

Device Modeling Report

COMPONENTS:
DIODE/ GENERAL PURPOSE RECTIFIER/ STANDARD
PART NUMBER: 1S1887
MANUFACTURER: TOSHIBA
REMARK: TC=25C



Bee Technologies Inc.

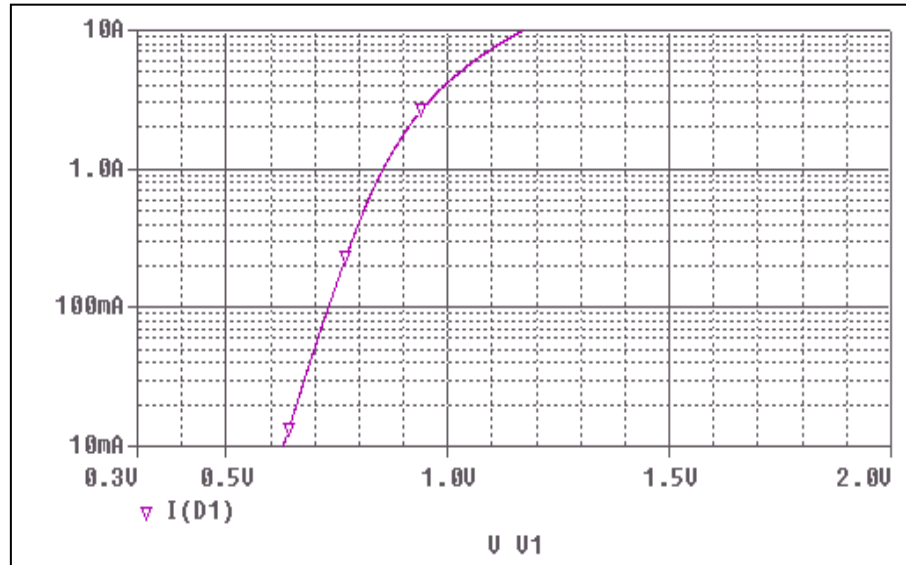
SPICE MODEL

```
*$  
* PART NUMBER: 1S1887  
* MANUFACTURER: TOSHIBA  
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.MODEL 1S1887 D  
+ IS=4.6505E-9  
+ N=1.6665  
+ RS=17.901E-3  
+ IKF=2.2411  
+ ISR=0  
+ CJO=55.707E-12  
+ M=.38303  
+ VJ=.45192  
+ BV=400  
+ IBV=10.000E-6  
+ TT=3.7222E-6  
*$
```

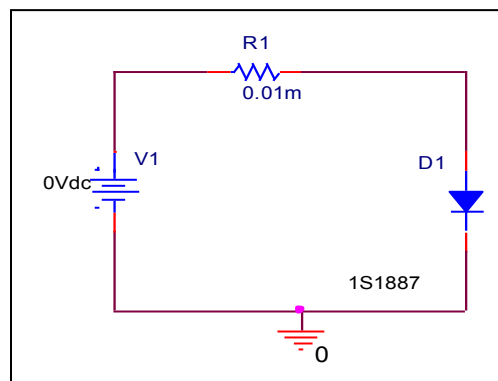
| PSpice model parameter | Model description |
|------------------------|---|
| IS | Saturation Current |
| N | Emission Coefficient |
| RS | Series Resistance |
| IKF | High-injection Knee Current |
| CJO | Zero-bias Junction Capacitance |
| M | Junction Grading Coefficient |
| VJ | Junction Potential |
| 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

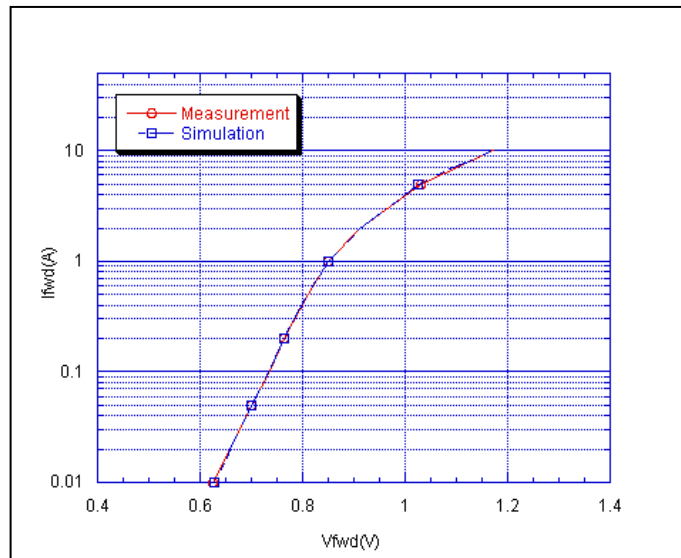


Evaluation Circuit



Comparison Graph

Circuit Simulation Result

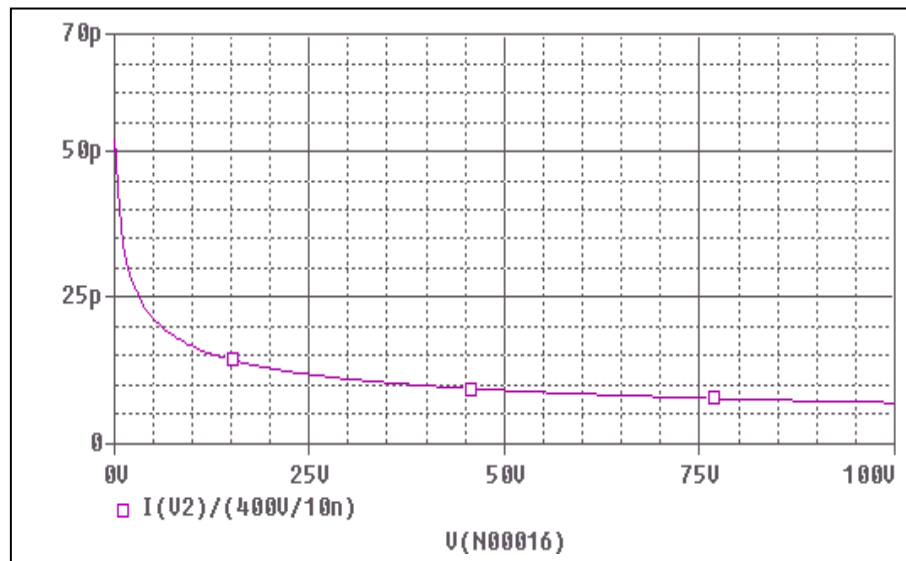


Simulation Result

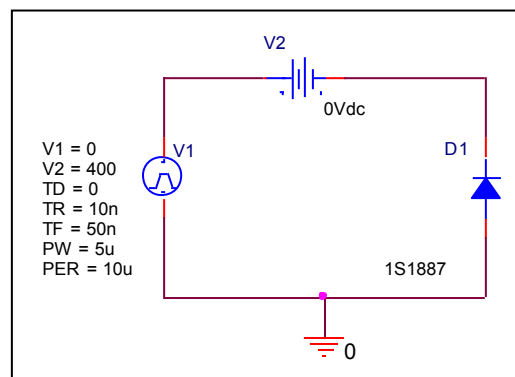
| Ifwd(A) | Vfwd(V) Measurement | Vfwd(V) Simulation | %Error |
|---------|------------------------|-----------------------|--------|
| 0.01 | 0.626 | 0.629 | -0.399 |
| 0.02 | 0.658 | 0.657 | 0.137 |
| 0.05 | 0.701 | 0.701 | -0.014 |
| 0.1 | 0.735 | 0.736 | -0.082 |
| 0.2 | 0.765 | 0.764 | 0.092 |
| 0.5 | 0.810 | 0.810 | -0.037 |
| 1 | 0.850 | 0.851 | -0.165 |
| 2 | 0.910 | 0.911 | -0.132 |
| 5 | 1.030 | 1.026 | 0.408 |
| 10 | 1.171 | 1.171 | -0.034 |

Junction Capacitance Characteristic

Circuit Simulation Result

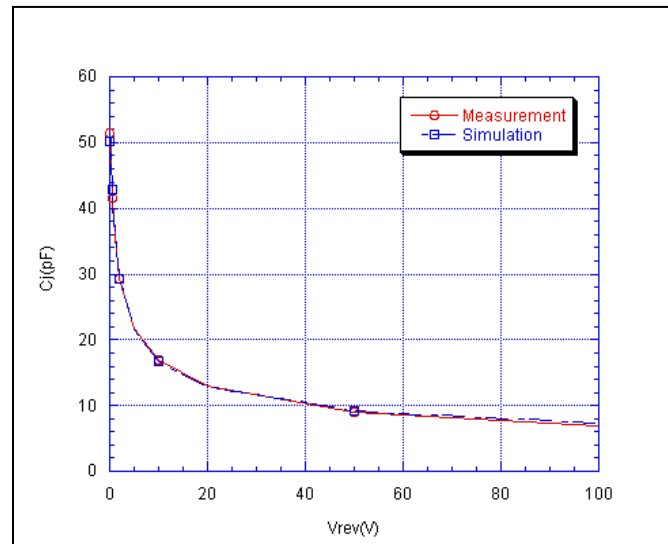


Evaluation Circuit



Comparison Graph

Circuit Simulation Result

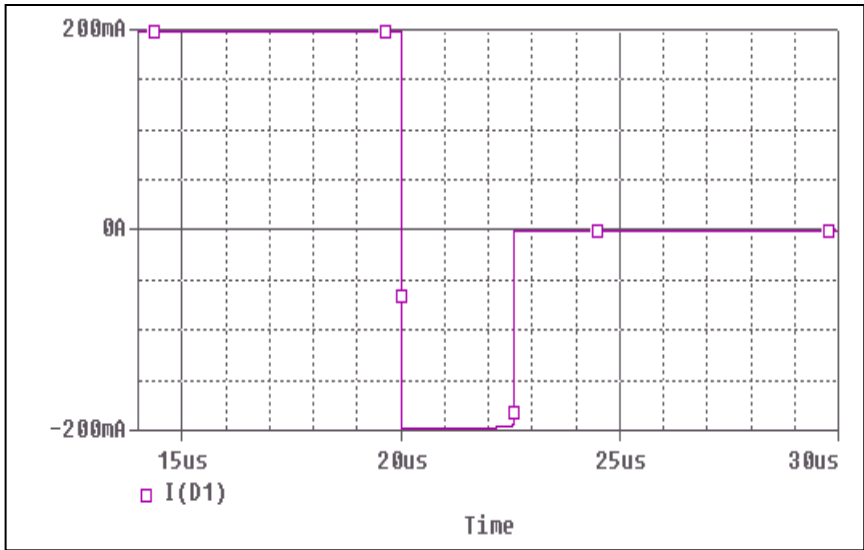


Simulation Result

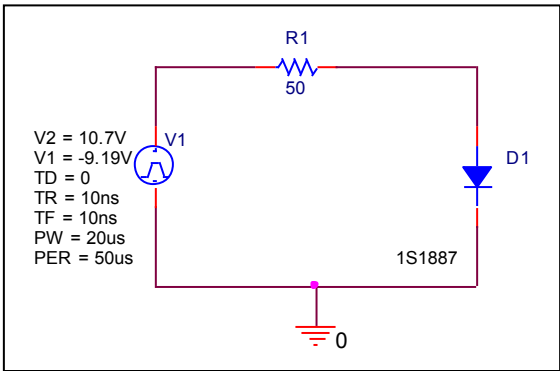
| Vrev(V) | Cj(pF) Measurement | Cj(pF) Simulation | %Error |
|---------|-----------------------|----------------------|--------|
| 0 | 55.832 | 55.832 | 0.000 |
| 0.1 | 51.537 | 50.127 | 2.736 |
| 0.2 | 48.403 | 50.617 | -4.574 |
| 0.5 | 41.632 | 42.862 | -2.954 |
| 1 | 35.607 | 36.107 | -1.404 |
| 2 | 29.252 | 29.375 | -0.420 |
| 5 | 21.729 | 21.492 | 1.091 |
| 10 | 16.895 | 16.773 | 0.722 |
| 20 | 12.887 | 12.950 | -0.489 |
| 50 | 8.986 | 9.158 | -1.912 |
| 100 | 6.778 | 7.034 | -3.769 |

Reverse Recovery Characteristic

Circuit Simulation Result



Evaluation Circuit

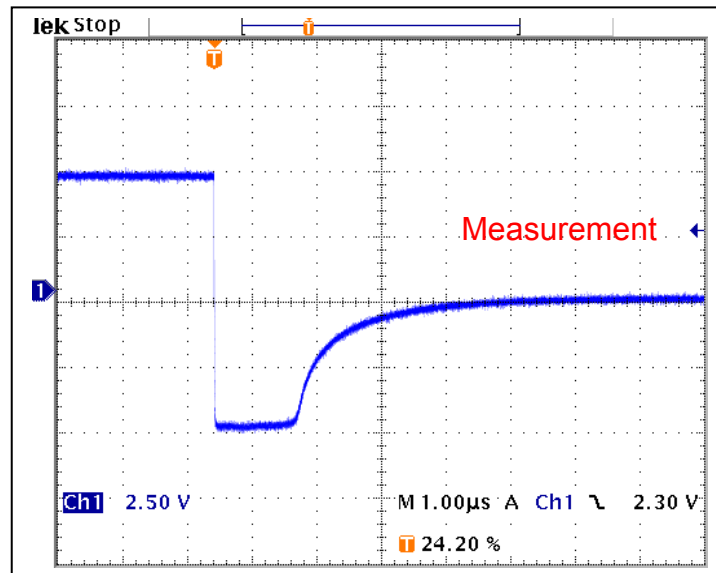


Compare Measurement vs. Simulation

| | Measurement | | Simulation | | %Error |
|-----|-------------|----|------------|----|--------|
| trr | 2.58 | us | 2.58 | us | 0.19 |

Reverse Recovery Characteristic

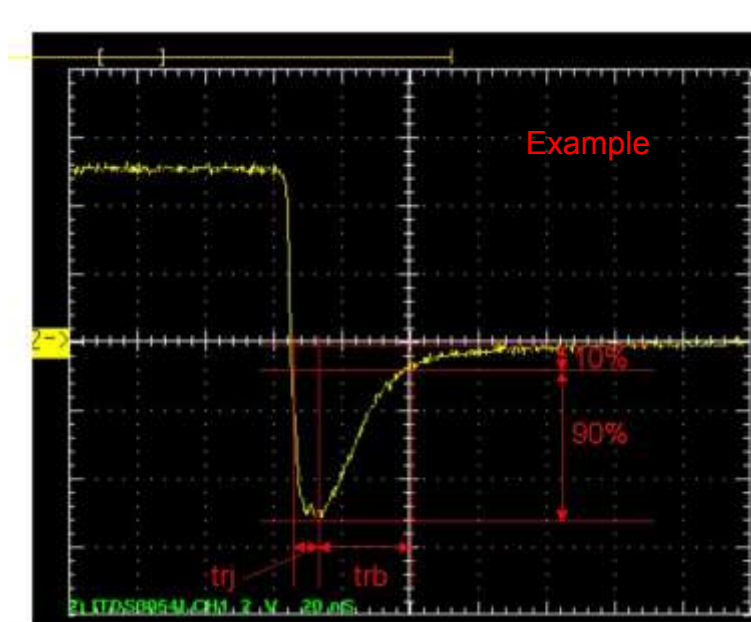
Reference



$T_{rj} = 1.24(\mu s)$

$T_{rb} = 1.34(\mu s)$

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



Relation between t_{rj} and t_{rb}