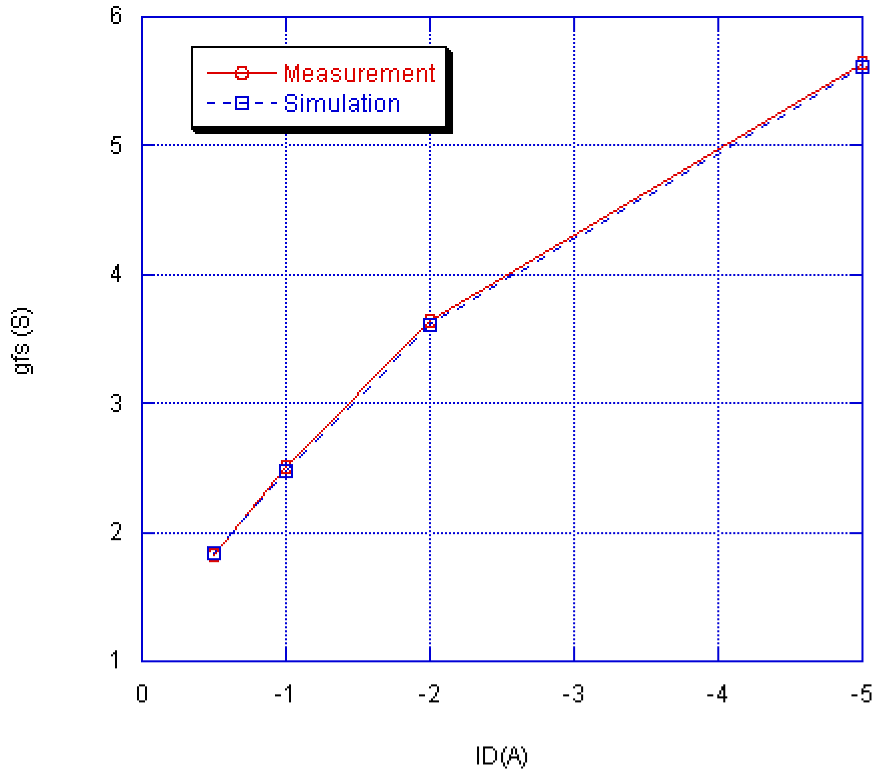
Device Modeling Report

COMPONENTS: Power MOSFET (Model Parameter)
PART NUMBER: 2SJ407
MANUFACTURER: TOSHIBA
REMARK: P Channel Model
Body Diode (Model Parameter) / ESD Protection Diode

Bee Technologies Inc.

Characteristic

Circuit Simulation Result

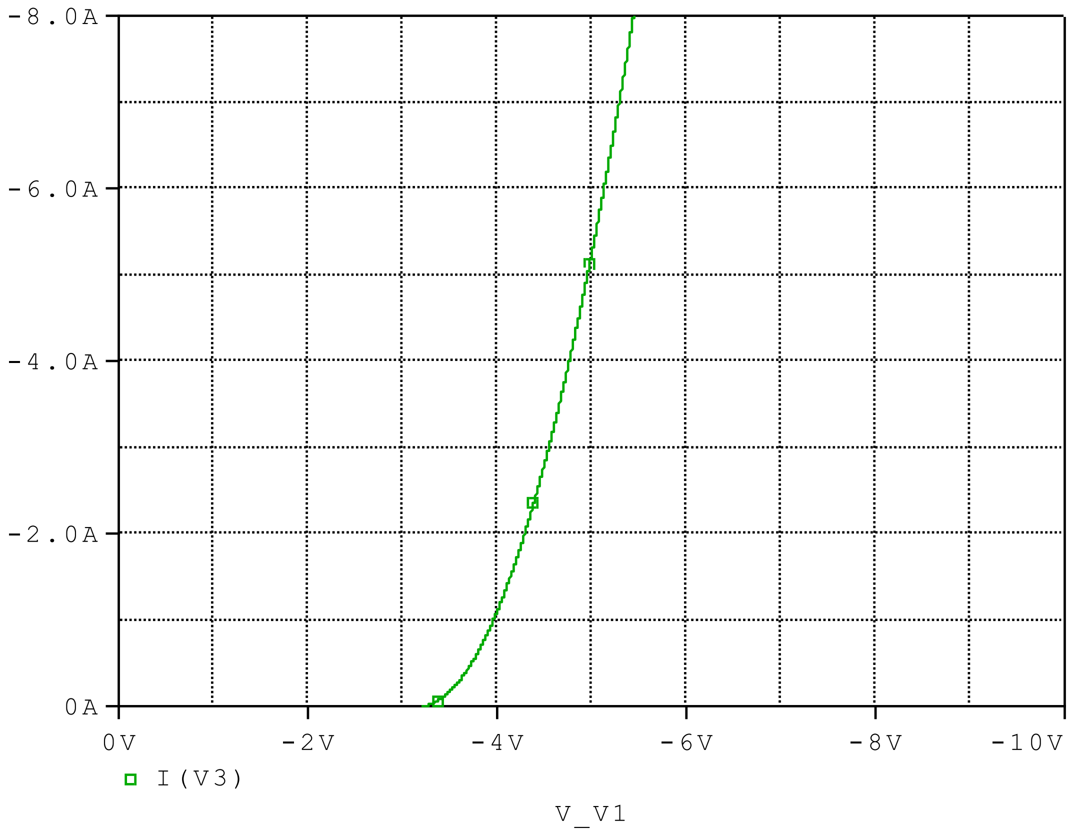


Comparison table

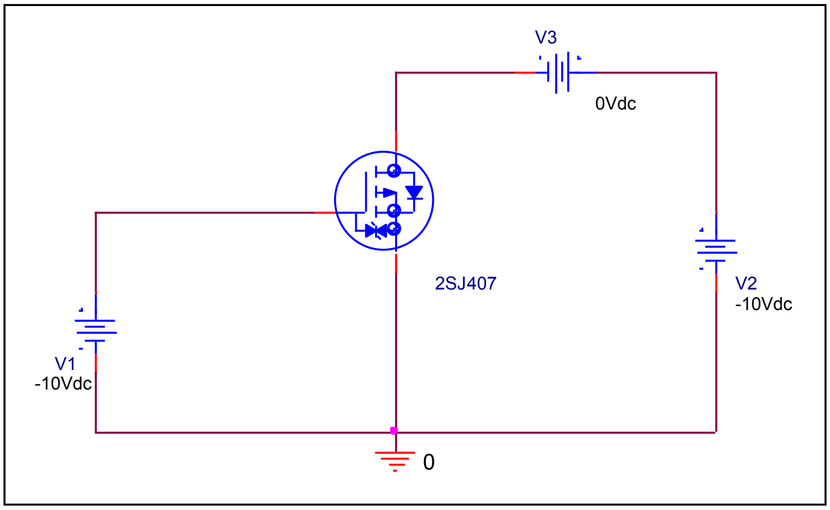
Id(A)	gfs		Error(%)
	Measurement	Simulation	
-0.500	1.818	1.845	1.476
-1.000	2.500	2.475	-0.990
-2.000	3.636	3.617	-0.542
-5.000	5.650	5.605	-0.785

Vgs-Id Characteristic

Circuit Simulation result

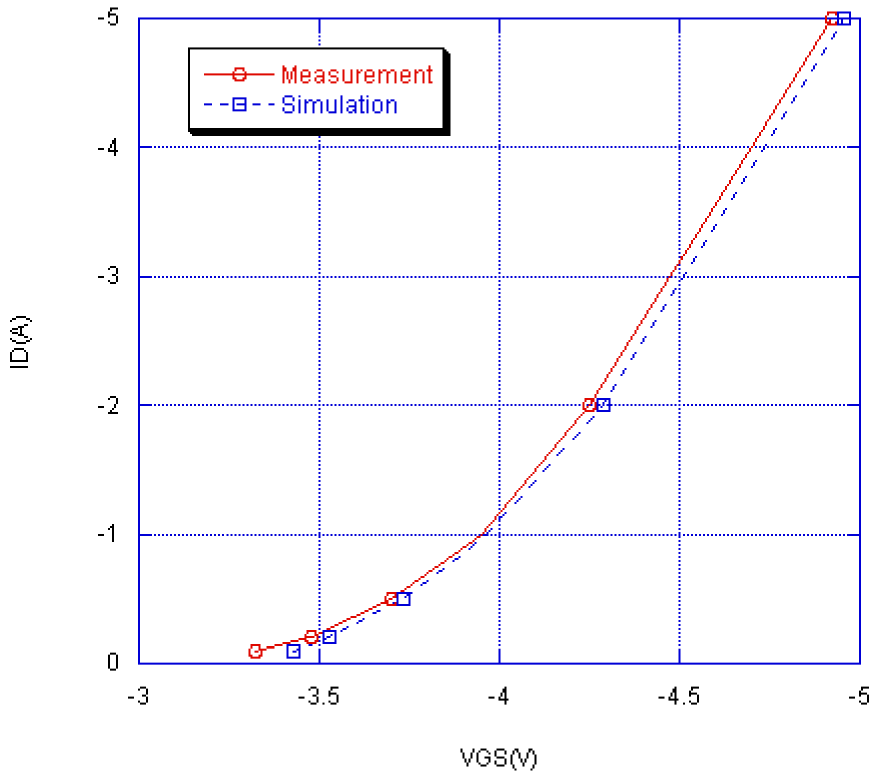


Evaluation circuit



Comparison Graph

Circuit Simulation Result

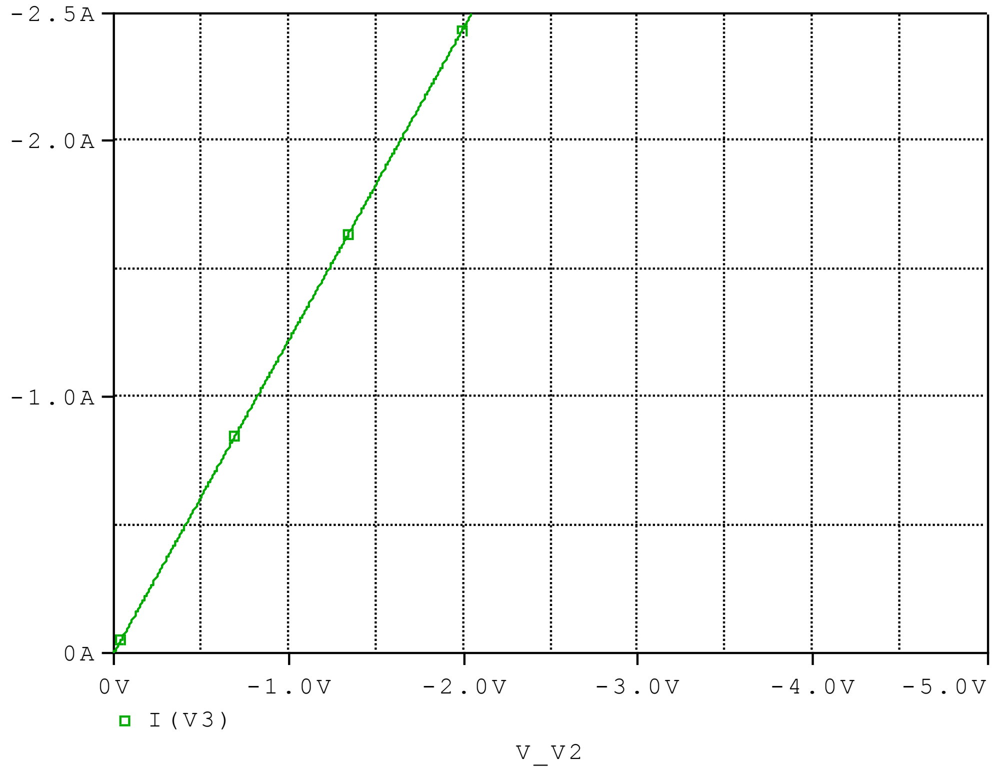


Simulation Result

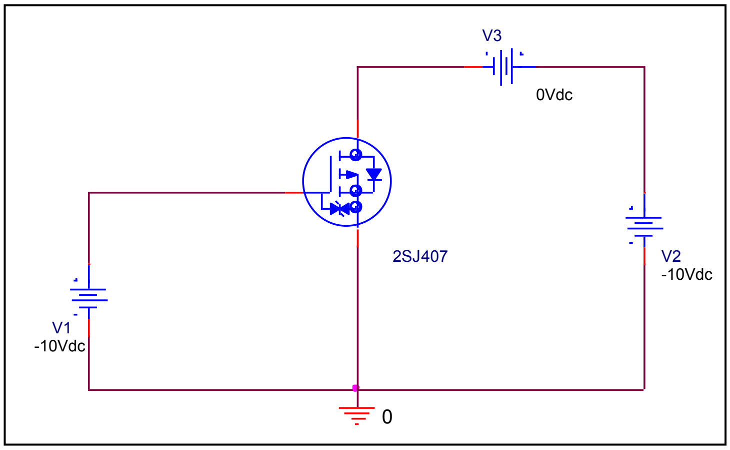
I_D(A)	V_{GS}(V)		Error (%)
	Measurement	Simulation	
-0.100	-3.320	-3.425	3.163
-0.200	-3.475	-3.527	1.499
-0.500	-3.700	-3.731	0.827
-1.000	-3.950	-3.962	0.294
-2.000	-4.250	-4.291	0.967
-5.000	-4.920	-4.955	0.715

Rds(on) Characteristic

Circuit Simulation result



Evaluation circuit

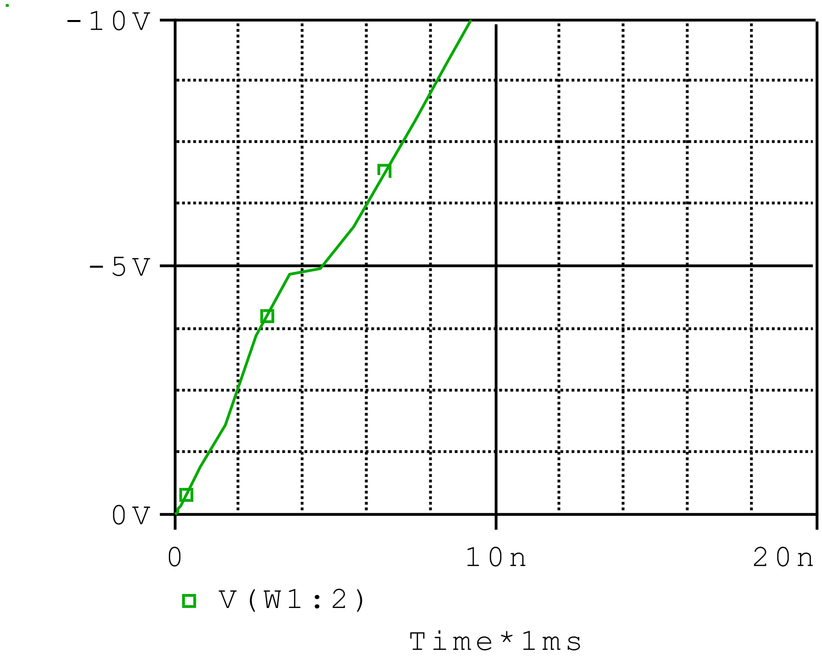


Simulation Result

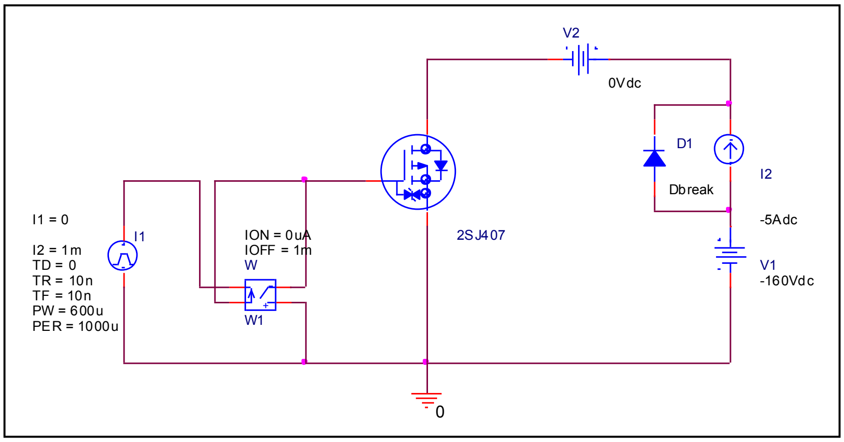
I_D=-2.5A, V_{GS}=-10V	Measurement		Simulation		Error (%)
R_{DS} (on)	0.800	Ω	0.800	Ω	0.000

Gate Charge Characteristic

Circuit Simulation result



Evaluation circuit

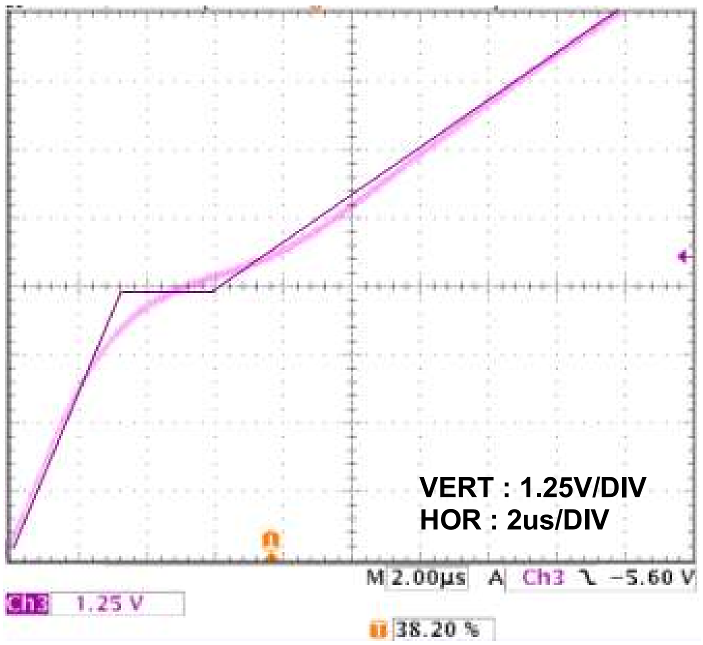


Simulation Result

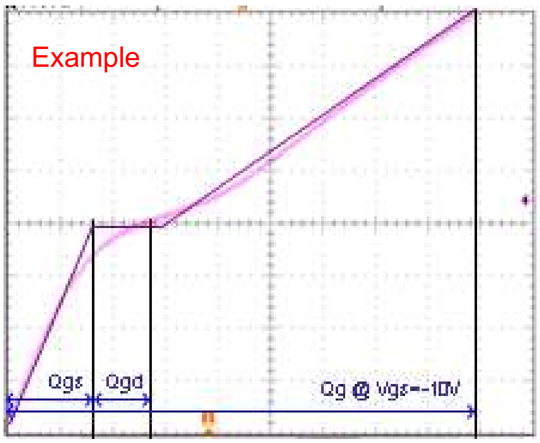
V_{DD}=-15V,I_D=-5A ,V_{GS}=-10V	Measurement		Simulation		Error (%)
Qgs	3.200	nC	3.517	nC	9.906
Qgd	2.700	nC	1.218	nC	-54.889
Qg	17.950	nC	9.264	nC	-48.390

Gate Charge Characteristic

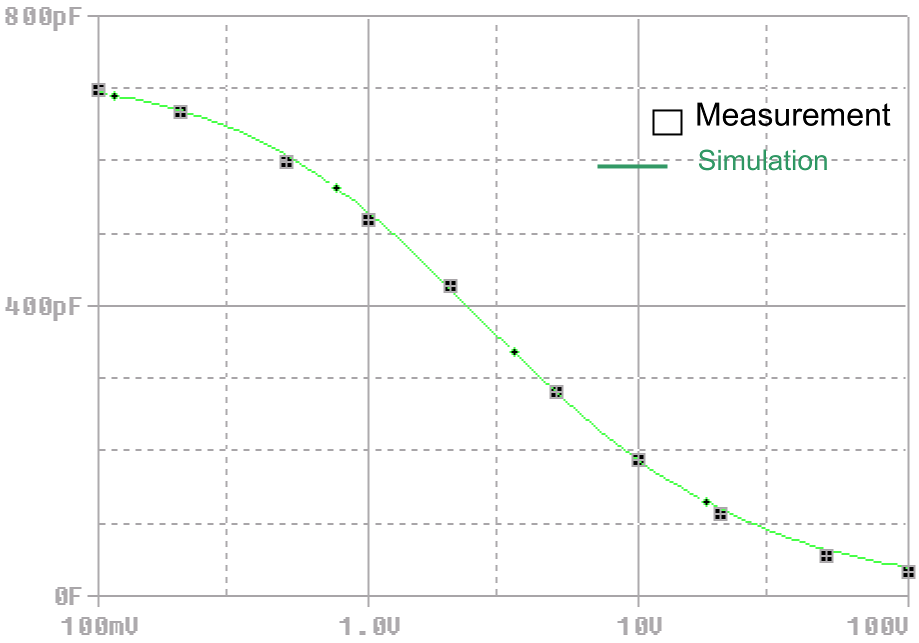
Reference



Qgs=3.2(nc)
Qgd=2.75(nc)
Qg=17.95(nc)
Conditions: V_{DD}=-15V,I_D=-5A,V_{GS}=-10V, IG=1mA



Capacitance Characteristic

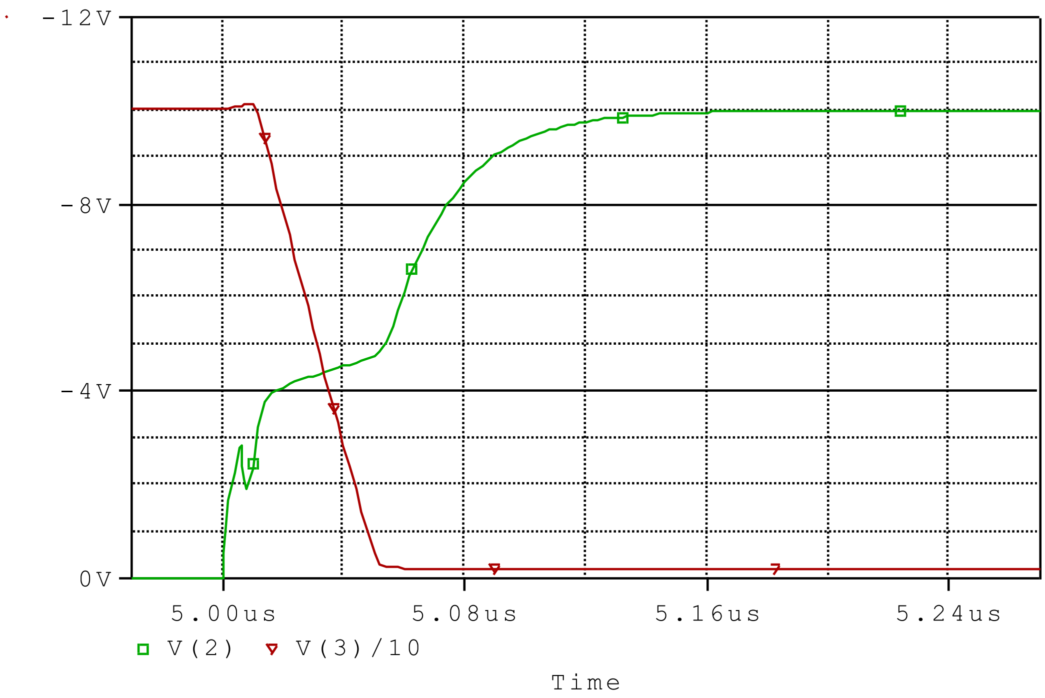


Simulation Result

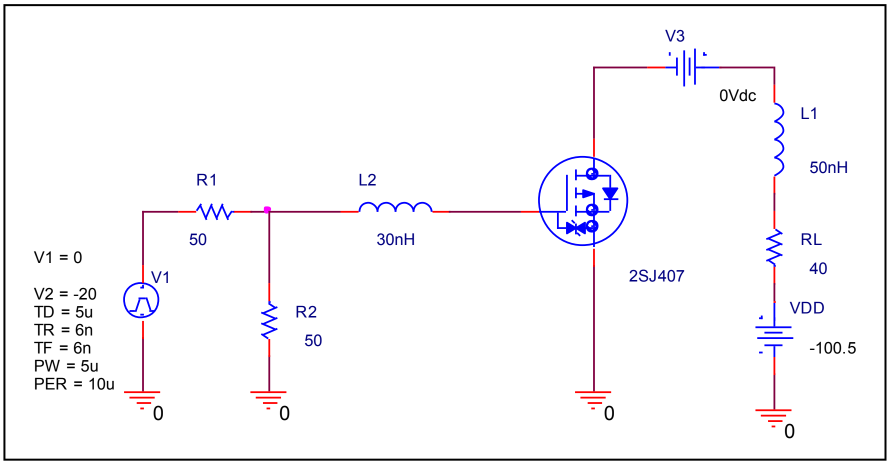
V_{DS}(V)	Cbd(pF)		Error(%)
	Measurement	Simulation	
0.100	700.000	694.000	-0.857
0.200	670.000	669.000	-0.149
0.500	600.000	605.000	0.833
1.000	520.000	527.000	1.346
2.000	430.000	425.000	-1.163
5.000	285.000	280.000	-1.754
10.000	190.000	187.000	-1.579
20.000	117.000	119.000	1.709
50.000	61.000	63.000	3.279
100.000	37.000	38.000	2.703

Switching Time Characteristic

Circuit Simulation result



Evaluation circuit

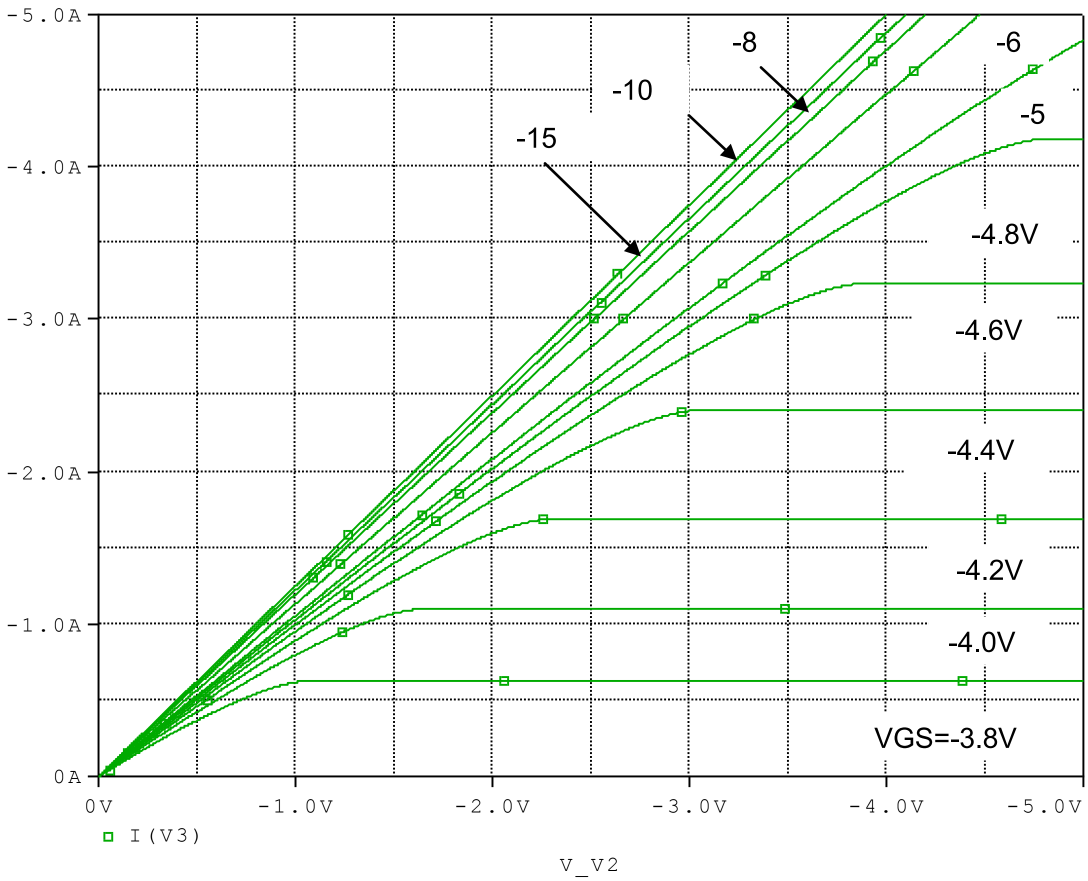


Simulation Result

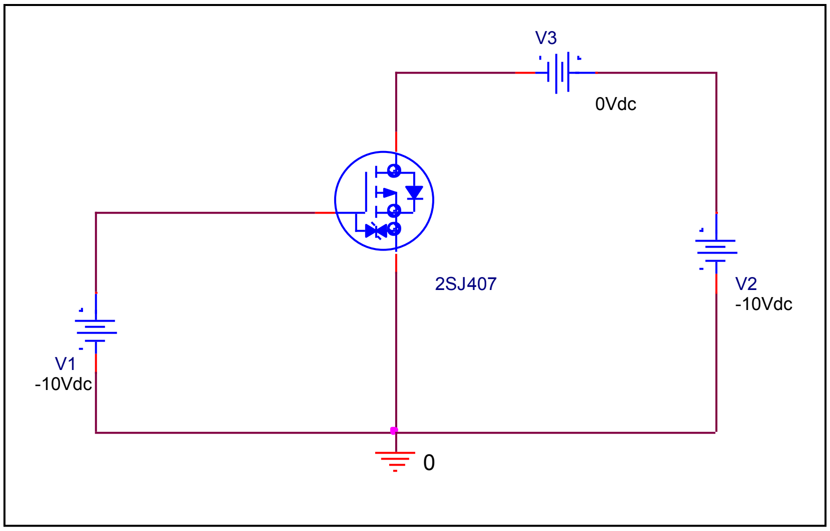
I_D=-2.5A, V_{DD}=-100V V_{GS}=0/10V	Measurement		Simulation		Error(%)
ton	30.000	ns	47.040	ns	56.800

Output Characteristic

Circuit Simulation result

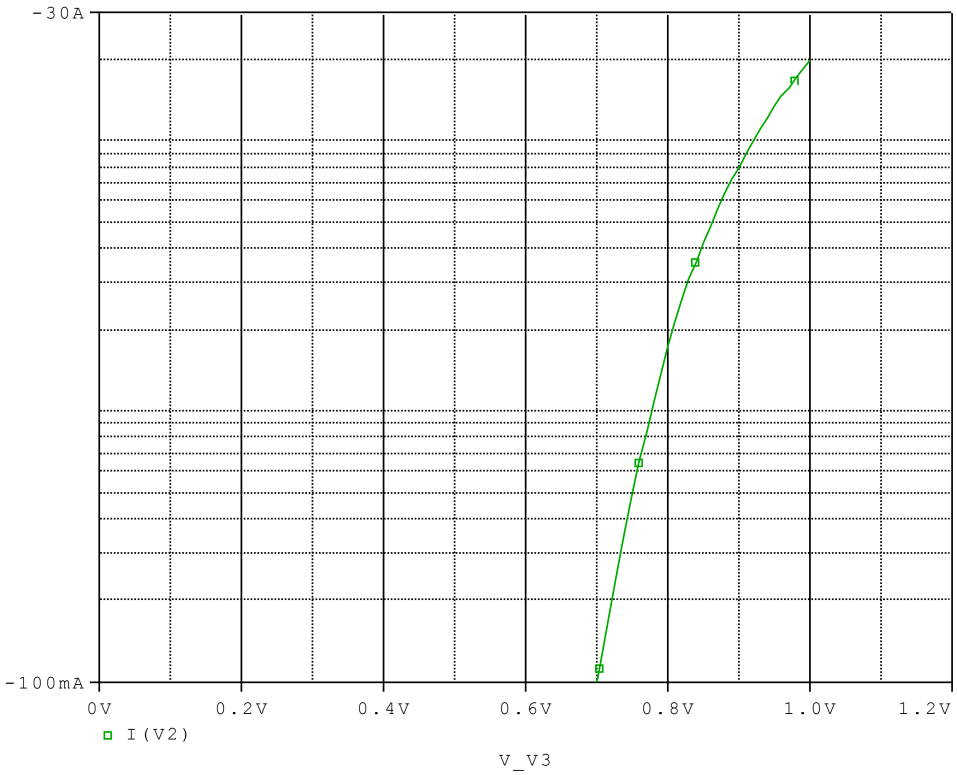


Evaluation circuit

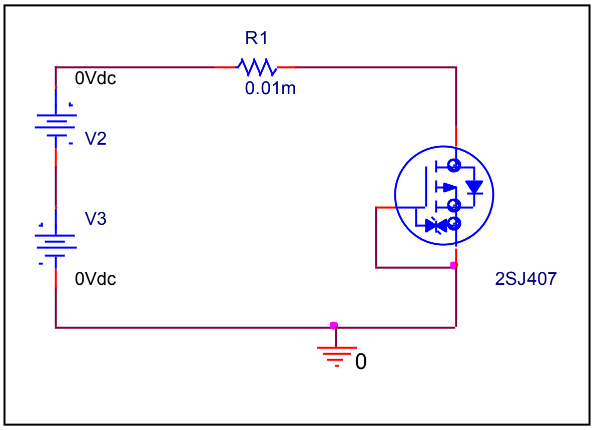


BODY DIODE SPICE MODEL
Forward Current Characteristic

Circuit Simulation Result

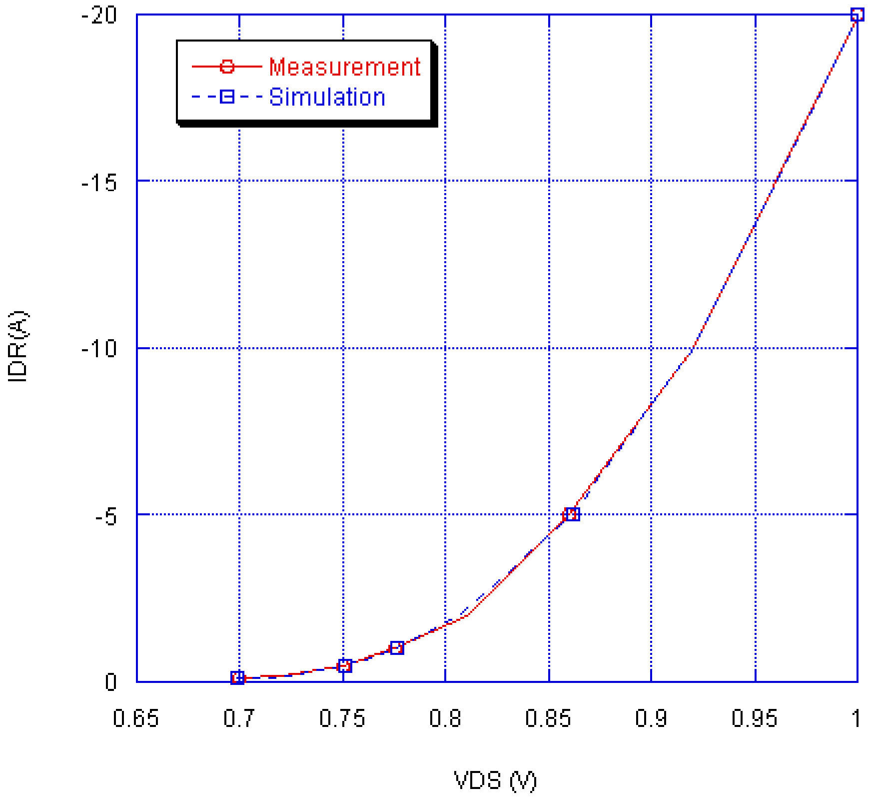


Evaluation Circuit



Comparison Graph

Circuit Simulation Result

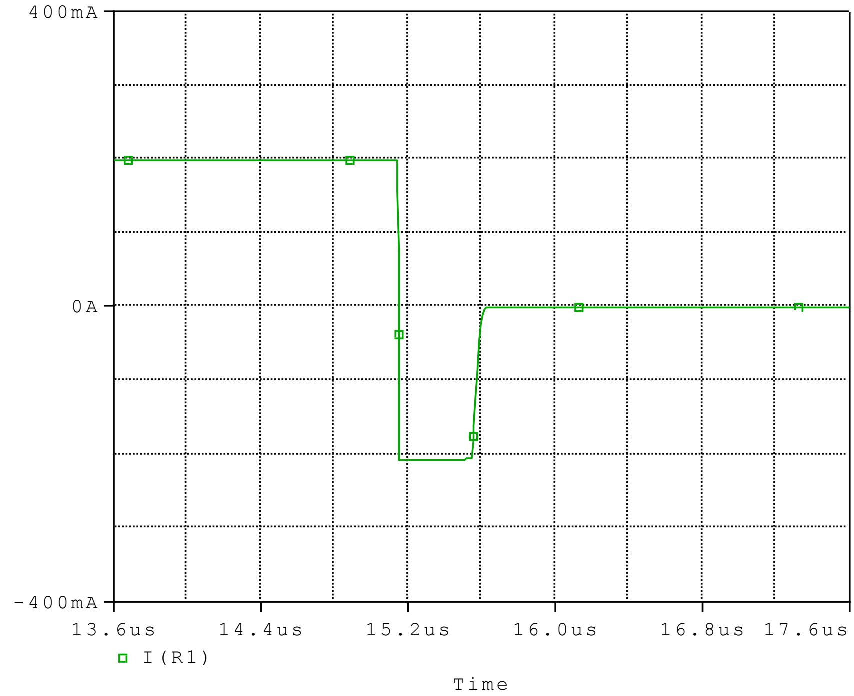


Simulation Result

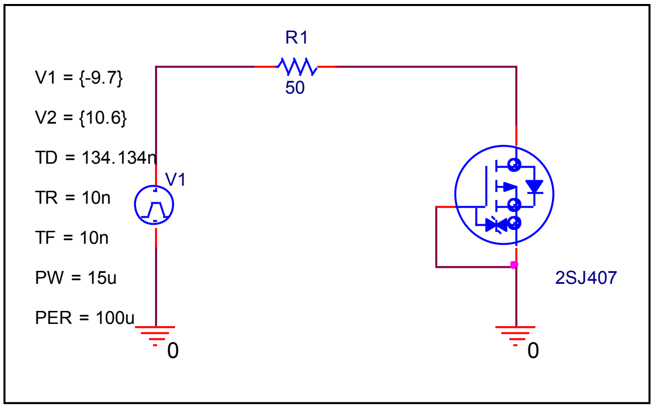
IDR(A)	VDS(V) Measurement	VDS(V) Simulation	%Error
-0.100	0.700	0.699	-0.143
-0.200	0.720	0.721	0.139
-0.500	0.750	0.751	0.133
-1.000	0.775	0.776	0.129
-2.000	0.810	0.807	-0.370
-5.000	0.860	0.862	0.233
-10.000	0.920	0.920	0.000
-20.000	1.000	1.000	0.000

Reverse Recovery Characteristic

Circuit Simulation Result



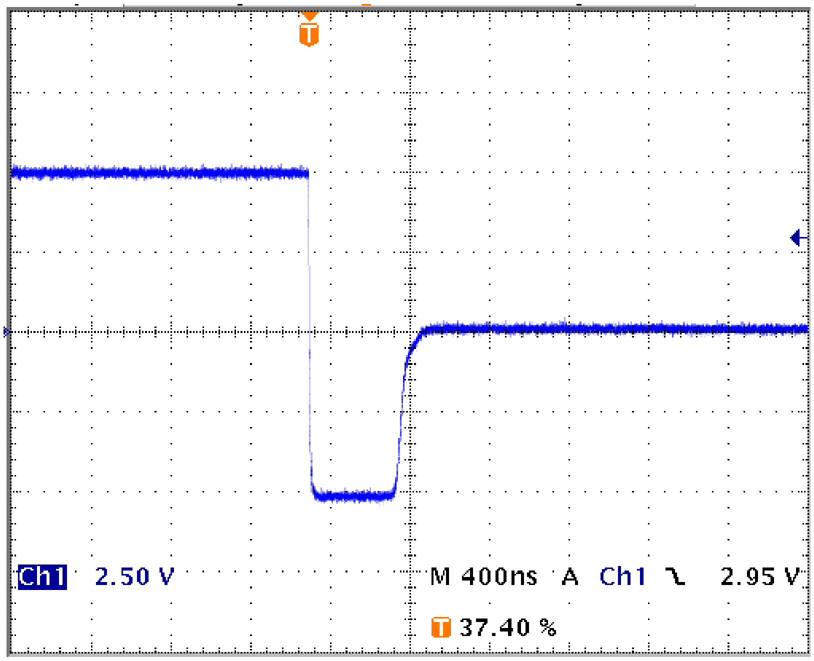
Evaluation Circuit



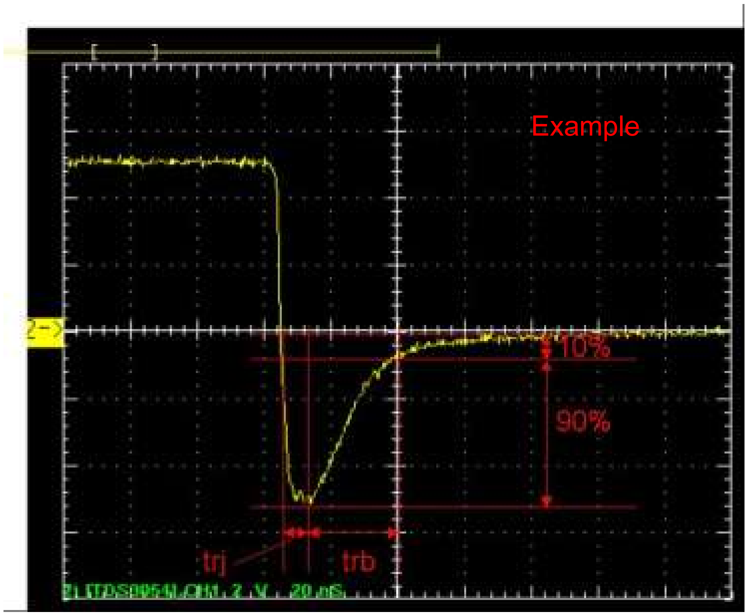
Compare Measurement vs. Simulation

	Measurement		Simulation		Error (%)
Trj	**384.000**	**ns**	**383.969**	**ns**	**-0.008**
Trb	**136.000**	**ns**	**59.261**	**ns**	**-56.426**
Trr	**520.000**	**ns**	**443.23**	**ns**	**-14.763**

Reverse Recovery Characteristic Reference



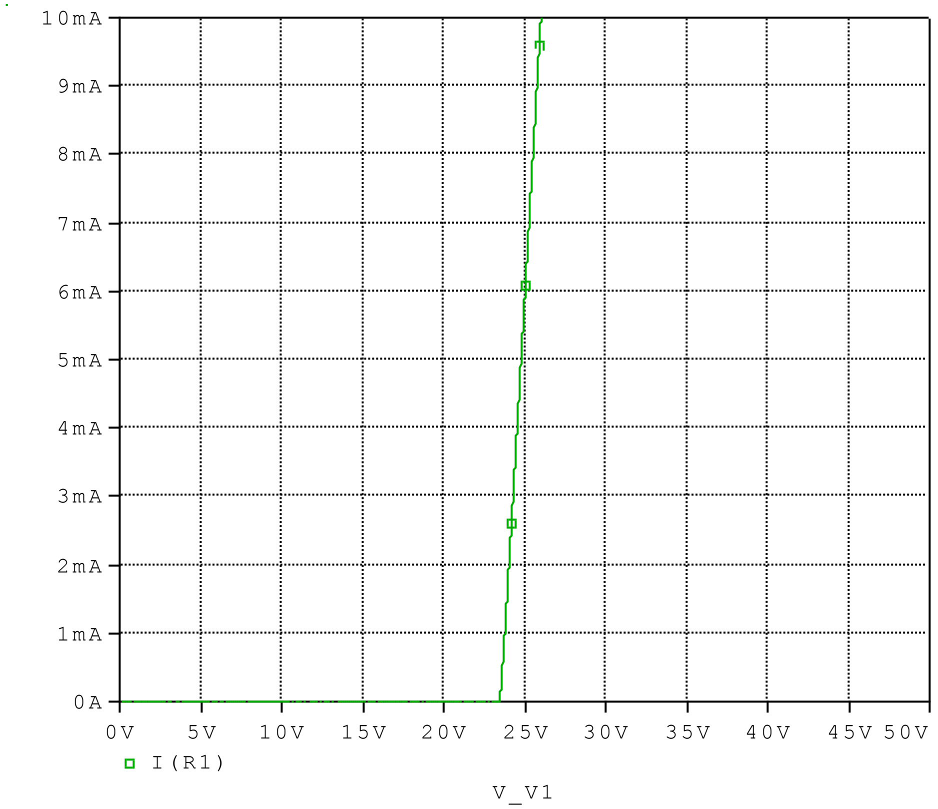
Trj=384(ns)
Trb=136(ns)
Conditions:Ifwd=Irev=0.2(A),Rl=50



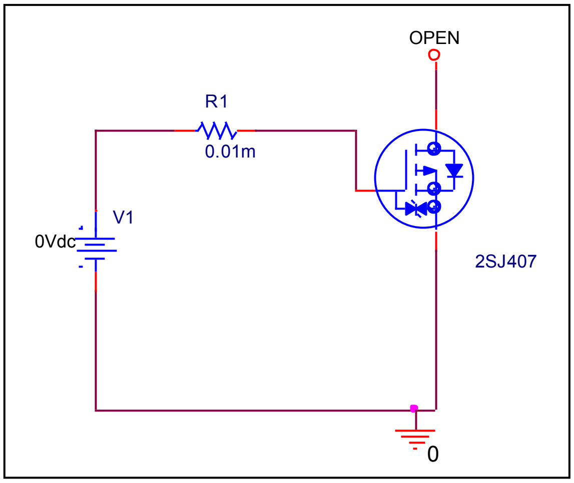
Relation between trj and trb

ESD PROTECTION DIODE SPICE MODEL
Zener Voltage Characteristic

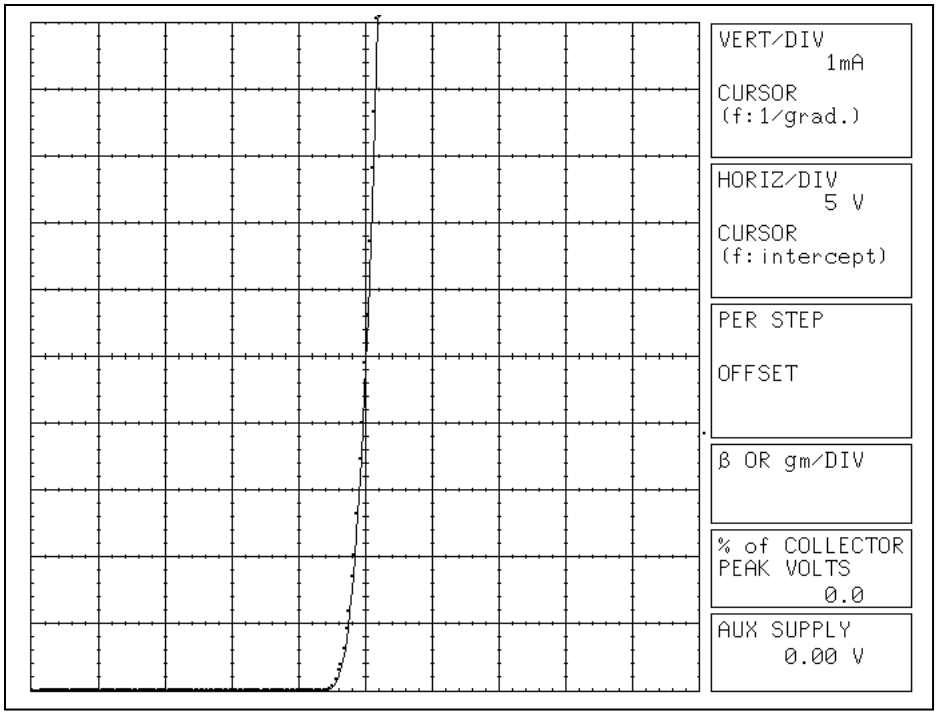
Circuit Simulation Result



Evaluation Circuit



Zener Voltage Characteristic Reference



VERT/DIV
1mA
CURSOR
(f:1/grad.)

HORIZ/DIV
5 V
CURSOR
(f:intercept)

PER STEP

OFFSET

β OR gm/DIV

% of COLLECTOR
PEAK VOLTS
0.0

AUX SUPPLY
0.00 V