Device Modeling Report

COMPONENTS: Power MOSFET (Model Parameter)
PART NUMBER: TPC8212-H
MANUFACTURER: TOSHIBA
Body Diode (Model Parameter) / ESD Protection Diode

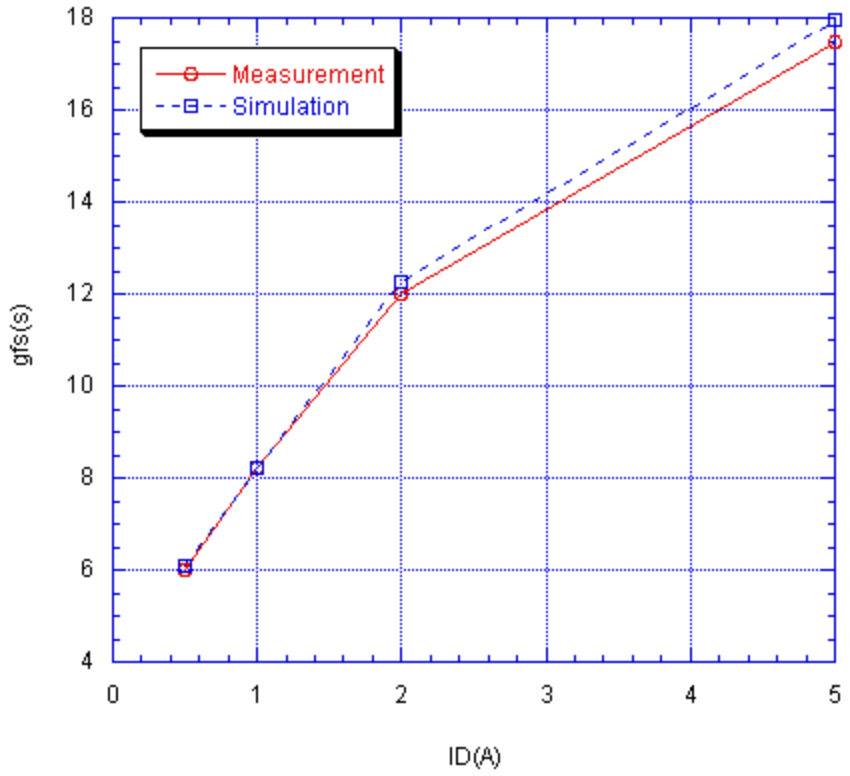
Bee Technologies Inc.

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

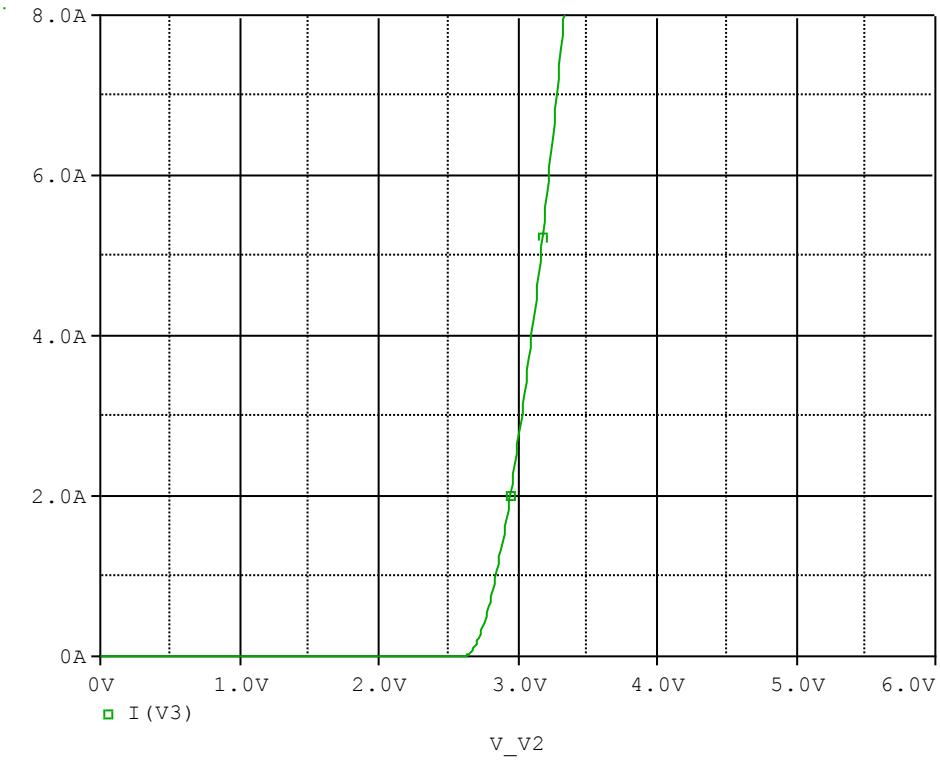


Comparison table

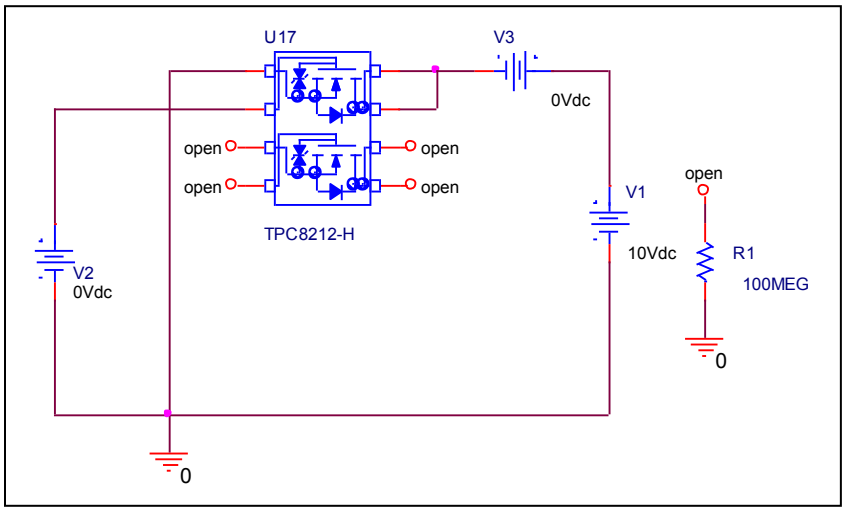
Id(A)	gfs		Error(%)
	Measurement	Simulation	
0.500	6.000	6.105	1.750
1.000	8.200	8.230	0.366
2.000	12.000	12.260	2.167
5.000	17.500	17.950	2.571

Vgs-Id Characteristic

Circuit Simulation result

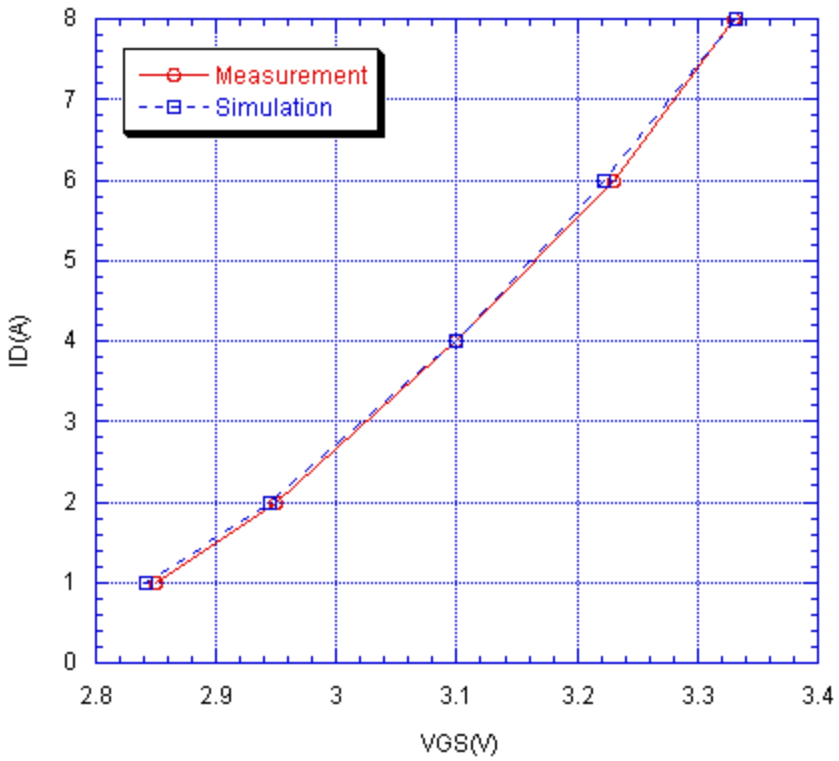


Evaluation circuit



Comparison Graph

Circuit Simulation Result

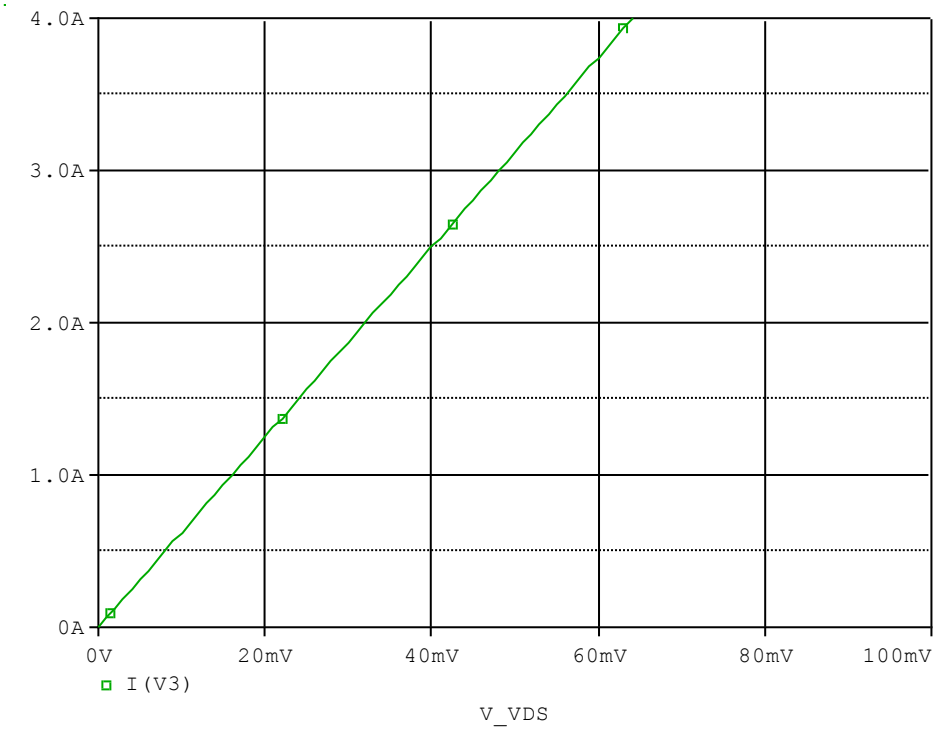


Simulation Result

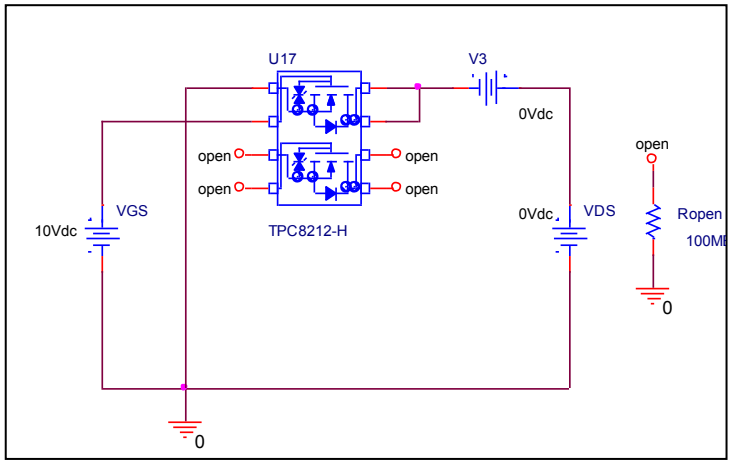
I_D(A)	V_{GS}(V)		Error (%)
	Measurement	Simulation	
1.000	2.850	2.842	-0.281
2.000	2.950	2.945	-0.169
4.000	3.100	3.099	-0.032
6.000	3.230	3.223	-0.217
8.000	3.330	3.332	0.060

Rds(on) Characteristic

Circuit Simulation result



Evaluation circuit

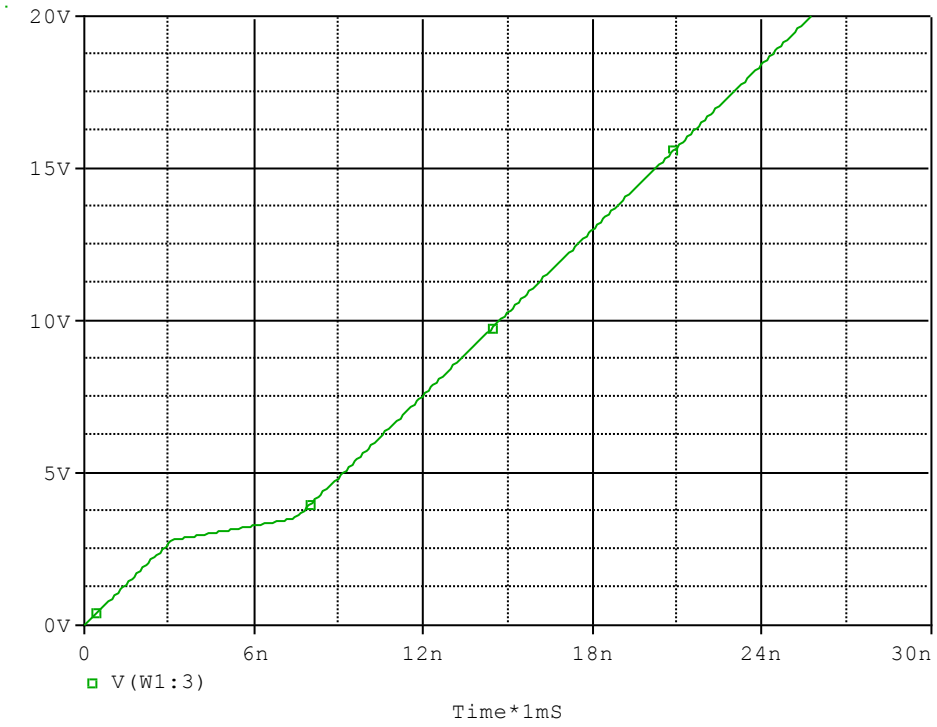


Simulation Result

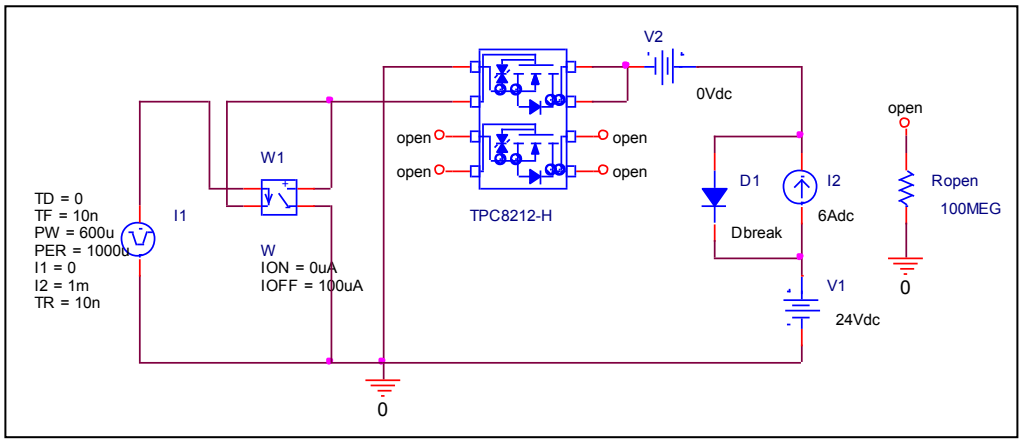
I_D=3.0A, V_{GS}=10V	Measurement		Simulation		Error (%)
R_{DS} (on)	16.000	mΩ	16.032	mΩ	0.200

Gate Charge Characteristic

Circuit Simulation result



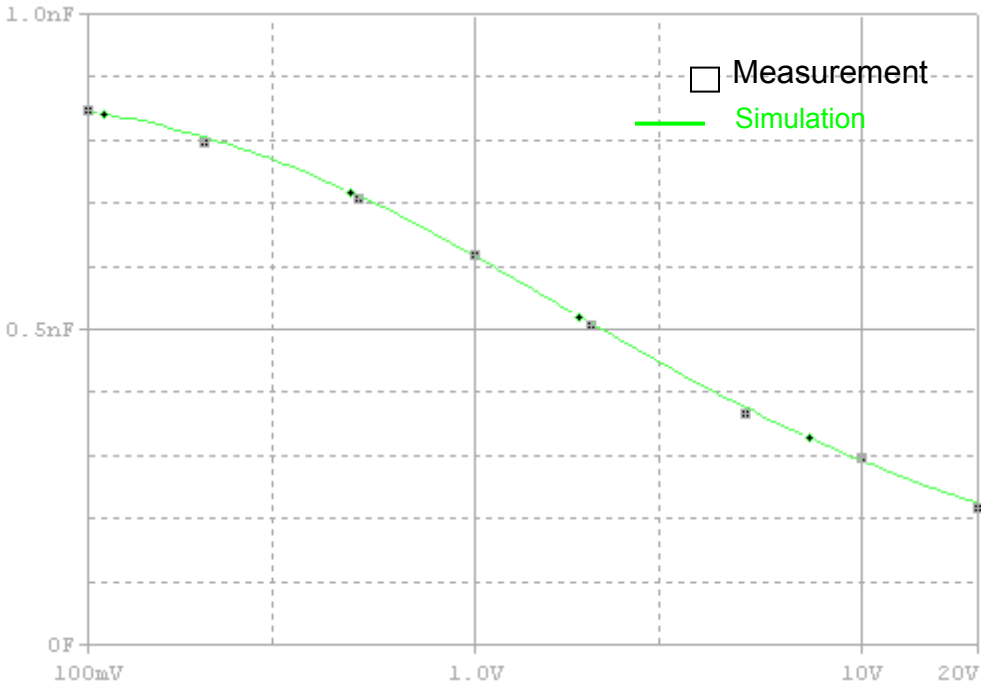
Evaluation circuit



Simulation Result

V_{DD}=24V,I_D=6.0A ,V_{GS}=10V	Measurement		Simulation		Error (%)
Qgs	3.100	nC	3.120	nC	0.645
Qgd	4.100	nC	4.194	nC	2.293
Qg	16.000	nC	14.698	nC	-8.138

Capacitance Characteristic

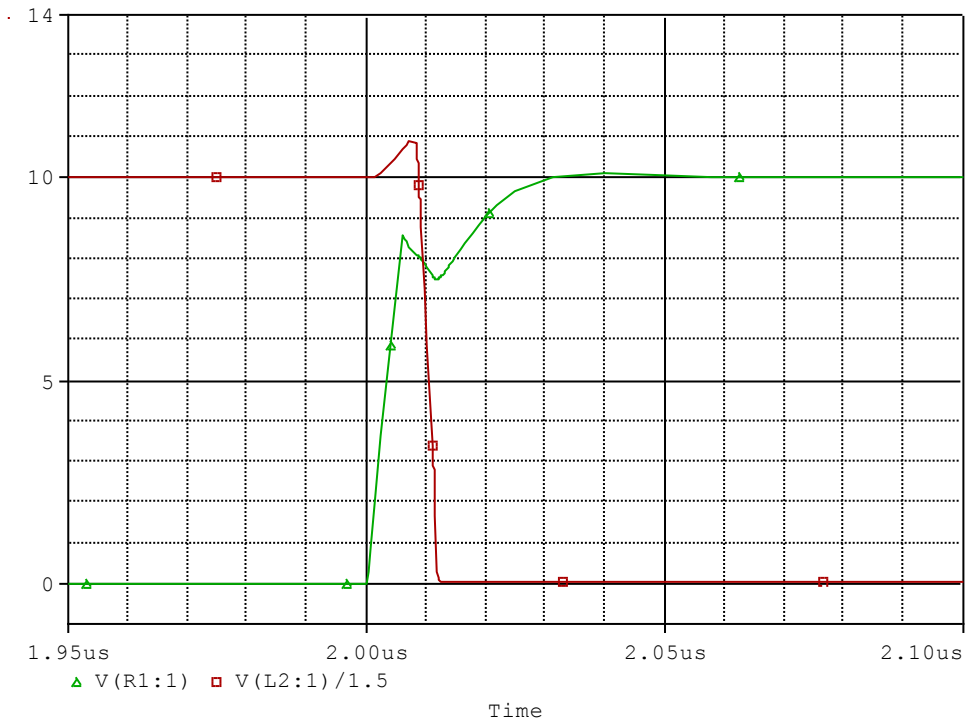


Simulation Result

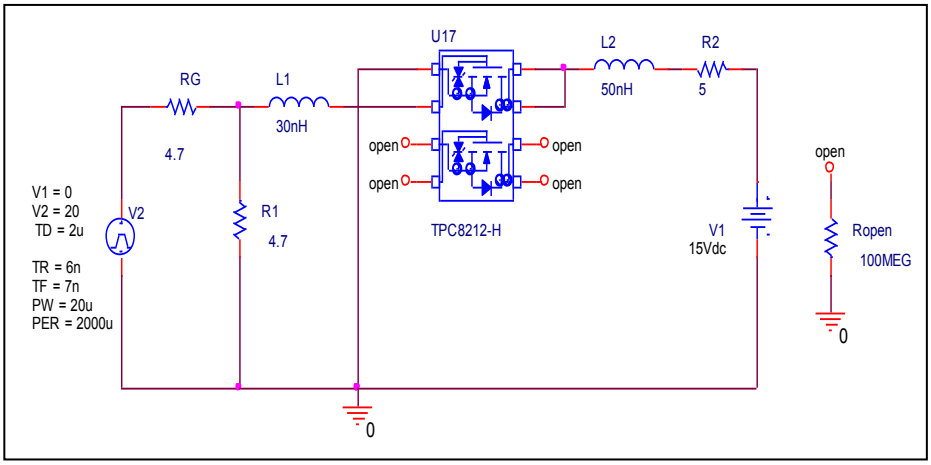
V_{DS}(V)	Cbd(nF)		Error(%)
	Measurement	Simulation	
0.100	0.850	0.855	0.588
0.200	0.800	0.790	-1.250
0.500	0.710	0.705	-0.704
1.000	0.620	0.622	0.323
2.000	0.510	0.515	0.980
5.000	0.370	0.366	-1.081
10.000	0.300	0.304	1.333
20.000	0.220	0.217	-1.364

Switching Time Characteristic

Circuit Simulation result



Evaluation circuit

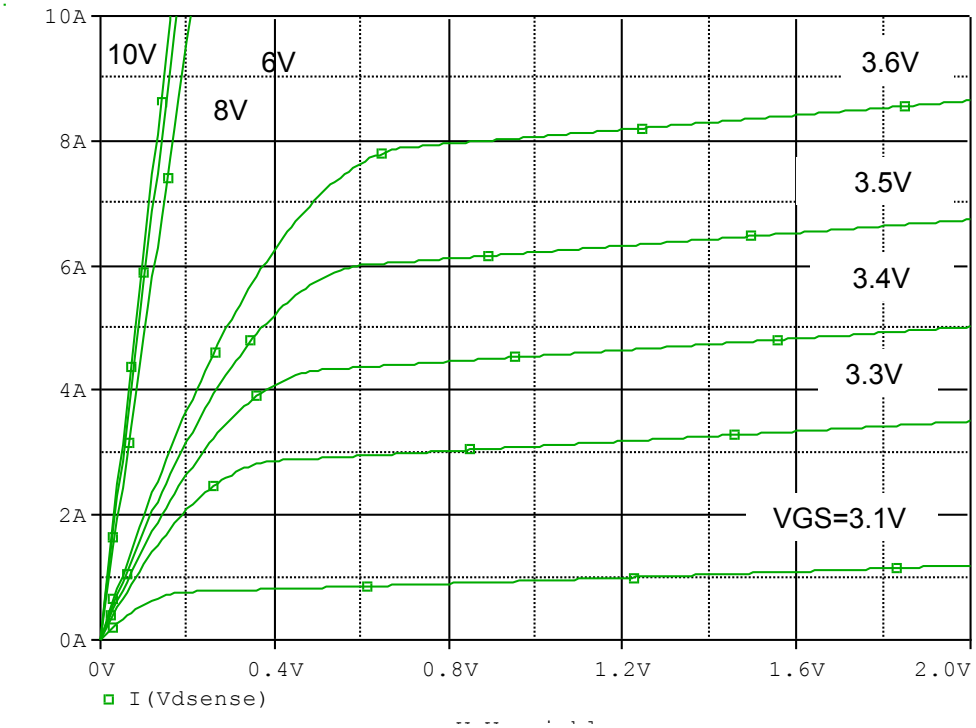


Simulation Result

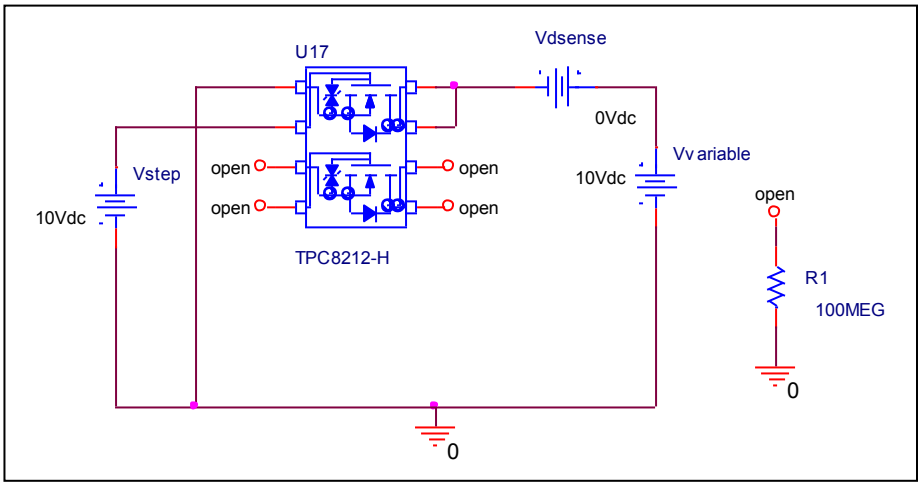
I_D=3.0A, V_{DD}=15V V_{GS}=0/10V	Measurement		Simulation		Error(%)
ton	11.000	ns	11.070	ns	0.636

Output Characteristic

Circuit Simulation result

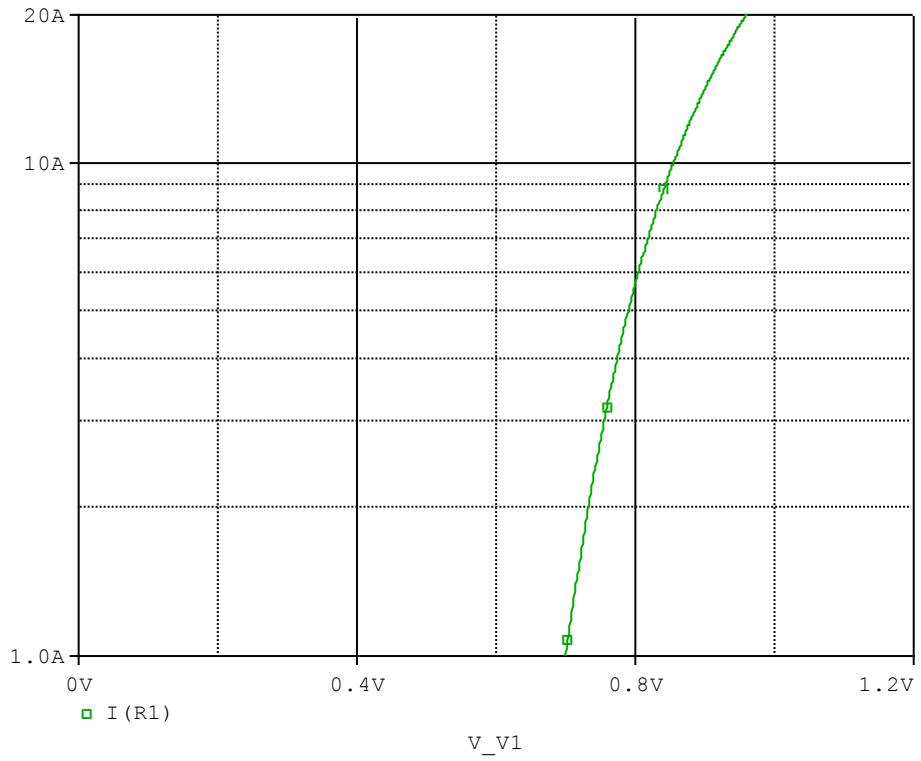


Evaluation circuit

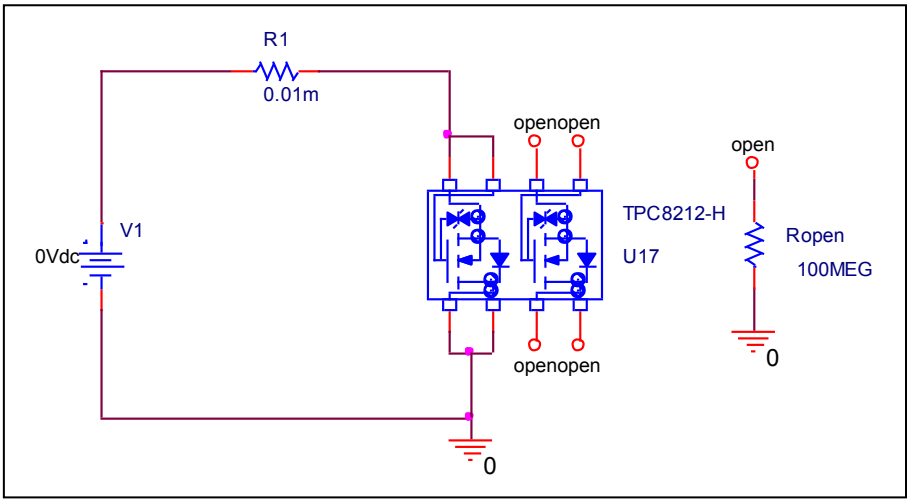


Forward Current Characteristic

Circuit Simulation Result

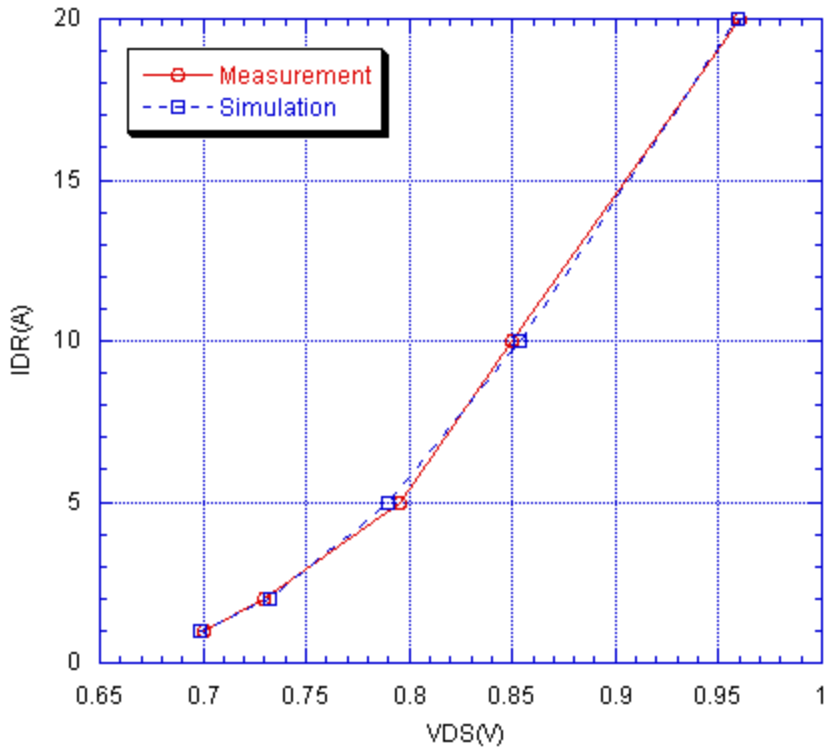


Evaluation Circuit



Comparison Graph

Circuit Simulation Result

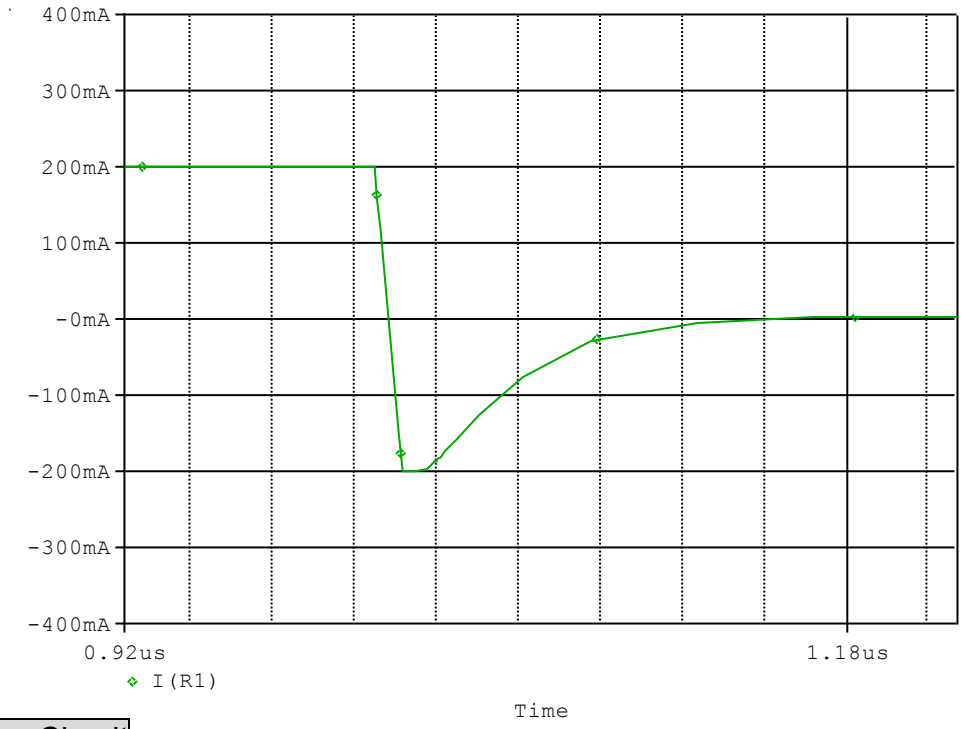


Simulation Result

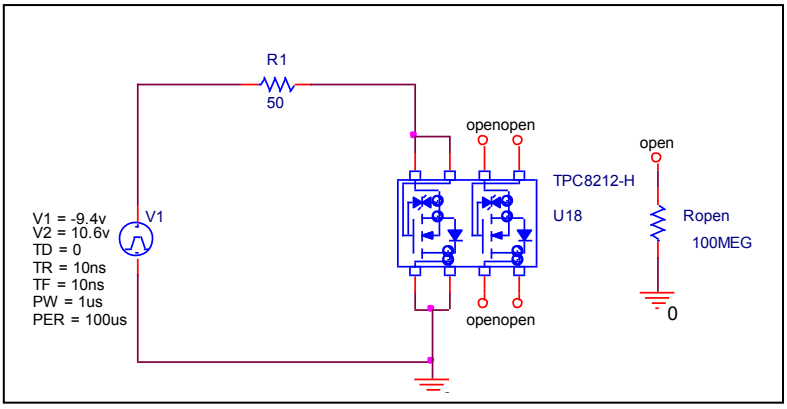
IDR (A)	VDS (V) Measurement	VDS (V) Simulation	%Error
1.000	0.700	0.699	-0.143
2.000	0.730	0.732	0.274
5.000	0.795	0.790	-0.629
10.000	0.850	0.854	0.471
20.000	0.960	0.959	-0.104

Reverse Recovery Characteristic

Circuit Simulation Result



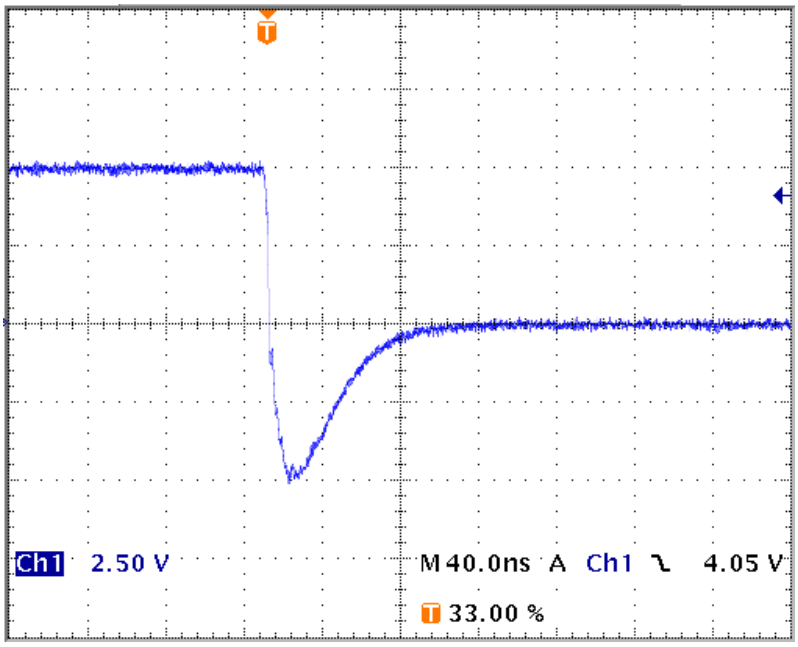
Evaluation Circuit



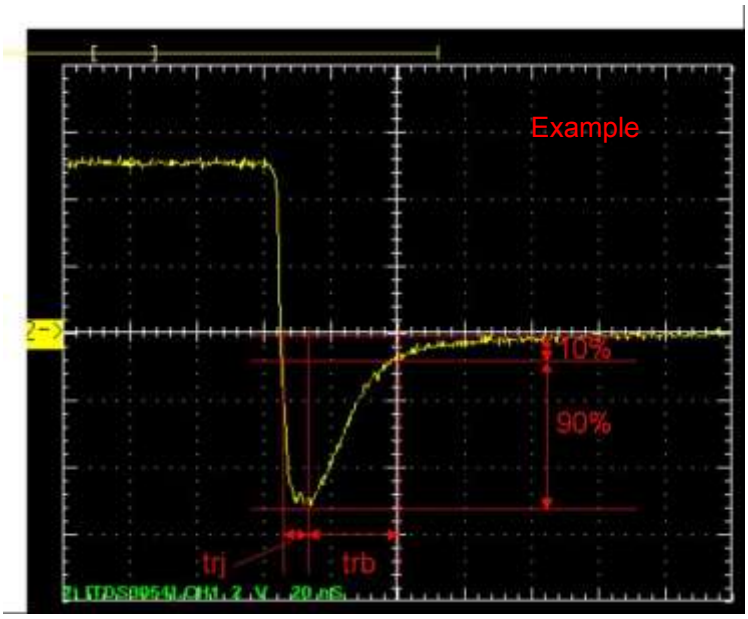
Compare Measurement vs. Simulation

	Measurement		Simulation		Error (%)
trj	**10.400**	**ns**	**12.466**	**ns**	**19.865**
trb	**56.000**	**ns**	**73.558**	**ns**	**31.354**
trr	**66.400**	**ns**	**86.024**	**ns**	**29.554**

Reverse Recovery Characteristic Reference



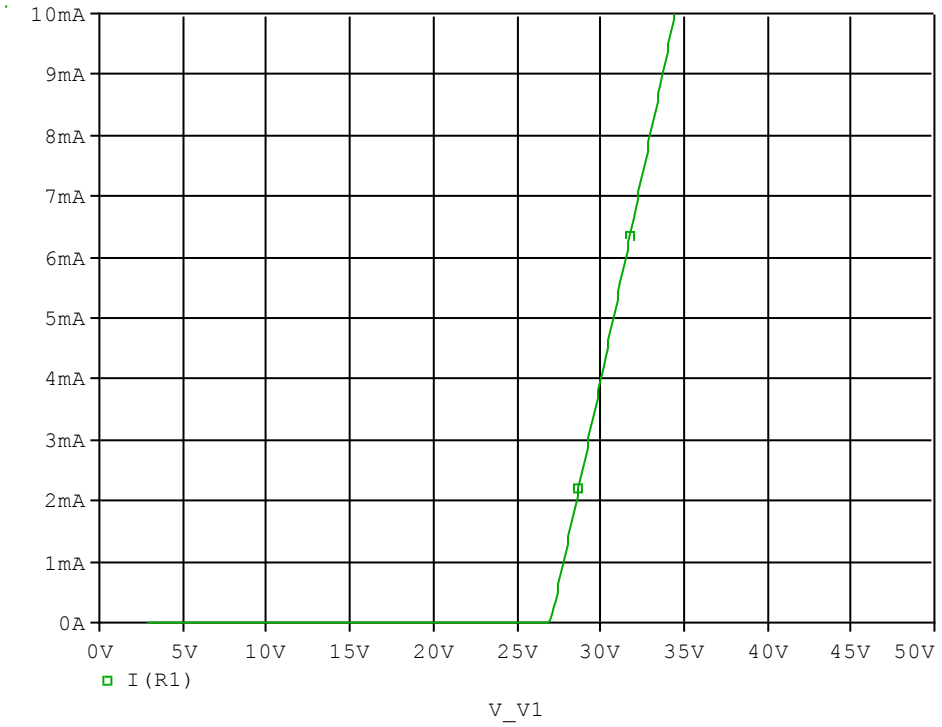
Trj=10.4(ns)
Trb=56.0(ns)
Conditions:Ifwd=Irev=0.2(A),Rl=50



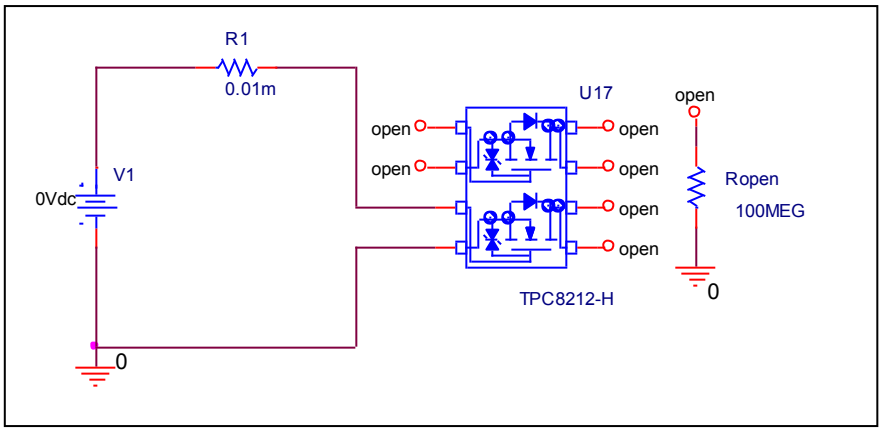
Relation between trj and trb

Zener Voltage Characteristic

Circuit Simulation Result



Evaluation Circuit



Zener Voltage Characteristic Reference