

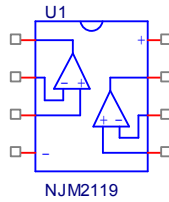
Device Modeling Report

COMPONENTS: OPERATIONAL AMPLIFIER
PART NUMBER: NJM2119
MANUFACTURER: NEW JAPAN RADIO CO., LTD



Bee Technologies Inc.

Spice Model



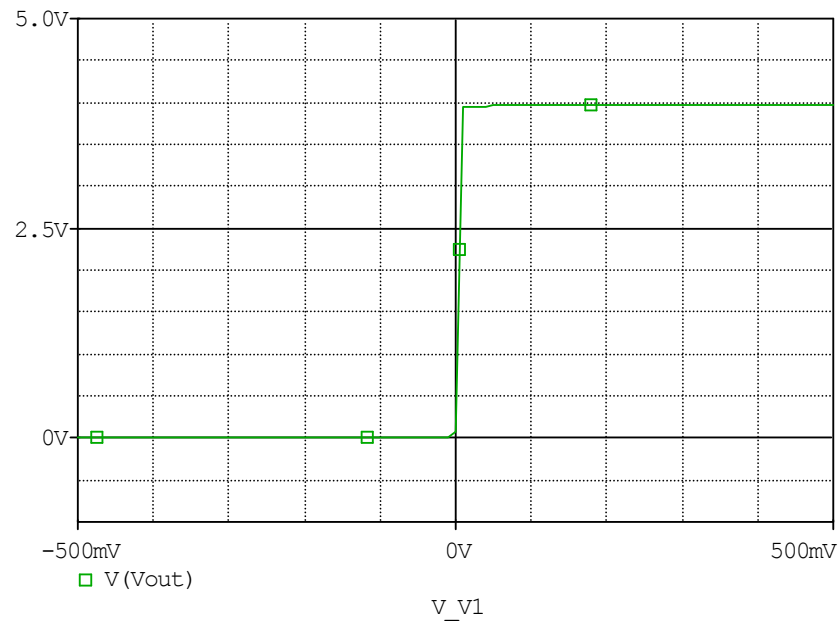
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*$
*PART NUMBER: NJM2119
*MANUFACTURER: NEW JAPAN RADIO
*OPAMP
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.SUBCKT NJM2119 OUT1 -IN1 +IN1 V- +IN2 -IN2 OUT2 V+
X_U1  +IN1 -IN1 V+ V- OUT1 NJM2119_S
X_U2  +IN2 -IN2 V+ V- OUT2 NJM2119_S
.ENDS njm2119
.SUBCKT njm2119_S 1 2 3 4 5
C1 11 12 86.600E-21
C2 6 7 31.400E-12
DC 5 53 DY
DE 54 5 DY
DLP 90 91 DX
DLN 92 90 DX
DP 4 3 DX
EGND 99 0 POLY(2) (3,0) (4,0) 0 .5 .5
FB 7 99 POLY(5) VB VC VE VLP VLN 0 38.120E6 -1E3 1E3 38E6 -38E6
GA 6 0 11 12 190.38E-6
GCM 0 6 10 99 2.1381E-9
IEE 3 10 DC 9.9321E-6
HLIM 90 0 Vlim 1K
Q1 11 2 13 QX1
Q2 12 1 14 QX2
R2 6 9 100.00E3
RC1 4 11 5.2526E3
RC2 4 12 5.2526E3
RE1 13 10 27.461
RE2 14 10 27.461
REE 10 99 1.5500E6
RO1 8 5 50
RO2 7 99 25
RP 3 4 35.717
VB 9 0 DC 0
VC 3 53 DC .76679
VE 54 4 DC .7743
Vlim 7 8 DC 0
VLP 91 0 DC 6.0050
VLN 0 92 DC 6.0050
.MODEL DX D(Is=800.00E-18)
.MODEL DY D(Is=800.00E-18 Rs=1m Cjo=10p)
.MODEL QX1 PNP(Is=800.00E-18 Bf=310.36)
.MODEL QX2 PNP(Is=803.4304E-18 Bf=306.48)
.ENDS
*$

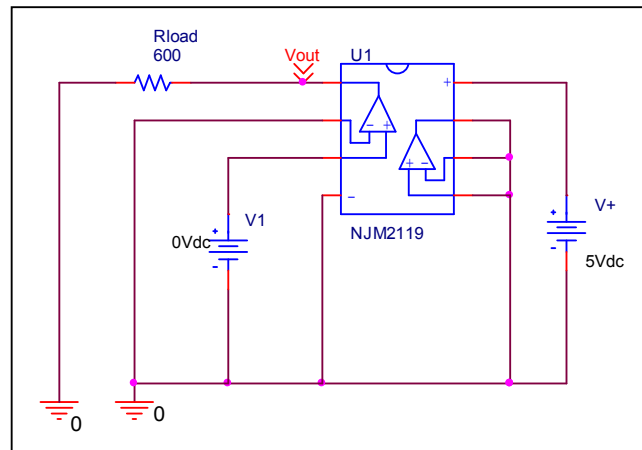
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Output Voltage Swing

Simulation result



Evaluation circuit

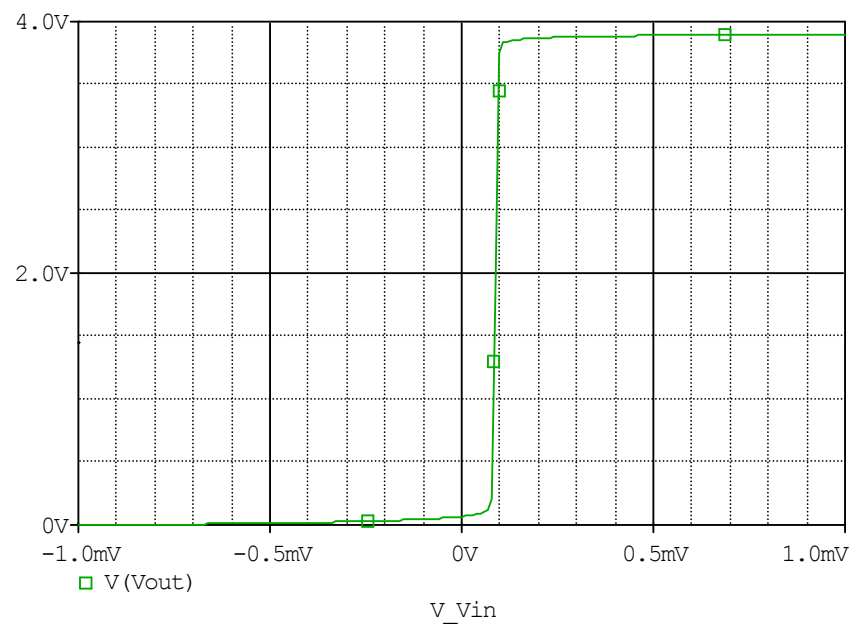


Comparison table

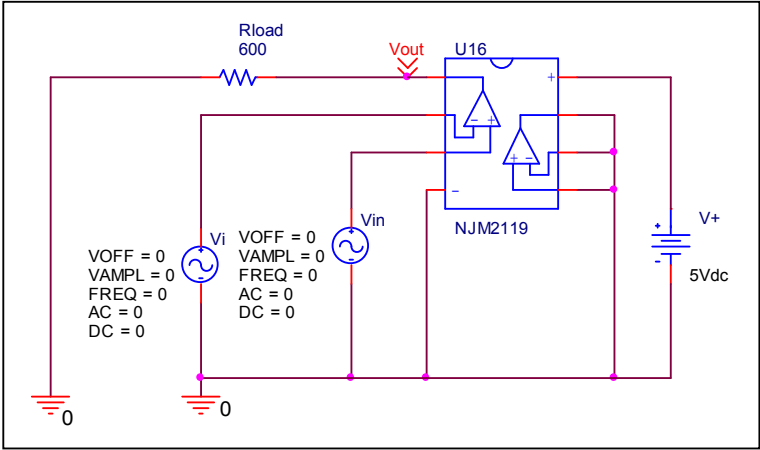
Output Voltage Swing	Data sheet	Simulation	%Error
V_{OM}^+ (V)	4	3.9655	-0.862
V_{OM}^- (mV)	5	5.0053	0.106

Input Offset Voltage

Simulation result



Evaluation circuit

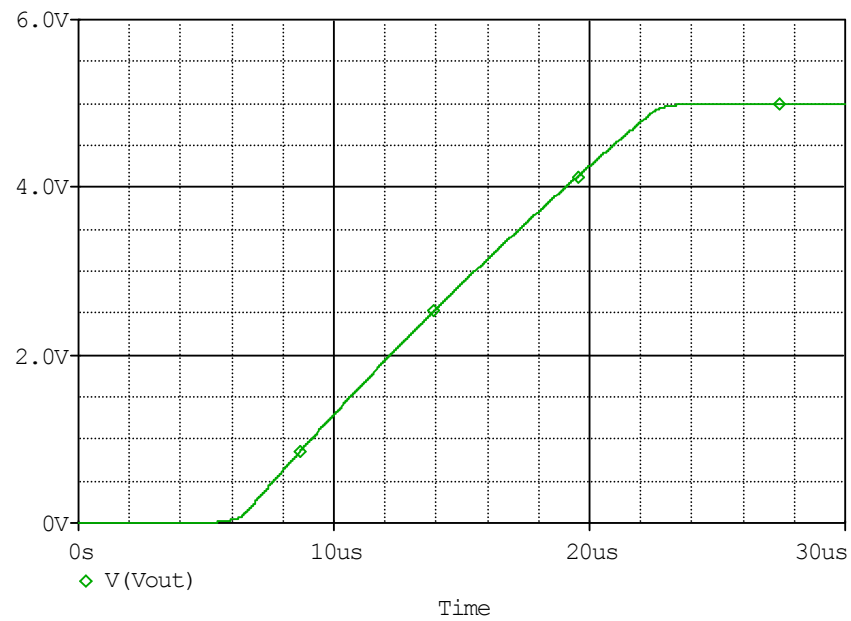


Comparison table

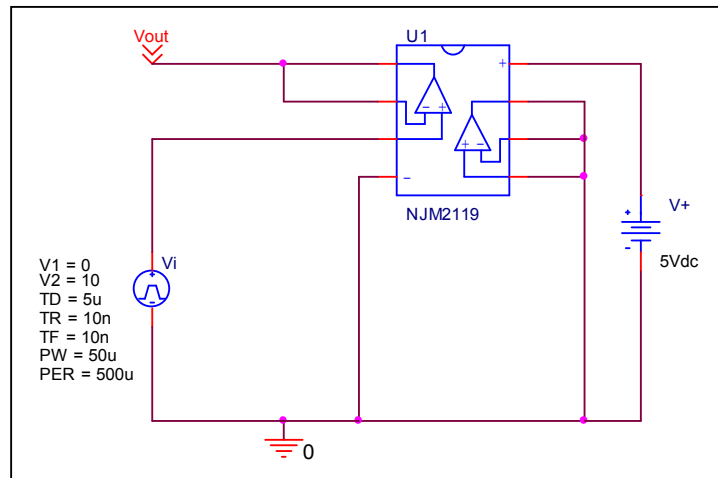
Vio	Measurement		Simulation		Error	
	90	uV	90.261	uV	0.29	%

Slew Rate

Simulation result



Evaluation circuit

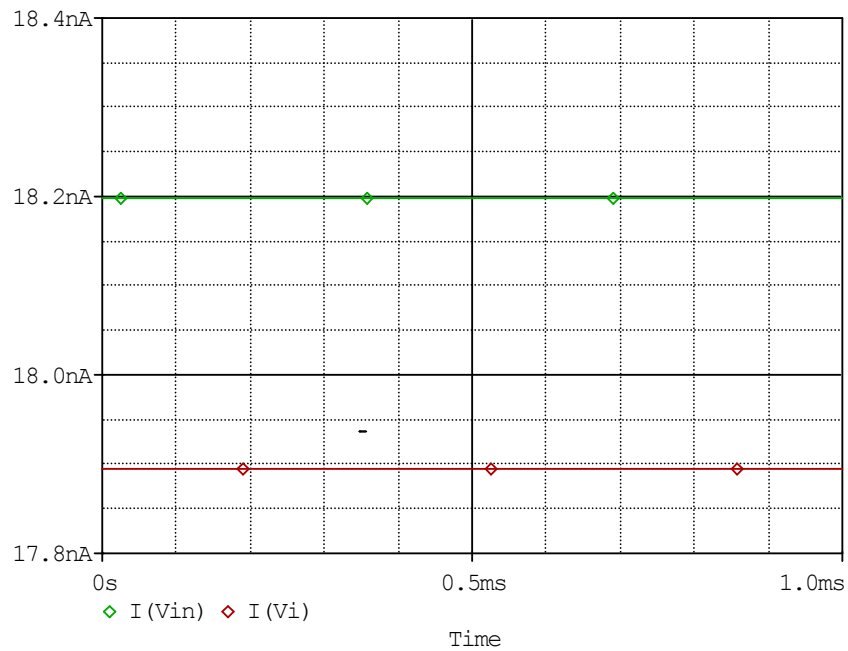


Comparison table

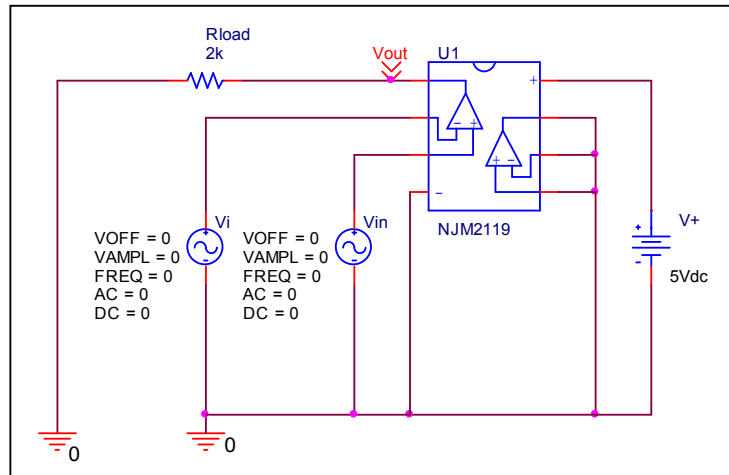
Slew Rate(v/us)	Data sheet	Simulation	%Error
	0.3	0.3013	0.433

Input current

Simulation result



Evaluation circuit

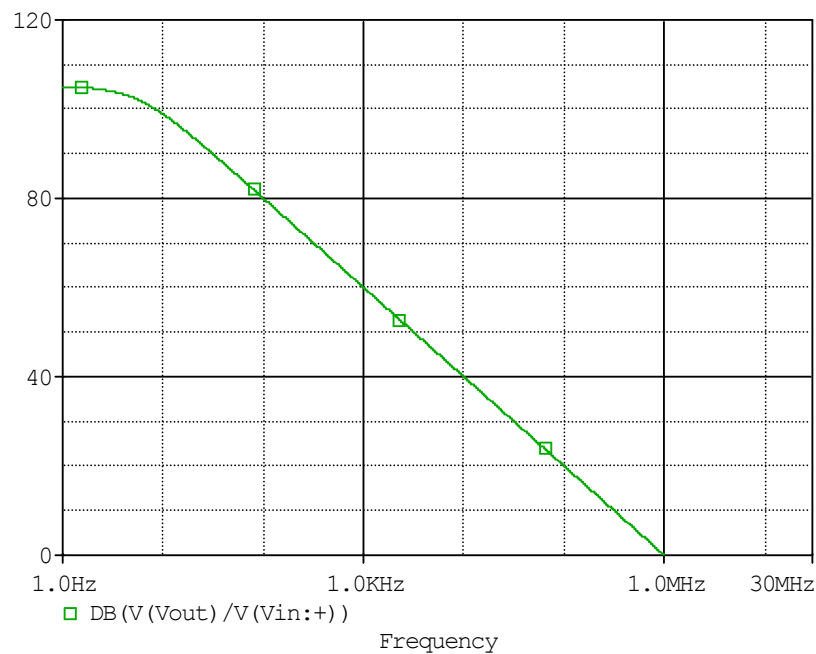


Comparison table

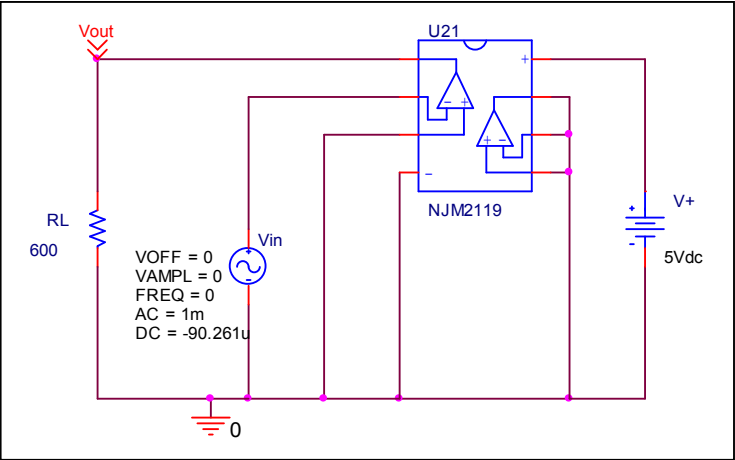
	Data sheet	Simulation	%Error
I _b (nA)	18	18.046	0.256
I _{io} (nA)	0.3	0.3037	1.233

Open Loop Voltage Gain vs. Frequency

Simulation result



Evaluation circuit

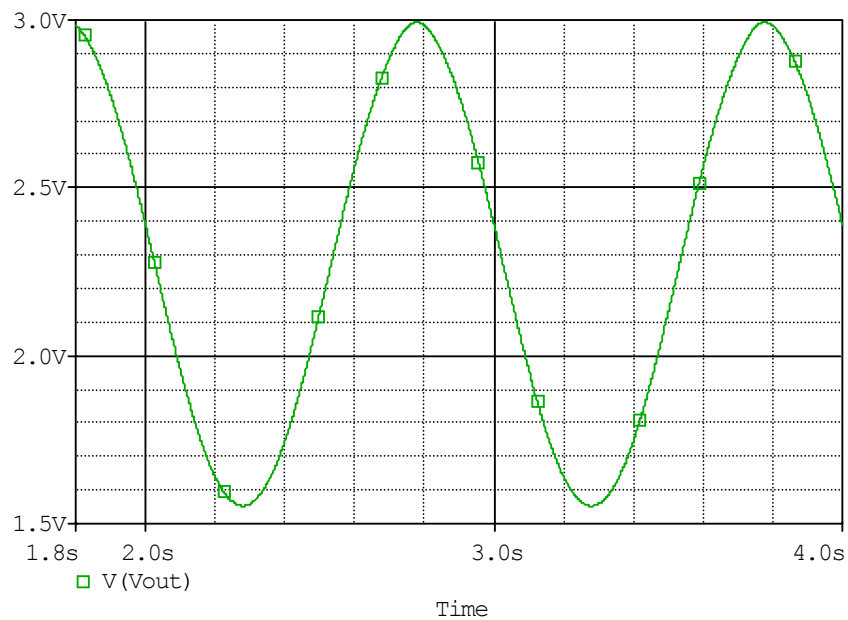


Comparison table

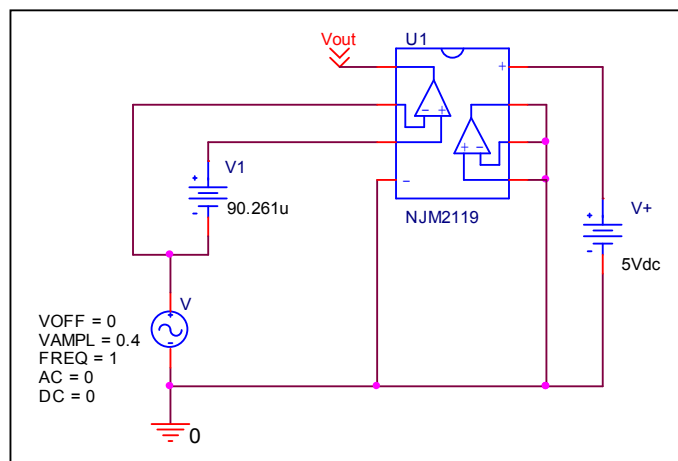
	Data sheet	Simulation	%Error
f-0dB(MHz)	1	1.0007	0.070
Av-dc	105	105.023	0.022

Common-Mode Rejection Voltage gain

Simulation result



Evaluation circuit



Common Mode Reject Ratio= $178299.4486 / (1.4396 / 0.8) = 99082.772$

= 99.919dB

Comparison table

CMRR(dB)	Data sheet	Simulation	%Error
	100	99.919	-0.081