Device Modeling Report

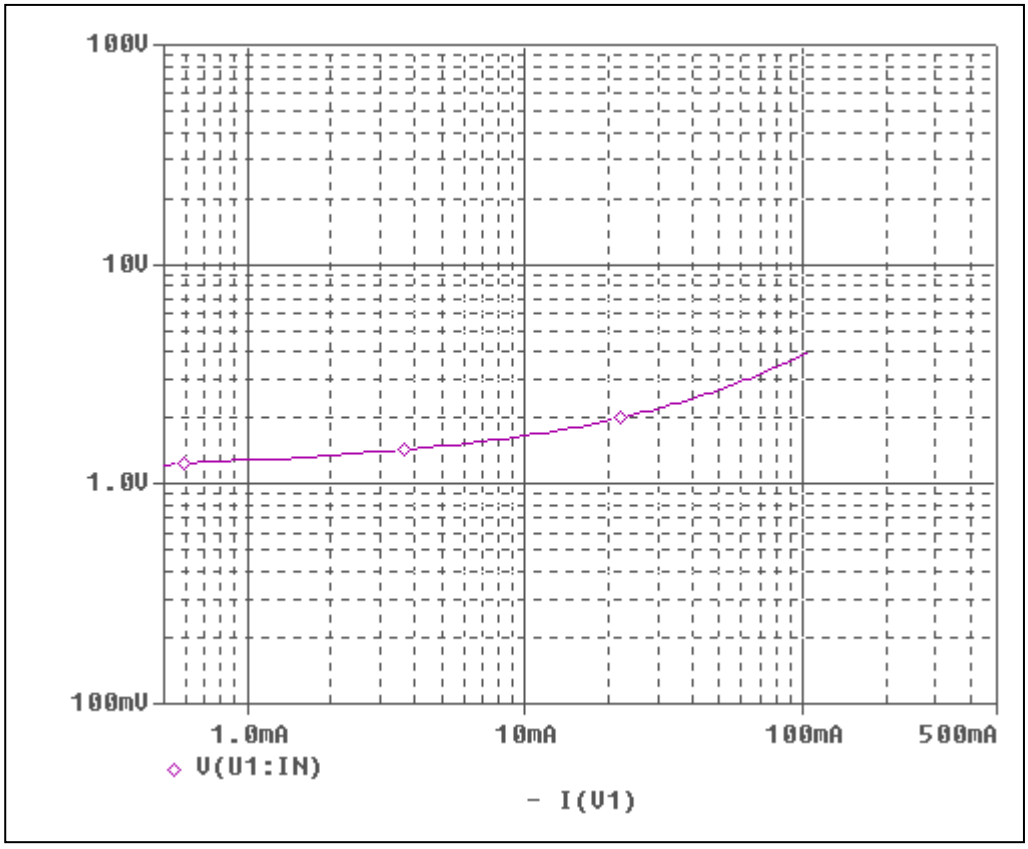
COMPONENTS: Digital transistors (built-in resistors)
PART NUMBER: DTD143ES
MANUFACTURER: ROHM

Bee Technologies Inc.

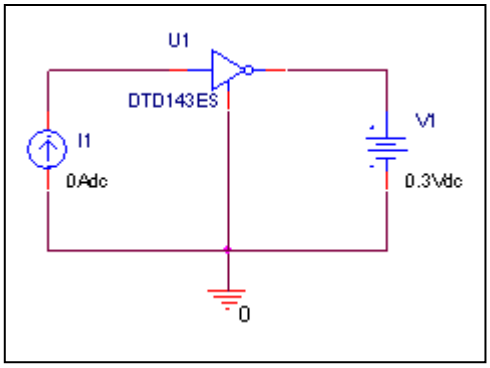
PSpice model parameter	Model description
IS	Saturation Current
BF	Ideal Maximum Forward Beta
NF	Forward Current Emission Coefficient
VAF	Forward Early Voltage
IKF	Forward Beta Roll-off Knee Current
ISE	Non-ideal Base-Emitter Diode Saturation Current
NE	Non-ideal Base-Emitter Diode Emission Coefficient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

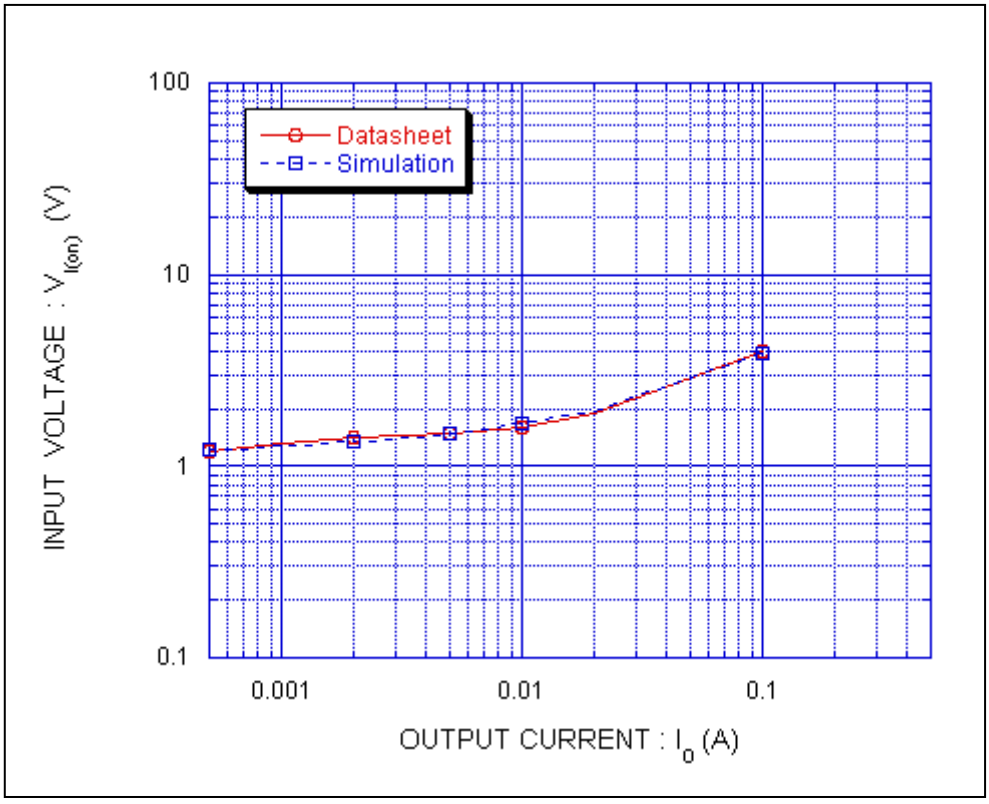


Evaluation circuit



Comparison Graph

Circuit Simulation Result



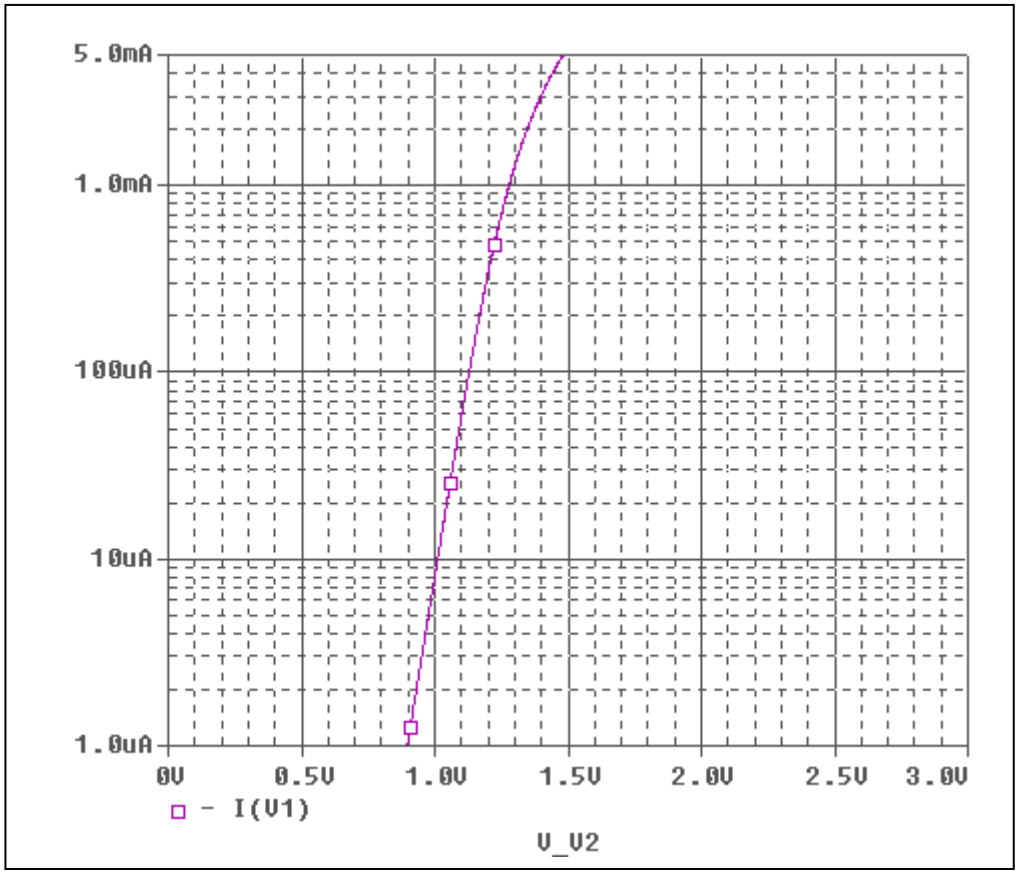
Simulation Result

Condition @ Vo = 0.3 V

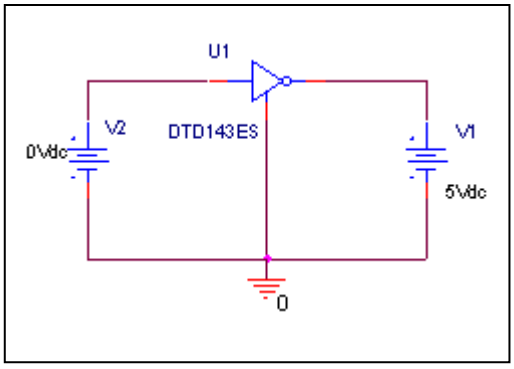
Io(A)	$V_{I(ON)}$ (V)		Error (%)
	Datasheet	Simulation	
500u	1.2	1.2281	2.2881
1m	1.3	1.2828	-1.3408
2m	1.4	1.3517	-3.5733
5m	1.5	1.4908	-0.6171
10m	1.6	1.6644	3.8693
20m	1.9	1.9501	2.5691
100m	4	3.9265	-1.8719

Output current vs. input voltage (OFF characteristics)

Circuit simulation result

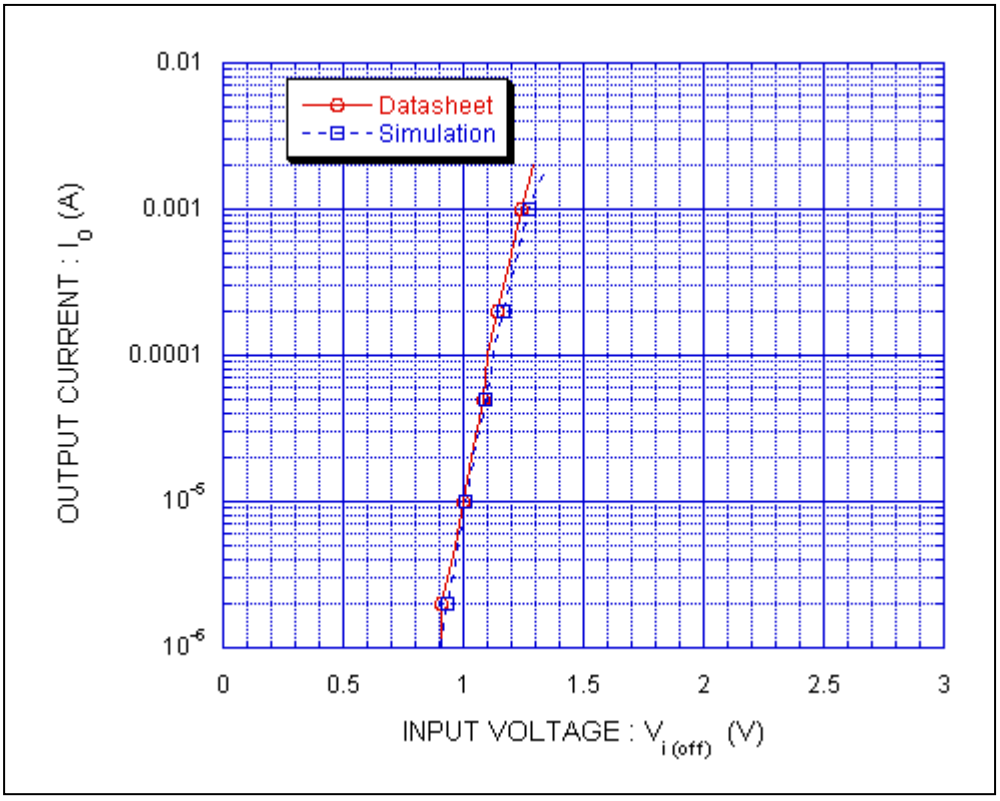


Evaluation circuit



Comparison Graph

Circuit Simulation Result



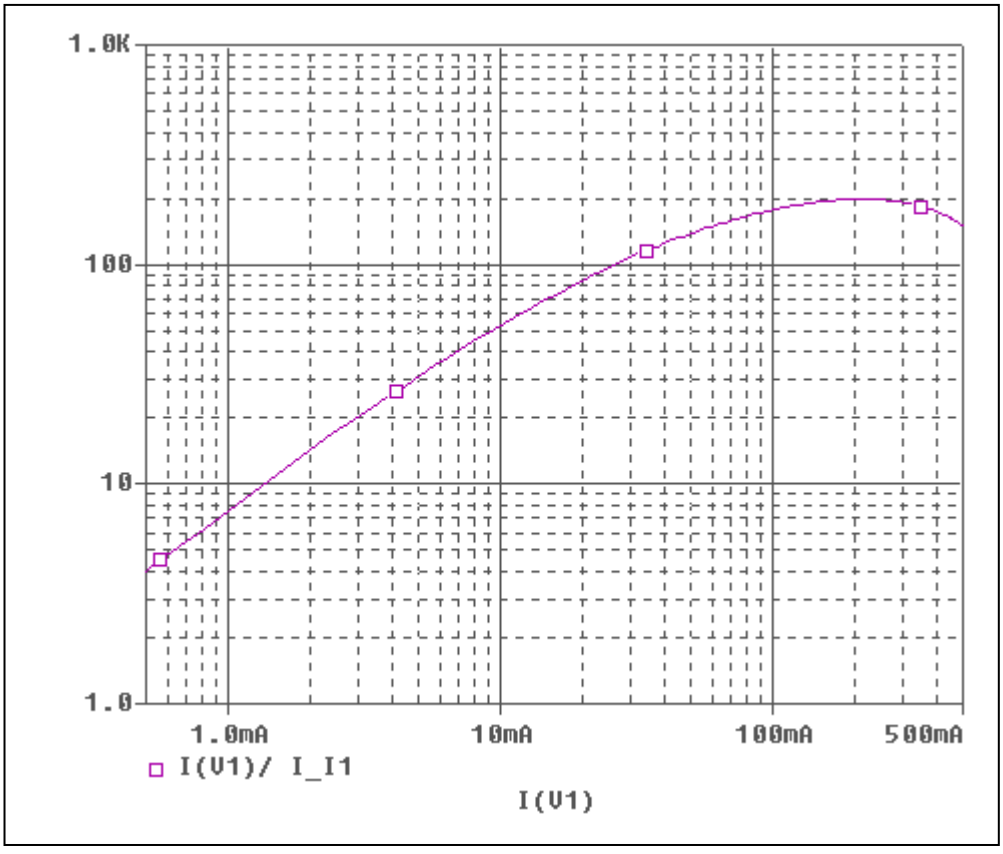
Simulation Result

Condition @ Vcc = 5 V

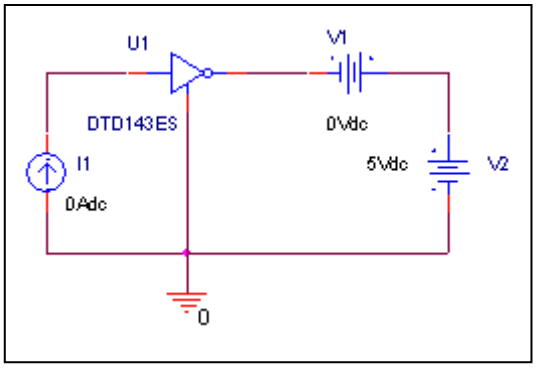
Io(A)	$V_{I(OFF)}$ (V)		Error (%)
	Datasheet	Simulation	
1u	0.9	0.900993	0.1102
2u	0.91	0.931680	2.3270
5u	0.97	0.976579	0.6737
10u	1.0	1.0114	1.1272
20u	1.03	1.0453	1.4637
50u	1.08	1.0919	1.0898
100u	1.1	1.1293	2.5945
200u	1.14	1.1690	2.4808
500u	1.2	1.2252	2.0568
1m	1.24	1.2791	3.0568
2m	1.29	1.3487	4.3523

DC current gain vs. output current

Circuit simulation result

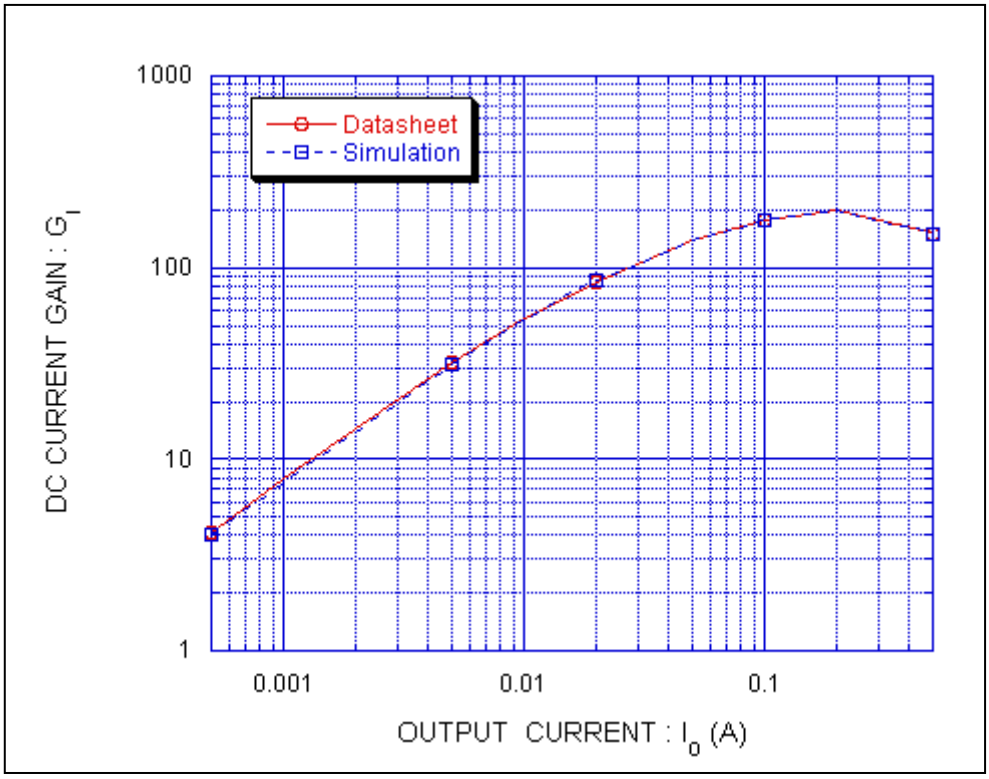


Evaluation circuit



Comparison Graph

Circuit Simulation Result



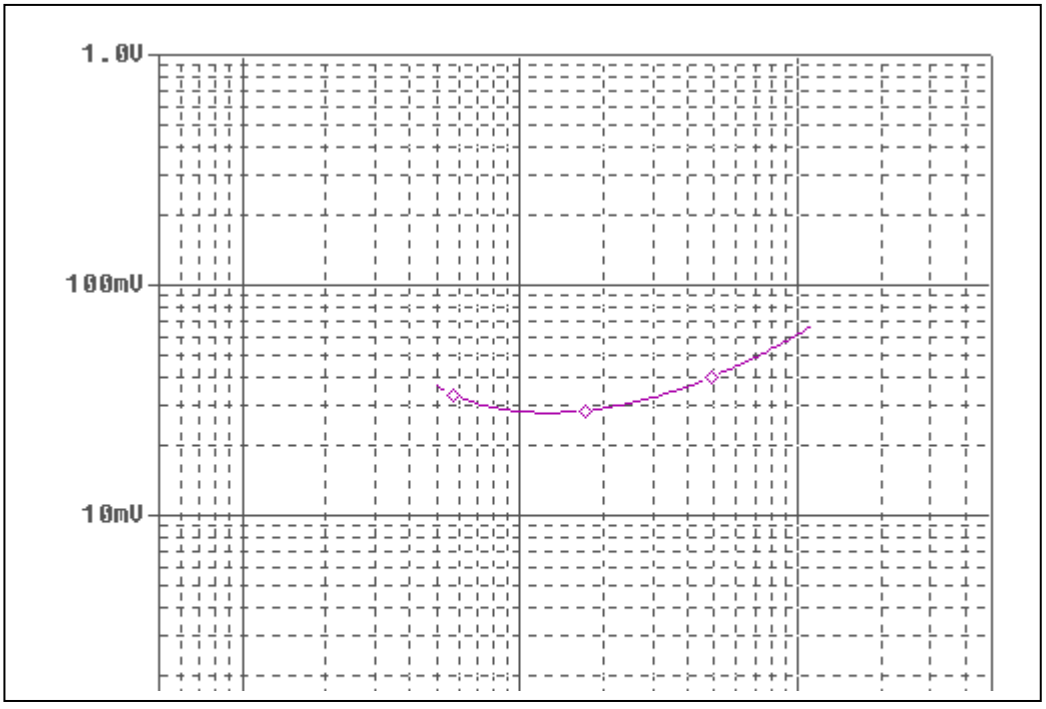
Simulation Result

Condition @ Vo = 5 V

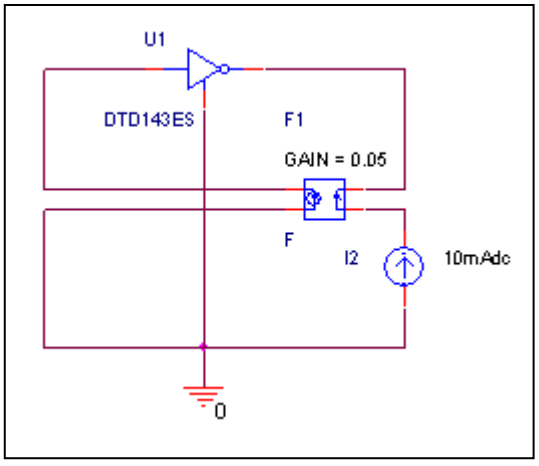
Ic(A)	hFE		Error (%)
	Datasheet	Simulation	
500u	4.1	4.0413	-1.4525
1m	8	7.6200	-4.9869
5m	32	31	-3.2258
10m	54	53.106	-1.6834
20m	84	85.146	1.3459
50m	140	138.906	-0.7876
100m	175	178.059	1.7180
200m	200	198.659	-0.6750
500m	150	150.902	0.5977

Output voltage VS. output current

Circuit simulation result

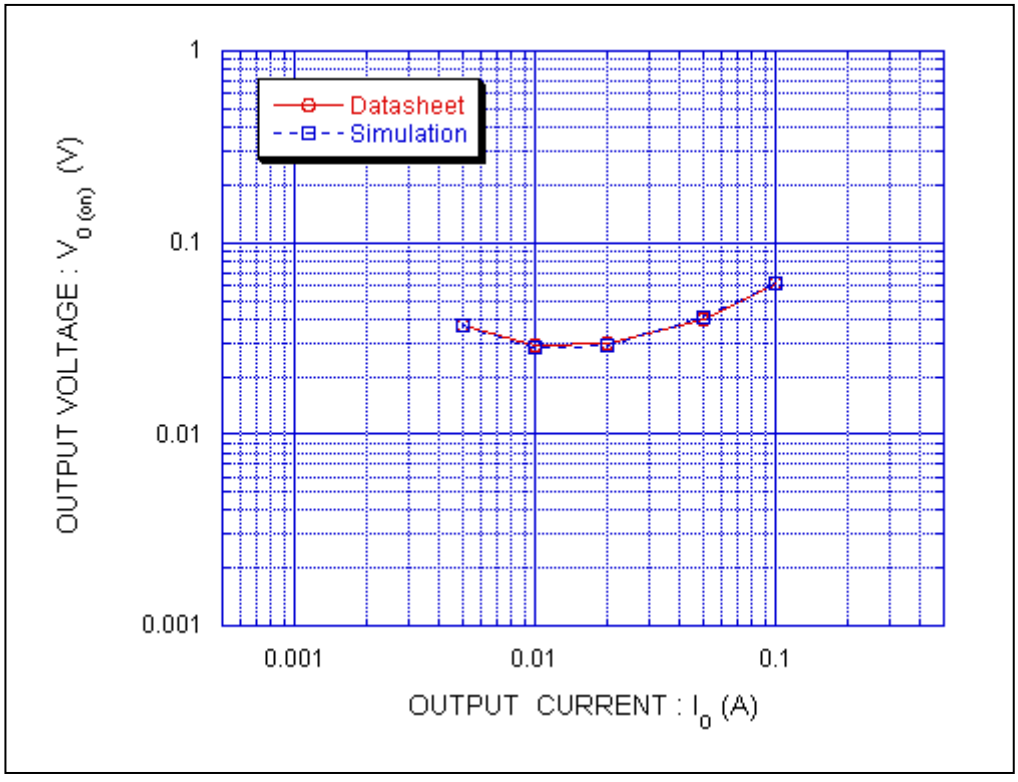


Evaluation circuit



Comparison Graph

Circuit Simulation Result



Simulation Result

Condition @ I_o/I_I = 20

Ic(A)	V_{CE} (sat)		Error (%)
	Datasheet	Simulation	
5m	37m	36.698m	-0.8229
10m	29m	28.340m	-2.3289
20m	30m	29.259m	-2.5326
50m	40m	40.512m	1.2638
100m	62m	61.433m	-0.9230