

# Project 1

## Deliverables for Project 1: Part 1

a:

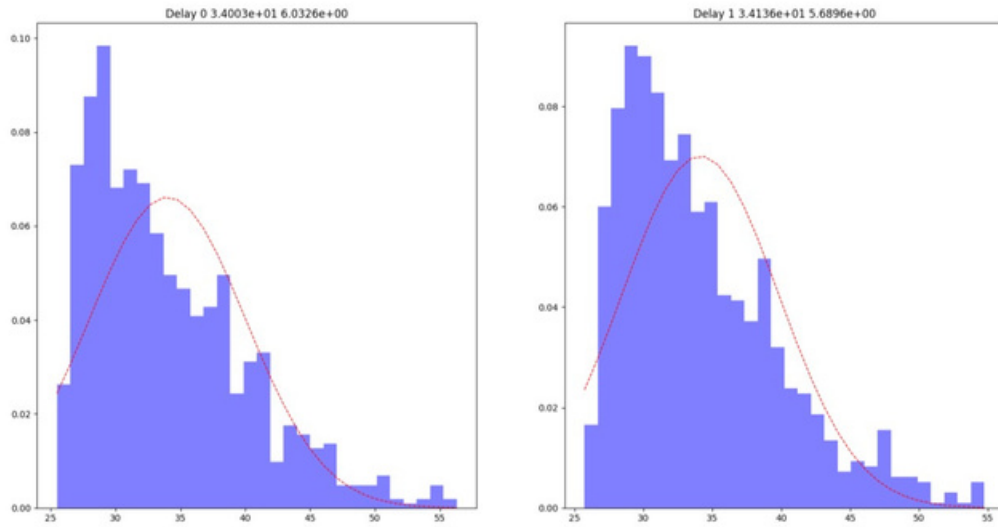


Fig. 1. Histogram and Gaussian estimate of D0 and D1 from 1000 samples.

Optional:

## 1. Latin Hypercube Sampling

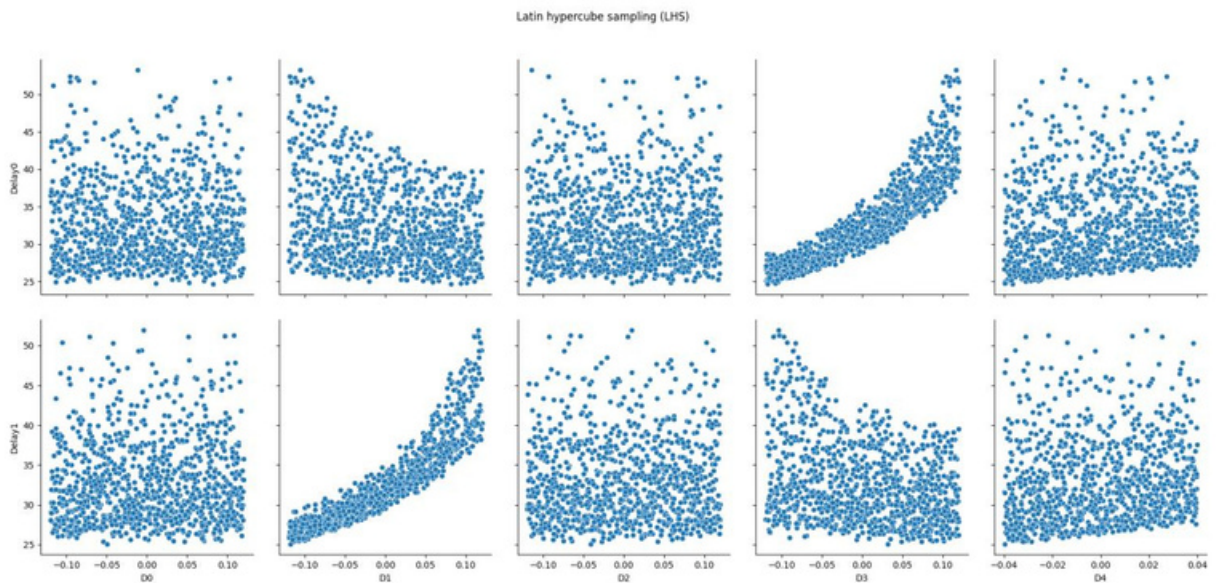


Fig. 2. Latin Hypercube sampling of Delay 0, And Delay 1 of size 1000 in the 5 VTH variations.

## 2. Sensitivity:

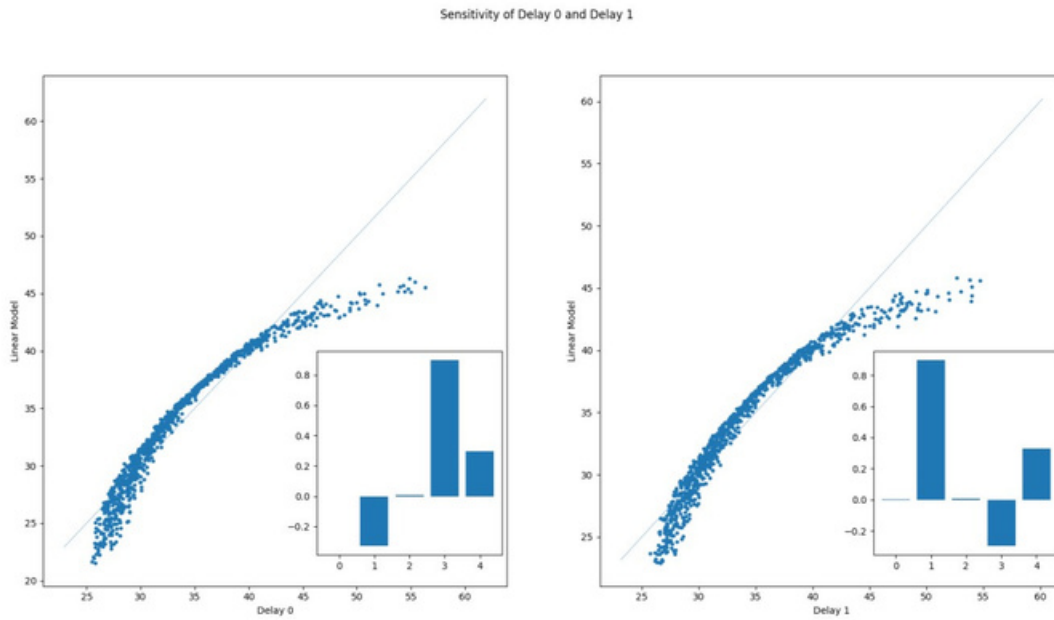


Fig. 3. Sensitivity of Delay 0, And Delay 1 of size 1000 in the 5 VTH variations.

b:

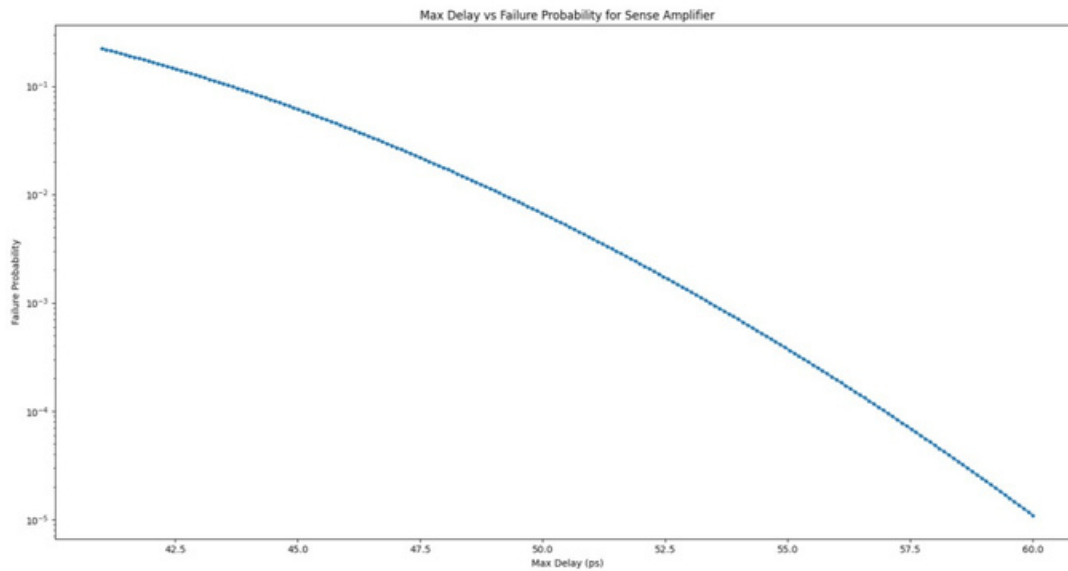


Fig. 4. Fail rate for D0 or D1 for delay 40ps to 50ps.

The value of fail rate for D0 or D1 > 50ps has been found 0.005002.

## Deliverables for Project 1: Part 2

a: According to the Sakurai model the calculated parasitic capacitance has been found 0.5678fF. To calculate the capacitance bit line length is found for 128 cells ( $128 \times 2\mu\text{m}$ ) and the height is found from metal layer M2 to the bottom layer  $3.288\mu\text{m}$ .

## Deliverables for Project 1: Part 3

a:

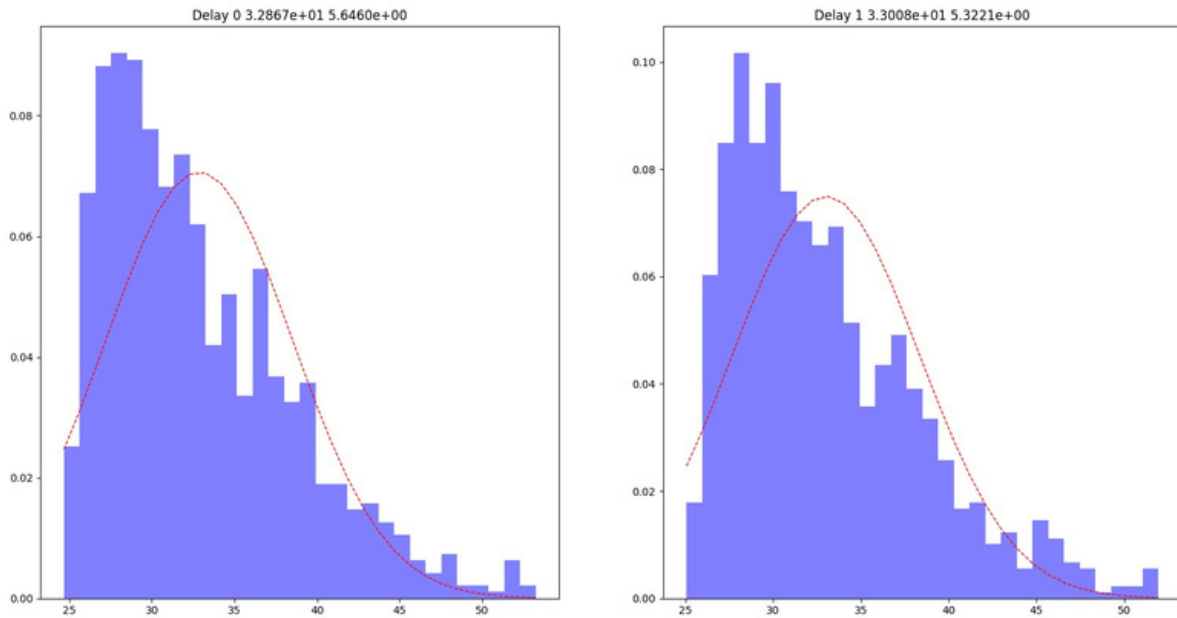


Fig. 5. Histogram and Gaussian estimate of D0 and D1 from 1000 samples with updated capacitance value.

Optional:

## 1. Sensitivity:

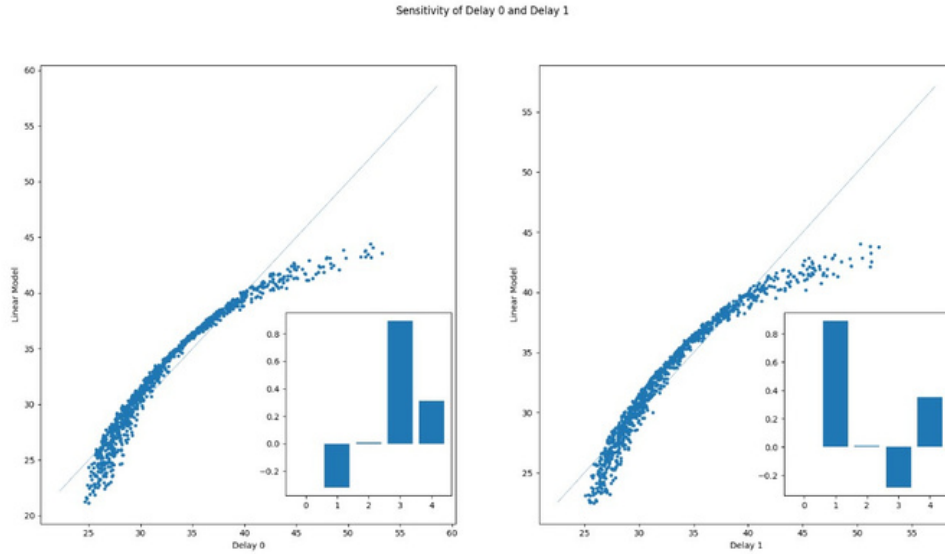


Fig. 6. Sensitivity of Delay 0, And Delay 1 of size 1000 in the 5 VTH variations with updated capacitance value.

b:

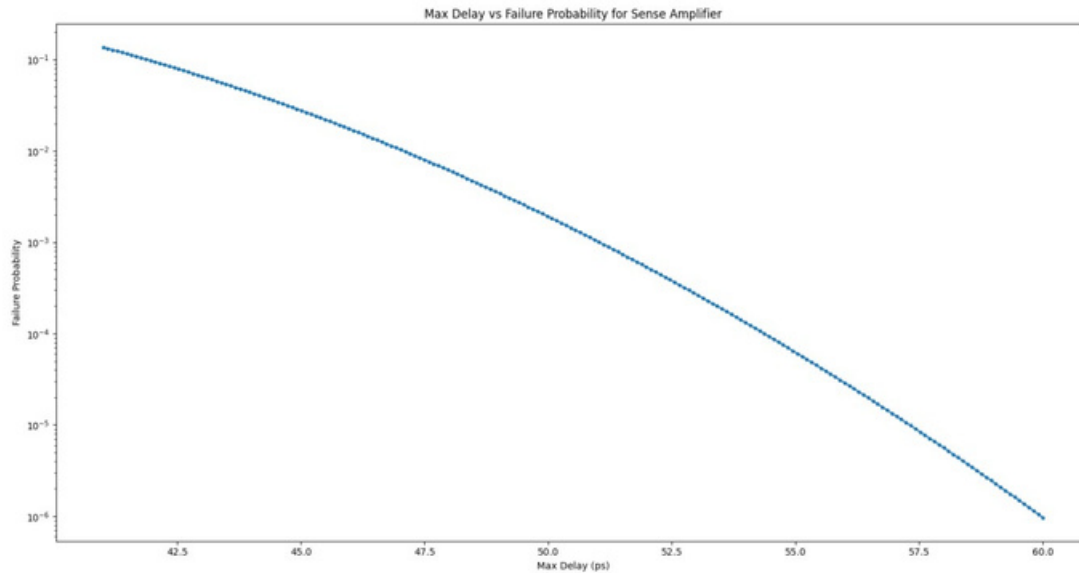


Fig. 7. Fail rate for D0 or D1 for delay 40ps to 50ps with updated capacitance value.

The value of fail rate for D0 or D1 > 50ps has been found 0.001360.

**C:** To understand the performance clearly, the sampling sets are kept the same for both cases. The main difference has been found in the fail rate for  $D0$  or  $D1 > 50ps$ . It is found 0.005002 for 1fF and 0.001360 for 0.5678fF. Parasitic capacitance was initially given 1fF, but as mentioned in part 2, section a, it has been found to be 0.5678fF according to the Sakurai model. Since the parasitic capacitance is decreased, which results in a decrease in the delays, and as a result, the fail rate is decreased. Therefore, it can be said that if the parasitic capacitance decreases, the fail rate also decreases.

## Deliverables for Project 1: Part 4

a: With parasitic 0.5678fF

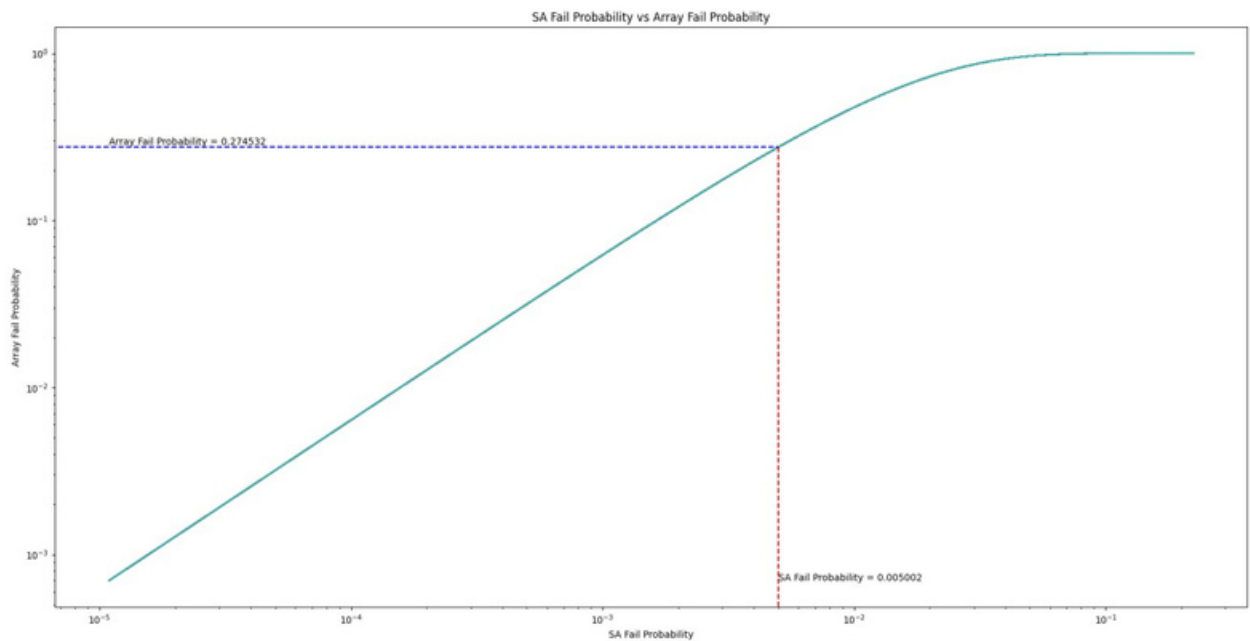


Fig. 8. Sense amplifier fail probability vs array fail probability with 1fF capacitance.

b: With parasitic 0.5678fF

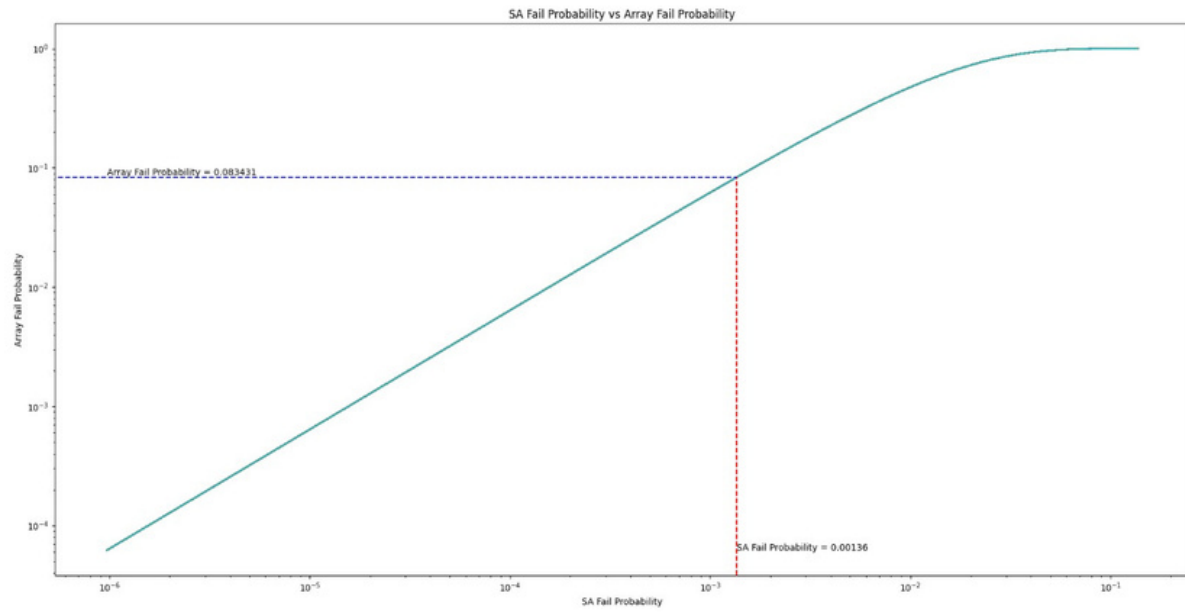


Fig. 9. Sense amplifier fail probability vs array fail probability with 0.5678fF capacitance.