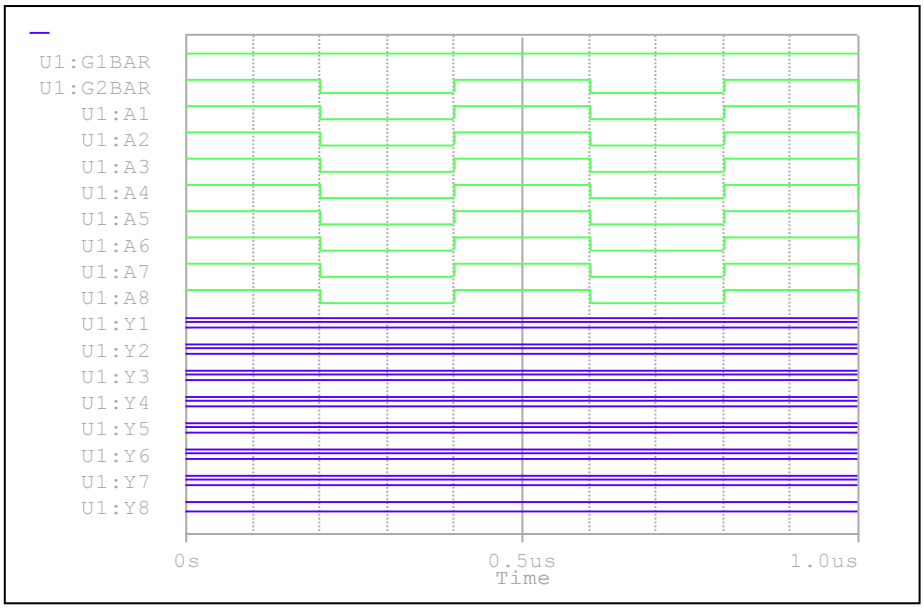
# Device Modeling Report

COMPONENTS : CMOS DIGITAL INTEGRATED CIRCUIT
PART NUMBER : TC74ACT540FW
MANUFACTURER : TOSHIBA

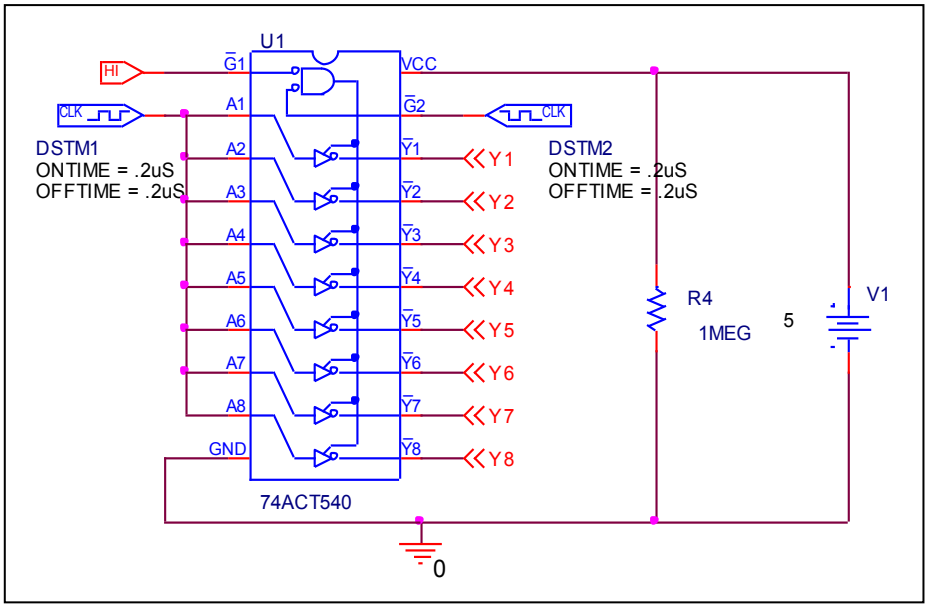

**Bee Technologies Inc.**

## Truth Table

Circuit simulation result




Evaluation circuit

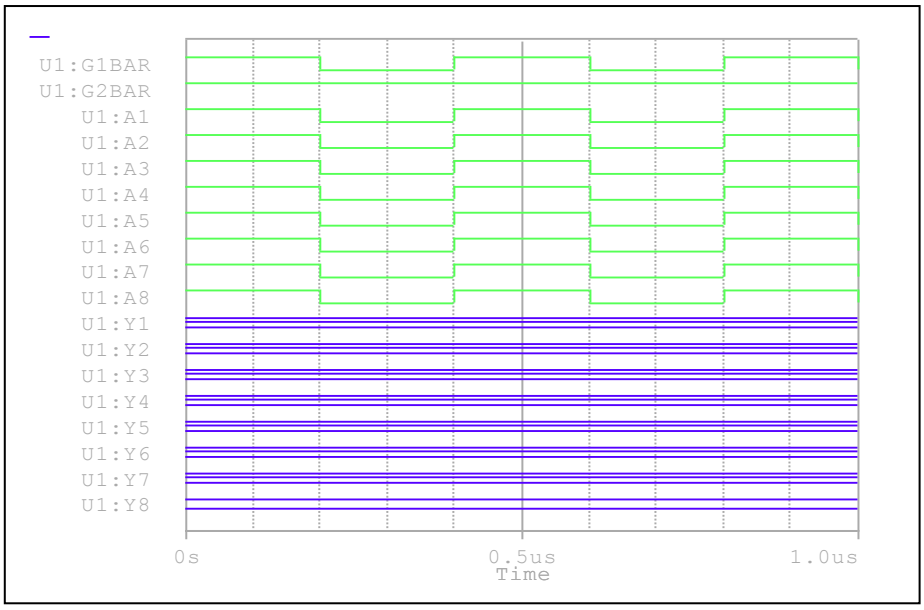



Comparison table

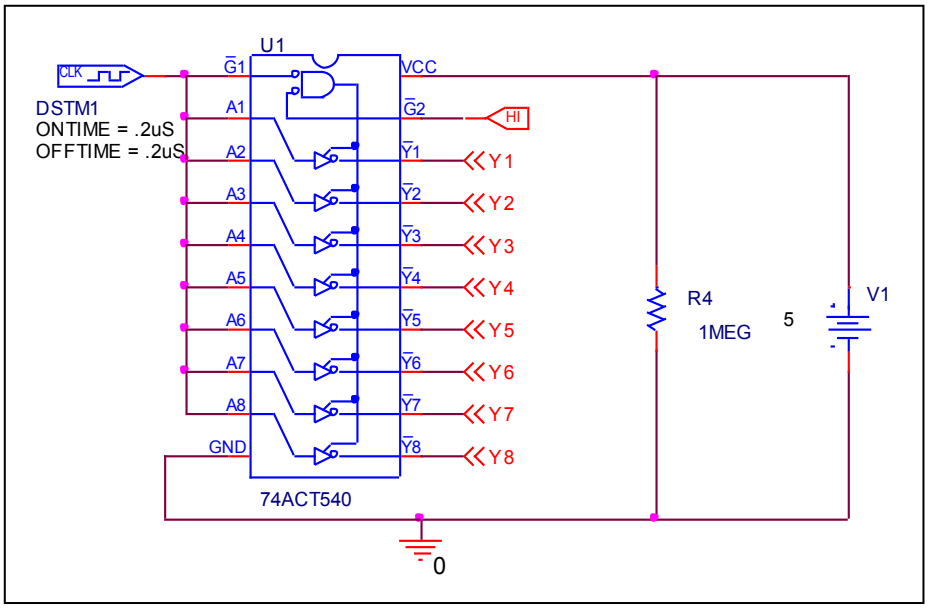
| Input | | | Output | | %Error |
|---|---|---|---|---|---|
| $\overline{G1}$ | $\overline{G2}$ | An | $\overline{Y}n$ (Measurement) | $\overline{Y}n$ (Simulation) | |
| H | X | X | Z | Z | 0 |

## Truth Table

Circuit simulation result




Evaluation circuit

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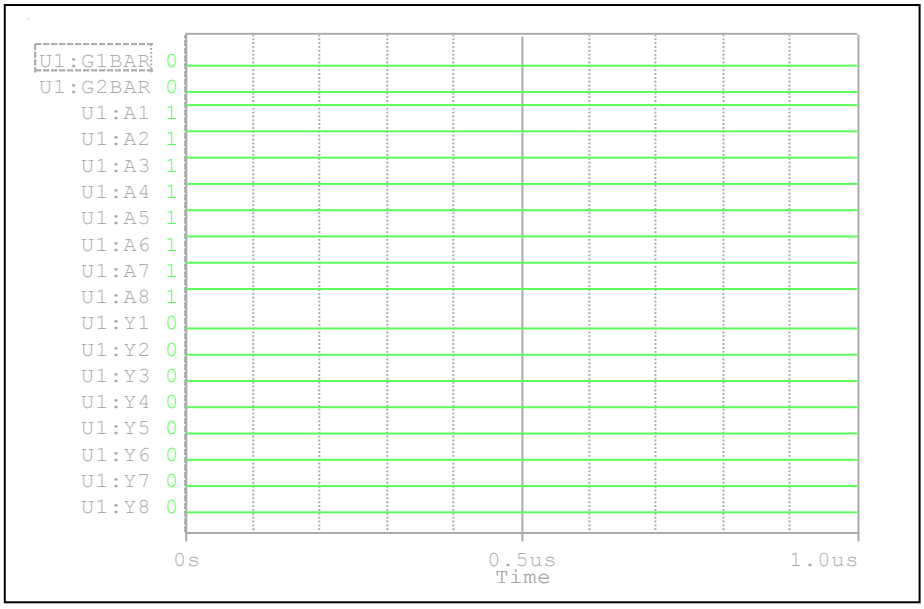
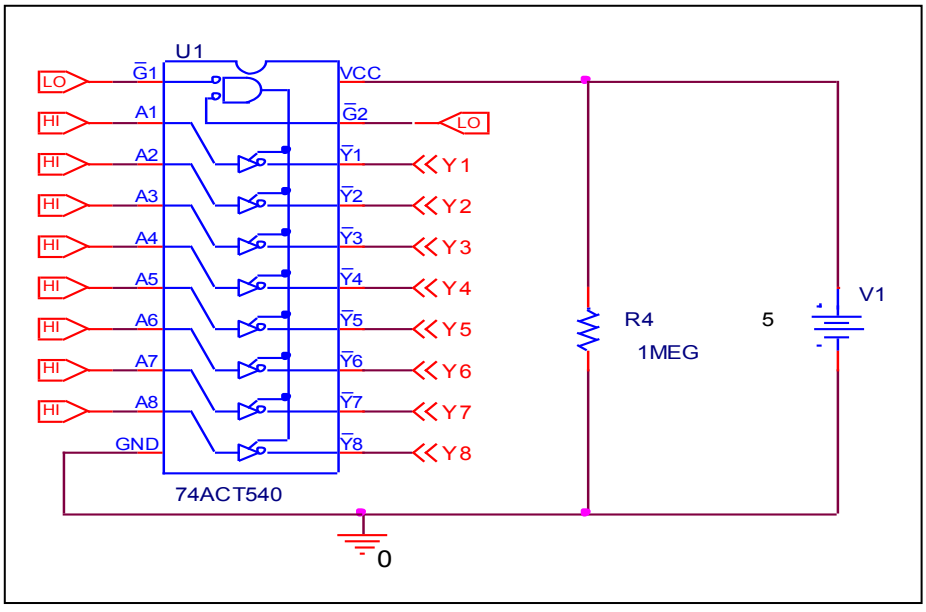
|---|---|---|---|---|---|
| $\overline{G1}$ | $\overline{G2}$ | An | $\overline{Yn}$ (Measurement) | $\overline{Yn}$ (Simulation) | |
| X | H | X | Z | Z | 0 |

## Truth Table

Circuit simulation result




Evaluation circuit

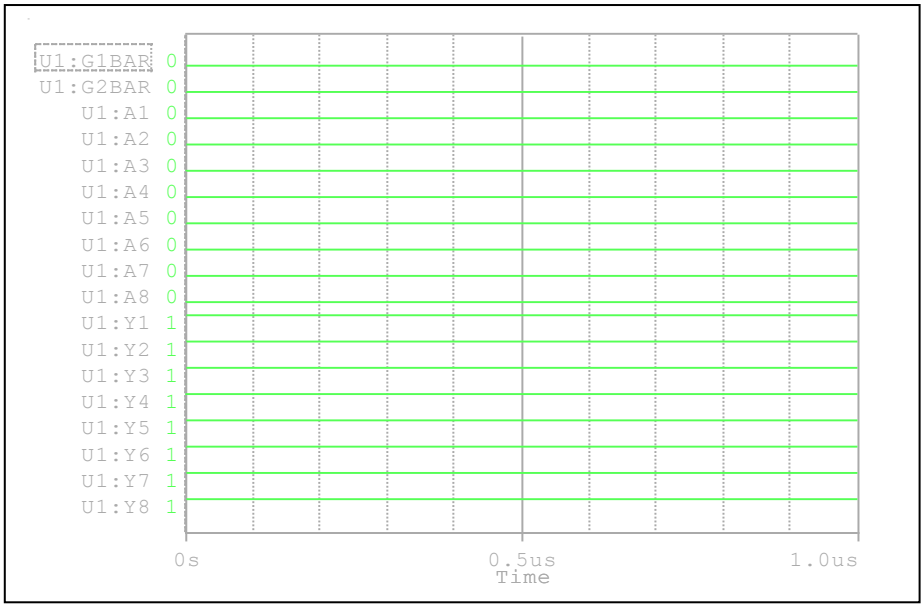



Comparison table

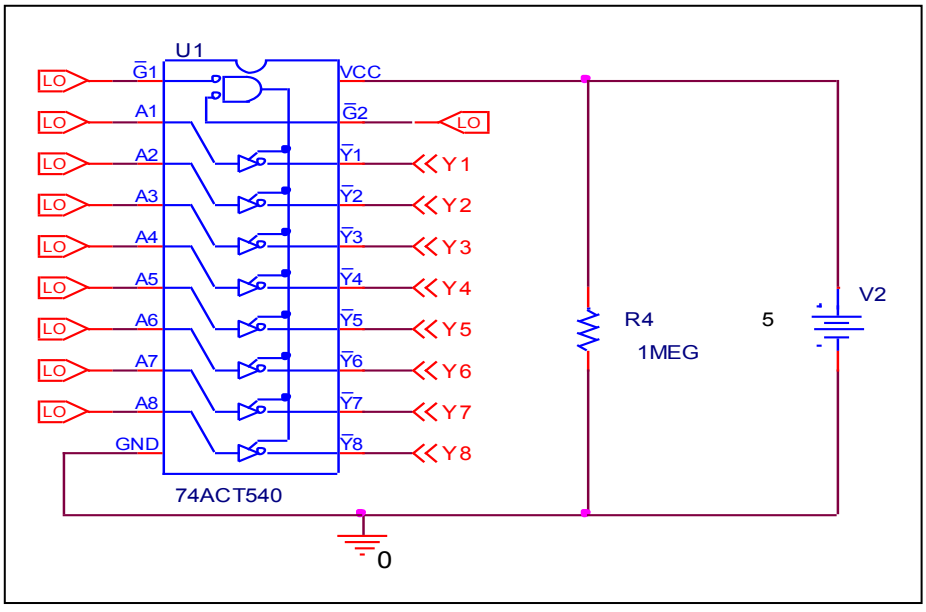
| Input | | | Output | | %Error |
|---|---|---|---|---|---|
| $\overline{G1}$ | $\overline{G2}$ | An | $\overline{Y}n$ (Measurement) | $\overline{Y}n$ (Simulation) | |
| L | L | H | L | L | 0 |

## Truth Table

Circuit simulation result




Evaluation circuit

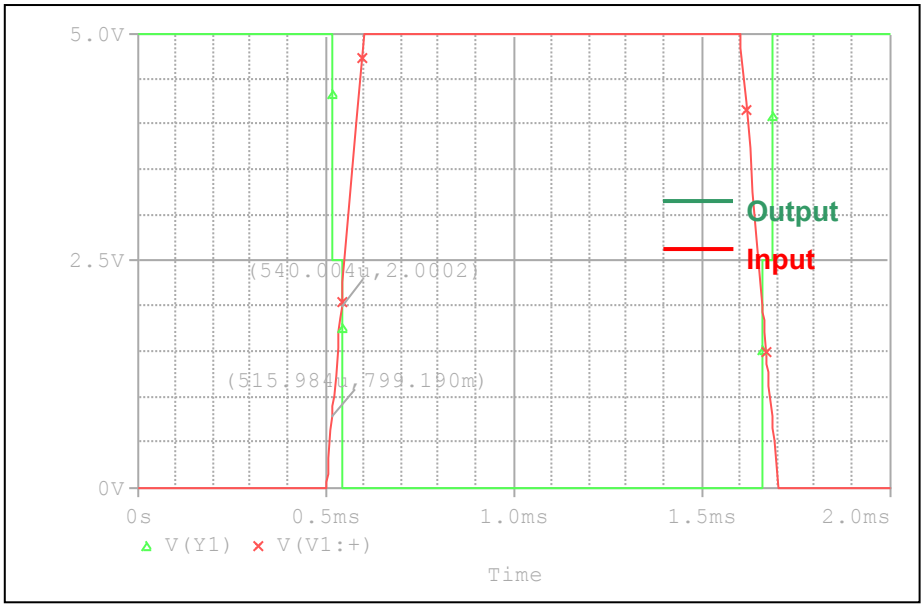



Comparison table

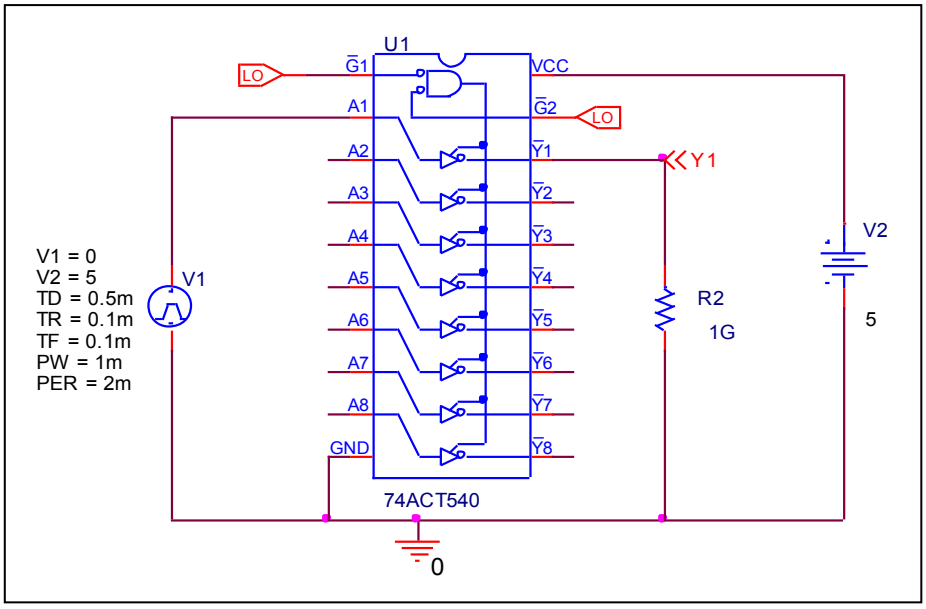
| Input | | | Output | | %Error |
|---|---|---|---|---|---|
| $\overline{G1}$ | $\overline{G2}$ | An | $\overline{Yn}$ (Measurement) | $\overline{Yn}$ (Simulation) | |
| L | L | L | H | H | 0 |

# High Level and Low Level Input Voltage

Circuit simulation result




Evaluation circuit

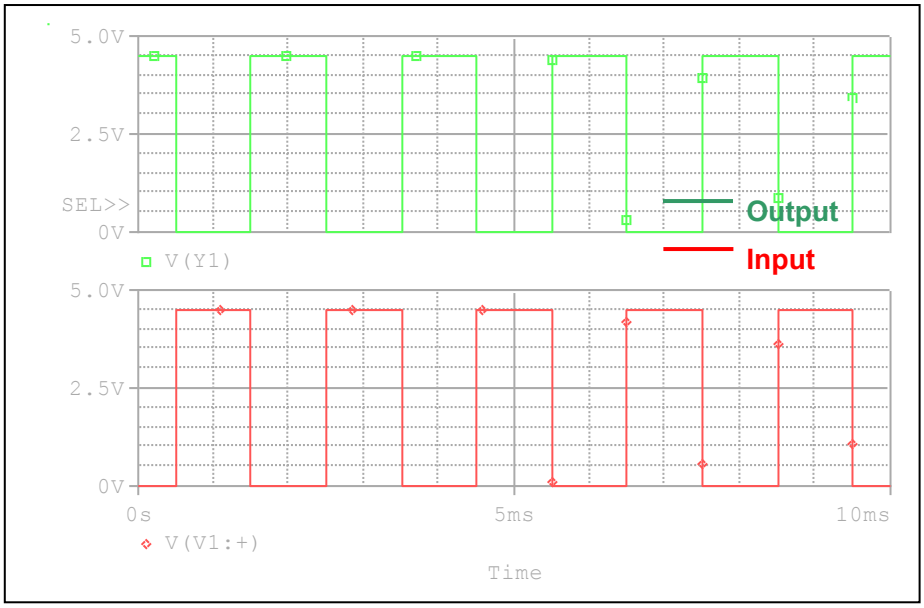



Comparison table

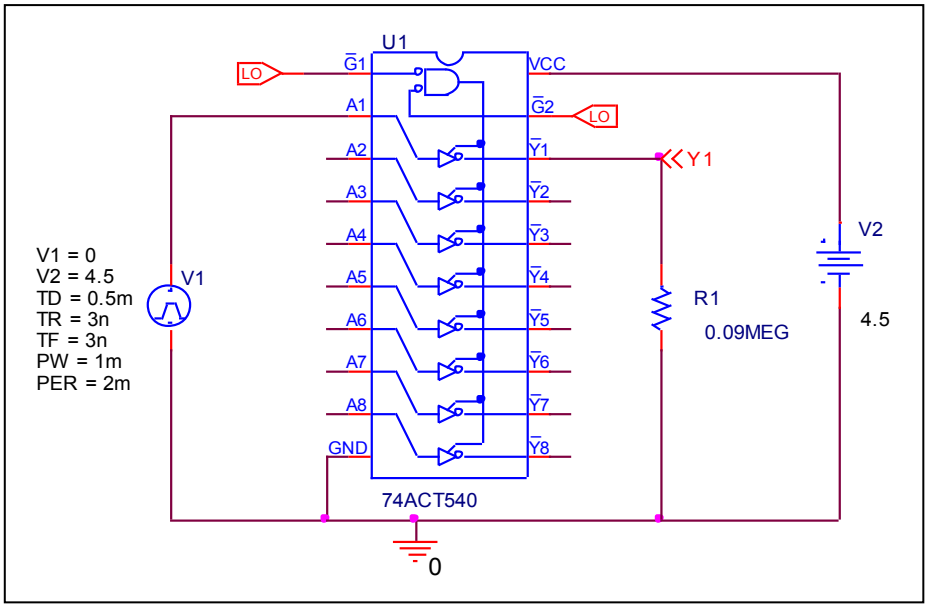
| $V_{CC}$ = 5V | Measurement | Simulation | %Error |
|---|---|---|---|
| $V_{IH}$ (V) | 2 | 2.0002 | 0.010 |
| $V_{IL}$ (V) | 0.8 | 0.79919 | -0.101 |

# High Level and Low Level Output Voltage

## Circuit simulation result




## Evaluation circuit

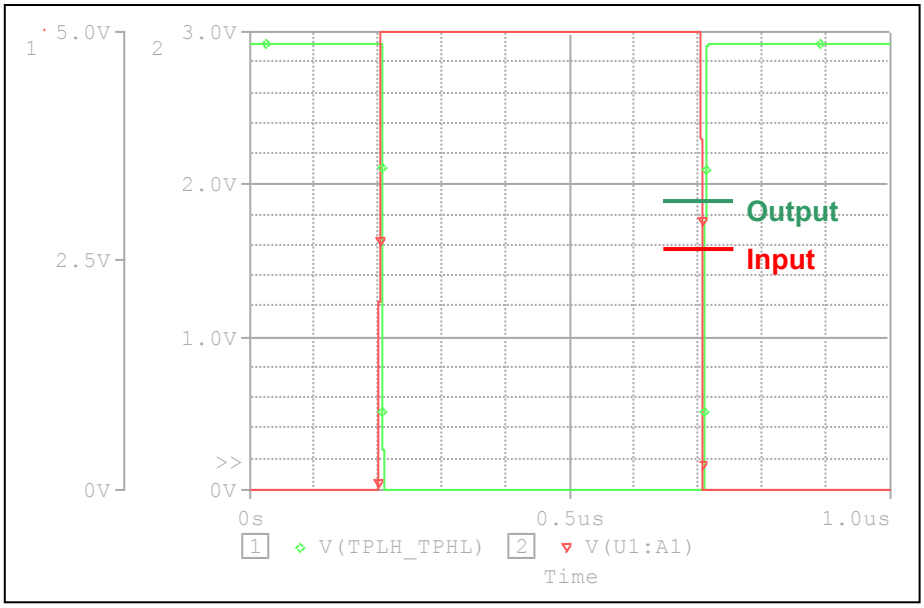



## Comparison table

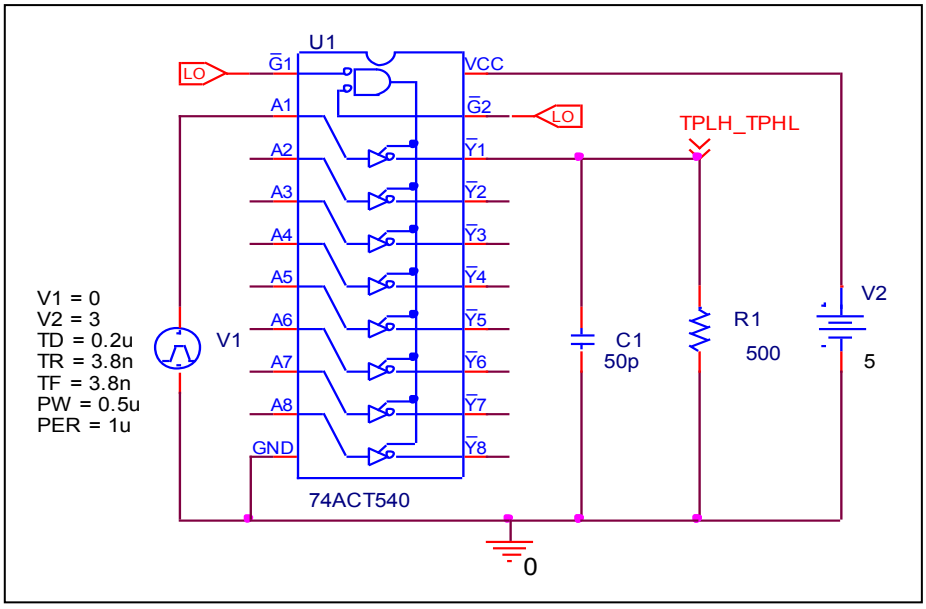
| $V_{CC}$ = 4.5V | Measurement | Simulation | %Error |
|---|---|---|---|
| $V_{OH}$ (V) | 4.5 | 4.4988 | -0.027 |
| $V_{OL}$ (V) | 0 | 0 | 0 |

## Propagation Delay Time

Circuit simulation result




Evaluation circuit

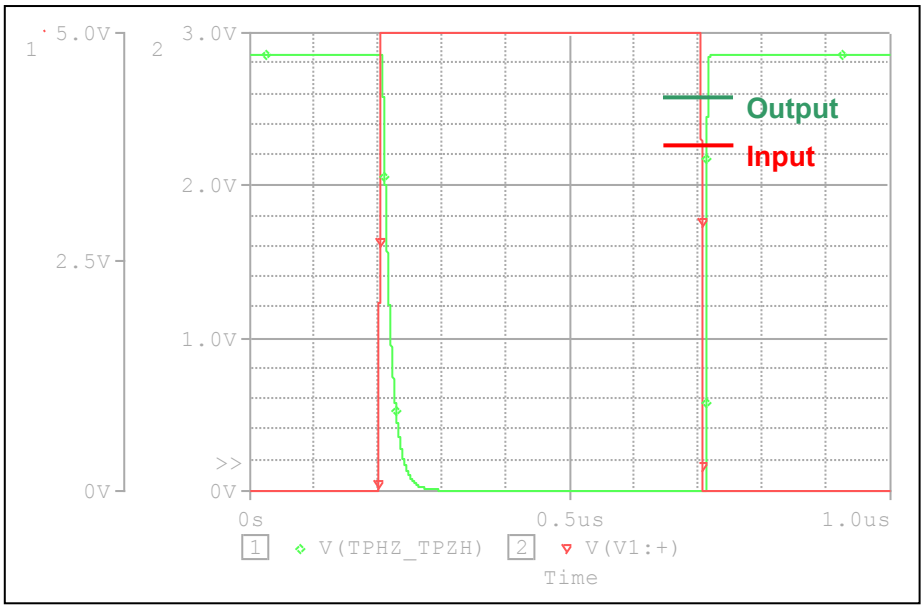



Comparison table **$C_L$ = 50 pF, $R_L$ = 500 Ω**

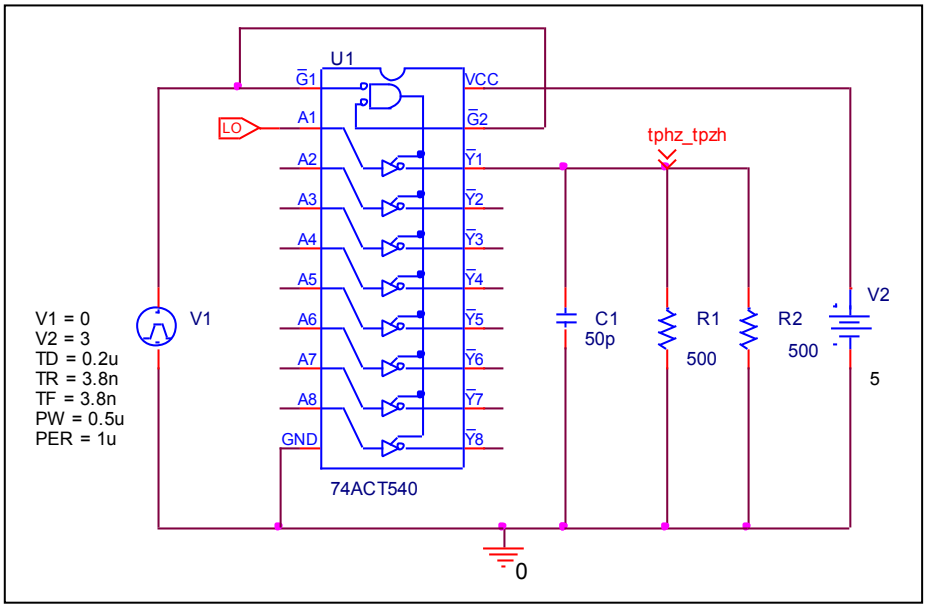
| tr = tf = 3 ns | Measurement | Simulation | %Error |
|---|---|---|---|
| **$t_{pLH}$ (ns)** | 5 | 5.0210 | 0.420 |
| **$t_{pHL}$ (ns)** | 5 | 5.03 | 0.600 |

## 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

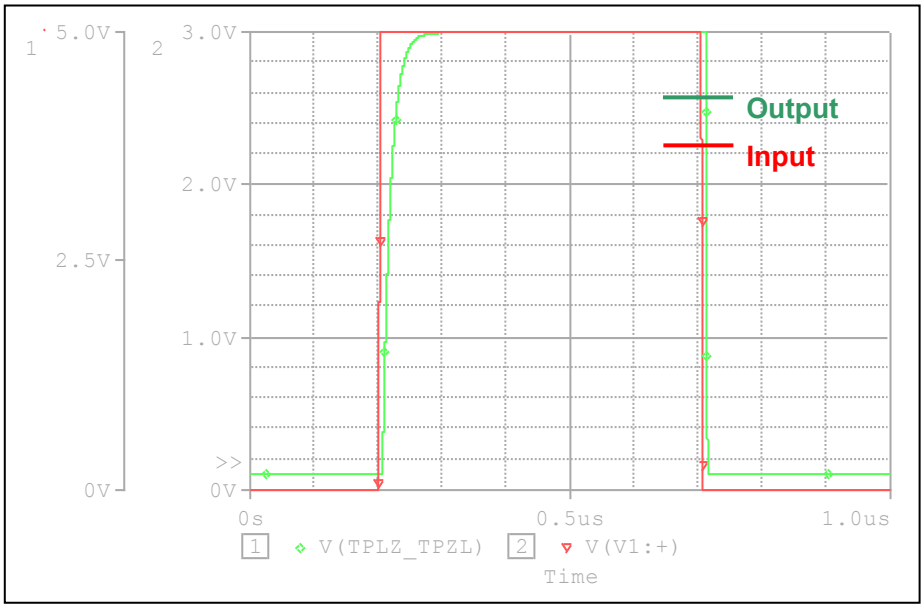



Comparison table $C_L = 50$ pF, $R_L = 500\ \Omega$

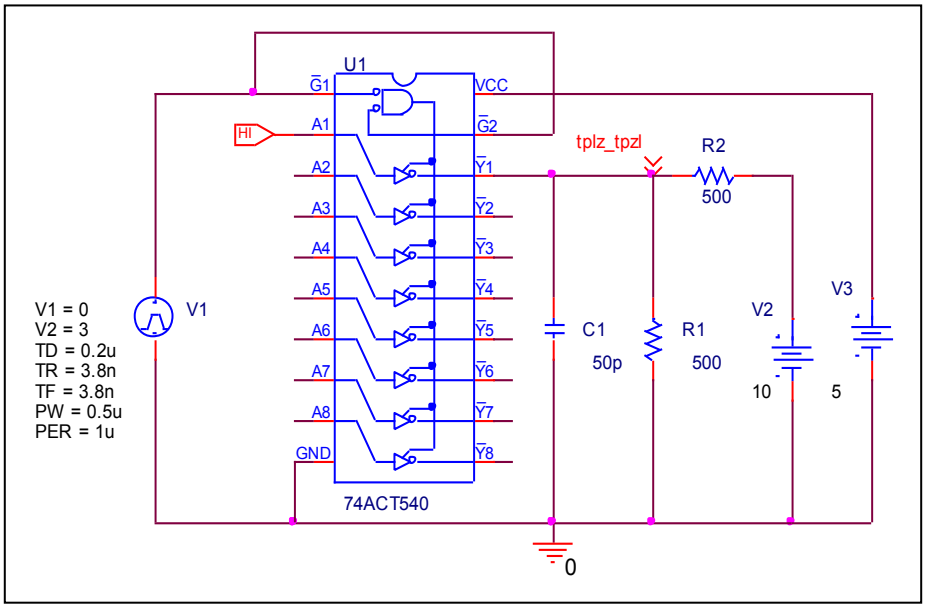
| tr = tf = 3 ns | Measurement | Simulation | %Error |
|---|---|---|---|
| $t_{PHZ}$ (ns) | 5.9 | 5.9843 | 1.429 |
| $t_{pZH}$ (ns) | 7.3 | 7.3133 | 0.182 |

## 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 pF, $R_L$ = 500 Ω

| tr = tf = 3 ns | Measurement | Simulation | %Error |
|---|---|---|---|
| $t_{PLZ}$ (ns) | 5.9 | 5.9705 | 1.195 |
| $t_{pZL}$ (ns) | 7.3 | 7.3961 | 1.316 |