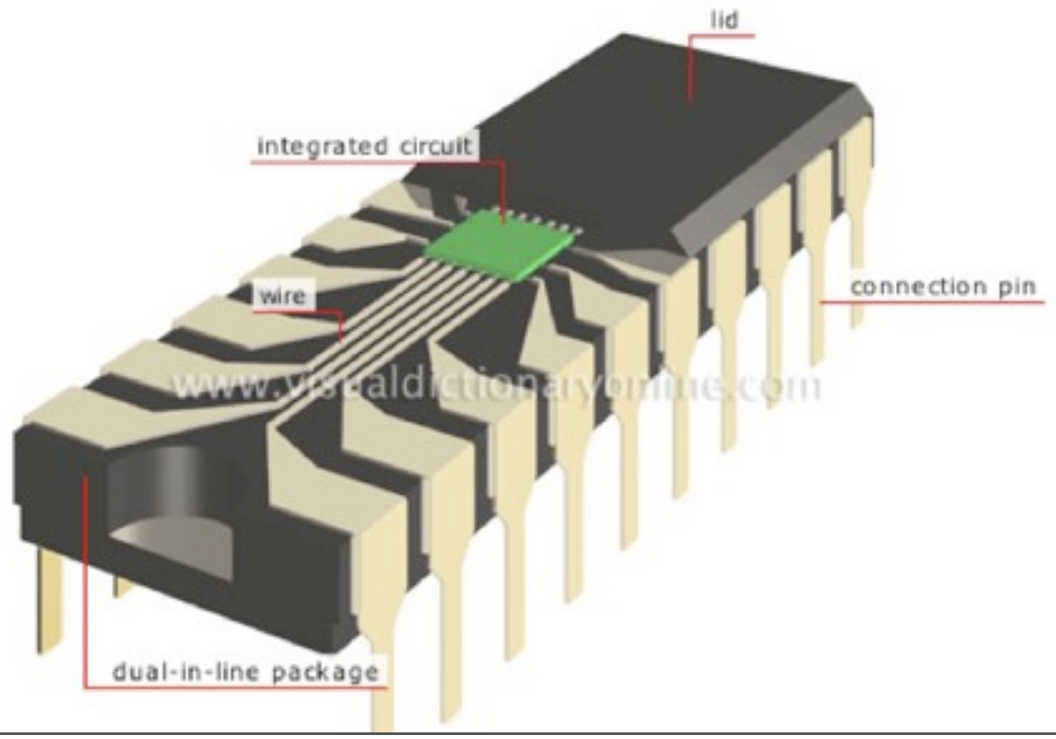
Integrated Circuits (IC's)

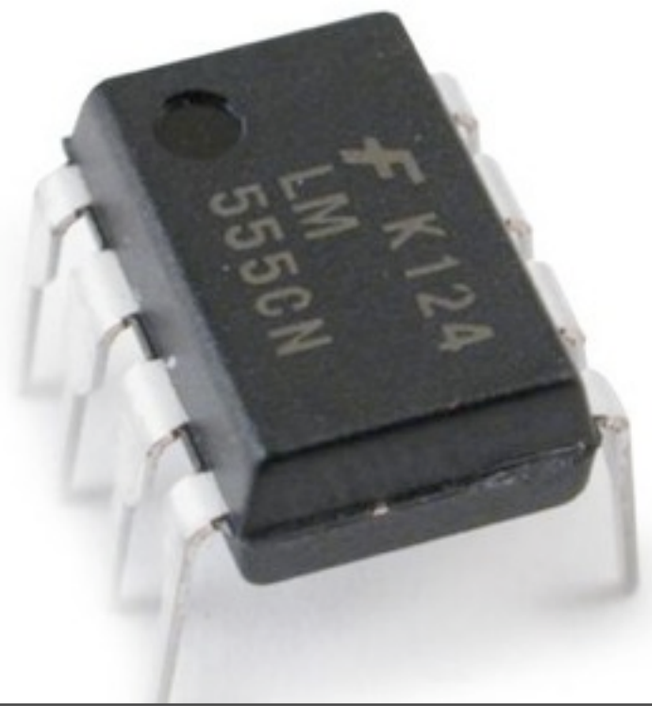
1) Multiple components (resisters, transistors, diodes, etc) built into a small single package.

2) Analog ICs deal with varying levels of voltage.

3) Digital ICs deal with only high (1) or low (0) states.

4) ICs are labeled with part number and manufacturing info.





Identifying ICs

1) All ICs have useful datasheets which can be found by entering the part # into google or searching through online retailers such as digikey.com, or mouser.com

2) Datasheets contain package information, electrical information, pin diagram, and hopefully application notes. Datasheets are your friend.

3) ICs come in a variety of packages. (ex. Voltage Reg. vs. 555 timer)

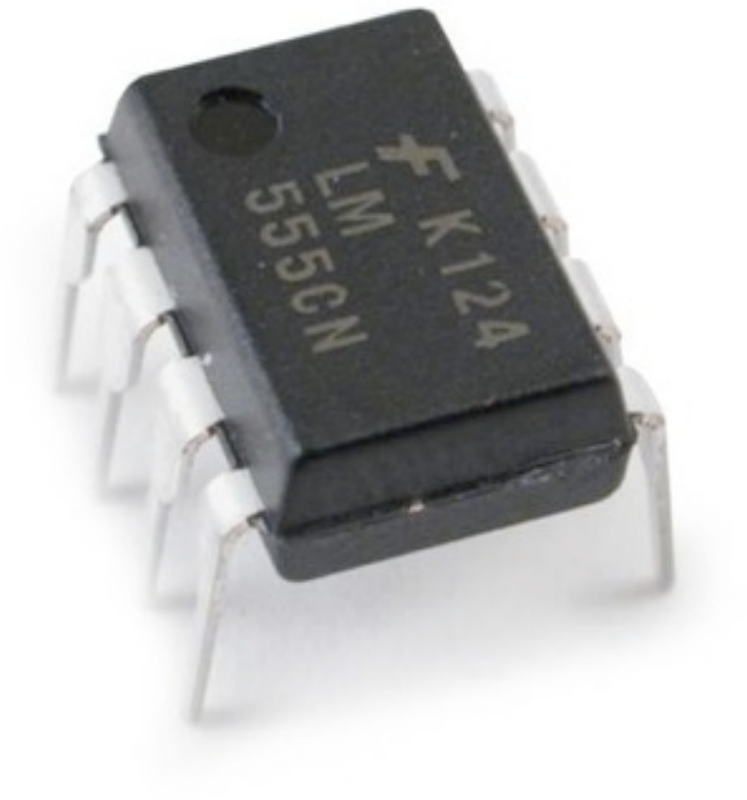
4) Surface mount components are extra small and are not meant for prototyping. You will be sad if you buy these by mistake.

5) DIP (Dual in line package) have pins spaced .1 inches apart, just like your breadboard. DIPs are your friend.

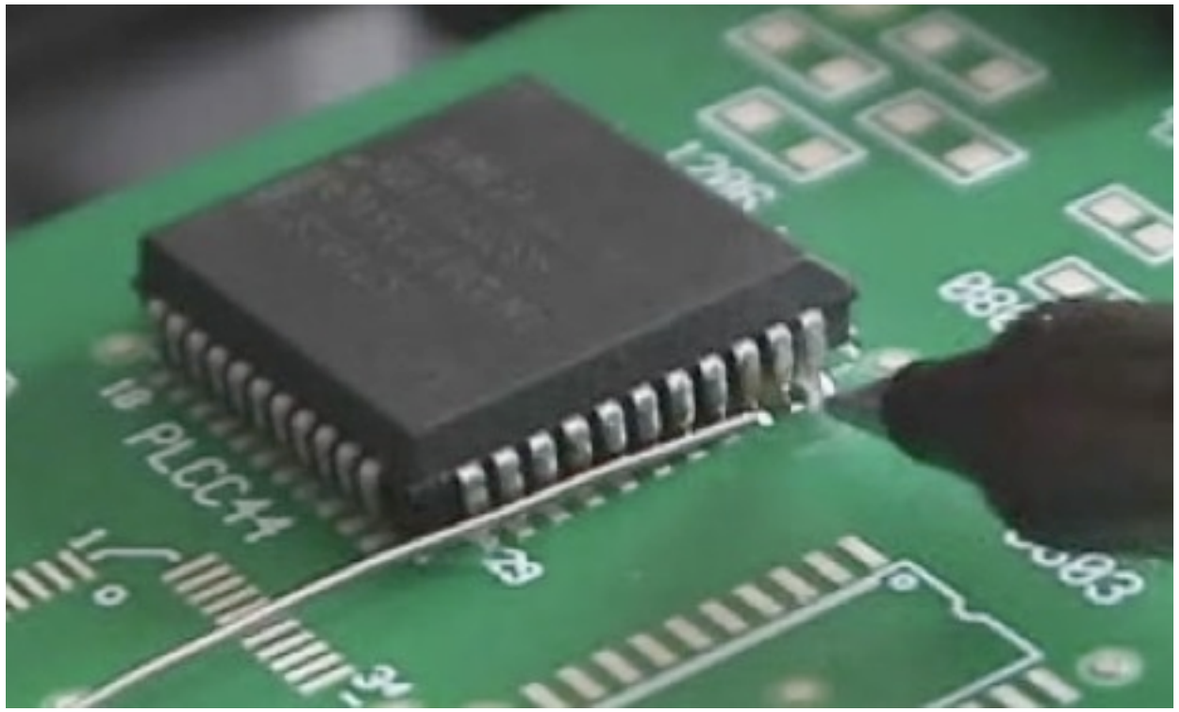
5) The top of an IC is typically marked with a notch or dot, or both.

6) Pins are numbered counterclockwise, starting in the upper left.

DIP



Surface Mount

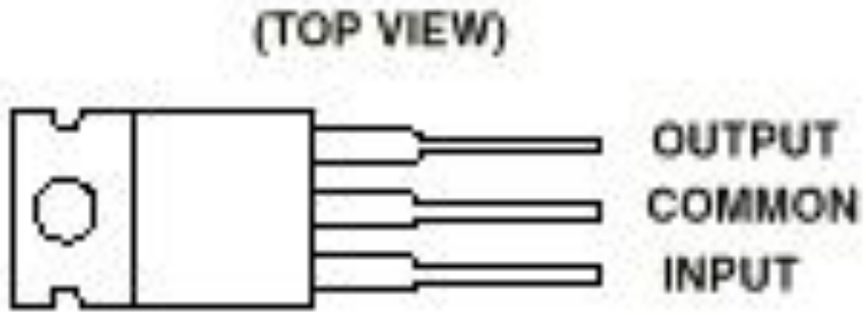


78XX Voltage Regulators

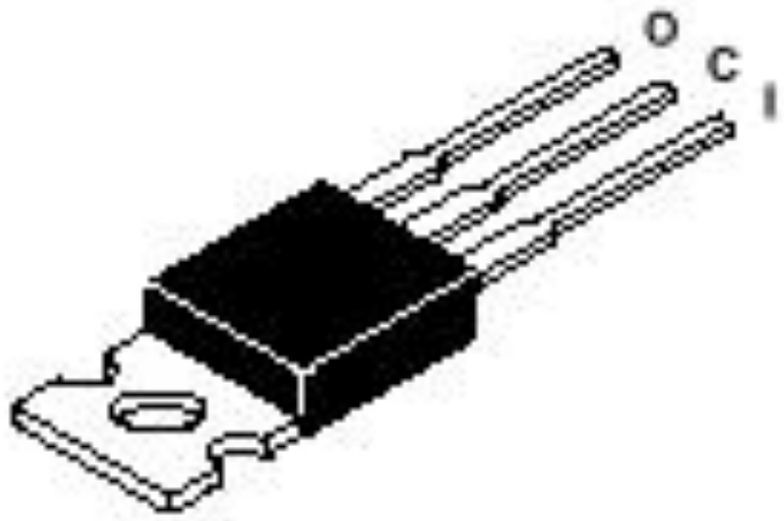
78xx family regulates a range of voltages.

2) 7805 regulates down to 5v. 7812 regulates down to 12v.

3) Extra voltage dissipated as heat.



The common terminal is in electrical contact with the mounting base.

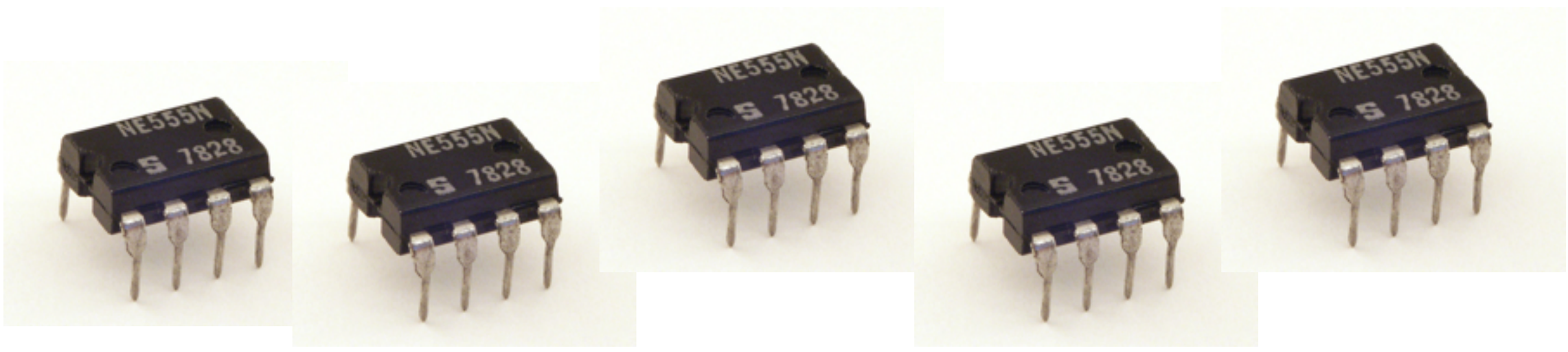


555 Timer

1) 555 is a precision timer that can operate as either a single shot timer (monostable mode) or an oscillator (astable mode).

2) 555 is "programed" by wiring it with resistors and capacitors.

3) Easy to use, cheap and has many applications such as led/light flashers, tone generators, one-shot timer circuits, etc



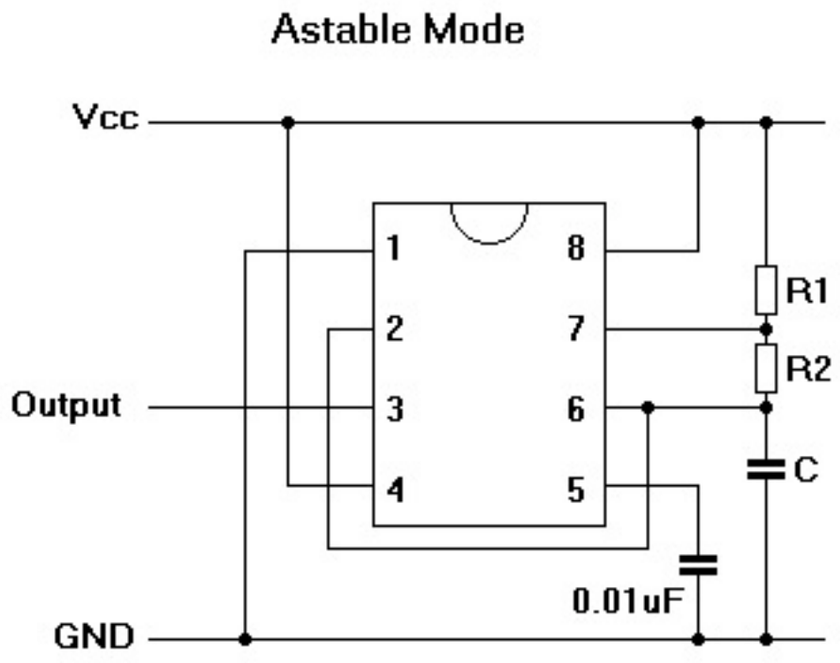
555 Astable mode

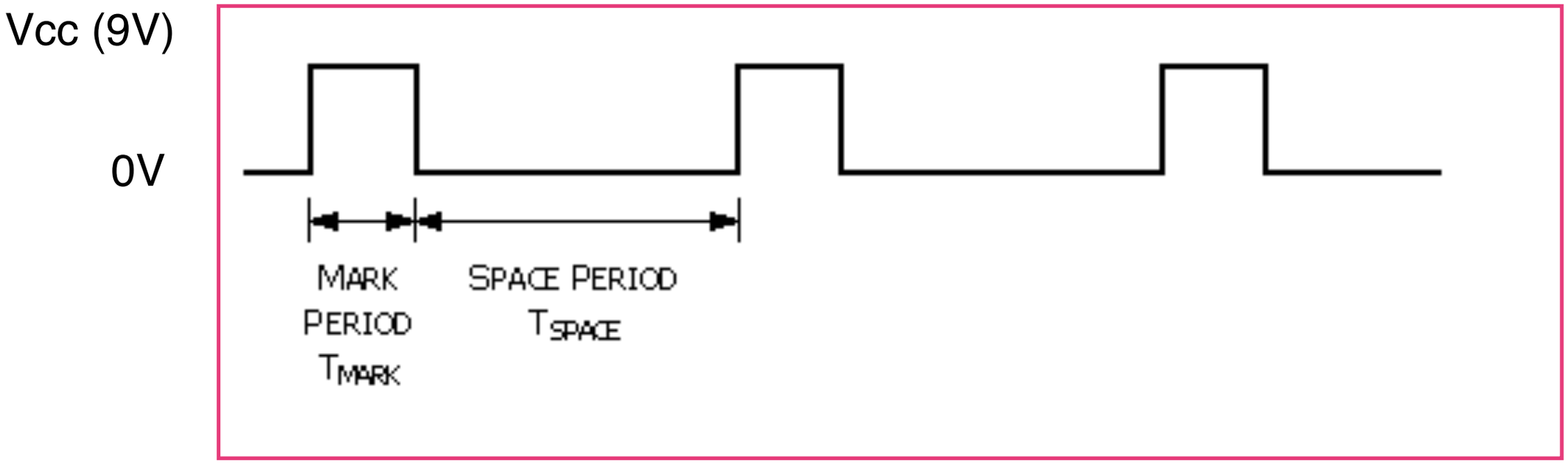
1) No stable state. Output jumps between Vcc and Ground.

2) Output is a "square wave" with a mark period and a space period.

3) Frequency is set by R1, R2 and C

4) Uses: flashing light, tone, pulse width modulation





If you need to know...

$$T_{mark} = 0.7(R_1 + R_2)C$$

$$T_{space} = 0.7R_2C$$

$$F = \frac{1.44}{(R_1 + 2R_2)C}$$

In other words:
The period of the sq. wave
is a function of R1, R2 and C!

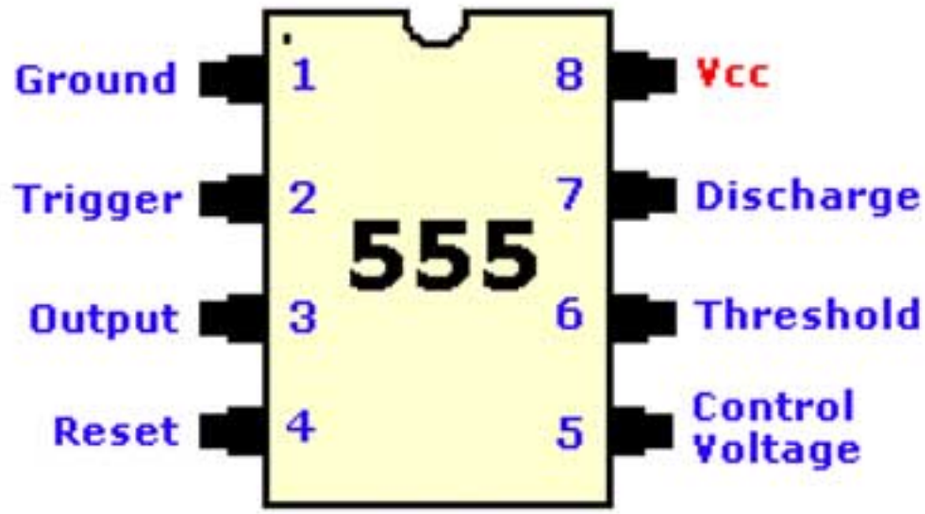
555 Pin Details

1. Connects to Ground!

2. Trigger: A short low (less than 1/3 Vcc) pulse on the trigger starts the timer. By connecting this to ground we "turn on" the 555 timer

3. Output: During a timing interval, the output stays at +VCC. Can source up to 200ma.

4. Reset: Forces pin 3 low if pulled to ground.



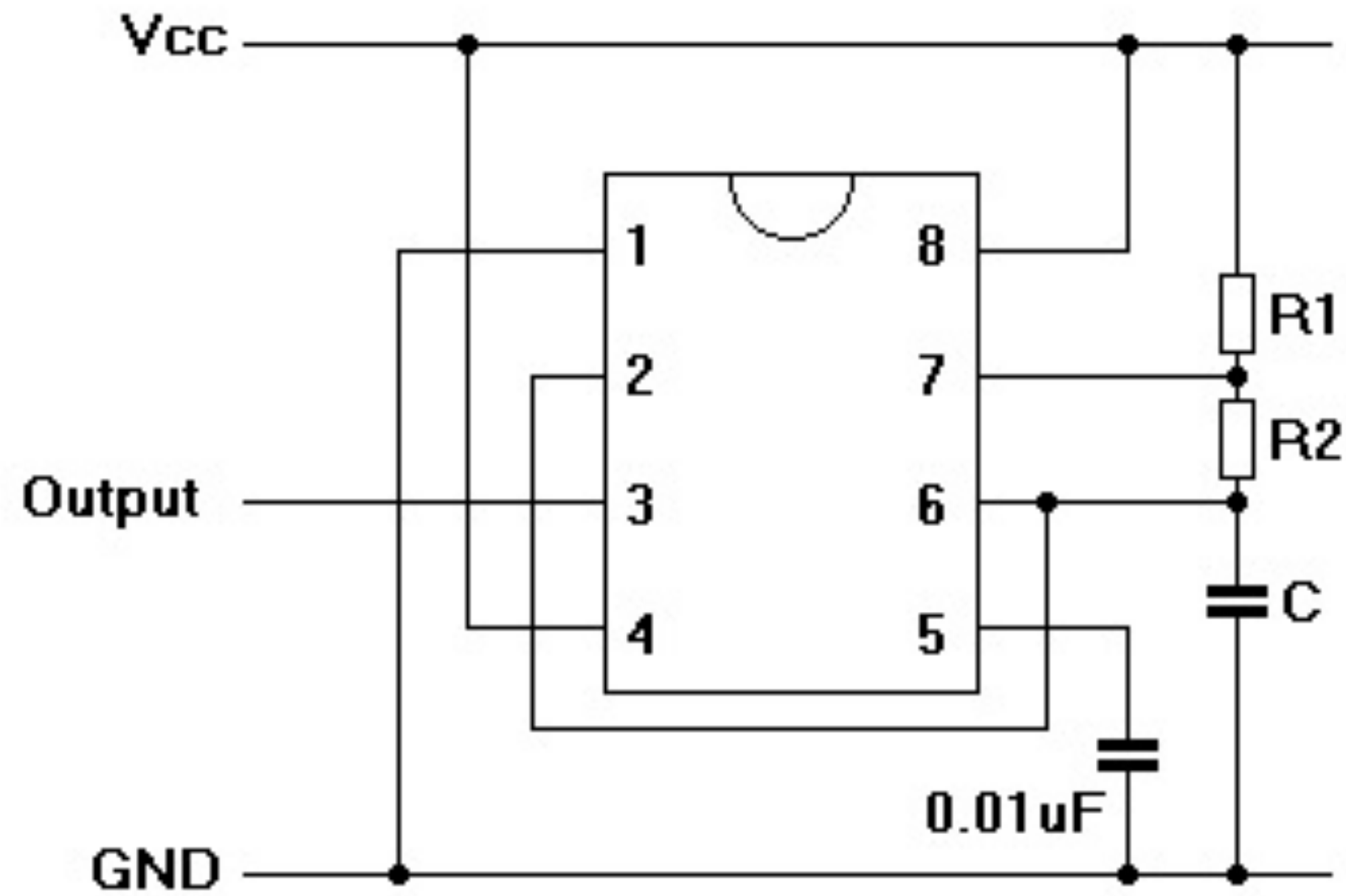
5. Control: Can be used to adjust threshold trigger voltage. Not used in our applications. Connect to ground with a .01uF cap to eliminate supply noise from Vcc.

6. Threshold: When threshold crosses above 2/3 Vcc timing interval ends.

7. Discharge: connects to ground when output goes low. Controls timing.

8. Vcc: Power supply. Typical range 4.5v to 16v.

Astable Mode



An alternate version

1) Pin order is different -- Be careful! Not always in order.

2) There's an extra LED coming out of pin 3.

3) De-coupling capacitor between the power rails.