

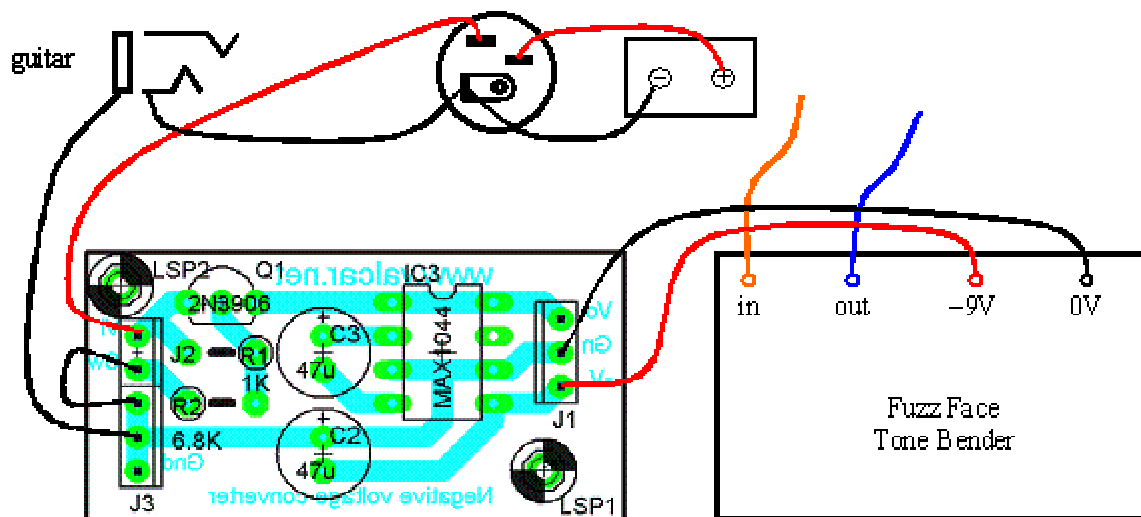
Charge Pump

One of the most interesting electronic circuits I've seen is the Charge Pump, based on the IC MAX 1044. This IC can double, divide or invert a positive DC voltage. Amazingly, it uses only few capacitors, and no transformer at all. Of course the output current is limited to few milliamps, but you can certainly find thousands of low power applications that can benefit from it. I show you here three layouts of printed circuit using IC MAX 1044, which are a halfer, a doubler and an inverter DC voltage. The most common of these circuits is of course the inverter, that generates negative voltages from a positive voltage. The main use of these circuits is to power effect pedals for guitars, or Stomp Box, if you like. There are several DIY projects whose circuit shall be powered by 18 VDC, + and - 9VDC, or even 4.5 V. All these voltages can be generated with the boards shown here, from a single 9VDC power supply. So the printed circuits are:

- 1) Inverter (Negative voltage converter) to generate negative voltage
- 2) Doubler (Voltage doubler) to double the input voltage
- 3) Converter (voltage converter) to generate negative voltage, doubled and/or half voltage.

The latter one is the most generic and can be used partially, for instance, to generate only the negative voltage (the others can be disregarded). In this case, some components may also be excluded from the circuit.

The circuits have separate inputs and outputs for easy assembly. The input voltage is also available in the output, which enables connecting the power with the pedal board without the wires to share holes (see application example below). There are three input and one output pads for grounding in order to ground the jacks.



Application example of Negative Voltage Converter in the Fuzz Face or Tone Bender pedal's circuit.

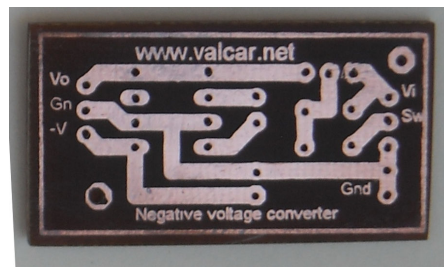
The Sw input pad can be used to switch on and off the output power. If Sw is grounded all the output lines are enabled, or disabled if Sw is disconnected or connected to the input voltage. Normally you just ground the Sw input through a jumper, as shown in the figure above, and the output will always be enabled.

The meaning of the input and output pads is shown in the table below

Input and output voltages

Symbol	Sense	Legend
V _i	Input	Power Supply (9V)
Sw	Input	Output switching (grounded: on - open: off)
Gnd	Input	Ground (0 V)
Gn	Output	Ground (0 V)
V _o	Output	Power Supply (8.3 v)
V ₋	Output	Negative Voltage (-9V)
2V	Output	Doubled Voltage (18 V)
V/2	Output	Half voltage (4.5 v)

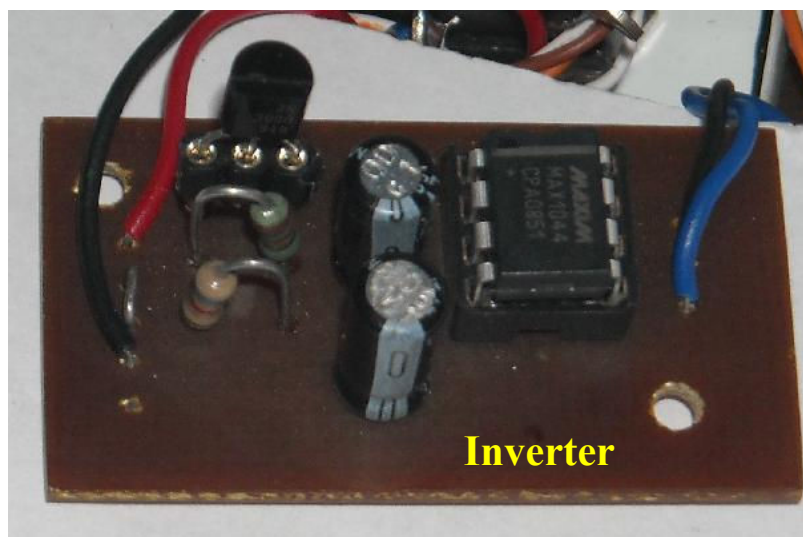
Inverter:



Of course, the bill list depends of the circuit you may want to make, so the next table shows you what you need to buy.

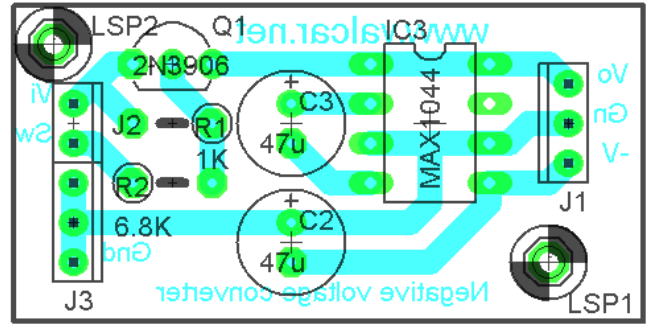
Bill Material List

Component	Type	Qty.	Value	Inverter	Doubler	Converter
R1	Resistor	1	1K	✓	✓	✓
R2	Resistor	1	6.8K	✓	✓	✓
C1	Capacitor	1	47uF		✓	✓
C2	Capacitor	1	47uF	✓	✓	✓
C3	Capacitor	1	47uF	✓		✓
C4	Capacitor	1	47uF			✓
C5	Capacitor	1	47uF			✓
D1	Diode	1	1N4004		✓	✓
D2	Diode	1	1N4004		✓	✓
Q1	Transistor	1	2N3906	✓	✓	✓
IC2, IC3	CI	1	MAX1044	✓	✓	✓

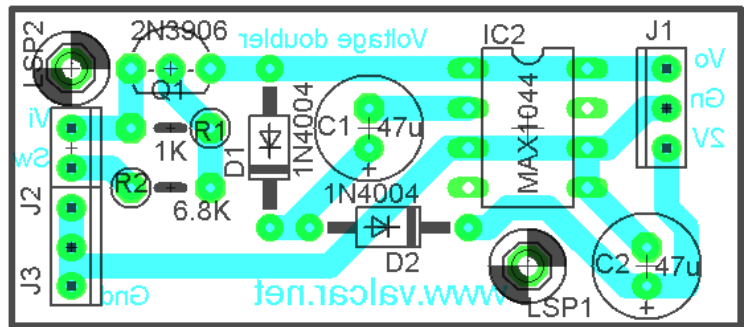


The parts layout of each circuit is shown below. Please note that the converter needs a jumper (J5).

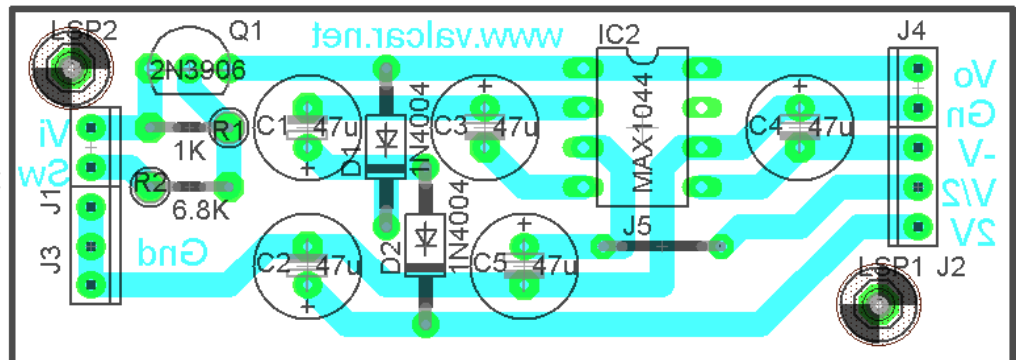
Inverter:



Doubler:



Converter:



The layout of the printed circuits are shown in next page. E-mail me if you get yourself in trouble with these circuits. Good look!!!

Valdemir Carrara

November 2010

