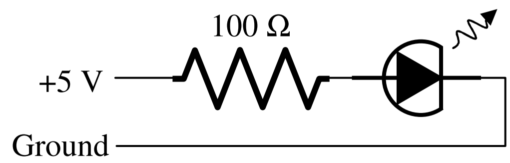
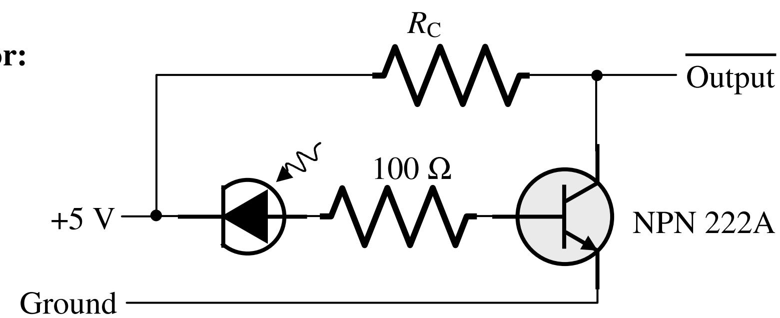
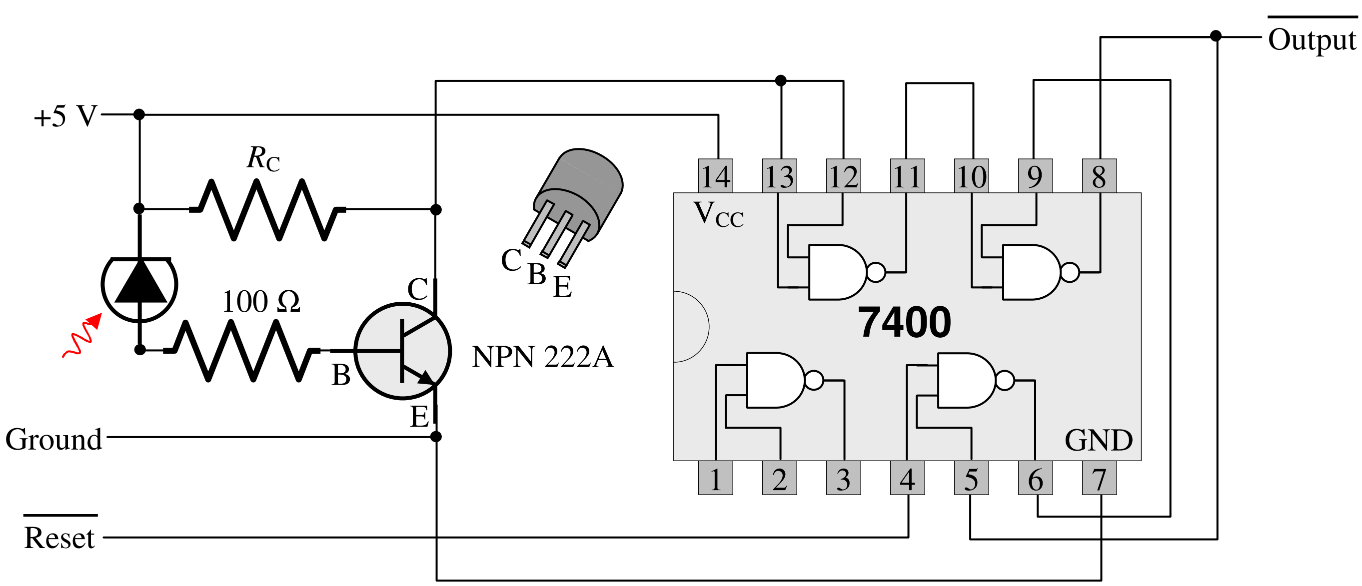
Build an LED Emitter:



Build a Digital Photodetector:

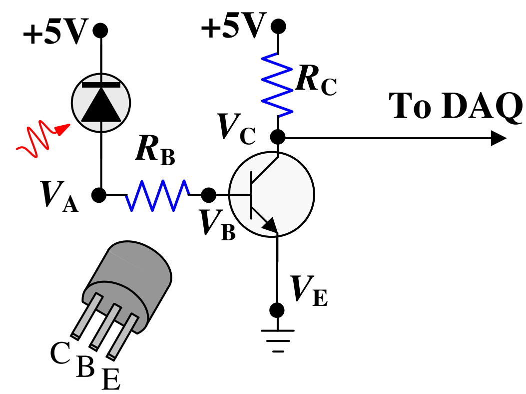


Build a Digital Photodetector with latch and reset:



With the 638-PD333-2C/H0L2 photodiodes, R_C is 10 kΩ.
With the alternate photodiodes, R_C is 100 Ω.
If you are using a different photodiode, you might have to experiment with R_C to get the appropriate results. In general, we want $V_C \rightarrow 0$ as it sees more light, and $V_C \rightarrow 5$V when it's in the dark.
For both circuits, the 100 Ω resistors attached to the transistor base "B" isn't strictly necessary.

Analog Photodiode Detector, Version 2:



This circuit generates an output voltage as follows:

"Dark" → 5.00 volts.
"Bright" → 0.05 volts.

For this circuit, the numerical value of R_B is pretty unimportant. I've tested it with values between 100Ω and 10kΩ.

For this circuit, the choice of R_C affects the kind of illumination you can easily detect.

If R_C is large (e.g, 10 kΩ), then generic room lighting creates an output voltage of about 1.0 V. If R_C is small (e.g, 1 kΩ), then generic room lighting creates an output voltage of about 4.0 V. These numbers assume that you're using the 638-PD333-2C/H0L2 photodiodes. See the note on the previous page if you're using a different kind.

You should adjust R_C (possibly using a potentiometer) so that the bulk of the illumination range you want (whether darker levels than background, or brighter) occupy most of the output voltage space. So, if you want to measure differences in light that is generally pretty bright, then use a small R_C. If you want to measure differences in light that is generally pretty dark, then use a larger R_C.

Parts List:

1.	Photodiodes:	Mouser # 638-PD333-2C/H0L2
2.	Bright Red LEDs:	Mouser # 638-333-2SURCS5306
3.	100 ohm resistors:	Mouser # 791-RC1/4-101JB
4.	10 kohm resistors:	Mouser # 791-RC1/4-103JB
5.	NPN Transistors:	Mouser # 610-PN2222A

6. Alternate Photodiodes: Mouser # 512-QSD2030, 710-1540051EA3590
7. Alternate Bright LED: Mouser # 638-333-2USOC/S530-A6