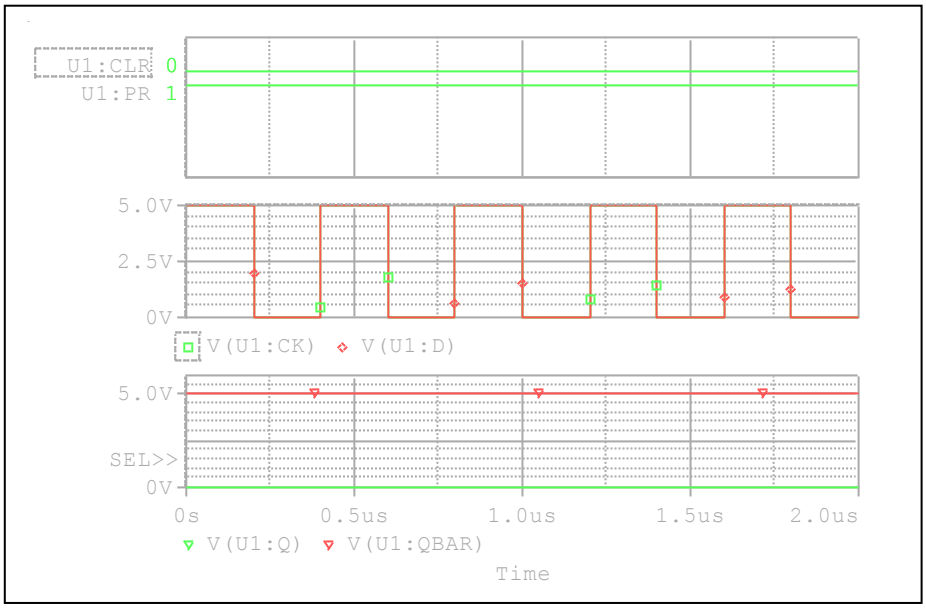
Device Modeling Report

COMPONENTS : CMOS DIGITAL INTEGRATED CIRCUIT
PART NUMBER : TC7WZ74FU
MANUFACTURER : TOSHIBA

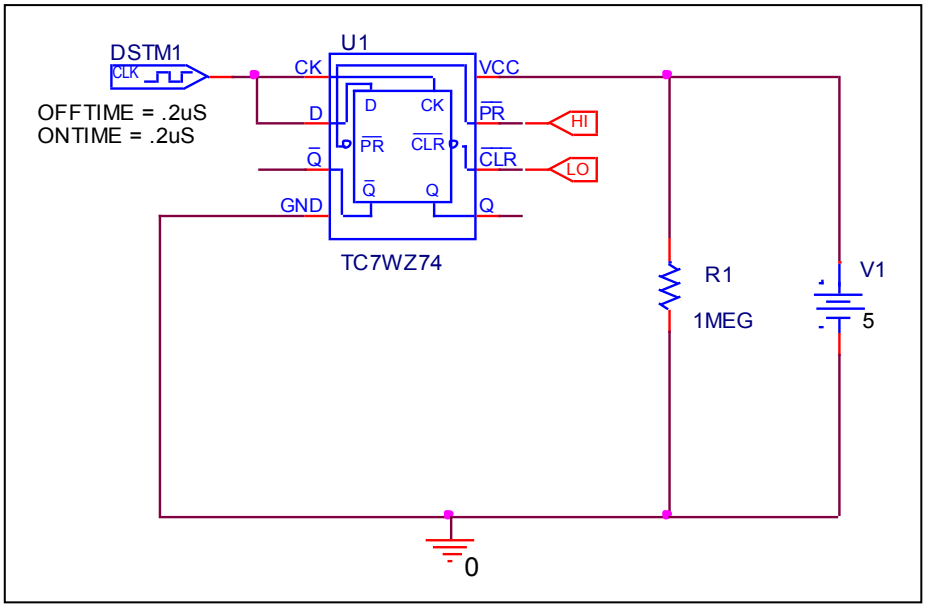
Bee Technologies Inc.

Truth Table

Circuit simulation result



Evaluation circuit

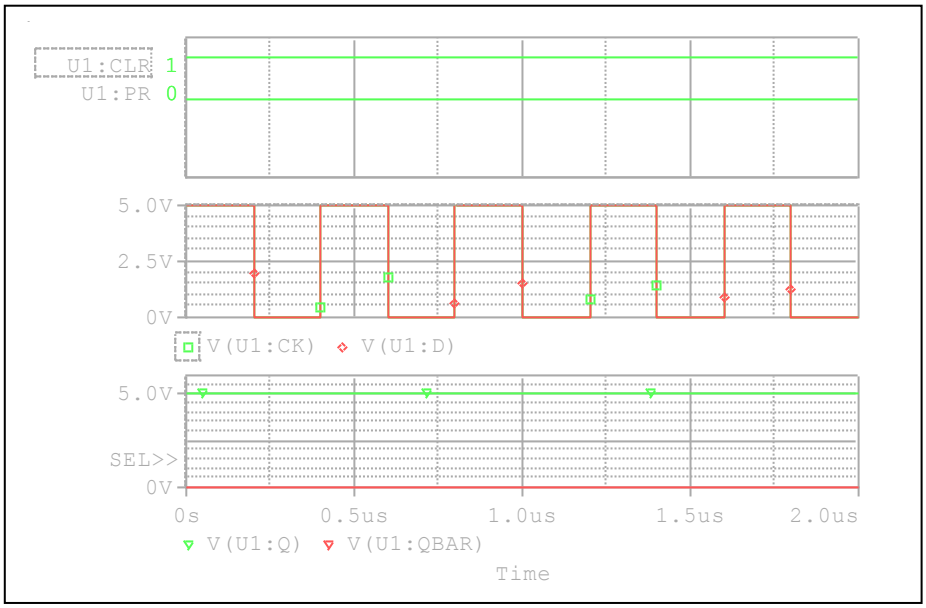


Comparison table

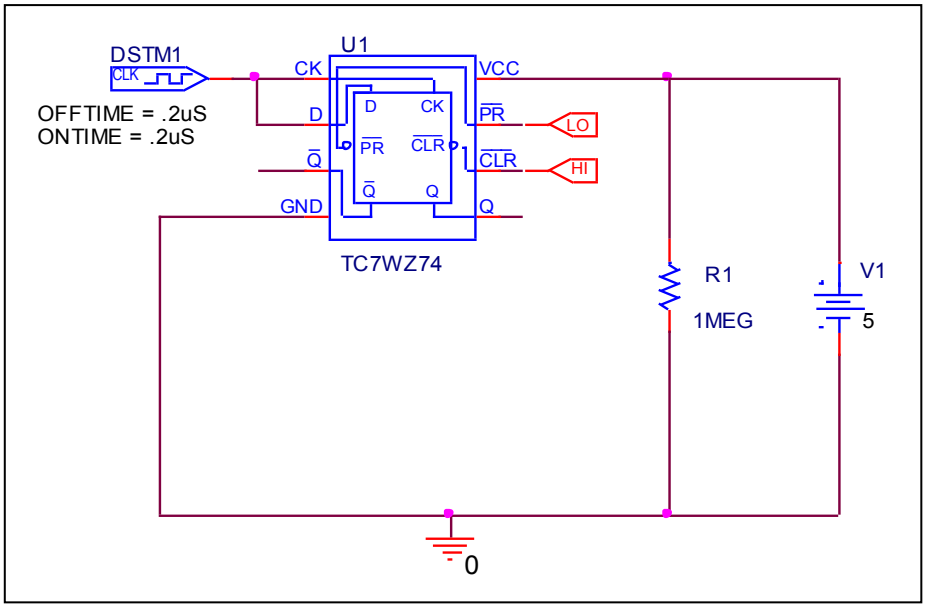
Input				Q		$\overline{Q}$		%Error
$\overline{CLR}$	$\overline{PR}$	D	CK	Measurement	Simulation	Measurement	Simulation	
L	H	X	X	L	L	H	H	0

Truth Table

Circuit simulation result



Evaluation circuit

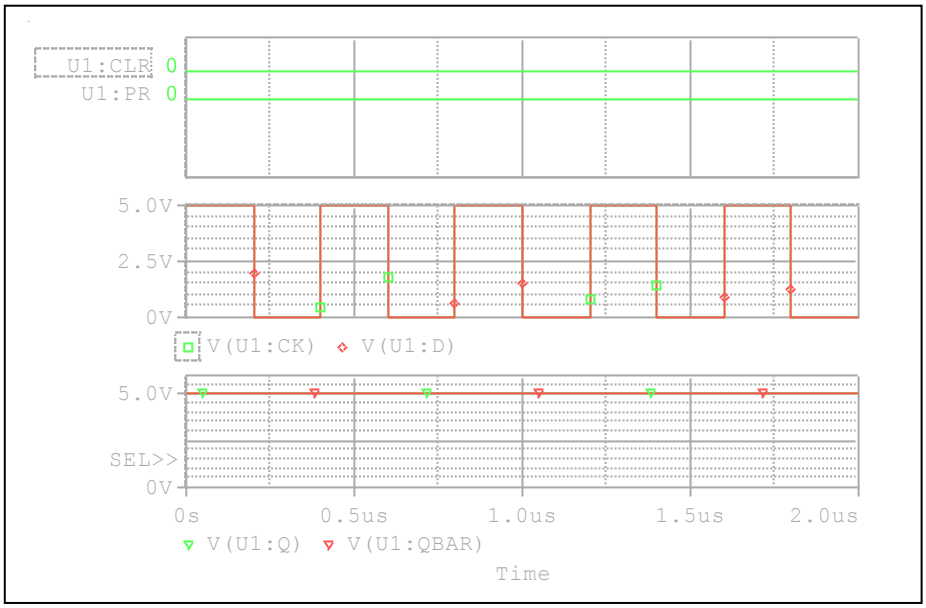


Comparison table

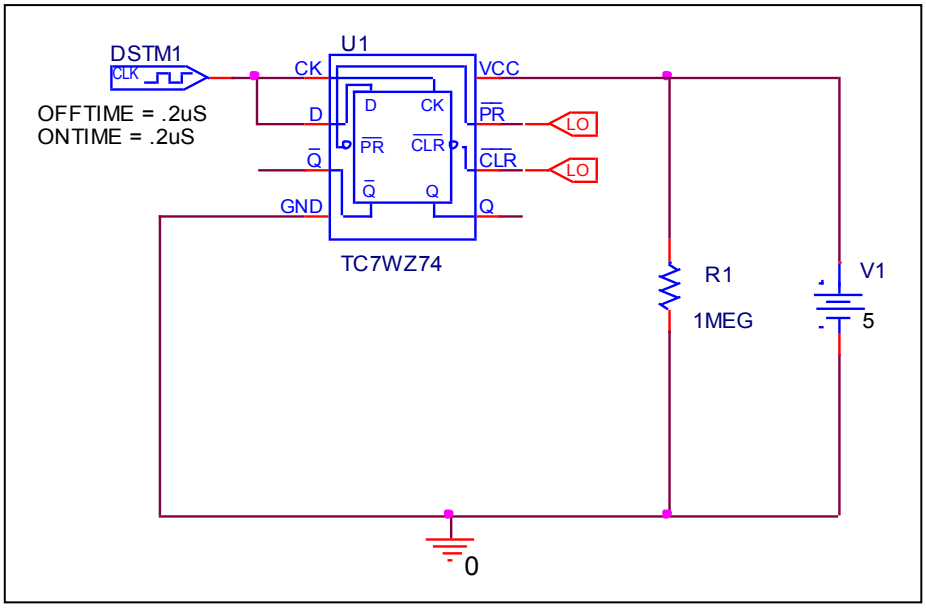
Input				Q		Q̄		%Error
CLR̄	PR̄	D	CK	Measurement	Simulation	Measurement	Simulation	
H	L	X	X	H	H	L	L	0

Truth Table

Circuit simulation result



Evaluation circuit

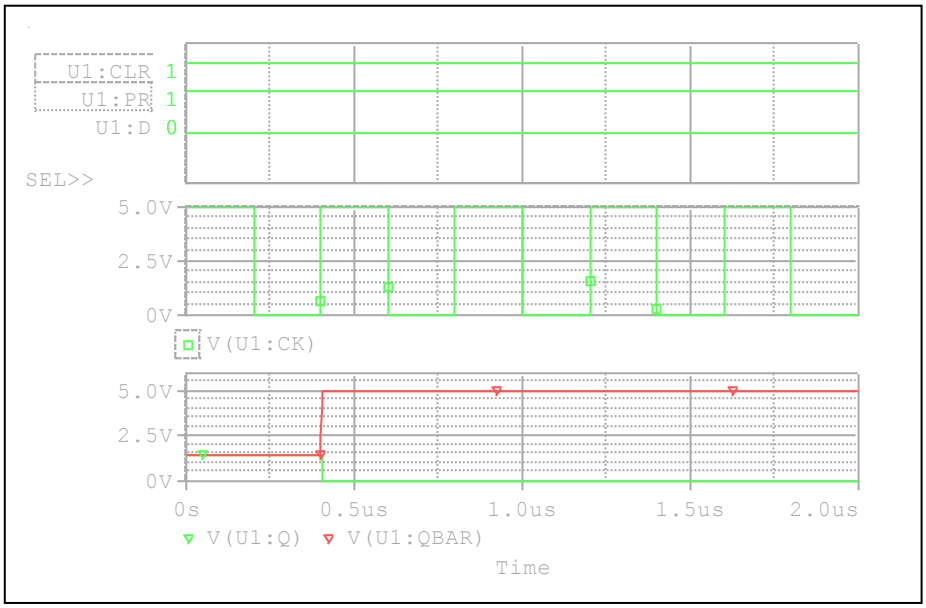


Comparison table

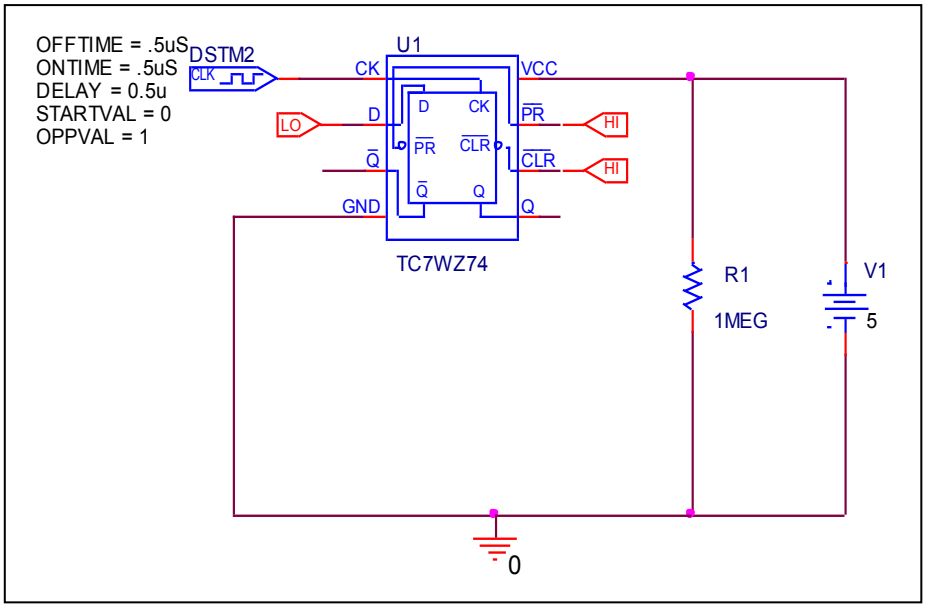
Input				Q		$\overline{Q}$		%Error
$\overline{CLR}$	$\overline{PR}$	D	CK	Measurement	Simulation	Measurement	Simulation	
L	L	X	X	H	H	H	H	0

Truth Table

Circuit simulation result



Evaluation circuit

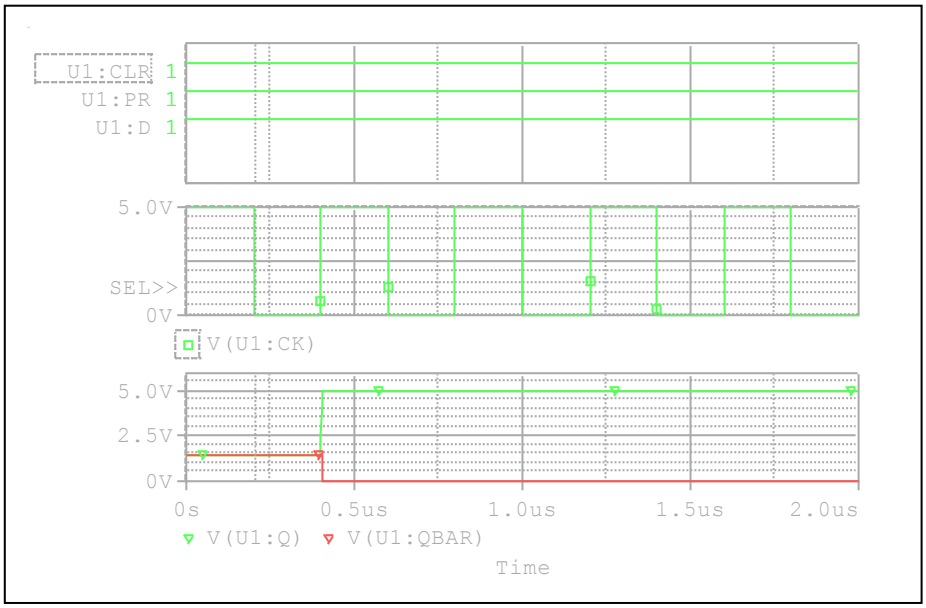


Comparison table

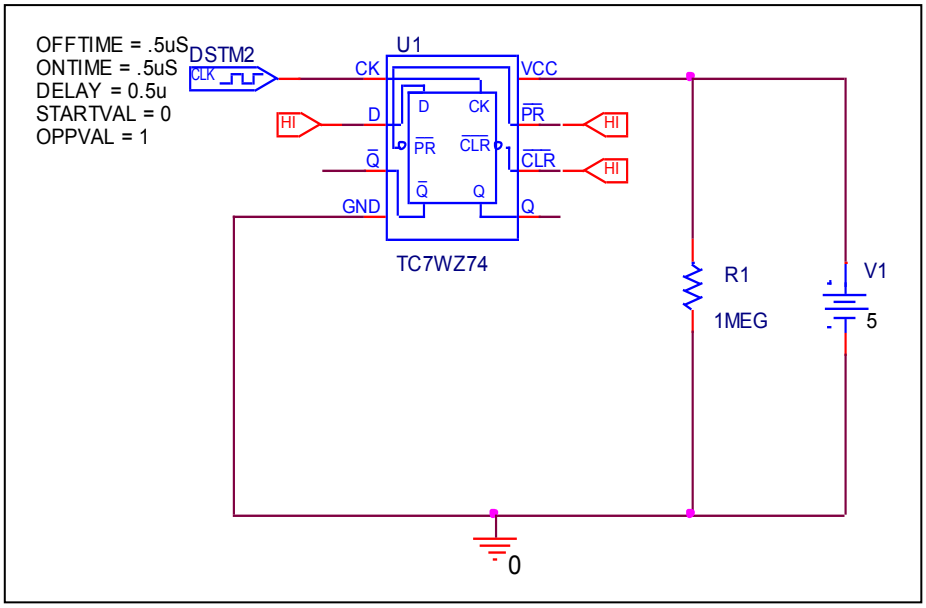
Input				Q		$\overline{Q}$		%Error
$\overline{CLR}$	$\overline{PR}$	D	CK	Measurement	Simulation	Measurement	Simulation	
H	H	L	↑	L	L	H	H	0

Truth Table

Circuit simulation result



Evaluation circuit

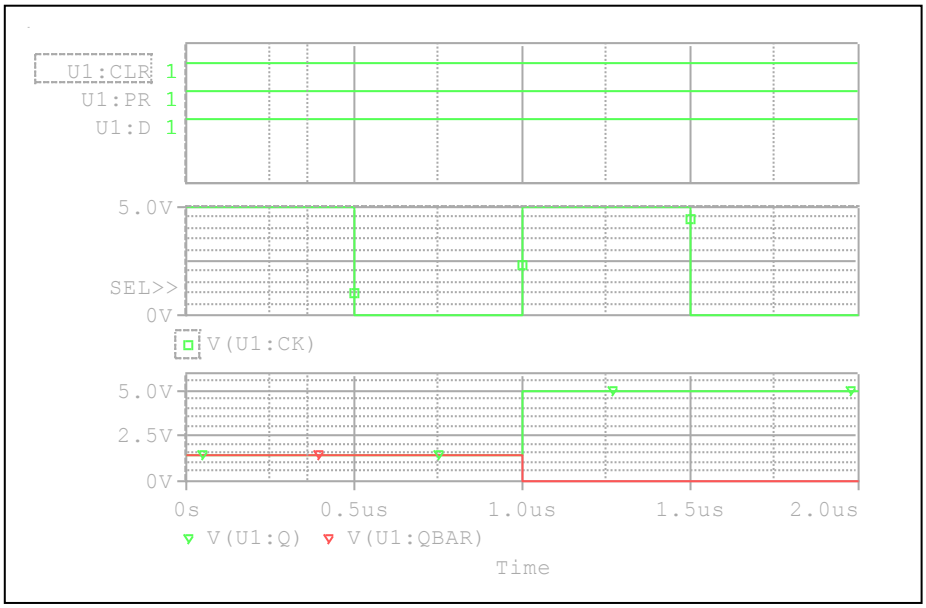


Comparison table

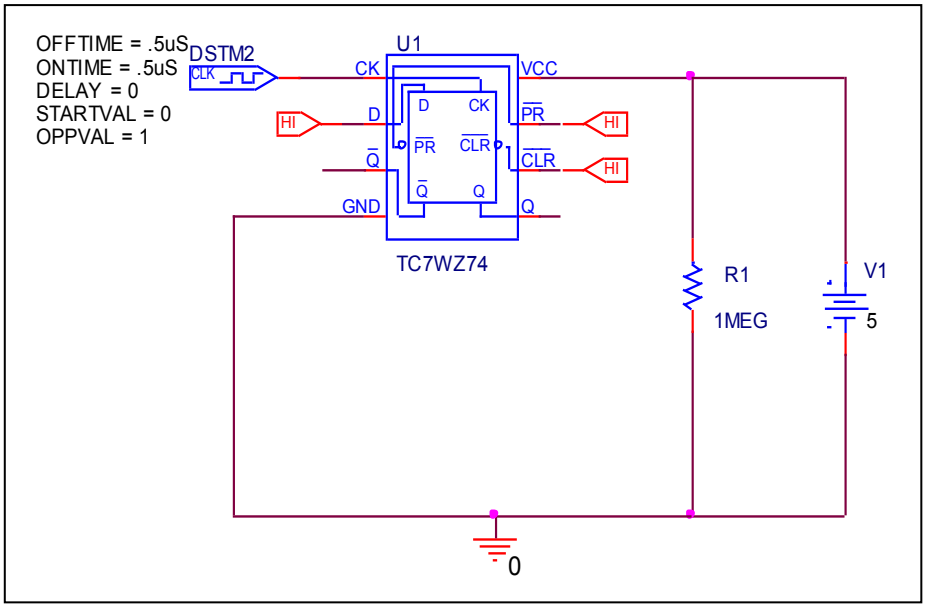
Input				Q		$\overline{Q}$		%Error
$\overline{CLR}$	$\overline{PR}$	D	CK	Measurement	Simulation	Measurement	Simulation	
H	H	H	↑	H	H	L	L	0

Truth Table

Circuit simulation result



Evaluation circuit

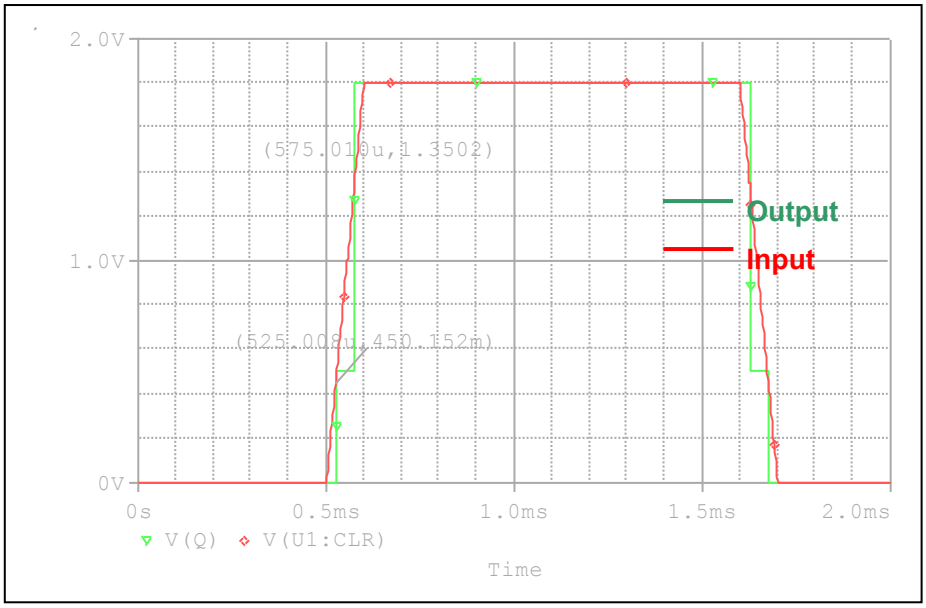


Comparison table

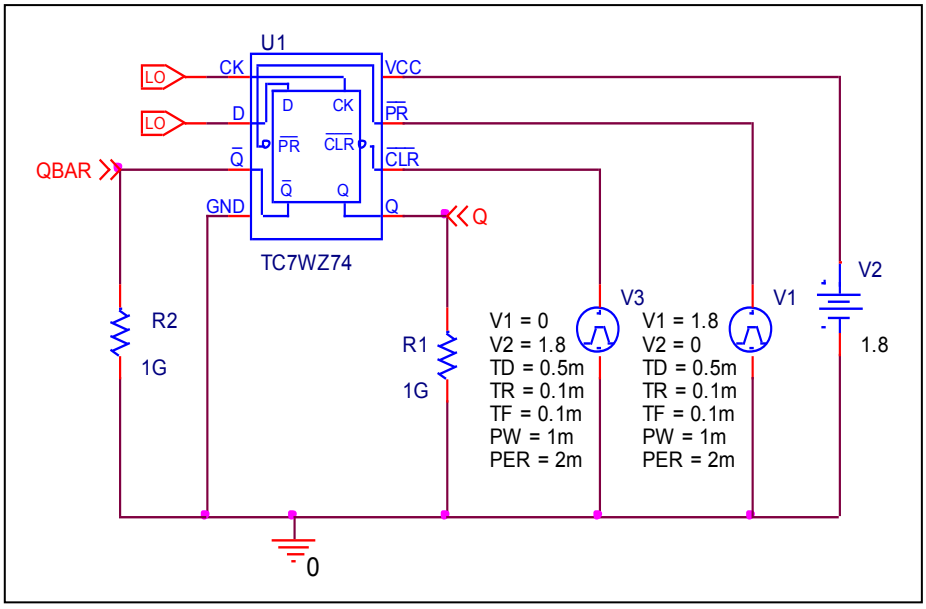
Input				Q		$\overline{Q}$		%Error
$\overline{CLR}$	$\overline{PR}$	D	CK	Measurement	Simulation	Measurement	Simulation	
H	H	X	↓	Qn	Qn	Qn	Qn	0

High Level and Low Level Input Voltage (V_{CC} = 1.8 V)

Circuit simulation result



Evaluation circuit

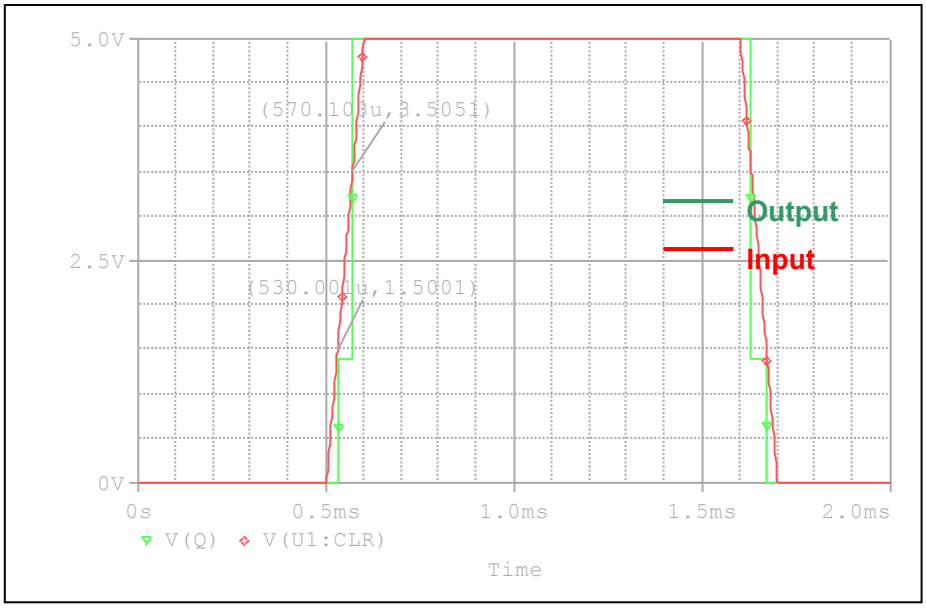


Comparison table

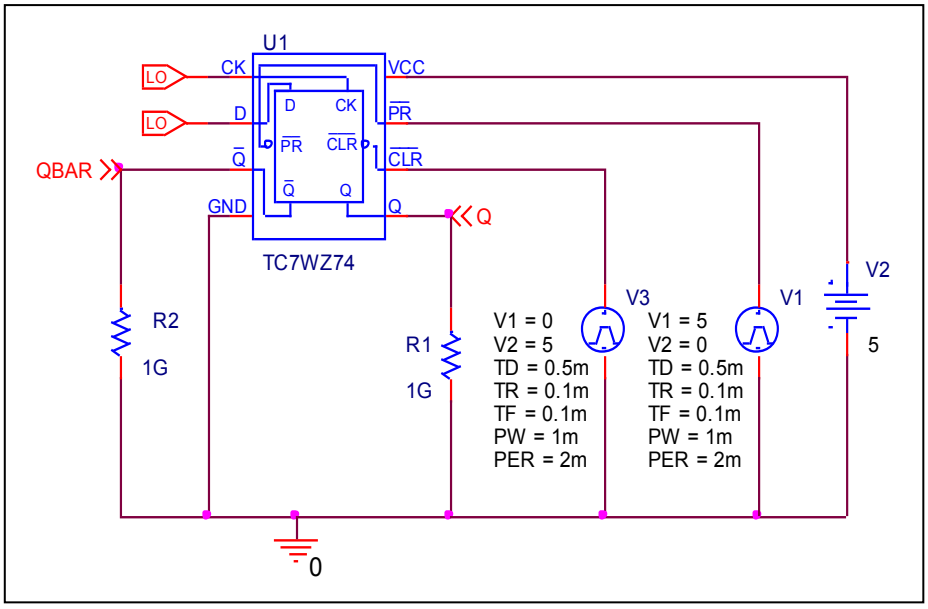
V_{CC} = 1.8 V	Measurement	Simulation	%Error
V_{IH} (V)	1.35	1.3502	0.015
V_{IL} (V)	0.45	0.450152	0.034

High Level and Low Level Input Voltage (V_{CC} = 5 V)

Circuit simulation result



Evaluation circuit

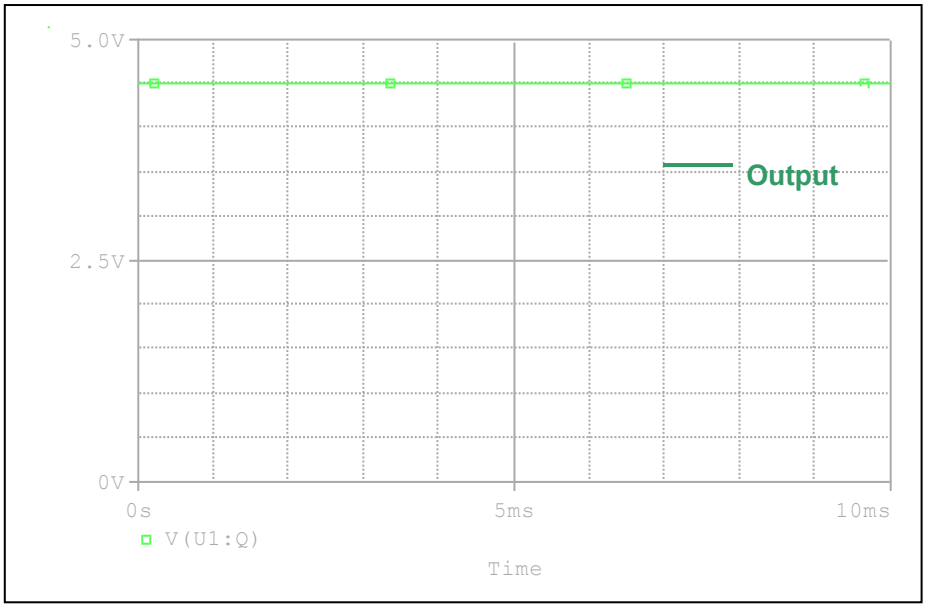


Comparison table

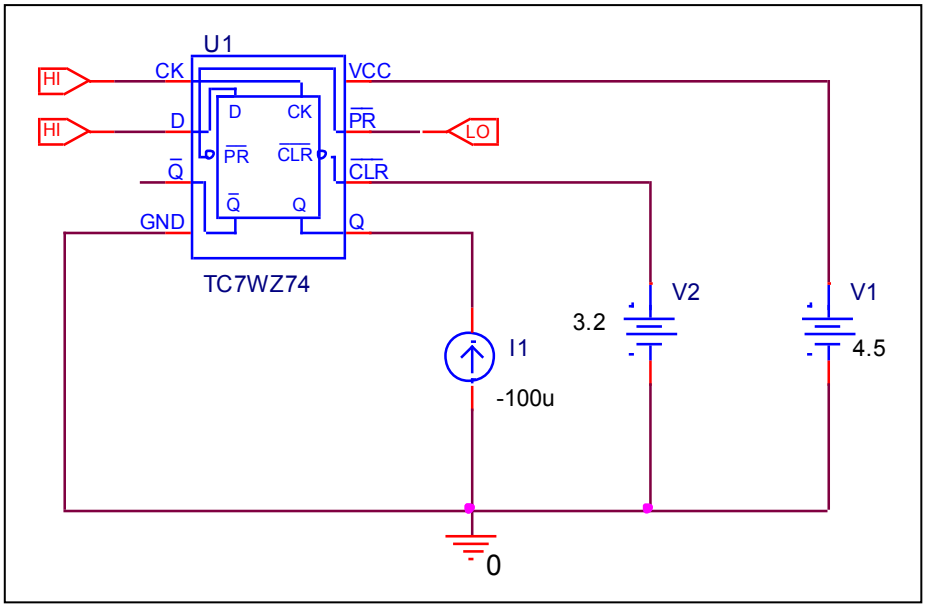
V_{CC} = 5 V	Measurement	Simulation	%Error
V_{IH} (V)	3.5	3.5051	0.146
V_{IL} (V)	1.5	1.5001	0.007

High Level Output Voltage

Circuit simulation result



Evaluation circuit

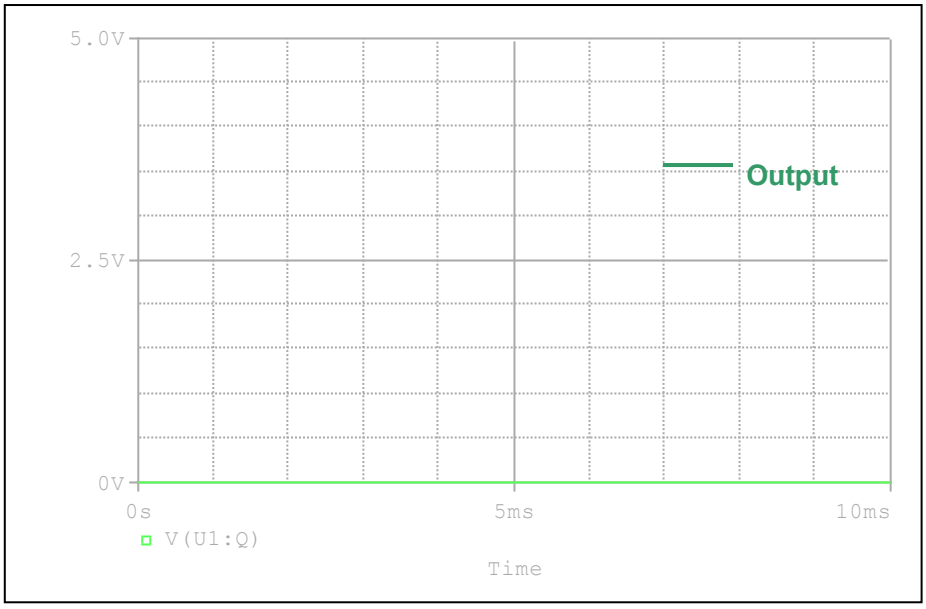


Comparison table

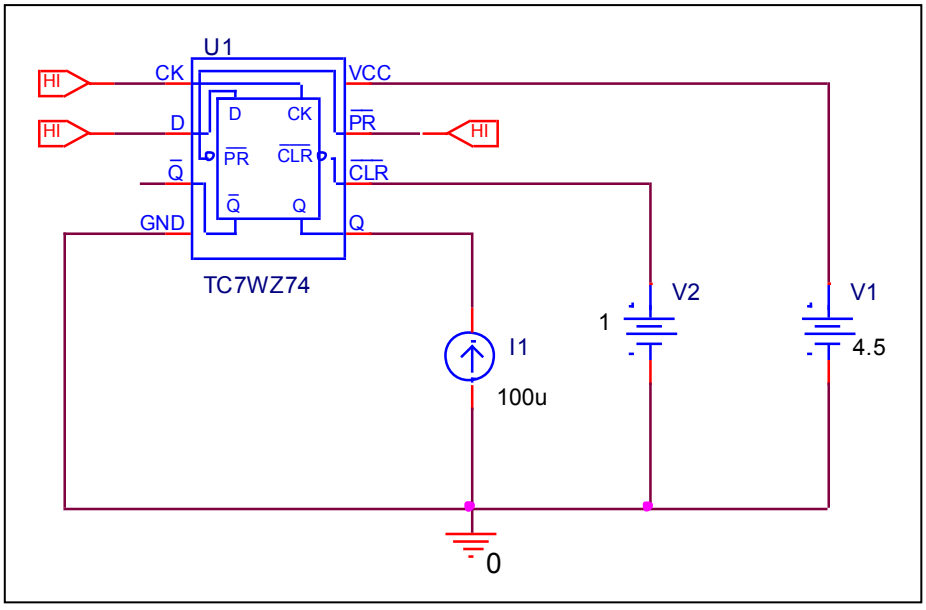
V_{CC} = 4.5V	Measurement	Simulation	%Error
V_{OH} (V)	4.5	4.499	-0.022

Low Level Output Voltage

Circuit simulation result



Evaluation circuit

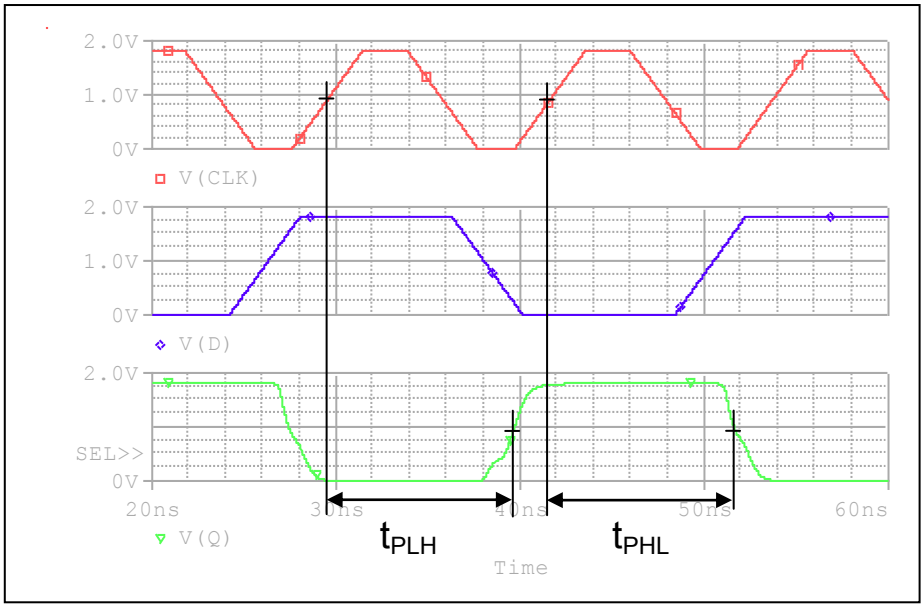


Comparison table

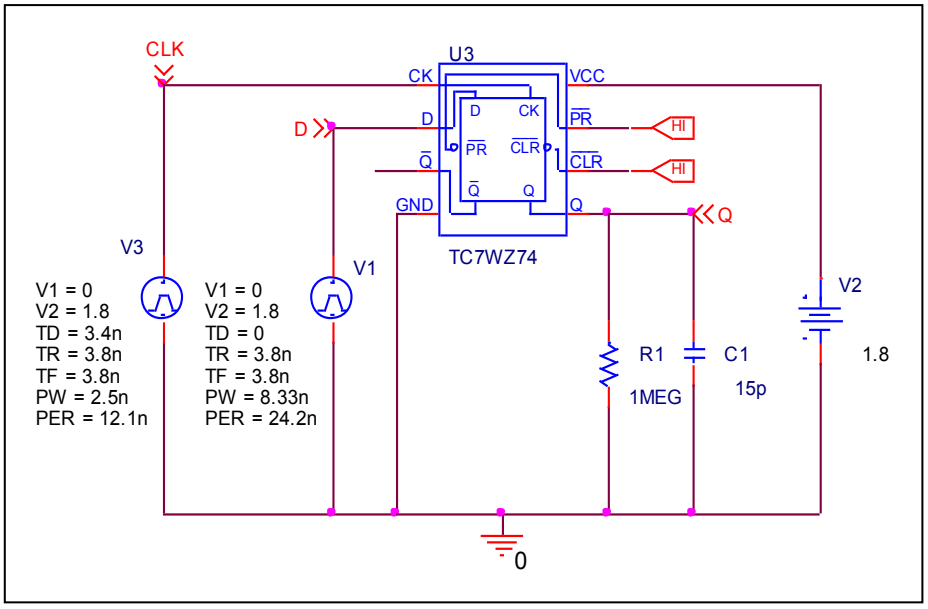
V_{CC} = 4.5V	Measurement	Simulation	%Error
V_{OL} (V)	0	0	0

Propagation Delay Time (V_{CC} = 1.8 V, CK-Q)

Circuit simulation result



Evaluation circuit

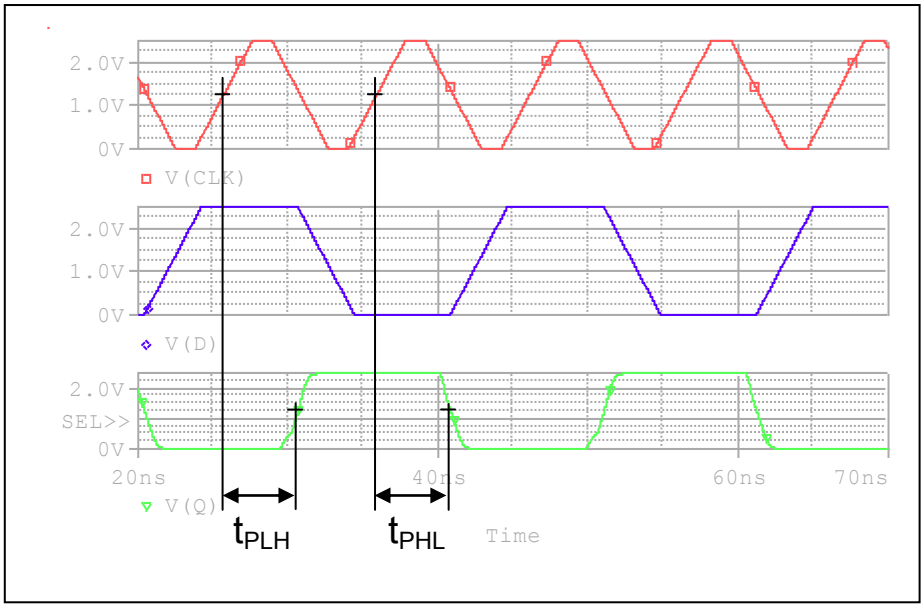


Comparison table C_L = 15 pF, R_L = 1 MEGΩ

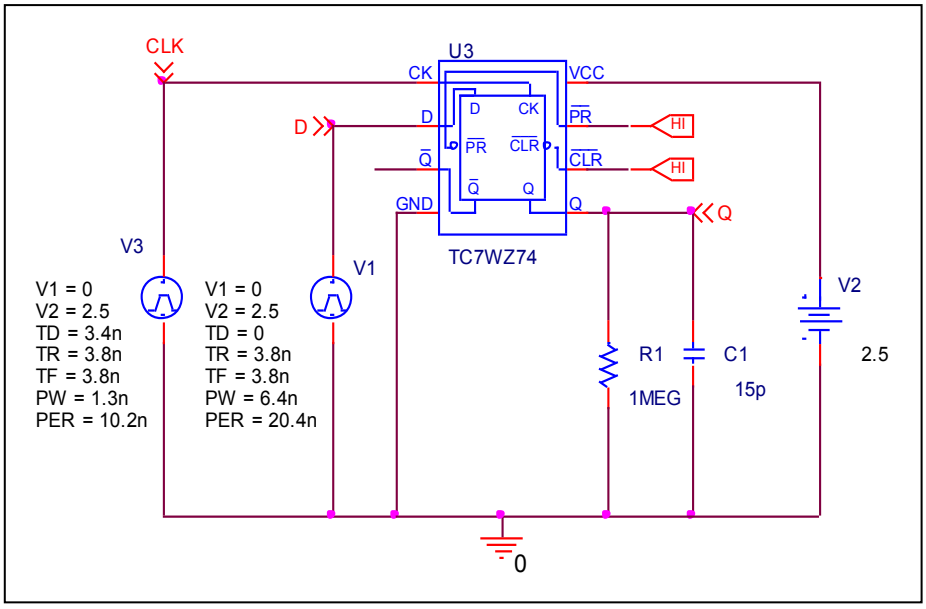
$t_r = t_f$ =3 ns	Measurement	Simulation	%Error
t_{PLH} (ns)	10	10.090	0.900
t_{PHL} (ns)	10	10.140	1.400

Propagation Delay Time (V_{CC} = 2.5 V, CK-Q)

Circuit simulation result



Evaluation circuit

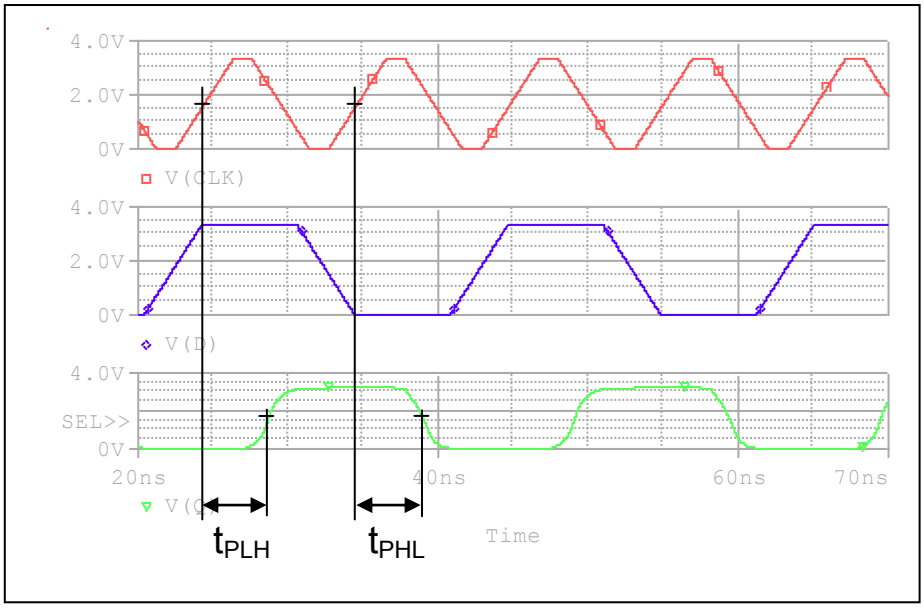


Comparison table C_L = 15 pF, R_L = 1 MEGΩ

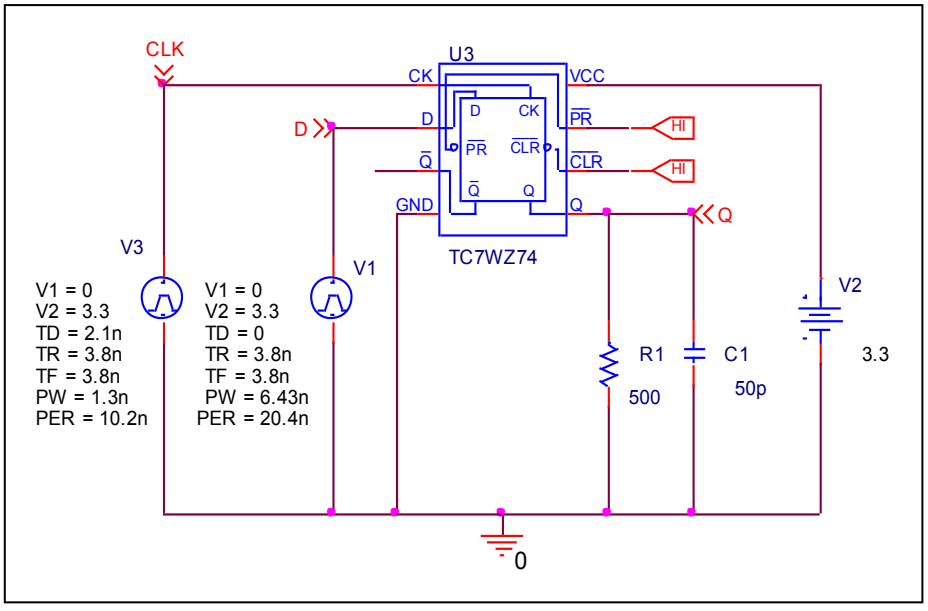
$t_r = t_f$ =3 ns	Measurement	Simulation	%Error
t_{PLH} (ns)	4.9	4.9625	1.276
t_{PHL} (ns)	4.9	4.9357	0.729

Propagation Delay Time (V_{CC} = 3.3 V, CK-Q)

Circuit simulation result



Evaluation circuit

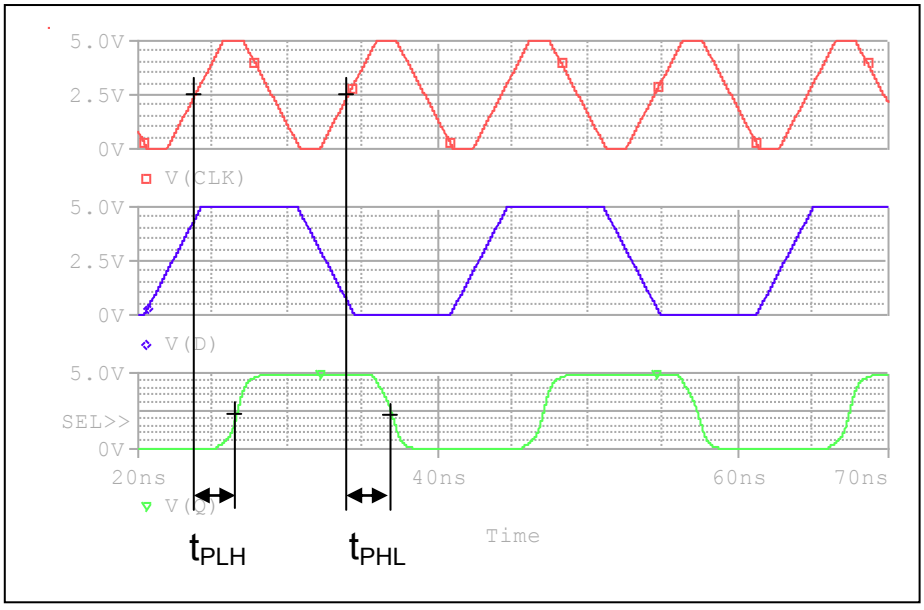


Comparison table C_L = 50 pF, R_L = 500 Ω

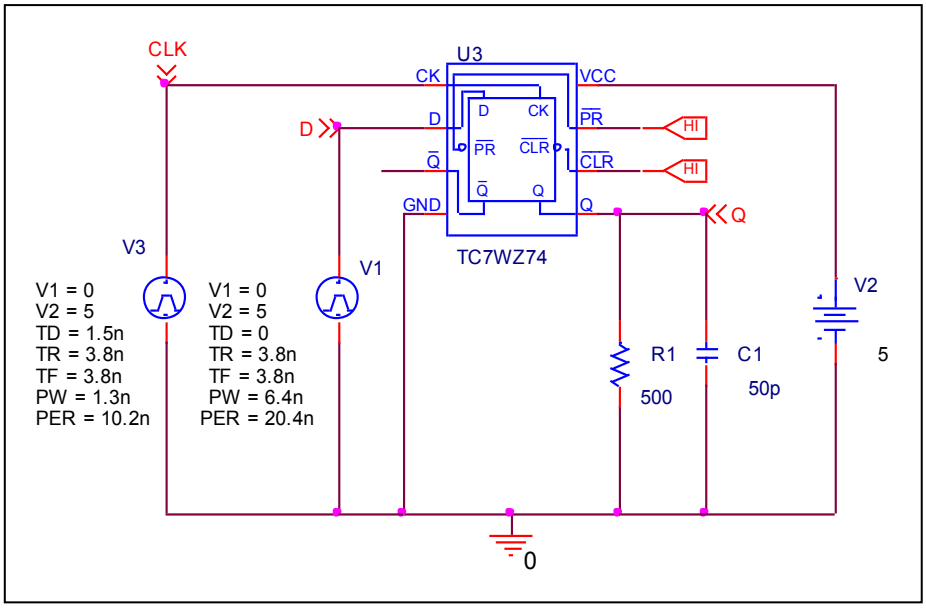
$t_r = t_f$ =3 ns	Measurement	Simulation	%Error
t_{PLH} (ns)	4.3	4.3083	0.193
t_{PHL} (ns)	4.3	4.3984	2.288

Propagation Delay Time (V_{CC} = 5 V, CK-Q)

Circuit simulation result



Evaluation circuit

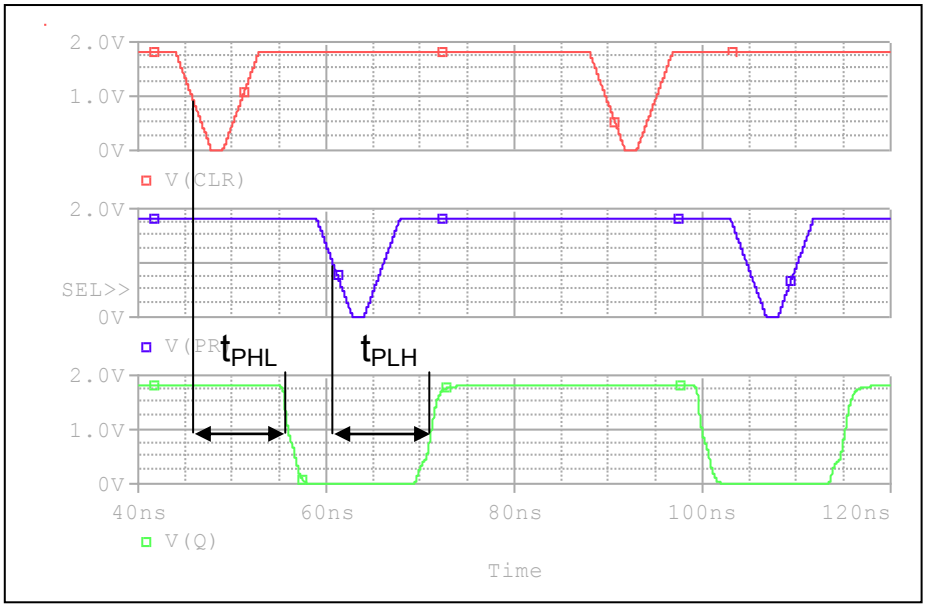


Comparison table C_L = 50 pF, R_L = 500 Ω

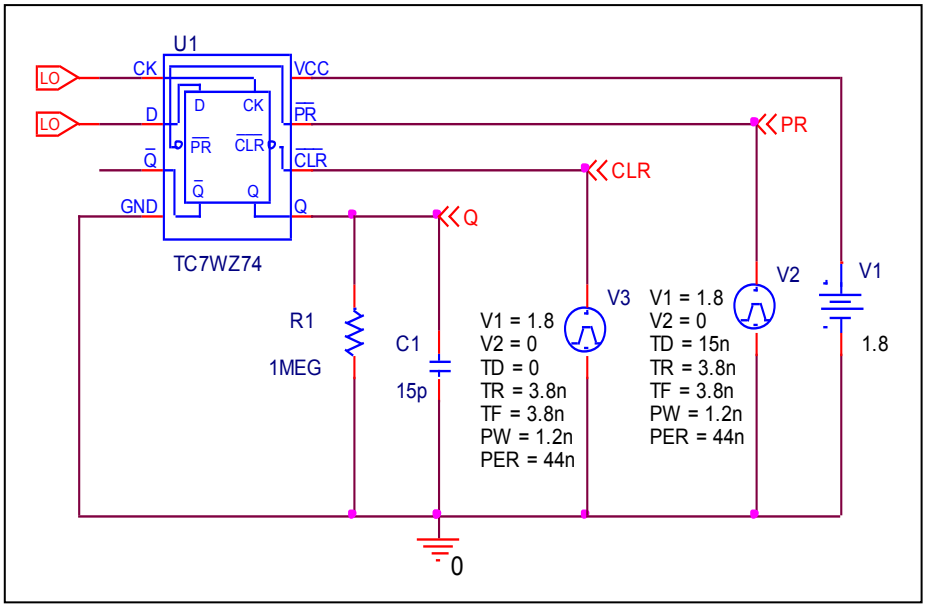
$t_r = t_f$ =3 ns	Measurement	Simulation	%Error
t_{PLH} (ns)	2.8	2.8216	0.771
t_{PHL} (ns)	2.8	2.8606	2.164

Propagation Delay Time (V_{CC} = 1.8 V, $\overline{CLR}$, $\overline{PR}$ -Q)

Circuit simulation result



Evaluation circuit

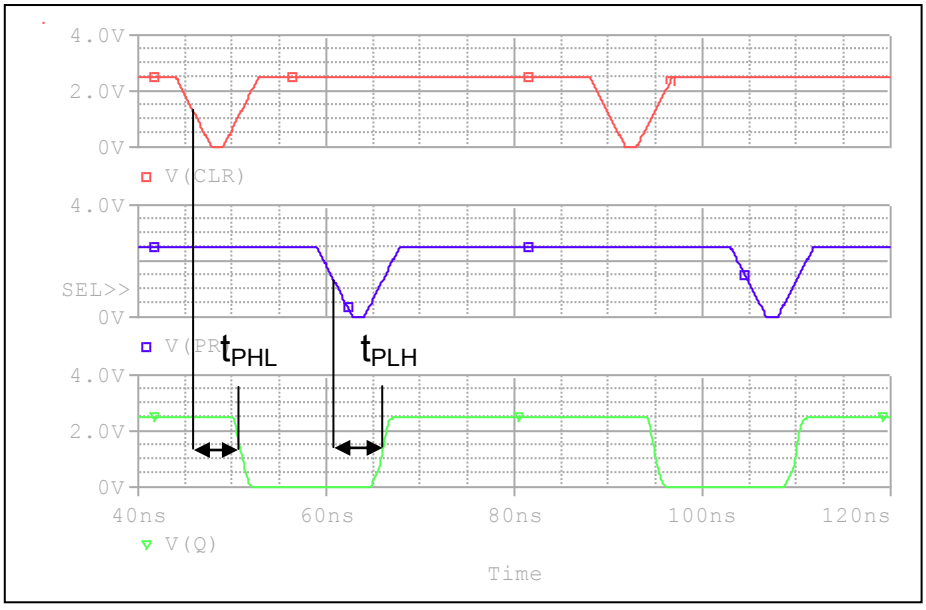


Comparison table C_L = 15 pF, R_L = 1 MEGΩ

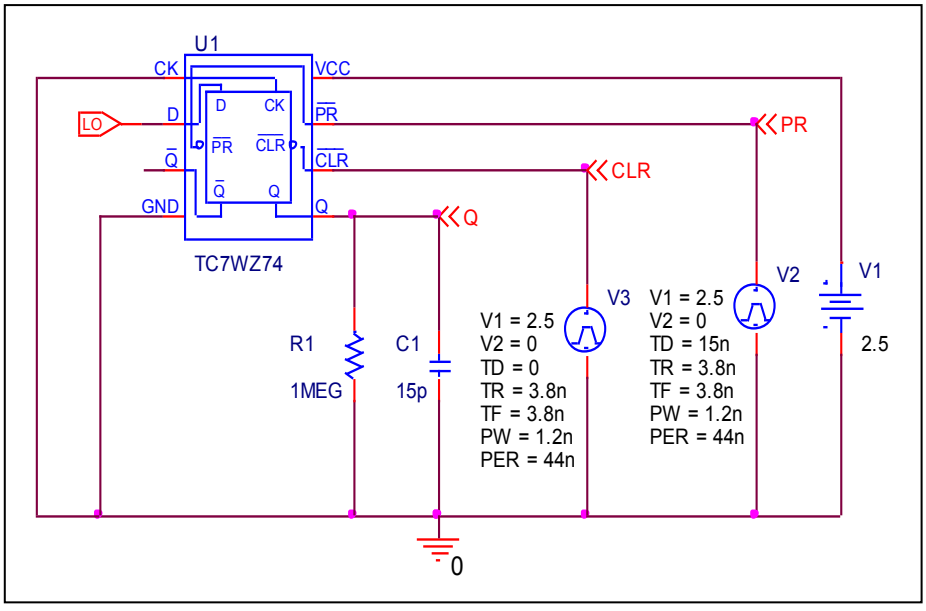
$t_r = t_f$ =3 ns	Measurement	Simulation	%Error
t_{PLH} (ns)	10	10.194	1.940
t_{PHL} (ns)	10	10.144	1.440

Propagation Delay Time (V_{CC} = 2.5 V, $\overline{CLR}$, $\overline{PR}$ -Q)

Circuit simulation result



Evaluation circuit

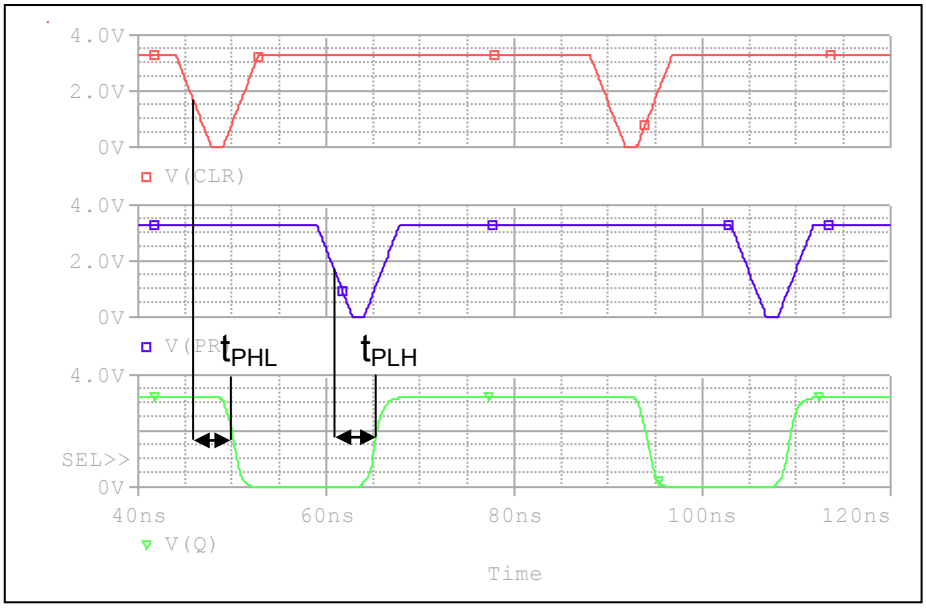


Comparison table C_L = 15 pF, R_L = 1 MEGΩ

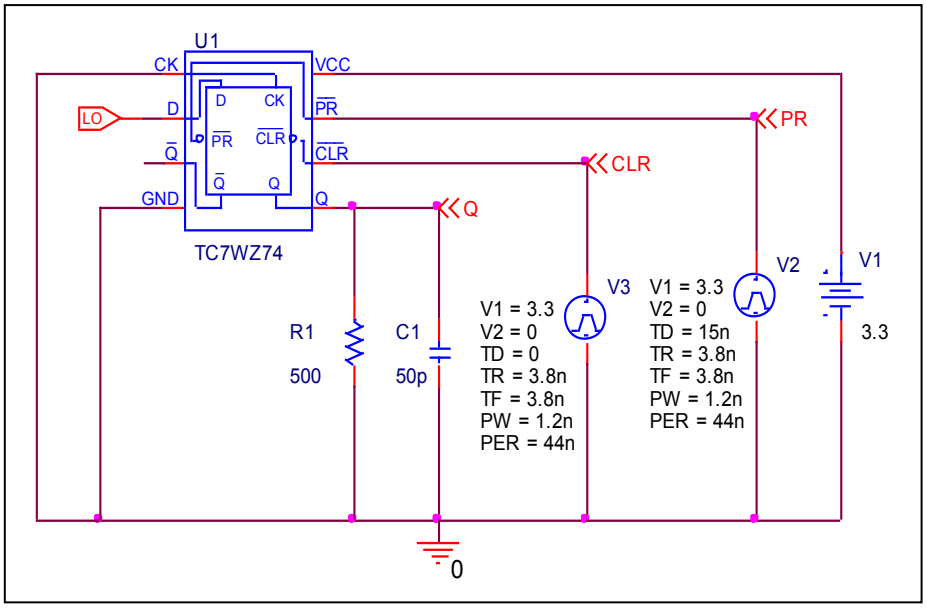
$t_r = t_f$ =3 ns	Measurement	Simulation	%Error
t_{PLH} (ns)	5	5.0575	1.150
t_{PHL} (ns)	5	5.03	0.600

Propagation Delay Time (V_{CC} = 3.3 V, $\overline{CLR}$, $\overline{PR}$ -Q)

Circuit simulation result



Evaluation circuit

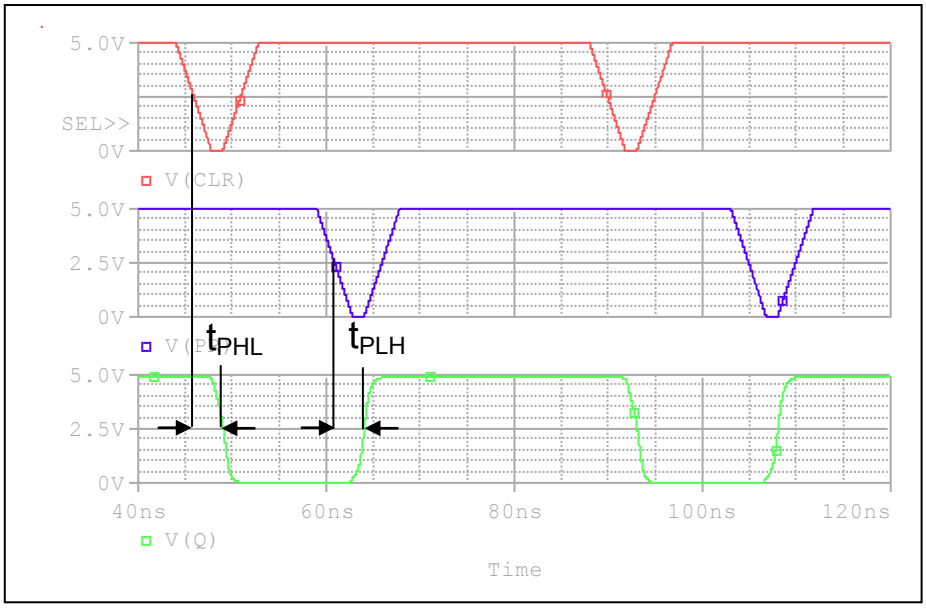


Comparison table C_L = 50 pF, R_L = 500 Ω

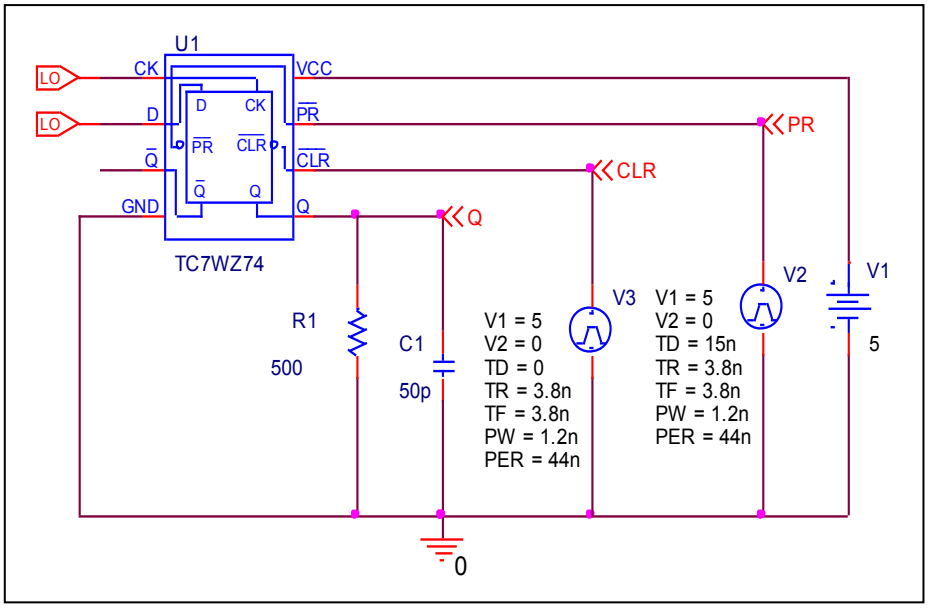
$t_r = t_f$ =3 ns	Measurement	Simulation	%Error
t_{PLH} (ns)	4.3	4.3112	0.260
t_{PHL} (ns)	4.3	4.2971	-0.067

Propagation Delay Time (V_{CC} = 5 V, $\overline{CLR}$, $\overline{PR}$ -Q)

Circuit simulation result



Evaluation circuit

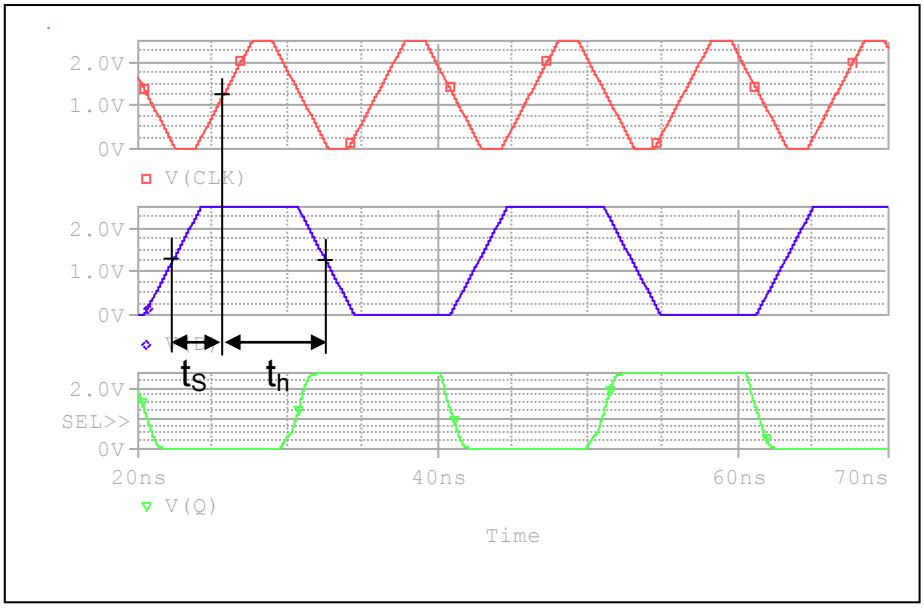


Comparison table C_L = 50 pF, R_L = 500 Ω

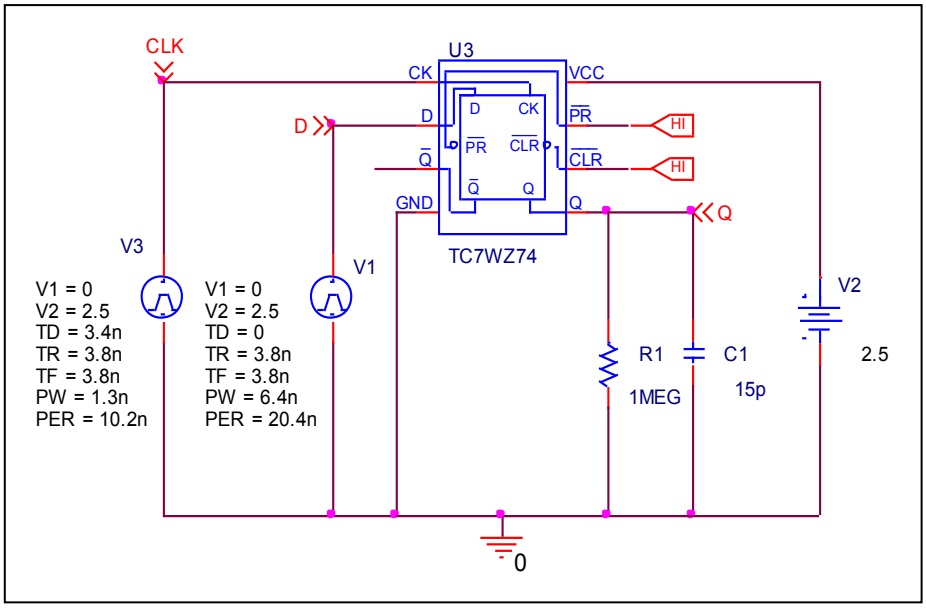
$t_r = t_f$ =3 ns	Measurement	Simulation	%Error
t_{PLH} (ns)	3.1	3.1267	0.861
t_{PHL} (ns)	3.1	3.1617	1.990

Minimum Setup Time and Minimum Hold time (t_s, t_h, V_{CC} = 2.5 V)

Circuit simulation result



Evaluation circuit

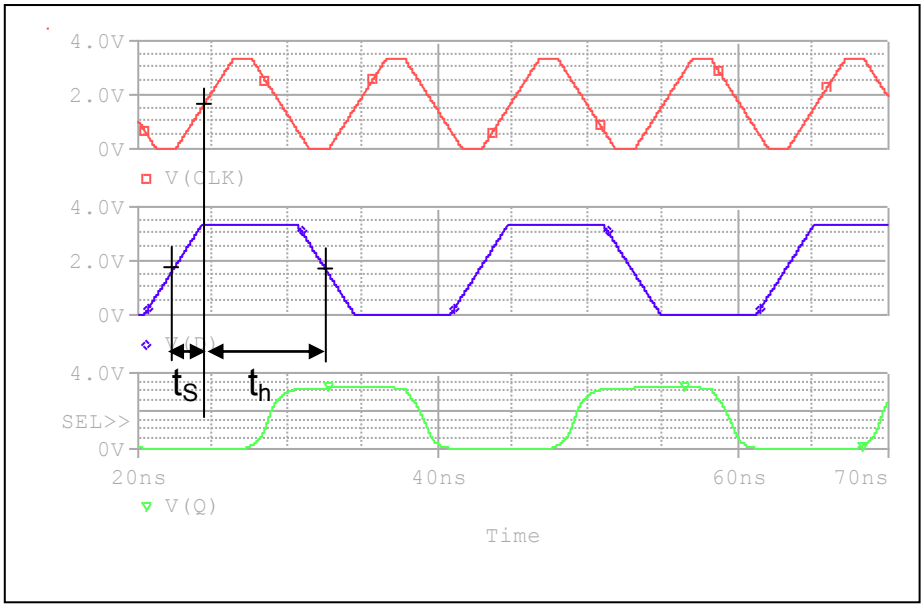


Comparison table C_L = 50 pF, R_L = 500 Ω

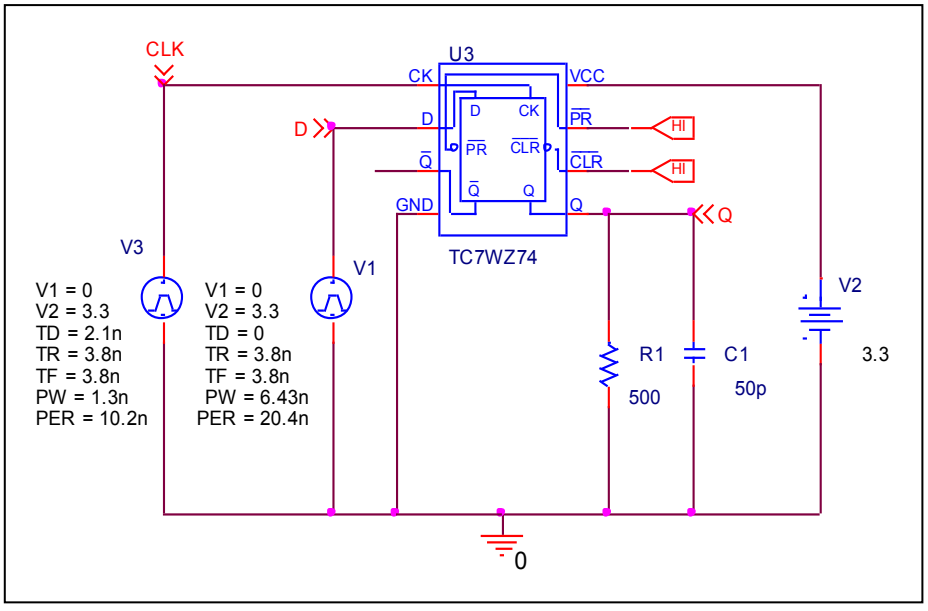
$t_r = t_f$ =3 ns	Measurement	Simulation	Output
t_S (ns)	Min 3.4	3.4	**Active**
t_h (ns)	Min 2.4	6.7998	**Active**

Minimum Setup Time and Minimum Hold time (t_s, t_h, V_{CC} = 3.3 V)

Circuit simulation result



Evaluation circuit

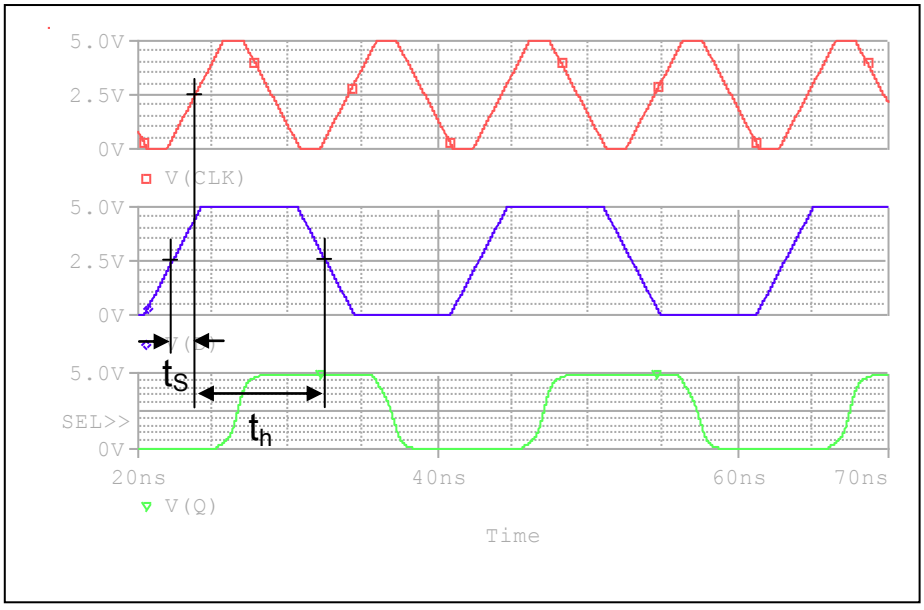


Comparison table C_L = 50 pF, R_L = 500 Ω

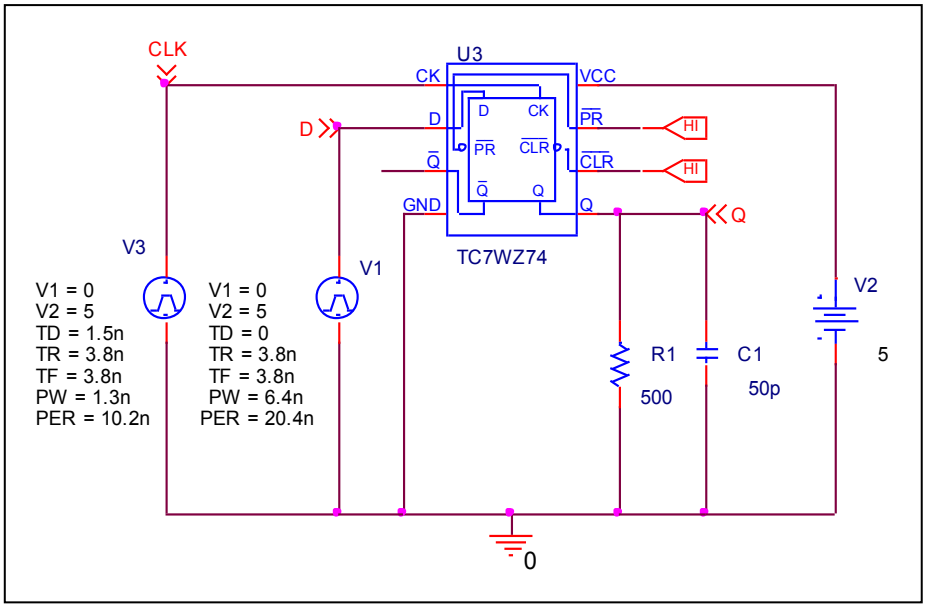
$t_r = t_f$ =3 ns	Measurement	Simulation	Output
t_S (ns)	Min 2.1	2.1	**Active**
t_h (ns)	Min 1.4	8.1302	**Active**

Minimum Setup Time and Minimum Hold time (t_s, t_h, V_{CC} = 5 V)

Circuit simulation result



Evaluation circuit



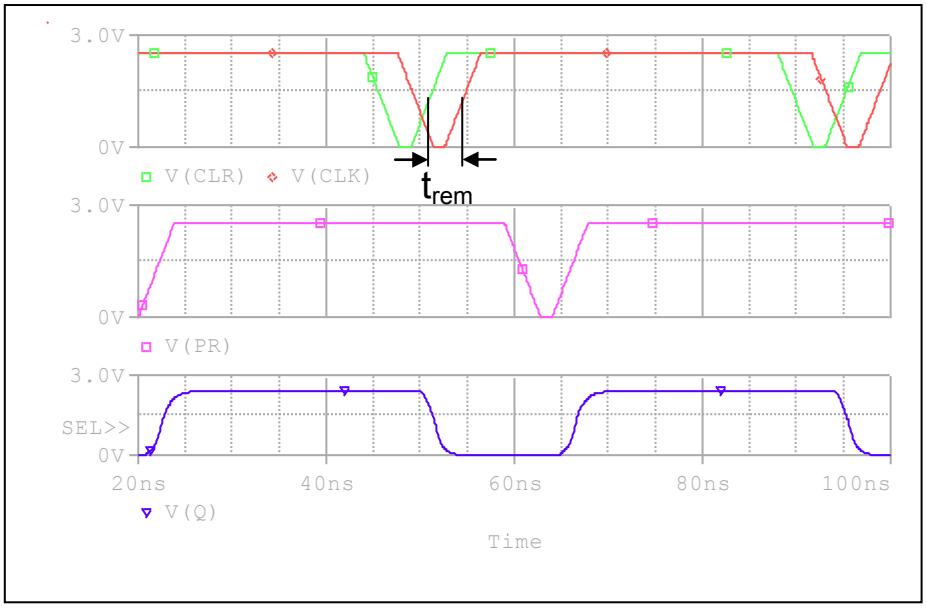
Comparison table

C_L = 50 pF, R_L = 500 Ω

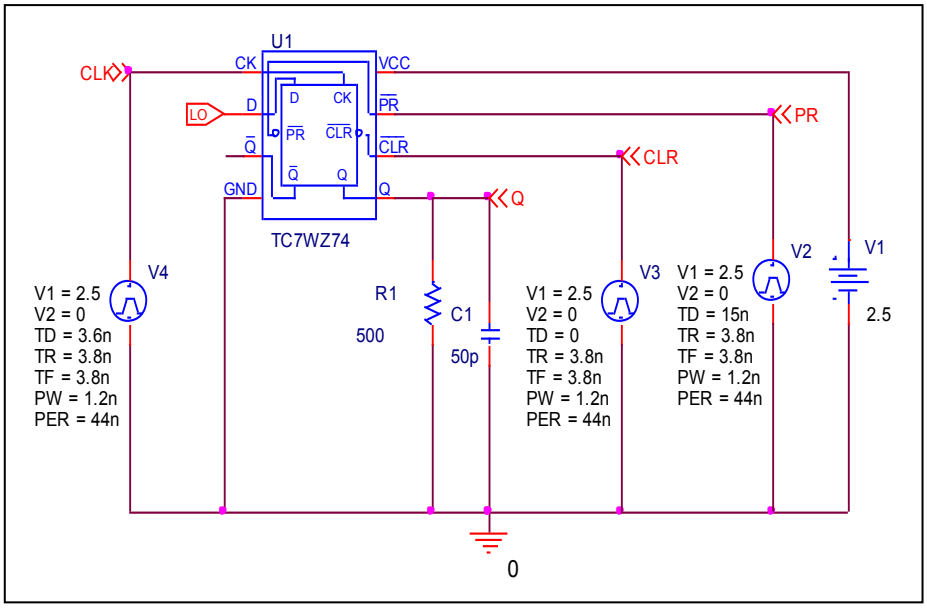
$t_r = t_f$ =3 ns	Measurement	Simulation	Output
t_S (ns)	Min 1.5	1.5	**Active**
t_h (ns)	Min 1.0	8.7	**Active**

Minimum Removal time (t_{rem}, V_{CC} = 2.5 V)

Circuit simulation result



Evaluation circuit

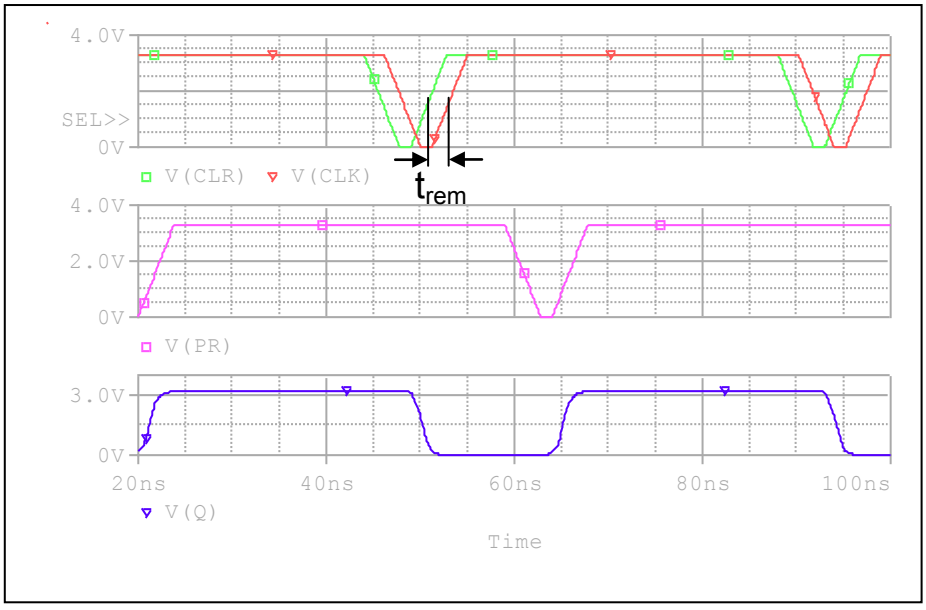


Comparison table C_L = 50 pF, R_L = 500 Ω

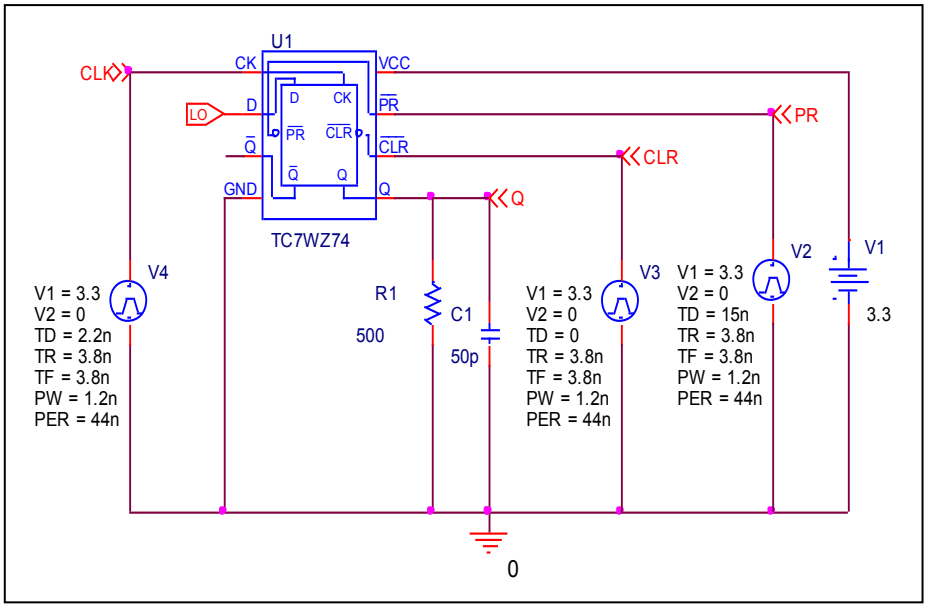
$t_r = t_f$ =3 ns	Measurement	Simulation	Output
t_{rem} (ns)	Min 3.6	3.6	**Active**

Minimum Removal time (t_{rem}, V_{CC} = 3.3 V)

Circuit simulation result



Evaluation circuit

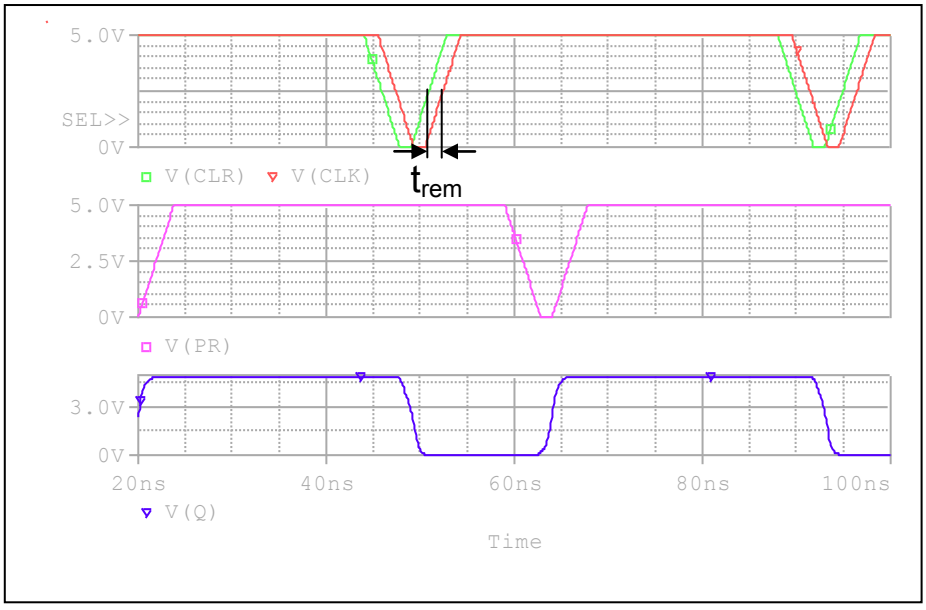


Comparison table C_L = 50 pF, R_L = 500 Ω

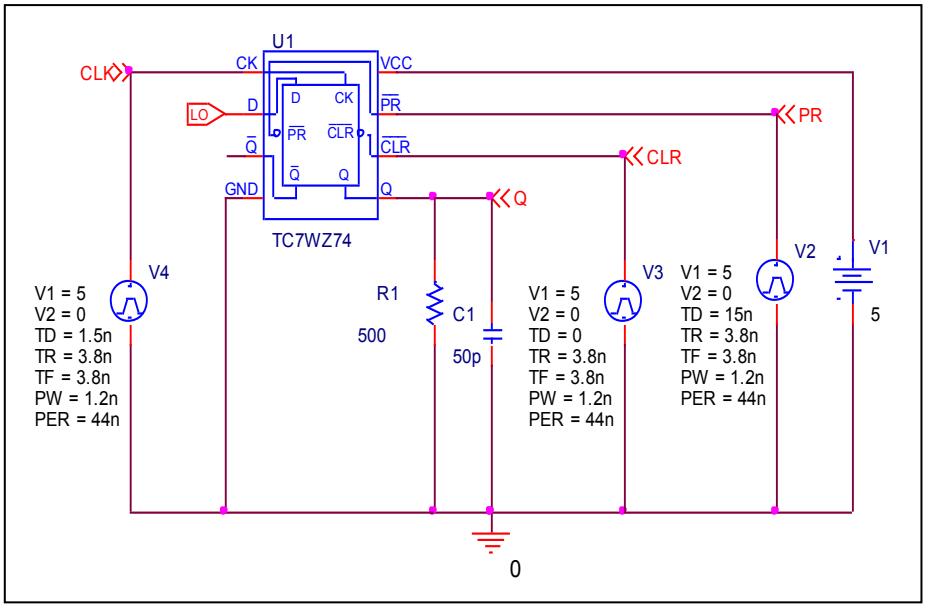
$t_r = t_f$ =3 ns	Measurement	Simulation	Output
t_{rem} (ns)	Min 2.2	2.2	**Active**

Minimum Removal time (t_{rem}, V_{CC} = 5 V)

Circuit simulation result



Evaluation circuit



Comparison table **C_L = 50 pF, R_L = 500 Ω**

$t_r = t_f$ =3 ns	Measurement	Simulation	Output
t_{rem} (ns)	Min 1.3	1.5	**Active**