

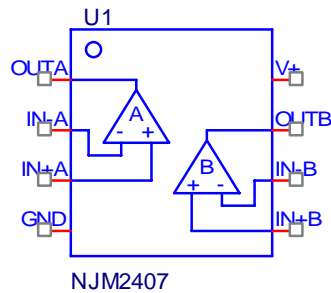
Device Modeling Report

COMPONENTS : VOLTAGE COMPARATOR
PART NUMBER : NJM2407
MANUFACTURER : NEW JAPAN RADIO



Bee Technologies Inc.

SPICE MODEL



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*PART NUMBER: NJM2407
*MANUFACTURER: NEW JAPAN RADIO
*BJT COMPARATOR
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.subckt njm2407 OUTA IN-A IN+A GND IN+B IN-B OUTB V+
X_U1 IN+A IN-A V+ GND OUTA njm2407_s
X_U2 IN+B IN-B V+ GND OUTB njm2407_s
.ends njm2407
.subckt njm2407_s In+ li- V+ V- O/P
f1 9 V+ v1 1
iee V+ 7 dc 100.0E-6
vi1 21 In+ dc 0.75
vi2 22 li- dc 0.749
q1 9 21 7 qin1
q2 8 22 7 qin2
q3 9 8 V- qmo
q4 8 8 V- qmi
.model qin1 PNP(Is=800.0E-18 Bf=1782)
.model qin2 PNP(Is=800.0E-18 Bf=2264)
.model qmi NPN(Is=897.2E-18 Bf=1002)
.model qmo NPN(Is=800.0E-18 Bf=1000 Cjc=1E-15 Tr=48.5E-8)
e1 10 V- 9 V- 1
v1 10 11 dc 45m
q5 O/P 11 V- qoc
.model qoc NPN(Is=800.0E-18 Bf=7.3E3 Cjc=1E-15 Tf=0.58E-8
+ Tr=49.8E-8 RE=35.8)
dp V- V+ dx
rp V+ V- 71.53
.model dx D(Is=800.0E-18)
.ends njm2407_s
*$

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BJT MODEL

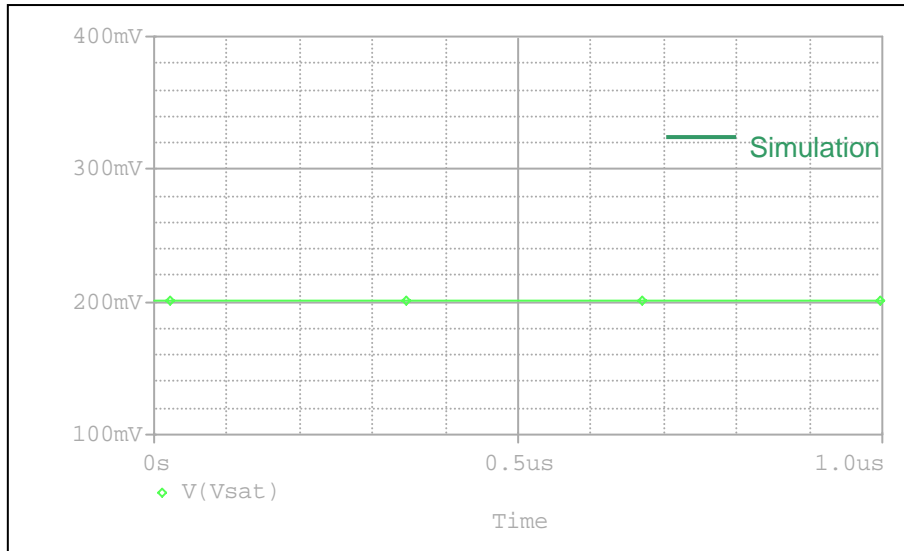
Pspice model parameter	Model description
IS	Saturation Current
BF	Ideal Maximum Forward Beta
CJC	Zero-bias Collector-Base Junction Capacitance
TF	Forward Transit Time
TR	Reverse Transit Time

DIODE MODEL

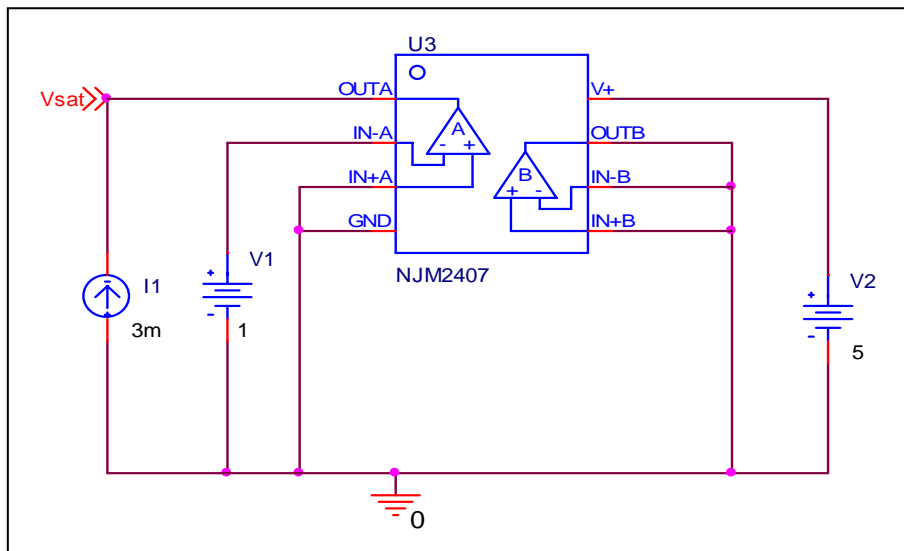
Pspice model parameter	Model description
IS	Saturation Current
RS	Series Resistance

Output Saturation Voltage

Simulation result



Evaluation Circuit

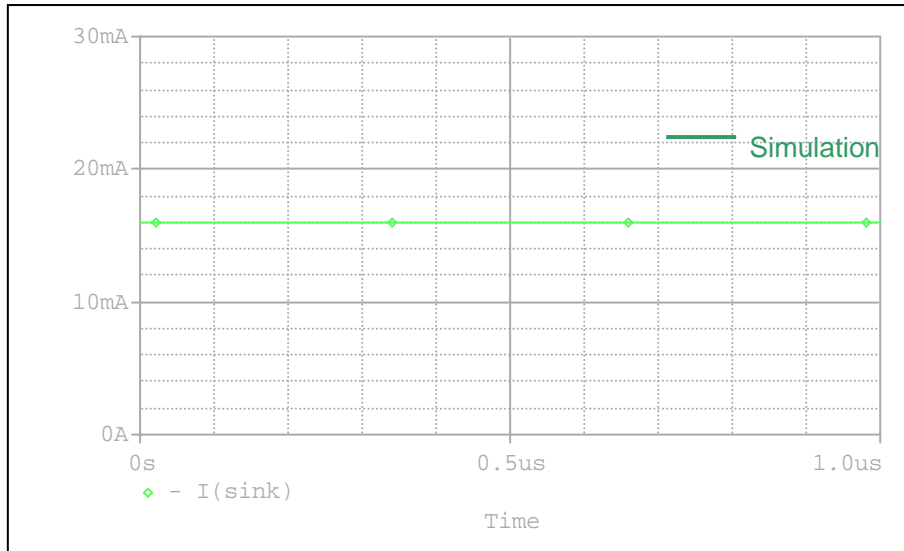


Compasion Table

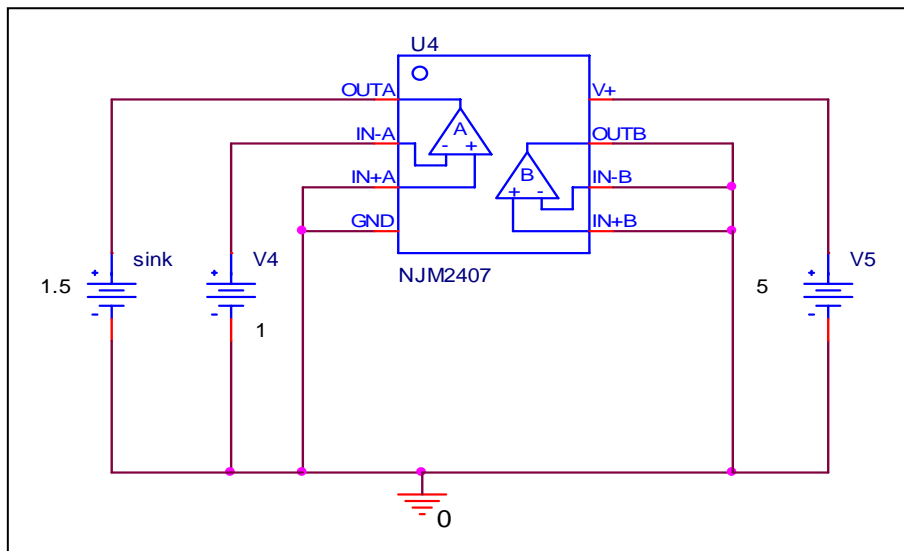
$I_{SINK} = 3 \text{ mA}$	Measurement	Simulation	%Error
$V_{SAT} \text{ (mV)}$	200	200.737	0.368

Output Sink Current

Simulation result



Evaluation Circuit

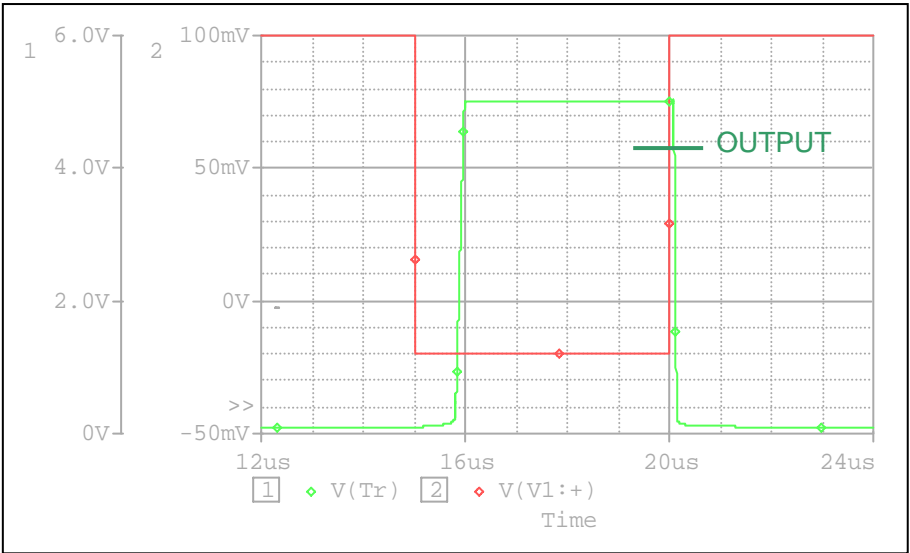


Compasion Table

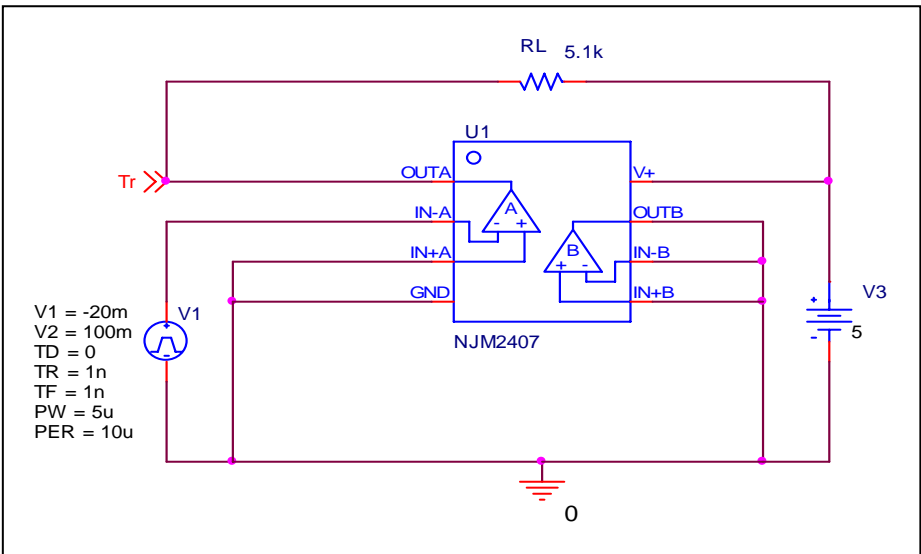
$V_o = 1.5 \text{ V}$	Measurement	Simulation	%Error
$I_{\text{SINK}} \text{ (mA)}$	16	16.007	0.044

Response time

Simulation result



Evaluation Circuit

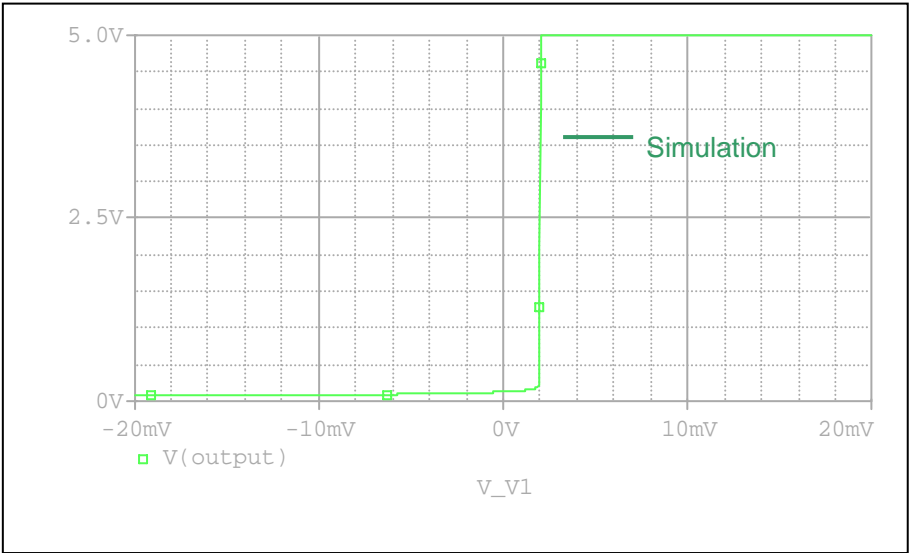


Compasion Table

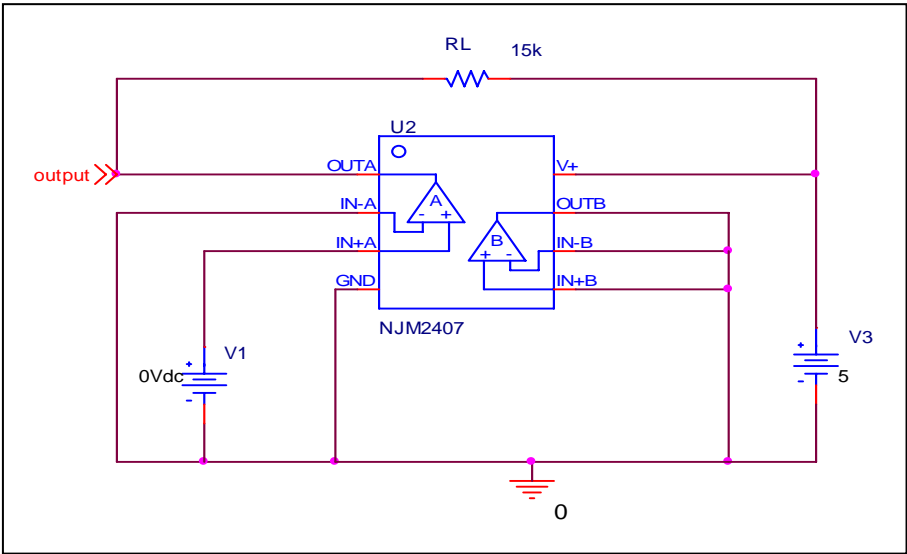
	Measurement	Simulation	% Error
Response time (us)	0.8	0.799	-0.125

Input Offset Voltage Characteristics

Simulation result



Evaluation Circuit

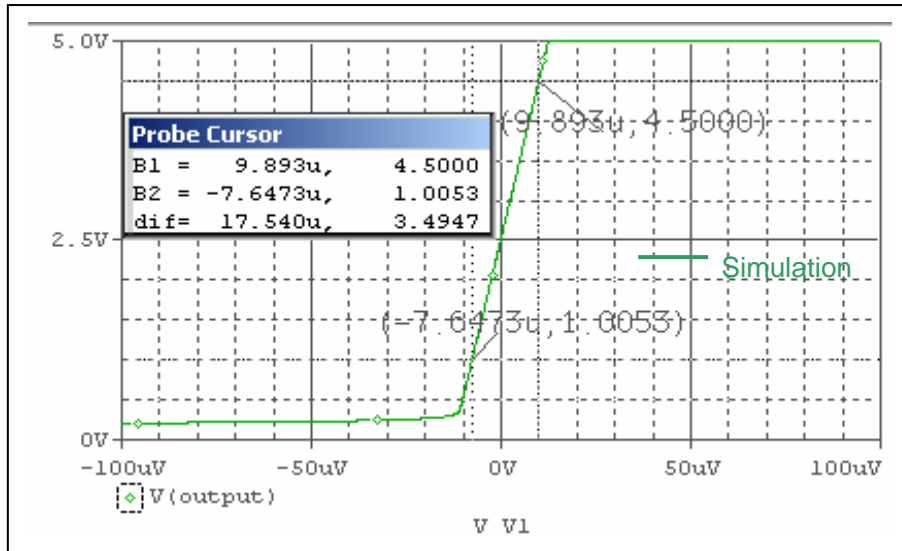


Compasion Table

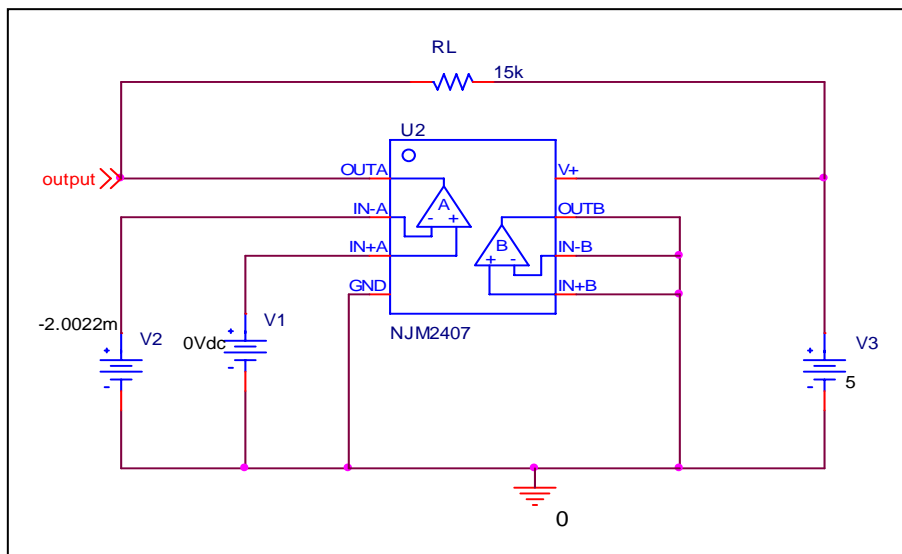
	Measurement	Simulation	%Error
$V_{io} \text{ (mV)}$	2	2.0022	0.11

Av Characteristics

Simulation result



Evaluation Circuit



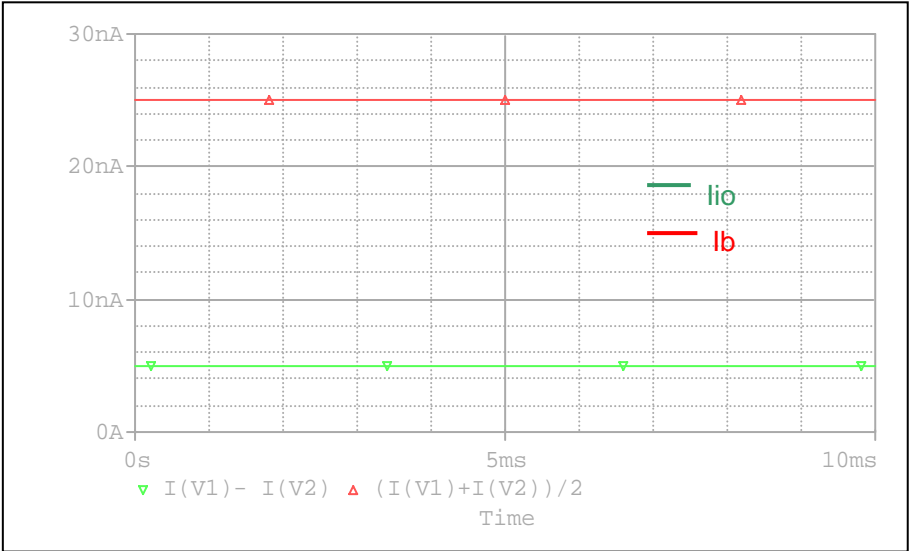
$$A_v = 20 \cdot \text{LOG}(3.4947/17.540\mu) \quad \text{dB}$$

Compasion Table

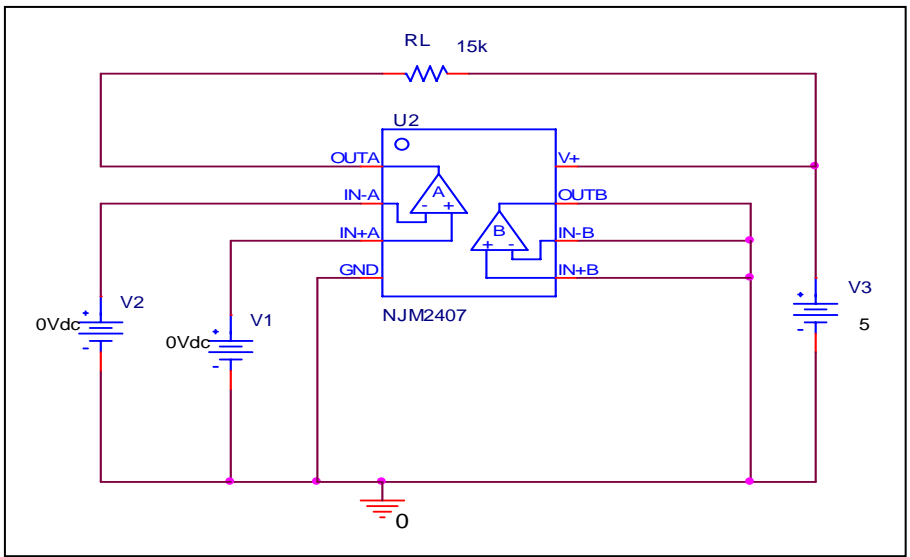
$R_L = 1k\Omega$	Measurement	Simulation	%Error
Av (dB)	106	105.987	-0.012

Input Bias Current Characteristics

Simulation result



Evaluation Circuit



Compasion Table

	Measurement	Simulation	% Error
Ib (nA)	25	25.001	0.004
Iio (nA)	5	5.0019	0.038