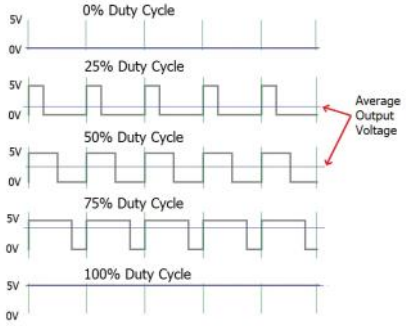
Lab 1B: PWM Lecture Notes

Thursday, October 14, 2021 6:45 AM

Lab Topics:

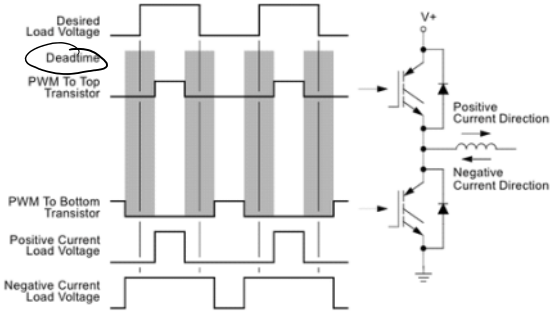
- PWM
  - What is it?
  - purpose
  - deadtime
  - 3525A
- Ckt layout considerations
  - avoid large loops
  - avoid needlessly long wires
  - use top and bottom of board
  - notice critical (high switch) loops, keep small.
- Hands-on demos (in class)
  - wire stripping
  - soldering
  - desoldering

PWM:



- often used to control switches in switching devices
- switch pairs are switched complementary to each other. (below)

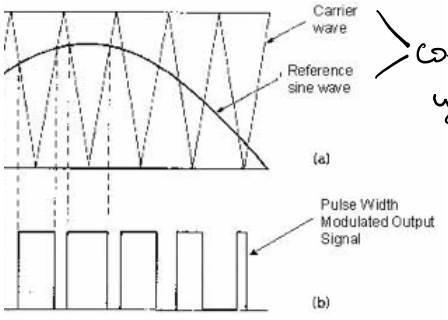
https://circuitdigest.com/tutorial/what-is-pwm-pulse-width-modulation



- real switches take time to switch. Deadtime avoids both switches being closed simultaneously

https://granitedevices.com/wiki/Dead-time_distortion

PWM usually achieved by:

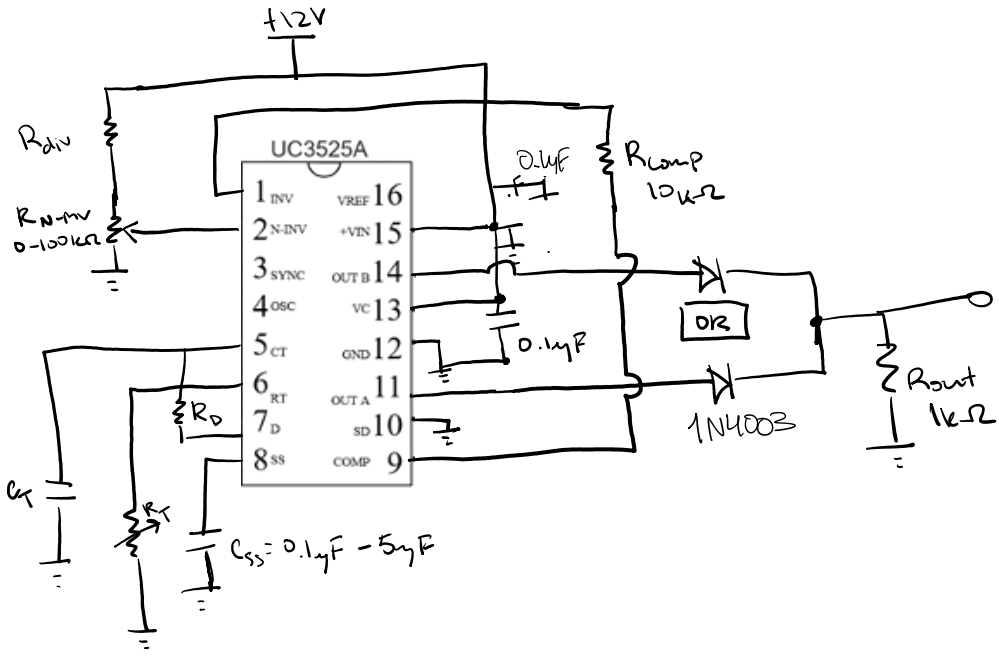


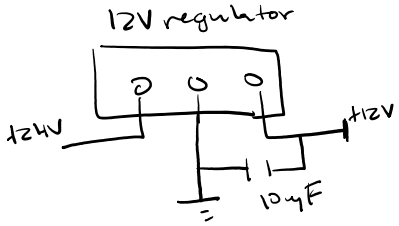
} comparator yields logic hi/lo

- For 3525A: oscillator waveform is the carrier, and n_{inv} input is reference

UC3525A

- common PWM controller
- we are using to control gate driver (will go over next lab section)





Calculations:

$$f = \frac{1}{C_T(0.7\,R_T + 3\,R_D)}$$

undergrads: $R_D \approx 33\Omega$

grads: $R_D = 0 - 100\Omega$ (recommended)

or

$0 - 500\Omega$ (datasheet recommended)

TBH: deadtime here does not matter much since gate driver adds own deadtime

Why OR outputs?

- gate driver needs only 1 input
- increased f_{sw} ($f_{osc} \equiv f_{sw}$)
- increased duty cycle range

Capacitors:

- bypass caps filter high frequency noise
  (more on this in capstone class)

Divider: