

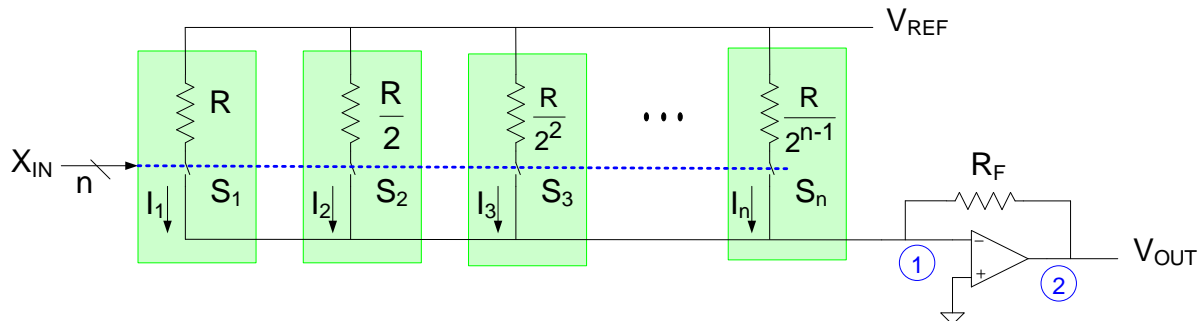
EE 435
Assignment 5
Spring 2024
 Due Friday April 26

Consider the current steering DAC shown below where everything is ideal except for the resistors. Assume the resistor on the left is made from a unary cell. The resistor $R/2$ is made by placing two unary cells in parallel, the resistor $R/4$ is made by placing 4 unary cells in parallel and so on with the right-most resistor formed by placing 2^{n-1} unary cells in parallel.

Assume the only non-ideality in the resistors is the local random variations that have variance

$$\sigma_{\frac{R}{R_N}} = \frac{A_p}{\sqrt{WL}}$$

Where R_N is the nominal value of the unary cell, W is the width of the resistor in the unary cell, L is the length of the resistor in the unary cell, and A_p is the Pelgrom parameter that characterizes the mismatch due to local random variations,



Part 1. Determine the yield of this DAC if the ENOB based upon the INL must be at most 1 LSB, $n=8$, $WL=5\mu\text{m}$, and $A_p=0.05\mu\text{m}$.

Part 2 (Extra Credit) Determine the area of the unary cell required to obtain a 99% yield if the ENOB based upon the INL must be at most 1 LSB, $n=8$, and $A_p=0.05\mu\text{m}$.