

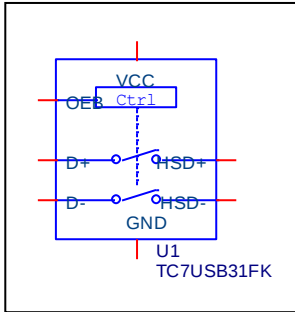
Device Modeling Report

COMPONENTS: USB Switch
PART NUMBER: TC7USB31WBG
MANUFACTURER: TOSHIBA



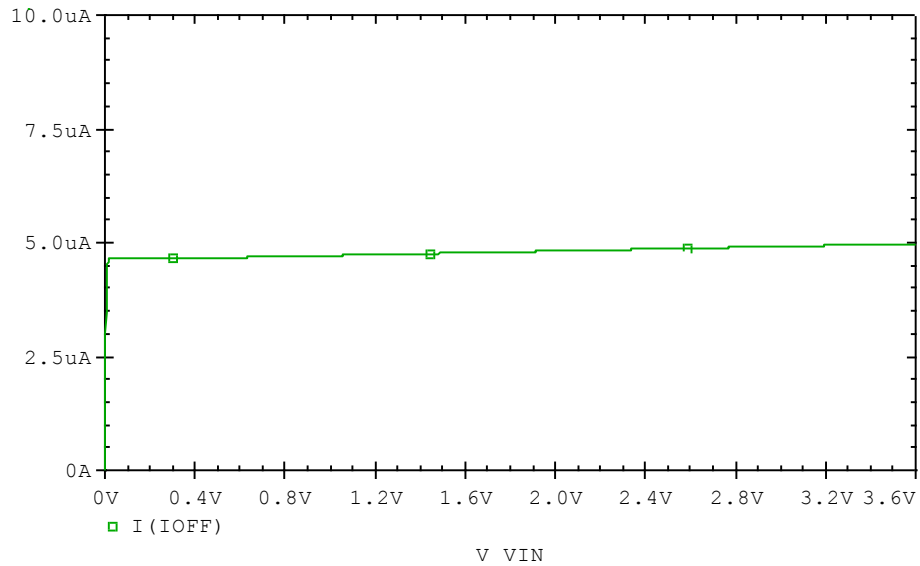
Bee Technologies Inc.

Circuit Configuration

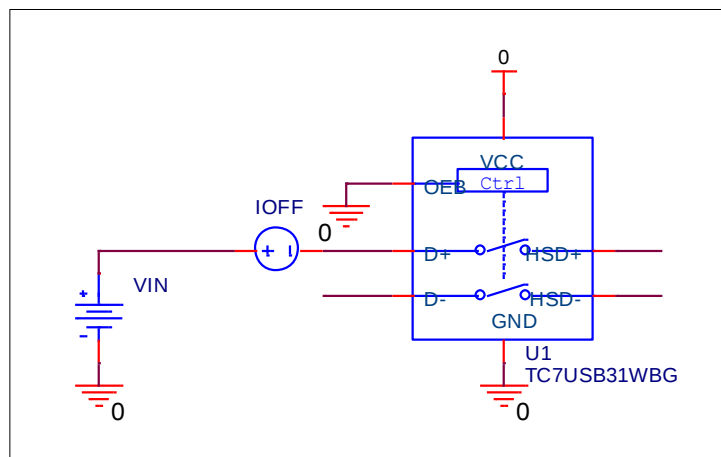


Power-Off Leakage Current Characteristics

Simulation result



Evaluation circuit



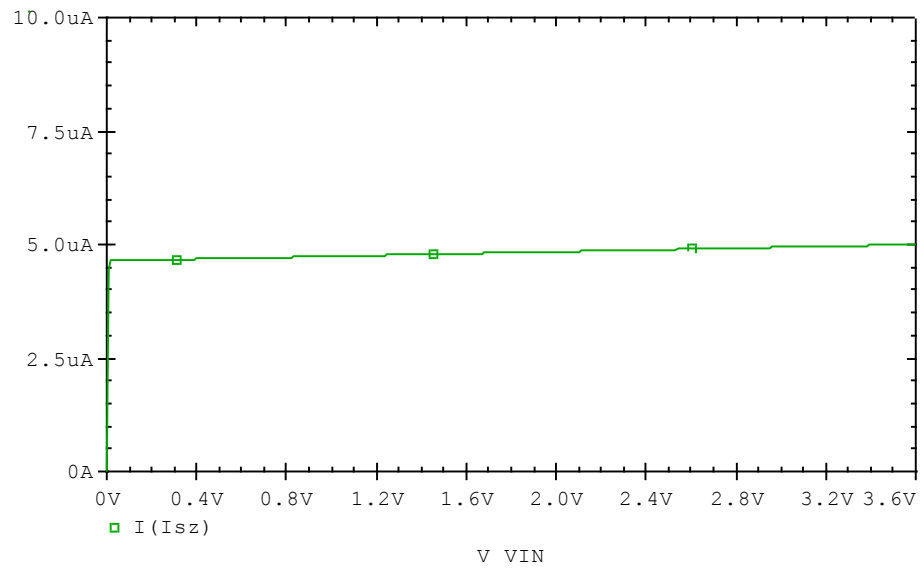
Simulation Result

Condition: $V_{CC} = 0$ V, $V_{IN} = 0$ to 3.6 V

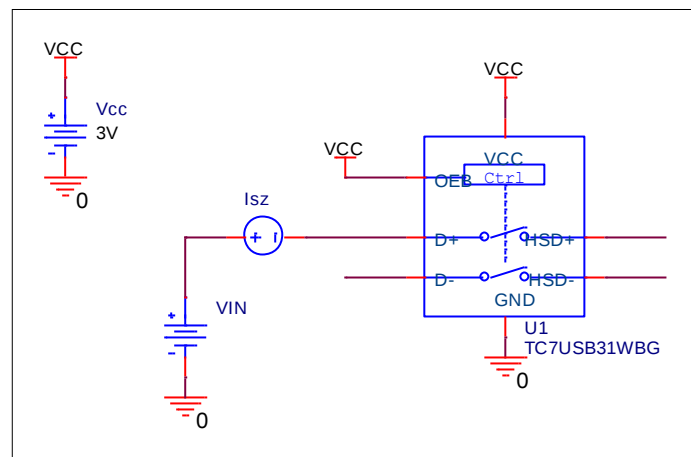
Parameters	Measurement	Simulation	%Error
I_{OFF} (uA)	5.0	4.977	-0.46

Off-State Leakage Current Characteristics

Simulation result



Evaluation circuit



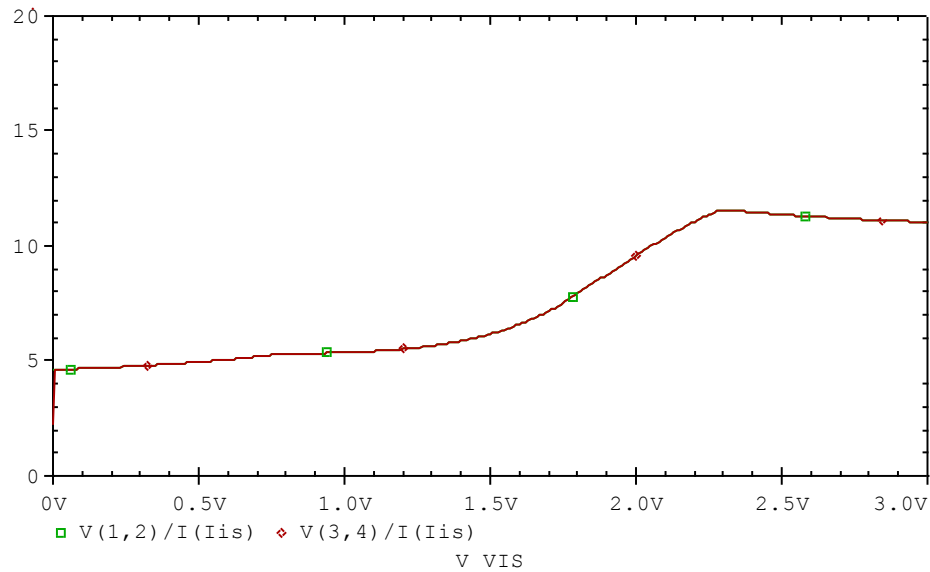
Simulation Result

Condition: $V_{CC} = 2.3$ to 3.6 V, $V_{IS} = 0$ to V_{CC}

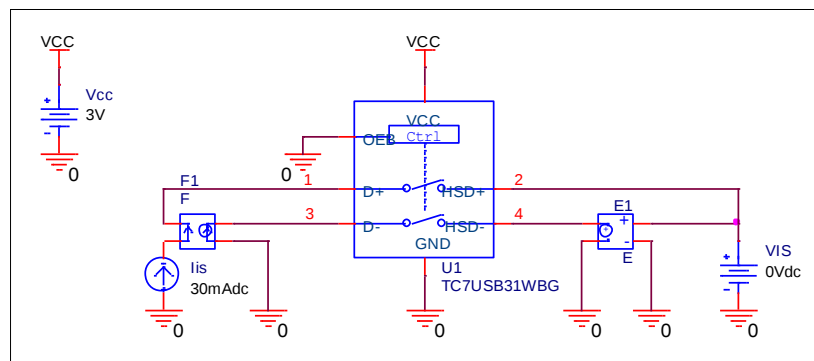
Parameters	Measurement	Simulation	%Error
I_{SZ} (uA)	5.0	5.0	0

ON Resistance Characteristics

Simulation result



Evaluation circuit



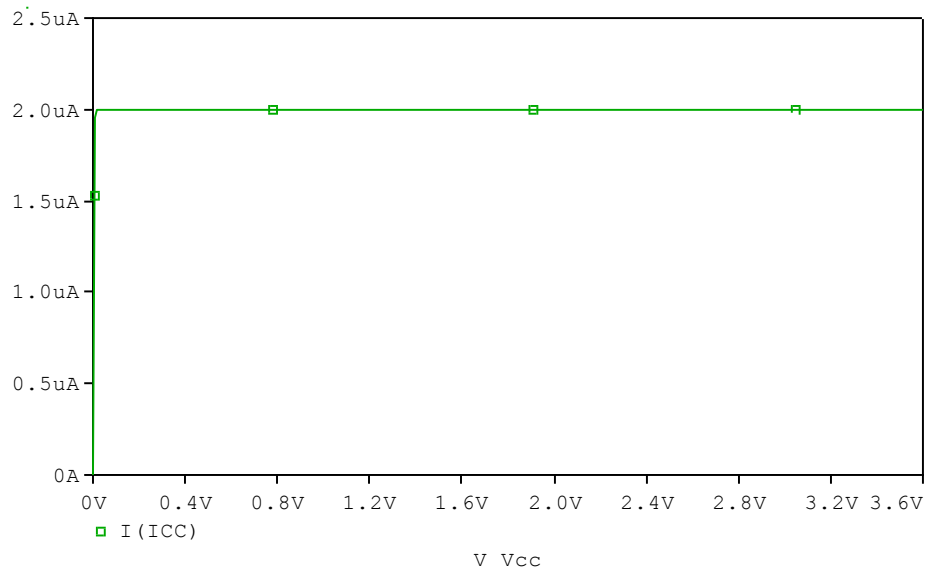
Simulation Result

Condition: $V_{CC} = 3V$, $I_{IS} = 30mA$ to V_{CC}

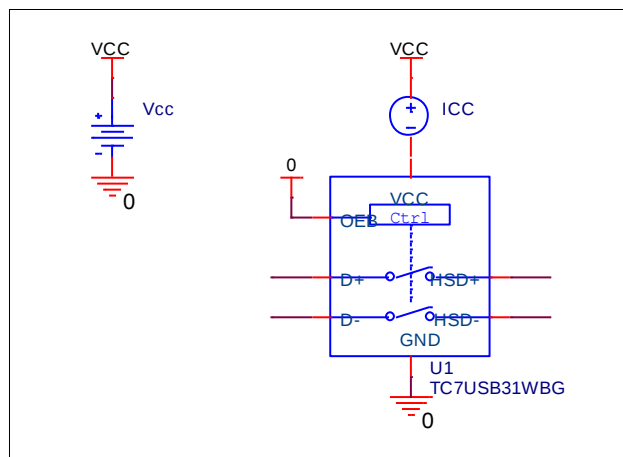
Parameters	Measurement	Simulation	%Error
$R_{ON} (\Omega) (V_{IS}=0V)$	4.5	4.612	2.49
$R_{ON} (\Omega) (V_{IS}=0.4V)$	5	4.868	-2.64
$R_{ON} (\Omega) (V_{IS}=3.0V)$	11	11.038	0.35
$R_{ON} (\Omega) (V_{IS}=0.4V, 1V)$	0.5	0.5	0.00

Quiescent Supply Current Characteristics

Simulation result



Evaluation circuit



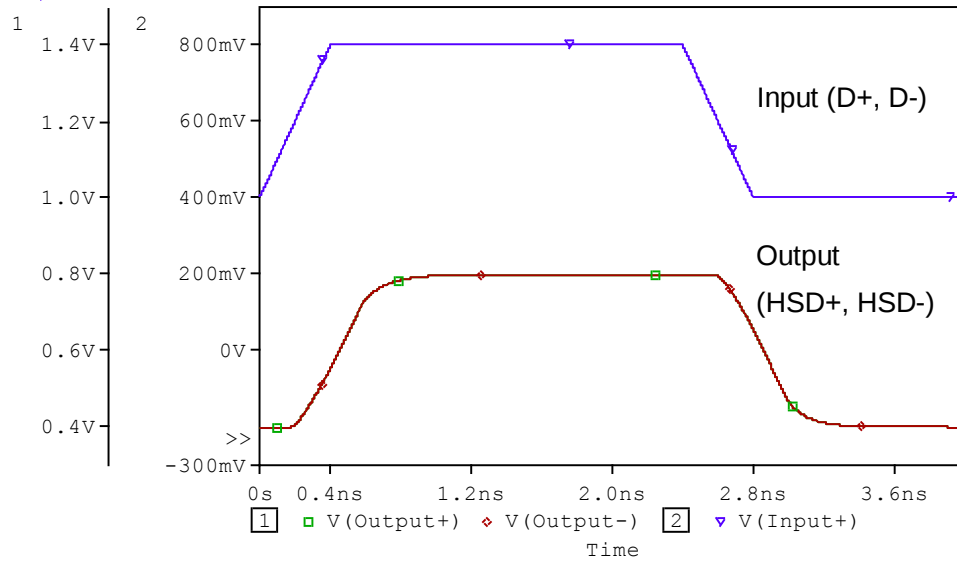
Simulation Result

Condition: $V_{CC} = 3.6 \text{ V}$, $V_{IN} = V_{CC}$ or GND

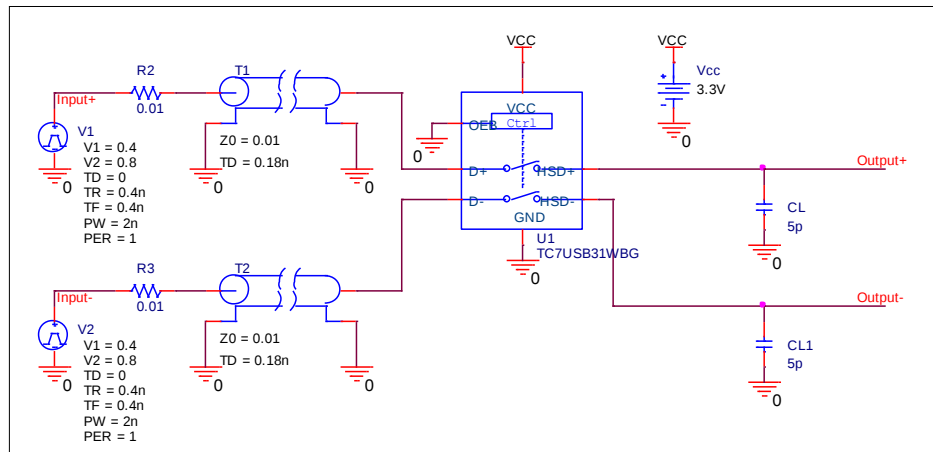
Parameters	Measurement	Simulation	%Error
$I_{CC} \text{ (uA)}$	2.0	1.998	-0.10

Propagation Delay Time Characteristics

Simulation result



Evaluation circuit

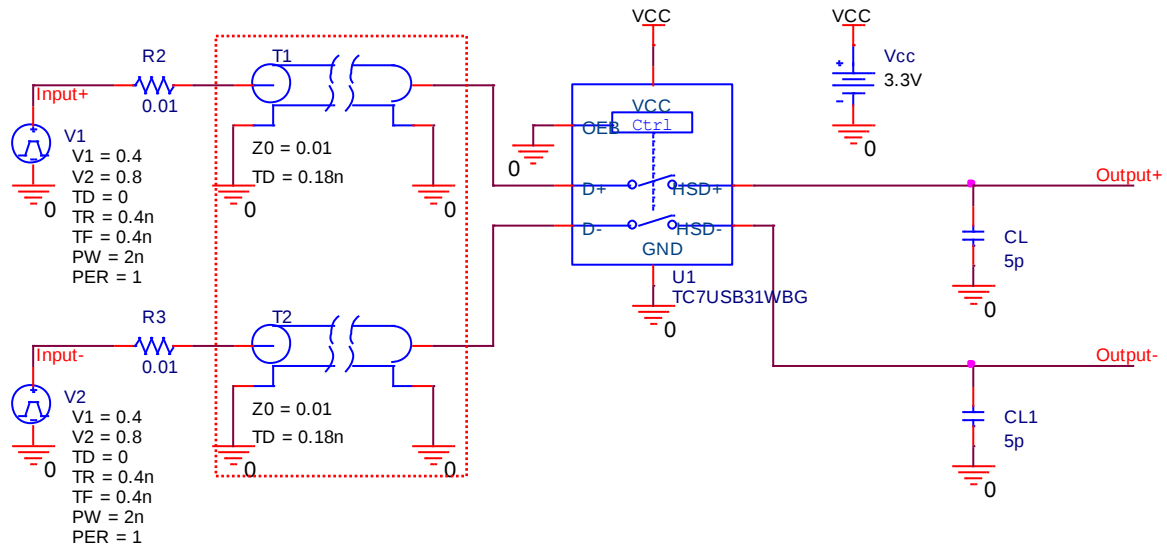


Simulation Result

Condition: $V_{CC} = 3.3\text{ V}$, $C_L = 5\text{ pF}$

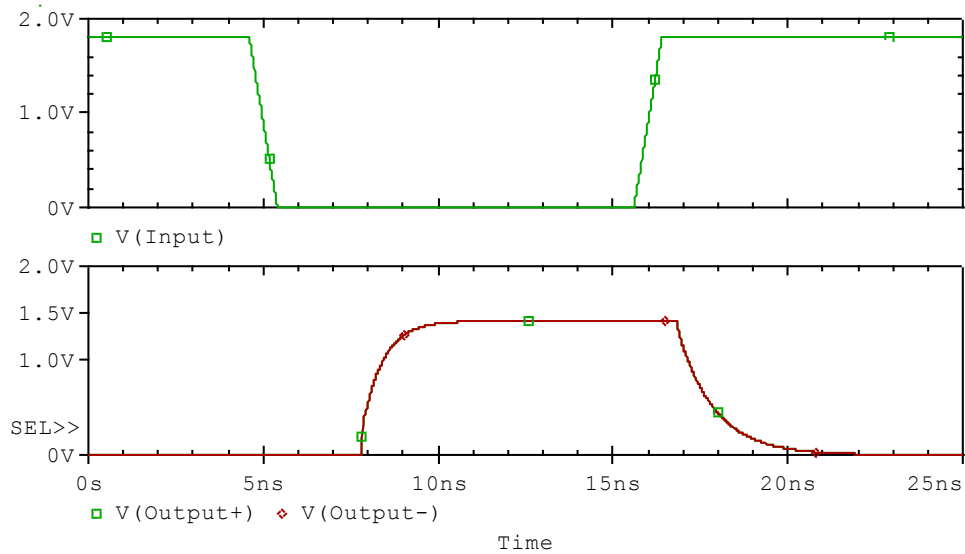
Parameters	Measurement	Simulation	%Error
tpd (ns) (Note 1)	0.25	0.255	2.00
t_{SK(P)} (ns)	0.10 [Typ.]	0.05	-
t_{SK(O)} (ns)	0.1 [Typ.]	0	-

Note 1: Propagation Delay Time Characteristics of TC7USB31FK are model using transmission line model with $T_D=0.18n$ and Z_0 that is matched with Z_{OUT} of the input signal.

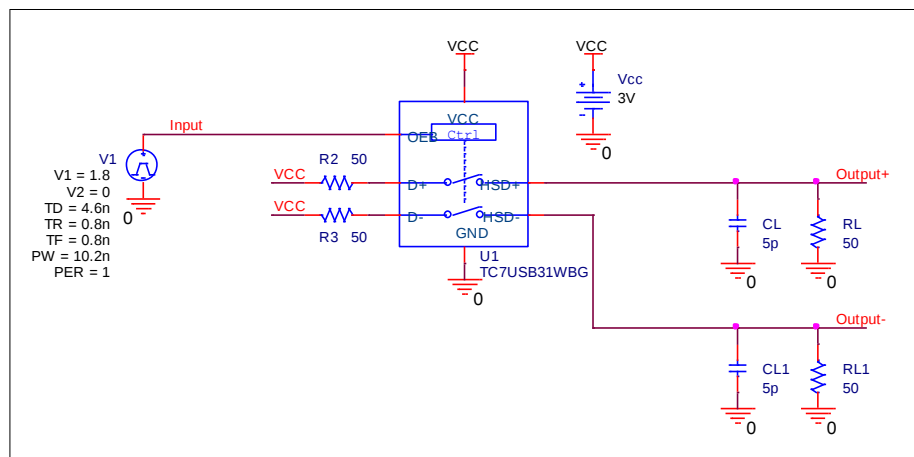


Turn ON/Turn OFF Time Characteristics

Simulation result



Evaluation circuit



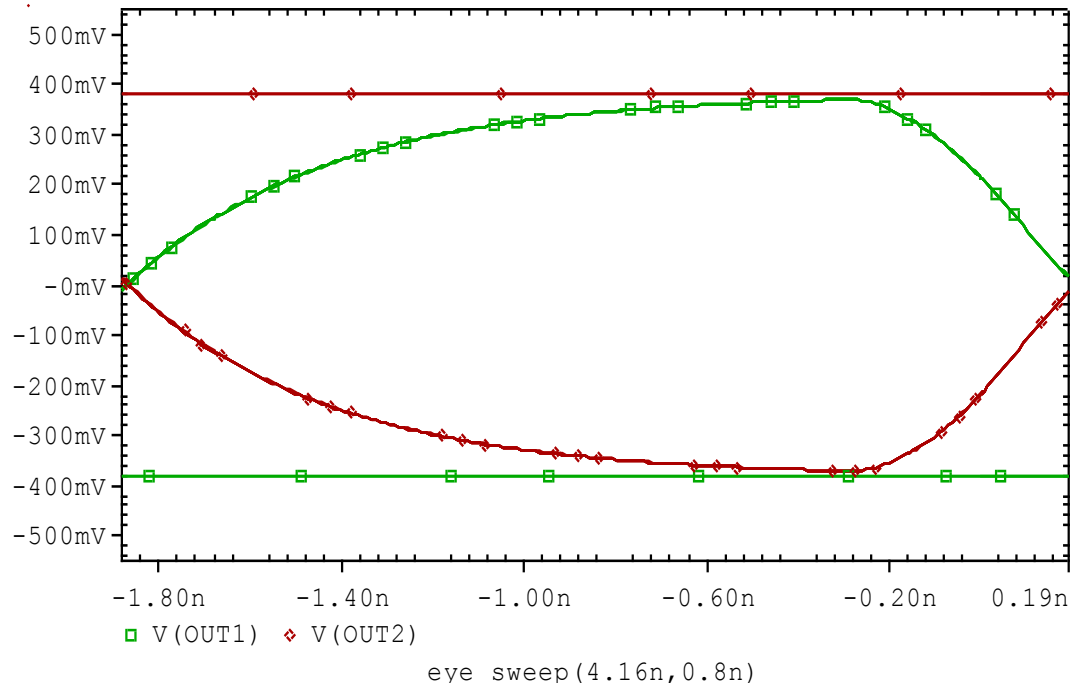
Simulation Result

Condition: $V_{CC} = 3.3\text{ V}$, $R_L = 5\Omega$, $C_L = 5\text{ pF}$

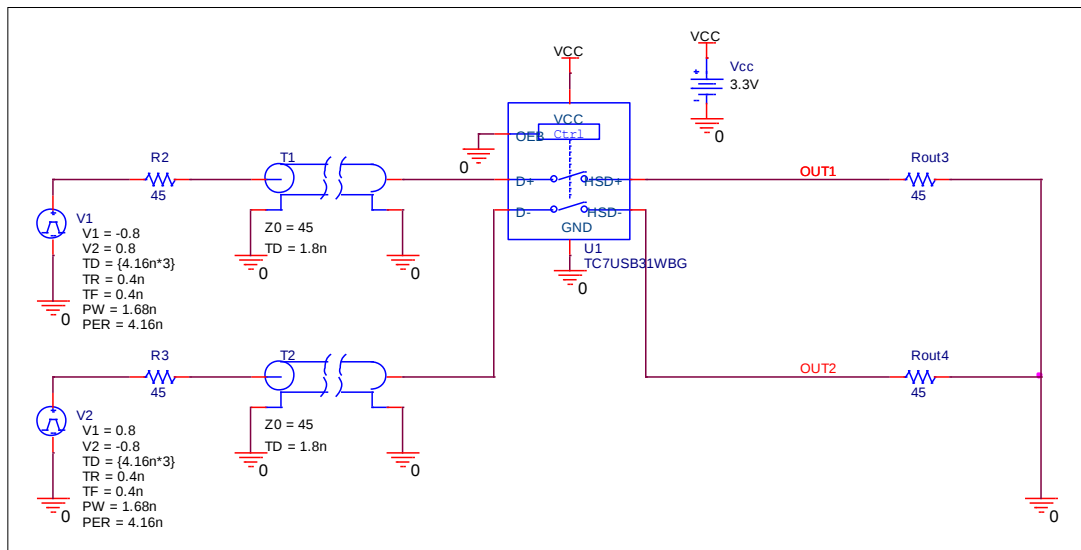
Parameters	Measurement	Simulation	%Error
$t_{ON}\text{ (ns)}$	4	4.033	0.83
$t_{OFF}\text{ (ns)}$	3.2	3.173	-0.84

USB2.0 Eye Pattern Characteristics

Simulation result

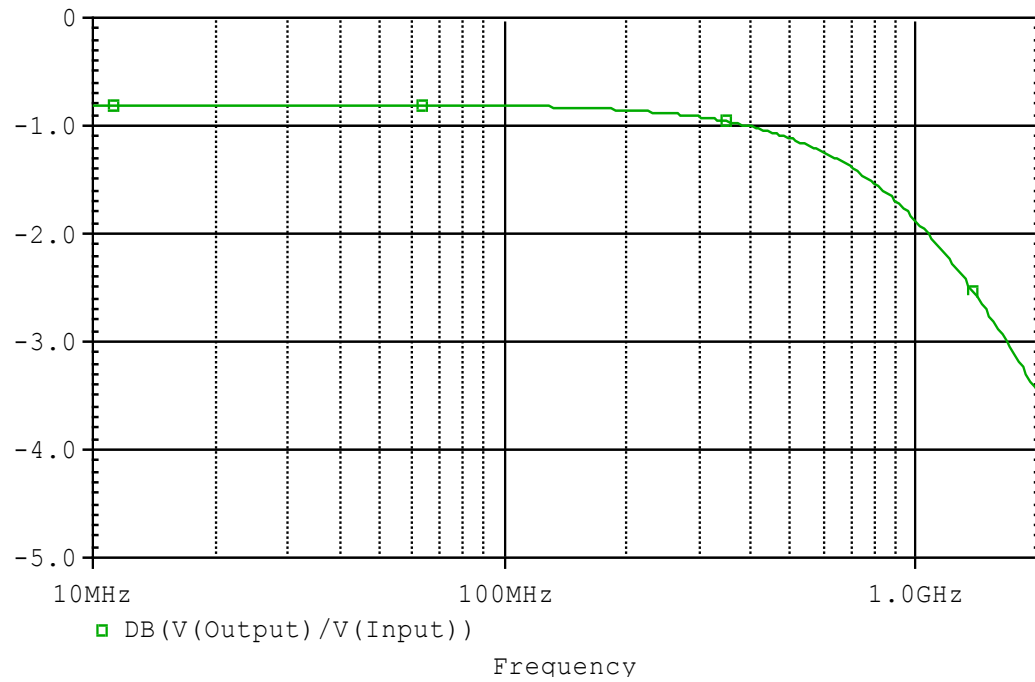


Evaluation circuit



Frequency Characteristics

Simulation result



Evaluation circuit

