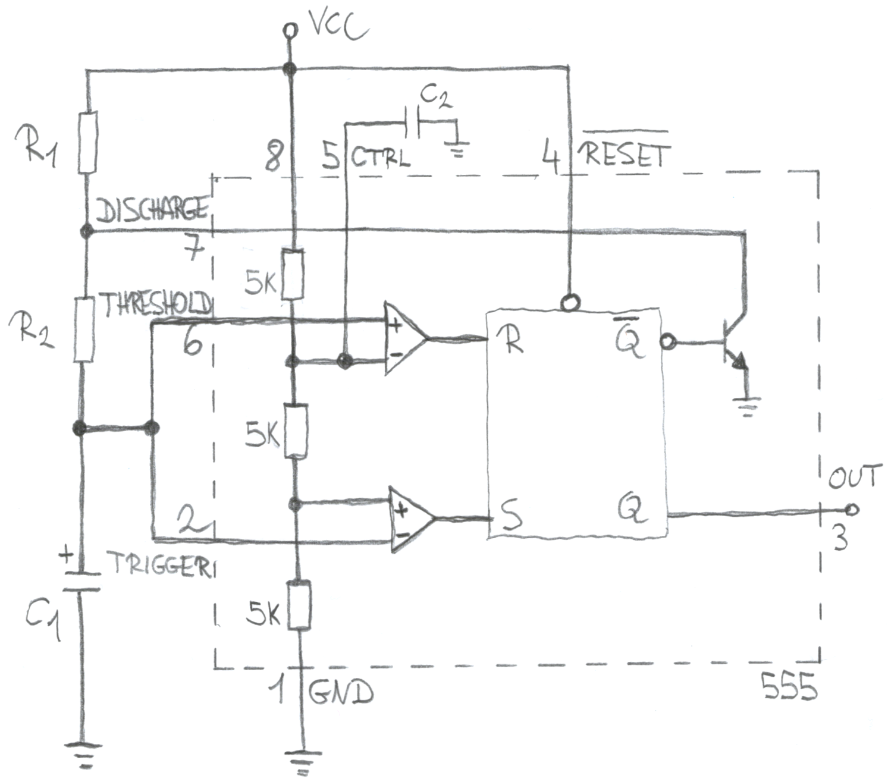
**NE555 astable multivibrator**



Note: VCC is between 4.5V and 15V, the output can sink/source 200mA and C2 is usually around 10nF.

Charge phase

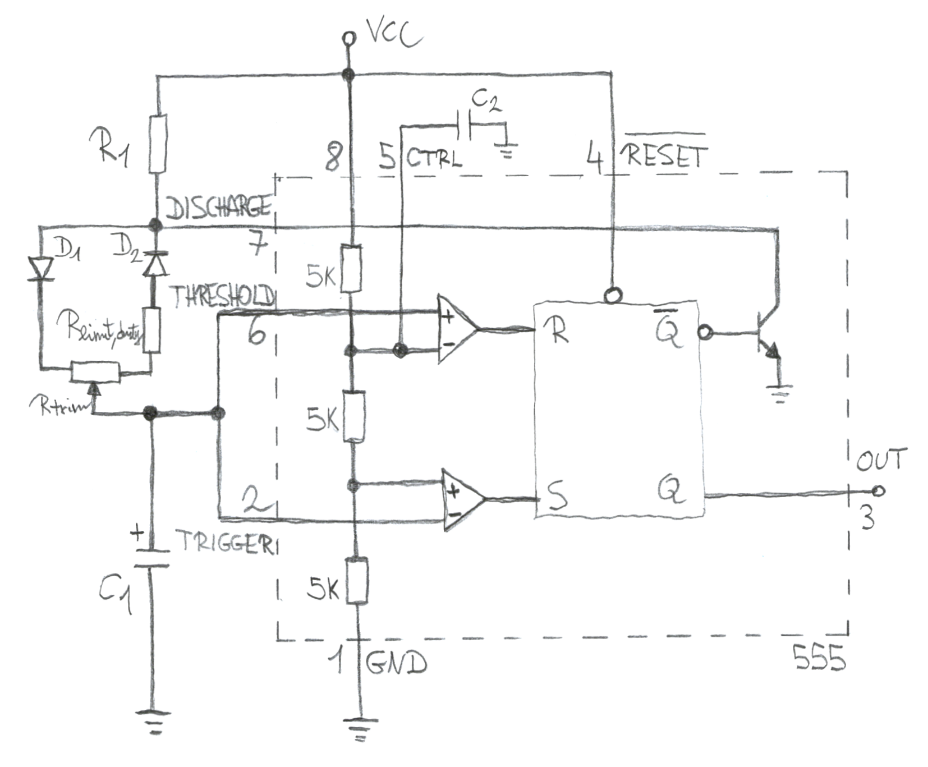
The capacitor charges through R1 and R2 from 1/3VCC to 2/3VCC; according to the capacitor formula:

Discharge phase

The capacitor discharges through R2 from 2/3VCC to 1/3VCC; according to the capacitor formula:

Frequency and duty-cycle

PWM circuit design



By employing a trimpot instead of R2, it’s possible to regulate the duty-cycle leaving the frequency constant. Rlimit,duty is mandatory to limit the discharge current through the internal transistor:

For example with D1=D2=1N4148, C1=100nF, C2=10nF, R1=1k, Rtrim=100k and Rlimit,duty=1k we get:

Notes:

* Remember to use a decoupling capacitor of 100nF between pin 1 and pin 8.
* Some suggest to remove R1 by connecting the diodes node to OUT. The problem is that the OUT high level is less than VCC and varies with drained current, so this circuit variant is less stable.
* Ceramic capacitors vary their capacity with voltage and especially with DC bias. With increasing VCC, the C1 1/3VCC DC bias also increases and thus the capacity decreases which rises the frequency. If VCC cannot be held constant, then it’s suggested to use a film capacitor.