Device Modeling Report

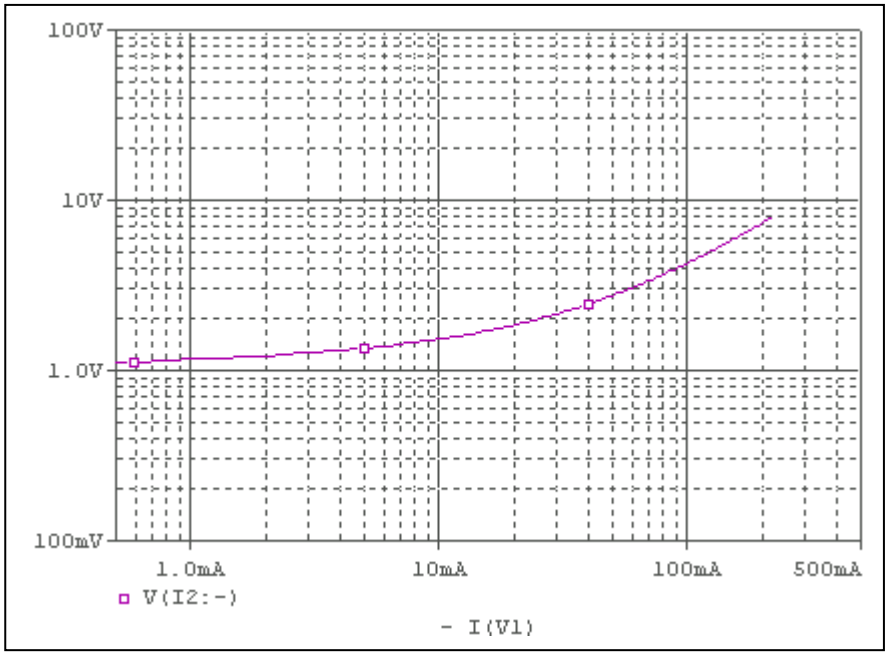
COMPONENTS: Digital transistors (built-in resistors)
PART NUMBER: DTD114ES
MANUFACTURER: ROHM

Bee Technologies Inc.

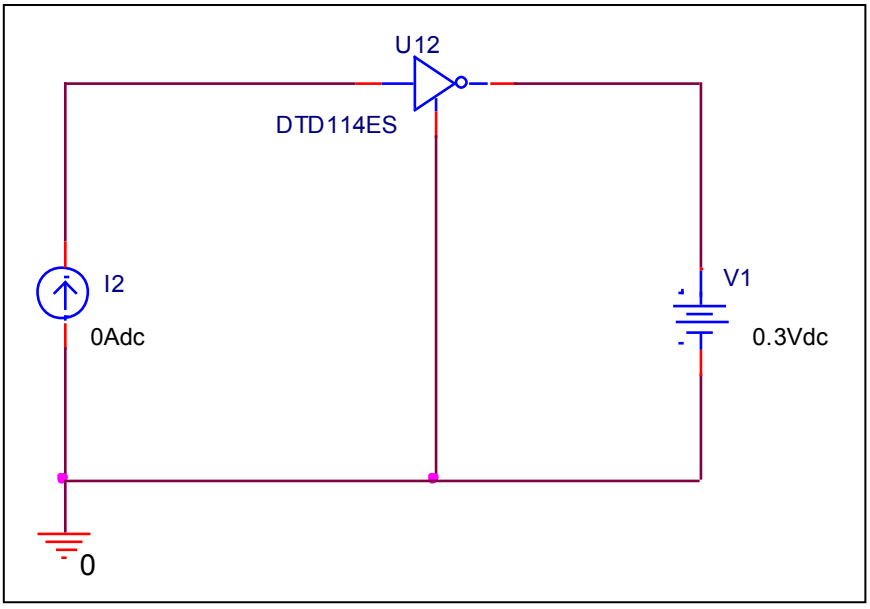
PSpice model parameter	Model description
IS	Saturation Current
BF	Ideal Maximum Forward Beta
NF	Forward Current Emission Coefficient
VAF	Forward Early Voltage
IKF	Forward Beta Roll-off Knee Current
ISE	Non-ideal Base-Emitter Diode Saturation Current
NE	Non-ideal Base-Emitter Diode Emission Coefficient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

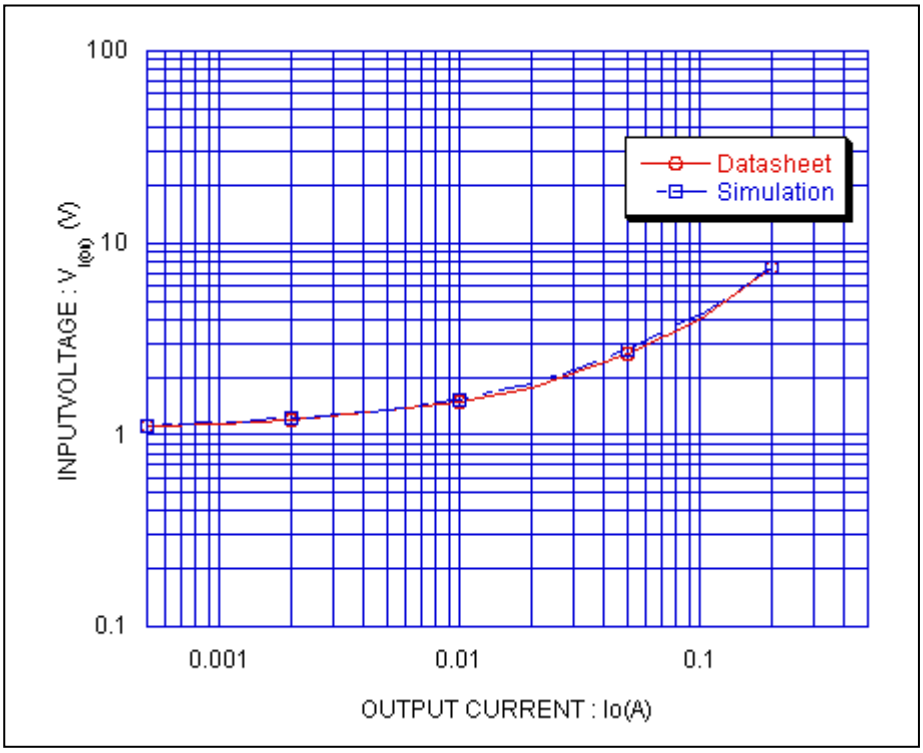


Evaluation circuit



Comparison Graph

Circuit Simulation Result



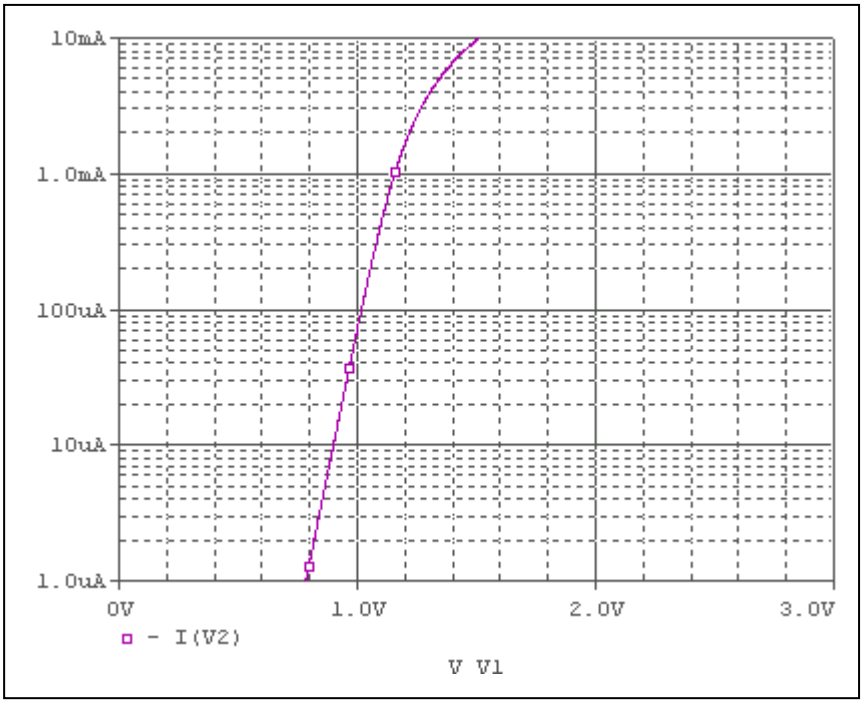
Simulation Result

Condition @ Vo = 0.3 V

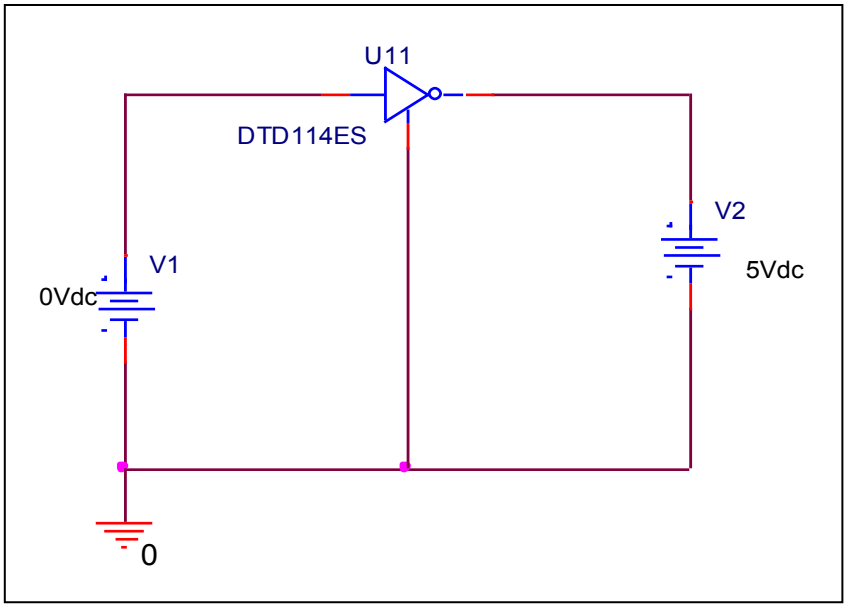
Io(A)	$V_{I(ON)}$ (V)		Error (%)
	Datasheet	Simulation	
500u	1.1	1.11	0.909
1m	1.15	1.16	0.869
2m	1.2	1.22	1.666
5m	1.35	1.35	0
10m	1.5	1.52	1.333
20m	1.75	1.82	4
50m	2.65	2.75	3.773
100m	4	4.15	3.75
200m	7.4	7.39	-0.135

Output current vs. input voltage (OFF characteristics)

Circuit simulation result

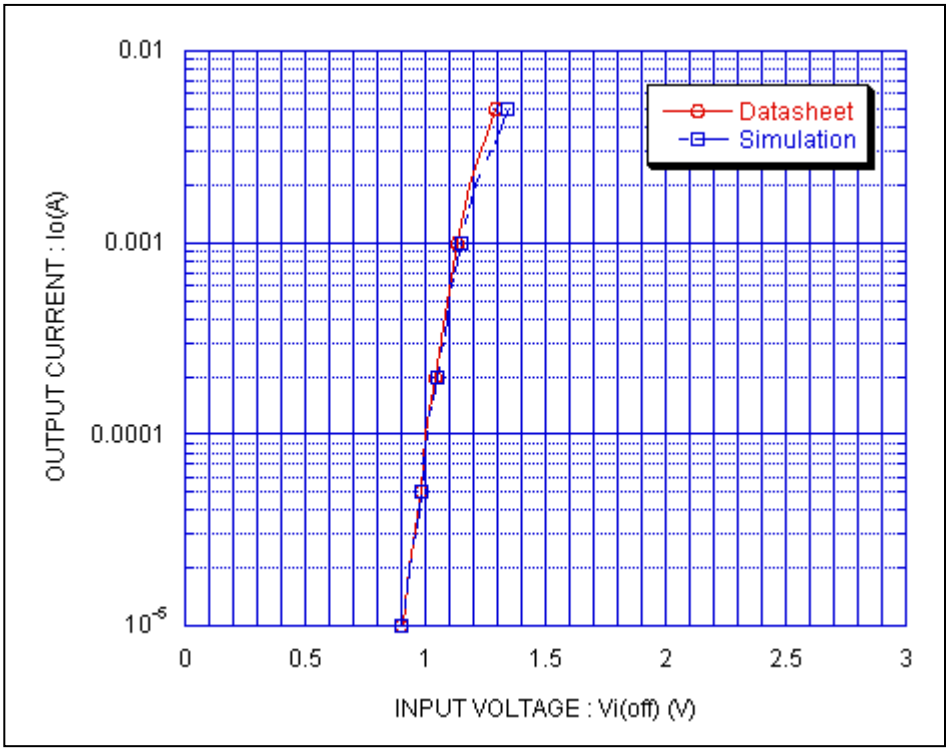


Evaluation circuit



Comparison Graph

Circuit Simulation Result



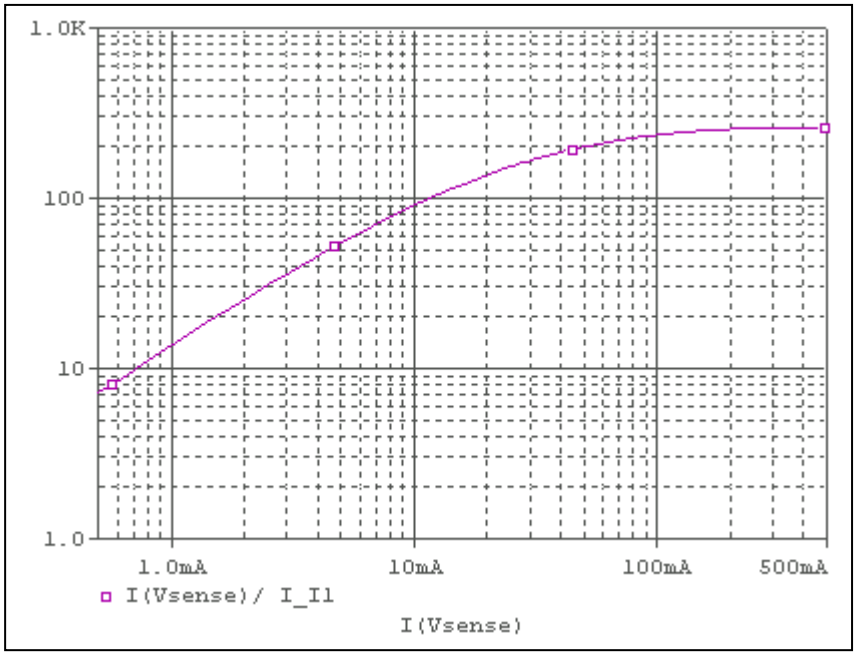
Simulation Result

Condition @ Vcc = 5 V

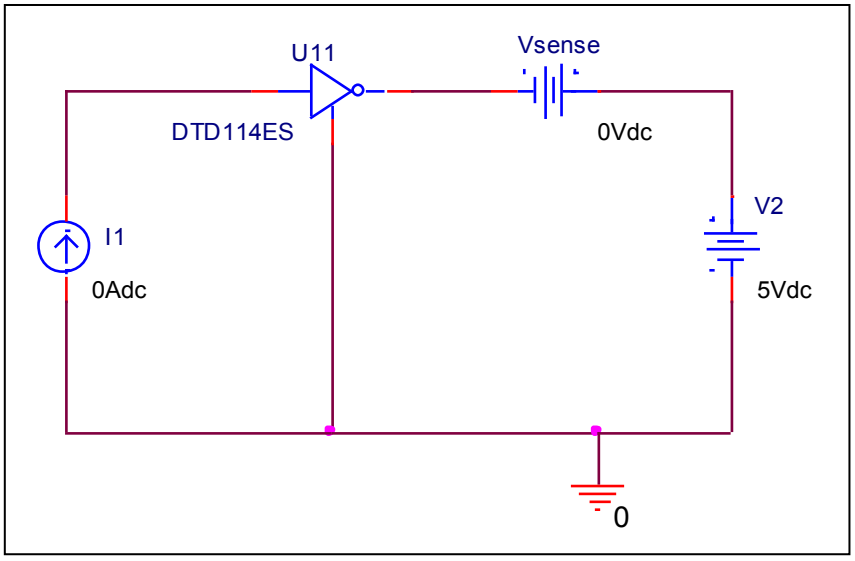
Io(A)	$V_{I(OFF)}$ (V)		Error (%)
	Datasheet	Simulation	
10u	0.9	0.9	0
20u	0.93	0.934	0.430
50u	0.98	0.98	0
100u	1	1.01	1
200u	1.04	1.05	0.961
500u	1.09	1.1	0.917
1m	1.13	1.15	1.769
2m	1.18	1.21	2.542
5m	1.29	1.34	3.875

DC current gain vs. output current

Circuit simulation result

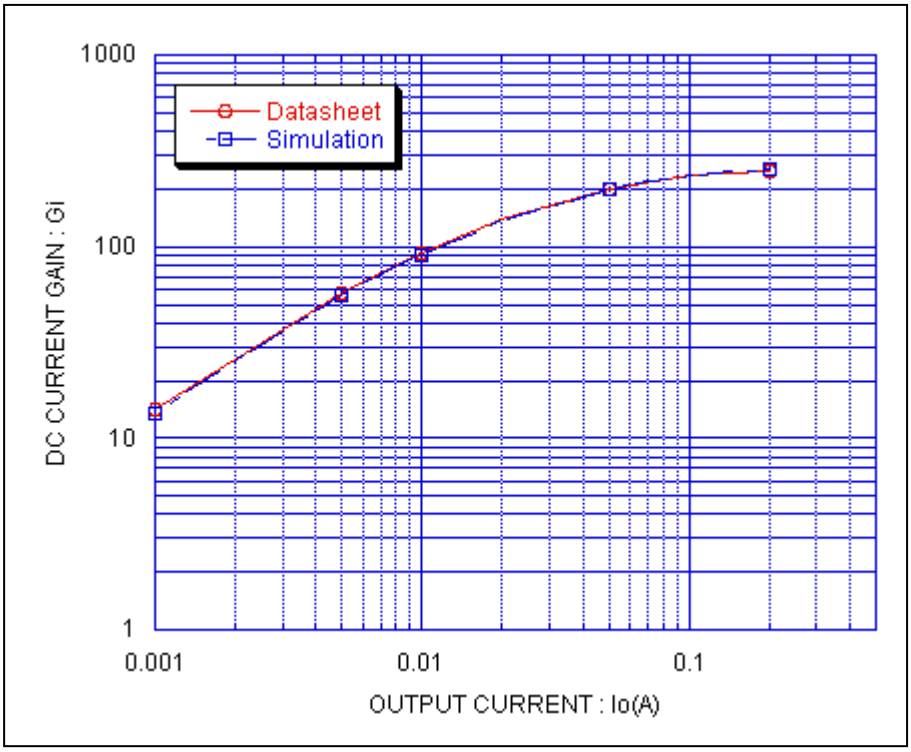


Evaluation circuit



Comparison Graph

Circuit Simulation Result



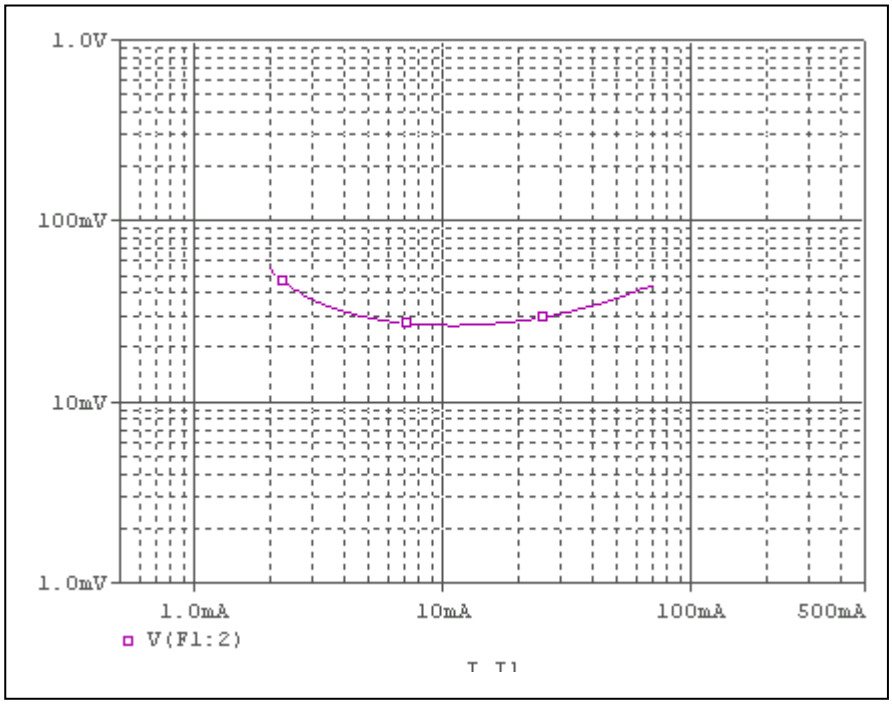
Simulation Result

Condition @ Vo = 5 V

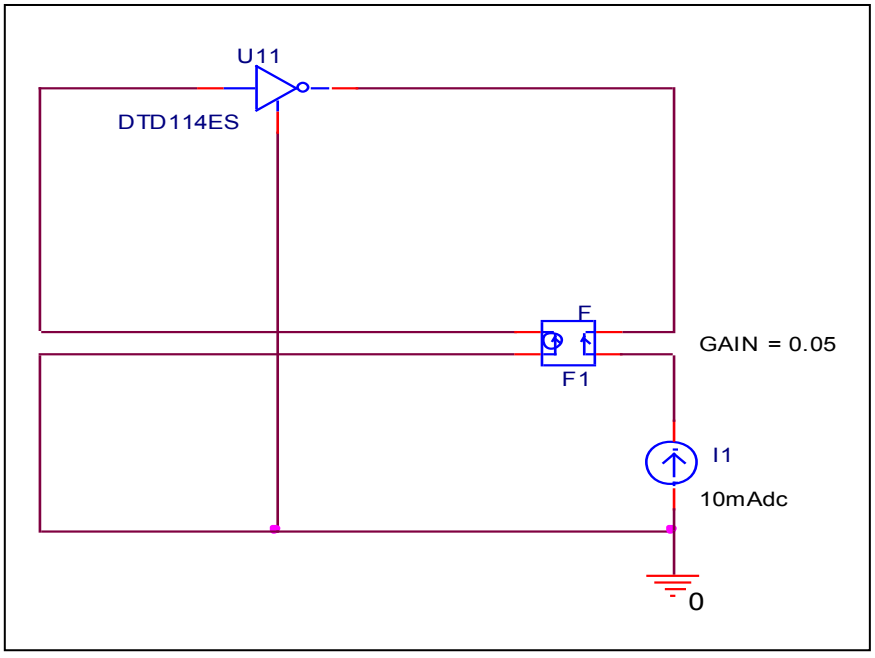
Ic(A)	hFE		Error (%)
	Datasheet	Simulation	
1m	14	13.57	-3.071
2m	26	25.4	-2.307
5m	57	55.4	-2.807
10m	93	91.28	-1.849
20m	140	137.28	-1.942
50m	200	200.36	0.18
100m	235	235.43	0.182
200m	245	254.77	3.987

Output voltage VS. output current

Circuit simulation result

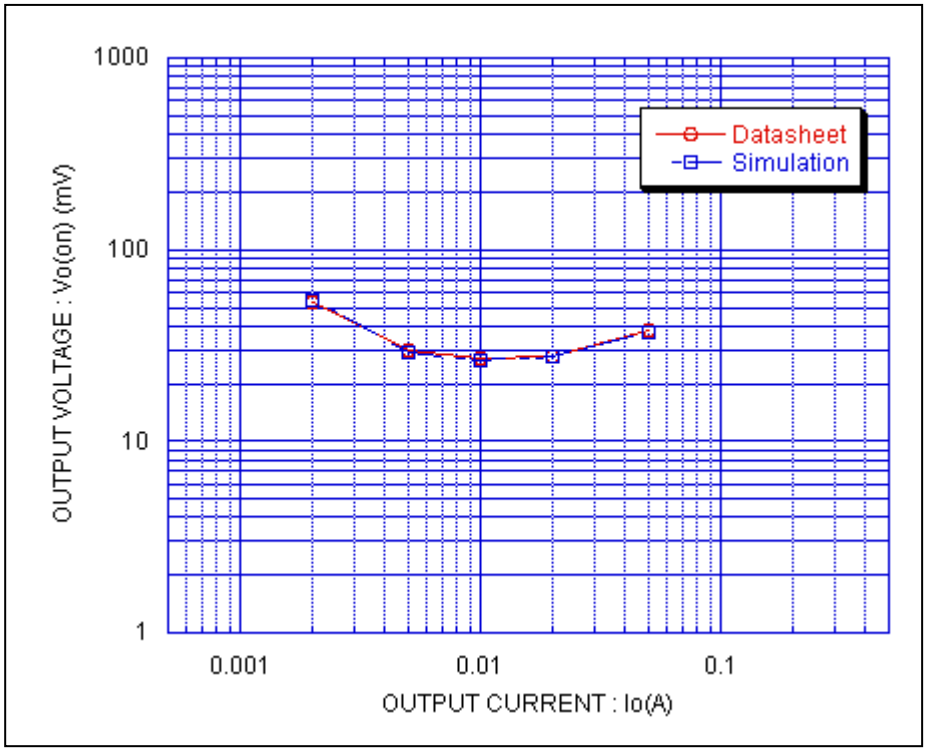


Evaluation circuit



Comparison Graph

Circuit Simulation Result



Simulation Result

Condition @ I_o/I_I = 20

Ic(A)	V_{CE} (sat)(mV)		Error (%)
	Datasheet	Simulation	
2m	53	54.8	3.396
5m	30	29.2	-2.666
10m	27	26.46	-2
20m	28	27.93	-0.25
50m	38	37.39	-1.605