Voltage Regulators

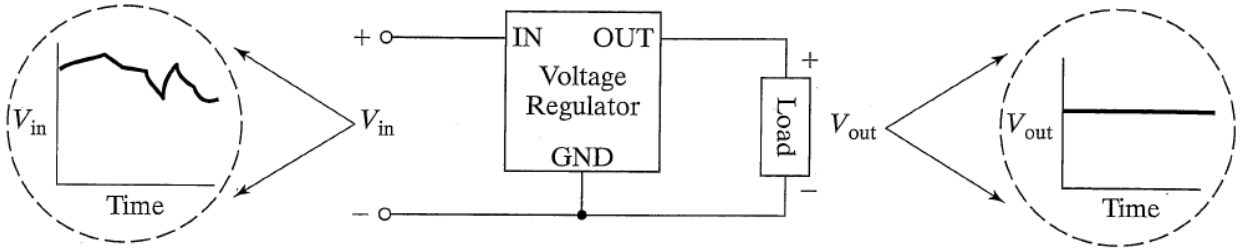
Mark Colton

Department of Mechanical Engineering

Brigham Young University

Voltage Regulators

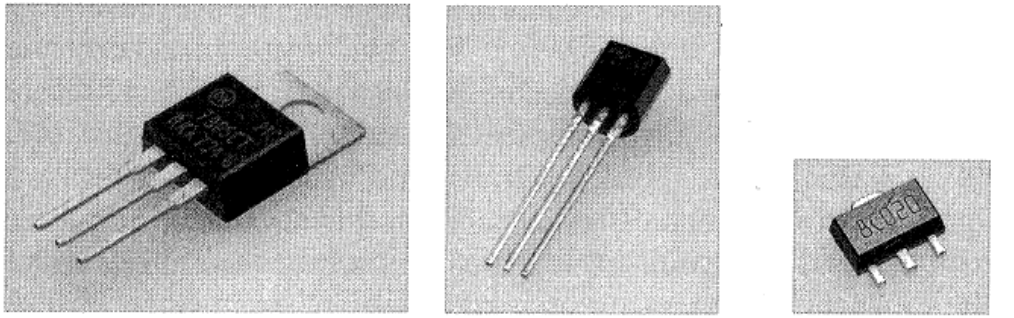
- Most circuits need a dependable, constant voltage source
- Using internal feedback, voltage regulators "regulate" the output voltage, given a non-ideal input voltage



"Introduction to Mechatronic Design," Carryer, Ohline, Kenny, 2011

Voltage Regulators

- Come in a number of voltages, packages, current capabilities, precisions, operating temperatures, dropout voltages, etc.

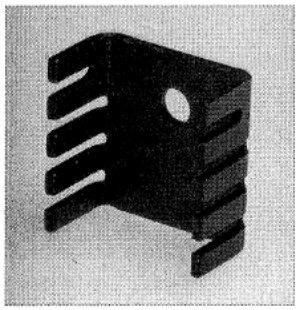
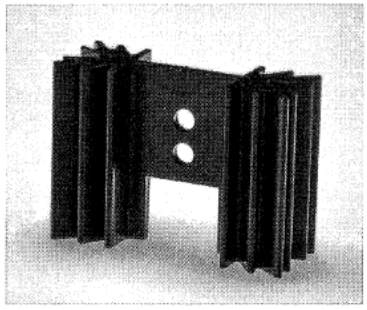
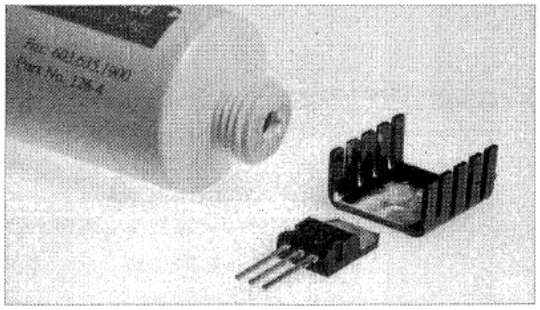


(a) TO-220 package (b) TO-92 package (c) SOT-89 package

"Introduction to Mechatronic Design," Carryer, Ohline, Kenny, 2011

Voltage Regulators: Other Considerations

- Sometimes (see text for guidelines) you should add a heat sink for applications with considerable current needs

"Introduction to Mechatronic Design," Carryer, Ohline, Kenny, 2011

- Dropout voltage:
  - The minimum difference between the input voltage and the output voltage to achieve the desired output voltage
  - Example: If a regulator has a dropout voltage of 0.5 V, and we want a 5 V output, then the input needs to be at least 5.5 V

Some Examples…

Take a look at Digi-Key

Take a look at the LM7805 data sheet

Linear vs. Switching Regulators

- The LM7805 and LM317 are *linear* regulators
  - There is a linear amplifier in the feedback circuit
- There are also *switching* regulators
  - Flexibility in output voltages (even lower than input voltage or of opposite polarity)
  - Higher efficiency
  - Lower temperature
  - Higher currents
  - Higher ripple
  - Increased complexity
- We'll focus on linear regulators