

Differences between NwAvGuy/RocketScientist's O2 Headphone Amp and this "agdr" 80x160mm version of an O2 desktop amplifier, plus situations that benefit from the ODA vs. the O2 and vice versa.

agdr 4-22-2013

This listing isn't meant to diminish NwAvGuy's O2 headphone amp in any way. After all, this amp is based on NwAvGuy's O2 design and the whole point is trying to incorporate many of his design philosophies written up in his web blog to take a guess at what his ODA amp might have been. I'm just working with a taller box, a lot more PC board space due to no batteries, the use of some surface mount parts, parts on both sides of the PCB, and big price drops on some high end chips like the LME49990 since the O2 came out. I've included some things that may be small upgrades and some modification ideas for the O2 that I posted on DIYAudio.com. This listing summarizes the differences between the two amps.

Item	O2	This version of an ODA
POWER SUPPLY		
power supply type	fixed voltage	adjustable voltage
power supply rails	+/-12Vdc & +/-8.4Vdc batteries	+/-17Vdc and +/-7Vdc via switch selection
batteries	yes, 2x 8.4Vdc NiMH	no
charges batteries from AC	yes	N/A
true ground power supply	yes	yes
power indicator	1 LED across both rails	2 LEDS, one across each power rail
main voltage regulators	LM7812 / LM7912 fixed, 3Vdc drop required	LT1963A / LT3015 adjustable low-noise LDOs
voltage pre-regulators	no	yes, LM317 and LM337 adjustable
voltage regulators heatsinked	no	yes, to aluminum case
rectifier diode snubbers	no	yes, as per hagermann
audio band power filter	capacitors	capacitor - (inductor + resistor) - capacitor (C-L/R-C)
power transformer type	wall plug AC transformer adapter	wall plug AC transformer adapter
power transformer - suggested	14Vac or 16Vac at 400mA - 1A	20Vac or 24Vac at 1A - 2.4A
power jack	2.1mm/5.5mm on front panel	2.1mm/5.5mm on back panel
EMI filter on power jack	no	yes, X2Y capacitor, optional to populate
power switch	front panel	back panel
input voltage range	14Vac- 20Vac at 400mA - 1A	20Vac -28Vac at 1A - 2.4A
OUTPUT BUFFER STAGE		
maximum output current per channel	125mA	375mA

maximum output voltage swing	7V peak	10.5V peak
output jacks	3.5mm and 1/4" Neutrik on front panel	3.5mm
output impedance	0.5R	0.25R + optional output series damping resistors
damping factor switchable	no	yes, via external 6 position switch
short circuit protected	yes, by NJM4556A chips	yes, by NJM4556AL chips
output current buffer chips	1 NJM4556A per channel (2 op amps)	3 NJM4556AL per channel (6 op amps)
output in 1x gain linearization loop	no	yes, with LME49990
output stage voltage gain	1x (current buffer)	1x (current buffer)
EMI filter on output jack	no	yes, optional X2Y capacitor
headphone output relay	no, some no-thump protection	yes, 12 second amp power-up turn-on delay
power management circuit	yes	no, no batteries + relay power thump prevention
intended load	headphones	headphones and small PC speakers
DC servo on output	no	yes, via OPA188 on each channel, +/-25uV max offset
Pads for optional output Zobel network	no	yes
output chips easily changeable if failed	yes, in DIP sockets	no, solder-in inline SIP8 packages

CASE, PCB, AND PARTS COST

case	B4-080 or B4-160 with 2 PCBs and ODAC	B2-080 or optional taller B3-080
case size	B2-080 = 1.18H x 4.27W x 3.15L (inches)	B4-080 = 2.11H x 6.68W x 3.15L (inches)
portable	transportable w/ batteries	less so than O2 -bigger - intended for desktop AC use
holds ODAC?	yes, without batteries	yes if 2 PCBs and B4-160 case are used
end panels with holes	front panel only	both front and rear panels
PCB	one 80mm x 100mm	80mm x 160mm, one or two PCBs if B3-160 used
PCB cost at iTEAD or Seeed studio	\$2.50 for 2 layer (\$25 for 10)	\$14 for 2 layer (\$69 for 5)
surface mount soldering required?	no	yes, smallest is 1206 parts and SOIC8 IC chips.
layers	2	2 standard, layout available for 4 w/ ground plane
PCB sides with parts	components top side	components both sides
PCB type	1.6mm FR4, HASL	1.6mm FR4, HASL
layout for optional 4 layer w/gnd plane	no	yes
parts cost with PCB	about \$30 - low cost!!	about \$140 - not so low cost
cost of case and AC adapter	about \$30	around \$30 - \$50 depending on adapter current

VOLUME POT AND COUPLING CAPACITORS

location of pot and capacitors	middle of circuit	middle of circuit
value of pot	10K	1K for lower Johnson noise, optionally can use 10K
brand and type of pot	Alps RK97 9mm	Bourns Pro Audio PD902 9mm

DC block capacitor per channel	2.2uF Kemet film	6x 4.7uF Wima film in parallel = 28uF
HPF filter corner frequency	1.8Hz	1.12Hz
Low end frequency response	about 10Hz	about 5Hz
input signal attenuation available	no	yes, optional pot series resistor, 50% standard
output stage input resistor	40.2k	5K (lower Johnson / thermal noise)

INPUT AND GAIN STAGE

input jacks	3.5mm front panel + rear RCA jacks	3.5mm front panel
input selector switch	N/A	yes, front 3.5mm or rear RCA
gain settings	2, usually set for 1x/2.5x or 2.5x/6.5x	4 position rotary switch. 1x, 2x, 4x, 6x etc.
RFI input filter	yes	yes, on both input jacks
RFI filter corner frequency	2.4Mhz	2.4Mhz
HF EMI input filters	no	yes, X2Y capacitor, optional to populate
Input impedance	10K	10K
gain chip	NJM2068 @ 0.7mA peak output per channel	2x LME49990 @ 7mA peak output per channel
bass boost	no	yes, optional to populate with external DPST switch
clipping indicator	no	yes, on gain stage output, front panel LED
gain chip easily removed for "rolling"	yes, NJM2068 in DIP8 socket	no, LME49990 are solder-on SOIC surface mount

Some situations the would benefit from ODA features over NwAvGuy's original O2 headphone amp

- * O2 doesn't have enough output voltage for a high impedance and/or low sensitivity headphone
- * O2 doesn't have enough current drive for a low sensitivity headphone
- * need more gain switch positions
- * need RCA input jacks
- * need 1/4 output jacks
- * want a clipping indicator to alert if gain switch is turned up to 0 high for the source level
- * want much lower DC output offset voltage
- * want more power line conducted noise filtering on power supply
- * want the Linear Technology LT1963A and LT3015 low noise LDO regulator pair
- * ...and possible lower noise and distortion via the chips used and design, but won't know for sure until AC parameters properly measured

Some situations the would benefit from NwAvGuy's original O2 headphone amp over this ODA version

- * need portability and batteries
- * want lowest cost
- * don't need RCA inputs or 1/4" output jacks
- * don't want to solder surface mount parts

ODA build options

- * snubber for diodes
- * x2y EMI capacitors on input, output and power cables
- * 2.4A transformer for full output current capability
- * different rail voltages than +/-7V and +/-17V
- * pre-amp RCA outputs on front or back panel
- * pre-amp out to gain stage or output stage
- * different gain switch settings than 1-2-4-6
- * external damping factor switch
- * external bass boost switch