

# Device Modeling Report

COMPONENTS:  
DIODE/ GENERAL PURPOSE RECTIFIER / STANDARD  
PART NUMBER: 1SR159-200  
MANUFACTURER: ROHM  
REMARK: TC= 25 C



**Bee Technologies Inc.**

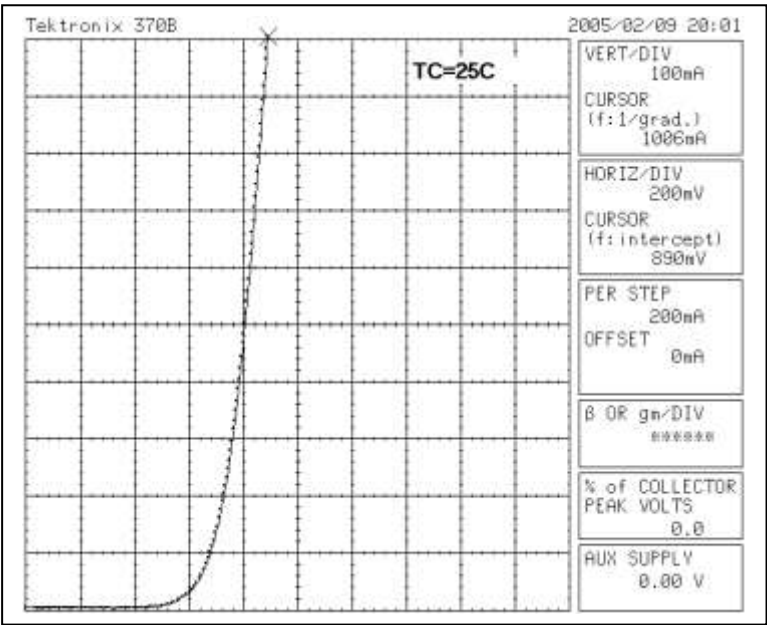
## SPICE MODEL

```
*$  
* PART NUMBER: 1SR159-200  
* MANUFACTURER: ROHM  
* VRM=200,TC=25C,IO=1.0A,IFSM=20A  
* All Rights Reserved Copyright (C) Bee Technologies Inc.2004  
.MODEL 1sr159-200_25C D  
+ IS=1.0000E-6  
+ N=2.2065  
+ RS=3.1843E-3  
+ IKF=.19055  
+ ISR=0  
+ CJO=23.192E-12  
+ M=.34971  
+ VJ=.43616  
+ BV=200  
+ IBV=10.000E-6  
+ TT=15.058E-9  
*$
```

| 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                             |

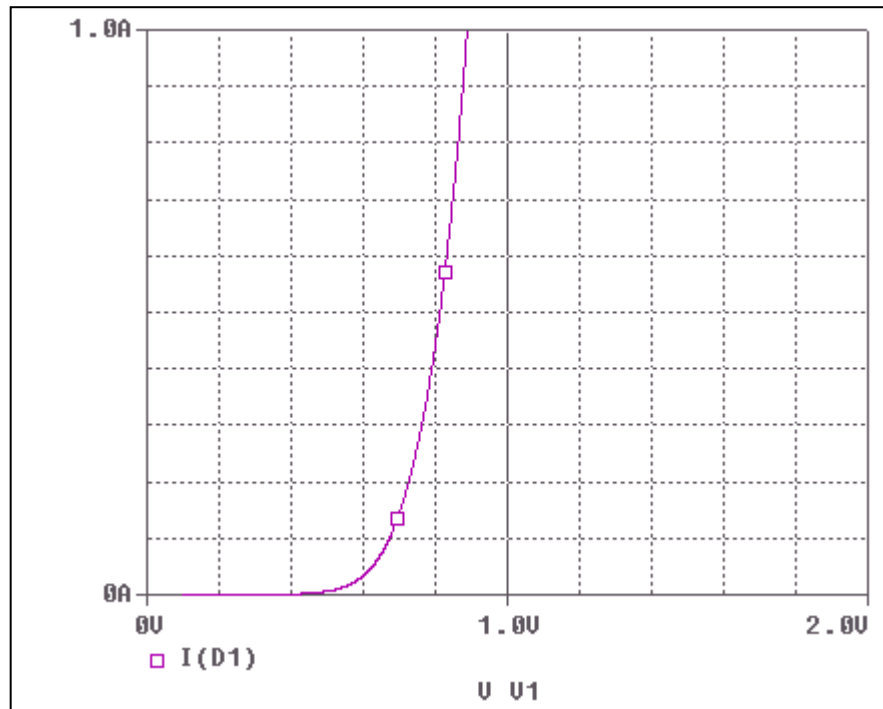
Forward Current Characteristic

Reference

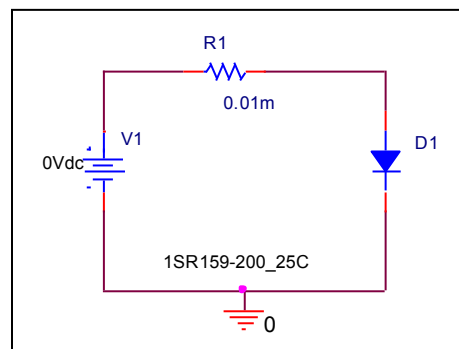


## Forward Current Characteristic

### Circuit Simulation Result

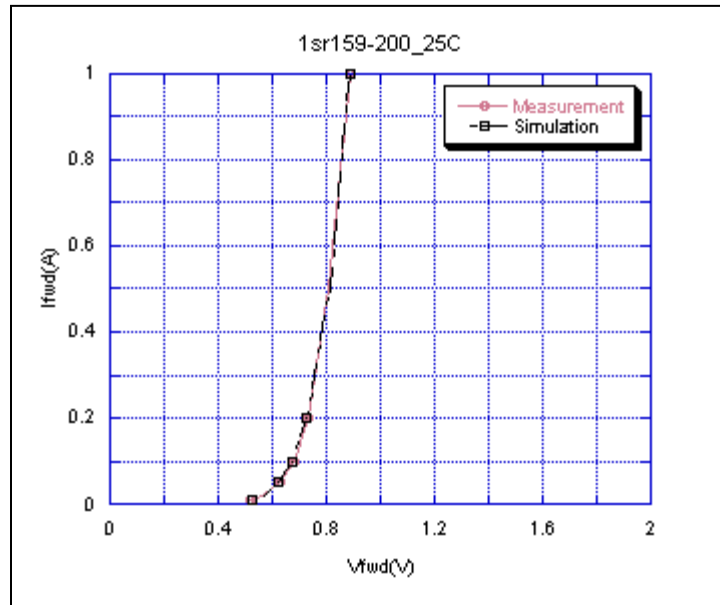


### Evaluation Circuit



## Comparison Graph

### Circuit Simulation Result

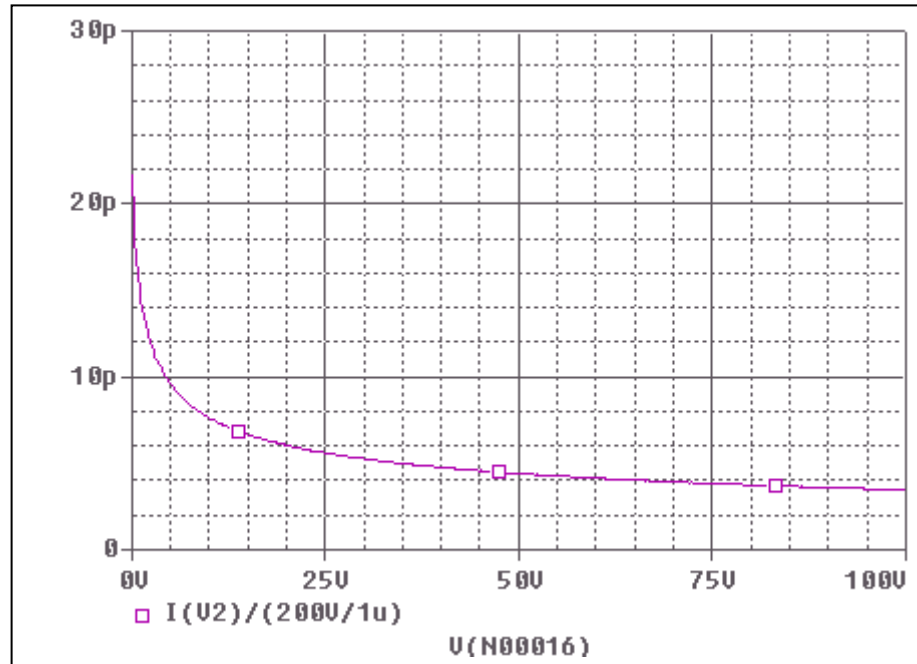


### Simulation Result

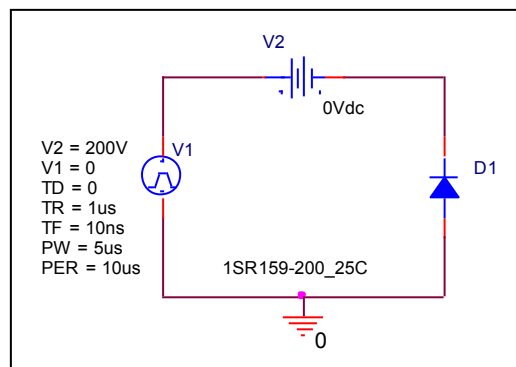
| Ifwd(A) | Vfwd(V)<br>Measurement | Vfwd(V)<br>Simulation | %Error |
|---------|------------------------|-----------------------|--------|
| 0.01    | 0.520                  | 0.527                 | -1.35  |
| 0.02    | 0.566                  | 0.568                 | -0.35  |
| 0.05    | 0.628                  | 0.625                 | 0.48   |
| 0.1     | 0.678                  | 0.672                 | 0.88   |
| 0.2     | 0.730                  | 0.724                 | 0.82   |
| 0.5     | 0.806                  | 0.812                 | -0.74  |
| 1       | 0.890                  | 0.888                 | 0.22   |

## Capacitance Characteristic

### Circuit Simulation Result

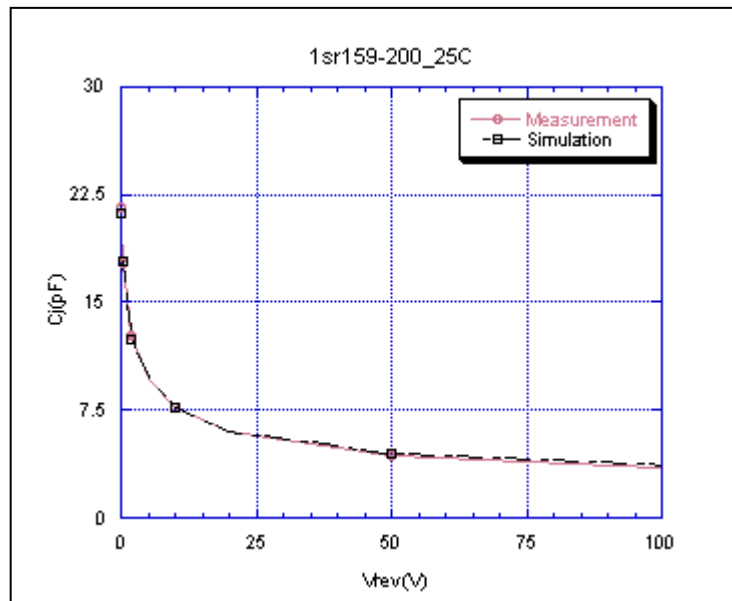


### Evaluation Circuit



## Comparison Graph

### Circuit Simulation Result



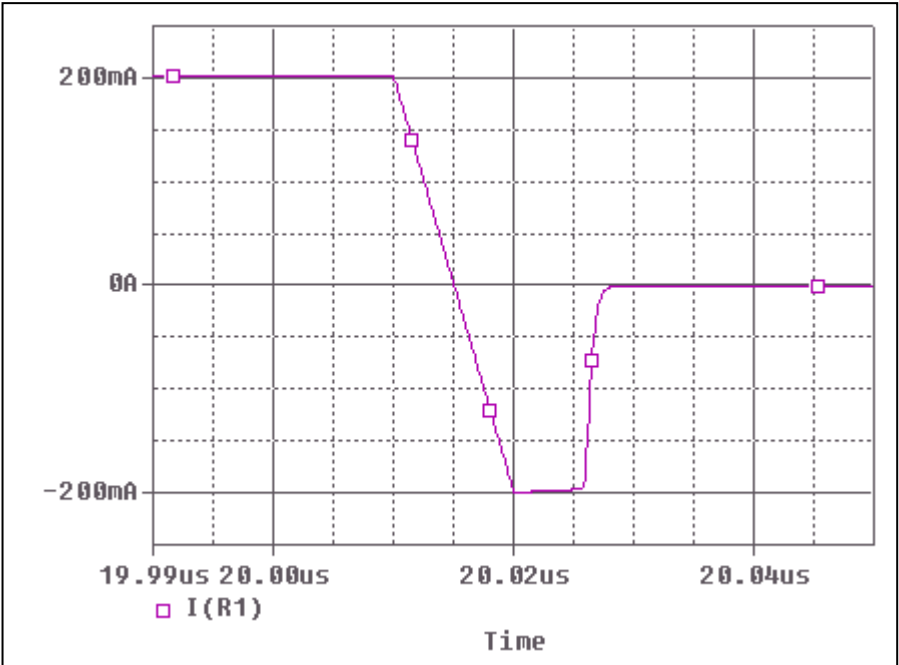
### Simulation Result

| $V_{rev}$ (V) | $C_j$ (pF)<br>Measurement | $C_j$ (pF)<br>Simulation | %Error |
|---------------|---------------------------|--------------------------|--------|
| 0             | 23.185                    | 23.185                   | 0.00   |
| 0.1           | 21.588                    | 21.146                   | 2.05   |
| 0.2           | 20.365                    | 20.350                   | 0.07   |
| 0.5           | 17.681                    | 17.782                   | -0.57  |
| 1             | 15.275                    | 15.287                   | -0.08  |
| 2             | 12.705                    | 12.374                   | 2.61   |
| 5             | 9.674                     | 9.607                    | 0.69   |
| 10            | 7.672                     | 7.651                    | 0.27   |
| 20            | 6.033                     | 6.038                    | -0.08  |
| 50            | 4.362                     | 4.412                    | -1.15  |
| 100           | 3.428                     | 3.462                    | -0.99  |

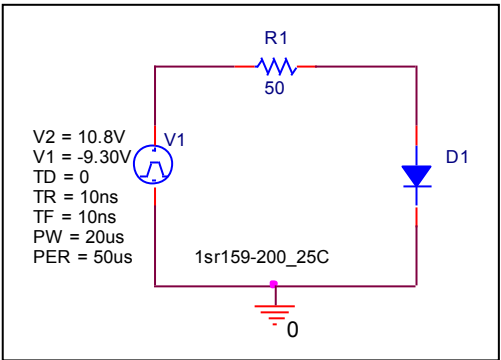


# Reverse Recovery Characteristic

## Circuit Simulation Result



## Evaluation Circuit

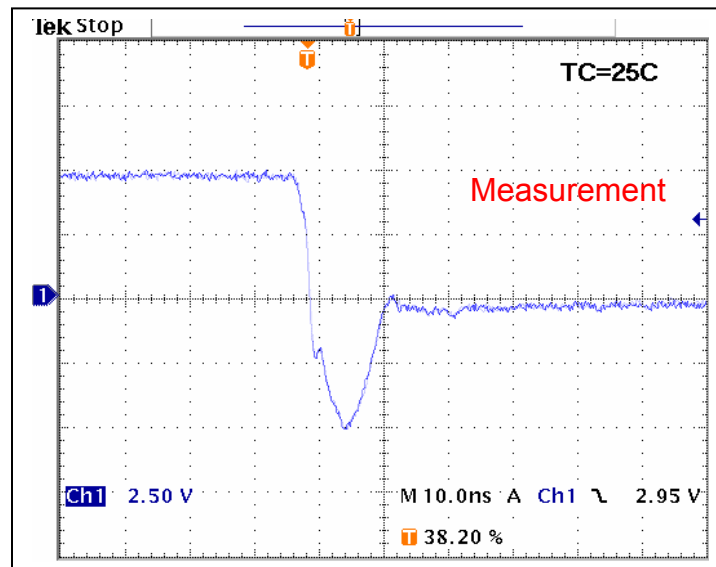


## Compare Measurement vs. Simulation

|            | Measurement  |           | Simulation   |           | %Error      |
|------------|--------------|-----------|--------------|-----------|-------------|
| <b>trr</b> | <b>11.20</b> | <b>ns</b> | <b>11.62</b> | <b>ns</b> | <b>3.75</b> |

## Reverse Recovery Characteristic

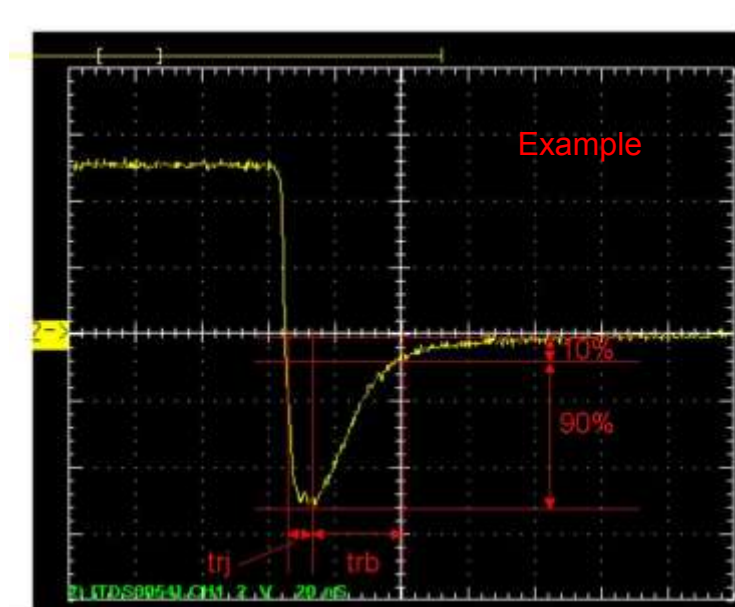
## Reference



$T_{rj} = 5.80(\text{ns})$

$T_{rb} = 5.40(\text{ns})$

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



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