Device Modeling Report

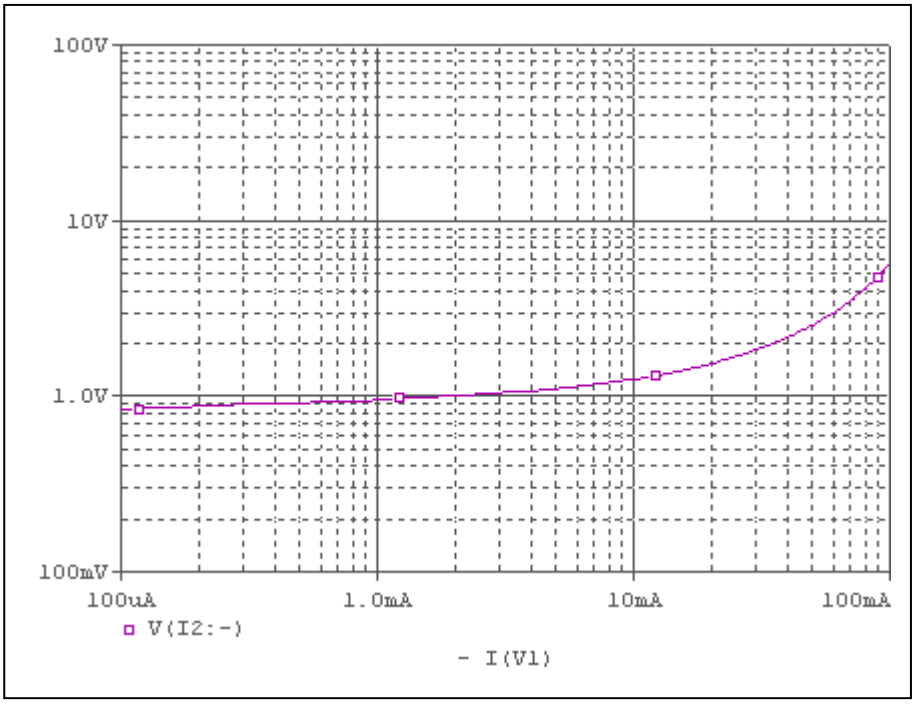
COMPONENTS: Digital transistors (built-in resistors)
PART NUMBER: DTC143XUA
MANUFACTURER: ROHM

Bee Technologies Inc.

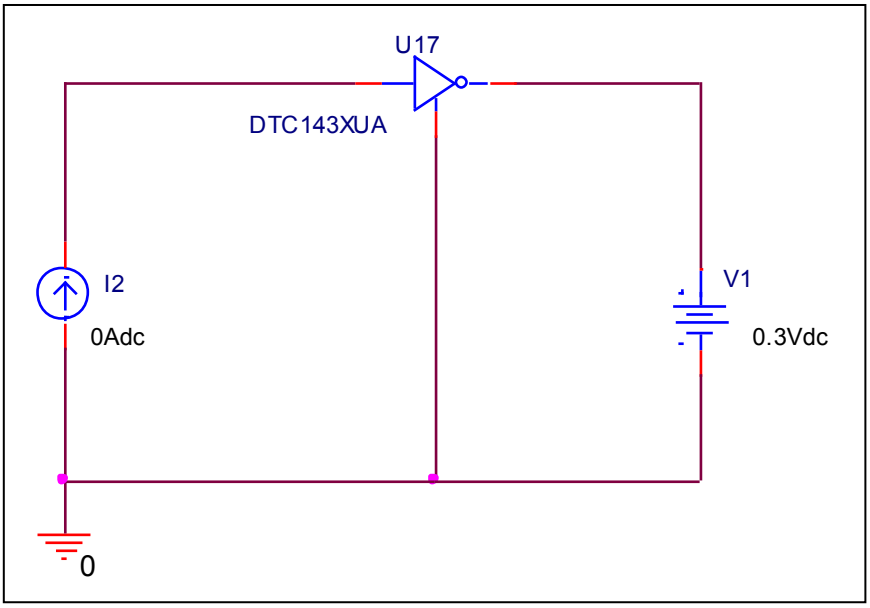
PSpice model parameter	Model description
IS	Saturation Current
BF	Ideal Maximum Forward Beta
NF	Forward Current Emission Coefficient
VAF	Forward Early Voltage
IKF	Forward Beta Roll-off Knee Current
ISE	Non-ideal Base-Emitter Diode Saturation Current
NE	Non-ideal Base-Emitter Diode Emission Coefficient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

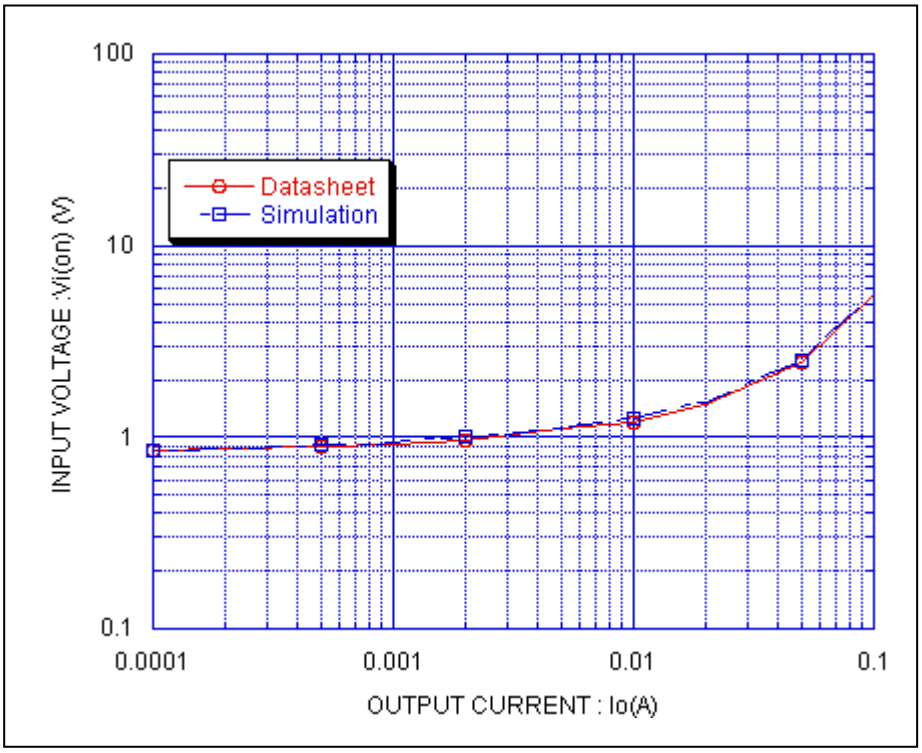


Evaluation circuit



Comparison Graph

Circuit Simulation Result



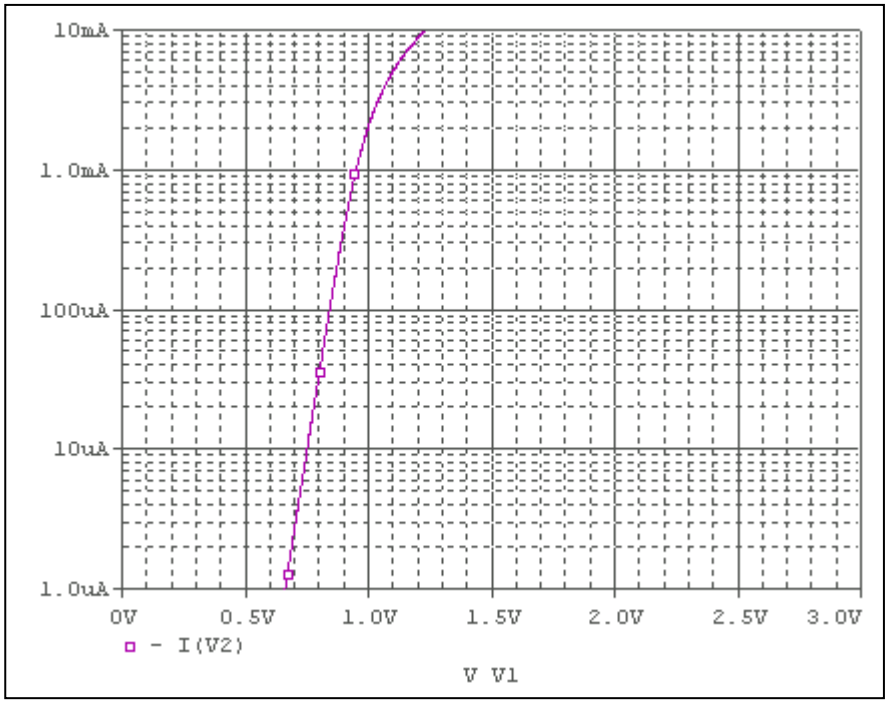
Simulation Result

Condition @ Vo = 0.3 V

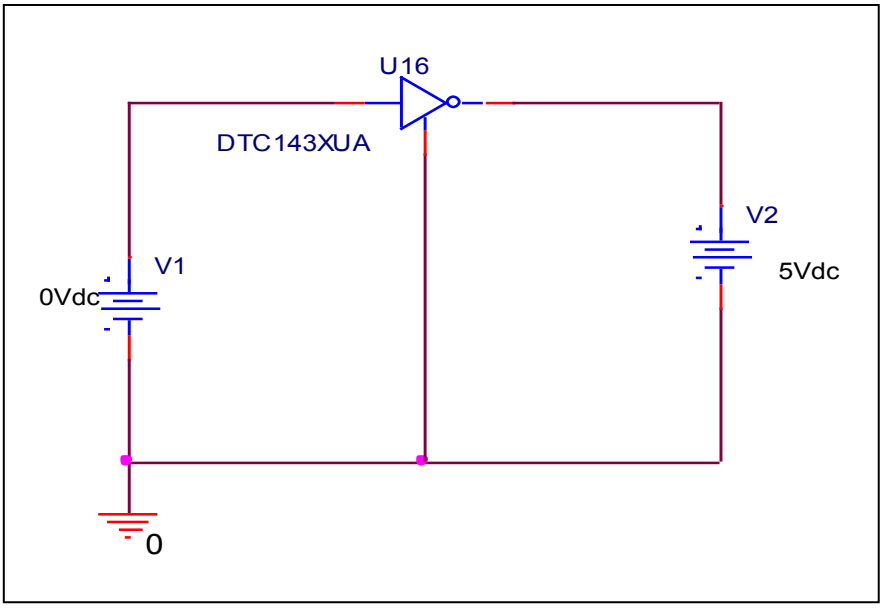
Io(A)	$V_{I(ON)}$ (V)		Error (%)
	Datasheet	Simulation	
100u	0.85	0.844	-0.705
200u	0.87	0.874	0.459
500u	0.89	0.91	2.247
1m	0.91	0.95	4.395
2m	0.96	1	4.166
5m	1.1	1.1	0
10m	1.2	1.25	4.166
20m	1.5	1.53	2
50m	2.45	2.54	3.673
100m	5.6	5.72	2.142

Output current vs. input voltage (OFF characteristics)

Circuit simulation result

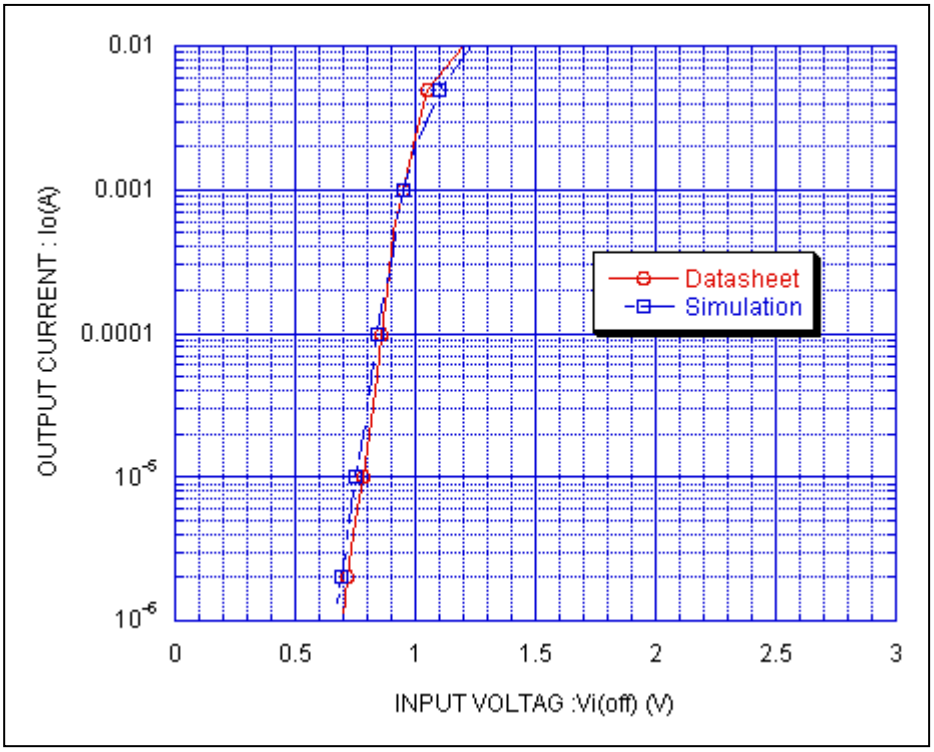


Evaluation circuit



Comparison Graph

Circuit Simulation Result



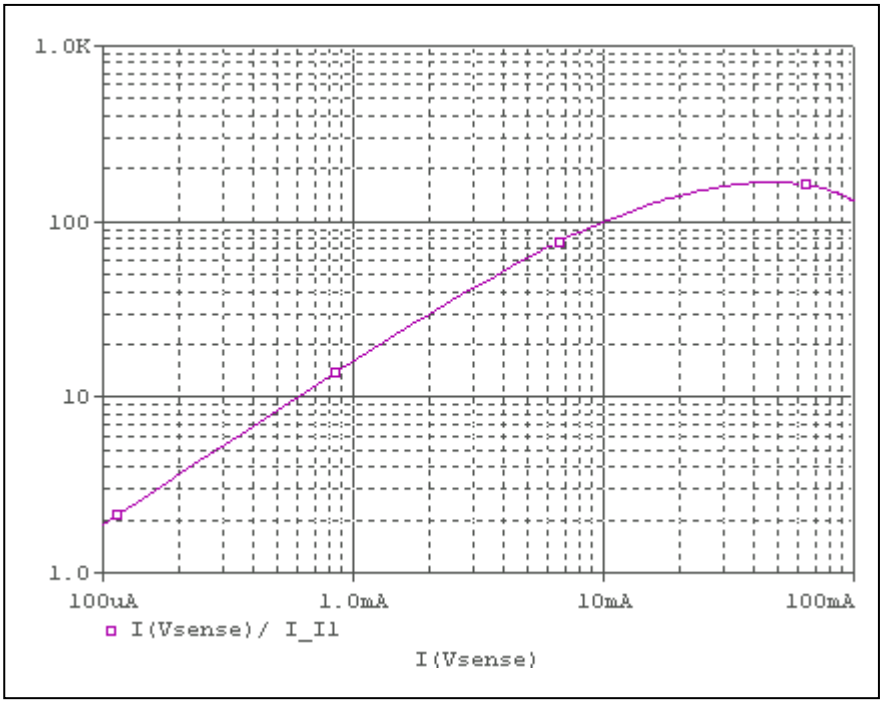
Simulation Result

Condition @ Vcc = 5 V

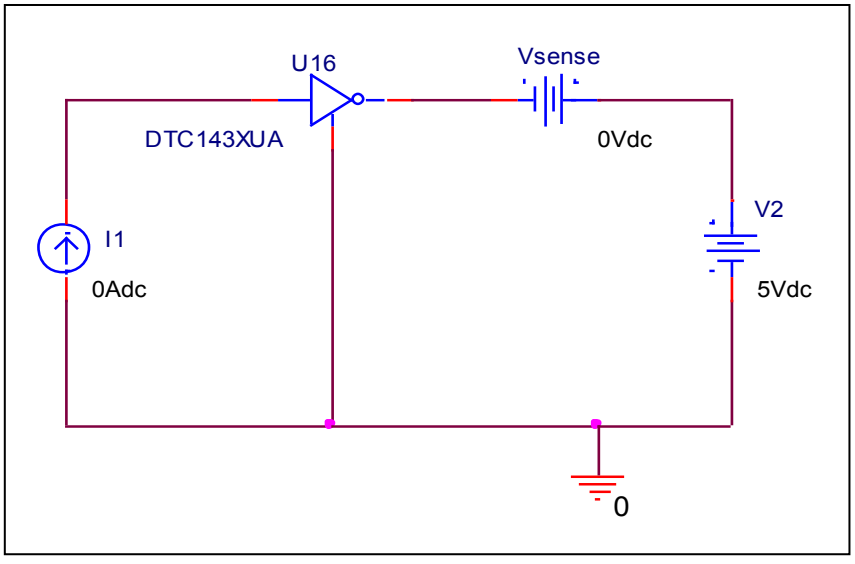
Io(A)	$V_{I(OFF)}$ (V)		Error (%)
	Datasheet	Simulation	
1u	0.69	0.66	-4.347
2u	0.72	0.69	-4.167
5u	0.75	0.724	-3.467
10u	0.78	0.75	-3.846
20u	0.81	0.78	-3.703
50u	0.84	0.815	-2.976
100u	0.86	0.842	-2.093
200u	0.88	0.873	-0.795
500u	0.91	0.913	0.329
1m	0.95	0.95	0
2m	0.99	1	1.01
5m	1.05	1.1	4.761
10m	1.2	1.23	2.5

DC current gain vs. output current

Circuit simulation result

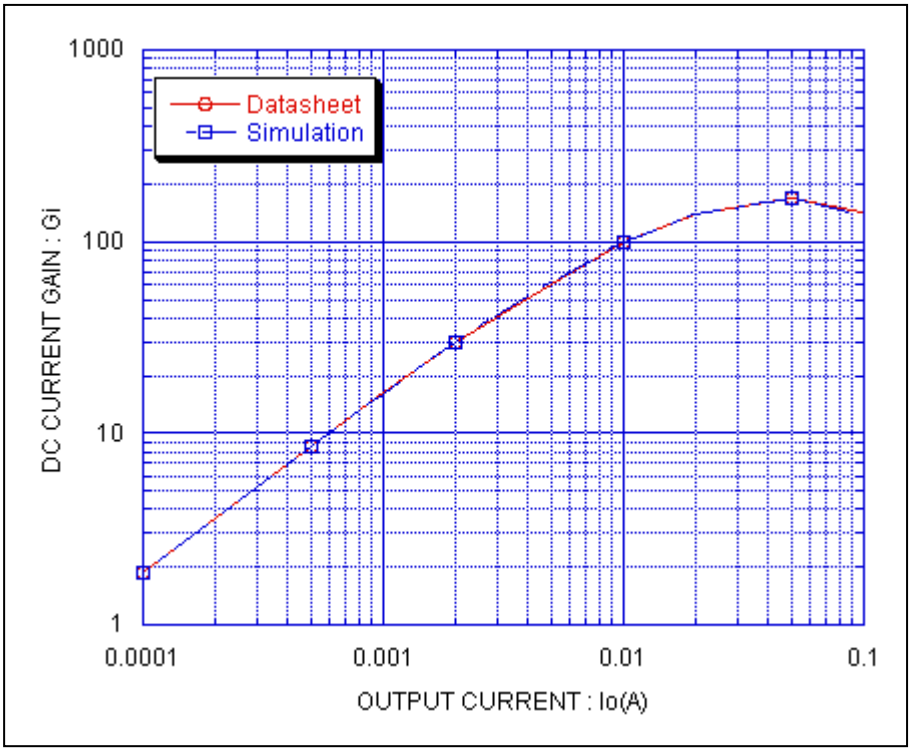


Evaluation circuit



Comparison Graph

Circuit Simulation Result



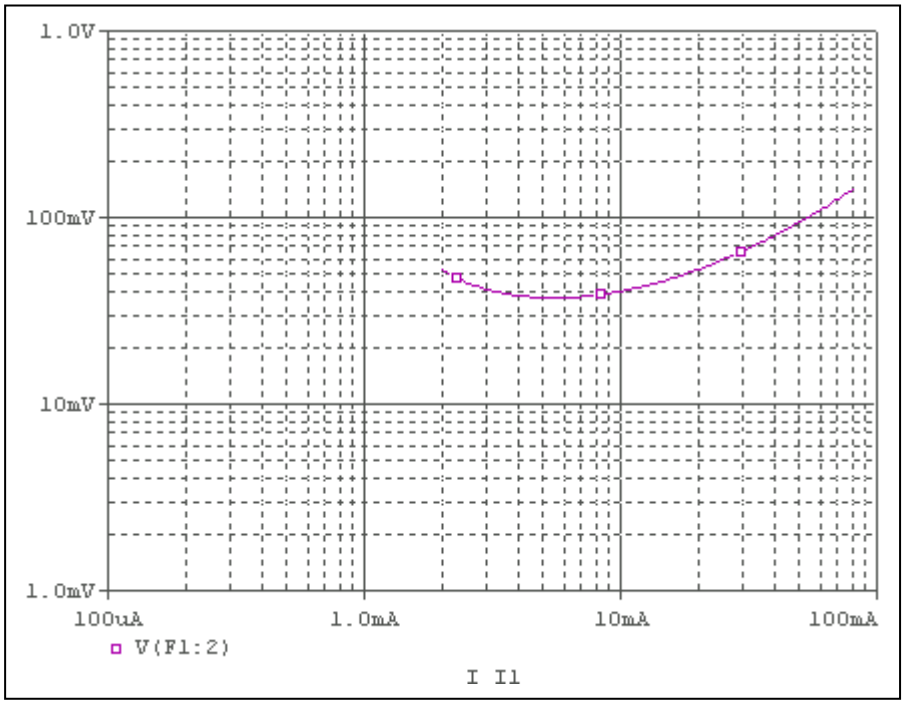
Simulation Result

Condition @ Vo = 5 V

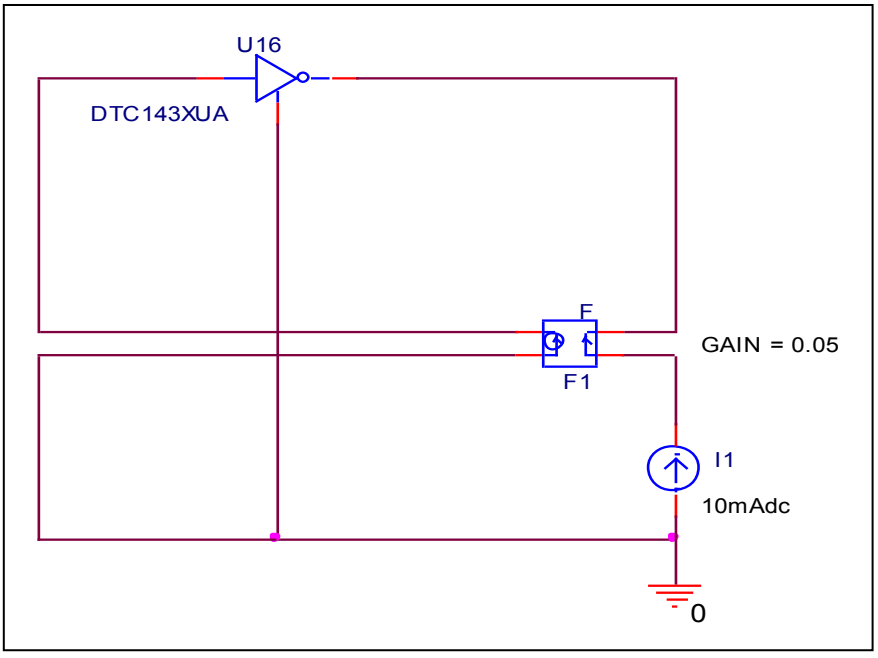
Ic(A)	hFE		Error (%)
	Datasheet	Simulation	
100u	1.85	1.866	0.864
200u	3.6	3.609	0.25
500u	8.5	8.48	-0.235
1m	16.5	16	-3.030
2m	29.5	29.7	0.677
5m	60	61.91	3.183
10m	99	99.16	0.161
20m	140	140	0
50m	170	167	-1.764
100m	140	133	-5

Output voltage VS. output current

Circuit simulation result

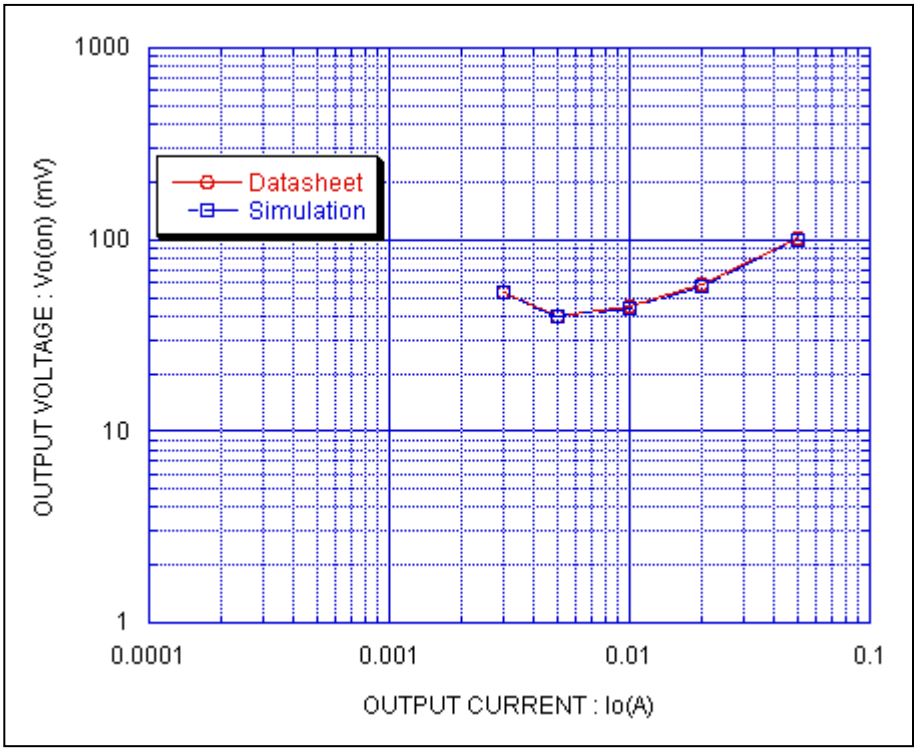


Evaluation circuit



Comparison Graph

Circuit Simulation Result



Simulation Result

Condition @ I_o/I_I = 20

Ic(A)	V_{CE} (sat)(mV)		Error (%)
	Datasheet	Simulation	
3m	53	52.83	-0.32
5m	39.5	40.2	1.772
10m	45	44.18	-1.822
20m	58	56.5	-2.586
50m	102	99.12	-2.823