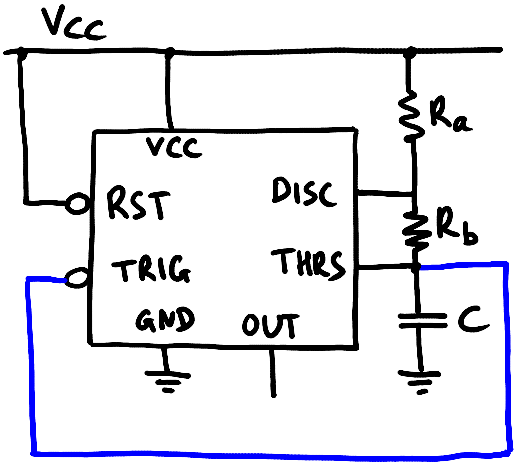
PHYS 3360 / AEP 3630
Lecture 31

Oscillator configuration of 555

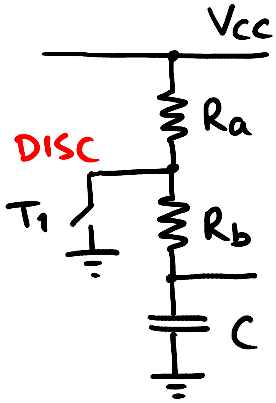


step 1) assume $v_c = 0$ @ $t = 0$

$v_{trig} = 0 < \frac{1}{3}V_{cc}$, => S=1 } $\bar{Q}$ = LO, T_1 = OFF

$v_{th} = 0 < \frac{2}{3}V_{cc}$, => R=0 } OUT = HI

=> C charges to V_{cc} thru $R_a + R_b$

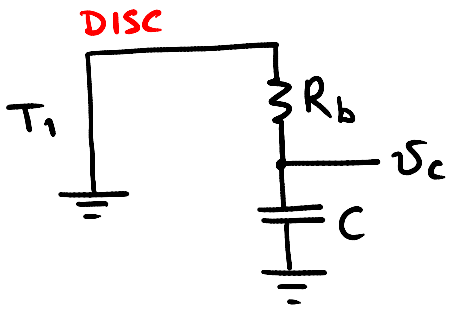


$v_c = v_{trig} = v_{th}$

step 2) when $v_c > \frac{1}{3}V_{cc}$, S=0 , $\bar{Q}$ unchanged

step 3) when $v_c \geq \frac{2}{3}V_{cc}$, R = 1, $\overline{Q}$ = HI, OUT = LO
T_1 = ON

C discharges to 0 thru R_b

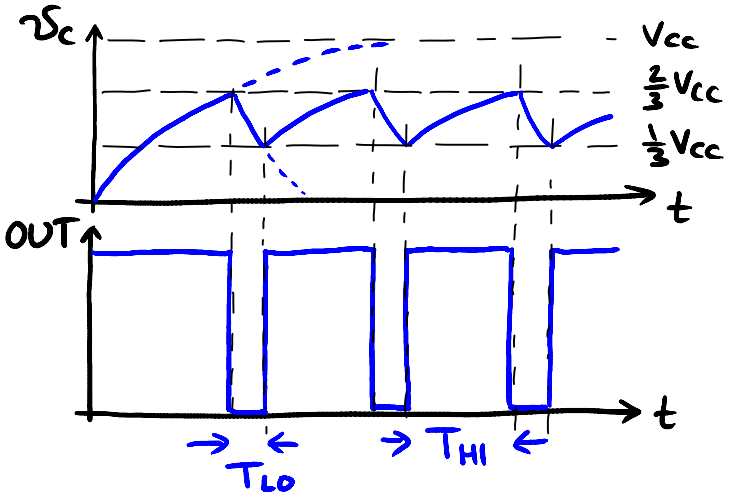


step 4) when $v_c < \frac{2}{3}V_{cc}$, R = 0, $\overline{Q}$ unchanged

step 5) when $v_c < \frac{1}{3}V_{cc}$, S = 1, $\overline{Q}$ = LO, OUT = HI
T_1 = OFF

C charges back to V_{cc} thru $R_a + R_b$

Repeat step 2)



* v_c is stuck between $\frac{1}{3}$ and $\frac{2}{3}V_{cc}$

* from cap. charging eqn.
$T_{HI} = (R_a + R_b)\, C \ln 2$
$T_{LO} = R_b C \ln 2$

$$f = \frac{1}{T_{HI} + T_{LO}} = \frac{1.44}{(R_a + 2R_b)\, C}$$

* f does not depend on V_{cc} (good!)

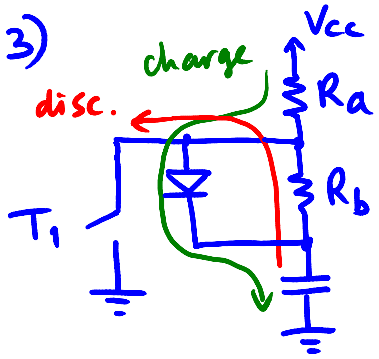
* f is stable (< 1%) mainly temp. fluctuations

Q: what if want $T_{H1} < T_{Lo}$?

1) invert OUT —▷o—

2) you can make $R_a \ll R_b$ to get a duty factor 50%
(but remember to keep $R_a \sim 1k\Omega$ to limit current thru T_1)

3)



$\tau_{disc} = R_b C$
(T_1=ON, D=OFF)

$\tau_{charg.} = R_a C$
(T_1=OFF, D=ON)