EECS192 Lecture 5
Feb. 14, 2017

Notes:
1. Check off-
   • 2/19: Motor drive/stall, steering servo from battery, schematics due (+
     part location rats nest- no copper)
   • PCB design due (Gerbers) Tues 2/21 midnight
2. 2/21 Quiz 3: switch mode power supply and regulator
3. CalDay Sat. April 22 @ UCB

Topics
• Wiring
• Battery cell balancing
• Power supplies
• Linear regulator
• Buck converter
• Boost converter- switch mode power supply
Power supply wiring - Star is better!

On board: what does this look like electrically (as a schematic)?
Which is "Star" config?
Which is "Star" config?
¬ supply waveforms with motor PWM

• Battery model
• Waveforms on board
• Wiring to reduce voltage resistance effects of wiring

\[ V_{IN} \xrightarrow{\text{regulator}} V_{REG} \]

0.5 ohm

Boost Converter \( V_{IN} < V_{REG} \)

\[ V_{REG} \]

Linear Regulator \( V_{IN} > V_{REG} \)

\[ V_{REG} \]

Buck Converter \( V_{IN} < V_{REG} \)

\[ V_{REG} \]
Linear Regulator, e.g. KA378R05

LDO = low drop out
Caution: not all are low drop out
LDO linear regulator LM2940

Typical Application

*Required if regulator is located far from power supply filter.

**C_{OUT} must be at least 22 \ \mu F to maintain stability. May be increased without bound to maintain regulation during transients. Locate as close as possible to the regulator. This capacitor must be rated over the same operating temperature range as the regulator and the ESR is critical; see curve.
Buck Converter

https://en.wikipedia.org/wiki/Buck_converter
Buck Converter
LM2678
DC-DC Gotchas

- Switch stuck on ➔ 11V LiPo burns out everything
- High peak currents ➔ big conductors, short leads
- 200 kHz radiation into sensor circuits or A/D
- Filter caps: low ESR, low inductance
- Feedback disconnect, noise on feedback line

Lin Reg Gotchhas

- Inefficient: need heat sink
- Filter caps: low ESR, low inductance possible instability!
Boost Converter- LT1370

Caution: ESR!
Need special cap
Boost Converter

Waveforms on board
(also see boost converter notes)