Device Modeling Report

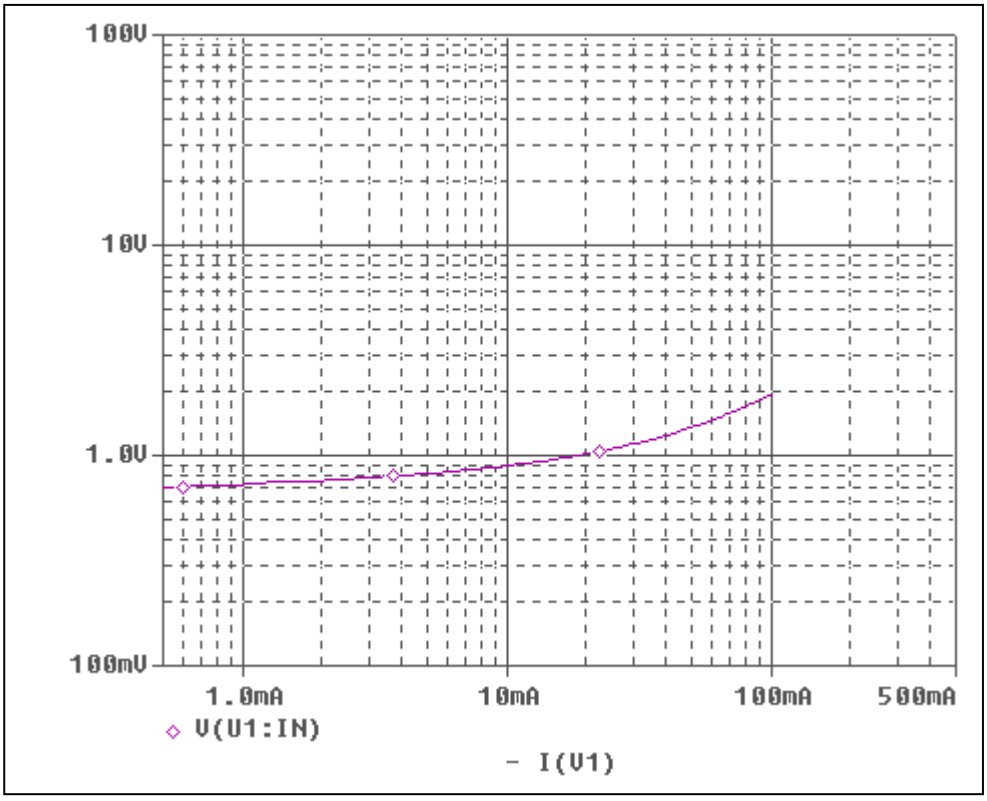
COMPONENTS: Digital transistors (built-in resistors)
PART NUMBER: DTD123YS
MANUFACTURER: ROHM

Bee Technologies Inc.

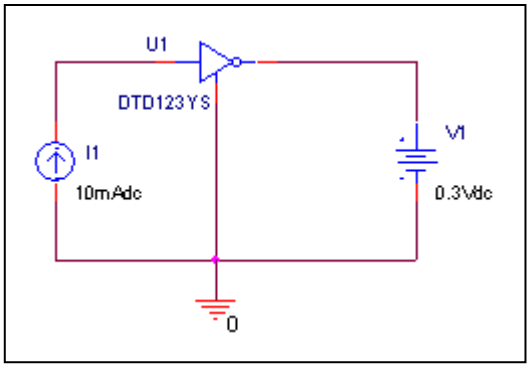
PSpice model parameter	Model description
IS	Saturation Current
BF	Ideal Maximum Forward Beta
NF	Forward Current Emission Coefficient
VAF	Forward Early Voltage
IKF	Forward Beta Roll-off Knee Current
ISE	Non-ideal Base-Emitter Diode Saturation Current
NE	Non-ideal Base-Emitter Diode Emission Coefficient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

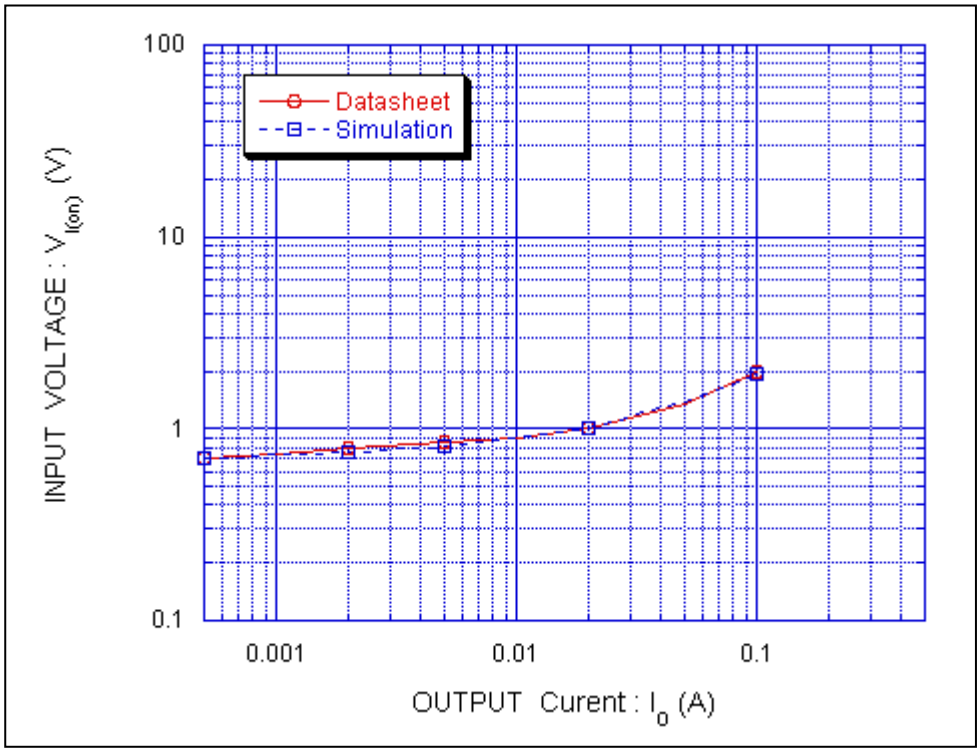


Evaluation circuit



Comparison Graph

Circuit Simulation Result



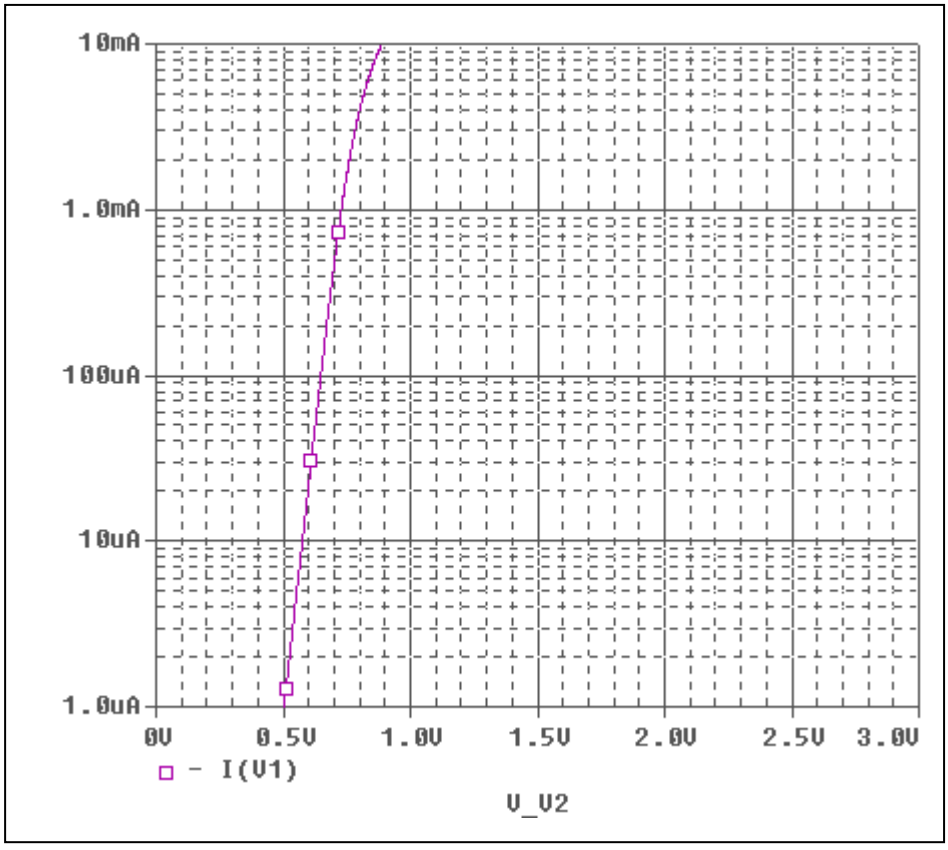
Simulation Result

Condition @ Vo = 0.3 V

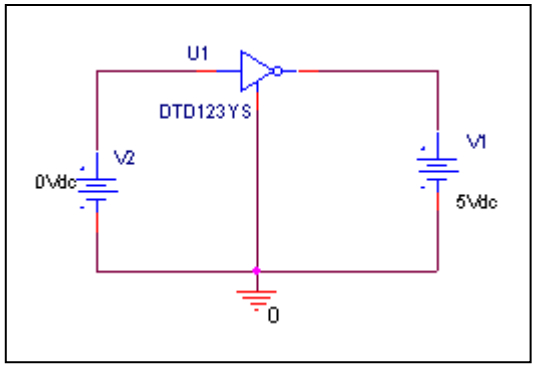
Io(A)	$V_{I(ON)}$ (V)		Error (%)
	Datasheet	Simulation	
500u	700m	703.509m	0.49879
1m	740m	731.024m	-1.22468
2m	790m	763.024m	-3.53541
5m	850m	822.046m	-3.40054
10m	900m	895.083m	-0.54933
20m	1	1.0189	1.85494
50m	1.35	1.3696	1.43107
100m	2	1.9554	-2.28086

Output current vs. input voltage (OFF characteristics)

Circuit simulation result

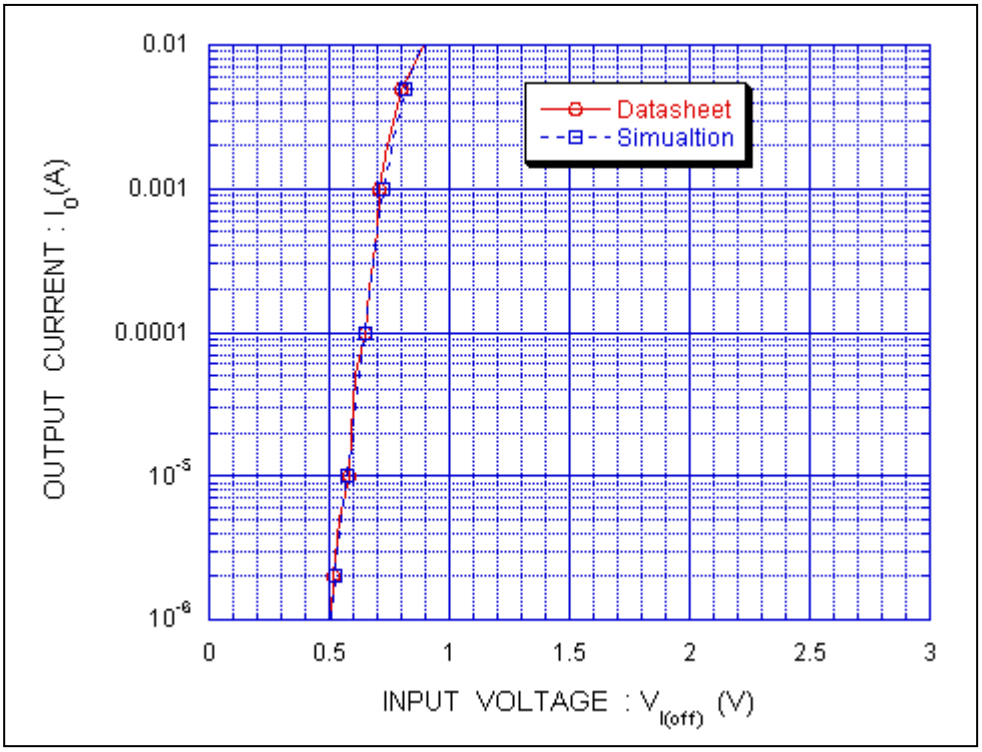


Evaluation circuit



Comparison Graph

Circuit Simulation Result



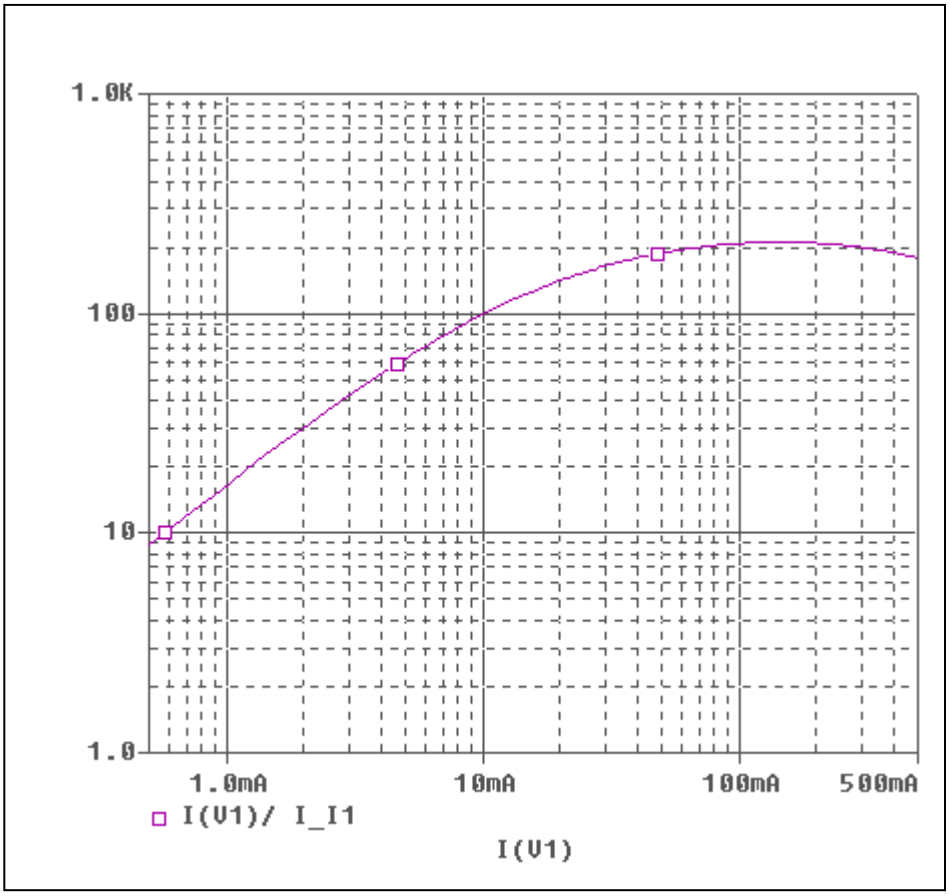
Simulation Result

Condition @ Vcc = 5 V

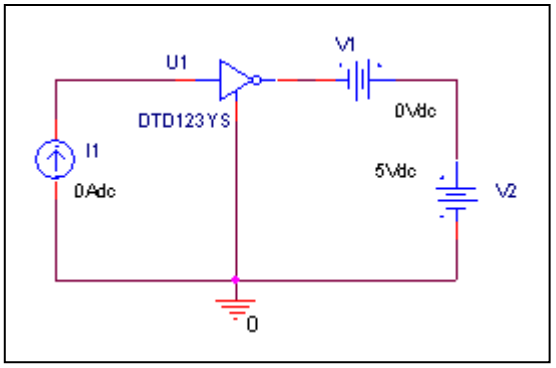
Io(A)	$V_{I(OFF)}$ (V)		Error (%)
	Datasheet	Simulation	
1u	0.5	0.502954	0.58733
2u	0.52	0.524947	0.94238
5u	0.54	0.553721	2.47796
10u	0.58	0.575862	-0.71857
20u	0.59	0.596980	1.16922
50u	0.61	0.626011	2.55762
100u	0.65	0.648479	-0.23455
200u	0.67	0.670544	0.08113
500u	0.7	0.702141	0.30492
1m	0.71	0.728957	2.60056
2m	0.74	0.760709	2.72233
5m	0.8	0.817241	2.10966
10m	0.89	0.887085	-0.32860

DC current gain vs. output current

Circuit simulation result

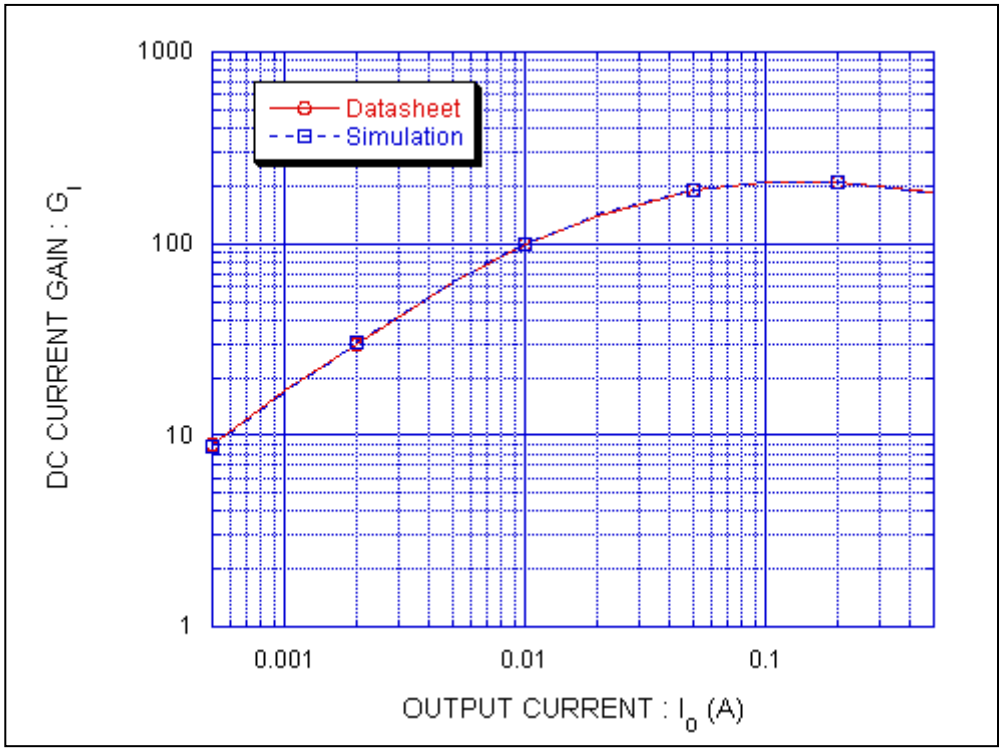


Evaluation circuit



Comparison Graph

Circuit Simulation Result



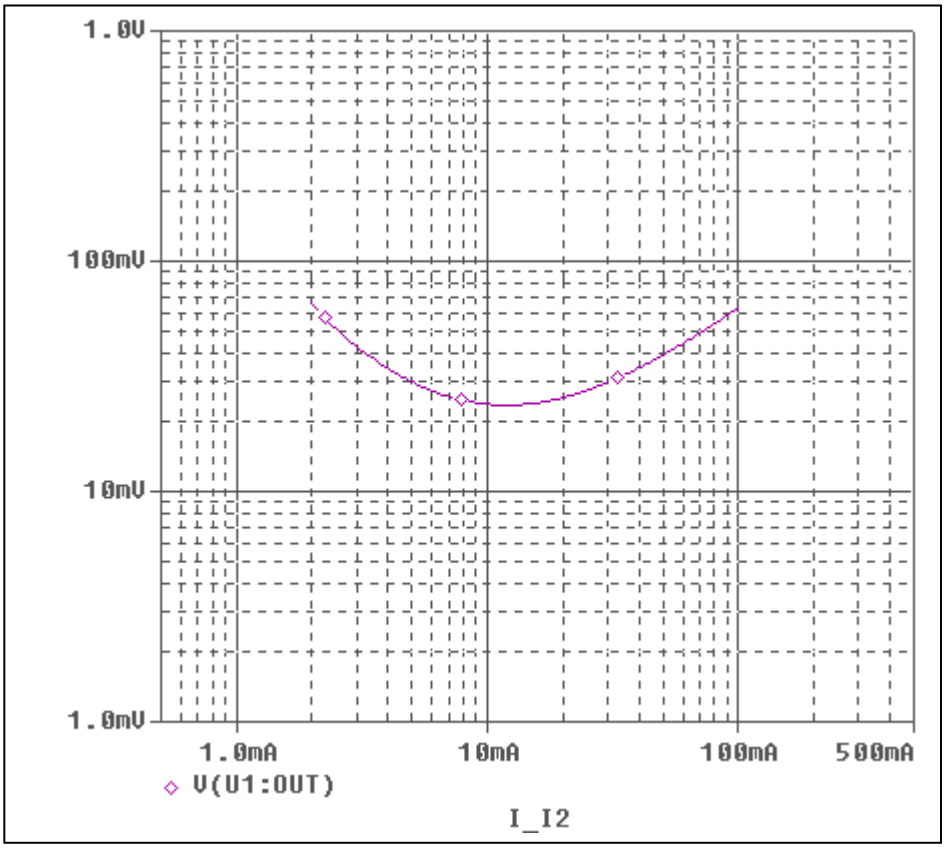
Simulation Result

Condition @ Vo = 5 V

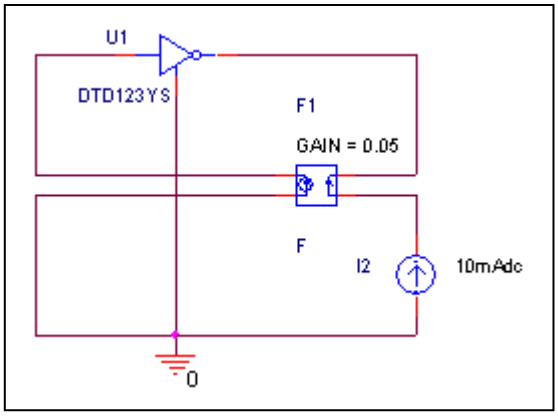
Ic(A)	hFE		Error (%)
	Datasheet	Simulation	
500u	9	8.7892	-2.39840
1m	17	16.598	-2.42198
2m	30	30.314	1.03583
5m	63	62.950	-0.07943
10m	100	99.372	-0.63197
20m	140	141.269	0.89829
50m	190	189.244	-0.39948
100m	210	208.508	-0.71556
200m	210	209.182	-0.39105
500m	180	178.775	-0.68522

Output voltage VS. output current

Circuit simulation result

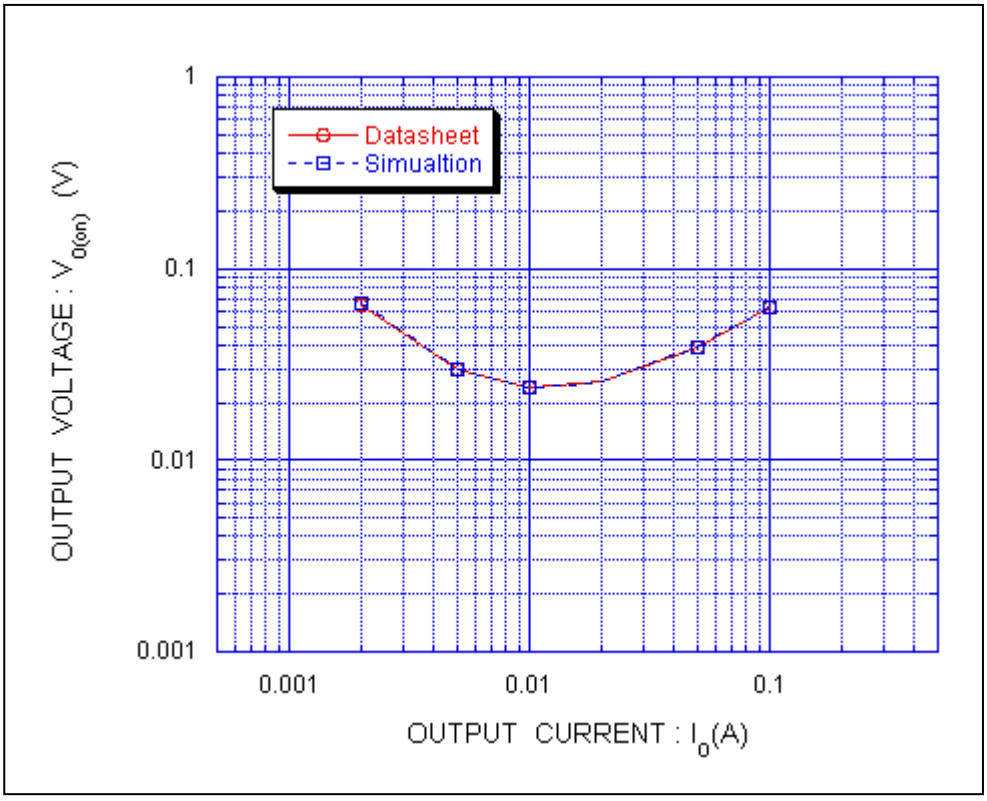


Evaluation circuit



Comparison Graph

Circuit Simulation Result



Simulation Result

Condition @ I_o/I_I = 20

Ic(A)	V_{CE} (sat)		Error (%)
	Datasheet	Simulation	
2m	65m	65.575m	0.87686
5m	30m	29.904m	-0.32103
10m	24m	23.963m	-0.15440
20m	26m	25.615m	-1.50303
50m	39m	39.128m	0.32713
100m	63m	63.200m	0.31646