Device Modeling Report

COMPONENTS: Power MOSFET (Model Parameter)
PART NUMBER: 2SK4029
MANUFACTURER: PANASONIC
ESD Protection Diode

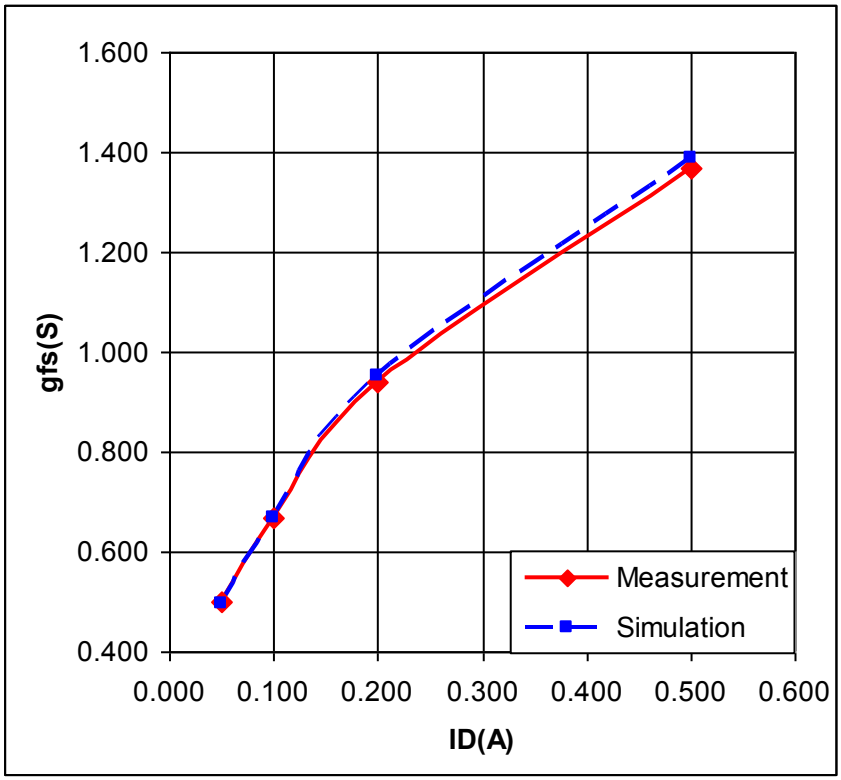
Bee Technologies Inc.

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

Transconductance Characteristic

Circuit Simulation Result

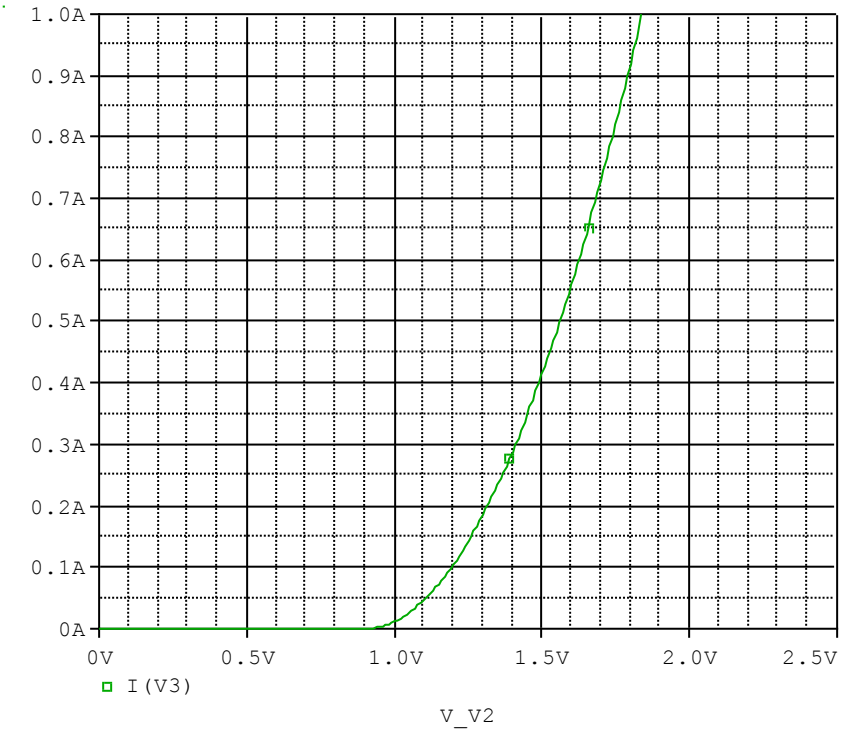


Comparison table

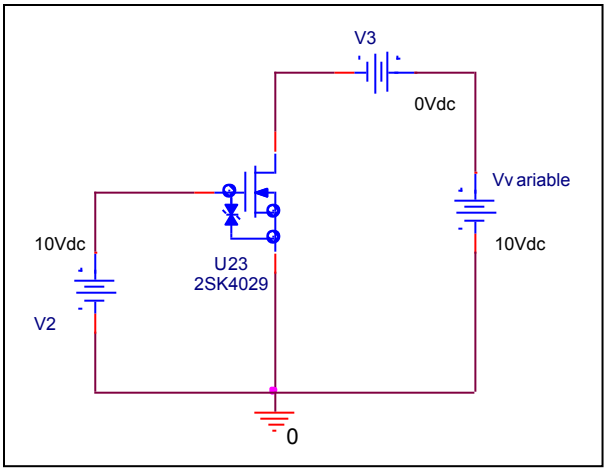
Id(A)	gfs		Error(%)
	Measurement	Simulation	
0.050	0.500	0.495	-1.000
0.100	0.667	0.667	0.000
0.200	0.940	0.952	1.277
0.500	1.370	1.388	1.314

Vgs-Id Characteristic

Circuit Simulation result

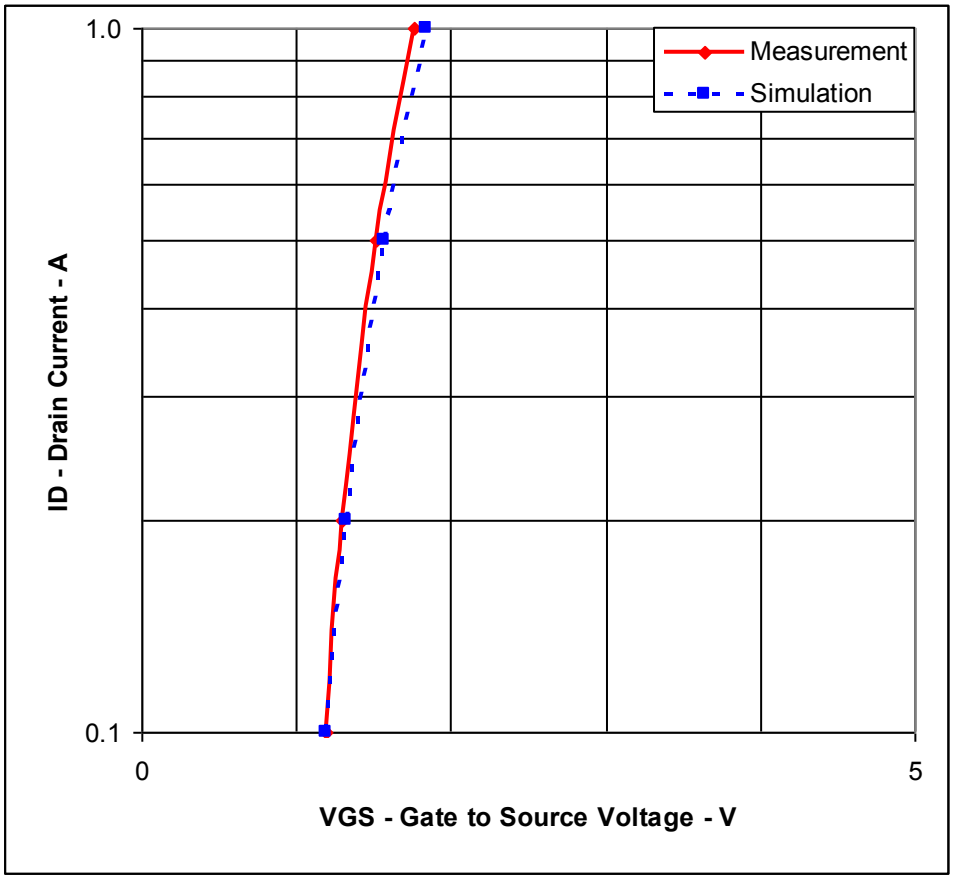


Evaluation circuit



Comparison Graph

Circuit Simulation Result

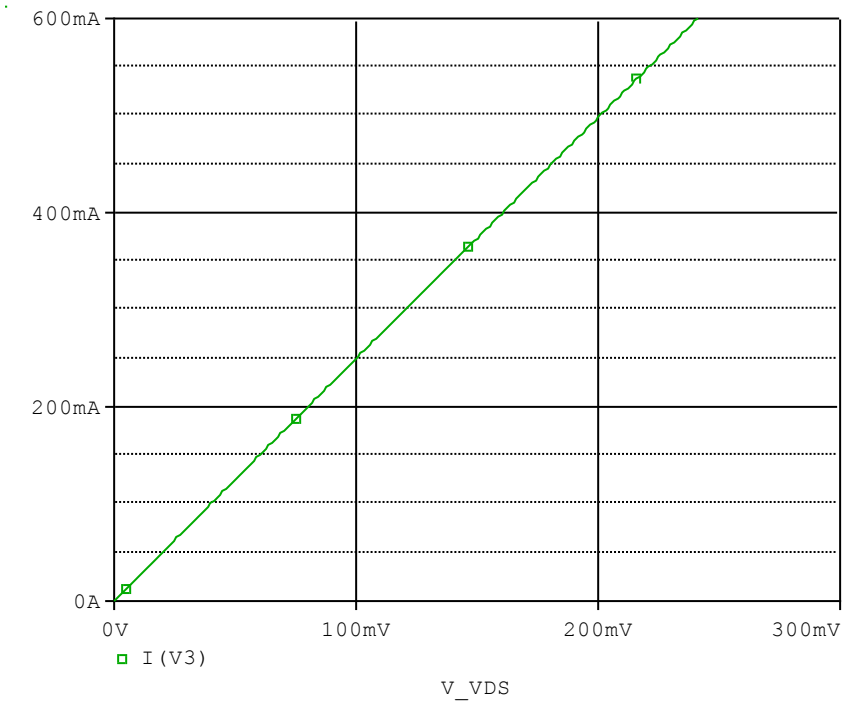


Simulation Result

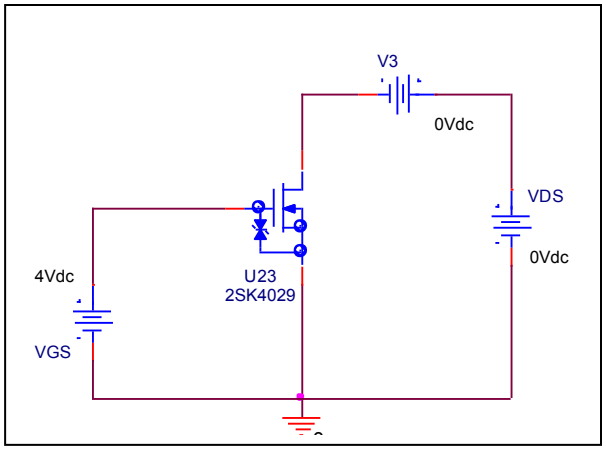
I_D(A)	V_{GS}(V)		Error (%)
	Measurement	Simulation	
0.100	1.190	1.193	0.252
0.200	1.300	1.315	1.154
0.500	1.510	1.561	3.377
1.000	1.760	1.839	4.489

Rds(on) Characteristic

Circuit Simulation result



Evaluation circuit

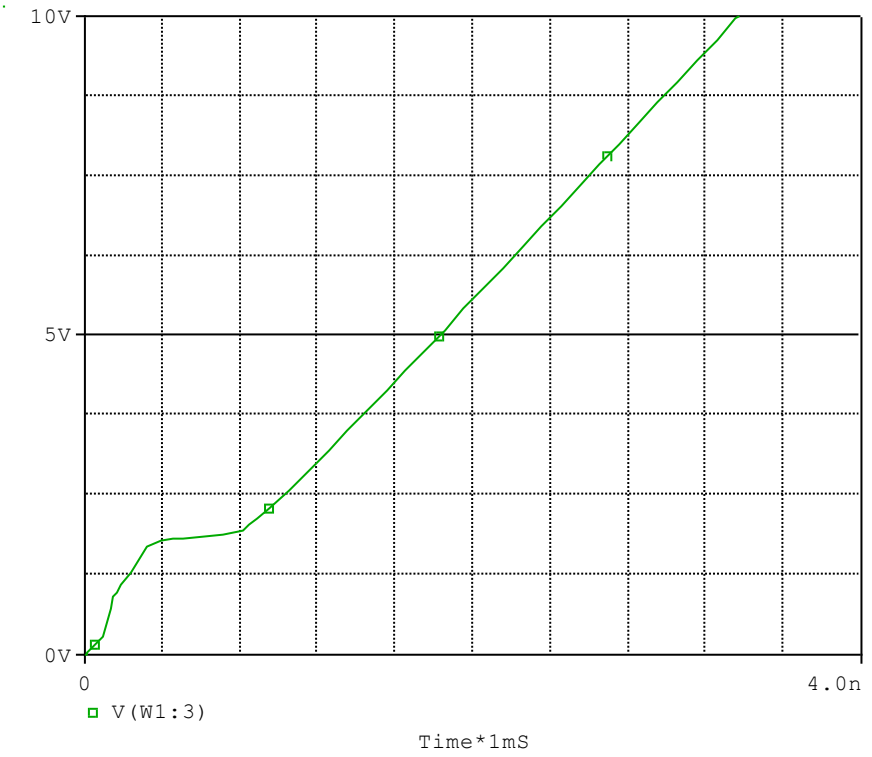


Simulation Result

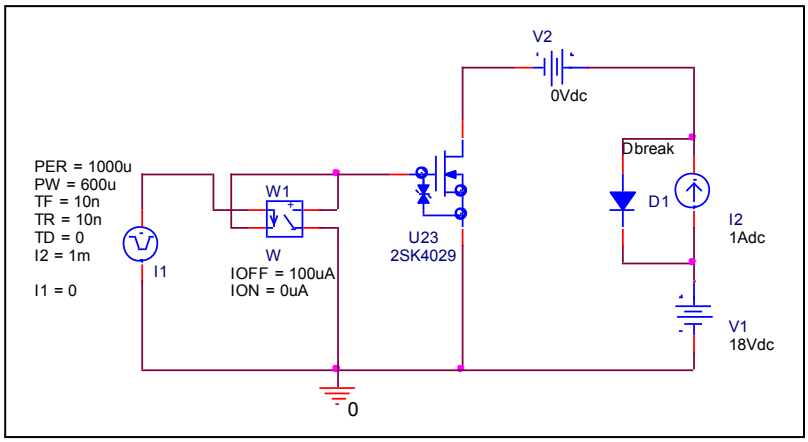
I_D=0.5A, V_{GS}=4V	Measurement		Simulation		Error (%)
R_{DS} (on)	0.400	Ω	0.401	Ω	2.500

Gate Charge Characteristic

Circuit Simulation result



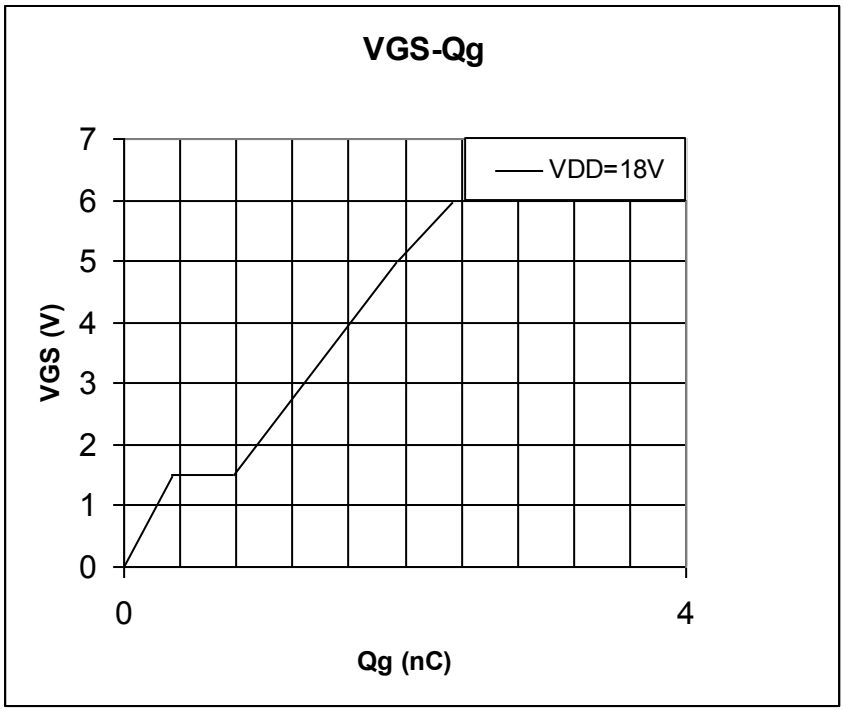
Evaluation circuit



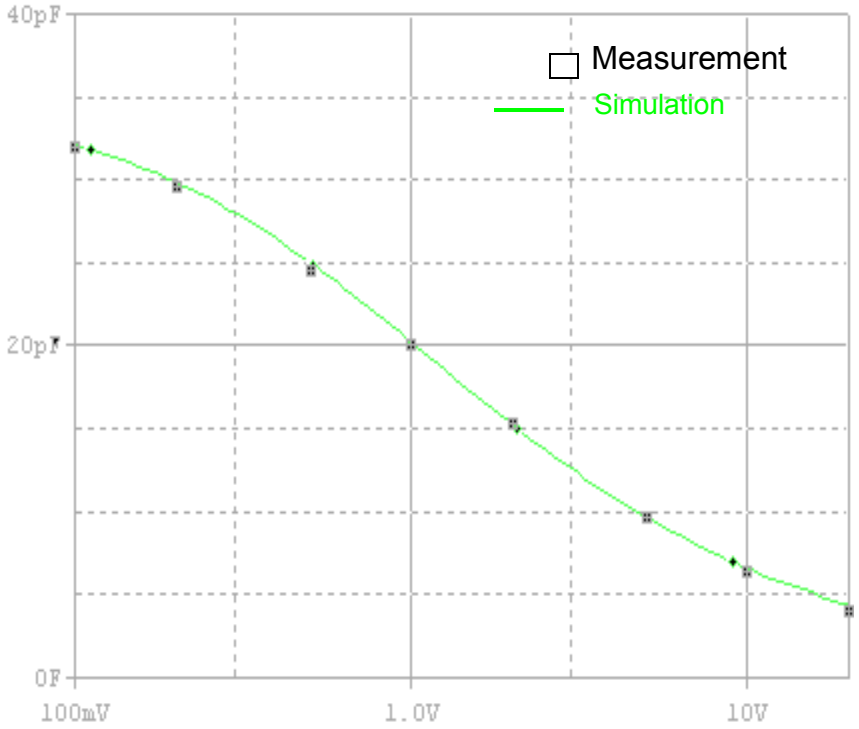
Simulation Result

V_{DD}=18V,I_D=1A ,V_{GS}=12V	Measurement		Simulation		Error (%)
Qgs	0.340	nC	0.364	nC	7.059
Qgd	0.450	nC	0.442	nC	-1.778
Qg	1.950	nC	1.918	nC	-1.641

Gate Charge Characteristic Reference



Capacitance Characteristic

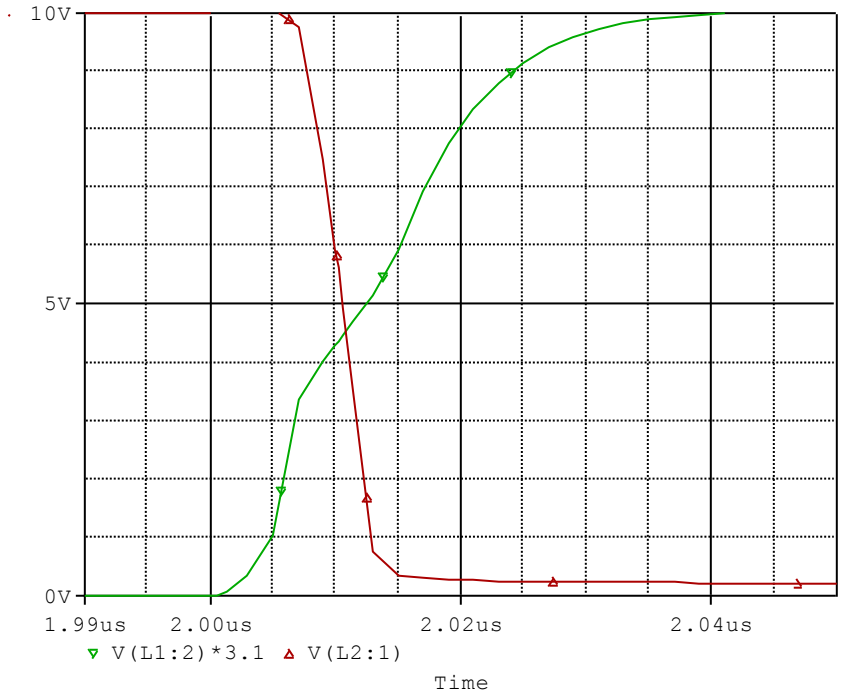


Simulation Result

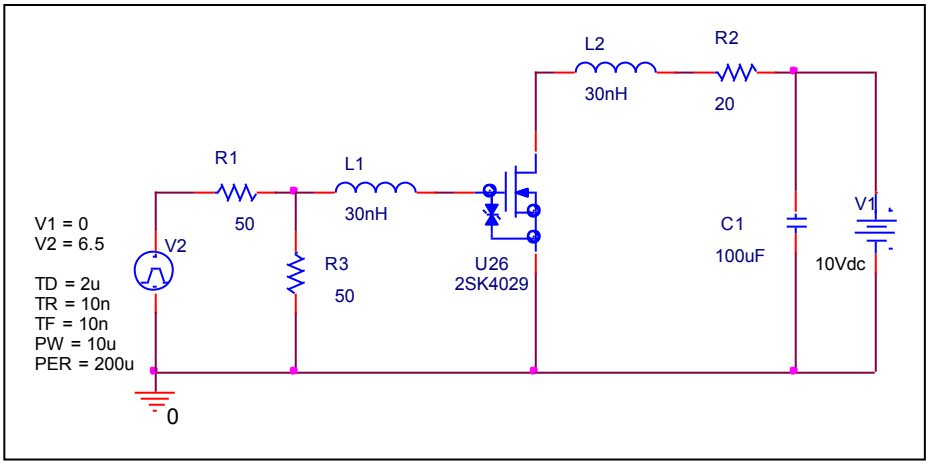
V_{DS}(V)	Cbd(pF)		Error(%)
	Measurement	Simulation	
0.100	32.185	32.180	-0.016
0.200	29.812	30.104	0.979
0.500	24.754	24.951	0.796
1.000	20.168	20.074	-0.466
2.000	15.428	15.220	-1.348
5.000	9.741	9.683	-0.595
10.000	6.571	6.629	0.883
20.000	4.167	4.382	5.160

Switching Time Characteristic

Circuit Simulation result



Evaluation circuit

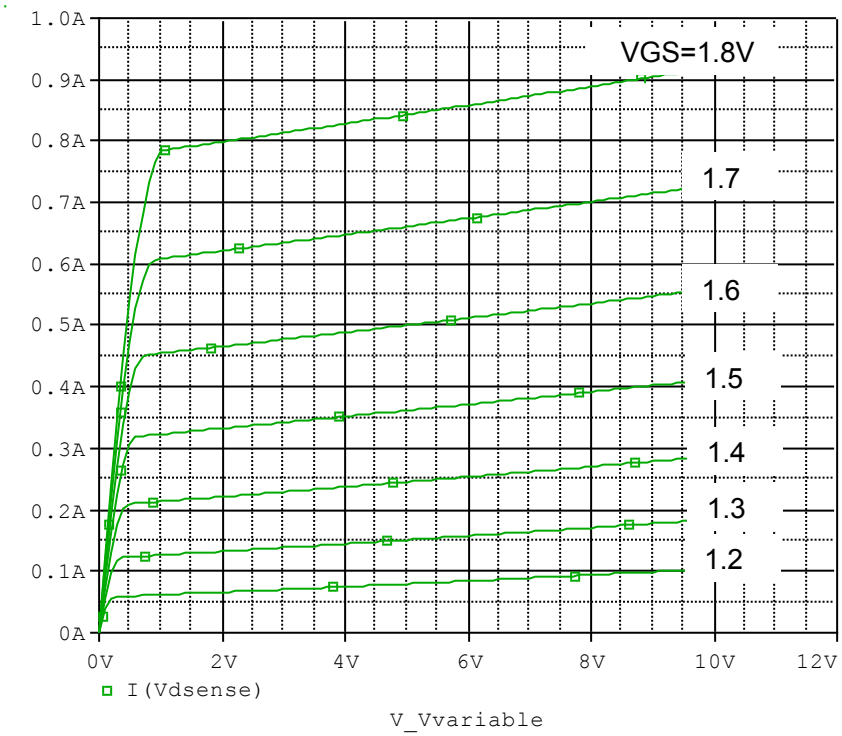


Simulation Result

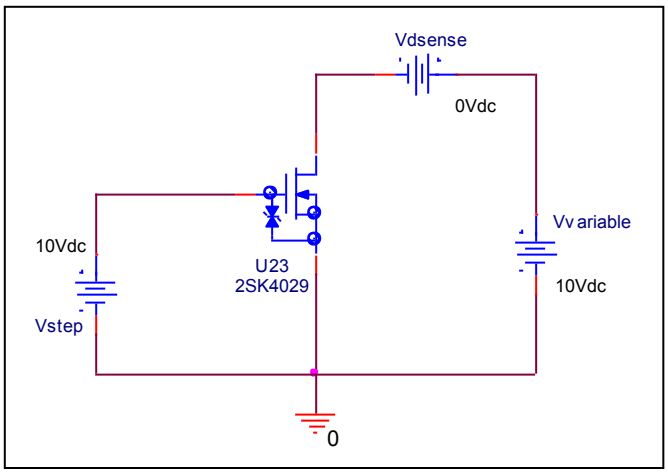
I_D=0.5 A, V_{DD}=10V V_{GS}=0/3.25V	Measurement		Simulation		Error(%)
ton	8.000	ns	7.789	ns	-2.638

Output Characteristic

Circuit Simulation result

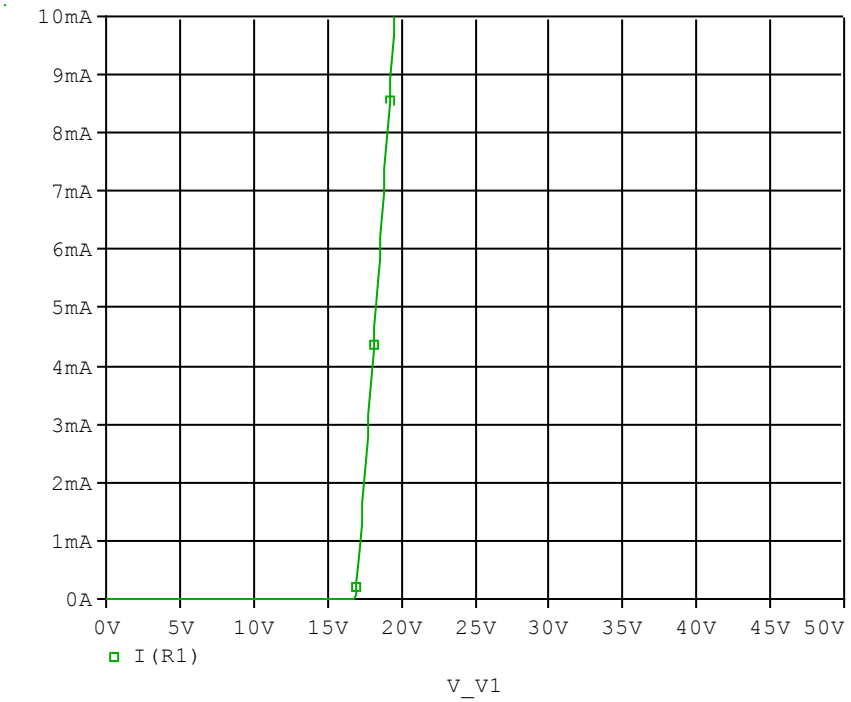


Evaluation circuit

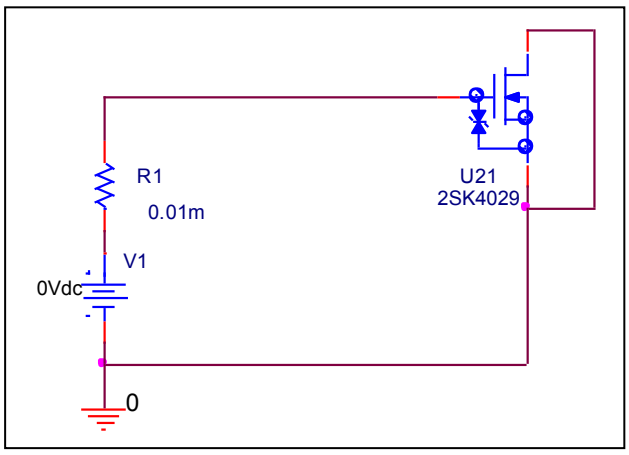


Zener Voltage Characteristic

Circuit Simulation Result



Evaluation Circuit



Zener Voltage Characteristic Reference