CPE151

Digital IC Design

Project 2

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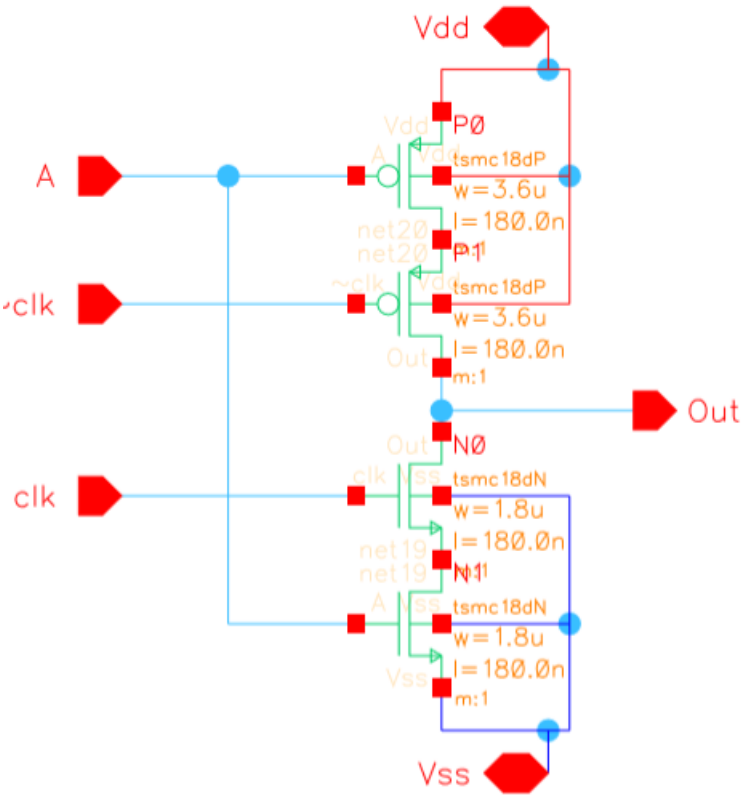
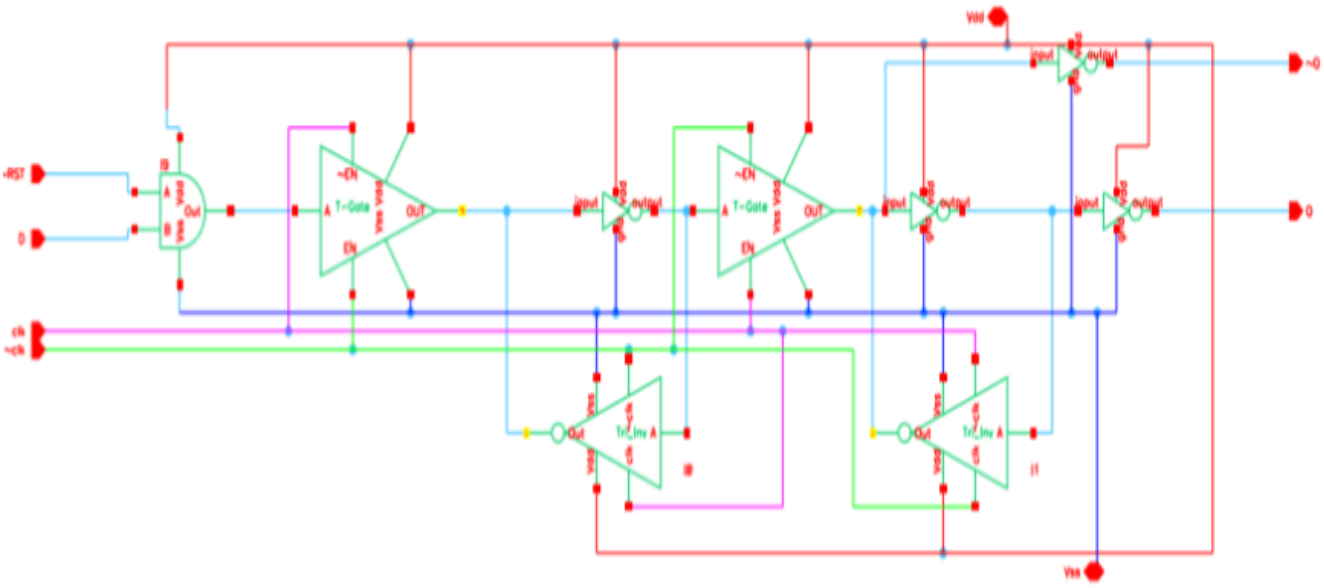
D- Flip Flop

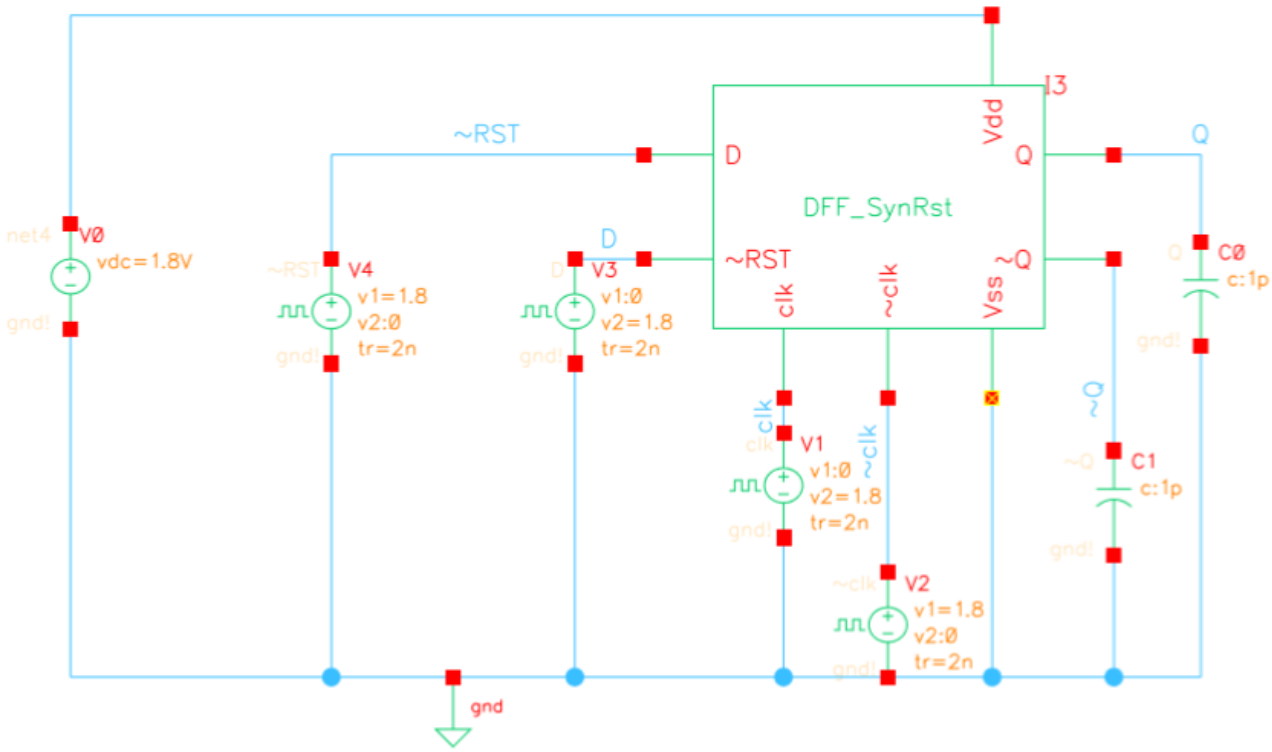
Tri-State Inverter:



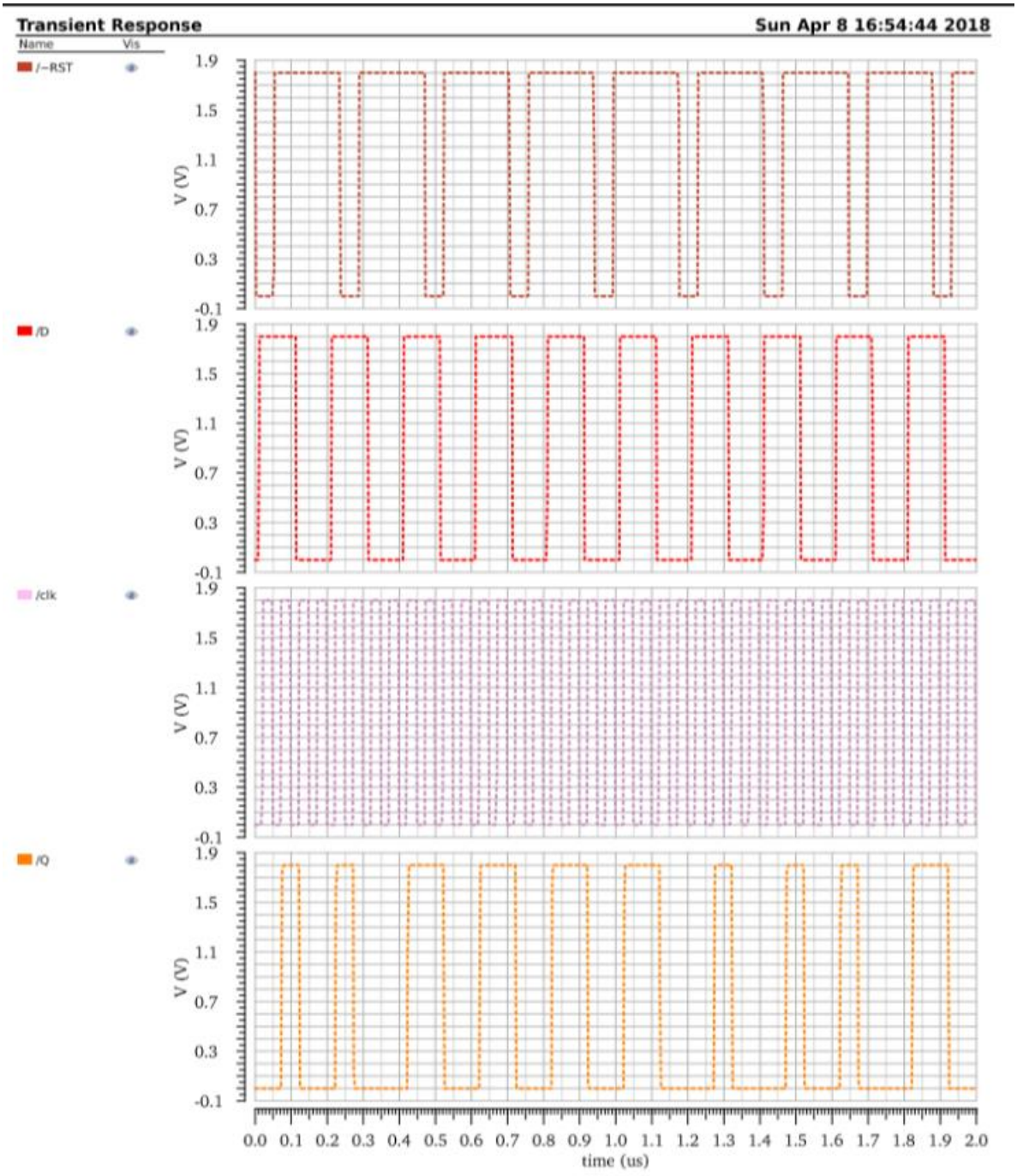
DFF Schematic:



DFF Test Bench:

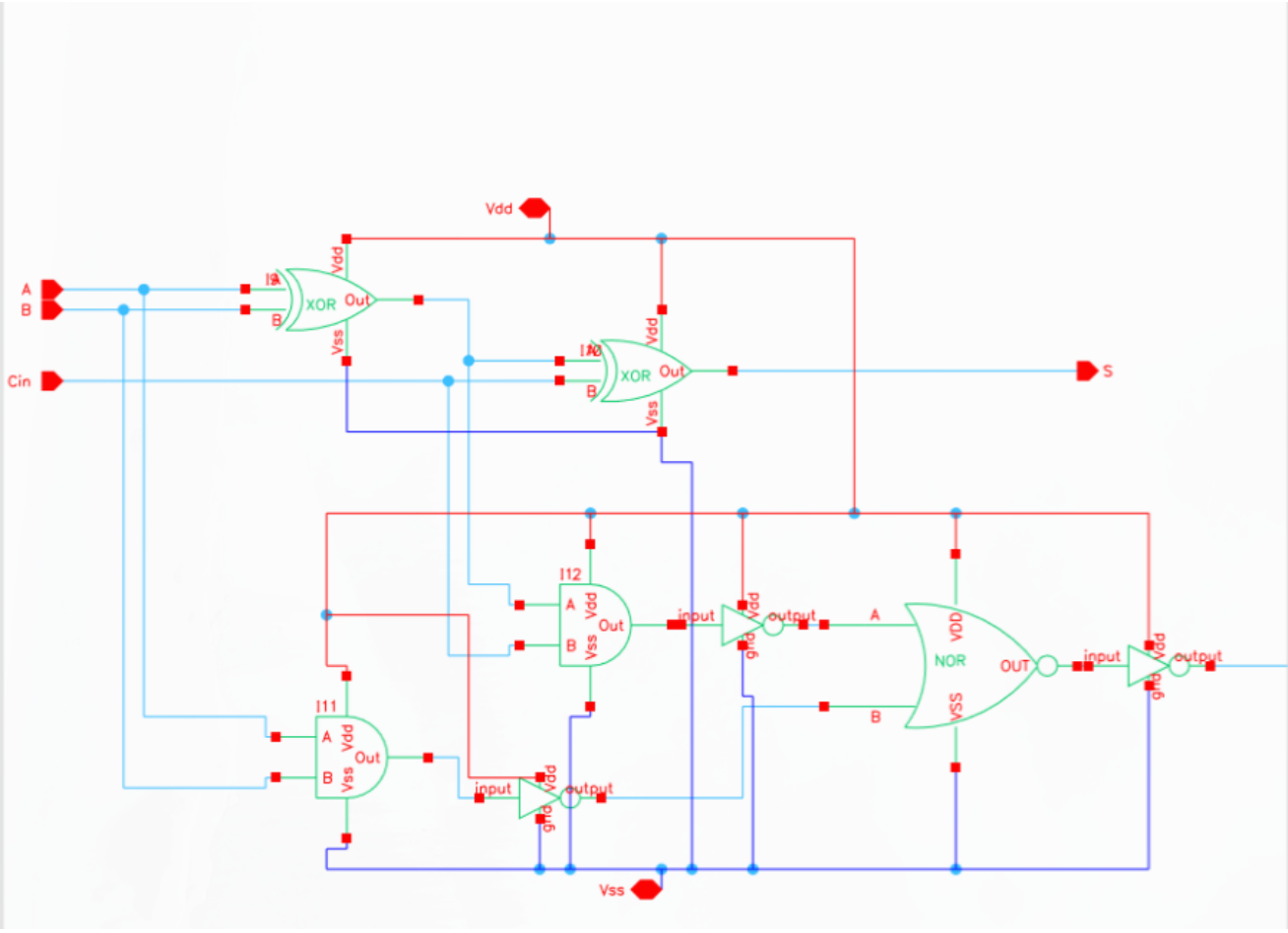


Waveform:

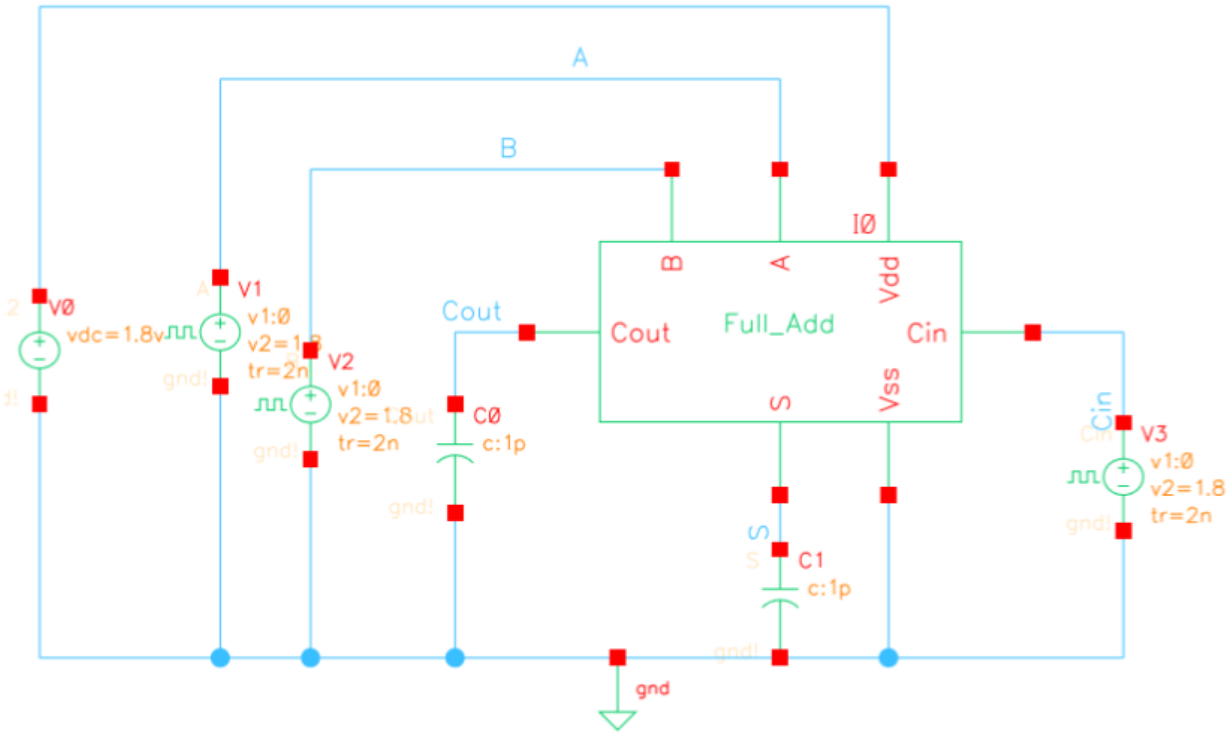

Transient Response
Sun Apr 8 16:54:44 2018
Name
Vis
/~RST
/D
/clk
/Q
V (V)
1.9
1.5
1.1
0.7
0.3
-0.1
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0
time (us)

Arithmetic Logical Unit:

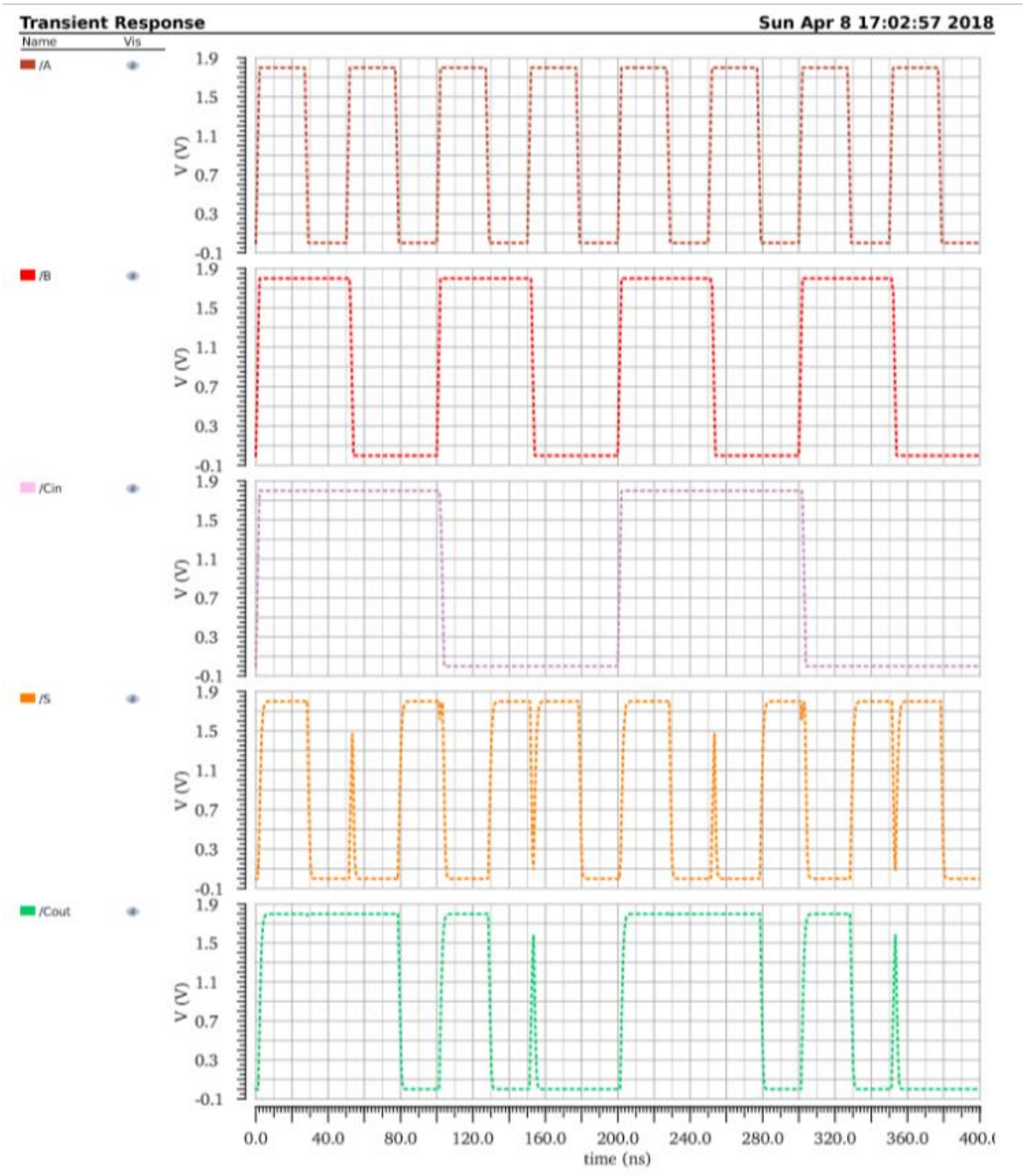
Full Adder:



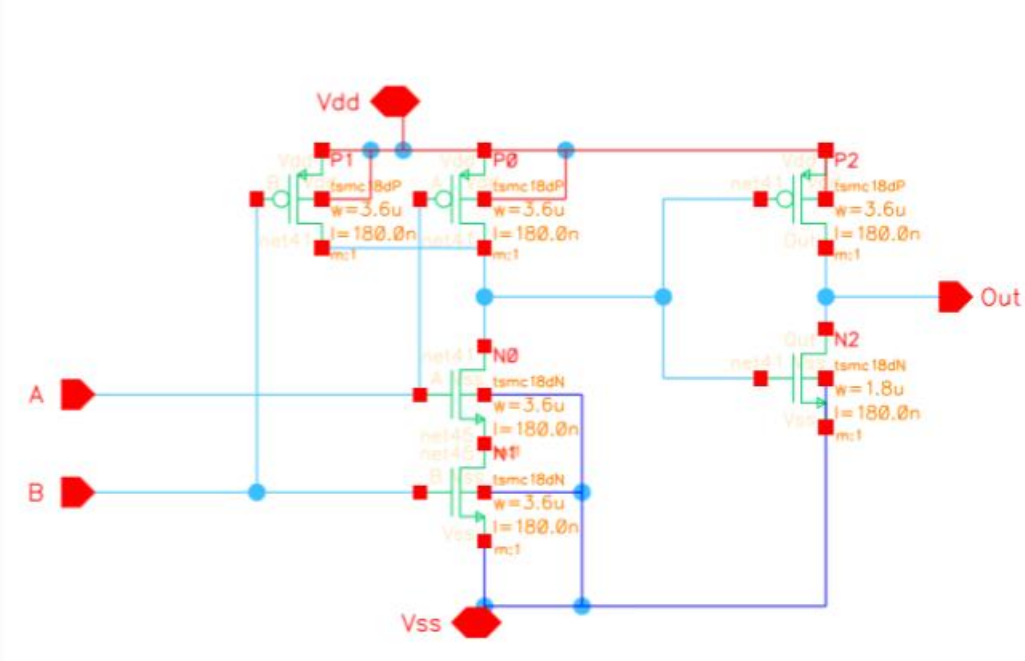
Test Bench:


A
B
I0
B
A
Vdd
Cout
Cout
Full_Add
Cin
S
Vss
V0
vdc=1.8v
V1
v1:0
v2=1.8
tr=2n
V2
v1:0
v2=1.8
tr=2n
C0
c:1p
C1
c:1p
Cin
V3
v1:0
v2=1.8
tr=2n
gnd
gnd!

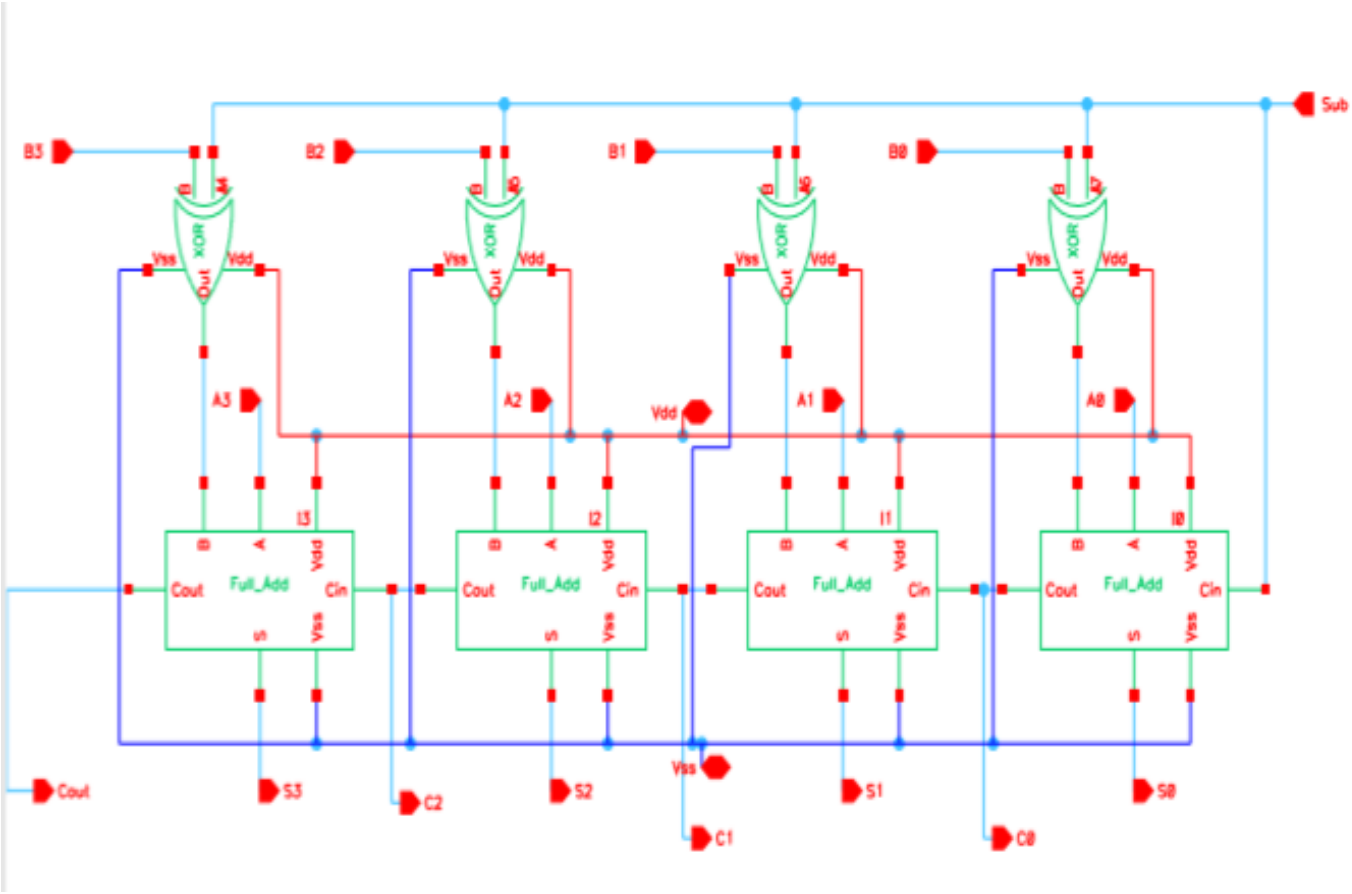
Waveform:


Transient Response
Sun Apr 8 17:02:57 2018
Name
Vis
/A
/B
/Cin
/S
/Cout
V (V)
1.9
1.5
1.1
0.7
0.3
-0.1
0.0
40.0
80.0
120.0
160.0
200.0
240.0
280.0
320.0
360.0
time (ns)

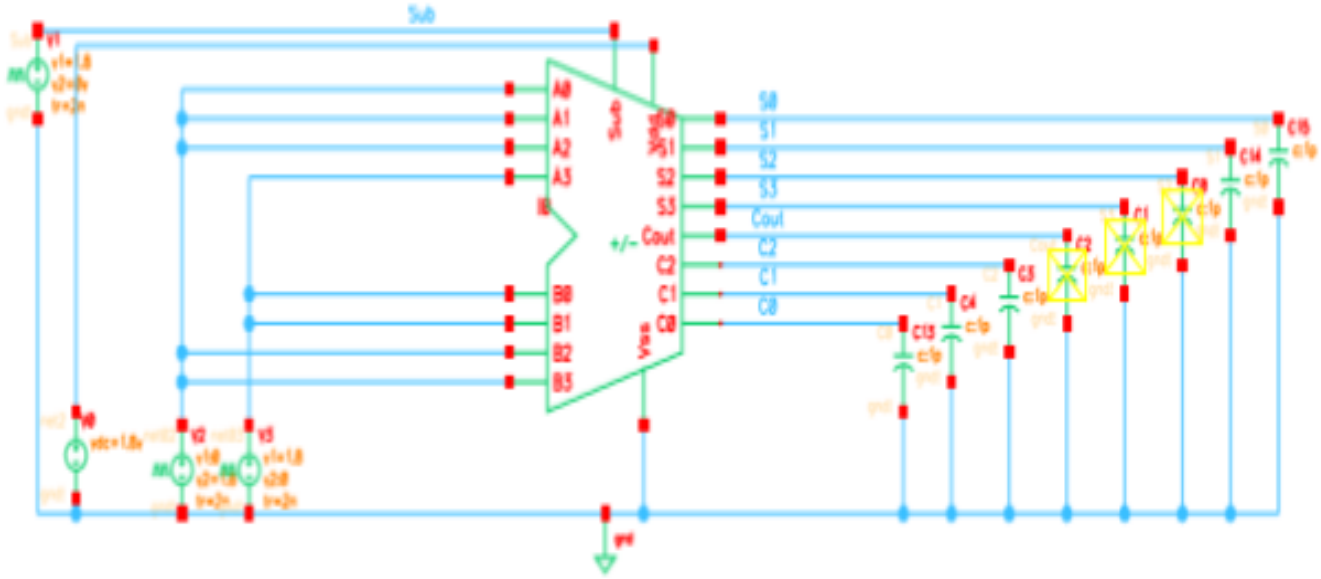
AND2_Schematic:



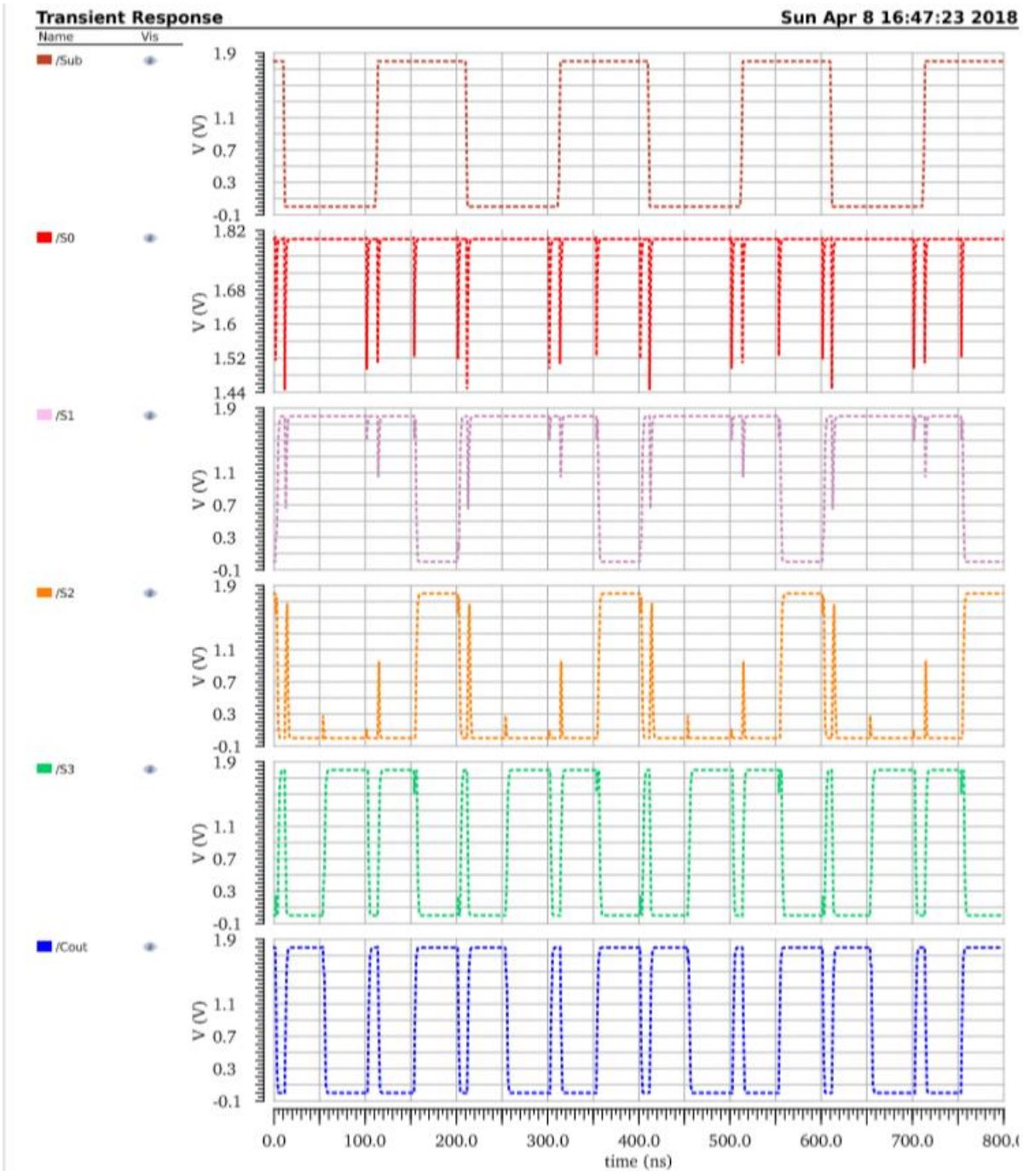
ADD/SUB Schematic:



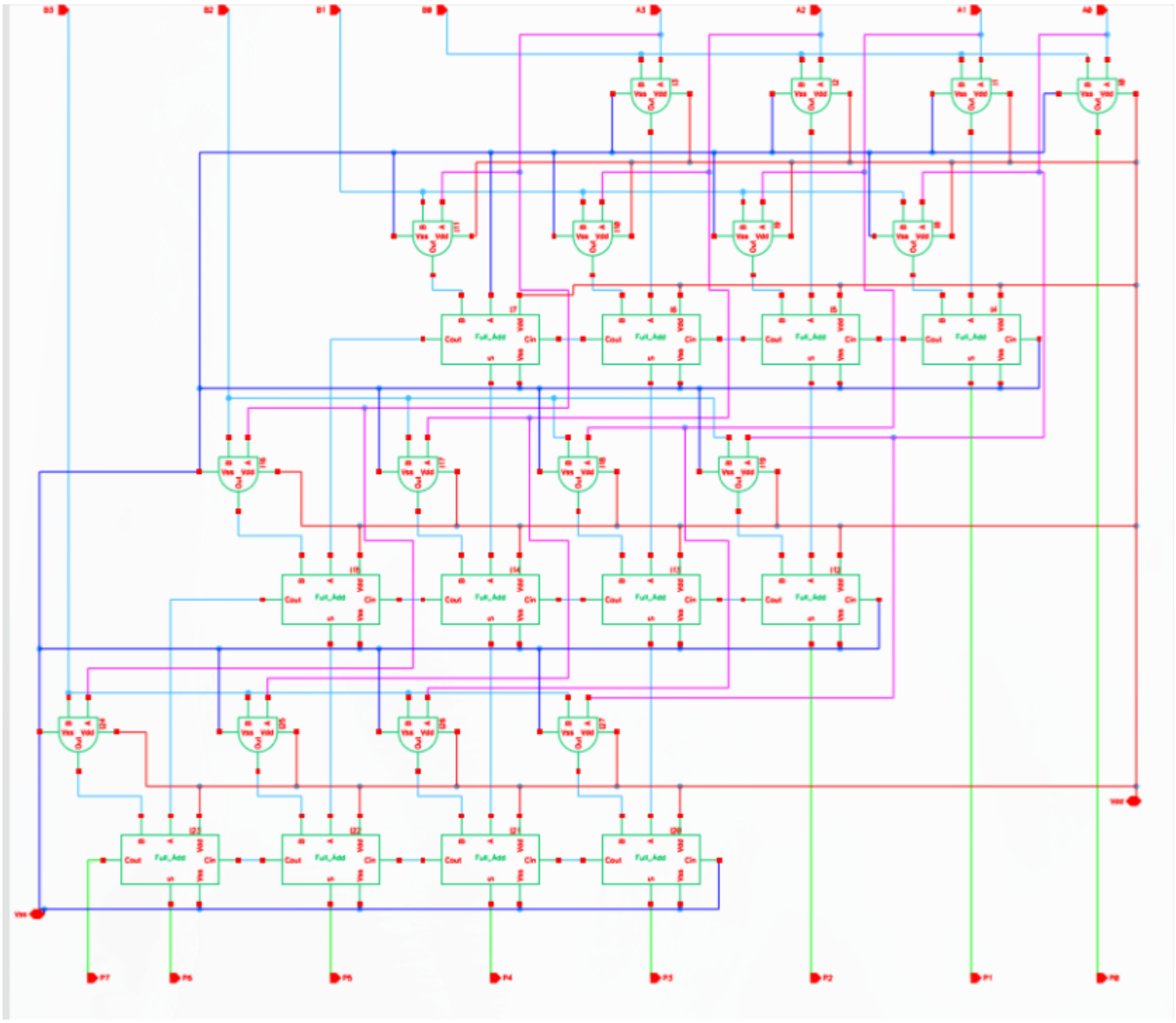
ADD/SUB test bench:



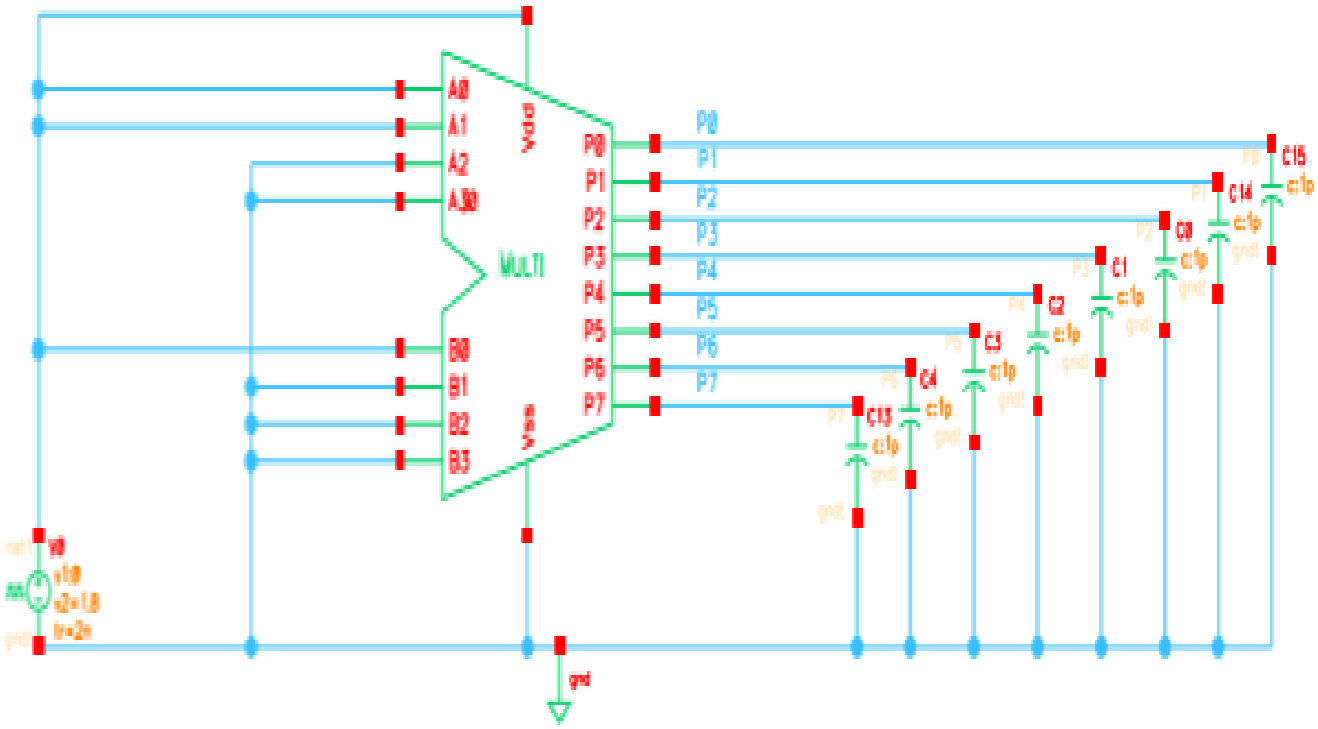
Waveform:


Transient Response
Sun Apr 8 16:47:23 2018
Name
Vis
/Sub
/S0
/S1
/S2
/S3
/Cout
V (V)
1.9
1.1
0.7
0.3
-0.1
1.82
1.68
1.6
1.52
1.44
0.0
100.0
200.0
300.0
400.0
500.0
600.0
700.0
time (ns)

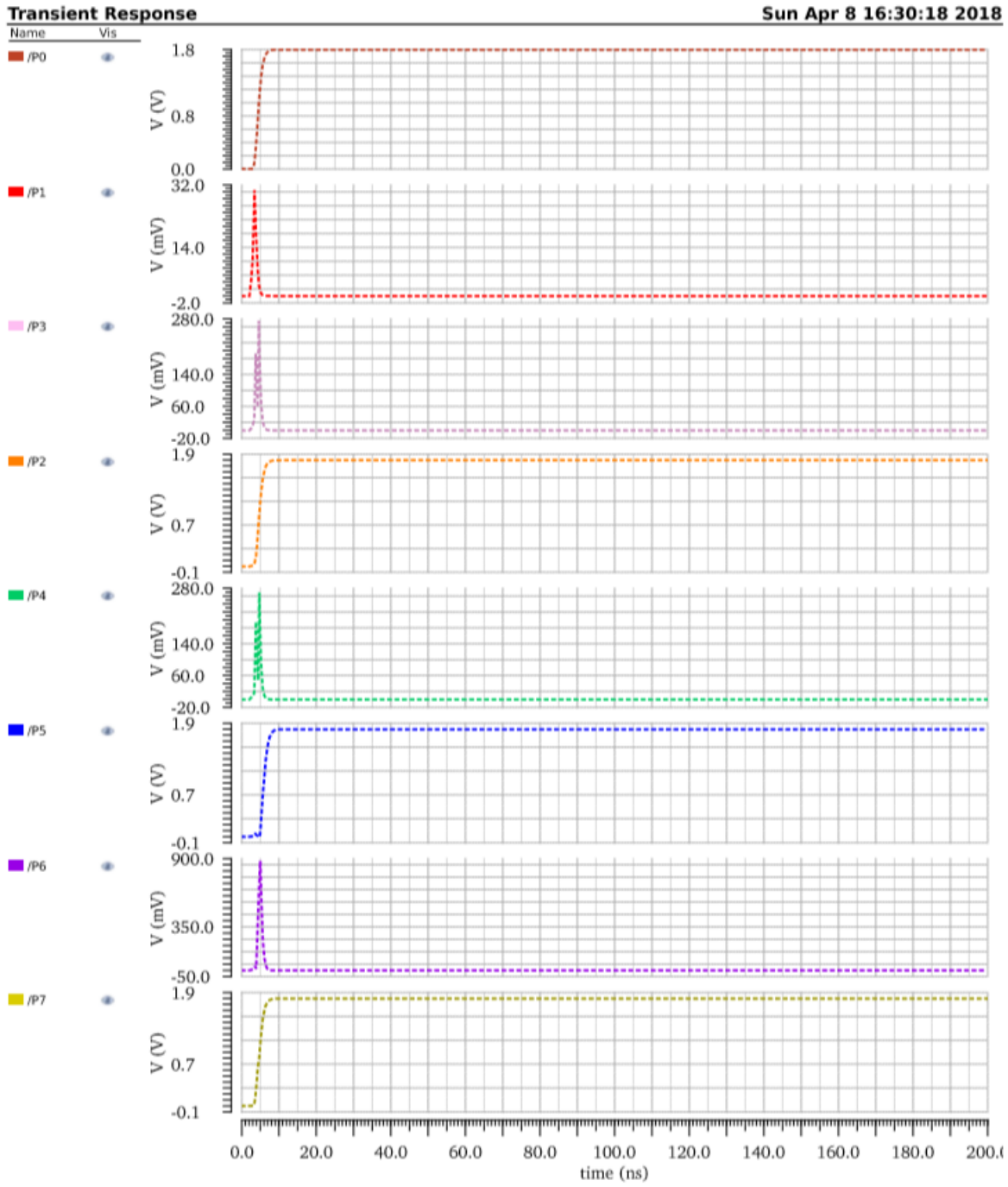
4 by 4 Multiplier Schematic:

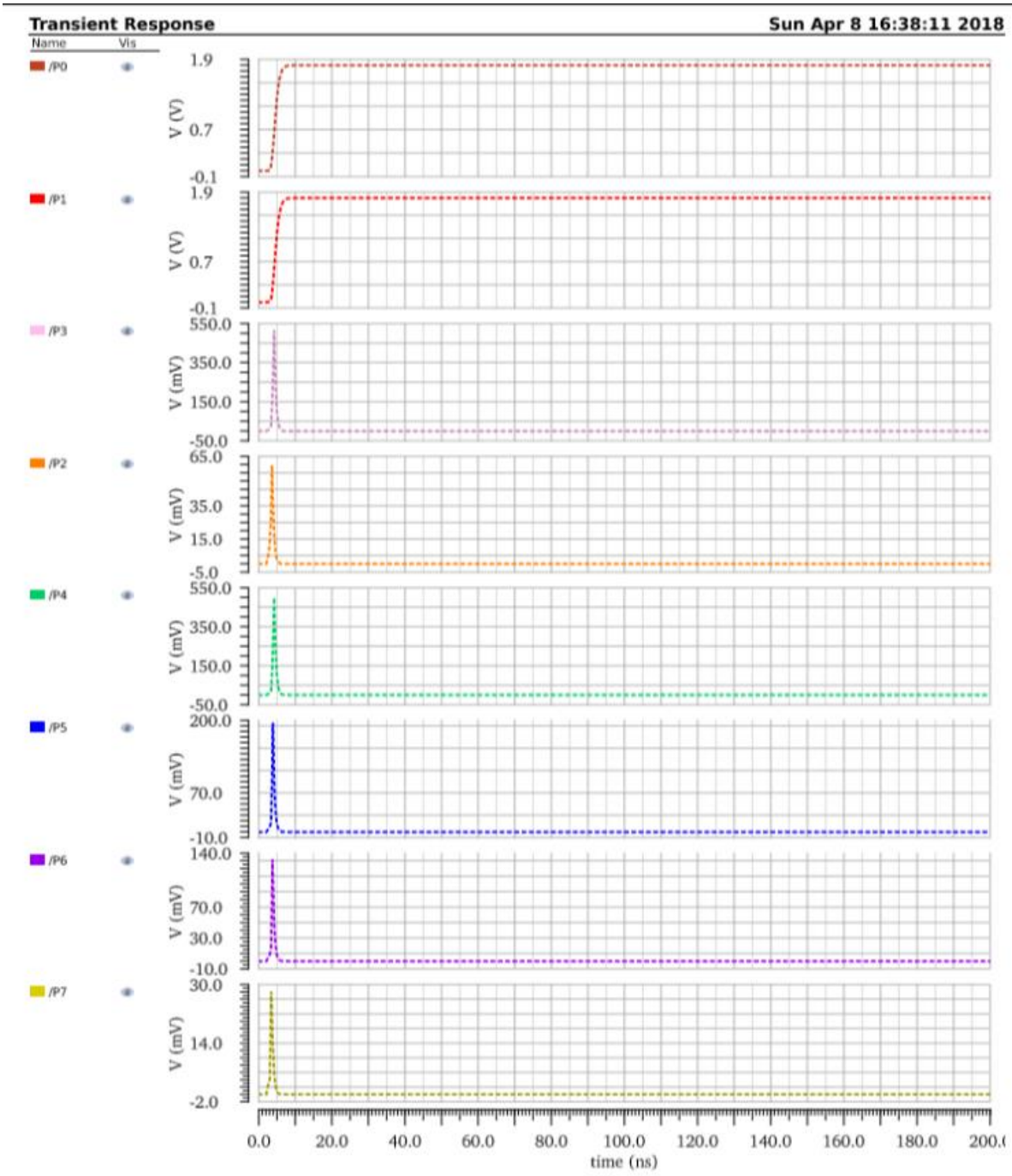


4 by 4 Multiplier Test Bench:

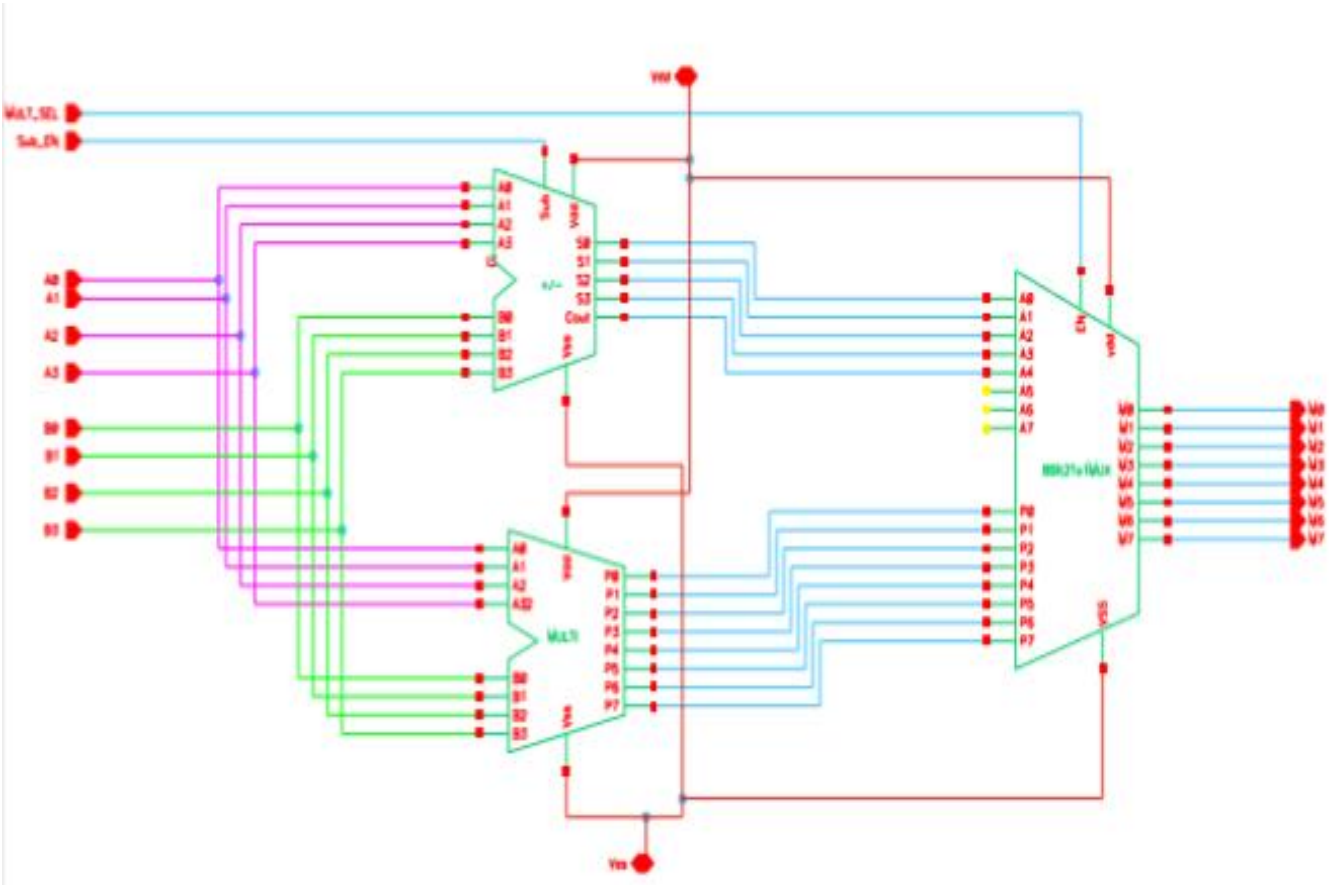


Waveform:

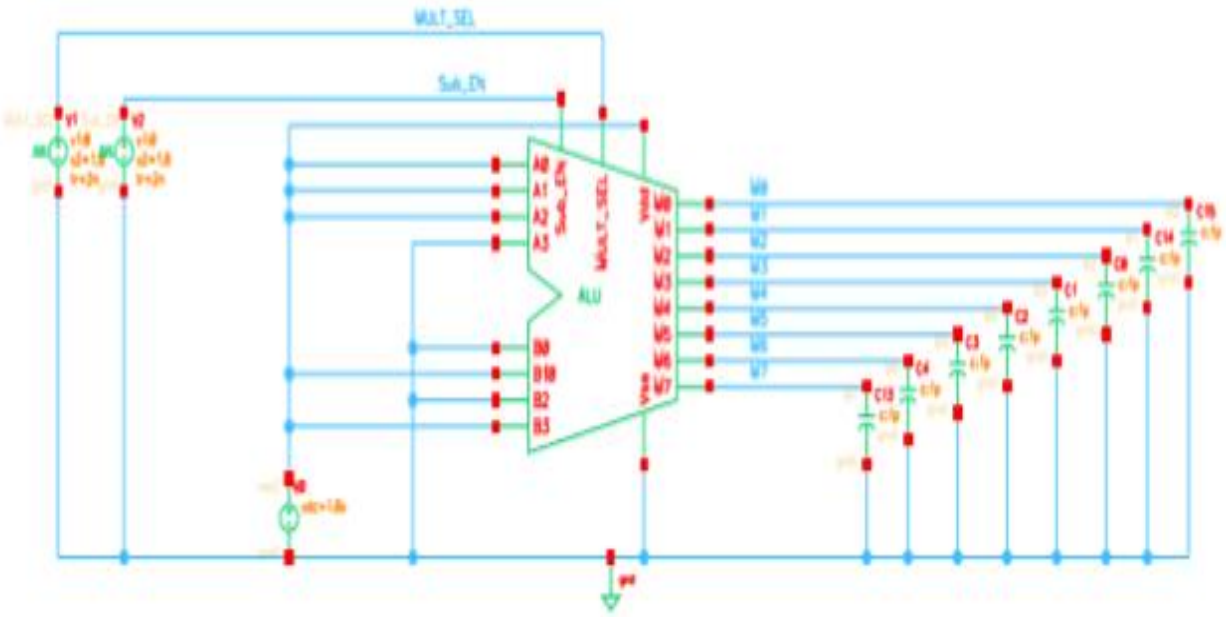

Transient Response
Sun Apr 8 16:30:18 2018
Name
Vis
/P0
/P1
/P3
/P2
/P4
/P5
/P6
/P7
V (V)
V (mV)
1.8
0.8
0.0
32.0
14.0
-2.0
280.0
140.0
60.0
-20.0
1.9
0.7
-0.1
900.0
350.0
-50.0
0.0
20.0
40.0
60.0
80.0
100.0
120.0
140.0
160.0
180.0
time (ns)


Transient Response
Sun Apr 8 16:38:11 2018
Name
Vis
/P0
/P1
/P3
/P2
/P4
/P5
/P6
/P7
V (V)
V (mV)
1.9
0.7
-0.1
550.0
350.0
150.0
-50.0
65.0
35.0
15.0
-5.0
200.0
70.0
-10.0
140.0
30.0
30.0
14.0
-2.0
0.0
20.0
40.0
60.0
80.0
100.0
120.0
140.0
160.0
180.0
time (ns)

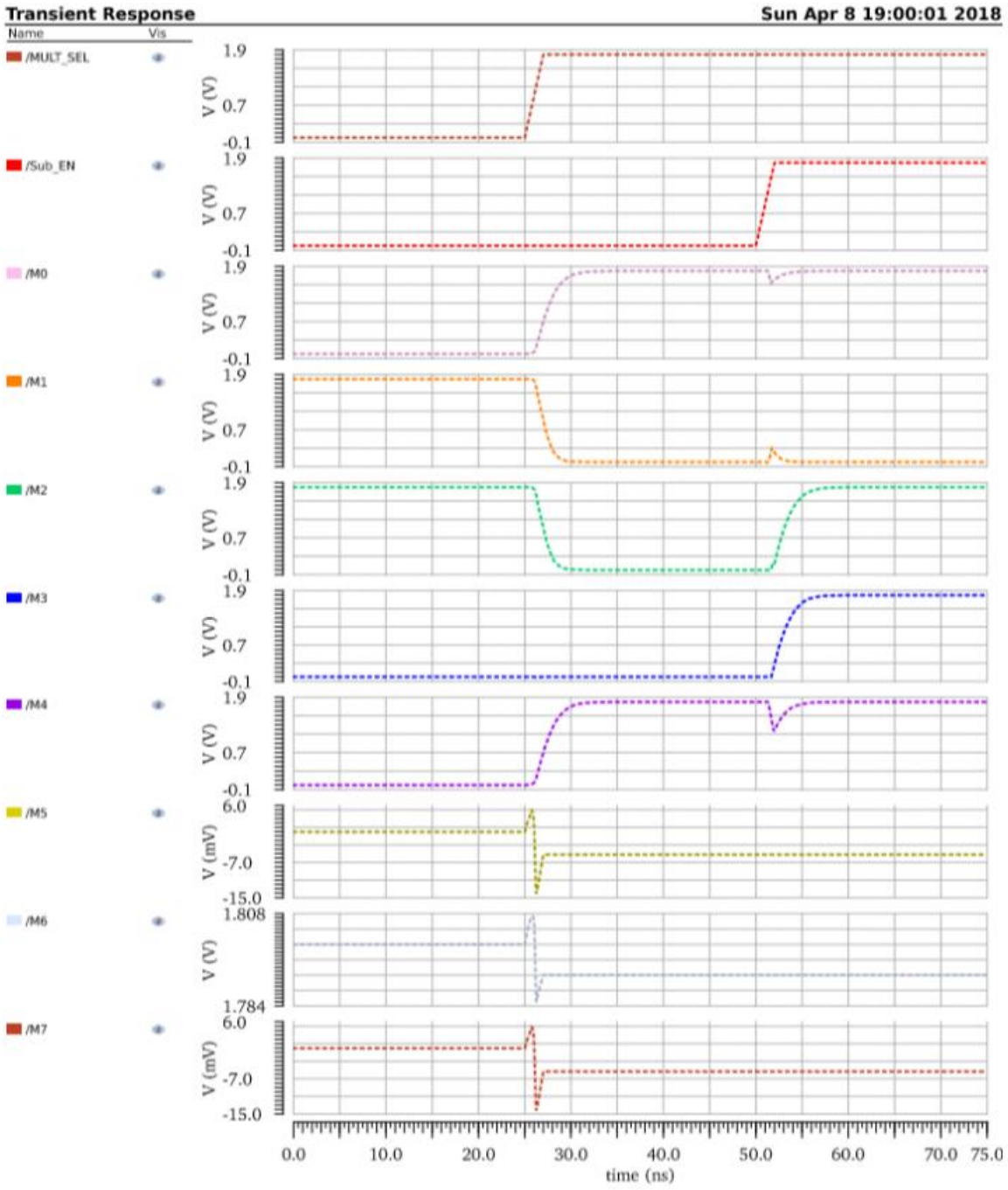
ALU Schematic:



ALU Test Bench:



Waveform:


Transient Response
Sun Apr 8 19:00:01 2018
Name
Vis
/MULT_SEL
/Sub_EN
/M0
/M1
/M2
/M3
/M4
/M5
/M6
/M7
1.9
0.7
-0.1
V (V)
6.0
-7.0
-15.0
V (mV)
1.808
1.784
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
75.0
time (ns)