Device Modeling Report

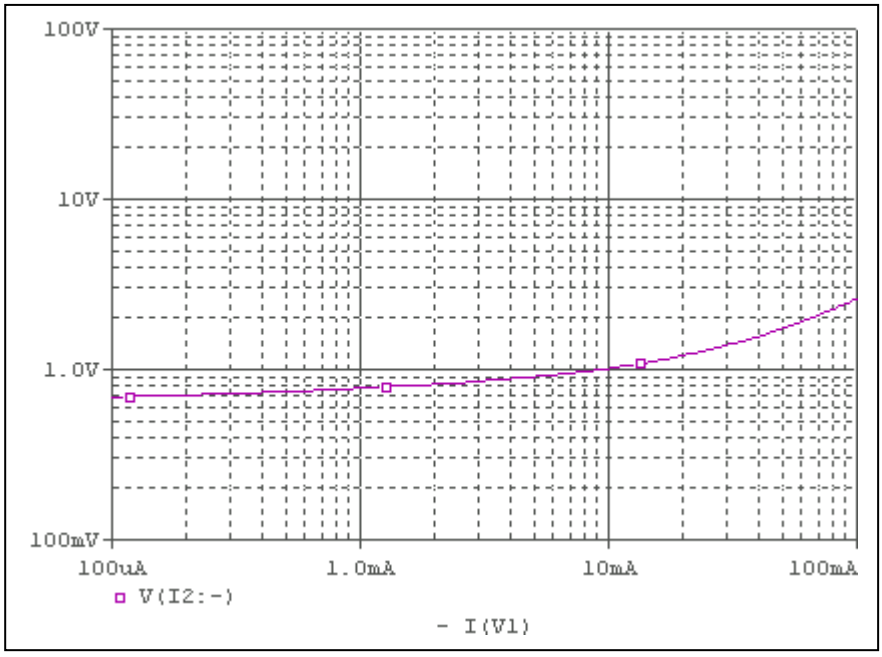
COMPONENTS: Digital transistors (built-in resistors)
PART NUMBER: DTC123YKA
MANUFACTURER: ROHM

Bee Technologies Inc.

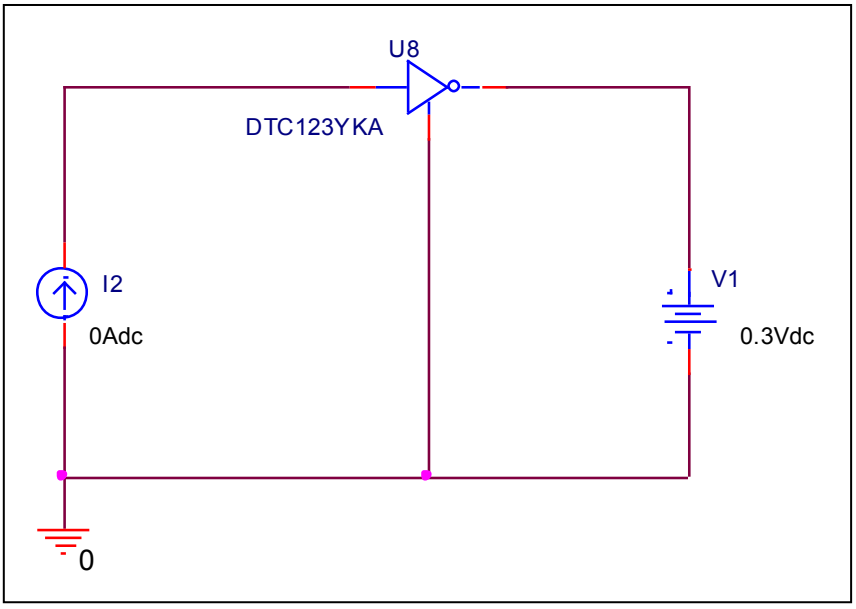
PSpice model parameter	Model description
IS	Saturation Current
BF	Ideal Maximum Forward Beta
NF	Forward Current Emission Coefficient
VAF	Forward Early Voltage
IKF	Forward Beta Roll-off Knee Current
ISE	Non-ideal Base-Emitter Diode Saturation Current
NE	Non-ideal Base-Emitter Diode Emission Coefficient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

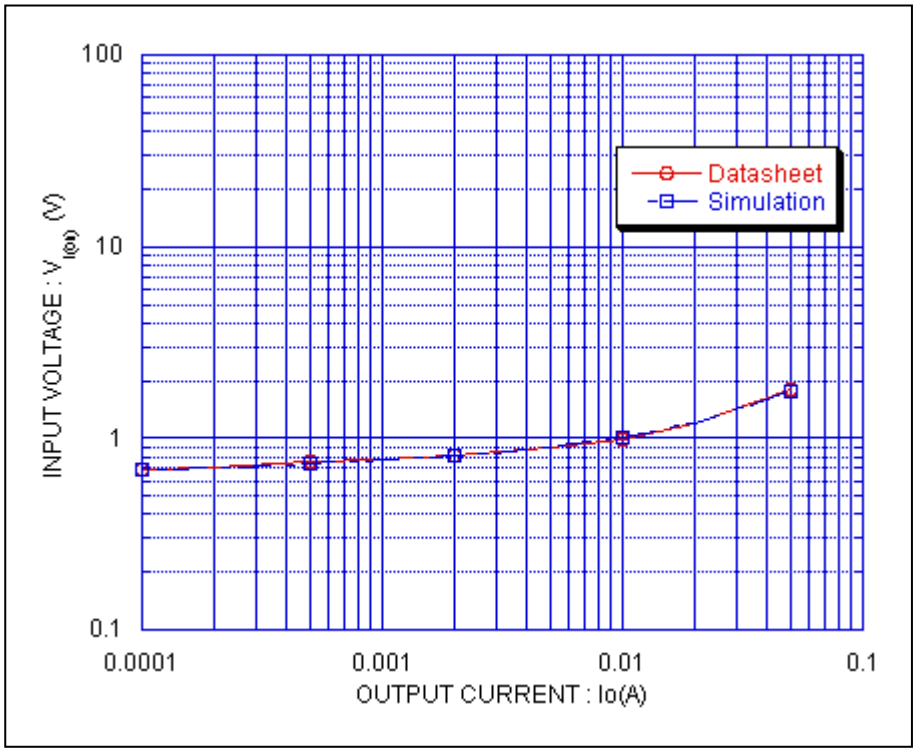


Evaluation circuit



Comparison Graph

Circuit Simulation Result



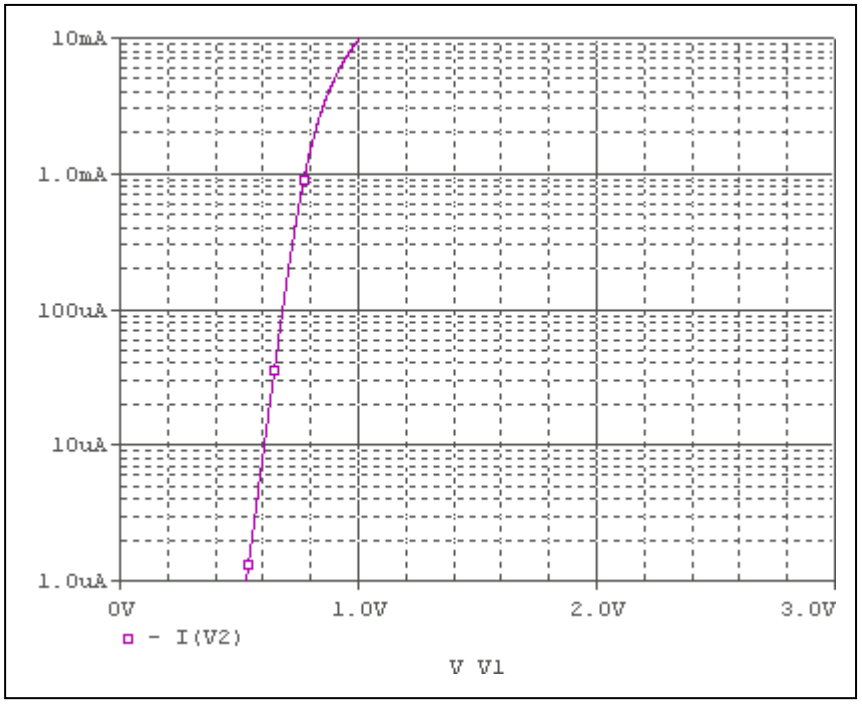
Simulation Result

Condition @ Vo = 0.3 V

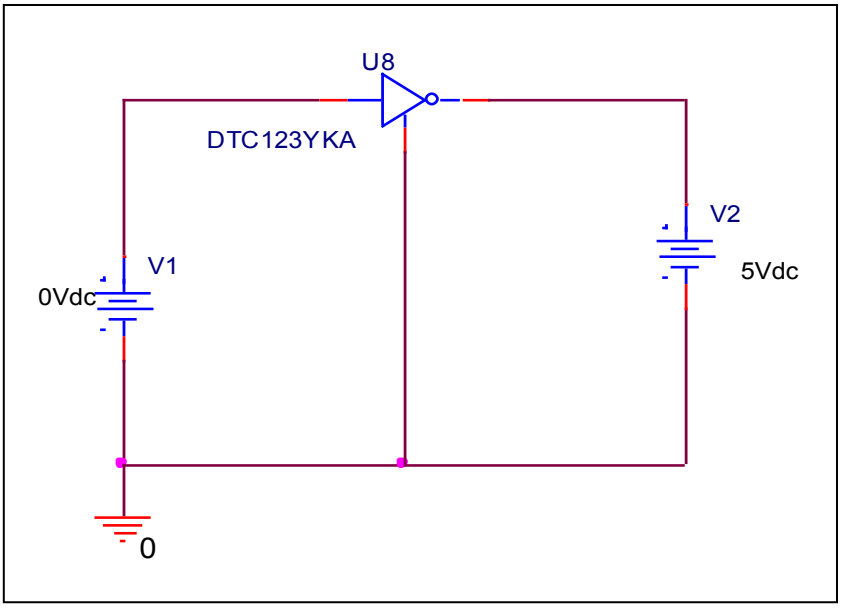
Io(A)	$V_{I(ON)}$ (V)		Error (%)
	Datasheet	Simulation	
100u	0.69	0.684	-0.869
200u	0.7	0.709	1.285
500u	0.75	0.745	-0.666
1m	0.77	0.778	1.038
2m	0.81	0.82	1.234
5m	0.89	0.905	1.685
10m	0.98	1.01	3.061
20m	1.2	1.207	0.583
50m	1.8	1.74	-3.333

Output current vs. input voltage (OFF characteristics)

Circuit simulation result

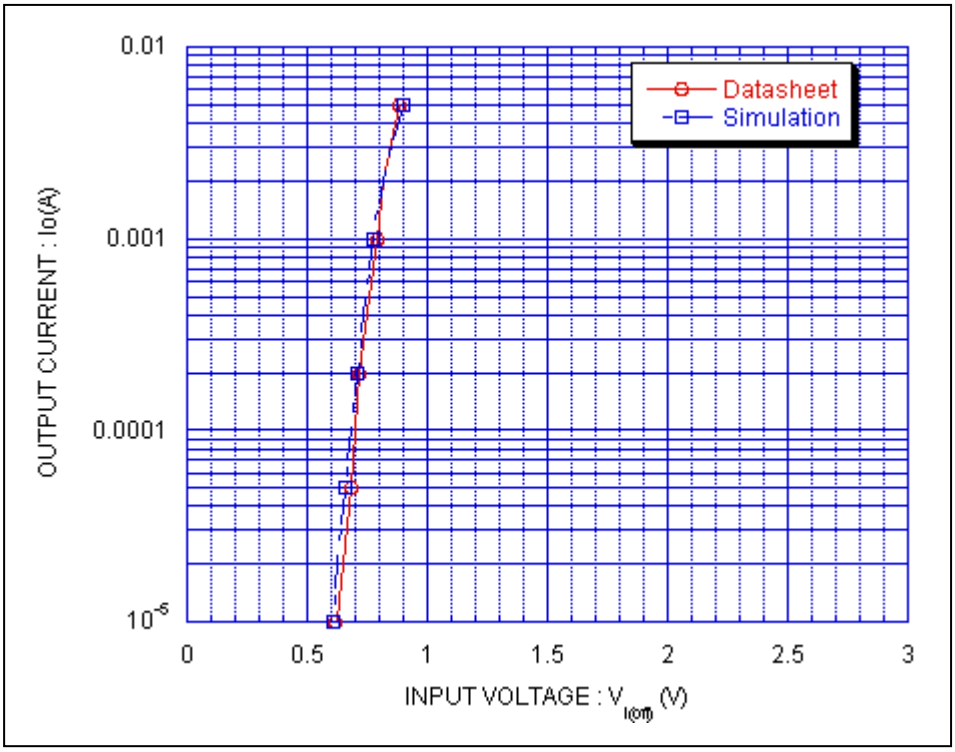


Evaluation circuit



Comparison Graph

Circuit Simulation Result



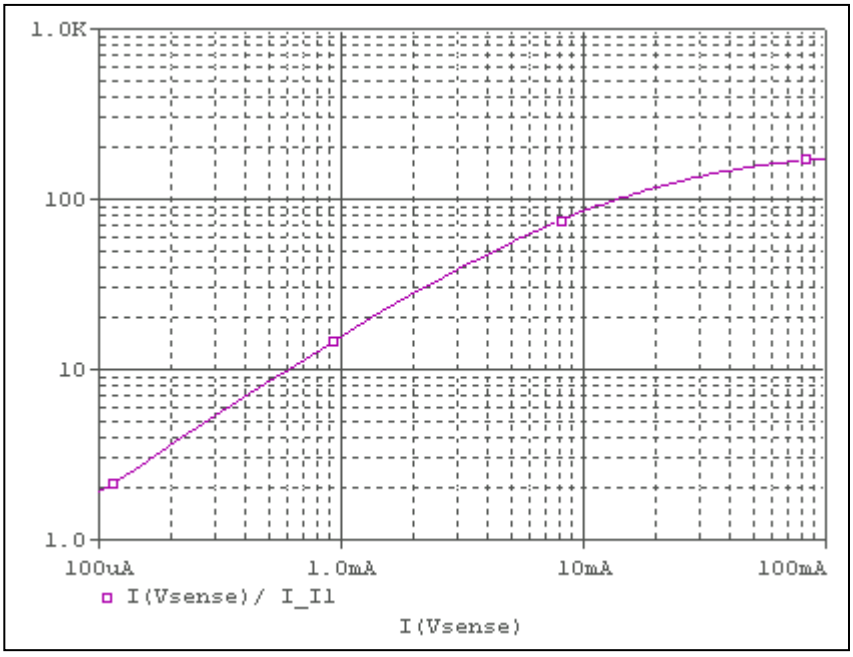
Simulation Result

Condition @ Vcc = 5 V

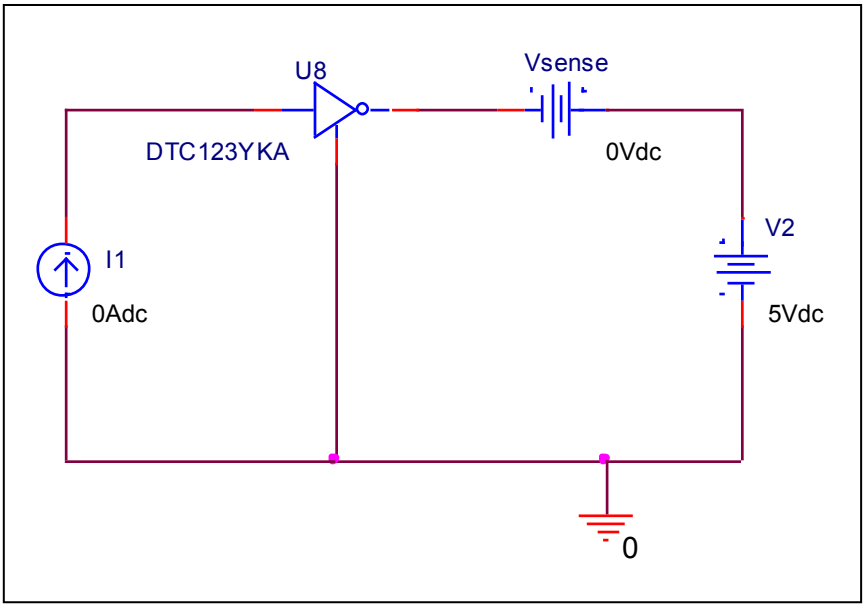
Io(A)	$V_{I(OFF)}$ (V)		Error (%)
	Datasheet	Simulation	
10u	0.62	0.605	-2.419
20u	0.65	0.628	-3.384
50u	0.68	0.66	-2.941
100u	0.7	0.682	-2.571
200u	0.72	0.708	-1.666
500u	0.76	0.743	-2.236
1m	0.79	0.776	-1.772
2m	0.82	0.817	-0.365
5m	0.88	0.9	2.272

DC current gain vs. output current

Circuit simulation result

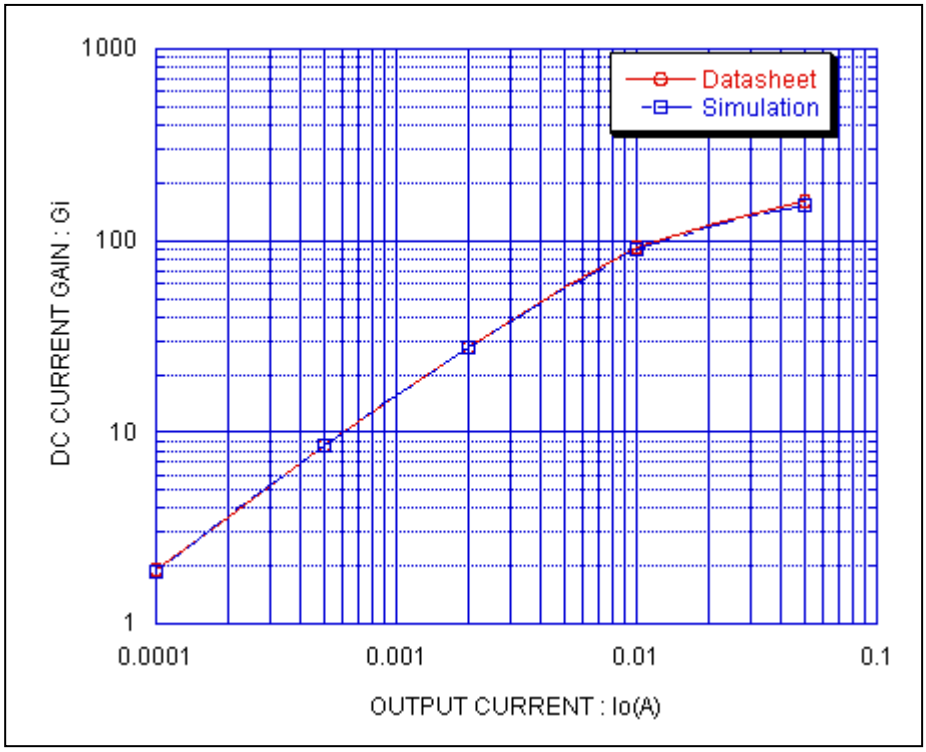


Evaluation circuit



Comparison Graph

Circuit Simulation Result



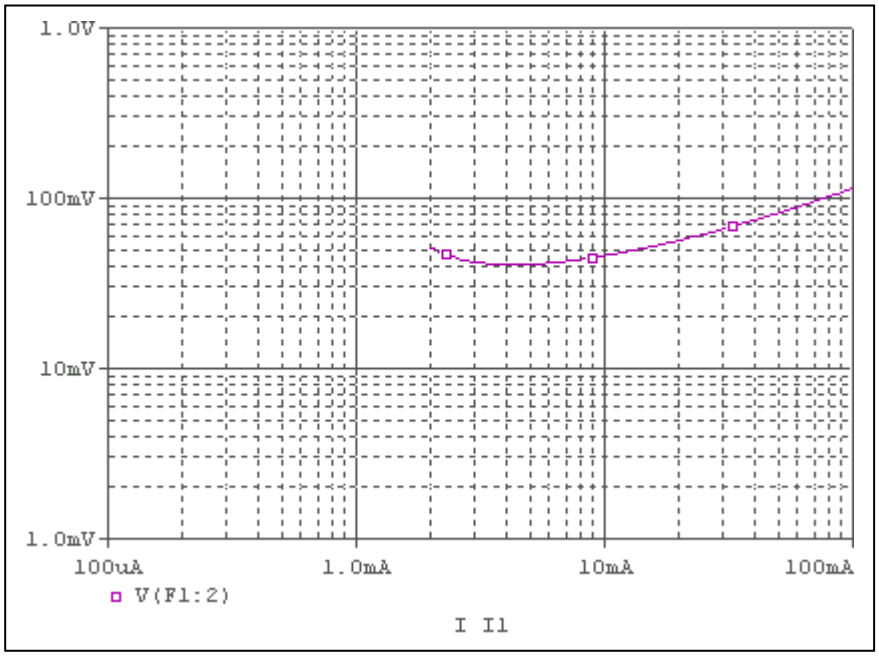
Simulation Result

Condition @ Vo = 5 V

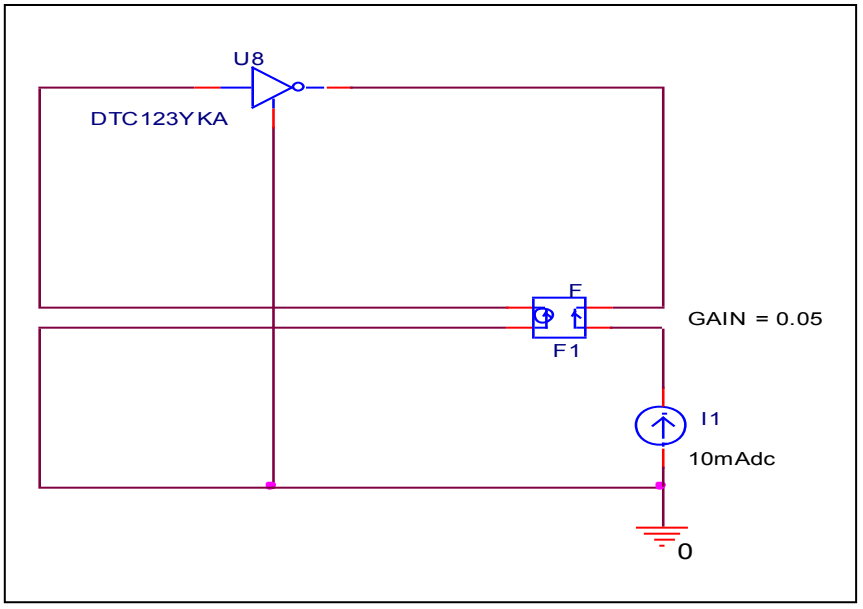
Ic(A)	hFE		Error (%)
	Datasheet	Simulation	
100u	1.9	1.89	-0.526
200u	3.6	3.66	1.666
500u	8.5	8.49	-0.117
1m	15.6	15.64	0.256
2m	28	28	0
5m	57	55.59	-2.473
10m	92	89.7	-2.5
20m	120	117	-2.5
50m	160	155	-3.125

Output voltage VS. output current

Circuit simulation result

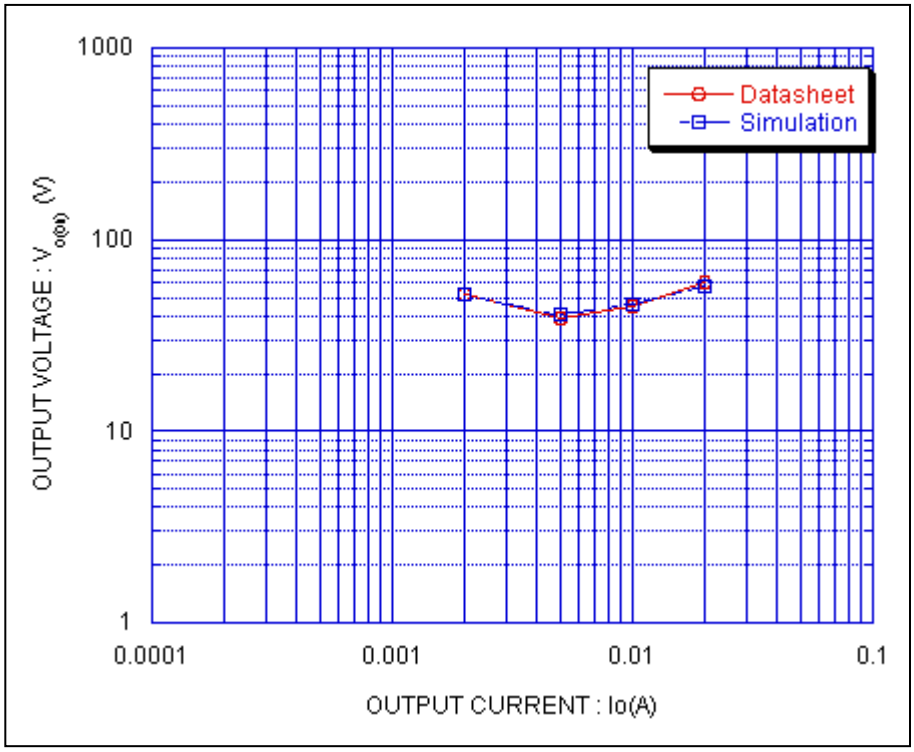


Evaluation circuit



Comparison Graph

Circuit Simulation Result



Simulation Result

Condition @ I_o/I_I = 20

Ic(A)	V_{CE} (sat)(mV)		Error (%)
	Datasheet	Simulation	
2m	52	51.49	-0.980
5m	39	40.88	4.820
10m	45	45.95	2.111
20m	60	57.69	-3.85