Device Modeling Report

COMPONENTS: MOSFET (Professional)
PART NUMBER: 2SJ537
MANUFACTURER: TOSHIBA
Body Diode (Professional) / ESD Protection

Bee Technologies Inc.

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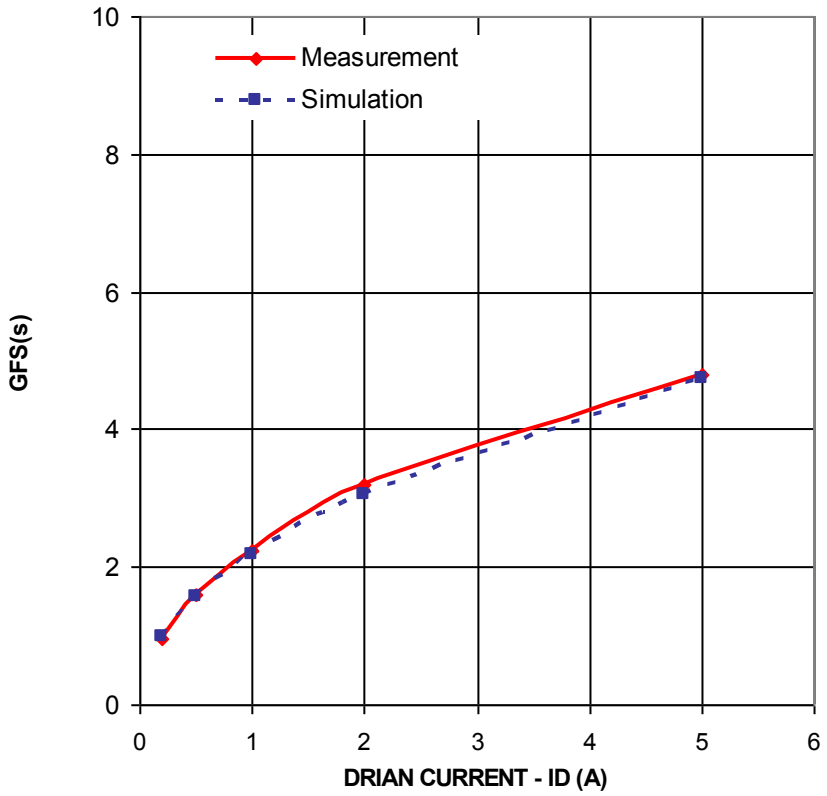
MOSFET MODEL PARAMETERS

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

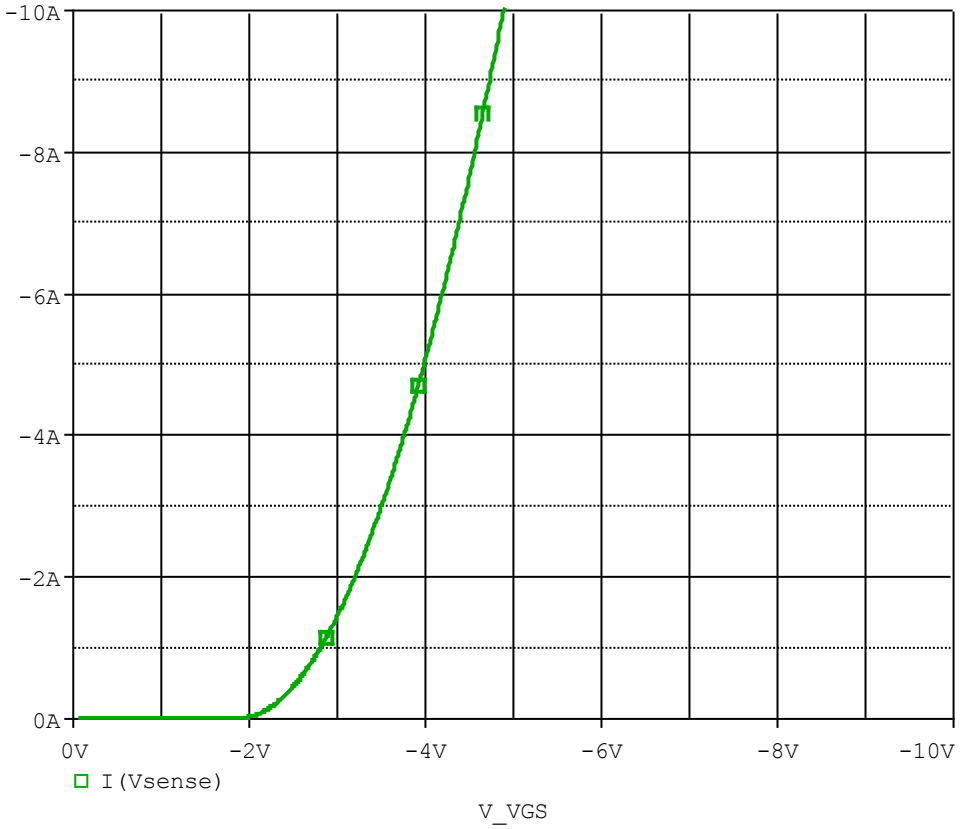


Comparison table

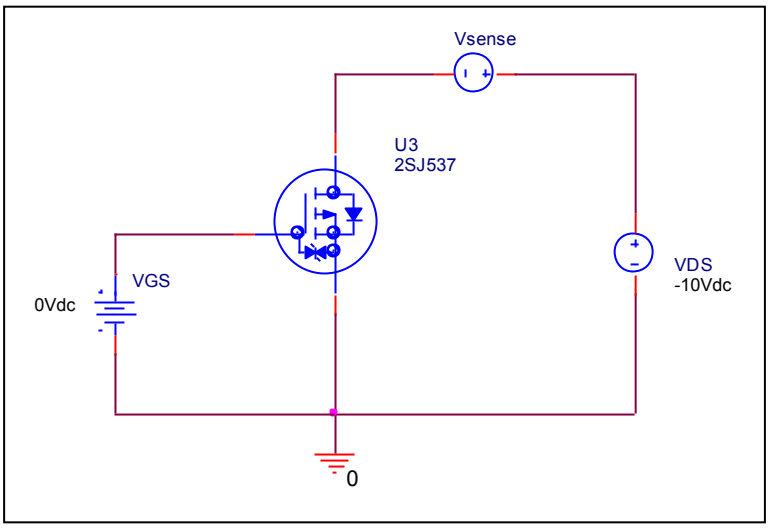
Id(A)	Gfs(S)		Error(%)
	Measurement	Simulation	
-0.200	0.950	0.989	4.105
-0.500	1.600	1.556	-2.750
-1.000	2.250	2.180	-3.111
-2.000	3.200	3.059	-4.406
-5.000	4.800	4.746	-1.125

Vgs-Id Characteristic

Circuit Simulation result

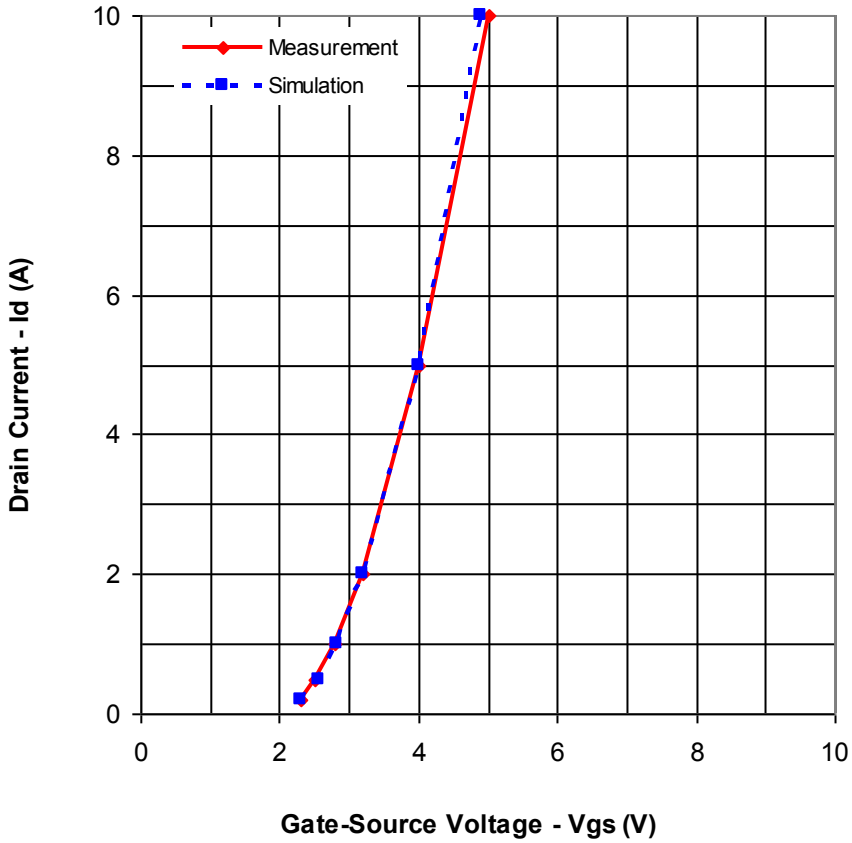


Evaluation circuit



Comparison Graph

Circuit Simulation Result

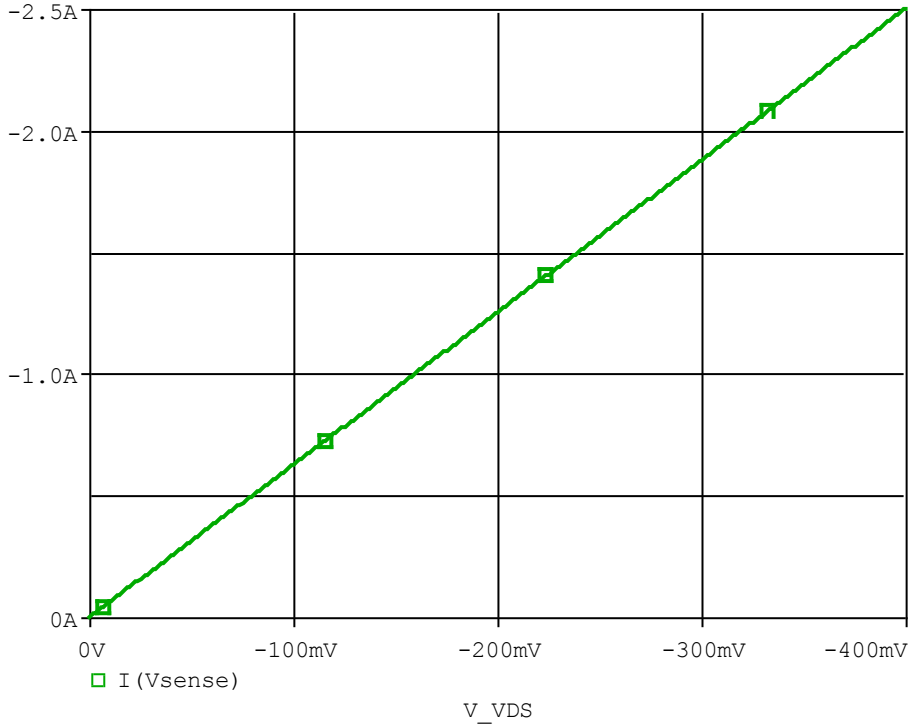


Simulation Result

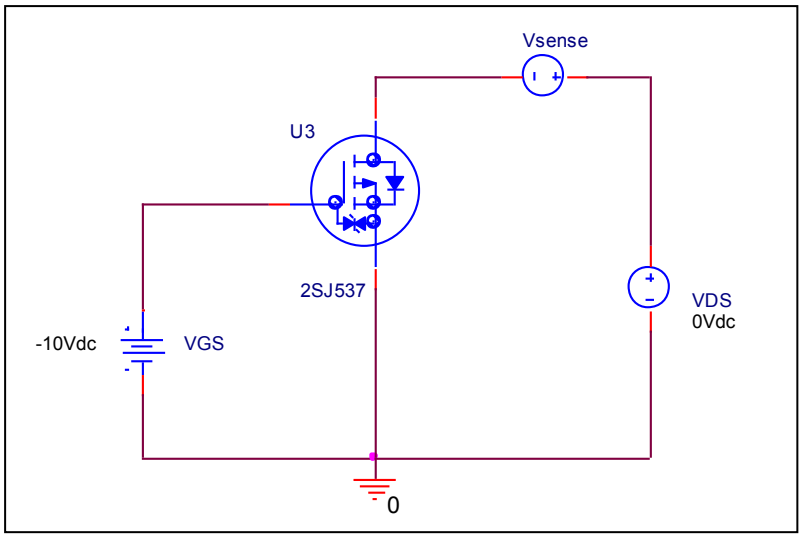
I_D(A)	V_{GS}(V)		Error (%)
	Measurement	Simulation	
-0.200	-2.300	-2.316	0.687
-0.500	-2.500	-2.552	2.080
-1.000	-2.800	-2.824	0.857
-2.000	-3.200	-3.213	0.406
-5.000	-4.000	-3.996	-0.100
-10.000	-5.020	-4.900	-2.390

Rds(on) Characteristic

Circuit Simulation result



Evaluation circuit

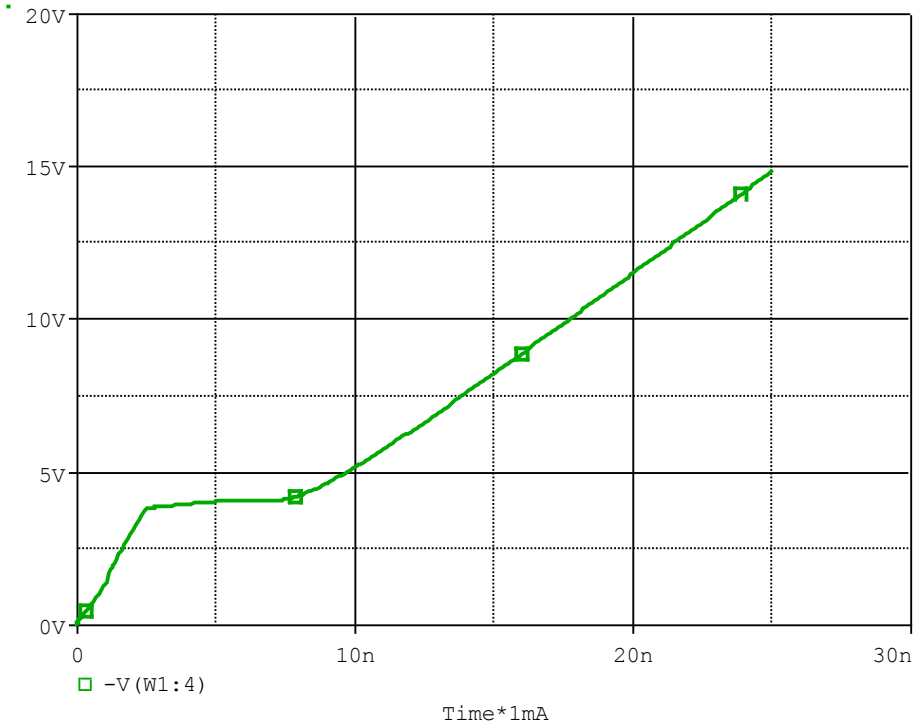


Simulation Result

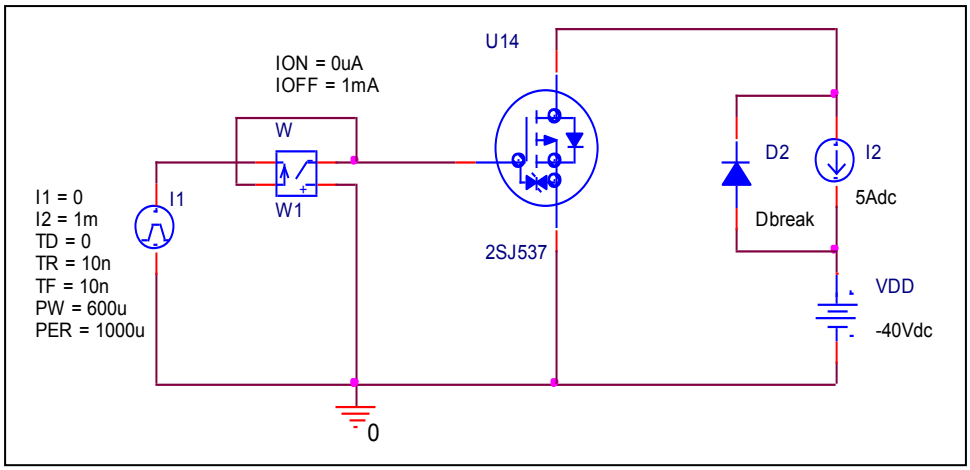
I_D=-2.5A, V_{GS}=-10V	Measurement		Simulation		Error (%)
R_{DS} (on)	0.160	Ω	0.160	Ω	0.000

Gate Charge Characteristic

Circuit Simulation Result



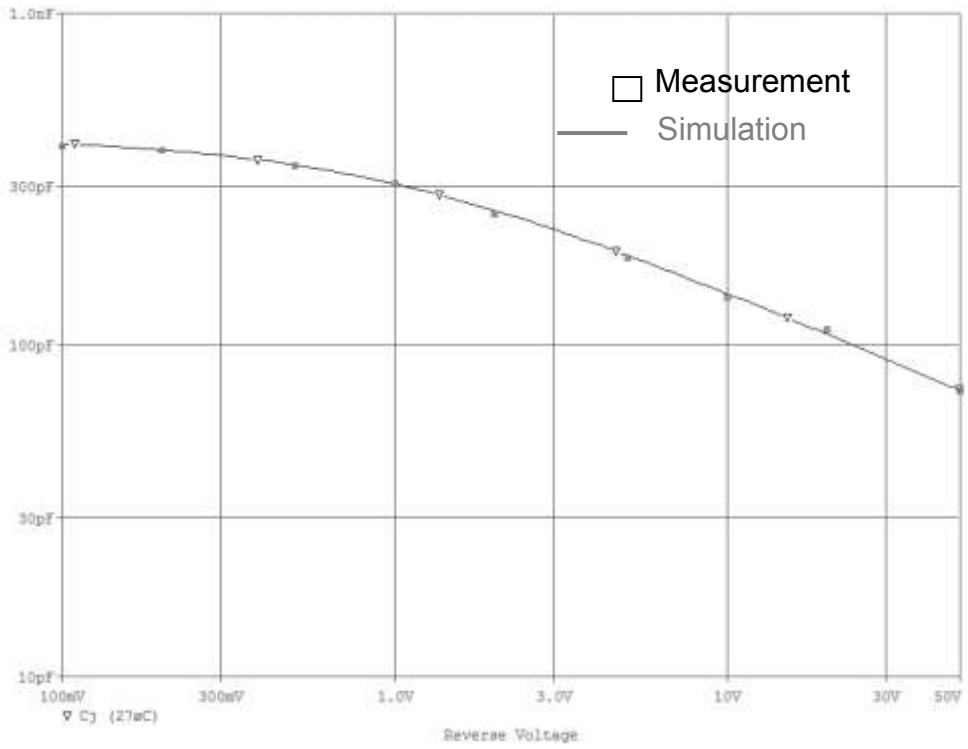
Evaluation Circuit



Simulation Result

V_{DD}=-40V, I_D= -5A ,V_{GS}=-10V	Measurement		Simulation		Error (%)
Qgs	2.500	nC	2.486	nC	-0.560
Qgd	5.000	nC	5.000	nC	0.000
Qg	18.000	nC	17.775	nC	-1.250

Capacitance Characteristic

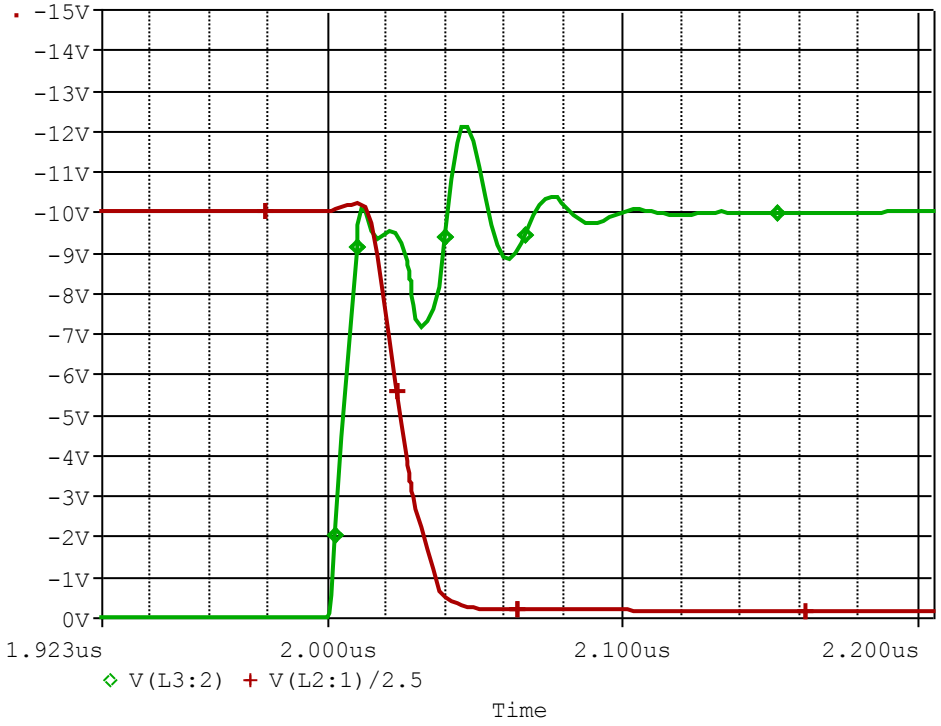


Simulation Result

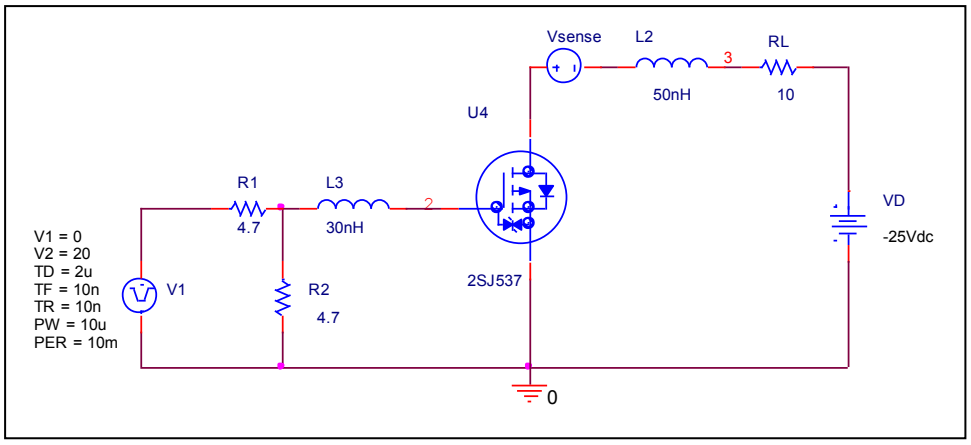
V_{DS}(V)	Cbd(pF)		Error(%)
	Measurement	Simulation	
0.100	400.000	405.000	1.250
0.200	390.000	392.000	0.513
0.500	370.000	370.000	0.000
1.000	310.000	310.000	0.000
2.000	250.000	250.000	0.000
5.000	180.000	184.000	2.222
10.000	140.000	138.000	-1.429
20.000	112.000	110.000	-1.786
50.000	73.000	70.000	-4.110

Switching Time Characteristic

Circuit Simulation Result



Evaluation Circuit

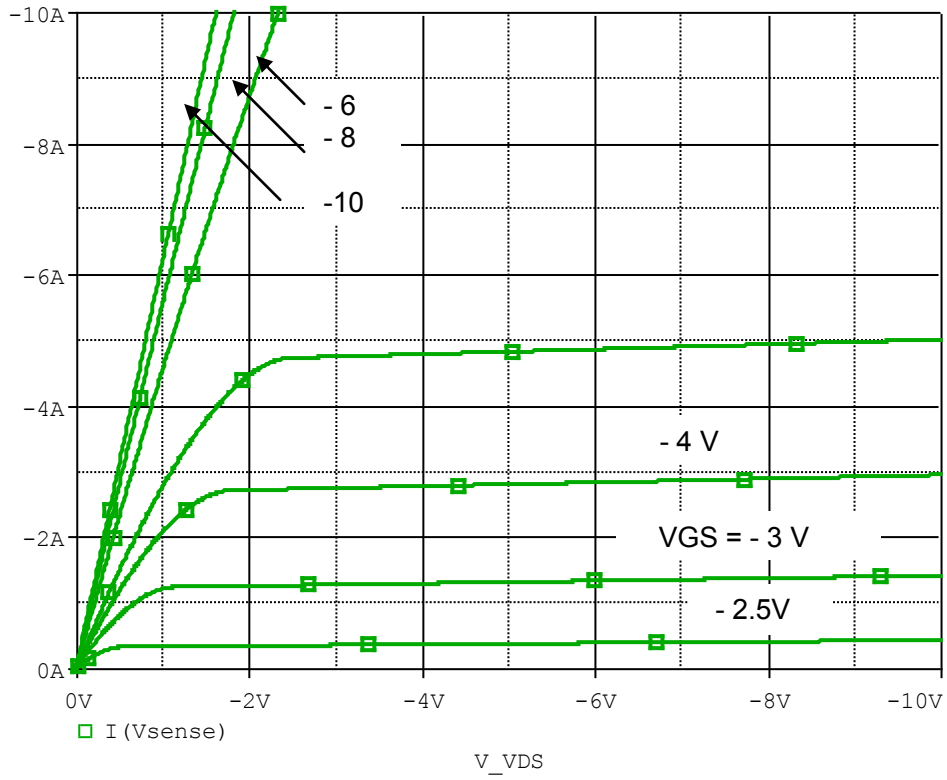


Simulation Result

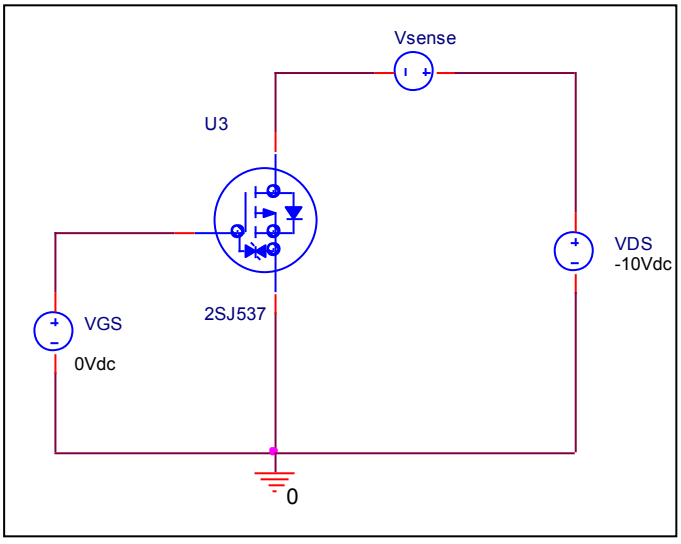
I_D=-2.5A, V_{DD}= -25V, V_{GS}=0/4V	Measurement		Simulation		Error(%)
Td(on)	35.000	ns	34.869	ns	-0.374

Output Characteristic

Circuit Simulation Result

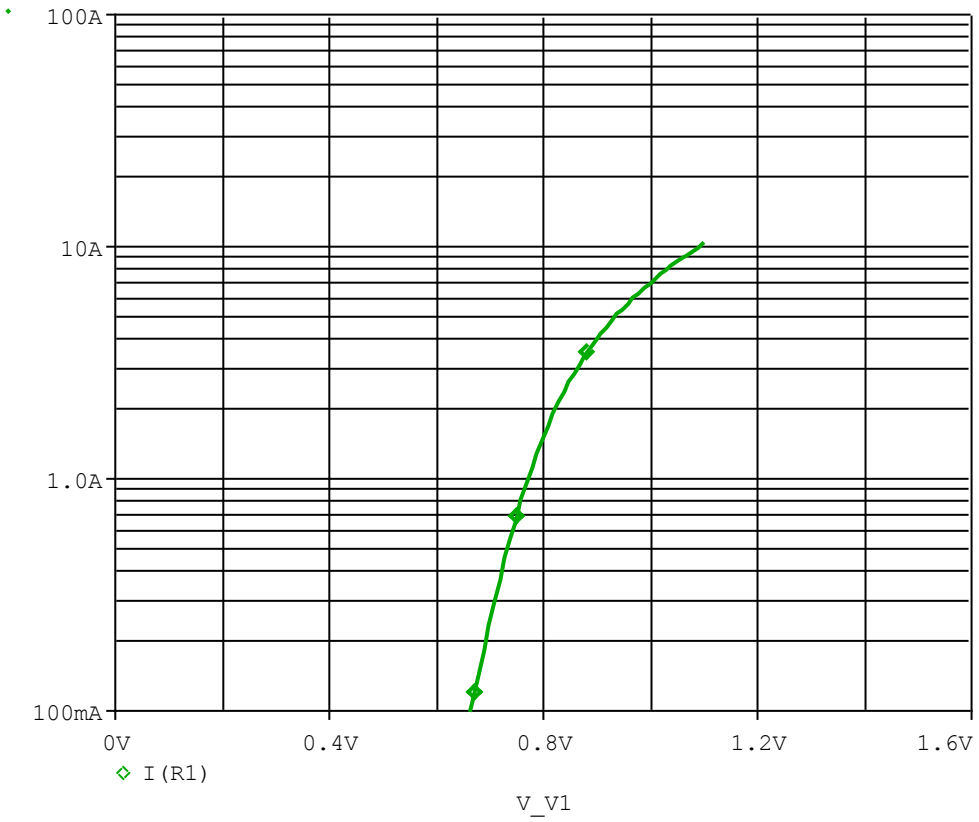


Evaluation Circuit

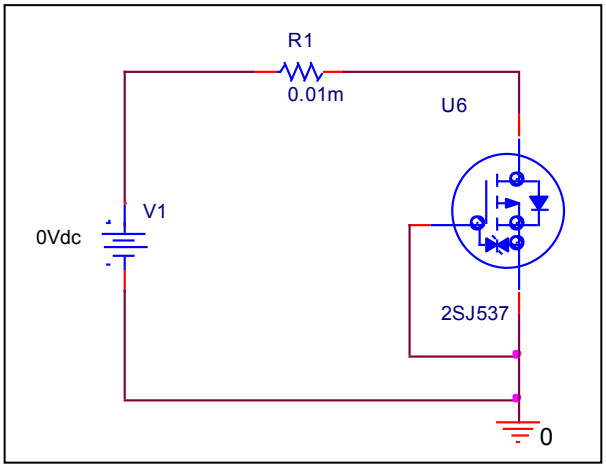


Forward Current Characteristic

Circuit Simulation Result

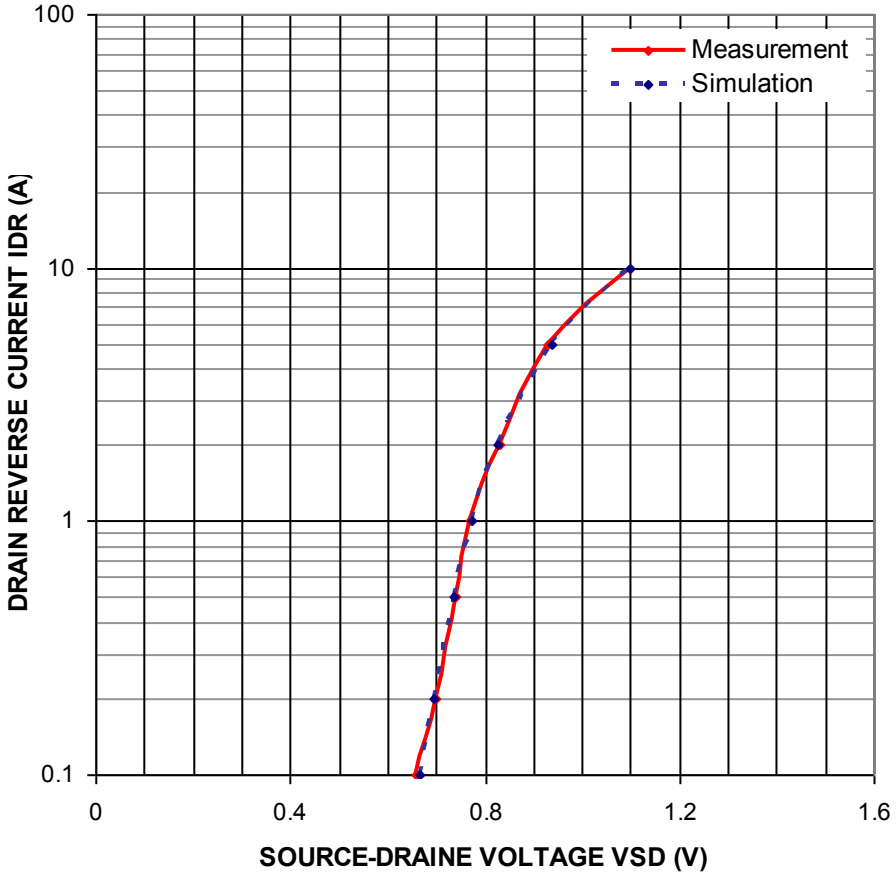


Evaluation Circuit



Comparison Graph

Circuit Simulation Result

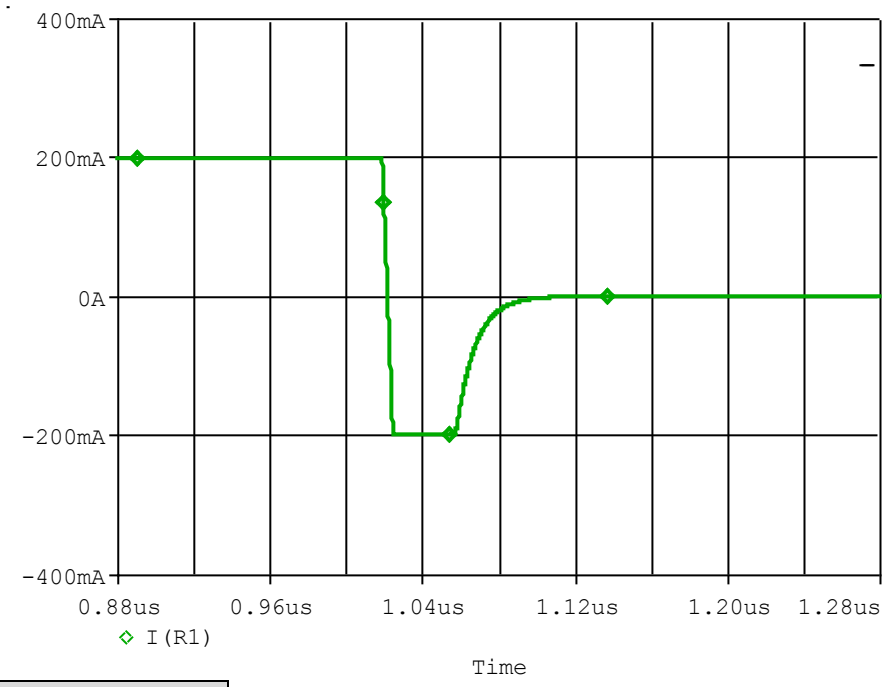


Simulation Result

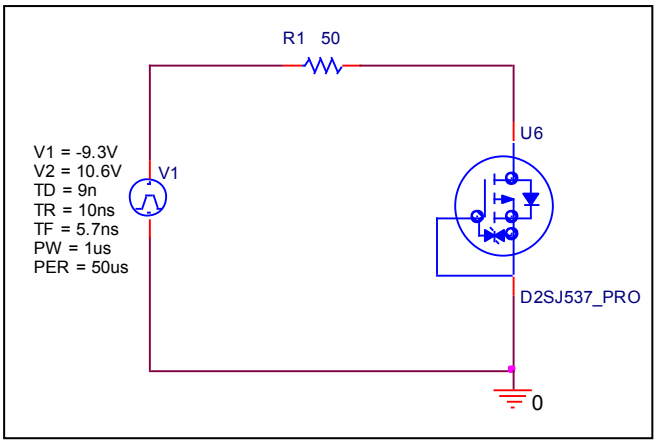
IDR(A)	VSD(V)		%Error
	Measurement	Simulation	
0.100	0.660	0.665	0.758
0.200	0.700	0.694	-0.857
0.500	0.740	0.735	-0.676
1.000	0.770	0.773	0.390
2.000	0.830	0.825	-0.602
5.000	0.930	0.939	0.968
10.000	1.100	1.099	-0.091

Reverse Recovery Characteristic (Body Diode)

Circuit Simulation Result



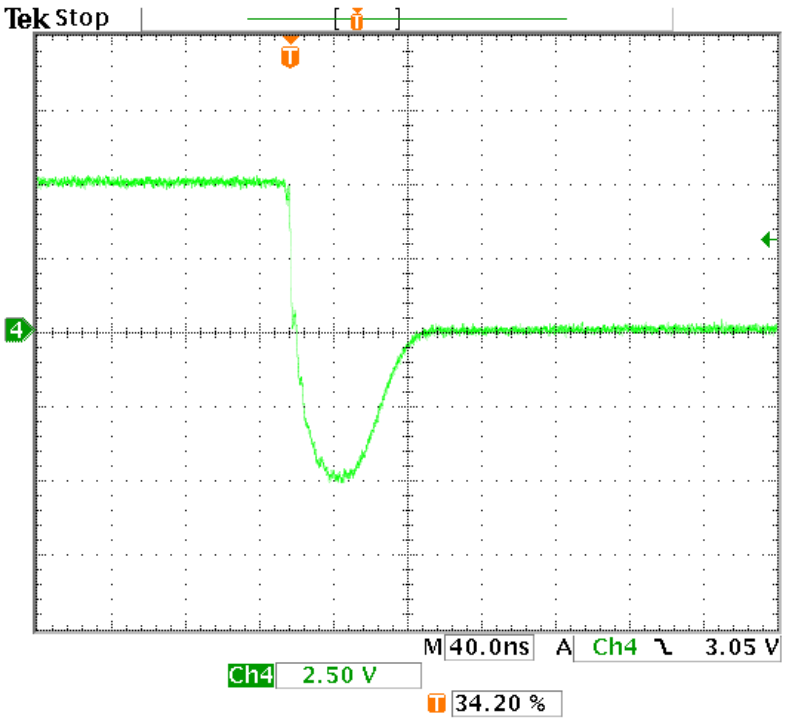
Evaluation Circuit



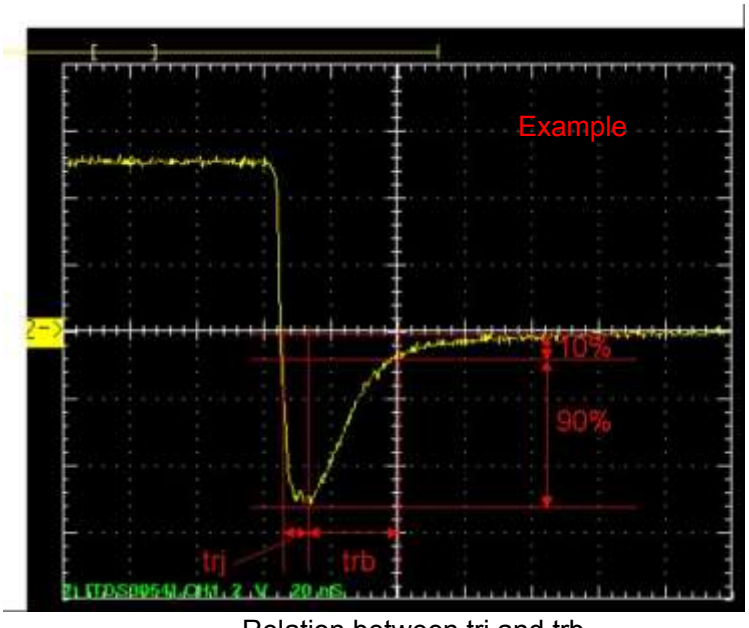
Compare Measurement vs. Simulation

	Measurement		Simulation		Error (%)
trj	**33.600**	**ns**	**33.939**	**ns**	**1.009**
trb	**24.500**	**ns**	**23.276**	**ns**	**-4.996**
trr	**58.400**	**ns**	**57.215**	**ns**	**-2.029**

Reverse Recovery Characteristic (Body Diode) Reference



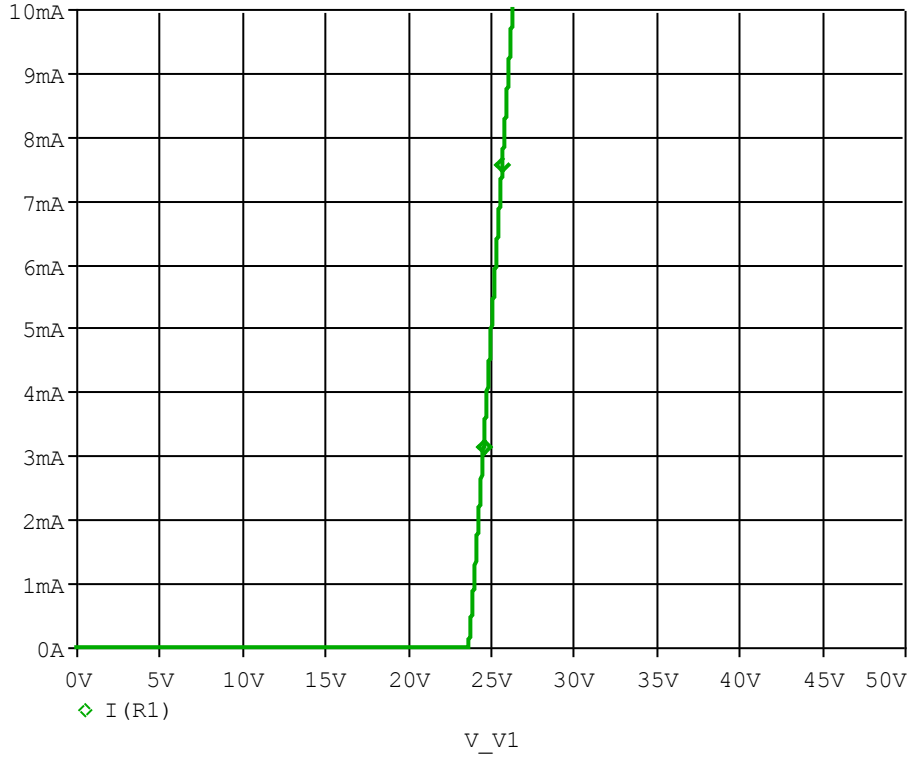
Trj= (33.6ns)
Trb= (58.4ns)
Conditions:Ifwd=Irev=0.2(A),Rl=50



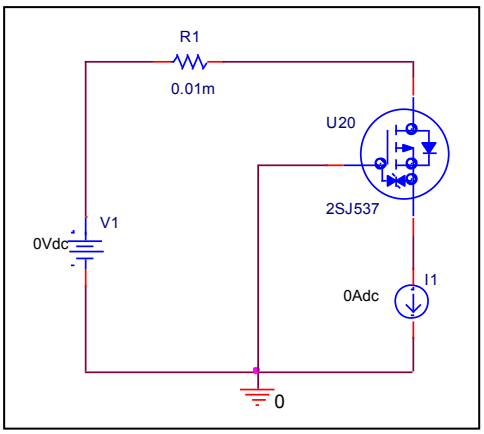
Relation between trj and trb

Zener Voltage Characteristic

Circuit Simulation Result



Evaluation Circuit



Zener Voltage Characteristic Reference