

## VOLTAGE-REGULATOR CIRCUIT

I would like to comment on the high-current voltage-regulator circuit that Robert Grossblatt presented in the "Drawing Board" department, for July 1983. Although Mr. Grossblatt's circuit certainly works, it suffers from two drawbacks: First, it uses two expensive PNP power transistors, and, second, it is more complex than it needs to be.

National Semiconductor's *Voltage Regulator Handbook* suggests the following circuit (Fig. 1).

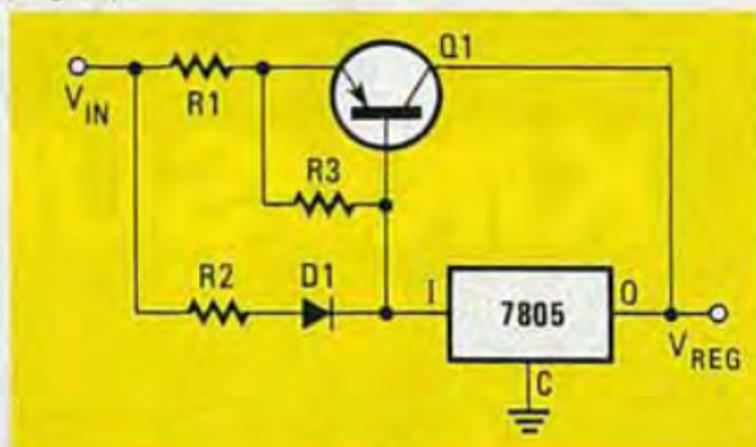


FIG. 1

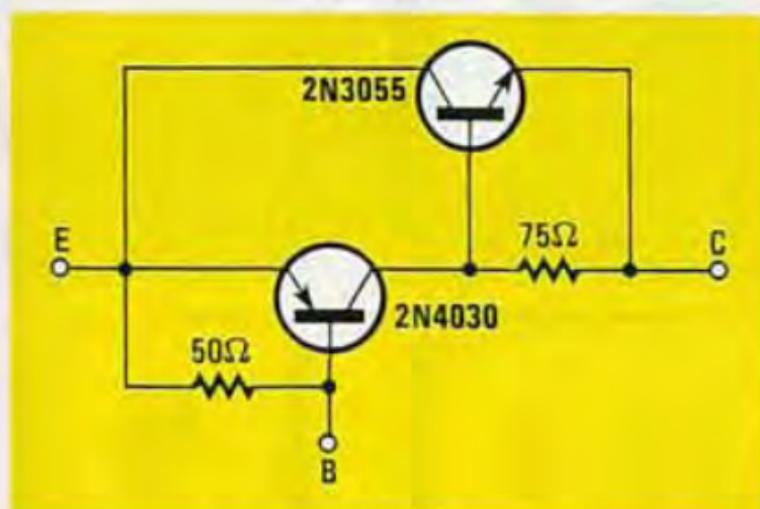


FIG. 2

This circuit uses the regulator's internal short-circuit protection to protect the transistor as well. The current through  $Q1$  is  $R2/R1$  times the regulator current, so the short-circuit current through  $Q1$  is  $R2/R1$  times the regulator's short-circuit current. Assuming appropriate heat-sinking, the regulator's thermal protection will also be extended to  $Q1$ .

For typical applications, National recommends the following components;  $Q1$ —2N4398,  $D1$ —IN4719,  $R2/R1 \geq 3$ ,  $R3$ —5 to 10 ohms.

Instead of using the expensive PNP power transistor, a small PNP transistor and an NPN power transistor can be combined as shown in Fig. 2.

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*The short-circuit protection in the 7805 was designed to handle the current capabilities of the 7805. Aside from dunking it in liquid nitrogen, you must have external protection if you use a pass transistor to increase the current. The circuit you sent will dump all the short-circuit current through the chip's internal pro-*

tection and, believe me, you'll fry the chip ... absolutely. You must provide another path for the excess current, as I did with Q2. The capacitors I indicate are needed for obvious reasons, and I can only assume that you left them out to make the drawing simpler. The same goes for the diode, D1, I used to protect against an input short.

As far as expense goes, the transistors needed only have to handle the current generated by the circuit that I developed, and you can get them for under \$1.00—about the same cost as the transistor you showed in your drawing. In any event, expense is a minor factor if the circuit cashes in the first time you have a short circuit. Remember—always design for worst case operation, because Murphy's Law shows clearly that pessimism can save you a lot of time and money.

ROBERT GROSSBLATT