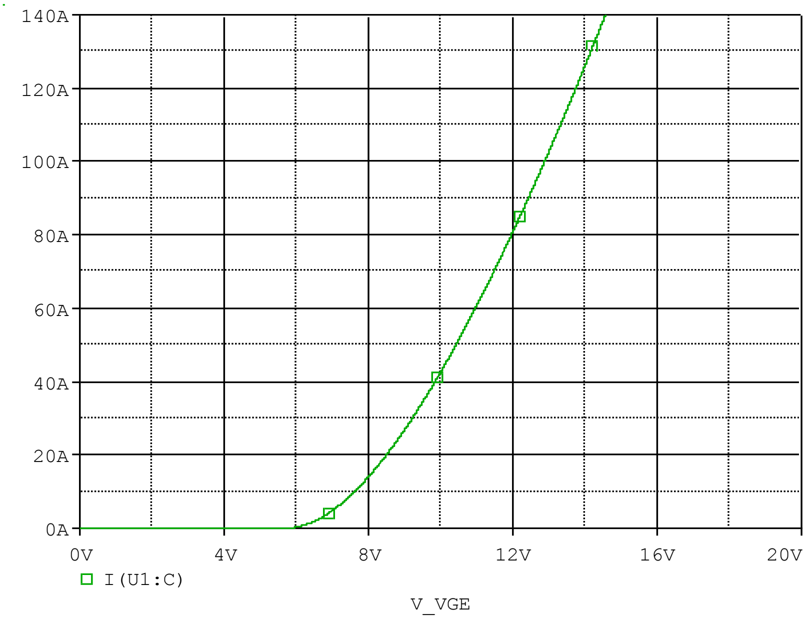
# Device Modeling Report

COMPONENTS: Insulated Gate Bipolar Transistor (IGBT)
PART NUMBER: KGH15N120NDA
MANUFACTURER: KEC

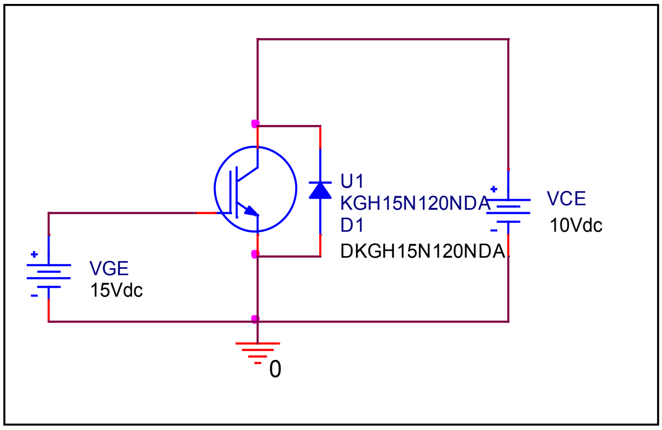
**Bee Technologies Inc.**

# SPICE MODEL
## Transfer Characteristics

Circuit Simulation result

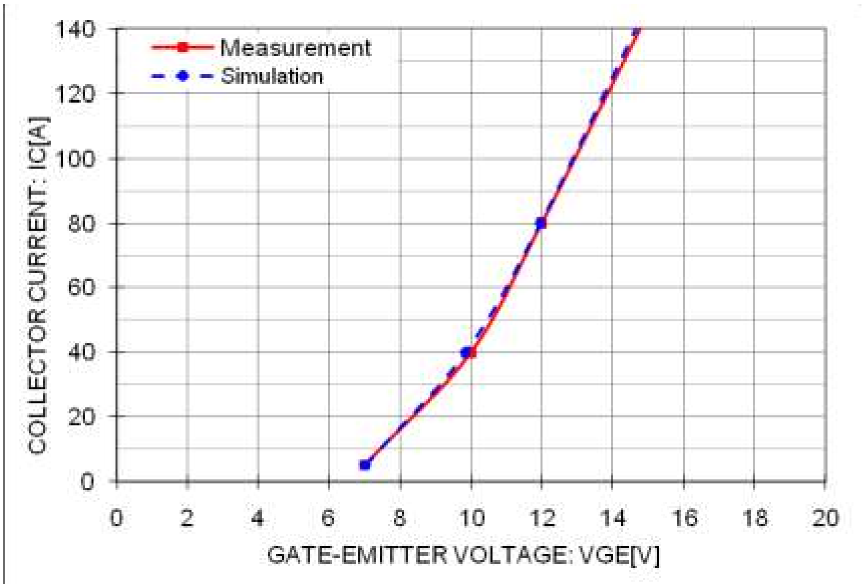


Evaluation circuit



# Comparison Graph

Simulation result



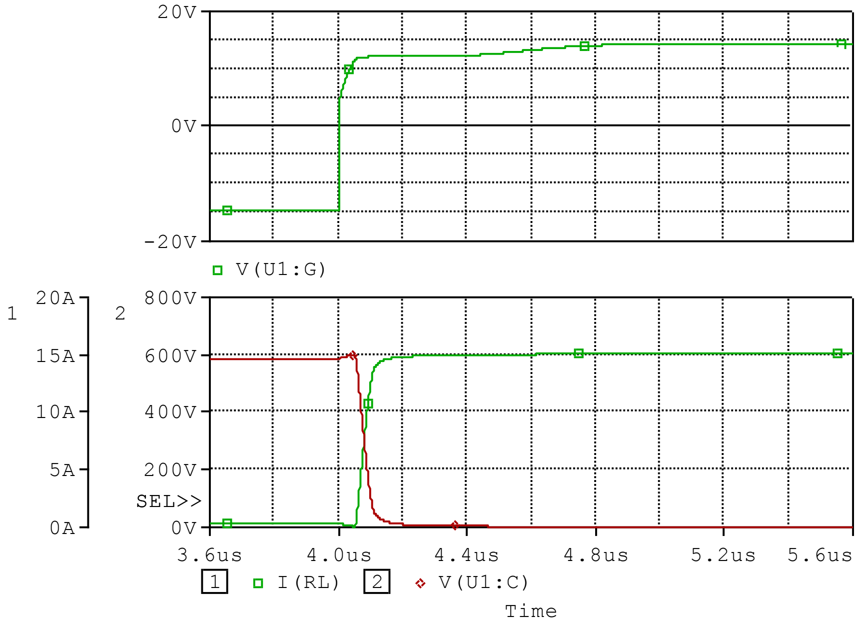
Comparison table

**Test condition: VCE =10 (V)**

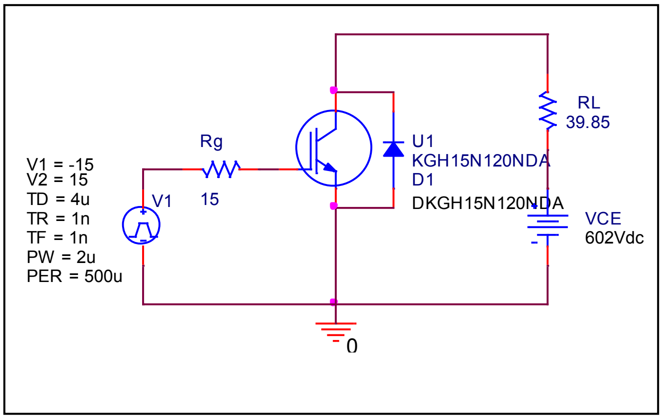
| IC (A) | VGE (V) | | %Error |
|---|---|---|---|
| | Measurement | Simulation | |
| 5 | 7.000 | 7.020 | 0.28 |
| 40 | 10.000 | 9.846 | -1.54 |
| 80 | 12.000 | 11.961 | -0.32 |
| 140 | 15.000 | 14.866 | -0.89 |

## Rise Time Characteristics

### Circuit Simulation result



### Evaluation circuit

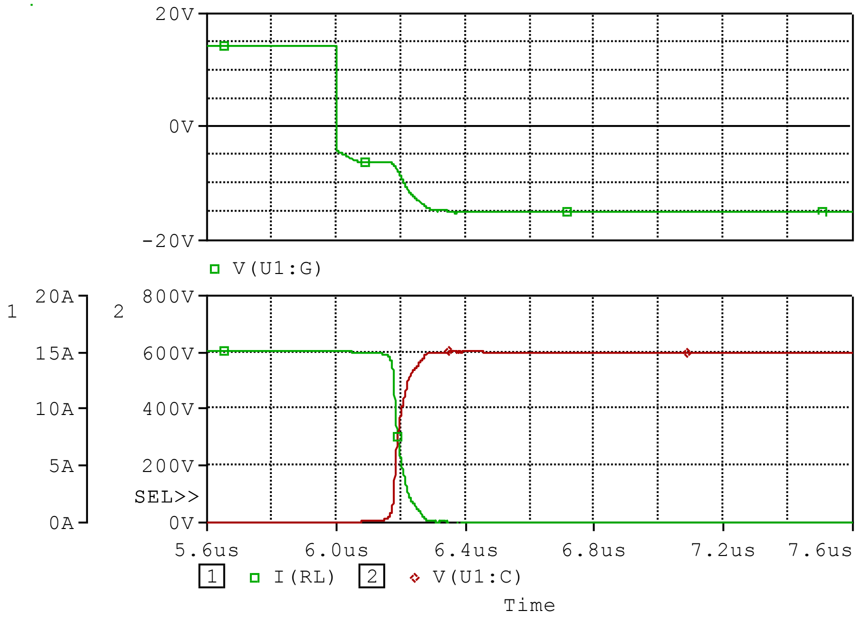


### Test condition: $I_C$=15 (A), $V_{CC}$=600 (V), $V_{GE}$= ±15 (V), $R_G$=15 (Ω)

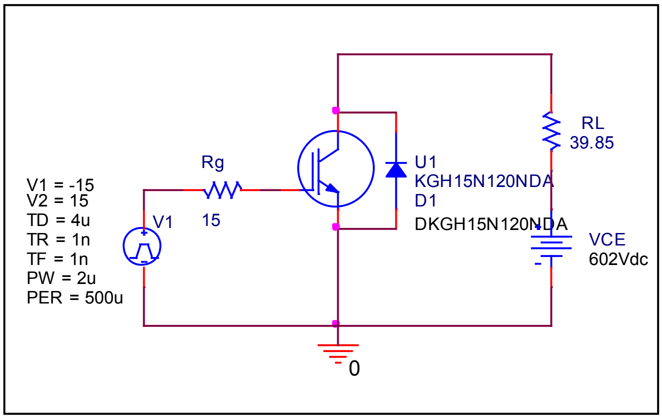
| Parameter | Unit | Measurement | Simulation | %Error |
|---|---|---|---|---|
| tr | ns | 50.000 | 48.457 | -3.09 |
| td(on) | ns | 60.000 | 59.200 | -1.33 |

# Fall Time Characteristics

## Circuit Simulation result



## Evaluation circuit

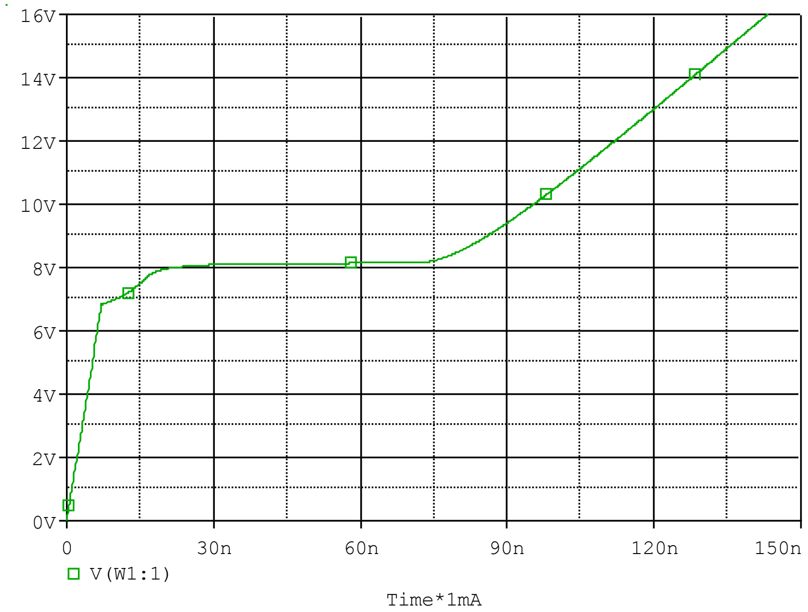


### Test condition: IC=15 (A), VCC=600 (V), VGE= ±15 (V), RG=15 (Ω)

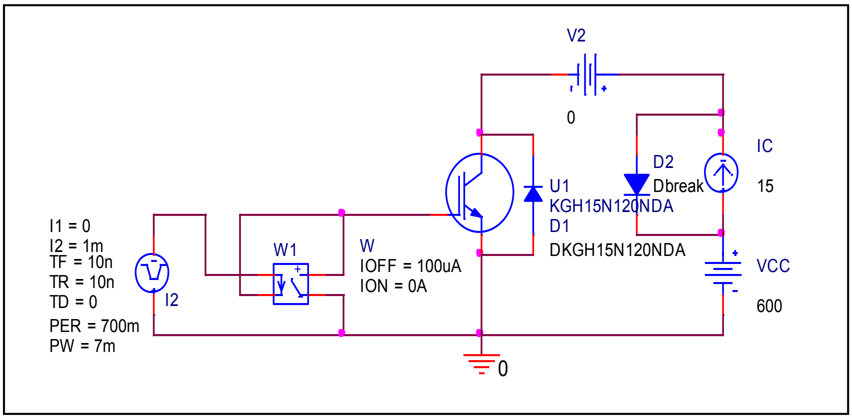
| Parameter | Unit | Measurement | Simulation | %Error |
|---|---|---|---|---|
| tf | ns | 70.000 | 68.869 | -1.62 |
| td(off) | ns | 180.000 | 175.500 | -2.50 |

# Gate Charge Characteristics

## Circuit Simulation result



## Evaluation circuit

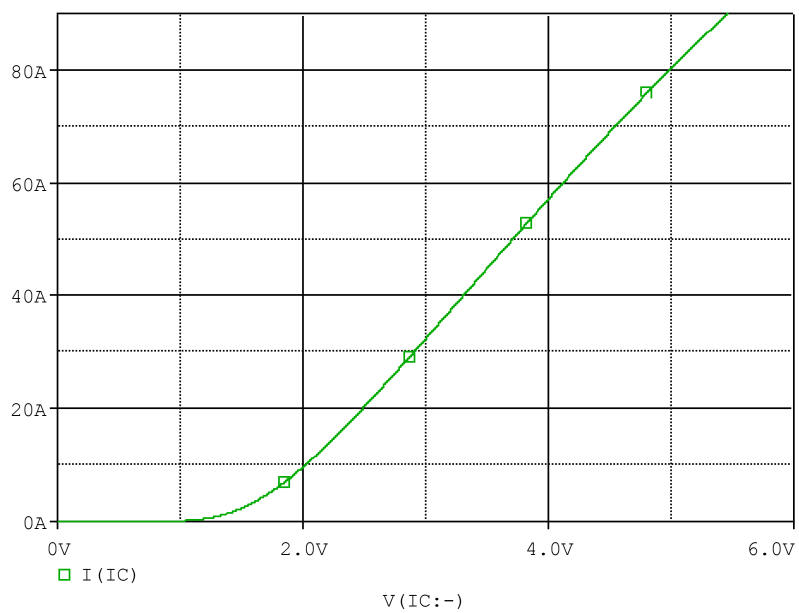


### Test condition: $V_{CC}$=600 (V), $I_C$=15 (A), $V_{GE}$=15 (V)

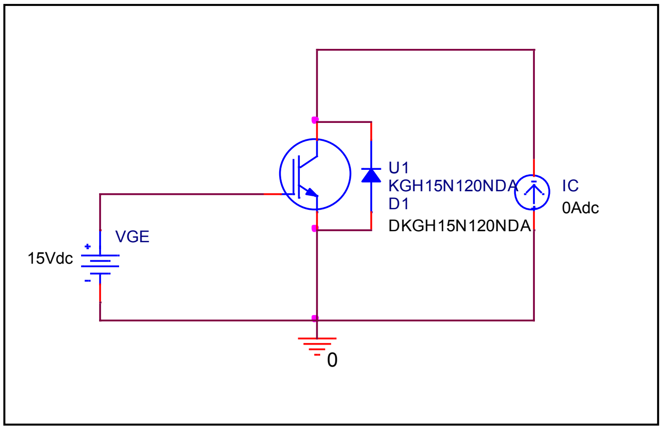
| Parameter | Unit | Measurement | Simulation | %Error |
|---|---|---|---|---|
| Qge | nc | 12.000 | 11.736 | -2.20 |
| Qgc | nc | 65.000 | 63.264 | -2.67 |
| Qg | nc | 140.000 | 135.506 | -3.21 |

## Saturation Characteristics

### Circuit Simulation result

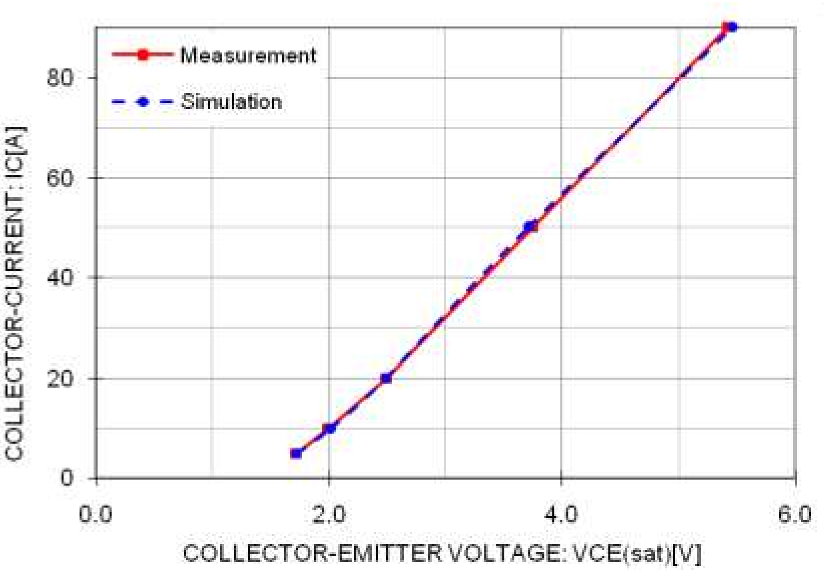


### Evaluation circuit



## Comparison Graph

Simulation result



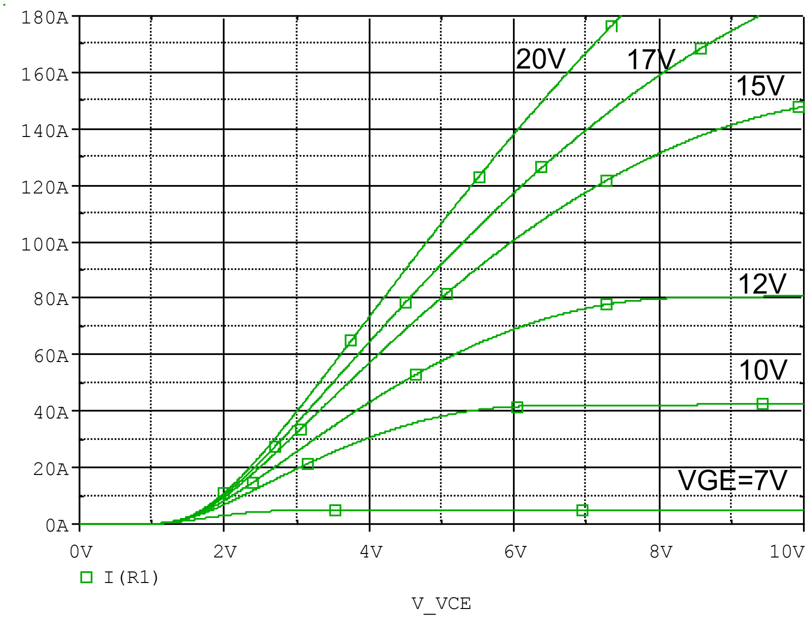
Comparison table

### Test condition: VGE =15 (V)

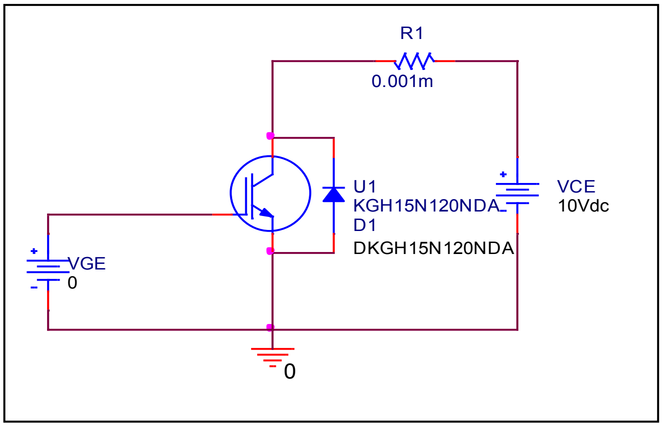
| IC(A) | VCE (V) | | %Error |
|---|---|---|---|
| | Measurement | Simulation | |
| 5 | 1.725 | 1.722 | -0.17 |
| 10 | 2.000 | 2.019 | 0.95 |
| 20 | 2.500 | 2.487 | -0.54 |
| 50 | 3.750 | 3.710 | -1.07 |
| 90 | 5.425 | 5.462 | 0.68 |

# Output Characteristics

## Circuit Simulation result

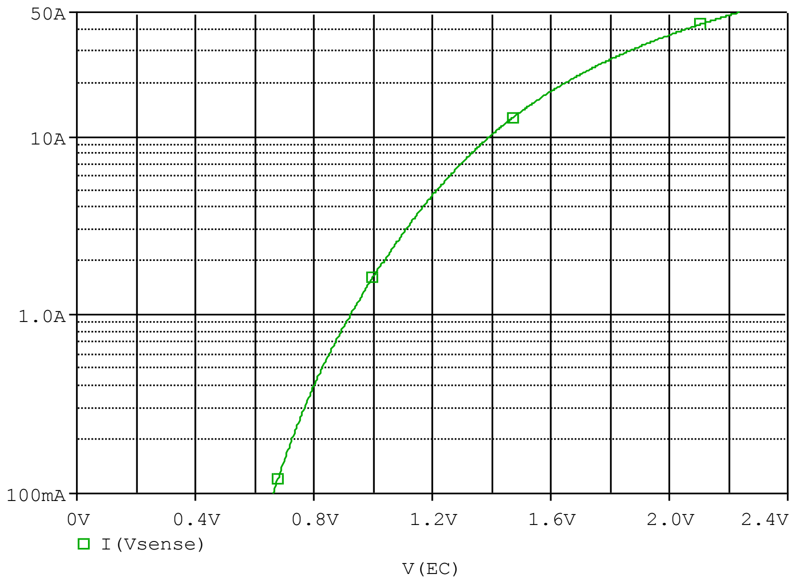


## Evaluation circuit

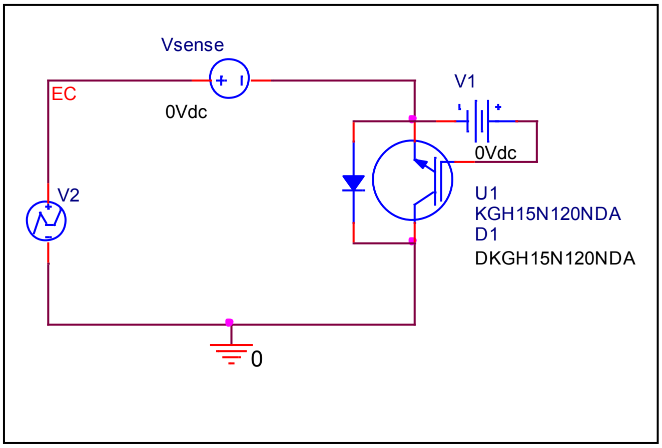


# FWD Forward Current Characteristics

## Circuit Simulation result

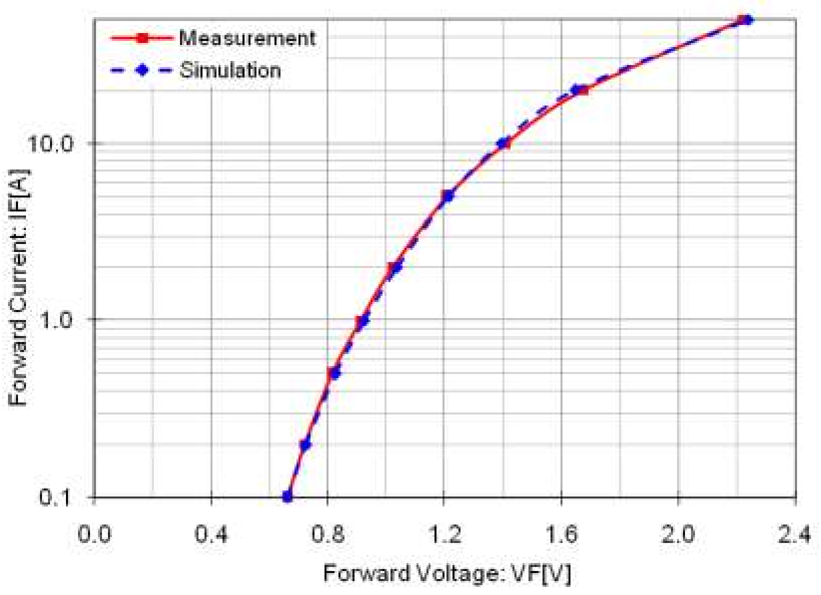


## Evaluation circuit



## Comparison Graph

Simulation result

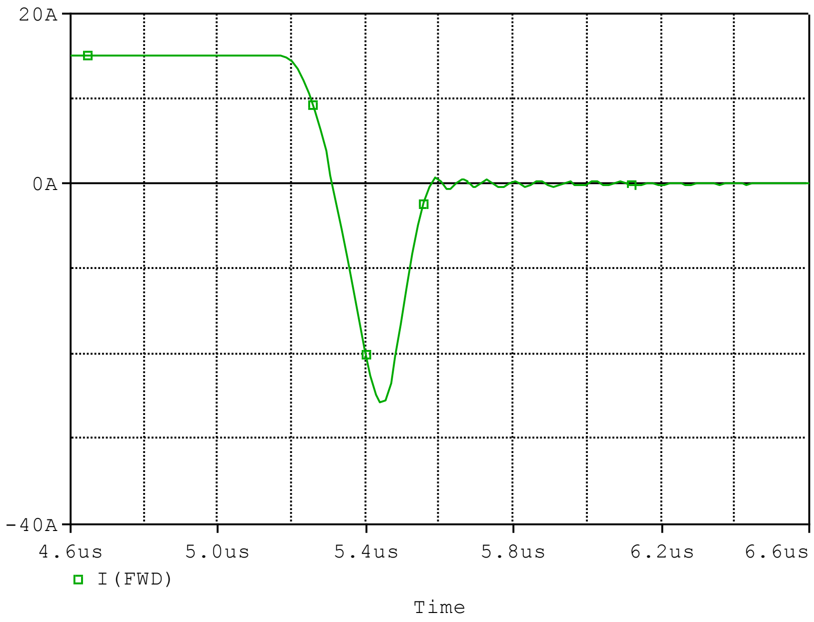


Comparison table

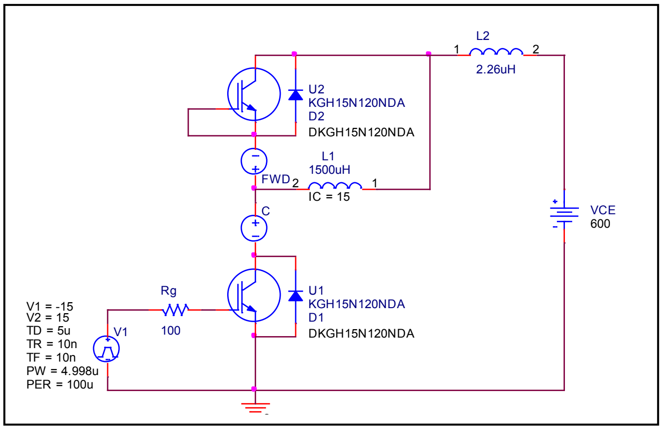
| IF(A) | VF (V) | | %Error |
|---|---|---|---|
| | Measurement | Simulation | |
| 0.1 | 0.660 | 0.662 | 0.30 |
| 0.2 | 0.718 | 0.725 | 0.97 |
| 0.5 | 0.814 | 0.827 | 1.60 |
| 1 | 0.910 | 0.923 | 1.43 |
| 2 | 1.020 | 1.035 | 1.47 |
| 5 | 1.210 | 1.215 | 0.40 |
| 10 | 1.410 | 1.393 | -1.21 |
| 20 | 1.675 | 1.647 | -1.65 |
| 50 | 2.220 | 2.239 | 0.86 |

# Reverse Recovery Characteristics

Circuit Simulation result



Evaluation circuit



## Test condition: VCC=600 (V), IC=15 (A), -di/dt=200 (A/us)

| Parameter | Unit | Measurement | Simulation | %Error |
|---|---|---|---|---|
| trr | nsec | 200.000 | 243.960 | 21.98 |
| Irr | A | 26.000 | 25.660 | -1.31 |