VCC         5C6<> 7D2>
HP_DET_G           5C4<>
HP_GND             5B4<> 7D2>
HP_IN_L            5C6<>
HP_IN_R            5C6<
HP_MUTE_L          3A7<> 5C5<
HP_OUT_L           5B3<> 7D5>
HP_OUT_R           5B3<> 7D5>
HP_SENSE           5C3<>
HP_SENSE_L         3A7<> 5D4<>
I2S0_LRCK          3A8<> 3B2<>
I2S0_MClk          3A8<> 3B4< 7D6>
I2S0_RESET         3A8<> 3B4<
I2S0_SCLK          3A8<> 3B2<> 7D5>
I2S0_SND_FROM_ADC  3A7<> 3C2<
I2S0_SND_TO_DAC    3A7<> 3C4<
INT2_I2C_CLK       3A7<> 3B2<>
INT2_I2C_DATA      3A8<> 3B2<>
LIN_AMP_OUT_L      6C3<>
LIN_AMP_OUT_R      6C3<>
LIN_DET            6C7<>
LIN_DET_EMI        6D7<
LIN_DET_G          6D8<>
LIN_GND            6C7<>
LIN_GND_HZ         6C5<
LIN_LCH            6C7<>
LIN_LCH_HZ         6D5<
LIN_L_NEG          6D4<>
LIN_L_NEG_BF       6D4<
LIN_L_POS          6C4<>
LIN_L_POS_BF       6C4<
LIN_RCH            6C7<>
LIN_RCH_HZ         6B5<
LIN_R_NEG          6B4<>
LIN_R_NEG_BF       6B4<
LIN_R_POS          6C4<>
LIN_R_POS_BF       6C4<
LIN_SENSE_L        3A7<> 6A7<> 6D8<>
LIN_SHTDWN         6B7<> 6C3<> 6C3<>
LP3985_BYPASS      3D6<>
LP3985_EN          3C7<>
L_AMP_IN_N         4D6<
L_AMP_IN_P         4D7<>
L_SPKR_NEG         4C3<> 4C5> 7C2>
L_SPKR_POS         4C3<> 4D5<> 7C2>
MAX4410_C1N        5C6<
MAX4410_C1P        5C6<>
MAX4410_VSS        5C5<>
MAX_STAR_GND       3C6<> 5B5< 5C6> 5C6< 5C7< 7C2>
MIC_AMP_FB         6A4<>
MIC_AMP_OUTPUT     6A4<>
MIC_BIAS           6A5<>
MIC_BIAS_REF       6B5<>
MIC_FILTER1        6A5<
MIC_FILTER2        6A4<
MIC_HIGH           4C2<> 6A6<
MIC_LOW            4C2<> 6A6<>
OPA_POS            6C2<>
OPA_STAR_GND       3C6<> 6A4<> 6A5< 6A7<> 6C1< 6C3< 7D2>
OPA_VREF           6A4<> 6C2<> 6C3<>
PMP_STAR_GND       7C2>
REF_STAR_GND       3A3< 3C6<> 7D2>
R_AMP_IN_N         4C6<
R_AMP_IN_P         4C7<>
R_SPKR_NEG         4C3<> 4C5> 7C2>
R_SPKR_POS         4C3<> 4C5<> 7C2>
SENSE_GND          5C4<> 6D8<> 7C2>
SLEEP_LED          3A6<> 3A8<> 7C2>
SPKR_MUTE          3A7<> 4C7<> 4C7<>
SPKR_STAR_GND      3A8<> 4B1<> 4B6<> 4C6<> 5C5< 5C6<> 7C2>
SUDO_G             6C2<>
SUDO_STAR_GND      3C6<> 6C5< 7C2>
TAS_AINLP          3C4<
TAS_AINRP          3C4<
TAS_CS1_PU         3B4<
TAS_FILT           3B2<>
TAS_IN_L           3C4< 6C2<
TAS_IN_MIC         3C4< 6A3<
TAS_IN_R           3C4< 6C2<
TAS_LF1LT          3C4<
TAS_LINB           3C4<
TAS_OUT<0>         3C2<>
TAS_OUT_COM        3B2<>
TAS_OUT_L          3C2> 4D7< 5C8<
TAS_OUT_R          3C2> 4C7< 5B8<
TAS_OUT_SPKR_L     4D7<
TAS_OUT_SPKR_R     4C7<
TAS_PLL            3B4<
TAS_PLL_RC         3B5<
TAS_RF1LT          3C4<
TAS_SDIN2          3C3<
TAS_STAR_GND       3A3< 3C2< 3C5< 3C6<> 5B7< 7D2>
TAS_VREFM          3B4<
TAS_VREFP          3B4< 6C1<>
```

*** Part Cross-Reference for the entire design ***

C1	CAP	5
C4	CAP	4
C5	CAP	4
C6	CAP	4
C10	CAP	3
C12	CAP	3
C16	CAP	3
C17	CAP	3
C18	CAP_P	3
C19	CAP	3
C20	CAP	3
C21	CAP	3
C22	CAP	4
C23	CAP	3
C24	CAP	5
C26	CAP_P	3
C27	CAP	3
C28	CAP	3
C29	CAP	3
C30	CAP_P	3
C31	CAP	3
C32	CAP_P	3
C34	CAP	5
C36	CAP	6
C37	CAP	3
C38	CAP	5
C39	CAP	5
C40	CAP_P	5
C41	CAP	3
C42	CAP	5
C43	CAP	5
C44	CAP	4
C45	CAP	5
C46	CAP	4
C47	CAP	5
C48	CAP	5
C49	CAP_P	4
C50	CAP	5
C55	CAP	3
C56	CAP	5
C58	CAP	6
C59	CAP	6
C60	CAP	6
C61	CAP	6
C62	CAP	6
C63	CAP	6
C64	CAP	6
C65	CAP	6
C66	CAP	6
C67	CAP	6
C68	CAP	6
C69	CAP	6
C70	CAP	6
C71	CAP	6
C75	CAP	6
C76	CAP	6
C79	CAP	5
C81	CAP_P	5
C82	CAP_P	5
C83	CAP_P	5
C84	CAP_P	6
C86	CAP	6
C89	CAP_P	3
C90	CAP	4
C91	CAP	4
C92	CAP	4
C93	CAP	4
C94	CAP	3
DZ1	SUPPR_TRANSIENT_4P1	5
DZ2	SUPPR_TRANSIENT_4P1	5
J1	CON_F30ST_D_SM	3
J4	CON_F4RT_S2MT_TH3	6
J6	CON_M2ST_S2MT_SM	3
J7	CON_MGRT_WRIB	4
J8	CON_F4RT_S2MT_TH3	5
L4	IND	5
L5	IND	5
L6	IND	5
L7	IND	3
L8	IND	5
L9	IND	5
L10	IND	5
L13	IND	6
L15	IND	6
L16	IND	6
L17	IND	6
L20	IND	5
Q1	TRA_2N7002DW	5 6
Q3	TRA_2N7002DW	3 6
Q4	TRA_DUAL_MMDT3904	6
R1	RES	5
R2	RES	3
R3	RES	4
R4	RES	5
R5	RES	5
R6	RES	5
R7	RES	5
R8	RES	5
R9	RES	6
R10	RES	6
R11	RES	6
R14	RES	6
R15	RES	3
R16	RES	6
R19	RES	6
R24	RES	6
R25	RES	6
R27	RES	3
R28	RES	3
R29	RES	5
R31	RES	5
R33	RES	5
R34	RES	5
R36	RES	5
R38	RES	3
R39	RES	4
R40	RES	4
R41	RES	6
R42	RES	6
R43	RES	6
R44	RES	4
R45	RES	6
R46	RES	6
R47	RES	6
R48	RES	6
R50	RES	6
R51	RES	6
R52	RES	6
R53	RES	6
R54	RES	5
R57	RES	6
R58	RES	5
R67	RES	3
R68	RES	3
R70	RES	6
R71	RES	6
R72	RES	3
R77	RES	3
R78	RES	3
R81	RES	3
R82	RES	5
R83	RES	5
R84	RES	5
R85	RES	6
R88	RES	6
U2	AUDIO_LM4991LD	4
U3	MAX4410	5
U4	AUDIO_LM4991LD	4
U5	TAS3004	3
U8	OPAMP_MAX4253	6
U9	OPAMP_MAX4253	6
VR2	VREG_LP3985	3
XW1	SHORT	3
XW2	SHORT	3
XW3	SHORT	3
XW6	SHORT	3
XW8	SHORT	3
XW10	SHORT	6
ZT1	MTGHOLE	2