

Device Modeling Report

COMPONENTS: Power MOSFET (Professional)
PART NUMBER: 2SK2462
MANUFACTURER: NEC
Body Diode (Professional)



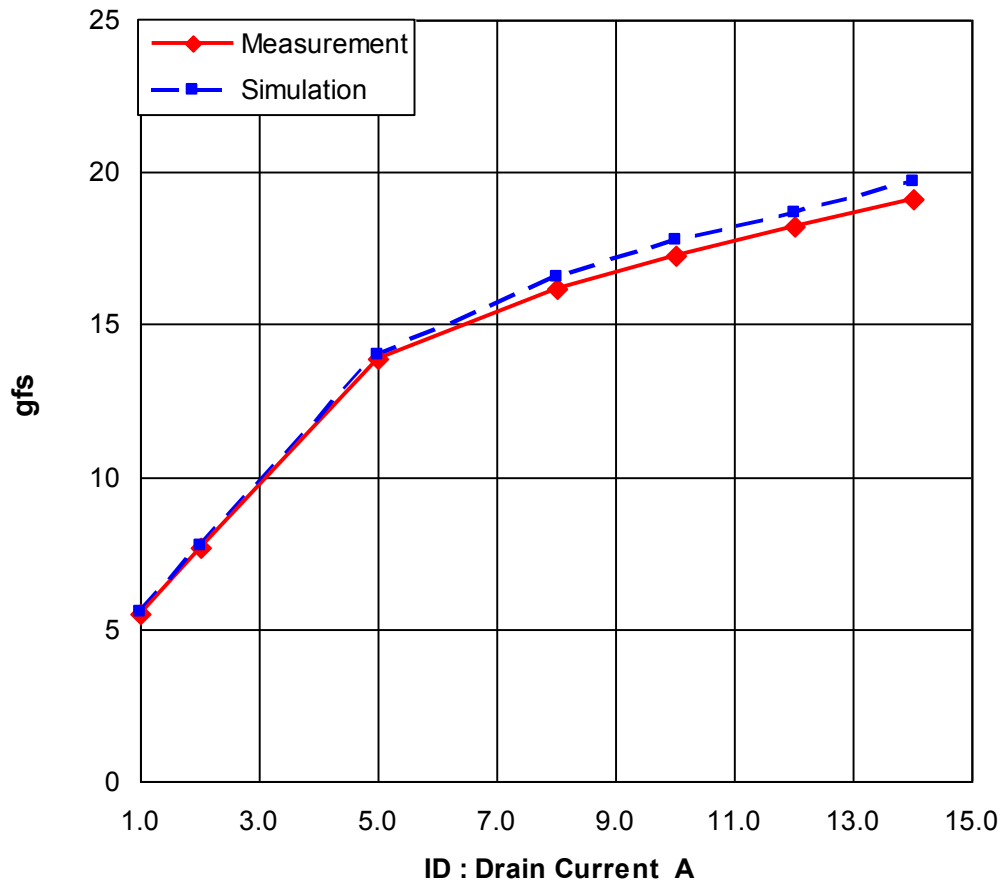
Bee Technologies Inc.

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

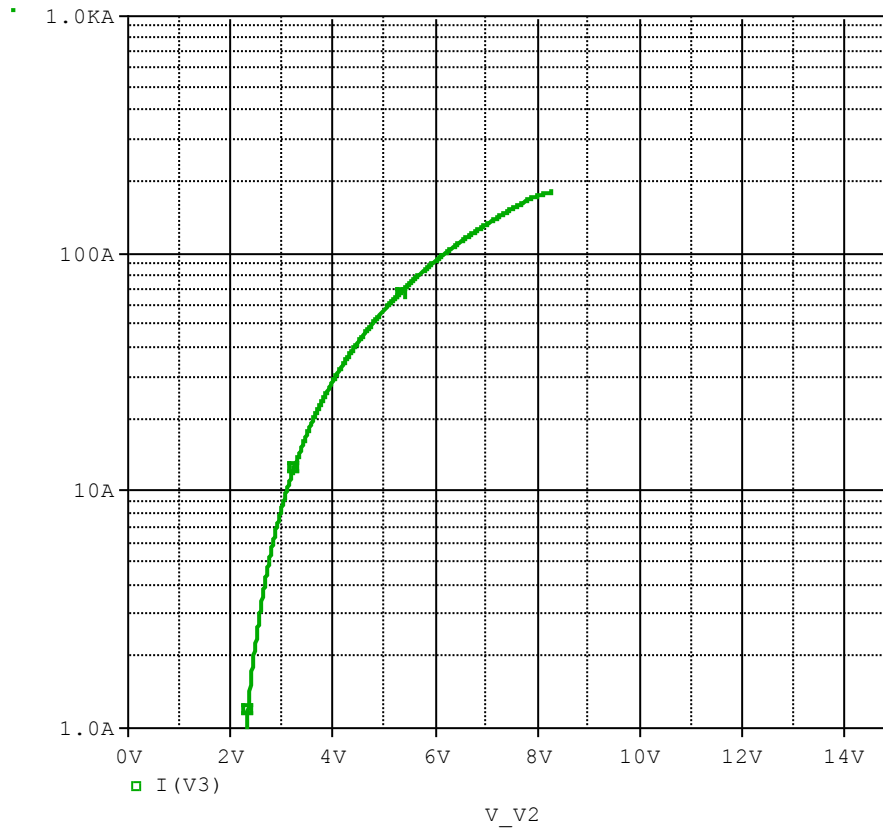


Comparison table

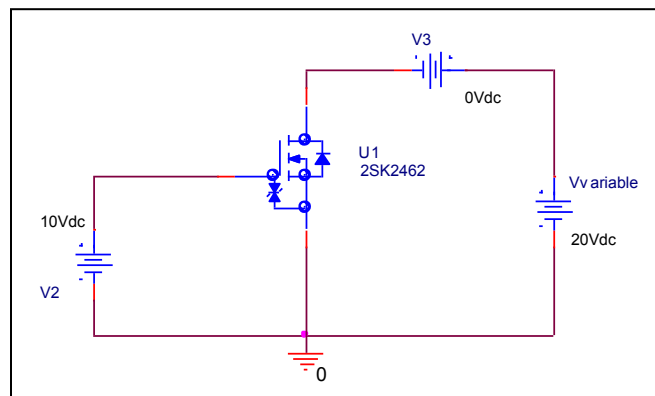
Id(A)	gfs		Error(%)
	Measurement	Simulation	
1.000	5.500	5.587	1.582
2.000	7.650	7.752	1.333
5.000	13.850	14.006	1.126
8.000	16.150	16.529	2.347
10.000	17.250	17.750	2.899
12.000	18.200	18.649	2.467
14.000	19.105	19.691	3.067

V_{gs}-I_d Characteristic

Circuit Simulation result

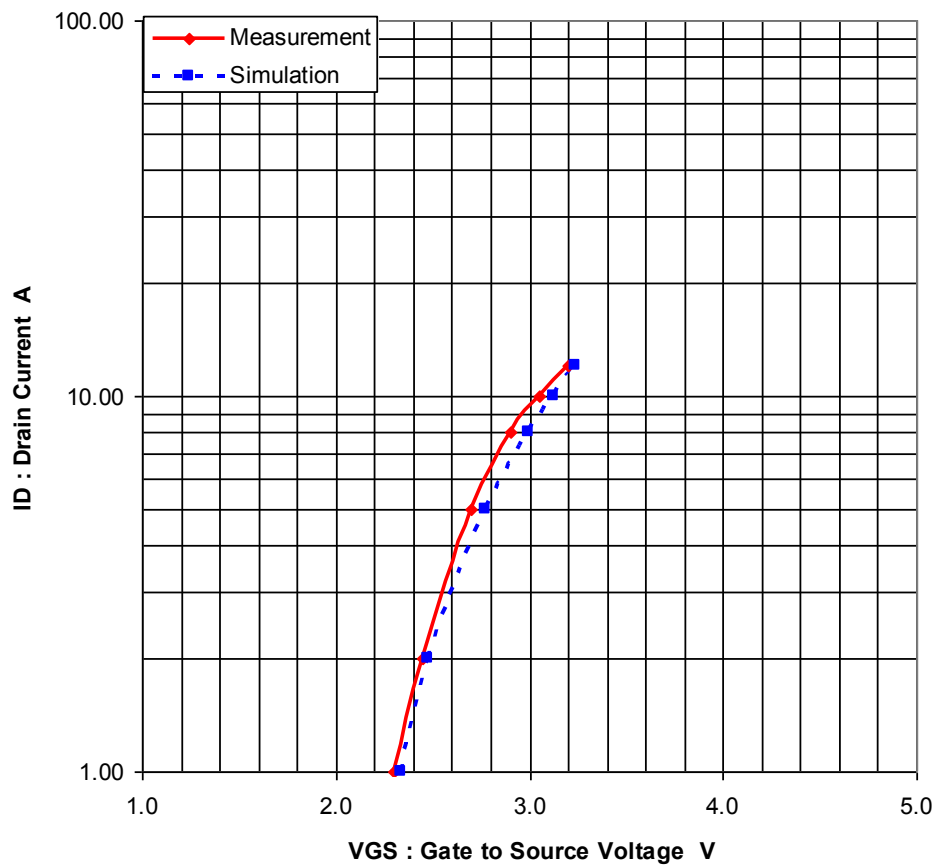


Evaluation circuit



Comparison Graph

Circuit Simulation Result

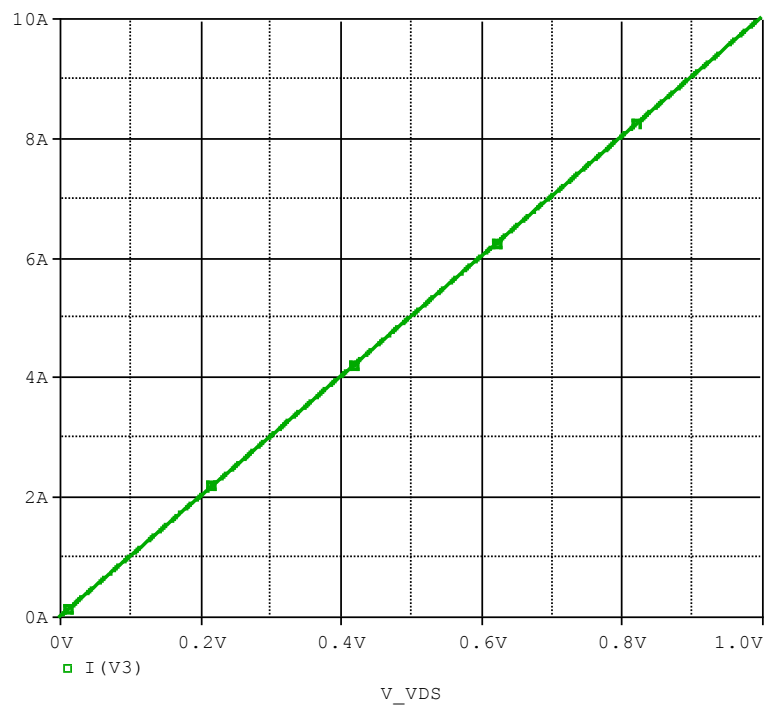


Simulation Result

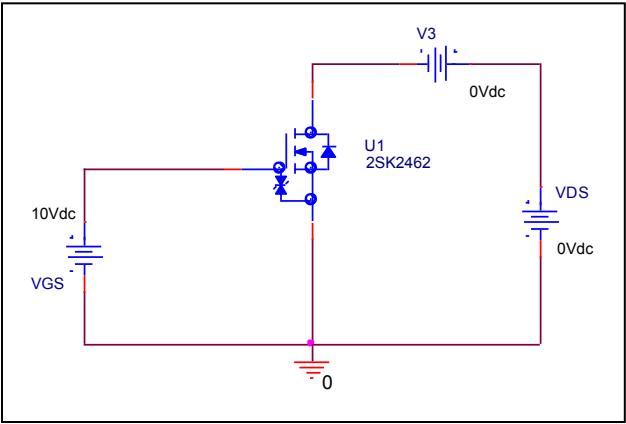
ID(A)	VGS(V)		Error (%)
	Measurement	Simulation	
1.000	2.300	2.333	1.435
2.000	2.450	2.477	1.102
5.000	2.700	2.776	2.815
8.000	2.900	2.991	3.138
10.000	3.050	3.126	2.492
12.000	3.200	3.235	1.094
14.000	3.300	3.354	1.636

Rds(on) Characteristic

Circuit Simulation result



Evaluation circuit

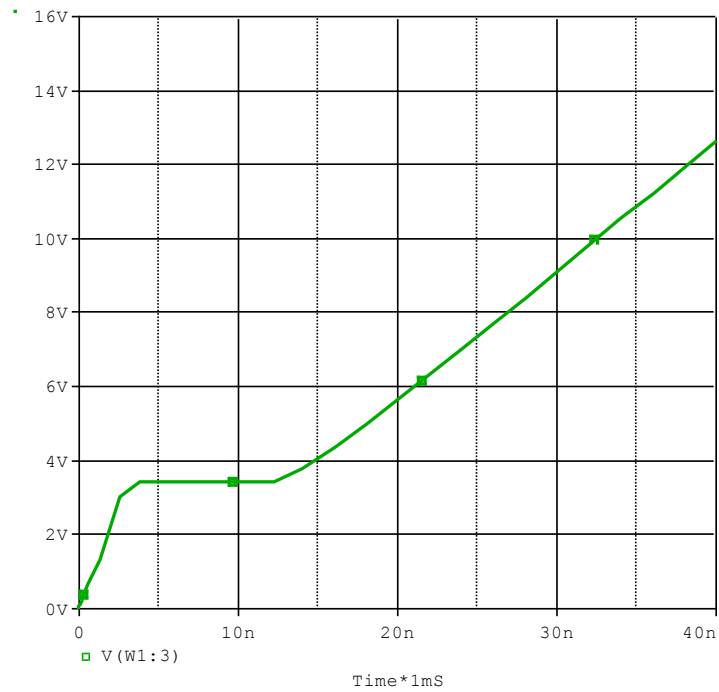


Simulation Result

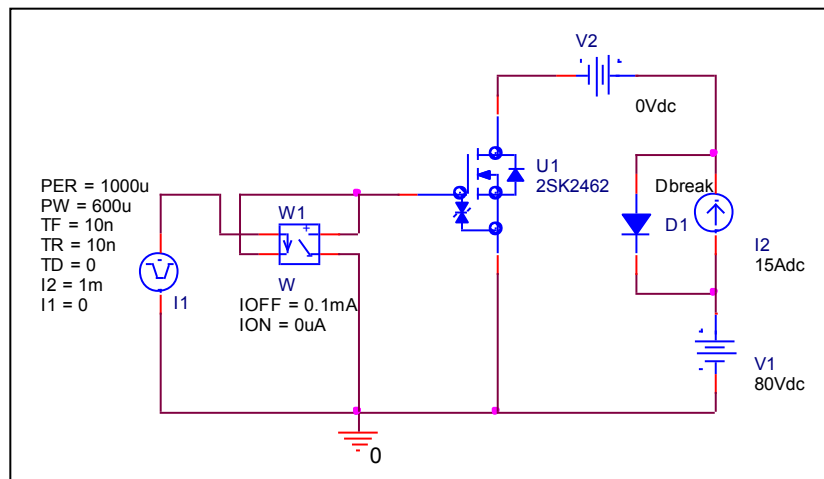
$I_D=8A, V_{GS}=10V$	Measurement	Simulation	Error (%)
$R_{DS} (on) (\Omega)$	0.100	0.100	0.000

Gate Charge Characteristic

Circuit Simulation result



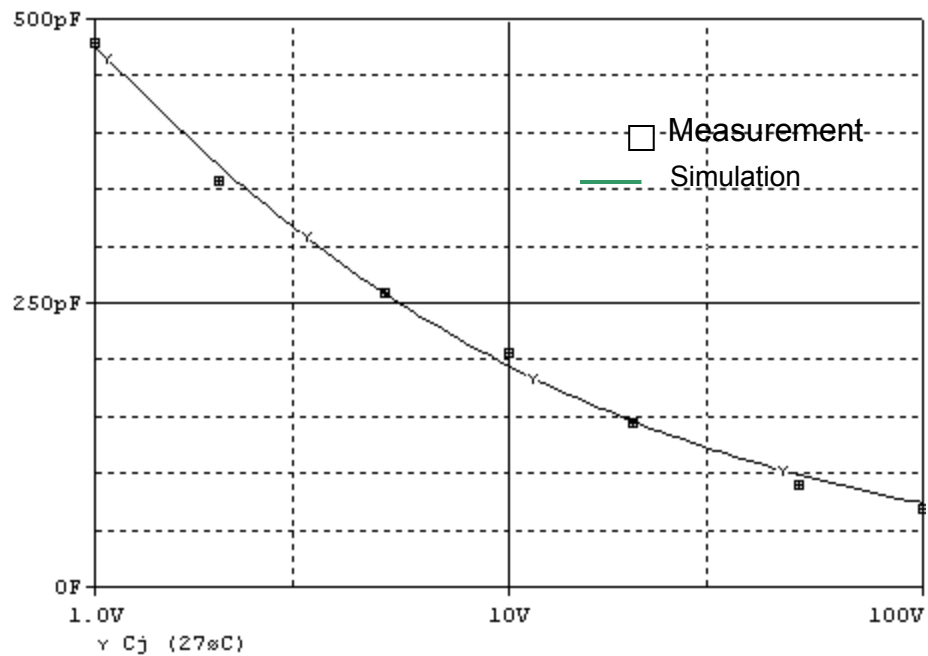
Evaluation circuit



Simulation Result

$V_{DD}=80V, I_D=15A$ $V_{GS}=10V$	Measurement	Simulation	Error (%)
Q_{gs}(nc)	3.000	3.077	2.567
Q_{gd}(nc)	9.000	9.060	0.667
Q_g(nc)	33.000	32.700	-0.909

Capacitance Characteristic

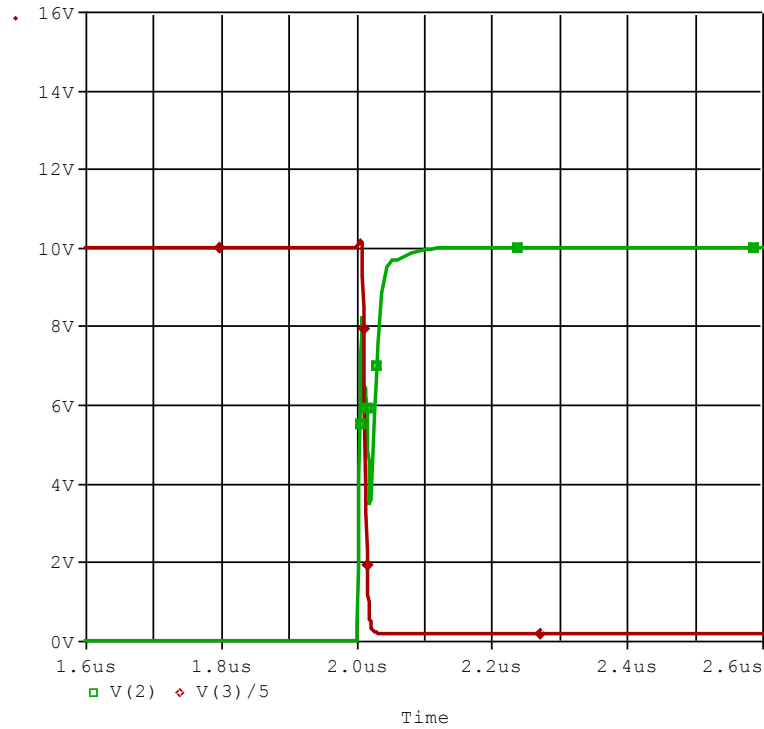


Simulation Result

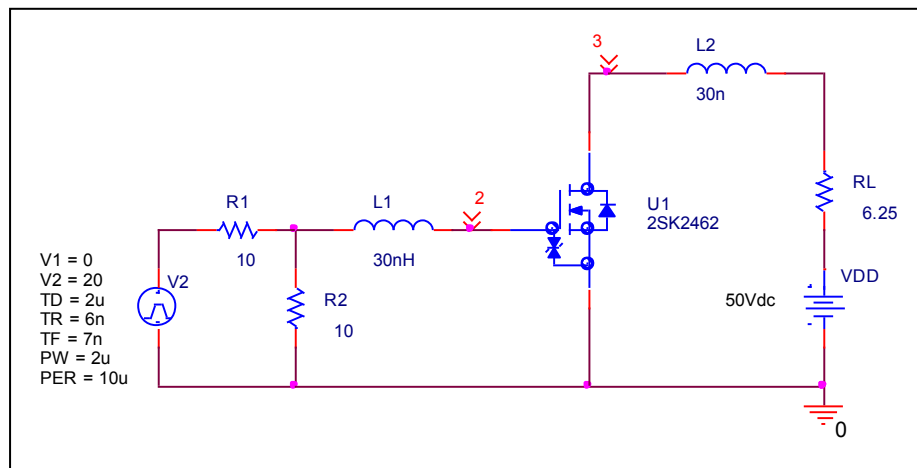
$V_{DS}(\text{V})$	$C_{bd}(\text{pF})$		Error(%)
	Measurement	Simulation	
1.000	480.000	476.000	-0.833
2.000	360.000	365.000	1.389
5.000	260.000	258.000	-0.769
8.000	208.000	195.000	-6.250
10.000	147.000	146.000	-0.680
12.000	92.000	95.000	3.261
14.000	70.000	72.000	2.857

Switching Time Characteristic

Circuit Simulation result



Evaluation circuit

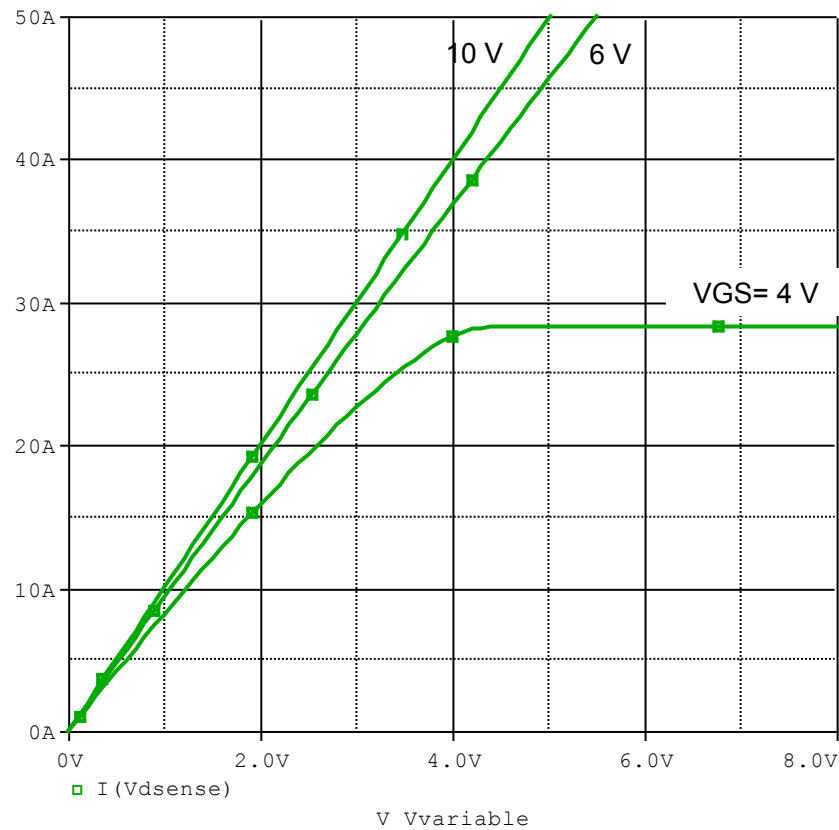


Simulation Result

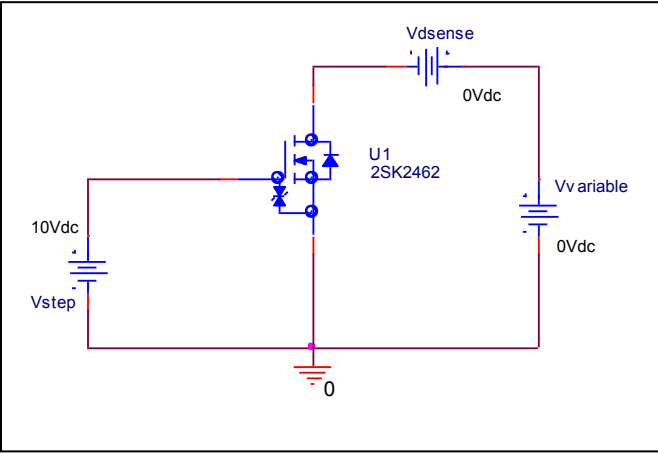
$I_D=8A$, $V_{DD}=50V$ $V_{GS}=10V$	Measurement	Simulation	Error(%)
Ton(ns)	16.000	16.075	0.469

Output Characteristic

Circuit Simulation result

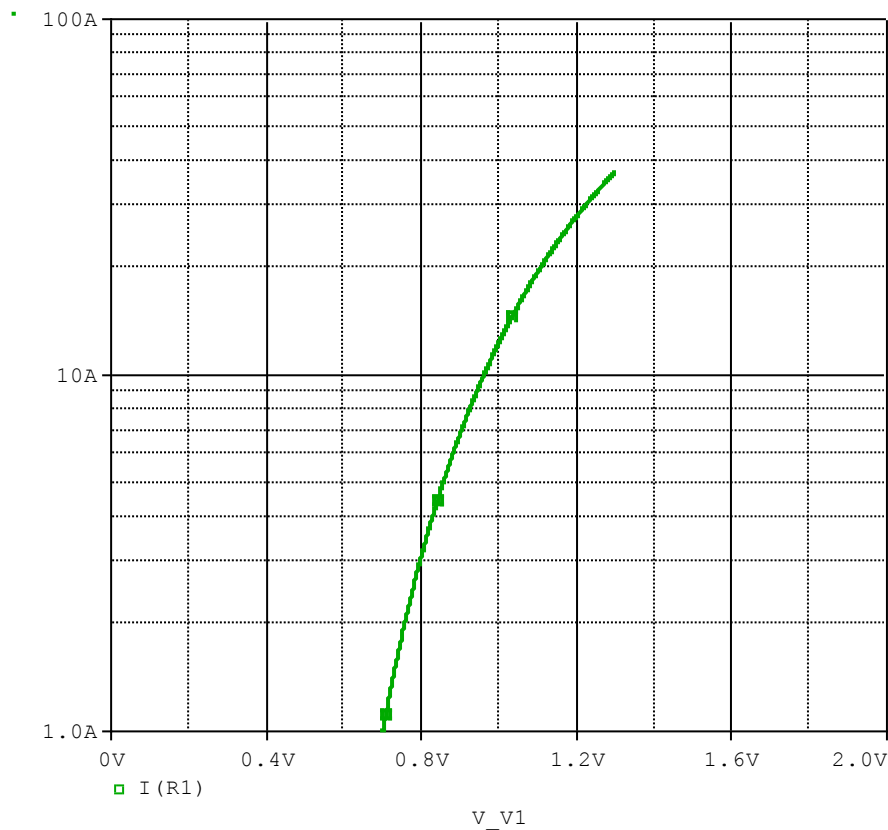


Evaluation circuit

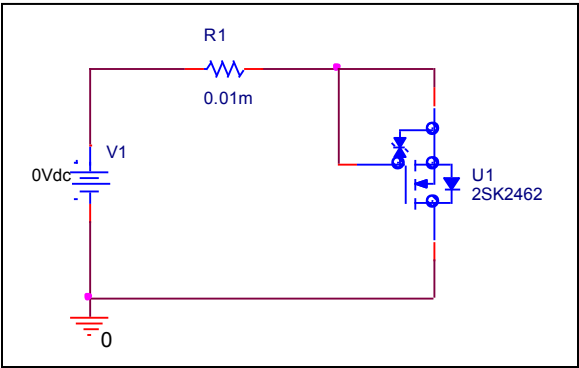


Forward Current Characteristic

Circuit Simulation Result

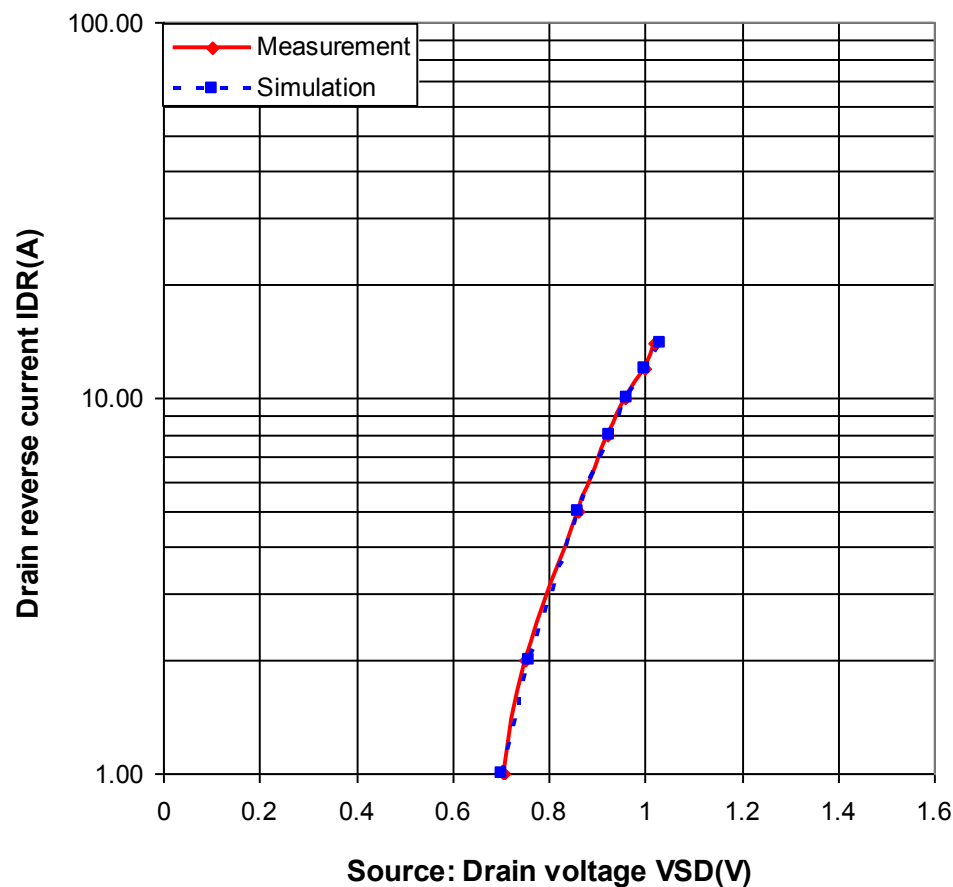


Evaluation Circuit



Comparison Graph

Circuit Simulation Result

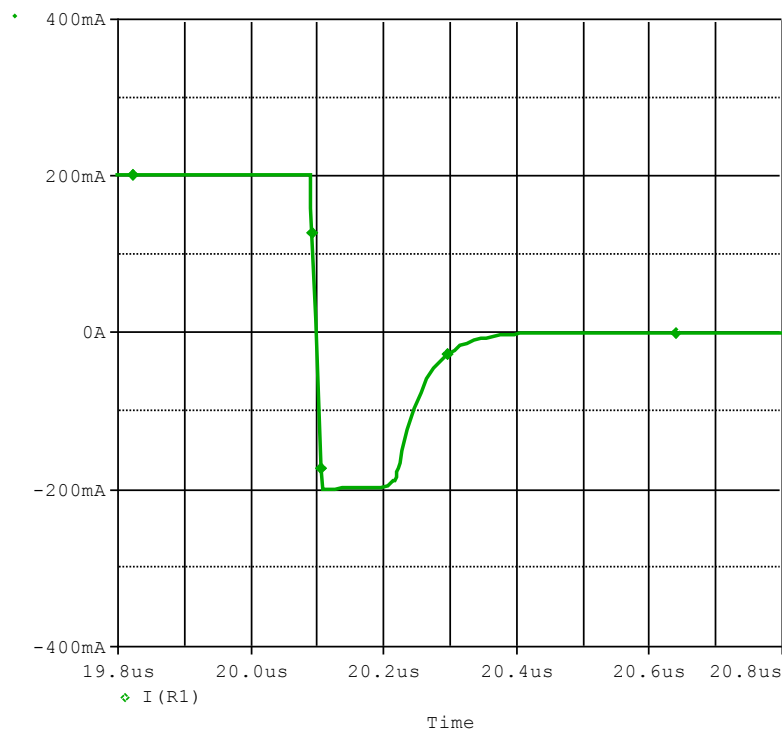


Simulation Result

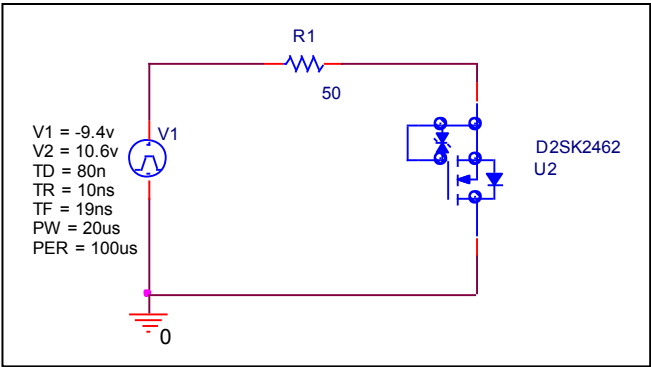
$IDR(A)$	$VSD(V)$ Measurement	$VSD(V)$ Simulation	%Error
1.000	0.705	0.704	-0.142
2.000	0.750	0.759	1.200
5.000	0.860	0.860	0.000
8.000	0.920	0.927	0.761
10.000	0.960	0.964	0.417
12.000	1.000	0.998	-0.200
14.000	1.020	1.030	0.980

Reverse Recovery Characteristic

Circuit Simulation Result



Evaluation Circuit

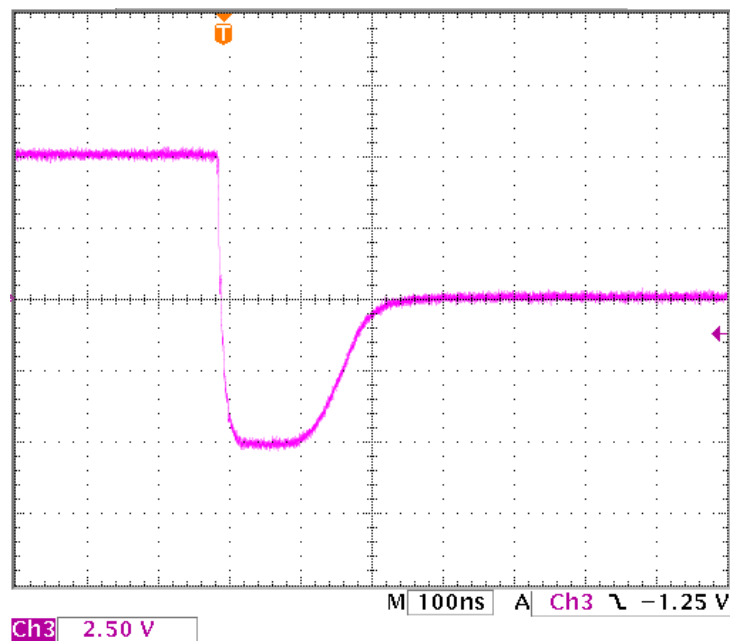


Compare Measurement vs. Simulation

	Measurement	Simulation	Error (%)
Trj(us)	108.000	109.542	1.428
trb(us)	102.000	101.208	-0.776
trr(us)	210.000	210.750	0.357

Reverse Recovery Characteristic

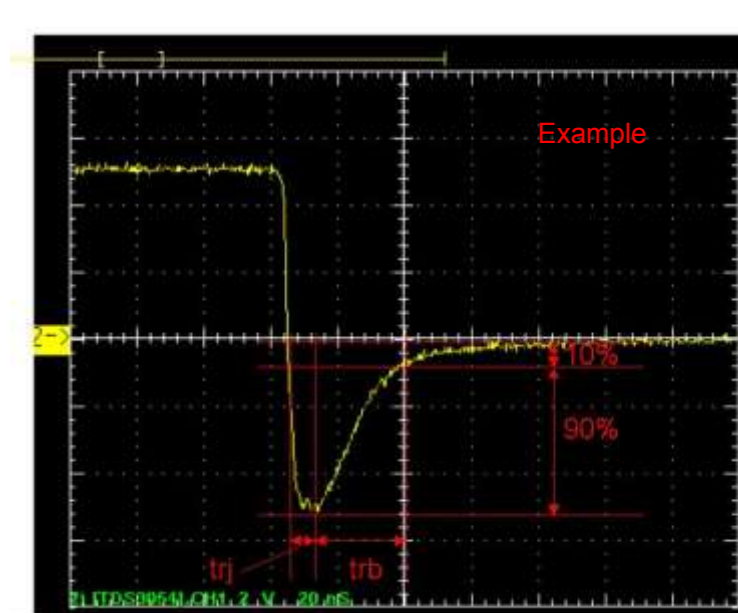
Reference



$T_{rr}=108(\text{ns})$

$T_{rb}=102(\text{ns})$

Conditions: $I_{fwd}=I_{rev}=0.2(\text{A})$, $R_I=50$



Relation between t_{rr} and t_{rb}