Device Modeling Report

COMPONENTS: Power MOSFET (Professional)
PART NUMBER: 2SK2461
MANUFACTURER: NEC
Body Diode (Professional) / ESD Protection Diode

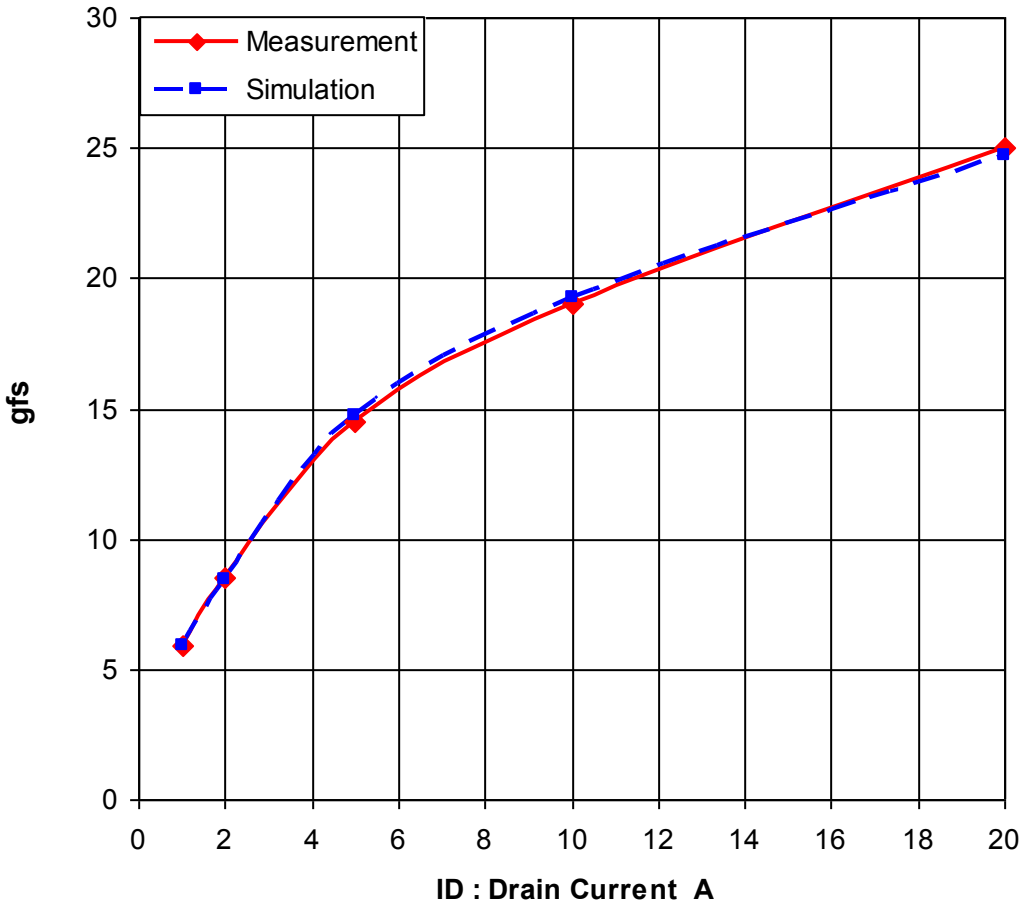
Bee Technologies Inc.

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

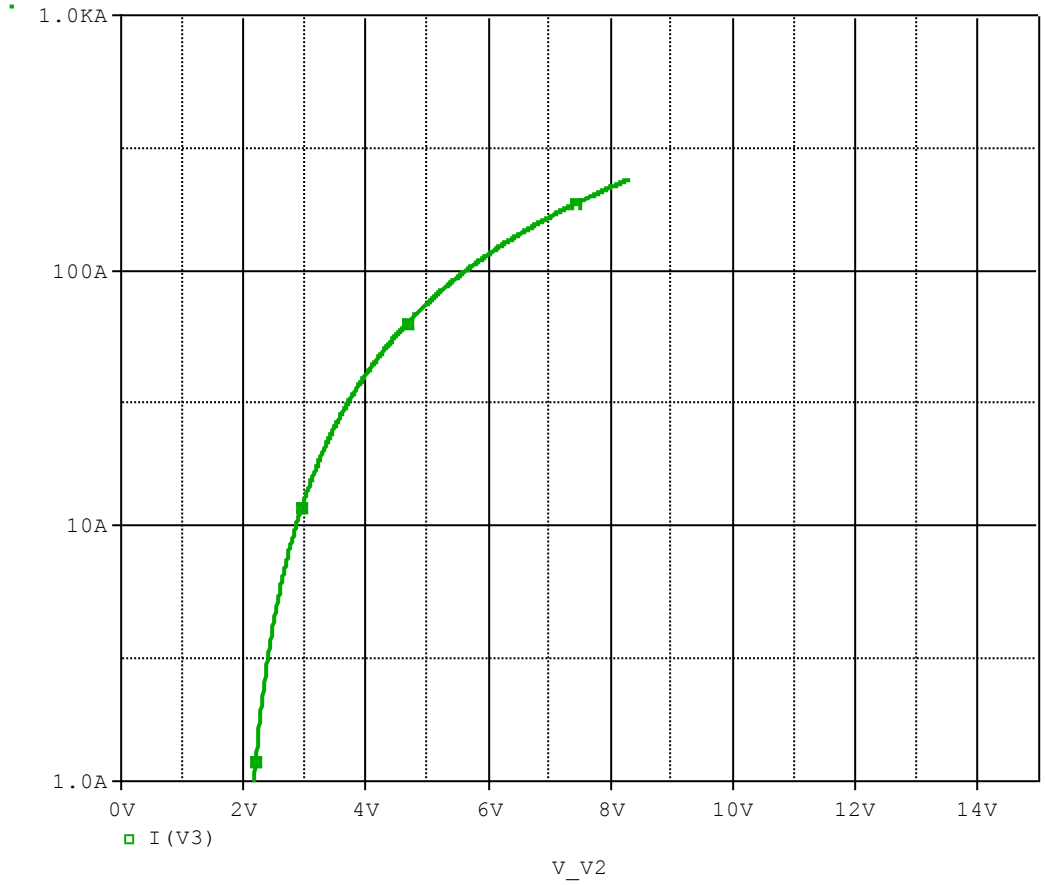


Comparison table

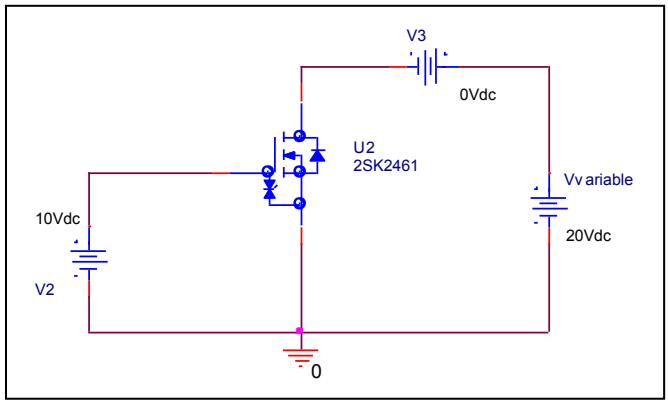
Id(A)	gfs		Error(%)
	Measurement	Simulation	
1.000	5.900	5.880	-0.339
2.000	8.500	8.470	-0.353
5.000	14.500	14.700	1.379
10.000	19.000	19.230	1.211
20.000	25.000	24.700	-1.200

Vgs-Id Characteristic

Circuit Simulation result

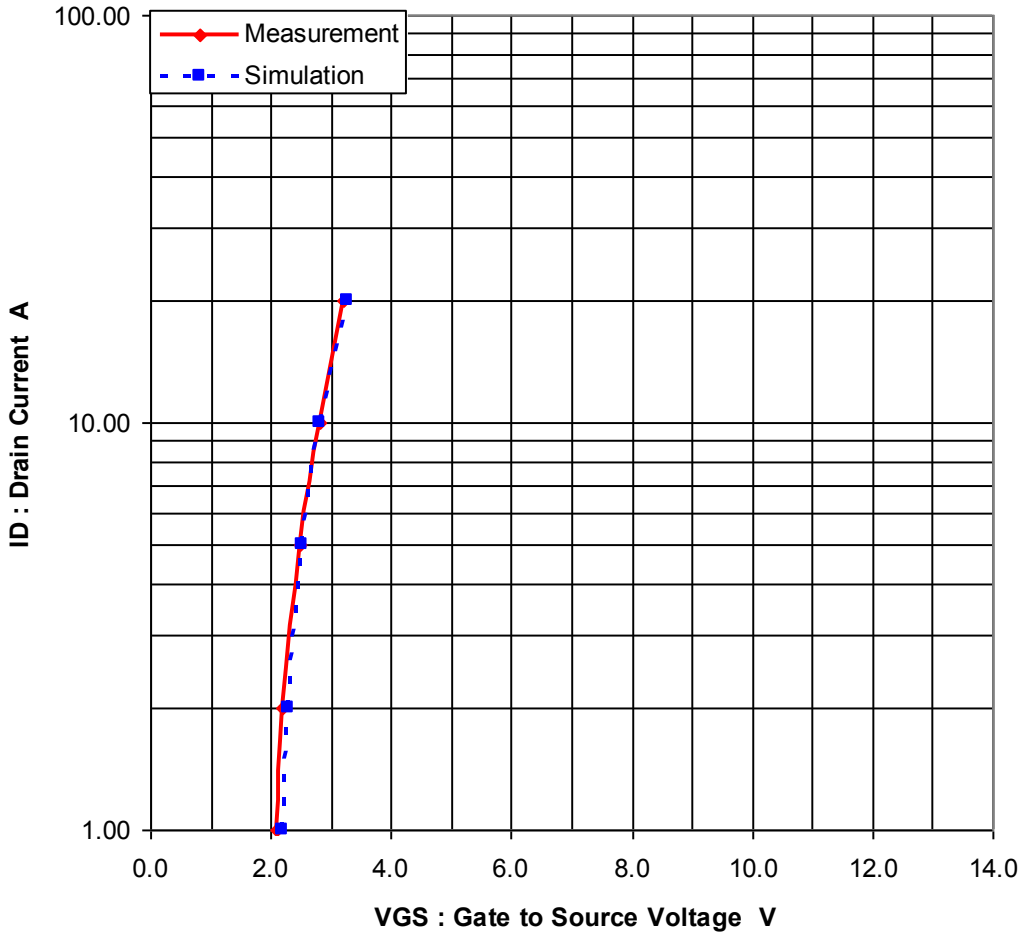


Evaluation circuit



Comparison Graph

Circuit Simulation Result

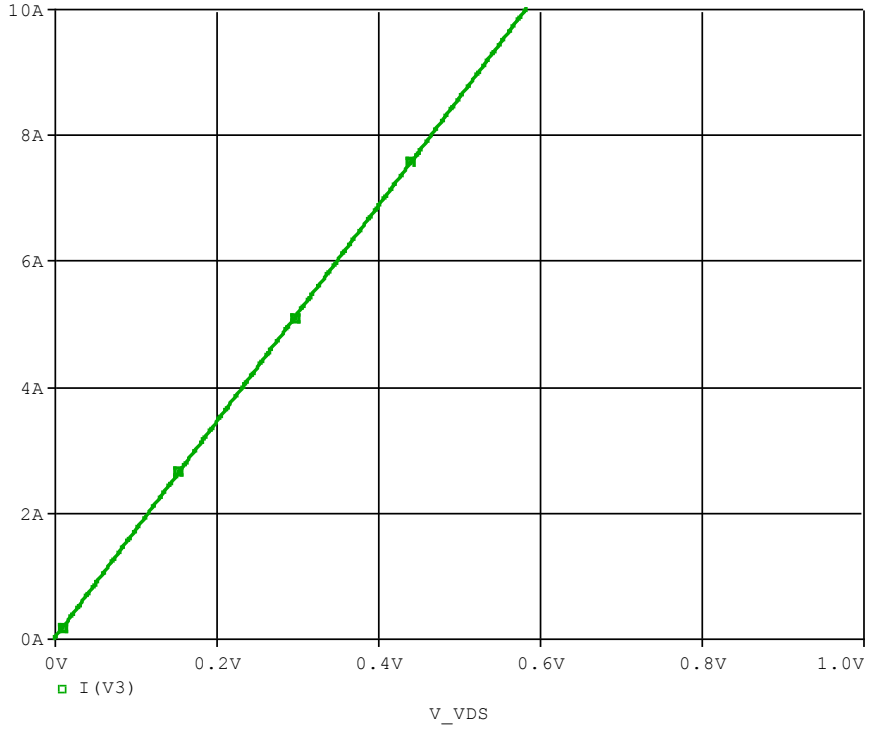


Simulation Result

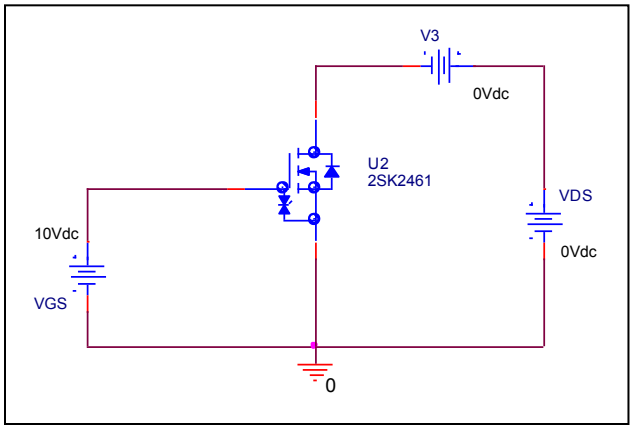
I_D(A)	V_{GS}(V)		Error (%)
	Measurement	Simulation	
1.000	2.100	2.190	4.286
2.000	2.200	2.300	4.545
5.000	2.500	2.520	0.800
10.000	2.800	2.820	0.714
20.000	3.200	3.270	2.187

Rds(on) Characteristic

Circuit Simulation result



Evaluation circuit

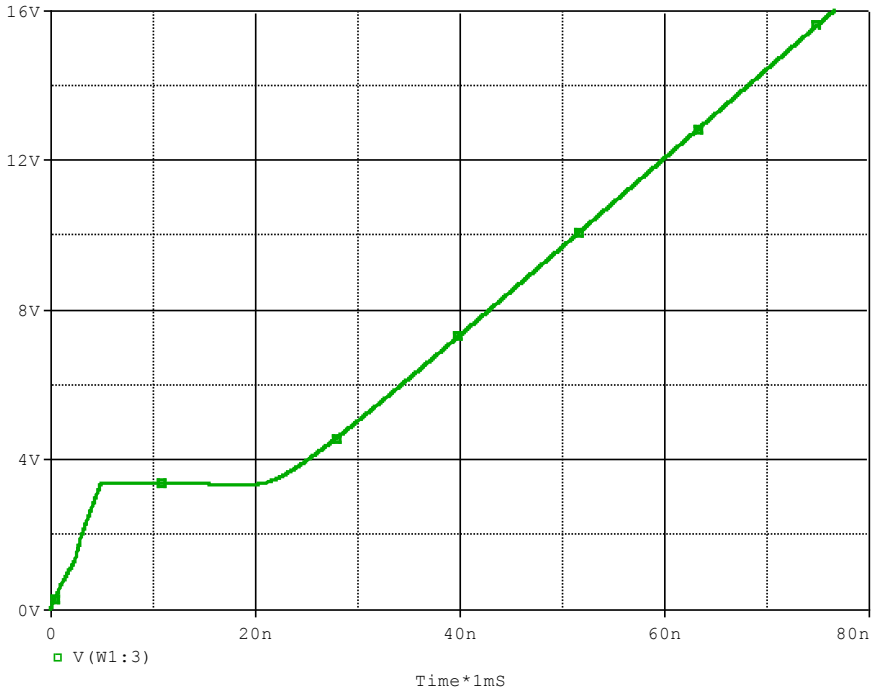


Simulation Result

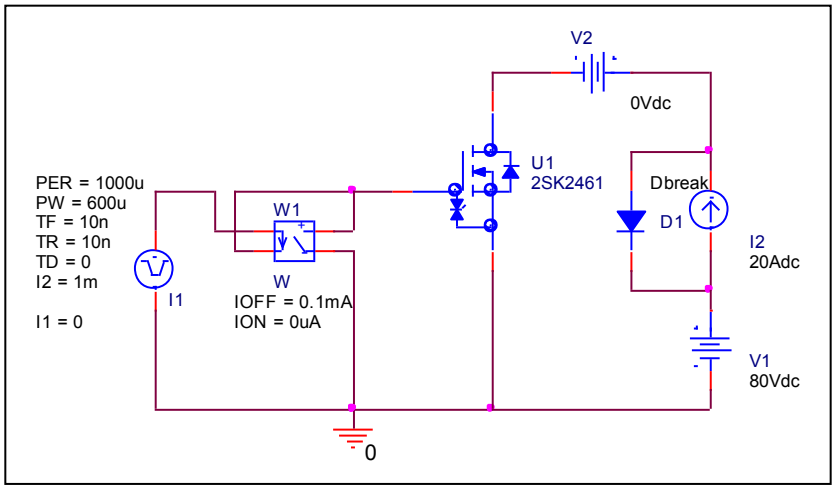
I_D=10A, V_{GS}=10V	Measurement	Simulation	Error (%)
R_{DS} (on) (Ω)	0.058	0.0583	0.517

Gate Charge Characteristic

Circuit Simulation result



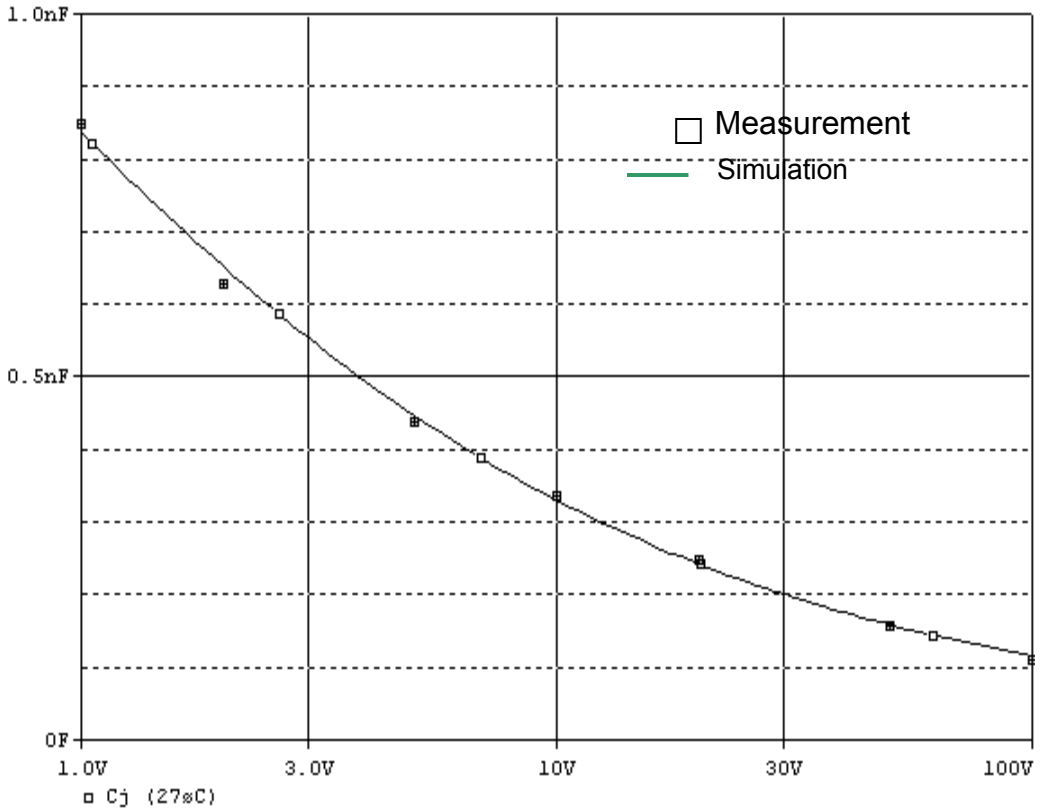
Evaluation circuit



Simulation Result

V_{DD}=80V,I_D=20A ,V_{GS}=10V	Measurement	Simulation	Error (%)
Qgs(nc)	5.000	4.984	-0.320
Qgd(nc)	15.000	15.116	0.773
Qg(nc)	51.00.	51.290	0.569

Capacitance Characteristic

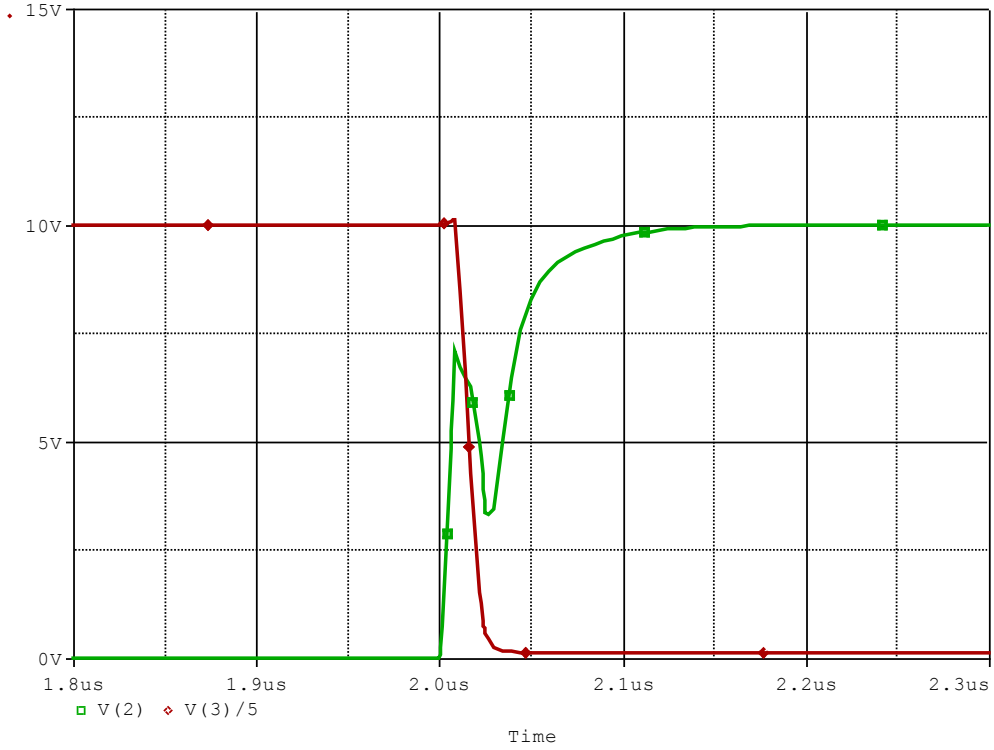


Simulation Result

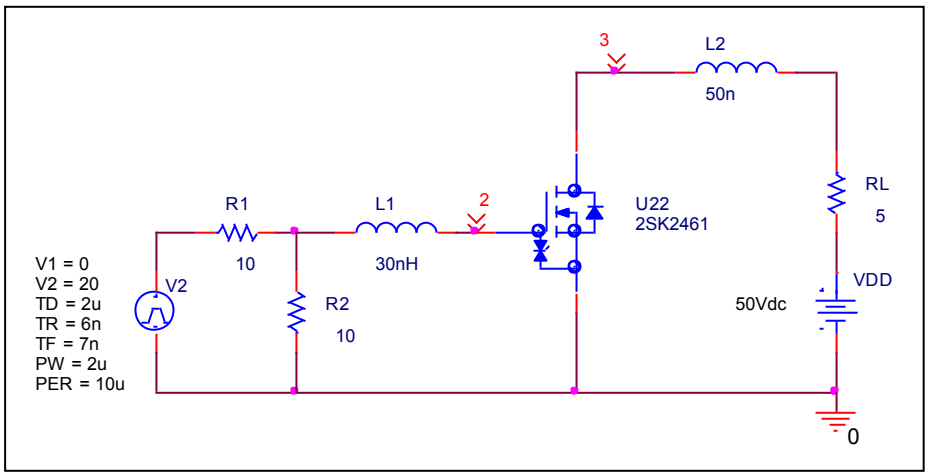
V_{DS}(V)	Cbd(pF)		Error(%)
	Measurement	Simulation	
1.00	850.00	849.00	-0.118
2.00	620.00	640.00	3.226
5.00	440.00	448.00	1.818
10.00	340.00	330.00	-2.941
20.00	250.00	243.00	-2.800
50.00	160.00	159.00	-0.625
100.00	114.00	113.00	-0.877

Switching Time Characteristic

Circuit Simulation result



Evaluation circuit

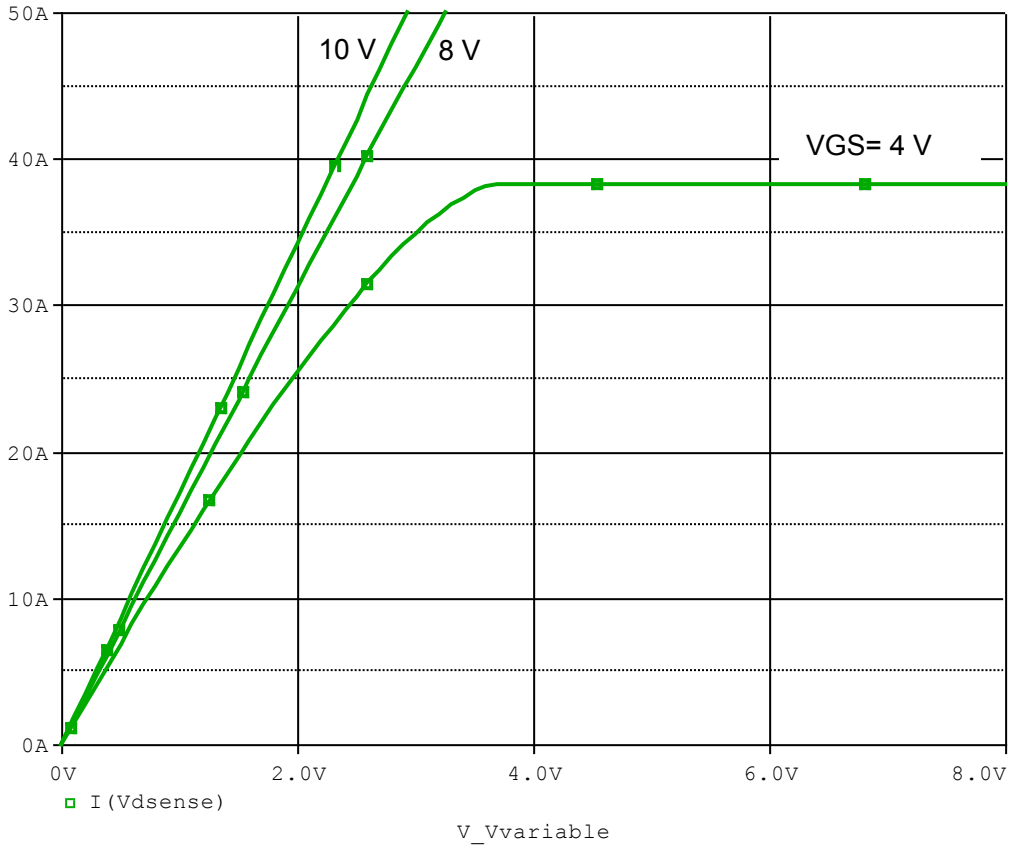


Simulation Result

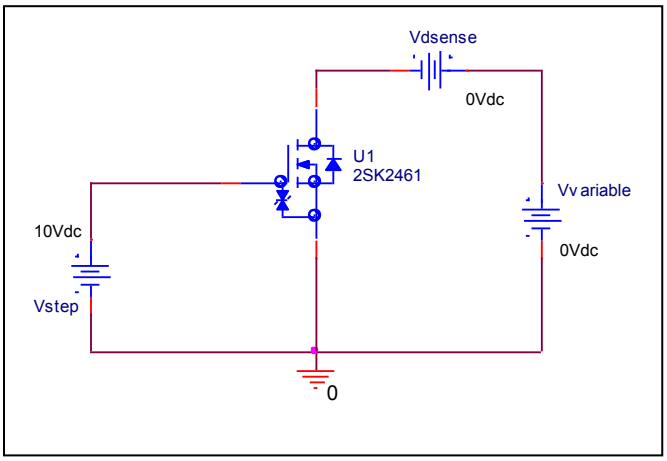
I_D=10A, V_{DD}=50V V_{GS}=10V	Measurement	Simulation	Error(%)
Ton(ns)	21.000	20.940	-0.286

Output Characteristic

Circuit Simulation result

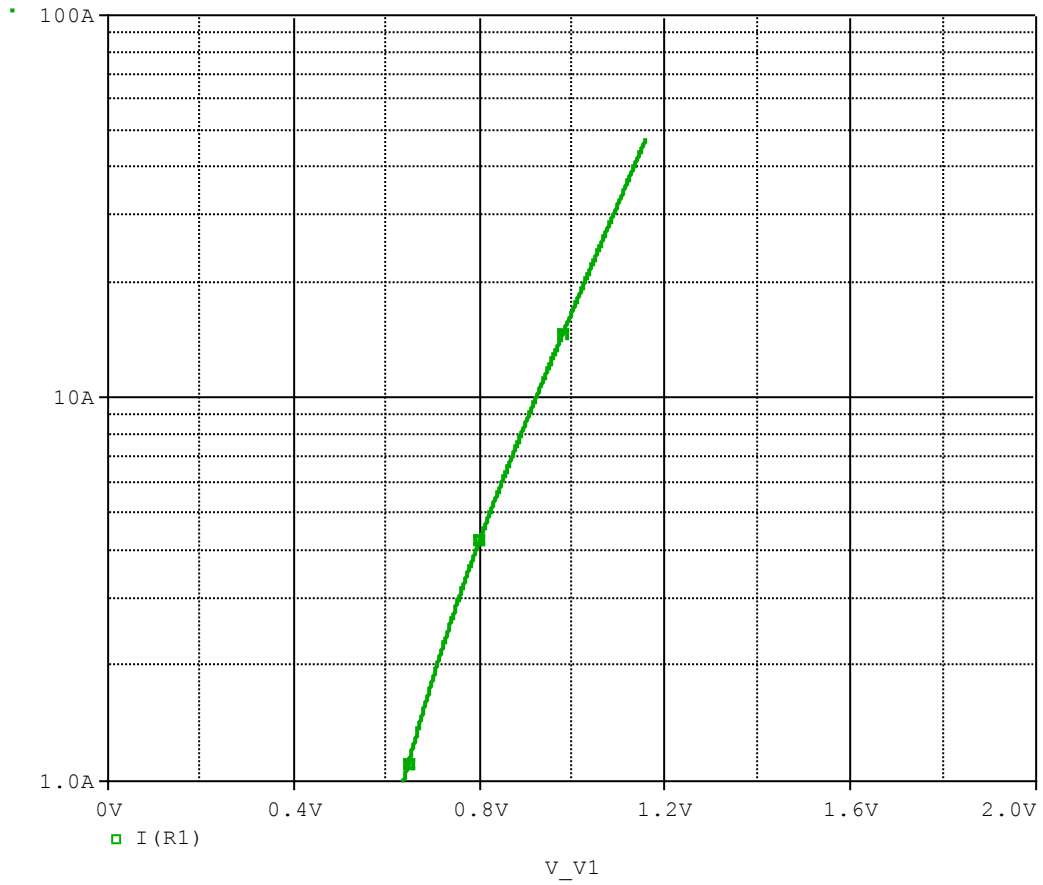


Evaluation circuit

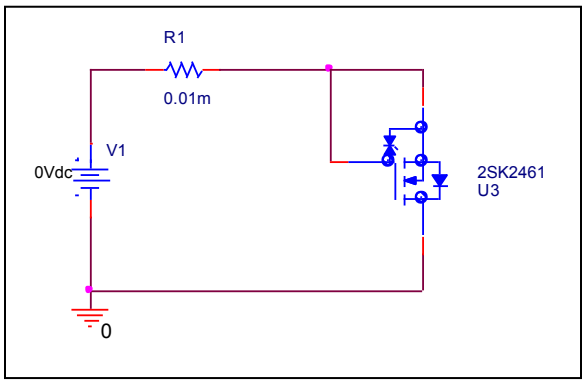


Forward Current Characteristic

Circuit Simulation Result

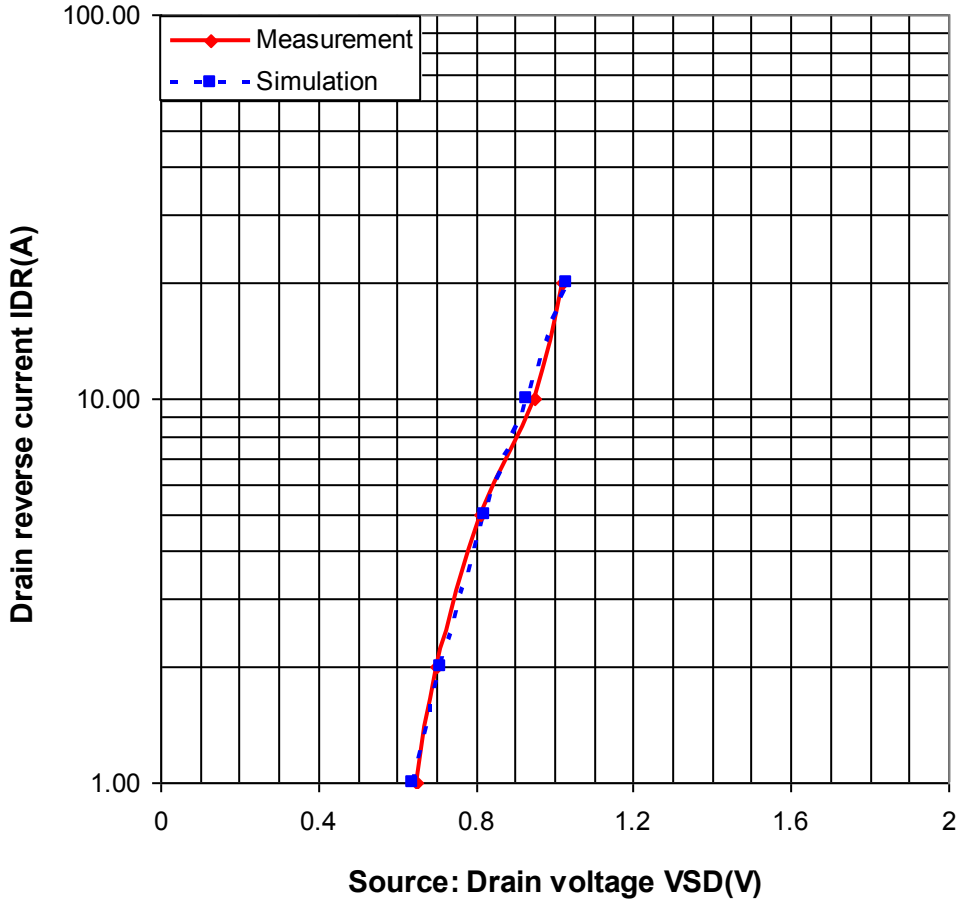


Evaluation Circuit



Comparison Graph

Circuit Simulation Result

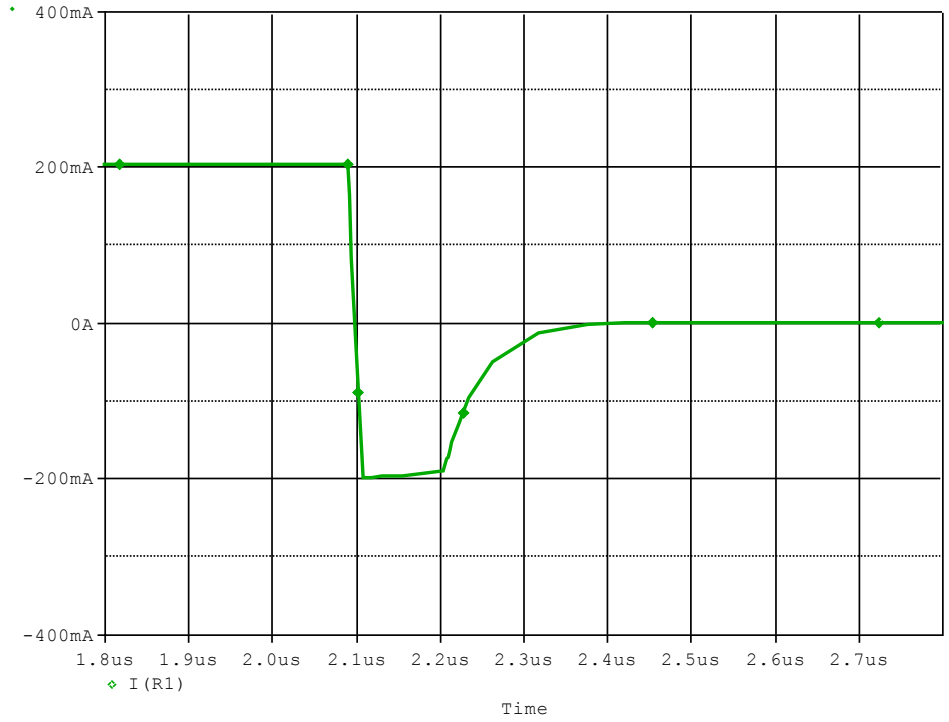


Simulation Result

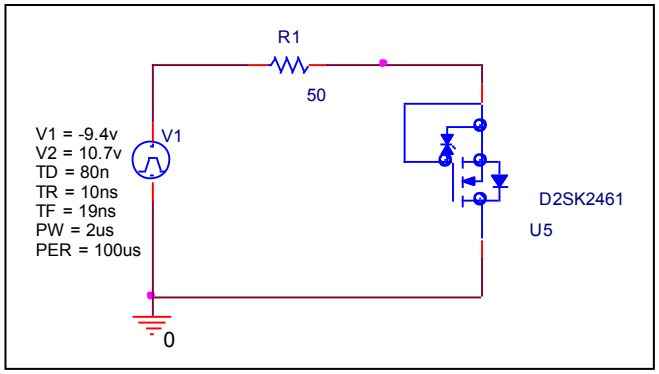
IDR(A)	VDS(V) Measurement	VDS(V) Simulation	%Error
1.000	0.650	0.640	-1.538
2.000	0.700	0.711	1.571
5.000	0.810	0.820	1.235
10.000	0.950	0.930	-2.105
20.000	1.020	1.028	0.784

Reverse Recovery Characteristic

Circuit Simulation Result



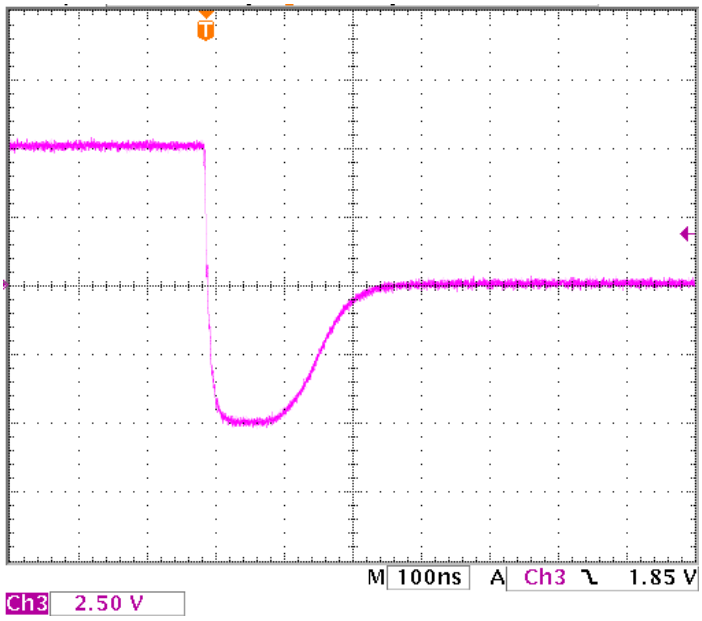
Evaluation Circuit



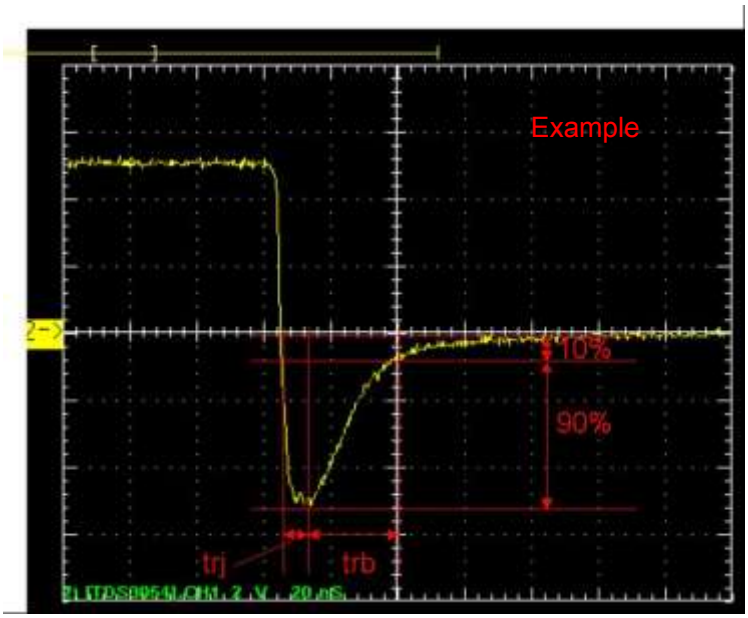
Compare Measurement vs. Simulation

	Measurement	Simulation	Error (%)
Trj(us)	104.000	104.042	0.040
trb(us)	106.000	105.475	-0.495
trr(us)	210.000	209.517	-0.230

Reverse Recovery Characteristic Reference



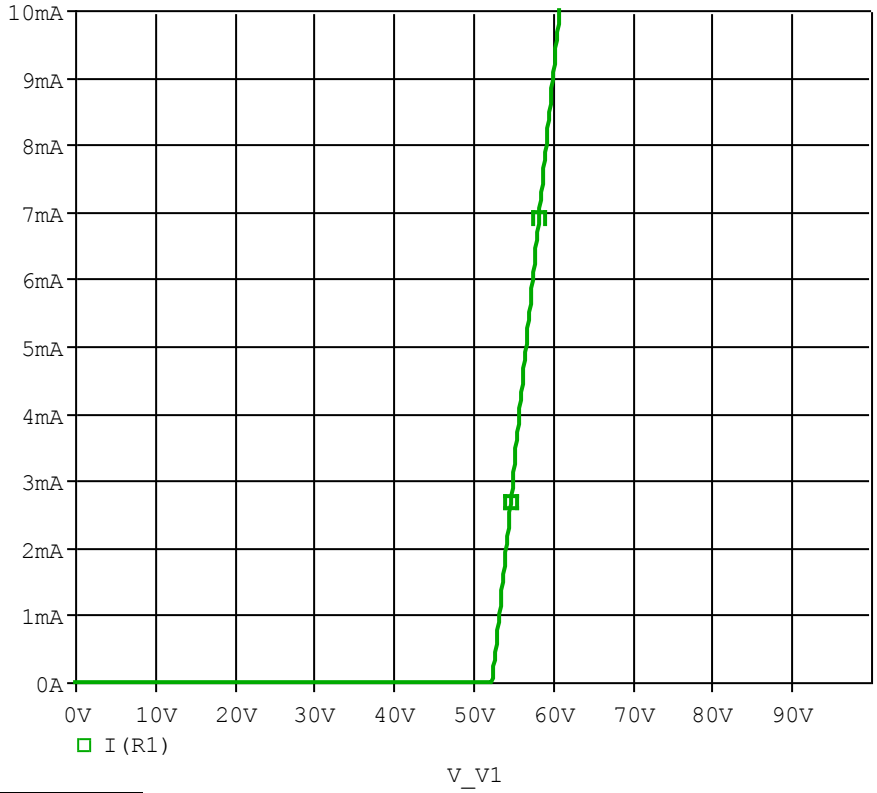
Trj=104(ns)
Trb=106(ns)
Conditions:Ifwd=Irev=0.2(A),Rl=50



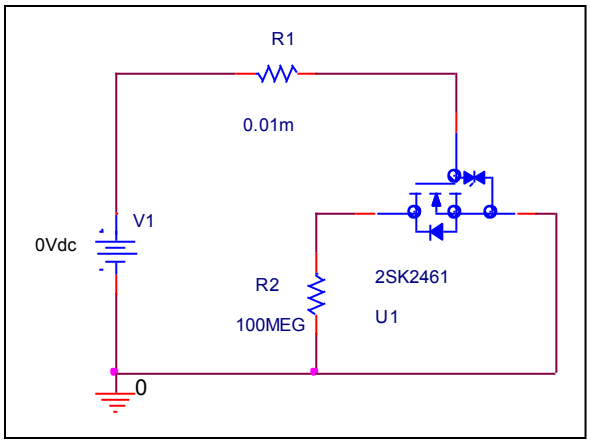
Relation between trj and trb

Zener Voltage Characteristic

Circuit Simulation Result



Evaluation Circuit



Zener Voltage Characteristic Reference