PROJECT 1 REPORT

SMALL STANDARD CELL LIBRARY

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➔ **Height of all the cells is 444.**
➔ **Width of the inverter cells is 28.**
➔ **Width of the NAND cells is 44.**
➔ **Width of the NOR cells is 44.**
➔ **Width of the fourth function f cells is 56.**
➔ **Width of the fourth function g cells is 56.**
➔ **Width of the fourth function h cells is 80.**

1- Inverter Cell

Stick Diagram

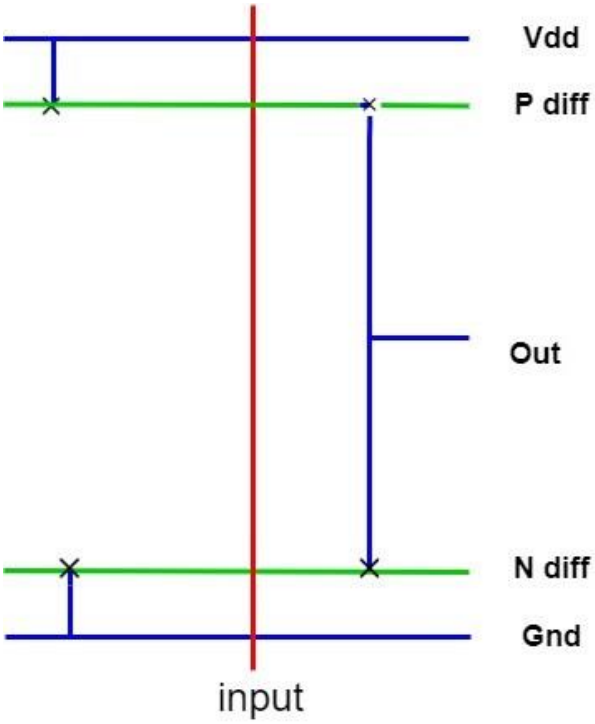

Figure 1

$$height = 32\lambda$$

Schematic

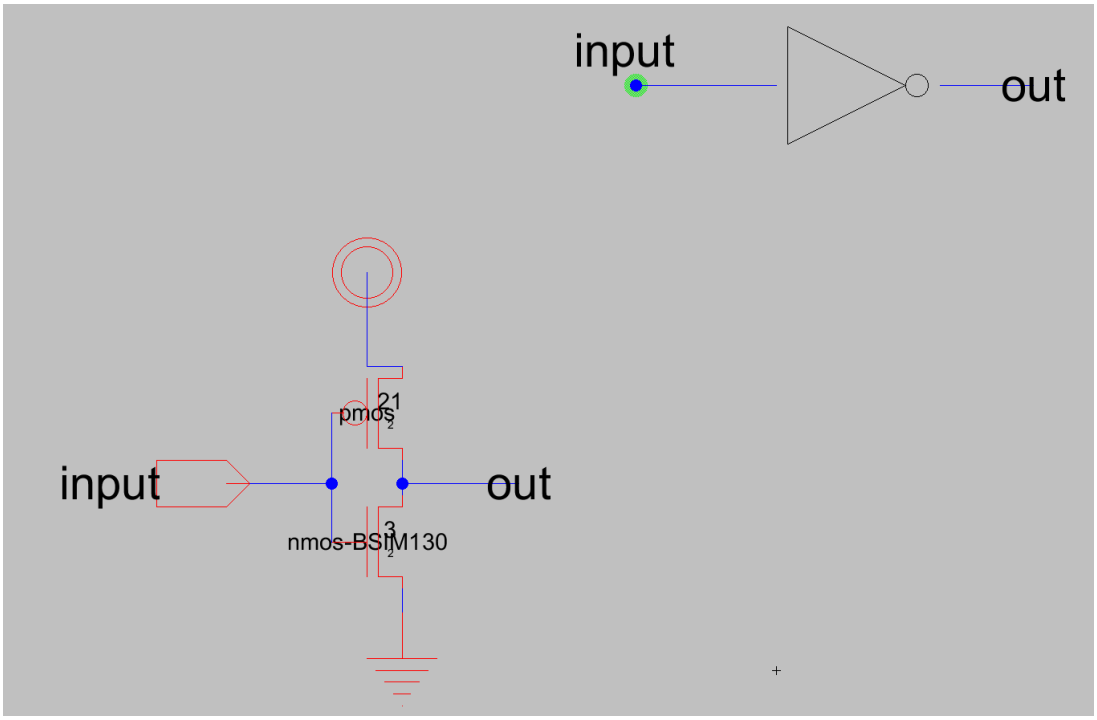

Figure 2

Size 1:

Layout

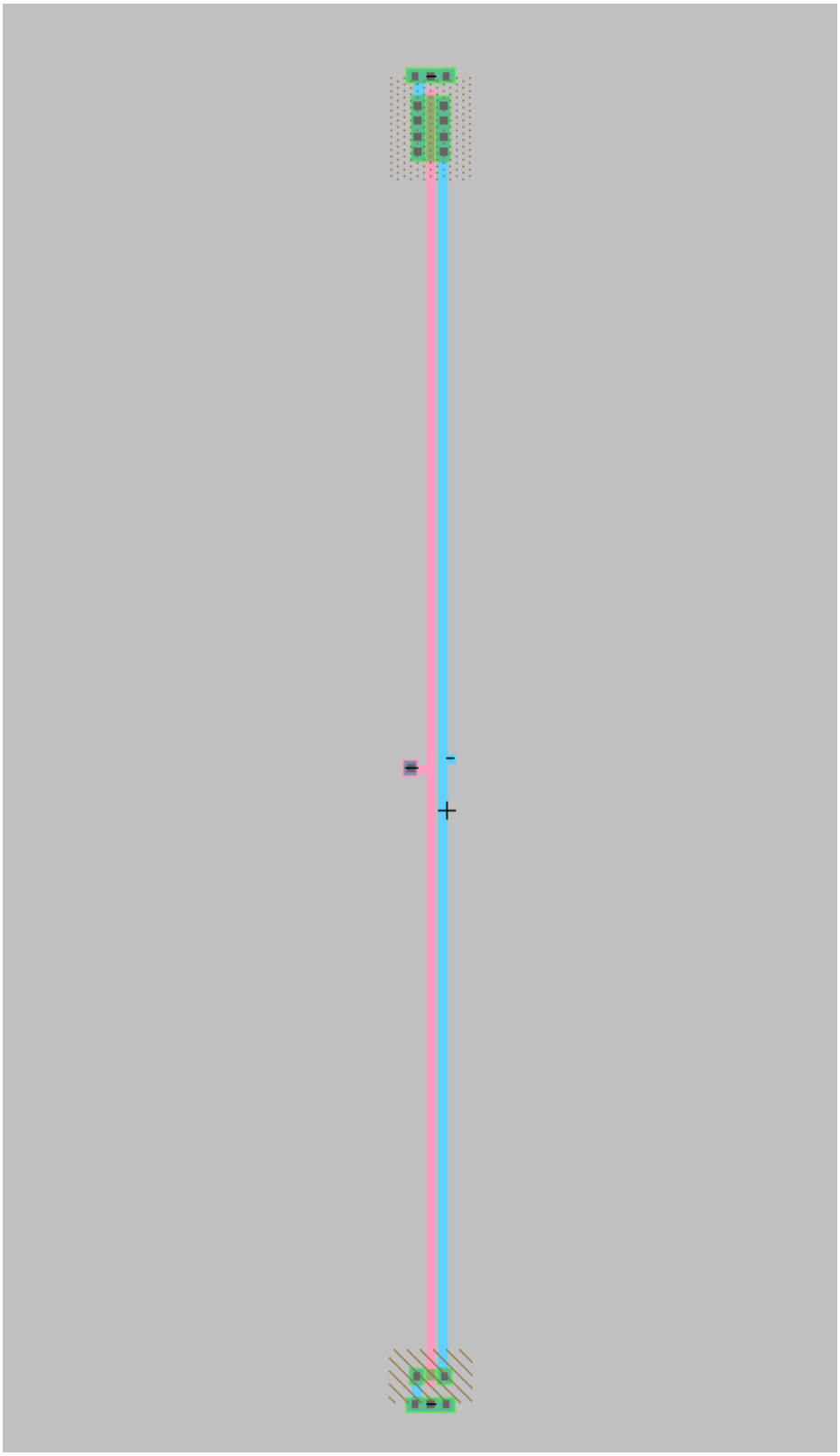

Figure 3

Propagation Delays

T_{pdf}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	7.90555e-010	1.18018e-009	1.95818e-009	3.55311e-009
100 ps	4.45051e-010	8.6712e-010	1.67825e-009	3.31425e-009
400 ps	4.8946e-010	8.99315e-010	1.70968e-009	3.34294e-009
800 ps	5.54836e-010	9.63462e-010	1.75826e-009	3.38683e-009

T_{pdr}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	2.1553e-010	4.35801e-010	7.78736e-010	1.31496e-009
100 ps	1.53248e-010	2.87238e-010	5.63054e-010	1.0856e-009
400 ps	1.87511e-010	3.20133e-010	5.96633e-010	1.12708e-009
800 ps	2.17578e-010	3.69864e-010	6.33786e-010	1.17742e-009

Linear Delay Model

Using T_{pdf}:

$7.9055e\text{-}10 = k_1 \times 130\ e\text{-}15 + 0 + k_3 \rightarrow (1)$
$4.8949\ e\text{-}10 = k_1 \times 130\ e\text{-}15 + k_2 \times 400\ e\text{-}12 + k_3 \rightarrow (2)$
$1.75826\ e\text{-}9 = k_1 \times 520\ e\text{-}15 + k_2 \times 800\ e\text{-}12 + k_3 \rightarrow (3)$

$k_1 = 4025.36$
$k_2 = -0.75$
$k_3 = 2.6725\ e\text{-}10$

$T_{pdf} = 4025.36 \times cload - 0.75 \times transition\ time + 2.6725\ e\text{-}10$

Using T_{pdr}:

$7.78736e\text{-}10 = k1 \times 520\ e\text{-}15 + 0 + k3$
$5.63\ e\text{-}10 = k1 \times 520\ e\text{-}15 + k2 \times 100e\text{-}12 + k3$
$1.87e\text{-}10 = k1 \times 130\ e\text{-}15 + k2 \times 400\ e\text{-}12 + k3$

K1 = 1.72 e-28
K2 = -1.2533
K3 = 6.83 e-10

$T_{pdr} = 1.72\ e\text{-}28 \times cload - 1.2533 \times transition\ time + 6.83\ e\text{-}10$

Size 2:

Layout

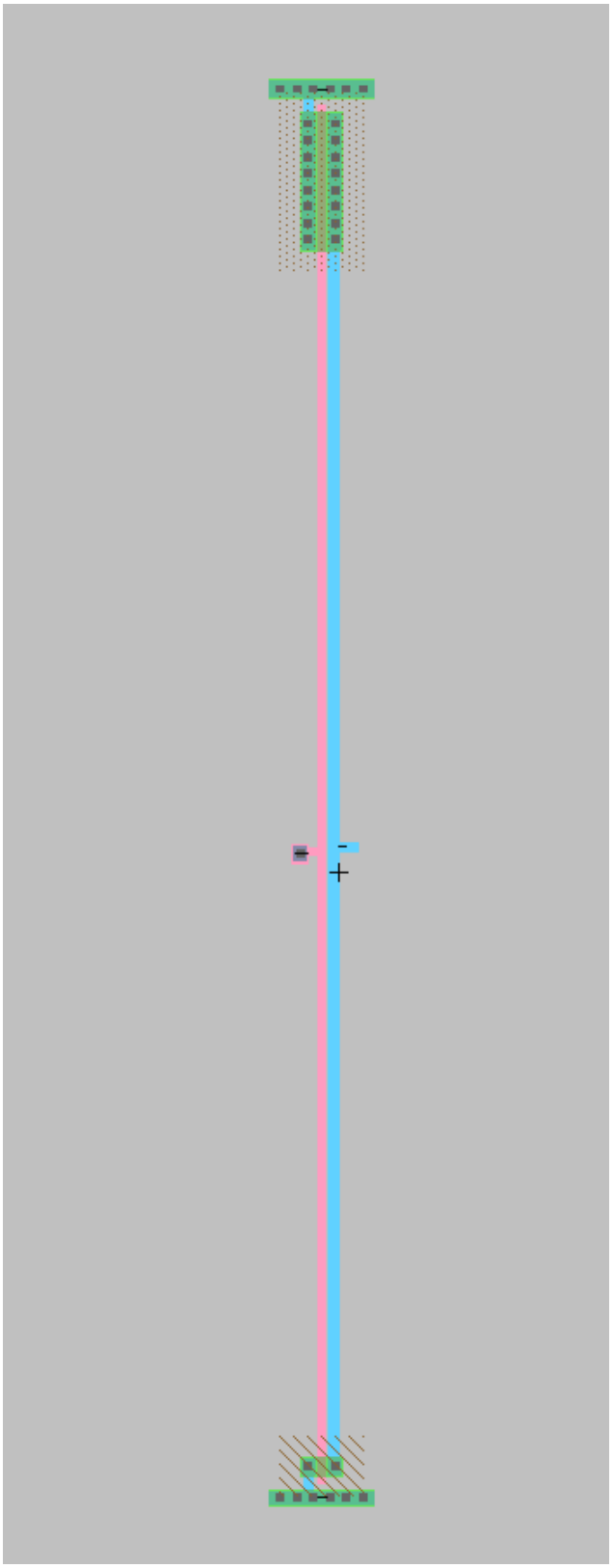

Figure 4

Propagation Delays

T_{pdf}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	5.69191e-010	7.79735e-010	1.1636e-009	1.92831e-009
100 ps	2.35652e-010	4.38918e-010	8.53784e-010	1.64567e-009
400 ps	2.7836e-010	4.7622e-010	8.88574e-010	1.67745e-009
800 ps	3.5887e-010	3.5887e-010	9.38817e-010	1.73187e-009

T_{pdr}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	6.03102e-011	2.11266e-010	4.34727e-010	7.75821e-010
100 ps	8.40354e-011	1.51996e-010	2.88591e-010	5.62606e-010
400 ps	1.11931e-010	1.87618e-010	3.19425e-010	5.93691e-010
800 ps	1.1537e-010	1.1537e-010	3.69549e-010	6.33402e-010

Linear Delay Model

Using Tpdf:

7.9055e-10 = k1 x 130 e -15 + 0 + k3 → (1)
4.8949 e-10 = k1 x 130 e -15 + k2 x 400 e-12 + k3 → (2)
1.75826 e-9 = k1 x 520 e -15 + k2 x 800 e-12 + k3 → (3)

k1= 4025.36
k2= -0.75
k3= 2.6725 e-10

Tpdf = 4025.36 x cload - 0.75 x transition time + 2.6725 e-10

Using Tpdr:

7.78736e-10 = k1 x 520 e-15 + 0 + k3
5.63 e-10 = k1 x 520 e-15 + k2 x 100e-12 + k3
1.87e-10 = k1 x 130 e-15 + k2 x 400 e-12 + k3

K1 = 1.72 e-28
K2 = -1.2533
K3 = 6.83 e-10

Tpdr = 1.72 e-28 x cload - 1.2533 x transition time + 6.83 e-10

Size 4:

Layout

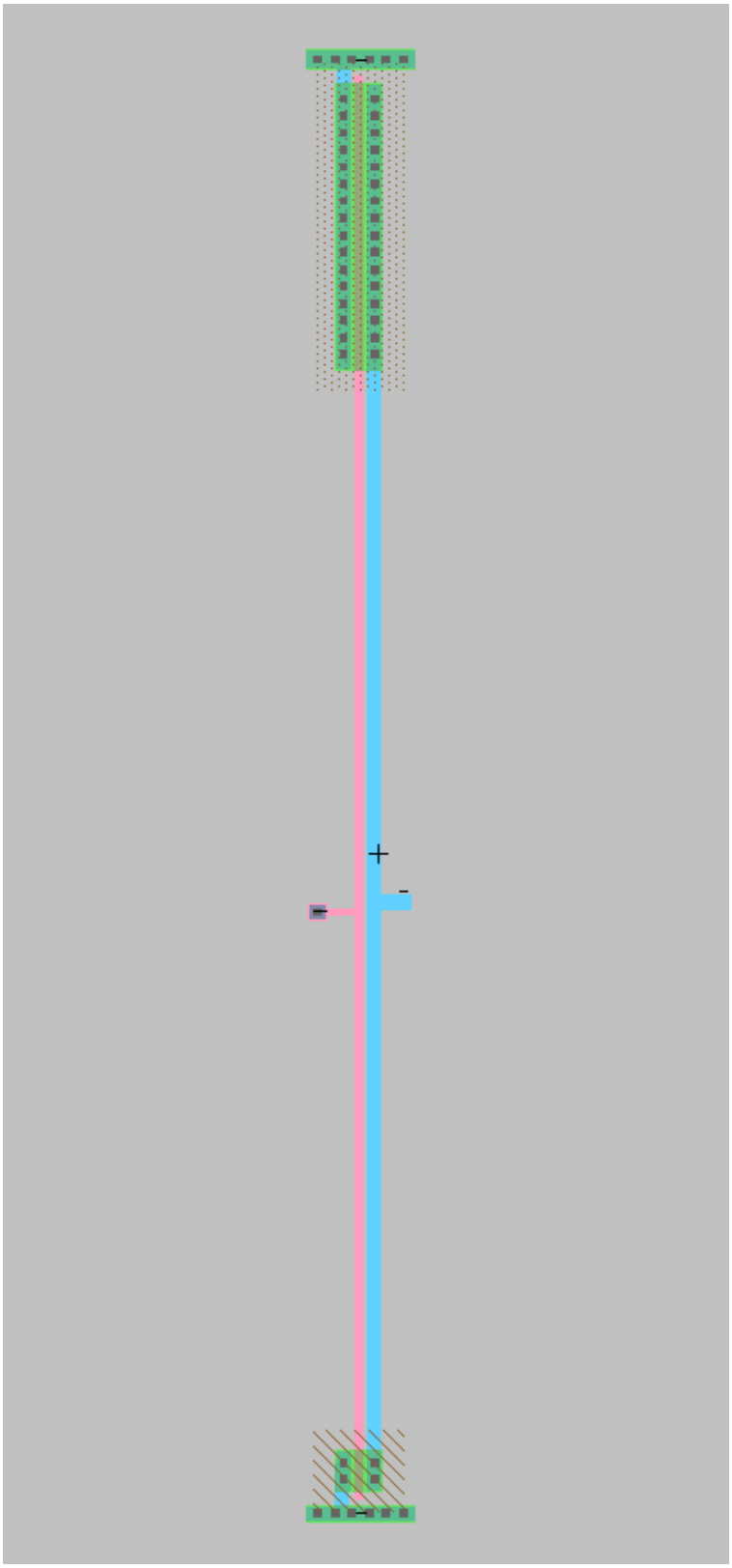

Figure 5

Propagation Delays

T_{pdf}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	7.81008e-010	4.47151e-010	5.71686e-010	1.14031e-009
100 ps	1.28271e-010	2.29438e-010	4.33323e-010	8.41132e-010
400 ps	1.84811e-010	2.77074e-010	4.73283e-010	8.81281e-010
800 ps	2.56536e-010	3.5693e-010	5.43175e-010	9.33578e-010

T_{pdr}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	2.1573e-010	3.6865e-011	6.36e-011	4.37739e-010
100 ps	5.05777e-011	8.37669e-011	1.51297e-010	2.87851e-010
400 ps	6.12656e-011	1.11064e-010	1.86916e-010	3.18027e-010
800 ps	4.61733e-011	1.15452e-010	2.16436e-010	3.69303e-010

Linear Delay Model

Using Tpdf

7.81e-10 = 130 e-15 x k1 + 0 + k3
4.33e-10 = 520 e-15 + 100e-12 x k2 + k3
1.848e-10 = 130 e-15 k1 + 400e-12 k2 + k3

K1 = -510
K2 = -1.4905
k3= 8.47e-10

Tpdf = -510 x cload -1.4905 x transition time + 8.47e-10

Using Tpdr

2.157e-10 = 130 e-15 k1 + 0 + k3
5.057 e-11 = 130e-15 k1 +100e-12 x k2 + k3
8.376e-11 = 260e-15 k1 + 100e-12 x k2 + k3

K1 = 254.85
K2 = -1.6513
k3= 1.8257e-10

Tpdr = 254.85 x cload -1.6513 x transition time + 1.8257e-10

Size 8:

Layout

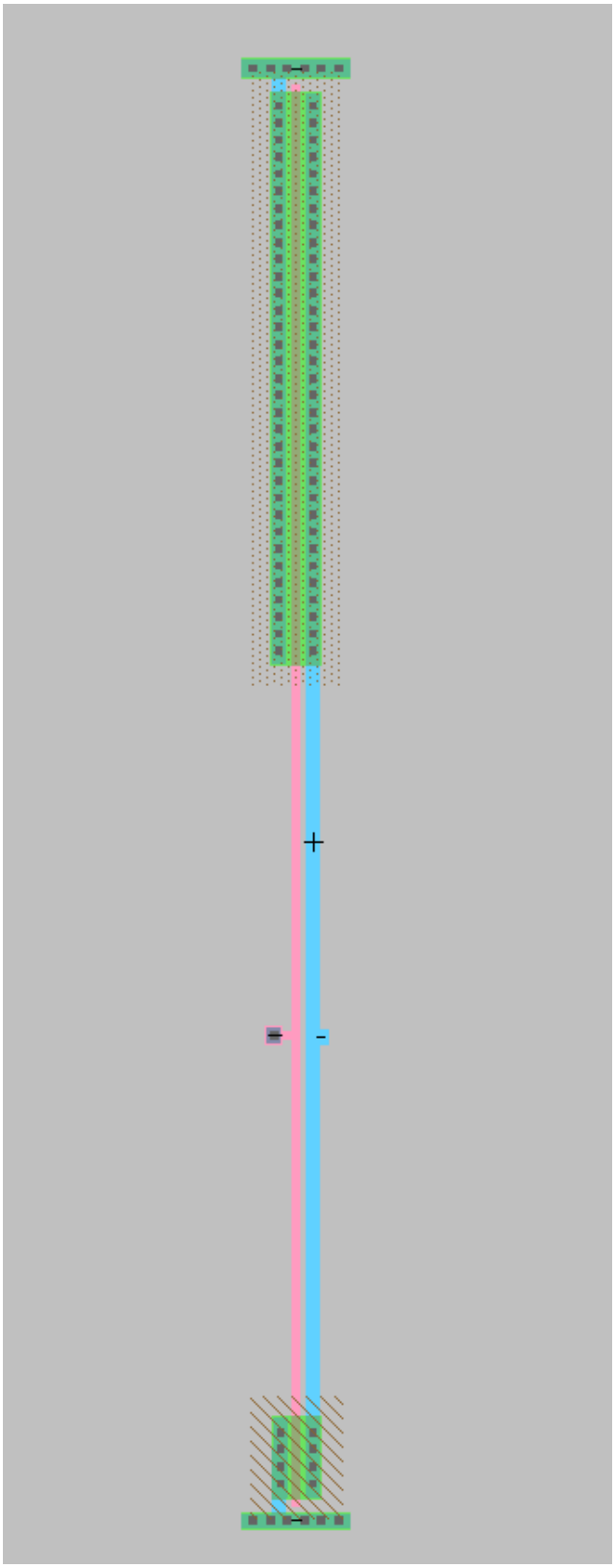

Figure 6

Propagation Delays

T_{pdf}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	3.77419e-010	4.52759e-010	5.72087e-010	7.84015e-010
100 ps	7.83796e-011	1.27649e-010	2.31712e-010	4.30783e-010
400 ps	1.34458e-010	1.84163e-010	2.76305e-010	4.70603e-010
800 ps	2.00911e-010	2.57082e-010	3.57556e-010	5.41174e-010

T_{pdr}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	1.04624e-010	3.73203e-011	6.30392e-011	2.15752e-010
100 ps	3.20593e-011	5.08357e-011	8.29229e-011	1.49394e-010
400 ps	2.74952e-011	6.14081e-011	1.11326e-010	1.86892e-010
800 ps	2.4333e-012	4.6723e-011	1.15879e-010	2.17464e-010

Linear Delay Model

Using Tpdf

7.84e-10 = 1040e-15 k1 + 0 + k3
4.308e-10 = 1040e-15 k1 + 100e-12 k2 + k3
1.345e-10 = 130e-15 k1 + 400e-12 k2 + k3

K1 = -838.79
K2 = -3.532
K3 = 1.65e-9

Tpdf = -838.79 x cload -3.532 x transition time +1.65e-9

Using Tpdr

6.30e-11 = 520e-15 k1 + 0 + k3
3.205e-11 = 130e-15 k1 + 100e-12 k2 + k3
1.158e-10 = 520e-15 k1 + 800e-12 k2 + k3

K1 = 96.282
K2 = 0.066
K3 = 1.2933e-11

Tpdr = 96.282 x cload + 6 0.066 x transition time + 1.2933e-11

2- 3 Input NAND Gate

Stick Diagram

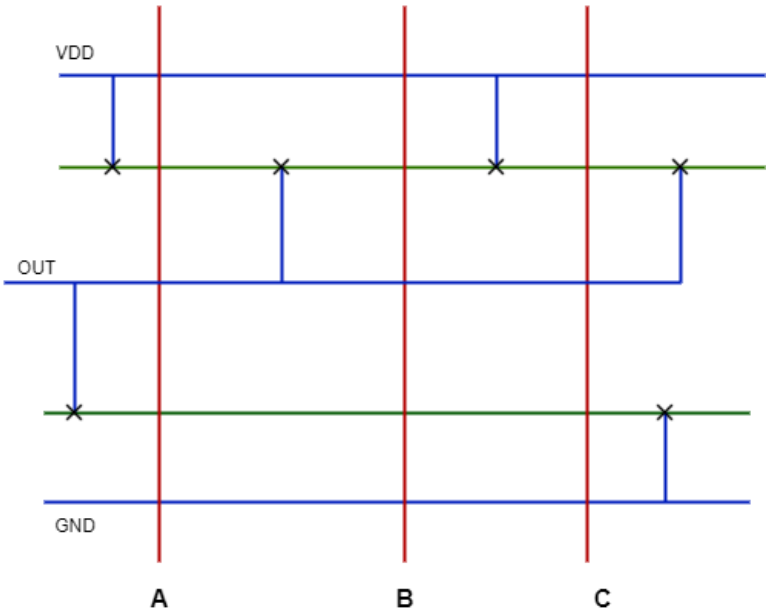

Figure 7

$$height = 40\lambda$$

Schematic

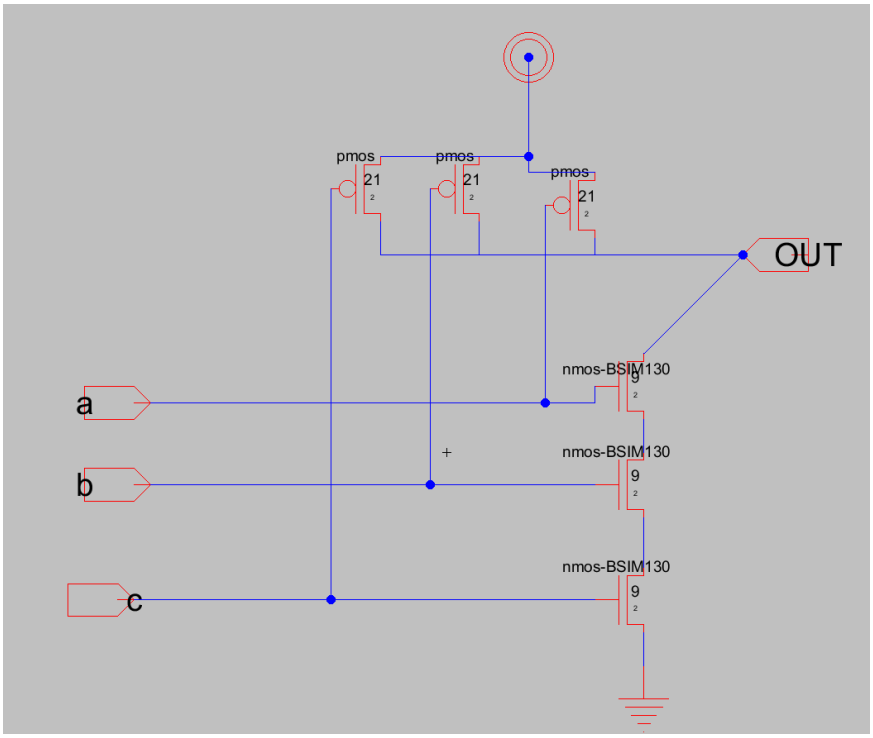

Figure 8

Size 1:

Layout

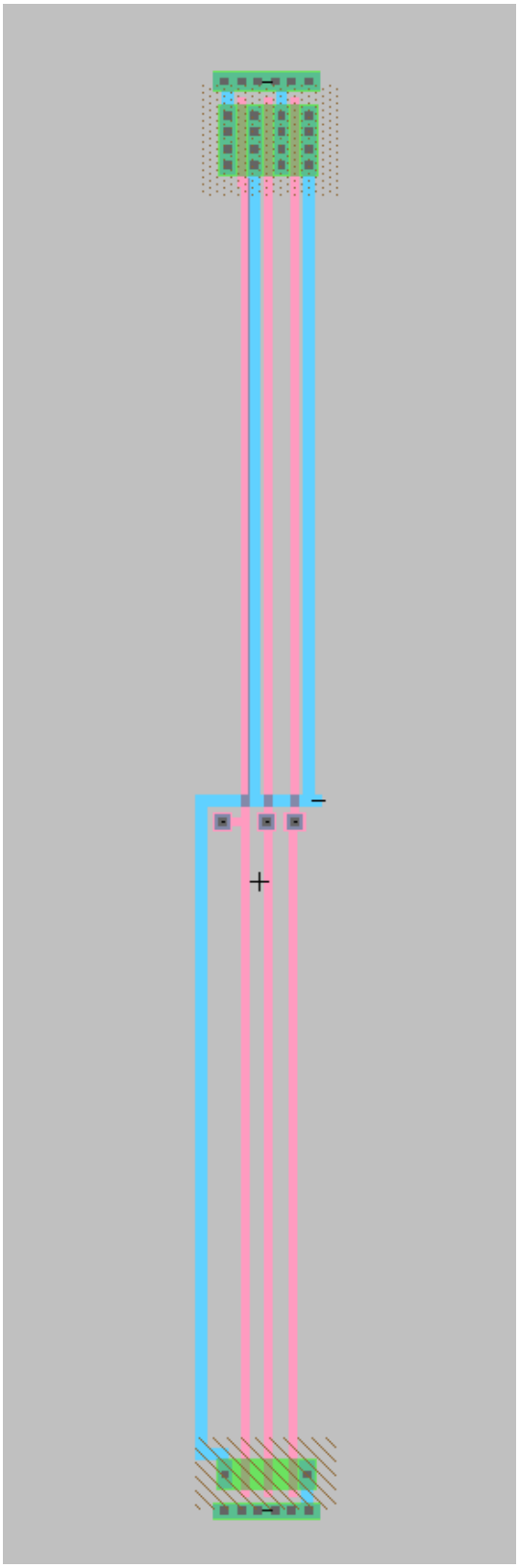

Figure 9

Propagation Delays

T_{pdf}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	5.59236e-010	8.42258e-010	1.36011e-009	2.40105e-009
100 ps	3.06382e-010	5.79815e-010	1.13432e-009	2.1963e-009
400 ps	3.4095e-010	6.12033e-010	1.16015e-009	2.21948e-009
800 ps	3.96229e-010	6.63049e-010	1.20673e-009	2.25347e-009

T_{pdr}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	2.78928e-10	4.84481e-010	8.06024e-010	1.33432e-009
100 ps	1.58218e-010	2.95292e-010	5.73163e-010	1.0996e-009
400 ps	1.96144e-010	3.26242e-010	6.04355e-010	1.13415e-009
800 ps	2.37571e-010	3.82808e-010	6.4414e-010	1.18362e-009

Linear Delay Model

Using Tpdf

3.06382e-010= (K1*130e-15) +(K2*100e-12) +K3

8.42258e-010= (K1*260e-15)+(K2*0e-12)+k3

2.21948e-009=(K1*1040e-15) +(K2*400e-12)+K3

K1= 2708.250769

K2=-1.838034

K3= 1.381128e-10

Tpdf = 2708.250769x cload -1.838034x transition time + 1.381128e-10

Using Tpdr

1.58218e-010= (K1*130e-15) +(K2*100e-12) +K3

4.84481e-010=(K1*260e-15)+(K2*0e-12)+k3

6.4414e-010=(K1*520e-15) +(K2*800e-12)+K3

K1= 2130.586923

K2=-0.492867

K3= -6.94e-11

Tpdr = 2130.586923x cload -0.492867x transition time -6.94e-11

Size 2:

Layout

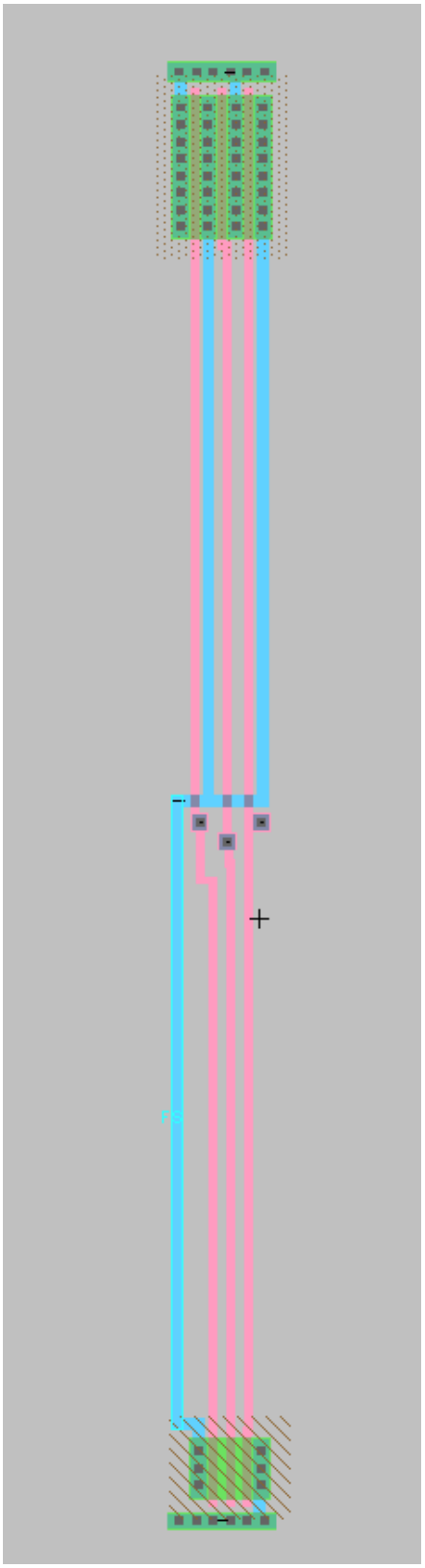

Figure 10

Propagation Delays

T_{pdf}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	4.05606e-010	5.57361e-010	8.36313e-010	1.35318e-009
100 ps	1.66418e-010	3.03877e-010	5.78831e-010	1.12502e-009
400 ps	2.04194e-010	3.34308e-010	6.2306e-010	1.15679e-009
800 ps	2.65308e-010	3.92035e-010	6.54074e-010	1.20058e-009

T_{pdr}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	1.43759e-010	2.77855e-010	4.81907e-010	8.04252e-010
100 ps	8.90937e-011	1.57185e-010	2.93437e-010	5.64261e-010
400 ps	1.23224e-010	1.94862e-010	3.27382e-010	6.00192e-010
800 ps	1.41745e-010	2.35985e-010	3.80932e-010	6.43283e-010

Linear Delay Model

Using Tpdf

4.05606e-010= (K1*130e-15) +(K2*0e-12) +K3

6.2306e-010= (K1*520e-15)+(K2*400e-12)+k3

1.20058e-009=(K1*1040e-15) +(K2*800e-12)+K3

K1= 2769.738462

K2=-2.15686

K3= 4.554e-11

Tpdf = 2769.738462 x cload -2.15686 x transition time + 4.554e-11

Using Tpdr

8.90937e-011= (K1*130e-15) +(K2*100e-12) +K3

2.77855e-010=(K1*260e-15)+(K2*0e-12)+k3

6.43283e-010=(K1*1040e-15) +(K2*800e-12)+K3

K1= 998.50

K2=-0.5071917

K3= 1.824454e-11

Tpdr = 998.50 x cload -0.5071917 x transition time + 1.824454e-11

Size 4:

Layout

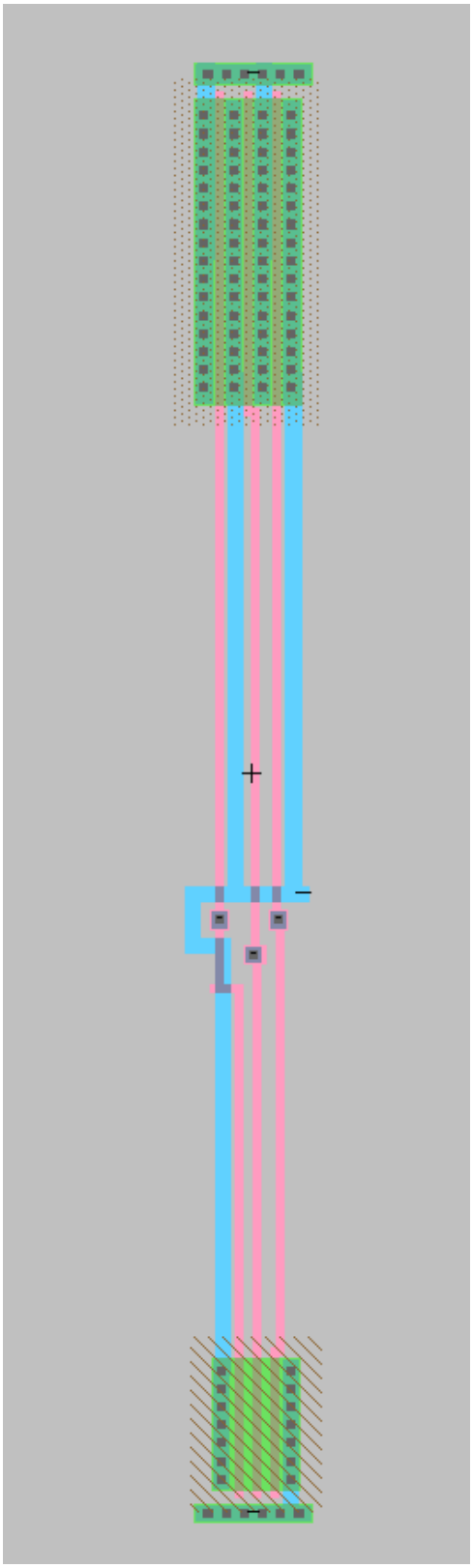

Figure 10

Propagation Delays

T_{pdf}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	3.11205e-010	4.07218e-010	5.60634e-010	8.40987e-010
100 ps	9.73306e-011	1.65932e-010	3.03166e-010	5.77622e-010
400 ps	1.39831e-010	2.04946e-010	3.33642e-010	6.06386e-010
800 ps	1.88202e-010	2.65252e-010	3.9457e-010	6.50933e-010

T_{pdr}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	5.77559e-011	1.98386e-010	2.73082e-010	4.87287e-010
100 ps	5.52297e-011	1.14182e-010	1.56163e-010	2.96364e-010
400 ps	7.70874e-011	1.222669e-10	1.95071e-010	3.25065e-010
800 ps	8.1296e-011	1.41289e-010	2.35328e-010	3.8088e-010

Linear Delay Model

Using Tpdf

9.73306e-011= (K1*130e-15) +(K2*100e-12) +K3

4.07218e-010= (K1*520e-15)+(K2*0e-12)+k3

6.50933e-010=(K1*1040e-15) +(K2*800e-12)+K3

K1= 748.0258791

K2=-0.181573

K3= 1.824454286e-11

Tpdf = 748.0258791x cload -0.181573x transition time + 1.824454286e-11

Using Tpdr

5.52297e-011= (K1*130e-15) +(K2*100e-12) +K3

1.98386e-010=(K1*260e-15)+(K2*0e-12)+k3

3.8088e-010=(K1*1040e-15) +(K2*800e-12)+K3

K1= 729.52989

K2=-0.483174

K3= 8.708228e-12

Tpdr = 729.52989 x cload -0.483174 x transition time + 8.708228e-12

3- Input NOR Gate

Stick Diagram

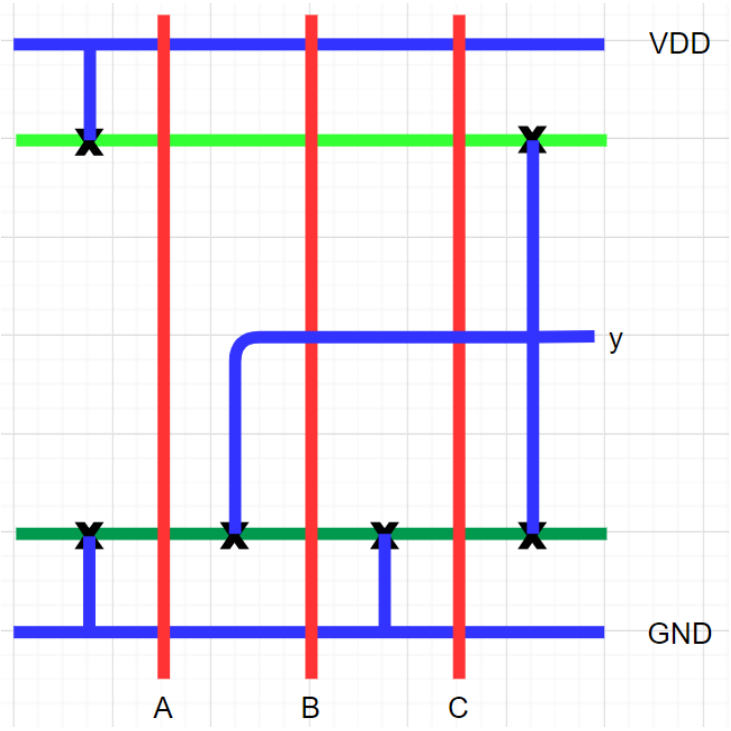

Figure 11

$$height = 40\lambda$$

Schematic

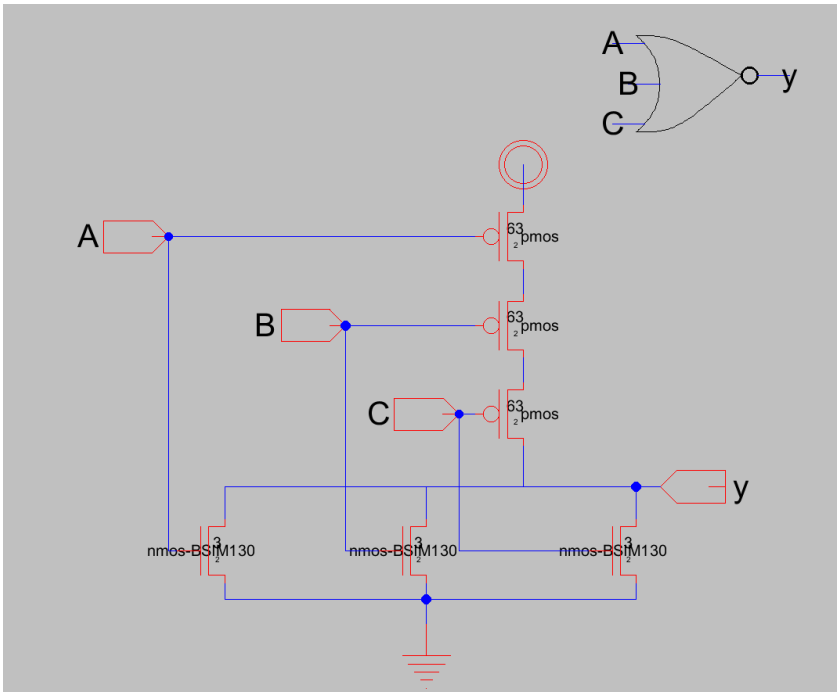

Figure 12

Size 1:

Layout

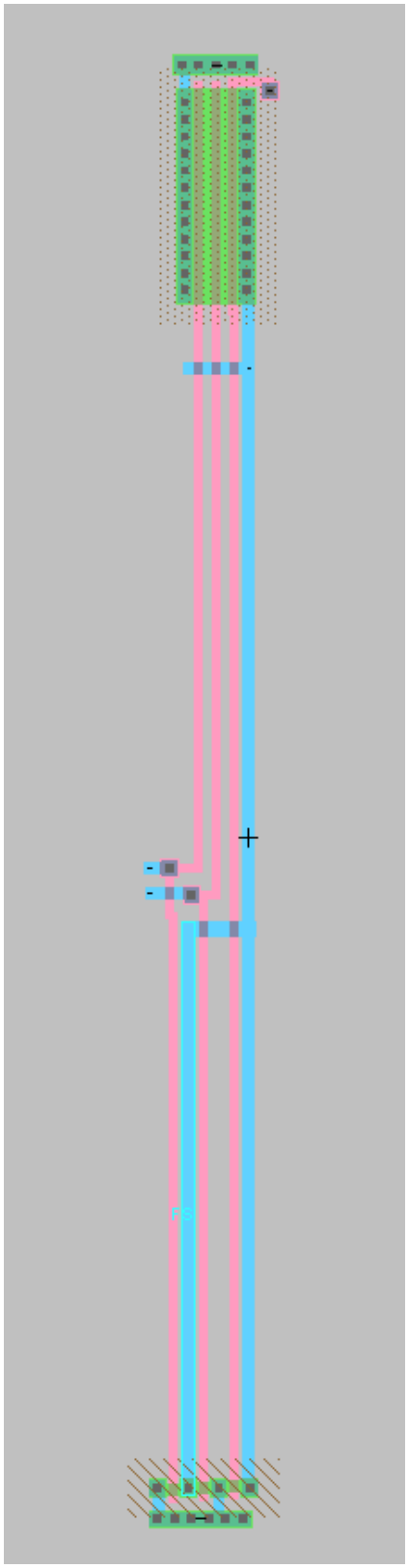

Figure 13

Propagation Delays

T_{pdf}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	9.94883e-010	1.34142e-009	2.11285e-009	3.69649e-009
100 ps	5.57007e-010	9.73346e-010	1.7938e-009	3.43064e-009
400 ps	6.03531e-010	1.01712e-009	1.82407e-009	3.46021e-009
800 ps	6.87091e-010	1.08423e-009	1.88151e-009	3.50729e-009

T_{pdr}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	3.28678e-011	1.41217e-010	4.25393e-010	9.00704e-010
100 ps	1.44074e-010	2.66613e-010	5.04107e-010	9.89129e-010
400 ps	1.3355e-010	2.49147e-010	4.86928e-010	9.74296e-010
800 ps	1.08609e-010	2.40405e-010	4.66806e-010	9.46462e-010

Linear Delay Model

Using Tpdf

5.57007e-010= (K1*130e-15) +(K2*100e-12) +K3

1.34142e-009= (K1*260e-15)+(K2*0e-12)+k3

3.50729e-009=(K1*520e-15) +(K2*800e-12)+K3

K1= -729.81

K2=4.621

K3= 1.897e-10

Tpdf = -729.81 x cload +4.621x transition time + 1.897e-10

Using Tpdr

1.44074e-010= (K1*130e-15) +(K2*100e-12) +K3

4.25393e-010= (K1*520e-15)+(K2*0e-12)+k3

9.46462e-010=(K1*520e-15) +(K2*800e-12)+K3

K1= 888.13

K2=0.65145

K3= -3.652e-11

Tpdr = 888.13 x cload +0.65145 x transition time -3.652e-11

Size 2:

Layout

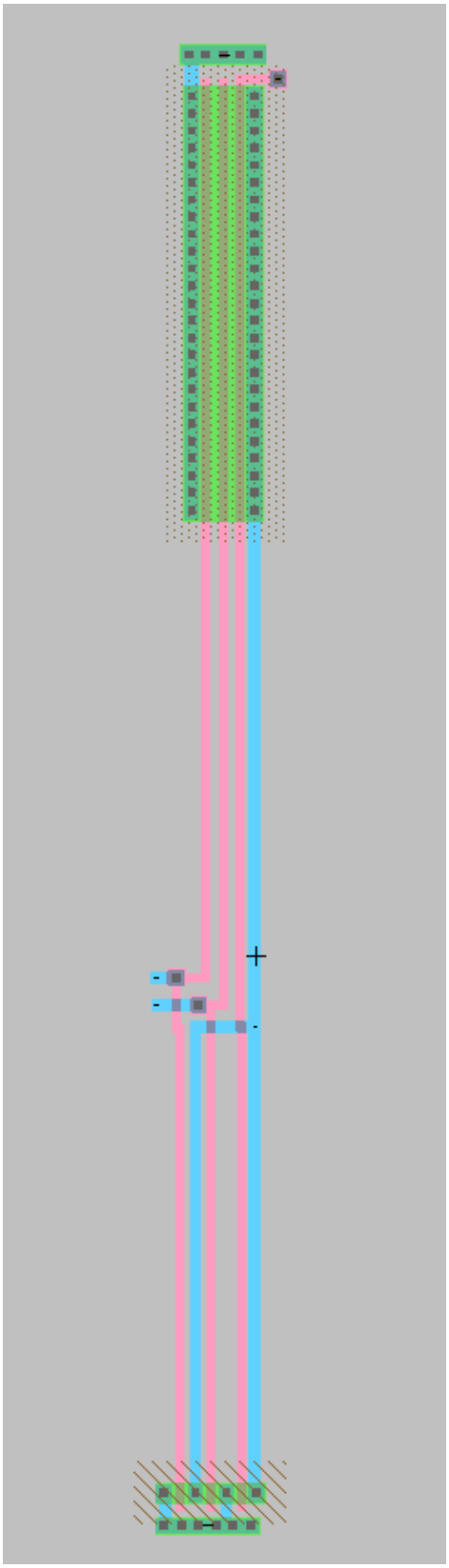

Figure 14

Propagation Delays

T_{pdf}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	8.02686e-010	9.83728e-010	1.32986e-009	2.08501e-009
100 ps	3.41543e-010	5.45943e-010	9.57151e-010	1.76099e-009
400 ps	3.94494e-010	5.91036e-010	9.94362e-010	1.79426e-009
800 ps	4.88405e-010	6.74705e-010	1.05999e-009	1.85214e-009

T_{pdr}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	1.43853e-010	3.298e-011	1.41144e-010	4.23943e-010
100 ps	8.42204e-011	1.4274e-010	2.62941e-010	4.96743e-010
400 ps	7.05747e-011	1.33614e-010	2.48029e-010	4.84508e-010
800 ps	2.95349e-011	1.07891e-010	2.36477e-010	4.65934e-010

Linear Delay Model

Using Tpdf

3.41543e-010= (K1*130e-15) +(K2*100e-12) +K3

1.32986e-009= (K1*520e-15)+(K2*0e-12)+k3

6.74705e-010=(K1*260e-15) +(K2*800e-12)+K3

K1= 2535.3

K2=5.1e-3

K3= 1.144e-11

Tpdf = 2535.3 x cload +5.1e-3x transition time + 1.144e-11

Using Tpdr

7.05747e-011= (K1*130e-15) +(K2*400e-12) +K3

1.41144e-010= (K1*520e-15)+(K2*0e-12)+k3

4.96743e-010=(K1*1040e-15) +(K2*100e-12)+K3

K1= 604.43

K2=0.41299

K3= -1.73164e-10

Tpdr = 604.43 x cload +0.41299 x transition time -1.73164e-10

Size 4:

Layout

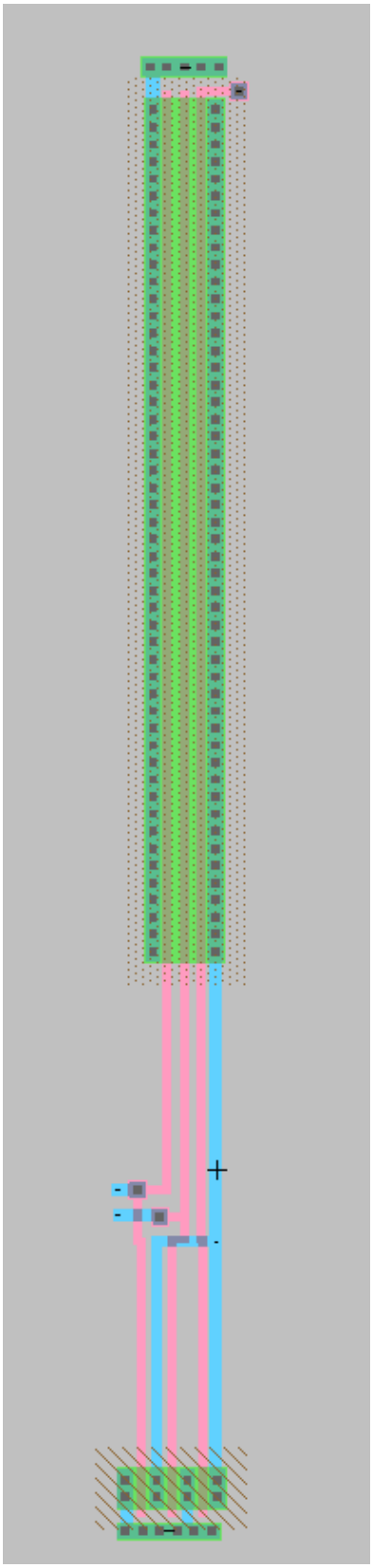

Figure 15

Propagation Delays

T_{pdf}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	7.02417e-010	7.96499e-010	9.77584e-010	1.32885e-009
100 ps	2.35193e-010	3.36829e-010	5.39488e-010	9.45689e-010
400 ps	2.96108e-010	3.90524e-010	5.84973e-010	9.81251e-010
800 ps	4.00421e-010	4.87898e-010	6.67044e-010	1.05058e-009

T_{pdr}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	2.12099e-010	1.41945e-010	3.18707e-011	1.43226e-010
100 ps	5.53591e-011	8.49669e-011	1.43694e-010	2.61303e-010
400 ps	3.33368e-011	7.06056e-011	1.32919e-010	2.48245e-010
800 ps	1.81337e-011	2.958e-011	1.08157e-010	2.35829e-010

Linear Delay Model

Using Tpdf

2.35193e-010= (K1*130e-15) +(K2*100e-12) +K3

1.32885e-009= (K1*1040e-15)+(K2*0e-12)+k3

6.67044e-010=(K1*520e-15) +(K2*800e-12)+K3

K1= 1196.37

K2=-0.0496

K3= 8.462e-11

Tpdf = 1196.37x cload -0.0496x transition time + 8.462e-11

Using Tpdr

1.05e-10 = 130e-15 k1 + 0 + k3

5.56e-11 = 130e-15 k1 + 100e-12 k2 + k3

9.02e-11 = 260e-15 k1 +400e-12 k2 +k3

K1 = 1406.15

K2 = -0.494

K3 = -7.78e-11

Tpdr = 1406.15 x cload -0.494 x transition time -7.78e-11

4- The function $f(x, y, z, w) = \overline{xy + wz}$

Stick Diagram

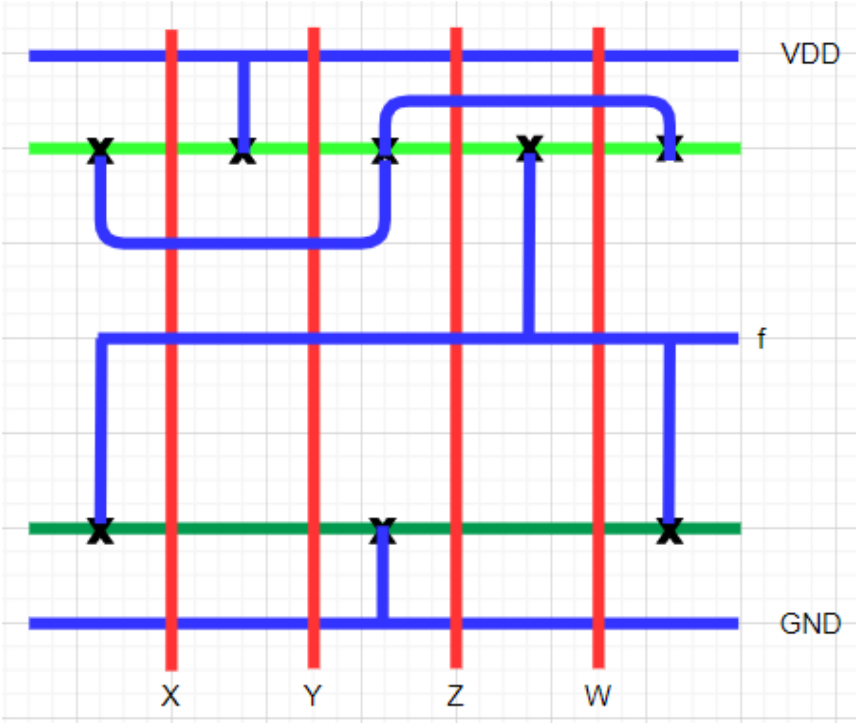

Figure 16

$$height = 48\lambda$$

Schematic

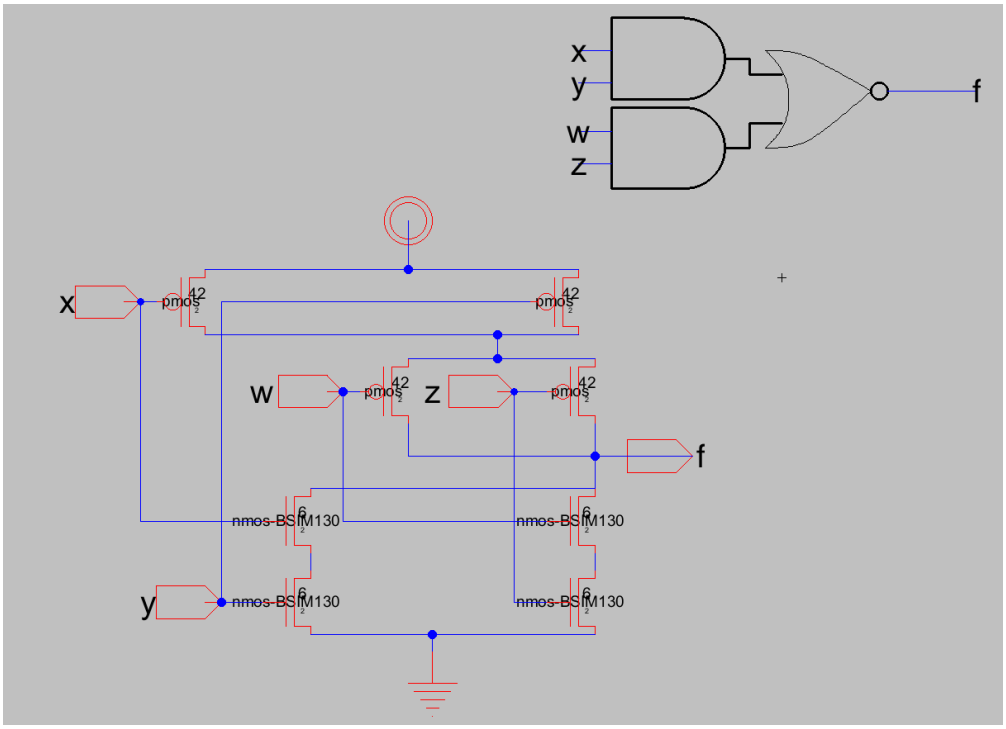

Figure 17

Size 1:

Layout

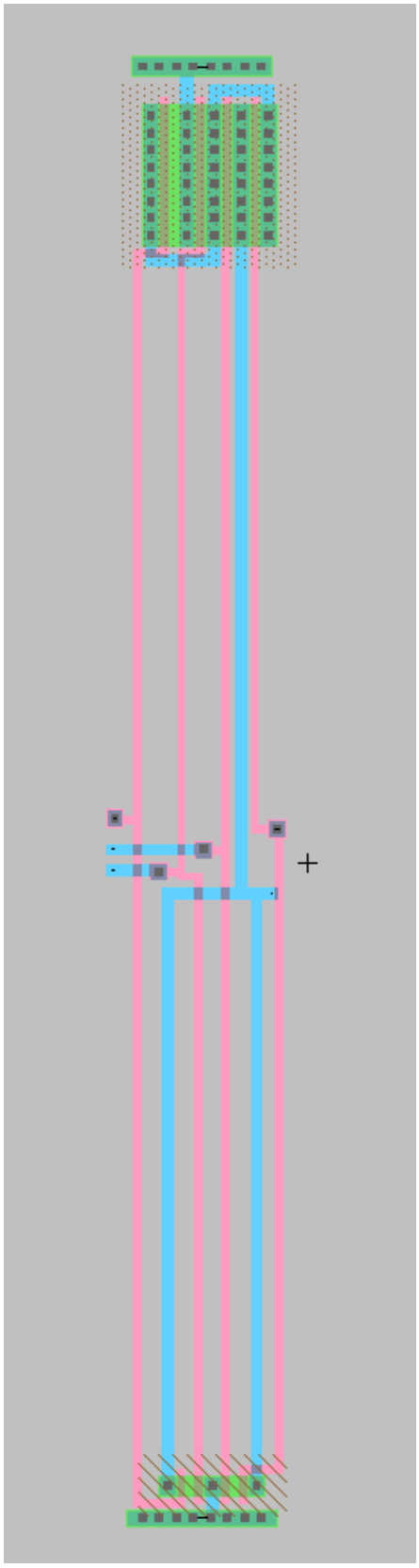

Figure 18

Propagation Delays

T_{pdf}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	7.7993e-010	1.04467e-009	1.61458e-009	2.78472e-009
100 ps	4.03291e-010	7.16808e-010	1.33595e-009	2.54249e-009
400 ps	4.4658e-010	7.49322e-010	1.3632e-009	2.57081e-009
800 ps	5.22926e-010	8.19162e-010	1.41624e-009	2.61198e-009

T_{pdr}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	8.57293e-011	2.72756e-010	5.62745e-010	1.05083e-009
100 ps	1.49387e-010	2.7536e-010	5.26061e-010	1.01262e-009
400 ps	1.56695e-010	2.75856e-010	5.23412e-010	1.01095e-009
800 ps	1.55713e-010	2.91029e-010	5.29459e-010	1.02787e-009

Linear Delay Model

Using Tpdf

7.799e-10 = 130e-15 k1 + 0 +k3

4.03e-10 = 130e-15 k1 + 100e-12 k2 + k3

1.36e-9 = 520e-15 + 400e-12 k2 + k3

K1 = 5353.07

k2= -3.769

K3 = 8.4 e-11

Tpdf = 5353.07 x cload -3.769 x transition time + 8.4 e-11

Using Tpdr

8.57e-11 = 130 e-15 k1 + 0 + k3

5.26e-10 = 520e-15 k1 + 100e-12 + k3

1.56e-10 = 130e-15 k1 + 400e-12 k2 + k3

K1 = 1083.91

K2 = 0.17575

K3 = -5.52e-11

Tpdr = 1083.91 x cload + 0.17575 x transition time -5.52e-11

Size 2:

Layout

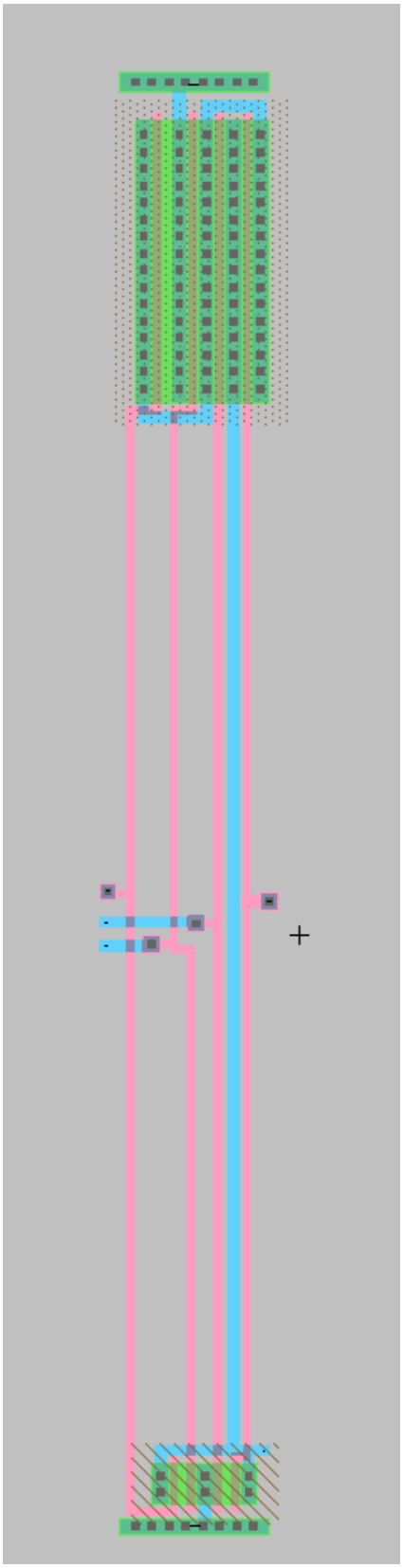

Figure 19

Propagation Delays

T_{pdf}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	6.28306e-010	7.83317e-010	1.0507e-009	1.60331e-009
100 ps	2.43963e-010	3.97512e-010	7.15835e-010	1.32275e-009
400 ps	2.93852e-010	4.40244e-010	7.50177e-010	1.34947e-009
800 ps	3.78422e-010	5.16643e-010	7.99635e-010	1.40225e-009

T_{pdr}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	3.33506e-011	8.69611e-011	2.72328e-010	5.6115e-010
100 ps	8.56002e-011	1.48168e-010	2.72846e-010	5.24541e-010
400 ps	9.02878e-011	1.55428e-010	2.73644e-010	5.20531e-010
800 ps	7.34747e-011	1.55666e-010	2.88397e-010	5.27924e-010

Linear Delay Model

Using Tpdf

5.47e-10 = 130e-15 k1 + 0 +k3

2.42e-10 = 260e-15 k1 + 100e-12 + k3

7.98e-10 = 1040e-15 k1 + 800e-12 + k3

K1 = 1307.101

K2 = -1.173

k3= 3.77e-10

Tpdf =1307.101 x cload -1.173 x transition time + 3.77e-10

Using Tpdr

1.05e-10 = 130e-15 k1 + 0 + k3

5.56e-11 = 130e-15 k1 + 100e-12 k2 + k3

9.02e-11 = 260e-15 k1 + 400e-12 k2 + k3

K1 = 1406.15

K2 = -0.494

K3 = -7.78e-11

Tpdr = 1406.15 x cload - 0.494 x transition time -7.78e-11

Size 4:

Layout

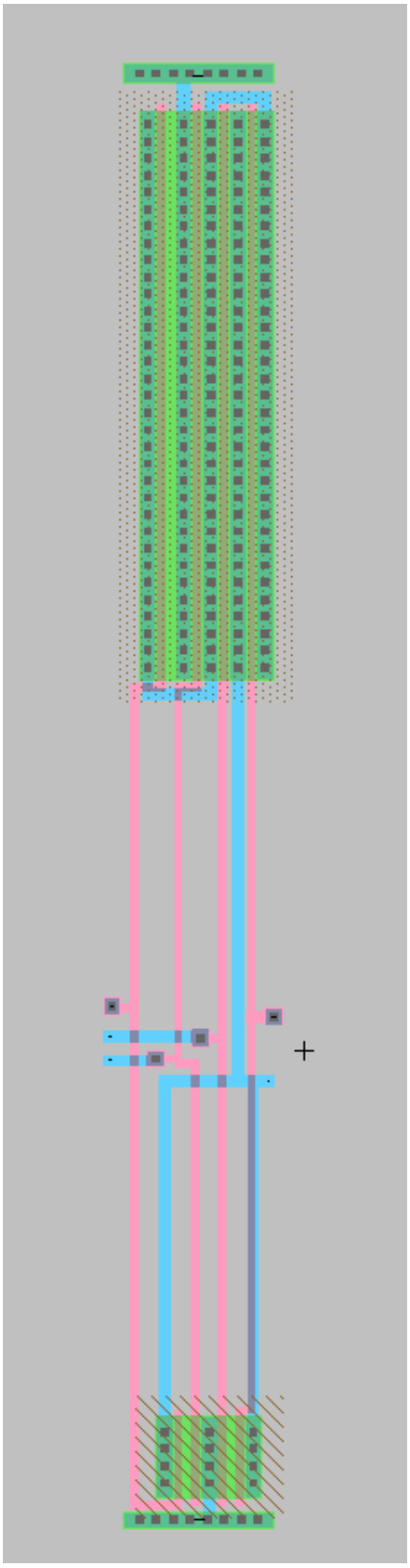

Figure 20

Propagation Delays

T_{pdf}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	5.47285e-010	6.30326e-010	7.79139e-010	1.04957e-009
100 ps	1.65828e-010	2.42059e-010	3.96217e-010	6.98302e-010
400 ps	2.23003e-010	2.92129e-010	4.35127e-010	7.35261e-010
800 ps	3.09629e-010	3.79907e-010	5.15467e-010	7.98991e-010

T_{pdr}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	1.05787e-010	3.17408e-011	8.77894e-011	2.7221e-010
100 ps	5.56799e-011	8.59193e-011	1.47289e-010	2.6797e-010
400 ps	5.05174e-011	9.02109e-011	1.56887e-010	2.7419e-010
800 ps	2.06591e-011	7.2543e-011	1.55723e-010	2.8991e-010

Linear Delay Model

Using Tpdf

1.79038e-010= (K1*130e-15) +(K2*100e-12) +K3

5.56749e-010= (K1*620e-15)+(K2*0e-12)+k3

7.67043e-010=(K1*1040e-15) +(K2*800e-12)+K3

K1=744.6963

K2=-0.1280

K3= 9.503728e-11

Tpdf = 744.6963 x cload -0.1280 x transition time + 9.503728e-11

Using Tpdr

1.31135e-010= (K1*130e-15) +(K2*100e-12) +K3

5.08172e-010= (K1*260e-15)+(K2*0e-12)+k3

7.25733e-010=(K1*520e-15) +(K2*800e-12)+K3

K1= 2487.55

K2=-0.53654

K3= 1.385928e-10

Tpdr = 2487.55x cload -0.53654 x transition time + 1.385928e-10

5- The function $g(x,y,z) = \overline{xy + xz + yz}$

Stick Diagram

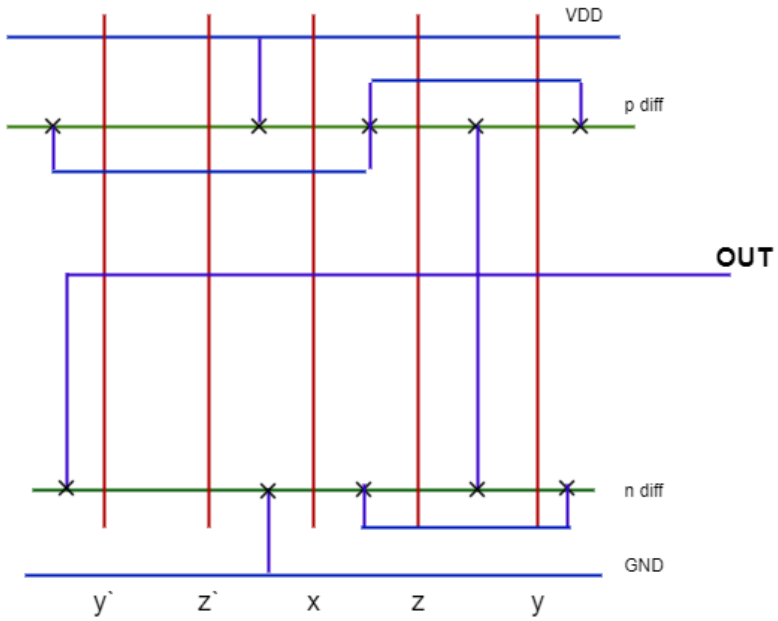

Figure 21

$$height = 56\lambda$$

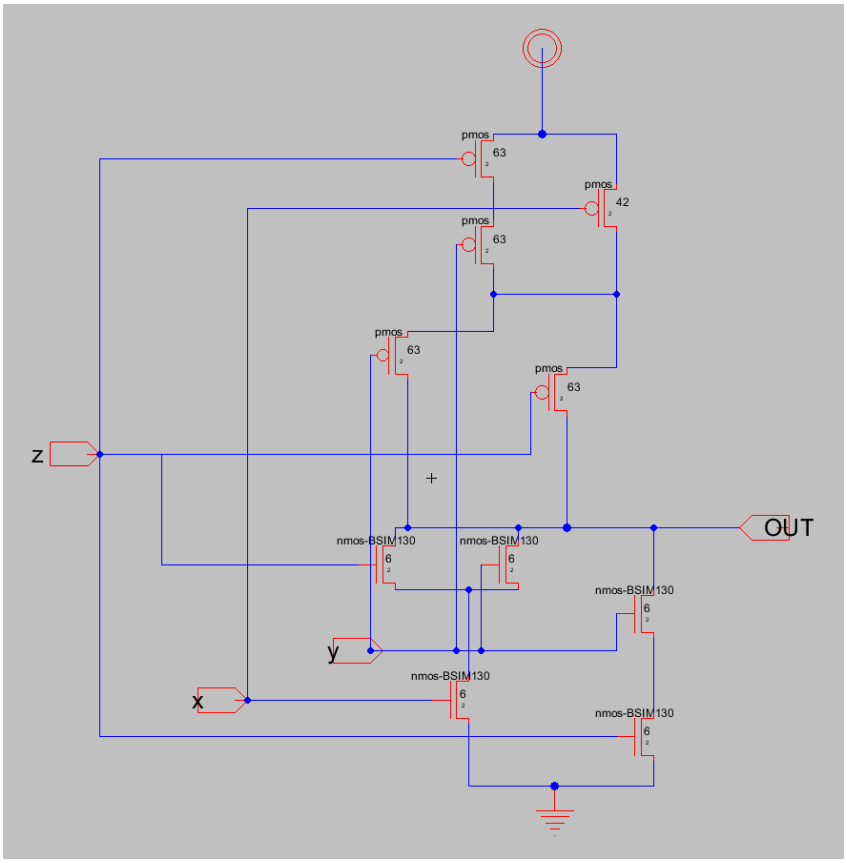

Figure 21

Size 1:

Layout

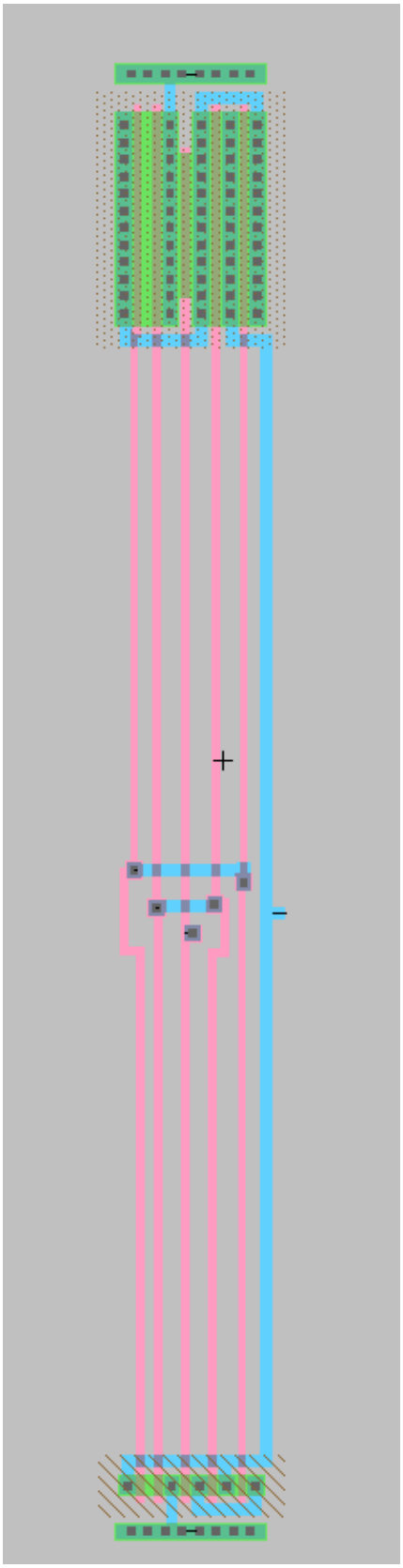

Figure 22

Propagation Delays

T_{pdf}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	6.96894e-010	9.53528e-010	1.51668e-009	2.68267e-009
100 ps	4.22112e-010	7.34425e-010	1.34565e-009	2.561e-009
400 ps	4.39067e-010	7.44635e-010	1.35873e-009	2.5675e-009
800 ps	4.92484e-010	7.85939e-010	1.38653e-009	2.5878e-009

T_{pdr}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	6.52635e-010	9.22698e-010	1.47636e-009	2.64939e-009
100 ps	3.70615e-010	6.79984e-010	1.30028e-009	2.51616e-009
400 ps	3.91647e-010	6.92703e-010	1.30498e-009	2.52213e-009
800 ps	4.47489e-010	7.37409e-010	1.33483e-009	2.5409e-009

Linear Delay Model

Using Tpdf

4.22112e-010= (K1*130e-15) +(K2*100e-12) +K3

1.51668e-009= (K1*520e-15)+(K2*0e-12)+k3

2.5878e-009=(K1*1040e-15) +(K2*800e-12)+K3

K1= 2699.9076

K2=-0.41604

K3= 1.12728e-10

Tpdf = 2699.9076 x cload -0.41604x transition time + 1.12728e-10

Using Tpdr

3.70615e-010= (K1*130e-15) +(K2*100e-12) +K3

1.47636e-009= (K1*520e-15)+(K2*0e-12)+k3

7.37409e-010=(K1*260e-15) +(K2*800e-12)+K3

K1= 2690.42

K2=-0.0492

K3= 7.72794e-11

Tpdr = 2690.42 x cload -0.0492x transition time + 7.72794e-11

Size 2:

Layout

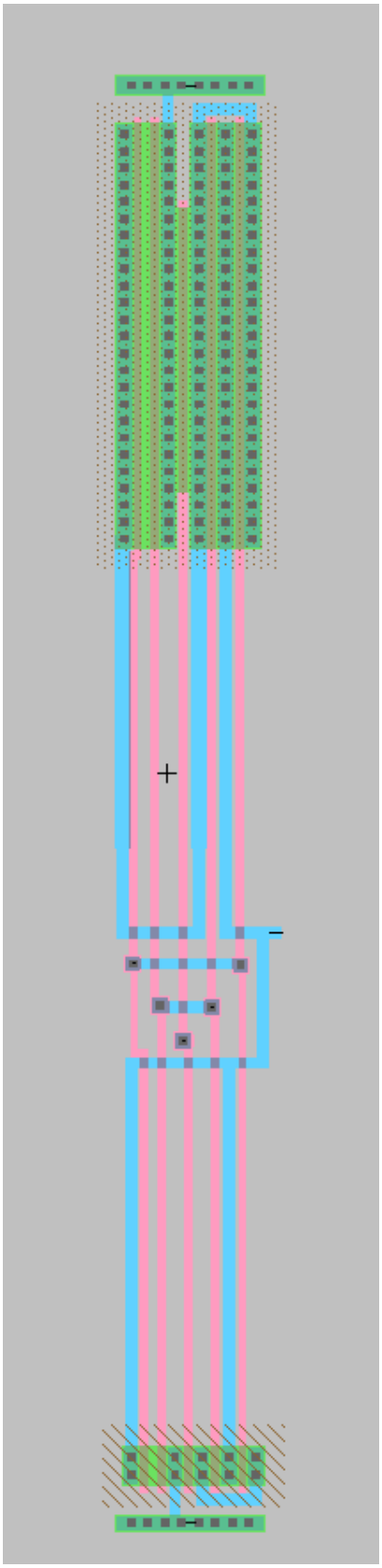

Figure 23

Propagation Delays

T_{pdf}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	5.56696e-010	6.87823e-010	9.49712e-010	1.50267e-009
100 ps	2.58636e-010	4.13089e-010	7.20544e-010	1.33706e-009
400 ps	2.88122e-010	4.34556e-010	7.35064e-010	1.34735e-009
800 ps	3.54498e-010	4.83445e-010	7.70966e-010	1.3692e-009

T_{pdr}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	5.05691e-010	6.48891e-010	9.16454e-010	1.4723e-009
100 ps	2.09841e-010	3.63682e-010	6.71145e-010	1.28297e-009
400 ps	2.42086e-010	3.86394e-010	6.8561e-010	1.29318e-009
800 ps	3.1223e-010	4.43407e-010	7.27228e-010	1.32609e-009

Linear Delay Model

Using Tpdf

2.58636e-010= (K1*130e-15) +(K2*100e-12) +K3

1.50267e-009= (K1*1040e-15)+(K2*0e-12)+k3

7.70966e-010=(K1*520e-15) +(K2*800e-12)+K3

K1= 1363.91

K2=-0.0279

K3= 8.41264e-11

Tpdf = 1363.91x cload -0. 0279 x transition time + 8.41264e-11

Using Tpdr

2.09841e-010= (K1*130e-15) +(K2*100e-12) +K3

1.4723e-009= (K1*1040e-15)+(K2*0e-12)+k3

7.27228e-010=(K1*520e-15) +(K2*800e-12)+K3

K1= 1383.82

K2=-0.03178

K3= 3.312276e-11

Tpdr = 1383.821x cload -0. 03178 x transition time + 3.312276e-11

Size 4:

Layout

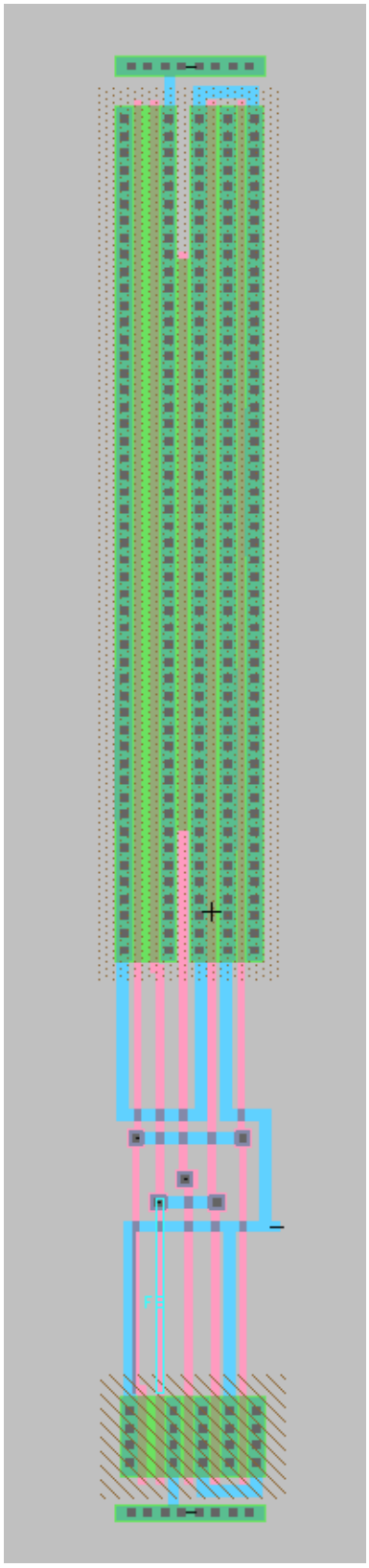

Figure 24

Propagation Delays

T_{pdf}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	4.83209e-010	5.56749e-010	6.91667e-010	9.53362e-010
100 ps	1.79038e-010	2.55775e-010	4.09018e-010	7.14334e-010
400 ps	2.16786e-010	2.8582e-010	4.29921e-010	7.27116e-010
800 ps	2.84614e-010	3.50855e-010	4.85088e-010	7.67043e-010

T_{pdr}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	4.24459e-010	5.08172e-010	6.5128e-010	9.18806e-010
100 ps	1.31135e-010	2.08094e-010	3.61279e-010	6.66689e-010
400 ps	1.73123e-010	2.4213e-010	3.85985e-010	6.80629e-010
800 ps	2.40103e-010	3.08917e-010	4.4536e-010	7.25733e-010

Linear Delay Model

Using Tpdf

1.79038e-010= (K1*130e-15) +(K2*100e-12) +K3

5.56749e-010= (K1*620e-15)+(K2*0e-12)+k3

7.67043e-010=(K1*1040e-15) +(K2*800e-12)+K3

K1=744.6963

K2=-0.1280

K3= 9.503728e-11

Tpdf = 744.6963 x cload -0.1280 x transition time + 9.503728e-11

Using Tpdr

1.31135e-010= (K1*130e-15) +(K2*100e-12) +K3

5.08172e-010= (K1*260e-15)+(K2*0e-12)+k3

7.25733e-010=(K1*520e-15) +(K2*800e-12)+K3

K1= 2487.55

K2=-0.53654

K3= 1.385928e-10

Tpdr = 2487.55x cload -0.53654 x transition time + 1.385928e-10

6- The function $h(w,x,y,z) = \overline{xyz + (x+y+z)w}$

Stick Diagram

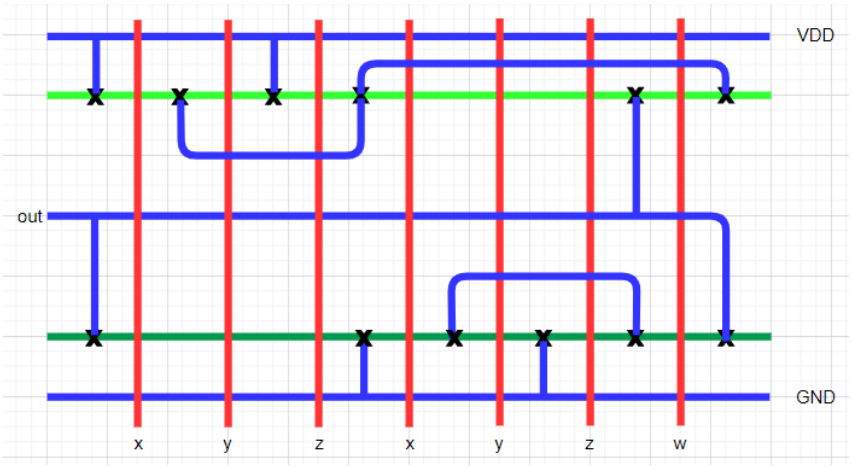

Figure 25

$$height = 72\lambda$$

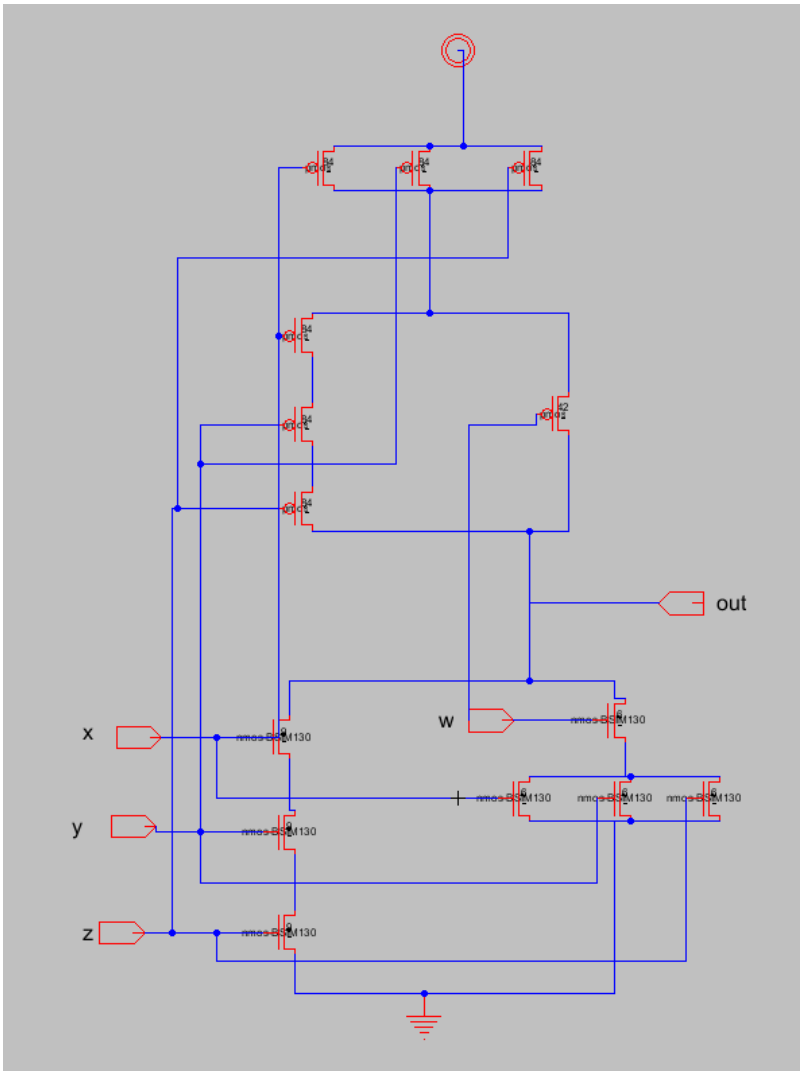

Figure 26

Size 1:

Layout

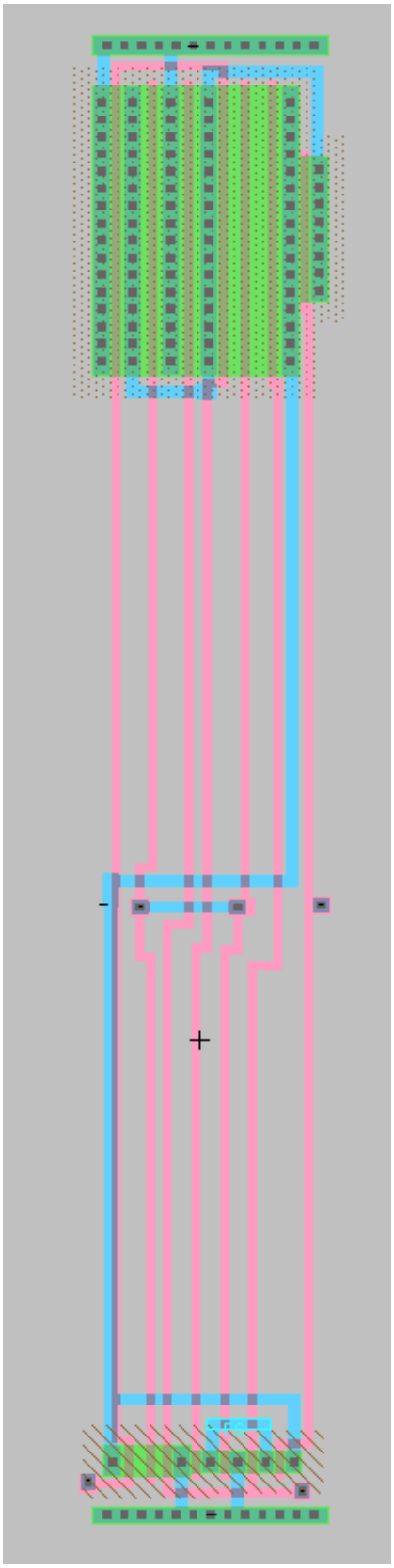

Figure 27

Propagation Delays

T_{pdf}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	8.23758e-010	1.05296e-009	1.54763e-009	2.56104e-009
100 ps	4.09499e-010	6.88334e-010	1.24288e-009	2.3053e-009
400 ps	4.49268e-010	7.1962e-010	1.26536e-009	2.32584e-009
800 ps	5.30066e-010	7.8373e-010	1.31883e-009	2.37263e-009

T_{pdr}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	7.96914e-010	1.0476e-009	1.58164e-009	2.74629e-009
100 ps	4.64221e-010	7.76108e-010	1.39188e-009	2.6032e-009
400 ps	4.84167e-010	7.88169e-010	1.39924e-009	2.61026e-009
800 ps	5.46521e-010	8.32074e-010	1.43521e-009	2.63234e-009

Linear Delay Model

Using Tpdf

8.23e-10 = 130e-15 k1 + 0 + k3

4.094 e10 = 130e-15 k1 + 100e-12 k2 + k3

1.265e-9 = 520e-15 k1 + 400e-12 k2 + k3

K1 = 5375.384

K2 = -4.136

K3 = 1.242 e-10

Tpdf = 5375.384 x cload -4.136 x transition time +1.242 e-10

Using Tpdr

7.96e-10 = 130e-15 k1 + 100 e-12 k2 + k3

4.6422e-10 = 130e-15 k1 + 100e-12 k2 + k3

1.399e-9 = 520e-15 + 400 e-12 k2 + k3

K1 = 4949.03

K2 = -3.3178

k3= 1.5262e-10

Tpdr = 4949.03 x cload -3.3178 x transition time + 1.5262e-10

Size 2:

Layout

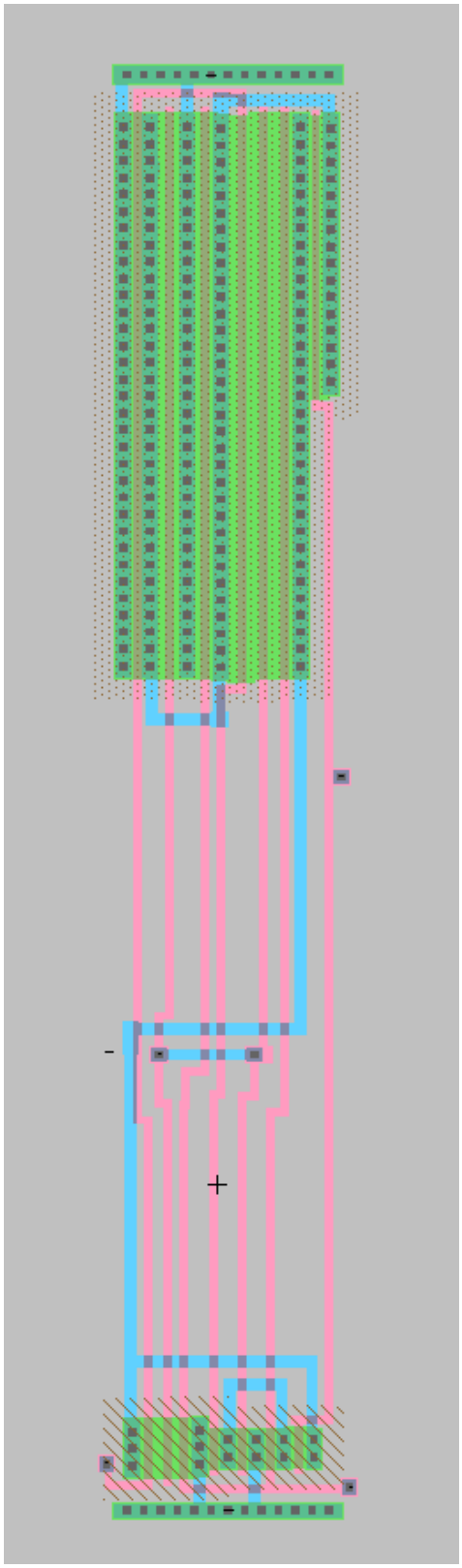

Figure 28

Propagation Delays

T_{pdf}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	6.91235e-010	8.16775e-010	1.05038e-009	1.53881e-009
100 ps	2.64358e-010	4.02451e-010	6.76022e-010	1.23006e-009
400 ps	3.11657e-010	4.45533e-010	7.06194e-010	1.25504e-009
800 ps	4.03887e-010	5.25701e-010	7.79443e-010	1.30769e-009

T_{pdr}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	6.61459e-010	7.84813e-010	1.03669e-009	1.58795e-009
100 ps	2.97159e-010	4.50903e-010	7.59026e-010	1.37028e-009
400 ps	3.27228e-010	4.75243e-010	7.78841e-010	1.38773e-009
800 ps	4.05676e-010	5.42132e-010	8.18619e-010	1.41484e-009

Linear Delay Model

Using Tpdf

6.912e-10 = 130e-15 k1 + 0 + k3

4.02e-10 = 260e-15 k1 + 100e-12 k2 + k3

1.255e-10 = 1040 e-15 k1 + 400e-12 k2 + k3

K1 = 4.412

K2 = -8.623

K3 = 1.176 e-10

Tpdf = 4.412 x cload -8.623 x transition time +1.176 e-10

Using Tpdr

6.52e-10 = 130e-15 k1 + 0 + k3

3.706e-10 = 130e-15 k1 + 100e-12 k2 + k3

1.30e-9 = 520 e-15 k1 + 400e-12 k2 + k3

K1 = 4547

K2 = -2.814

K3 = 6.08e-11

Tpdr = 4547 x cload -2.814 x transition time + 6.08e-11

Size 4:

Layout

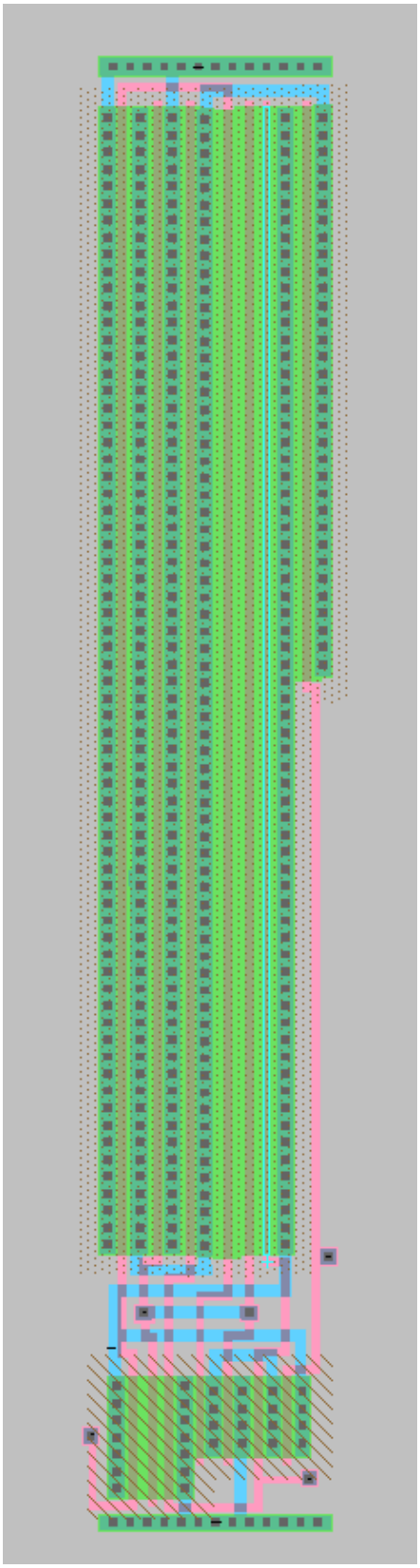

Figure 29

Propagation Delays

T_{pdf}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	6.23976e-010	6.91979e-010	8.15826e-010	1.04903e-009
100 ps	1.92941e-010	2.63131e-010	4.02232e-010	6.71701e-010
400 ps	2.47861e-010	3.1157e-010	4.40401e-010	7.04835e-010
800 ps	3.44529e-010	4.05096e-010	5.25548e-010	7.73373e-010

T_{pdr}

	Cinv	2Cinv	4Cinv	8Cinv
0 ps	5.92793e-010	6.60356e-010	7.87321e-010	1.03882e-009
100 ps	2.17746e-010	2.9541e-010	4.48863e-010	7.5383e-010
400 ps	2.59274e-010	3.29519e-010	4.73972e-010	7.71332e-010
800 ps	3.40315e-010	4.05881e-010	5.39018e-010	8.20457e-010

Linear Delay Model

Using Tpdf

6.23e-10 = 130e-15 k1 + 0 +k3

4.02e-10 = 520e-15 +100 e-12 k2 + k3

1.92e-10 = 130e-15 + 100e-12 k2 + k3

K1 = 538.46

K2 = -4.31

K3 = 5.53e-10

Tpdf = 538.46 x cload -4.31 x transition time + 5.53e-10

Using Tpdr

5.927e-10 = 130e-15 k1 + 0 + k3

2.177e-10 = 130e-15 k1 + 100e-12 + k3

1.038e-9 = 1040e-15 + 0 + k3

K1 = -6.51 e22

K2 = -5.927e20

K3 = 6.77e10

Tpdr = -6.51 e22 x cload -5.927e20 x transition time + 6.77e10

Contribution work:

Every member took two functions and was responsible for creating its stick diagram, schematic, layout, simulations and its calculations.

Marwan	**Function 3,4**
Mohammed	**Function 1,6**
Donia	**Function 2,5**