

Device Modeling Report

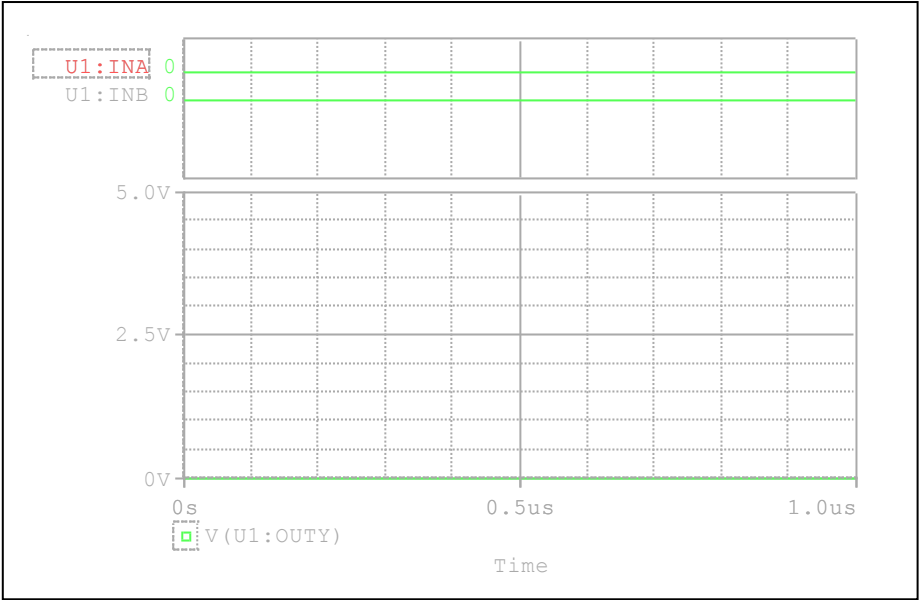
COMPONENTS : CMOS DIGITAL INTEGRATED CIRCUIT
PART NUMBER : TC7SZ32FU
MANUFACTURER : TOSHIBA



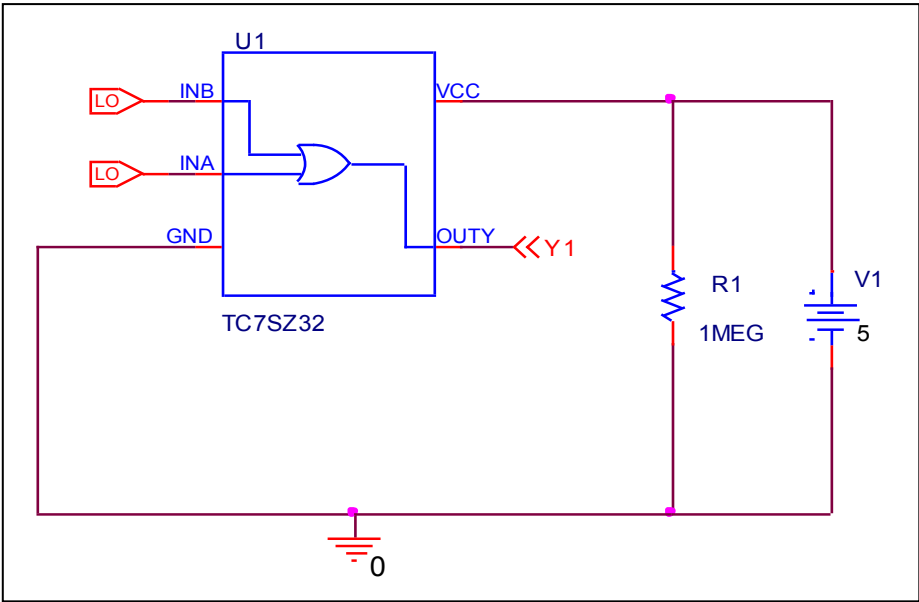
Bee Technologies Inc.

Truth Table

Circuit simulation result



Evaluation circuit

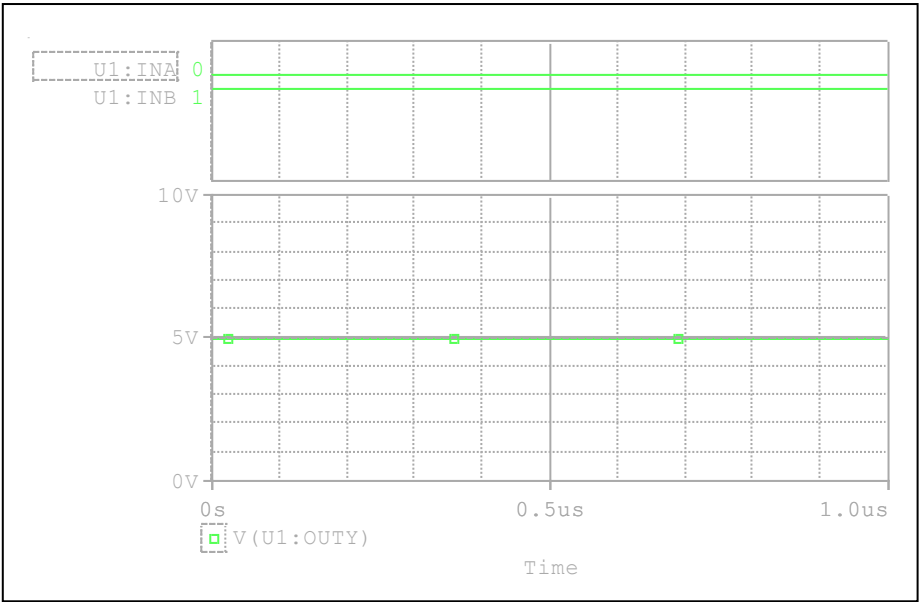


Comparison table

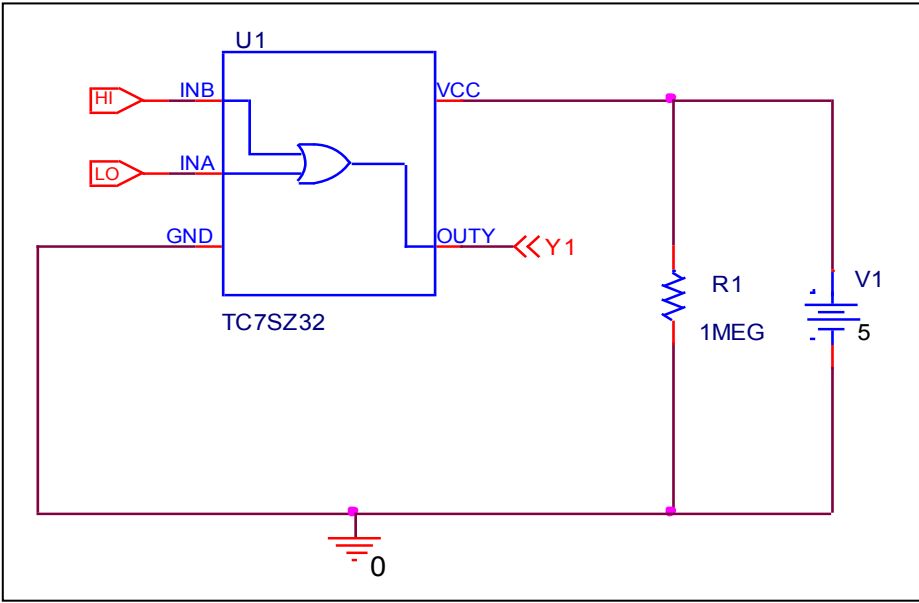
Input		Output		%Error
An	Bn	Yn (Measurement)	Yn (Simulation)	
L	L	L	L	0

Truth Table

Circuit simulation result



Evaluation circuit

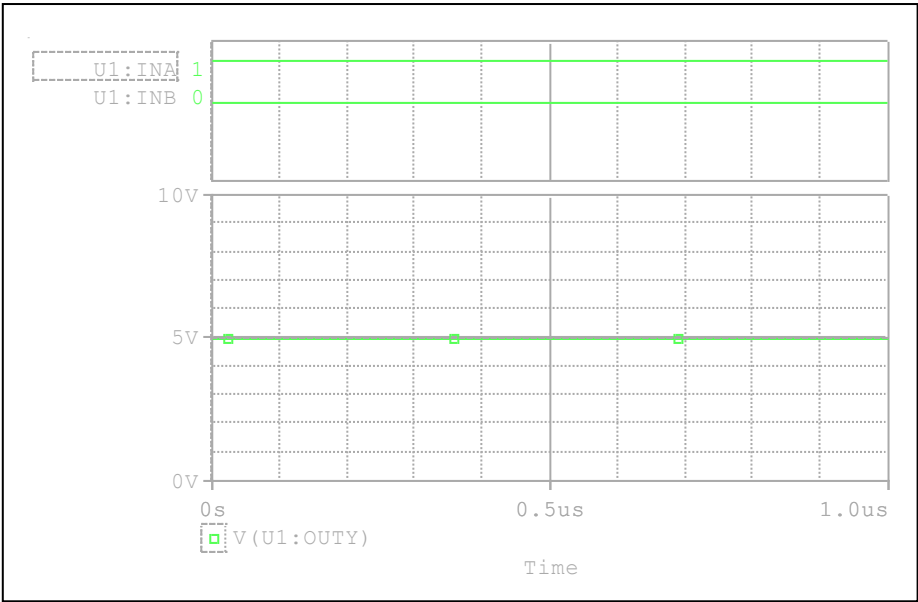


Comparison table

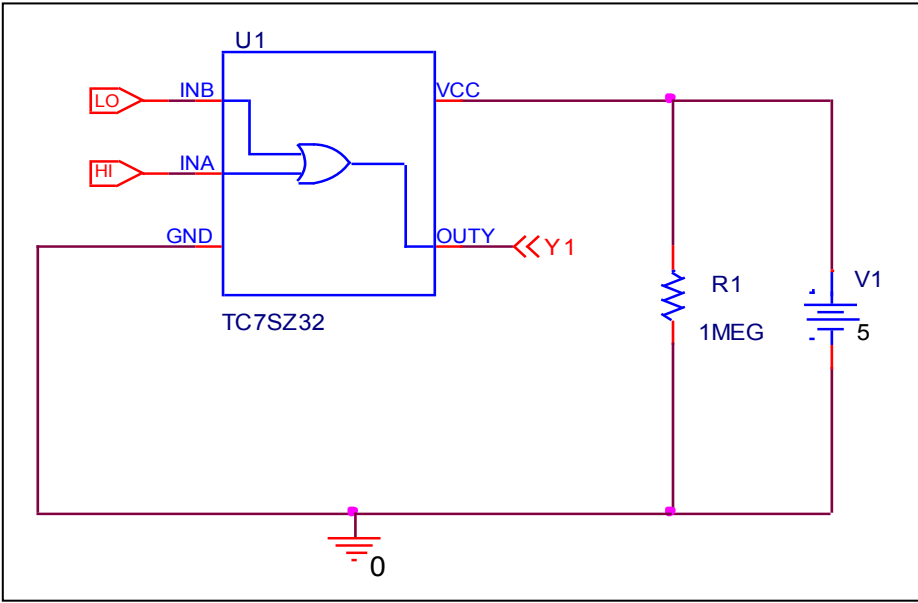
Input		Output		%Error
An	Bn	Yn (Measurement)	Yn (Simulation)	
L	H	H	H	0

Truth Table

Circuit simulation result



Evaluation circuit

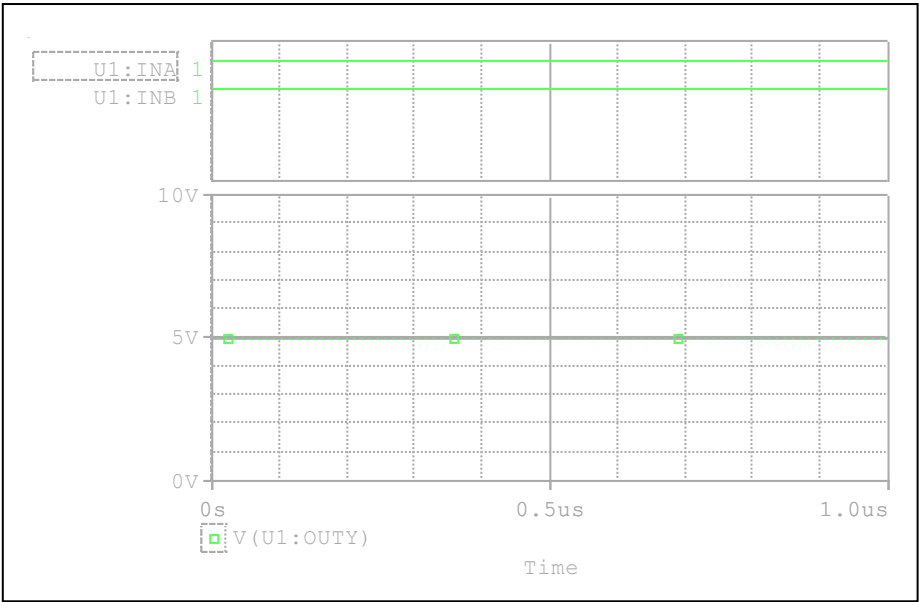


Comparison table

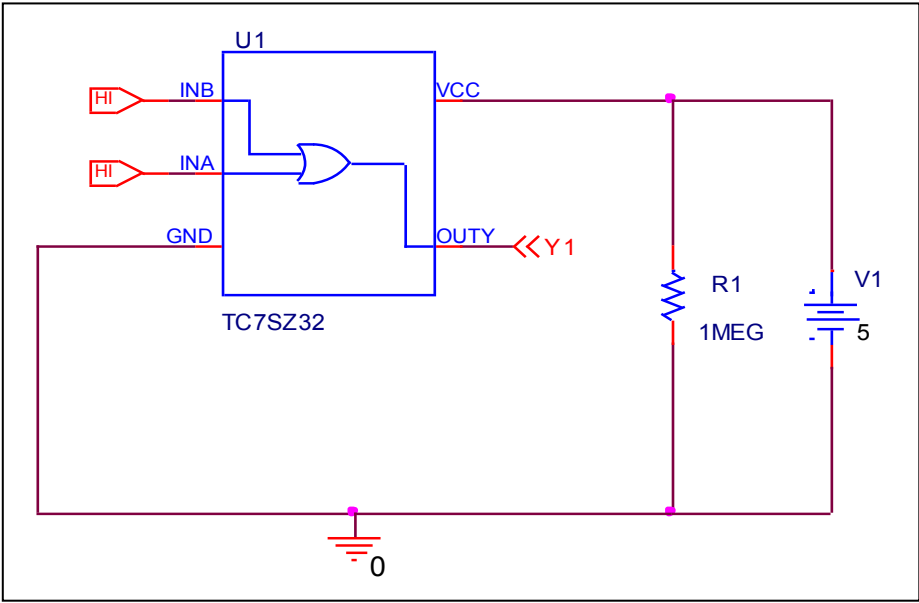
Input		Output		%Error
An	Bn	Yn (Measurement)	Yn (Simulation)	
H	L	H	H	0

Truth Table

Circuit simulation result



Evaluation circuit

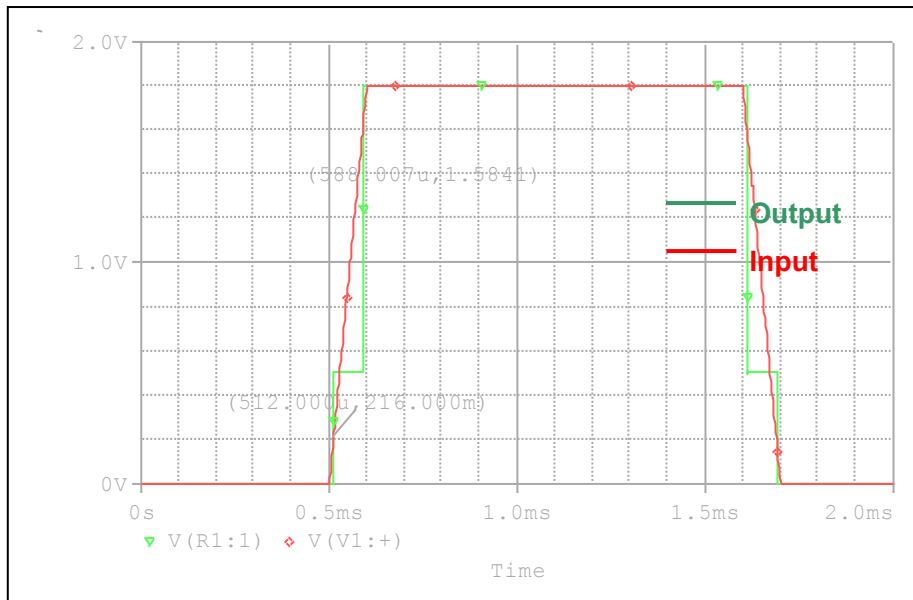


Comparison table

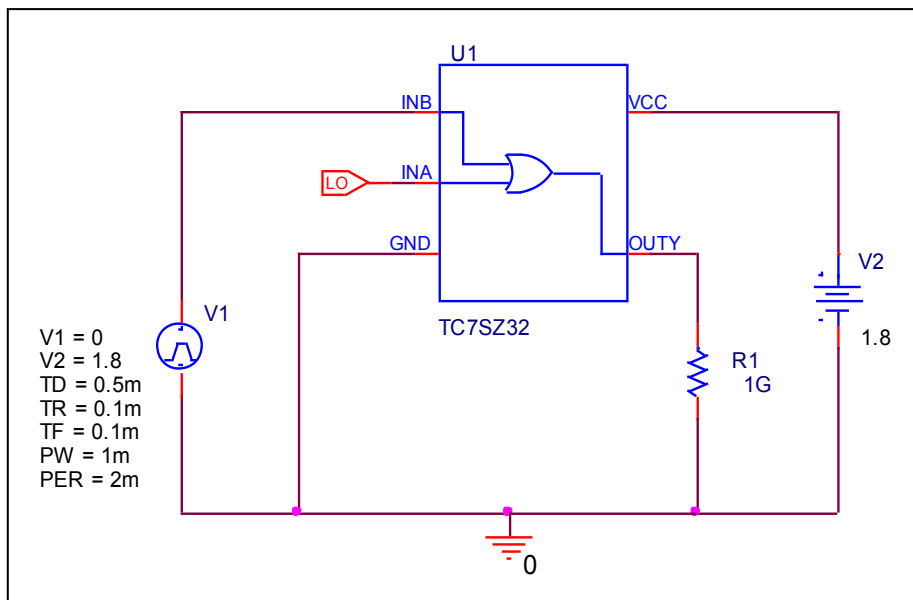
Input		Output		%Error
An	Bn	Yn (Measurement)	Yn (Simulation)	
H	H	H	H	0

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

Circuit simulation result



Evaluation circuit

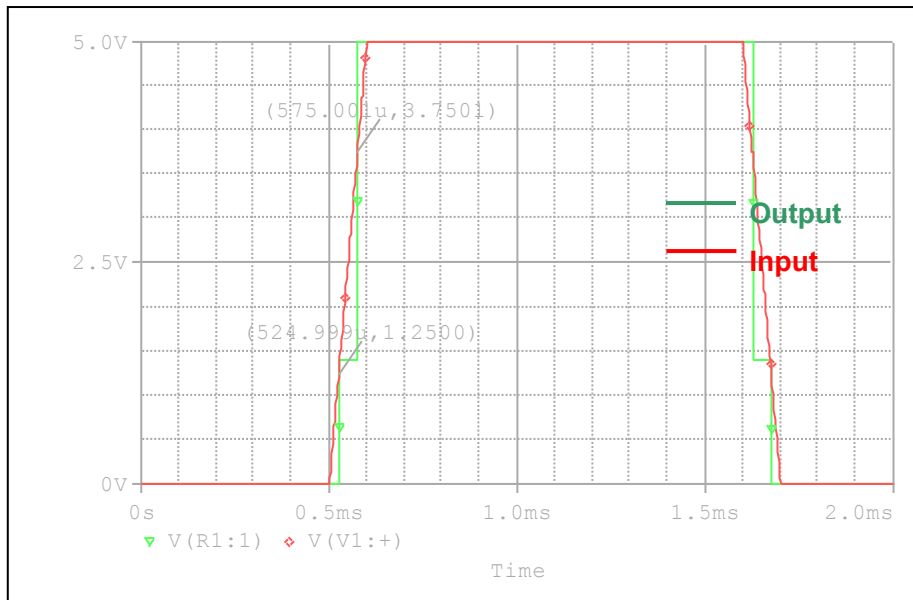


Comparison table

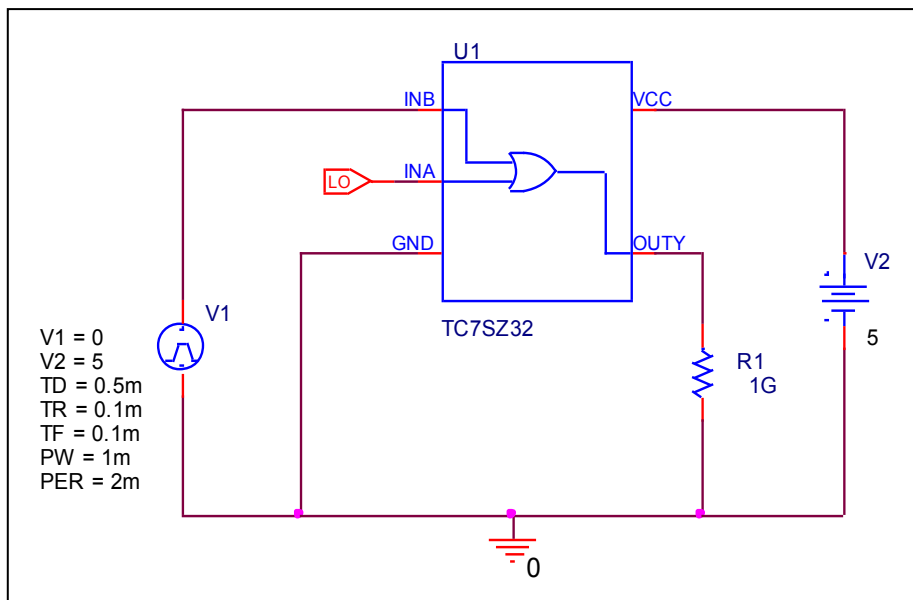
$V_{CC} = 1.8 \text{ V}$	Measurement	Simulation	%Error
Min $V_{IH} = (V_{CC} \cdot 0.88) \text{ V}$	1.584	1.5841	0.006
Min $V_{IL} = (V_{CC} \cdot 0.12) \text{ V}$	0.216	0.216	0

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

Circuit simulation result



Evaluation circuit

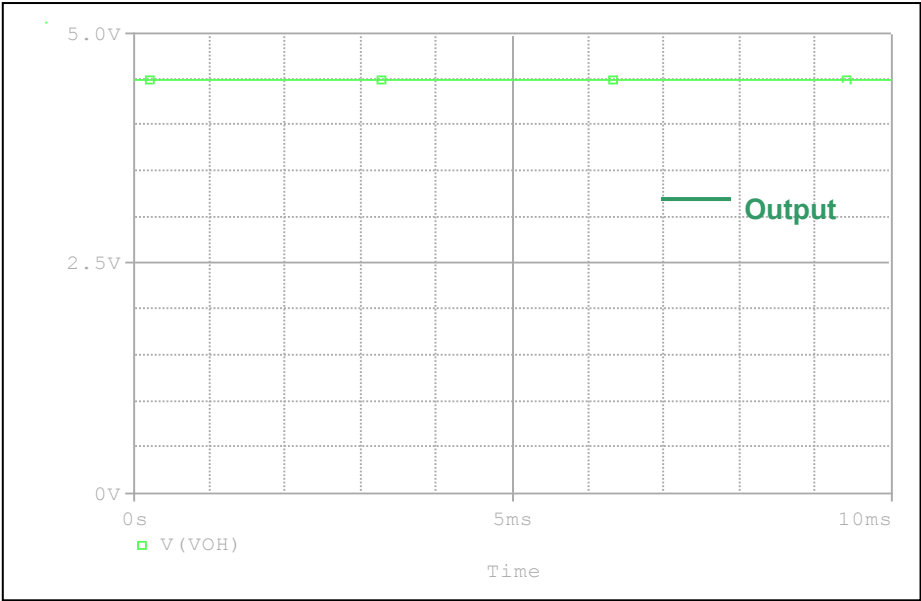


Comparison table

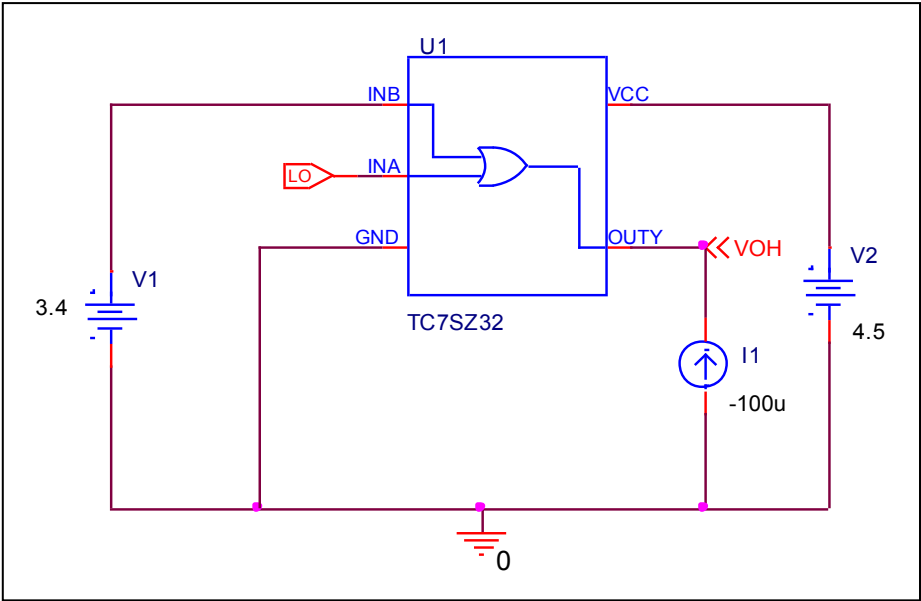
V_{CC} = 5 V	Measurement	Simulation	%Error
Min V_{IH} = (V_{CC}*0.75) V	3.75	3.7501	0.003
Min V_{IL} = (V_{CC}*0.25) V	1.25	1.25	0

High Level Output Voltage

Circuit simulation result



Evaluation circuit

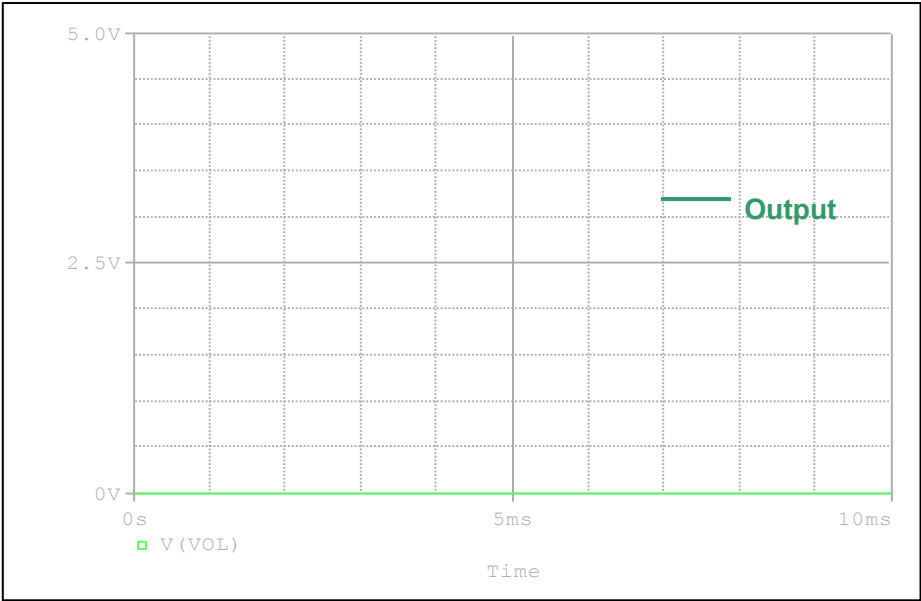


Comparison table

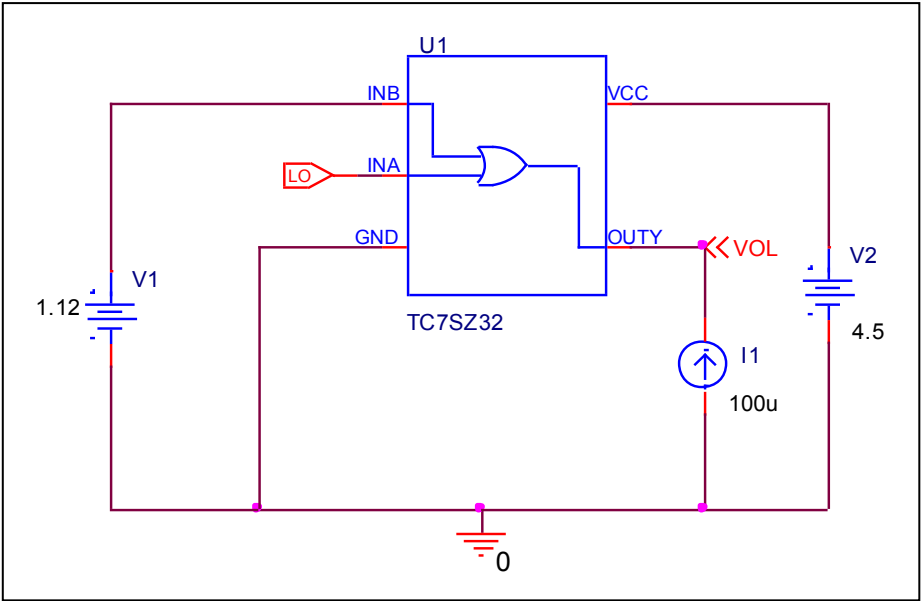
$V_{IN} = V_{IH}, V_{CC} = 4.5V$	Measurement	Simulation	%Error
$V_{OH} (V)$	4.5	4.4982	-0.04

Low Level Output Voltage

Circuit simulation result



Evaluation circuit

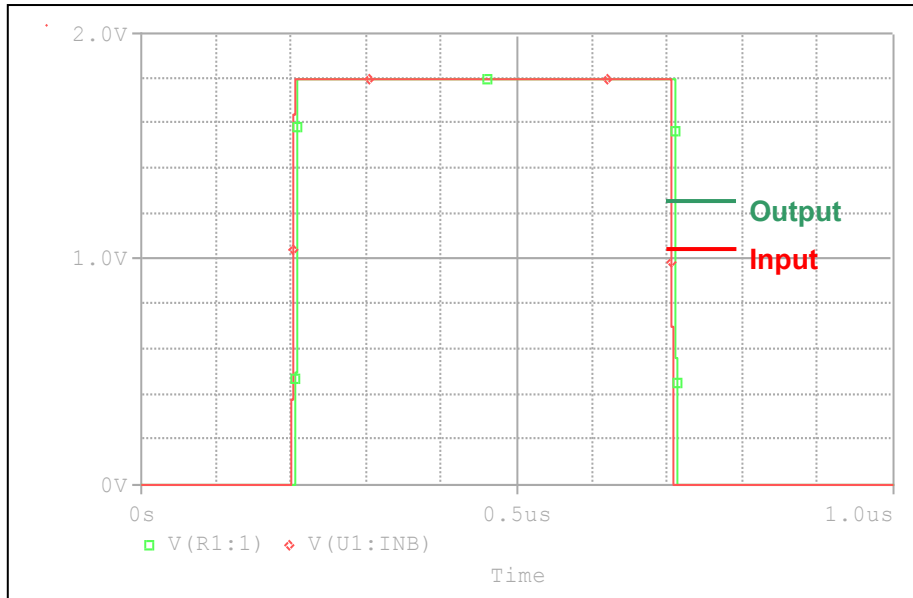


Comparison table

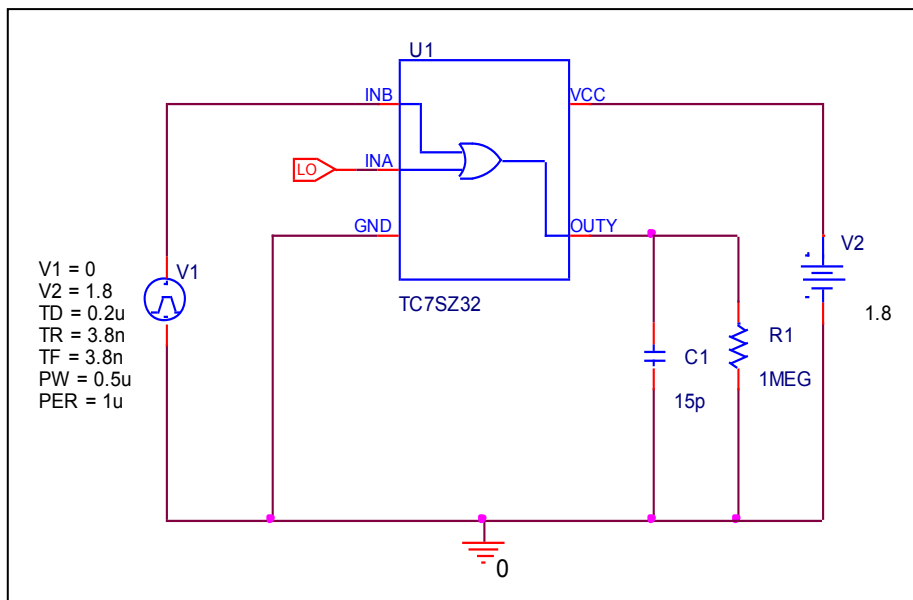
$V_{IN} = V_{IL}, V_{CC} = 4.5V$	Measurement	Simulation	%Error
$V_{OL} (V)$	0	0	0

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

Circuit simulation result



Evaluation circuit

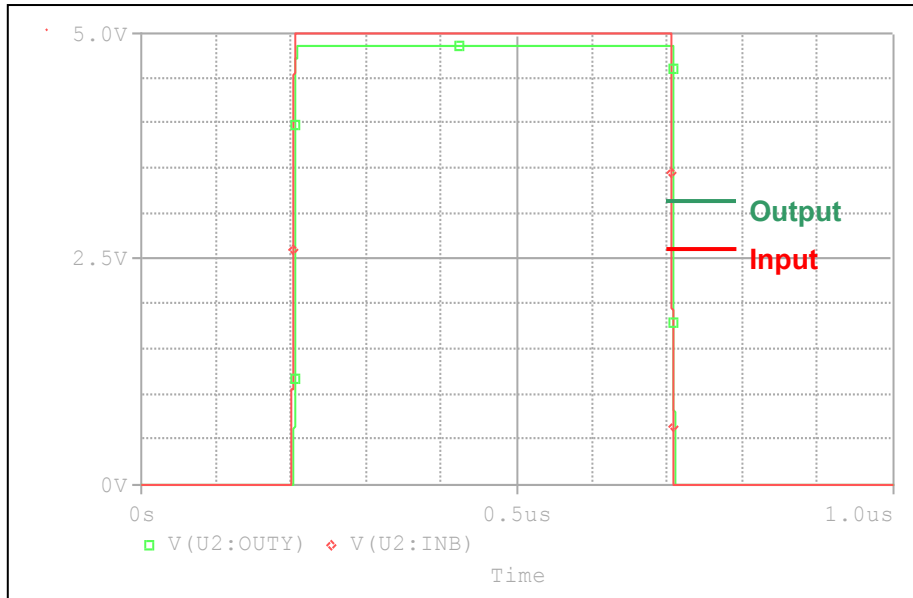


Comparison table $C_L=15 \text{ pF}$, $R_L= 1 \text{ M}\Omega$

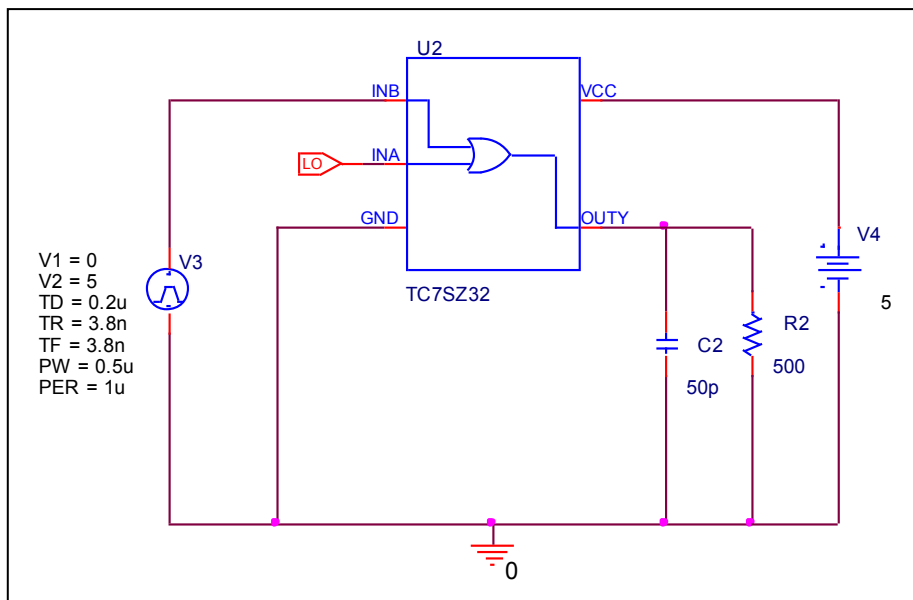
$V_{CC} = 1.8 \text{ V}$, $T_r=T_f=3 \text{ ns}$	Measurement	Simulation	%Error
$t_{pLH} \text{ (ns)}$	4.6	4.6004	0.009
$t_{pHL} \text{ (ns)}$	4.6	4.6672	1.461

Propagation Delay Time ($V_{CC} = 5\text{ V}$)

Circuit simulation result



Evaluation circuit



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

$V_{CC} = 5\text{ V}$, $T_r=T_f = 3\text{ ns}$	Measurement	Simulation	%Error
$t_{pLH}\text{ (ns)}$	2.4	2.4796	3.317
$t_{pHL}\text{ (ns)}$	2.4	2.422	0.917