

Device Modeling Report

COMPONENTS: Digital transistors (built-in resistors)
PART NUMBER: DTC114EM
MANUFACTURER: ROHM

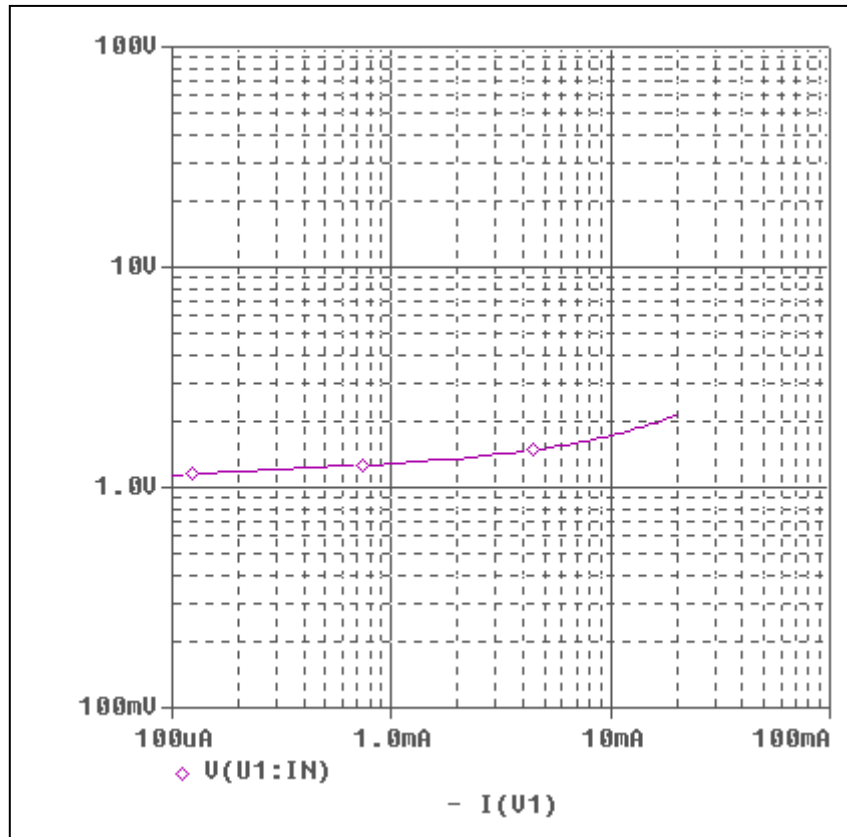


Bee Technologies Inc.

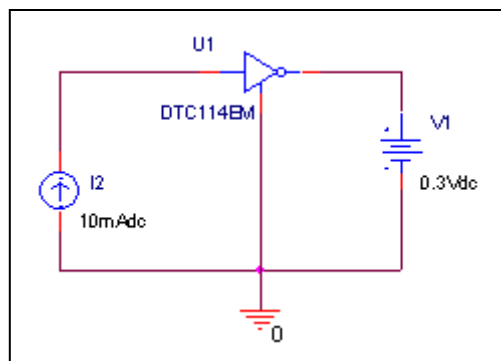
PSpice model parameter	Model description
IS	Saturation Current
BF	Ideal Maximum Forward Beta
NF	Forward Current Emission Coefficient
VAF	Forward Early Voltage
IKF	Forward Beta Roll-off Knee Current
ISE	Non-ideal Base-Emitter Diode Saturation Current
NE	Non-ideal Base-Emitter Diode Emission Coefficient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

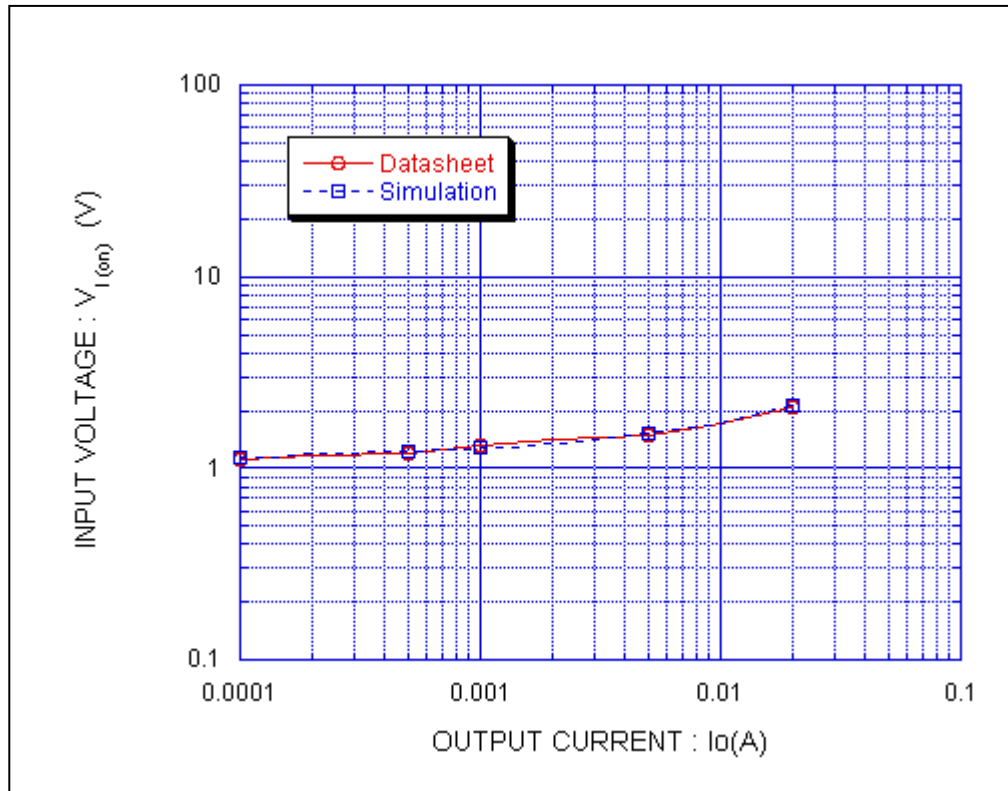


Evaluation circuit



Comparison Graph

Circuit Simulation Result



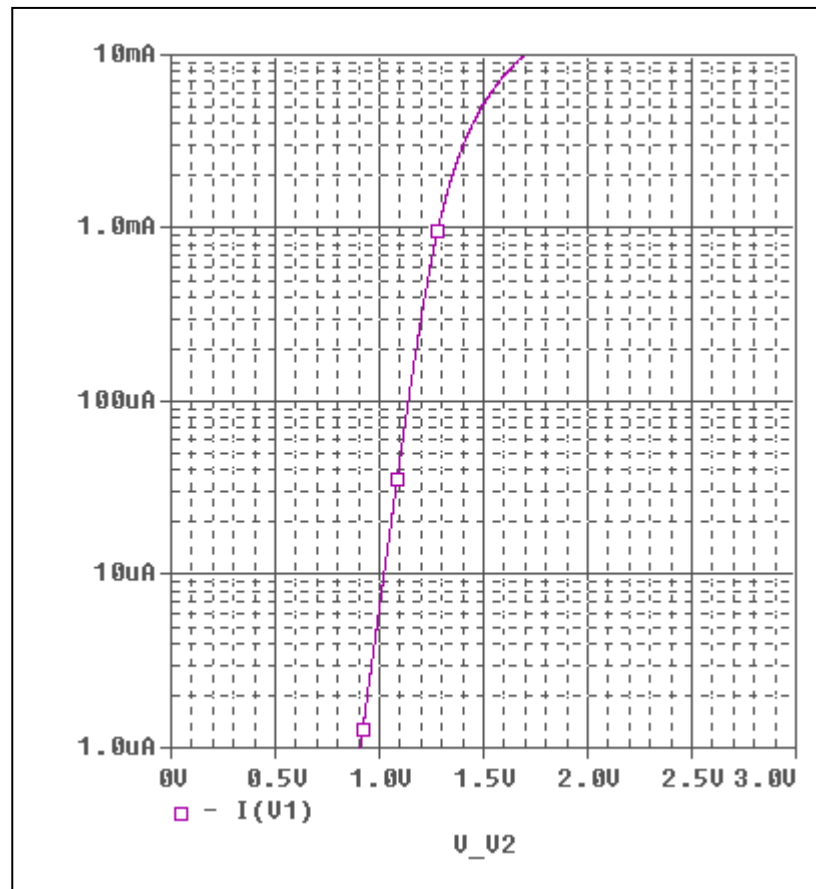
Simulation Result

Condition @ $V_o = 0.3$ V

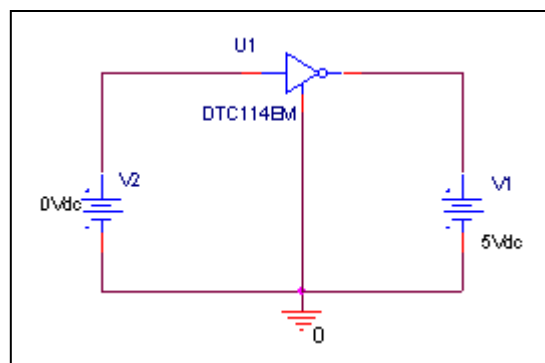
I_o (A)	$V_{I(ON)}$ (V)		Error (%)
	Datasheet	Simulation	
100u	1.1	1.1436	3.9636
200u	1.17	1.1805	0.8974
500u	1.2	1.2370	3.0833
1m	1.3	1.2885	0.8846
2m	1.4	1.3578	3.0143
5m	1.5	1.5057	0.3800
10m	1.7	1.7203	1.1941
20m	2.1	2.1509	2.4238

Output current vs. input voltage (OFF characteristics)

Circuit simulation result

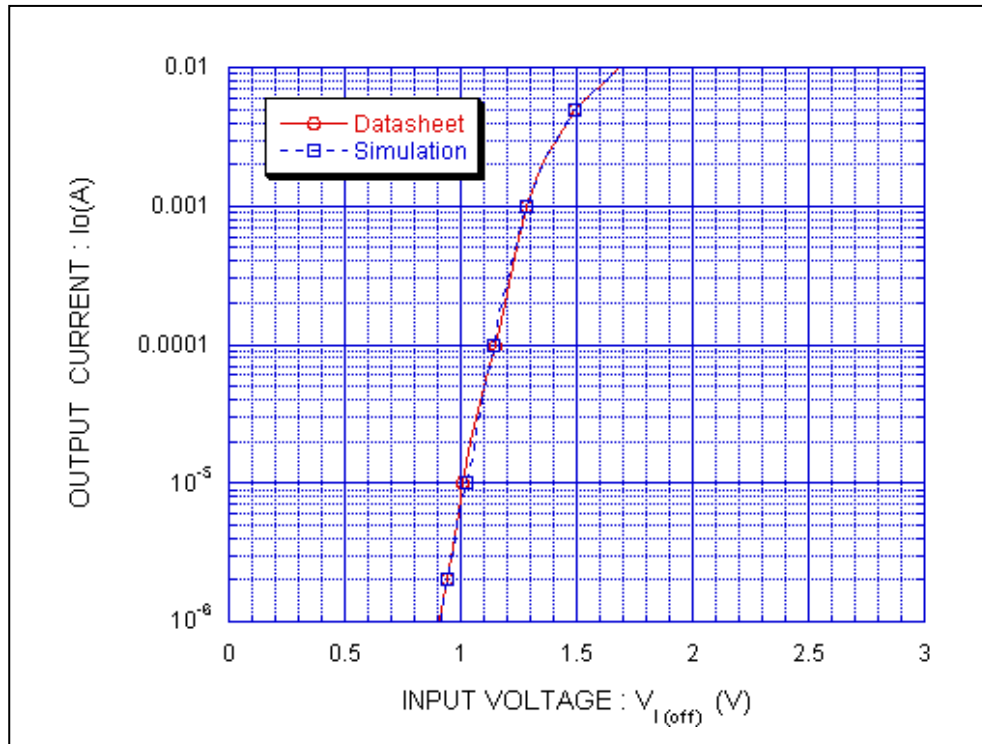


Evaluation circuit



Comparison Graph

Circuit Simulation Result



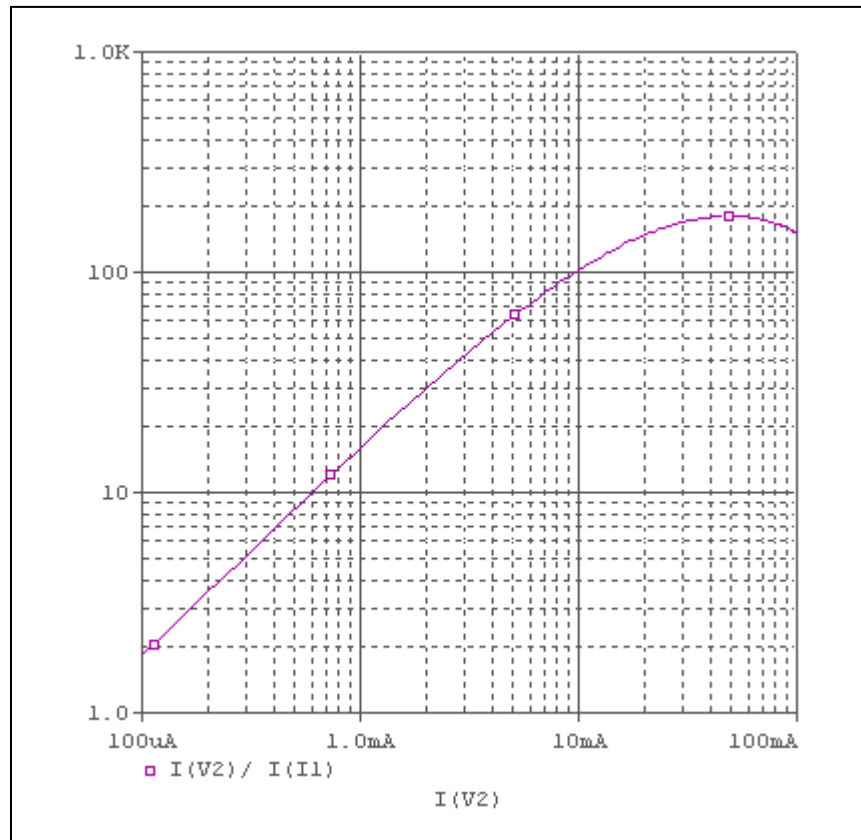
Simulation Result

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

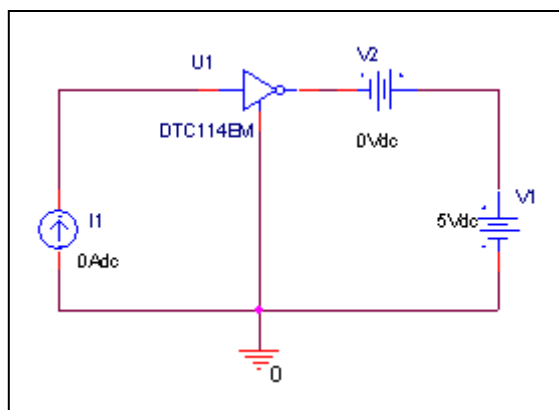
I_o (A)	$V_{I(off)}$ (V)		Error (%)
	Datasheet	Simulation	
1u	0.9	0.907660	0.8511
2u	0.94	0.942051	0.2182
5u	0.98	0.986207	0.6334
10u	1.01	1.0225	1.2376
20u	1.04	1.0586	1.7885
50u	1.1	1.1029	0.2636
100u	1.15	1.1404	0.8348
200u	1.19	1.1769	1.1008
500u	1.24	1.2328	0.5806
1m	1.28	1.2828	0.2187
2m	1.35	1.3508	0.0593
5m	1.49	1.4931	0.2081
10m	1.68	1.6942	0.8452

DC current gain vs. output current

Circuit simulation result

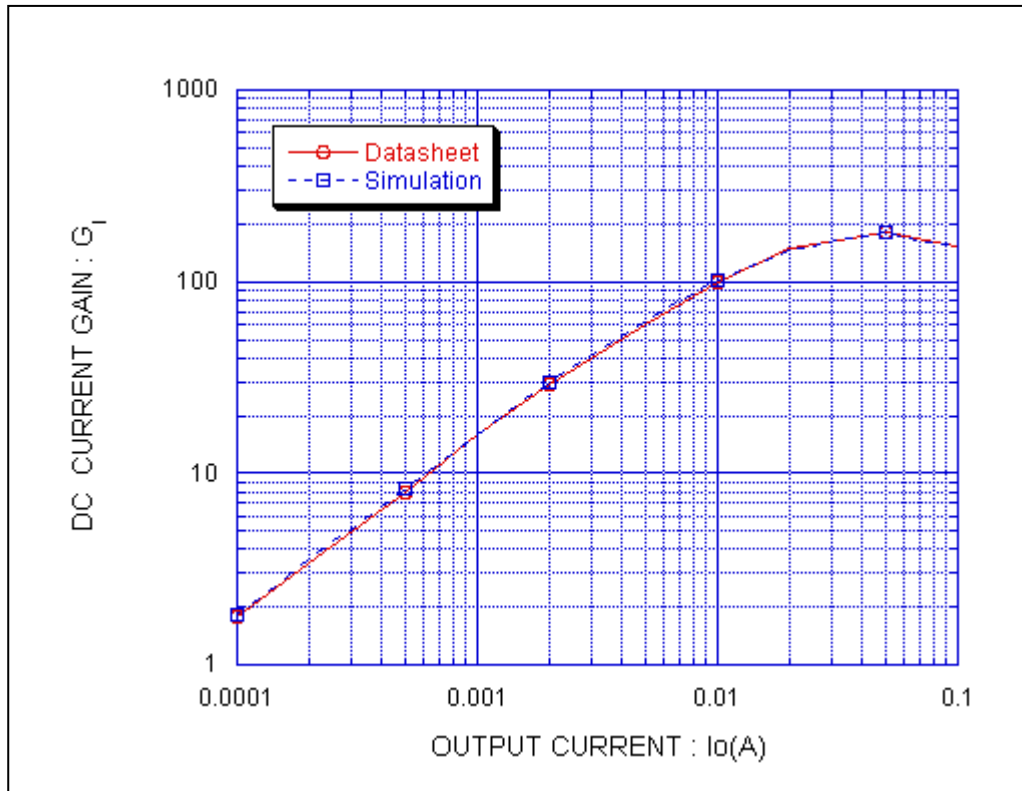


Evaluation circuit



Comparison Graph

Circuit Simulation Result



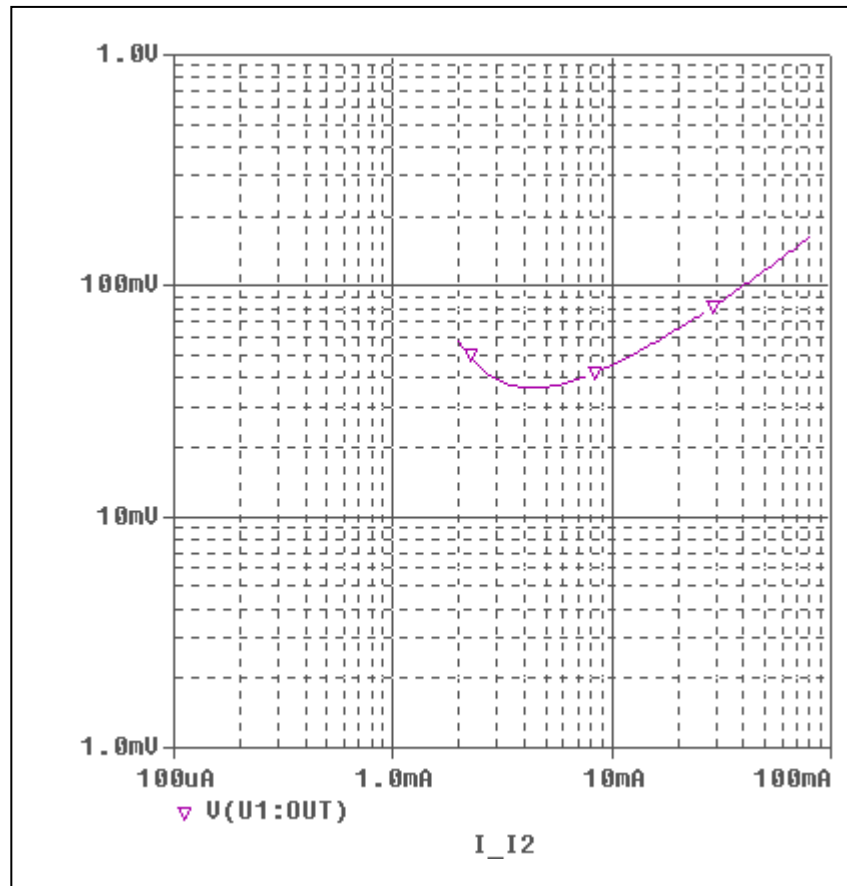
Simulation Result

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

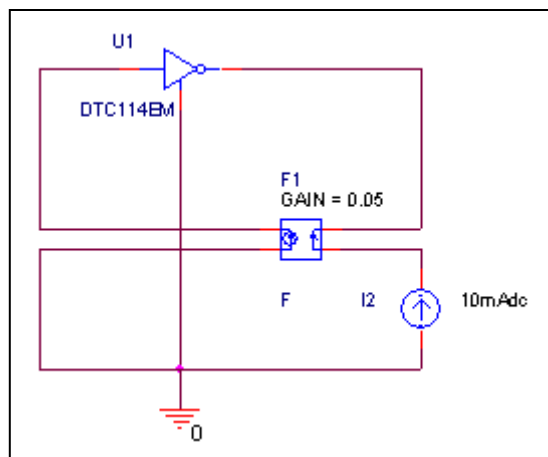
I_o (A)	$V_{I(off)}$ (V)		Error (%)
	Datasheet	Simulation	
100u	1.8	1.8100	0.5556
200u	3.4	3.5469	4.3206
500u	8	8.3834	4.7925
1m	16	15.912	0.5500
2m	29	29.572	1.9724
5m	60	62.846	4.7433
10m	100	102.162	2.1620
20m	150	147.118	1.9213
50m	180	179.771	0.1272
100m	150	151.130	0.7533

Output voltage VS. output current

Circuit simulation result

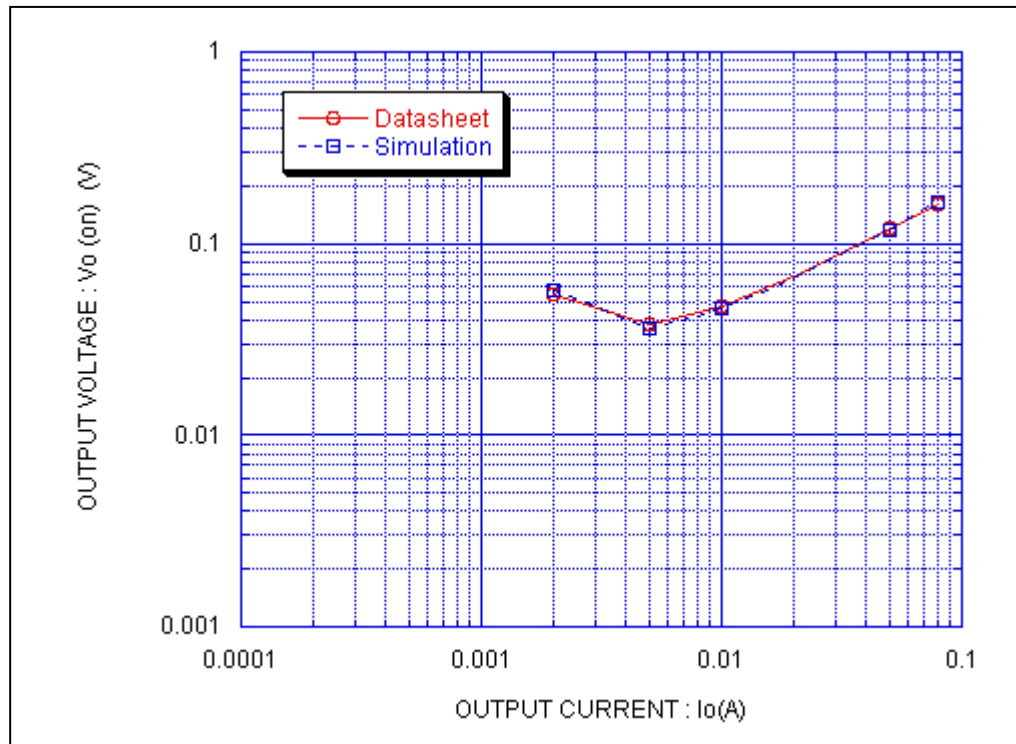


Evaluation circuit



Comparison Graph

Circuit Simulation Result



Simulation Result

Condition @ $I_o/I_i = 20$

Io(A)	V _{I(off)} (V)		Error (%)
	Datasheet	Simulation	
2m	55m	57.139m	3.8891
5m	38m	36.542m	3.8368
10m	47m	45.455m	3.2872
20m	67m	65.453m	2.3090
50m	120m	117.331m	2.2242
80m	160m	163.009m	1.8806