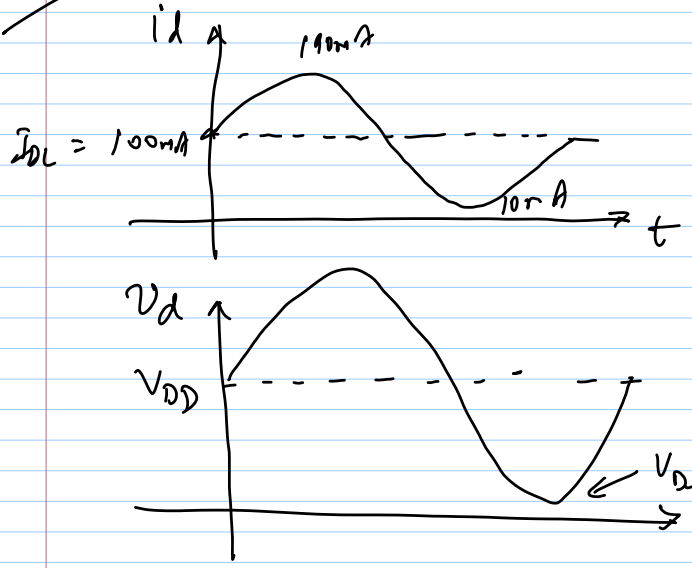
12/11/13

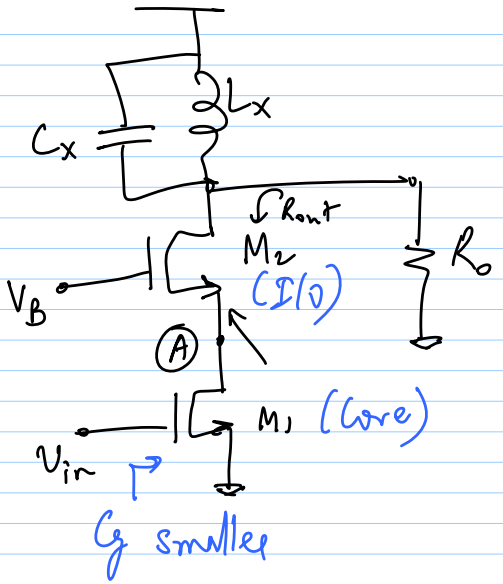
Lec 43



→ g_m is nonlinear

1) gain ⟷
2) linearity
3) η
4) noise (OOB)
5) Pout

* Device W's are in several mm
* L > L_{min} may give better linearity but larger C_g & C_d
* r_{ds} of device is low due to large W ⇒ Cascode possibility

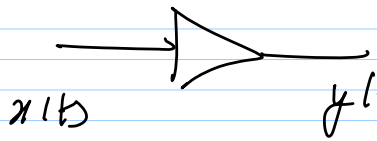


- Swing is limited
- C_{par} @ (A)
+ V_A swing is small ⇒ v_{d_1} is small (better linearity)
+ Stability
+ R_{out} is larger
+ Breakdown Voltage Stresses are lower

Core devices — 90nm, 1.2V
→ I/O " — 250nm, 2.5V

* V_{DSAT_2} — choose equal to V_{DSAT_1}
* L = L_{min_2}, W — V_{DSAT_2}, I_{DC}
* V_B — choose such that
  a) V_A is large enough for linearity
  b) M_2 does not go into triode

Linearity



$$x(t) = a(t)\cos(\omega_0 t + \varphi(t))$$

$$y(t) = A(t)\cos[\omega_0 t + \varphi(t) + \theta(t)]$$

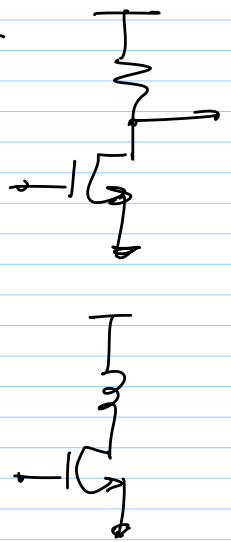
If PA BW >> signal BW:

$$y(t) \approx A(a(t))\cos[\omega_0 t + \varphi(t) + \theta(a(t))]$$

$A(a(t))$: AM-AM char.

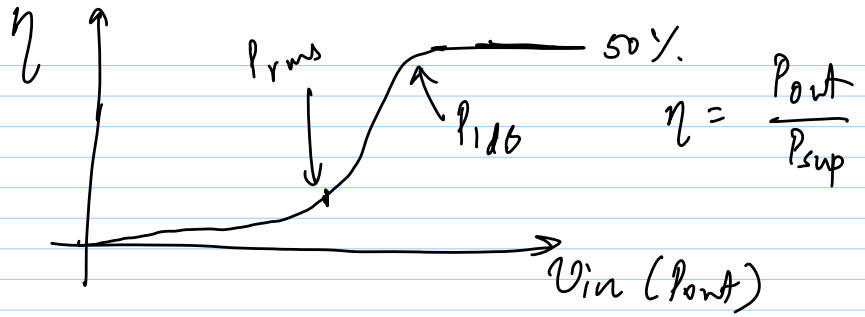
$\theta(a(t))$: AM-PM char.

η vers A



$\eta_{max} = 25\%$

$\eta_{max} = 50\%$



$$\eta = \frac{P_{out}}{P_{sup}}$$

PAE – power added efficiency when gain is not large

$$\eta_{PAE} = \frac{P_{out}}{P_{in} + P_{sup}}$$