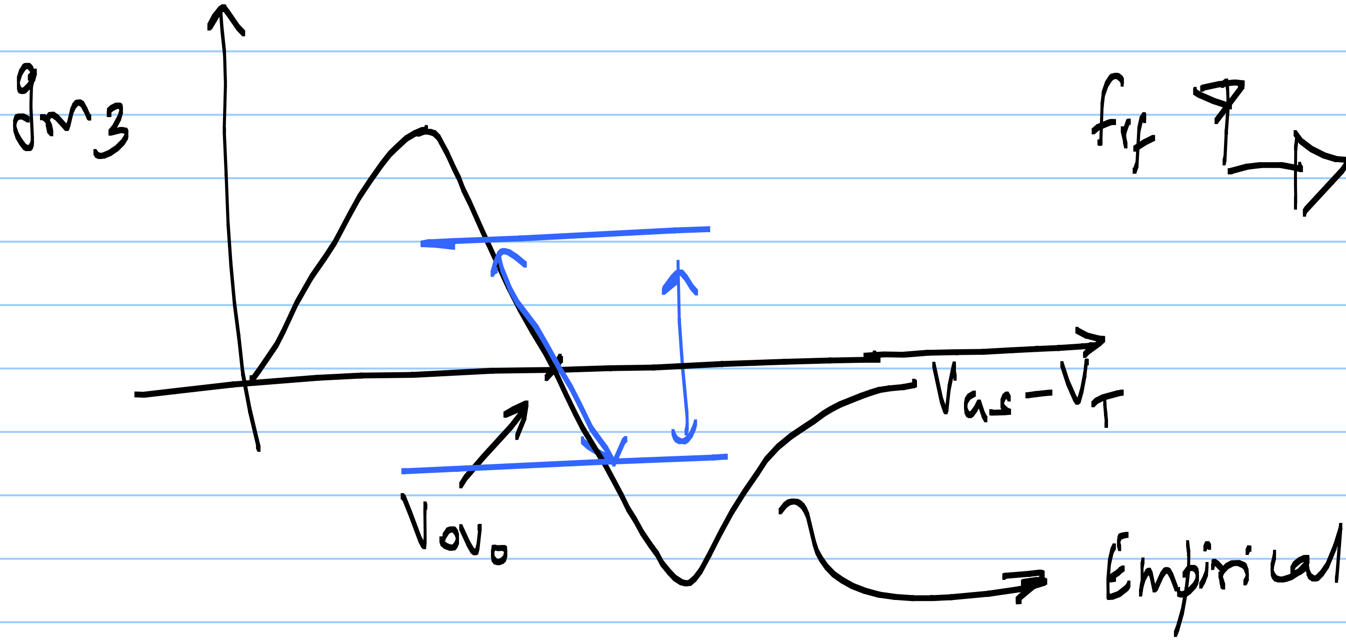
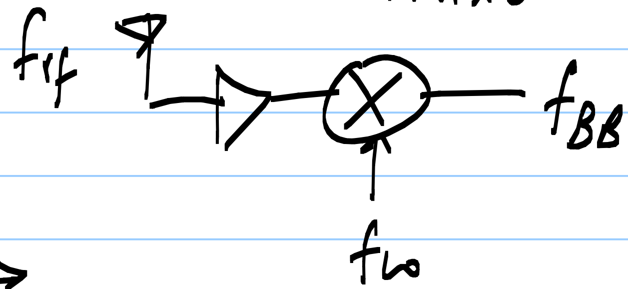
27/2/20

Lec 19

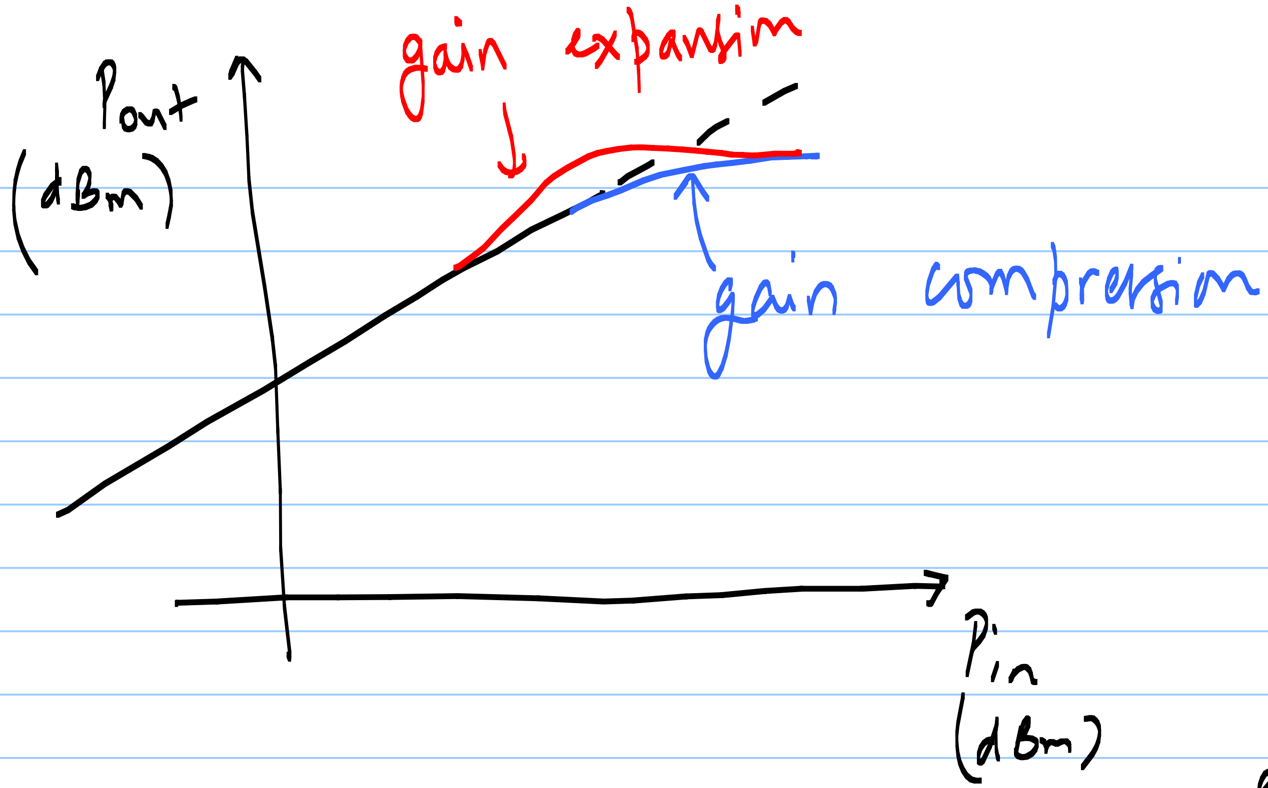
$$g_m = \mu_n C_{ox} \left(\frac{W}{L}\right)(V_{GS} - V_T)$$

IIP_2 : zero-IF mixers or direct conversion mixers





* If we design LNA so that the amplifying device has $(V_{GS}-V_T) = V_{OV_0}$ you will achieve very high IIP_3
* g_{m_3} slope around V_{OV_0} is high
  ⇒ ensure that IIP_3 is met over PVT variations
* Otherwise, operate at very high $V_{GS}-V_T$ where $|g_{m_3}|$ is low & has small slope
* g_{m_3} has +ve or -ve signs depending on $(V_{GS}-V_T) > V_{OV_0}$ or $< V_{OV_0}$
  ⇒ you can achieve gain expansion or gain compression



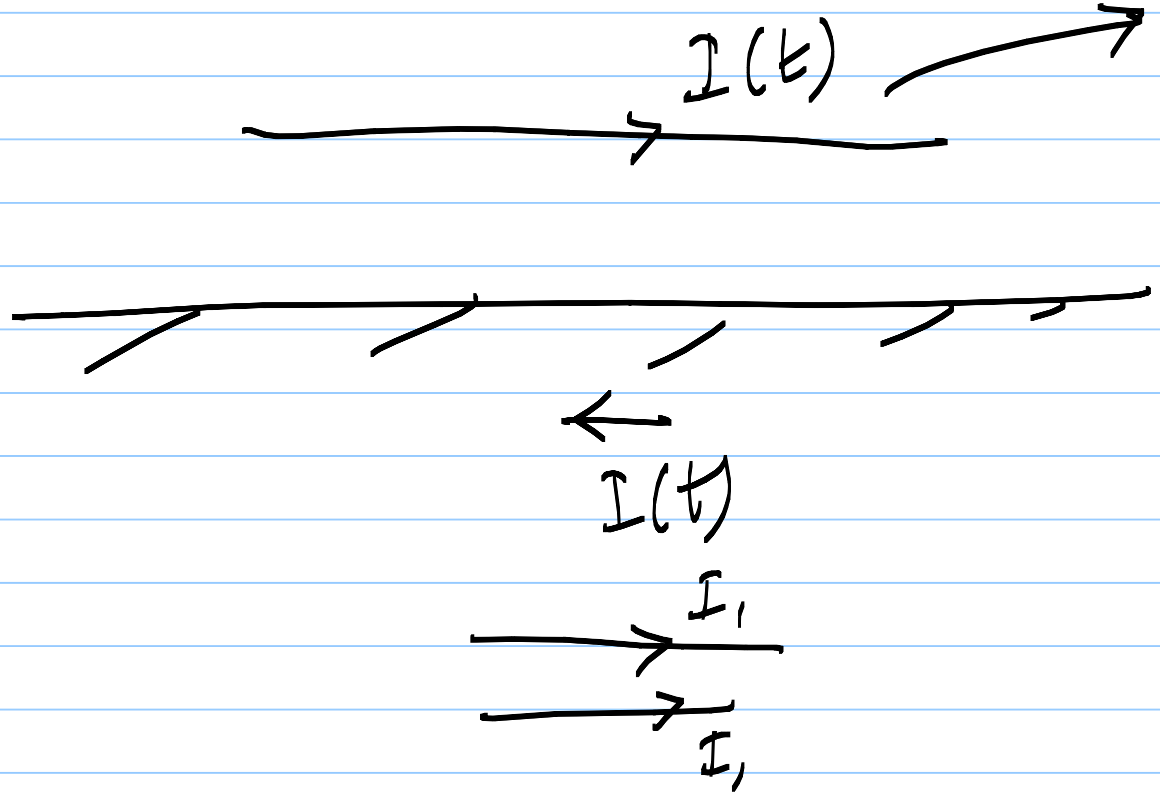
fundamental term: $\alpha_1 + \frac{3\alpha_3 A^2}{4}$

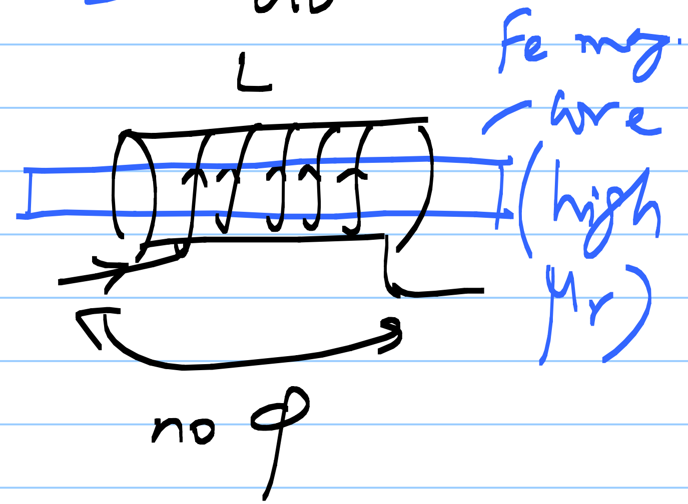
— gain compression at large $V_{GS}-V_T$

— gain expansion at small $V_{GS}-V_T$

Spiral Inductors

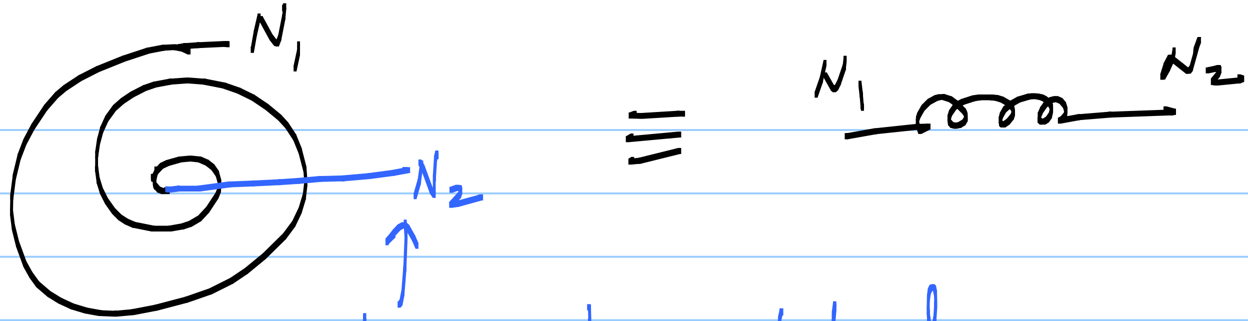
$$V = L \frac{dI(t)}{dt}$$





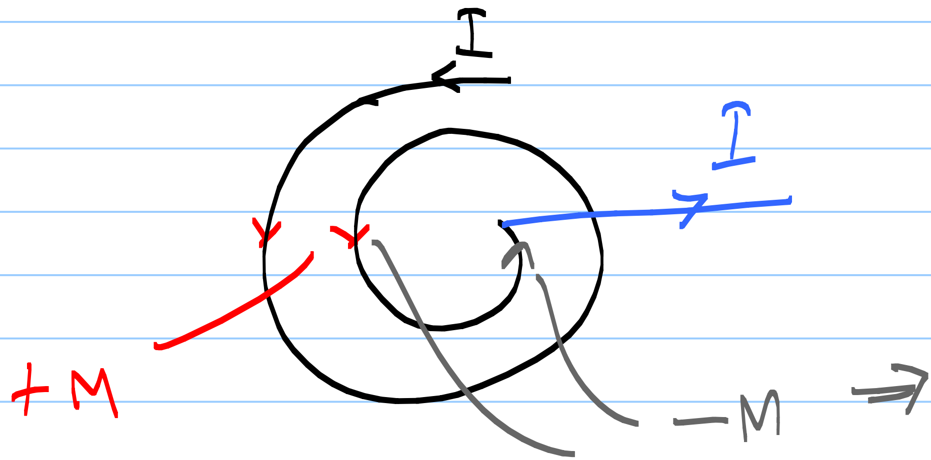
On silicon

* Only air cored inductors
* Only planar (or combination of planar) structures

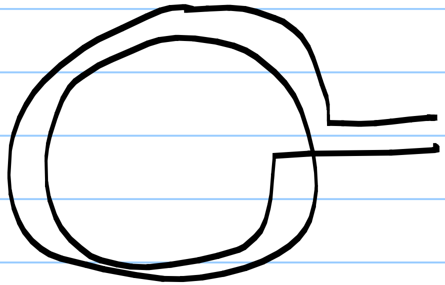


↑ different metal layer

* If spiral has total wire length l, ensure that $l <<< \lambda$



⇒ build inductors with large inner diameters



nH inductors require several 100s of μm to mm of length

* Multilayer spirals are also possible
  - ⇒ choose current directions to produce additive M