



cmos028fdsoi Technology

RVT models

DK1.2\_RF\_mmW

Comparison with DK1.1\_RF\_mmW model(s)

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Sep 24, 2018

Technology R&D Crolles Site – TDP/TDS/SPICE Modeling

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## General information on RVT models

- Maximum supply voltage is - V.
- Validity domain is defined as follows:
  - ✓ Drawn gate length varies from 30nm to 10um.
  - ✓ Drawn transistor width varies from 80nm to 10um.
  - ✓ Device temperature varies from -40 °C to 125 °C.

## Output parameters definitions

- Model(s): nfet\_acc, pfet\_acc
  - ✓  $V_{t\_lin}$  : Threshold voltage defined as  $V_{gs}$  value for which drain current is  $i_{vt} \cdot M \cdot 1 \cdot W / (1 \cdot L + 0 + 1 \cdot p\_la)$  at  $V_{ds} = 0.05V$ .
  - ✓  $I_{g\_on}$  : Gate current at  $V_{ds} = 0V$  and  $V_{gs} = 1V$ .
  - ✓  $\tau_{aueff}$  : Time constant computed as  $V_{dd} / I_{eff} \cdot C_{ggmean}$ .
  - ✓  $I_{lin}$  : Drain current at  $V_{gs} = 1V$ ,  $V_{ds} = 0.05V$ .
  - ✓  $I_{off\_g}$  : Gate current at  $V_{gs} = 0V$ ,  $V_{ds} = v_{ds\_sat}V$ .
  - ✓  $V_{t\_sat}$  : Threshold voltage defined as  $V_{gs}$  value for which drain current is  $i_{vt} \cdot M \cdot 1 \cdot W / (1 \cdot L + 0 + 1 \cdot p\_la)$  at  $V_{ds} = v_{ds\_sat}V$ .
  - ✓  $I_{eff}$  : Average drain current  $(I_{low} + I_{high}) / 2$ .
  - ✓  $I_{sat}$  : Drain current at  $V_{gs} = 1V$ ,  $V_{ds} = V_{dd}V$ .
  - ✓  $Log_{ioff}$  :  $\log_{10}(I_{offsat})$ .

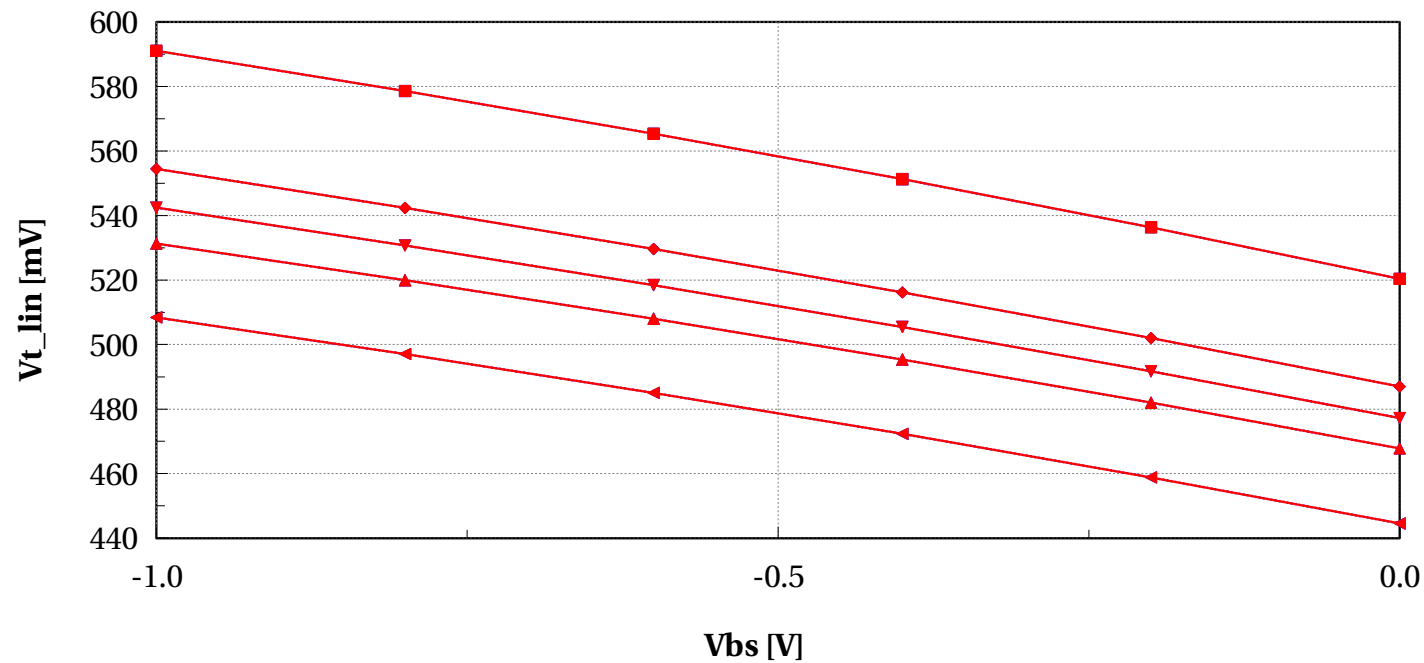
# **nfet\_acc**

## **Electrical characteristics scaling**

## Scaling versus $V_{bs}$ ( $L=1\mu m, W=1\mu m$ )

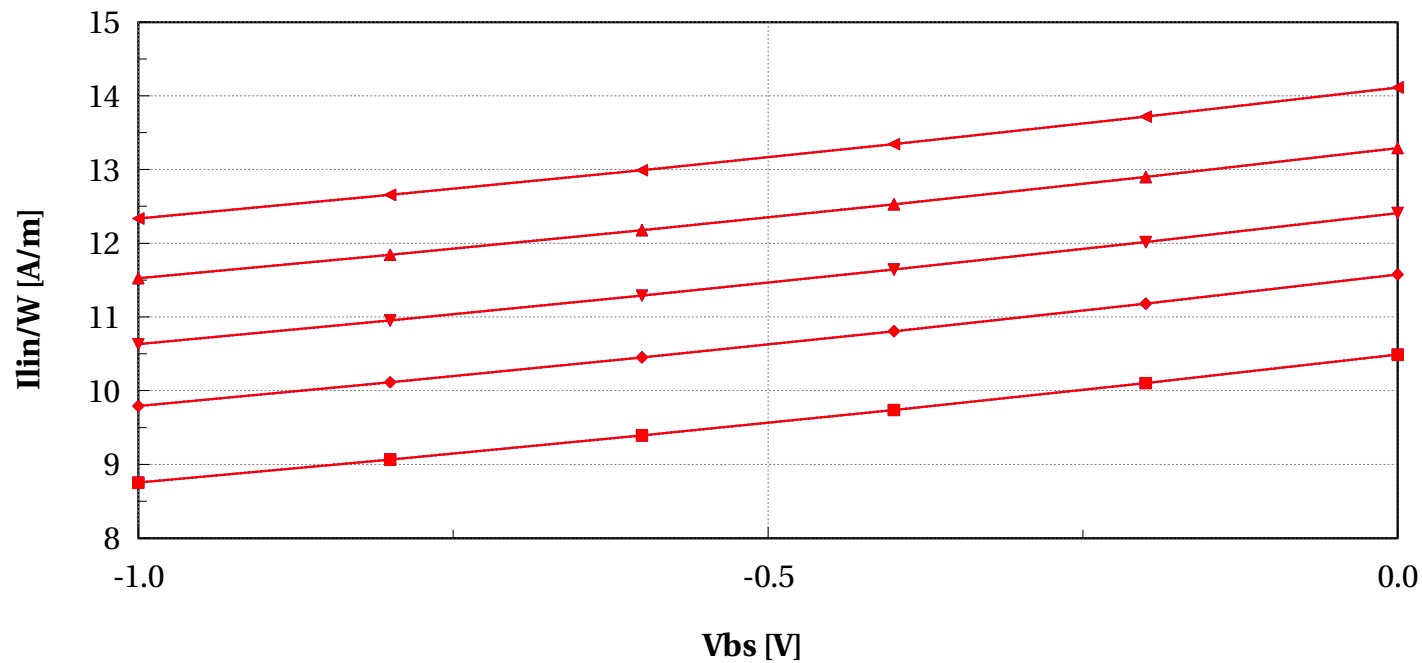
# nfet\_acc, Vt\_lin [mV] vs Vbs [V]

w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1



# nfet\_acc, Ilin/W [A/m] vs Vbs [V]

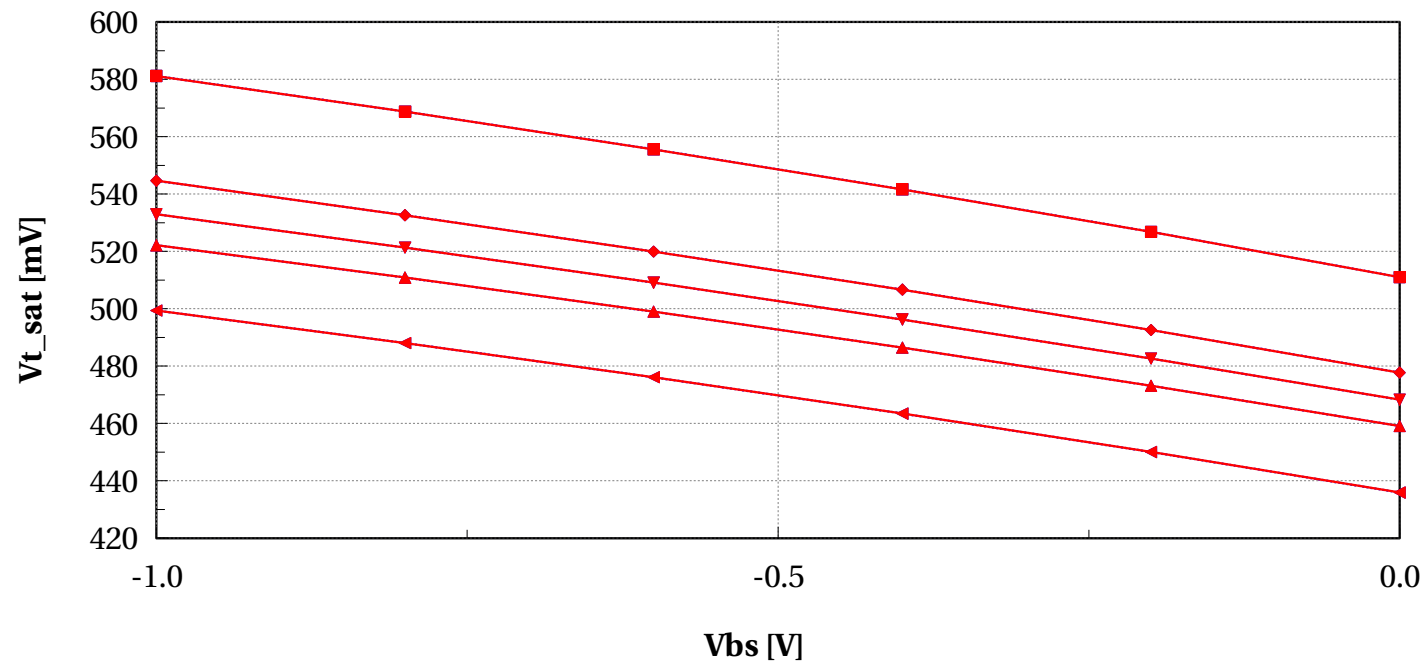
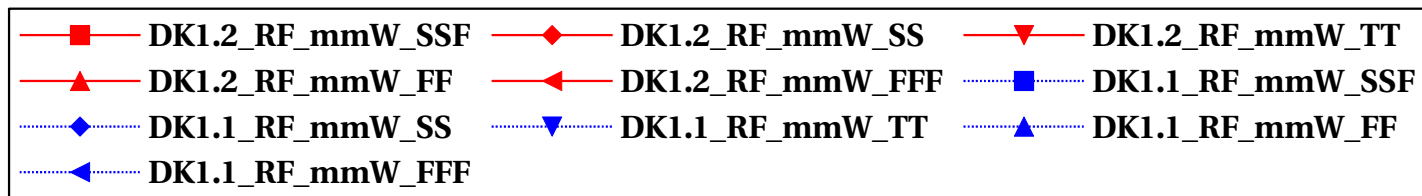
w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1





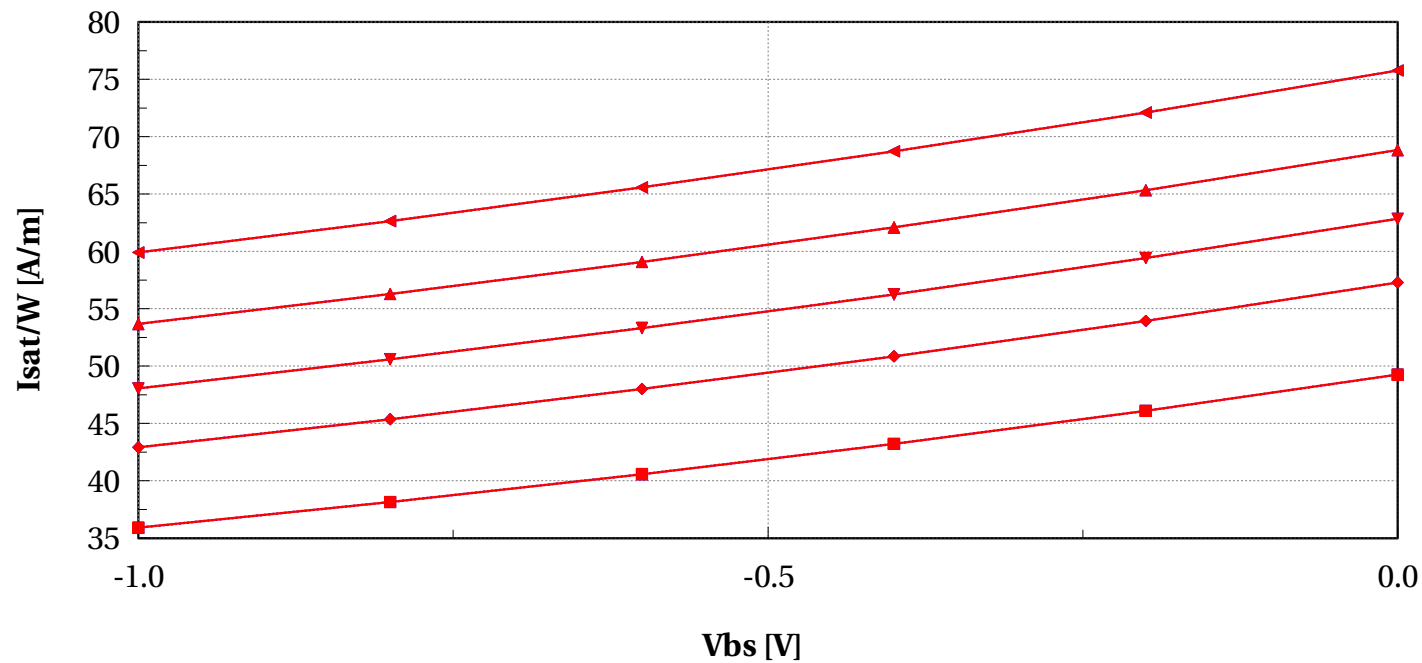
# nfet\_acc, Vt\_sat [mV] vs Vbs [V]

w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1



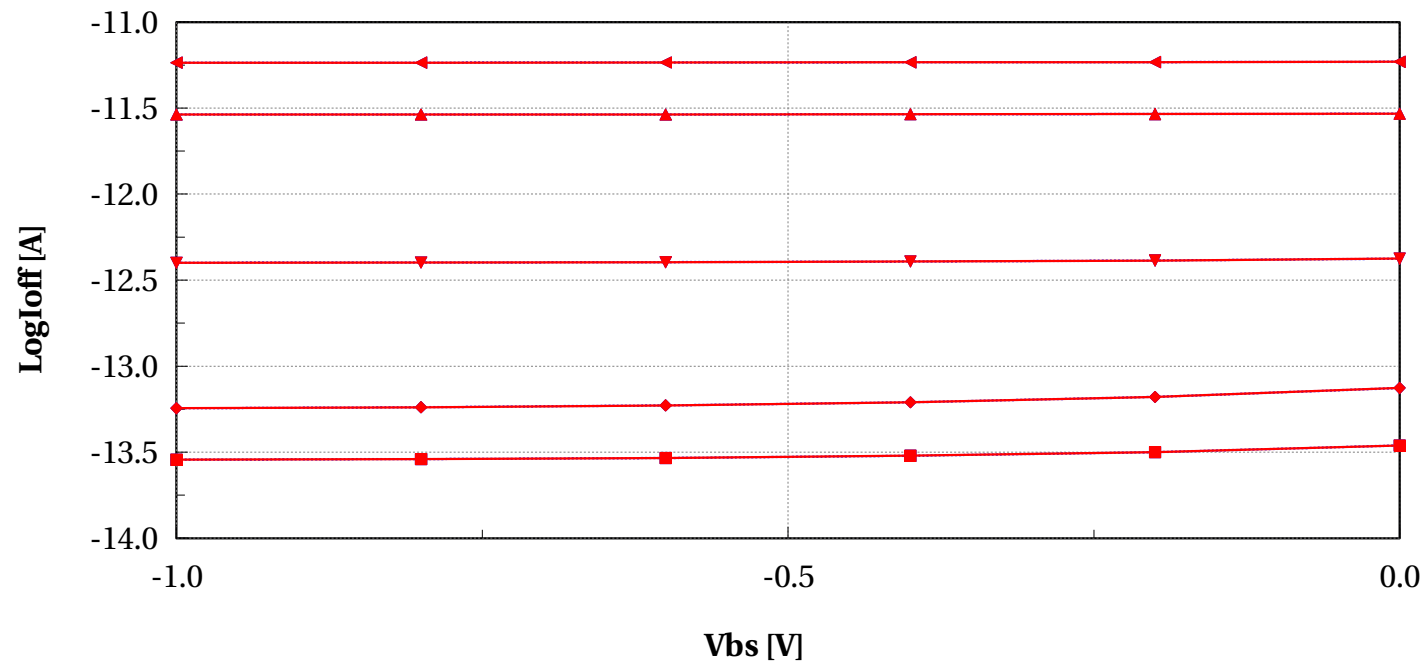
## nfet\_acc, Isat/W [A/m] vs Vbs [V]

w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1



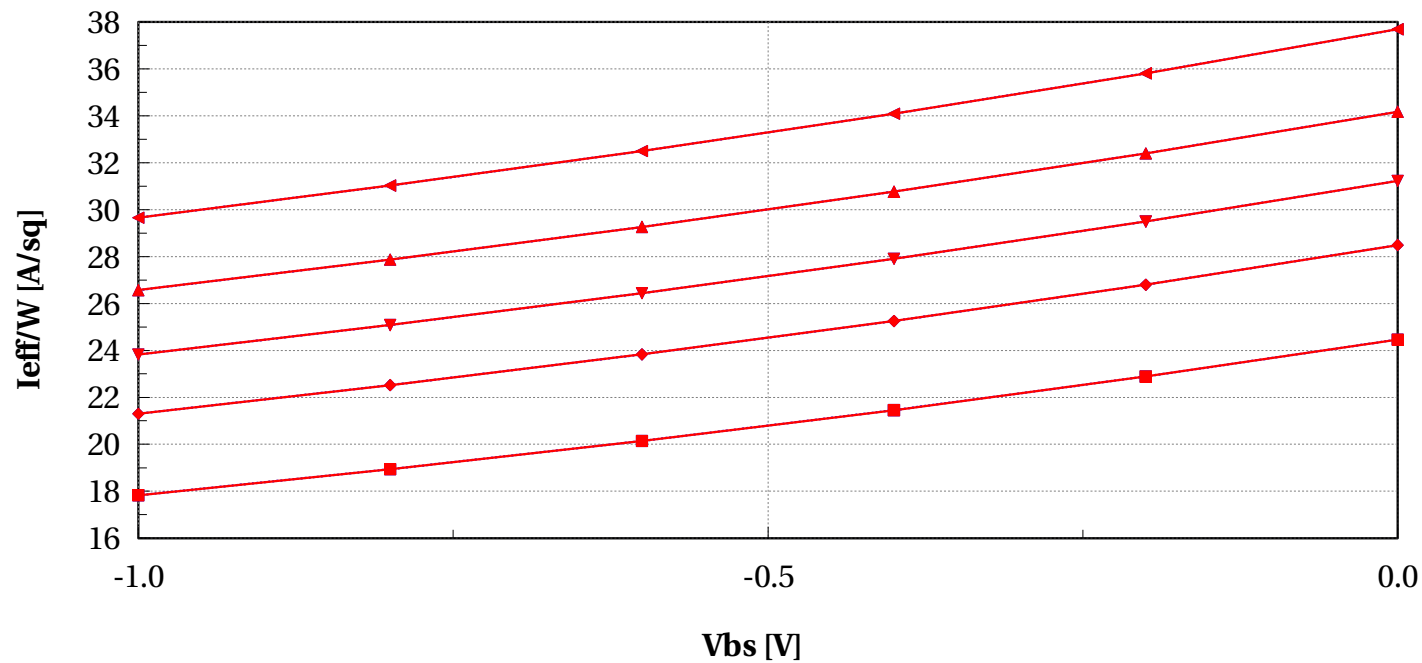
# nfet\_acc, LogIoff [A] vs Vbs [V]

w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1



# nfet\_acc, I<sub>eff</sub>/W [A/sq] vs V<sub>bs</sub> [V]

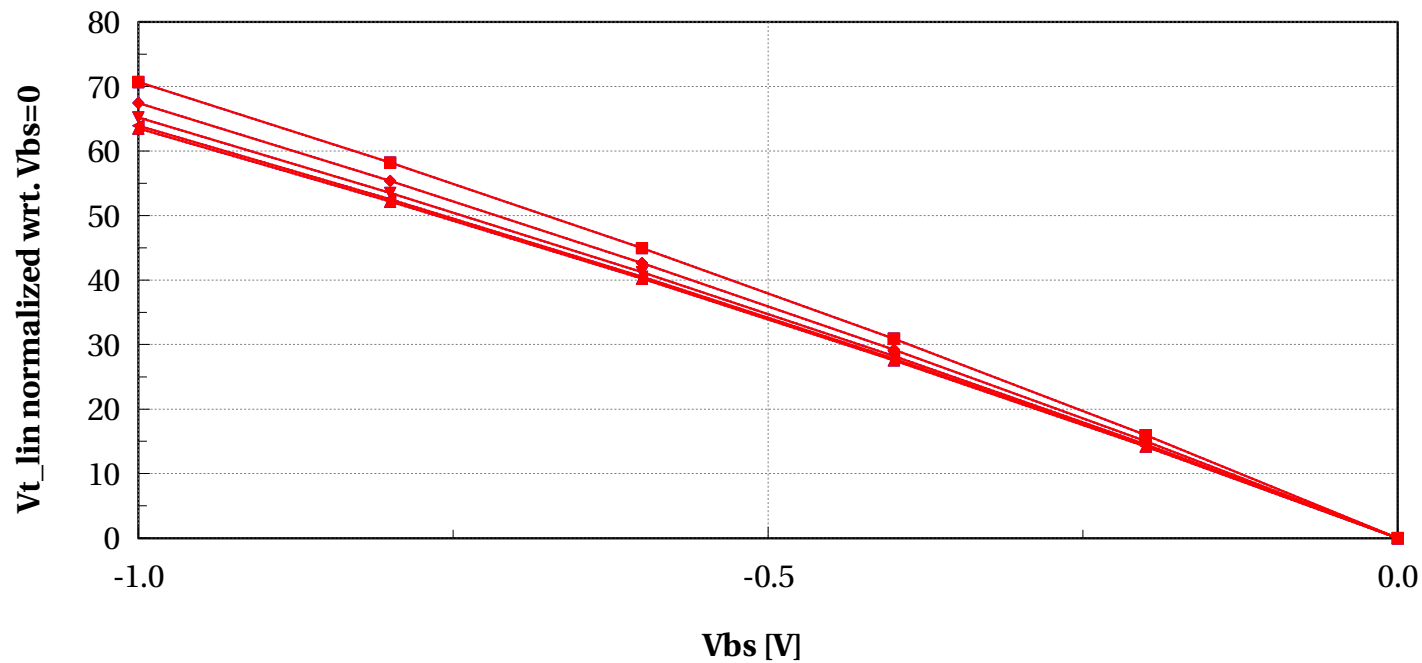
w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1



## Scaling versus $V_{bs}$ normalized ( $L=1\mu m, W=1\mu m$ )

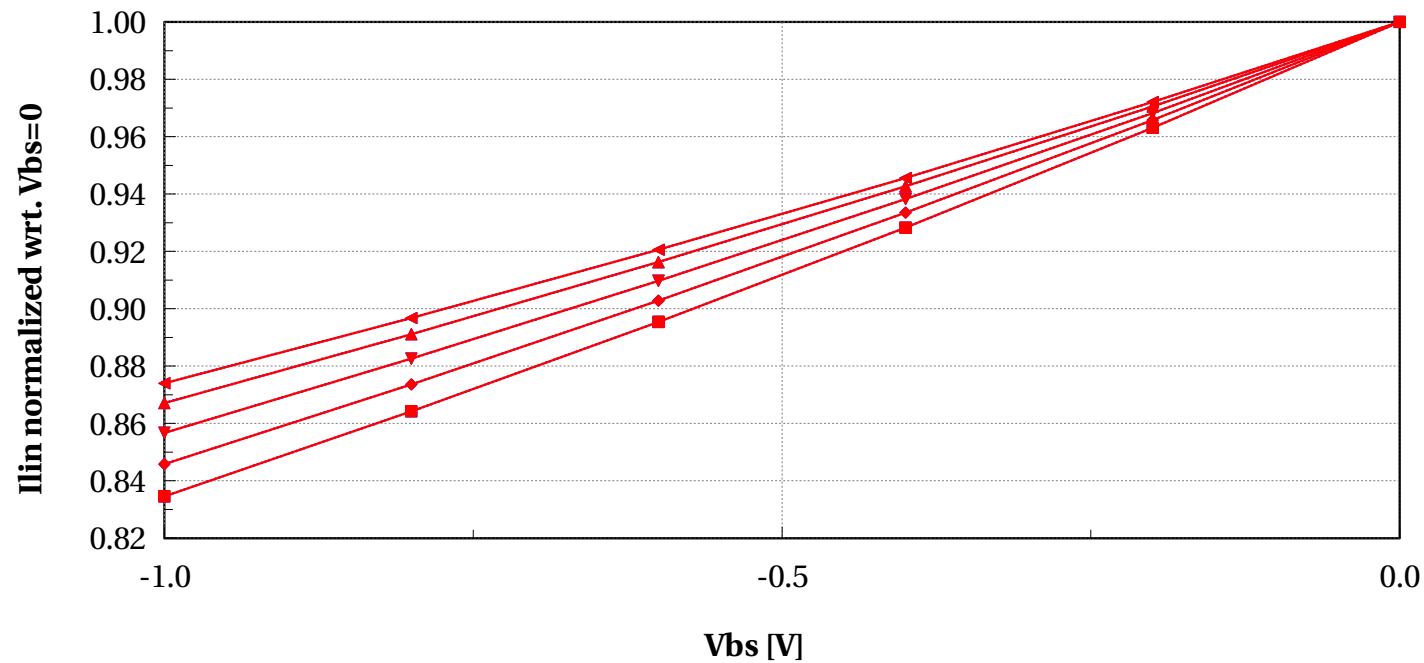
## nfet\_acc, Vt\_lin normalized wrt. Vbs=0 vs Vbs [V]

w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1



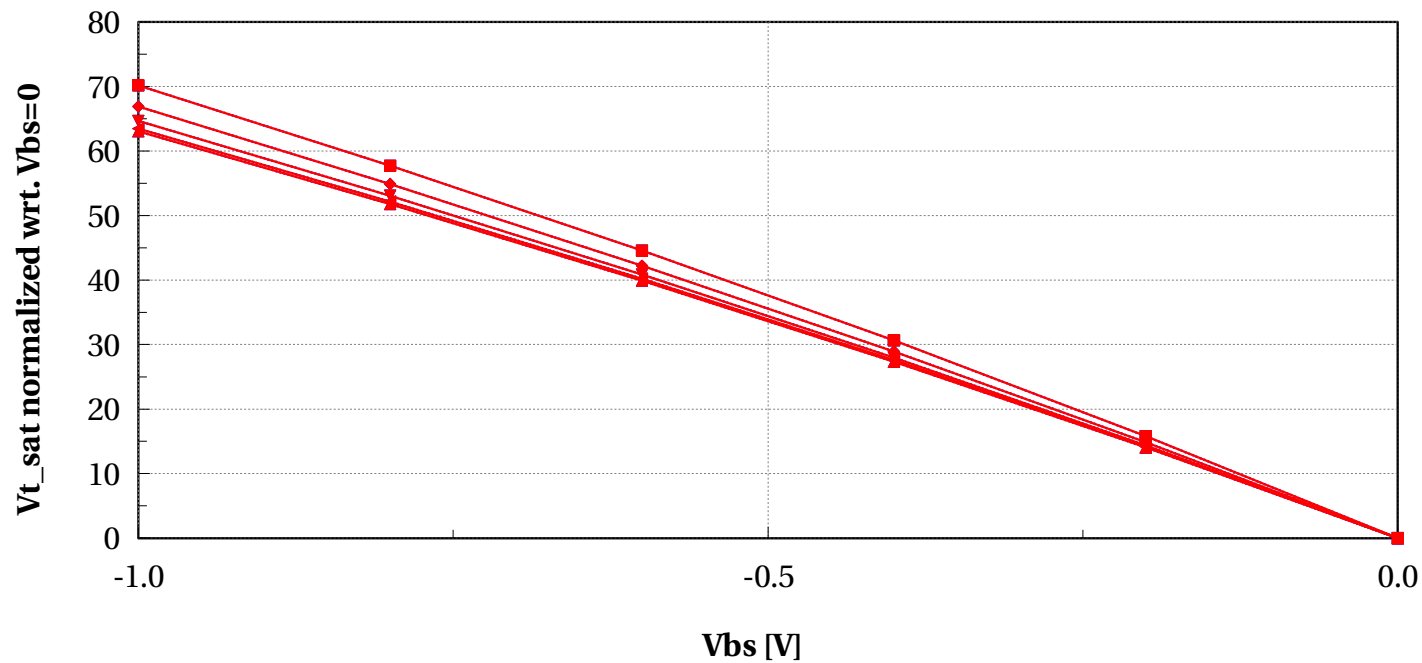
# nfet\_acc, Ilin normalized wrt. Vbs=0 vs Vbs [V]

w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1



## nfet\_acc, Vt\_sat normalized wrt. Vbs=0 vs Vbs [V]

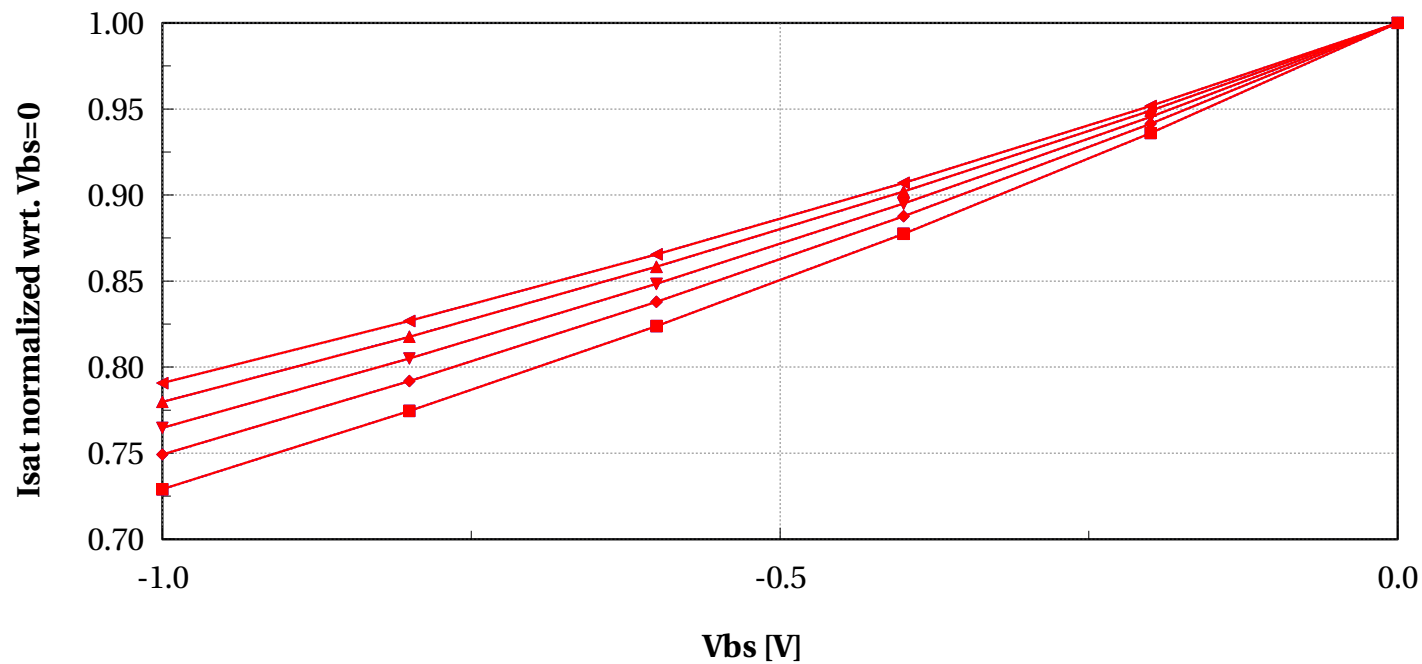
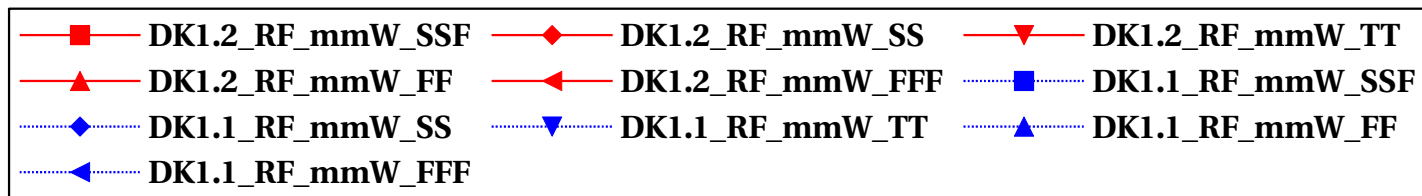
w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1





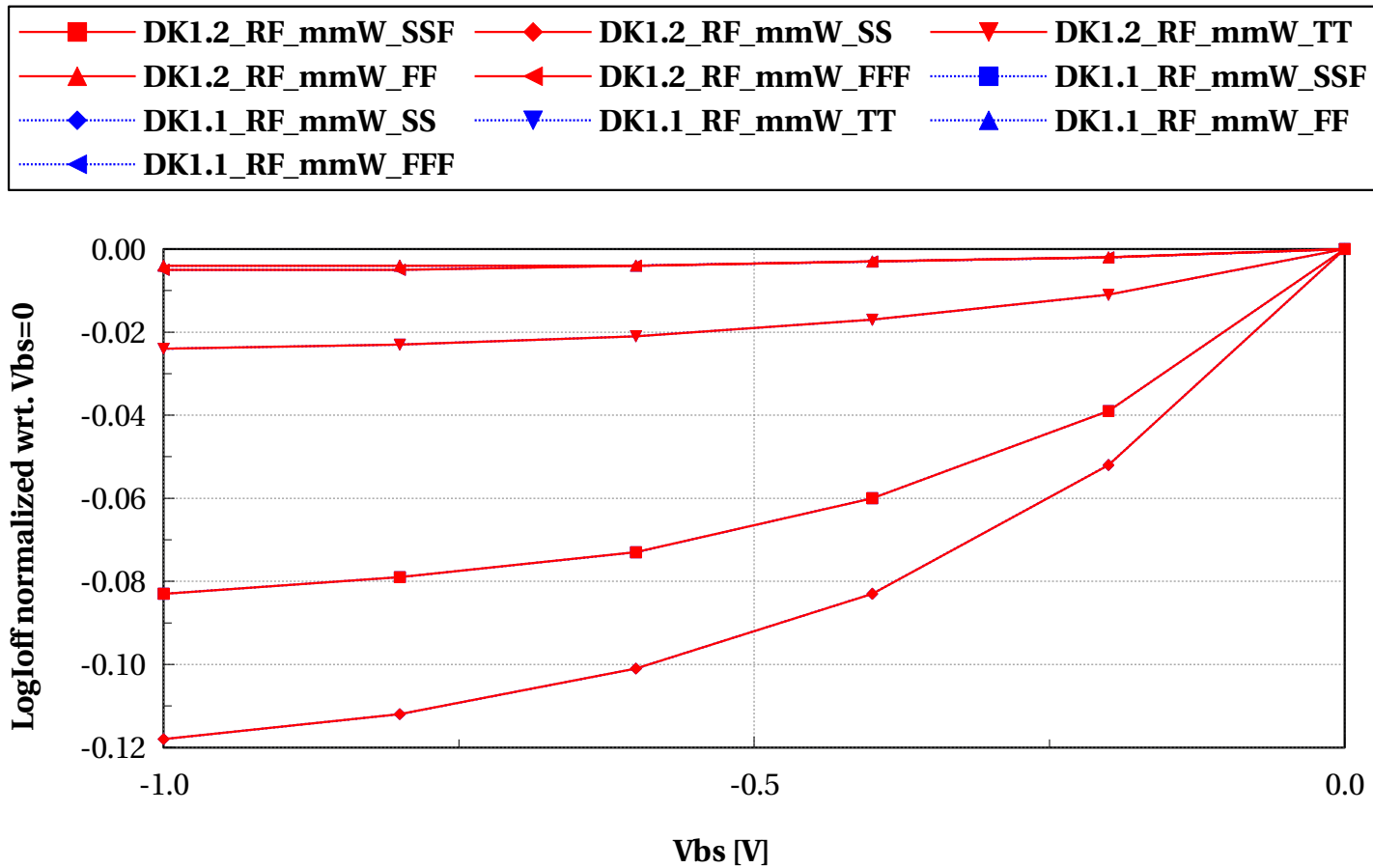
## nfet\_acc, Isat normalized wrt. Vbs=0 vs Vbs [V]

w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1



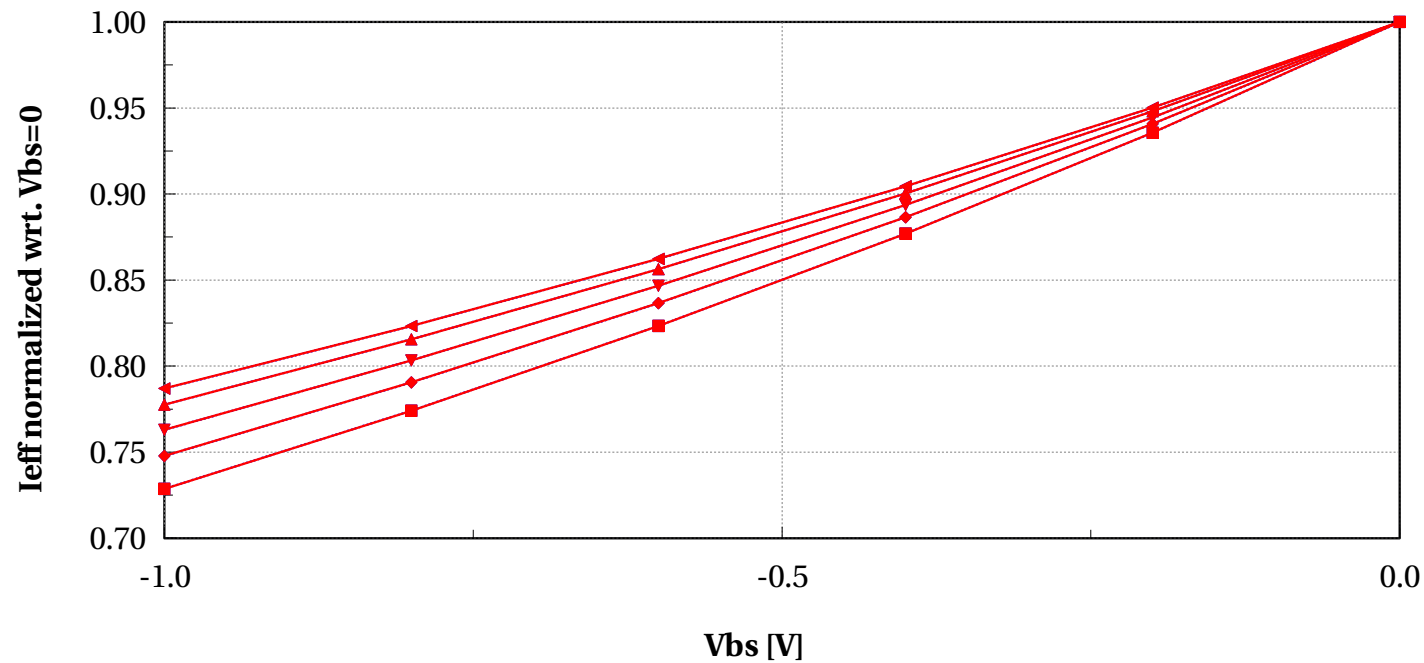
# nfet\_acc, LogIoff normalized wrt. Vbs=0 vs Vbs [V]

w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1



## nfet\_acc, Ieff normalized wrt. Vbs=0 vs Vbs [V]

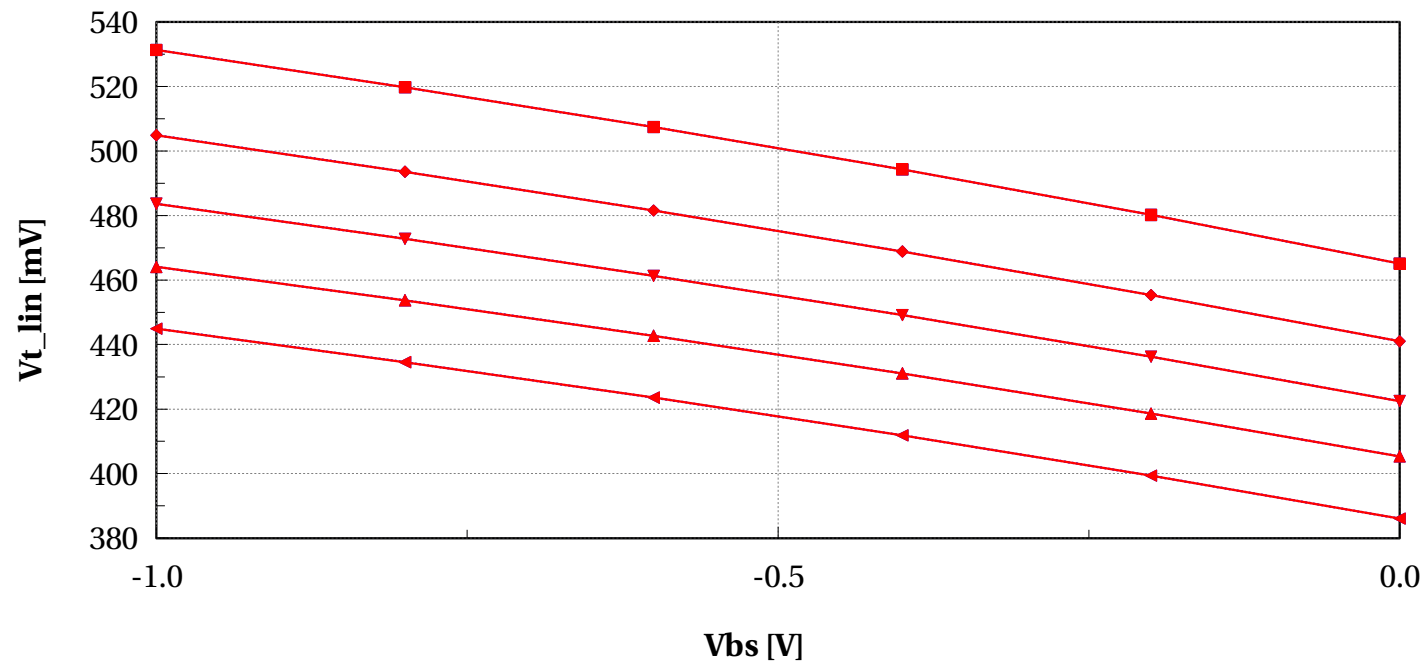
w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1



## Scaling versus $V_{bs}$ ( $L=30\text{nm}$ , $W=210\text{nm}$ )

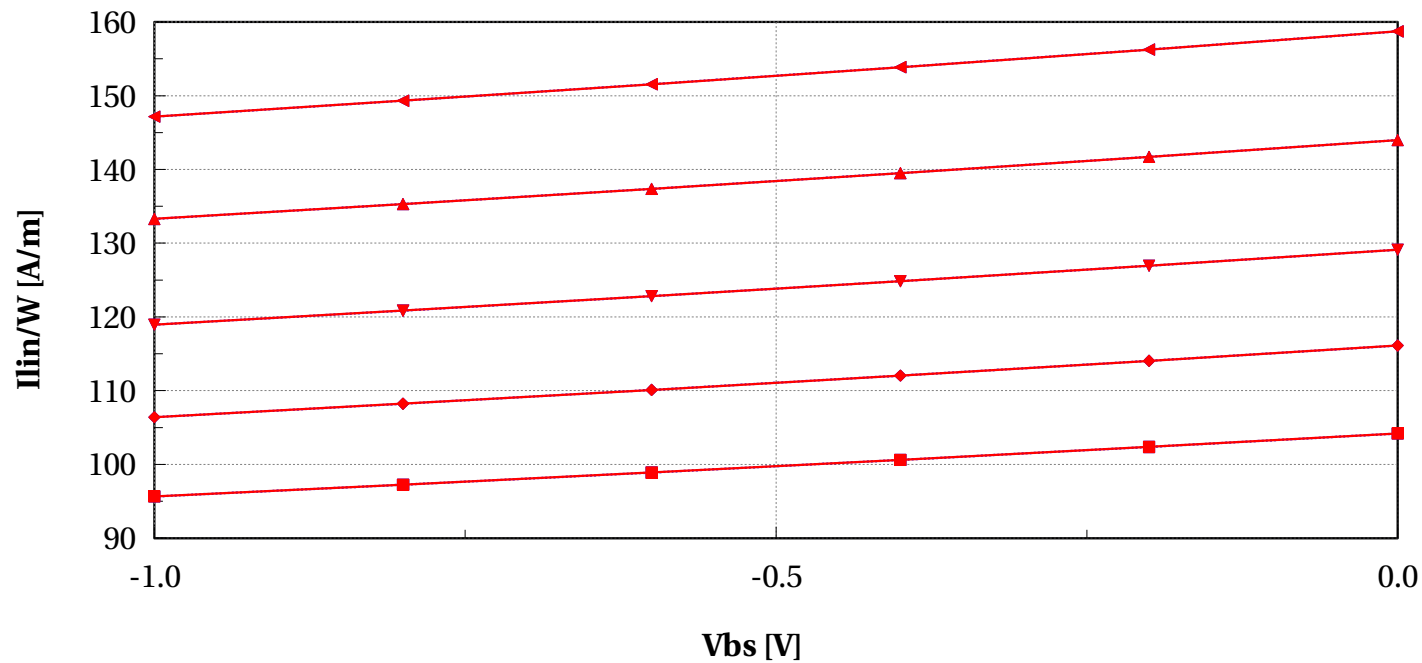
# nfet\_acc, Vt\_lin [mV] vs Vbs [V]

w==210e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1



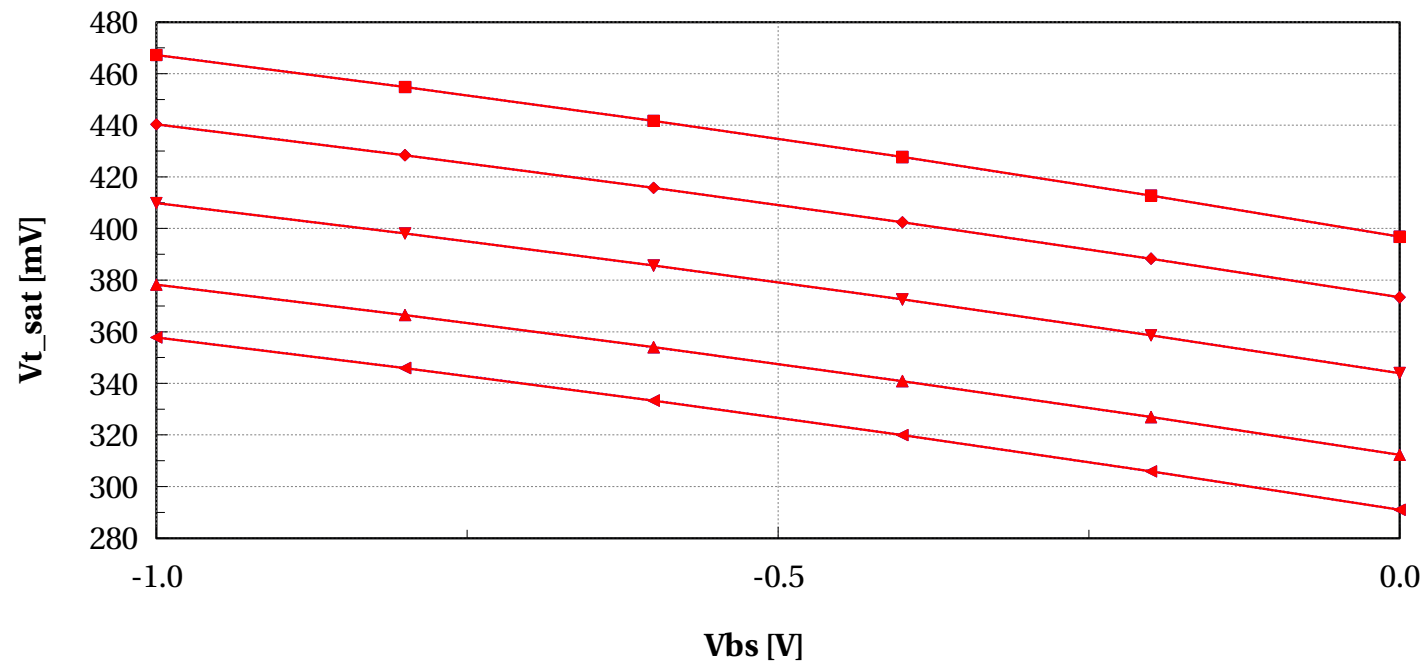
# nfet\_acc, I<sub>lin</sub>/W [A/m] vs V<sub>bs</sub> [V]

w==210e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1



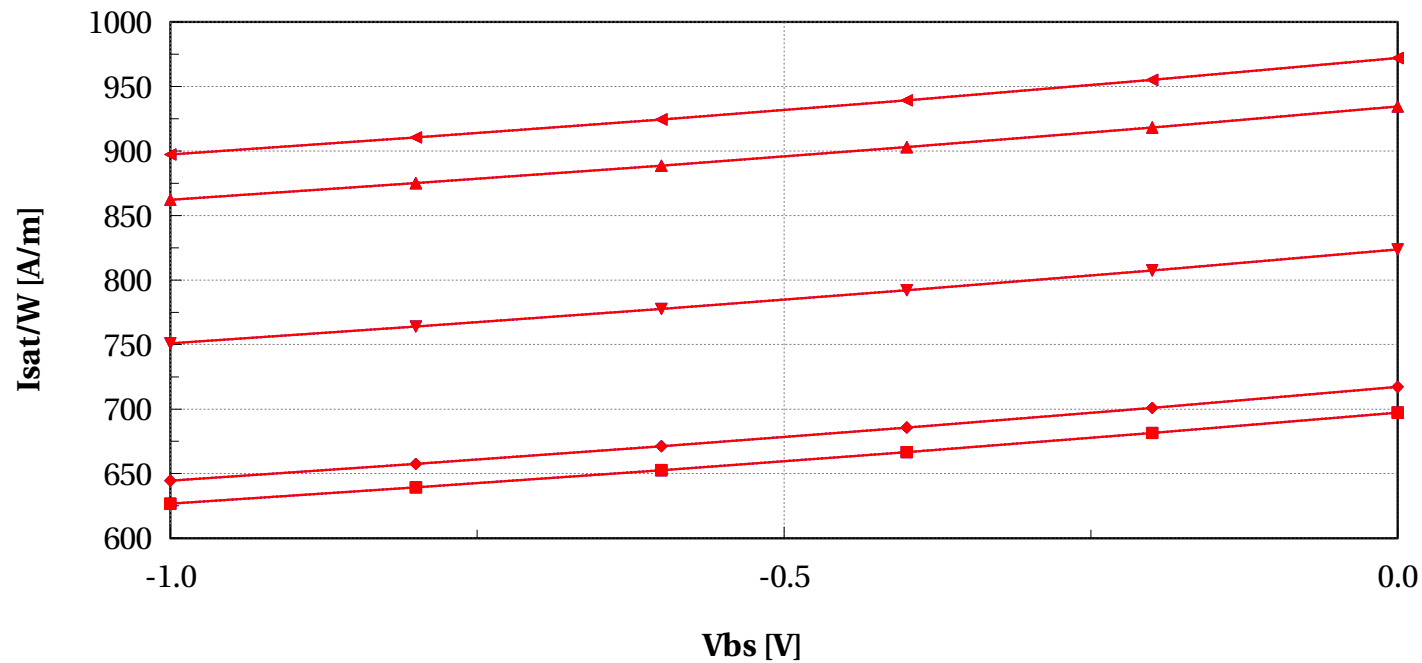
# nfet\_acc, Vt\_sat [mV] vs Vbs [V]

w==210e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1



# nfet\_acc, Isat/W [A/m] vs Vbs [V]

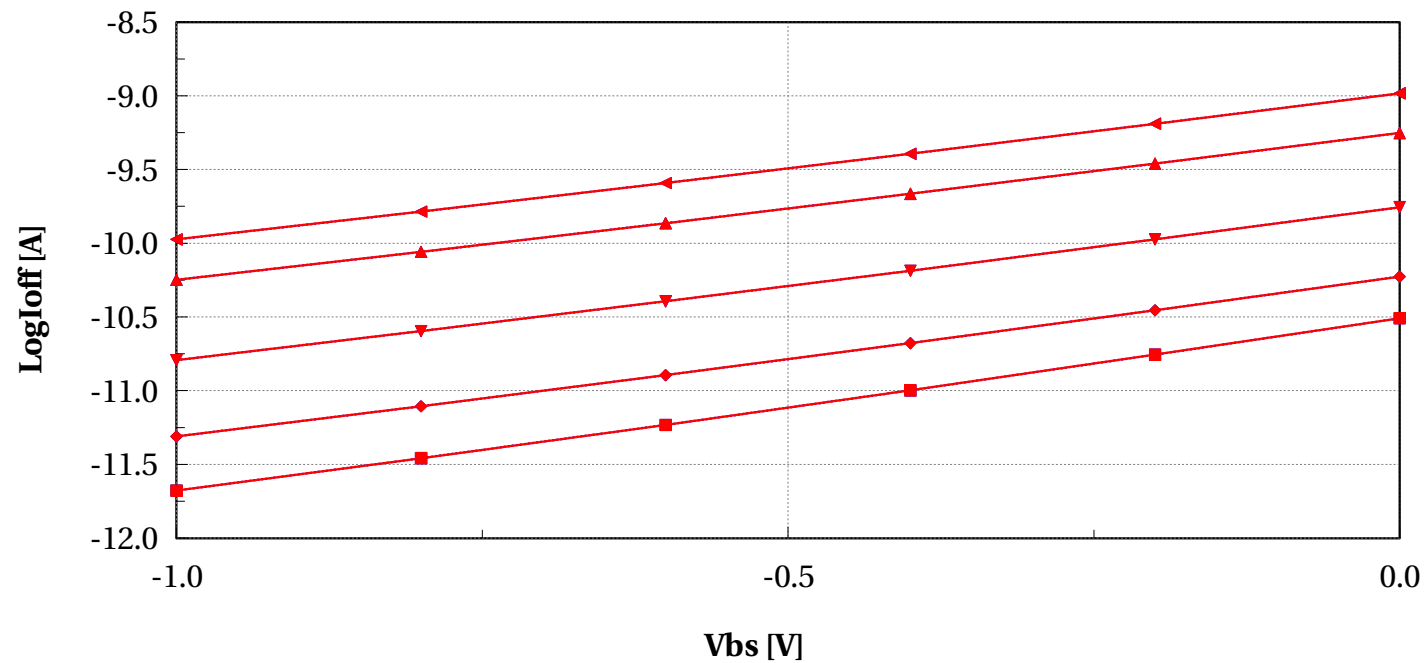
w==210e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1





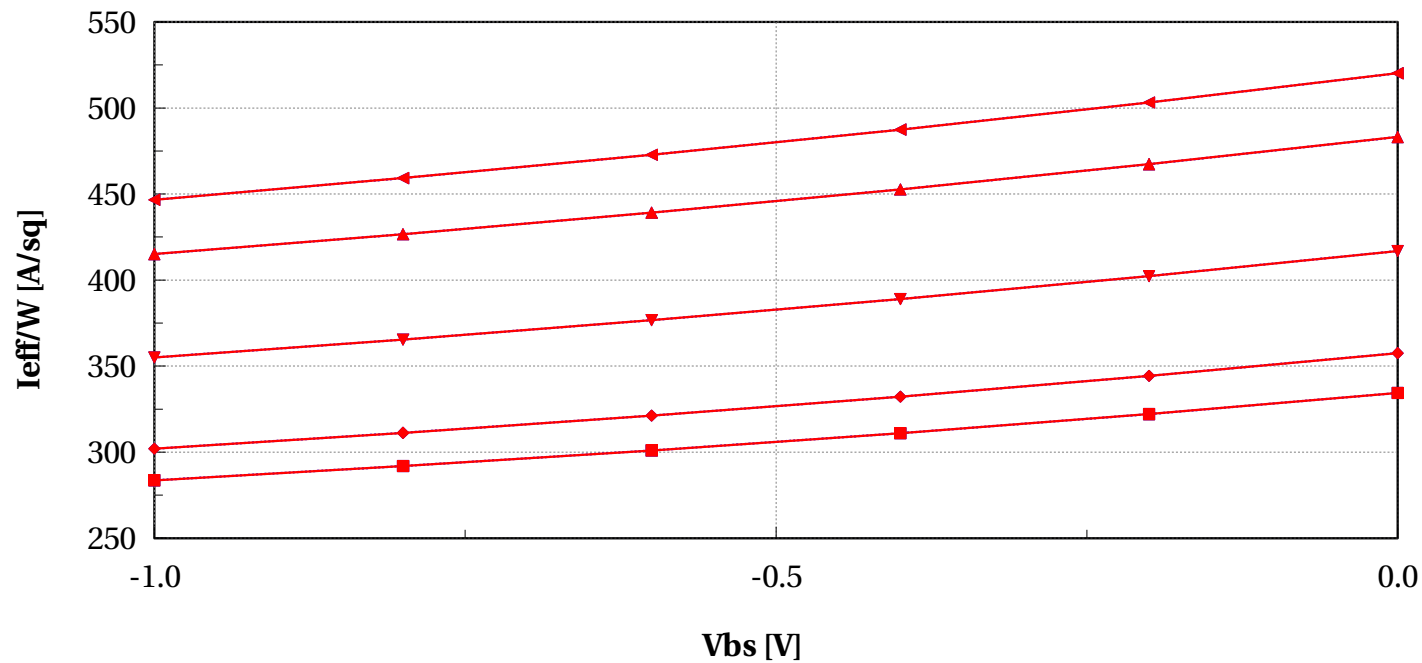
# nfet\_acc, LogIoff [A] vs Vbs [V]

w==210e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1



# nfet\_acc, I<sub>eff</sub>/W [A/sq] vs V<sub>bs</sub> [V]

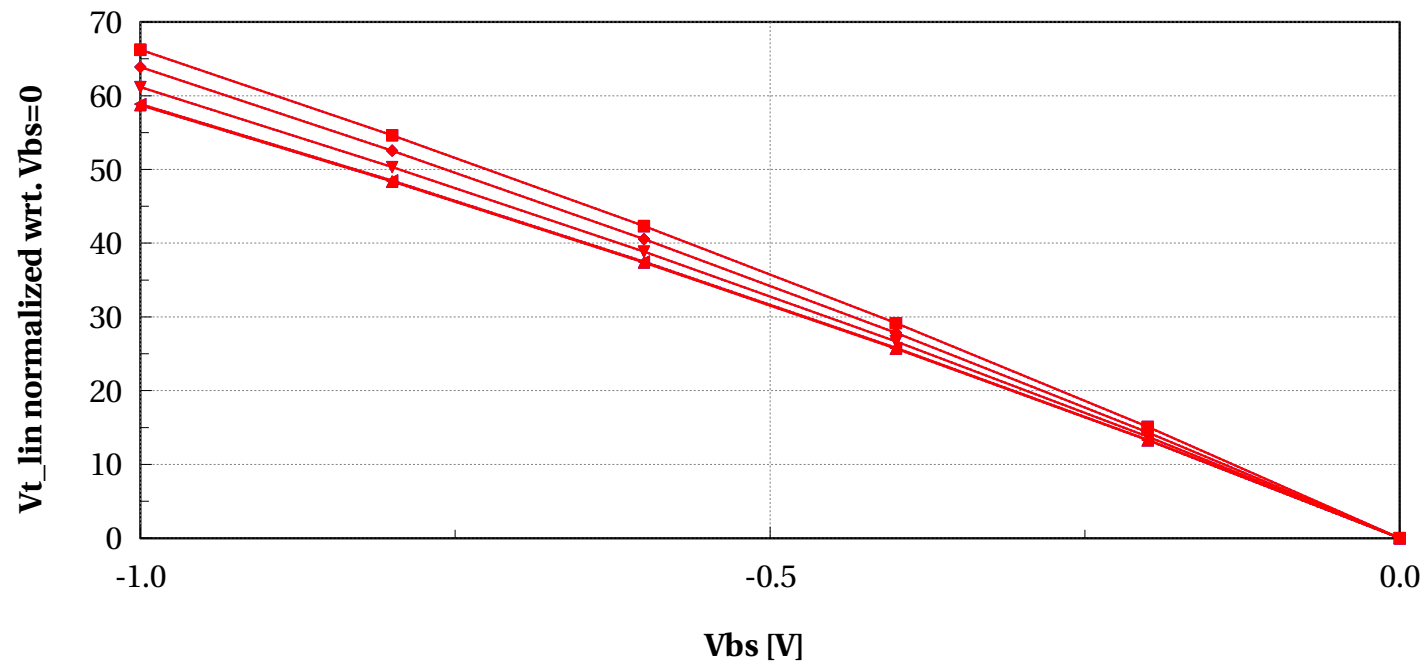
w==210e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1



## Scaling versus $V_{bs}$ normalized ( $L=30\text{nm}$ , $W=210\text{nm}$ )

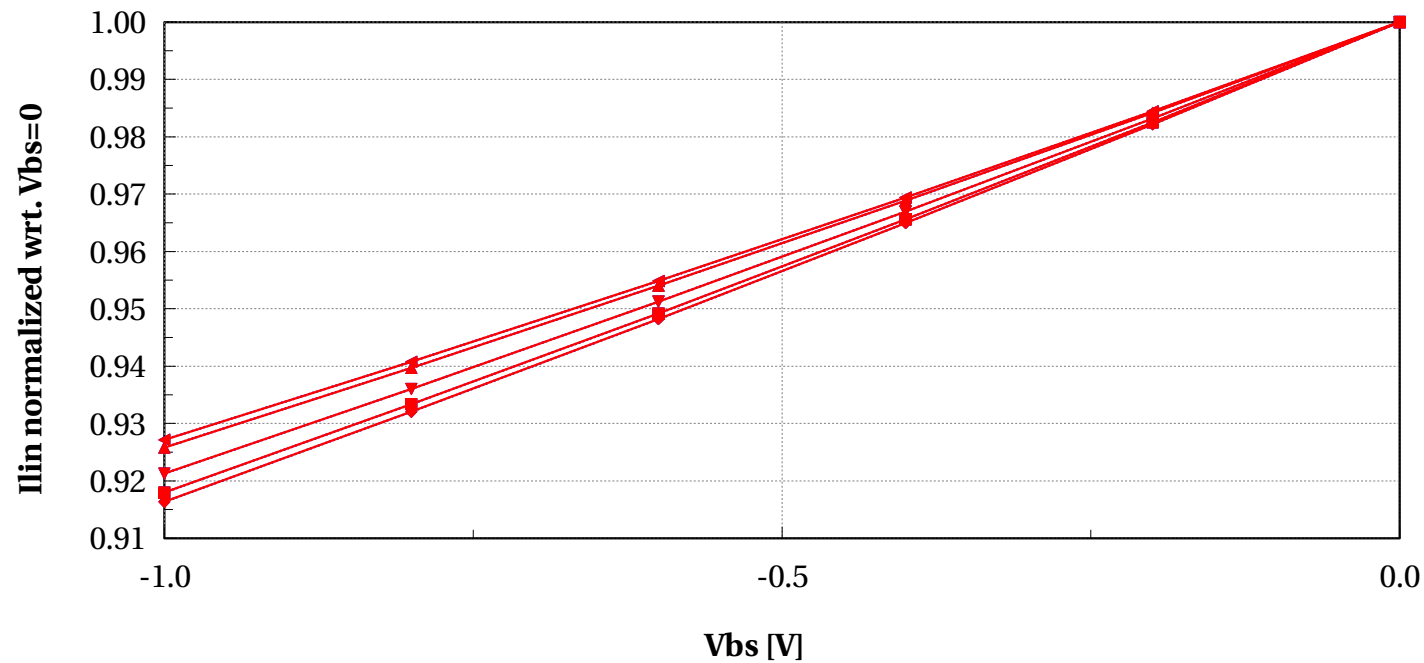
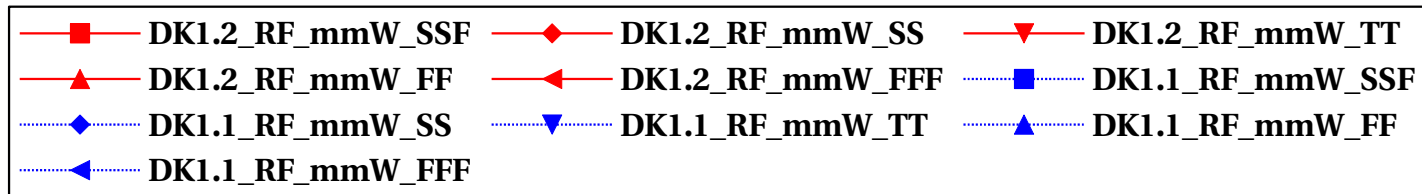
## nfet\_acc, Vt\_lin normalized wrt. Vbs=0 vs Vbs [V]

w==210e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1



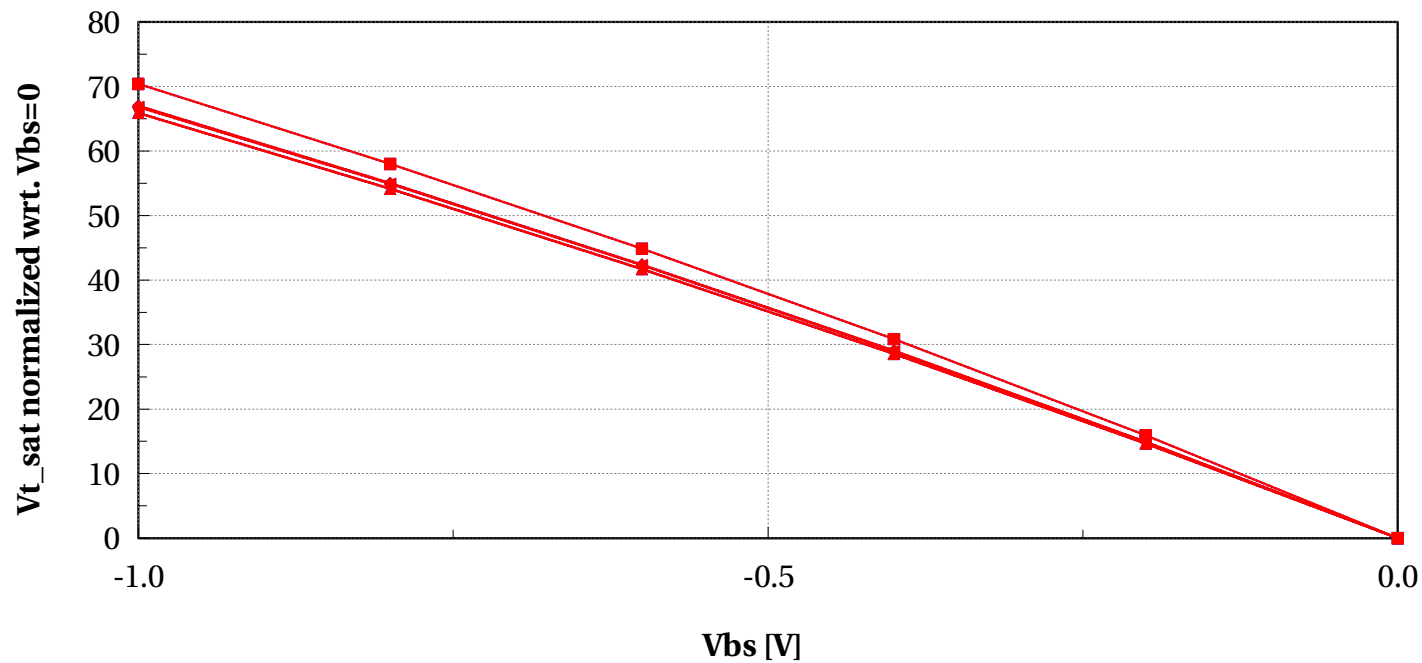
## nfet\_acc, Ilin normalized wrt. Vbs=0 vs Vbs [V]

w==210e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1



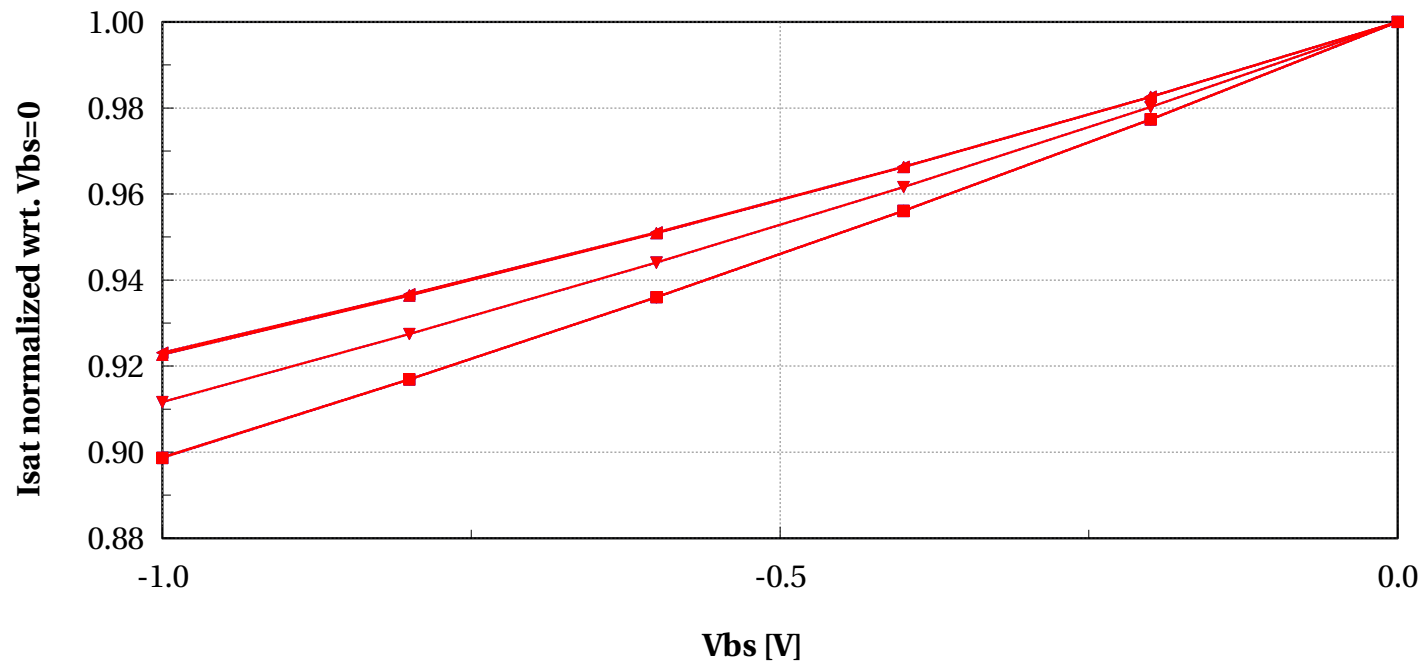
## nfet\_acc, Vt\_sat normalized wrt. Vbs=0 vs Vbs [V]

w==210e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1



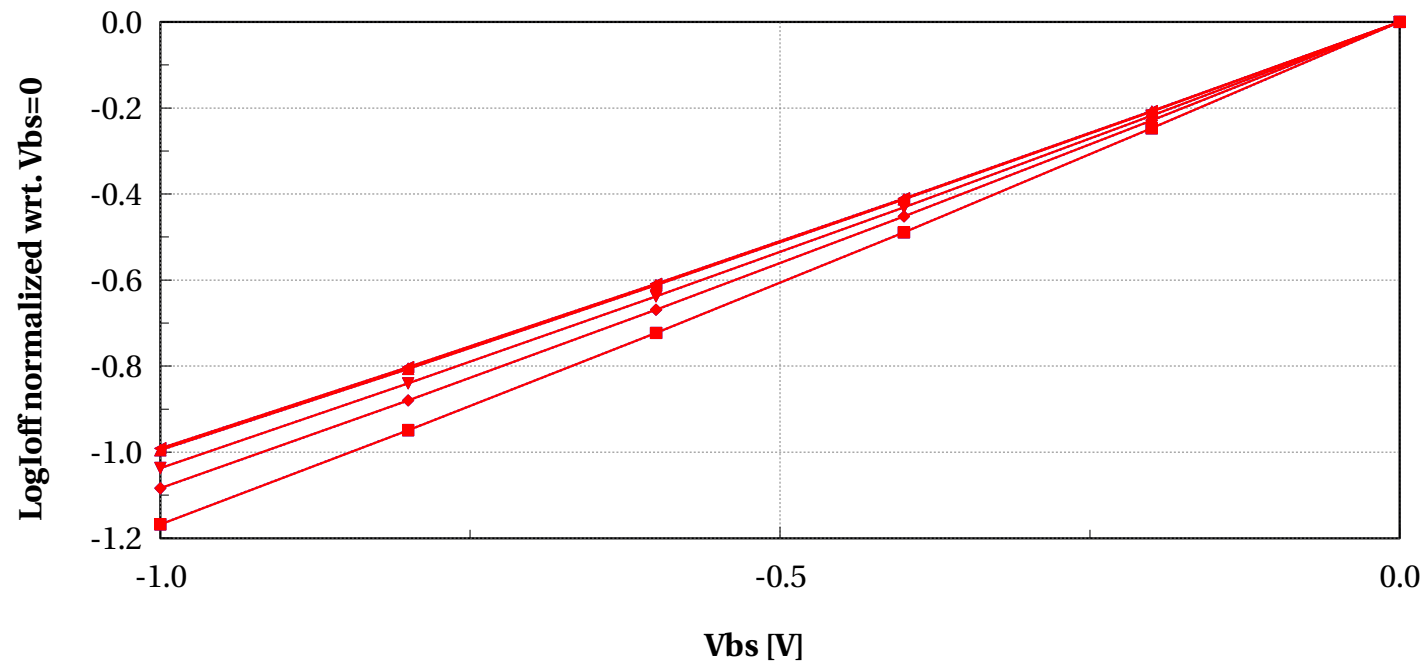
## nfet\_acc, Isat normalized wrt. Vbs=0 vs Vbs [V]

w==210e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1



# nfet\_acc, LogIoff normalized wrt. Vbs=0 vs Vbs [V]

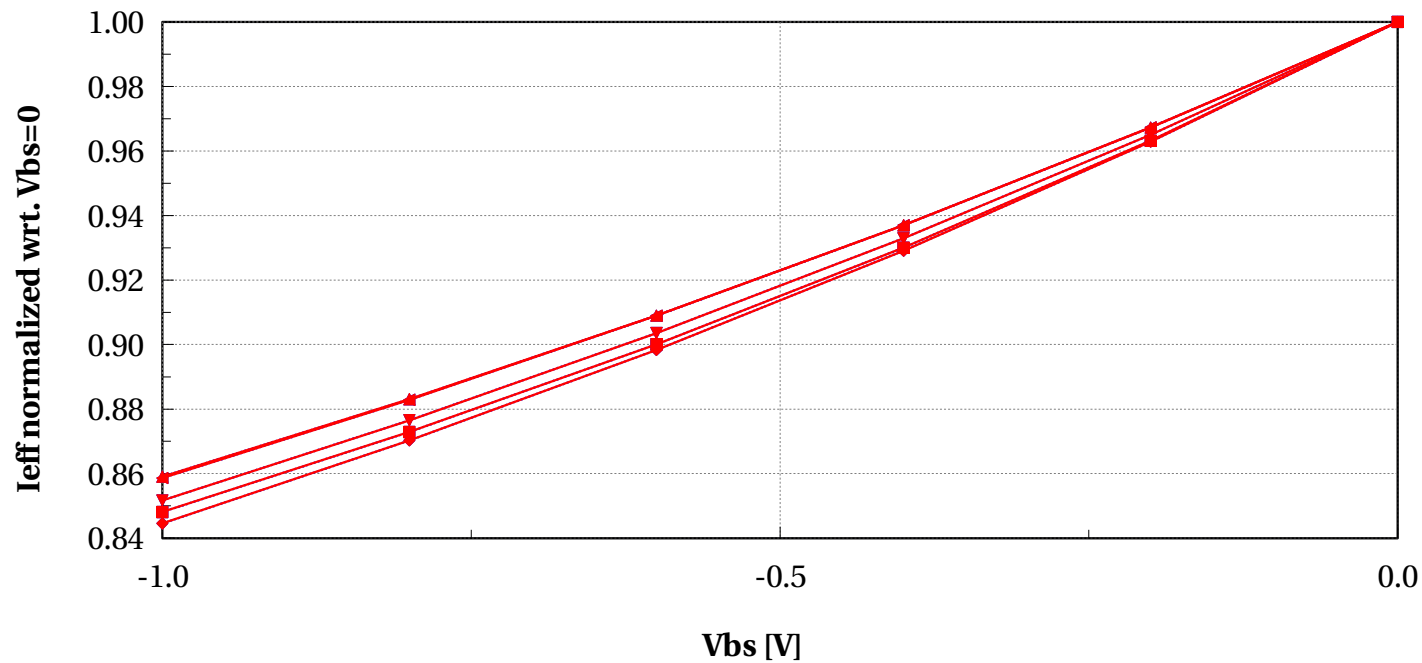
w==210e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1





## nfet\_acc, Ieff normalized wrt. Vbs=0 vs Vbs [V]

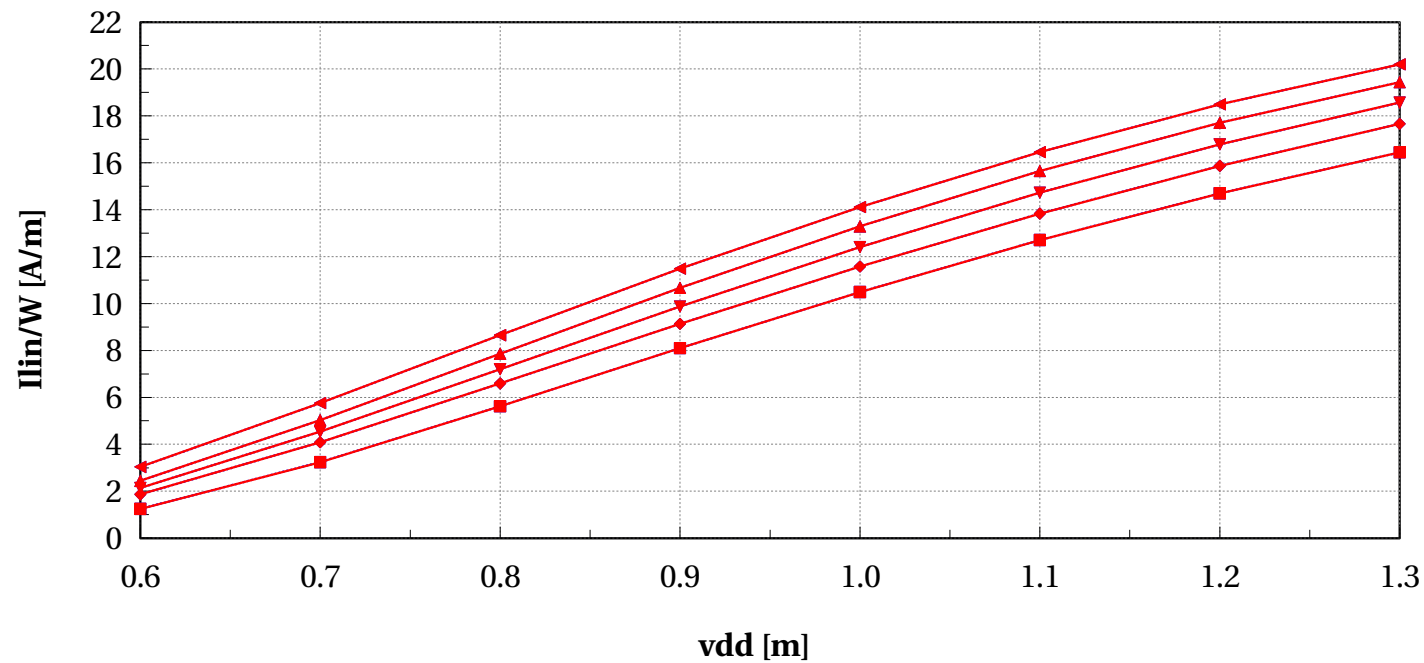
w==210e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1



## Vdd effect ( $l=1\mu\text{m}, w=1\mu\text{m}$ )

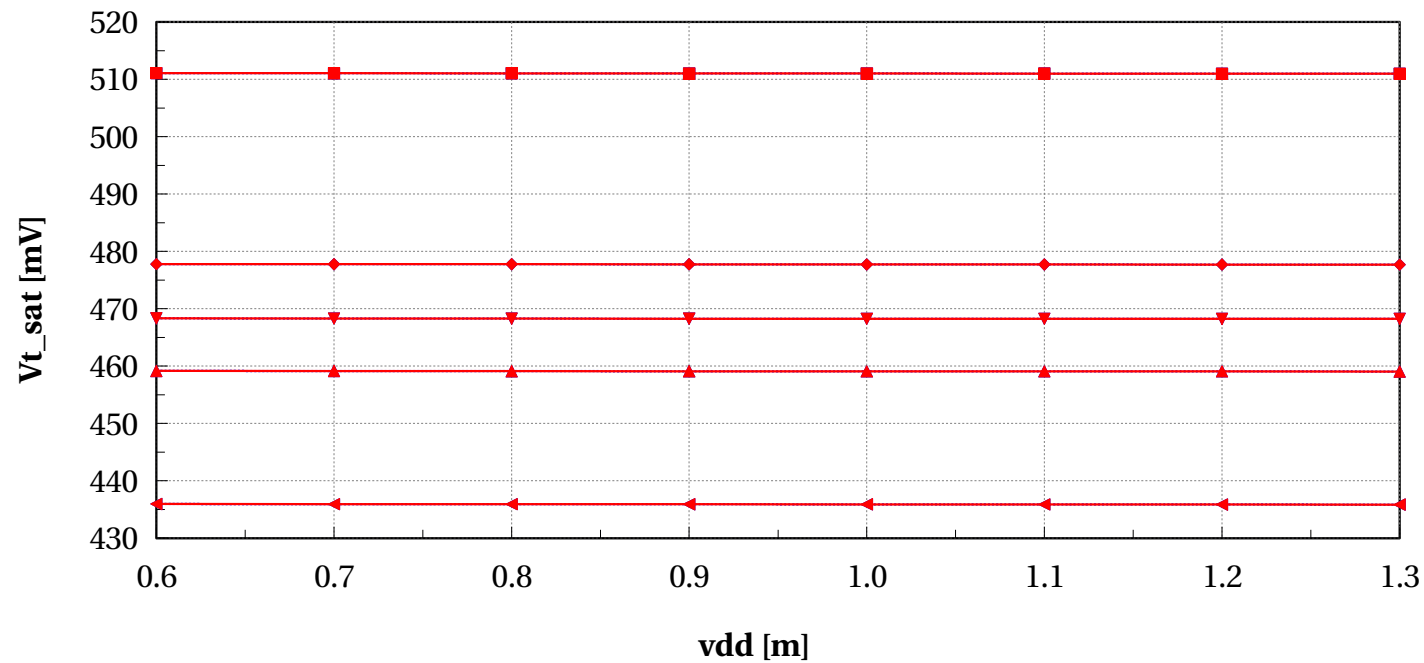
# nfet\_acc, I<sub>lin</sub>/W [A/m] vs v<sub>dd</sub> [m]

l==1e-6 and w==1e-6 and Temp==25 and V<sub>bs</sub>==0 and p<sub>la</sub>==0



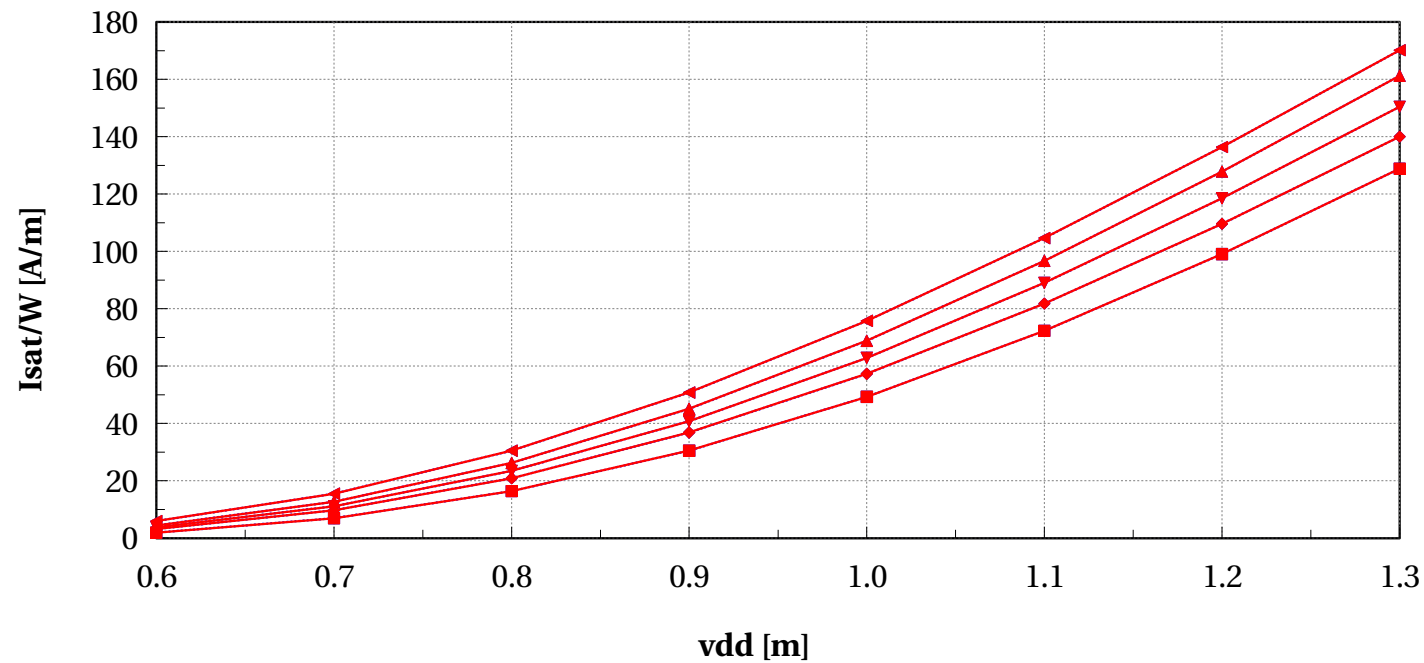
# nfet\_acc, Vt\_sat [mV] vs vdd [m]

$l=1e-6$  and  $w=1e-6$  and  $Temp=25$  and  $Vbs=0$  and  $p_{la}=0$



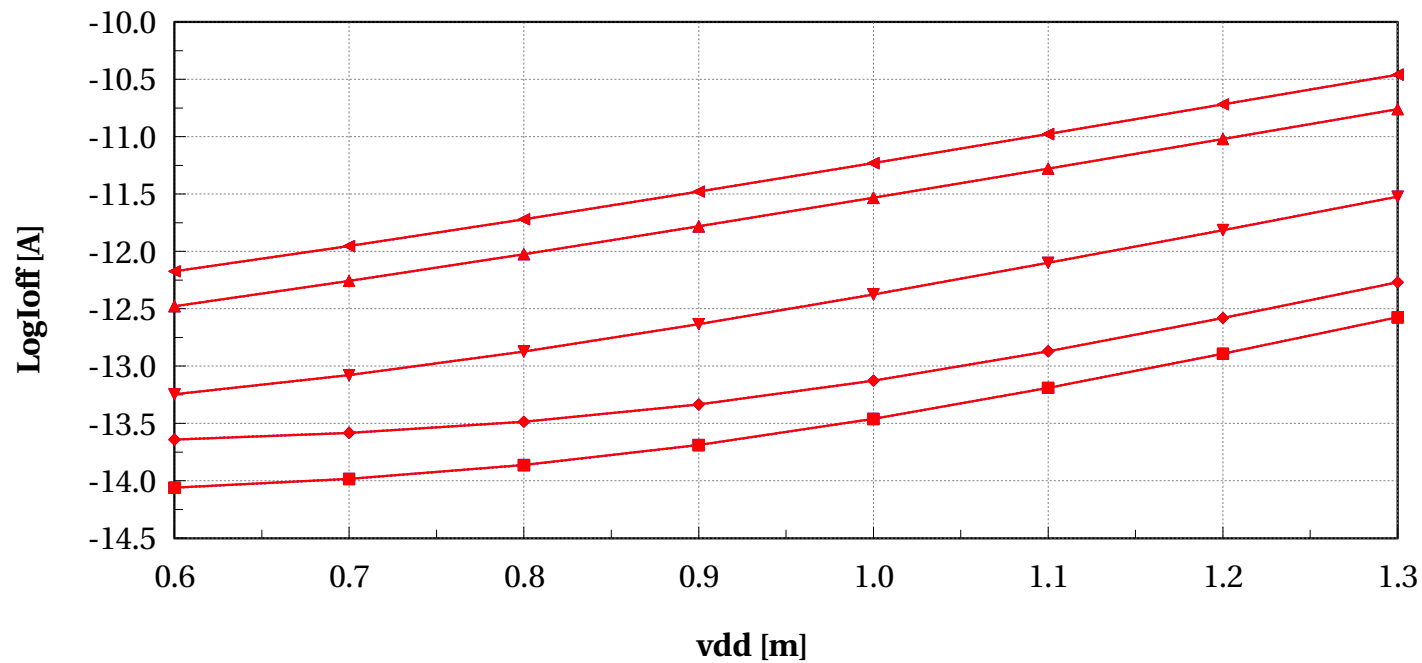
## nfet\_acc, Isat/W [A/m] vs vdd [m]

$l=1e-6$  and  $w=1e-6$  and  $Temp=25$  and  $V_{bs}=0$  and  $p_{la}=0$



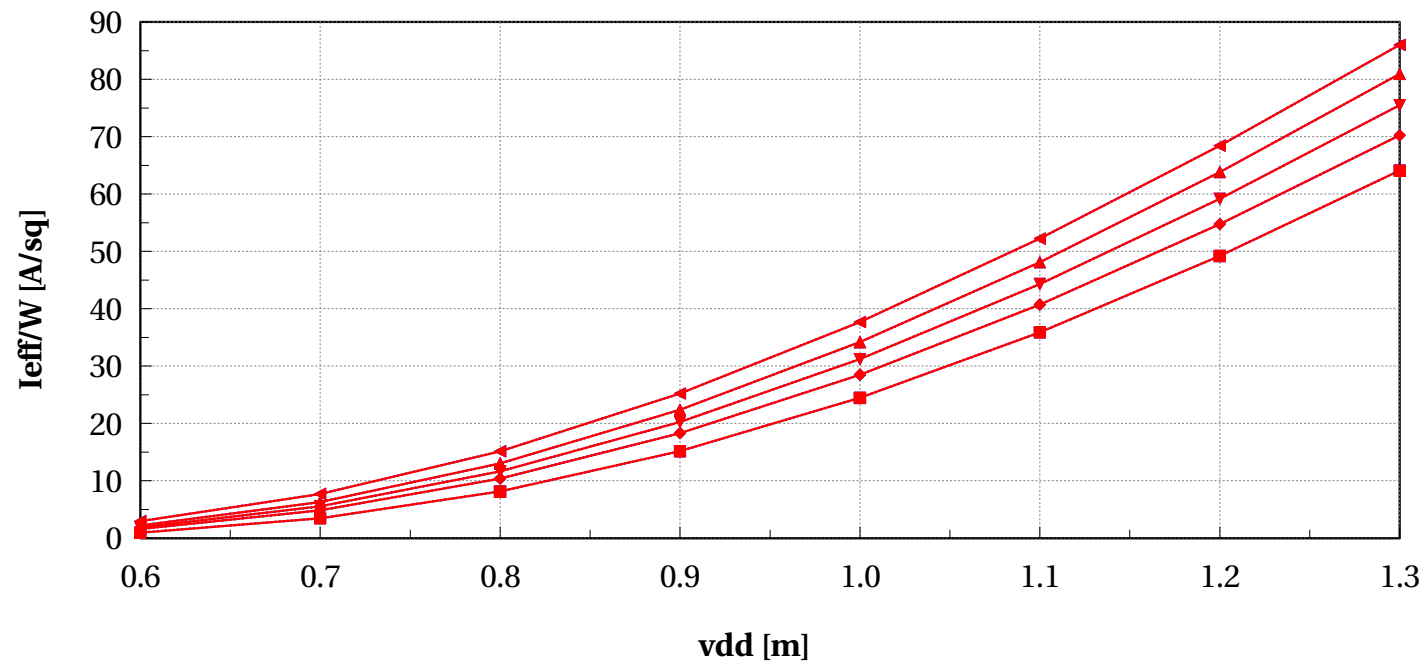
# nfet\_acc, LogIoff [A] vs vdd [m]

$l=1e-6$  and  $w=1e-6$  and  $Temp=25$  and  $Vbs=0$  and  $p\_la=0$



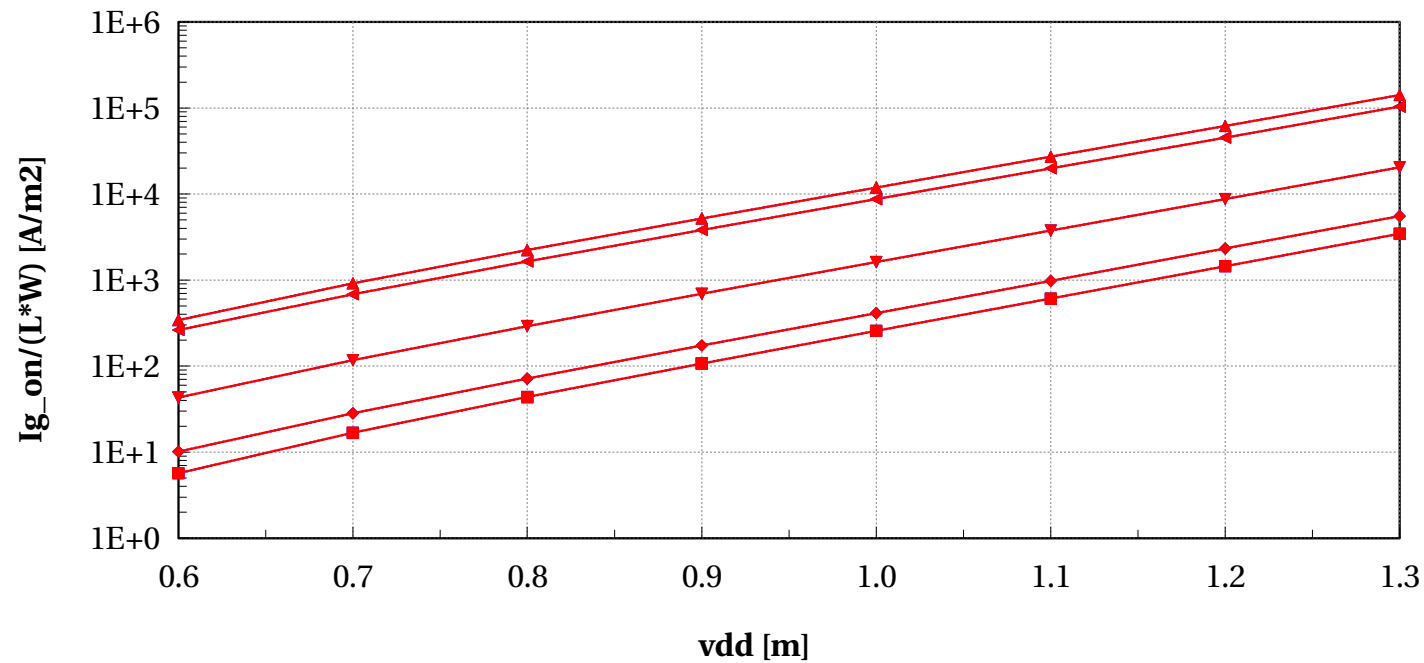
## nfet\_acc, I<sub>eff</sub>/W [A/sq] vs v<sub>dd</sub> [m]

$l=1e-6$  and  $w=1e-6$  and Temp==25 and V<sub>bs</sub>=0 and p<sub>la</sub>=0



# nfet\_acc, Ig\_on/(L\*W) [A/m2] vs vdd [m]

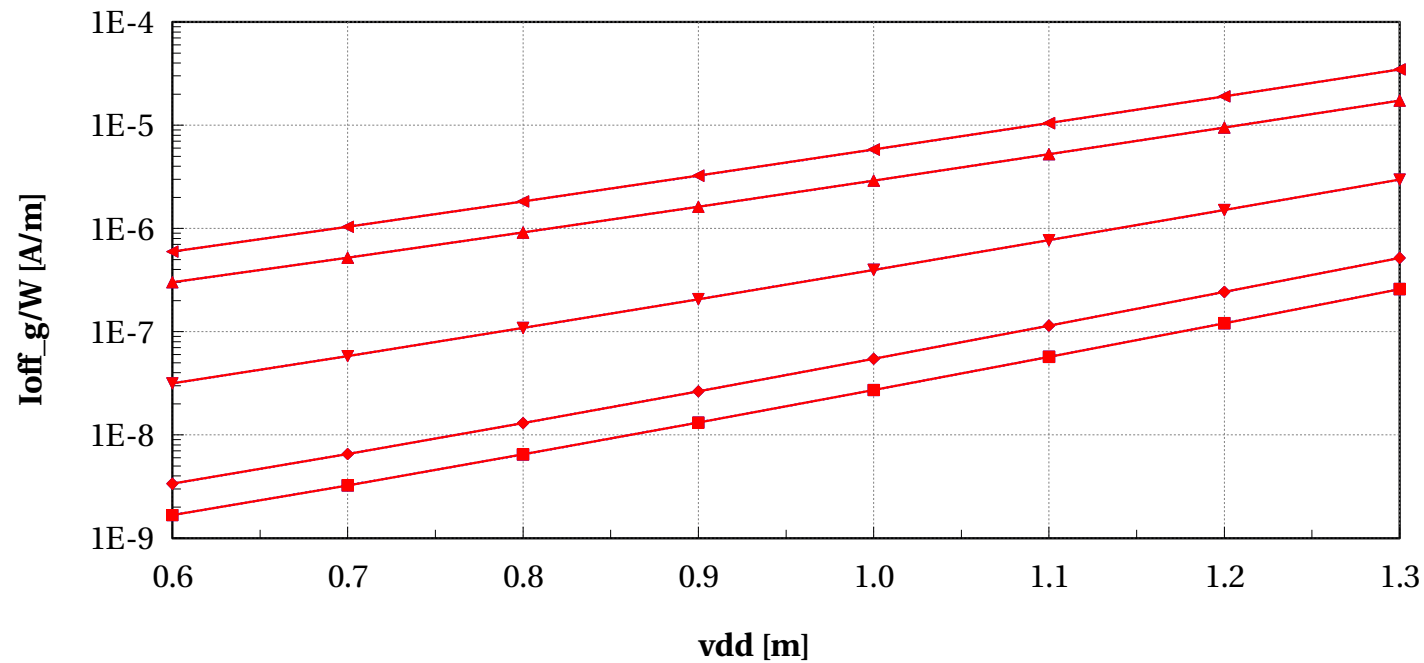
$l=1e-6$  and  $w=1e-6$  and Temp==25 and Vbs==0 and p\_la==0





# nfet\_acc, Ioff\_g/W [A/m] vs vdd [m]

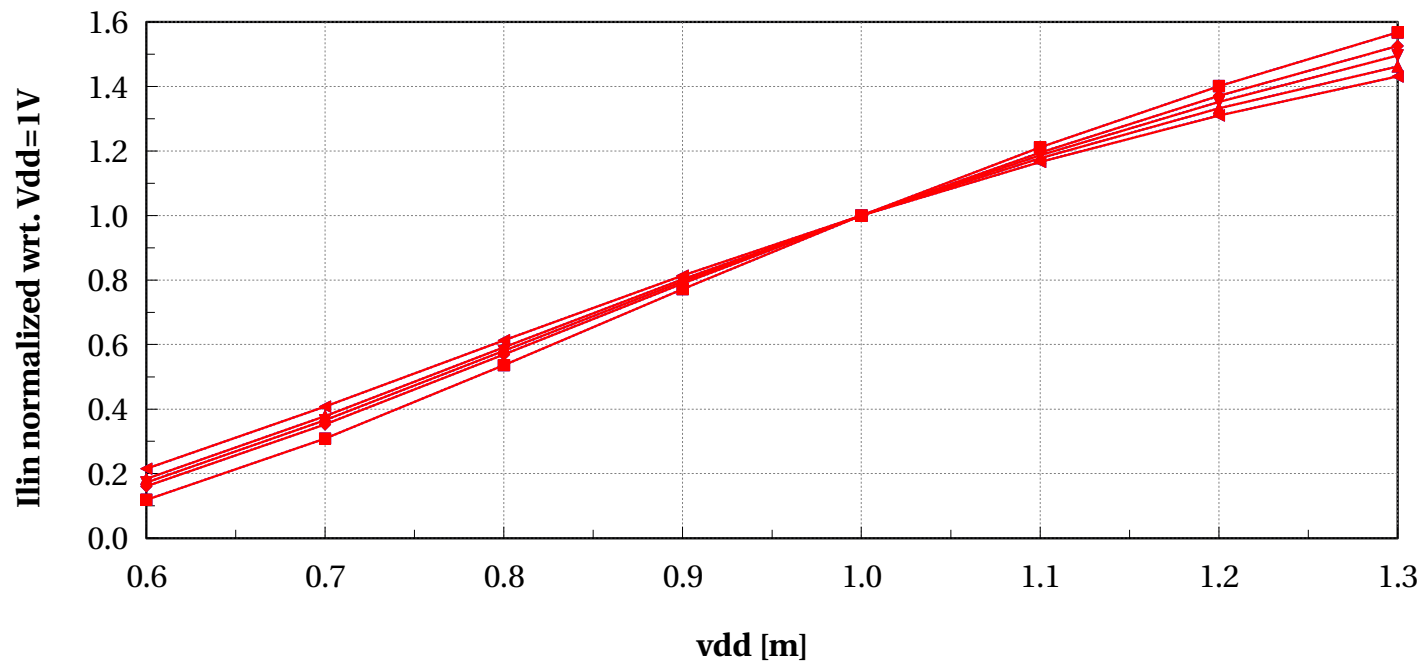
$l=1e-6$  and  $w=1e-6$  and  $Temp=25$  and  $Vbs=0$  and  $p\_la=0$



## Vdd effect normalized ( $l=1\mu\text{m}, w=1\mu\text{m}$ )

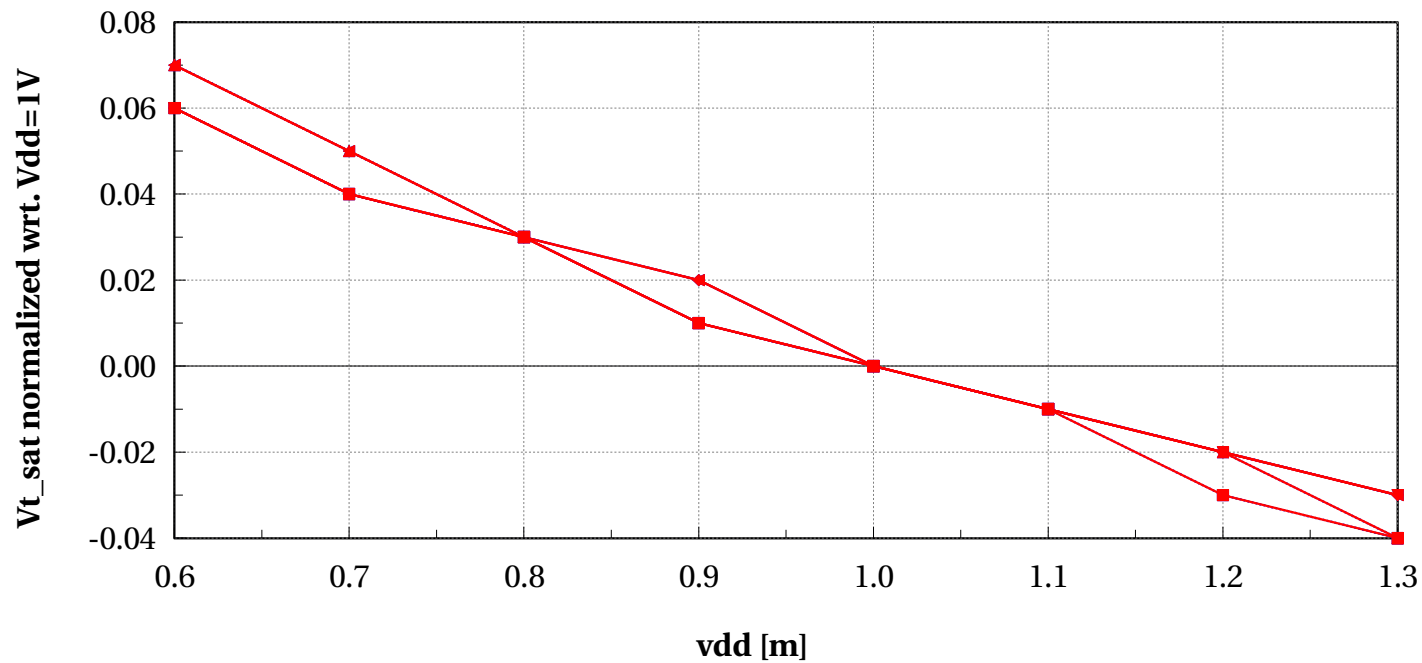
## nfet\_acc, I<sub>lin</sub> normalized wrt. V<sub>dd</sub>=1V vs v<sub>dd</sub> [m]

$l=1\text{e-}6$  and  $w=1\text{e-}6$  and Temp==25 and V<sub>bs</sub>=0 and p<sub>la</sub>=0



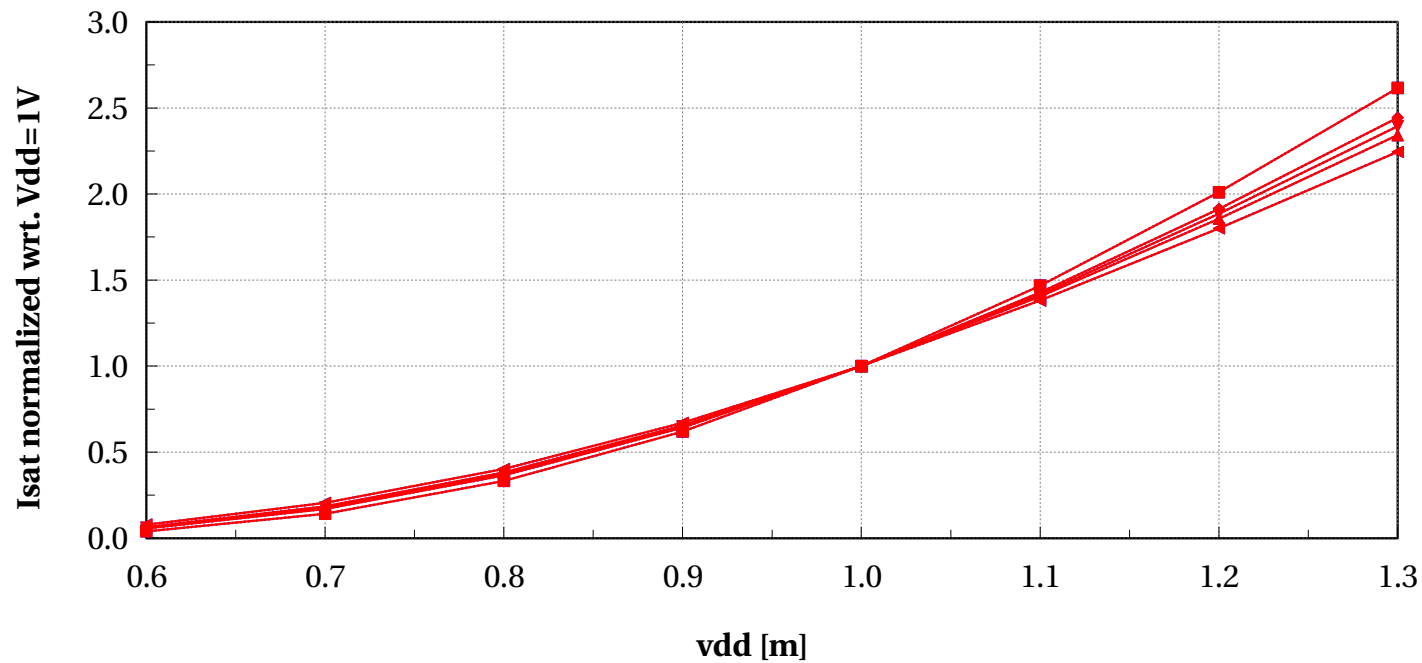
## nfet\_acc, Vt\_sat normalized wrt. Vdd=1V vs vdd [m]

$l=1e-6$  and  $w=1e-6$  and Temp==25 and Vbs==0 and p\_la==0



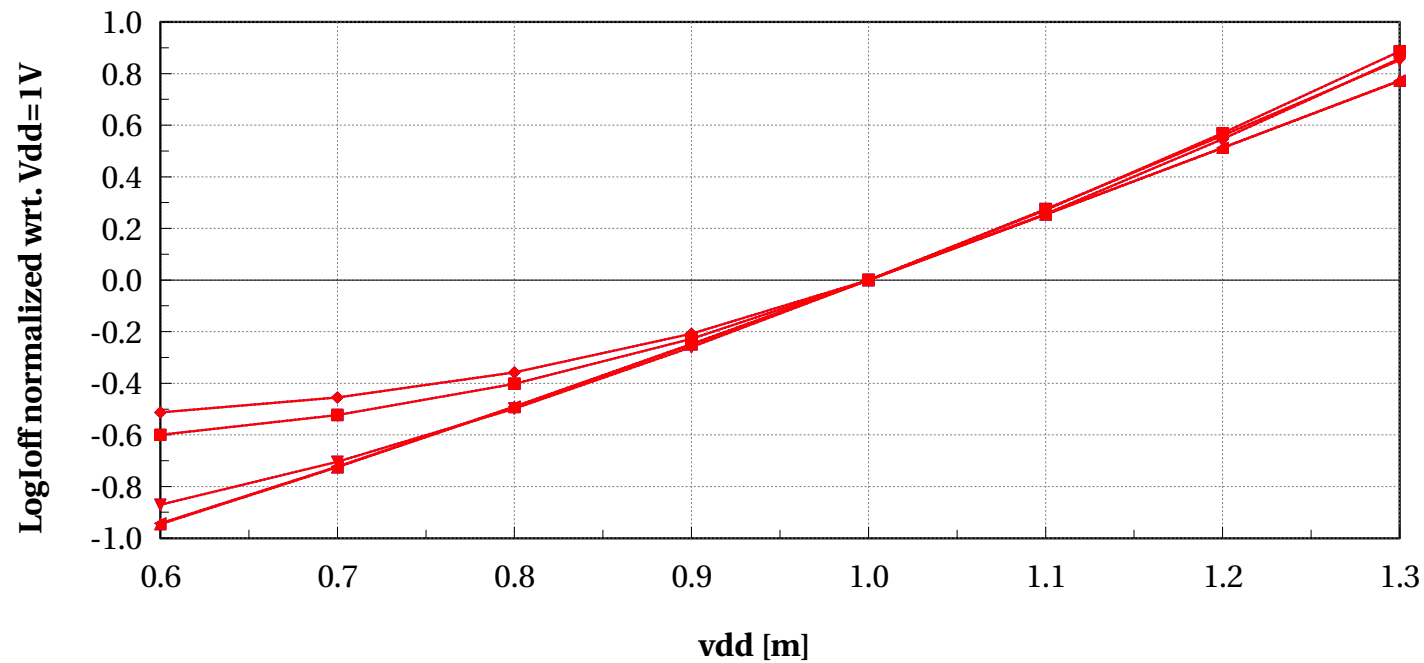
## nfet\_acc, Isat normalized wrt. Vdd=1V vs vdd [m]

$l=1e-6$  and  $w=1e-6$  and  $Temp=25$  and  $Vbs=0$  and  $p_{la}=0$



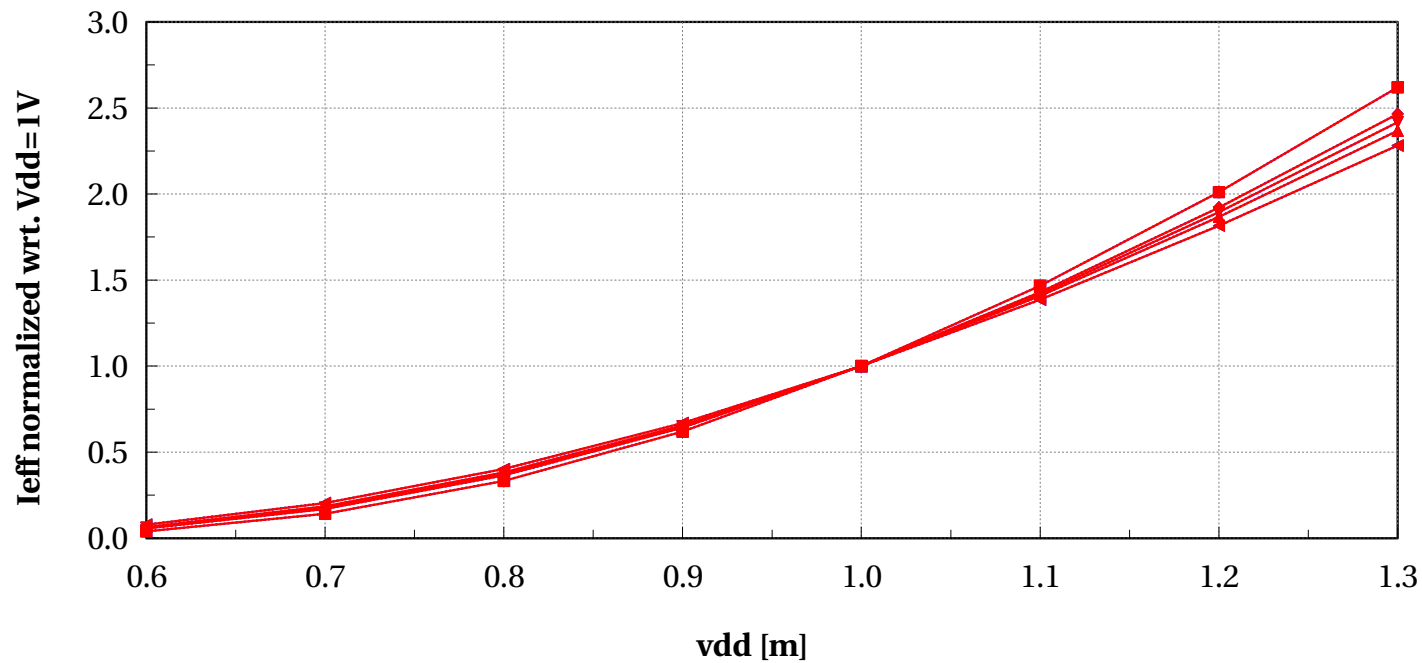
## nfet\_acc, Logloff normalized wrt. Vdd=1V vs vdd [m]

$l=1e-6$  and  $w=1e-6$  and  $Temp=25$  and  $Vbs=0$  and  $p_{la}=0$



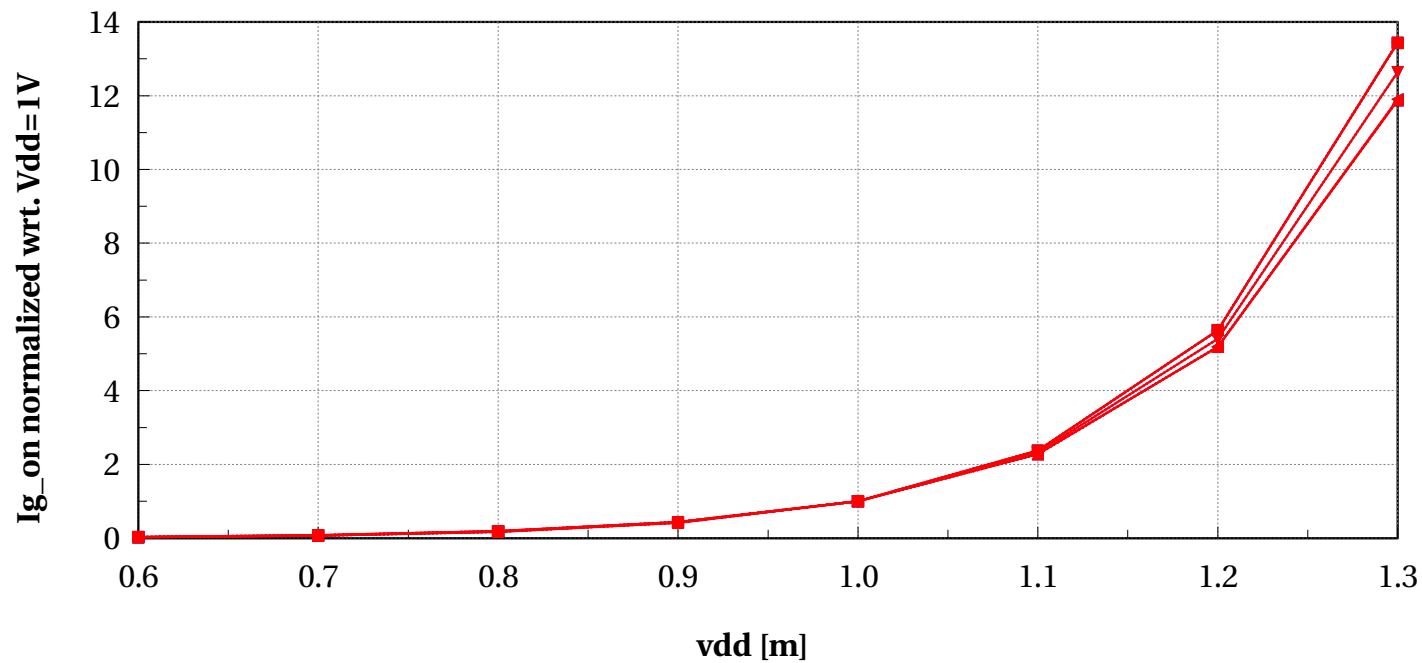
## nfet\_acc, Ieff normalized wrt. Vdd=1V vs vdd [m]

$l=1\text{e-}6$  and  $w=1\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



## nfet\_acc, Ig\_on normalized wrt. Vdd=1V vs vdd [m]

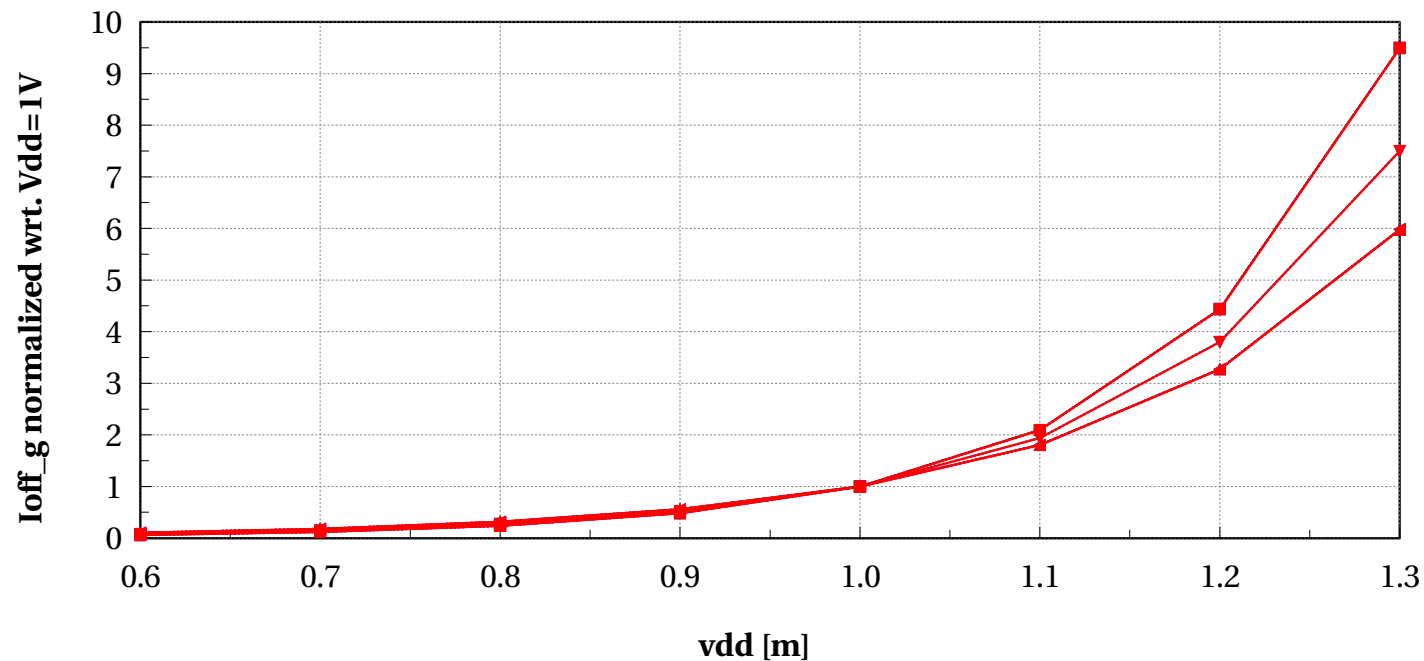
$l=1e-6$  and  $w=1e-6$  and  $Temp=25$  and  $Vbs=0$  and  $p_{la}=0$





## nfet\_acc, Ioff\_g normalized wrt. Vdd=1V vs vdd [m]

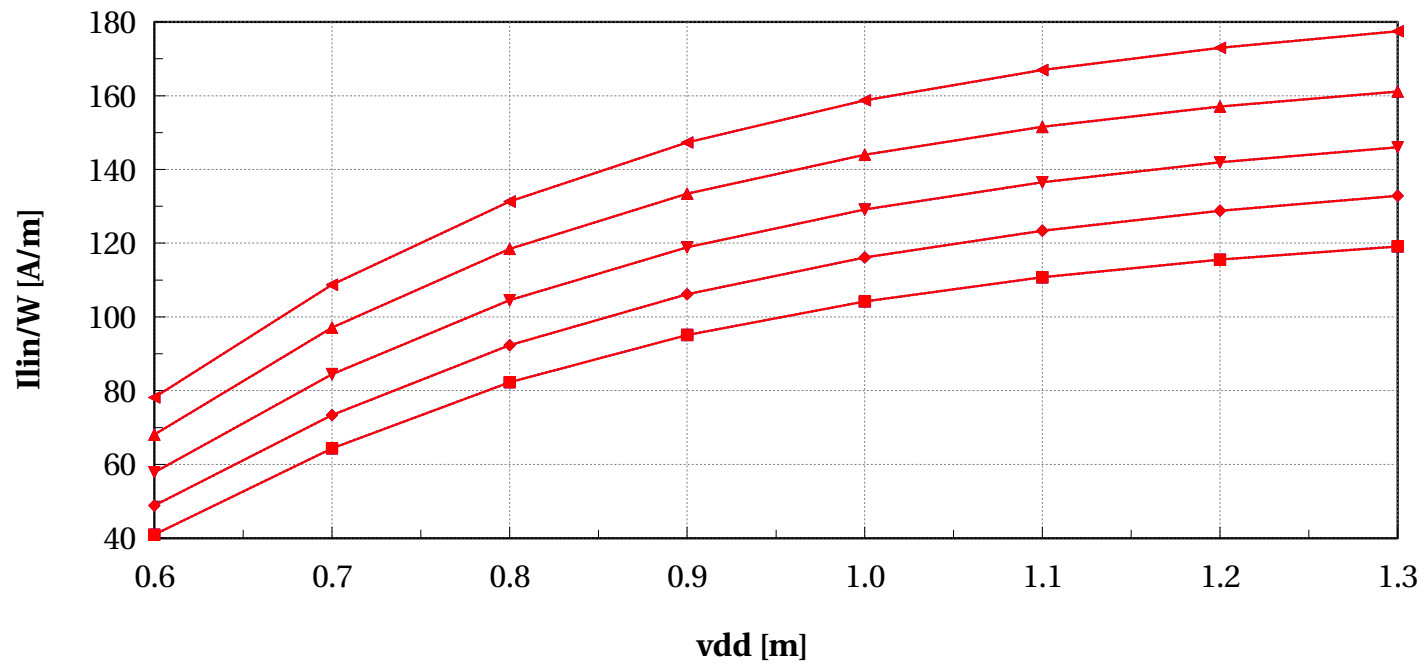
$l=1e-6$  and  $w=1e-6$  and  $Temp=25$  and  $Vbs=0$  and  $p_{la}=0$



## Vdd effect ( $l=30\text{e-}9$ $w=210\text{e-}9$ )

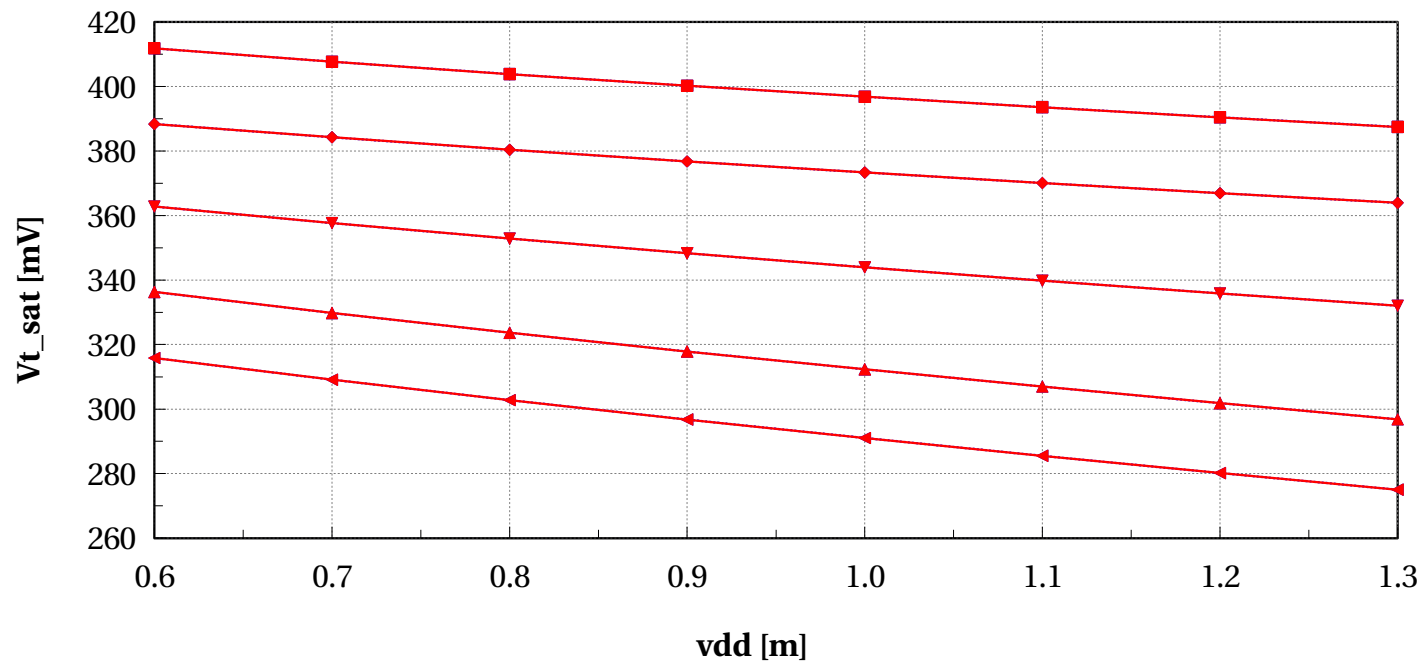
## nfet\_acc, I<sub>lin</sub>/W [A/m] vs v<sub>dd</sub> [m]

$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and Temp==25 and V<sub>bs</sub>=0 and p<sub>la</sub>=0



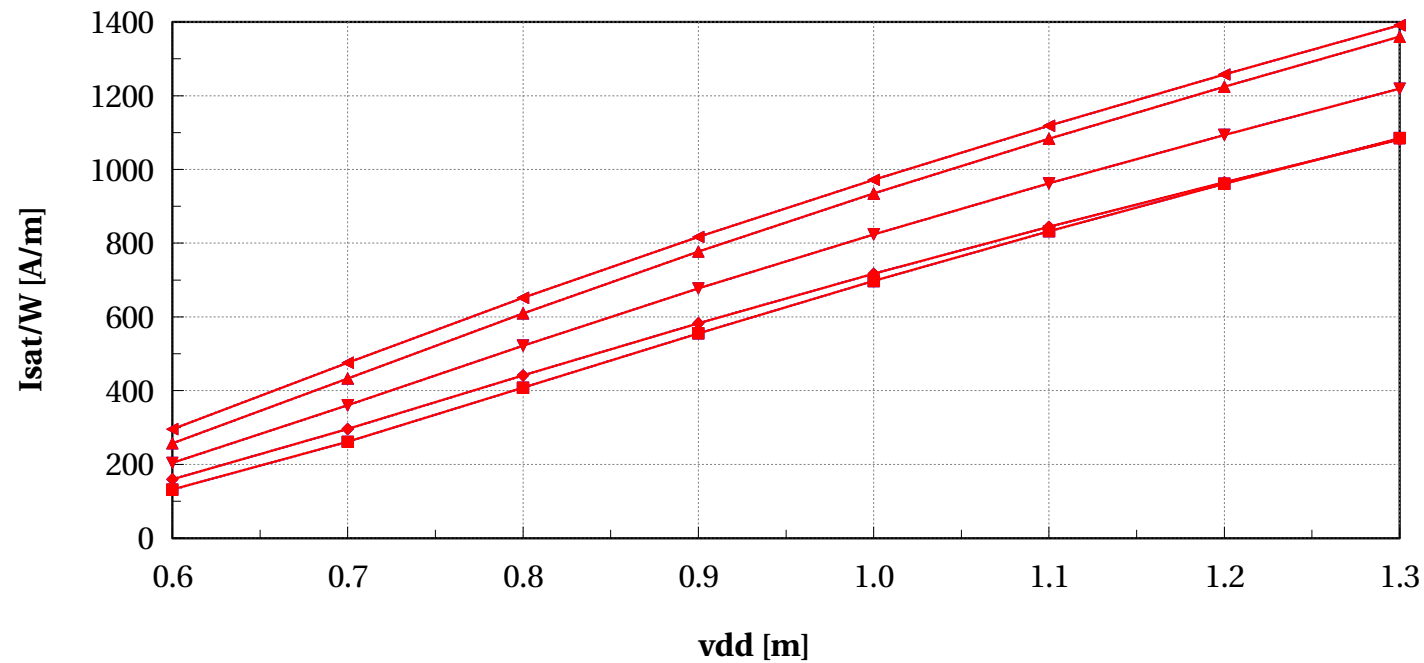
# nfet\_acc, Vt\_sat [mV] vs vdd [m]

$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



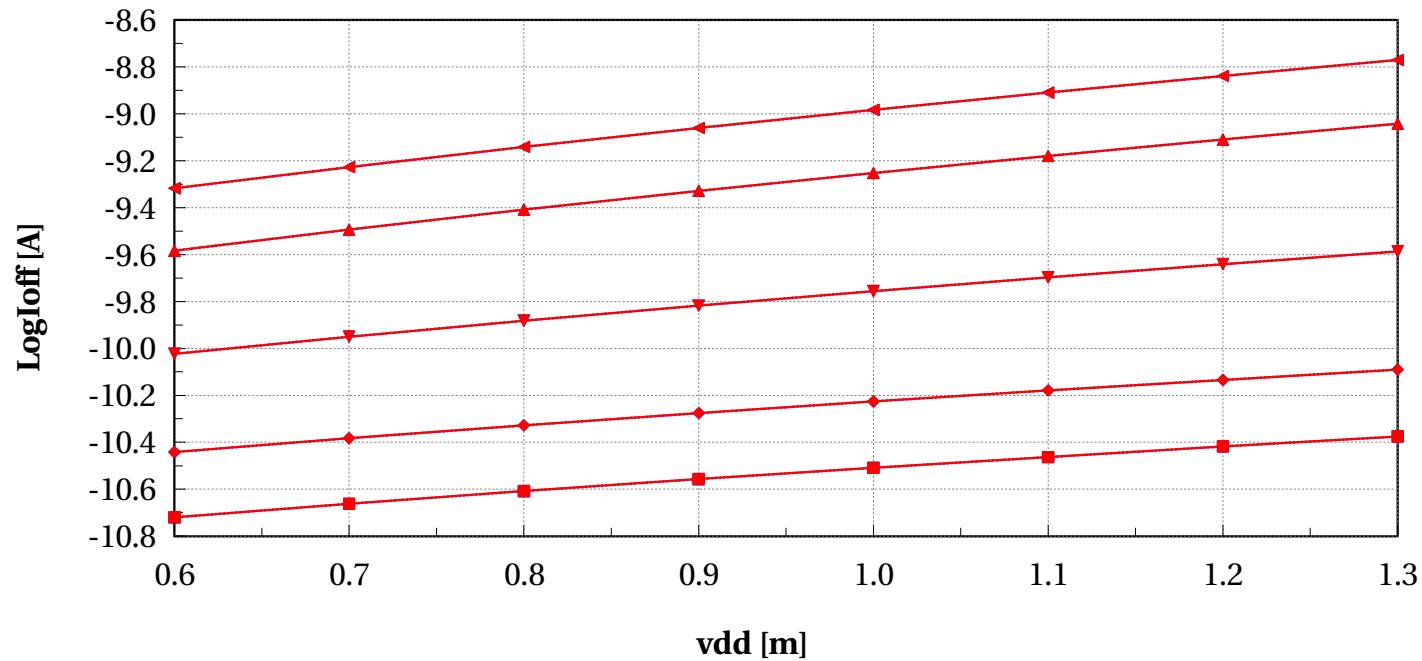
## nfet\_acc, Isat/W [A/m] vs vdd [m]

$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



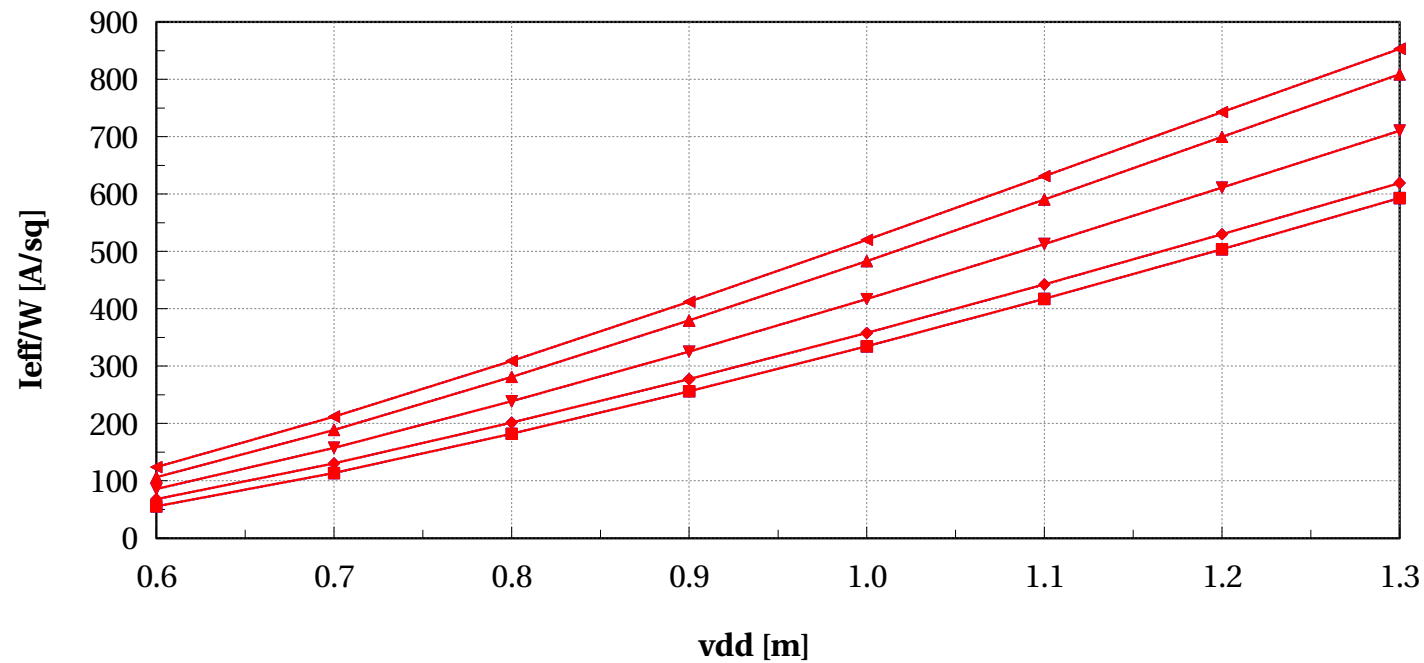
# nfet\_acc, LogIoff [A] vs vdd [m]

$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



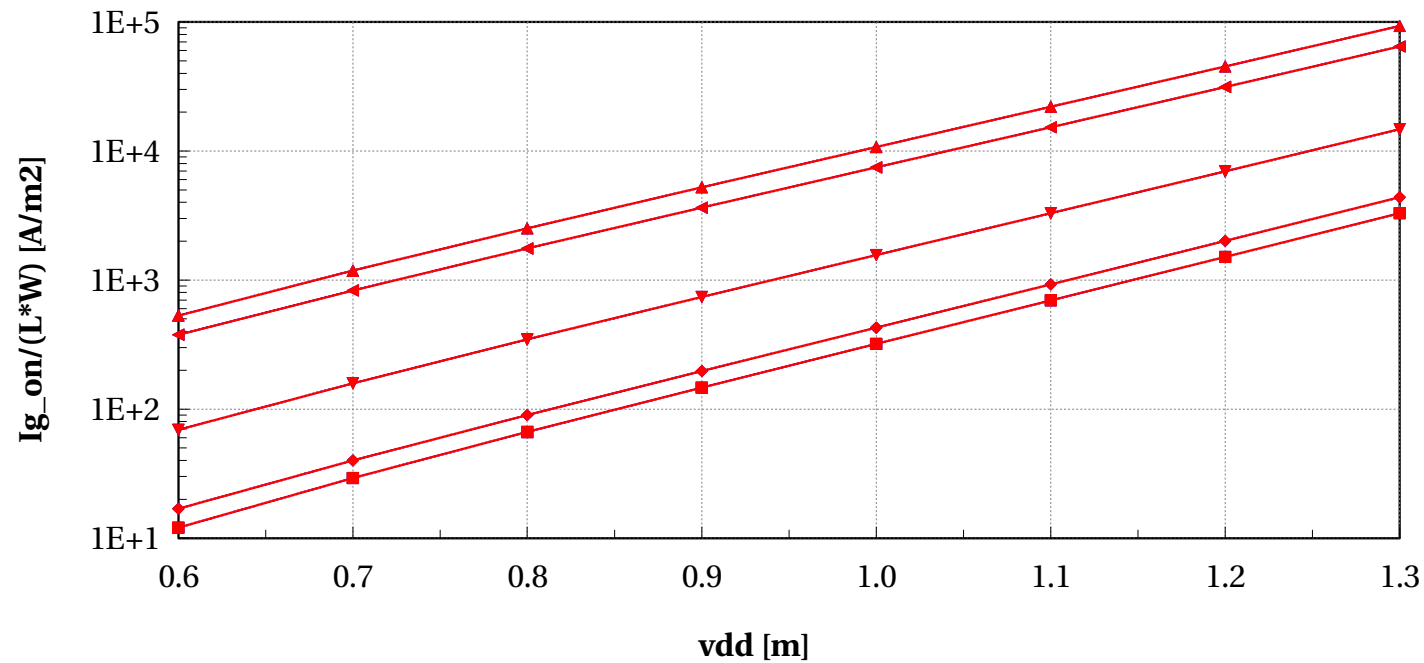
# nfet\_acc, I<sub>eff</sub>/W [A/sq] vs v<sub>dd</sub> [m]

$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



# nfet\_acc, Ig\_on/(L\*W) [A/m2] vs vdd [m]

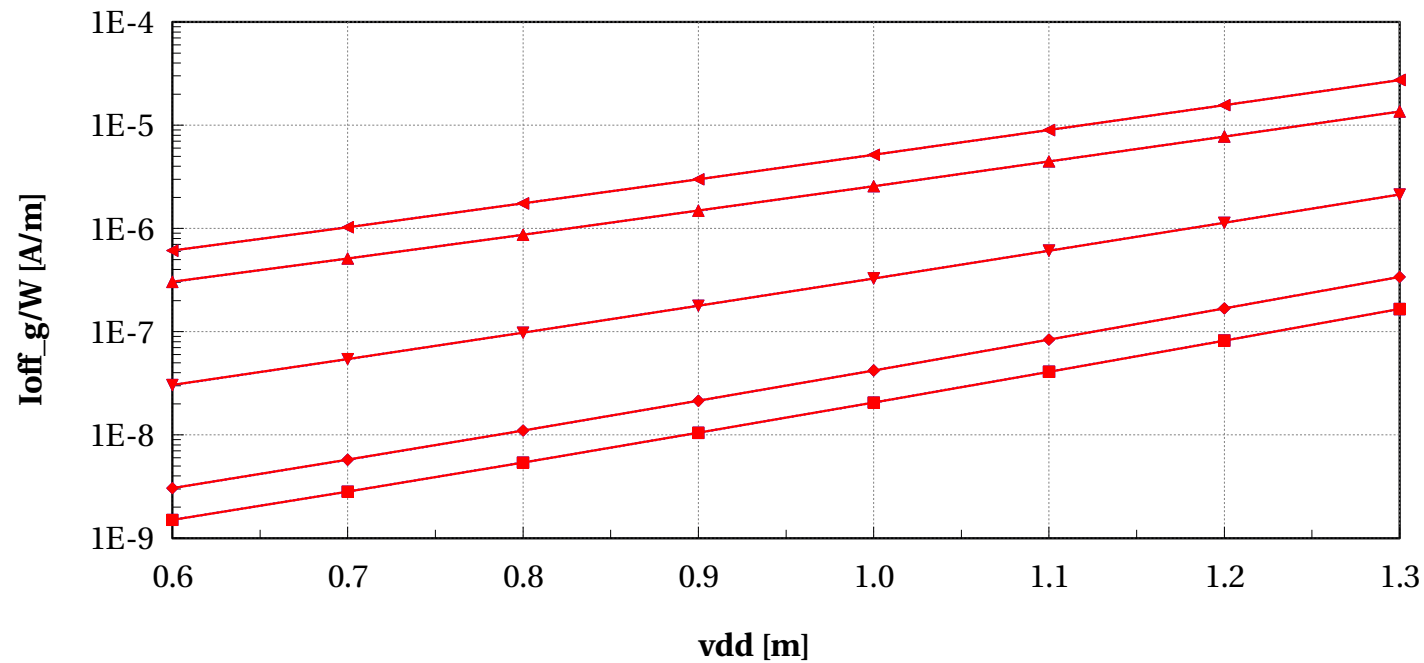
l==30e-9 and w==0.21e-6 and Temp==25 and Vbs==0 and p\_la==0





# nfet\_acc, Ioff\_g/W [A/m] vs vdd [m]

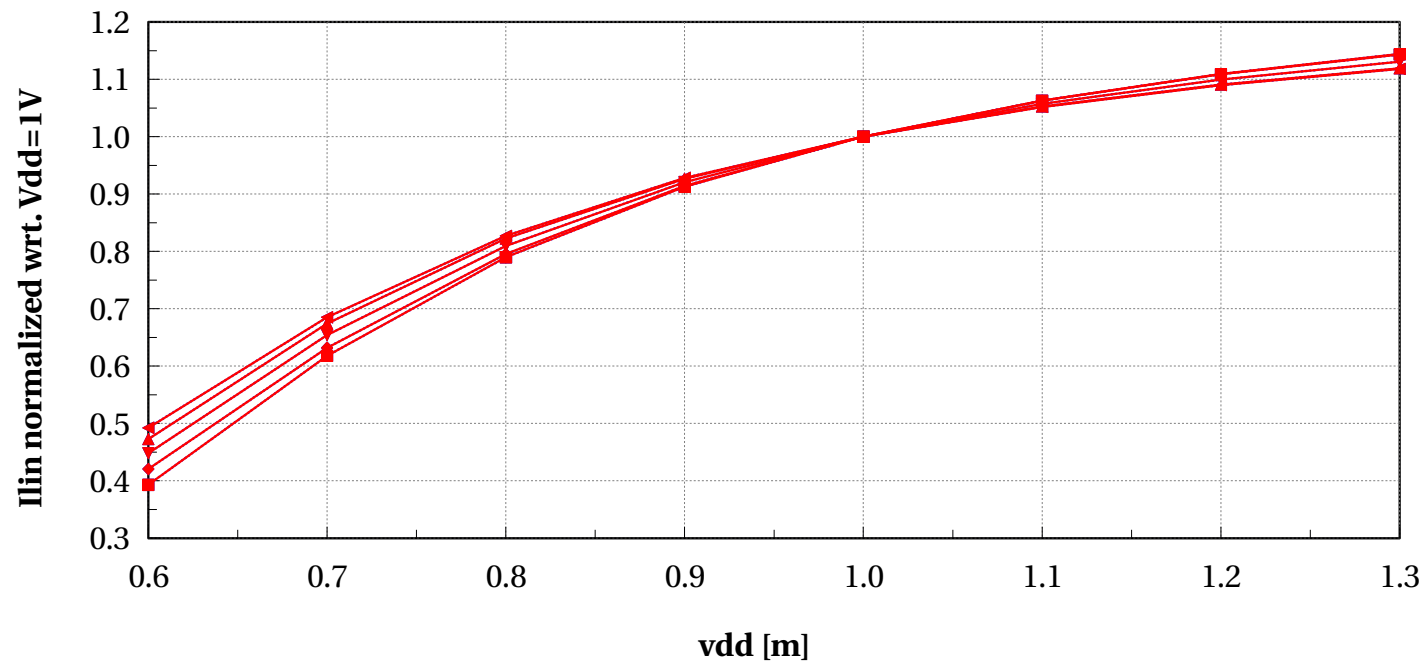
$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



## Vdd effect normalized ( $l=30\text{e-}9$ $w=210\text{e-}9$ )

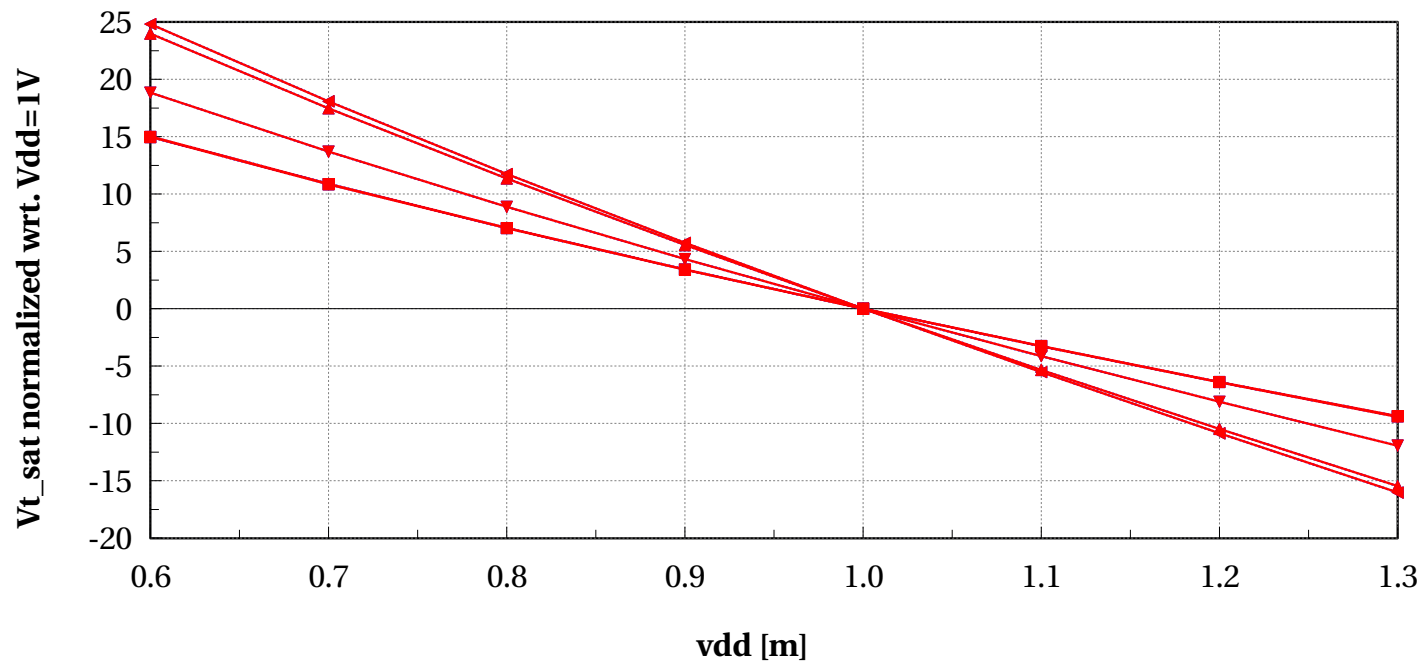
## nfet\_acc, I<sub>lin</sub> normalized wrt. V<sub>dd</sub>=1V vs v<sub>dd</sub> [m]

$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



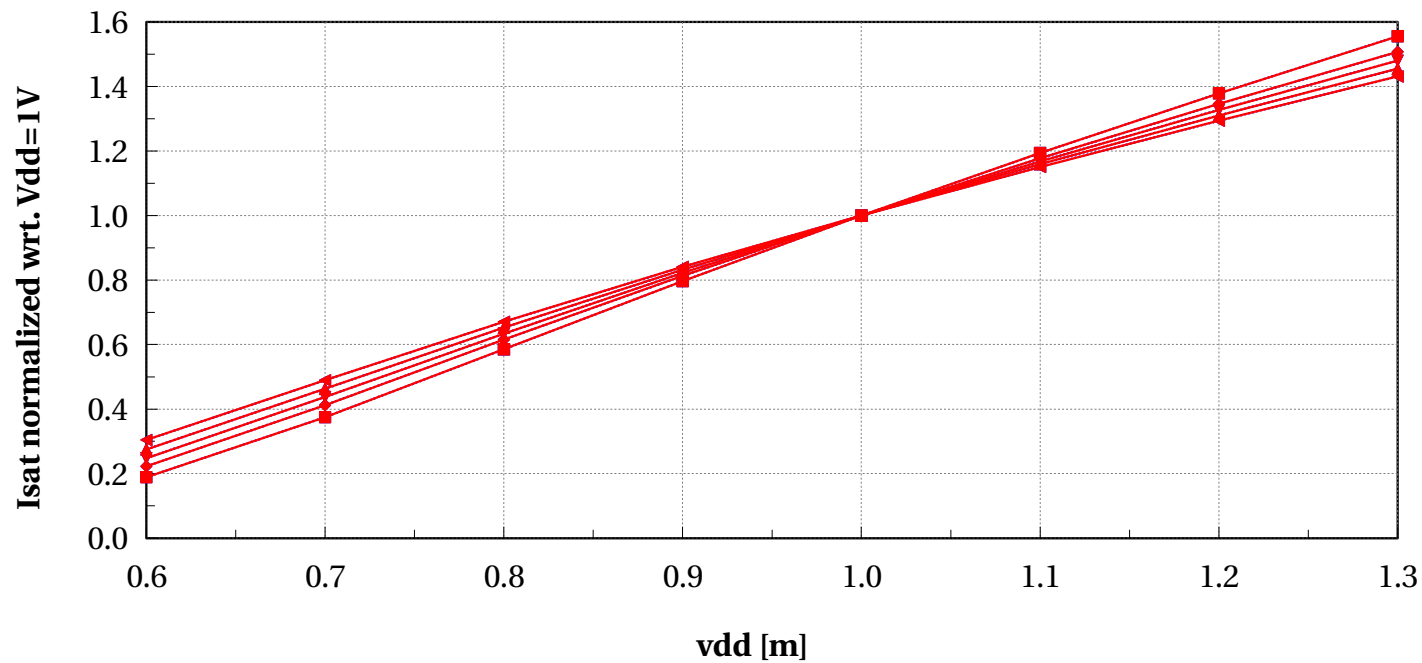
## nfet\_acc, Vt\_sat normalized wrt. Vdd=1V vs vdd [m]

$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



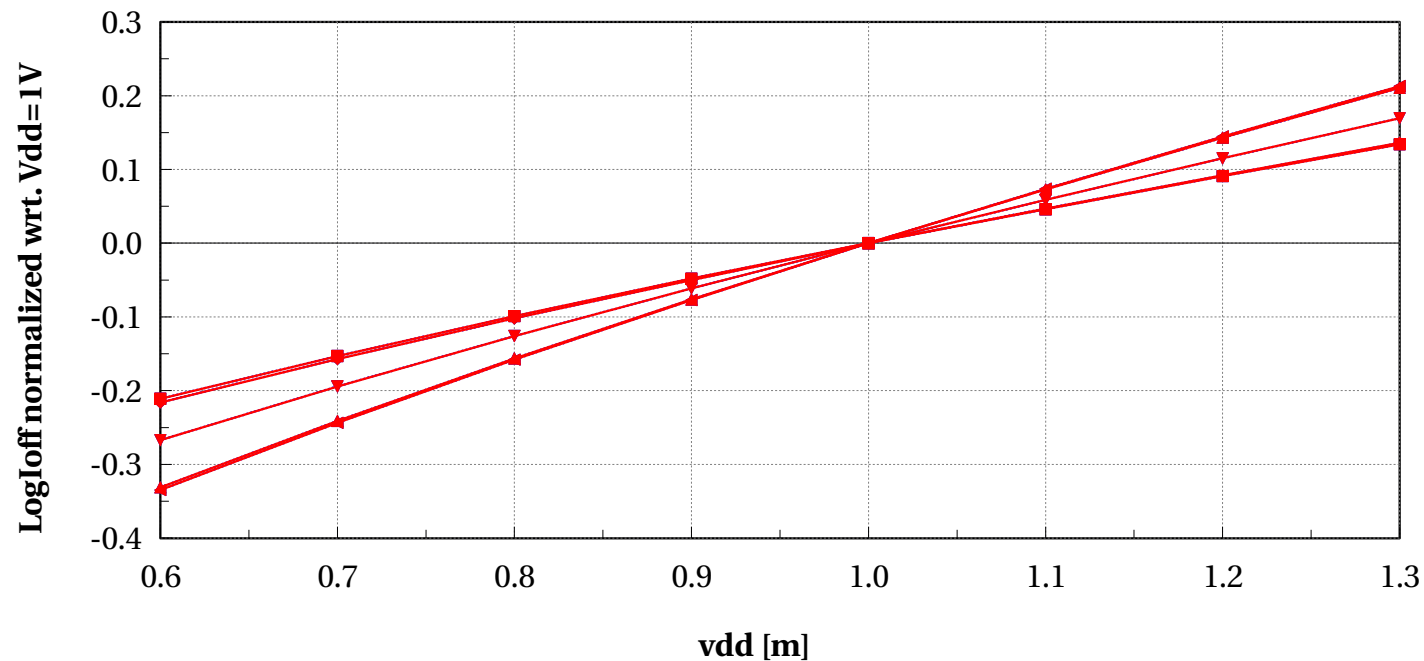
## nfet\_acc, Isat normalized wrt. Vdd=1V vs vdd [m]

$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



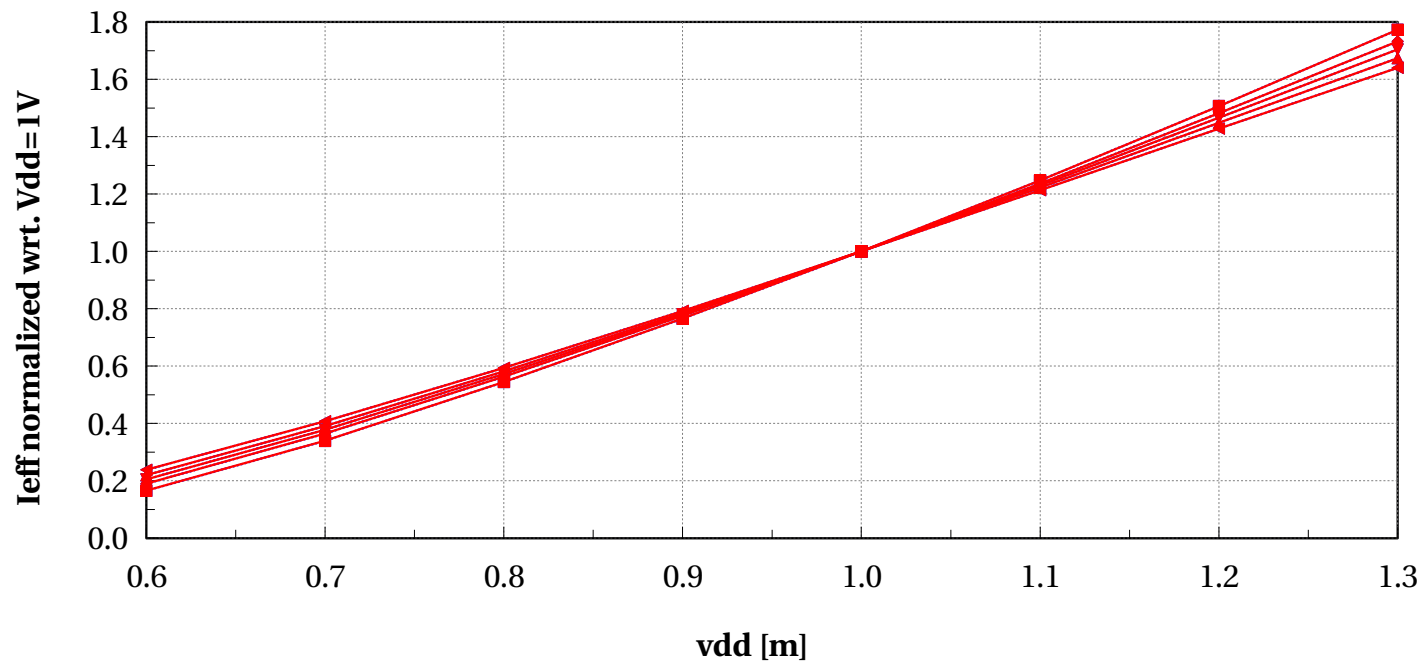
## nfet\_acc, LogIoff normalized wrt. Vdd=1V vs vdd [m]

$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



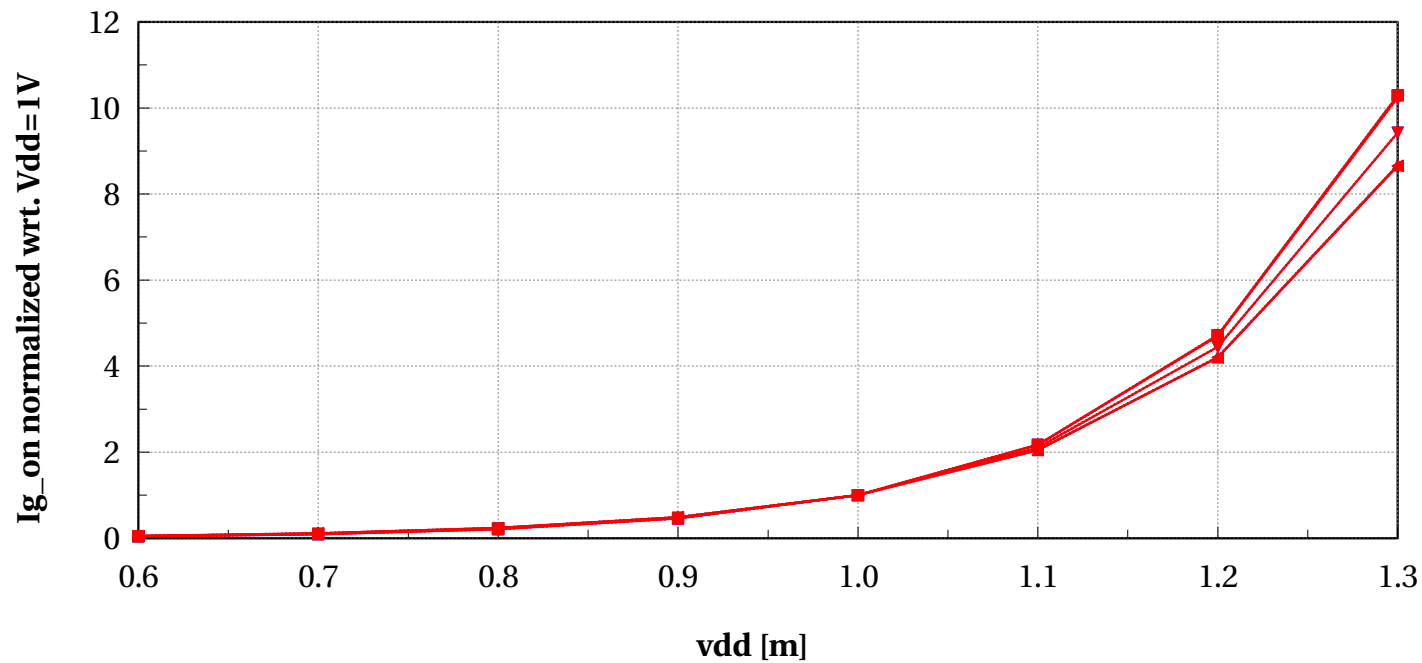
## nfet\_acc, Ieff normalized wrt. Vdd=1V vs vdd [m]

$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



## nfet\_acc, Ig\_on normalized wrt. Vdd=1V vs vdd [m]

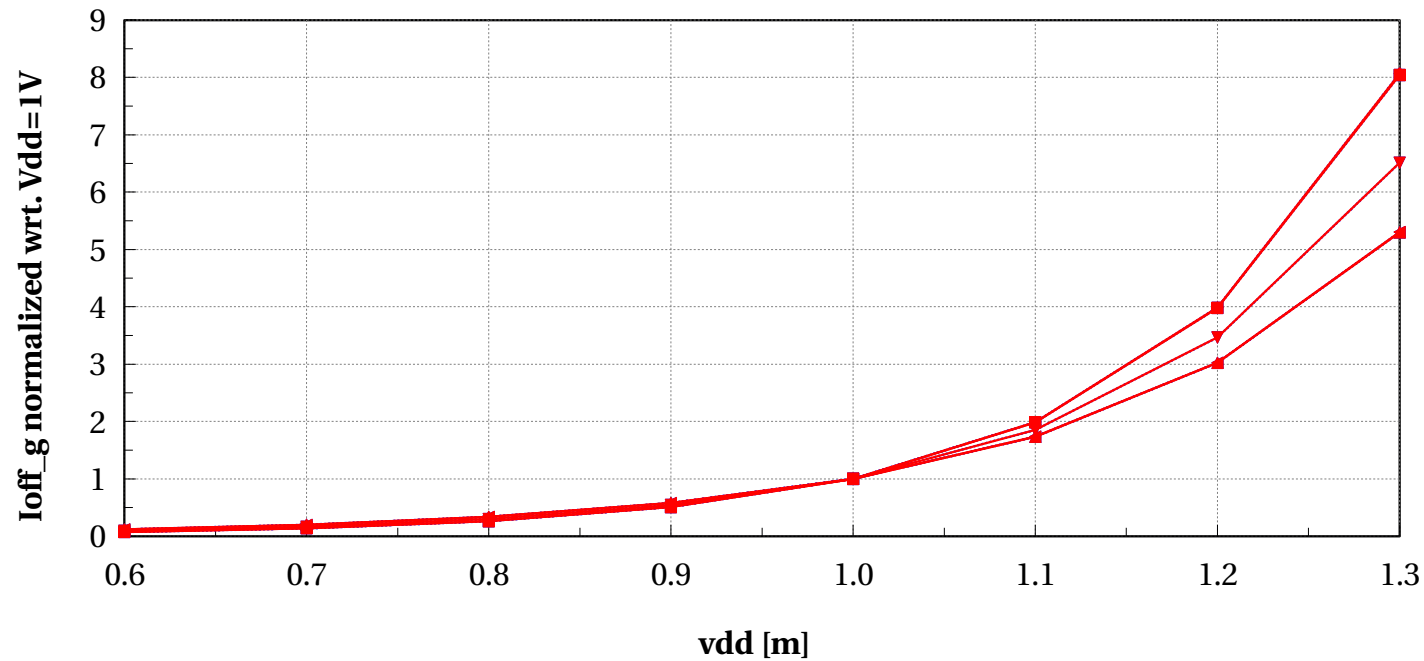
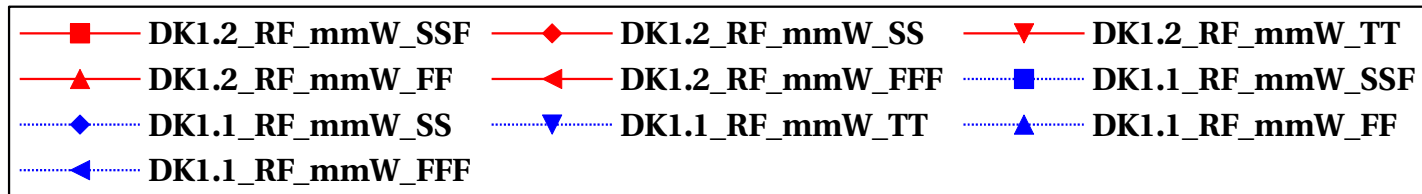
$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$





## nfet\_acc, Ioff\_g normalized wrt. Vdd=1V vs vdd [m]

$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



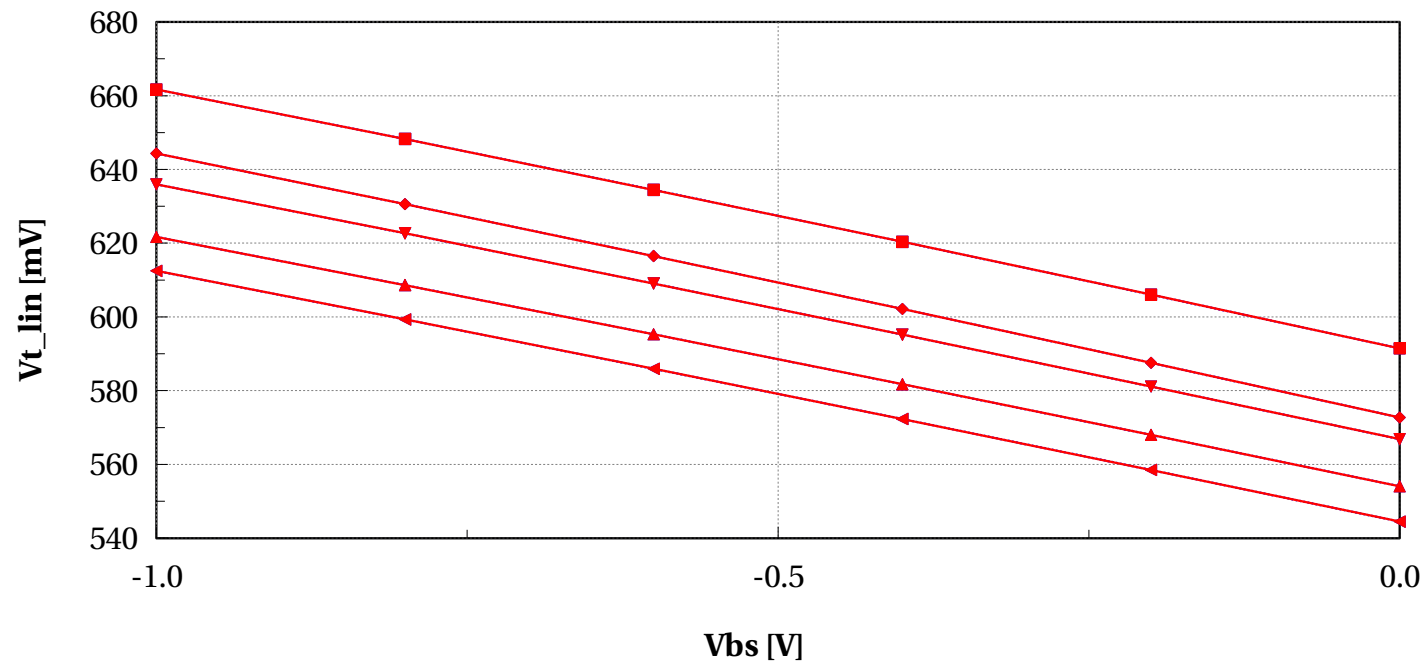
# pfet\_acc

## Electrical characteristics scaling

## Scaling versus $V_{bs}$ ( $L=1\mu m, W=1\mu m$ )

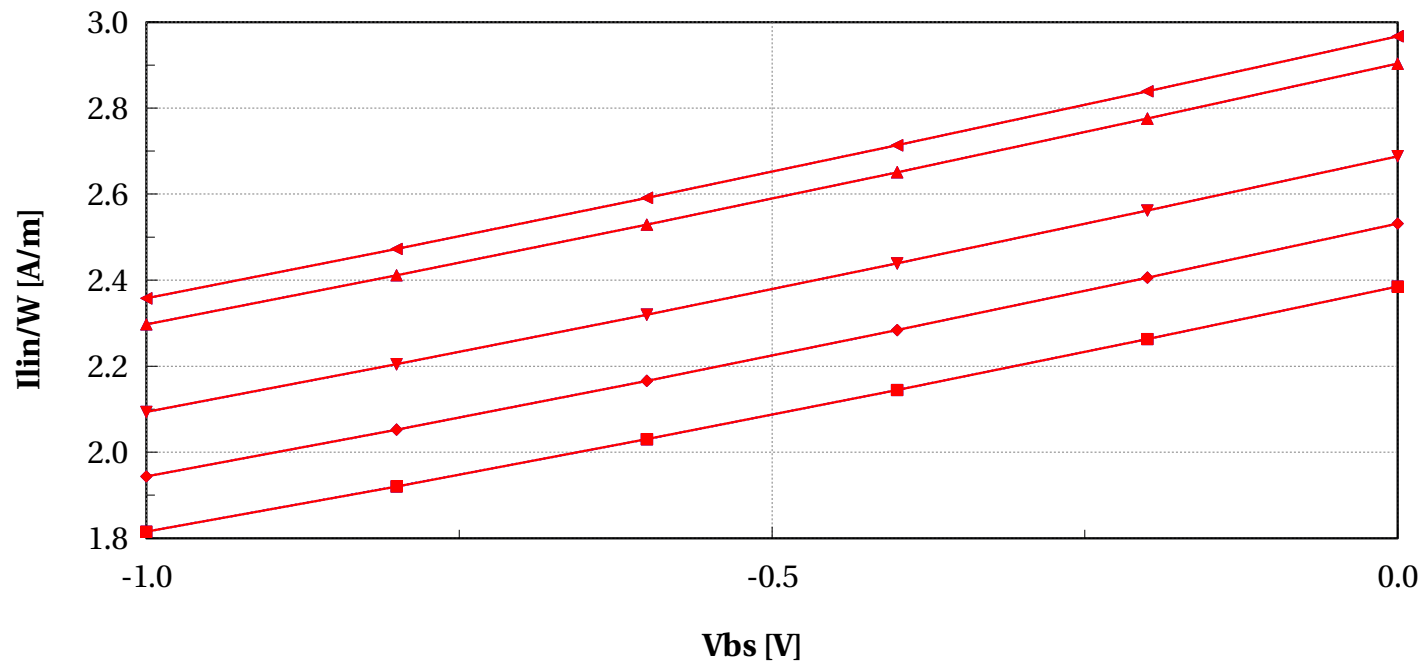
# pfet\_acc, Vt\_lin [mV] vs Vbs [V]

w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1



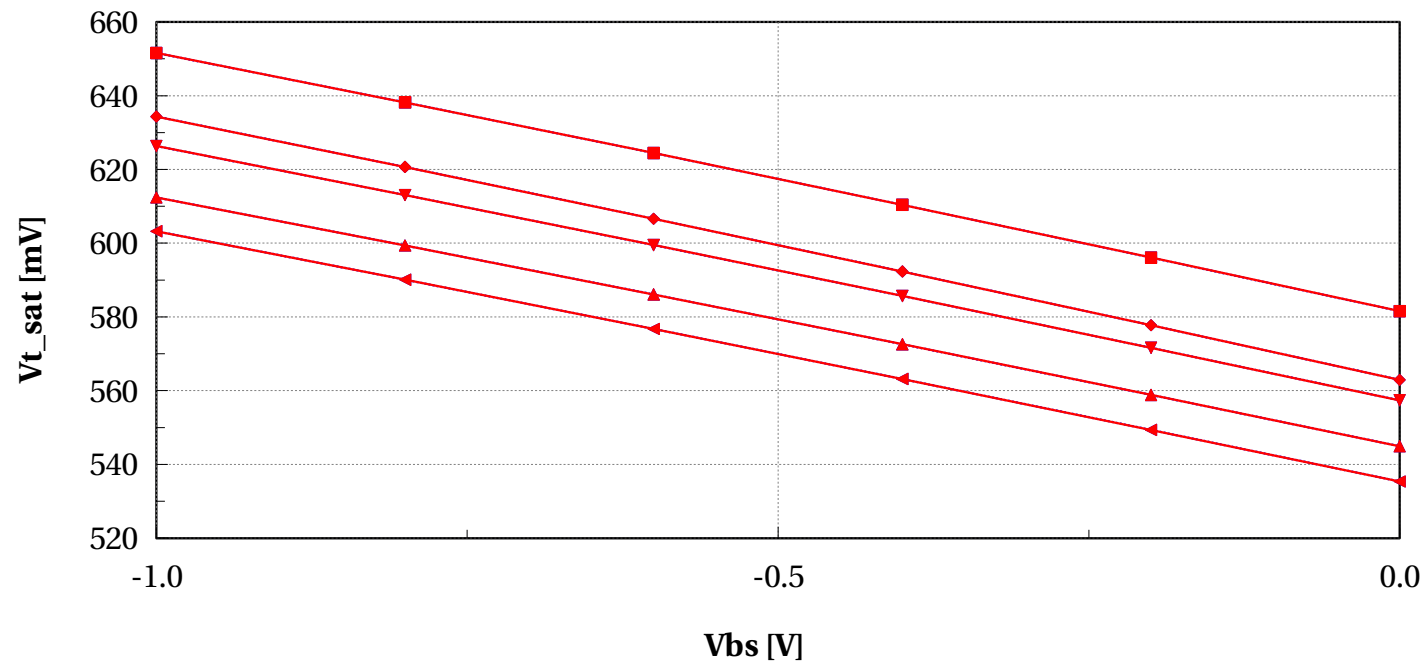
# pfet\_acc, I<sub>lin</sub>/W [A/m] vs V<sub>bs</sub> [V]

w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1



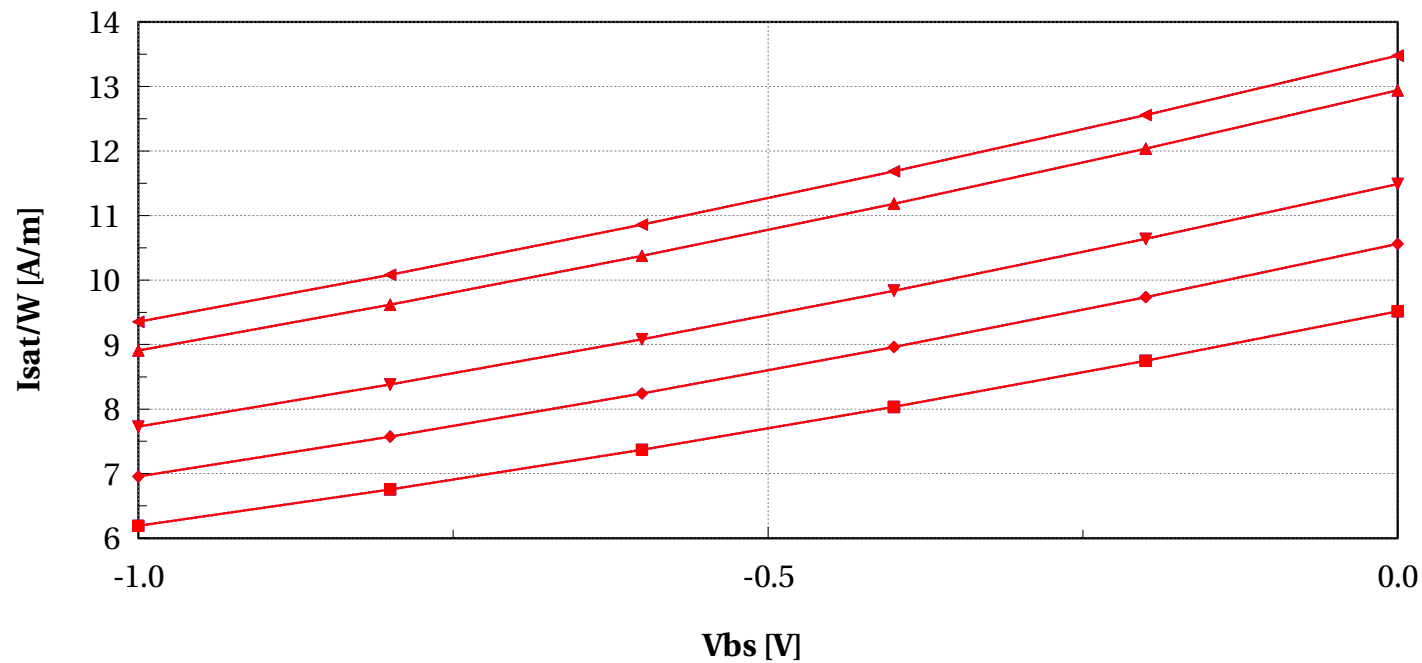
# pfet\_acc, Vt\_sat [mV] vs Vbs [V]

w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1



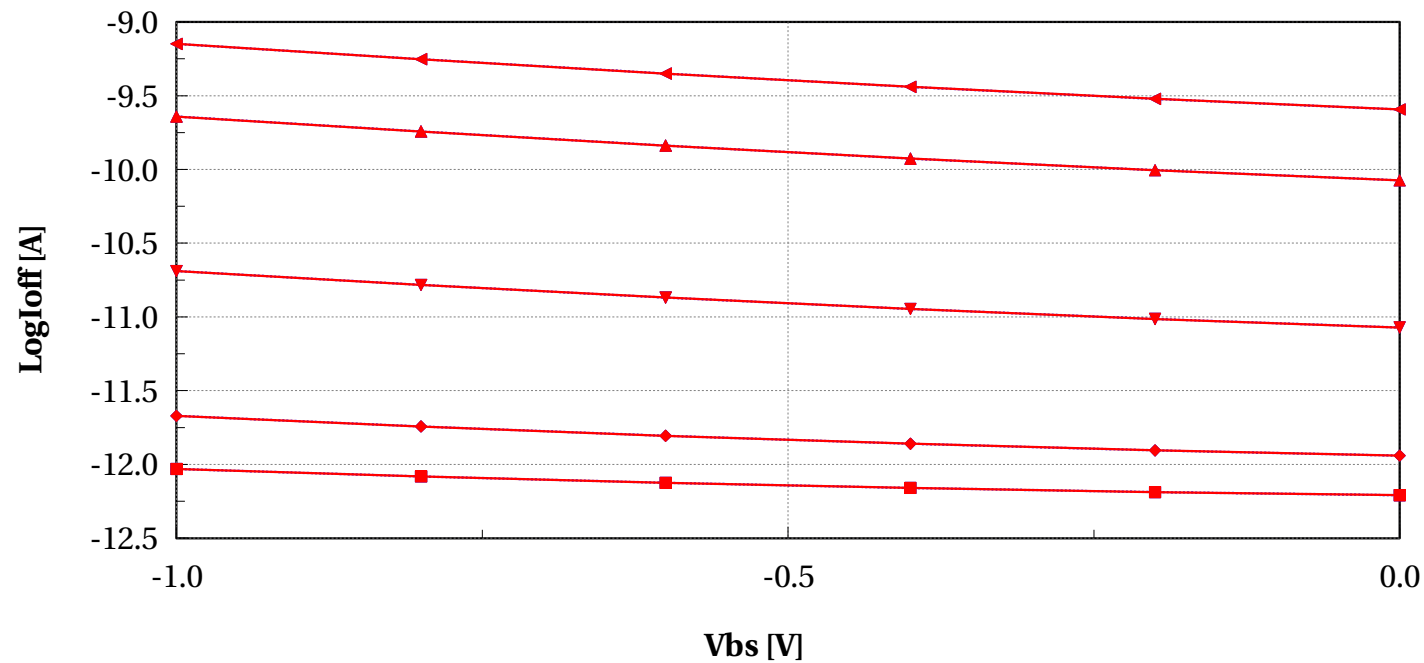
# pfet\_acc, Isat/W [A/m] vs Vbs [V]

w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1



# pfet\_acc, LogIoff [A] vs Vbs [V]

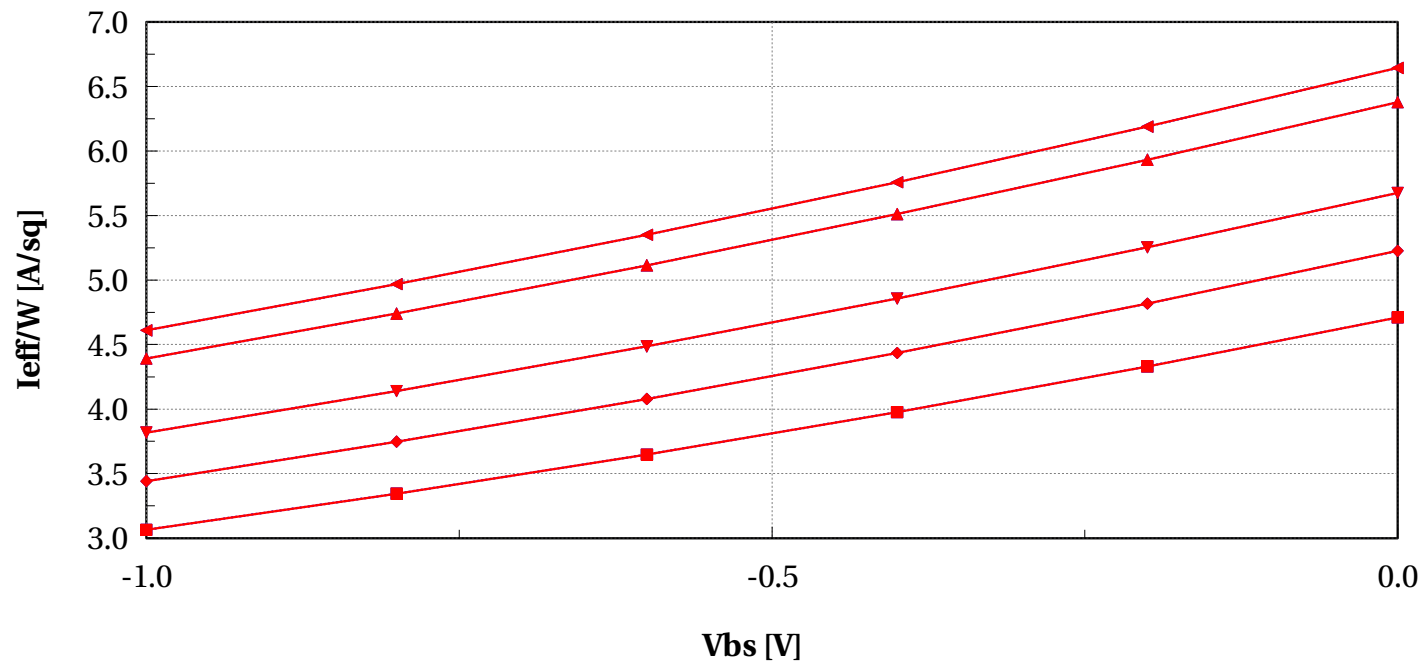
w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1





# pfet\_acc, I<sub>eff</sub>/W [A/sq] vs V<sub>bs</sub> [V]

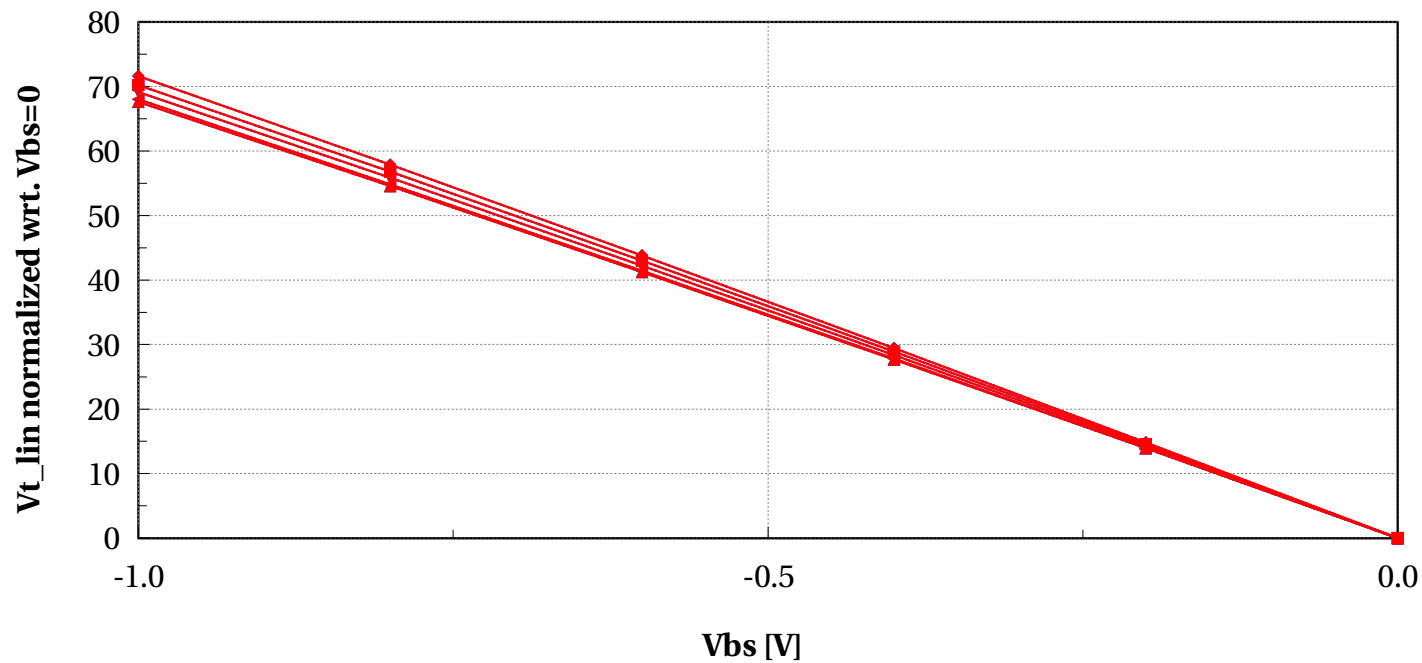
w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1



## Scaling versus $V_{bs}$ normalized ( $L=1\mu m, W=1\mu m$ )

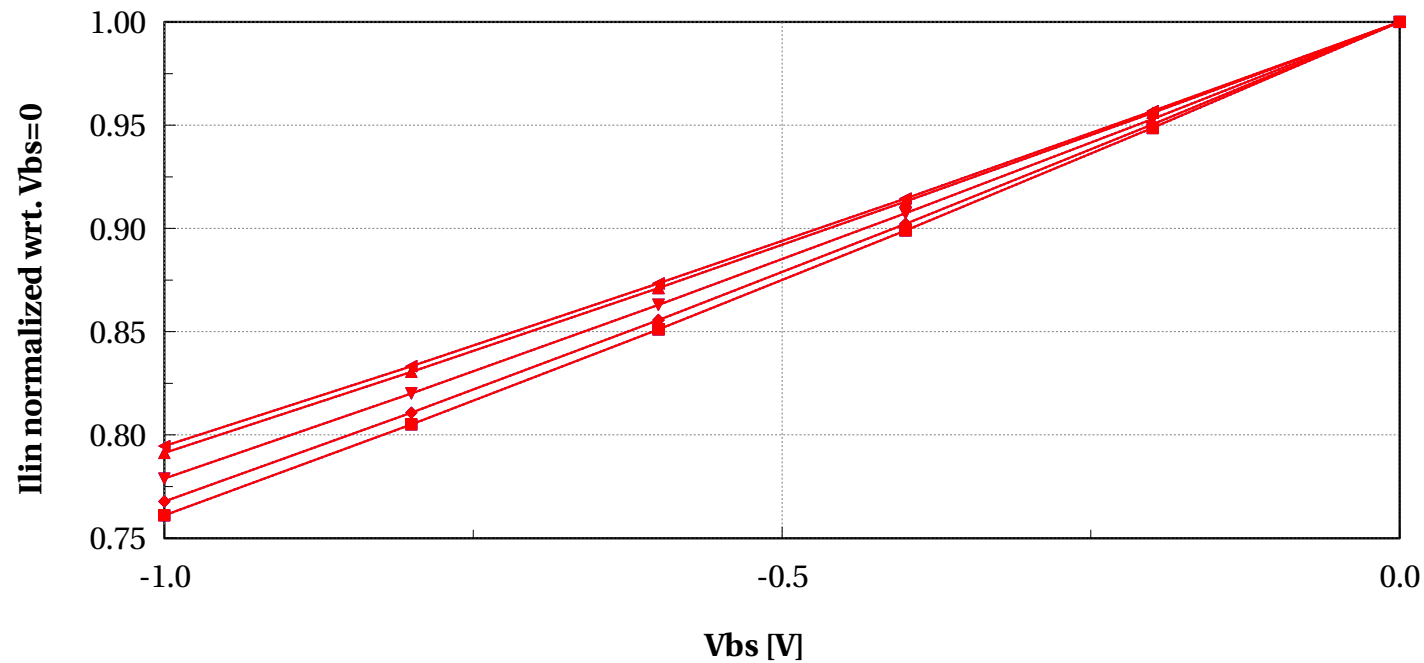
## pfet\_acc, Vt\_lin normalized wrt. Vbs=0 vs Vbs [V]

w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1



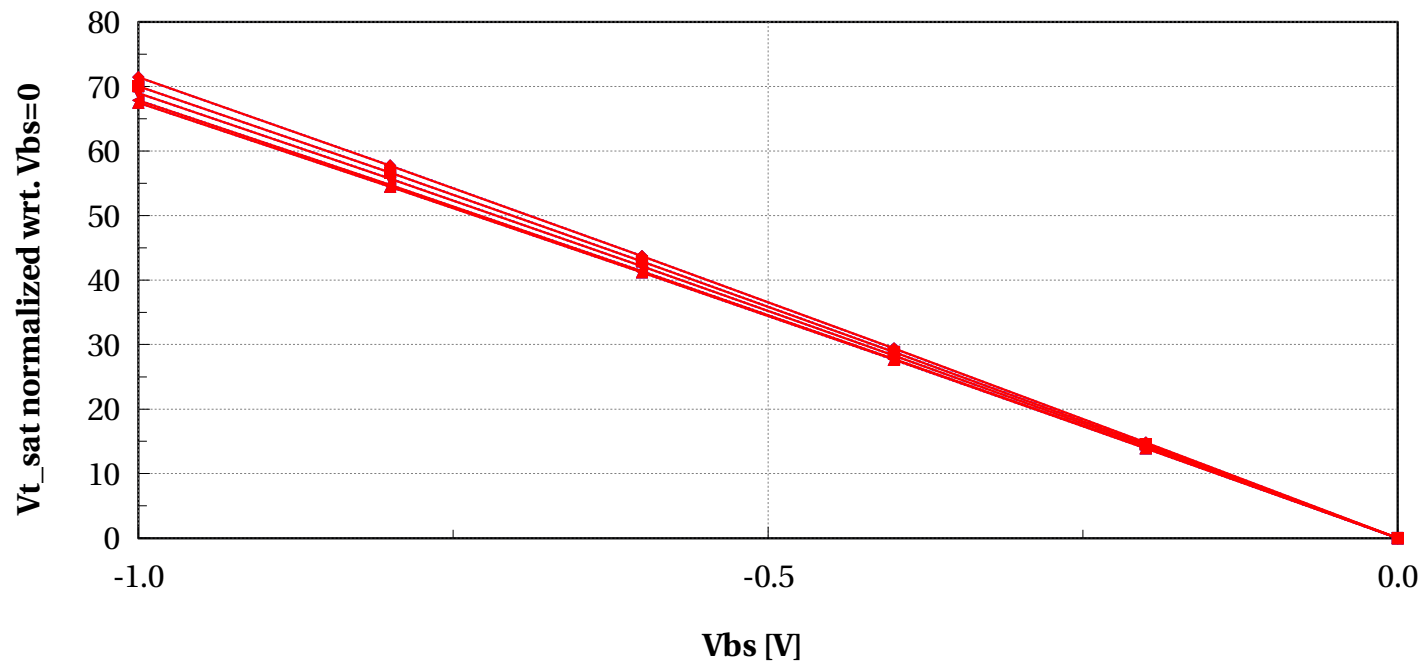
## pfet\_acc, I<sub>lin</sub> normalized wrt. V<sub>bs</sub>=0 vs V<sub>bs</sub> [V]

w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1



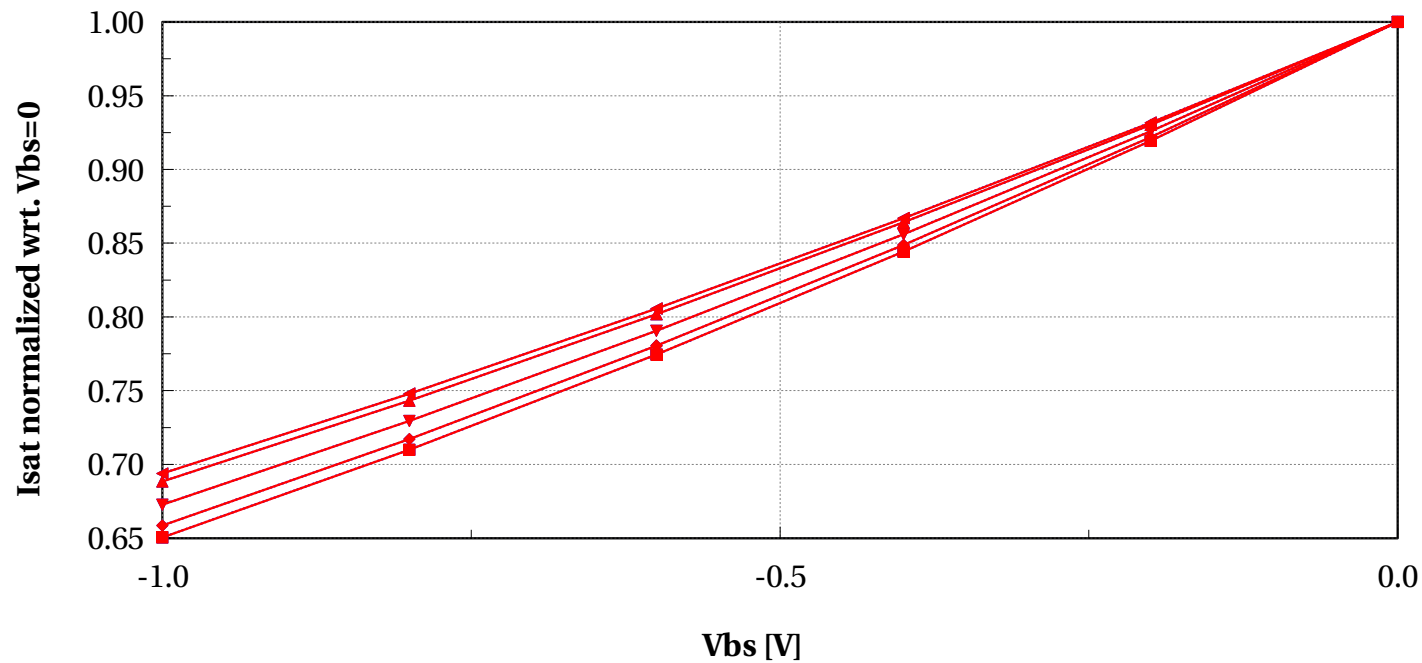
## pfet\_acc, Vt\_sat normalized wrt. Vbs=0 vs Vbs [V]

w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1



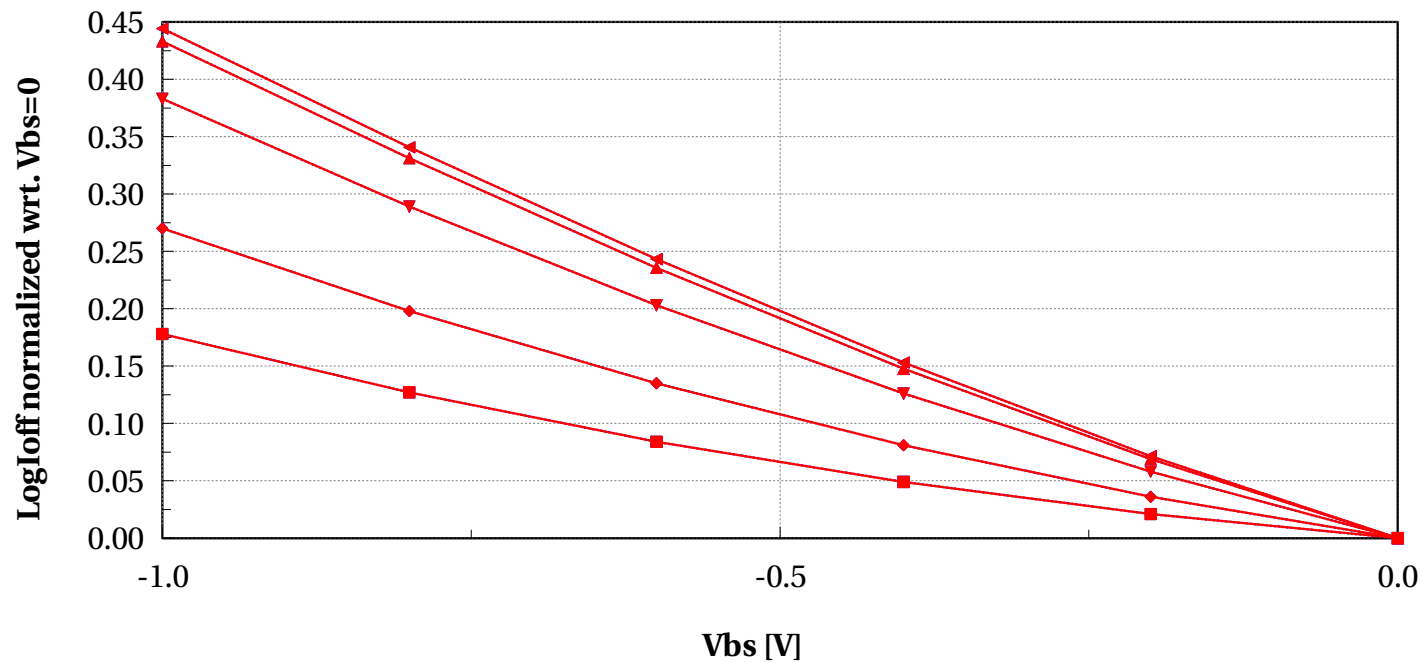
# pfet\_acc, Isat normalized wrt. Vbs=0 vs Vbs [V]

w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1



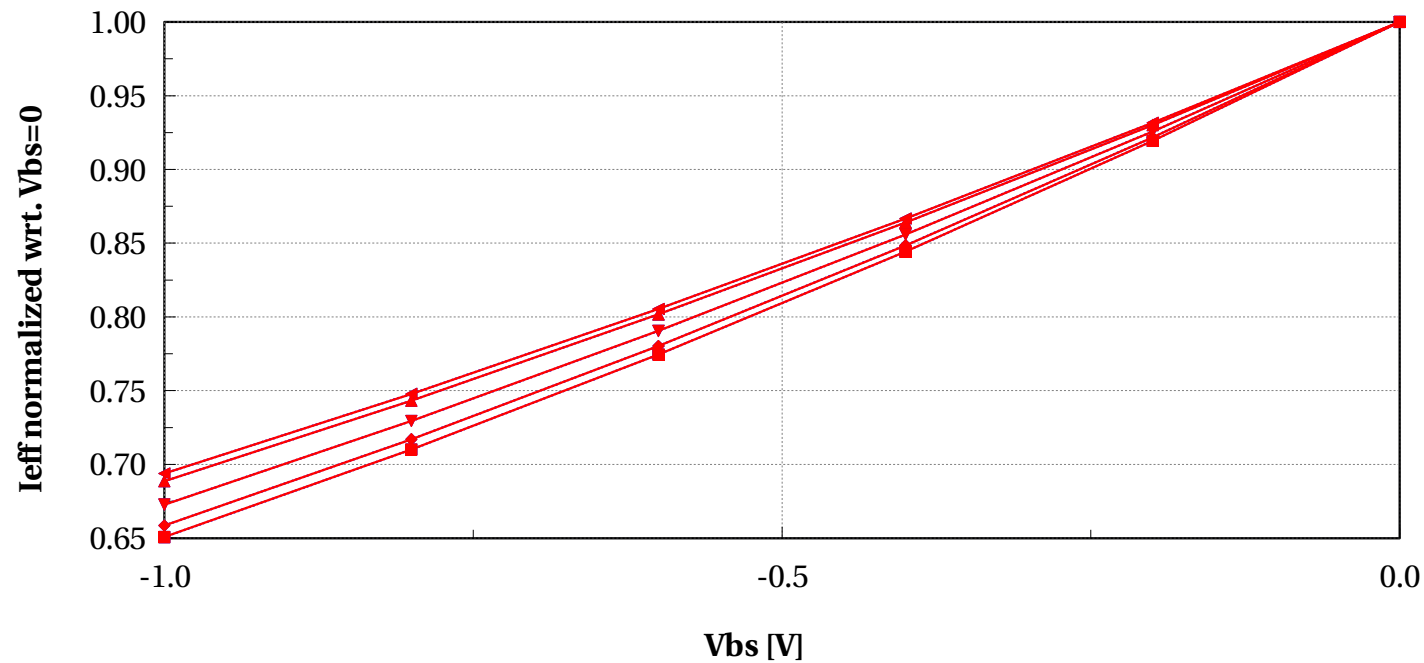
## pfet\_acc, LogIoff normalized wrt. Vbs=0 vs Vbs [V]

w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1



## pfet\_acc, Ieff normalized wrt. Vbs=0 vs Vbs [V]

w==1e-6 and L==1e-6 and Temp==25 and p\_la==0 and Vdd==1

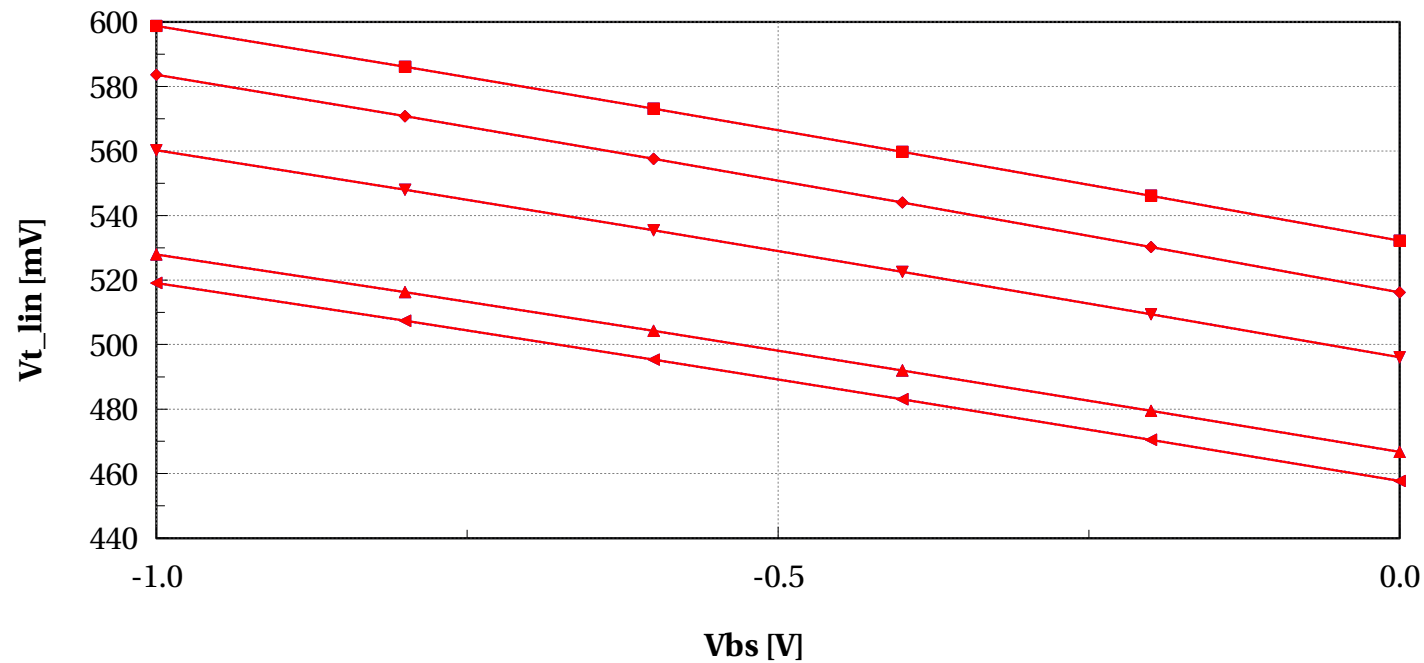




## Scaling versus $V_{bs}$ ( $L=30\text{nm}$ , $W=300\text{nm}$ )

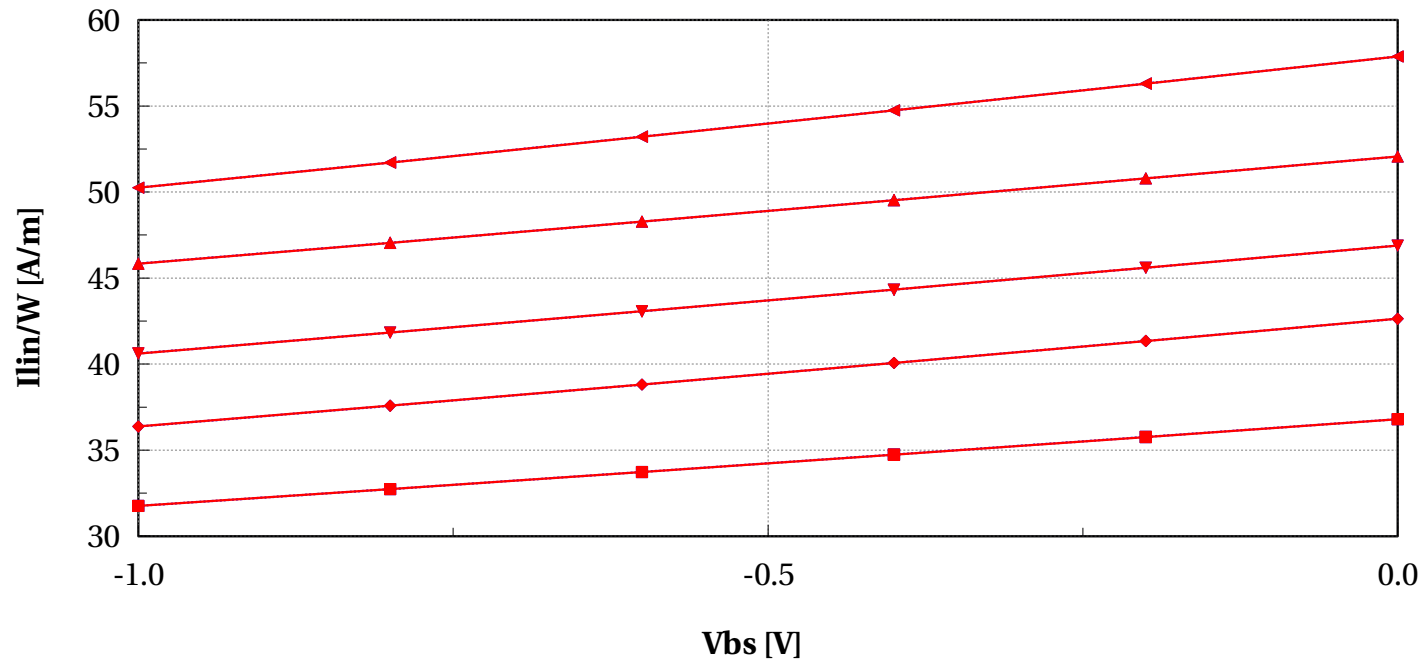
# pfet\_acc, Vt\_lin [mV] vs Vbs [V]

w==300e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1



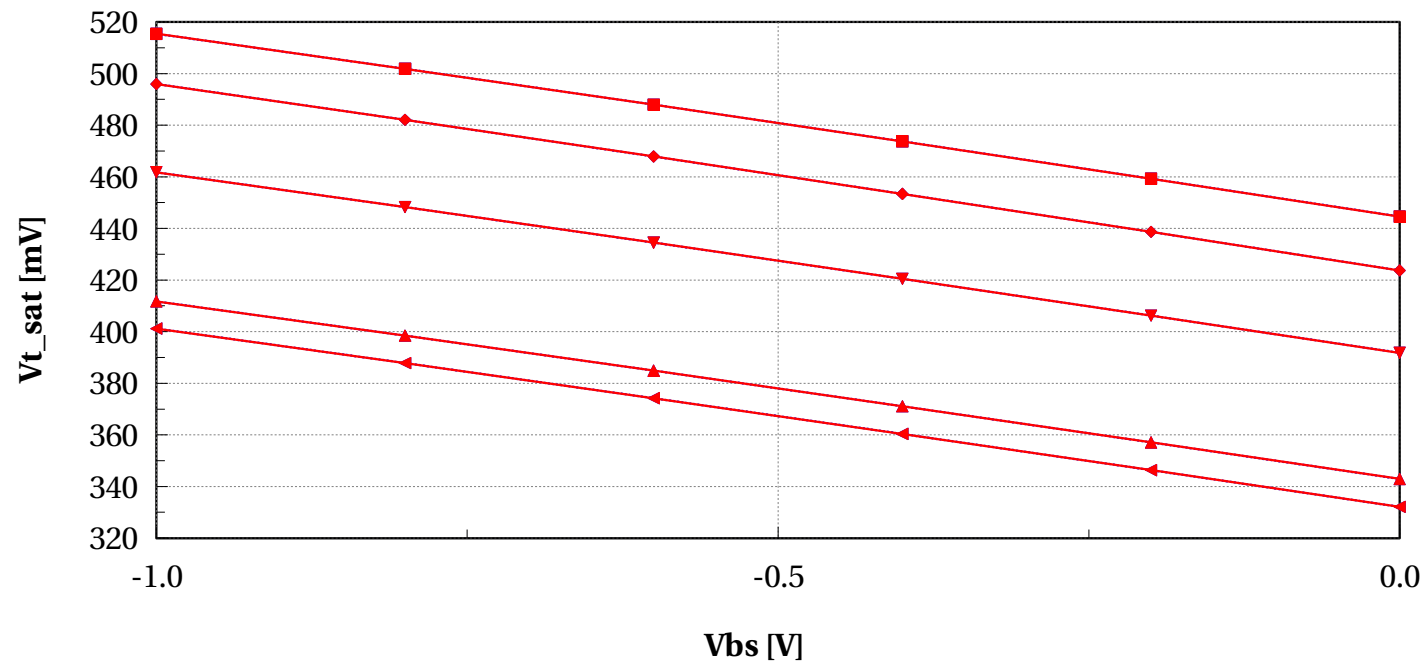
# pfet\_acc, I<sub>lin</sub>/W [A/m] vs V<sub>bs</sub> [V]

w==300e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1



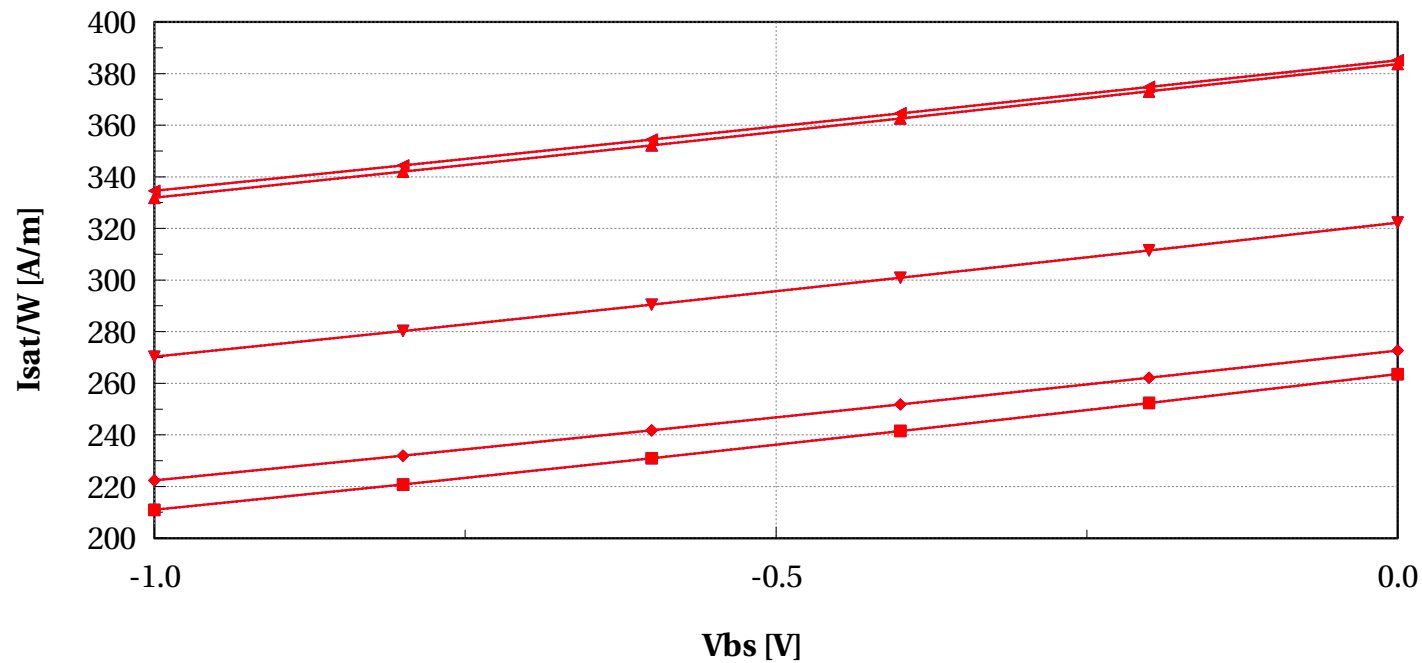
# pfet\_acc, Vt\_sat [mV] vs Vbs [V]

w==300e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1



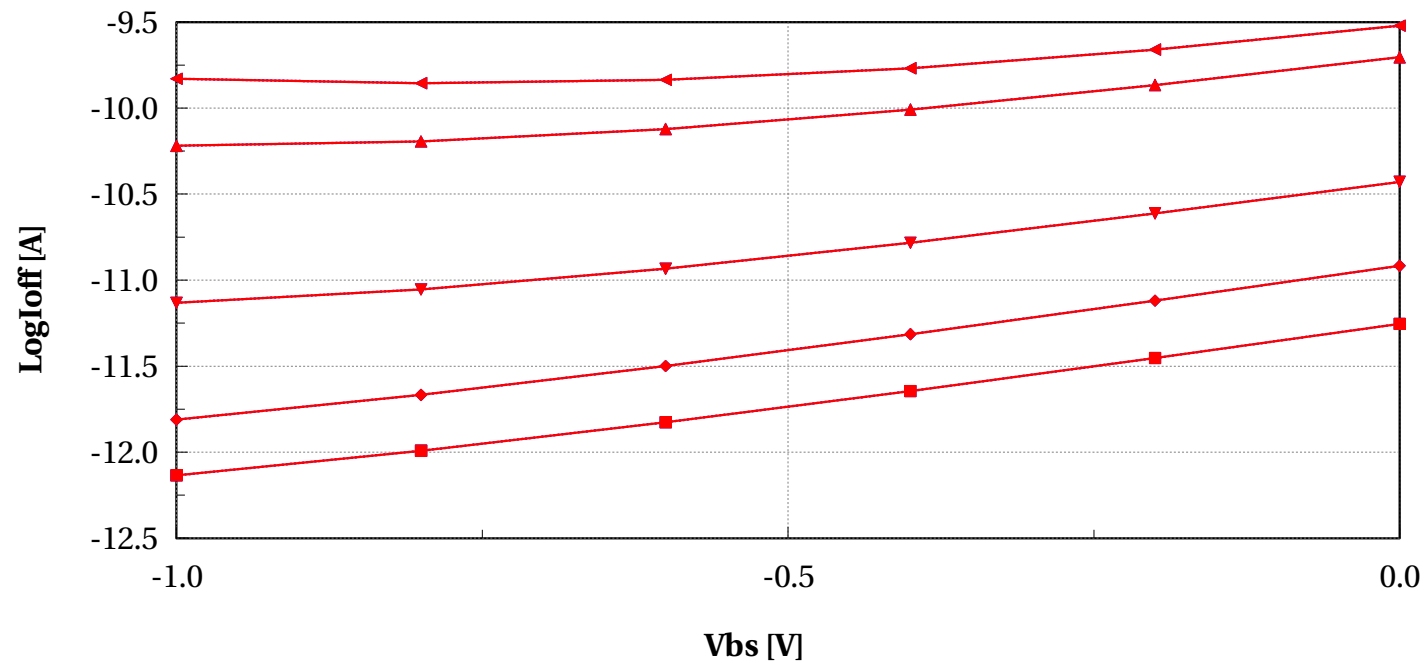
# pfet\_acc, Isat/W [A/m] vs Vbs [V]

w==300e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1



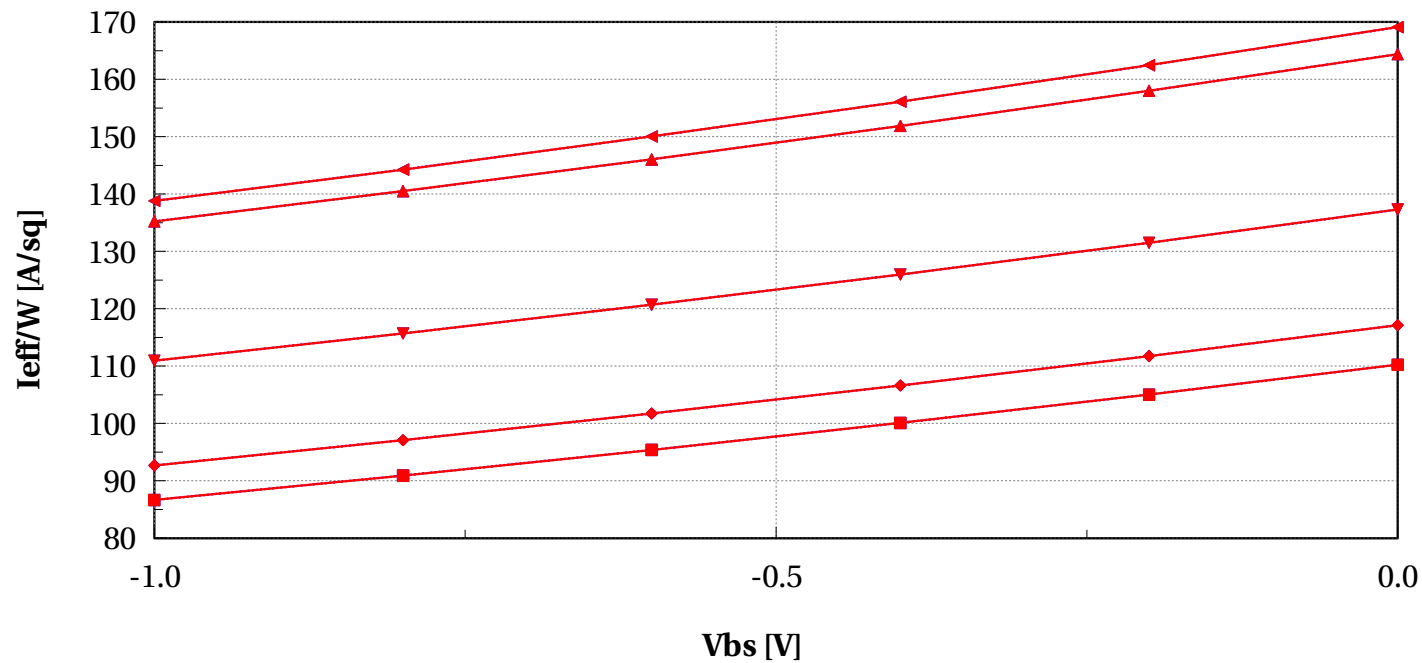
# pfet\_acc, LogIoff [A] vs Vbs [V]

w==300e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1



# pfet\_acc, I<sub>eff</sub>/W [A/sq] vs V<sub>bs</sub> [V]

w==300e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1

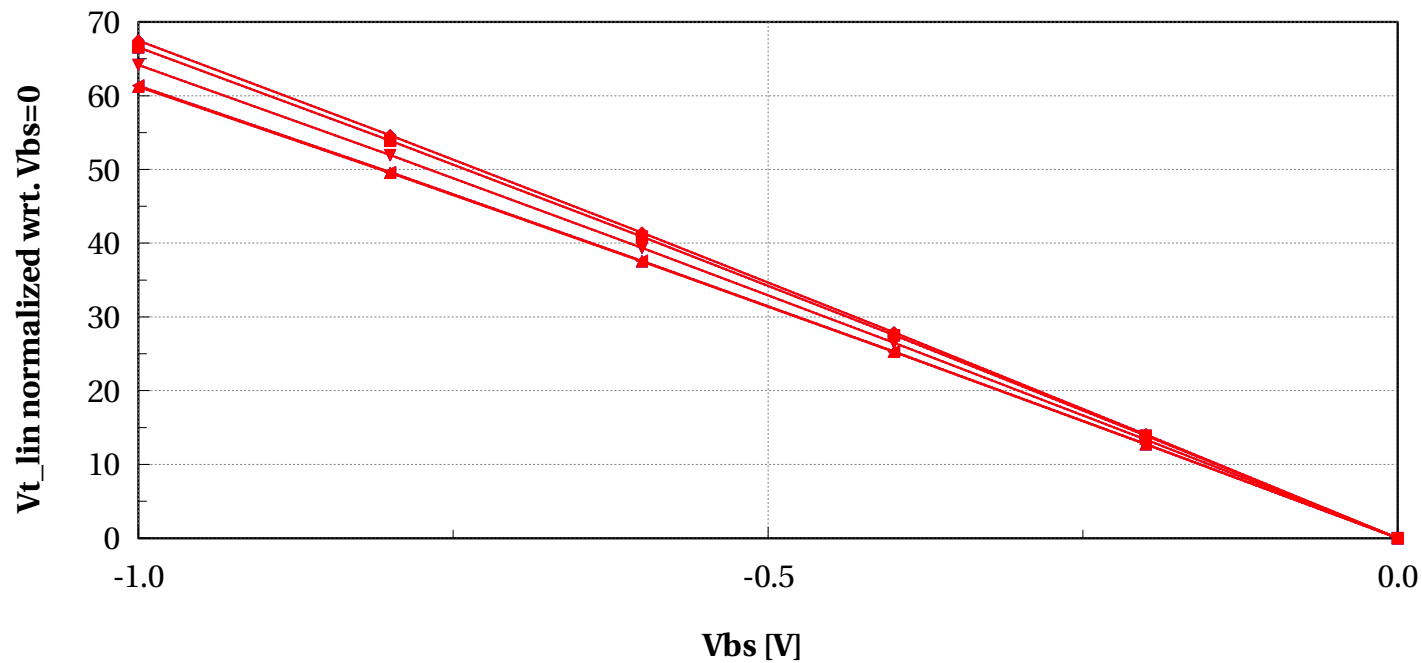


## Scaling versus $V_{bs}$ normalized ( $L=30\text{nm}$ , $W=210\text{nm}$ )



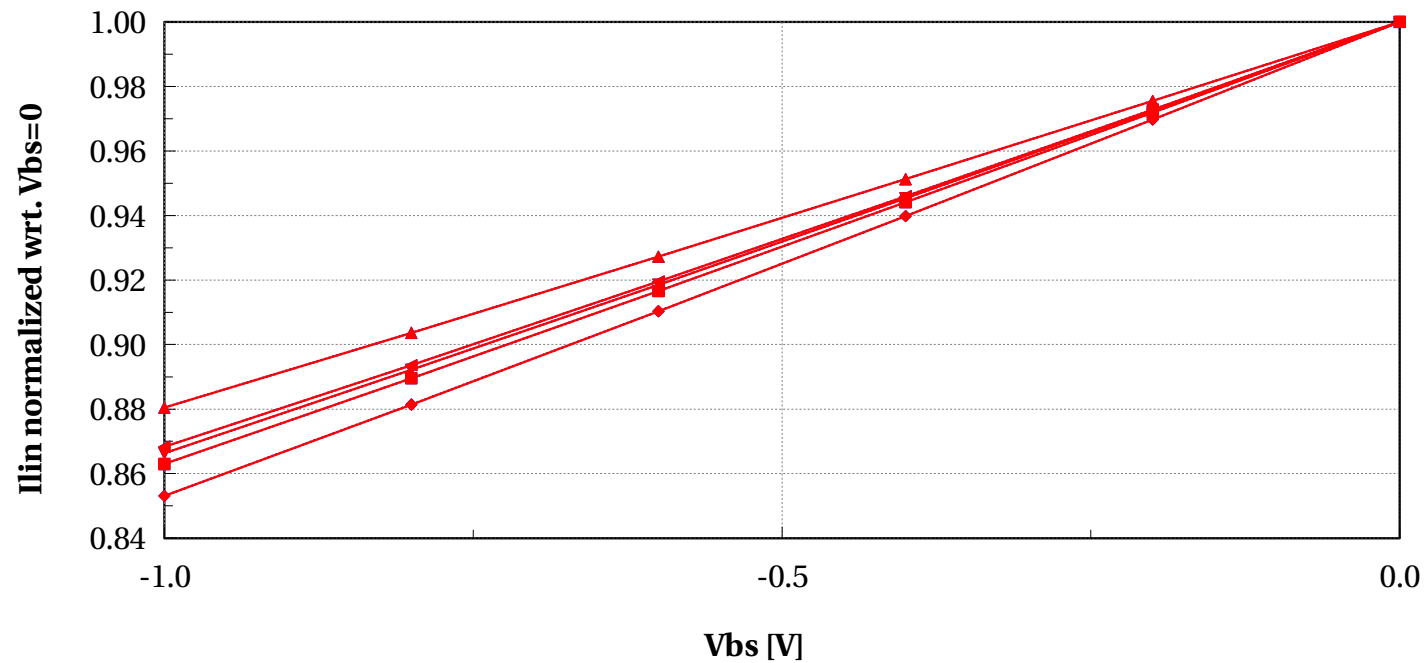
## pfet\_acc, Vt\_lin normalized wrt. Vbs=0 vs Vbs [V]

w==300e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1



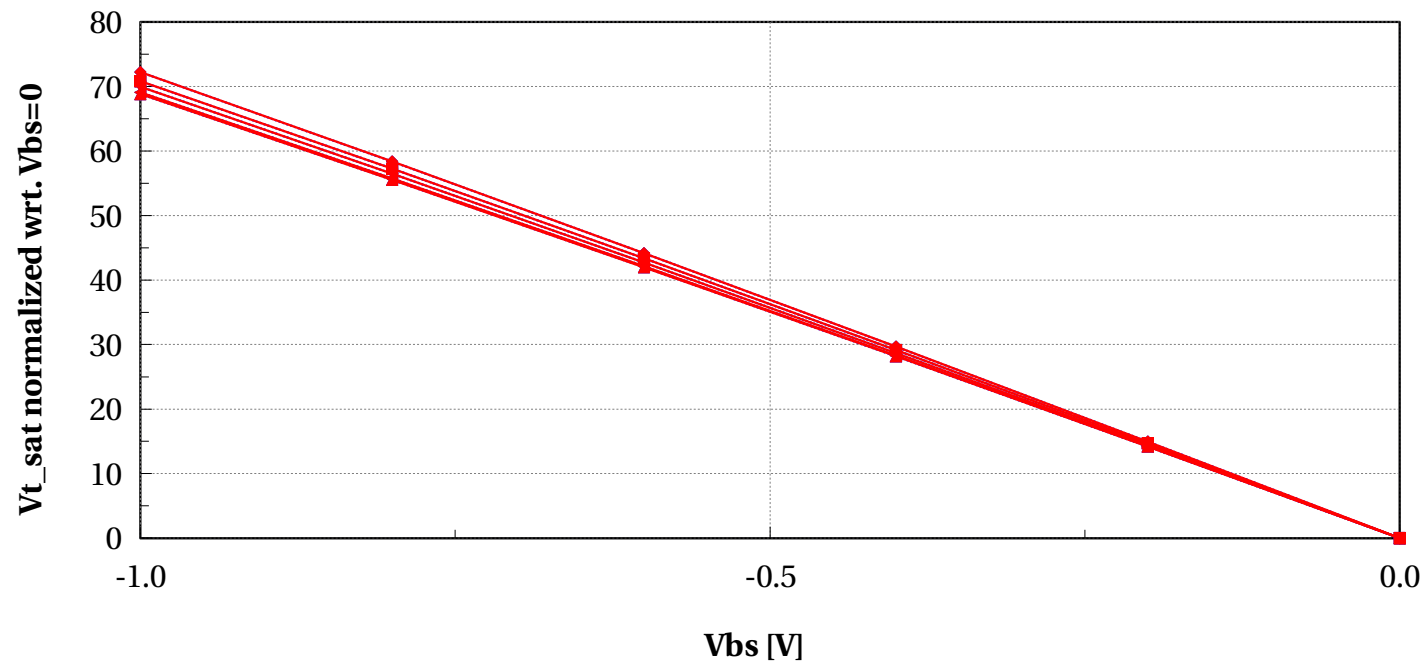
# pfet\_acc, I<sub>lin</sub> normalized wrt. V<sub>bs</sub>=0 vs V<sub>bs</sub> [V]

w==300e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1



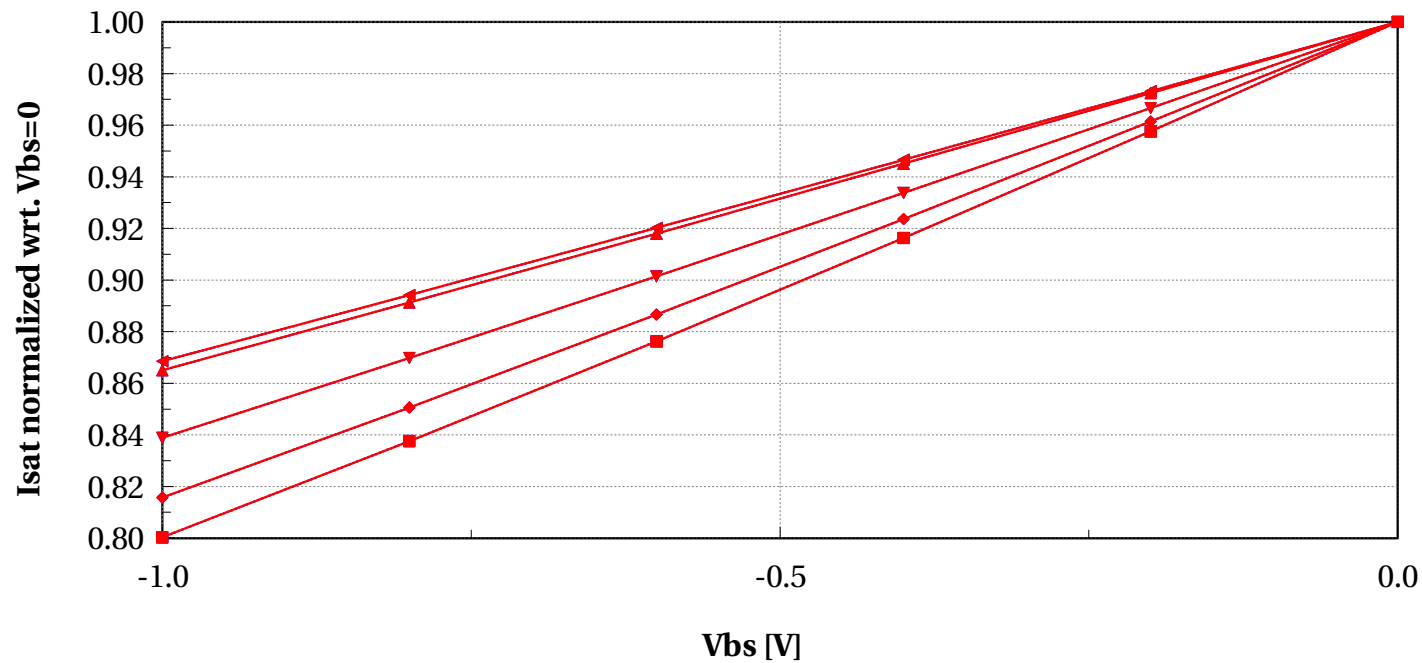
## pfet\_acc, Vt\_sat normalized wrt. Vbs=0 vs Vbs [V]

w==300e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1



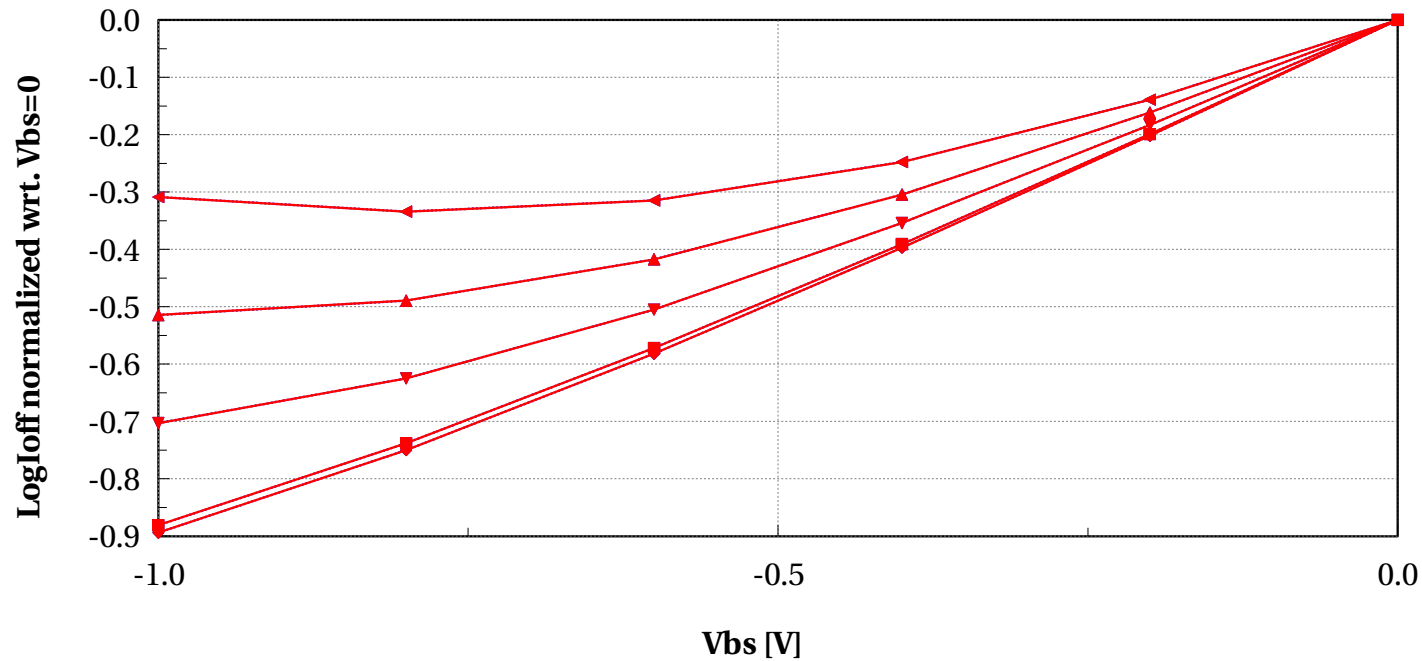
## pfet\_acc, Isat normalized wrt. Vbs=0 vs Vbs [V]

w==300e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1



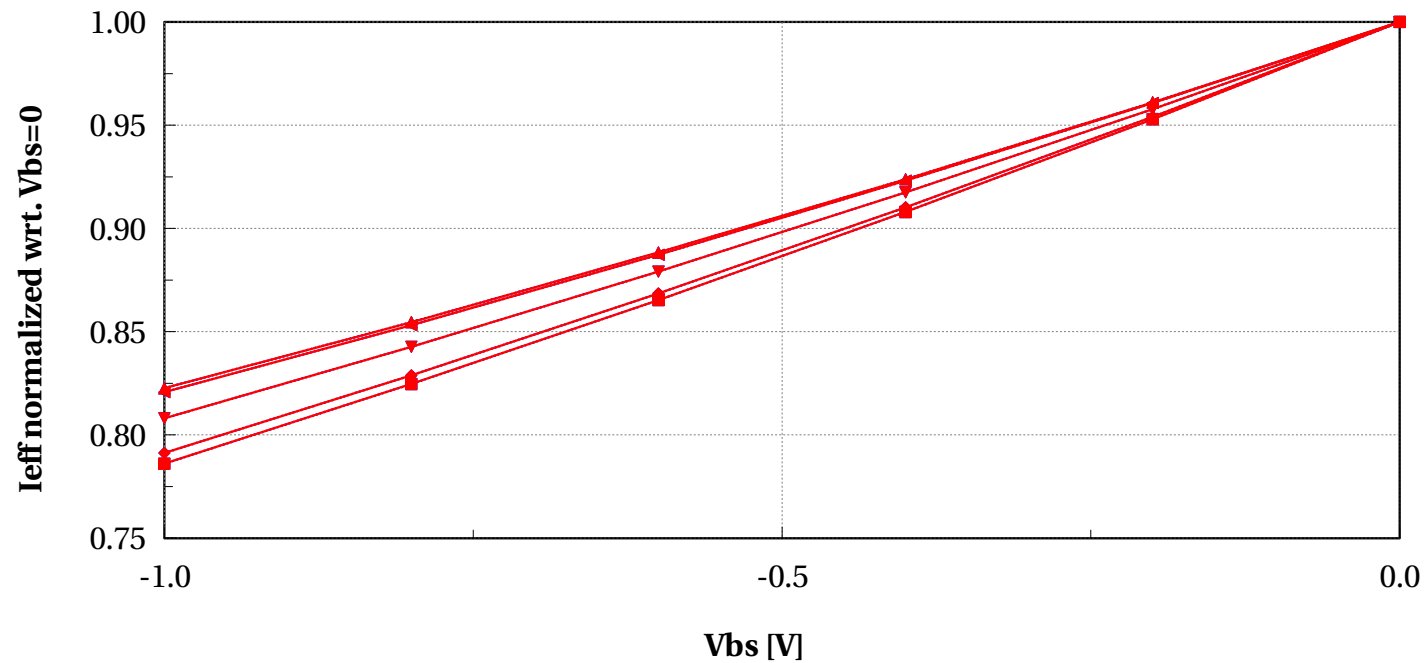
# pfet\_acc, LogIoff normalized wrt. Vbs=0 vs Vbs [V]

w==300e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1



# pfet\_acc, Ieff normalized wrt. Vbs=0 vs Vbs [V]

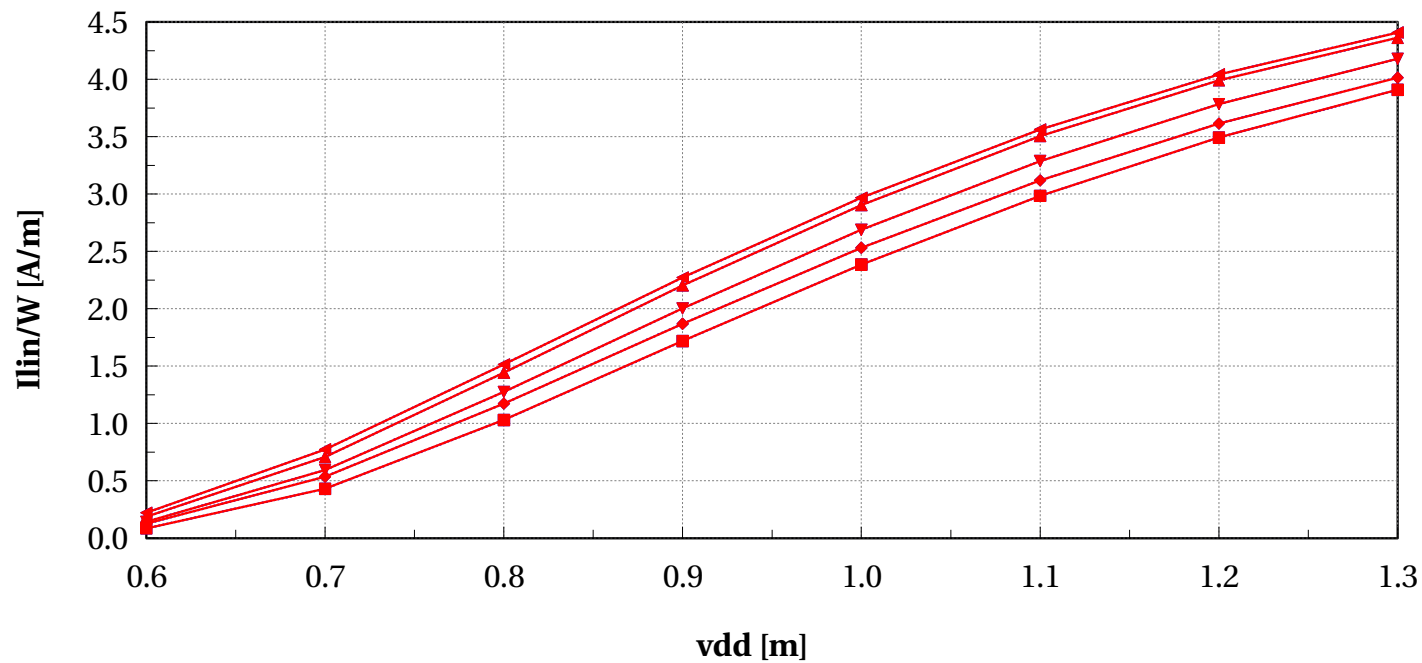
w==300e-9 and L==0.03e-6 and Temp==25 and p\_la==0 and Vdd==1



## Vdd effect ( $l=1\mu\text{m}, w=1\mu\text{m}$ )

# pfet\_acc, I<sub>lin</sub>/W [A/m] vs v<sub>dd</sub> [m]

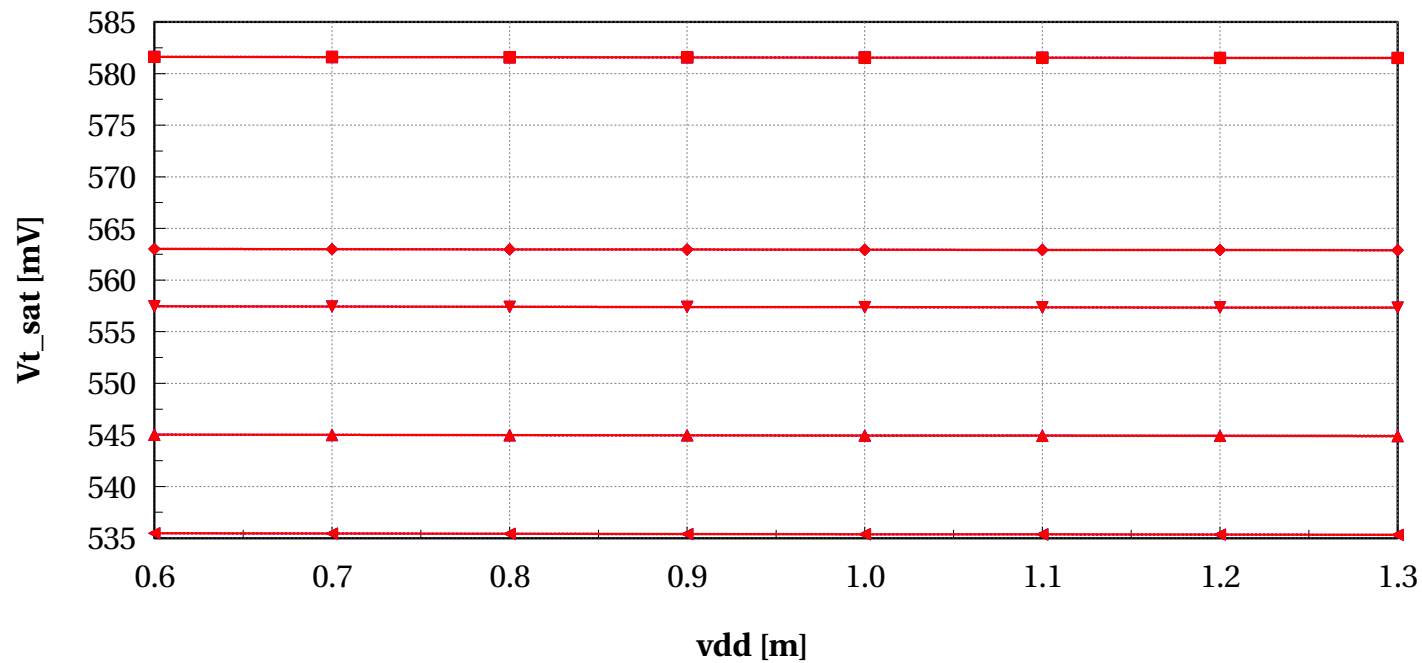
l==1e-6 and w==1e-6 and Temp==25 and V<sub>bs</sub>==0 and p<sub>la</sub>==0





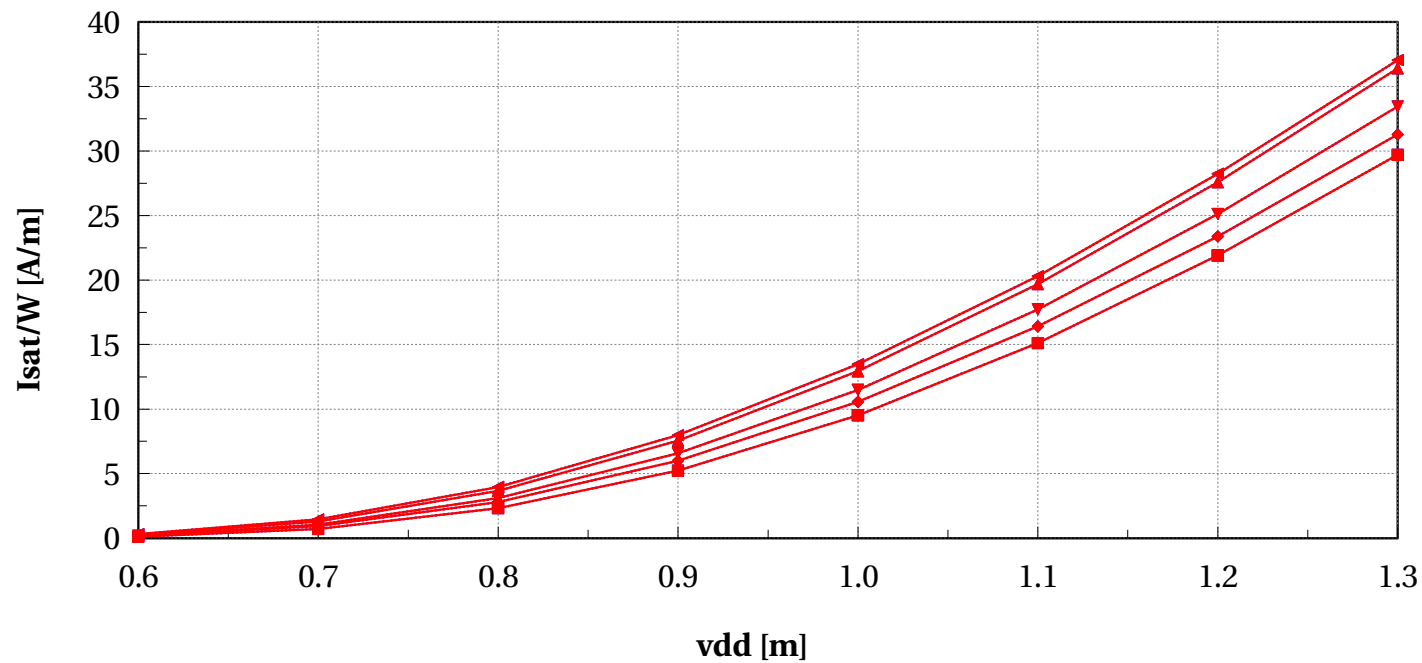
# pfet\_acc, Vt\_sat [mV] vs vdd [m]

$l=1e-6$  and  $w=1e-6$  and Temp==25 and Vbs==0 and p\_la==0



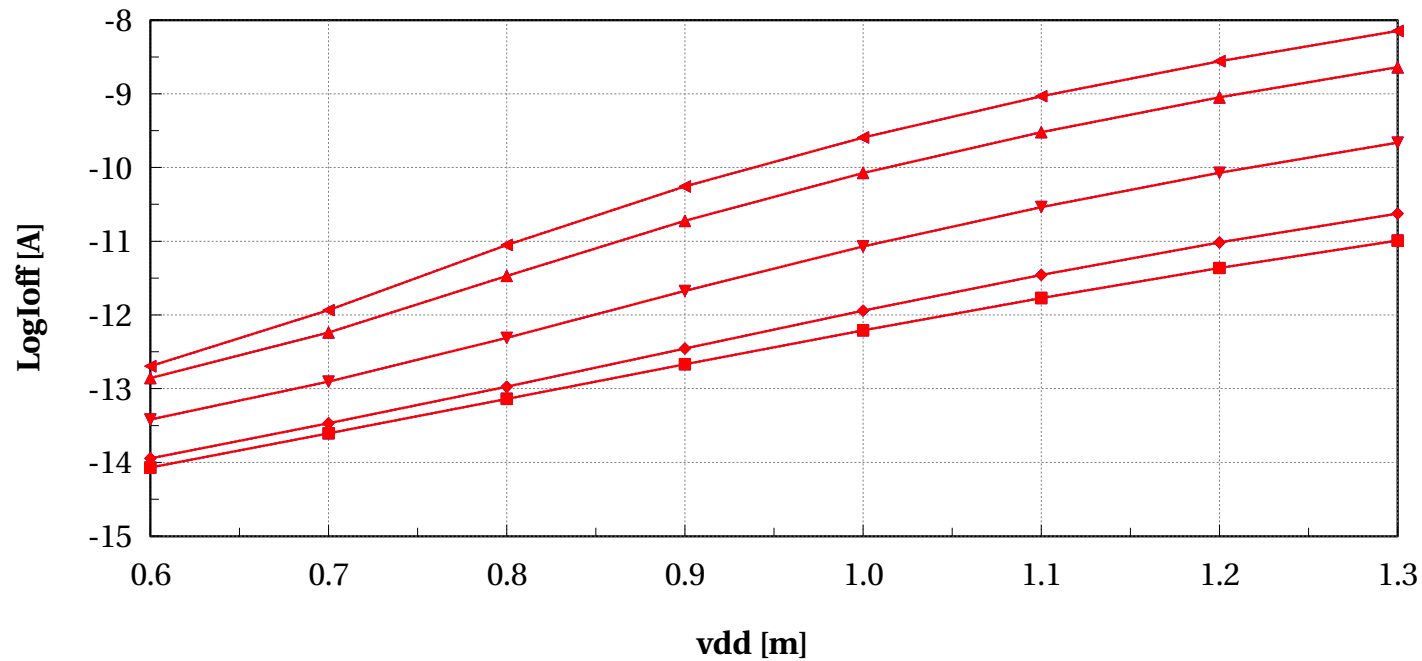
## pfet\_acc, Isat/W [A/m] vs vdd [m]

$l=1e-6$  and  $w=1e-6$  and  $Temp=25$  and  $V_{bs}=0$  and  $p_{la}=0$



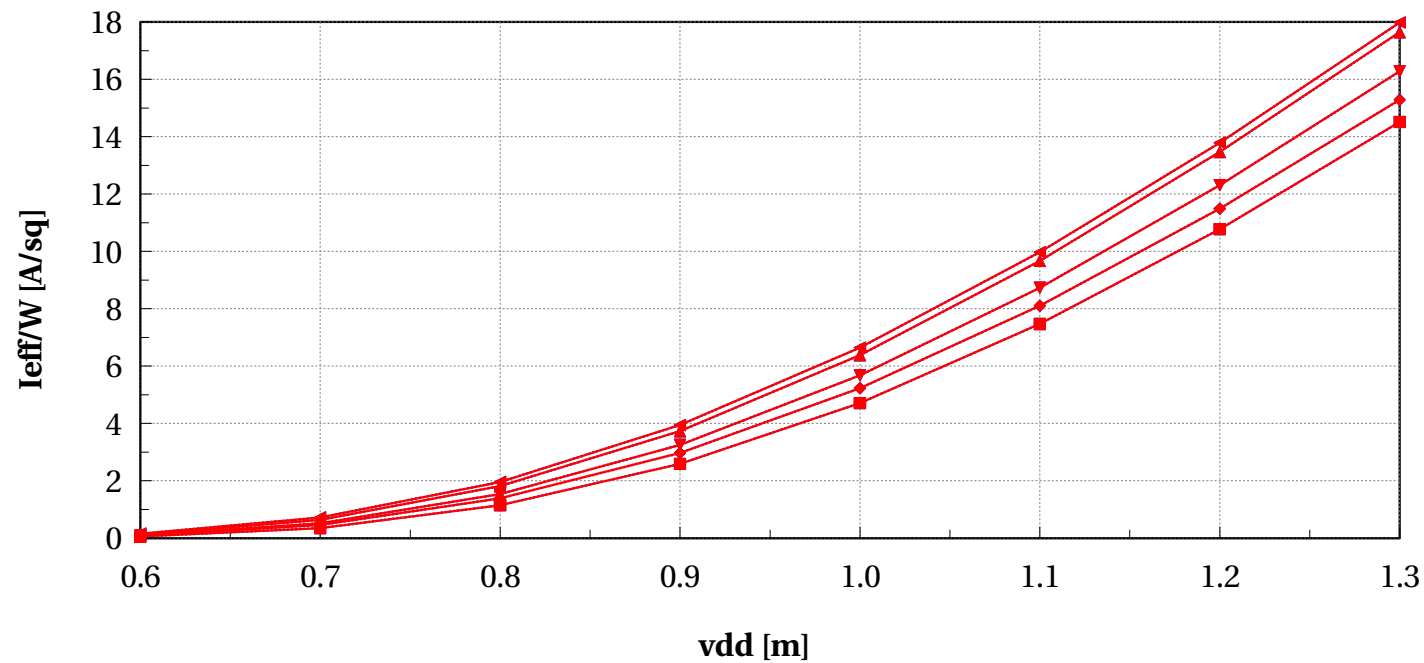
# pfet\_acc, LogIoff [A] vs vdd [m]

$l=1e-6$  and  $w=1e-6$  and Temp==25 and Vbs==0 and p\_la==0



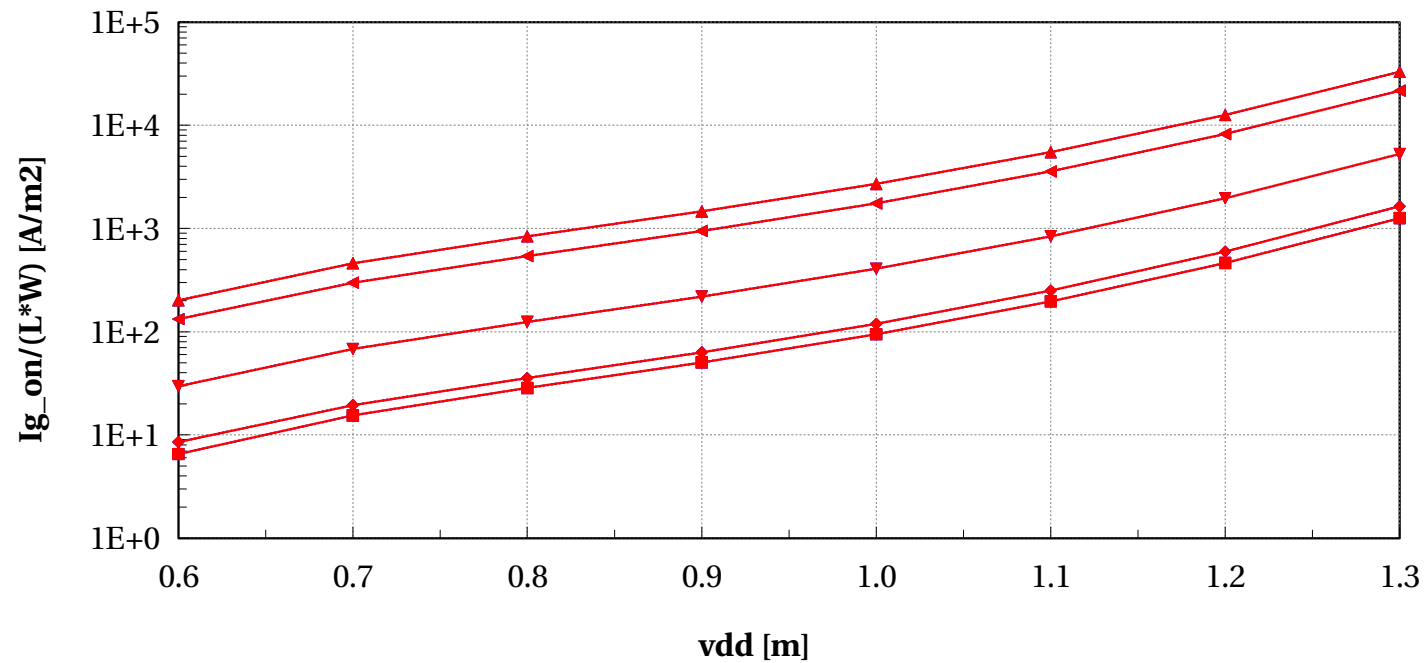
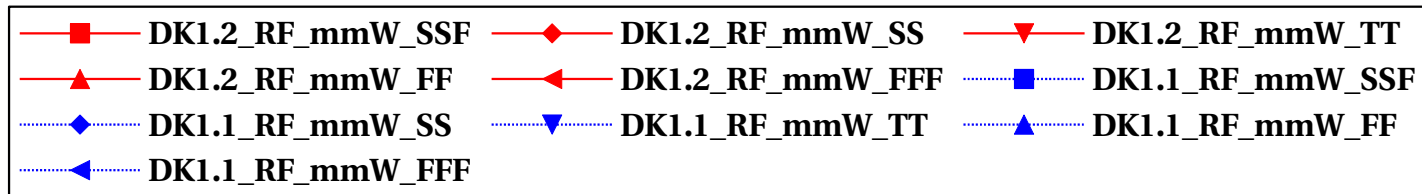
# pfet\_acc, I<sub>eff</sub>/W [A/sq] vs v<sub>dd</sub> [m]

l==1e-6 and w==1e-6 and Temp==25 and V<sub>bs</sub>==0 and p<sub>la</sub>==0



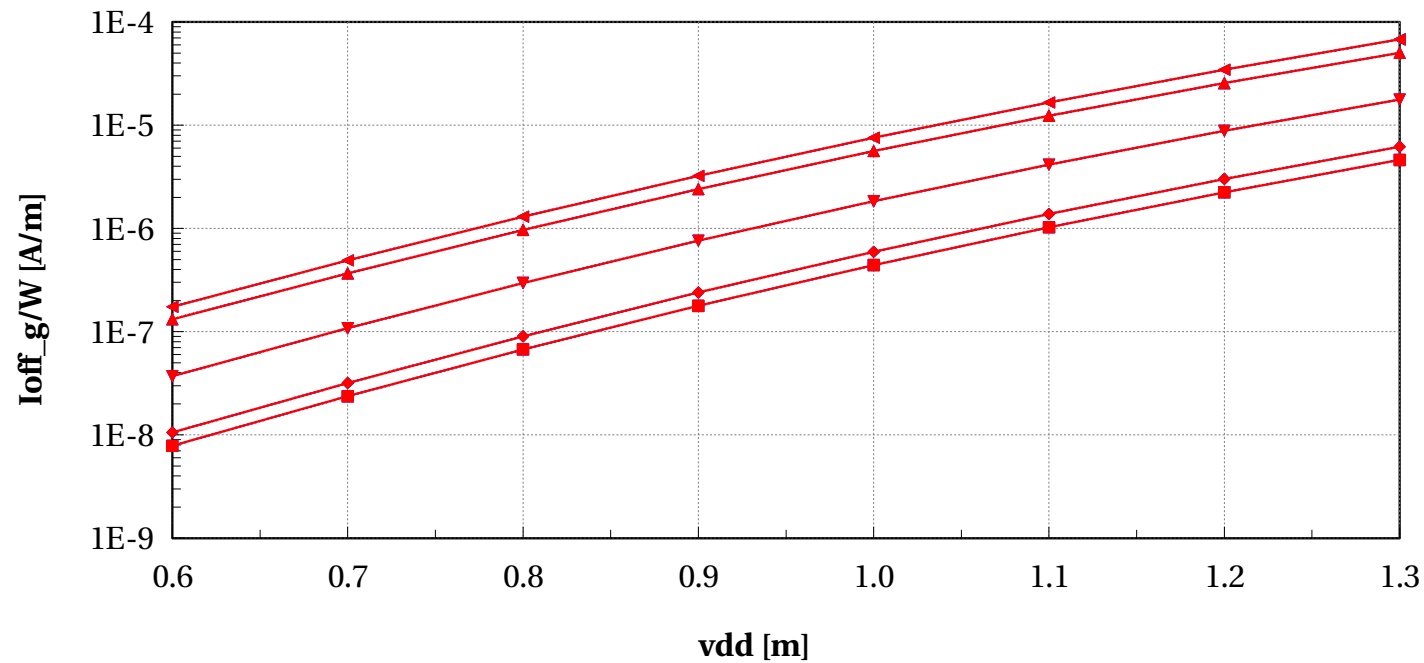
# **pfet\_acc, Ig\_on/(L\*W) [A/m2] vs vdd [m]**

$l=1e-6$  and  $w=1e-6$  and Temp==25 and Vbs==0 and p\_la==0



# pfet\_acc, Ioff\_g/W [A/m] vs vdd [m]

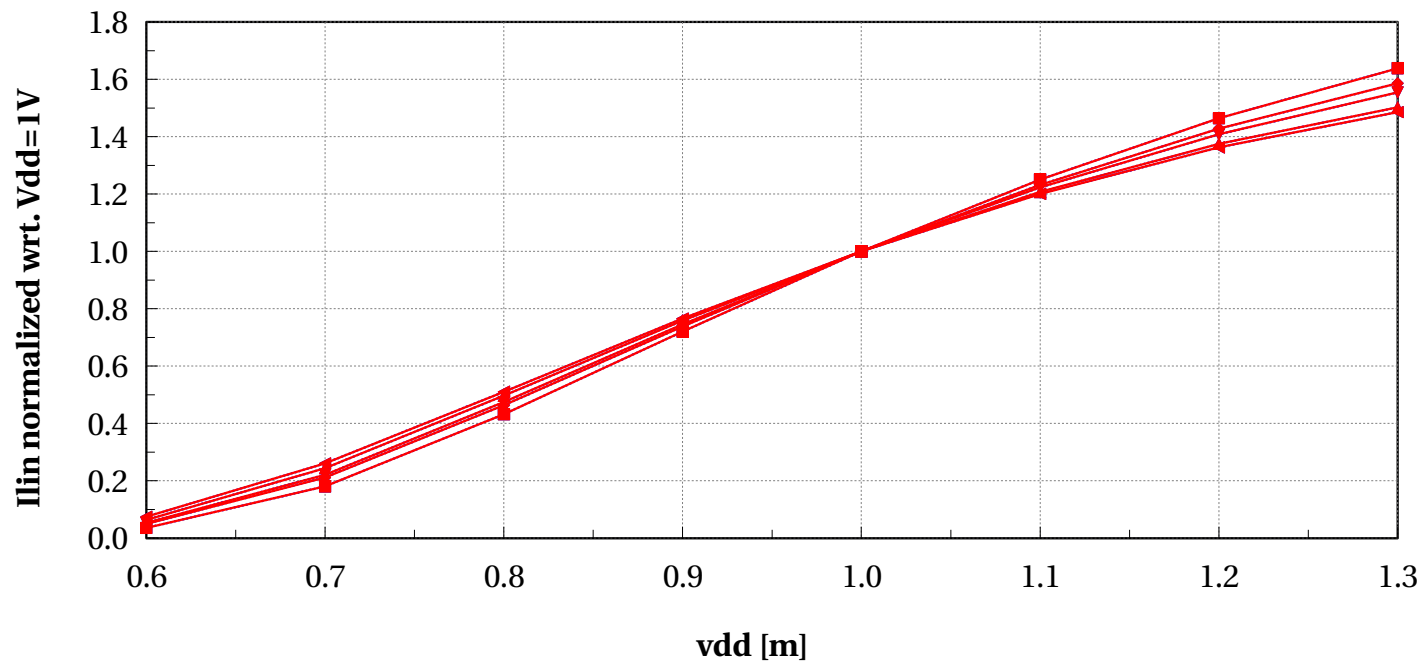
$l=1e-6$  and  $w=1e-6$  and Temp==25 and Vbs==0 and p\_la==0



## Vdd effect normalized ( $l=1\mu\text{m}, w=1\mu\text{m}$ )

## pfet\_acc, Ilin normalized wrt. Vdd=1V vs vdd [m]

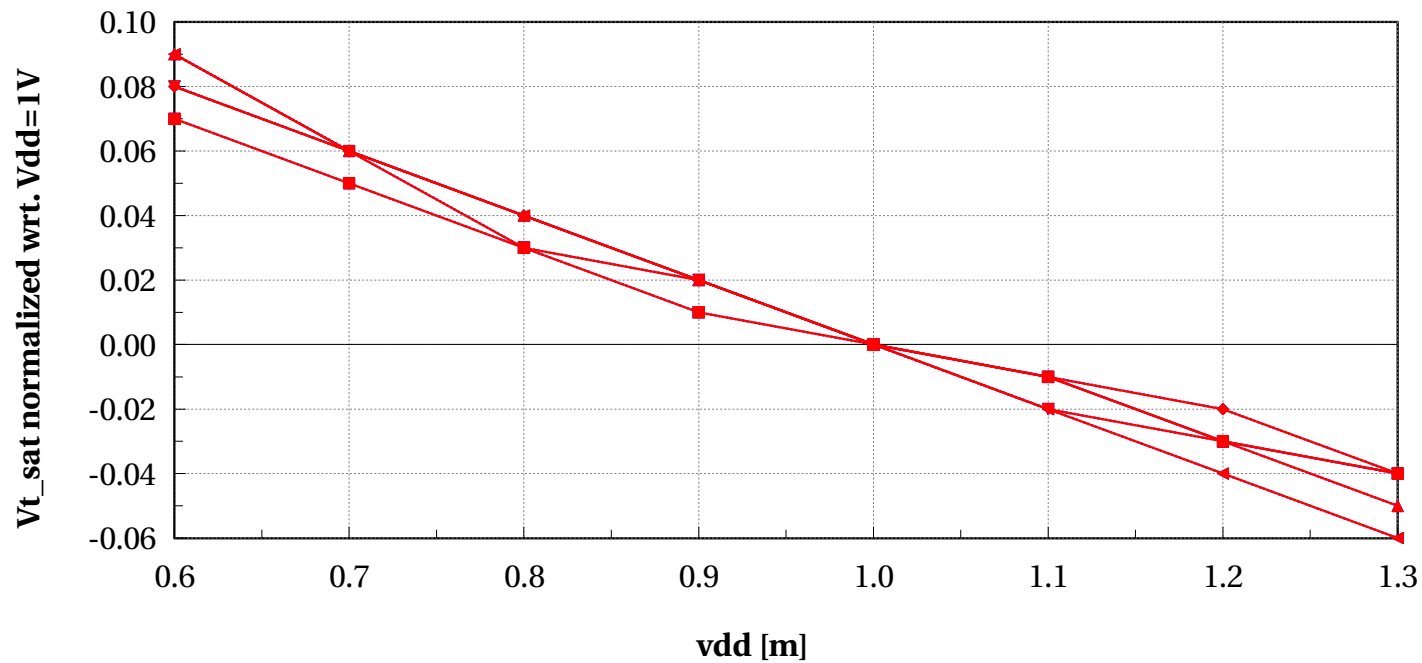
$l=1\text{e-}6$  and  $w=1\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$





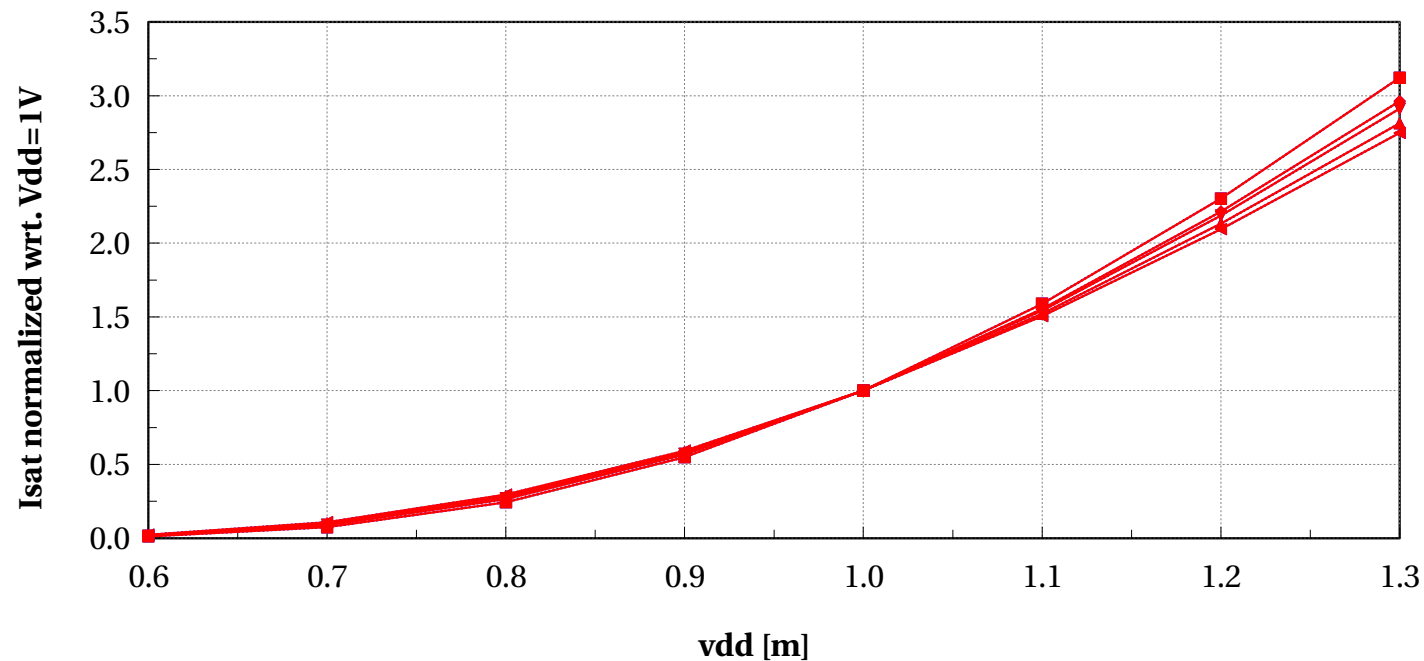
## pfet\_acc, Vt\_sat normalized wrt. Vdd=1V vs vdd [m]

$l=1e-6$  and  $w=1e-6$  and Temp==25 and Vbs==0 and p\_la==0



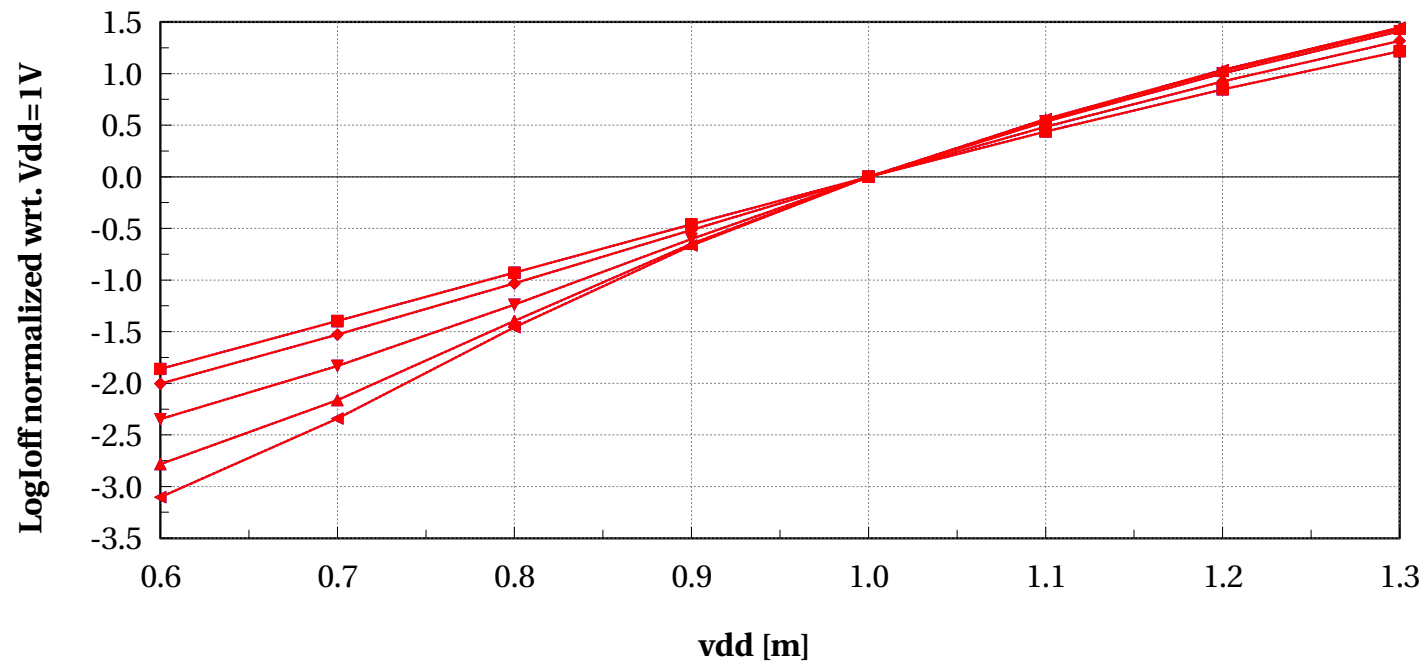
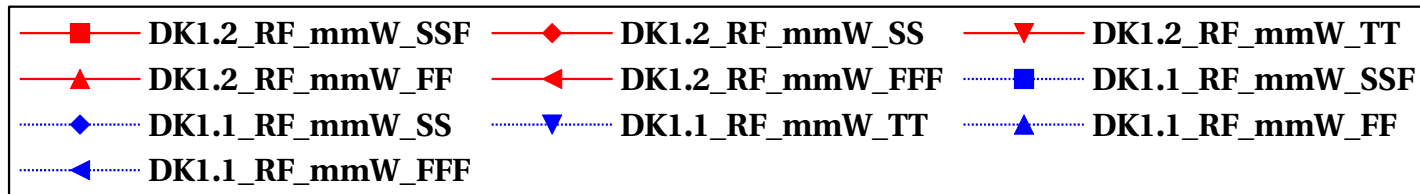
## pfet\_acc, Isat normalized wrt. Vdd=1V vs vdd [m]

$l=1e-6$  and  $w=1e-6$  and  $Temp=25$  and  $Vbs=0$  and  $p_{la}=0$



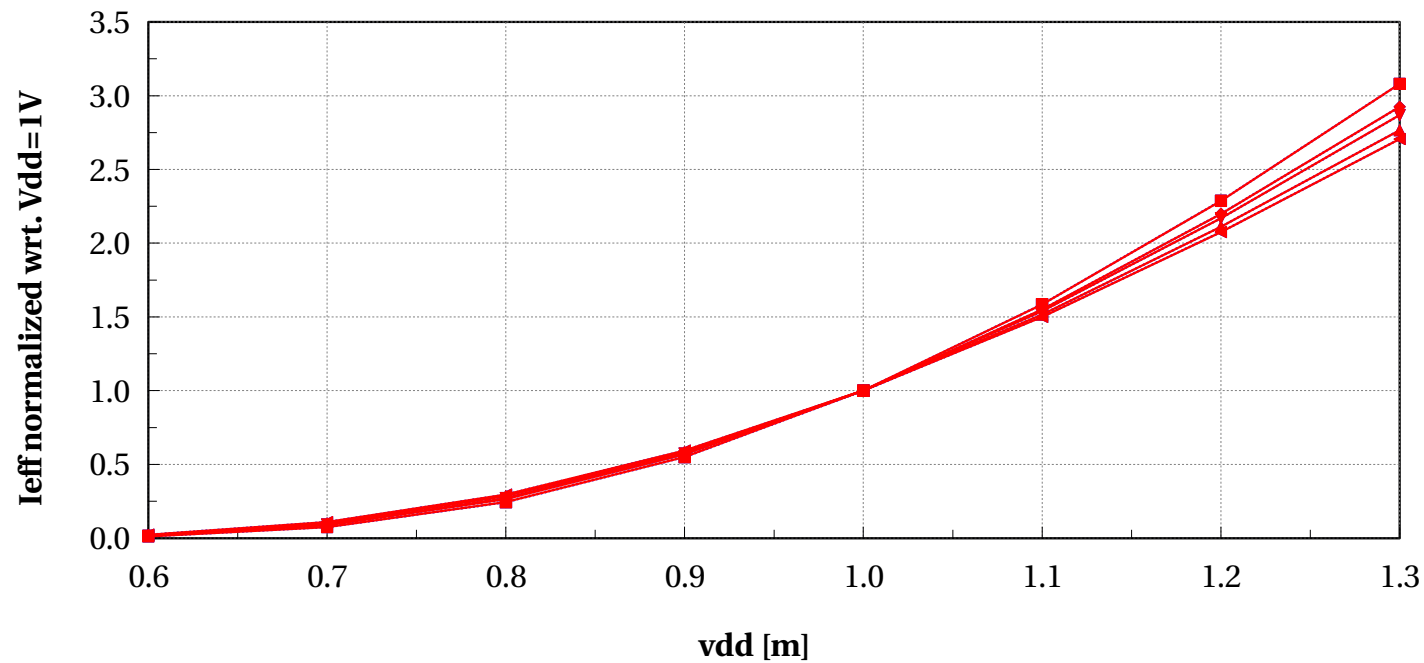
# pfet\_acc, LogIoff normalized wrt. Vdd=1V vs vdd [m]

$l=1e-6$  and  $w=1e-6$  and  $Temp=25$  and  $Vbs=0$  and  $p_{la}=0$



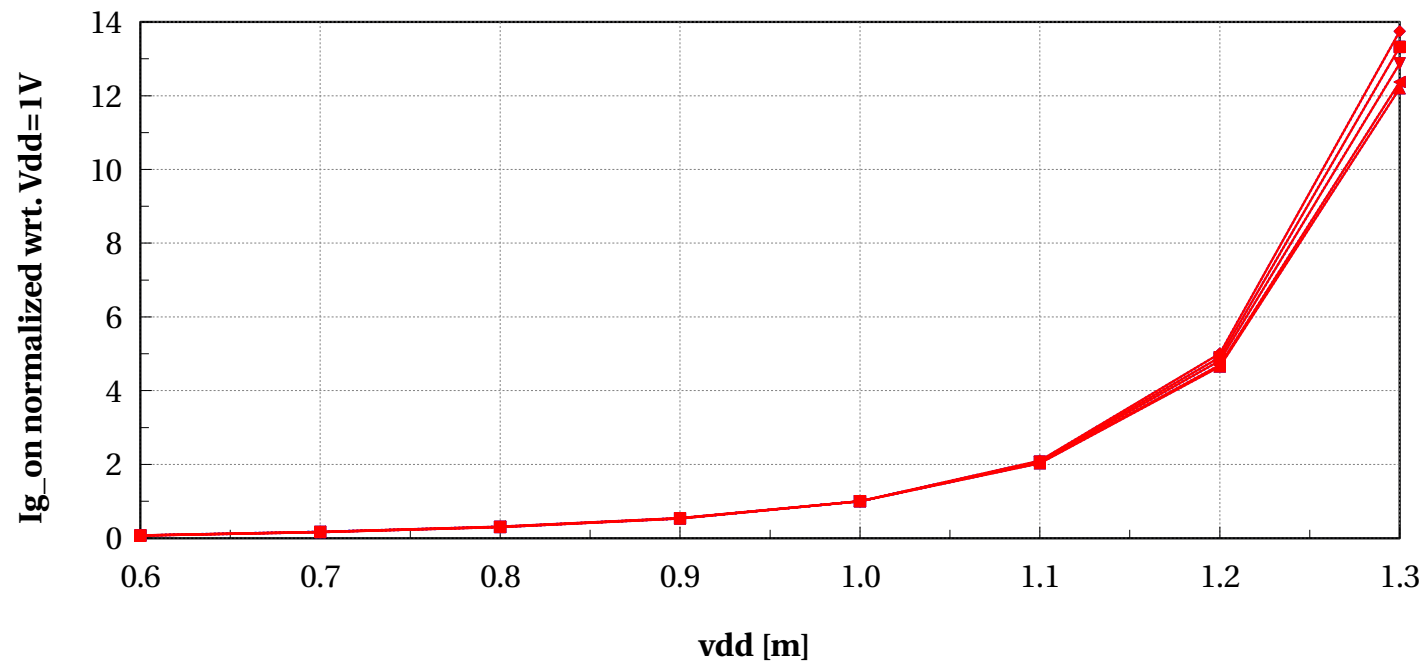
## pfet\_acc, Ieff normalized wrt. Vdd=1V vs vdd [m]

$l=1\text{e-}6$  and  $w=1\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



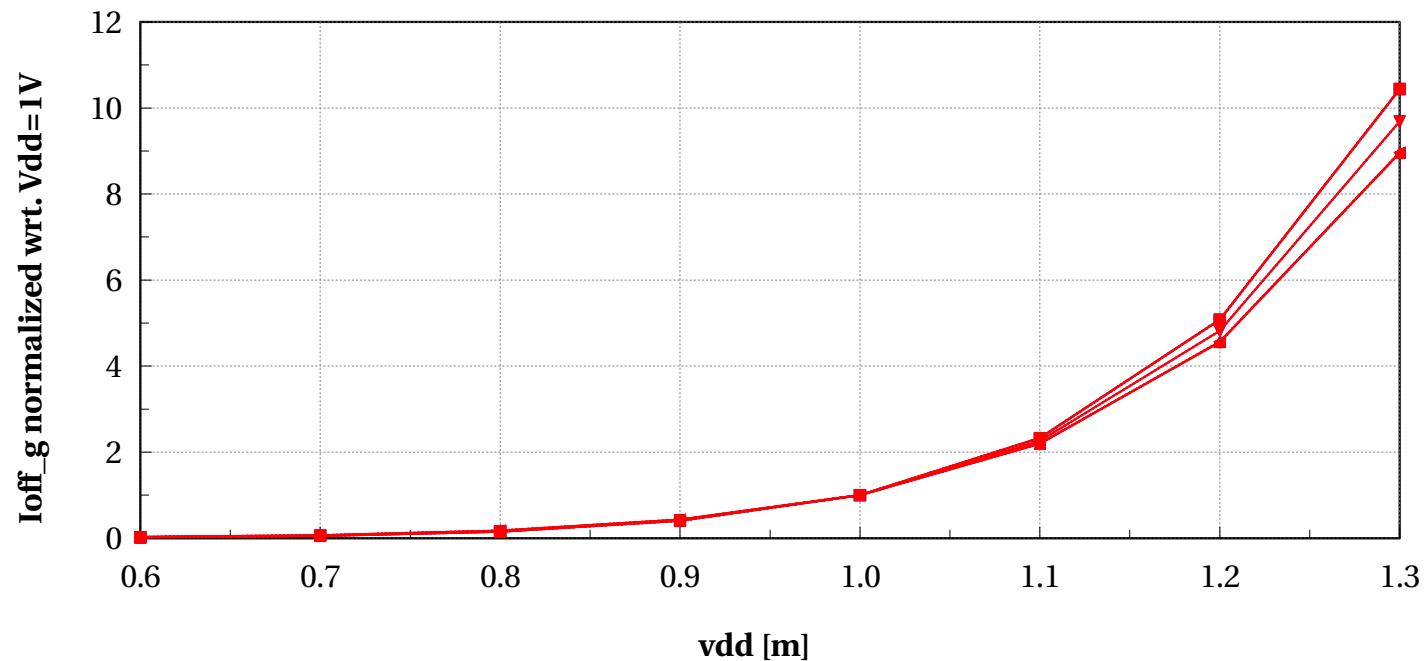
# pfet\_acc, Ig\_on normalized wrt. Vdd=1V vs vdd [m]

$l=1e-6$  and  $w=1e-6$  and Temp==25 and Vbs==0 and p\_la==0



## pfet\_acc, Ioff\_g normalized wrt. Vdd=1V vs vdd [m]

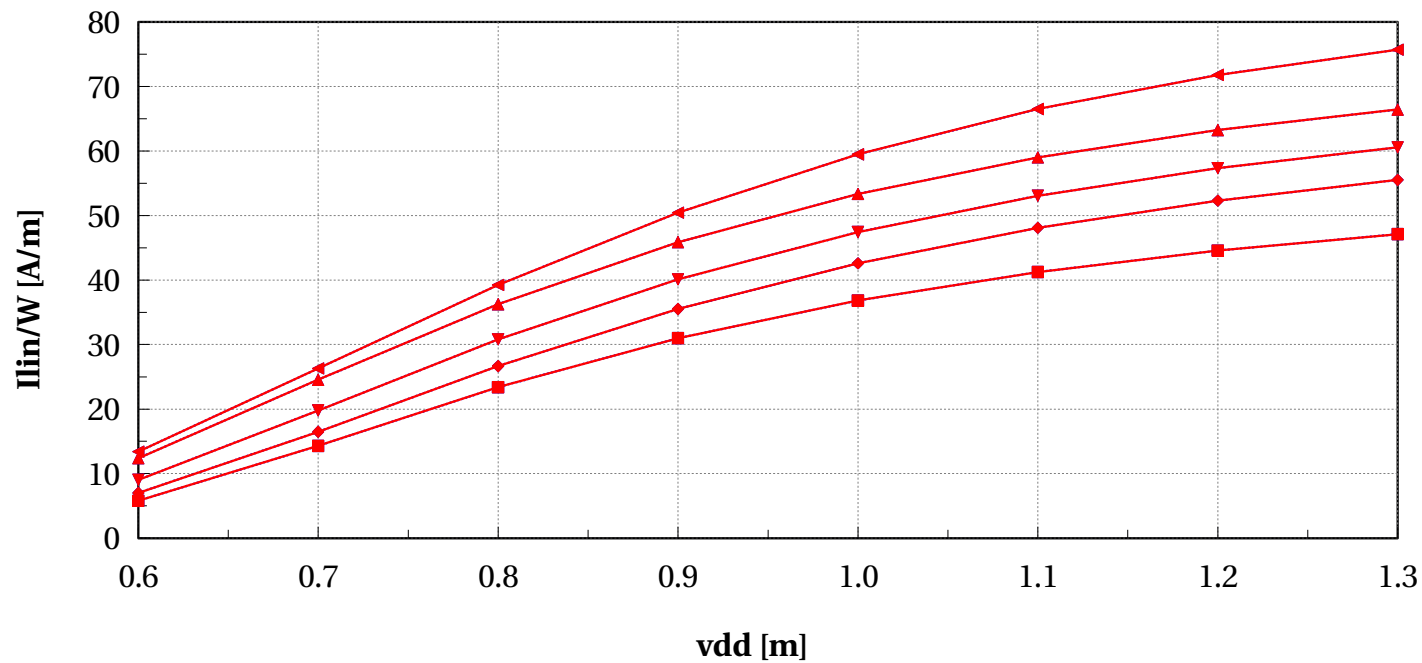
$l=1e-6$  and  $w=1e-6$  and  $Temp=25$  and  $Vbs=0$  and  $p_{la}=0$



## Vdd effect ( $l=30\text{e-}9$ $w=300\text{e-}9$ )

## pfet\_acc, I<sub>lin</sub>/W [A/m] vs v<sub>dd</sub> [m]

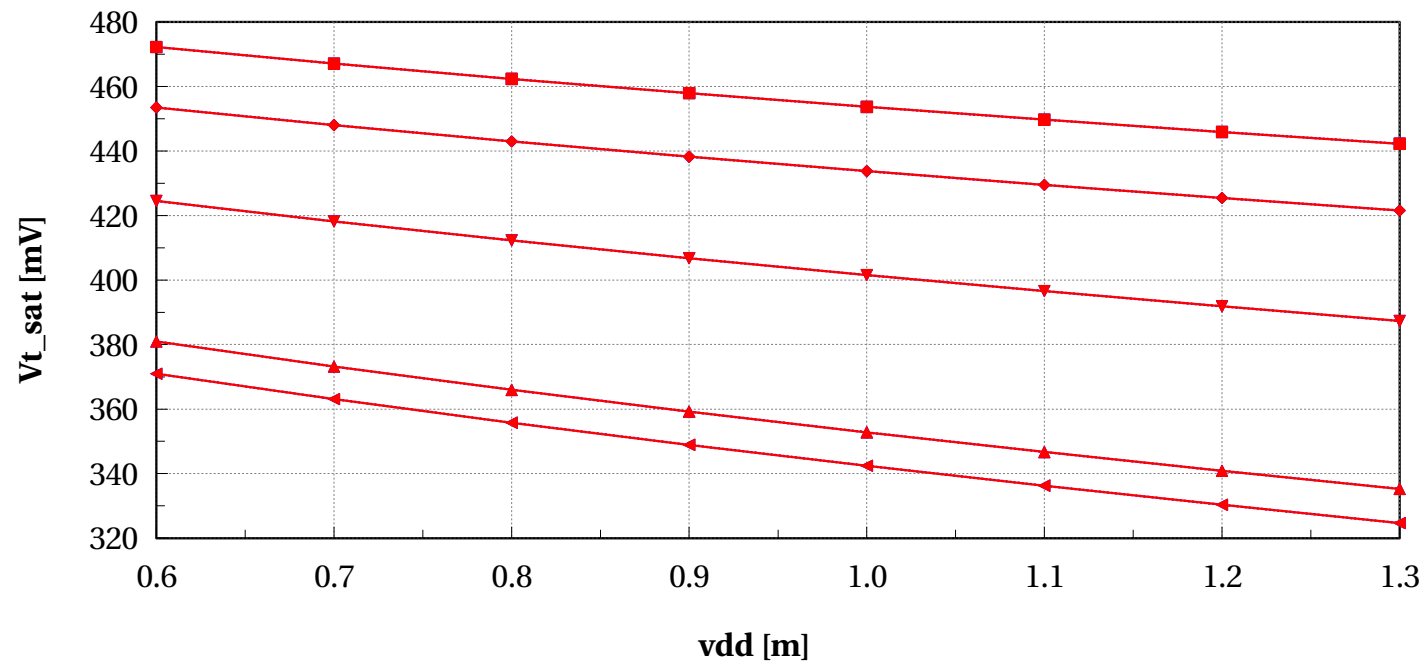
$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and Temp= $25$  and  $V_{bs}=0$  and  $p_{la}=0$





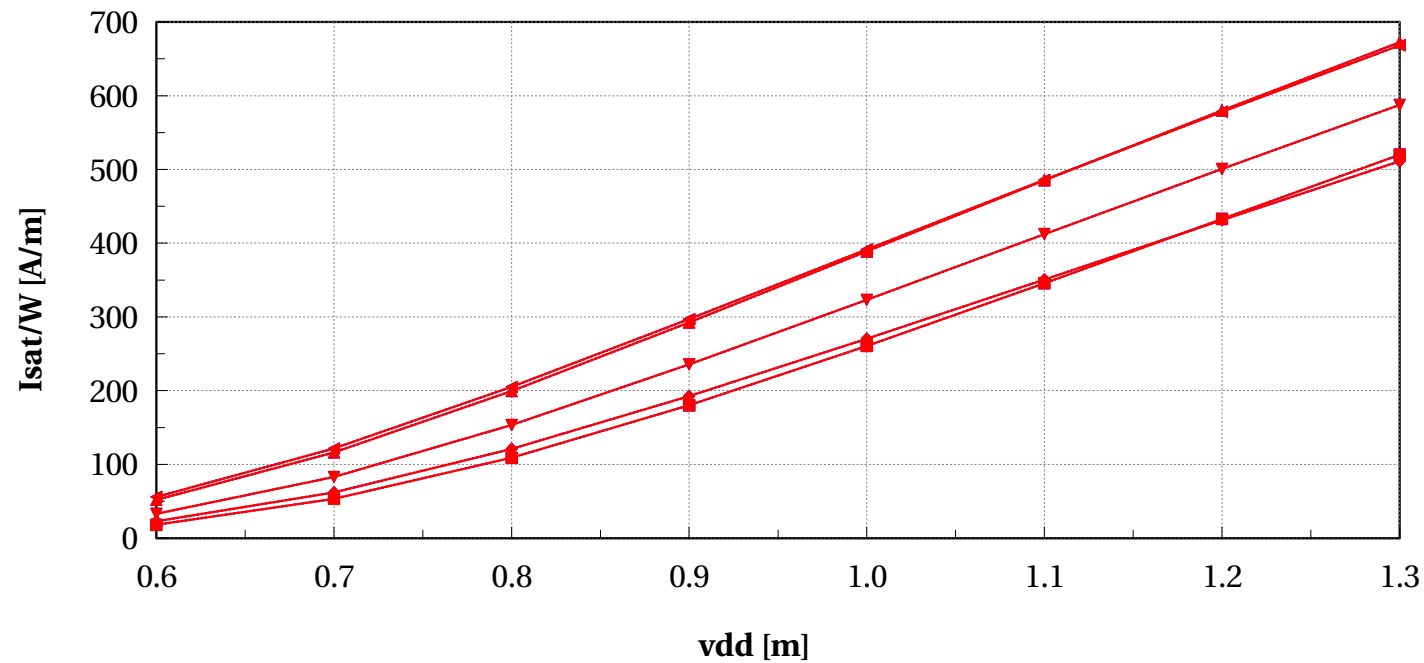
# pfet\_acc, Vt\_sat [mV] vs vdd [m]

$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



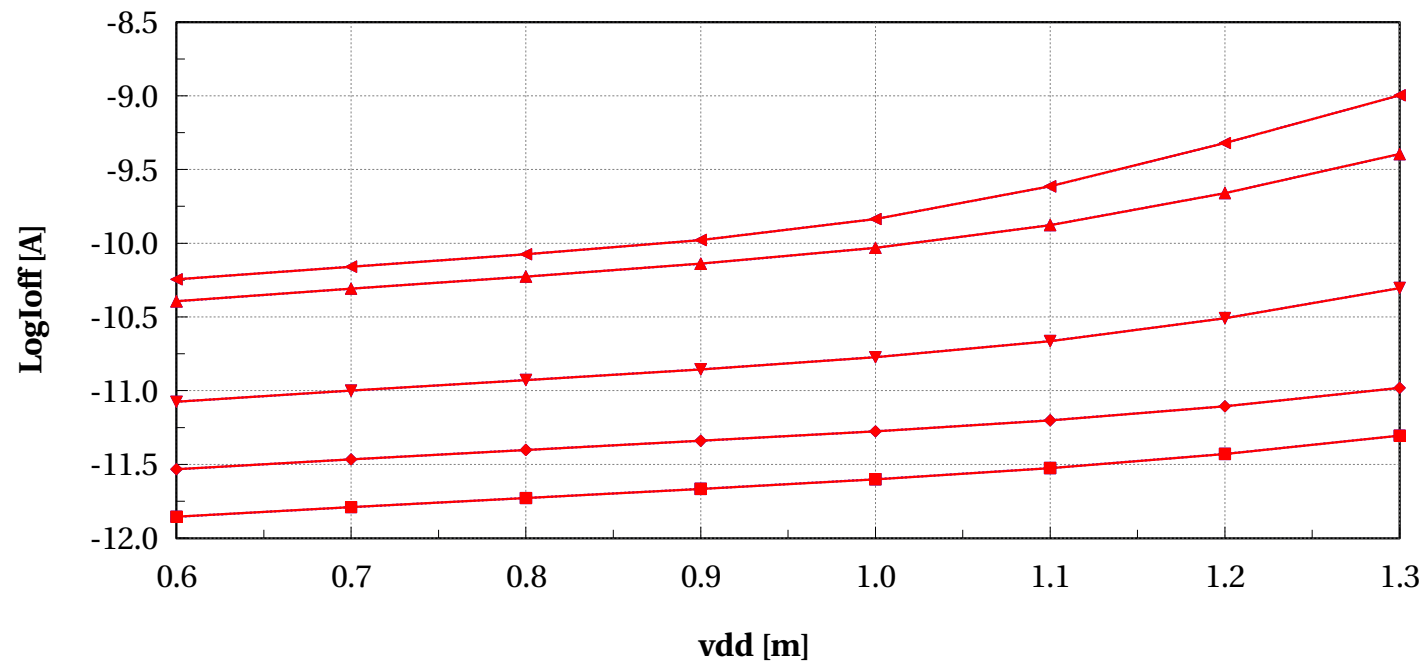
## pfet\_acc, Isat/W [A/m] vs vdd [m]

$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



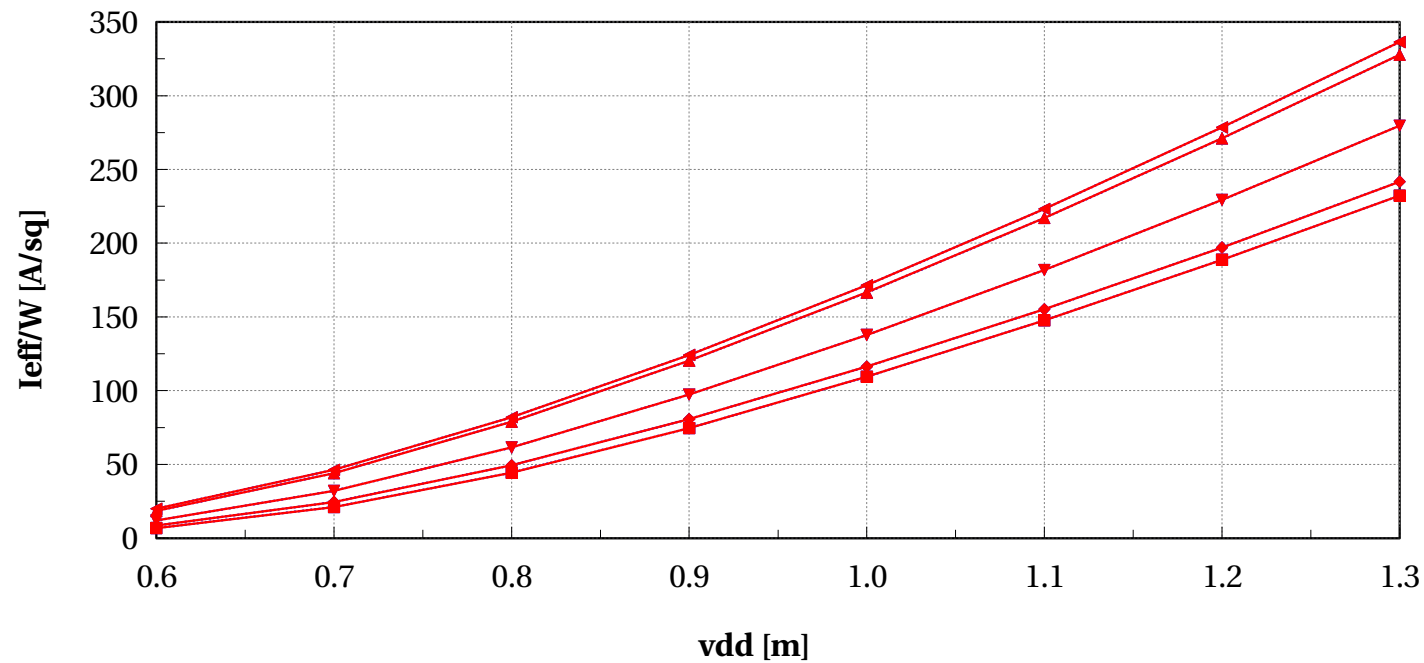
# pfet\_acc, LogIoff [A] vs vdd [m]

$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



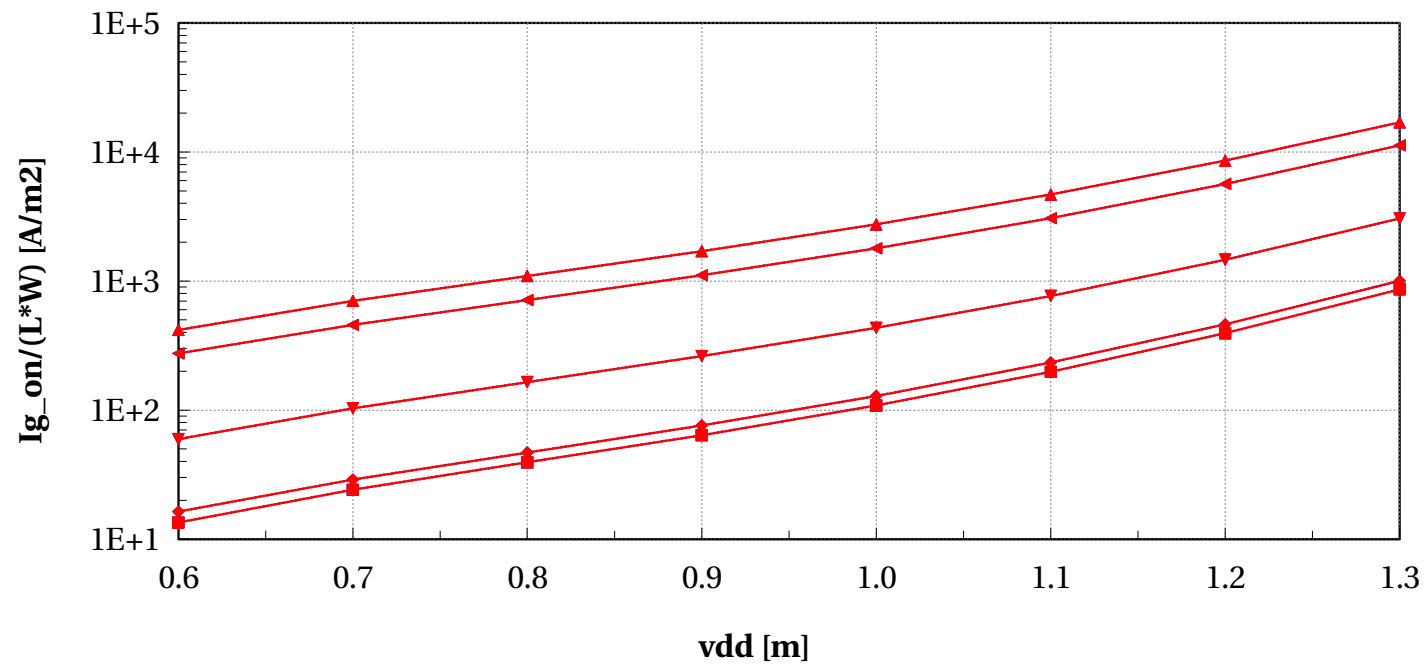
# pfet\_acc, I<sub>eff</sub>/W [A/sq] vs v<sub>dd</sub> [m]

l==30e-9 and w==0.21e-6 and Temp==25 and V<sub>bs</sub>==0 and p<sub>la</sub>==0



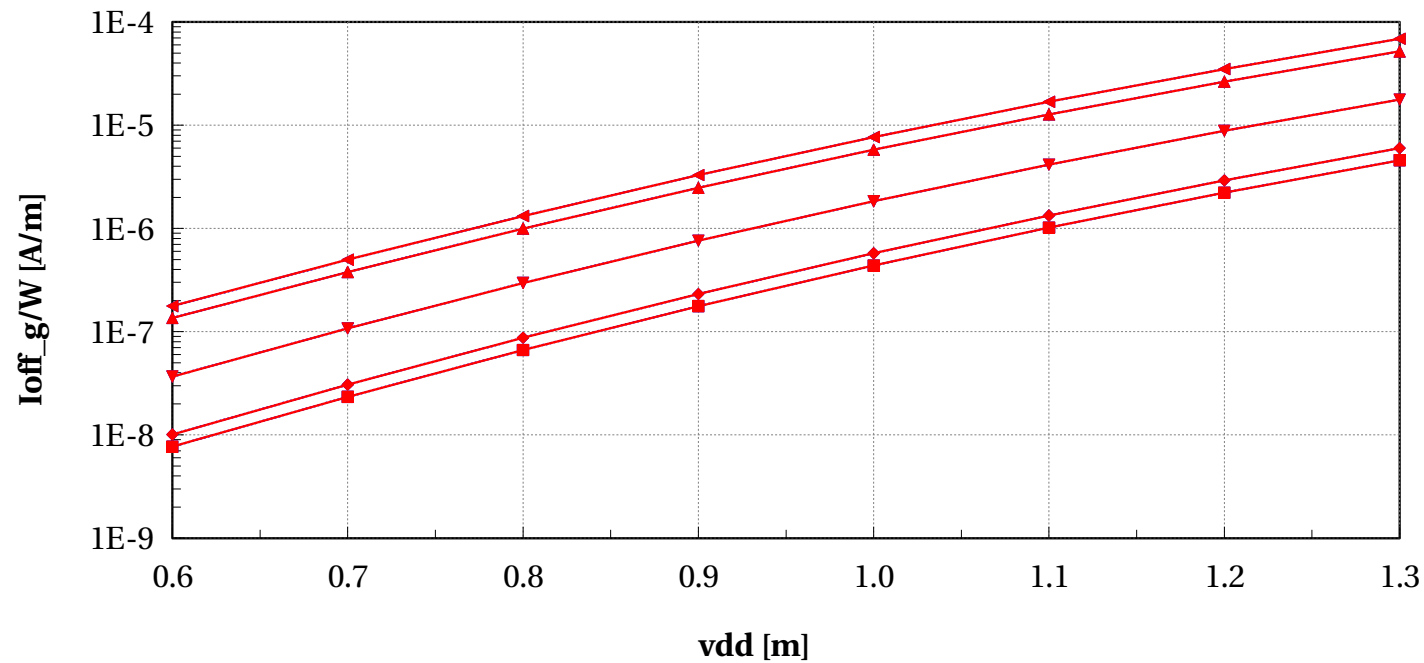
# pfet\_acc, Ig\_on/(L\*W) [A/m2] vs vdd [m]

l==30e-9 and w==0.21e-6 and Temp==25 and Vbs==0 and p\_la==0



# pfet\_acc, Ioff\_g/W [A/m] vs vdd [m]

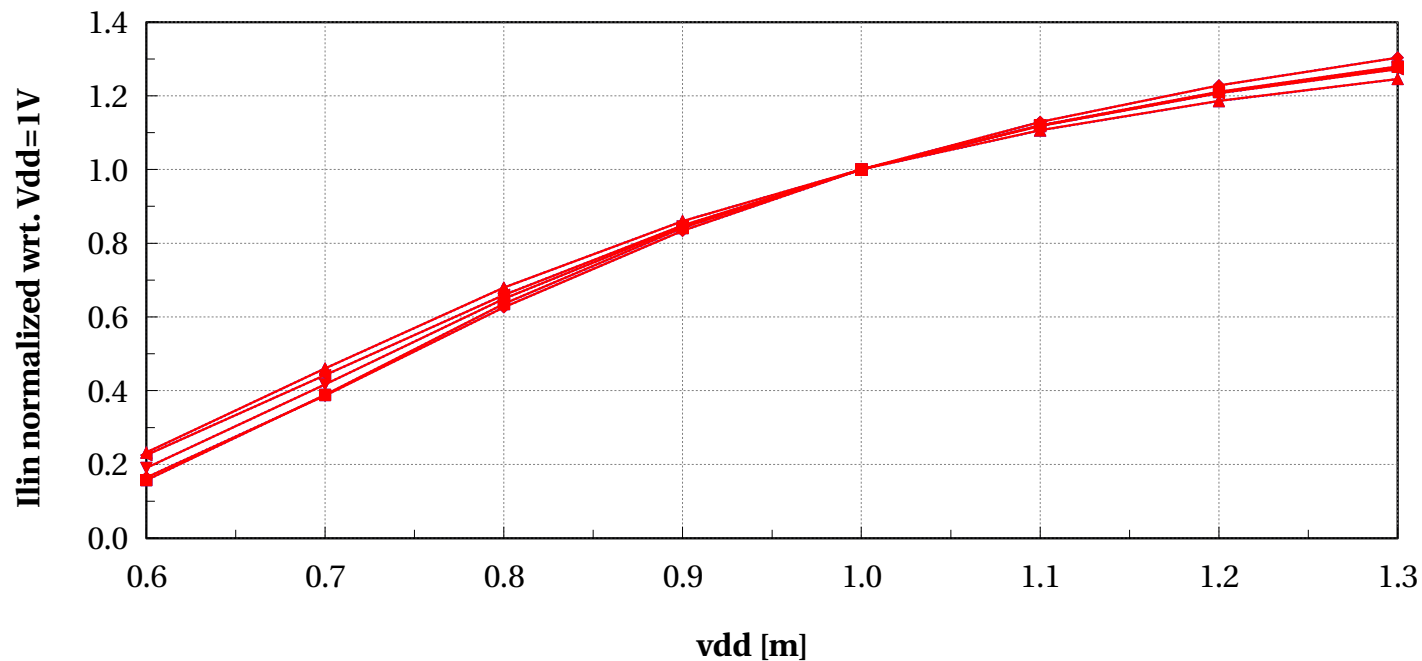
$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



## Vdd effect normalized ( $l=30\text{e-}9$ $w=300\text{e-}9$ )

## pfet\_acc, Ilin normalized wrt. Vdd=1V vs vdd [m]

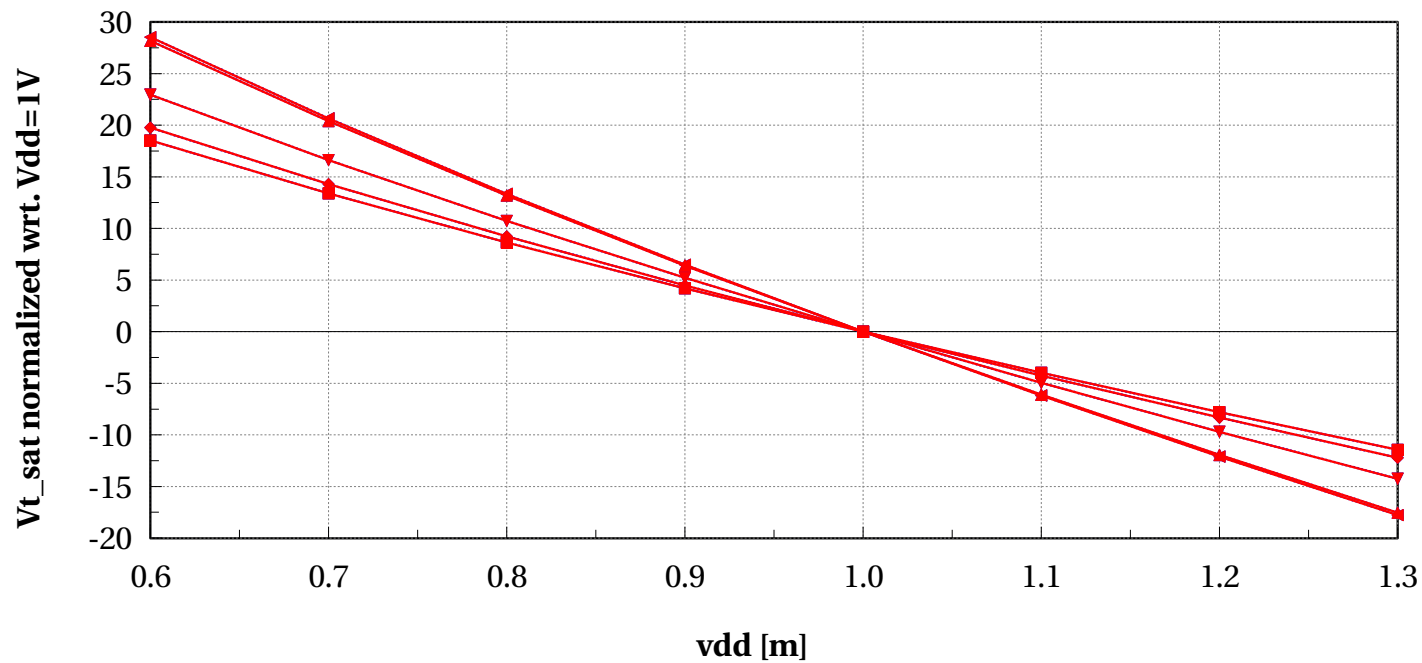
$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$





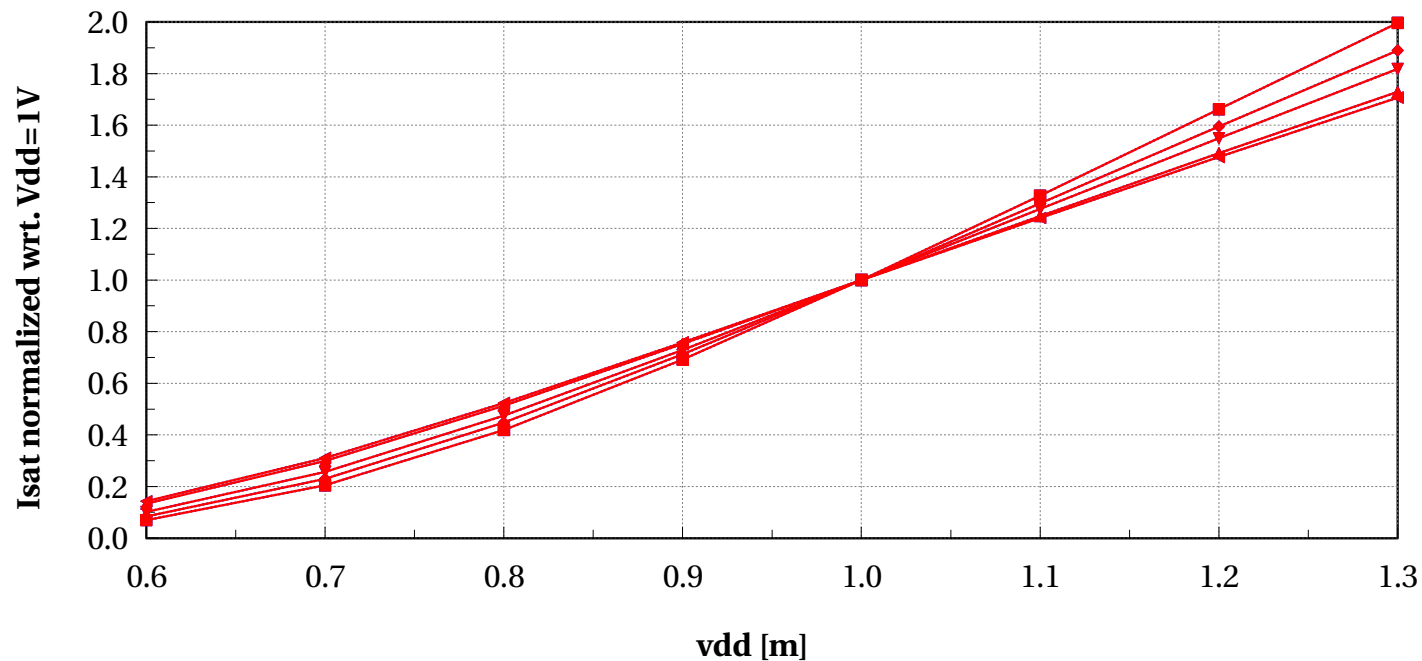
## pfet\_acc, Vt\_sat normalized wrt. Vdd=1V vs vdd [m]

$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



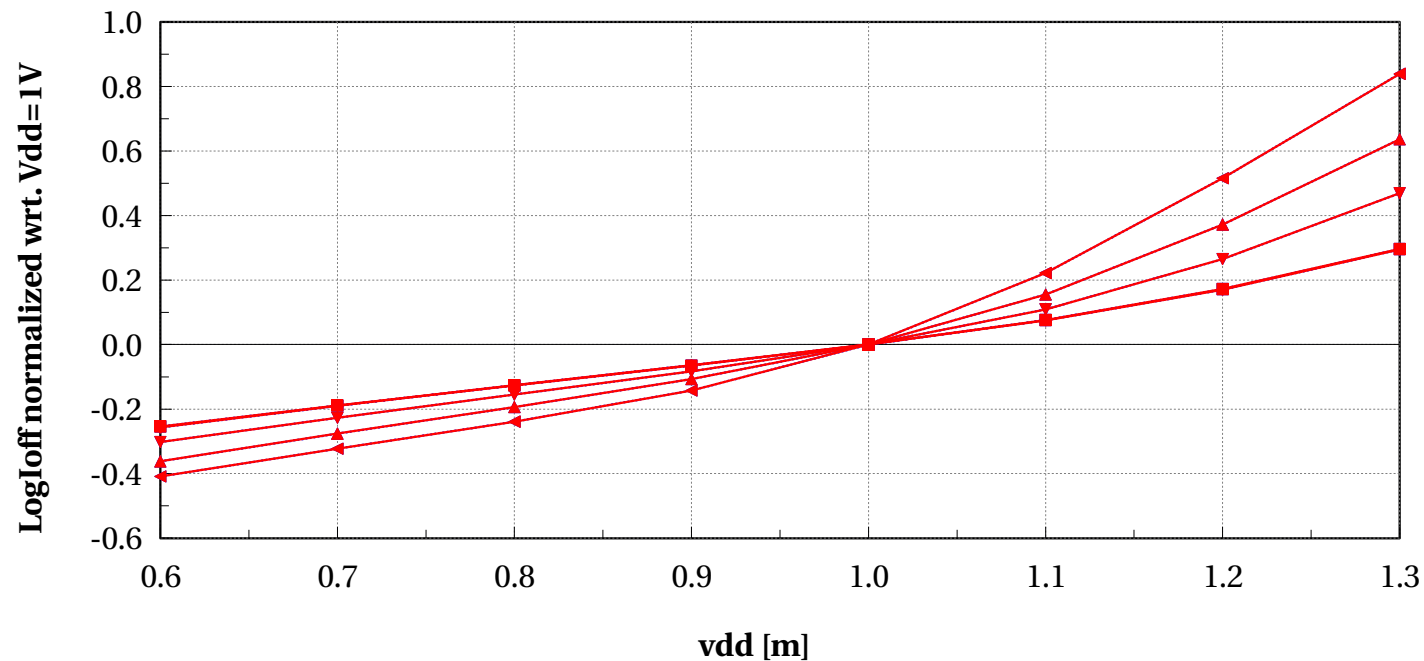
## pfet\_acc, Isat normalized wrt. Vdd=1V vs vdd [m]

$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



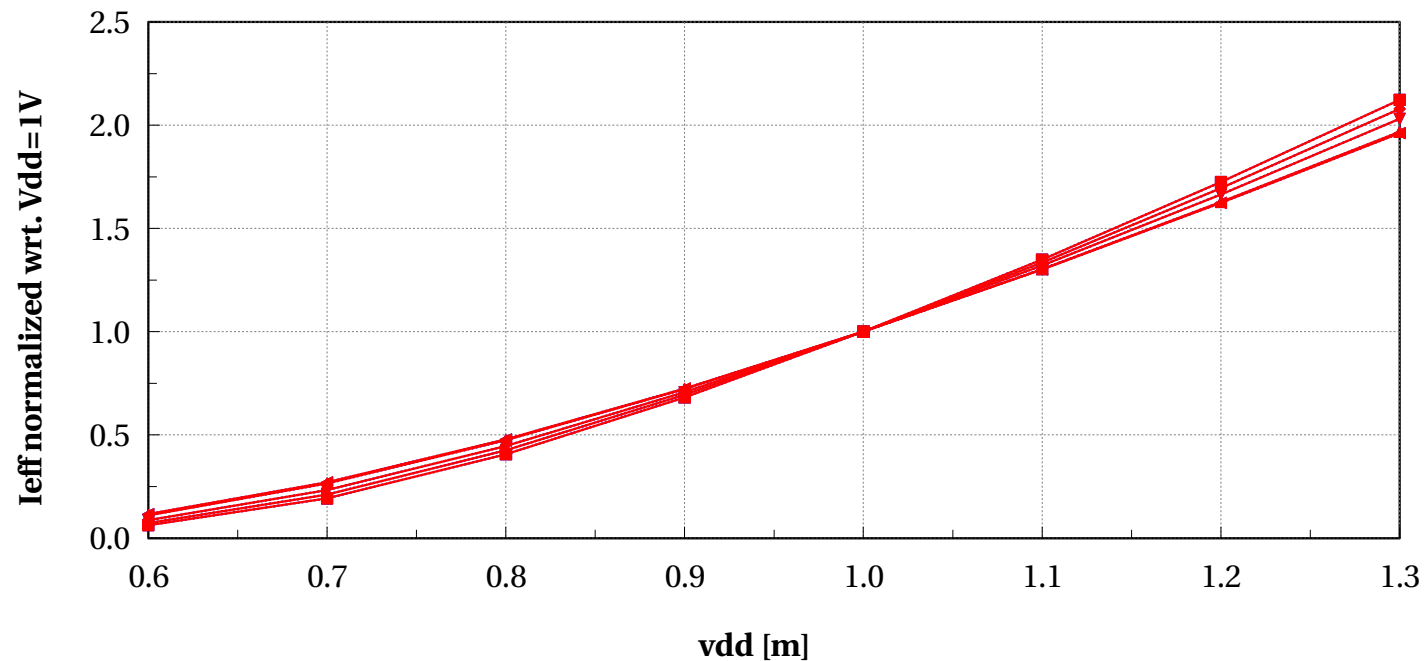
## pfet\_acc, LogIoff normalized wrt. Vdd=1V vs vdd [m]

$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



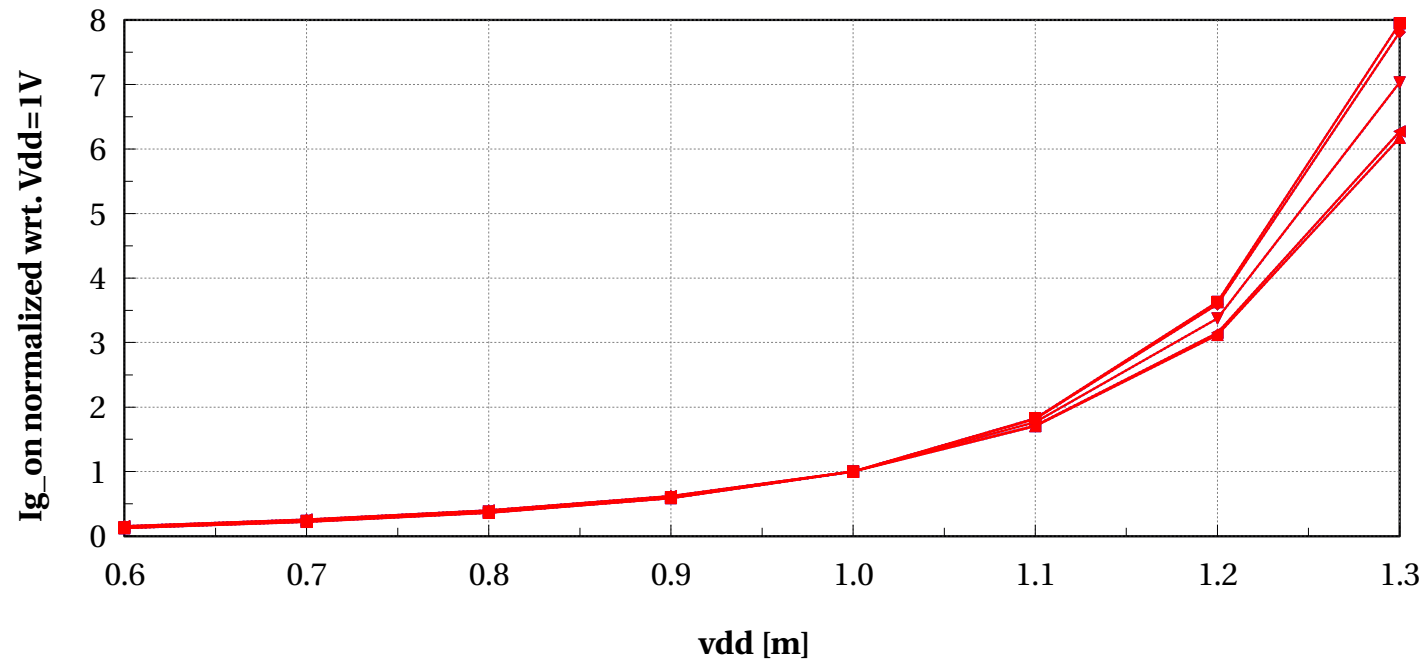
## pfet\_acc, Ieff normalized wrt. Vdd=1V vs vdd [m]

$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



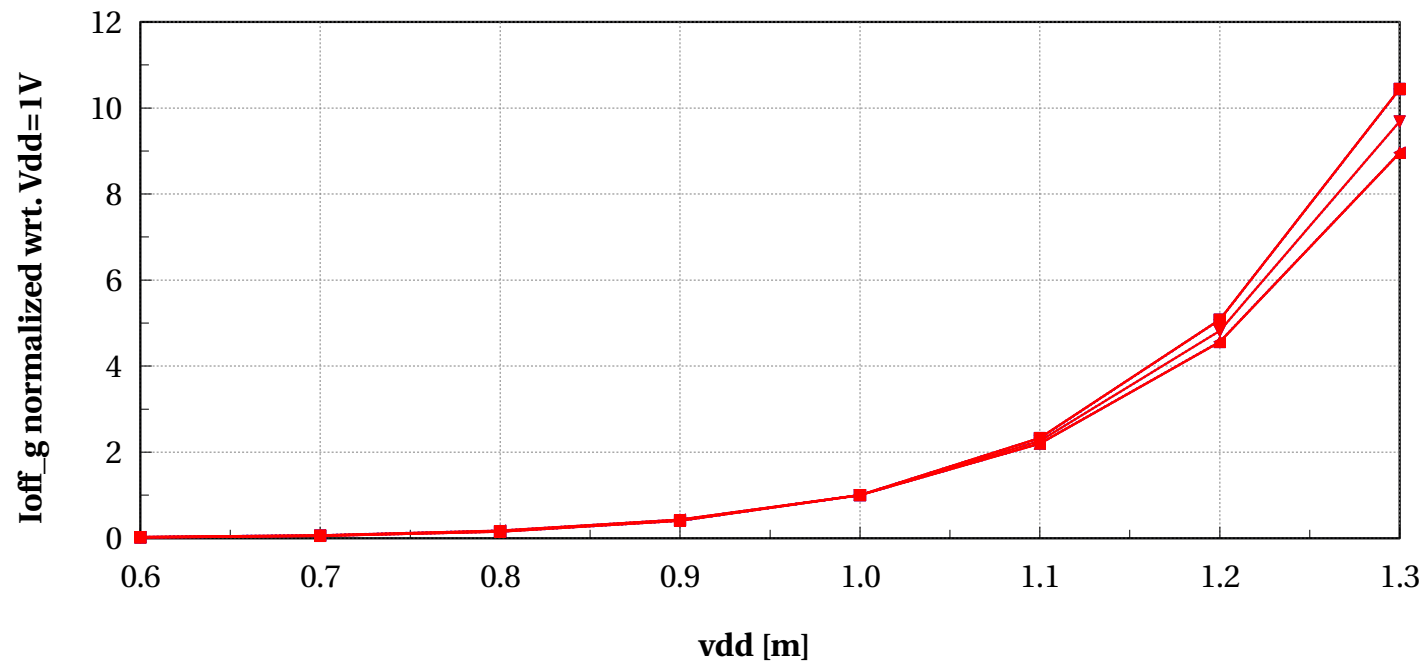
## pfet\_acc, Ig\_on normalized wrt. Vdd=1V vs vdd [m]

$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



## pfet\_acc, Ioff\_g normalized wrt. Vdd=1V vs vdd [m]

$l=30\text{e-}9$  and  $w=0.21\text{e-}6$  and  $\text{Temp}=25$  and  $V_{bs}=0$  and  $p_{la}=0$



# Annex

## Conditions of simulations

The simulations were done with SBenchLSF Alpha using Eldo simulator 2018.3.

- Model nfet\_acc (DK1.2\_RF\_mmW)

- ✓ Input Parameters

- ✗  $v_{ds\_sat} = V_{dd}$  V
- ✗  $i_{vt} = 300e-9$  A
- ✗  $mc\_runs = 1000$
- ✗  $v_{step\_ivt} = 0.005$  V
- ✗  $v_{ds\_off} = v_{ds\_sat}$  V
- ✗  $v_{gs\_off} = 0$  V
- ✗  $temp = 25$  °C
- ✗  $v_{gs\_start} = -0.5$  V
- ✗  $mc\_sens = 0$
- ✗  $v_{ds\_lin} = 0.05$  V
- ✗  $sbenchlsf\_release = Alpha$
- ✗  $plashrink\_ivt = 1$
- ✗  $v_{bs} = 0$  V
- ✗  $ams\_release = 2018.3$



- ✗ model\_version = 1.2.d
- ✗ mc\_nsigma = 3
- ✗ ithslwi = 10e-9 A
- ✗ vgs\_stop = vdd V
- ✗ shrink\_ivt = 1
- ✗ vdd = 1 V
- ✗ dlshrink\_ivt = 0
- ✓ Sweep Parameters
  - ✗ vbs = 0.0, -0.2, -0.4, -0.6, -0.8, -1.0
  - ✗ vdd = 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3
- ✓ Extra parameters
  - ✗ gflag\_\_noisedev\_\_rvt\_\_cmos028fdsoi = 0
  - ✗ rvt\_dev = 0
- Model pfet\_acc (DK1.2\_RF\_mmW)
  - ✓ Input Parameters
    - ✗ vds\_sat = Vdd V
    - ✗ ivt = 70e-9 A
    - ✗ mc\_runs = 1000
    - ✗ vstep\_ivt = 0.005 V
    - ✗ vds\_off = vds\_sat V
    - ✗ vgs\_off = 0 V
    - ✗ temp = 25 °C
    - ✗ vgs\_start = -0.5 V
    - ✗ mc\_sens = 0
    - ✗ vds\_lin = 0.05 V

- ✗ sbenchlsf\_release = Alpha
- ✗ plashrink\_ivt = 1
- ✗ vbs = 0 V
- ✗ ams\_release = 2018.3
- ✗ model\_version = 1.2.d
- ✗ mc\_nsigma = 3
- ✗ ithslwi = 10e-9 A
- ✗ vgs\_stop = vdd V
- ✗ shrink\_ivt = 1
- ✗ vdd = 1 V
- ✗ dlshrink\_ivt = 0
- ✓ Sweep Parameters
  - ✗ vbs = 0.0, -0.2, -0.4, -0.6, -0.8, -1.0
  - ✗ vdd = 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3
- ✓ Extra parameters
  - ✗ gflag\_\_noisedev\_\_rvt\_\_cmos028fdsoi = 0
  - ✗ rvt\_dev = 0
- Model nfet\_acc (DK1.1\_RF\_mmW)
  - ✓ Input Parameters
    - ✗ vds\_sat = Vdd V
    - ✗ ivt = 300e-9 A
    - ✗ mc\_runs = 1000
    - ✗ vstep\_ivt = 0.005 V
    - ✗ vds\_off = vds\_sat V
    - ✗ vgs\_off = 0 V

- ✗ temp = 25 °C
- ✗ vgs\_start = -0.5 V
- ✗ mc\_sens = 0
- ✗ vds\_lin = 0.05 V
- ✗ sbenchlsf\_release = Alpha
- ✗ plashrink\_ivt = 1
- ✗ vbs = 0 V
- ✗ ams\_release = 2018.3
- ✗ model\_version = 1.2.c
- ✗ mc\_nsigma = 3
- ✗ ithslwi = 10e-9 A
- ✗ vgs\_stop = vdd V
- ✗ shrink\_ivt = 1
- ✗ vdd = 1 V
- ✗ dlshrink\_ivt = 0
- ✓ Sweep Parameters
  - ✗ vbs = 0.0, -0.2, -0.4, -0.6, -0.8, -1.0
  - ✗ vdd = 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3
- ✓ Extra parameters
  - ✗ gflag\_\_noisedev\_\_rvt\_\_cmos028fdsoi = 0
  - ✗ rvt\_dev = 0
- Model pfet\_acc (DK1.1\_RF\_mmW)
  - ✓ Input Parameters
    - ✗ vds\_sat = Vdd V
    - ✗ ivt = 70e-9 A

- ✗ mc\_runs = 1000
- ✗ vstep\_ivt = 0.005 V
- ✗ vds\_off = vds\_sat V
- ✗ vgs\_off = 0 V
- ✗ temp = 25 °C
- ✗ vgs\_start = -0.5 V
- ✗ mc\_sens = 0
- ✗ vds\_lin = 0.05 V
- ✗ sbenchlsf\_release = Alpha
- ✗ plashrink\_ivt = 1
- ✗ vbs = 0 V
- ✗ ams\_release = 2018.3
- ✗ model\_version = 1.2.c
- ✗ mc\_nsigma = 3
- ✗ ithslwi = 10e-9 A
- ✗ vgs\_stop = vdd V
- ✗ shrink\_ivt = 1
- ✗ vdd = 1 V
- ✗ dlshrink\_ivt = 0
- ✓ Sweep Parameters
  - ✗ vbs = 0.0, -0.2, -0.4, -0.6, -0.8, -1.0
  - ✗ vdd = 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3
- ✓ Extra parameters
  - ✗ gflag\_\_noisedev\_\_rvt\_\_cmos028fdsoi = 0
  - ✗ rvt\_dev = 0