

Baofeng Battery Eliminator BF-8, Tear-Down

This is the battery eliminator supplied for the BaoFeng UV-82 series hand-held radios. The eliminator is snapped to the back of the radio in place of the normal battery. The cable is then plugged into a cigarette lighter or accessory socket (12V only). This allows your radio to run off the vehicle or other selected 12V source. The eliminator supplies 7.5V (nominal) to the radio directly from car. Note that with the car running, the nominal 12 volts in the vehicle system may actually be as high as 14.4 volts.

As shown, the label on the eliminator states an input rating of 12-14vdc and an output of 7.5 volts at 3A. (presumably max?)



What's inside

There are 2 - TO220 devices fastened to a small aluminum heatsink (20 x 34 x 1.8mm.), 2 electrolytic capacitors and 2 ceramic capacitors. See schematic at end of article.

The board and the heatsink are secured to the plastic case with epoxy, as you can see in the photos which follow.

The TO-220 devices appear to be **L7808CV** (8 volt 1.5 amp) voltage regulators, from ST Microelectronics.

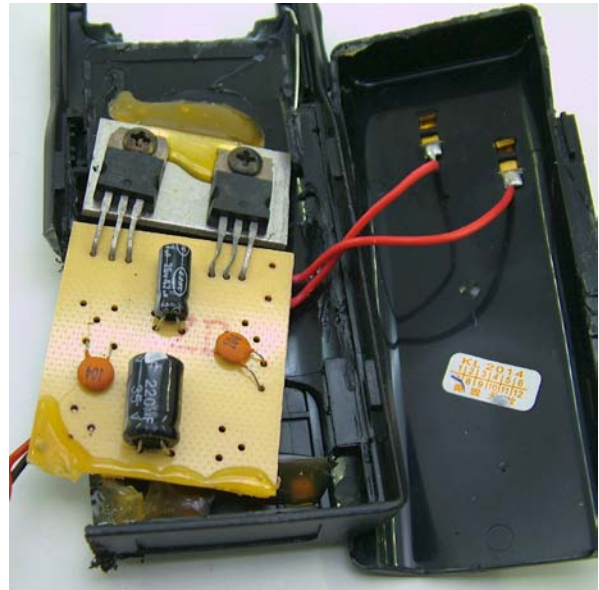
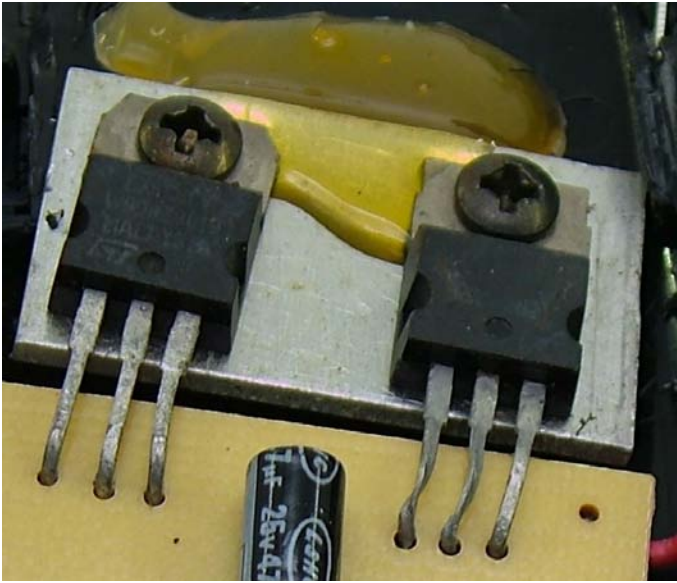
However, it is obvious that an attempt has been made to wipe the branding from the devices, which suggests to me that a) they are either counterfeit parts or b) they are process rejects from ST for some reason that is not immediately obvious.**

I note as well, the leads of one device seem to be twisted as if removed from another product. Overall workmanship and soldering is very much sub-standard.

What is somewhat unusual, is that the 2 L7808CV voltage regulators are wired in parallel. This is not an application that you normally find on a manufacturers datasheet.

The UV82 transceiver needs about 1.6 amps at 8 volts to produce 5 watts RF output, so a single regulator will not do the job. (max current for L7808CV is 1.5 amps) This parallel arrangement of 2 regulators only works well if the regulated output voltages of the parts are matched, in other words very close together. In practice, one of the 2 devices will take more current and will approach its current limit. Then it will fold back and cause the 2nd regulator to provide more of the output current. Some kind of equilibrium is eventually established. As well, with both mounted on the same small common heatsink, the same sharing will occur for maximum junction temperature.

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Tests & Measurements

I first checked the RF output of my UV82 at several supply voltages, measured at the battery connection terminals on the back of the radio.

No surprises here –

@ 7.5V Current = 1.5A radio Po= 4.8W

@ 8.0V Current =1.55A radio Po=5.0W

@ 8.2V Current =1.57A radio Po=5.1W

The BF-8 battery eliminator that I had measured 8.1V output with no load, and 7.98V when connected to the UV82. If we assume that the input voltage to the BF-8 is 14 volts from a vehicle 12V system, and the current at 5 watts out is 1.55 amps, then the power dissipation in the BF-8 (directed into the little heatsink) would be $(14-8) \times 1.55$ or about 9.3 watts.

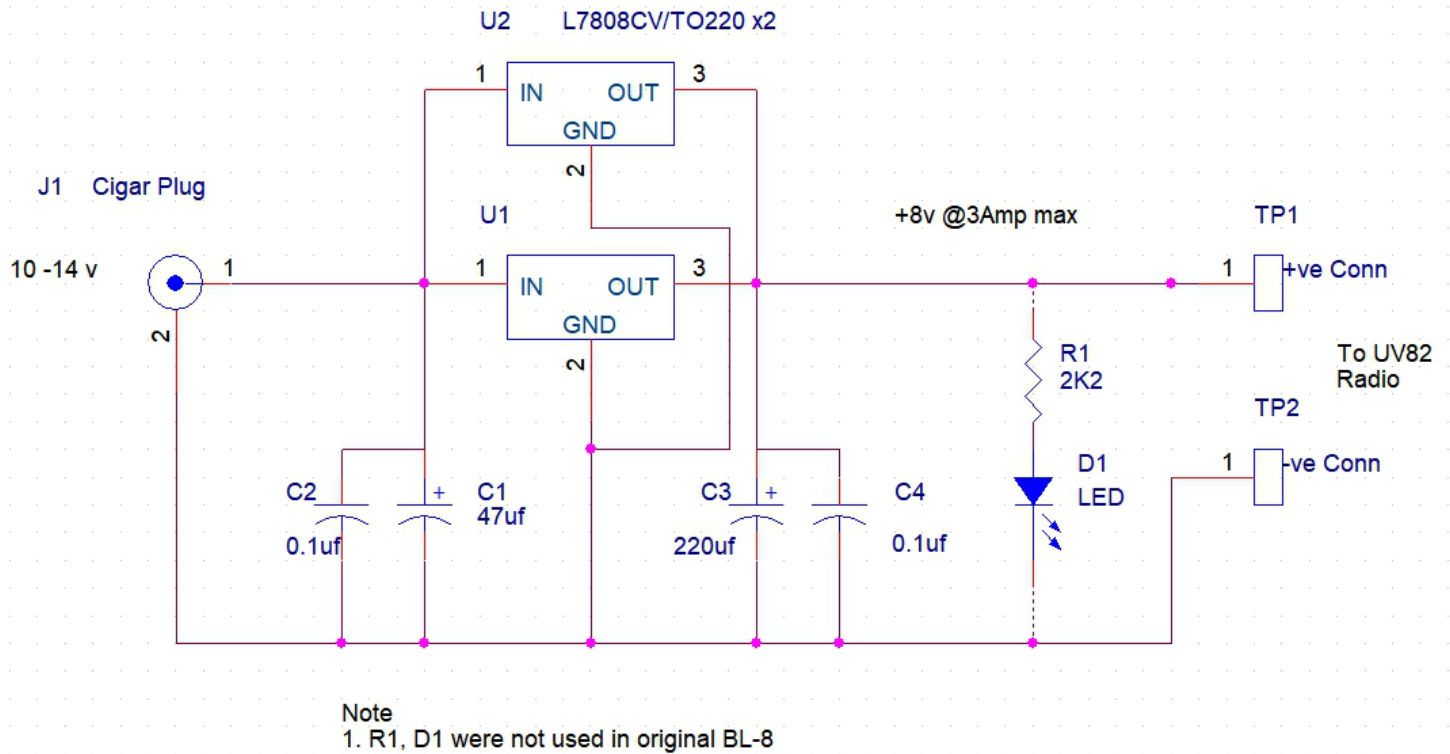
The L7808CV spec, shows that the thermal resistance from junction to case is 5 deg C per watt. The devices were dry mounted to the heatsink, so I added another 1 deg C per watt. (now j-hs=6 deg C/W) Therefore the temperature rise on the heatsink will approximate 6×9.3 or 55.8 C degrees. At an ambient temperature of 25 deg. C, the heatsink may then reach an actual temperature of $55.8 + 25$ or 80.8 degrees C. Heat conduction through the plastic case is the only means of cooling the heatsink.

I wondered if the confined space inside the BL-8 might result in even higher heatsink temperatures during extended transmissions. To check this out, I loaded the BF-8 output terminals with a 5 ohm 25 watt resistor to simulate the UV82 (1.6A), connected the input to +14V and monitored the output voltage for 15 minutes. The output voltage remained at 7.98V throughout the test.

The back of the BL-8 did feel quite hot to the touch. I regret I did not have means for temperature measurement at the time.

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Schematic



Summary:

In spite of the sloppy workmanship and unconventional circuit, the BF-8 did its job.

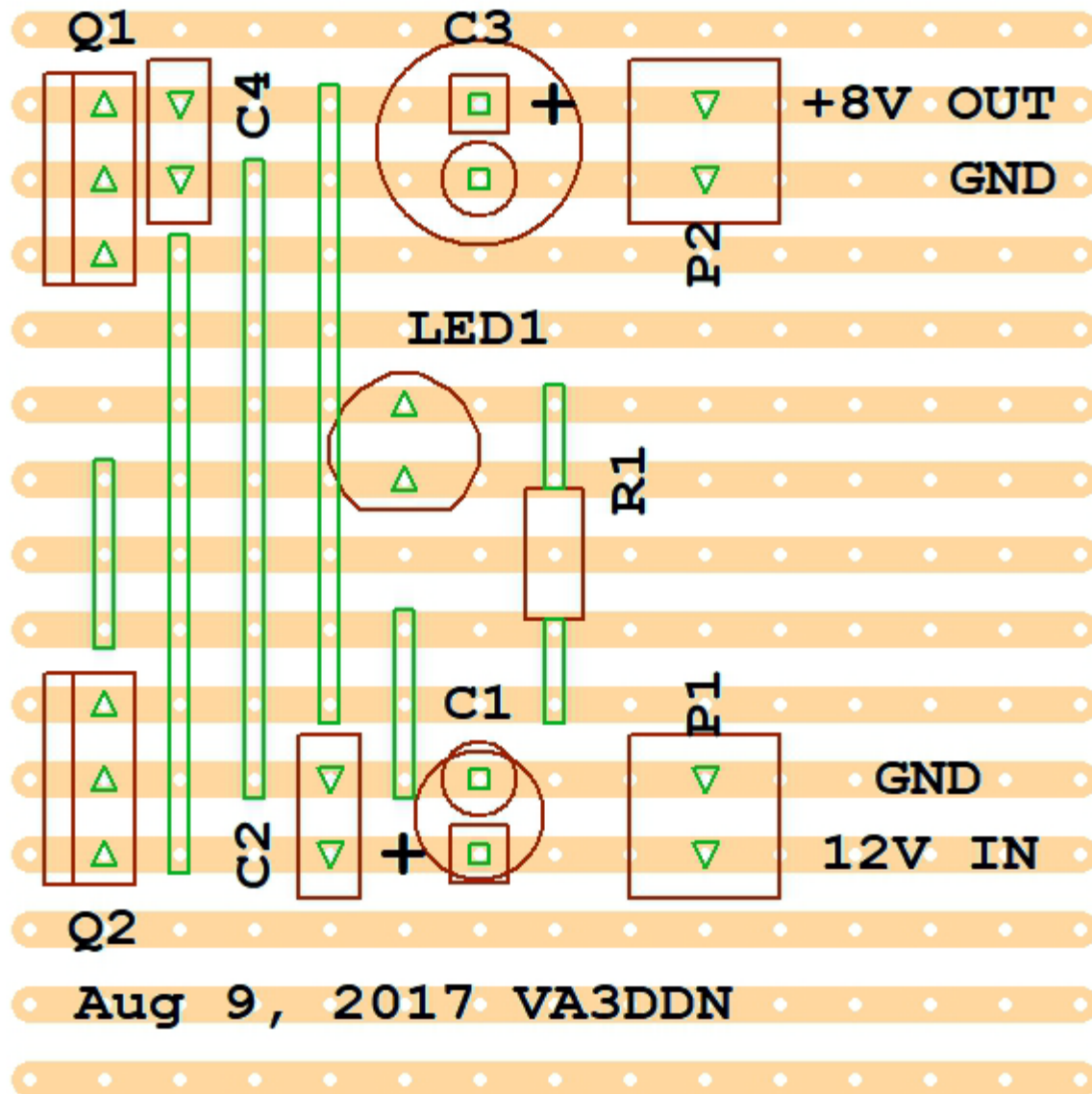
It is unlikely anyone would have a one way conversation of 15 minutes so overtemperature should not be a problem.

For anyone interested, I ended up building this same circuit on some strip-board and using it to power a UV82 used as a dedicated APRS transmitter, with a TinyTrak controller.

The strip-board outline below shows how I placed the parts, including the LED/resistor D1/R1 for monitoring V_o .

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Strip-Board Layout of the 2-Regulator Circuit



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****Note:** part counterfeiting and junk parts re-branding is too large a topic to be addressed here. I have personally run into situations involving both counterfeit semiconductors and rebranded factory reject semiconductors. Readers are encouraged to Google these topics which sadly are occurring much too often.