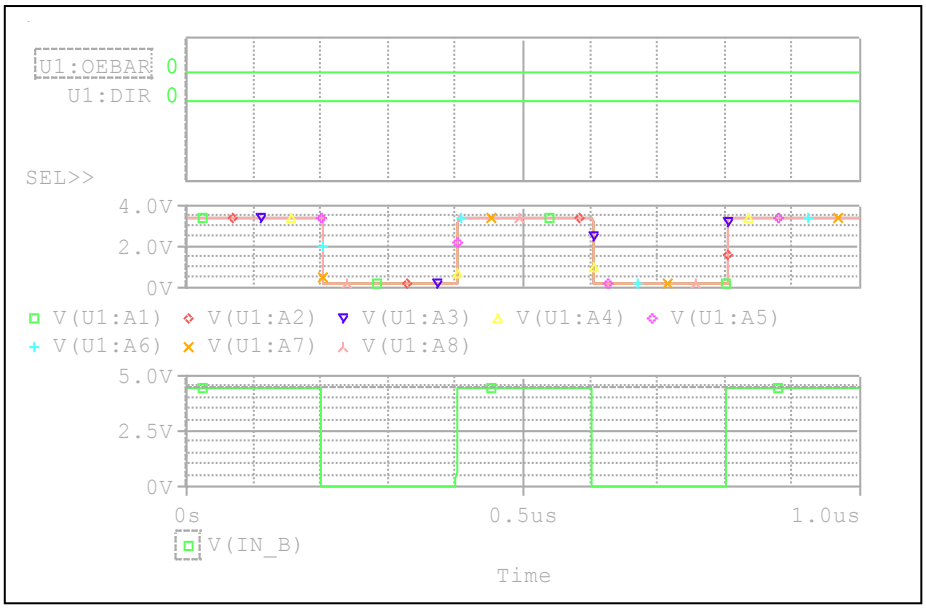
Device Modeling Report

COMPONENTS : CMOS DIGITAL INTEGRATED CIRCUIT
PART NUMBER : TC74VCX245FT
MANUFACTURER : TOSHIBA

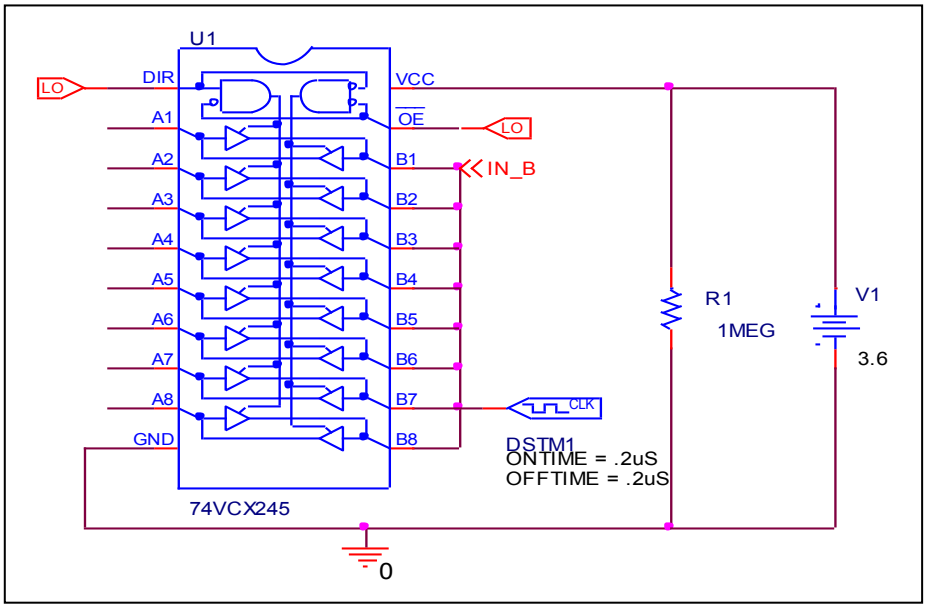
Bee Technologies Inc.

Truth Table

Circuit simulation result



Evaluation circuit

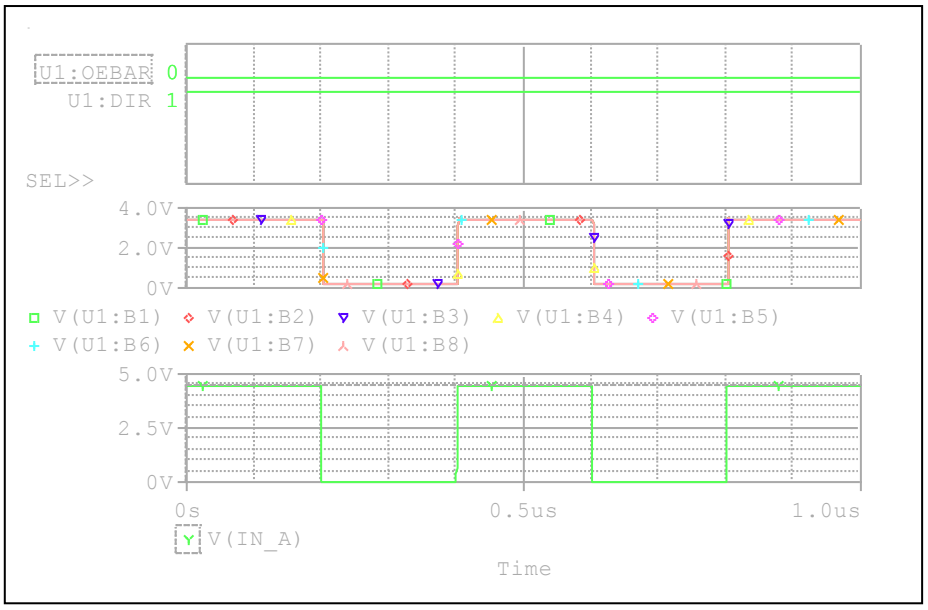


Comparison table **Function : A BUS = OUTPUT, B BUS = INPUT**

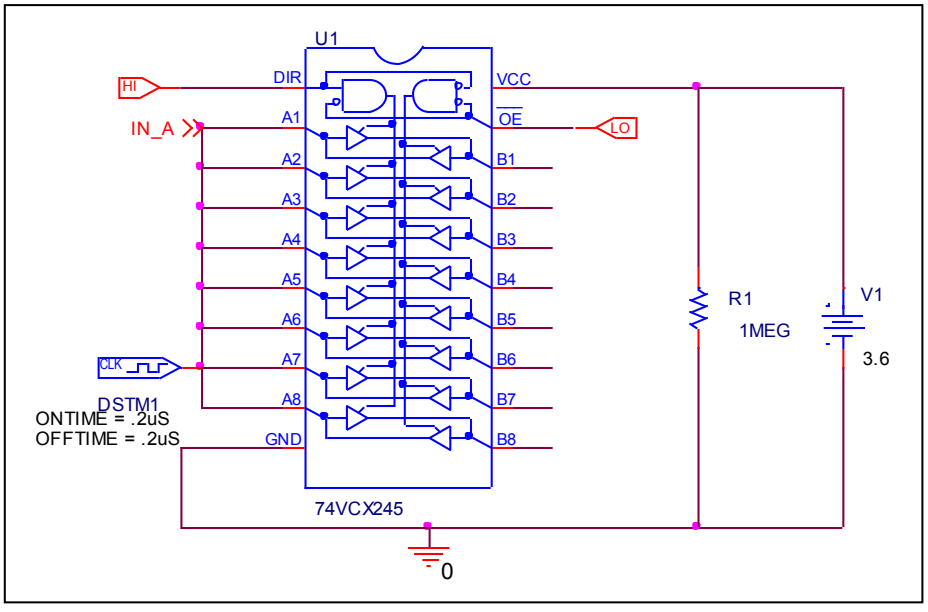
Input		Output		%Error
$\overline{OE}$	DIR	Measurement	Simulation	
L	L	A=B	A=B	0

Truth Table

Circuit simulation result



Evaluation circuit

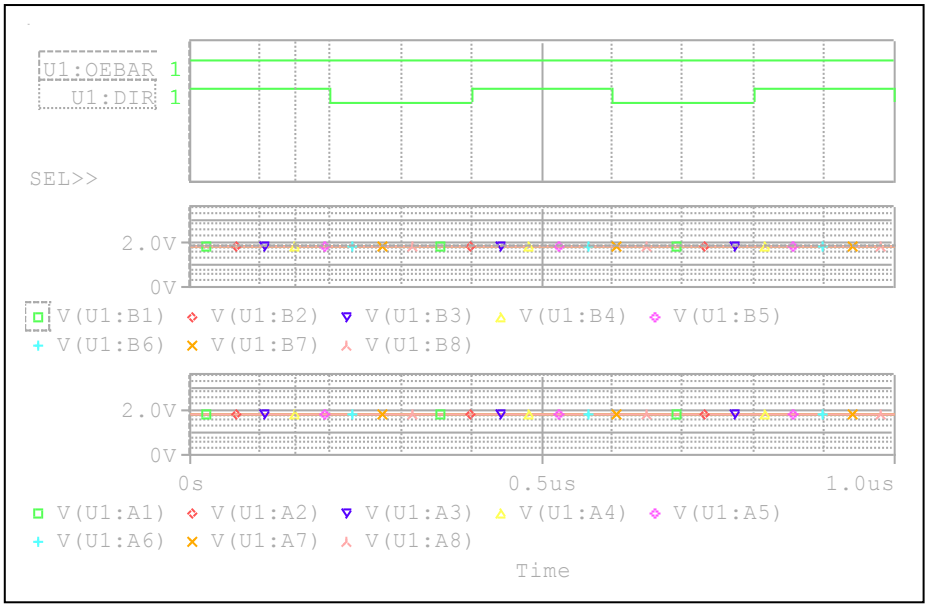


Comparison table **Function : A BUS = INPUT, B BUS = OUTPUT**

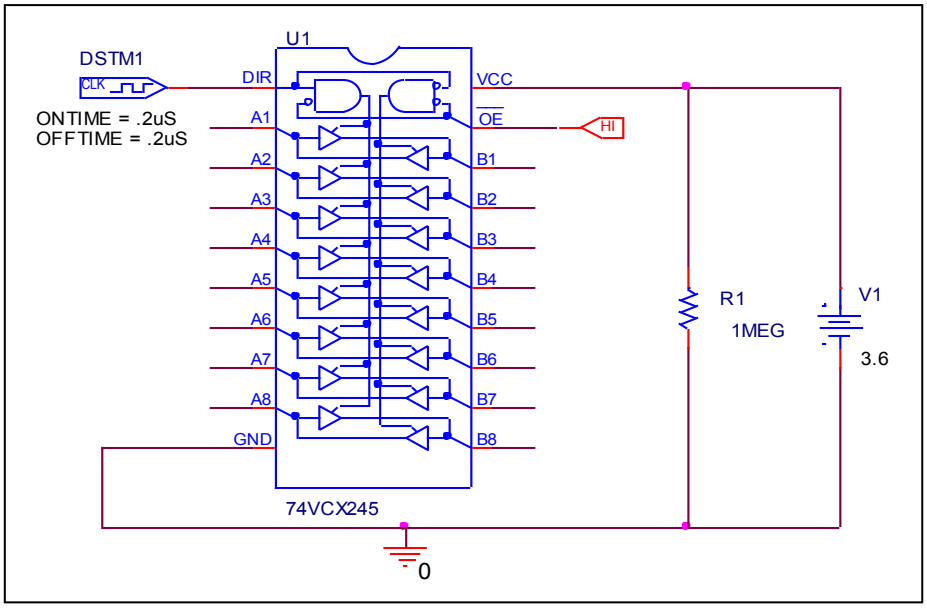
Input		Output		%Error
$\overline{OE}$	DIR	Measurement	Simulation	
L	H	B=A	B=A	0

Truth Table

Circuit simulation result



Evaluation circuit

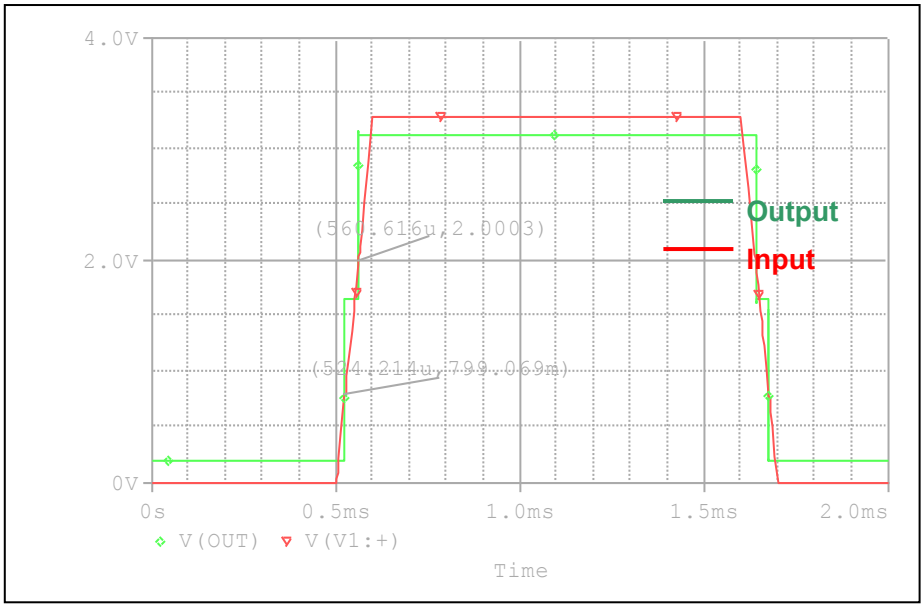


Comparison table **Function : A BUS and B BUS = HIGH IMPEDANCE**

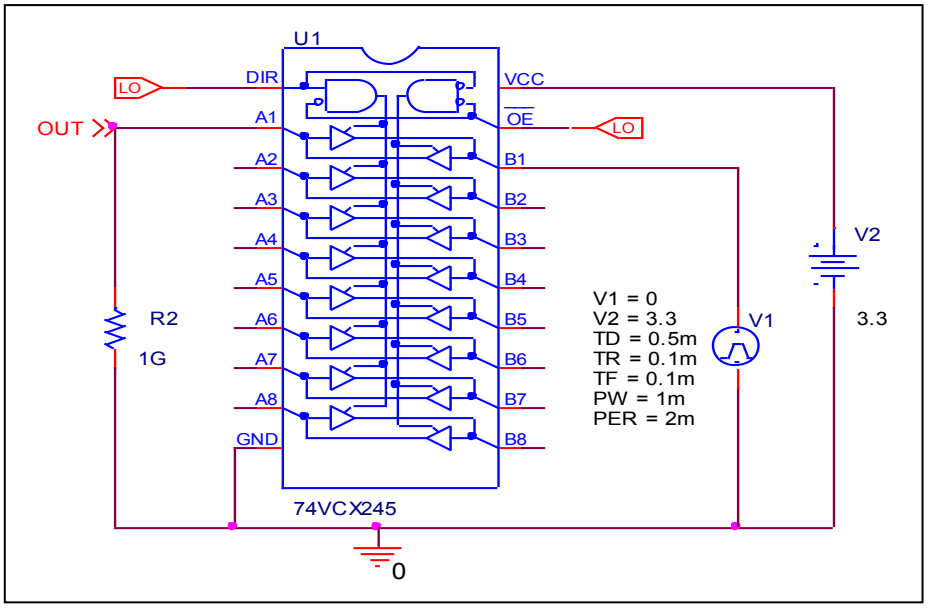
Input		Output		%Error
$\overline{OE}$	DIR	Measurement	Simulation	
H	X	Z	Z	0

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

Circuit simulation result



Evaluation circuit

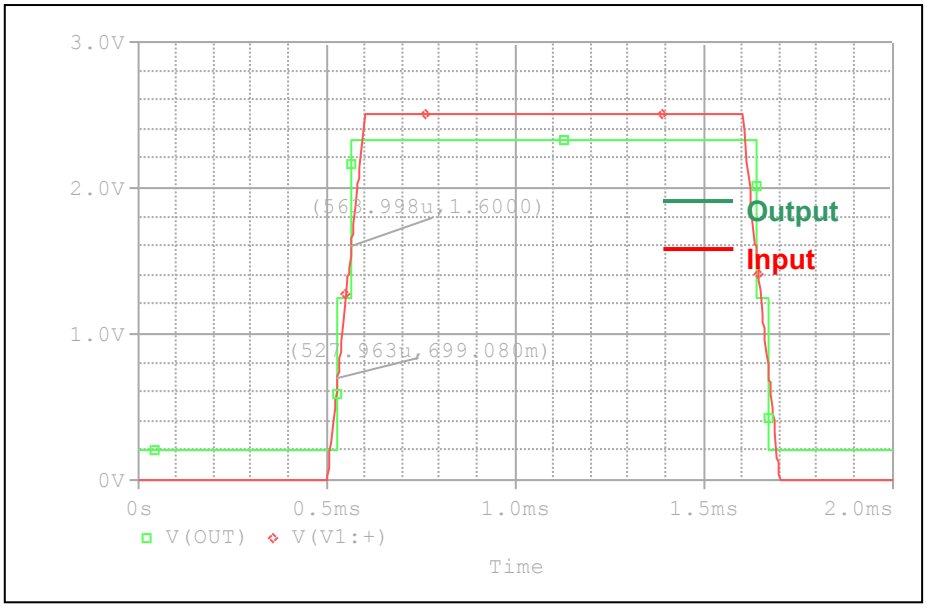


Comparison table

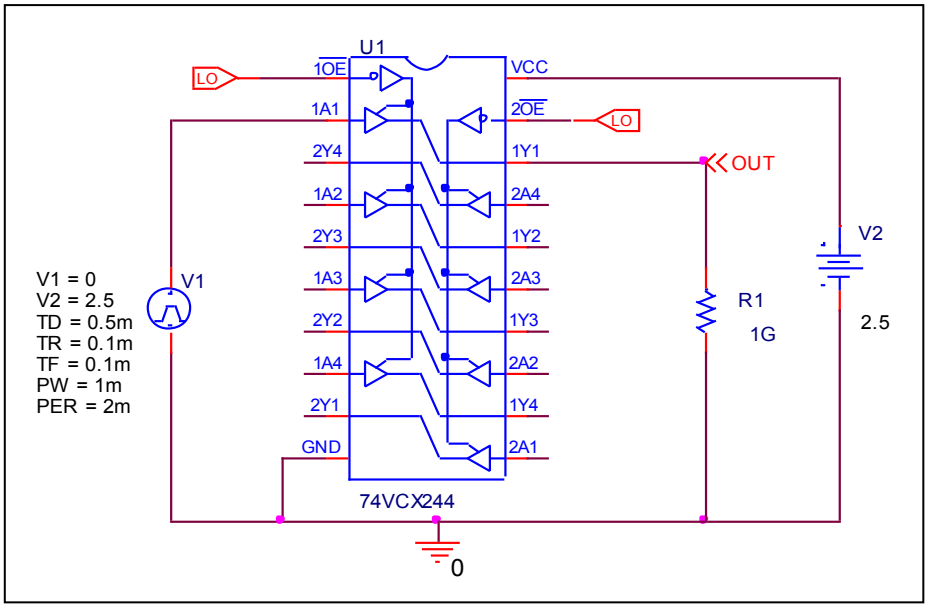
V_{CC} = 3.3 V	Measurement	Simulation	%Error
V_{IH} (V)	2	2	0
V_{IL} (V)	0.8	0.799069	-0.116

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

Circuit simulation result



Evaluation circuit

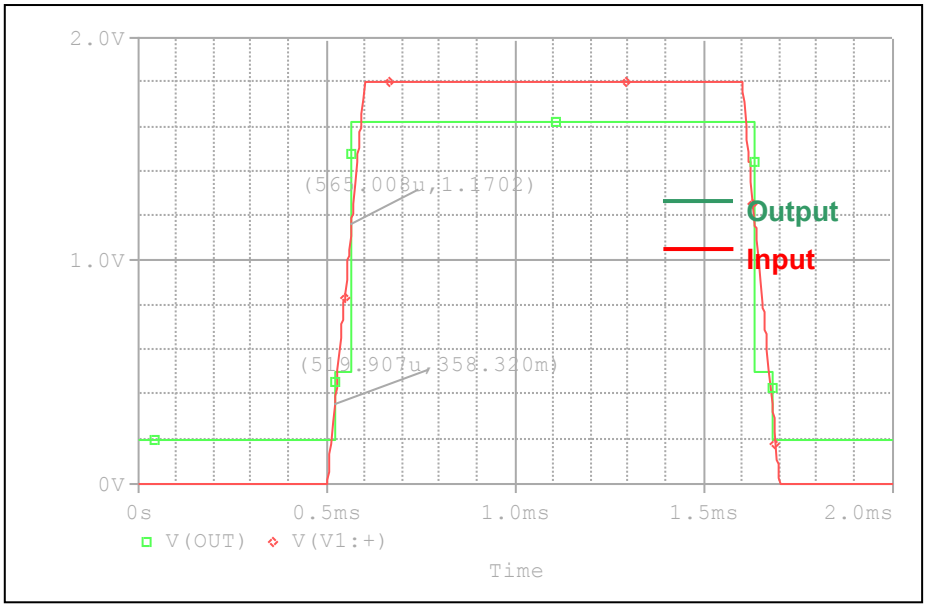


Comparison table

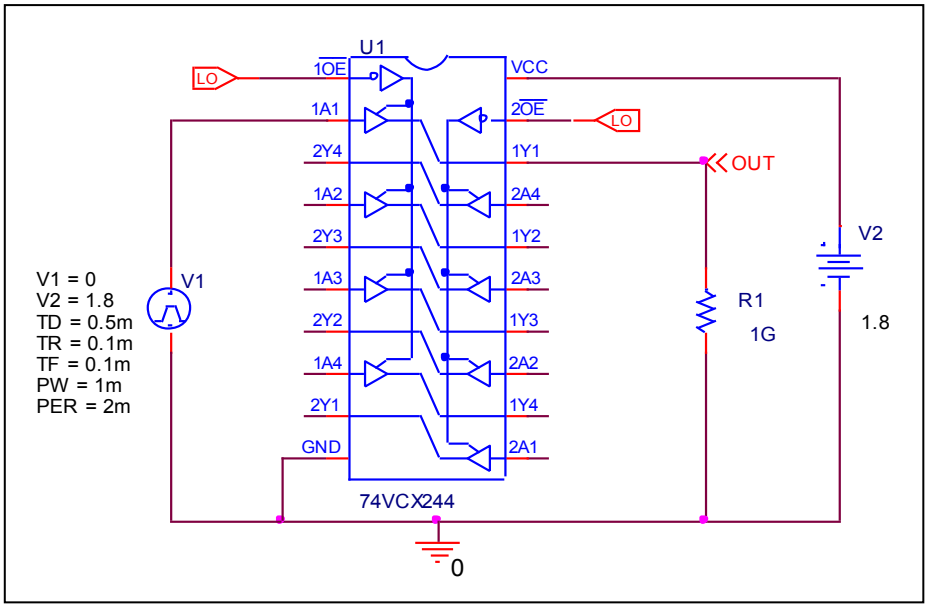
V_{CC} = 2.5 V	Measurement	Simulation	%Error
V_{IH} (V)	1.6	1.6	0
V_{IL} (V)	0.7	0.699080	-0.131

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

Circuit simulation result



Evaluation circuit

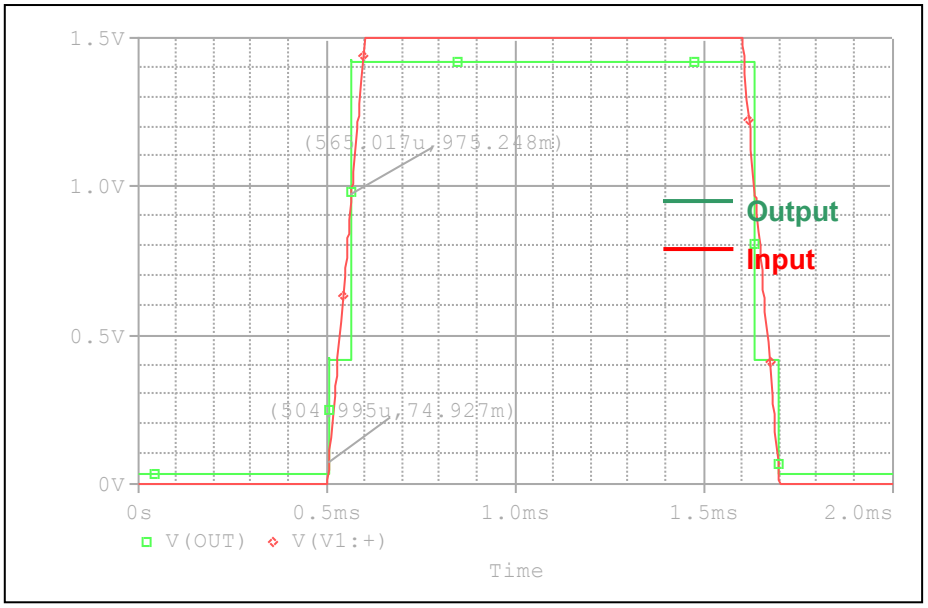


Comparison table

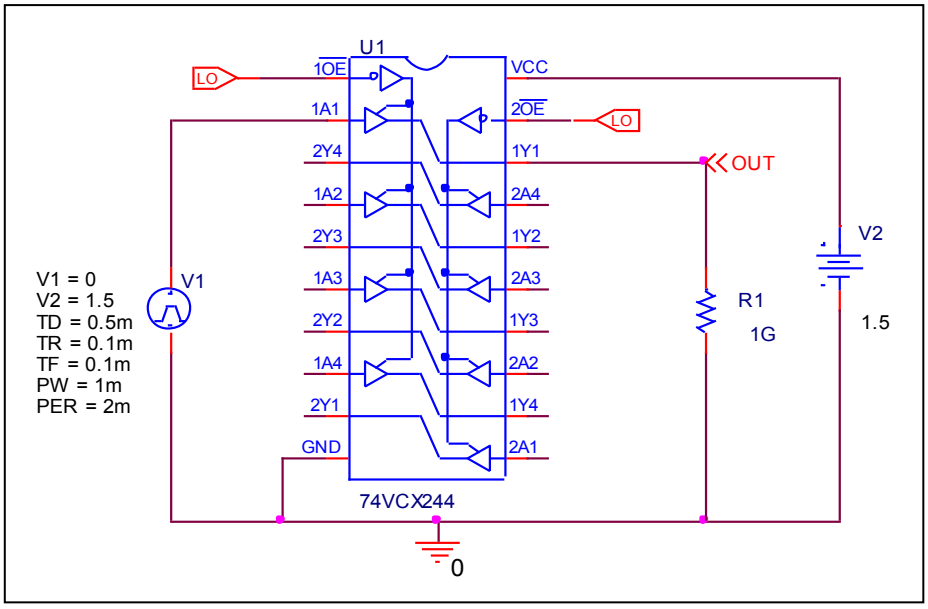
V_{CC} = 1.8 V	Measurement	Simulation	%Error
Min V_{IH} = (V_{CC}*0.65) (V)	1.17	1.1702	0.017
Max V_{IL} = (V_{CC}*0.2) (V)	0.36	0.358320	-0.467

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

Circuit simulation result



Evaluation circuit

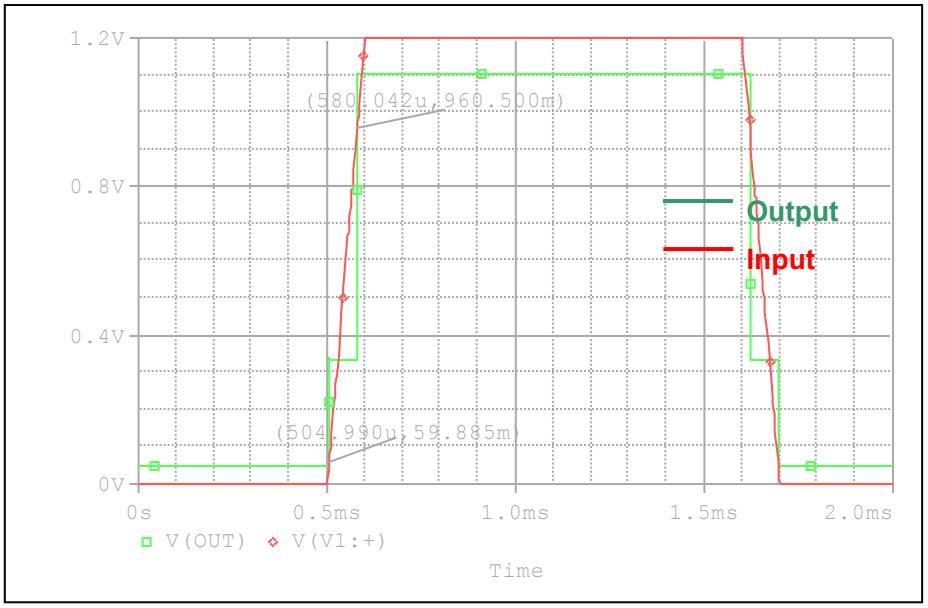


Comparison table

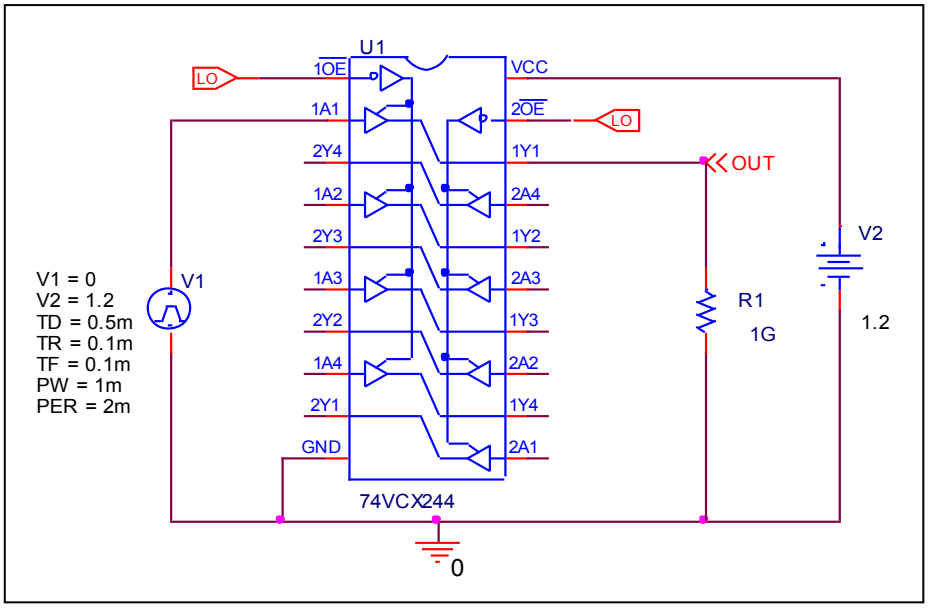
V_{CC} = 1.5 V	Measurement	Simulation	%Error
Min V_{IH} = (V_{CC}*0.65) (V)	0.975	0.975248	0.025
Max V_{IL} = (V_{CC}*0.05) (V)	0.075	0.074927	-0.097

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

Circuit simulation result



Evaluation circuit

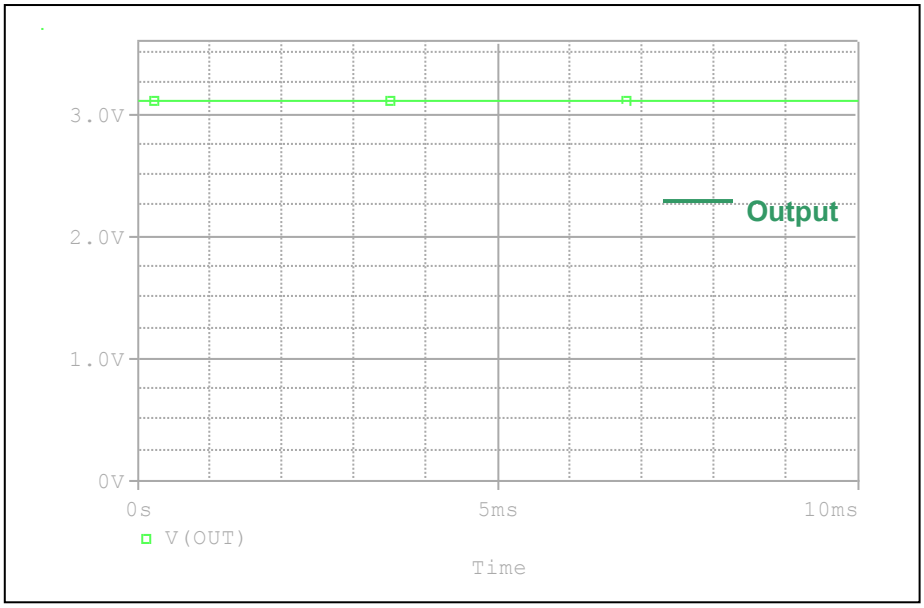


Comparison table

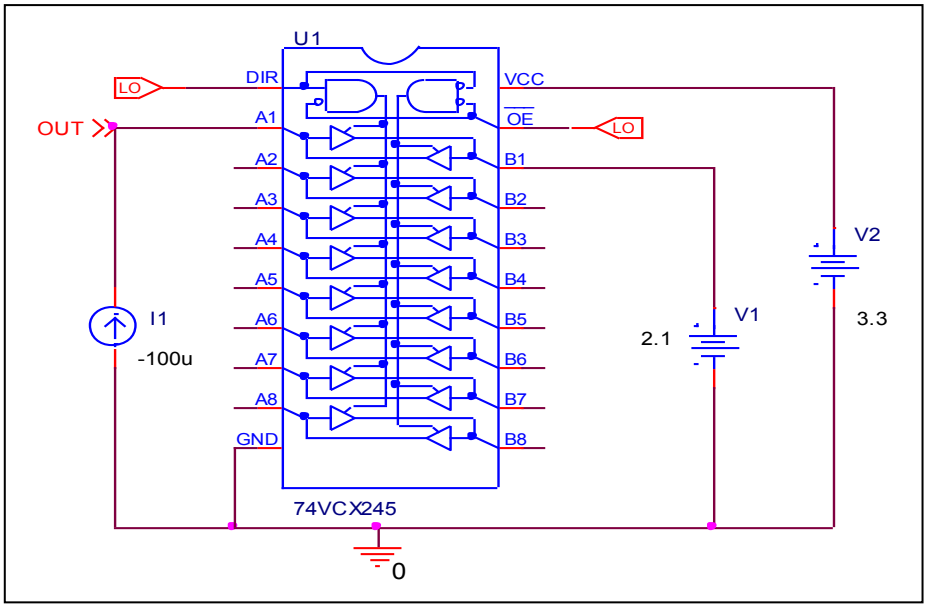
V_{CC} = 1.2 V	Measurement	Simulation	%Error
Min V_{IH} = (V_{CC}*0.8) (V)	0.96	0.9605	0.052
Max V_{IL} = (V_{CC}*0.05) (V)	0.06	0.059885	-0.192

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

Circuit simulation result



Evaluation circuit

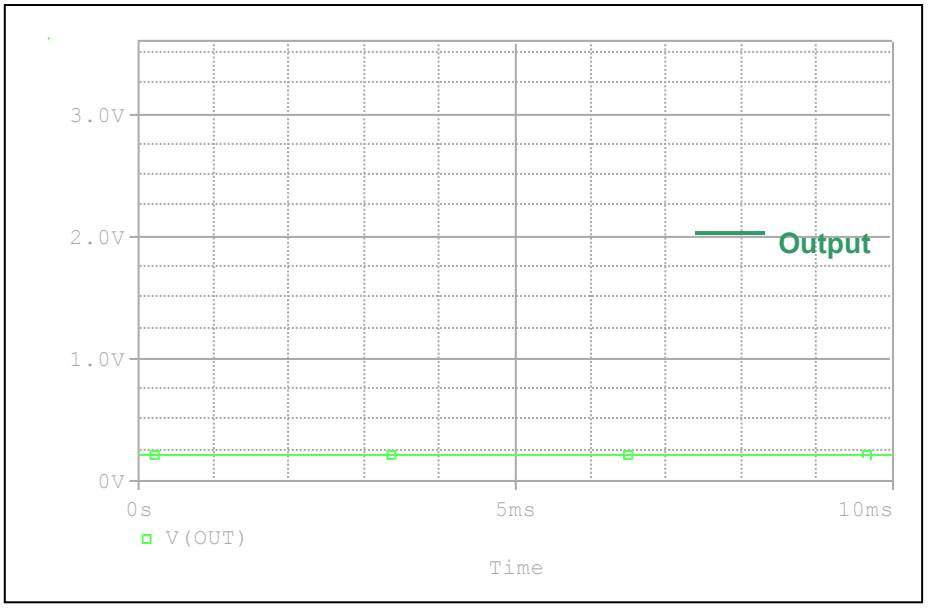


Comparison table

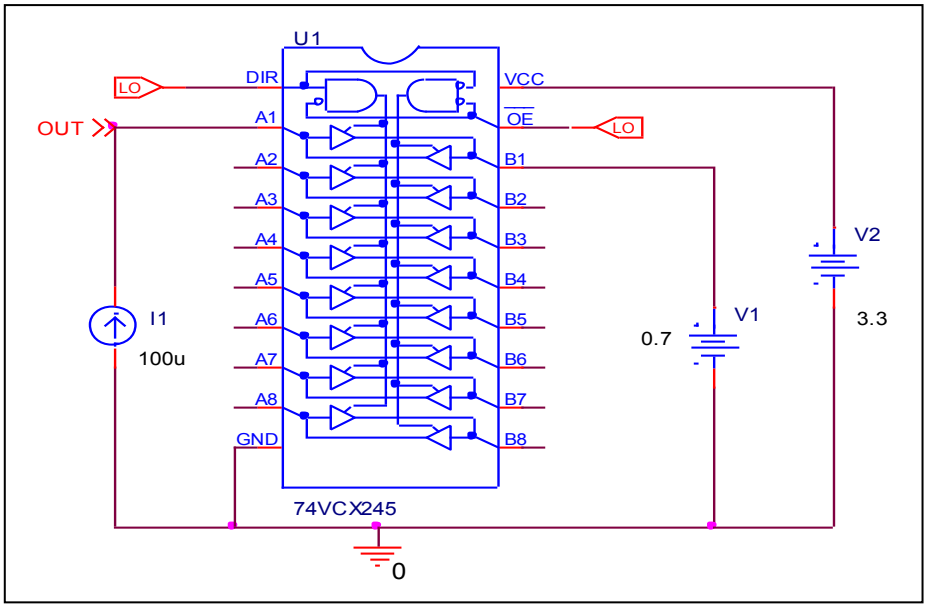
$V_{IN} = V_{IH}$, V_{CC} = 3.3 V	Measurement	Simulation	%Error
Min V_{OH} = (V_{CC} - 0.2) V	3.1	3.1167	0.539

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

Circuit simulation result



Evaluation circuit

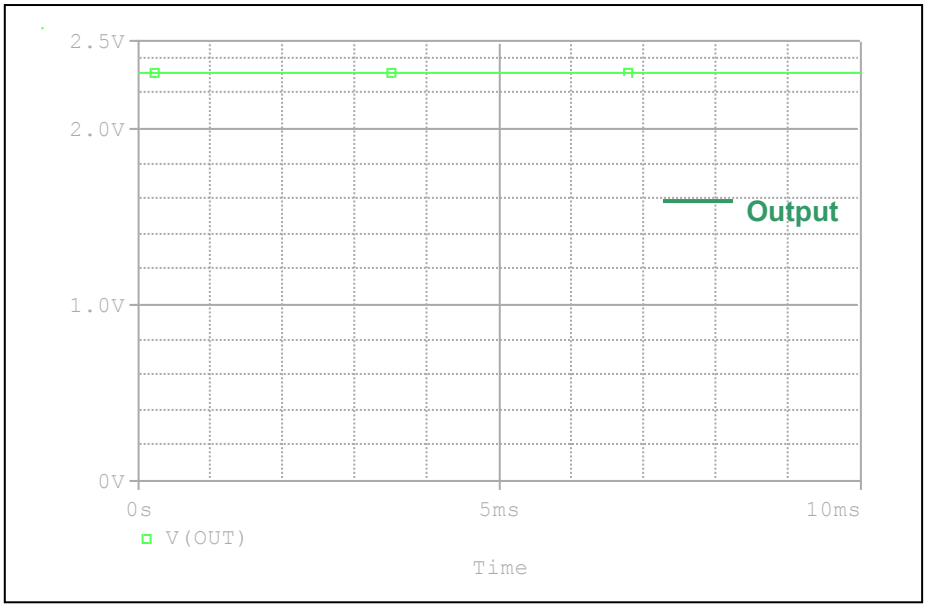


Comparison table

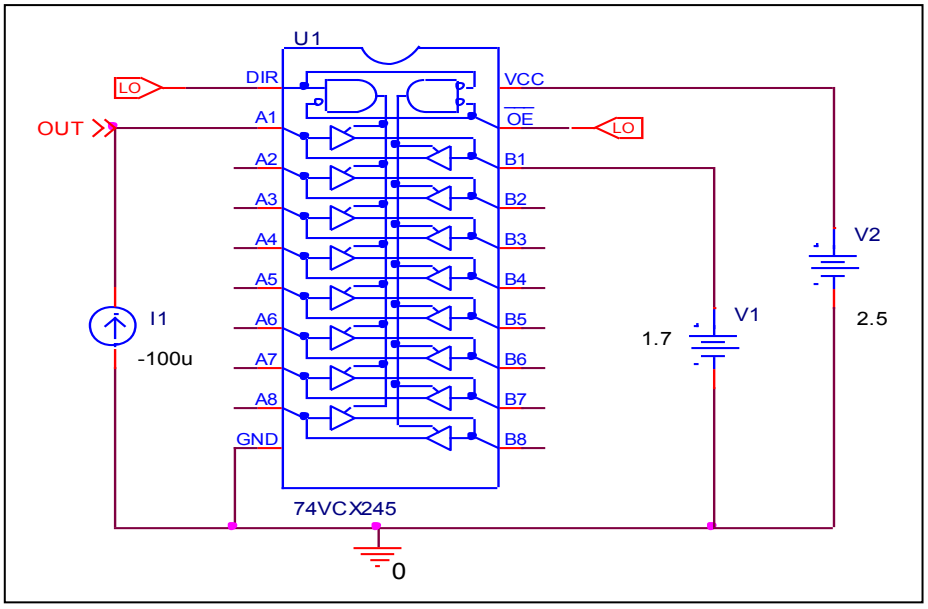
V_{IN} = V_{IL}, V_{CC} = 3.3 V	Measurement	Simulation	%Error
V_{OL} (V)	0.2	0.207763	3.882

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

Circuit simulation result



Evaluation circuit

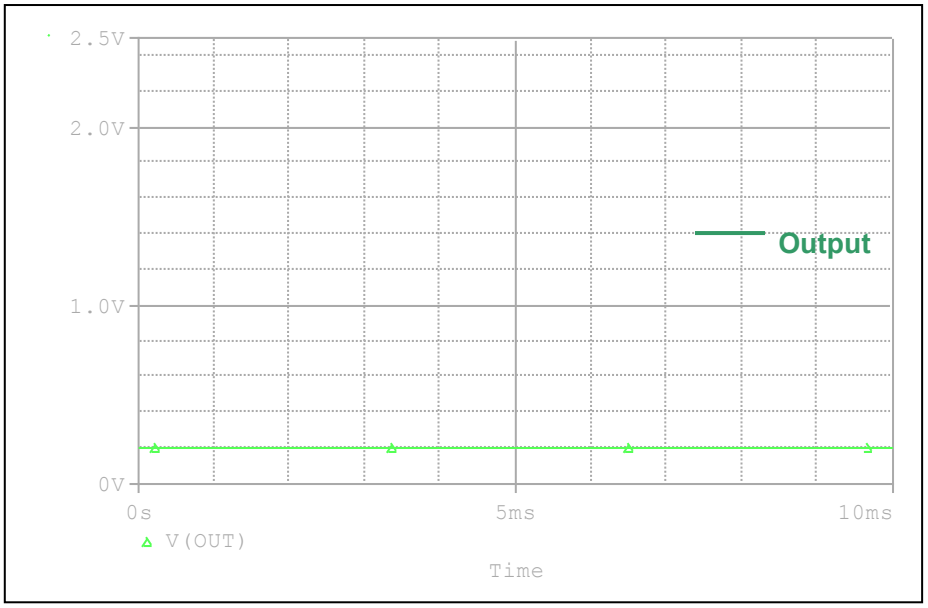


Comparison table

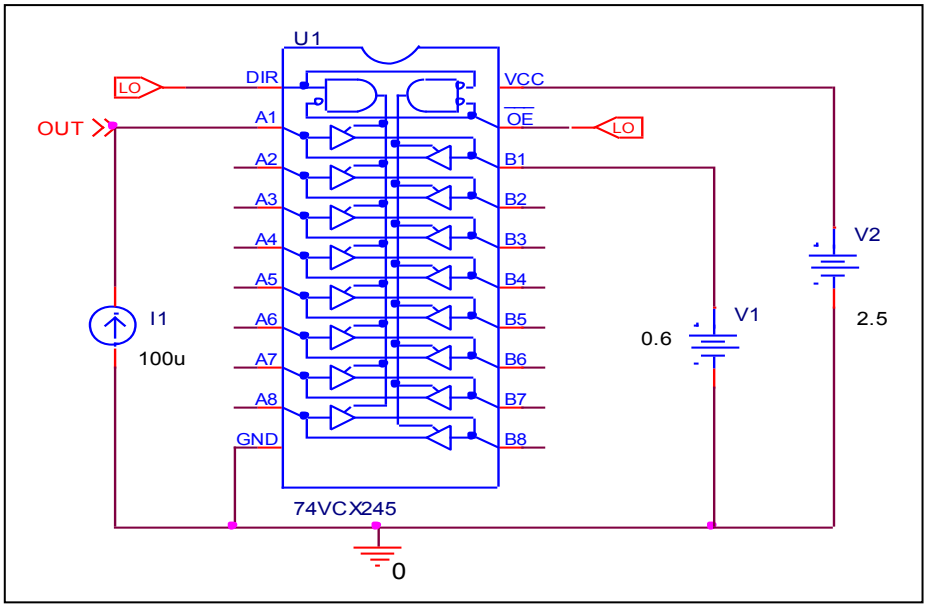
$V_{IN} = V_{IH}$, V_{CC} = 2.5 V	Measurement	Simulation	%Error
Min V_{OH} = (V_{CC} - 0.2) V	2.3	2.3139	0.604

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

Circuit simulation result



Evaluation circuit

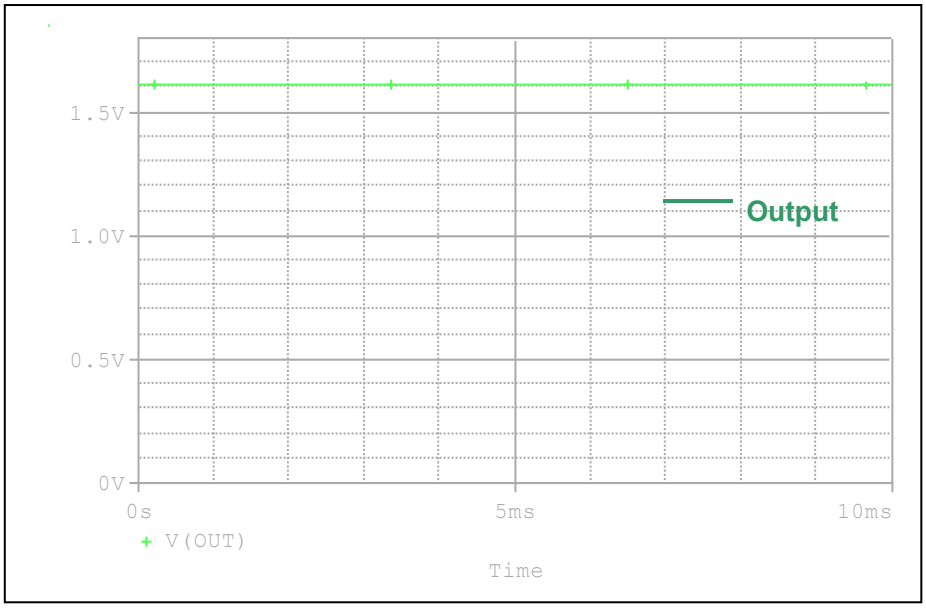


Comparison table

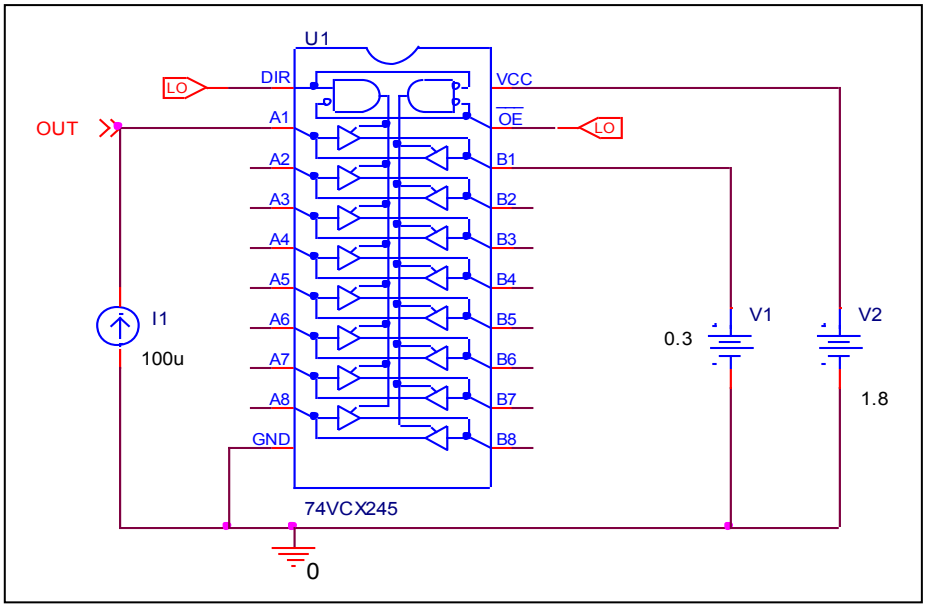
$V_{IN} = V_{IL}$, V_{CC} = 2.5 V	Measurement	Simulation	%Error
V_{OL} (V)	0.2	0.202055	1.028

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

Circuit simulation result



Evaluation circuit

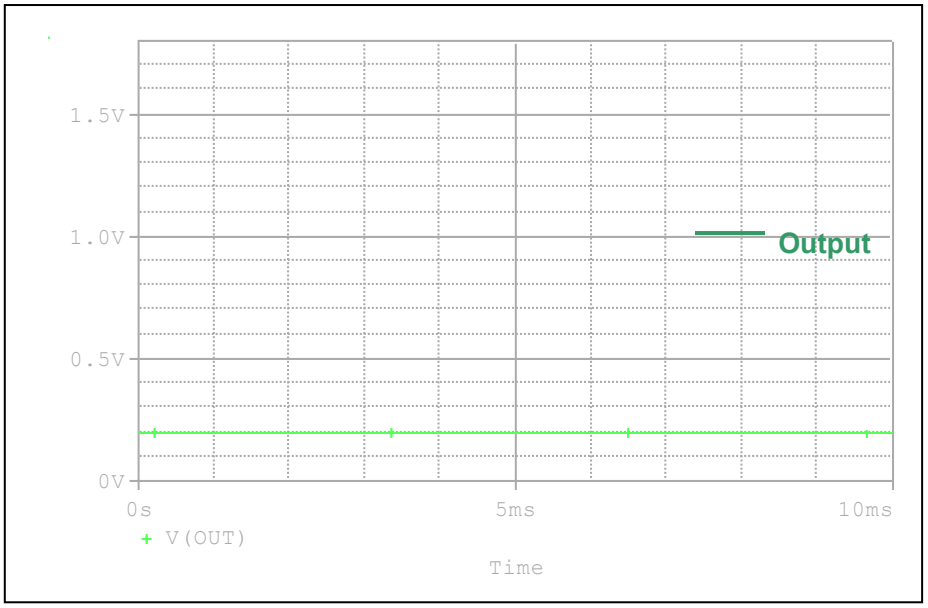


Comparison table

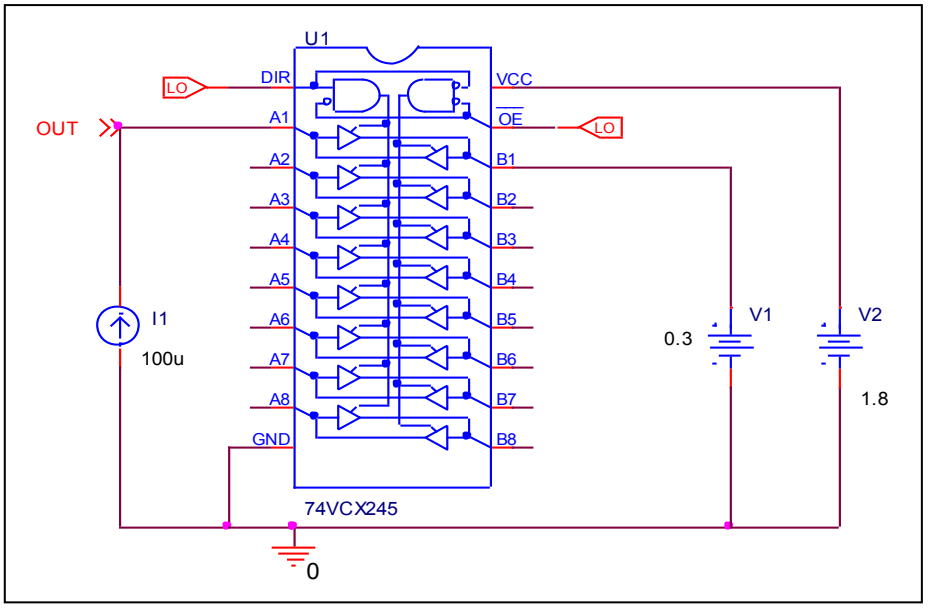
$V_{IN} = V_{IH}$, V_{CC} = 1.8 V	Measurement	Simulation	%Error
Min V_{OH} = (V_{CC} - 0.2) V	1.6	1.6127	0.794

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

Circuit simulation result



Evaluation circuit

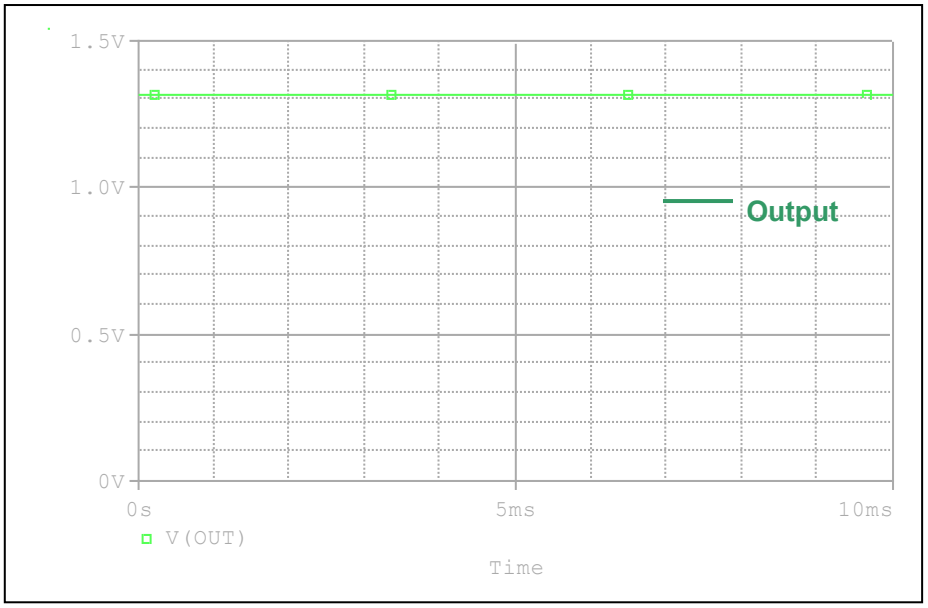


Comparison table

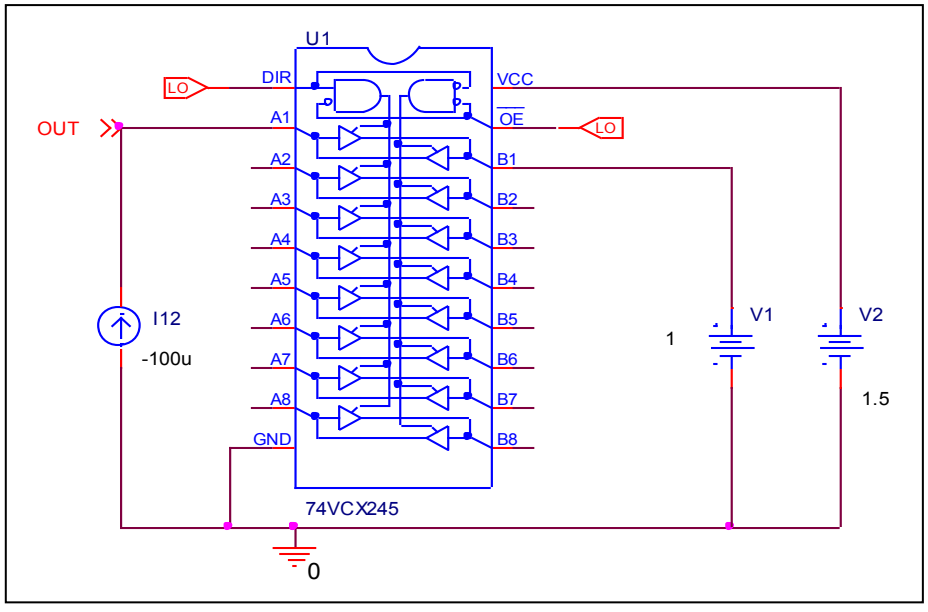
V_{IN} = V_{IL}, V_{CC} = 1.8 V	Measurement	Simulation	%Error
V_{OL} (V)	0.2	0.198052	-0.974

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

Circuit simulation result



Evaluation circuit

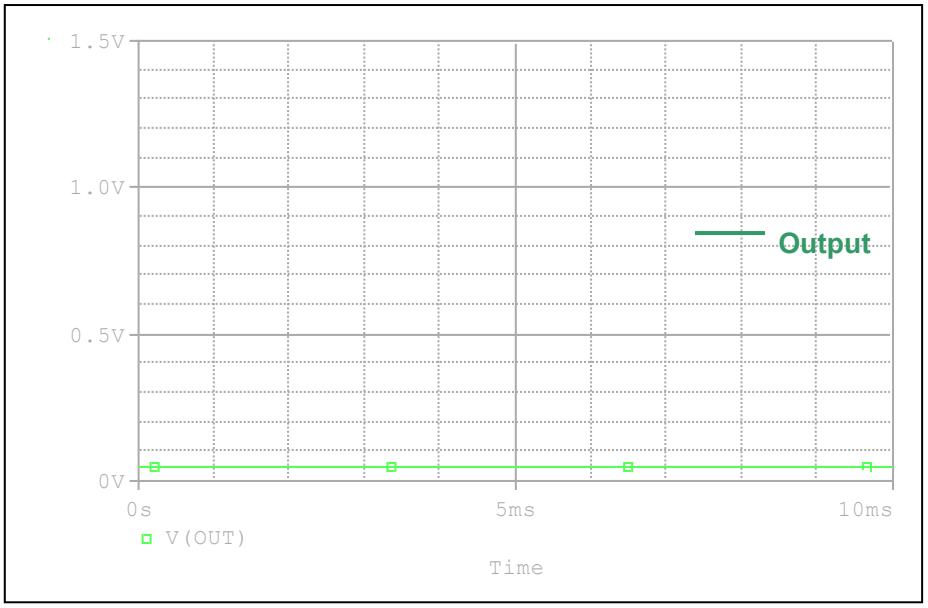


Comparison table

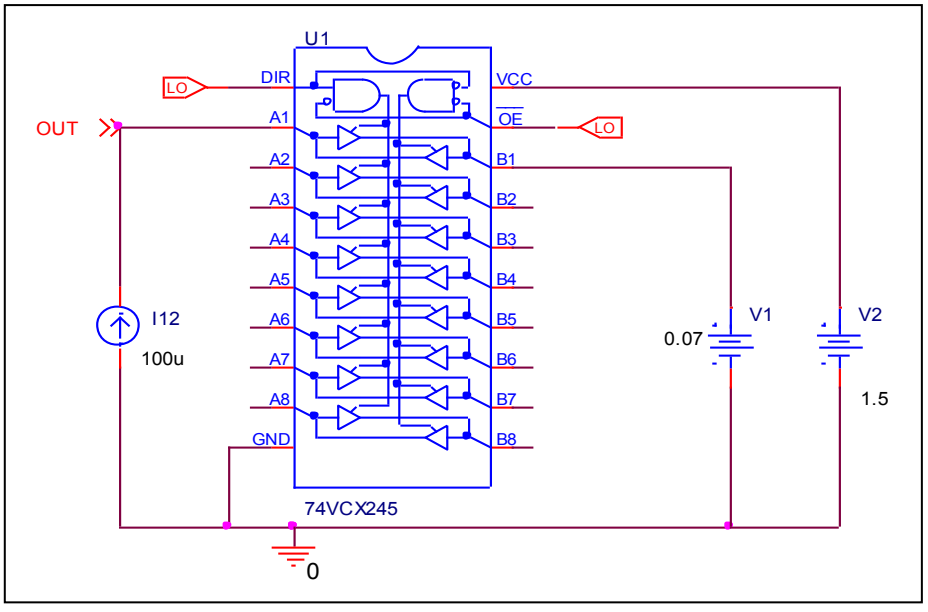
$V_{IN} = V_{IH}$, V_{CC} = 1.5 V	Measurement	Simulation	%Error
Min V_{OH} = (V_{CC} - 0.2) V	1.3	1.3148	1.138

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

Circuit simulation result



Evaluation circuit

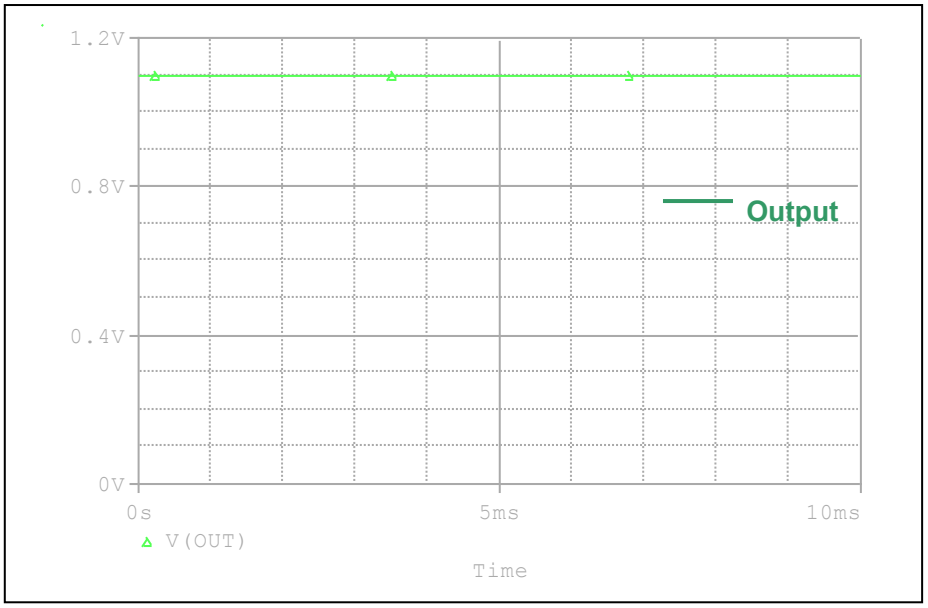


Comparison table

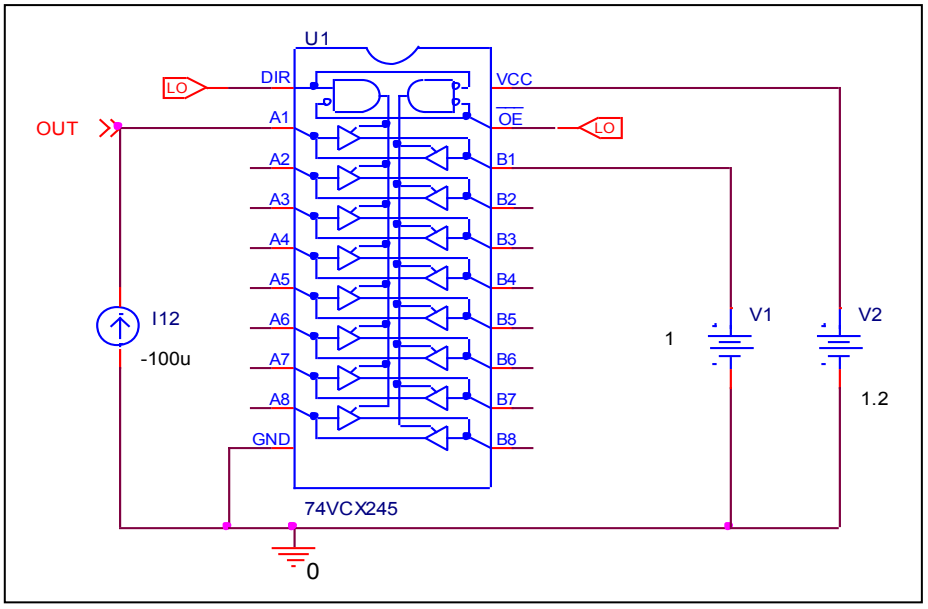
V_{IN} = V_{IL}, V_{CC} = 1.5 V	Measurement	Simulation	%Error
V_{OL} (V)	0.05	0.047899	-4.202

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

Circuit simulation result



Evaluation circuit

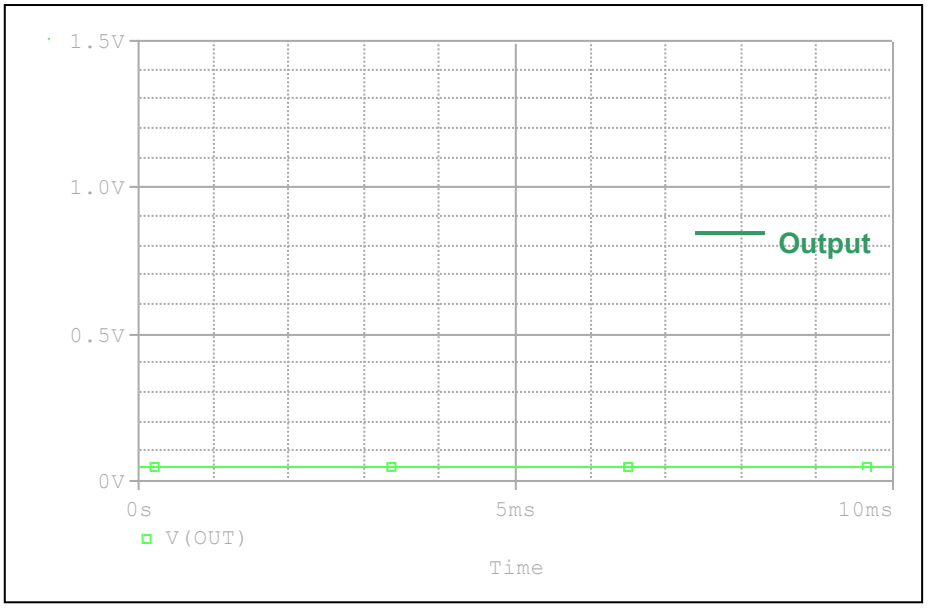


Comparison table

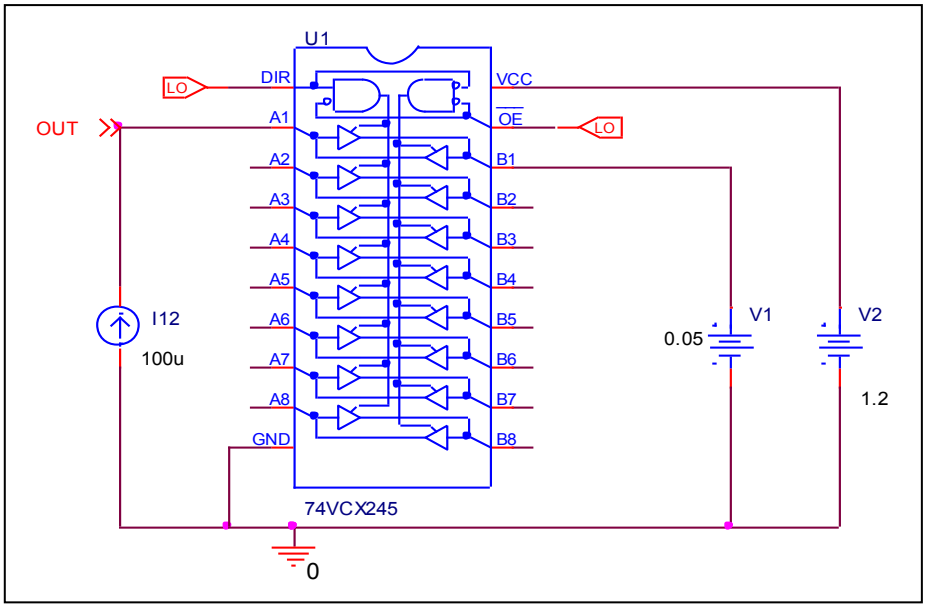
$V_{IN} = V_{IH}$, V_{CC} = 1.2 V	Measurement	Simulation	%Error
Min V_{OH} = (V_{CC} - 0.1) V	1.1	1.1002	0.018

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

Circuit simulation result



Evaluation circuit

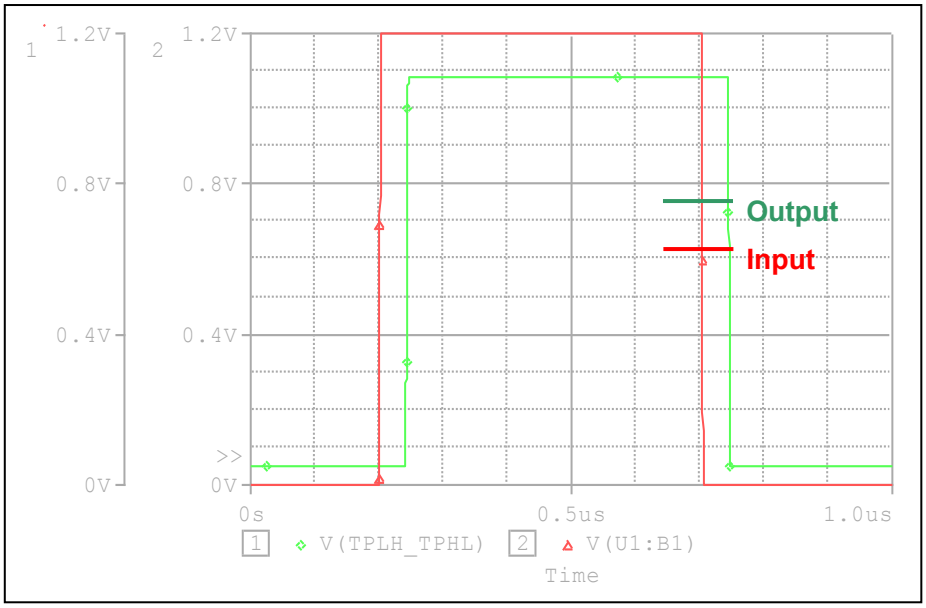


Comparison table

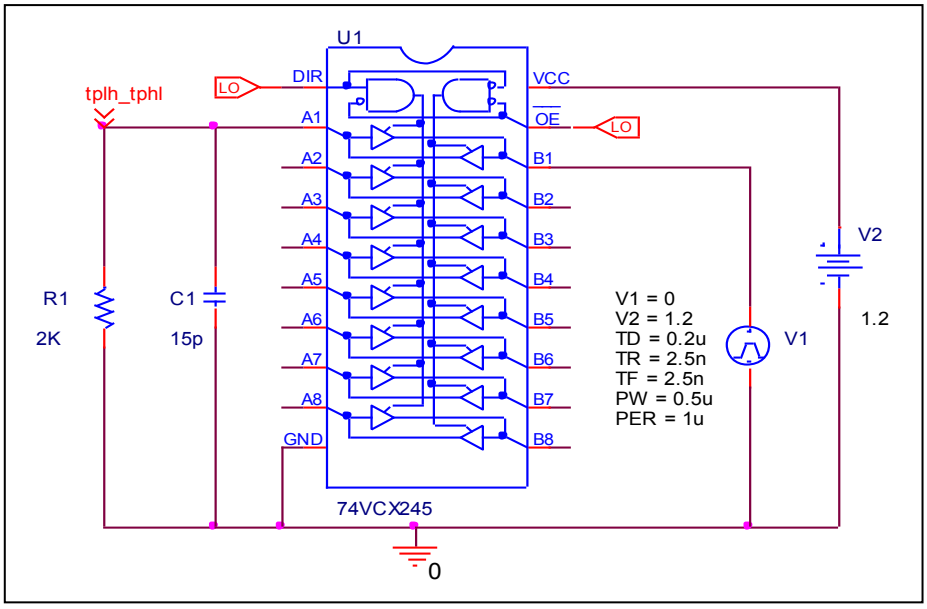
$V_{IN} = V_{IL}$, V_{CC} = 1.2 V	Measurement	Simulation	%Error
V_{OL} (V)	0.05	0.048448	-3.104

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

Circuit simulation result



Evaluation circuit

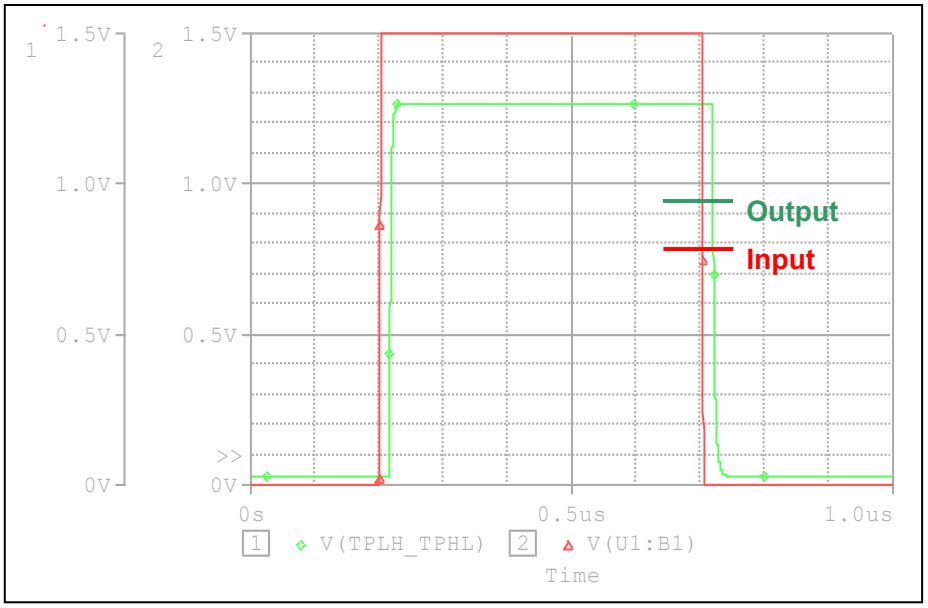


Comparison table C_L = 15 pF, R_L = 2 KΩ

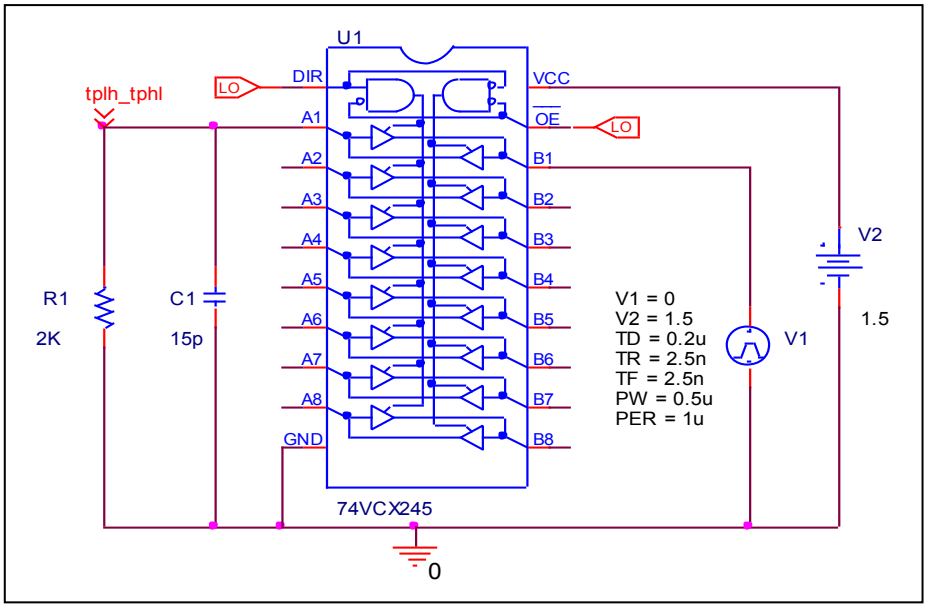
V_{CC} = 1.2 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{pLH} (ns)	42	41.775	-0.536
t_{pHL} (ns)	42	41.761	-0.569

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

Circuit simulation result



Evaluation circuit

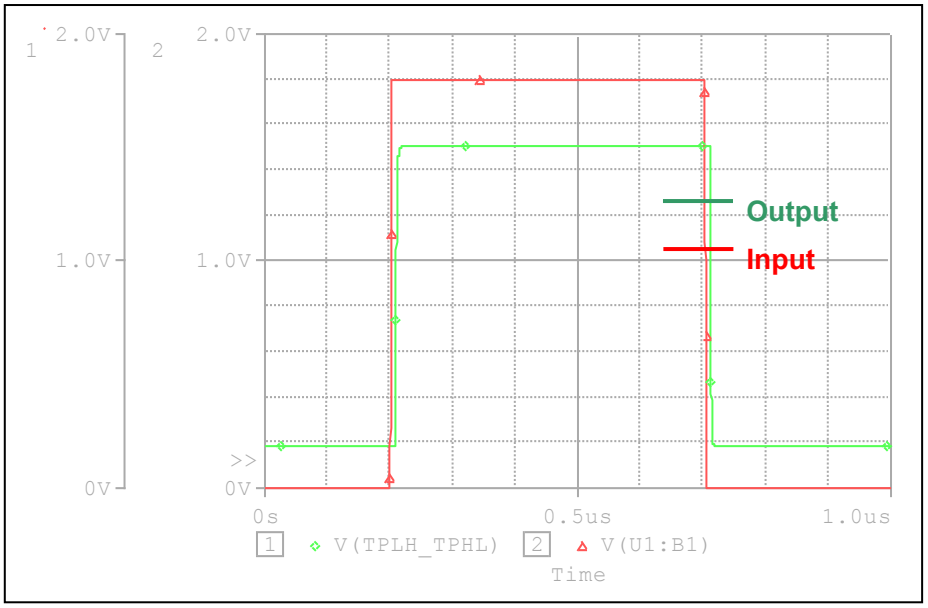


Comparison table C_L = 15 pF, R_L = 2 KΩ

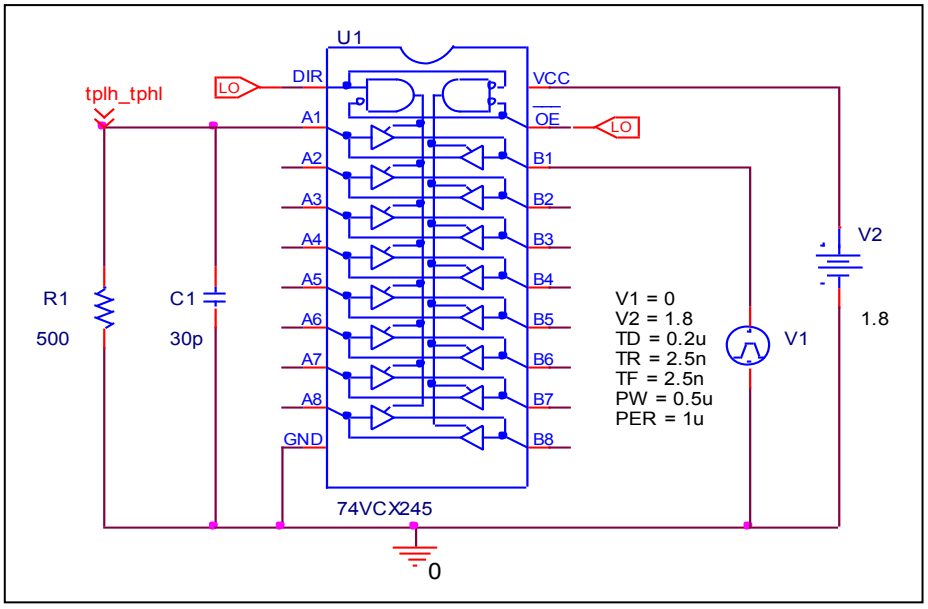
V_{CC} = 1.5 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{pLH} (ns)	16.8	16.430	-2.202
t_{pHL} (ns)	16.8	16.628	-1.024

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

Circuit simulation result



Evaluation circuit

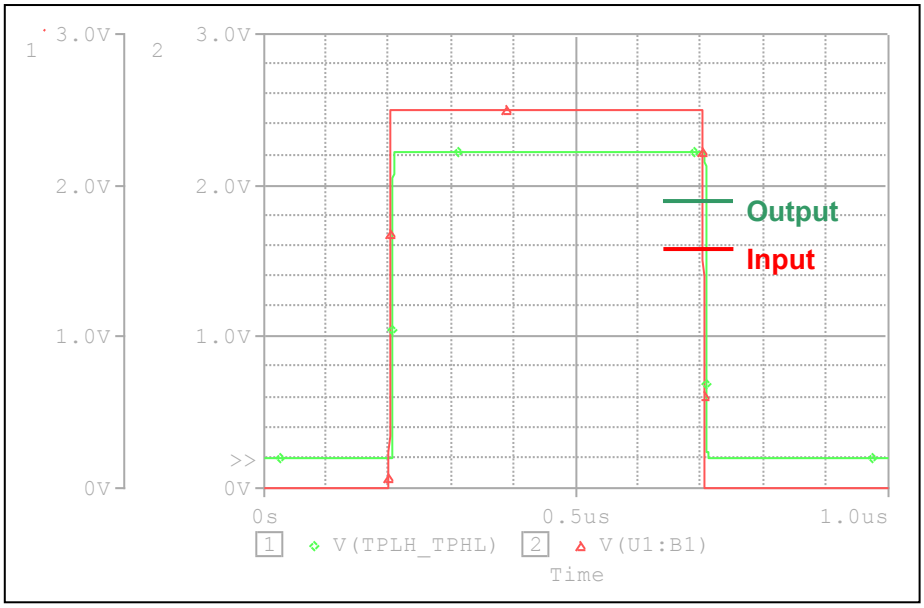


Comparison table **C_L = 30 pF, R_L = 500 Ω**

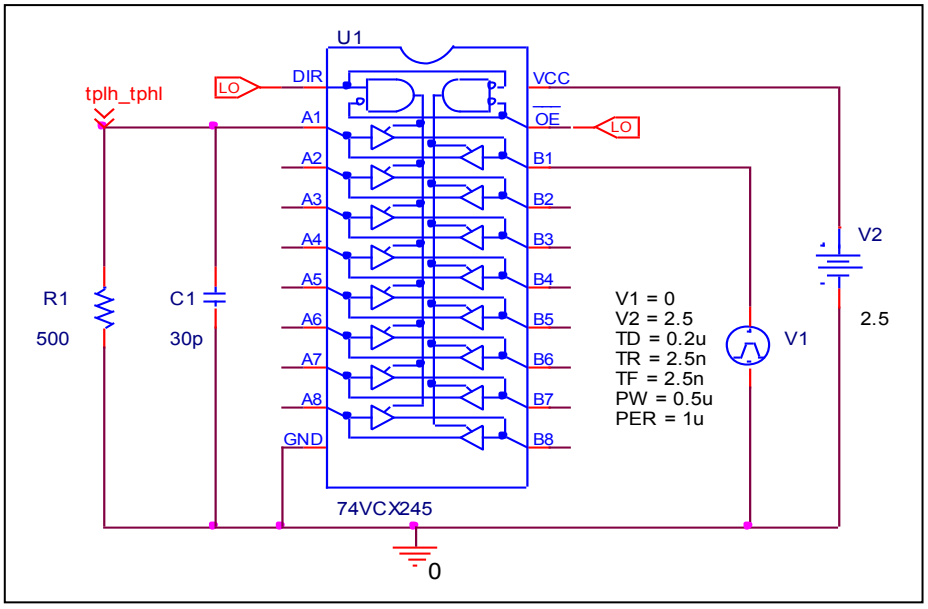
V_{CC} = 1.8 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{pLH} (ns)	8.4	8.2719	-1.525
t_{pHL} (ns)	8.4	8.3228	-0.919

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

Circuit simulation result



Evaluation circuit

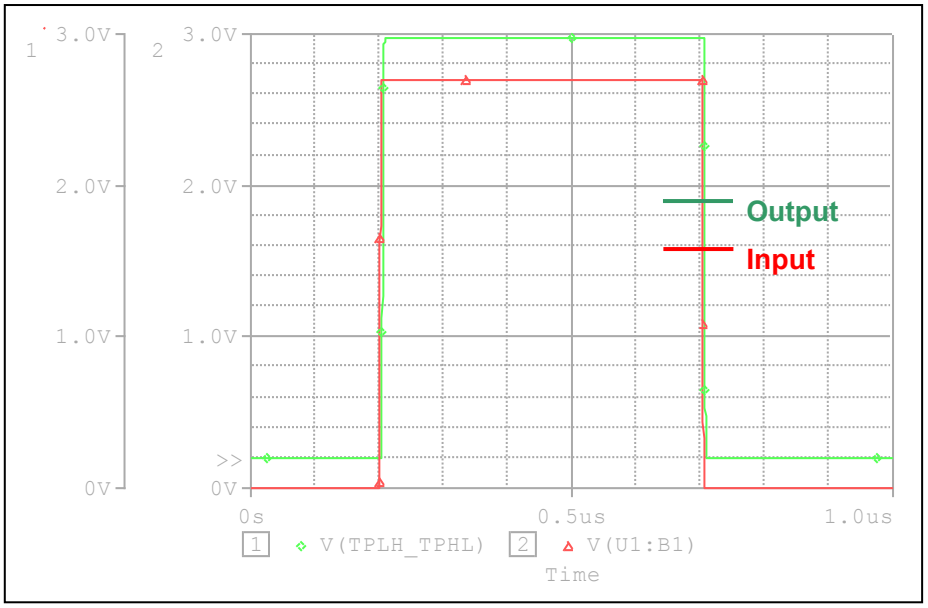


Comparison table C_L = 30 pF, R_L = 500 Ω

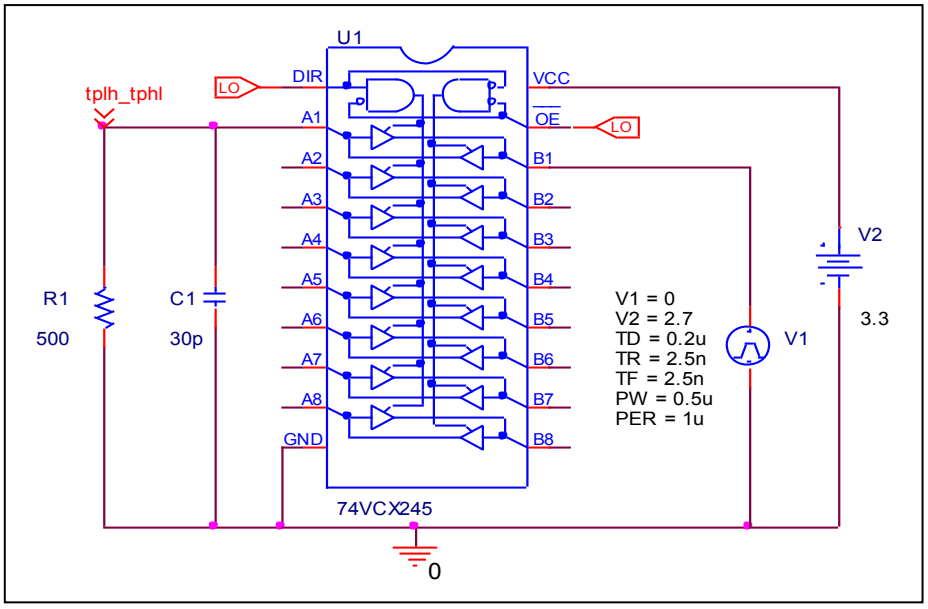
V_{CC} = 2.5 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{pLH} (ns)	4.2	4.1483	-1.231
t_{pHL} (ns)	4.2	4.2043	0.102

Propagation Delay Time (V_{CC} = 3.3)

Circuit simulation result



Evaluation circuit

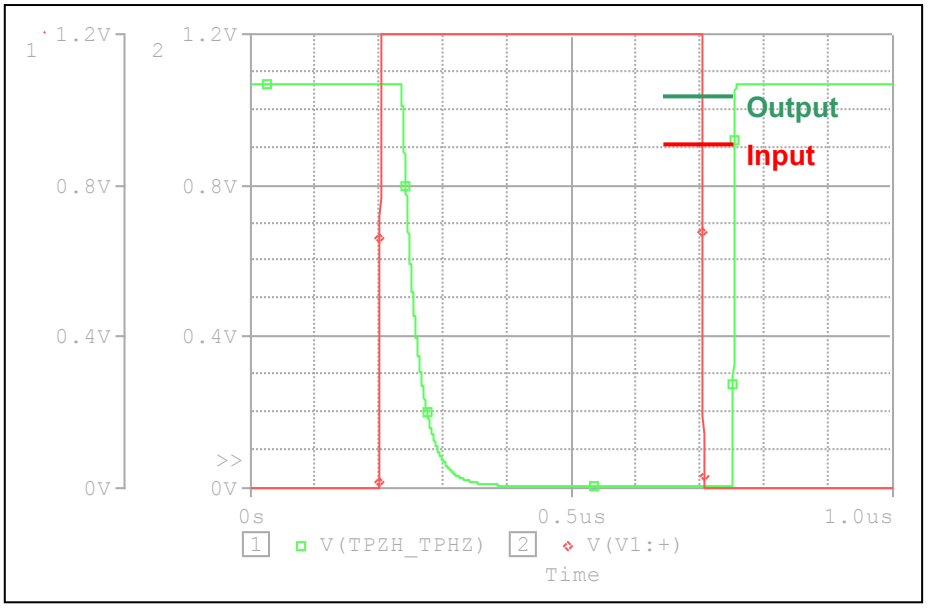


Comparison table **C_L = 30 pF, R_L = 500 Ω**

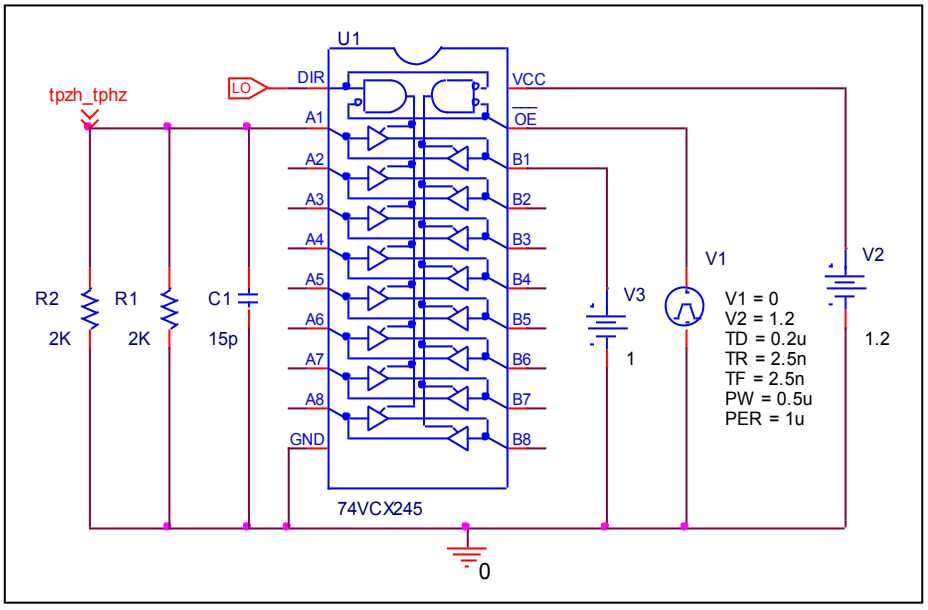
V_{CC} = 3.3 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{pLH} (ns)	3.5	3.4489	-1.460
t_{pHL} (ns)	3.5	3.4608	-1.120

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

Circuit simulation result



Evaluation circuit

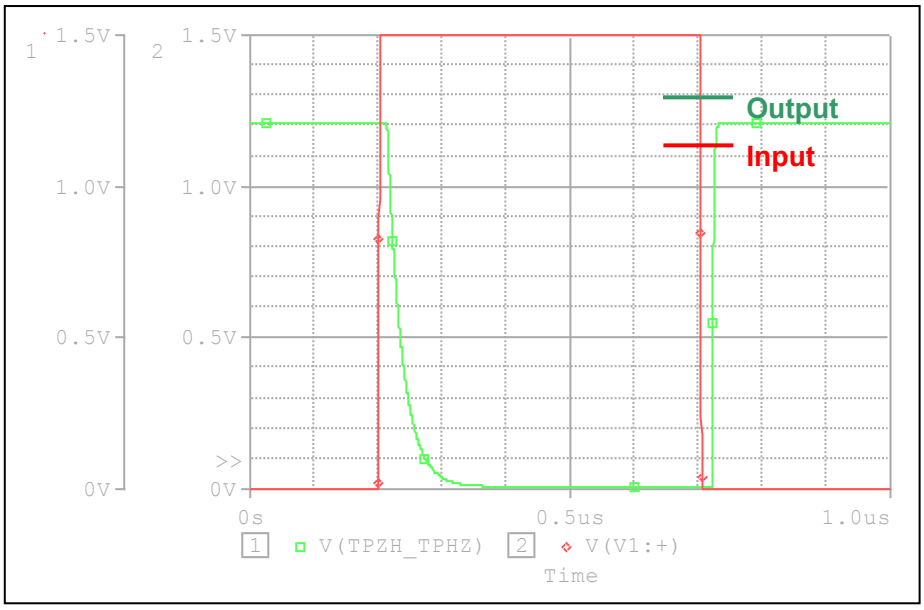


Comparison table **C_L = 15 pF, R_L = 2 kΩ**

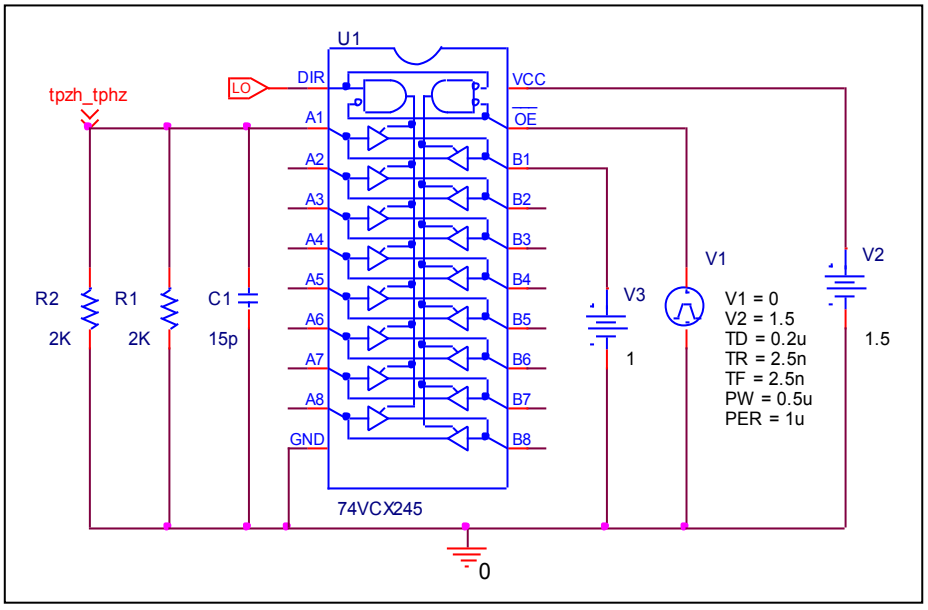
V_{CC} =1.2 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{PHZ} (ns)	36	35.665	-0.931
t_{pZH} (ns)	49	48.407	-1.210

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

Circuit simulation result



Evaluation circuit

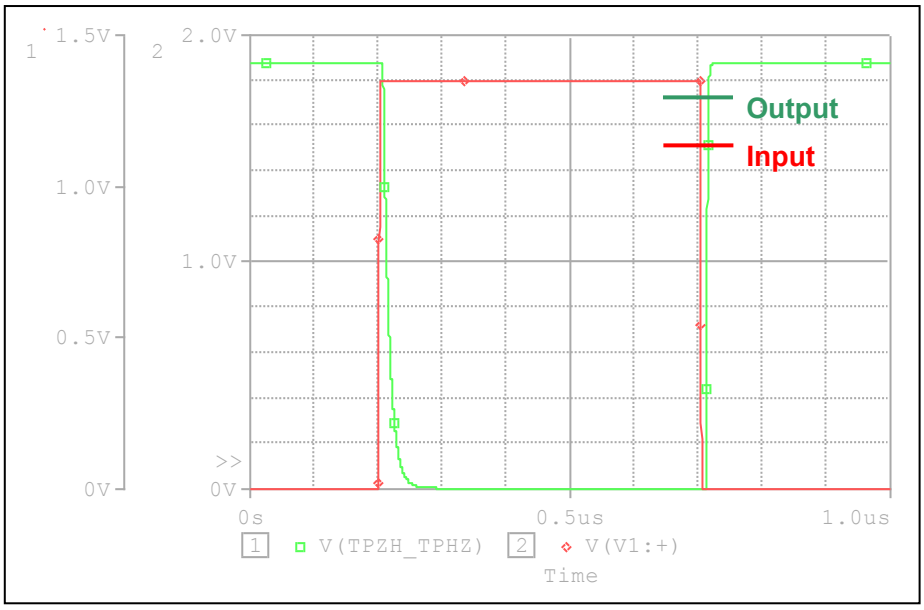


Comparison table **C_L = 15 pF, R_L = 2 kΩ**

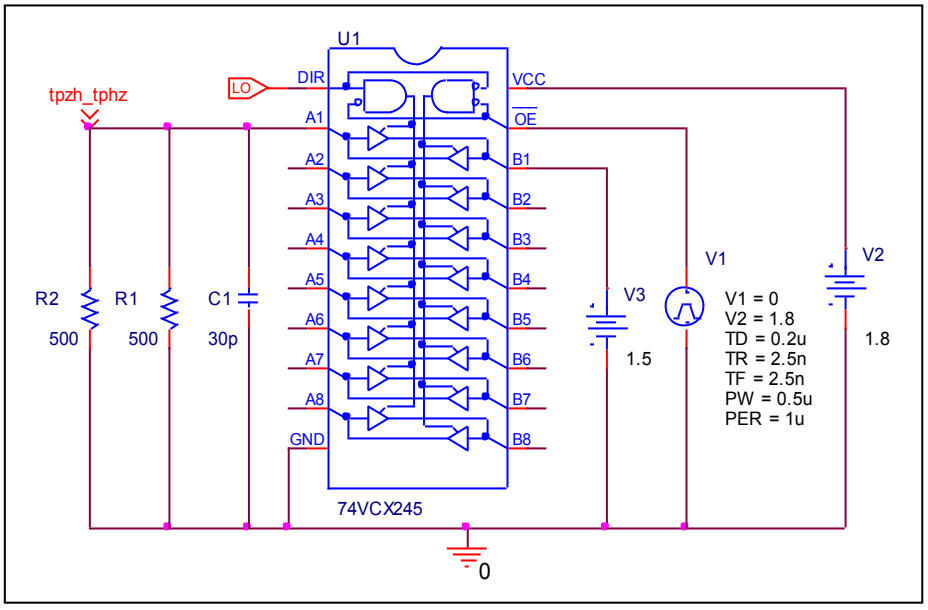
V_{CC} =1.5 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{PHZ} (ns)	14.4	14.343	-0.396
t_{pZH} (ns)	19.6	19.422	-0.908

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

Circuit simulation result



Evaluation circuit

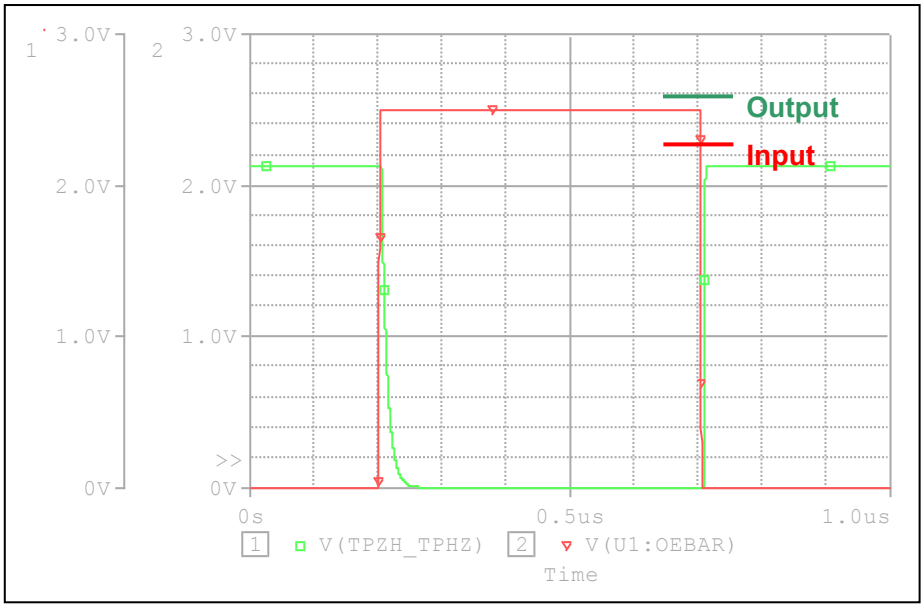


Comparison table **C_L = 30 pF, R_L = 500 Ω**

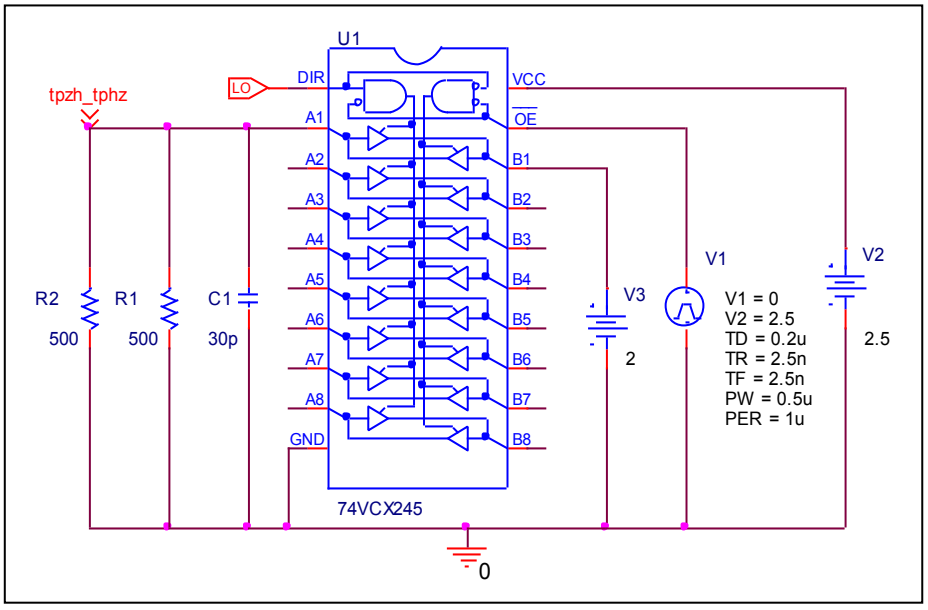
V_{CC} =1.8 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{PHZ} (ns)	7.2	7.1372	-0.872
t_{pZH} (ns)	9.8	9.728	-0.735

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

Circuit simulation result



Evaluation circuit

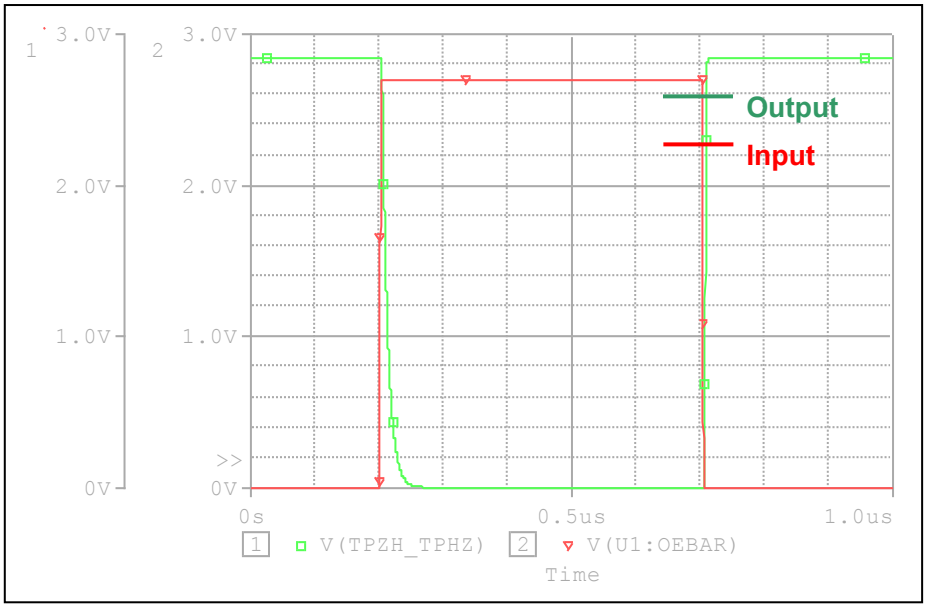


Comparison table C_L = 30 pF, R_L = 500 Ω

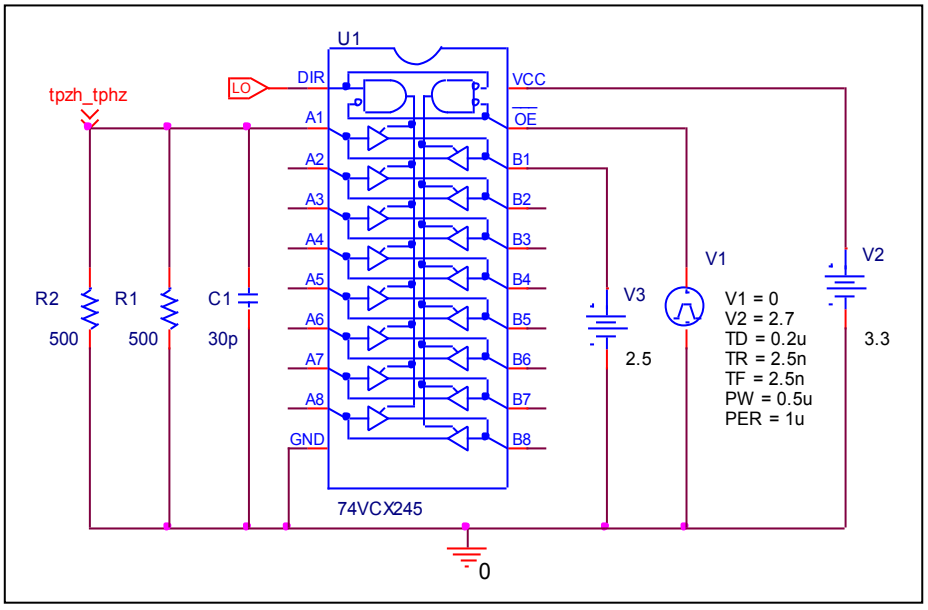
V_{CC} =2.5 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{PHZ} (ns)	4.0	4.0101	0.253
t_{pZH} (ns)	5.6	5.5637	-0.648

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

Circuit simulation result



Evaluation circuit

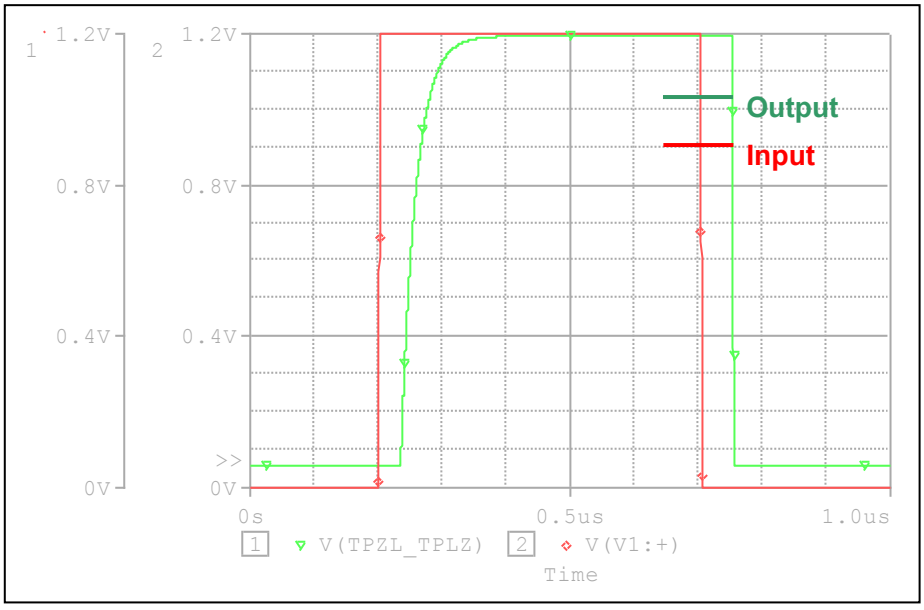


Comparison table **C_L = 30 pF, R_L = 500 Ω**

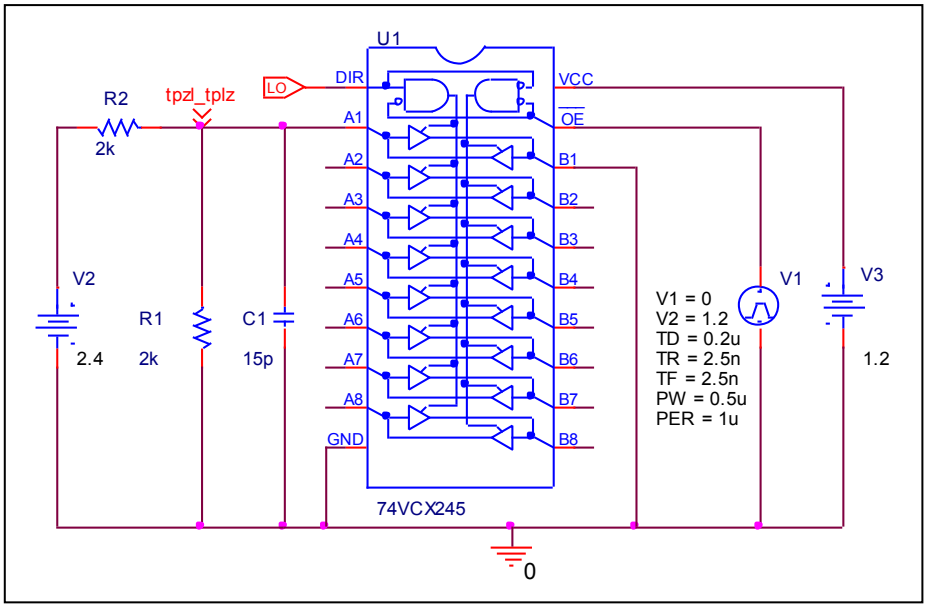
V_{CC} = 3.3 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{PHZ} (ns)	3.6	3.5127	-2.425
t_{pZH} (ns)	4.5	4.3381	-3.598

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

Circuit simulation result



Evaluation circuit

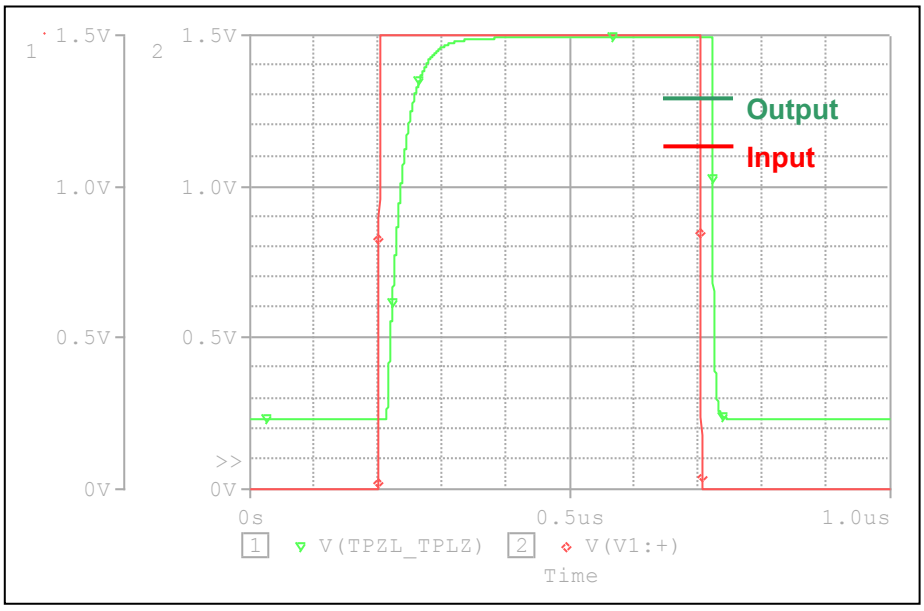


Comparison table **C_L = 15 pF, R_L = 2 kΩ**

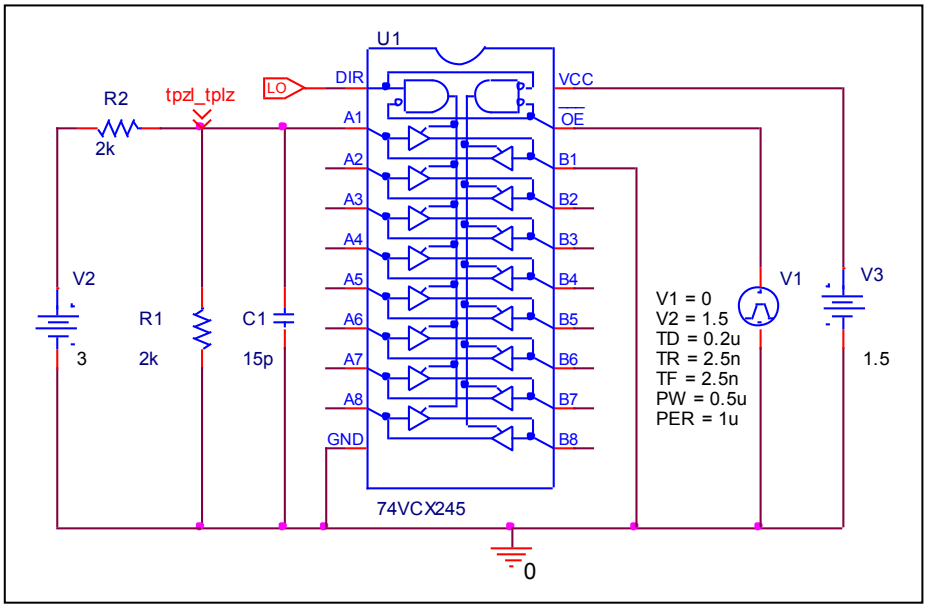
V_{CC} =1.2 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{PLZ} (ns)	36	35.485	-1.431
t_{pZL} (ns)	49	48.771	-0.467

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

Circuit simulation result



Evaluation circuit

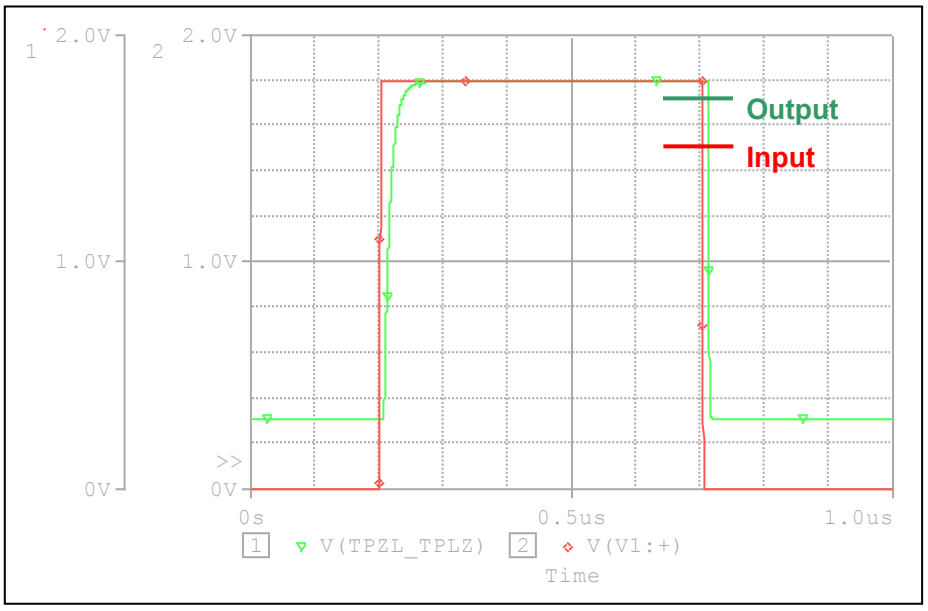


Comparison table **C_L = 15 pF, R_L = 2 kΩ**

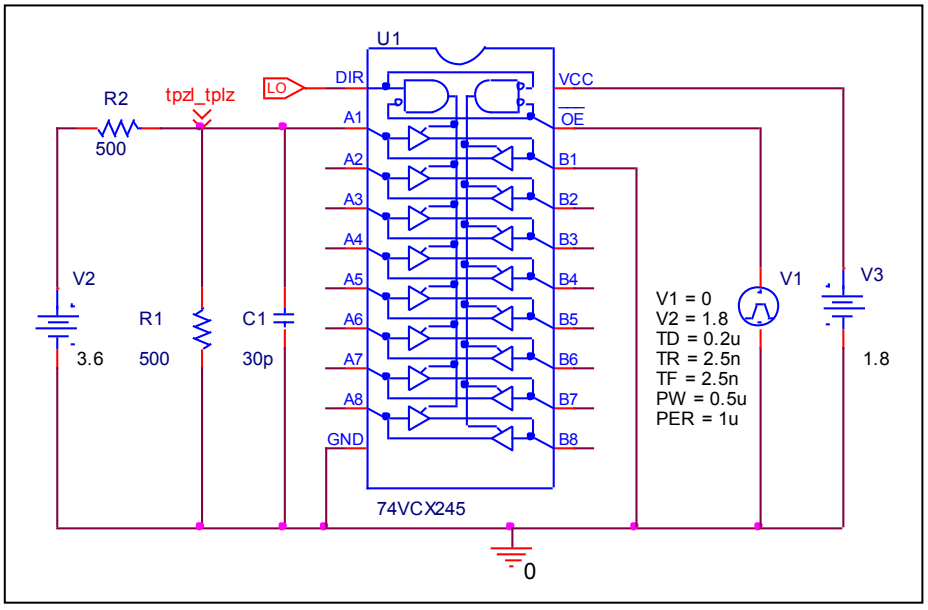
V_{CC} =1.5 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{PLZ} (ns)	14.4	14.127	-1.896
t_{pZL} (ns)	19.6	19.441	-0.811

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

Circuit simulation result



Evaluation circuit

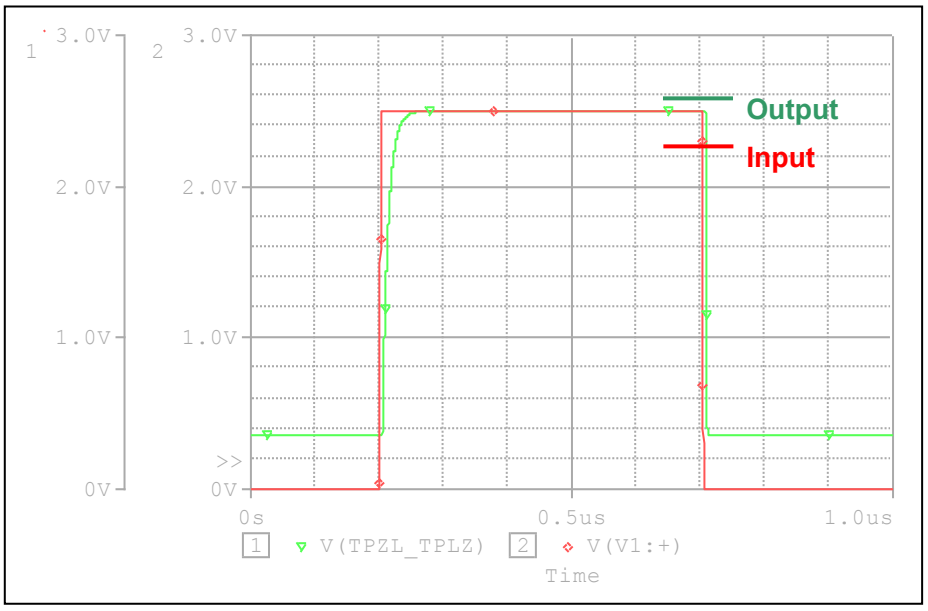


Comparison table C_L = 30 pF, R_L = 500 Ω

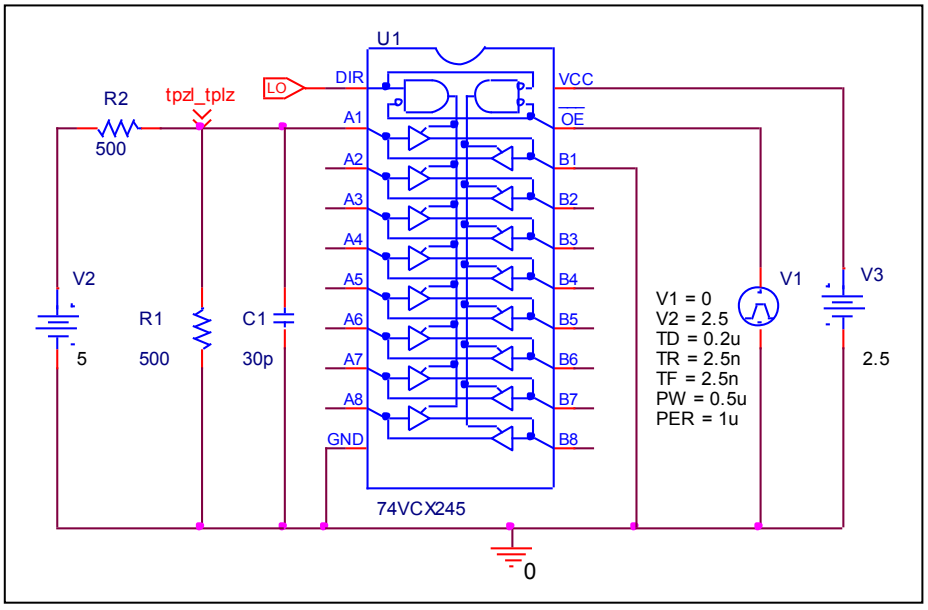
V_{CC} =1.8 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{PLZ} (ns)	7.2	7.0614	-1.925
t_{pZL} (ns)	9.8	9.721	-0.806

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

Circuit simulation result



Evaluation circuit

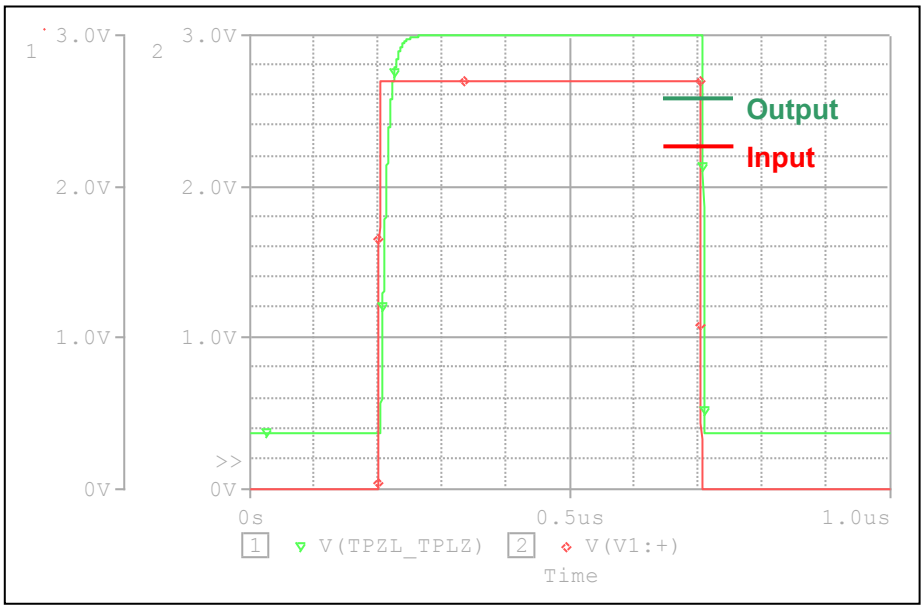


Comparison table C_L = 30 pF, R_L = 500 Ω

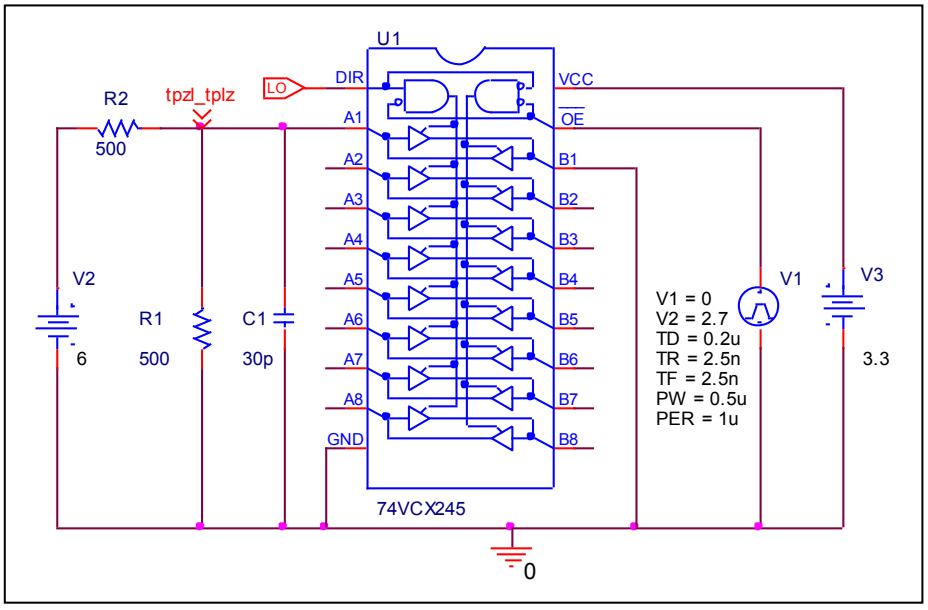
V_{CC} = 2.5 V, t_r=t_f= 2 ns	Measurement	Simulation	%Error
t_{PLZ} (ns)	4	3.9939	-0.153
t_{pZL} (ns)	5.6	5.4786	-2.168

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)	3.6	3.5963	-0.103
t_{pZL} (ns)	4.5	4.4497	-1.118