

Device Modeling Report

COMPONENTS: BRT
PART NUMBER: RN1416
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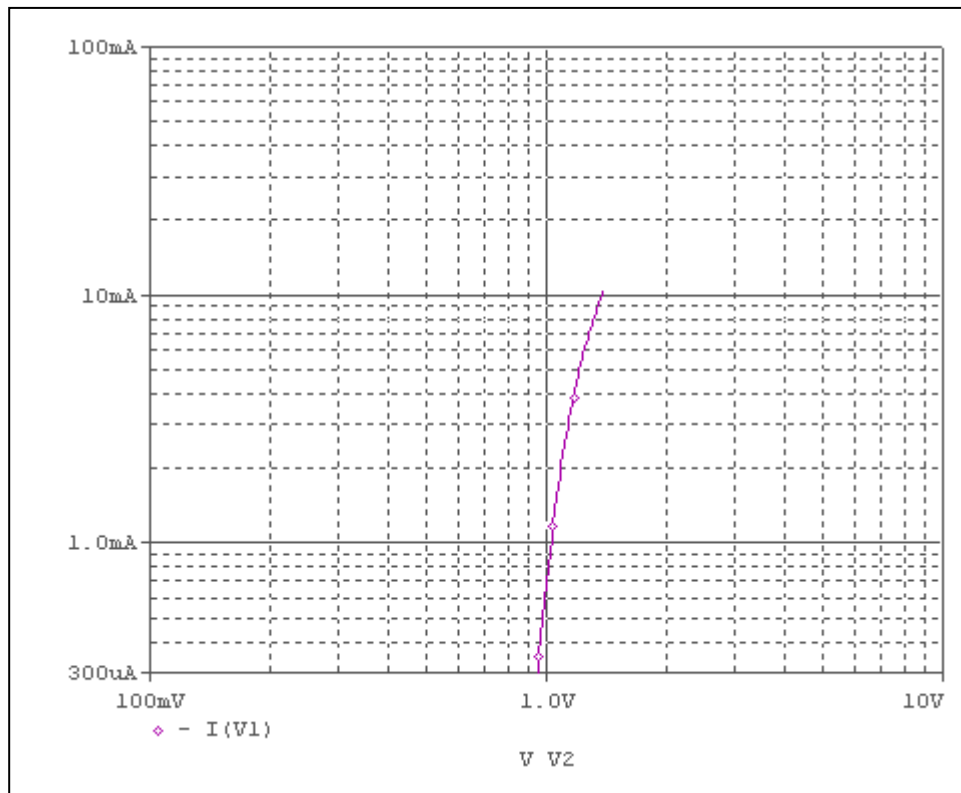


Bee Technologies Inc.

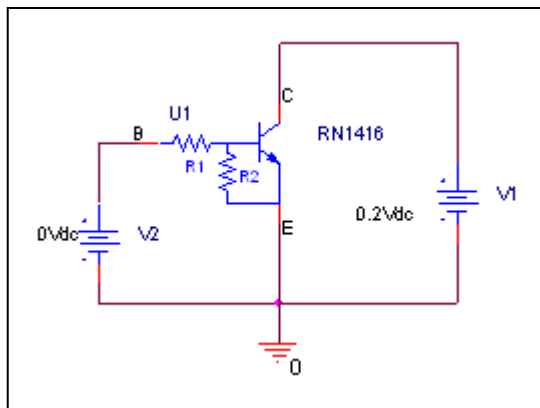
PSpice model parameter	Model description
IS	Saturation Current
BF	Ideal Maximum Forward Beta
NF	Forward Current Emission Coefficient
VAF	Forward Early Voltage
IKF	Forward Beta Roll-off Knee Current
ISE	Non-ideal Base-Emitter Diode Saturation Current
NE	Non-ideal Base-Emitter Diode Emission Coefficient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

Input voltage vs. output current (ON characteristics)

Circuit simulation result

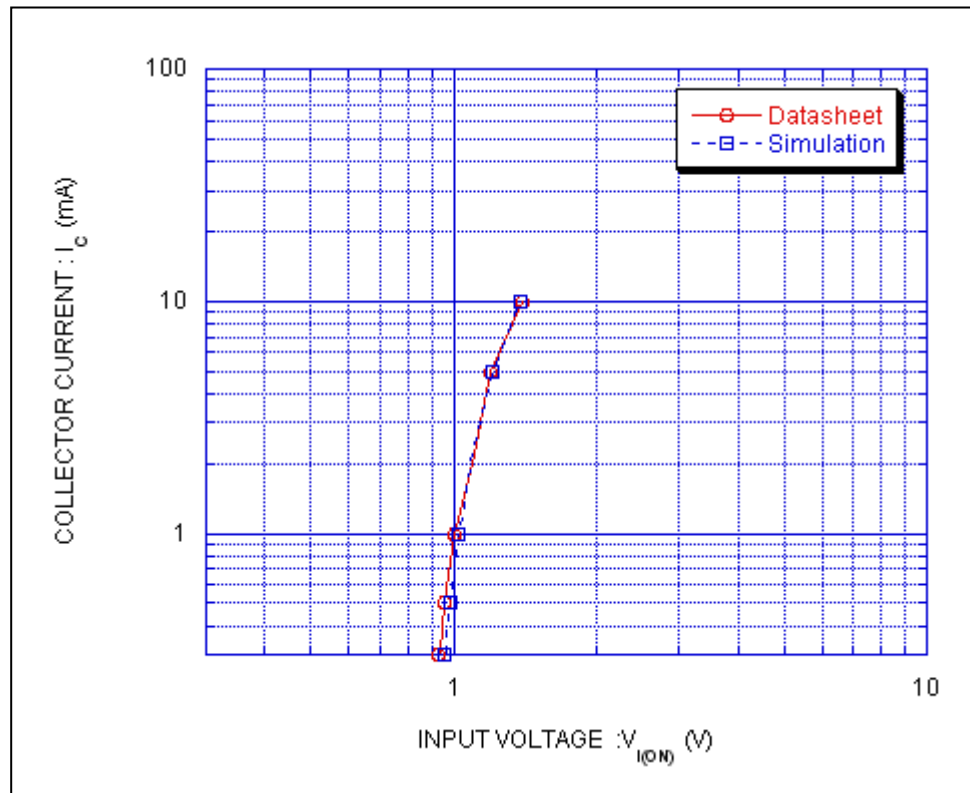


Evaluation circuit



Comparison Graph

Circuit Simulation Result



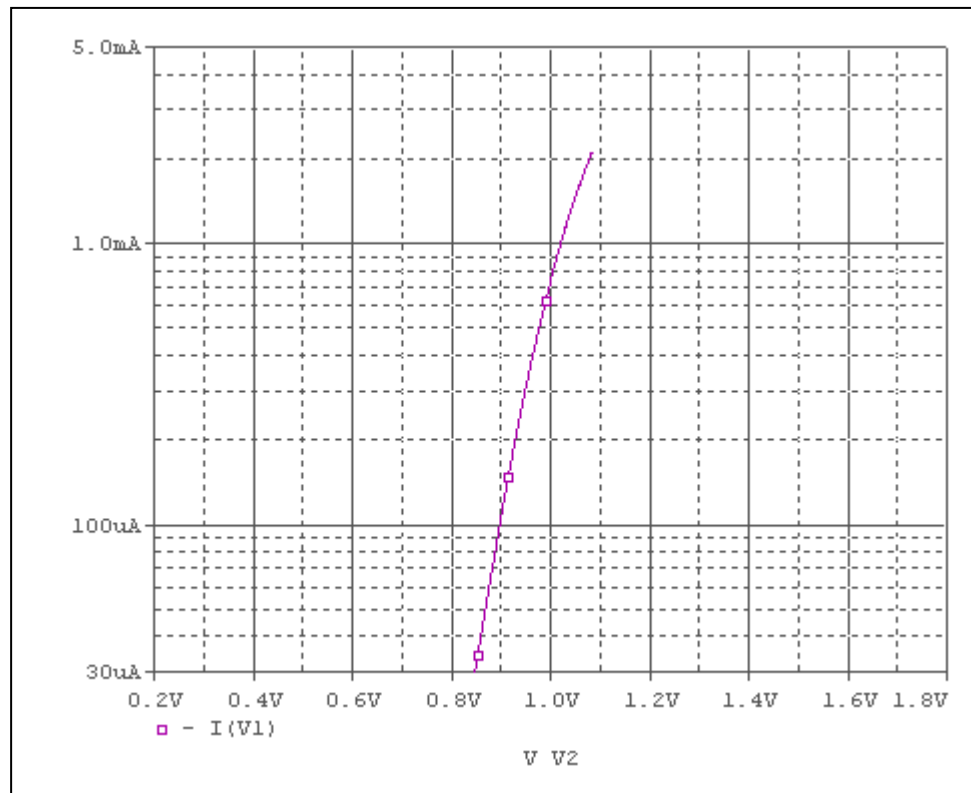
Simulation Result

Condition @ $V_{ce} = 0.2$ V

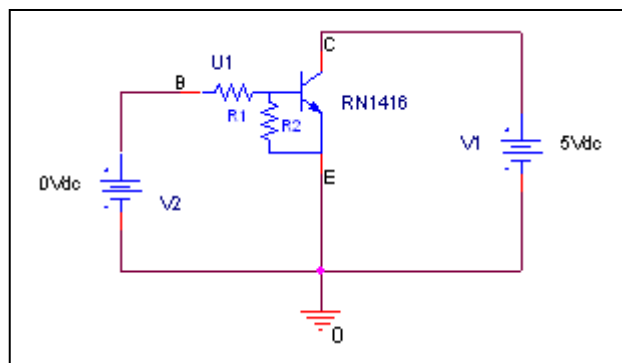
I_c (mA)	$V_{I(ON)}$ (V)		Error (%)
	Datasheet	Simulation	
0.3	0.93	0.952776	2.4490
0.5	0.96	0.980457	2.1309
1	1	1.0272	2.7200
2	1.1	1.0877	-1.1182
5	1.2	1.2132	1.1000
10	1.4	1.3853	-1.0500

Output current vs. input voltage (OFF characteristics)

Circuit simulation result

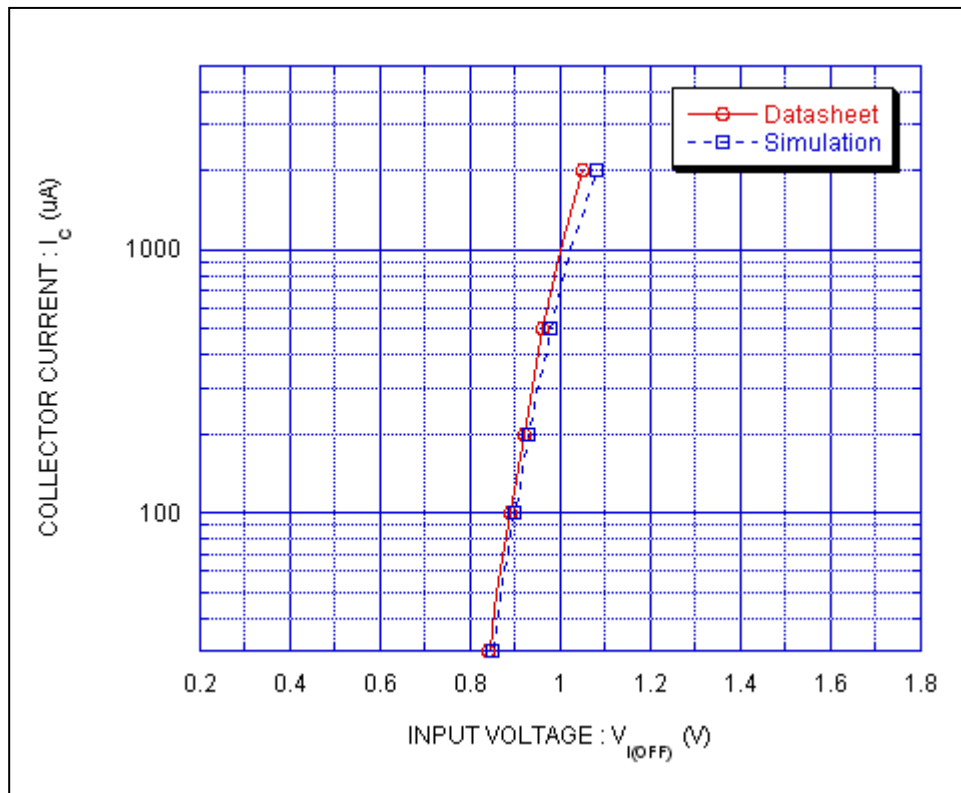


Evaluation circuit



Comparison Graph

Circuit Simulation Result



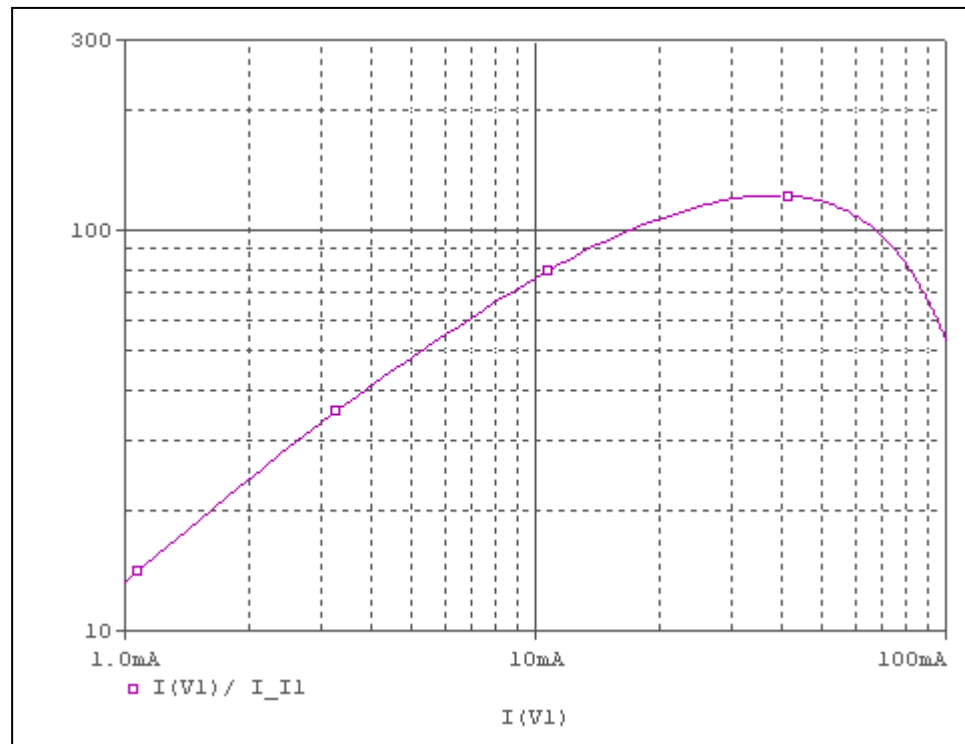
Simulation Result

Condition @ $V_{ce} = 5\text{ V}$

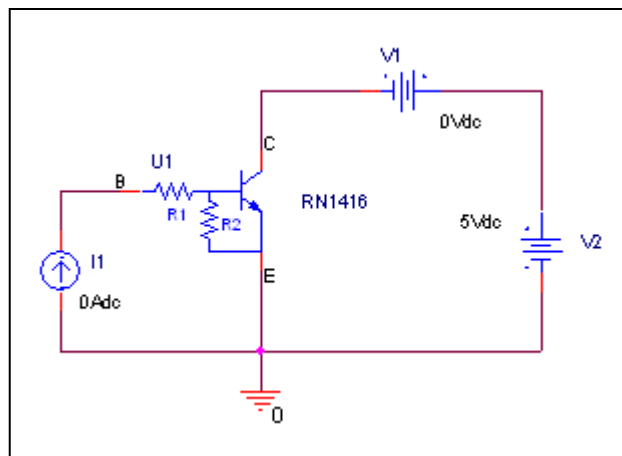
Ic(uA)	V _{I(Off)} (V)		Error (%)
	Datasheet	Simulation	
30	0.84	0.847706	0.9174
50	0.86	0.868344	0.9702
100	0.89	0.898369	0.9403
200	0.92	0.928662	0.9415
500	0.96	0.976603	1.7295
1000	1.0	1.0209	2.0900
2000	1.05	1.0789	2.7524

DC current gain vs. output current

Circuit simulation result

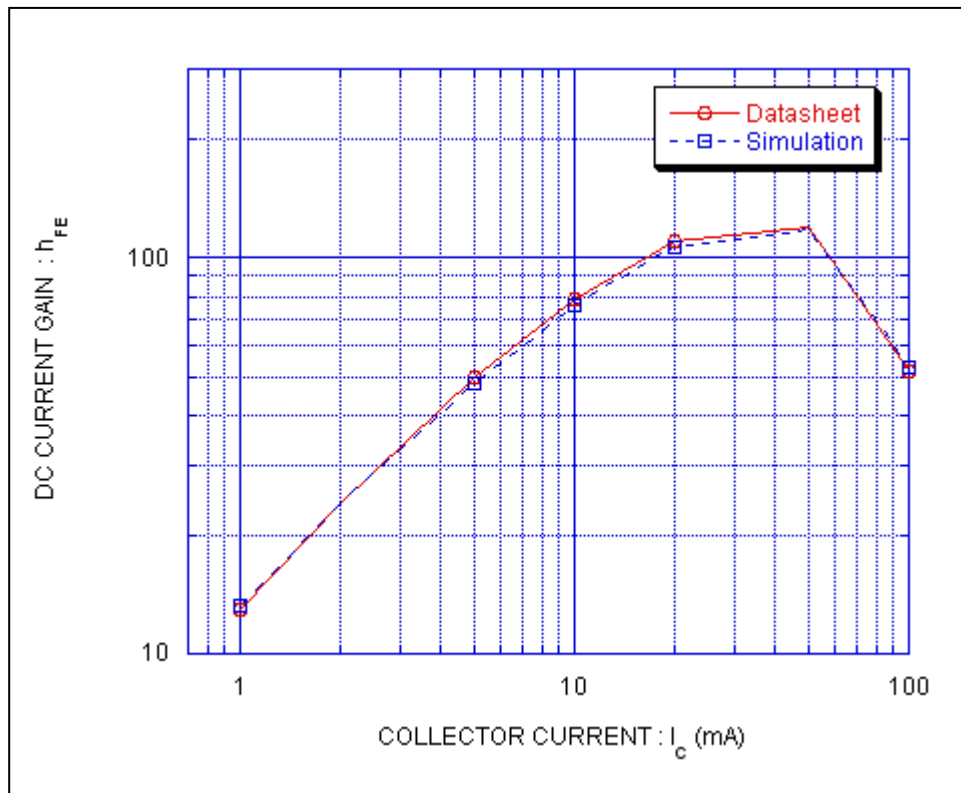


Evaluation circuit



Comparison Graph

Circuit Simulation Result



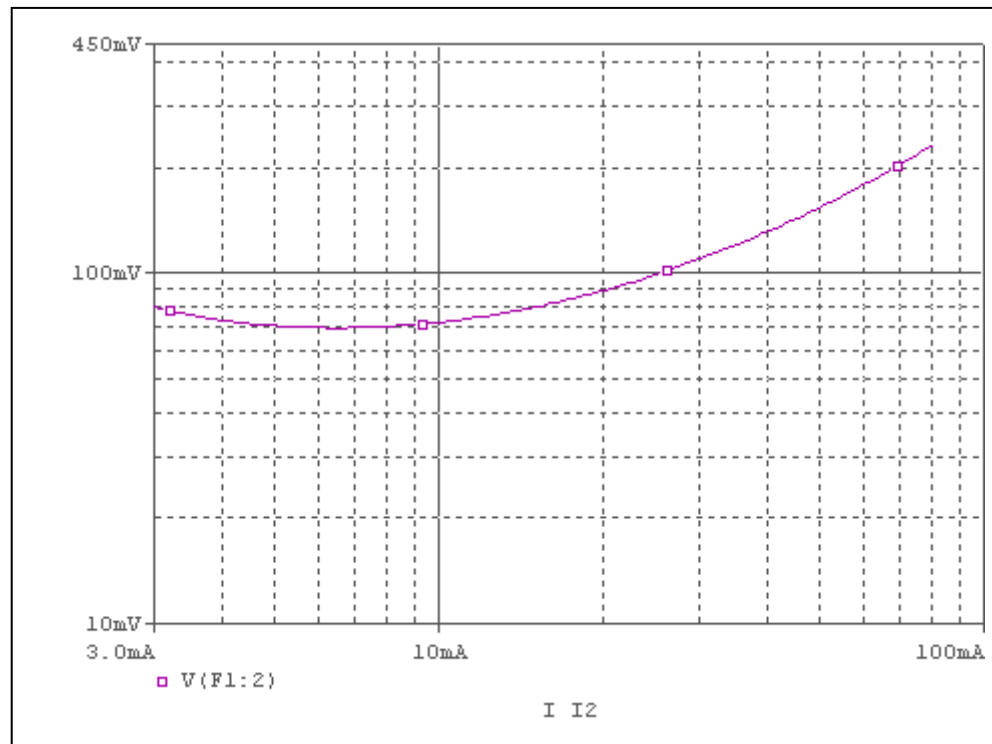
Simulation Result

Condition @ $V_{ce} = 5\text{ V}$

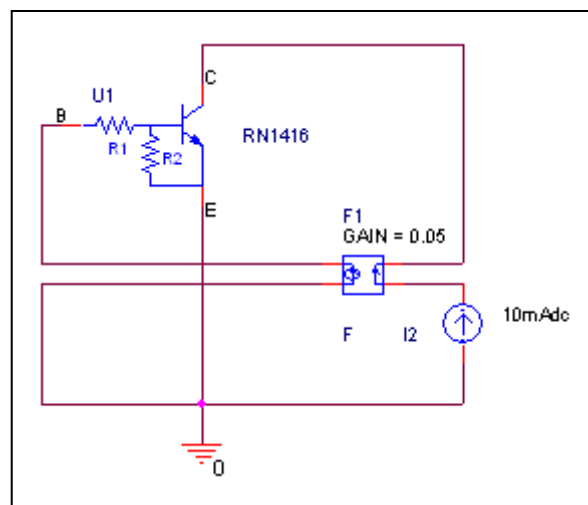
$I_C(\text{mA})$	h_{FE}		Error (%)
	Datasheet	Simulation	
1	13	13.232	1.7846
2	24	23.910	-0.3750
5	50	48.436	-3.1280
10	79	76.125	-3.6392
20	110	107.044	-2.6873
50	120	118.284	-1.4300
100	52	52.731	1.4058

Output voltage VS. output current

Circuit simulation result

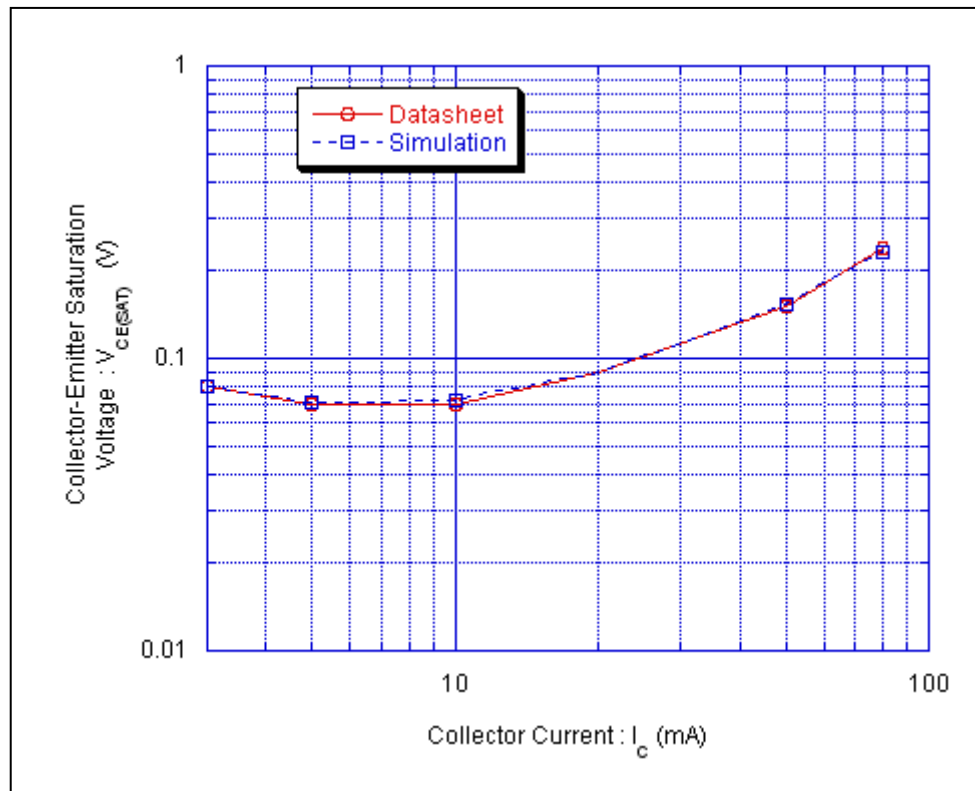


Evaluation circuit



Comparison Graph

Circuit Simulation Result



Simulation Result

Condition @ $I_C/I_B = 20$

Ic(mA)	V _{CE} (sat) (mV)		Error (%)
	Datasheet	Simulation	
3	0.08	0.080201	0.2512
5	0.07	0.070705	1.0071
10	0.07	0.072390	3.4143
20	0.089	0.089104	0.1169
50	0.15	0.154112	2.7413
80	0.24	0.230617	-3.9096