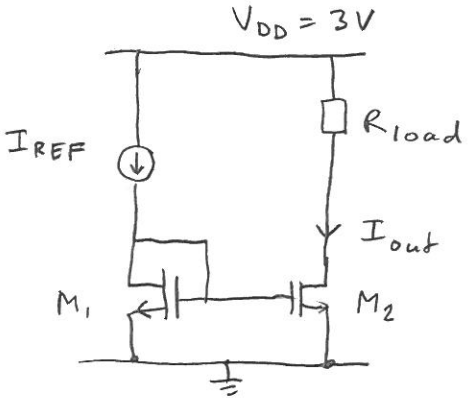
Example current mirror

2010-01-24/Bengt M.

#1.

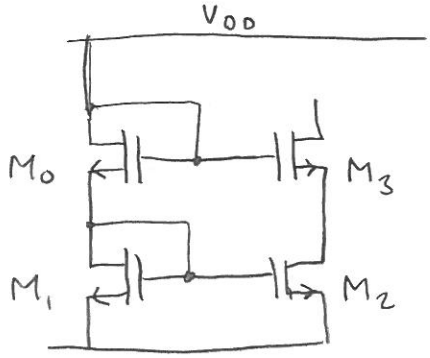


Suppose $I_{REF} = 50\,mA$ and $I_{out} = 200\,mA$ is wanted.

Design #1

$$\left(\frac{W}{L}\right)_2 = 4 \cdot \left(\frac{W}{L}\right)_1$$

#2. Cascode current mirror

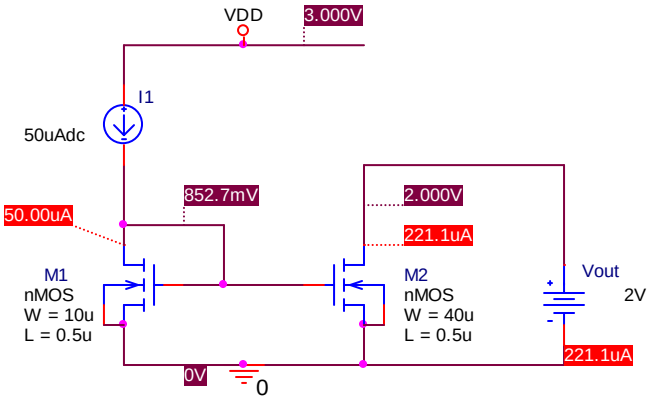


Design #2

$$\frac{\left(\frac{W}{L}\right)_3}{\left(\frac{W}{L}\right)_0} = \frac{\left(\frac{W}{L}\right)_2}{\left(\frac{W}{L}\right)_1}$$

Design of a current mirror 2010-01-24 Bengt Molin

Design #1 Basic mirror

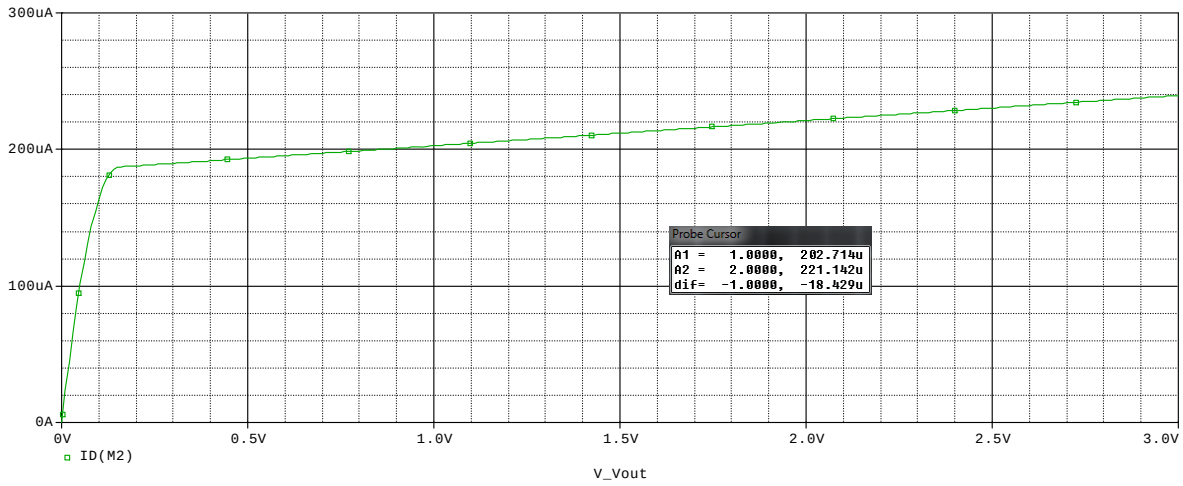


From output file Vout= 2V DC

NAME	M_M2	M_M1
MODEL	nMOS	nMOS
ID	2.21E-04	5.00E-05
VGS	8.53E-01	8.53E-01
VDS	2.00E+00	8.53E-01
VBS	0.00E+00	0.00E+00
VTH	7.00E-01	7.00E-01
VDSAT	1.53E-01	1.53E-01
GM	2.90E-03	6.55E-04
GDS	1.84E-05	4.61E-06

$$r_o = \frac{1}{GDS} = \frac{1}{1.84 \cdot 10^{-5}} = 54.3\ \text{k}\Omega$$

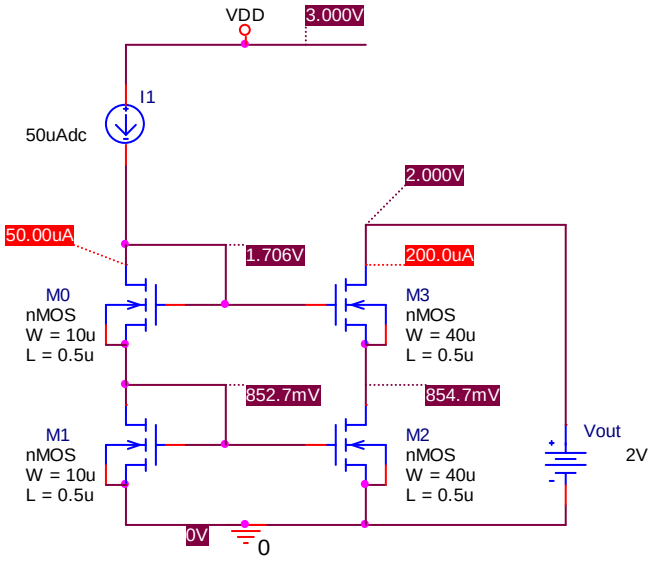
DC-sweep Vout from 0V to 3V



From the slope: $r_o = \frac{1}{18.429\text{u}} = 54.3\ \text{k}\Omega$

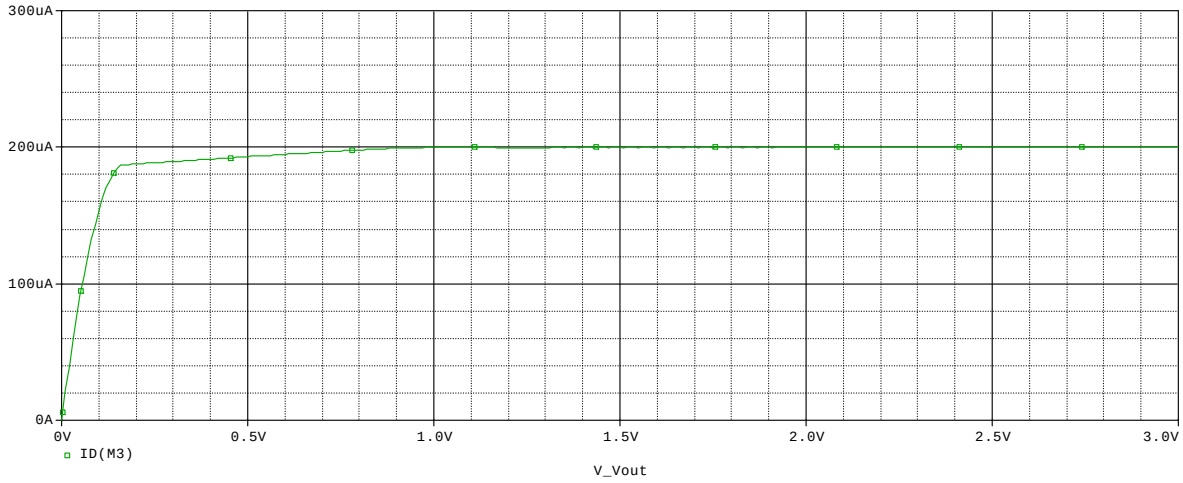
λ=0.1 means an increase of current 10% for a 1 V increase of V_{DS}.

Design #2 Cascode mirror



Wooow, it works!

DC-sweep Vout from 0V to 3V



Good current source 200 uA for Vout>1V.