Device Modeling Report

COMPONENTS: Power MOSFET (Professional)
PART NUMBER: SPW47N60CFD
MANUFACTURER: Infineon technologies
REMARK: Body Diode (Special)

Bee Technologies Inc.

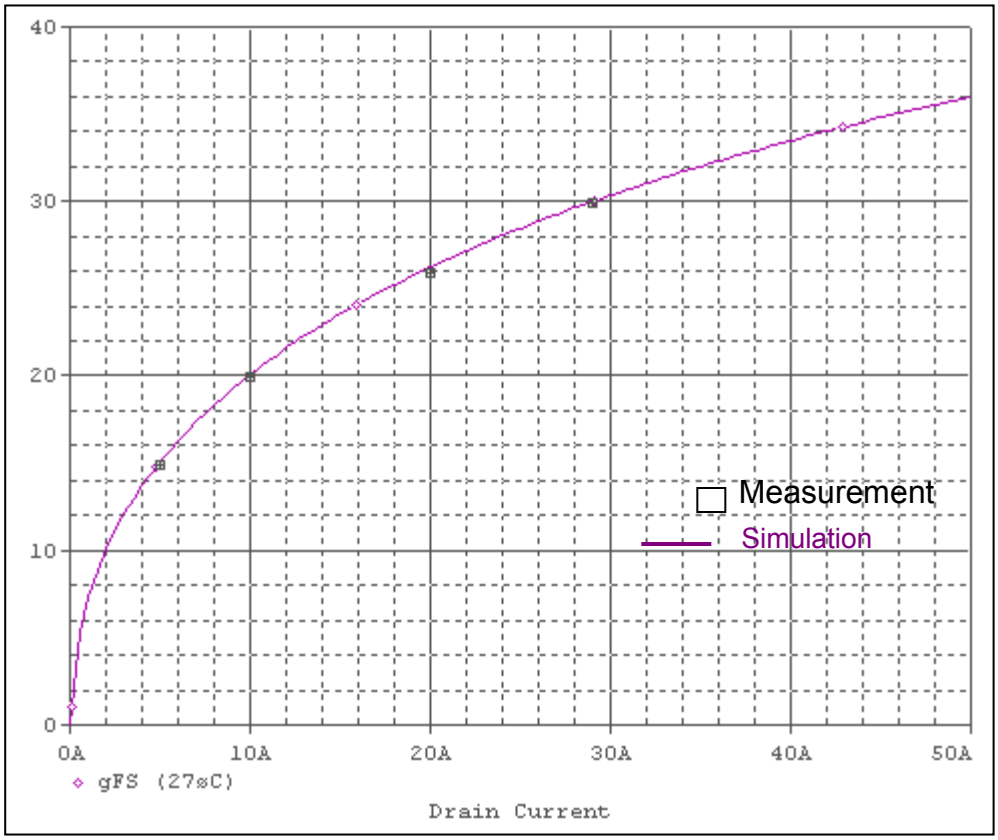
POWER MOSFET MODEL

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

Body Diode Model

Pspice model parameter	Model description
IS	Saturation Current
N	Emission Coefficient
RS	Series Resistance
IKF	High-injection Knee Current
CJO	Zero-bias Junction Capacitance
M	Junction Grading Coefficient
VJ	Junction Potential
ISR	Recombination Current Saturation Value
BV	Reverse Breakdown Voltage(a positive value)
IBV	Reverse Breakdown Current(a positive value)
TT	Transit Time

Transconductance Characteristic

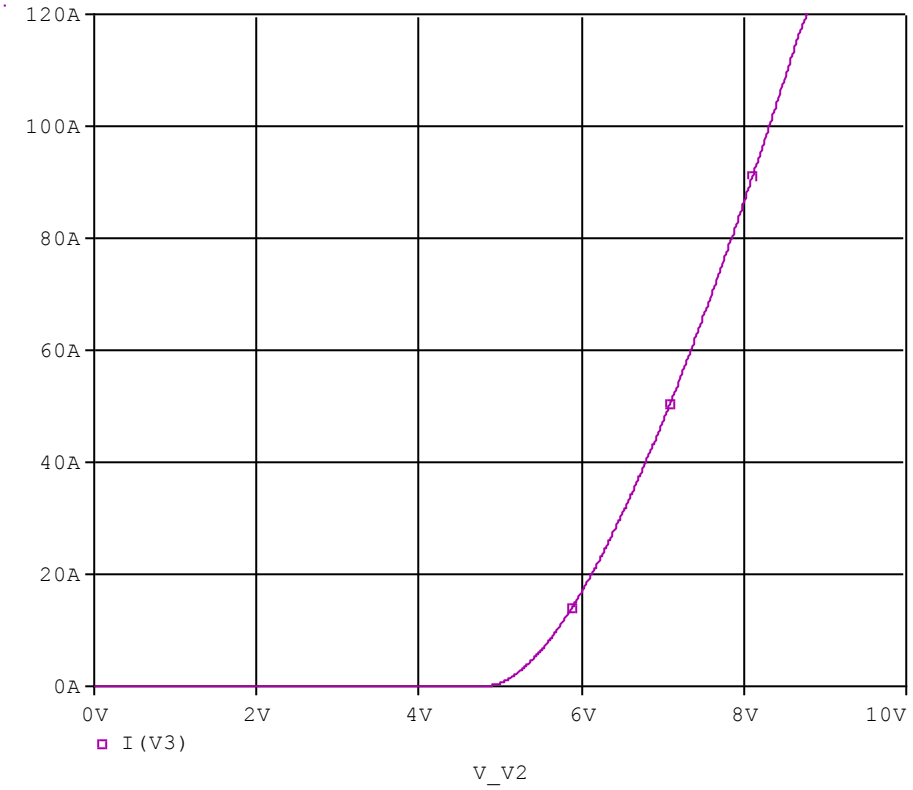


Simulation Result

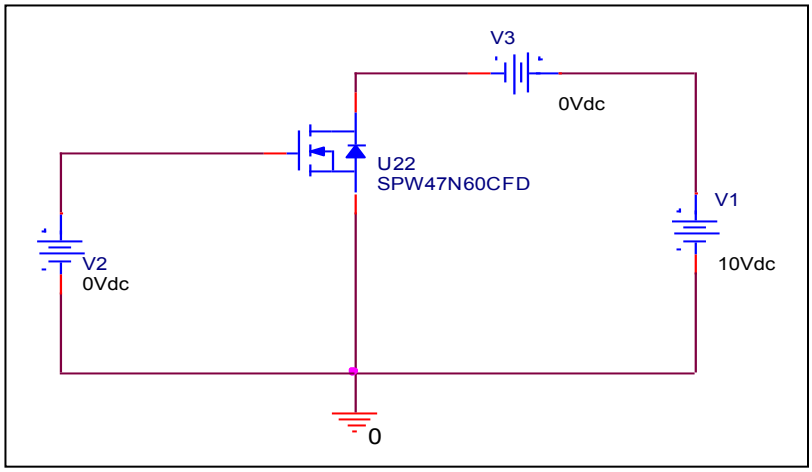
I_D(A)	g_{fs}		Error (%)
	Measurement	Simulation	
5.000	15.000	15.045	0.300
10.000	20.000	20.024	0.120
20.000	26.000	26.281	1.081

Vgs-Id Characteristic

Circuit Simulation result

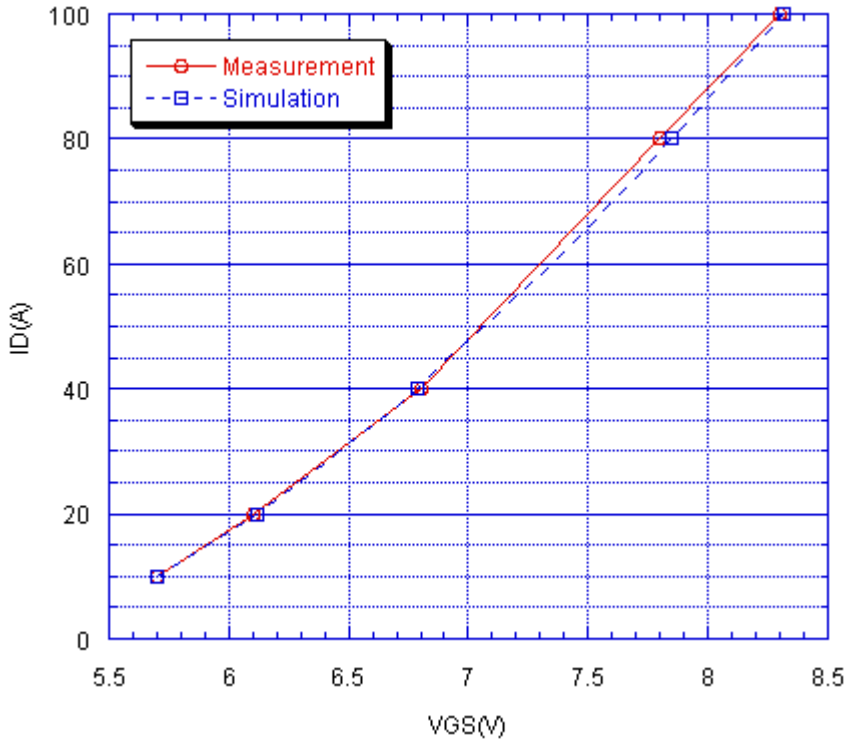


Evaluation circuit



Comparison Graph

Circuit Simulation Result

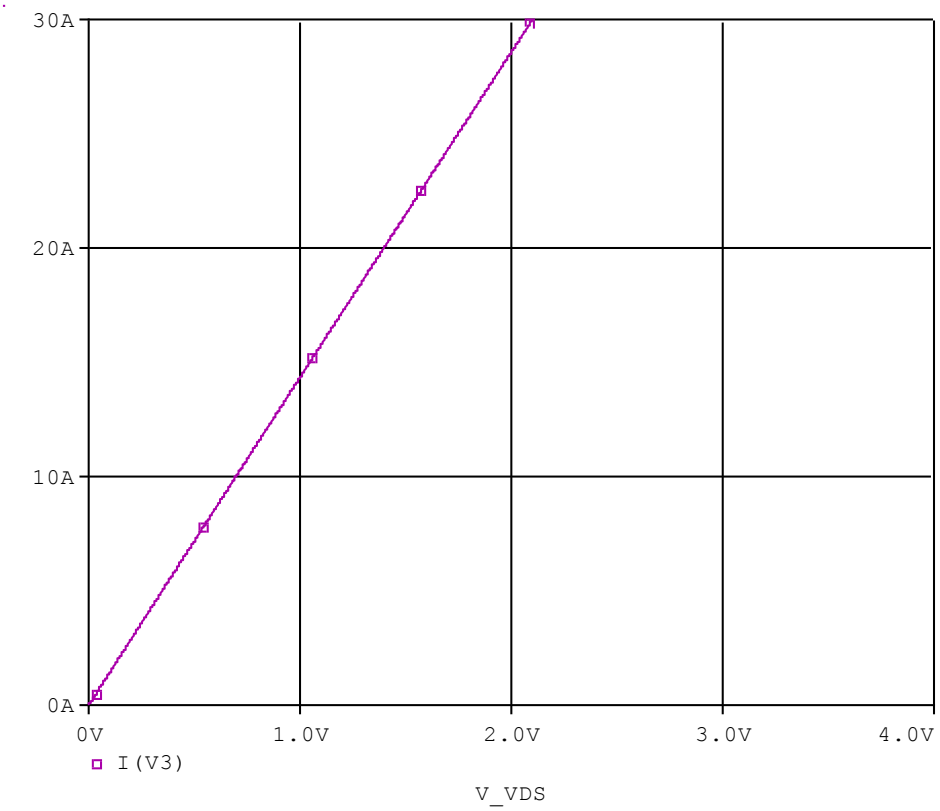


Simulation Result

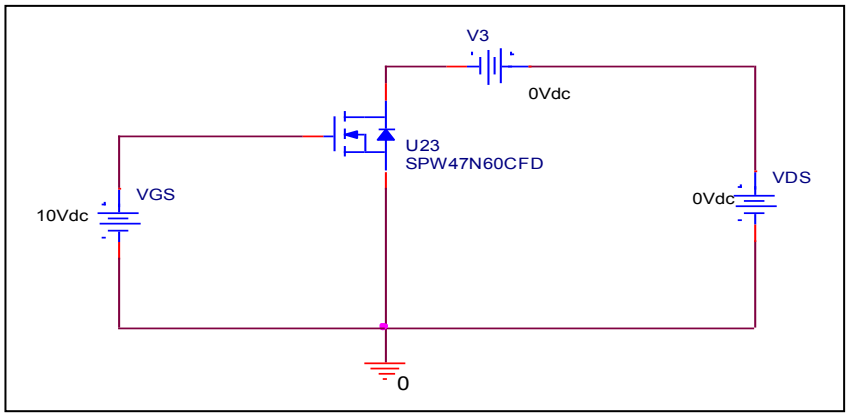
I_D(A)	V_{GS}(V)		Error (%)
	Measurement	Simulation	
10.000	5.700	5.704	0.070
20.000	6.100	6.121	0.344
40.000	6.800	6.786	-0.206
60.000	7.300	7.347	0.644
80.000	7.800	7.846	0.590
100.000	8.300	8.315	0.181

Id-Rds(on) Characteristic

Circuit Simulation result



Evaluation circuit

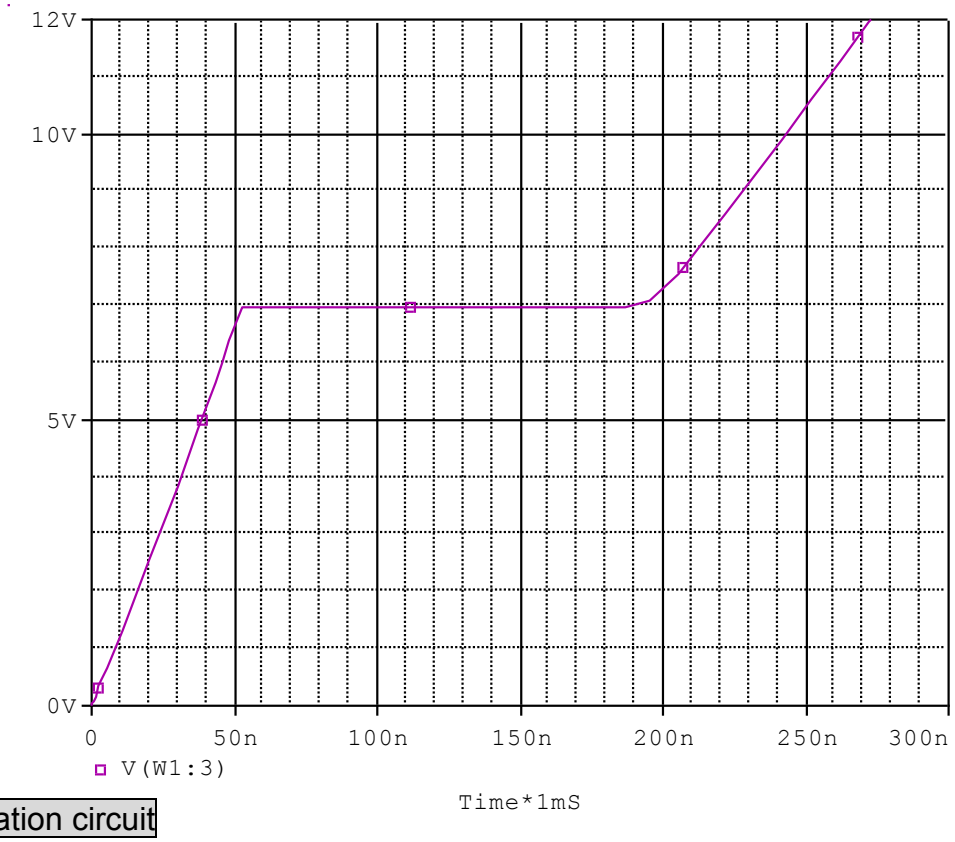


Simulation Result

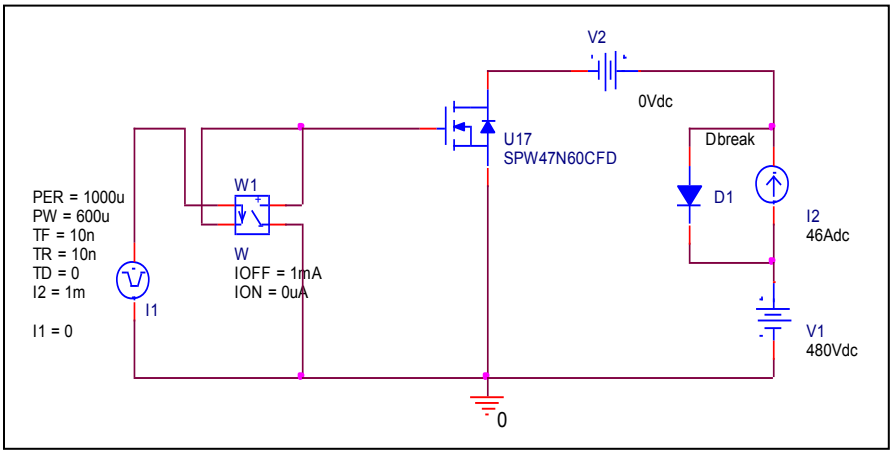
I_D=29, V_{GS}=10V	Measurement		Simulation		Error (%)
R_{DS} (on)	0.070	mΩ	0.070	Ω	0.000

Gate Charge Characteristic

Circuit Simulation result



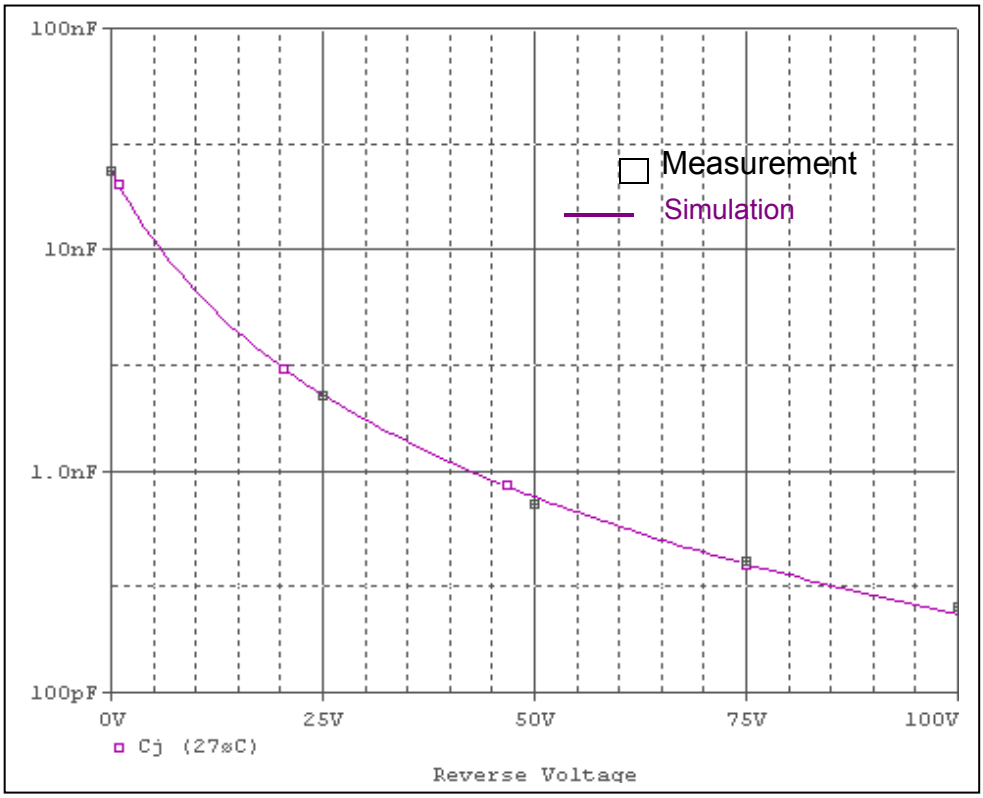
Evaluation circuit



Simulation Result

V_{DD}=480V,I_D=46A	Measurement		Simulation		Error (%)
Qgs	54.000	nC	54.015	nC	0.028
Qgd	130.000	nC	130.657	nC	0.505
Qg	248.000	nC	243.436	nC	-1.840

Capacitance Characteristic

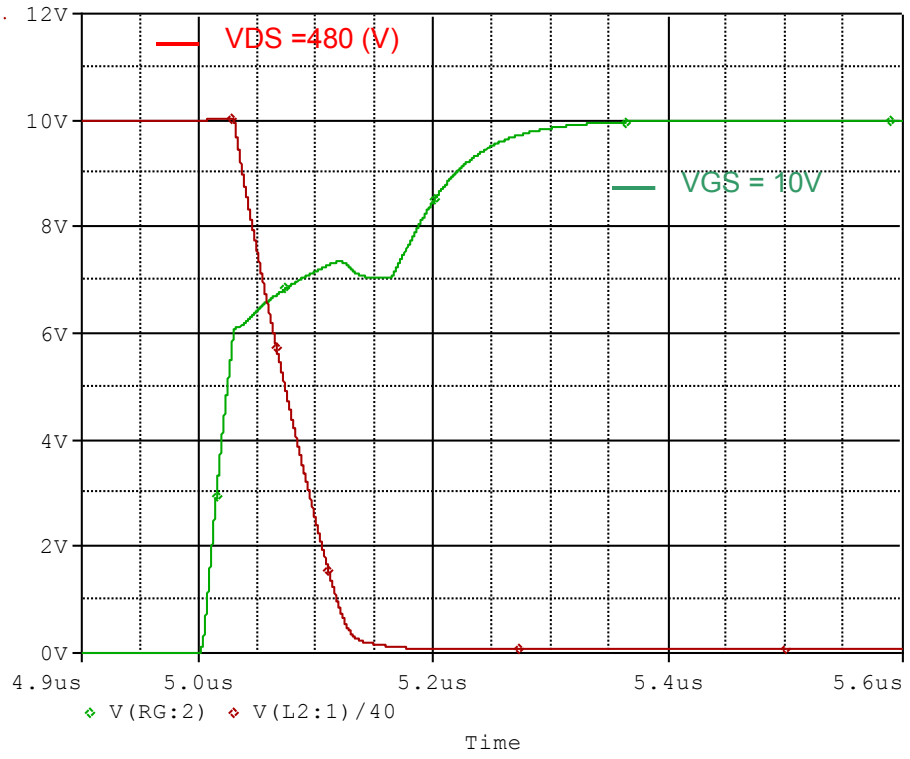


Simulation Result

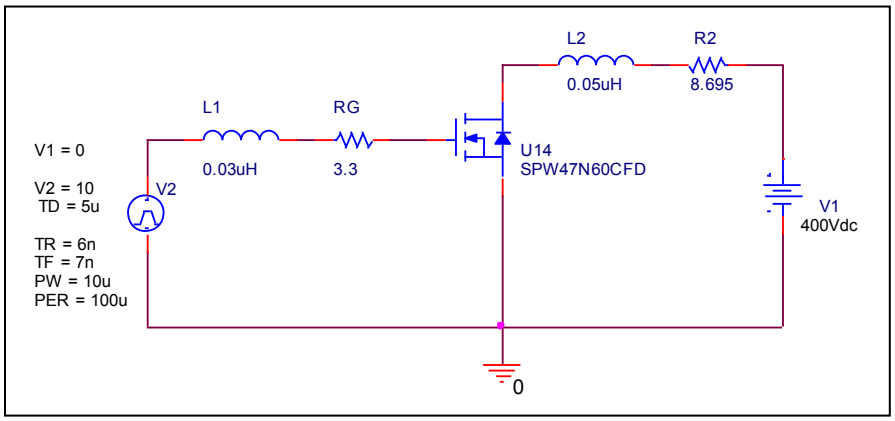
V_{DS}(V)	Cbd(pF)		Error(%)
	Measurement	Simulation	
0.000	23000.000	23020.000	0.087
25.000	2220.000	2220.000	0.000
50.000	729.000	738.000	1.235
75.000	399.000	395.000	-1.003
100.000	249.000	244.000	-2.008

Switching Time Characteristic

Circuit Simulation result



Evaluation circuit

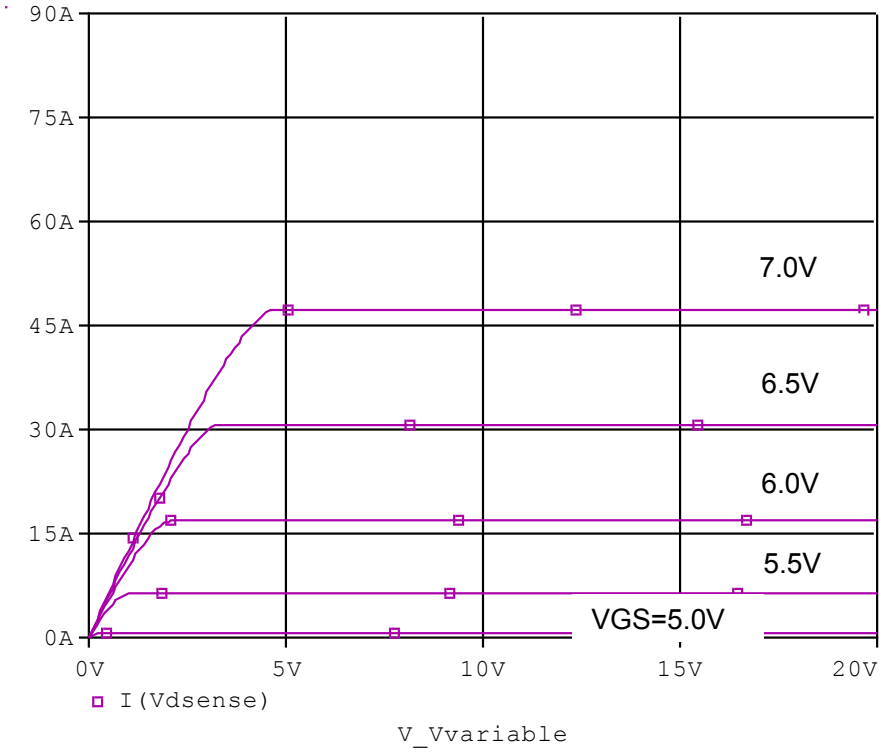


Simulation Result

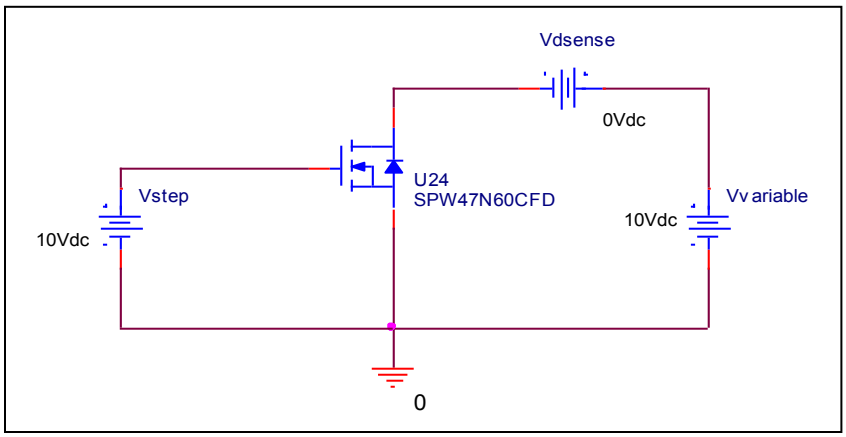
I_D=46A, V_{DD}=480V V_{GS}=0/10V	Measurement		Simulation		Error(%)
td (on)	30.000	ns	30.079	ns	0.323

Output Characteristic

Circuit Simulation result

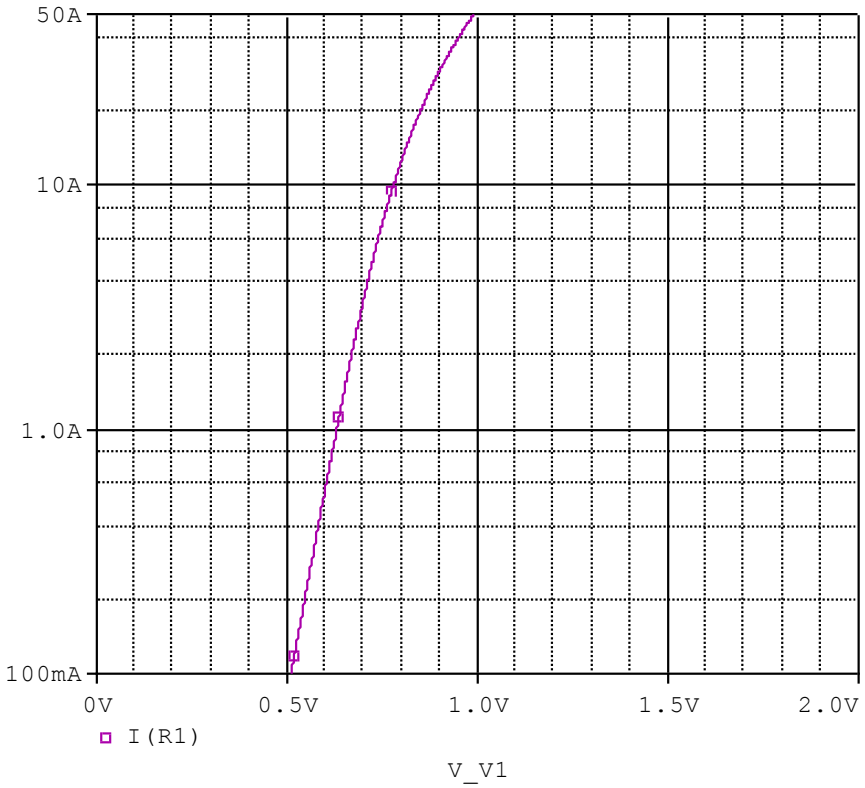


Evaluation circuit

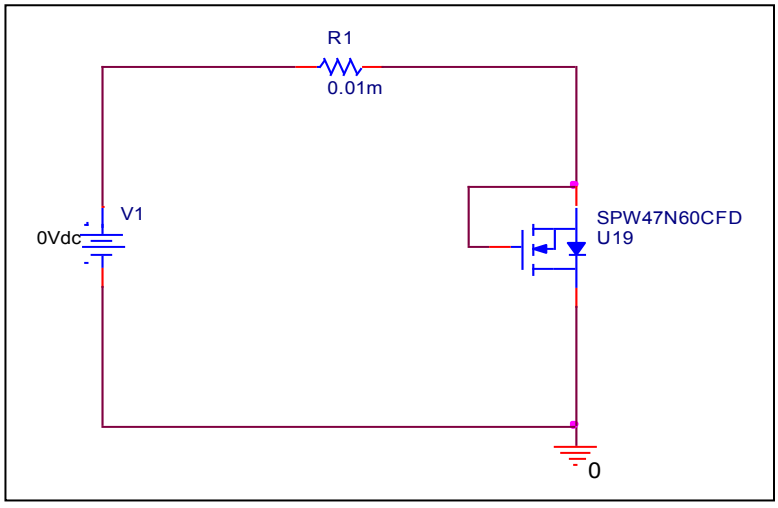


Forward Current Characteristic of Reverse Diode

Circuit Simulation Result

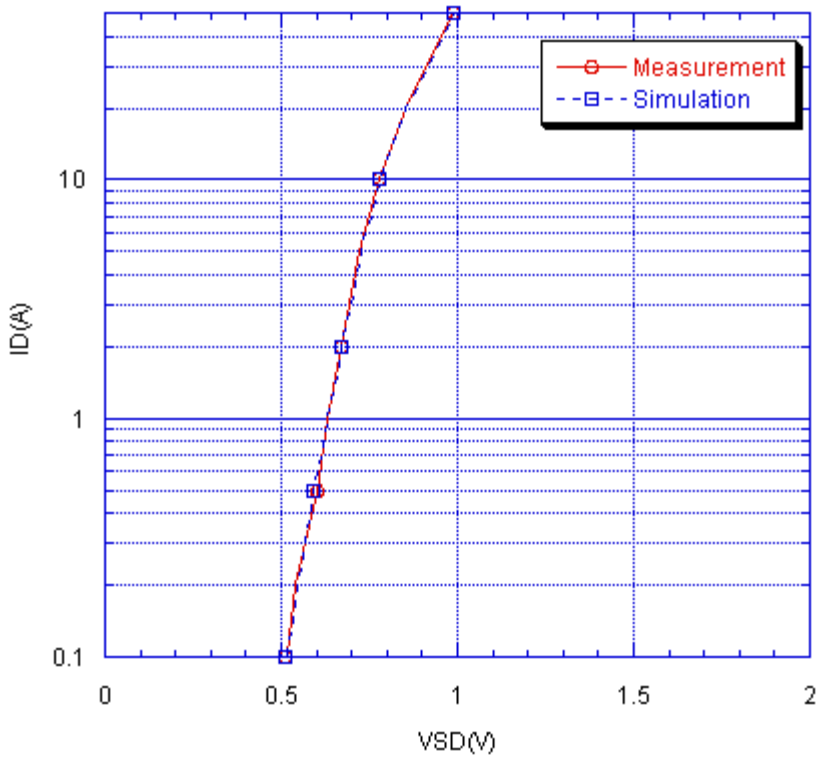


Evaluation Circuit



Comparison Graph

Circuit Simulation Result

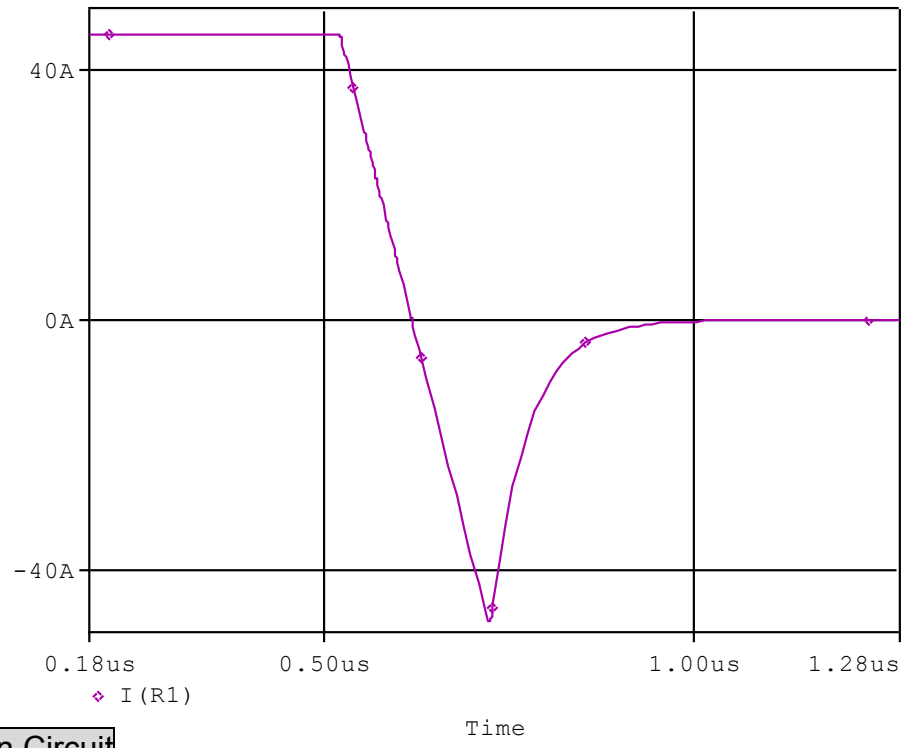


Simulation Result

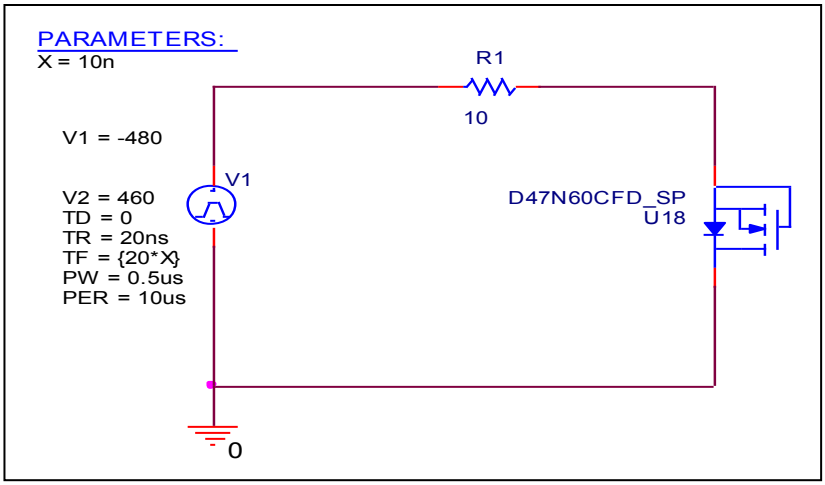
Ifwd(A)	Vfwd(V) Measurement	Vfwd(V) Simulation	%Error
0.100	0.510	0.510	0.000
0.200	0.540	0.545	0.926
0.500	0.600	0.593	-1.167
1.000	0.630	0.630	0.000
2.000	0.670	0.668	-0.299
5.000	0.720	0.725	0.694
10.000	0.780	0.779	-0.128
20.000	0.850	0.850	0.000
50.000	0.990	0.990	0.000

Reverse Recovery Characteristic

Circuit Simulation Result



Evaluation Circuit



Compare Measurement vs. Simulation

	Measurement		Simulation		Error(%)
trr	**0.210**	**us**	**0.215**	**us**	**2.381**