

# Device Modeling Report

COMPONENTS: TRANSISTOR  
PART NUMBER: 2SC5808-TL-E  
MANUFACTURER: SANYO



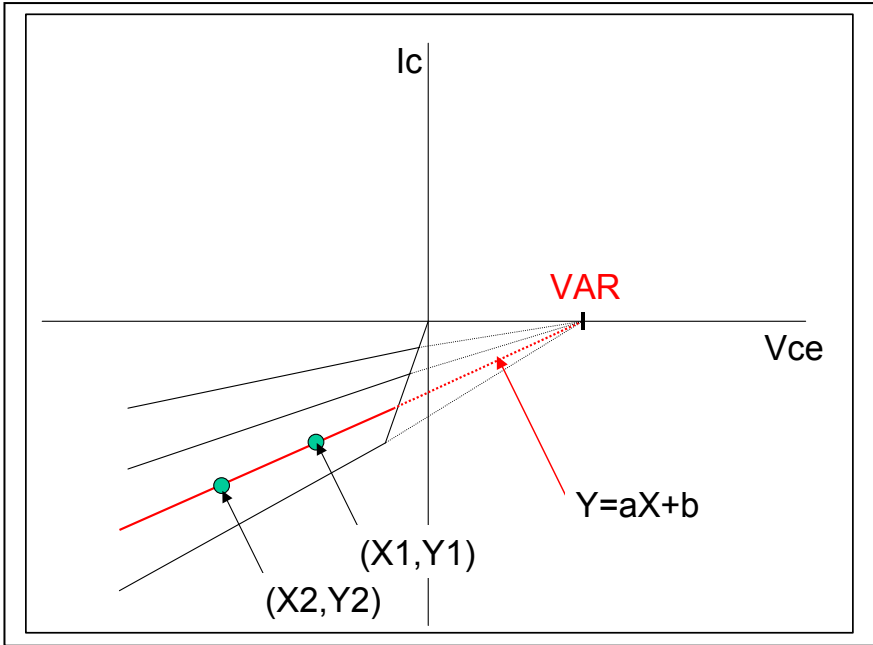
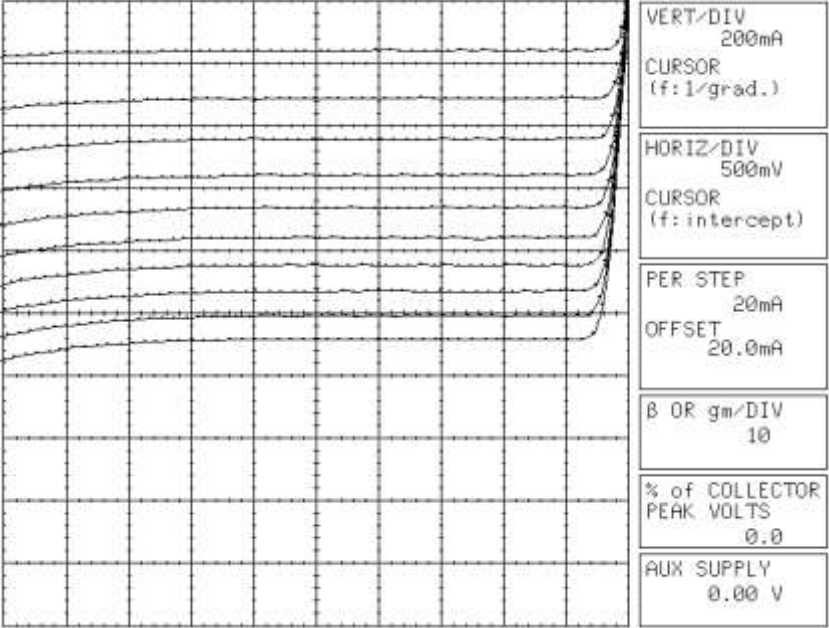
**Bee Technologies Inc.**

## TRANSISTOR MODEL

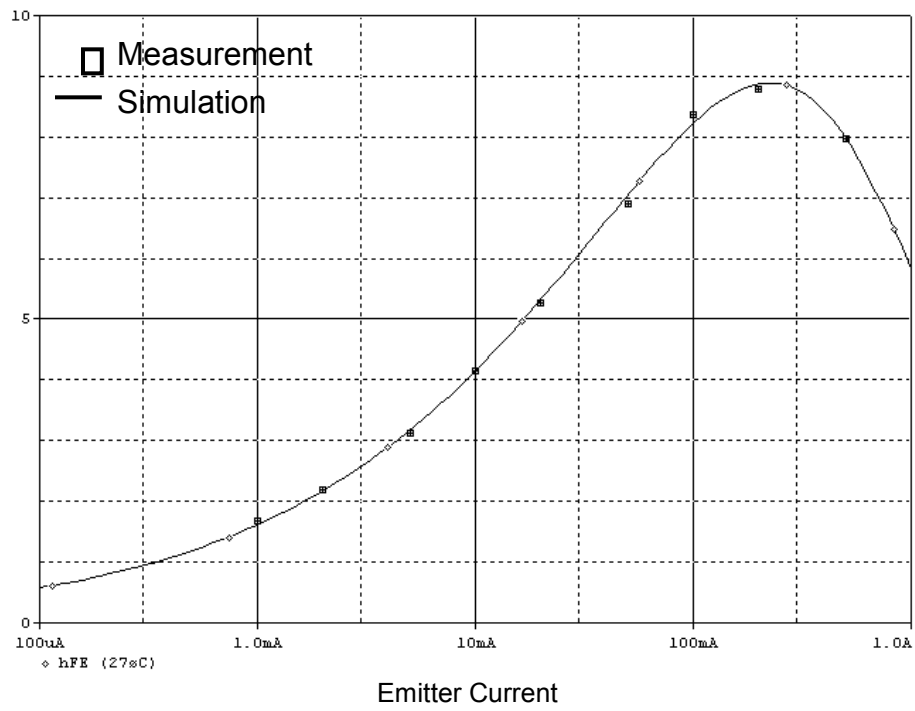
PSpice model parameter	Model description
IS	Saturation Current
BF	Ideal Maximum Forward Beta
NF	Forward Current Emission Coefficient
VAF	Forward Early Voltage
IKF	Forward Beta Roll-off Knee Current
ISE	Non-ideal Base-Emitter Diode Saturation Current
NE	Non-ideal Base-Emitter Diode Emission Coefficient
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 $f=1/2\pi*TF$
TR	Reverse Transit Time
EG	Activation Energy
XTB	Forward Beta Temperature Coefficient
XTI	Temperature Coefficient for IS

Reverse

### Reverse Early Voltage Characteristic

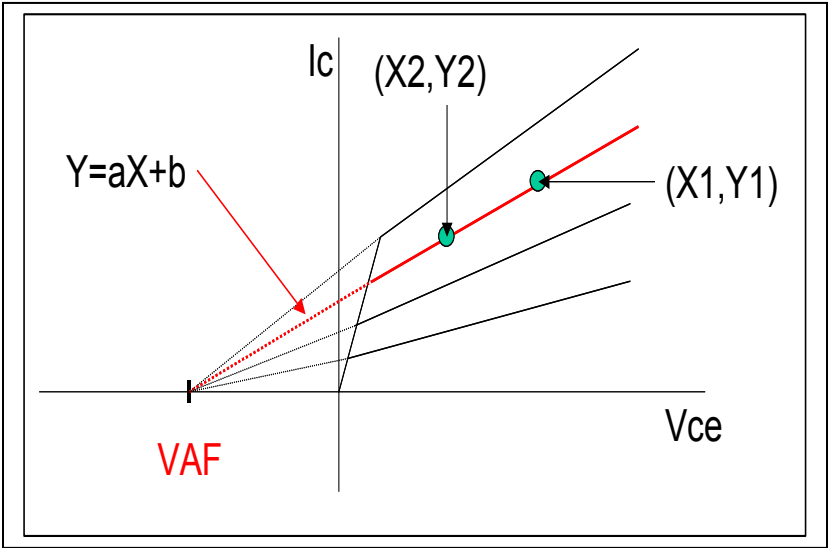
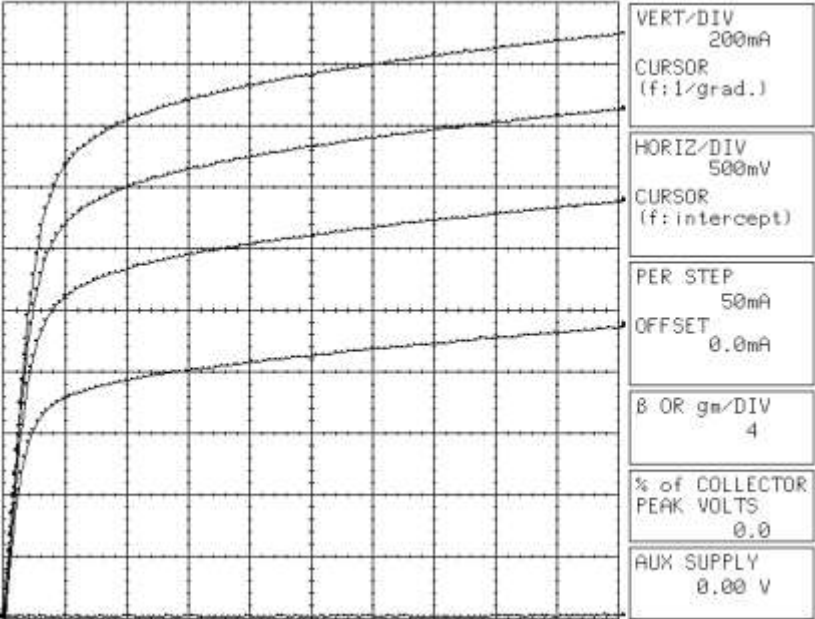


## Reverse DC Beta Characteristic ( $I_e$ vs. $h_{FE}$ )

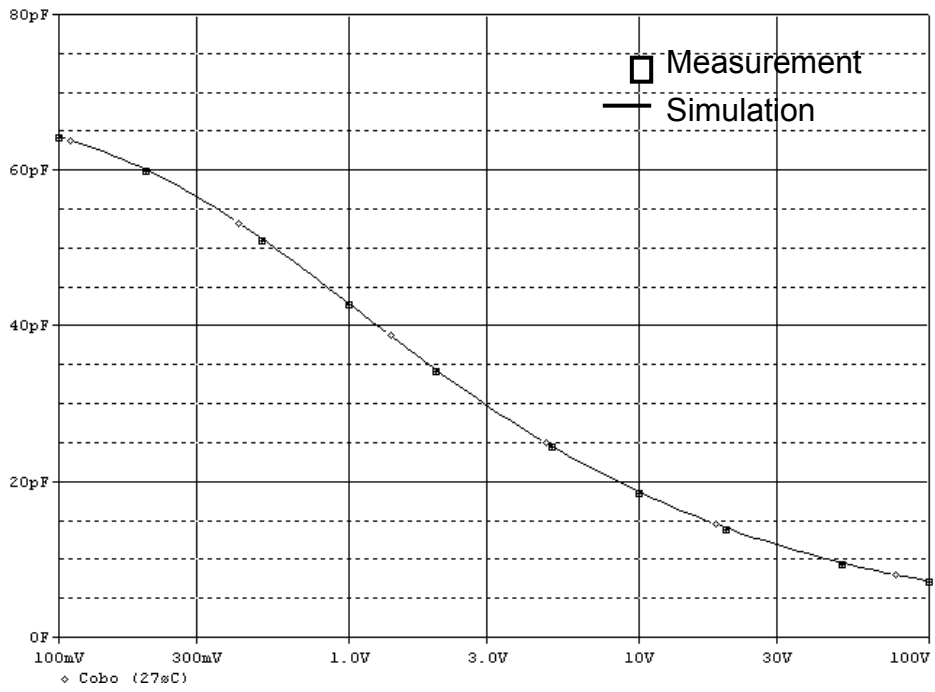


Forward

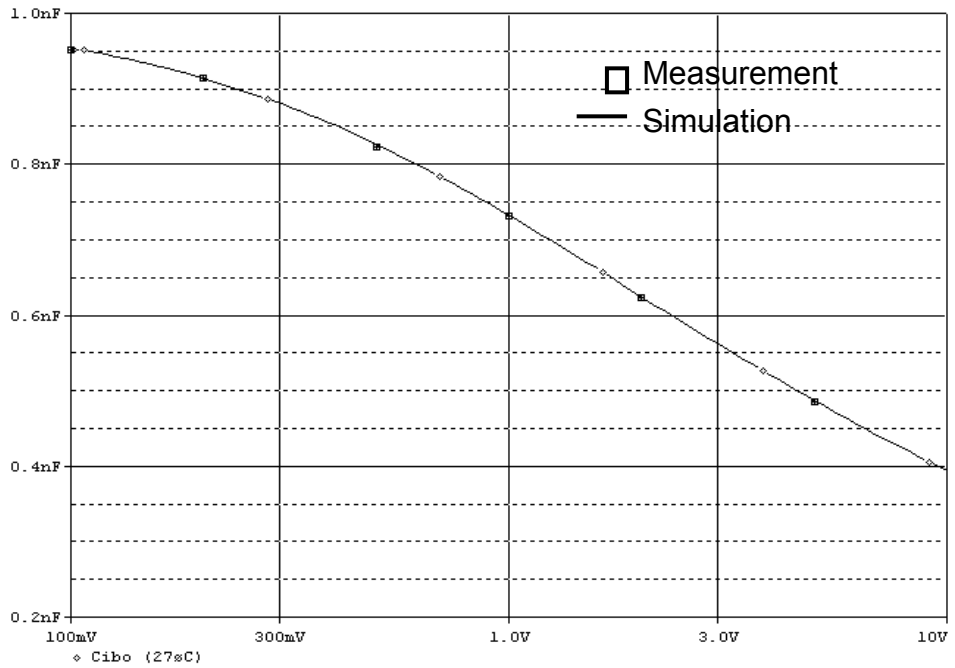
### Forward Early Voltage Characteristic



## C-B Capacitance Characteristics

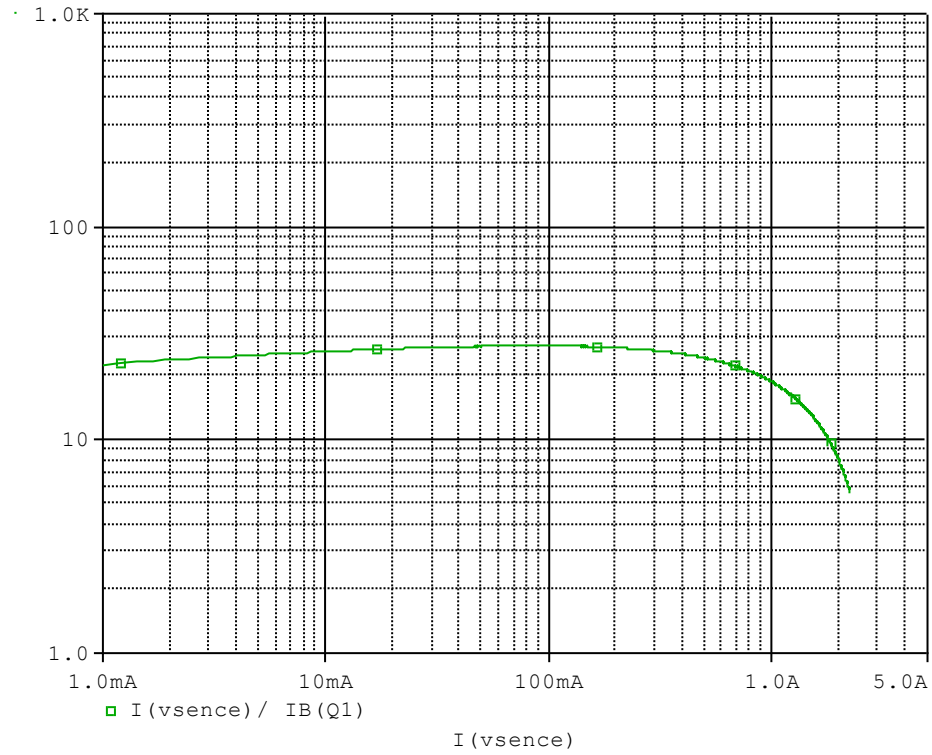


## E-B Capacitance Characteristics

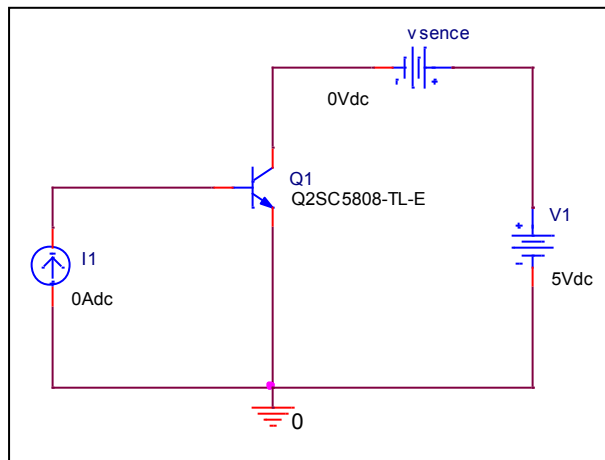


# Transistor $h_{FE}$ - $I_C$ Characteristics

## Circuit Simulation Result

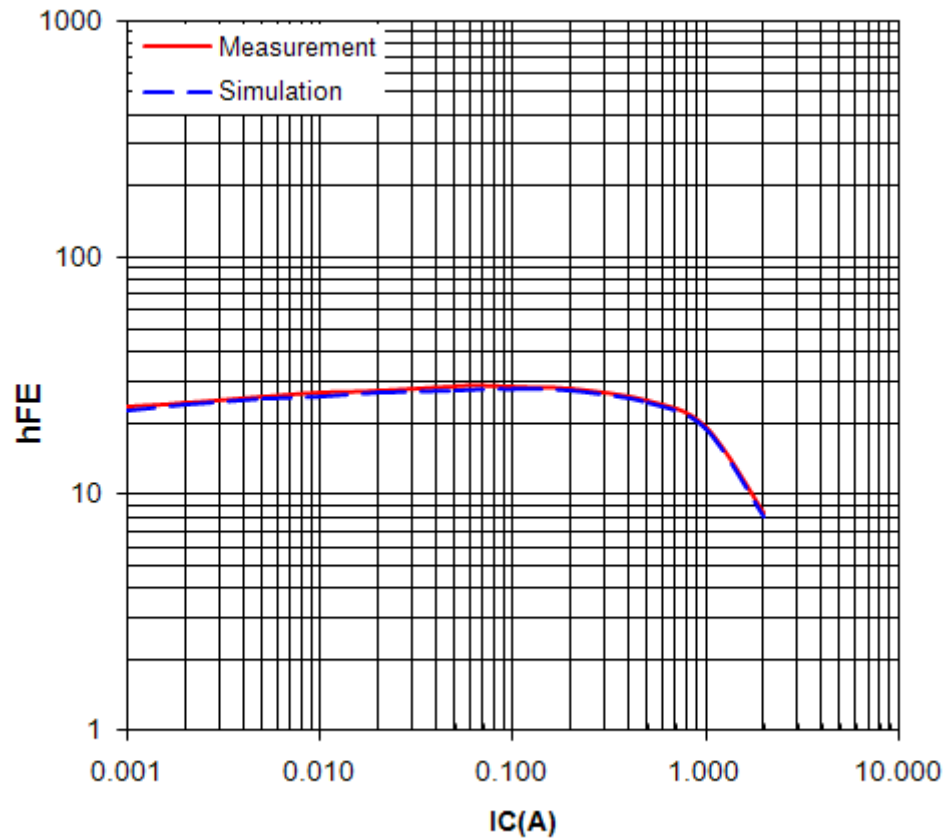


## Evaluation Circuit



## Comparison Graph

### Circuit Simulation Result



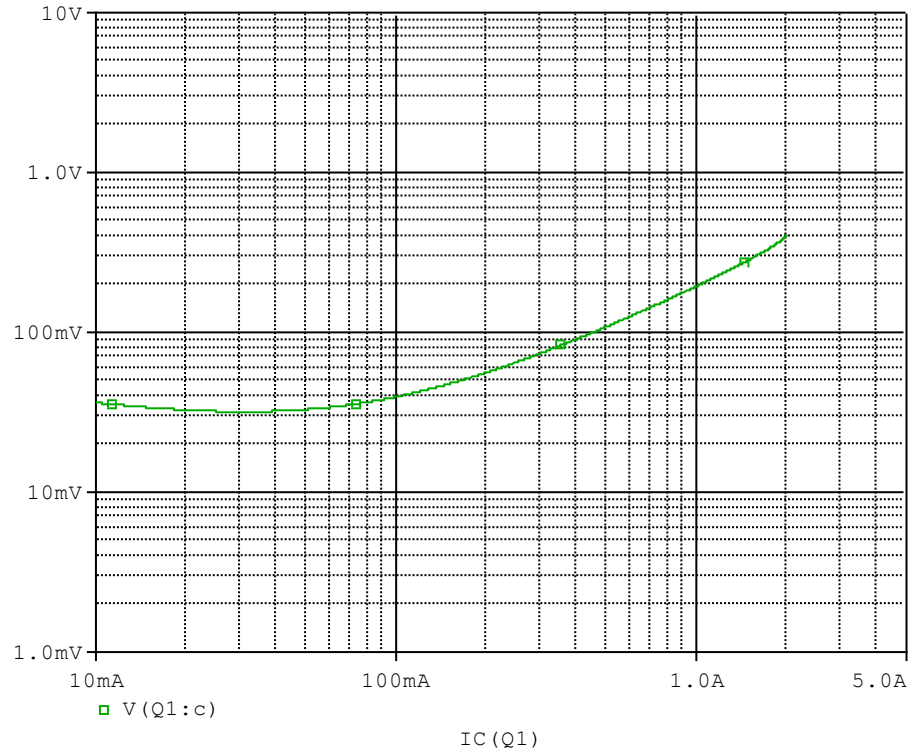
### Simulation Result

IC(A)	hFE		Error(%)
	Measurement	Simulation	
0.001	23.455	22.618	-3.569
0.002	24.174	23.728	-1.845
0.005	26.000	25.085	-3.519
0.010	27.000	25.997	-3.715
0.020	27.300	26.769	-1.945
0.050	28.606	27.520	-3.795
0.100	28.500	27.665	-2.930
0.200	28.000	27.111	-3.175
0.500	25.000	24.268	-2.928
1.000	19.300	18.741	-2.896
2.000	8.259	7.980	-3.387

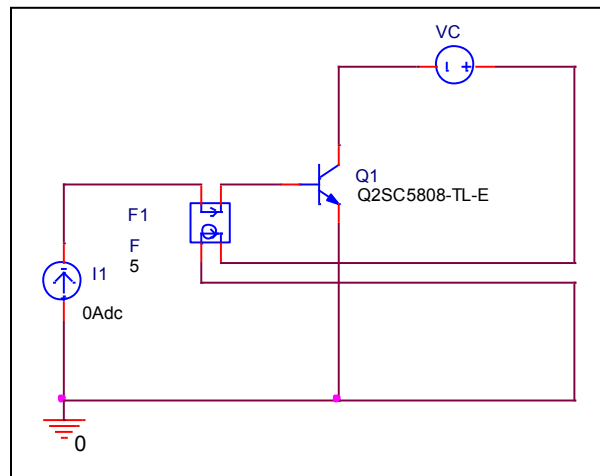


# $V_{CE(Sat)}$ - $I_C$ Characteristics

## Circuit Simulation Result

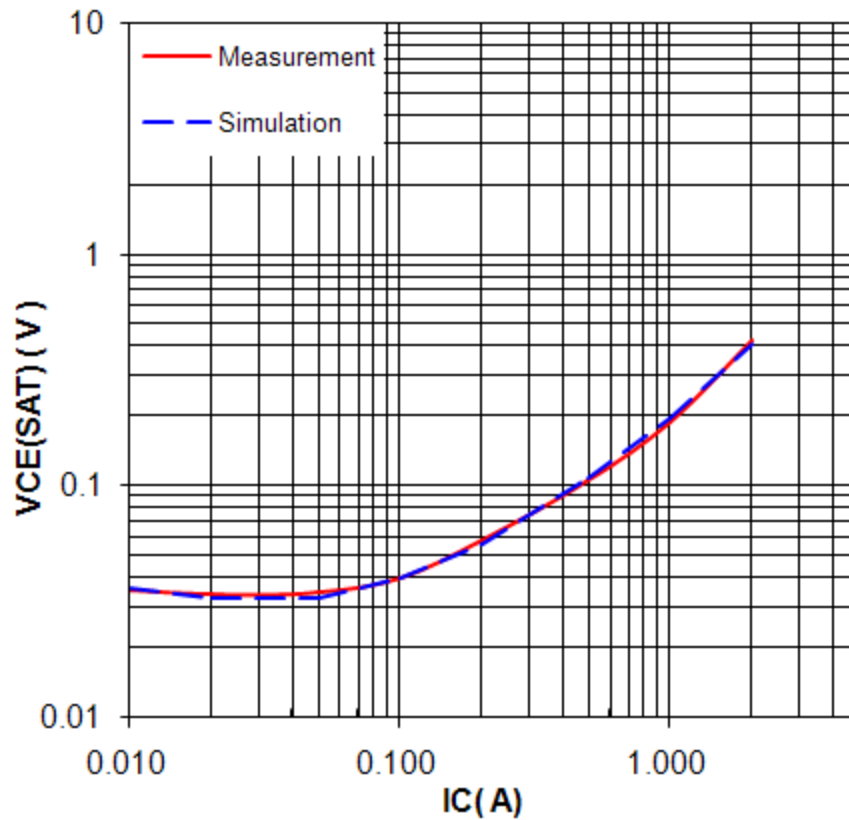


## Evaluation Circuit



## Comparison Graph

Circuit Simulation Result

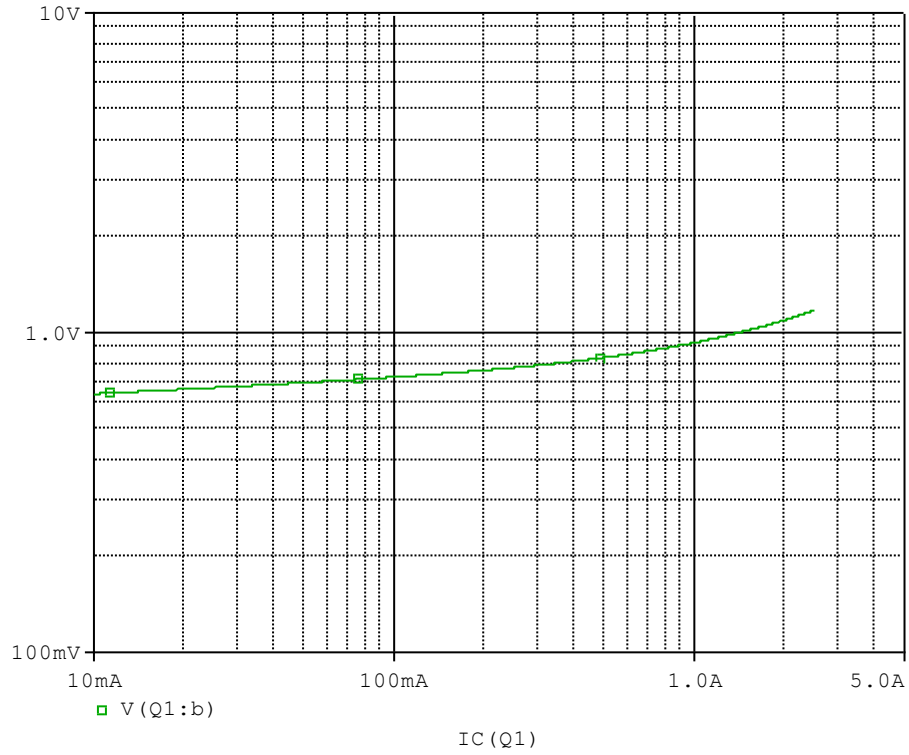


Simulation Result

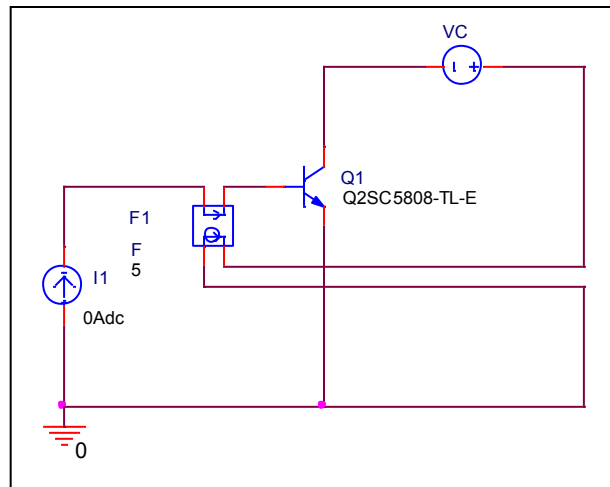
IC(A)	VCE(sat)(V)		Error(%)
	Measurement	Simulation	
0.01000	0.03550	0.03636	2.41690
0.02000	0.03400	0.03265	-3.96176
0.05000	0.03450	0.03292	-4.59420
0.10000	0.04000	0.03954	-1.14000
0.20000	0.05850	0.05619	-3.94872
0.50000	0.10500	0.10836	3.19619
1.00000	0.19000	0.19480	2.52579
2.00000	0.42500	0.40721	-4.18659

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

## Circuit Simulation Result

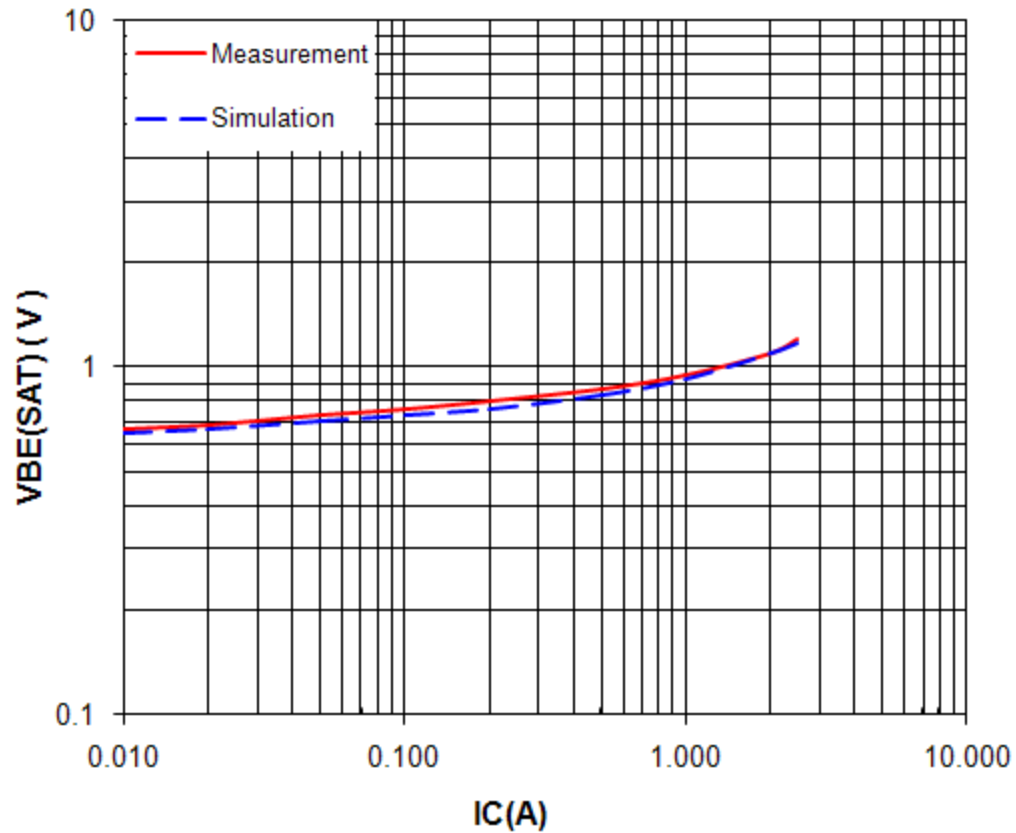


## Evaluation Circuit



## Comparison Graph

Circuit Simulation Result

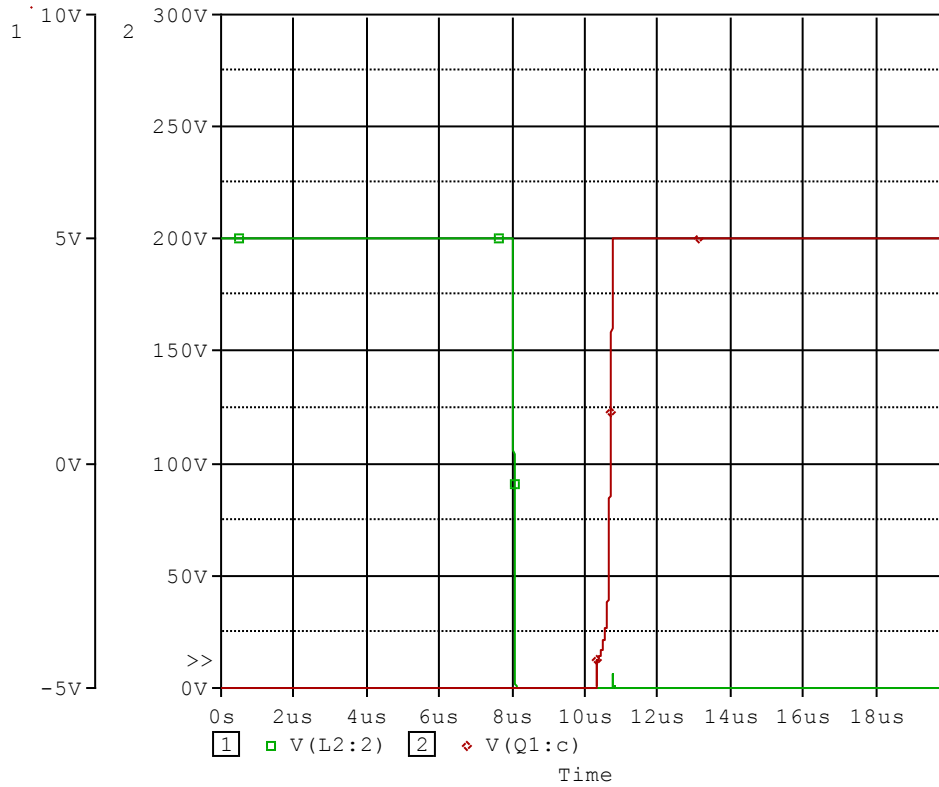


Simulation Result

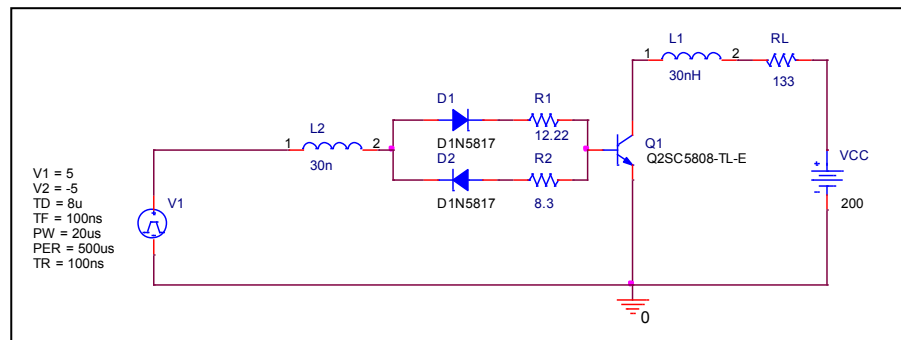
IC(A)	VBE(sat)(V)		Error(%)
	Measurement	Simulation	
0.01000	0.665	0.643	-3.236
0.02000	0.685	0.665	-2.861
0.05000	0.725	0.697	-3.802
0.10000	0.755	0.726	-3.820
0.20000	0.800	0.763	-4.656
0.50000	0.870	0.836	-3.897
1.00000	0.950	0.931	-2.038
2.00000	1.100	1.096	-0.373
2.50000	1.200	1.173	-2.258

# Switching Characteristics

## Circuit simulation result



## Evaluation circuit

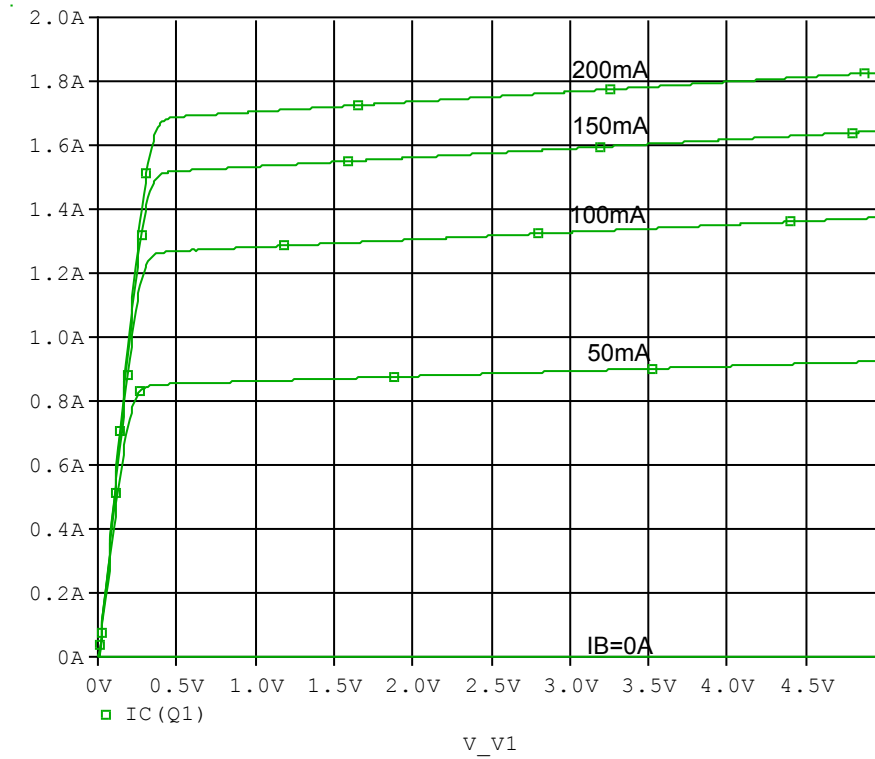


## Simulation result

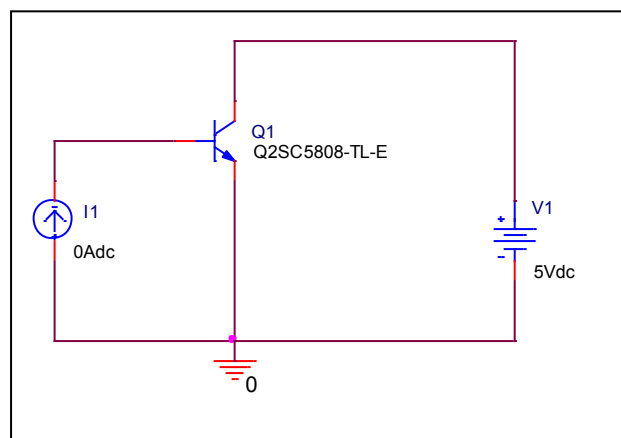
	Measurement	Simulation	%Error
<b>t<sub>f</sub> (us)</b>	<b>0.2500</b>	<b>0.2497</b>	<b>-0.1244</b>
<b>t<sub>stg</sub> (us)</b>	<b>2.5000</b>	<b>2.5006</b>	<b>0.0240</b>

# Output Characteristics

## Circuit Simulation Result



## Evaluation Circuit



# Output Characteristics

# Reference

