

The DIY Dimmer Switch

A winter-time project that can save you money and amps.

By **TOM WETHERBEE**

The new Sensibulbs are so bright that I wanted to install a dimmer. With the dimmer described below, I am able to get half the light while using only one-sixth the power. (Editor's note: Many LEDs are not dimmable. In our comparison, only Imtra's GU4-21 bulbs are dimmable with this device.)

Sailor's Solutions offers a mini-dimmer for \$23. Being cheap, I elected to build my own for about \$5. The dimmer is a simple circuit and is easy for anyone with a little soldering experience to make.

As shown on the schematic below and the photo at right, my dimmer circuit consists of three components: a transistor, a linear potentiometer with integral switch, and a self-resetting PTC over-current protection device. The protection device acts as a circuit breaker in the event of a short circuit. The switch on the potentiometer is used as a power switch. The potentiometer provides a variable voltage to the base of the transistor. The transistor serves as the power device and passes the voltage to the Sensibulb. This type of device is called a voltage-follower or emitter-follower circuit.

Turning the dimmer knob clockwise clicks the switch on at the dimmest setting. Turning further increases the brightness. If you prefer to switch on full brightness and then dim, reverse the plus and minus wires connecting the potentiometer. Having the switch integrated with the dimmer makes it simple to use.

The parts and sources I used are listed below, but you can substitute similar components. If you use a different potentiometer, make sure it will fit. If the shaft on the potentiometer is too long, it can be easily shortened with a hack saw. Snipping off or folding back the lugs on the potentiometer will give

you a little more room.

Once you have the parts, use the large photo at right to guide placement, and the schematic below for electrical connections.

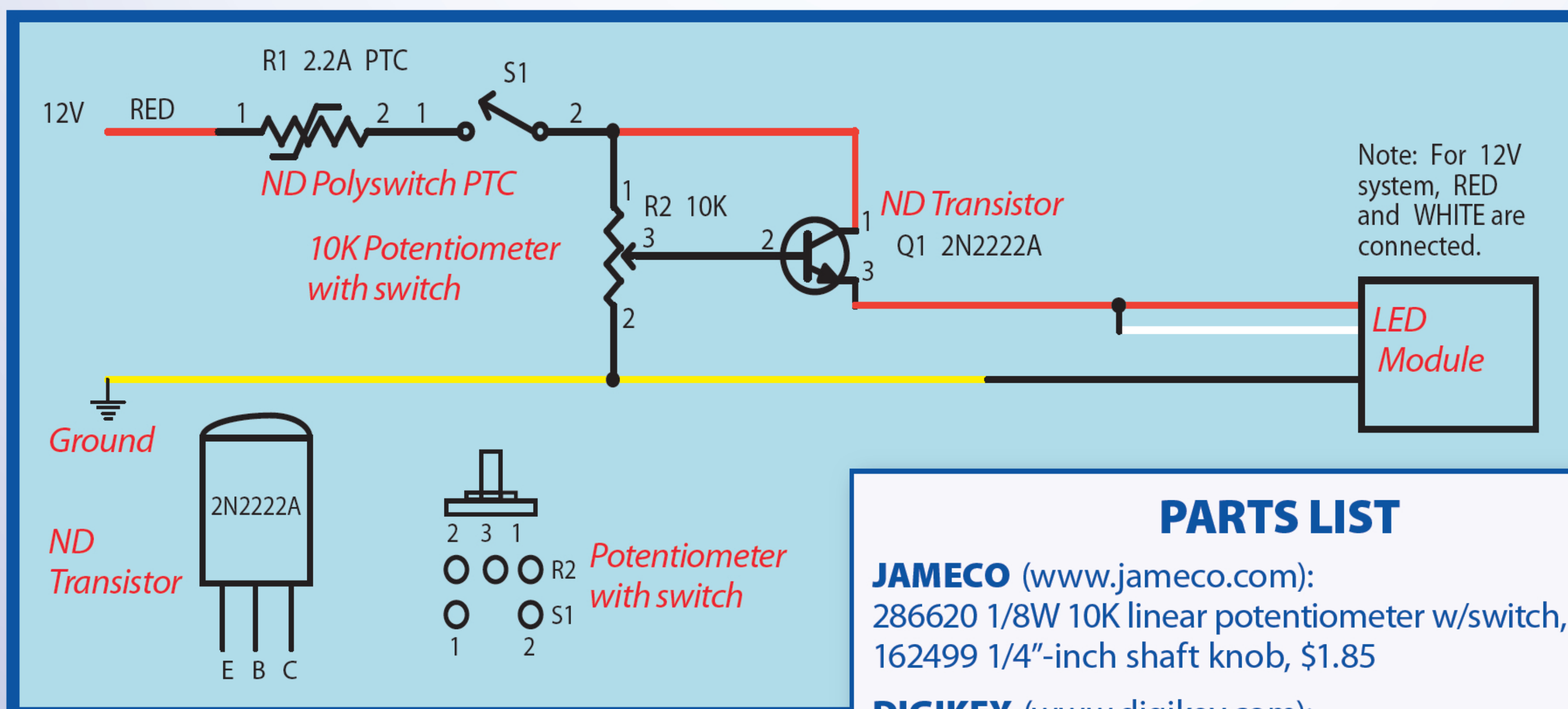
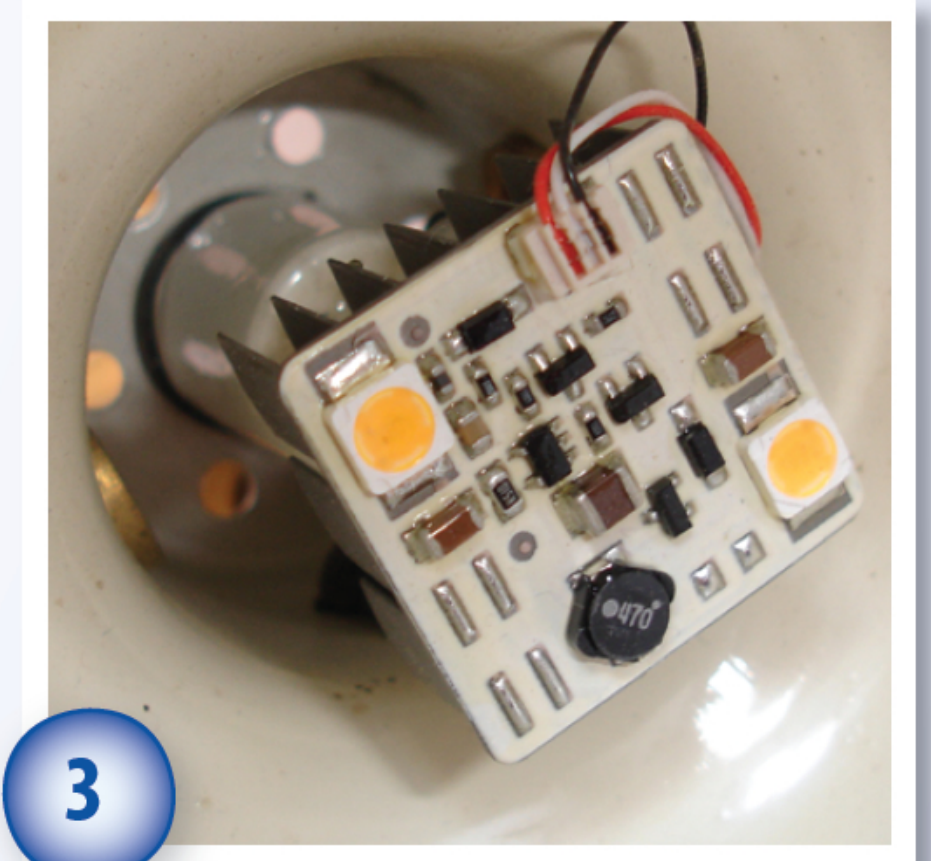
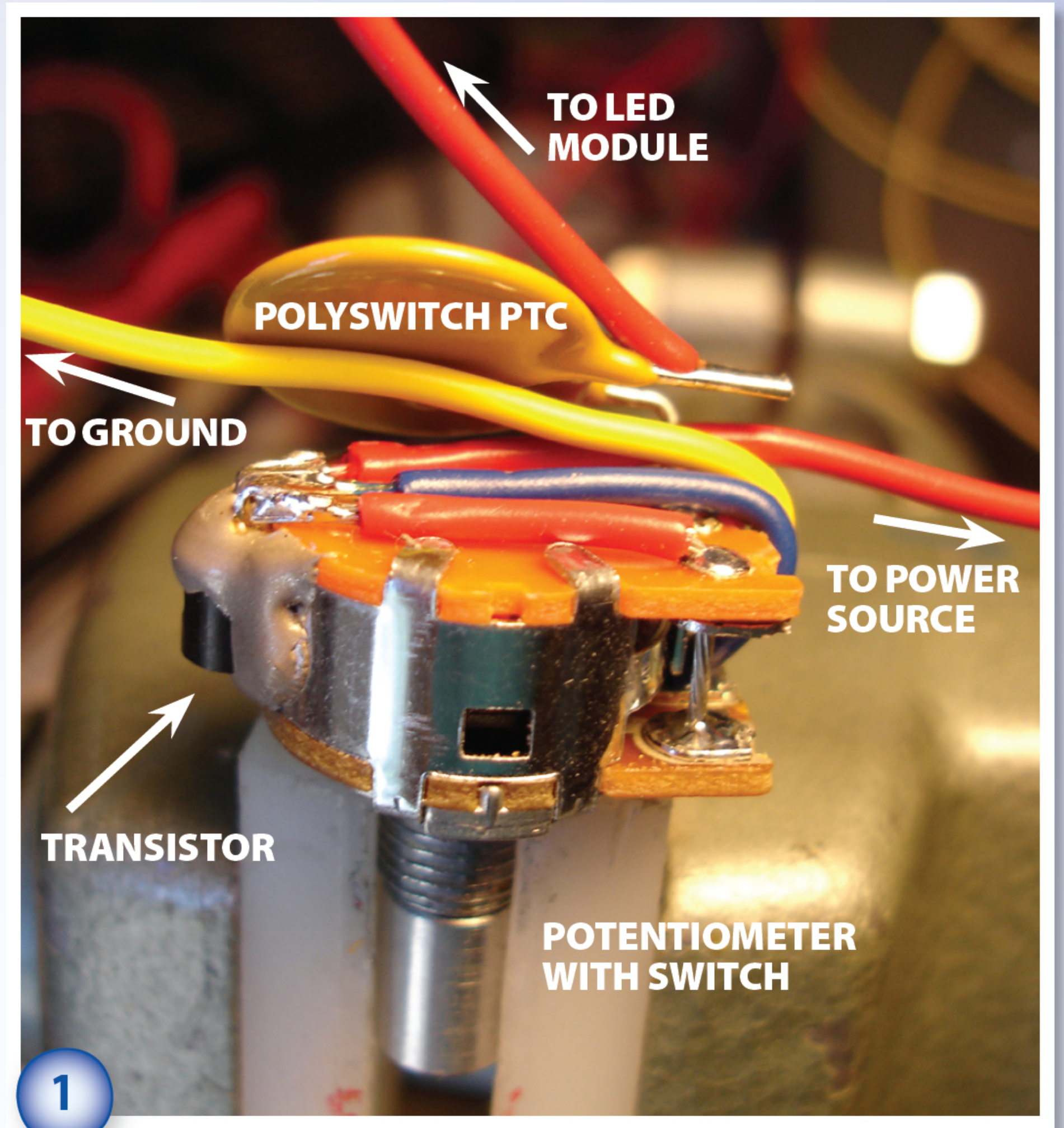
I chose to solder the transistor and PTC protection device directly to the potentiometer. This saves space and makes for good vibration resistance.

The transistor requires a small heat sink. By gluing it to the side of the potentiometer, you can use the case of the potentiometer. I used heat sink epoxy (amorphous gray material in photo) for better heat transfer, but ordinary epoxy is adequate.

The older Sensibulbs, as shown in the schematic, have three wires. For 12-volt operation, the red and white wires are connected. If you have a newer Sensibulb, you can ignore the white wire in the schematic.

Small pieces of insulation stripped from scrap wire can be used to insulate the module's leads and keep them from shorting. Also, leave slack in the wires for the lamp to swivel and rotate.

Finally, be sure to test the dimmer before installing it into the lamp, just in case you have a faulty component or bad connection.



PARTS LIST

JAMECO (www.jameco.com):
286620 1/8W 10K linear potentiometer w/switch, \$2.35
162499 1/4"-inch shaft knob, \$1.85

DIGIKEY (www.digikey.com):
RXEF185-ND Polyswitch PTC protection device, 53¢
P2N2222AGOS-ND transistor, 36¢

1. The components are soldered or glued to the potentiometer.
2. The potentiometer fits through the same hole as the original toggle switch.
3. For a more secure fit, the Sensibulb can be glued directly to the lamp post. See "Tools and Techniques" on www.practical-sailor.com for instructions.