Device Modeling Report

COMPONENTS: Power MOSFET (Professional)
PART NUMBER: TPCM8002-H
MANUFACTURER: TOSHIBA
Body Diode (Professional)

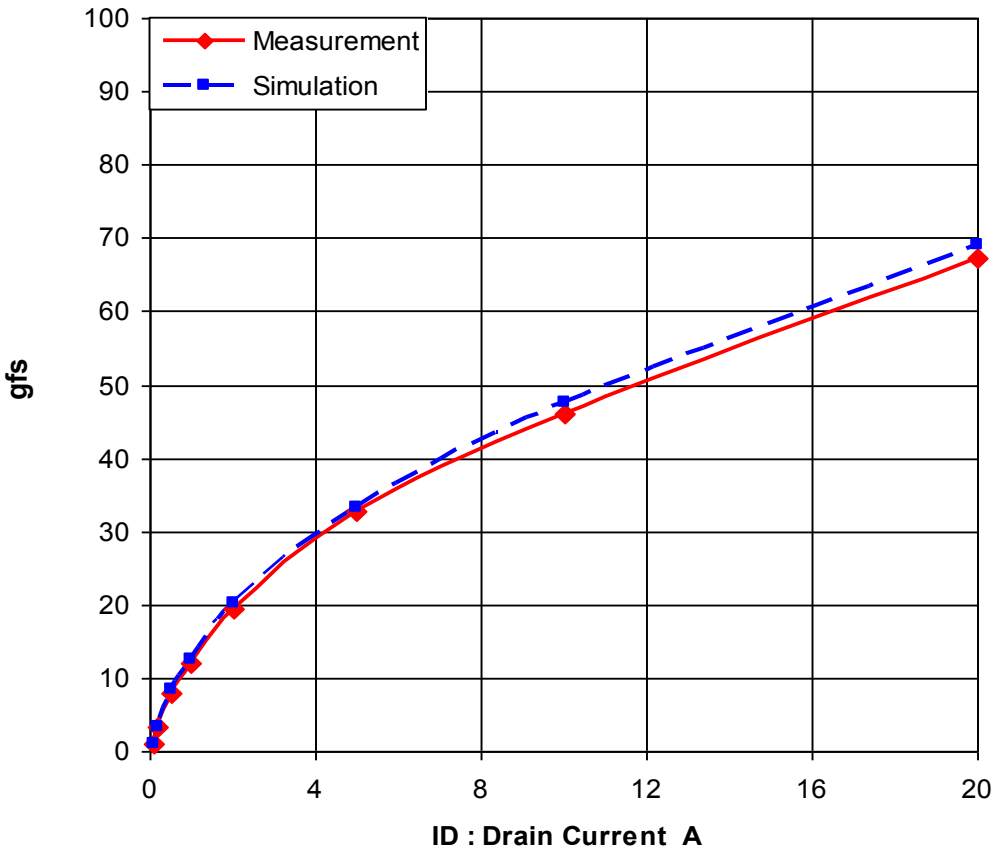
Bee Technologies Inc.

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

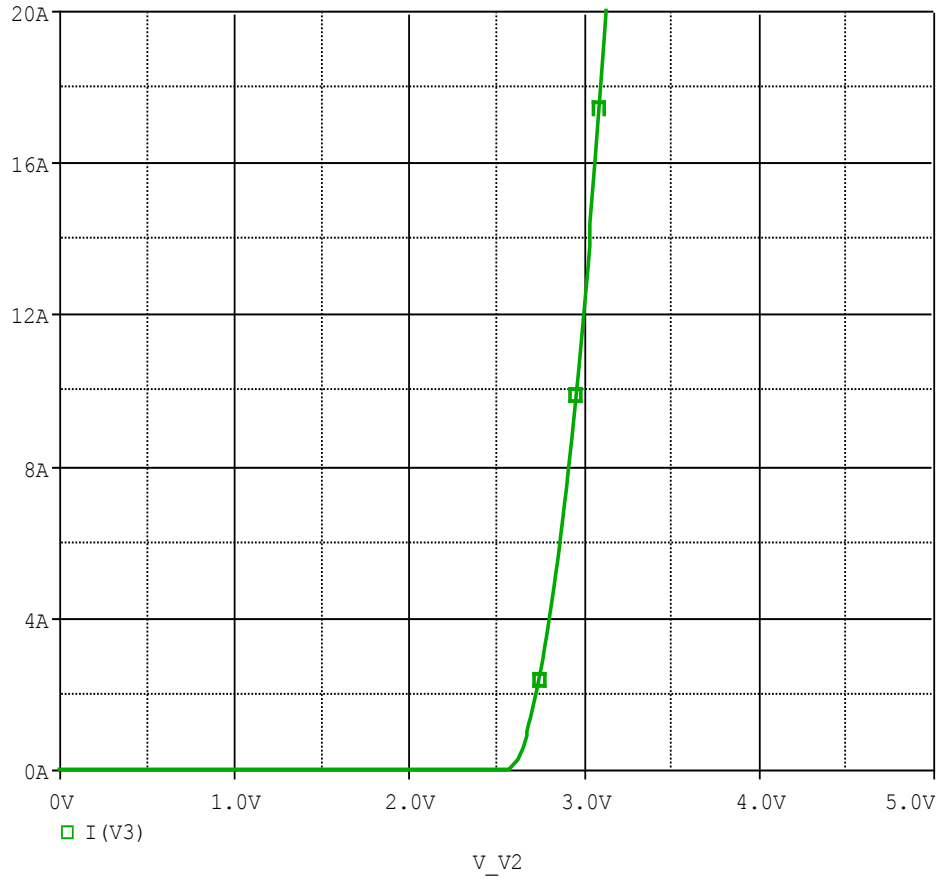


Comparison table

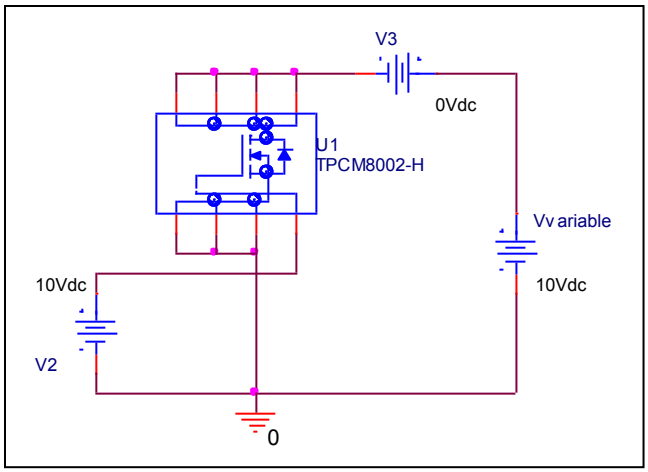
Id(A)	gfs		Error(%)
	Measurement	Simulation	
0.100	1.100	1.111	1.000
0.200	3.200	3.333	4.156
0.500	8.000	8.333	4.163
1.000	12.000	12.500	4.167
2.000	19.366	20.222	4.420
5.000	32.667	33.250	1.785
10.000	46.000	47.619	3.520
20.000	67.333	68.966	2.425

Vgs-Id Characteristic

Circuit Simulation result

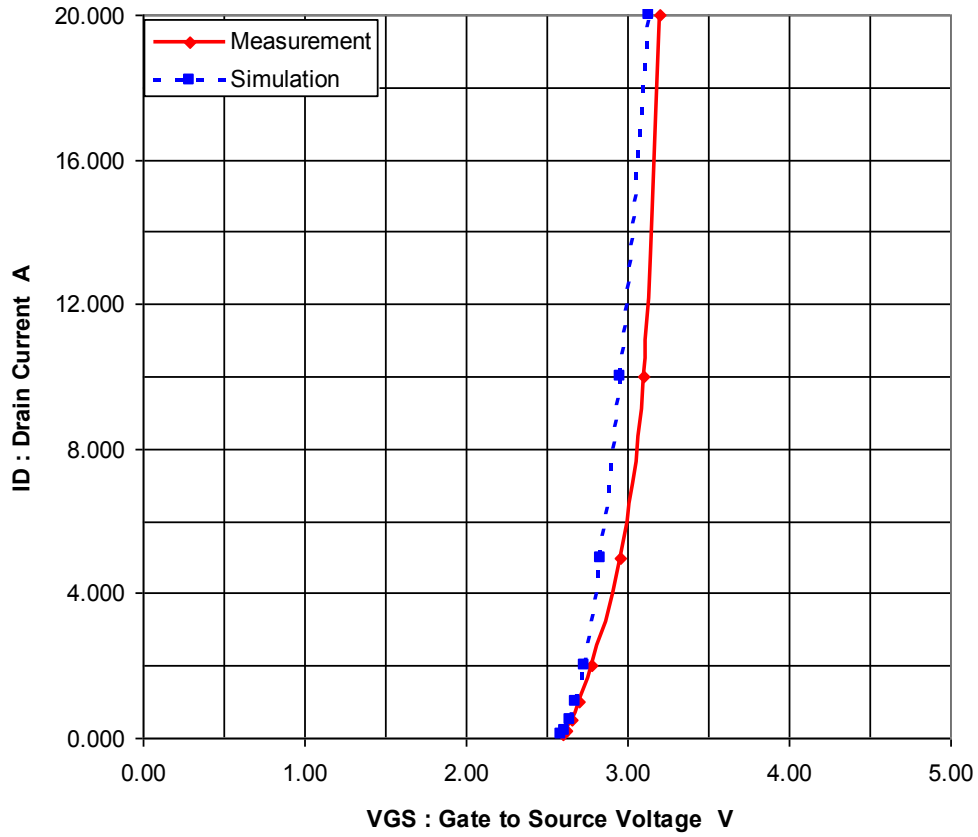


Evaluation circuit



Comparison Graph

Circuit Simulation Result

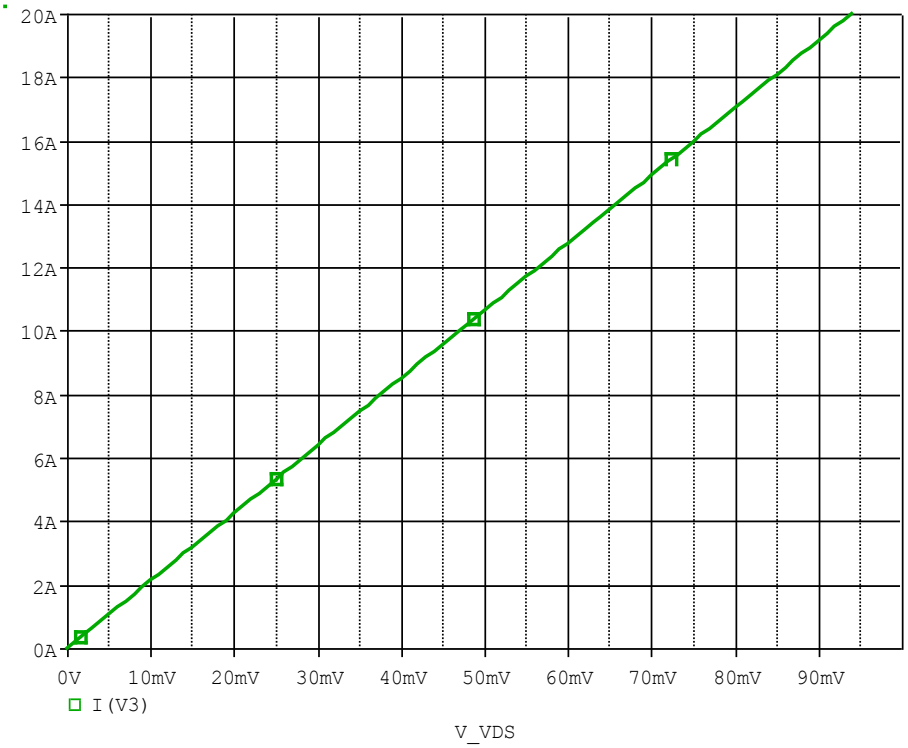


Simulation Result

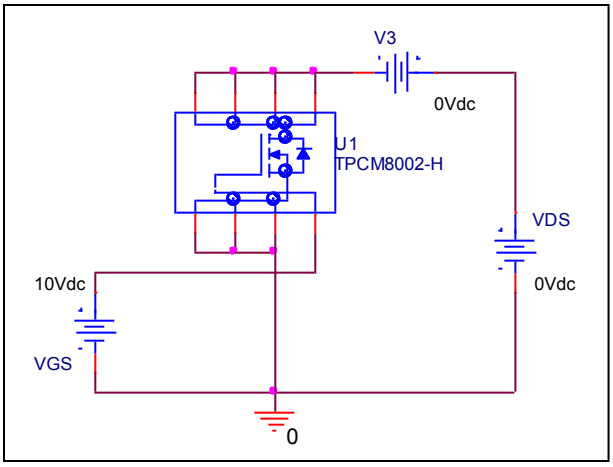
I_D(A)	V_{GS}(V)		Error (%)
	Measurement	Simulation	
0.100	2.600	2.587	-0.500
0.200	2.620	2.607	-0.496
0.500	2.650	2.641	-0.340
1.000	2.700	2.678	-0.815
2.000	2.780	2.731	-1.763
5.000	2.950	2.836	-3.864
10.000	3.100	2.957	-4.613
20.000	3.200	3.131	-2.156

Rds(on) Characteristic

Circuit Simulation result



Evaluation circuit

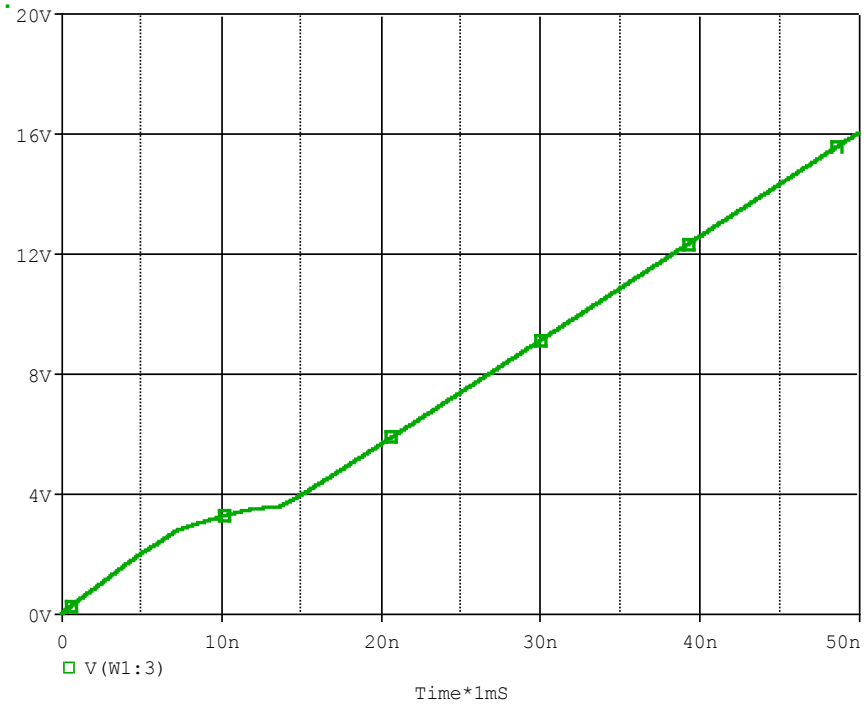


Simulation Result

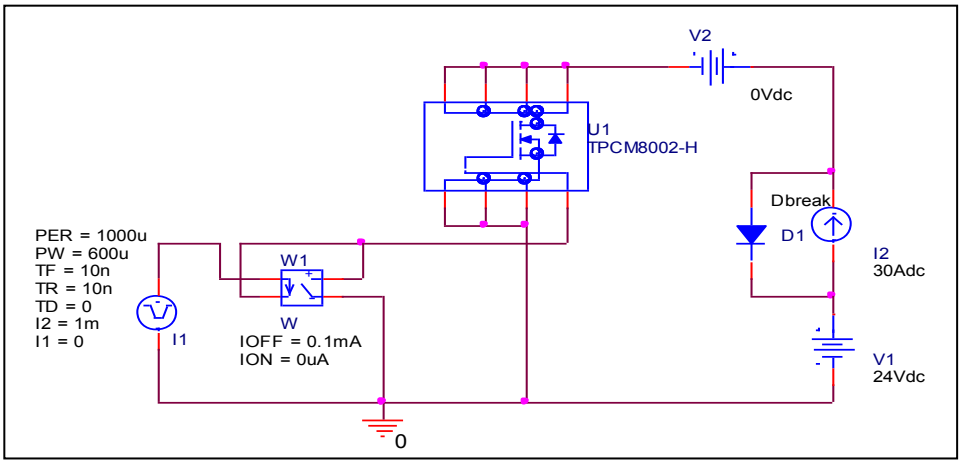
I_D=15A, V_{GS}=10V	Measurement	Simulation	Error (%)
R_{DS} (on) (mΩ)	4.700	4.697	-0.064

Gate Charge Characteristic

Circuit Simulation result



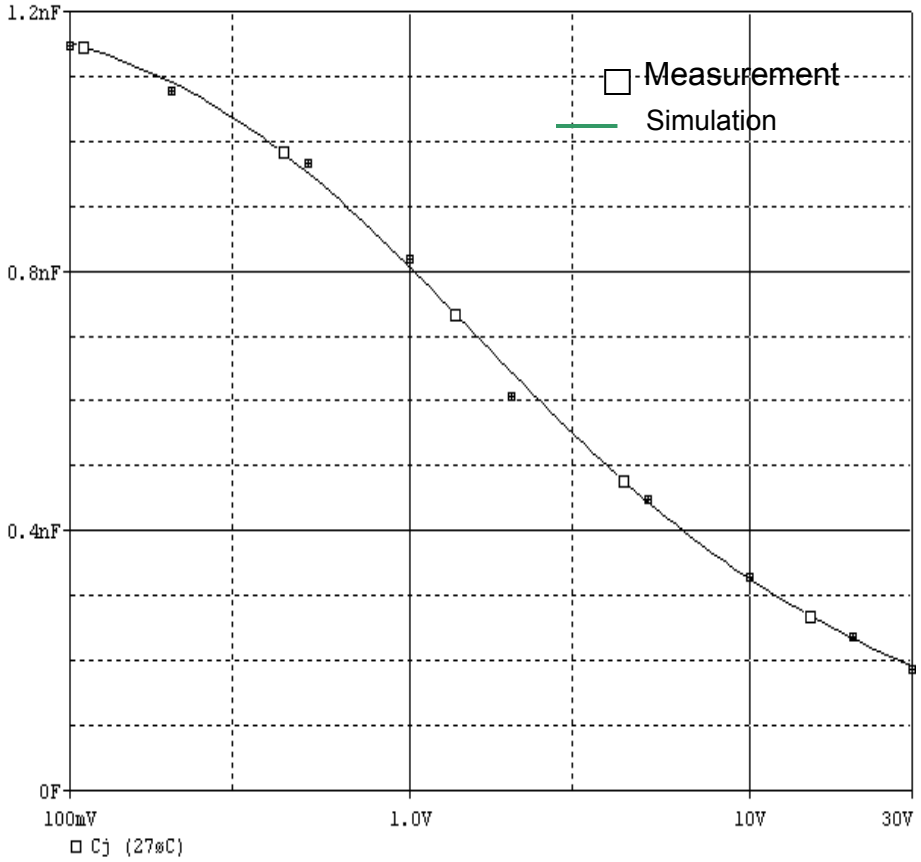
Evaluation circuit



Simulation Result

V_{DD}=24V,I_D=30A ,V_{GS}=10V	Measurement	Simulation	Error (%)
Qgs(nc)	7.500	7.500	0.000
Qgd(nc)	6.000	6.006	0.100
Qg(nc)	32.500	32.590	0.277

Capacitance Characteristic

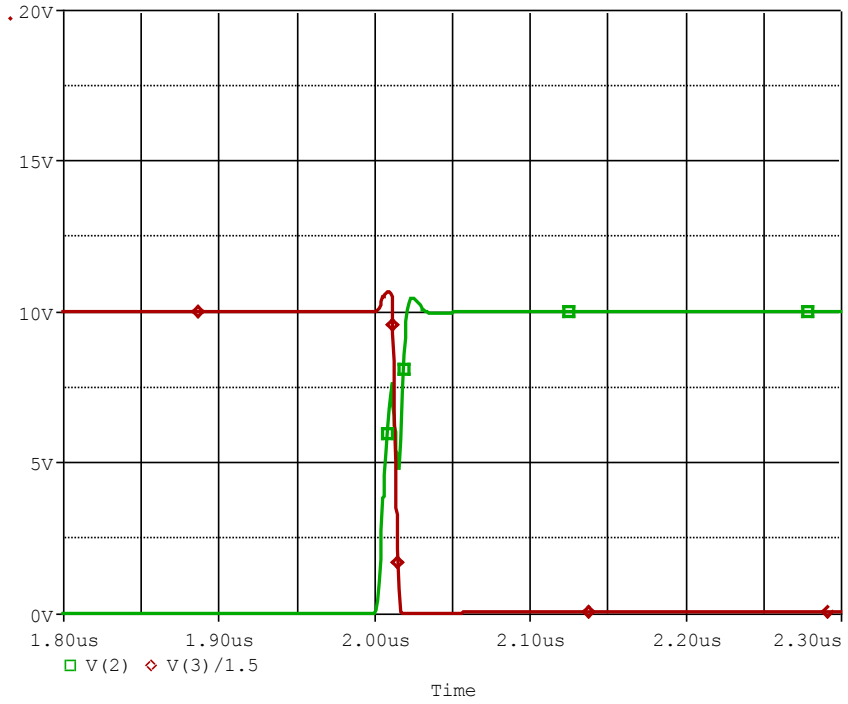


Simulation Result

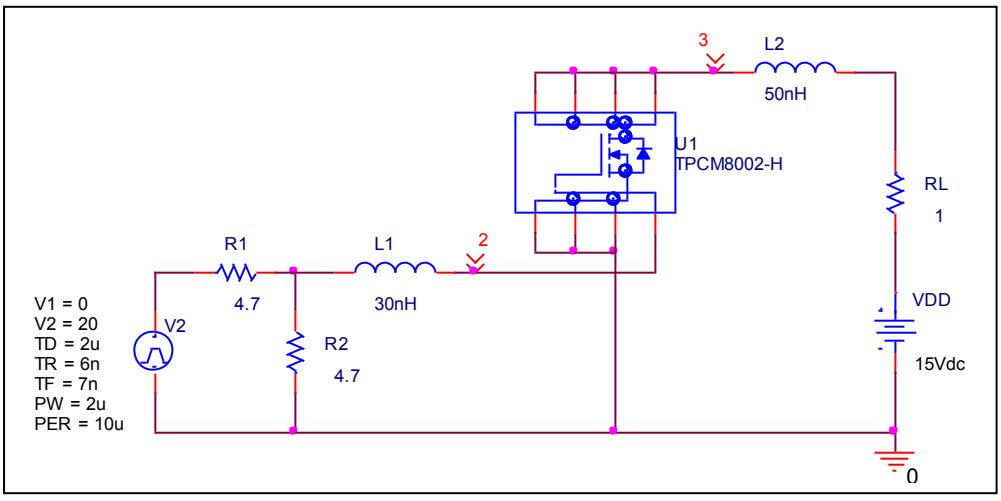
V_{DS}(V)	Cbd(nF)		Error(%)
	Measurement	Simulation	
0.100	1.150	1.152	0.174
1.000	0.820	0.805	-1.829
10.000	0.330	0.325	-1.515
30.000	0.190	0.192	1.053

Switching Time Characteristic

Circuit Simulation result



Evaluation circuit

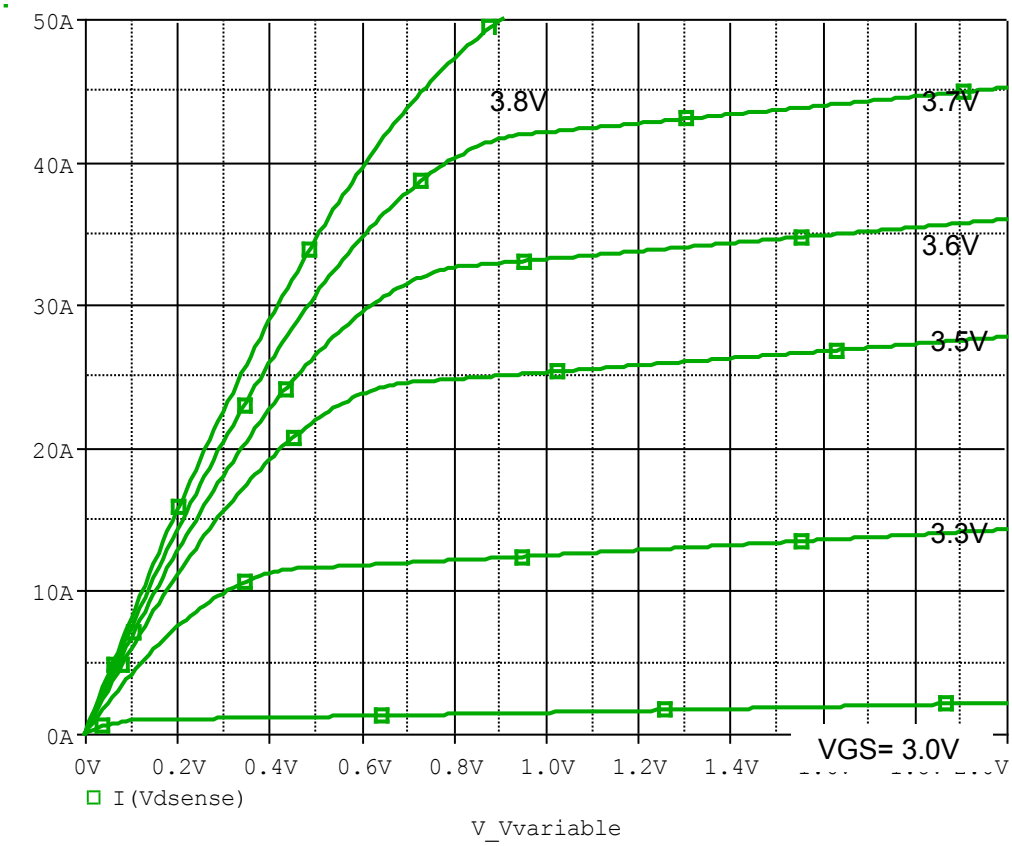


Simulation Result

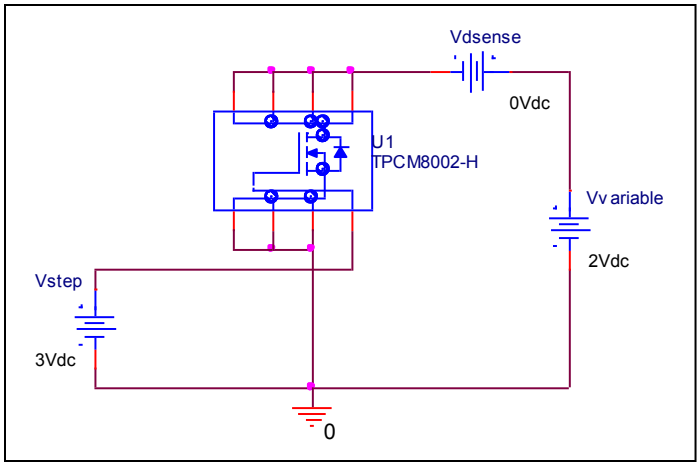
I_D=15A, V_{DD}=15V V_{GS}=10V	Measurement	Simulation	Error(%)
Ton(ns)	13.000	13.073	0.562

Output Characteristic

Circuit Simulation result

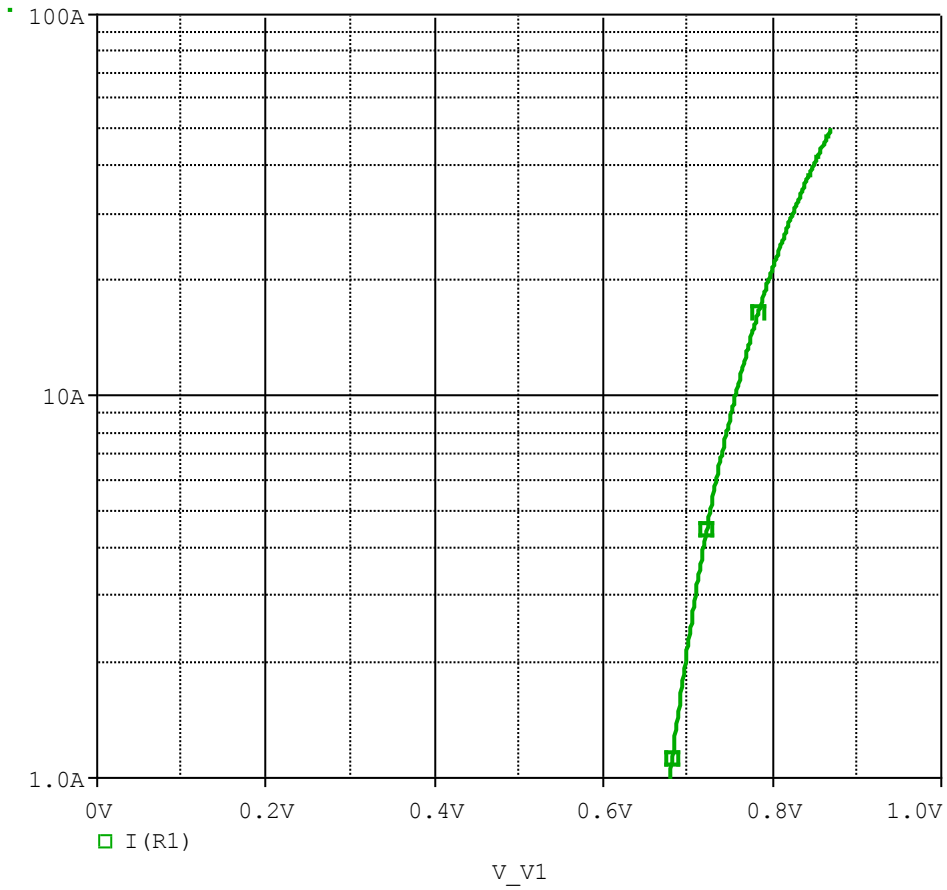


Evaluation circuit

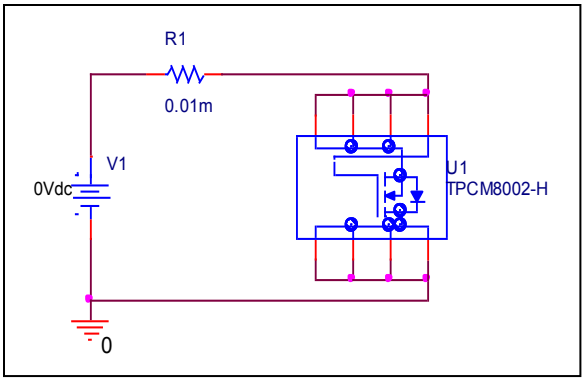


Forward Current Characteristic

Circuit Simulation Result

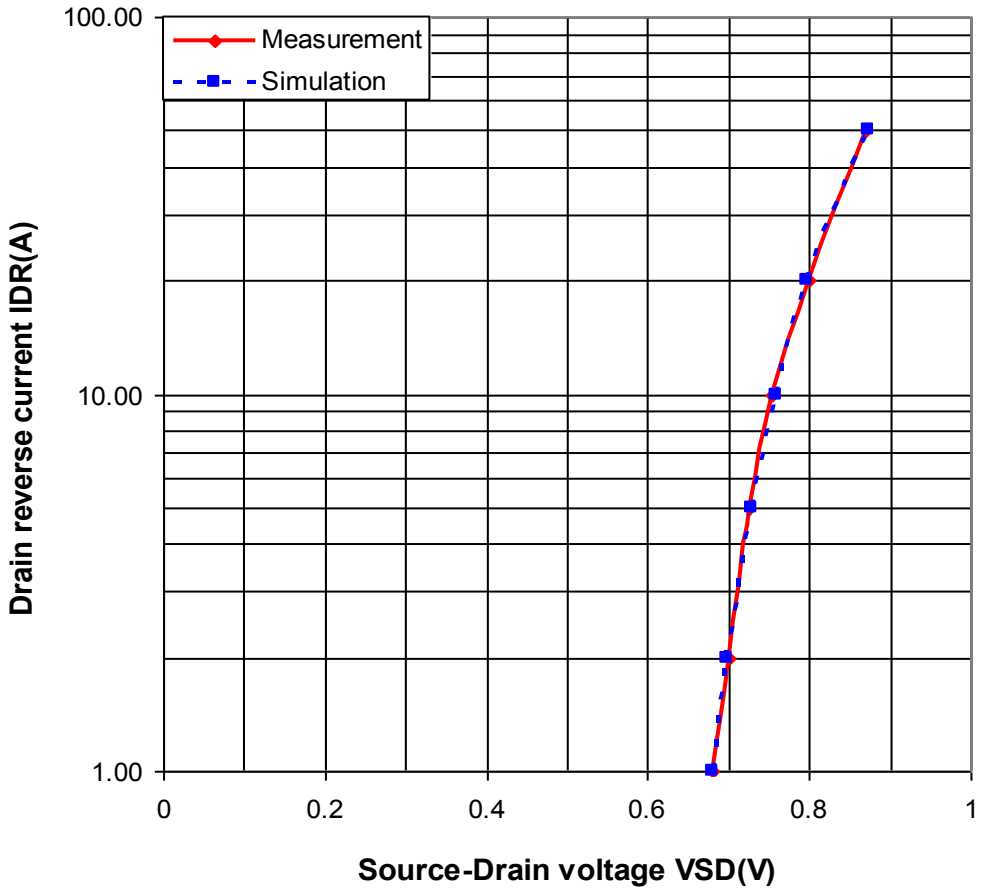


Evaluation Circuit



Comparison Graph

Circuit Simulation Result

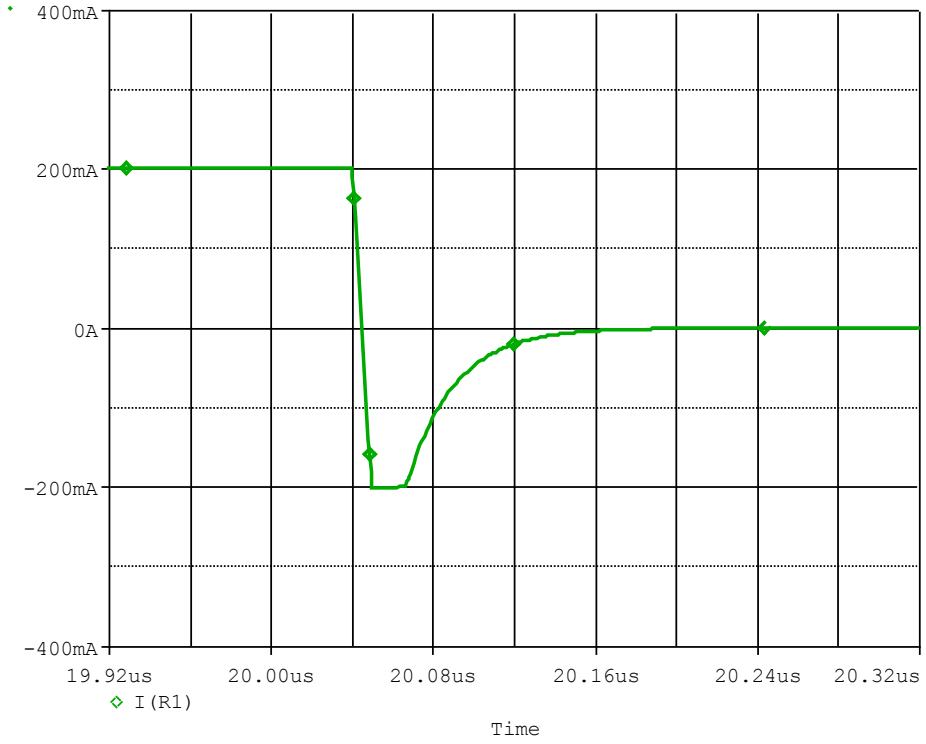


Simulation Result

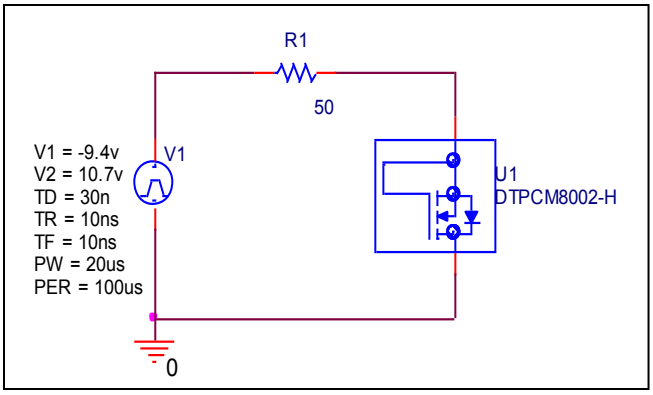
IDR(A)	VSD(V) Measurement	VSD(V) Simulation	%Error
1.000	0.680	0.679	-0.147
2.000	0.700	0.698	-0.286
5.000	0.725	0.728	0.414
10.000	0.755	0.758	0.397
20.000	0.800	0.797	-0.375
50.000	0.870	0.872	0.230

Reverse Recovery Characteristic

Circuit Simulation Result



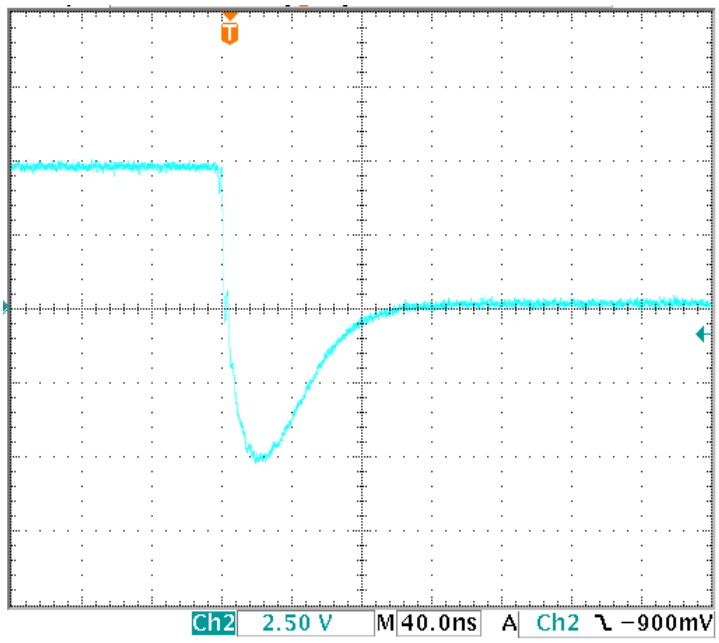
Evaluation Circuit



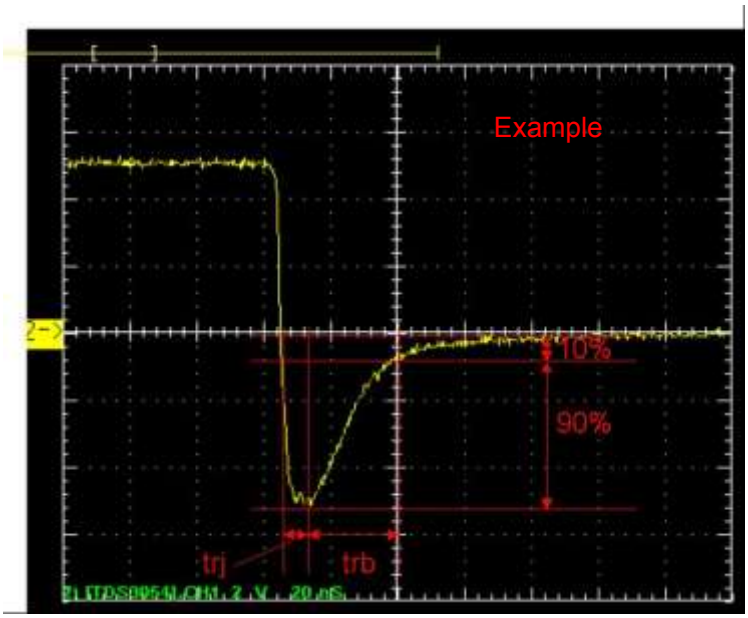
Compare Measurement vs. Simulation

	Measurement	Simulation	Error (%)
Trj(ns)	**20.800**	**20.922**	**0.587**
trb(ns)	**54.400**	**54.600**	**0.368**
trr(ns)	**75.200**	**75.522**	**0.428**

Reverse Recovery Characteristic Reference



Trj=20.8 (ns)
Trb=54.4 (ns)
Conditions:Ifwd=Irev=0.2(A),Rl=50



Relation between trj and trb