

# Device Modeling Report

COMPONENTS: DIODE/ GENERAL PURPOSE  
RECTIFIER/ STANDARD MODEL  
PART NUMBER: D5LC20U  
MANUFACTURER: SHINDENGEN

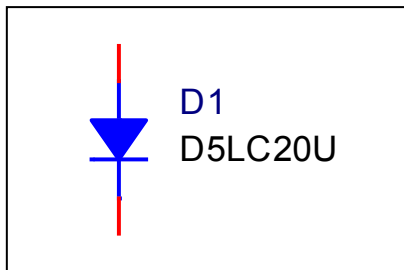


**Bee Technologies Inc.**

## SPICE MODEL

```
*$  
* PART NUMBER: D5LC20U  
* MANUFACTURER: SHINDENGEN  
* VRRM=200V, IF=5A  
* All Rights Reserved Copyright (C) Bee Technologies Inc. 2011  
.MODEL D5LC20U D  
+ IS=3.1856E-9  
+ N=1.3728  
+ RS=16.062E-3  
+ IKF=.12611  
+ CJO=171.20E-12  
+ M=.4391  
+ VJ=.64132  
+ ISR=0  
+ BV=210  
+ IBV=10e-6  
+ TT=12.356E-9  
*$
```

## Circuit Configuration

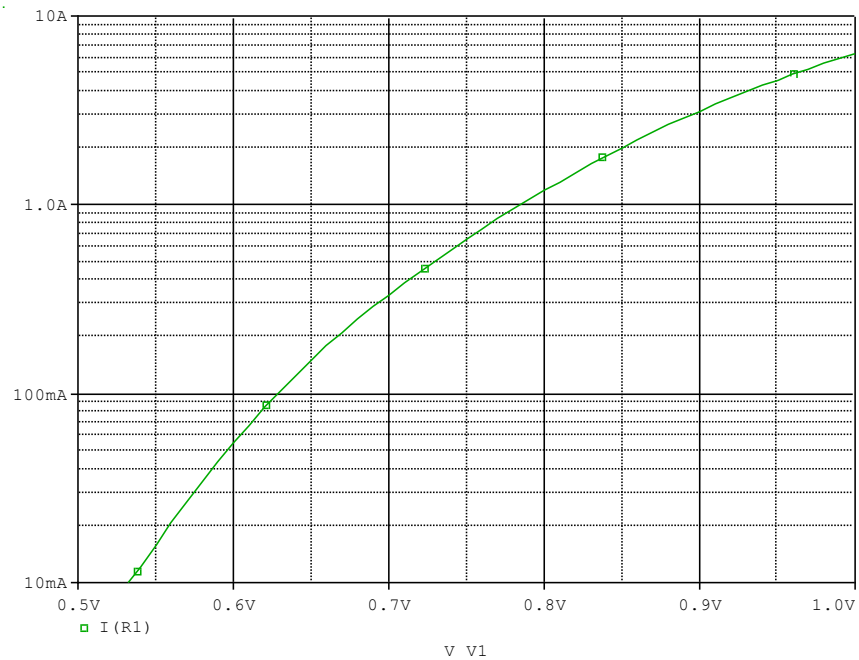


## DIODE MODEL PARAMETERS

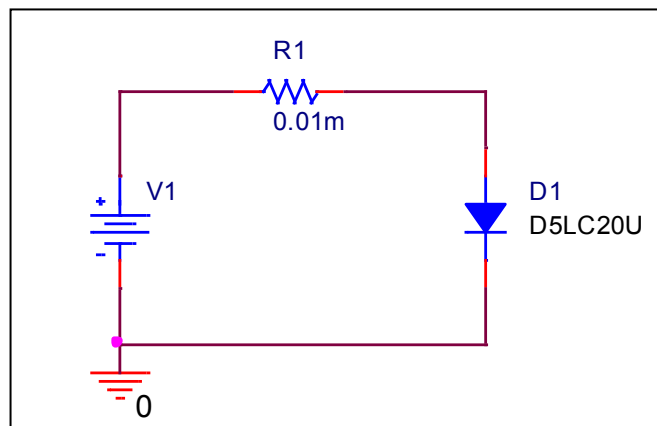
<b>PSpice model parameter</b>	<b>Model description</b>
IS	Saturation Current
N	Emission Coefficient
RS	Series Resistance
IKF	High-injection Knee Current
CJO	Zero-bias Junction Capacitance
M	Junction Grading Coefficient
VJ	Junction Potential
ISR	Recombination Current Saturation Value
BV	Reverse Breakdown Voltage(a positive value)
IBV	Reverse Breakdown Current(a positive value)
TT	Transit Time
EG	Energy-band Gap

## Forward Current Characteristics

Circuit Simulation result

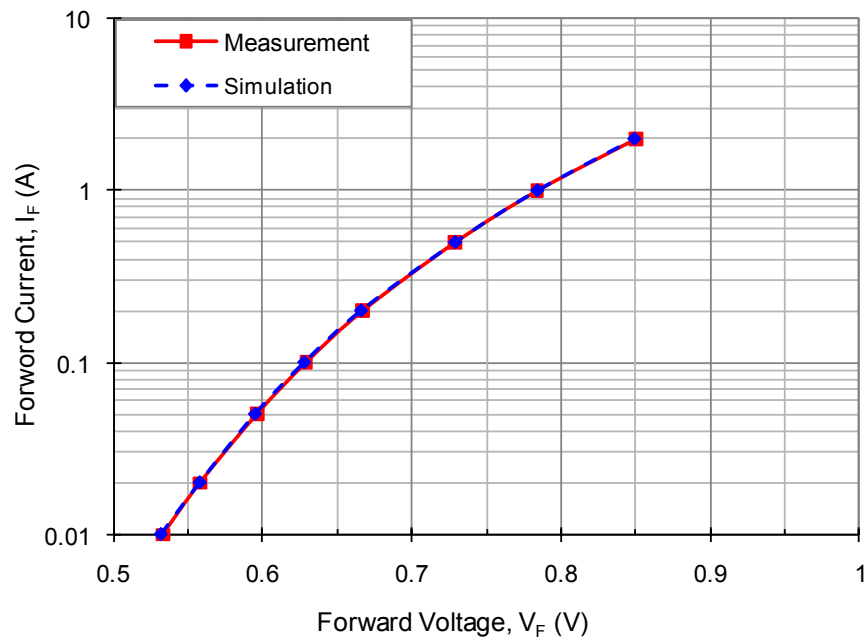


Evaluation circuit



## Comparison Graph

Circuit Simulation result

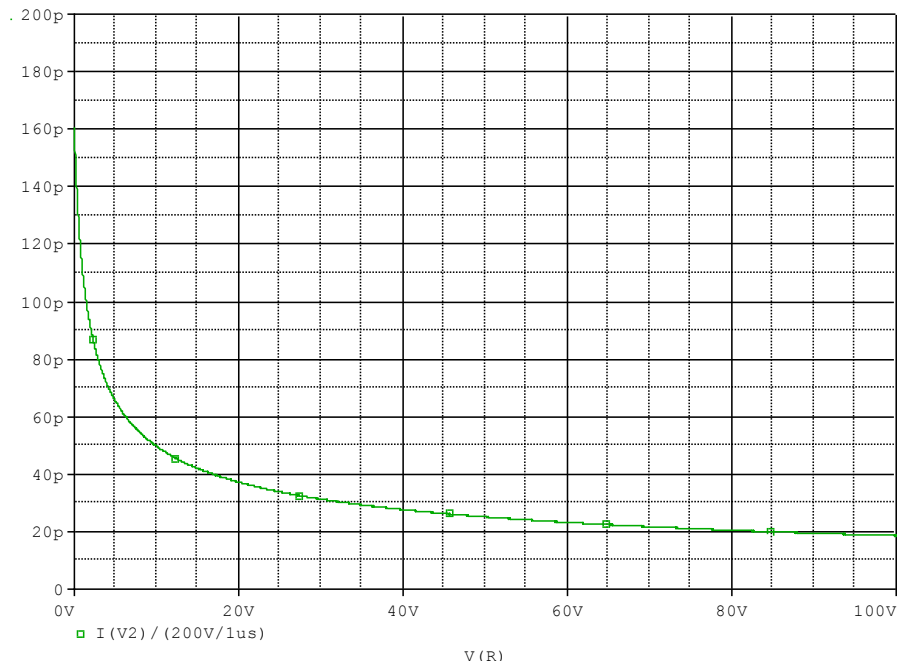


Comparison table

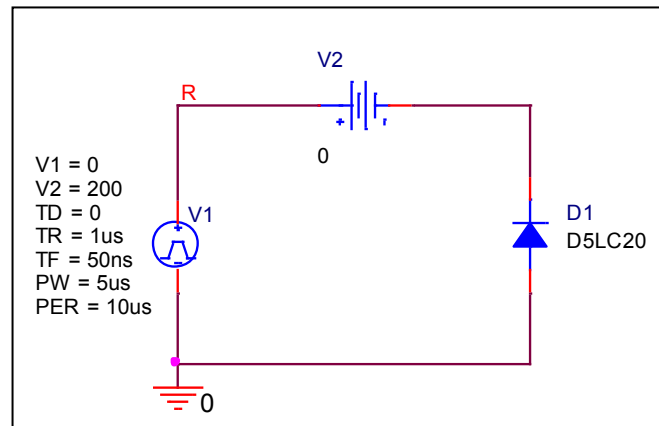
$I_F$ (A)	$V_F$ (V)		%Error
	Measurement	Simulation	
0.01	0.533	0.532	-0.19
0.02	0.558	0.558	0.00
0.05	0.596	0.595	-0.17
0.1	0.629	0.628	-0.16
0.2	0.667	0.666	-0.15
0.5	0.729	0.729	0.00
1	0.784	0.784	0.00
2	0.850	0.849	-0.12

## Junction Capacitance Characteristic

### Circuit Simulation result

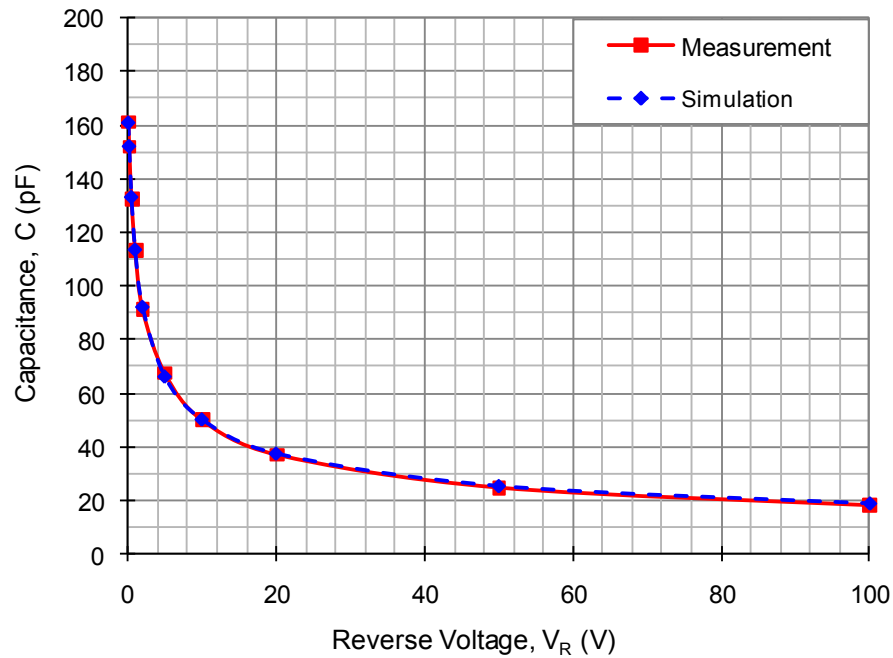


### Evaluation circuit



## Comparison Graph

Circuit Simulation result

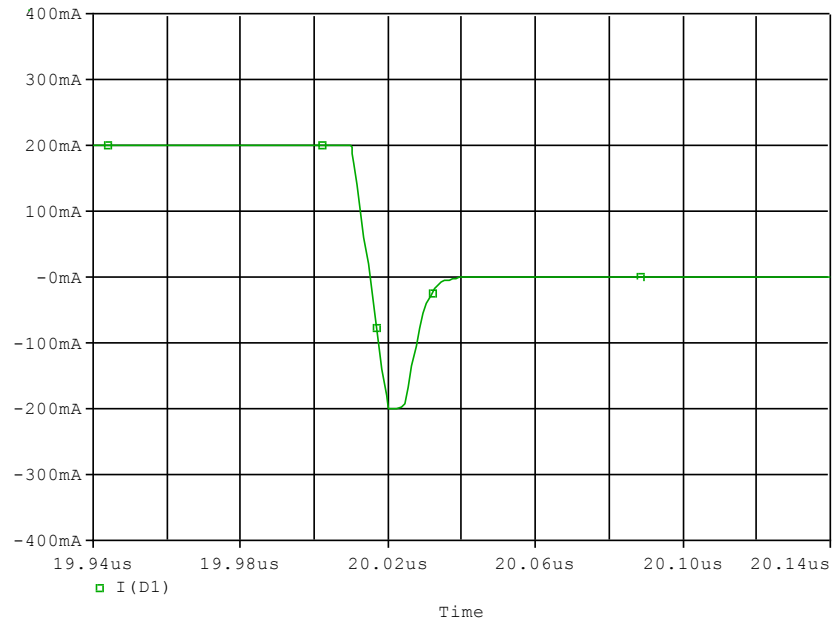


Comparison table

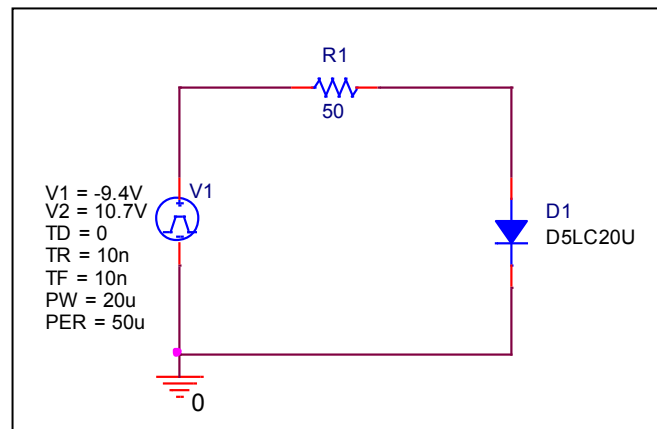
$V_R$ (V)	C (pF)		%Error
	Measurement	Simulation	
0.1	161.080	160.800	-0.17
0.2	152.000	152.000	0.00
0.5	132.450	133.033	0.44
1	113.360	113.404	0.04
2	91.239	92.000	0.83
5	67.456	66.000	-2.16
10	50.000	50.000	0.00
20	37.106	37.246	0.38
50	24.760	25.120	1.45
100	18.178	18.600	2.32

# Reverse Recovery Characteristics

## Circuit Simulation result



## Evaluation circuit



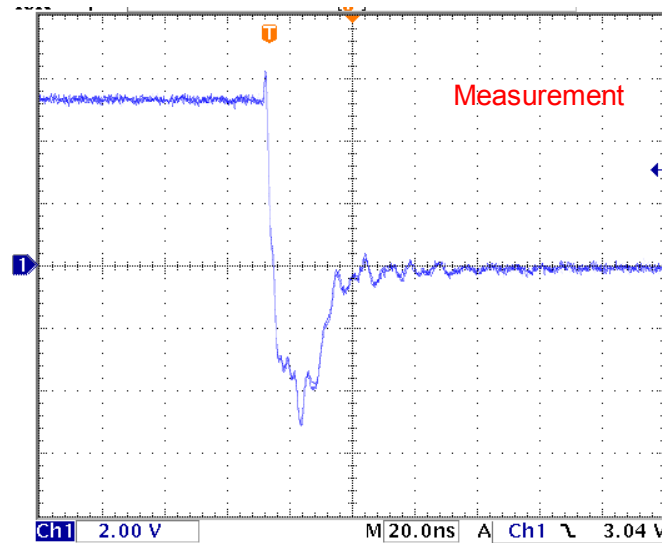
## Comparison Measurement vs. Simulation

Parameter	Unit	Measurement	Simulation	%Error
trj	ns	8.8	8.81	0.11



## Reverse Recovery Characteristics

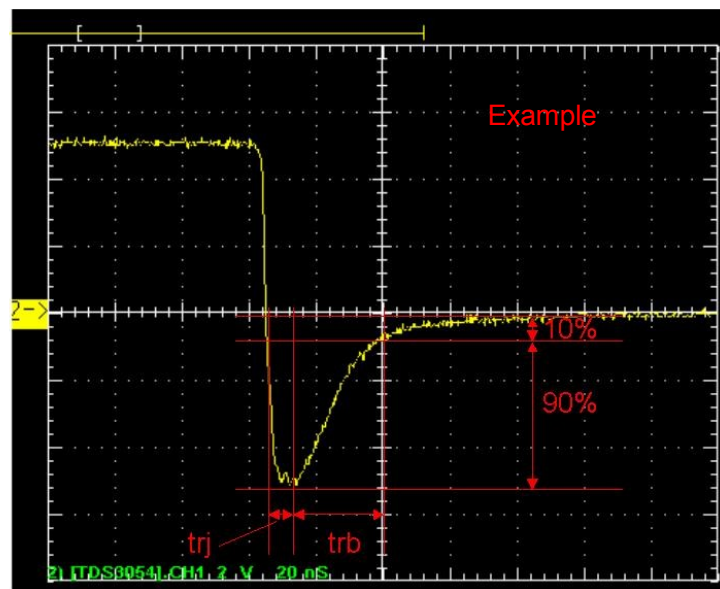
## Reference



$T_{rj} = 8.8(\text{ns})$

$T_{rb} = 16.4(\text{ns})$

Conditions:  $I_{fwd} = I_{rev} = 0.2(\text{A})$ ,  $R_I = 50$



Relation between  $t_{rj}$  and  $t_{rb}$