Device Modeling Report

COMPONENTS: Power MOSFET (Professional)
PART NUMBER: SPW47N60C3
MANUFACTURER: Infineon technologies
REMARK: Body Diode (Special)

Bee Technologies Inc.

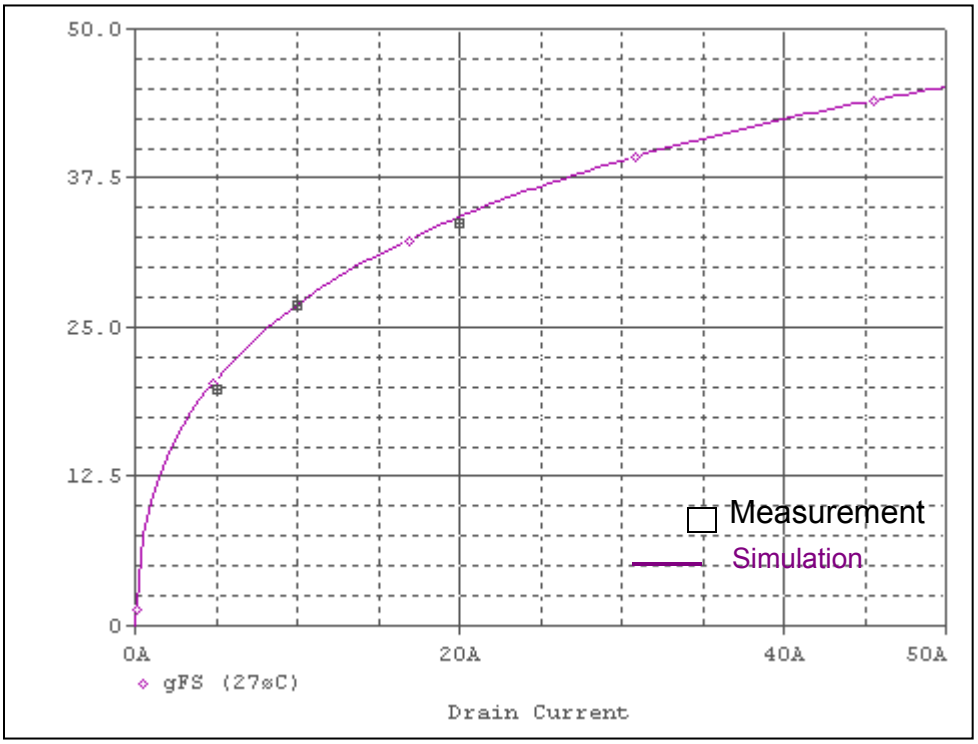
POWER MOSFET MODEL

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

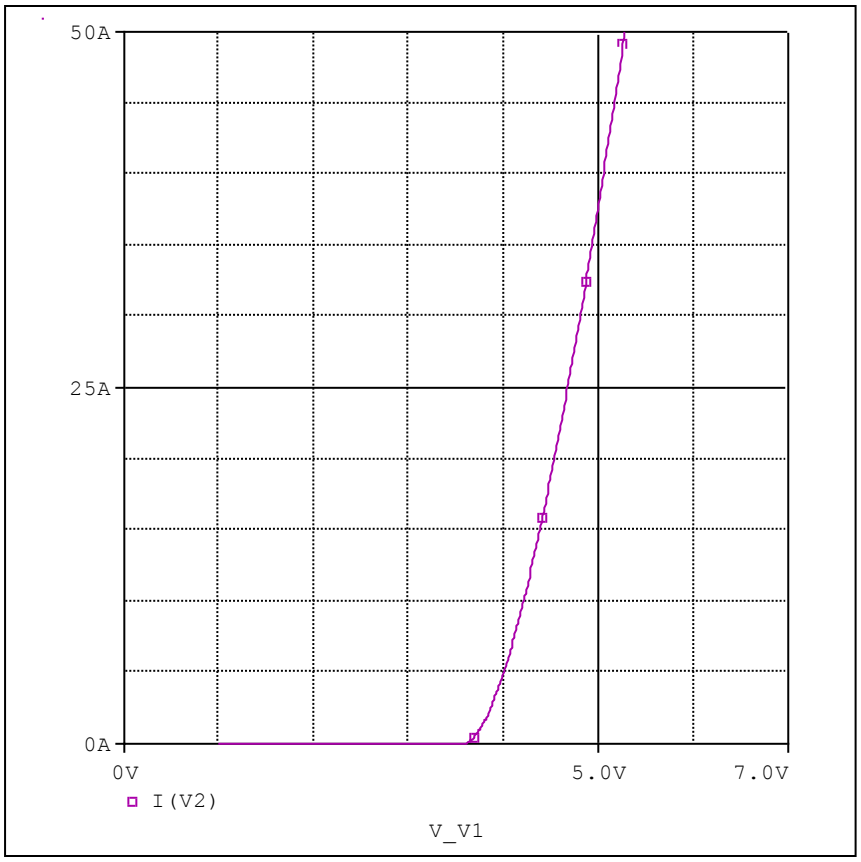


Simulation Result

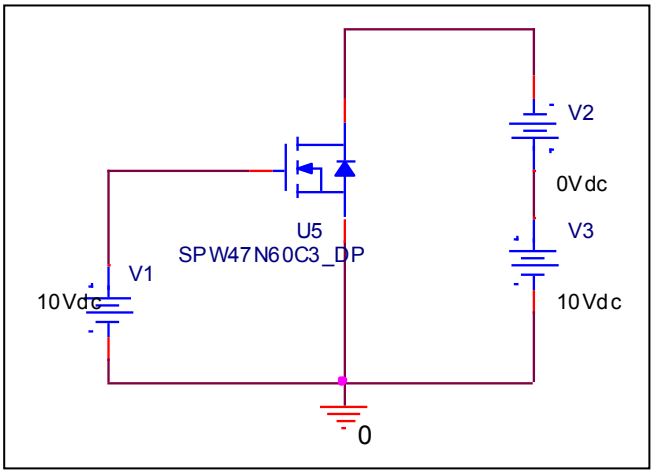
I_D(A)	g_{fs}		Error (%)
	Measurement	Simulation	
5	20	20.67	3.35
10	27.027	26.92	-0.3959
20	33.89	34.25	1.06226

Vgs-Id Characteristic

Circuit Simulation result

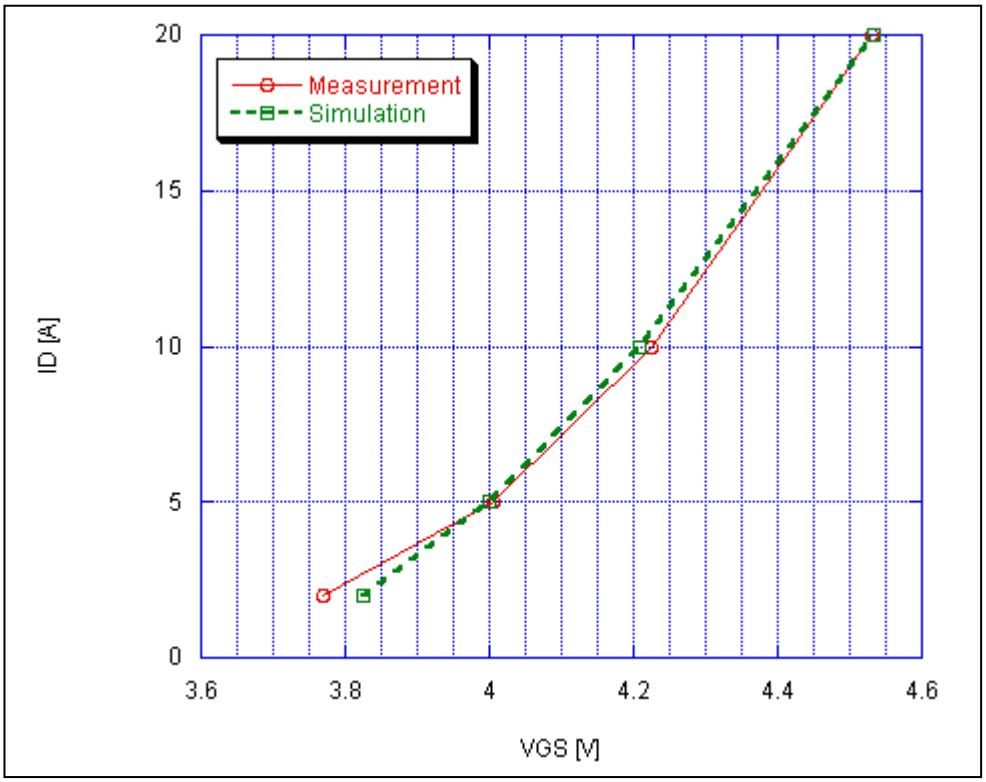


Evaluation circuit



Comparison Graph

Circuit Simulation Result

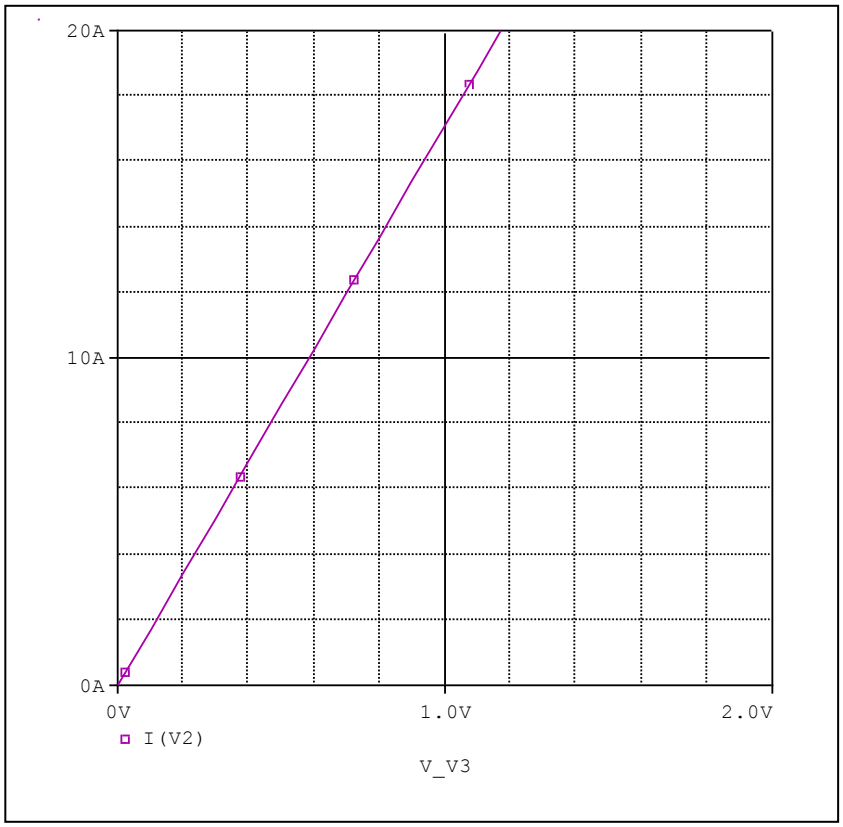


Simulation Result

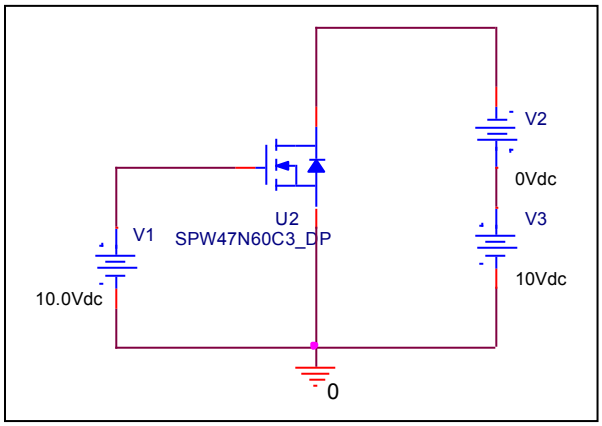
I_D(A)	V_{GS}(V)		Error (%)
	Measurement	Simulation	
2	3.77	3.825	1.459
5	4.005	3.9988	-0.155
10	4.225	4.2076	-0.412
20	4.53	4.5322	0.049

Id-Rds(on) Characteristic

Circuit Simulation result



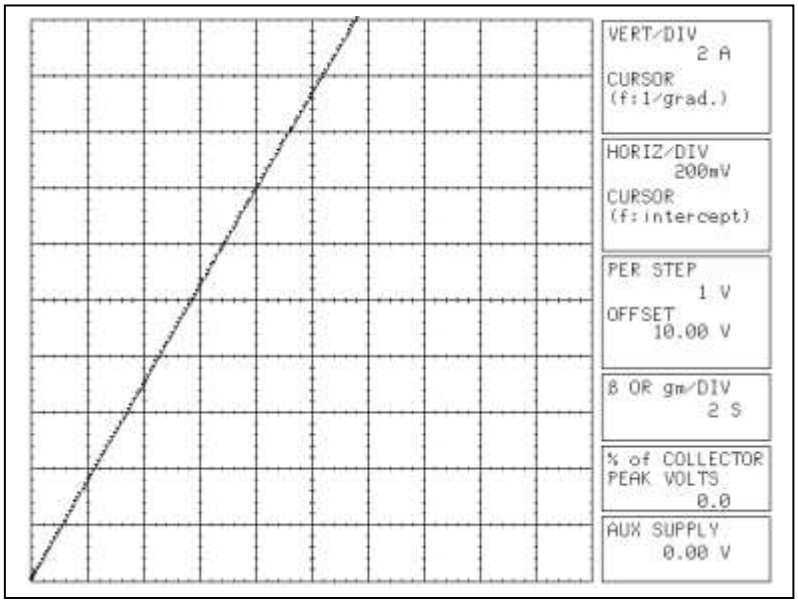
Evaluation circuit



Simulation Result

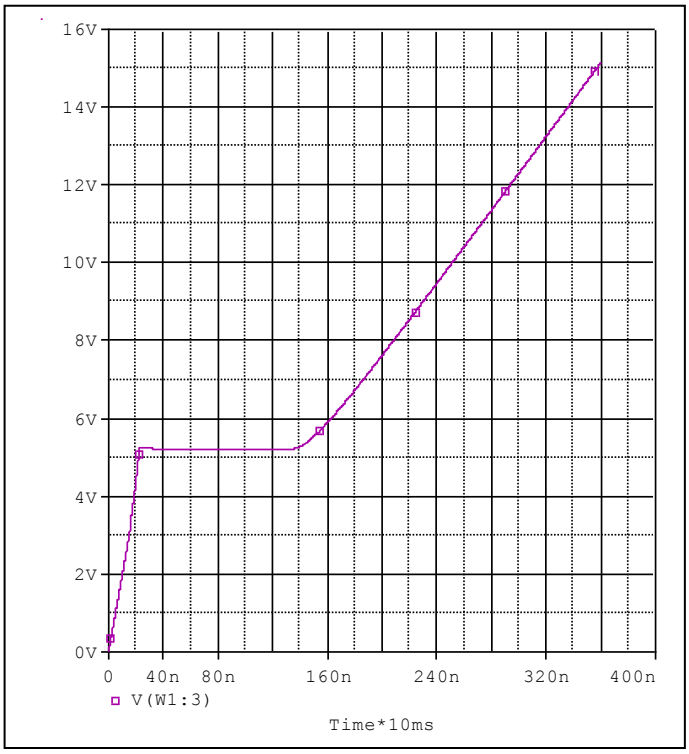
I_D=20, V_{GS}=10V	Measurement		Simulation		Error (%)
R_{DS} (on)	58.5	mΩ	58.5	Ω	0

Id-Rds(on) Characteristic Reference

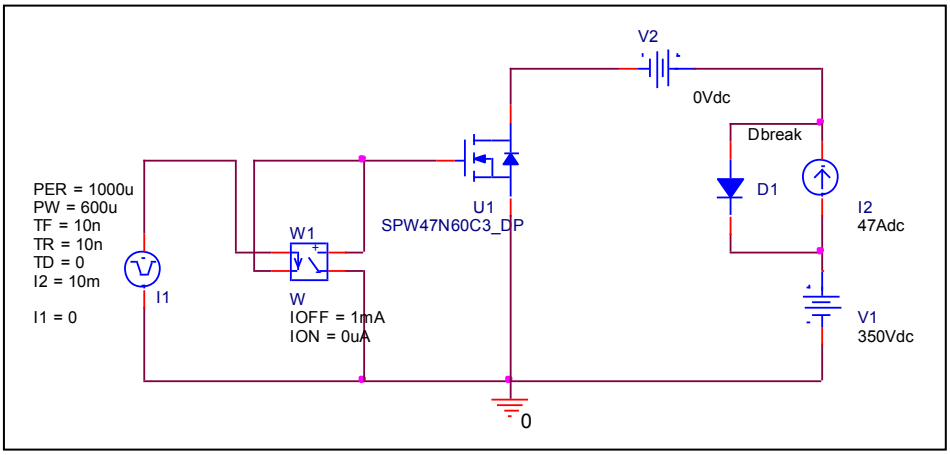


Gate Charge Characteristic

Circuit Simulation result



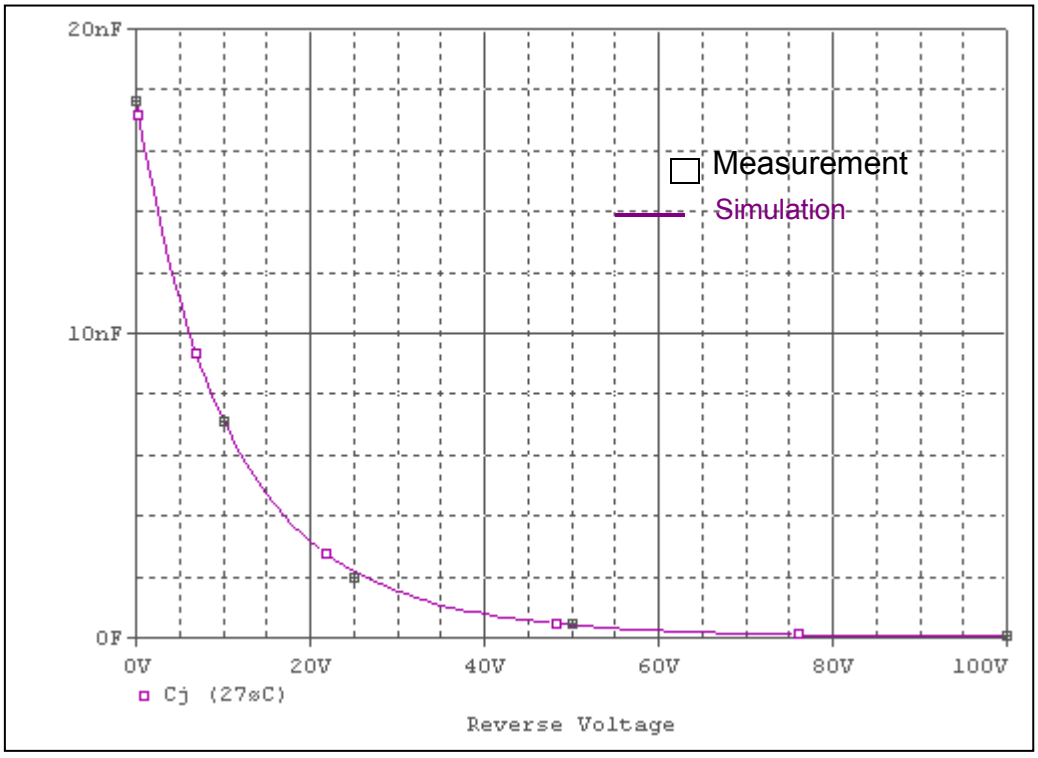
Evaluation circuit



Simulation Result

V_{DD}=350V,I_D=47A	Measurement		Simulation		Error (%)
Qgs	24	nC	23.894	nC	-0.442
Qgd	121	nC	120.354	nC	-0.534
Qg	252	nC	251.669	nC	-0.131

Capacitance Characteristic

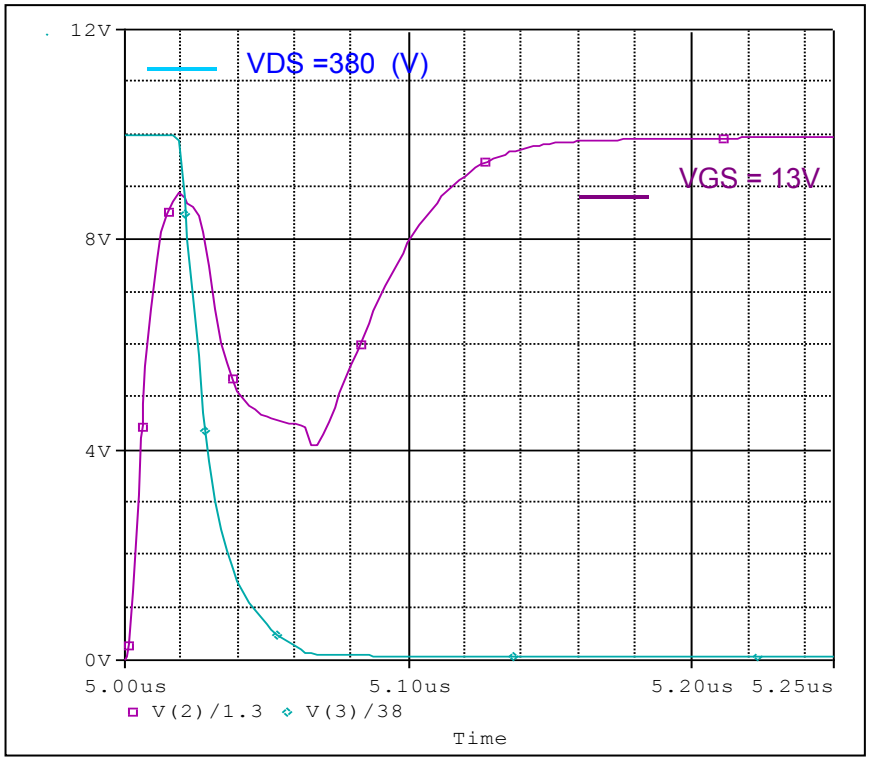


Simulation Result

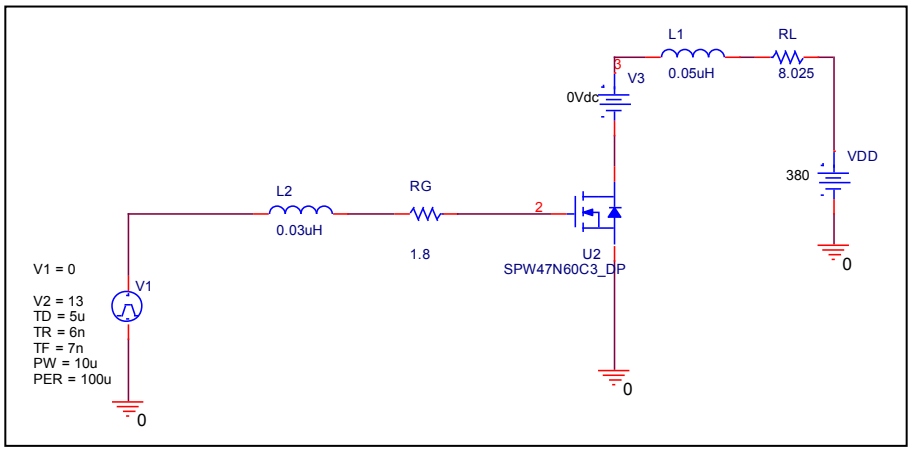
V_{DS}(V)	Cbd(pF)		Error(%)
	Measurement	Simulation	
0	17700	17710	0.0565
5	7200	7150	-0.69
25	2055	2150	4.623
50	645	648	0.465

Switching Time Characteristic

Circuit Simulation result



Evaluation circuit

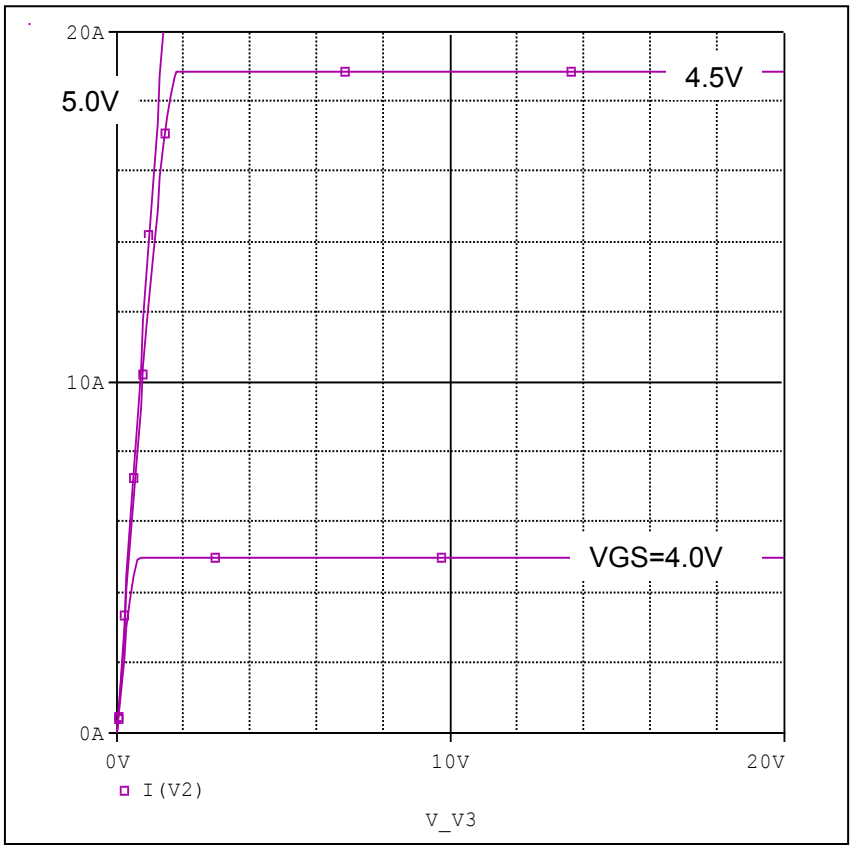


Simulation Result

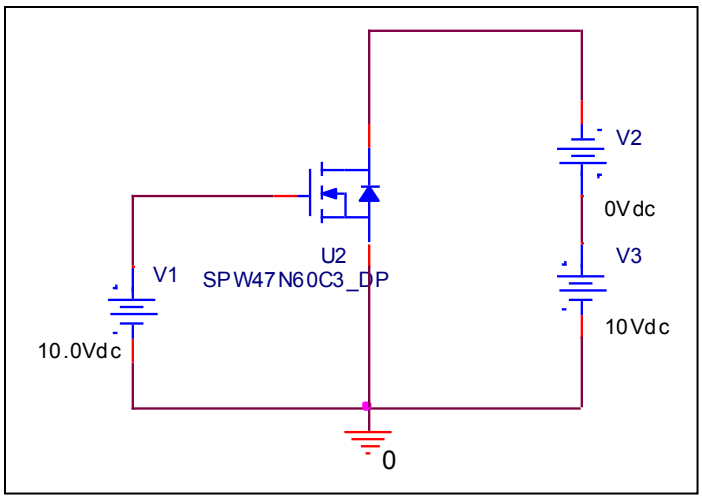
I_D=47A, V_{DD}=380V V_{GS}=0/13V	Measurement		Simulation		Error(%)
td (on)	18	ns	18.049	ns	0.272

Output Characteristic

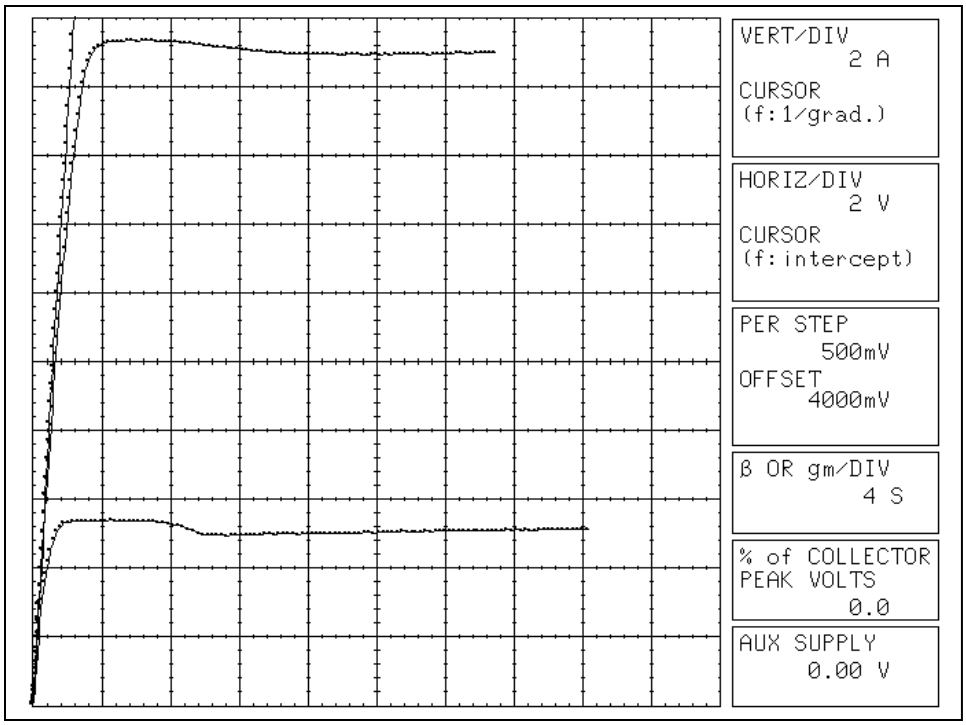
Circuit Simulation result



Evaluation circuit

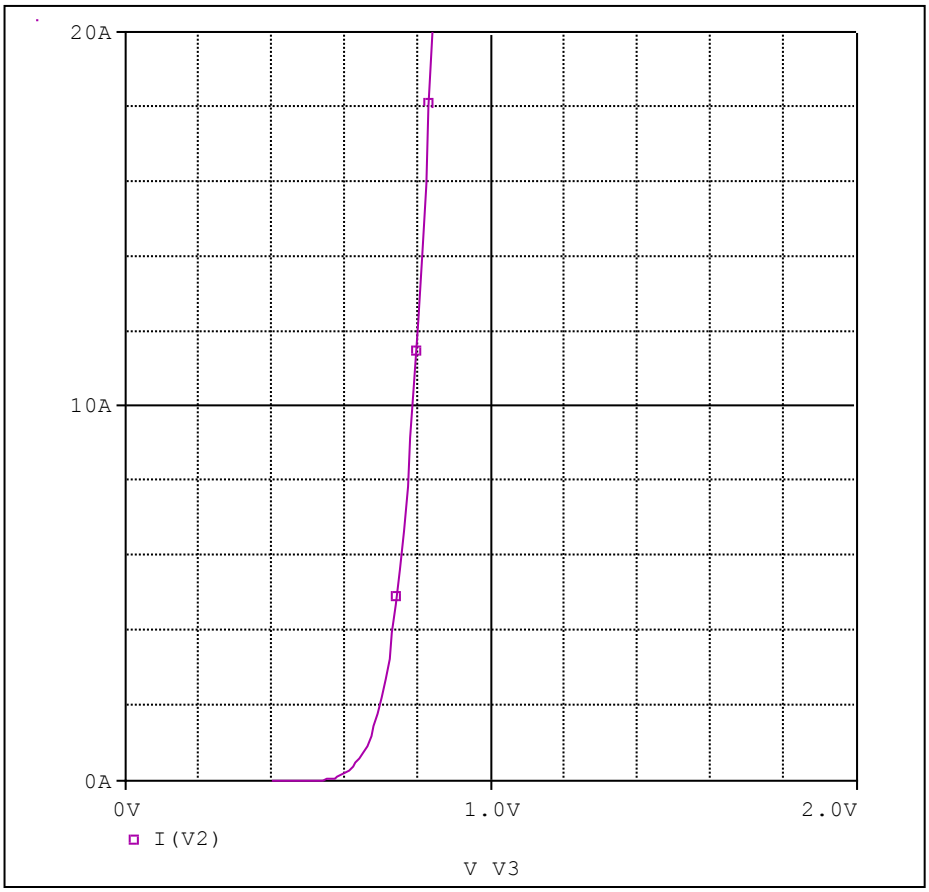


Output Characteristic Reference

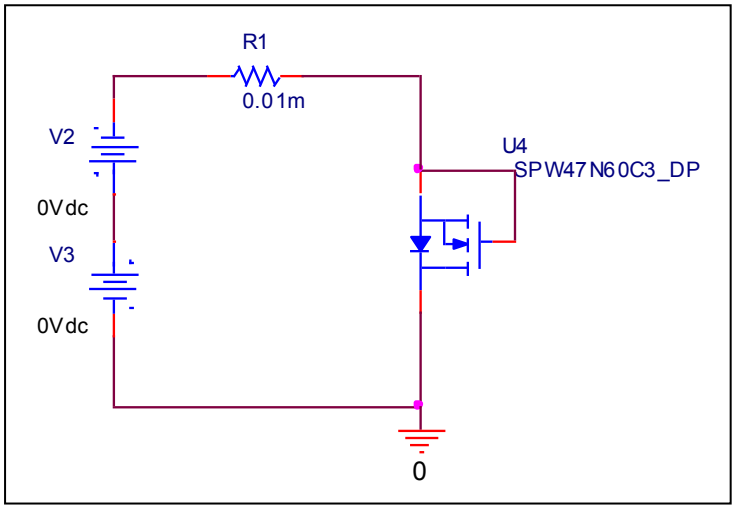


Forward Current Characteristic of Reverse Diode

Circuit Simulation Result

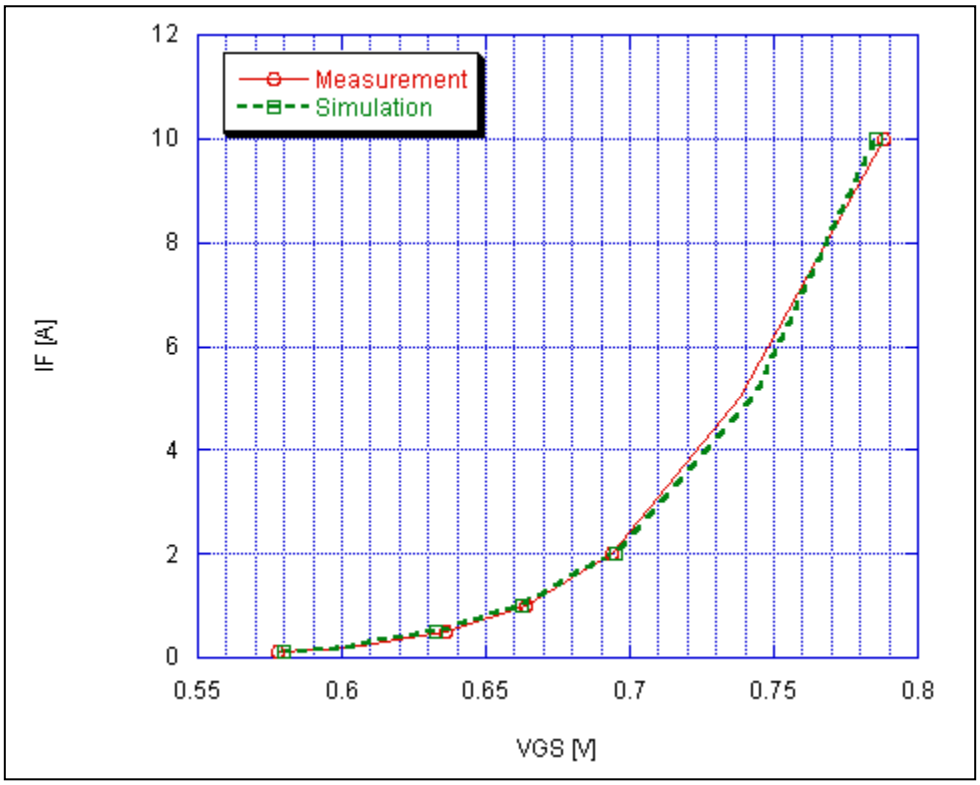


Evaluation Circuit



Comparison Graph

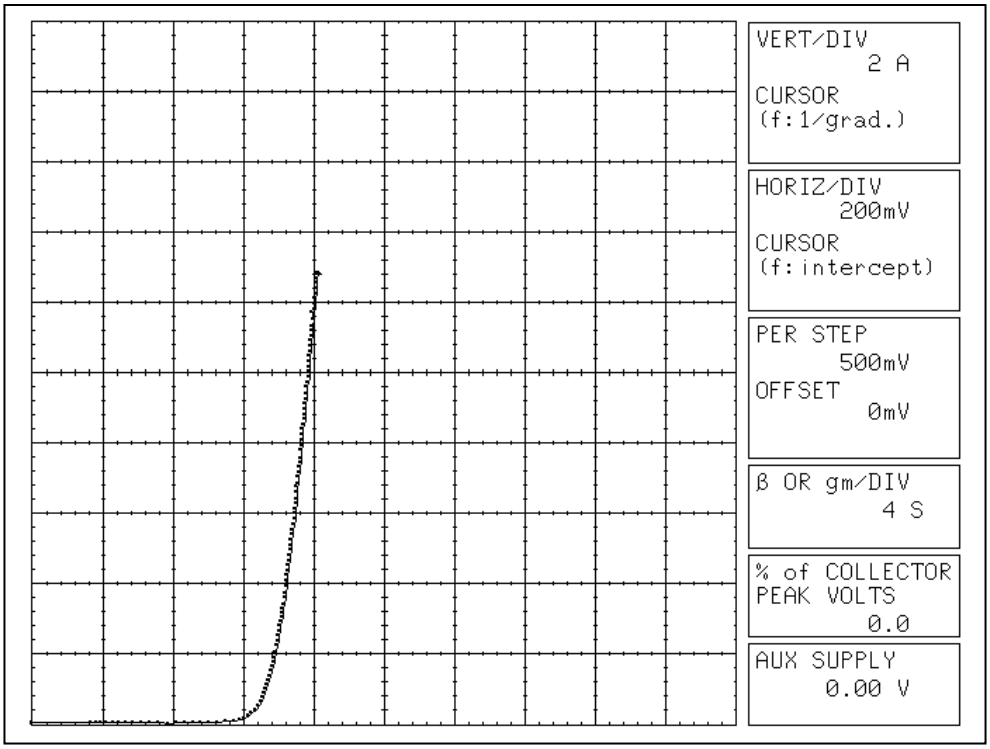
Circuit Simulation Result



Simulation Result

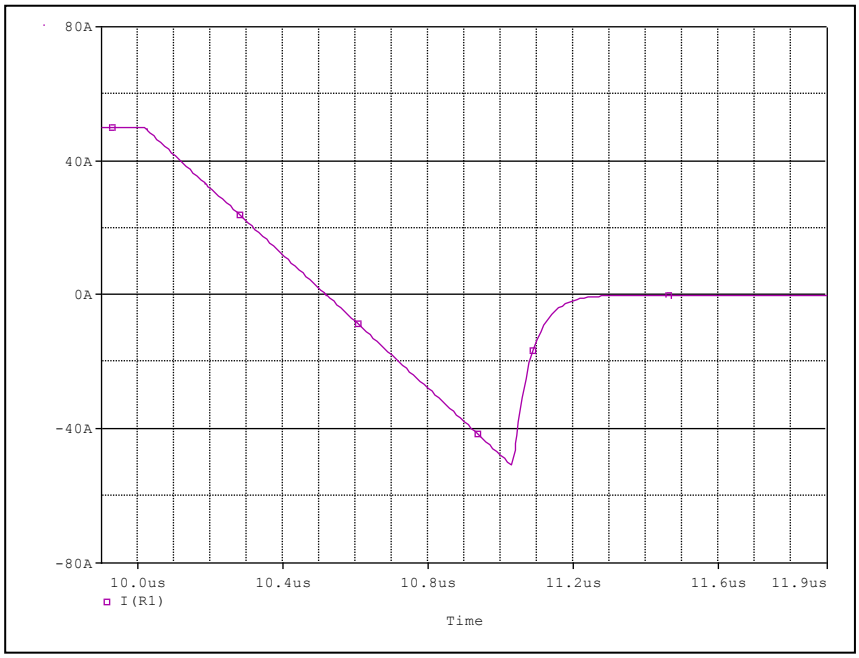
Ifwd(A)	Vfwd(V) Measurement	Vfwd(V) Simulation	%Error
0.1	0.578	0.580	0.346
0.2	0.602	0.600458	-0.256
0.5	0.636	0.632909	-0.486
1	0.664	0.662429	-0.237
2	0.694	0.695146	0.165
5	0.738	0.743130	0.695
10	0.788	0.785662	-0.297

Forward Current Characteristic Reference

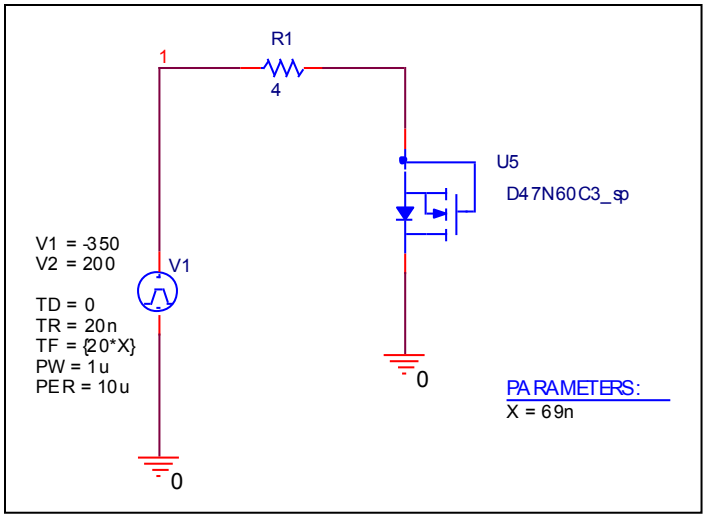


Reverse Recovery Characteristic

Circuit Simulation Result



Evaluation Circuit



Compare Measurement vs. Simulation

	Measurement		Simulation		Error(%)
trr	**580**	**us**	**580.645**	**us**	**0.11**