Device Modeling Report

COMPONENTS: Power MOSFET (Professional)
PART NUMBER: TPC6107
MANUFACTURER: TOSHIBA
REMARK: P Channel Model
Body Diode (Professional) / ESD Protection Diode

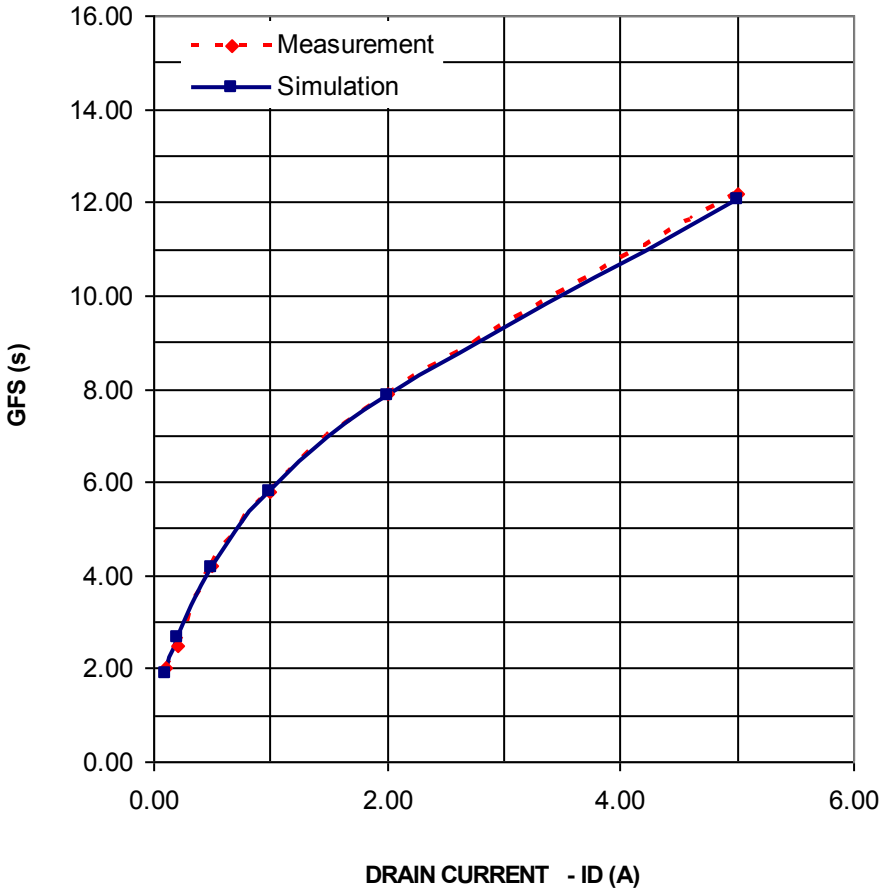
Bee Technologies Inc.

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

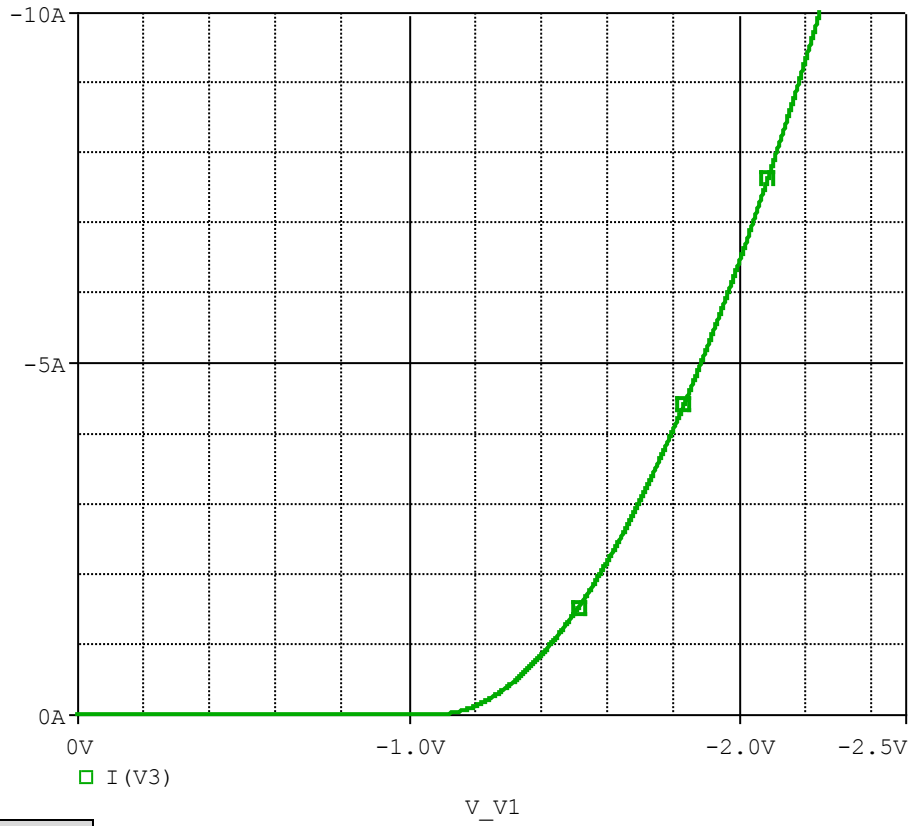


Comparison table

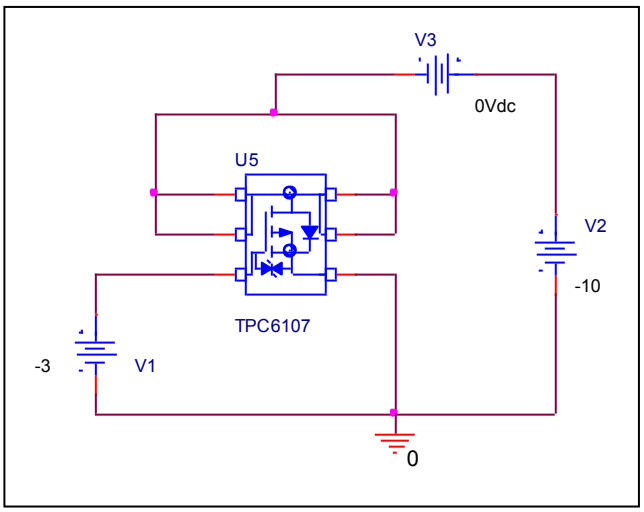
Id(A)	gfs		Error(%)
	Measurement	Simulation	
-0.100	2.000	1.904	-4.800
-0.200	2.500	2.672	6.880
-0.500	4.200	4.163	-0.881
-1.000	5.800	5.787	-0.224
-2.000	7.900	7.830	-0.886
-5.000	12.200	12.057	-1.172

Vgs-Id Characteristic

Circuit Simulation result

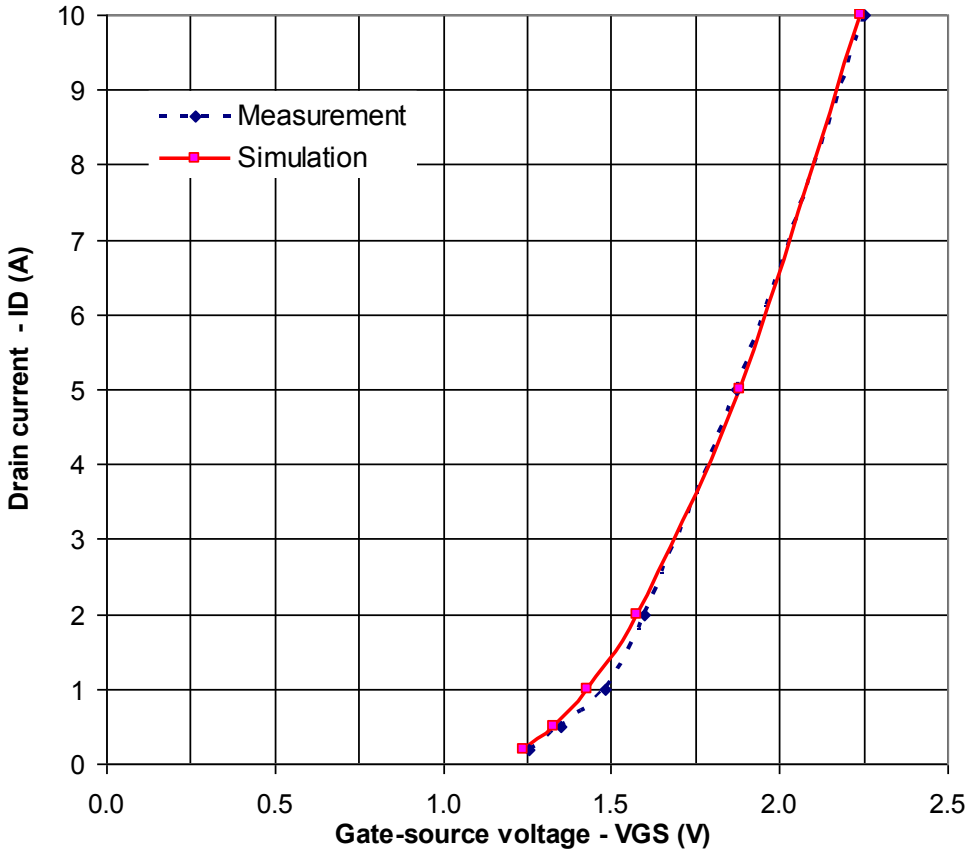


Evaluation circuit



Comparison Graph

Circuit Simulation Result

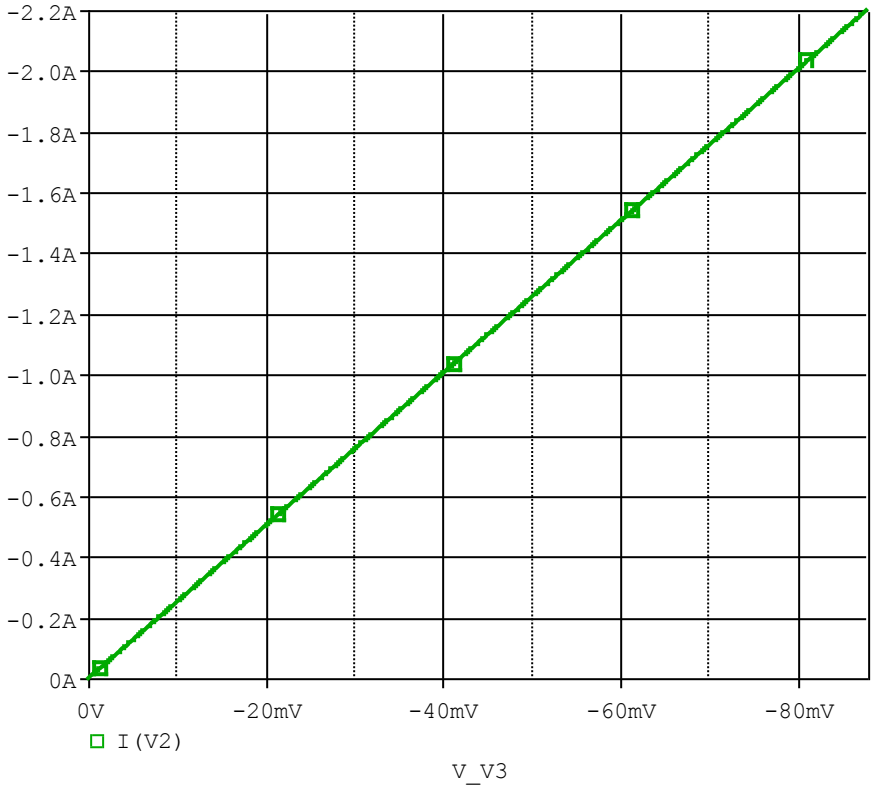


Simulation Result

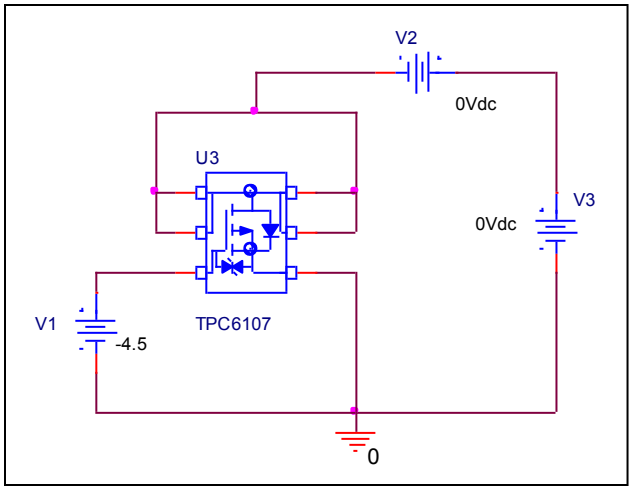
I_D(A)	V_{GS}(V)		Error (%)
	Measurement	Simulation	
-0.200	-1.255	-1.239	-1.275
-0.500	-1.350	-1.329	-1.556
-1.000	-1.480	-1.431	-3.311
-2.000	-1.600	-1.579	-1.313
-5.000	-1.870	-1.883	0.695
-10.000	-2.250	-2.243	-0.311

Rds(on) Characteristic

Circuit Simulation result



Evaluation circuit

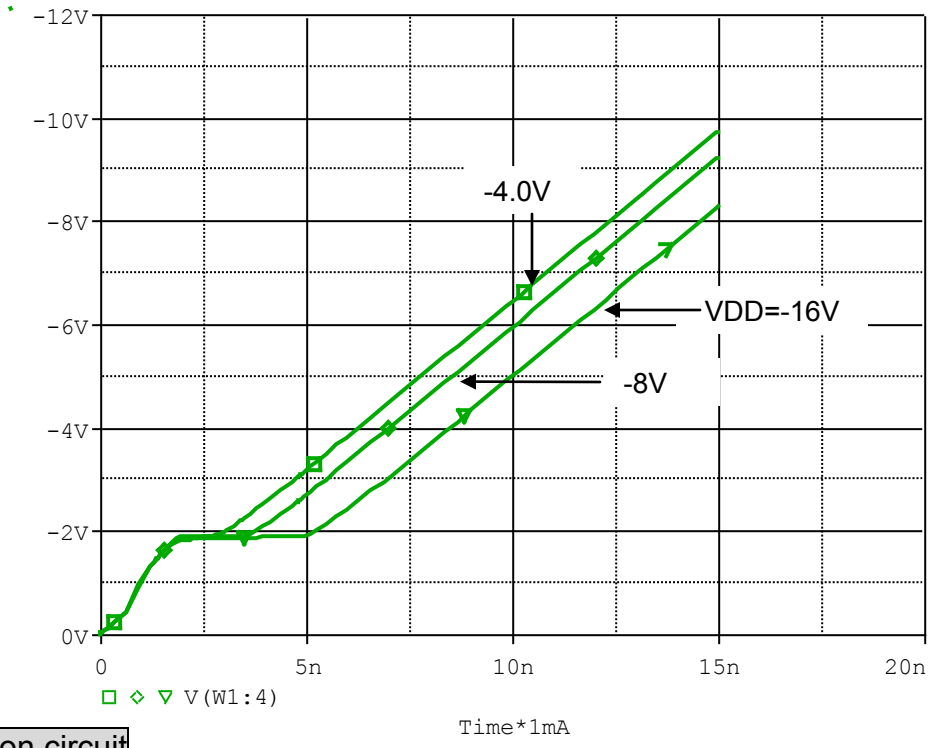


Simulation Result

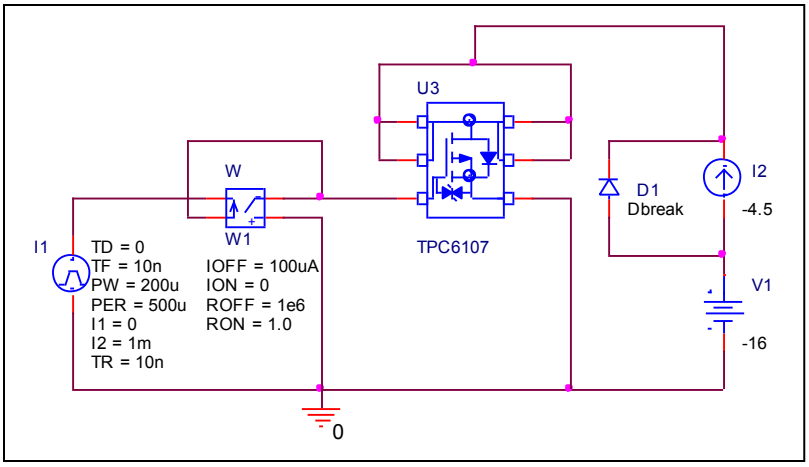
I_D=-2.2A, V_{GS}=-4.5V	Measurement		Simulation		Error (%)
R_{DS} (on)	40.000	mΩ	40.000	mΩ	0.000

Gate Charge Characteristic

Circuit Simulation result



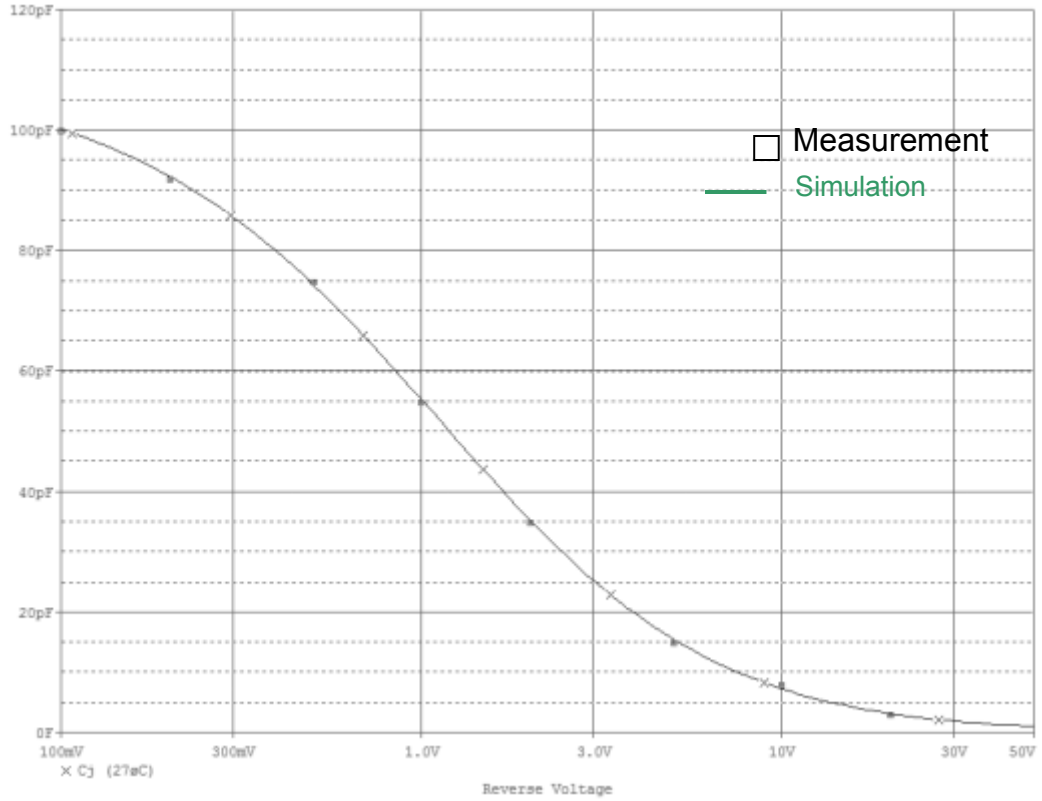
Evaluation circuit



Simulation Result

V_{DD}=-16V,I_D=-4.5A ,V_{GS}=-5V	Measurement		Simulation		Error (%)
Qgs	2.000	nC	2.052	nC	2.600
Qgd	3.000	nC	2.991	nC	-0.300
Qg	10.000	nC	10.070	nC	0.700

Capacitance Characteristic

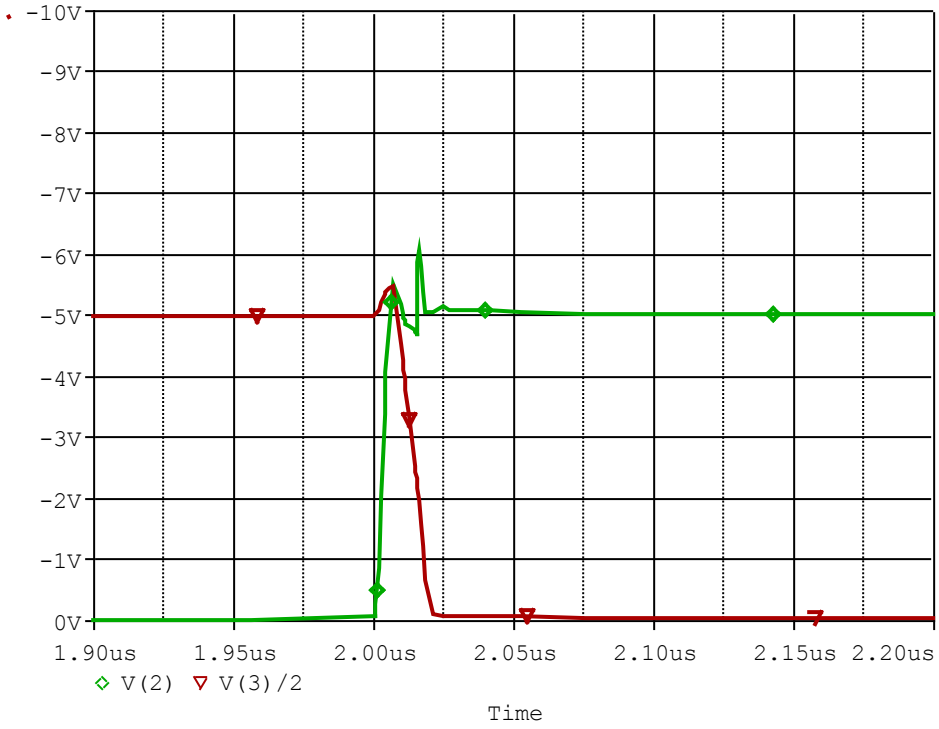


Simulation Result

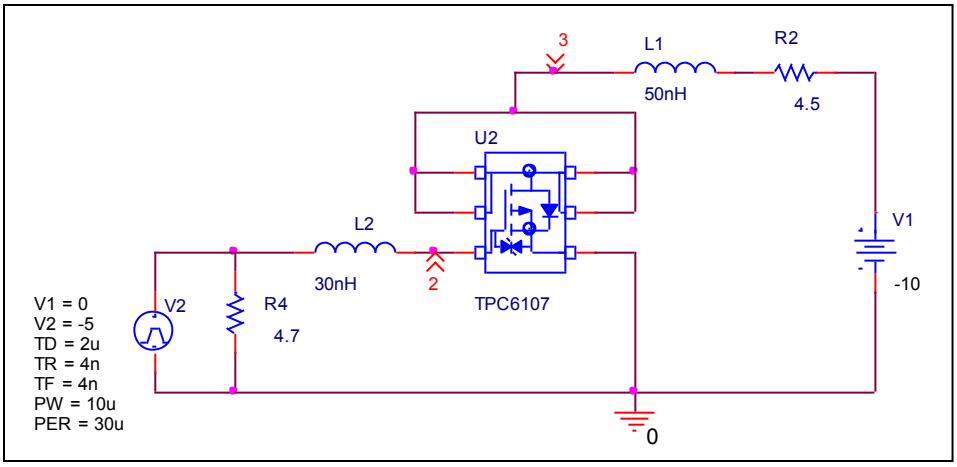
V_{DS}(V)	Cbd(pF)		Error(%)
	Measurement	Simulation	
-0.100	100.000	100.000	0.000
-0.200	92.000	90.000	-2.174
-0.500	75.000	74.000	-1.333
-1.000	55.000	53.000	-3.636
-2.000	35.000	34.500	-1.429
-5.000	15.000	14.500	-3.333
-10.000	8.000	8.000	0.000
-20.000	4.000	4.100	2.500

SwitchingTime Characteristic

Circuit Simulation result



Evaluation circuit

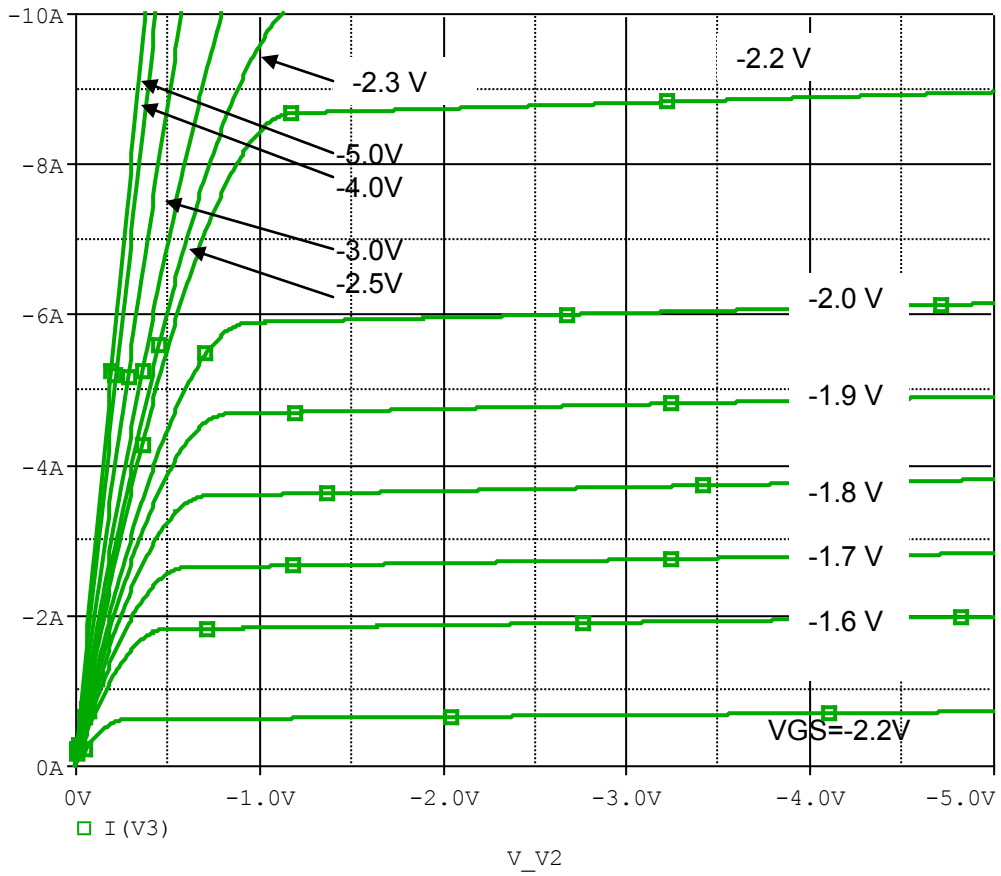


Simulation Result

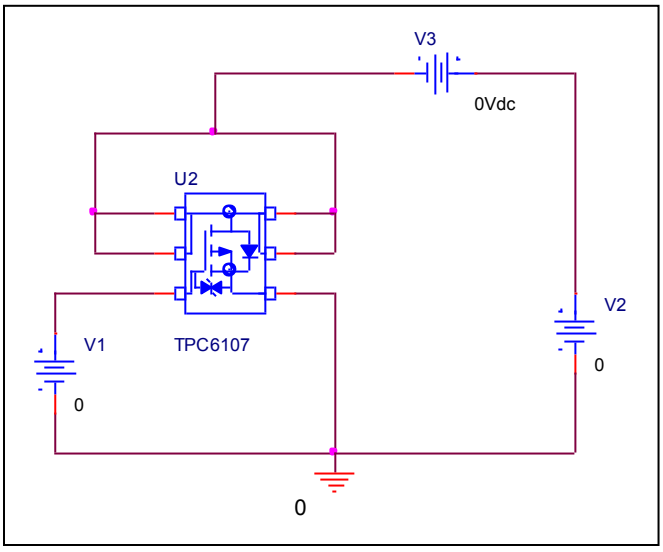
I_D=-2.2A, V_{DD}=-10V V_{GS}=-5V	Measurement		Simulation		Error(%)
ton	16.000	ns	16.113	ns	0.706

Output Characteristic

Circuit Simulation result

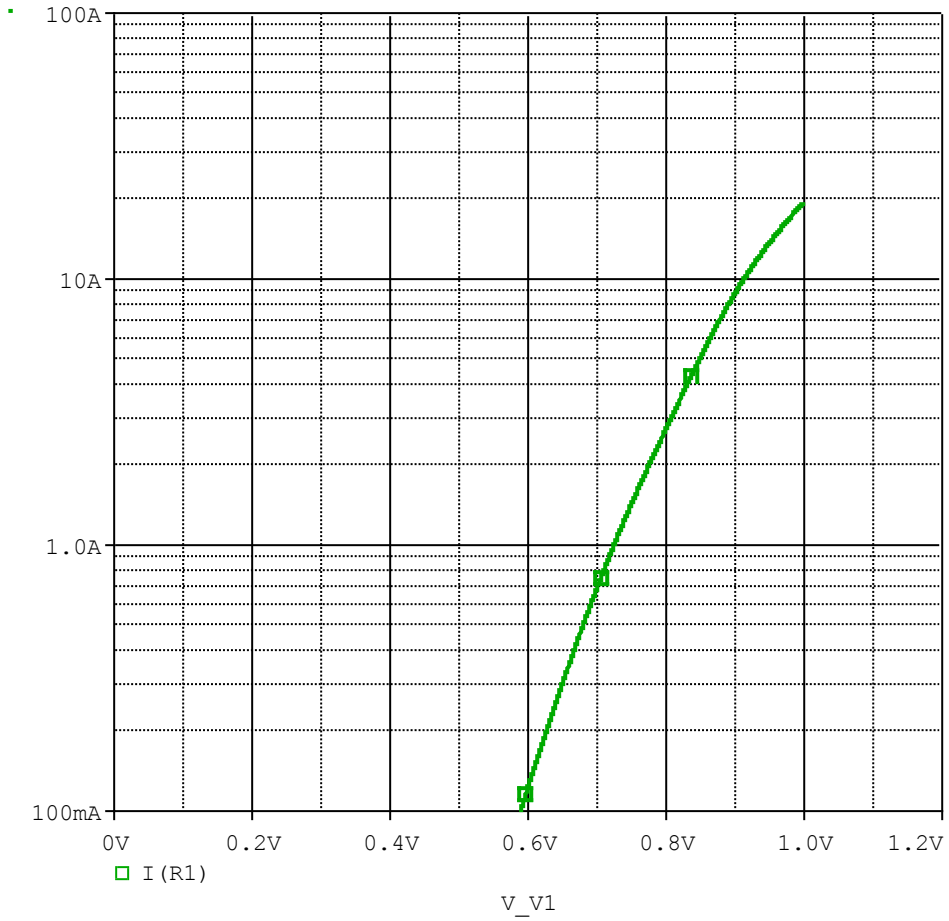


Evaluation circuit

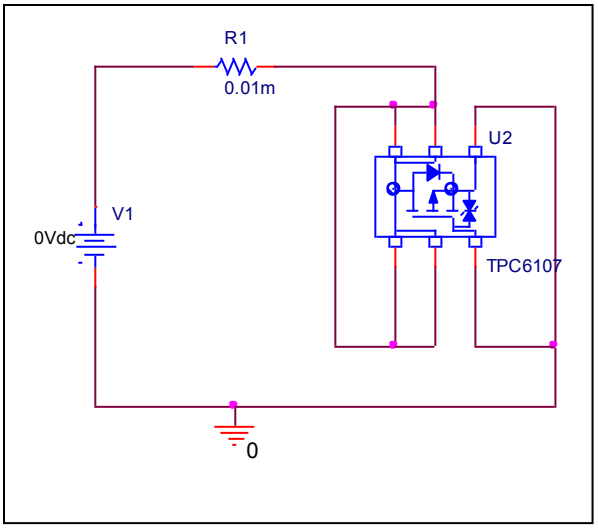


Forward Current Characteristic

Circuit Simulation Result

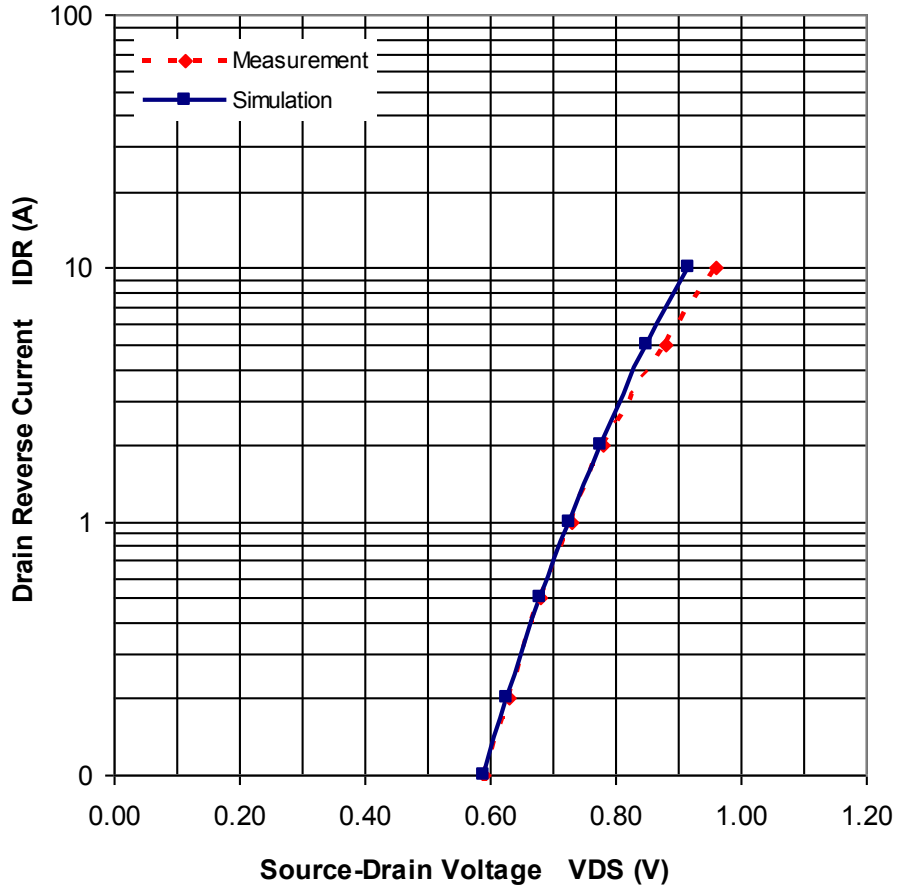


Evaluation Circuit



Comparison Graph

Circuit Simulation Result

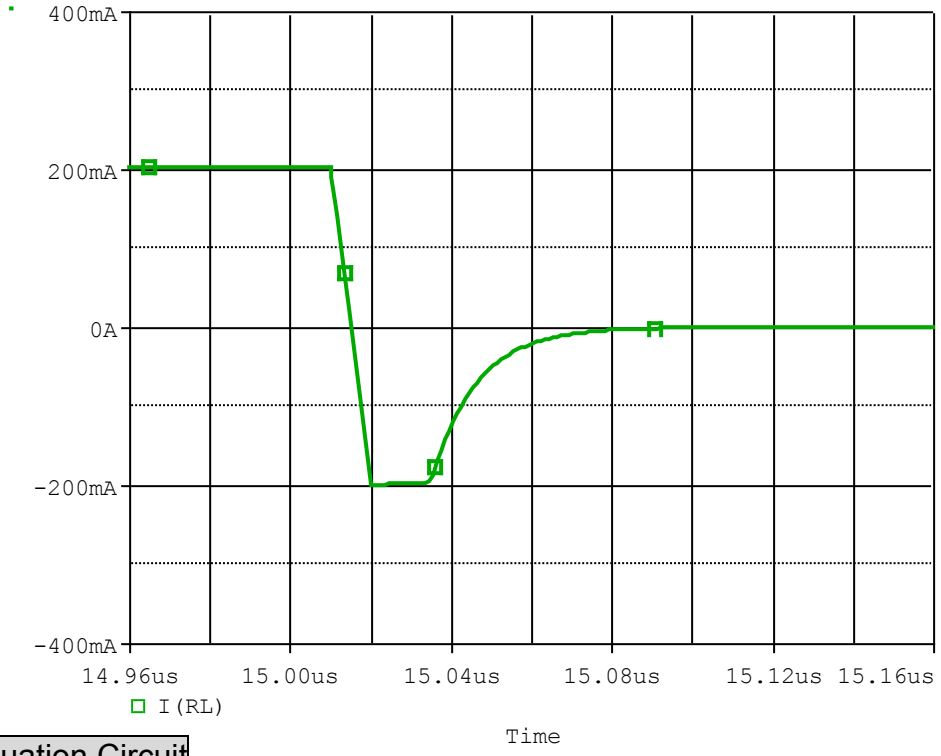


Simulation Result

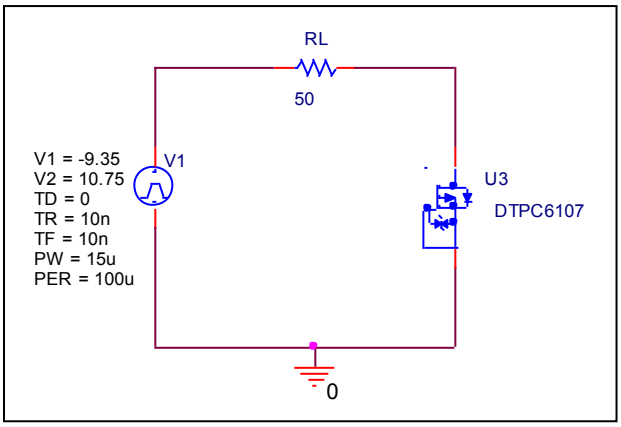
IDR(A)	VDS(V) Measurement	VDS(V) Simulation	%Error
0.100	0.590	0.590	0.000
0.200	0.630	0.628	-0.317
0.500	0.680	0.680	0.000
1.000	0.730	0.726	-0.548
2.000	0.780	0.777	-0.385
5.000	0.880	0.851	-3.295
10.000	0.960	0.915	-4.687

Reverse Recovery Characteristic

Circuit Simulation Result



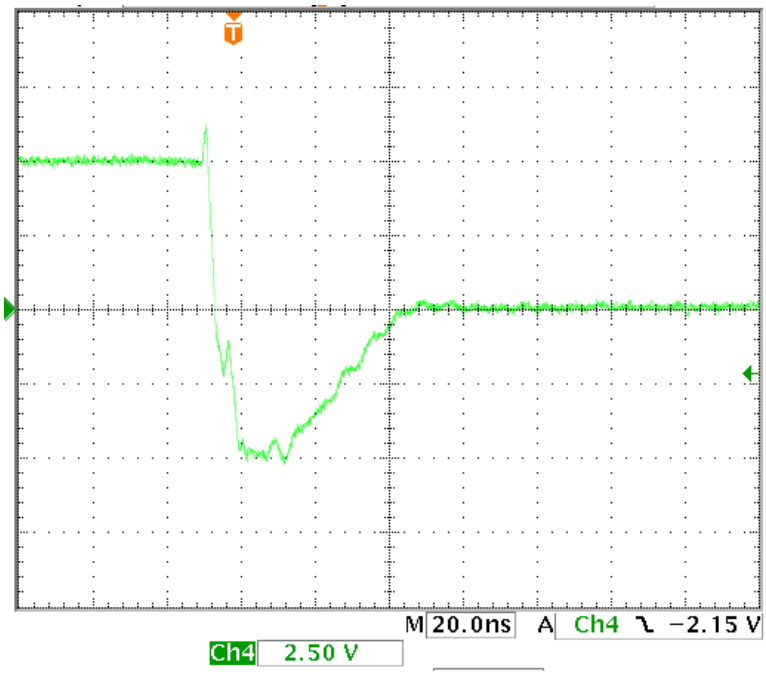
Evaluation Circuit



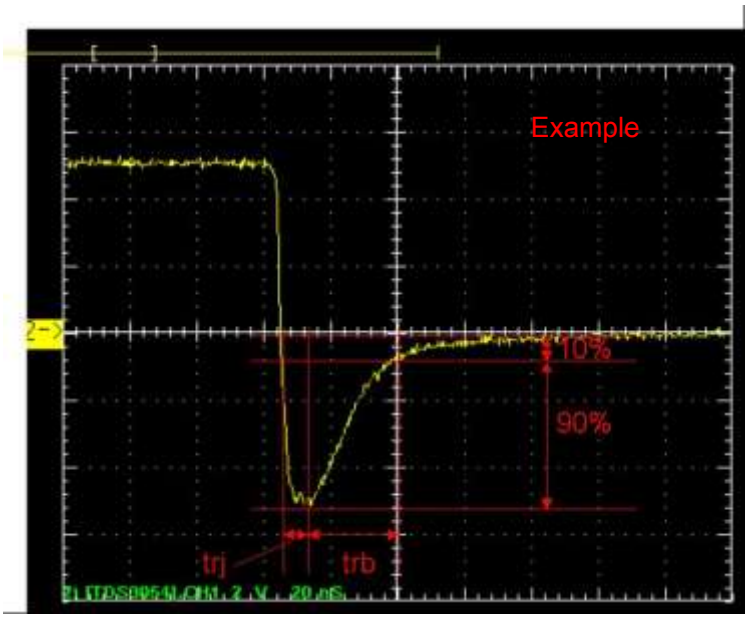
Compare Measurement vs. Simulation

	Measurement		Simulation		Error (%)
trj	18.400	ns	18.619	ns	1.190
trb	27.000	ns	26.291	ns	-2.626
trr	45.400	ns	44.910	ns	-4.852

Reverse Recovery Characteristic Reference



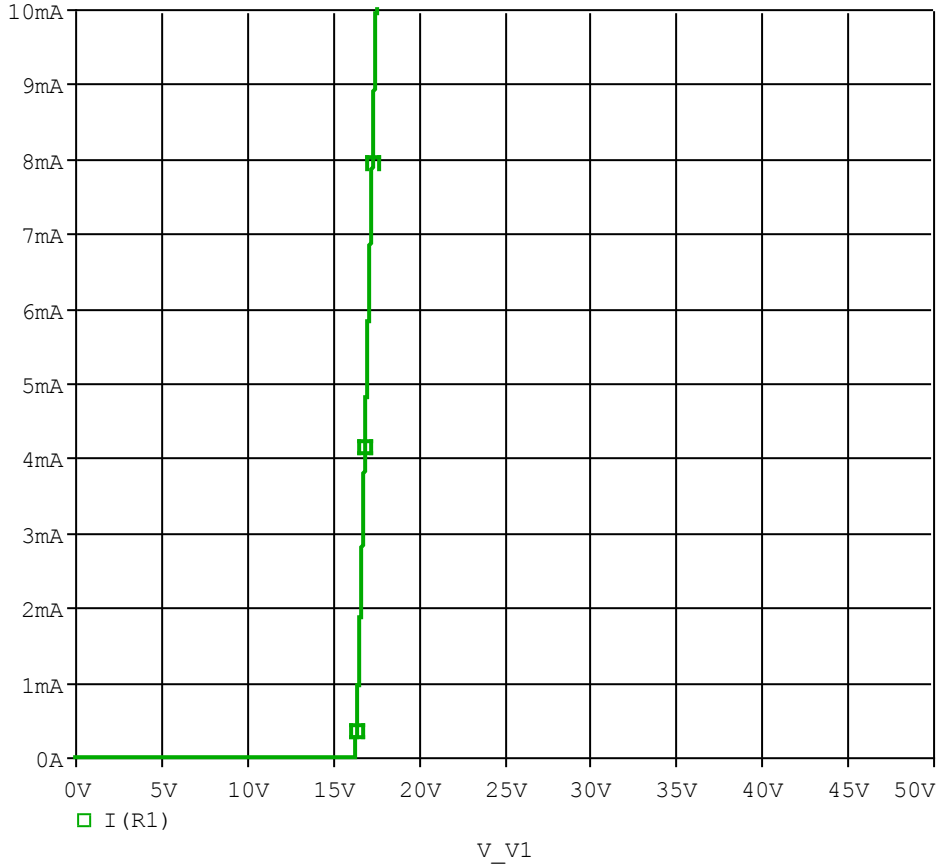
Trj=18.4(ns)
Trb=27.0(ns)
Conditions:Ifwd=Irev=0.2(A),Rl=50



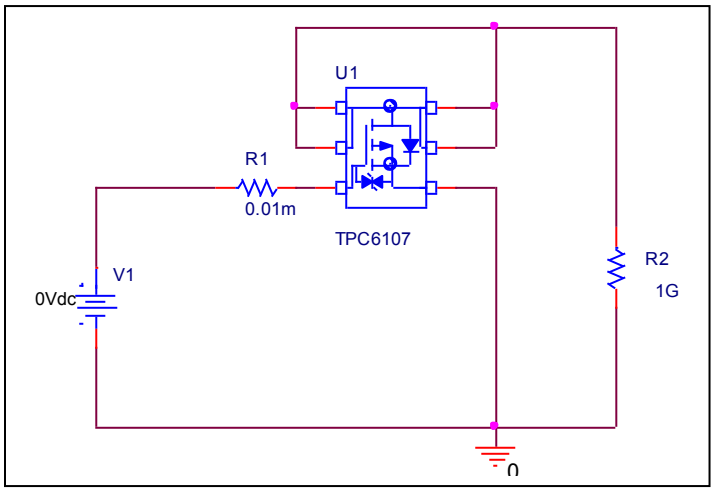
Relation between trj and trb

ZenerVoltage Characteristic

Circuit Simulation Result



Evaluation Circuit



Zener Voltage Characteristic Reference