

Device Modeling Report

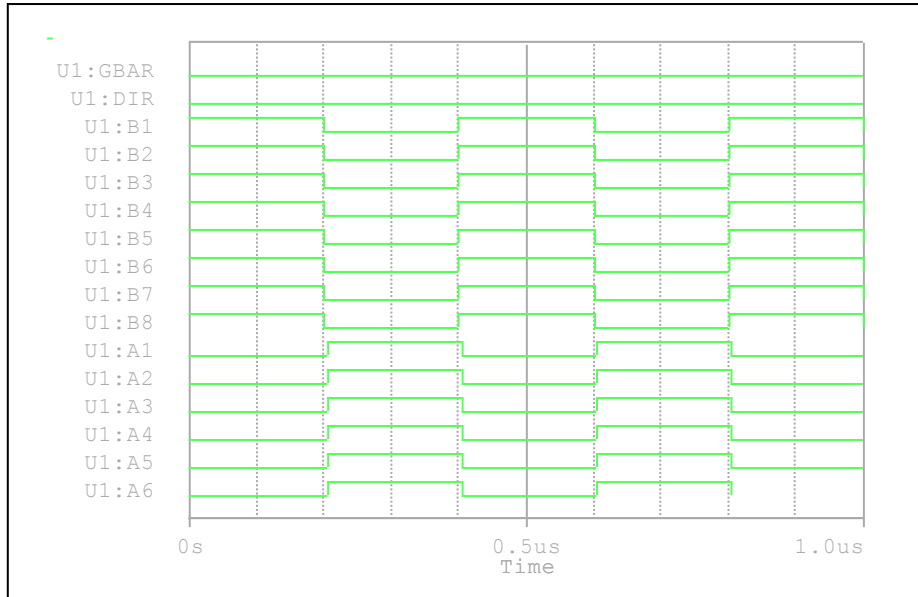
COMPONENTS : CMOS DIGITAL INTEGRATED CIRCUIT
PART NUMBER : TC74ACT640FW
MANUFACTURER : TOSHIBA



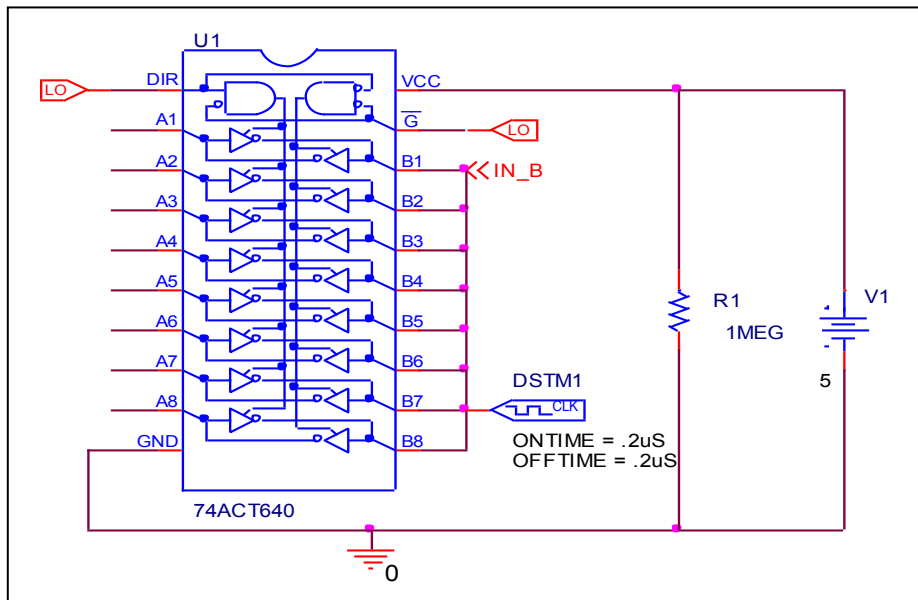
Bee Technologies Inc.

Truth Table

Circuit simulation result



Evaluation circuit



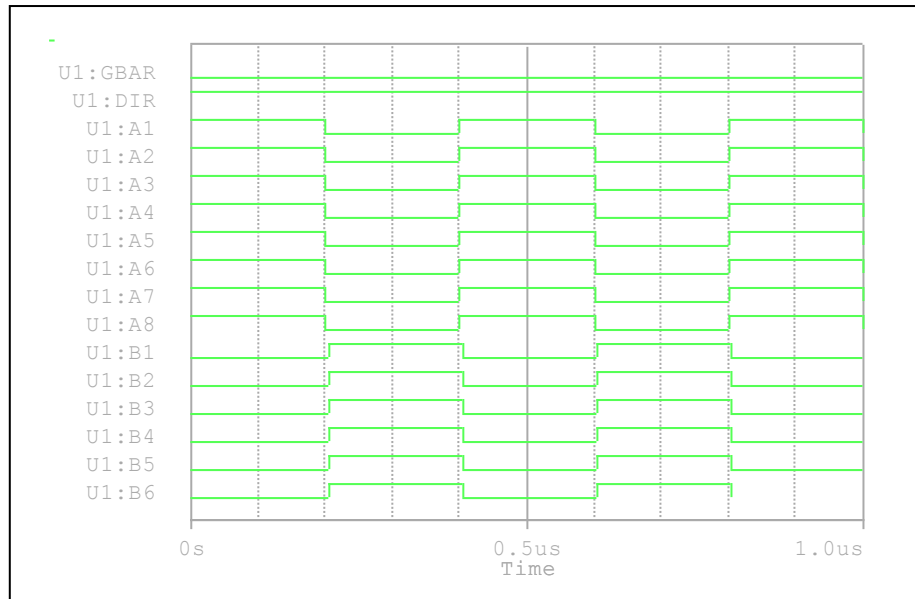
Comparison table

Function : A BUS = OUTPUT, B BUS = INPUT

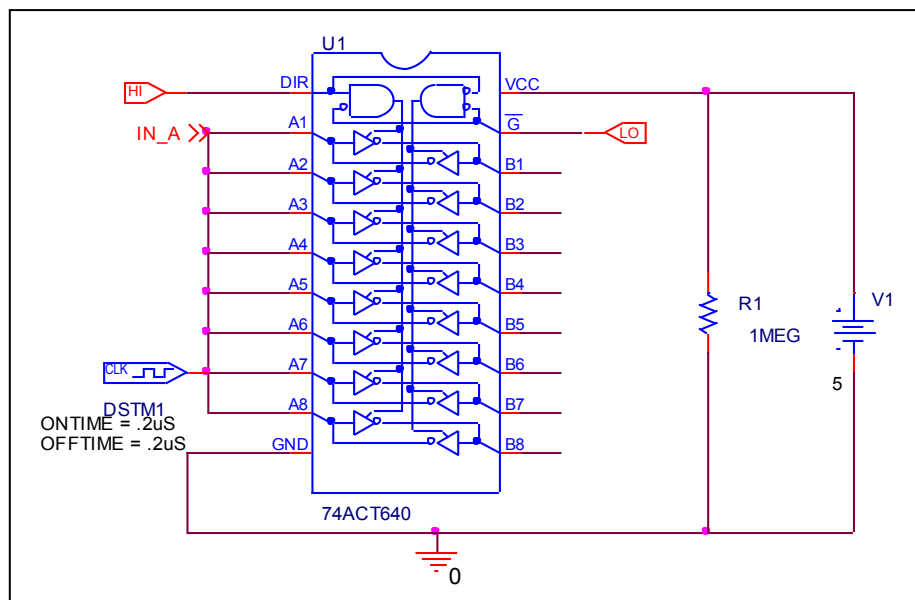
Input		Output		%Error
$\overline{G}$	DIR	Measurement	Simulation	
L	L	$A = \overline{B}$	$A = \overline{B}$	0

Truth Table

Circuit simulation result



Evaluation circuit



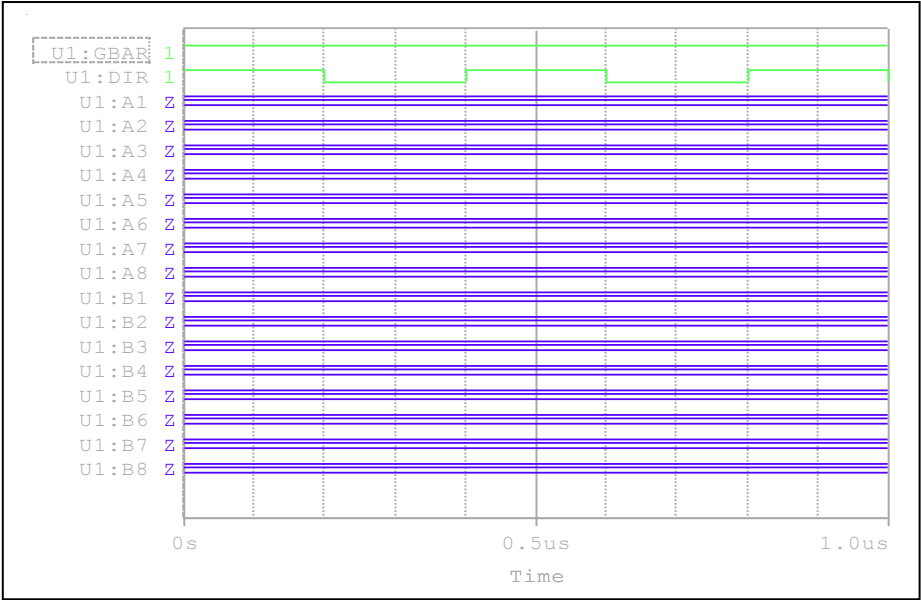
Comparison table

Function : A BUS = INPUT, B BUS = OUTPUT

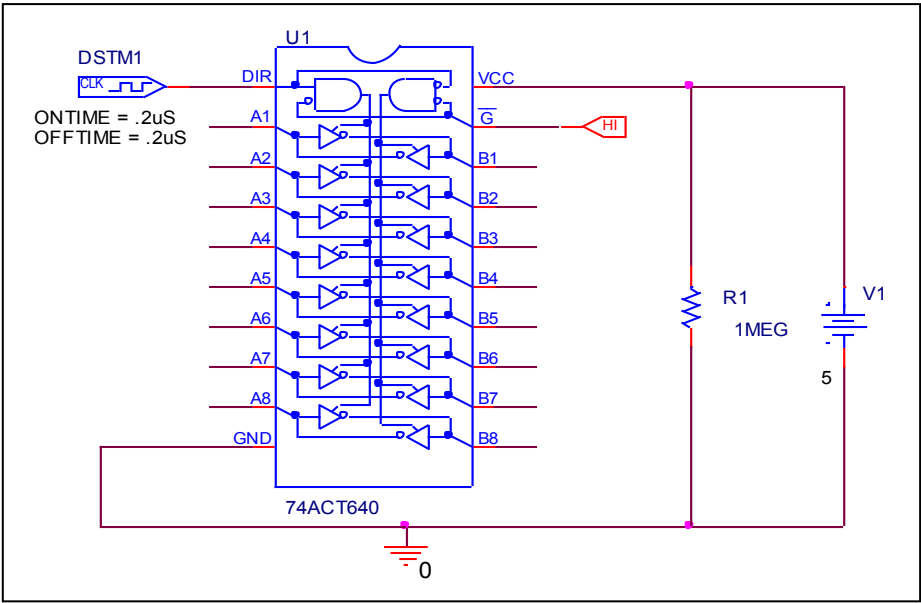
Input		Output		%Error
$\overline{G}$	DIR	Measurement	Simulation	
L	H	$B = \overline{A}$	$B = \overline{A}$	0

Truth Table

Circuit simulation result



Evaluation circuit



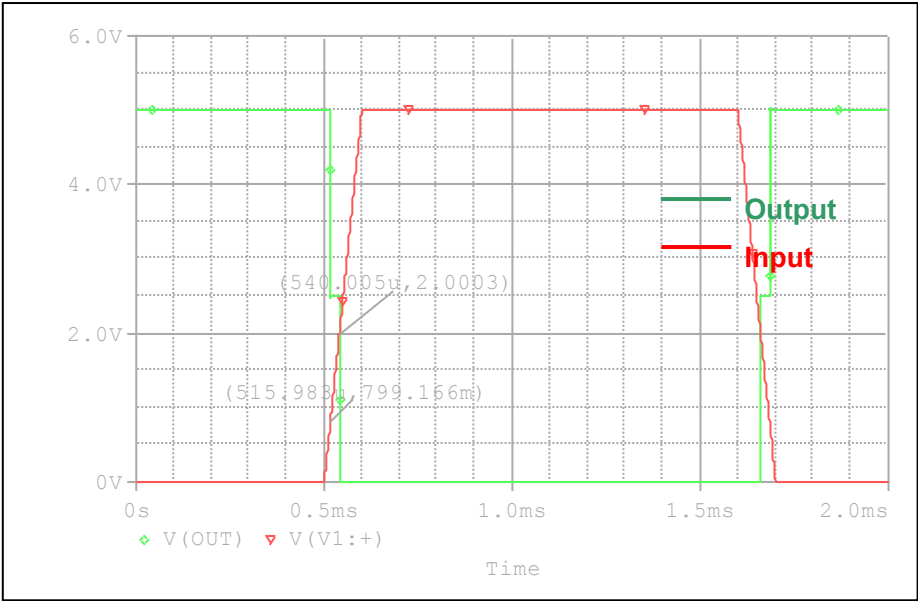
Comparison table

Function : A BUS and B BUS = HIGH IMPEDANCE

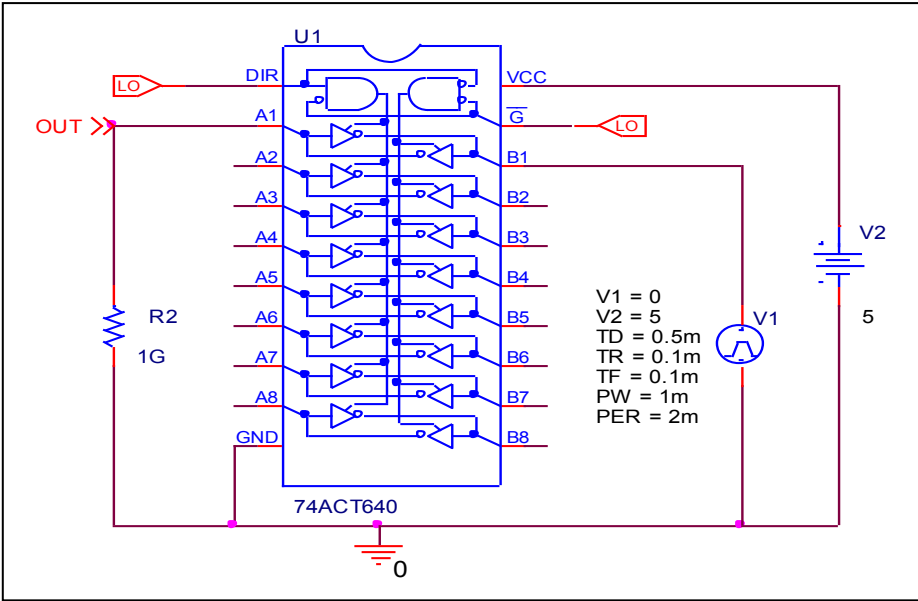
Input		Output		%Error
$\overline{G}$	DIR	Measurement	Simulation	
H	X	Z	Z	0

High Level and Low Level Input Voltage

Circuit simulation result



Evaluation circuit

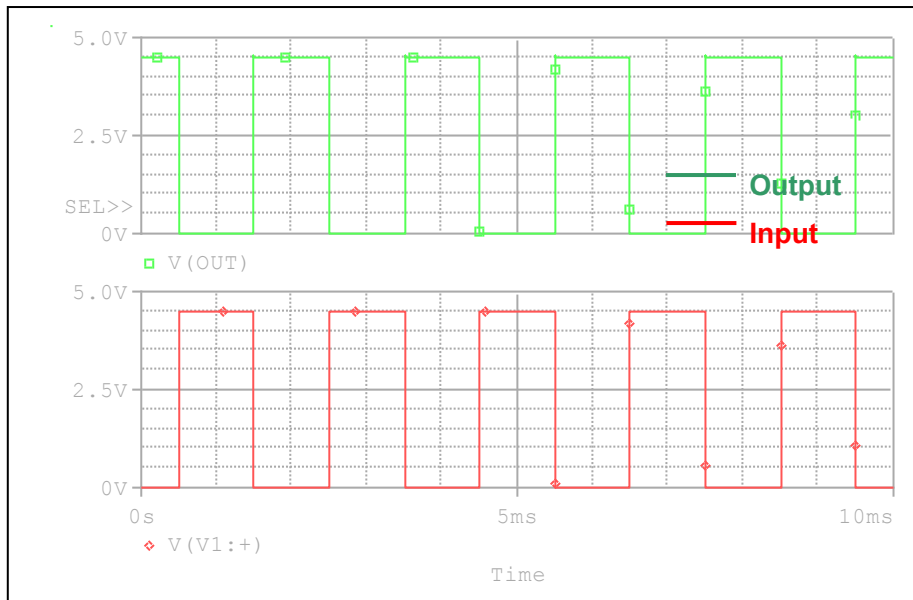


Comparison table

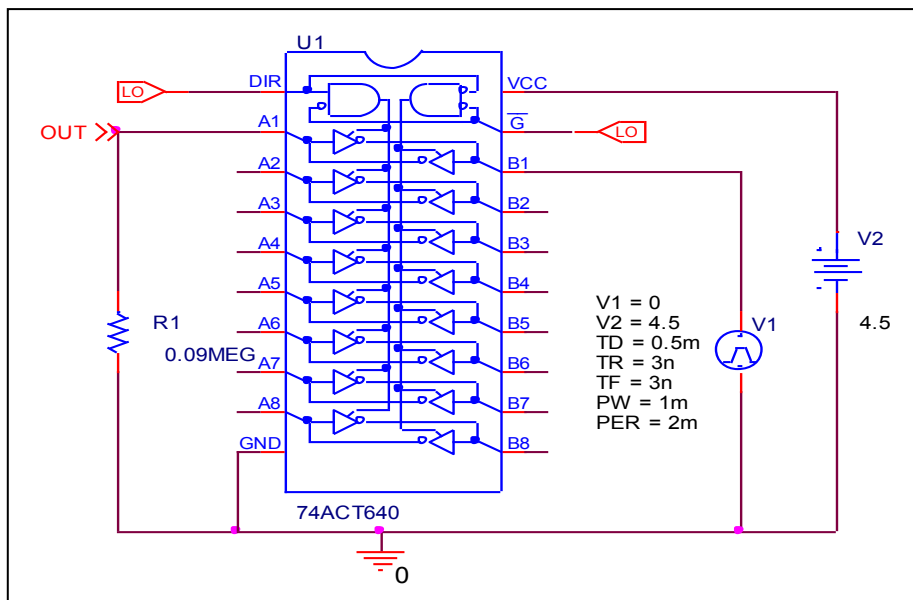
V _{CC} = 5V	Measurement	Simulation	%Error
V _{IH} (V)	2	2.0003	0.015
V _{IL} (V)	0.8	0.799166	-0.104

High Level and Low Level Output Voltage

Circuit simulation result



Evaluation circuit

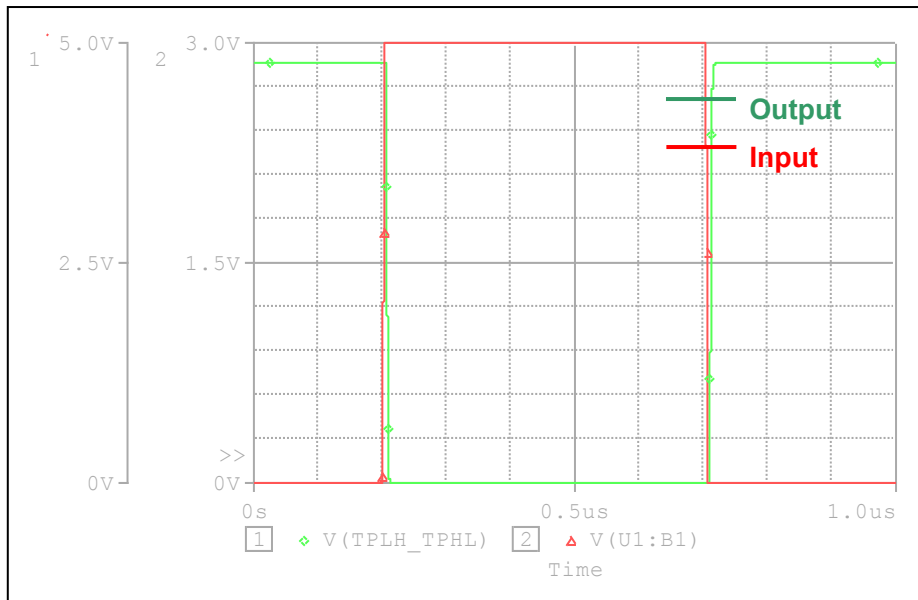


Comparison table

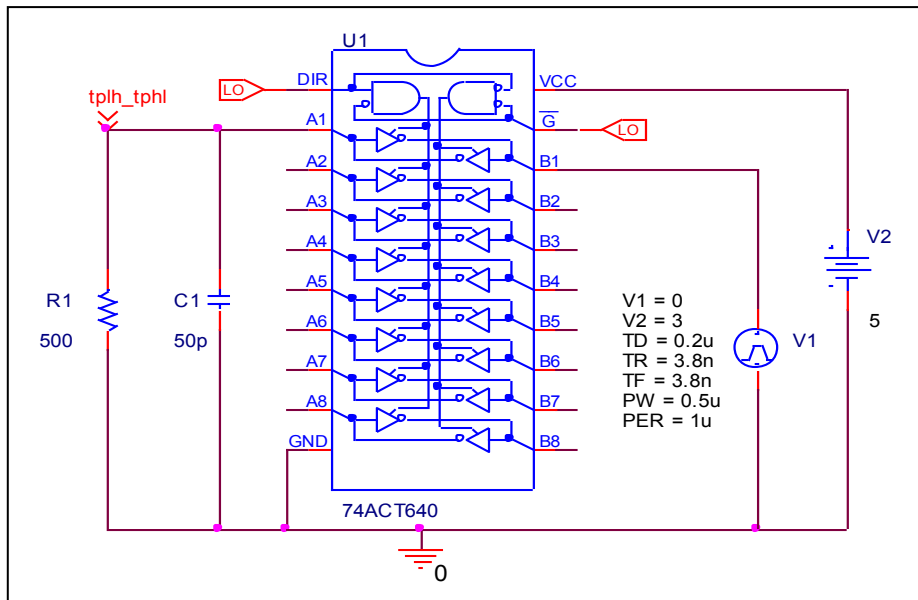
$V_{CC} = 4.5V$	Measurement	Simulation	%Error
$V_{OH} (V)$	4.5	4.4987	-0.029
$V_{OL} (V)$	0	0	0

Propagation Delay Time

Circuit simulation result



Evaluation circuit

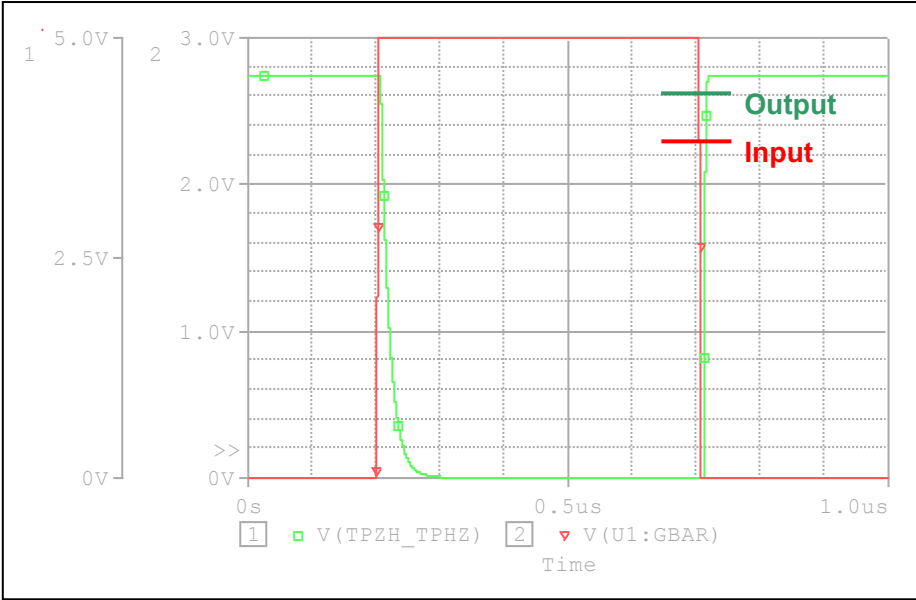


Comparison table $C_L = 50 \text{ pF}$, $R_L = 500 \Omega$

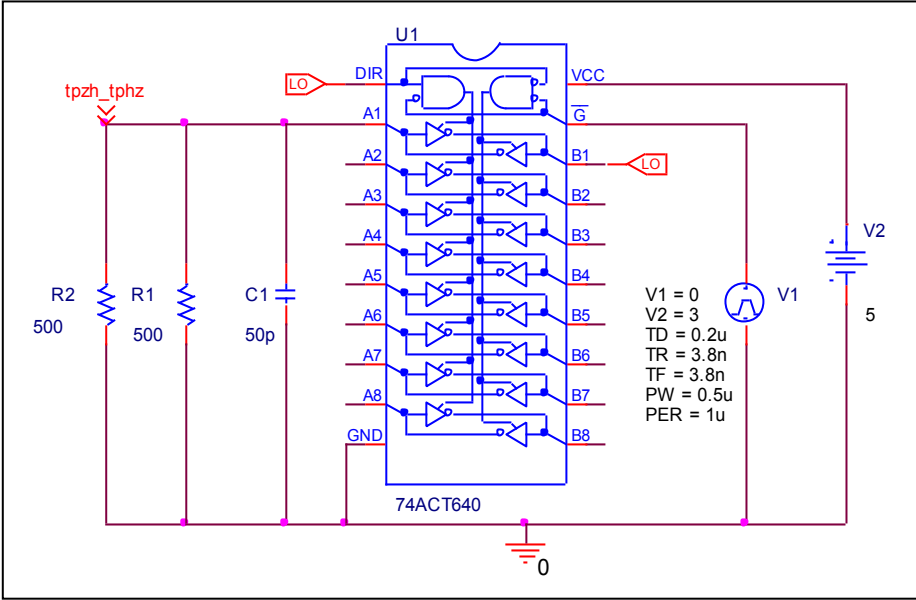
$t_r = t_f = 3 \text{ ns}$	Measurement	Simulation	%Error
$t_{PLH} \text{ (ns)}$	5.7	5.7112	0.196
$t_{PHL} \text{ (ns)}$	5.7	5.7158	0.277

Output enable time, high impedance (off) to high output (t_{PZH})
Output disable time, high to high impedance (off) output (t_{PHZ})

Circuit simulation result



Evaluation circuit

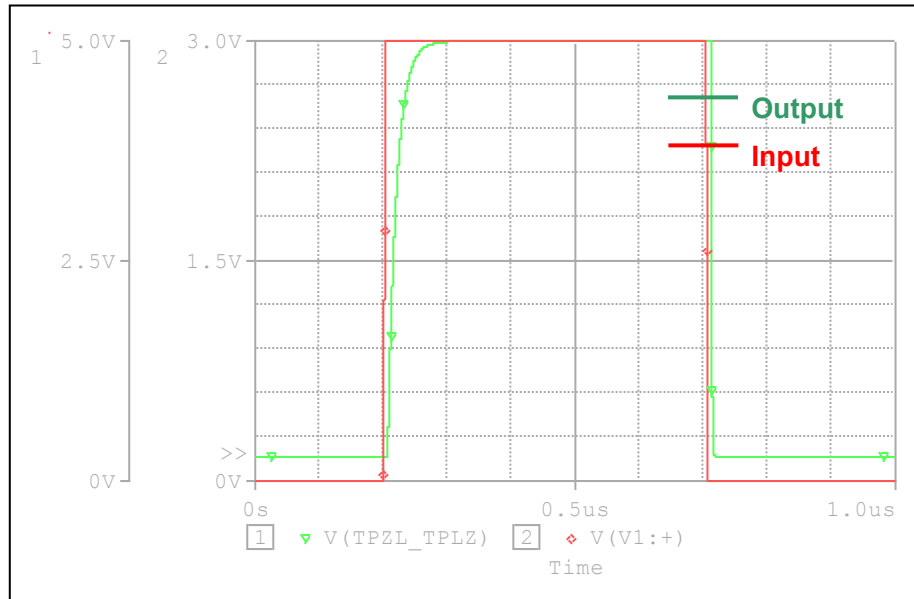


Comparison table $C_L = 50 \text{ pF}$, $R_L = 500 \Omega$

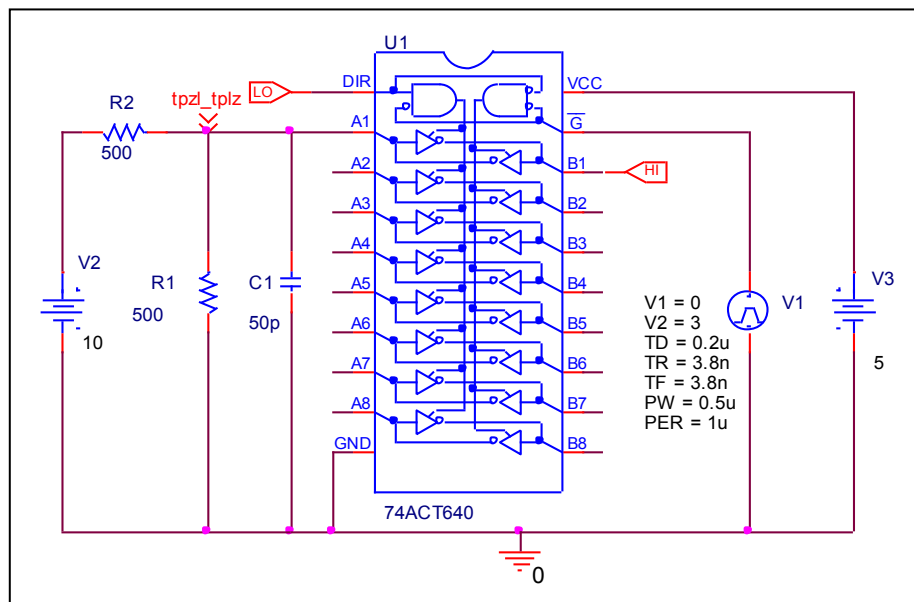
$t_r = t_f = 3 \text{ ns}$	Measurement	Simulation	%Error
$t_{PZH} \text{ (ns)}$	7.3	7.3756	1.036
$t_{PHZ} \text{ (ns)}$	6.3	6.3545	0.865

Output enable time, high impedance (off) to low output (t_{PZL})
Output disable time, low to high impedance (off) output (t_{PLZ})

Circuit simulation result



Evaluation circuit



Comparison table $C_L = 50 \text{ pF}$, $R_L = 500 \Omega$

$t_r = t_f = 3 \text{ ns}$	Measurement	Simulation	%Error
$t_{PZL} \text{ (ns)}$	7.3	7.3644	0.882
$t_{PLZ} \text{ (ns)}$	6.3	6.3547	0.868