

Problems for exercise 2 (Komponenter):

1. Problem 3.4 (solved numerically, shown by teacher)
2. Problem 3.1 (in (b) it is enough to calculate some extremes)
3. Problem 3.3. (Hint: first calculate g_m by deriving I_d with respect to V_{gs})
4. Problem 3.5
(Hint: variations in V_T will not affect the current, since the overdrive is kept constant)
5. Problem 3.8 (reasoning problem, no calculations necessary)
6. Problem solved by the teacher:

An on-chip inductor is needed for a 2.4GHz oscillator (Bluetooth). The self-resonance frequency must be at least double the frequency of operation (4.8GHz). To achieve the best performance an as high as possible quality factor (Q) is desired. At our disposal we have a process with a thick (3 μ m) top metall with 4 μ m oxide to the substrate. To simplify the calculations the substrate is assumed to be perfectly conducting for capacitive currents, but isolating for inductive ones. No substrate losses will then occur degrading the quality factor. Design the inductor and determine its quality factor and self-resonance frequency.

7. Problem 2.1
8. Problem 2.2 a-c (Extension: what would change if you had more metl-layers at your disposal? Just reasoning, no calculations needed.)
9. Problem 2.5
10. Problem 2.9 (After solving the problem, think about the contradiction between high matching accuracy and operation frequency for a resistor)