

# Device Modeling Report

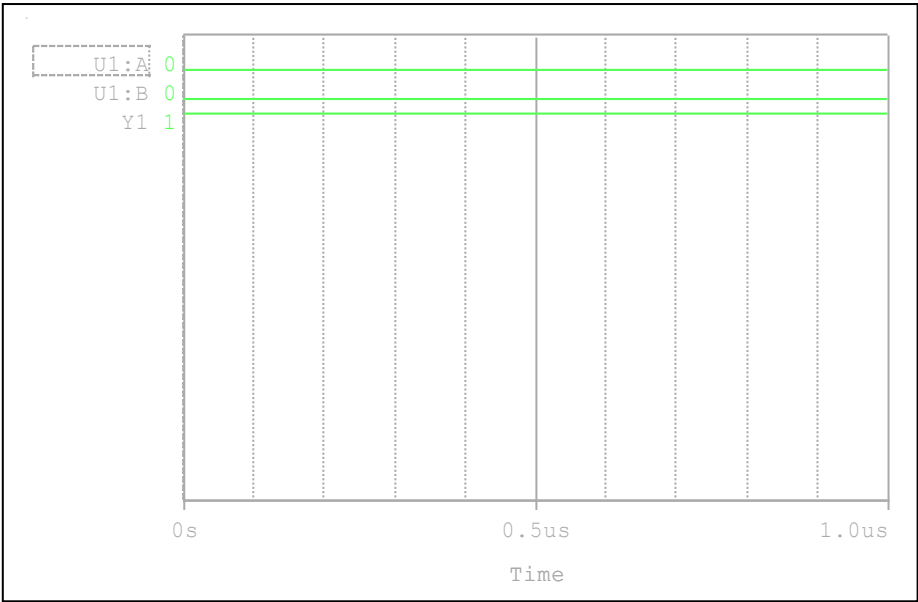
COMPONENTS : CMOS DIGITAL INTEGRATED CIRCUIT  
PART NUMBER : TC7SH02FU  
MANUFACTURER : TOSHIBA



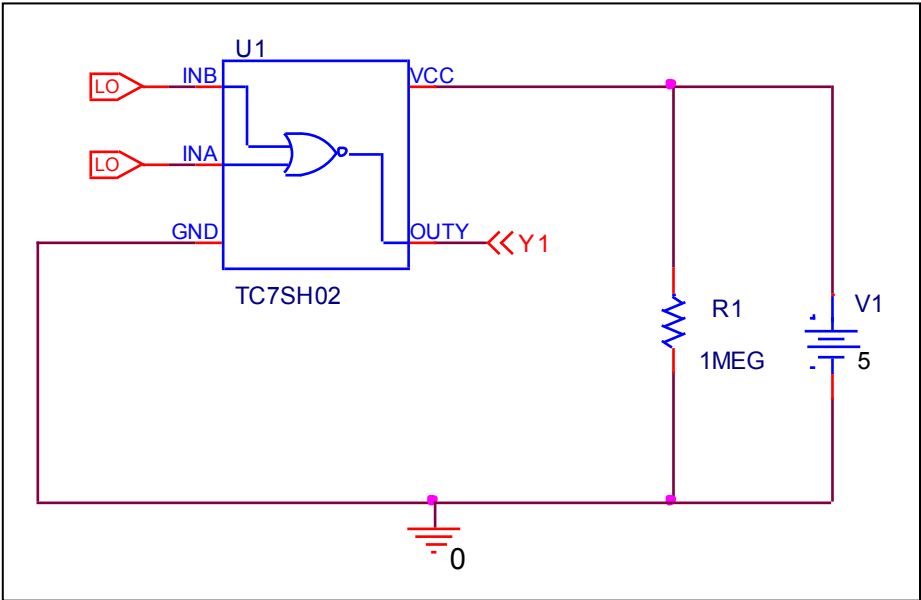
**Bee Technologies Inc.**

# Truth Table

Circuit simulation result



Evaluation circuit

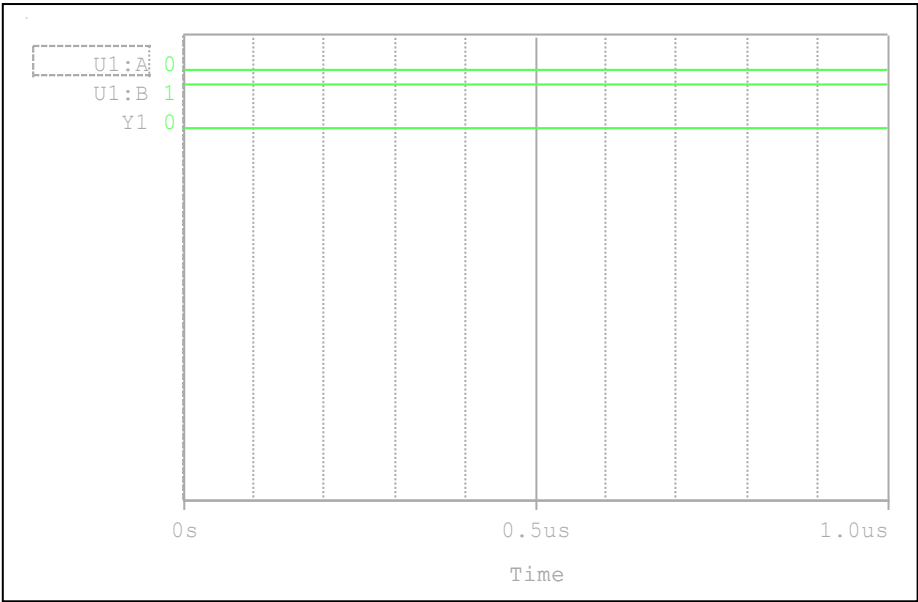


Comparison table

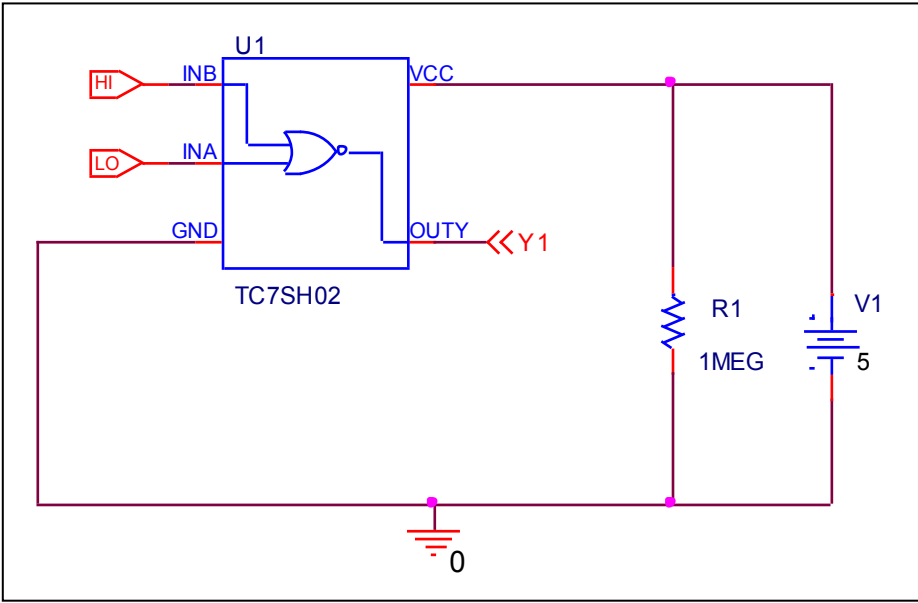
| Input |    | Output           |                 | %Error |
|-------|----|------------------|-----------------|--------|
| An    | Bn | Yn (Measurement) | Yn (Simulation) |        |
| L     | L  | H                | H               | 0      |

# Truth Table

## Circuit simulation result



## Evaluation circuit

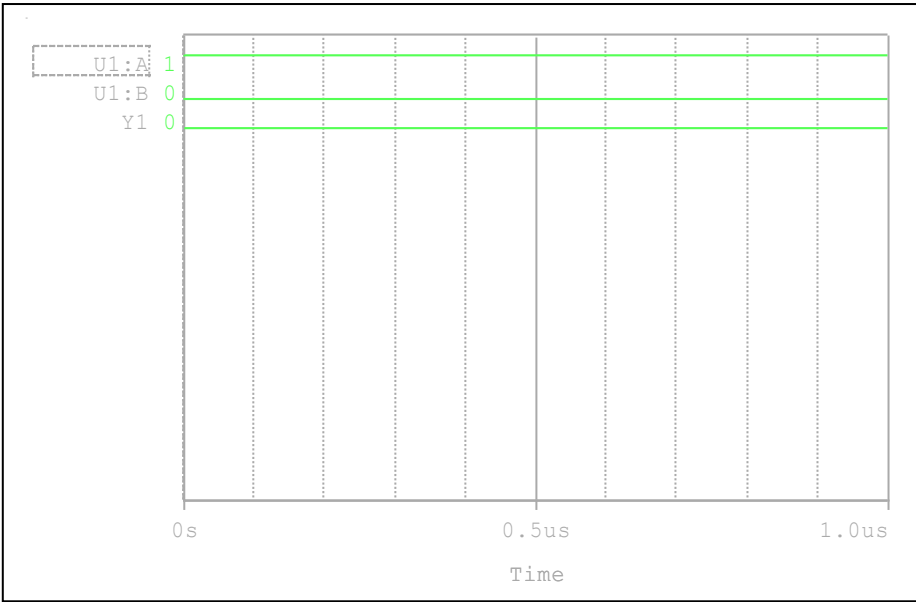


## Comparison table

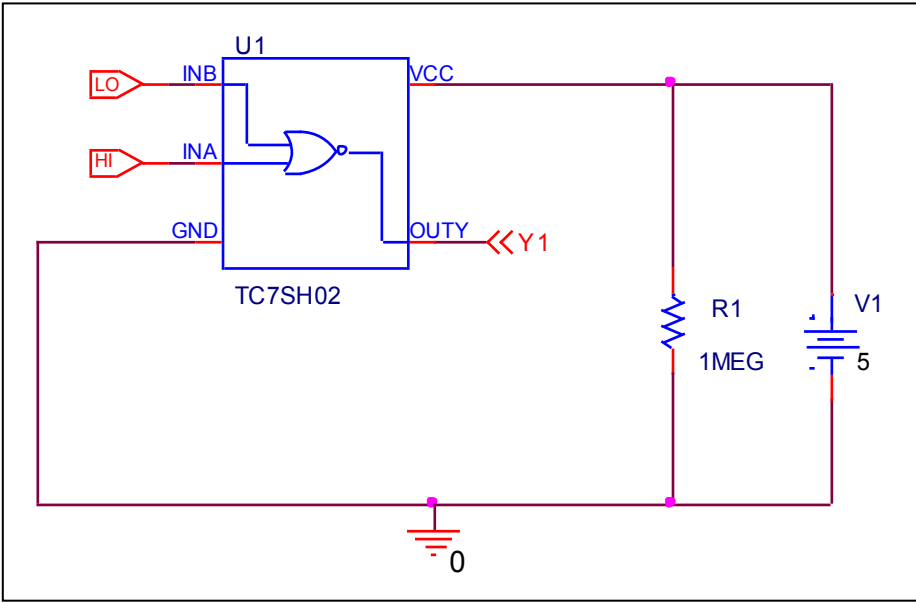
| Input |    | Output           |                 | %Error |
|-------|----|------------------|-----------------|--------|
| An    | Bn | Yn (Measurement) | Yn (Simulation) |        |
| L     | H  | L                | L               | 0      |

# Truth Table

## Circuit simulation result



## Evaluation circuit

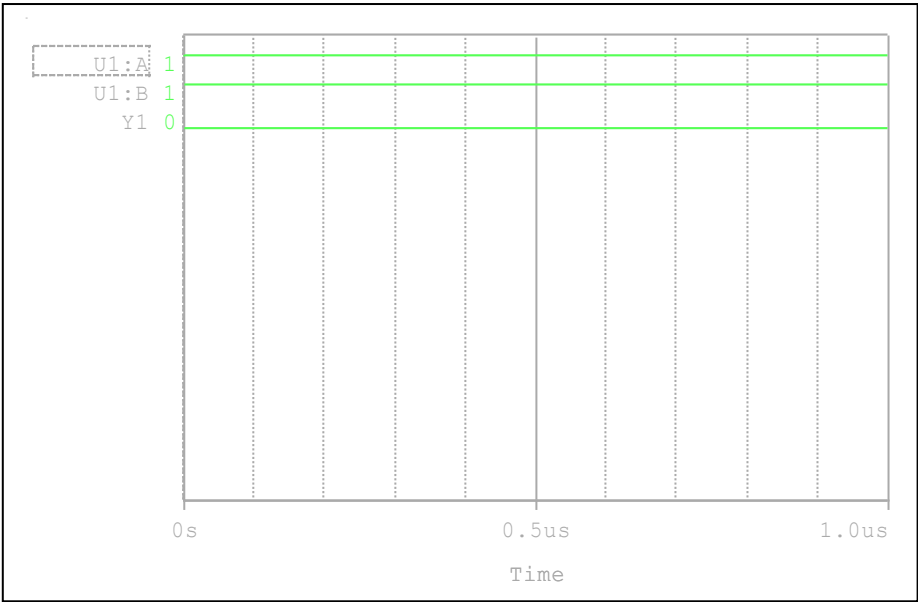


## Comparison table

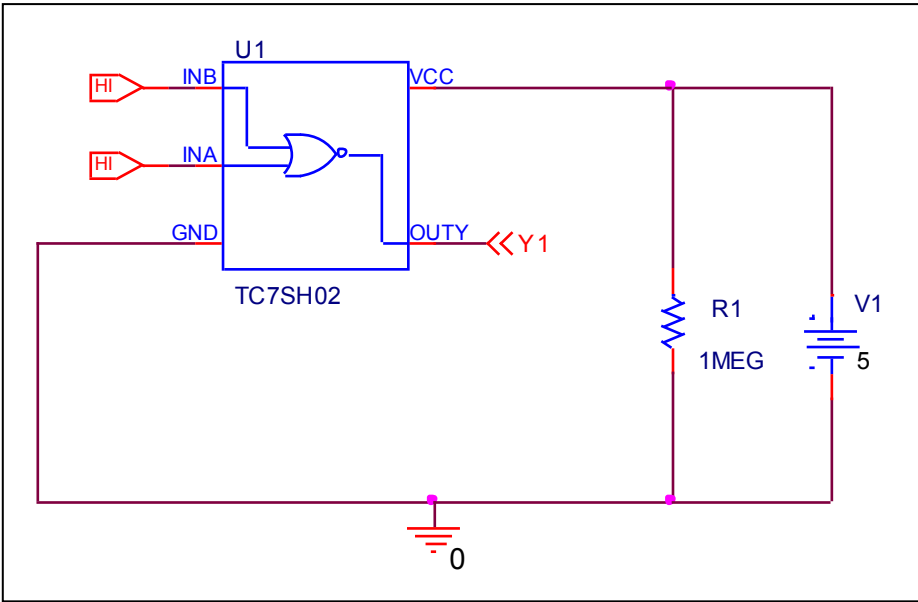
| Input |    | Output           |                 | %Error |
|-------|----|------------------|-----------------|--------|
| An    | Bn | Yn (Measurement) | Yn (Simulation) |        |
| H     | L  | L                | L               | 0      |

# Truth Table

## Circuit simulation result



## Evaluation circuit

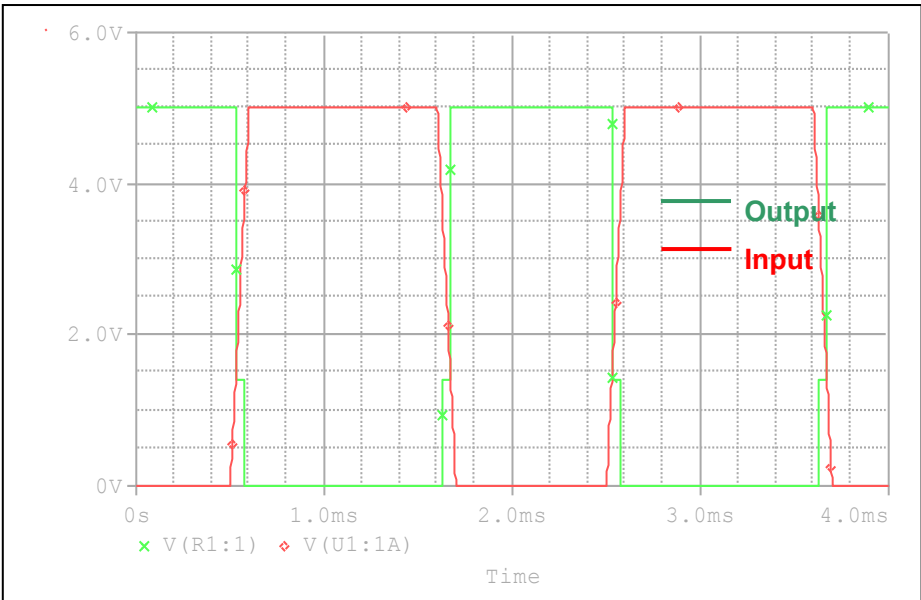


## Comparison table

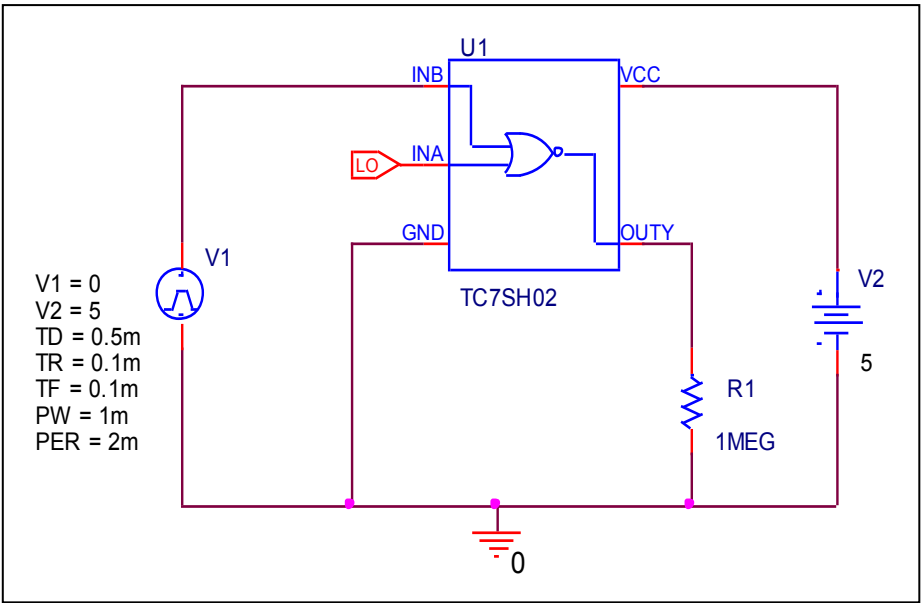
| Input |    | Output           |                 | %Error |
|-------|----|------------------|-----------------|--------|
| An    | Bn | Yn (Measurement) | Yn (Simulation) |        |
| H     | H  | L                | L               | 0      |

# High Level and Low Level Input Voltage

## Circuit simulation result



## Evaluation circuit

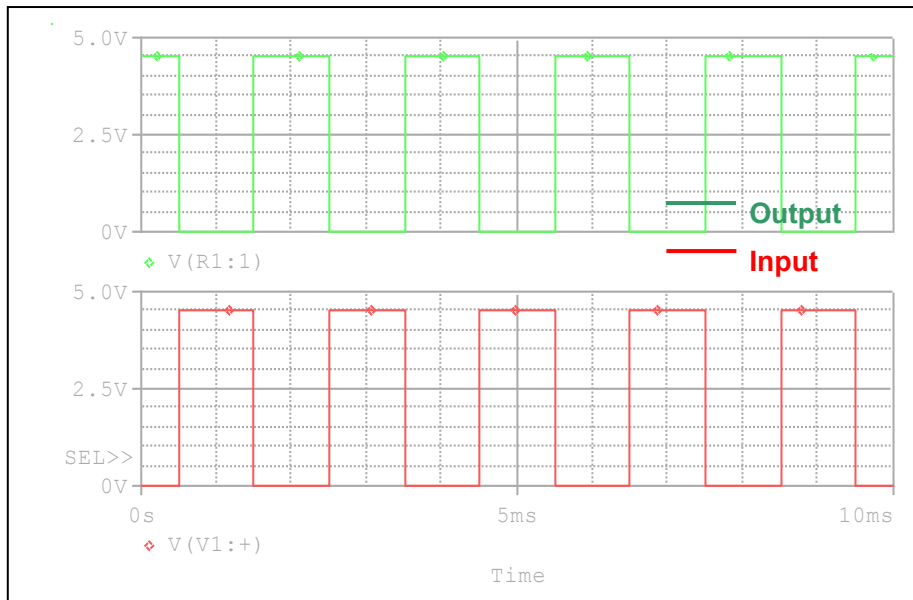


## Comparison table

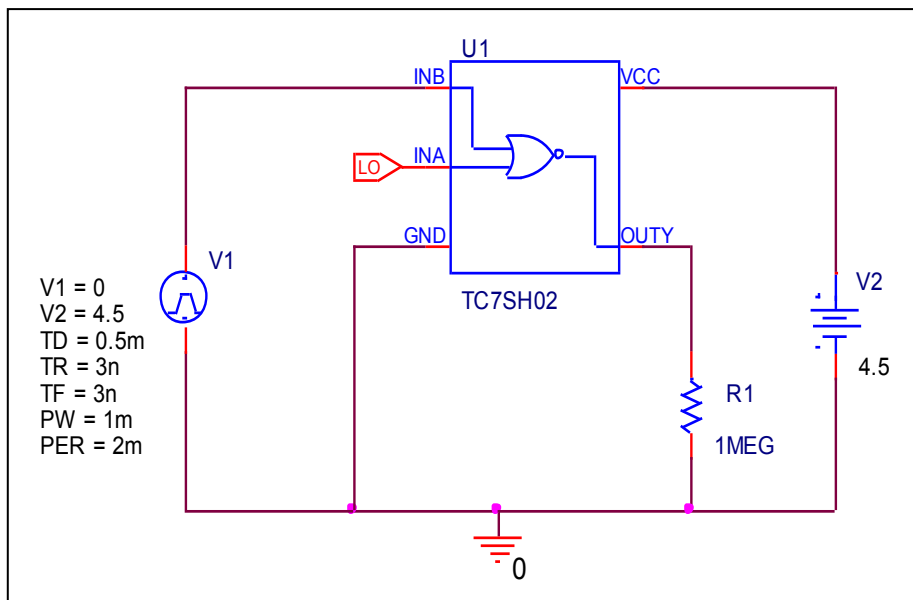
| $V_{CC} = 5V$                         | Measurement | Simulation | %Error |
|---------------------------------------|-------------|------------|--------|
| Min $V_{IH} = (V_{CC} \cdot 0.7) (V)$ | 3.5         | 3.6252     | 3.577  |
| Min $V_{IL} = (V_{CC} \cdot 0.3) (V)$ | 1.5         | 1.4951     | -0.327 |

## High Level and Low Level Output Voltage

### Circuit simulation result



### Evaluation circuit

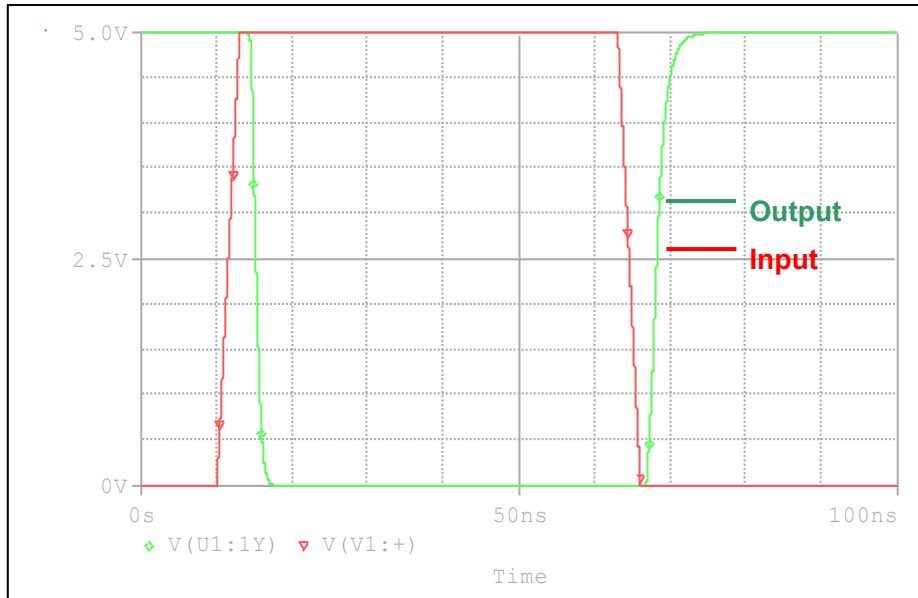


### Comparison table

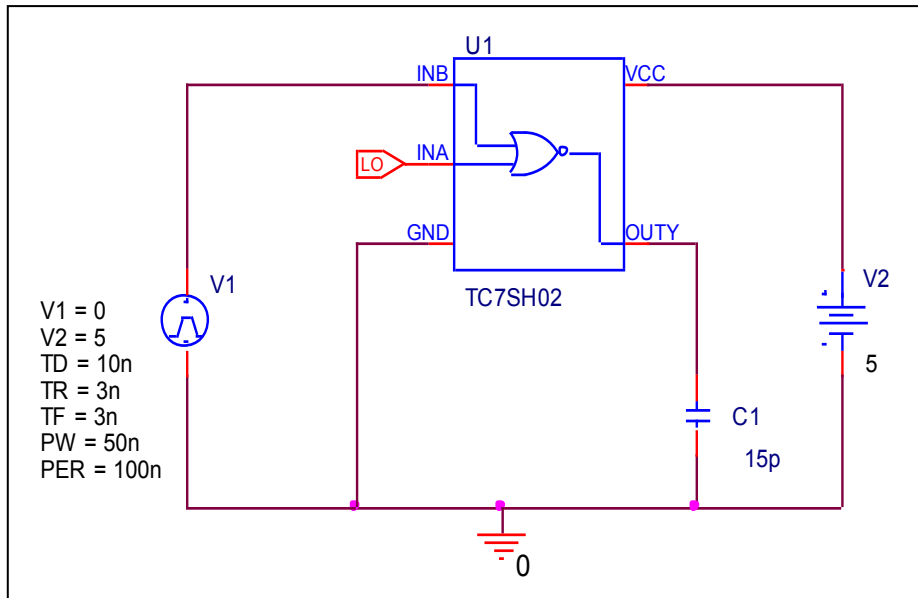
| $V_{CC} = 4.5V$ | Measurement | Simulation | %Error |
|-----------------|-------------|------------|--------|
| $V_{OH} (V)$    | 4.5         | 4.4965     | -0.078 |
| $V_{OL} (V)$    | 0           | 0          | 0      |

## Propagation Delay Time

### Circuit simulation result



### Evaluation circuit



### Comparison table

| $C_L=15\text{pF}, V_{CC}=5\text{V}, T_r=T_f=3\text{ns}$ | Measurement | Simulation | %Error |
|---------------------------------------------------------|-------------|------------|--------|
| $t_{pLH} \text{ (ns)}$                                  | 3.6         | 3.6560     | 1.556  |
| $t_{pHL} \text{ (ns)}$                                  | 3.6         | 3.6664     | 1.844  |