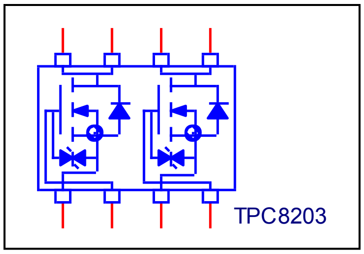
Device Modeling Report

COMPONENTS: Power MOSFET (Model Parameter)
PART NUMBER: TPC8203
MANUFACTURER: TOSHIBA
Body Diode (Model Parameter) / ESD Protection Diode

Bee Technologies Inc.

Circuit Configuration

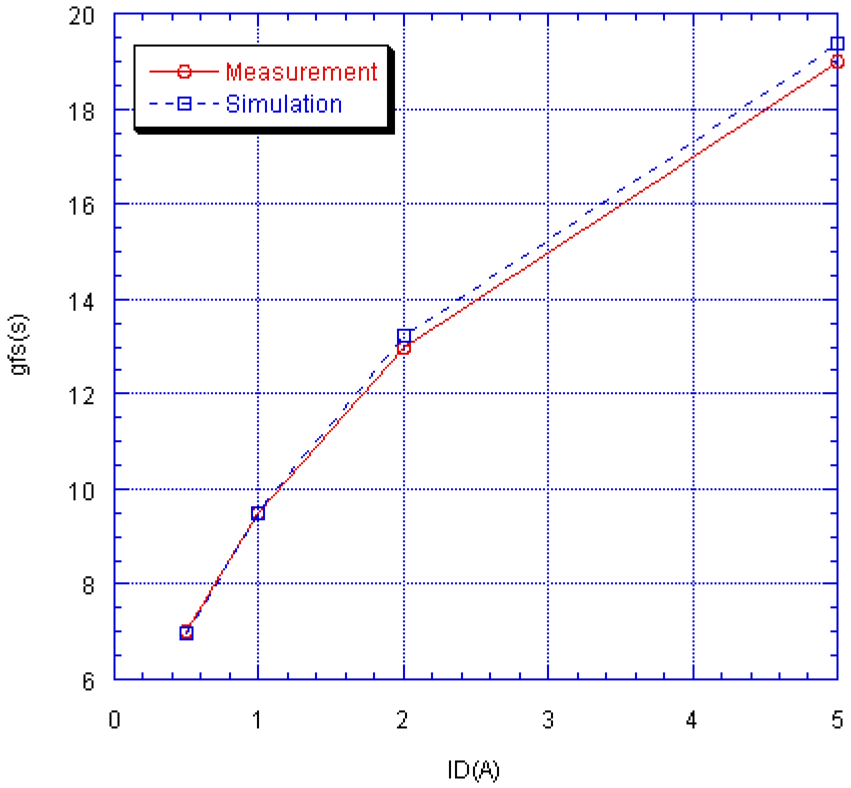


MOSFET MODEL

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

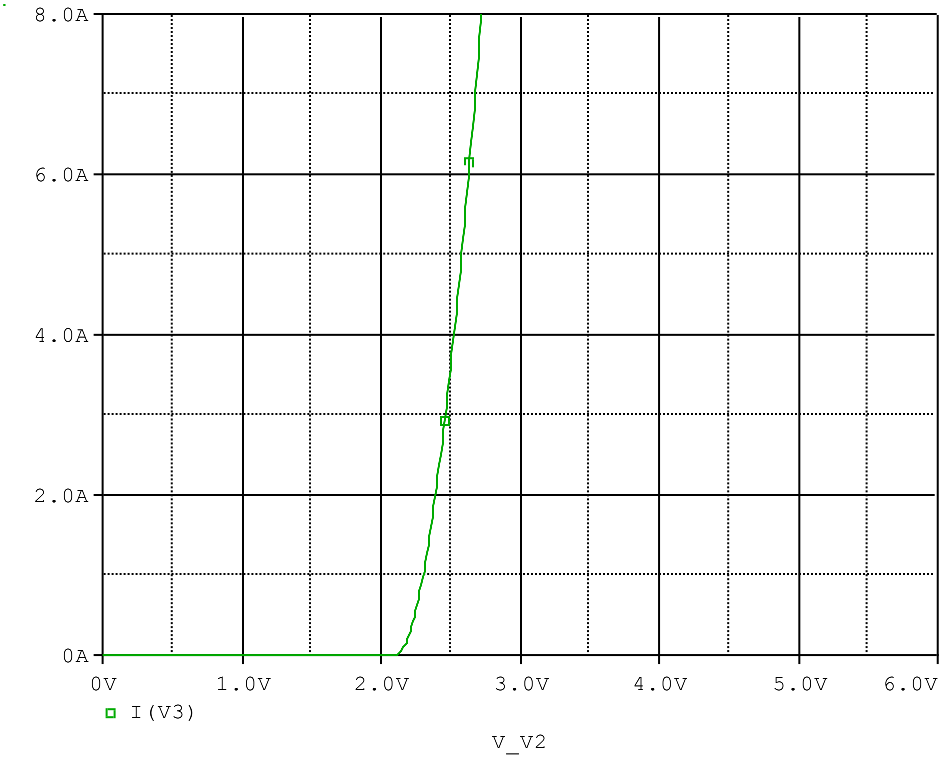


Comparison table

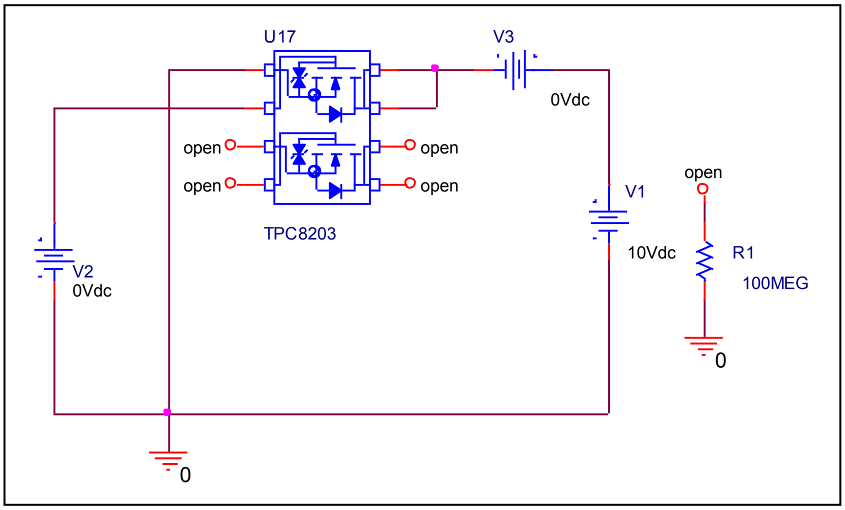
Id(A)	gfs		Error(%)
	Measurement	Simulation	
0.500	7.000	6.950	-0.714
1.000	9.500	9.480	-0.211
2.000	13.000	13.230	1.769
5.000	19.000	19.370	1.947

Vgs-Id Characteristic

Circuit Simulation result

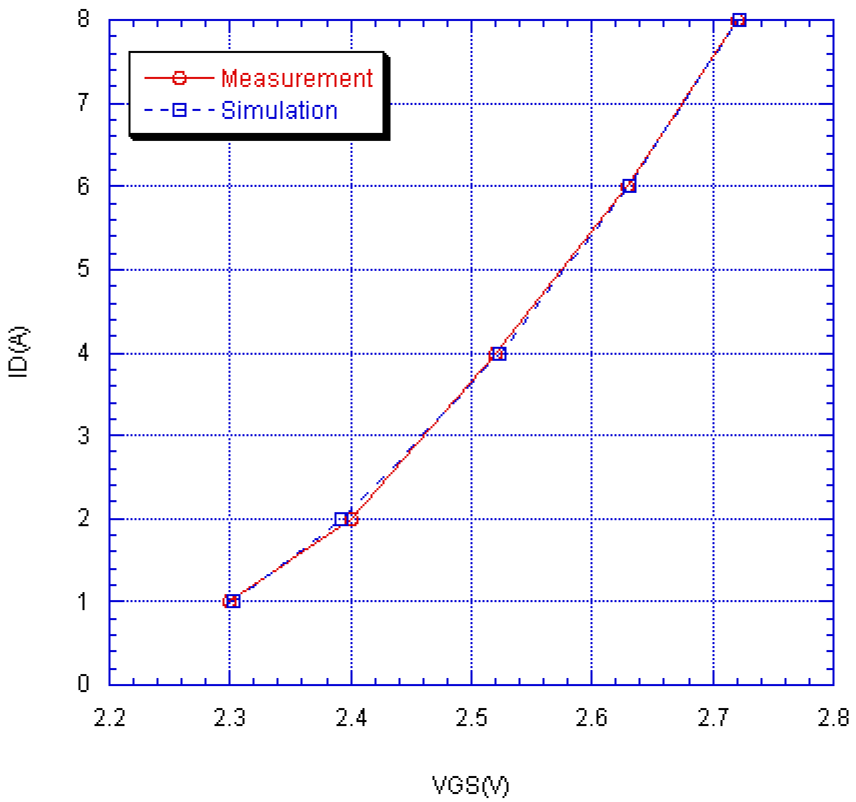


Evaluation circuit



Comparison Graph

Circuit Simulation Result

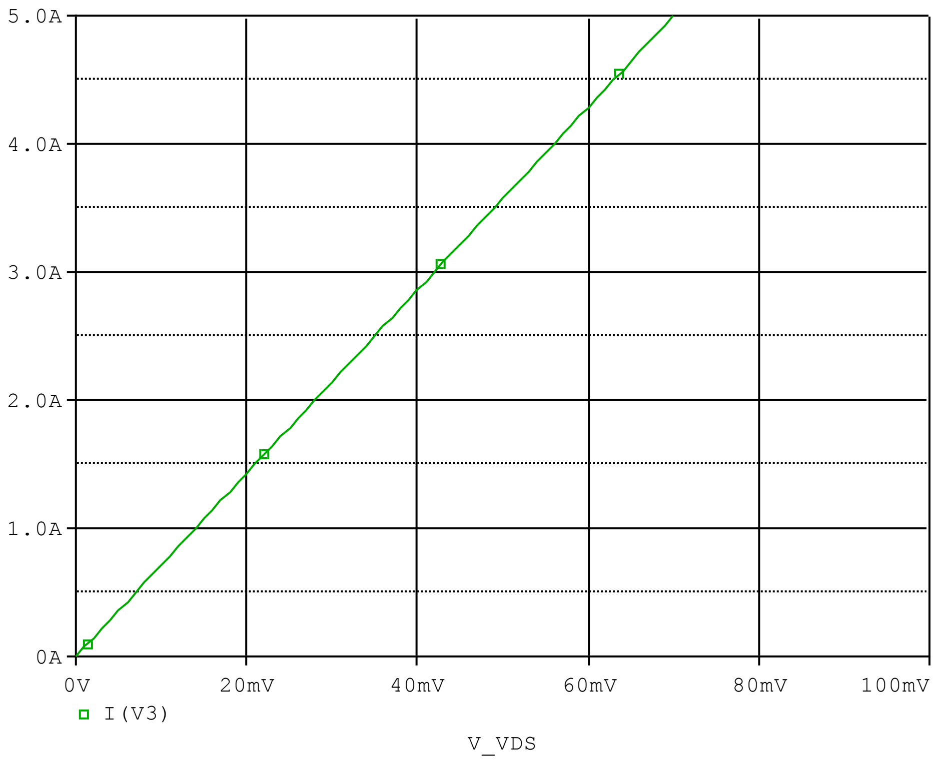


Simulation Result

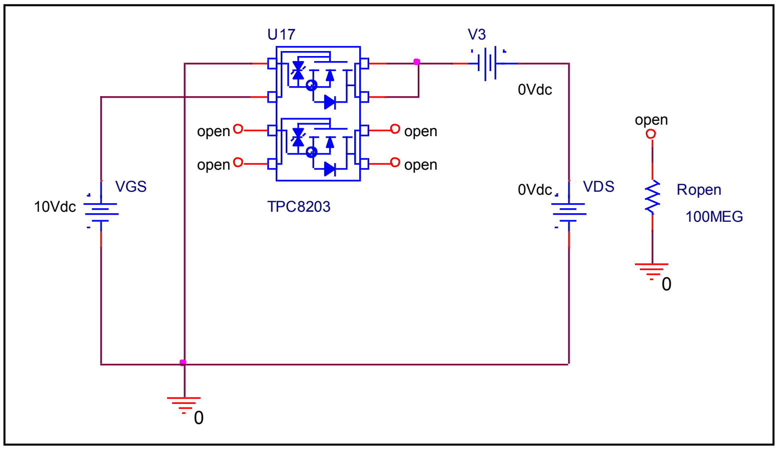
I_D(A)	V_{GS}(V)		Error (%)
	Measurement	Simulation	
1.000	2.300	2.303	0.130
2.000	2.400	2.392	-0.333
4.000	2.520	2.524	0.159
6.000	2.630	2.631	0.038
8.000	2.720	2.723	0.110

Rds(on) Characteristic

Circuit Simulation result



Evaluation circuit

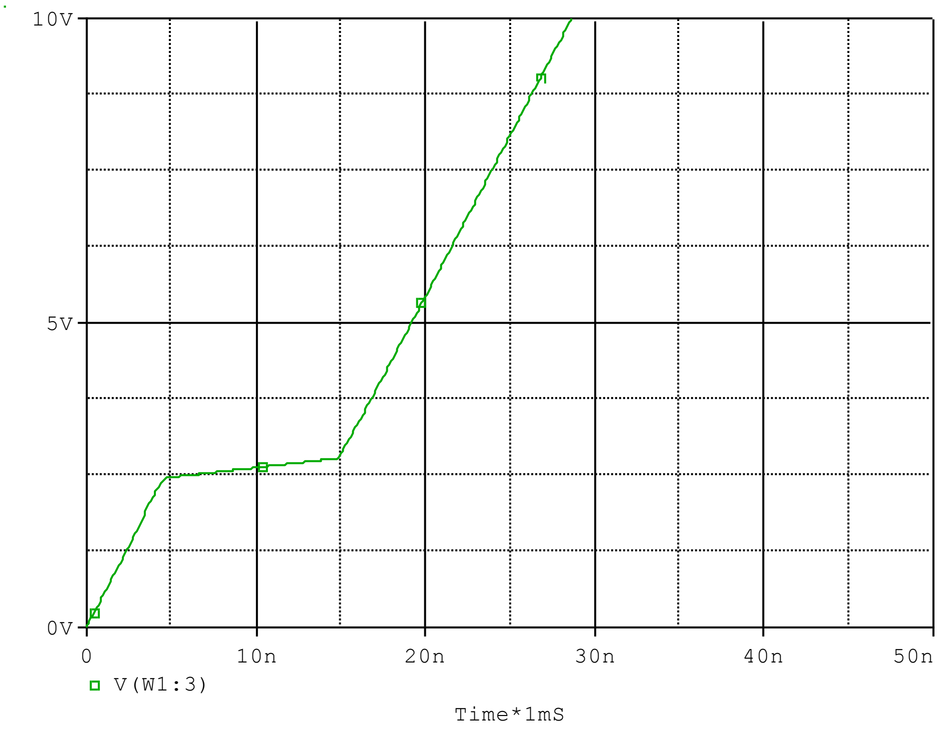


Simulation Result

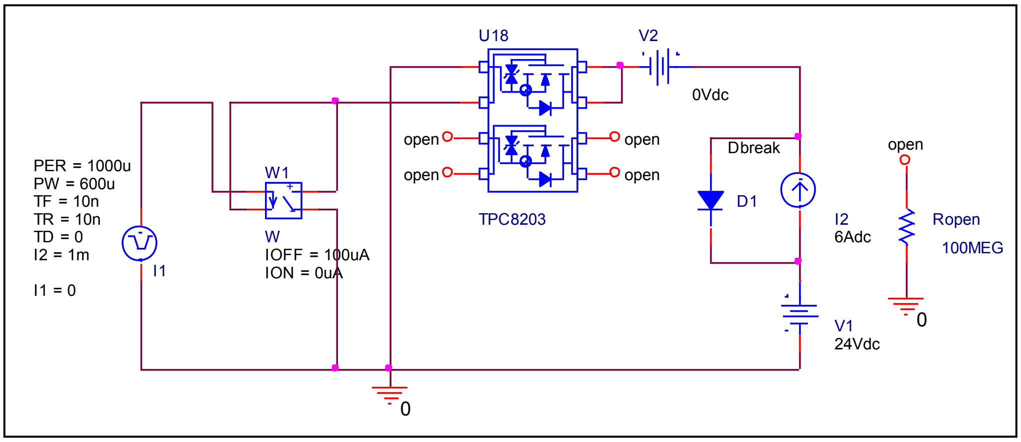
I_D=3.0A, V_{GS}=10V	Measurement		Simulation		Error (%)
R_{DS} (on)	14.000	mΩ	14.000	mΩ	0.000

Gate Charge Characteristic

Circuit Simulation result



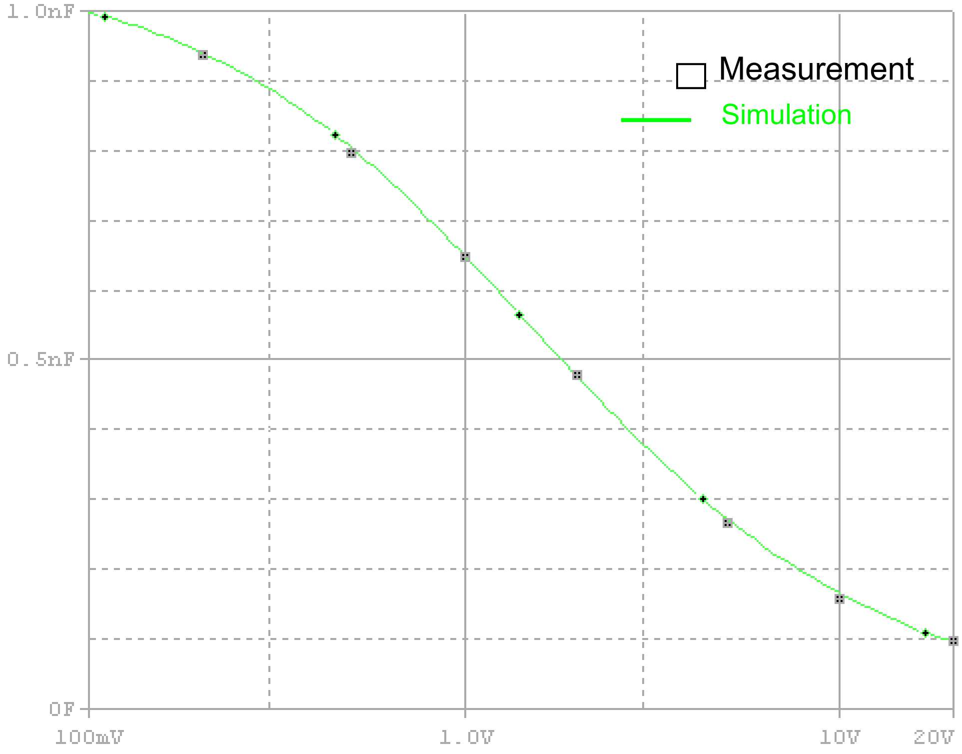
Evaluation circuit



Simulation Result

V_{DD}=24V,I_D=6.0A ,V_{GS}=10V	Measurement		Simulation		Error (%)
Qgs	4.700	nC	4.719	nC	0.404
Qgd	10.000	nC	10.112	nC	1.120
Qg	40.000	nC	28.627	nC	-28.433

Capacitance Characteristic

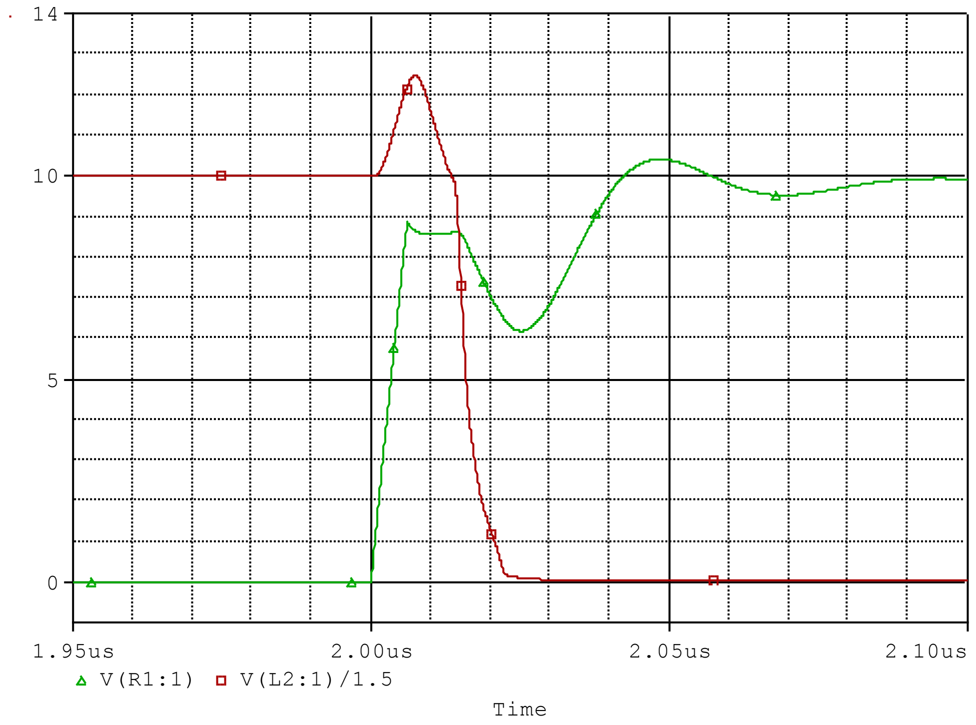


Simulation Result

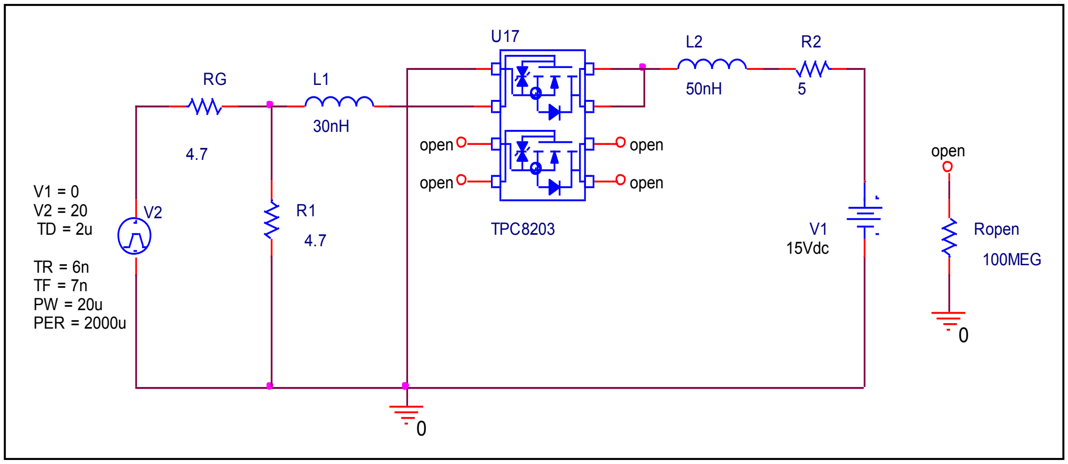
V_{DS}(V)	Cbd(nF)		Error(%)
	Measurement	Simulation	
0.100	1.000	1.024	2.400
0.200	0.940	0.940	0.000
0.500	0.800	0.797	-0.375
1.000	0.650	0.648	-0.308
2.000	0.480	0.481	0.208
5.000	0.270	0.267	-1.111
10.000	0.160	0.155	-3.125
20.000	0.100	0.102	2.000

Switching Time Characteristic

Circuit Simulation result



Evaluation circuit

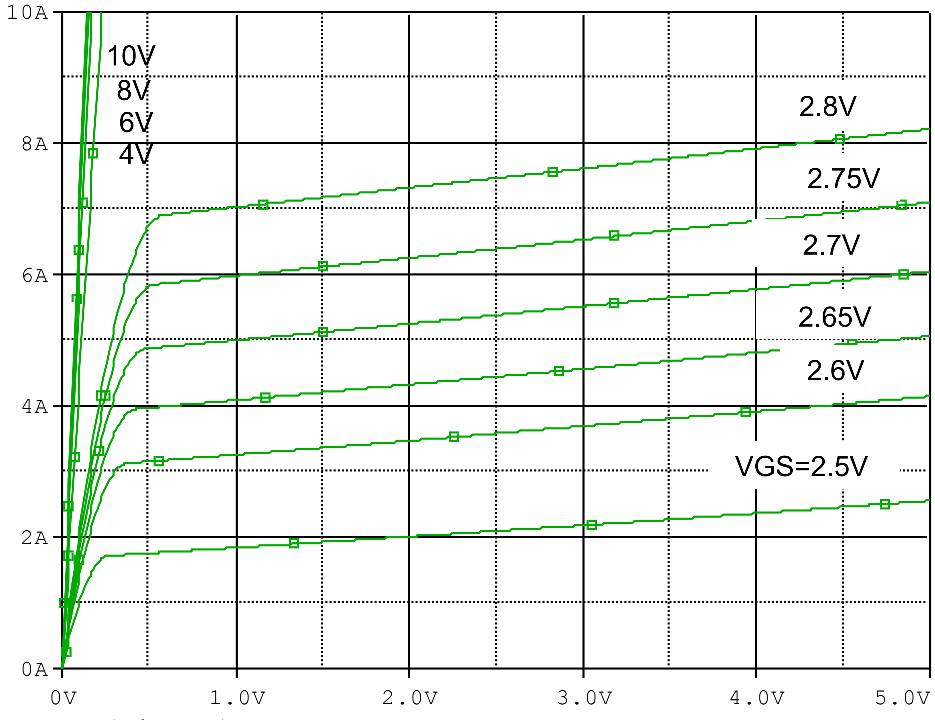


Simulation Result

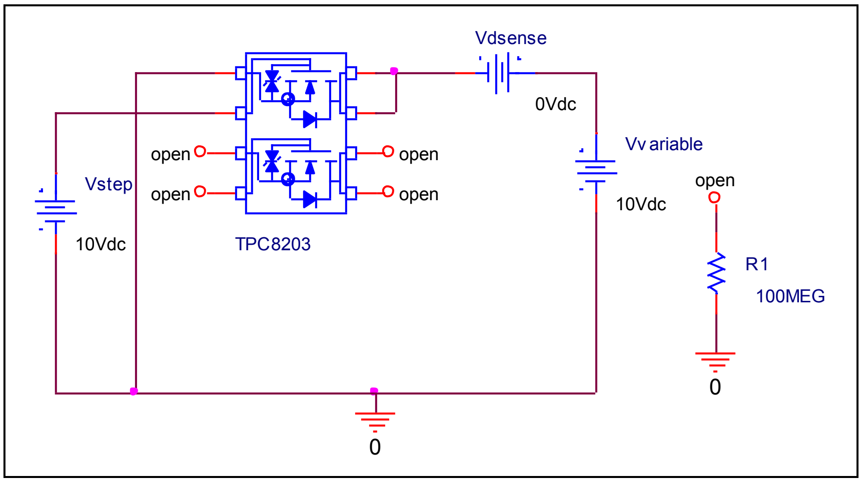
I_D=3.0A, V_{DD}=15V V_{GS}=0/10V	Measurement		Simulation		Error(%)
ton	**20.000**	**ns**	**20.052**	**ns**	**0.260**

Output Characteristic

Circuit Simulation result

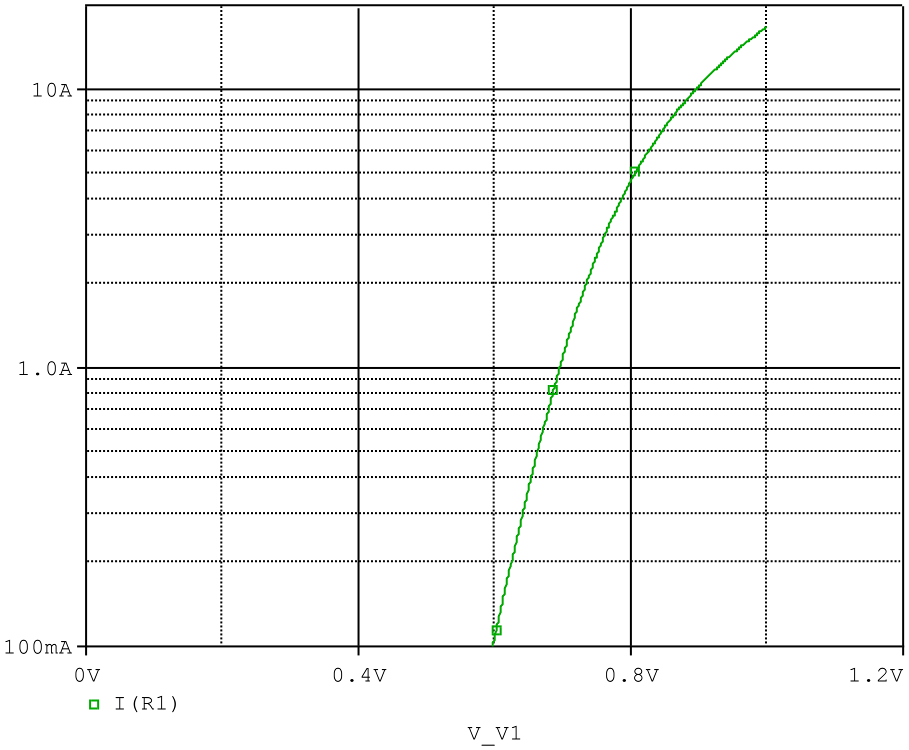


Evaluation circuit

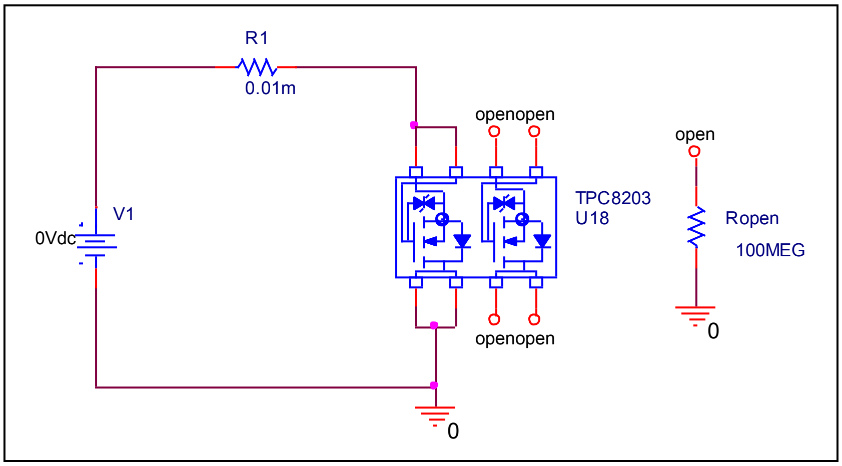


Forward Current Characteristic

Circuit Simulation Result

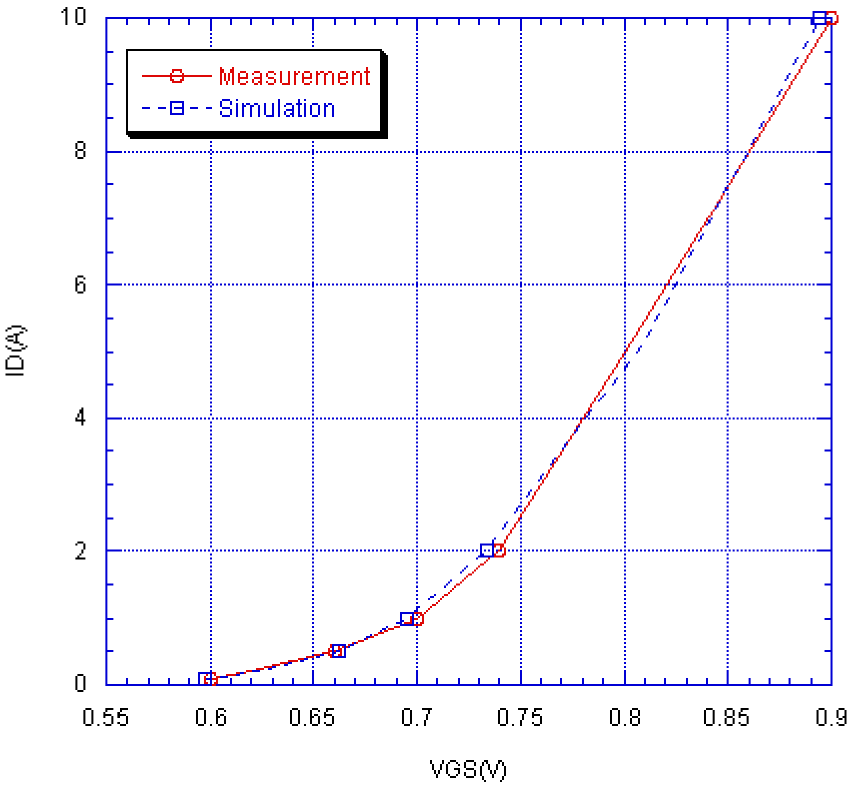


Evaluation Circuit



Comparison Graph

Circuit Simulation Result

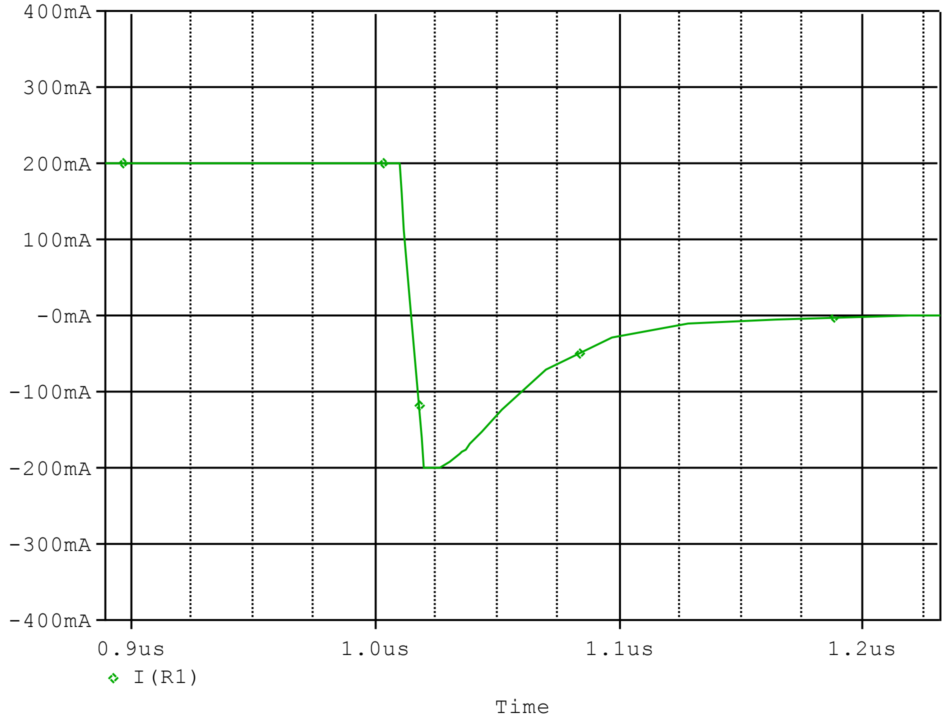


Simulation Result

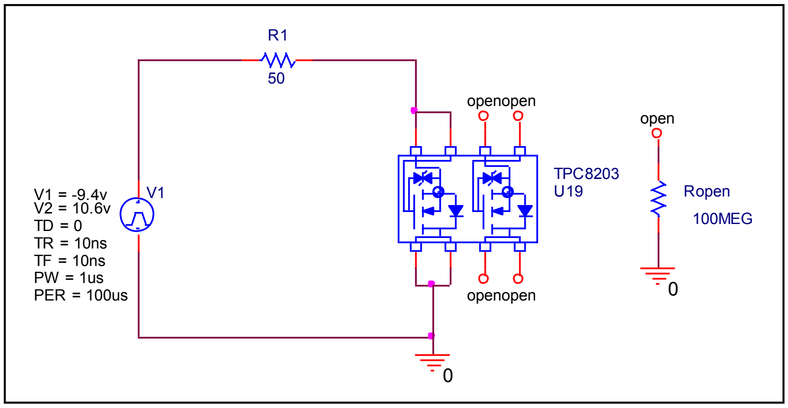
IDR (A)	VDS (V) Measurement	VDS (V) Simulation	%Error
0.100	0.600	0.597	-0.500
0.200	0.620	0.624	0.645
0.500	0.660	0.662	0.303
1.000	0.700	0.695	-0.714
2.000	0.740	0.734	-0.811
5.000	0.800	0.806	0.750
10.000	0.900	0.894	-0.667

Reverse Recovery Characteristic

Circuit Simulation Result



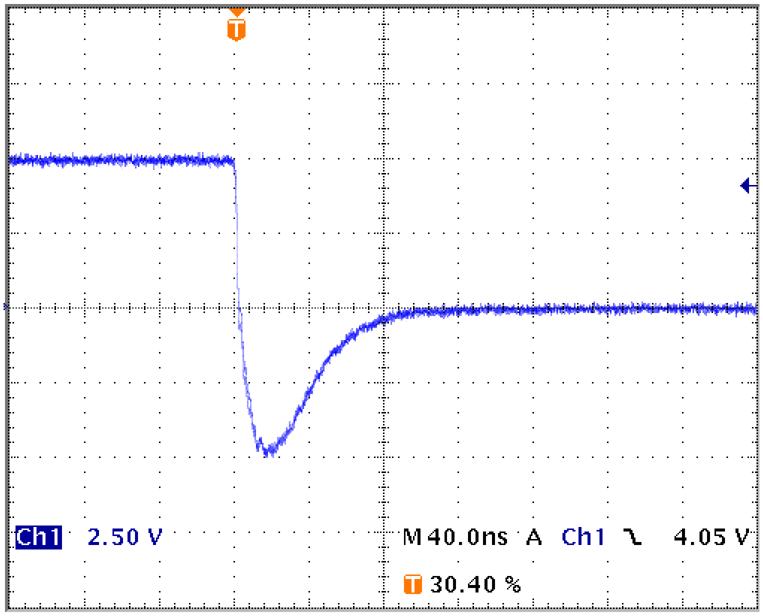
Evaluation Circuit



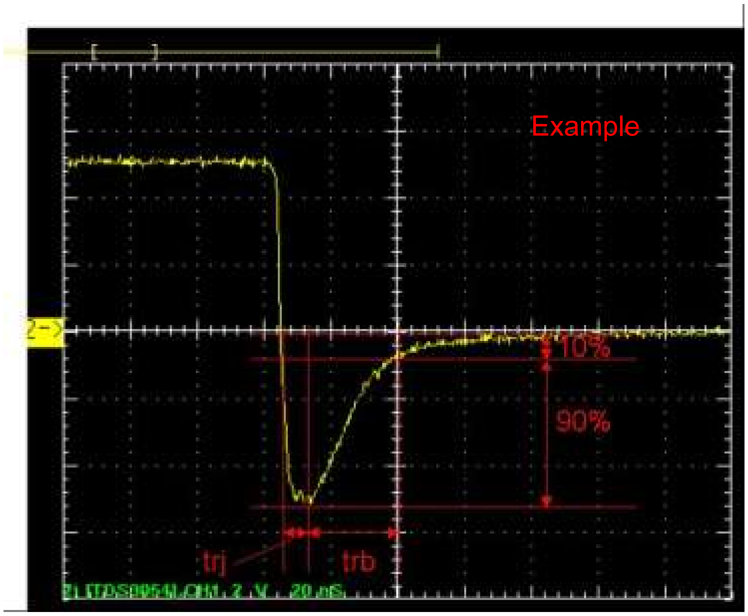
Compare Measurement vs. Simulation

	Measurement		Simulation		Error (%)
trj	**10.300**	**ns**	**10.344**	**ns**	**0.427**
trb	**65.300**	**ns**	**80.020**	**ns**	**22.542**
trr	**75.600**	**ns**	**90.364**	**ns**	**19.529**

Reverse Recovery Characteristic



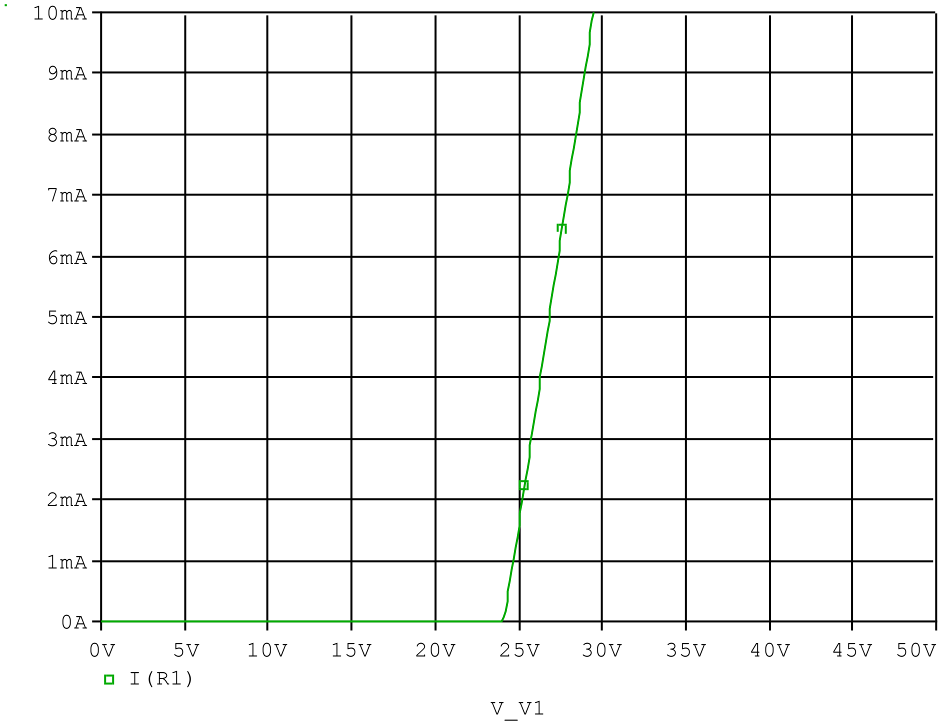
Trj=10.3(ns)
Trb=65.3(ns)
Conditions:Ifwd=Irev=0.2(A),Rl=50



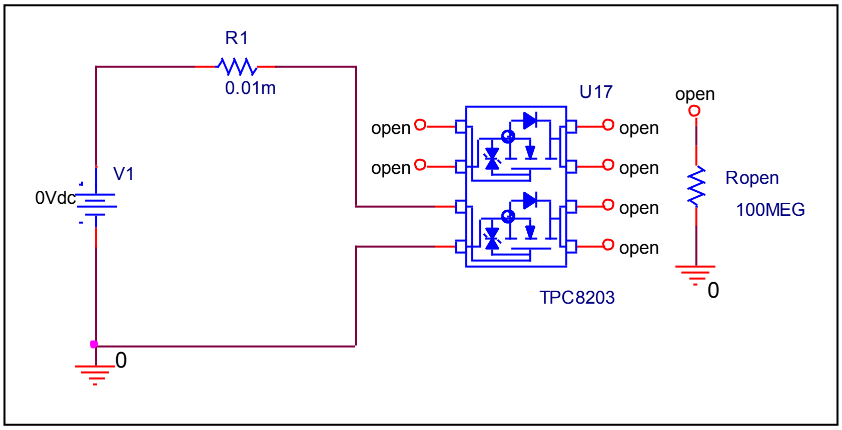
Relation between trj and trb

Zener Voltage Characteristic

Circuit Simulation Result



Evaluation Circuit



Zener Voltage Characteristic **Reference**