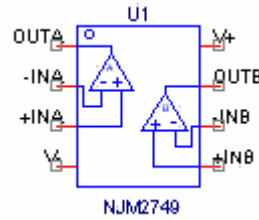# Device Modeling Report

COMPONENTS: OPERATIONAL AMPLIFIER
PART NUMBER: NJM2749
MANUFACTURER: NEW JAPAN RADIO

Bee Technologies Inc.

Spice Model


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*$
* PART NUMBER: NJM2749
* MANUFACTURER: NEW JAPAN RADIO
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.Subckt NJM2749 OUTA -INA +INA V- +INB -INB OUTB V+
X_U1    +INA -INA V+ V- OUTA NJM2749_SUB
X_U2    +INB -INB V+ V- OUTB NJM2749_SUB
.ends  NJM2749
.subckt NJM2749_SUB 1 2 3 4 5
 c1   11 12 2.8868E-12
 c2    6  7 10.000E-12
 css  10 99 1.0000E-30
 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 35.368E6 -1E3 1E3 35E6 -35E6
 ga    6  0 11 12 113.10E-6
 gcm   0  6 10 99 2.8409E-9
 iss   3 10 dc 130.00E-6
 hlim 90  0 vlim 1K
 j1   11  2 10 jx1
 j2   12  1 10 jx2
 r2    6  9 100.00E3
 rd1   4 11 8.8419E3
 rd2   4 12 8.8419E3
 ro1   8  5 50
 ro2   7 99 25
 rp    3  4 1.8000E3
 rss  10 99 1.5385E6
 vb    9  0 dc 0
 vc    3 53 dc 2.2979
 ve   54  4 dc 2.2979
 vlim  7  8 dc 0
 vlp  91  0 dc 20
 vln   0 92 dc 20
.model dx D(Is=800.00E-18)
.model dy D(Is=800.00E-18 Rs=1m Cjo=10p)
.model jx1 PJF(Is=24.250E-12 Beta=98.392E-6 Vto=-.9996)
.model jx2 PJF(Is=11.750E-12 Beta=98.392E-6 Vto=-1.000400)
.ends
*$
```
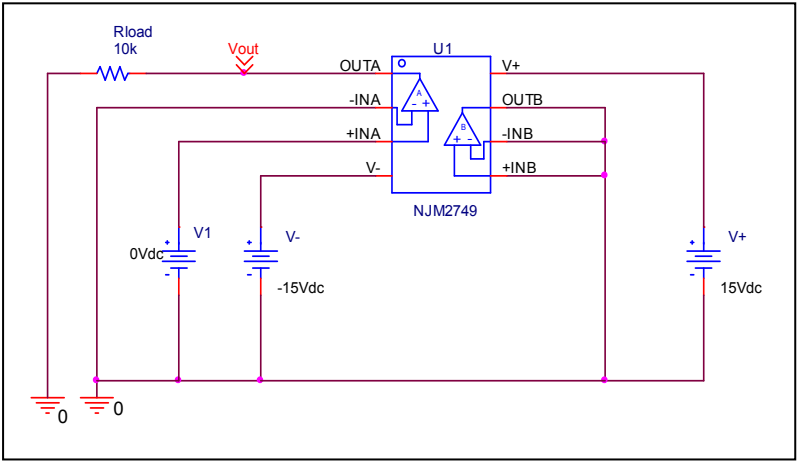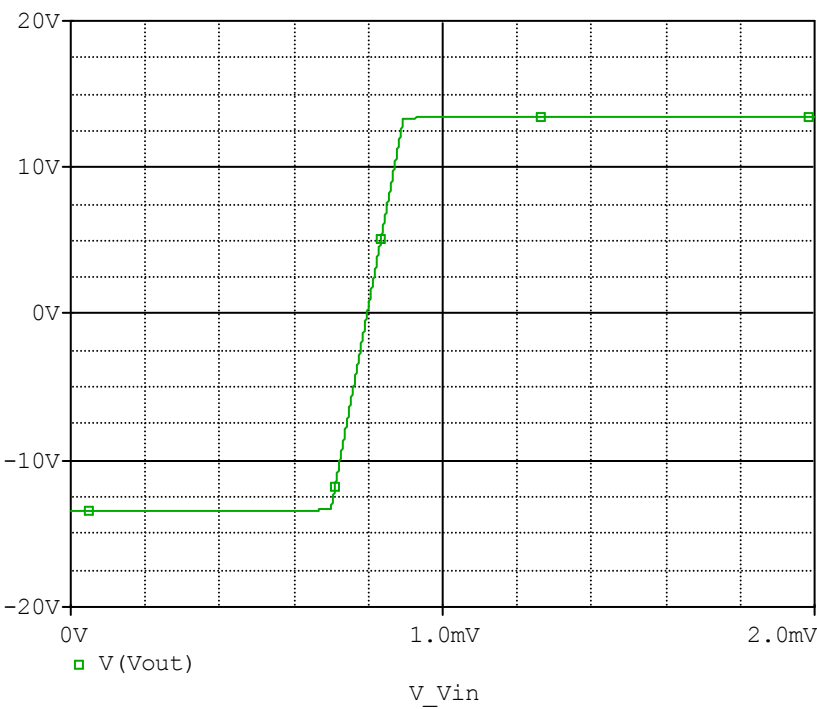
Output Voltage Swing

V_V1
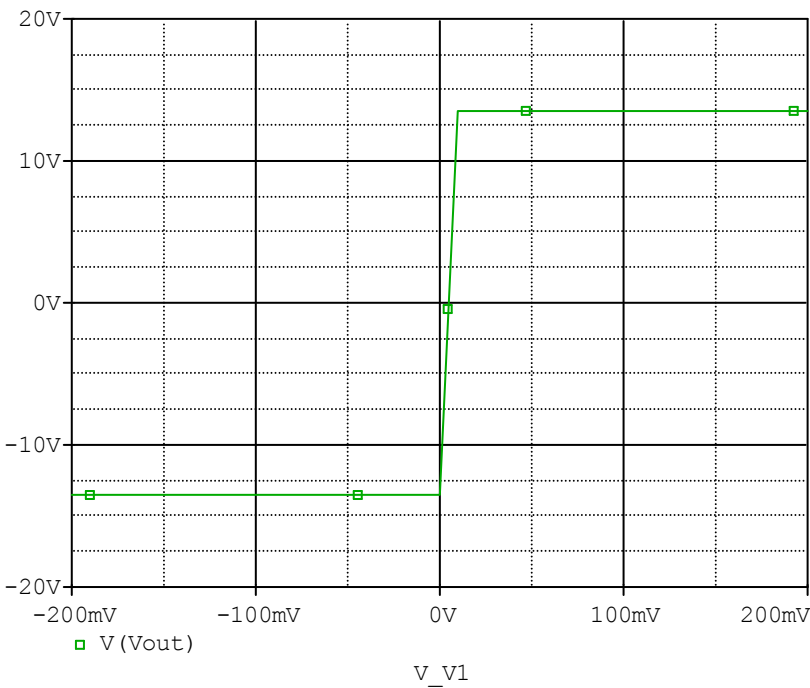
Evaluation circuit

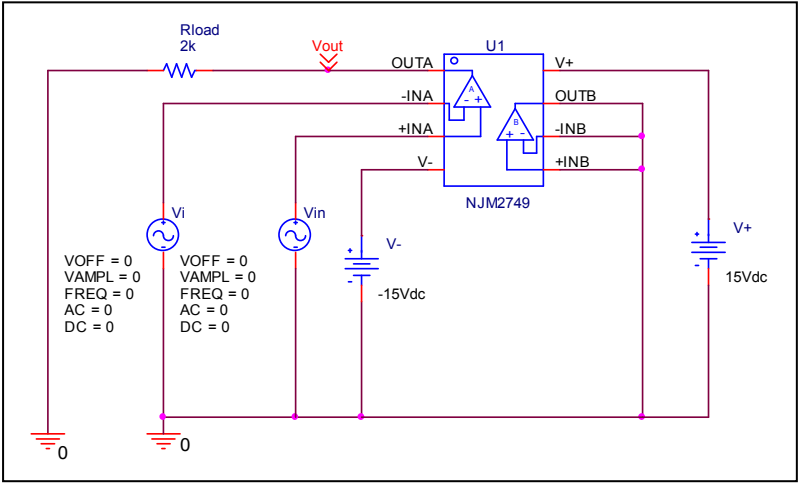| Output Voltage Swing	Measurement	Simulation	%Error
+Vout(V)	+13.500	+13.499	-0.010
-Vout(V)	-13.500	-13.499	-0.010

Input Offset Voltage

V(Vout)

V_Vin

Vos	Measurement		Simulation		Error	
	0.800	mV	0.797	mV	-0.380	%

Slew Rate
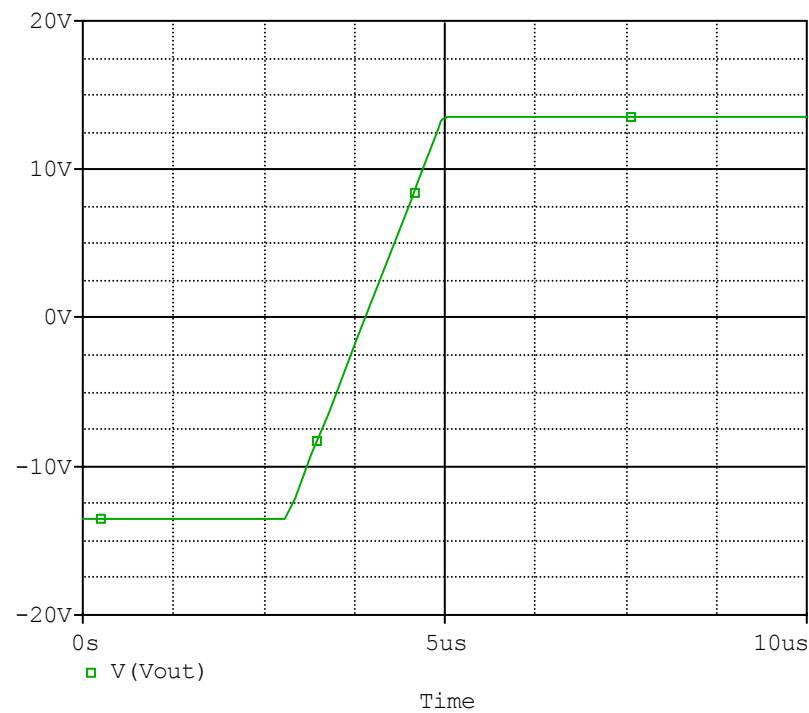
Evaluation circuit
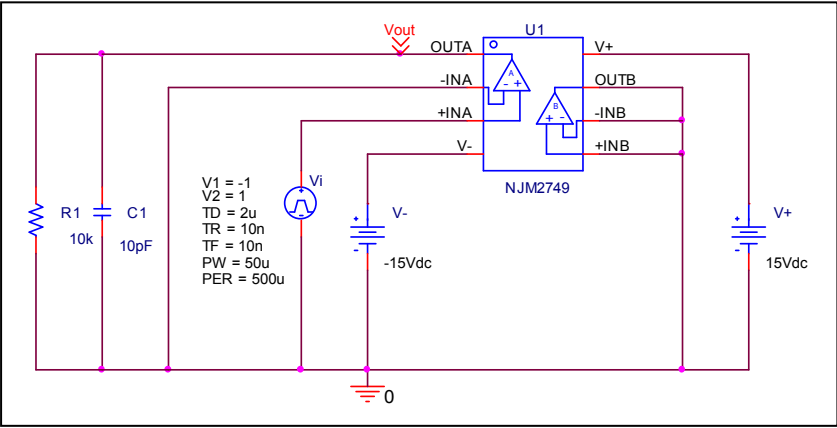
Slew Rate(v/us)	Measurement	Simulation	%Error
	13.000	12.538	-3.550

Input current Ib, Ibos

Simulation result
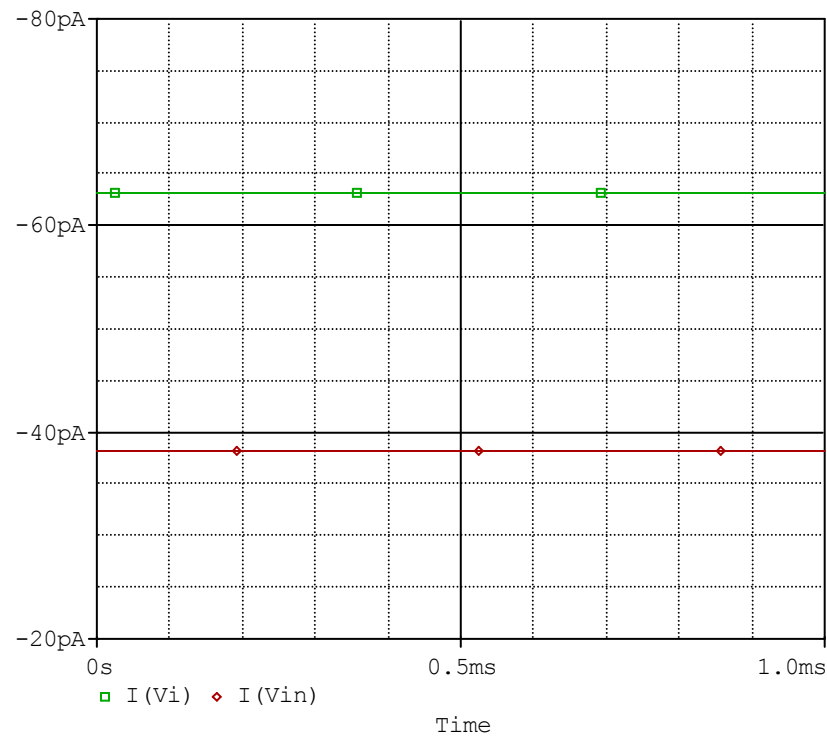
Evaluation circuit
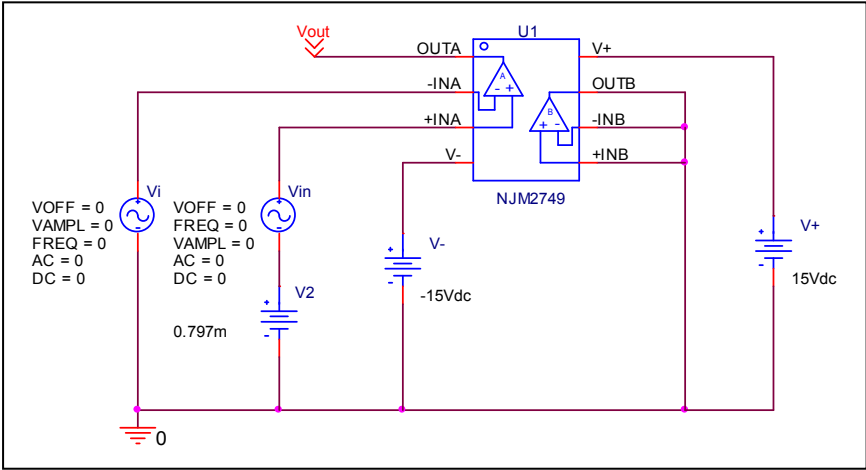
	Measurement	Simulation	%Error
Ib(nA)	50.000	50.599	1.200
Ibos(nA)	25.000	24.989	-0.040

Open Loop Voltage Gain vs. Frequency , Av-dc, f-0dB

DB(V(Vout)/V(Vin:+))

Frequency
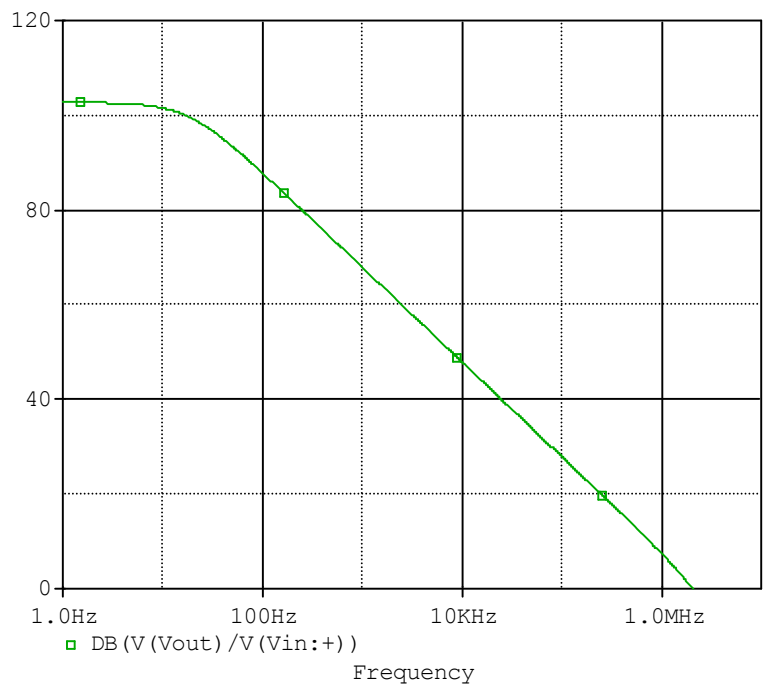
Evaluation circuit
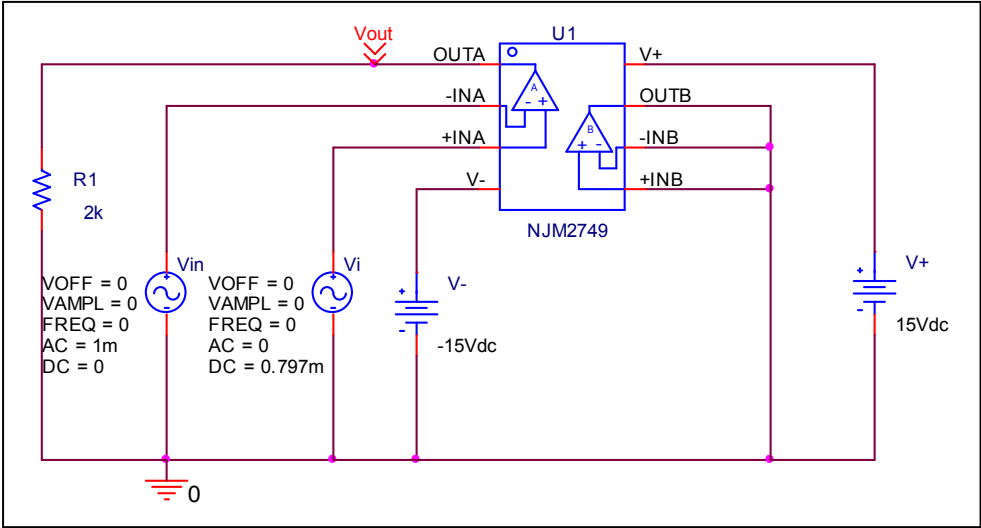
	Measurement	Simulation	%Error
f-0dB(MHz)	2.000	2.070	3.500
Av-dc(dB)	100.000	102.675	2.680

Common-Mode Rejection Voltage gain

Simulation result
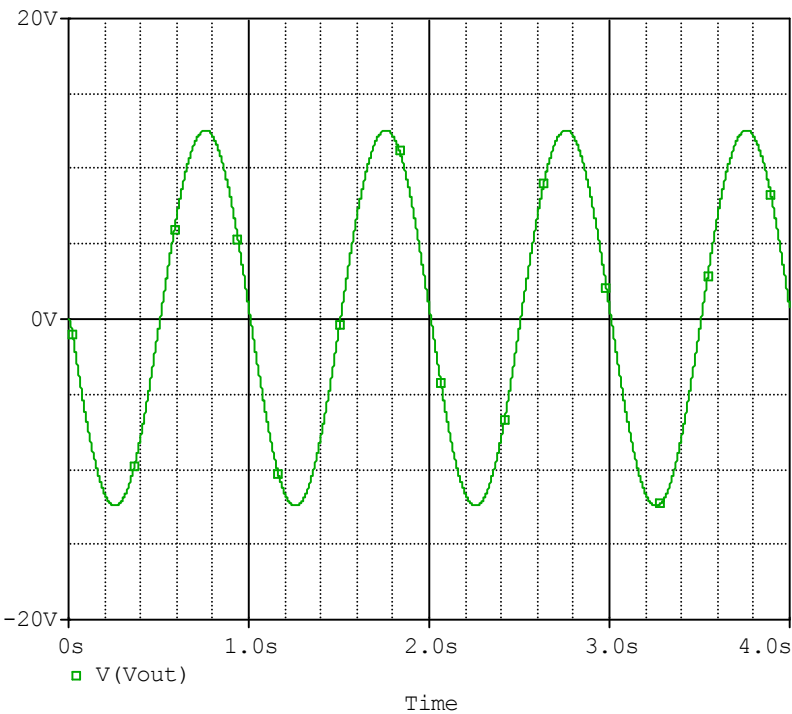
Evaluation circuit
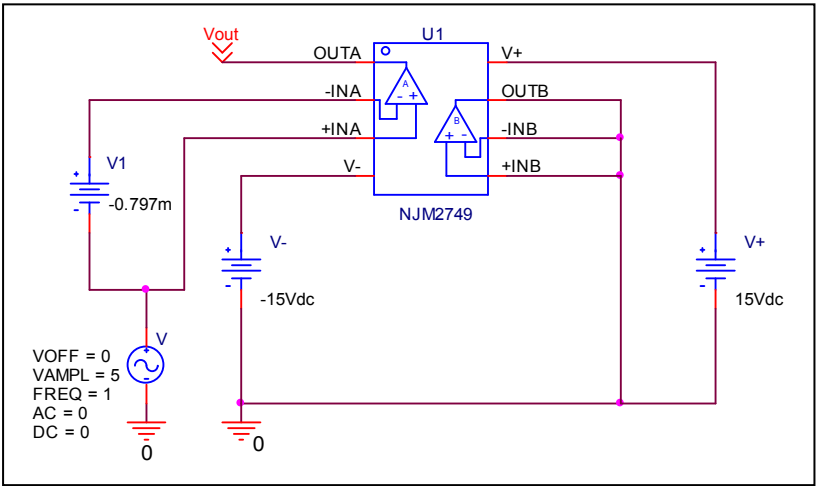
CMRR=20*LOG(136066.1197/(25.019/10)) = 94.709 dB

CMRR (dB)	Measurement	Simulation	%Error
	92.000	94.709	2.940