MOS Capacitances

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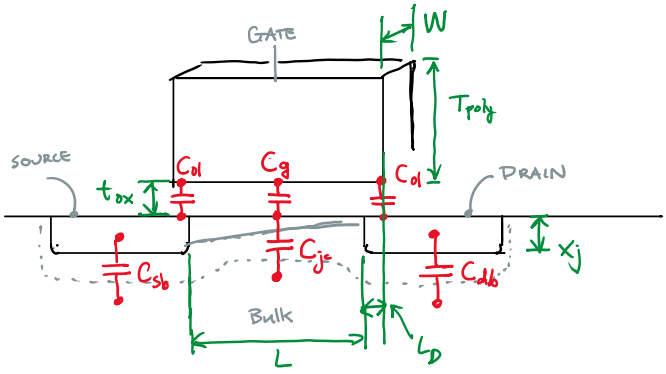
Typical MOS:



Capacitances:

- C_g - Gate capacitance
- C_{jc} - Junction capacitance
- C_{sb}, C_{db} - Source/Drain to Bulk capacitance
- C_{ol} - Overlap & Fringe Parasitic capacitances

Measurements:

- W - Device width
- T_{poly} - Gate polyoxide layer thickness
- t_{ox} - Thickness between gate & diffusion
- L - Device length
- L_D - Gate & source/drain overlapping length
- x_j - Thickness of sidewall

Gate Capacitances

Simple Model: $\boxed{C_g = C_{ox} \cdot WL}$

By regions of operation:

$$C_g = C_{gb} + C_{gs} + C_{gd}$$

(C_g TOTAL) (C_{gb} to BULK) (C_{gs} to SOURCE) (C_{gd} to DRAIN)

$V_{GS} \leq V_T$ -	CUTOFF:	$C_{ox} \cdot WL$	+ 0	+ 0	
$V_T < V_{GS} \leq V_{DS} + V_T$ -	SATURATION:	0	+ $\frac{2}{3} C_{ox} \cdot WL$	+ 0	← Pinched off
$V_{GS} > V_{DS} + V_T$ -	LINEAR:	0	+ $\frac{1}{2} C_{ox} WL$	+ $\frac{1}{2} C_{ox} WL$	