Device Modeling Report

COMPONENTS: Power MOSFET (Professional)
PART NUMBER: TPCA8005-H
MANUFACTURER: TOSHIBA
Body Diode (Special) / ESD Protection Diode

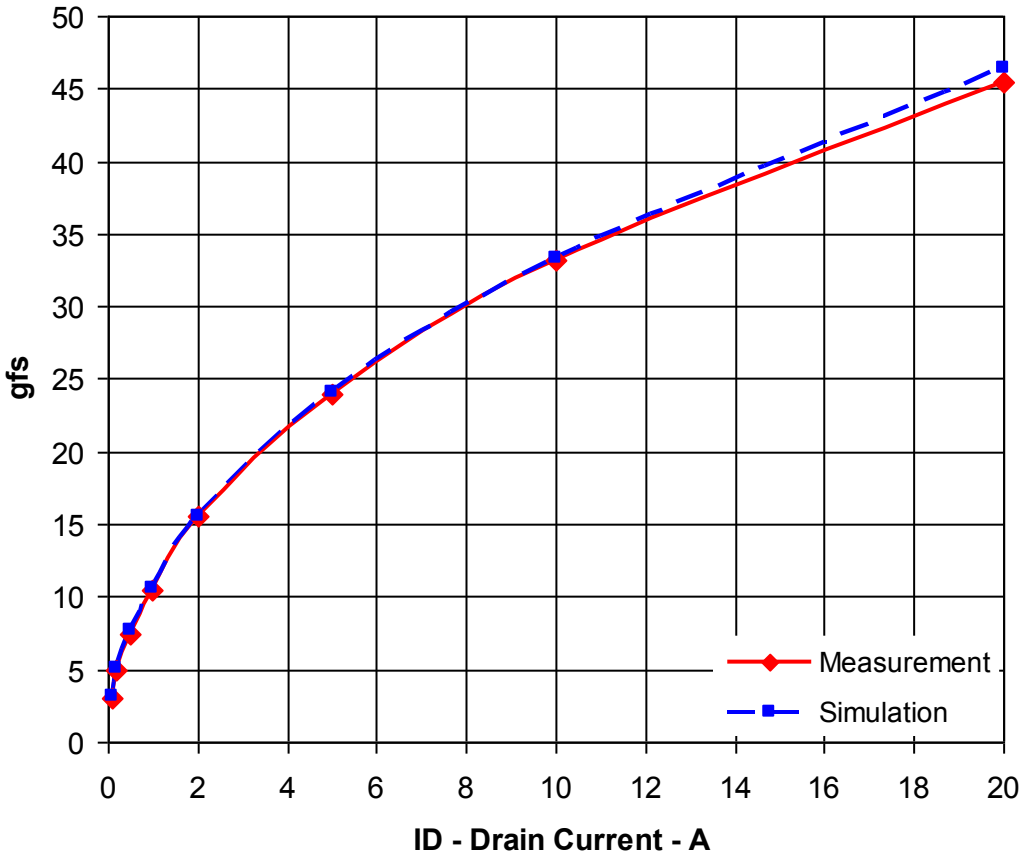
Bee Technologies Inc.

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	Mobility Modulation
KAPPA	Saturation Field Factor
VMAX	Maximum Drift Velocity of Carriers
XJ	Metallurgical Junction Depth
UO	Surface Mobility

Transconductance Characteristic

Circuit Simulation Result

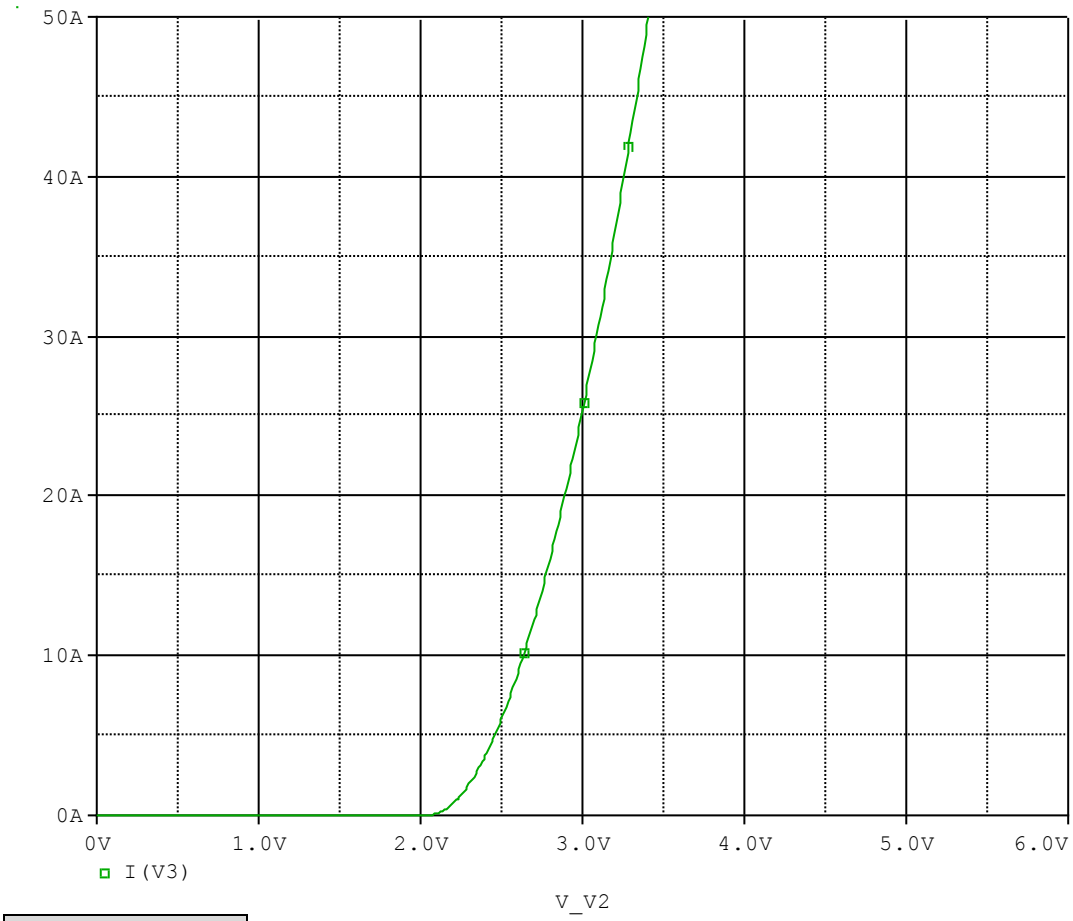


Comparison table

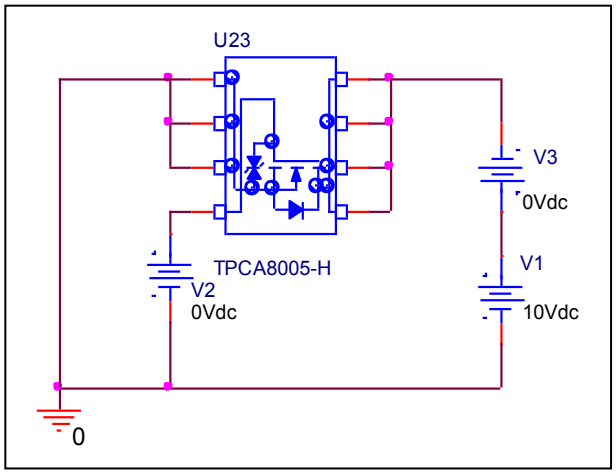
Id(A)	gfs		Error(%)
	Measurement	Simulation	
0.1	3.000	3.125	4.167
0.2	5.000	5.128	2.560
0.5	7.500	7.692	2.560
1	10.500	10.638	1.314
2	15.500	15.625	0.806
5	24.000	24.038	0.158
10	33.200	33.333	0.401
20	45.500	46.404	1.987

Vgs-Id Characteristic

Circuit Simulation result

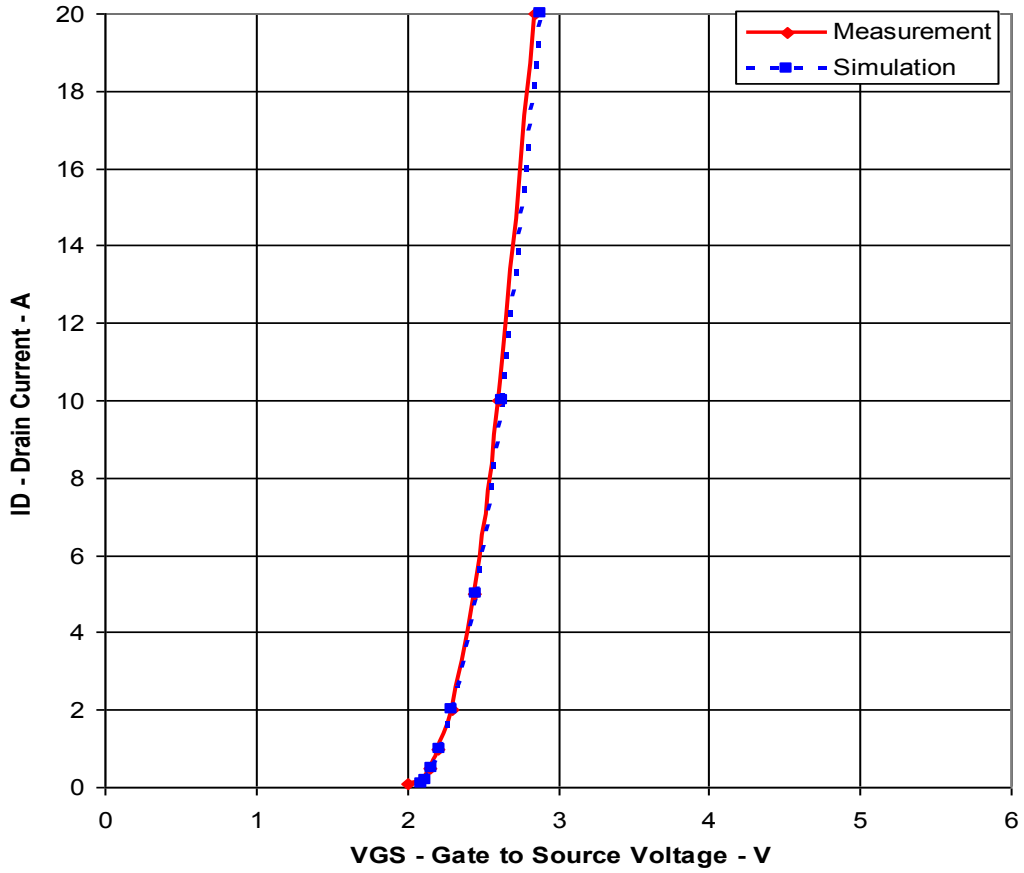


Evaluation circuit



Comparison Graph

Circuit Simulation Result

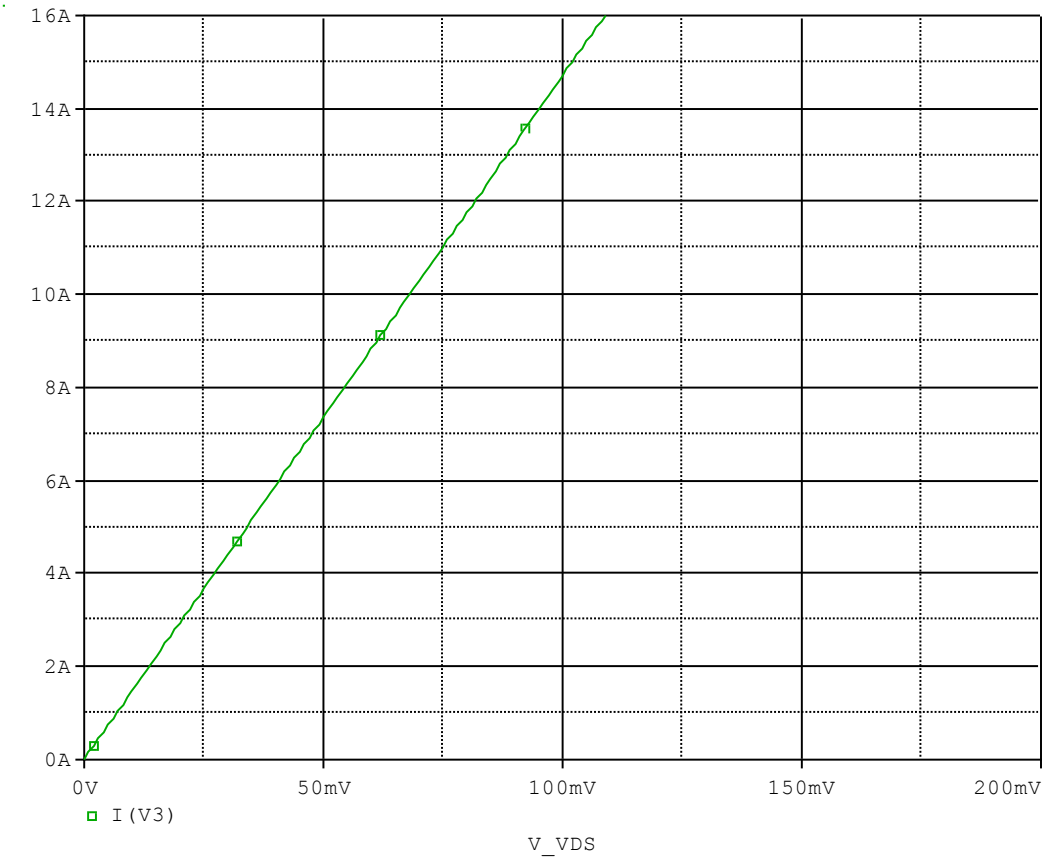


Simulation Result

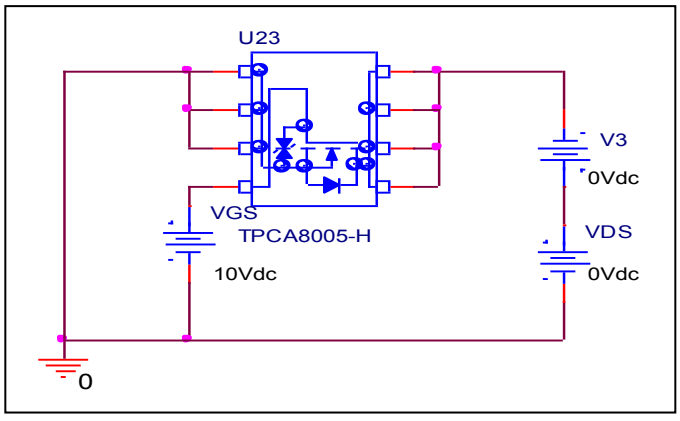
I_D(A)	V_{GS}(V)		Error (%)
	Measurement	Simulation	
0.1	2.000	2.097	4.855
0.2	2.100	2.122	1.024
0.5	2.150	2.170	0.930
1	2.200	2.225	1.114
2	2.300	2.303	0.122
5	2.450	2.458	0.335
10	2.600	2.635	1.358
20	2.850	2.890	1.389

Rds(on) Characteristic

Circuit Simulation result



Evaluation circuit

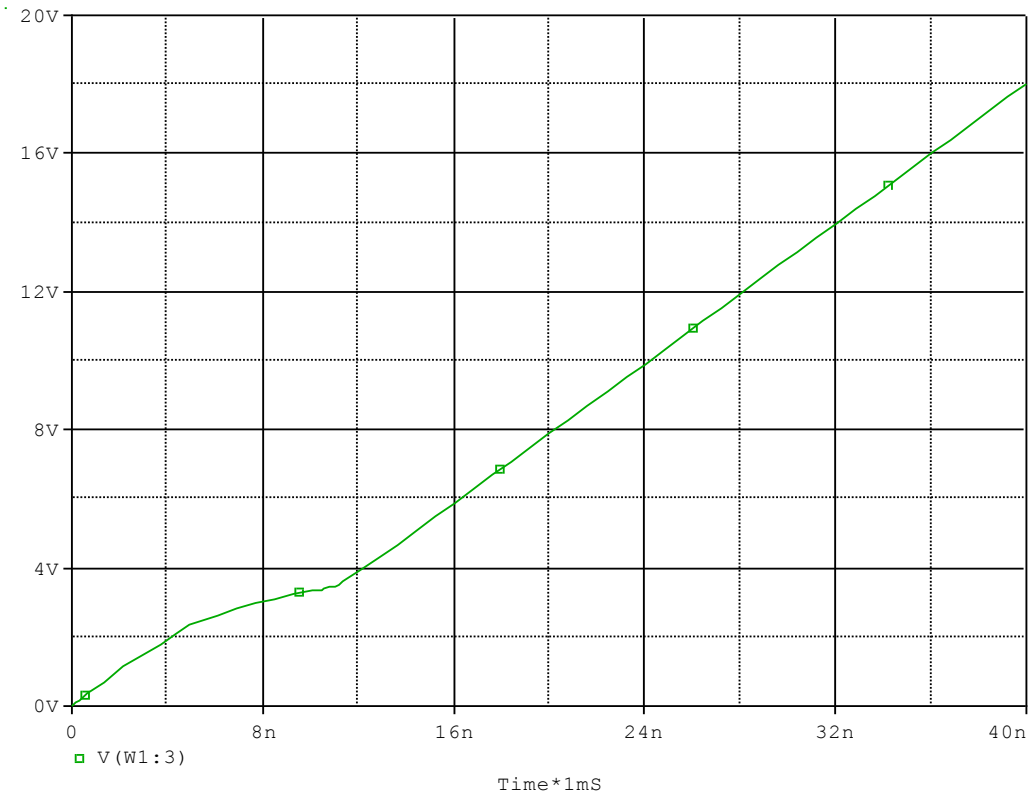


Simulation Result

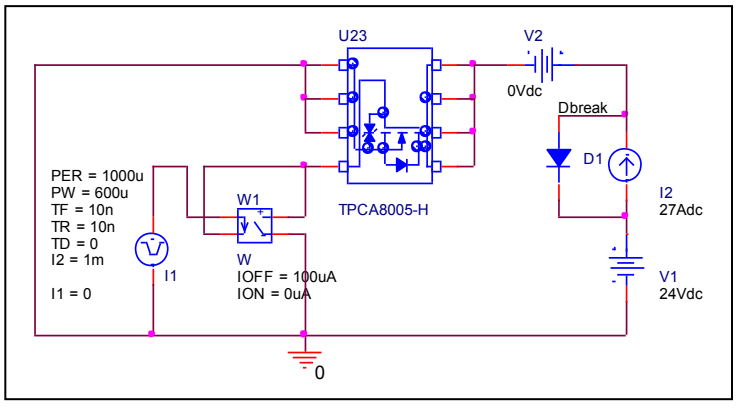
I_D=14A, V_{GS}=10V	Measurement		Simulation		Error (%)
R_{DS} (on)	6.800	mΩ	6.799	mΩ	-0.015

Gate Charge Characteristic

Circuit Simulation result



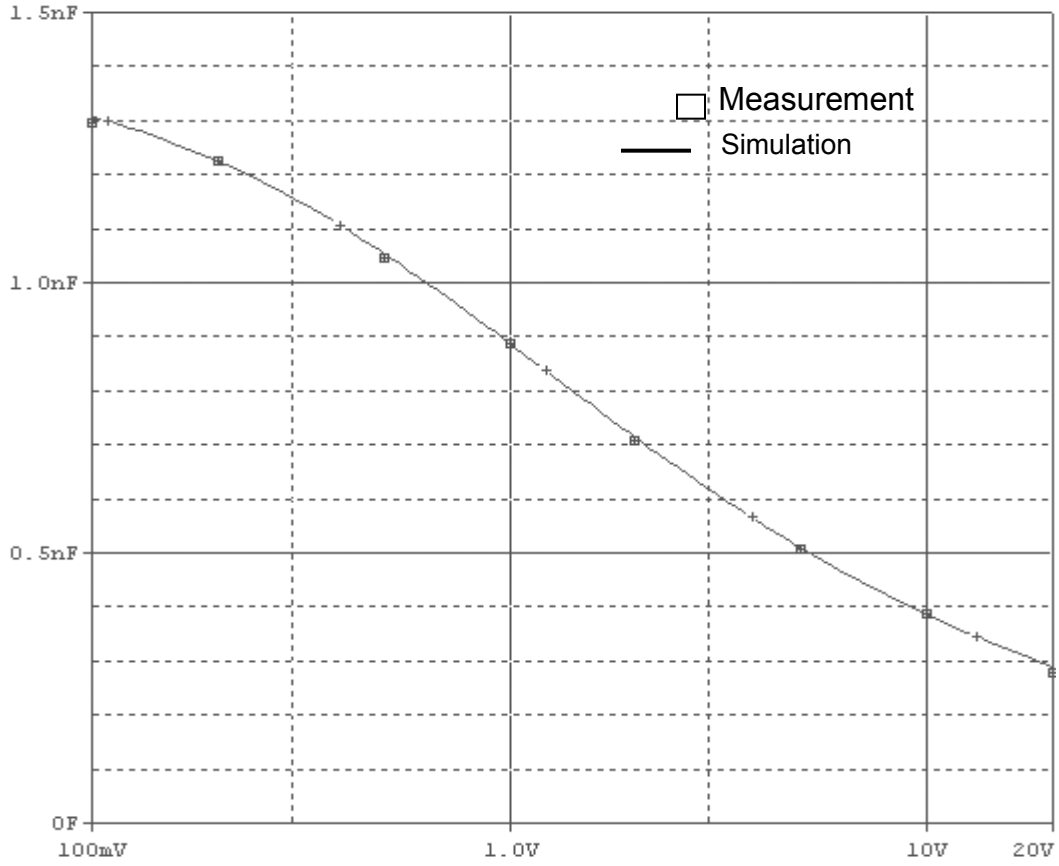
Evaluation circuit



Simulation Result

V_{DD}=24V,I_D=27A ,V_{GS}=10V	Measurement	Simulation	Error (%)
Qgs(nC)	4.700	4.724	0.511
Qgd(nC)	5.600	5.696	1.714
Qg	24.000	24.207	0.863

Capacitance Characteristic

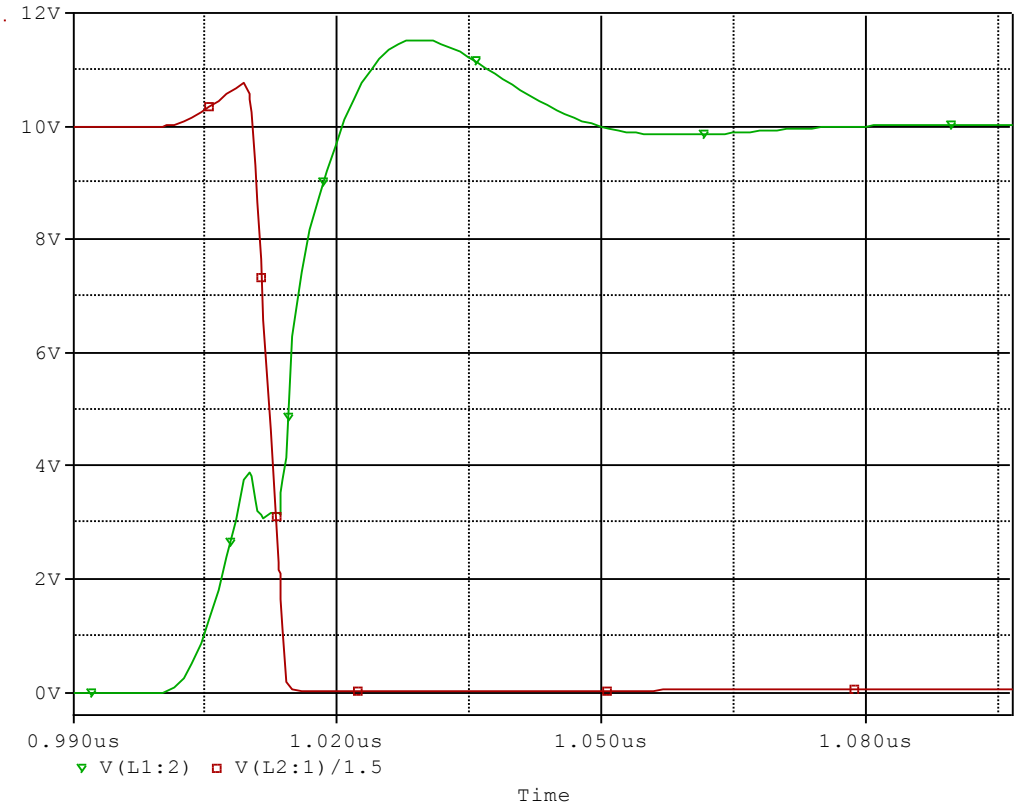


Simulation Result

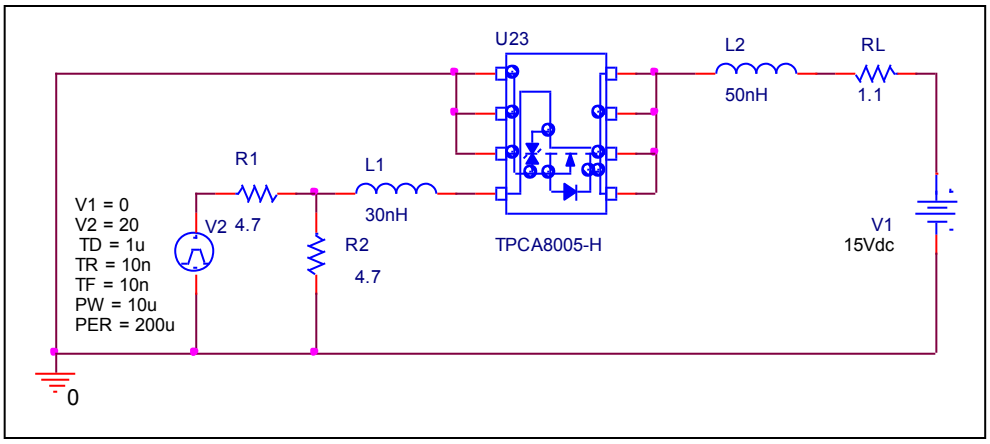
V_{DS}(V)	Cbd(pF)		Error(%)
	Measurement	Simulation	
0.1	1300.000	1305.000	0.385
0.2	1230.000	1232.000	0.163
0.5	1050.000	1053.000	0.286
1	890.000	890.000	0.000
2	710.000	712.000	0.282
5	510.000	511.000	0.196
10	390.000	390.000	0.000
20	280.000	284.000	1.429

Switching Time Characteristic

Circuit Simulation result



Evaluation circuit

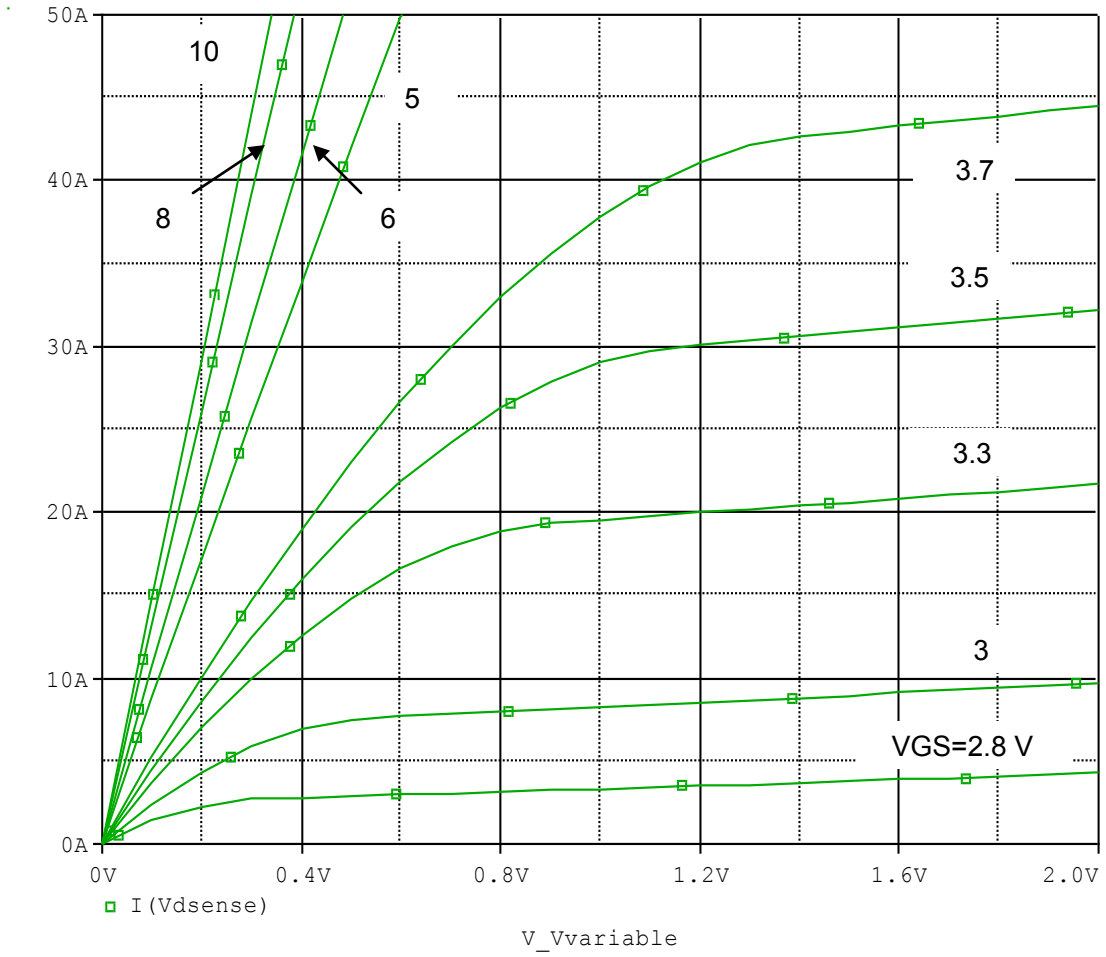


Simulation Result

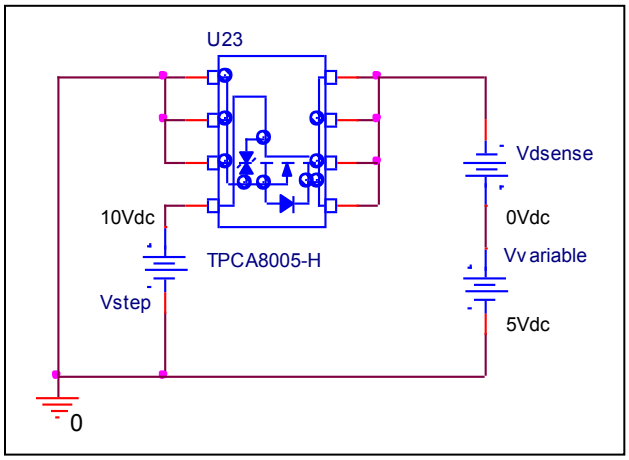
I_D=14 A, V_{DD}=15V V_{GS}=0/10V	Measurement	Simulation	Error(%)
Ton(ns)	9.000	9.094	1.044

Output Characteristic

Circuit Simulation result

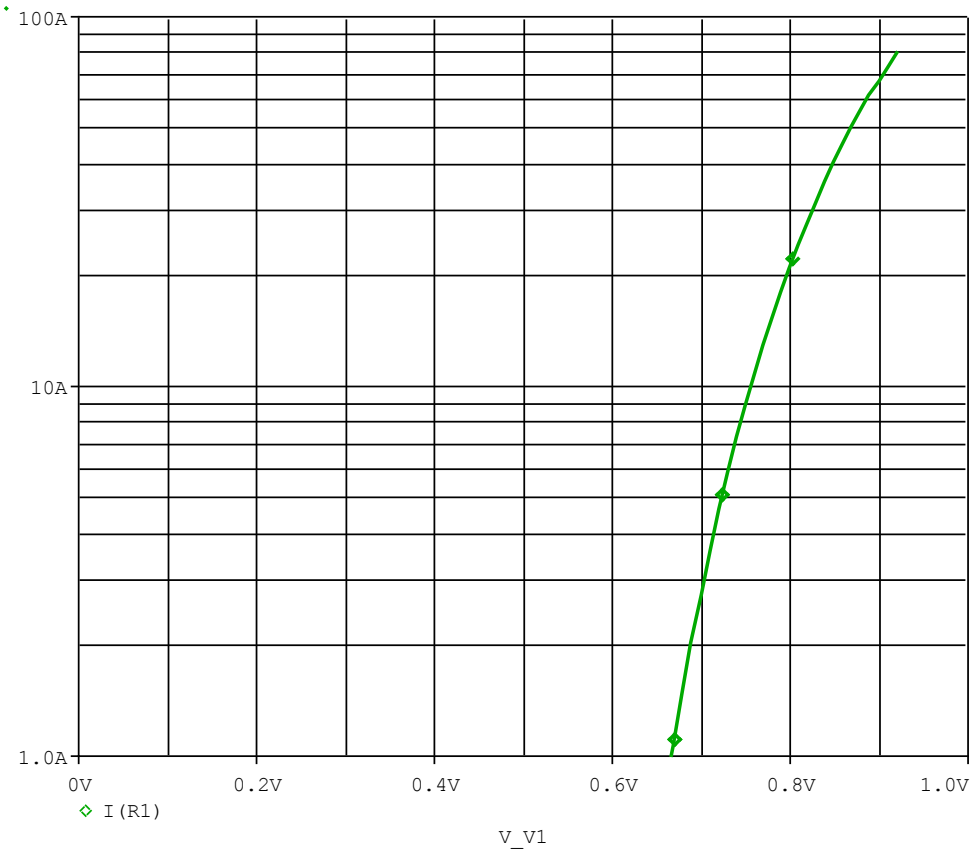


Evaluation circuit

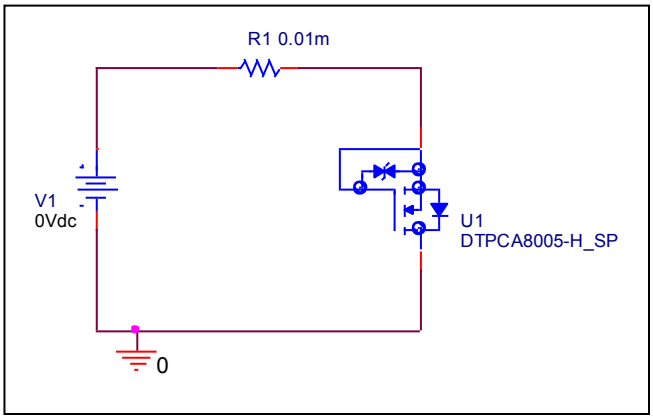


Forward Current Characteristic

Circuit Simulation Result

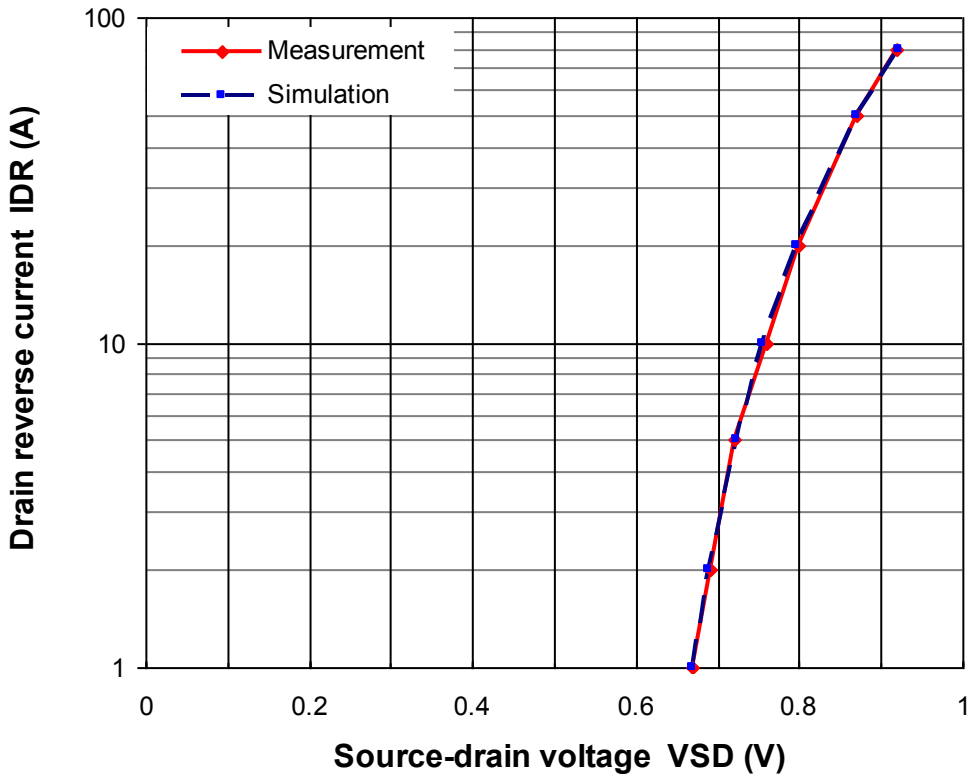


Evaluation Circuit



Comparison Graph

Circuit Simulation Result

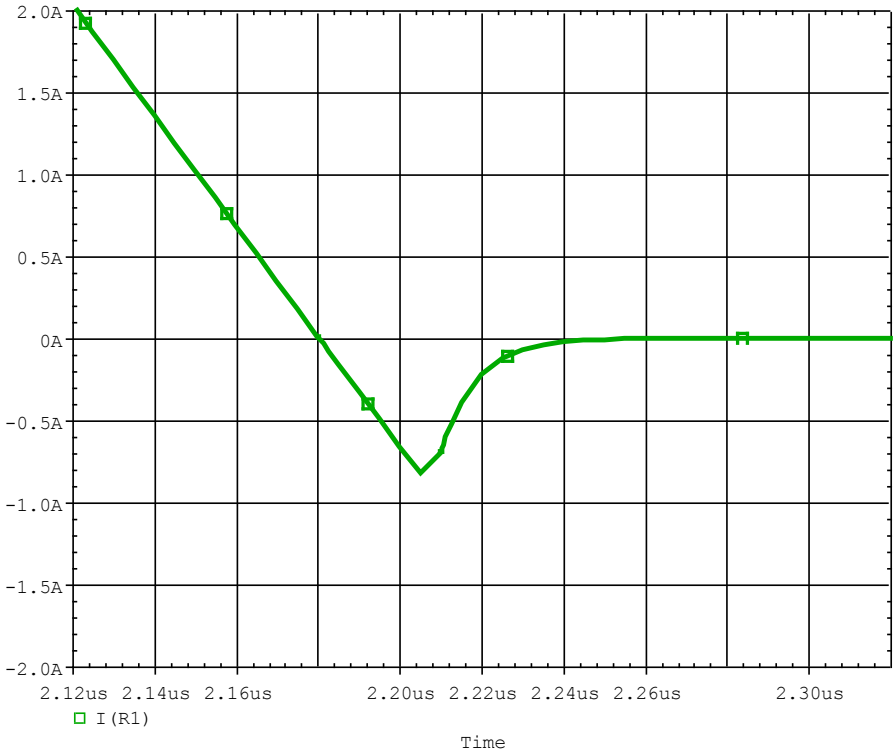


Simulation Result

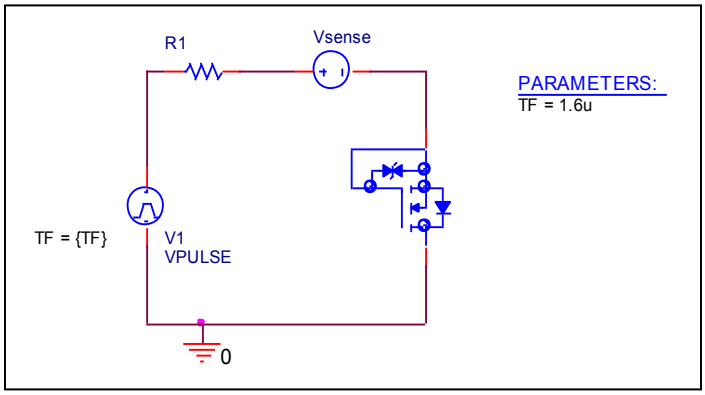
IDR(A)	VSD(V)		%Error
	Measurement	Simulation	
1	0.6700	0.6683	-0.2537
2	0.6900	0.6895	-0.0725
5	0.7200	0.7231	0.4306
10	0.7600	0.7561	-0.5132
20	0.8000	0.7974	-0.3250
50	0.8700	0.8702	0.0230

Reverse Recovery Characteristics (Body Diode)

Circuit Simulation Result



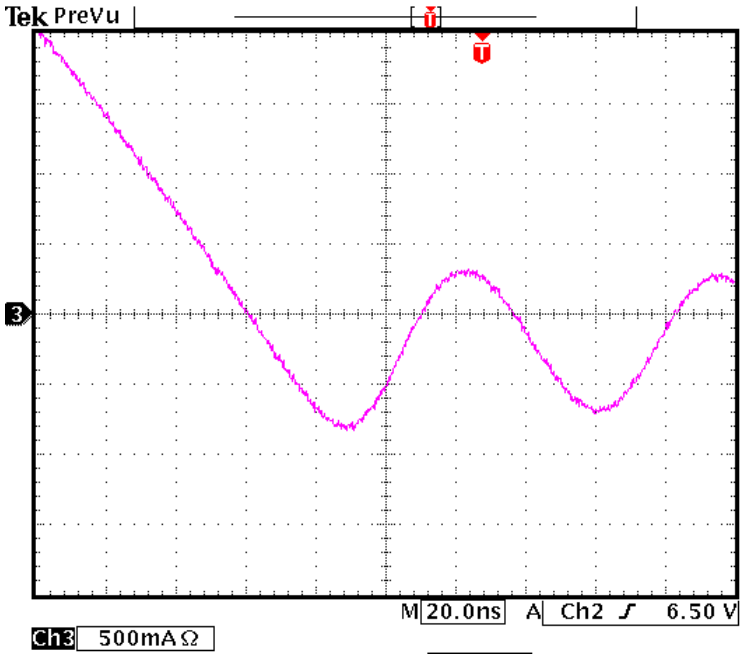
Evaluation Circuit



Compare Measurement vs. Simulation

	Measurement		Simulation		Error (%)
trr	45.2	ns	46.12	ns	2.04

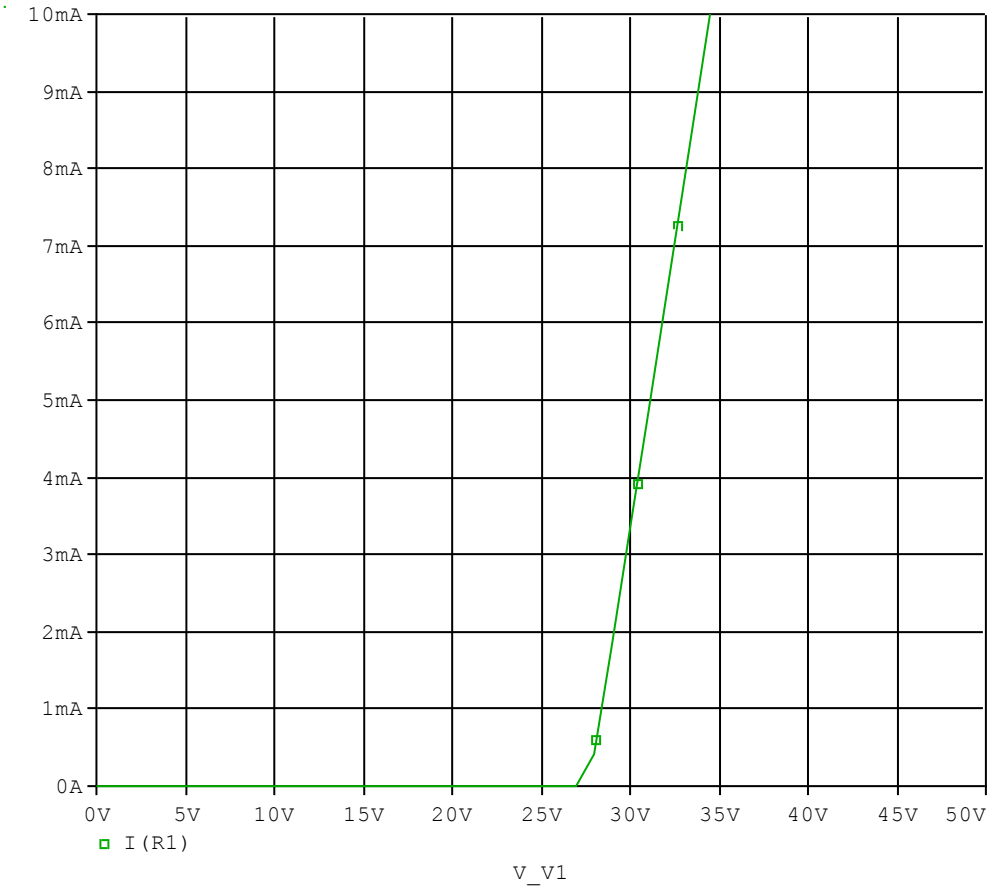
Reverse Recovery Characteristic (Body Diode) Reference



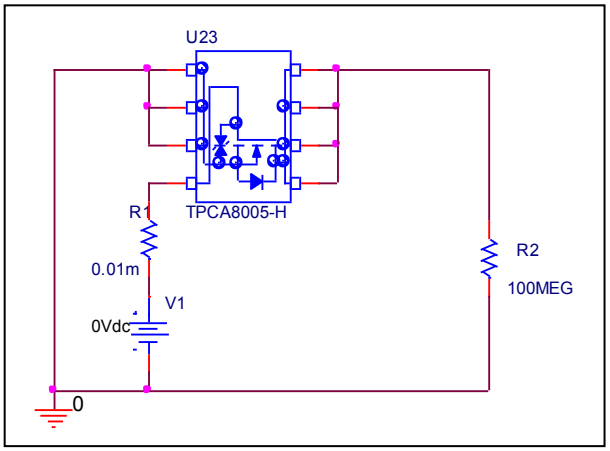
Trr=45.2ns
Conditions:Ifwd=di/dt=30A/us

Zener Voltage Characteristic

Circuit Simulation Result



Evaluation Circuit



Zener Voltage Characteristic Reference