



GTO 24001

1 CHANNEL POWER AMPLIFIER

SERVICE MANUAL



JBL Consumer Products
250 Crossways Park Dr.
Woodbury, New York 11797

Rev0 12/2008

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Discontinued XXXX

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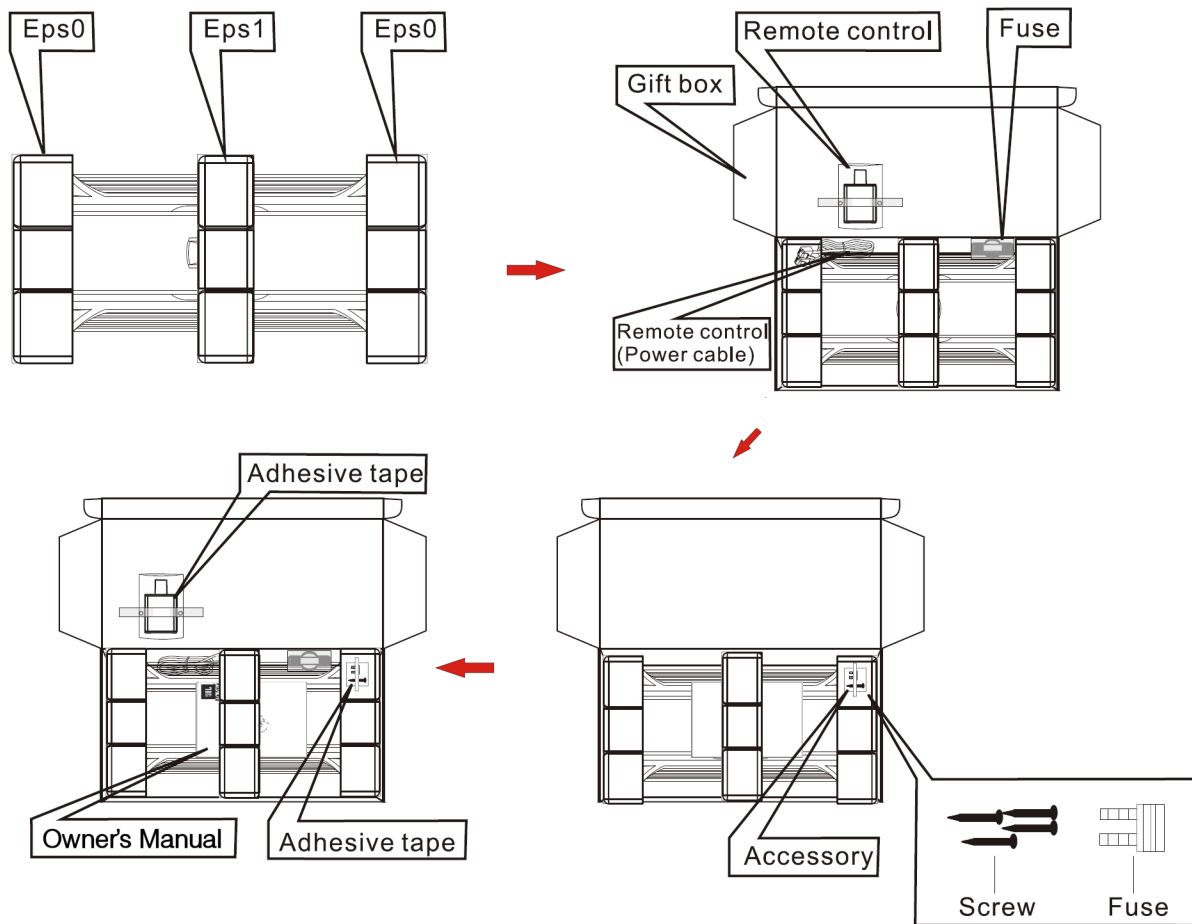
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GTO 24001 Specifications

Output Power:	1700W RMS x 1 channels @ 4 ohms; ≤1% THD + N
(14.4V supply)	2400W RMS x 1 channels @ 2 ohms; ≤1% THD + N
Signal-to-noise ratio:	65dBA (reference 1W into 4 ohms)
	97dBA (reference rated power into 4 ohms)
Frequency response:	20Hz – 330Hz (–3dB)
THD+N 1KHz LPF=22KHz	≤0.5% (rated power @ 4 ohms)
Input Impedance	>20K ohms
Maximum input signal:	6.0V
Maximum sensitivity:	200mV
Bass Boost @ 20-100Hz	0-12dB
DC Offset	<30mV
Output regulation:	32dB @ 4 ohms
Idle Current @ 4 ohms	4.2A
Max Current Draw	300A
Remote Operating Voltages	ON 5V
Turn-on delay time	3 sec
Circuit Protection	Temperature (76C), Short circuit
Operating voltage range	(8-16V)
Dimensions:	24 3/16 x 10 3/8 x 2 1/8" (630 x 263 x 53mm)
Fuses:	(1) x 300A In-line fuse block

JBL continually strives to update and improve existing products, as well as create new ones. The specifications and details in this and related JBL publications are therefore subject to change without notice.

GTO24001 PACKAGING



Name	Part no	Q'ty
Carton box		1 PCS
Gift box	GIFT-BOX-24001	1 PCS
Poly bag		1 PCS
Dryer		1 PCS
Owner's Manual	visit www.jbl.com	1 PCS
EPS	EPS-0	2 PCS
	EPS-1	2 PCS
ACCESSORY		
Screw	SCR-BSH4-15BK	4 PCS
Fuse + Fuse Holder	FUSE-300A	1 PCS
Poly bag		1 PCS
Remote control	REM-24001	1 PCS

NO	PART'S NAME				MATERIAL		Q'TY	SPECIFICATION	REMARK
GRD	A	B	C	THIRD	UNIT	SCALE	DATE	MODEL	
DDA	0.05	0.1	0.2	ANGLE	MM		2008.12.02	DRW NO	MP-08D5-0177
1-10	0.05	0.1	0.2						
10-100	0.1	0.2	0.3						
				DRW		CHECK	APPRO	NAME	

PACKING DRAWING

GTO24001 CAR AUDIO SUBWOOFER AMPLIFIER

Installation Warnings and Tips

- Disconnect the negative (–) lead from your vehicle's battery.
- At the installation sites, locate and make a note of all fuel lines, hydraulic brake lines, vacuum lines and electrical wiring. Use extreme caution when cutting or drilling in and around these areas.
- Choose a safe mounting location away from moisture.
- Make sure there is sufficient air circulation at the mounting location for the amplifier to cool itself.
- Mount the amplifier, using the supplied hardware.

Specifications

- 1700W RMS x 1 channel @ 4 ohms and $\leq 1\%$ THD + N*
 - 2400W RMS x 1 channel @ 2 ohms, 14.4V supply and $\leq 1\%$ THD + N*
 - Frequency response: 20Hz – 330Hz (–3dB)
 - Maximum input signal: 6V*
 - Maximum sensitivity: 200mV*
 - THD + N: 0.5%
 - Signal-to-noise ratio: 65dBA (reference 1W into 4 ohms)*
 - Signal-to-noise ratio: 97dBA (reference rated power into 4 ohms)
- * CEA-2006A-compliant

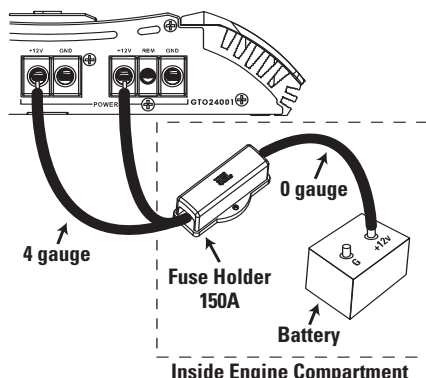
1 Speaker Output Connectors

- Connect the speakers to these terminals, observing proper polarity. Either + or – terminal may be used. Minimum total impedance is 2 ohms.

2 Fuse Holder/+12V Connection

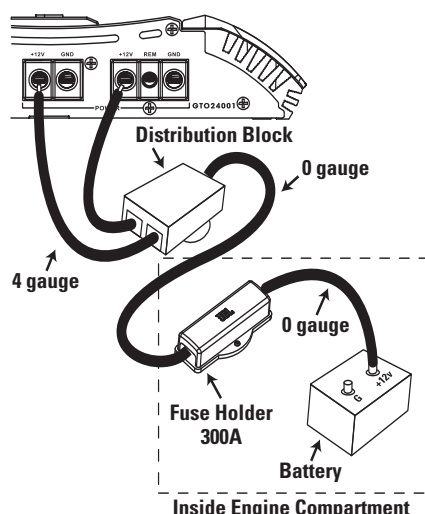
- Replace fuse only with the same type and rating.
- Mount the fuse holder within 18" of the vehicle's battery, inside the engine compartment and connect one end of the fuse holder to the battery's "+" terminal using a single piece of 0 gauge wire as shown in diagrams 2a and 2b.
- For normal installation, connect two pieces of 4 gauge wire to the other end of the fuse holder as in diagram 2a. Route both pieces of 4 gauge wire through the car, using rubber grommets in all locations where the wire must pass through metal. Connect the other end of the 4 gauge wire to the two "+" terminals on the amplifier's power connectors 3 (on the previous illustrations page).

Figure 2a.



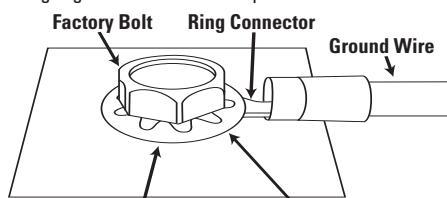
- For competition installations, replace the fuse with a 300A ANL (not included). Connect a single piece of 0 gauge wire to the other end of the fuse holder as in diagram 2b. Route the 0 gauge wire through the car, using rubber grommets in all locations where the wire must pass through metal. Connect the other end of the 0 gauge wire to the input terminal of a power distribution block (not included) designed to accept 0 gauge wire. Connect two pieces of 4 gauge wire to the distribution block and connect the other ends of the wire to the two "+" terminals on the amplifier's power connectors 3 (on the previous illustrations page).

Figure 2b.



3 Power Input Connectors

- +12V: See "fuseholder" 2.
- GND: Connect to the vehicle's chassis using 4 gauge wire. Refer to the picture below.



Note: Remove any paint below ring connector.

- REM: Connect to the "Remote Out" lead from the source unit or to a source of switched 12V+ (ACC).

4 Aux Output Connectors (RCA)

- Nonfiltered pass-through output. Connect to the input of an additional amplifier.

5 Input Connectors (RCA)

- Connect to the RCA outputs from the source unit or signal processor.

6 Input-Level Control

- Used to match the input level of the amplifier to the output level of the source unit.
- See 12 for the adjustment procedure.

7 Low-Pass Filter Frequency Control

- 12dB/octave low-pass filter, variable from 32Hz to 320Hz.
- See 13 for the adjustment procedure.

8 DBO (Dynamic Bass Optimization) Variable Subsonic High-Pass Filter With Variable Boost (Q)

- For woofers in tuned (vented) enclosures, set the Frequency control to a value 10Hz below the enclosure's resonance (tuned) frequency.
- For woofers in sealed boxes, set the control to any value you prefer, between 30Hz and 50Hz.
- Set the Boost control according to your preference, being careful not to apply enough boost to damage your woofer(s).

A DBO High-Pass Filter Frequency control, variable between 10Hz and 100Hz. See above for appropriate settings.

B DBO Boost control provides up to 12dB of boost, slightly above the high-pass filter's frequency. See above for appropriate settings.

9 Remote Level Control (RLC) Connector

- Connect the Remote Level Control (RLC) here, using the supplied RJ-11 cable.

10 Power On LED

- Illuminated when the amplifier is on.

11 Protect LED

- Illuminated under any of the following fault conditions: battery over/under voltage, short circuit in speaker wires, amplifier is too hot, amplifier's output circuit has failed (DC voltage is present in the amplifier's output).

12 Setting Input Level

A Turn Input Level control counterclockwise to 6V (minimum).

B With a dynamic music track playing, turn the head unit's volume control to the 3/4 position.

C Turn Input Level control clockwise until the bass output is proportionate to the output of the high-frequency speakers, according to your preference.

D Input level is now adjusted correctly.

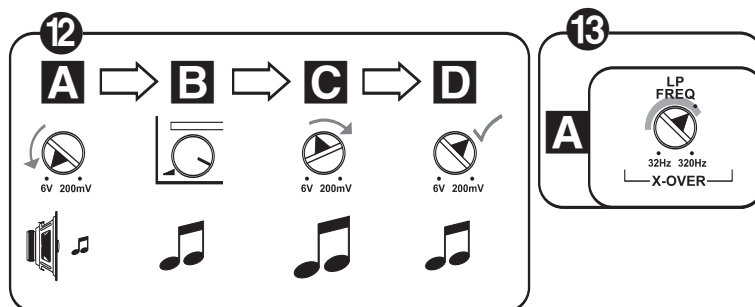
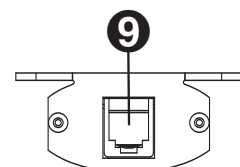
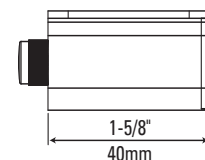
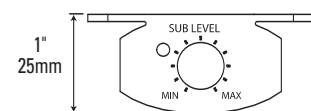
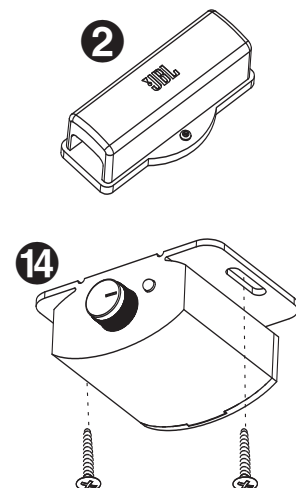
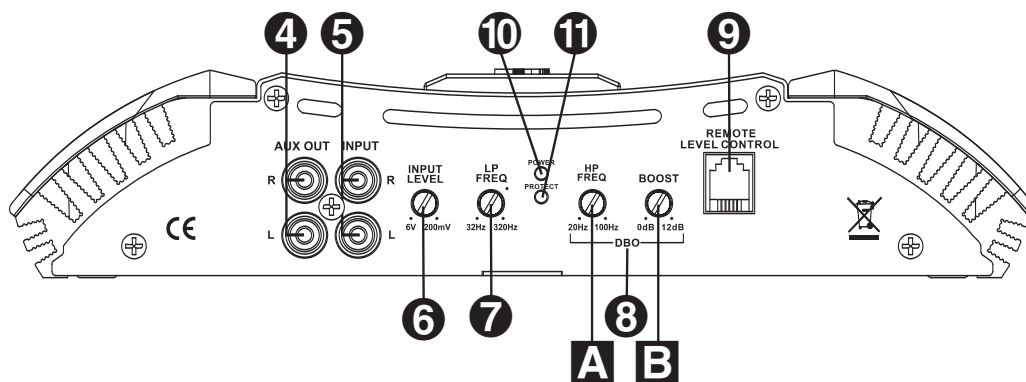
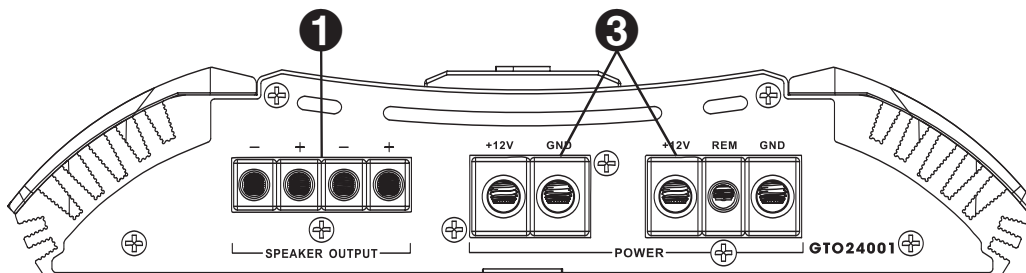
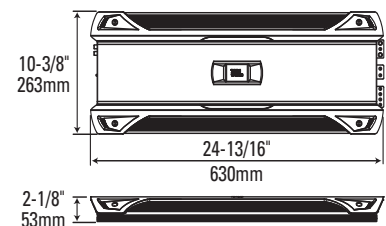
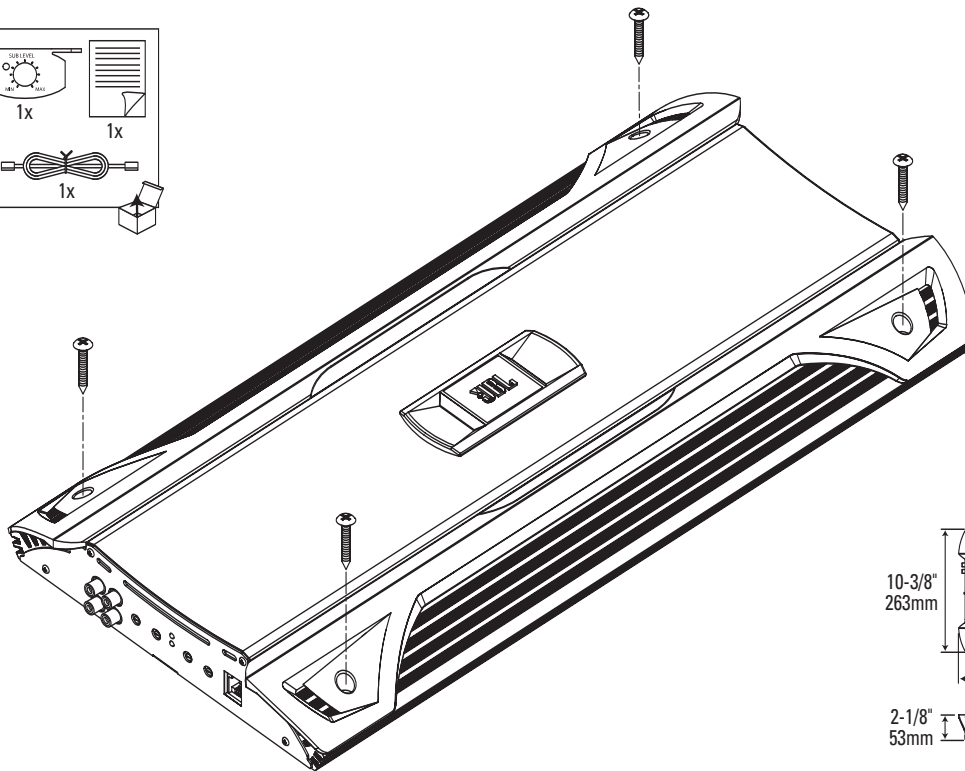
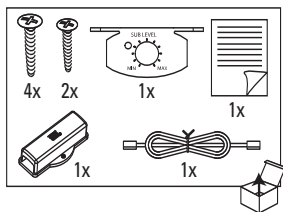
13 Setting the Crossover

A Crossover setting for subwoofers.

Note: Acceptable frequency ranges are indicated in gray.

14 Remote Level Control

The Remote Level Control, if installed, will allow you to adjust the level of bass while seated in the listening position.



Amplifier Troubleshooting Guide

1. Status LED on Amplifier not Lit - Head Unit (Source) Turned ON

Verify:

- A. Remote turn-on wire from source to amplifier has proper voltage
- B. Power (B+) connections at amplifier, terminal blocks, and battery are secure
- C. Ground (GND) connections at amplifier and vehicle chassis are secure
- D. Battery B+ fuse (if used) is OK
- E. Amplifier fuse is OK
- F. B+ at battery and B+ at amplifier has proper voltage

2. Status LED's Lit, No Output from Speakers in Normal Operating Condition

Verify:

- A. RCA cables from amplifier to source are securely connected
- B. Volume adjustment on amplifier is correctly adjusted
- C. Source is ON and playing

3. Engine Noise From Speaker(s)

Turn source OFF, Disconnect RCA cables at amplifier. If noise stops, check equipment & cables leading to amplifier.

Verify:

- A. RCA cables are of good quality with no breakage to internal shields
- B. RCA cables from source to amplifier are not run alongside any power cables

4. Amplifier Output Distorted Music

Verify:

- A. Source output music to amplifier is not distorted
- B. Source output sensitivity is correctly adjusted

5. Amplifier Shuts Down, Green LED's are Lit - Amplifier is in Thermal Protection Mode

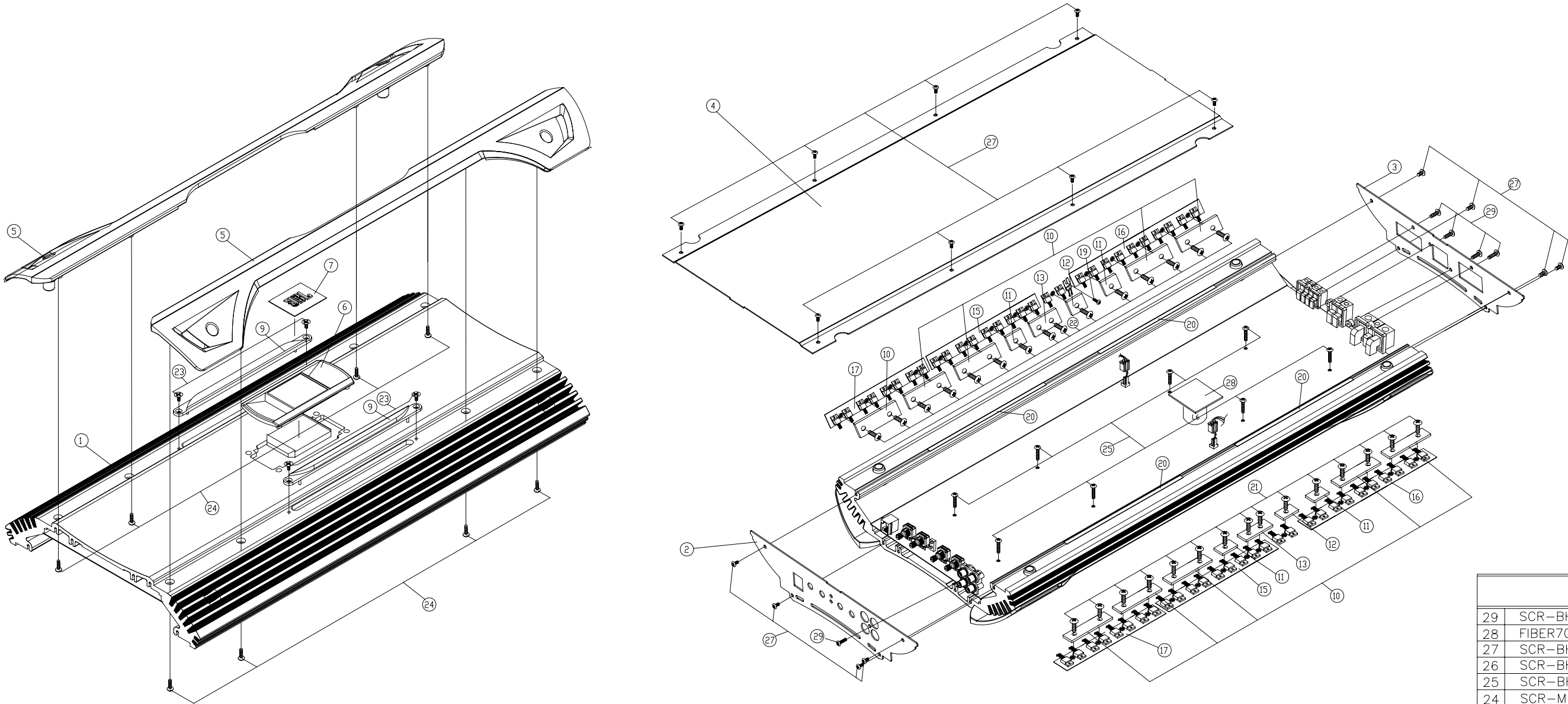
Verify:

- A. Amplifier is mounted with adequate air circulation around heatsinks or vents
- B. Amplifier is not mounted under carpet or sealed enclosure
- C. Speakers meet correct impedance for application (mono or stereo hookup)

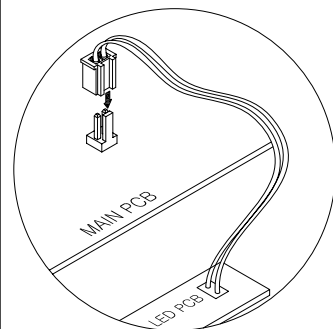
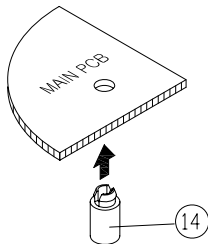
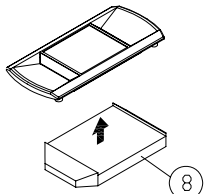
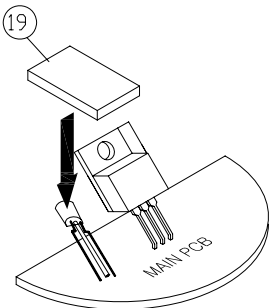
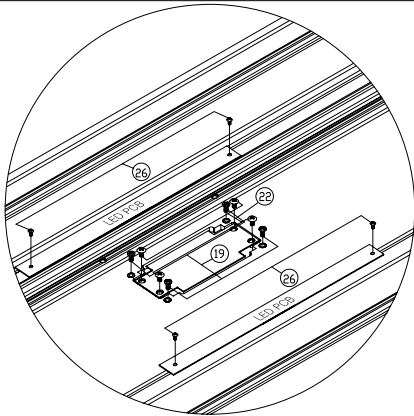
6. Amplifier Does Not Turn ON, and Red LED is Lit Amplifier (and not Connected to a Shorted Speaker)

Verify:

- A. Speaker crossover (if used) is not defective



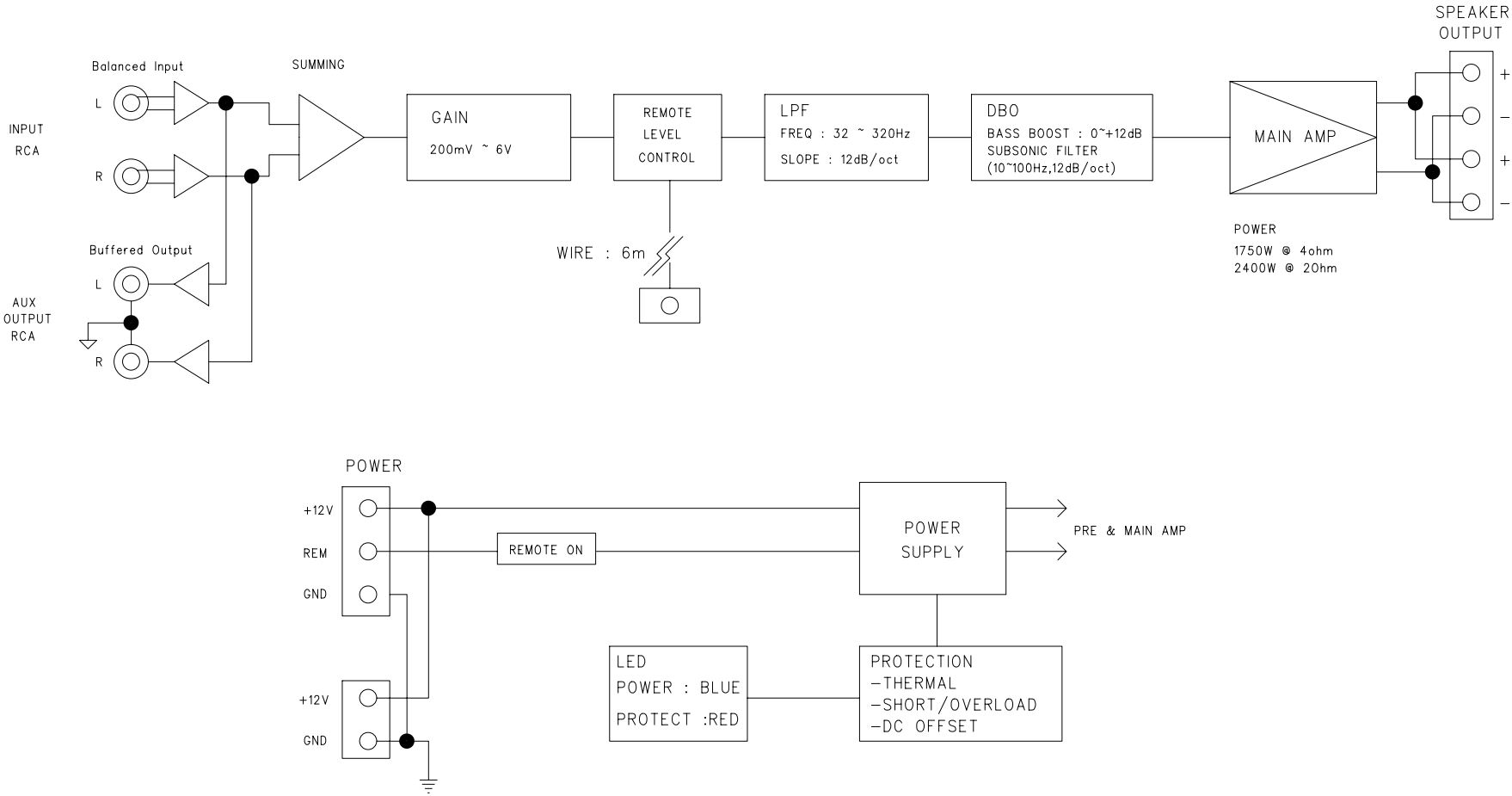
GTO24001			
29	SCR-BH3-8BK	SCREW	5PCS
28	FIBER70-148	FIBER PAPER	0.5PCS
27	SCR-BH3-6BK	SCREW	16PCS
26	SCR-BH3-6NI	SCREW	4PCS
25	SCR-BH3-14NI	SCREW	8PCS
24	SCR-MB4-8NI	SCREW	8PCS
23	SCR-FH3-6NI	SCREW	4PCS
22	SCR-MB3-6NI	SCREW	4PCS
21	SCR-MB4-14NI	SCREW	30PCS
20	FIBER6-200	FIBER PAPER	4PCS
19	RUB10-10-2	RUBBER	1PCS
18	SCR-BH3-5NI	WASHER SCREW	5PCS
17	PAD-130-23	SILICON PAD	2PCS
16	PAD-160-23	SILICON PAD	2PCS
15	PAD-140-23	SILICON PAD	2PCS
14	PCB BRACKET	PCB SUPPORT	8PCS
13	JIG-45-15	CLIP "A"	2PCS
12	JIG-42-15	CLIP "B"	2PCS
11	JIG-30-15	CLIP "C"	4PCS
10	JIG-61-15	CLIP "D"	9PCS
9	LENS	LENS	2PCS
8	BADGE LED	BADGE ILLUMINANT	1PCS
7	BADGE-24001	LOGO BADGE	1PCS
6	DECO-24001	CENTER DECO	1PCS
5	MOUF-GTO24001	MOUNTING FOOT	2PCS
4	BOTC-GTO24001	BOTTOM COVER	1PCS
3	PAN-RGTO24001	REAR PANEL	1PCS
2	PAN-FGTO24001	FRONT PANEL	1PCS
1	HEA-GTO24001	HEAT SINK	1PCS
NO.	PART NO.	PART NAME	Q'TY



GTO24001



REVISION RECORD			
LTR	ECO NO:	APPROVED:	DATE:



		COMPANY: HCG			
		TITLE: GT024001			
DRAWN: B.I.SONG	DATED: Oct.14	CODE:	SIZE: A4	DRAWING NO:	REV: Φ
CHECKED:	DATED:				
QUALITY CONTROL:	DATED:				
RELEASED:	DATED:				
		SCALE: N/A			SHEET: 3 OF 4

GTO24001 Electrical Parts List				
Part Number		Description	Qty	Reference Designator
MAIN PCB				
<i>Resistors</i>				
RES68001/8-F	Resistor	METAL FILM 1/8WF680 OHM	1	R3
RES56001/8-F	Resistor	METAL FILM 1/8WF560 OHM	1	R4
RES78701/8-F	Resistor	METAL FILM 1/8WF787 OHM	1	R48
RES13011/8-F	Resistor	METAL FILM 1/8WF1.3K OHM	1	R44
RES15011/8-F	Resistor	METAL FILM 1/8WF1.5K OHM	1	R52
RES24011/8-F	Resistor	METAL FILM 1/8WF2.4K OHM	4	R150,151,214,215
RES32411/8-F	Resistor	METAL FILM 1/8WF3.24K OHM	1	R46
RES36011/8-F	Resistor	METAL FILM 1/8WF3.6K OHM	1	R47
RES43011/8-F	Resistor	METAL FILM 1/8WF4.3K OHM	1	R56
RES47011/8-F	Resistor	METAL FILM 1/8WF4.7K OHM	3	R20,71,73
RES62011/8-F	Resistor	METAL FILM 1/8WF6.2K OHM	1	R55
RES94011/8-F	Resistor	METAL FILM 1/8WF9.4K OHM	2	R22,23
RES91011/8-F	Resistor	METAL FILM 1/8WF9.1K OHM	1	R5
RES10021/8-F	Resistor	METAL FILM 1/8WF10K OHM	2	R36,89
RES13021/8-F	Resistor	METAL FILM 1/8WF13K OHM	1	R238
RES21021/8-F	Resistor	METAL FILM 1/8WF21K OHM	2	R35,91
RES22021/8-F	Resistor	METAL FILM 1/8WF22K OHM	4	R24,25,37,38
RES47021/8-F	Resistor	METAL FILM 1/8WF47K OHM	6	R26,27,28,30,54,74
RES2201/8-J	Resistor	CARBON FILM 1/8WJ22 OHM	5	R49,57,75,76,97
RES1011/8-J	Resistor	CARBON FILM 1/8WJ100 OHM	2	R19,68
RES1511/8-J	Resistor	CARBON FILM 1/8WJ150 OHM	2	R6,32
RES4711/8-J	Resistor	CARBON FILM 1/8WJ470 OHM	1	R80
RES5111/8-J	Resistor	CARBON FILM 1/8WJ510 OHM	2	R15,17
RES1021/8-J	Resistor	CARBON FILM 1/8WJ1K OHM	12	R39,42,45,60,65,92,121,149,173,191,202,236
RES1221/8-J	Resistor	CARBON FILM 1/8WJ1.2K OHM	1	R81
RES2021/8-J	Resistor	CARBON FILM 1/8WJ2K OHM	1	R1
RES2221/8-J	Resistor	CARBON FILM 1/8WJ2.2K OHM	5	R110,140,164,228,69
RES3321/8-J	Resistor	CARBON FILM 1/8WJ3.3K OHM	2	R59, 240
RES4721/8-J	Resistor	CARBON FILM 1/8WJ4.7K OHM	10	R21,111,125,141,165,175,178,229,50,51
RES5111/8-J	Resistor	CARBON FILM 1/8WJ5.1K OHM	1	R11
RES5621/8-J	Resistor	CARBON FILM 1/8WJ5.6K OHM	2	R33,34
RES1031/8-J	Resistor	CARBON FILM 1/8WJ10K OHM	14	R8,10,18,31,62,64,66,79,90,95,126,176,185,239
RES1531/8-J	Resistor	CARBON FILM 1/8WJ15K OHM	4	R9,16,124,174
RES2031/8-J	Resistor	CARBON FILM 1/8WJ20K OHM	1	R40
RES2231/8-J	Resistor	CARBON FILM 1/8WJ22K OHM	3	R63,94,82
RES2731/8-J	Resistor	CARBON FILM 1/8WJ27K OHM	1	R96
RES3031/8-J	Resistor	CARBON FILM 1/8WJ30K OHM	1	R13
RES4731/8-J	Resistor	CARBON FILM 1/8WJ47K OHM	2	R29,43
RES5631/8-J	Resistor	CARBON FILM 1/8WJ56K OHM	2	R183,184
RES7531/8-J	Resistor	CARBON FILM 1/8WJ75K OHM	3	R53,70,72
RES1041/8-J	Resistor	CARBON FILM 1/8WJ100K OHM	7	R2,14,127,177,88,93,83
RES1041/8-J	Resistor	CARBON FILM 1/8WJ150K OHM	1	R7
RES1541/8-J	Resistor	CARBON FILM 1/8WJ1M OHM	3	R58,61,67
RES1001/4-J	Resistor	METAL FILM 1/4WJ10 OHM	32	R98,99,100,101,102,112,113,114,128,129,130,131,132,142,143,144,152,153,154,155,156,166,167,168,216,217,218,219,220,230,231,232
RES1511/4-J	Resistor	METAL FILM 1/4WJ150 OHM	20	R186,187,188,189,190,192,193,194,195,196,203,204,205,206,207,208,209,210,211,212
RES1041/4-J	Resistor	METAL FILM 1/4WJ100K OHM	32	R103,104,105,106,107,116,117,118,133,134,135,136,137,145,146,147,157,158,159,160,161,169,170,171,221,222,223,224,225,233,234,235
RES2211/2-J	Resistor	METAL FILM 1/2WJ220OHM	2	R12,237
RES4721/0-J	Resistor	METAL FILM 1WJ4.7K OHM	2	R77,78
RESM2R2-J-2W	Resistor	MOR 2WJ(3.8x11m/m)2.2 OHM	3	R182,200,201
RESM470-J-2W	Resistor	MOR 2WJ(3.8x11m/m)47 OHM	4	R108,138,162,226
RESM101-J-2W	Resistor	MOR 5WJ(3.8x11m/m)100 OHM	2	R197,213
RESM222-J-2W	Resistor	MOR 2WJ(3.8x11m/m)2.2K OHM	3	R179,180,181
RESM472-J-3W	Resistor	MOR 3WJ(3.8x11m/m)4.7K OHM	4	R84,85,86,87
RESM472-J-2W	Resistor	MOR 2WJ(3.8x11m/m)4.7K OHM	2	R198,199
RESM221-J-3W	Resistor	MOR 3WJ(5.5x15m/m)220 OHM	4	R115,119,122,123
RESSR01-J-5W	Resistor	SHUNT 3LEAD 5W0.01 OHM	8	R41,109,120,139,148,163,172,227
RES0001/8-J	Resistor	RES. CF 0R0 OHM 1/8W ±5%	1	R241

Part Number		Description	Qty	Reference Designator
MAIN PCB				
GF063PB502K	volume	GF063PB502K	1	SV1
15S-3B500x2	Boost Pot	V12L5(9x5)G(PH2D)N 15S-3B500x2	1	VR4
15S-3B20Kx2	Input Level Pot	V12L5(9x5)G(PH2D)N 15S-3B20Kx2	1	VR1
15C50Kx2	LP Freq. Pot	V12L5(9x5)G(PH2D)N 15S-15C50Kx2	1	VR2
15C200K+C2Kx2	HP freq. Pot	V12L5(9x5)G(PH2D)N 15S-15C200K+C2Kx2	1	VR3
<i>Capacitors</i>				
CAP0501R0-E	Capacitor	ELECTROLYTIC"MHA/SD"1uF/50V	1	C40
CAP0504R7-E	Capacitor	ELECTROLYTIC"MHA/SD"4.7uF/50V	1	C41
CAP016100-E	Capacitor	ELECTROLYTIC"MHA/SD"10uF/16V	5	C13,14,37,39,42
CAP050100-E	Capacitor	ELECTROLYTIC"MHA/SD"10uF/50V	4	C108,110,122,123
CAP016101-E	Capacitor	ELECTROLYTIC"MHA/SD"100uF/16V	5	C29,32,96,128,130
CAP016220-E	Capacitor	ELECTROLYTIC"MHA/SD"22uF/16V	9	C4,5,6,7,28,31,50,51,63
CAP016220-NE	Capacitor	ELECTROLYTIC"NE", NON POLAR TYPE22uF/16V	1	C60
CAP016470-E	Capacitor	ELECTROLYTIC"MHA/SD"47uF/16V	4	C49,52,57,150
CAP050101-E	Capacitor	ELECTROLYTIC"MHA/SD"100uF/50V	4	C109,111,124,126
CAP100102-M	Capacitor	MYLAR 5% 100V 102J	4	C72,80,87,143
CAP100103-M	Capacitor	MYLAR 5% 100V103J	5	C55,64,65,67,68
CAP100683-M	Capacitor	MYLAR 5% 100V683J	1	C44
CAP100823-M	Capacitor	MYLAR 5% 100V823J	1	C43
CAP063104-M	Capacitor	MYLAR 5% 63V "TL TYPE"104J	13	C2,56,74,76,82,88,91,95,107,144,147,148,149
CAP063224-M	Capacitor	MYLAR 5% 63V "TL TYPE"224J	3	C15,33,34
CAP063824-M	Capacitor	MYLAR 5% 63V "TL TYPE"824J	1	C9
CAP063105-M	Capacitor	MYLAR 5% 63V "TL TYPE"105J	3	C97,98,105
CAP050220-C	Capacitor	CERAMIC DISK 50V "NPO"22 pF	6	C8,10,11,12,16,66
CAP050470-C	Capacitor	CERAMIC DISK 50V "NPO"47pF	2	C53,54
CAP050331-C	Capacitor	CERAMIC DISK 50V 330pF	2	C58,59
CAP050471-C	Capacitor	CERAMIC DISK 50V 470pF	1	C1, C151,152
CAP050821-C	Capacitor	CERAMIC DISK 50V 820pF	1	C45
CAP050102-C	Capacitor	CERAMIC DISK 50V 102pF	4	C27,38, 153,154
CAP050104-C	Capacitor	MLCC104pF	23	C3,17,18,19,20,21,22,23,24,30,46,47,48,77,92,125,127,129,131,146,103,155,156
CAP200100-BP	Capacitor	ELECTRO "SSP/BP", SIZE=16x25mm10uF/200V	2	C61,62
CAP200330-BP	Capacitor	ELECTRO "SSP/BP", SIZE=18x25mm33uF/200V	2	C78,93
CAP080102-E	Capacitor	ELECTRO "MHA"SIZE=18X25m/m1000uF/80V	10	C71,75,79,83,86,90,117,121,132,142
CAP080222-E	Capacitor	ELECTRO "HC/DL"SIZE=30X25m/m2200uF/80V	4	C115,116,118,120
CAP025222-E	Capacitor	3300UF 25V 105°C ±20% 25*18 WL	10	C99,100,101,102,106,135,136,137,138,139
CAP630102-B	Capacitor	MYLAR 10% 630V "BOX TYPE",Pitch=7.5m/m102K	2	C25,112
CAP100105-B	Capacitor	MYLAR 5% 100V "BOX TYPE"105J	4	C70,89,141,145
CAP100225-B	Capacitor	MYLAR 10% 100V "BOX TYPE"225K	4	C113,114,133,134
CAP250225-B	Capacitor	MYLAR 10% 250V "BOX TYPE"225K	1	C119
CAP100335-B	Capacitor	MYLAR 10% 100V "BOX TYPE"475K	2	C73,81
CAP250106-B	Capacitor	MYLAR 10% 250V "BOX TYPE"106K	2	C26,94
<i>Semiconductors</i>				
TR-KTC3198GR	Transistor	SMALL SIGNAL NPN "TO-92"KTC3198GR	7	Q1,2,5,6,7,36,37
TR-KTA1023Y	Transistor	SMALL SIGNAL PNP "TO-92L"KTA1023Y	5	Q4,16,17,34,35
TR-KTC1027Y	Transistor	SMALL SIGNAL NPN "TO-92L"KTC1027Y	1	Q3
DIODE-1N4148	Diode	SWITCHING SIGNAL1SS133	3	D5,6,8
DIODE-1N4004	Diode	RECTIFIER1N4004	1	D7
DIODE-FR154	Diode	FAST RECOVERYFR154/1504	8	D11,12,13,14,15,16,17,18
IC-LM361N	IC	COMPARATOR IC, DIP-16LM361N	1	U7
IC-MC14060	IC	DIVIDER IC, DIP-14MC14060	1	U6
IC-NJM13600	IC	ELEC VOLUME, DIP-16NJM13600	1	U3
IC-TL072CN	IC	DUAL OP AMP "DIP-08"TL072CN	1	U2
IC-TL074CN	IC	QUAD OP AMP "DIP-14"TL074CN	3	U1,4,5
IC-KIA78D06PI	IC	VOTAGE REGULATOR, +6V 1ALDOKIA78D06PI	1	U10
IC-KIA7812API	IC	VOTAGE REGULATOR +12V 1AKIA7812PI	1	U8
IC-KIA7812API	IC	VOTAGE REGULATOR -12V 1AKIA7912PI	1	U9
FET-IRF640	FET	N-CH POWER FET "TO-220"IRF640	12	Q13,14,15,23,24,25,31,32,33,63,64,65
FET-IRF9640	FET	P-CH POWER FET "TO-220"IRF9640	20	Q8,9,10,11,12,18,19,20,21,22,26,27,28,29,30,58,59,60,61,62
FET-IRF3205	FET	N-CH POWER FET "TO-220"IRF3205	20	Q38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57

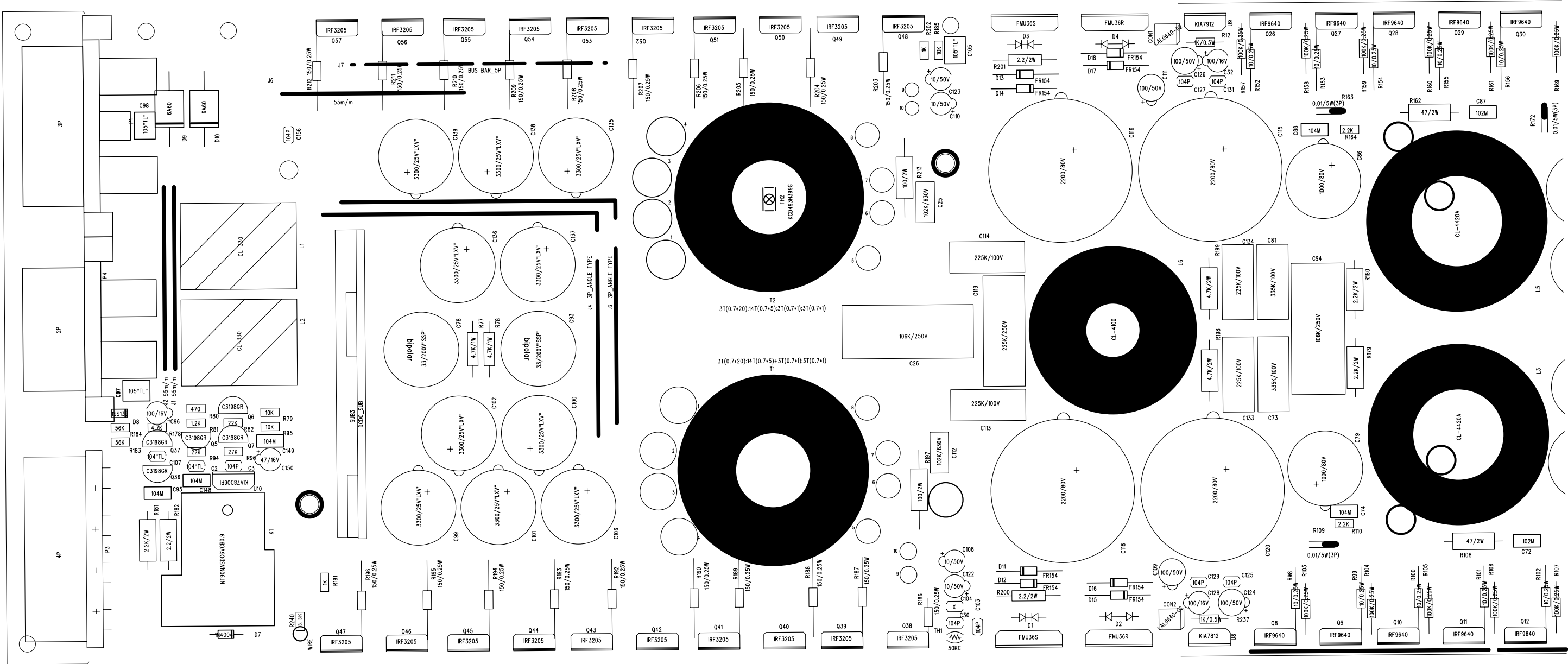
Part Number	Description		Qty	Reference Designator
MAIN PCB				
DIODE-6A60	Diode	RECTIFIER6A60	2	D9,10
DIODE-MU36R	silicon bridge	FAST RECOVERY,TO-3PFMU36R	2	D2,4
DIODE-MU36S	silicon bridge	FAST RECOVERY,TO-3PFMU36S	2	D1,3
Miscellaneous				
CRYSTAL-2.56MG	crystal	CERAMIC RESONATOR,2.56MHzZTA2.56MG	1	X1
RET94011/8-F	thermistor	NTC RESISTOR 50KFTD5-350	1	TH1
KCD493H399G	thermistor	DIODE TYPE, 49KOHM +/-3%KCD493H399G	1	TH2
B59100C70A70	thermistor	PTC RESISTOR 100 OHM 70°C	1	TH3
CORE-24001-0	transformer	44PHI MAGNETICS3T(0.7X20):14T(0.7X5)+3T(0.7X1)+3T(0.7X1) (3nd left)	1	T1(3nd left)
CORE-24001-1	transformer	44PHI MAGNETICS3T(0.7X20):14T(0.7X5)+3T(0.7X1)+3T(0.7X1) (3nd right)	1	T2(3nd right)
CORECL-330	Inductor	BAR CORECL-330	2	L1,2
CORECL-4420A	Inductor	IRON CORE (HEAT SHRINK TUBE)CL-4420A	4	L3,4,5,7
CORECL-4100	Inductor	IRON CORECL-4100	1	L6
NT90NASDC6VCB	relay	DC6V, 40ANT90NASDC6VCB0.9	1	K1
4PDEK623PCB4-B	terminal	GOLD PLATED,4PDEK623PCB4-B	1	JA1
LED-L284LBC	LED	3Φ, BLUE , MILKY typeBLUE	1	LED1
LED-L3141C	LED	3Φ, RED	1	LED2
JSZ2A-29	power terminal	NI PLATED,TRANSPARENCY,2PJSZ2A-29	1	P4
JSZ3-29	power terminal	NI PLATED,TRANSPARENCY,3PJSZ3-29	1	P1
JSZ4A-23	output terminal	NI PLATED,TRANSPARENCY,4PJSZ4A-23	1	P3
PLAL0640-02P	2P connector	LOCK WAFER,2PLAL0640-02	2	CON1,2
AV4-8.4-13A	RCA JACK	GOLD PLATED,4PSD-R-04G04-310	1	JA02
JUMPER-80MM	Copper bar	BAR JUMPER55m/m	3	J1,2,6
JUMPER-55MM	Copper bar	COPPER 0.8t(Ni PLATED) 5P	1	J7
JUMPER-100MM	Copper bar	COPPER 1.0t(Ni PLATED) , RIGHT ANGLE type,3PMA-BA-02-6397-0	2	J3,4
FIBER8-200	Paper pad	200.0×8.0×0.5t	0.25	for FET
FIBER6-200	Paper pad	200.0×6.0×0.5t	0.05	for diode
Driver sub PCB (X 2)				
Resistors				
RES-3900-0805-F	Resistor	SMD"0805" 1/8WF390 OHM	1(x2)	R34
RES-1002-0805-F	Resistor	SMD"0805" 1/8WF10K OHM	2(x2)	R5,37
RES-1003-0805-F	Resistor	RES, SMD 100K OHM 1/8W ±1% 0805	1(x2)	R38
RES-1502-0805-F	Resistor	SMD"0805" 1/8WF15K OHM	1(x2)	R32
RES-1004-0805-F	Resistor	SMD"0805" 1/8WF1M OHM	1(x2)	R40
RES-101-0805-J	Resistor	SMD"0805" 1/8WJ100 OHM	6(x2)	R1,2,3,4,23,24
RES-241-0805-J	Resistor	SMD"0805" 1/8WJ240 OHM	2(x2)	R11,12
RES-471-0805-J	Resistor	SMD"0805" 1/8WJ470 OHM	1(x2)	R31
RES-102-0805-J	Resistor	SMD"0805" 1/8WJ1K OHM	2(x2)	R7,8
RES-202-0805-J	Resistor	SMD"0805" 1/8WJ2K OHM	3(x2)	R19,20,39
RES-222-0805-J	Resistor	SMD"0805" 1/8WJ2.2K OHM	1(x2)	R33
RES-332-0805-J	Resistor	SMD"0805" 1/8WJ3.3K OHM	1(x2)	R48
RES-103-0805-J	Resistor	SMD"0805" 1/8WJ10K OHM	3(x2)	R35,42,47
RES-223-0805-J	Resistor	SMD"0805" 1/8WJ22K OHM	2(x2)	R45,46
RES-333-0805-J	Resistor	SMD"0805" 1/8WJ33K OHM	2(x2)	R43,44
RES-472-0805-J	Resistor	SMD"0805" 1/8WJ4.7K OHM	1(x2)	R41
RES-105-0805-J	Resistor	SMD"0805" 1/8WJ1M OHM	2(x2)	R36,56
RES-2R2-1206-J	Resistor	SMD"1206" 1/4WJ2.2 OHM	4(x2)	R27,28,29,30
RES-4R7-1206-J	Resistor	SMD"1206" 1/4WJ4.7 OHM	4(x2)	R13,14,15,16
RES-121-1206-J	Resistor	SMD"1206" 1/4WJ120 OHM	2(x2)	(SMT)R21,22
RES-271-1206-J	Resistor	SMD"1206" 1/4WJ270 OHM	2(x2)	R17,18
RES911/8-J	Resistor	CARBON FILM 1/5WJ910 OHM	4(x2)	R9,10,25,26
RESM392-J-3W	Resistor	MOR 3WJ(3.8x11m/m)3.9K OHM	1(x2)	R6
Capacitors				
CAP050104-0805	Capacitor	SMD"0805"104pF	4(x2)	(SMT)C6,7,9,12
CAP050224-0805	Capacitor	SMD"0805"224pF	1(x2)	C10

Part Number		Description	Qty	Reference Designator
Driver sub PCB (X 2)				
CAP050105-0805	Capacitor	SMD"0805"105pF	2(x2)	C1,3
CAP063105-M	Capacitor	MYLAR 5% 63V "TL TYPE"105 J	2(x2)	C2,4
CAP0501R0-E-1	Capacitor	ELECTROLYTIC"SE/SRE", h=5m/m1uF/50V	1(x2)	C11
CAP025220-E-1	Capacitor	ELECTROLYTIC"SE/SRE", h=5m/m22uF/25V	1(x2)	C8
CAP050104-C	Capacitor	CERAMIC RADIAL MLCC104pF	2(x2)	C14,16
Semiconductors				
IC-KIA393F	IC	DUAL COMPARATOR,SO-08KIA393F	1(x2)	U1
TR-KTA1661Y	Transistor	HIGH CURRENT PNP,SOT-89KTA1661Y	2(x2)	Q22,23
TR-KTC4373Y	Transistor	HIGH CURRENT NPN,SOT-89KTC4373Y	1(x2)	Q21
DIODE-LL4148	Diode	SWITCHING SIGNAL "CHIP"LL4148/RLS4148	12(x2)	D4,5,6,7,8,9,10,11,12,13,14,15
TR-KTC1027Y	Transistor	SMALL SIGNAL NPN "TO-92L"KTC1027Y	8(x2)	Q3,4,7,8,15,16,17,18
TR-KTA1023Y	Transistor	SMALL SIGNAL PNP "TO-92L"KTA1023Y	8(x2)	Q5,6,9,10,13,14,19,20
TR-KSC3503	Transistor	VIDEO NPN "TO-126"KSC3503/KTC3503	2(x2)	Q1,2
TR-KSA1381	Transistor	VIDEO PNP "TO-126"KSA1381/KTA1381	2(x2)	Q11,12
IN4742	Diode	ZENER 12V 1W1N4742	3(x2)	D1,2,3
Miscellaneous				
HLAL02TB220J	inductor	AXIAL TYPE,22uHLAL02TB220J	4(x2)	L1,2,3,4
TM2007-C9G-08P	Pin	PIN HEADER C-TYPE 8P(R-ANGLE)TM2007-C9G-08P	2(x2)	HP1,2
PWM PCB				
Resistors				
RES-1501-0805-F	Resistor	SMD"0805"1/8WF1.5K OHM	1	R30
RES-4301-0805-F	Resistor	SMD"0805"1/8WF4.3K OHM	1	R29
RES-6811-0805-F	Resistor	SMD"0805"1/8WF6.81K OHM	1	R28
RES-1002-0805-F	Resistor	SMD"0805"1/8WF10K OHM	1	R31
RES-1502-0805-F	Resistor	SMD"0805"1/8WF15K OHM	1	R37
RES-2002-0805-F	Resistor	SMD"0805"1/8WF20K OHM	1	R18
RES-2872-0805-F	Resistor	SMD"0805"1/8WF28.7K OHM	1	R19
RES-4303-0805-F	Resistor	SMD"0805"1/8WF430K OHM	1	R5
RES-4R7-0805-J	Resistor	SMD"0805"1/8WJ4.7 OHM	1	R8
RES-471-0805-J	Resistor	SMD"0805"1/8WJ470 OHM	3	R34,35,44
RES-102-0805-J	Resistor	SMD"0805"1/8WJ1K OHM	2	R15,45
RES-332-0805-J	Resistor	SMD"0805"1/8WJ3.3K OHM	1	R46
RES-472-0805-J	Resistor	SMD"0805"1/8WJ4.7K OHM	10	R3,4,11,12,13,14,23,36,38,42
RES-822-0805-J	Resistor	SMD"0805"1/8WJ8.2K OHM	1	R2
RES-103-0805-J	Resistor	SMD"0805"1/8WJ10K OHM	4	R6,7,41,43
RES-153-0805-J	Resistor	SMD"0805"1/8WJ15K OHM	2	R21,22
RES-1202-0805-F	Resistor	SMD"0805"1/8WF12K OHM	1	R16
RES-2212-0805-F	Resistor	SMD"0805"1/8WF22.1K OHM	1	R17
RES-4322-0805-F	Resistor	SMD"0805"1/8WF43.2K OHM	1	R20
RES-473-0805-J	Resistor	SMD"0805"1/8WJ47K OHM	1	R9,24
RES-563-0805-J	Resistor	SMD"0805"1/8WJ56K OHM	1	R1
RES-224-0805-J	Resistor	SMD"0805"1/8WJ220K OHM	2	R39,47
RES-3322-0805-F	Resistor	RES. SMD 33K2 OHM 1/8W ±1% 0805	1	R10
RES-824-0805-J	Resistor	SMD"0805"1/8WJ820K OHM	1	R40
RES-105-0805-J	Resistor	SMD"0805"1/8WJ1M OHM	1	R25
RES-4R7-1206-J	Resistor	SMD"1206"1/4WJ4.7 OHM	2	R26,27
RES2211/2-J	Resistor	METAL FILM 1/2WJ220 OHM	2	R32,33
Capacitors				
CAP050330-0805	Capacitor	SMD"0805"50V 5%33pF	1	C24
CAP050104-0805	Capacitor	SMD"0805"50V 5%104pF	7	C1,4,9,10,11,22,23
CAP050224-0805	Capacitor	SMD"0805"50V 5%224pF	1	C6
CAP050474-0805	Capacitor	SMD"0805"50V 5%474pF	1	C16
CAP050105-0805	Capacitor	SMD"0805"50V 5%105pF	5	C3,5,17,18,20
CAP100102-M	Capacitor	MYLAR 5% 100V 102J	1	C7
CAP0501R0-E-1	Capacitor	ELECTROLYTIC "SE/SRE", h=5m/m1uF/50V	1	C13
CAP016100-E-1	Capacitor	ELECTROLYTIC "SE/SRE", h=5m/m10uF/16V	3	C2,12,19

Part Number	Description		Qty	Reference Designator
PWM PCB				
CAP016470-E-1	Capacitor	ELECTROLYTIC "SE/SRE", h=5m/m47uF/16V	3	C8,15,21
CAP016101-E-1	Capacitor	ELECTROLYTIC "SE/SRE", h=5m/m100uF/16V	1	C14
Semiconductors				
DIODE-LL4148	Diode	SWITCHING SIGNAL,MINI MELFLL4148	3	D1,2,3
KDS184	Diode	SWITCHING SIGNAL,"SOT-23"KDS184	2	D4,5
IC-TL494CD	IC	PWM "SO-16"TL494CD	1	U1
IC-KIA393F	IC	COMPARATOR"SO-08"KIA393F	2	U2,3
TR-KTA1661Y	Transistor	HIGH CURRENT PNP "SOT-89"KTA1661Y	1	Q1
TR-KTA1504GR	Transistor	SMALL SIGNAL PNP "SOT-23"KTA1504GR	3	Q3,7,10
TR-KTC3875GR	Transistor	SMALL SIGNAL NPN "SOT-23"KTC3875GR	6	Q2,6,8,9,11,12
TR-KTB985BK	Transistor	SMALL SIGNAL PNP "TO-92L"KTB985BK	2	Q4,5
Miscellaneous				
TM2007-B11G-06	Pin	PIN HEADER 6P(R-ANGLE4MM)TM2007-B11G-06	2	HP1 ,2
Badge LED PCB				
RES-470-1206-J	Resistor	SMD"1206"1/4WJ47 OHM	4	R1,2,3,4
CAP050104-1206	Capacitor	SMD"1206"50V 5%104pF	1	C1
LED-0	LED ass'y	65*41*2.7 with LED	1	
W-2-150MM	2P connector	black/red 2P(150m/m)	1	
RES-470-1206-J	Resistor	SMD"1206"1/4WJ47 OHM	2*2	R1,2
LED-1	LED ass'y	178*6*2.7 with LED	2	
W2-150MM	Wire ass'y	AWG#24,2P(3P WAFER -STRIP)150m/m	1	
W-2-120MM	2P connector	Black/Red 2P(120m/m)	1	

REVISIONS

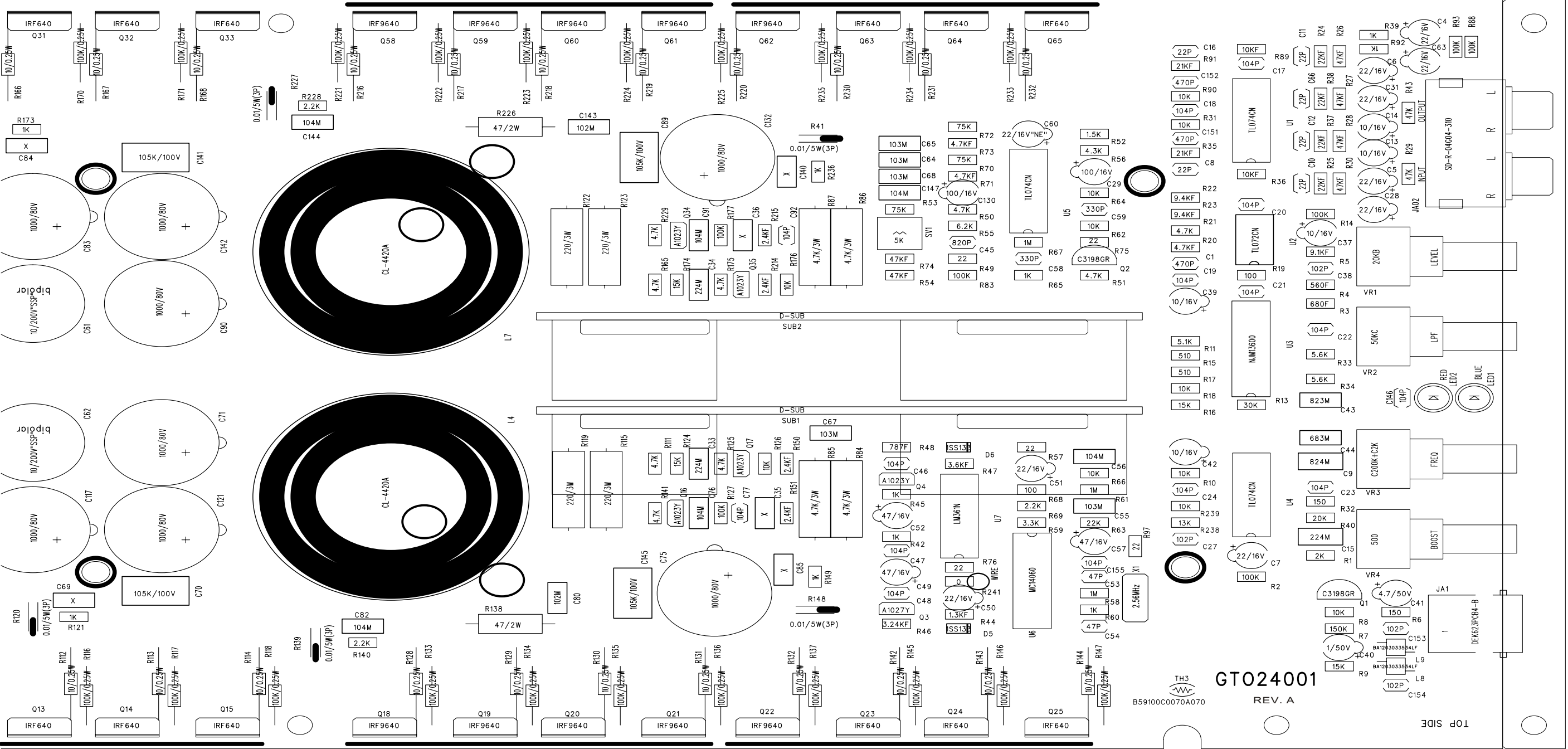
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UNIT	SCALE	DATE	MODEL	GTO24001
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DRAW	CHECK	APPRO	NAME GTO24001 TOPVIEW	
			CODE NO.	ISSUE
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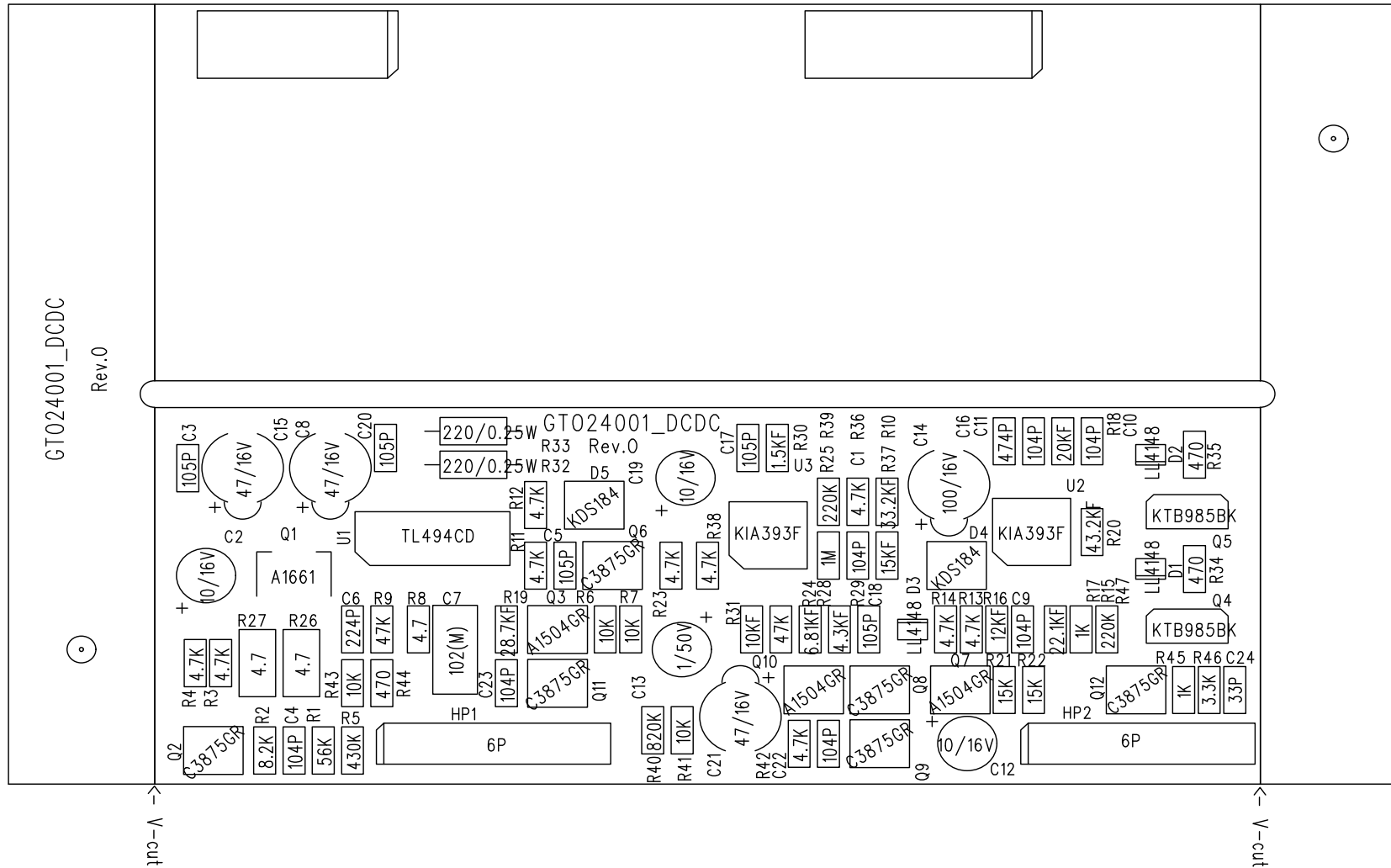
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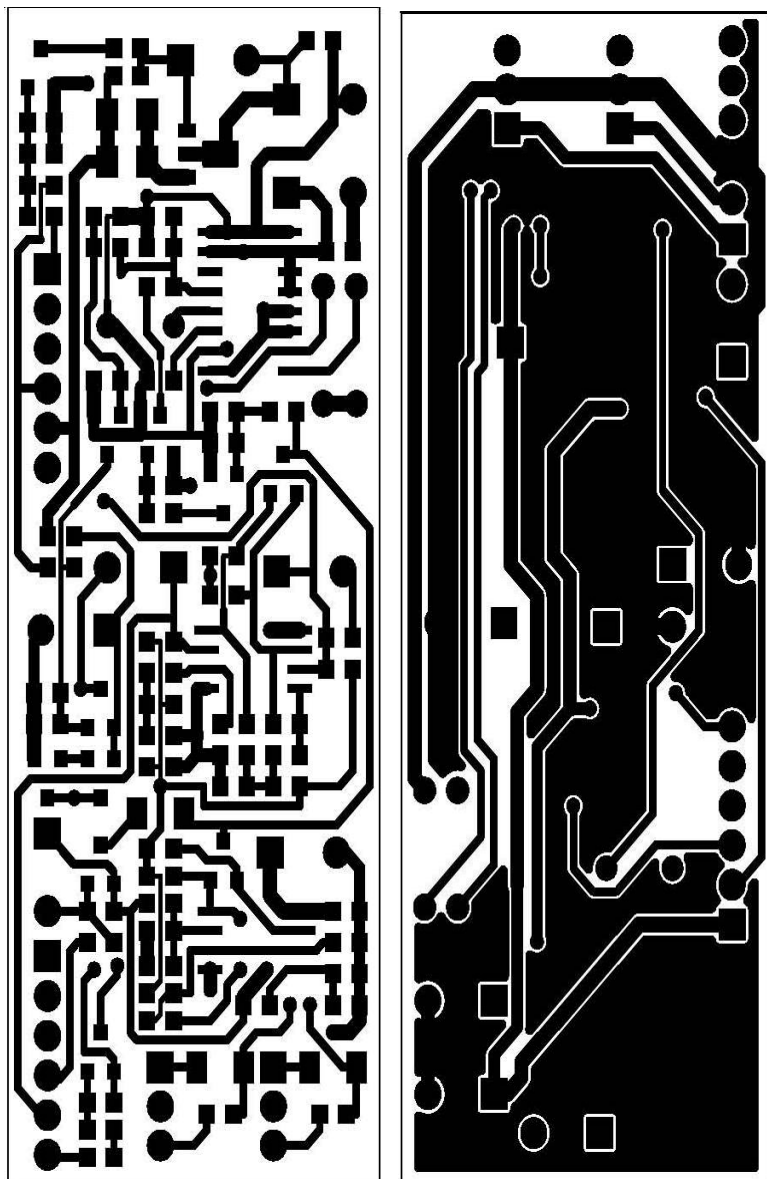


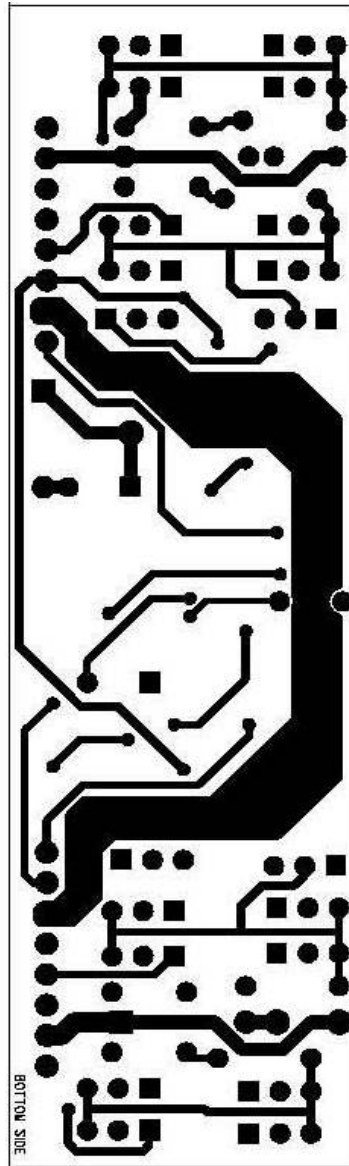
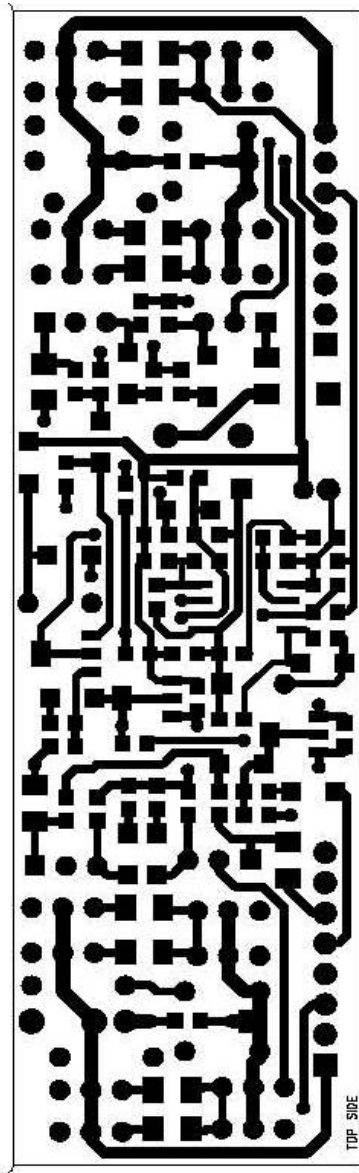
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			CODE NO.		ISSUE	
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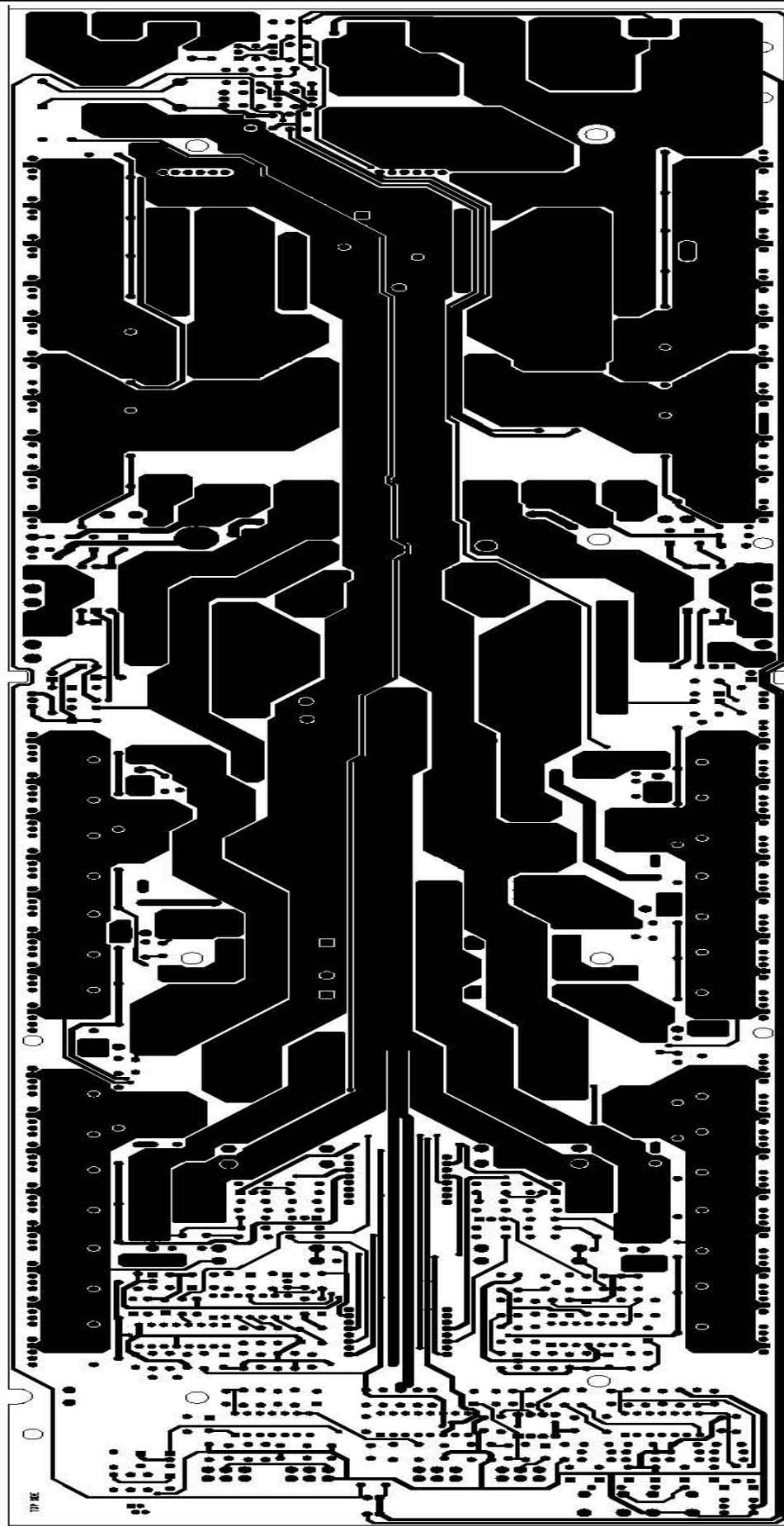
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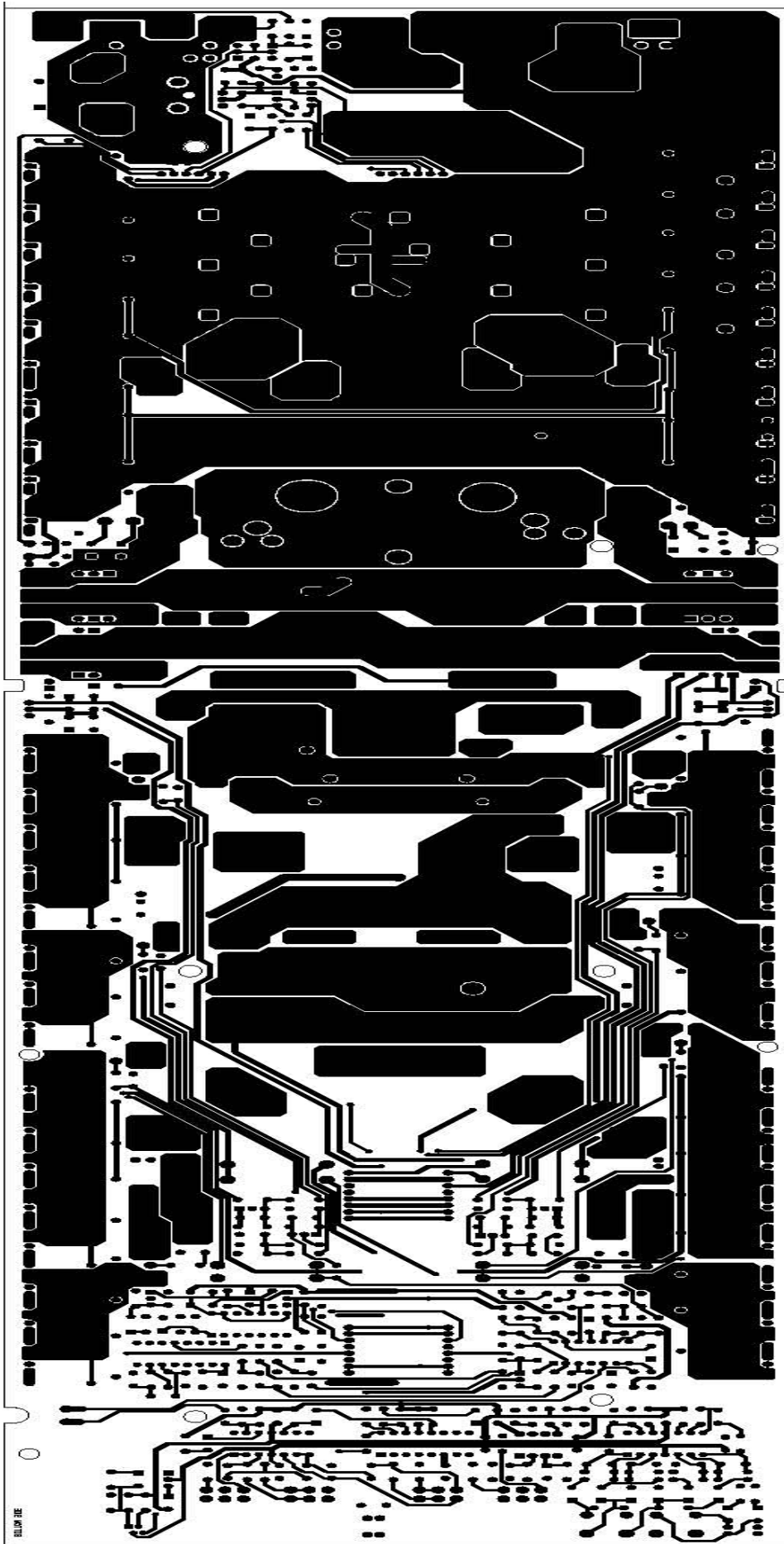


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MATERIAL			Q'TY		REMARK	
UNIT	SCALE	DATE		MODEL		GTO24001
MM		2008. 11. 06		RELA. DRAW NO		
DRAW	CHECK	APPRO		NAME		
				GTO24001 TOPVIEW		
				CODE NO.		ISSUE
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August 2000

LM161/LM361

High Speed Differential Comparators

General Description

The LM161/LM361 is a very high speed differential input, complementary TTL output voltage comparator with improved characteristics over the SE529/NE529 for which it is a pin-for-pin replacement. The device has been optimized for greater speed performance and lower input offset voltage. Typically delay varies only 3 ns for over-drive variations of 5 mV to 500 mV. It may be operated from op amp supplies ($\pm 15V$).

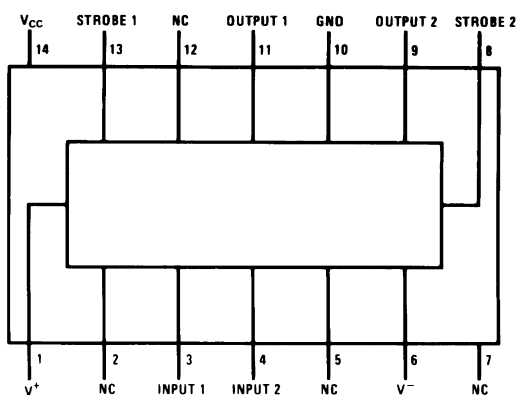
Complementary outputs having maximum skew are provided. Applications involve high speed analog to digital converters and zero-crossing detectors in disk file systems.

Features

- Independent strobes
- Guaranteed high speed: 20 ns max
- Tight delay matching on both outputs
- Complementary TTL outputs
- Operates from op amp supplies: $\pm 15V$
- Low speed variation with overdrive variation
- Low input offset voltage
- Versatile supply voltage range

Connection Diagrams

Dual-In-Line Package

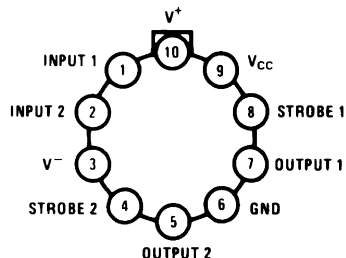


00570802

Top View

Order Number LM361M, LM361MX or LM361N
See NS Package Number M14A or N14A

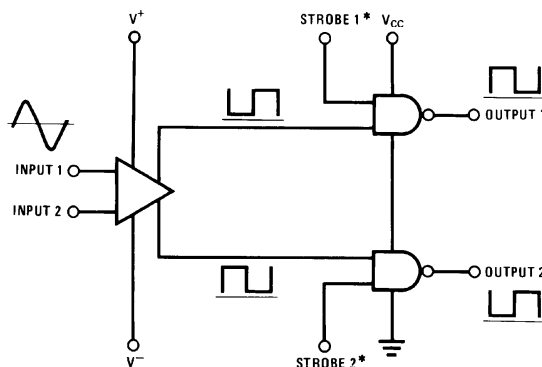
Metal Can Package



00570803

Order Number LM161H/883 or LM361H
See NS Package Number H10C

Logic Diagram



00570804

*Output is low when current is drawn from strobe pin.

LM161/LM361 High Speed Differential Comparators



14-Bit Binary Counter and Oscillator

The MC14060B is a 14-stage binary ripple counter with an on-chip oscillator buffer. The oscillator configuration allows design of either RC or crystal oscillator circuits. Also included on the chip is a reset function which places all outputs into the zero state and disables the oscillator. A negative transition on Clock will advance the counter to the next state. Schmitt trigger action on the input line permits very slow input rise and fall times. Applications include time delay circuits, counter controls, and frequency dividing circuits.

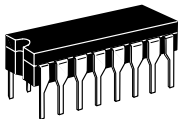
- Fully static operation
- Diode Protection on All Inputs
- Supply Voltage Range = 3.0 V to 18 V
- Capable of Driving Two Low-power TTL Loads or One Low-power Schottky TTL Load Over the Rated Temperature Range
- Buffered Outputs Available from Stages 4 Through 10 and 12 Through 14
- Common Reset Line
- Pin-for-Pin Replacement for CD4060B

TRUTH TABLE

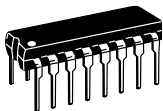
Clock	Reset	Output State
	L	No Change
	L	Advance to next state
X	H	All Outputs are low

X = Don't Care

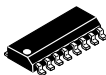
MC14060B



L SUFFIX
CERAMIC
CASE 620



P SUFFIX
PLASTIC
CASE 648



D SUFFIX
SOIC
CASE 751B

ORDERING INFORMATION

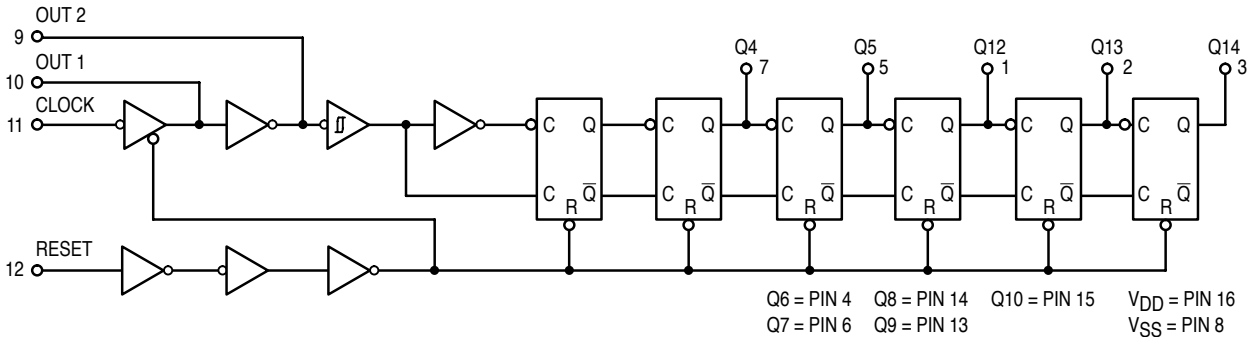
MC14XXXBCP	Plastic
MC14XXXBCL	Ceramic
MC14XXXBD	SOIC

T_A = - 55° to 125°C for all packages.

PIN ASSIGNMENT

Q12	1	16	V _{DD}
Q13	2	15	Q10
Q14	3	14	Q8
Q6	4	13	Q9
Q5	5	12	RESET
Q7	6	11	CLOCK
Q4	7	10	OUT 1
V _{SS}	8	9	OUT 2

LOGIC DIAGRAM





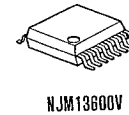
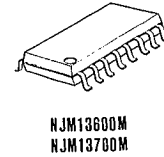
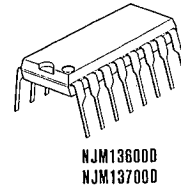
NJM13600/13700

DUAL OPERATIONAL TRANSCONDUCTANCE AMPLIFIER

■ GENERAL DESCRIPTION

The NJM13600/13700 consist of two current controlled transconductance amplifiers each with differential inputs and a push pull output. The two amplifiers share common supplies but otherwise operate independently. Linearizing diodes are provided at the inputs to reduce distortion and allow higher input levels. The results is a 10 dB signal-to-noise improvement referenced to 0.5 percent THD. Controlled impedance buffers are provided which are especially designed to complement the dynamic range of the amplifiers.

■ PACKAGE OUTLINE

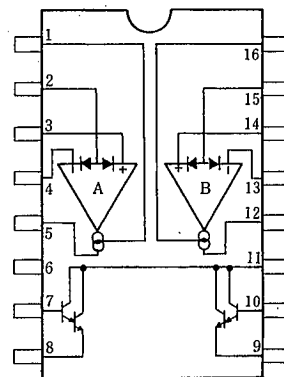


■ FEATURES

- Package Outline
- Bipolar Technology

DIP16, DMP16, (SSOP16)

■ PIN CONFIGURATION

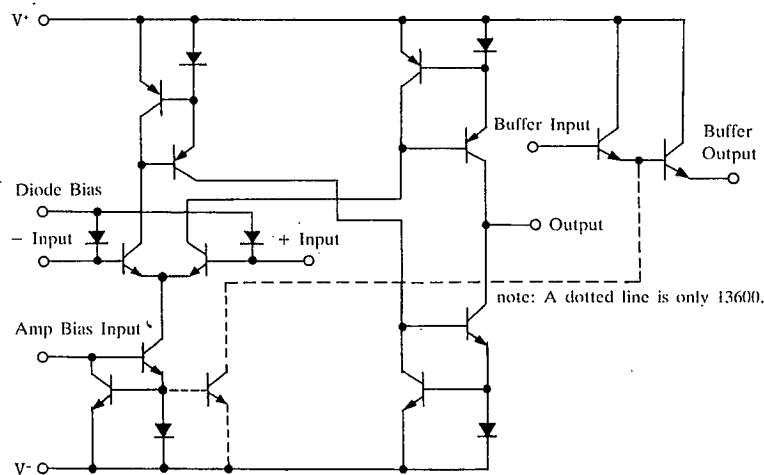


NJM13600D, NJM13600M, NJM13600V
NJM13700D, NJM13700M

PIN FUNCTION

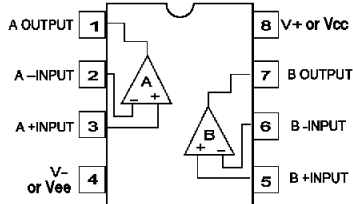
- | | |
|---------------------|----------------------|
| 1. Amp Bias Input A | 9. Buffer Output B |
| 2. Diode Bias A | 10. Buffer Input B |
| 3. + Input | 11. V ⁺ |
| 4. - Input | 12. Output B |
| 5. Output A | 13. - Input B |
| 6. V ⁻ | 14. + Input B |
| 7. Buffer Input A | 15. Diode Bias B |
| 8. Buffer Output A | 16. Amp Bias Input B |

■ EQUIVALENT CIRCUIT

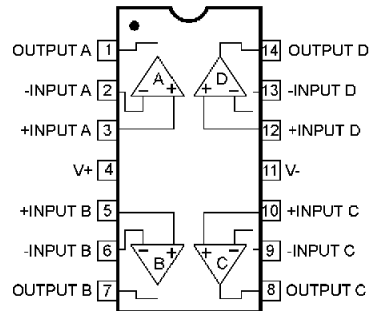


Semiconductors

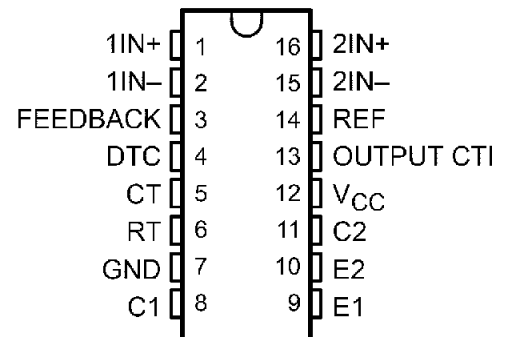
TL072CN DUAL OP-AMP U2
KAI393 COMPARATOR U1,2,3



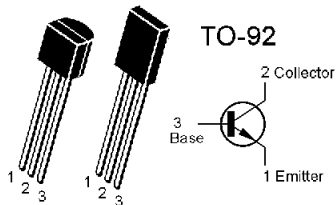
TL074CN QUAD OP-AMP U1,4,5



TL494CD PWM U1

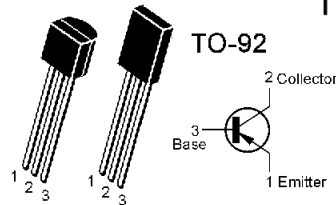


KTC1027 Q3,4,7,8,15-18
KTC3198 Q1,2,5,6,7,36,37

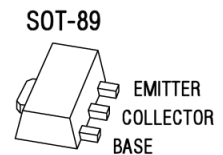


KTB985 Q4,5

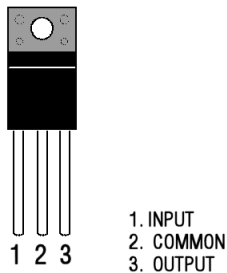
KTA1023 Q4-6,9,10,13,14,16,
17,19,20,34,35



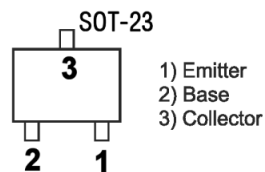
KTA1661 Q1,22,23
KTC4373 Q21



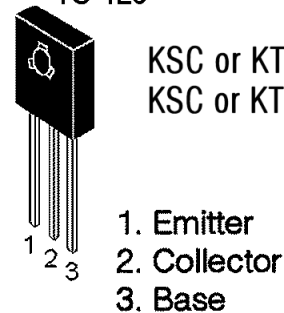
KIA78D06PI U10



KTA1504 Q3,7,10
KTC3875 Q2,6,8,9,11,12



TO-126

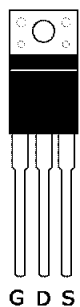


KSC or KTC3503 Q1,2
KSC or KTC1381 Q11,12

MOSFET

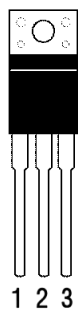
IRF640 Q13-15,23-25,31-33,63-65
IRF9640 Q8-12,18-22,26-30,58-62
IRF3205 Q38-57

TO-220



KIA7812PI +12 U8

TO-220



1. Input
2. Ground
3. Output

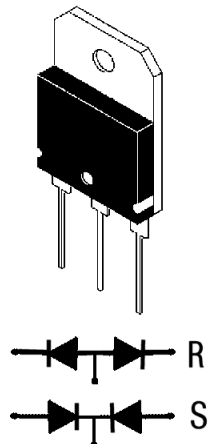
KIA7912PI -12 U9

TO-220



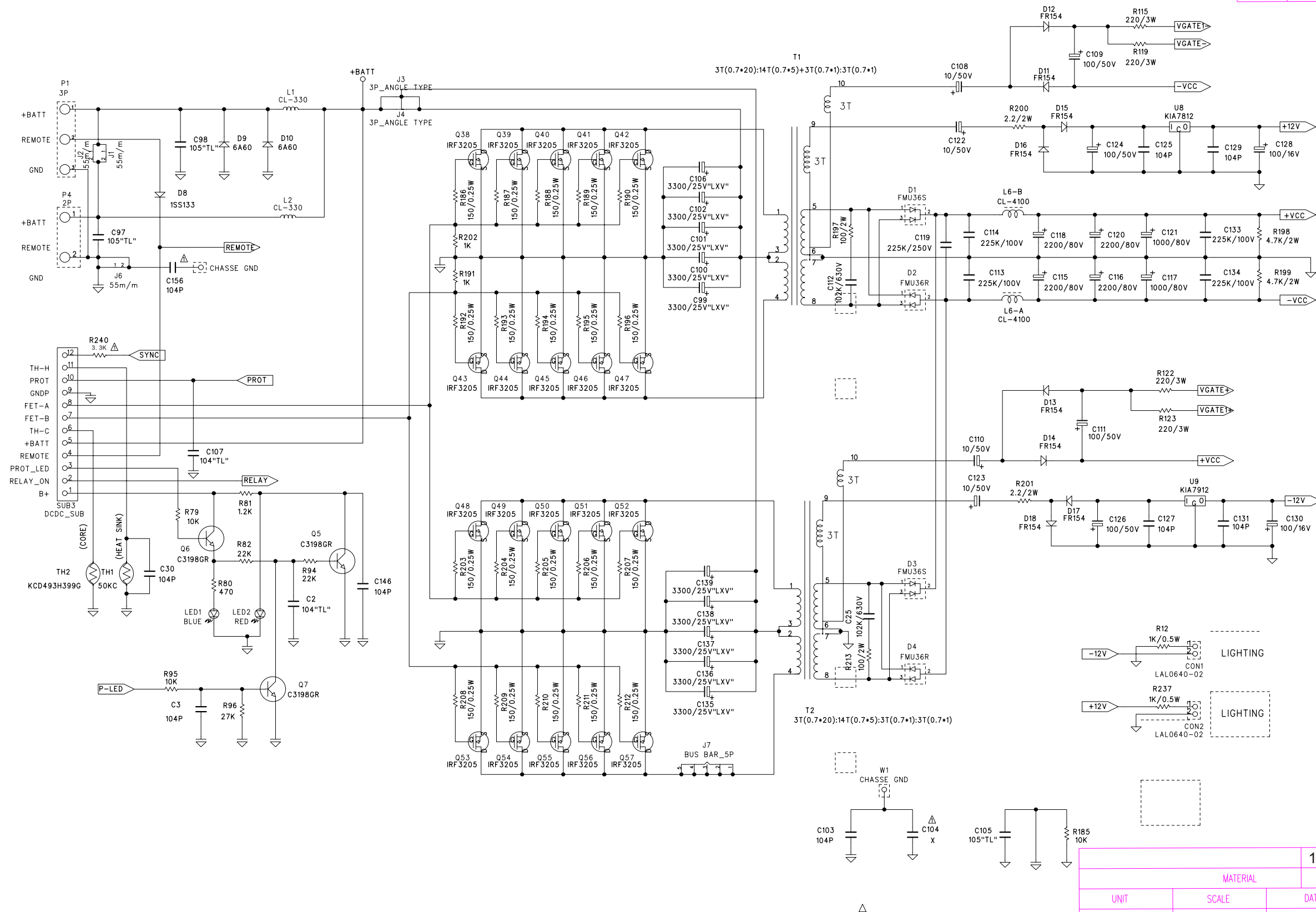
1. Ground
2. Input
3. Output

FMU36R D2,4
FMU36S D1,3
DUAL DIODE





REV	DESCRIPTION	DATE
1		
2		

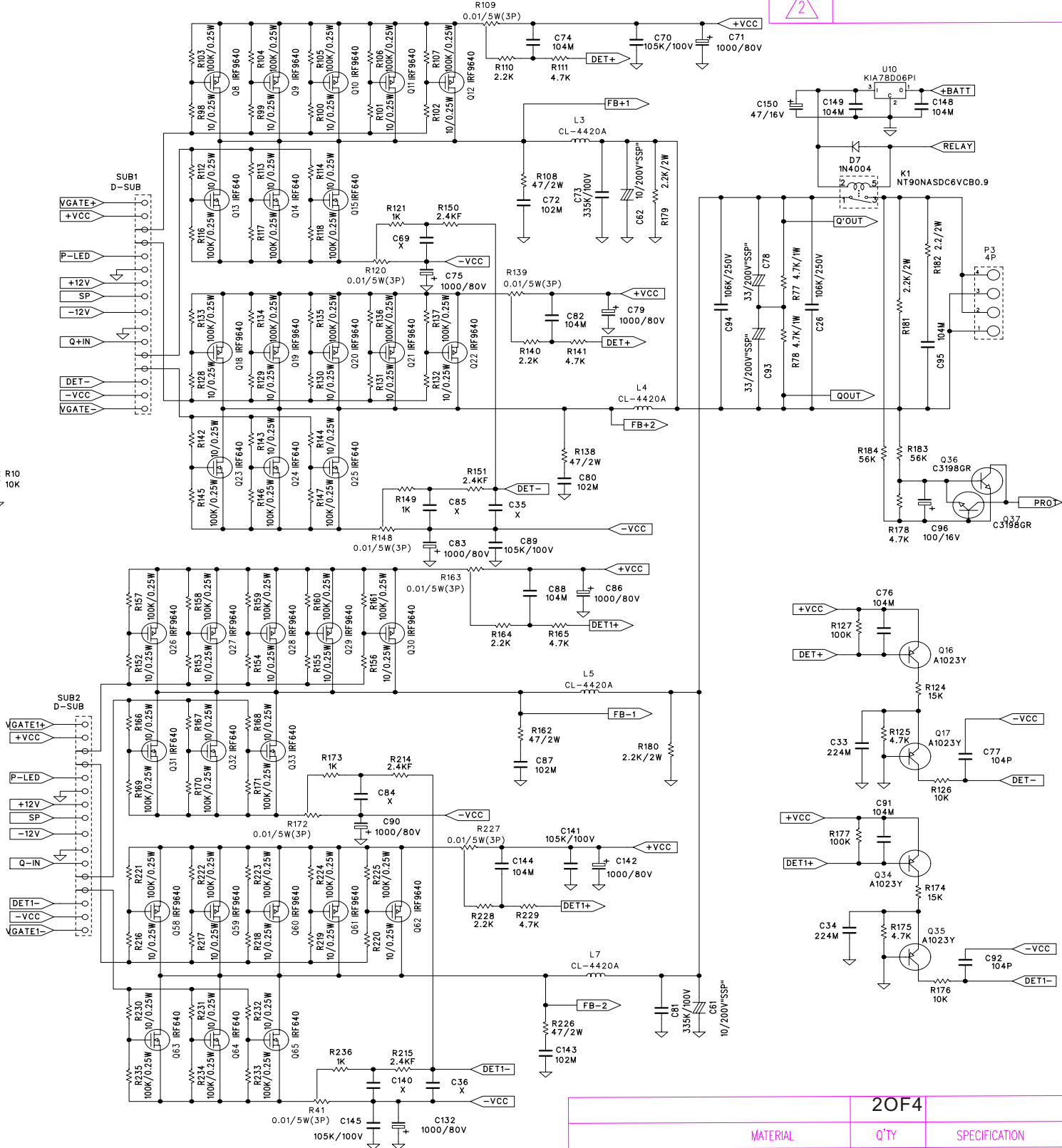
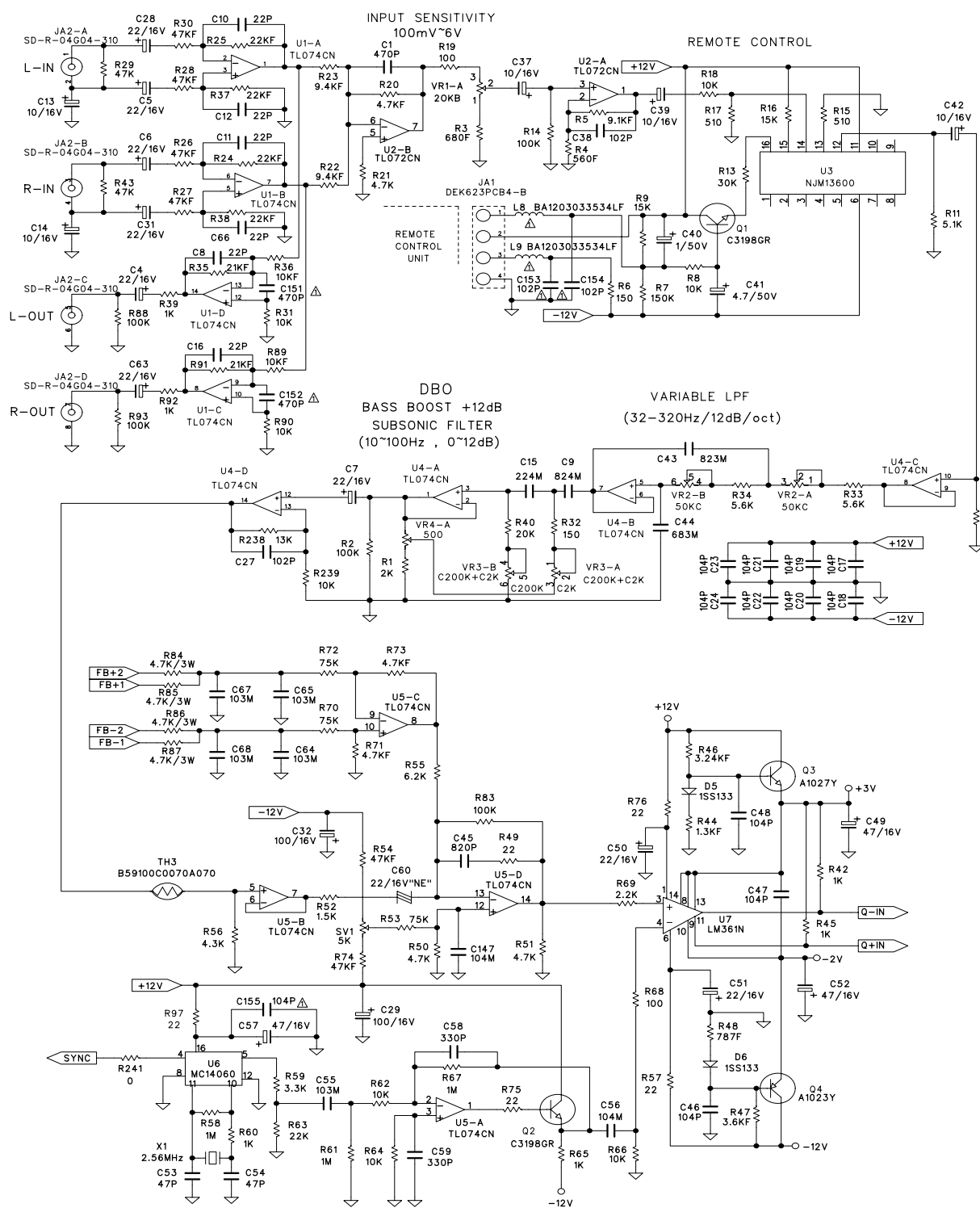


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DRAW	CHECK	APPRO	NAME	
			GTO24001 SCH	
			CODE NO.	ISSUE
				1/1



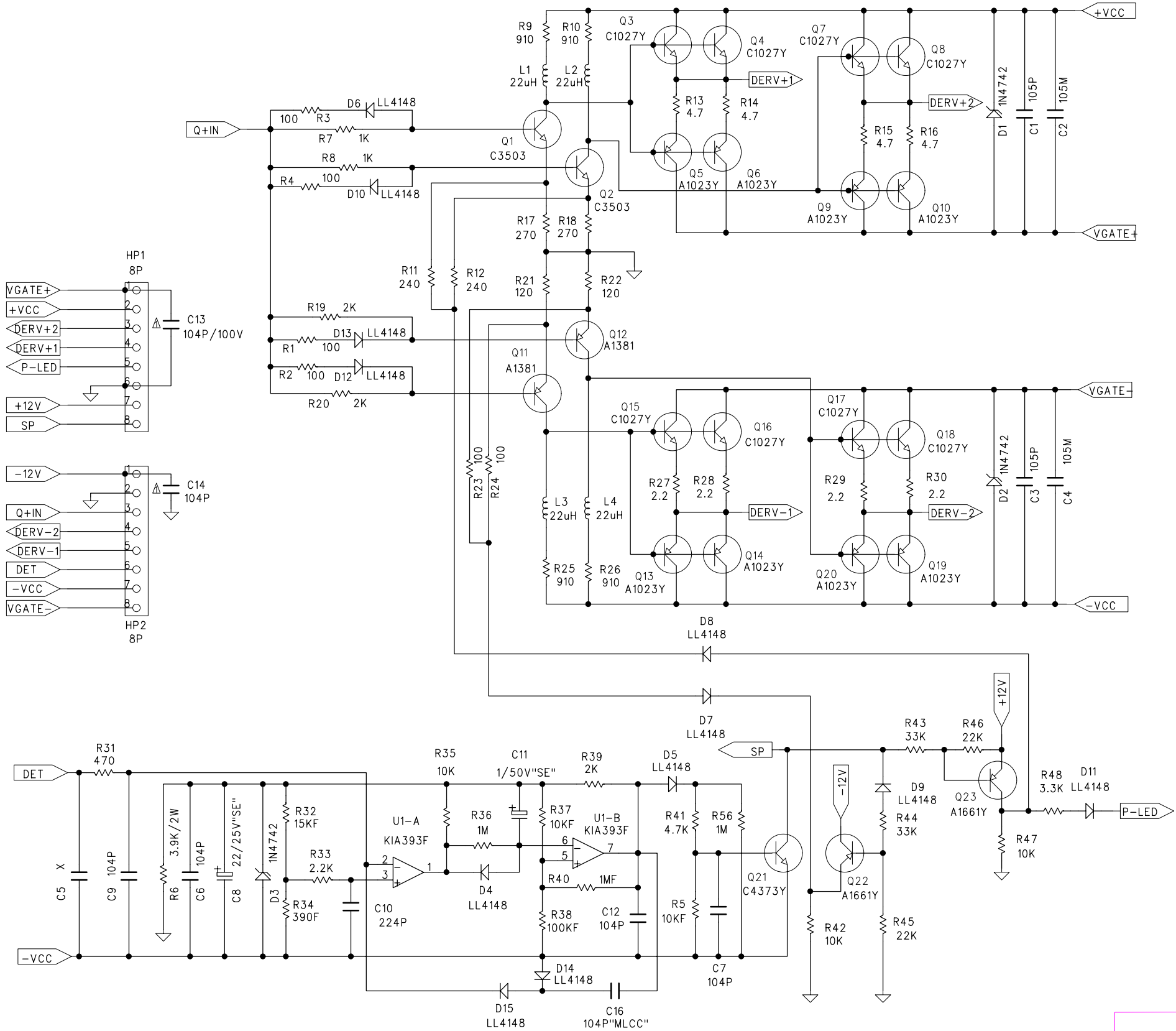
REVISIONS

REV	DESCRIPTION	DATE
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2		



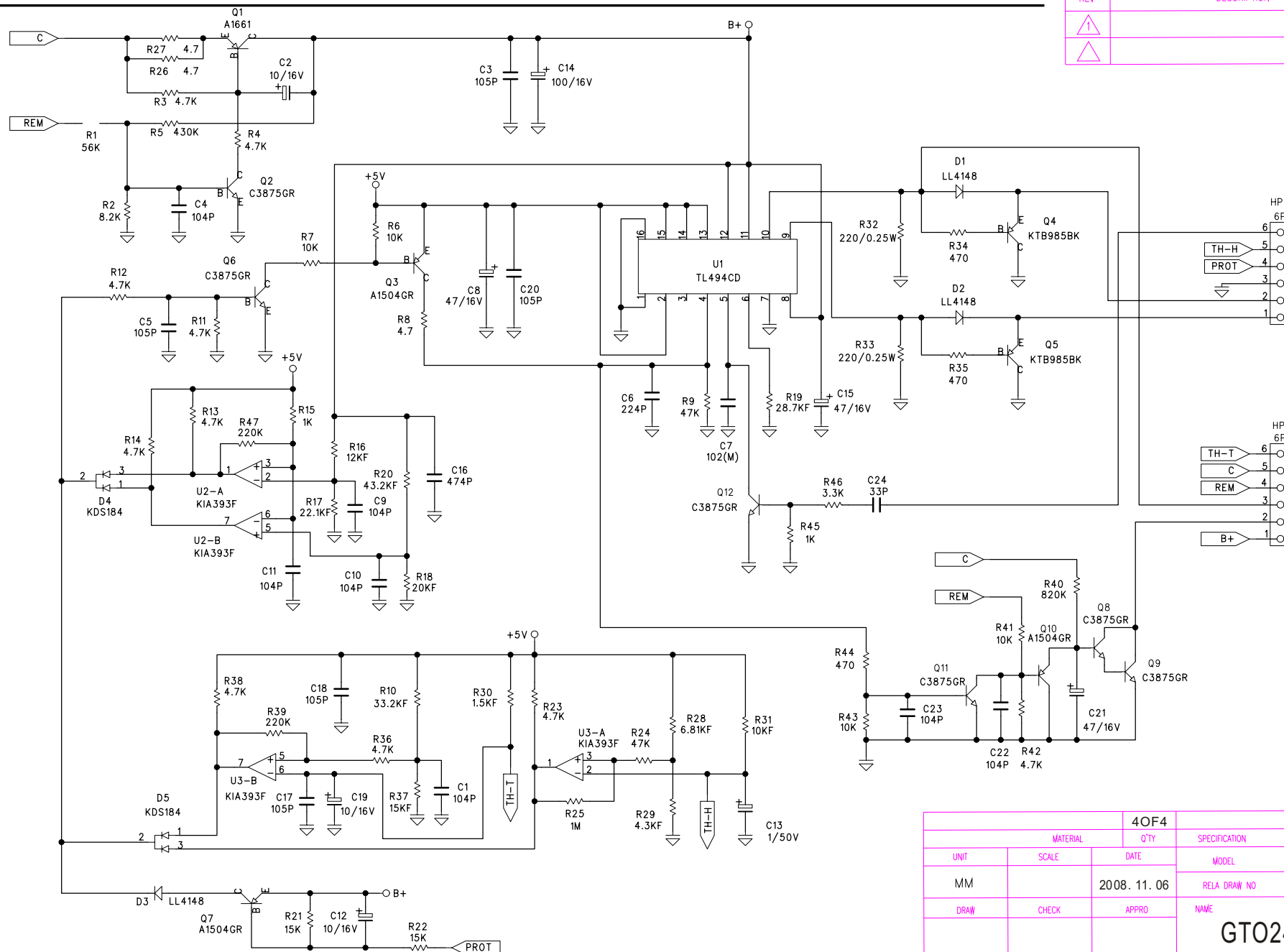
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MM		2008. 11. 06	RELA DRAW NO	
DRAW	CHECK	APPRO	NAME	GTO24001 SCH
			CODE NO.	ISSUE
				1/1

REV	DESCRIPTION	DATE
1		
2		



			3OF4		
MATERIAL		Q'TY	SPECIFICATION	REMARK	
UNIT	SCALE	DATE	MODEL	GTO24001	
MM		2008. 11. 06	RELA DRAW NO		
DRAW	CHECK	APPRO	NAME	GTO24001 SCH	
			CODE NO.	ISSUE	

REV	DESCRIPTION	DATE
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2		



4OF4				
MATERIAL		Q'TY	SPECIFICATION	REMARK
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DRAW	CHECK	APPRO	NAME	GTO24001 SCH
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				ISSUE
				1/1