

Device Modeling Report

COMPONENTS : PHOTOCOUPLER
PART NUMBER : TLP280
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)

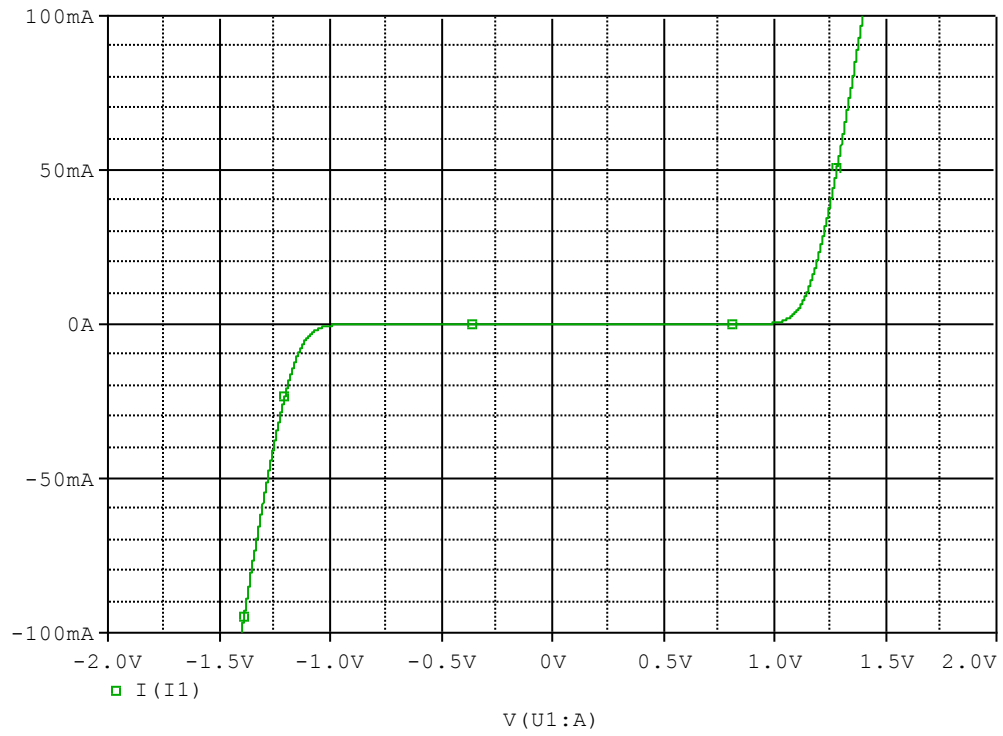
E<Name><(+)Node><(–)Node>VALUE={Expression}

CURRENT CONTROLLED MODEL(W)

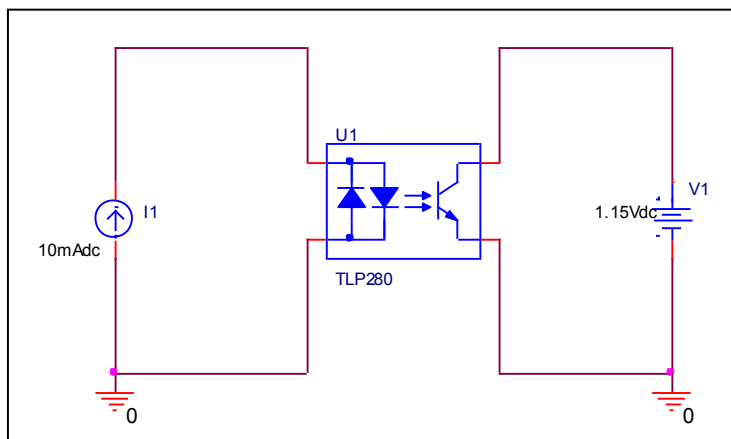
Pspice model parameter	Model description
IOFF	Controlling current to Off state
ION	Controlling current to On state
ROFF	Off Resistance
RON	On Resistance

LED IV Curve Characteristics

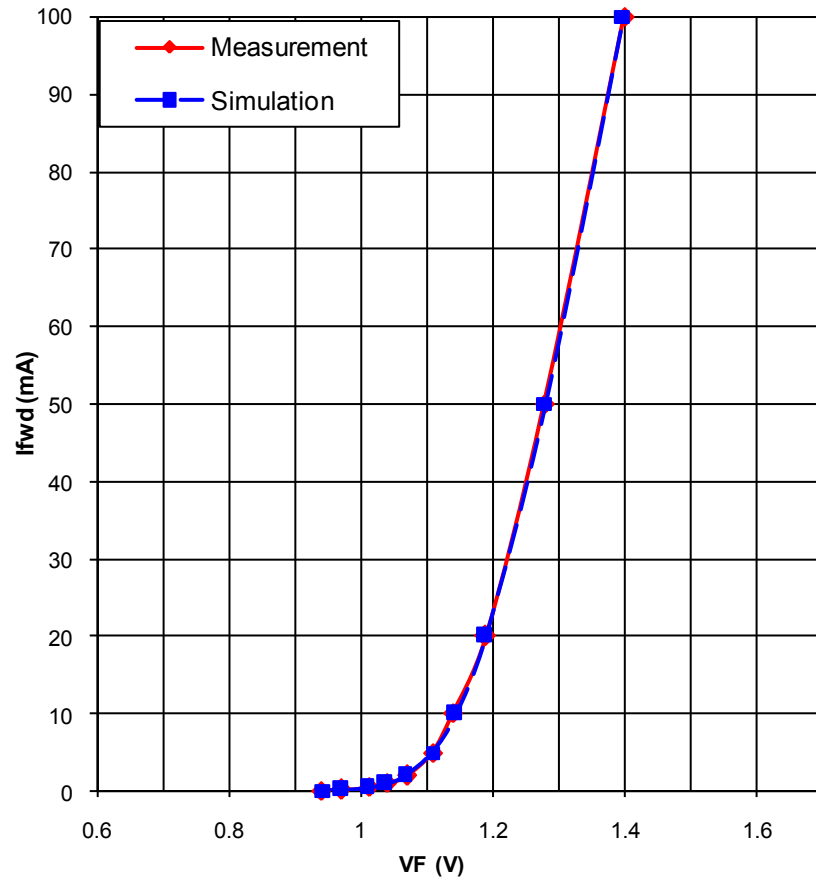
Simulation result



Evaluation Circuit



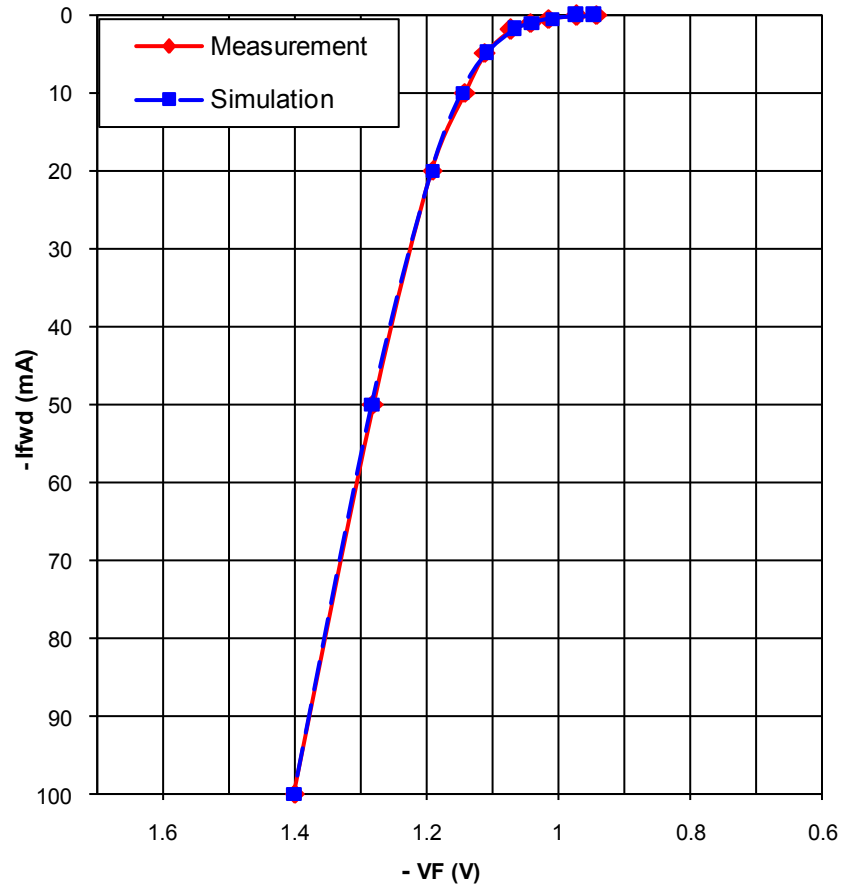
Comparison Graph



Comparison Table

Ifwd (mA)	Vfwd(V)		% Error
	Measurement	Simulation	
0.100	0.940	0.944	0.426
0.200	0.970	0.972	0.206
0.500	1.013	1.009	-0.375
1.000	1.040	1.038	-0.221
2.000	1.070	1.067	-0.318
5.000	1.110	1.109	-0.099
10.000	1.140	1.145	0.439
20.000	1.190	1.190	0.025
50.000	1.280	1.281	0.078
100.000	1.400	1.399	-0.086

Comparison Graph

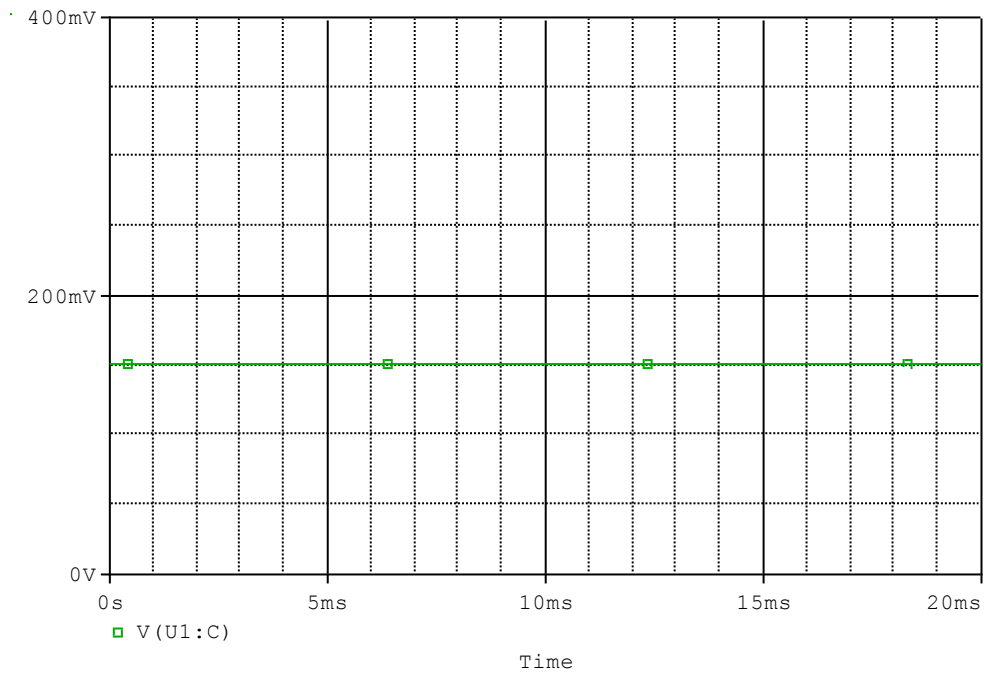


Comparison Table

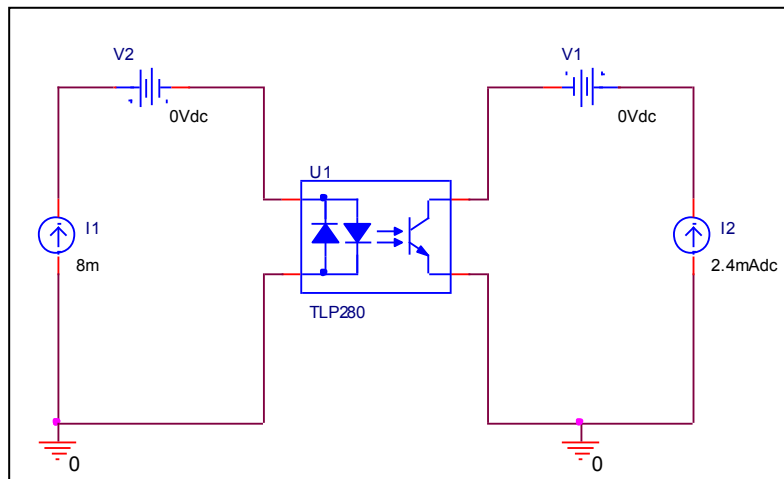
Ifwd (mA)	Vfwd(V)		% Error
	Measurement	Simulation	
-100.000	-1.400	-1.399	-0.086
-50.000	-1.280	-1.281	0.078
-20.000	-1.190	-1.190	0.025
-10.000	-1.140	-1.145	0.439
-5.000	-1.110	-1.109	-0.099
-2.000	-1.070	-1.067	-0.318
-1.000	-1.040	-1.038	-0.221
-0.500	-1.013	-1.009	-0.375
-0.200	-0.970	-0.972	0.206
-0.100	-0.940	-0.944	0.426

Transistor Saturation Characteristics

Simulation result



Evaluation Circuit

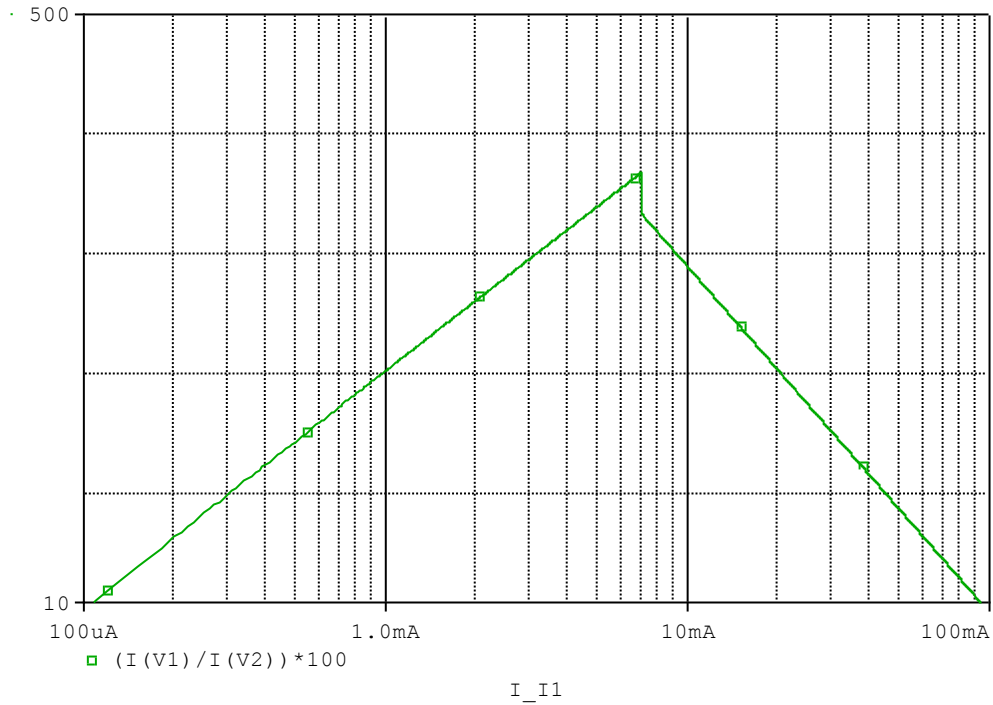


Comparison Table

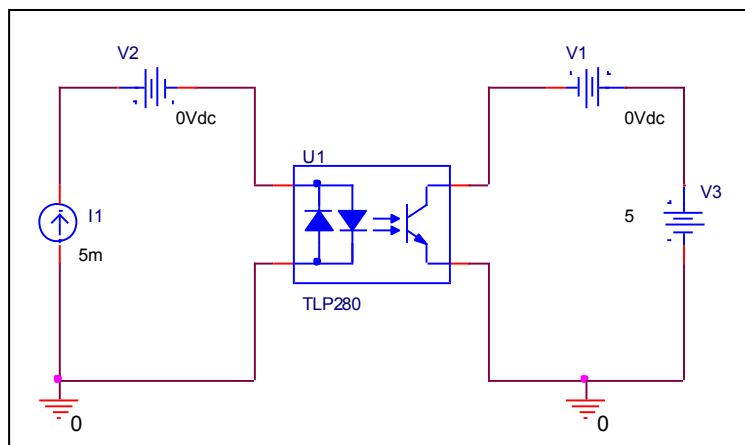
	Measurement	Simulation	% Error
$V_{CE(sat)}$ (V)	0.4 (Max)	0.151	-

CTR(Current Transfer Ratio) Characteristics

Simulation result



Evaluation Circuit



Rise Curve Table

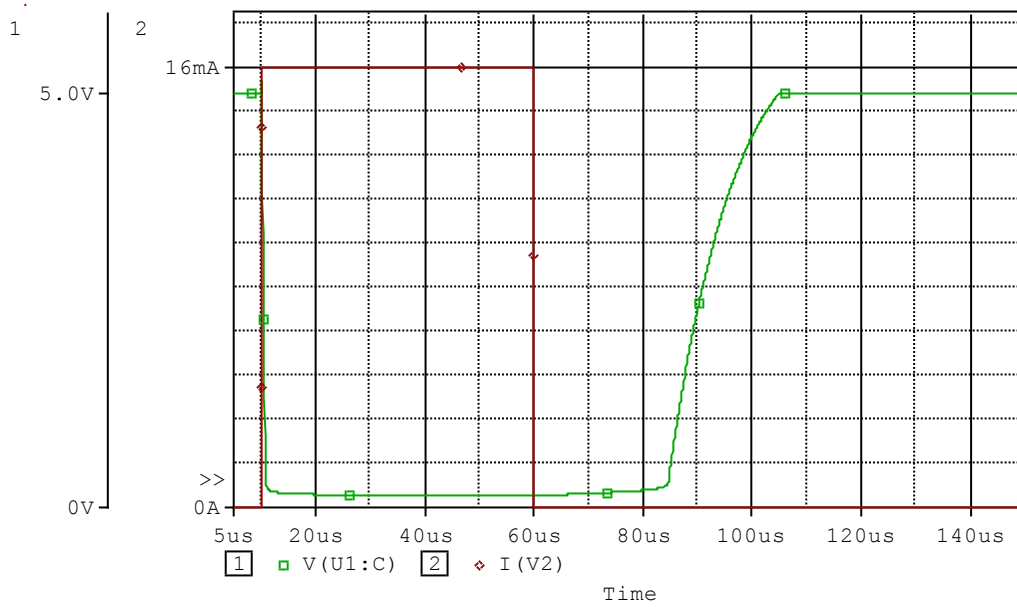
If (mA)	IO/IF		% Error
	Measurement	Simulation	
0.200	68.000	64.903	-4.554
0.500	140.000	143.931	2.808
1.000	210.000	203.170	-3.252
2.000	275.000	261.653	-4.853
5.000	340.000	339.277	-0.213
7.000	345.000	360.487	4.489

Fall Curve Table

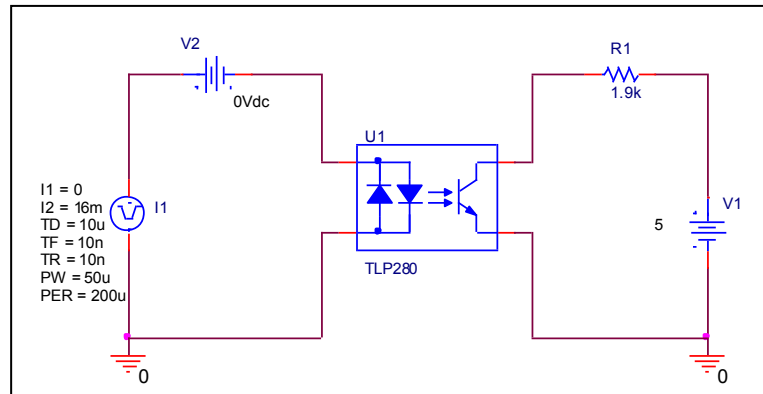
If(mA)	IO/IF		% Error
	Measurement	Simulation	
7.000	345.000	360.487	4.489
10.000	305.000	289.858	-4.965
20.000	195.000	202.915	4.059
50.000	92.000	88.487	-3.818

Switching Time Characteristics

Simulation result



Evaluation Circuit



Comparison Table

$I_F=16\text{mA}$, $R_L=1.9\text{k}\Omega$	Measurement	Simulation	% Error
t_s (us)	25.000	25.007	0.028
t_{OFF} (us)	40.000	40.034	0.085