Device Modeling Report

COMPONENTS: Power MOSFET (Professional)
PART NUMBER: 2SJ494
MANUFACTURER: NEC
Body Diode (Professional) / ESD Protection Diode

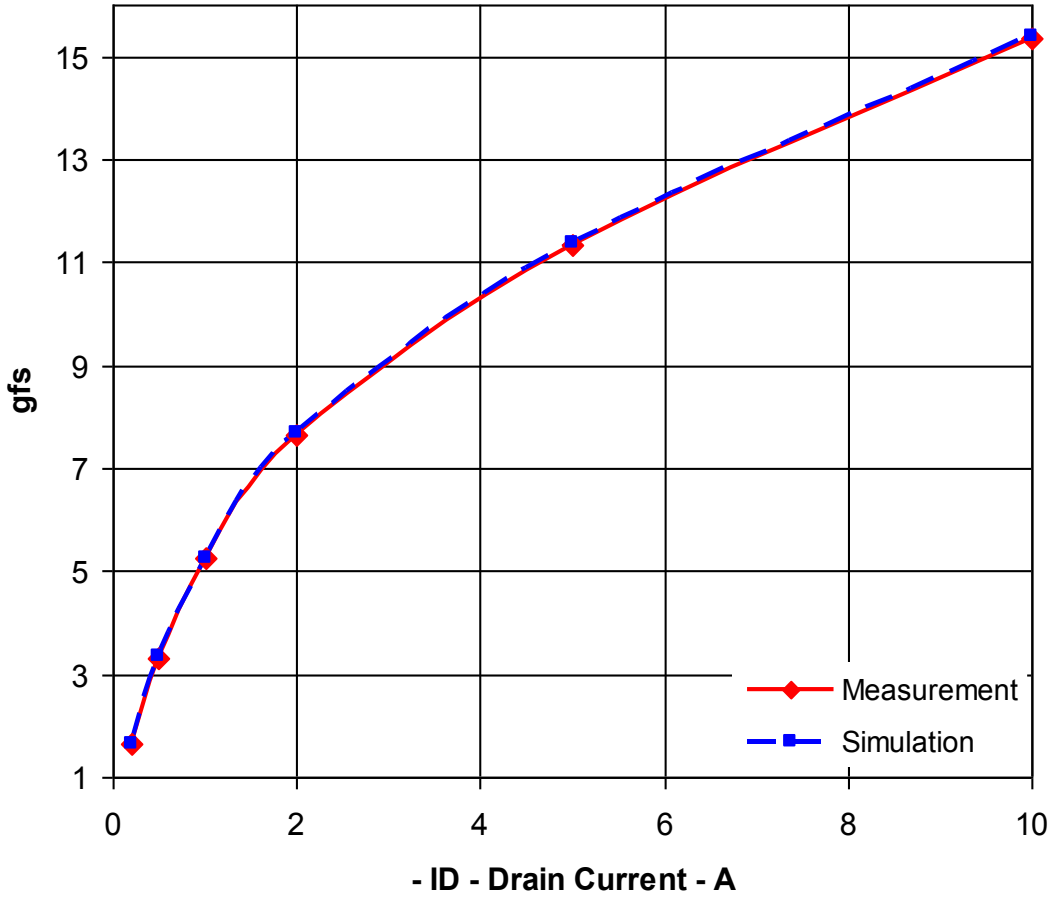
Bee Technologies Inc.

MOSFET MODEL

Pspice model parameter	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	Modility Modulation
KAPPA	Saturation Field Factor
VMAX	Maximum Drift Velocity of Carriers
XJ	Metallurgical Junction Depth
UO	Surface Mobility

Transconductance Characteristic

Circuit Simulation Result

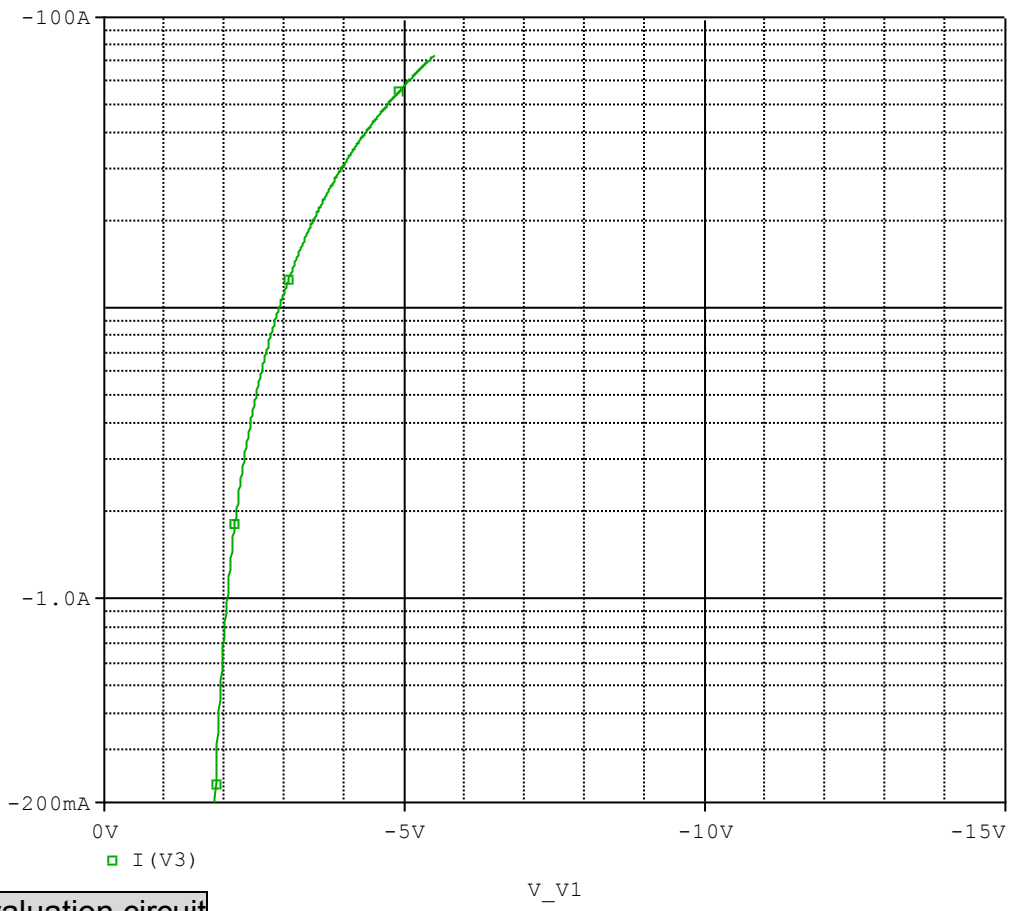


Comparison table

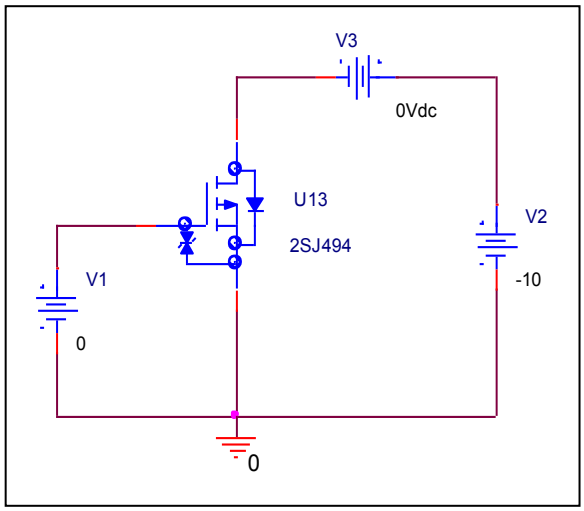
Id(A)	gfs		Error(%)
	Measurement	Simulation	
-0.2	1.667	1.667	0.000
-0.5	3.300	3.333	1.000
-1	5.250	5.263	0.248
-2	7.650	7.692	0.549
-5	11.350	11.364	0.123
-10	15.350	15.385	0.228

Vgs-Id Characteristic

Circuit Simulation result

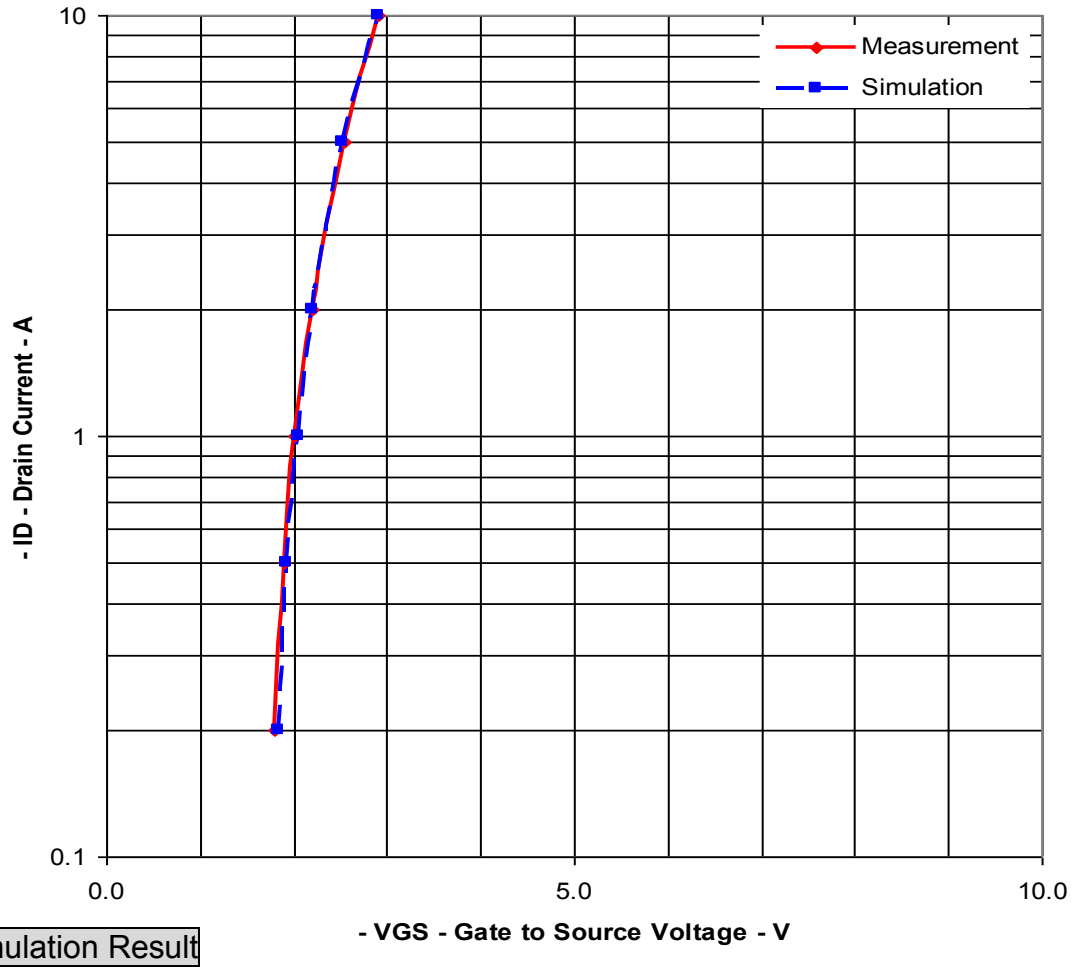


Evaluation circuit



Comparison Graph

Circuit Simulation Result

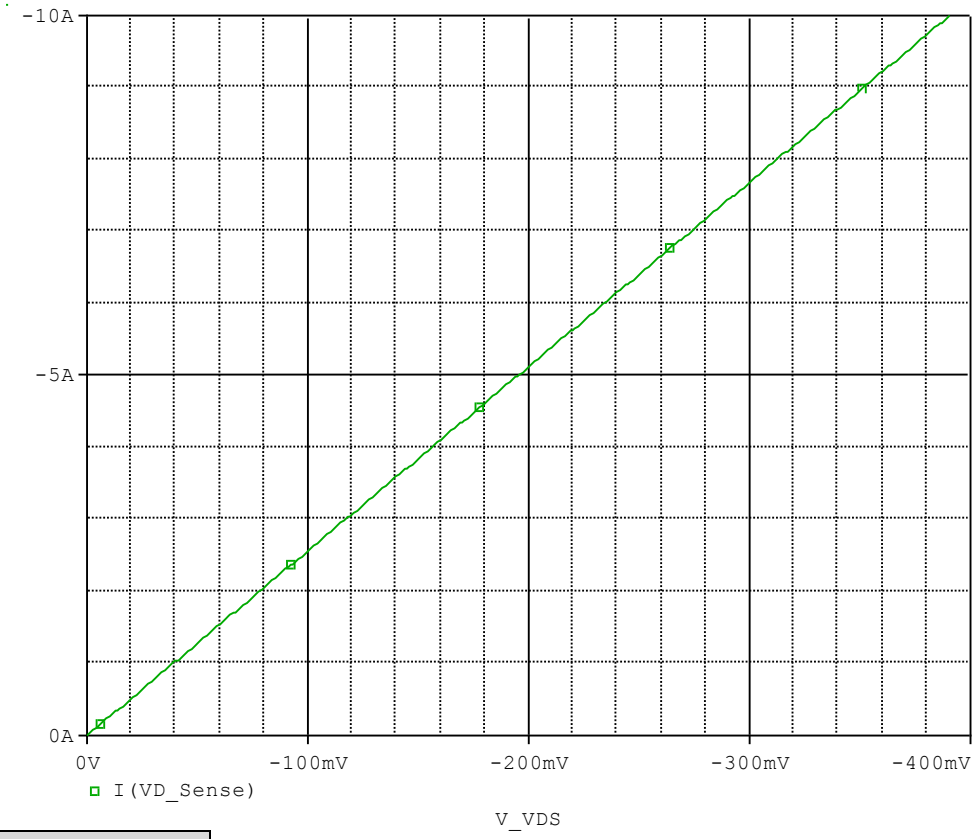


Simulation Result

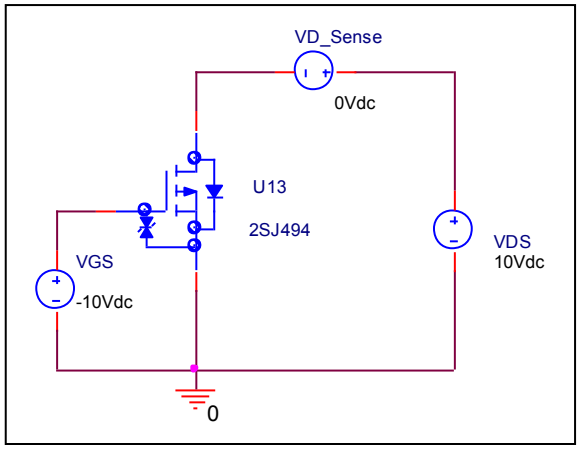
I_D(A)	V_{GS}(V)		Error (%)
	Measurement	Simulation	
-0.2	-1.800	-1.833	1.833
-0.5	-1.900	-1.931	1.632
-1	-2.000	-2.044	2.200
-2	-2.200	-2.200	0.000
-5	-2.550	-2.526	-0.941
-10	-2.900	-2.911	0.379

Rds(on) Characteristic

Circuit Simulation result



Evaluation circuit

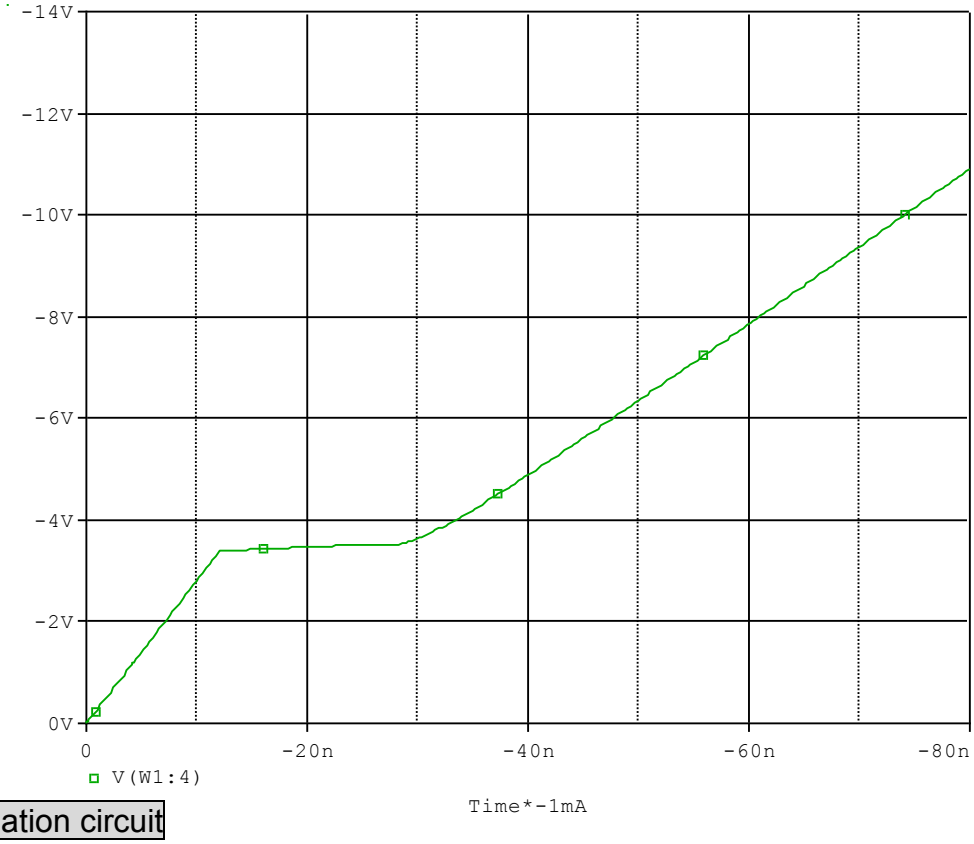


Simulation Result

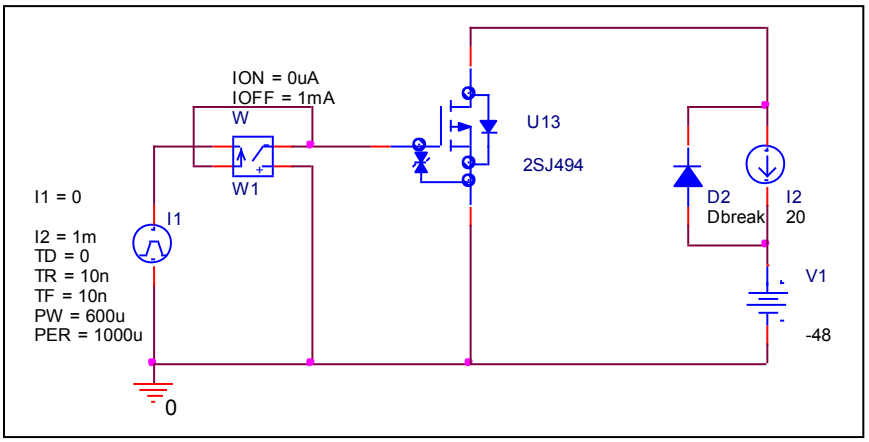
I_D=-10A, V_{GS}=-10V	Measurement	Simulation	Error (%)
R_{DS} (on) Ω	0.039	0.039	0

Gate Charge Characteristic

Circuit Simulation result



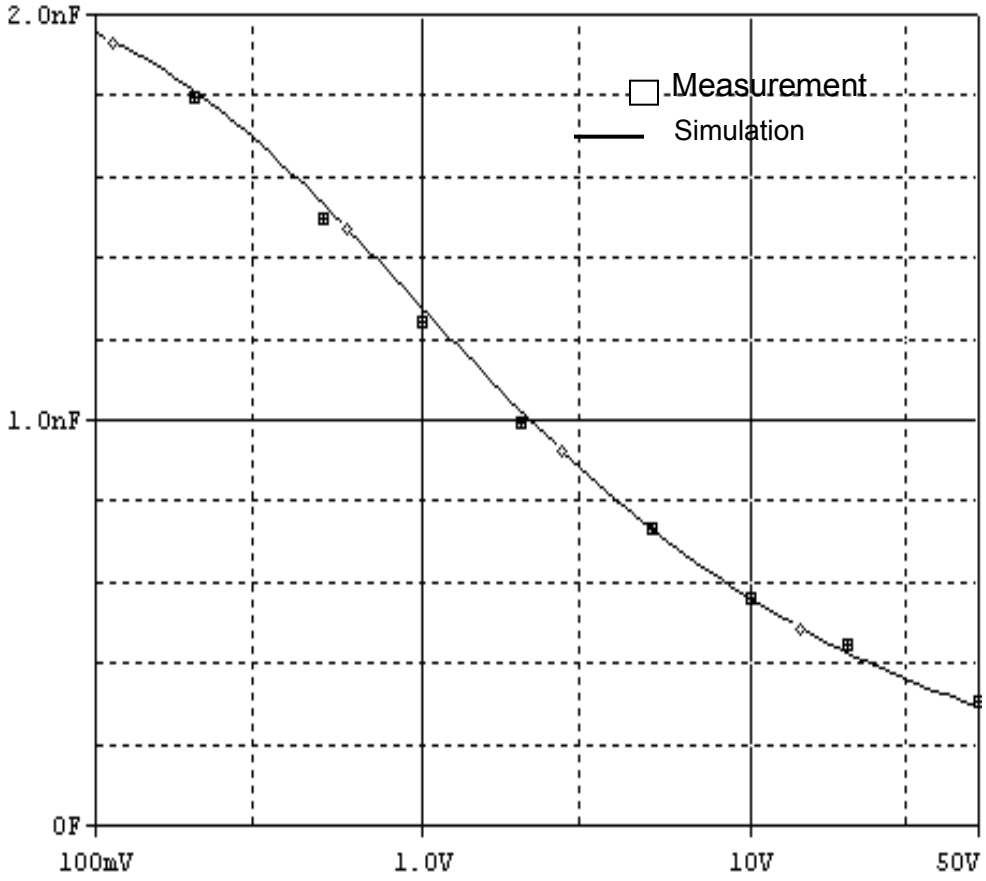
Evaluation circuit



Simulation Result

V_{DD}=-48V,I_D=-20A ,V_{GS}=-10V	Measurement	Simulation	Error (%)
Qgs (nC)	12.000	12.069	0.575
Qgd(nC)	16.000	16.035	0.219
Qg(nC)	74.000	74.138	0.186

Capacitance Characteristic

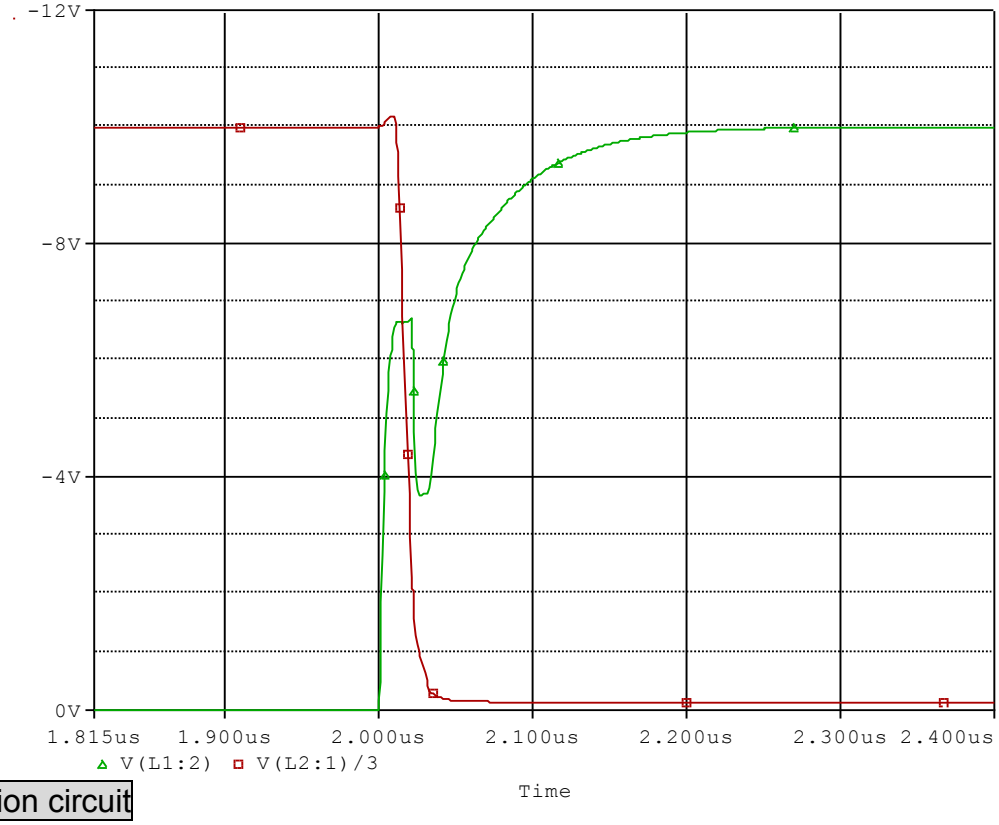


Simulation Result

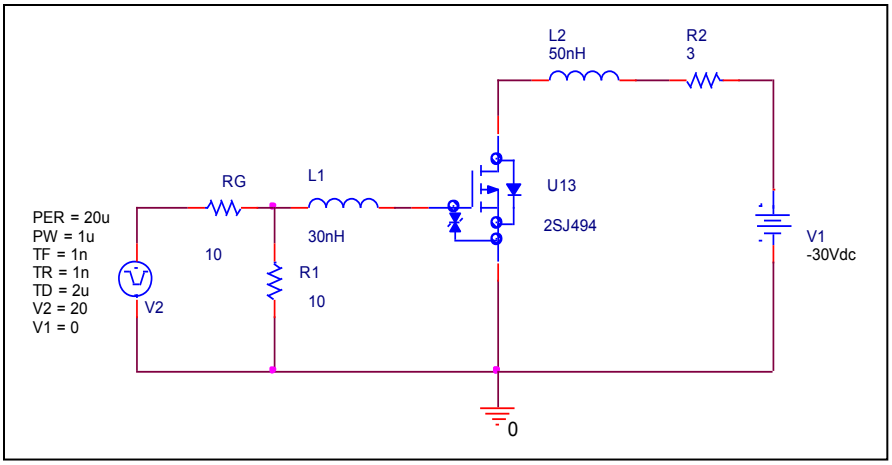
V_{DS}(V)	Cbd(pF)		Error(%)
	Measurement	Simulation	
0.1	2000	1995	-0.250
0.2	1800	1803	0.167
0.5	1500	1507	0.467
1	1250	1255	0.400
2	1000	1004	0.400
5	740	740	0.000
10	570	570	0.000
20	450	447	-0.667
50	310	308	-0.645

Switching Time Characteristic

Circuit Simulation result



Evaluation circuit

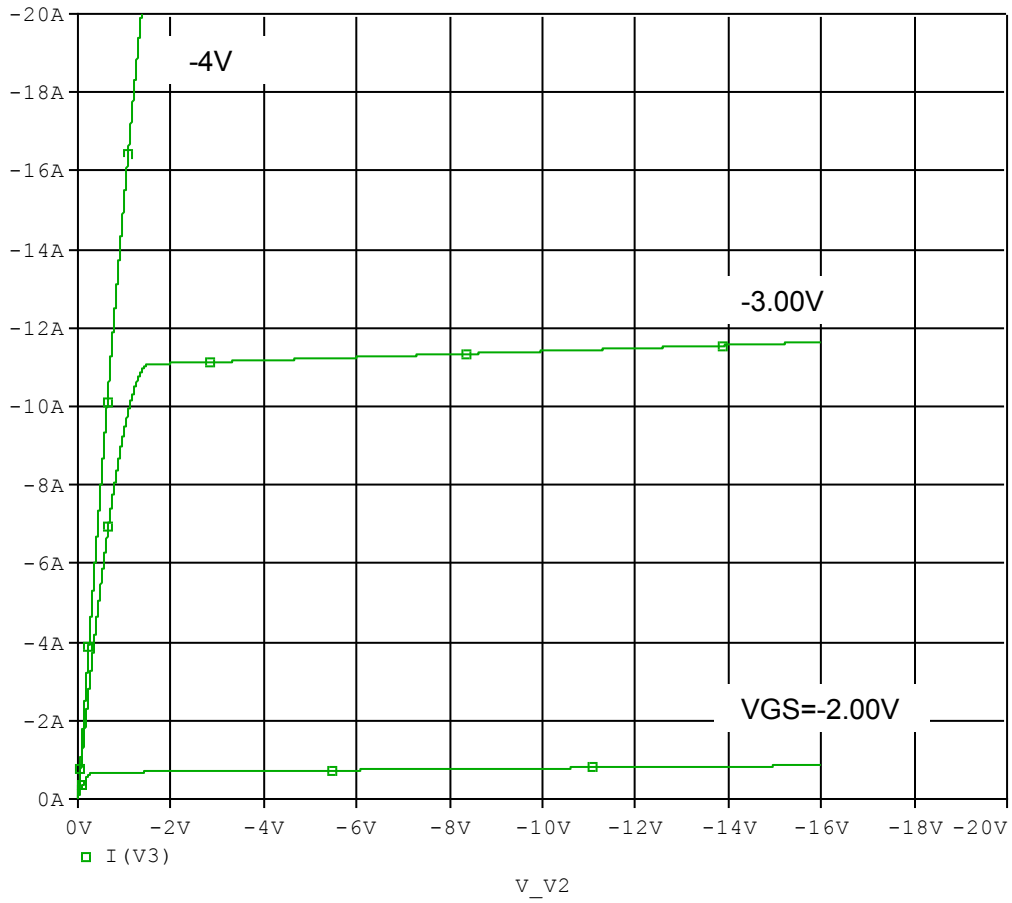


Simulation Result

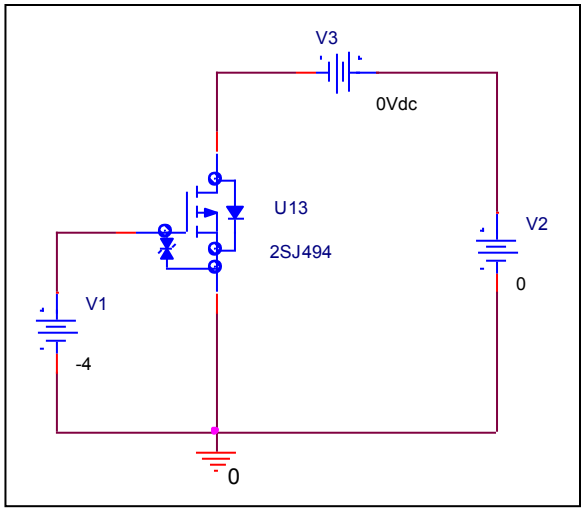
I_D=-10A, V_{DD}=-30V V_{GS}=0/-10V	Measurement	Simulation	Error(%)
Ton(ns)	25.000	25.067	0.268

Output Characteristic

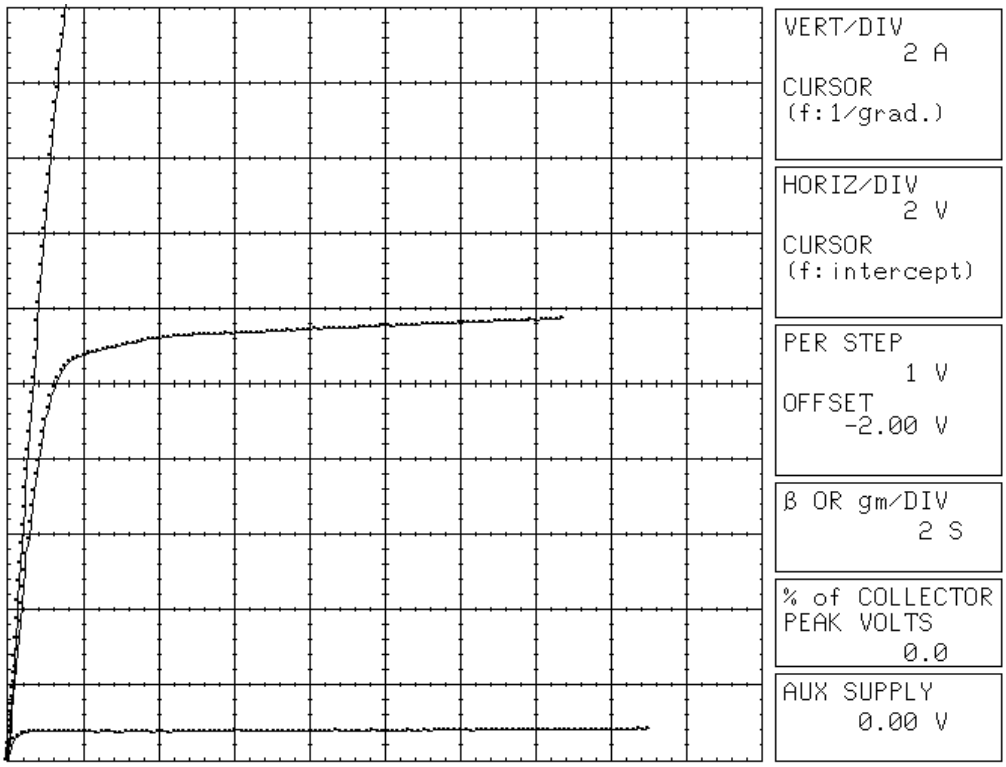
Circuit Simulation result



Evaluation circuit

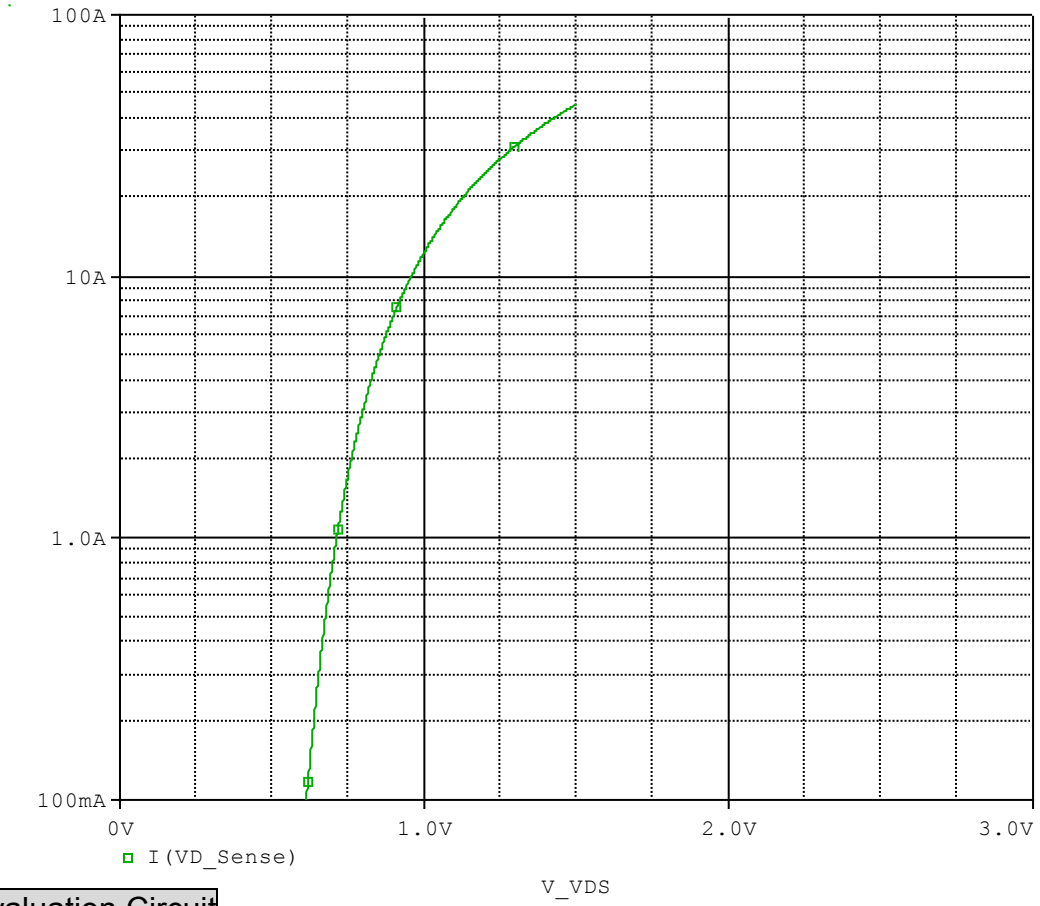


Output Characteristic Reference

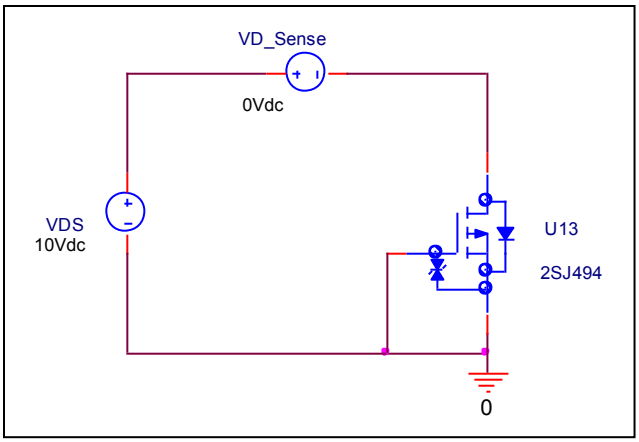


Forward Current Characteristic

Circuit Simulation Result

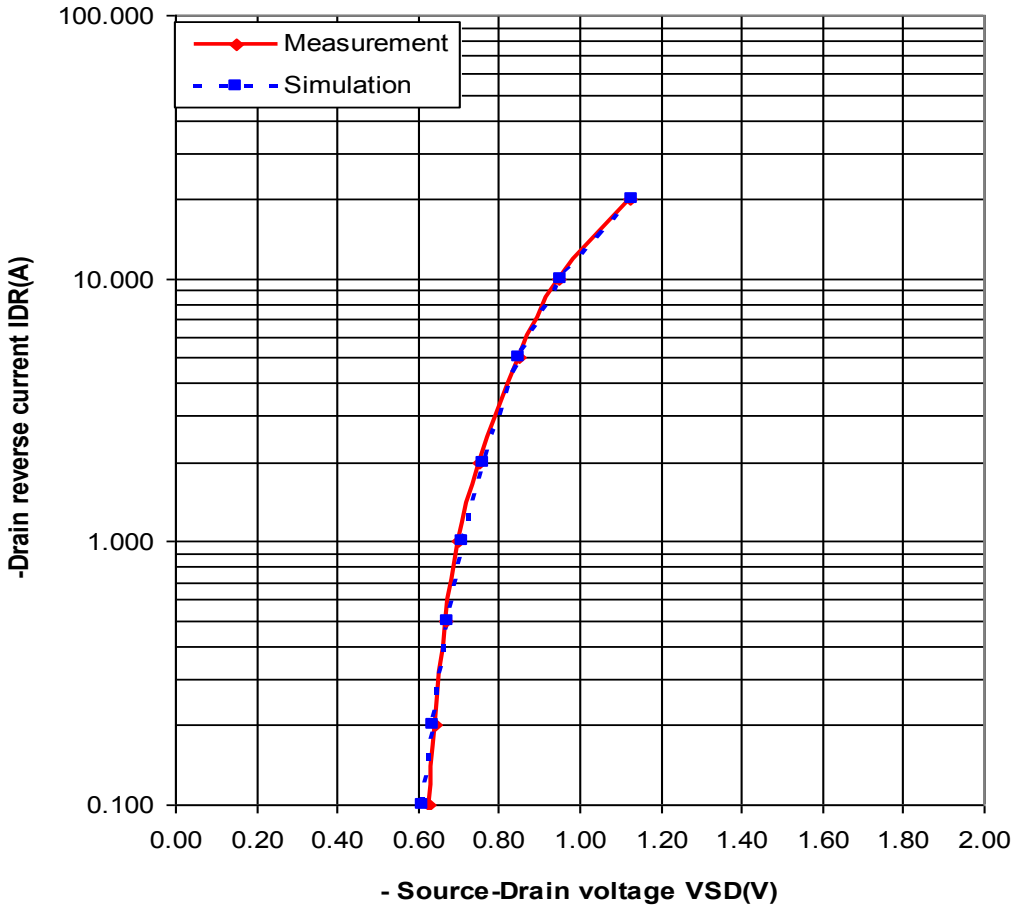


Evaluation Circuit



Comparison Graph

Circuit Simulation Result

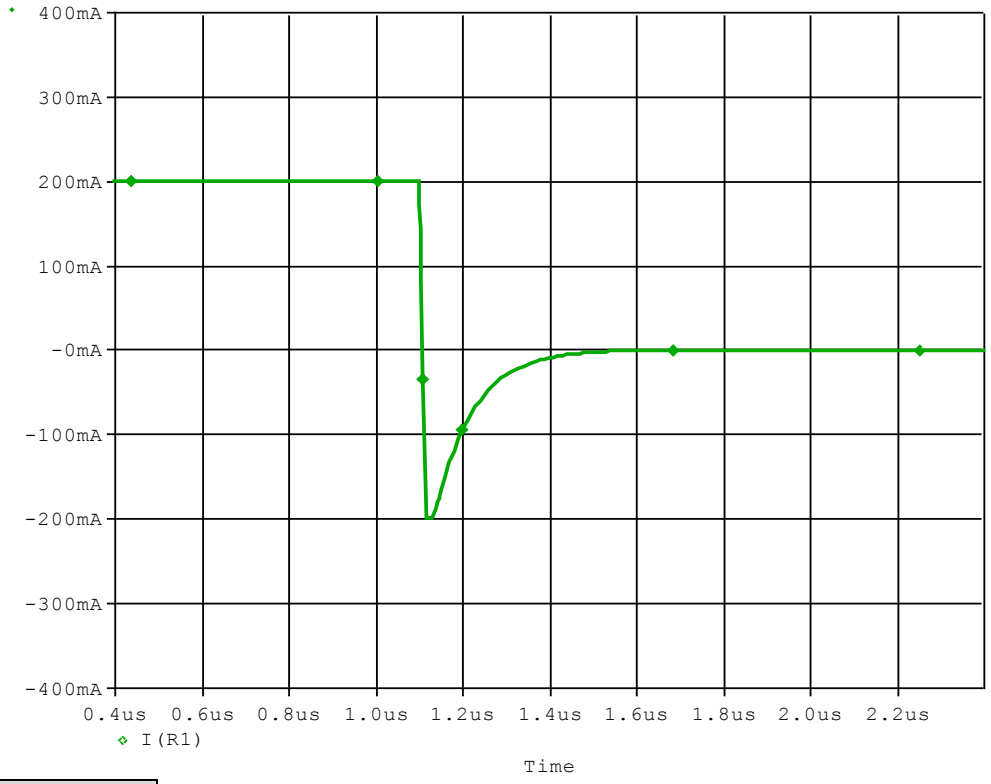


Simulation Result

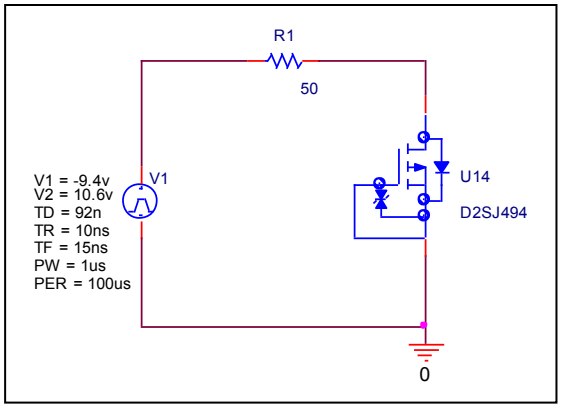
IDR(A)	VDS(V) Measurement	VDS(V) Simulation	%Error
-0.1	-0.625	-0.613	-1.920
-0.2	-0.640	-0.637	-0.469
-0.5	-0.670	-0.674	0.597
-1	-0.700	-0.711	1.571
-2	-0.750	-0.760	1.333
-5	-0.850	-0.851	0.118
-10	-0.950	-0.953	0.316
-20	-1.125	-1.127	0.178

Reverse Recovery Characteristic

Circuit Simulation Result



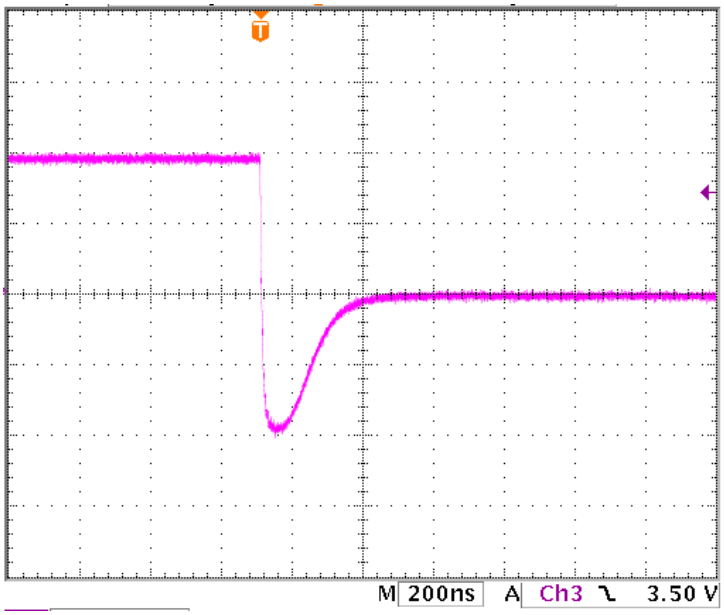
Evaluation Circuit



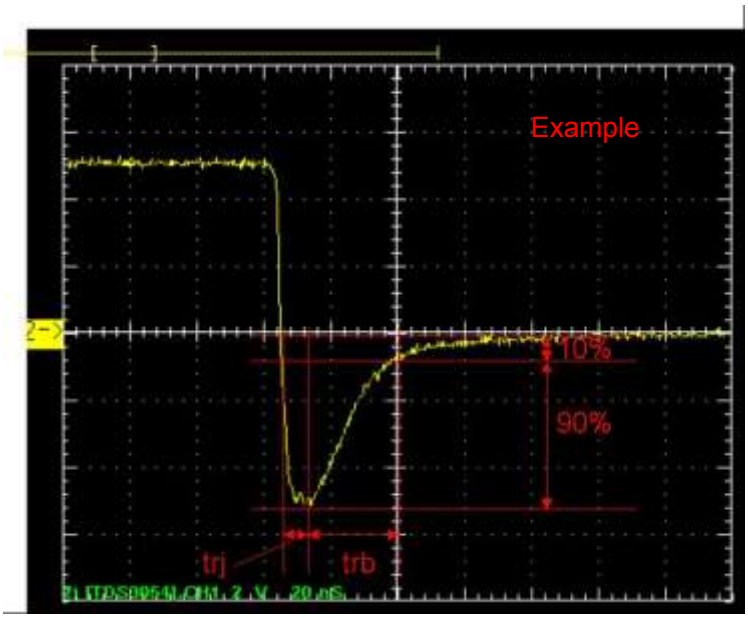
Compare Measurement vs. Simulation

	Measurement	Simulation	Error (%)
trj (ns)	22.000	22.096	0.436
Trb (ns)	269.00	269.818	0.304
Trr (ns)	291.000	291.914	0.314

Reverse Recovery Characteristic Reference



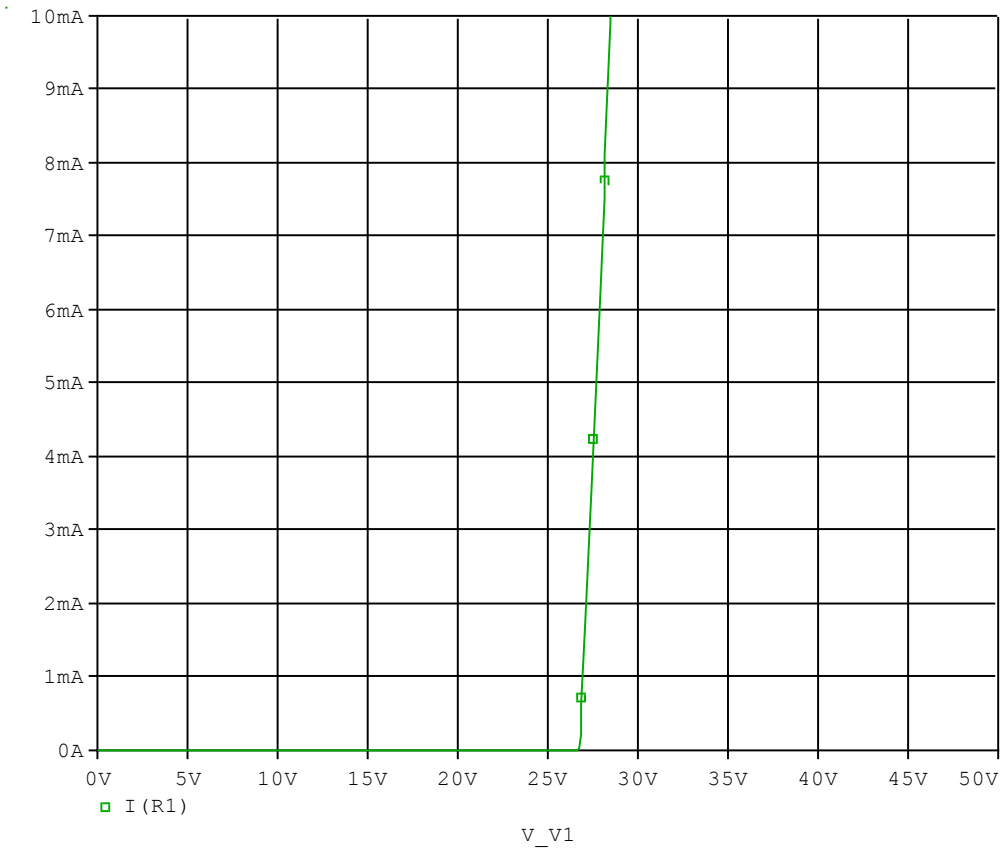
Trj=22.000(ns)
Trb=269.000(ns)
Conditions:Ifwd=Irev=0.2(A),Rl=50



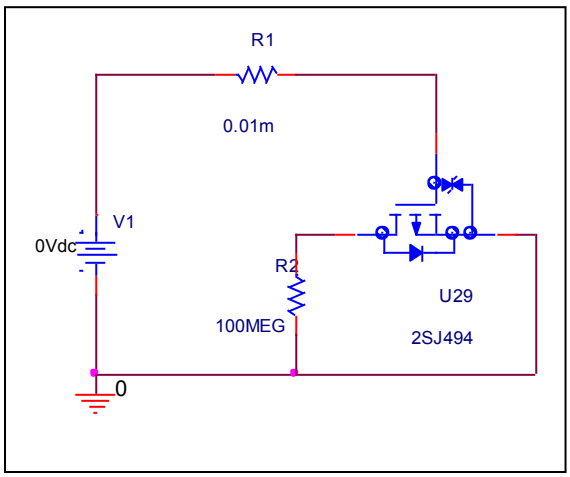
Relation between trj and trb

Zener Voltage Characteristic

Circuit Simulation Result



Evaluation Circuit



Zener Voltage Characteristic Reference