Device Modeling Report

COMPONENTS: TRANSISTOR
PART NUMBER: 2SA2046
MANUFACTURER: PANASONIC

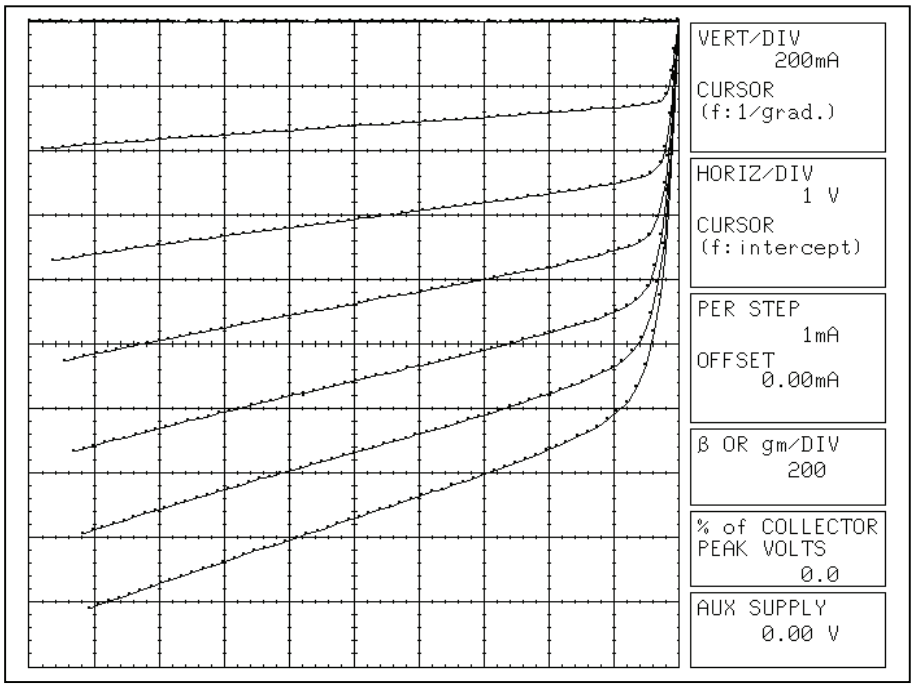
Bee Technologies Inc.

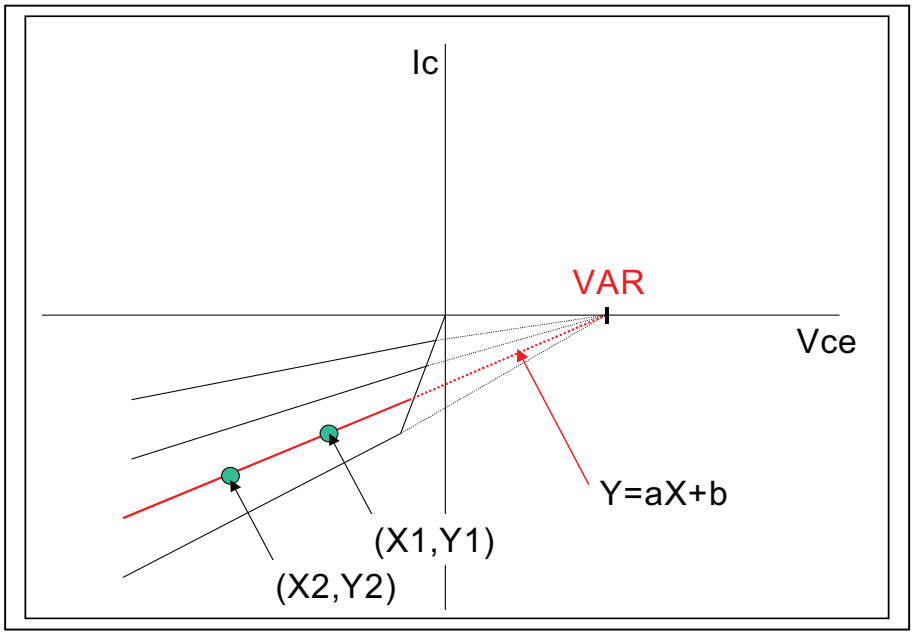
TRANSISTOR MODEL

PSpice model parameter	Model description
IS	Saturation Current
BF	Ideal Maximum Forward Beta
NF	Forward Current Emission Coefficient
VAF	Forward Early Voltage
IKF	Forward Beta Roll-off Knee Current
ISE	Non-ideal Base-Emitter Diode Saturation Current
NE	Non-ideal Base-Emitter Diode Emission Coefficient
BR	Ideal Maximum Reverse Beta
NR	Reverse Emission Coefficient
VAR	Reverse Early Voltage
IKR	Reverse Beta Roll-off Knee Current
ISC	Non-ideal Base-Collector Diode Saturation Current
NC	Non-ideal Base-Collector Diode Emission Coefficient
NK	Forward Beta Roll-off Slope Exponent
RE	Emitter Resistance
RB	Base Resistance
RC	Series Collector Resistance
CJE	Zero-bias Emitter-Base Junction Capacitance
VJE	Emitter-Base Junction Potential
MJE	Emitter-Base Junction Grading Coefficient
CJC	Zero-bias Collector-Base Junction Capacitance
VJC	Collector-base Junction Potential
MJC	Collector-base Junction Grading Coefficient
FC	Coefficient for Onset of Forward-bias Depletion Capacitance
TF	Forward Transit Time
XTF	Coefficient for TF Dependency on Vce
VTF	Voltage for TF Dependency on Vce
ITF	Current for TF Dependency on Ic
PTF	Excess Phase at f=1/2pi*TF
TR	Reverse Transit Time
EG	Activation Energy
XTB	Forward Beta Temperature Coefficient
XTI	Temperature Coefficient for IS

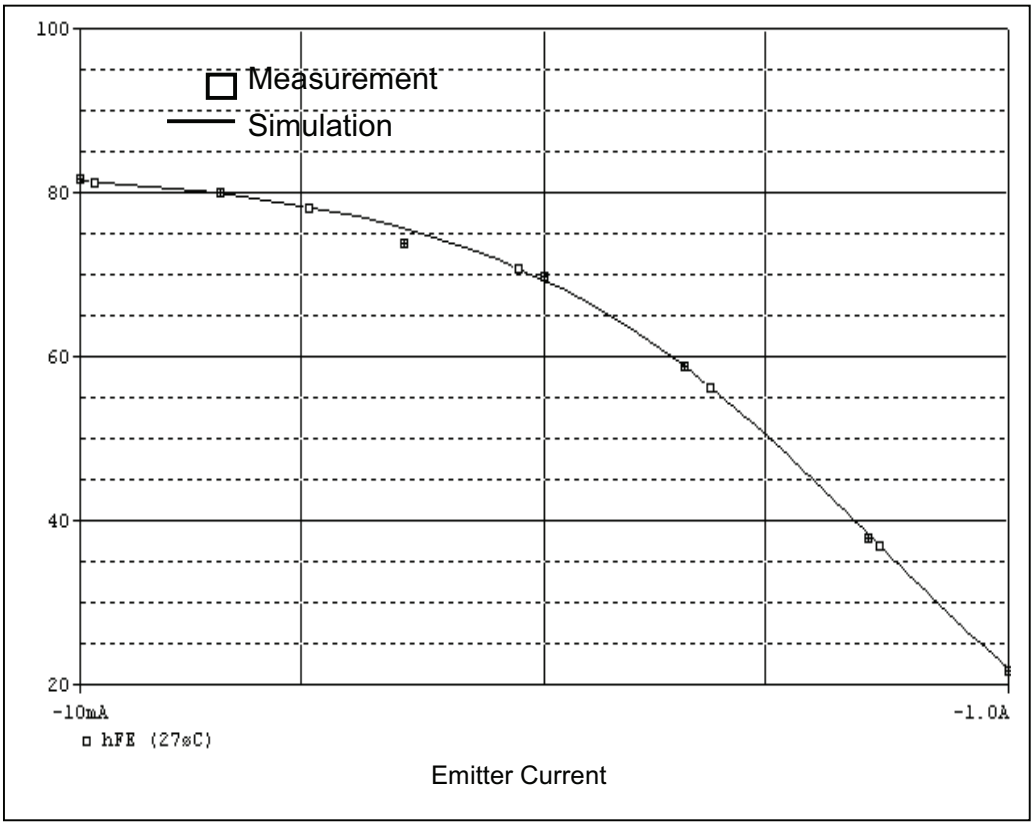
Reverse

Reverse Early Voltage Characteristic



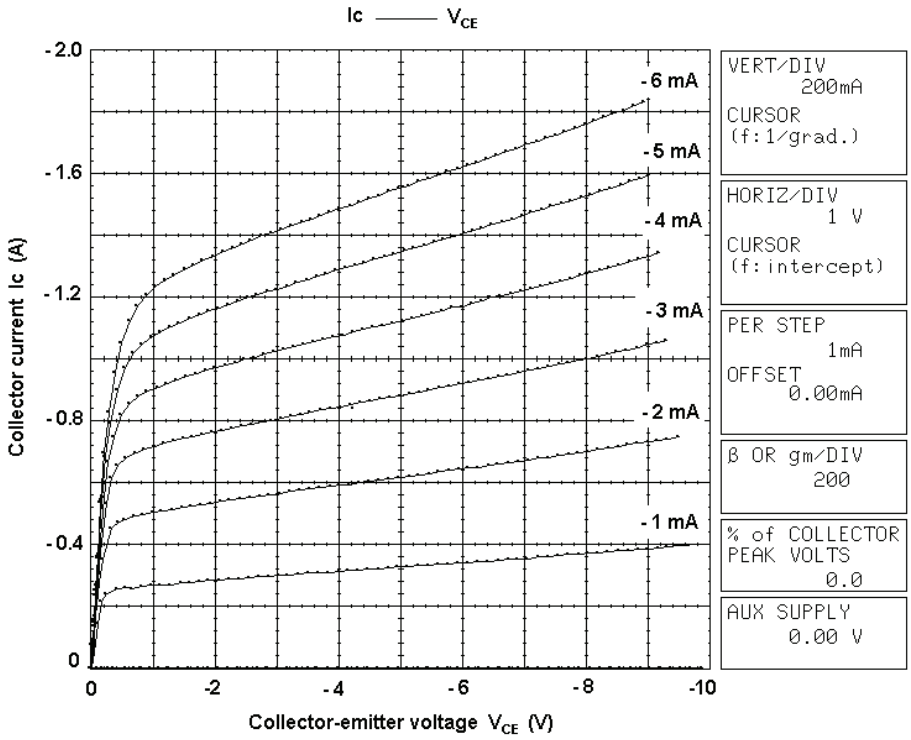


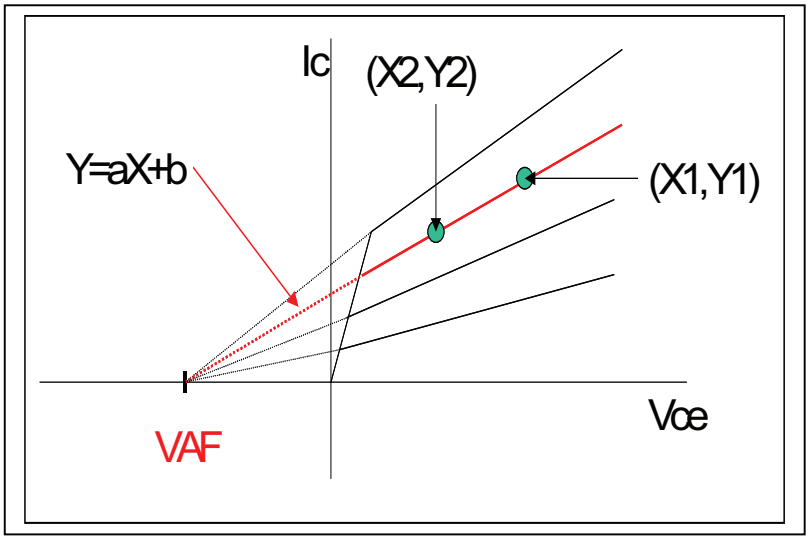
Reverse DC Beta Characteristic (Ie vs. h_{FE})



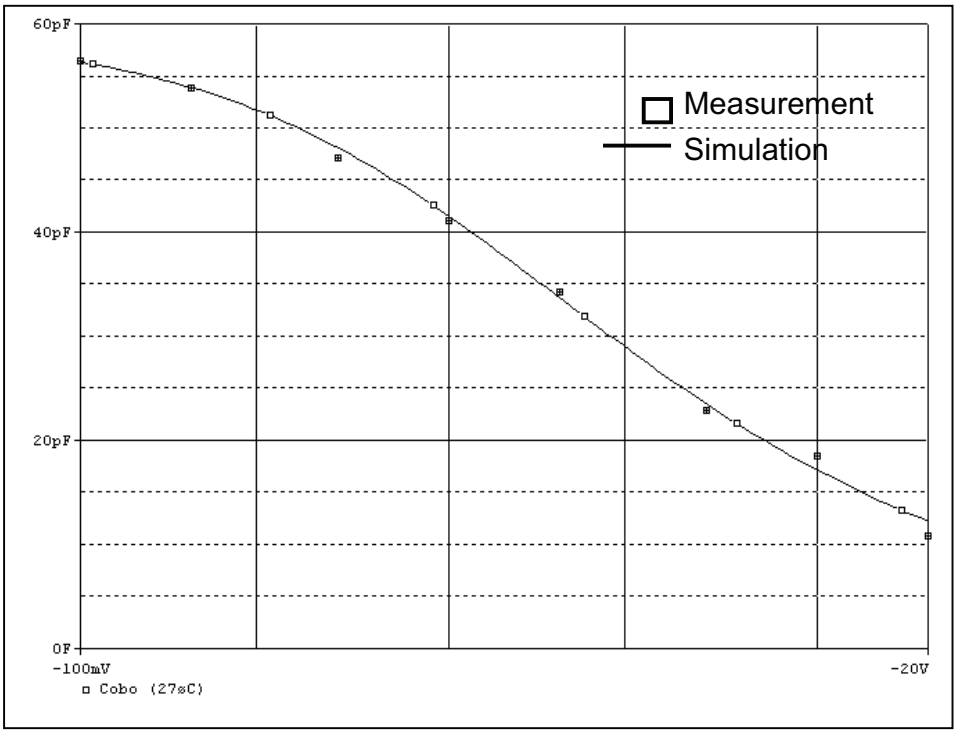
Forward

Forward Early Voltage Characteristic

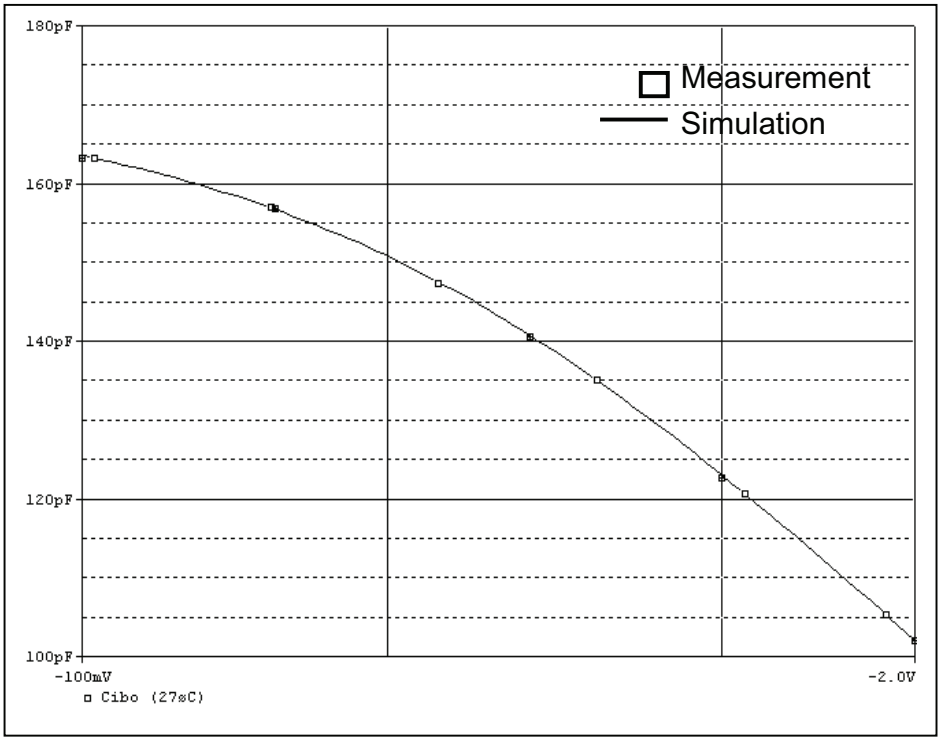




C-B Capacitance Characteristics

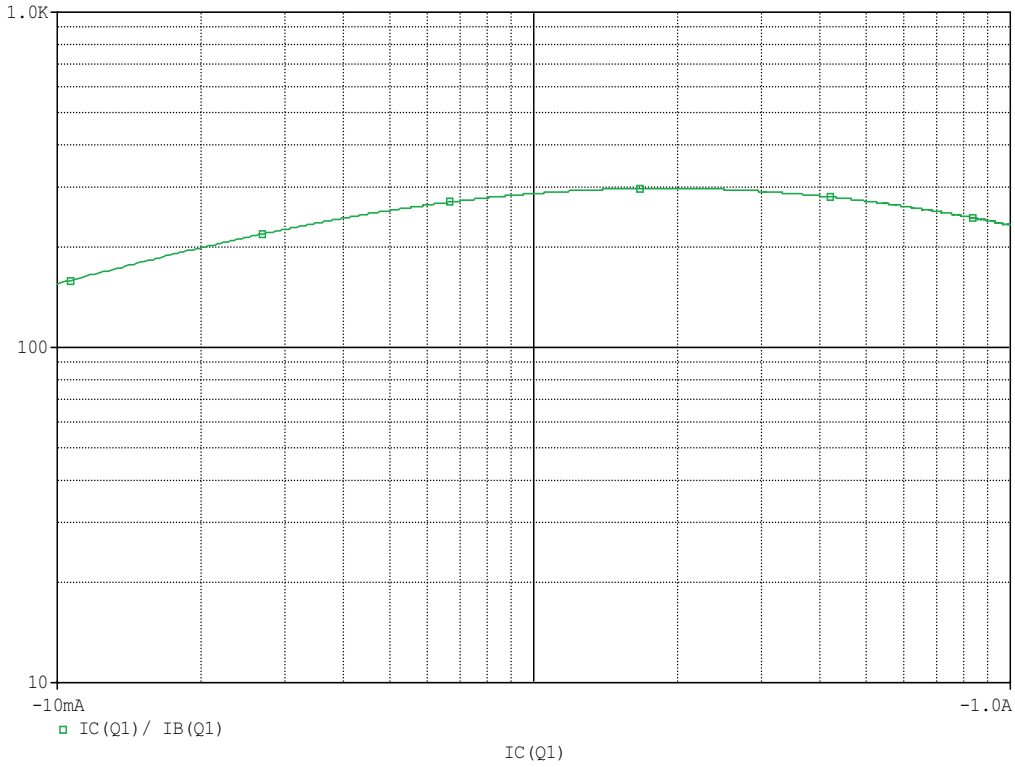


E-B Capacitance Characteristics

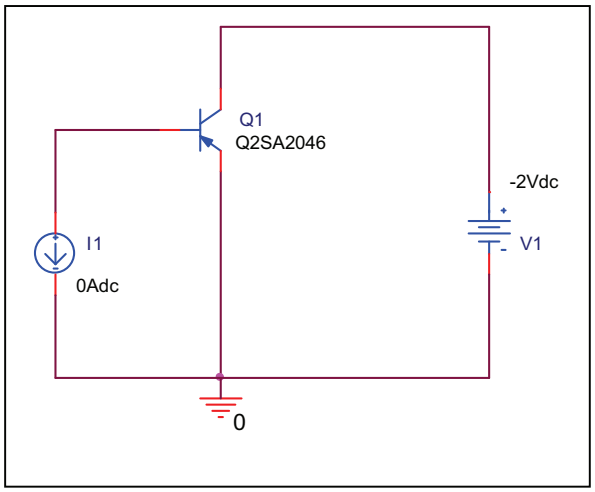


Transistor h_{FE}-I_C Characteristics

Circuit Simulation Result

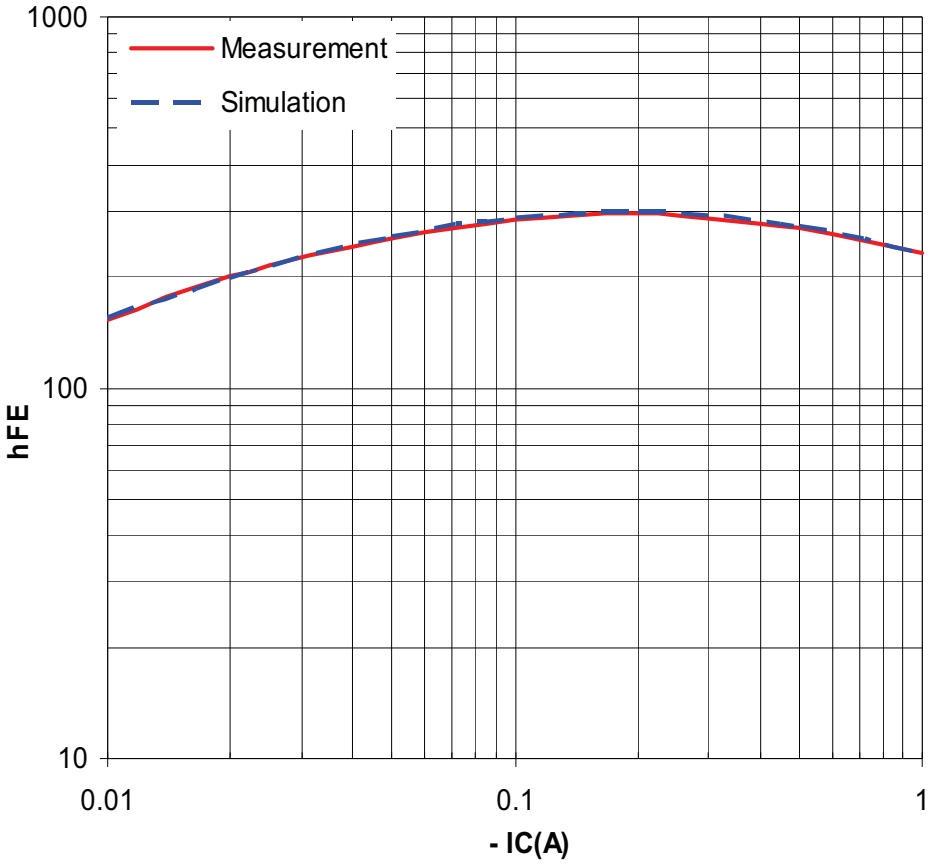


Evaluation Circuit



Comparison Graph

Circuit Simulation Result

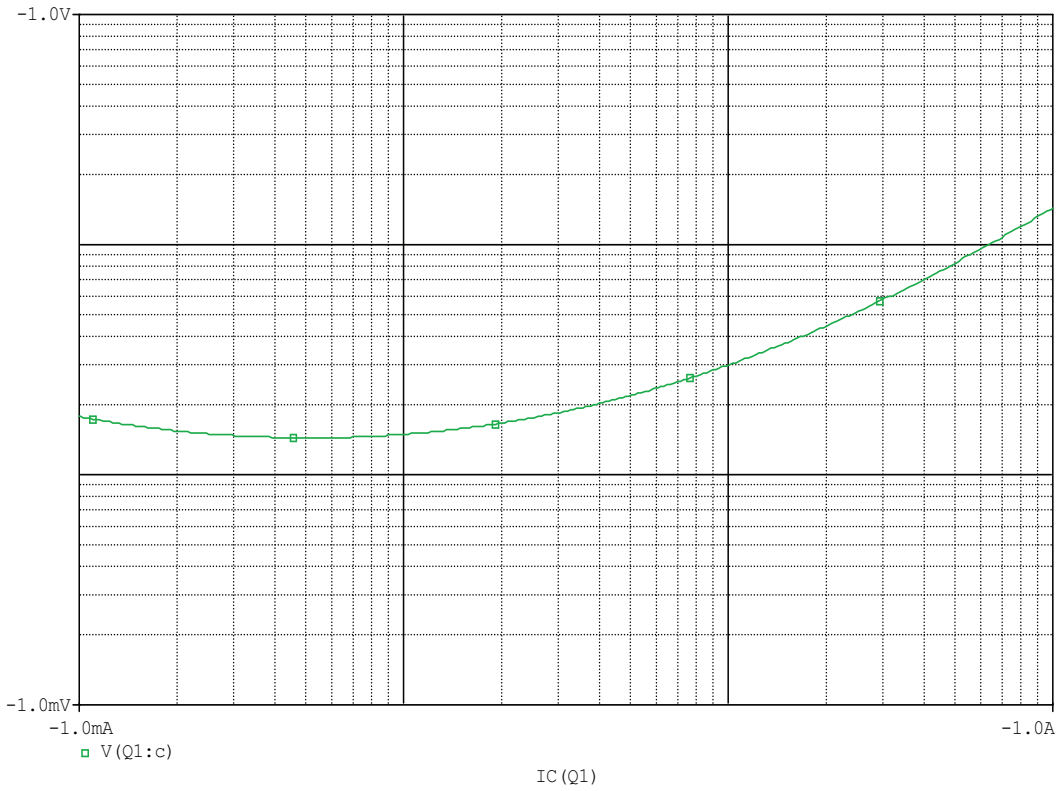


Simulation Result

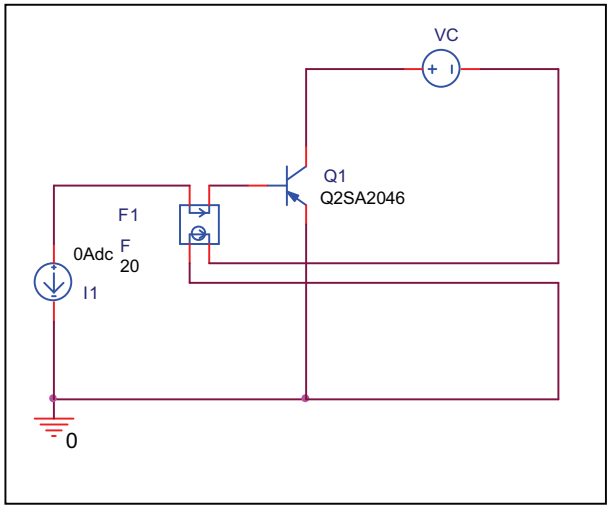
Ic(A)	hFE		Error(%)
	Measurement	Simulation	
-0.010	152.110	154.328	1.458
-0.020	200.000	198.815	-0.593
-0.050	252.780	256.354	1.414
-0.100	285.710	287.782	0.725
-0.200	295.690	297.997	0.780
-0.500	270.850	272.949	0.775
-1.000	232.100	231.884	-0.093

$V_{CE(Sat)}$-I_C Characteristics

Circuit Simulation Result

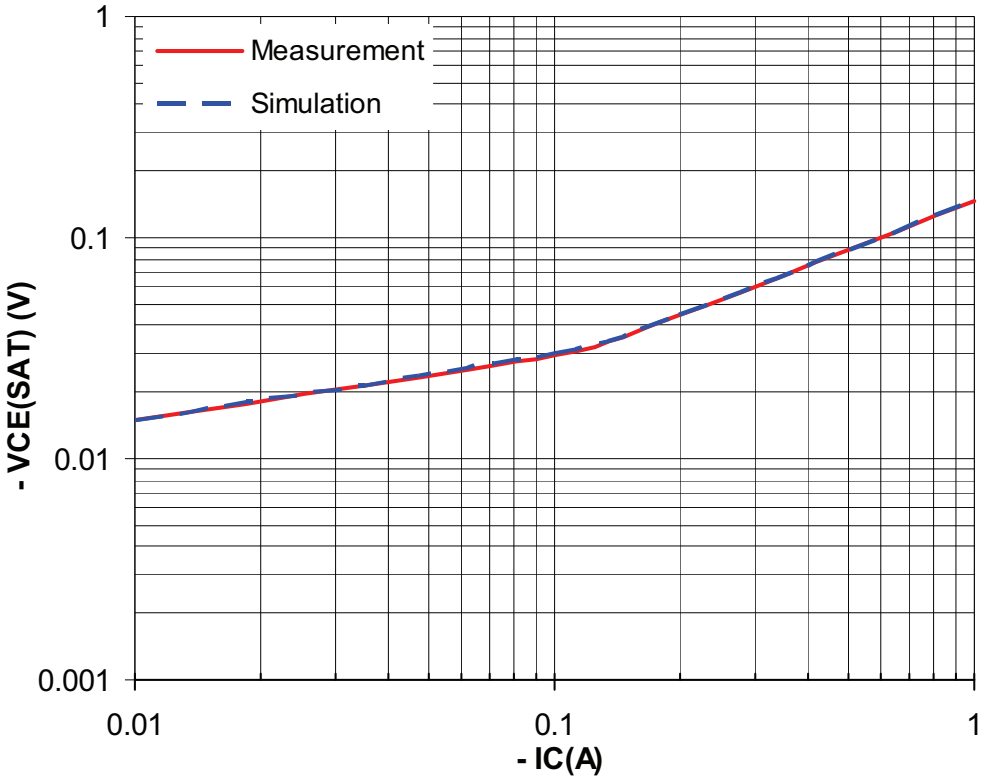


Evaluation Circuit



Comparison Graph

Circuit Simulation Result

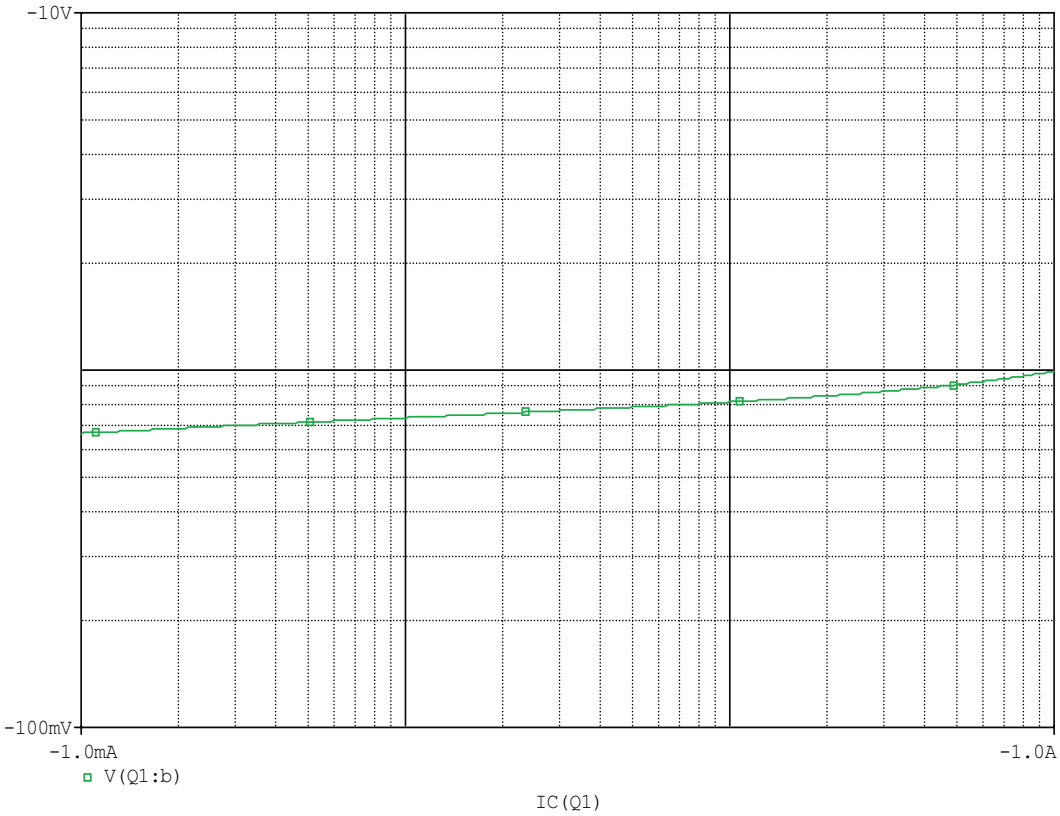


Simulation Result

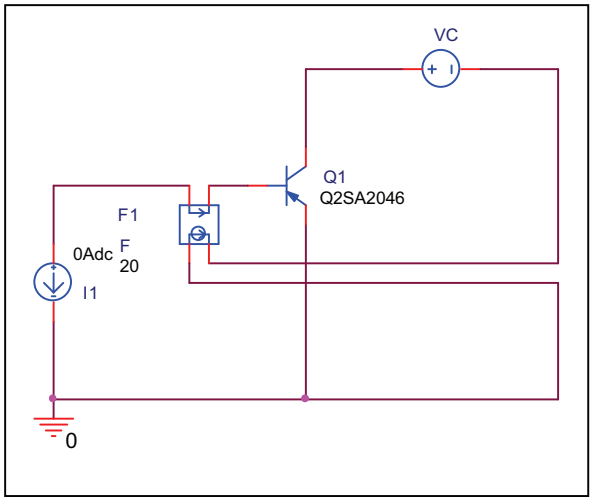
IC(A)	VCE(sat)(V)		Error(%)
	Measurement	Simulation	
-0.010	-0.015	-0.014	-0.127
-0.100	-0.295	-0.029	1.661
-0.200	-0.044	-0.044	0.216
-1.000	-0.146	-0.146	0.163

$V_{BE(Sat)}$-I_C Characteristics

Circuit Simulation Result

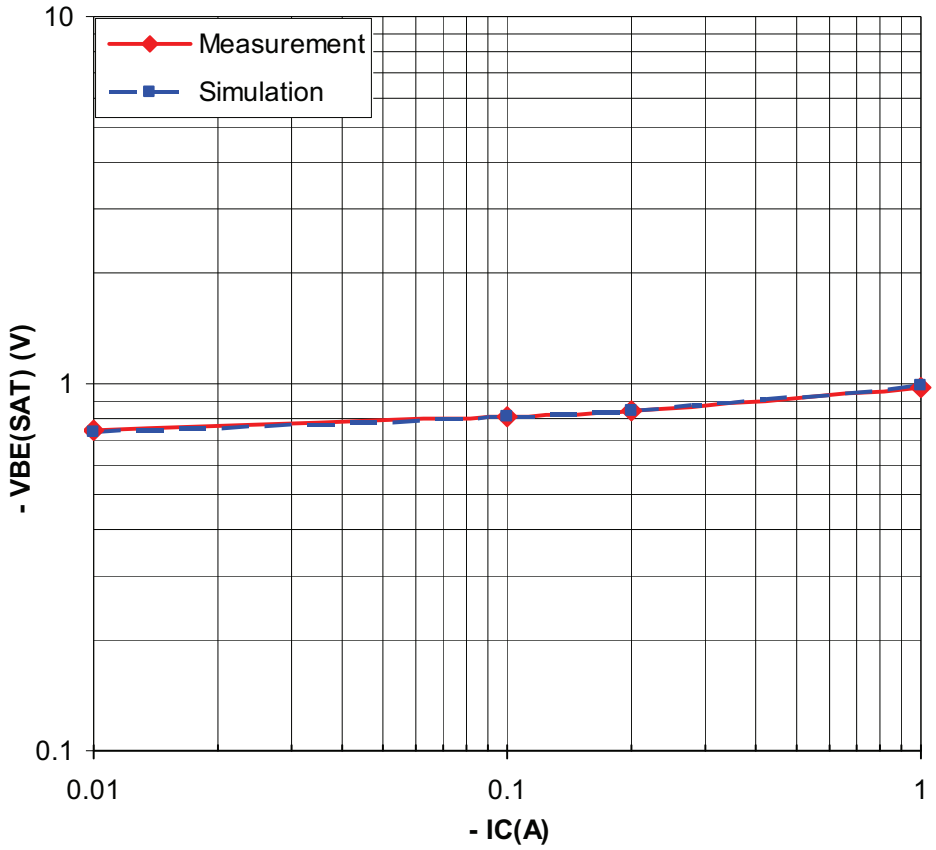


Evaluation Circuit



Comparison Graph

Circuit Simulation Result

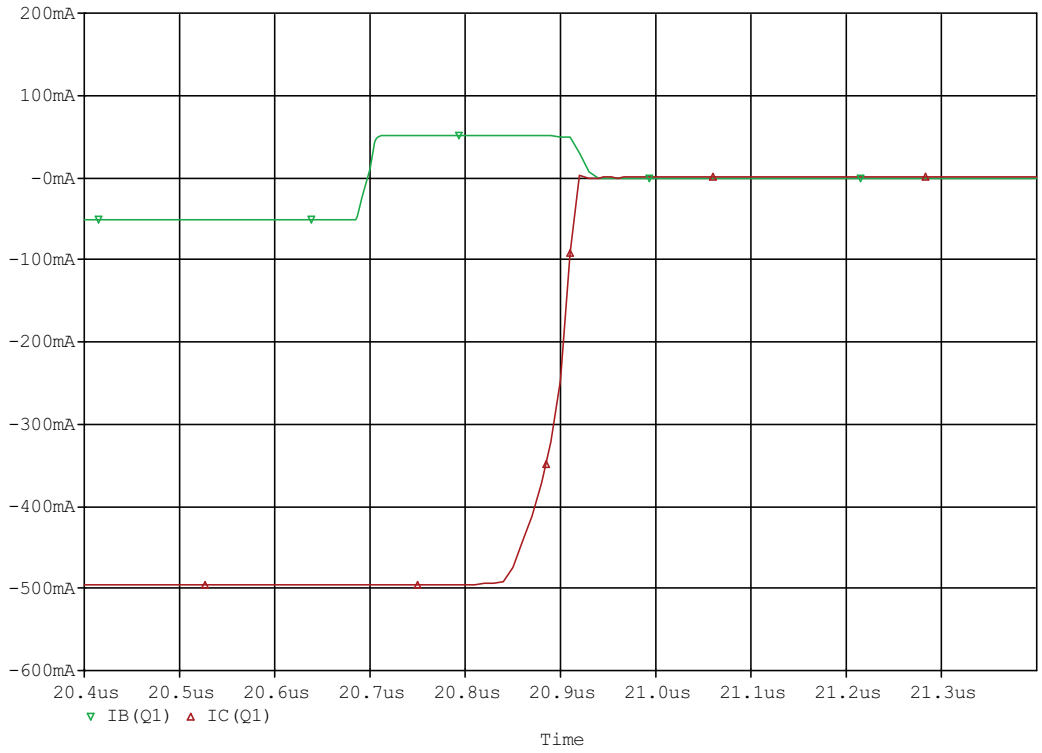


Simulation Result

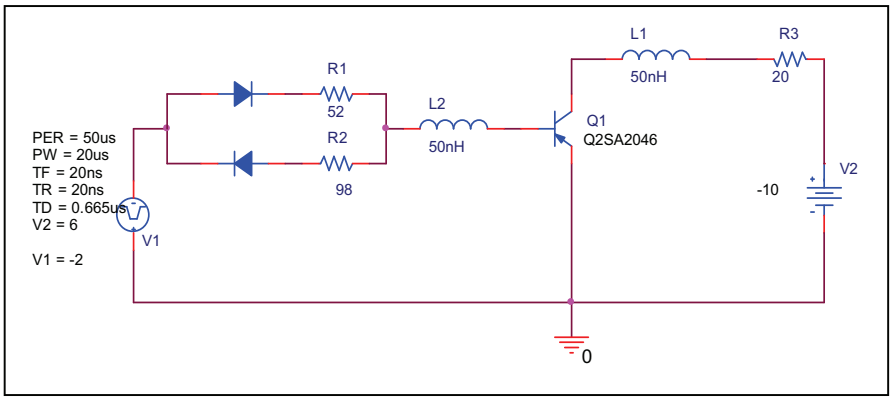
IC(A)	VBE(sat)(V)		Error(%)
	Measurement	Simulation	
-0.010	-0.745	-0.735	-1.342
-0.100	-0.816	-0.814	-0.245
-0.200	-0.846	-0.847	0.118
-1.000	-0.980	-0.992	1.224

Switching Characteristics

Circuit simulation result



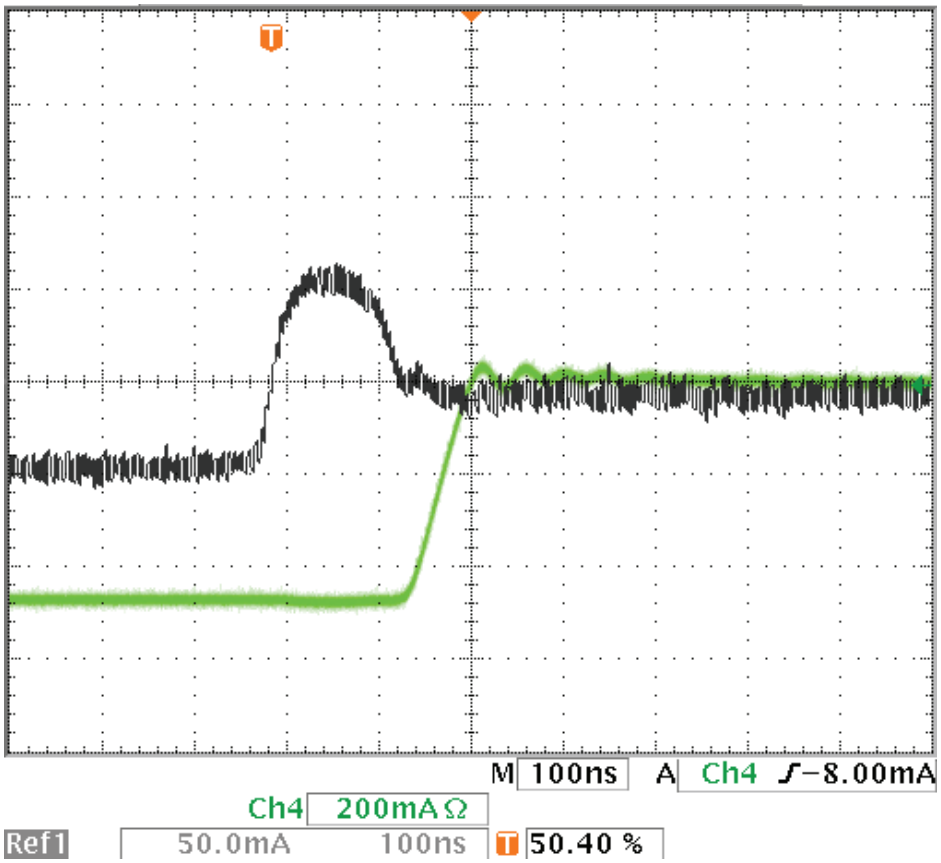
Evaluation circuit



Simulation result

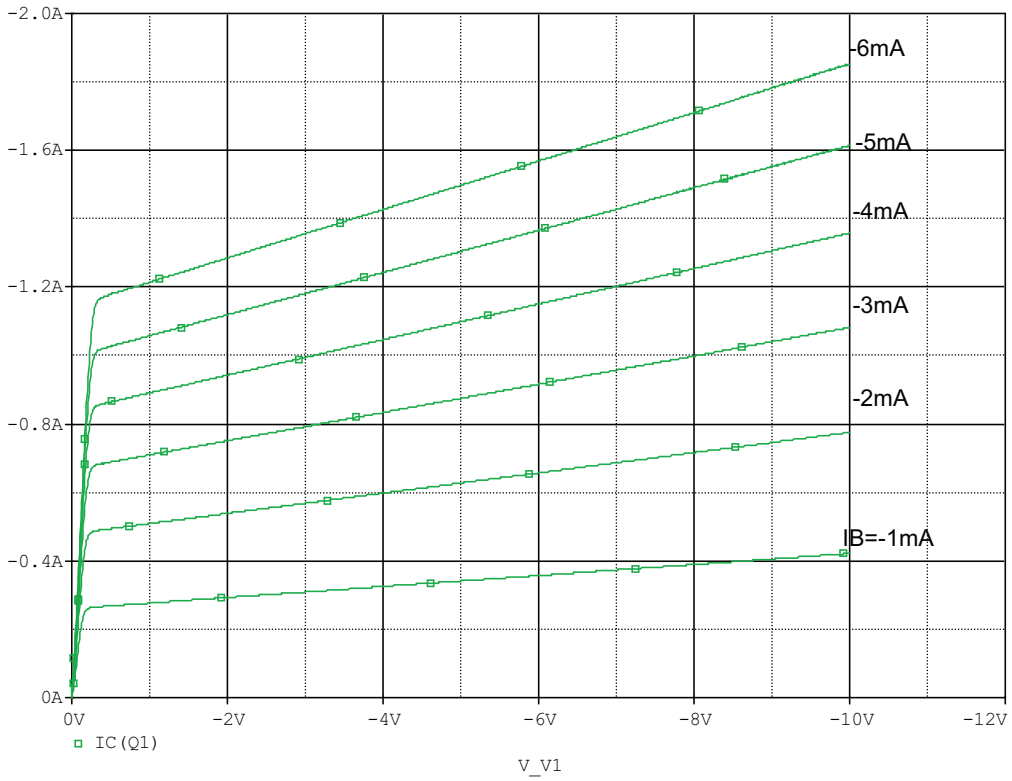
	Measurement	Simulation	%Error
t_{stg} (ns)	170.000	170.003	0.002
t_f (ns)	56.000	56.077	0.137

Switching Characteristics Reference

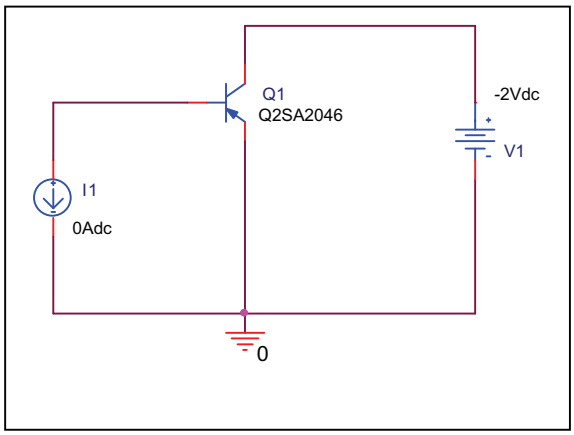


Output Characteristics

Circuit Simulation Result



Evaluation Circuit



Output Characteristics Reference