Assignment 2

ECE 445

Submission deadline: 13th Nov,2023

100 points

1. Design a structure as shown in Figure 1.
2. Show the meshing, band diagram and electric field at 0V, 0.5V and -1 V, for L=1 um, n-Si=10^{16}/cm^3. Observe how the band structure and electric field changes with respect to applied bias.
3. Plot the R_{on} for L=0.5 um, 1 um, 1.5 um, while keeping n-Si 10^{16}/cm^3.
4. Plot the R_{on} for n-Si= 10^{15}, 10^{16}, 10^{17} /cm^3, while keeping L=1 um.
5. Plot the maximum electric field E_{max} for L=0.5 um, 1 um, 1.5 um, while keeping n-Si 10^{16}/cm^3, at -10 V.
6. Plot the maximum electric field E_{max} for n-Si= 10^{15}, 10^{16}, 10^{17} /cm^3, while keeping L=1 um. at -10 V.
7. Bonus: Find the cut-off frequency $f_{co}=1/(2\pi R_{on}C_{off})$, for your design of choice (Which design do you think would be best for the operating this diode at high frequency? Hint: $C_{off}=\varepsilon A/d$, d=depletion width)