Device Modeling Report

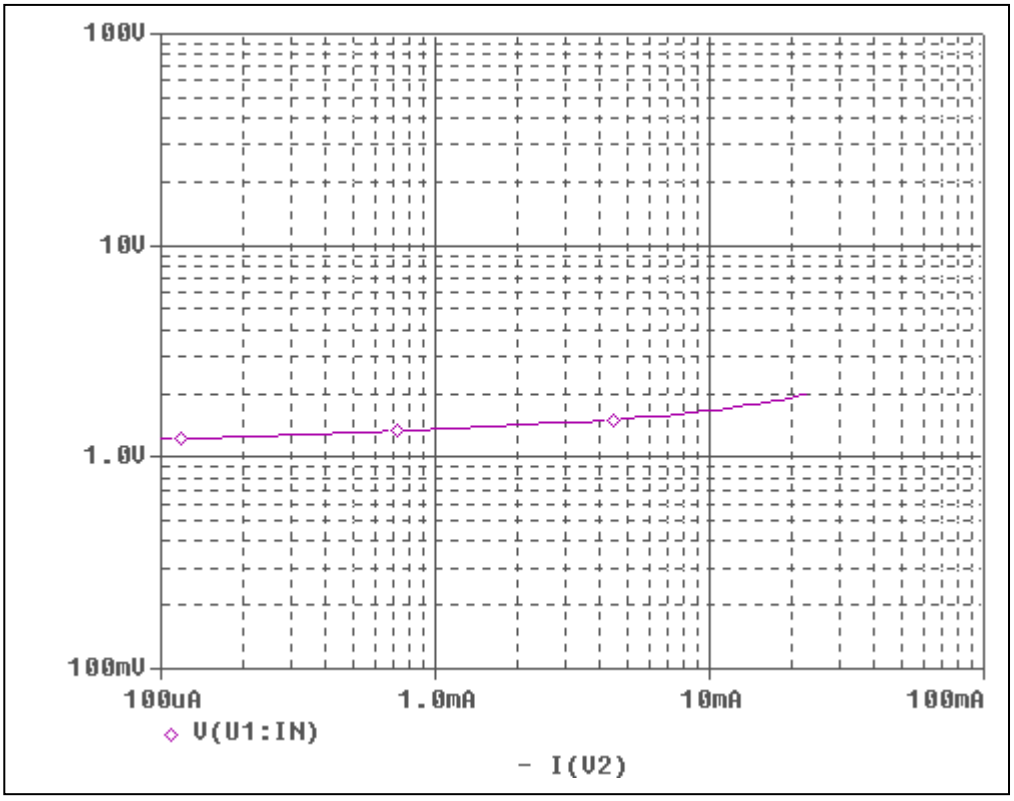
COMPONENTS: Digital transistors (built-in resistors)
PART NUMBER: DTC143EE
MANUFACTURER: ROHM

Bee Technologies Inc.

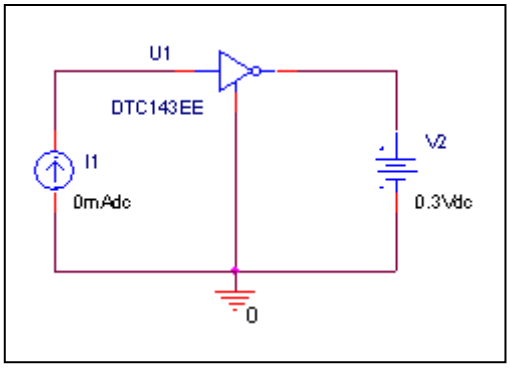
PSpice model parameter	Model description
IS	Saturation Current
BF	Ideal Maximum Forward Beta
NF	Forward Current Emission Coefficient
VAF	Forward Early Voltage
IKF	Forward Beta Roll-off Knee Current
ISE	Non-ideal Base-Emitter Diode Saturation Current
NE	Non-ideal Base-Emitter Diode Emission Coefficient
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=1/2pi*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

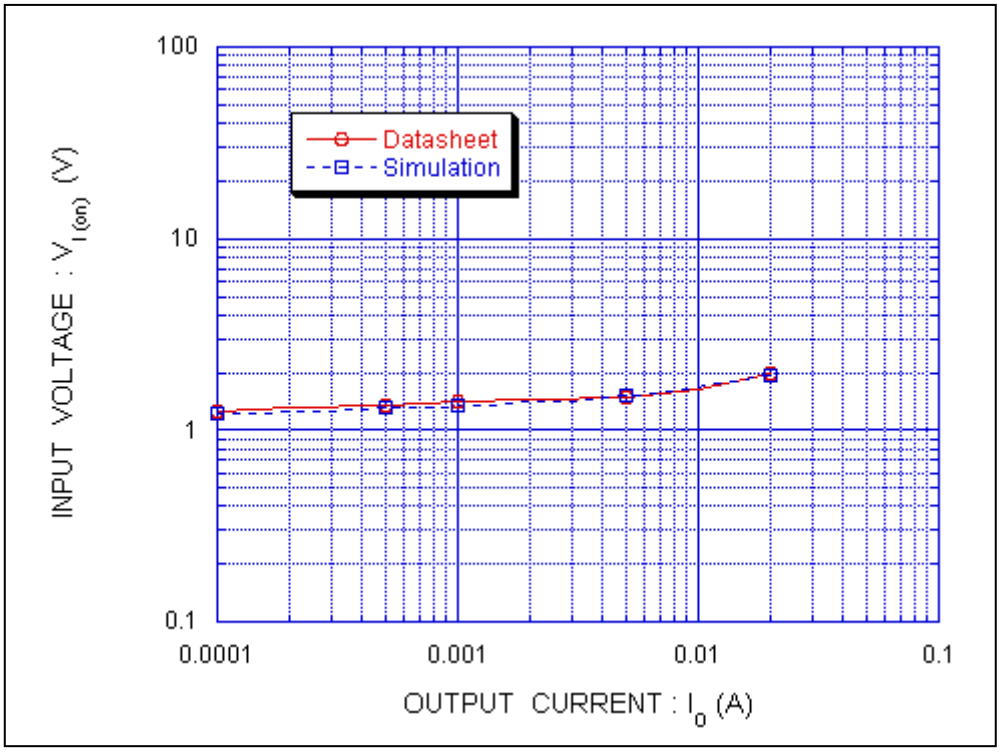


Evaluation circuit



Comparison Graph

Circuit Simulation Result



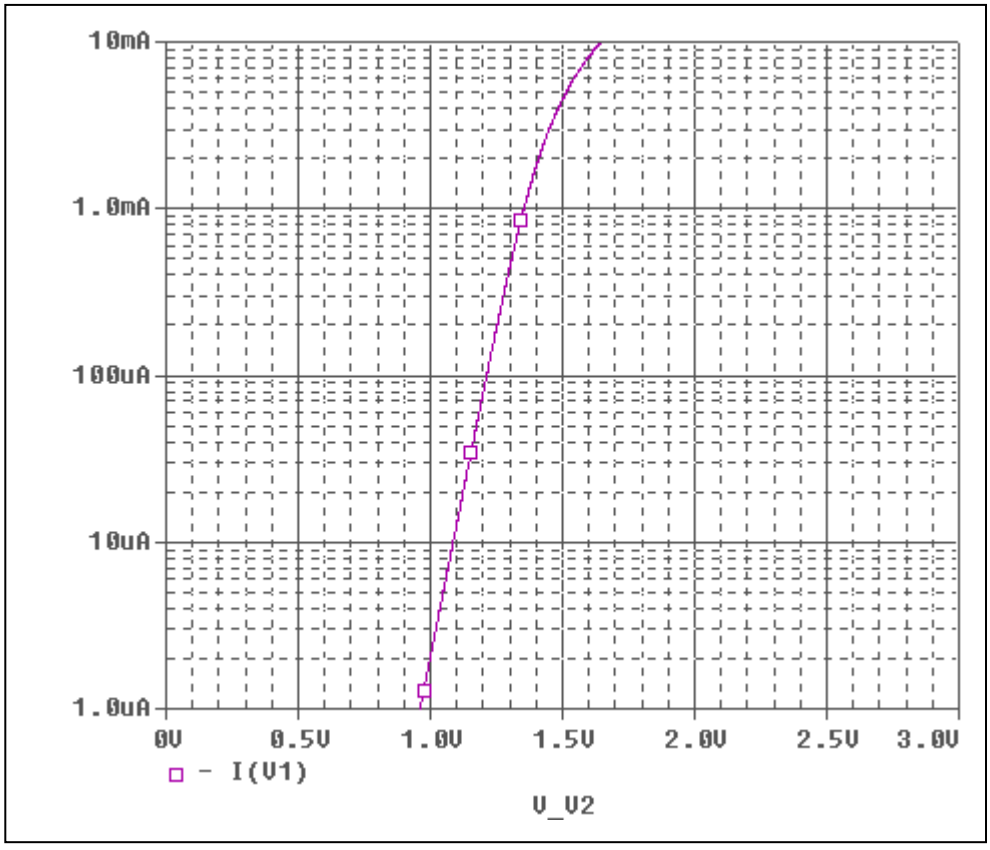
Simulation Result

Condition @ Vo = 0.3 V

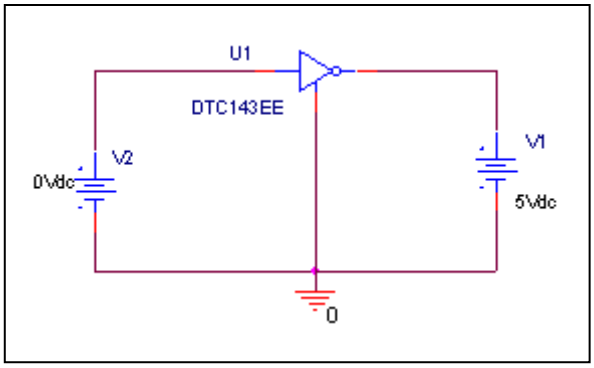
Ic(A)	$V_{I(ON)}$ (V)		Error (%)
	Datasheet	Simulation	
100u	1.25	1.2143	-2.85600
200u	1.3	1.2557	-3.40769
500u	1.35	1.3116	-2.84444
1m	1.4	1.3588	-2.94286
2m	1.45	1.4157	-2.36552
5m	1.5	1.5228	1.52000
10m	1.65	1.6616	0.70303
20m	2	1.9217	-3.91500

Output current vs. input voltage (OFF characteristics)

Circuit simulation result

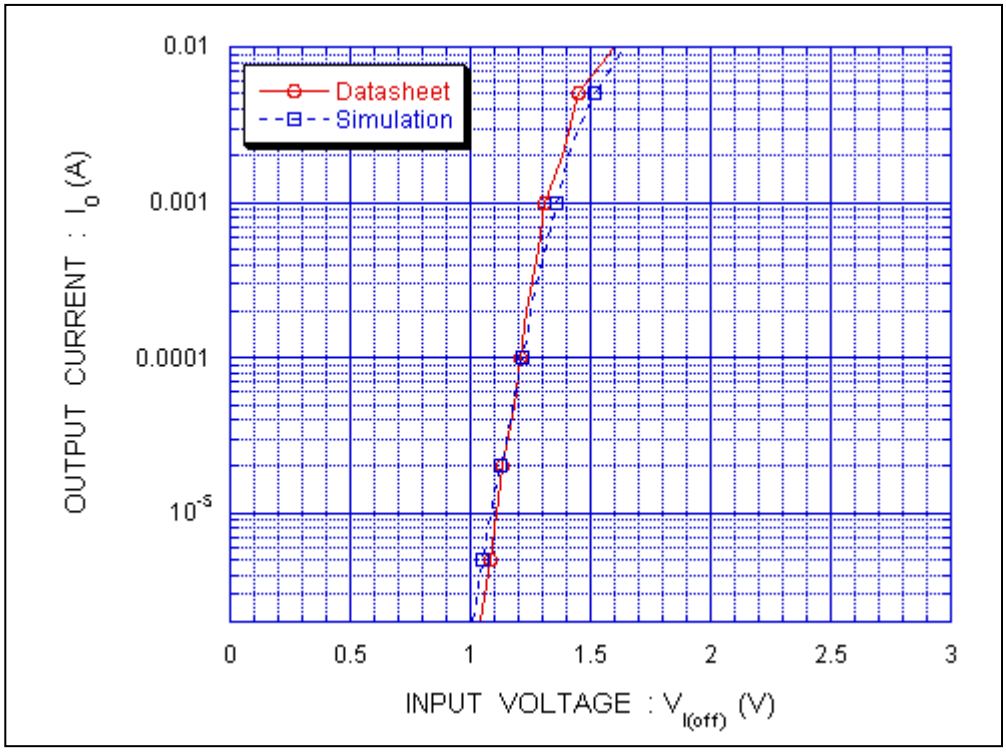


Evaluation circuit



Comparison Graph

Circuit Simulation Result



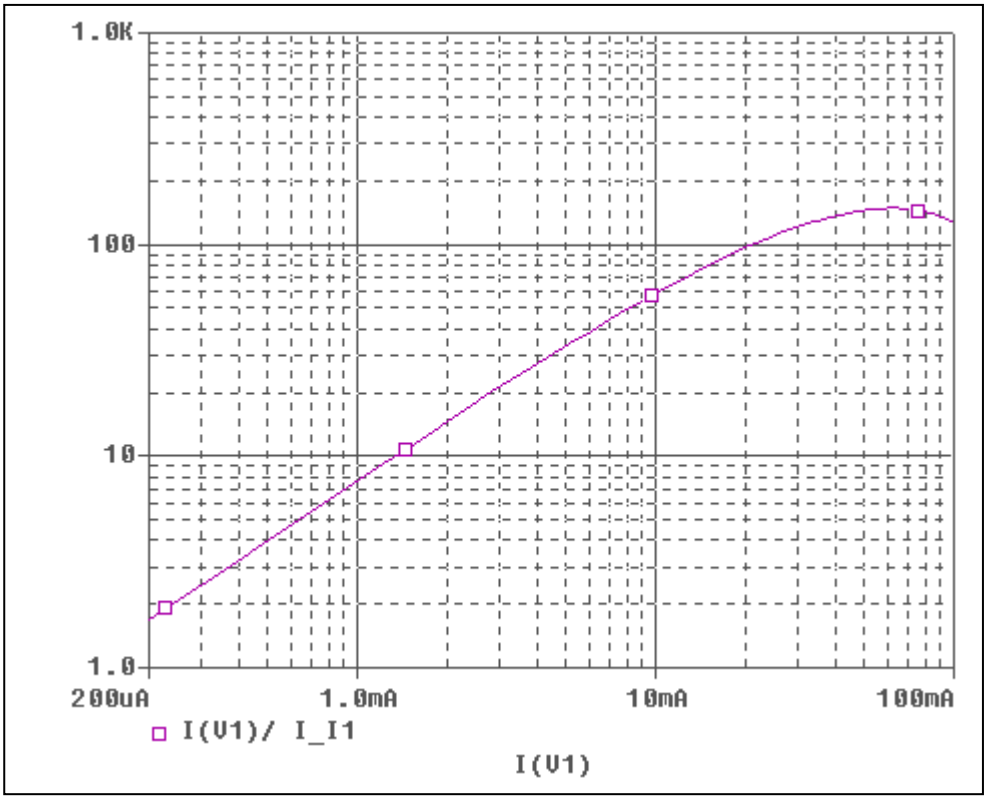
Simulation Result

Condition @ Vcc = 5 V

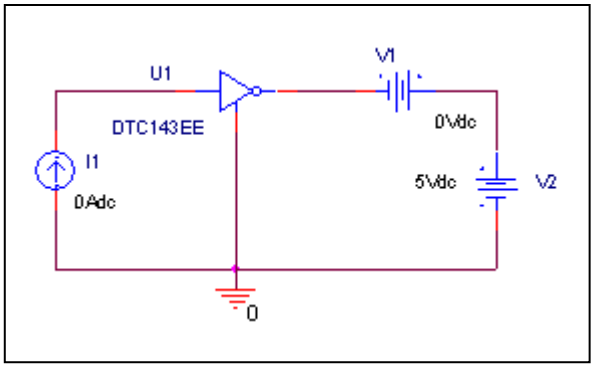
Ic(A)	$V_{I(OFF)}$ (V)		Error (%)
	Datasheet	Simulation	
2u	1.03	0.9987	-3.03883
5u	1.08	1.0480	-2.96296
10u	1.11	1.0856	-2.19820
20u	1.13	1.1245	-0.48673
50u	1.18	1.1748	-0.44068
100u	1.21	1.2150	0.41322
200u	1.23	1.2534	1.90244
500u	1.28	1.3082	2.20313
1m	1.31	1.3562	3.52672
2m	1.38	1.4110	2.24638
5m	1.45	1.5137	4.39310
10m	1.6	1.6456	2.85000

DC current gain vs. output current

Circuit simulation result

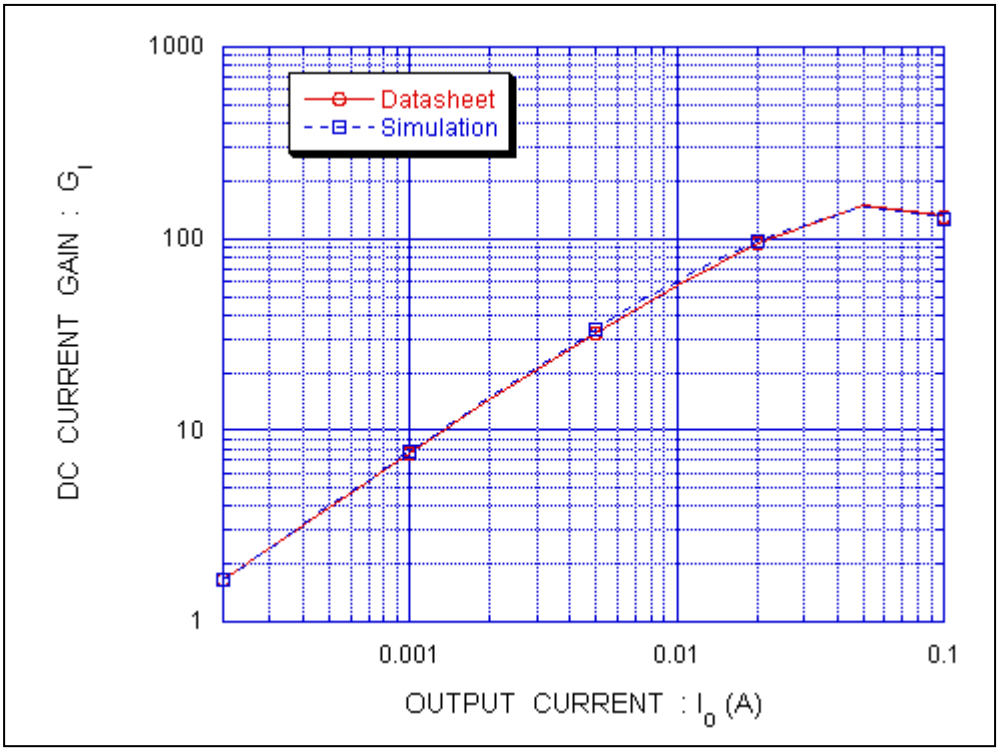


Evaluation circuit



Comparison Graph

Circuit Simulation Result



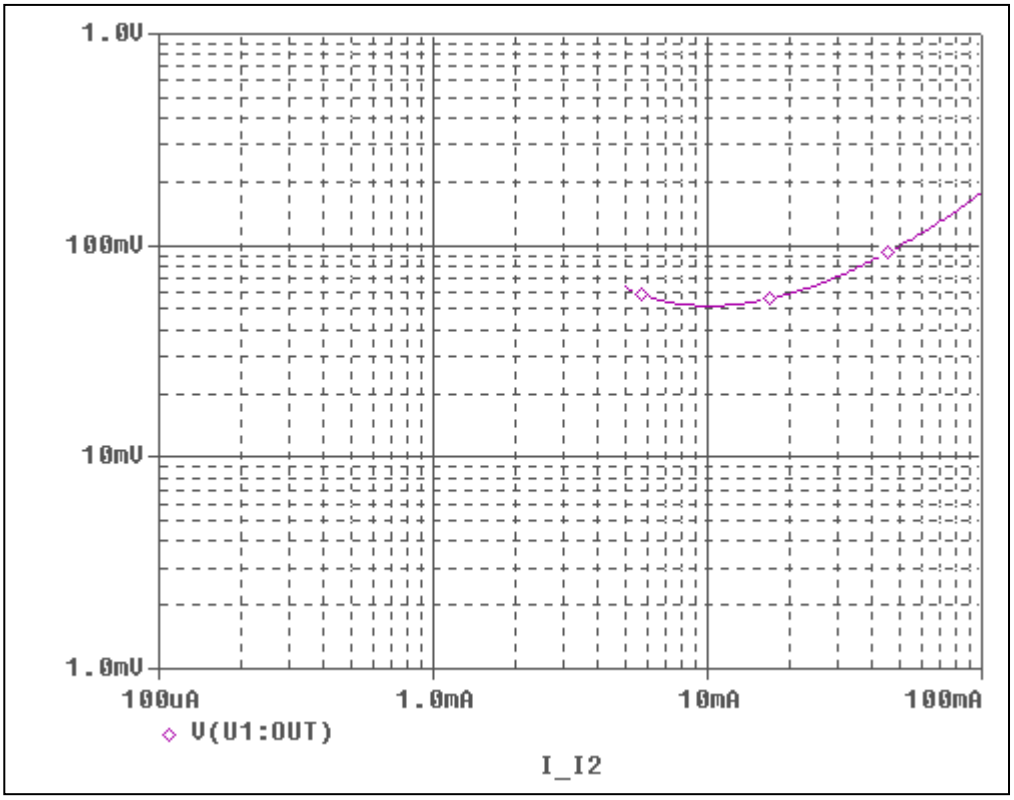
Simulation Result

Condition @ Vo = 5 V

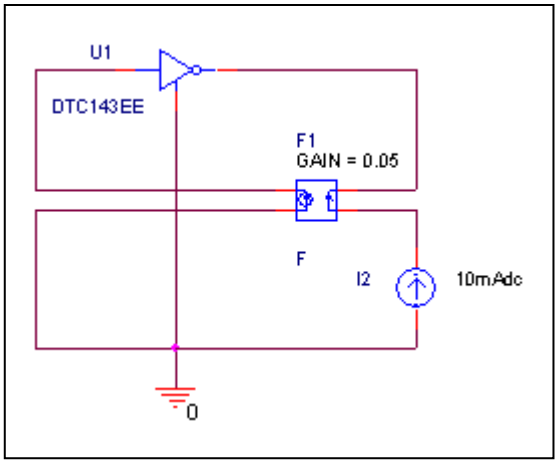
Ic(A)	hFE		Error (%)
	Datasheet	Simulation	
200u	1.6615	1.6719	0.62594
500u	3.9728	4.0195	1.17549
1m	7.5539	7.6554	1.34368
2m	14.328	14.643	2.19849
5m	32.367	33.289	2.84858
10m	57.558	59.330	3.07863
20m	95.463	97.025	1.63624
50m	149.083	145.549	-2.37049
100m	129.971	125.418	-3.50309

Output voltage VS. output current

Circuit simulation result

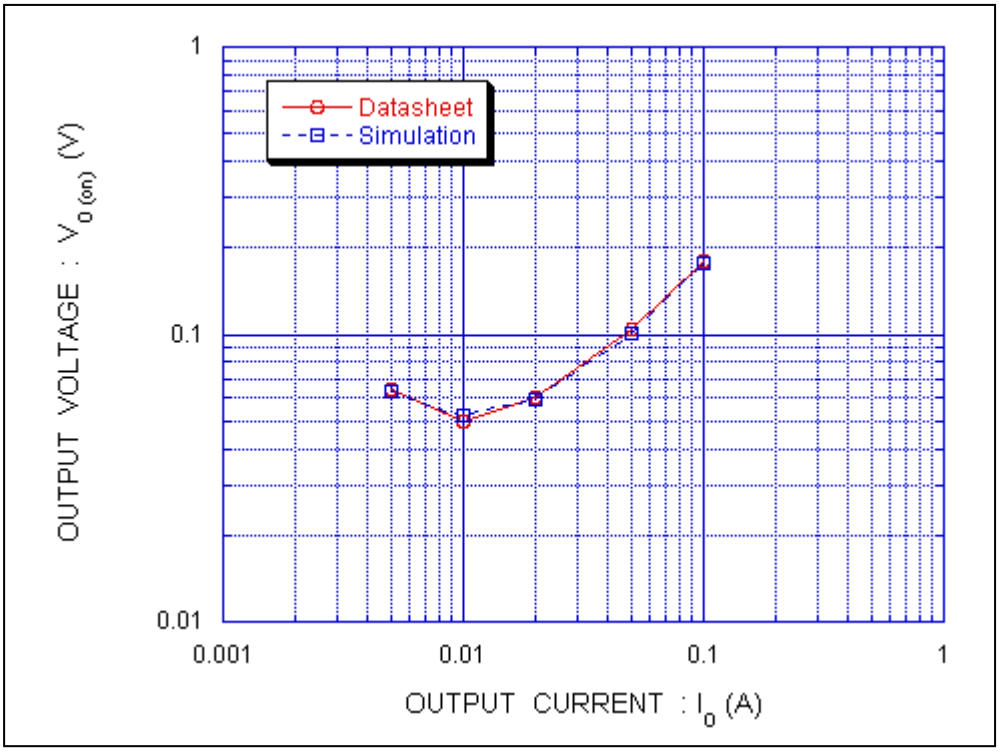


Evaluation circuit



Comparison Graph

Circuit Simulation Result



Simulation Result

Condition @ I_o/I_I = 20

Ic(A)	V_{CE} (sat)		Error (%)
	Datasheet	Simulation	
5m	64m	63.836m	-0.25625
10m	50m	51.933m	3.86600
20m	60m	59.531m	-0.78167
50m	105m	100.189m	-4.58190
100m	180m	177.053m	-1.63722