

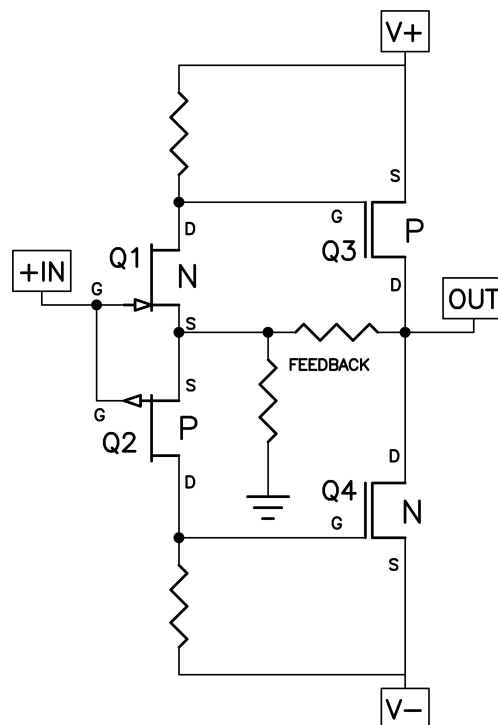
# The DIY ACA mini Amplifier

by Nelson Pass

The first amp camp goes back almost ten years when a small group of people held the first and only event in Sebastopol California. I had the privilege of designing this little class A amplifier which has proven to be popular among audio DIYers and is currently available in the “store” at [www.diyAudio.com](http://www.diyAudio.com). Over the years it has acquired a nice chassis and some minor improvements.

Another Amp Camp was planned but then delayed waiting for Covid to bugger off, but finally the organizers of the Burning Amp Festival decided to go online with it, and once again I have had the pleasure of doing the design, something a little different. My goal was to make a nice little class A amplifier that brings some interesting circuit design elements but at a much lower cost, while still appealing to more *sophisticated audiophiles*.

Here is the simplified schematic of the ACA mini:

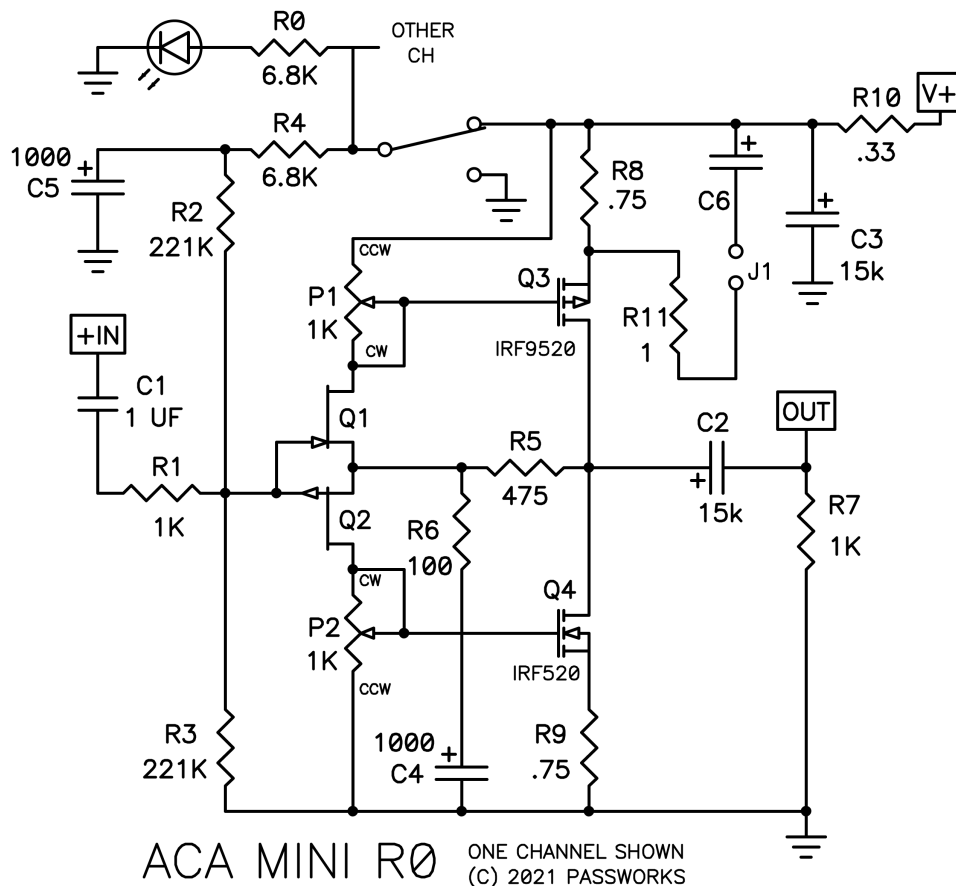


This would be described as a Class A two-stage complementary push-pull amplifier using Jfet input transistors (Q1, Q2) and Mosfet output transistors (Q3, Q4) operated in Common-Source mode. It uses a current feedback loop (CFA). The input transistors are undegenerated push-pull and the output transistors are degenerated via Source resistors.

Some will note the resemblance to the First Watt F7 and F5 amplifiers, but the basic circuit previously appeared in Plantefeve's Selectronics amplifier and probably earlier.

In this case there is an interesting twist that we will discuss later.

Here is the full schematic, showing one channel.



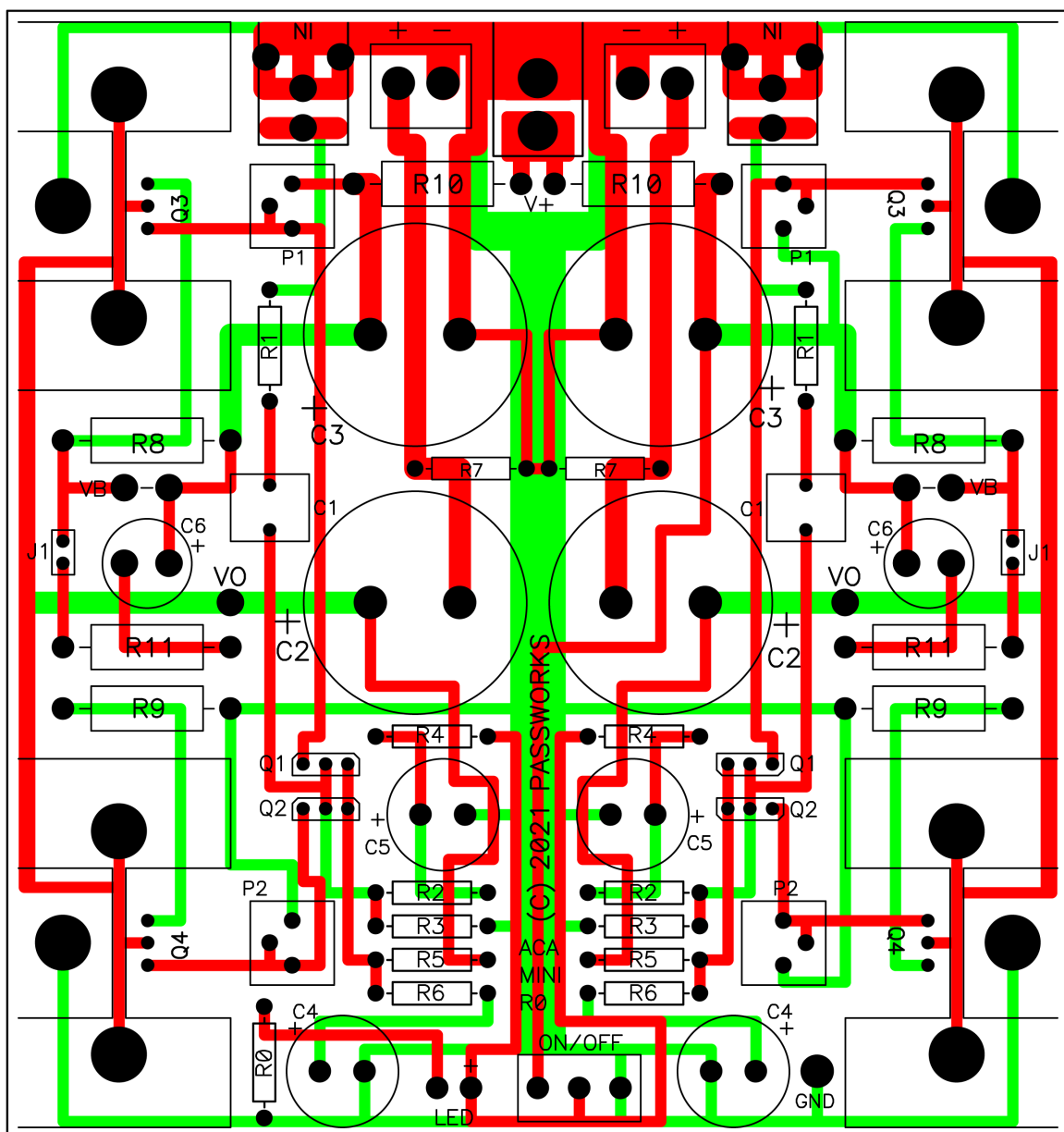
At the top, the switch, resistor R0 and the display LED occur only once and other parts are duplicated for the two channels on the circuit board, segregated as Left and Right.

This amplifier runs off a single supply, and is necessarily coupled at the input and output through capacitors C1 and C2. The feedback resistors R5 and R6 are also capacitively coupled to ground through C4. Resistors R2 and R3 provide a reference voltage that the amplifier output will settle into, slightly lower than halfway between Ground and the 24 V positive supply.

Resistors P1 and P2 are potentiometers that will be adjusted to set the idle current of the output Mosfets at about 0.4 Amps, which is about 5 watts dissipation for each output device.

Because the transistors will drift with temperature, we add resistors R8 and R9 to the Source pins of the output stage Mosfets. Known as degenerating resistors, they make the two devices more matched and provide ballast to stabilize the bias current.

The amplifier will be powered by an external “desktop” switching supply at 24 volts. R10 and C3 are power supply filters that clean up the high frequency AC noise from the voltage seen at the positive supply rail. R4 and C5 are also power supply filters as well as a timing mechanism for slow turn-on and turn-off, avoiding thumps visited upon the loudspeaker.



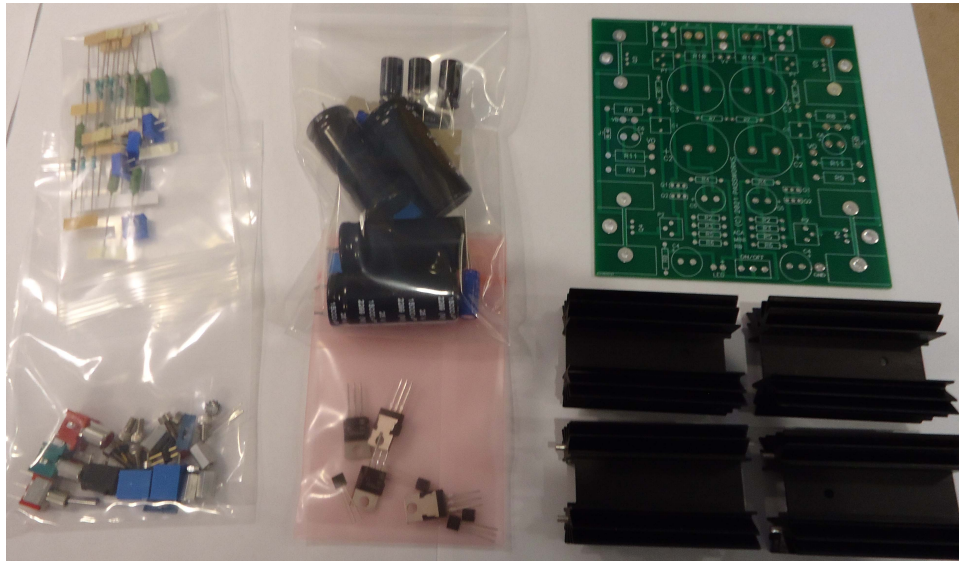
And here is the Bill of Materials:

## ACA MINI R0

## BILL OF MATERIALS 10/23/21

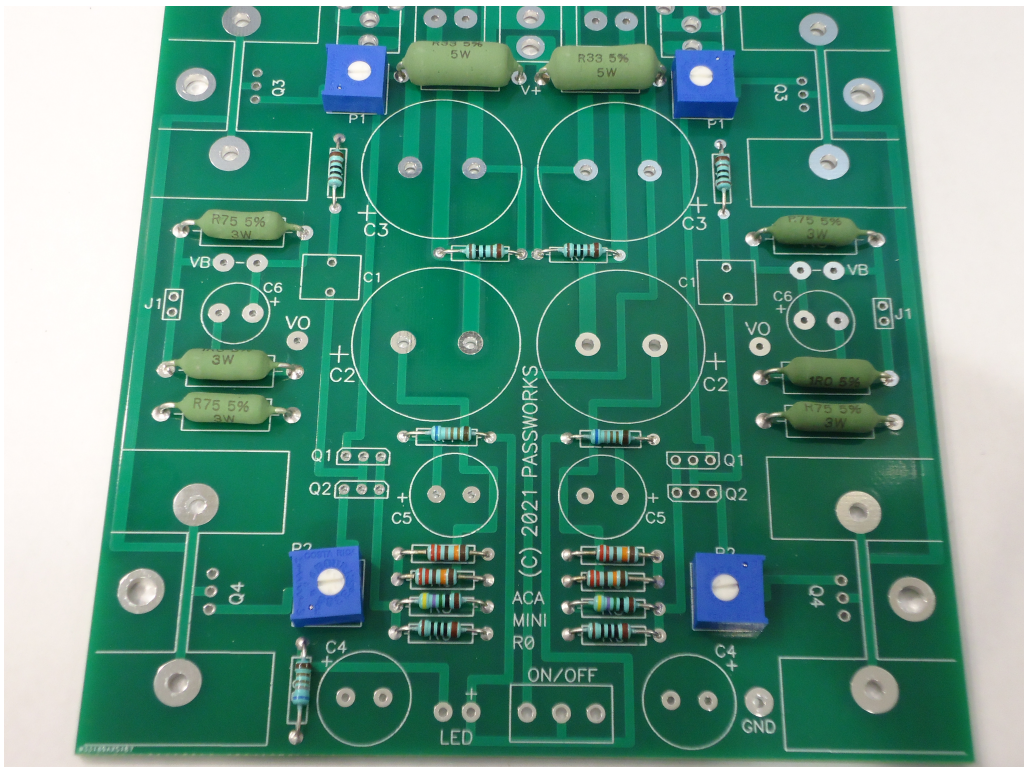
REFERENCE	QTY	ITEM	SOURCE	PART #
PC BOARD	1	2 CHANNEL PC BOARD		
R1, R7	4	1K	DIGIKEY	PPC1.00KYCT-ND
R2, R3	4	221K	DIGIKEY	PPC221KYCT-ND
R0, R4	3	6.8K	DIGIKEY	PPC6.81KYCT-ND
R5	2	475	DIGIKEY	PPC475YCT-ND
R6	2	100	DIGIKEY	PPC100YCT-ND
R8, R9	4	0.75 OHM 3W	DIGIKEY	PPC3W.75TB-ND
R10	2	0.33 OHM 3W	DIGIKEY	PPC3W.33CT-ND
R11	2	1.0 OHM 3W	DIGIKEY	PPC3W1.0TB-ND
P1, P2	4	1000 OHM PC MOUNT POT	DIGIKEY	3386P-102LF-ND
Q1	2	LSK170 JFET	LS	
Q2	2	LSJ74 JFET	LS	
Q3	2	IRF9520 (HARRIS)		
Q4	2	IRF520 (HARRIS)		
C1	2	1 UF FILM CAP - WIMA	MOUSER	505-MKS21/100/5
C2, C3	4	15K UF ELECTROLYTIC	DIGIKEY	495-77174-ND
C4, C5	3	1000 UF 25V ELECT	DIGIKEY	493-5913-1-ND
C6	2	3.3F 2.7V SUPERCAP	MOUSER	581-SCCR20B335PRBLE
INPUT CONN L	1	RCA INPUT PC MOUNT GRN	DIGIKEY	CP-1423-ND
INPUT CONN R	1	RCA INPUT PC MOUNT RED	DIGIKEY	CP-1419-ND
POWER CONN	1	PWR JACK 2.5X5.5MM	DIGIKEY	CP-037B-ND
OUTPUT CONN	2	TERM BLOCK 5MM 2 POS	DIGIKEY	ED-1609-ND
SWITCH	1	SPDT SWITCH	DIGIKEY	EG2355-ND
LED	1	LED	DIGIKEY	1080-1063-ND
SCREW #3 M	4	M3X8 SOCKET HEAD		
NUT #3 M	4	M3 KEPNUT		
SCREW 6-32	4	6-32 X 0.25"		
SPACER 6-32	4	6-32 X 0.5"		
HEAT SINK	4	AAVID TO-220 BOARD MNT	DIGIKEY	HS380-ND
POWER SUPP	1	MEANWELL GSM90B24-P1M	DIGIKEY	
PS CORD	1			

The kit arrives looking like this, plus the power supply and cord:



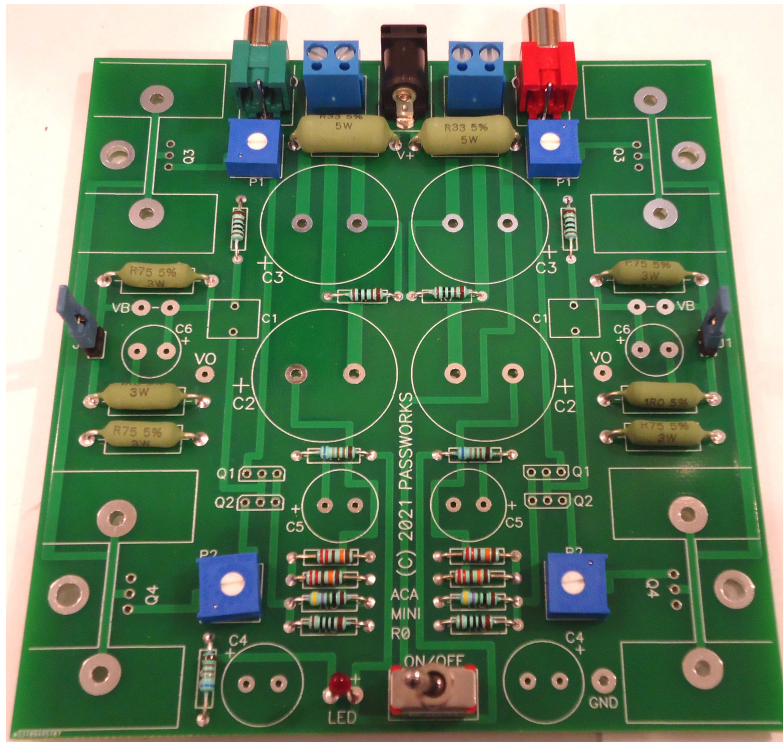
I suggest that you count out the parts, confirming that they match the BOM before you start.

I further suggest that assembly starts with the resistors - first all the small 0.4 watt resistors mounted and soldered, then the larger resistors and the potentiometers. I recommend that you use a digital multimeter to check the resistance values of each before mounting, as the color codes on these can be confusing.





Next comes the connectors. You will note the jumpers on each side with the two longer pc pins joined to the blue shorting connector. The long lead on the LED is +



And below we have mounted the small capacitors. Make note of the polarities, as it is easy to put them in backward.

