Device Modeling Report

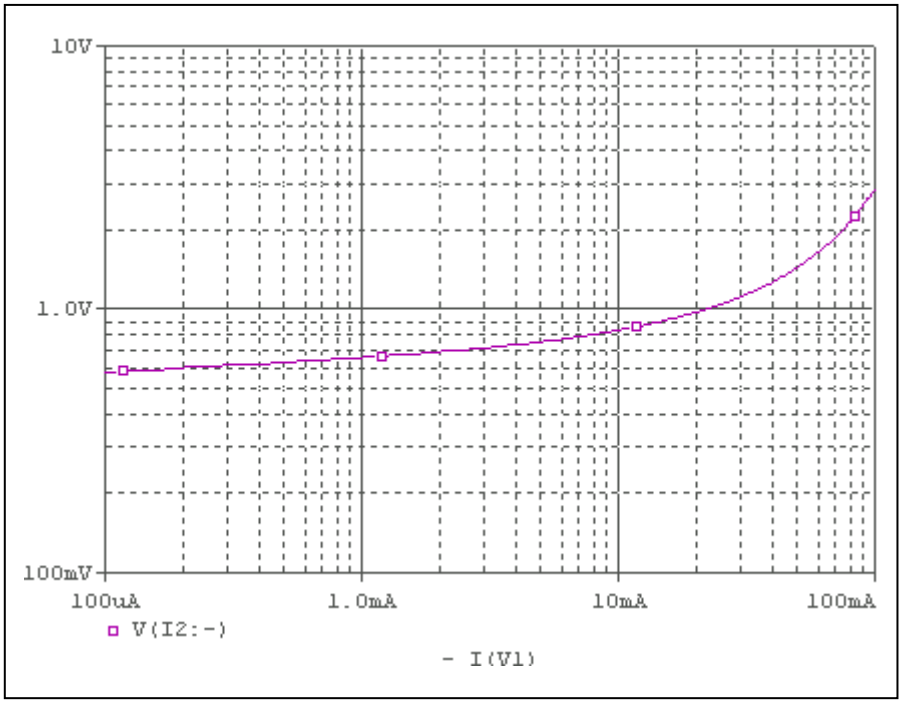
COMPONENTS: Digital transistors (built-in resistors)
PART NUMBER: DTC123JE
MANUFACTURER: ROHM

Bee Technologies Inc.

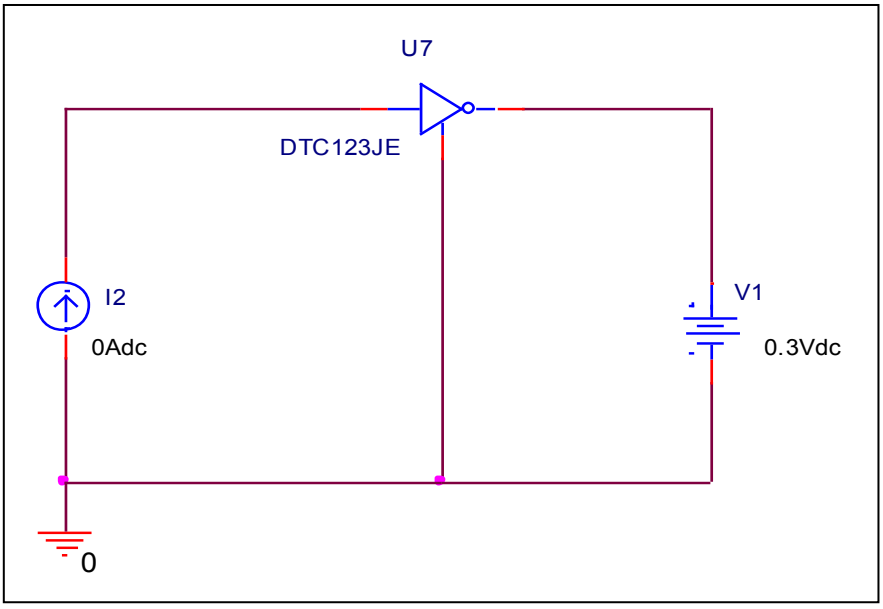
PSpice model parameter	Model description
IS	Saturation Current
BF	Ideal Maximum Forward Beta
NF	Forward Current Emission Coefficient
VAF	Forward Early Voltage
IKF	Forward Beta Roll-off Knee Current
ISE	Non-ideal Base-Emitter Diode Saturation Current
NE	Non-ideal Base-Emitter Diode Emission Coefficient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

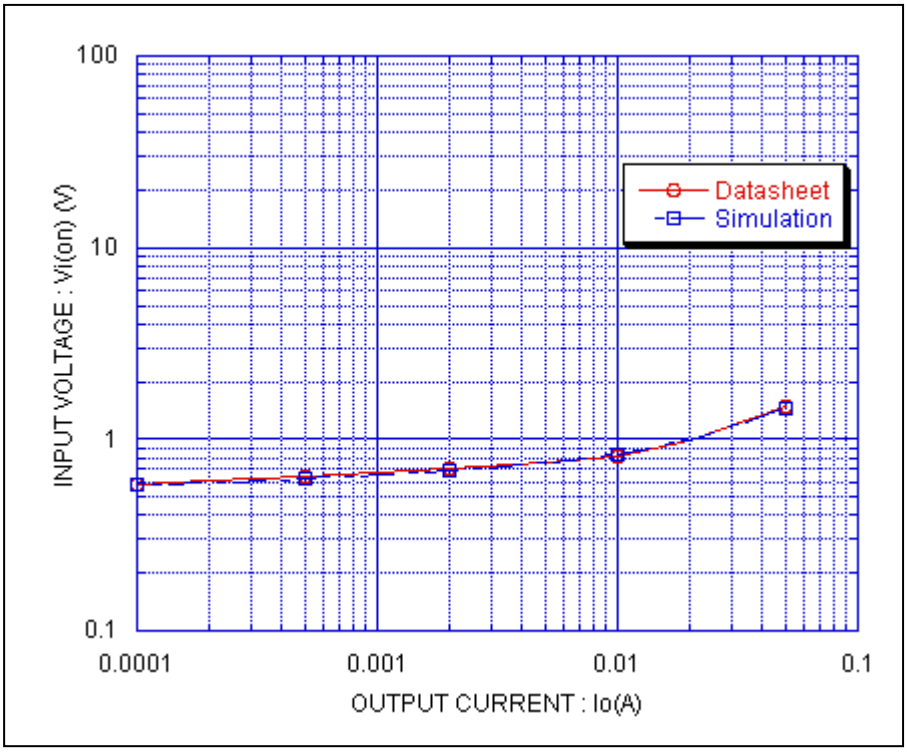


Evaluation circuit



Comparison Graph

Circuit Simulation Result



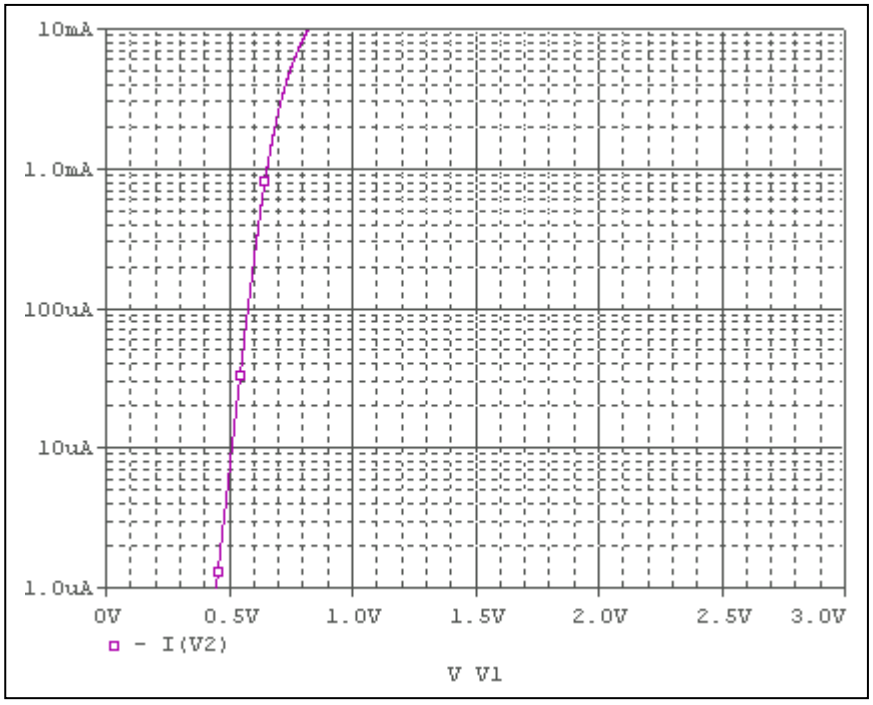
Simulation Result

Condition @ Vo = 0.3 V

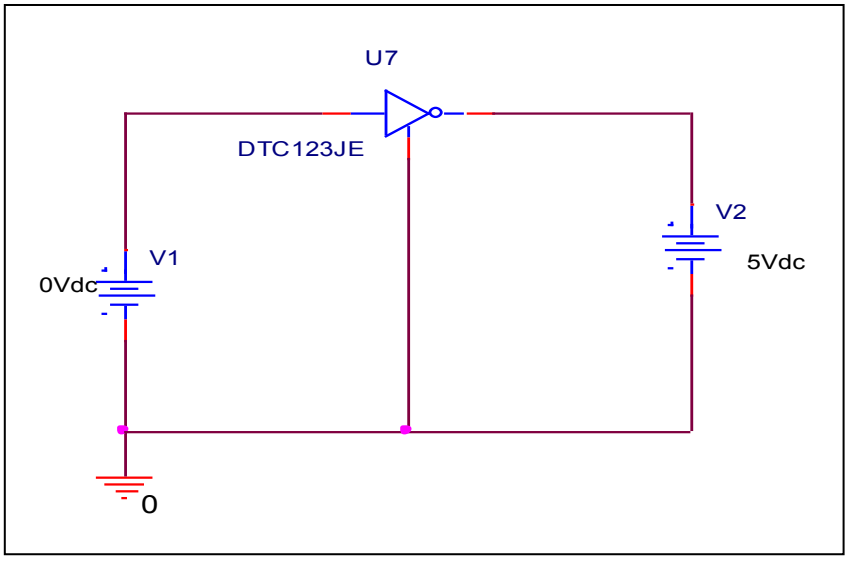
Io(A)	$V_{I(ON)}$ (V)		Error (%)
	Datasheet	Simulation	
100u	0.585	0.577	-1.367
200u	0.605	0.598	-1.157
500u	0.64	0.629	-1.718
1m	0.67	0.656	-2.089
2m	0.7	0.689	-1.571
5m	0.75	0.753	0.4
10m	0.81	0.832	2.716
20m	0.99	0.99	0
50m	1.5	1.44	-4

Output current vs. input voltage (OFF characteristics)

Circuit simulation result

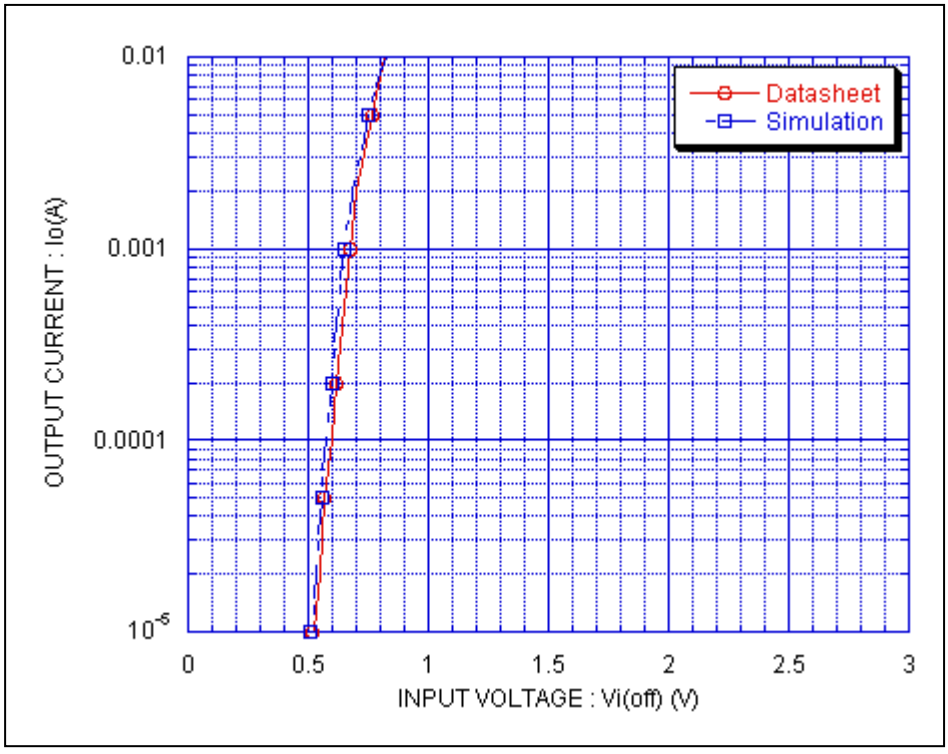


Evaluation circuit



Comparison Graph

Circuit Simulation Result



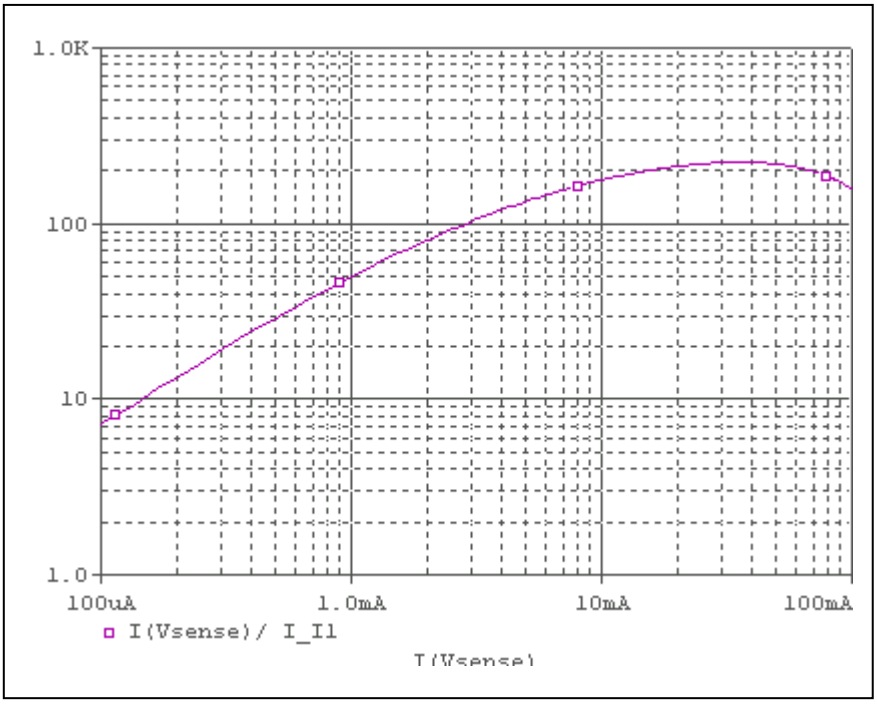
Simulation Result

Condition @ V_{CC} = 5 V

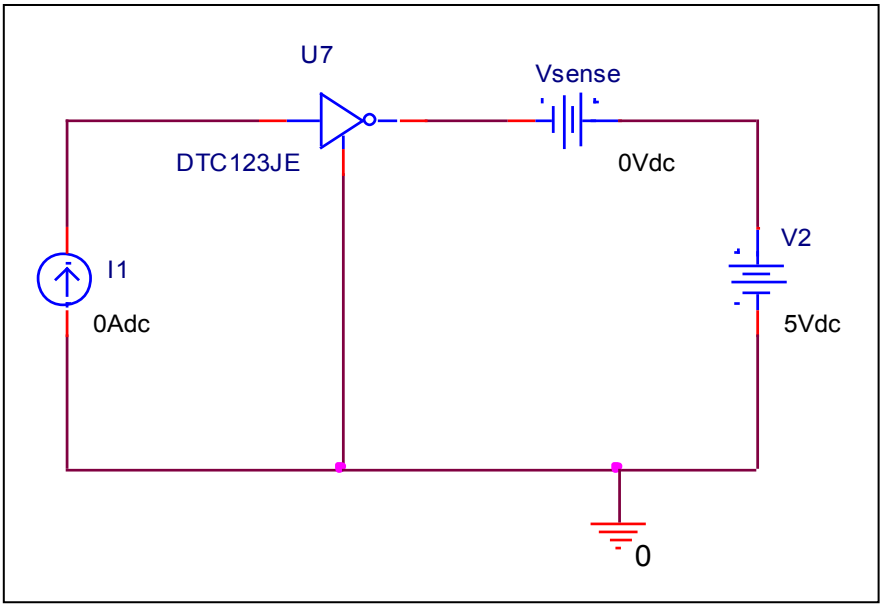
Io(A)	$V_{I(Off)}$ (V)		Error (%)
	Datasheet	Simulation	
10u	0.52	0.511	-1.730
20u	0.55	0.53	-3.636
50u	0.57	0.556	-2.456
100u	0.6	0.576	-4
200u	0.62	0.6	-3.225
500u	0.65	0.626	-3.692
1m	0.675	0.653	-3.259
2m	0.7	0.685	-2.142
5m	0.77	0.747	-2.987
10m	0.82	0.822	0.243

DC current gain vs. output current

Circuit simulation result

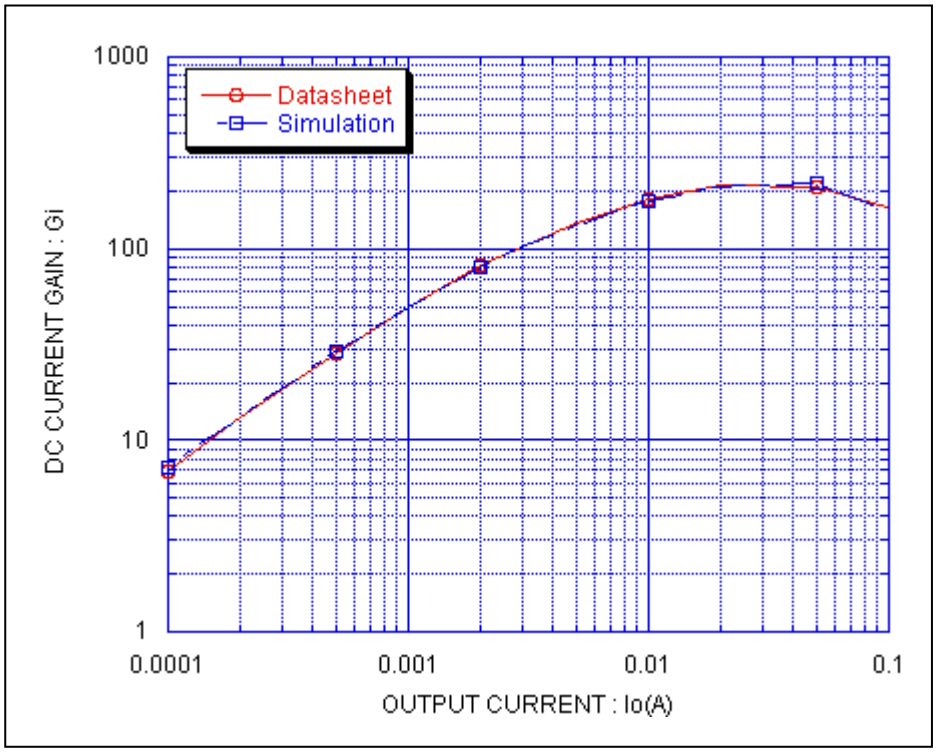


Evaluation circuit



Comparison Graph

Circuit Simulation Result



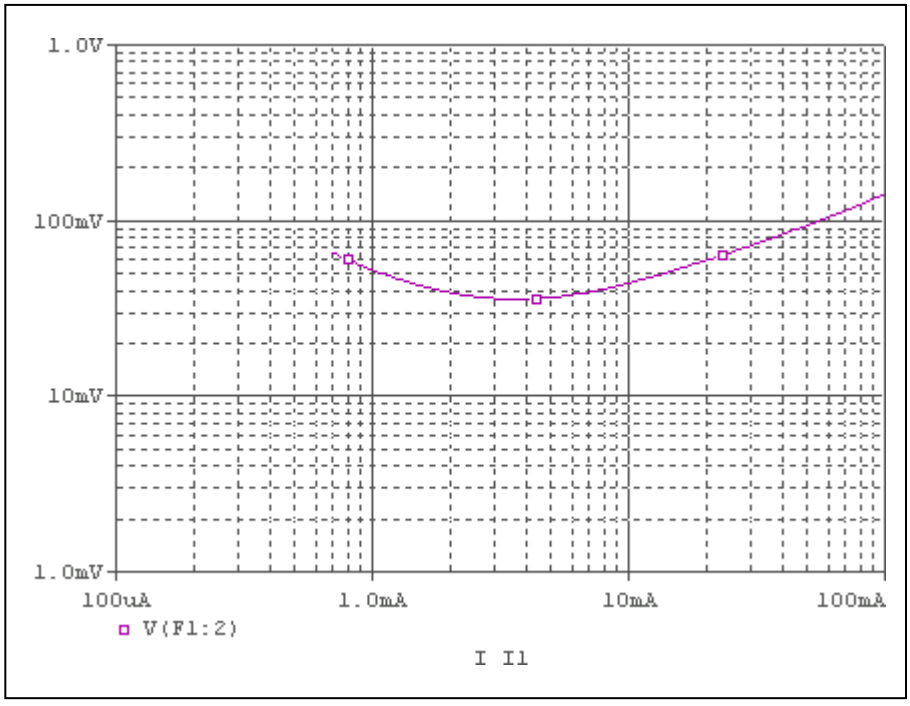
Simulation Result

Condition @ V_{CC} = 5V

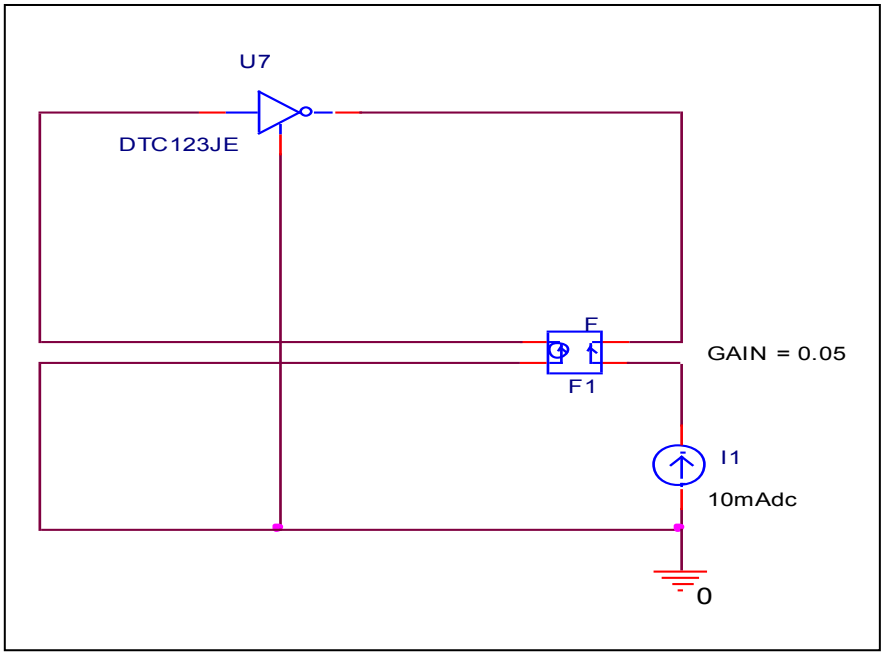
Io(A)	GAIN		Error (%)
	Datasheet	Simulation	
100u	6.9	7.12	3.188
200u	13	13.302	2.323
500u	28.5	28.9	1.403
1m	49.5	49.6	0.202
2m	81	80.7	-0.37
5m	137	133	-2.919
10m	180	176	-2.222
20m	215	211	-1.860
50m	210	218	3.809
100m	160	154	-3.75

Output voltage VS. output current

Circuit simulation result

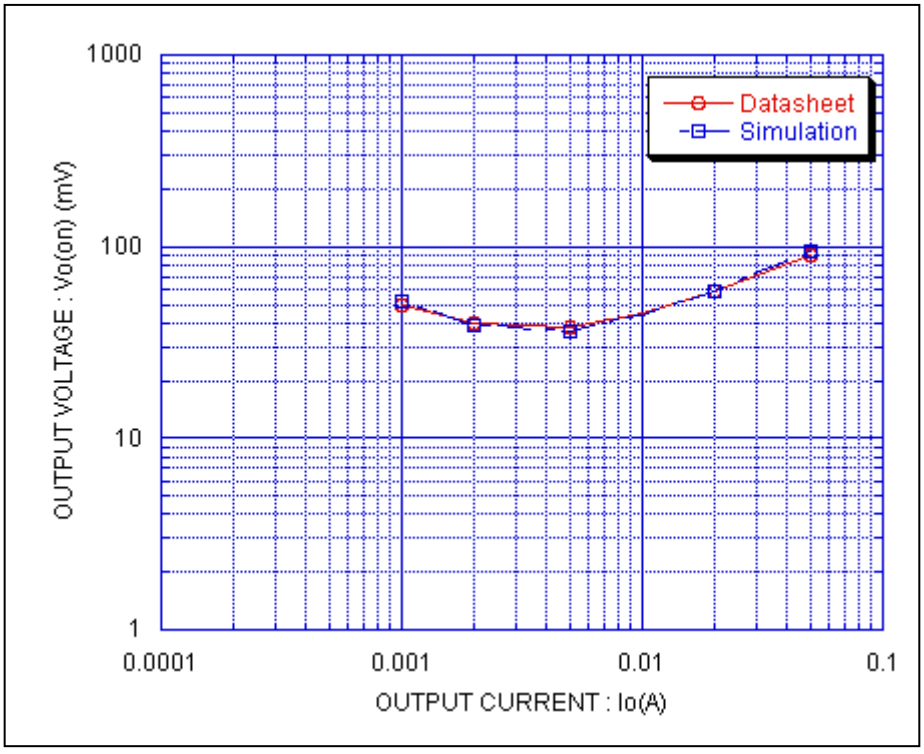


Evaluation circuit



Comparison Graph

Circuit Simulation Result



Simulation Result

Condition @ Io/Iı = 20

Io(A)	$V_{0(on)}$ (mV)		Error (%)
	Datasheet	Simulation	
1m	50	52.3	4.6
2m	39.5	38.92	-1.468
5m	37.5	36.47	-2.746
10m	45	44.01	-2.2
20m	59	59.1	0.169
50m	90	94.01	4.455