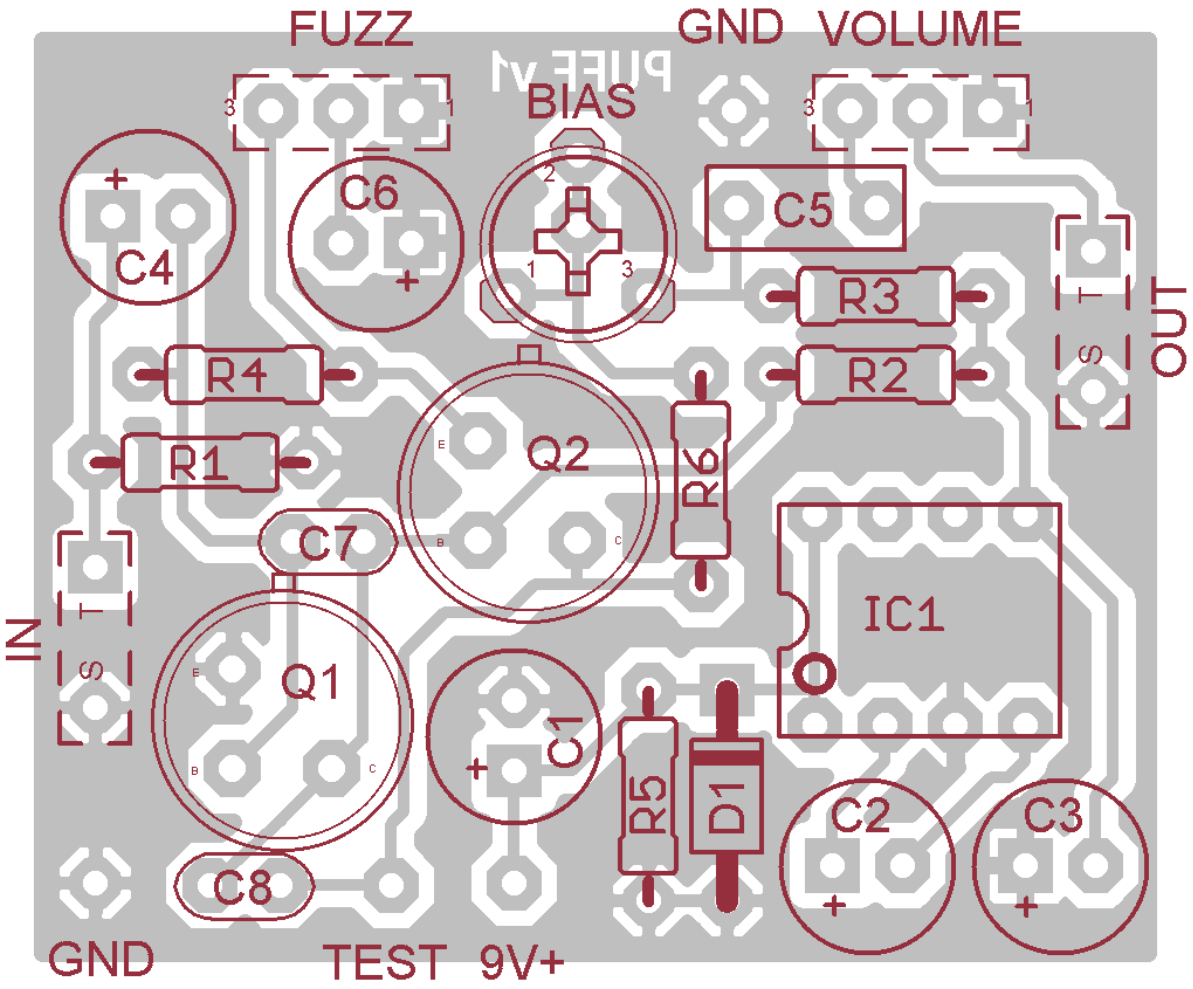
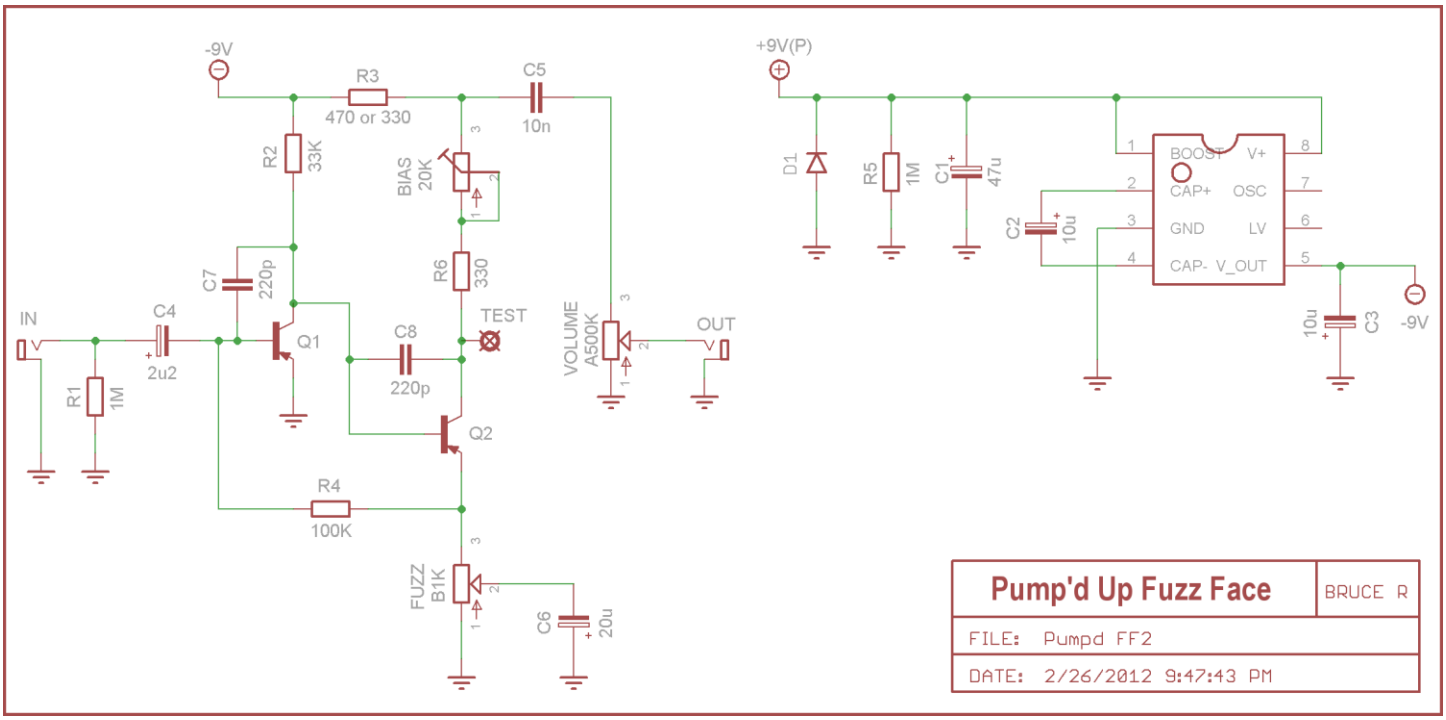
Fuzz Face PNP with Charge Pump

This is an updated PCB from www.guitarpcb.com which includes a few modifications from the original circuit on which it is based.



Part	Value
R1	1M
R2	33K
R3	470 or 330
R4	100K
R5	1M
R6	330
D1	1n4001
BIAS	20K Trimmer
IC1	7660S or compatible charge pump-see text
C1	47u

Part	Value
C2	10u
C3	10u
C4	2u2
C5	10n
C6	20u
C7, C8	100-220p Ceramic (Optional-see text)
Q1	PNP Transistor ~80-100 hFE
Q2	PNP Transistor ~95-120 hFE
VOLUME	A500K
FUZZ	B1K



Notes about this build

- A charge pump has been added to allow this Positive-Ground circuit to share a power supply with negative ground pedals. Positive-Ground circuits typically cannot share a power adapter with negative ground pedals. This is ideal for pedal boards that use daisy-chained power and projects which contain multiple effects within a single enclosure.
- The charge pump you use must be compatible with the 7660/1044 pin layout. Some charge pumps have a frequency-boost feature which will increase the oscillator from the default 10kHz up to 35-45kHz. We recommend that you use a charge pump with this boost feature to avoid any whine or clock noise. We have seen a high failure rate with some manufacturers' MAX1044 chips, so we prefer the 7660S (e.g.: TC7660**S**CPA). While all 1044 chips seem to have the boost feature, on the 7660 chips, the "S" designation after the number indicates that it has the frequency boost feature, whereas the original 7660 (without an "S") chips did not.
- The original Arbiter Fuzz Face pedals were equipped with NKT275, AC128, or SFT363E transistors, depending on what date the unit was manufactured. None of these are readily available today, and those that do exist are quite expensive. Many of the most commonly available and affordable Germanium transistors available today come in a TO-5 metal canister, which this board was intended to accommodate. Examples of these include 2n404, 2n404A, 2n1305, 2n1307, 2n1309, CV7355, etc. There are a number of Germanium transistors that come in smaller packages as well, which also fit on this board easily.
- Germanium transistors can be damaged by heat. We recommend that you socket the transistor holes, and then insert the transistors into the sockets after the heat has dissipated. If you don't socket, it is recommended that you use a small alligator clip on the component side of the lead from the solder joint to act as a heat sink while soldering.

- Vintage germanium transistors vary greatly from one piece to the next, including gain values, leakage, etc. Some of these transistors may generate some high-end hiss, which is not desirable. To account for this, this board layout includes 2 small capacitors which were not in the original circuit, C7 and C8. These act as a filter for the hiss, but do not reduce the level of any of the high-pitch guitar notes. We recommend that you initially build this project without these, and determine if they are needed after performing a sound check. If used, recommended values are 100-220pf.
- This circuit also contains modern features such as a reverse-polarity protection diode, and 2 pull-down resistors that discharge capacitors when the circuit is not in use. There is also a biasing trimmer resistor that is described in more detail in the next section.
- This PCB has a ground for each audio jack sleeve. If you use another wiring scheme to ground the sleeve of the audio jacks, such as a GuitarPCB.com 3PDT board, star wiring, etc, you may leave these empty and just use the "T" or "tip" pads. Just make sure the board is connected to ground at some point or it will not work.

Biasing

In order to have this circuit sound like a Fuzz Face, you must use transistors in the recommended gain (hFE) ranges and correctly bias the circuit. There is a 20K trimmer potentiometer on this board designed to help you adjust the bias perfectly to adjust for variances in transistors. The "Test" pad on the board can be populated with a single SIP socket, or a thick lead from a diode, etc. If you have a digital multimeter with test clips, you can clip one DMM test lead onto this bias test pin and the other to ground, leaving your hands free to adjust the trimmer. To properly bias, adjust the trimmer until your DMM reads about 4.5-4.8 VDC, or half of the input voltage (most guitar effects wall adapters and new 9V batteries measure about 9.6 VDC).

For more information (hyperlinks embedded within):

- *Crash Course in Pedal Building* by Bruce R.
- *Technology of the Fuzz Face,* by RG Keen.
- *How and Why to Solder Correctly* YouTube video by Curious Inventor
- *Easy Pedal Wiring Diagram, Pots and Power* by GuitarPCB.com forum members
- *Boards with T and S style wiring options* by tonmann
- *Biasing Part One* by tonmann

Special thanks to:

- RG Keen, for his analysis of this circuit on geofex.com (see link above)
- Tonepad, as I referenced their charge pump circuit on their bipolar power project
- BeeJive Pedals, as I referenced their Fuzz Face circuit and borrowed a few of their ideas around the trimmer and bias test terminal on the layout.