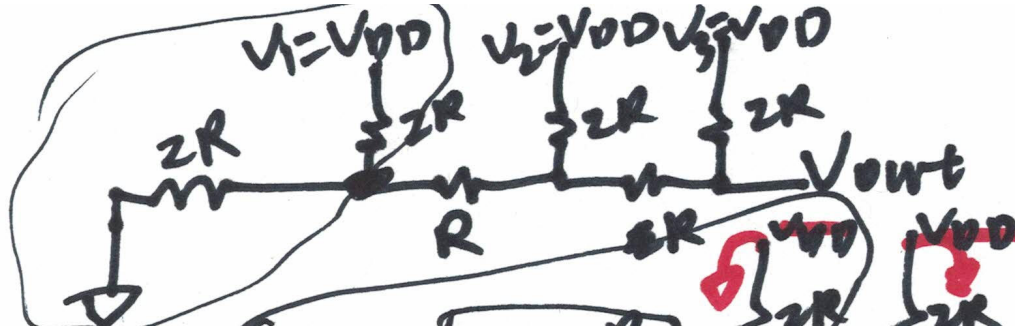
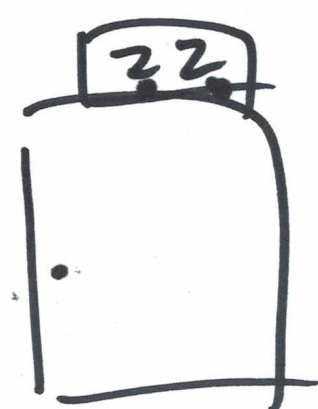
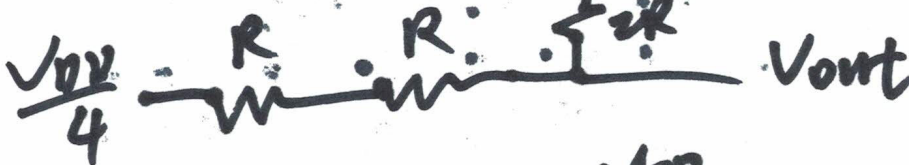
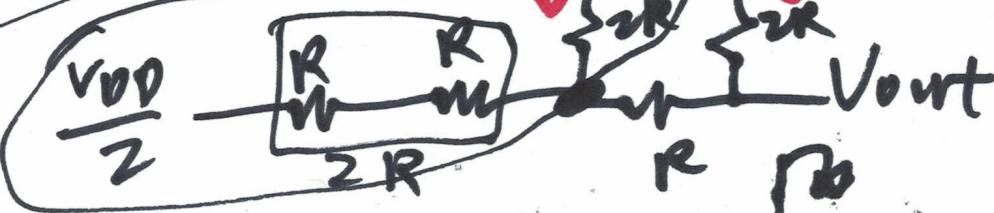


(R-2R DAC)

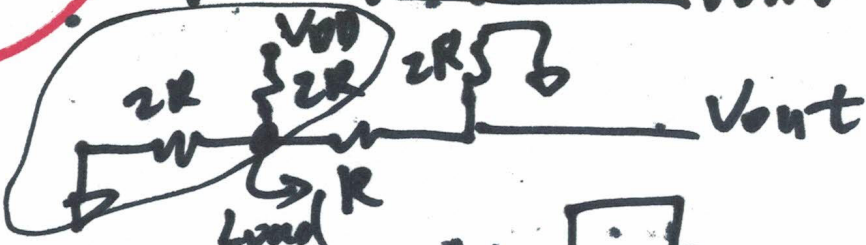
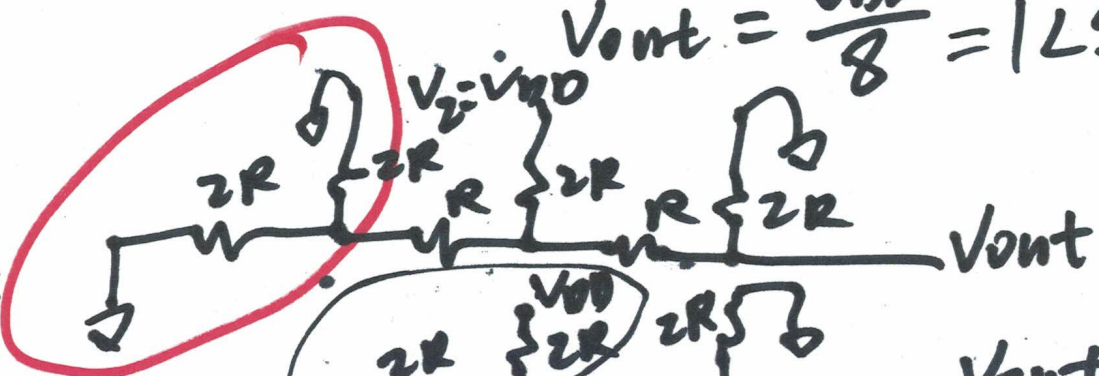


V_1 only:



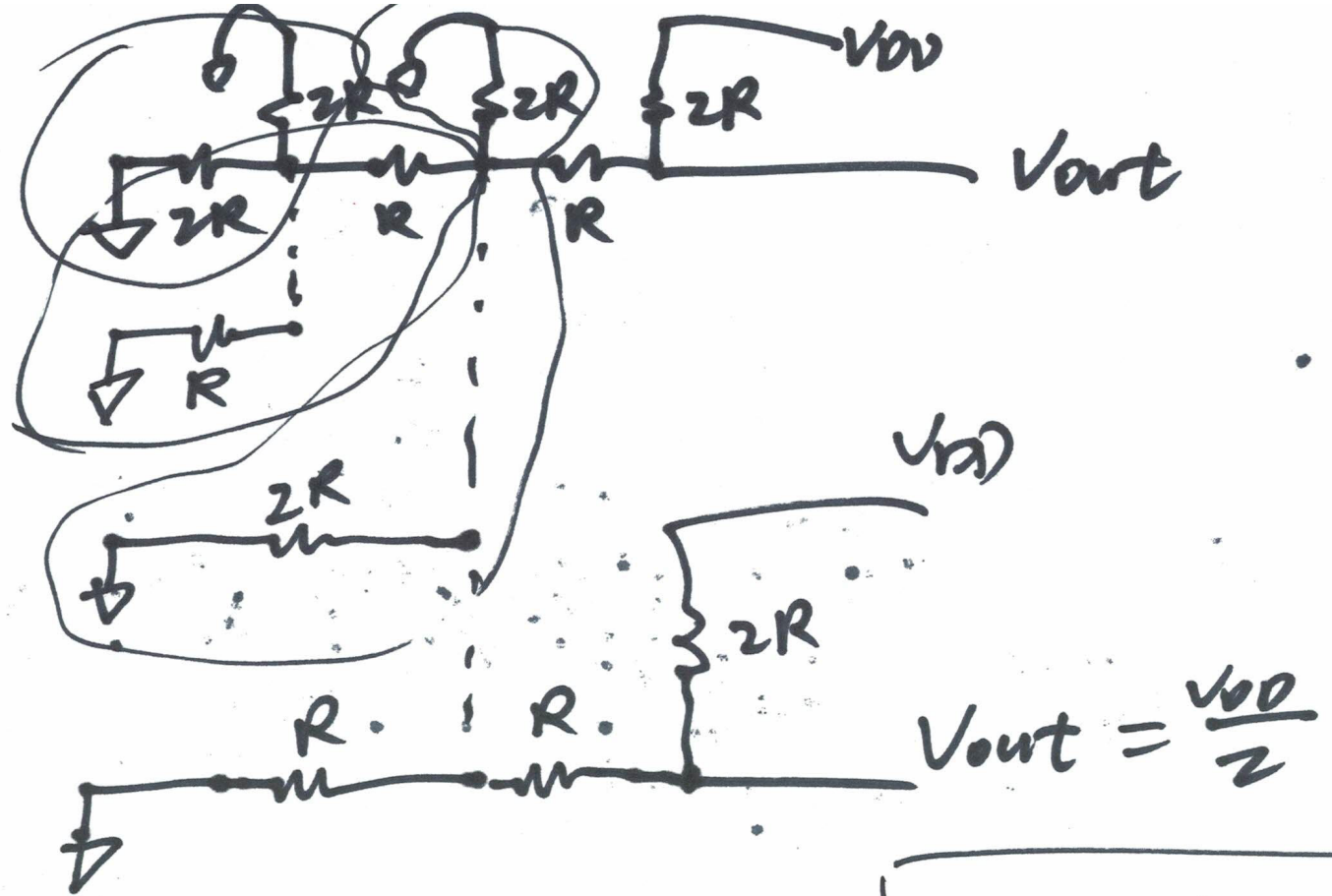
$V_{out} = \frac{V_{DD}}{8} = 1 \text{ LSB}$

V_2 only:

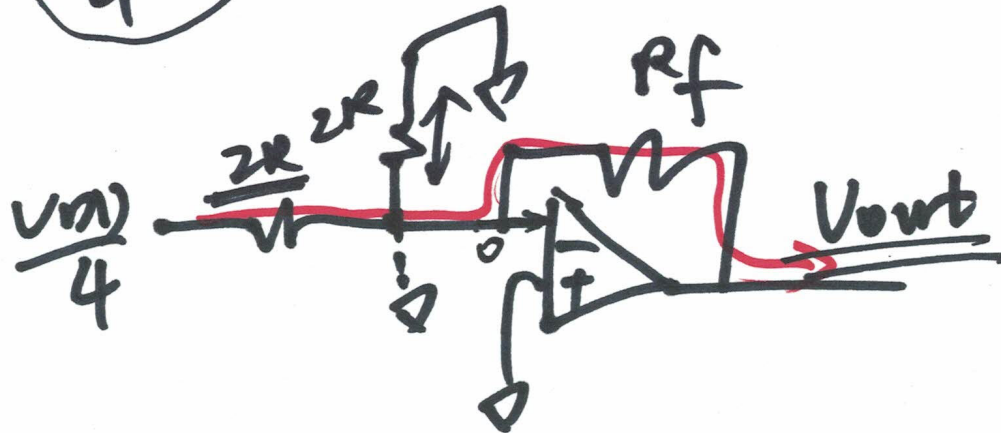
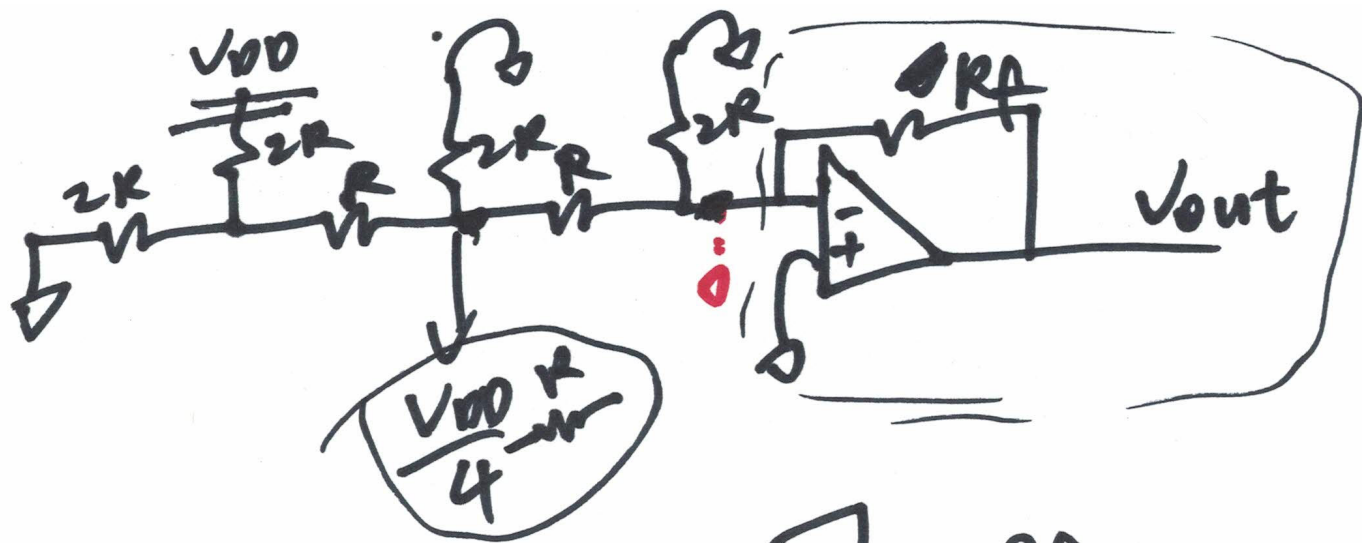


$V_{out} = \frac{V_{DD}}{4}$

V_3 only:



$$V_{out} = \frac{V_{DD}}{8} + \frac{V_{DD}}{4} + \frac{V_{DD}}{2} = \frac{7}{8} V_{DD} = V_{FS} = \frac{2^N - 1}{2^N} \cdot V_{DD}$$



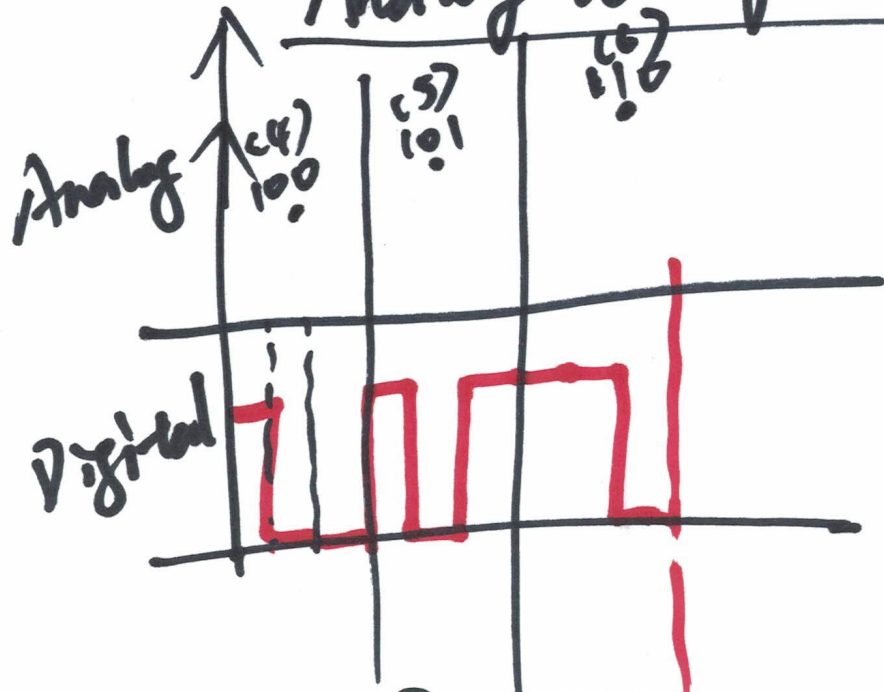
$$\frac{\frac{V_{DD}}{4} - 0}{2R} = \frac{0 - V_{out}}{R_f}$$

~~$$\frac{\frac{V_{DD}}{4} - 0}{2R} = \frac{0 - \frac{V_{DD}}{8}}{R_f} \Rightarrow \frac{V_{DD}}{4} \cdot R_f = -\frac{V_{DD}}{8} \cdot 2R$$~~

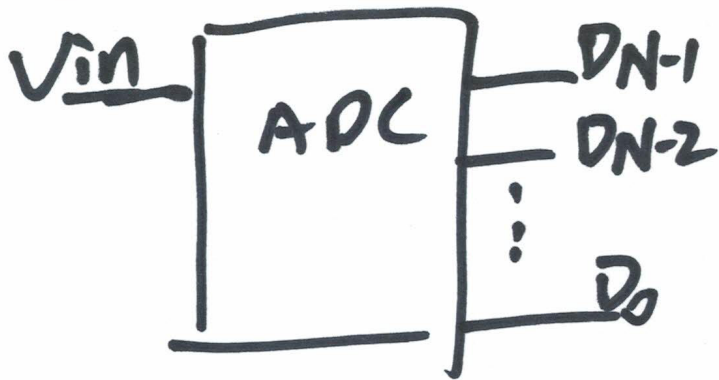
$$R_f = R$$

3

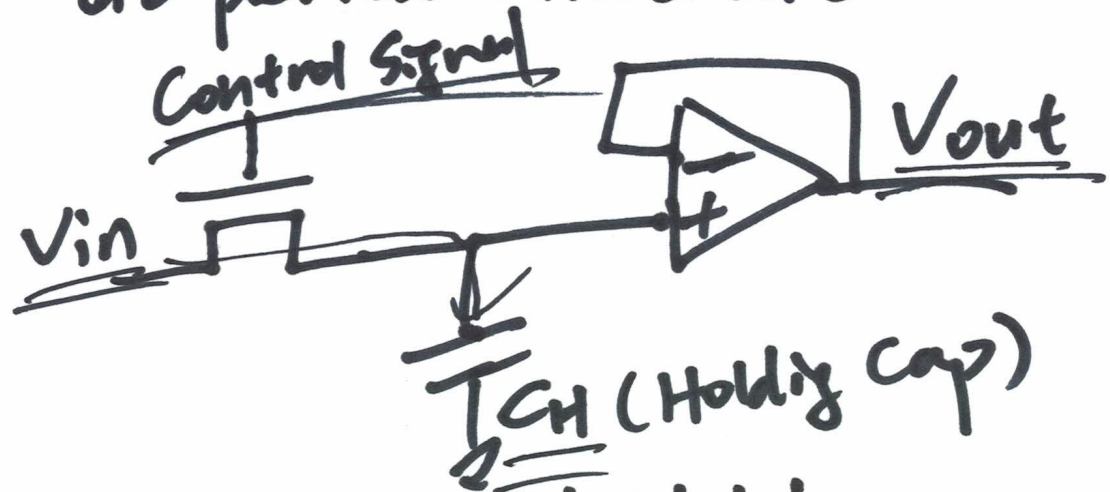
Analog to Digital Converters (ADCs)



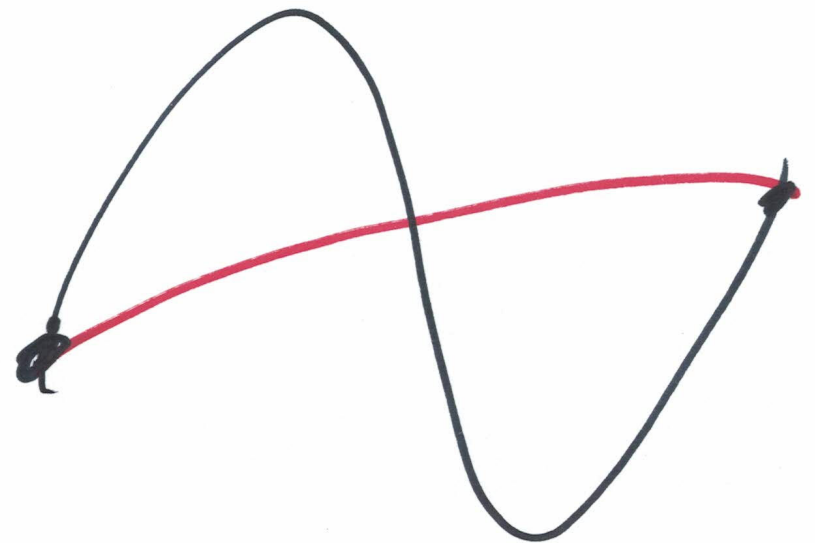
① Block Diagram



② Sampling: measuring signal at periodic intervals



Sample and Hold



• Nyquist-Shannon Sampling Theorem.

$$f_s \geq 2 \cdot f_{\max}$$

Sampling frequency \rightarrow max ~~signal~~ signal frequency

• Aliasing: Introduction of false (alias) frequencies in the process of sampling

• ADC resolution: 3-bit ADC. 2^3