

Home-Work 4

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The MOS transistor is designed as per the given spec. and for obtaining the $I_{off}=0.1\text{ nA}/\mu\text{m}$ we have changed SSRC and Halo doping parameters and the value of parameters at which this optimum value is obtained are as follows

SSRC:-Peak Concentration $6\text{e}18$ peak position= 0.035

HALO :- Peak Concentration $1\text{e}19$ Junction value $1\text{e}18$ Depth: 0.01

Q1 (a) Figure (a) & (b) shows I_d - V_g curve (semilog) for $V_d=1.5\text{v}$. and $V_d=0.05\text{v}$. resp. It is clear by comparing the two graphs that I_{off} is smaller for lower V_d .

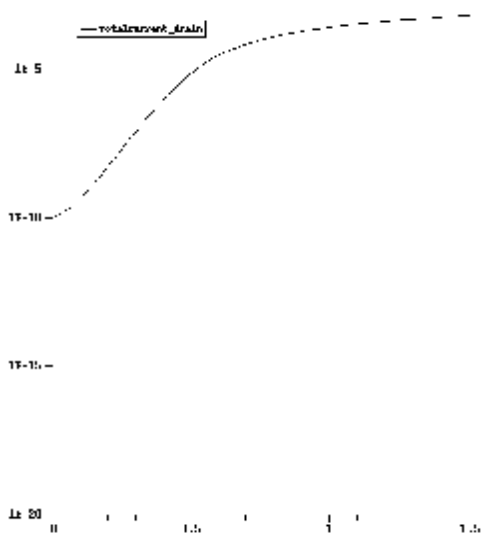


Fig.(a) I_d - V_g for $V_d=1.5\text{v}$.

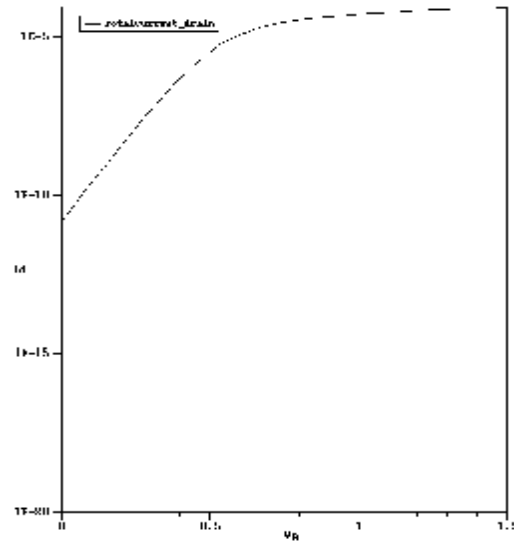


Fig.(b) I_d - V_g for $V_d=0.05\text{v}$.

(b) Doping conc. along Y direction at $X=100\text{ \AA}$ is as shown in the fig. (c)

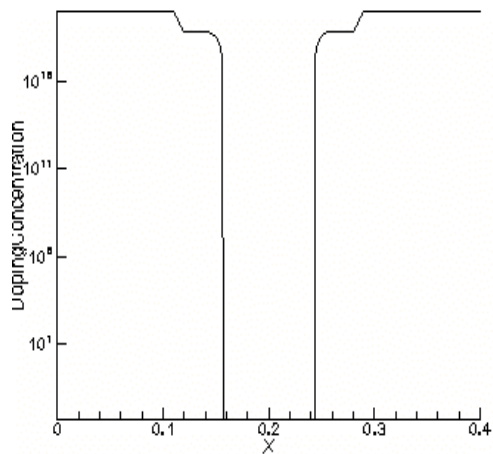


fig. (c) Doping Conc. For $X=100\text{ \AA}$

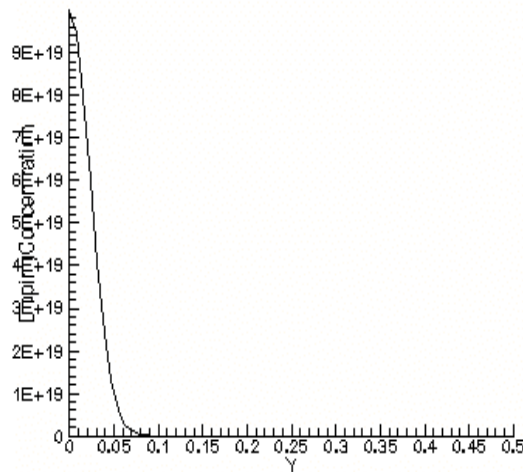


fig.(d) Doping Conc. For $Y=0.05\mu\text{m}$

(c) Doping conc. along X direction at $Y=0.05\mu\text{m}$, $Y=0.13\mu\text{m}$, $Y=0.165\mu\text{m}$ & $Y=0.2\mu\text{m}$ is as shown in the fig. (d), (e), (f) & (g) resp.

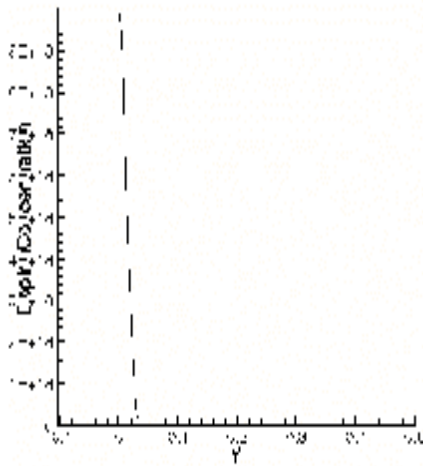


Fig. (e) Doping Conc. For $Y=0.13\mu\text{m}$

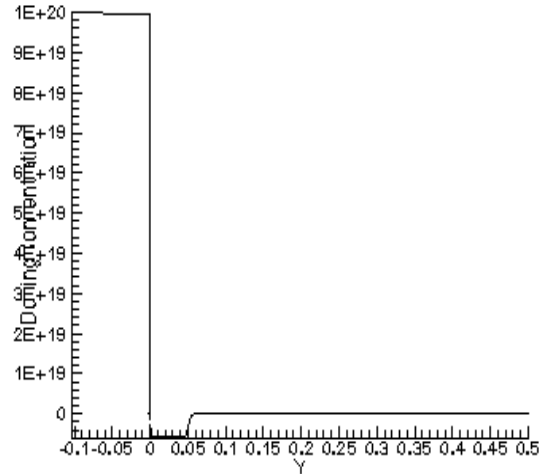


fig. (f) Doping Conc. For $Y=0.165\mu\text{m}$

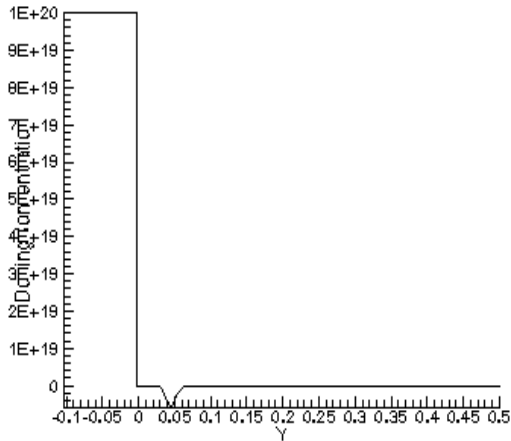
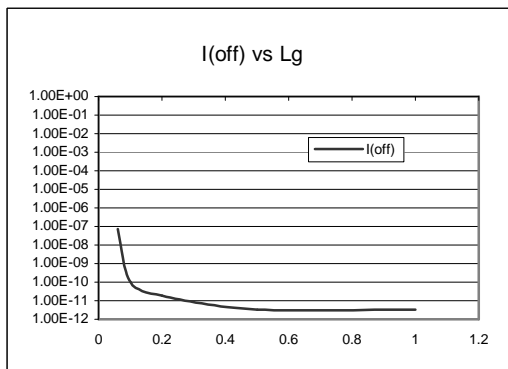
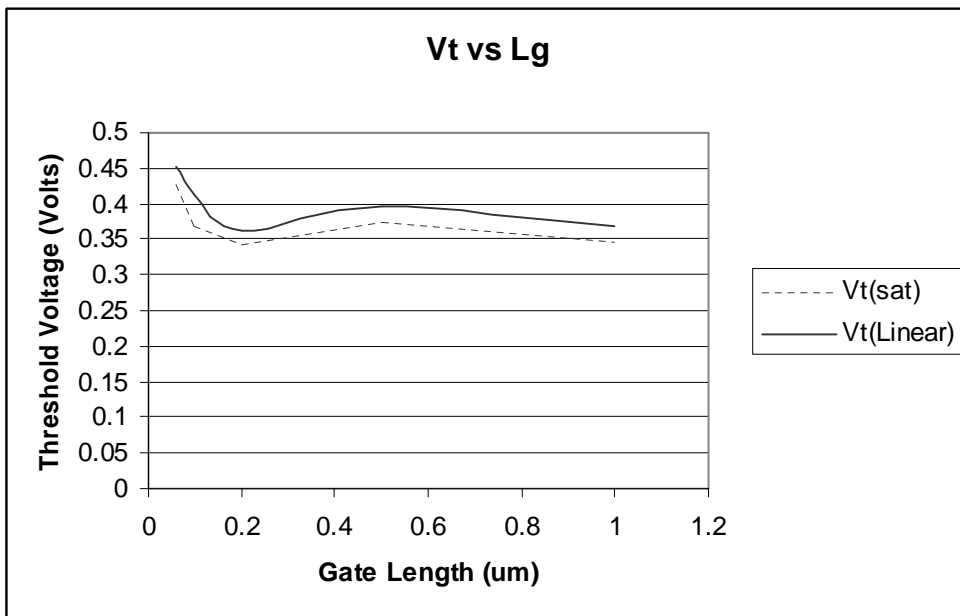


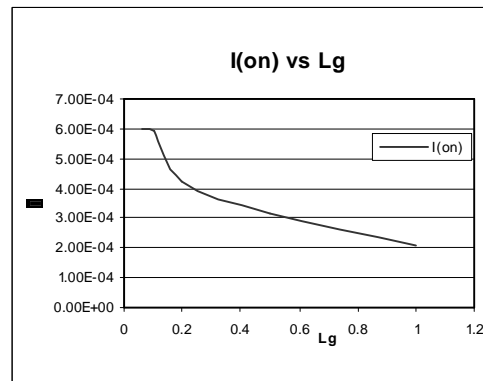
fig. (g) Doping Conc. For $Y=0.2\mu\text{m}$

Q2 Table for parameters with varying L_g is as shown below. For $L_g = 0.2\mu\text{m}$ shows a difference from the expected result due to short channel effect as is evident from V_t graphs. DIBL is calculated using $\text{DIBL} = (\text{lin_vt_sat_vt}) / (1.5 - 0.05)$. The corresponding graphs extracted is also accompanied.

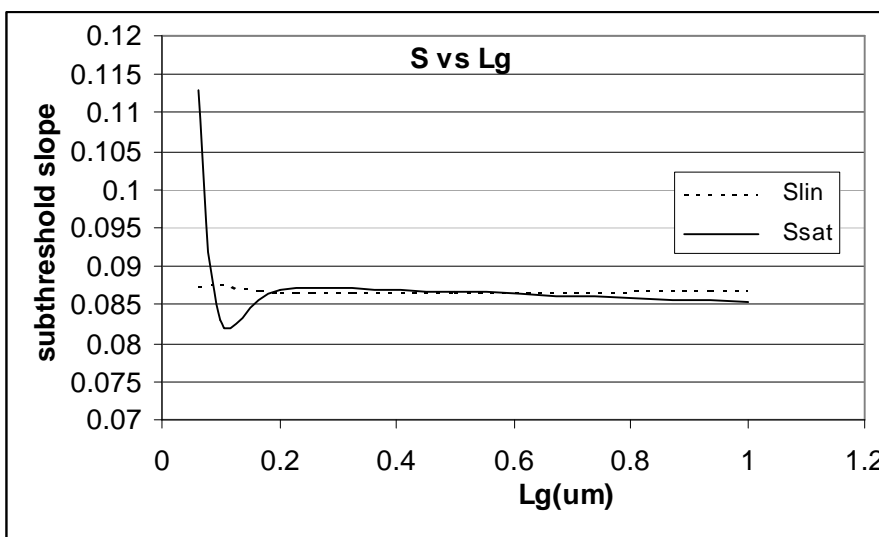
$L_g(\mu\text{m})$	$V_{t\text{lin}}(\text{v})$	$V_{t\text{sat}}(\text{v})$	$I_{\text{off}}(\text{A})$	$I_{\text{on}}(\text{A})$	S_{lin}	S_{sat}	DIBL
0.06	0.452	0.427	74.5nA	0.597mA	0.08745	0.113	0.0172
0.1	0.412	0.368	18.5pA	0.422mA	0.08776	0.083	0.0303
0.2	0.362	0.342	3.41pA	0.3135mA	0.08662	0.0868	0.0138
0.5	0.3971	0.375	3.39pA	0.209mA	0.08664	0.0866	0.0152
1.0	0.3668	0.346	0.0996nA	0.592mA	0.08698	0.0854	0.0143



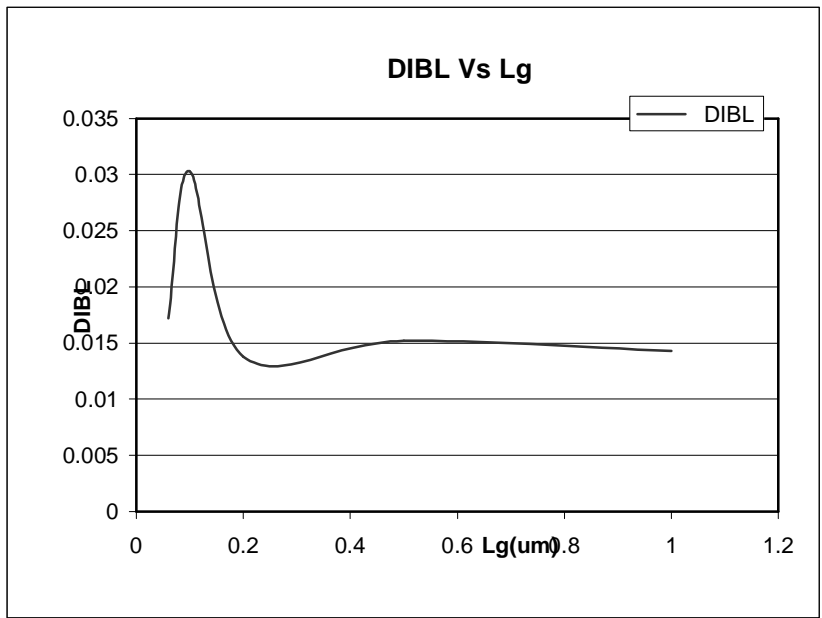
Ioff vs. Lg



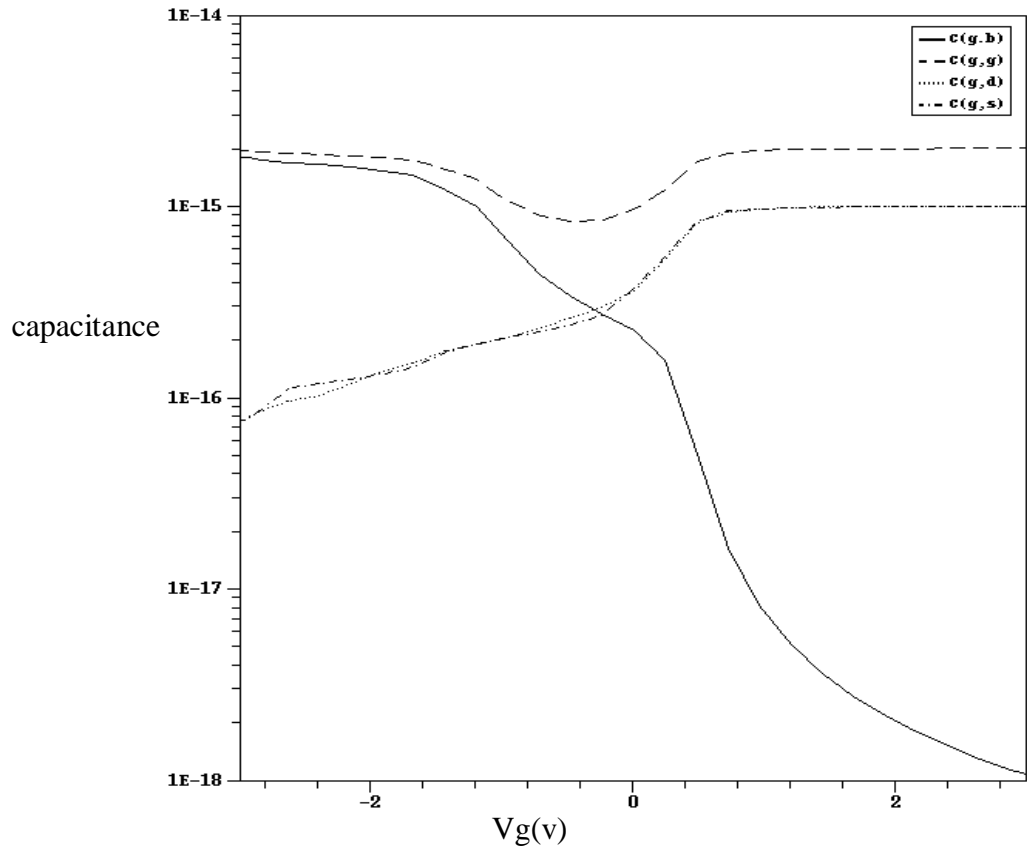
Ion vs Lg



Linear Subthreshold and Saturation Subthreshold Slope



Q3) The graphs for all Capacitance's are as shown in the fig.



Using ac analysis at 100 KHz and $V_d=0.0v$ the Capacitances are as obtained in the fig.

Q4) The SSRC and Halo Profiles are as shown in the following fig.

SSRC:-

Q4:- Peak Concentration 8.2×10^{17} peak position=0.035

Q1:- Peak Concentration 6×10^{18} peak position=0.035

Halo:-

Q4:- Peak Concentration 8.5×10^{18} Junction value 1.35×10^{18} Depth:0.015

Q1:- Peak Concentration 1×10^{19} Junction value 1×10^{18} Depth:0.01

