



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		?	?	?	?

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

P84
TUBA
DVT
12/11/2002

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	BOM OPTION
051-6256	1	SCHEM, TUBA, P84	SCH1	
820-1373	1	PCBF, TUBA, P84	PCB1	

DIMENSIONS ARE IN MILLIMETERS		METRIC		 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	NONE MATERIAL / FINISH NOTED AS APPLICABLE SIZE D	SCHEM, TUBA, P84 EVT	
 THIRD ANGLE PROJECTION				DRAWING NUMBER 405599 REV. 0A 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

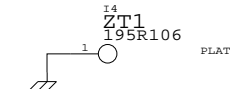
SEE PCB CAD FILES FOR MORE SPECIFIC INFO.

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

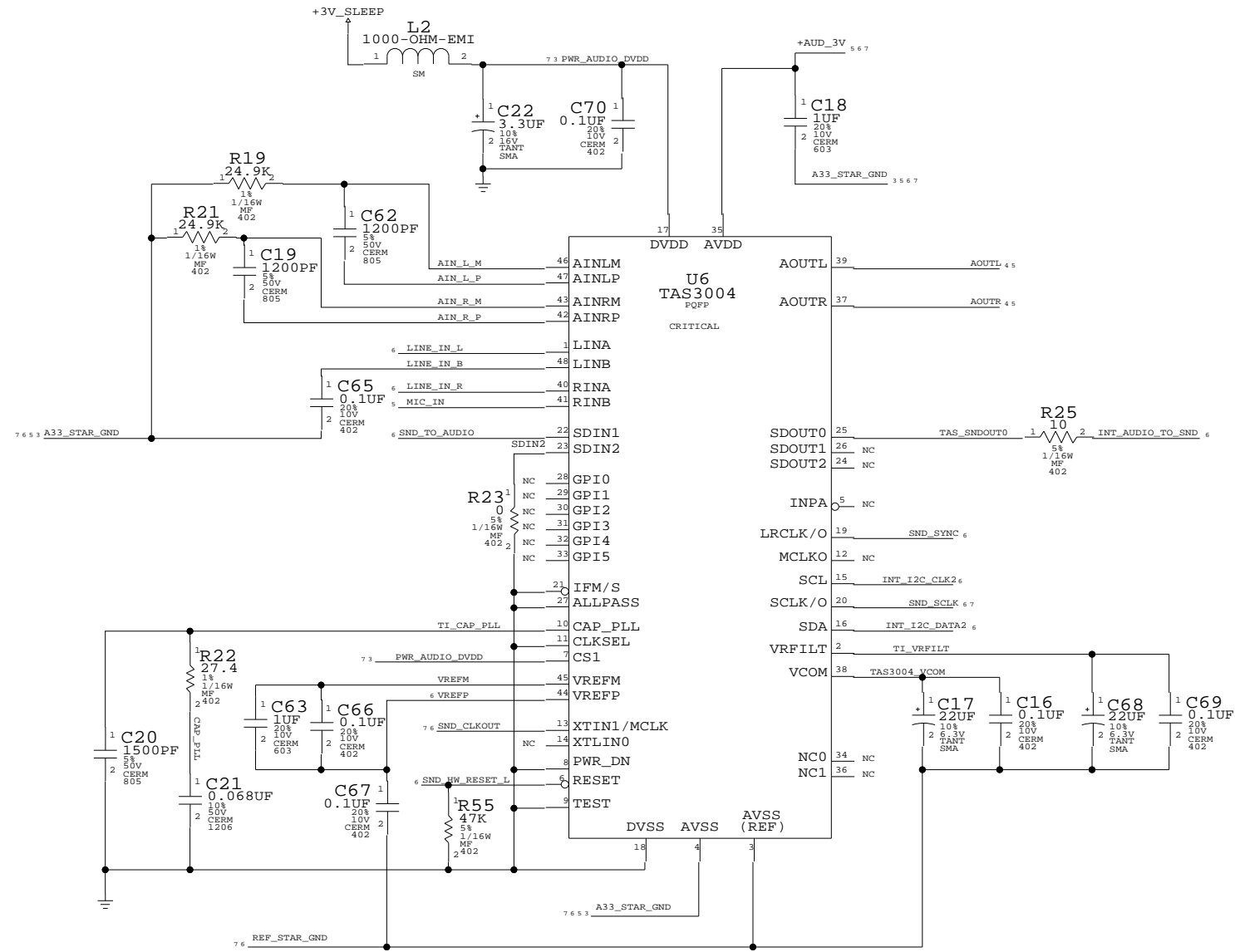
BOARD INFORMATION

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	D	405599	0A
SCALE	SHT	OF	
NONE	2	9	

SNAPPER (AUDIO CODEC W/ EQ)

PLACE THESE CAPS NEAR TAS3004



SNAPPER CONTROL

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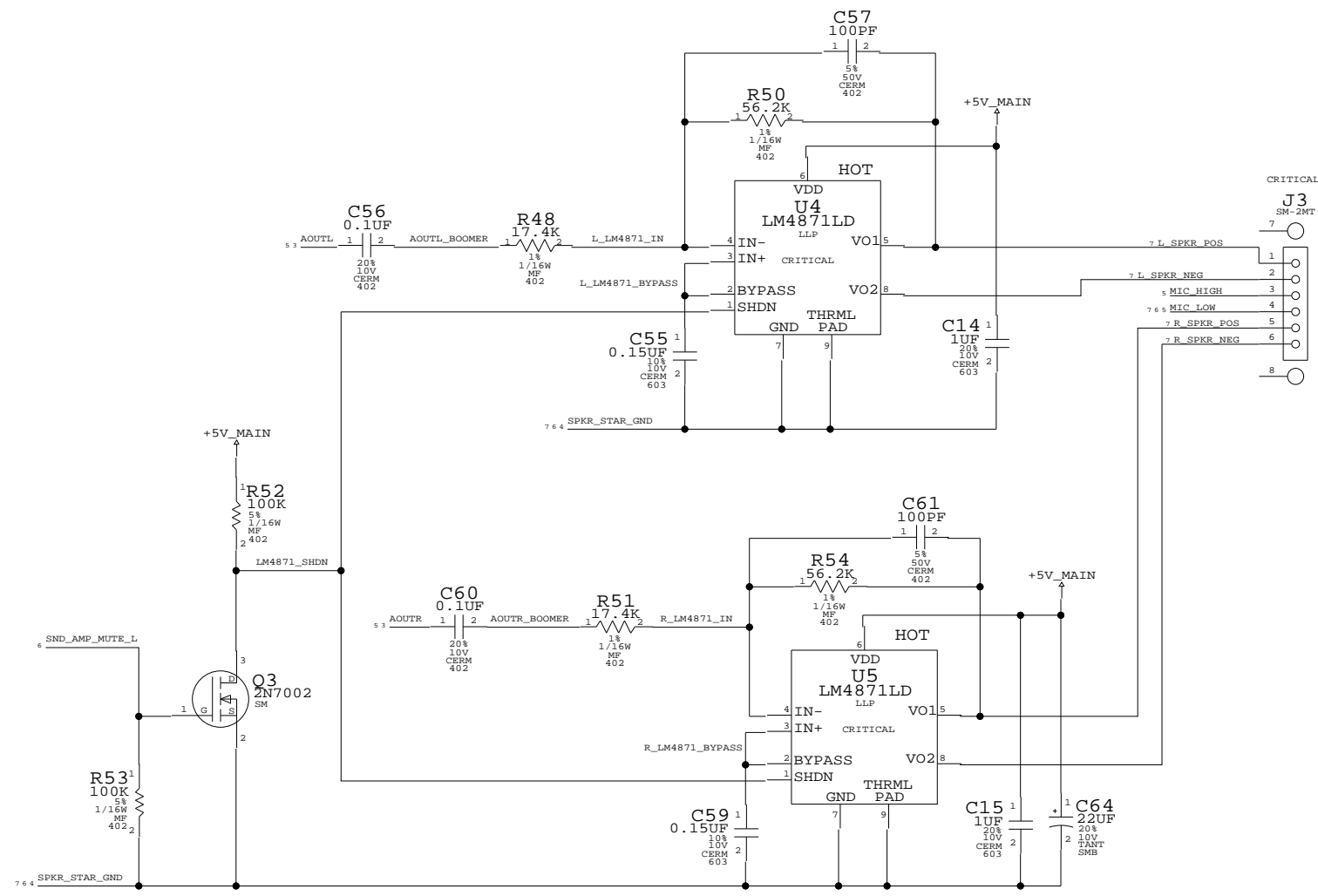
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NONE	3	9

BOOMER SPEAKER AMP



PLACE C64 CLOSE TO PIN 6 AT U4 AND U5

SPEAKERS

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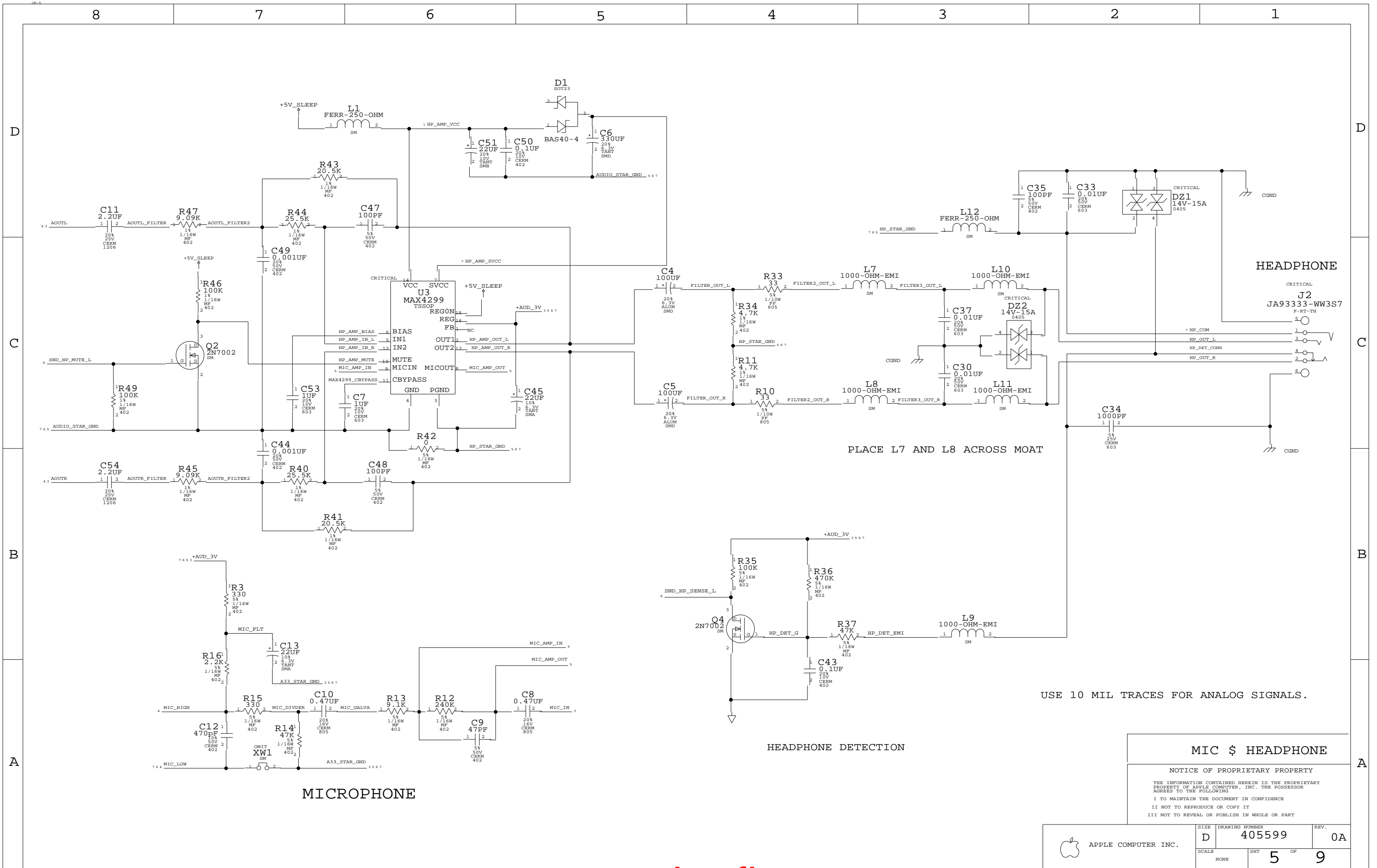
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SIZE D	DRAWING NUMBER 405599	REV. 0A
SCALE NONE	SHT 4	OF 9



PLACE L7 AND L8 ACROSS MOAT

USE 10 MIL TRACES FOR ANALOG SIGNALS.

MICROPHONE

HEADPHONE DETECTION

HEADPHONE

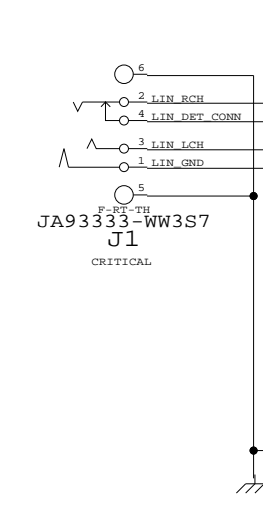
MIC & HEADPHONE

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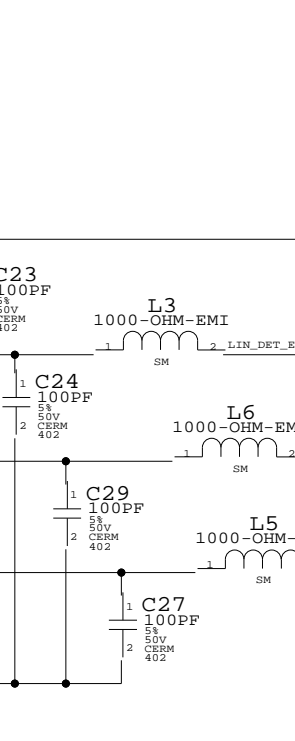
APPLE COMPUTER INC.	SIZE	DRAWING NUMBER	REV.
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SCALE	SHT	OF	
NONE	5	9	

LINE IN AMPLIFIER

LINE IN CONNECTOR

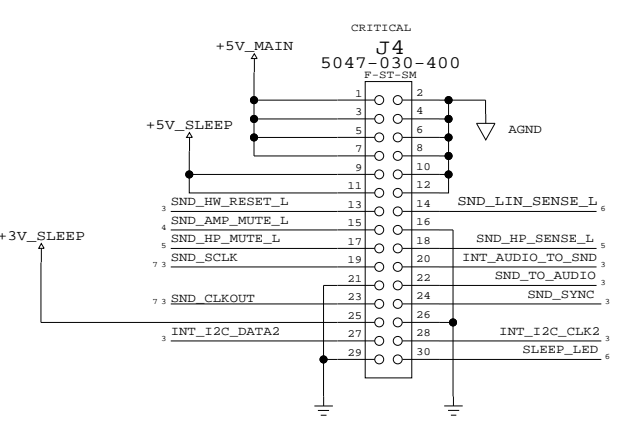


LINE-IN DETECTION

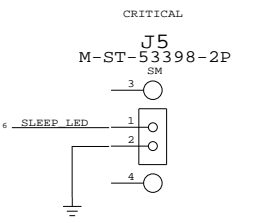


USE 10 MIL TRACES FOR ANALOG SIGNALS.

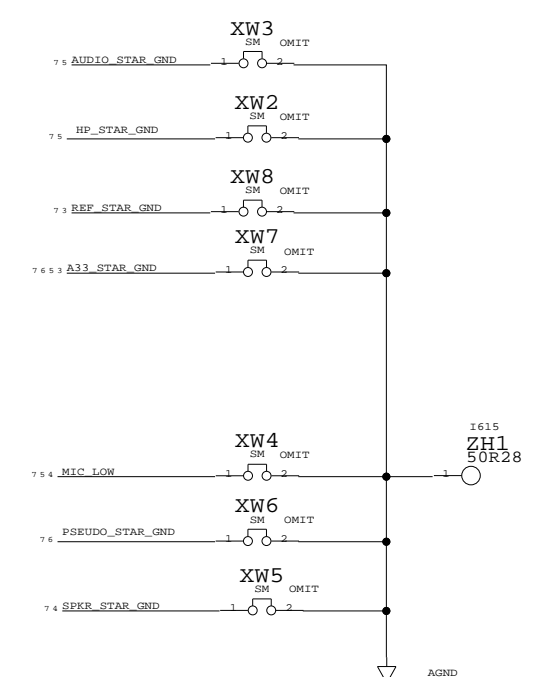
SOUND BOARD CONNECTOR



SLEEP LED CONNECTOR



AUDIO STAR GROUND



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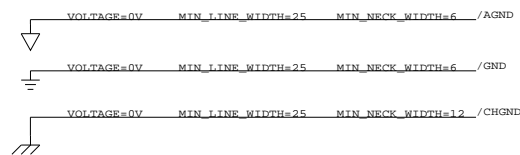
APPLE COMPUTER INC.	SIZE D SCALE NONE	DRAWING NUMBER 405599	REV. 0A
	SHEET 6 OF 9		

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
- REPINNED 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
- REPINNED OUT 30-PIN CONNECTOR
- FIXED OVER-SENSITIVE TO 60 HZ NOISE FOR LINE-IN CIRCUIT
- CHANGED OP-AMP GAIN FOR SPEAKER

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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SCALE	SHT	OF	
NONE	7	9	

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

+3V_SLEEP	7D4
+3V_WAKE	7D4
+3V_SLEEP	7D4
+AUD_3V	3D5 5B4 5B7 5C5 6D2 6D3 6D5 7D4
/AGND	7A4
/CHGND	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	5B8 5D5 6B8 7C4
CAJ_PLL	3B9
FILTER2_OUT_L	5C4
FILTER2_OUT_R	5C4
FILTER3_OUT_L	5C3
FILTER3_OUT_R	5C3
FILTER_OUT_L	5C4
FILTER_OUT_R	5C4
GND_GALVA	6C5
GND_GALVB	6C5
GND_HZ	6C8
HP_AMP_BIAS	5C7
HP_AMP_IN_L	5C7
HP_AMP_IN_R	5C7
HP_AMP_MUTE	5C7
HP_AMP_OUT_L	5C6
HP_AMP_OUT_R	5C6
HP_AMP_EVCC	5C6 7C4
HP_AMP_VCC	5D6 7D4
HP_DW	5C2 7D4
HP_DET_CONN	5C2
HP_DET_EMI	5B3
HP_DET_G	5B4
HP_DET_L	5C2
HP_DET_R	5C2
HP_STAR_GND	5B6 5C3 5C4 6B8 7C4
INT_AUDIO_TO_END	3C4 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_EMI	6C7
LIN_DET_G	6D6
LIN_GND	6C8
LIN_LCH	6C8
LIN_RCH	6C8
LM4871_BYPASS	4C5
L_M4871_FILTER	7C4
L_M4871_IN	4D5
L_SPEK_REG	4C4 7D4
L_SPEK_POB	4D4 7D4
MAX4439_BYPASS	5C7
MIC_AMP_IN	5A5 5C7
MIC_AMP_OUT	5A5 5C6
MIC_DIVERG	5A7
MIC_FLT	5B7
MIC_GALVA	5A7
MIC_HIGH	4C4 5A8
MIC_IN	3C7 5A5
MIC_LOW	4C4 5A8 6A8 7C4
PSEUDO_STAR_GND	6A8 6C5 7C4
PWR_AUDIO_DIVD	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_REG	4C4 7D4
R_SPEK_POB	4C4 7D4
SDI2	3C6
SLEEP_LED	6A3 6A4
SND_AMP_MUTE_L	4C7 6A5
SND_CLKOUT	3B6 6A5 7B4
SND_HP_MUTE_L	5C8 6A5
SND_HP_SENSE_L	3B5 6A4
SND_HP_SENSE_R	3B5 6A4
SND_HM_RESET_L	3B6 6A5
SND_LIN_SENSE_L	6A4 6D5
SND_SICL	3B5 6A5 7B4
SND_SYNC	3B5 6A4
SND_TO_AUDIO	3C7 6A4
SPKR_STAR_GND	4B7 4C6 6A8 7C4
SUDO_GND	6C3
SUDO_GND_OUT	6C4
SUDO_L	6D3
SUDO_L_M	6D4
SUDO_L_P	6D4
SUDO_R	6C3
SUDO_R_M	6C4
SUDO_R_P	6C4
TAS3904_VCOM	3B5
TAS_ENDOUTO	3C5
TI_CAP_FLT	3B6
TI_WFFILT	3B5
VREFM	3B6
VREFP	3B6 6C2

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	SCALE NONE	SHT 8 OF 9	

*** 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 3B6
 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 5B6
 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 SUPPR_TRANSIENT_4P1 5D2
 D22 SUPPR_TRANSIENT_4P1 5C3
 J1 CON_F48T_S2MT_TH3 6C8
 J2 CON_F48T_S2MT_TH3 5C1
 J3 CON_M88T_M818 6D3
 J4 CON_F30ST_D_5M 6B4
 J5 CON_M82T_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 TPA_2B3P04 6C2
 Q2 TPA_2N7002 5C7
 Q3 TPA_2N7002 4B6
 Q4 TPA_2N7002 5B4
 Q5 TPA_2N7002 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
 R46 RES 5C7
 R47 RES 5D7
 R48 RES 4D6
 R49 RES 5C8
 R50 RES 4D5
 R51 RES 4C5
 R52 RES 4C6
 R53 RES 4B7
 R54 RES 4C5
 R55 RES 3B6
 U1 OPAMP_TLV2162 6C3 6D3
 U2 OPAMP_TLV2161 6C3
 U3 MAX4299 5C6
 U4 AUDIO_IAM4871LD 4D6
 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 5D9

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