

# 積體電路設計 HW3 report

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## Netlist :

### 1. adder.sp

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C > Users > willy > Desktop > ICD_hw3 > adder.sp
 1  * 4-bit ripple adder
 2  ***first 1-bit full adder***
 3  .subckt adder A1 B1 A2 B2 A3 B3 A4 B4 Cin S1 S2 S3 S4 Cout vdd gnd
 4  M1 D1 A1 vdd vdd P_18 l=0.18u w=2u m=1
 5  M2 D1 B1 vdd vdd P_18 l=0.18u w=2u m=1
 6  M3 D2 Cin D1 vdd P_18 l=0.18u w=2u m=1
 7  M4 D2 Cin D3 gnd N_18 l=0.18u w=1u m=1
 8  M5 D3 A1 gnd gnd N_18 l=0.18u w=1u m=1
 9  M6 D3 B1 gnd gnd N_18 l=0.18u w=1u m=1
10  M7 D4 A1 vdd vdd P_18 l=0.18u w=2u m=1
11  M8 D2 B1 D4 vdd P_18 l=0.18u w=2u m=1
12  M9 D2 B1 D5 gnd N_18 l=0.18u w=1u m=1
13  M10 D5 A1 gnd gnd N_18 l=0.18u w=1u m=1
14  M11 D6 A1 vdd vdd P_18 l=0.18u w=2u m=1
15  M12 D6 B1 vdd vdd P_18 l=0.18u w=2u m=1
16  M13 D6 Cin vdd vdd P_18 l=0.18u w=2u m=1
17  M14 D7 D2 D6 vdd P_18 l=0.18u w=2u m=1
18  M15 D7 D2 D8 gnd N_18 l=0.18u w=1u m=1
19  M16 D8 A1 gnd gnd N_18 l=0.18u w=1u m=1
20  M17 D8 B1 gnd gnd N_18 l=0.18u w=1u m=1
21  M18 D8 Cin gnd gnd N_18 l=0.18u w=1u m=1
22  M19 D9 A1 vdd vdd P_18 l=0.18u w=2u m=1
23  M20 D10 B1 D9 vdd P_18 l=0.18u w=2u m=1
24  M21 D7 Cin D10 vdd P_18 l=0.18u w=2u m=1
25  M22 D7 Cin D11 gnd N_18 l=0.18u w=1u m=1
26  M23 D11 B1 D12 gnd N_18 l=0.18u w=1u m=1
27  M24 D12 A1 gnd gnd N_18 l=0.18u w=1u m=1
28  M25 C1 D2 vdd vdd P_18 l=0.18u w=2u m=1
29  M26 C1 D2 gnd gnd N_18 l=0.18u w=1u m=1
30  M27 S1 D7 vdd vdd P_18 l=0.18u w=2u m=1
31  M28 S1 D7 gnd gnd N_18 l=0.18u w=1u m=1
32  ***second 1-bit full adder***
33  M29 E1 A2 vdd vdd P_18 l=0.18u w=2u m=1
34  M30 E1 B2 vdd vdd P_18 l=0.18u w=2u m=1
35  M31 E2 C1 E1 vdd P_18 l=0.18u w=2u m=1
36  M32 E2 C1 E3 gnd N_18 l=0.18u w=1u m=1
37  M33 E3 A2 gnd gnd N_18 l=0.18u w=1u m=1
38  M34 E3 B2 gnd gnd N_18 l=0.18u w=1u m=1
39  M35 E4 A2 vdd vdd P_18 l=0.18u w=2u m=1
40  M36 E2 B2 E4 vdd P_18 l=0.18u w=2u m=1
41  M37 E2 B2 E5 gnd N_18 l=0.18u w=1u m=1
42  M38 E5 A2 gnd gnd N_18 l=0.18u w=1u m=1
43  M39 E6 A2 vdd vdd P_18 l=0.18u w=2u m=1
44  M40 E6 B2 vdd vdd P_18 l=0.18u w=2u m=1
45  M41 E6 C1 vdd vdd P_18 l=0.18u w=2u m=1
46  M42 E7 E2 E6 vdd P_18 l=0.18u w=2u m=1
47  M43 E7 E2 E8 gnd N_18 l=0.18u w=1u m=1
48  M44 E8 A2 gnd gnd N_18 l=0.18u w=1u m=1
49  M45 E8 B2 gnd gnd N_18 l=0.18u w=1u m=1
50  M46 E8 C1 gnd gnd N_18 l=0.18u w=1u m=1
51  M47 E9 A2 vdd vdd P_18 l=0.18u w=2u m=1
52  M48 E10 B2 E9 vdd P_18 l=0.18u w=2u m=1
53  M49 E7 C1 E10 vdd P_18 l=0.18u w=2u m=1
54  M50 E7 C1 E11 gnd N_18 l=0.18u w=1u m=1
55  M51 E11 B2 E12 gnd N_18 l=0.18u w=1u m=1
56  M52 E12 A2 gnd gnd N_18 l=0.18u w=1u m=1
57  M53 E2 E2 vdd vdd P_18 l=0.18u w=2u m=1
58  M54 C2 E2 gnd gnd N_18 l=0.18u w=1u m=1
59  M55 S2 E7 vdd vdd P_18 l=0.18u w=2u m=1
60  M56 S2 E7 gnd gnd N_18 l=0.18u w=1u m=1
  .. .
64  ***third 1-bit full adder***
65  M57 F1 A3 vdd vdd P_18 l=0.18u w=2u m=1
66  M58 F1 B3 vdd vdd P_18 l=0.18u w=2u m=1
67  M59 F2 C2 F1 vdd P_18 l=0.18u w=2u m=1
68  M60 F2 C2 F3 gnd N_18 l=0.18u w=1u m=1
69  M61 F3 A3 gnd gnd N_18 l=0.18u w=1u m=1
70  M62 F3 B3 gnd gnd N_18 l=0.18u w=1u m=1
71  M63 F4 A3 vdd vdd P_18 l=0.18u w=2u m=1
72  M64 F2 B3 F4 vdd P_18 l=0.18u w=2u m=1
73  M65 F2 B3 F5 gnd N_18 l=0.18u w=1u m=1
74  M66 F5 A3 gnd gnd N_18 l=0.18u w=1u m=1
75  M67 F6 A3 vdd vdd P_18 l=0.18u w=2u m=1
76  M68 F6 B3 vdd vdd P_18 l=0.18u w=2u m=1
77  M69 F6 C2 vdd vdd P_18 l=0.18u w=2u m=1
78  M70 F7 F2 F6 vdd P_18 l=0.18u w=2u m=1
79  M71 F7 F2 F8 gnd N_18 l=0.18u w=1u m=1
80  M72 F8 A3 gnd gnd N_18 l=0.18u w=1u m=1
81  M73 F8 B3 gnd gnd N_18 l=0.18u w=1u m=1
82  M74 F8 C2 gnd gnd N_18 l=0.18u w=1u m=1
83  M75 F9 A3 vdd vdd P_18 l=0.18u w=2u m=1
84  M76 F10 B3 F9 vdd P_18 l=0.18u w=2u m=1
85  M77 F7 C2 F10 vdd P_18 l=0.18u w=2u m=1
86  M78 F11 C2 F11 gnd N_18 l=0.18u w=1u m=1
87  M79 F11 B3 F12 gnd N_18 l=0.18u w=1u m=1
88  M80 F12 A3 gnd gnd N_18 l=0.18u w=1u m=1
89  M81 C3 F2 vdd vdd P_18 l=0.18u w=2u m=1
90  M82 C3 F2 gnd gnd N_18 l=0.18u w=1u m=1
91  M83 S3 F7 vdd vdd P_18 l=0.18u w=2u m=1
92  M84 S3 F7 gnd gnd N_18 l=0.18u w=1u m=1
93  ***fourth 1-bit full adder***
94  M85 G1 A4 vdd vdd P_18 l=0.18u w=2u m=1
95  M86 G1 B4 vdd vdd P_18 l=0.18u w=2u m=1
96  M87 G2 C3 G1 vdd P_18 l=0.18u w=2u m=1
97  M88 G2 C3 G3 gnd N_18 l=0.18u w=1u m=1
98  M89 G3 A4 gnd gnd N_18 l=0.18u w=1u m=1
99  M90 G3 B4 gnd gnd N_18 l=0.18u w=1u m=1
100 M91 G4 A4 vdd vdd P_18 l=0.18u w=2u m=1
101 M92 G2 C4 G4 vdd P_18 l=0.18u w=2u m=1
102 M93 G2 B4 G5 gnd N_18 l=0.18u w=1u m=1
103 M94 G5 A4 gnd gnd N_18 l=0.18u w=1u m=1
104 M95 G6 A4 vdd vdd P_18 l=0.18u w=2u m=1
105 M96 G6 B4 vdd vdd P_18 l=0.18u w=2u m=1
106 M97 G6 C3 vdd vdd P_18 l=0.18u w=2u m=1
107 M98 G7 G2 G6 vdd P_18 l=0.18u w=2u m=1
108 M99 G7 G2 G8 gnd N_18 l=0.18u w=1u m=1
109 M100 G8 A4 gnd gnd N_18 l=0.18u w=1u m=1
110 M101 G8 B4 gnd gnd N_18 l=0.18u w=1u m=1
111 M102 G8 C3 gnd gnd N_18 l=0.18u w=1u m=1
112 M103 G9 A4 vdd vdd P_18 l=0.18u w=2u m=1
113 M104 G10 B4 G9 vdd P_18 l=0.18u w=2u m=1
114 M105 G7 C3 G10 vdd P_18 l=0.18u w=2u m=1
115 M106 G7 C3 G11 gnd N_18 l=0.18u w=1u m=1
116 M107 G11 B4 G12 gnd N_18 l=0.18u w=1u m=1
117 M108 G12 A4 gnd gnd N_18 l=0.18u w=1u m=1
118 M109 Cout G2 vdd vdd P_18 l=0.18u w=2u m=1
119 M110 Cout G2 gnd gnd N_18 l=0.18u w=1u m=1
120 M111 S4 G7 vdd vdd P_18 l=0.18u w=2u m=1
121 M112 S4 G7 gnd gnd N_18 l=0.18u w=1u m=1
122 .
123 .ends
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## 2. adder.pex.sp

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1 * File: adder.pex.sp
2 * Created: Fri Nov 8 13:28:07 2024
3 * Program "Calibre XRC"
4 * Version "v2022.3_33.19"
5 *
6 .include "adder.pex.sp"
7 .subckt adder S1 S2 S3 COUT S4 A1 VDD NND B1 CIN C1 A2 B2 C2 A3 C3 A4 B4
8 *
9 * B4 B4
10 * A4 A4
11 * C3 C3
12 * A3 A3
13 * C2 C2
14 * B2 B2
15 * A2 A2
16 * C1 C1
17 * CIN CIN
18 * B1 B1
19 * GND GND
20 * VDD VDD
21 * A1 A1
22 * S4 S4
23 * COUT COUT
24 * S3 S3
25 * S2 S2
26 * S1 S1
27 M5 N_D3_M5_d N_A1_M5_g N_GND_M5_s N_GND_M5_b N_18 L=1.e-07 W=1e-06 AD=8.2e-13
28 + M5=8e-13 PD=2.64e-06 PS=2.6e-06
29 M6 N_D3_M6_d N_B1_M6_g N_GND_M6_s N_GND_M6_b N_18 L=1.e-07 W=1e-06 AD=8.2e-13
30 + M6=8e-13 PD=2.64e-06 PS=2.6e-06
31 M4 N_D2_M4_d N_CIN_M4_g N_D3_M4_s N_GND_M5_b N_18 L=1.e-07 W=1e-06 AD=8.2e-13
32 + M4=8e-13 PD=2.64e-06 PS=2.6e-06
33 M10 N_D5_M10_d N_A1_M10_g N_GND_M10_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
34 + M10=8e-13 PD=2.64e-06 PS=2.6e-06
35 M9 N_D2_M9_d N_B1_M9_g N_D5_M9_s N_GND_M5_b N_18 L=1.e-07 W=1e-06 AD=8.2e-13
36 + M9=8e-13 PD=2.64e-06 PS=2.6e-06
37 M26 N_C1_M26_d N_D2_M26_g N_GND_M26_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
38 + M26=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
39 M16 N_D8_M16_d N_A1_M16_g N_GND_M16_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
40 + M16=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
41 M17 N_D8_M17_d N_B1_M17_g N_GND_M17_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
42 + M17=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
43 M18 N_D8_M18_d N_CIN_M18_g N_GND_M18_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
44 + M18=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
45 M15 N_D7_M15_d N_D2_M15_g N_D8_M15_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
46 + M15=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
47 M24 N_D12_M24_d N_A1_M24_g N_GND_M24_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
48 + M24=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
49 M23 N_D11_M23_d N_B1_M23_g N_D12_M23_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
50 + M23=8e-13 PD=2.64e-06 PS=2.6e-06
51 M22 N_D7_M22_d N_CIN_M22_g N_D11_M22_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
52 + M22=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
53 M28 N_L51_M28_d N_D7_M28_g N_GND_M28_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
54 + M28=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
55 M33 N_E3_M33_d N_A2_M33_g N_GND_M33_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
56 + M33=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
57 M54 N_E3_M4_d N_B2_M4_g N_GND_M4_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
58 + M54=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
117 M94 N_G5_M94_d N_A4_M94_g N_GND_M94_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
118 + M94=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
119 M93 N_G2_M93_d N_B4_M93_g N_GND_M93_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
120 + M93=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
121 M10 N_COUT_M10_d N_G2_M10_g N_GND_M10_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
122 + M10=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
123 M108 N_G8_M108_d N_A4_M108_g N_GND_M108_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
124 + M108=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
125 M109 N_G9_M109_d N_A4_M109_g N_GND_M109_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
126 + M109=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
127 M102 N_G8_M102_d N_C3_M102_g N_GND_M102_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
128 + M102=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
129 M91 N_G7_M99_d N_G2_M99_g N_G8_M99_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
130 + M91=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
131 M108 N_G12_M108_d N_A4_M108_g N_GND_M108_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
132 + M108=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
133 M109 N_G13_M109_d N_A4_M109_g N_GND_M109_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
134 + M109=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
135 M106 N_G7_M106_d N_C3_M106_g N_G11_M106_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
136 + M106=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
137 M112 N_S4_M112_d N_G7_M112_g N_GND_M112_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
138 + M112=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
139 M11 N_D14_M14_d N_A1_M14_g N_VDD_M14_s N_VDD_M14_b P_18 L=1.e-07 W=2e-06 AD=1.64e-12
140 + M11=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
141 M11 D_N12_M12_d N_D12_M12_g N_VDD_M12_s N_VDD_M12_b P_18 L=1.e-07 W=2e-06 AD=1.64e-12
142 + M11=8e-12 PD=3.64e-06 PS=3.6e-06
143 M3 N_D2_M2 d N_CIN_M2_g N_D1_M3_s N_VDD_M3_b P_18 L=1.e-07 W=2e-06 AD=1.64e-12
144 + M3=8e-12 PD=3.64e-06 PS=3.6e-06
145 M7 N_D4_M7_d N_A1_M7_g N_VDD_M7_s N_VDD_M7_b P_18 L=1.e-07 W=2e-06 AD=1.64e-12
146 + M7=8e-12 PD=3.64e-06 PS=3.6e-06
147 M8 N_D2_M2_d N_A1_M2_g N_VDD_M2_s N_VDD_M2_b P_18 L=1.e-07 W=2e-06 AD=1.64e-12
148 + M8=8e-12 PD=3.64e-06 PS=3.6e-06
149 M25 N_C1_M25_d N_D2_M25_g N_D3_M25_s N_VDD_M25_b P_18 L=1.e-07 W=2e-06
150 + M25=8e-12 PD=3.64e-06 PS=3.6e-06
151 M13 N_M13_d N_CIN_M13_g N_VDD_M13_s N_VDD_M13_b P_18 L=1.e-07 W=2e-06
152 + M13=8e-12 AS=1.6e-12 PD=3.64e-06 PS=3.6e-06
153 M11 N_D3_M11_d N_B1_M11_g N_VDD_M11_s N_VDD_M11_b P_18 L=1.e-07 W=2e-06
154 + M11=8e-12 AS=1.6e-12 PD=3.64e-06 PS=3.6e-06
155 M11 N_D4_M14_d N_D6_M14_g N_VDD_M14_s N_VDD_M14_b P_18 L=1.e-07 W=2e-06
156 + M11=8e-12 AS=1.6e-12 PD=3.64e-06 PS=3.6e-06
157 M14 N_D7_M14_d N_D2_M14_g N_D6_M14_s N_VDD_M14_b P_18 L=1.e-07 W=2e-06
158 + M14=8e-12 AS=1.6e-12 PD=3.64e-06 PS=3.6e-06
159 M19 N_D9_M19_d N_A1_M19_g N_VDD_M19_s N_VDD_M19_b P_18 L=1.e-07 W=2e-06
160 + M19=8e-12 AS=1.6e-12 PD=3.64e-06 PS=3.6e-06
161 M20 N_D18_M20_d N_D9_M20_g N_VDD_M20_s N_VDD_M20_b P_18 L=1.e-07 W=2e-06
162 + M20=8e-12 AS=1.6e-12 PD=3.64e-06 PS=3.6e-06
163 M21 N_D7_M21_d N_CIN_M21_g N_D10_M21_s N_VDD_M21_b P_18 L=1.e-07 W=2e-06
164 + M21=8e-12 AS=1.6e-12 PD=3.64e-06 PS=3.6e-06
165 M27 N_S1_M27_d N_D7_M27_g N_VDD_M27_s N_VDD_M27_b P_18 L=1.e-07 W=2e-06
166 + M27=8e-12 AS=1.6e-12 PD=3.64e-06 PS=3.6e-06
167 M22 N_E1_M22_d N_A2_M22_g N_VDD_M22_s N_VDD_M22_b P_18 L=1.e-07 W=2e-06
168 + M22=8e-12 AS=1.6e-12 PD=3.64e-06 PS=3.6e-06
169 M30 N_E3_M30_d N_B2_M30_g N_VDD_M30_s N_VDD_M30_b P_18 L=1.e-07 W=2e-06
170 + M30=8e-12 AS=1.6e-12 PD=3.64e-06 PS=3.6e-06
171 M31 N_E2_M31_d N_C1_M31_g N_E1_M31_s N_VDD_M31_b P_18 L=1.e-07 W=2e-06
172 + M31=8e-12 AS=1.6e-12 PD=3.64e-06 PS=3.6e-06
173 M35 N_E4_M35_d N_A2_M35_g N_VDD_M35_s N_VDD_M35_b P_18 L=1.e-07 W=2e-06
174 + M35=8e-12 AS=1.6e-12 PD=3.64e-06 PS=3.6e-06
59 M32 N_E2_M32_d N_C1_M32_g N_E3_M32_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
60 + M32=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
61 M38 N_E5_M38_d N_A2_M38_g N_GND_M38_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
62 + M38=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
63 M37 N_E2_M37_d N_B2_M37_g N_E5_M37_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
64 + M37=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
65 M54 N_C2_M54_d N_E2_M54_g N_GND_M54_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
66 + M54=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
67 M44 N_E8_M44_d N_A2_M44_g N_GND_M44_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
68 + M44=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
69 M45 N_E8_M45_d N_B2_M45_g N_GND_M45_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
70 + M45=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
71 M46 N_E8_M46_d N_C2_M46_g N_GND_M46_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
72 + M46=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
73 M43 N_E7_M43_d N_E2_M43_g N_E8_M43_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
74 + M43=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
75 M52 N_E12_M52_d N_A2_M52_g N_GND_M52_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
76 + M52=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
77 M51 N_E11_M51_d N_B2_M51_g N_E12_M51_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
78 + M51=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
79 M58 N_E7_M58_d N_C2_M58_g N_F1_M58_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
80 + M58=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
81 M56 N_S2_M56_d N_E2_M56_g N_GND_M56_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
82 + M56=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
83 M61 N_F3_M62_d N_B3_M62_g N_GND_M62_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
84 + M61=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
85 M62 N_F3_M62_d N_B3_M62_g N_GND_M62_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
86 + M62=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
87 M68 N_F2_M68_d N_C2_M68_g N_F3_M68_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
88 + M68=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
89 M66 N_F5_M66_d N_A3_M66_g N_GND_M66_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
90 + M66=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
91 M65 N_F2_M65_d N_B3_M65_g N_F5_M65_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
92 + M65=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
93 M82 N_C3_M82_d N_F2_M82_g N_GND_M82_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
94 + M82=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
95 M72 N_F8_M72_d N_A3_M72_g N_GND_M72_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
96 + M72=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
97 M73 N_F8_M73_d N_B3_M73_g N_GND_M73_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
98 + M73=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
99 M74 N_F8_M74_d N_C2_M74_g N_GND_M74_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
100 + M74=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
101 M71 N_F7_M71_d N_F2_M71_g N_F8_M71_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
102 + M71=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
103 M88 N_F12_M88_d N_A3_M88_g N_GND_M88_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
104 + M88=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
105 M79 N_F11_M79_d N_B3_M79_g N_F12_M79_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
106 + M79=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
107 M78 N_F7_M78_d N_C2_M78_g N_F1_M78_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
108 + M78=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
109 M84 N_S3_M84_d N_F7_M84_g N_GND_M84_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
110 + M84=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
111 M89 N_G3_M89_d N_A4_M89_g N_GND_M89_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
112 + M89=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
113 M90 N_G4_M90_d N_B4_M90_g N_GND_M90_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
114 + M90=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
115 M88 N_G2_M88_d N_C3_M88_g N_G3_M88_s N_GND_M5_b N_18 L=1.e-07 W=1e-06
116 + M88=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
175 M36 N_E2_M36_d N_B2_M36_g N_E4_M36_s N_VDD_M36_b P_18 L=1.e-07 W=2e-06
176 + M36=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
177 M50 N_C2_M50_d N_B2_M50_g N_VDD_M50_s N_VDD_M50_b P_18 L=1.e-07 W=2e-06
178 + M50=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
179 M41 N_E1_M41_d N_C1_M41_g N_VDD_M41_s N_VDD_M41_b P_18 L=1.e-07 W=2e-06
180 + M41=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
181 M48 N_E6_M48_d N_B2_M48_g N_VDD_M48_s N_VDD_M48_b P_18 L=1.e-07 W=2e-06
182 + M48=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
183 M59 N_E7_M59_d N_B2_M59_g N_VDD_M59_s N_VDD_M59_b P_18 L=1.e-07 W=2e-06
184 + M59=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
185 M32 N_E1_M32_d N_A2_M32_g N_E6_M32_s N_VDD_M32_b P_18 L=1.e-07 W=2e-06
186 + M32=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
187 M47 N_E9_M47_d N_E2_M47_g N_VDD_M47_s N_VDD_M47_b P_18 L=1.e-07 W=2e-06
188 + M47=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
189 M48 N_E10_M48_d N_B2_M48_g N_E9_M48_s N_VDD_M48_b P_18 L=1.e-07 W=2e-06
190 + M48=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
191 M50 N_E11_M50_d N_A2_M50_g N_E6_M50_s N_VDD_M50_b P_18 L=1.e-07 W=2e-06
192 + M50=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
193 M55 N_S2_M55_d N_E2_M55_g N_VDD_M55_s N_VDD_M55_b P_18 L=1.e-07 W=2e-06
194 + M55=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
195 M57 N_F1_M57_d N_A3_M57_g N_VDD_M57_s N_VDD_M57_b P_18 L=1.e-07 W=2e-06
196 + M57=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
197 M58 N_F1_M58_d N_A3_M58_g N_VDD_M58_s N_VDD_M58_b P_18 L=1.e-07 W=2e-06
198 + M58=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
199 M59 N_F2_M59_d N_C2_M59_g N_VDD_M59_s N_VDD_M59_b P_18 L=1.e-07 W=2e-06
200 + M59=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
201 M63 N_F4_M63_d N_A3_M63_g N_VDD_M63_s N_VDD_M63_b P_18 L=1.e-07 W=2e-06
202 + M63=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
203 M64 N_F2_M64_d N_A3_M64_g N_V4_M64_s N_VDD_M64_b P_18 L=1.e-07 W=2e-06
204 + M64=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
205 M65 N_F2_M65_d N_A3_M65_g N_V4_M65_s N_VDD_M65_b P_18 L=1.e-07 W=2e-06
206 + M65=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
207 M66 N_F2_M66_d N_A3_M66_g N_V4_M66_s N_VDD_M66_b P_18 L=1.e-07 W=2e-06
208 + M66=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
209 M68 N_F6_M68_d N_A3_M68_g N_V6_M68_s N_VDD_M68_b P_18 L=1.e-07 W=2e-06
210 + M68=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
211 M67 N_F6_M67_d N_A3_M67_g N_V6_M67_s N_VDD_M67_b P_18 L=1.e-07 W=2e-06
212 + M67=8e-13 AS=8e-13 PD=2.64e-06 PS=2.6e-06
213 M68 N_F7_M68_d N_A3_M68_g N_V6_M68_s N_VDD_M68_b P_18 L=1.e-07 W=2e-06
214 + M68=8e-12 AS=8e-12 PD=3.64e-06 PS=3.6e-06
215 M75 N_F9_M75_d N_A3_M75_g N_V6_M75_s N_VDD_M75_b P_18 L=1.e-07 W=2e-06
216 + M75=8e-12 AS=8e-12 PD=3.64e-06 PS=3.6e-06
217 M76 N_F10_M76_d N_B3_M76_g N_F9_M76_s N_VDD_M76_b P_18 L=1.e-07 W=2e-06
218 + M76=8e-12 AS=8e-12 PD=3.64e-06 PS=3.6e-06
219 M77 N_F11_M77_d N_A3_M77_g N_V6_M77_s N_VDD_M77_b P_18 L=1.e-07 W=2e-06
220 + M77=8e-12 AS=8e-12 PD=3.64e-06 PS=3.6e-06
221 M83 N_S3_M83_d N_E2_M83_g N_V6_M83_s N_VDD_M83_b P_18 L=1.e-07 W=2e-06
222 + M83=8e-12 AS=8e-12 PD=3.64e-06 PS=3.6e-06
223 M85 N_G1_M85_d N_A4_M85_g N_V6_M85_s N_VDD_M85_b P_18 L=1.e-07 W=2e-06
224 + M85=8e-12 AS=8e-12 PD=3.64e-06 PS=3.6e-06
225 M86 N_G1_M86_d N_A4_M86_g N_V6_M86_s N_VDD_M86_b P_18 L=1.e-07 W=2e-06
226 + M86=8e-12 AS=8e-12 PD=3.64e-06 PS=3.6e-06
227 M89 N_F12_M89_d N_A3_M89_g N_V6_M89_s N_VDD_M89_b P_18 L=1.e-07 W=2e-06
228 + M89=8e-12 AS=8e-12 PD=3.64e-06 PS=3.6e-06
229 M91 N_G4_M91_d N_A4_M91_g N_V6_M91_s N_VDD_M91_b P_18 L=1.e-07 W=2e-06
230 + M91=8e-12 AS=8e-12 PD=3.64e-06 PS=3.6e-06
231 M92 N_G2_M92_d N_B4_M92_g N_G4_M92_s N_VDD_M92_b P_18 L=1.e-07 W=2e-06
232 + M92=8e-12 AS=8e-12 PD=3.64e-06 PS=3.6e-06

```

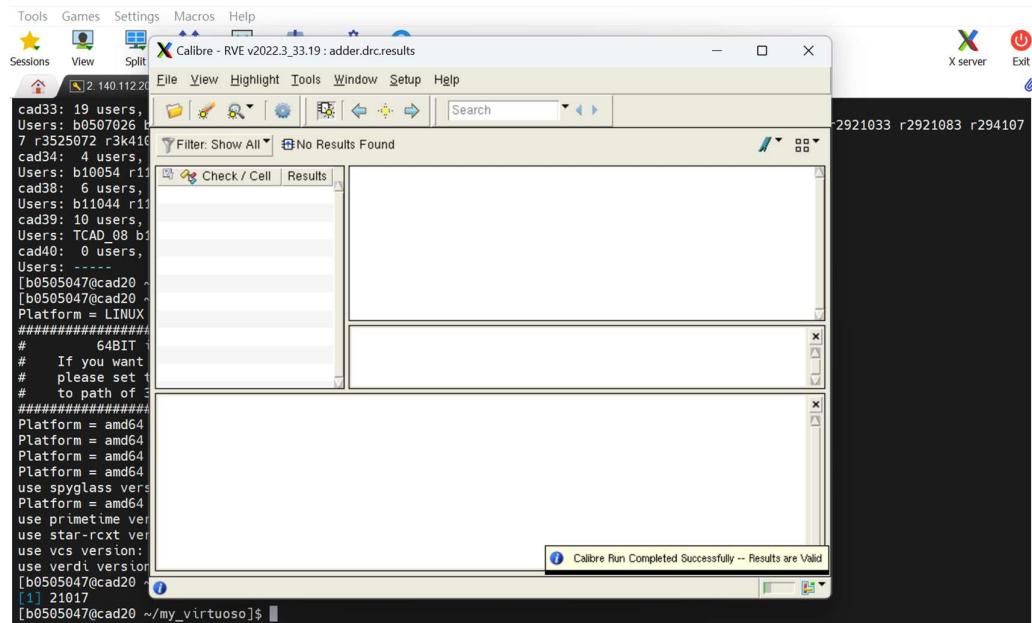
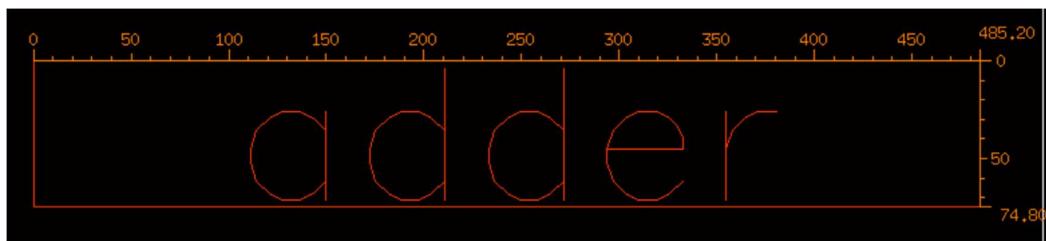
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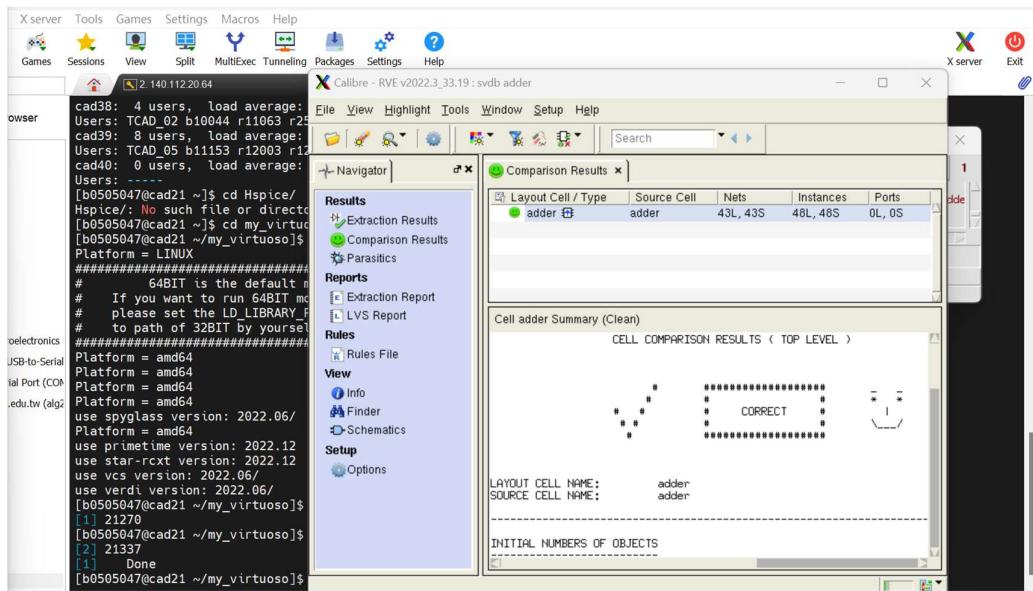
233 M109 N_COUT_M109_d N_G2_M109_g N_VDD_M109_s N_VDD_M109_b P_18 L=1.8e-07 W=2e-06
234 + AD=1.64e-12 AS=1.6e-12 PD=3.64e-06 PS=3.6e-06
235 M97 N_G6_M97_d N_C3_M97_g N_VDD_M97_s N_VDD_M97_b P_18 L=1.8e-07 W=2e-06
236 + AD=1.64e-12 AS=1.6e-12 PD=3.64e-06 PS=3.6e-06
237 M96 N_G6_M96_d N_B4_M96_g N_VDD_M96_s N_VDD_M96_b P_18 L=1.8e-07 W=2e-06
238 + AD=1.64e-12 AS=1.6e-12 PD=3.64e-06 PS=3.6e-06
239 M95 N_G6_M95_d N_A4_M95_g N_VDD_M95_s N_VDD_M95_b P_18 L=1.8e-07 W=2e-06
240 + AD=1.64e-12 AS=1.6e-12 PD=3.64e-06 PS=3.6e-06
241 M98 N_G7_M98_d N_G2_M98_g N_G6_M98_s N_VDD_M98_b P_18 L=1.8e-07 W=2e-06
242 + AD=1.64e-12 AS=1.6e-12 PD=3.64e-06 PS=3.6e-06
243 M103 N_G9_M103_d N_A4_M103_g N_VDD_M103_s N_VDD_M103_b P_18 L=1.8e-07 W=2e-06
244 + AD=1.64e-12 AS=1.6e-12 PD=3.64e-06 PS=3.6e-06
245 M104 N_G10_M104_d N_B4_M104_g N_G9_M104_s N_VDD_M104_b P_18 L=1.8e-07 W=2e-06
246 + AD=1.64e-12 AS=1.6e-12 PD=3.64e-06 PS=3.6e-06
247 M105 N_G10_M105_d N_C3_M105_g N_G10_M105_s N_VDD_M105_b P_18 L=1.8e-07 W=2e-06
248 + AD=1.64e-12 AS=1.6e-12 PD=3.64e-06 PS=3.6e-06
249 M111 N_S4_M111_d N_G7_M111_g N_VDD_M111_s N_VDD_M111_b P_18 L=1.8e-07 W=2e-06
250 + AD=1.64e-12 AS=1.6e-12 PD=3.64e-06 PS=3.6e-06
251 *
252 .include "adder.pex.sp.ADDER.pxi"
253 *
254 .ends
255 *
256 *

```

## Layout :

$$\text{Area} = 485.2 \times 74.8 = 36292.96 \mu\text{m}^2$$

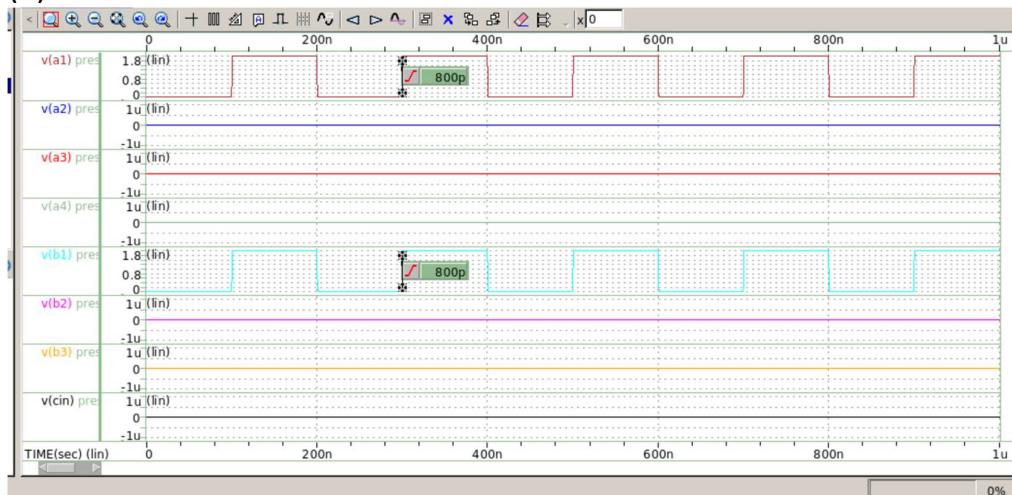


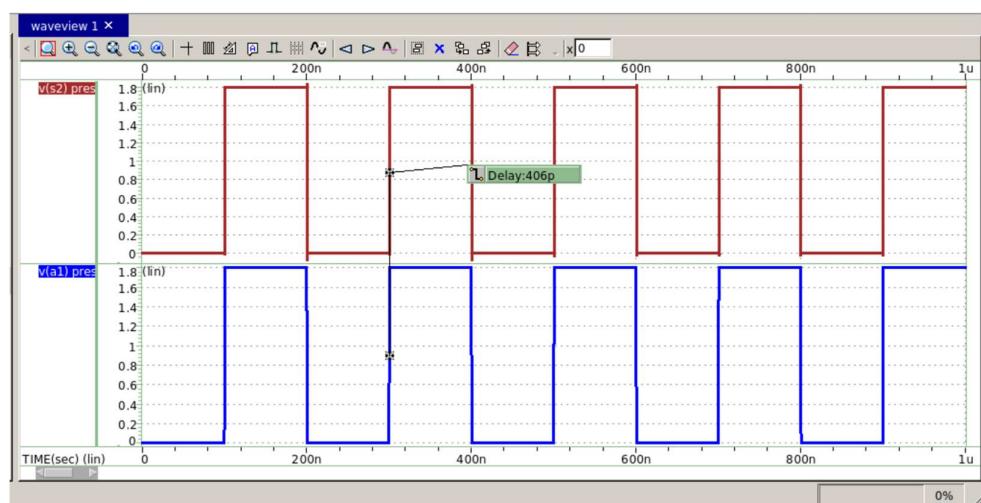
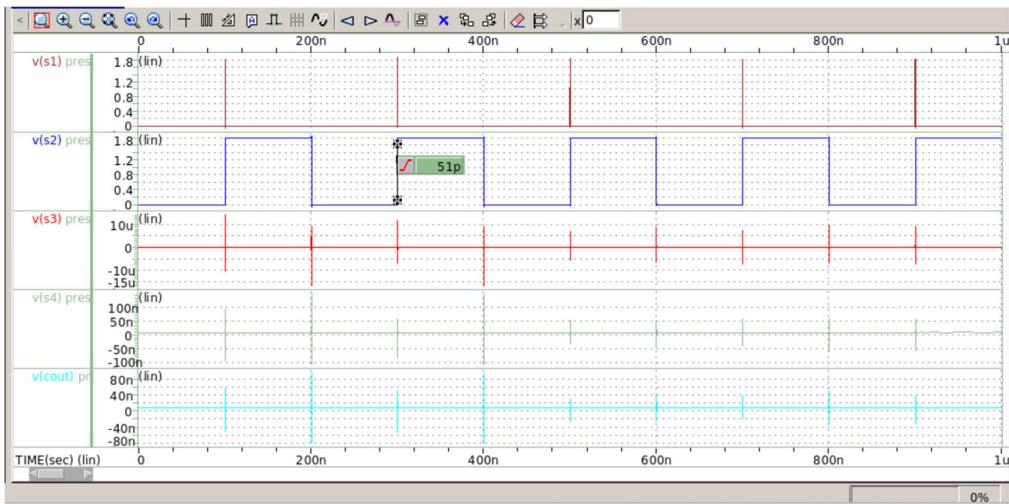


## Simulation :

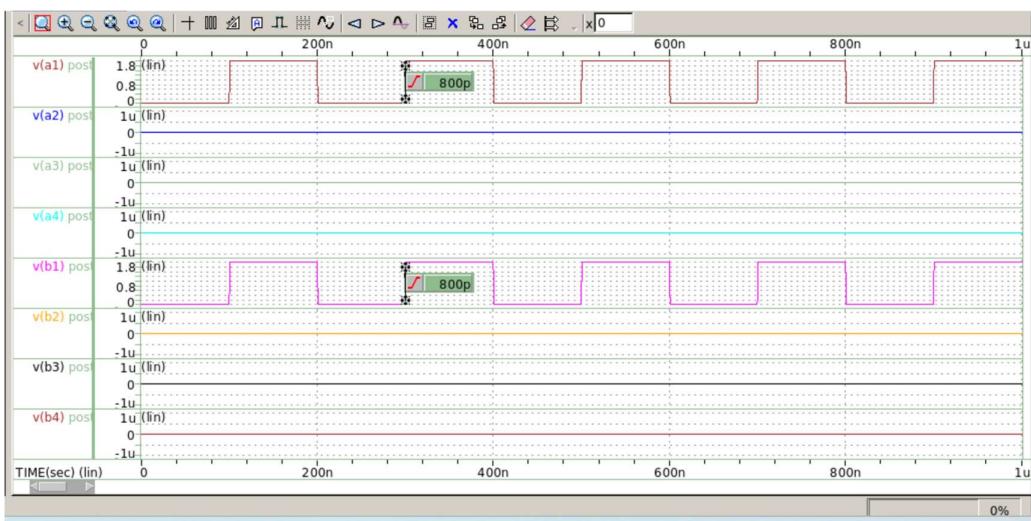
a. 0001 + 0001

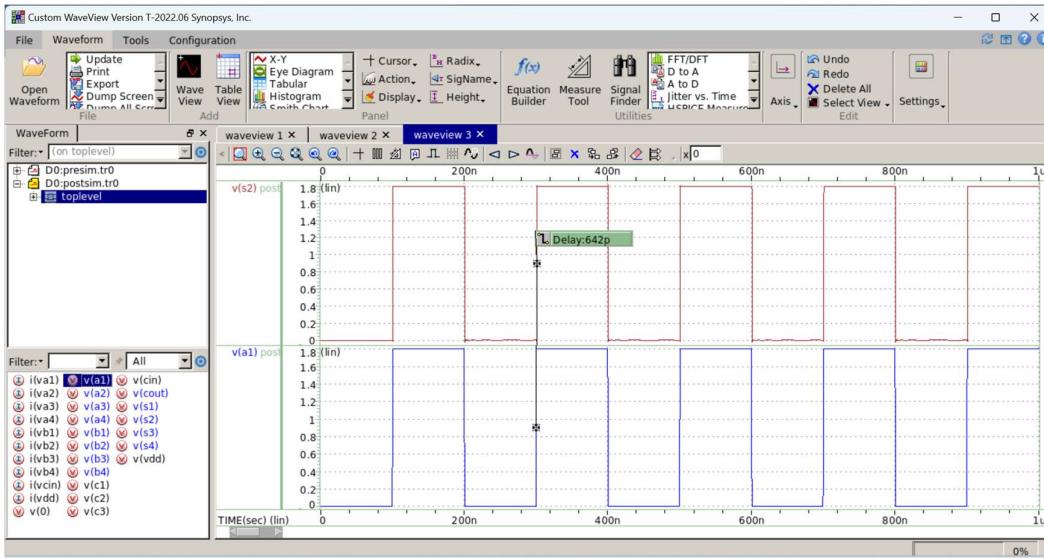
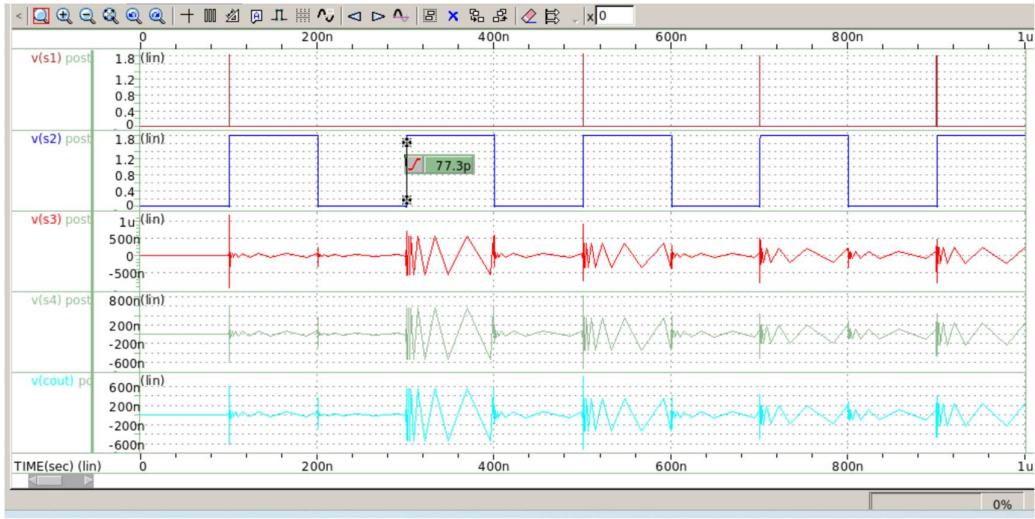
(1) Pre-sim





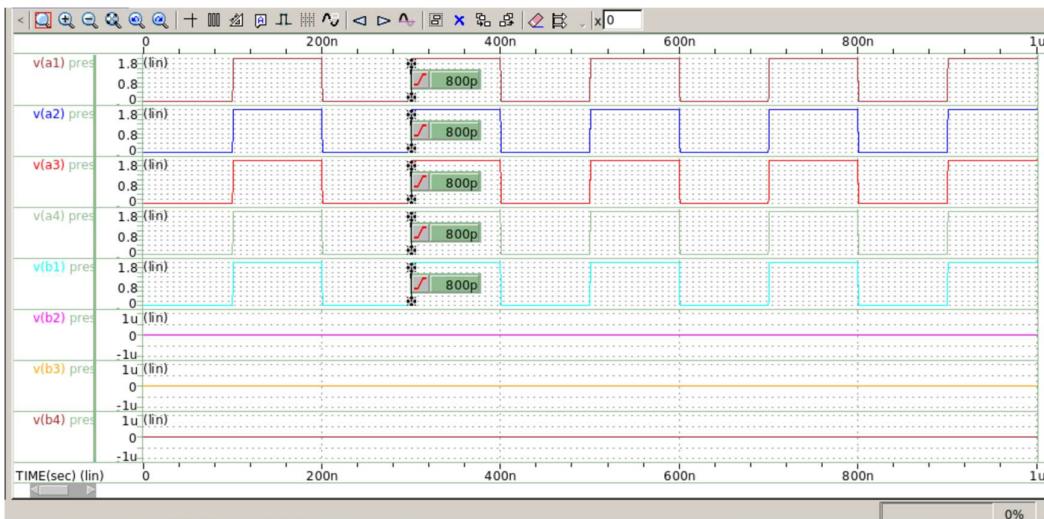
## (2) Post-sim

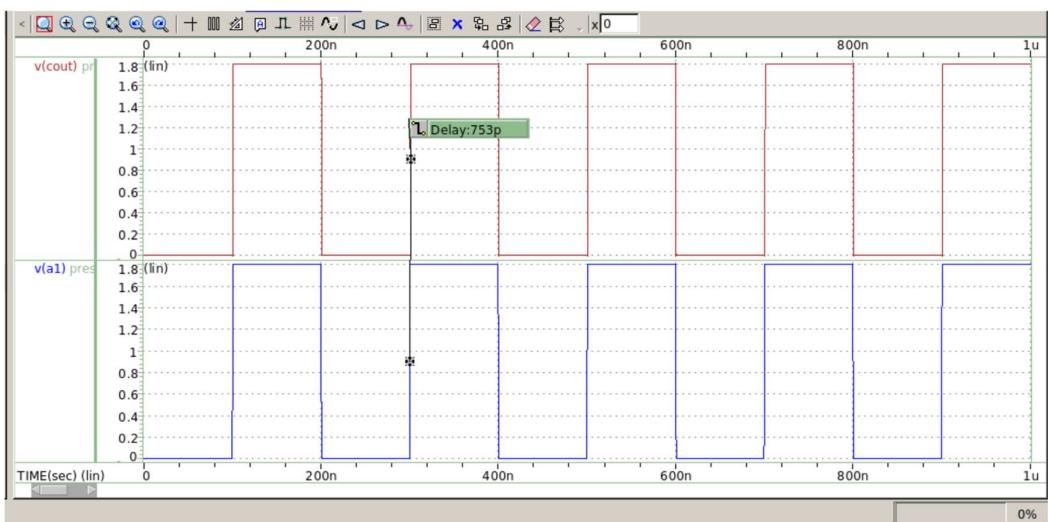
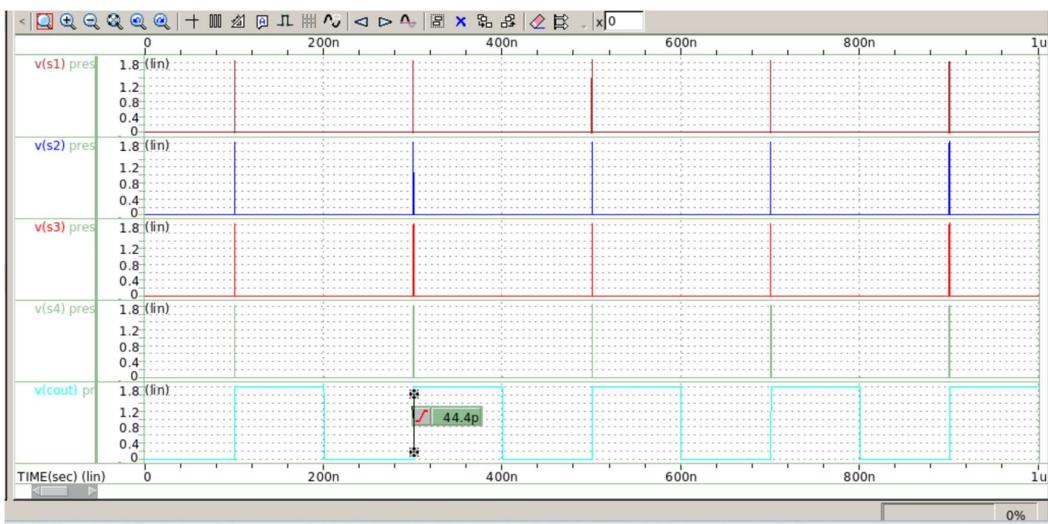




b. 1111 + 0001

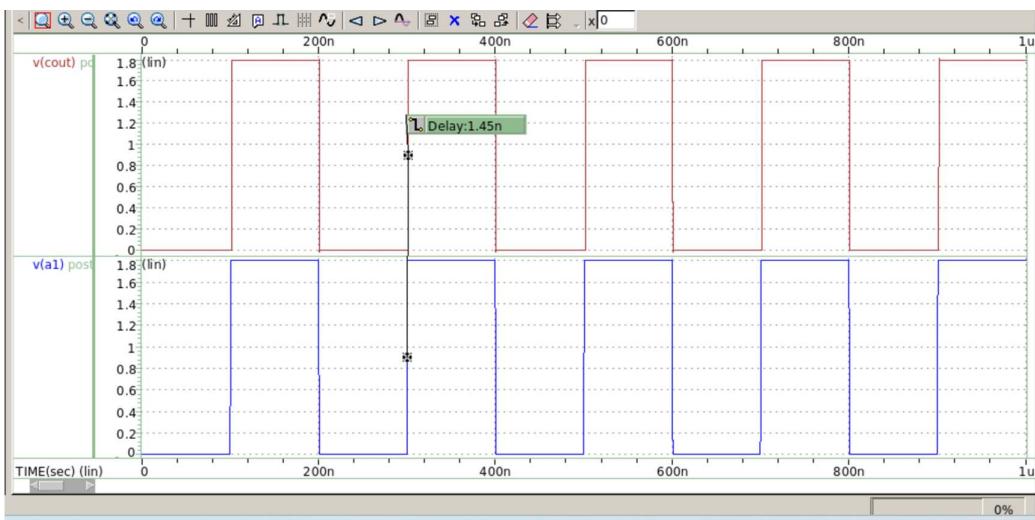
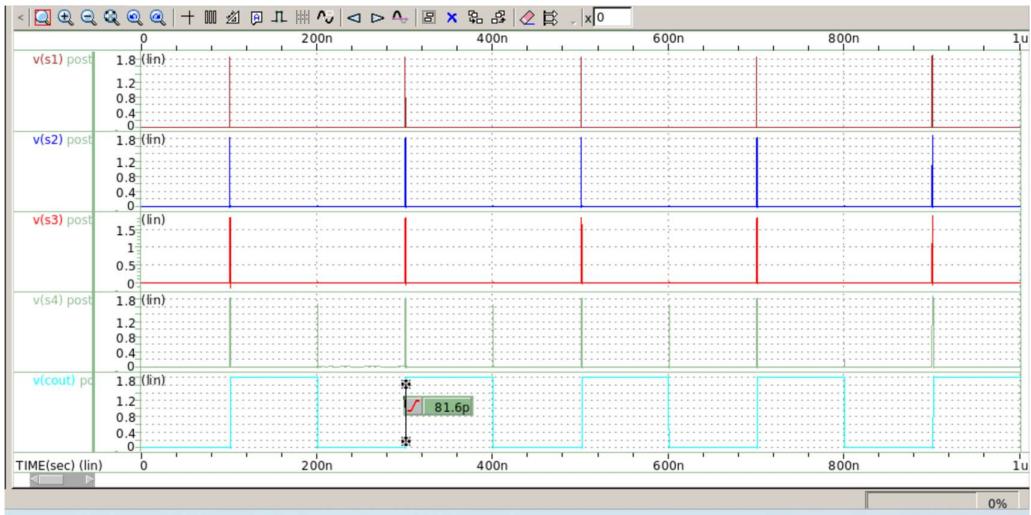
(1) Pre-sim





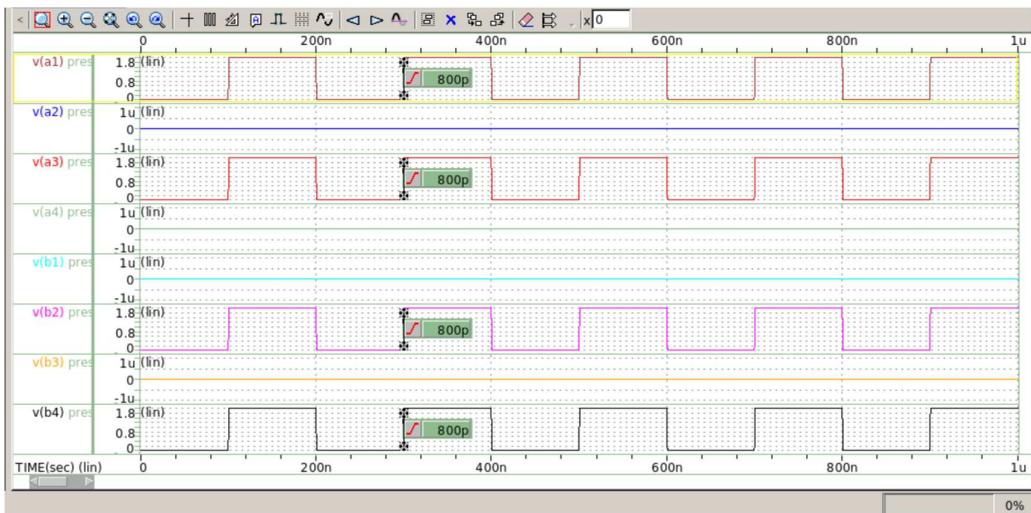
## (2) Post-sim

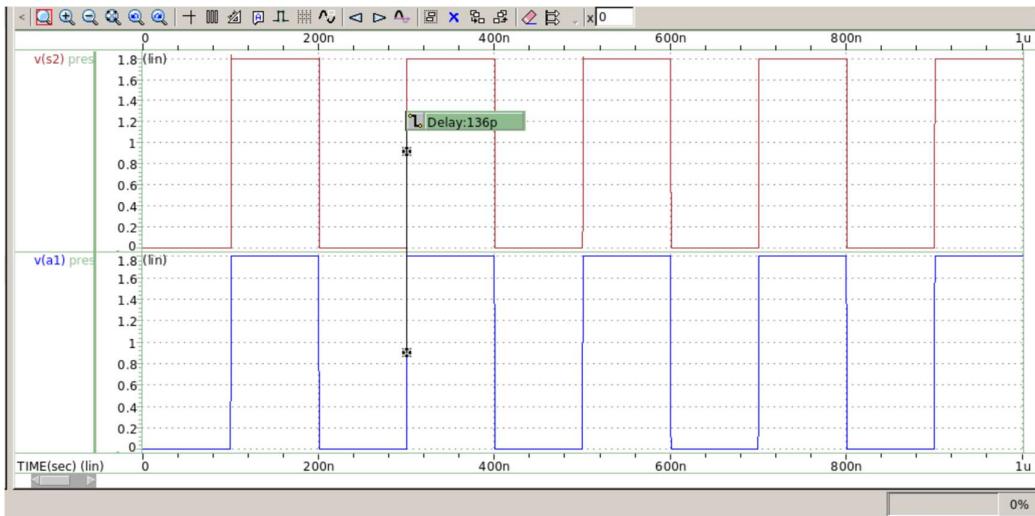
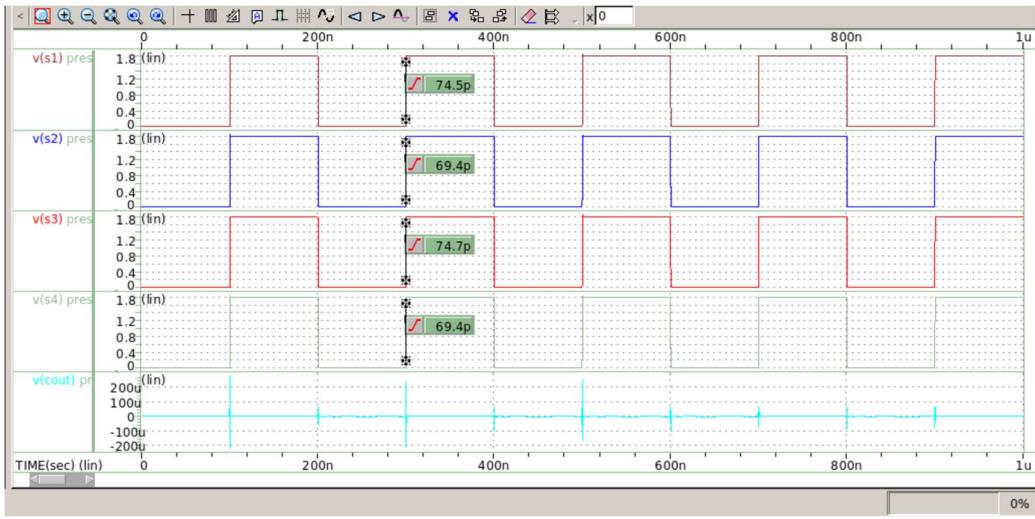




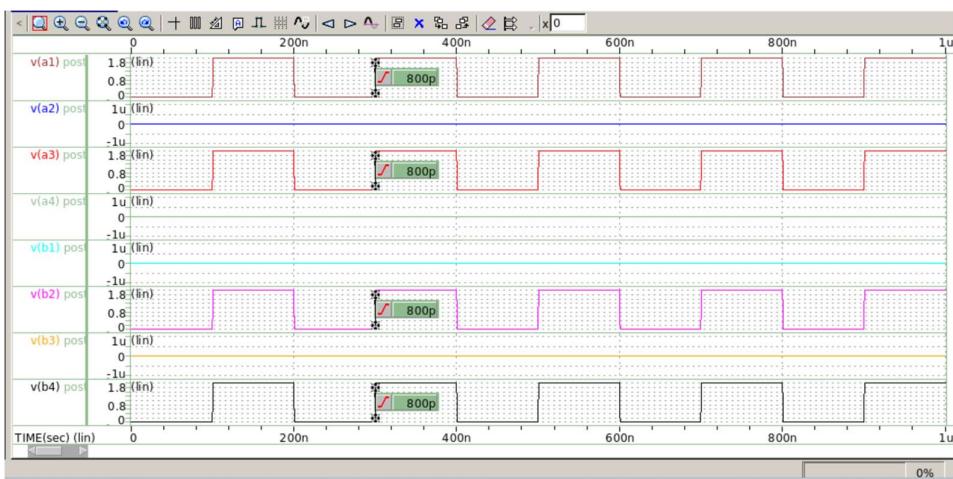
c. 0101 + 1010

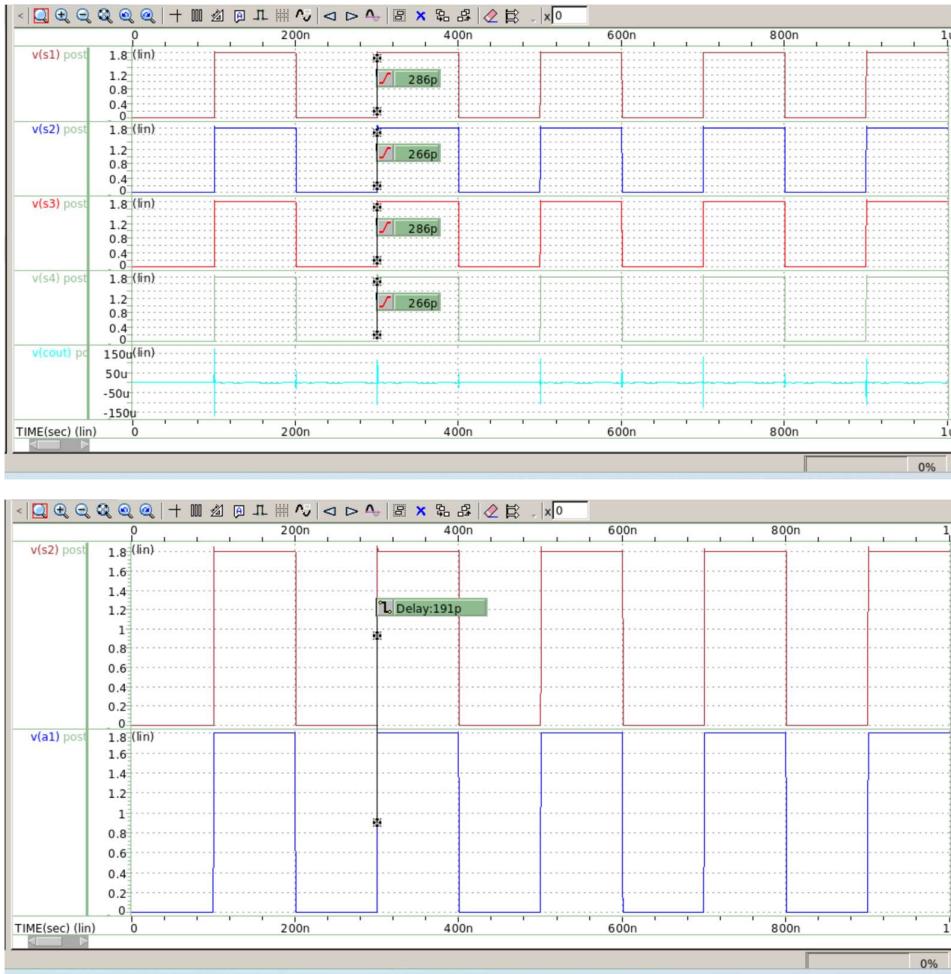
(1) Pre-sim





## (2) Post-sim





## Analysis :

從三個小題中的結果可以發現，post-sim 的 output delay 都比 pre-sim 來得大，這是因為在 post-sim 中包含了寄生電容與電阻，因此對信號的傳播造成影響。