

# Device Modeling Report

COMPONENTS:  
DIODE/ GENERAL PURPOSE RECTIFIER/ STANDARD  
PART NUMBER: 1SS187  
MANUFACTURER: TOSHIBA



**Bee Technologies Inc.**

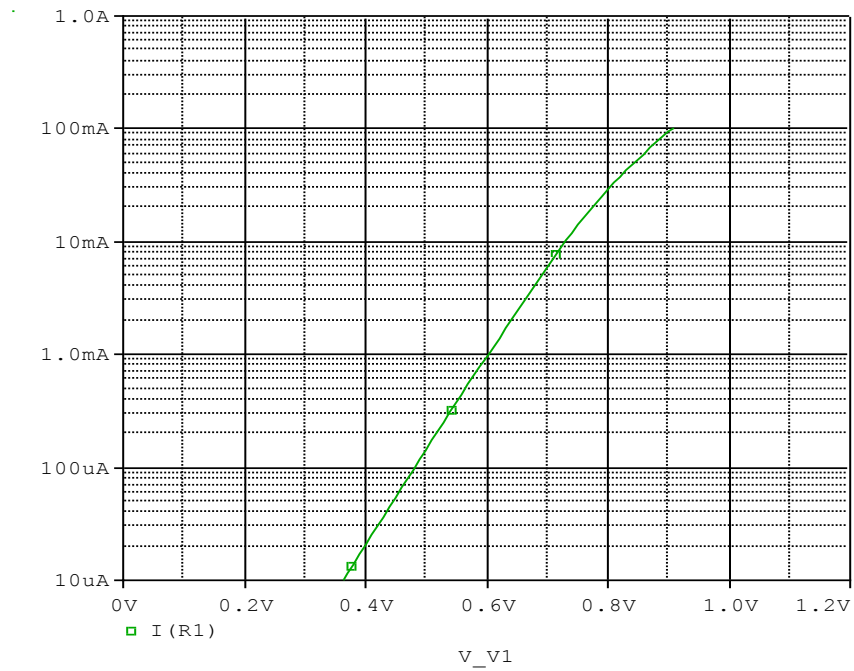
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## DIODE MODEL PARAMETERS

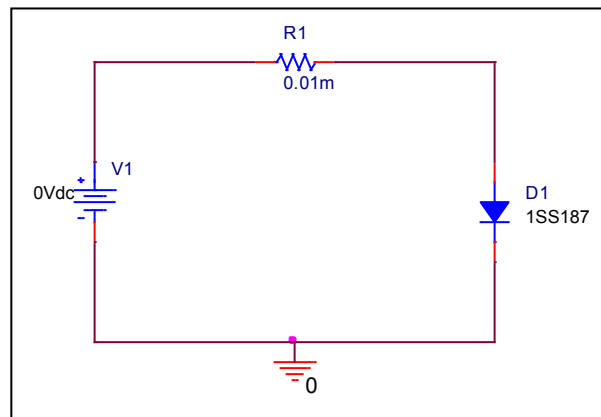
| PSpice model parameter | Model description                           |
|------------------------|---------------------------------------------|
| IS                     | Saturation Current                          |
| N                      | Emission Coefficient                        |
| RS                     | 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                                |
| EG                     | Energy-band Gap                             |

## Forward Current Characteristic

### Circuit Simulation Result

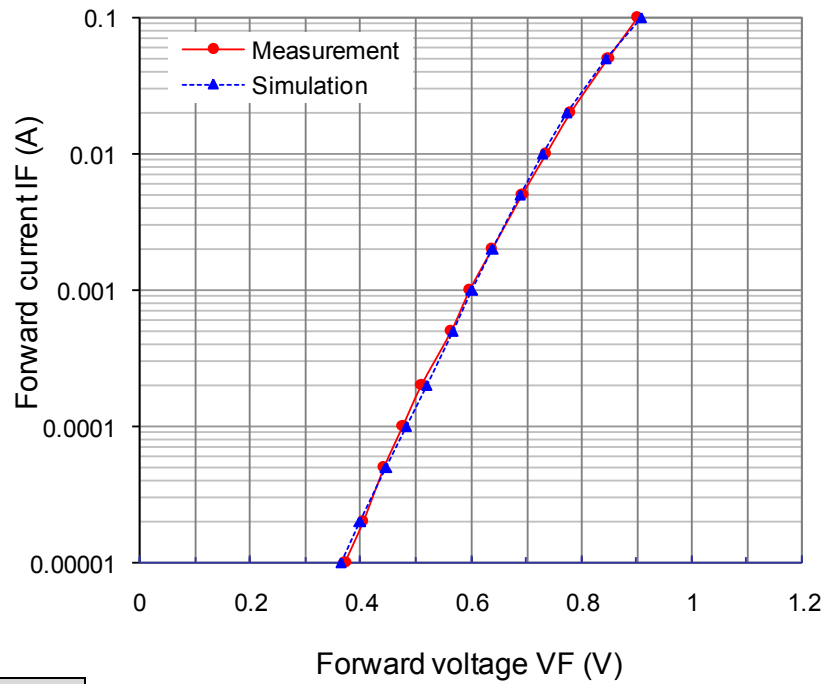


### Evaluation Circuit



## Comparison Graph

Circuit Simulation Result

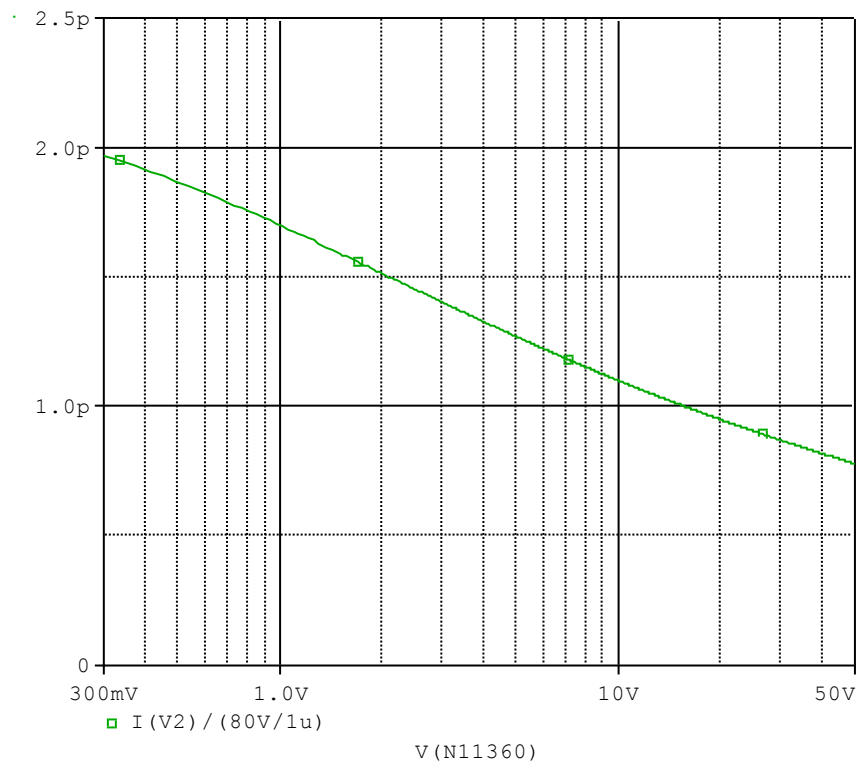


Simulation Result

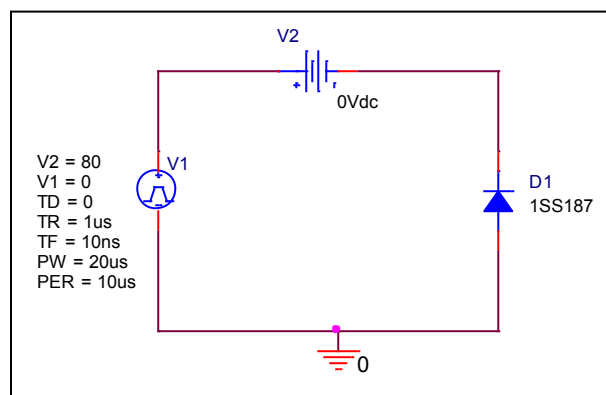
| Ifwd (A) | Vfwd (V)    |            | %Error |
|----------|-------------|------------|--------|
|          | Measurement | Simulation |        |
| 0.00001  | 0.372       | 0.362      | -2.57  |
| 0.00002  | 0.403       | 0.398      | -1.15  |
| 0.00005  | 0.442       | 0.446      | 0.84   |
| 0.0001   | 0.476       | 0.482      | 1.21   |
| 0.0002   | 0.510       | 0.518      | 1.51   |
| 0.0005   | 0.563       | 0.565      | 0.36   |
| 0.001    | 0.596       | 0.602      | 0.97   |
| 0.002    | 0.637       | 0.639      | 0.25   |
| 0.005    | 0.693       | 0.689      | -0.62  |
| 0.01     | 0.735       | 0.729      | -0.82  |
| 0.02     | 0.780       | 0.773      | -0.90  |
| 0.05     | 0.848       | 0.844      | -0.52  |
| 0.1      | 0.900       | 0.907      | 0.77   |

## Capacitance Characteristic

### Circuit Simulation Result

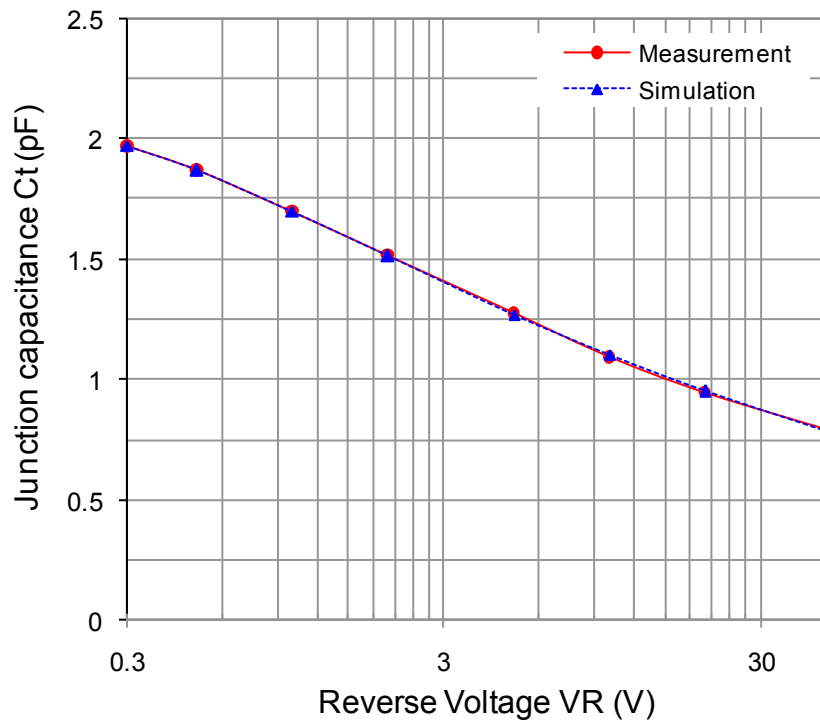


### Evaluation Circuit



## Comparison Graph

### Circuit Simulation Result

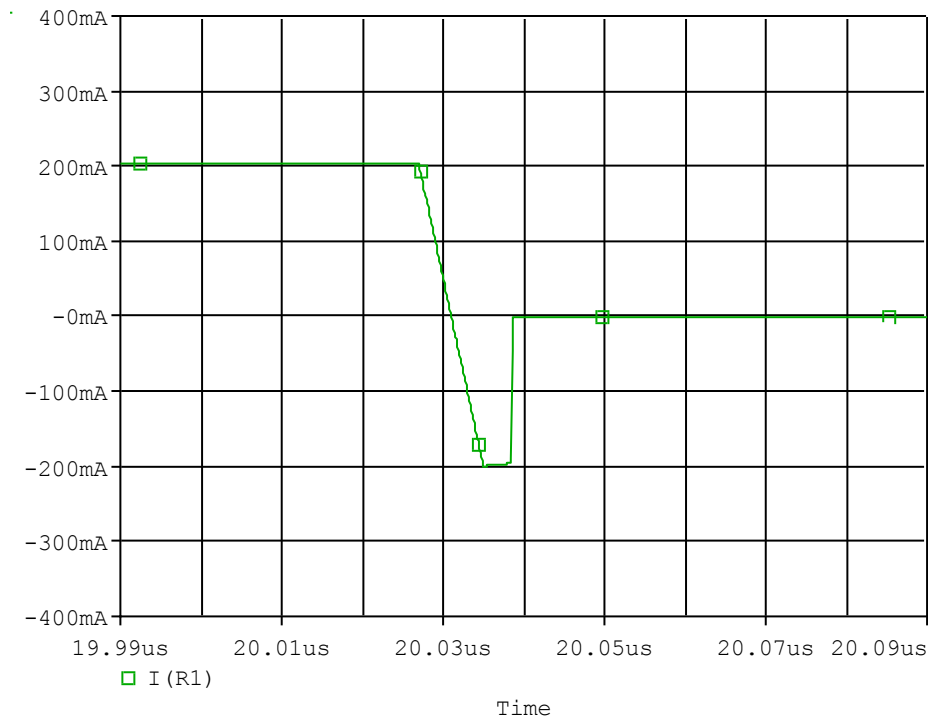


### Simulation Result

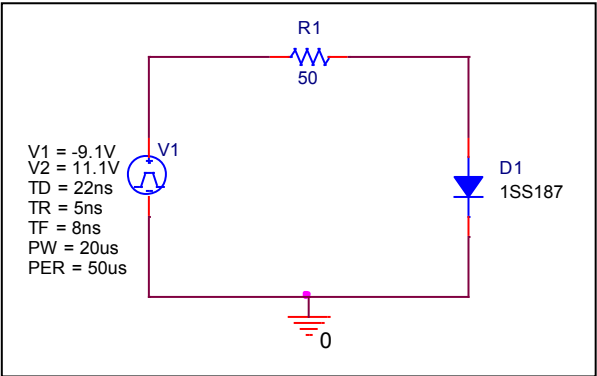
| Vrev (V) | Ct (pF)     |            | %Error |
|----------|-------------|------------|--------|
|          | Measurement | Simulation |        |
| 0.3      | 1.967       | 1.969      | 0.08   |
| 0.5      | 1.868       | 1.867      | -0.07  |
| 1        | 1.697       | 1.699      | 0.11   |
| 2        | 1.518       | 1.513      | -0.36  |
| 5        | 1.271       | 1.269      | -0.19  |
| 10       | 1.089       | 1.100      | 0.99   |
| 20       | 0.945       | 0.949      | 0.42   |
| 50       | 0.787       | 0.779      | -1.05  |

# Reverse Recovery Characteristic

## Circuit Simulation Result



## Evaluation Circuit



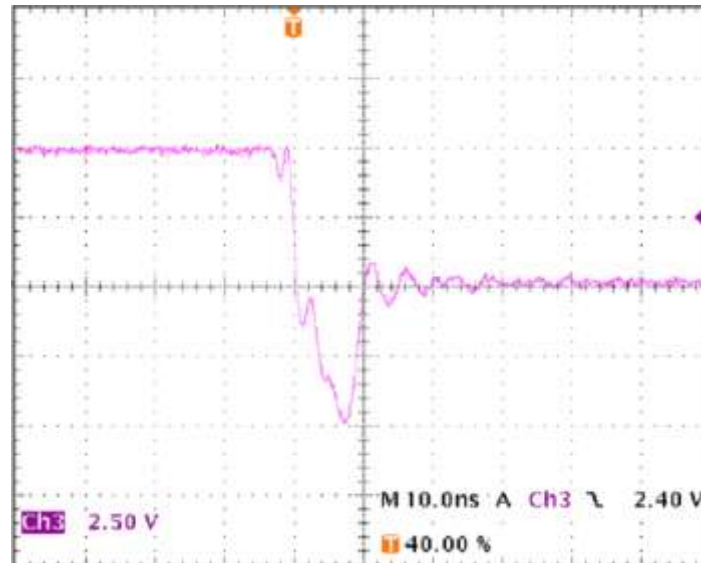
## Compare Measurement vs. Simulation

|     |    | Measurement | Simulation | %Error |
|-----|----|-------------|------------|--------|
| trj | ns | 7.00        | 6.97       | -0.43  |

## Reverse Recovery Characteristic

## Reference

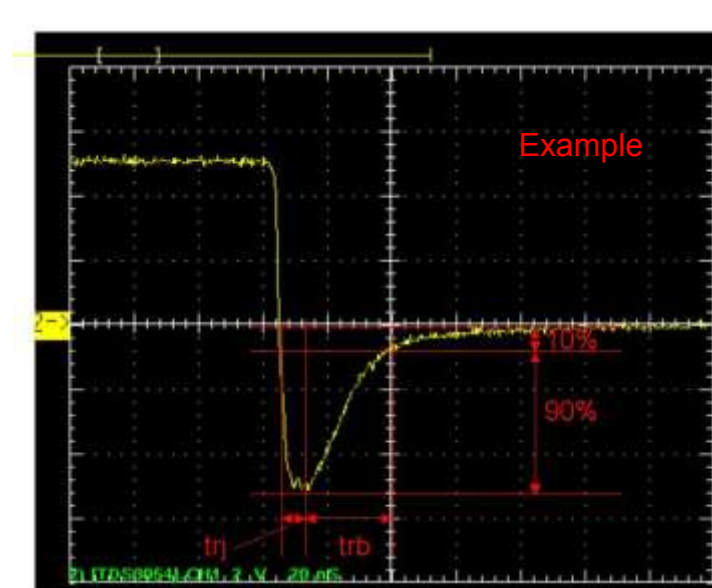
### Measurement



$T_{rj} = 7.0(\text{ns})$

$T_{rb} = 2.4(\text{ns})$

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



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



