Device Modeling Report

COMPONENTS: Power MOSFET (Professional)
PART NUMBER: SPW35N60CFD
MANUFACTURER: Infineon technologies
REMARK: Body Diode (Special)

Bee Technologies Inc.

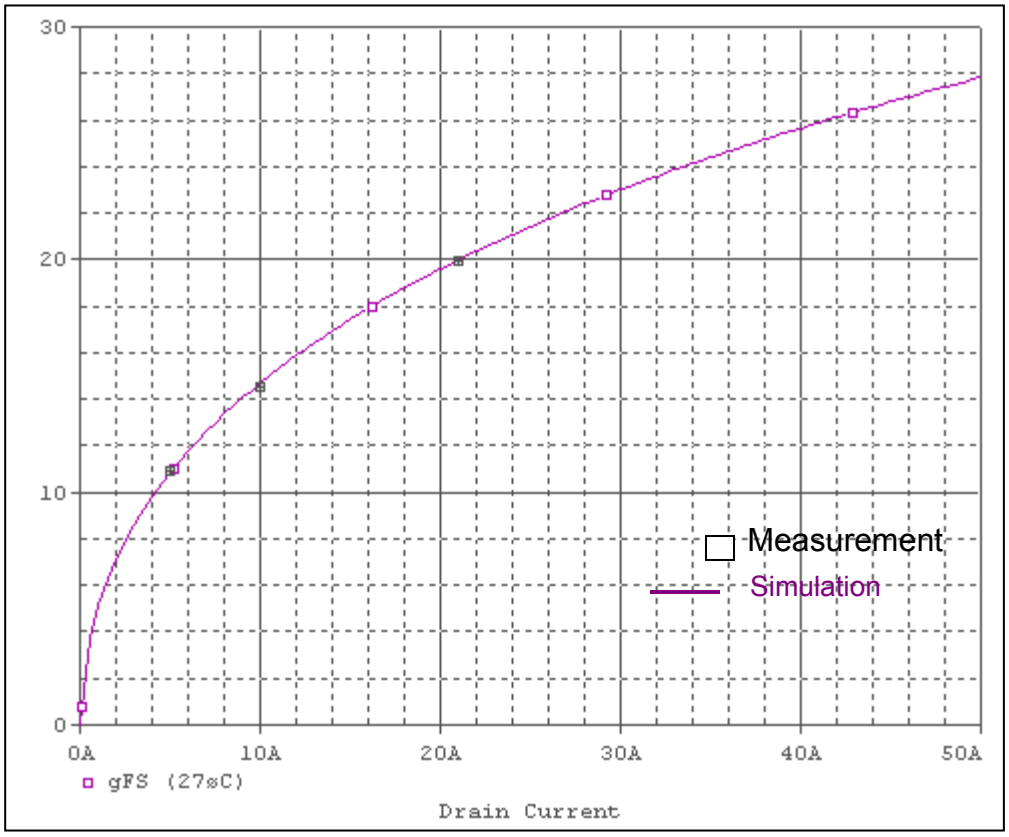
POWER MOSFET MODEL

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

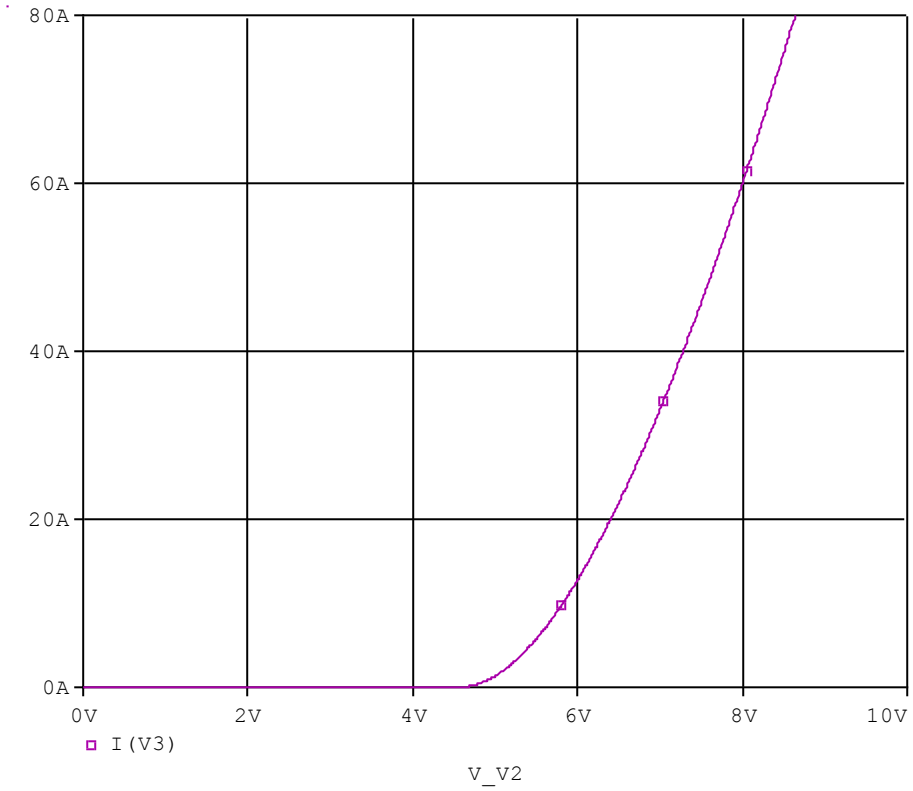


Simulation Result

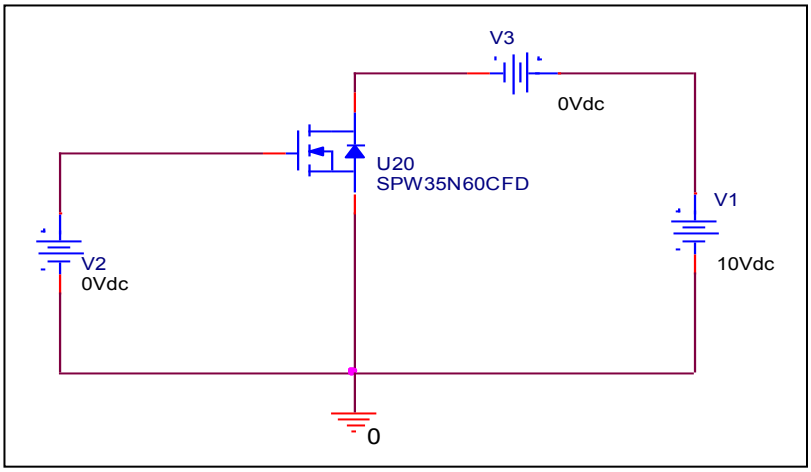
I_D(A)	g_{fs}		Error (%)
	Measurement	Simulation	
5.000	11.000	10.982	-0.164
10.000	14.600	14.650	0.342
20.000	19.500	19.500	0.000

Vgs-Id Characteristic

Circuit Simulation result

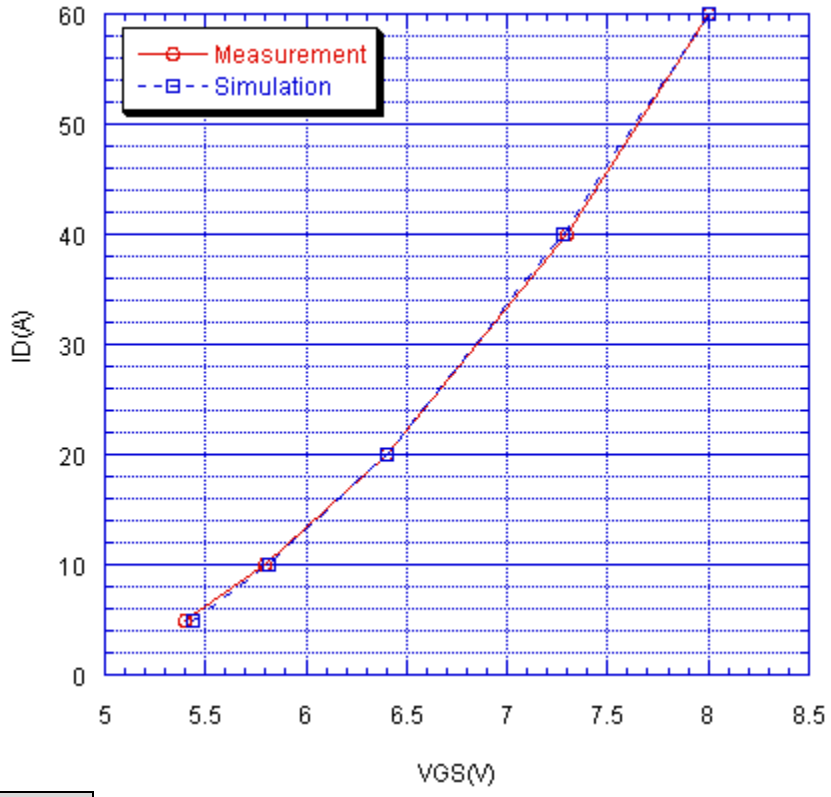


Evaluation circuit



Comparison Graph

Circuit Simulation Result

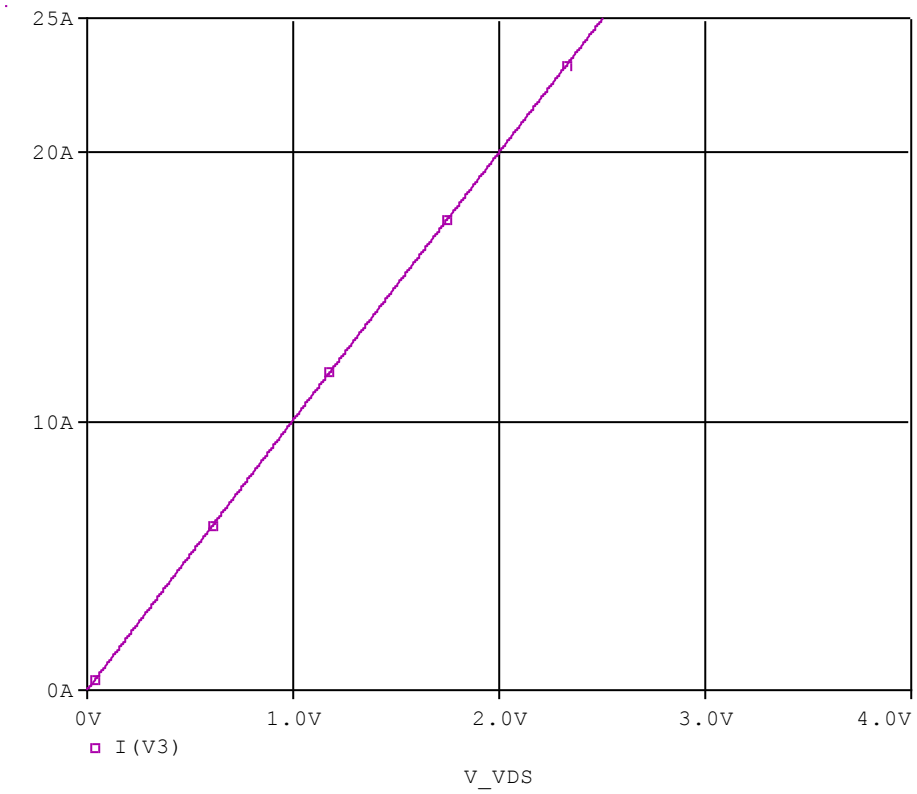


Simulation Result

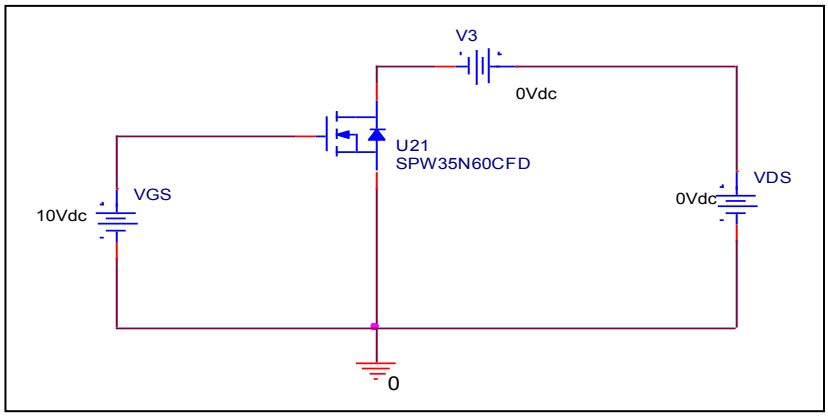
I_D(A)	V_{GS}(V)		Error (%)
	Measurement	Simulation	
5.000	5.400	5.438	0.704
10.000	5.800	5.820	0.345
20.000	6.400	6.400	0.000
40.000	7.300	7.279	-0.288
60.000	8.000	8.000	0.000

Id-Rds(on) Characteristic

Circuit Simulation result



Evaluation circuit

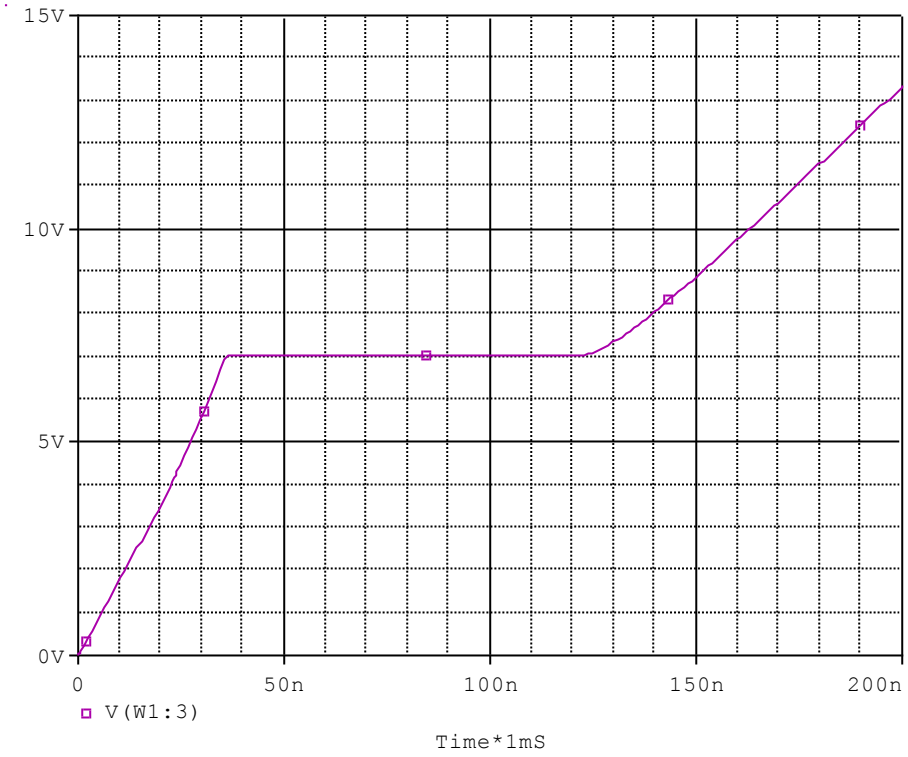


Simulation Result

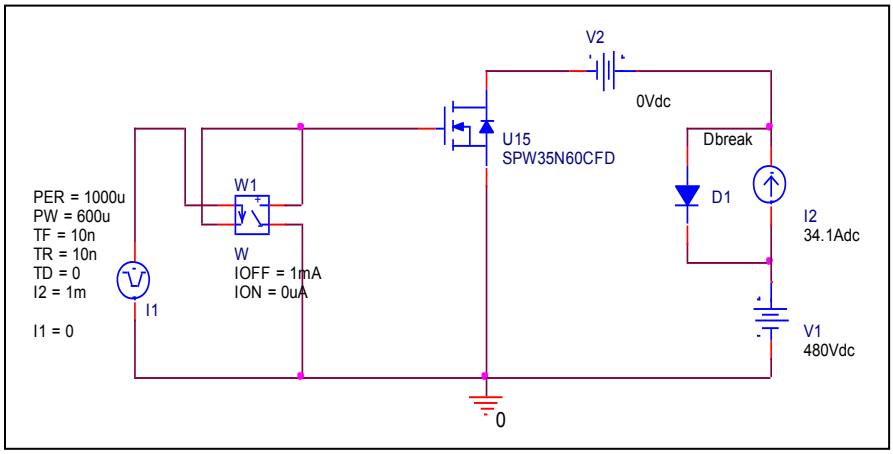
I_D=21.6, V_{GS}=10V	Measurement		Simulation		Error (%)
R_{DS} (on)	0.100	mΩ	0.100	Ω	0.000

Gate Charge Characteristic

Circuit Simulation result



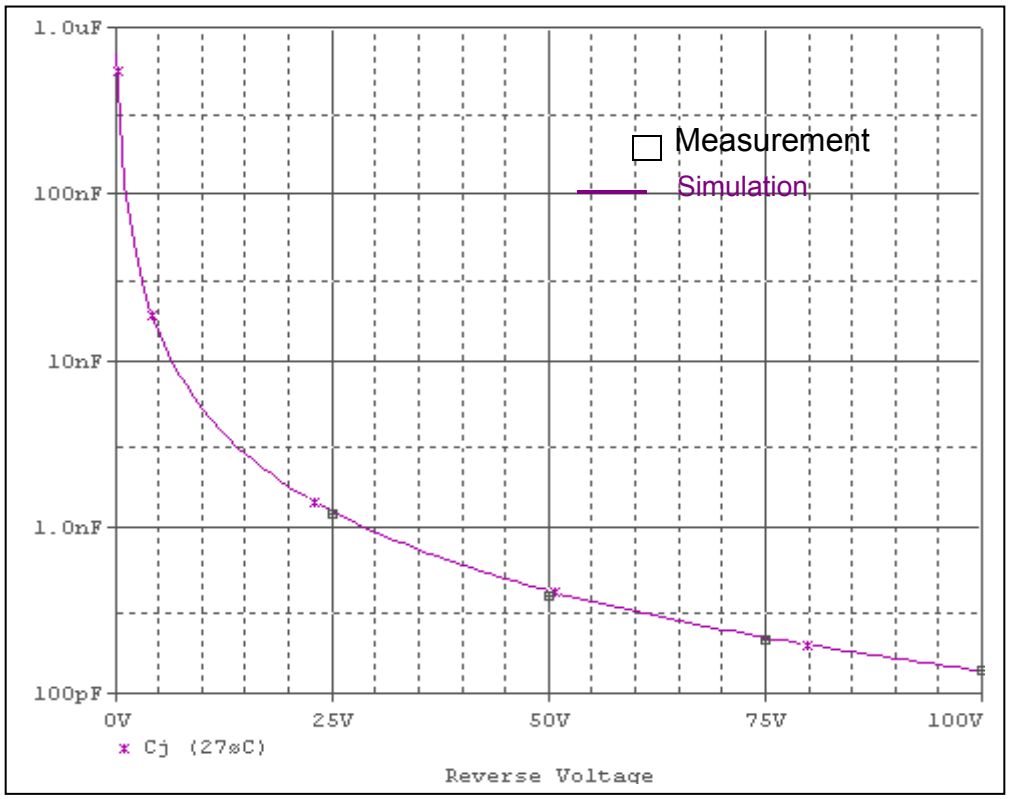
Evaluation circuit



Simulation Result

V_{DD}=480V,I_D=34.1A	Measurement		Simulation		Error (%)
Qgs	36.000	nC	36.180	nC	0.500
Qgd	87.000	nC	86.966	nC	-0.039
Qg	163.000	nC	163.146	nC	0.090

Capacitance Characteristic

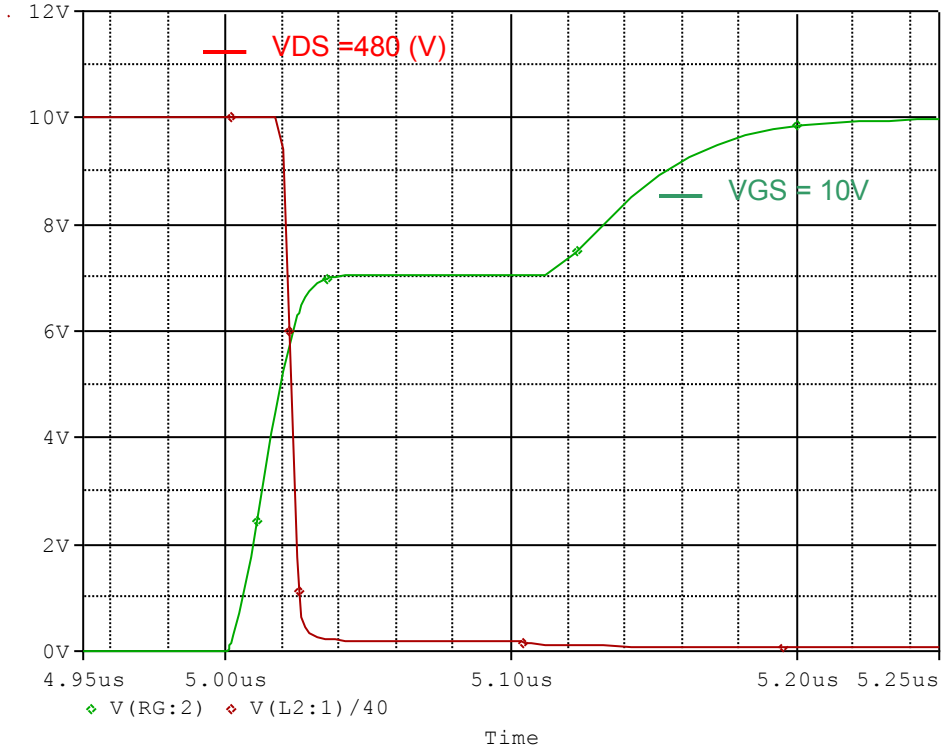


Simulation Result

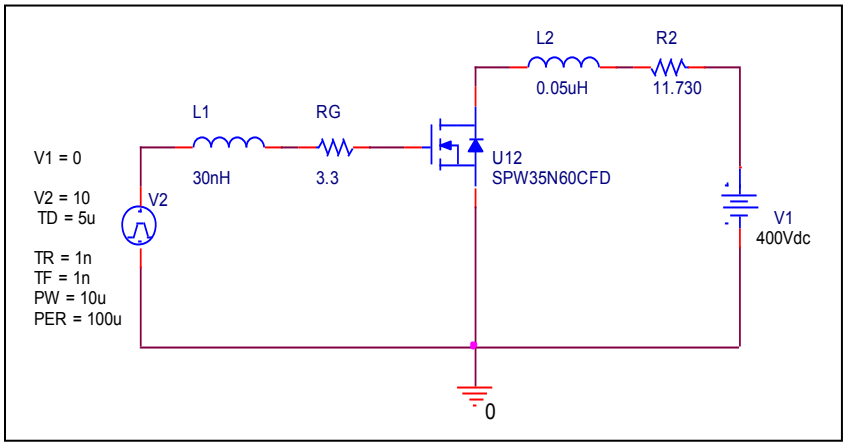
V_{DS}(V)	Cbd(pF)		Error(%)
	Measurement	Simulation	
25.000	1240	1245	0.403
50.000	395	399	1.013
75.000	215	220	2.326
100.000	140	139	-0.714

Switching Time Characteristic

Circuit Simulation result



Evaluation circuit

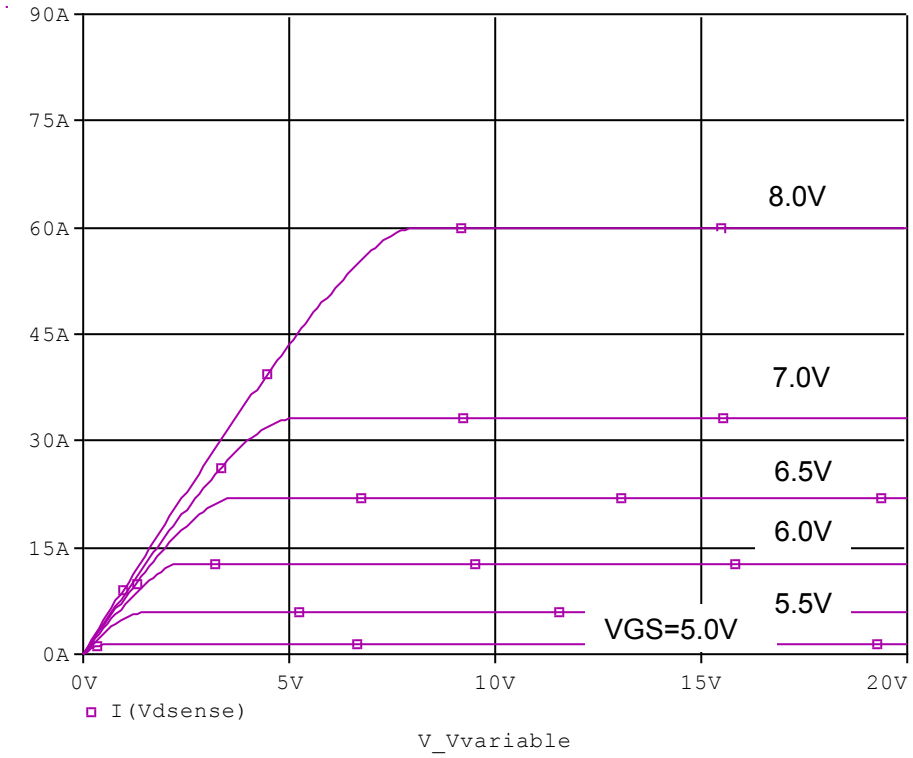


Simulation Result

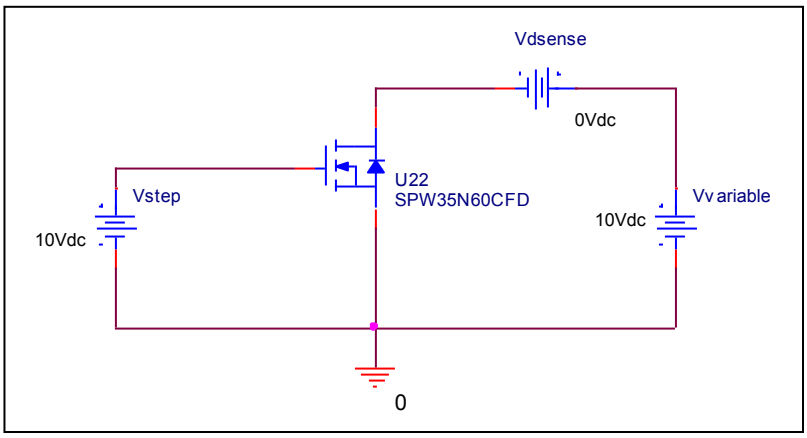
I_D=34.1A, V_{DD}=480V V_{GS}=0/10V	Measurement		Simulation		Error(%)
td (on)	20.000	ns	19.997	ns	-0.015

Output Characteristic

Circuit Simulation result

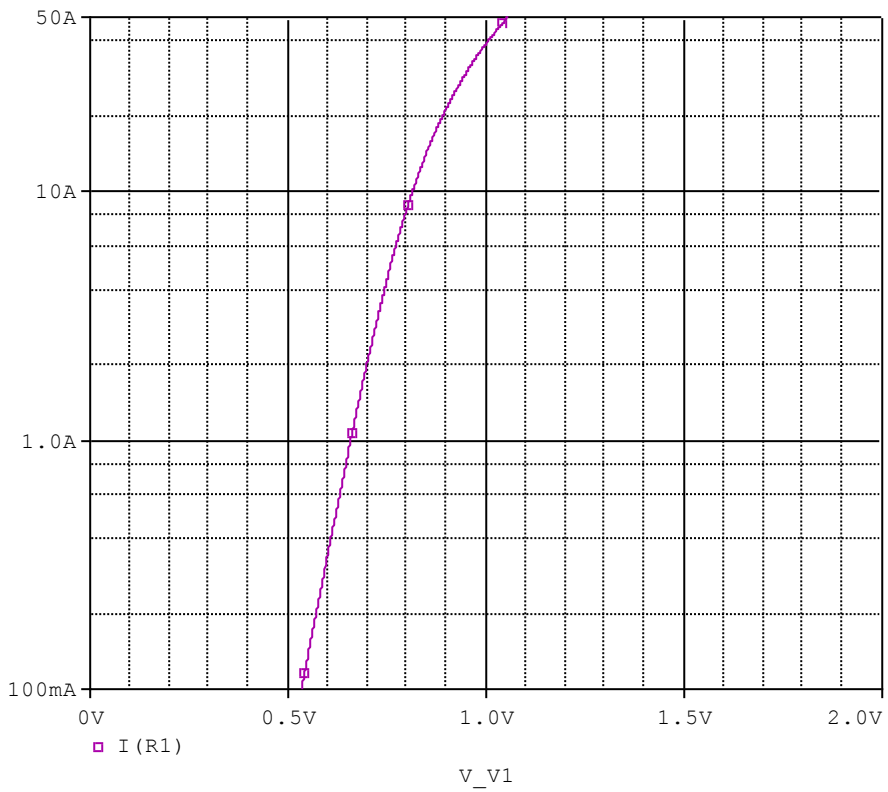


Evaluation circuit

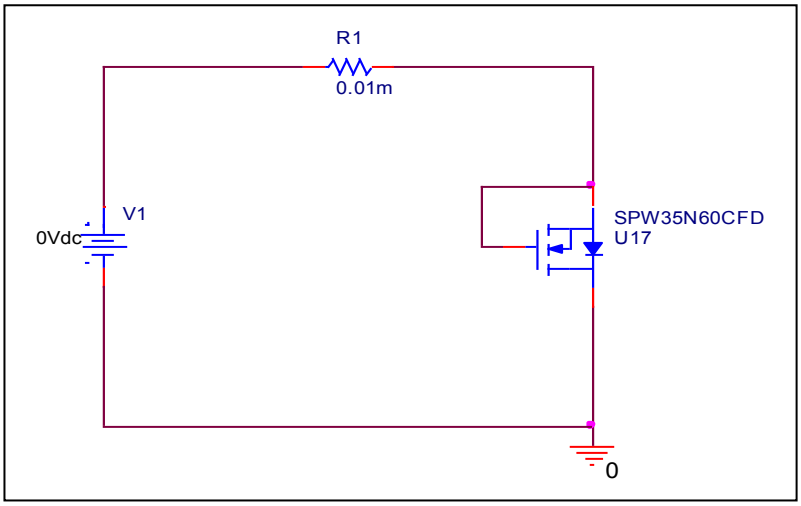


Forward Current Characteristic of Reverse Diode

Circuit Simulation Result

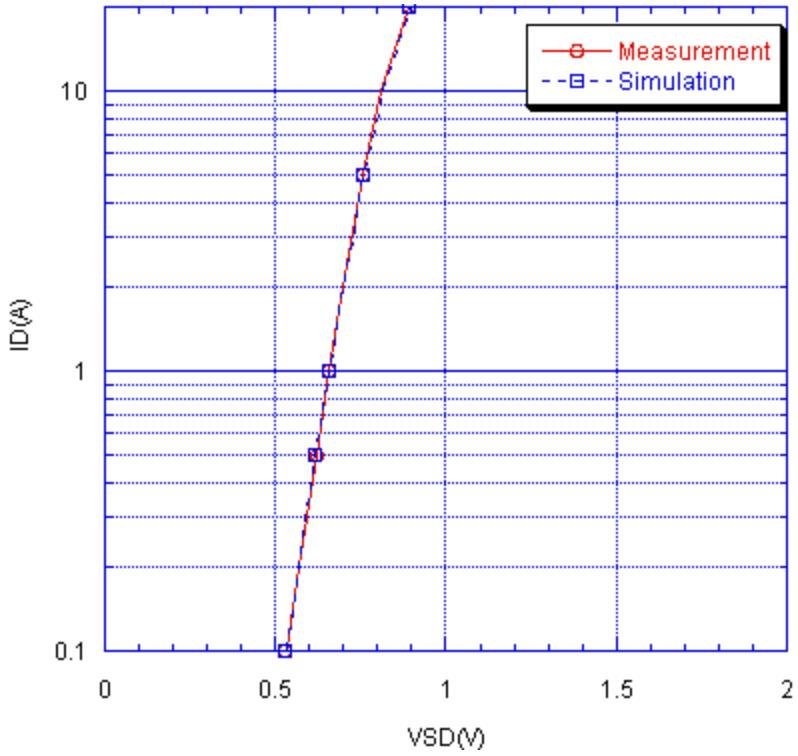


Evaluation Circuit



Comparison Graph

Circuit Simulation Result

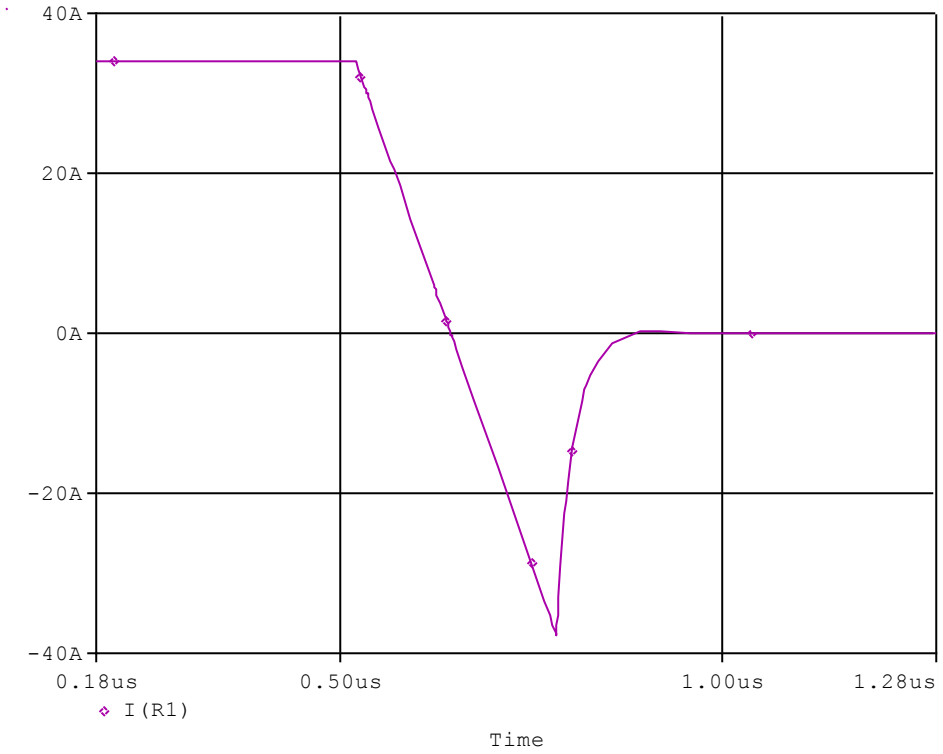


Simulation Result

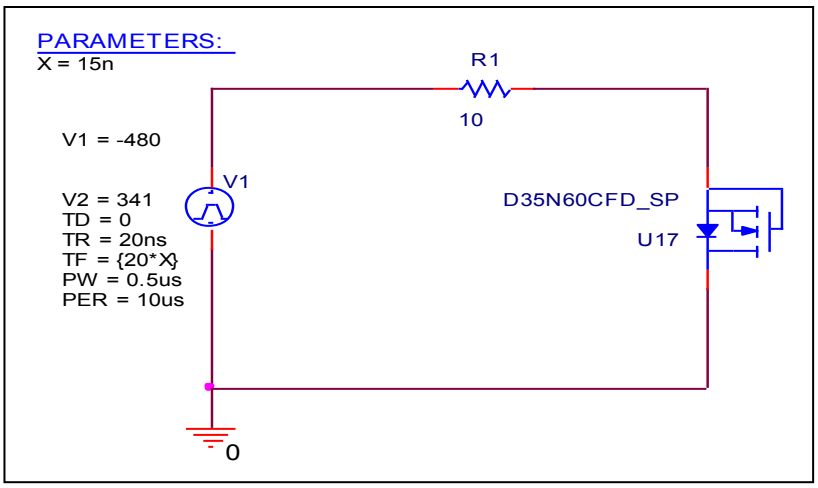
Ifwd(A)	Vfwd(V) Measurement	Vfwd(V) Simulation	%Error
0.100	0.530	0.531	0.189
0.200	0.570	0.570	0.000
0.500	0.620	0.619	-0.161
1.000	0.660	0.659	-0.152
2.000	0.700	0.698	-0.286
5.000	0.755	0.757	0.265
10.000	0.810	0.813	0.370
20.000	0.890	0.890	0.000
50.000	0.950	0.950	0.000

Reverse Recovery Characteristic

Circuit Simulation Result



Evaluation Circuit



Compare Measurement vs. Simulation

	Measurement		Simulation		Error(%)
trr	**0.180**	**us**	**0.179**	**us**	**-0.556**