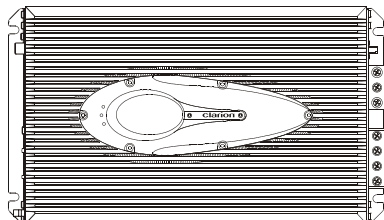


Service Manual



160W x 2 Channel Power Amplifier

Model **APA2160**
(GA-981E-51)

SPECIFICATIONS

Rated Output:	80w x 2 (stereo mode) (20Hz~20kHz, 0.05%, 4ohm, 2-ch simultaneous output) 250W x 1 (Monomode) (20Hz~20kHz, 0.2%, 4ohm, 1-ch output)
Maximum Power:	160W x 2 (Stereo mode)
Frequency Response:	10Hz~50kHz(+/-1.0dB)
Harmonic Distortion:	0.025% (1kHz, 10w, 4ohm)
S/N Rate:	100dB
Applicable	
Speaker Impedance:	4ohm (2ohm~8ohm)
Input Sensibility:	200mV~6,000mV
Power Source Voltage:	14.4V
Ground:	Negative
Power Consumption:	19A (with 80Wx2 rated output) 1.1A (amplifier ON, no input)
Dimensions(mm):	165(W) x 56(H) x 287(D) mm
Weight:	2.7Kg

NOTE

- We cannot supply PWB with component parts in principle. When a circuit on PWB has failure, please repair it by component parts base. Parts, which are not mentioned in service manual, are not supplied.
- For improvement purposes, specifications and design are subject to change without prior notice.

FEATURES

1. Maximum Power Output 320W
2. Continuous Average Power Output 160W
(80W x 2 into 4ohm 20Hz-20kHz at 0.05% THD)
3. Typical 2-ohm Stereo 125W x 2 at 0.2% THD
4. Typical 2-ohm Bridged Power 1kHz 250W x 1 at 0.2% THD
5. Bass Extender Control 0~15dB at 45Hz
6. Adjustable 55Hz-550Hz, 12dB/oct. High/Low-Pass Crossover
7. Mixed- Mode Operation

8. Built in Bridging capability
9. MOS-FET Output Design
10. Speaker Level Inputs
11. Double-Sided FR4 PC Board

To engineers in charge of repair or inspection of our products

Before repair or inspection, make sure to follow the instructions so that customers and Engineers in charge of repair or inspection can avoid suffering any risk or injury

1. Use specified parts.

The system uses parts with special safety features against fire and voltage. Use only parts with equivalent characteristics when replacing them. The use of unspecified parts shall be regarded as remodeling for which we shall not be liable. The onus of product liability (PL) shall not be our responsibility in cases where an accident or failure is as a result of unspecified parts being used.

2. Place the parts and wiring back in their original positions after replacement or re-wiring.

For proper circuit construction, use of insulation tubes, bonding, gaps to PWB, etc, is involved. The wiring connection and routing to the PWB are specially planned using clamps to keep away from heated and high voltage parts. Ensure that they are placed back in their original positions after repair or inspection. If extended damage is caused due to negligence during repair, the legal responsibility shall be with the repairing company.

3. Check for safety after repair.

Check that the screws, parts and wires are put back securely in their original position after repair. Ensure for safety reasons there is no possibility of secondary problems around the repaired spots. If extended damage is caused due to negligence of repair, the legal responsibility shall be with the repairing company.

4. Caution in removal and making wiring connection to the parts for the automobile.
Disconnect the battery terminal after turning the ignition key off. If wrong wiring connections are made with the battery connected, a short circuit and/or fire may occur. If extensive damage is caused due to negligence of repair, the legal responsibility shall be with the repairing company.

5. Cautions regarding chips.
Do not reuse removed chips even when no abnormality is observed in their appearance. Always replace them with new ones. (The chip parts include resistors, capacitors, diodes, transistors, etc). The negative

pole of tantalum capacitors is highly susceptible to heat, so use special care when replacing them and check the operation afterwards.

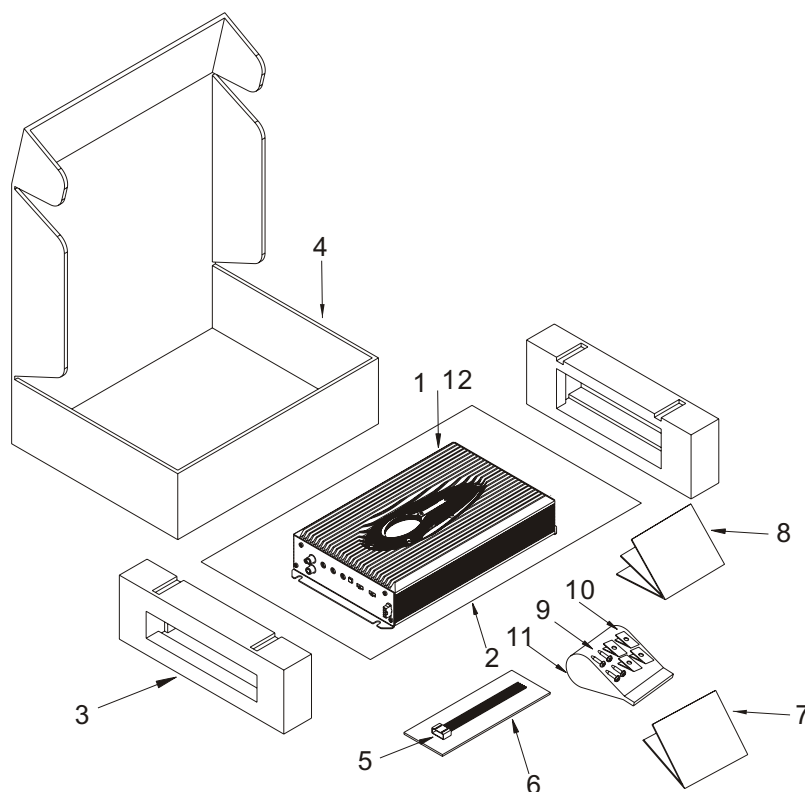
6. Cautions in handling flexible PWB Before working with a soldering iron, make sure that the iron tip temperature is around 270 Celsius degree. Take care not to apply the iron tip repeatedly (more than three times) to the same patterns. Also take care not to apply the tip with force.

7. Turn the unit OFF during disassembly and parts replacement. Recheck all work before you apply power to the unit.

TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	SOLUTION
No audio	Low or no turn-on voltage	Check remote connections at amplifier and head unit.
	Blown fuse	Replace with new fast-blown fuse (same rating).
	Power wires not connected	-Check power and ground connection at amplifier. -Check battery connections.
	Speakers not connected or blown	-Check speaker connections at amplifier. -Measure coil impedance.
Audio cycles on and off	Thermal protection circuits are shutting amplifier off	- Check location for adequate ventilation. - Consult an authorized Clarion dealer
Disturbed sound	Gain controls is not set properly, or damaged speaker cones	-Adjust gain control -Check each speaker cone for signs of damage (e.g. frozen cone, burning smell, etc)
Sound lacks punch	Speakers wired incorrectly, which causes cancellation of bass frequencies	Check polarity of wires from amplifier to each speakers as illustrated in connection examples
Whining or ticking noise in the sound with engine on	Amplifier is picking up alternator noise or radiated noise	-Check power and ground connections on amplifier. -Check or move audio cables -Install an in-line noise filter on head unit's power wire -Check alternator and/or voltage regulator -Test for weak battery or add water to battery

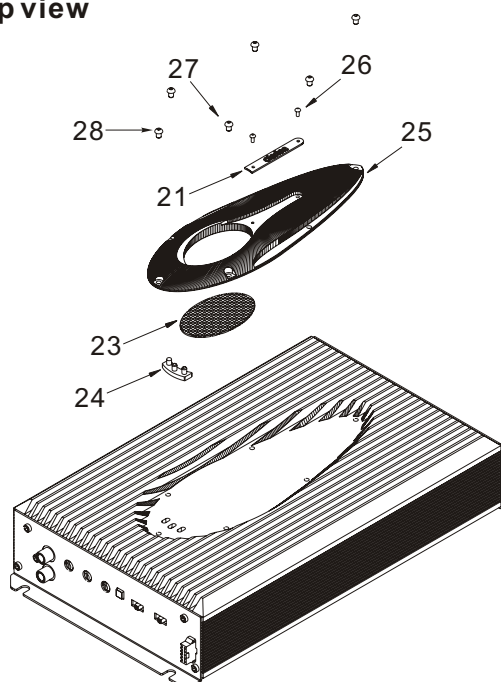
COMPONENTS



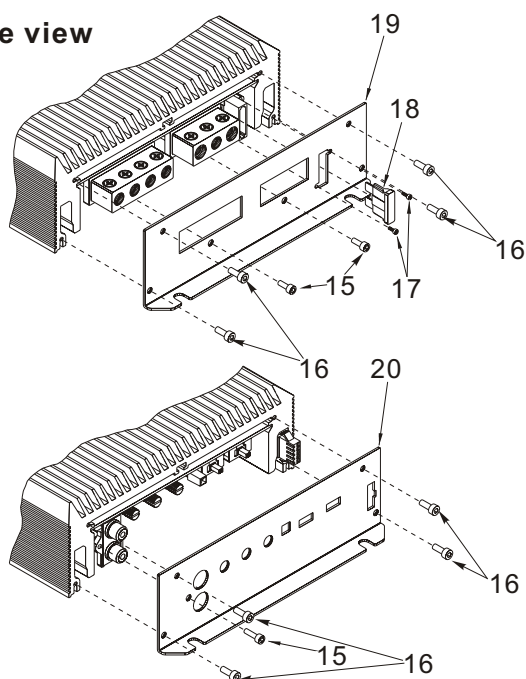
NO.	PART NO.	MANUFACTURE NO.	DESCRIPTION	SPEC	QTY.
1	653-0433-36	81-00302-00	SET PLATE	APA2160(CLARION)	1
2	-----	78-00113-00	PE BAG 0.06mm	30*50 CM	1
3	-----	79-00APA-00	INNER CARD BOARD	APA2160	2
4	-----	79-A2160-GK	GIFT BOX	APA2160(CLARION)	1
5	653-0433-08	35-00121-01	5P INPUT CONN'T (PACK)	H7755P-05 WIRE300	1
6	-----	78-00294-01	ZIPPER BAG	#4, 8.5*12mm	1
7	-----	82-00APA-GK	WARRANTY CARD	MULTI-LANGUAGE	1
8	-----	80-02160-WW	I/B	MULTI-LANGUAGE	1
9	653-0433-44	ST-RP440-20	SCREW	R-HEAD BLACK 4*20	4
10	653-0433-16	74-00173-00	PLATE NUT	ATTACHMENT	4
11	-----	78-00294-00	ZIPPER BAG	#2, 6*8.5CM	1
12	-----	81-00300-00	BARCODE	GA981E51	1

EXPLODED VIEW / PARTS LIST

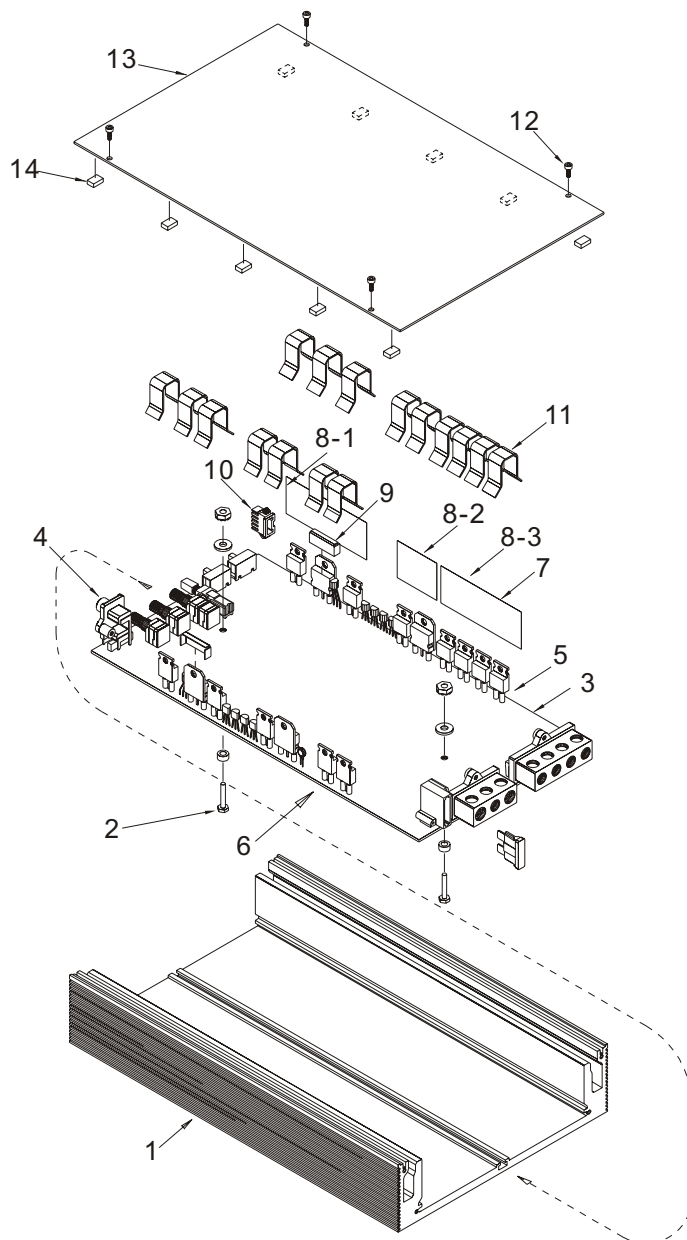
Top view



Side view



Bottom view



EXPLODED VIEW / PARTS LIST

NO.	PART NO.	MANUFACTURE NO.	DESCRIPTION	SPEC	QTY.
1	653-0433-21	77-00285-00	HEAT-SINK	259.1mm BLACK	1
2	653-0433-45	YH-00007-00	SCREW	A+B+C+D	2
3	653-0432-92	11-A2160-00	P.C.B	2160	1
4	653-0433-06	32-20223-04	RCA JACK2P RL-	1416-2GRED/WHITE	1
5	653-0433-23	78-00284-00	SILICON TUBE	2mm*6mm	8
6	653-0433-24	78-00292-00	SILICON TUBE	2mm*8mm	24
7	653-0433-31	78-00310-00	KAPTON	25mm*65mm	1
8-1	653-0433-28	78-00305-00	MICA	25*30mm	2
8-2	653-0433-29	78-00306-00	MICA	25*40mm	3
8-3	653-0433-30	78-00307-00	MICA	25*50mm	2
9	653-0433-14	74-00165-00	CLIP	-0.5mm	2
10	653-0433-07	34-00150-03	5P INPUT CONN'T (ONBOARD)	H7755R-05 WIRE100	1
11	653-0433-13	74-00153-00	CLIP	BLACK	16
12	653-0433-43	ST-RP430-06	SCREW	R-HEAD BLACK 3*6	4
13	653-0433-11	72-00383-00	BOTTOM COVER		1
14	653-0433-27	78-00296-00	SPONGE W/ADHASIVE	10*20mm,3mm(TH)	10
15	653-0433-41	ST-IH230-12	SCREW	HEX NICKEL PLATED3*12	3
16	653-0433-39	SM-RH230-05	SCREW	NICKEL PLATED M3*5	8
17	653-0433-42	ST-RP220-08	SCREW	R-HEAD NICKEL PLATED 2*8	2
18	653-0433-18	76-00224-00	FUSE	ATC-30A	1
19	653-0433-10	71-00557-00	REAR PANNEL	CLARION	1
20	653-0433-09	71-00556-00	FRONT PANNEL		1
21	653-0433-17	75-00020-00	BADGE	CLARION	1
23	653-0433-12	73-00132-00	MESH	APA	1
24	653-0433-20	76-00382-00	LED LIGHT GUIDE	APA2160,4320	1
25	653-0433-15	74-00172-00	PLATE	METALCOLOR	1
26	653-0433-37	SM-RH220-05	SCREW	NICKEL PLATED M2*5	2
27	653-0433-40	ST-IH230-08	SCREW	HEX NICKEL PLATED 3*8	5
28	653-0433-38	SM-RH230-03	SCREW	NICKEL PLATED M3*3	1

ELECTRICAL PART LIST

MAIN PWB SECTION

NO.	PART NO.	MANUFACTURE NO.	DESCRIPTION	SPEC	QTY.
C1	653-0432-55	03-21040-04	POLYCAP	104J	1
C2	653-0432-50	02-24701-21	ELE. CAPACITOR	47uF/16V	1
C3	653-0432-55	03-21040-04	POLYCAP	104J	1
C4	653-0432-55	03-21040-04	POLYCAP	104J	1
C5	653-0432-55	03-21040-04	POLYCAP	104J	1
C6	653-0432-66	04-20680-02	CERAMIC	68P -NPO- 50V	1
C7	653-0432-56	03-21510-05	CERAMIC CAPACITOR	151P/K	1
C8	653-0432-55	03-21040-04	POLYCAP	104J	1
C9	653-0432-55	03-21040-04	POLYCAP	104J	1
C10	653-0432-55	03-21040-04	POLYCAP	104J	1
C11	653-0432-64	04-20100-02	CERAMIC	10P -NPO- 50V	1
C12	653-0432-62	03-25630-04	POLYCAP	563J	1
C13	653-0432-62	03-25630-04	POLYCAP	563J	1
C14	653-0432-55	03-21040-04	POLYCAP	104J	1
C15	653-0432-55	03-21040-04	POLYCAP	104J	1
C16	653-0432-55	03-21040-04	POLYCAP	104J	1
C17	653-0432-61	03-25620-04	POLYCAP	562J	1

C18	653-0432-61	03-25620-04	POLYCAP	562J	1
C19	653-0432-49	02-21003-41	E/C.16*32 L ESR	1000uf/50V 105C	1
C20	653-0432-55	03-21040-04	POLYCAP	104J	1
C21	653-0432-61	03-25620-04	POLYCAP	562J	1
C22	653-0432-61	03-25620-04	POLYCAP	562J	1
C23	653-0432-66	04-20680-02	CERAMIC	68P -NPO- 50V	1
C24	653-0432-66	04-20680-02	CERAMIC	68P -NPO- 50V	1
C25	653-0432-58	03-24720-04	POLYCAP	472J	1
C26	653-0432-62	03-25630-04	POLYCAP	563J	1
C27	653-0432-62	03-25630-04	POLYCAP	563J	1
C28	653-0432-48	02-21002-00	ELE. CAPACITOR	100uF/16V	1
C29	653-0432-55	03-21040-04	POLYCAP	104J	1
C30	653-0432-55	03-21040-04	POLYCAP	104J	1
C31	653-0432-66	04-20680-02	CERAMIC	68P -NPO- 50V	1
C32	653-0432-66	04-20680-02	CERAMIC	68P -NPO- 50V	1
C33	653-0432-47	02-21001-41	ELE. CAPACITOR	10uf/50V	1
C34	653-0432-47	02-21001-41	ELE. CAPACITOR	10uf/50V	1
C35	653-0432-63	03-26820-04	POLYCAP	682J	1
C36	653-0432-53	03-21020-04	POLYCAP	102J	1
C37	653-0432-49	02-21003-41	E/C.16*32 L ESR	1000uf/50V 105C	1
C38	653-0432-46	02-21000-41	ELE. CAPACITOR	1uf/50V	1
C39	653-0432-65	04-20330-02	CERAMIC	33P -NPO- 100V	1
C40	653-0432-65	04-20330-02	CERAMIC	33P -NPO- 100V	1
C41	653-0432-59	03-24730-04	POLYCAP	473J	1
C42	653-0432-57	03-22720-04	POLYCAP	272J	1
C43	653-0432-60	03-24740-04	POLYCAP	474J	1
C44	653-0432-53	03-21020-04	POLYCAP	102J	1
C45	653-0432-55	03-21040-04	POLYCAP	104J	1
C46	653-0432-55	03-21040-04	POLYCAP	104J	1
C47	653-0432-51	02-24702-21	ELE. CAPACITOR	470uf/16V	1
C48	653-0432-51	02-24702-21	ELE. CAPACITOR	470uf/16V	1
C49	653-0432-52	02-26803-21	ELE. CAPACITOR	6800uf/16V ESR	1
C50	653-0432-63	03-26820-04	POLYCAP	682J	1
C51	653-0432-55	03-21040-04	POLYCAP	104J	1
C52	653-0432-55	03-21040-04	POLYCAP	104J	1
C53	653-0432-55	03-21040-04	POLYCAP	104J	1
C54	653-0432-55	03-21040-04	POLYCAP	104J	1
C55	653-0432-55	03-21040-04	POLYCAP	104J	1
C56	653-0432-55	03-21040-04	POLYCAP	104J	1
C57	653-0432-48	02-21002-00	ELE. CAPACITOR	100uF/16V	1
C58	653-0432-47	02-21001-41	ELE. CAPACITOR	10uf/50V	1
C59	653-0432-60	03-24740-04	POLYCAP	474J	1
C60	653-0432-65	04-20330-02	CERAMIC	33P -NPO- 100V	1
C61	653-0432-65	04-20330-02	CERAMIC	33P -NPO- 100V	1
C62	653-0432-55	03-21040-04	POLYCAP	104J	1
C63	653-0432-52	02-26803-21	ELE. CAPACITOR	6800uf/16V ESR	1
C64	653-0432-55	03-21040-04	POLYCAP	104J	1
C65	653-0432-47	02-21001-41	ELE. CAPACITOR	10uf/50V	1
C66	653-0432-60	03-24740-04	POLYCAP	474J	1
C67	653-0432-47	02-21001-41	ELE. CAPACITOR	10uf/50V	1
C68	653-0432-47	02-21001-41	ELE. CAPACITOR	10uf/50V	1
C69	653-0432-60	03-24740-04	POLYCAP	474J	1
C70	653-0432-57	03-22720-04	POLYCAP	272J	1
C71	653-0432-55	03-21040-04	POLYCAP	104J	1
C72	653-0432-55	03-21040-04	POLYCAP	104J	1

C73	653-0432-55	03-21040-04	POLYCAP	104J	1
C74	653-0432-54	03-21030-04	POLYCAP	103J	1
C75	653-0432-55	03-21040-04	POLYCAP	104J	1
C76	653-0432-55	03-21040-04	POLYCAP	104J	1
C77	653-0432-55	03-21040-04	POLYCAP	104J	1
C78	653-0432-66	04-20680-02	CERAMIC	68P -NPO- 50V	1
C79	653-0432-66	04-20680-02	CERAMIC	68P -NPO- 50V	1
C80	653-0432-54	03-21030-04	POLYCAP	103J	1
C81	653-0432-54	03-21030-04	POLYCAP	103J	1
C82	653-0432-55	03-21040-04	POLYCAP	104J	1
C83	653-0432-66	04-20680-02	CERAMIC	68P -NPO- 50V	1
C84	653-0432-55	03-21040-04	POLYCAP	104J	1
C85	653-0432-56	03-21510-05	CERAMIC CAPACITOR	151P/K	1
C86	653-0432-64	04-20100-02	CERAMIC	10P -NPO- 50V	1
C87	653-0432-55	03-21040-04	POLYCAP	104J	1
C88	653-0432-65	04-20330-02	CERAMIC	33P -NPO- 100V	1
C89	653-0432-50	02-24701-21	ELE. CAPACITOR	47uF/16V	1
C90	653-0432-47	02-21001-41	ELE. CAPACITOR	10uf/50V	1
C91	653-0432-55	03-21040-04	POLYCAP	104J	1
C92	653-0432-47	02-21001-41	ELE. CAPACITOR	10uf/50V	1
C93	653-0432-47	02-21001-41	ELE. CAPACITOR	10uf/50V	1
C94	653-0432-65	04-20330-02	CERAMIC	33P -NPO- 100V	1
D1	653-0432-91	09-40008-00	RECT ULTRAFast	FES8DT,MUR820	1
D2	653-0432-91	09-40008-00	RECT ULTRAFast	FES8DT,MUR820	1
D3	653-0432-91	09-40008-00	RECT ULTRAFast	FES8DT,MUR820	1
D4	653-0432-91	09-40008-00	RECT ULTRAFast	FES8DT,MUR820	1
D5	653-0432-85	09-14148-01	DIODE 1N4148	DO-35 50mA 100V	1
D6	653-0432-85	09-14148-01	DIODE 1N4148	DO-35 50mA 100V	1
D7	653-0432-85	09-14148-01	DIODE 1N4148	DO-35 50mA 100V	1
D8	653-0432-85	09-14148-01	DIODE 1N4148	DO-35 50mA 100V	1
D9	653-0432-86	09-14934-00	DIODE FAST 100V	1N4934,1N4734	1
D10	653-0432-86	09-14934-00	DIODE FAST 100V	1N4934,1N4734	1
D11	653-0432-85	09-14148-01	DIODE 1N4148	DO-35 50mA 100V	1
D12	653-0432-85	09-14148-01	DIODE 1N4148	DO-35 50mA 100V	1
D13	653-0432-85	09-14148-01	DIODE 1N4148	DO-35 50mA 100V	1
D14	653-0432-87	09-15401-01	DIODE	IN5402 3A/200V	1
D15	653-0432-85	09-14148-01	DIODE 1N4148	DO-35 50mA 100V	1
D16	653-0432-85	09-14148-01	DIODE 1N4148	DO-35 50mA 100V	1
D17	653-0432-86	09-14934-00	DIODE FAST 100V	1N4934,1N4734	1
D18	653-0432-86	09-14934-00	DIODE FAST 100V	1N4934,1N4734	1
D19	653-0432-85	09-14148-01	DIODE 1N4148	DO-35 50mA 100V	1
D20	653-0432-85	09-14148-01	DIODE 1N4148	DO-35 50mA 100V	1
DZ1	653-0432-88	09-20100-03	ZENER DIODE	HZ11-2TA 10V	1
DZ2	653-0432-89	09-20120-03	ZENER DIODE	1N759A 12V 1/2W	1
DZ3	653-0432-90	09-20160-03	ZENER DIODE	HZ16-2TA 16V	1
DZ4	653-0432-90	09-20160-03	ZENER DIODE	HZ16-2TA 16V	1
DZ5	653-0432-84	09-00680-00	ZENER 68V	1N981B,1N5266B	1
DZ6	653-0432-84	09-00680-00	ZENER 68V	1N981B,1N5266B	1
FH1	653-0433-19	76-00239-00	FUSE HOLD	JEF-703E	1
J1	653-0433-05	32-00657-00	TERMINAL	SL-KOR-4P	1
J2	653-0433-04	32-00655-00	TERMINAL	SL-KOR-3P	1
L1	653-0433-01	20-00107-00	COIL (17-1/2)	SMALL ZIBBLE	1
L2	653-0433-01	20-00107-00	COIL (17-1/2)	SMALL ZIBBLE	1
L3	653-0433-02	20-00144-00	CHOKE MH-7380	TOROID PWRIN	1
LED1	653-0432-99	19-00302-01	LED BLUE	BB437C	1

LED2	653-0432-99	19-00302-01	LED BLUE	BB437C	1
LED3	653-0432-99	19-00302-01	LED BLUE	BB437C	1
M1	653-0432-80	08-02807-00	HEXFET	IRF2807 82A75V	1
M2	653-0432-80	08-02807-00	HEXFET	IRF2807 82A75V	1
Q1	653-0432-78	08-00035-00	TRANSISTOR	TIP35C	1
Q2	653-0432-81	08-10006-01	T.R	MPSA06 (BULK)	1
Q3	653-0432-76	08-00031-00	TRANSISTOR	TIP31C	1
Q4	653-0432-82	08-10056-01	T.R	MPSA56 (BULK)	1
Q5	653-0432-82	08-10056-01	T.R	MPSA56 (BULK)	1
Q6	653-0432-81	08-10006-01	T.R	MPSA06 (BULK)	1
Q7	653-0432-81	08-10006-01	T.R	MPSA06 (BULK)	1
Q8	653-0432-77	08-00032-00	TRANSISTOR	TIP32C	1
Q9	653-0432-79	08-00036-00	TRANSISTOR	TIP36C	1
Q10	653-0432-82	08-10056-01	T.R	MPSA56 (BULK)	1
Q11	653-0432-81	08-10006-01	T.R	MPSA06 (BULK)	1
Q12	653-0432-82	08-10056-01	T.R	MPSA56 (BULK)	1
Q13	653-0432-82	08-10056-01	T.R	MPSA56 (BULK)	1
Q14	653-0432-81	08-10006-01	T.R	MPSA06 (BULK)	1
Q15	653-0432-81	08-10006-01	T.R	MPSA06 (BULK)	1
Q16	653-0432-82	08-10056-01	T.R	MPSA56 (BULK)	1
Q17	653-0432-82	08-10056-01	T.R	MPSA56 (BULK)	1
Q18	653-0432-81	08-10006-01	T.R	MPSA06 (BULK)	1
Q19	653-0432-81	08-10006-01	T.R	MPSA06 (BULK)	1
Q20	653-0432-83	08-26715-00	TRANSISTOR	2N6715 2A50V	1
Q21	653-0432-82	08-10056-01	T.R	MPSA56 (BULK)	1
Q22	653-0432-82	08-10056-01	T.R	MPSA56 (BULK)	1
Q23	653-0432-81	08-10006-01	T.R	MPSA06 (BULK)	1
Q24	653-0432-78	08-00035-00	TRANSISTOR	TIP35C	1
Q25	653-0432-76	08-00031-00	TRANSISTOR	TIP31C	1
Q26	653-0432-82	08-10056-01	T.R	MPSA56 (BULK)	1
Q27	653-0432-82	08-10056-01	T.R	MPSA56 (BULK)	1
Q28	653-0432-81	08-10006-01	T.R	MPSA06 (BULK)	1
Q29	653-0432-81	08-10006-01	T.R	MPSA06 (BULK)	1
Q30	653-0432-77	08-00032-00	TRANSISTOR	TIP32C	1
Q31	653-0432-79	08-00036-00	TRANSISTOR	TIP36C	1
R1	653-0432-26	01-53420-63	RESISTOR 1%	3.48 K 1/8W	1
R2	653-0432-22	01-52710-63	RESISTOR 1%	274 ohm 1/8W	1
R3	653-0432-05	01-51010-63	RESISTOR 1%	100 ohm 1/8W	1
R4	653-0432-05	01-51010-63	RESISTOR 1%	100 ohm 1/8W	1
R5	653-0432-05	01-51010-63	RESISTOR 1%	100 ohm 1/8W	1
R6	653-0432-05	01-51010-63	RESISTOR 1%	100 ohm 1/8W	1
R7	653-0432-01	01-10001-22	RESISTOR -MO-	0.1 ohm 1/2W	1
R8	653-0432-34	01-55001-43	RESISTOR 1%	5.1 ohm 1/4W	1
R9	653-0432-31	01-54720-63	RESISTOR 1%	4.75 K 1/8W	1
R103	653-0432-07	01-51030-63	RESISTOR 1%	10 K 1/8W	1
R101	653-0432-12	01-51830-63	RESISTOR 1%	18.2 K 1/8W	1
R102	653-0432-12	01-51830-63	RESISTOR 1%	18.2 K 1/8W	1
R104	653-0432-13	01-52020-63	RESISTOR 1%	2 K 1/8W	1
R107	653-0432-14	01-52030-63	RESISTOR 1%	20 K 1/8W	1
R108	653-0432-14	01-52030-63	RESISTOR 1%	20 K 1/8W	1
R106	653-0432-40	01-57510-63	RESISTOR 1%	750 ohm 1/8W	1
R109	653-0432-40	01-57510-63	RESISTOR 1%	750 ohm 1/8W	1
R10	653-0432-42	01-58220-63	RESISTOR 1%	8.25 K 1/8W	1
R100	653-0432-44	01-59300-63	RESISTOR 1%	93.1 ohm 1/8W	1
R105	653-0432-44	01-59300-63	RESISTOR 1%	93.1 ohm 1/8W	1

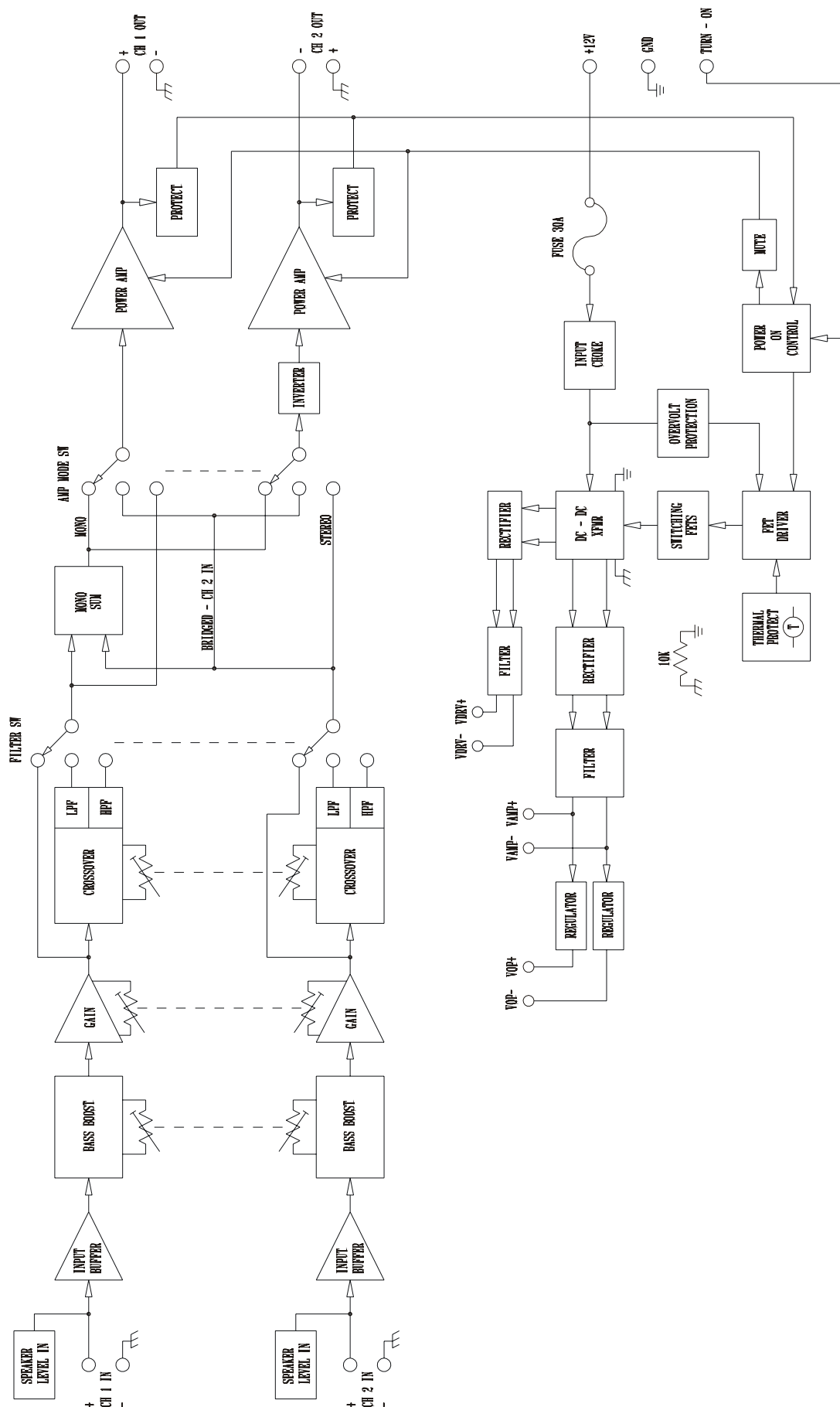
R114	653-0432-06	01-51020-63	RESISTOR 1%	1 K 1/8W	1
R116	653-0432-06	01-51020-63	RESISTOR 1%	1 K 1/8W	1
R111	653-0432-08	01-51101-63	RESISTOR 1%	1.1 K 1/8W	1
R110	653-0432-09	01-51210-63	RESISTOR 1%	121 ohm 1/8W	1
R119	653-0432-10	01-51420-63	RESISTOR 1%	1.43 K 1/8W	1
R117	653-0432-16	01-52130-63	RESISTOR 1%	21 K 1/8W	1
R118	653-0432-16	01-52130-63	RESISTOR 1%	21 K 1/8W	1
R113	653-0432-20	01-52440-63	RESISTOR 1%	243 K 1/8W	1
R115	653-0432-27	01-53910-43	RESISTOR 1%	392 ohm 1/4W	1
R11	653-0432-34	01-55001-43	RESISTOR 1%	5.1 ohm 1/4W	1
R112	653-0432-45	01-59320-63	RESISTOR 1%	9.31 K 1/8W	1
R127	653-0432-06	01-51020-63	RESISTOR 1%	1 K 1/8W	1
R121	653-0432-07	01-51030-63	RESISTOR 1%	10 K 1/8W	1
R126	653-0432-13	01-52020-63	RESISTOR 1%	2 K 1/8W	1
R123	653-0432-18	01-52206-63	RESISTOR 1%	22.1 ohm 1/8W	1
R125	653-0432-18	01-52206-63	RESISTOR 1%	22.1 ohm 1/8W	1
R128	653-0432-18	01-52206-63	RESISTOR 1%	22.1 ohm 1/8W	1
R120	653-0432-33	01-54740-63	RESISTOR 1%	475 K 1/8W	1
R124	653-0432-39	01-56800-63	RESISTOR 1%	681 ohm 1/8W	1
R129	653-0432-39	01-56800-63	RESISTOR 1%	681 ohm 1/8W	1
R122	653-0432-42	01-58220-63	RESISTOR 1%	8.25 K 1/8W	1
R132	653-0432-06	01-51020-63	RESISTOR 1%	1 K 1/8W	1
R138	653-0432-12	01-51830-63	RESISTOR 1%	18.2 K 1/8W	1
R139	653-0432-12	01-51830-63	RESISTOR 1%	18.2 K 1/8W	1
R131	653-0432-13	01-52020-63	RESISTOR 1%	2 K 1/8W	1
R130	653-0432-18	01-52206-63	RESISTOR 1%	22.1 ohm 1/8W	1
R137	653-0432-20	01-52440-63	RESISTOR 1%	243 K 1/8W	1
R13	653-0432-31	01-54720-63	RESISTOR 1%	4.75 K 1/8W	1
R133	653-0432-32	01-54730-63	RESISTOR 1%	47.5 K 1/8W	1
R136	653-0432-33	01-54740-63	RESISTOR 1%	475 K 1/8W	1
R134	653-0432-37	01-55910-63	RESISTOR 1%	590 ohm 1/8W	1
R135	653-0432-37	01-55910-63	RESISTOR 1%	590 ohm 1/8W	1
R14	653-0432-01	01-10001-22	RESISTOR -MO-	0.1 ohm 1/2W	1
R141	653-0432-14	01-52030-63	RESISTOR 1%	20 K 1/8W	1
R144	653-0432-15	01-52120-63	RESISTOR 1%	2.15 K 1/8W	1
R146	653-0432-18	01-52206-63	RESISTOR 1%	22.1 ohm 1/8W	1
R143	653-0432-21	01-52702-63	RESISTOR 1%	27.4 K 1/8W	1
R140	653-0432-33	01-54740-63	RESISTOR 1%	475 K 1/8W	1
R142	653-0432-35	01-55120-63	RESISTOR 1%	5.11 K 1/8W	1
R149	653-0432-38	01-56320-63	RESISTOR 1%	6.34 K 1/8W	1
R148	653-0432-41	01-58200-63	RESISTOR 1%	82.5 ohm 1/8W	1
R147	653-0432-42	01-58220-63	RESISTOR 1%	8.25 K 1/8W	1
R145	653-0432-43	01-59000-63	RESISTOR 1%	909 ohm 1/8W	1
R158	653-0432-01	01-10001-22	RESISTOR -MO-	0.1 ohm 1/2W	1
R157	653-0432-07	01-51030-63	RESISTOR 1%	10 K 1/8W	1
R153	653-0432-18	01-52206-63	RESISTOR 1%	22.1 ohm 1/8W	1
R155	653-0432-18	01-52206-63	RESISTOR 1%	22.1 ohm 1/8W	1
R159	653-0432-19	01-52230-63	RESISTOR 1%	22.1 K 1/8W	1
R152	653-0432-30	01-54710-63	RESISTOR 1%	475 ohm 1/8W	1
R156	653-0432-30	01-54710-63	RESISTOR 1%	475 ohm 1/8W	1
R15	653-0432-31	01-54720-63	RESISTOR 1%	4.75 K 1/8W	1
R151	653-0432-31	01-54720-63	RESISTOR 1%	4.75 K 1/8W	1
R150	653-0432-36	01-55618-63	RESISTOR 1%	56.2 ohm 1/8W	1
R154	653-0432-38	01-56320-63	RESISTOR 1%	6.34 K 1/8W	1
R162	653-0432-01	01-10001-22	RESISTOR -MO-	0.1 ohm 1/2W	1

R160	653-0432-04	01-51000-63	RESISTOR 1%	10 ohm 1/8W	1
R163	653-0432-04	01-51000-63	RESISTOR 1%	10 ohm 1/8W	1
R166	653-0432-05	01-51010-63	RESISTOR 1%	100 ohm 1/8W	1
R167	653-0432-05	01-51010-63	RESISTOR 1%	100 ohm 1/8W	1
R168	653-0432-05	01-51010-63	RESISTOR 1%	100 ohm 1/8W	1
R169	653-0432-05	01-51010-63	RESISTOR 1%	100 ohm 1/8W	1
R161	653-0432-24	01-53330-63	RESISTOR 1%	33.2 K 1/8W	1
R164	653-0432-24	01-53330-63	RESISTOR 1%	33.2 K 1/8W	1
R165	653-0432-26	01-53420-63	RESISTOR 1%	3.48 K 1/8W	1
R16	653-0432-31	01-54720-63	RESISTOR 1%	4.75 K 1/8W	1
R176	653-0432-14	01-52030-63	RESISTOR 1%	20 K 1/8W	1
R177	653-0432-14	01-52030-63	RESISTOR 1%	20 K 1/8W	1
R172	653-0432-18	01-52206-63	RESISTOR 1%	22.1 ohm 1/8W	1
R173	653-0432-18	01-52206-63	RESISTOR 1%	22.1 ohm 1/8W	1
R174	653-0432-18	01-52206-63	RESISTOR 1%	22.1 ohm 1/8W	1
R175	653-0432-18	01-52206-63	RESISTOR 1%	22.1 ohm 1/8W	1
R170	653-0432-19	01-52230-63	RESISTOR 1%	22.1 K 1/8W	1
R171	653-0432-22	01-52710-63	RESISTOR 1%	274 ohm 1/8W	1
R17	653-0432-31	01-54720-63	RESISTOR 1%	4.75 K 1/8W	1
R18	653-0432-31	01-54720-63	RESISTOR 1%	4.75 K 1/8W	1
R19	653-0432-15	01-52120-63	RESISTOR 1%	2.15 K 1/8W	1
R20	653-0432-43	01-59000-63	RESISTOR 1%	909 ohm 1/8W	1
R21	653-0432-18	01-52206-63	RESISTOR 1%	22.1 ohm 1/8W	1
R22	653-0432-30	01-54710-63	RESISTOR 1%	475 ohm 1/8W	1
R23	653-0432-18	01-52206-63	RESISTOR 1%	22.1 ohm 1/8W	1
R24	653-0432-38	01-56320-63	RESISTOR 1%	6.34 K 1/8W	1
R25	653-0432-18	01-52206-63	RESISTOR 1%	22.1 ohm 1/8W	1
R26	653-0432-30	01-54710-63	RESISTOR 1%	475 ohm 1/8W	1
R27	653-0432-34	01-55001-43	RESISTOR 1%	5.1 ohm 1/4W	1
R28	653-0432-42	01-58220-63	RESISTOR 1%	8.25 K 1/8W	1
R29	653-0432-38	01-56320-63	RESISTOR 1%	6.34 K 1/8W	1
R31	653-0432-36	01-55618-63	RESISTOR 1%	56.2 ohm 1/8W	1
R32	653-0432-34	01-55001-43	RESISTOR 1%	5.1 ohm 1/4W	1
R33	653-0432-13	01-52020-63	RESISTOR 1%	2 K 1/8W	1
R34	653-0432-13	01-52020-63	RESISTOR 1%	2 K 1/8W	1
R35	653-0432-13	01-52020-63	RESISTOR 1%	2 K 1/8W	1
R36	653-0432-26	01-53420-63	RESISTOR 1%	3.48 K 1/8W	1
R37	653-0432-13	01-52020-63	RESISTOR 1%	2 K 1/8W	1
R38	653-0432-10	01-51420-63	RESISTOR 1%	1.43 K 1/8W	1
R39	653-0432-42	01-58220-63	RESISTOR 1%	8.25 K 1/8W	1
R40	653-0432-39	01-56800-63	RESISTOR 1%	681 ohm 1/8W	1
R41	653-0432-18	01-52206-63	RESISTOR 1%	22.1 ohm 1/8W	1
R42	653-0432-06	01-51020-63	RESISTOR 1%	1 K 1/8W	1
R43	653-0432-13	01-52020-63	RESISTOR 1%	2 K 1/8W	1
R44	653-0432-18	01-52206-63	RESISTOR 1%	22.1 ohm 1/8W	1
R45	653-0432-39	01-56800-63	RESISTOR 1%	681 ohm 1/8W	1
R46	653-0432-18	01-52206-63	RESISTOR 1%	22.1 ohm 1/8W	1
R47	653-0432-06	01-51020-63	RESISTOR 1%	1 K 1/8W	1
R48	653-0432-13	01-52020-63	RESISTOR 1%	2 K 1/8W	1
R49	653-0432-18	01-52206-63	RESISTOR 1%	22.1 ohm 1/8W	1
R50	653-0432-13	01-52020-63	RESISTOR 1%	2 K 1/8W	1
R51	653-0432-03	01-13000-22	RESISTOR -MO-	30 ohm 1/2W	1
R52	653-0432-13	01-52020-63	RESISTOR 1%	2 K 1/8W	1
R53	653-0432-31	01-54720-63	RESISTOR 1%	4.75 K 1/8W	1
R54	653-0432-11	01-51538-63	RESISTOR 1%	15.8 K 1/8W	1

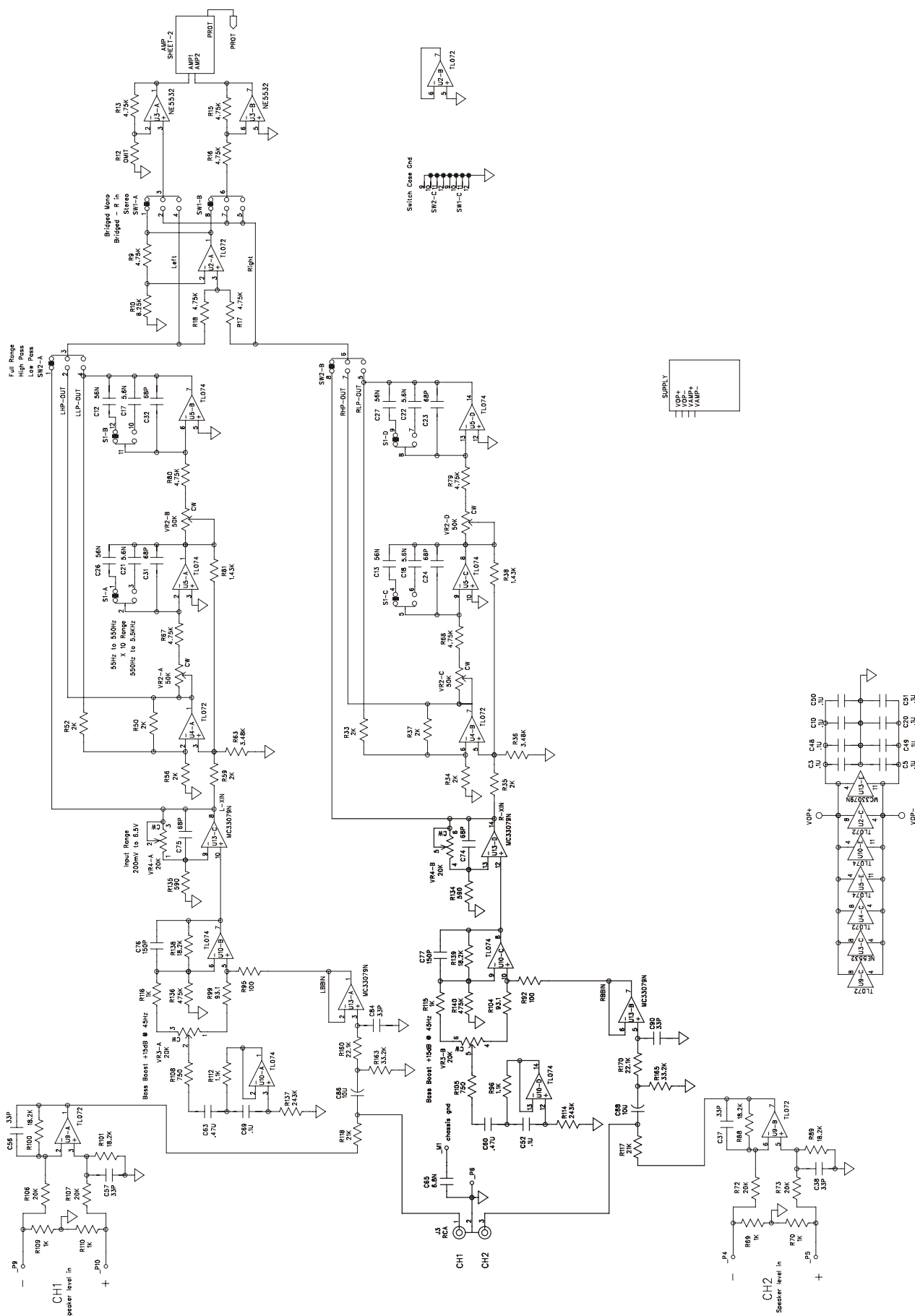
R55	653-0432-07	01-51030-63	RESISTOR 1%	10 K 1/8W	1
R56	653-0432-13	01-52020-63	RESISTOR 1%	2 K 1/8W	1
R57	653-0432-31	01-54720-63	RESISTOR 1%	4.75 K 1/8W	1
R58	653-0432-02	01-12750-63	RESISTOR	2.7 M 1/8W	1
R59	653-0432-13	01-52020-63	RESISTOR 1%	2 K 1/8W	1
R60	653-0432-27	01-53910-43	RESISTOR 1%	392 ohm 1/4W	1
R61	653-0432-06	01-51020-63	RESISTOR 1%	1 K 1/8W	1
R62	653-0432-02	01-12750-63	RESISTOR	2.7 M 1/8W	1
R63	653-0432-07	01-51030-63	RESISTOR 1%	10 K 1/8W	1
R64	653-0432-26	01-53420-63	RESISTOR 1%	3.48 K 1/8W	1
R65	653-0432-13	01-52020-63	RESISTOR 1%	2 K 1/8W	1
R66	653-0432-15	01-52120-63	RESISTOR 1%	2.15 K 1/8W	1
R67	653-0432-18	01-52206-63	RESISTOR 1%	22.1 ohm 1/8W	1
R68	653-0432-31	01-54720-63	RESISTOR 1%	4.75 K 1/8W	1
R69	653-0432-31	01-54720-63	RESISTOR 1%	4.75 K 1/8W	1
R70	653-0432-23	01-53120-22	RESISTOR 1%	3.16 K 1/2W	1
R71	653-0432-14	01-52030-63	RESISTOR 1%	20 K 1/8W	1
R72	653-0432-14	01-52030-63	RESISTOR 1%	20 K 1/8W	1
R73	653-0432-31	01-54720-63	RESISTOR 1%	4.75 K 1/8W	1
R74	653-0432-31	01-54720-63	RESISTOR 1%	4.75 K 1/8W	1
R75	653-0432-31	01-54720-63	RESISTOR 1%	4.75 K 1/8W	1
R76	653-0432-05	01-51010-63	RESISTOR 1%	100 ohm 1/8W	1
R77	653-0432-32	01-54730-63	RESISTOR 1%	47.5 K 1/8W	1
R78	653-0432-31	01-54720-63	RESISTOR 1%	4.75 K 1/8W	1
R79	653-0432-31	01-54720-63	RESISTOR 1%	4.75 K 1/8W	1
R80	653-0432-10	01-51420-63	RESISTOR 1%	1.43 K 1/8W	1
R81	653-0432-07	01-51030-63	RESISTOR 1%	10 K 1/8W	1
R82	653-0432-18	01-52206-63	RESISTOR 1%	22.1 ohm 1/8W	1
R83	653-0432-28	01-54340-63	RESISTOR 1%	432 K 1/8W	1
R84	653-0432-25	01-53340-63	RESISTOR 1%	332 K 1/8W	1
R85	653-0432-07	01-51030-63	RESISTOR 1%	10 K 1/8W	1
R86	653-0432-07	01-51030-63	RESISTOR 1%	10 K 1/8W	1
R87	653-0432-12	01-51830-63	RESISTOR 1%	18.2 K 1/8W	1
R88	653-0432-12	01-51830-63	RESISTOR 1%	18.2 K 1/8W	1
R89	653-0432-34	01-55001-43	RESISTOR 1%	5.1 ohm 1/4W	1
R90	653-0432-29	01-54710-43	RESISTOR 1%	475 ohm 1/4W	1
R91	653-0432-23	01-53120-22	RESISTOR 1%	3.16 K 1/2W	1
R92	653-0432-17	01-52200-63	RESISTOR 1%	221 ohm 1/8W	1
R93	653-0432-05	01-51010-63	RESISTOR 1%	100 ohm 1/8W	1
R94	653-0432-13	01-52020-63	RESISTOR 1%	2 K 1/8W	1
R95	653-0432-05	01-51010-63	RESISTOR 1%	100 ohm 1/8W	1
R96	653-0432-08	01-51101-63	RESISTOR 1%	1.1 K 1/8W	1
R97	653-0432-23	01-53120-22	RESISTOR 1%	3.16 K 1/2W	1
R98	653-0432-06	01-51020-63	RESISTOR 1%	1 K 1/8W	1
R99	653-0432-34	01-55001-43	RESISTOR 1%	5.1 ohm 1/4W	1
RE0	653-0432-41	01-58200-63	RESISTOR 1%	82.5 ohm 1/8W	1
S1	653-0432-97	18-00862-00	SW SP70300-0402	11SB-N W/KNOBBLACK	1
SW1	653-0432-98	18-30001-01	SWITCH SV65020	H0203-6H-01-FN	1
SW2	653-0432-98	18-30001-01	SWITCH SV65020	H0203-6H-01-FN	1
TH1	653-0432-94	13-11003-00	THERMISTOR BEAD	TDC05D410L 100K	1
TH2	653-0432-94	13-11003-00	THERMISTOR BEAD	TDC05D410L 100K	1
TVR4	653-0432-95	15-20203-15	VR 20KB*2	RK097122011K	1
TVR3	653-0432-95	15-20203-15	VR 20KB*2	RK097122011K	1
U1	653-0432-71	07-00337-00	I.C.	KA337TU	1
U2	653-0432-68	07-00072-01	I.C	TI072	1

U3	653-0432-75	07-05532-00	I.C.	NTM5532D	1
U4	653-0432-68	07-00072-01	I.C.	TL072	1
U5	653-0432-69	07-00074-01	I.C.	TLO74	1
U6	653-0432-72	07-00393-01	I.C.	LM393N	1
U7	653-0432-67	07-00025-00	I.C.	4N25	1
U8	653-0432-75	07-05532-00	I.C.	NTM5532D	1
U9	653-0432-68	07-00072-01	I.C.	TL072	1
U10	653-0432-69	07-00074-01	I.C.	TLO74	1
U11	653-0432-67	07-00025-00	I.C.	4N25	1
U12	653-0432-74	07-03525-01	I.C.	SG3525AN	1
U13	653-0432-73	07-00837-00	I.C. (SGS)	MC33079N,LM837N	1
U14	653-0432-70	07-00317-00	I.C.	KA317TU	1
VR1	653-0432-93	13-00207-00	TRIM-6-VERT-500	500 ohm	1
VR2	653-0432-96	15-40050-05	VR C50K*4	RK097142001E	1
VR5	653-0432-93	13-00207-00	TRIM-6-VERT-500	500 ohm	1
X1	653-0433-03	20-00145-00	TRANSFORMER	APA2160	1

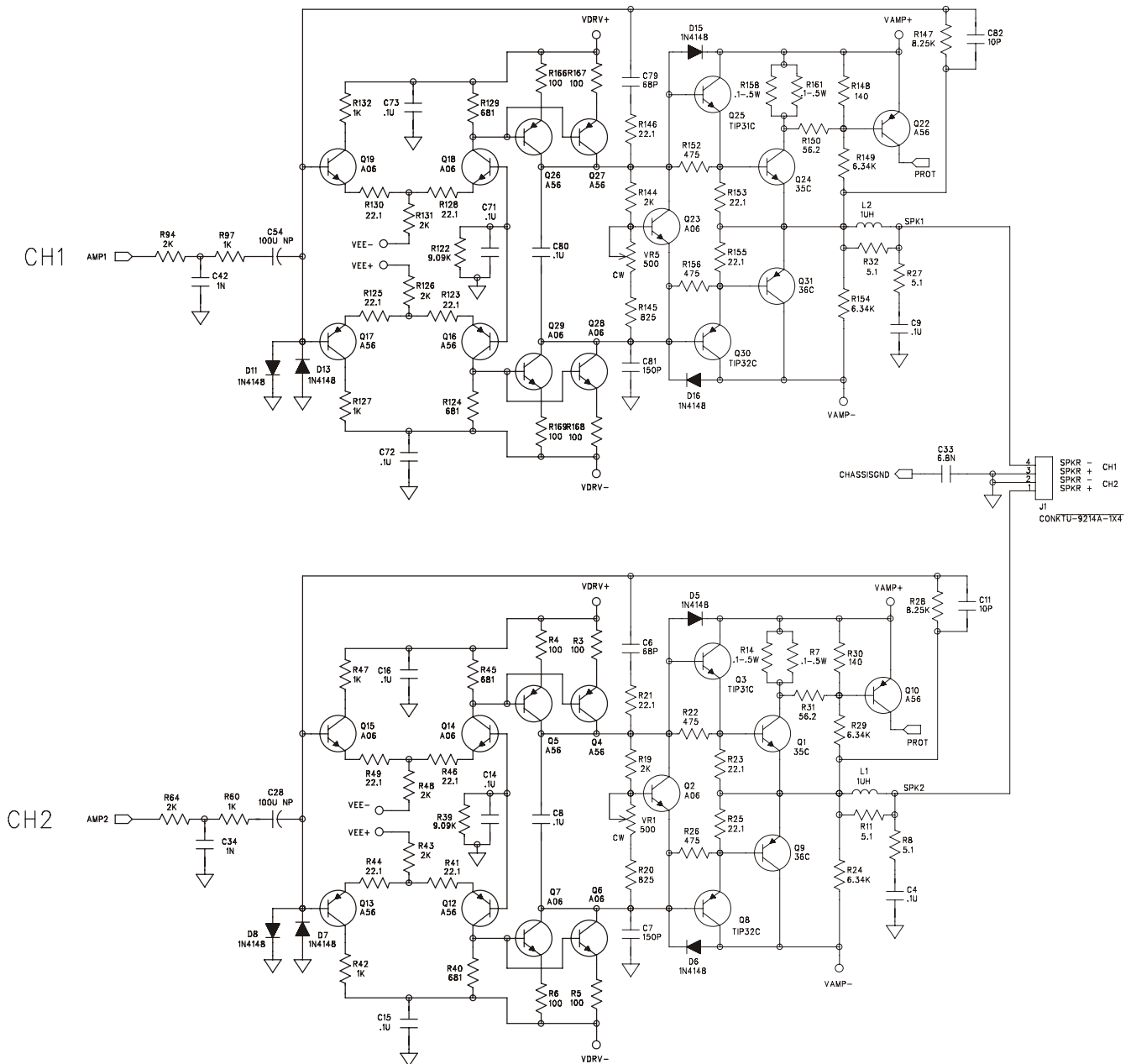
BLOCK DIAGRAM

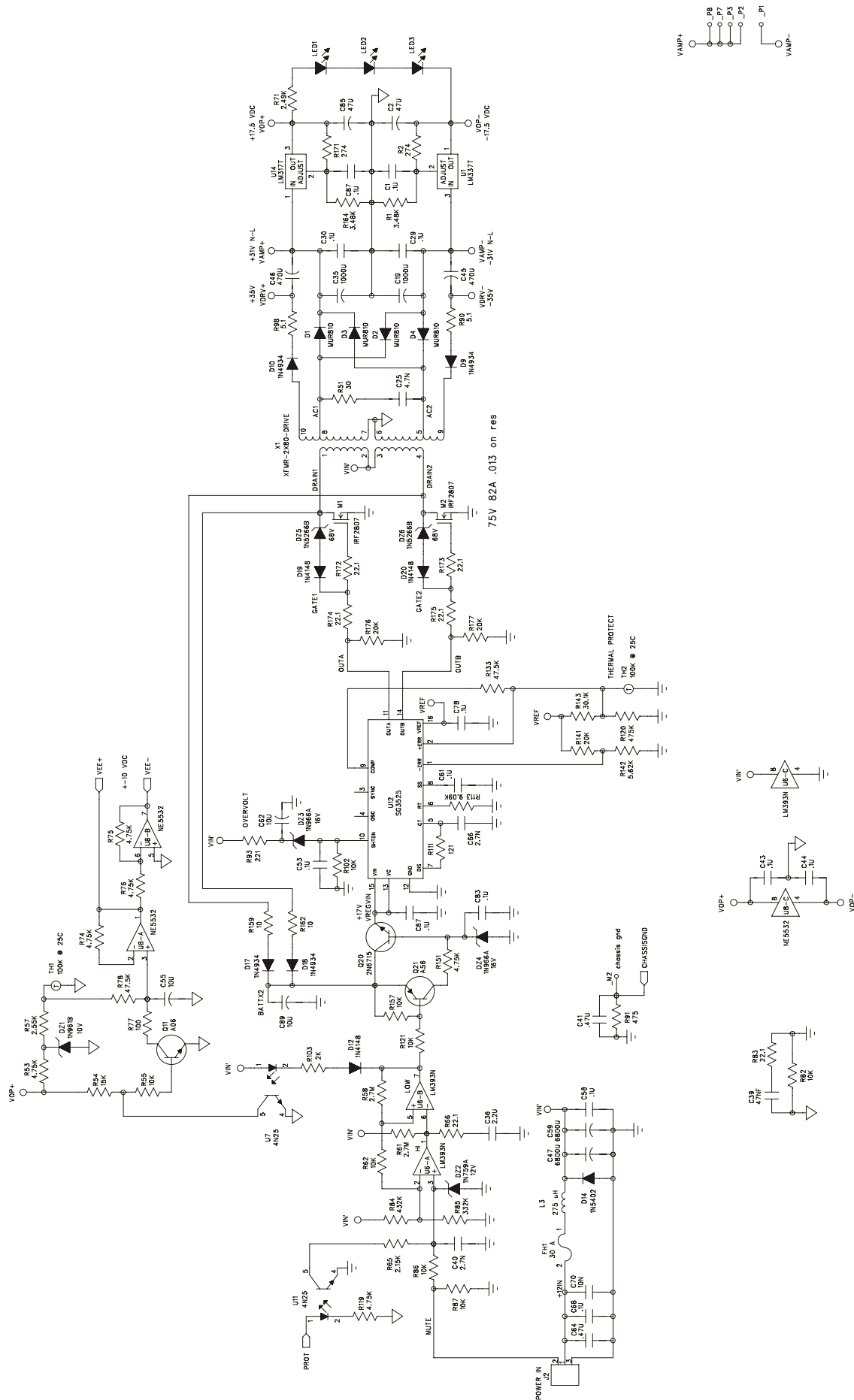


CIRCUIT DIAGRAM
Main PWB section 1/3

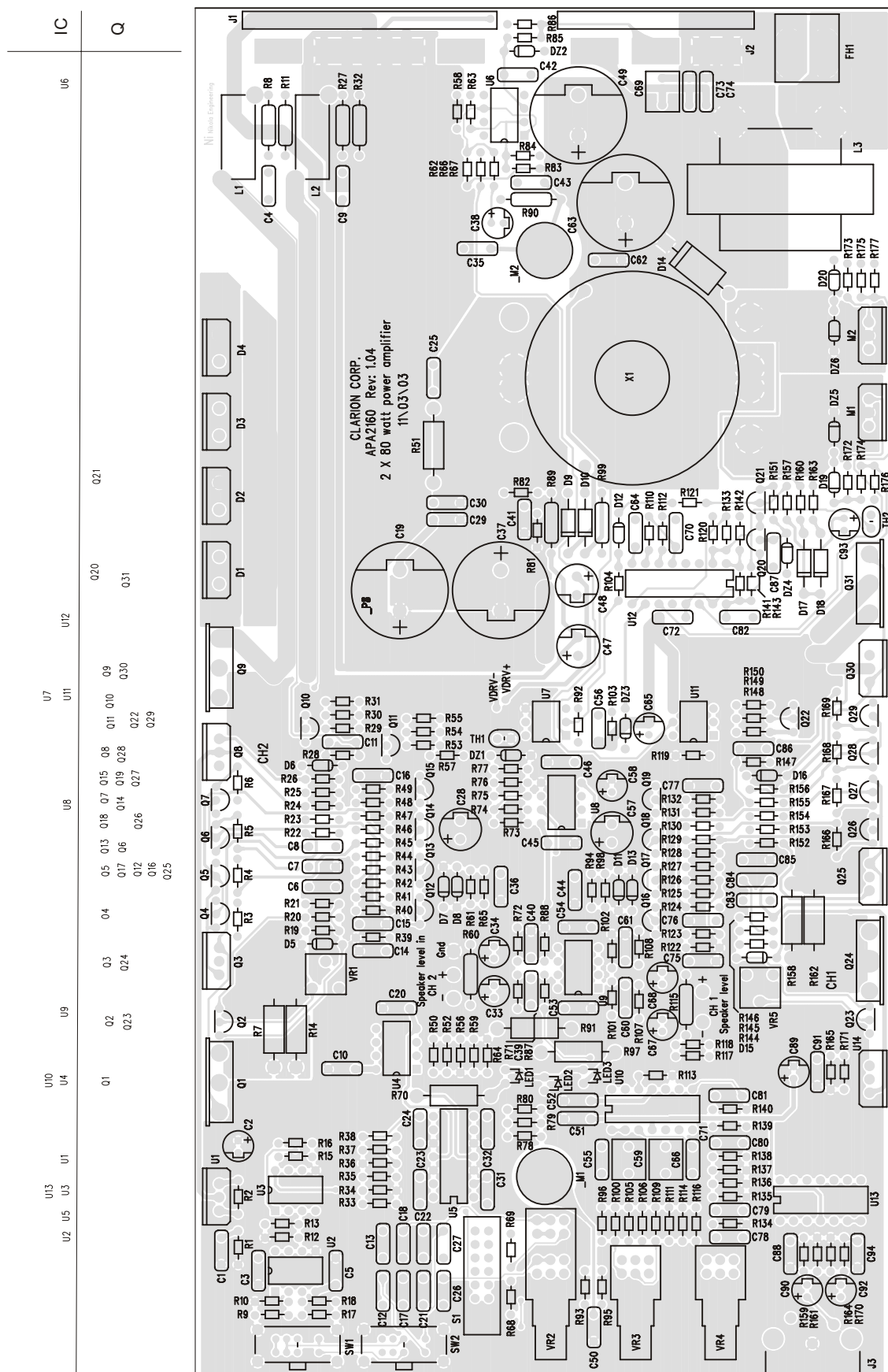


Main PWB section 2/3





PRINTED WIRING BOARD
MAIN PWB SECTION 1/2
COMPONENT SIDE VIEW



PRINTED WIRING BOARD
MAIN PWB SECTION 2/2
SOLDER SIDE VIEW

