Device Modeling Report

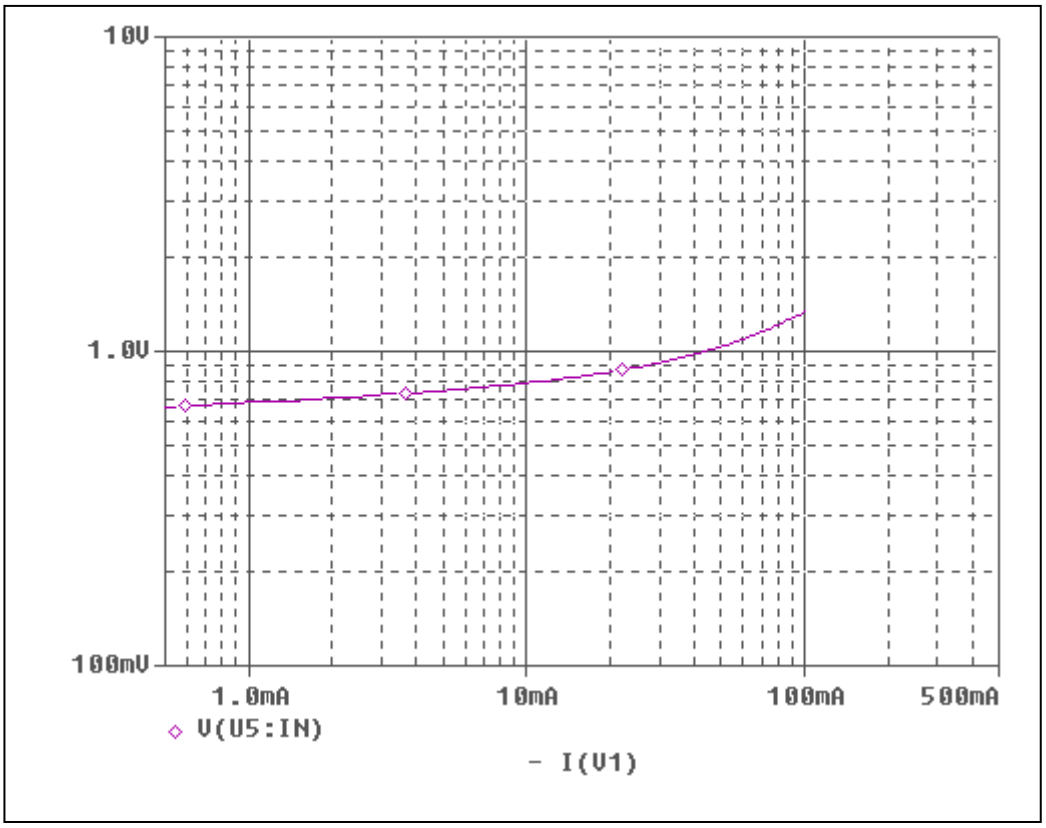
COMPONENTS: Digital transistors (built-in resistors)
PART NUMBER: DTD113ZS
MANUFACTURER: ROHM

Bee Technologies Inc.

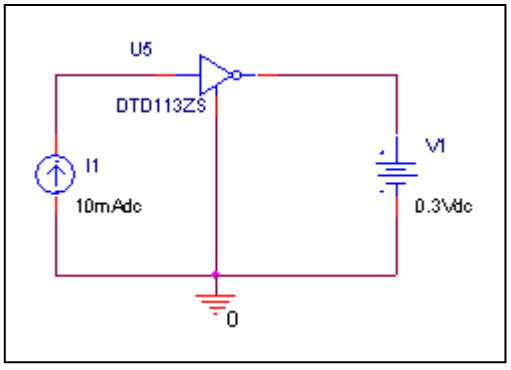
PSpice model parameter	Model description
IS	Saturation Current
BF	Ideal Maximum Forward Beta
NF	Forward Current Emission Coefficient
VAF	Forward Early Voltage
IKF	Forward Beta Roll-off Knee Current
ISE	Non-ideal Base-Emitter Diode Saturation Current
NE	Non-ideal Base-Emitter Diode Emission Coefficient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

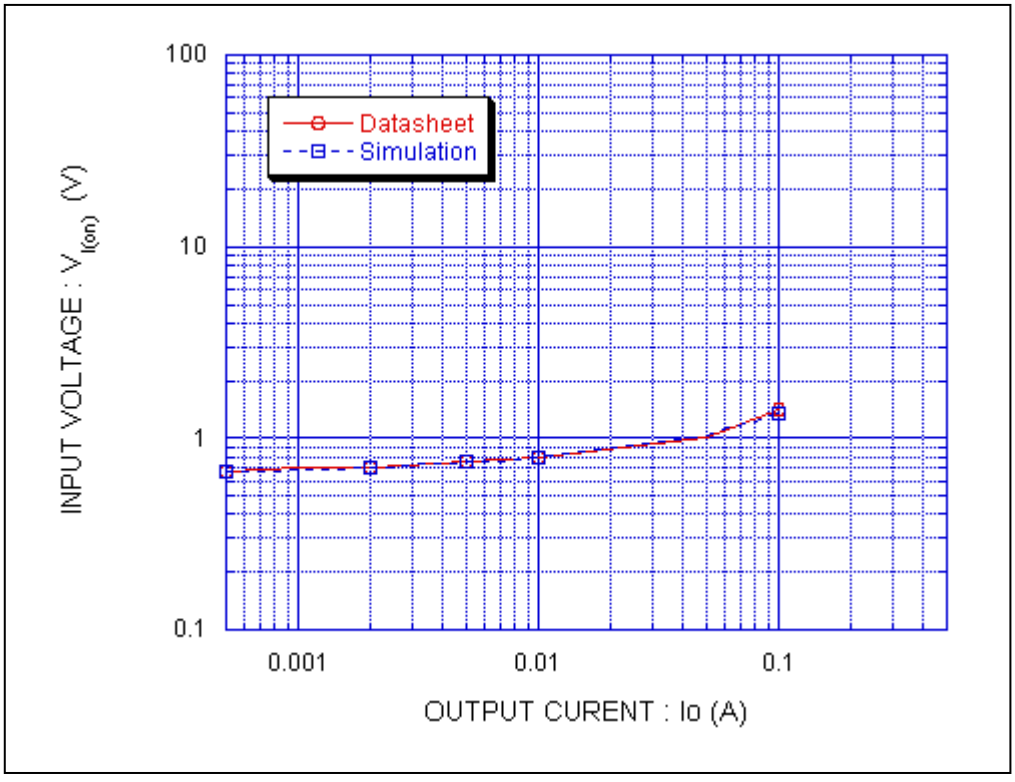


Evaluation circuit



Comparison Graph

Circuit Simulation Result



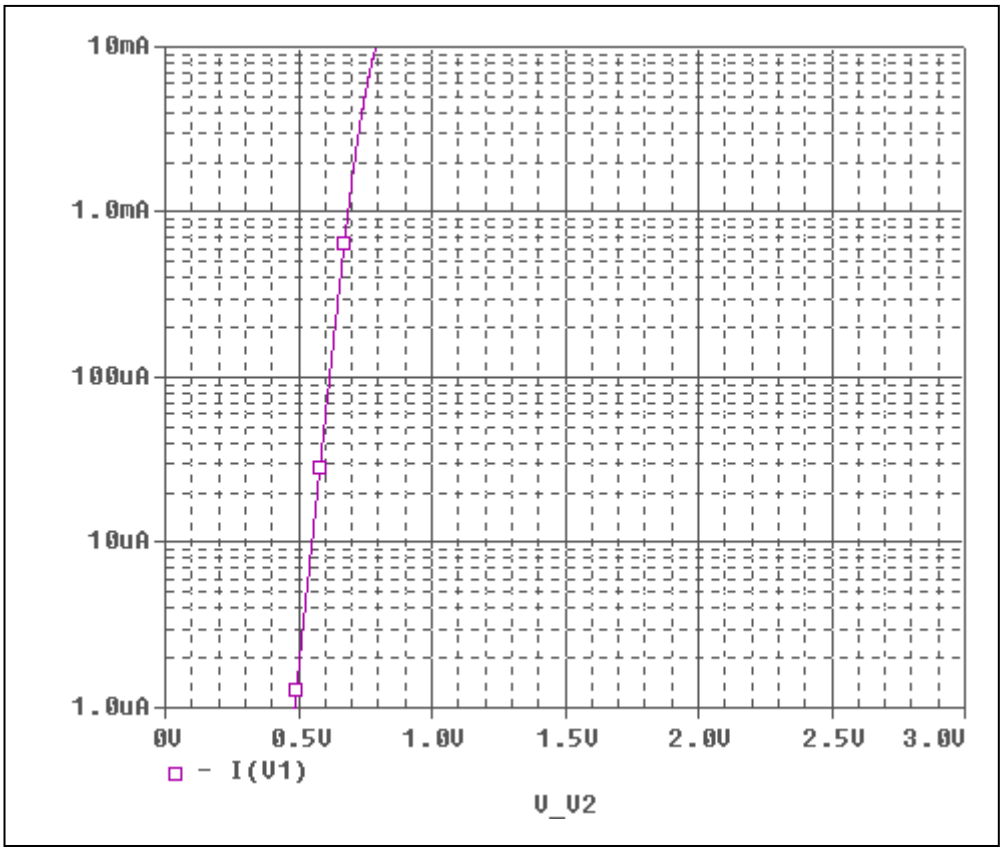
Simulation Result

Condition @ Vo = 0.3 V

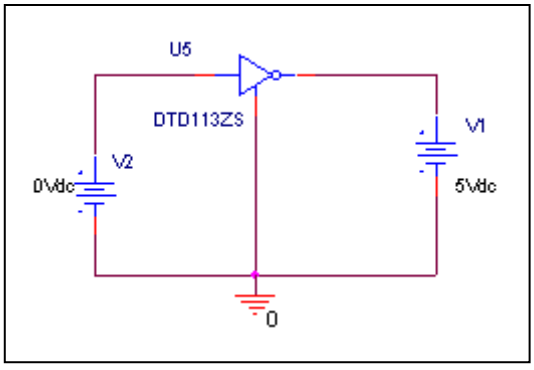
Ic(A)	$V_{I(ON)}$ (V)		Error (%)
	Datasheet	Simulation	
500u	670m	665.133m	-0.72642
1m	700m	687.419m	-1.79729
2m	710m	711.650m	0.23239
5m	750m	751.38m	0.18400
10m	800m	794.163m	-0.72962
50m	1	1.0392	3.92000
100m	1.4	1.3411	-4.20714

Output current vs. input voltage (OFF characteristics)

Circuit simulation result

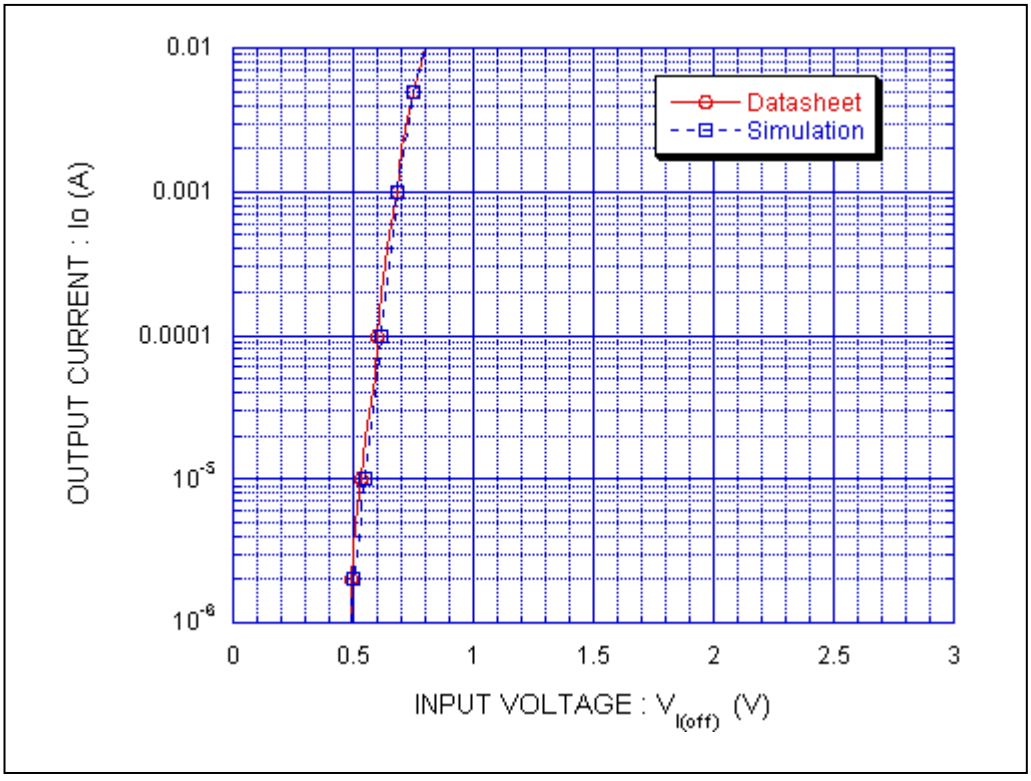


Evaluation circuit



Comparison Graph

Circuit Simulation Result



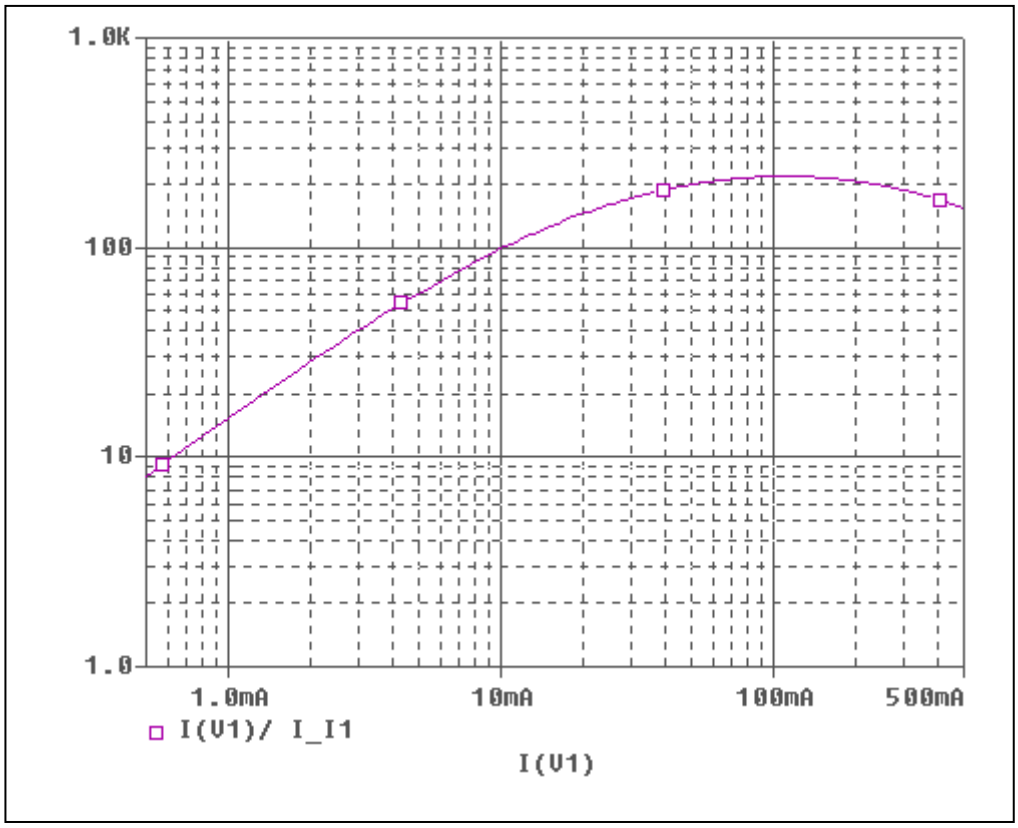
Simulation Result

Condition @ Vcc = 5 V

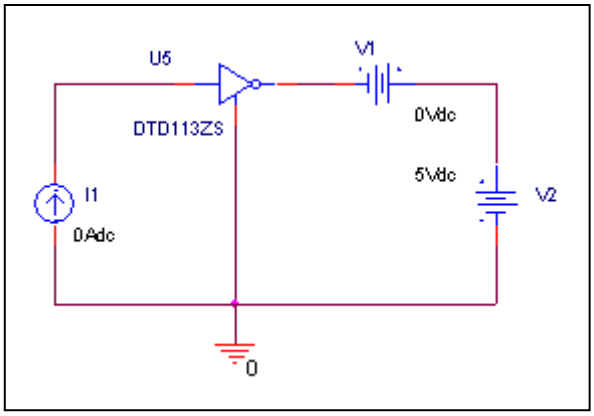
Ic(A)	$V_{I(OFF)}$ (V)		Error (%)
	Datasheet	Simulation	
1u	0.48	0.484854	1.01125
2u	0.49	0.505023	3.06592
5u	0.51	0.531119	4.14098
10u	0.53	0.550536	3.87472
20u	0.55	0.570643	3.75327
50u	0.59	0.596856	1.16203
100u	0.6	0.616462	2.74367
200u	0.62	0.636963	2.73597
500u	0.65	0.664341	2.20631
1m	0.68	0.685846	0.85971
2m	0.7	0.710291	1.47014
5m	0.75	0.749458	-0.07227
10m	0.8	0.790443	-1.19463

DC current gain vs. output current

Circuit simulation result

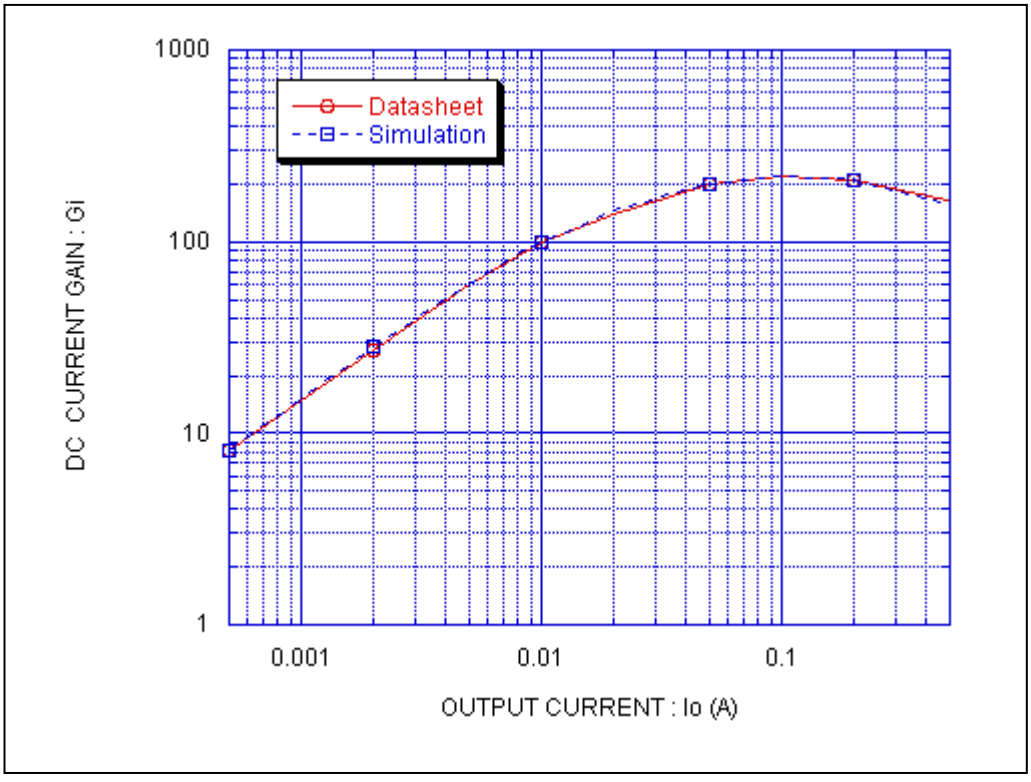


Evaluation circuit



Comparison Graph

Circuit Simulation Result



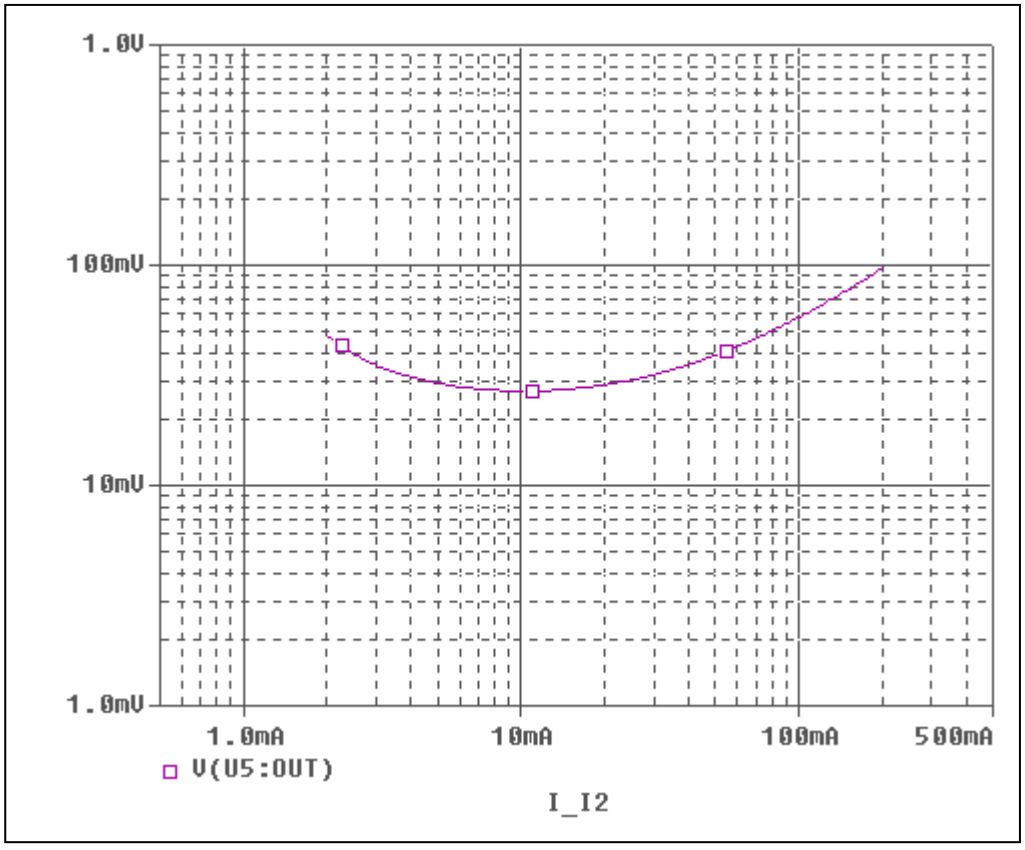
Simulation Result

Condition @ Vo = 5 V

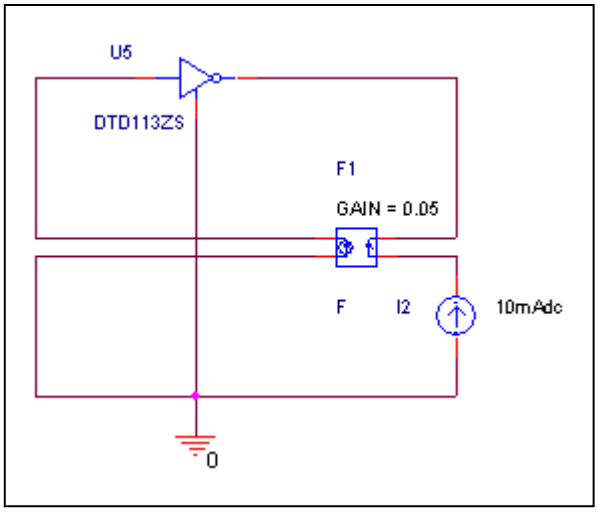
Ic(A)	hFE		Error (%)
	Datasheet	Simulation	
500u	8.2	8.0836	-1.43995
1m	15	15.291	1.94000
2m	28	28.517	1.84643
5m	60	60.774	1.29000
10m	99	99.042	0.04242
20m	140	145.705	4.07500
50m	200	200.442	0.22100
100m	220	218.386	-0.73364
200m	210	207.369	-1.25286
500m	160	152.757	-4.52688

Output voltage VS. output current

Circuit simulation result

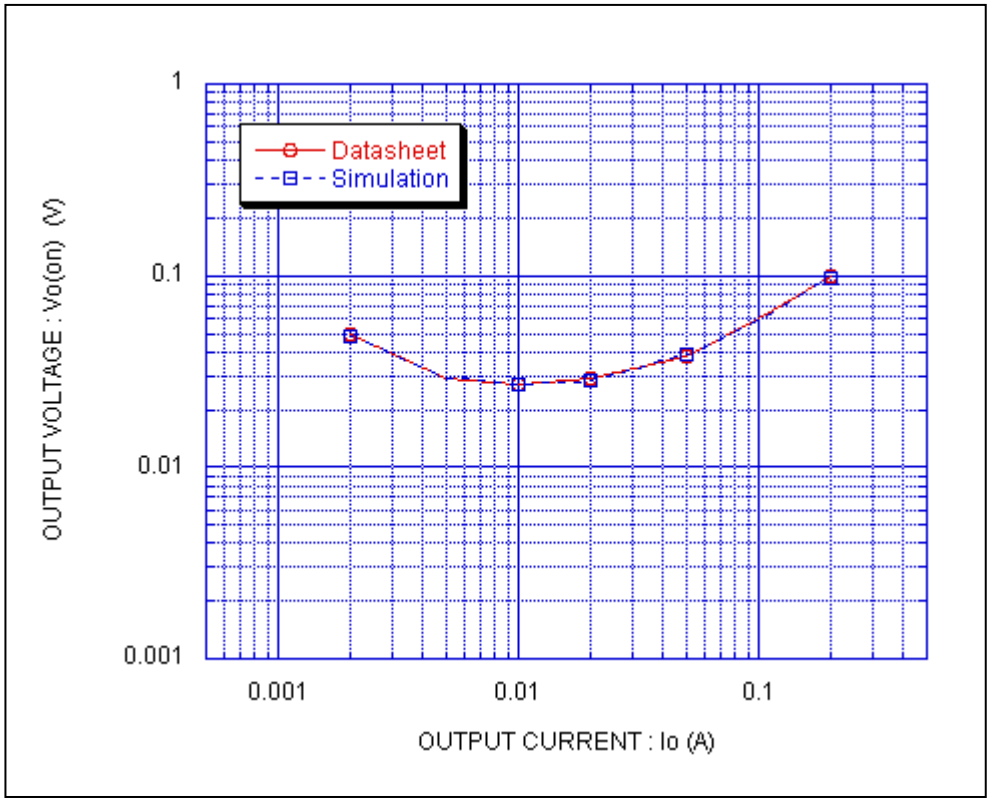


Evaluation circuit



Comparison Graph

Circuit Simulation Result



Simulation Result

Condition @ I_o/I_I = 20

Ic(A)	V_{CE} (sat)		Error (%)
	Datasheet	Simulation	
2m	49m	48.347m	-1.35065
5m	29m	29.130m	0.44828
10m	27m	26.859m	-0.52222
20m	29m	28.704m	-1.02069
50m	38m	39.189m	3.12895
100m	60m	58.155m	-3.07500
200m	100m	97.471m	-2.52900