

HEADPHONE AMPLIFIER

HLF30AB

Can be good to be in charge of when you want to listen undisturbed on the stereo. Easier stereos are not usually equipped with an adjustable volume control to the headphone jack. Another experience of the existing headphone jack is that the signal and noise ratio usually are bad. If you choose to expand the number of stereo components with a home-built discrete headphone amplifier appear next little problem. The audio signal to the headphone amplifier should be the line signal the drive stage is feeds with. The problem is that this signal not is available (unless you have a good model of your stereo of course). The solution is to modify the amplifier or receiver, so that you can connect a headphone amplifier. If this line signal is used, then protect it with one resistor per channel, 200-400ohm.

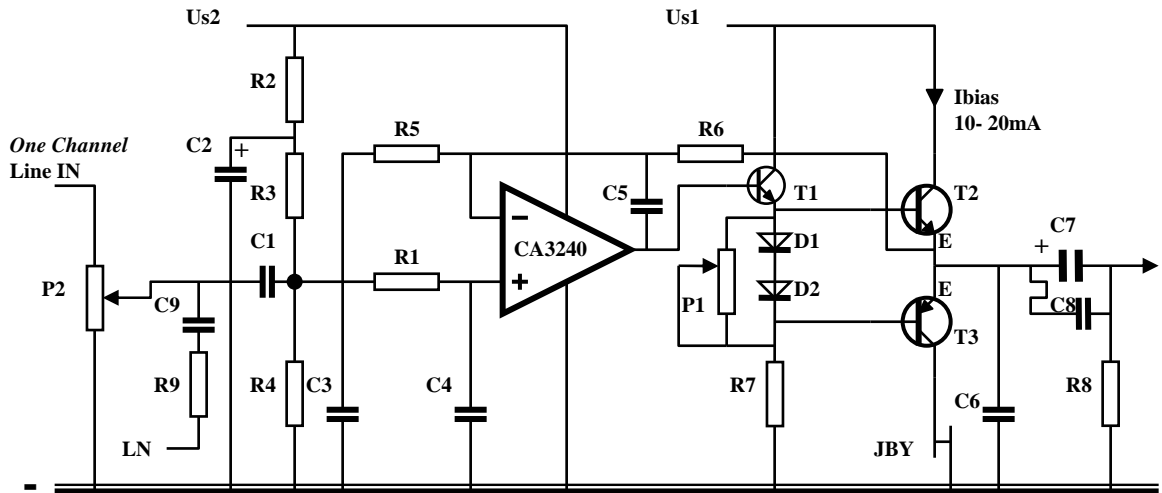
This headphone amplifier is designed for low impedance headphones, 30ohm or thereabouts. It comes in three variants. The difference lies in how the panel will be assembled. The actual PWB is double sided but only one side contains tracks for the components, while the other side only caring the ground plane. Two variants using hole-mounted components which are located on the ground plane. The amplifier works in class AB, but through a single power supply. This means that you must use a capacitor between the driver stage and the headphones, but it makes no technical disadvantage of this coupling. The risk of having direct current through the headphones is non-existent. There is also room for an additional capacitor, which can complement the E-lytic at high notes and it is a 220n polycarbonate; however, today's surface-mounted E-lytics is very HF-adapted. Poppers at power on, or insertion of headphones when the amplifier is on - has been solved with various LP filter for the power supply and a resistor in parallel over the headphone jack.

The power unit is optimized for +20 VDC (110mA), for good and decent power linearity. It is also possible to drive it with a fixed voltage regulator, type 7818 (18V) which you can choose to implement directly on the board. The problem is to finding one marked with 20V? For an external event may LM317 be eligible. Is the rectified line transformer voltage higher than 40V can you construct a "voltage regulator" with two transistors - or use a zener diode in series before LM317 and let it thus act as a voltage thief? The idea behind this construction is that the power supply is taken from the current stereo amplifiers interior. So it requires an intervention in certain electronic devices, out of the ordinary...

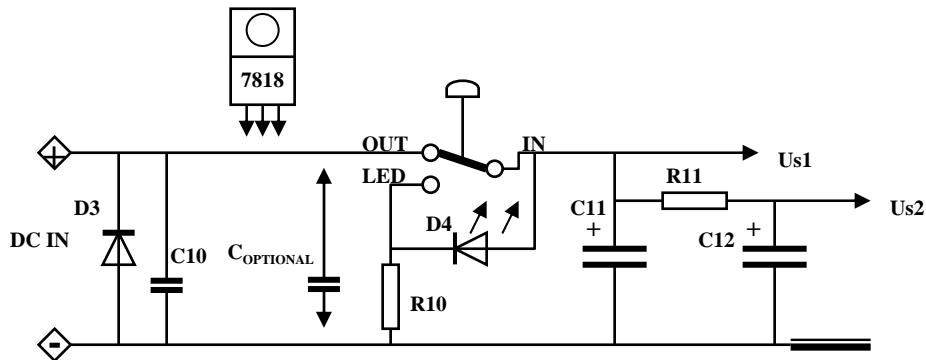
The requirements for ripple free feeding are not that critical, operational amplifiers are relatively immune to hum. Noise can be a problem if a driver transistor is bad. The circuit in general does not generate any audible noise. Examine the drive transistors so that they are matched! Before the amplifier can be used you must set the bias current. Make sure that the resistance of P1 is zero. Then connect an ampere meter between the PNP transistor collector and ground (JBY). Connect the feeding voltage and turn up the current for 10mA. Preheat the transistor heat sink with a hair dryer. When the amp is warm, the bias current is nearby 20mA. HLF30AB is prepared for a loudness filter. This can be built if the need exists? If you choose to use a switch to the loudness function, must it be a 2-pole. The smartest is to select a 2-pole toggle switches with a mid-position. Then you can have two variations of loudness filter and no loudness in the center position. Various proposals are described here.

CIRCUIT DIAGRAM

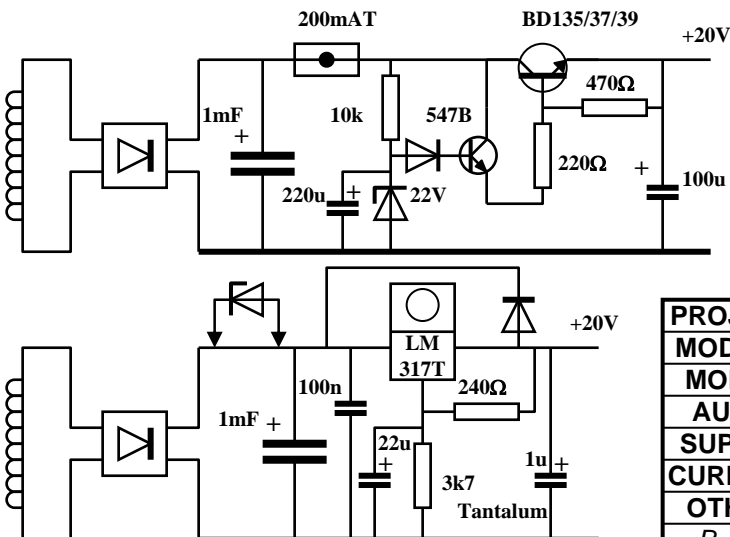
AMPLIFIER (one of two):



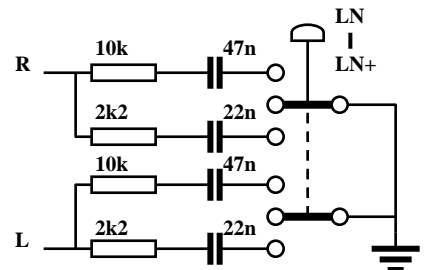
VOLTAGE SUPPLY CIRCUIT:



PROPOSALS FOR TWO POWER SUPPLIES:

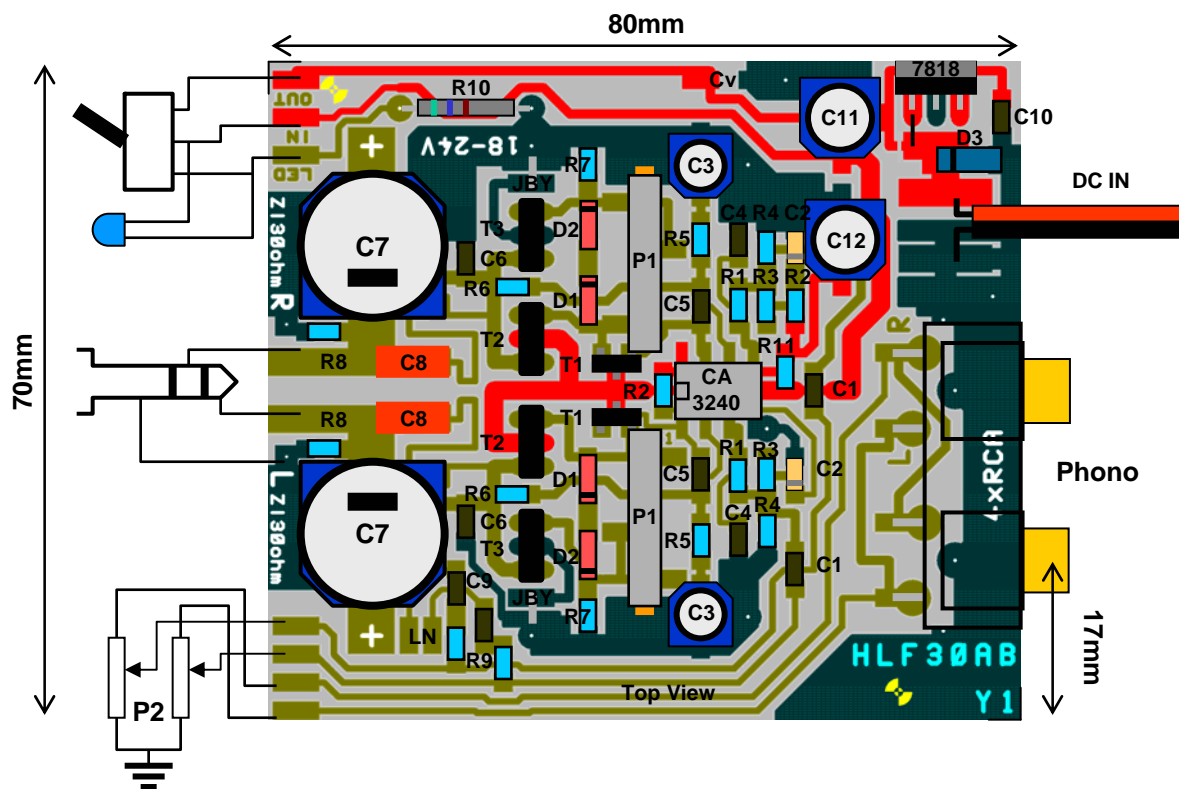


LOUDNESS- CIRCUITS (R9/C9):



PROJECT	Headphone Amplifier (STEREO)	
MODULE		
MODEL	HLF30AB	
AUDIT	A-1	DRAWING: 1 of 1
SUPPLY	≥ 18VDC	≤ 20VDC
CURRENT	~ 100mA	~ 110mA
OTHER	Max 2.0W (20VDC)	
B. Lindqvist		2004-03

PLACING OF COMPONENTS



SMR1206 (x2):

R1 = 10k
R2 = 470k
R3 = 2M2
R4 = 2M2
R5 = 4k7
R6 = 10k
R7 = 470Ω
R8 = 470Ω
R11 = 47Ω

SMC1206 (x2):

C1 = 100n
C4 = 22p
C5 = 47p
C6 = 22n

Other capacitors (x2):

C2 = 470n, Tantalum, SMD
C3 = 22μ, E-lytic. SMD
C7 ≥ 2200μ, E-lytic. SMD
C8 = 220n, Plastic cap.
C10 (1pc.) = 100n, SMC1206
C11&C12 (1pc.) = 220μ, E-lytic. SMD

Other components:

R10 = 470Ω, 1W, (Us-2)/I_{D4}
P1 (x2) = 100Ω, prec. ELFA 164-72-146
P2 = 2x100k log, Panel mounted
RCA = 4-pole, Gilt socket
Jack = 3-pole, Panel mounted
On/Off = Switch, 1-pole, 2 ways, Panel mounted

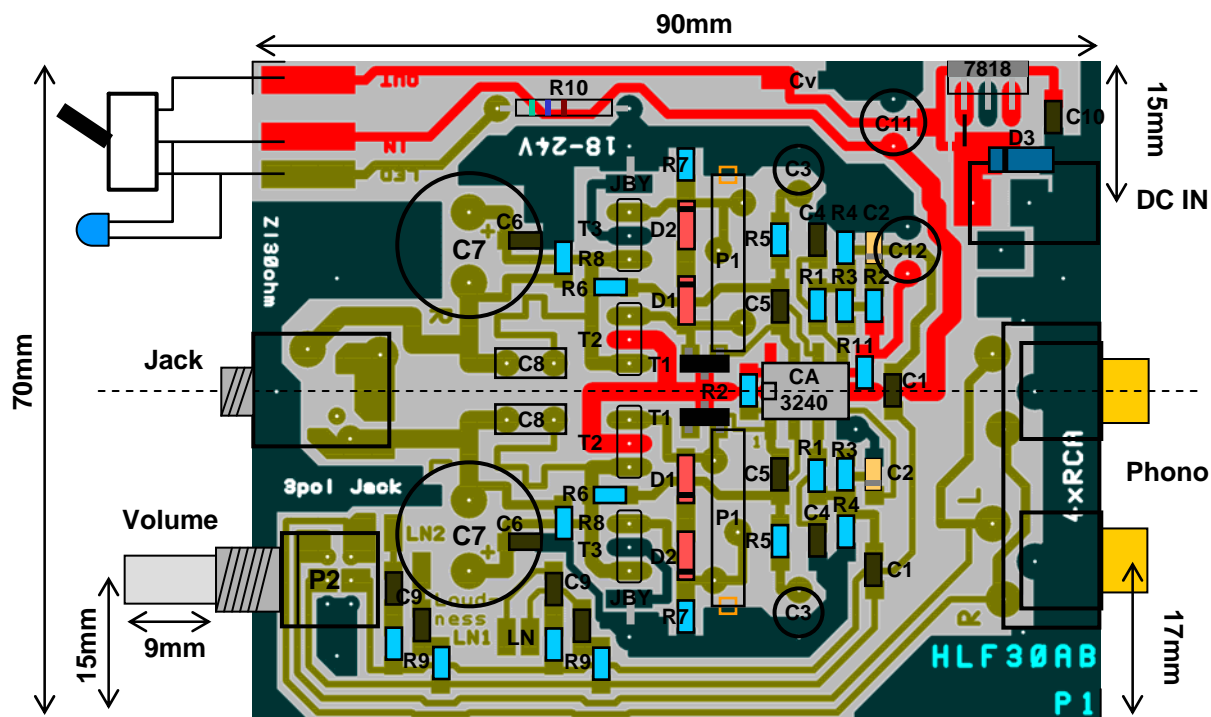
Semi conductors:

D1&D2 (x2) = BAS32, SMD
D3 = LL5817, SMD
D4 = LED
T1 (x2) = BC847B, SMD (1F)
T2 (x2) = BD135, NPN
T3 (x2) = BD136, PNP
IC = CA3240 (double OP), Hole mount

Double side board. Drill 9 ground via holes that are marked on the layout pattern. All components shall be surface mounted, but the ground legs on the RCA-connector will be hole mounted, while the hole-mounted signal pins are bent and soldered on the component side. The ground plane has no tracks.

PROJECT	Headphone Amplifier	
MODULE		
MODEL	HLF30AB	Y1
AUDIT	A-1	DRAWING: 1 of 1
OTHER	SMD variant	
B. Lindqvist		2004-03

PLACING OF COMPONENTS



SMR1206 (x2):

R1 = 10k
R2 = 470k
R3 = 2M2
R4 = 2M2
R5 = 4k7
R6 = 10k
R7 = 470Ω
R8 = 470Ω
R11 = 47Ω

SMC1206 (x2):

C1 = 100n
C4 = 22p
C5 = 47p
C6 = 22n

Other capacitors (x2):

C2 = 470n, Tantalum, SMD
C3 = 22μ, E-lytic. Hole mount
C7 ≥ 2200μ, E-lytic. Hole mount
C8 = 220n, Plastic cap. Hole mount
C10 (1pc.) = 100n, SMC1206
C11&C12 (1pc.) = 220μ, E-lytic. HM

Other components:

R10 = 470Ω, 1W, (Us-2)/I_{D4}
P1 (x2) = 100Ω, prec. ELFA 164-72-146
P2 = 2x100k log, Alps
RCA = 4-pol, Gilt socket
Jack = 3-pol, ELFA 142-70-050
DC IN = Battery connector, ELFA 142-05-159
On/Off = Switch, 1-pole, 2 ways, Panel mounted

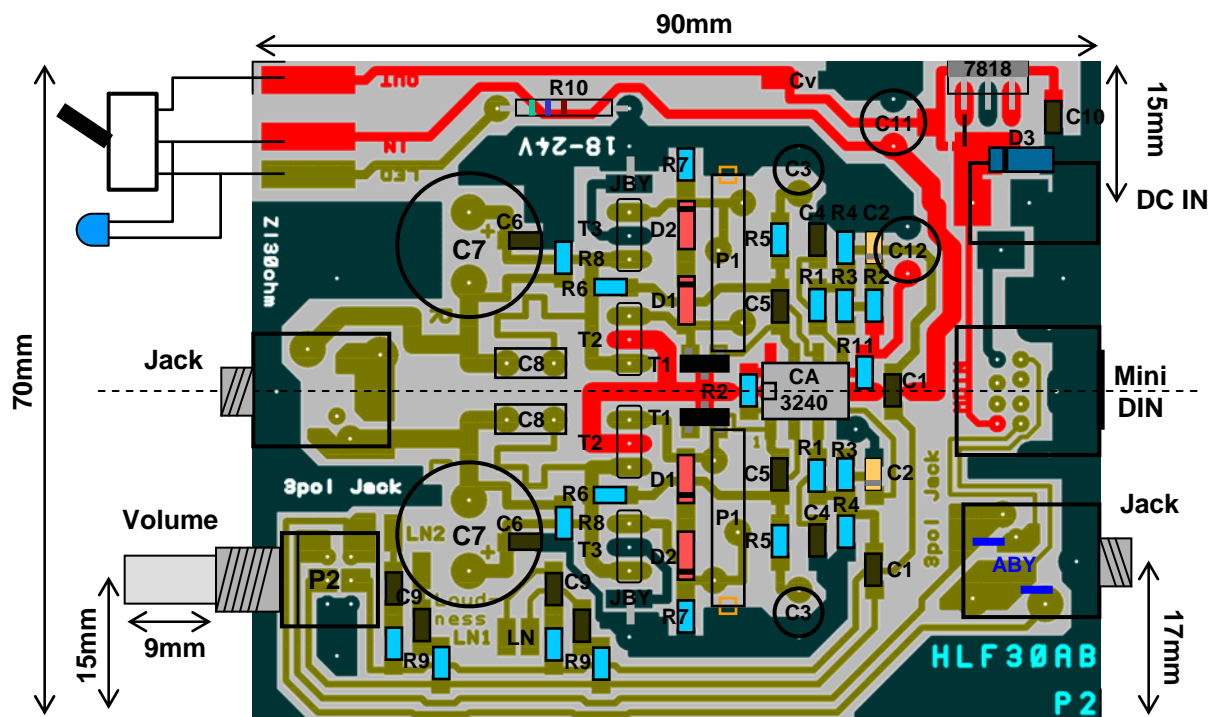
Semi conductors:

D1&D2 (x2) = BAS32, SMD
D3 = LL5817, SMD
D4 = LED
T1 (x2) = BC847B, SMD (1F)
T2 (x2) = BD135, NPN
T3 (x2) = BD136, PNP
IC = CA3240 (double OP), Hole mount

Double side board. Drill 6 ground via holes and some more that are marked on the layout pattern. Mount the OP (with cutted legs) like the other SMD components. Hole-mounted components shall be mounted from the ground plane side. The ground plane has no tracks.

PROJECT	Headphone Amplifier	
MODULE		
MODEL	HLF30AB	P1
AUDIT	A-1	DRAWING: 1 of 1
OTHER	Panel variant 1 (4-RCA)	
B. Lindqvist		2004-03

PLACING OF COMPONENTS



SMR1206 (x2):

R1 = 10k
R2 = 470k
R3 = 2M2
R4 = 2M2
R5 = 4k7
R6 = 10k
R7 = 470Ω
R8 = 470Ω
R11 = 47Ω

SMC1206 (x2):

C1 = 100n
C4 = 22p
C5 = 47p
C6 = 22n

Other capacitors (x2):

C2 = 470n, Tantalum, SMD
C3 = 22μ, E-lytic. Hole mount
C7 ≥ 2200μ, E-lytic. Hole mount
C8 = 220n, Plastic cap. Hole mount
C10 (1pc.) = 100n, SMC1206
C11&C12 (1pc.) = 220μ, E-lytic. HM

Other components:

R10 = 470Ω, 1W, (Us-2)/I_{D4}
P1 (x2) = 100Ω, prec. ELFA 164-72-146
P2 = 2x100k log, Alps
Jack = 3-pol, ELFA 142-70-050
MDIN = At least 4 poles, ELFA 142-19-481
DC IN = Battery connector, ELFA 142-05-159
On/Off = Switch, 1-pole, 2 ways, Panel mounted

Semi conductors:

D1&D2 (x2) = BAS32, SMD
D3 = LL5817, SMD
D4 = LED
T1 (x2) = BC847B, SMD (1F)
T2 (x2) = BD135, NPN
T3 (x2) = BD136, PNP
IC = CA3240 (double OP), Hole mount

On this variant you can choose only one MDIN-connector for both audio and supply. Do not forget the jumpers ABY. The second option is a battery-connector and a stereo jack for audio.

Double side board. Drill 6 ground via holes and some more that are marked on the layout pattern. Mount the OP (with cutted legs) like the other SMD components. Hole-mounted components shall be mounted from the ground plane side. The ground plane has no tracks.

PROJECT	Headphone Amplifier	
MODULE		
MODEL	HLF30AB	P2
AUDIT	A-1	DRAWING: 1 of 1
OTHER	Panel variant 2 (MDIN/S-Jack)	
B. Lindqvist		2004-03

THE DRAWINGS IS NOT ACCORDING TO SCALE

[mm]

Top View

FRONT

44.0

74.0

10.0

4.0

10.0

42.0

10.0

34.0

22.0

37.0

25.0

15.0

20.0

18.0

6.0

S-switch & LED

(Loudness)

3-pole jack

Chassis ground

Volume P2

70.0

ALUMINUM SHEET
1mm

HOLE DIM.
DIAMETER

10.0

7.0

6.0

4.0

2-3
M3 or
Sheet
metal
screw

BACKSIDE

Batt-conn.

4xRCA

37.0

19.0

20.0

19.0

33.0

5.0

Screwdriver

5.0

CONCERN'S VARIANT
P1

/INSIDE/

OTHER DIMENSIONS
COMPLIES WITH THE
FRONT

For T2 and T3 must a heat sink be manufactured. It can sit independently on the circuit board. Remember that insulators should be used for T2 - if the transistor collector lead outwards and the heat sink have contact to the ground potential.

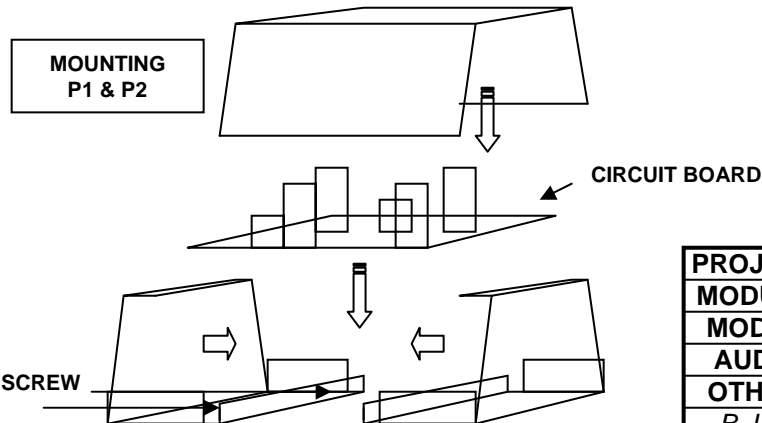
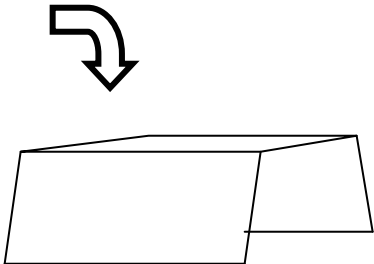
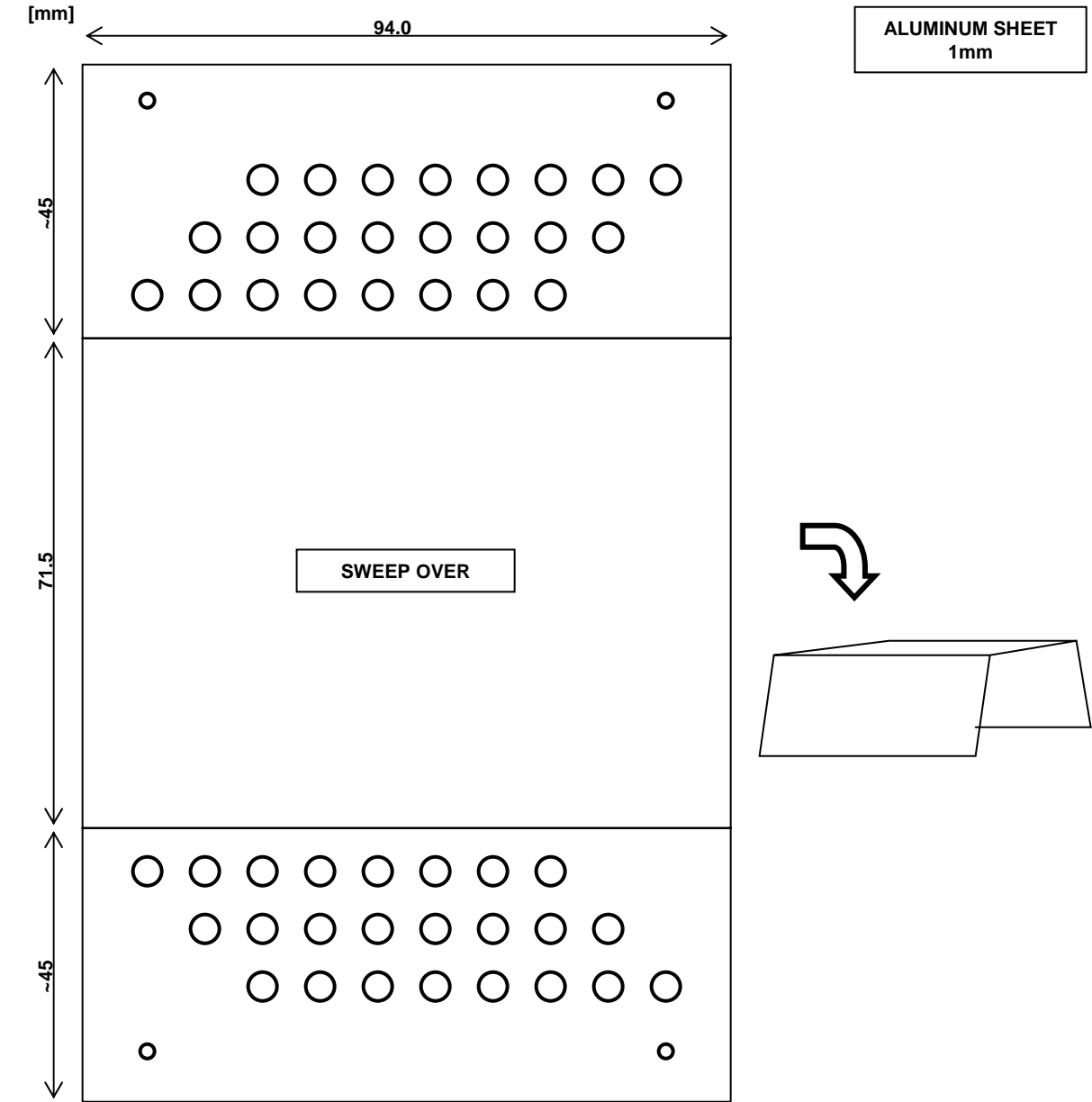
PROJECT	Headphone Amplifier	
MODULE		
MODEL	HLF30AB	P1/2
AUDIT	A-1	DRAWING: 1 of 2
OTHER	Device Box of aluminum sheet	
B. Lindqvist		2004-03

For T2 and T3 must a heat sink be manufactured. It can sit independently on the circuit board. Remember that insulators should be used for T2 - if the transistor collector lead outwards and the heat sink have contact to the ground potential.

PROJECT	<i>Headphone Amplifier</i>	
MODULE		
MODEL	HLF30AB	P1/2
AUDIT	A-1	DRAWING: 1 of 2
OTHER	<i>Device Box of aluminum sheet</i>	
<i>B. Lindqvist</i>		<i>2004-03</i>

DRAWING

THE DRAWINGS IS NOT ACCORDING TO SCALE



PROJECT	Headphone Amplifier	
MODULE		
MODEL	HLF30AB	P1/2
AUDIT	A-1	DRAWING: 2 of 2
OTHER	Device Box of aluminum sheet	
B. Lindqvist		2004-03