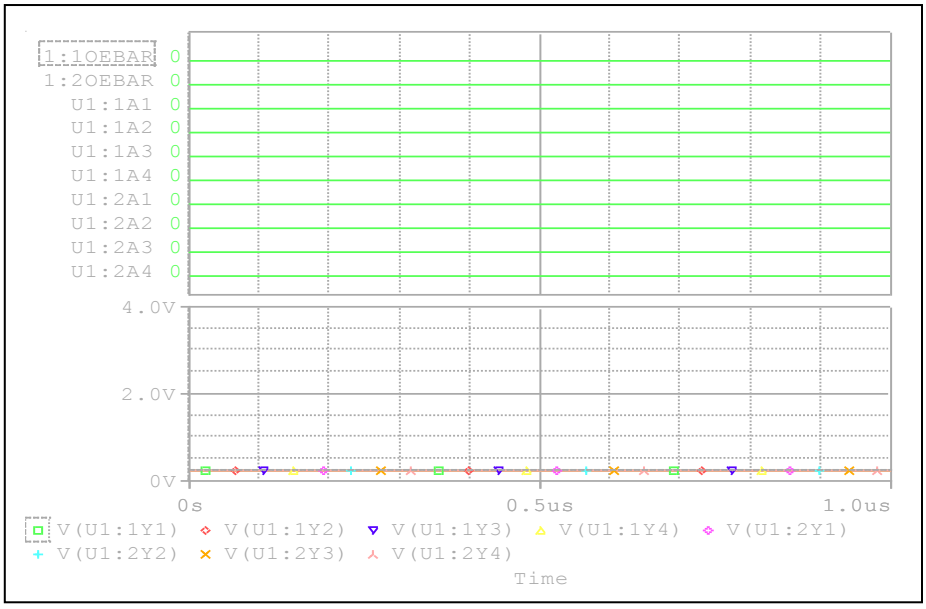
Device Modeling Report

COMPONENTS : CMOS DIGITAL INTEGRATED CIRCUIT
PART NUMBER : TC74VCX244FT
MANUFACTURER : TOSHIBA

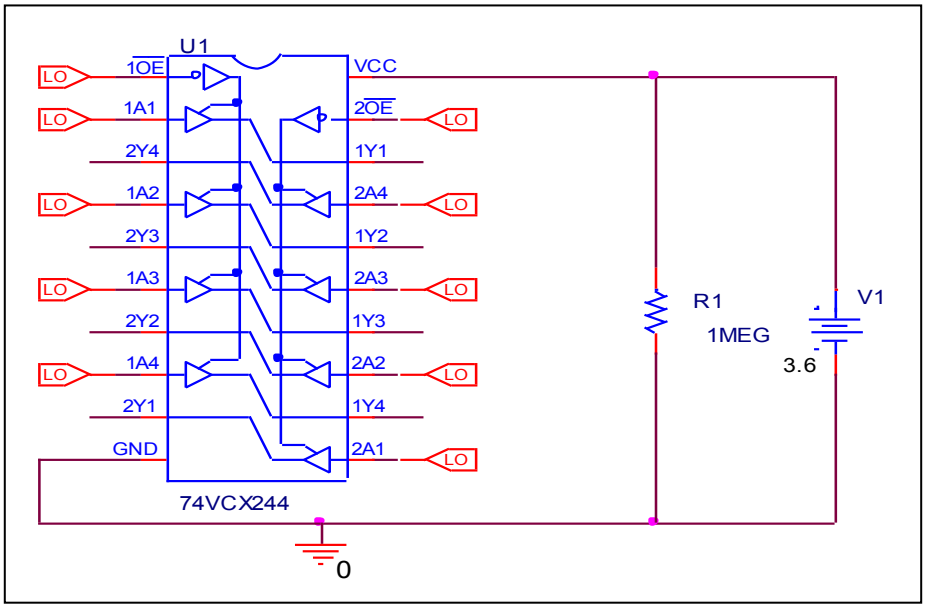
Bee Technologies Inc.

Truth Table

Circuit simulation result



Evaluation circuit

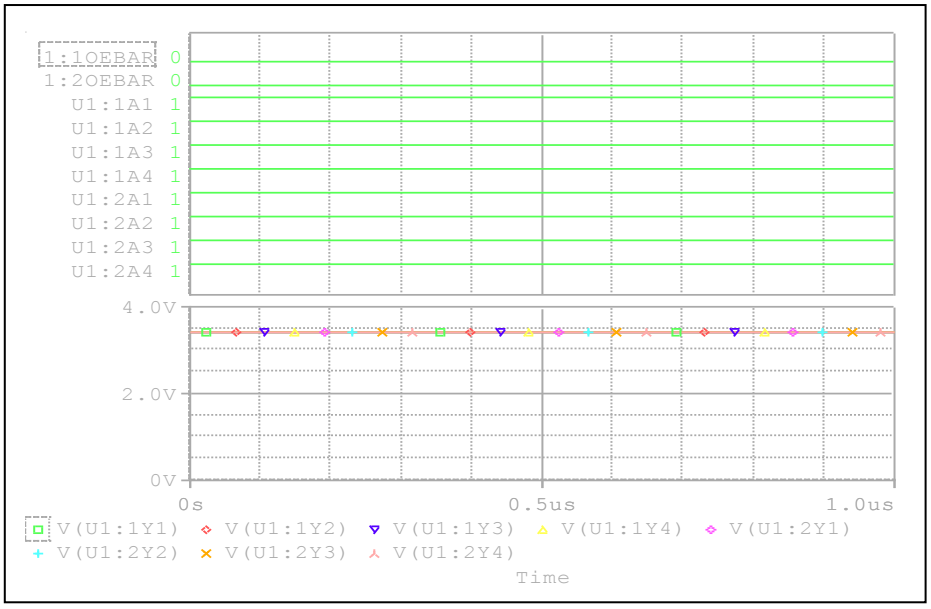


Comparison table

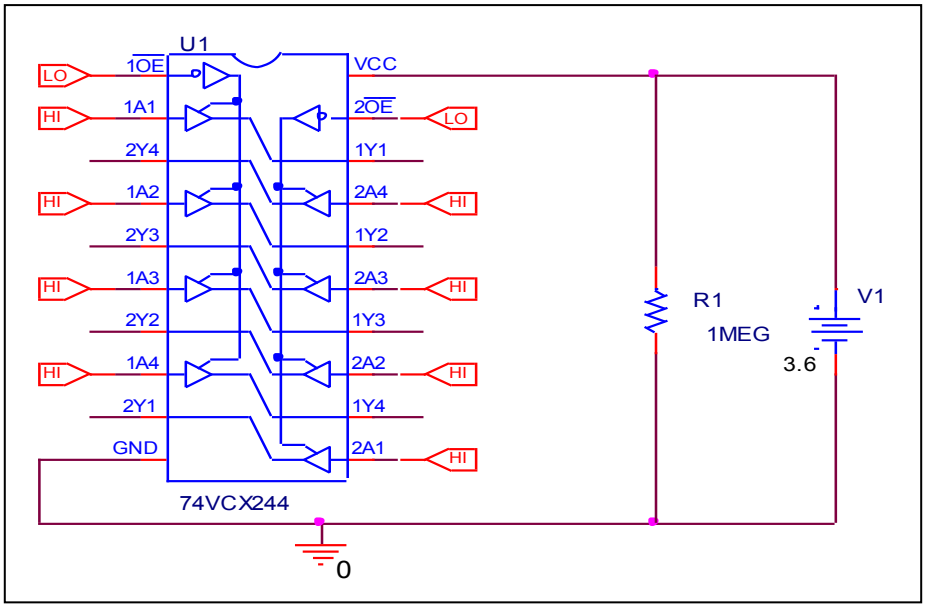
Input		Output		%Error
$\overline{OE}$	An	Yn (Measurement)	Yn (Simulation)	
L	L	L	L	0

Truth Table

Circuit simulation result



Evaluation circuit

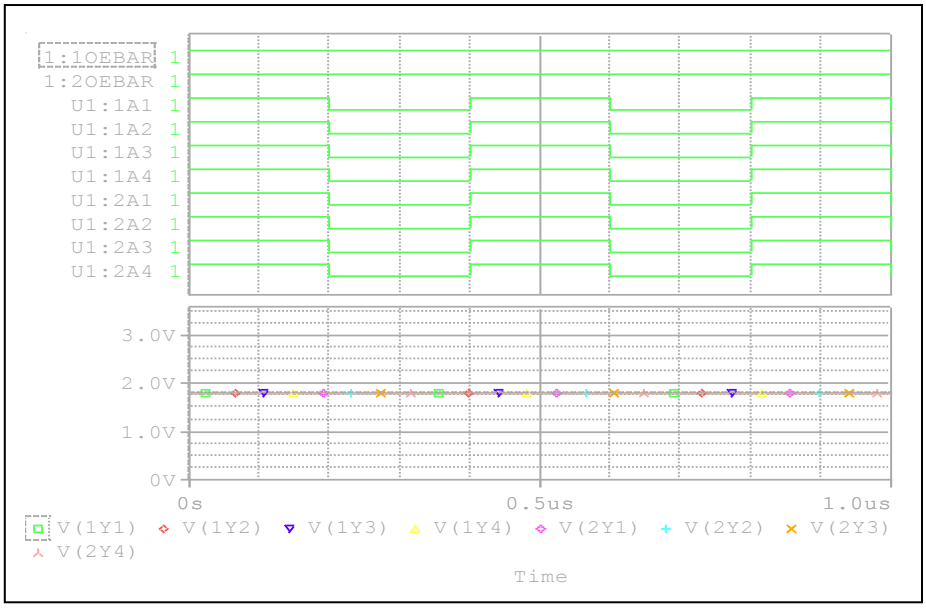


Comparison table

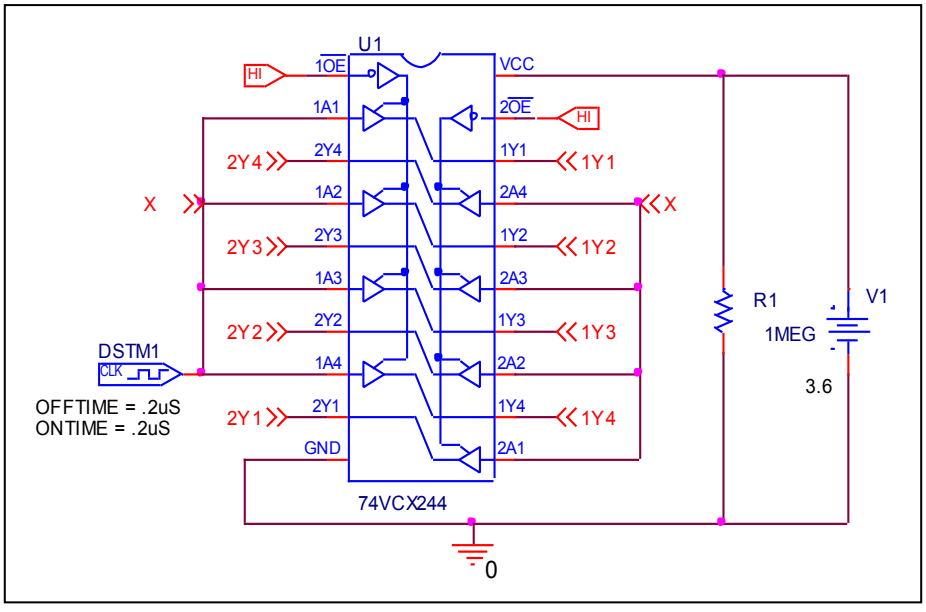
Input		Output		%Error
$\overline{OE}$	An	Yn (Measurement)	Yn (Simulation)	
L	H	H	H	0

Truth Table

Circuit simulation result



Evaluation circuit

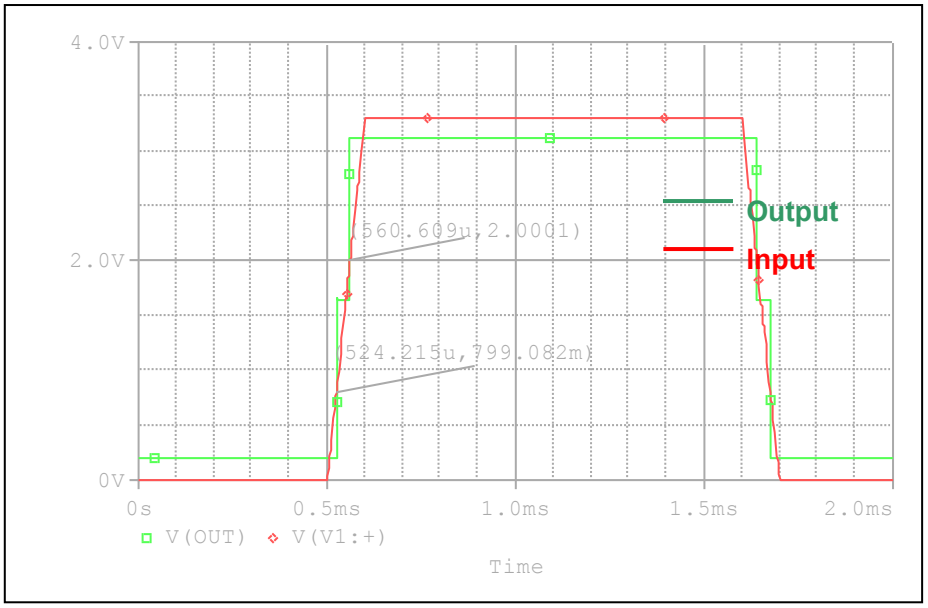


Comparison table

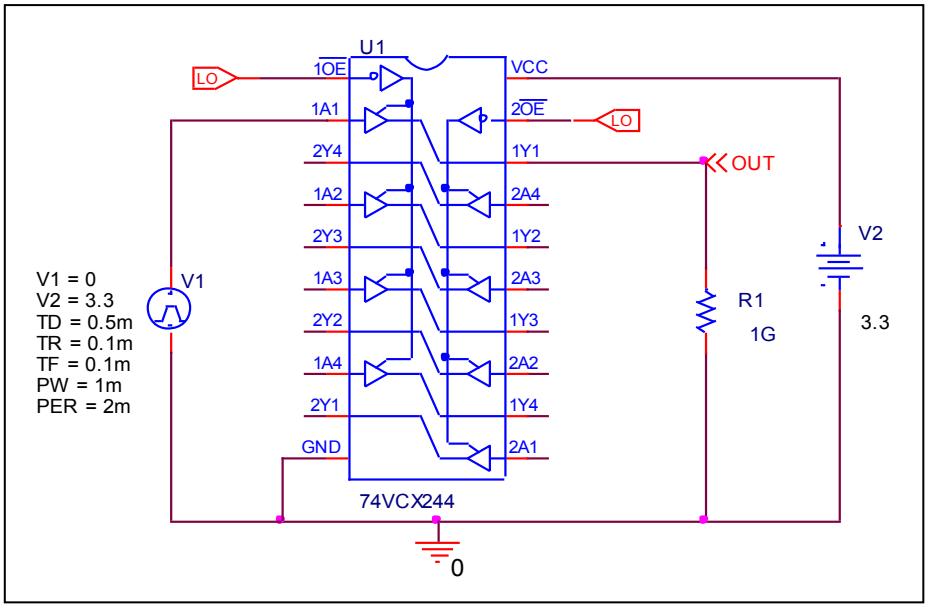
Input		Output		%Error
$\overline{OE}$	An	Yn (Measurement)	Yn (Simulation)	
H	X	Z	Z	0

High Level and Low Level Input Voltage (2.7 V < V_{CC} ≤ 3.6 V)

Circuit simulation result



Evaluation circuit

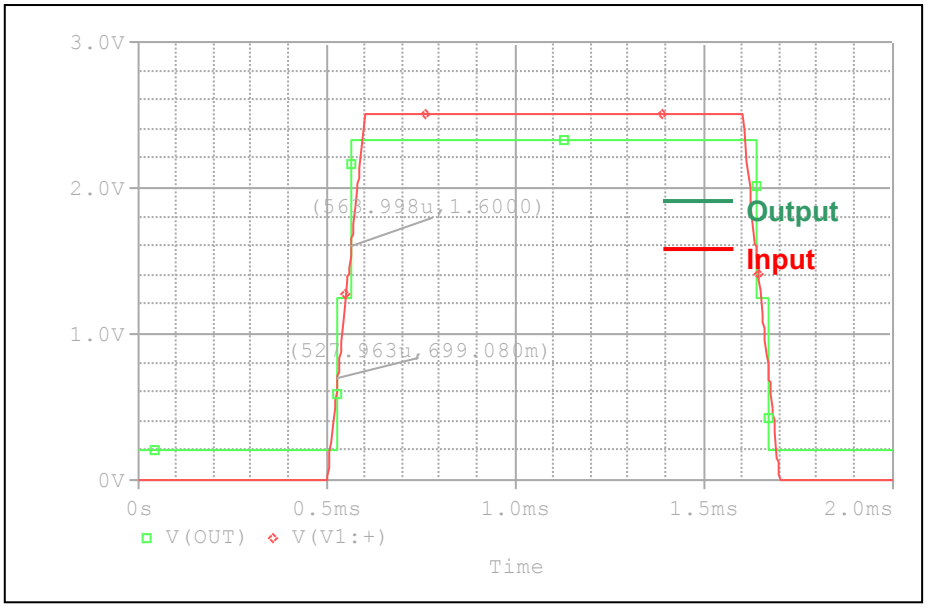


Comparison table

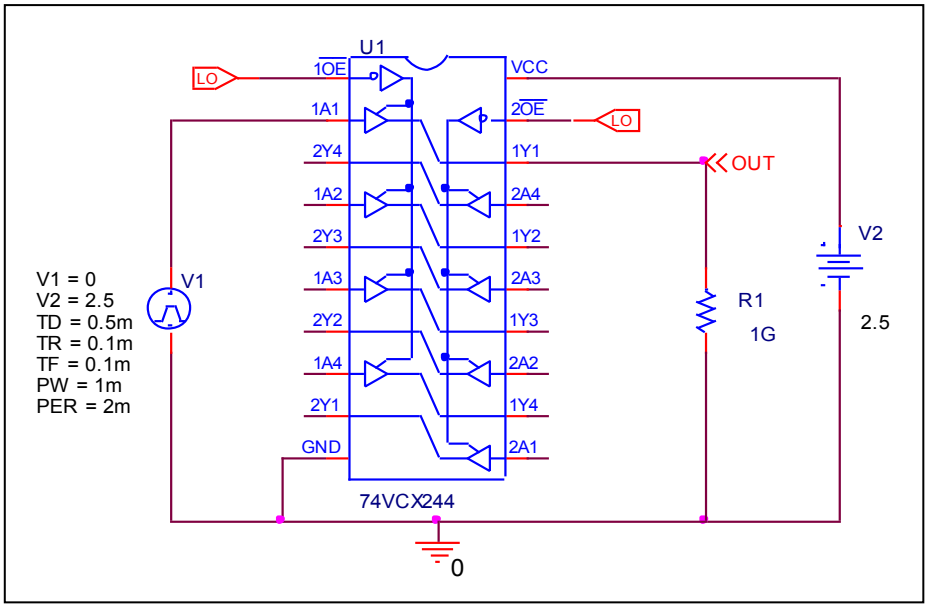
V_{CC} = 3.3 V	Measurement	Simulation	%Error
V_{IH} (V)	2	2	0
V_{IL} (V)	0.8	0.799082	-0.115

High Level and Low Level Input Voltage (2.3 V ≤ V_{CC} ≤ 2.7 V)

Circuit simulation result



Evaluation circuit

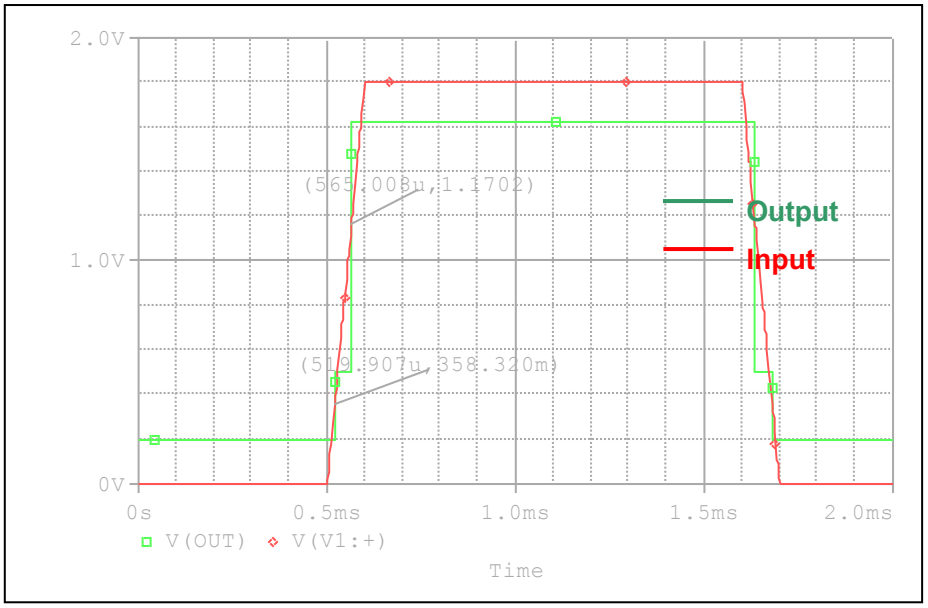


Comparison table

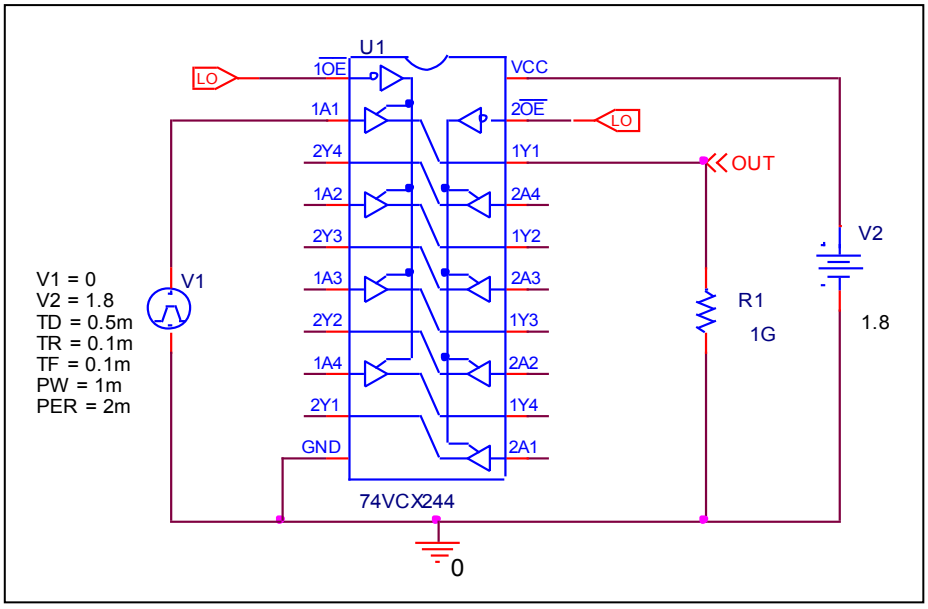
V_{CC} = 2.5 V	Measurement	Simulation	%Error
V_{IH} (V)	1.6	1.6	0
V_{IL} (V)	0.7	0.699080	-0.131

High Level and Low Level Input Voltage (1.65 V ≤ V_{CC} < 2.3 V)

Circuit simulation result



Evaluation circuit

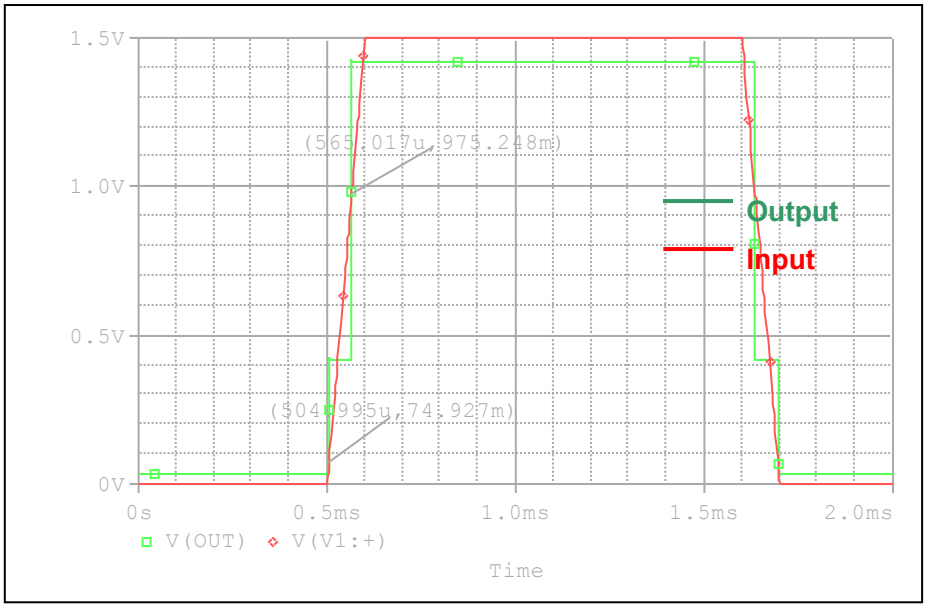


Comparison table

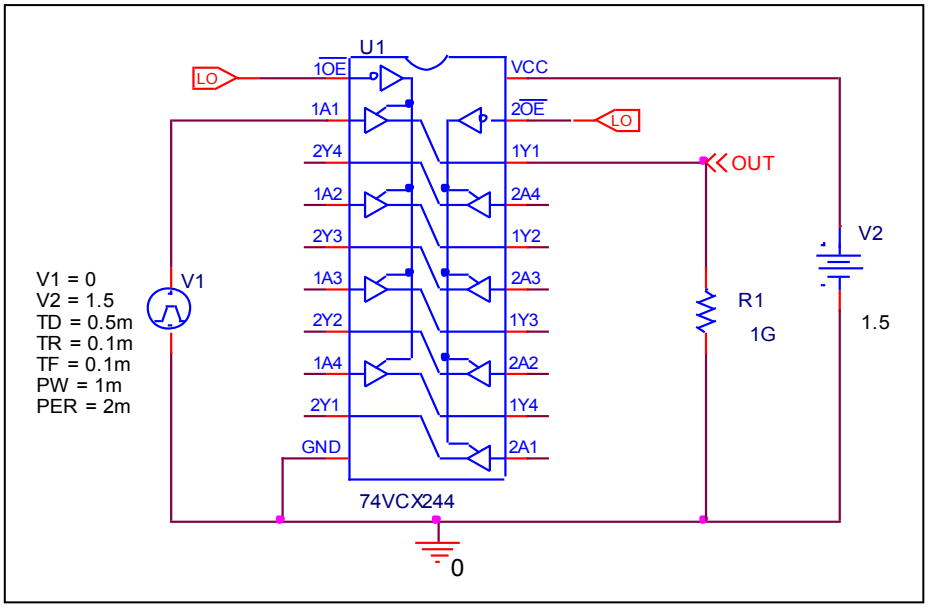
V_{CC} = 1.8 V	Measurement	Simulation	%Error
Min V_{IH} = (V_{CC}*0.65) (V)	1.17	1.1702	0.017
Max V_{IL} = (V_{CC}*0.2) (V)	0.36	0.358320	-0.467

High Level and Low Level Input Voltage (1.4 V ≤ V_{CC} < 1.65 V)

Circuit simulation result



Evaluation circuit

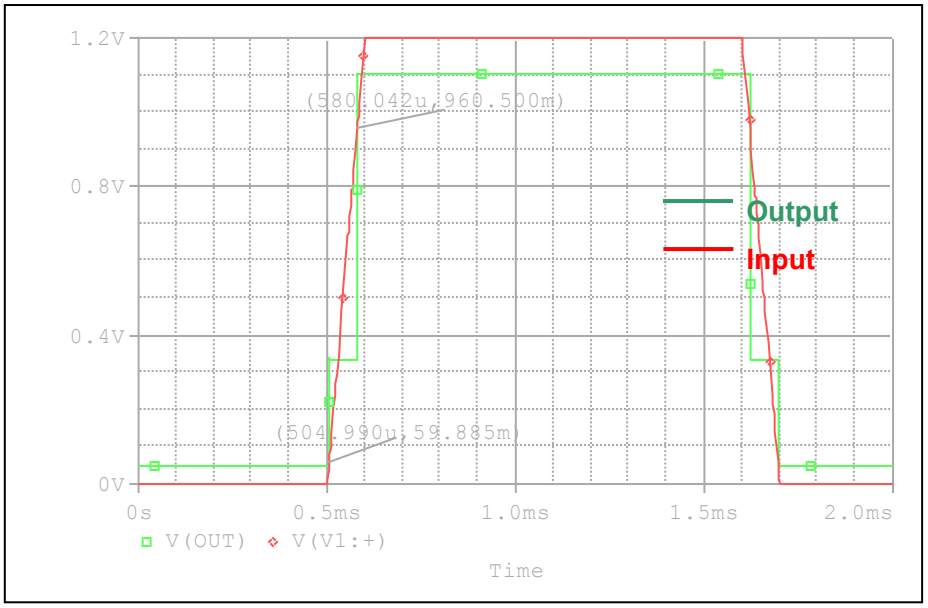


Comparison table

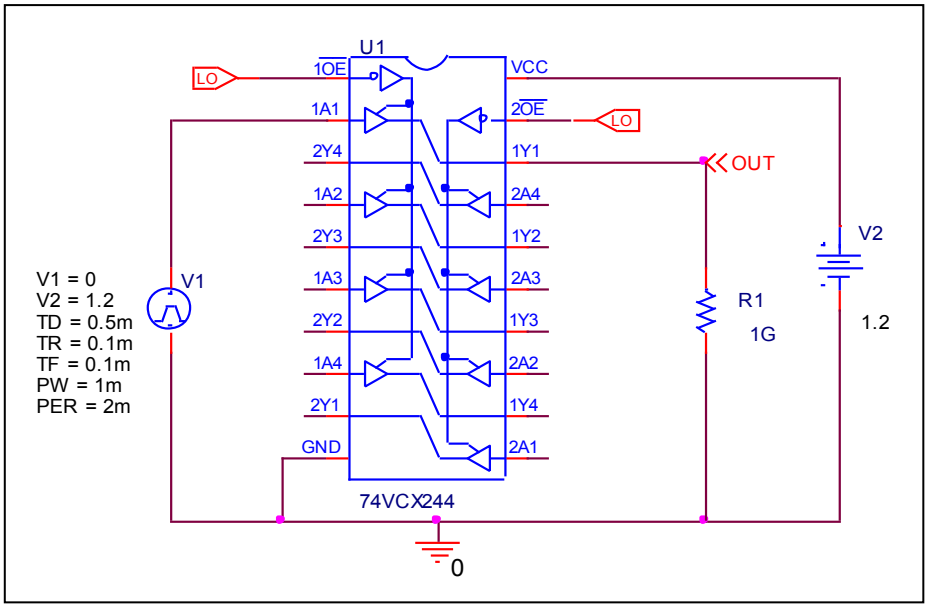
V_{CC} = 1.5 V	Measurement	Simulation	%Error
Min V_{IH} = (V_{CC}*0.65) (V)	0.975	0.975248	0.025
Max V_{IL} = (V_{CC}*0.05) (V)	0.075	0.074927	-0.097

High Level and Low Level Input Voltage (1.2 V ≤ V_{CC} < 1.4 V)

Circuit simulation result



Evaluation circuit

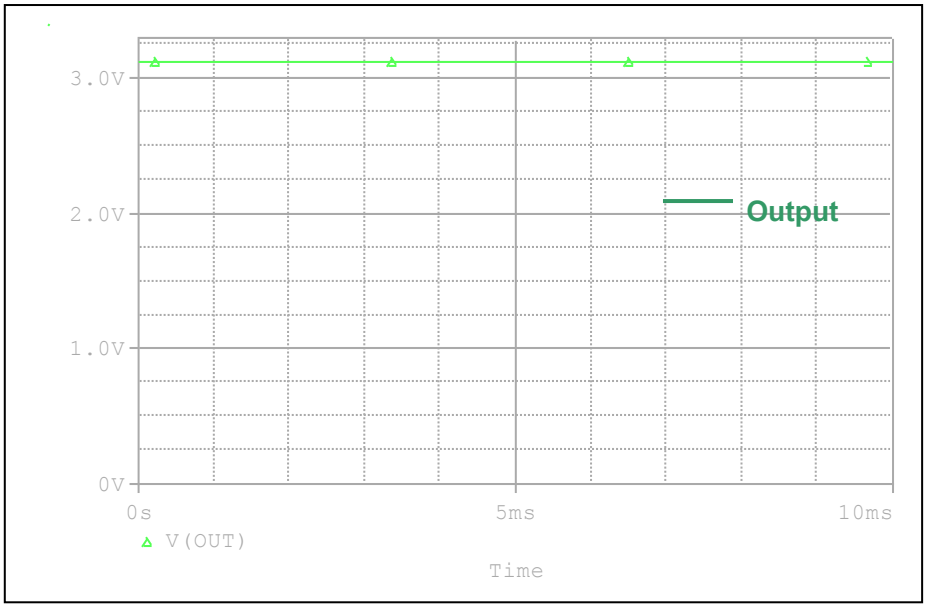


Comparison table

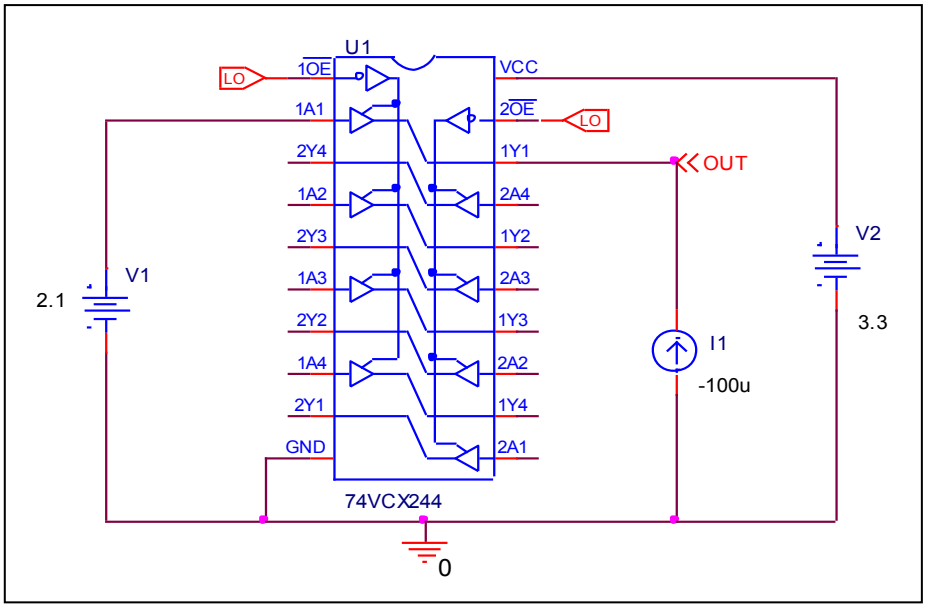
V_{CC} = 1.2 V	Measurement	Simulation	%Error
Min V_{IH} = (V_{CC}*0.8) (V)	0.96	0.9605	0.052
Max V_{IL} = (V_{CC}*0.05) (V)	0.06	0.059885	-0.192

High Level Output Voltage (2.7 V < V_{CC} ≤ 3.6 V)

Circuit simulation result



Evaluation circuit

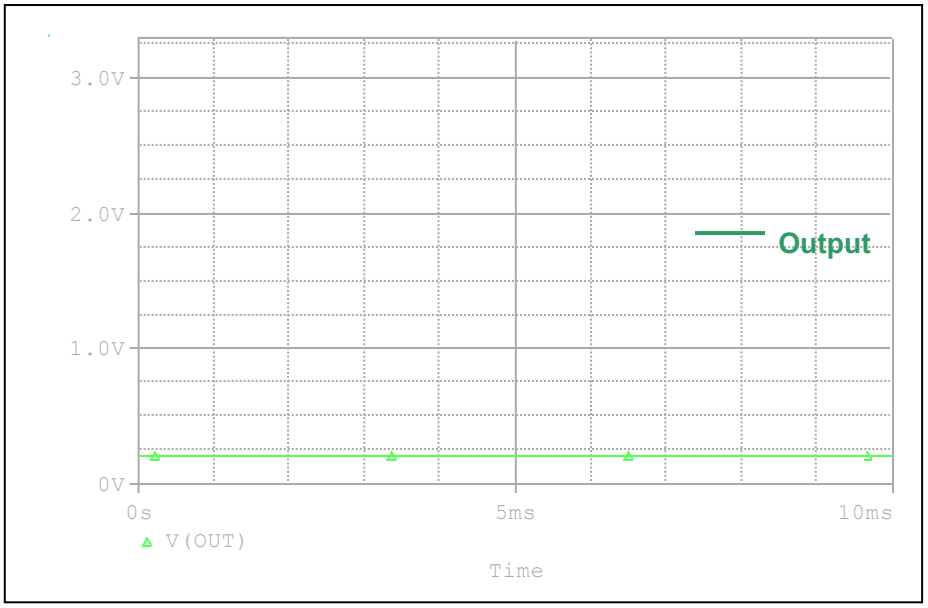


Comparison table

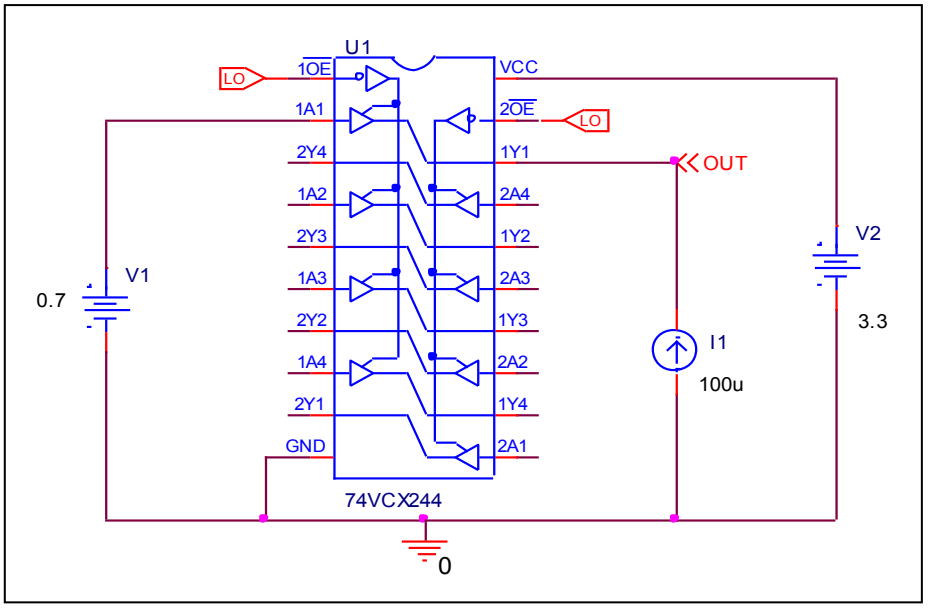
V_{IN} = V_{IH}, V_{CC} = 3.3 V	Measurement	Simulation	%Error
Min V_{OH} = (V_{CC} - 0.2) V	3.1	3.1176	0.568

Low Level Output Voltage (2.7 V < V_{CC} ≤ 3.6 V)

Circuit simulation result



Evaluation circuit

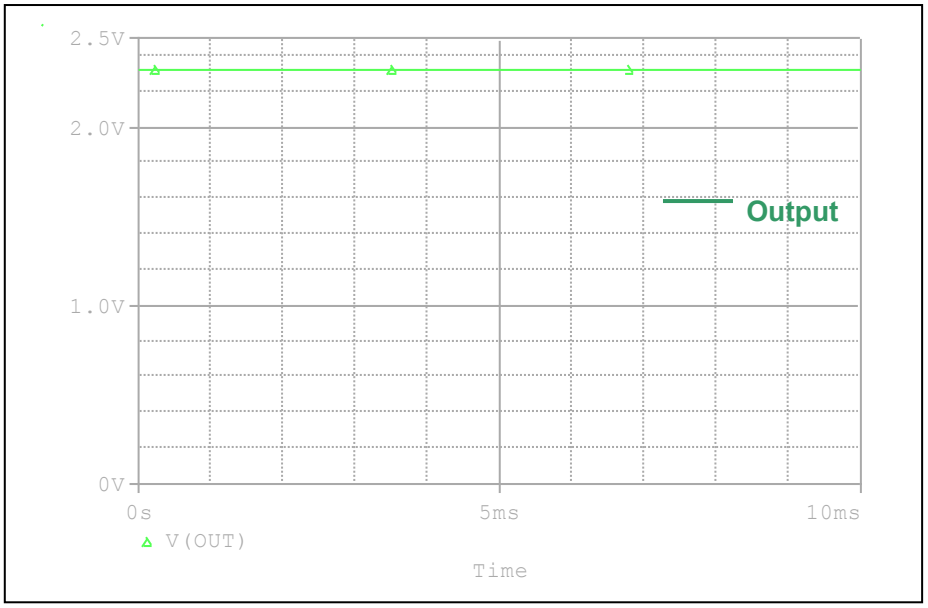


Comparison table

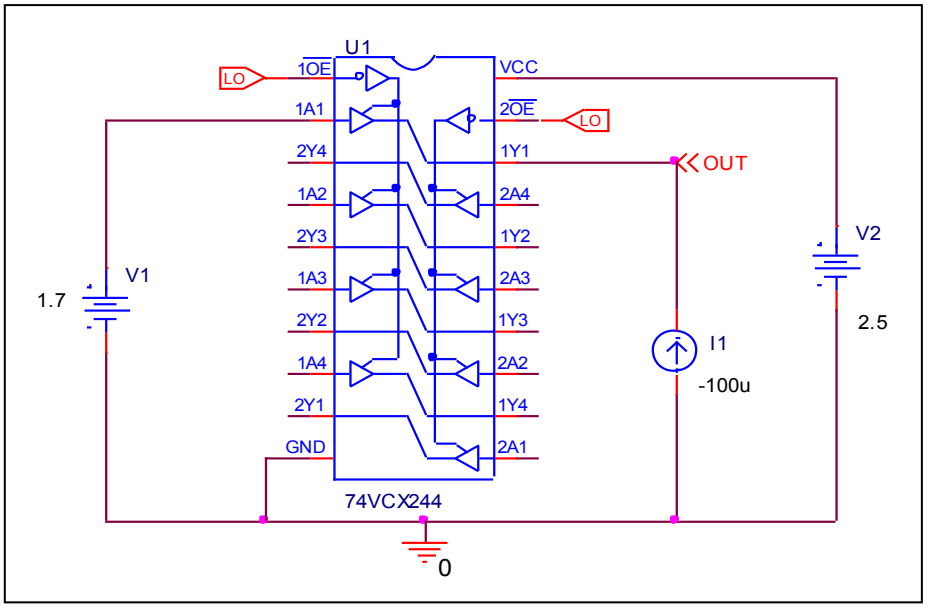
$V_{IN} = V_{IL}$, V_{CC} = 3.3 V	Measurement	Simulation	%Error
V_{OL} (V)	0.2	0.207763	3.882

High Level Output Voltage (2.3 V ≤ V_{CC} ≤ 2.7 V)

Circuit simulation result



Evaluation circuit

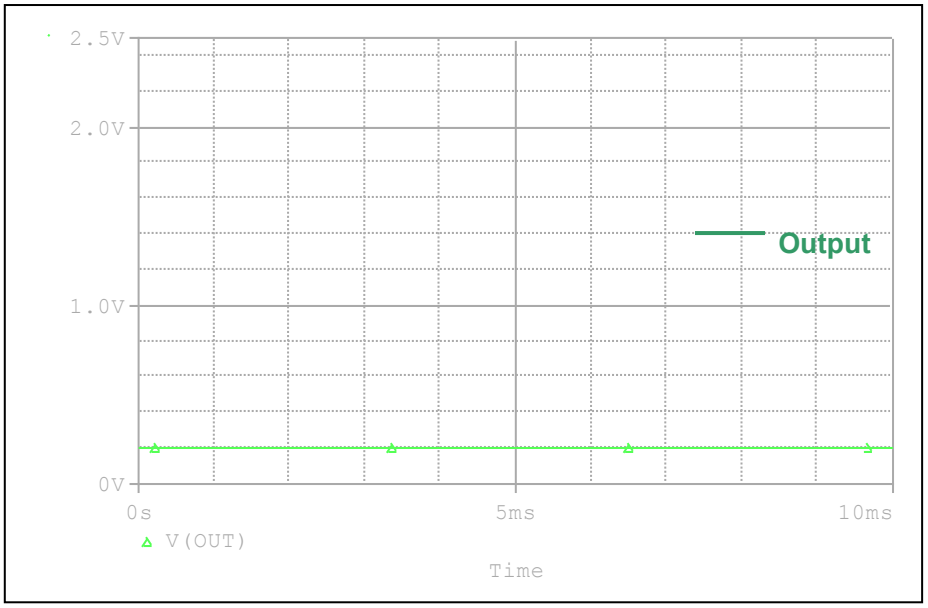


Comparison table

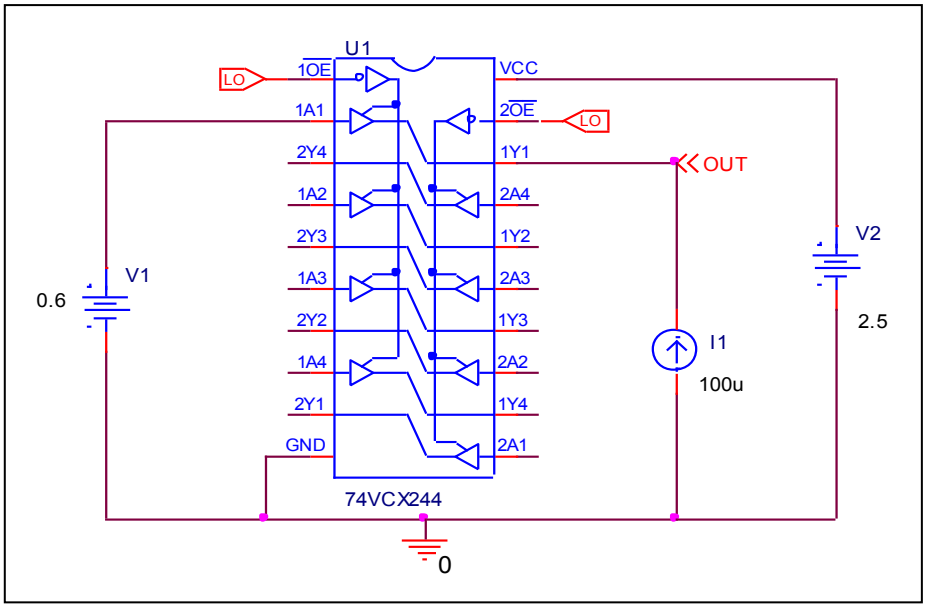
$V_{IN} = V_{IH}$, V_{CC} = 2.5 V	Measurement	Simulation	%Error
Min V_{OH} = (V_{CC} - 0.2) V	2.3	2.3257	1.117

Low Level Output Voltage (2.3 V ≤ V_{CC} ≤ 2.7 V)

Circuit simulation result



Evaluation circuit

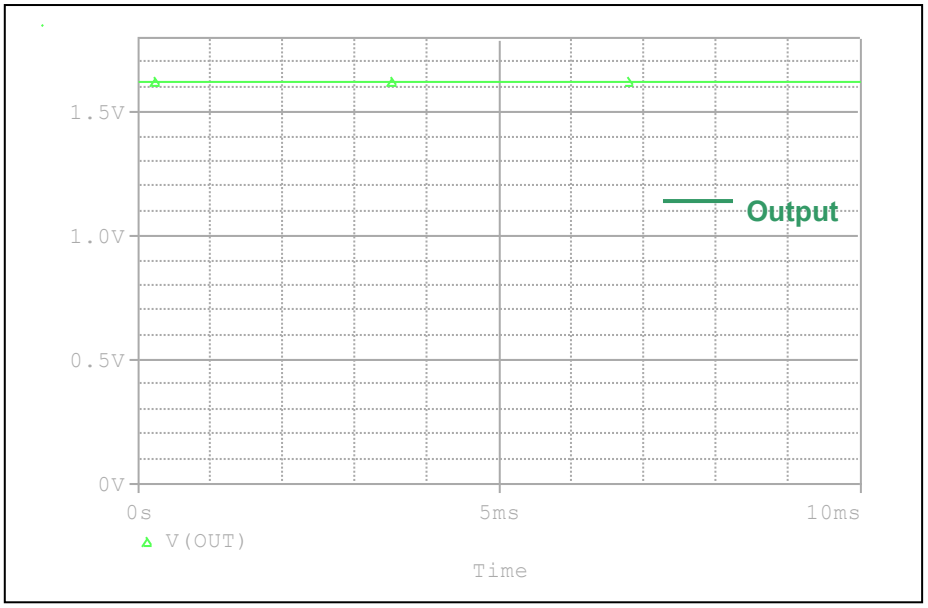


Comparison table

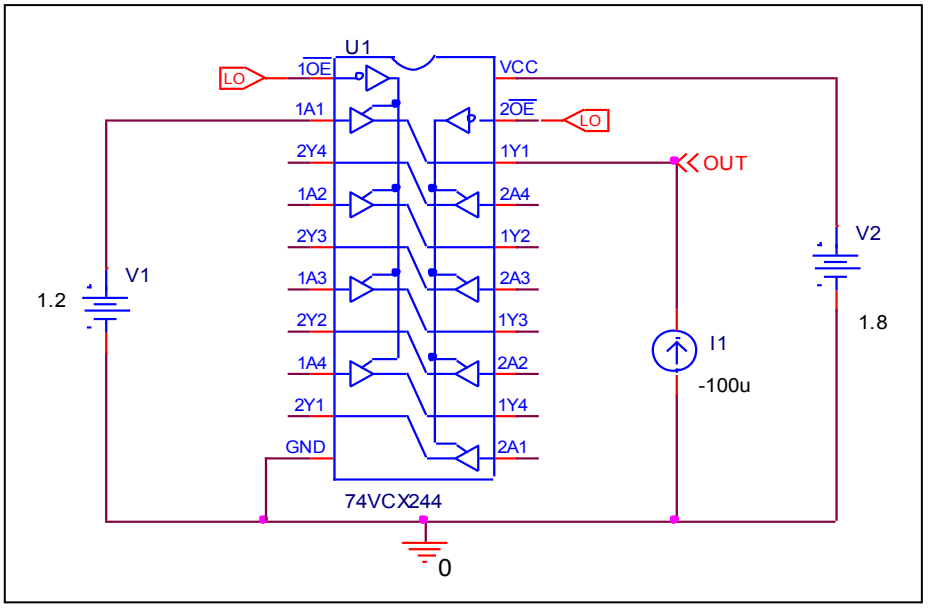
V_{IN} = V_{IL}, V_{CC} = 2.5 V	Measurement	Simulation	%Error
V_{OL} (V)	0.2	0.202055	1.028

High Level Output Voltage (1.65 V ≤ V_{CC} < 2.3 V)

Circuit simulation result



Evaluation circuit

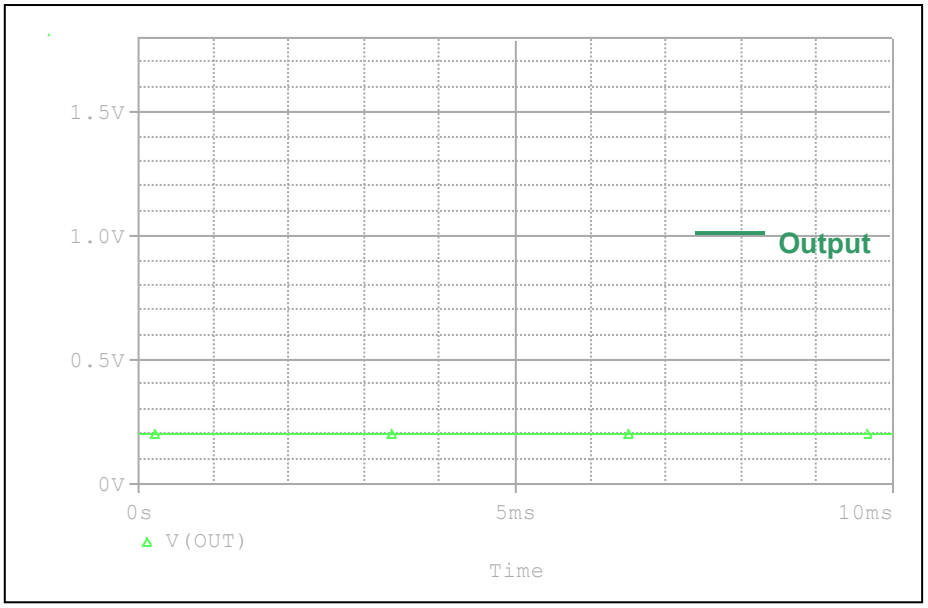


Comparison table

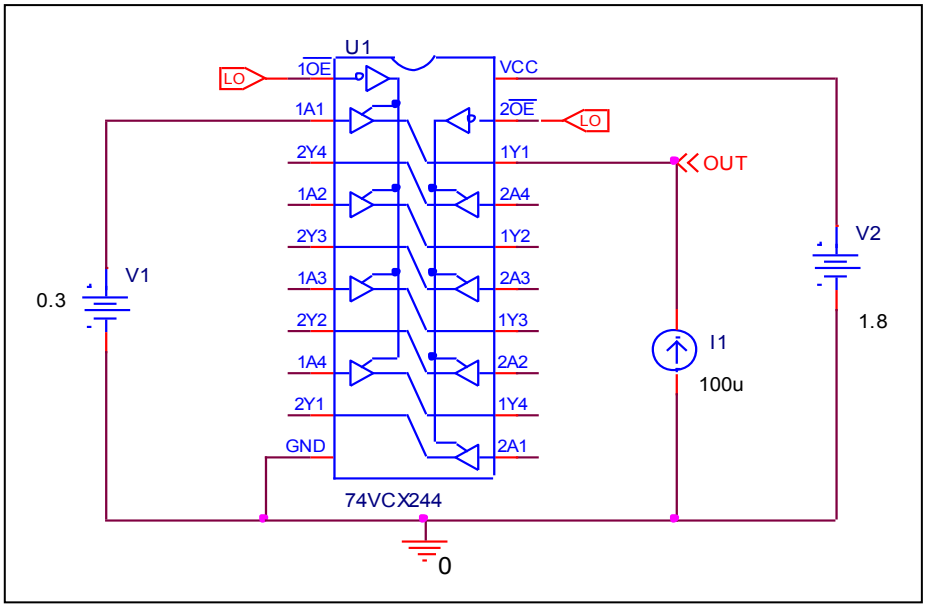
$V_{IN} = V_{IH}$, V_{CC} = 1.8 V	Measurement	Simulation	%Error
Min V_{OH} = (V_{CC} - 0.2) V	1.6	1.6184	1.150

Low Level Output Voltage (1.65 V ≤ V_{CC} < 2.3 V)

Circuit simulation result



Evaluation circuit

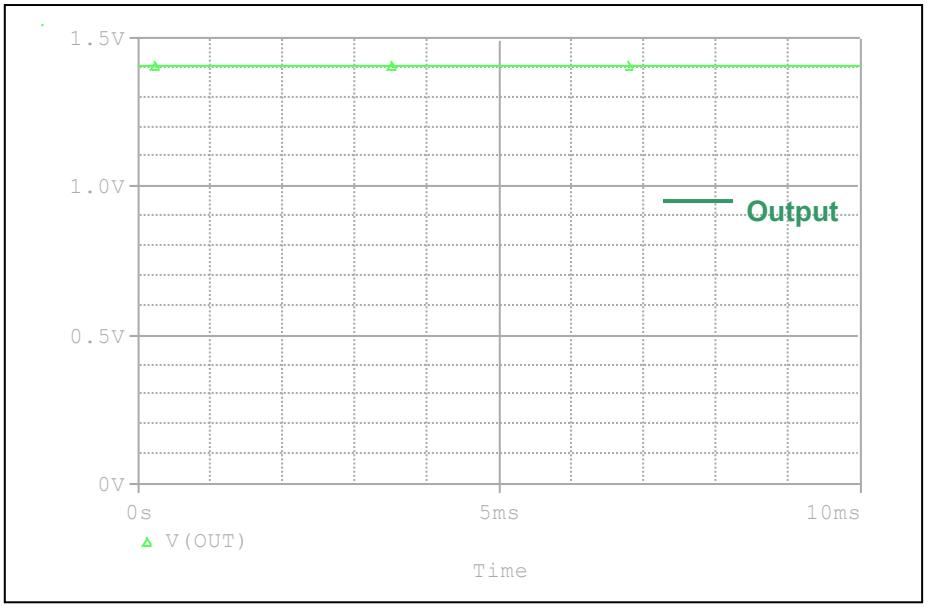


Comparison table

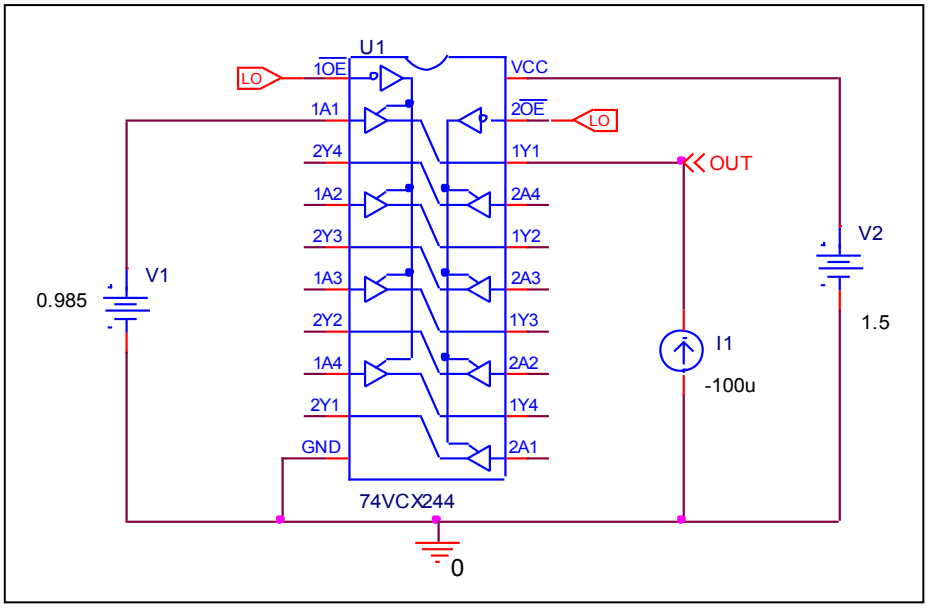
V_{IN} = V_{IL}, V_{CC} = 1.8 V	Measurement	Simulation	%Error
V_{OL} (V)	0.2	0.198	-1

High Level Output Voltage (1.4 V ≤ V_{CC} < 1.65 V)

Circuit simulation result



Evaluation circuit

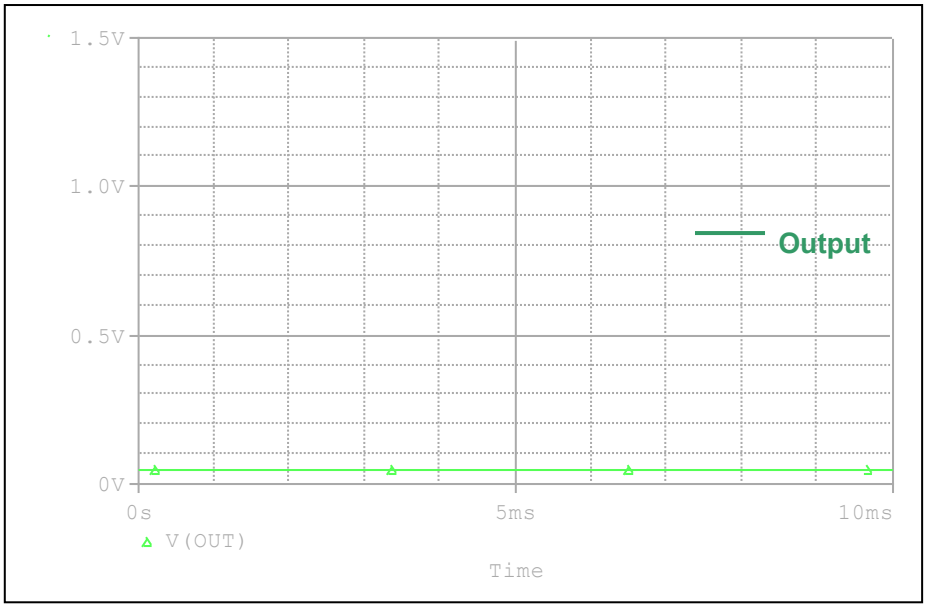


Comparison table

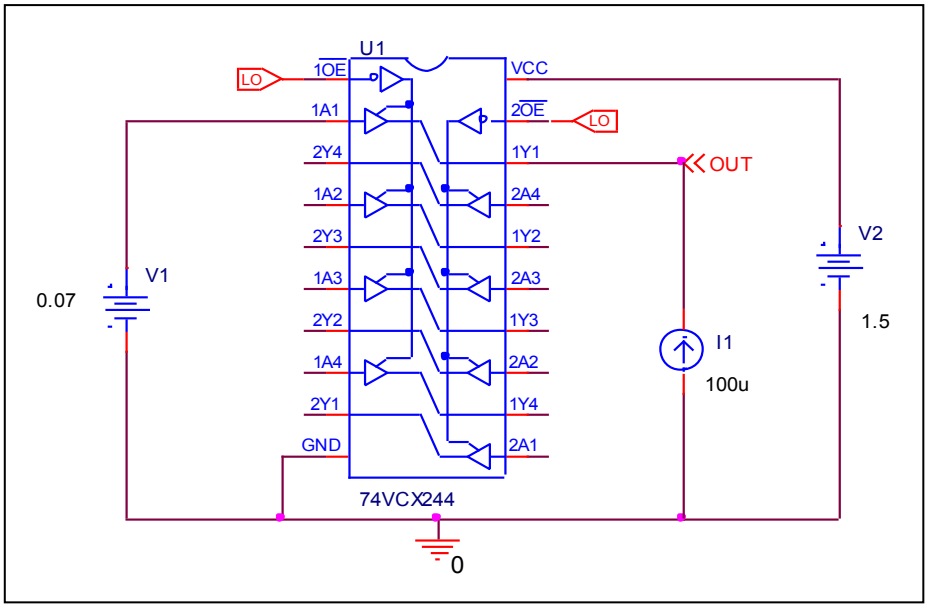
$V_{IN} = V_{IH}$, V_{CC} = 1.5 V	Measurement	Simulation	%Error
Min V_{OH} = (V_{CC} - 0.1) V	1.4	1.4078	0.557

Low Level Output Voltage (1.4 V ≤ V_{CC} < 1.65 V)

Circuit simulation result



Evaluation circuit

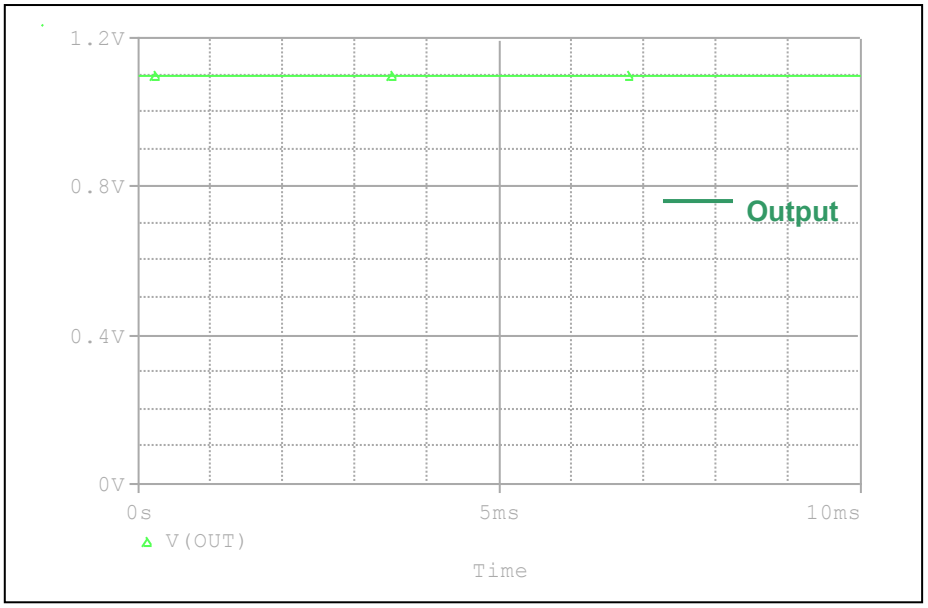


Comparison table

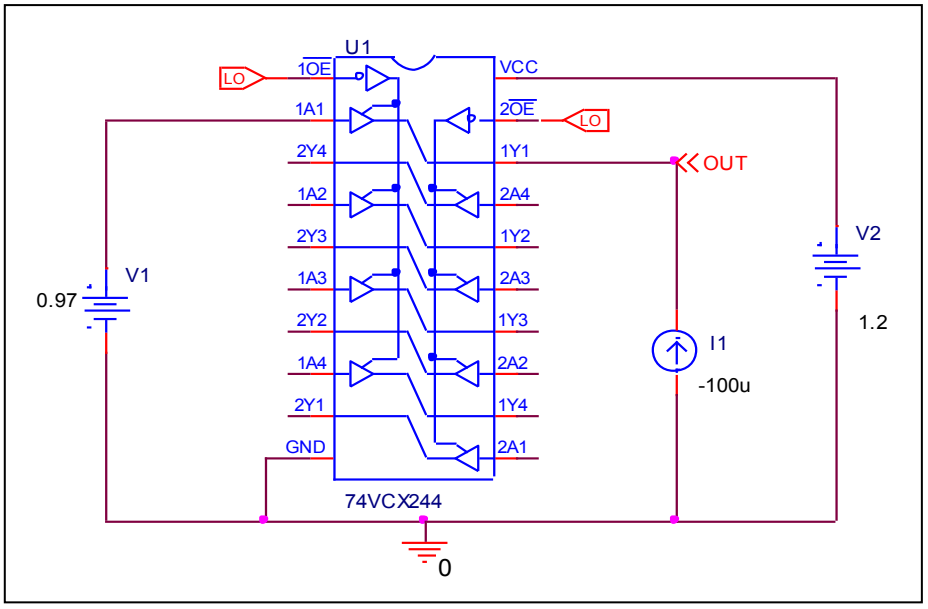
$V_{IN} = V_{IL}$, V_{CC} = 1.5 V	Measurement	Simulation	%Error
V_{OL} (V)	0.05	0.04786	-4.28

High Level Output Voltage (1.2 V ≤ V_{CC} < 1.4 V)

Circuit simulation result



Evaluation circuit

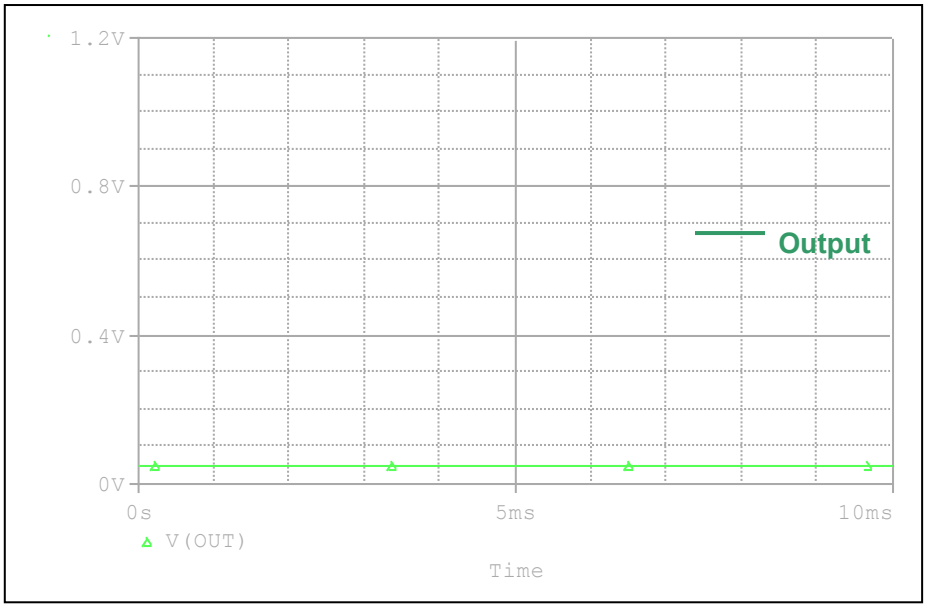


Comparison table

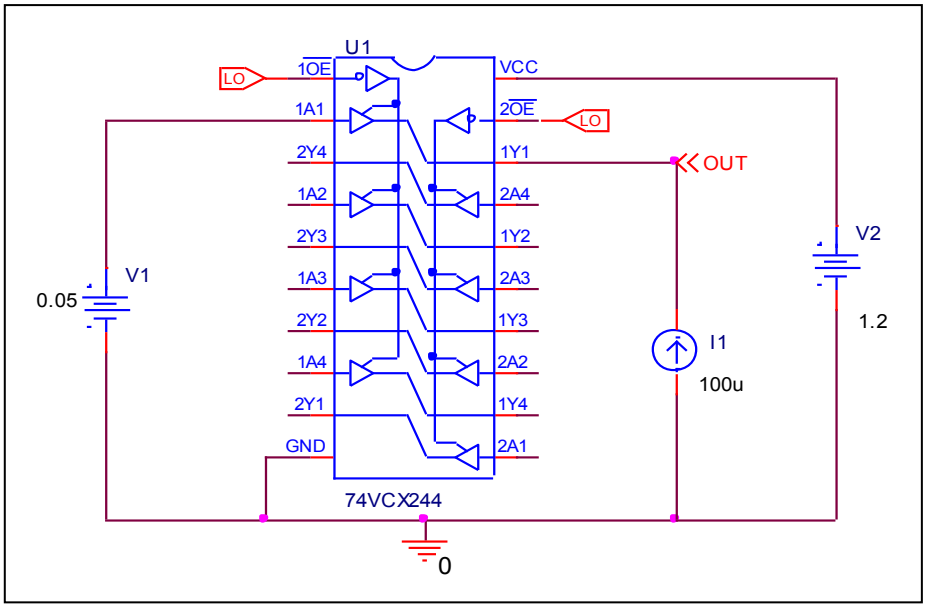
V_{IN} = V_{IH}, V_{CC} = 1.2 V	Measurement	Simulation	%Error
Min V_{OH} = (V_{CC} - 0.1) V	1.1	1.1002	0.018

Low Level Output Voltage (1.2 V ≤ V_{CC} < 1.4 V)

Circuit simulation result



Evaluation circuit

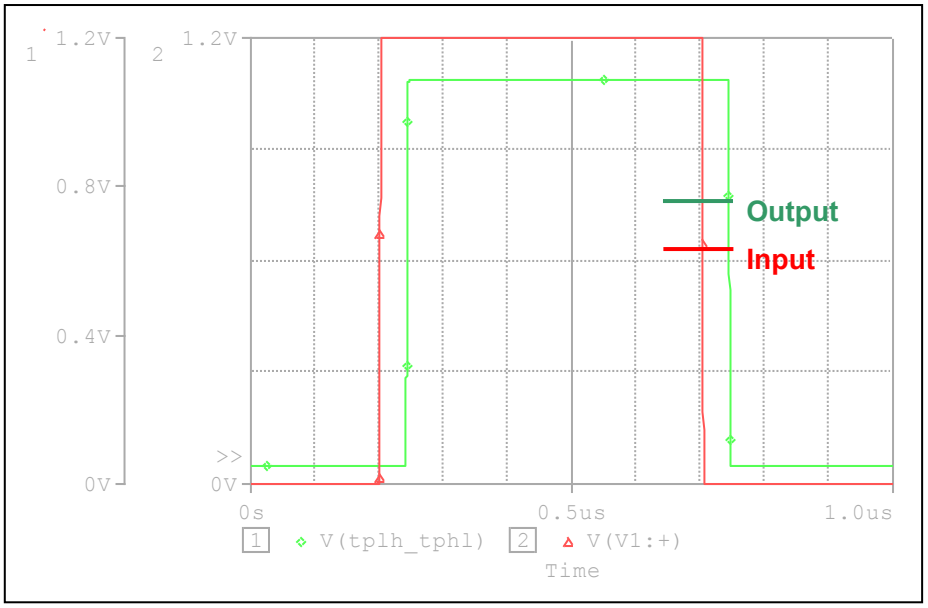


Comparison table

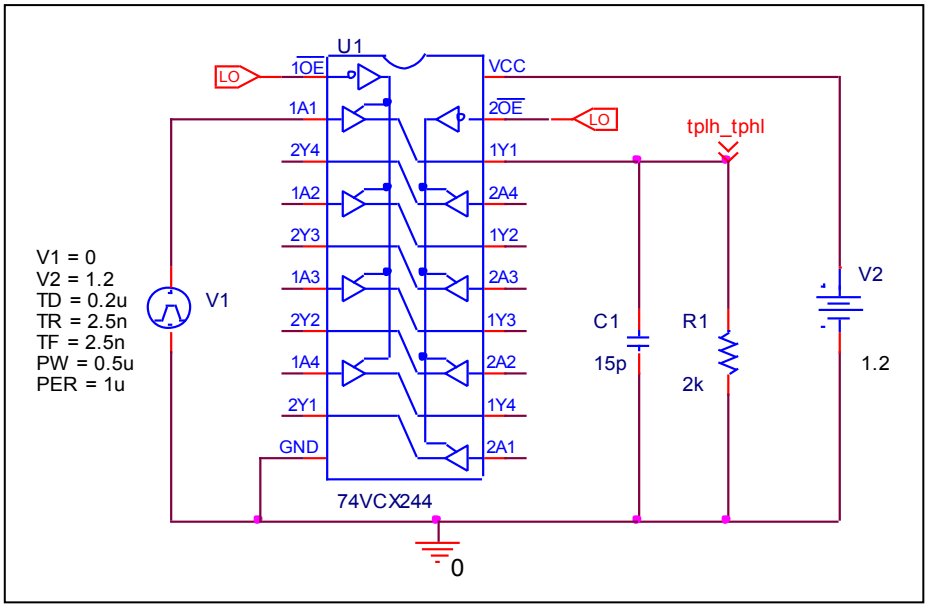
V_{IN} = V_{IL}, V_{CC} = 1.2 V	Measurement	Simulation	%Error
V_{OL} (V)	0.05	0.048446	-3.108

Propagation Delay Time (V_{CC} = 1.2 V)

Circuit simulation result



Evaluation circuit

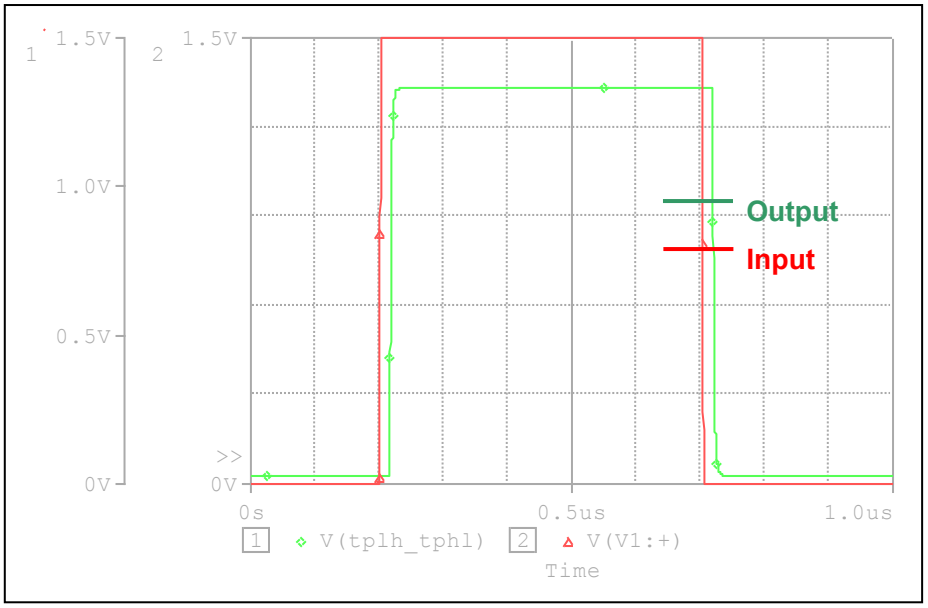


Comparison table C_L = 15 pF, R_L = 2 KΩ

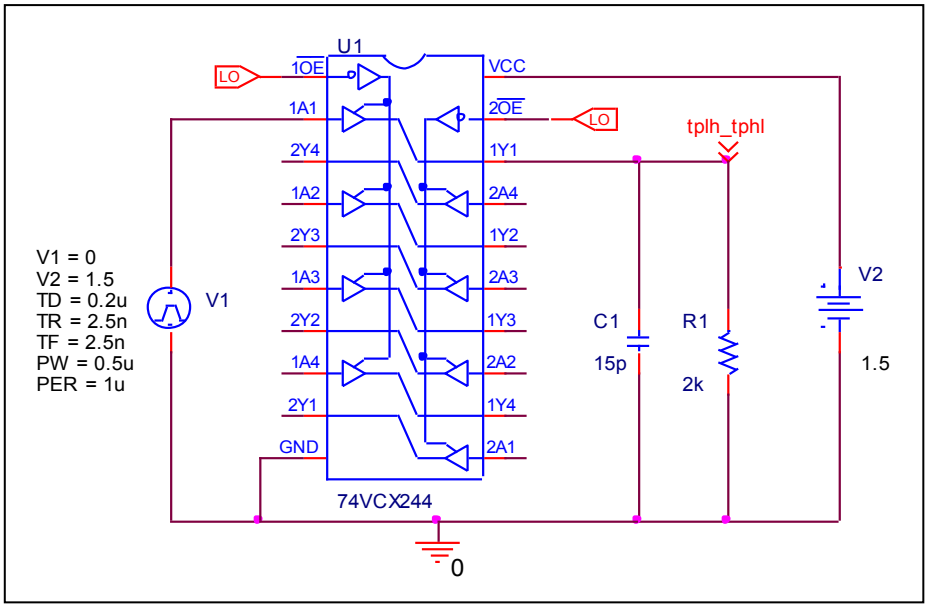
V_{CC} = 1.2 V, t_r = t_f = 2 ns	Measurement	Simulation	%Error
t_{pLH} (ns)	42	41.898	-0.243
t_{pHL} (ns)	42	41.570	-1.024

Propagation Delay Time (V_{CC} = 1.5 V)

Circuit simulation result



Evaluation circuit

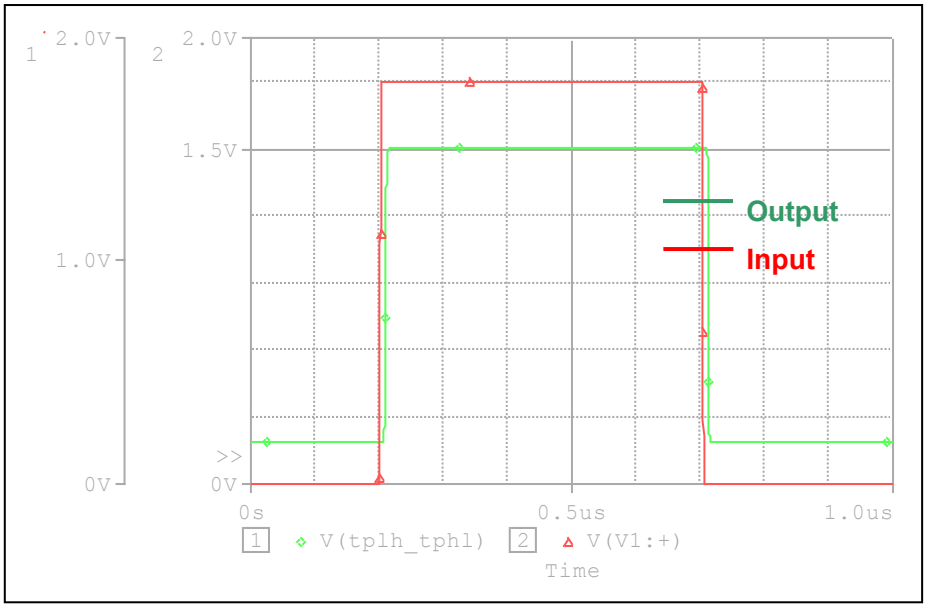


Comparison table C_L = 15 pF, R_L = 2 KΩ

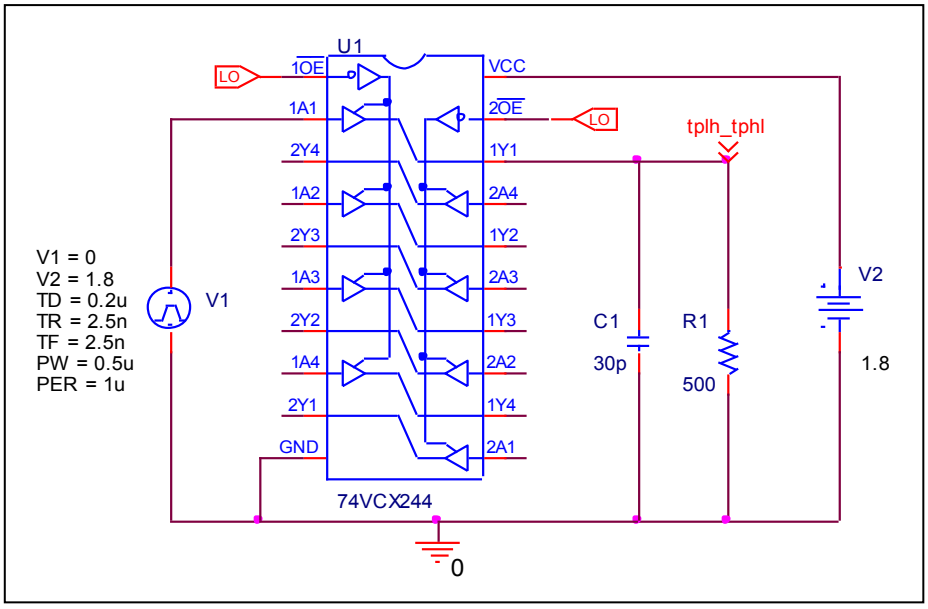
V_{CC} = 1.5 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{pLH} (ns)	16.8	16.565	-1.399
t_{pHL} (ns)	16.8	16.616	-1.095

Propagation Delay Time (V_{CC} = 1.8 V)

Circuit simulation result



Evaluation circuit

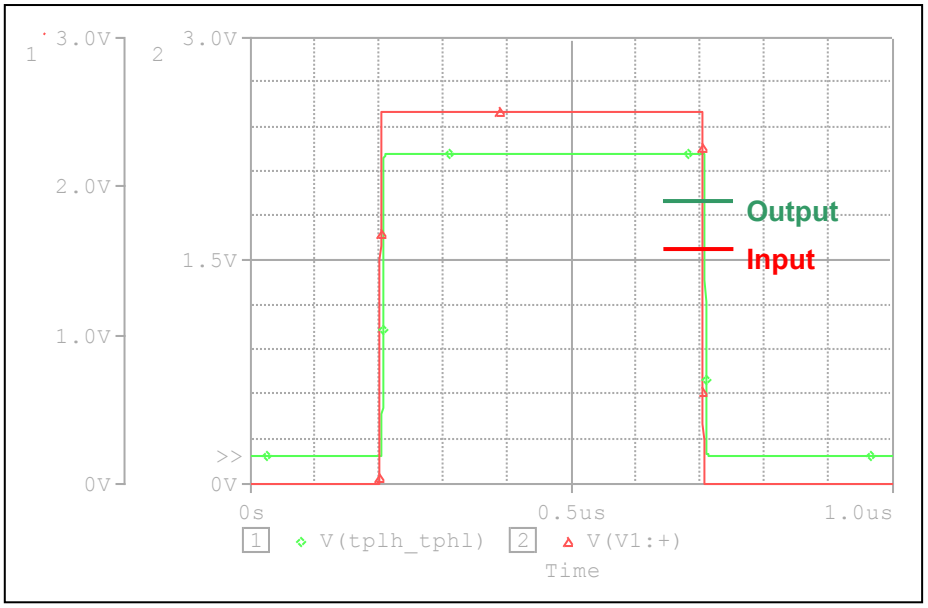


Comparison table **C_L = 30 pF, R_L = 500 Ω**

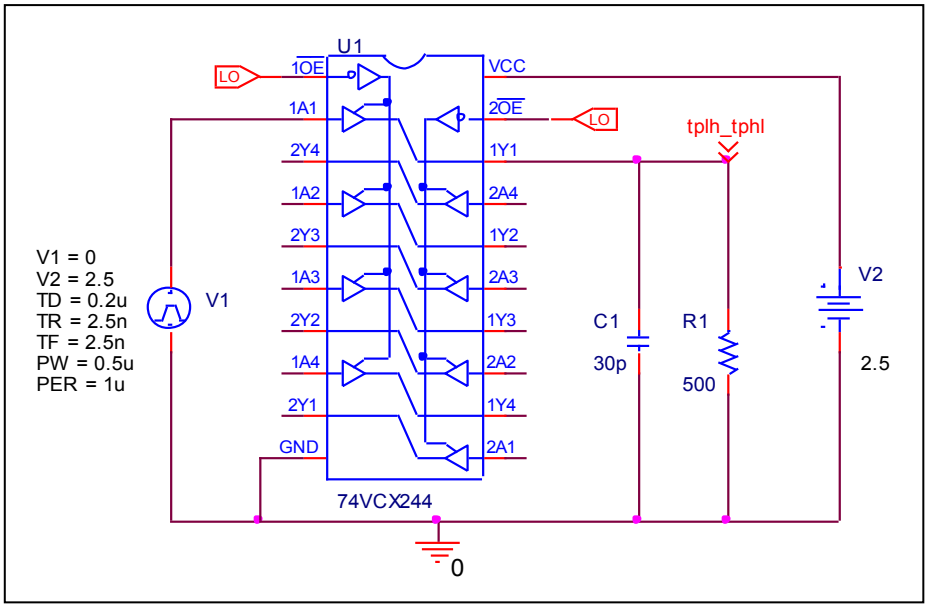
V_{CC} = 1.8 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{pLH} (ns)	8.4	8.2821	-1.404
t_{pHL} (ns)	8.4	8.3285	-0.851

Propagation Delay Time (V_{CC} = 2.5 V)

Circuit simulation result



Evaluation circuit

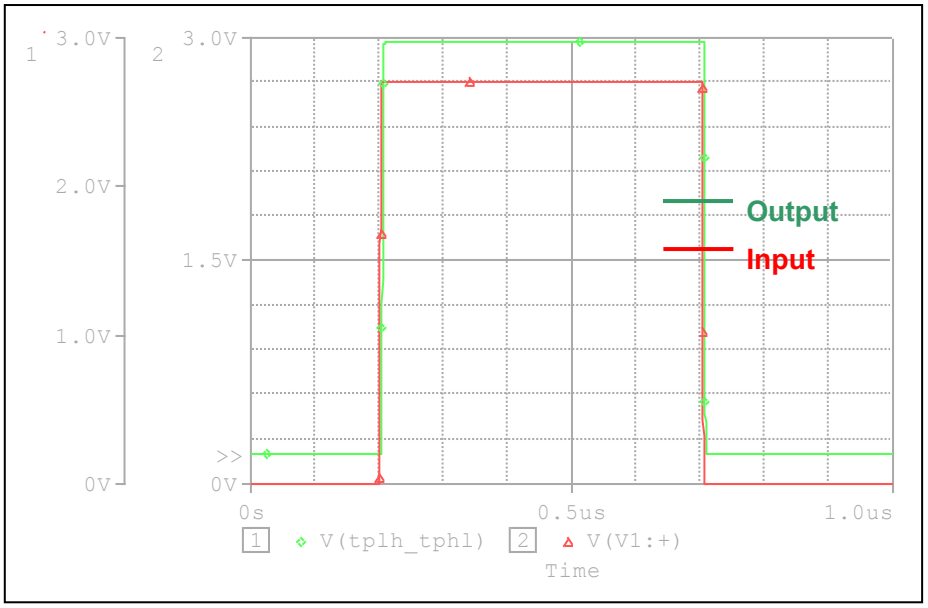


Comparison table **C_L = 30 pF, R_L = 500 Ω**

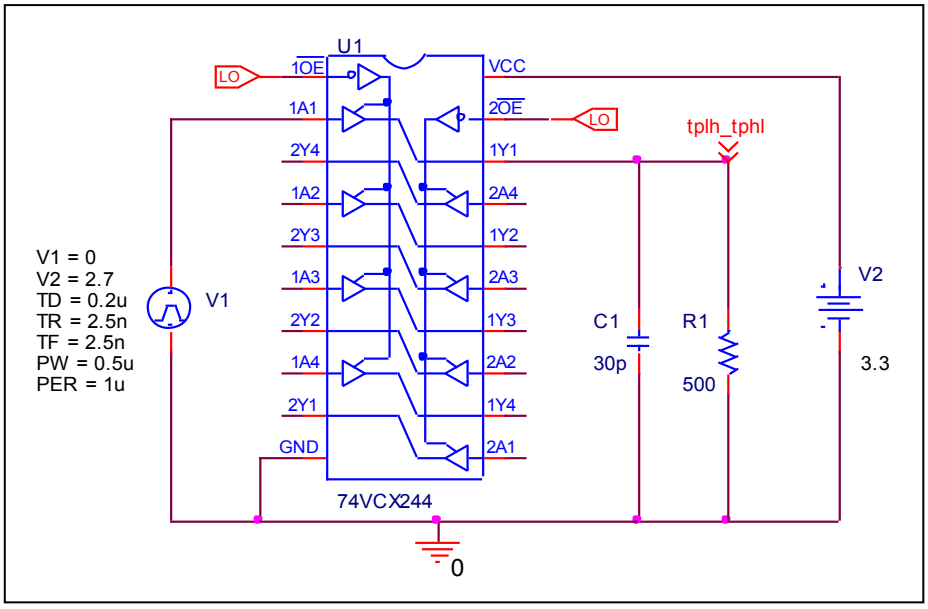
V_{CC} = 2.5 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{pLH} (ns)	4.2	4.1775	-0.536
t_{pHL} (ns)	4.2	4.1338	-1.576

Propagation Delay Time (V_{CC} = 3.3)

Circuit simulation result



Evaluation circuit

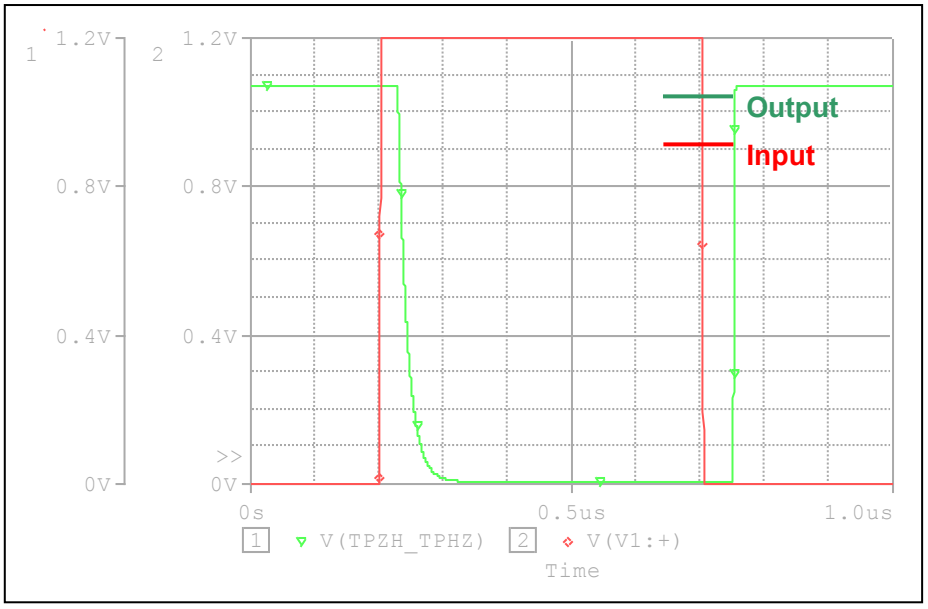


Comparison table **C_L = 30 pF, R_L = 500 Ω**

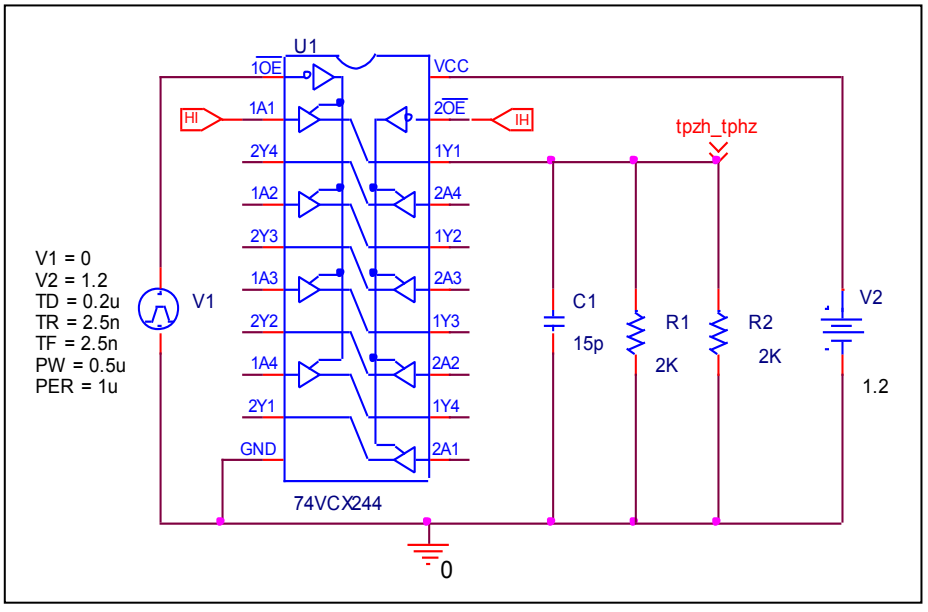
V_{CC} = 3.3 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{pLH} (ns)	3.5	3.457	-1.229
t_{pHL} (ns)	3.5	3.4915	-0.243

Output enable time(t_{PZH}) and Output disable time(t_{PHZ}) (V_{CC} = 1.2)

Circuit simulation result



Evaluation circuit

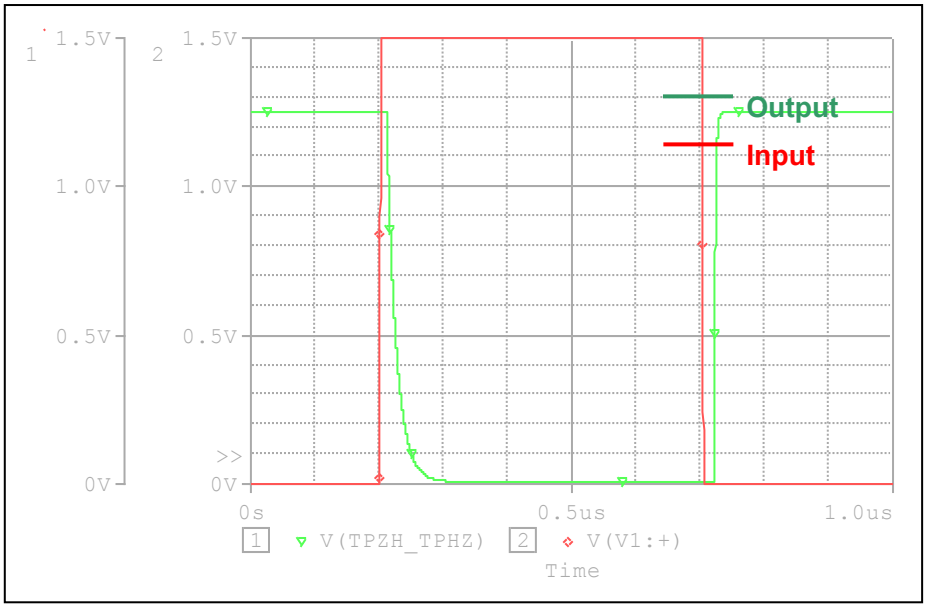


Comparison table C_L = 15 pF, R_L = 2 kΩ

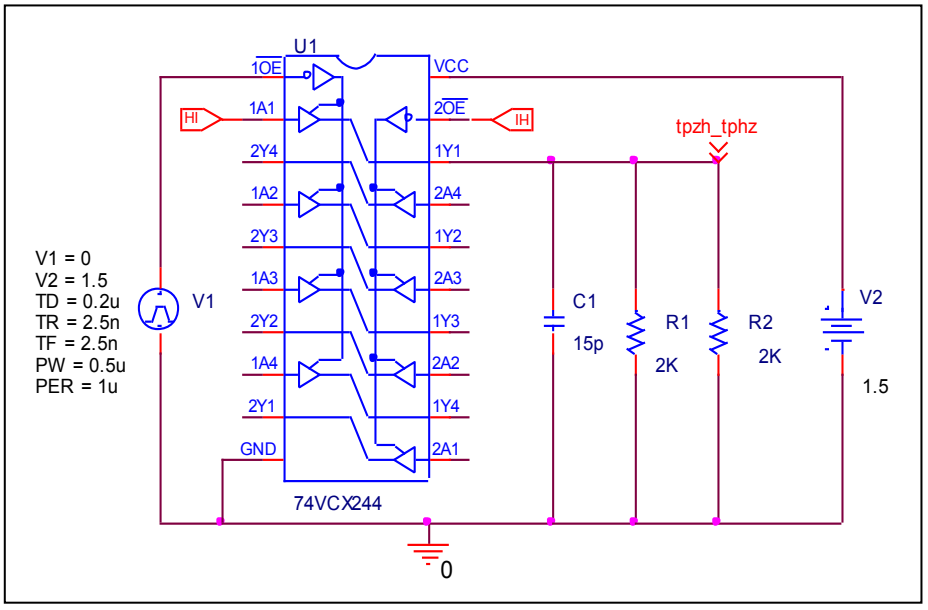
V_{CC} =1.2 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{PHZ} (ns)	29	28.866	-0.462
t_{pZH} (ns)	49	48.920	-0.163

Output enable time(t_{PZH}) and Output disable time(t_{PHZ}) (V_{CC} = 1.5)

Circuit simulation result



Evaluation circuit

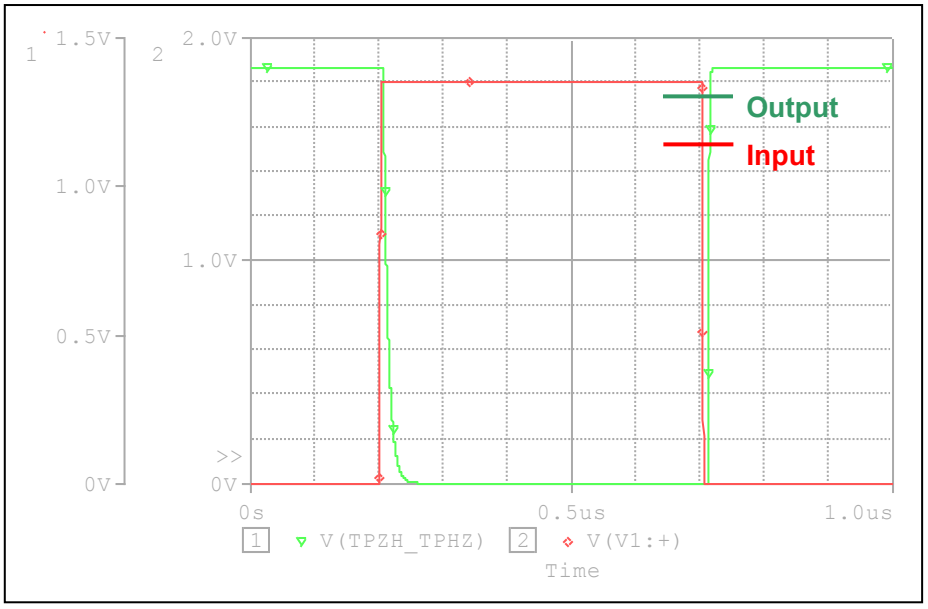


Comparison table C_L = 15 pF, R_L = 2 kΩ

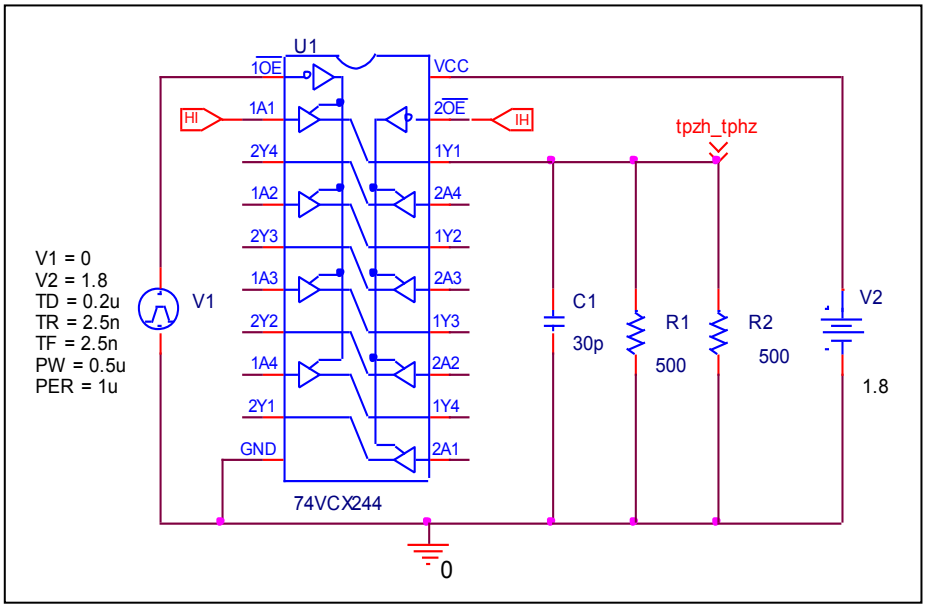
V_{CC} =1.5 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{PHZ} (ns)	11.6	11.335	-2.284
t_{pZH} (ns)	19.6	19.540	-0.306

Output enable time(t_{PZH}) and Output disable time(t_{PHZ}) (V_{CC} = 1.8)

Circuit simulation result



Evaluation circuit

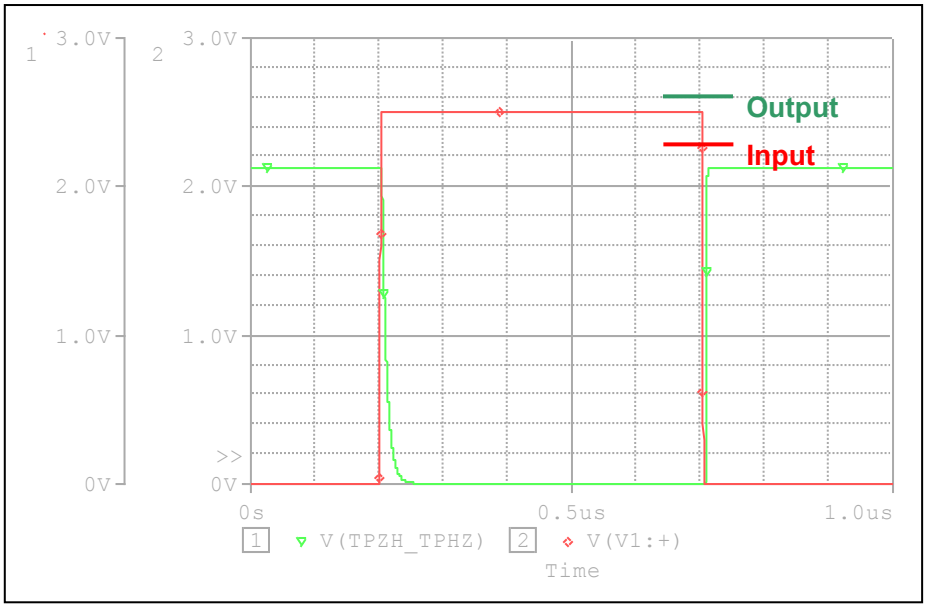


Comparison table C_L = 30 pF, R_L = 500 Ω

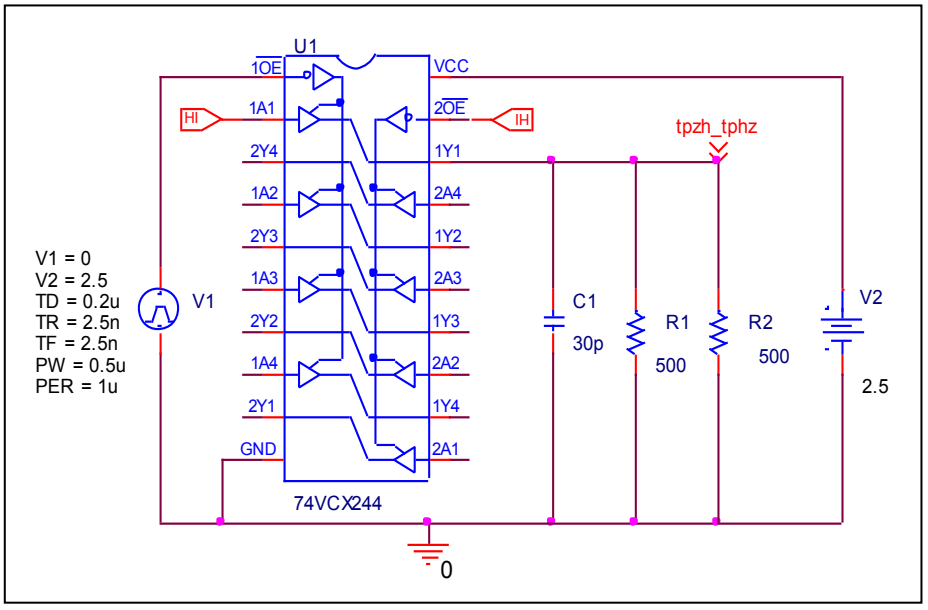
V_{CC} =1.8 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{PHZ} (ns)	5.8	5.7099	-1.553
t_{pZH} (ns)	9.8	9.758	-0.429

Output enable time(t_{PZH}) and Output disable time(t_{PHZ}) (V_{CC} = 2.5)

Circuit simulation result



Evaluation circuit

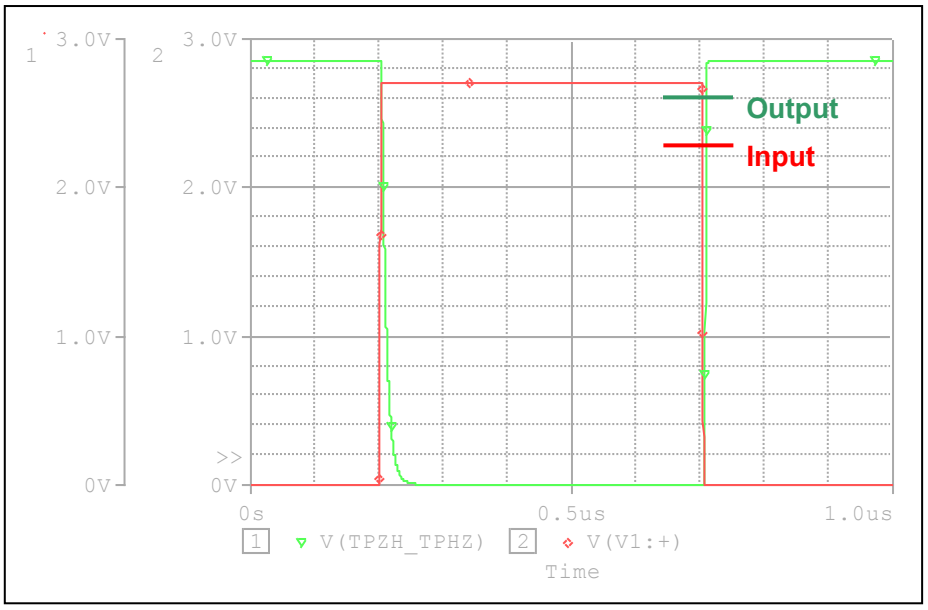


Comparison table C_L = 30 pF, R_L = 500 Ω

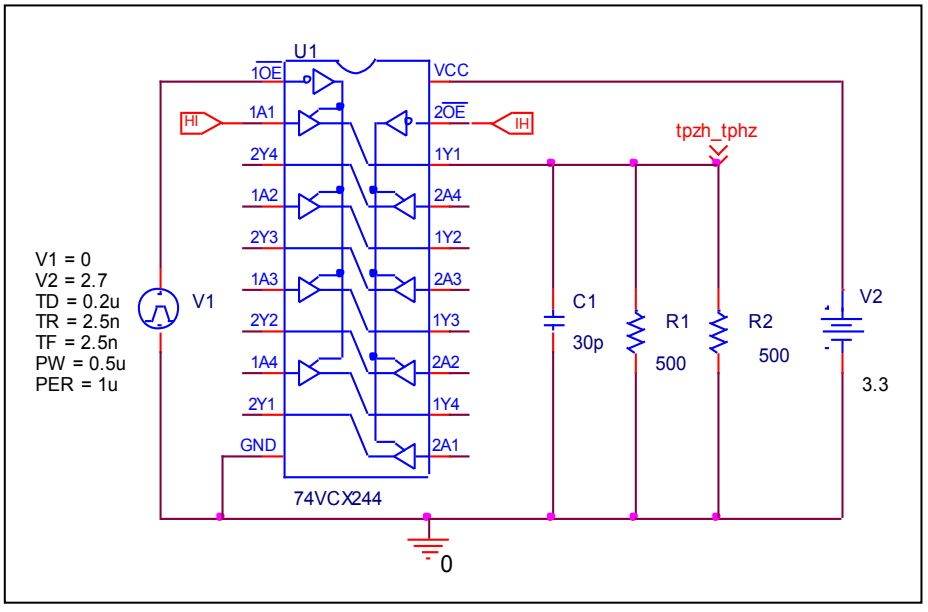
V_{CC} =2.5 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{PHZ} (ns)	3.2	3.2053	0.166
t_{pZH} (ns)	5.5	5.4764	-0.429

Output enable time(t_{PZH}) and Output disable time(t_{PHZ}) (V_{CC} = 3.3)

Circuit simulation result



Evaluation circuit

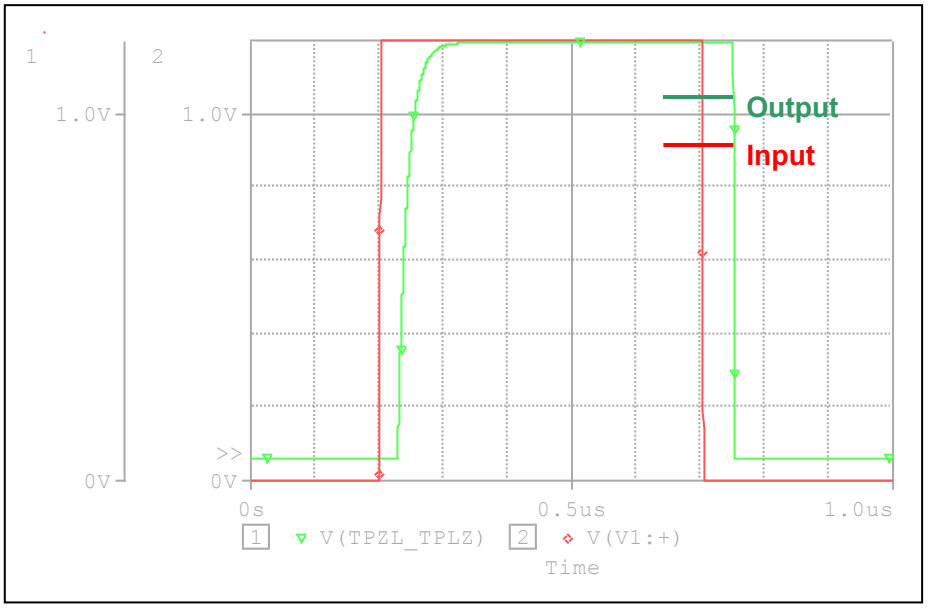


Comparison table C_L = 30 pF, R_L = 500 Ω

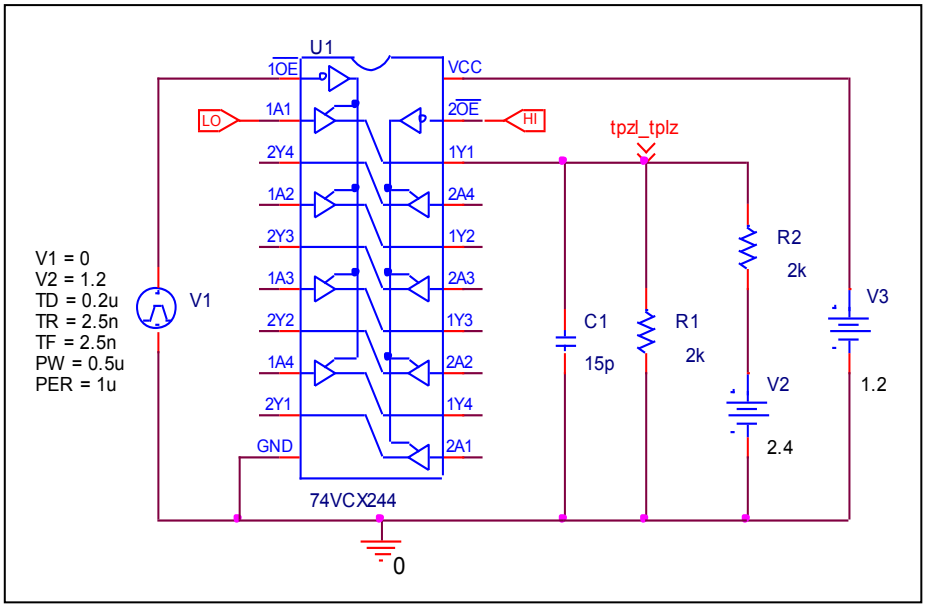
V_{CC} = 3.3 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{PHZ} (ns)	3	2.9521	-1.597
t_{pZH} (ns)	4.5	4.4339	-1.469

Output enable time (t_{PZL}) and Output disable time (t_{PLZ}) (V_{CC} = 1.2)

Circuit simulation result



Evaluation circuit

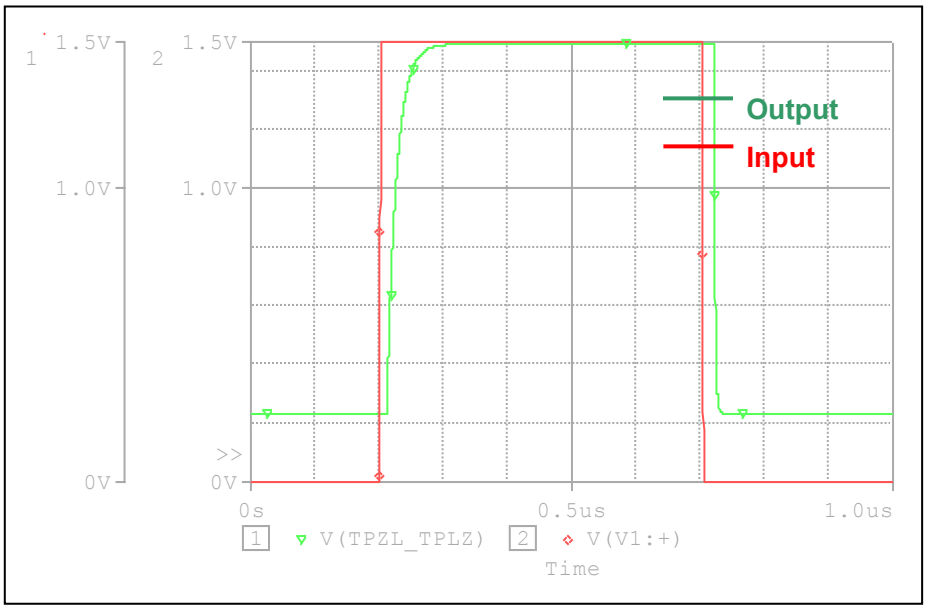


Comparison table C_L = 15 pF, R_L = 2 kΩ

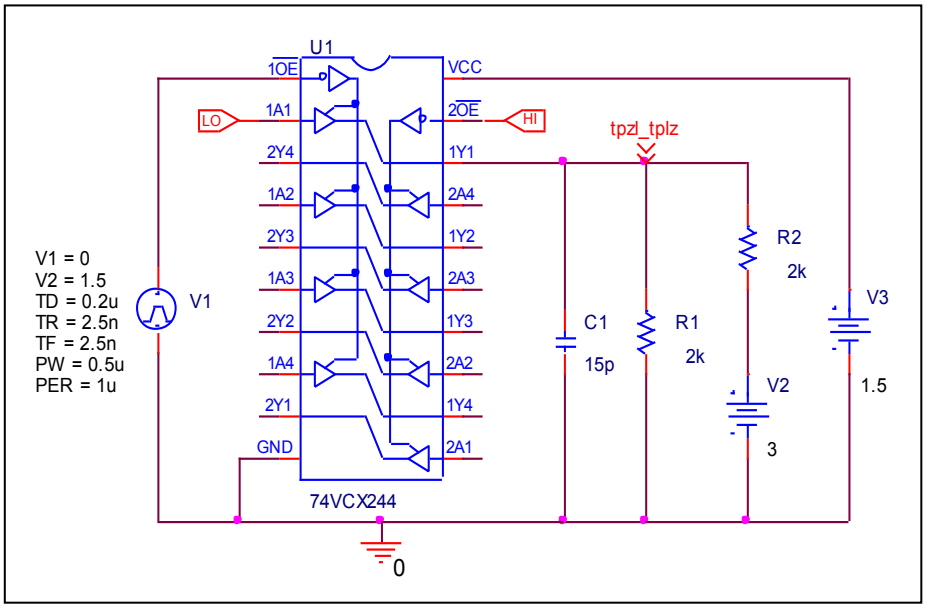
V_{CC} =1.2 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{PLZ} (ns)	29	28.524	-1.641
t_{pZL} (ns)	49	48.294	-1.441

Output enable time (t_{PZL}) and Output disable time (t_{PLZ}) (V_{CC} = 1.5)

Circuit simulation result



Evaluation circuit

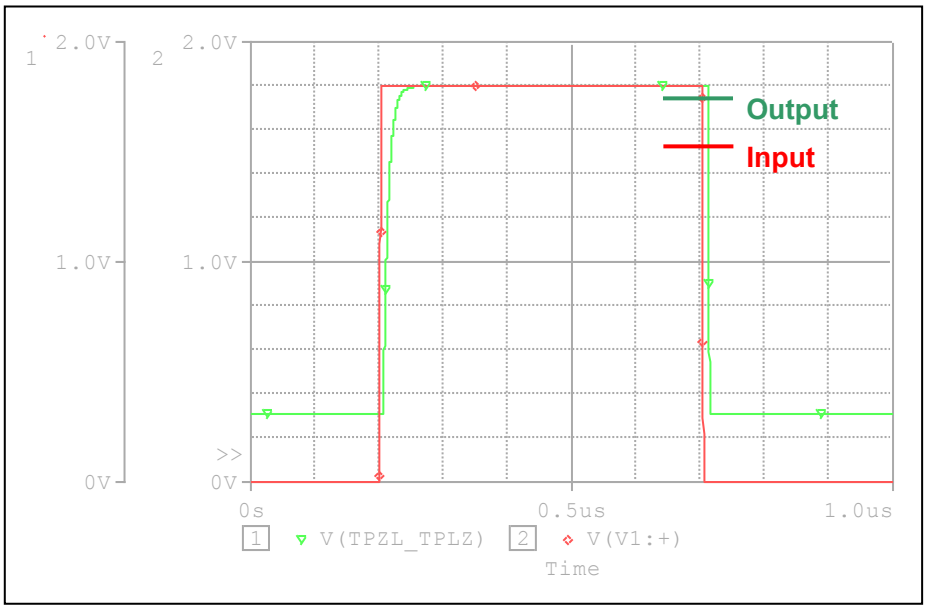


Comparison table C_L = 15 pF, R_L = 2 kΩ

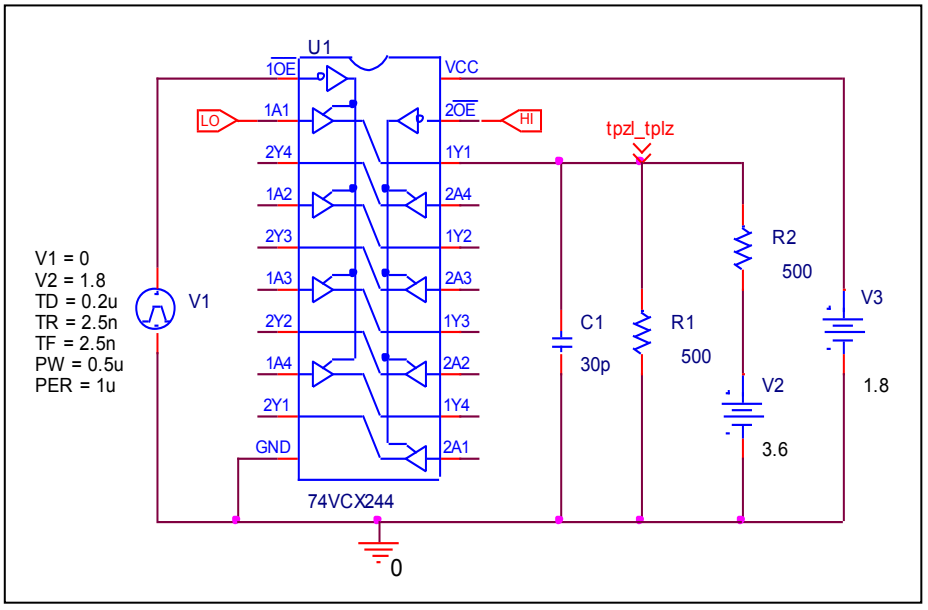
V_{CC} =1.5 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{PLZ} (ns)	11.6	11.518	-0.707
t_{pZL} (ns)	19.6	19.395	-1.046

Output enable time (t_{PZL}) and Output disable time (t_{PLZ}) (V_{CC} = 1.8)

Circuit simulation result



Evaluation circuit

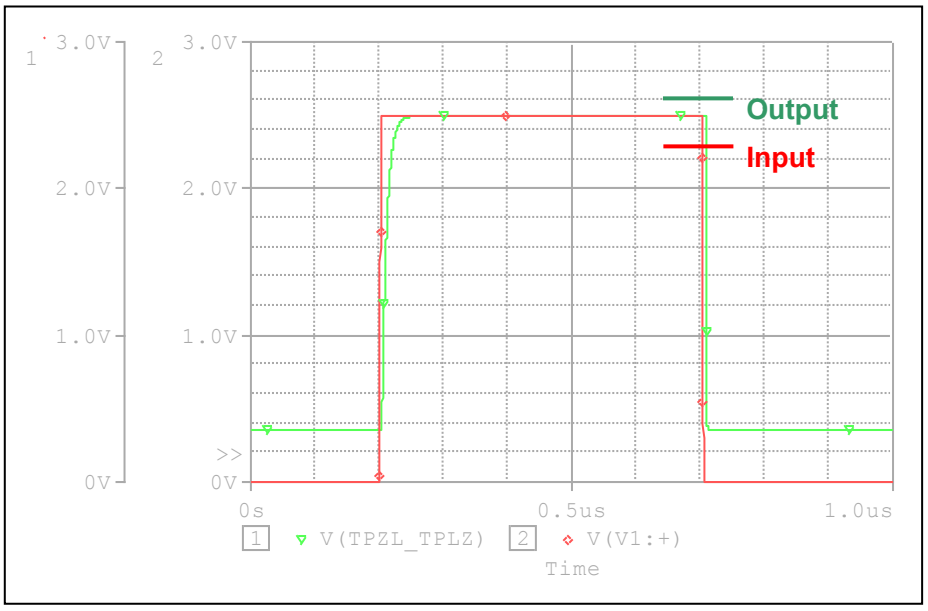


Comparison table C_L = 30 pF, R_L = 500 Ω

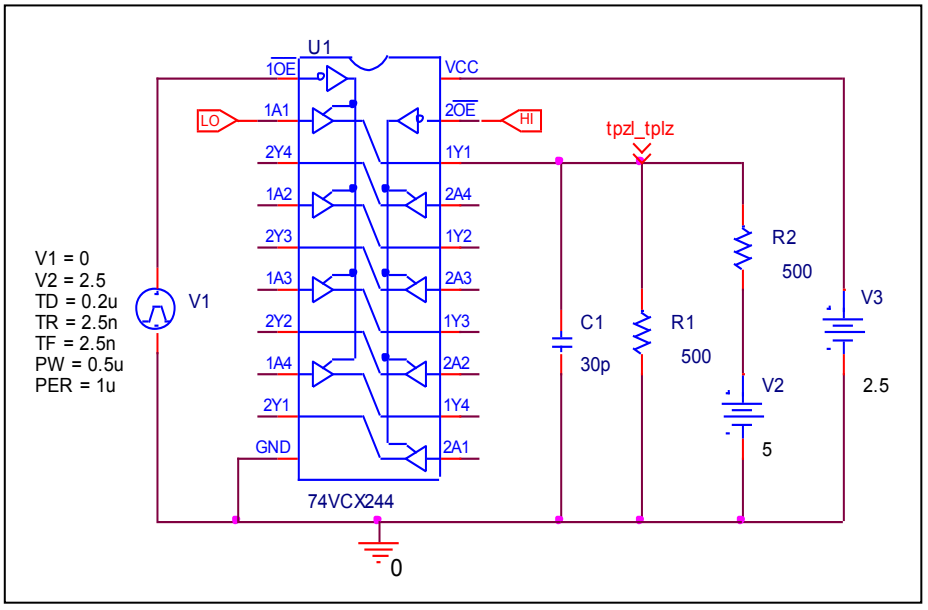
V_{CC} =1.8 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{PLZ} (ns)	5.8	5.7361	-1.102
t_{pZL} (ns)	9.8	9.746	-0.551

Output enable time (t_{PZL}) and Output disable time (t_{PLZ}) (V_{CC} = 2.5)

Circuit simulation result



Evaluation circuit

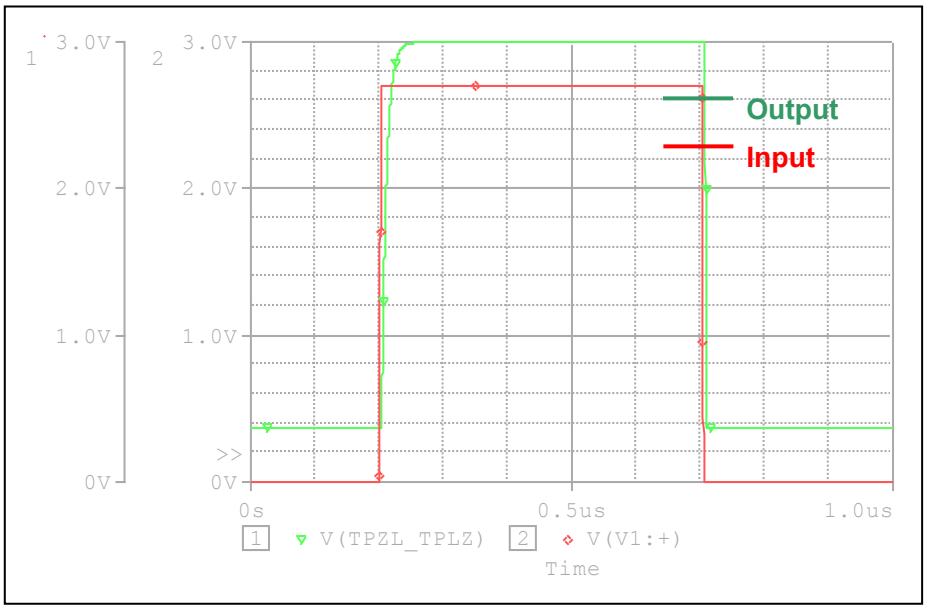


Comparison table C_L = 30 pF, R_L = 500 Ω

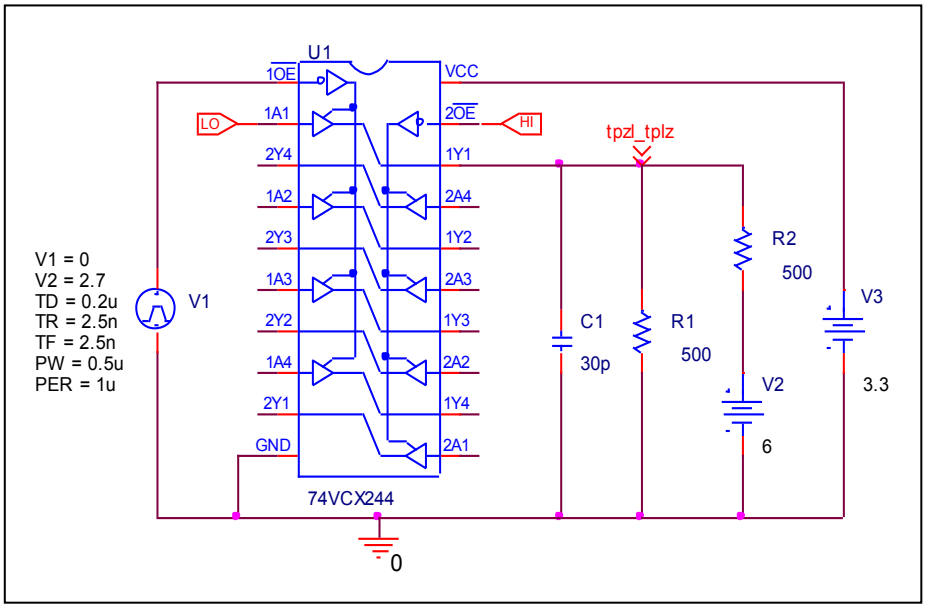
V_{CC} = 2.5 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{PLZ} (ns)	3.2	3.1922	-0.244
t_{pZL} (ns)	5.5	5.4955	-0.082

Output enable time (t_{PZL}) and Output disable time (t_{PLZ}) (V_{CC} = 3.3)

Circuit simulation result



Evaluation circuit



Comparison table C_L = 30 pF, R_L = 500 Ω

V_{CC} = 3.3 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{PLZ} (ns)	3	3.0229	0.763
t_{pZL} (ns)	4.5	4.4805	-0.433