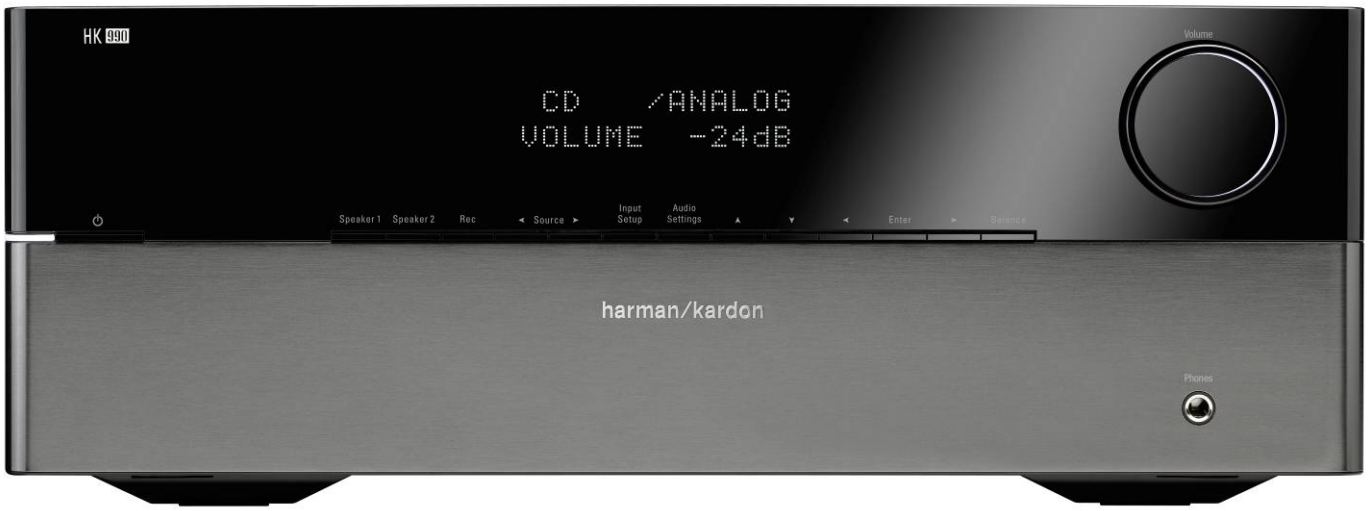
harman/kardon **Service Manual**

HK 990/230

2 x 200W INTEGRATED STEREO AMPLIFIER



Released EU2009

harman/kardon, Inc.
250 Crossways Park Dr.
Woodbury, New York, 11797

Rev 0, 03/2009

CONTENTS

Specifications

		NOMINAL
Continuous Average Power Per Channel (FTC)	8 Ohms:	150 Watts@<0.03%THD
20 Hz – 20 kHz, both channels driven	4 Ohms:	300 Watts@<0.3%THD
Dynamic Power (IHF, 1 kHz Tone Burst)	8 Ohms:	220 Watts
	4 Ohms:	440 Watts
High instantaneous current capability (HCC)		±200 Amps
Power Bandwidth @ Half-Rated output, 8Ω		20 Hz - 100 kHz
Frequency response @ 1W (+0/-3dB)		5 Hz - 120 kHz
Damping factor (20Hz-20k Hz)		>200
Signal-to-noise Ratio (Reference rated power output, A-WTD)	Tuner/CD	100 dB
	Phono (MC):	75 dB
Input sensitivity/Impedance	Tuner/CD	350 mV/43k Ohms
	Phono (MM):	10 mV/47k Ohms
	Phono (MC):	1 mV/100 Ohms
Overload	Tuner/CD	2.8V
	Phono (MM):	85 mV
	Phono (MC):	8.5 mV
Tone control range, Bass @ 100 Hz/Treble @ 10 kHz		±10 dB/±10 dB
Power supply		AC 230V, 50 Hz
Power consumption		1000 W
Standby power consumption		1W
Dimensions (Width x Height x Depth)		440 x 160 x 444 mm
Depth includes Volume Button and Loudspeaker Terminals		
Weight		24 kg

harman/kardon

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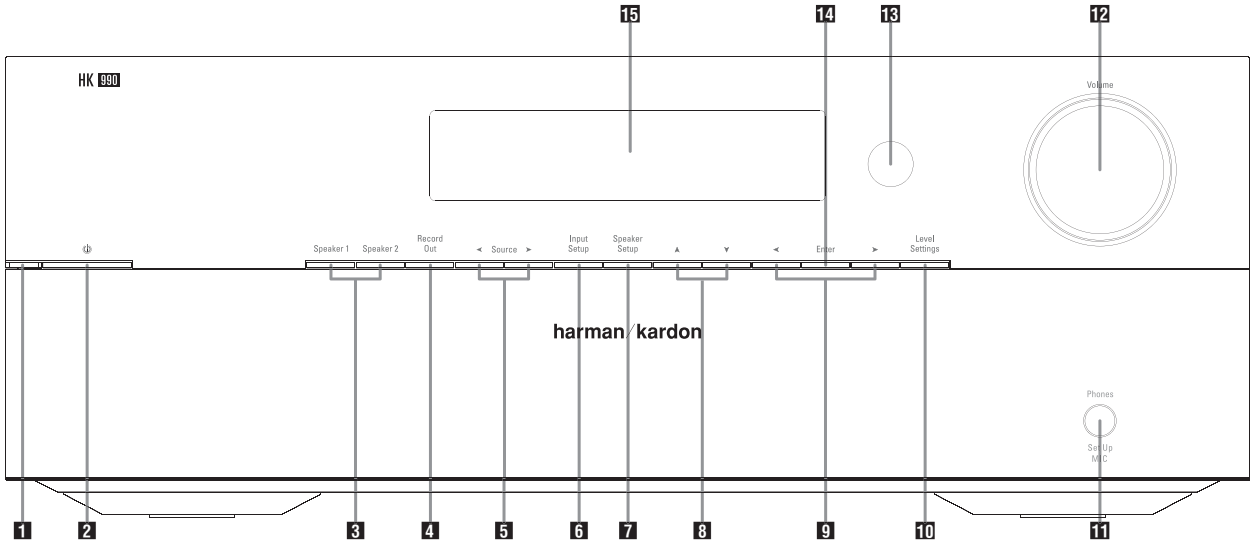
Part no. 8509 9012 0000

Controls and Functions



1 Power Indicator: This LED will illuminate in amber when the unit is in the Standby mode to signal that the unit is ready to be turned on. When the unit is in operation, the indicator will turn white.

2 System Power Control: Press this button to turn on the HK 990; press it again to turn the unit off (to Standby). Entering Standby also saves all Setup parameters.

3 Speaker 1/2 Selectors: Press to select speaker pair 1 or 2, or both, or neither (headphone output only).

4 Record Out Selector: First press shows the record source presently selected in the display. Pressing on the the Source selectors **5** within a few seconds after pressing **4** changes the record source. Exit this function by pressing **4** again, or wait for a few seconds until exit takes place automatically.

5 Input Source Selector: Select input source for listening by pressing one of the "Source" buttons repeatedly to scroll through all the Inputs either forwards or backwards, until the display shows the desired source.

6 Input Setup Button: Press this Button to enter/exit the Input Setup Mode. Here you can select the physical connection for each source (Analog/Digital etc.) as well as Gain, Bass/Treble etc. Refer to the Setup section of this manual.

7 Speaker Setup Selector: Press this Button to enter the Speaker Setup Menu, where you can switch subwoofers on and off, select crossover frequency, run automatic speaker setup (EzSet/EQ) etc. Refer to the Setup section of this manual.

8 Up/Down Arrow Buttons: Press to scroll through various options for adjustment in a menu.

9 Left/Right Arrow Buttons: Press to increase/decrease a parameter or to select between parameters after selecting a menu for adjustment with the Up/Down Arrow Buttons.

10 Level Settings Button: Press to enter/exit the Balance left/right adjustment for the speakers as well as subwoofer level.

11 Headphone Jack/Setup Microphone Input: Plug in headphones if desired. With both "Speaker 1" and "2" selectors in the Off position, output is supplied only to headphones. When using the automatic loudspeaker setup and calibration system (EzSet/EQ), plug the microphone in here.

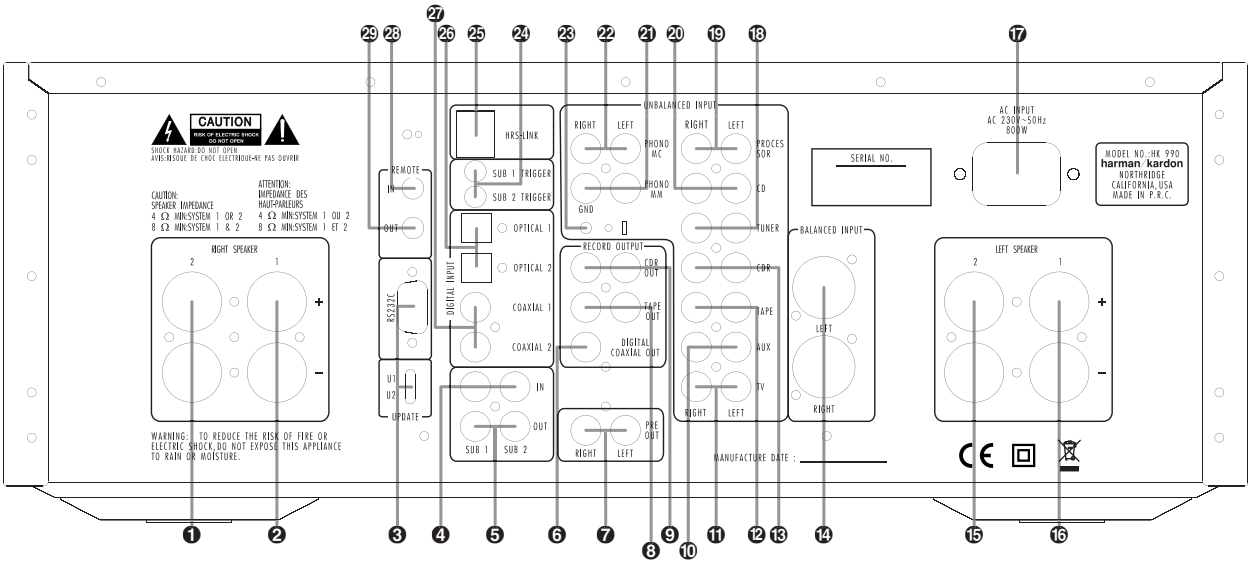
12 Volume Control: Turn to raise or lower output volume.

13 Remote Sensor Window: The sensor behind this window receives infrared signals from the remote control. Aim the remote at this area and do not block or cover it unless an external remote sensor is installed.

14 Enter Button: Press to select a parameter for adjustment and to confirm.

15 Main Information Display: This display delivers messages and status indications to help you operate the amplifier.

Connections



❶ Right Loudspeaker output, System 2.

❷ Right Loudspeaker output, System 1.

❸ RS-232 connector for possible future PC update. Update Switch.

❹ Input jacks for one or two subwoofer signals from external surround processor.

❺ Output jacks for two subwoofers.

❻ Digital coaxial output jack for digital recording. Also permits digital recording of analog sources.

❼ Preamplifier output jacks.

❽ Analog output jacks for tape recording.

❾ Analog output jacks for CD Recorder analog recording.

❿ AUX input jacks, suitable for analog signals from video games, video recorders etc.

⓫ TV input jacks for analog sound input from your TV.

⓬ TAPE input jacks for analog tape replay.

⓭ CDR input jacks, for CD Recorder analog replay.

⓮ Balanced analog inputs (XLR), for use with all signal sources that output balanced signals. Available via the CD Input function only, as an alternative to the unbalanced RCA jacks (Input ⓴). Pin configuration for the XLR Inputs: Pin 1 is Ground, Pin 2 is Plus/Hot, Pin 3 is Minus/Cold.

⓯ Left Loudspeaker output, System 2.

⓰ Left Loudspeaker output, System 1.

⓱ Power lead AC input.

⓲ TUNER analog Input jacks.

⓳ PROCESSOR Analog Inputs. These Inputs go directly to the power amplifier section of the HK 990, bypassing the Volume and Tone Control. Here you can connect the Front Channel Pre Out L+R signals from an external surround processor, to benefit from the superior power of the HK 990 and control volume from the processor. **NOTE**: Only use the Processor Input with a device that has its own volume control!

⓴ CD analog Input jacks. You can select either this Input or the Balanced Input as analog Input in the CD Input Setup Mode.

㉑ Phono Input for record player with Moving Magnet (high output and high impedance) or High-Output Moving Coil cartridge.

㉒ Phono Input for record player with Moving Coil (low output and low impedance) cartridge.

㉓ If your record player has a separate Ground wire, attach it here to avoid hum noise.

㉔ Connect the trigger Input (if available) on one or two subwoofers to these trigger ON/OFF output jacks. When you switch ON the HK 990, it sends a trigger signal, which switches ON the subwoofer. When switching OFF the HK 990, the subwoofer also switches OFF.

㉕ HRS (High-Resolution Synchronization) Input. Use the included HRS-cable to connect the HD 990 CD player (or other similarly equipped player) for optimum sound quality.

㉖ Optical Digital Inputs (TOS-Link). Connect any digital device with Optical Digital Output to one of these Inputs. Push the Optical Jack through the hinged door that covers the Input until it clicks into place.

㉗ Coaxial Digital Inputs. Connect any digital device with Coaxial Digital Output to one of these Inputs. Usually, Coaxial Digital transmission is preferred to Optical, given a choice.

㉘ Remote IN. To control your HK 990 with an external infrared remote sensor, connect the wire from the remote sensor here.

㉙ Remote OUT. Connect other Harman Kardon devices (you may also experiment with other brands) that you wish to control with the HK 990 Remote Control to this Output.

Remote Control

Band: Switches between frequency bands on a Tuner.

FM Mode: Switches between Stereo and Mono on a Tuner.

Auto: Switches between Automatic and Manual tuning on a Tuner.

Mem: For memorizing a radio station in the Preset Memory of a Tuner.

Clear: Clears the memory of a CD/CDR or clears a preset from Tuner station list.

Check: Press this button to check the order of tracks programmed into a CD player's memory.

Prog: Press this button to begin the process of programming a CD player to play the tracks of a disc in a specific order.

Speaker Setup: Press to enter the HK 990 Speaker Setup functions. See below for explanation of the Speaker Setup process.

Input Setup: Press to enter the HK 990 Input Setup functions. See below for explanation of the Input Setup process.

Arrow Buttons (> < ∧ ∨): This round button is used to navigate within the menus of the HK 990.

EQ Preset: Press to enter the HK 990 Equalizer Preset functions. See below for explanation of the EQ Presets.

Level Settings: Press to enter the HK 990 Level Setting functions. See below for explanation of the Level Setting process.

Enter: Press to confirm a selection within a HK 990 setup procedure or to switch between selections. See under each Setup process for further explanations.

Scroll +/–: When listening to a Tuner, press + to tune to higher frequency stations and – to tune to lower frequency stations. Also see the Owners Manual for your harman/kardon tuner.

Volume +/–: Press to adjust the HK 990 volume up or down.

Select: When listening to a tuner, press this button to alternate between Auto Tune, Manual Tune or Preset Tune.

Pause: When playing a CD, press this button to momentarily pause the disc. Press again to resume play.

Mute: Press this button to momentarily silence the HK 990. "Muted" flashes in the front panel display. Press again to re-activate sound output.

≪ and ≫ (Search Buttons): Press one of these buttons to search fast forward or backward on a CD or Tape. You can hear intermittent sounds from the CD while searching. Normal playback resumes when you release the button.

|<< and >>| (Skip Buttons): Press one of these buttons to move to the next track or to the previous track on a CD or Tape. Repeatedly pressing one of the buttons skips more tracks. On a CD, pressing Skip Forward while playing the last track skips to track 1, and pressing Skip Back while playing track 1 skips to the last track.

Stop: Press this button to stop play of a CD or Tape.

Play: Press this button to start playback of a CD or Tape. If the CD drawer is open, the drawer closes and play begins. Pressing the Play Button again pauses play momentarily, same as the Pause Button.

+10 and -10: When playing a CD, press the +10 Button to skip 10 tracks forward and the -10 Button to skip 10 tracks backward from the track you are playing. More presses again skips 10 more tracks. If there are less than 10 tracks to the end or start of the CD, the last or first track is played.

Folder + and Folder - : When playing a CD with MP3 files, these buttons move to the next or the previous folder with MP3 material.

Repeat: When playing a CD, pressing this button once repeats the current track, shown as "Rep 1" in the CD player's display. Pressing once more repeats the entire CD, shown as "Rep All" in the CD player's display. Third press exits repeat play.

Repeat A-B: When playing a CD, press once to establish a starting point (shown as "Rep A" in the CD player's display) and a second time to establish an end point (shown as Rep A-B in the CD player's display). The music between these two points is repeated as a loop until you press the button a third time, returning to normal play.

Open/Close: Opens the CD drawer when it is closed and closes it when it is open. The drawer may also be closed by pressing Play.

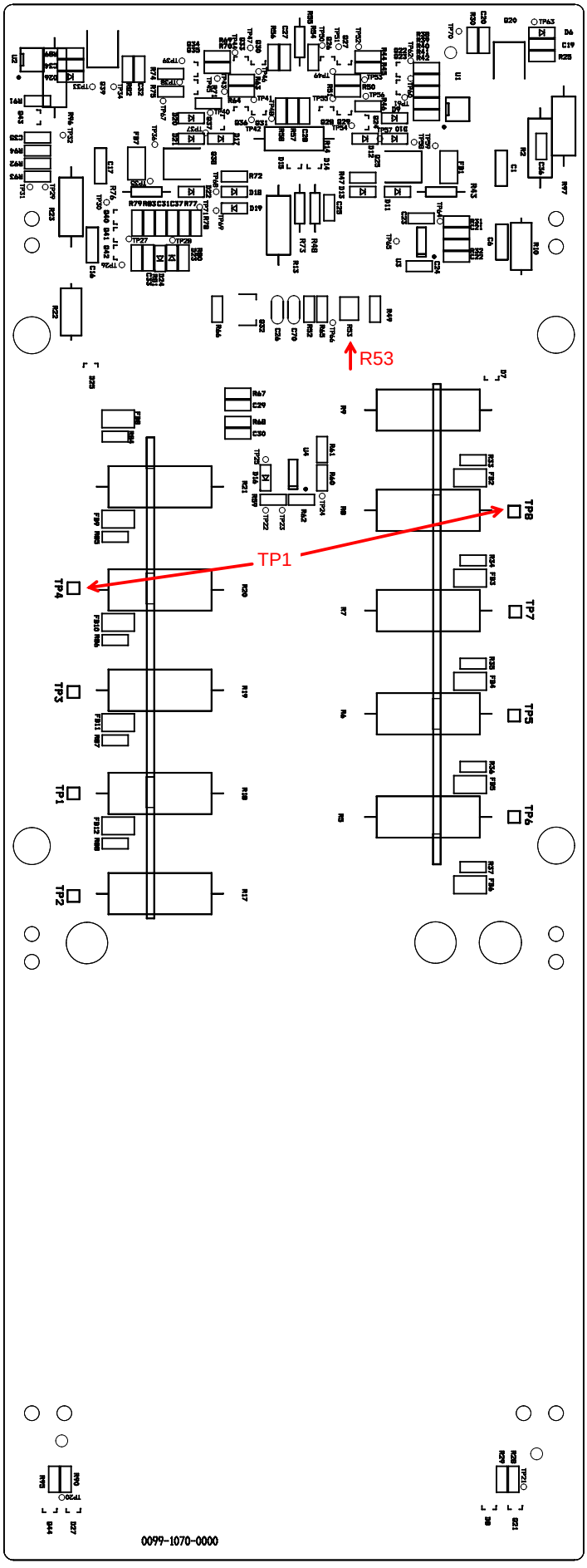
Random: When playing a CD, press this button to play all tracks in random order.

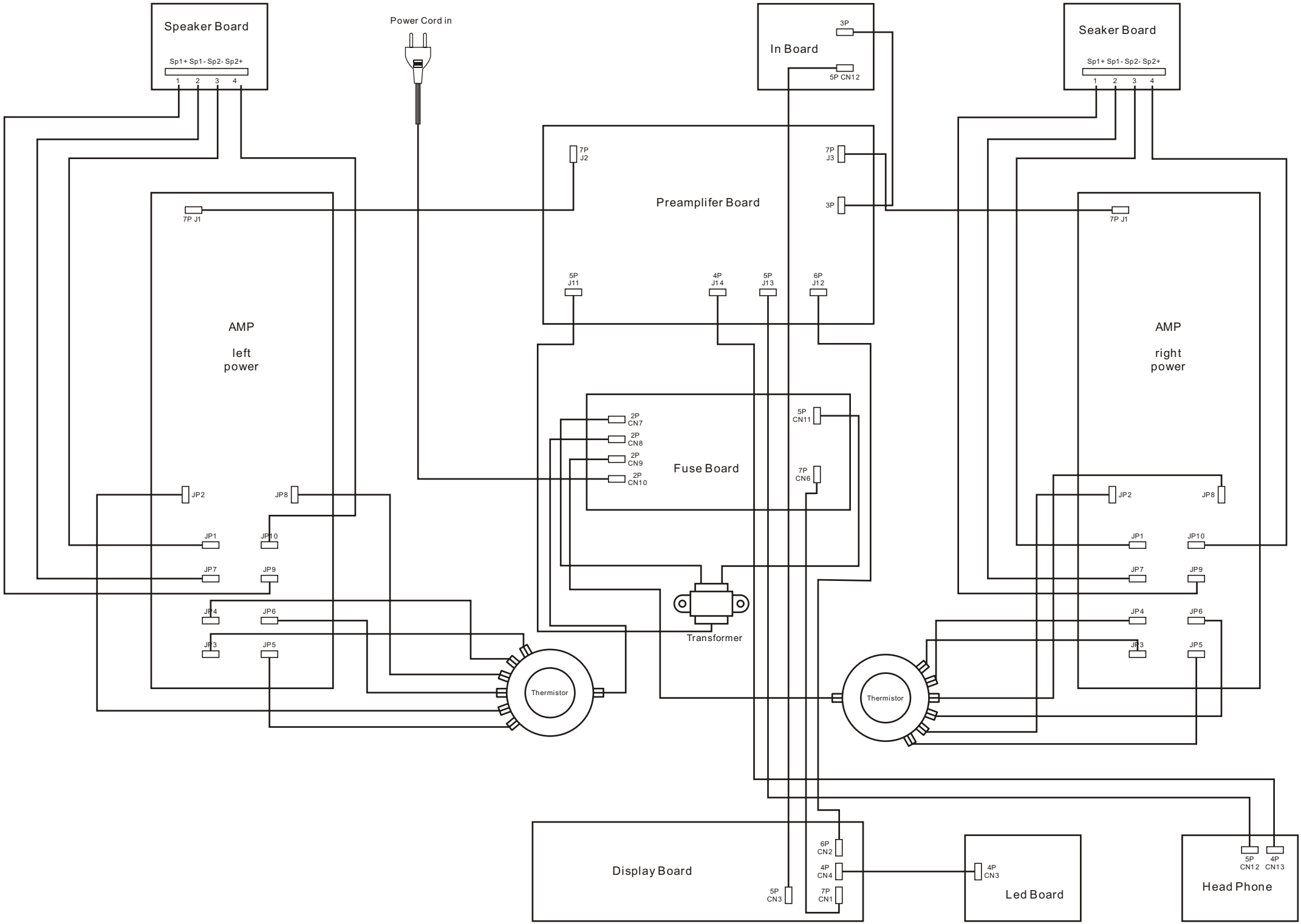
AMP Adjustment

Iding Adjustment
Precaution for handling measuring instrument
The ground side of the measuring instrument to be connected to the speaker terminal of this unit must be kept in floating condition because this unit is equiped with the floating balanced power amplifier.

Condition
 * Start adjustment 5 minutes or more after the power is turned on.
 * Non loaded condition.

Idling Adjustment
Adjust R53 so that the DC voltage of TP1 becomes +38mV .




Speaker Board
Sp1+ Sp1- Sp2- Sp2+
1 2 3 4
Power Cord in
In Board
3P
5P CN12
Seaker Board
Sp1+ Sp1- Sp2- Sp2+
1 2 3 4
7P J2
7P J3
3P
Preamplifer Board
7P J1
7P J1
5P J11
4P J14
5P J13
6P J12
AMP
left
power
AMP
right
power
2P CN7
2P CN8
2P CN9
2P CN10
Fuse Board
5P CN11
7P CN6
JP2
JP8
JP1
JP10
JP7
JP9
JP4
JP6
JP3
JP5
JP2
JP8
JP1
JP10
JP7
JP9
JP4
JP6
JP3
JP5
Transformer
Thermistor
Thermistor
6P CN2
4P CN4
7P CN1
5P CN3
Display Board
4P CN3
Led Board
5P CN12
4P CN13
Head Phone

High Performance Multibit Σ-Δ DAC with SACD Playback

AD1955ARS

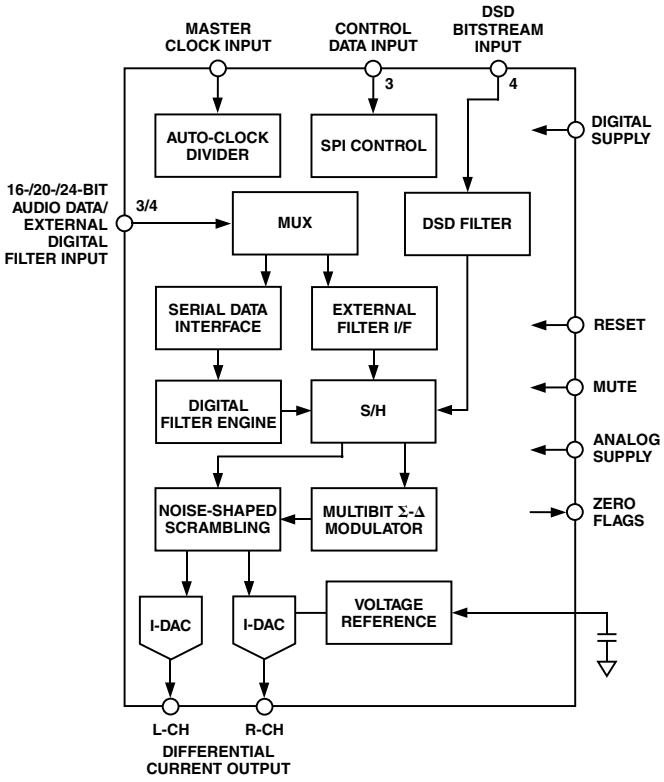
FEATURES

5 V Power Supply Stereo Audio DAC System
Accepts 16-/18-/20-/24-Bit Data
Supports 24-Bit, 192 kHz Sample Rate PCM Audio Data
Supports SACD Bit Stream and External Digital Filter Interface
Accepts a Wide Range of PCM Sample Rates Including: 32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, and 192 kHz
Multibit Sigma-Delta Modulator with "Perfect Differential Linearity Restoration" for Reduced Idle Tones and Noise Floor
Data Directed Scrambling DAC—Low Sensitivity to Jitter
Supports SACD Playback with "Bit Expansion" Filter
Differential Current Output for Optimum Performance
8.64 mA p-p Differential Output
120 dB SNR/DNR (not muted) at 48 kHz Sample Rate (A-Weighted Stereo)
123 dB SNR/DNR (Mono)
–110 dB THD + N
110 dB Stop-Band Attenuation with ±0.0002 dB Pass-Band Ripple
8× Oversampling Digital Filter
On-Chip Clickless Volume Control
Supports SACD-Mute Pattern Detection
Supports 64 f_S/128 f_S DSD SACD with Phase Mode
Internal Digital Filter Pass-Through for External Filter
Master Clock: 256 f_S, 512 f_S, 768 f_S
Hardware and Software Controllable Clickless Mute
Serial (SPI) Control for Serial Mode, Number of Bits, Sample Rate, Volume, Mute, De-Emphasis, Mono Mode
Digital De-Emphasis for 32 kHz, 44.1 kHz, and 48 kHz Sample Rates
Flexible Serial Data Port with Right-Justified, Left-Justified, I^2S, and DSP Modes
28-Lead SSOP Plastic Package

APPLICATIONS

High End DVD Audio
SACD
CD
Home Theater Systems
Automotive Audio Systems
Sampling Musical Keyboards
Digital Mixing Consoles
Digital Audio Effects Processors

FUNCTIONAL BLOCK DIAGRAM



PRODUCT OVERVIEW

The AD1955 is a complete, high performance, single-chip, stereo digital audio playback system. It is comprised of a multibit sigma-delta modulator, high performance digital interpolation filters, and continuous-time differential current output DACs. Other features include an on-chip clickless stereo attenuator and mute capability, programmed through an SPI compatible serial control port. The AD1955 is fully compatible with all known DVD audio formats including 192 kHz as well as 96 kHz sample frequencies and 24 bits. It is also backward compatible by supporting 50 µs/15 µs digital de-emphasis intended for "redbook" compact discs, as well as de-emphasis at 32 kHz and 48 kHz sample rates.

The AD1955 has a very flexible serial data input port that allows for glueless interconnection to a variety of ADCs, DSPs, SACD decoders, external digital filters, AES/EBU receivers, and

(continued on page 12)

REV. 0

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781/329-4700 www.analog.com
Fax: 781/326-8703

ABSOLUTE MAXIMUM RATINGS*

Parameter	Min	Max	Unit
DV_{DD} to DGND	–0.3	6	V
AV_{DD} to AGND	–0.3	6	V
Digital Inputs	DGND – 0.3	DV_{DD} + 0.3	V
Analog Outputs	AGND – 0.3	AV_{DD} + 0.3	V
AGND to DGND	–0.3	+0.3	V
Reference Voltage		$(AV_{DD} + 0.3)/2$	
Soldering		300	°C
		10	sec

*Stresses greater than those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

PACKAGE CHARACTERISTICS

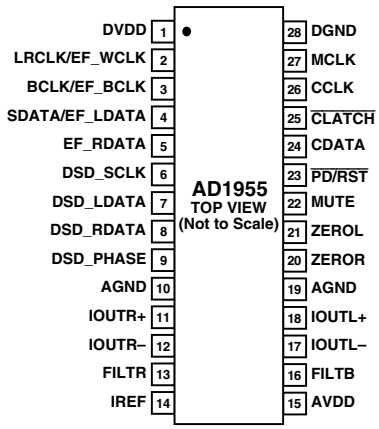
Package	Typ	Unit
θ_{JA} (Thermal Resistance [Junction-to-Ambient])	109.0	°C/W
θ_{JC} (Thermal Resistance [Junction-to-Case])	39.0	°C/W

ORDERING GUIDE

Model	Temperature	Package Description	Package Option*
AD1955ARS	–40°C to +85°C	28-Lead SSOP	RS-28
AD1955ARSRL	–40°C to +85°C	28-Lead SSOP	RS-28 on 13" Reels
EVAL-AD1955EB		Evaluation Board	

*RS = Shrink Small Outline Package

PIN CONFIGURATION



CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although the AD1955 features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

Advanced Monolithic Systems

AMS1117

1A LOW DROPOUT VOLTAGE REGULATOR

FEATURES

- **Three Terminal Adjustable or Fixed Voltages* 1.5V, 1.8V, 2.5V, 2.85V, 3.3V and 5.0V**
- **Output Current of 1A**
- **Operates Down to 1V Dropout**
- **Line Regulation: 0.2% Max.**
- **Load Regulation: 0.4% Max.**
- **SOT-223, TO-252 and SO-8 package available**

APPLICATIONS

- **High Efficiency Linear Regulators**
- **Post Regulators for Switching Supplies**
- **5V to 3.3V Linear Regulator**
- **Battery Chargers**
- **Active SCSI Terminators**
- **Power Management for Notebook**
- **Battery Powered Instrumentation**

GENERAL DESCRIPTION

The AMS1117 series of adjustable and fixed voltage regulators are designed to provide 1A output current and to operate down to 1V input-to-output differential. The dropout voltage of the device is guaranteed maximum 1.3V at maximum output current, decreasing at lower load currents.

On-chip trimming adjusts the reference voltage to 1%. Current limit is also trimmed, minimizing the stress under overload conditions on both the regulator and power source circuitry.

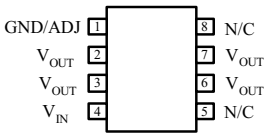
The AMS1117 devices are pin compatible with other three-terminal SCSI regulators and are offered in the low profile surface mount SOT-223 package, in the 8L SOIC package and in the TO-252 (DPAK) plastic package.

ORDERING INFORMATION:

PACKAGE TYPE			OPERATING JUNCTION
TO-252	SOT-223	8L SOIC	TEMPERATURE RANGE
AMS1117CD	AMS1117	AMS1117CS	-40 to 125° C
AMS1117CD-1.5	AMS1117-1.5	AMS1117CS-1.5	-40 to 125° C
AMS1117CD-1.8	AMS1117-1.8	AMS1117CS-1.8	-40 to 125° C
AMS1117CD-2.5	AMS1117-2.5	AMS1117CS-2.5	-40 to 125° C
AMS1117CD-2.85	AMS1117-2.85	AMS1117CS-2.85	-40 to 125° C
AMS1117CD-3.3	AMS1117-3.3	AMS1117CS-3.3	-40 to 125° C
AMS1117CD-5.0	AMS1117-5.0	AMS1117CS-5.0	-40 to 125° C

*For additional available fixed voltages contact factory.

8L SOIC Top View

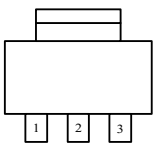


PIN CONNECTIONS

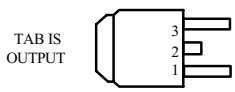
3 PIN FIXED/ADJUSTABLE VERSION

1- Ground/Adjust
2- V_{OUT}
3- V_{IN}

SOT-223 Top View



TO-252 FRONT VIEW



BSS123

N-CHANNEL ENHANCEMENT MODE FIELD EFFECT TRANSISTOR

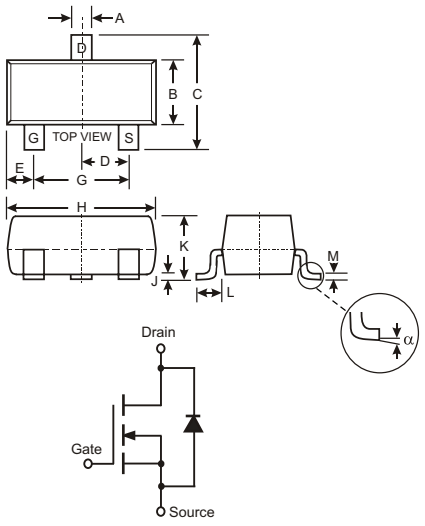
NEW PRODUCT

Features

- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- High Drain-Source Voltage Rating

Mechanical Data

- Case: SOT-23, Molded Plastic
- Case material - UL Flammability Rating 94V-0
- Moisture sensitivity: Level 1 per J-STD-020A
- Terminals: Solderable per MIL-STD-202, Method 208
- Terminal Connections: See Diagram
- Marking: K23 (See Page 3)
- Ordering & Date Code Information: See Page 3
- Weight: 0.008 grams (approx.)



SOT-23		
Dim	**Min**	**Max**
A	0.37	0.51
B	1.20	1.40
C	2.30	2.50
D	0.89	1.03
E	0.45	0.60
G	1.78	2.05
H	2.80	3.00
J	0.013	0.10
K	0.903	1.10
L	0.45	0.61
M	0.085	0.180
α	0°	8°
All Dimensions in mm		

Maximum Ratings

@ T_A = 25°C unless otherwise specified

Characteristic		Symbol	BSS123	Units
Drain-Source Voltage		V_{DSS}	100	V
Drain-Gate Voltage $R_{GS} \leq 20K\Omega$		V_{DGR}	100	V
Gate-Source Voltage	Continuous	V_{GSS}	±20	V
Drain Current (Note 1)	Continuous Pulsed	I_D I_{DM}	170 680	mA
Total Power Dissipation (Note 1)		P_d	300	mW
Thermal Resistance, Junction to Ambient (Note 1)		$R_{\theta JA}$	417	°C/W
Operating and Storage Temperature Range		T_j, T_{STG}	-55 to +150	°C

Note: 1. Part mounted on FR-4 board with recommended pad layout, which can be found on our website at http://www.diodes.com/datasheets/ap02001.pdf.

GENERAL DESCRIPTION

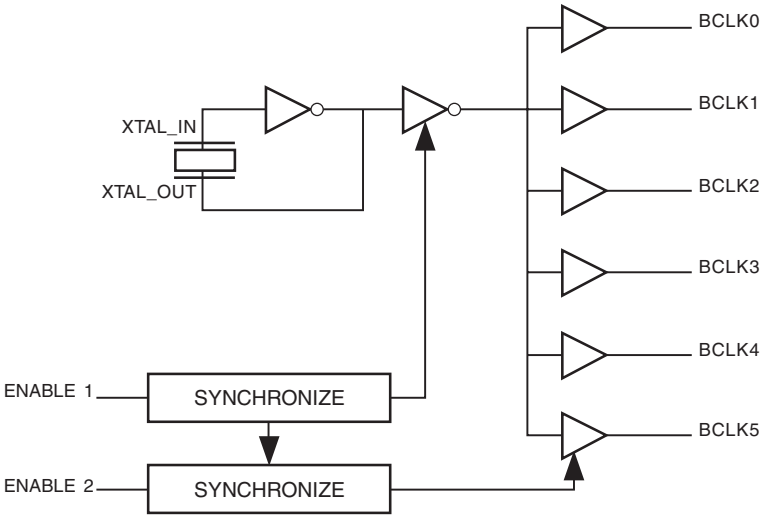
The ICS83905 is a low skew, 1-to-6 LVCMOS / LVTTL Fanout Buffer and a member of the HiPerClockS™ family of High Performance Clock Solutions from ICS. The ICS83905 single ended clock input accepts LVCMOS or LVTTL input levels. The low impedance LVCMOS/LVTTL outputs are designed to drive 50Ω series or parallel terminated transmission lines. The effective fanout can be increased from 6 to 12 by utilizing the ability of the outputs to drive two series terminated lines.

The ICS83905 is characterized at full 3.3V, 2.5V, and 1.8V, mixed 3.3V/2.5V, 3.3V/1.8V and 2.5V/1.8V output operating supply mode. Guaranteed output and part-to-part skew characteristics along with the 1.8V output capabilities makes the ICS83905 ideal for high performance, single ended applications that also require a limited output voltage.

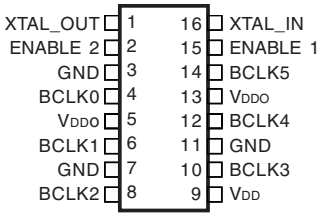
FEATURES

- 6 LVCMOS / LVTTL outputs
- Crystal oscillator interface
- Output frequency range: 10MHz to 50MHz
- Crystal input frequency range: 10MHz to 50MHz
- Output skew: 10ps (typical)
- 5V tolerant enable inputs
- Synchronous output enables
- Operating supply modes: Full 3.3V, 2.5V and 1.8V, mixed 3.3Vcore/2.5V or1.8V operating supply, and mixed 2.5V core/1.8V operating supply
- 0°C to 70°C ambient operating temperature
- Lead-Free package fully RoHS compliant
- Pin compatible to MPC905
- Industrial version available upon request

BLOCK DIAGRAM

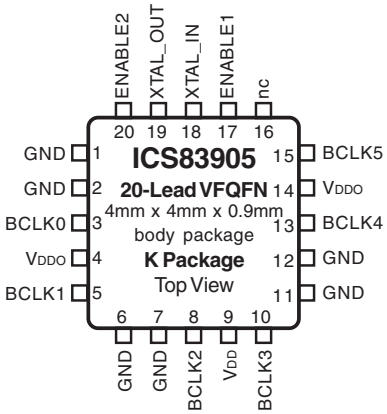


PIN ASSIGNMENT

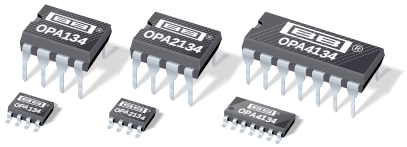


ICS83905
16-Lead SOIC
3.9mm x 9.9mm x 1.38mm body package
M Pacakge
Top View

ICS83905
16-Lead TSSOP
4.4mm x 3.0mm x 0.92mm body package
G Pacakge
Top View



BURR - BROWN®



OPA134
OPA2134
OPA4134

SoundPLUS™ High Performance AUDIO OPERATIONAL AMPLIFIERS

FEATURES

- SUPERIOR SOUND QUALITY
- ULTRA LOW DISTORTION: 0.00008%
- LOW NOISE: 8nV/√Hz
- TRUE FET-INPUT: I_B = 5pA
- HIGH SPEED:
  - SLEW RATE: 20V/µs
  - BANDWIDTH: 8MHz
- HIGH OPEN-LOOP GAIN: 120dB (600Ω)
- WIDE SUPPLY RANGE: ±2.5V to ±18V
- SINGLE, DUAL, AND QUAD VERSIONS

APPLICATIONS

- PROFESSIONAL AUDIO AND MUSIC
- LINE DRIVERS
- LINE RECEIVERS
- MULTIMEDIA AUDIO
- ACTIVE FILTERS
- PREAMPLIFIERS
- INTEGRATORS
- CROSSOVER NETWORKS

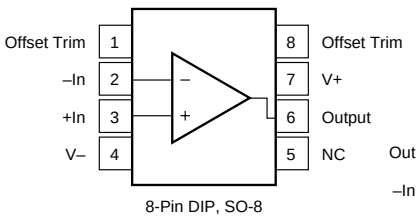
DESCRIPTION

The OPA134 series are ultra-low distortion, low noise operational amplifiers fully specified for audio applications. A true FET input stage was incorporated to provide superior sound quality and speed for exceptional audio performance. This in combination with high output drive capability and excellent dc performance allows use in a wide variety of demanding applications. In addition, the OPA134's wide output swing, to within 1V of the rails, allows increased headroom making it ideal for use in any audio circuit.

OPA134 op amps are easy to use and free from phase inversion and overload problems often found in common FET-input op amps. They can be operated from ±2.5V to ±18V power supplies. Input cascode circuitry provides excellent common-mode rejection and maintains low input bias current over its wide input voltage range, minimizing distortion. OPA134 series op amps are unity-gain stable and provide excellent dynamic behavior over a wide range of load conditions, including high load capacitance. The dual and quad versions feature completely independent circuitry for lowest crosstalk and freedom from interaction, even when overdriven or overloaded.

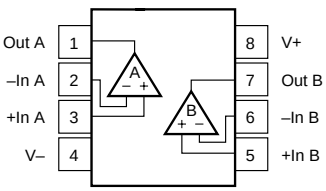
Single and dual versions are available in 8-pin DIP and SO-8 surface-mount packages in standard configurations. The quad is available in 14-pin DIP and SO-14 surface mount packages. All are specified for –40°C to +85°C operation. A SPICE macromodel is available for design analysis.

OPA134



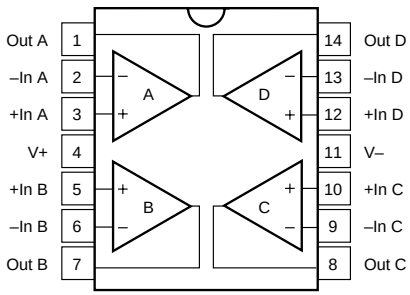
8-Pin DIP, SO-8

OPA2134



8-Pin DIP, SO-8

OPA4134



14-Pin DIP
SO-14

International Airport Industrial Park • Mailing Address: PO Box 11400, Tucson, AZ 85734 • Street Address: 6730 S. Tucson Blvd., Tucson, AZ 85706 • Tel: (520) 746-1111 • Twx: 910-952-1111
Internet: http://www.burr-brown.com/ • FAXLine: (800) 548-6133 (US/Canada Only) • Cable: BBRCORP • Telex: 066-6491 • FAX: (520) 889-1510 • Immediate Product Info: (800) 548-6132

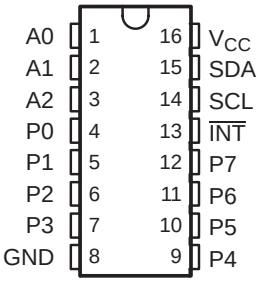
PDS-1339C

Printed in U.S.A. December, 1997

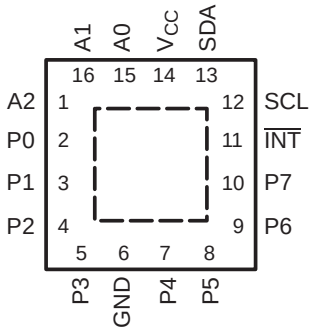
FEATURES

- **I²C to Parallel Port Expander**
- **Open-Drain Active-Low Interrupt Output**
- **Operating Power-Supply Voltage Range of 2.3 V to 5.5 V**
- **5-V Tolerant I/Os**
- **400-kHz Fast I²C Bus**
- **Three Hardware Address Pins Allow up to Eight Devices on the I²C/SMBus**
- **Input/Output Configuration Register**
- **Polarity Inversion Register**
- **Internal Power-On Reset**
- **Power-Up With All Channels Configured as Inputs**
- **No Glitch on Power-Up**
- **Latched Outputs With High-Current Drive Maximum Capability for Directly Driving LEDs**
- **Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II**
- **ESD Protection Exceeds JESD 22**
  - **2000-V Human-Body Model (A114-A)**
  - **200-V Machine Model (A115-A)**
  - **1000-V Charged-Device Model (C101)**

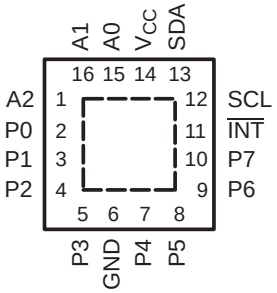
DB, DBQ, DGV, DW, OR PW PACKAGE (TOP VIEW)



RGV PACKAGE (TOP VIEW)



RGT PACKAGE (TOP VIEW)



DESCRIPTION/ORDERING INFORMATION

This 8-bit I/O expander for the two-line bidirectional bus (I^2C) is designed for 2.3-V to 5.5-V V_{CC} operation. It provides general-purpose remote I/O expansion for most microcontroller families via the I^2C interface [serial clock (SCL), serial data (SDA)].

The PCA9554A consists of one 8-bit Configuration (input or output selection), Input, Output, and Polarity Inversion (active high or active low) registers. At power-on, the I/Os are configured as inputs with a weak pull up to V_{CC}. However, the system master can enable the I/Os as either inputs or outputs by writing to the I/O configuration bits. The data for each input or output is kept in the corresponding Input or Output register. The polarity of the Input Port register can be inverted with the Polarity Inversion register. All registers can be read by the system master.

The system master can reset the PCA9554A in the event of a timeout or other improper operation by utilizing the power-on reset feature which puts the registers in their default state and initializes the I^2C/SMBus state machine.

The PCA9554A open-drain interrupt ($\overline{INT}$) output is activated when any input state differs from its corresponding Input Port register state and is used to indicate to the system master that an input state has changed.

$\overline{INT}$ can be connected to the interrupt input of a microcontroller. By sending an interrupt signal on this line, the remote I/O can inform the microcontroller if there is incoming data on its ports without having to communicate via the I^2C bus. Thus, the PCA9554A can remain a simple slave device.

The device's outputs (latched) have high-current drive capability for directly driving LEDs and low current consumption.

Two-Channel, Asynchronous Sample Rate Converter with Integrated Digital Audio Interface Receiver and Transmitter

FEATURES

- **Two-Channel Asynchronous Sample Rate Converter (SRC)**
  - **Dynamic Range with –60dB Input (A-Weighted): 144dB typical**
  - **Total Harmonic Distortion and Noise (THD+N) with Full-Scale Input: –140dB typical**
  - **Supports Audio Input and Output Data Word Lengths Up to 24 Bits**
  - **Supports Input and Output Sampling Frequencies Up to 216kHz**
  - **Automatic Detection of the Input-to-Output Sampling Ratio**
  - **Wide Input-to-Output Conversion Range: 16:1 to 1:16 Continuous**
  - **Excellent Jitter Attenuation Characteristics**
  - **Digital De-Emphasis Filtering for 32kHz, 44.1kHz, and 48kHz Input Sampling Rates**
  - **Digital Output Attenuation and Mute Functions**
  - **Output Word Length Reduction**
  - **Status Registers and Interrupt Generation for Sampling Ratio and Ready Flags**
- **Digital Audio Interface Transmitter (DIT)**
  - **Supports Sampling Rates Up to 216kHz**
  - **Includes Differential Line Driver and CMOS Buffered Outputs**
  - **Block-Sized Data Buffers for Both Channel Status and User Data**
  - **Status Registers and Interrupt Generation for Flag and Error Conditions**
- **User-Selectable Serial Host Interface: SPI or Philips I²C™**
  - **Provides Access to On-Chip Registers and Data Buffers**
- **Digital Audio Interface Receiver (DIR)**
  - **PLL Lock Range Includes Sampling Rates from 20kHz to 216kHz**
  - **Includes Four Differential Input Line Receivers and an Input Multiplexer**
  - **Bypass Multiplexer Routes Line Receiver Outputs to Line Driver and Buffer Outputs**
  - **Block-Sized Data Buffers for Both Channel Status and User Data**
  - **Automatic Detection of Non-PCM Audio Streams (DTS CD/LD and IEC 61937 formats)**
  - **Audio CD Q-Channel Sub-Code Decoding and Data Buffer**
  - **Status Registers and Interrupt Generation for Flag and Error Conditions**
  - **Low Jitter Recovered Clock Output**
- **Two Audio Serial Ports (Ports A and B)**
  - **Synchronous Serial Interface to External Signal Processors, Data Converters, and Logic**
  - **Slave or Master Mode Operation with Sampling Rates up to 216kHz**
  - **Supports Left-Justified, Right-Justified, and Philips I²S™ Data Formats**
  - **Supports Audio Data Word Lengths Up to 24 Bits**
- **Four General-Purpose Digital Outputs**
  - **Multifunction Programmable Via Control Registers**
- **Extensive Power-Down Support**
  - **Functional Blocks May Be Disabled Individually When Not In Use**
- **Operates From +1.8V Core and +3.3V I/O Power Supplies**
- **Small TQFP-48 Package, Compatible with the SRC4382 and DIX4192**

WM8740

24-bit, High Performance 192kHz Stereo DAC

Advanced Information, July 2000, Rev 1.7

DESCRIPTION

The WM8740 is a very high performance stereo DAC designed for audio applications such as CD, DVD, home theatre systems, set top boxes and digital TV. The WM8740 supports data input word lengths from 16 to 24-bits and sampling rates up to 192kHz. The WM8740 consists of a serial interface port, digital interpolation filter, multi-bit sigma delta modulator and stereo DAC in a small 28-pin SSOP package. The WM8740 also includes a digitally controllable mute and attenuator function on each channel.

The internal digital filter has two selectable roll-off characteristics. A sharp or slow roll-off can be selected dependent on application requirements. Additionally, the internal digital filter can be by-passed and the WM8740 used with an external digital filter.

The WM8740 supports two connection schemes for audio DAC control. The SPI-compatible serial control port provides access to a wide range of features including on-chip mute, attenuation and phase reversal. A hardware controllable interface is also available.

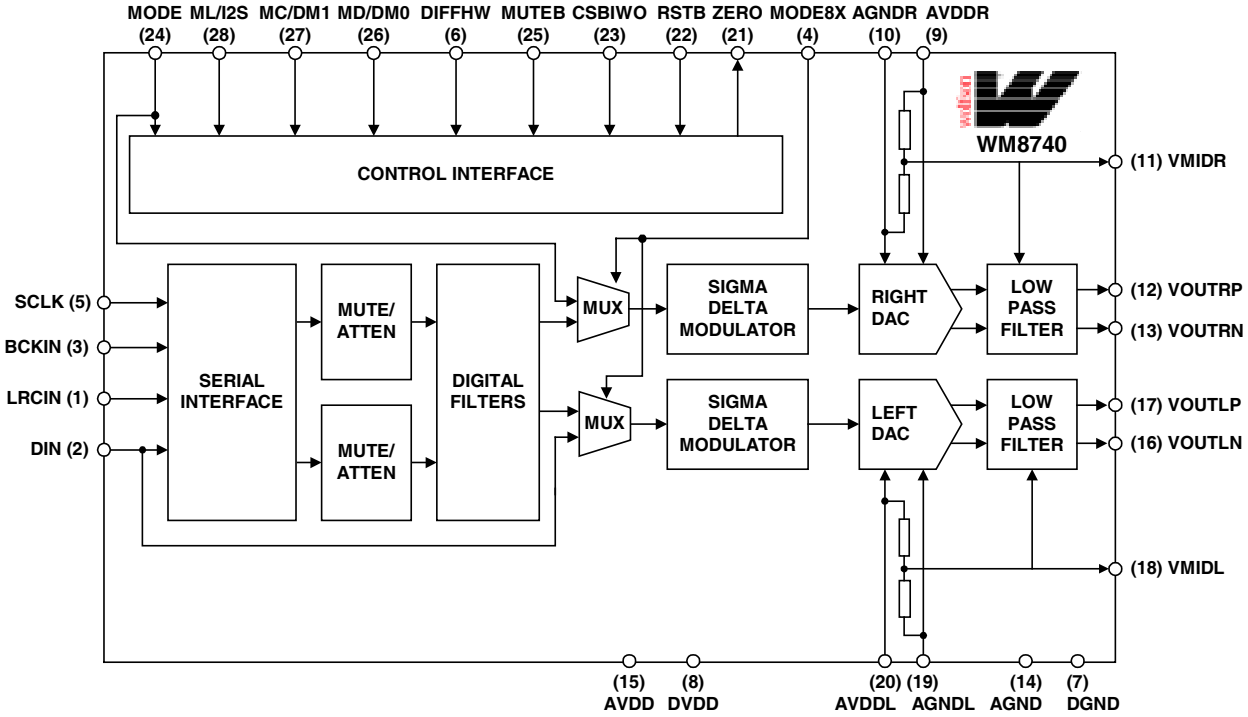
FEATURES

- 120dB SNR ('A' weighted mono @48kHz), THD+N: -104dB @ FS
- 117dB SNR ('A' weighted stereo @48kHz), THD+N: -104dB @ FS
- Sampling frequency: 8kHz to 192kHz
- Selectable digital filter roll-off
- Optional interface to industry standard external filters
- Differential mono mode needing no glue logic
- Input data word: 16 to 24-bit
- Hardware or SPI compatible serial port control modes:
  - Hardware mode: mute, de-emphasis, audio format control
  - Serial mode: mute, de-emphasis, attenuation (256 steps), phase reversal
- Fully differential voltage outputs

APPLICATIONS

- CD, DVD audio
- Home theatre systems
- Professional audio systems

BLOCK DIAGRAM



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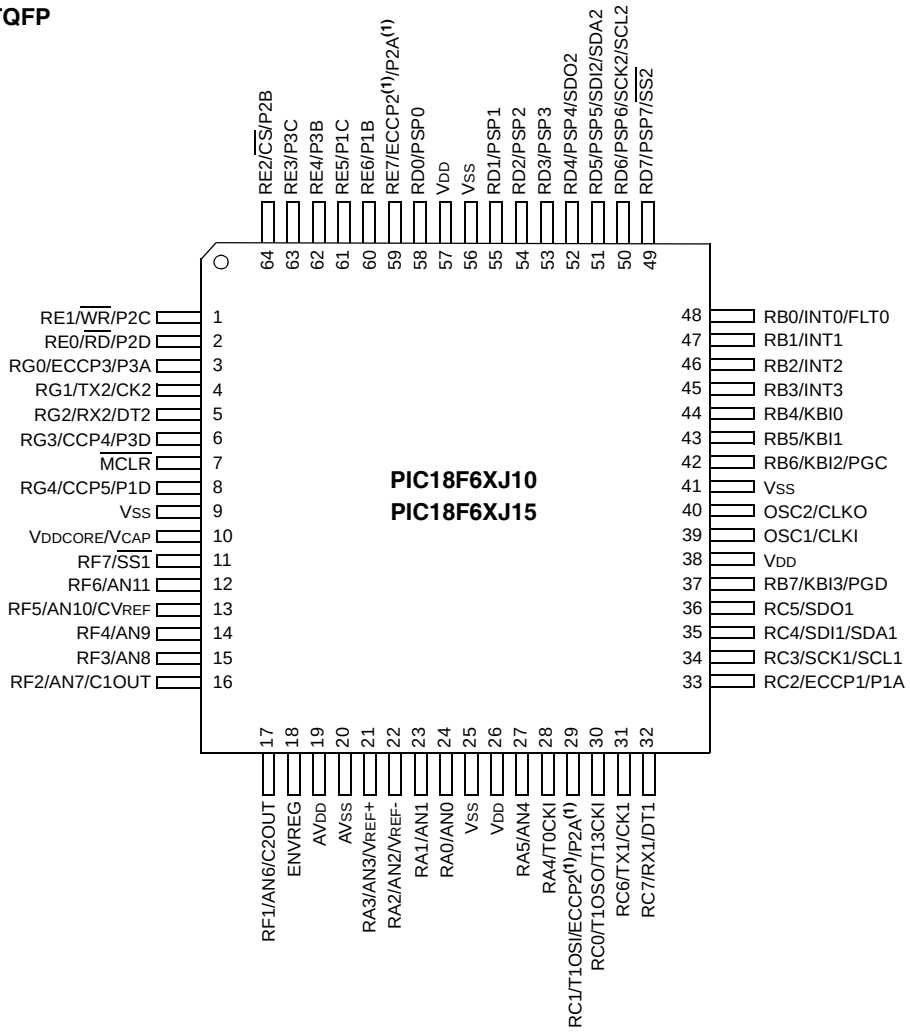
http://www.wolfson.co.uk

Advanced Information data sheets contain preliminary data on new products in the preproduction phase of development. Supplementary data will be published at a later date.

Device	Program Memory		SRAM Data Memory (bytes)	I/O	10-bit A/D (ch)	CCP/ ECCP (PWM)	MSSP			EUSART	Comparators	Timers 8/16-bit	External Bus
	Flash (bytes)	# Single-Word Instructions						SPI™	Master I^2C™				
PIC18F65J10	32K	16384	2048	50	11	2/3	2	Y	Y	2	2	2/3	N
PIC18F65J15	48K	24576	2048	50	11	2/3	2	Y	Y	2	2	2/3	N
PIC18F66J10	64K	32768	2048	50	11	2/3	2	Y	Y	2	2	2/3	N
PIC18F66J15	96K	49152	3936	50	11	2/3	2	Y	Y	2	2	2/3	N
PIC18F67J10	128K	65536	3936	50	11	2/3	2	Y	Y	2	2	2/3	N
PIC18F85J10	32K	16384	2048	66	15	2/3	2	Y	Y	2	2	2/3	Y
PIC18F85J15	48K	24576	2048	66	15	2/3	2	Y	Y	2	2	2/3	Y
PIC18F86J10	64K	32768	2048	66	15	2/3	2	Y	Y	2	2	2/3	Y
PIC18F86J15	96K	49152	3936	66	15	2/3	2	Y	Y	2	2	2/3	Y
PIC18F87J10	128K	65536	3936	66	15	2/3	2	Y	Y	2	2	2/3	Y

Pin Diagrams

64-Pin TQFP



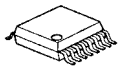
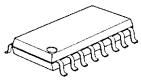
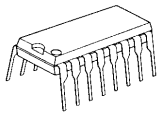
Note 1: The ECCP2/P2A pin placement depends on the setting of the CCP2MX configuration bit.

2-CHANNEL ELECTRONIC VOLUME

■ GENERAL DESCRIPTION

NJW1159 is a two channel electronic volume IC. It is included output buffer amplifier and also resistor output terminal for using external amplifier to customize for your application. These functions are controlled by three-wired serial data. And the chip selector is available for using four chips on same serial bus line. It's available for two-channel stereo and or multi-channel audio volume.

■ PACKAGE OUTLINE

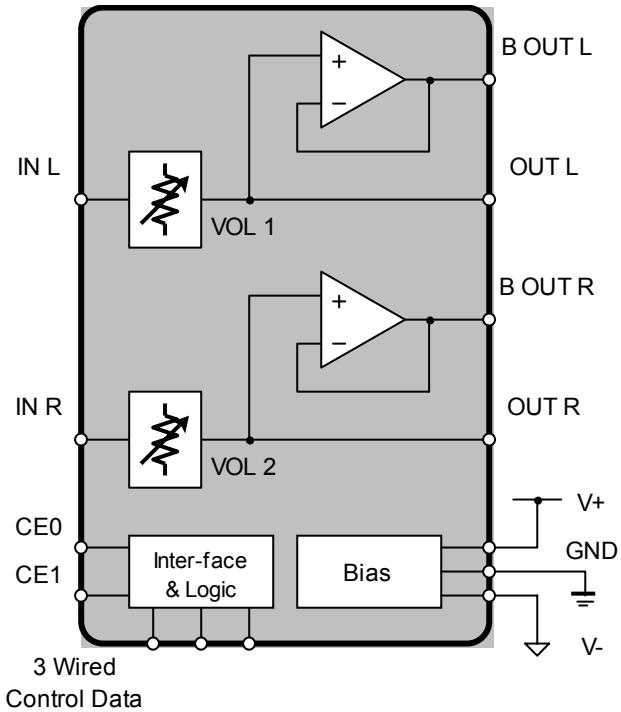




NJW1159V **NJW1159M** **NJW1159D**

■ FEATURES

● Operating Voltage	±4.5 to ±7.5V
● Three-Wired Serial Data Control	
● Chip Selector	available for using four chips on same serial bus line.
● Volume	0 to -95dB/1dBstep, MUTE
● Bi-CMOS Technology	
● Package Outline	SSOP16, DMP16, DIP16

■ BLOCK DIAGRAM



National Semiconductor

November 2004

LM137/LM337
3-Terminal Adjustable Negative Regulators

General Description

The LM137/LM337 are adjustable 3-terminal negative voltage regulators capable of supplying in excess of –1.5A over an output voltage range of –1.2V to –37V. These regulators are exceptionally easy to apply, requiring only 2 external resistors to set the output voltage and 1 output capacitor for frequency compensation. The circuit design has been optimized for excellent regulation and low thermal transients. Further, the LM137 series features internal current limiting, thermal shutdown and safe-area compensation, making them virtually blowout-proof against overloads.

The LM137/LM337 serve a wide variety of applications including local on-card regulation, programmable-output voltage regulation or precision current regulation. The LM137/LM337 are ideal complements to the LM117/LM317 adjustable positive regulators.

Features

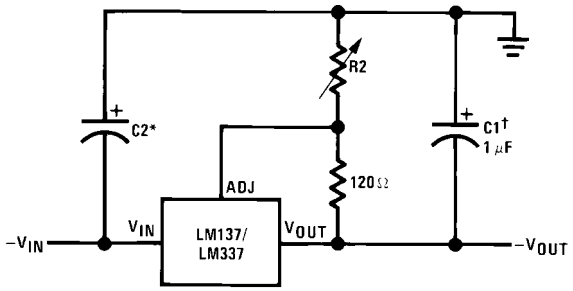
- Output voltage adjustable from –1.2V to –37V
- 1.5A output current guaranteed, –55˚C to +150˚C
- Line regulation typically 0.01%/V
- Load regulation typically 0.3%
- Excellent thermal regulation, 0.002%/W
- 77 dB ripple rejection
- Excellent rejection of thermal transients
- 50 ppm/˚C temperature coefficient
- Temperature-independent current limit
- Internal thermal overload protection
- P+ Product Enhancement tested
- Standard 3-lead transistor package
- Output is short circuit protected

LM137 Series Packages and Power Capability

Device	Package	Rated Power Dissipation	Design Load Current
LM137/337	TO-3 (K)	20W	1.5A
	TO-39 (H)	2W	0.5A
LM337	TO-220 (T)	15W	1.5A
LM337	SOT-223 (MP)	2W	1A

Typical Applications

Adjustable Negative Voltage Regulator



00906701

Full output current not available at high input-output voltages

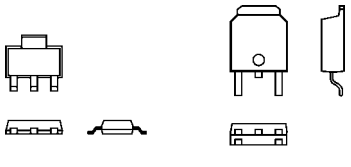
$$-V_{OUT} = -1.25V\left(1 + \frac{R2}{120}\right) + \left(-I_{ADJ} \times R2\right)$$

†C1 = 1 µF solid tantalum or 10 µF aluminum electrolytic required for stability

*C2 = 1 µF solid tantalum is required only if regulator is more than 4" from power-supply filter capacitor

Output capacitors in the range of 1 µF to 1000 µF of aluminum or tantalum electrolytic are commonly used to provide improved output impedance and rejection of transients

Comparison between SOT-223 and D-Pak (TO-252) Packages



00906731

Scale 1:1

National Semiconductor

August 1999

LM117/LM317A/LM317 3-Terminal Adjustable Regulator

General Description

The LM117 series of adjustable 3-terminal positive voltage regulators is capable of supplying in excess of 1.5A over a 1.2V to 37V output range. They are exceptionally easy to use and require only two external resistors to set the output voltage. Further, both line and load regulation are better than standard fixed regulators. Also, the LM117 is packaged in standard transistor packages which are easily mounted and handled.

In addition to higher performance than fixed regulators, the LM117 series offers full overload protection available only in IC's. Included on the chip are current limit, thermal overload protection and safe area protection. All overload protection circuitry remains fully functional even if the adjustment terminal is disconnected.

Normally, no capacitors are needed unless the device is situated more than 6 inches from the input filter capacitors in which case an input bypass is needed. An optional output capacitor can be added to improve transient response. The adjustment terminal can be bypassed to achieve very high ripple rejection ratios which are difficult to achieve with standard 3-terminal regulators.

Besides replacing fixed regulators, the LM117 is useful in a wide variety of other applications. Since the regulator is "floating" and sees only the input-to-output differential voltage, supplies of several hundred volts can be regulated as long as the maximum input to output differential is not exceeded, i.e., avoid short-circuiting the output.

Also, it makes an especially simple adjustable switching regulator, a programmable output regulator, or by connecting a fixed resistor between the adjustment pin and output, the LM117 can be used as a precision current regulator. Supplies with electronic shutdown can be achieved by clamping the adjustment terminal to ground which programs the output to 1.2V where most loads draw little current.

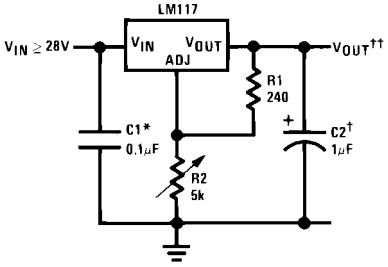
For applications requiring greater output current, see LM150 series (3A) and LM138 series (5A) data sheets. For the negative complement, see LM137 series data sheet.

Features

- Guaranteed 1% output voltage tolerance (LM317A)
- Guaranteed max. 0.01%/V line regulation (LM317A)
- Guaranteed max. 0.3% load regulation (LM117)
- Guaranteed 1.5A output current
- Adjustable output down to 1.2V
- Current limit constant with temperature
- P^+ Product Enhancement tested
- 80 dB ripple rejection
- Output is short-circuit protected

Typical Applications

1.2V–25V Adjustable Regulator



DS009063-1

Full output current not available at high input-output voltages

*Needed if device is more than 6 inches from filter capacitors.

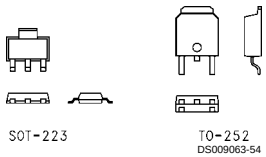
†Optional — improves transient response. Output capacitors in the range of 1 μF to 1000 μF of aluminum or tantalum electrolytic are commonly used to provide improved output impedance and rejection of transients.

$$\dagger\dagger V_{OUT} = 1.25V\left(1 + \frac{R2}{R1}\right) + I_{ADJ}(R_2)$$

LM117 Series Packages

Part Number Suffix	Package	Design Load Current
K	TO-3	1.5A
H	**TO-39**	**0.5A**
T	TO-220	1.5A
E	**LCC**	**0.5A**
S	TO-263	1.5A
EMP	SOT-223	1A
MDT	**TO-252**	**0.5A**

SOT-223 vs D-Pak (TO-252) Packages



DS009063-54

Scale 1:1

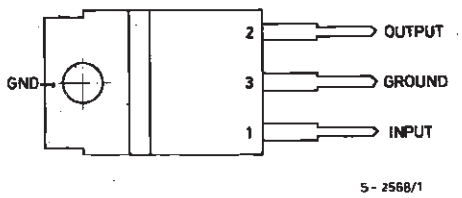
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_i	DC Input Voltage (for V_O = 5 to 18V) (for V_O = 20, 24V)	35 40	V V
I_o	Output Current	Internally limited	
P_{tot}	Power Dissipation	Internally limited	
T_{op}	Operating Junction Temperature Range (for **L7800**) (for **L7800C**)	-55 to 150 0 to 150	°C °C
T_{stg}	Storage Temperature Range	-65 to 150	°C

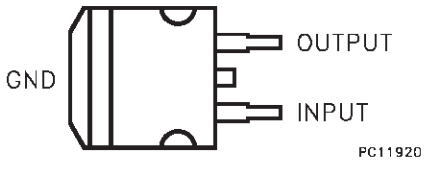
THERMAL DATA

Symbol	Parameter		D^2PAK	TO-220	TO-220FP	TO-3	Unit
$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	3	3	5	4	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5	50	60	35	°C/W

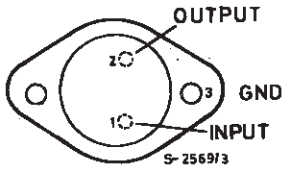
CONNECTION DIAGRAM AND ORDERING NUMBERS (top view)



TO-220 & TO-220FP



D^2PAK



TO-3

Type	TO-220	D^2PAK (*)	TO-220FP	TO-3	Output Voltage
L7805				L7805T	5V
L7805C	L7805CV	L7805CD2T	L7805CP	L7805CT	5V
L7852C	L7852CV	L7852CD2T	L7852CP	L7852CT	5.2V
L7806				L7806T	6V
L7806C	L7806CV	L7806CD2T	L7806CP	L7806CT	6V
L7808				L7808T	8V
L7808C	L7808CV	L7808CD2T	L7808CP	L7808CT	8V
L7885C	L7885CV	L7885CD2T	L7885CP	L7885CT	8.5V
L7809C	L7809CV	L7809CD2T	L7809CP	L7809CT	9V
L7812				L7812T	12V
L7812C	L7812CV	L7812CD2T	L7812CP	L7812CT	12V
L7815				L7815T	15V
L7815C	L7815CV	L7815CD2T	L7815CP	L7815CT	15V
L7818				L7818T	18V
L7818C	L7818CV	L7818CD2T	L7818CP	L7818CT	18V
L7820				L7820T	20V
L7820C	L7820CV	L7820CD2T	L7820CP	L7820CT	20V
L7824				L7824T	24V
L7824C	L7824CV	L7824CD2T	L7824CP	L7824CT	24V

(*) AVAILABLE IN TAPE AND REEL WITH "-TR" SUFFIX

Advanced Monolithic Systems

AMS1085CT

3A LOW DROPOUT VOLTAGE REGULATOR

FEATURES

- **Three Terminal Adjustable or Fixed Voltages 1.5V, 2.5V, 2.85V, 3.0V, 3.3V, 3.5V and 5.0V**
- **Output Current of 3A**
- **Operates Down to 1V Dropout**
- **Load Regulation: 0.1%**
- **Line Regulation: 0.015%**
- **TO-220, TO-263 and TO-252 packages available**

APPLICATIONS

- **High Efficiency Linear Regulators**
- **Post Regulators for Switching Supplies**
- **Microprocessor Supply**
- **Battery Chargers**
- **Constant Current Regulators**
- **Notebook/Personal Computer Supplies**
- **Portable Instrumentation**

GENERAL DESCRIPTION

The AMS1085 series of adjustable and fixed voltage regulators are designed to provide 3A output current and to operate down to 1V input-to-output differential. The dropout voltage of the device is guaranteed maximum 1.5V at maximum output current, decreasing at lower load currents.

On-chip trimming adjusts the reference voltage to 1%. Current limit is also trimmed, minimizing the stress under overload conditions on both the regulator and power source circuitry.

The AMS1085 devices are pin compatible with older three-terminal regulators and are offered in 3 lead TO-220 package, 3 and 2 lead TO-263 (Plastic DD) and TO-252 (D PAK) package.

ORDERING INFORMATION:

PACKAGE TYPE			OPERATING JUNCTION
3 LEAD TO-220	2&3 LEAD TO-263	TO-252	TEMPERATURE RANGE
AMS1085CT	AMS1085CM	AMS1085CD	0 to 125° C
AMS1085CT-1.5	AMS1085CM-1.5	AMS1085CD-1.5	0 to 125° C
AMS1085CT-2.5	AMS1085CM-2.5	AMS1085CD-2.5	0 to 125° C
AMS1085CT-2.85	AMS1085CM-2.85	AMS1085CD-2.85	0 to 125° C
AMS1085CT-3.0	AMS1085CM-3.0	AMS1085CD-3.0	0 to 125° C
AMS1085CT-3.3	AMS1085CM-3.3	AMS1085CD-3.3	0 to 125° C
AMS1085CT-3.5	AMS1085CM-3.5	AMS1085CD-3.5	0 to 125° C
AMS1085CT-5.0	AMS1085CM-5.0	AMS1085CD-5.0	0 to 125° C

PIN CONNECTIONS

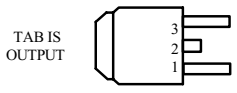
FIXED VERSION

1- Ground
2- V_{OUT}
3- V_{IN}

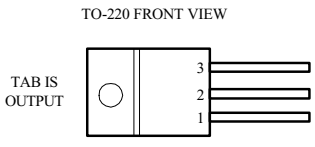
ADJUSTABLE VERSION

1- Adjust
2- V_{OUT}
3- V_{IN}

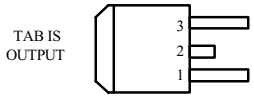
TO-252 FRONT VIEW



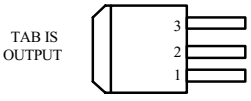
TO-220 FRONT VIEW



2L TO-263 FRONT VIEW



3L TO-263 FRONT VIEW



Advanced Monolithic Systems, Inc. 6680B Sierra Lane, Dublin, CA 94568 Phone (925) 556-9090 Fax (925) 556-9140

Low Cost, General Purpose High Speed JFET Amplifier

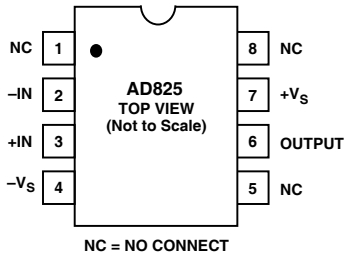
AD825

FEATURES
High Speed
41 MHz, –3 dB Bandwidth
125 V/μs Slew Rate
80 ns Settling Time
Input Bias Current of 20 pA and Noise Current of 10 fA/√Hz
Input Voltage Noise of 12 nV/√Hz
Fully Specified Power Supplies: ±5 V to ±15 V
Low Distortion: –76 dB at 1 MHz
High Output Drive Capability
Drives Unlimited Capacitance Load
50 mA Min Output Current
No Phase Reversal When Input Is at Rail
Available in 8-Lead SOIC

APPLICATIONS
CCD
Low Distortion Filters
Mixed Gain Stages
Audio Amplifier
Photo Detector Interface
ADC Input Buffer
DAC Output Buffer

CONNECTION DIAGRAM

8-Lead Plastic SOIC (R) Package



NC = NO CONNECT

PRODUCT DESCRIPTION

The AD825 is a superbly optimized operational amplifier for high speed, low cost and dc parameters, making it ideally suited for a broad range of signal conditioning and data acquisition applications. The ac performance, gain, bandwidth, slew rate and drive capability are all very stable over temperature. The AD825 also maintains stable gain under varying load conditions.

The unique input stage has ultralow input bias current and ultralow input current noise. Signals that go to either rail on this high performance input do not cause phase reversals at the output. These features make the AD825 a good choice as a buffer for MUX outputs, creating minimal offset and gain errors.

The AD825 is fully specified for operation with dual ±5 V and ±15 V supplies. This power supply flexibility, and the low supply current of 6.5 mA with excellent ac characteristics under all supply conditions, makes the AD825 well suited for many demanding applications.

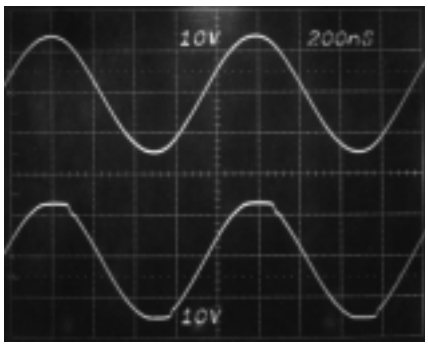


Figure 1. Performance with Rail-to-Rail Input Signals

REV. C

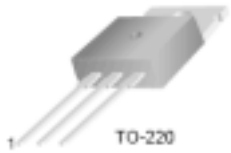
One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781/329-4700 World Wide Web Site: http://www.analog.com
Fax: 781/326-8703

FAIRCHILD SEMICONDUCTOR®

July 2008

TIP31/TIP31A/TIP31B/TIP31C
NPN Epitaxial Silicon Transistor

Features
- Complementary to TIP32/TIP32A/TIP32B/TIP32C



1. Base 2. Collector 3. Emitter

Absolute Maximum Ratings T_C=25°C unless otherwise noted

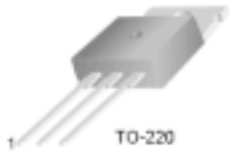
Symbol	Parameter	Value	Units
V_{CBO}	Collector-Base Voltage : TIP31 : TIP31A : TIP31B : TIP31C	40 60 80 100	V V V V
V_{CEO}	Collector-Emitter Voltage : TIP31 : TIP31A : TIP31B : TIP31C	40 60 80 100	V V V V
V_{EBO}	Emitter-Base Voltage	5	V
I_C	Collector Current (DC)	3	A
I_{CP}	Collector Current (Pulse)	5	A
I_B	Base Current	1	A
P_C	Collector Dissipation (T_C=25°C)	40	W
	Collector Dissipation (T_a=25°C)	2	W
T_J	Junction Temperature	150	°C
T_{STG}	Storage Temperature	- 65 ~ 150	°C

FAIRCHILD SEMICONDUCTOR®

July 2008

TIP32/TIP32A/TIP32B/TIP32C
PNP Epitaxial Silicon Transistor

Features
- Complementary to TIP31/TIP31A/TIP31B/TIP31C



1. Base 2. Collector 3. Emitter

Absolute Maximum Ratings T_C=25°C unless otherwise noted

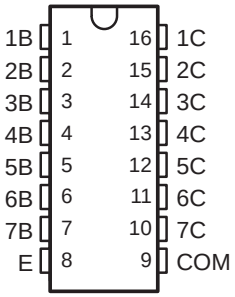
Symbol	Parameter	Value	Units
V_{CBO}	Collector-Base Voltage : TIP32 : TIP32A : TIP32B : TIP32C	- 40 - 60 - 80 - 100	V V V V
V_{CEO}	Collector-Emitter Voltage : TIP32 : TIP32A : TIP32B : TIP32C	- 40 - 60 - 80 -100	V V V V
V_{EBO}	Emitter-Base Voltage	- 5	V
I_C	Collector Current (DC)	- 3	A
I_{CP}	Collector Current (Pulse)	- 5	A
I_B	Base Current	- 3	A
P_C	Collector Dissipation (T_C=25°C)	40	W
	Collector Dissipation (T_a=25°C)	2	W
T_J	Junction Temperature	150	°C
T_{STG}	Storage Temperature	- 65 ~ 150	°C

SLRS027 – DECEMBER 1976 – REVISED APRIL 1993

HIGH-VOLTAGE HIGH-CURRENT DARLINGTON TRANSISTOR ARRAYS

- **500-mA Rated Collector Current (Single Output)**
- **High-Voltage Outputs . . . 50 V**
- **Output Clamp Diodes**
- **Inputs Compatible With Various Types of Logic**
- **Relay Driver Applications**
- **Designed to Be Interchangeable With Sprague ULN2001A Series**

D OR N PACKAGE
(TOP VIEW)

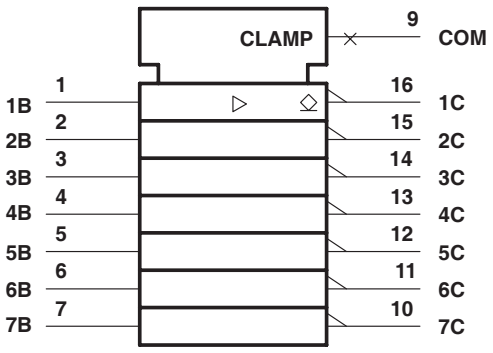


description

The ULN2001A, ULN2002A, ULN2003A, and ULN2004A are monolithic high-voltage, high-current Darlington transistor arrays. Each consists of seven npn Darlington pairs that feature high-voltage outputs with common-cathode clamp diodes for switching inductive loads. The collector-current rating of a single Darlington pair is 500 mA. The Darlington pairs may be paralleled for higher current capability. Applications include relay drivers, hammer drivers, lamp drivers, display drivers (LED and gas discharge), line drivers, and logic buffers. For 100-V (otherwise interchangeable) versions, see the SN75465 through SN75469.

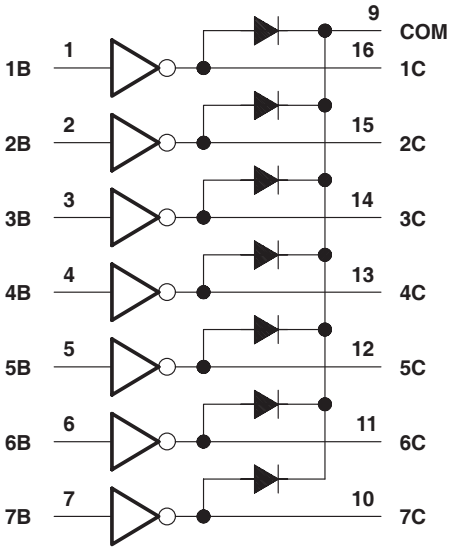
The ULN2001A is a general-purpose array and can be used with TTL and CMOS technologies. The ULN2002A is specifically designed for use with 14- to 25-V PMOS devices. Each input of this device has a zener diode and resistor in series to control the input current to a safe limit. The ULN2003A has a 2.7-kΩ series base resistor for each Darlington pair for operation directly with TTL or 5-V CMOS devices. The ULN2004A has a 10.5-kΩ series base resistor to allow its operation directly from CMOS devices that use supply voltages of 6 to 15 V. The required input current of the ULN2004A is below that of the ULN2003A, and the required voltage is less than that required by the ULN2002A.

logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram



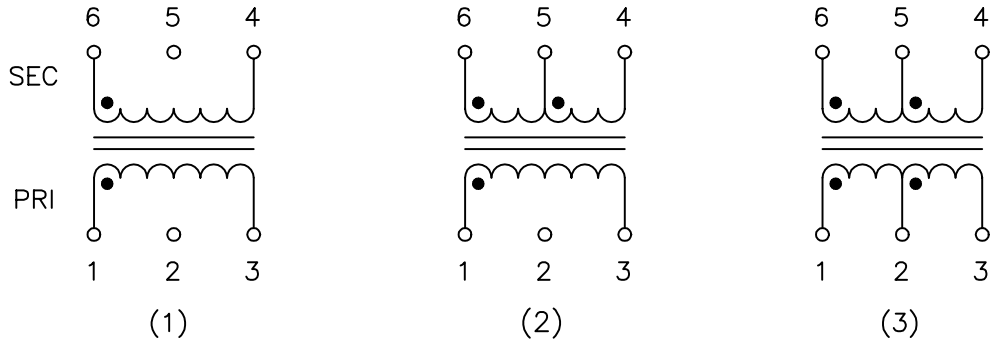
Wide Band RF Transformer
for Set-Top Box and Cable Modem Applications

Hanrun Electronics Company Limited

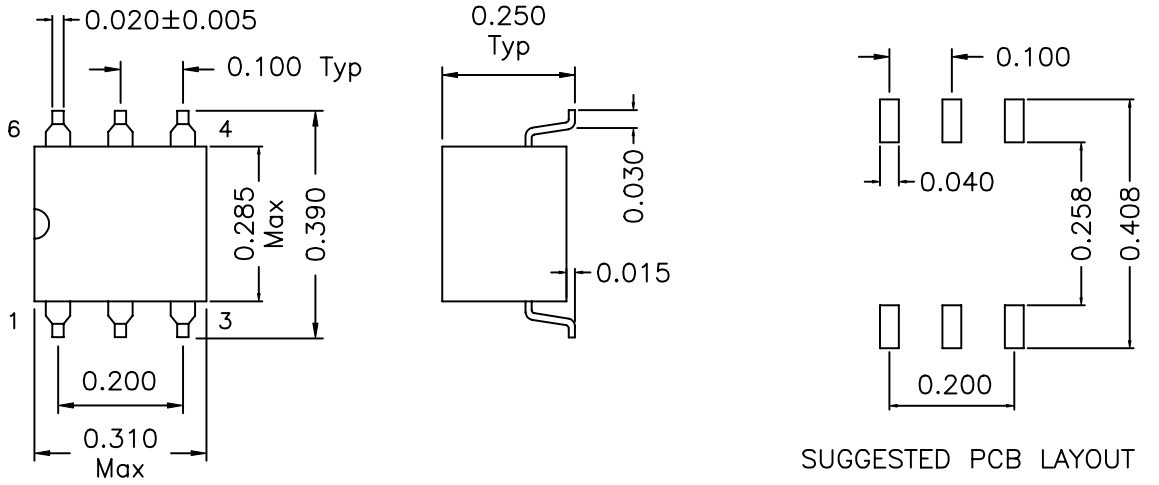
Electrical Specification @25°C

Part Number	Schematic	Impedance Ratio	Frequency Bandwidth (MHz)	PIN1–3 OCL uH (Min)	PIN1–3 DCR ohm (Max)	PIN6–4 OCL uH (Min)	PIN6–4 DCR ohm (Max)
HR600601	(1)	1:1	0.005 ~ 100	780	0.320	780	0.320
HR600602	(1)	1:1	0.04 ~ 175	95	0.200	95	0.200
HR600603	(1)	1.5:1	0.1 ~ 150	80	0.145	51	0.130
HR600604	(1)	4:1	0.2 ~ 300	95	0.160	25	0.115
HR600605	(2)	1:1	0.005 ~ 100	780	0.320	780	0.320
HR600606	(2)	1:1	0.04 ~ 175	95	0.200	95	0.200
HR600607	(2)	4:1	0.2 ~ 300	95	0.160	25	0.115
HR600608	(3)	1:1	0.005 ~ 100	780	0.320	780	0.320
HR600609	(4)	1:1	0.04 ~ 175	95	0.200	95	0.200
HR600610	(5)	1.5:1	0.1 ~ 150	80	0.145	51	0.130
HR600611	(6)	4:1	0.2 ~ 300	95	0.160	25	0.115

Schematics



Mechanical Dimensions



SUGGESTED PCB LAYOUT

Part No.:	Unless otherwise specified, Tol.:	Rev: A	DRWN:	Date:
Dimensions in inches	.xxx ±0.010	Page 1/1	APPD:	Date:

T l (07C0) 21210C7 2121C79 • F (07C0) 21210C5 • E M `l h @ l h h J • htt h

1 Second Generation Aureus™ DSPs

1.1 Features

- DA708/B/DA788B: 32-/64-Bit 250-/266-MHz Floating-Point DSP
- Upgrades to C67x+ CPU From DA6xx Family:
  - 2X CPU Registers [64 General-Purpose]
  - New Audio-Specific Instructions
  - Compatible With the DA6xx C67x CPU
- Enhanced Memory System
  - 256K-Byte Unified Program/Data RAM
  - 768K-Byte Unified Program/Data ROM
  - Single-Cycle Data Access From CPU
  - Large Program Cache (32K-Byte) Supports RAM, ROM, and External Memory
- External Memory Interface (EMIF) Supports:
  - 100-/133-MHz SDRAM (16-Bit)
  - Async NOR Flash, SRAM (8- or 16-Bit)
  - NAND Flash (8- or 16-Bit)
- Enhanced I/O System
  - High-Performance Crossbar Switch
  - Dedicated McASP DMA Bus
  - Deterministic I/O Performance
- dMAX Dual Data Movement Accelerator:
  - Memory-to-Memory Transfers
  - Memory-to-Peripheral Transfers
  - Packing/Unpacking Delay Data
  - Circular Addressing
  - Non-Sequential Addressing for Reverb
- Three Multichannel Audio Serial Ports
  - Transmit/Receive Clocks up to 50 MHz
  - Five Clock Zones and 16 Serial Data Pins
  - Supports TDM, I2S, and Similar Formats
  - DIT Only (McASP2)
- Two 10-MHz SPI Ports With 3-, 4-, and 5-Pin Options
- Two Inter-Integrated Circuit (I2C) Ports
- Real-Time Interrupt Counter/Watchdog
- Oscillator- and Software-Controlled PLL
- Commercial or Extended Temperature
- 144-Pin, 0.5-mm, PowerPAD™ Thin Quad Flatpack (TQFP) [RFP Suffix]
- Security Features Available

- Applications
  - A/V and DVD Receiver
  - Multizone A/V Receiver
  - HDD Jukebox
  - Navigation Systems
  - High-Speed Encode With Simultaneous Multichannel Decode
- Software Support
  - Dolby® Digital, Dolby® Digital EX, Dolby® Digital Plus, Dolby® TrueHD, Dolby® Pro Logic® IIx, Dolby® Headphone, Dolby® Virtual Surround,
  - DTS®5.1, DTS-ES™ 6.1, DTS Neo:6™, DTS 96/24™, DTS-ES 96/24™, DTS-HD™ (DA788B only)
  - MPEG-2 AAC LC Decode
  - MPEG-4 AAC LC Encode/Decode
  - THX® Select 2, THX® Ultra 2, Neural-THX® Surround
  - MP3 Encode, MP3 Decode
  - WMA8 Encode, WMA9 Decode
  - HDCD® Decode
  - ATRAC3plus® Encode, ATRAC3plus® Decode
  - Audyssey MultEQ XT®, MultEQ®, PrevEQ®, 2EQ®
  - SRS® Circle Surround™ II (CS II)
  - TI Bass Boost
  - TI Perfect Playback™ Compressed Audio Enhancer
  - TI Virtualizer/Headphone
  - TI Effects Library
  - TI DSD-to-PCM Decode
  - TI Filter Library
  - TI Performance Audio Framework (PA/F)
  - TI DSP/BIOS™
  - Chip Support Library and DSP Library

1.2 Trademarks

Aureus, Perfect Playback, DSP/BIOS, PowerPAD, TMS320C6000, C6000, Code Composer Studio, XDS, TMS320, TMS320C62x, and TMS320C67x are trademarks of Texas Instruments.

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SRS is a registered trademark of SRS Labs, Inc. in the U.S. and selected foreign countries.

Circle Surround II is a trademark of SRS Labs, Inc.

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DTS is a registered trademark of Digital Theater Systems, Inc.

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ATRAC3plus is a registered trademark of Sony Corporation in Japan and/or other countries/territories.

THX is a registered trademark of THX Ltd.

All trademarks are the property of their respective owners.

2.13 Pin Maps

Figure 2-2 shows the pin assignments on the 144-pin RFP package.

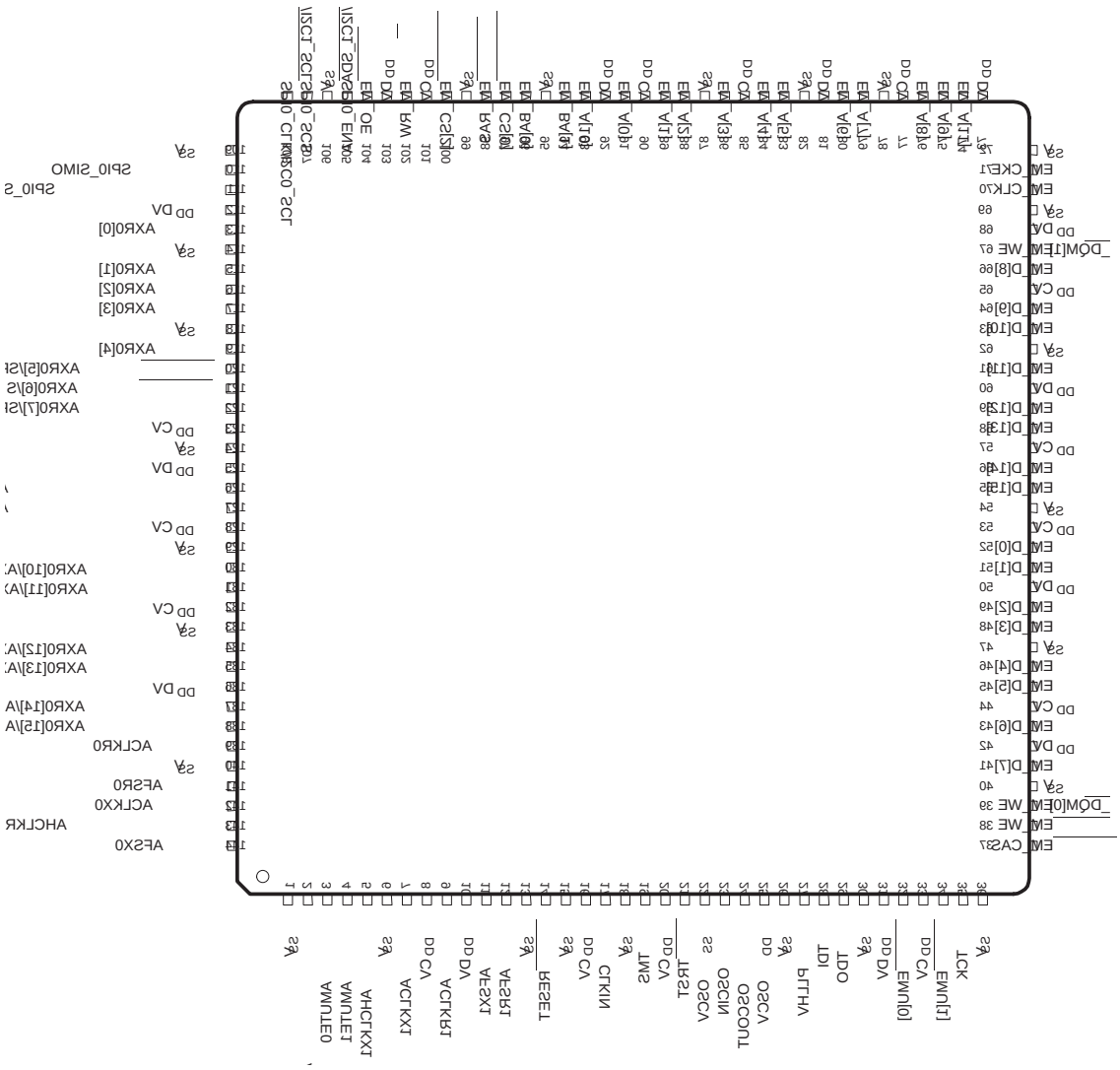
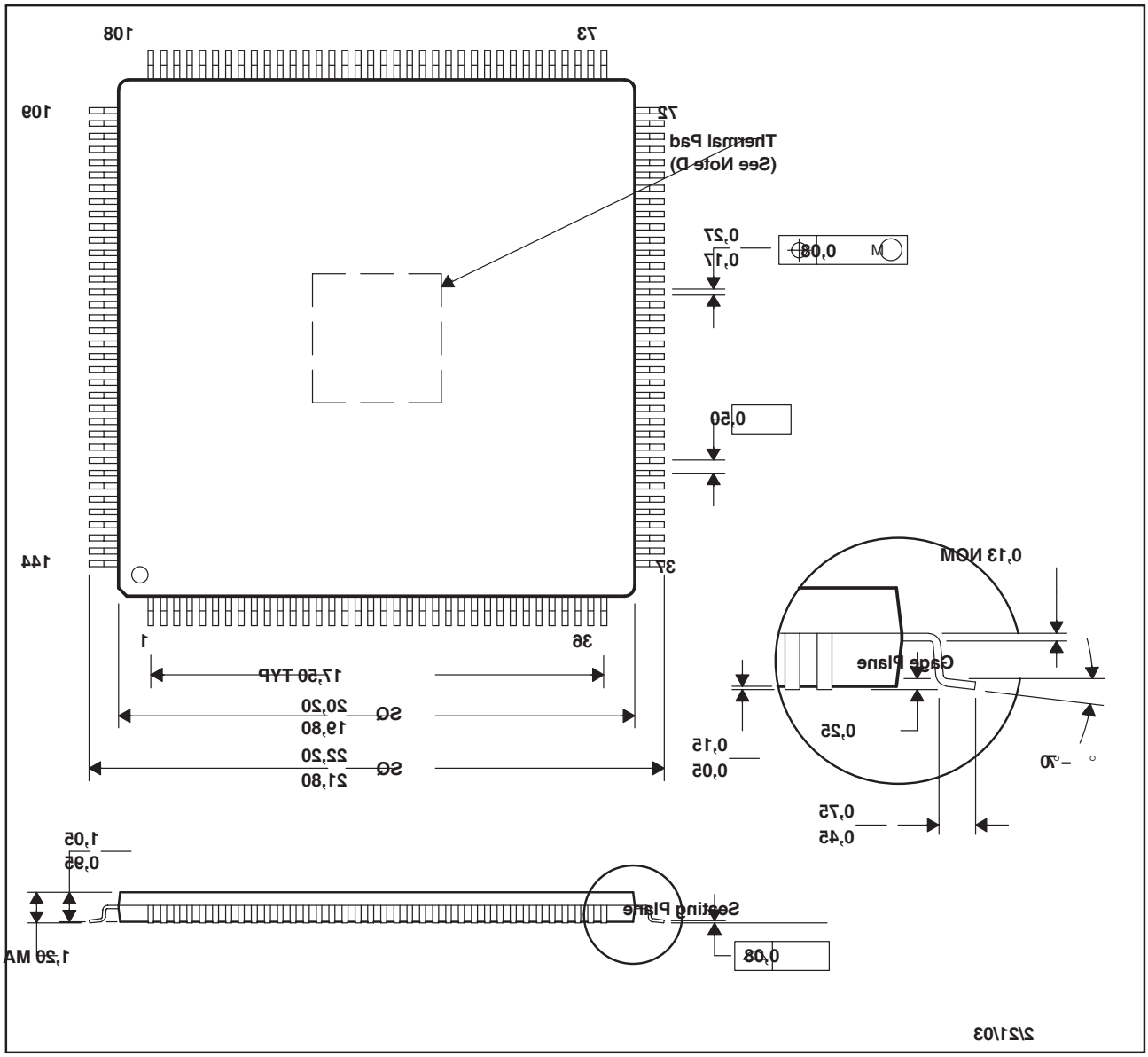


Figure 2-2. 144-Pin Low-Profile Quad Flatpack (RFP Suffix)—Top View

5.3 PowerPAD™ Plastic Quad Flatpack Mechanical Data Drawing (RFP)

DA708/B/DA788B Device-Specific RFP (S-PQFP-G144) PowerPAD™ PLASTIC QUAD FLATPACK



A. All linear dimensions are in millimeters.

B. This drawing is subject to change without notice.

C. Body dimensions do not include mold flash or protrusion.

D. The package thermal performance may be enhanced by bonding the thermal pad to an external plane. This pad is electronically and thermally connected to the backside of the die and possibly selected leads. Actual size: 5.4 mm × 5.4 mm.

E. Falls within JEDEC MS-026.

Document Title

4Bank x 1M x 16bits Synchronous DRAM

Revision History

Revision No.	History	Draft Date	Remark
1.0	First Version Release	Nov. 2004	
	1. Changed tOH: 2.0 --> 2.5 [tCK = 7 & 7.5 (CL3) Product]		
1.1	1. Changed Input High/Low Voltage (Page 08) 2. Changed DC characteristics (Page 09) - IDD2NS: 18mA -> 15mA - IDD5:210 / 195 / 180mA -> 170 / 160 / 150mA [Speed 200 / 166 / 143 / 133MHz] 3. Changed Clock High / Low pulse width Time (Page 11) 4. Changed tAC Time (Page11) 5. Changed tRRD Time (Page12)	Dec. 2004	
1.2	1. Corrected Revision No.: 2.0 -> 1.1 2. Deleted Remark at Revision History 3. Corrected AC OPERATING CONDITION - CL 50pF -> 30pF 4. Changed DC OPERATING CONDITION - VIH MAX VDDQ+2.0 -> VDDQ+0.3 and Typ 3.3 -> 3.0 - VIL MIN VSSQ-2.0 -> -0.3	Dec. 2004	
1.3	1. Modified note for Super Low Power in ORDERING INFORMATION	Jan. 2005	
1.4	1. Corrected PIN ASSIGNMENT A12 to NC	Jan. 2005	
1.5	1. Corrected comments for overshoot and undershoot	Feb. 2005	

DESCRIPTION

The Hynix HY57V641620E(L/S)T(P) series is a 67,108,864bit CMOS Synchronous DRAM, ideally suited for the memory applications which require wide data I/O and high bandwidth. HY57V641620E(L/S)T(P) is organized as 4banks of 1,048,576x16.

HY57V641620E(L/S)T(P) is offering fully synchronous operation referenced to a positive edge of the clock. All inputs and outputs are synchronized with the rising edge of the clock input. The data paths are internally pipelined to achieve very high bandwidth. All input and output voltage levels are compatible with LVTTL.

Programmable options include the length of pipeline (Read latency of 2 or 3), the number of consecutive read or write cycles initiated by a single control command (Burst length of 1,2,4,8 or full page), and the burst count sequence(sequential or interleave). A burst of read or write cycles in progress can be terminated by a burst terminate command or can be interrupted and replaced by a new burst read or write command on any cycle. (This pipelined design is not restricted by a '2N' rule)

FEATURES

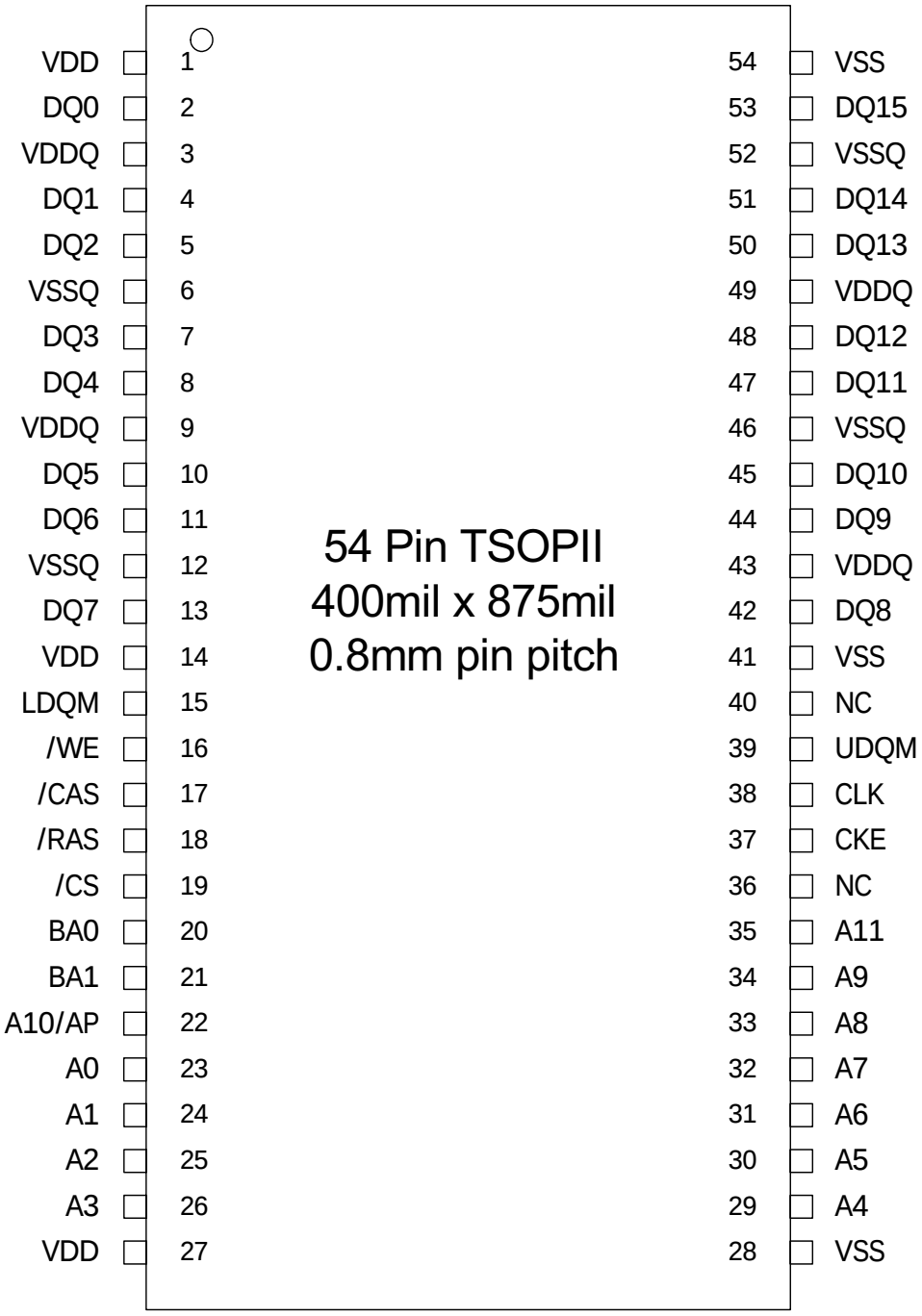
- Voltage: VDD, VDDQ 3.3V supply voltage
- All device pins are compatible with LVTTL interface
- 54 Pin TSOPII (Lead or Lead Free Package)
- All inputs and outputs referenced to positive edge of system clock
- Data mask function by UDQM, LDQM
- Internal four banks operation
- Auto refresh and self refresh
- 4096 Refresh cycles / 64ms
- Programmable Burst Length and Burst Type
  - 1, 2, 4, 8 or full page for Sequential Burst
  - 1, 2, 4 or 8 for Interleave Burst
- Programmable $\overline{\text{CAS}}$ Latency; 2, 3 Clocks
- Burst Read Single Write operation

ORDERING INFORMATION

Part No.	Clock Frequency	Organization	Interface	Package
HY57V641620E(L/S)T(P)-5I	200MHz	4Banks x 1Mbits x16	LVTTL	54 Pin TSOPII
HY57V641620E(L/S)T(P)-6I	166MHz			
HY57V641620E(L/S)T(P)-7I	143MHz			
HY57V641620E(L/S)T(P)-HI	133MHz			

Note: 1. HY57V641620ET-xI Series: Normal power, Leaded.
2. HY57V641620ELT-xI Series: Low power, Leaded.
3. HY57V641620EST-xI Series: Super Low power, Leaded.
4. HY57V641620ETP-xI Series: Normal power, Lead Free.
5. HY57V641620ELTP-xI Series: Low power, Lead Free.
6. HY57V641620ESTP-xI Series: Super Low Power, Lead Free

PIN ASSIGNMENTS

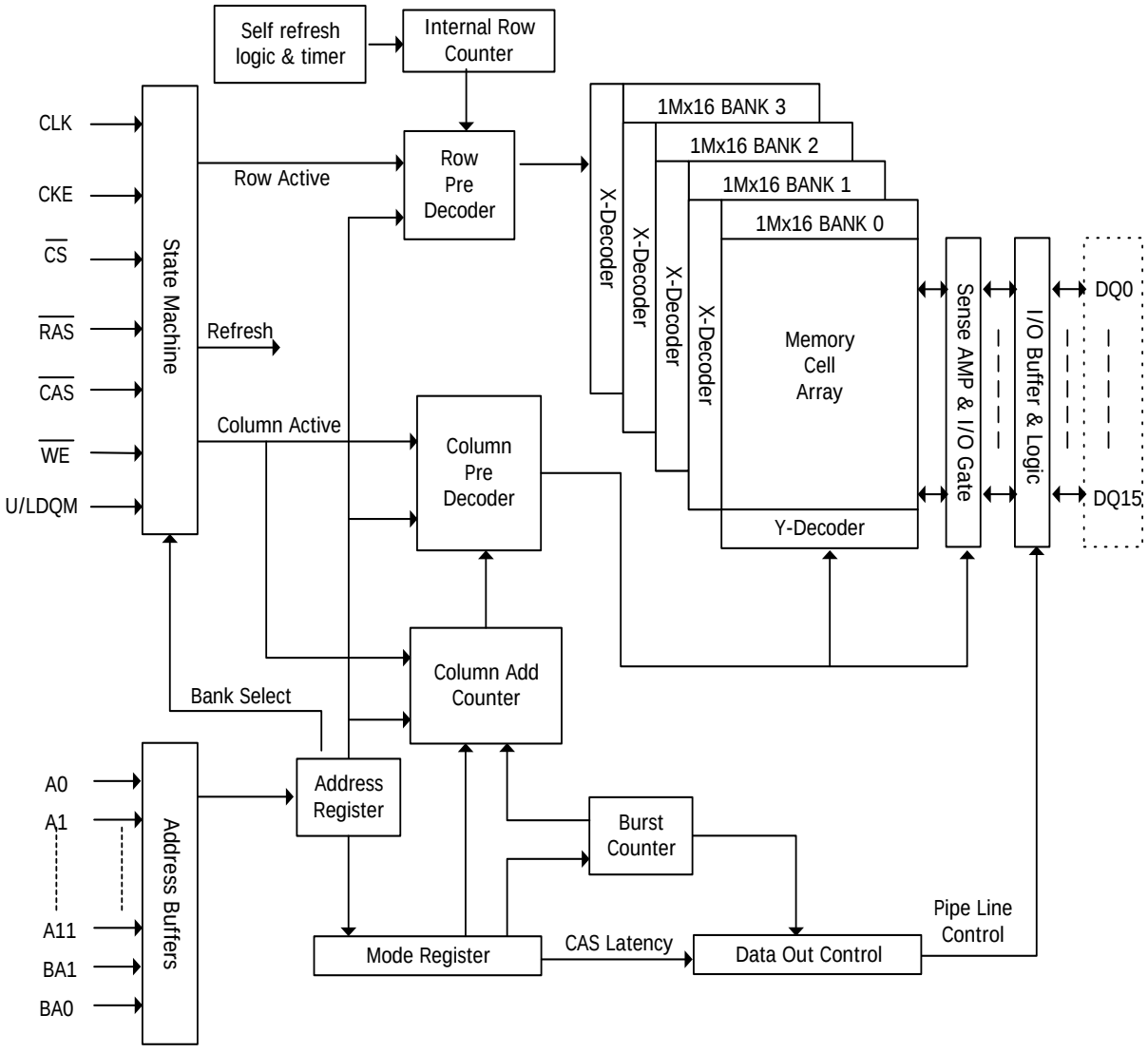


PIN DESCRIPTION

SYMBOL	TYPE	DESCRIPTION
CLK	Clock	The system clock input. All other inputs are registered to the SDRAM on the rising edge of CLK
CKE	Clock Enable	Controls internal clock signal and when deactivated, the SDRAM will be one of the states among power down, suspend or self refresh
$\overline{CS}$	Chip Select	Enables or disables all inputs except CLK, CKE, UDQM and LDQM
BA0, BA1	Bank Address	Selects bank to be activated during $\overline{RAS}$ activity Selects bank to be read/written during $\overline{CAS}$ activity
A0 ~ A11	Address	Row Address: RA0 ~ RA11, Column Address: CA0 ~ CA7 Auto-precharge flag: A10
$\overline{RAS}$, $\overline{CAS}$, $\overline{WE}$	Row Address Strobe, Column Address Strobe, Write Enable	$\overline{RAS}$, $\overline{CAS}$ and $\overline{WE}$ define the operation Refer function truth table for details
UDQM, LDQM	Data Input/Output Mask	Controls output buffers in read mode and masks input data in write mode
DQ0 ~ DQ15	Data Input / Output	Multiplexed data input / output pin
VDD / VSS	Power Supply / Ground	Power supply for internal circuits and input buffers
VDDQ / VSSQ	Data Output Power / Ground	Power supply for output buffers
NC	No Connection	No connection

FUNCTIONAL BLOCK DIAGRAM

1Mbit x 4banks x 16 I/O Synchronous DRAM



S29AL016D

16 Megabit (2 M x 8-Bit/1 M x 16-Bit) CMOS 3.0 Volt-only Boot Sector Flash Memory

SPANSION™

Data Sheet

PRELIMINARY

Distinctive Characteristics

Architectural Advantages

- **Single power supply operation**
  - Full voltage range: 2.7 to 3.6 volt read and write operations for battery-powered applications
- **Manufactured on 200nm process technology**
  - Fully compatible with 0.23 µm Am29LV160D and MBM29LV160E devices
- **Flexible sector architecture**
  - One 16 Kbyte, two 8 Kbyte, one 32 Kbyte, and thirty-one 64 Kbyte sectors (byte mode)
  - One 8 Kword, two 4 Kword, one 16 Kword, and thirty-one 32 Kword sectors (word mode)
- **Sector Protection features**
  - A hardware method of locking a sector to prevent any program or erase operations within that sector
  - Sectors can be locked in-system or via programming equipment
  - Temporary Sector Unprotect feature allows code changes in previously locked sectors
- **Unlock Bypass Program Command**
  - Reduces overall programming time when issuing multiple program command sequences
- **Top or bottom boot block configurations available**
- **Compatibility with JEDEC standards**
  - Pinout and software compatible with single-power supply Flash
  - Superior inadvertent write protection

Performance Characteristics

- **High performance**
  - Access times as fast as 70 ns
- **Ultra low power consumption (typical values at 5 MHz)**
  - 200 nA Automatic Sleep mode current
  - 200 nA standby mode current
  - 9 mA read current
  - 20 mA program/erase current
- **Cycling endurance: 1,000,000 cycles per sector typical**
- **Data retention: 20 years typical**

Package Options

- **48-ball FBGA**
- **48-pin TSOP**
- **44-pin SOP**

Software Features

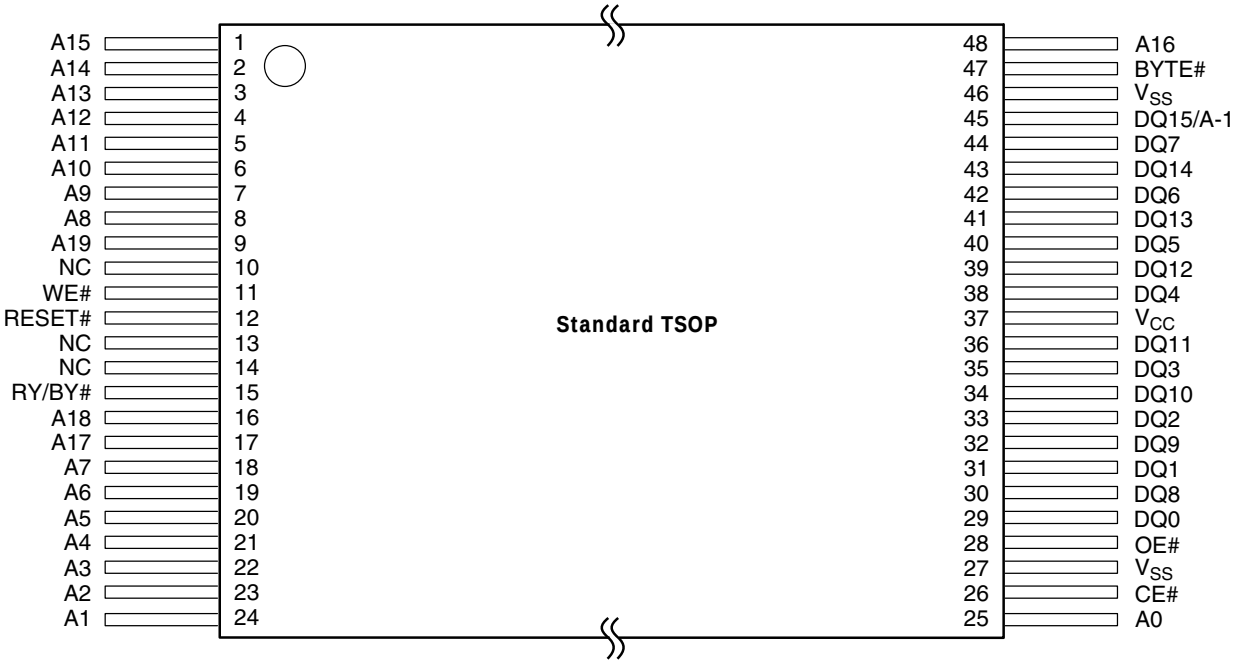
- **CFI (Common Flash Interface) compliant**
  - Provides device-specific information to the system, allowing host software to easily reconfigure for different Flash devices
- **Erase Suspend/Erase Resume**
  - Suspends an erase operation to read data from, or program data to, a sector that is not being erased, then resumes the erase operation
- **Data# Polling and toggle bits**
  - Provides a software method of detecting program or erase operation completion

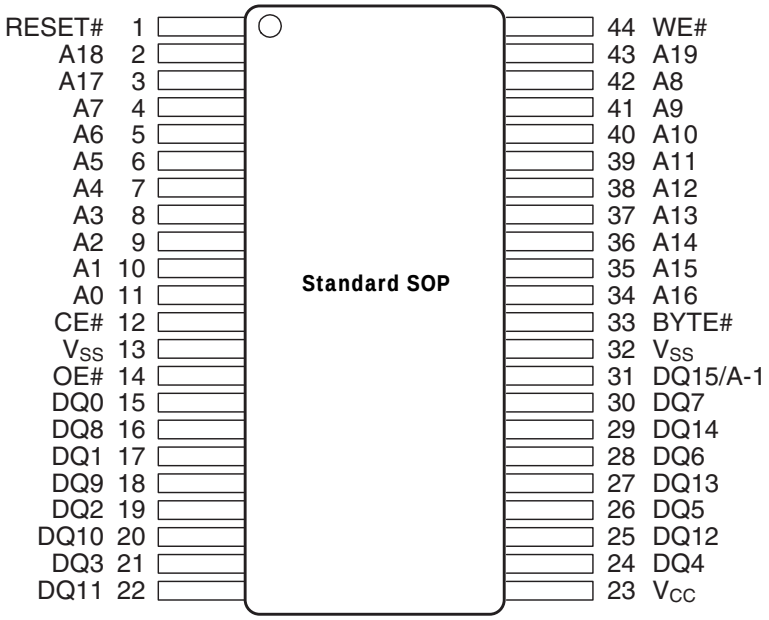
Hardware Features

- **Ready/Busy# pin (RY/BY#)**
  - Provides a hardware method of detecting program or erase cycle completion

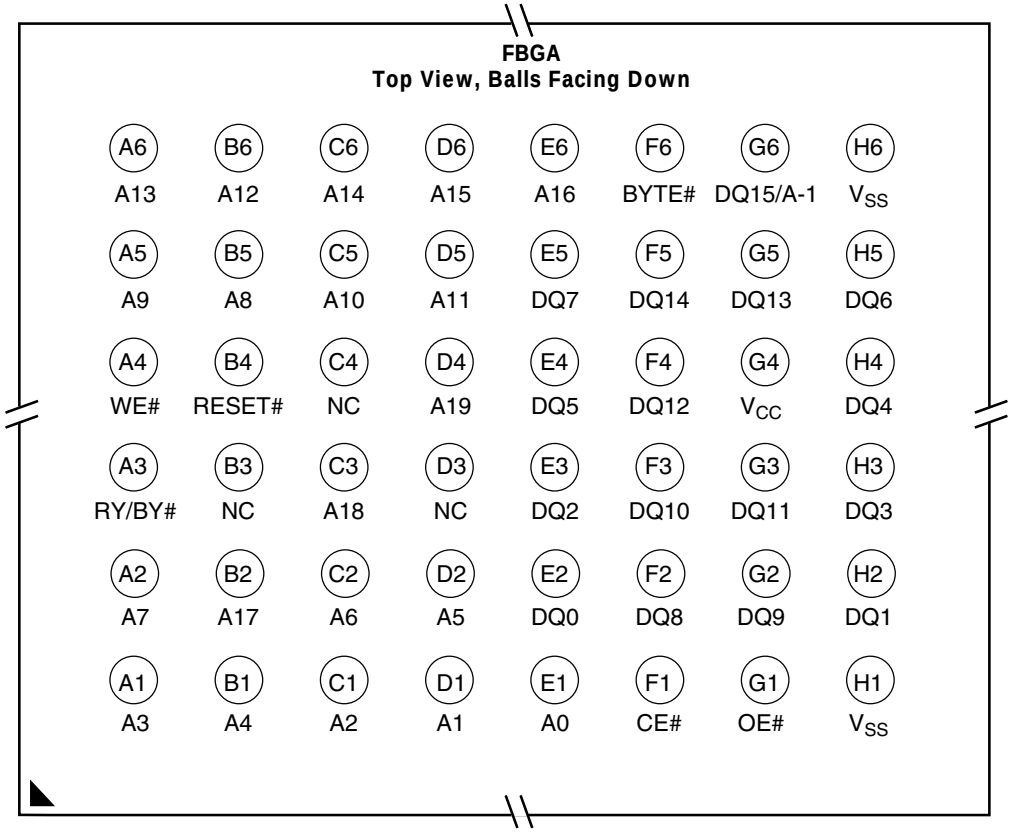
Publication Number S29AL016D_00 **Revision** A **Amendment** 2 **Issue Date** December 17, 2004

Connection Diagrams





Connection Diagrams



Special Handling Instructions

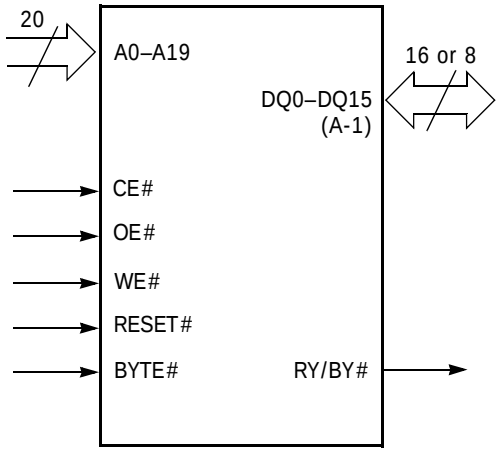
Special handling is required for Flash Memory products in FBGA packages.

Flash memory devices in FBGA packages may be damaged if exposed to ultrasonic cleaning methods. The package and/or data integrity may be compromised if the package body is exposed to temperatures above 150°C for prolonged periods of time.

Pin Configuration

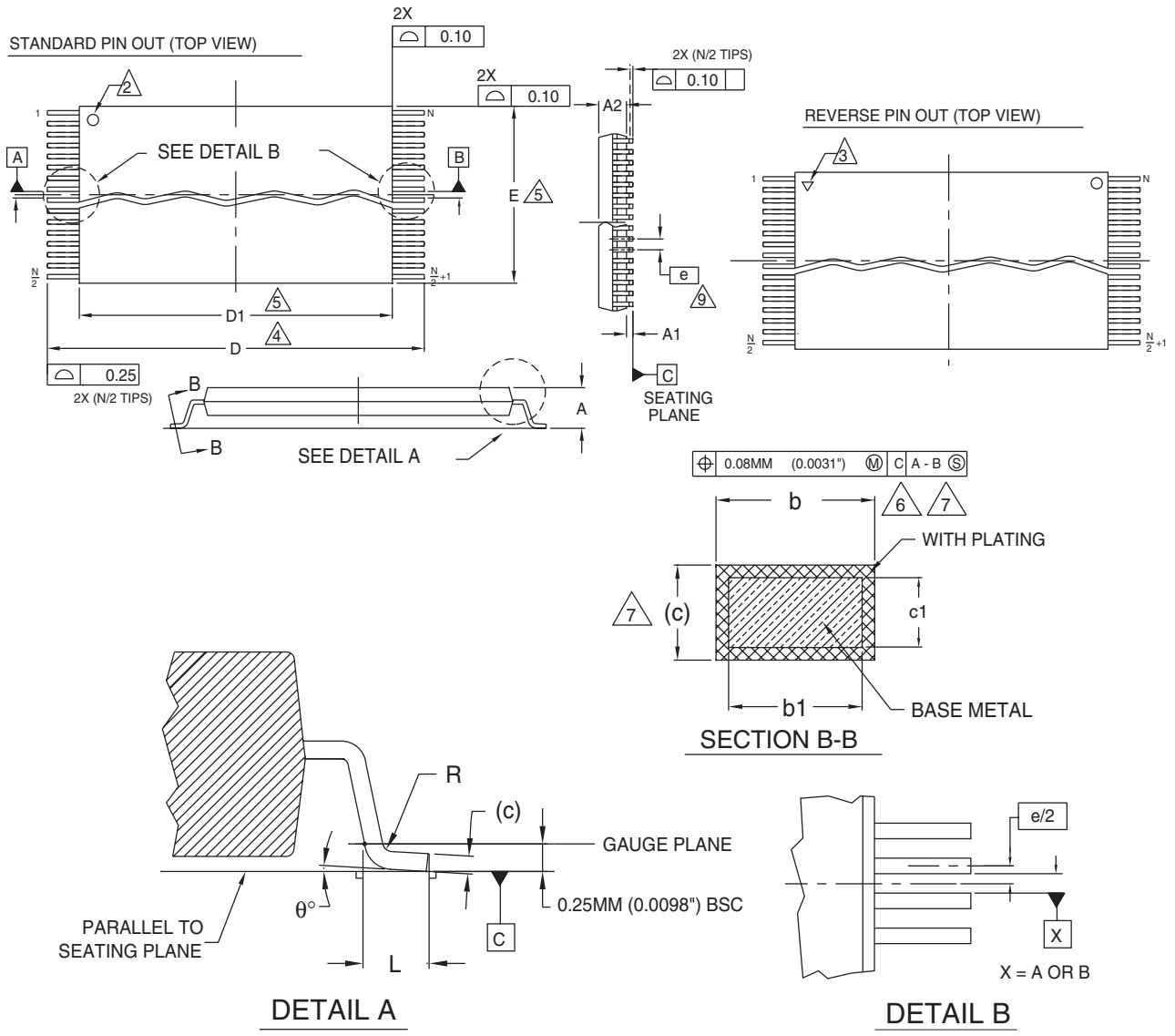
A0–A19	=	20 addresses
DQ0–DQ14	=	15 data inputs/outputs
DQ15/A-1	=	DQ15 (data input/output, word mode), A-1 (LSB address input, byte mode)
BYTE#	=	Selects 8-bit or 16-bit mode
CE#	=	Chip enable
OE#	=	Output enable
WE#	=	Write enable
RESET#	=	Hardware reset pin
RY/BY#	=	Ready/Busy output
V_{CC}	=	3.0 volt-only single power supply (see Product Selector Guide for speed options and voltage supply tolerances)
V_{SS}	=	Device ground
NC	=	Pin not connected internally

Logic Symbol



Physical Dimensions

TS 048—48-Pin Standard TSOP



Jedec	MO-142 (D) DD		
Symbol	MIN	NOM	MAX
A	—	—	1.20
A1	0.05	—	0.15
A2	0.95	1.00	1.05
b1	0.17	0.20	0.23
b	0.17	0.22	0.27
c1	0.10	—	0.16
c	0.10	—	0.21
D	19.80	20.00	20.20
D1	18.30	18.40	18.50
E	11.90	12.00	12.10
e	0.50 BASIC		
L	0.50	0.60	0.70
θ	0°	—	8°
R	0.08	—	0.20
N	48		

NOTES:

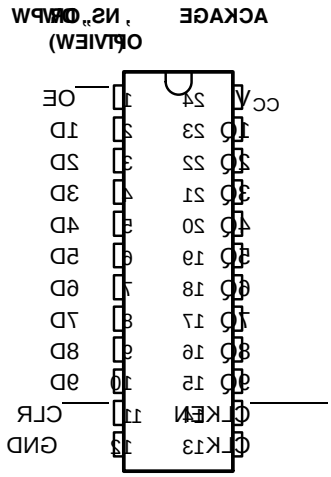
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (mm). (DIMENSIONING AND TOLERANCING CONFORMS TO ANSI Y14.5M-1982)
2. PIN 1 IDENTIFIER FOR REVERSE PIN OUT (DIE UP).
3. PIN 1 IDENTIFIER FOR REVERSE PIN OUT (DIE DOWN), INK OR LASER MARK.
4. TO BE DETERMINED AT THE SEATING PLANE -C-. THE SEATING PLANE IS DEFINED AS THE PLANE OF CONTACT THAT IS MADE WHEN THE PACKAGE LEADS ARE ALLOWED TO REST FREELY ON A FLAT HORIZONTAL SURFACE.
5. DIMENSIONS D1 AND E DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTUSION IS 0.15mm (.0059") PER SIDE.
6. DIMENSION b DOES NOT INCLUDE DAMBAR PROTUSION. ALLOWABLE DAMBAR PROTUSION SHALL BE 0.08 (0.0031") TOTAL IN EXCESS OF b DIMENSION AT MAX. MATERIAL CONDITION. MINIMUM SPACE BETWEEN PROTRUSION AND AN ADJACENT LEAD TO BE 0.07 (0.0028").
7. THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.10MM (.0039") AND 0.25MM (0.0098") FROM THE LEAD TIP.
8. LEAD COPLANARITY SHALL BE WITHIN 0.10mm (0.004") AS MEASURED FROM THE SEATING PLANE.
9. DIMENSION "e" IS MEASURED AT THE CENTERLINE OF THE LEADS.

3355 \ 16-038.10c

** For reference only. BSC is an ANSI standard for Basic Space Centering.*

FEATURES

- **Operates From 1.65 V to 3.6 V**
- **Inputs Accept Voltages to 5.5 V**
- **Max t_{pd} of 7.9 ns at 3.3 V**
- **Typical V_{OLP} (Output Ground Bounce) <0.8 V at V_{CC} = 3.3 V, T_A = 25°C**
- **Typical V_{OHV} (Output V_{OH} Undershoot) >2 V at V_{CC} = 3.3 V, T_A = 25°C**
- **Supports Mixed-Mode Signal Operation on All Ports (5-V Input/Output Voltage With 3.3-V V_{CC})**
- **I_{off} Supports Partial-Power-Down Mode Operation**
- **Latch-Up Performance Exceeds 250 mA Per JESD 17**
- **ESD Protection Exceeds JESD 22**
  - **– 2000-V Human-Body Model (A114-A)**
  - **– 200-V Machine Model (A115-A)**
  - **– 1000-V Charged-Device Model (C101)**



DESCRIPTION/ORDERING INFORMATION

This 9-bit bus-interface flip-flop is designed for 1.65-V to 3.6-V V_{CC} operation.

The SN74LVC823A is designed specifically for driving highly capacitive or relatively low-impedance loads. It is particularly suitable for implementing wider buffer registers, I/O ports, bidirectional bus drivers with parity, and working registers.

With the clock-enable ($\overline{CLKEN}$) input low, the nine D-type edge-triggered flip-flops enter data on the low-to-high transitions of the clock. Taking $\overline{CLKEN}$ high disables the clock buffer, latching the outputs. This device has noninverting data (D) inputs. Taking the clear ($\overline{CLR}$) input low causes the nine Q outputs to go low, independently of the clock.

ORDERING INFORMATION

T_A	PACKAGE(1)		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	SOIC – DW	Tube of 25	SN74LVC823ADW	LVC823A
		Reel of 2000	SN74LVC823ADWR	
	SOP – NS	Reel of 2000	SN74LVC823ANSR	LVC823A
	SSOP – DB	Reel of 2000	SN74LVC823ADBR	LC823A
	TSSOP – PW	Tube of 60	SN74LVC823APW	LC823A
		Reel of 2000	SN74LVC823APWR	
		Reel of 250	SN74LVC823APWT	
	TVSOP – DGV	Reel of 2000	SN74LVC823ADGVR	LC823A

(1) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

DESCRIPTION/ORDERING INFORMATION (CONTINUED)

A buffered output-enable ($\overline{OE}$) input can be used to place the nine outputs in either a normal logic state (high or low logic levels) or the high-impedance state. $\overline{OE}$ does not affect the internal operations of the latch. Previously stored data can be retained or new data can be entered while the outputs are in the high-impedance state.

Inputs can be driven from either 3.3-V or 5-V devices. This feature allows the use of these devices as translators in a mixed 3.3-V/5-V system environment.

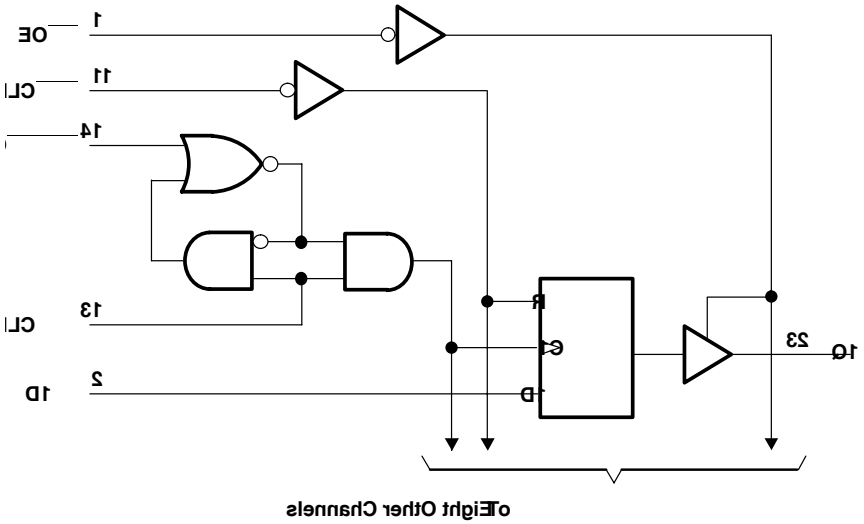
This device is fully specified for partial-power-down applications using I_{off}. The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

To ensure the high-impedance state during power up or power down, $\overline{OE}$ should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

**FUNCTION TABLE
(EACH FLIP-FLOP)**

INPUTS					OUTPUT Q
$\overline{OE}$	$\overline{CLR}$	$\overline{CLKEN}$	CLK	D	
L	L	X	X	X	L
L	H	L	↑	H	H
L	H	L	↑	L	L
L	H	H	X	X	Q_0
H	X	X	X	X	Z

LOGIC DIAGRAM (POSITIVE LOGIC)



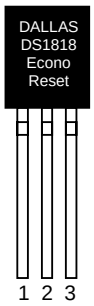
DS1818
3.3V EconoReset with Pushbutton

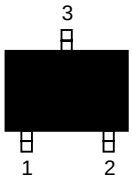
www.maxim-ic.com

FEATURES

- Automatically restarts a microprocessor after power failure
- Monitors pushbutton for external override
- Maintains reset for 150 ms after V_{CC} returns to an in-tolerance condition
- Reduces need for discrete components
- Precision temperature-compensated voltage reference and voltage sensor
- Accurate 5%, 10% or 20% power monitoring
- Low-cost TO-92 or space saving surface mount SOT-23 packages available
- Efficient open-drain output with internal 5.5 kΩ pull-up resistor
- Operating temperature -40°C to +85°C

PIN ASSIGNMENT





TOP VIEW
SOT-23 PACKAGE
See Mech.
Drawings Section
On Website

BOTTOM VIEW
TO-92 PACKAGE
See Mech.
Drawings Section
On Website

PIN DESCRIPTION

TO-92

1	$\overline{RST}$	Active Low Reset Output
2	V_{CC}	Power Supply
3	GND	Ground

SOT-23

1	$\overline{RST}$	Active Low Reset Output
2	V_{CC}	Power Supply
3	GND	Ground

DESCRIPTION

The DS1818 EconoReset uses a precision temperature-compensated reference and comparator circuit to monitor the status of the power supply (V_{CC}). When an out-of-tolerance condition is detected, an internal power-fail signal is generated which forces reset to the active state. When V_{CC} returns to an in-tolerance condition, the reset signal is kept in the active state for approximately 150 ms to allow the power supply and processor to stabilize.

The DS1818 also monitors a pushbutton on the reset output. If the reset line is pulled low, a reset is generated upon release and the DS1818 output will be held in reset output low for typically 150 ms.

March 1999
Revised February 2005

NC7WZ07
TinyLogic® UHS Dual Buffer (Open Drain Outputs)

General Description

The NC7WZ07 is a dual buffer with open drain outputs from Fairchild's Ultra High Speed Series of TinyLogic® in the space saving SC70 6-lead package. The device is fabricated with advanced CMOS technology to achieve ultra high speed with high output drive while maintaining low static power dissipation over a very broad V_{CC} operating range. The device is specified to operate over the 1.65V to 5.5V V_{CC} range. The inputs and outputs are high impedance when V_{CC} is 0V. Inputs tolerate voltages up to 7V independent of V_{CC} operating voltage.

Features

- Space saving SC70 6-lead package
- Ultra small MicroPak™ Pb-Free leadless package
- Ultra High Speed: t_{PZL} 2.3 ns Typ into 50 pF at 5V V_{CC}
- High I_{OL} Output Drive: +24 mA at 3V V_{CC}
- Broad V_{CC} Operating Range: 1.65V to 5.5V
- Matches the performance of LCX when operated at 3.3V V_{CC}
- Power down high impedance inputs/outputs
- Overvoltage tolerant inputs facilitate 5V to 3V translation
- Patented noise/EMI reduction circuitry implemented

Ordering Code:

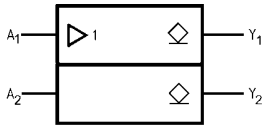
Order Number	Package Number	Product Code Top Mark	Package Description	Supplied As
NC7WZ07P6X	MAA06A	Z07	6-Lead SC70, EIAJ SC88, 1.25mm Wide	3k Units on Tape and Reel
NC7WZ07P6X_NL (Note 1)	MAA06A	Z07	Pb-Free 6-Lead SC70, EIAJ SC88, 1.25mm Wide	3k Units on Tape and Reel
NC7WZ07L6X	MAC06A	D3	Pb-Free 6-Lead MicroPak, 1.0mm Wide	5k Units on Tape and Reel

Pb-Free package per JEDEC J-STD-020B.

Note 1: "_NL" indicates Pb-Free product (per JEDEC J-STD-020B). Device is available in Tape and Reel only.

Logic Symbol

IEEE/IEC



Pin Descriptions

Pin Names	Description
A_1, A_2	Data Inputs
Y_1, Y_2	Output

Function Table

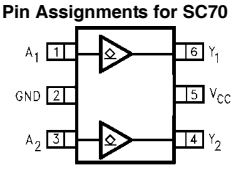
Y = A

Input	Output
A	**Y**
L	L
H	Z

H = HIGH Logic Level
L = LOW Logic Level

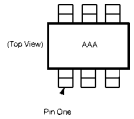
Connection Diagrams

Pin Assignments for SC70



(Top View)

Pin One Orientation Diagram



AAA represents Product Code Top Mark - see ordering code

Note: Orientation of Top Mark determines Pin One location. Read the top product code mark left to right, Pin One is the lower left pin (see diagram).

Pad Assignments for MicroPak

(Top Thru View)

FAN1112

1A 1.2V Low Dropout Linear Regulator

Features

- Low dropout voltage
- Load regulation: 0.05% typical
- Trimmed current limit
- On-chip thermal limiting
- Standard SOT-223 and TO-252 packages
- Three-terminal fixed 1.2V

Applications

- Post regulator for switching supplies
- Supply for low-voltage processors

Description

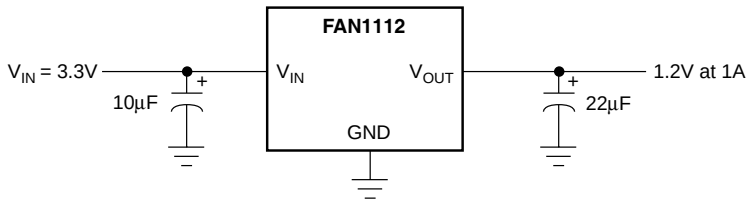
The FAN1112 is a 1.2V low dropout three-terminal regulator with 1A output current capability. The device has been optimized for low voltage where transient response and minimum input voltage are critical.

Current limit is trimmed to ensure specified output current and controlled short-circuit current. On-chip thermal limiting provides protection against any combination of overload and ambient temperatures that would create excessive junction temperatures.

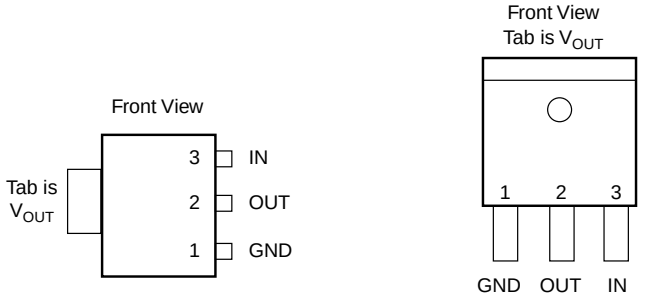
Unlike PNP type regulators where up to 10% of the output current is wasted as quiescent current, the quiescent current of the FAN1112 flows into the load, increasing efficiency.

The FAN1112 regulator is available in the industry-standard SOT-223 and TO-252 (DPAK) power packages.

Typical Application



Pin Assignments



4-Lead Plastic SOT-223
Θ_{JC} = 15°C/W*

3-Lead Plastic TO-252
Θ_{JC} = 3°C/W*

*With package soldered to 0.5 square inch copper area over backside ground plane or internal power plane., Θ_{JA} can vary from 30°C/W to more than 50°C/W. Other mounting techniques may provide better thermal resistance than 30°C/W.

Absolute Maximum Ratings

Parameter	Min.	Max.	Unit
V_{IN}		18	V
$(V_{IN} – V_{OUT}) * I_{OUT}$		See Figure 1	
Operating Junction Temperature Range	0	125	°C
Storage Temperature Range	-65	150	°C
Lead Temperature (Soldering, 10 sec.)		300	°C

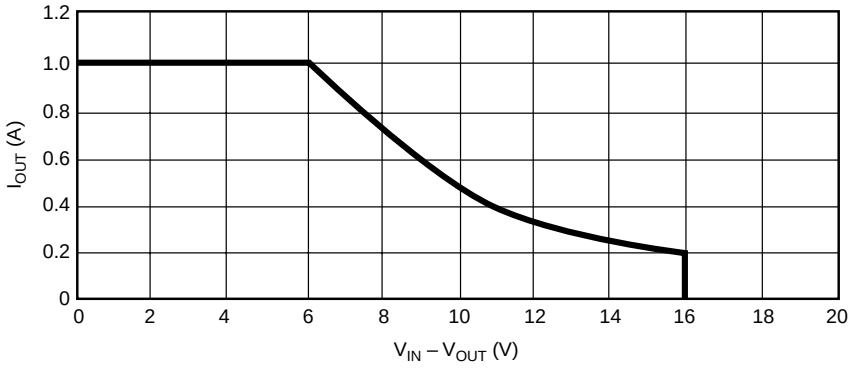


Figure 1. Absolute Maximum Safe Operating Area

PIC18F87J10 Family Data Sheet

64/80-Pin High-Performance, 1-Mbit Flash Microcontrollers with nanoWatt Technology

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

Trademarks

QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
ISO/TS 16949:2002

Microchip received ISO/TS-16949:2002 quality system certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona and Mountain View, California in October 2003. The Company's quality system processes and procedures are for its PICmicro® 8-bit MCUs, KEELOQ® code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.

PIC18F87J10 FAMILY

64/80-Pin, High-Performance, 1-Mbit Flash Microcontrollers with nanoWatt Technology

Special Microcontroller Features:

- Operating voltage range: 2.0V to 3.6V
- 5.5V tolerant input (digital pins only)
- On-chip 2.5V regulator
- Low-power, high-speed CMOS Flash technology
- C compiler optimized architecture:
  - Optional extended instruction set designed to optimize re-entrant code
- Priority levels for interrupts
- 8 x 8 Single-Cycle Hardware Multiplier
- Extended Watchdog Timer (WDT):
  - Programmable period from 4 ms to 131s
- Single-Supply In-Circuit Serial Programming™ (ICSP™) via two pins
- In-Circuit Debug (ICD) with three Break points via two pins
- Power-Managed modes:
  - Run: CPU on, peripherals on
  - Idle: CPU off, peripherals on
  - Sleep: CPU off, peripherals off

Flexible Oscillator Structure:

- Two Crystal modes, up to 40 MHz
- 4x Phase Lock Loop (PLL)
- Two External Clock modes, up to 40 MHz
- Internal 31 kHz oscillator
- Secondary oscillator using Timer1 @ 32 kHz
- Two-Speed Oscillator Start-up
- Fail-Safe Clock Monitor:
  - Allows for safe shutdown if peripheral clock stops

Peripheral Highlights:

- High-current sink/source 25 mA/25 mA (PORTB and PORTC)
- Four programmable external interrupts
- Four input change interrupts
- Two Capture/Compare/PWM (CCP) modules
- Three Enhanced Capture/Compare/PWM (ECCP) modules:
  - One, two or four PWM outputs
  - Selectable polarity
  - Programmable dead time
  - Auto-Shutdown and Auto-Restart
- Two Master Synchronous Serial Port (MSSP) modules supporting 3-wire SPI™ (all 4 modes) and I^2C™ Master and Slave modes
- Two Enhanced Addressable USART modules:
  - Supports RS-485, RS-232 and LIN 1.2
  - Auto-Wake-up on Start bit
  - Auto-Baud Detect
- 10-bit, up to 15-channel Analog-to-Digital Converter module (A/D):
  - Auto-acquisition capability
  - Conversion available during Sleep
  - Self-calibration feature
- Dual analog comparators with input multiplexing

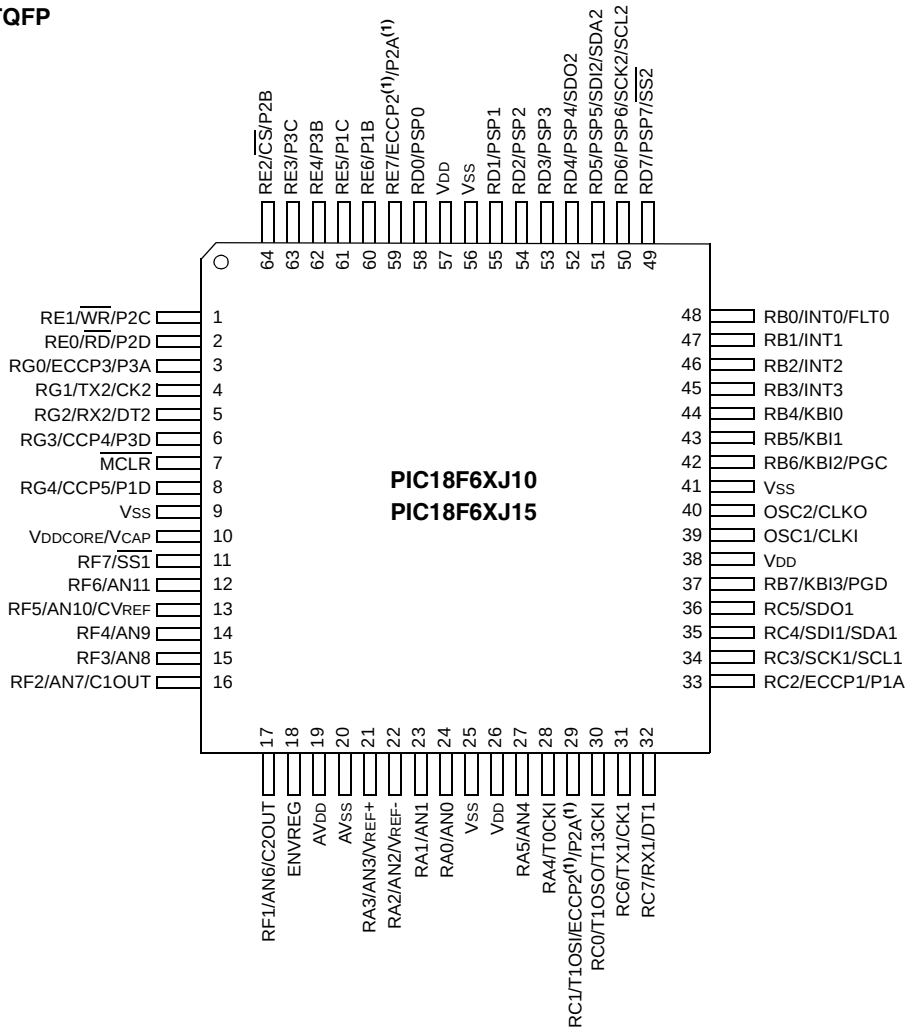
External Memory Bus (PIC18F8XJ10/8XJ15 only):

- Address capability of up to 2 Mbytes
- 8-bit or 16-bit interface
- 12-bit, 16-bit and 20-bit Addressing modes

Device	Program Memory		SRAM Data Memory (bytes)	I/O	10-bit A/D (ch)	CCP/ ECCP (PWM)	MSSP			EUSART	Comparators	Timers 8/16-bit	External Bus
	Flash (bytes)	# Single-Word Instructions						SPI™	Master I^2C™				
PIC18F65J10	32K	16384	2048	50	11	2/3	2	Y	Y	2	2	2/3	N
PIC18F65J15	48K	24576	2048	50	11	2/3	2	Y	Y	2	2	2/3	N
PIC18F66J10	64K	32768	2048	50	11	2/3	2	Y	Y	2	2	2/3	N
PIC18F66J15	96K	49152	3936	50	11	2/3	2	Y	Y	2	2	2/3	N
PIC18F67J10	128K	65536	3936	50	11	2/3	2	Y	Y	2	2	2/3	N
PIC18F85J10	32K	16384	2048	66	15	2/3	2	Y	Y	2	2	2/3	Y
PIC18F85J15	48K	24576	2048	66	15	2/3	2	Y	Y	2	2	2/3	Y
PIC18F86J10	64K	32768	2048	66	15	2/3	2	Y	Y	2	2	2/3	Y
PIC18F86J15	96K	49152	3936	66	15	2/3	2	Y	Y	2	2	2/3	Y
PIC18F87J10	128K	65536	3936	66	15	2/3	2	Y	Y	2	2	2/3	Y

Pin Diagrams

64-Pin TQFP



Note 1: The ECCP2/P2A pin placement depends on the setting of the CCP2MX configuration bit.

Features

- **Low-voltage and Standard-voltage Operation**
  - **2.7 (V_{CC} = 2.7V to 5.5V)**
  - **1.8 (V_{CC} = 1.8V to 5.5V)**
- **Internally Organized 128 x 8 (1K), 256 x 8 (2K), 512 x 8 (4K), 1024 x 8 (8K) or 2048 x 8 (16K)**
- **Two-wire Serial Interface**
- **Schmitt Trigger, Filtered Inputs for Noise Suppression**
- **Bidirectional Data Transfer Protocol**
- **100 kHz (1.8V) and 400 kHz (2.5V, 2.7V, 5V) Compatibility**
- **Write Protect Pin for Hardware Data Protection**
- **8-byte Page (1K, 2K), 16-byte Page (4K, 8K, 16K) Write Modes**
- **Partial Page Writes Allowed**
- **Self-timed Write Cycle (5 ms max)**
- **High-reliability**
  - **Endurance: 1 Million Write Cycles**
  - **Data Retention: 100 Years**
- **Automotive Grade, Extended Temperature and Lead-free/Halogen-free Devices Available**
- **8-lead PDIP, 8-lead JEDEC SOIC, 8-lead MAP, 5-lead SOT23, 8-lead TSSOP and 8-ball dBGA2 Packages**
- **Die Sales: Wafer Form, Waffle Pack and Bumped Wafers**

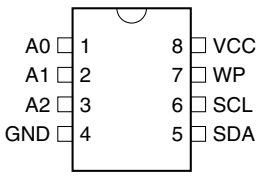
Description

The AT24C01A/02/04/08/16 provides 1024/2048/4096/8192/16384 bits of serial electrically erasable and programmable read-only memory (EEPROM) organized as 128/256/512/1024/2048 words of 8 bits each. The device is optimized for use in many industrial and commercial applications where low-power and low-voltage operation are essential. The AT24C01A/02/04/08/16 is available in space-saving 8-lead PDIP, 8-lead JEDEC SOIC, 8-lead MAP, 5-lead SOT23 (AT24C01A/AT24C02/AT24C04), 8-lead TSSOP, and 8-ball dBGA2 packages and is accessed via a Two-wire serial interface. In addition, the entire family is available in 2.7V (2.7V to 5.5V) and 1.8V (1.8V to 5.5V) versions.

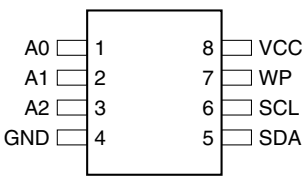
Table 1. Pin Configuration

Pin Name	Function
A0 - A2	Address Inputs
SDA	Serial Data
SCL	Serial Clock Input
WP	Write Protect
NC	No Connect
GND	Ground
VCC	Power Supply

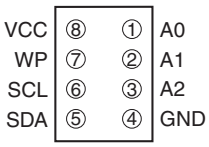
8-lead TSSOP



8-lead SOIC

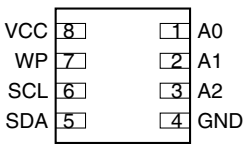


8-ball dBGA2



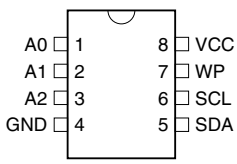
Bottom View

8-lead MAP

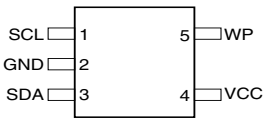


Bottom View

8-lead PDIP



5-lead SOT23



Two-wire Serial EEPROM

1K (128 x 8)

2K (256 x 8)

4K (512 x 8)

8K (1024 x 8)

16K (2048 x 8)

AT24C01A
AT24C02
AT24C04
AT24C08(1)
AT24C16(2)

Note: 1. This device is not recommended for new designs. Please refer to AT24C08A.

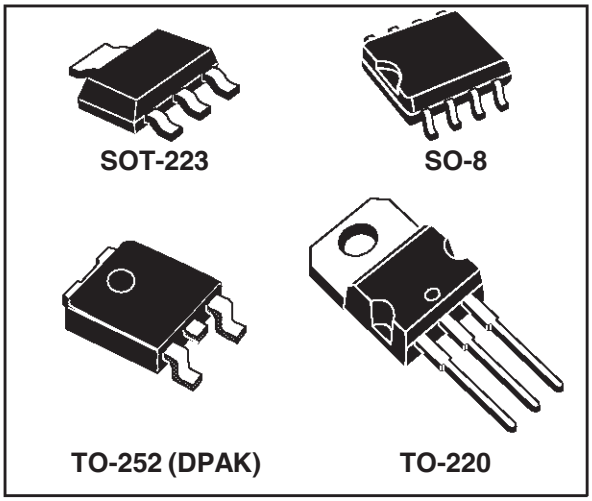
2. This device is not recommended for new designs. Please refer to AT24C16A.

0180T–SEEPR–12/04

LD1117 SERIES

LOW DROP FIXED AND ADJUSTABLE POSITIVE VOLTAGE REGULATORS

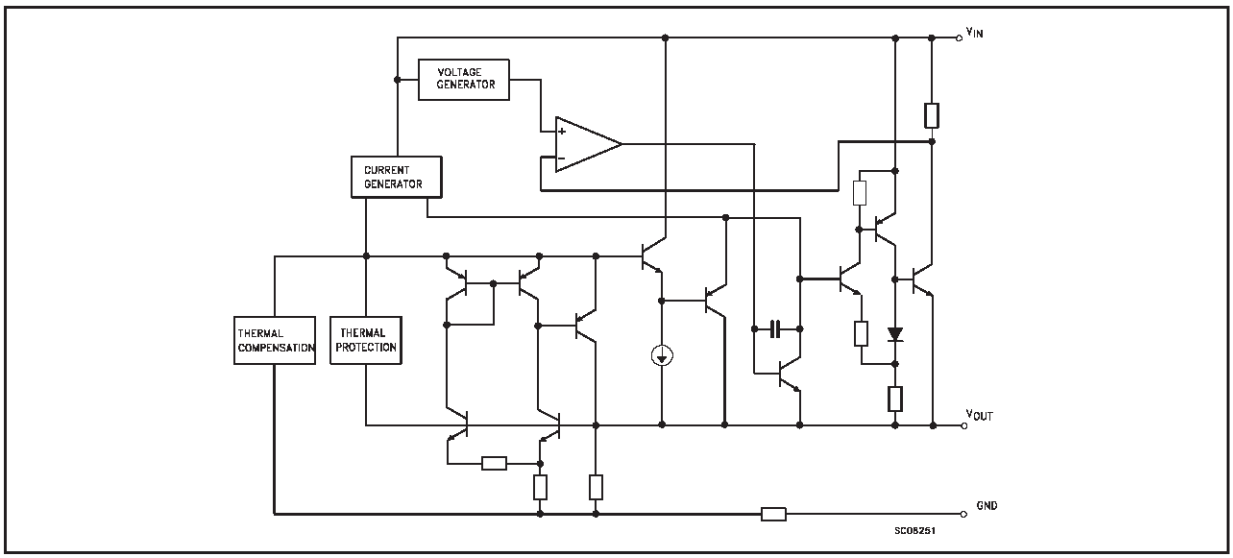
- LOW DROPOUT VOLTAGE (1V TYP)
- 2.85V DEVICE PERFORMANCES ARE SUITABLE FOR SCSI-2 ACTIVE TERMINATION
- OUTPUT CURRENT UP TO 800mA
- FIXED OUTPUT VOLTAGE OF: 1.8V, 2.5V, 2.85V, 3.0V, 3.3V, 5.0V
- ADJUSTABLE VERSION AVAILABILITY (V_{ref}=1.25V)
- INTERNAL CURRENT AND THERMAL LIMIT
- AVAILABLE IN ± 1% (AT 25°C) AND 2% IN FULL TEMPERATURE RANGE
- SUPPLY VOLTAGE REJECTION : 75 dB (TYP)
- TEMPERATURE RANGE : 0°C TO 125°C



DESCRIPTION

The LD1117 is a LOW DROP Voltage Regulator able to provide up to 800mA of Output Current, available even in adjustable version (V_{ref}=1.25V). Concerning fixed versions, are offered the following Output Voltages: 2.5V, 2.85V, 3.0V 3.3V and 5.0V. The 2.85V type is ideal for SCSI-2 lines active termination. The device is supplied in: SOT-223, DPAK, SO-8 and TO-220. The SOT-223 and DPAK surface mount packages optimize the thermal characteristics even offering a relevant space saving effect. High efficency is assured by NPN pass transistor. In fact in this case, unlike than PNP one, the Quiescent Current flows mostly into the load. Only a very common 10µF minimum capacitor is needed for stability. On chip trimming allows the regulator to reach a very tight output voltage tolerance, within ± 1% at 25 °C. The ADJUSTABLE LD1117 is pin to pin compatible with the other standard Adjustable voltage regulators maintaining the better performances in terms of Drop and Tolerance.

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

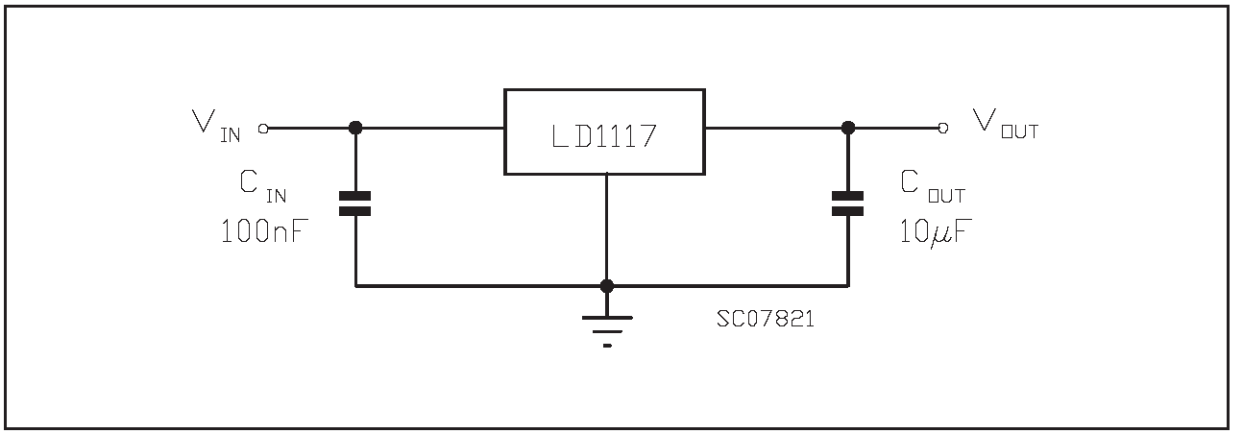
Symbol	Parameter	Value	Unit
V_{IN}	DC Input Voltage	15	V
P_{tot}	Power Dissipation	12	W
T_{stg}	Storage Temperature Range	-40 to 150	°C
T_{op}	Operating Junction Temperature Range	0 to 125	°C

Absolute Maximum Ratings are those value beyond which damage to the device may occur. Functional operation under these condition is not implied. Over the above suggested Max Power Dissipation a Short Circuit could definetively damage the device.

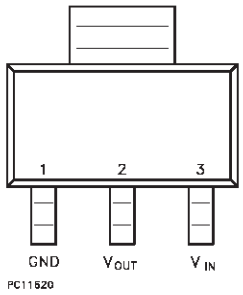
THERMAL DATA

Symbol	Parameter	SOT-223	SO-8	DPAK	TO-220	Unit
$R_{thj-case}$	Thermal Resistance Junction-case	15	20	8	3	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient				50	°C/W

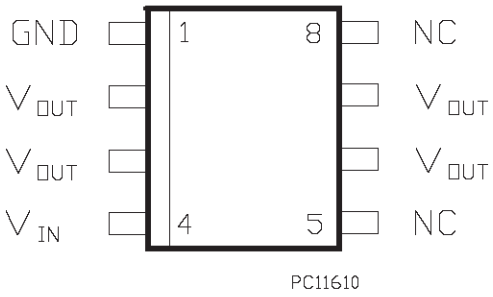
APPLICATION CIRCUIT



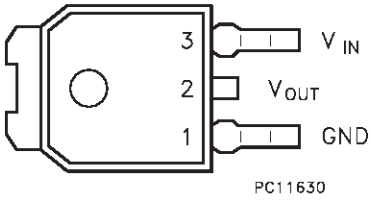
CONNECTION DIAGRAM AND ORDERING NUMBERS (top view)



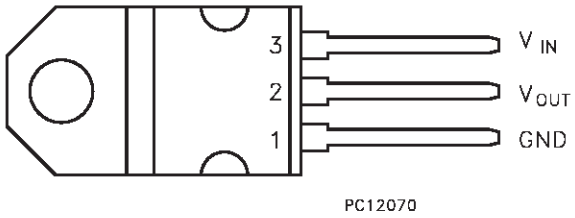
SOT-223



SO-8



DPAK



TO-220

SOT-223	SO-8	DPAK	TO-220	Output Voltage
LD1117S18	LD1117D18	LD1117DT18	LD1117V18	1.8V
LD1117S18C	LD1117D18C	LD1117DT18C	LD1117V18C	1.8V
LD1117S25	LD1117D25	LD1117DT25	LD1117V25	2.5V
LD1117S25C	LD1117D25C	LD1117DT25C	LD1117V25C	2.5V
LD1117S28	LD1117D28	LD1117DT28	LD1117V28	2.85V
LD1117S30	LD1117D30	LD1117DT30	LD1117V30	3V
LD1117S30C	LD1117D30C	LD1117DT30C	LD1117V30C	3V
LD1117S33	LD1117D33	LD1117DT33	LD1117V33	3.3V
LD1117S33C	LD1117D33C	LD1117DT33C	LD1117V33C	3.3V
LD1117S50	LD1117D50	LD1117DT50	LD1117V50	5V
LD1117S50C	LD1117D50C	LD1117DT50C	LD1117V50C	5V
LD1117S	LD1117D	LD1117DT	LD1117V	ADJUSTABLE FROM 1.25 TO 15V

KA78XX/KA78XXA

3-Terminal 1A Positive Voltage Regulator

Features

- Output Current up to 1A
- Output Voltages of 5, 6, 8, 9, 10, 12, 15, 18, 24V
- Thermal Overload Protection
- Short Circuit Protection
- Output Transistor Safe Operating Area Protection

Description

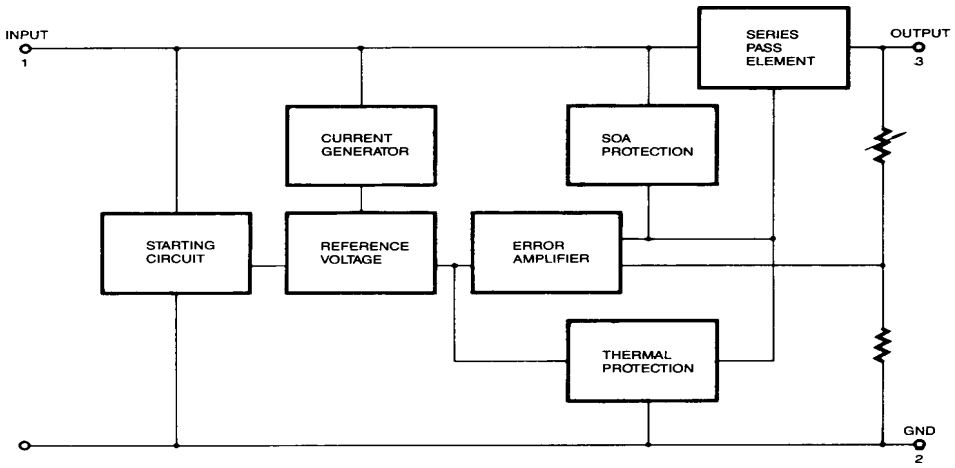
The KA78XX/KA78XXA series of three-terminal positive regulator are available in the TO-220/D-PAK package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut down and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

TO-220

D-PAK

1. Input 2. GND 3. Output

Internal Block Digram



Rev. 1.0.0

cosmo

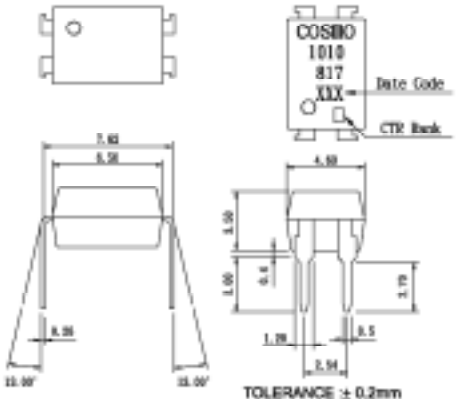
High Reliability Photo Coupler K1010

UL 1577 (File No.E169586) VDE 0884 / 0860 / 0805 (File No.101347)

Features

1. Current transfer ratio
   (CTR:MIN.50% at IF=5mA Vce=5V)
2. High isolation voltage between input and output
   (Viso:5000Vrms).
3. Compact dual-in-line package.
4. Available package : DIP/ SMD/ H.

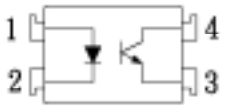
Outside Dimension : Unit (mm)



Applications

1. Registers, copiers, automatic vending machines.
2. System appliances, measuring instruments.
3. Computer terminals, programmable controllers.
4. Communications, telephone, etc.
5. Electric home appliances, such as oil fan heaters, Microwave oven, Washer, Refrigerator, Air conditioner, etc.
6. Medical instruments, physical and chemical equipment.
7. Signal transmission between circuits of different potentials and impedances.
8. Facsimile equipment, Audio, Video.
9. Switching power supply, Laser beam printer.

Schematic : Top View



1. Anode
2. Cathode
3. Emitter
4. Collector

Absolute Maximum Ratings

(Ta=25°C)

Parameter		Symbol	Rating	Unit
Input	Forward current	IF	50	mA
	Peak forward current	IFM	1	A
	Reverse voltage	VR	6	V
	Power dissipation	PD	70	mW
Output	Collector-emitter voltage	VCEO	80	V
	Emitter-collector voltage	VECO	6	V
	Collector current	IC	50	mA
	Collector power dissipation	PC	150	mW
Total power dissipation		Ptot	200	mW
Isolation voltage 1 minute		Viso	5000	Vrms
Operating temperature		Topr	-30 to +100	°C
Storage temperature		Tstg	-55 to +125	°C
Soldering temperature 10 second		Tsol	260	°C

Electro-optical Characteristics

(Ta=25°C)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input	Forward voltage	VF	IF =20mA	—	1.2	1.4	V
	Peak forward voltage	VFM	IFM =0.5A	—	—	3.0	V
	Reverse current	IR	VR =4V	—	—	10	uA
	Terminal capacitance	Ct	V=0, f=1kHz	—	30	—	pF
Output	Collector dark current	ICEO	VCE =20V	—	—	0.1	uA
Transfer charac-teristics	Current transfer ratio	CTR	IF=5mA, VCE =5V	50	—	600	%
	Collector-emitter saturation voltage	VCE(sat)	IF=20mA, IC=1mA	—	0.1	0.2	V
	Isolation resistance	Riso	DC500V	$5X10^{10}$	10^{11}	—	ohm
	Floating capacitance	Cf	V=0, f=1MHz	—	0.6	1.0	pF
	Cut-off frequency	fc	VCC=5V, IC=2mA, RL=100ohm	—	80	—	kHz
	Response time(Rise)	tr	VCE=2V, IC=2mA, RL=100ohm	—	4	18	us
	Response time(Fall)	tf		—	3	18	us

19-4323; Rev 10; 8/01

MAXIM

+5V-Powered, Multichannel RS-232 Drivers/Receivers

General Description

The MAX220–MAX249 family of line drivers/receivers is intended for all EIA/TIA-232E and V.28/V.24 communications interfaces, particularly applications where ±12V is not available.

These parts are especially useful in battery-powered systems, since their low-power shutdown mode reduces power dissipation to less than 5µW. The MAX225, MAX233, MAX235, and MAX245/MAX246/MAX247 use no external components and are recommended for applications where printed circuit board space is critical.

Applications

Portable Computers

Low-Power Modems

Interface Translation

Battery-Powered RS-232 Systems

Multidrop RS-232 Networks

Features

Superior to Bipolar

- **Operate from Single +5V Power Supply (+5V and +12V—MAX231/MAX239)**
- **Low-Power Receive Mode in Shutdown (MAX223/MAX242)**
- **Meet All EIA/TIA-232E and V.28 Specifications**
- **Multiple Drivers and Receivers**
- **3-State Driver and Receiver Outputs**
- **Open-Line Detection (MAX243)**

Ordering Information

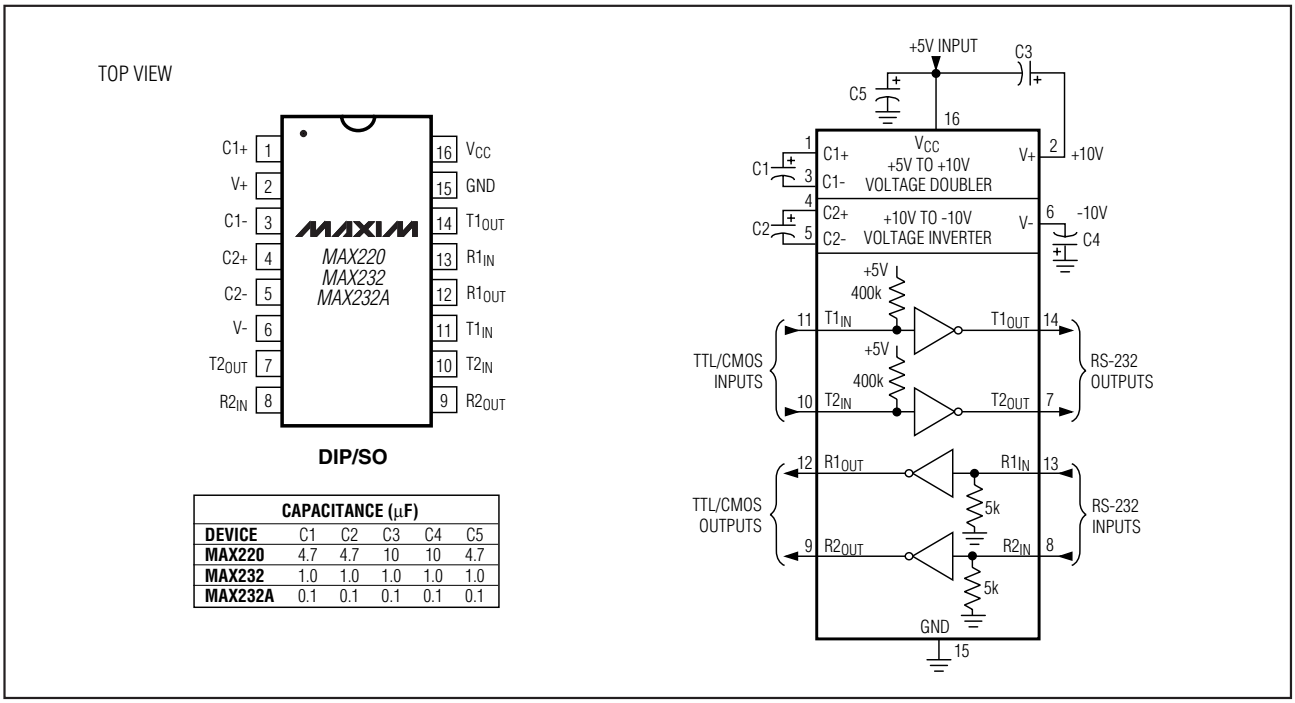
PART	TEMP. RANGE	PIN-PACKAGE
MAX220CPE	0°C to +70°C	16 Plastic DIP
MAX220CSE	0°C to +70°C	16 Narrow SO
MAX220CWE	0°C to +70°C	16 Wide SO
MAX220C/D	0°C to +70°C	Dice*
MAX220EPE	-40°C to +85°C	16 Plastic DIP
MAX220ESE	-40°C to +85°C	16 Narrow SO
MAX220EWE	-40°C to +85°C	16 Wide SO
MAX220EJE	-40°C to +85°C	16 CERDIP
MAX220MJE	-55°C to +125°C	16 CERDIP

Ordering Information continued at end of data sheet.

**Contact factory for dice specifications.*

Selection Table

Part Number	Power Supply (V)	No. of RS-232 Drivers/Rx	No. of Ext. Caps	Nominal Cap. Value (µF)	SHDN & Three-State	Rx Active in SHDN	Data Rate (kbps)	Features
MAX220	+5	2/2	4	0.1	No	—	120	Ultra-low-power, industry-standard pinout
MAX222	+5	2/2	4	0.1	Yes	—	200	Low-power shutdown
MAX223 (MAX213)	+5	4/5	4	1.0 (0.1)	Yes	✔	120	MAX241 and receivers active in shutdown
MAX225	+5	5/5	0	—	Yes	✔	120	Available in SO
MAX230 (MAX200)	+5	5/0	4	1.0 (0.1)	Yes	—	120	5 drivers with shutdown
MAX231 (MAX201)	+5 and +7.5 to +13.2	2/2	2	1.0 (0.1)	No	—	120	Standard +5/+12V or battery supplies; same functions as MAX232
MAX232 (MAX202)	+5	2/2	4	1.0 (0.1)	No	—	120 (64)	Industry standard
MAX232A	+5	2/2	4	0.1	No	—	200	Higher slew rate, small caps
MAX233 (MAX203)	+5	2/2	0	—	No	—	120	No external caps
MAX233A	+5	2/2	0	—	No	—	200	No external caps, high slew rate
MAX234 (MAX204)	+5	4/0	4	1.0 (0.1)	No	—	120	Replaces 1488
MAX235 (MAX205)	+5	5/5	0	—	Yes	—	120	No external caps
MAX236 (MAX206)	+5	4/3	4	1.0 (0.1)	Yes	—	120	Shutdown, three state
MAX237 (MAX207)	+5	5/3	4	1.0 (0.1)	No	—	120	Complements IBM PC serial port
MAX238 (MAX208)	+5	4/4	4	1.0 (0.1)	No	—	120	Replaces 1488 and 1489
MAX239 (MAX209)	+5 and +7.5 to +13.2	3/5	2	1.0 (0.1)	No	—	120	Standard +5/+12V or battery supplies; single-package solution for IBM PC serial port
MAX240	+5	5/5	4	1.0	Yes	—	120	DIP or flatpack package
MAX241 (MAX211)	+5	4/5	4	1.0 (0.1)	Yes	—	120	Complete IBM PC serial port
MAX242	+5	2/2	4	0.1	Yes	✔	200	Separate shutdown and enable
MAX243	+5	2/2	4	0.1	No	—	200	Open-line detection simplifies cabling
MAX244	+5	8/10	4	1.0	No	—	120	High slew rate
MAX245	+5	8/10	0	—	Yes	✔	120	High slew rate, int. caps, two shutdown modes
MAX246	+5	8/10	0	—	Yes	✔	120	High slew rate, int. caps, three shutdown modes
MAX247	+5	8/9	0	—	Yes	✔	120	High slew rate, int. caps, nine operating modes
MAX248	+5	8/8	4	1.0	Yes	✔	120	High slew rate, selective half-chip enables
MAX249	+5	6/10	4	1.0	Yes	✔	120	Available in quad flatpack package



CAPACITANCE (µF)					
DEVICE	C1	C2	C3	C4	C5
MAX220	4.7	4.7	10	10	4.7
MAX232	1.0	1.0	1.0	1.0	1.0
MAX232A	0.1	0.1	0.1	0.1	0.1

Figure 5. MAX220/MAX232/MAX232A Pin Configuration and Typical Operating Circuit

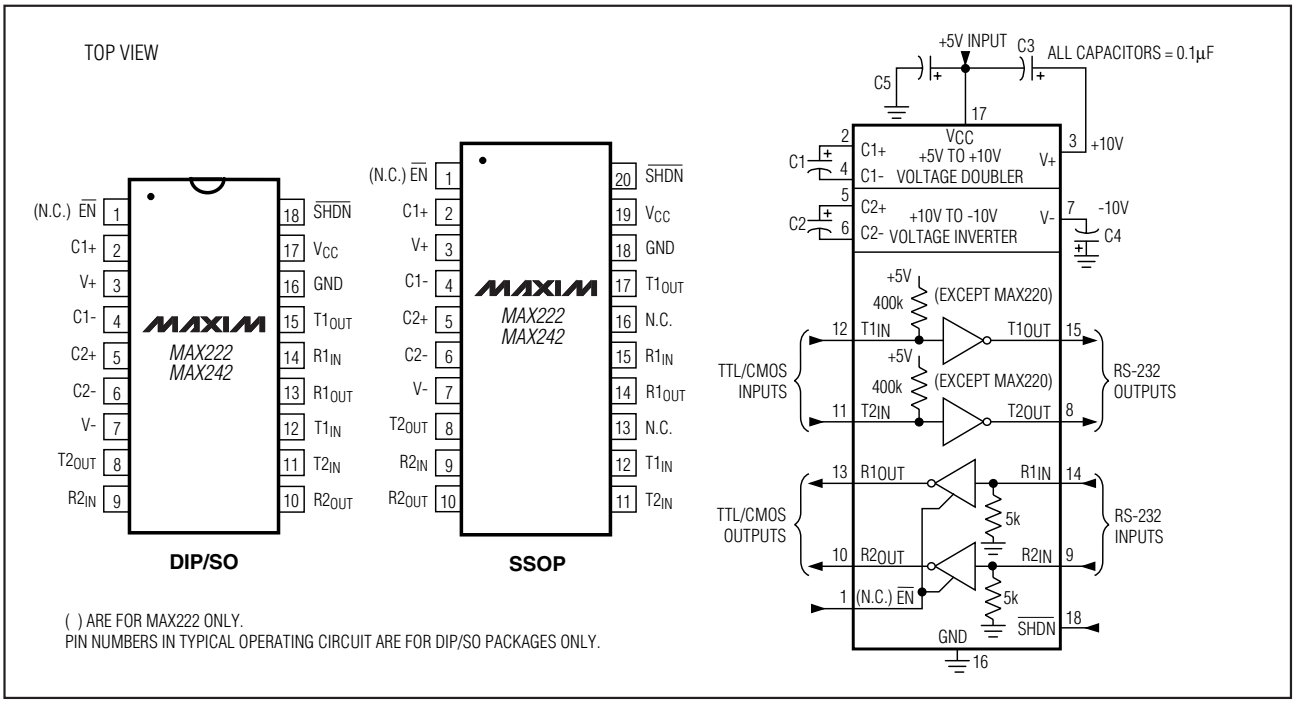
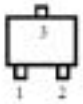


Figure 6. MAX222/MAX242 Pin Configurations and Typical Operating Circuit

2SC2073

1. BASE
2. COLLECTOR
3. EMITTER

2SC2406



1) Base
2) Emitter
3) Collector

2SC1815

1. EMITTER
2. COLLECTOR
3. BASE

2SA950

1. EMITTER
2. COLLECTOR
3. BASE

2SC2458

1. EMITTER
2. COLLECTOR
3. BASE

2SC2235

1. EMITTER
2. COLLECTOR
3. BASE

2SC2120

1. EMITTER
2. COLLECTOR
3. BASE

Low Cost, General-Purpose High Speed JFET Amplifier

AD825

FEATURES

High speed
- **41 MHz, −3 dB bandwidth**
- **125 V/µs slew rate**
- **80 ns settling time**

Input bias current of 20 pA and noise current of 10 fA/√Hz
Input voltage noise of 12 nV/√Hz
Fully specified power supplies: ±5 V to ±15 V
Low distortion: −76 dB at 1 MHz
High output drive capability
- **Drives unlimited capacitance load**
- **50 mA min output current**

No phase reversal when input is at rail
Available in 8-lead SOIC

APPLICATIONS

CCDs
Low distortion filters
Mixed gain stages
Audio amplifiers
Photo detector interfaces
ADC input buffers
DAC output buffers

GENERAL DESCRIPTION

The AD825 is a superbly optimized operational amplifier for high speed, low cost, and dc parameters, making it ideally suited for a broad range of signal conditioning and data acquisition applications. The ac performance, gain, bandwidth, slew rate, and drive capability are all very stable over temperature. The AD825 also maintains stable gain under varying load conditions.

The unique input stage has ultralow input bias current and input current noise. Signals that go to either rail on this high performance input do not cause phase reversals at the output. These features make the AD825 a good choice as a buffer for MUX outputs, creating minimal offset and gain errors.

The AD825 is fully specified for operation with dual ±5 V and ±15 V supplies. This power supply flexibility, and the low supply current of 6.5 mA with excellent ac characteristics under all supply conditions, makes the AD825 well-suited for many demanding applications.

CONNECTION DIAGRAMS

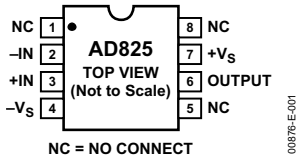


Figure 1. 8-Lead Plastic SOIC (R) Package

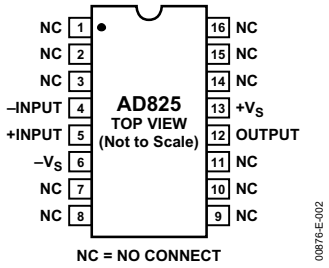


Figure 2. 16-Lead Plastic SOIC (R-16) Package

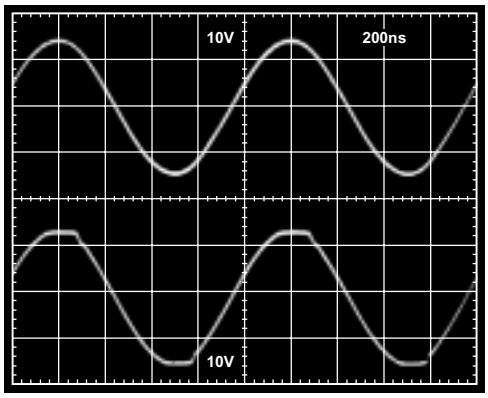


Figure 3. Performance with Rail-to-Rail Input Signals

Rev. F

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781.329.4700 **www.analog.com**
Fax: 781.326.8703

AK4683
Asynchronous Multi-Channel Audio CODEC with DIR/T

GENERAL DESCRIPTION

The AK4683 is a single chip CODEC that includes two channels of ADC and four channels of DAC. The ADC outputs 24bit data and the DAC accepts up to 24bit input data. The ADC has the Enhanced Dual Bit architecture with wide dynamic range. The DAC introduces the new developed Advanced Multi-Bit architecture, and achieves wider dynamic range and lower outband noise. The also has digital audio receiver (DIR) and transmitter (DIT) compatible with 192kHz, 24bits. The DIR can automatically detect a Non-PCM bit stream such as Dolby Digital (AC-3)*.

The AK4683 has a dynamic range of 100dB for ADC, 106dB for DAC and is well suited for digital TV and home theater system.

* Dolby Digital (AC-3) is a trademark of Dolby Laboratories.

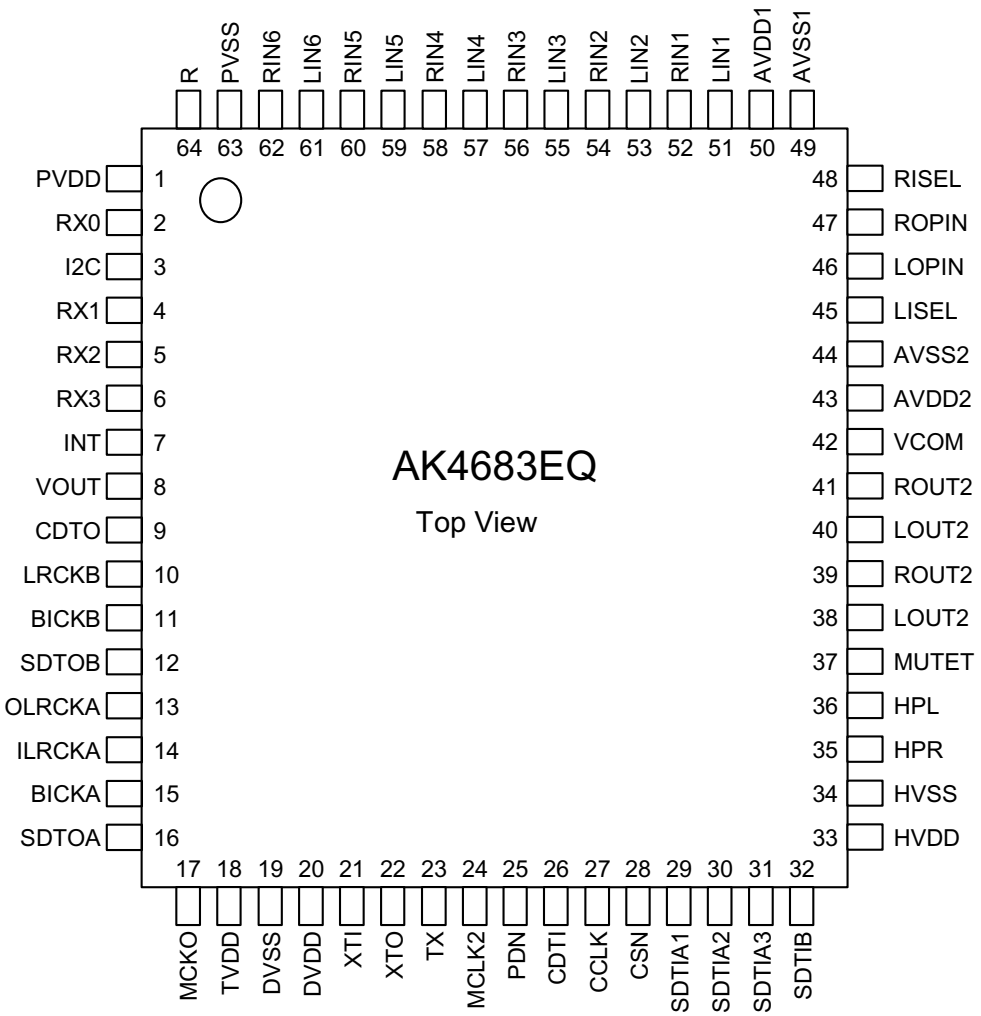
FEATURES

☐ ADC/DAC part
- **☐ Asynchronous ADC/DAC Operation**
- **☐ 6:1 Input Selector with Pre-amp**
- **☐ 2ch 24bit ADC**
  - **- 64x Oversampling**
  - **- Sampling Rate up to 96kHz**
  - **- Linear Phase Digital Anti-Alias Filter**
  - **- Single-Ended Input**
  - **- S/(N+D): 90dB**
  - **- Dynamic Range, S/N: 100dB**
  - **- Digital HPF for Offset Cancellation**
  - **- Channel Independent Digital Volume (+24/-103dB, 0.5dB/step)**
  - **- Soft Mute**
  - **- Overflow Flag**
- **☐ 4ch 24bit DAC**
  - **- 128x Oversampling**
  - **- Sampling Rate up to 192kHz**
  - **- 24bit 8 times Digital Filter**
  - **- Single-Ended Outputs**
  - **- S/(N+D): 90dB**
  - **- Dynamic Range, S/N: 106dB**
  - **- Channel Independent Digital Volume (+12/-115dB, 0.5dB/step)**
  - **- Soft Mute**
  - **- De-emphasis Filter (32kHz, 44.1kHz, 48kHz)**
  - **- Zero Detect Function**
- **☐ Stereo Headphone Amp with Volume**
  - **- 50mW at 16ohm**
  - **- Click-noise free at Power on/off**
- **☐ High Jitter Tolerance**

■ Ordering Guide

AK4683EQ	-20 ~ +85°C	64pin LQFP (0.5mm pitch)
AKD4683	Evaluation Board for AK4683	

■ Pin Layout



■ Compatibility with AK4588

Functions	AK4588	AK4683
DAC, ADC Asynchronous operation	NOT Available	Available
DAC ch#	8ch	4ch
HP-Amp	-	2ch
ADC Input selector	-	6:1

PIN/FUNCTION

No.	Pin Name	I/O	Function
1	PVDD	-	PLL Power supply Pin, 4.5V~5.5V
2	RX0	I	Receiver Channel 0 Pin (Internal biased pin. Internally biased at PVDD/2)
3	I2C	I	Control Mode Select Pin. "L": 4-wire Serial, "H": I^2C Bus
4	RX1	I	Receiver Channel 1 Pin
5	RX2	I	Receiver Channel 2 Pin
6	RX3	I	Receiver Channel 3 Pin
7	INT	O	Interrupt Pin
8	VOUT	O	V-bit Output Pin for Receiver Input
	DZF	O	Zero Input Detect Pin When the input data of DAC follow total 8192 LRCK cycles with "0" input data, this pin goes to "H". And when RSTN1 bit is "0", PWDA bit is "0", this pin goes to "H".
	OVF	O	Analog Input Overflow Detect Pin This pin goes to "H" if the analog input of Lch or Rch overflows.
9	CDTO	O	Control Data Output Pin in Serial Mode and I2C pin = "L".
10	LRCKB	I/O	Channel Clock B Pin
11	BICKB	I/O	Audio Serial Data Clock B Pin
12	SDTOB	O	Audio Serial Data Output B Pin
13	OLRCKA	I/O	Output Channel Clock A Pin
14	ILRCKA	I/O	Input Channel Clock A Pin
15	BICKA	I/O	Audio Serial Data Clock A Pin
16	SDTOA	O	Audio Serial Data Output A Pin
17	MCKO	O	Master Clock Output Pin
18	TVDD	-	Output Buffer Power Supply Pin, 2.7V~5.5V
19	DVSS	-	Digital Ground Pin, 0V
20	DVDD	-	Digital Power Supply Pin, 4.5V~5.5V
21	XTI	I	X'tal Input Pin
22	XTO	O	X'tal Output Pin
23	TX	O	Transmit Channel Output pin When DIT bit = "0", RX0~3 Through. When DIT bit = "1", Internal DIT Output.
24	MCLK2	I	Master Clock Input Pin
25	PDN	I	Power-Down Mode & Reset Pin When "L", the AK4683 is powered-down, all registers are reset. And then all digital output pins go "L". The AK4683 must be reset once upon power-up.
26	CDTI	I	Control Data Input Pin in Serial Mode and I2C pin = "L".
	SDA	I/O	Control Data Pin in Serial Mode and I2C pin = "H".
27	CCLK	I	Control Data Clock Pin in Serial Mode and I2C pin = "L"
	SCL	I	Control Data Clock Pin in Serial Mode and I2C pin = "H"
28	CSN	I	Chip Select Pin in Serial Mode and I2C pin = "L".
	TEST	I	This pin should be connected to DVSS in Serial Mode and I2C pin = "H".
29	SDTIA1	I	Audio Serial Data Input A1 Pin
30	SDTIA2	I	Audio Serial Data Input A2 Pin
31	SDTIA3	I	Audio Serial Data Input A3 Pin
32	SDTIB	I	Audio Serial Data Input B Pin
33	HVDD	-	HP Power Supply Pin, 4.5V~5.5V
34	HVSS	-	HP Ground Pin, 0V
35	HPR	O	HP Rch Output Pin
36	HPL	O	HP Lch Output Pin
37	MUTET	-	HP Common Voltage Output Pin 1μF capacitor should be connected to HVSS externally.

No.	Pin Name	I/O	Function
38	LOUT2	O	DAC2 Lch Positive Analog Output Pin
39	ROUT2	O	DAC2 Rch Positive Analog Output Pin
40	LOUT1	O	DAC1 Lch Positive Analog Output Pin
41	ROUT1	O	DAC1 Rch Positive Analog Output Pin
42	VCOM	-	DAC/ADC Common Voltage Output Pin 2.2μF capacitor should be connected to AVSS2 externally.
43	AVDD2	-	DAC Power Supply Pin, 4.5V~5.5V
44	AVSS2	-	DAC Ground Pin, 0V
45	LISEL	O	Lch Feedback Resistor Output Pin
46	LOPIN	O	Lch Feedback Resistor Input Pin. 0.5 x AVDD1.
47	ROPIN	O	Rch Feedback Resistor Input Pin. 0.5 x AVDD1.
48	RISEL	O	Rch Feedback Resistor Output Pin
49	AVSS1	-	ADC Ground Pin, 0V
50	AVDD1	-	ADC Power Supply Pin, 4.5V~5.5V
51	LIN1	I	Lch Input 1 Pin
52	RIN1	I	Rch Input 1 Pin
53	LIN2	I	Lch Input 2 Pin
54	RIN2	I	Rch Input 2 Pin
55	LIN3	I	Lch Input 3 Pin
56	RIN3	I	Rch Input 3 Pin
57	LIN4	I	Lch Input 4 Pin
58	RIN4	I	Rch Input 4 Pin
59	LIN5	I	Lch Input 5 Pin
60	RIN5	I	Rch Input 5 Pin
61	LIN6	I	Lch Input 6 Pin
62	RIN6	I	Rch Input 6 Pin
63	PVSS	-	PLL Ground pin
64	R	-	External Resistor Pin 12kΩ +/-1% resistor should be connected to PVSS externally.

Note: All input pins except internal biased pin (RX0) and analog input pins (LIN1-6, RIN1-6) should not be left floating.

■ Handling of Unused Pin

The unused I/O pins should be processed appropriately as below.

Classification	Pin Name	Setting
Analog	RX0, LOUT1-2, ROUT1-2, LIN1-6, RIN1-6	These pins should be open.
Digital	INT, XTO, MCKO, VOUT/DZF/OVF, SDTOA-B, CDTO, TX	These pins should be open.
	RX1-3, CSN, CCLK, CDTI, XTI, MCLK2, OLRCKA, ILRCKA, BICKA, SDTIA1-3, LRCKB, BICKB, SDTIB	These pins should be connected to DVSS.

CS5361

114 dB, 192 kHz, Multi-Bit Audio A/D Converter

Features

- Advanced Multi-bit Delta-sigma Architecture
- 24-bit Conversion
- 114 dB Dynamic Range
- -105 dB THD+N
- System Sampling Rates up to 192 kHz
- 135 mW Power Consumption
- High-pass Filter and DC Offset Calibration
- Supports Logic Levels Between 5 and 2.5 V
- Differential Analog Architecture
- Overflow Detection
- Pin-compatible with the CS5381

General Description

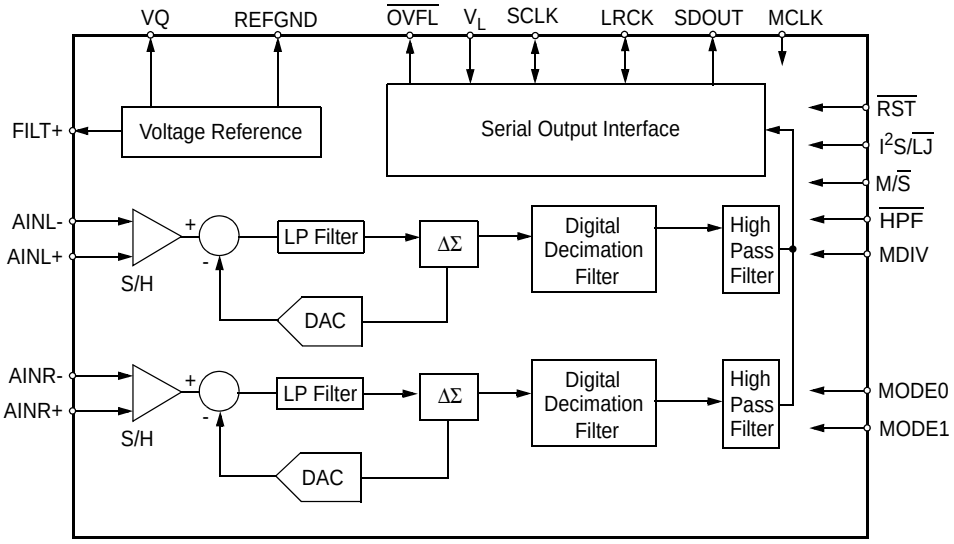
The CS5361 is a complete analog-to-digital converter for digital audio systems. It performs sampling, analog-to-digital conversion, and anti-alias filtering. The CS5361 generates 24-bit values for both left and right inputs in serial form at sample rates up to 192 kHz per channel.

The CS5361 uses a 5th-order, multi-bit, delta-sigma modulator followed by digital filtering and decimation. This removes the need for an external anti-alias filter. The ADC uses a differential architecture which provides excellent noise rejection.

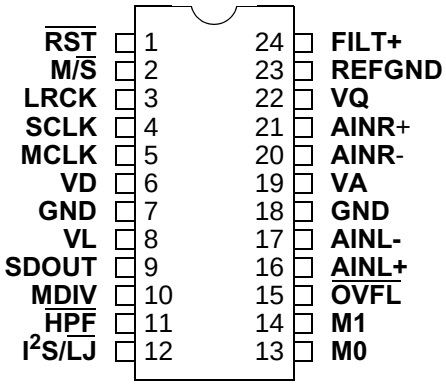
The CS5361 is ideal for audio systems requiring wide dynamic range, negligible distortion, and low noise. These applications include A/V receivers, DVD-R, CD-R, digital mixing consoles, and effects processors.

ORDERING INFORMATION

CS5361-KSZ	-10° to 70°C 24-pin SOIC	Lead Free
CS5361-KZZ	-10° to 70°C 24-pin TSSOP	Lead Free
CS5361-DZZ	-40° to 85°C 24-pin TSSOP	Lead Free
CDB5361	Evaluation Board	



2.0 PIN DESCRIPTIONS



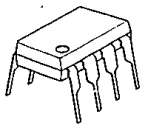
Pin Name	#	Pin Description
RST	1	**Reset** (*Input*) - The device enters a low power mode when low.
M/S	2	**Master/Slave Mode** *(Input)* - Selects operation as either clock master or slave.
LRCK	3	**Left Right Clock** (*Input*/*Output*) - Determines which channel, Left or Right, is currently active on the serial audio data line.
SCLK	4	**Serial Clock** (*Input*/*Output*) - Serial clock for the serial audio interface.
MCLK	5	**Master Clock** (*Input*) - Clock source for the delta-sigma modulator and digital filters.
VD	6	**Digital Power** (*Input*) **-** Positive power supply for the digital section.
GND	7,18	**Ground** (*Input*) - Ground reference. Must be connected to analog ground.
VL	8	**Logic Power** (*Input*) **-** Positive power for the digital input/output.
SDOUT	9	**Serial Audio Data Output** (*Output*) - Output for two's complement serial audio data.
MDIV	10	**MCLK Divider** *(Input*) **-** Enables a master clock divide by two function.
HPF	11	**High-pass Filter Enable** *(Input*) **-** Enables the Digital High-Pass Filter.
I2S/LJ	12	**Serial Audio Interface Format Select** (*Input*) -Selects either the left-justified or I^2S format for the SAI.
M0 M1	13, 14	**Mode Selection** (*Input*) - Determines the operational mode of the device.
OVFL	15	**Overflow** *(Output, open drain)* **-** Detects an overflow condition on both left and right channels.
AINL+ AINL-	16, 17	**Differential Left Channel Analog Input** (*Input*) - Signals are presented differentially to the delta-sigma modulators via the AINL+/- pins.
VA	19	**Analog Power** (*Input*) **-** Positive power supply for the analog section.
AINR- AINR+	20, 21	**Differential Right Channel Analog Input** (*Input*) -Signals are presented differentially to the delta-sigma modulators via the AINR+/- pins.
VQ	22	**Quiescent Voltage** *(Output)* **-** Filter connection for the internal quiescent reference voltage.
REF_GND	23	**Reference Ground** (*Input*) - Ground reference for the internal sampling circuits.
FILT+	24	**Positive Voltage Reference** (*Output*) **-** Positive reference voltage for the internal sampling circuits.

LOW-NOISE DUAL OPERATIONAL AMPLIFIER

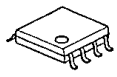
■ GENERAL DESCRIPTION

The NJM2068 is a high performance, low noise dual operational amplifier. This amplifier features popular pin-out, superior noise performance, and superior total harmonic distortion. This amplifier also features guaranteed noise performance with substantially higher gain-bandwidth product and slew rate which far exceeds that of the 4558 type amplifier. The specially designed low noise input transistors allow the NJM2068 to be used in very low noise signal processing applications such as audio preamplifiers and servo error amplifier.

■ PACKAGE OUTLINE

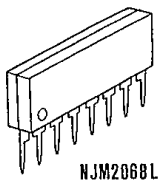


NJM2068D



NJM2068M

NJM2068V



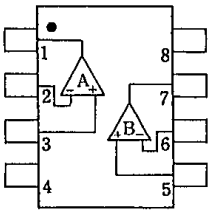
NJM2068L

■ FEATURES

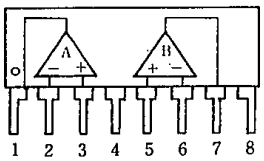
- Operating Voltage (±4V～±18V)
- Low Total Harmonic Distortion (0.001% typ.)
- Low Noise Voltage (FLAT+JISA, 0.56 μV typ.)
- High Slew Rate (6V/μs typ.)
- Unity Gain Bandwidth (27MHz @f=10kHz)
- Package Outline DIP8, DMP8, SIP8, SSOP8
- Bipolar Technology

4

■ PIN CONFIGURATION



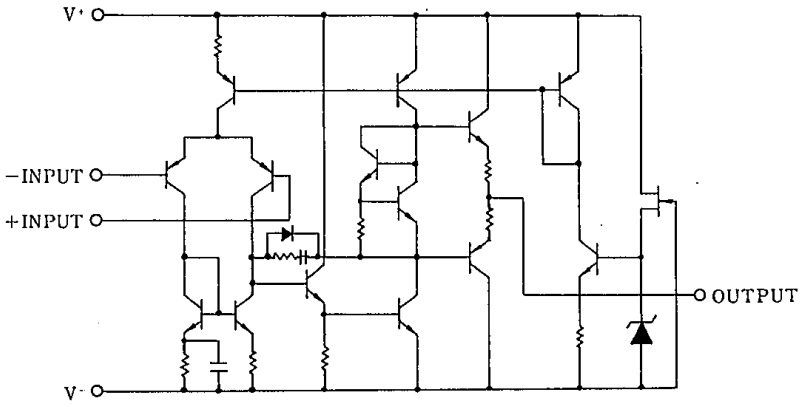
NJM2068D
NJM2068M
NJM2068V



NJM2068L

PIN FUNCITON
1. A OUTPUT
2. A−INPUT
3. A+INPUT
4. V⁻
5. B+INPUT
6. B−INPUT
7. B OUTPUT
8. V⁺

■ EQUIVALENT CIRCUIT (1/2 Shown)



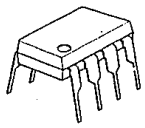
HIGH PERFORMANCE LOW-NOISE DUAL OPERATIONAL AMPLIFIER

■ GENERAL DESCRIPTION

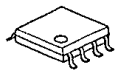
The NJM5532 is a high performance dual low noise operational amplifier. Compared to the standard dual operational amplifiers, such as the NJM1458, it shows better noise performance, improved output drive capability, and considerably higher small-signal and power bandwidths.

This makes the device especially suitable for application in high quality and professional audio equipment, instrumentation, control circuits, and telephone channel amplifiers. The op amp is internally compensated for gains equil to one If very low noise is of prime importance, version be used which has guaranteed NJM5532DD it is recommended that the noise specifications.

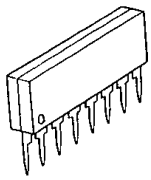
■ PACKAGE OUTLINE



NJM5532D



NJM5532M

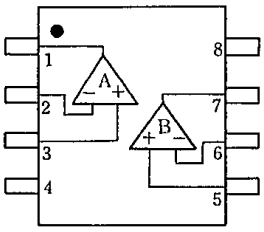


NJM5532L

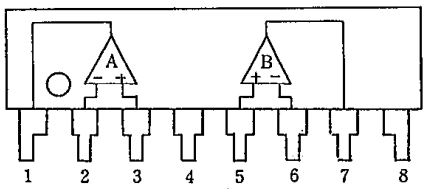
■ FEATURES

- Operating Voltage (±3V～±20V)
- Small Signal Bandwidth (10MHz typ.)
- Output Drive Capability (600Ω, 10Vrms typ.)
- Input Noise Voltage ($5nV/\sqrt{Hz}$ typ.)
- Power Bandwidth (140kHz typ.)
- Slew Rate ($8V/\mu s$ typ.)
- Package Outline DIP8, DMP8, SIP8
- Bipolar Technology

■ PIN CONFIGURATION



NJM5532D
NJM5532M

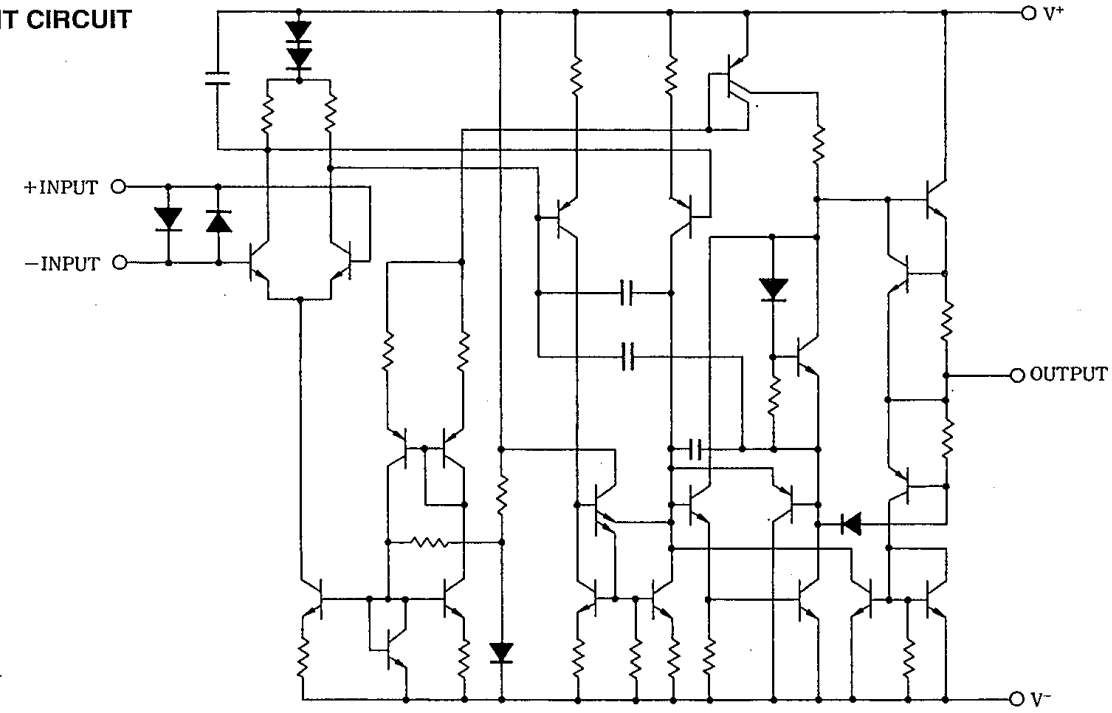


NJM5532L

PIN FUNCTION
1. A OUTPUT
2. A−INPUT
3. A+INPUT
4. V⁻
5. B+INPUT
6. B−INPUT
7. B OUTPUT
8. V⁺

■ EQUIVALENT CIRCUIT

(1/2 Shown)



ANALOG FUNCTION SWITCH

■ GENERAL DESCRIPTION

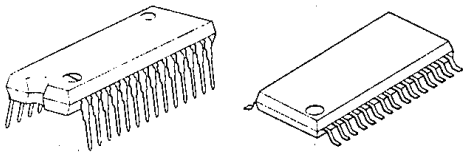
The NJU7313A is a dual 4-channel and quad 2-channel analog function switch, especially suitable for input selector of audio equipments.

The high break down voltage analog switch controlled by 14-bit serial data based on logic operating voltage (5V) can ON and OFF of ±15V signal.

The analog switch is realized superior linearity of on-resistance in all voltage range, low distortion and wide dynamic range.

Furthermore, the both of single and dual power supply application provides easy designing.

■ PACKAGE OUTLINE



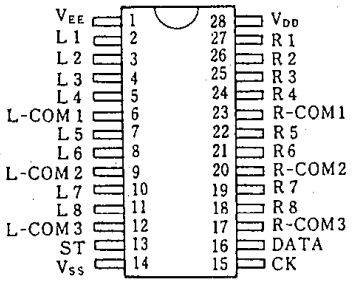
NJU7313AL NJU7313AM

6

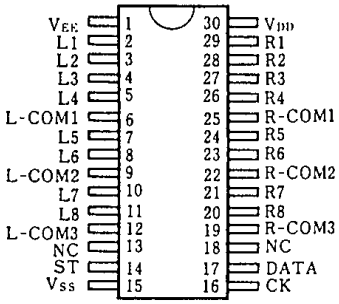
■ FEATURES

- Analog switch: dual 3 channel and quad 2 channel.
- High Break Down Voltage ------ ±15V.
- Low Distortion ------ THD: 0.002% (typ).
- Superior Linearity of ON Resistance.
- Serial Data Control.
- Package Outline SDIP 28 / DMP 30
- C-MOS Technology

■ PIN CONFIGURATION

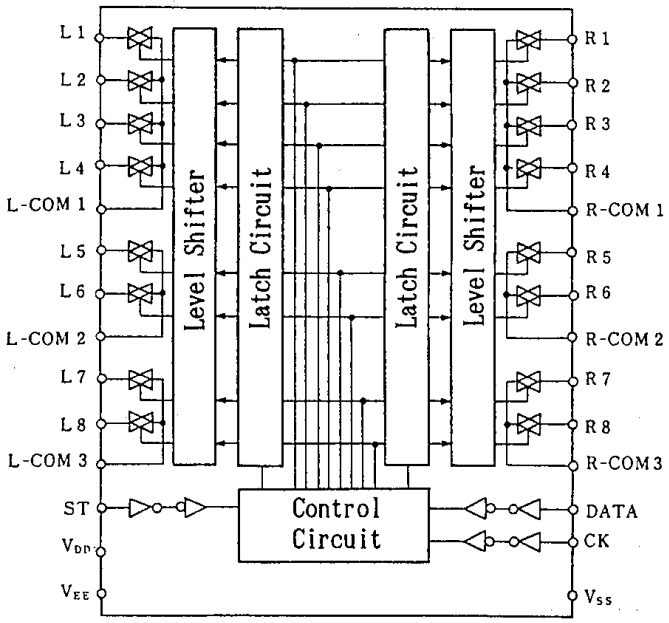


NJU7313AL



NJU7313AM

■ BLOCK DIAGRAM



Dual Bipolar/JFET, Audio Operational Amplifier

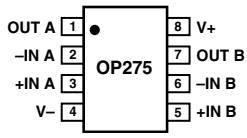
OP275*

FEATURES
Excellent Sonic Characteristics
Low Noise: 6 nV/√Hz
Low Distortion: 0.0006%
High Slew Rate: 22 V/μs
Wide Bandwidth: 9 MHz
Low Supply Current: 5 mA
Low Offset Voltage: 1 mV
Low Offset Current: 2 nA
Unity Gain Stable
SOIC-8 Package
PDIP-8 Package

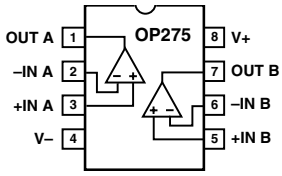
APPLICATIONS
High Performance Audio
Active Filters
Fast Amplifiers
Integrators

PIN CONNECTIONS

8-Lead Narrow-Body SOIC (S Suffix)



8-Lead PDIP (P Suffix)



GENERAL DESCRIPTION

The OP275 is the first amplifier to feature the Butler Amplifier front end. This new front end design combines both bipolar and JFET transistors to attain amplifiers with the accuracy and low noise performance of bipolar transistors, and the speed and sound quality of JFETs. Total Harmonic Distortion plus Noise equals that of previous audio amplifiers, but at much lower supply currents.

A very low l/f corner of below 6 Hz maintains a flat noise density response. Whether noise is measured at either 30 Hz or 1 kHz, it is only 6 nV√Hz. The JFET portion of the input stage gives the OP275 its high slew rates to keep distortion low, even when large output swings are required, and the 22 V/μs slew rate of the OP275 is the fastest of any standard audio amplifier. Best of all, this low noise and high speed are accomplished using less than 5 mA of supply current, lower than any standard audio amplifier.

Improved dc performance is also provided with bias and offset currents greatly reduced over purely bipolar designs. Input offset voltage is guaranteed at 1 mV and is typically less than 200 μV. This allows the OP275 to be used in many dc-coupled or summing applications without the need for special selections or the added noise of additional offset adjustment circuitry.

The output is capable of driving 600 Ω loads to 10 V rms while maintaining low distortion. THD + Noise at 3 V rms is a low 0.0006%.

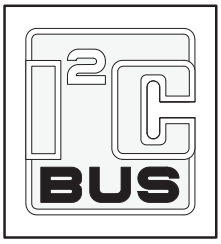
The OP275 is specified over the extended industrial (–40°C to +85°C) temperature range. OP275s are available in both plastic DIP and SOIC-8 packages. SOIC-8 packages are available in 2500-piece reels. Many audio amplifiers are not offered in SOIC-8 surface-mount packages for a variety of reasons; however, the OP275 was designed so that it would offer full performance in surface-mount packaging.

*Protected by U.S. Patent No. 5,101,126.

REV. C

One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106, U.S.A.
Tel: 781/329-4700 **www.analog.com**
Fax: 781/326-8703

16-bit I²C and SMBus I/O port with interrupt PCA9555



FEATURES

- Operating power supply voltage range of 2.3 V to 5.5 V
- 5 V tolerant I/Os
- Polarity inversion register
- Active-LOW interrupt output
- Low stand-by current
- Noise filter on SCL/SDA inputs
- No glitch on power-up
- Internal power-on reset
- 16 I/O pins which default to 16 inputs
- 0 kHz to 400 kHz clock frequency
- ESD protection exceeds 2000 V HBM per JESD22-A114, 200 V MM per JESD22-A115, and 1000 V CDM per JESD22-C101
- Latch-up testing is done to JESDEC Standard JESD78 which exceeds 100 mA
- Five packages offered: DIP24, SO24, SSOP24, TSSOP24, and HVQFN24

DESCRIPTION

The PCA9555 is a 24-pin CMOS device that provide 16 bits of General Purpose parallel Input/Output (GPIO) expansion for I²C/SMBus applications and was developed to enhance the Philips family of I²C I/O expanders. The improvements include higher drive capability, 5 V I/O tolerance, lower supply current, individual I/O configuration, and smaller packaging. I/O expanders provide a simple solution when additional I/O is needed for ACPI power switches, sensors, pushbuttons, LEDs, fans, etc.

The PCA9555 consist of two 8-bit Configuration (Input or Output selection); Input, Output and Polarity inversion (Active-HIGH or Active-LOW operation) registers. The system master can enable the I/Os as either inputs or outputs by writing to the I/O configuration bits. The data for each Input or Output is kept in the corresponding Input or Output register. The polarity of the read register can be inverted with the Polarity Inversion Register. All registers can be read by the system master. Although pin-to-pin and I²C address compatible with the PCF8575, software changes are required due to the enhancements and are discussed in *Application Note AN469*.

The PCA9555 open-drain interrupt output is activated when any input state differs from its corresponding input port register state and is used to indicate to the system master that an input state has changed. The power-on reset sets the registers to their default values and initializes the device state machine.

Three hardware pins (A0, A1, A2) vary the fixed I²C address and allow up to eight devices to share the same I²C/SMBus. The fixed I²C address of the PCA9555 is the same as the PCA9554 allowing up to eight of these devices in any combination to share the same I²C/SMBus.

ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	ORDER CODE	TOPSIDE MARK	DRAWING NUMBER
24-Pin Plastic DIP	–40 °C to +85 °C	PCA9555N	PCA9555	SOT101-1
24-Pin Plastic SO	–40 °C to +85 °C	PCA9555D	PCA9555D	SOT137-1
24-Pin Plastic SSOP	–40 °C to +85 °C	PCA9555DB	PCA9555	SOT340-1
24-Pin Plastic TSSOP	–40 °C to +85 °C	PCA9555PW	PCA9555	SOT355-1
24-Pin Plastic HVQFN	–40 °C to +85 °C	PCA9555BS	9555	SOT616-1

Standard packing quantities and other packaging data are available at www.standardproducts.philips.com/packaging.
I²C is a trademark of Philips Semiconductors Corporation.
SMBus as specified by the Smart Battery System Implementers Forum is a derivative of the Philips I²C patent.

PIN CONFIGURATION — DIP, SO, SSOP, TSSOP

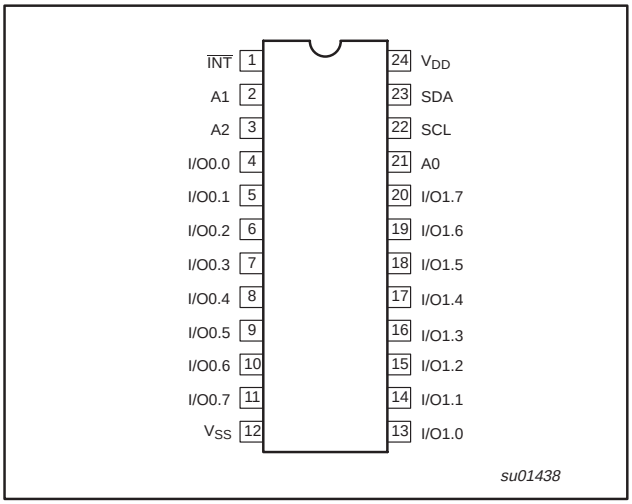


Figure 1. Pin configuration — DIP, SO, SSOP, TSSOP

PIN CONFIGURATION — HVQFN

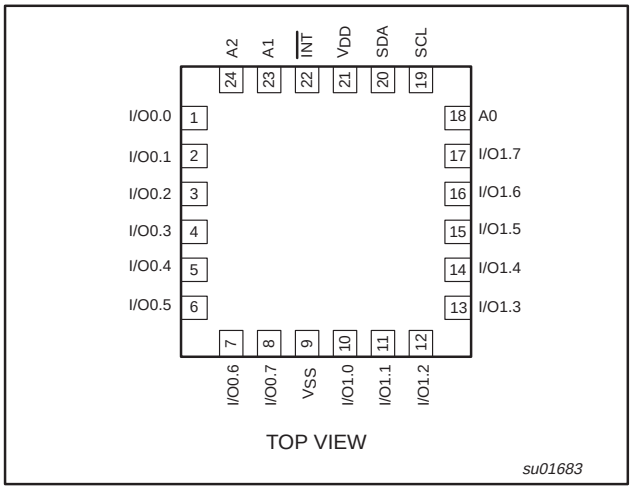


Figure 2. Pin configuration — HVQFN

PIN DESCRIPTION

PIN NUMBER		SYMBOL	FUNCTION
DIP, SO, SSOP, TSSOP	HVQFN		
1	22	$\overline{INT}$	Interrupt output (open-drain)
2	23	A1	Address input 1
3	24	A2	Address input 2
4–11	1–8	I/O0.0–I/O0.7	I/O0.0 to I/O0.7
12	9	V_{SS}	Supply ground
13–20	10–17	I/O1.0–I/O1.7	I/O1.0 to I/O1.7
21	18	A0	Address input 0
22	19	SCL	Serial clock line
23	20	SDA	Serial data line
24	21	V_{DD}	Supply voltage

BLOCK DIAGRAM

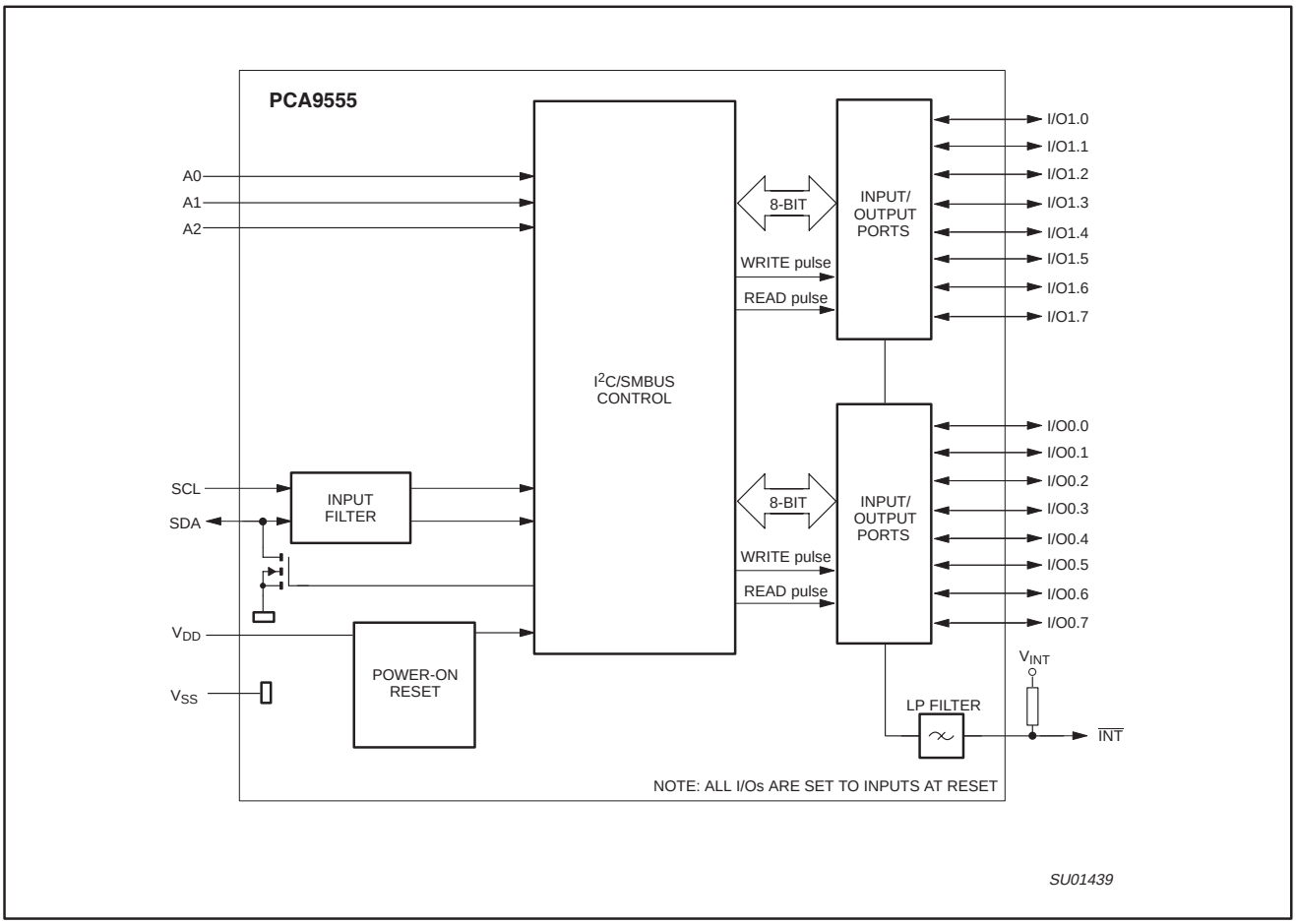


Figure 3. Block diagram

C-MOS QUAD SPST ANALOG SWITCH

■ GENERAL DESCRIPTION

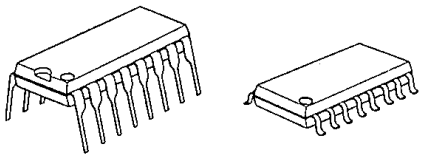
The NJU201A is a quad break-before-make SPST analog switch protected up to 44V operating voltage.

All switches are controlled by TTL or C-MOS compatible input.

The low on-state resistance is about half compare with the NJU7301.

The NJU201A is functionally and pin-to-pin compatible with SILICONIX DG201A.

■ PACKAGE OUTLINE

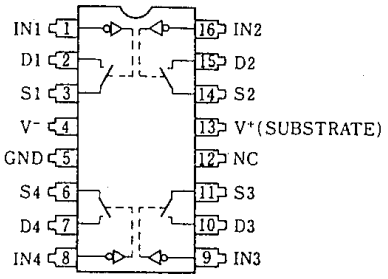


NJU201AD NJU201AM

■ FEATURES

- High Break Down Voltage -- 44V
- Low On-state Resistance
- Package Outline -- DIP/DMP 16
- C-MOS Technology

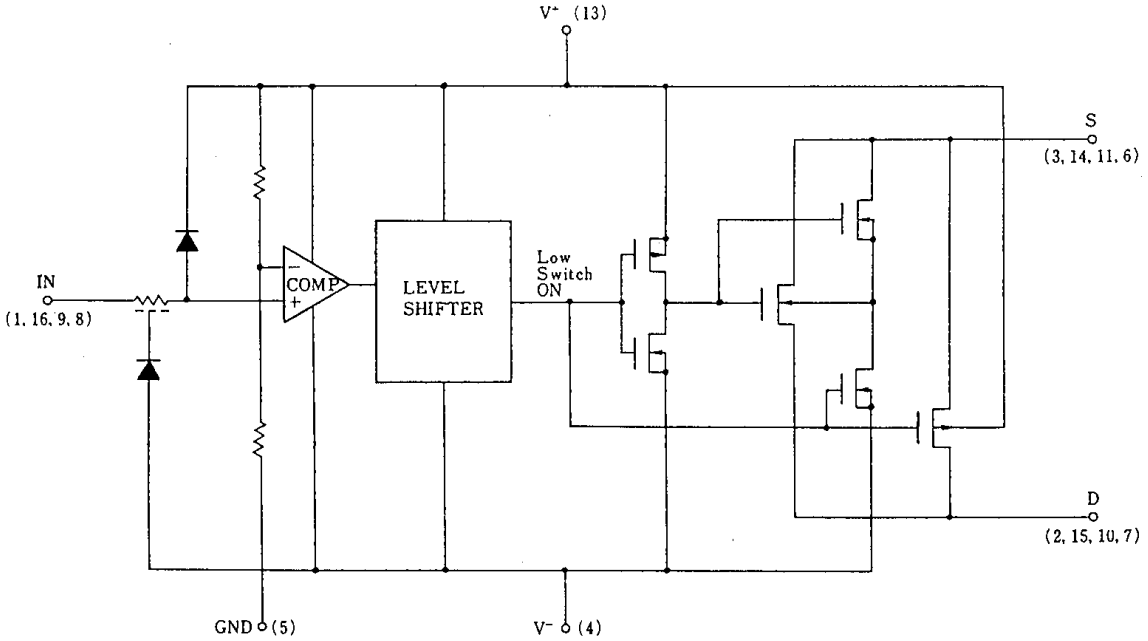
■ PIN CONFIGURATION



■ TRUTH TABLE

Logic (In)	Switch
0	ON
1	OFF

■ EQUIVALENT CIRCUIT



* Logic input threshold voltage V_{TH} is about V^+ x 0.128(V).
When the designing, enough margin is required.

- **Low Power Consumption**
- **Wide Common-Mode and Differential Voltage Ranges**
- **Low Input Bias and Offset Currents**
- **Output Short-Circuit Protection**
- **Low Total Harmonic Distortion 0.003% Typ**
- **Low Noise V_n = 18 nV/$\sqrt{Hz}$ Typ at f = 1 kHz**
- **High Input Impedance . . . JFET Input Stage**
- **Internal Frequency Compensation**
- **Latch-Up-Free Operation**
- **High Slew Rate . . . 13 V/μs Typ**
- **Common-Mode Input Voltage Range Includes V_{CC+}**

description

The JFET-input operational amplifiers in the TL07_ series are designed as low-noise versions of the TL08_ series amplifiers with low input bias and offset currents and fast slew rate. The low harmonic distortion and low noise make the TL07_ series ideally suited for high-fidelity and audio preamplifier applications. Each amplifier features JFET inputs (for high input impedance) coupled with bipolar output stages integrated on a single monolithic chip.

The C-suffix devices are characterized for operation from 0°C to 70°C. The I-suffix devices are characterized for operation from –40°C to 85°C. The M-suffix devices are characterized for operation over the full military temperature range of –55°C to 125°C.

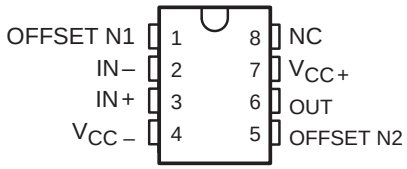
AVAILABLE OPTIONS

T_A	V_{IO}max AT 25°C	PACKAGE							
		SMALL OUTLINE (D)†	CHIP CARRIER (FK)	CERAMIC DIP (J)	CERAMIC DIP (JG)	PLASTIC DIP (N)	PLASTIC DIP (P)	TSSOP PACKAGE (PW)	FLAT PACKAGE (W)
0°C to 70°C	10 mV	TL071CD	—	—	—	—	TL071CP	TL071CPWLE	—
	6 mV	TL071ACD					TL071ACP	—	
	3 mV	TL071BCD					TL071BCP	—	
	10 mV	TL072CD	—	—	—	—	TL072CP	TL072CPWLE	—
	6 mV	TL072ACD					TL072ACP	—	
	3 mV	TL072BCD					TL072BCP	—	
	10 mV	TL074CD	—	—	—	TL074CN	—	TL074CPWLE	—
	6 mV	TL074ACD				TL074ACN		—	
	3 mV	TL074BCD				TL074BCN		—	
–40°C to 85°C	6 mV	TL071ID	—	—	—	—	TL071IP	—	—
		TL072ID				—	TL072IP		
		TL074ID				TL074IN	—		
–55°C to 125°C	6 mV	—	TL071MFK	—	TL071MJG	—	—	—	—
	6 mV		TL072MFK	—	TL072MJG	—	TL072MP		—
	9 mV		TL074MFK	TL074MJ	—	TL074MN	—		TL074MW

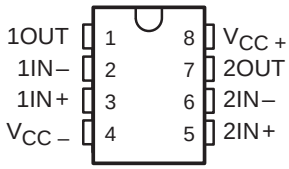
† The D package is available taped and reeled. Add the suffix R to the device type (e.g., TL071CDR). The PW package is only available left-ended taped and reeled (e.g., TL072CPWLE).

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

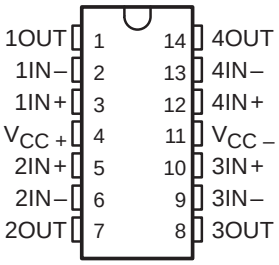
TL071, TL071A, TL071B
D, JG, P, OR PW PACKAGE
(TOP VIEW)



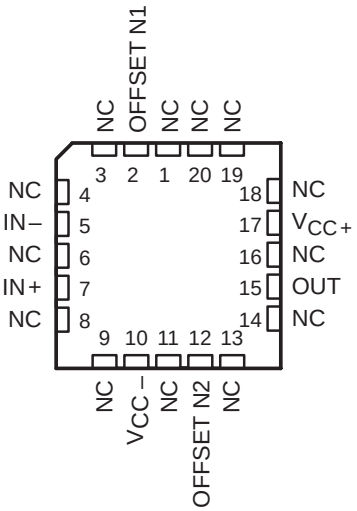
TL072, TL072A, TL072B
D, JG, P, OR PW PACKAGE
(TOP VIEW)



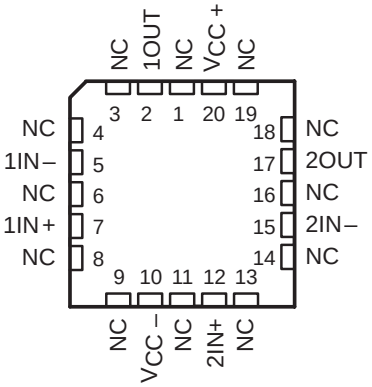
TL074, TL074A, TL074B
D, J, N, OR PW PACKAGE
TL074 . . . W PACKAGE
(TOP VIEW)



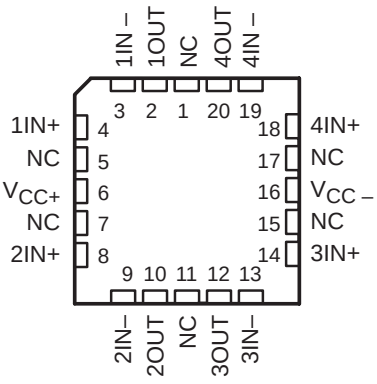
TL071
FK PACKAGE
(TOP VIEW)



TL072
FK PACKAGE
(TOP VIEW)



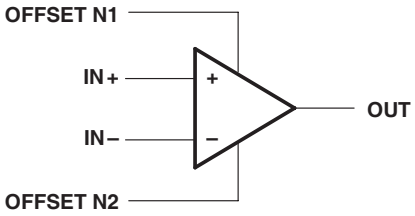
TL074
FK PACKAGE
(TOP VIEW)



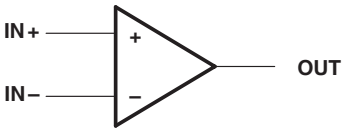
NC – No internal connection

symbols

TL071



TL072 (each amplifier)
TL074 (each amplifier)

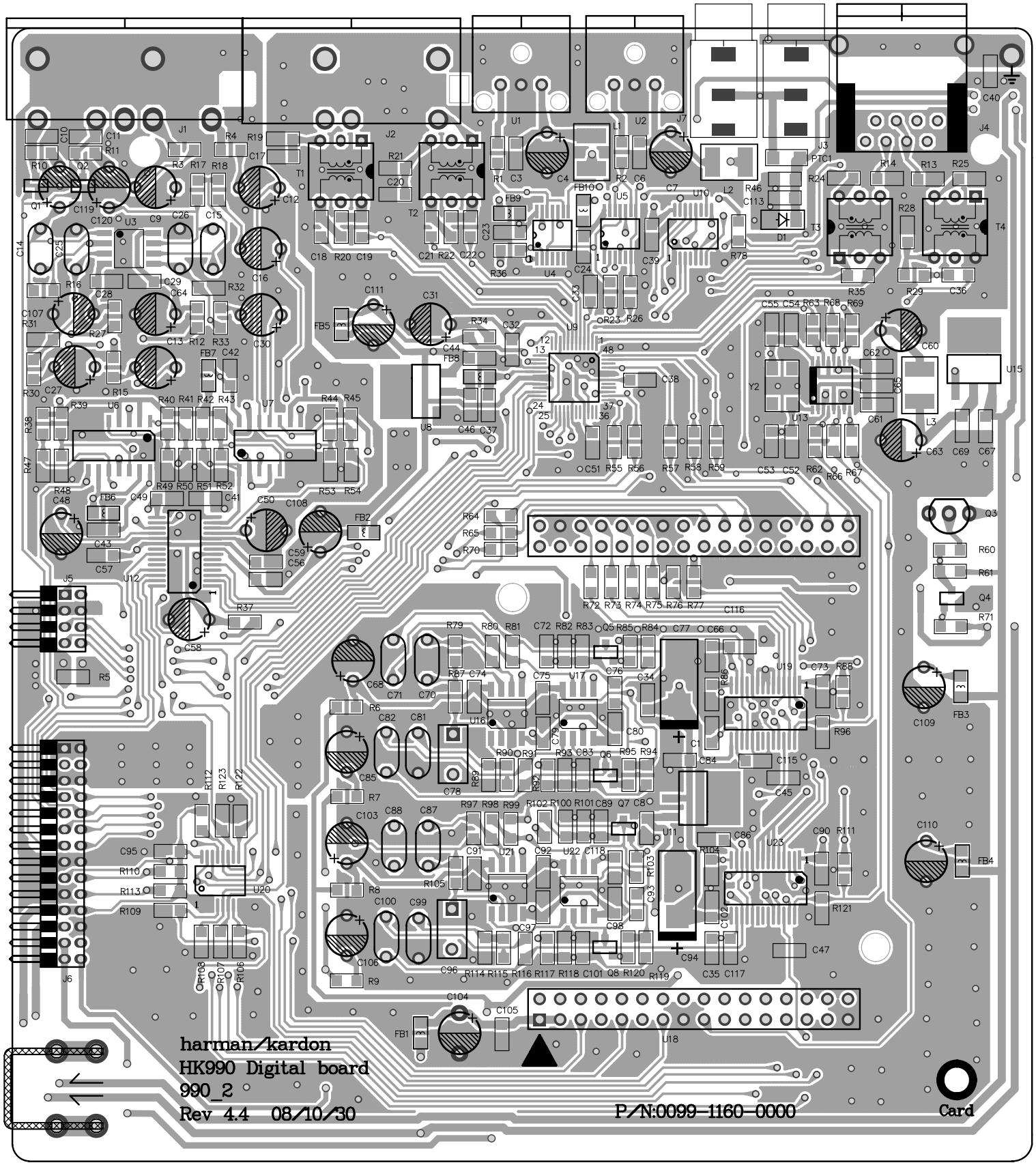


2SA1298 PNP
2SA1312 PNP
DTC343TK NPN
2SC3324 NPN
2SC3265 NPN
2SC1035 NPN

1) Emitter
2) Base
3) Collector

3-Pin Regulaeor IC
LD1117S5.0

SOT-223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Rev 4.4 08/10/30
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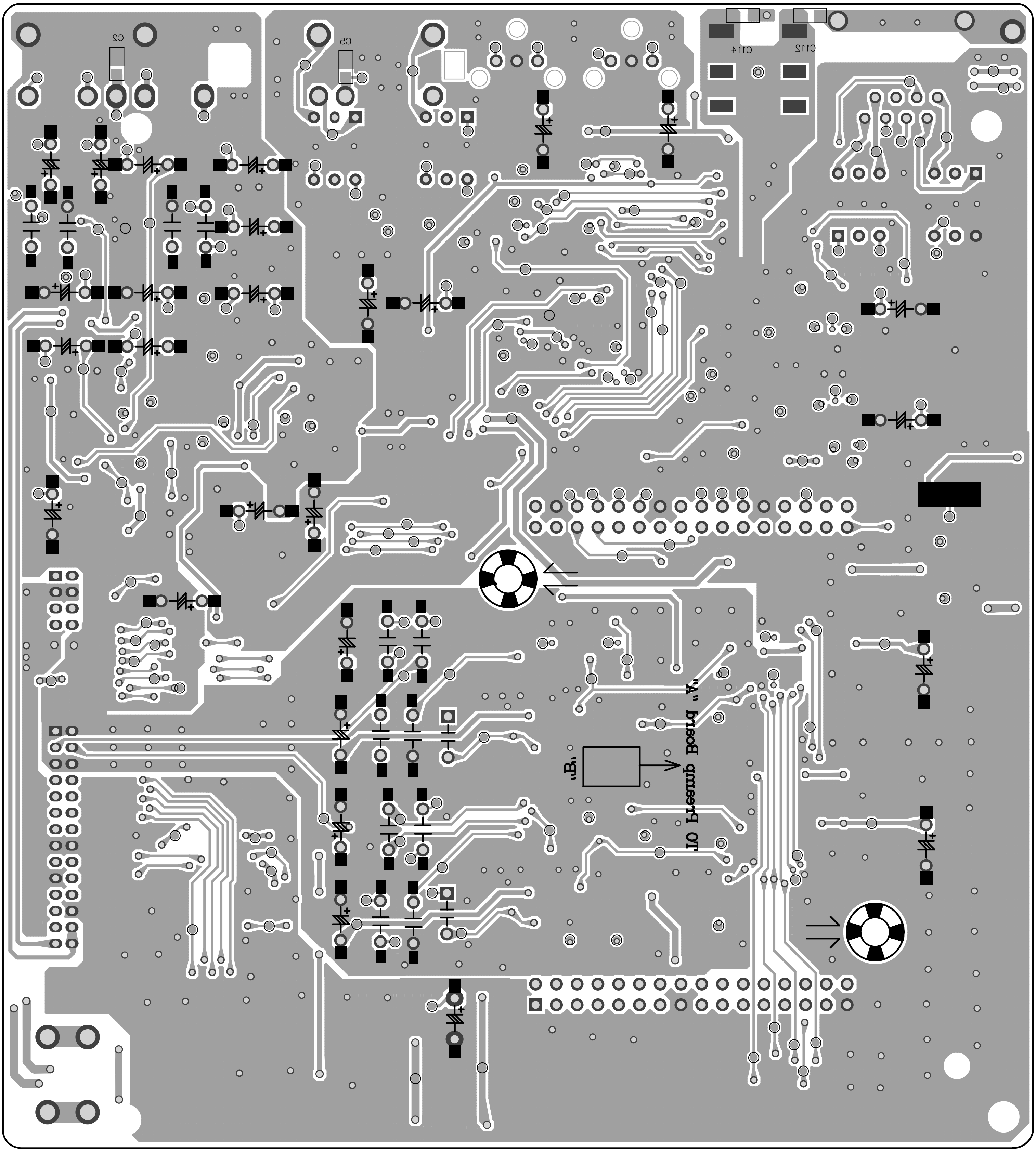
Card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C5
C114
C112
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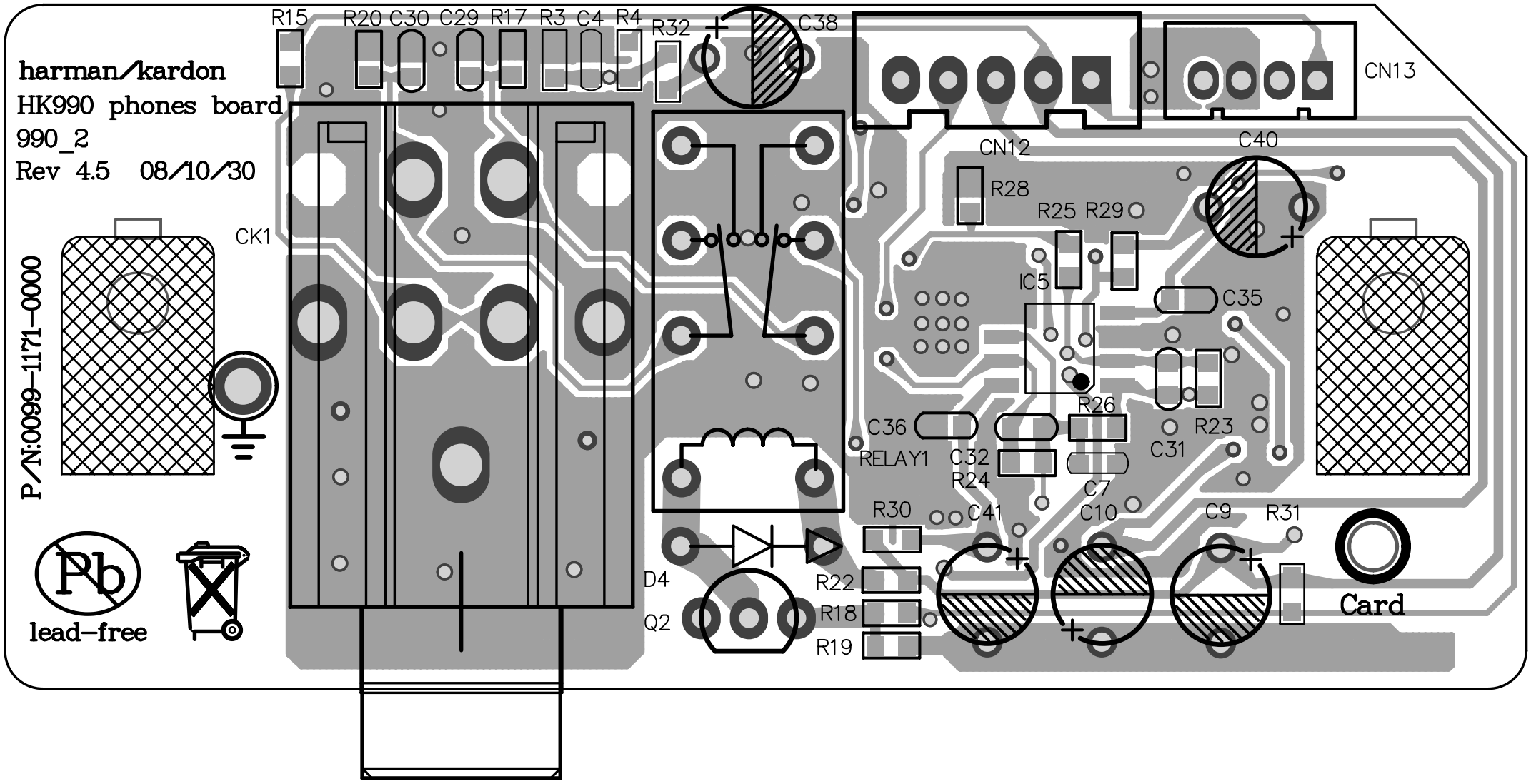
"B"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R32
C38
CN13
CN12
C40
R28
R25
R29
IC5
C35
CK1
R26
C36
R23
RELAY1
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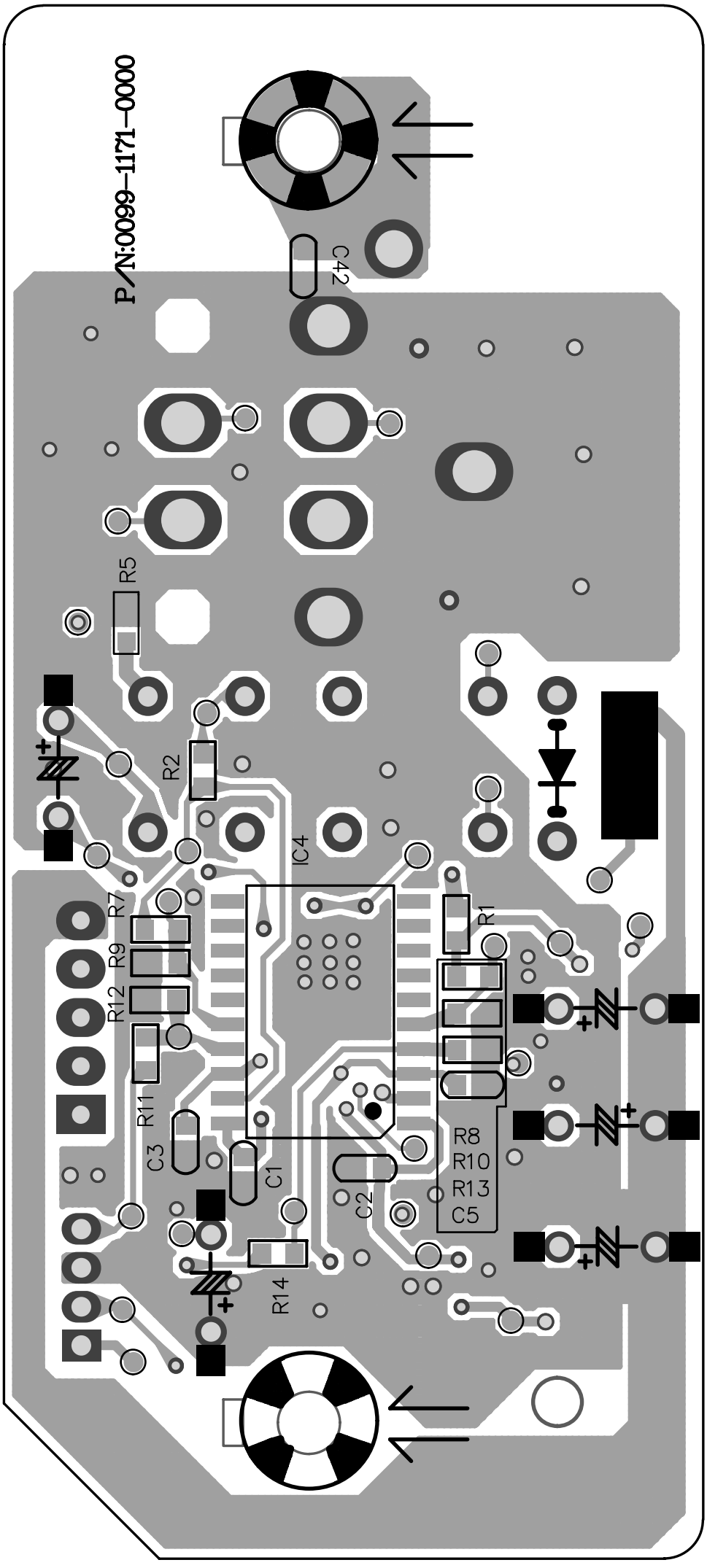
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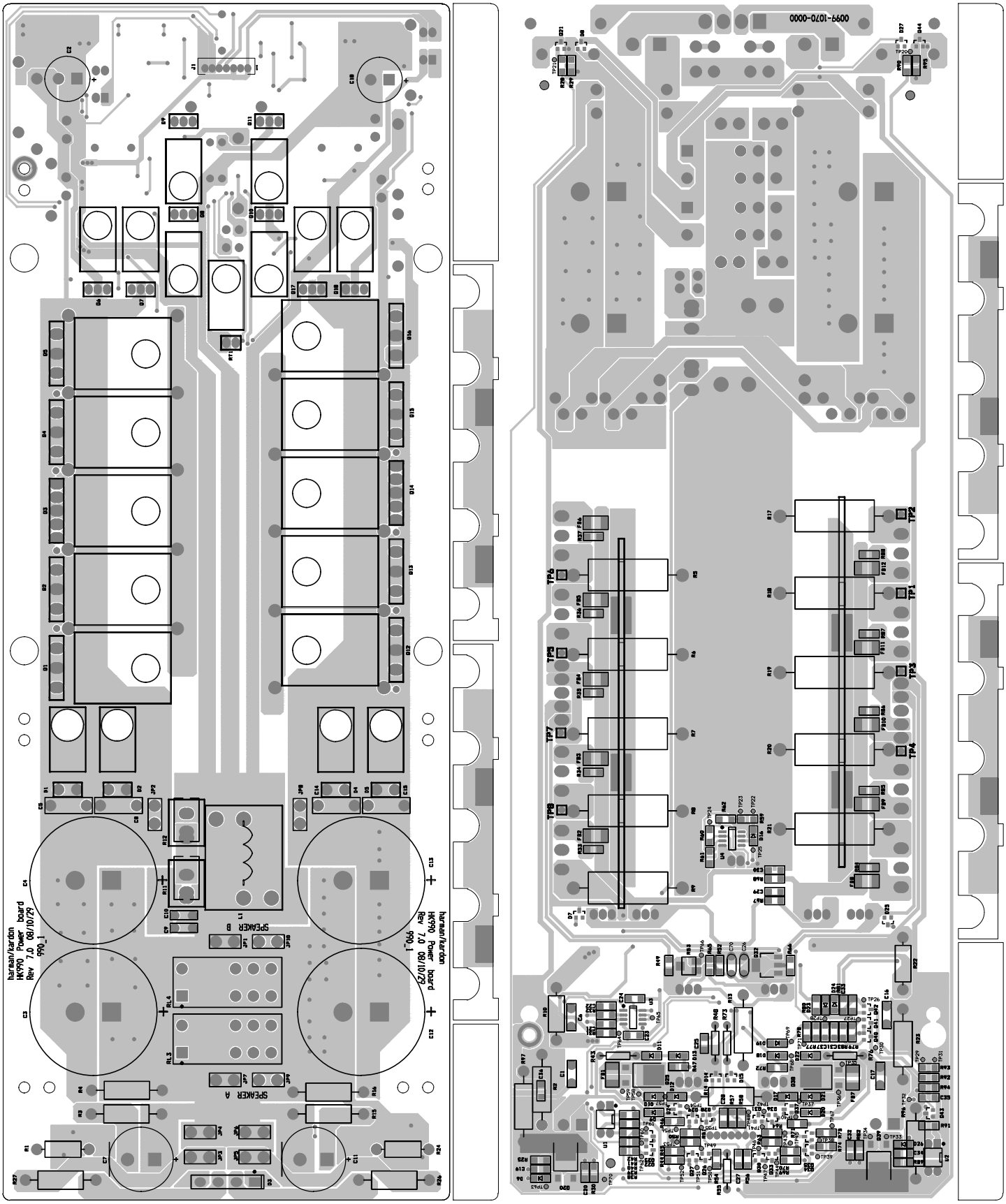
R10
R13
C5
R14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SPEAKER
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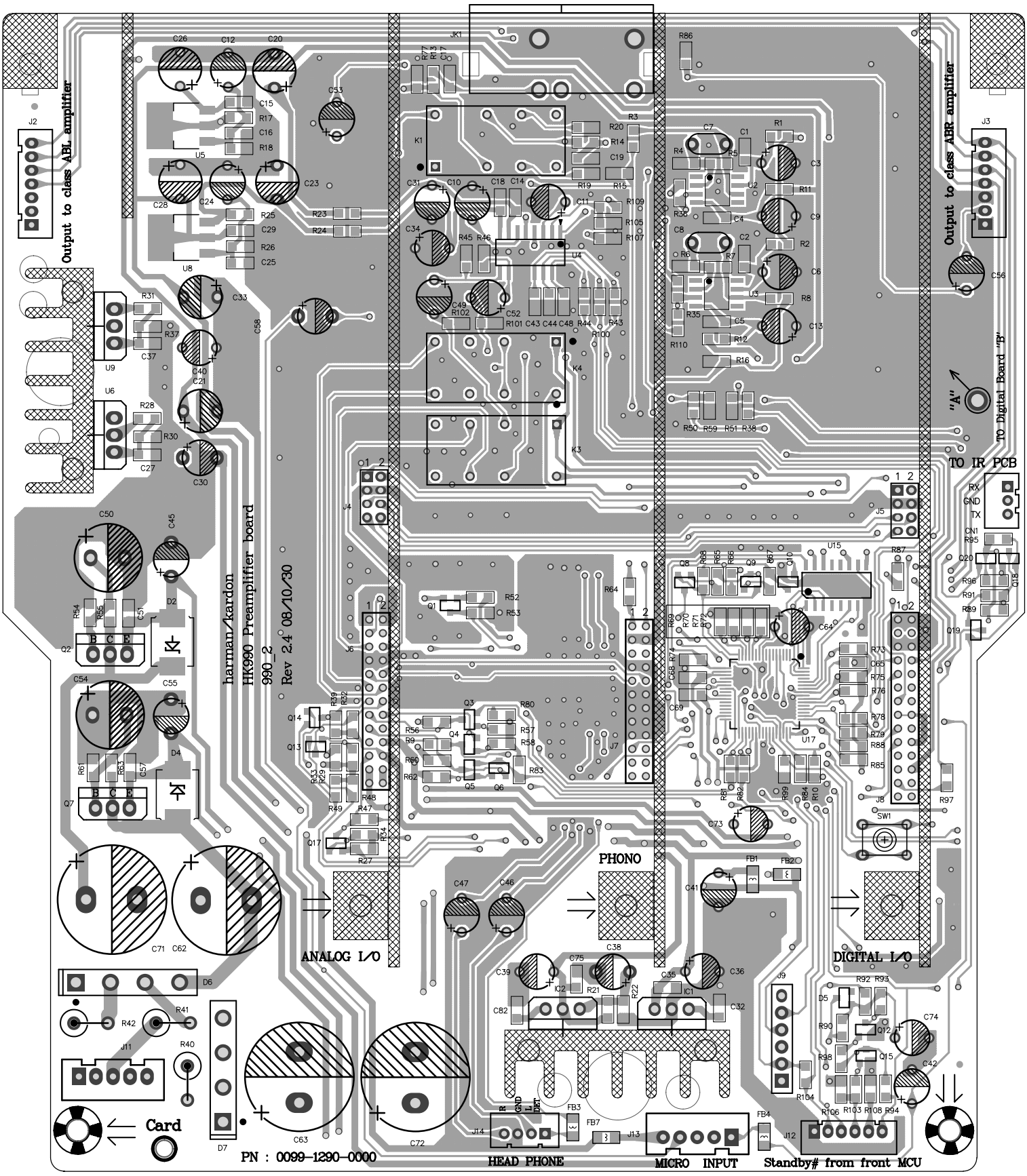
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Output to class ABR amplifier
TO IR PCB
"A"
TO Digital Board "B"
harman/kardon
HK990 Preamplifier board
990_2 Rev 2.4 08/10/30
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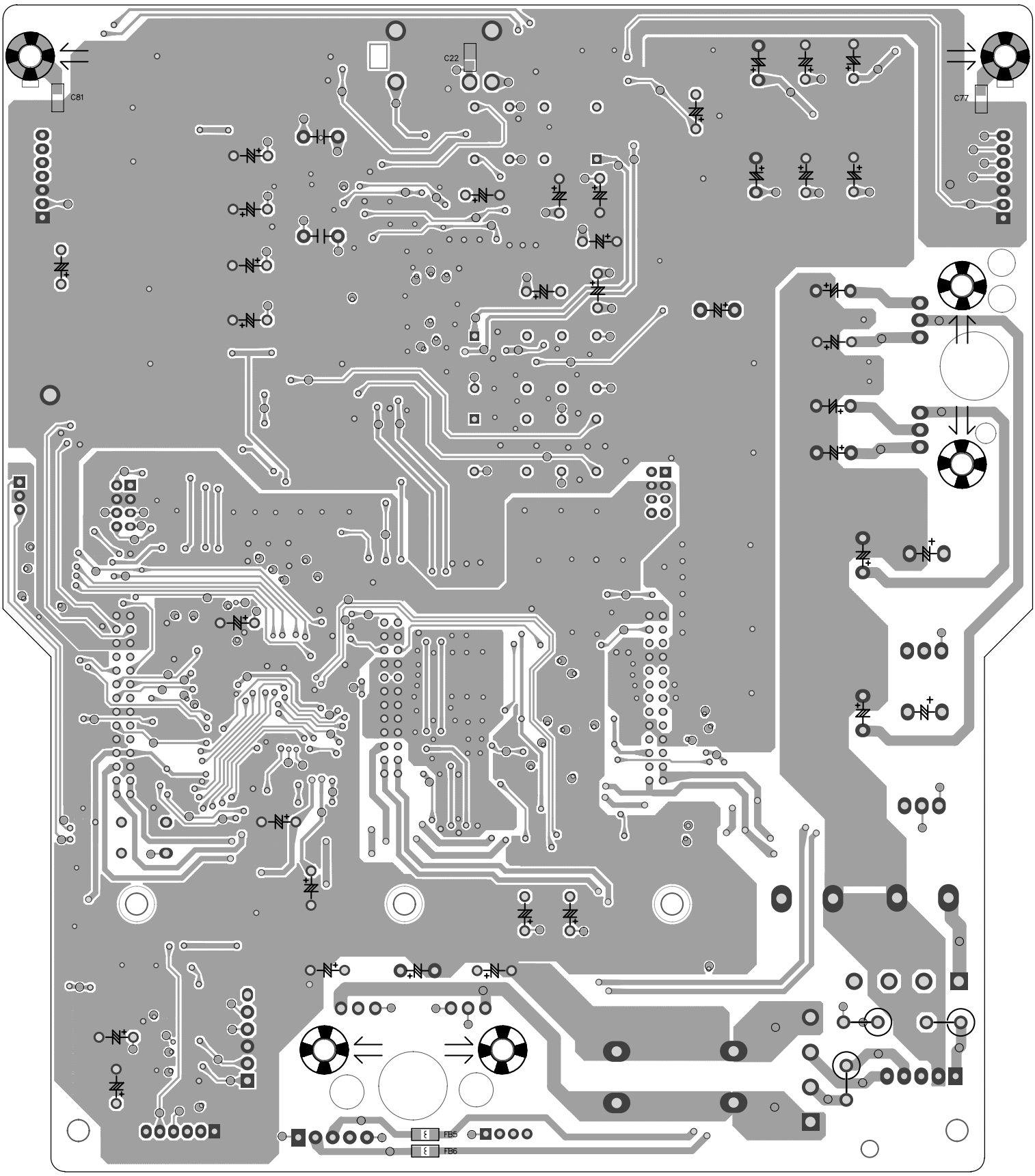
ANALOG I/O
DIGITAL I/O
Card
PN : 0099-1290-0000
HEAD PHONE
MICRO INPUT
Standby# from front MCU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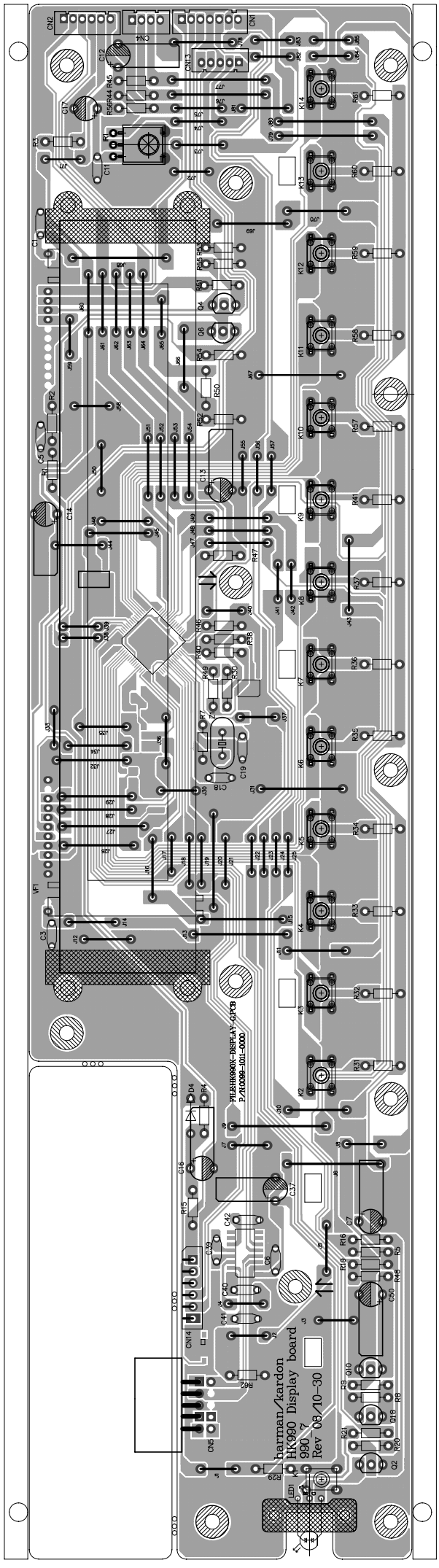
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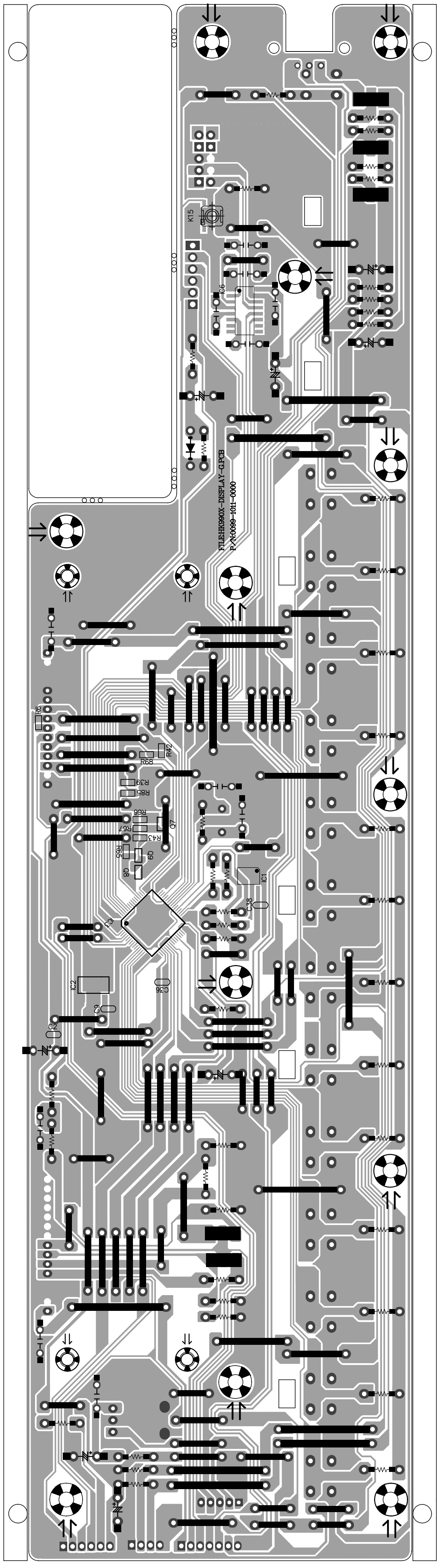
Rev 08.10-30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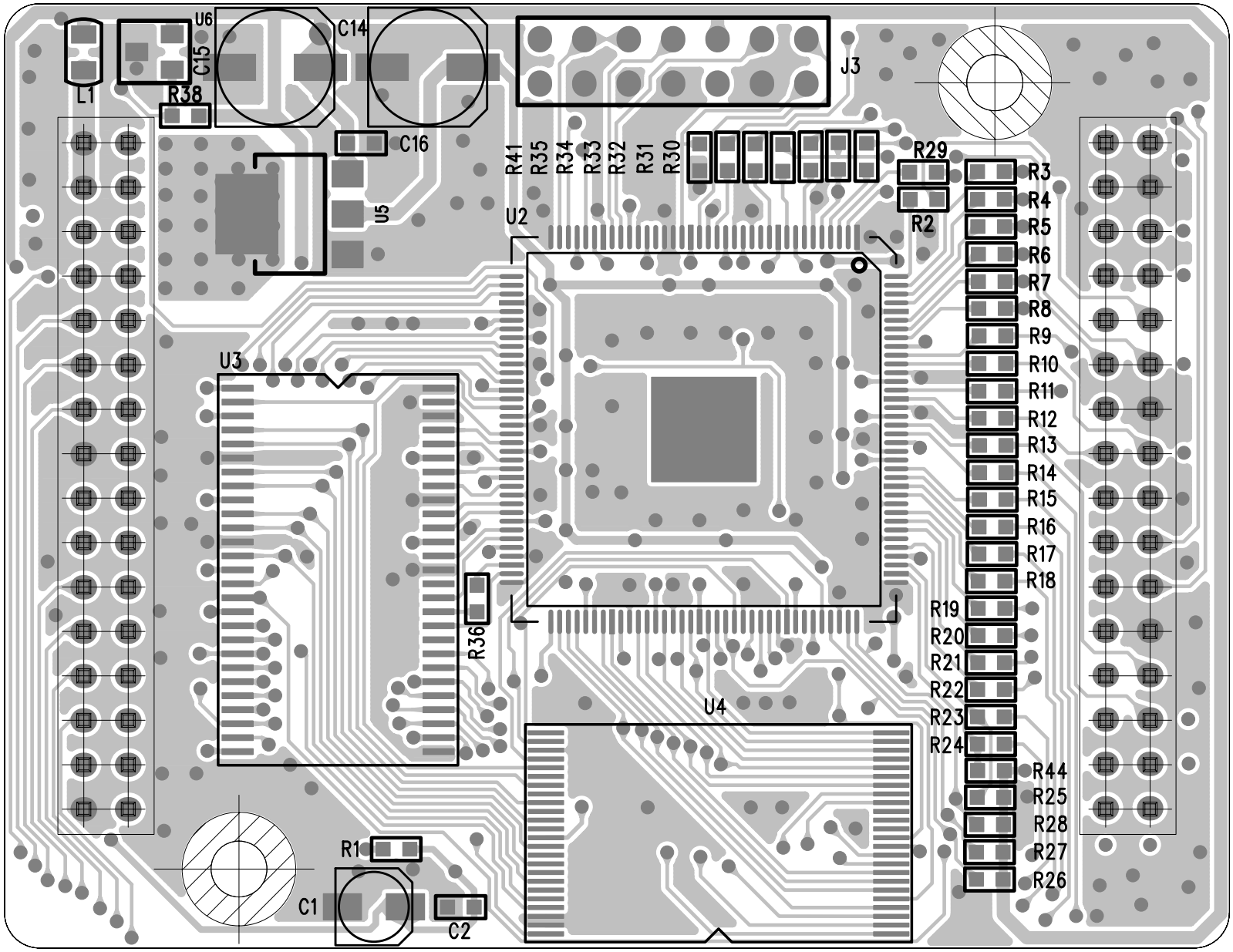
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R38
C16
U5
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U2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
U3
R36
R19
R20
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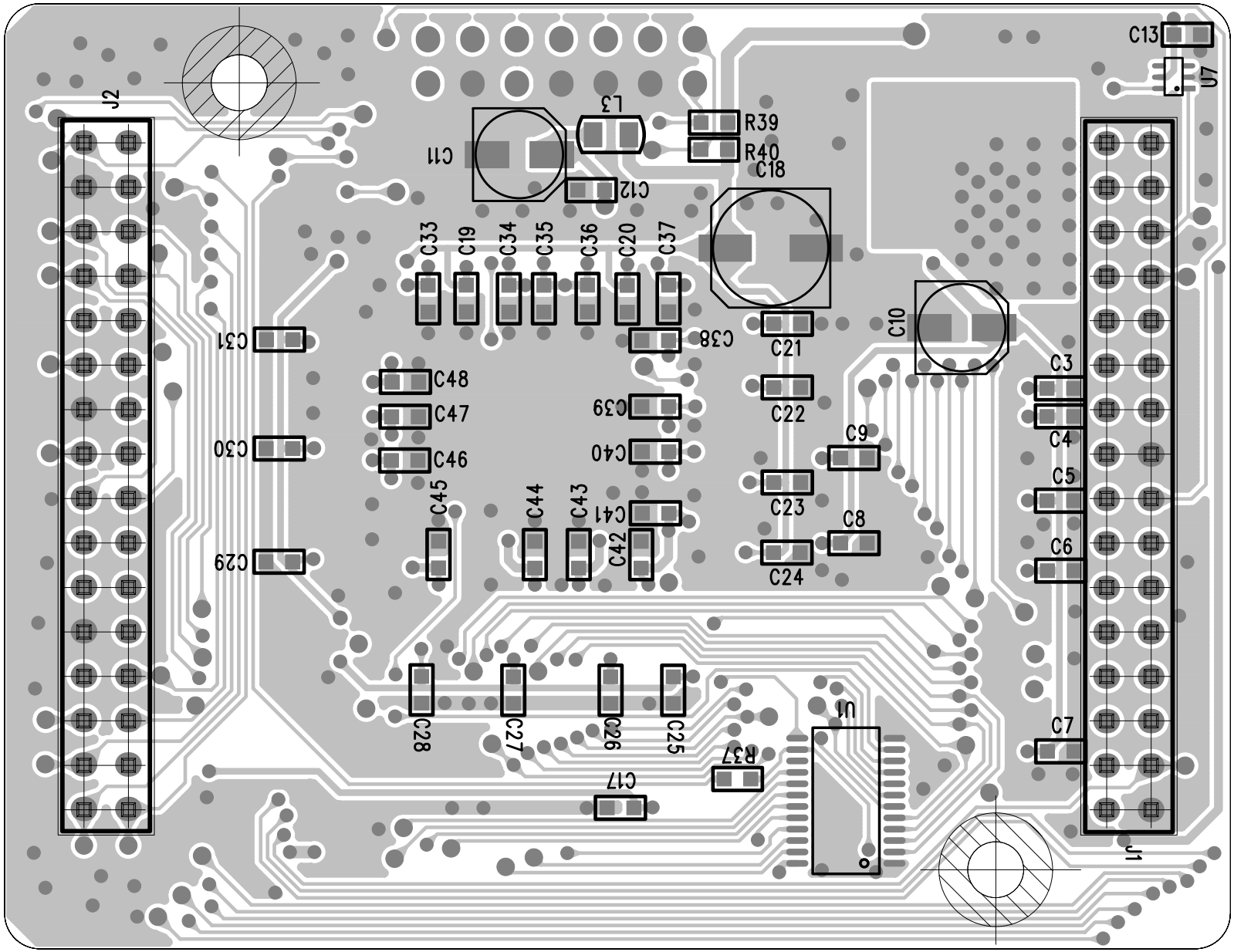
R27
R26
R1
C1
C2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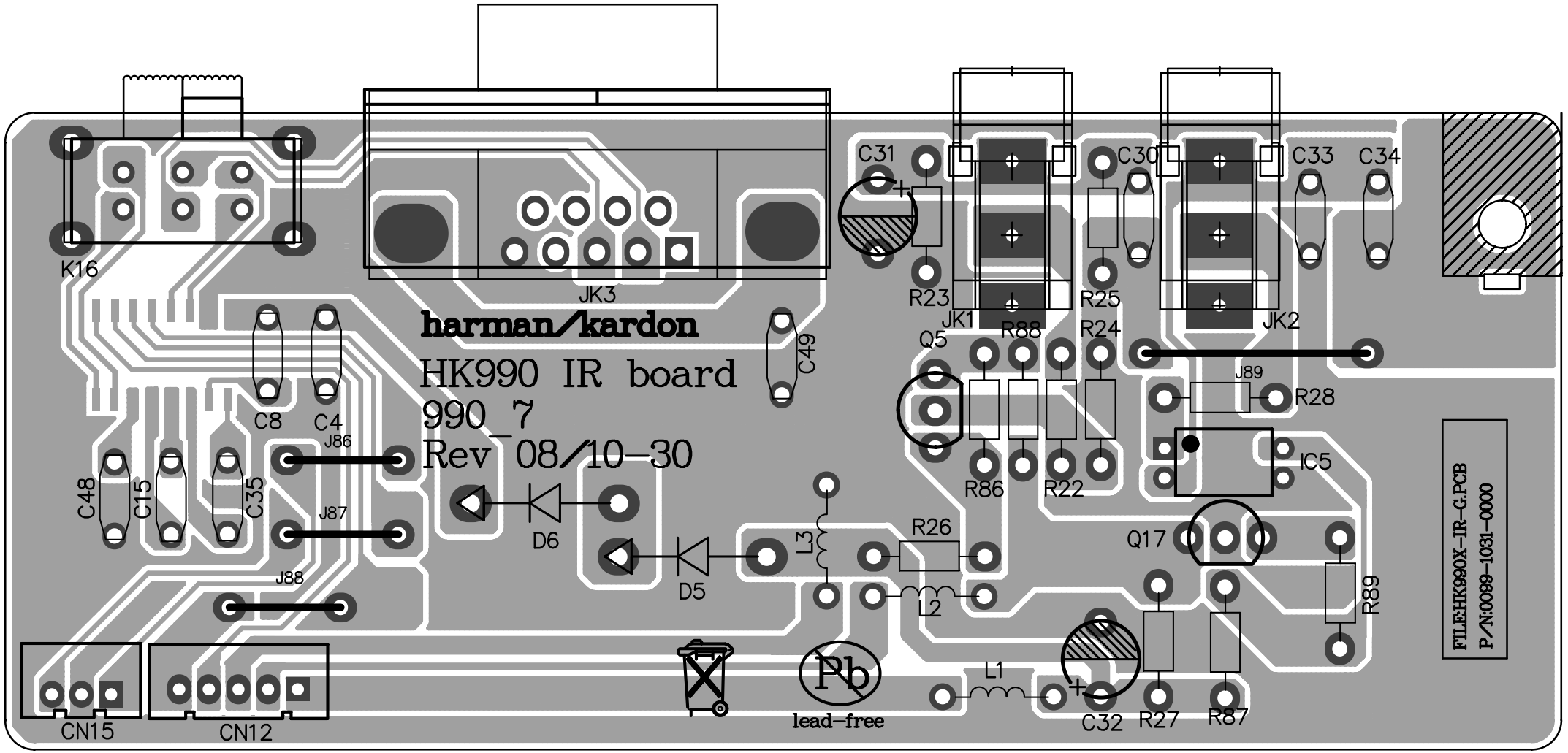
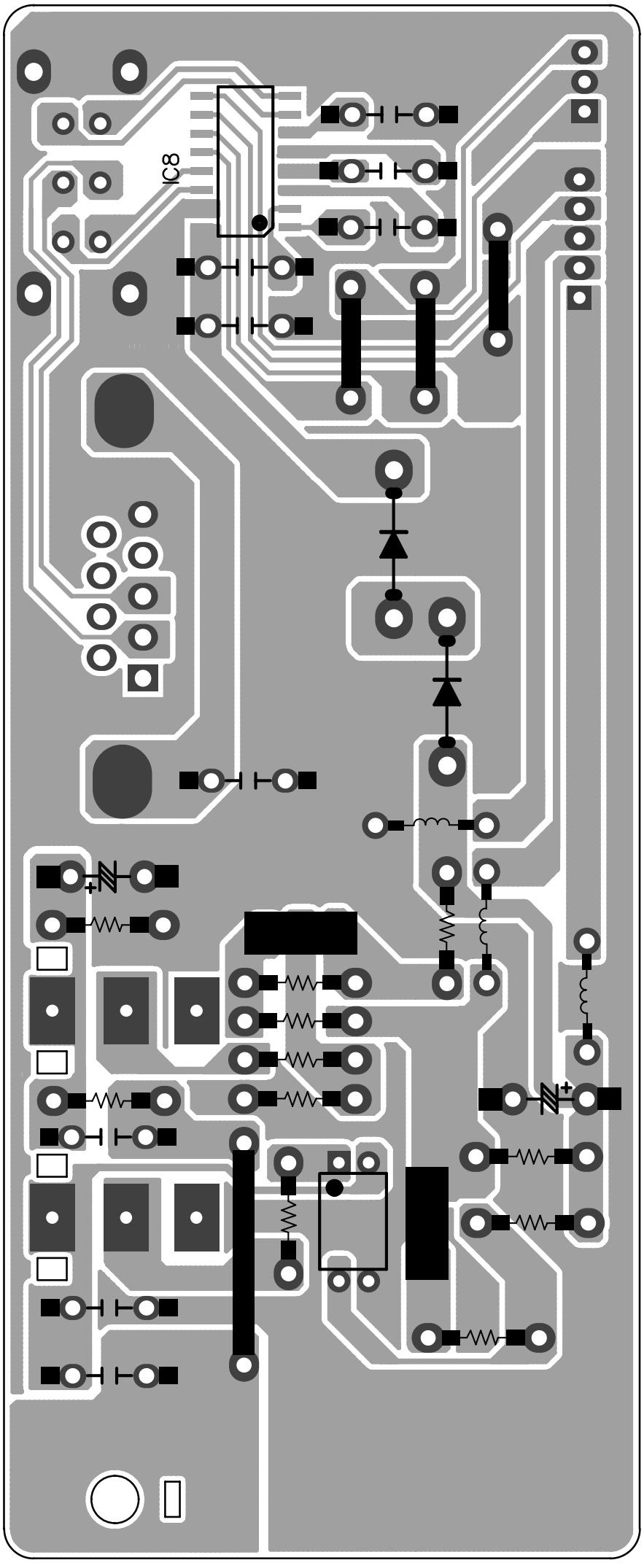
L3
R39
R40
C11
C12
C18
C33
C19
C34
C35
C36
C20
C37
C38
C21
C10
C13
U7
C31
C48
C47
C46
C39
C40
C22
C9
C3
C4
C30
C45
C44
C43
C41
C42
C23
C8
C5
C6
C29
C24
C28
C27
C26
C25
U5
R37
C17
C7
J1

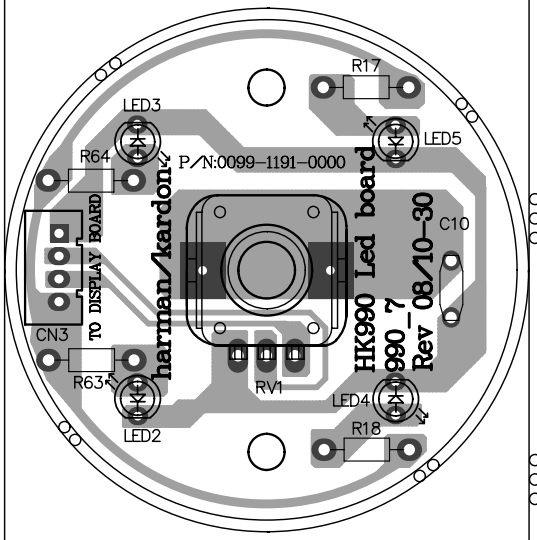

K16
JK3
C31
C30
C33
C34
R23
JK1
R88
R25
R24
JK2
Q5
C49
harman/kardon
HK990 IR board
990_7
Rev 08/10-30
C8
C4
J86
J89
R28
C48
C15
C35
J87
D6
L3
R26
IC5
R86
R22
Q17
J88
D5
L2
R89
L1
C32
R27
R87
CN15
CN12
lead-free
FILE:HK990X-IR-G.PCB
P/N:0099-1031-0000


IC8

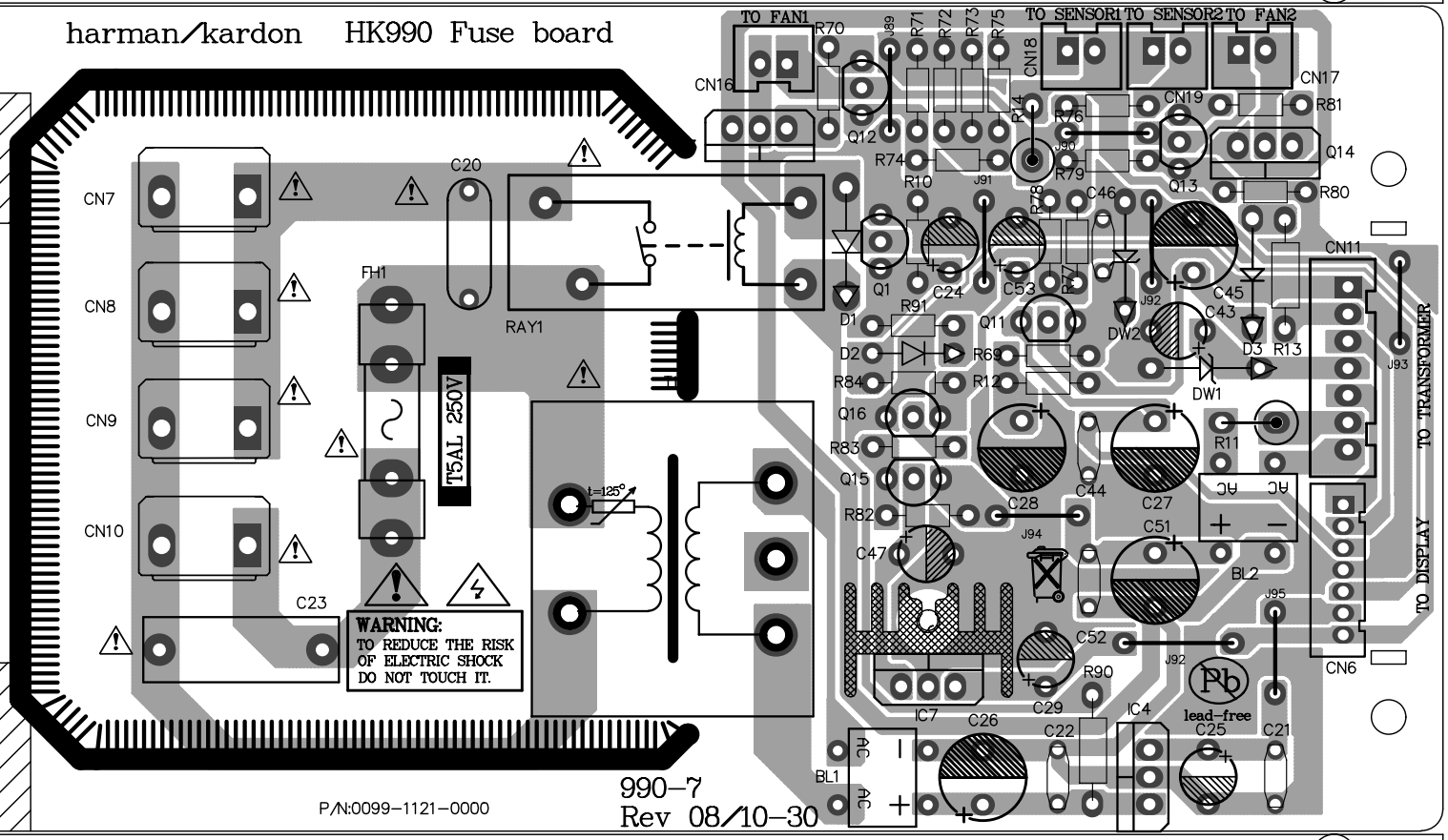
FILE:HK990X-FUSE-G.PCB

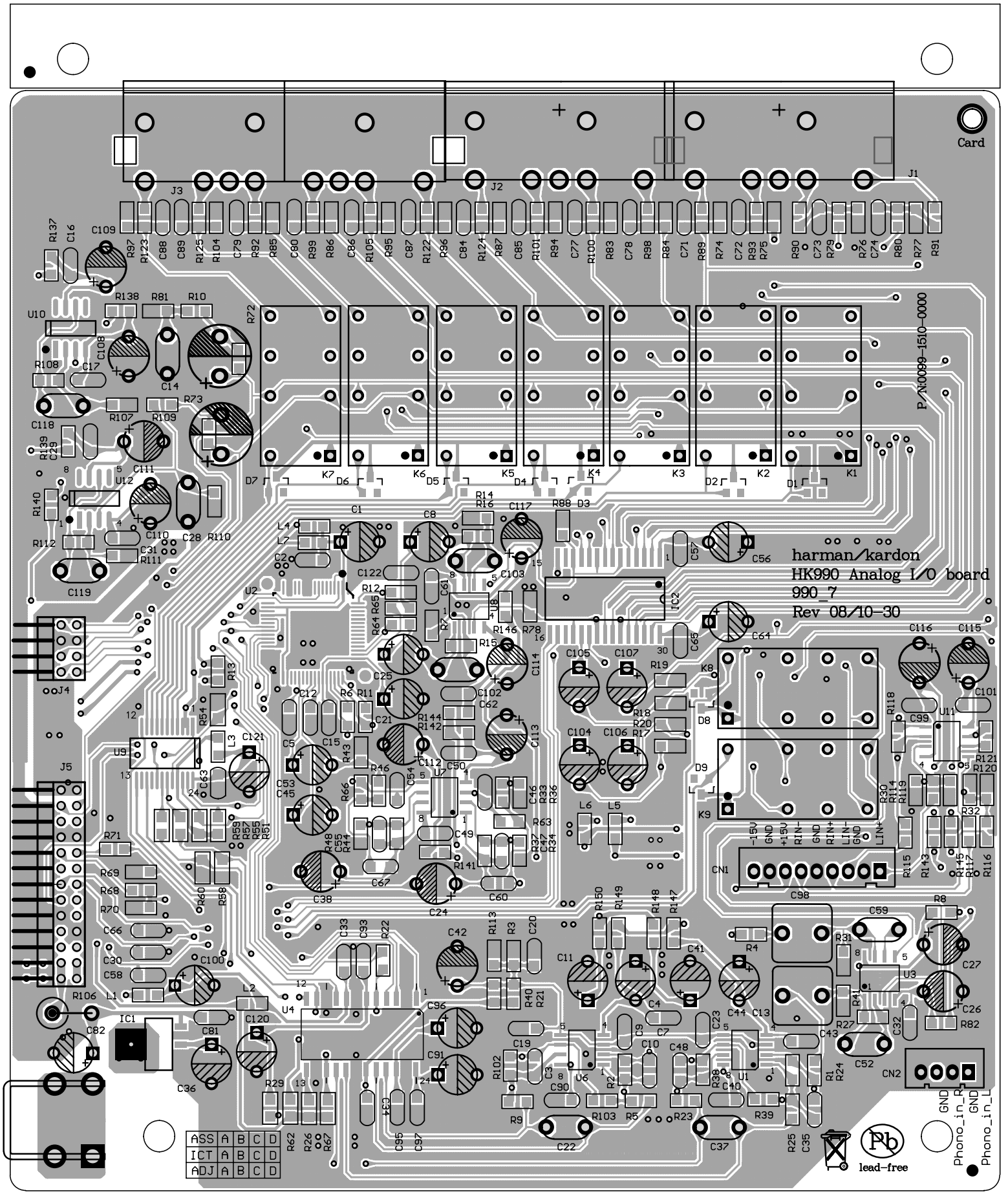
P/N:0099-1301-0000

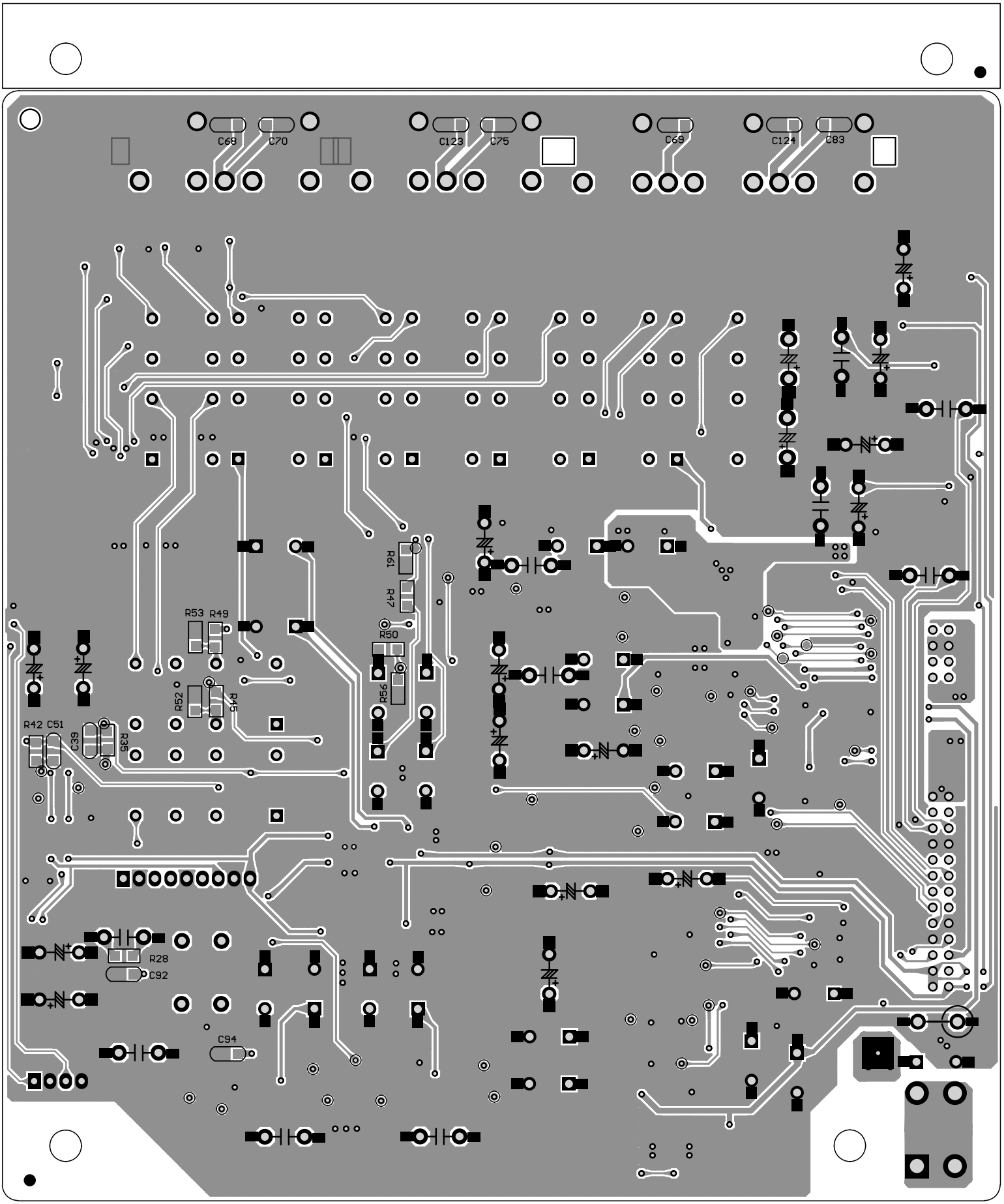
DATE:2008-10-30 WSX

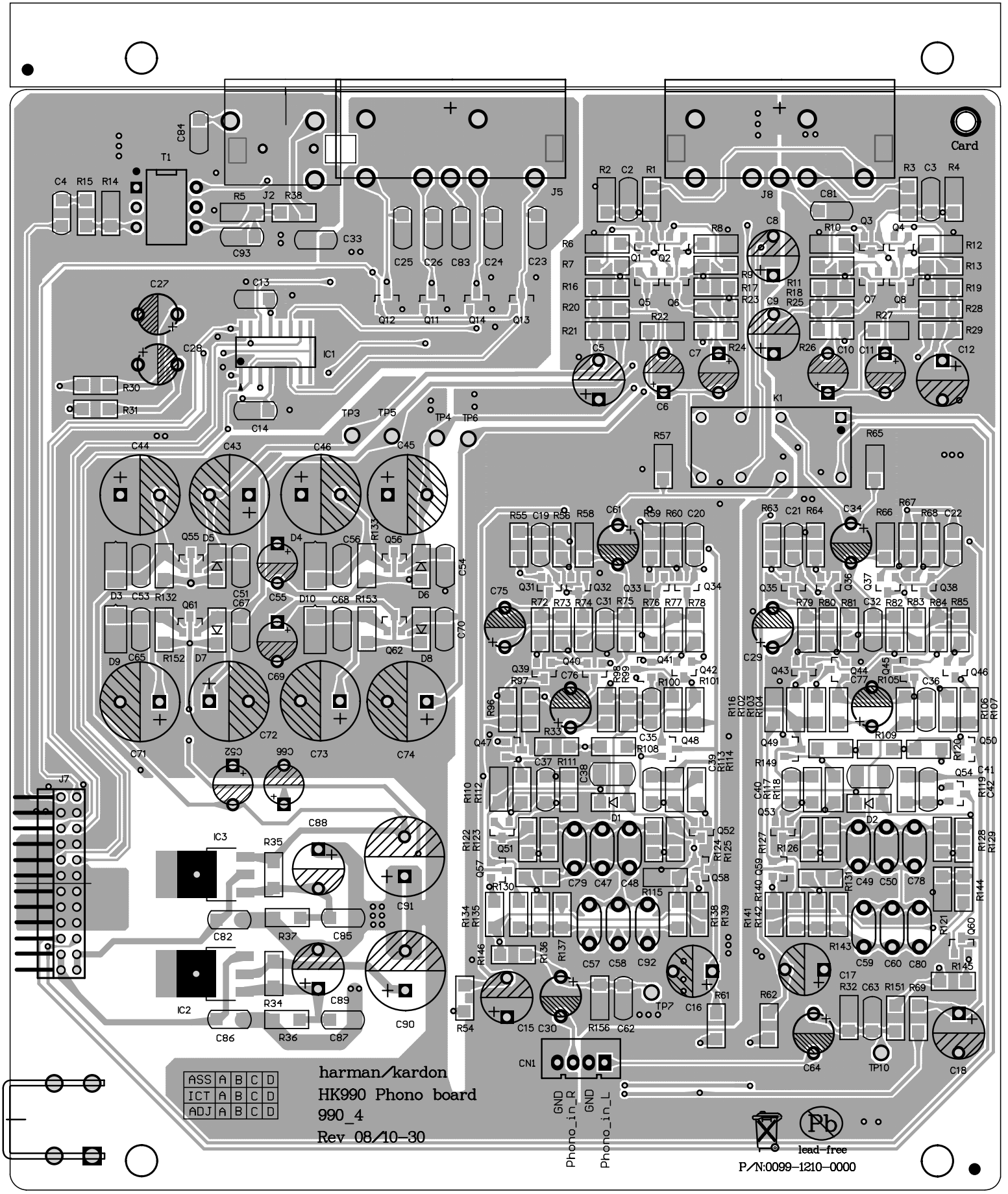


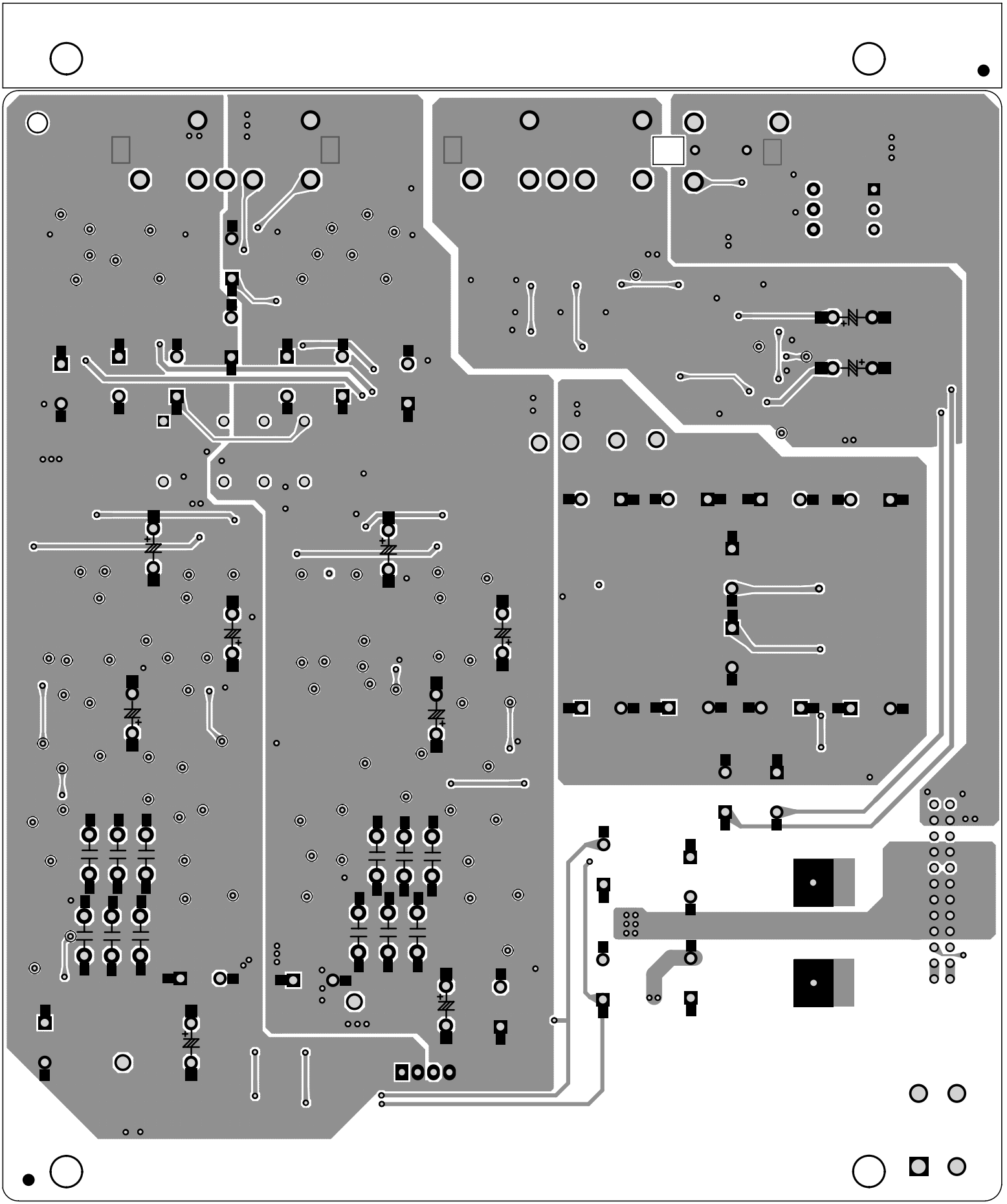
harman/kardon HK990 Fuse board

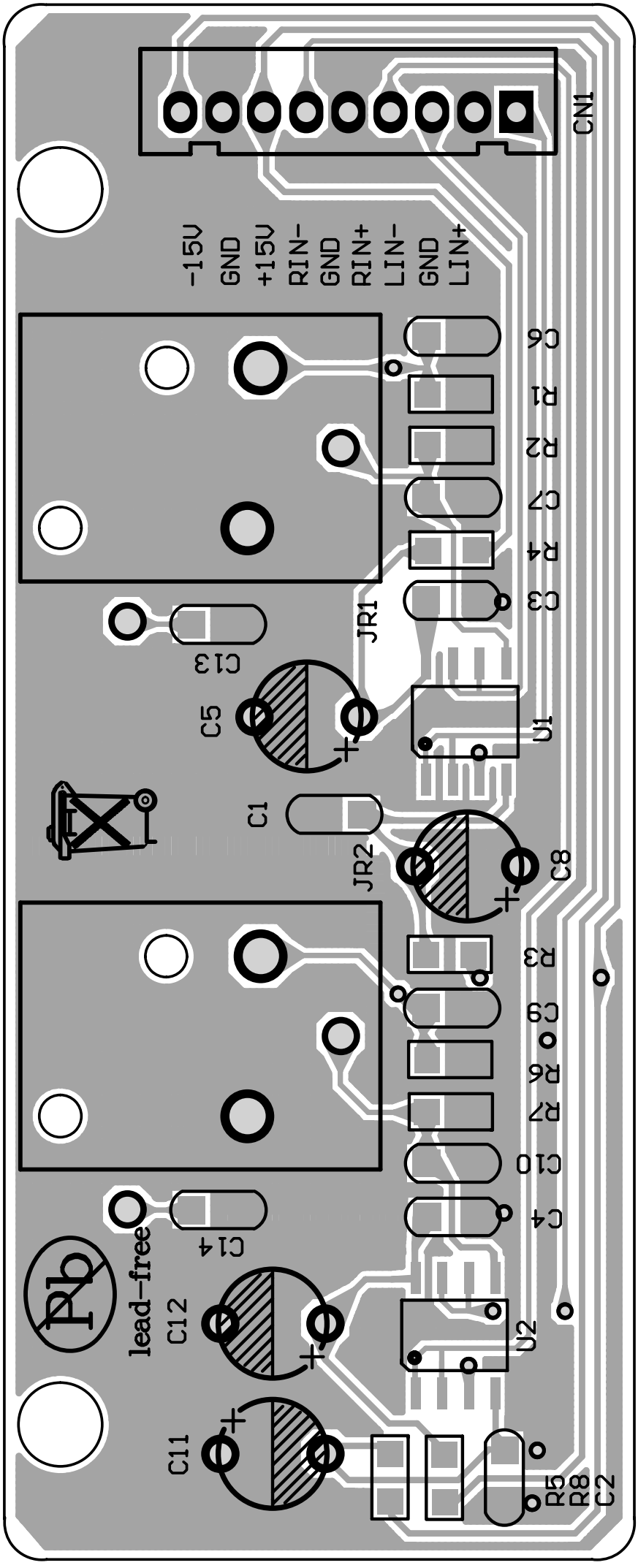


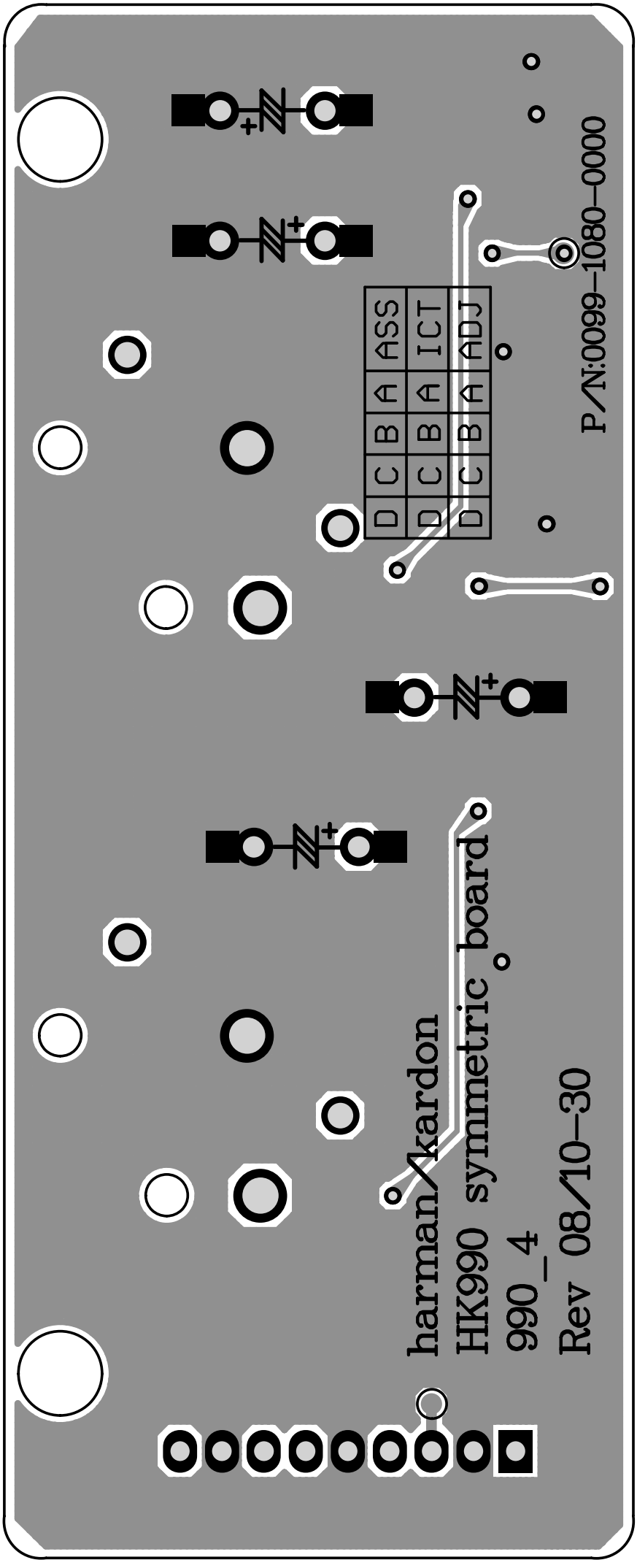

harman/kardon
HK990 Analog I/O board
990_7
Rev 08/10-30
P/N:0099-1510-0000
Card
J1
J2
J3
J4
J5
K1
K2
K3
K4
K5
K6
K7
K8
K9
CN1
CN2
IC1
IC2
U1
U2
U3
U4
U6
U7
U9
U10
U11
U12
D1
D2
D3
D4
D5
D6
D7
D8
D9
-15V
GND
+15V
RIN-
GND
RIN+
LIN-
GND
LIN+
GND
Phono_in_R
GND
Phono_in_L
ASS A B C D
ICT A B C D
ADJ A B C D
Pb
lead-free


C68
C70
C123
C75
C69
C124
C83
R61
R47
R53
R49
R50
R52
R55
R45
R42
C51
C39
R35
R28
C92
C94


Card
J5
J8
T1
J2
K1
IC1
IC2
IC3
J7
CN1
TP3
TP4
TP5
TP6
TP7
TP10
harman/kardon
HK990 Phono board
990_4
Rev 08/10-30
ASS A B C D
ICT A B C D
ADJ A B C D
GND
Phono_in_R
GND
Phono_in_L
Pb
lead-free
P/N:0099-1210-0000




CN1
-15V
GND
+15V
RIN-
GND
RIN+
LIN-
GND
LIN+
C6
R1
R2
C7
R4
C3
JR1
C13
C5
U1
C1
JR2
C8
R3
C9
R6
R7
C10
C4
C14
lead-free
C12
U2
C11
R5
R8
C2


P/N:0099-1080-0000
D C B A ASS
D C B A ICT
D C B A ADJ
harman/kardon
HK990 symmetric board
990_4
Rev 08/10-30

DSP & Oscillator
DSP & Oscillator

- WM_BITCLK
- SDATAR1
- WM_SDATA
- WM_LRCLK
- WDCLK
- I2C_SCL
- SDATAL2
- SDATAL1
- SDATAR2
- SRC_SDATA
- BITCLK
- SRC_BITCLK
- SRC_LRCLK
- I2C_SDA
- DAC_L
- SRC_AESOUT
- ADC_LRCLK
- ADC_BITCLK
- ADC_SDATA
- CS_AD1955_1#
- CS_AD1955_2#
- CS_WM8740#
- MUTE_OUT
- SDO
- SCK
- DAC_R
- I2C_SCL
- I2C_SDA
- RST_SRC#
- RST_AD1955#
- MUTE_LISTEN#
- CLK_24_MHZ_4
- CLK_24_MHZ_2
- CLK_24_MHZ_3
- CLK_24_MHZ_5
- SRC_LOCK#
- SUB_SEL
- RST_SUB#
- SRC_INT#
- TAPE_SEL
- TAPE_SEL

DAC
DAC

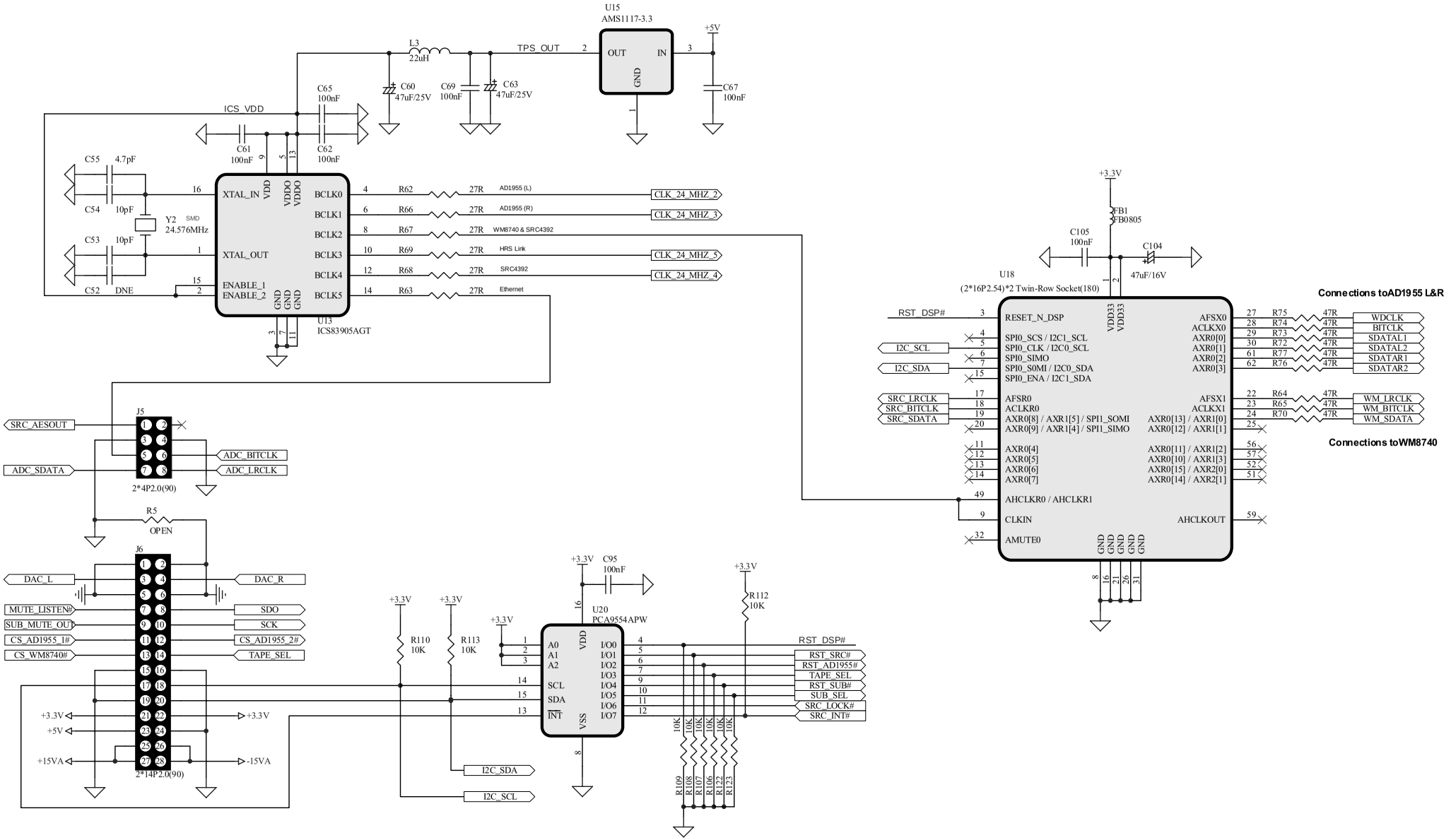
- SCK
- SDATAR2
- WDCLK
- CS_AD1955_2#
- SDO
- CLK_24_MHZ_2
- BITCLK
- SDATAL1
- SDATAL2
- CLK_24_MHZ_3
- CS_AD1955_1#
- SDATAR1
- DAC_R
- RST_AD1955#
- BITCLK
- DAC_L
- SCK
- SDO
- RST_AD1955#
- WDCLK

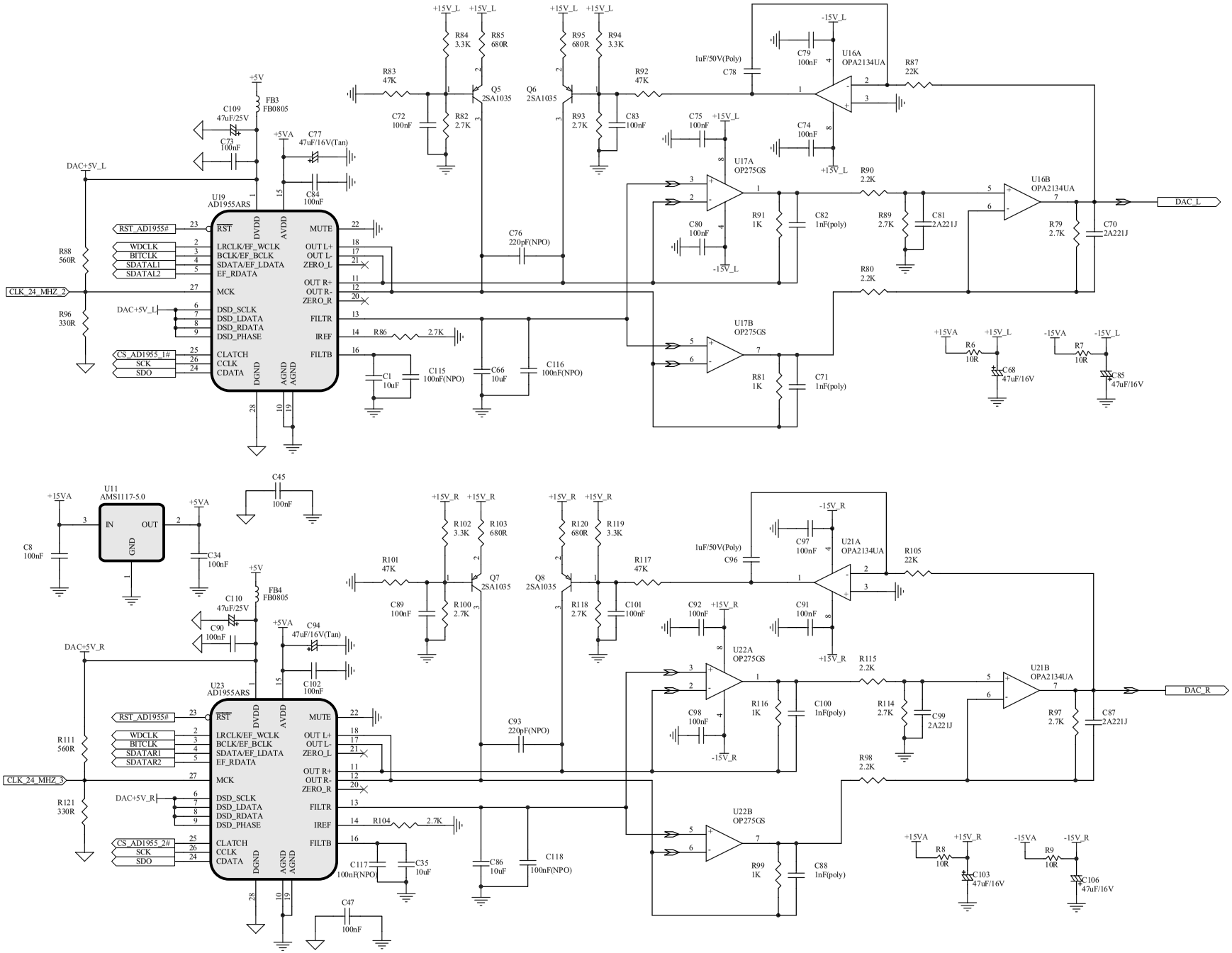
Digital Inputs
Digital Inputs

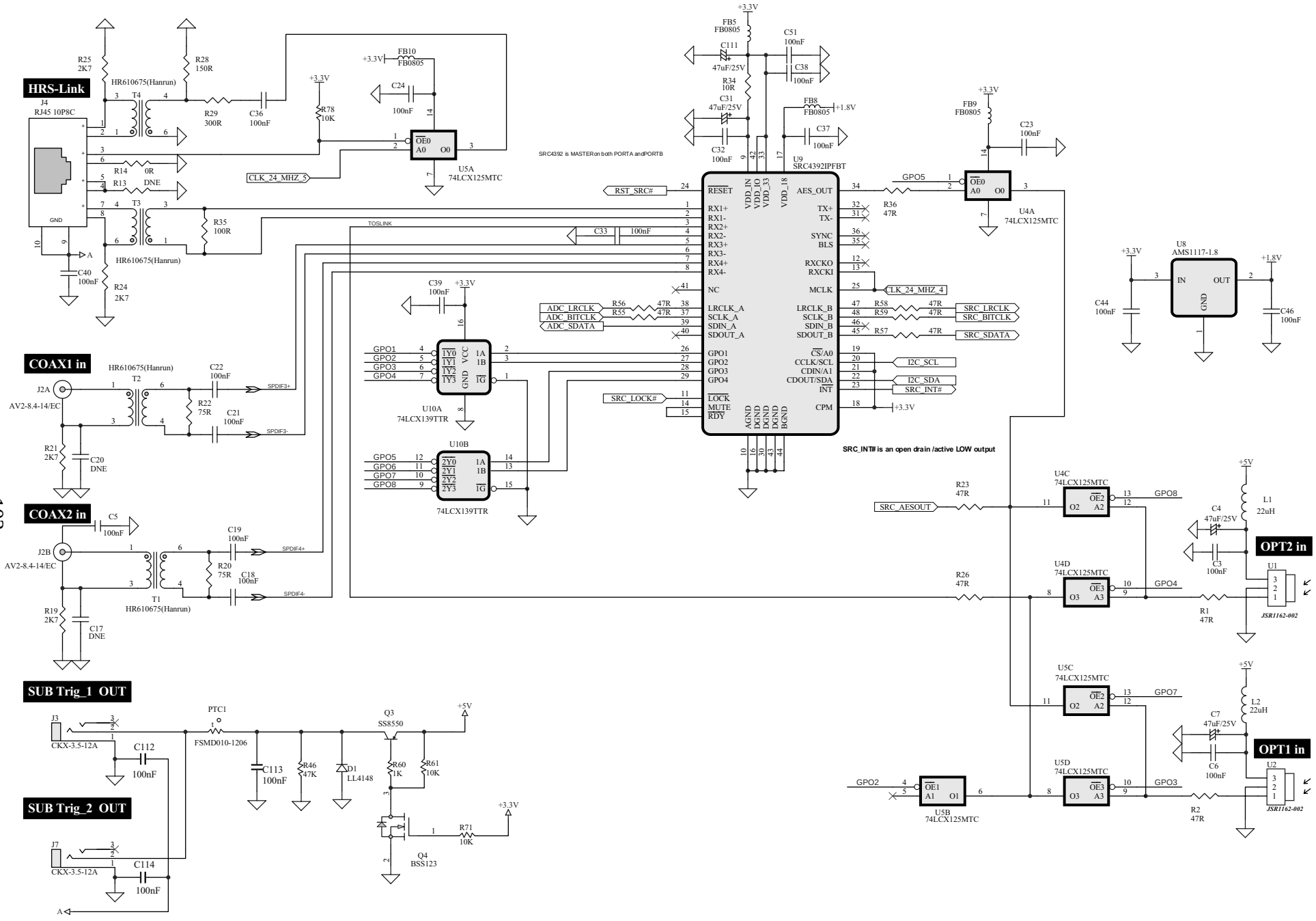
- SRC_INT#
- CLK_24_MHZ_4
- RST_SRC#
- I2C_SCL
- SRC_SDATA
- SRC_LOCK#
- SRC_LRCLK
- SRC_BITCLK
- ADC_LRCLK
- ADC_BITCLK
- I2C_SDA
- ADC_SDATA
- SRC_AESOUT
- CLK_24_MHZ_5

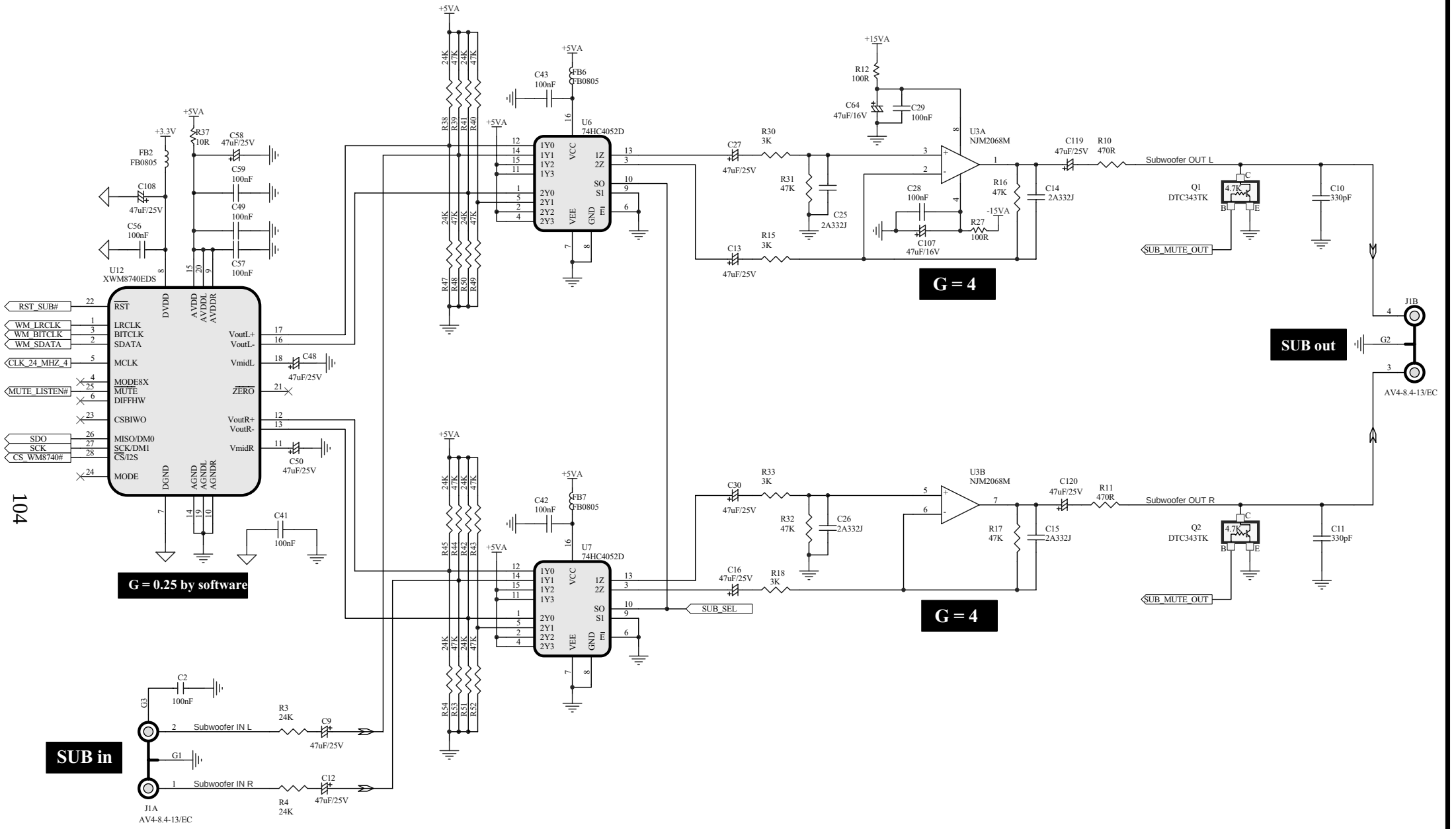
Subwoofer DAC
Subwoofer DAC

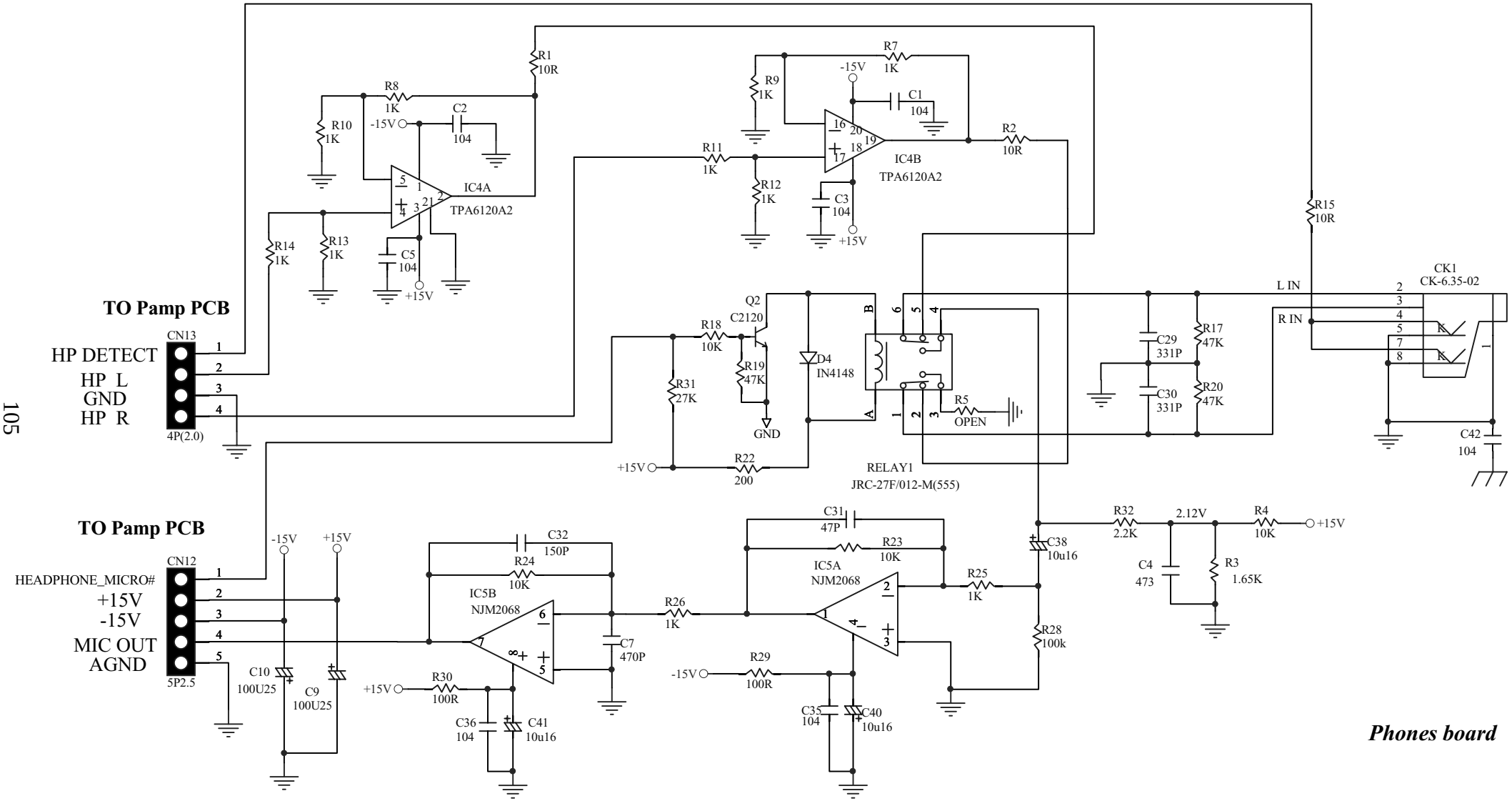
- SDO
- SCK
- CS_WM8740#
- CLK_24_MHZ_4
- RST_SUB#
- WM_BITCLK
- WM_LRCLK
- WM_SDATA
- MUTE_OUT
- MUTE_OUT
- MUTE_LISTEN#
- SUB_SEL

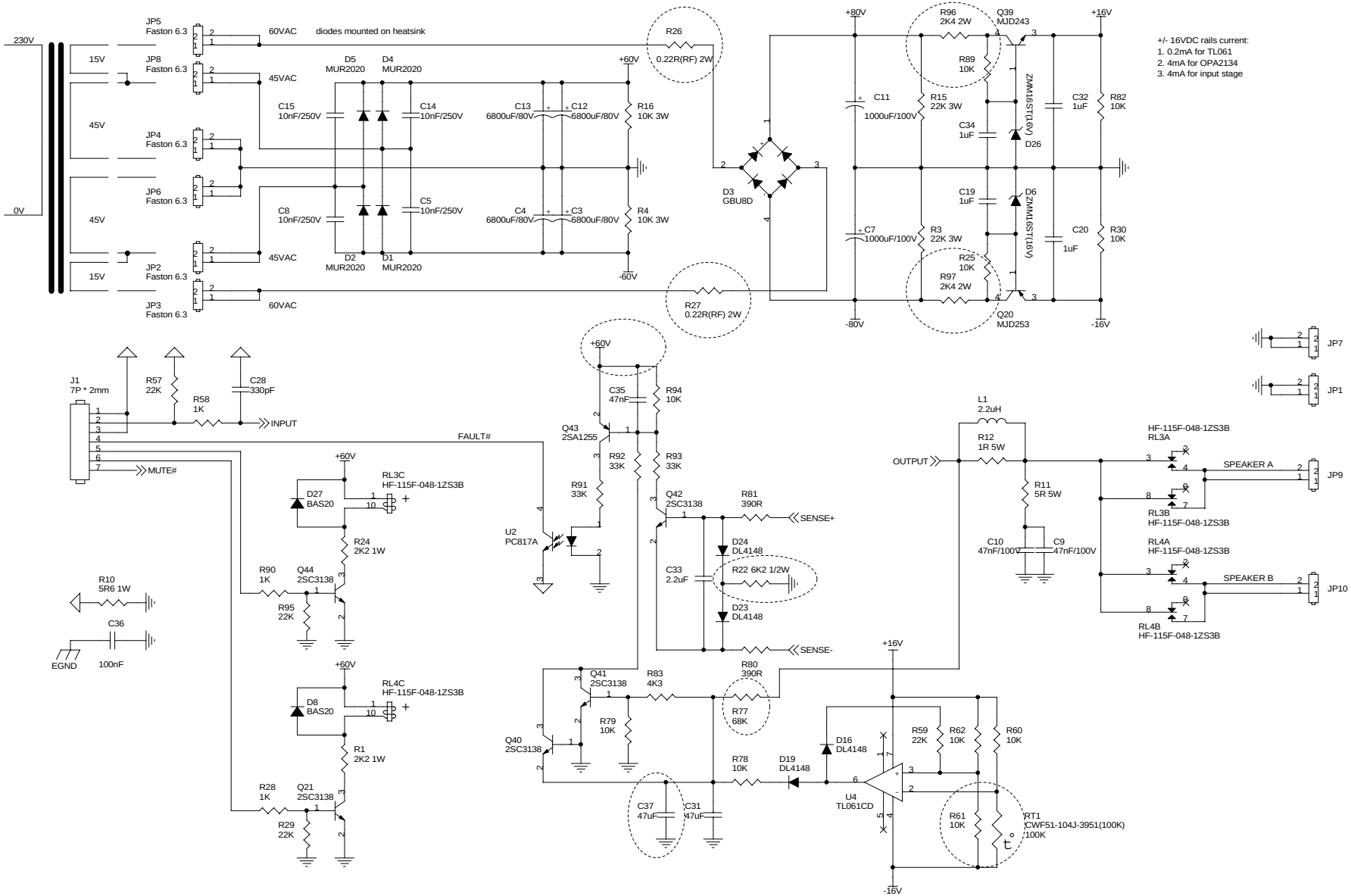

U15
AMS1117-3.3
L3
22uH
TPS_OUT
OUT
IN
GND
+5V
C60
47uF/25V
C69
100nF
C63
47uF/25V
C67
100nF
C65
100nF
ICS_VDD
C61
100nF
C62
100nF
C55
4.7pF
C54
10pF
C53
10pF
C52
DNE
Y2
SMD
24.576MHz
XTAL_IN
XTAL_OUT
ENABLE_1
ENABLE_2
VDD
VDDO
GND
BCLK0
BCLK1
BCLK2
BCLK3
BCLK4
BCLK5
R62
R66
R67
R69
R68
R63
27R
AD1955 (L)
AD1955 (R)
WM8740 & SRC4392
HRS Link
SRC4392
Ethernet
CLK_24_MHZ_2
CLK_24_MHZ_3
CLK_24_MHZ_5
CLK_24_MHZ_4
U13
ICS83905AGT
+3.3V
FB1
FB0805
C105
100nF
C104
47uF/16V
U18
(2*16P2.54)*2 Twin-Row Socket(180)
Connections toAD1955 L&R
Connections toWM8740
RST_DSP#
RESET_N_DSP
SPI0_SCS / I2C1_SCL
SPI0_CLK / I2C0_SCL
SPI0_SIMO
SPI0_S0MI / I2C0_SDA
SPI0_ENA / I2C1_SDA
I2C_SCL
I2C_SDA
SRC_LRCLK
SRC_BITCLK
SRC_SDATA
AFSR0
ACLKR0
AXR0[8] / AXR1[5] / SPI1_SOMI
AXR0[9] / AXR1[4] / SPI1_SIMO
AXR0[4]
AXR0[5]
AXR0[6]
AXR0[7]
AHCLKR0 / AHCLKR1
CLKIN
AMUTE0
AFSX0
ACLKX0
AXR0[0]
AXR0[1]
AXR0[2]
AXR0[3]
AFSX1
ACLKX1
AXR0[13] / AXR1[0]
AXR0[12] / AXR1[1]
AXR0[11] / AXR1[2]
AXR0[10] / AXR1[3]
AXR0[15] / AXR2[0]
AXR0[14] / AXR2[1]
AHCLKOUT
VDD33
R75
R74
R73
R72
R77
R76
R64
R65
R70
47R
WDCLK
BITCLK
SDATAL1
SDATAL2
SDATAR1
SDATAR2
WM_LRCLK
WM_BITCLK
WM_SDATA
J5
SRC_AESOUT
ADC_SDATA
ADC_BITCLK
ADC_LRCLK
2*4P2.0(90)
R5
OPEN
J6
DAC_L
DAC_R
MUTE_LISTEN#
SUB_MUTE_OUT
CS_AD1955_1#
CS_WM8740#
SDO
SCK
CS_AD1955_2#
TAPE_SEL
+3.3V
+5V
+15VA
-15VA
2*14P2.0(90)
U20
PCA9554APW
A0
A1
A2
SCL
SDA
INT
VSS
I/O0
I/O1
I/O2
I/O3
I/O4
I/O5
I/O6
I/O7
C95
100nF
R110
10K
R113
10K
R112
10K
RST_SRC#
RST_AD1955#
TAPE_SEL
RST_SUB#
SUB_SEL
SRC_LOCK#
SRC_INT#
R109
R108
R107
R106
R122
R123
10K

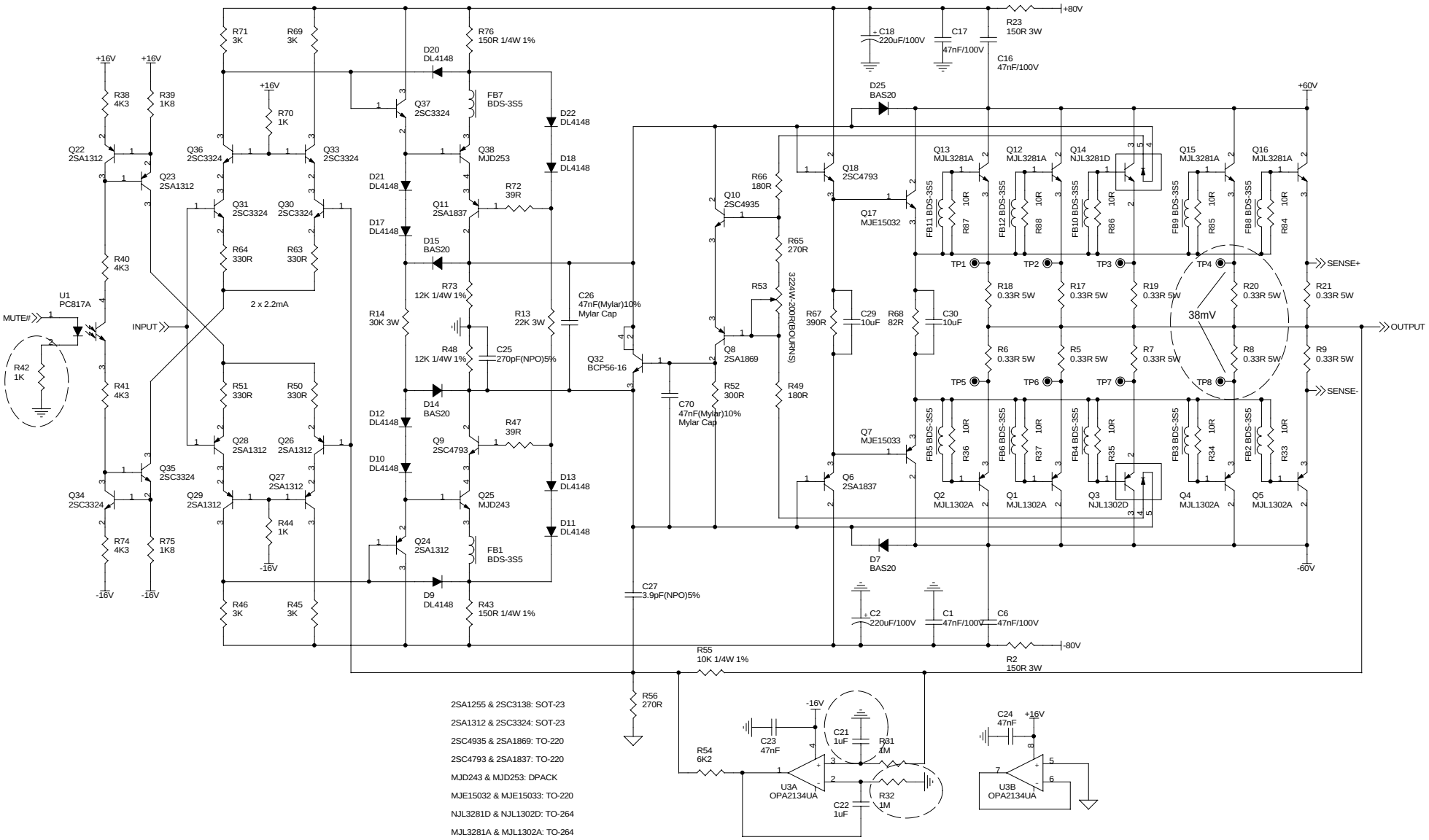

+15V_L
+15V_L
R84
3.3K
R85
680R
R83
47K
Q5
2SA1035
C72
100nF
R82
2.7K
+15V_L
+15V_L
R95
680R
R94
3.3K
Q6
2SA1035
R93
2.7K
C83
100nF
R92
47K
1uF/50V(Poly)
C78
-15V_L
C79
100nF
U16A
OPA2134UA
R87
22K
C75
100nF
+15V_L
C74
100nF
+15V_L
+5V
FB3
FB0805
C109
47uF/25V
C73
100nF
+5VA
C77
47uF/16V(Tan)
C84
100nF
DAC+5V_L
U19
AD1955ARS
U17A
OP275GS
R90
2.2K
U16B
OPA2134UA
DAC_L
RST_AD1955#
WDCLK
BITCLK
SDATAL1
SDATAL2
R88
560R
CLK_24_MHZ_2
R96
330R
DAC+5V_L
CS_AD1955_1#
SCK
SDO
RST
LRCLK/EF_WCLK
BCLK/EF_BCLK
SDATA/EF_LDATA
EF_RDATA
MCK
DSD_SCLK
DSD_LDATA
DSD_RDATA
DSD_PHASE
CLATCH
CCLK
CDATA
DVDD
AVDD
MUTE
OUT L+
OUT L-
ZERO_L
OUT R+
OUT R-
ZERO_R
FILTR
IREF
FILTB
DGND
AGND
AGND
C76
220pF(NPO)
R91
1K
C82
1nF(poly)
C80
100nF
-15V_L
R89
2.7K
C81
2A221J
R79
2.7K
C70
2A221J
R80
2.2K
R86
2.7K
C1
10uF
C115
100nF(NPO)
C66
10uF
C116
100nF(NPO)
U17B
OP275GS
R81
1K
C71
1nF(poly)
+15VA
+15V_L
R6
10R
C68
47uF/16V
-15VA
-15V_L
R7
10R
C85
47uF/16V
U11
AMS1117-5.0
IN
OUT
GND
+15VA
+5VA
C8
100nF
C34
100nF
C45
100nF
+15V_R
+15V_R
R102
3.3K
R103
680R
R101
47K
Q7
2SA1035
C89
100nF
R100
2.7K
+15V_R
+15V_R
R120
680R
R119
3.3K
Q8
2SA1035
R118
2.7K
C101
100nF
R117
47K
1uF/50V(Poly)
C96
-15V_R
C97
100nF
U21A
OPA2134UA
R105
22K
C92
100nF
+15V_R
C91
100nF
+15V_R
+5V
FB4
FB0805
C110
47uF/25V
C90
100nF
+5VA
C94
47uF/16V(Tan)
C102
100nF
DAC+5V_R
U23
AD1955ARS
U22A
OP275GS
R115
2.2K
U21B
OPA2134UA
DAC_R
RST_AD1955#
WDCLK
BITCLK
SDATAR1
SDATAR2
R111
560R
CLK_24_MHZ_3
R121
330R
DAC+5V_R
CS_AD1955_2#
SCK
SDO
RST
LRCLK/EF_WCLK
BCLK/EF_BCLK
SDATA/EF_LDATA
EF_RDATA
MCK
DSD_SCLK
DSD_LDATA
DSD_RDATA
DSD_PHASE
CLATCH
CCLK
CDATA
DVDD
AVDD
MUTE
OUT L+
OUT L-
ZERO_L
OUT R+
OUT R-
ZERO_R
FILTR
IREF
FILTB
DGND
AGND
AGND
C93
220pF(NPO)
R116
1K
C100
1nF(poly)
C98
100nF
-15V_R
R114
2.7K
C99
2A221J
R97
2.7K
C87
2A221J
R98
2.2K
R104
2.7K
C117
100nF(NPO)
C35
10uF
C86
10uF
C118
100nF(NPO)
U22B
OP275GS
R99
1K
C88
1nF(poly)
C47
100nF
+15VA
+15V_R
R8
10R
C103
47uF/16V
-15VA
-15V_R
R9
10R
C106
47uF/16V

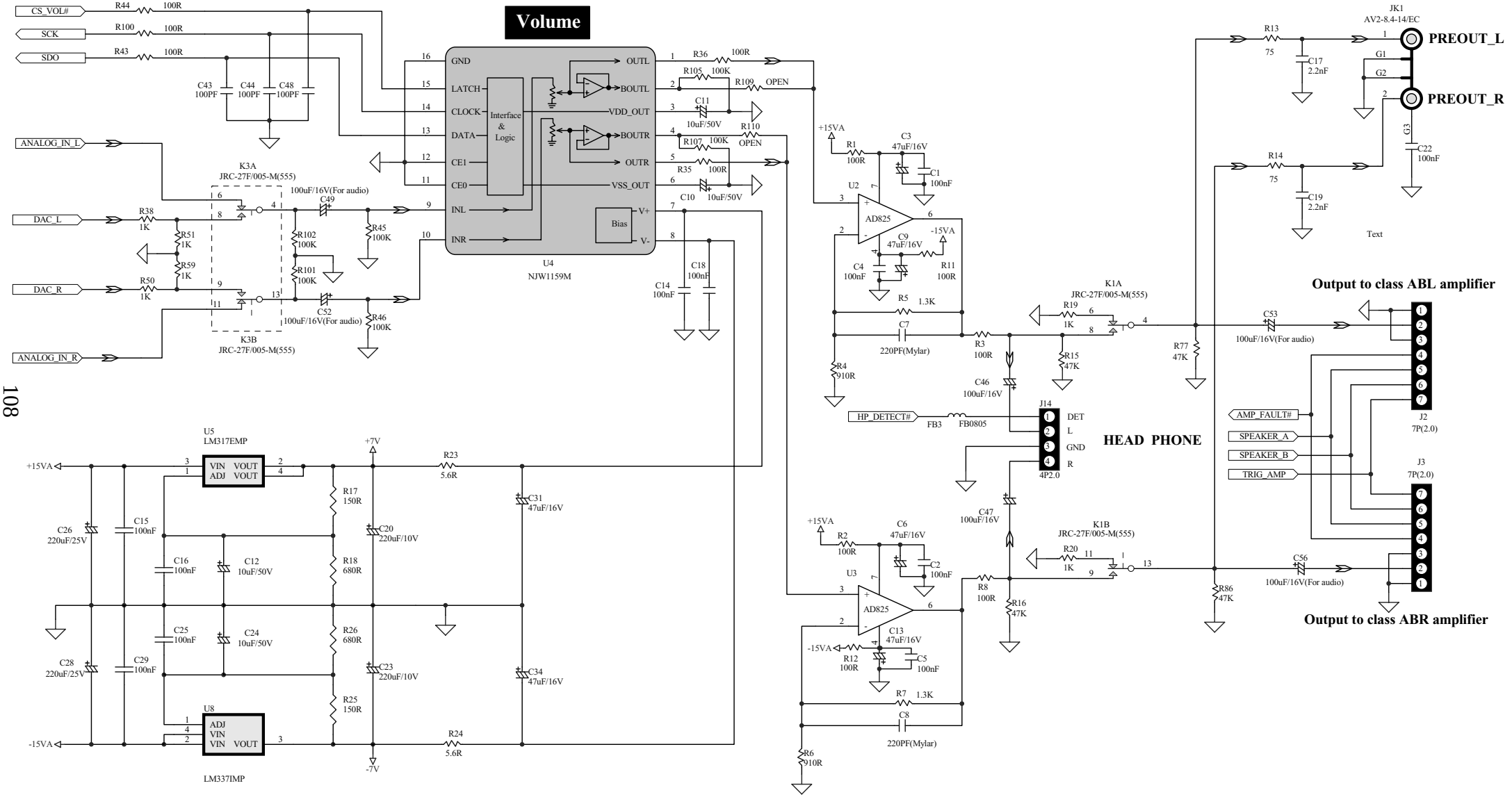

HRS-Link
J4
RJ45 10P8C
HR610675(Hanrun)
T4
T3
R25
2K7
R28
150R
R29
300R
C36
100nF
R78
10K
FB10
FB0805
C24
100nF
U5A
74LCX125MTC
CLK_24_MHZ_5
R14
0R
R13
DNE
R35
100R
C40
100nF
R24
2K7
TOSLINK
SRC4392 is MASTER on both PORTA and PORTB
U9
SRC4392IPFBT
RST_SRC#
RESET
RX1+
RX1-
RX2+
RX2-
RX3+
RX3-
RX4+
RX4-
NC
LRCLK_A
SCLK_A
SDIN_A
SDOUT_A
AES_OUT
TX+
TX-
SYNC
BLS
RXCKO
RXCKI
MCLK
LRCLK_B
SCLK_B
SDIN_B
SDOUT_B
GPO1
GPO2
GPO3
GPO4
CS/A0
CCLK/SCL
CDIN/A1
CDOUT/SDA
INT
LOCK
MUTE
RDY
CPM
VDD_IN
VDD_IO
VDD_33
VDD_18
AGND
DGND
DGND
DGND
BGND
FB5
FB0805
C111
47uF/25V
C51
100nF
C38
100nF
R34
10R
C31
47uF/25V
C32
100nF
FB8
FB0805
+1.8V
C37
100nF
FB9
FB0805
C23
100nF
C33
100nF
C39
100nF
ADC_LRCLK
ADC_BITCLK
ADC_SDATA
R56
R55
47R
SRC_LRCLK
SRC_BITCLK
SRC_SDATA
R58
R59
R57
I2C_SCL
I2C_SDA
SRC_INT#
SRC_LOCK#
CLK_24_MHZ_4
GPO5
R36
47R
U4A
74LCX125MTC
U8
AMS1117-1.8
C44
100nF
C46
100nF
+1.8V
U10A
74LCX139TTR
U10B
74LCX139TTR
SRC_INT# is an open drain /active LOW output
COAX1 in
J2A
AV2-8.4-14/EC
T2
R22
75R
C22
100nF
C21
100nF
SPDIF3+
SPDIF3-
R21
2K7
C20
DNE
COAX2 in
J2B
AV2-8.4-14/EC
T1
C5
100nF
C19
100nF
C18
100nF
R20
75R
SPDIF4+
SPDIF4-
R19
2K7
C17
DNE
SUB Trig_1 OUT
J3
CKX-3.5-12A
C112
100nF
PTC1
FSMD010-1206
C113
100nF
R46
47K
D1
LL4148
Q3
SS8550
R60
1K
R61
10K
R71
10K
Q4
BSS123
SUB Trig_2 OUT
J7
CKX-3.5-12A
C114
100nF
R23
47R
R26
47R
SRC_AESOUT
U4C
74LCX125MTC
U4D
74LCX125MTC
U5C
74LCX125MTC
U5D
74LCX125MTC
U5B
74LCX125MTC
GPO8
GPO4
GPO7
GPO3
GPO2
R1
47R
R2
47R
L1
22uH
L2
22uH
C4
47uF/25V
C3
100nF
C7
47uF/25V
C6
100nF
OPT2 in
OPT1 in
U1
U2
JSR1162-002
JSR1162-002

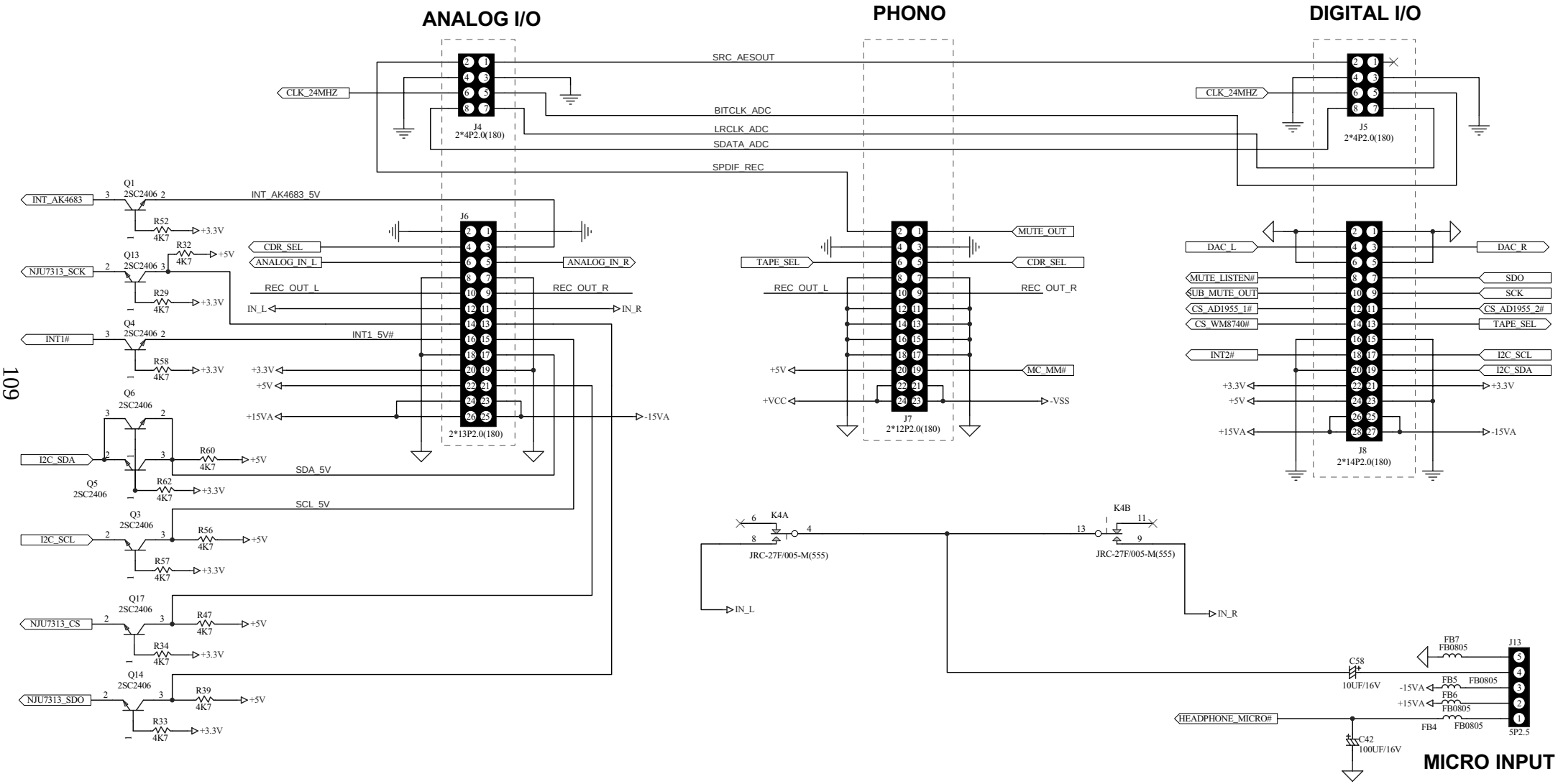

SUB in
SUB out
G = 0.25 by software
G = 4
G = 4
U12
XWM8740EDS
U6
74HC4052D
U7
74HC4052D
U3A
NJM2068M
U3B
NJM2068M
Subwoofer IN L
Subwoofer IN R
Subwoofer OUT L
Subwoofer OUT R
SUB_MUTE_OUT
SUB_SEL
RST_SUB#
WM_LRCLK
WM_BITCLK
WM_SDATA
CLK_24_MHZ_4
MUTE_LISTEN#
SDO
SCK
CS_WM8740#
J1A
AV4-8.4-13/EC
J1B
AV4-8.4-13/EC
Q1
DTC343TK
Q2
DTC343TK

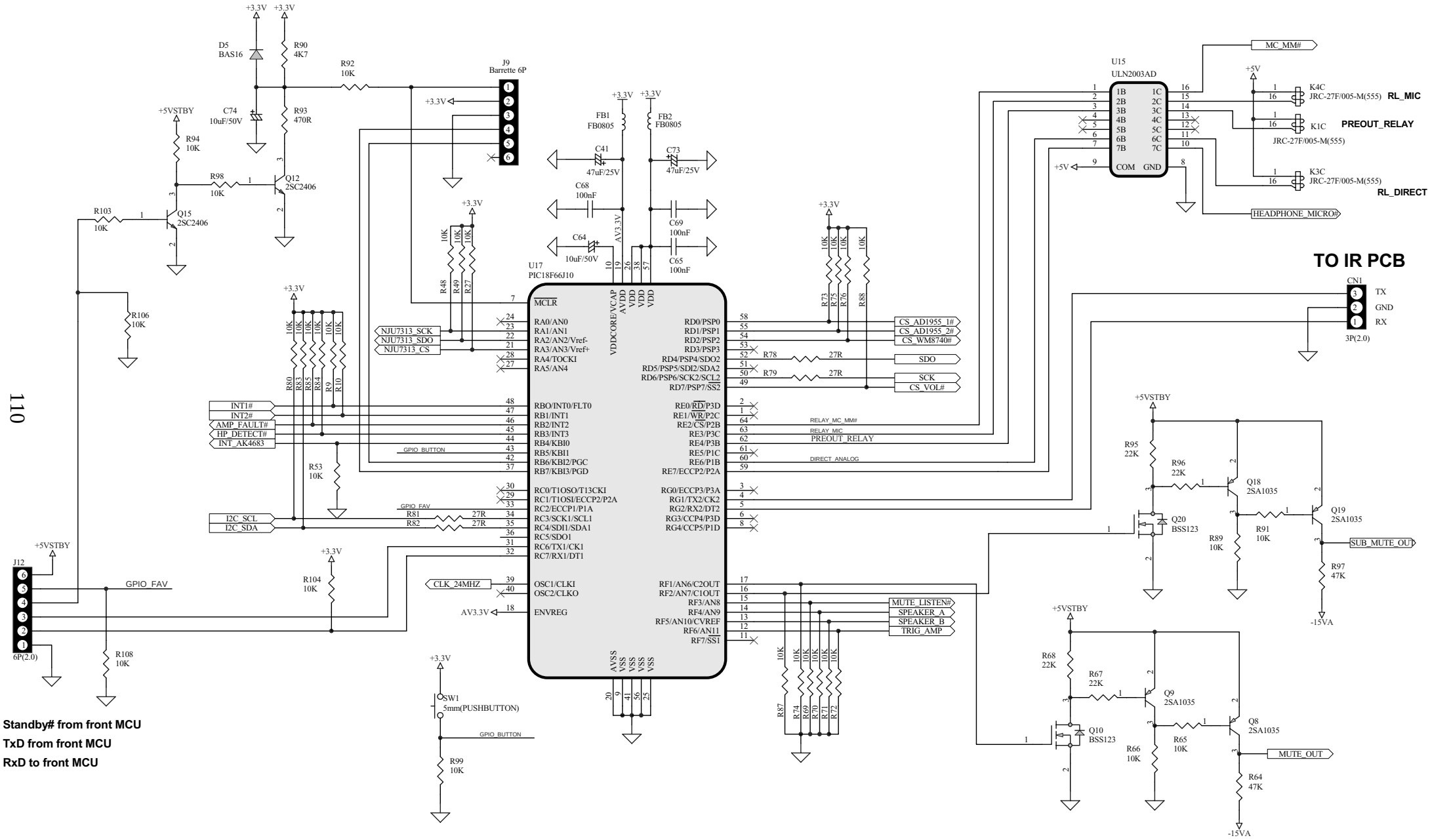

TO Pamp PCB
HP DETECT
HP L
GND
HP R
CN13
4P(2.0)
TO Pamp PCB
HEADPHONE_MICRO#
+15V
-15V
MIC OUT
AGND
CN12
5P2.5
R1 10R
R2 10R
R7 1K
R8 1K
R9 1K
R10 1K
R11 1K
R12 1K
R13 1K
R14 1K
C1 104
C2 104
C3 104
C5 104
IC4A
IC4B
TPA6120A2
Q2
C2120
R18 10K
R19 47K
R31 27K
R22 200
D4
IN4148
RELAY1
JRC-27F/012-M(555)
R5 OPEN
GND
R15 10R
L IN
R IN
CK1
CK-6.35-02
C29 331P
C30 331P
R17 47K
R20 47K
C42 104
C31 47P
R23 10K
C32 150P
R24 10K
IC5A
IC5B
NJM2068
R25 1K
R26 1K
C38 10u16
R32 2.2K
2.12V
R4 10K
C4 473
R3 1.65K
R28 100k
C7 470P
R29 100R
R30 100R
C35 104
C40 10u16
C36 104
C41 10u16
C10 100U25
C9 100U25
Phones board

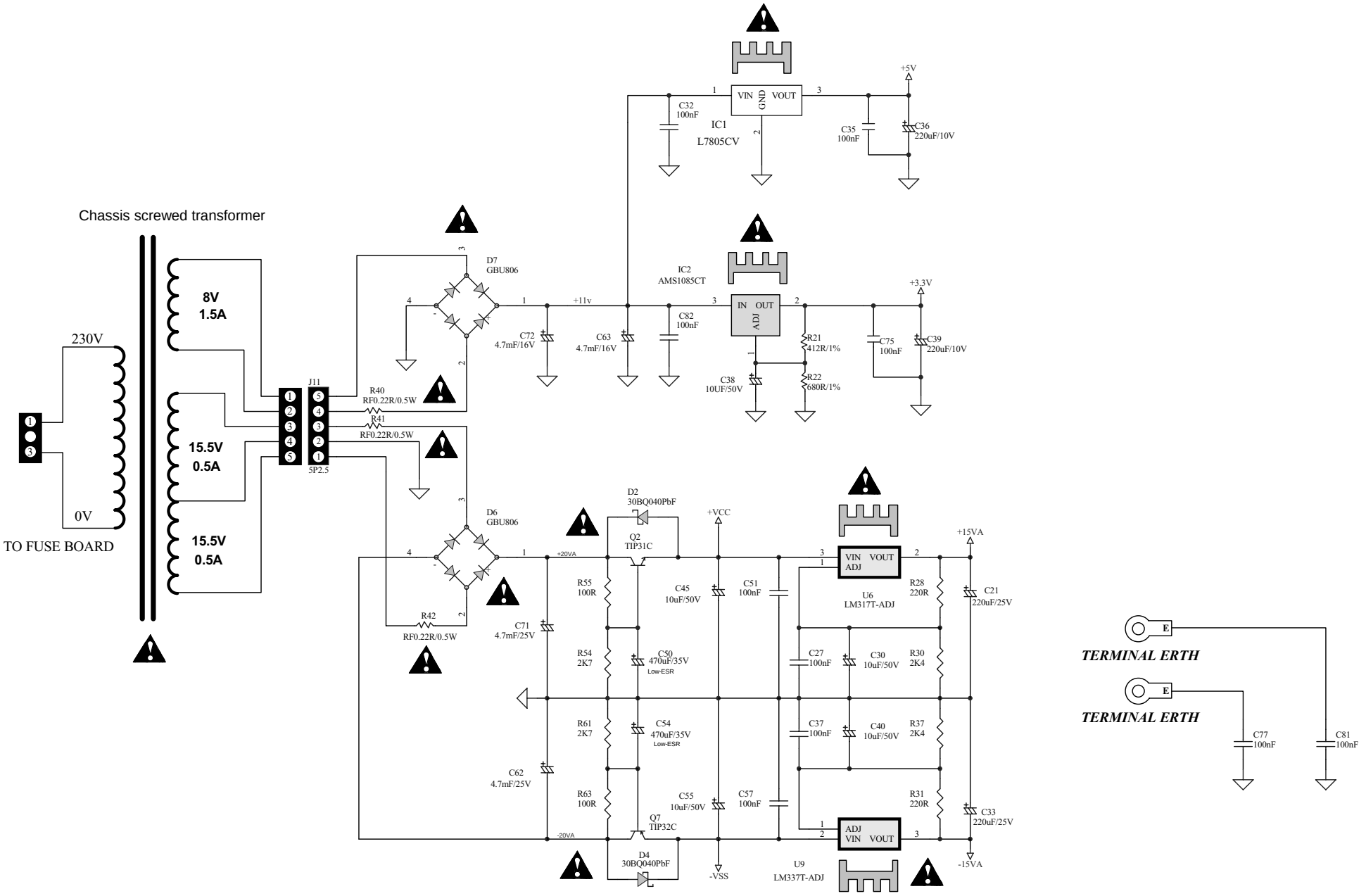

230V
0V
15V
45V
45V
15V
JP5 Faston 6.3
JP8 Faston 6.3
JP4 Faston 6.3
JP6 Faston 6.3
JP2 Faston 6.3
JP3 Faston 6.3
60VAC
diodes mounted on heatsink
45VAC
45VAC
60VAC
D5 MUR2020
D4 MUR2020
D2 MUR2020
D1 MUR2020
C15 10nF/250V
C14 10nF/250V
C8 10nF/250V
C5 10nF/250V
C13 6800uF/80V
C12 6800uF/80V
C4 6800uF/80V
C3 6800uF/80V
R26 0.22R(RF) 2W
R16 10K 3W
R4 10K 3W
R27 0.22R(RF) 2W
+60V
-60V
D3 GBU8D
+80V
-80V
Q39 MJD243
Q20 MJD253
R96 2K4 2W
R89 10K
R97 2K4 2W
R25 10K
C11 1000uF/100V
C7 1000uF/100V
R15 22K 3W
R3 22K 3W
C34 1uF
C19 1uF
ZMM16ST(16V)
D26
D6
C32 1uF
C20 1uF
R82 10K
R30 10K
+16V
-16V
+/- 16VDC rails current:
1. 0.2mA for TL061
2. 4mA for OPA2134
3. 4mA for input stage
J1 7P * 2mm
R57 22K
R58 1K
C28 330pF
INPUT
MUTE#
FAULT#
+60V
C35 47nF
R94 10K
Q43 2SA1255
R92 33K
R93 33K
R91 33K
U2 PC817A
Q42 2SC3138
R81 390R
SENSE+
D24 DL4148
C33 2.2uF
R22 6K2 1/2W
D23 DL4148
SENSE-
RL3C HF-115F-048-1ZS3B
D27 BAS20
R24 2K2 1W
R90 1K
Q44 2SC3138
R95 22K
RL4C HF-115F-048-1ZS3B
D8 BAS20
R1 2K2 1W
R28 1K
Q21 2SC3138
R29 22K
R10 5R6 1W
C36 100nF
EGND
Q41 2SC3138
R83 4K3
R80 390R
R77 68K
Q40 2SC3138
R79 10K
R78 10K
D19 DL4148
D16 DL4148
C37 47uF
C31 47uF
U4 TL061CD
R59 22K
R62 10K
R60 10K
R61 10K
RT1 (CWF51-104J-3951(100K) 100K
L1 2.2uH
R12 1R 5W
OUTPUT
R11 5R 5W
C10 47nF/100V
C9 47nF/100V
HF-115F-048-1ZS3B RL3A
RL3B HF-115F-048-1ZS3B
RL4A HF-115F-048-1ZS3B
RL4B HF-115F-048-1ZS3B
SPEAKER A
SPEAKER B
JP7
JP1
JP9
JP10

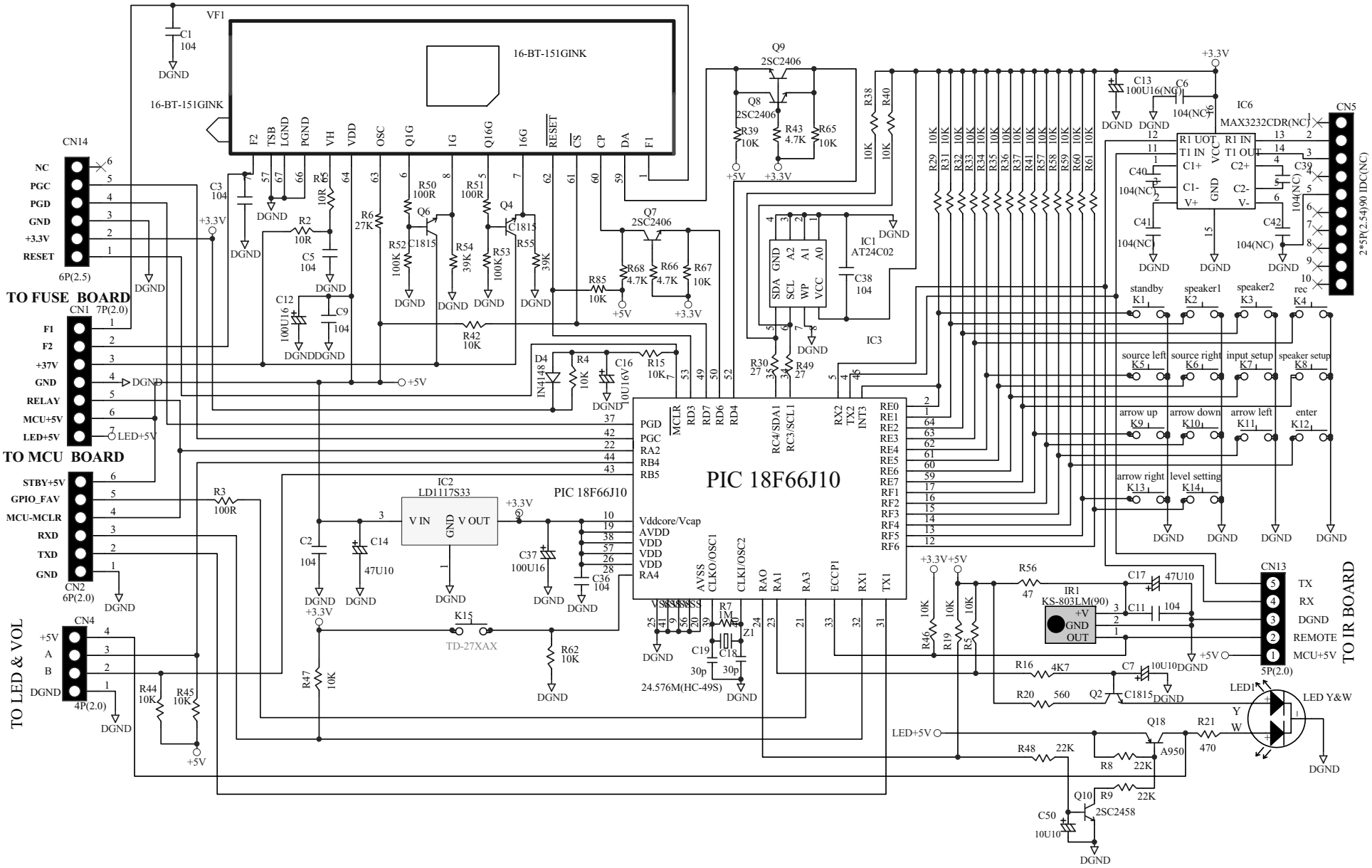

+16V
-16V
+80V
-80V
+60V
-60V
MUTE#
INPUT
OUTPUT
SENSE+
SENSE-
U1
PC817A
2 x 2.2mA
38mV
TP1
TP2
TP3
TP4
TP5
TP6
TP7
TP8
R71 3K
R69 3K
R76 150R 1/4W 1%
R70 1K
R38 4K3
R39 1K8
R40 4K3
R41 4K3
R42 1K
R64 330R
R63 330R
R51 330R
R50 330R
R44 1K
R74 4K3
R75 1K8
R46 3K
R45 3K
R43 150R 1/4W 1%
R73 12K 1/4W 1%
R14 30K 3W
R48 12K 1/4W 1%
R13 22K 3W
R47 39R
R72 39R
R66 180R
R65 270R
R53 3324W-200R(BOURNS)
R67 390R
R68 82R
R52 300R
R49 180R
R23 150R 3W
R2 150R 3W
R55 10K 1/4W 1%
R56 270R
R54 6K2
R18 0.33R 5W
R17 0.33R 5W
R19 0.33R 5W
R20 0.33R 5W
R21 0.33R 5W
R6 0.33R 5W
R5 0.33R 5W
R7 0.33R 5W
R8 0.33R 5W
R9 0.33R 5W
C18 220uF/100V
C17 47nF/100V
C16 47nF/100V
C2 220uF/100V
C1 47nF/100V
C6 47nF/100V
C26 47nF(Mylar)10%
Mylar Cap
C25 270pF(NPO)5%
C29 10uF
C30 10uF
C70 47nF(Mylar)10%
Mylar Cap
C27 3.9pF(NPO)5%
C23 47nF
C21 1uF
R31 1M
C22 1uF
R32 1M
C24 47nF
U3A OPA2134UA
U3B OPA2134UA
D20 DL4148
D22 DL4148
D18 DL4148
D21 DL4148
D17 DL4148
D15 BAS20
D14 BAS20
D12 DL4148
D10 DL4148
D13 DL4148
D11 DL4148
D9 DL4148
D25 BAS20
D7 BAS20
Q37 2SC3324
FB7 BDS-3S5
Q38 MJD253
Q11 2SA1837
Q24 2SA1312
FB1 BDS-3S5
Q25 MJD243
Q9 2SC4793
Q32 BCP56-16
Q8 2SA1869
Q10 2SC4935
Q18 2SC4793
Q17 MJE15032
Q7 MJE15033
Q6 2SA1837
Q22 2SA1312
Q23 2SA1312
Q36 2SC3324
Q33 2SC3324
Q31 2SC3324
Q30 2SC3324
Q28 2SA1312
Q26 2SA1312
Q27 2SA1312
Q29 2SA1312
Q35 2SC3324
Q34 2SC3324
Q13 MJL3281A
Q12 MJL3281A
Q14 NJL3281D
Q15 MJL3281A
Q16 MJL3281A
Q2 MJL1302A
Q1 MJL1302A
Q3 NJL1302D
Q4 MJL1302A
Q5 MJL1302A
FB11 BDS-3S5
FB12 BDS-3S5
FB10 BDS-3S5
FB9 BDS-3S5
FB8 BDS-3S5
FB5 BDS-3S5
FB6 BDS-3S5
FB4 BDS-3S5
FB3 BDS-3S5
FB2 BDS-3S5
R87 10R
R88 10R
R86 10R
R85 10R
R84 10R
R36 10R
R37 10R
R35 10R
R34 10R
R33 10R
2SA1255 & 2SC3138: SOT-23
2SA1312 & 2SC3324: SOT-23
2SC4935 & 2SA1869: TO-220
2SC4793 & 2SA1837: TO-220
MJD243 & MJD253: DPACK
MJE15032 & MJE15033: TO-220
NJL3281D & NJL1302D: TO-264
MJL3281A & MJL1302A: TO-264

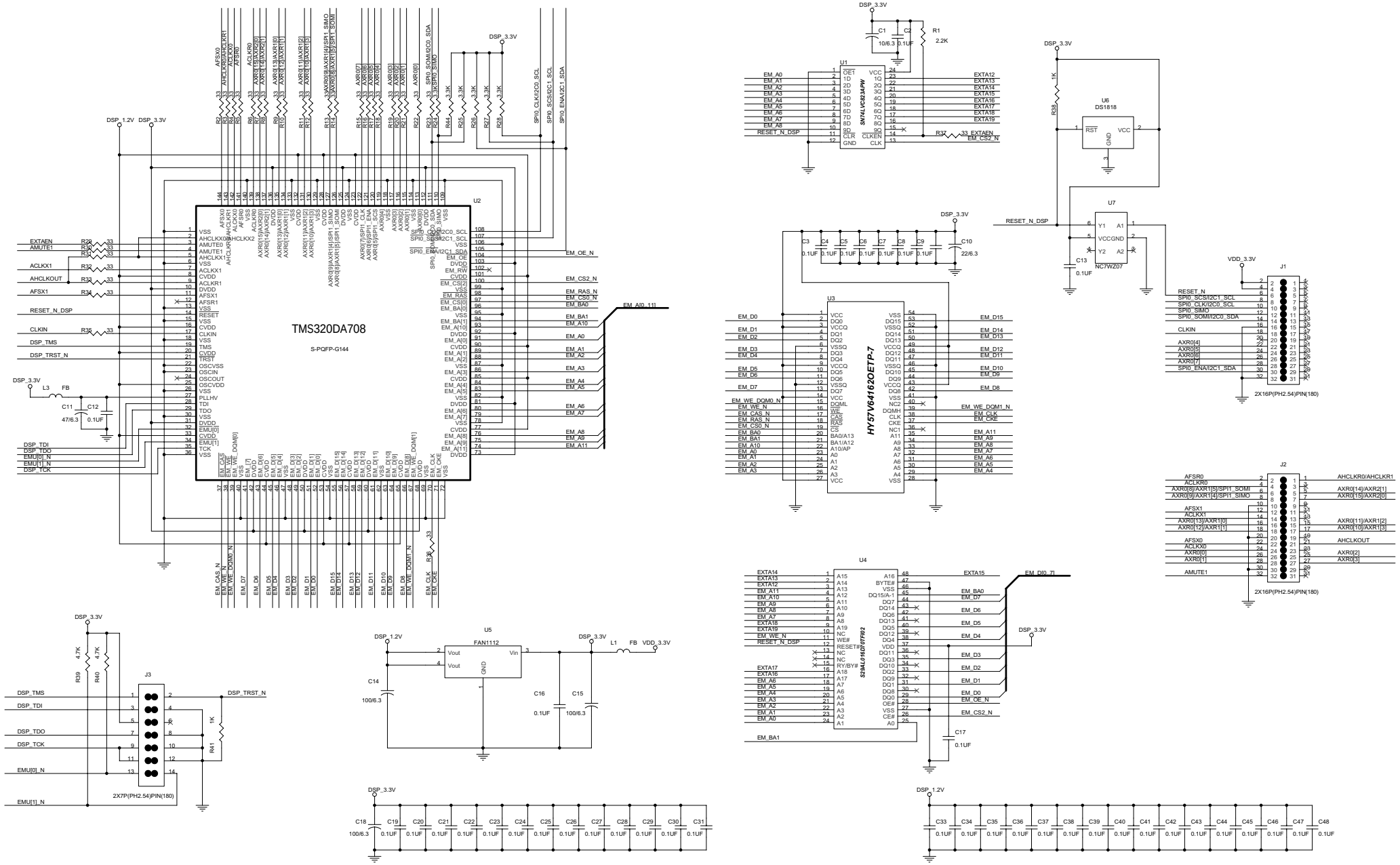

Volume
CS_VOL#
SCK
SDO
R44 100R
R100 100R
R43 100R
C43 100PF
C44 100PF
C48 100PF
ANALOG_IN_L
ANALOG_IN_R
DAC_L
DAC_R
K3A
JRC-27F/005-M(555)
K3B
JRC-27F/005-M(555)
100uF/16V(For audio)
C49
C52
R38 1K
R50 1K
R51 1K
R59 1K
R102 100K
R101 100K
R45 100K
R46 100K
GND
LATCH
CLOCK
DATA
CE1
CE0
INL
INR
Interface & Logic
OUTL
BOUTL
VDD_OUT
BOUTR
OUTR
VSS_OUT
Bias
V+
V-
U4
NJW1159M
R36 100R
R105 100K
R109 OPEN
C11 10uF/50V
R110 OPEN
R107 100K
R35 100R
C10 10uF/50V
C14 100nF
C18 100nF
+15VA
R1 100R
C3 47uF/16V
C1 100nF
U2
AD825
C9 47uF/16V
-15VA
C4 100nF
R11 100R
R5 1.3K
C7 220PF(Mylar)
R3 100R
R4 910R
K1A
JRC-27F/005-M(555)
R19 1K
R15 47K
C46 100uF/16V
HP_DETECT#
FB3
FB0805
J14
DET
L
GND
R
4P2.0
HEAD PHONE
C47 100uF/16V
+15VA
R2 100R
C6 47uF/16V
C2 100nF
U3
AD825
C13 47uF/16V
-15VA
R12 100R
C5 100nF
R7 1.3K
C8 220PF(Mylar)
R6 910R
K1B
JRC-27F/005-M(555)
R20 1K
R8 100R
R16 47K
R77 47K
R86 47K
JK1
AV2-8.4-14/EC
PREOUT_L
PREOUT_R
G1
G2
G3
R13 75
R14 75
C17 2.2nF
C19 2.2nF
C22 100nF
Text
Output to class ABL amplifier
C53 100uF/16V(For audio)
C56 100uF/16V(For audio)
Output to class ABR amplifier
AMP_FAULT#
SPEAKER_A
SPEAKER_B
TRIG_AMP
J2
7P(2.0)
J3
7P(2.0)
U5
LM317EMP
VIN VOUT
ADJ VOUT
+7V
-7V
R23 5.6R
R24 5.6R
R17 150R
R18 680R
R26 680R
R25 150R
C20 220uF/10V
C23 220uF/10V
C31 47uF/16V
C34 47uF/16V
C26 220uF/25V
C15 100nF
C16 100nF
C12 10uF/50V
C25 100nF
C24 10uF/50V
C28 220uF/25V
C29 100nF
U8
ADJ
VIN
VIN VOUT
LM337IMP

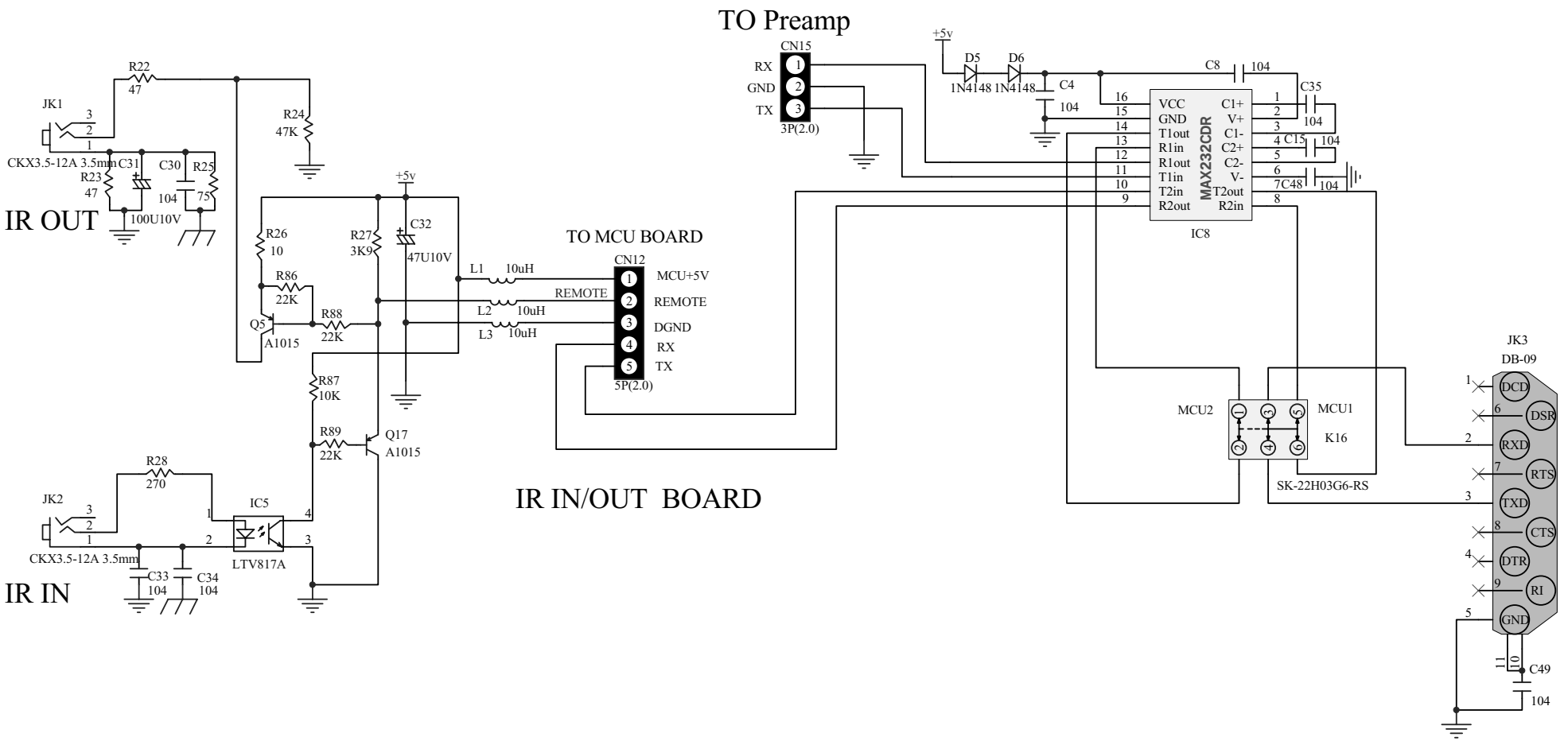

ANALOG I/O
PHONO
DIGITAL I/O
CLK_24MHZ
SRC_AESOUT
BITCLK_ADC
LRCLK_ADC
SDATA_ADC
SPDIF_REC
J4
2*4P2.0(180)
J5
2*4P2.0(180)
J6
2*13P2.0(180)
J7
2*12P2.0(180)
J8
2*14P2.0(180)
INT_AK4683
INT_AK4683_5V
NJU7313_SCK
INT1#
INT1_5V#
I2C_SDA
SDA_5V
I2C_SCL
SCL_5V
NJU7313_CS
NJU7313_SDO
CDR_SEL
ANALOG_IN_L
ANALOG_IN_R
REC_OUT_L
REC_OUT_R
IN_L
IN_R
TAPE_SEL
MUTE_OUT
MC_MM#
-VSS
DAC_L
DAC_R
MUTE_LISTEN#
SUB_MUTE_OUT
CS_AD1955_1#
CS_WM8740#
SDO
SCK
CS_AD1955_2#
TAPE_SEL
INT2#
I2C_SCL
I2C_SDA
+3.3V
+5V
+15VA
-15VA
+VCC
Q1
2SC2406
Q13
Q4
Q6
Q5
Q3
Q17
Q14
R52
R32
R29
R58
R60
R62
R56
R57
R47
R34
R39
R33
4K7
K4A
K4B
JRC-27F/005-M(555)
C58
10UF/16V
C42
100UF/16V
FB7
FB0805
FB5
FB6
FB4
J13
5P2.5
HEADPHONE_MICRO#
MICRO INPUT

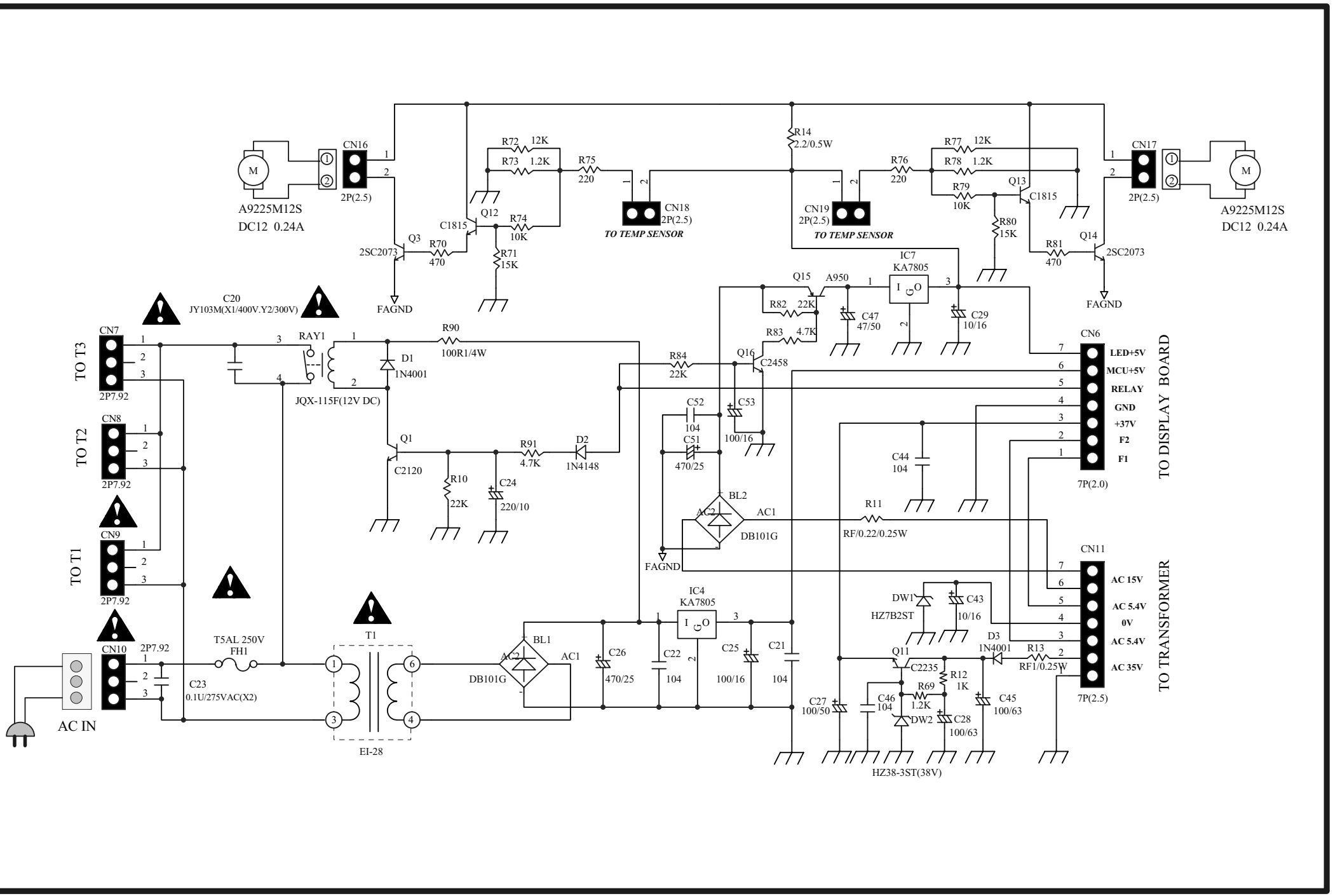

U17
PIC18F66J10
MCLR
RA0/AN0
RA1/AN1
RA2/AN2/Vref-
RA3/AN3/Vref+
RA4/T0CKI
RA5/AN4
RB0/INT0/FLT0
RB1/INT1
RB2/INT2
RB3/INT3
RB4/KBI0
RB5/KBI1
RB6/KBI2/PGC
RB7/KBI3/PGD
RC0/T1OSO/T13CKI
RC1/T1OSI/ECCP2/P2A
RC2/ECCP1/P1A
RC3/SCK1/SCL1
RC4/SDI1/SDA1
RC5/SDO1
RC6/TX1/CK1
RC7/RX1/DT1
OSC1/CLKI
OSC2/CLKO
ENVREG
RD0/PSP0
RD1/PSP1
RD2/PSP2
RD3/PSP3
RD4/PSP4/SDO2
RD5/PSP5/SDI2/SDA2
RD6/PSP6/SCK2/SCL2
RD7/PSP7/SS2
RE0/RD/P3D
RE1/WR/P2C
RE2/CS/P2B
RE3/P3C
RE4/P3B
RE5/P1C
RE6/P1B
RE7/ECCP2/P2A
RG0/ECCP3/P3A
RG1/TX2/CK2
RG2/RX2/DT2
RG3/CCP4/P3D
RG4/CCP5/P1D
RF1/AN6/C2OUT
RF2/AN7/C1OUT
RF3/AN8
RF4/AN9
RF5/AN10/CVREF
RF6/AN11
RF7/SS1
VDDCORE/VCAP
AVDD
VDD
AVSS
VSS
AV3.3V
NJU7313_SCK
NJU7313_SDO
NJU7313_CS
INT1#
INT2#
AMP_FAULT#
HP_DETECT#
INT_AK4683
GPIO_BUTTON
GPIO_FAV
I2C_SCL
I2C_SDA
CLK_24MHZ
CS_AD1955_1#
CS_AD1955_2#
CS_WM8740#
SDO
SCK
CS_VOL#
RELAY_MC_MM#
RELAY_MIC
PREOUT_RELAY
DIRECT_ANALOG
MUTE_LISTEN#
SPEAKER_A
SPEAKER_B
TRIG_AMP
+3.3V
+5VSTBY
+5V
AV3.3V
D5
BAS16
R90
4K7
R92
10K
R93
470R
C74
10uF/50V
R94
10K
R98
10K
Q12
2SC2406
Q15
2SC2406
R103
10K
R106
10K
J9
Barrette 6P
FB1
FB0805
FB2
FB0805
C41
47uF/25V
C73
47uF/25V
C68
100nF
C69
100nF
C64
10uF/50V
C65
100nF
R48
R49
R27
R80
R83
R85
R84
R9
R10
R53
10K
R81
27R
R82
27R
R104
10K
R108
10K
J12
6P(2.0)
SW1
5mm(PUSHBUTTON)
R99
10K
R73
R75
R76
R88
R78
27R
R79
27R
U15
ULN2003AD
COM
GND
K4C
JRC-27F/005-M(555)
RL_MIC
K1C
JRC-27F/005-M(555)
PREOUT_RELAY
K3C
JRC-27F/005-M(555)
RL_DIRECT
MC_MM#
HEADPHONE_MICRO#
TO IR PCB
CN1
TX
GND
RX
3P(2.0)
R95
22K
R96
22K
Q18
2SA1035
Q19
2SA1035
Q20
BSS123
R89
10K
R91
10K
R97
47K
SUB_MUTE_OUT
-15VA
R68
22K
R67
22K
Q9
2SA1035
Q8
2SA1035
Q10
BSS123
R66
10K
R65
10K
R64
47K
MUTE_OUT
-15VA
R87
R74
R69
R70
R71
R72
Standby# from front MCU
TxD from front MCU
RxD to front MCU

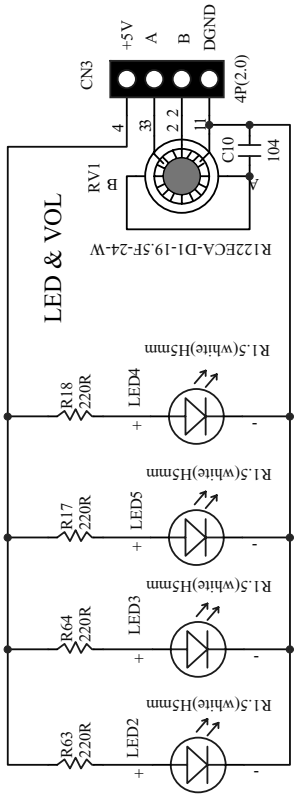

Chassis screwed transformer
230V
0V
TO FUSE BOARD
8V
1.5A
15.5V
0.5A
15.5V
0.5A
J11
5P2.5
R40
RF0.22R/0.5W
R41
RF0.22R/0.5W
R42
RF0.22R/0.5W
D7
GBU806
D6
GBU806
IC1
L7805CV
VIN
GND
VOUT
C32
100nF
C35
100nF
C36
220uF/10V
+5V
IC2
AMS1085CT
IN
OUT
ADJ
+11v
C72
4.7mF/16V
C63
4.7mF/16V
C82
100nF
R21
412R/1%
R22
680R/1%
C38
10UF/50V
C75
100nF
C39
220uF/10V
+3.3V
D2
30BQ040PbF
Q2
TIP31C
+VCC
+20VA
R55
100R
C45
10uF/50V
C51
100nF
U6
LM317T-ADJ
VIN
VOUT
ADJ
R28
220R
C21
220uF/25V
+15VA
C71
4.7mF/25V
R54
2K7
C50
470uF/35V
Low-ESR
C27
100nF
C30
10uF/50V
R30
2K4
R61
2K7
C54
470uF/35V
Low-ESR
C37
100nF
C40
10uF/50V
R37
2K4
C62
4.7mF/25V
R63
100R
C55
10uF/50V
C57
100nF
R31
220R
C33
220uF/25V
Q7
TIP32C
-20VA
D4
30BQ040PbF
-VSS
U9
LM337T-ADJ
ADJ
VIN
VOUT
-15VA
E
TERMINAL ERTH
E
TERMINAL ERTH
C77
100nF
C81
100nF

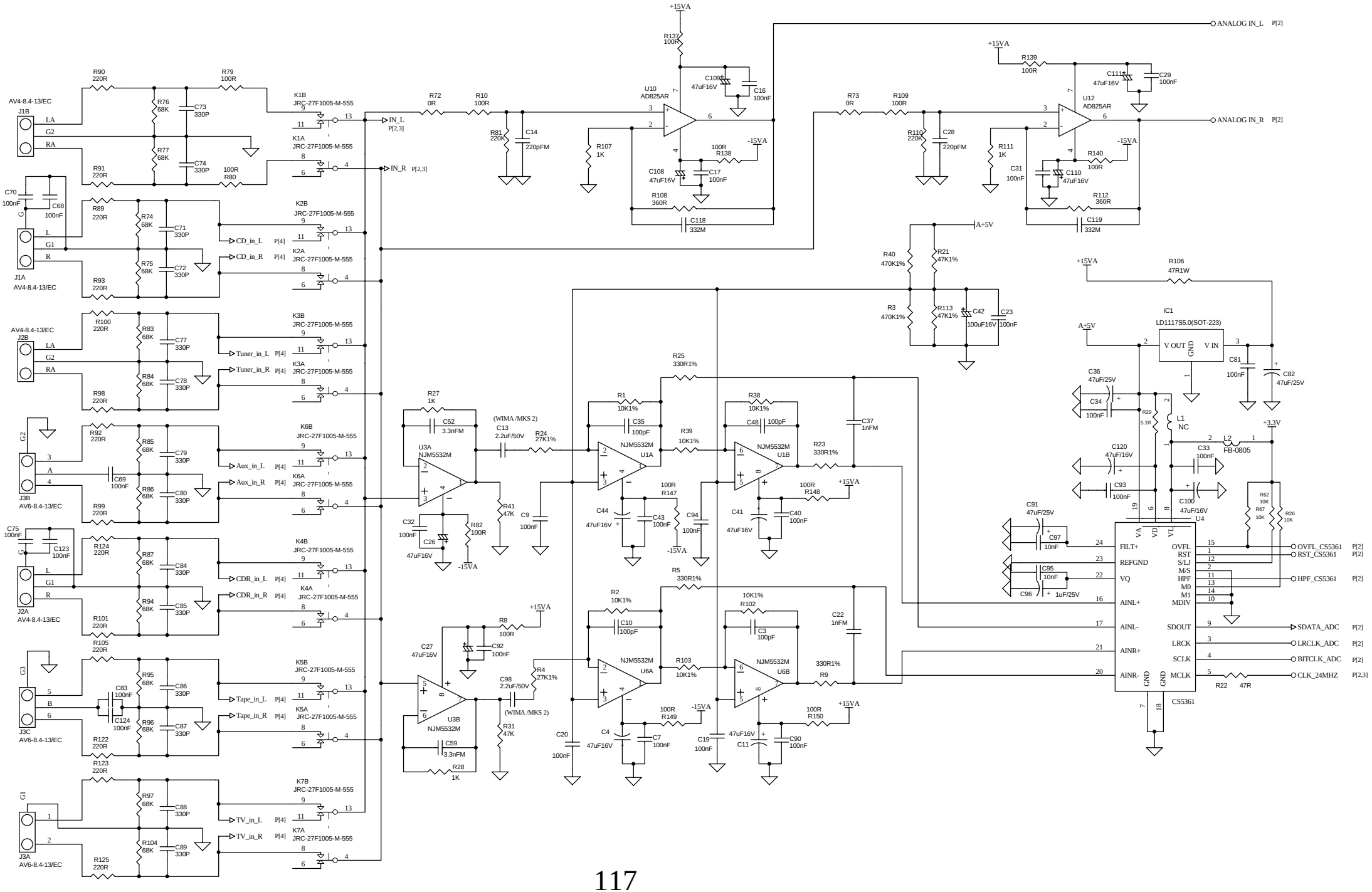

VF1
16-BT-151GINK
PIC 18F66J10
IC1 AT24C02
IC2 LD1117S33
IC3
IC6 MAX3232CDR(NC)
TO FUSE BOARD
TO MCU BOARD
TO LED & VOL
TO IR BOARD
CN1 7P(2.0)
CN2 6P(2.0)
CN4 4P(2.0)
CN5 2*5P(2.54)90 IDC(NC)
CN13 5P(2.0)
CN14 6P(2.5)
IR1 KS-803LM(90)
LED1 LED Y&W
24.576M(HC-49S)
TD-27XAX
standby K1
speaker1 K2
speaker2 K3
rec K4
source left K5
source right K6
input setup K7
speaker setup K8
arrow up K9
arrow down K10
arrow left K11
enter K12
arrow right K13
level setting K14

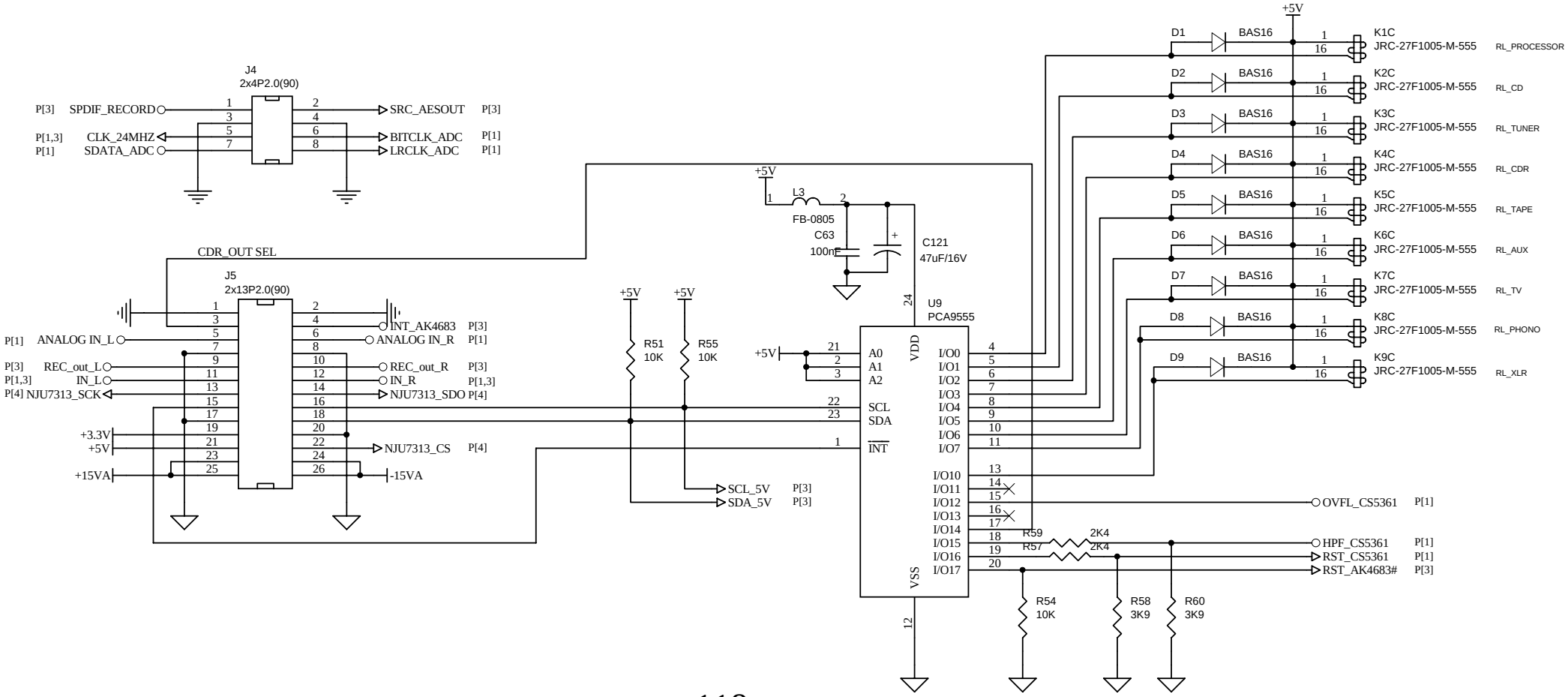

TMS320DA708
S-PQFP-G144
HY57V64162OETP-7
SN74LVC8234PW
S29AL016D70TF02
FAN1112
DS1818
NC7WZ07
2X16P(PH2.54)PIN(180)
2X7P(PH2.54)PIN(180)
DSP_3.3V
DSP_1.2V
VDD_3.3V

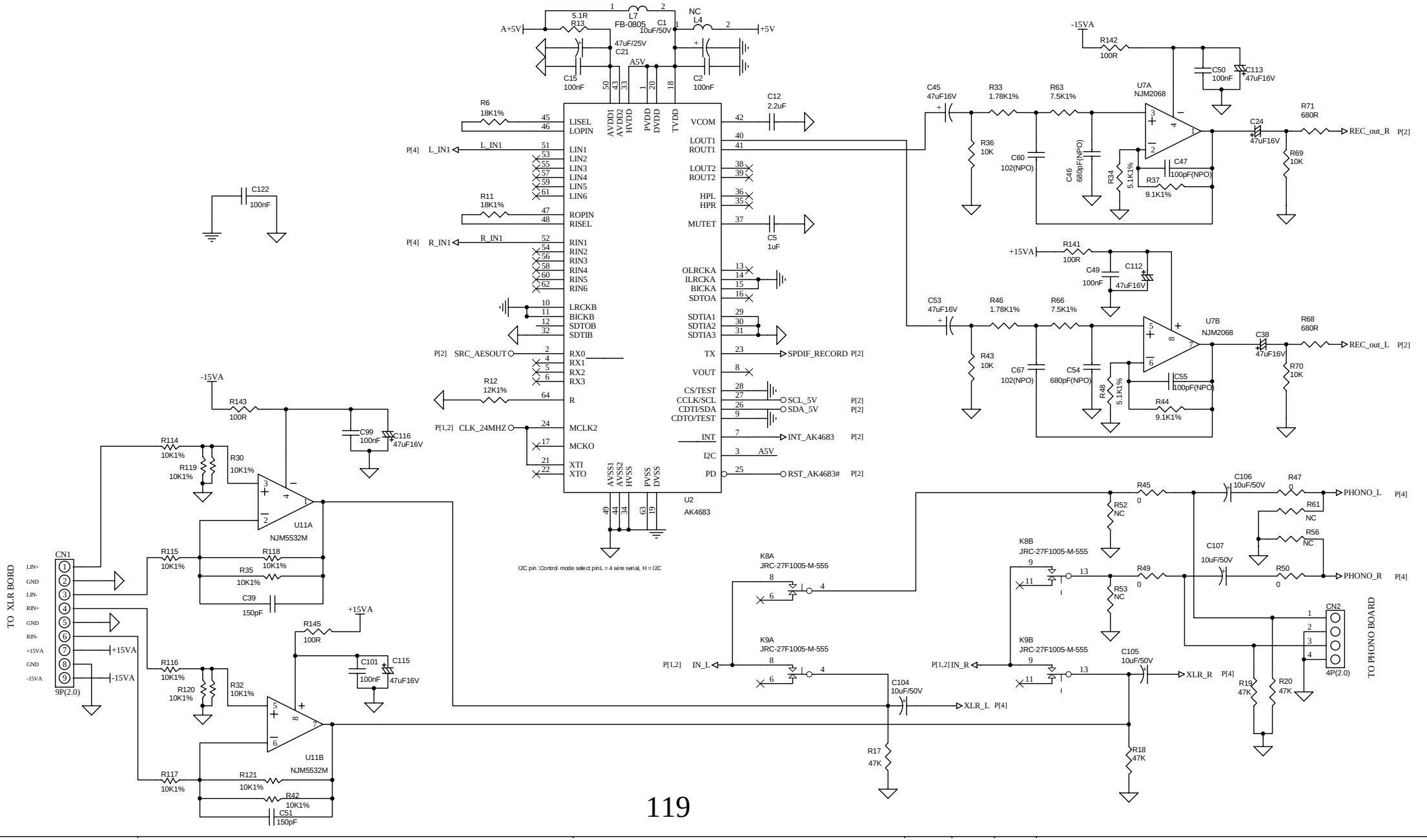

TO Preamp
CN15
RX
GND
TX
3P(2.0)
+5v
D5
D6
1N4148
1N4148
C4
104
C8
104
C35
104
C15
104
C48
104
MAX232CDR
VCC
GND
T1out
R1in
R1out
T1in
T2in
R2out
C1+
V+
C1-
C2+
C2-
V-
T2out
R2in
IC8
JK1
CKX3.5-12A 3.5mm
R22
47
R23
47
C31
100U10V
C30
104
R25
75
R24
47K
IR OUT
+5v
R26
10
R27
3K9
C32
47U10V
R86
22K
R88
22K
Q5
A1015
TO MCU BOARD
CN12
L1 10uH
REMOTE
L2 10uH
L3 10uH
MCU+5V
REMOTE
DGND
RX
TX
5P(2.0)
R87
10K
R89
22K
Q17
A1015
R28
270
JK2
CKX3.5-12A 3.5mm
IC5
LTV817A
C33
104
C34
104
IR IN
IR IN/OUT BOARD
MCU2
MCU1
K16
SK-22H03G6-RS
JK3
DB-09
DCD
DSR
RXD
RTS
TXD
CTS
DTR
RI
GND
C49
104

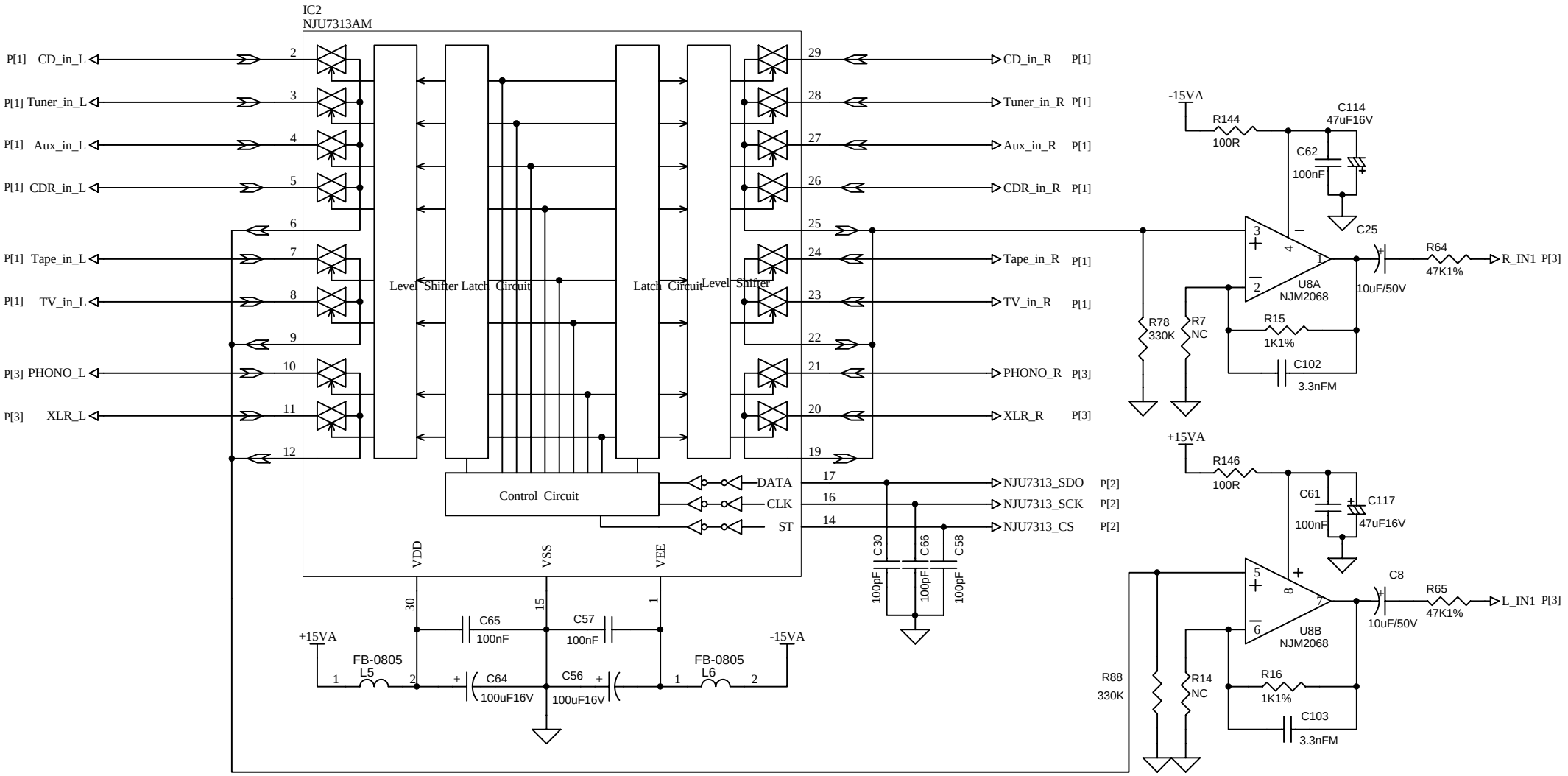

A9225M12S
DC12 0.24A
CN16
2P(2.5)
R72 12K
R73 1.2K
R75 220
R14 2.2/0.5W
R76 220
R77 12K
R78 1.2K
R79 10K
Q13 C1815
R80 15K
R81 470
Q14 2SC2073
CN17
2P(2.5)
A9225M12S
DC12 0.24A
CN18 2P(2.5)
TO TEMP SENSOR
CN19 2P(2.5)
TO TEMP SENSOR
Q12 C1815
R74 10K
Q3 2SC2073
R70 470
R71 15K
FAGND
IC7 KA7805
Q15 A950
R82 22K
R83 4.7K
C47 47/50
C29 10/16
C20 JY103M(X1/400V.Y2/300V)
CN7
TO T3
2P7.92
RAY1
JQX-115F(12V DC)
D1 1N4001
R90 100R1/4W
R84 22K
Q16 C2458
CN8
TO T2
2P7.92
Q1 C2120
R91 4.7K
D2 1N4148
R10 22K
C24 220/10
C52 104
C53 100/16
C51 470/25
CN6
LED+5V
MCU+5V
RELAY
GND
+37V
F2
F1
7P(2.0)
TO DISPLAY BOARD
C44 104
BL2 DB101G
R11 RF/0.22/0.25W
CN9
TO T1
2P7.92
FAGND
CN11
AC 15V
AC 5.4V
0V
AC 5.4V
AC 35V
7P(2.5)
TO TRANSFORMER
IC4 KA7805
DW1 HZ7B2ST
C43 10/16
D3 1N4001
R13 RF1/0.25W
Q11 C2235
R12 1K
R69 1.2K
DW2
C28 100/63
C45 100/63
C46 104
C27 100/50
HZ38-3ST(38V)
CN10
2P7.92
AC IN
T5AL 250V
FH1
C23 0.1U/275VAC(X2)
T1
EI-28
BL1 DB101G
C26 470/25
C22 104
C25 100/16
C21 104

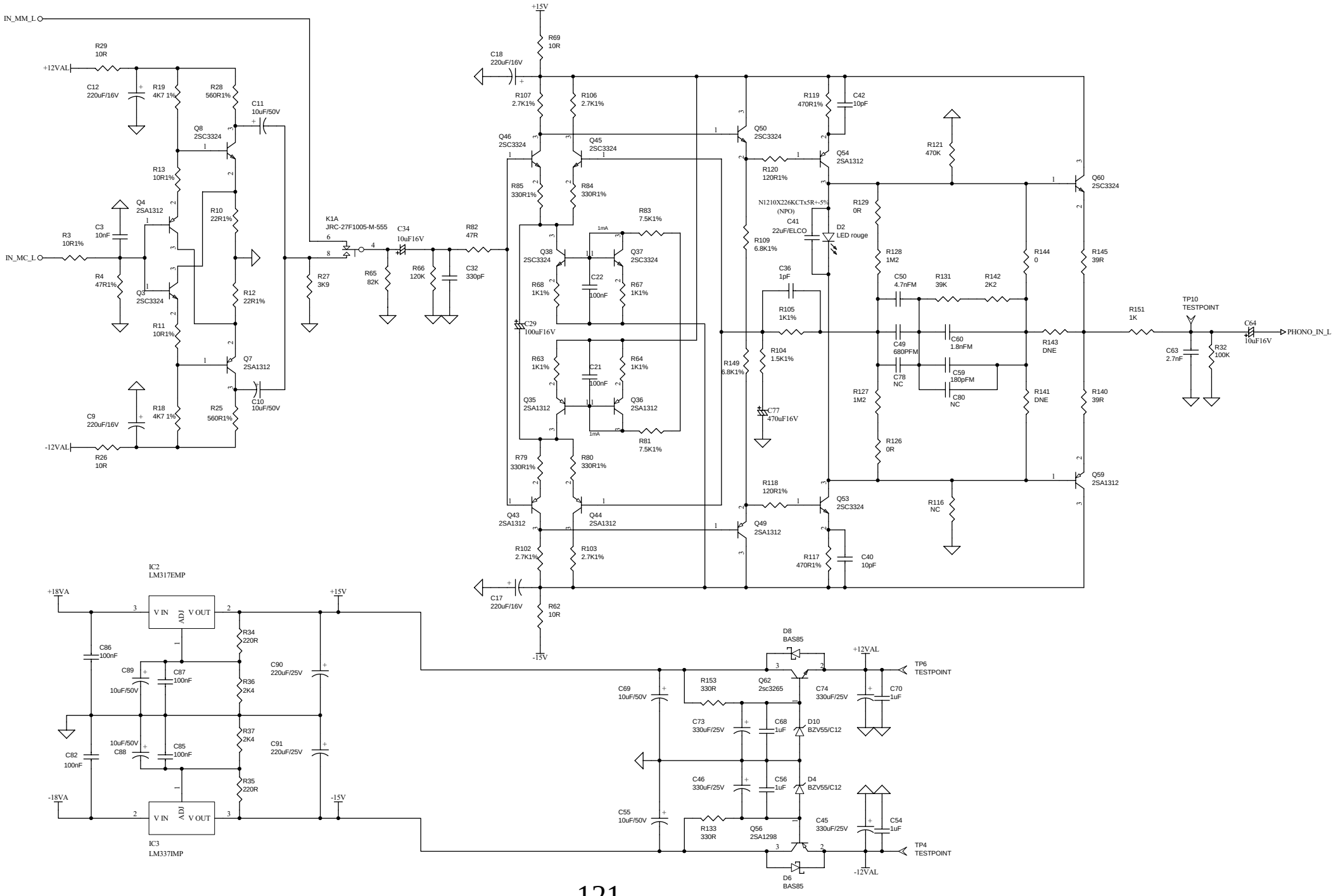

LED & VOL
CN3
+5V
A
B
DGND
4P(2.0)
4
3
2
1
RV1
B
A
C10
104
R122ECA-D1-19.5F-24-W
R18
220R
LED4
R1.5(white)H5mm
R17
220R
LED5
R1.5(white)H5mm
R64
220R
LED3
R1.5(white)H5mm
R63
220R
LED2
R1.5(white)H5mm

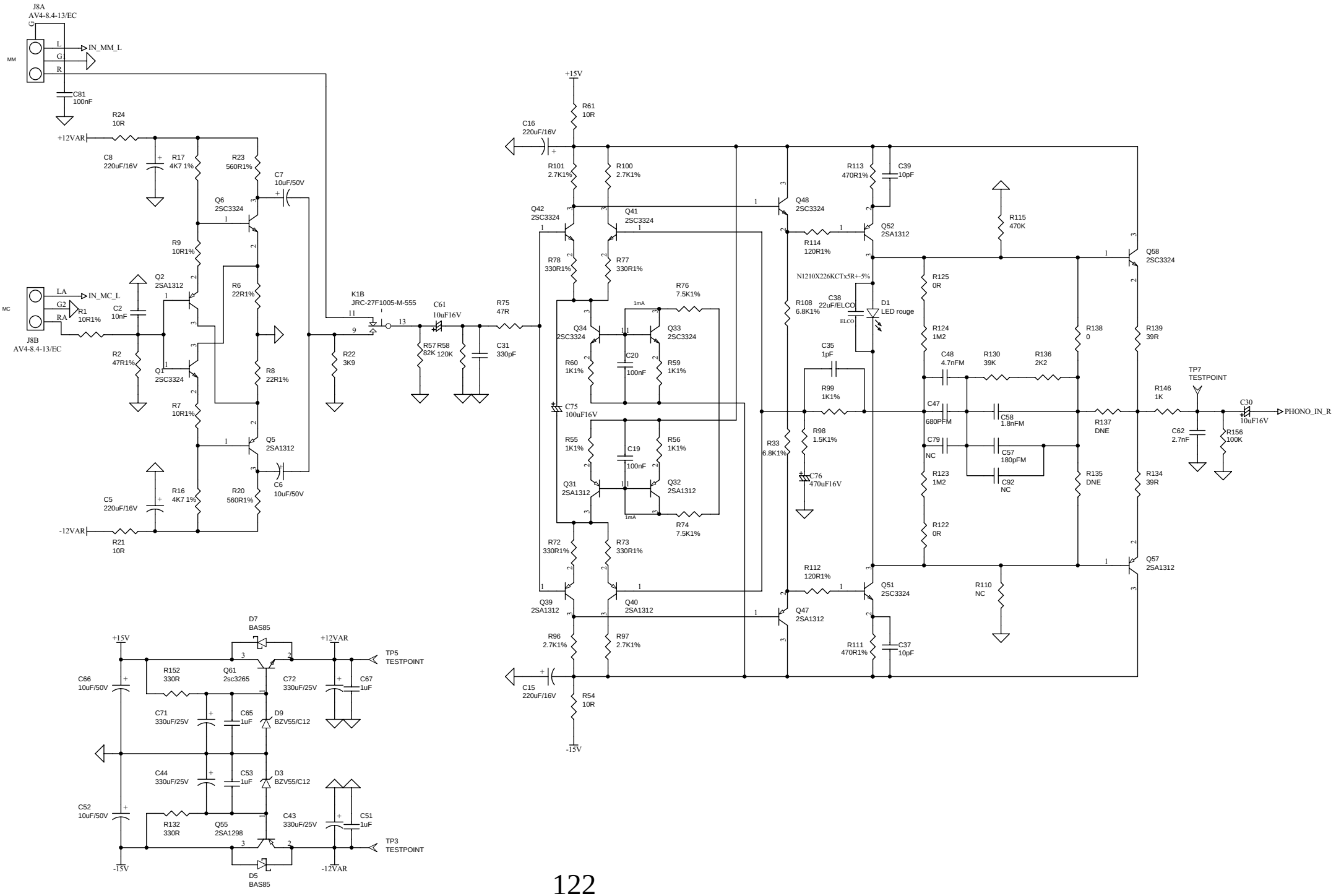

ANALOG IN_L P[2]
ANALOG IN_R P[2]
+15VA
-15VA
A+5V
+3.3V
IN_L P[2,3]
IN_R P[2,3]
U10 AD825AR
U12 AD825AR
R137 100R
R139 100R
R72 0R
R10 100R
R73 0R
R109 100R
R81 220K
C14 220pFM
R107 1K
R110 220K
C28 220pFM
R111 1K
C31 100nF
C109 47uF16V
C16 100nF
C108 47uF16V
C17 100nF
R108 360R
C118 332M
R138 100R
C111 47uF16V
C29 100nF
C110 47uF16V
R140 100R
R112 360R
C119 332M
J1B
J1A
J2B
J2A
J3B
J3C
J3A
AV4-8.4-13/EC
AV6-8.4-13/EC
LA
G2
RA
G
L
G1
R
K1B JRC-27F1005-M-555
K1A JRC-27F1005-M-555
K2B JRC-27F1005-M-555
K2A JRC-27F1005-M-555
K3B JRC-27F1005-M-555
K3A JRC-27F1005-M-555
K6B JRC-27F1005-M-555
K6A JRC-27F1005-M-555
K4B JRC-27F1005-M-555
K4A JRC-27F1005-M-555
K5B JRC-27F1005-M-555
K5A JRC-27F1005-M-555
K7B JRC-27F1005-M-555
K7A JRC-27F1005-M-555
CD_in_L P[4]
CD_in_R P[4]
Tuner_in_L P[4]
Tuner_in_R P[4]
Aux_in_L P[4]
Aux_in_R P[4]
CDR_in_L P[4]
CDR_in_R P[4]
Tape_in_L P[4]
Tape_in_R P[4]
TV_in_L P[4]
TV_in_R P[4]
R40 470K1%
R21 47K1%
R3 470K1%
R113 47K1%
C42 100uF16V
C23 100nF
R106 47R1W
IC1 LD1117S5.0(SOT-223)
V OUT
GND
V IN
C81 100nF
C82 47uF/25V
C36 47uF/25V
C34 100nF
R29 5.1R
L1 NC
L2 FB-0805
C120 47uF/16V
C33 100nF
C93 100nF
C100 47uF/16V
U4
CS5361
VA
VD
VL
GND
FILT+
REFGND
VQ
AINL+
AINL-
AINR+
AINR-
OVFL
RST
S/LJ
M/S
HPF
M0
M1
MDIV
SDOUT
LRCK
SCLK
MCLK
OVFL_CS5361 P[2]
RST_CS5361 P[2]
HPF_CS5361 P[2]
SDATA_ADC P[2]
LRCLK_ADC P[2]
BITCLK_ADC P[2]
CLK_24MHZ P[2,3]
R62 10K
R67 10K
R26 10K
R22 47R
C91 47uF/25V
C97 10nF
C95 10nF
C96 1uF/25V
U3A NJM5532M
U3B NJM5532M
U1A NJM5532M
U1B NJM5532M
U6A NJM5532M
U6B NJM5532M
R27 1K
C52 3.3nFM
C13 2.2uF/50V
(WIMA /MKS 2)
R24 27K1%
C32 100nF
C26 47uF16V
R82 100R
R41 47K
C9 100nF
R8 100R
C92 100nF
C27 47uF16V
C98 2.2uF/50V
R4 27K1%
R31 47K
C59 3.3nFM
R28 1K
R25 330R1%
R1 10K1%
C35 100pF
R39 10K1%
R38 10K1%
C48 100pF
C37 1nFM
R23 330R1%
C44 47uF16V
C43 100nF
R147 100R
C94 100nF
C41 47uF16V
C40 100nF
R148 100R
R5 330R1%
R2 10K1%
C10 100pF
R103 10K1%
R102 10K1%
C3 100pF
C22 1nFM
R9 330R1%
C20 100nF
C4 47uF16V
C7 100nF
R149 100R
C19 100nF
C11 47uF16V
C90 100nF
R150 100R

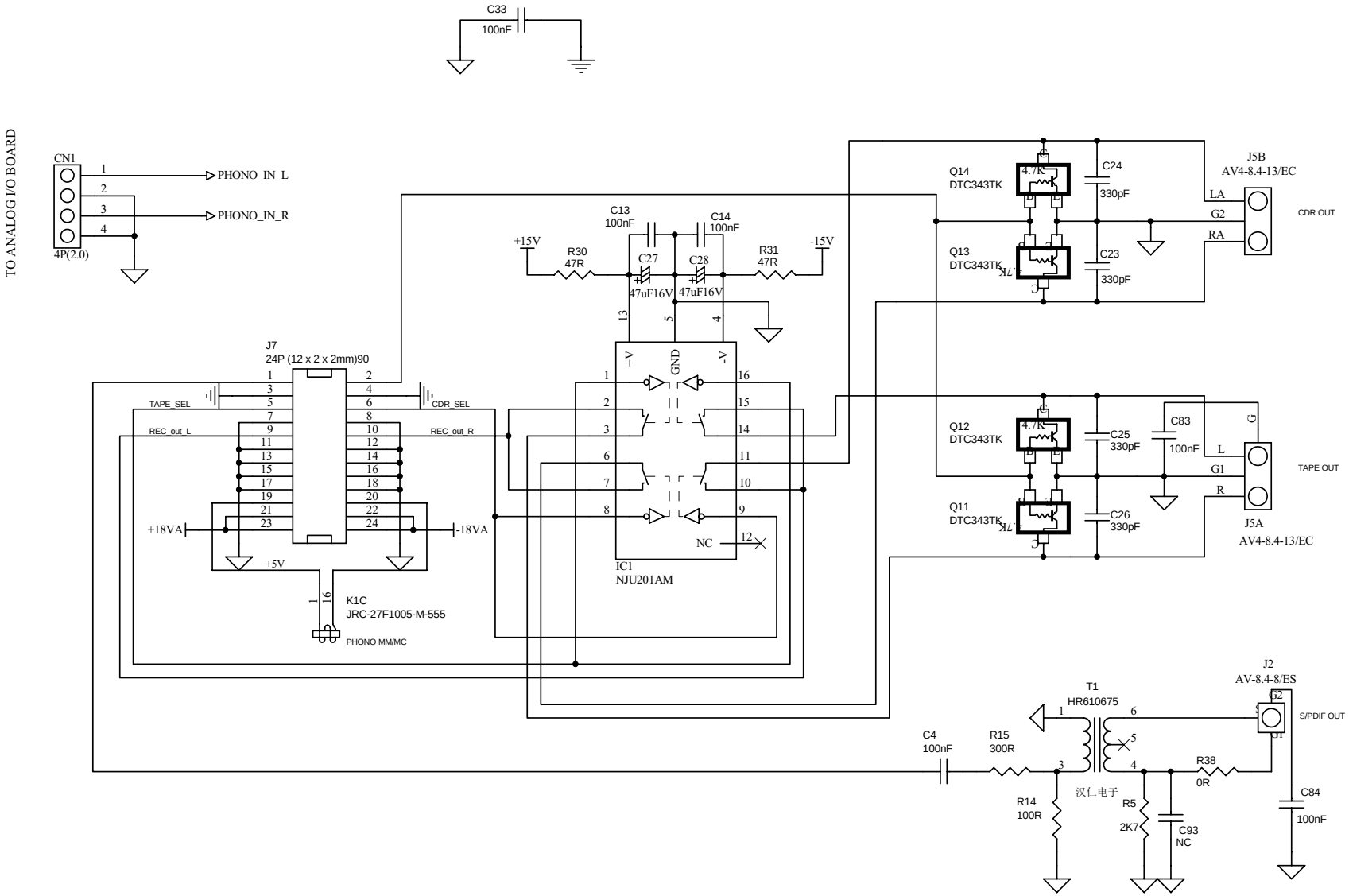

J4
2x4P2.0(90)
P[3] SPDIF_RECORD
SRC_AESOUT P[3]
P[1,3] CLK_24MHZ
BITCLK_ADC P[1]
P[1] SDATA_ADC
LRCLK_ADC P[1]
CDR_OUT SEL
J5
2x13P2.0(90)
INT_AK4683 P[3]
P[1] ANALOG IN_L
ANALOG IN_R P[1]
P[3] REC_out_L
REC_out_R P[3]
P[1,3] IN_L
IN_R P[1,3]
P[4] NJU7313_SCK
NJU7313_SDO P[4]
+3.3V
+5V
NJU7313_CS P[4]
+15VA
-15VA
+5V
L3
FB-0805
C63
100nF
C121
47uF/16V
R51
10K
R55
10K
U9
PCA9555
A0
A1
A2
SCL
SDA
INT
VDD
VSS
I/O0
I/O1
I/O2
I/O3
I/O4
I/O5
I/O6
I/O7
I/O10
I/O11
I/O12
I/O13
I/O14
I/O15
I/O16
I/O17
SCL_5V P[3]
SDA_5V P[3]
OVFL_CS5361 P[1]
HPF_CS5361 P[1]
RST_CS5361 P[1]
RST_AK4683# P[3]
R59
2K4
R57
2K4
R54
10K
R58
3K9
R60
3K9
D1 BAS16
D2 BAS16
D3 BAS16
D4 BAS16
D5 BAS16
D6 BAS16
D7 BAS16
D8 BAS16
D9 BAS16
K1C
JRC-27F1005-M-555
RL_PROCESSOR
K2C
JRC-27F1005-M-555
RL_CD
K3C
JRC-27F1005-M-555
RL_TUNER
K4C
JRC-27F1005-M-555
RL_CDR
K5C
JRC-27F1005-M-555
RL_TAPE
K6C
JRC-27F1005-M-555
RL_AUX
K7C
JRC-27F1005-M-555
RL_TV
K8C
JRC-27F1005-M-555
RL_PHONO
K9C
JRC-27F1005-M-555
RL_XLR

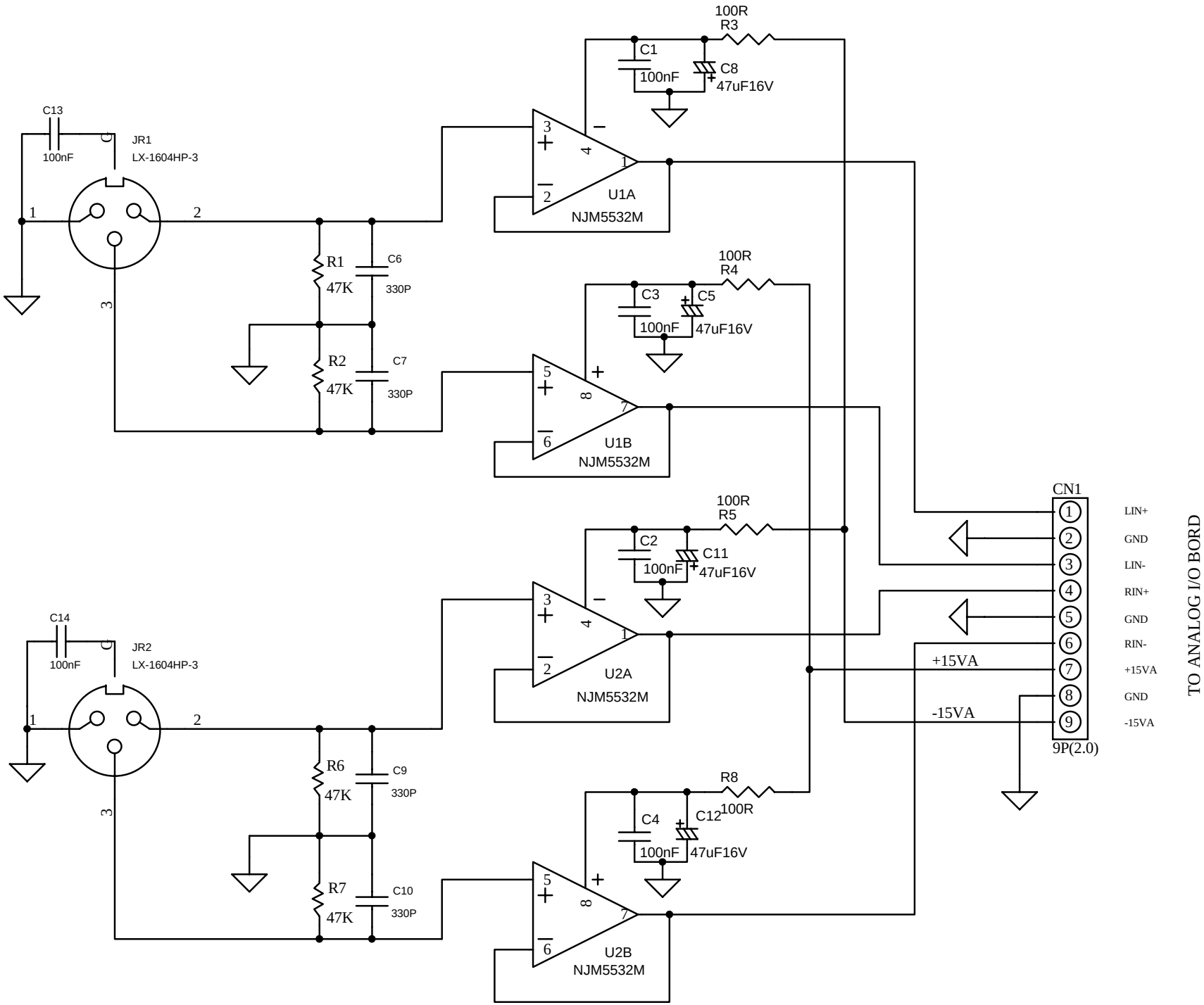

A+5V
5.1R
R13
L7
FB-0805
C1
10uF/50V
NC
L4
+5V
47uF/25V
C21
A5V
C15
100nF
C2
100nF
C12
2.2uF
C5
1uF
R6
18K1%
R11
18K1%
P[4] L_IN1
L_IN1
P[4] R_IN1
R_IN1
P[2] SRC_AESOUT
R12
12K1%
P[1,2] CLK_24MHZ
LISEL
LOPIN
LIN1
LIN2
LIN3
LIN4
LIN5
LIN6
ROPIN
RISEL
RIN1
RIN2
RIN3
RIN4
RIN5
RIN6
LRCKB
BICKB
SDTOB
SDTIB
RX0
RX1
RX2
RX3
R
MCLK2
MCKO
XTI
XTO
AVDD1
AVDD2
HVDD
PVDD
DVDD
TVDD
AVSS1
AVSS2
HVSS
PVSS
DVSS
VCOM
LOUT1
ROUT1
LOUT2
ROUT2
HPL
HPR
MUTET
OLRCKA
ILRCKA
BICKA
SDTOA
SDTIA1
SDTIA2
SDTIA3
TX
VOUT
CS/TEST
CCLK/SCL
CDTI/SDA
CDTO/TEST
INT
I2C
PD
SPDIF_RECORD P[2]
SCL_5V P[2]
SDA_5V P[2]
INT_AK4683 P[2]
RST_AK4683# P[2]
U2
AK4683
I2C pin :Control mode select pinL = 4 wire serial, H = I2C
C122
100nF
-15VA
R142
100R
C50
100nF
C113
47uF16V
C45
47uF16V
R33
1.78K1%
R63
7.5K1%
U7A
NJM2068
R36
10K
C60
102(NPO)
C46
680pF(NPO)
R34
5.1K1%
C47
100pF(NPO)
R37
9.1K1%
C24
47uF16V
R71
680R
R69
10K
REC_out_R P[2]
+15VA
R141
100R
C49
100nF
C112
47uF16V
C53
47uF16V
R46
1.78K1%
R66
7.5K1%
U7B
NJM2068
R43
10K
C67
102(NPO)
C54
680pF(NPO)
R48
5.1K1%
C55
100pF(NPO)
R44
9.1K1%
C38
47uF16V
R68
680R
R70
10K
REC_out_L P[2]
-15VA
R143
100R
C99
100nF
C116
47uF16V
R114
10K1%
R119
10K1%
R30
10K1%
U11A
NJM5532M
R115
10K1%
R118
10K1%
R35
10K1%
C39
150pF
+15VA
R145
100R
C101
100nF
C115
47uF16V
R116
10K1%
R120
10K1%
R32
10K1%
U11B
NJM5532M
R117
10K1%
R121
10K1%
R42
10K1%
C51
150pF
CN1
LIN+
GND
LIN-
RIN+
GND
RIN-
+15VA
GND
-15VA
9P(2.0)
TO XLR BORD
K8A
JRC-27F1005-M-555
K9A
JRC-27F1005-M-555
P[1,2] IN_L
K8B
JRC-27F1005-M-555
K9B
JRC-27F1005-M-555
P[1,2] IN_R
C104
10uF/50V
XLR_L P[4]
C105
10uF/50V
XLR_R P[4]
R17
47K
R18
47K
R45
0
R52
NC
C106
10uF/50V
R47
0
PHONO_L P[4]
R61
NC
R56
NC
C107
10uF/50V
R49
0
R53
NC
R50
0
PHONO_R P[4]
CN2
4P(2.0)
TO PHONO BOARD
R19
47K
R20
47K

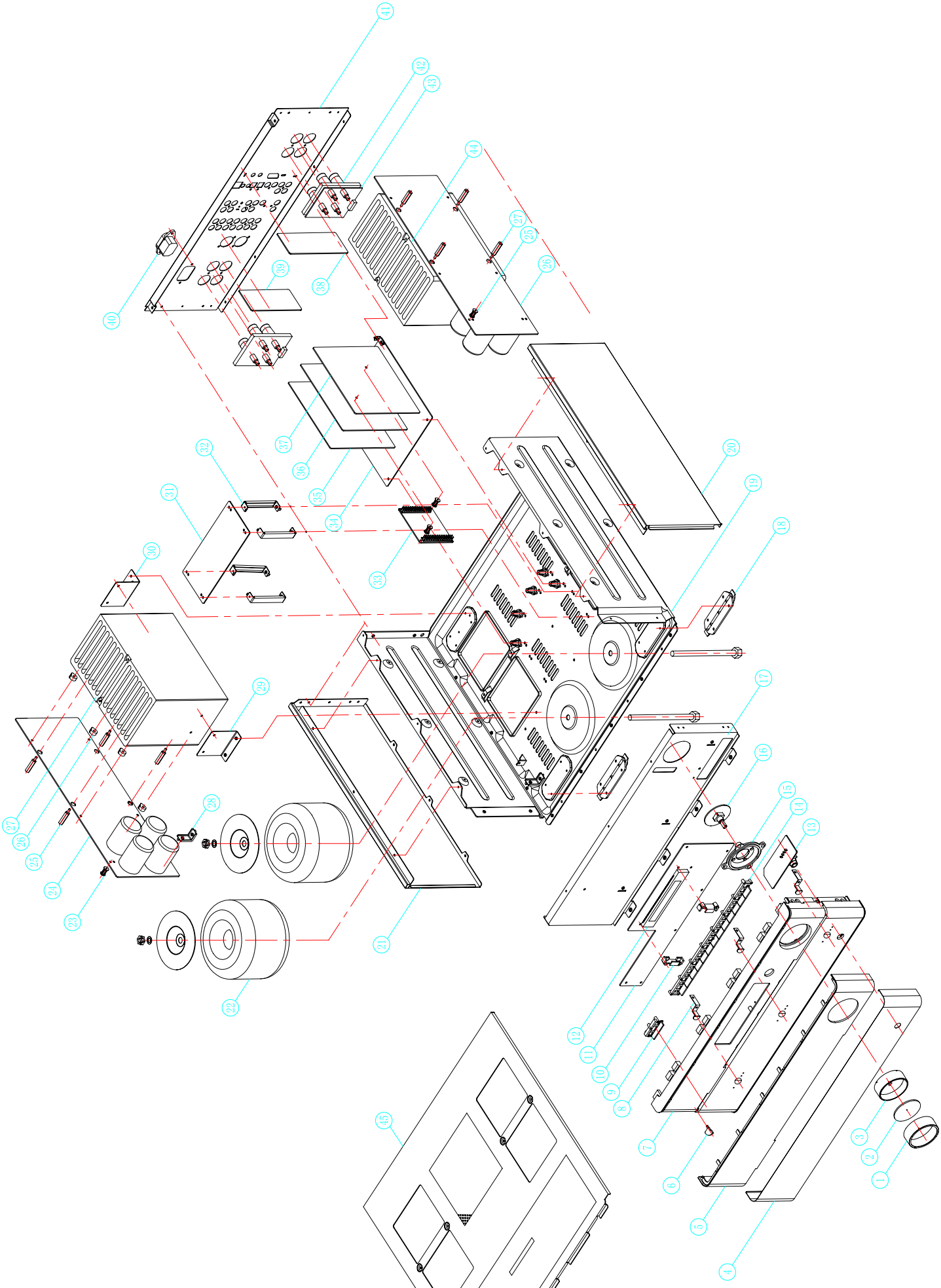

IC2
NJU7313AM
P[1] CD_in_L
P[1] Tuner_in_L
P[1] Aux_in_L
P[1] CDR_in_L
P[1] Tape_in_L
P[1] TV_in_L
P[3] PHONO_L
P[3] XLR_L
Level Shifter Latch Circuit
Latch Circuit Level Shifter
Control Circuit
DATA
CLK
ST
CD_in_R P[1]
Tuner_in_R P[1]
Aux_in_R P[1]
CDR_in_R P[1]
Tape_in_R P[1]
TV_in_R P[1]
PHONO_R P[3]
XLR_R P[3]
NJU7313_SDO P[2]
NJU7313_SCK P[2]
NJU7313_CS P[2]
VDD
VSS
VEE
C65 100nF
C57 100nF
C64 100uF16V
C56 100uF16V
FB-0805 L5
FB-0805 L6
+15VA
-15VA
C30 100pF
C66 100pF
C58 100pF
-15VA
R144 100R
C114 47uF16V
C62 100nF
C25
R78 330K
R7 NC
R15 1K1%
C102 3.3nFM
U8A NJM2068
10uF/50V
R64 47K1%
R_IN1 P[3]
+15VA
R146 100R
C61 100nF
C117 47uF16V
C8
10uF/50V
R65 47K1%
L_IN1 P[3]
U8B NJM2068
R88 330K
R14 NC
R16 1K1%
C103 3.3nFM


IN_MM_L
IN_MC_L
+12VAL
-12VAL
+15V
-15V
+18VA
-18VA
R29 10R
C12 220uF/16V
R19 4K7 1%
R28 560R1%
C11 10uF/50V
Q8 2SC3324
R13 10R1%
Q4 2SA1312
R10 22R1%
C3 10nF
R3 10R1%
R4 47R1%
Q3 2SC3324
R12 22R1%
R11 10R1%
Q7 2SA1312
C10 10uF/50V
C9 220uF/16V
R18 4K7 1%
R25 560R1%
R26 10R
K1A JRC-27F1005-M-555
C34 10uF16V
R82 47R
R27 3K9
R65 82K
R66 120K
C32 330pF
R69 10R
C18 220uF/16V
R107 2.7K1%
R106 2.7K1%
Q46 2SC3324
Q45 2SC3324
R85 330R1%
R84 330R1%
R83 7.5K1%
Q38 2SC3324
Q37 2SC3324
C22 100nF
R68 1K1%
R67 1K1%
C29 100uF16V
R63 1K1%
R64 1K1%
C21 100nF
Q35 2SA1312
Q36 2SA1312
R81 7.5K1%
R79 330R1%
R80 330R1%
Q43 2SA1312
Q44 2SA1312
R102 2.7K1%
R103 2.7K1%
C17 220uF/16V
R62 10R
Q50 2SC3324
Q54 2SA1312
R119 470R1%
C42 10pF
R120 120R1%
R121 470K
N1210X226KCTx5R+-5% (NPO)
C41 22uF/ELCO
D2 LED rouge
R109 6.8K1%
C36 1pF
R105 1K1%
R104 1.5K1%
R149 6.8K1%
C77 470uF16V
R129 0R
R128 1M2
C50 4.7nFM
R131 39K
R142 2K2
C49 680PFM
C78 NC
C60 1.8nFM
C59 180pFM
C80 NC
R127 1M2
R126 0R
R118 120R1%
Q53 2SC3324
Q49 2SA1312
R116 NC
R117 470R1%
C40 10pF
Q60 2SC3324
R144 0
R145 39R
R143 DNE
R141 DNE
R140 39R
Q59 2SA1312
R151 1K
TP10 TESTPOINT
C64 10uF16V
C63 2.7nF
R32 100K
PHONO_IN_L
IC2 LM317EMP
V IN
ADJ
V OUT
C86 100nF
C89 10uF/50V
C87 100nF
R34 220R
R36 2K4
C90 220uF/25V
C82 100nF
C88 10uF/50V
C85 100nF
R37 2K4
C91 220uF/25V
R35 220R
IC3 LM337IMP
D8 BAS85
D10 BZV55/C12
D4 BZV55/C12
D6 BAS85
Q62 2sc3265
Q56 2SA1298
R153 330R
R133 330R
C69 10uF/50V
C55 10uF/50V
C73 330uF/25V
C46 330uF/25V
C74 330uF/25V
C45 330uF/25V
C68 1uF
C56 1uF
C70 1uF
C54 1uF
TP6 TESTPOINT
TP4 TESTPOINT


J8A
AV4-8.4-13/EC
MM
L
G
R
IN_MM_L
C81
100nF
R24
10R
+12VAR
C8
220uF/16V
R17
4K7 1%
R23
560R1%
C7
10uF/50V
Q6
2SC3324
R9
10R1%
R6
22R1%
Q2
2SA1312
MC
LA
G2
RA
IN_MC_L
R1
10R1%
C2
10nF
J8B
AV4-8.4-13/EC
R2
47R1%
Q1
2SC3324
R8
22R1%
R7
10R1%
Q5
2SA1312
C6
10uF/50V
C5
220uF/16V
R16
4K7 1%
R20
560R1%
-12VAR
R21
10R
K1B
JRC-27F1005-M-555
11
9
13
R22
3K9
C61
10uF16V
R57
82K
R58
120K
R75
47R
C31
330pF
+15V
R61
10R
C16
220uF/16V
R101
2.7K1%
R100
2.7K1%
Q42
2SC3324
Q41
2SC3324
R78
330R1%
R77
330R1%
R76
7.5K1%
1mA
Q34
2SC3324
Q33
2SC3324
R60
1K1%
C20
100nF
R59
1K1%
C75
100uF16V
R55
1K1%
C19
100nF
R56
1K1%
Q31
2SA1312
Q32
2SA1312
R74
7.5K1%
R72
330R1%
R73
330R1%
Q39
2SA1312
Q40
2SA1312
R96
2.7K1%
R97
2.7K1%
C15
220uF/16V
R54
10R
-15V
Q48
2SC3324
Q52
2SA1312
R113
470R1%
C39
10pF
R114
120R1%
R115
470K
N1210X226KCTx5R+-5%
C38
22uF/ELCO
ELCO
D1
LED rouge
R108
6.8K1%
R125
0R
R124
1M2
R138
0
R139
39R
Q58
2SC3324
C35
1pF
C48
4.7nFM
R130
39K
R136
2K2
R99
1K1%
R33
6.8K1%
R98
1.5K1%
C76
470uF16V
C47
680PFM
C58
1.8nFM
C79
NC
C57
180pFM
C92
NC
R123
1M2
R135
DNE
R134
39R
R122
0R
R137
DNE
TP7
TESTPOINT
R146
1K
C30
10uF16V
PHONO_IN_R
C62
2.7nF
R156
100K
R112
120R1%
Q51
2SC3324
R110
NC
Q57
2SA1312
Q47
2SA1312
R111
470R1%
C37
10pF
D7
BAS85
+15V
+12VAR
TP5
TESTPOINT
C66
10uF/50V
R152
330R
Q61
2sc3265
C72
330uF/25V
C67
1uF
C71
330uF/25V
C65
1uF
D9
BZV55/C12
C44
330uF/25V
C53
1uF
D3
BZV55/C12
C52
10uF/50V
R132
330R
Q55
2SA1298
C43
330uF/25V
C51
1uF
TP3
TESTPOINT
-15V
-12VAR
D5
BAS85


TO ANALOG I/O BOARD
CN1
4P(2.0)
PHONO_IN_L
PHONO_IN_R
C33
100nF
C13
100nF
C14
100nF
+15V
-15V
R30
47R
R31
47R
C27
47uF16V
C28
47uF16V
J7
24P (12 x 2 x 2mm)90
TAPE_SEL
CDR_SEL
REC_out_L
REC_out_R
+18VA
-18VA
+5V
K1C
JRC-27F1005-M-555
PHONO MM/MC
+V
GND
-V
IC1
NJU201AM
NC
Q14
DTC343TK
Q13
DTC343TK
Q12
DTC343TK
Q11
DTC343TK
4.7K
C24
330pF
C23
330pF
C25
330pF
C26
330pF
C83
100nF
J5B
AV4-8.4-13/EC
LA
G2
RA
CDR OUT
J5A
AV4-8.4-13/EC
L
G1
R
TAPE OUT
T1
HR610675
J2
AV-8.4-8/ES
S/PDIF OUT
C4
100nF
R15
300R
R14
100R
R5
2K7
C93
NC
R38
0R
C84
100nF
汉仁电子


C13
100nF
JR1
LX-1604HP-3
1
2
3
R1
47K
C6
330P
R2
47K
C7
330P
100R
R3
C1
100nF
C8
47uF16V
U1A
NJM5532M
100R
R4
C3
100nF
C5
47uF16V
U1B
NJM5532M
C14
100nF
JR2
LX-1604HP-3
R6
47K
C9
330P
R7
47K
C10
330P
100R
R5
C2
100nF
C11
47uF16V
U2A
NJM5532M
R8
C4
100nF
C12
100R
47uF16V
U2B
NJM5532M
CN1
+15VA
-15VA
LIN+
GND
LIN-
RIN+
GND
RIN-
+15VA
GND
-15VA
9P(2.0)
TO ANALOG I/O BORD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990 Explode List

NO	PART.NO	DESCRIPTION	QTY
1	6549 101A 0000	VOLUME KNOB COVER	1
2	7448 1020 0000	VOLUME KNOB LENS	1
3	7548 101C 0000	VOLUME PASTEM	1
4	6049 101E 0000	AL PANEL	1
5	7749 101A 0000	DISPLAY LENS	1
6	7448 103A 0000	STANDY LENS	1
7	7049 101D 0000	PASTEM PANEL	1
8	5548 103A 0000	EARTHING CUPREM	3
9	7348 101A 0000	POWER KNOB	1
10	7549 101A 0000	DISPLAY BRACKET	2
11	0099 1011 0000	DISPLAY PCB	1
12	1521 6151 0101	DISPLAY	1
13	0099 1210 000B	PHONE BOARD	1
14	7349 101A 0000	FUNCTION KNOB	2
15	7549 102B 0000	LAMPSHADE	1
16	0099 1191 0000	VOL PCB	1
17	5349 104D 0000	SUBPANEL	1
18	7948 1010 0000	FOOT	4
19	6249 101F 0000	BOTTOM COVER	1
20	6449 102A 0000	RIGHT SIDE PANEL	1
21	6449 101A 0000	LEFT SIDE PANEL	1
22	4090 1015 0000	TOROIDAL TRANSFORMER	2
23	7900 0040 0000	PASTEM PILLAR H=14	2
24	0099 1070 0000	POWER PCB	2
25	5349 1060 0000	BOLT	8
26	7900 0070 0000	PASTEM PILLAR H=5	8
27	5149 105D 0000	LEFT HEATSINK	1
28	5349 101A 0000	PCB BRACKET	2
29	5349 102A 0000	HEATSINK FRONT BRACKET	2
30	5349 103A 0000	HEATSINK REAR BRACKET	2
31	0099 1121 0000	RELAY PCB	1
32	5349 105A 0000	RELAY PCB BRACKET	4
33	0099 1280 0000	DSP PCB	1
34	0099 1290 000D	PREAMP MAIN PCB	1
35	0099 1510 0000	I / OPCB	1
36	0099 1210 0000	PHONO PCB	1
37	0099 1160 0000	DIGITAL PCB	1
38	0099 1171 0000	PHONE	1
39	0099 1031 0000	IR PCB	1
40	3103 1202 0952	AC SOCKET	1
41	6349 101E 0000	BACK COVER	1
42	7548 1050 0000	SPEAKER BRACKET	2
43	0099 1321 000A	SPEAKER JOINT BOARD	2
44	5149 106D 0000	RIGHT HEATSINK	1

Digital BOARD PART LIST

P/N:0099-1160-0000

Used	Part Type	Designator Description	Part number
1	4.7pF/50V±5% X7R 0805 MLCC	C55	2103 5479 0140
2	10pF/50V±5% X7R 0805 MLCC	C53 C54	2103 5100 0140
4	10uF/25V±10% Y5V 0805 MLCC	C1 C35 C66 C86	2103 5106 0140
2	220pF/50V±5% NPO 0805 MLCC	C76 C93	2103 5221 0140
4	220PF/100V±5% Mylar .CaP	C70 C81 C87 C99	2217 3221 0243
2	330pF/50V±5% X7R 0805 MLCC	C10 C11	2103 5330 0140
4	1000PF/100V±5% Mylar .CaP	C71 C82 C88 C100	2217 3102 0243
4	3300PF/100V±5% Mylar .CaP	C14 C15 C25 C26	2217 3332 0243
4	0.1uF/10V±5% NPO 0805 MLCC	C115 C116 C117 C118	2103 6104 1645
59	0.1uF/50V±5% X7R 0805 MLCC	C2 C3 C5 C6 C8 C18 C19 C21 C22 C23 C24 C28 C29 C32 C33 C34 C36 C37 C38 C39 C40 C41 C42 C43 C44 C45 C46 C47 C49 C51 C56 C57 C59 C61 C62 C65 C67 C69 C72 C73 C74 C75 C79 C80 C83 C84 C89 C90 C91 C92 C95 C97 C98 C101 C102 C105 C112 C113 C114	2103 5104 0140
2	1uF/50V±5%(Metalized polyester	C78 C96	2207 4105 0100
2	47uF/16V(Tan) CS45	C77 C94	2340 0310 0009
7	47uF/16V±20% E.CaP	C64 C68 C85 C103 C104 C106 C107	2340 0310 1015
20	47uF/25V±20% E.CaP	C4 C7 C9 C12 C13 C16 C27 C30 C31 C48 C50 C58 C60 C63 C108 109 C110 C111 C119 C120	2340 0410 1015
10	FB(0805)1210(TB20129Z601)EMI 100MHz 600R	FB1 FB2 FB3 FB4 FB5 FB6 FB7 FB8 FB9 FB10	1852 0120 9100
1	AV2-8.4-14/EC	J2	2910 2322 2141
1	AV4-8.4-13/EC	J1	2910 4211 2131
2	CKX-3.5-12A 3.5mm DC JACK	J3 J7	2801 1335 1203
1	2*4P2.0(90)Twin-Row Pin	J5	3102 1008 4802
1	2*14P2.0(90)Twin-Row Pin	J6	3102 1028 4802
1	RJ45 10P8C	J4	2807 0345 0000
3	22uH --1812	L1 L2 L3	1882 2019 0101
4	2SA1035R SC-59 Panasonic	Q5 Q6 Q7 Q8	1111 0350 1101
1	BSS123 SOT23 (Fairchild)	Q4	1180 1230 1011
2	DTC343TK SOT23 ROHM	Q1 Q2	1150 3430 0341
1	SS8550 SOT23	Q3	1310 8008 5502
1	ICS83905AGT TSS0P16 ICS	U13	1083 9052 0615
2	JSR1162-002	U1 U2	1341 1621 0100
1	LL4148	D1	1301 4148 1500
1	NJM2068M DMP8 JRC	U3	1031 2068 1300
2	OP275GS SOIC8 (Analog Device)	U17 U22	1000 2750 0413
2	OPA2134UA SO-8 (Burr-brown)	U16 U21	1002 1340 0738
1	PCA9554APW TSSOP16 PHILIPS	U20	1009 5540 4915
1	SRC4392IPFBT TQFP48 ICS	U9	1004 3920 0726
1	XWM8740EDS SSOP28 (Wolfson)	U12	1008 7400 6714
1	(2*16P2.54)*2 Twin-Row Socket(180)	U18	3102 1016 5802

2	74HC4052D S016 PHILIPS	U6 U7	1004 0520 4913
2	74LCX125MTC TSSOP14 ST	U4 U5	1074 1250 1915
1	74LCX139TTR TSSOP16	U10	1074 1392 0815
2	AD1955ARS SSOP28 (Analog Device)	U19 U23	1001 9550 0414
1	AMS1117-1.8 SOT-223 AMS	U8	1011 7180 0156
1	AMS1117-3.3 SOT-223 AMS	U15	1011 7330 0128
1	AMS1117-5.0 SOT-223 AMS	U11	1011 7500 0128
1	0R±5% 0805	R14	2401 8200 0400
5	1K±5% 0805 film capacitor) MKS2 WIMA	R60 R81 R91 R99 R116	2401 8210 2400
4	2.2K±5% 0805	R80 R90 R98 R115	2401 8222 2400
14	2.7K±5% 0805	R79 R82 R19 R21 R24 R25 R86 R89 R93 R97 R10(R104 R114 R118	2401 8227 2400
4	3.3K±5% 0805	R84 R94 R102 R119	2401 8233 2400
4	3K±5% 0805	R15 R18 R30 R33	2401 0823 0204
12	10K±5% 0805	R61 R71 R78 R106 R107 R108 R109 R110 R112 R113 R122 R123	2401 8210 3400
6	10R±5% 0805	R6 R7 R8 R9 R34 R37	2401 8210 0400
2	22K±5% 0805	R87 R105	2401 8222 3400
10	24K±5% 0805	R3 R4 R38 R41 R42 R45 R47 R50 R51 R54	2401 0824 0204
6	27R±5% 0805	R62 R63 R66 R67 R68 R69	2401 8227 0400
17	47K±5% 0805	R16 R17 R31 R32 R39 R40 R43 R44 R46 R48 R49 R52 R53 R83 R92 R101 R117	2401 8247 3400
19	47R±5% 0805	R1 R2 R23 R26 R36 R55 R56 R57 R58 R59 R64 R65 R70 R72 R73 R74 R75 R76 R77	2401 8247 0400
2	75R±5% 0805	R20 R22	2401 8275 0400
3	100R±5% 0805	R12 R27 R35	2401 8210 1400
1	150R±5% 0805	R28	2401 8215 1400
1	300R±5% 0805	R29	2401 8230 1400
2	330R±5% 0805	R96 R121	2401 8233 1400
2	470R±5% 0805	R10 R11	2401 8247 1400
2	560R±5% 0805	R88 R111	2401 8256 1400
4	680R±5% 0805	R85 R95 R103 R120	2401 8268 1400
1	FSMD010-1206 PTC	PTC1	2410 0901 0205
4	HR610675 Wideband RF transformer (Hanrun)	T1 T2 T3 T4	1061 0672 1801
1	24.576MHz(CS5032)	Y2	2705 2457 6026

PHONES BOARD PART LIST

P/N:0099-1171-0000

Used	Part Type	Designator Description	Part number
===	==========	==========	==========
1	CK-6.35-02 JACK	CK1	2822 2200 0100
1	4P(2.0mm)SOCKET	CN13	3100 4040 0200
1	5P2.5mm SOCKET	CN12	3100 5050 0200
3	10uF/16V±20% E.CAP	C38 C40 C41	2310 0310 1015
1	47PF/50V±5% X7R 0603 MLCC	C31	2103 5470 0130
2	100uF/25V±20% E.CAP	C9 C10	2311 0410 1015
7	0.1uF/50V±5% X7R 0603 MLCC	C1 C2 C3 C5 C35 C36 C42	2156 1040 0130
1	150PF/50V±5% X7R 0603 MLCC	C32	2103 5151 0130
2	330PF/50V±5% X7R 0603 MLCC	C29 C30	2103 5331 0130
1	470PF/50V±5% X7R 0603 MLCC	C7	2103 5471 0130
1	0.047uF/50V±5% X7R 0603 MLCC	C4	2115 6473 0130

1	IN4148	D4	1311 1414 8000
1	NJM2068M SOIC8 JRC	IC5	1031 2068 1300
1	TPA6120A2 DWP-20 (Texas lnstrument)	IC4	1061 2020 6138
1	1.65K±1% 0603	R3	2403 1216 5203
10	1K±5% 0603	R7 R8 R9 R10 R11 R12 R13 R14 R25 R26	2401 1221 0203
1	2.2K±5% 0603	R32	2401 1222 2203
4	10K±5% 0603	R4 R18 R23 R24	2401 1221 0303
3	10R±5% 0603	R1 R2 R15	2401 1221 0003
1	27K±5% 0603	R31	2401 1222 7303
3	47K±5% 0603	R17 R19 R20	2401 1224 7303
2	100R±5% 0603	R29 R30	2401 1221 0103
1	100k±5% 0603	R28	2401 1221 0403
1	200R±5% 0603	R22	2401 1222 0103
1	JRC-27F/012-M(555)	RELAY1	4712 2027 0006
1	2SC2120Y TO-92 TOSHIBA	Q2	1132 1200 0162

HK990 PART LIST

L&R Power amplifier board

PN : 0099-1070-0000

Used	Part Type	Designator Description	Part number
6	47nF/100V	C1 C6 C9 C10 C16 C17	2217 3473 0243
2	220uF/100V	C2 C18	2321 0810 5093
4	6800uF/80V	C3 C4 C12 C13	2362 1410 9093
4	10nF/250V	C5 C8 C14 C15	2223 3103 0400
2	1000uF/100V	C11 C7	2312 0810 7073
6	1uF/1206	C19 C20 C21 C22 C32 C34	2103 5105 0150
3	47nF/1206	C23 C24 C35	2115 5473 0150
1	270pF(NPO)5%/1206	C25	2103 5271 0155
2	47nF(Mylar)10%	C70 C26	2217 3473 0243
1	3.9pF(NPO)5%/1206	C27	2103 5399 0155
1	330pF/1206	C28	2103 5331 0150
2	10uF/1206	C30 C29	2103 5106 0150
2	47uF/1206	C31 C37	2115 5476 0150
1	2.2uF/1206	C33	2103 5225 0150
1	100nF/1206	C36	2103 5104 0150
4	MUR2020	D1 D2 D4 D5	1360 0202 0000
1	GBU8D	D3	1361 3000 0080
2	ZMM16ST(16V)	D6 D26	1301 6002 0100
6	BAS20	D7 D8 D14 D15 D25 D27	1340 0200 0100
14	DL4148	D9 D10 D11 D12 D13 D16 D17 D18 D19 D20 D21 D22 D23 D24	1310 4414 8000
12	WCB-403025-M382-T	FB1 FB2 FB3 FB4 FB5 FB6 FB7 FB8 FB9 FB10 FB11 FB12	1874 0302 5382
10	250 TERMINAL	JP1 JP2 JP3 JP4 JP5 JP6 JP7 JP8 JP9 JP10	2932 5000 2500
1	7P * 2mm	J1	3100 4070 0200
1	2.2uH	L1	1832 2000 0001
4	MJL1302A	Q1 Q2 Q4 Q5	1191 3020 1200

1	NJL1302D	Q3	1191 3020 1210
2	2SA1837	Q6 Q11	1111 8370 0130
1	MJE15033	Q7	1181 5033 1220
1	2SA1869	Q8	1111 8690 0100
2	2SC4793	Q9 Q18	1134 7930 0000
1	2SC4935	Q10	1134 9350 0120
4	MJL3281A	Q12 Q13 Q15 Q16	1183 2810 1200
1	NJL3281D	Q14	1193 2810 1210
1	MJE15032	Q17	1181 5032 1220
2	MJD253	Q20 Q38	1180 2530 1200
5	2SC3138	Q21 Q40 Q41 Q42 Q44	1133 1380 0121
7	2SA1312	Q22 Q23 Q24 Q26 Q27 Q28 Q29	1111 3120 0172
2	MJD243	Q39 Q25	1180 2430 1200
7	2SC3324	Q30 Q31 Q33 Q34 Q35 Q36 Q37	1133 3240 0717
1	BCP56-16	Q32	1185 6160 1400
1	2SA1255	Q43	1111 2550 0101
2	HF-115F-048-1ZS3B	RL3 RL4	4712 1150 0600
1	CWF51-104J-3951(100K)	RT1	1609 1070 0601
2	2K2 1W	R24 R1	2401 5222 2200
2	150R 3W	R2 R23	2413 0721 5108
3	22K 3W	R3 R13 R15	2413 0722 2310
2	10K 3W	R4 R16	2413 0721 0308
10	0.33R 5W	R5 R6 R7 R8 R9 R17 R18 R19 R20 R21	2413 1023 3808
1	5R6 1W	R10	2401 5225 6900
1	5R 5W	R11	2412 1025 0910
1	1R 5W	R12	2412 1021 0910
1	30K 3W	R14	2413 0723 0310
1	6K2 1/2W	R22	2413 0426 2211
10	10K/1206	R25 R30 R60 R61 R62 R78 R79 R82 R89 R94	2402 0911 0305
2	0.22R(RF) 2W	R26 R27	2410 0622 2815
6	1K/1206	R28 R42 R44 R58 R70 R90	2402 0911 0205
4	22K/1206	R29 R57 R59 R95	2402 0912 2205
2	1M/1206	R31 R32	2402 0911 0505
10	10R/1206	R33 R34 R35 R36 R37 R84 R85 R86 R87 R88	2402 0911 0005
5	4K3/1206	R38 R40 R41 R74 R83	2402 0914 3205
2	1K8/1206	R39 R75	2402 0911 8205
2	150R 1/4W 1%	R43 R76	2402 0311 5111
4	3K/1206	R45 R46 R69 R71	2401 0823 0204
2	39R/1206	R72 R47	2401 2239 0500
2	12K 1/4W 1%	R73 R48	2402 0311 2311
2	180R/1206	R66 R49	2402 0911 8105
4	330R/1206	R50 R51 R63 R64	2402 0913 3105
1	300R/1206	R52	2402 0913 0105
1	3224W-200R(BOURNS)	R53	4402 3324 2000
1	6K2/1206	R54	2402 0916 2205
1	10K 1/4W 1%	R55	2402 0311 0011

2	270R/1206	R65 R56	2402 0912 7105
3	390R/1206	R67 R80 R81	2402 0913 9105
1	82R/1206	R68	2402 0918 2005
1	68K/1206	R77	2402 0916 8305
3	33K/1206	R91 R92 R93	2402 0913 3305
2	2K4 /2W	R96 R97	2413 0622 4213
2	PC817A	U2 U1	1000 8170 5501
1	OPA2134UA	U3	1002 1340 0738
1	TL061CD	U4	1000 0610 6138

Preamp PART LIST

P/N:0099-1290-0000

Used	Part Type	Designator Description	Part number
1	3P(2.0mm)Socket	CN1	3100 4030 0200
2	2200PF/50V±5% X7R 0805 MLCC	C17 C19	2103 5220 0140
2	4700uF/16V±20% E.CAP	C63 C72	2342 3106 6000
2	4700uF/25V±20% E.CAP	C62 C71	2342 4105 5000
1	10UF/16V±20% E.CAP	C58	2310 0310 1015
11	10UF/50V±20% E.CAP	C10 C11 C12 C24 C30 C38 C40 C45 C55 C64 C74	2310 0610 1015
6	47uF/16V±20% E.CAP	C3 C6 C9 C13 C31 C34	2340 0310 1015
2	47uF/25V±20% E.CAP	C41 C73	2340 0410 1015
3	100PF/50V±5% X7R 0805 MLCC	C43 C44 C48	2103 5101 0140
24	0.1uF/50V±5% X7R 0805 MLCC	C1 C2 C4 C5 C14 C15 C16 C18 C22 C25 C27 C29 C32 C35 C37 C51 C57 C65 C68 C69 C75 C77 C81 C82	2103 5104 0140
4	100uF/16V(For audio)±20% E.CAP	C49 C52 C53 C56	2311 0310 1025
3	100UF/16V±20% E.CAP	C42 C46 C47	2311 0310 1015
2	220PF/100V±5% Mylar.CaP	C7 C8	2203 2221 0244
4	220uF/10V±20% E.CAP	C36 C39 C20 C23	2321 0410 1015
4	220uF/25V±20% E.CAP	C21 C26 C28 C33	2321 0410 1015
2	470uF/35V±20% E.CAP	C50 C54	2341 0510 3015
2	30BQ040TRPbF(SMC IRF)	D2 D4	1310 0030 0401
1	BAS16 SOT23	D5	1340 0161 0100
2	GBU806 Rrectifying Diode	D6 D7	1361 3000 0806
7	FB(0805) 1210(TB20129Z601)EMI 100MHz 600R	FB1 FB2 FB3 FB4 FB5 FB6 FB7	1852 0120 9100
2	2*4P2.0(180)Twin-Row Socket	J4 J5	3107 0404 6602
1	2*13P2.0(180)Twin-Row Socket	J6	3102 0926 6802
1	2*12P2.0(180)Twin-Row Socket	J7	3107 0412 6662
1	2*14P2.0(180)Twin-Row Socket	J8	3102 0928 6802
1	6P 2.5mm(180)Single Row pin	J9	3106 0506 0802
1	4P(2.0mm)Socket	J14	3100 4040 0200
2	5P(2.5mm)Socket	J11 J13	3100 5050 0200
1	6P(2.0mm)Socket	J12	3100 4060 0200
2	7P(2.0mm)Socket	J2 J3	3100 4070 0200
1	AV2-8.4-14/EC	JK1	2910 2191 0200
1	L7805CV TO-220	IC1	1007 8050 7027
1	AMS1085CT TO-220 AMS	IC2	1001 1085 0800
3	JRC-27F/005-M(555)	K1 K3 K4	4712 0000 2700
1	TIP31C TO-220 FAIRCHILD	Q2	1110 0310 6000
1	TIP32C TO-220 FAIRCHILD	Q7	1110 0320 6000
4	2SA1035R (SC-59 Panasonic)	Q8 Q9 Q18 Q19	1111 0350 1101

10	2SC2406R (SC-59 Panasonic)	Q1 Q3 Q4 Q5 Q6 Q12 Q13 Q14 Q15 Q17	1132 4060 5000
2	BSS123 SOT23	Q10 Q20	1180 1230 1011
2	1.3K±5% 0805	R5 R7	2401 8221 3204
6	1K±5% 0805	R19 R20 R38 R50 R51 R59	2401 8210 2400
3	RF0.22R/0.5W±5%	R40 R41 R42	2406 0422 2815
2	2.4K±5% 0805	R30 R37	2401 8224 2400
2	2.7K±5% 0805	R54 R61	2401 8227 2400
13	4.7K±5% 0805	R29 R32 R33 R34 R39 R47 R52 R56 R57 R58 R60 R62 R90	2401 8247 2400
2	5.6R±5% 0805	R23 R24	2401 8256 9400
32	10K±5% 0805	R9 R10 R27 R48 R49 R53 R65 R66 R69 R70 R71 R72 R73 R74 R75 R76 R80 R83 R84 R85 R87 R88 R89 R91 R92 R94 R98 R99 R103 R104 R106 R108	2401 8210 3400
4	22K±5% 0805	R67 R68 R95 R96	2401 8222 3400
4	27R±5% 0805	R78 R79 R81 R82	2401 8227 0400
6	47K±5% 0805	R15 R16 R64 R77 R86 R97	2401 8247 3400
2	75R±5% 0805	R13 R14	2401 8275 0400
6	100K±5% 0805	R45 R46 R101 R102 R105 R107	2401 8210 4400
13	100R±5% 0805	R1 R2 R3 R8 R11 R12 R35 R36 R43 R44 R55 R63 R100	2401 8210 1400
2	150R±5% 0805	R17 R25	2401 8215 1400
2	220R±5% 0805	R28 R31	2401 8222 1400
1	412R±1% 0805	R21	2414 0841 2104
1	470R±5% 0805	R93	2401 8247 1400
2	680R±5% 0805	R18 R26	2401 8268 1400
1	680R±1% 0805	R22	2414 0868 0104
2	910R±5% 0805	R4 R6	2401 8291 1400
1	TSAB-3 (H=5mm) PUSHBUTTON	SW1	4502 4000 3100
2	AD825AR SOIC8 (Analog Device)	U2 U3	1000 8250 0438
1	LM317EMP SOT223 (National Semiconductor)	U5	1043 0317 0861
1	LM317T-ADJ TO-220 (National Semiconductor)	U6	1000 3170 5427
1	LM337IMP SOT223 (National Semiconductor)	U8	1000 3370 4361
1	LM337T-ADJ TO-220 (National Semiconductor)	U9	1000 3370 4349
1	NJW1159M DMP16 JRC	U4	1001 1590 3130
1	PIC18F66J10 TQFP64 (Microchip Technology)	U17	1001 8662 1326
1	ULN2003AD(SOL160-P-150-1.27) TEXAS	U15	1002 0030 6138
2	7P PLUG TO PLUG 2468#26X5C＆2547#28X1C 2.0 L=180MM		3307 0504 0282
1	6P PLUG TO PHOUSING 2468#26X6C 2.0 L=380MM		3306 0504 0385
1	5P PLUG TO PLUG 2468#26X5C 2.5 L=300MM		3304 0505 0302
1	4P PLUG TO PLUG2468#26X4C 2.0 L=60MM		3304 0504 0064
1	3P PLUG TO HOUSING2468#26X3C 2.0 L=60MM		3303 0504 0063

HK990 PART LIST

P/N:0099-1011-0000

Used	Part Type	Designator Description	Part number
2	30pF/50V±10%	C18 C19	2115 6300 0123
4	0.1uF/50V±10%	C1 C3 C5 C11	2115 6104 0123
4	0.1uF/50V±5% 0603	C2 C9 C36 C38	2156 1040 0130
2	10uF/10V±20% E.CAP	C7 C50	2310 0210 1015
1	10uF/16V±20% E.CAP	C16	2310 0310 1015

2	47uF/10V±20% E.CAP	C14 C17	2340 0210 0015
2	100uF/16V±20% E.CAP	C12 C37	2311 0310 1015
1	7P PLUG TO HOUSING2468#26X7C 2.0 L=300MM	CN1	3307 0704 0335
1	4P HOUSING TO HOUSING2468#26X4C 2.0 L=60MM	CN4	3304 0504 0064
1	5P PLUG TO HOUSING2468#26X7C 2.0 L=300MM	CN13	3304 0505 0302
1	6P PLUG TO PHOUSING 2468#26X6C 2.0 L=380MM	CN2	3306 0504 0385
1	1*6P(2.5)(90°)	CN14	3100 0506 0802
1	IN4148	D4	1311 1414 8000
1	AT24C02 SOP8 (ATMEL)	IC1	1002 4010 6620
1	LD1117S33 SOT-223 (ST)	IC2	1054 1117 2800
1	PIC18F66J10 TQFP64 (Microchip Technology)	IC3	1001 8662 1326
1	KS-803LM(90°)	IR1	1304 0008 0300
1	LED (Y&W)	LED1	1402 1203 0015
14	TSHC-78A-5.0	K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 K11 K12 K13 K14	4502 4007 8100
3	2SC2406 SC-59 (PANASONIC)	Q7 Q8 Q9	1132 4060 5000
3	2SC1815 TO-92 (TOSHIBA)	Q2 Q4 Q6	1131 8150 0172
1	2SC2458 TO-92 (TOSHIBA)	Q10	1132 4580 0172
1	2SA950 TO-92 (TOSHIBA)	Q18	1110 9500 0162
1	1MΩ1/8W±5%	R7	2401 0221 0511
1	4.7KΩ1/8W±5%	R16	2401 0224 7211
25	10KΩ1/8W±5%	R4 R5 R15 R19 R29 R31 R32 R33 R34 R35 R36 R37 R38 R40 R41 R44 R45 R46 R47 R57 R58 R59 R60 R61 R62	2401 0221 0311
5	10KΩ±5% 0603	R39 R42 R65 R67 R85	2401 1221 0303
3	4.7KΩ±5% 0603	R43 R66 R68	2401 1224 7203
1	27KΩ±5% 0603	R6	2401 1222 7303
2	10Ω1/8W±5%	R1 R2	2401 0221 0011
2	27Ω1/8W±5%	R30 R49	2401 0222 7011
1	27KΩ1/8W±5%	R6	2401 0222 7311
2	39KΩ1/8W±5%	R54 R55	2401 0223 9311
1	47Ω1/8W±5%	R56	2401 0224 7011
2	100KΩ1/8W±5%	R52 R53	2401 0221 0411
3	100Ω1/8W±5%	R3 R50 R51	2401 0221 0111
1	470Ω1/8W±5%	R21	2401 0224 7111
1	560Ω1/8W±5%	R20	2401 0225 6111
1	16-BT-151GINK	VF1	1521 6151 0101
1	24.576MHZ(HC-49S)	Z1	2705 2457 6026

HK990 PART LIST

DSP-PCB P/N:0099-1280-0000

Used	Part Type	Designator Description	Part number
41	0.1UF/50V±5% 0603	C2 C3 C4 C5 C6 C7 C8 C9 C12 C13 C16 C17 C19 C20 C21 C22 C23 C24 C25 C26 C27 C28 C29 C30 C31 C33 C34 C35 C36 C37 C38 C39 C40 C41 C42 C43 C44 C45 C46 C47 C48	2156 1040 0130
1	10UF/6.3V±20% SMDE.CAP 4X5.4	C1	2310 0100 0138
1	22UF/6.3V ±20% SMDE.CAP 5X5.4	C10	2320 0121 1138
1	47UF/6.3V ±20% SMDE.CAP 5X5.4	C11	2340 0111 1138
3	100UF/6.3V ±20% SMDE.CAP 6.3X5.4	C14 C15 C18	2311 0110 2138

2	2*16P(2.54)(180°)	J1 J2	3113 0516 6872
1	2*7P(2.54)(180°)	J3	3102 1007 5802
2	FB---0805	L1 L3	1852 0120 9100
1	2.2K---0603	R1	2401 1222 2203
31	33Ω---0603	R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13 R14 R15 R16 R17 R18 R19 R20 R21 R22 R23 R29 R30 R31 R32 R33 R34 R35 R36 R37	2401 1223 3003
6	3.3K±5% 0603	R24 R25 R26 R27 R28 R44	2401 1223 3203
2	1K±5% 0603	R38 R41	2401 1221 0203
2	4.7K±5% 0603	R39 R40	2401 1224 7203
1	SN74LVC823APW TSSOP24 (TI)	U1	1074 8230 6115
1	TMS320D708E001BRFP LPQF-144 (TI)	U2	1032 0700 6158
1	HY57V64162OETP-7 TSOP54 (HNNIX)	U3	1057 6410 8942
1	S29AL016D70TFI02 TSOP48 (SPANSION)	U4	1029 0162 0742
1	FAN1112S SOT-223 (FAIRCHILD)	U5	1011 1200 1961
1	DS1818 SOT-23 (DALLAS)	U6	1001 8180 1356
1	NC7WZ07P6X_NL SC-70 (FAIRCHILD)	U7	1000 7070 1965

HK990 PART LIST

P/N:0099-1031-0000

Used	Part Type	Designator Description	Part number
9	0.1uF/50V±10%	C4 C8 C15 C30 C33 C34 C35 C48 C49	2115 6104 0123
1	47uF/10V±20% E.CAP	C32	2340 0210 0015
1	100uF/10V±20% E.CAP	C31	2311 0210 1015
1	5P(2.0) SOCKET	CN12	3100 4050 0200
1	3P PLUG TO HOUSING2468#26X3C 2.0 L=150MM	CN15	3303 0504 0063
2	IN4148	D5 D6	1311 1414 8000
1	K1010(817) DIP4 (COSMO)	IC5	1022 8170 7012
1	MAX232 SOP16 (MAXIM)	IC8	1000 2320 3613
1	DB9	JK3	2806 0590 0000
2	CKX3.5-12A 3.5mm	JK1 JK2	2801 1335 1203
1	SK-22H03G6-RS	K16	4200 2200 0500
3	10uH	L1 L2 L3	1881 0002 0000
2	2SA1015 TO-92 (TOSHIBA)	Q5 Q17	1111 0510 0712
1	3.9KΩ1/8W±5%	R27	2401 0223 9211
1	10KΩ1/8W±5%	R87	2401 0221 0311
3	22KΩ1/8W±5%	R86 R88 R89	2401 0222 2311
1	47KΩ1/8W±5%	R24	2401 0224 7311
1	10Ω1/8W±5%	R26	2401 0221 0011
2	47Ω1/8W±5%	R22 R23	2401 0224 7011
1	75Ω1/8W±5%	R25	2401 0227 5011
1	270Ω1/8W±5%	R28	2401 0222 7111

HK990 PART LIST

P/N:0099-1121-0000

Used	Part Type	Designator Description	Part number
2	DB101G	BL1	1361 3011 0100
1	220uF/10V±20% E.CAP	C24	2321 0210 2015
2	100uF/16V±20% E.CAP	C25 C53	2311 0310 1015

2	470uF/25V±20% E.CAP	C26	2341 0410 1015
5	0.1uF/50V±10%	C21 C22 C44 C46 C52	2115 6104 0123
1	47uF/50V±20% E.CAP	C47	2340 0610 1010
1	100uF/50V±20% E.CAP	C27	2311 0610 1015
2	100uF/63V±20% E.CAP	C28 C45	2311 0710 1015
1	0.1uF/275VAC(X2)	C23	2210 3104 0600
1	JY103M(X1/400V.Y2/300V)	C20	2210 3103 0600
4	2P(2.5) SOCKET	CN16 CN17 CN18 CN19	3100 5020 0200
4	3P(3.96) SOCKET	CN7 CN8 CN9 CN10	3100 0702 0050
1	7P(2.0) SOCHET	CN6	3100 4070 0200
1	7P(2.5) SOCKET	CN11	3100 5070 0200
1	IN4148	D2	1311 1414 8000
2	IN4001	D1 D3	1360 1400 1005
1	HZ7B2ST	DW1	1300 5660 0200
1	HZ38-3ST	DW2	1303 8002 0200
1	FUSE T5AL 250V	FH1	1601 0515 0120
2	KA7805 TO-220 (FAIRCHILD)	IC4 IC7	1019 7805 0800
1	2SC2120 TO-92 (TOSHIBA)	Q1	1132 1200 0162
1	2SC2235 TO-92 (TOSHIBA)	Q11	1132 2350 6000
1	2SC2458 TO-92 (TOSHIBA)	Q16	1132 4580 0172
1	2SA950 TO-92 (TOSHIBA)	Q15	1110 9500 0162
2	2SC2073 TO-220 (MOSPEC)	Q3 Q14	1132 0730 7000
2	2SC1815 TO-92 (TOSHIBA)	Q12 Q13	1131 8150 0172
1	1K1/8W±5%	R12	2401 0221 0211
3	1.2K1/8W±5%	R69 R73 R78	2401 0221 2211
2	4.7K1/8W±5%	R83 R91	2401 0224 7211
2	10K1/8W±5%	R74 R79	2401 0221 0311
2	12K1/8W±5%	R72 R77	2401 0221 2311
2	15K1/8W±5%	R71 R80	2401 0221 5311
3	22K1/8W±5%	R10 R82 R84	2401 0222 2311
2	220Ω1/8W±5%	R75 R76	2401 0222 2111
2	470Ω1/8W±5%	R70 R81	2401 0224 7111
1	100Ω1/8W±5%	R90	2401 0221 0111
1	2.2Ω0.5W±5%	R14	2406 4222 2900
1	RF11/4W±5%	R13	2406 3210 9000
1	RF0.221/4W±5%	R11	2406 0322 2815
1	JQX-115F(12V DC)	RAY1	4712 1211 5006
1	EI-28 Transformer	T1	4070 1285 0000
1	EI-57Transformer	T2	4090 1575 0003
2	Toroidal Transformer	T3 T4	4090 1015 0001
2	THERMISTANCE 02DSBJ WITH LEAD AND 2P2.5mm		1609 0282 0070
2	FAN A9225 M12S DC12V 0.24A		9105 2518 7242
2	FUSE HOLDER		1601 0001 0000
1	FUSE COVER		1608 0001 0000

HK990 PART LIST

P/N:0099-1191-0000

Used	Part Type	Designator Description	Part number
===	==========	==========	==========
1	0.1uF/50V±10%	C10	2115 6104 0123
4	LED IL0445W31BOLG201	LED2 LED3 LED4 LED5	1402 0705 0006

4	220Ω1/8W±5%	R17 R18 R63 R64	2401 0222 2111
1	R122ECA-D1-19.5F-24-W	RV1	4401 2211 9524

HK990 PART LIST

Analog I/O-PCB P/N:0099-1510-0000

Used	Part Type	Designator Description	Part number
23	47uF/16V--DIP	C24 C26 C27 C38 C53 C108 C109 C110 C111 C11 C113 C114 C115 C116 C117 C4 C11 C41 C44 C45 C100 C120 C121	2340 0310 1015
3	100uF/16V--DIP	C42 C56 C64	2311 0310 1015
1	1uF/25V--DIP	C96	2319 0410 1015
4	47uF/25V--DIP	C21 C36 C82 C91	2340 0410 1015
14	330pF/50V--C_0805	C71 C72 C73 C74 C77 C78 C79 C80 C84 C85 C86 C87 C88 C89	2103 5330 0140
2	2.2uF/50V--DIP(MKS2)	C13 C98	2207 4224 0100
7	10uF/50V--DIP	C1 C8 C25 C104 C105 C106 C107	2310 0610 1015
2	220pF/100V--DIP	C14 C28	2217 3221 0243
2	1000pF/100V--DIP	C22 C37	2217 3102 0243
6	3300pF/100V--DIP	C52 C59 C102 C103 C118 C119	2217 3332 0243
37	0.1uF/50V--C_0805	C2 C7 C9 C15 C16 C17 C19 C20 C23 C29 C31 C32 C33 C34 C40 C43 C49 C50 C57 C61 C62 C65 C68 C69 C70 C75 C81 C83 C90 C92 C93 C94 C99 C101 C122 C123 C124 C63	2103 5104 0140
2	100pF/50V(NPO)--C_0805	C47 C55	2103 5101 0145
7	100pF/50V--C_0805	C3 C10 C30 C35 C48 C58 C66	2103 5101 0140
2	1000pF/50V(NPO)--C_0805	C60 C67	2103 5102 0145
2	150pF/50V--C_0805	C39 C51	2103 5151 1400
2	0.01uF/50V--C_0805	C95 C97	2103 5103 0140
1	1uF/50V--C_0805	C5	2103 5105 0140
1	2.2uF/50V--C_0805	C12	2103 5225 0140
2	680pF/50V(NPO)--C_0805	C46 C54	2103 5681 0145
1	9P(2.0) --JACK	CN1	3100 4090 0200
1	4P(2.0) --JACK	CN2	3100 4040 0200
9	BAS16--SOT23	D1 D2 D3 D4 D5 D6 D7 D8 D9	1340 0161 0100
6	0R--R_0805	R45 R47 R49 R50 R72 R73	2401 8200 0400
2	1K1%--R_0805	R15 R16	2401 8110 2400
4	1K--R_0805	R27 R28 R107 R111	2401 8210 2400
2	1.78K1%--R_0805	R33 R46	2403 0817 8804
2	2K4--R_0805	R57 R59	2401 8224 2400
1	LD1117S5.0(SOT-223)	IC1	1011 1751 1428
1	NJU7313AM--SDMP30(JRC)	IC2	1007 3130 3160
2	AV4-8.4-13/EC--RCA JACK	J1 J2	2910 4011 0510
1	AV6-8.4-13/EC--RCA JACK	J3	2910 6011 2031
1	2x4P2.0(90) --JACK	J4	3102 1008 4802
1	2x13P2.0(90) --JACK	J5	3102 0926 7802

9	JRC-27F1005-M-555	K1 K2 K3 K4 K5 K6 K7 K8 K9	4712 2027 0006
5	FB--L_0805	L2 L3 L5 L6 L7	1852 0120 9100
2	3K9--R_0805	R58 R60	2401 8239 2400
2	5.1K1%--R_0805	R34 R48	2403 0815 1204
2	5.1R--R_0805	R13 R29	2401 0825 1904
2	7.5K1%--R_0805	R63 R66	2402 0817 5904
2	9.1K1%--R_0805	R37 R44	2403 0819 1204
18	10K1%--R_0805	R1 R2 R30 R32 R35 R38 R39 R42 R102 R103 R11 R115 R116 R117 R118 R119 R120 R121	2401 8110 3400
10	10K--R_0805	R36 R43 R69 R70 R26 R51 R54 R55 R62 R67	2401 8210 3400
1	12K1%--R_0805	R12	2402 0811 2304
2	18K1%--R_0805	R6 R11	2402 0811 8304
2	27K1%--R_0805	R4 R24	2402 0812 7304
4	47K1%--R_0805	R21 R64 R65 R113	2414 0847 1004
6	47K--R_0805	R17 R18 R19 R20 R31 R41	2401 8247 3400
1	47R/1W--DIP	R106	2401 0524 7012
1	47R--R_0805	R22	2401 8247 0400
14	68K--R_0805	R74 R75 R76 R77 R83 R84 R85 R86 R87 R94 R95 R96 R97 R104	2401 8268 3400
20	100R--R_0805	R8 R10 R79 R80 R82 R109 R137 R138 R139 R140 R141 R142 R143 R144 R145 R146 R147 R148 R149 R150	2401 8210 1400
2	220K--R_0805	R81 R110	2401 8222 4400
14	220R--R_0805	R89 R90 R91 R92 R93 R98 R99 R100 R101 R105 R122 R123 R124 R125	2401 8222 1400
2	330K--R_0805	R78 R88	2401 8233 4400
4	330R1%--R_0805	R5 R9 R23 R25	2402 0813 3104
2	360R--R_0805	R108 R112	2401 0823 6104
2	470K1%--R_0805	R3 R40	2401 8147 4400
2	680R--R_0805	R68 R71	2401 8268 1400
2	AD825AR--SOIC8(Analog Device)	U10 U12	1000 8250 0438
1	AK4683EQ--LQFP64(AKM)	U2	1004 6830 0526
1	CS5361--SOIC24	U4	1053 6121 4101
2	NJM2068M--DMP8(JRC)	U7 U8	1031 2068 1300
4	NJM5532M--DMP8(JRC)	U1 U3 U6 U11	1031 5532 1300
1	PCA9555--TSSOP24(Philips)	U9	1009 5550 4915

HK990 PART LIST

Phono-PCB P/N:0099-1210-0000

Used	Part Type	Designator Description	Part number
2	47uF/16V--DIP	C27 C28	2340 0310 1015
15	0.1uF/50V--C_1206	C4 C13 C14 C19 C20 C21 C22 C33 C81 C82 C83 C84 C85 C86 C87	2103 5104 0150
2	100uF/16V--DIP	C29 C75	2311 0310 1015
2	2700pF/50V--C_1206	C62 C63	2115 5272 0150
2	1pF/50V--C_1206	C35 C36	2103 5109 0150

8	1uF/50V--C_1206	C51 C53 C54 C56 C65 C67 C68 C70	2103 5105 0150
2	1800pF/100V--DIP	C58 C60	2217 3182 0243
2	4700pF/100V--DIP	C48 C50	2217 3472 0243
1	4P(2.0)--JACK	CN1	3100 4040 0200
2	0.01uF/50V--R_1206	C2 C3	2103 5103 0150
4	10pF/50--C_1206	C37 C39 C40 C42	2103 5100 0150
4	10uF16V--DIP	C30 C34 C61 C64	2310 0310 1015
10	10uF/50V--DIP	C6 C7 C10 C11 C52 C55 C66 C69 C88 C89	2310 0610 1015
2	22uF/10V(ELCO)--C_1210	C38 C41	2103 6221 1620
2	180pF/100V--DIP	C57 C59	2217 2182 0200
8	220uF/16V--DIP	C5 C8 C9 C12 C15 C16 C17 C18	2321 0310 1015
2	220uF/25V--DIP	C90 C91	2321 0410 1015
2	470uF/16V--DIP	C76 C77	2341 0310 3025
6	330pF/50V--R_1206	C23 C24 C25 C26 C31 C32	2103 5331 0150
8	330uF/25V--DIP	C43 C44 C45 C46 C71 C72 C73 C74	2331 0410 1015
2	680pF/100V--DIP	C47 C49	2217 2681 0243
2	LED rouge--1206	D1 D2	1403 0100 0007
4	BAS85--SOD80C(PHILIPS)	D5 D6 D7 D8	1300 0850 0101
4	BZV55/C12(12V)--SMD	D3 D4 D9 D10	1301 2555 0100
1	LM317EMP--SOT223	IC2	1043 0317 0861
1	LM337IMP--SOT223	IC3	1000 3370 4361
1	NJU201AM--DMP16(JRC)	IC1	1000 2010 3160
1	24P (12 x 2 x 2mm)90--JACK	J7	3102 1024 4802
2	AV4-8.4-13/EC--JACK	J5 J8	2910 4011 0510
1	AV-8.4-8/ES--JACK	J2	2910 1321 1003
1	JRC-27F1005-M-555--Relay	K1	4712 0000 2700
2	2SA1298--SOT23(Toshiba)	Q55 Q56	1111 2980 0101
18	2SA1312--SOT23(Toshiba)	Q2 Q4 Q5 Q7 Q31 Q32 Q35 Q36 Q39 Q40 Q43 Q44 Q47 Q49 Q52 Q54 Q57 Q59	1111 3120 0172
18	2SC3324--SOT23(Toshiba)	Q1 Q3 Q6 Q8 Q33 Q34 Q37 Q38 Q41 Q42 Q45 Q46 Q48 Q50 Q51 Q53 Q58Q60	1133 3240 0717
2	2sc3265--SOT23(Toshiba)	Q61 Q62	1133 2650 0141
4	DTC343TK--SOT23(ROHM)	Q11 Q12 Q13 Q14	1150 3430 0341
7	0R--R_1206	R138 R144 R38 R122 R125 R126 R129	2401-0920-0005
2	1.5K1%--R_1206	R98 R104	2402 0911 5205
10	1K1%--R_1206	R55 R56 R59 R60 R63 R64 R67 R68 R99 R105	2402 0911 0205
2	1K--R_1206	R146 R151	2401 2210 2500
4	1M2--R_1206	R123 R124 R127 R128	2401 2212 5500
8	2.7K1%--R_1206	R96 R97 R100 R101 R102 R103 R106 R107	2402 0912 7005
2	2K2--R_1206	R136 R142	2401 2222 2500
2	2K4--R_1206	R36 R37	2401 2224 2500
1	2K7--R_1206	R5	2401 2227 2500
2	3K9--R1206	R22 R27	2401 2239 2500
4	4K7 1%--R_1206	R16 R17 R18 R19	2402 0914 7105
4	6.8K1%--R_1206	R33 R108 R109 R149	2402 0916 8205
4	7.5K1%--R_1206	R74 R76 R81 R83	2402 0917 5005

6	10R1%--R_1206	R1 R3 R7 R9 R11 R13	2402 0911 0305
8	10R--R_1206	R21 R24 R26 R29 R54 R61 R62 R69	2401 2210 0500
4	22R1%--R_1206	R6 R8 R10 R12	2402 0912 2005
2	39K--R_1206	R130 R131	2401 2239 3500
4	39R--R_1206	R134 R139 R140 R145	2401 2239 0500
2	47R1%--R_1206	R2 R4	2402 0914 7005
4	47R--R_1206	R30 R31 R75 R82	2401 2247 0500
2	82K--R_1206	R57 R65	2401 2282 3500
2	100K--R_1206	R32 R156	2401 2210 4500
1	100R--R_1206	R14	2401 2210 1500
2	120K--R_1206	R58 R66	2401 2212 4500
4	120R1%--R_1206	R112 R114 R118 R120	2402 0911 2005
2	220R--R_1206	R34 R35	2401 2222 1500
1	300R--R_1206	R15	2401 2230 1500
8	330R1%--R_1206	R72 R73 R77 R78 R79 R80 R84 R85	2402 0913 3105
4	330R--R_1206	R132 R133 R152 R153	2401 2233 1500
2	470K--R_1206	R115 R121	2401 2247 4500
4	470R1%--R_1206	R111 R113 R117 R119	2402 0914 7005
4	560R1%--R_1206	R20 R23 R25 R28	2402 0915 6005
1	HR610675--Wideband RF transformer	T1	1061 0672 1801
1	4P PLUG TO PLUG1533#28X2C 2.0 L=350MM 2.4GND		3604 6043 5032

HK990 PART LIST

Symmetric-PCB P/N:0099-1080-0000

Used	Part Type	Designator Description	Part number
6	0.1uF/50V--C_0805	C1 C2 C3 C4 C13 C14	2103 5104 0140
4	330pF/50V--C_0805	C6 C7 C9 C10	2103 5330 0140
4	47uF/16V--DIP	C5 C8 C11 C12	2340 0310 1015
1	9P(2.0)--JACK	CN1	3100 4090 0200
2	LX-1604HP-3--JACK	JR1 JR2	2990 3330 0320
4	47K--R_0805	R1 R2 R6 R7	2401 8247 3400
4	100R--R_0805	R3 R4 R5 R8	2401 8210 1400
2	NJM5532M--DMP8(JRC)	U1 U2	1031 5532 1300
1	9P PLUG TO PLUG 2547#28X4C&2468#26X3C 2.0 L=120mm 2.5GND1346		3309 0504 0574