

Module 2: Assignment, 7nm FinFET Device and Inverter Characterization

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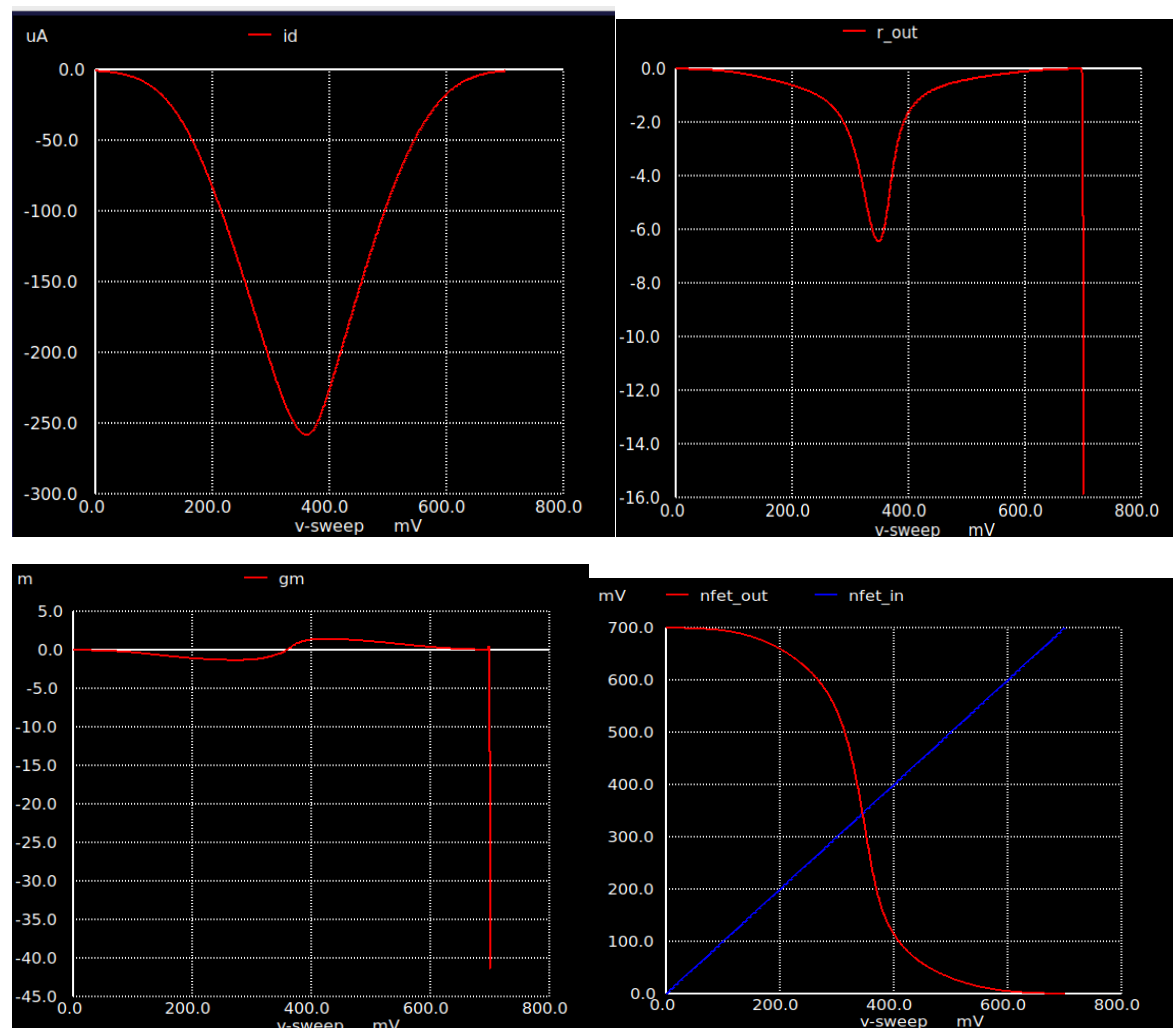
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Results summary:

S.No	W/L (PMOS)		W/L (NMOS)		Vth (V)	Id (A)	P (W)	tpd (ps)	Av	f (Hz)	Gm_max (mS)
1	L= 7n	nfin=14	L= 7n	nfin=14	0.344786	1.69E-15	1.185E-15	25.302	6.428	2.246E+10	1.23
2	L= 7n	nfin=16	L= 7n	nfin=16	0.344786	1.93E-15	1.36E-15	25.302	6.428	2.246E+10	1.41
3	L= 7n	nfin= 8	L= 7n	nfin=8	0.344786	9.68E-16	6.77E-16	25.302	6.428	2.246E+10	0.706
Vuniq	L= 7n	nfin=14	L= 7n	nfin=14	0.499	1.01E-14	7.1E-15	26.62	4.673	2.077E+10	129.8

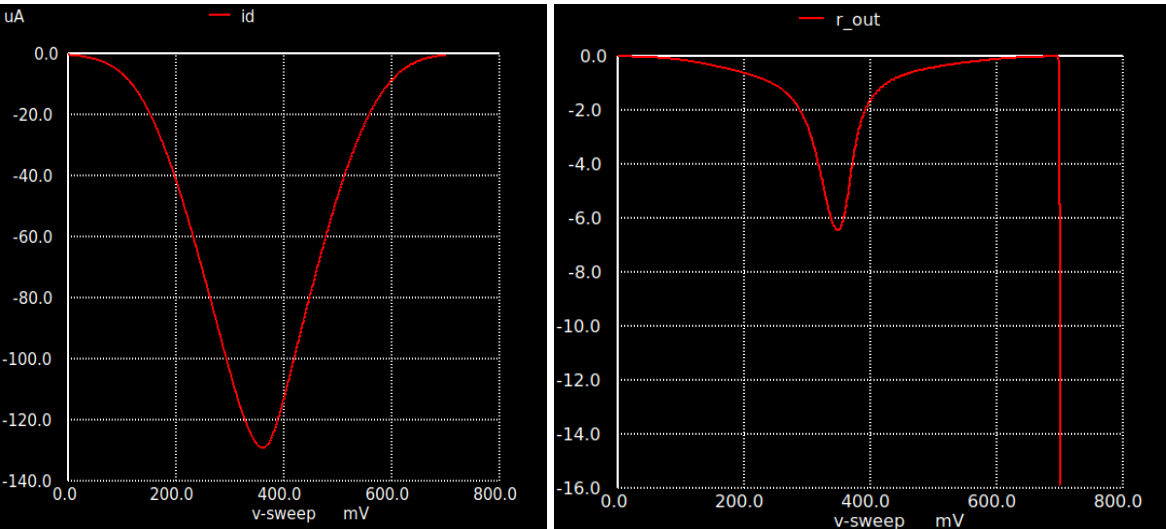
Test case: L= 7n, nfin=16--→ plots & report

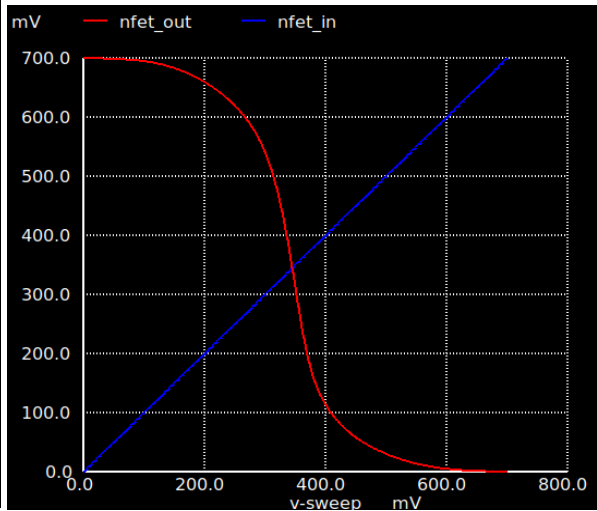
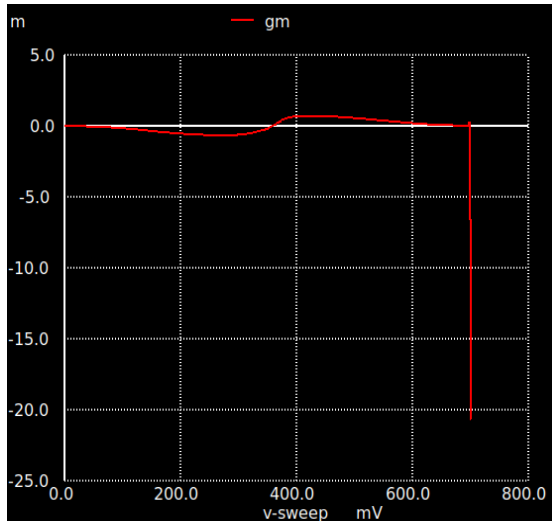


Generated Reports:

```
Doing analysis at TEMP = 27.000000 and TNOM = 27.000000
Using SPARSE 1.3 as Direct Linear Solver
Reference value : 5.36000e-01
No. of Data Rows : 701
v_th = 3.447862e-01
max_gain = 6.428448e+00 at= 3.500000e-01
v_il = 3.488156e-01
v_oh = 3.190767e-01
v_ih = 3.510961e-01
v_ol = 3.044187e-01
v_th = 3.447862e-01
max_gain = 6.428448e+00
v_il = 3.488156e-01
v_oh = 3.190767e-01
v_ih = 3.510961e-01
v_ol = 3.044187e-01
nmh = -3.20194e-02
nml = 4.439690e-02
gm_max = 1.412349e-03 at= 4.250000e-01
Doing analysis at TEMP = 27.000000 and TNOM = 27.000000
Using SPARSE 1.3 as Direct Linear Solver
Initial Transient Solution
-----
Node          Voltage
----          -
nfet_out      0.699647
nfet_in       0
vdd           0.7
v2#branch     -9.2244e-07
v1#branch     8.25478e-12
Reference value : 4.30000e-11
No. of Data Rows : 71
tr = 2.100000e-11
tf = 2.351715e-11
t_delay = 4.451715e-11
f = 2.246325e+10
v2#branch     -9.2244e-07
v1#branch     8.25478e-12
Reference value : 0.00000e+00
No. of Data Rows : 120
tpr = 2.500000e-11
tpf = 2.560432e-11
id_pwr = -1.93606e-15 from= 2.00000e-11 to= 6.00000e-11
tpr = 2.500000e-11
tpf = 2.560432e-11
tp = 2.530216e-11
id_pwr = -1.93607e-15
pwr = -1.35525e-15
power = 3.388114e-05
Doing analysis at TEMP = 27.000000 and TNOM = 27.000000
Using SPARSE 1.3 as Direct Linear Solver
Initial Transient Solution
-----
Node          Voltage
----          -
nfet_out      0.699647
nfet_in       0
vdd           0.7
v2#branch     -9.2244e-07
v1#branch     8.25478e-12
Reference value : 4.30000e-11
No. of Data Rows : 71
tr = 2.100000e-11
tf = 2.351715e-11
t_delay = 4.451715e-11
f = 2.246325e+10
```

Test case: $L = 7n$, $n_{fin}=8$ --> plots & report





Generated Reports:

```

Using SPARSE 1.3 as Direct Linear Solver
Reference value : 6.49000e-01
No. of Data Rows : 701
v_th = 3.447862e-01
max_gain = 6.428448e+00 at= 3.500000e-01
v_l = 3.488156e-01
voh = 3.190767e-01
vih = 3.510961e-01
vol = 3.044188e-01
nmh = -3.20194e-02
nml = 4.439680e-02
gm_max = 7.061744e-04 at= 4.250000e-01
Doing analysis at TEMP = 27.000000 and TNOM = 27.000000

Using SPARSE 1.3 as Direct Linear Solver

Initial Transient Solution
-----
Node          Voltage
----          -
nfet_out      0.699647
nfet_in       0
vdd           0.7
v2#branch     -4.6122e-07
v1#branch     4.12739e-12

Reference value : 5.45000e-11
No. of Data Rows : 120
tpr = 2.500000e-11
tpf = 2.560432e-11
id_pwr = -9.68032e-16 from= 2.00000e-11 to= 6.00000e-11

tpr = 2.500000e-11
tpf = 2.560432e-11
id_pwr = -9.68032e-16 from= 2.00000e-11 to= 6.00000e-11
pwr = -6.77623e-16
power = 1.694057e-05
Doing analysis at TEMP = 27.000000 and TNOM = 27.000000

Using SPARSE 1.3 as Direct Linear Solver

Initial Transient Solution
-----
Node          Voltage
----          -
nfet_out      0.699647
nfet_in       0
vdd           0.7
v2#branch     -4.6122e-07
v1#branch     4.12739e-12

No. of Data Rows : 71
tr = 2.100000e-11
tf = 2.351715e-11
t_delay = 4.451715e-11
f = 2.246325e+10

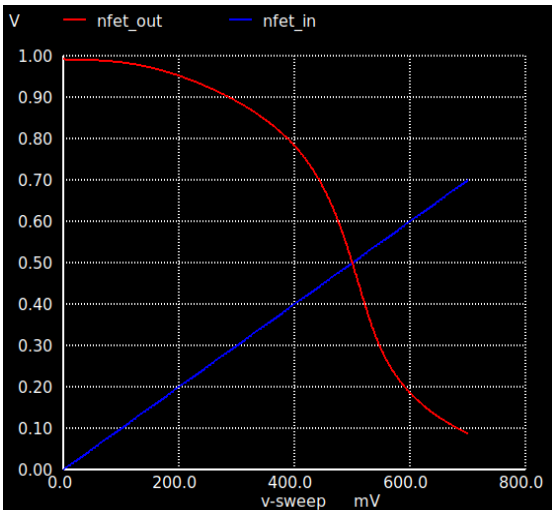
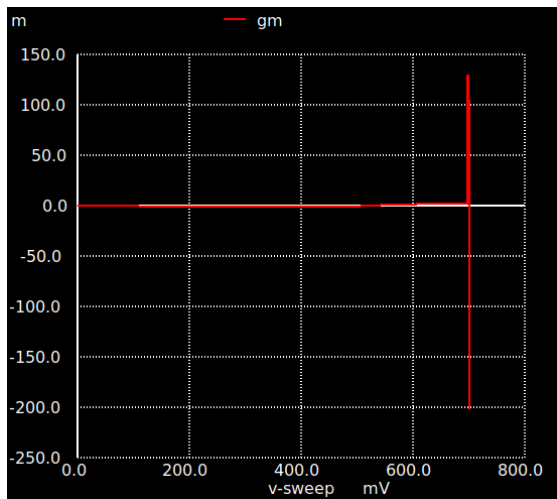
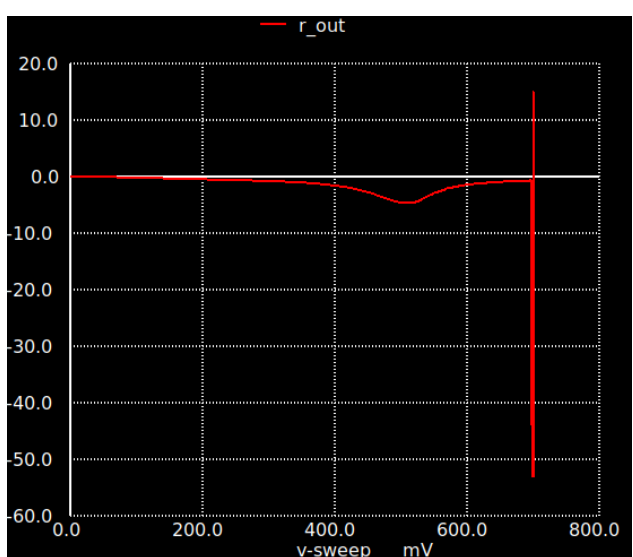
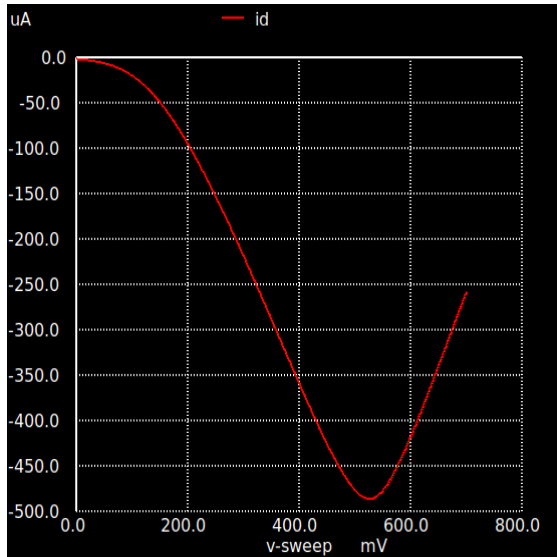
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Test_Case with Vuniq Source

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** sch_path: /home/maddy/asap_7nm_Xschem/inverter_vtc.sch
** .subckt inverter_vtc
Xpfet1 nfet_out nfet_in vdd vdd asap_7nm_pfet l=7e-009 nfin=14
Xnfet1 nfet_out nfet_in GND GND asap_7nm_nfet l=7e-009 nfin=14
V1 nfet_in GND pulse(0 0.7 20p 10p 10p 20p 500p 1)
V2 vdd Vuniq 0.7
Vx Vuniq GND 0.292 #### $ Anil ASCII_value is 292####
**** End of circuit definition ****

```



Generated Reports:

```

Using SPARSE 1.3 as Direct Linear Solver
Reference value : 6.47000e-01
No. of Data Rows : 701
v_th = 4.998321e-01
max_gain = 4.673490e+00 at= 5.110000e-01 id_pwr
v_il = 5.088800e-01
v_oh = 4.580632e-01
v_ih = 5.126282e-01
v_ol = 4.405507e-01
gm_max = 1.298350e-01 at= 6.980000e-01
Doing analysis at TEMP = 27.000000 and TNOM = 27.000000

Using SPARSE 1.3 as Direct Linear Solver
Initial Transient Solution
-----
Node          Voltage
----          -
nfet_out      0.991318
nfet_in       0
vdd           0.992
vuniq         0.292
vx#branch     -1.76928e-06
v2#branch     -1.76928e-06
v1#branch     1.45912e-11

No. of Data Rows : 120
tpr = 2.500000e-11
tpf = 2.825783e-11
tp = 2.662891e-11
id_pwr = -1.01436e-14
pwr = -7.10054e-15
power = 1.775135e-04
Doing analysis at TEMP = 27.000000 and TNOM = 27.000000

Using SPARSE 1.3 as Direct Linear Solver
Initial Transient Solution
-----
Node          Voltage
----          -
nfet_out      0.991318
nfet_in       0
vdd           0.992
vuniq         0.292
vx#branch     -1.76928e-06
v2#branch     -1.76928e-06
v1#branch     1.45912e-11

No. of Data Rows : 71
tr = 2.100000e-11
tf = 2.713823e-11
t_delay = 4.813823e-11
f = 2.077351e+10

```