

Device Modeling Report

COMPONENTS : PHOTOCOUPLER
PART NUMBER : TLP124
MANUFACTURER : TOSHIBA



Bee Technologies Inc.

DIODE MODEL

Pspice model Parameter	Model description
IS	Saturation Current
N	Emission Coefficient
RS	Series Resistance
IKF	High-injection Knee Current
CJO	Zero-bias Junction Capacitance
M	Junction Grading Coefficient
VJ	Junction Potential
ISR	Recombination Current Saturation Value
BV	Reverse Breakdown Voltage(a positive value)
IBV	Reverse Breakdown Current(a positive value)
TT	Transit Time

BIPOLAR JUNCTION TRANSISTOR MODEL

Pspice model parameter	Model description
NR	Reverse Emission Coefficient
RB	Base Resistance
RC	Series Collector Resistance
CJE	Zero-bias Emitter-Base Junction Capacitance
CJC	Zero-bias Collector-Base Junction Capacitance
TF	Forward Transit Time
TR	Reverse Transit Time

VOLTAGE CONTROLLED VOLTAGE SOURCE MODEL(VCVS)

E<Name><(+)Node><(−)Node>VALUE={Expression}

E<Name><(+)Node><(−)Node>TABLE={Expression}

VOLTAGE CONTROLLED CURRENT SOURCE MODEL(VCCS)

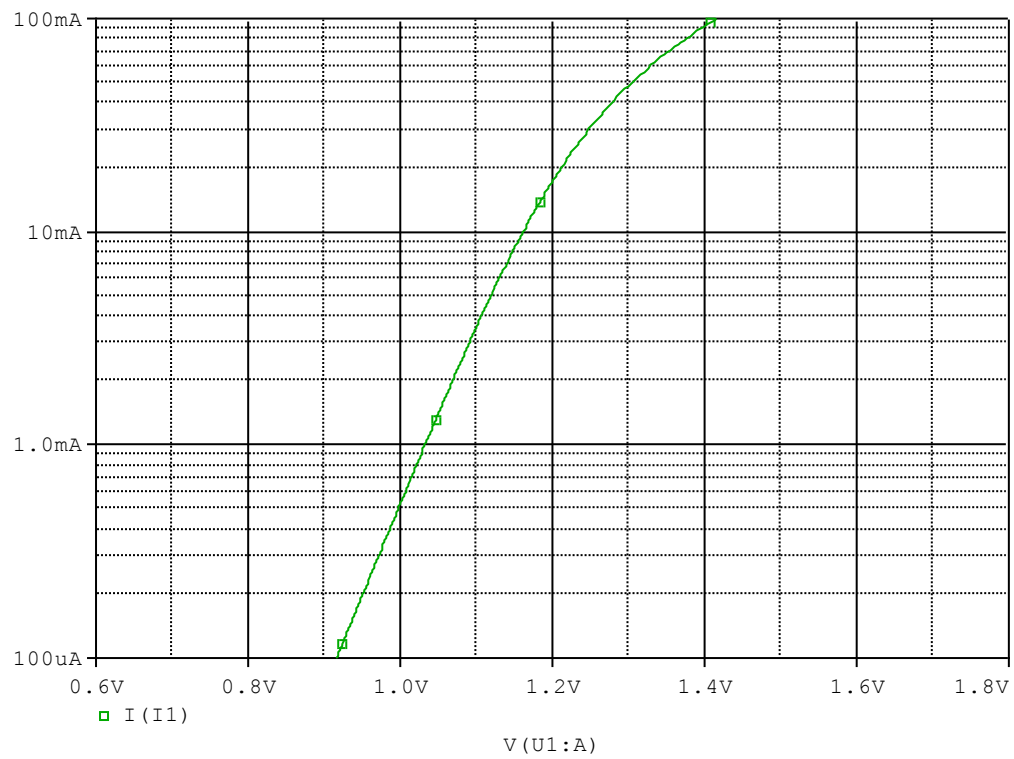
E<Name><(+)Node><(−)Node>VALUE={Expression}

CURRENT CONTROLLED MODEL(W)

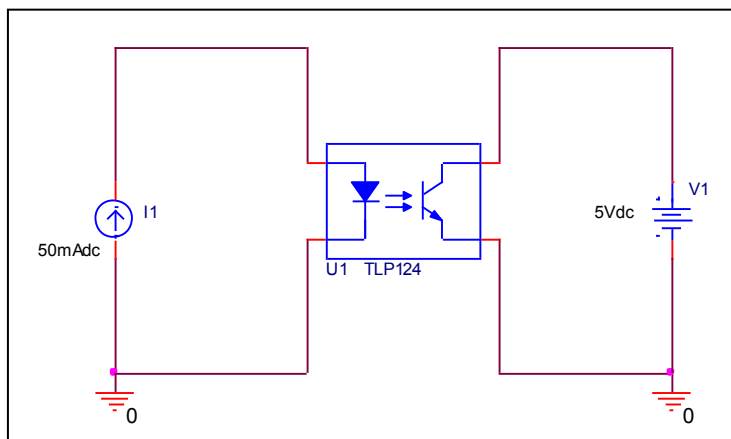
Pspice model parameter	Model description
IOFF	Controlling current to Off state
ION	Controlling current to On state
ROFF	Off Resistance
RON	On Resistance

LED IV Curve Characteristics

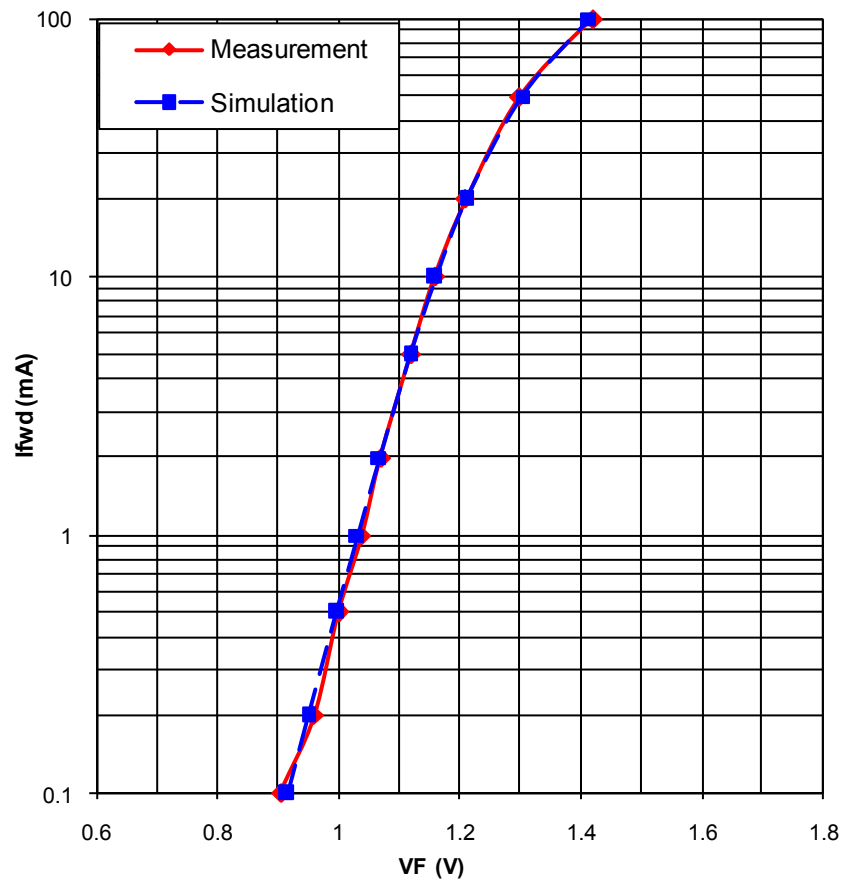
Simulation result



Evaluation Circuit



Comparison Graph

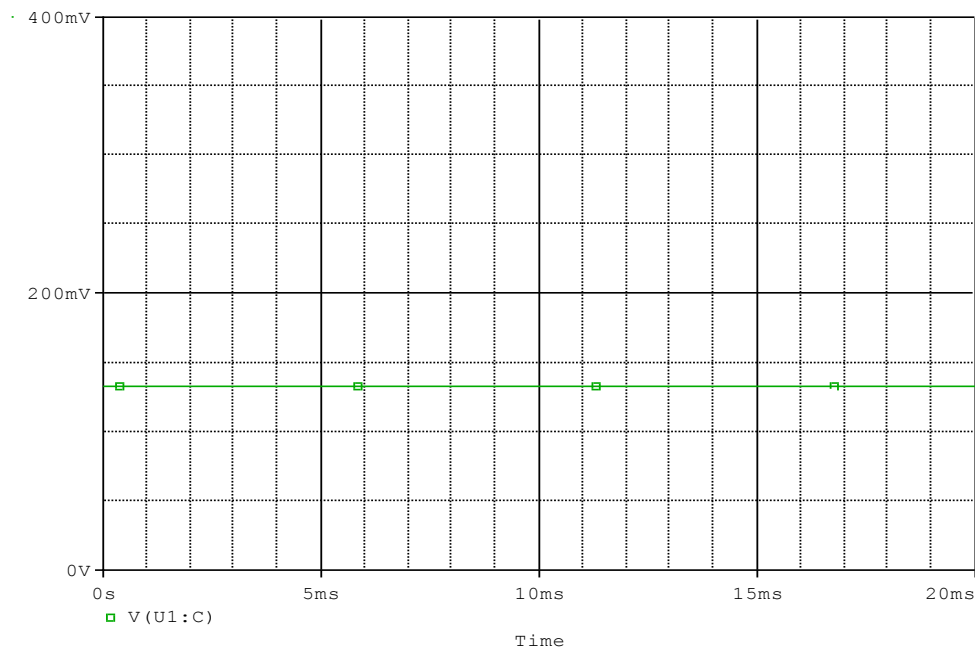


Comparison Table

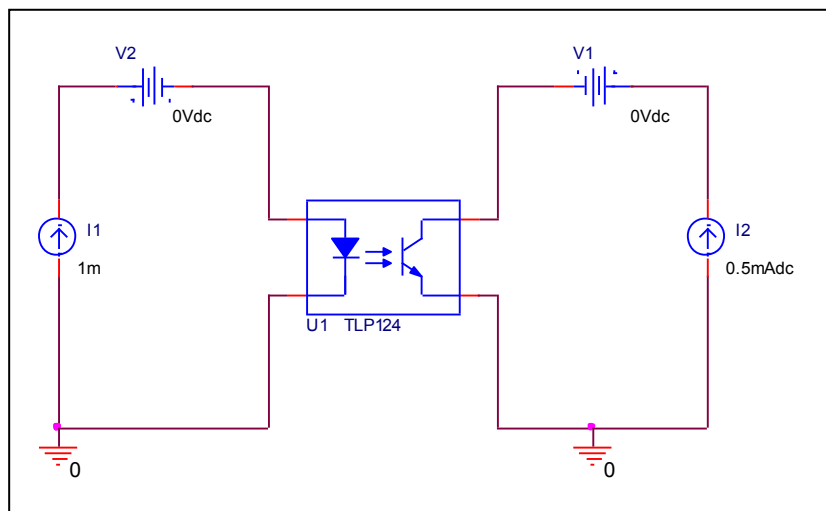
Ifwd (mA)	Vfwd(V)		% Error
	Measurement	Simulation	
0.100	0.905	0.916	1.215
0.200	0.960	0.951	-0.979
0.500	1.000	0.998	-0.210
1.000	1.038	1.033	-0.511
2.000	1.070	1.068	-0.178
5.000	1.120	1.119	-0.054
10.000	1.160	1.161	0.103
20.000	1.210	1.212	0.140
50.000	1.299	1.304	0.408
100.000	1.420	1.416	-0.282

Transistor Saturation Characteristics

Simulation result



Evaluation Circuit



Comparison Table

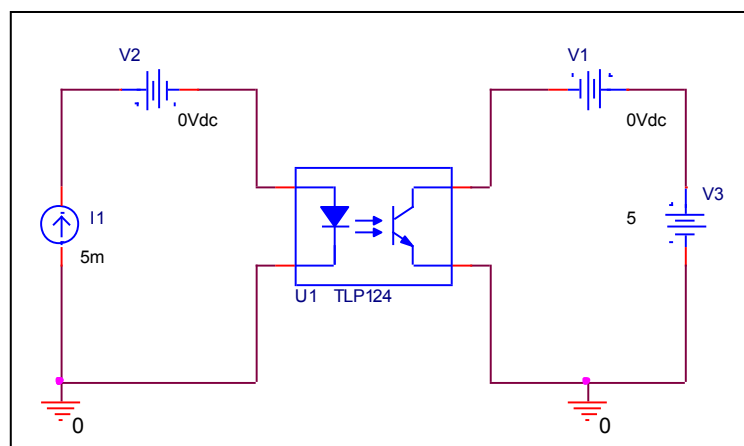
	Measurement	Simulation	% Error
$V_{CE(sat)}$ (V)	0.4 (Max)	0.133	-

CTR(Current Transfer Ratio) Characteristics

Simulation result



Evaluation Circuit



Rise Curve Table

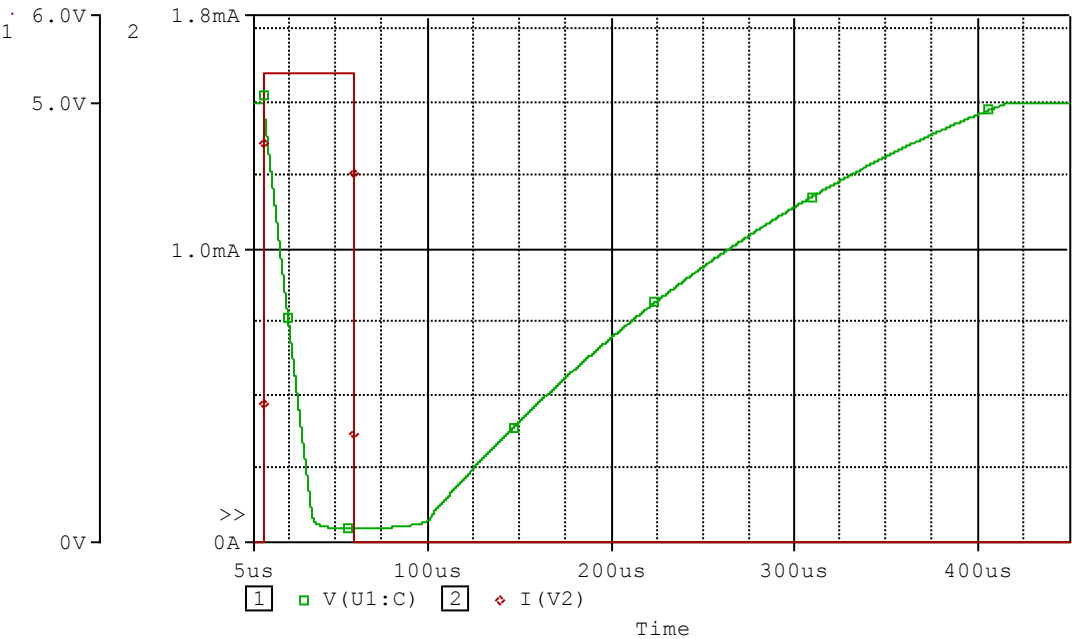
If (mA)	IO/IF		% Error
	Measurement	Simulation	
0.200	250.000	259.552	3.821
0.500	495.000	487.065	-1.603
1.000	693.000	659.329	-4.859
2.000	875.000	831.455	-4.977
2.700	910.000	906.515	-0.383

Fall Curve Table

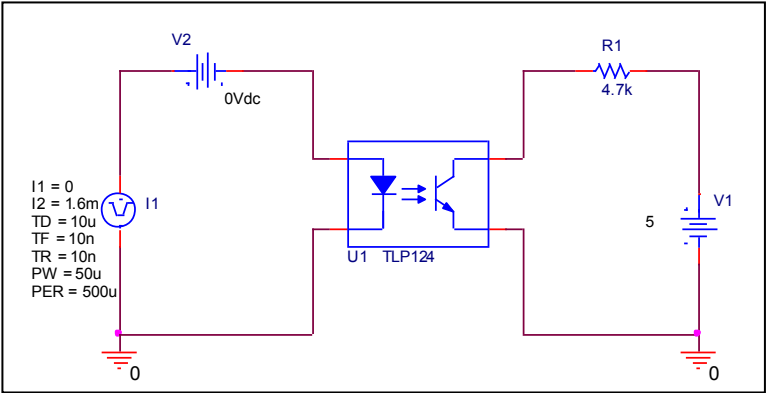
If(mA)	IO/IF		% Error
	Measurement	Simulation	
2.700	910.000	906.515	-0.383
3.000	890.000	850.029	-4.491
5.000	690.000	657.468	-4.715
8.000	470.000	485.427	3.282
10.000	400.000	398.141	-0.465

Switching Time Characteristics

Simulation result



Evaluation Circuit



Comparison Table

$I_F=1.6\text{mA}$, $R_L=4.7\text{k}\Omega$	Measurement	Simulation	% Error
t_s (us)	50.000	49.999	-0.002
t_{OFF} (us)	300.000	300.030	0.010