Description:

This Hi Fi Headphone Amplifier will boost the output power of portable CD players, tape players, and the like, for enjoyable listening with full dynamic range from high quality stereo headphones. The amplifier has a built-in volume control suitable for use with line level inputs. Both loud and soft passages are reproduced with much improved impact and clarity, made possible by using a 9V power source, compared to the typical 3V power source of portable stereos.

Features:

- Discrete circuitry
- Ultra low noise
- Low parts count
- Uses easy to find parts
- Single 9V battery operation
- Lasts over 15 hours on one alkaline cell
- Drives high and low impedance headphones or speakers
- Can use as general purpose stereo amplifier

The Circuit:

The input and output are AC coupled because of single supply operation. The input is level shifted by R2-4 to bias the output voltage to approx. (V+) - ((V+) - (2 volts)) / 2 for maximum output voltage swing, and amplified by Q1. The output of Q1 is coupled to Q2 and its output is biased by D1-3 to the output compound transistors Q3, Q5 and Q4, Q6. Negative feedback is sent back to Q1 through its emitter, attenuated by C3, R7. The voltage gain is approx. R5/R7, which is adjusted to get a good balance between maximum output from 1Vp-p input, and good positioning of the volume control for low-volume listening using headphones.

Happy Listening,
Tom Wong (tomwong@bnr.ca / tomwong@nortel.ca)

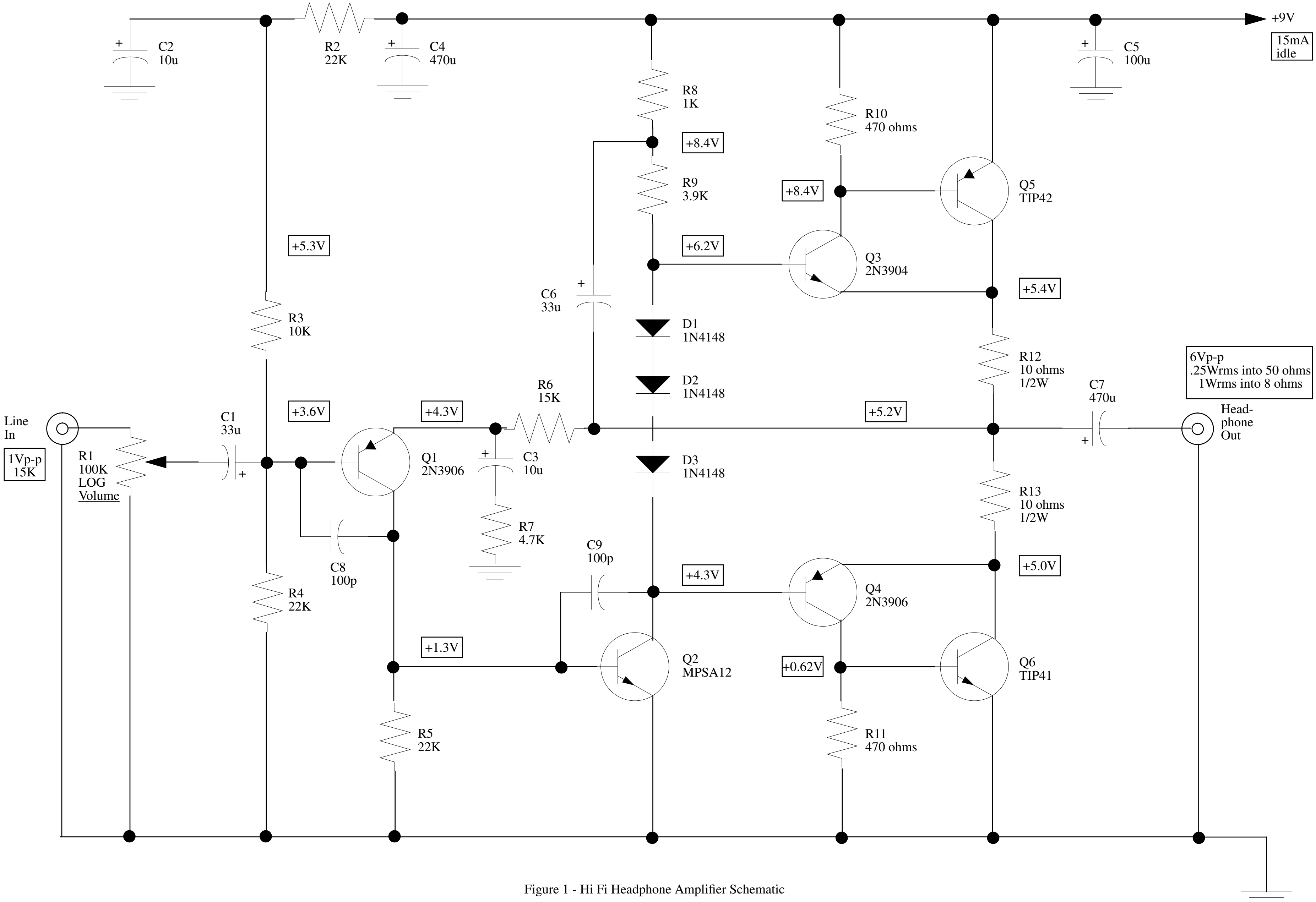


Figure 1 - Hi Fi Headphone Amplifier Schematic

Resistors:		Capacitors:		Transistors / Diodes:	
R1	100K Log Pot	C1, 6	33uF 16V Electrolytic	Q1, 4	2N3906 PNP general purpose transistor
R2, 4, 5	22K	C2, 3	10uF 16V Elec.	Q2	MPSA12 NPN darlington transistor
R3	10K	C5	100uF 16V Elec.	Q3	2N3904 NPN general purpose transistor
R6	15K	C4, 7	470uF 16V Elec.	Q5	TIP42 PNP power transistor
R7	4.7K	C8, 9	100pF mono. ceramic	Q6	TIP41 NPN power transistor
R8	1K				
R9	3.9K			D1-3	1N4148 general purpose diode
R10, 11	470 ohms				
R12, 13	10 ohms 1/2W			* Q3, 4 and Q5, 6 matched complementary pairs	
				* Heatsinks may be necessary if driving speakers (see data sheet for TIP41)	
* R2-11 all 1/4W					

Miscellaneous:

- 9V battery
- Battery clip
- SPST power switch
- Volume knob
- Perforated circuit board (such as Radio Shack 276-158)
- 2 x 1/4” stereo phone jacks
- Shielded audio cable for internal wiring
- 1/8” stereo phone cord
- 2 x 1/8” to 1/4” stereo phone plug adaptors
- 9V AC adaptor
- DC power jack with battery cut-off switch
- Enclosure (3-1/2” diskette 5-disk case works well)

* Double all resistors, capacitors, transistors, and diodes for stereo amplifier

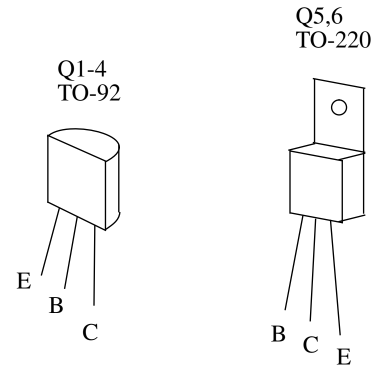
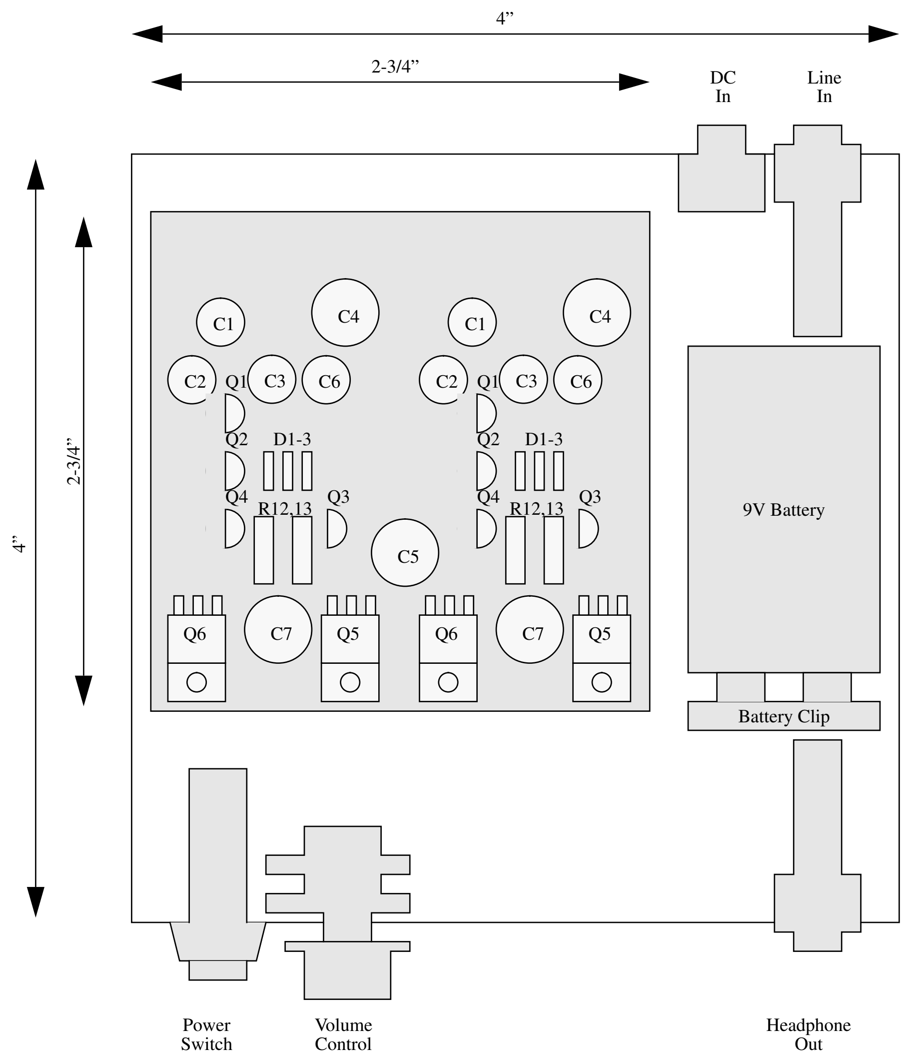


Figure 2 - Parts List



* Lay out parts as per schematic
* Begin by wiring output transistors
* Work towards input end
* Complete one channel and test, then proceed with second channel
* Use shielded audio cable for all audio connections
* Make sure DC power jack cuts off the battery when plug is inserted
* For optimum results, use wiring diagram below

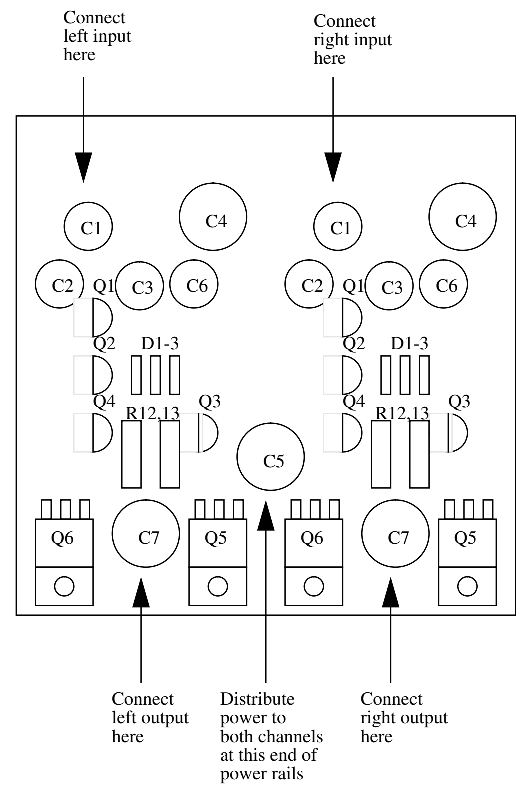


Figure 3 - Parts Placement Diagram