

# Device Modeling Report

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PART NUMBER : TLP521-1  
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REMARK : SAMPLE A



**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}

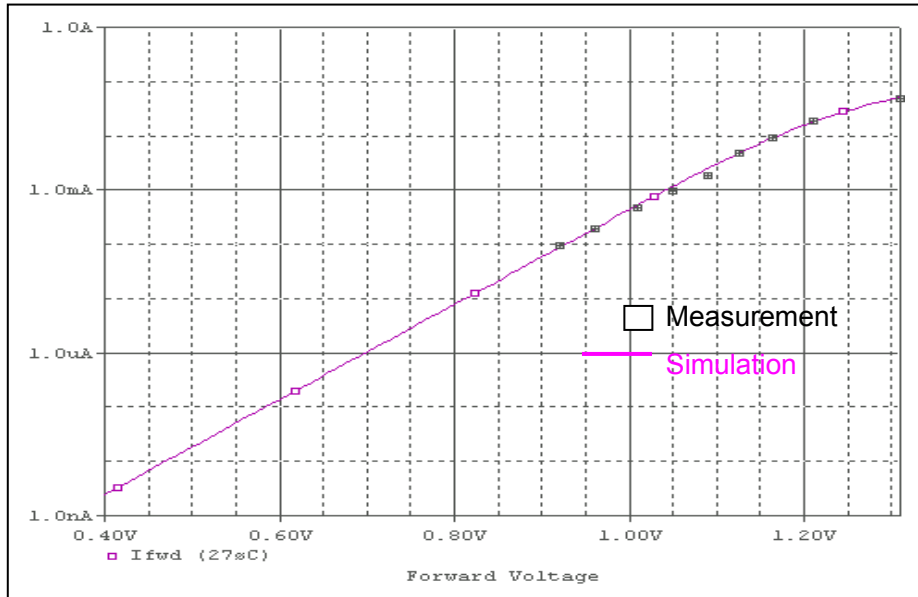
## **VOLTAGE CONTROLLED CURRENT SOURCE MODEL(VCCS)**

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

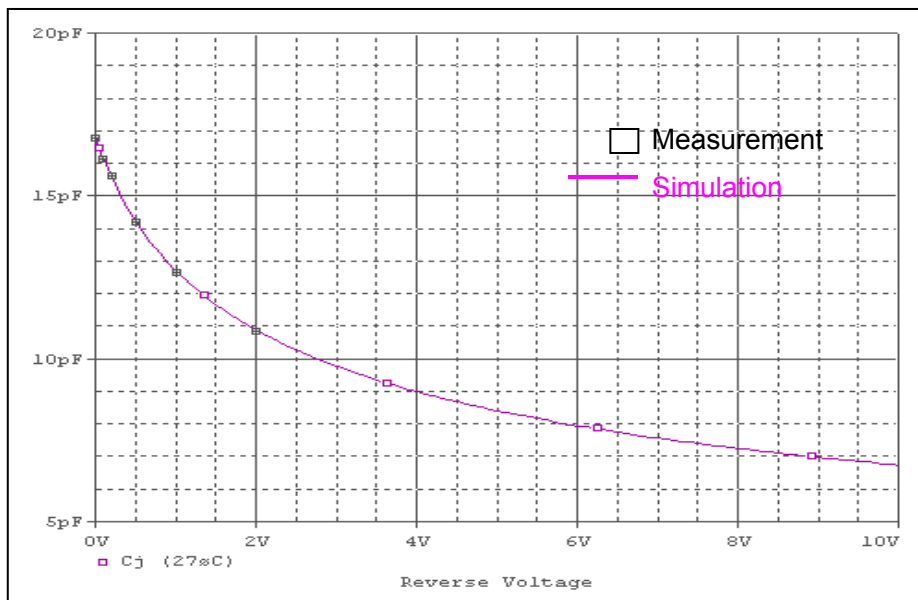
## **CURRENT CONTROLLED MODEL(W)**

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

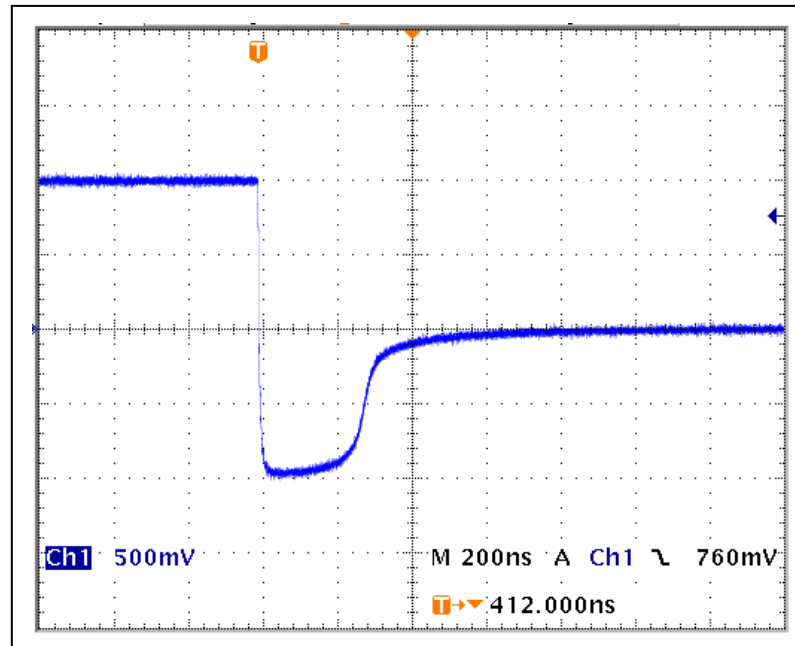
## Input Device Forward Current Characteristics



## Input Device Junction Capacitance Characteristics



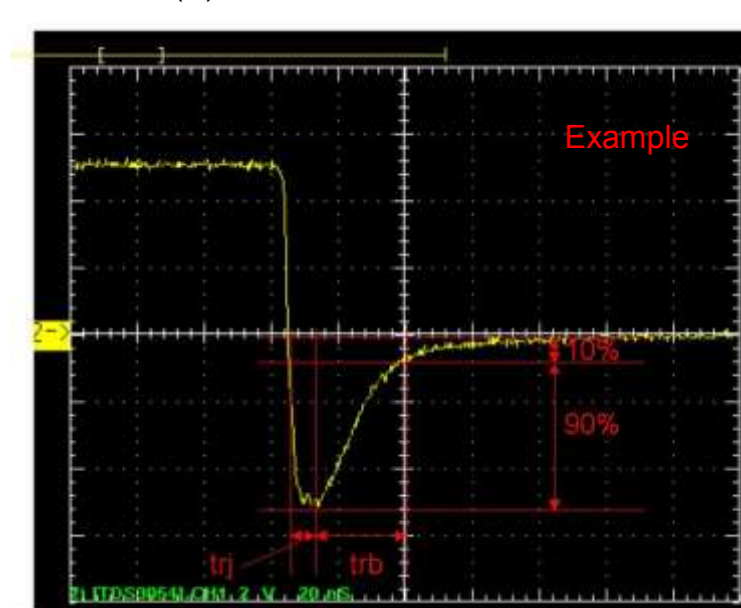
## Input Device Reverse Recovery Characteristics



$trj=120n(s)$

$trb=288n(s)$

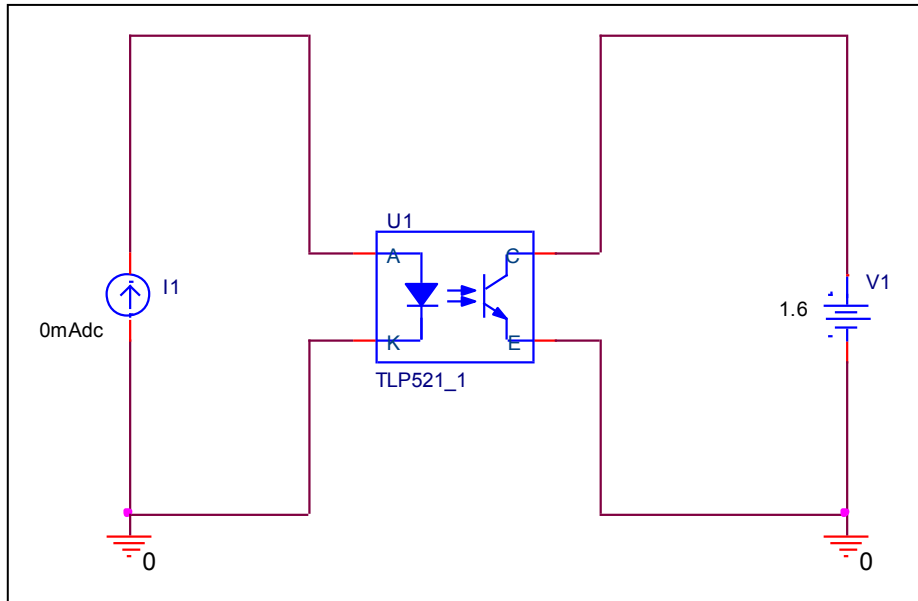
Conditions:  $I_{fwd}=I_{rev}=0.04(A)$ ,  $R_I=50$



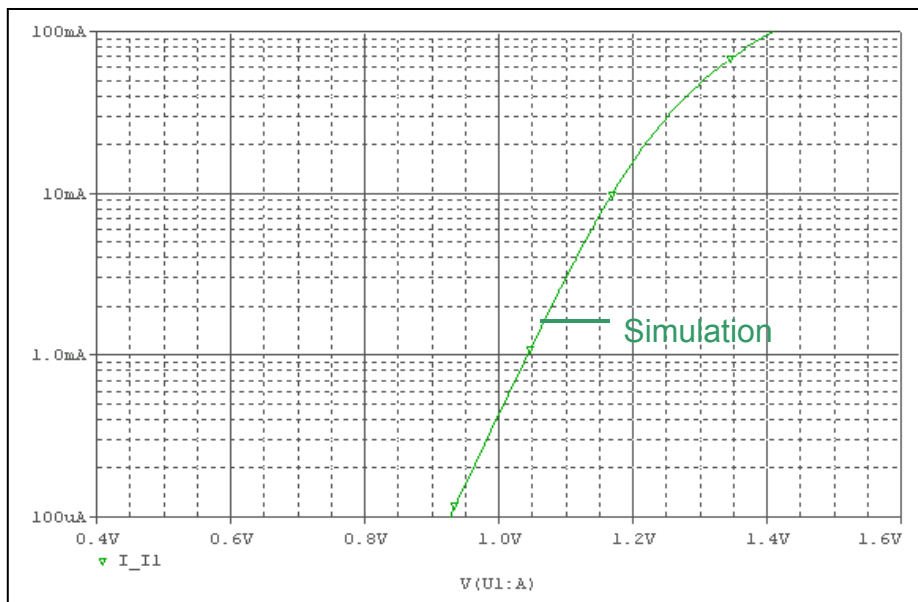
Relation between  $trj$  and  $trb$

# LED IV Curve Characteristics

## Evaluation Circuit



## Simulation result

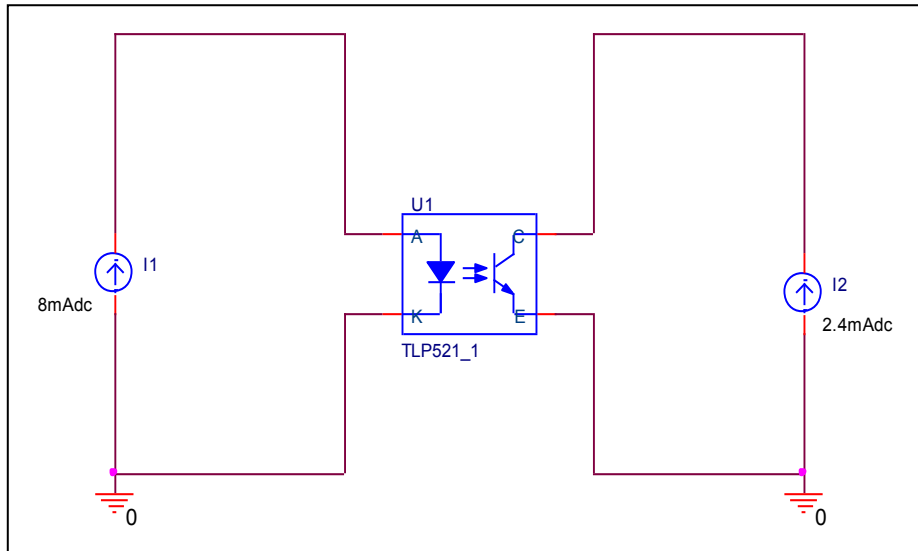


## Comparison Table

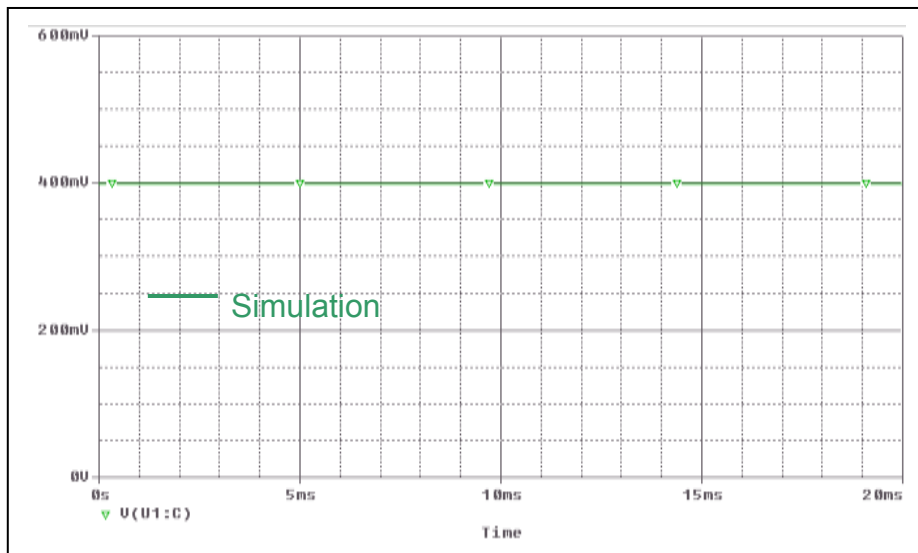
Ifwd(A)	Vfwd(V)		% Error
	Measurement	Simulation	
0.0001	0.92	0.927116	0.773
0.0002	0.96	0.961572	0.164
0.0005	1.01	1.0076	-0.238
0.001	1.05	1.0427	-0.695
0.002	1.09	1.0785	-1.055
0.005	1.125	1.1283	0.293
0.01	1.165	1.1697	0.403
0.02	1.21	1.2182	0.678
0.05	1.31	1.3060	-0.305

# Transistor Saturation Characteristics

## Evaluation Circuit



## Simulation result



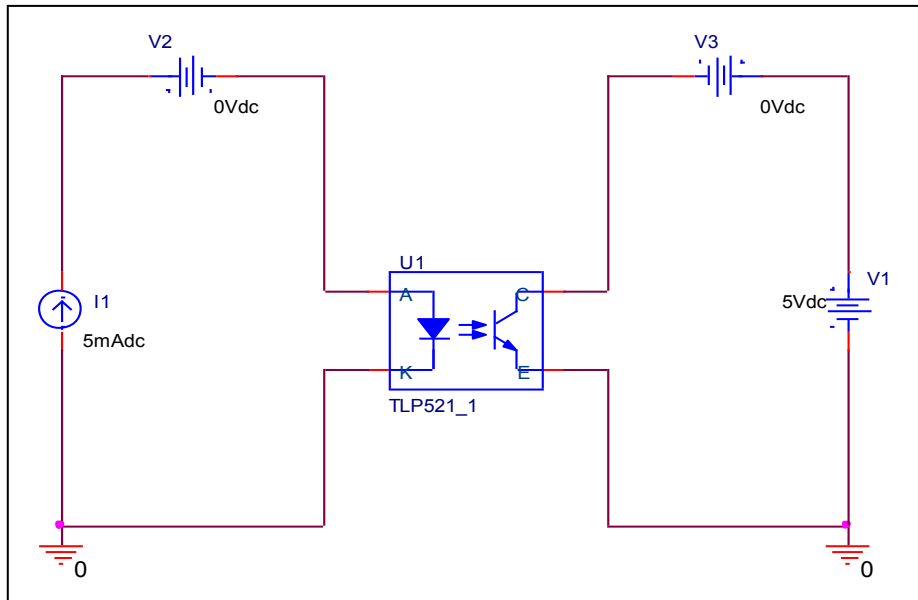
## Comparison Table

	Measurement	Simulation	% Error
$V_{ce} \text{ (sat)}$	0.4 V	0.398485 V	-0.379

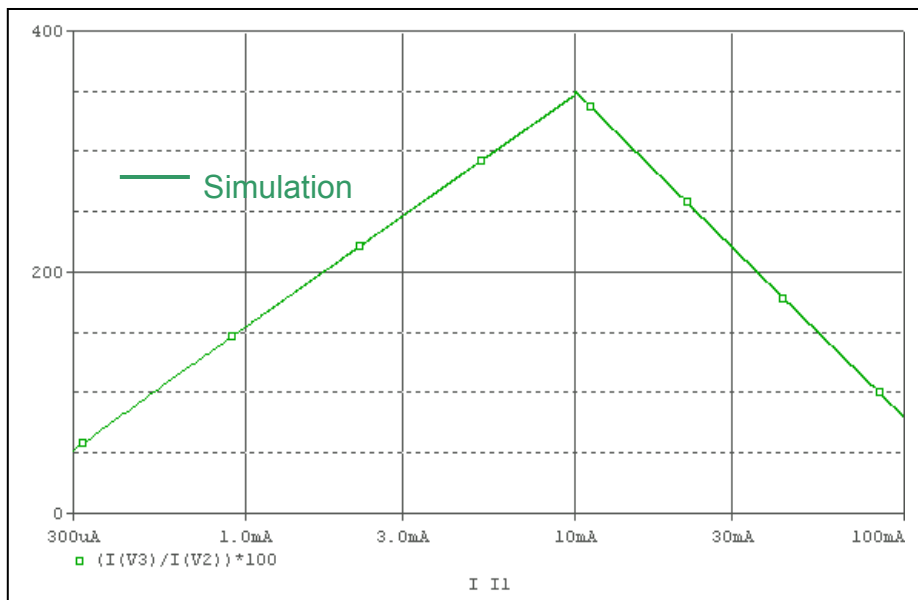


# CTR(Current Transfer Ratio) Characteristics

## Evaluation Circuit



## Simulation result



### Rise Curve Table

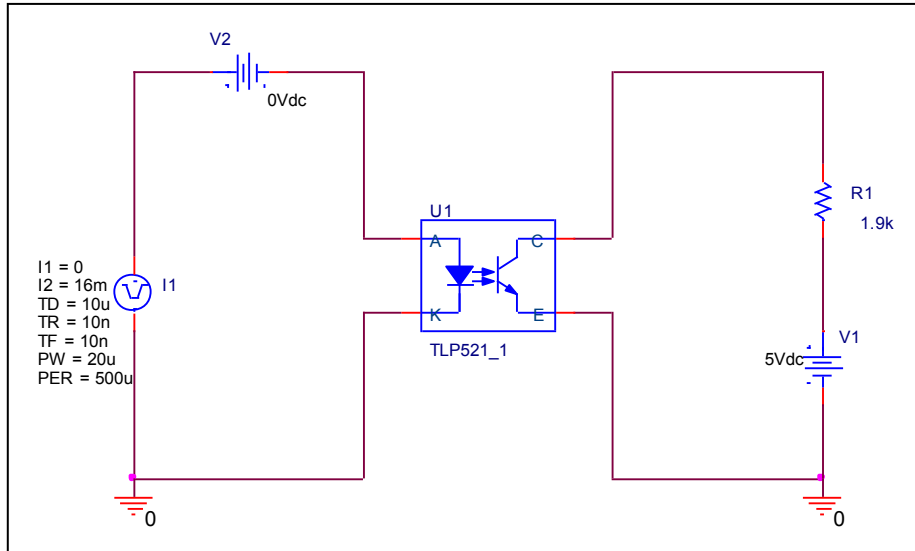
If(mA)	CTR(%)		% Error
	Measurement	Simulation	
0.5	95	95.875	0.921
1	160	154.340	-3.538
3	250	246.570	-1.372
5	300	289.174	-3.609
8	330	328.211	-0.542
10	350	350.044	0.013

### Fall Curve Table

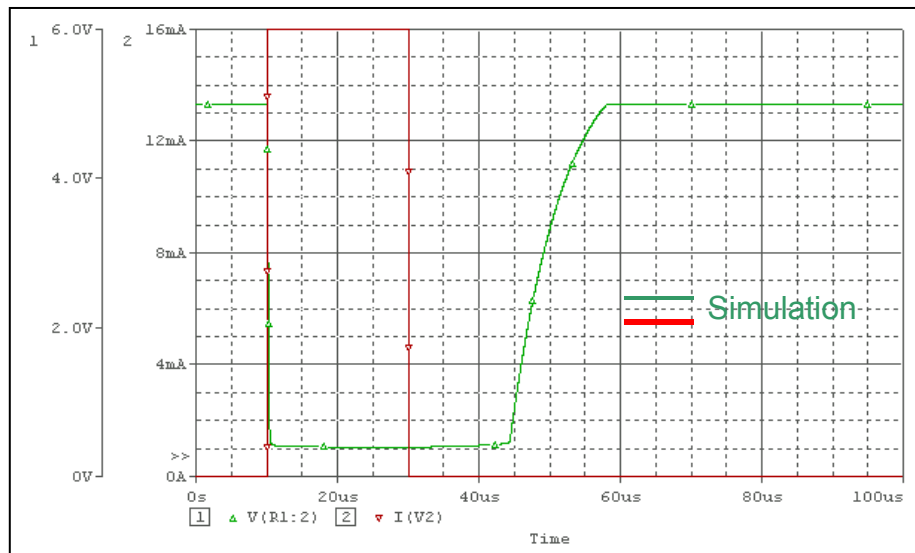
If(mA)	CTR(%)		% Error
	Measurement	Simulation	
10	350	350.044	0.013
20	280	268.431	-4.132
30	230	220.757	-4.019
40	190	186.974	-1.593
50	160	160.801	0.501
60	140	139.438	-0.401

# Switching Time Characteristics

## Evaluation Circuit



## Simulation result



## Comparison Table

$V_{CC}=5V, I_F=16mA, R_L=1.9k\Omega$	Measurement	Simulation	% Error
<b>Ts (us)</b>	15	14.966	-0.227
<b>Toff (us)</b>	25	24.920	-0.320