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Reg.No	19BEC0358		
Student Name	ARPIT PATAWAT		
Course Code	ECE3002	**Slot & Semester**	L43+L44 WINTER -- 2021-22
Course Name	VLSI system design		
Program Title	Lab Assignment 1		
Faculty	Dr. Ragunath G		

School of Electronics Engineering ,VIT, Vellore

1.PlotTransfer characteristics of a PMOS and Determine the threshold voltage (Approximate) of the PMOS.

2. Plot Drain characteristics of a PMOS and Determine the operating regions (Approximate) of the PMOS.

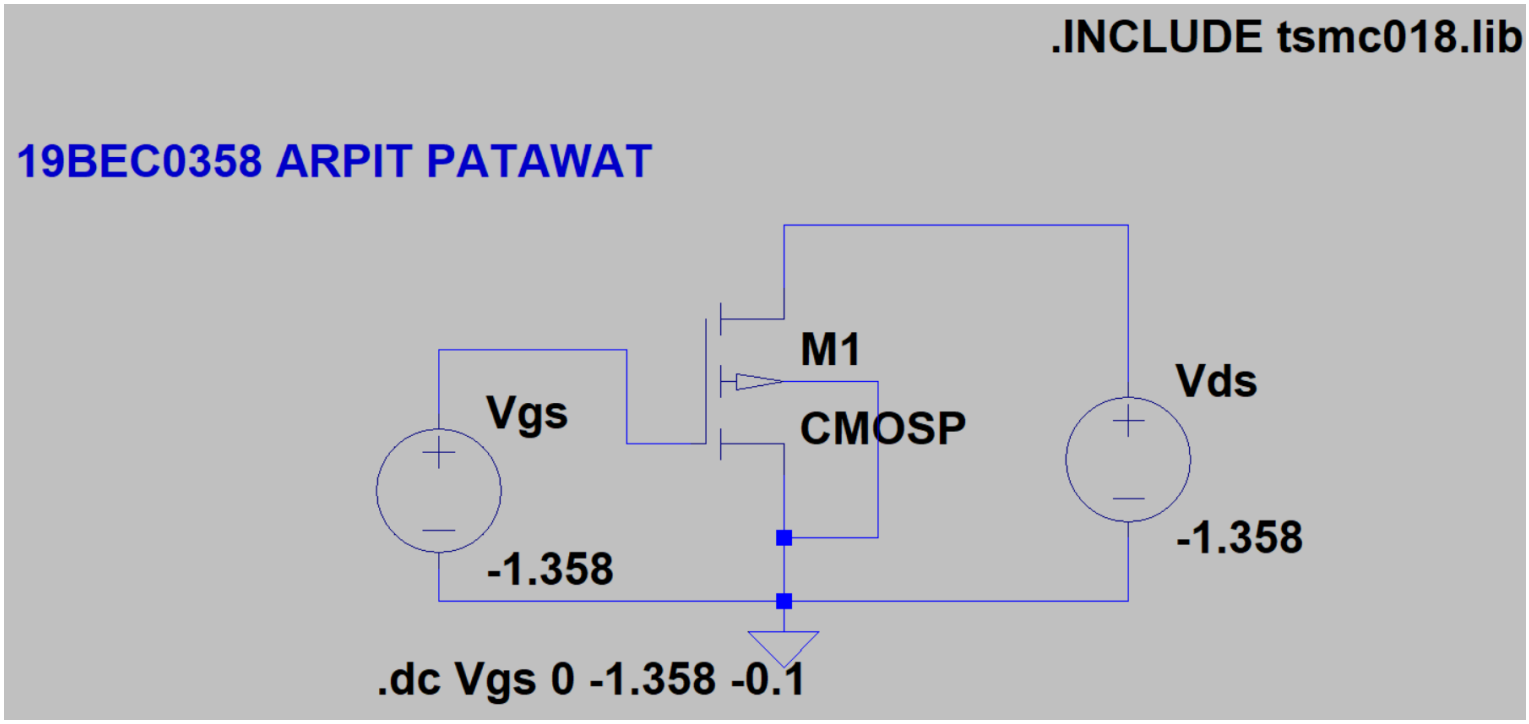
3. Determine the channel length modulation parameter (λ)from saturation region of the PMOS.

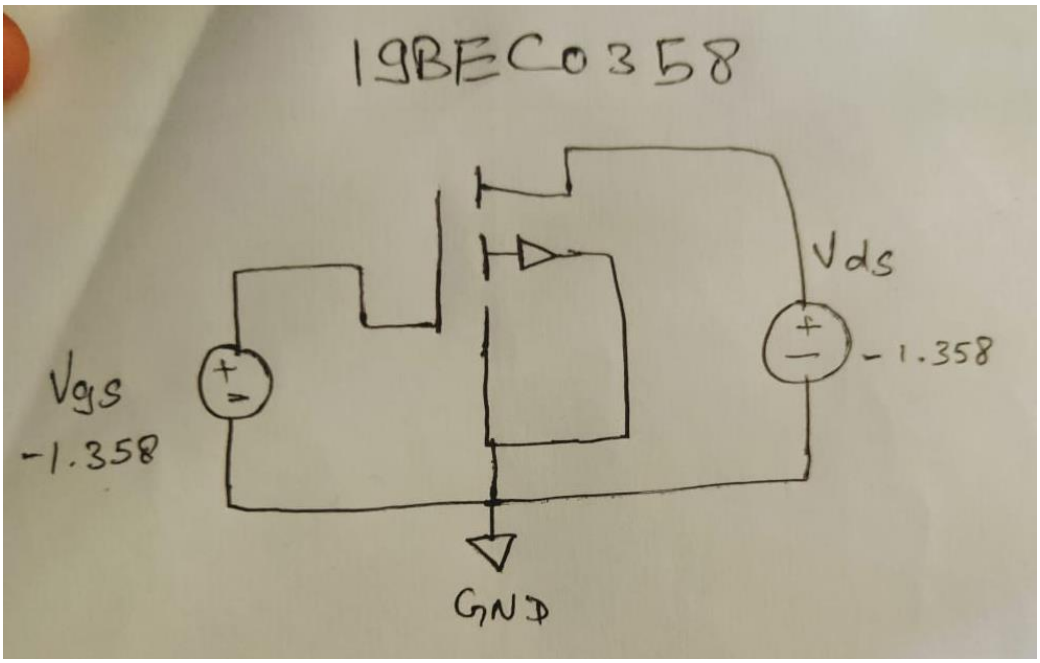
4. Show the body effect of the PMOS with different V_{SB}.

1.

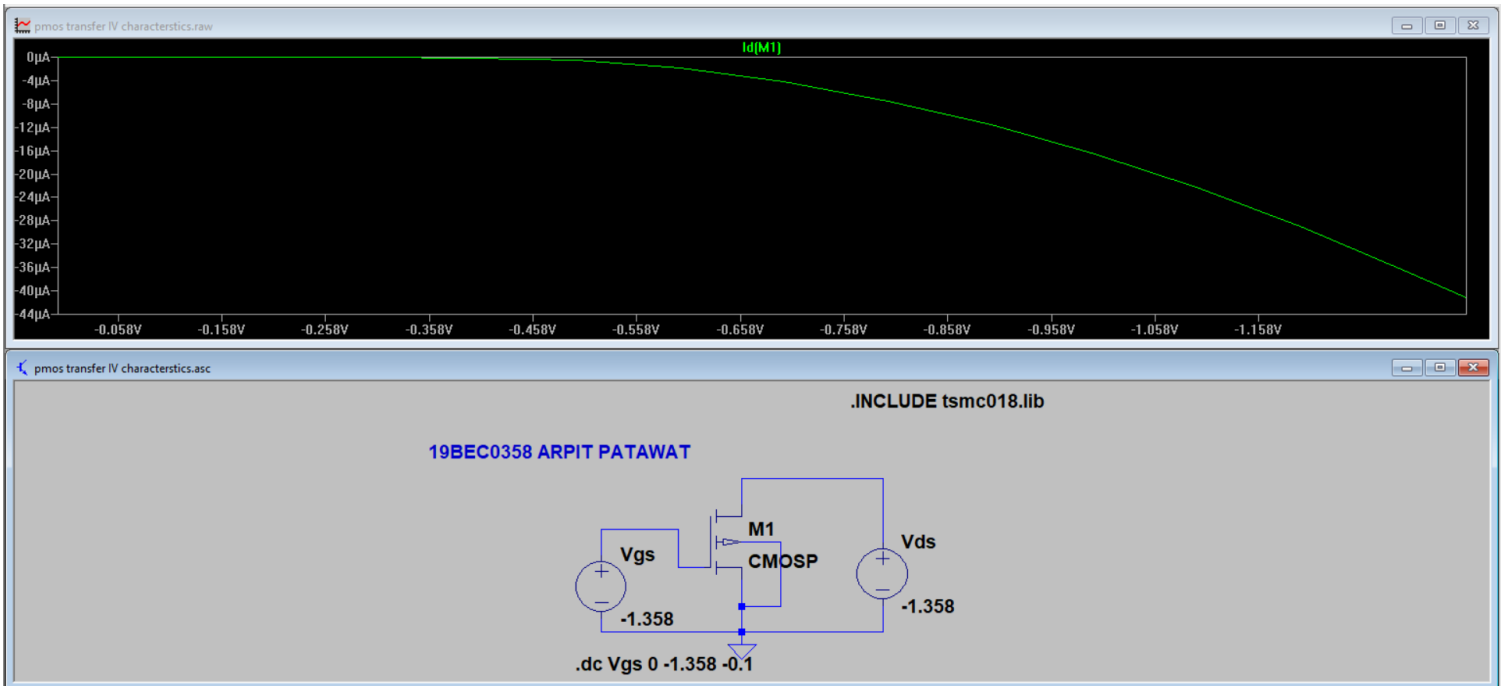
Aim → to plot transfer characteristics of PMOS and determine threshold voltage

Circuit Diagram → Width = length = 180 nm

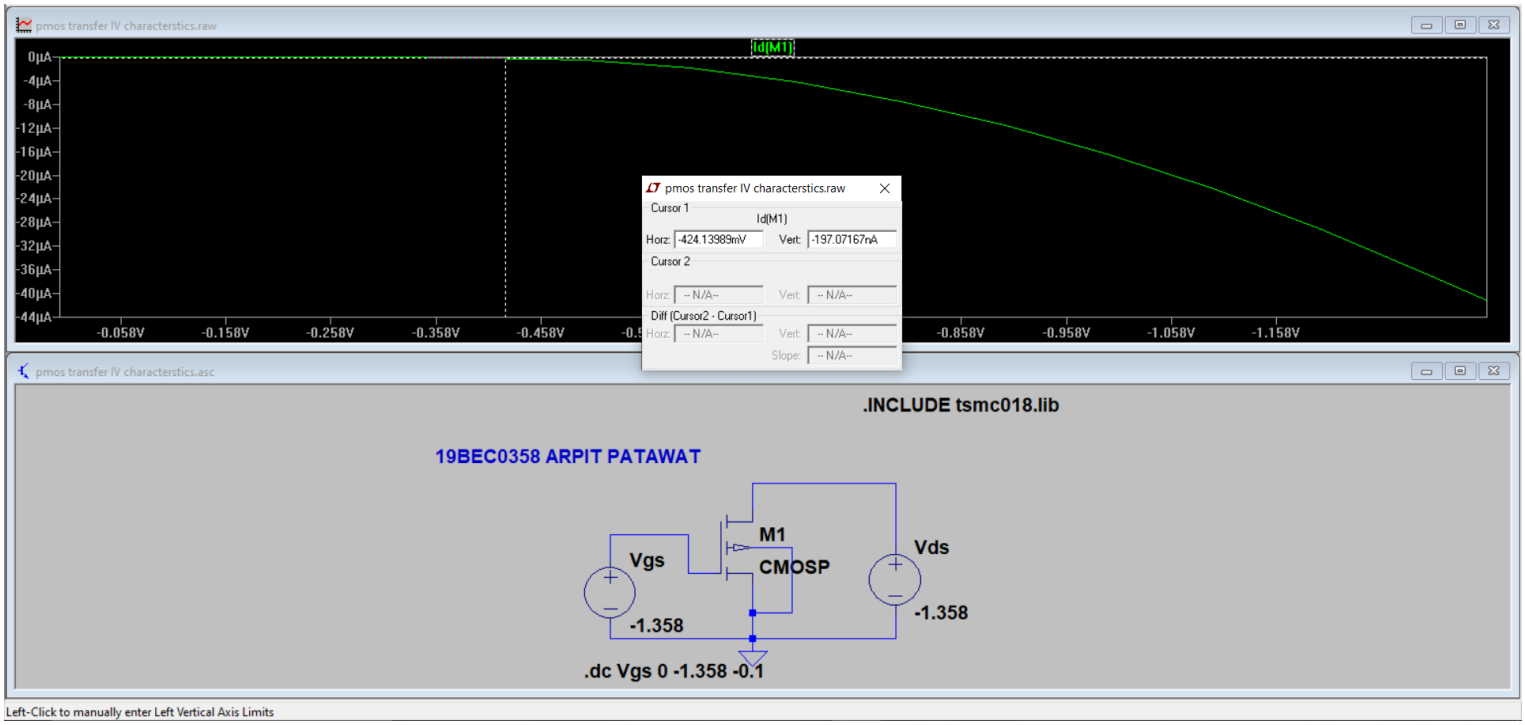




Simulation →



Result →

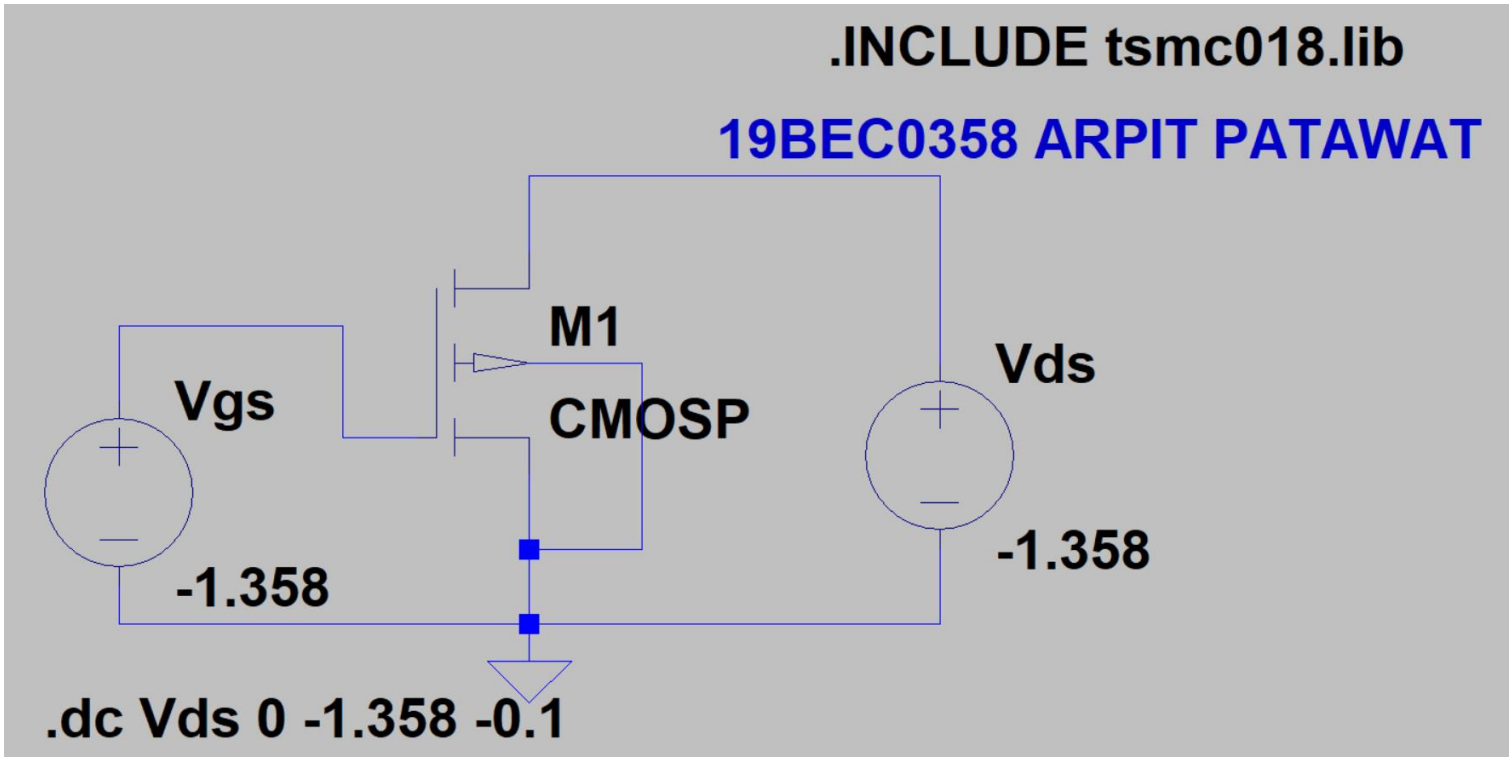


Graph b/w Vgs and Id

Threshold value → **-0.424V**

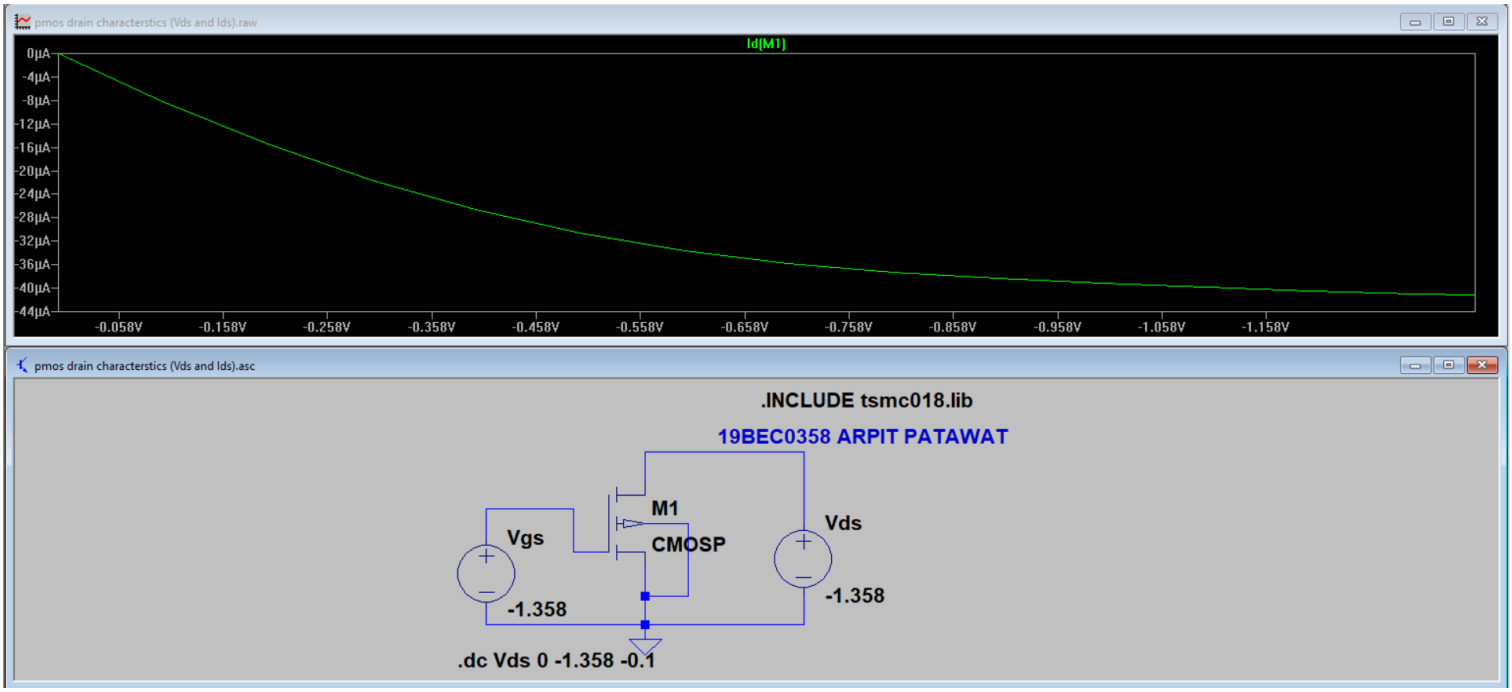
2.

Aim → to plot Drain characteristics of PMOS and determine Operating Regions of PMOS



Circuit Diagram →

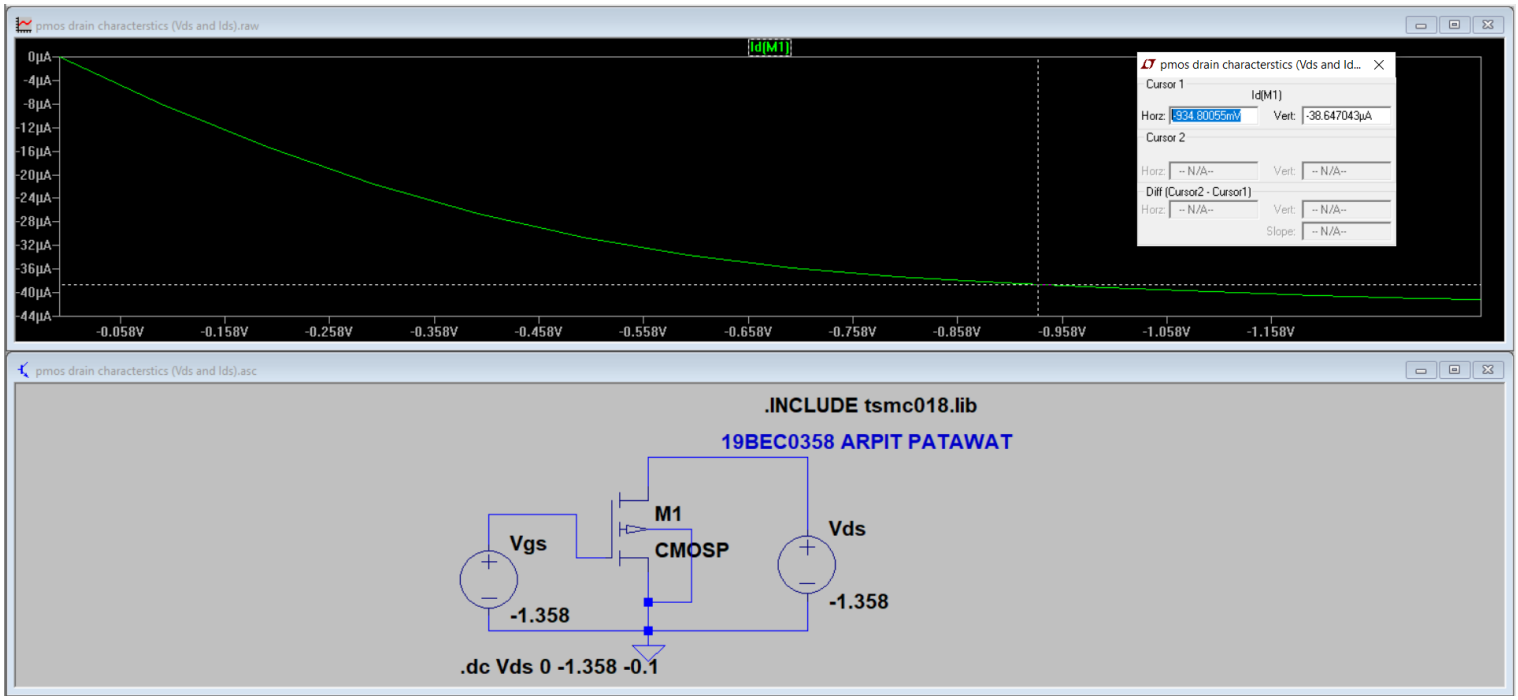
Simulation →



Graph b/w Vds and Id

Result → When Vds = Vgs – Vt → transistor goes to saturation

Vds = -1.358 – (-0.424v) → -0.934V

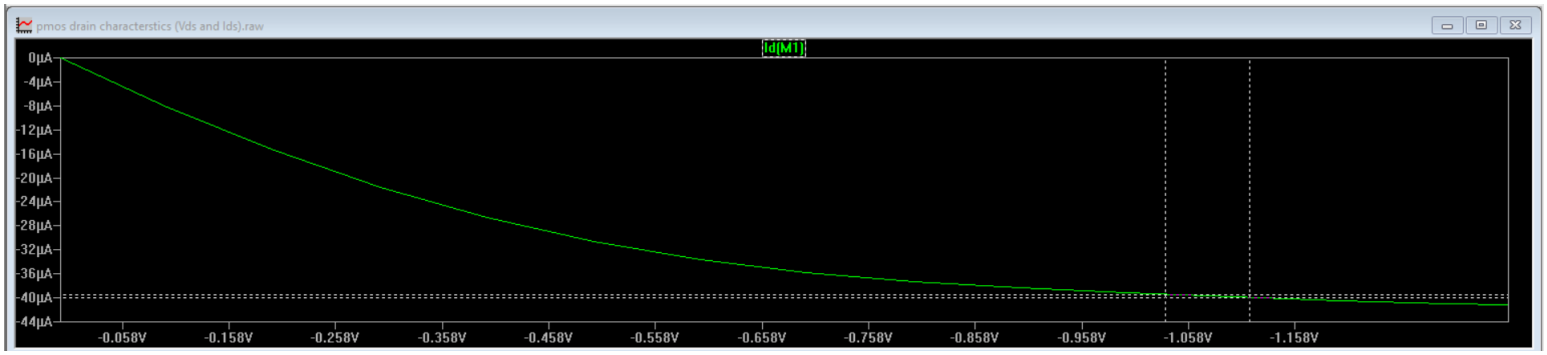


Left side of mark of -0.934 is linear mode and right part is saturation mode.

3

Aim → to determine the channel length modulation parameter from saturation region of PMOS

Circuit Diagram →



Here we have to take 2 points from the saturation region of drain characteristic of PMOS from which we will get absolute vds1, vds2 and corresponding absolute current ids1 and ids2 and these values are used to find the channel length modulation of PMOS from saturation region of PMOS.

$$I_{d1} = \frac{\beta(v_{gs}-v_t)^2(1+\lambda v_{ds1})}{2}$$ -------- Eq 1

$$I_{d2} = \frac{\beta(v_{gs}-v_t)^2(1+\lambda v_{ds2})}{2}$$ -------- Eq 2

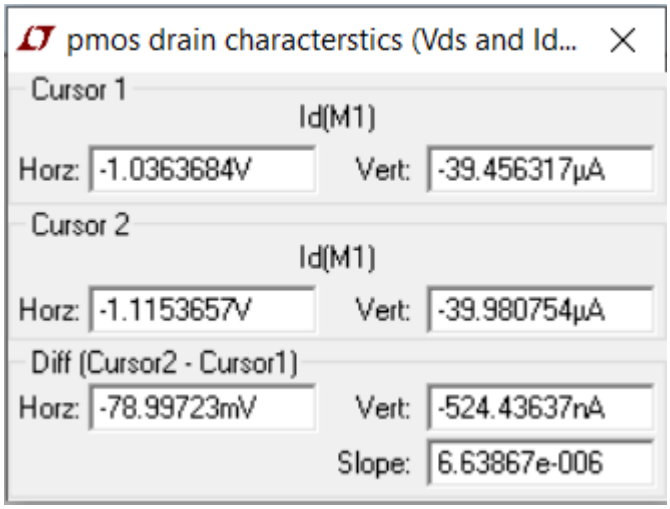
Eq 2 / Eq 1 →

$$\frac{I_{d2}}{I_{d1}} = \frac{(1+\lambda * v_{ds2})}{(1+\lambda * v_{ds1})}$$

$$\frac{39.980}{39.456} = \frac{(1+\ \lambda * 1.115)}{(1+\lambda * 1.036)}$$

$1.013 * (1+\lambda * 1.036) = (1+\ \lambda * 1.115)$

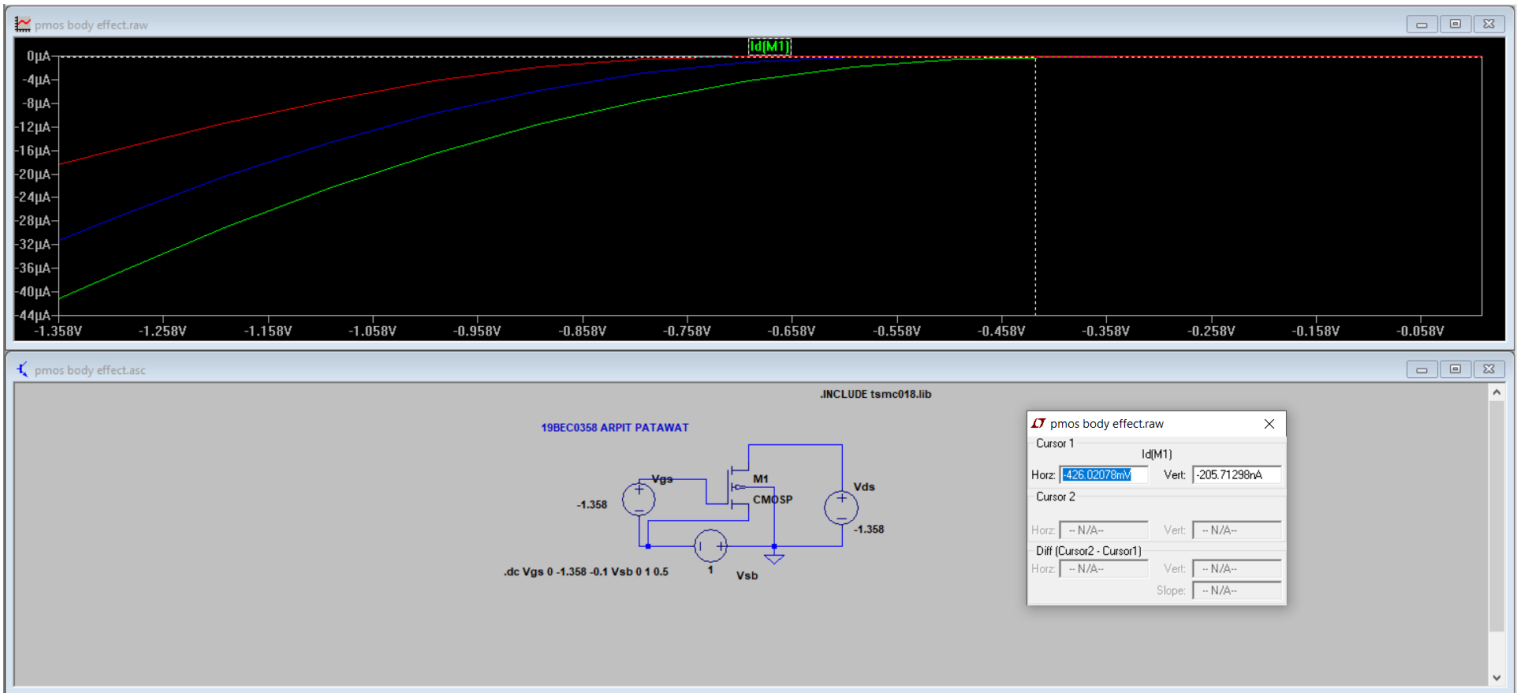
$\lambda * (1.049\ -1.115) = 1 - 1.013$ → $\lambda = 0.196$ V^-1

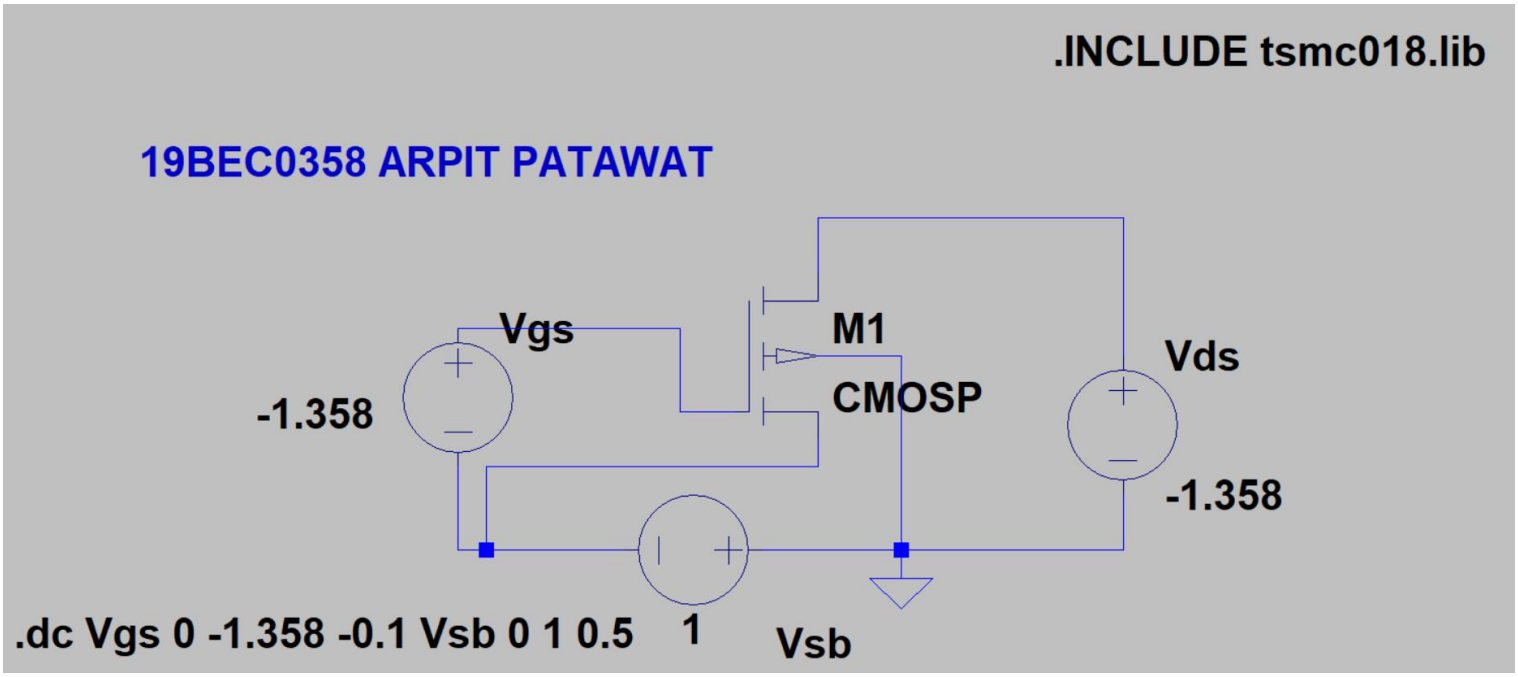


4

Aim → to Show body effect of PMOS with different Vsb

Circuit Diagram →





As we keep on increasing Vsb, threshold voltage increase. This is body effect of PMOS.