Device Modeling Report

COMPONENTS: Power MOSFET (Model Parameter)
PART NUMBER: TPC8032-H
MANUFACTURER: TOSHIBA
Body Diode (Model Parameter)

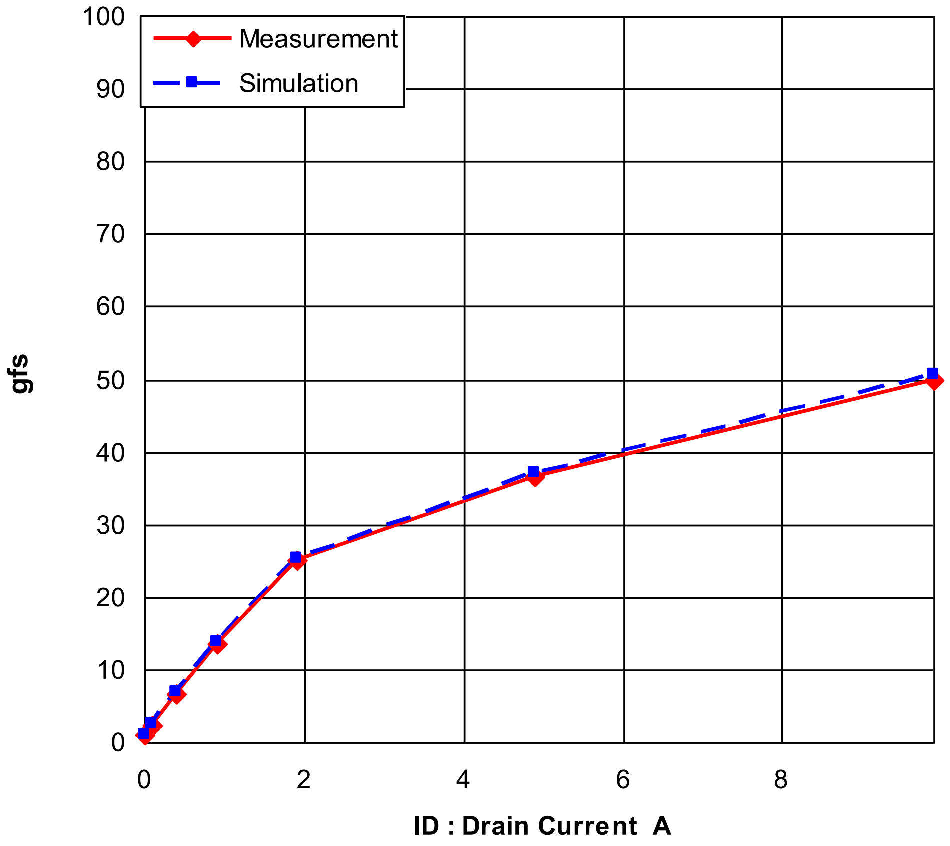
Bee Technologies Inc.

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

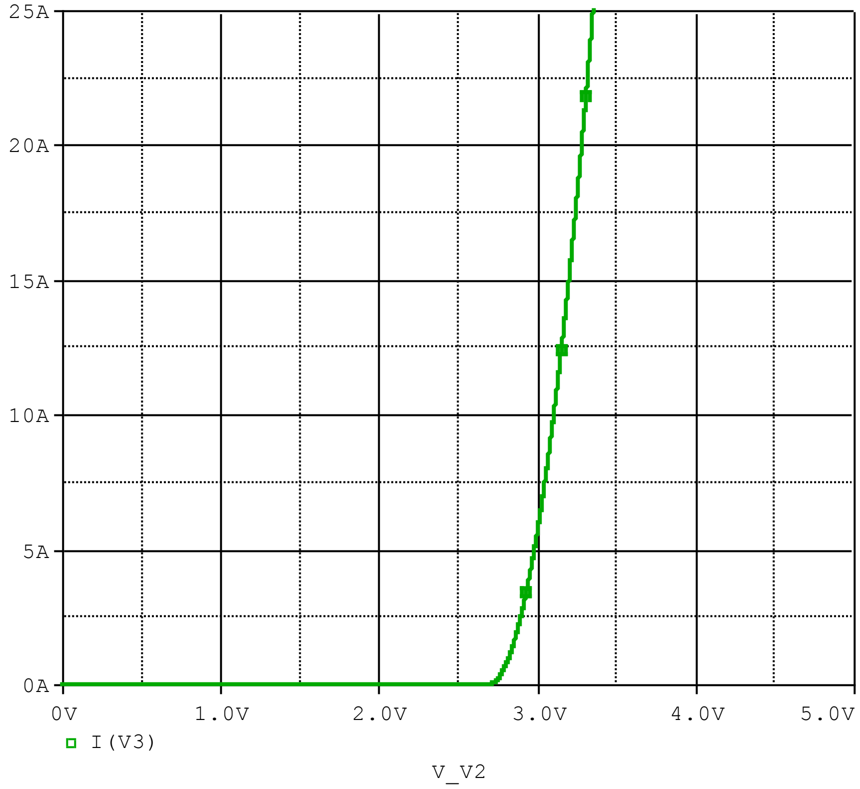


Comparison table

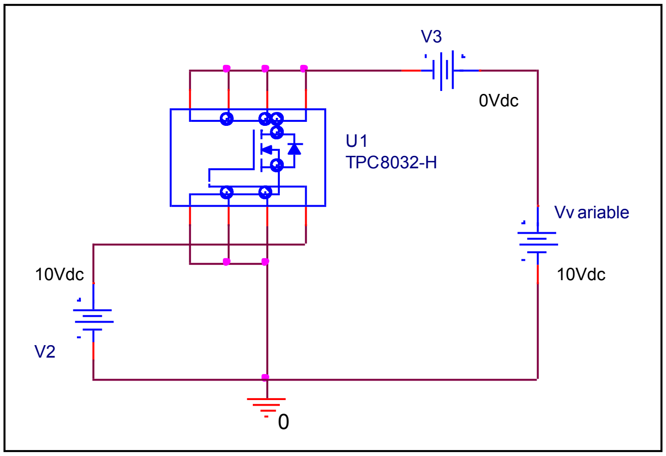
Id(A)	gfs		Error(%)
	Measurement	Simulation	
0.100	0.950	0.935	-1.579
0.200	2.400	2.439	1.625
0.500	6.700	6.849	2.224
1.000	13.500	13.698	1.467
2.000	25.000	25.316	1.264
5.000	36.500	37.037	1.471
10.000	50.000	50.761	1.522

Vgs-Id Characteristic

Circuit Simulation result

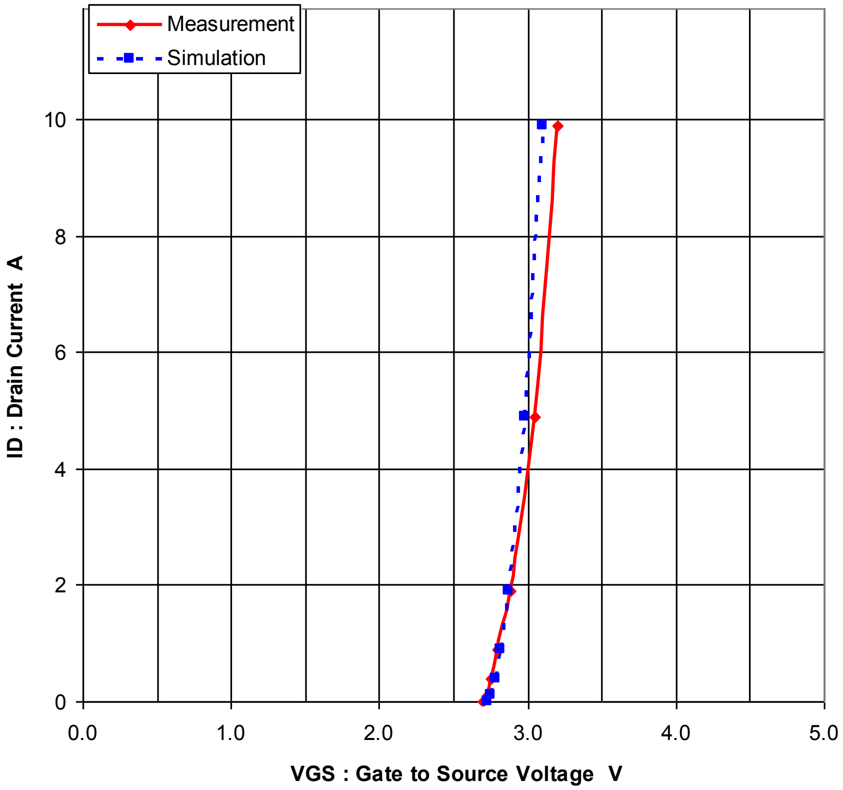


Evaluation circuit



Comparison Graph

Circuit Simulation Result

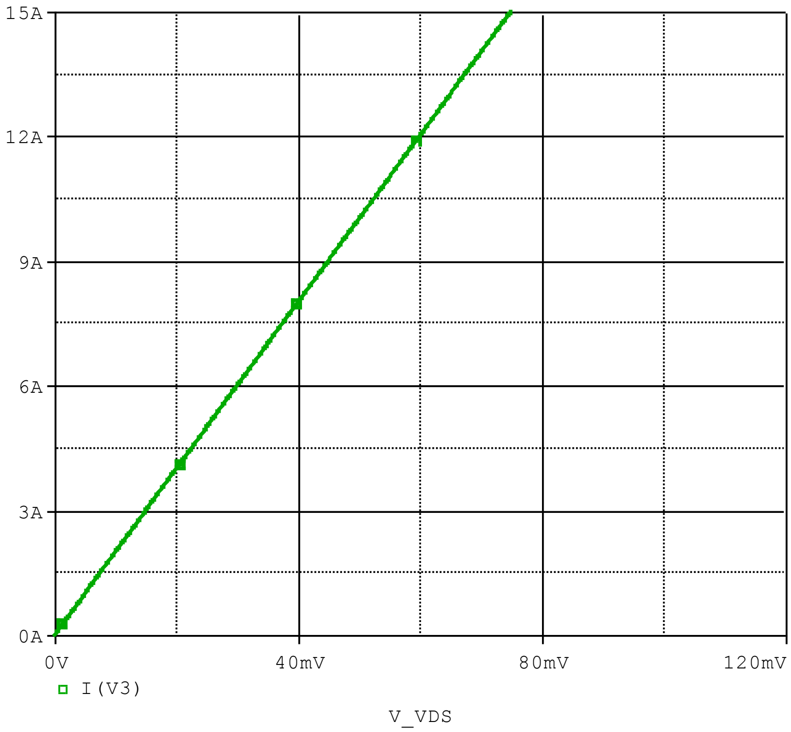


Simulation Result

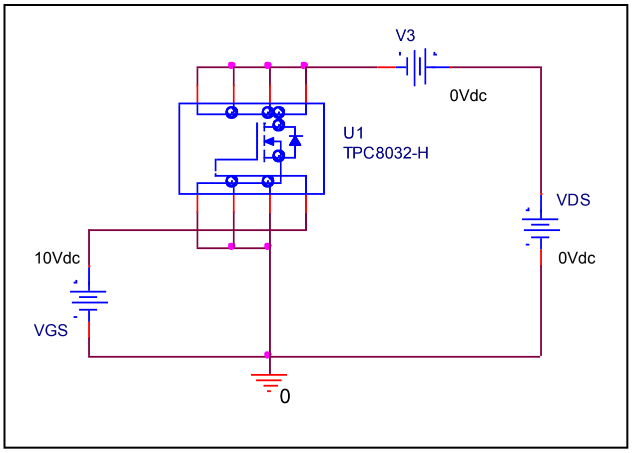
I_D(A)	V_{GS}(V)		Error (%)
	Measurement	**Simulation**	
0.100	**2.700**	**2.726**	**0.963**
0.200	**2.730**	**2.748**	**0.659**
0.500	**2.750**	**2.782**	**1.164**
1.000	**2.800**	**2.823**	**0.821**
2.000	**2.880**	**2.876**	**-0.139**
5.000	**3.050**	**2.984**	**-2.164**
10.000	**3.200**	**3.107**	**-2.906**

Rds(on) Characteristic

Circuit Simulation result



Evaluation circuit

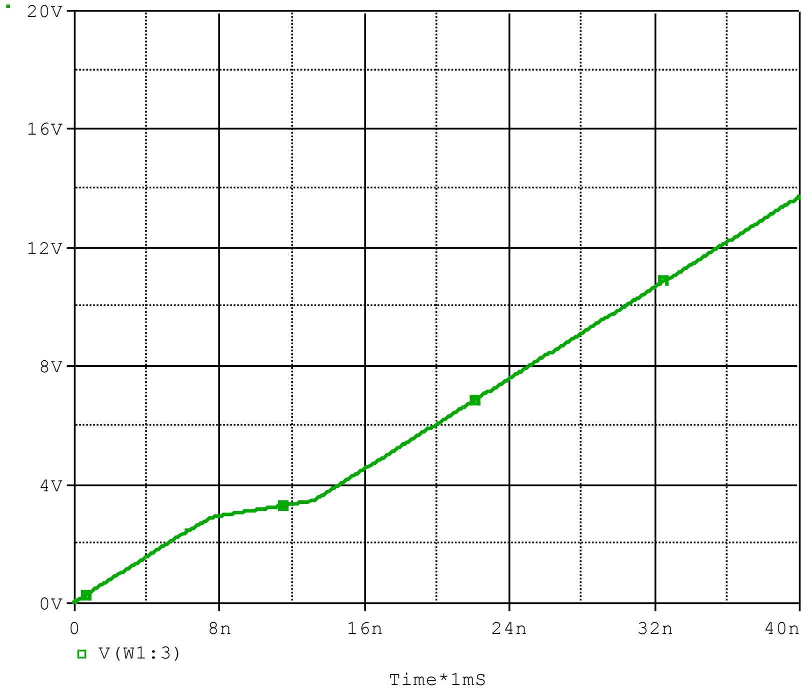


Simulation Result

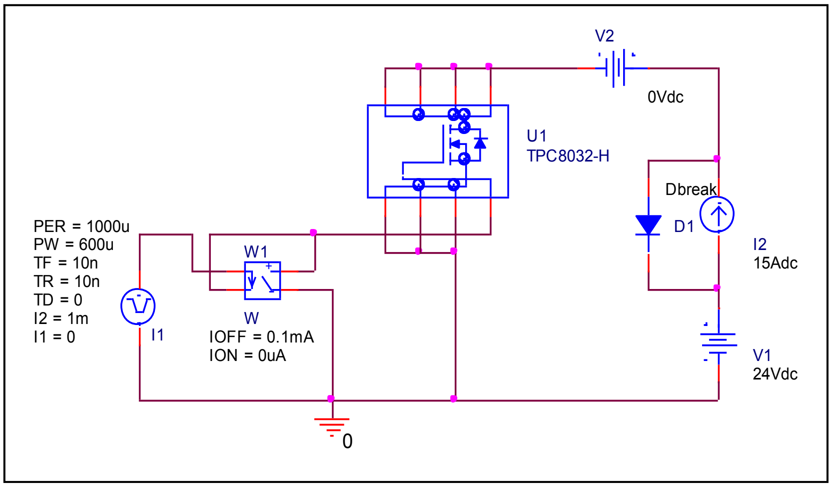
I_D=7.5A, V_{GS}=10V	Measurement	Simulation	Error (%)
R_{DS} (on) (Ω)	0.005	0.005	0.000

Gate Charge Characteristic

Circuit Simulation result



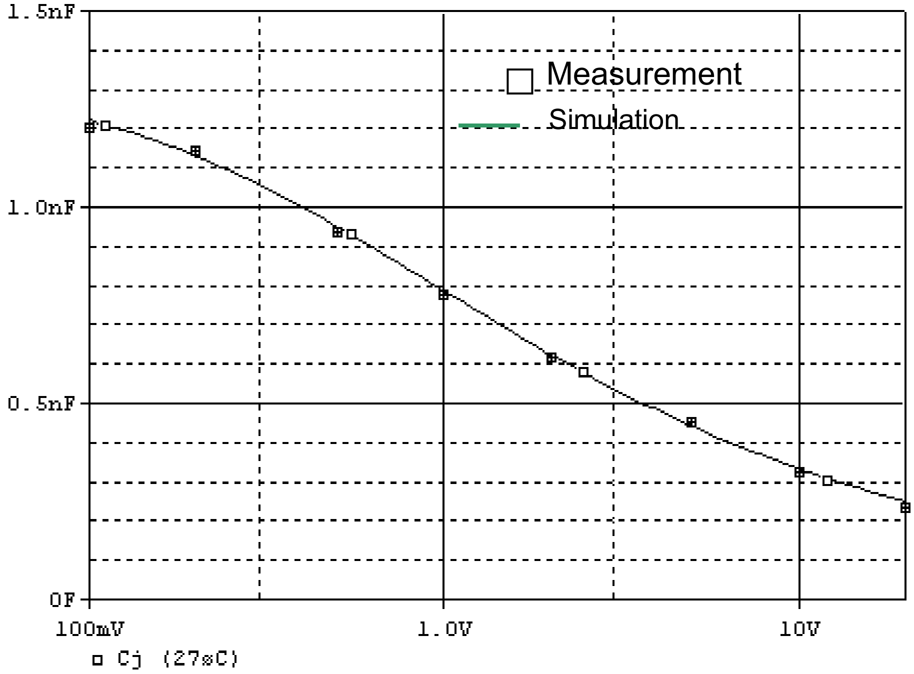
Evaluation circuit



Simulation Result

V_{DD}=24V,I_D=15A ,V_{GS}=10V	Measurement	Simulation	Error (%)
Qgs(nc)	7.900	7.830	-0.886
Qgd(nc)	5.200	5.242	0.808
Qg(nc)	32.000	30.403	-4.991

Capacitance Characteristic

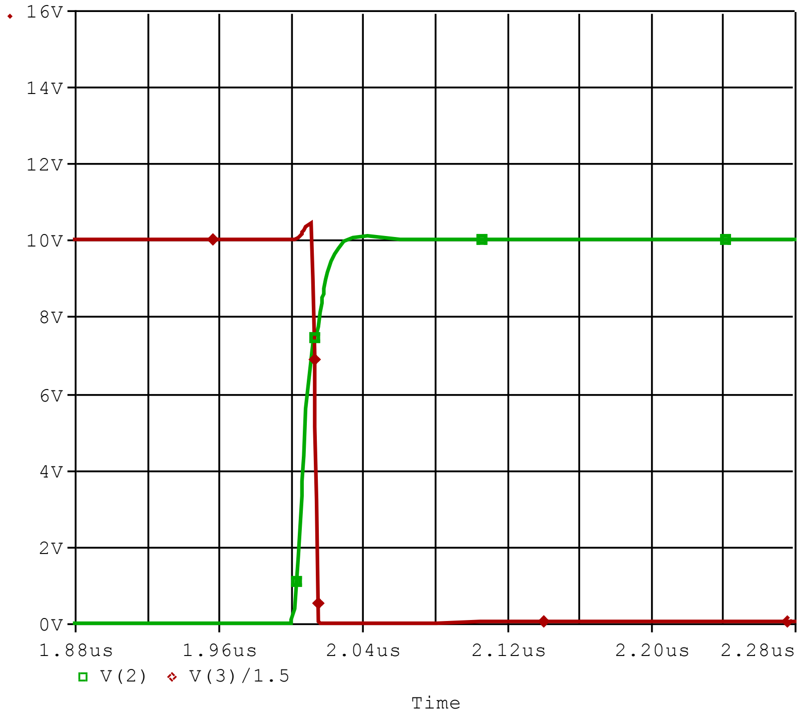


Simulation Result

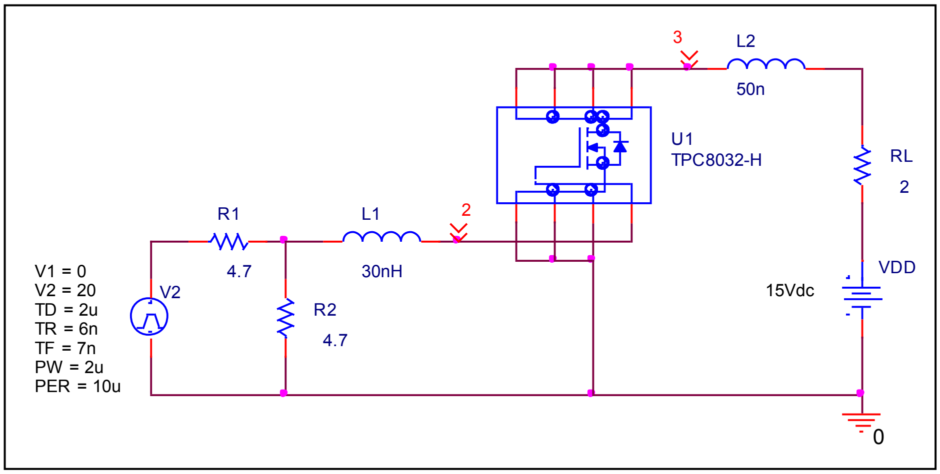
V_{DS}(V)	Cbd(pF)		Error(%)
	Measurement	Simulation	
0.100	1210.000	1220.000	0.826
0.200	1150.000	1125.000	-2.174
0.500	940.000	950.000	1.064
1.000	780.000	785.000	0.641
2.000	620.000	625.000	0.806
5.000	460.000	450.000	-2.174
10.000	330.000	335.000	1.515
20.000	240.000	245.000	2.083

Switching Time Characteristic

Circuit Simulation result



Evaluation circuit

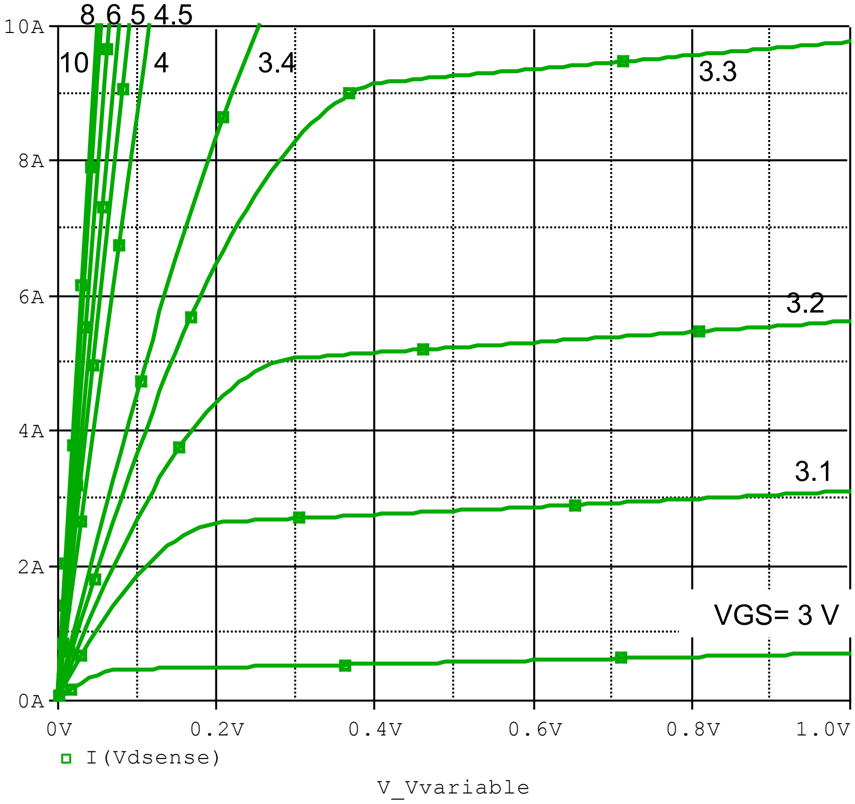


Simulation Result

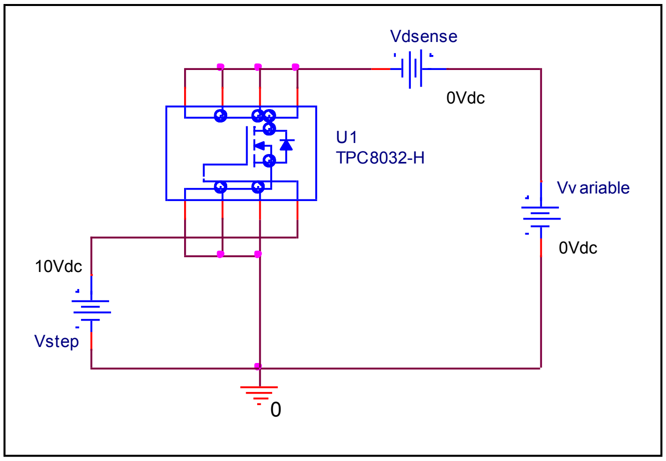
I_D=7.5A, V_{DD}=15V V_{GS}=10V	Measurement	Simulation	Error(%)
Ton(ns)	12.000	11.992	-0.067

Output Characteristic

Circuit Simulation result

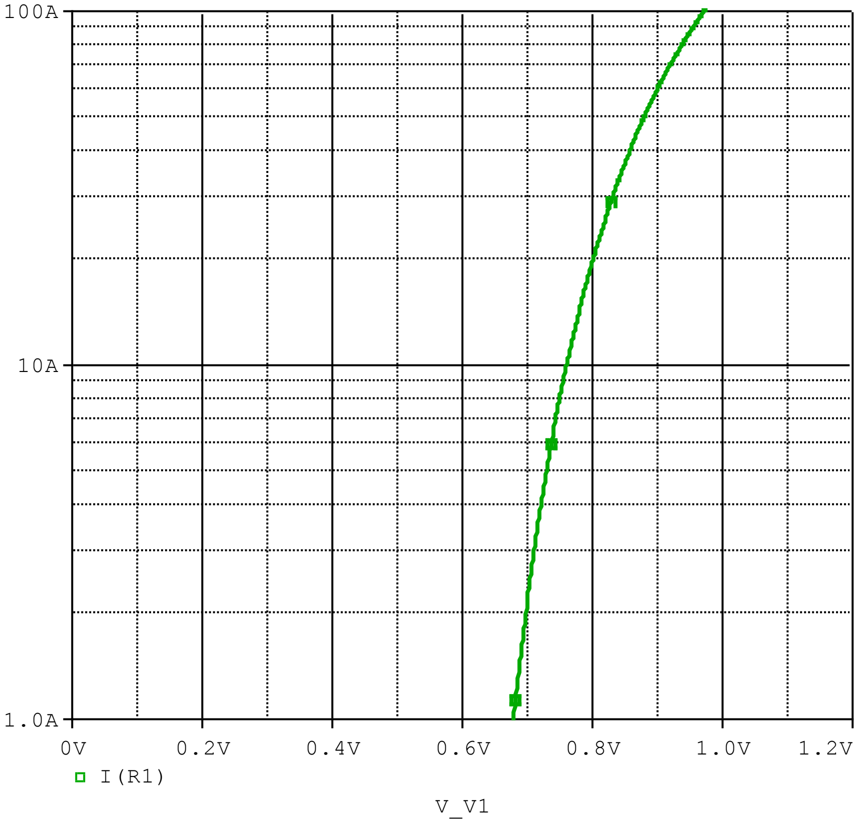


Evaluation circuit

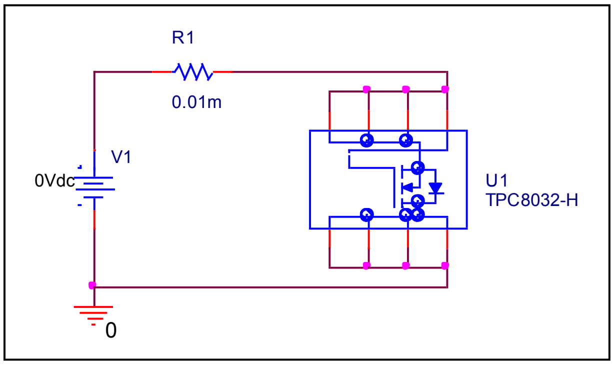


BODY DIODE SPICE MODEL
Forward Current Characteristic

Circuit Simulation Result

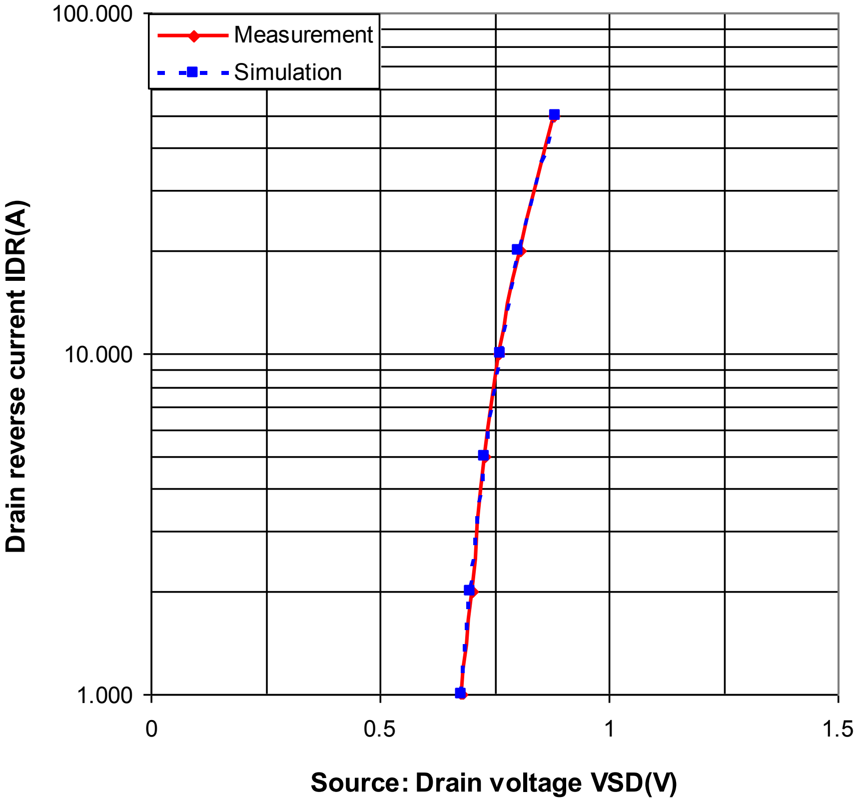


Evaluation Circuit



Comparison Graph

Circuit Simulation Result

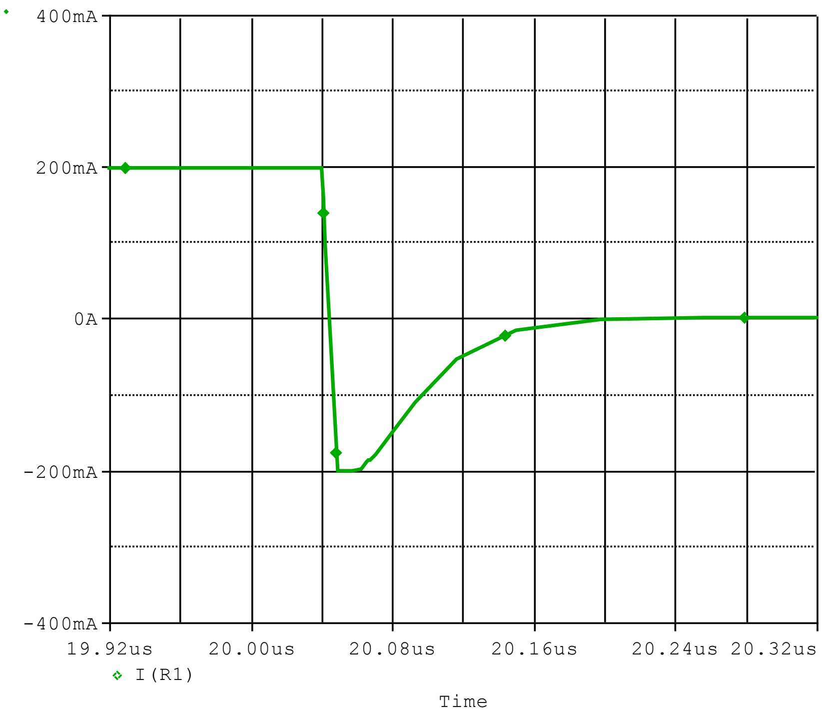


Simulation Result

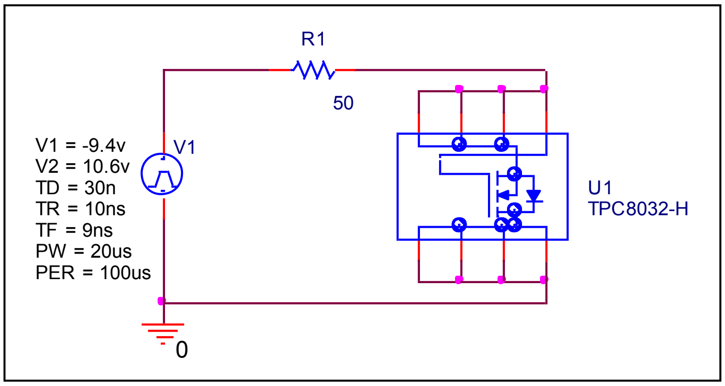
IDR(A)	VSD(V) Measurement	VSD(V) Simulation	%Error
1.000	0.680	0.679	-0.147
2.000	0.700	0.699	-0.143
5.000	0.730	0.730	0.000
10.000	0.760	0.762	0.263
20.000	0.805	0.803	-0.248
50.000	0.880	0.882	0.227

Reverse Recovery Characteristic

Circuit Simulation Result



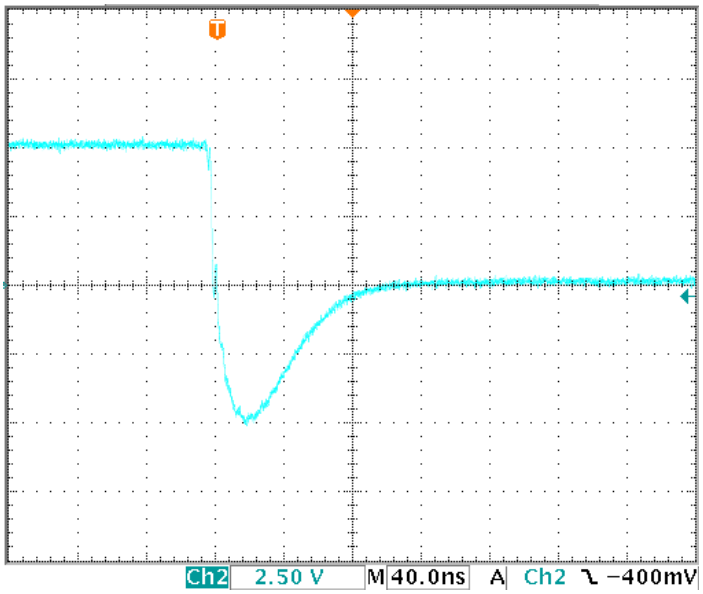
Evaluation Circuit



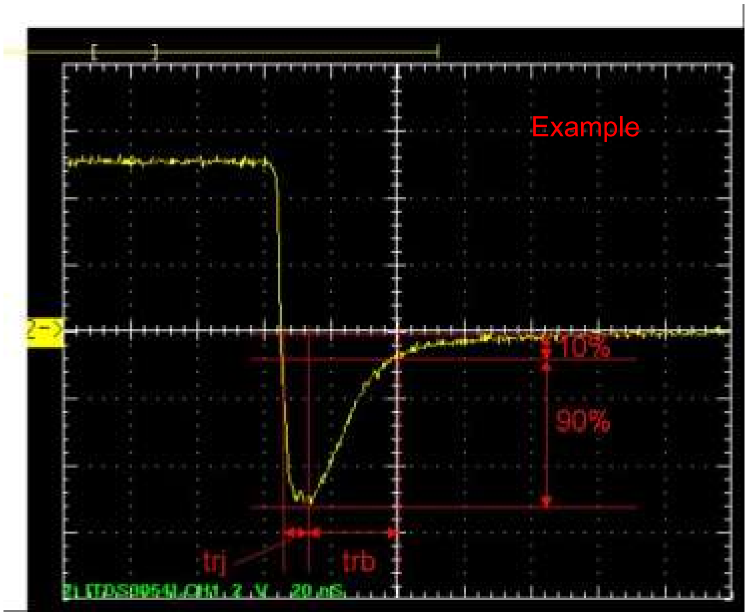
Compare Measurement vs. Simulation

	Measurement	Simulation	Error (%)
Trj(ns)	**16.800**	**16.540**	**-1.548**

Reverse Recovery Characteristic Reference



Trj= 16.8 (ns)
Trb= 61.6 (ns)
Conditions:Ifwd=Irev=0.2(A),Rl=50



Relation between trj and trb