Device Modeling Report

COMPONENTS: MOSFET (Professional)
PART NUMBER: 2SJ334
MANUFACTURER: TOSHIBA
Body Diode (Professional) / ESD Protection

Bee Technologies Inc.

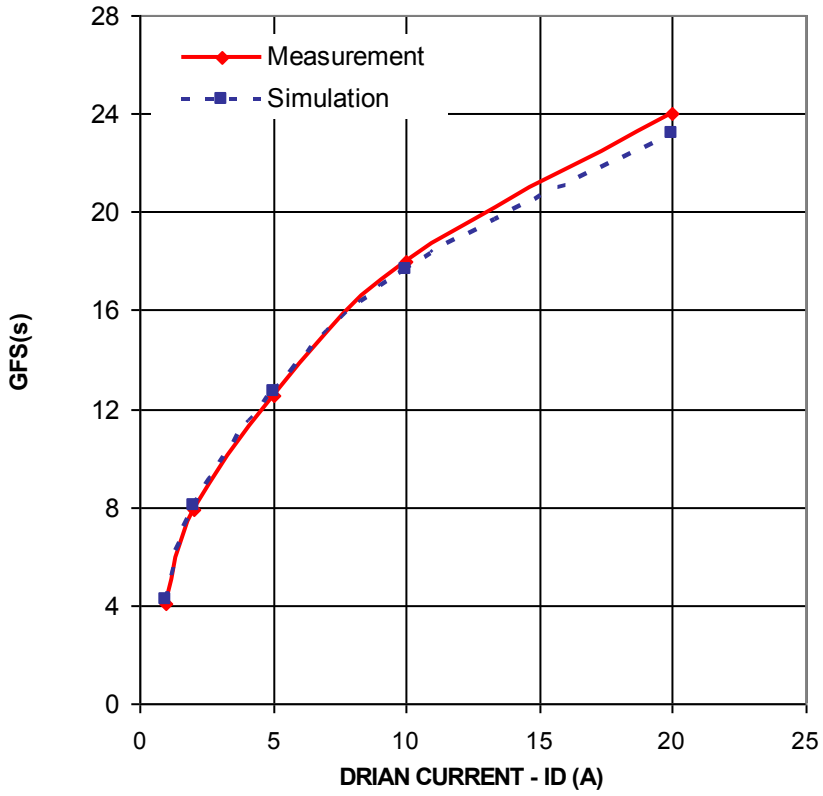
.

MOSFET MODEL PARAMETERS

PSpice model parameters	Model description
LEVEL	
L	Channel Length
W	Channel Width
KP	Transconductance
RS	Source Ohmic Resistance
RD	Ohmic Drain Resistance
VTO	Zero-bias Threshold Voltage
RDS	Drain-Source Shunt Resistance
TOX	Gate Oxide Thickness
CGSO	Zero-bias Gate-Source Capacitance
CGDO	Zero-bias Gate-Drain Capacitance
CBD	Zero-bias Bulk-Drain Junction Capacitance
MJ	Bulk Junction Grading Coefficient
PB	Bulk Junction Potential
FC	Bulk Junction Forward-bias Capacitance Coefficient
RG	Gate Ohmic Resistance
IS	Bulk Junction Saturation Current
N	Bulk Junction Emission Coefficient
RB	Bulk Series Resistance
PHI	Surface Inversion Potential
GAMMA	Body-effect Parameter
DELTA	Width effect on Threshold Voltage
ETA	Static Feedback on Threshold Voltage
THETA	Mobility Modulation
KAPPA	Saturation Field Factor
VMAX	Maximum Drift Velocity of Carriers
XJ	Metallurgical Junction Depth
UO	Surface Mobility

Transconductance Characteristic

Circuit Simulation Result

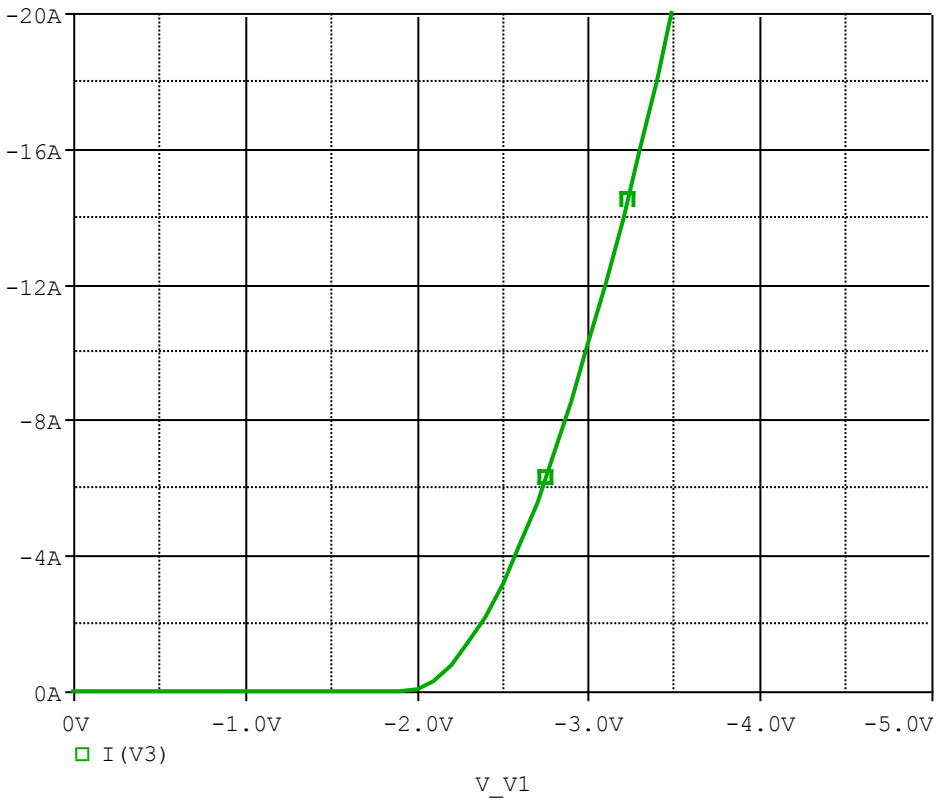


Comparison table

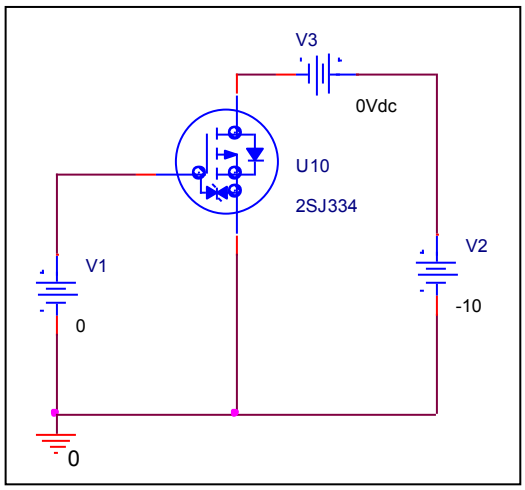
Id(A)	Gfs(S)		Error(%)
	Measurement	Simulation	
-1.000	4.100	4.230	3.171
-2.000	7.900	8.070	2.152
-5.000	12.500	12.729	1.832
-10.000	18.000	17.690	-1.722
-20.000	24.000	23.161	-3.496

Vgs-Id Characteristic

Circuit Simulation result

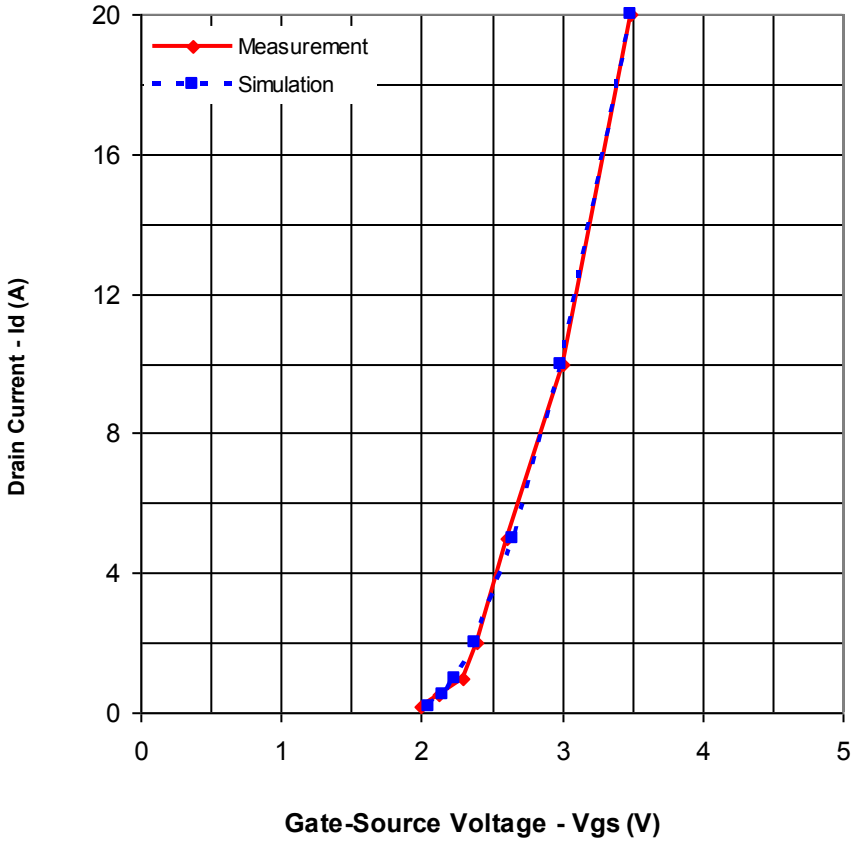


Evaluation circuit



Comparison Graph

Circuit Simulation Result

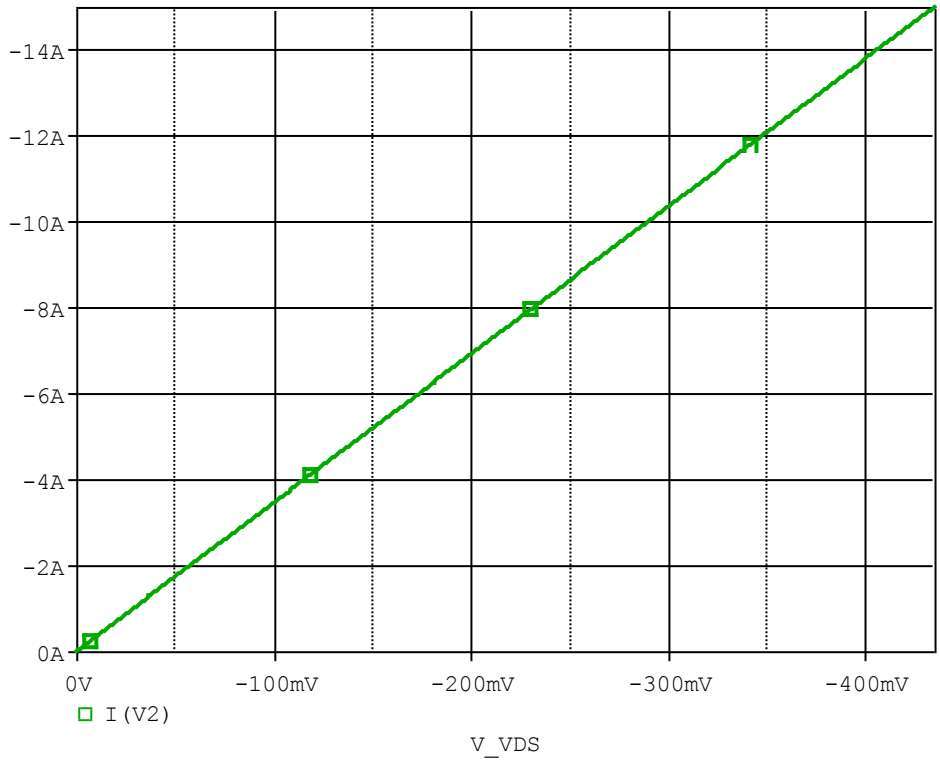


Simulation Result

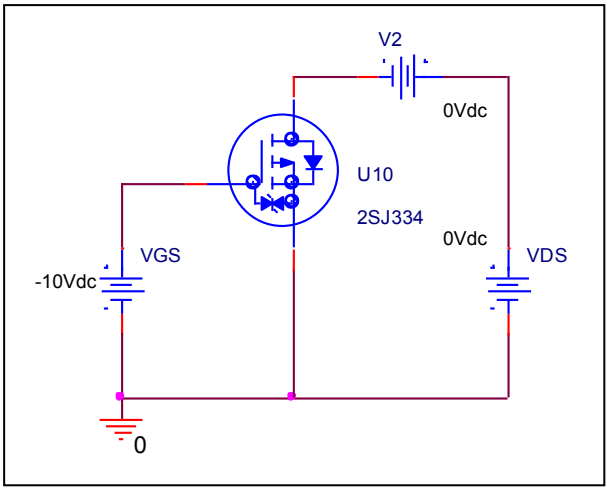
I_D(A)	V_{GS}(V)		Error (%)
	Measurement	Simulation	
-0.200	-2.000	-2.057	2.850
-0.500	-2.120	-2.144	1.132
-1.000	-2.300	-2.241	-2.565
-2.000	-2.400	-2.377	-0.958
-5.000	-2.600	-2.656	2.154
-10.000	-3.000	-2.988	-0.400
-20.000	-3.490	-3.486	-0.115

Rds(on) Characteristic

Circuit Simulation result



Evaluation circuit

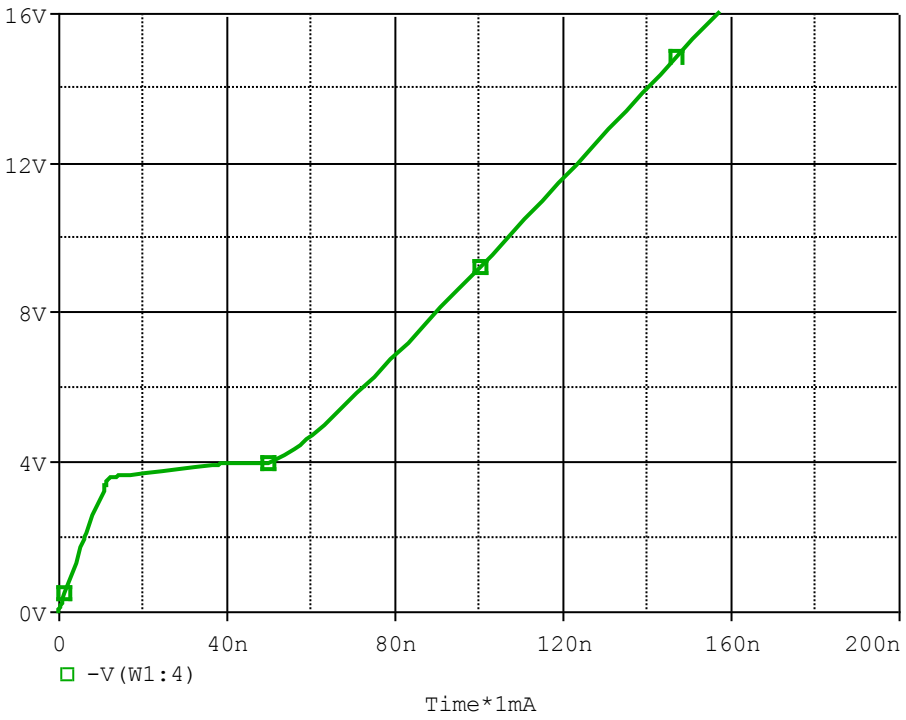


Simulation Result

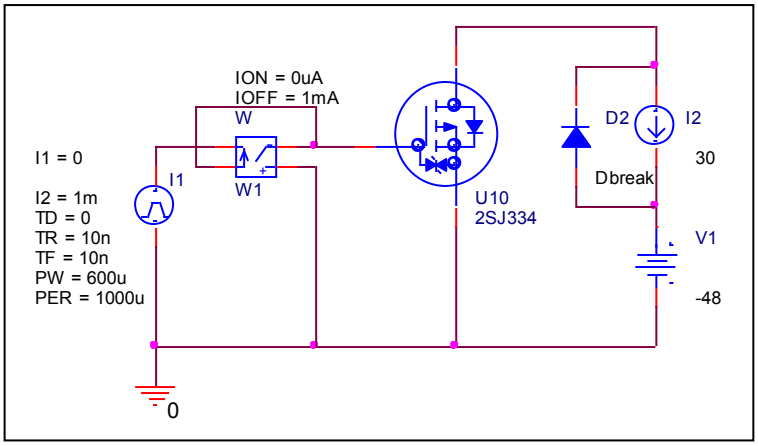
I_D=-15A, V_{GS}=-10V	Measurement		Simulation		Error (%)
R_{DS} (on)	29.000	mΩ	29.000	mΩ	0.000

Gate Charge Characteristic

Circuit Simulation Result



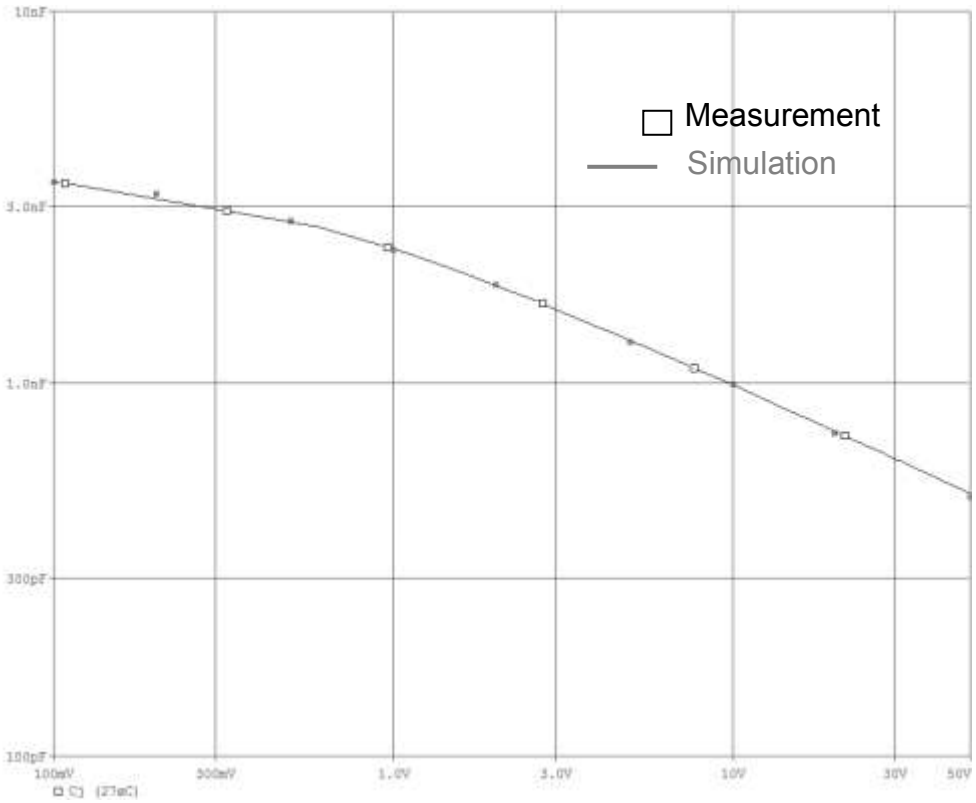
Evaluation Circuit



Simulation Result

V_{DD}=-48V, I_D= -30A ,V_{GS}=-10V	Measurement		Simulation		Error (%)
Qgs	13.000	nC	12.456	nC	-4.185
Qgd	38.000	nC	37.895	nC	-0.276
Qg	107.000	nC	107.018	nC	0.017

Capacitance Characteristic

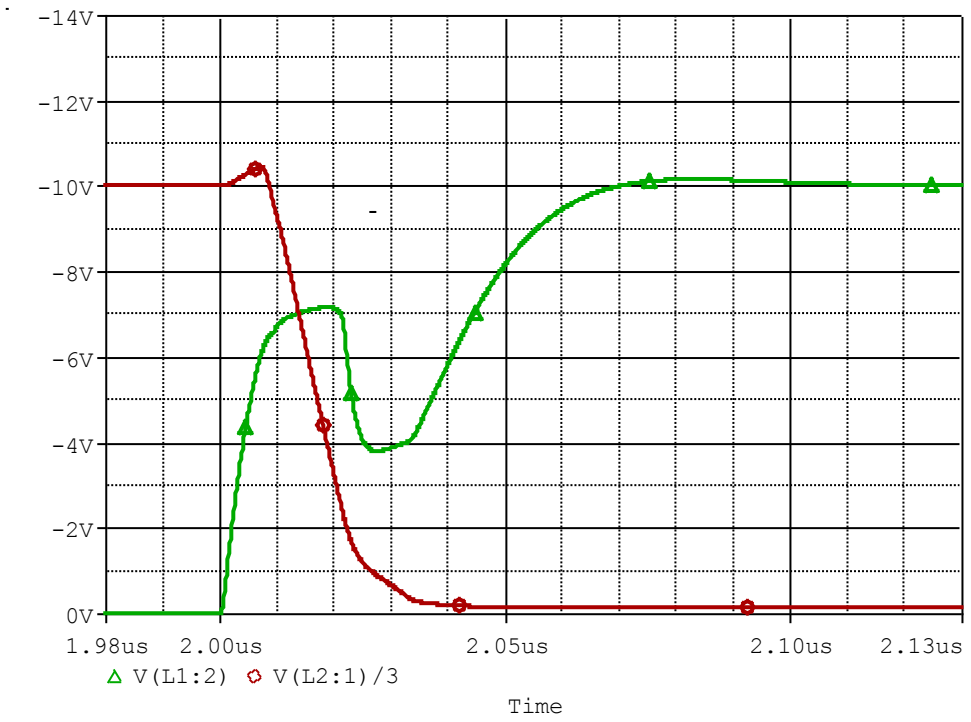


Simulation Result

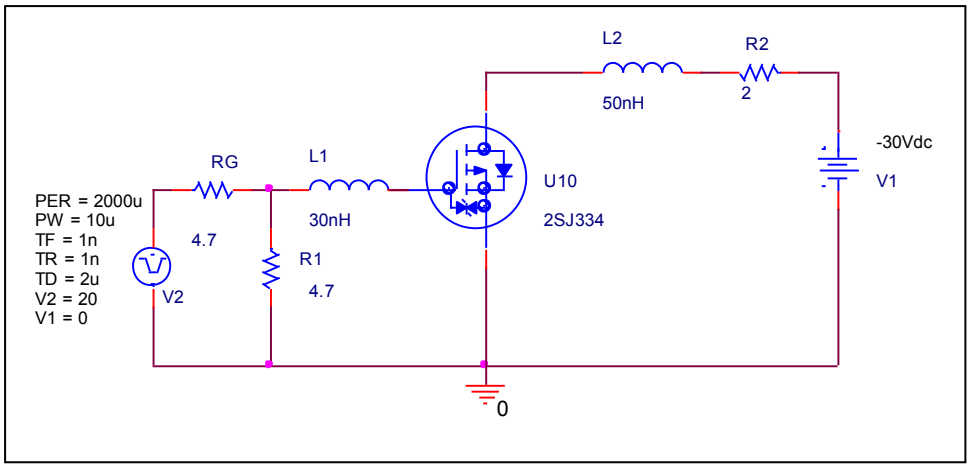
V_{DS}(V)	Cbd(pF)		Error(%)
	Measurement	Simulation	
0.100	3600.000	3500.000	-2.778
0.200	3200.000	3250.000	1.563
0.500	2700.000	2750.000	1.852
1.000	2300.000	2300.000	0.000
2.000	1900.000	1850.000	-2.632
5.000	1350.000	1300.000	-3.704
10.000	1000.000	1000.000	0.000
20.000	750.000	740.000	-1.333
50.000	480.000	500.000	4.167

Switching Time Characteristic

Circuit Simulation Result



Evaluation Circuit

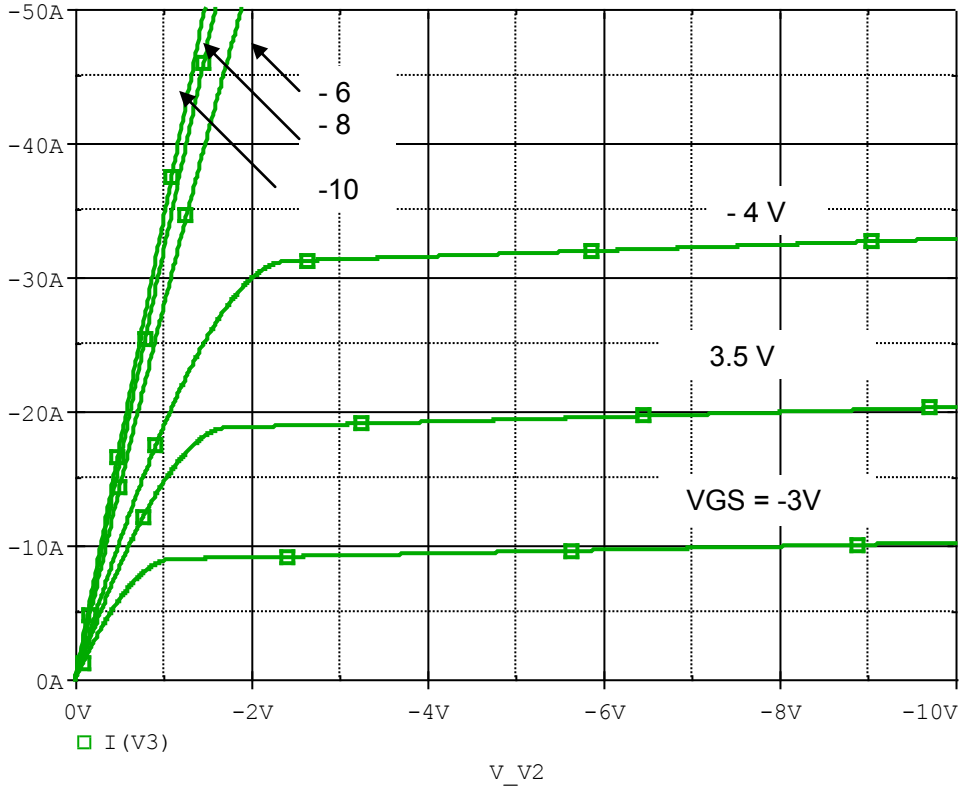


Simulation Result

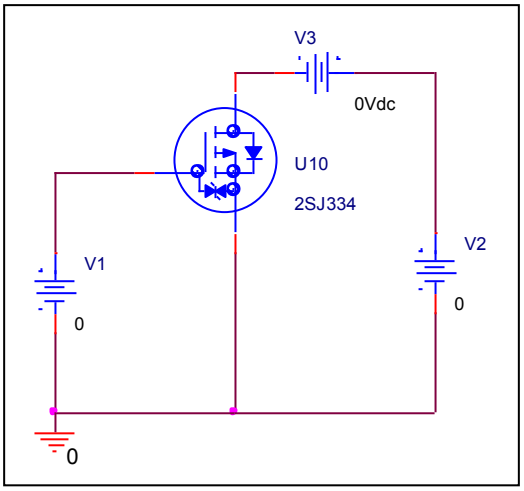
I_D=-15A, V_{DD}= -30V, V_{GS}=-10V	Measurement		Simulation		Error(%)
Td(on)	25.000	ns	25.146	ns	0.584

Output Characteristic

Circuit Simulation Result

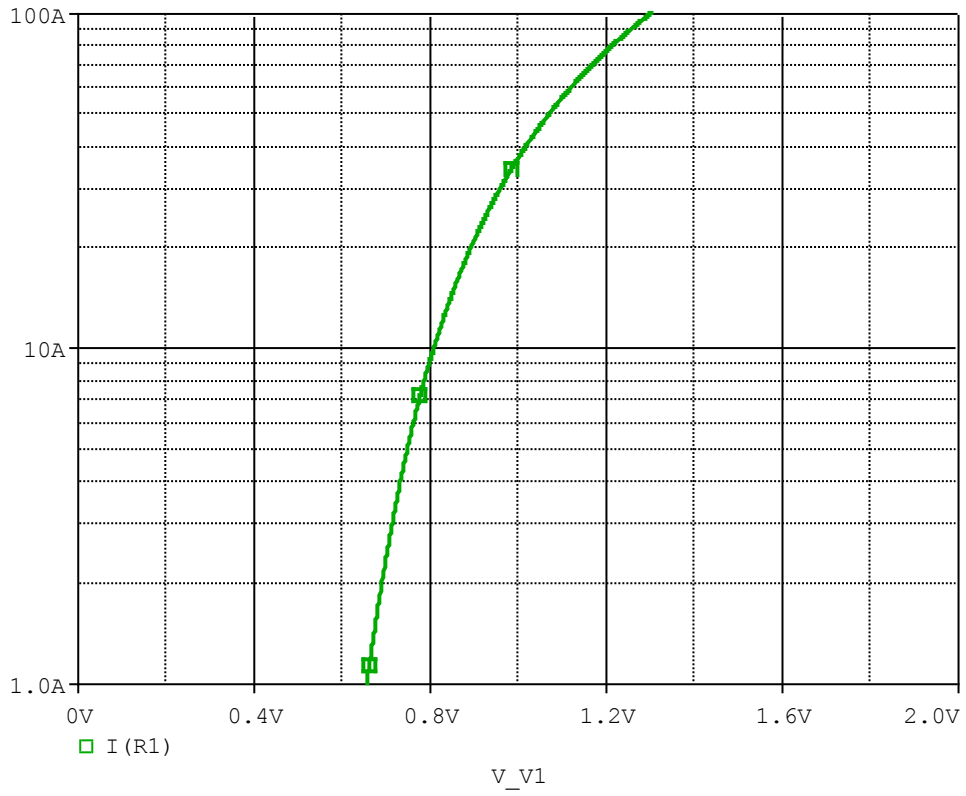


Evaluation Circuit

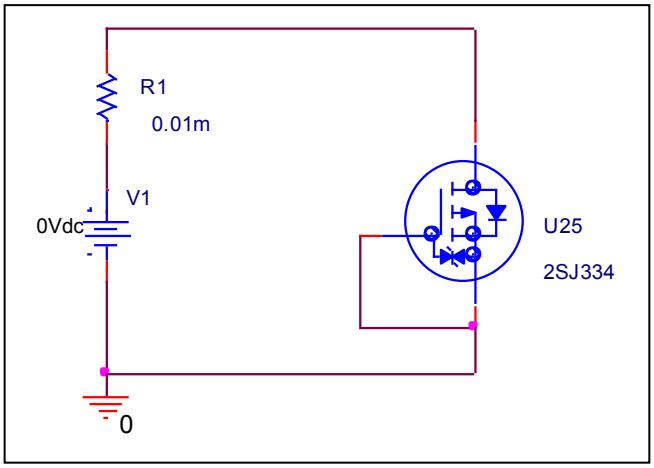


Forward Current Characteristic

Circuit Simulation Result

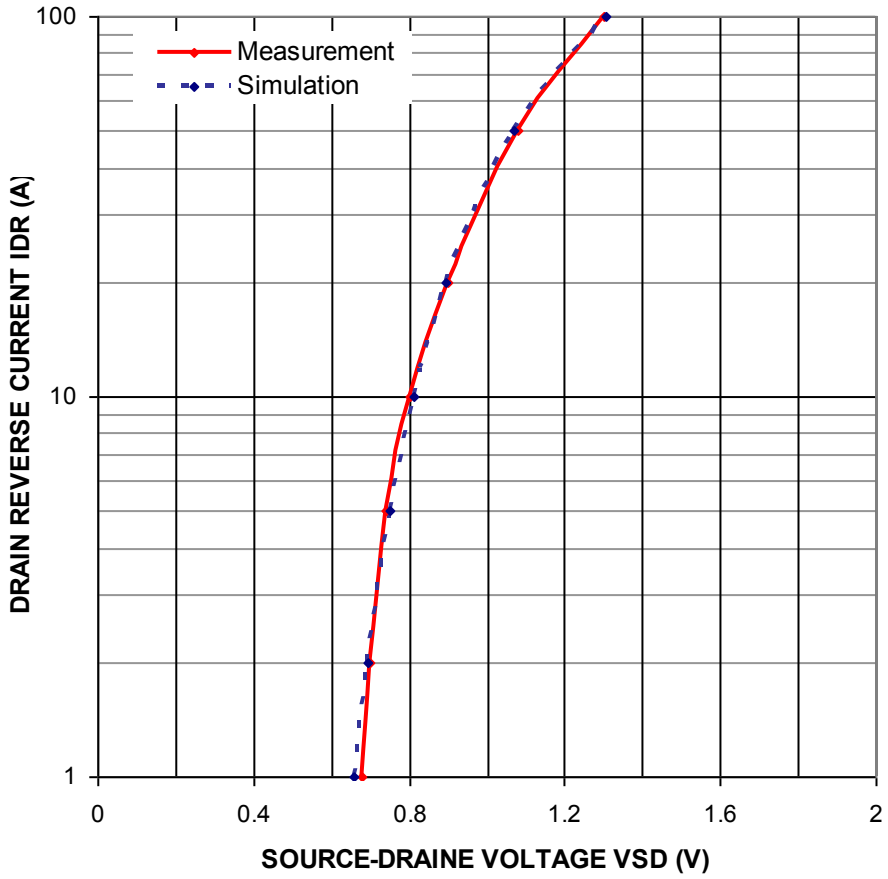


Evaluation Circuit



Comparison Graph

Circuit Simulation Result

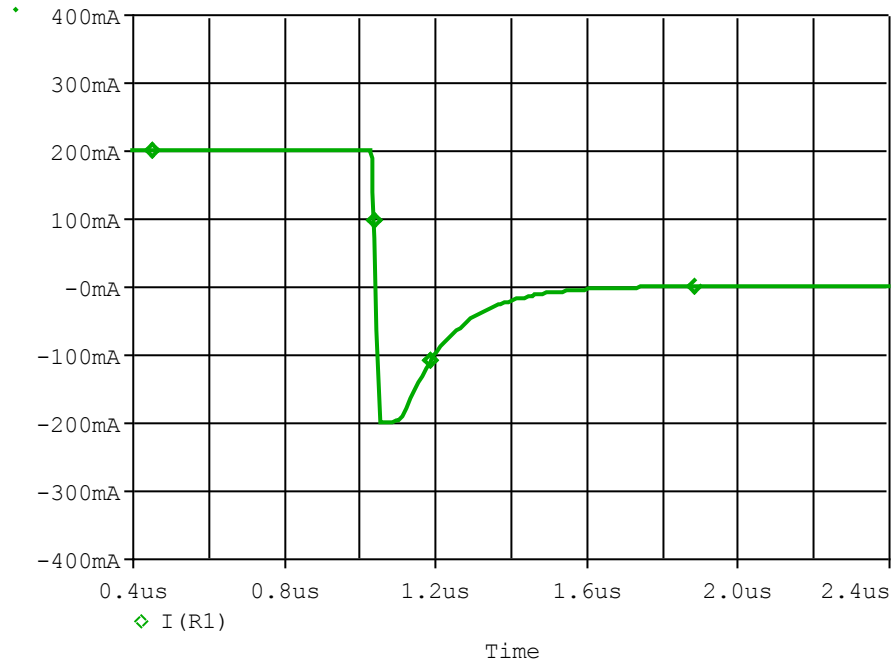


Simulation Result

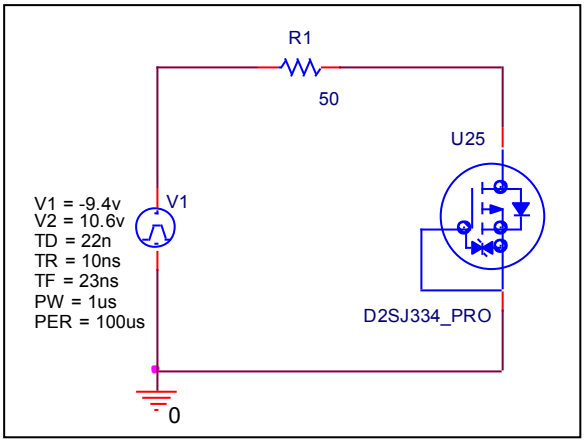
IDR(A)	VSD(V)		%Error
	Measurement	Simulation	
1.000	0.680	0.658	-3.235
2.000	0.700	0.692	-1.143
5.000	0.740	0.749	1.216
10.000	0.800	0.810	1.250
20.000	0.900	0.896	-0.444
50.000	1.080	1.070	-0.926
100.000	1.300	1.304	0.308

Reverse Recovery Characteristic (Body Diode)

Circuit Simulation Result



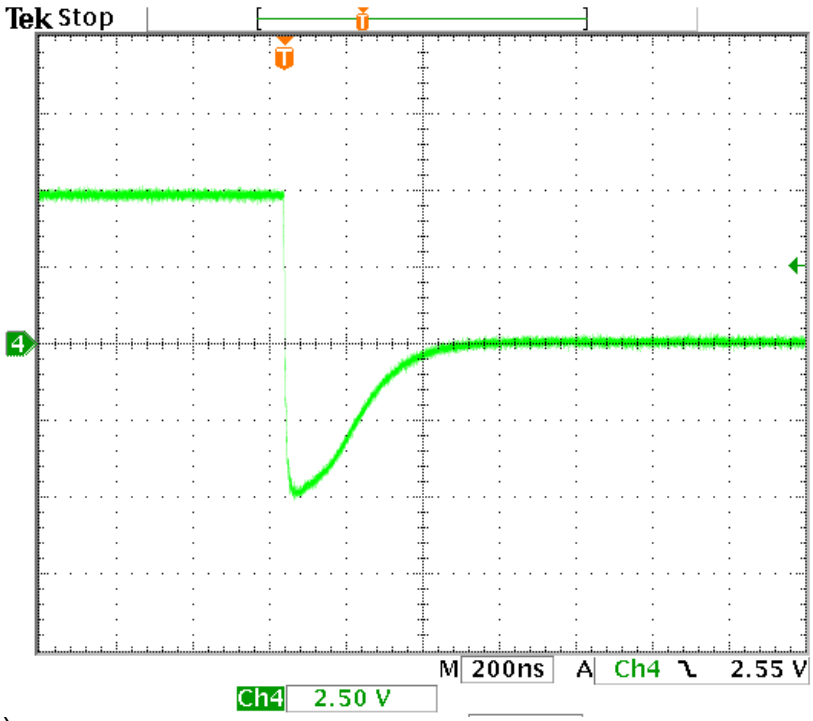
Evaluation Circuit



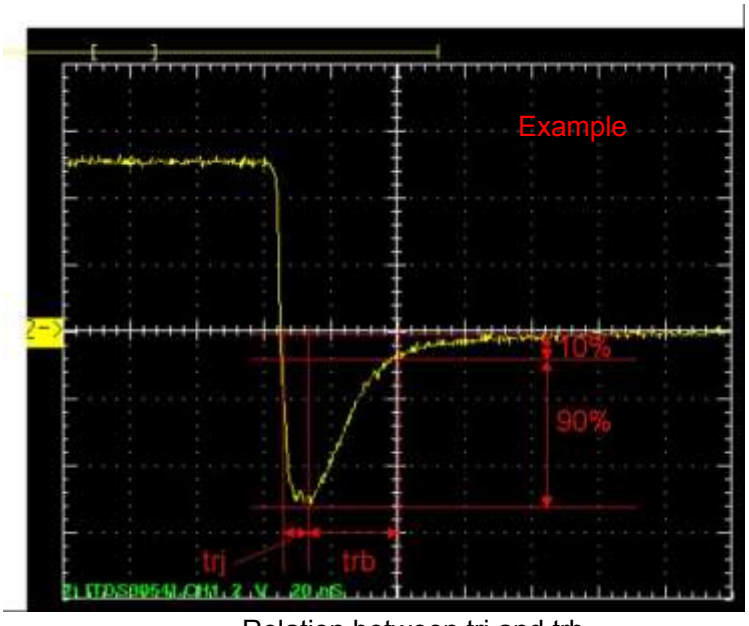
Compare Measurement vs. Simulation

	Measurement		Simulation		Error (%)
trj	60.000	ns	59.572	ns	-0.713
trb	300.000	ns	294.737	ns	-1.754
trr	360.000	ns	354.309	ns	-1.581

Reverse Recovery Characteristic (Body Diode) Reference



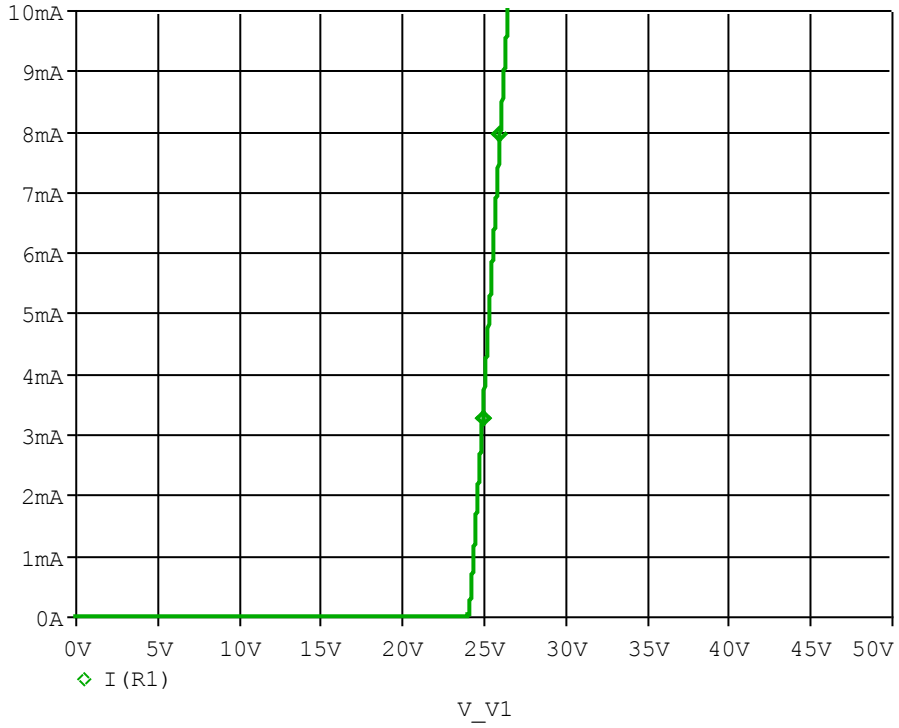
Trj= (60ns)
Trb= (300ns)
Conditions:Ifwd=Irev=0.2(A),Rl=50



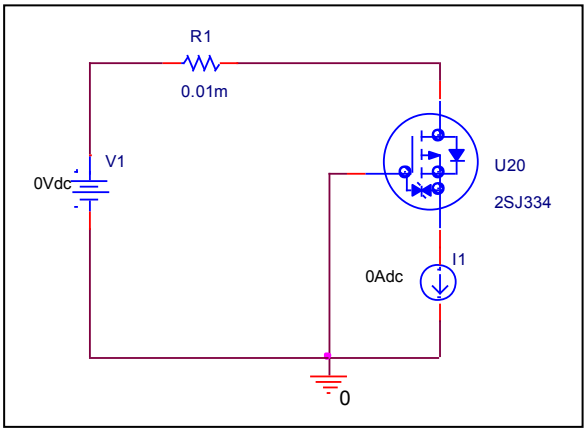
Relation between trj and trb

Zener Voltage Characteristic

Circuit Simulation Result



Evaluation Circuit



Zener Voltage Characteristic Reference