

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.

DRAWING			CK APPD	ENG APPD
REV	ZONE	ECN	DESCRIPTION OF CHANGE	DATE
02		262657	ENGINEERING RELEASED	02/19/03 ?

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SCHEM, TT, Q16A

Mon Oct 27 19:25:53 2003

PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	BOM OPTION
051-6572	1	SCHEM, TT, Q16A	SCH1	
820-1602	1	PCBF, TT, Q16A	PCB1	

DIMENSIONS ARE IN MILLIMETERS		METRIC		Apple Computer Inc.	
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DO NOT SCALE DRAWING				TITLE	
				SCHEM, TT, Q16A	
				DRAWING NUMBER 051-6572 REV. 01	
				SHEET 1 OF 12	

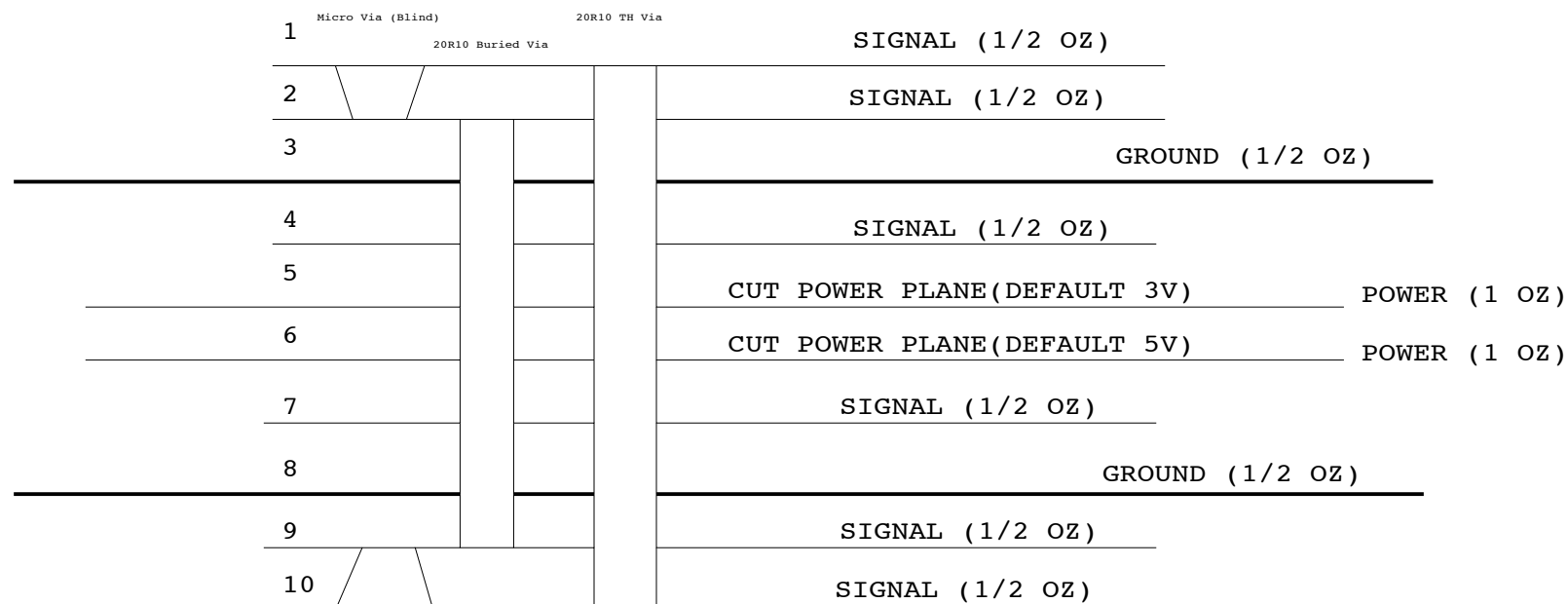
PCB SPECS

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

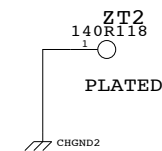
IMPEDANCE : 50 OHMS +/- 10%
 DIELECTRIC: FR-4
 LAYER COUNT: 10
 SIGNAL TRACE WIDTH: 4 MILS
 SIGNAL TRACE SPACING: 4 MILS
 PREPREG THICKNESS: 3-6 MILS

SEE PCB CAD FILES FOR MORE SPECIFIC INFO.

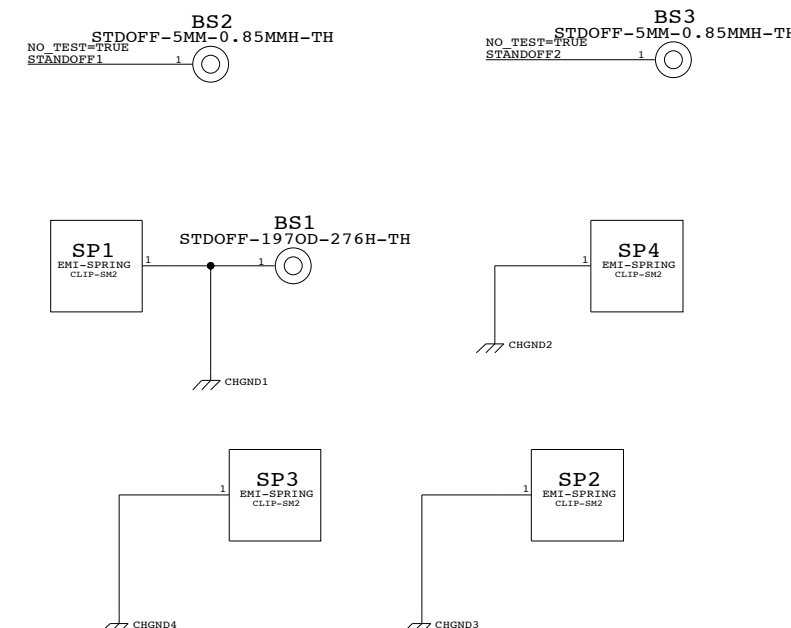
BOARD STACK-UP AND CONSTRUCTION



BOARD HOLES



PCB BOARD STANDOFFS / FINGER SPRINGS



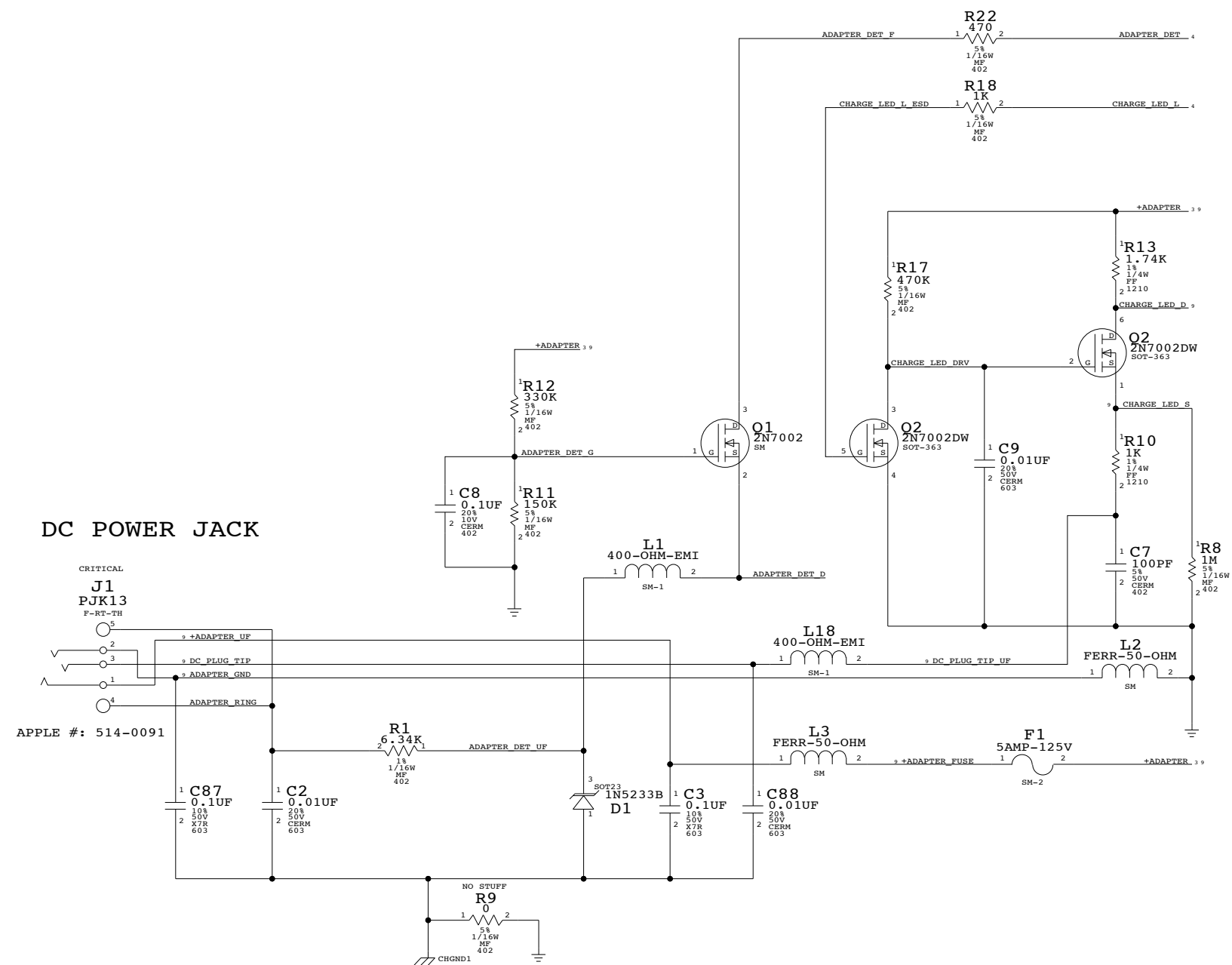
BOARD INFORMATION

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	D	051-6572	01
	SCALE	SHT	OF
	NONE	2	12

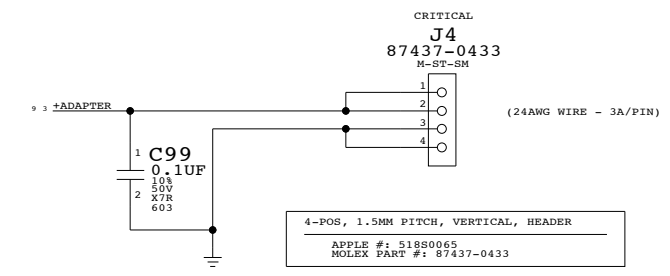
CHARGE LED SUPPORT

(TO 40-P LIO CONNECTOR)



PLACE C2, C3 AND R2 CLOSE TO J1
PLACE L1, L2 AND L3 CLOSE TO J1

POWER CONNECTOR (TO MLB)



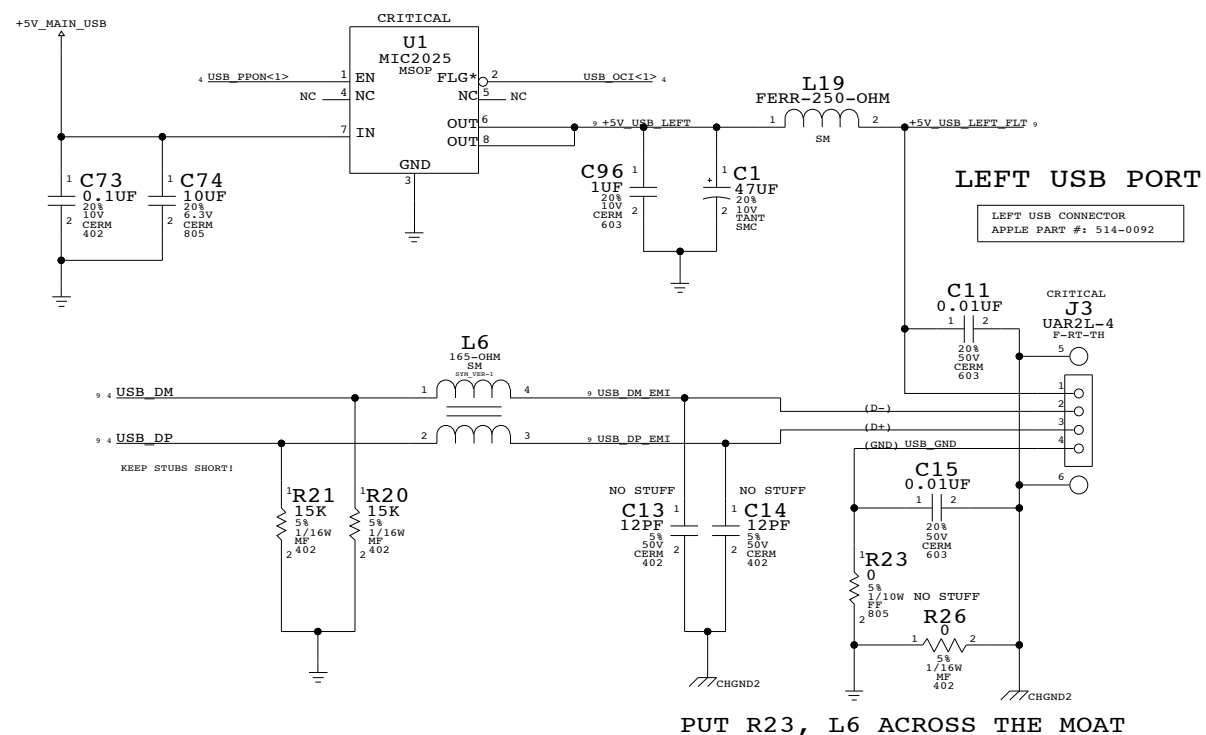
APPLE #: 514-0091

DC POWER INPUT

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	SCALE	SHT	OF
	NONE	3	12

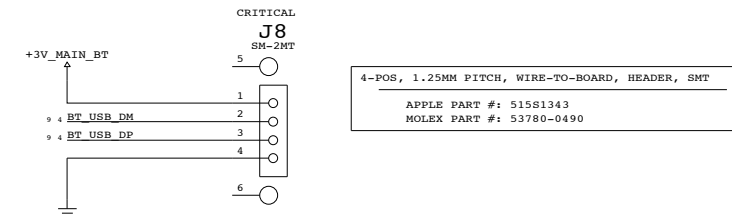
LEFT USB CONNECTOR



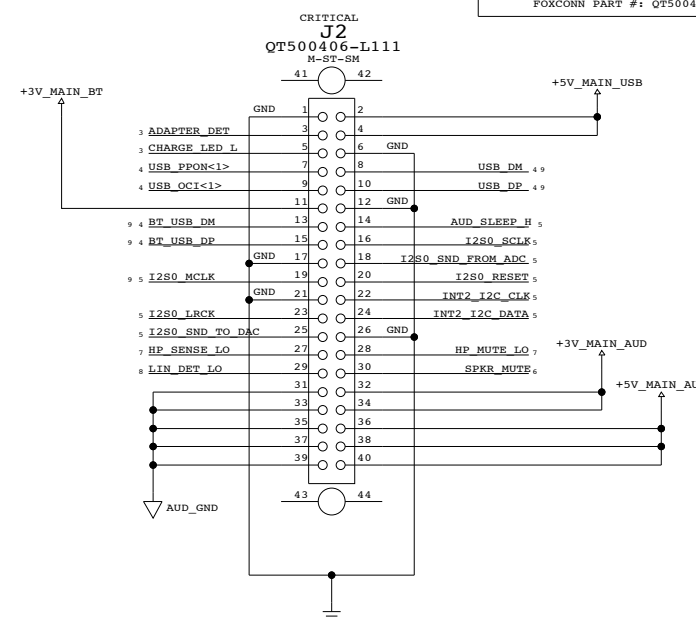
LEFT USB PORT

LEFT USB CONNECTOR
APPLE PART #: 514-0092

BLUETOOTH CONNECTOR



AUDIO/USB CONNECTOR



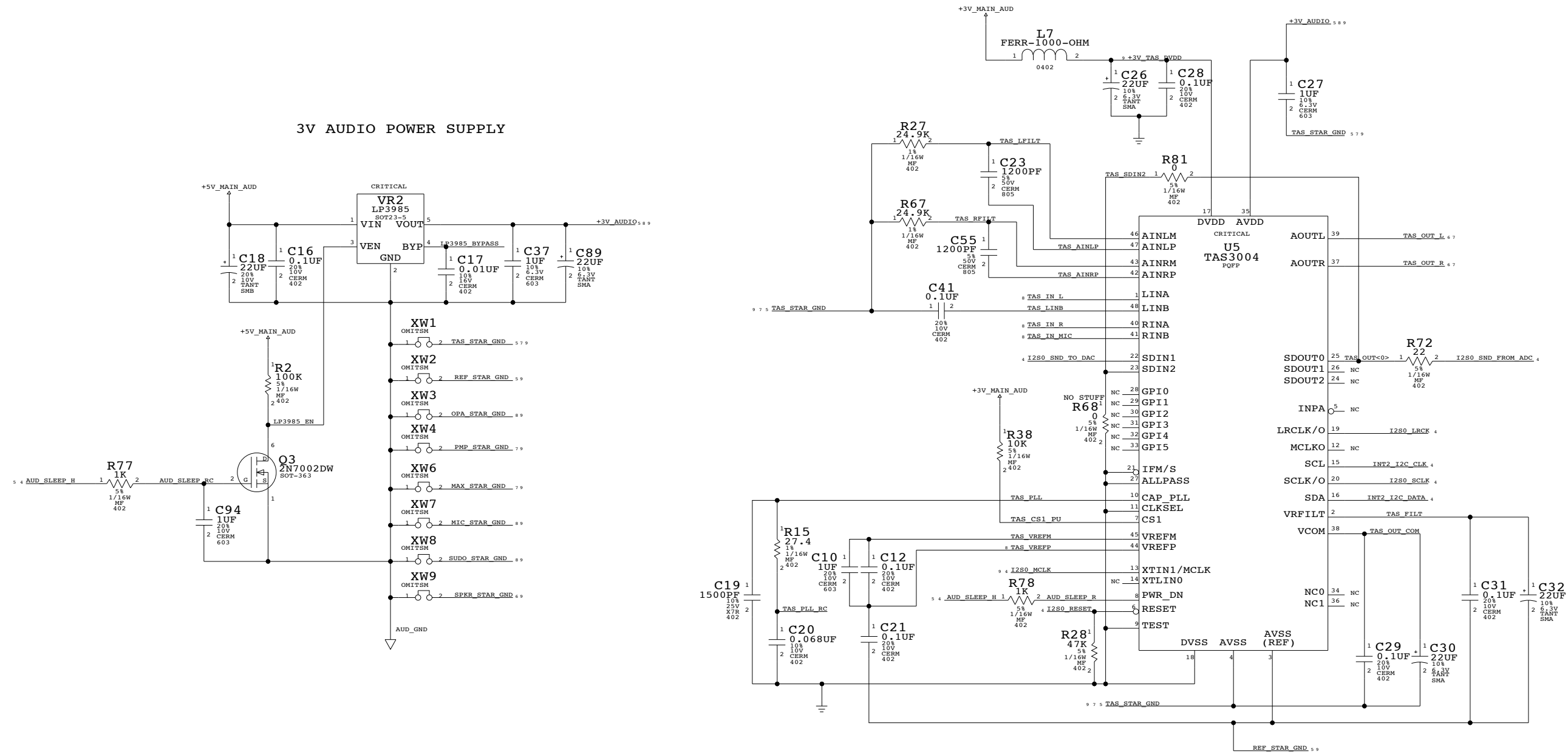
USB CONNECTOR (LEFT)
& ALS (LEFT)

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SCALE		SHT	OF
NONE		4	12

SNAPPER CONTROL INTERFACE

3V AUDIO POWER SUPPLY

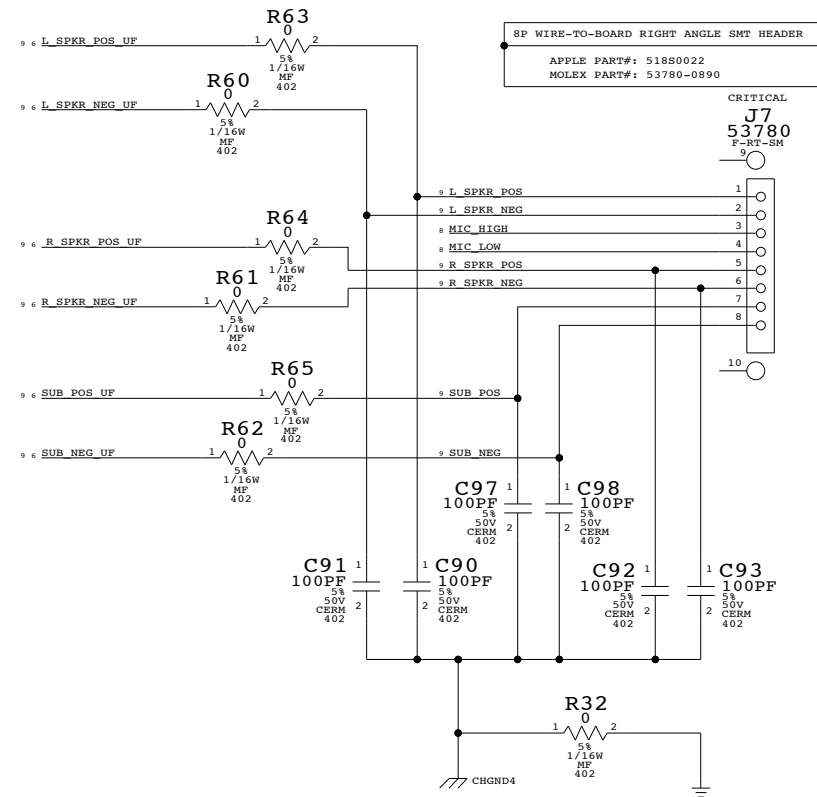
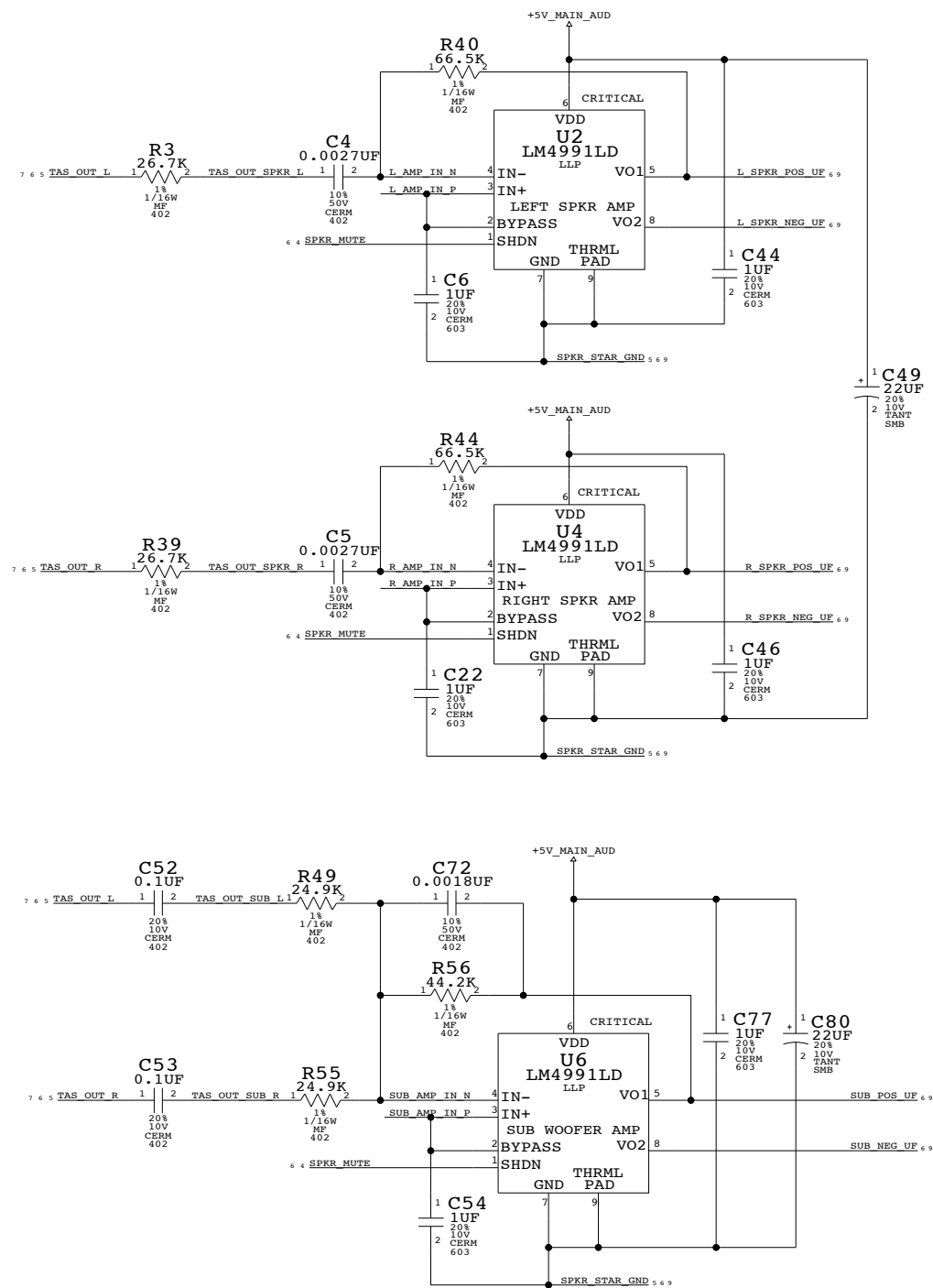


SNAPPER (AUDIO) CONTROL INTERFACE

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	D	051-6572	01
SCALE	NONE	SHT	OF
		5	12

SPEAKER DRIVER



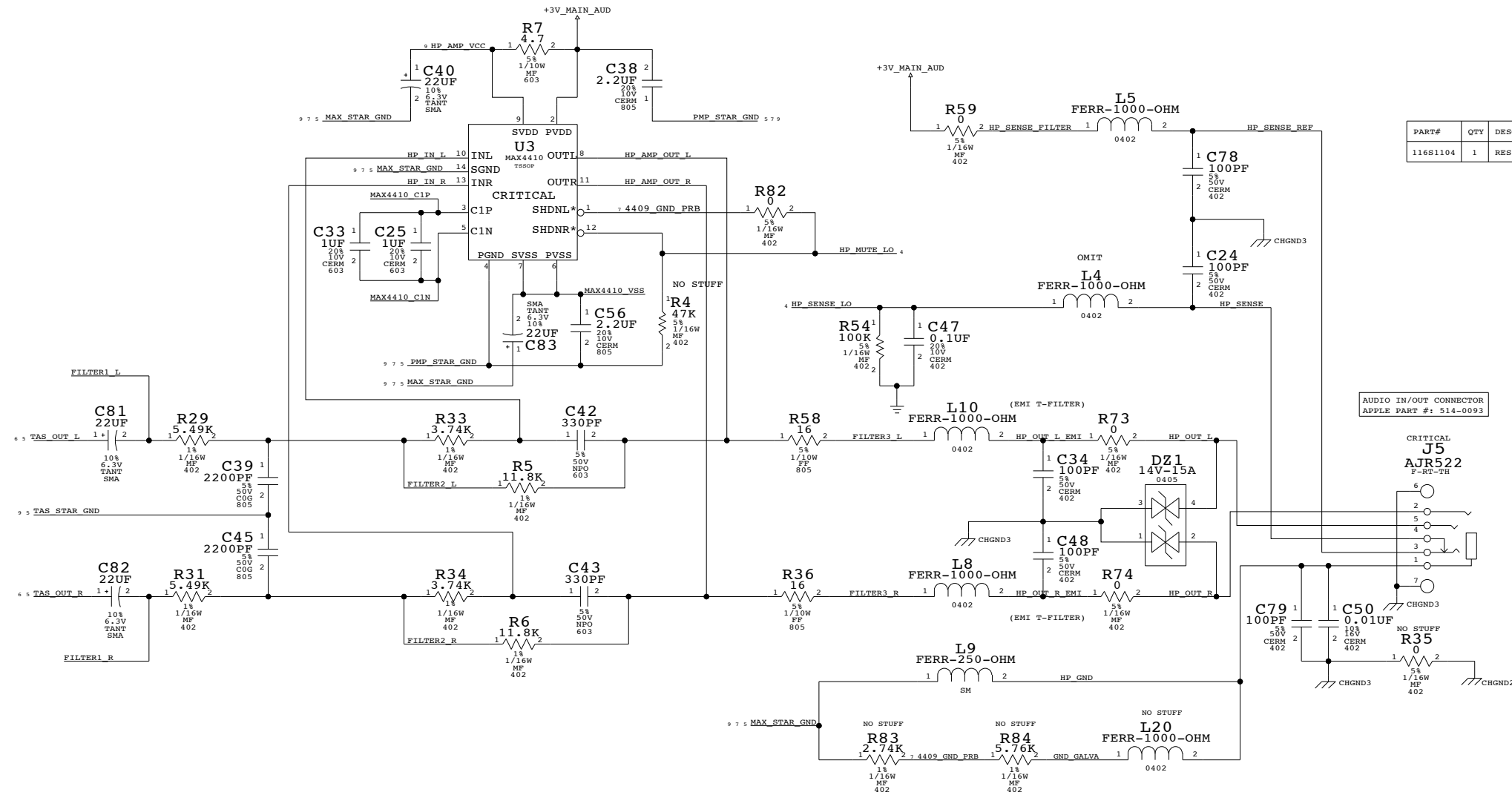
SPEAKER DRIVERS

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		6	12

HEADPHONE DRIVER



PART#	QTY	DESCRIPTION	REFERENCE DESIGNATOR(S)	BOM OPTION
116S1104	1	RES, MF, 1/16W, 10K OHM, 5, 0402, 4MD	L4	

AUDIO IN/OUT CONNECTOR
APPLE PART #: 514-0093

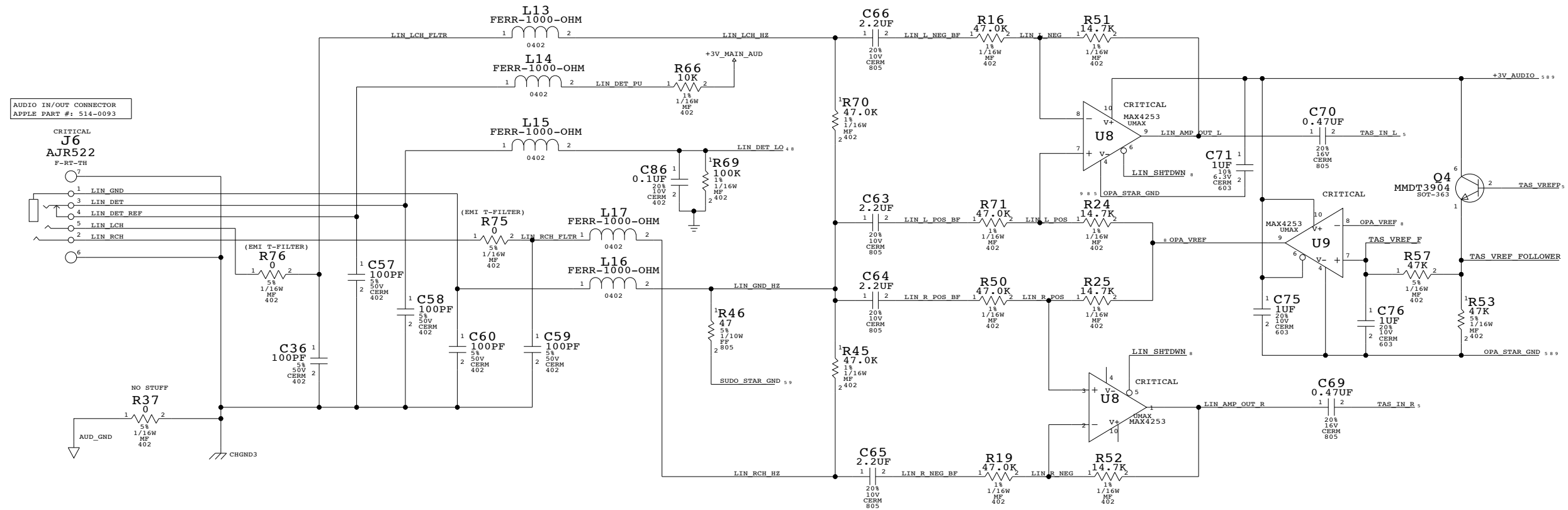
CRITICAL
J5
AJR522
F-RZ-DH

HEADPHONE DRIVER

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SCALE	NONE	SHT	7 OF 12

LINE-IN AMP

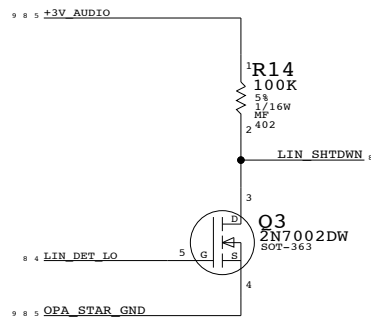


AUDIO IN/OUT CONNECTOR
APPLE PART #: 514-0093

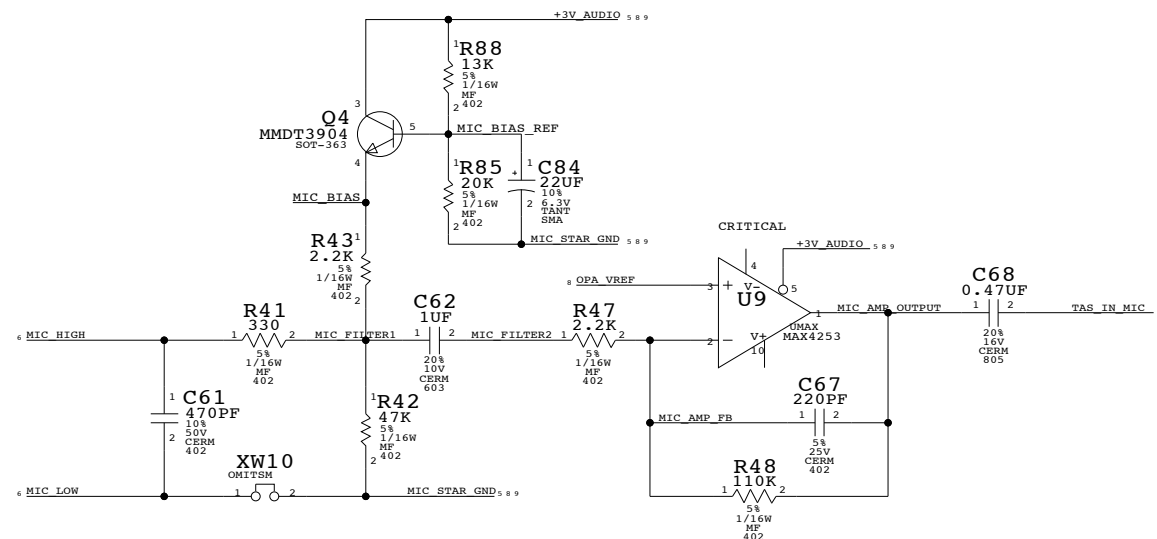
CRITICAL
J6
AJR522
F-RT-TH

1 LIN_GND
3 LIN_DET
4 LIN_DET_REF
5 LIN_LCH
2 LIN_RCH

NO STUFF
R37
5%
1/16W
MF
402



MICROPHONE AMP



MICROPHONE AMP. & LINE-IN AMP.

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	NONE	D 051-6572	01
8 OF 12			

SIGNAL CONSTRAINTS

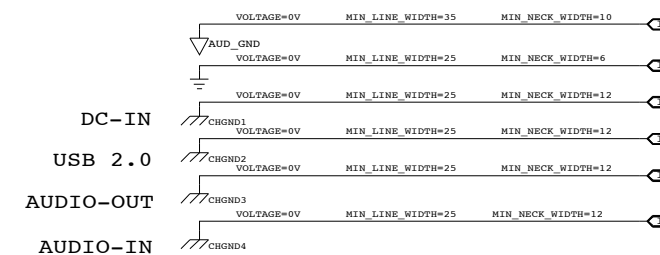
SIGNAL NAME	DIFF_PAIR	MATCHED_DELAY	MIN_LINE_WIDTH NET_PHYSICAL_TYPE	NET_SPACING_TYPE
USB_DM	USB DIFF PAIR STRIP	LENGTH_TOLERANCE=20	NEC_USB_PAIR	7 MIL SPACING
USB_DP	USB DIFF PAIR STRIP	LENGTH_TOLERANCE=20	NEC_USB_PAIR	7 MIL SPACING
USB_DM_EMI	USB DIFF PAIR	LENGTH_TOLERANCE=20	NEC_USB_PAIR	7 MIL SPACING
USB_DP_EMI	USB DIFF PAIR	LENGTH_TOLERANCE=20	NEC_USB_PAIR	7 MIL SPACING
BT_USB_DM	BT_USB_DIFF	LENGTH_TOLERANCE=20	MIN_LINE_WIDTH=5	12 MIL SPACING
BT_USB_DP	BT_USB_DIFF	LENGTH_TOLERANCE=20	MIN_LINE_WIDTH=5	12 MIL SPACING
I2S0_MCLK	N/A	N/A	MIN_LINE_WIDTH=5	9 MIL SPACING

LAYER 4 (STRIP LINES)
E=3.8, W=3.9, B=8.7, T=0.7, S=7(IN MIL)
ZSINGLE = 47.5 OHM
ZDIFF = 88.0 OHM

LAYER 2 (STRIP LINES)
E=3.8, W=5, H=3, T=0.7, S=12(IN MIL)
ZSINGLE = 45.0 OHM
ZDIFF = 89.1 OHM

POWER NET CONSTRAINTS

GROUP	SIG_NAME	VOLTAGE	MIN_LINE_WIDTH	MIN_NECK_WIDTH
MAIN/SLEEP	+5V_MAIN_USB	VOLTAGE=5V	MIN_LINE_WIDTH=35	MIN_NECK_WIDTH=10
	+3V_MAIN_BT	VOLTAGE=3.3V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10
	+5V_MAIN_AUD	VOLTAGE=5V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10
	+3V_MAIN_AUD	VOLTAGE=3.3V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10
DC ADAPTER	+ADAPTER	VOLTAGE=24V	MIN_LINE_WIDTH=50	MIN_NECK_WIDTH=10
	+ADAPTER_UP	VOLTAGE=24V	MIN_LINE_WIDTH=50	MIN_NECK_WIDTH=10
	+ADAPTER_FUSE	VOLTAGE=24V	MIN_LINE_WIDTH=50	MIN_NECK_WIDTH=10
	ADAPTER_GND	VOLTAGE=0V	MIN_LINE_WIDTH=50	MIN_NECK_WIDTH=10
	CHARGE_LED_D		MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10
	CHARGE_LED_S		MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10
	DC_PLUG_TIP		MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10
	DC_PLUG_TIP_UP		MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10
USB 2.0	+5V_USB_LEFT_FLT	VOLTAGE=5V	MIN_LINE_WIDTH=35	MIN_NECK_WIDTH=10
	+5V_USB_LEFT	VOLTAGE=5V	MIN_LINE_WIDTH=35	MIN_NECK_WIDTH=10
AUDIO	+3V_AUDIO	VOLTAGE=3V	MIN_LINE_WIDTH=20	MIN_NECK_WIDTH=10
	+3V_TAS_DVDD	VOLTAGE=3V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10
	+3V_AUDIO_FILTERED	VOLTAGE=3V	MIN_LINE_WIDTH=10	MIN_NECK_WIDTH=5
	TAS_STAR_GND	VOLTAGE=0V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10
	REF_STAR_GND	VOLTAGE=0V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10
	OPA_STAR_GND	VOLTAGE=0V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10
	PMP_STAR_GND	VOLTAGE=0V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10
	MAX_STAR_GND	VOLTAGE=0V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10
	MIC_STAR_GND	VOLTAGE=0V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10
	SUDO_STAR_GND	VOLTAGE=0V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10
	SPKR_STAR_GND	VOLTAGE=0V	MIN_LINE_WIDTH=15	MIN_NECK_WIDTH=10
	L_SPKR_POS		MIN_LINE_WIDTH=20	
	L_SPKR_POS_UP		MIN_LINE_WIDTH=20	
	L_SPKR_NEG		MIN_LINE_WIDTH=20	
	L_SPKR_NEG_UP		MIN_LINE_WIDTH=20	
	R_SPKR_POS		MIN_LINE_WIDTH=20	
	R_SPKR_POS_UP		MIN_LINE_WIDTH=20	
	R_SPKR_NEG		MIN_LINE_WIDTH=20	
	R_SPKR_NEG_UP		MIN_LINE_WIDTH=20	
	SUB_POS		MIN_LINE_WIDTH=20	
	SUB_POS_UP		MIN_LINE_WIDTH=20	
	SUB_NEG		MIN_LINE_WIDTH=20	
	SUB_NEG_UP		MIN_LINE_WIDTH=20	
HP_AMP_VCC	VOLTAGE=3V	MIN_LINE_WIDTH=25	MIN_NECK_WIDTH=10	



SIGNAL & POWER CONSTRAINTS

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SCALE	NONE		SHT OF
	9		12

8

7

6

5

4

3

2

1

REVISION HISTORY

(REV. 01) 10/27/2003 - SCHEMATIC ORIGINATED FROM Q16 L10

D

D

C

C

B

B

A

A


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SCALE	SHT		OF
NONE	10		12

8

7

6

5

4

3

2

1

	8	7	6	5	4	3	2	1			
D	<pre> *** Signal Cross-Reference for the entire design *** +3V_AUDIO 5C5< 5D2< 8A3< 8B4< 8B7< 8D1< 8D2> +3V_AUDIO_FILTERED 9C2> +3V_MAIN_AUD 9D2> +3V_MAIN_BT 9D2> +3V_TAS_DVDD 5D3< 9C2> +3V_MAIN_AUD 9D2> +3V_MAIN_USB 9D2> +3V_USB_LEFT 4C6< 9C2> +3V_USB_LEFT_FLT 4C3< 9C2> +ADAPTER 2B4< 3C3< 3C4< 3C6< 9D2> +ADAPTER_FUSE 3B5< 9D2> +ADAPTER_UP 3B7< 9D2> 4410_CHD_PNB 7B4< 7C5< ADAPTER_DET 3D4< 4B3< ADAPTER_DET_D 3B5< ADAPTER_DET_F 3D5< ADAPTER_DET_G 3C6< ADAPTER_DET_UP 3B6< ADAPTER_GND 3B7< 9D2> ADAPTER_RING 3B7< AUD_SLEEP_H 4B2< 5B4< 5B8< AUD_SLEEP_R 5B4< AUD_SLEEP_RC 5B7< BT_USB_DM 4B3< 4C3< 9D6> BT_USB_DP 4B3< 4C3< 9C6> CHANGE_LED_D 3C4< 9D2> CHANGE_LED_DRV 3C5< CHANGE_LED_L 3D4< 4B3< CHANGE_LED_L_ESD 3D5< CHANGE_LED_S 3C4< 9D2> DC_PLUG_TIP 3B7< 9D2> DC_PLUG_TIP_UP 3B5< 9C2> FILTER1_L 7C7< FILTER1_R 7B7< FILTER2_L 7B6< FILTER2_R 7B4< FILTER3_L 7C5< FILTER3_R 7B5< GND_CAVIA 7B4< HP_AMP_OUT_L 7C5< HP_AMP_OUT_R 7C5< HP_AMP_VCC 7D6< 9B2> HP_GND 7B4< HP_IN_L 7C6< HP_IN_R 7C6< HP_MUTE_LO 4B2< 7C4< HP_OUT_L 7C4< HP_OUT_L_RMI 7C4< HP_OUT_R 7B4< HP_OUT_R_RMI 7B4< HP_SENSE 7C3< HP_SENSE_FILTER 7C4< HP_SENSE_LO 4B3< 7C5< HP_SENSE_REF 7C3< I2S0_LRCK 4B3< 5B2< I2S0_MCLK 4B3< 5B4< 9C6> I2S0_RESET 4B3< 5B4< I2S0_SCLK 4B2< 5B2< I2S0_SMD_FROM_ADC 4B2< 5C2< I2S0_SMD_TO_DAC 4B3< 5C4< INT2_I2C_CLK 4B2< 5B2< INT2_I2C_DATA 4B3< 5B2< LIN_AMP_OUT_L 8C3< LIN_AMP_OUT_R 8C3< LIN_DET 8C7< LIN_DET_LO 4B3< 8B7< 8C5< LIN_DET_PU 8D5< LIN_DET_REF 8C7< LIN_GND 8C7< LIN_GND_HE 8C5< LIN_LCH 8C7< LIN_LCH_FLTR 8D6< LIN_LCH_HS 8D5< LIN_L_NEG 8D4< LIN_L_NEG_BP 8D4< LIN_L_POS 8C4< LIN_L_POS_BP 8C4< LIN_RCH 8C7< LIN_RCH_FLTR 8C6< LIN_RCH_HS 8B4< LIN_R_NEG 8B4< LIN_R_NEG_BP 8B4< LIN_R_POS 8C4< LIN_R_POS_BP 8C4< LIN_SFTDRW 8B7< 8C3< 8C3> LP3985_BYPASS 5C6< LP3985_EN 5B7< L_AMP_IN_N 6D6< L_AMP_IN_P 6D7< L_SFPR_NEG 6C2< 9B2> L_SFPR_NEG_UP 6C3< 6C5< 9B2> L_SFPR_POS 6C2< 9B2> L_SFPR_POS_UP 6C3< 6D5< 9B2> MAX4410_C1H 7C6< MAX4410_C1P 7C6< MAX4410_VBS 7C5< MIC_STAB_GND 5B6< 7B5< 7C6< 7C6< 9C2> MIC_AMP_FB 8A4< MIC_AMP_OUTPUT 8A4< MIC_BIAS 8A5< MIC_BIAS_REF 8A5< MIC_FILTER1 8A5< MIC_FILTER2 8A4< MIC_HIGH 6C2< 8A6< MIC_LOW 6C2< 8A6< MIC_STAB_GND 5B6< 8A4< 8A4< 8A4< 9C2> OPA_STAB_GND 5B6< 8A7< 8C1< 8C3< 9C2> OPA_VREF 8A4< 8C2< 8C3> OPM_STAB_GND 5B6< 7C4< 7C6< 9C2> REF_STAB_GND 5A3< 5C6< 9C2> R_AMP_IN_N 6C6< R_AMP_IN_P 6C7< R_SFPR_NEG 6C2< 9B2> R_SFPR_NEG_UP 6C3< 6C5< 9B2> R_SFPR_POS 6C2< 9B2> R_SFPR_POS_UP 6C3< 6C5< 9B2> SPKR_MUTE 4B2< 6A7< 6C7< 6C7< SPKR_STAB_GND 5B6< 6A6< 8B6< 8C6< 9B2> SUB_AMP_IN_N 6A6< SUB_AMP_IN_P 6A7< SUB_NRG 6B2< 9B2> SUB_NRG_UP 6A5< 6B3< 9B2> SUB_POS 6C2< 9B2> SUB_POS_UP 6A5< 6C3< 9B2> SUDO_STAB_GND 5B6< 8C5< 9B2> TAB_A1HELP 5C4< TAB_CH1_PU 5B4< TAB_FILT 5B2< TAB_IN_L 5C4< 8C2< TAB_IN_MIC 5C4< 8A3< TAB_IN_R 5C4< 8C2< TAB_LFILT 5C4< TAB_LINB 5C4< TAB_OUT<> 5C2< TAB_OUT_COM 5B2< TAB_OUT_L 5C2< 6B7< 6D7< 7C7< TAB_OUT_R 5C2< 6A7< 6C7< 7B7< TAB_OUT_SFPR_L 6D7< TAB_OUT_SFPR_R 6C7< TAB_OUT_SUB_L 6B7< TAB_OUT_SUB_R 6A7< TAB_PLL 5B4< TAB_PLL_RC 5B4< TAB_RFILT 5C4< TAB_SDR2 5C3< TAB_STAB_GND 5A3< 5C5< 5C6< 7B7< 9C2> TAB_VREFM 5B4< TAB_VREFP 5B4< 8C1< TAB_VREF_P 8C2< TAB_VREF_FOLLOWER 8C1< USB_DM 4B3< 4B7< 9D6> USB_DM_DMI 4B6< 9D6> USB_DP 4B2< 4B7< 9D6> USB_DP_DMI 4B6< 9D6> USB_GND 4B5< USB_OCI<1> 4B3< 4C6> USB_PP0R<1> 4B3< 4C7< </pre>								C	B	A
	8	7	6	5	4	3	2	1			

	8	7	6	5	4	3	2	1	
D	<pre> *** Part Cross-Reference for the entire design *** B81 PCB_STANDOFF 2 C1 CAP_P 4 C2 CAP 3 C3 CAP 3 C4 CAP 6 C5 CAP 6 C6 CAP 6 C7 CAP 3 C8 CAP 3 C9 CAP 3 C10 CAP 5 C11 CAP 4 C12 CAP 5 C13 CAP 4 C14 CAP 4 C15 CAP 4 C16 CAP 5 C17 CAP 5 C18 CAP_P 5 C19 CAP 5 C20 CAP 5 C21 CAP 5 C22 CAP 6 C23 CAP 5 C24 CAP 7 C25 CAP 7 C26 CAP_P 5 C27 CAP 5 C28 CAP 5 C29 CAP 5 C30 CAP_P 5 C31 CAP 5 C32 CAP_P 5 C33 CAP 7 C34 CAP 7 C36 CAP 8 C37 CAP 7 C38 CAP 7 C39 CAP 7 C40 CAP_P 5 C41 CAP 5 C42 CAP 7 C43 CAP 7 C44 CAP 6 C45 CAP 7 C46 CAP 6 C47 CAP 7 C48 CAP 7 C49 CAP_P 6 C50 CAP 7 C52 CAP 6 C53 CAP 6 C54 CAP 6 C55 CAP 5 C56 CAP 7 C57 CAP 8 C58 CAP 8 C59 CAP 8 C60 CAP 8 C61 CAP 8 C62 CAP 8 C63 CAP 8 C64 CAP 8 C65 CAP 8 C66 CAP 8 C67 CAP 8 C68 CAP 8 C69 CAP 8 C70 CAP 8 C71 CAP 8 C72 CAP 6 C73 CAP 4 C74 CAP 4 C75 CAP 8 C76 CAP 8 C77 CAP 6 C78 CAP 7 C79 CAP 7 C80 CAP_P 6 C81 CAP_P 7 C82 CAP_P 7 C83 CAP_P 7 C84 CAP_P 8 C86 CAP 8 C87 CAP 3 C88 CAP 3 C89 CAP_P 5 C90 CAP 6 C91 CAP 6 C92 CAP 6 C93 CAP 6 C94 CAP 4 C96 CAP 4 C97 CAP 6 C98 CAP 6 C99 CAP 3 D1 ZENER 3 D81 SUPPL_TRANSPARENT_4P1 7 F1 FUSE 3 J1 CON_F38T_S2MT_TH3 3 J2 CON_J44GT_D4MT_5M 4 J3 CON_F48T_5M8_S2MT_TH 4 J4 CON_M48T_8_M 3 J5 CON_F38T_S2MT_TH2 7 J6 CON_F58T_S2MT_TH2 8 J7 CON_F88T_S2MT_5M 6 J8 CON_48V_W4ID 4 L1 IND 3 L2 IND 3 L3 IND 3 L4 IND 7 L5 IND 7 L6 FILTER_4P 4 L7 IND 5 L8 IND 7 L9 IND 7 L10 IND 7 L13 IND 8 L14 IND 8 L15 IND 8 L16 IND 8 L17 IND 8 L18 IND 3 L19 IND 4 L20 IND 7 Q1 TRA_2N7002 3 Q2 TRA_2N7002DM 3 Q3 TRA_2N7002DM 5 8 Q4 TRA_DUAL_MMOT3904 8 R1 RES 3 R2 RES 5 R3 RES 6 R4 RES 7 R5 RES 7 R6 RES 7 R7 RES 7 R8 RES 3 R9 RES 3 R10 RES 3 R11 RES 3 R12 RES 3 R13 RES 3 R14 RES 8 R15 RES 5 R16 RES 8 R17 RES 3 R18 RES 3 R19 RES 8 R20 RES 4 R21 RES 4 R22 RES 3 R23 RES 4 R24 RES 8 R25 RES 8 R26 RES 4 R27 RES 5 R28 RES 5 R29 RES 7 R31 RES 7 R32 RES 6 R33 RES 7 R34 RES 7 R35 RES 7 R36 RES 7 R37 RES 8 R38 RES 5 R39 RES 6 R40 RES 6 R41 RES 8 R42 RES 8 R43 RES 8 R44 RES 6 R45 RES 6 R46 RES 8 R47 RES 8 R48 RES 8 R49 RES 6 R50 RES 8 R51 RES 8 R52 RES 8 R53 RES 8 R54 RES 7 R55 RES 6 R56 RES 6 R57 RES 8 R58 RES 7 R59 RES 7 R60 RES 6 R61 RES 6 R62 RES 6 R63 RES 6 R64 RES 6 R65 RES 6 R66 RES 8 R67 RES 5 R68 RES 5 R69 RES 8 R70 RES 8 R71 RES 8 R72 RES 5 R73 RES 7 R74 RES 7 R75 RES 8 R76 RES 8 R77 RES 5 R78 RES 5 R81 RES 5 R82 RES 7 R83 RES 7 R84 RES 7 R85 RES 8 R88 RES 8 SP1 SPRING_CLIP_IP_BMI 2 SP2 SPRING_CLIP_IP_BMI 2 SP3 SPRING_CLIP_IP_BMI 2 SP4 SPRING_CLIP_IP_BMI 2 U1 INT_MIC2023 4 U2 AUDIO_I44991LD 6 U3 MAX4410 7 U4 AUDIO_I44991LD 6 U5 TAB3004 5 U6 AUDIO_I44991LD 6 U8 OPAMP_MAX4253 8 U9 OPAMP_MAX4253 8 VW2 VREG_LP3985 5 XW1 SHORT 5 XW2 SHORT 5 XW3 SHORT 5 XW4 SHORT 5 XW6 SHORT 5 XW7 SHORT 5 XW8 SHORT 5 XW9 SHORT 5 XW10 SHORT 8 ZT2 MPOHOLE 2 </pre>								D
C									C
B									B
A									A
	8	7	6	5	4	3	2	1	