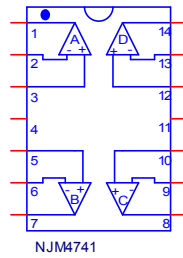# Device Modeling Report

COMPONENTS: OPERATIONAL AMPLIFIER
PART NUMBER:NJM4741
MANUFACTURER: NEW JAPAN RADIO CO.,LTD

**Bee Technologies Inc.**

SPice Model

NJM4741

```
*$
* PART NUMBER: NJM4741
* MANUFACTURER: NEW JAPAN RADIO
* All Rights Reserved Copyright (C) Bee Technologies Inc. 2007
.Subckt NJM4741 OUT1 -IN1 +IN1 V+ +IN2 -IN2 OUT2 OUT3 -IN3 +IN3 V-
+ +IN4 -IN4 OUT4
X_U1    +IN1 -IN1 V+ V- OUT1 NJM4741_ME
X_U2    +IN2 -IN2 V+ V- OUT2 NJM4741_ME
X_U3    +IN3 -IN3 V+ V- OUT3 NJM4741_ME
X_U4    +IN4 -IN4 V+ V- OUT4 NJM4741_ME
.ends  NJM4741
.subckt NJM4741_ME  1 2 3 4 5
 c1   11 12 8.6603E-12
 c2    6  7 30.000E-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 3.0387E6 -1E3 1E3 3E6 -3E6
 ga    6  0 11 12 659.73E-6
 gcm   0  6 10 99 659.73E-12
 iee   3 10 dc 50.602E-6
 hlim 90  0 vlim 1K
 q1   11  2 13 qx1
 q2   12  1 14 qx2
 r2    6  9 100.00E3
 rc1   4 11 1.5158E3
 rc2   4 12 1.5158E3
 re1  13 10 487.50
 re2  14 10 487.50
 ree  10 99 3.9524E6
 ro1   8  5 50
 ro2   7 99 25
 rp    3  4 1.8055E3
 vb    9  0 dc 0
 vc    3 53 dc 3.3395
 ve   54  4 dc 3.3395
 vlim  7  8 dc 0
 vlp  91  0 dc 100
 vln   0 92 dc 100
.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=214.33)
.model qx2 PNP(Is=831.5400E-18 Bf=298.49)
.ends
*$
```
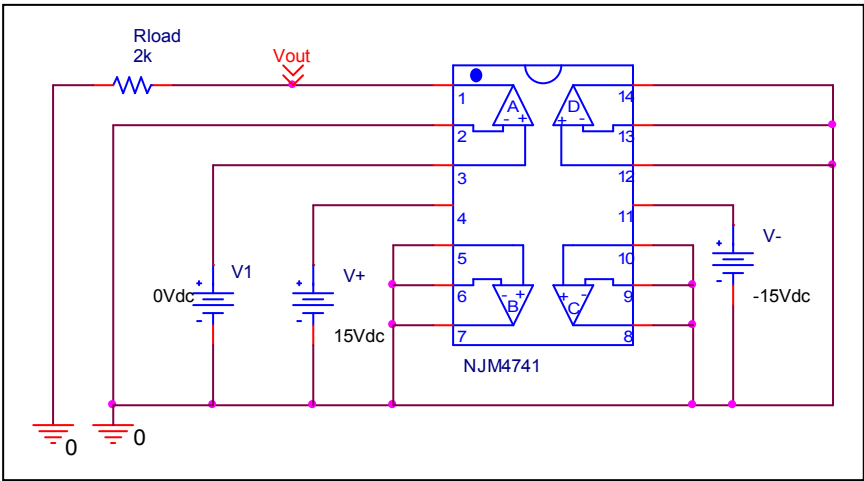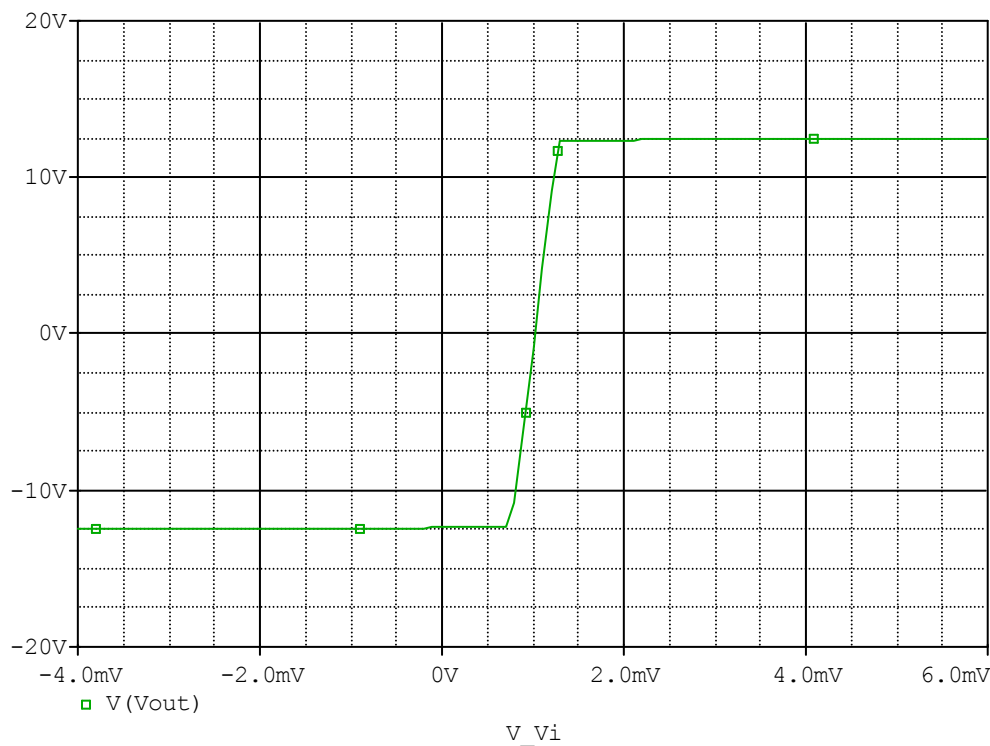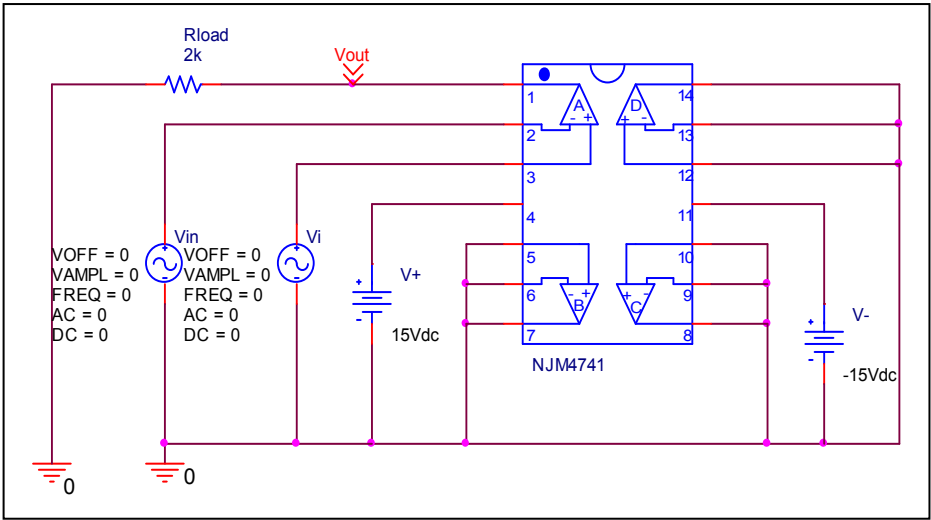
Output Voltage Swing

V(Vout)

V_V1
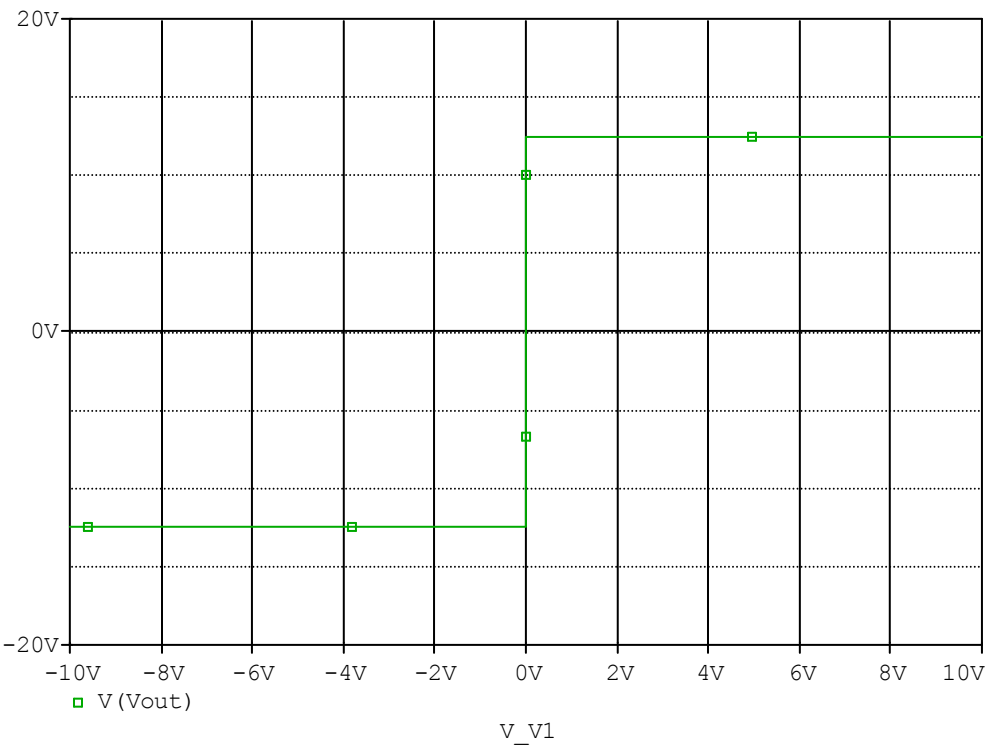
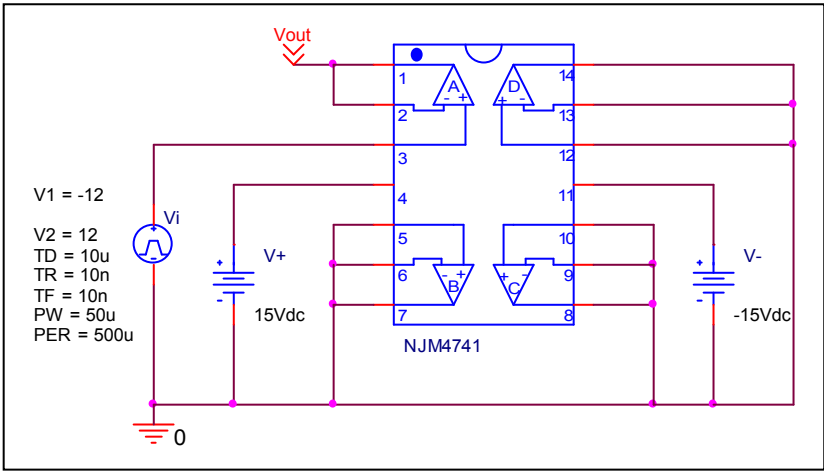| Output Voltage Swing	Measurement	Simulation	%Error
+Vout(V)	12.5	12.499	-0.008
-Vout(V)	12.5	12.499	-0.008

Input Offset Voltage

V_Vi

	Measurement		Simulation		Error	
Vos	1.000	mV	1.000	mV	0.000	%

Slew Rate

♦ V(Vout)

Time
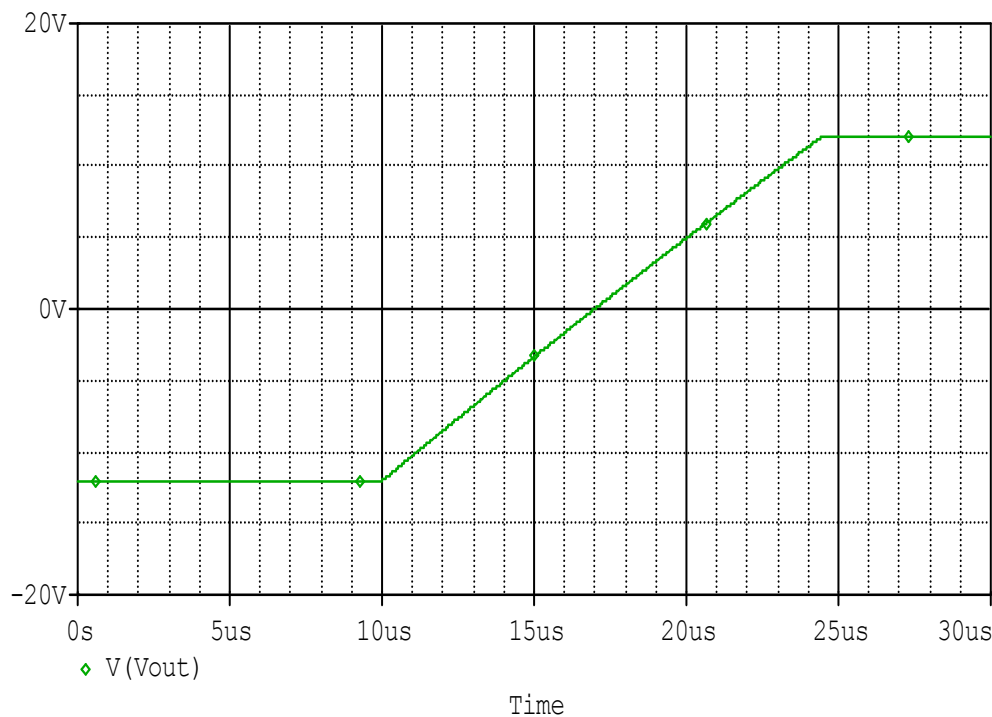
Evaluation circuit

Slew Rate(v/us)	Measurement	Simulation	%Error
	1.600	1.67	4.375

Input current
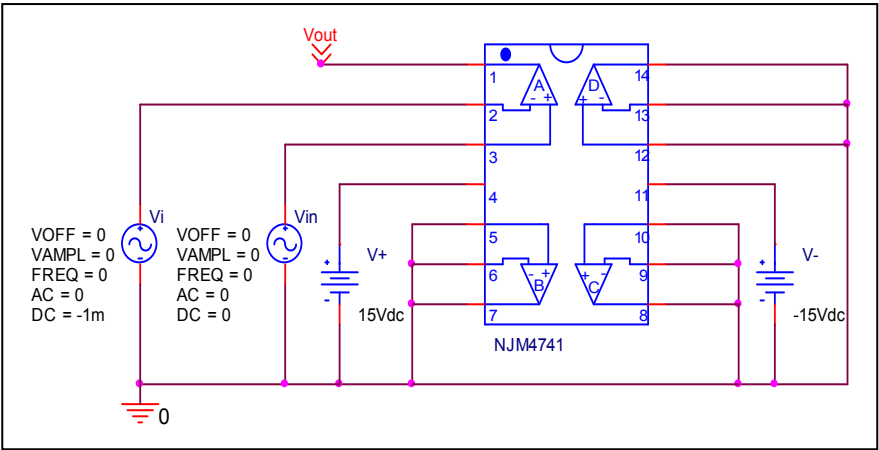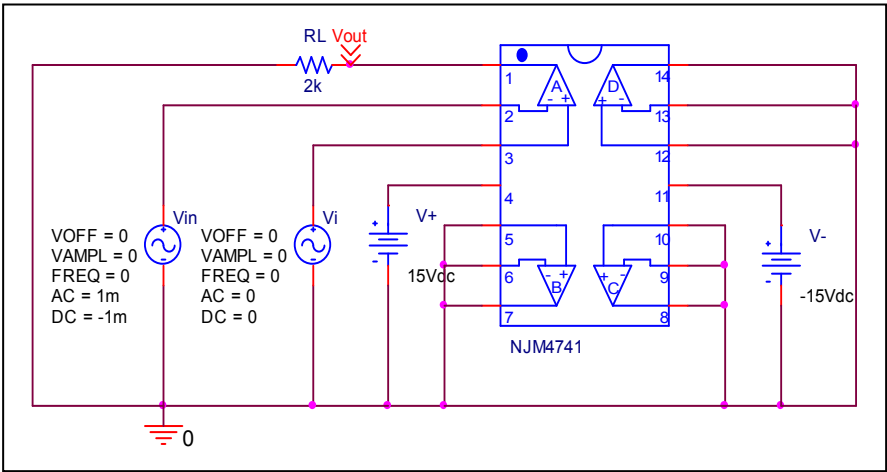
	Measurement	Simulation	%Error
Ib(nA)	100.000	100.444	0.444
Ibos(nA)	30.000	30.364	1.213

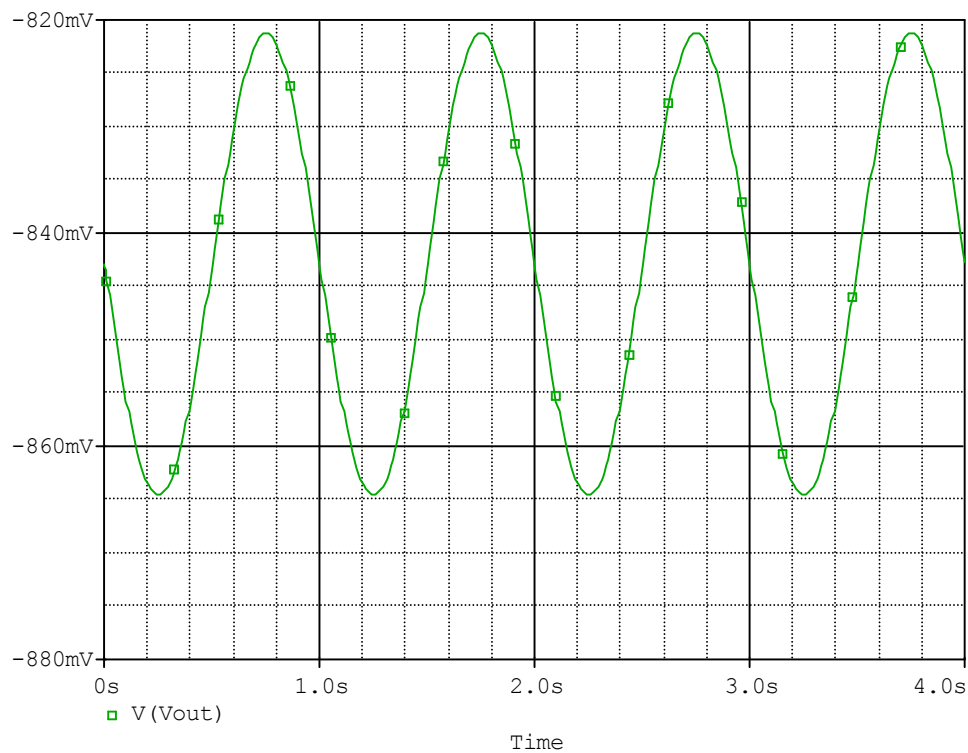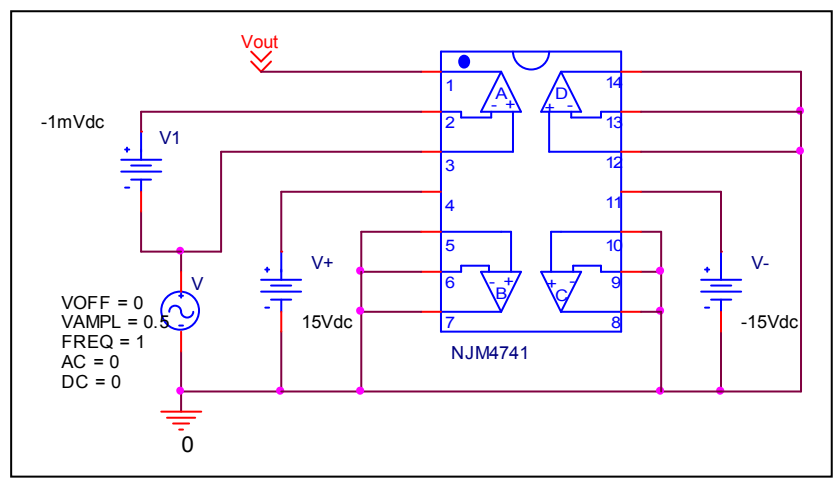# Open Loop Voltage Gain vs. Frequency

Simulation result

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

Frequency
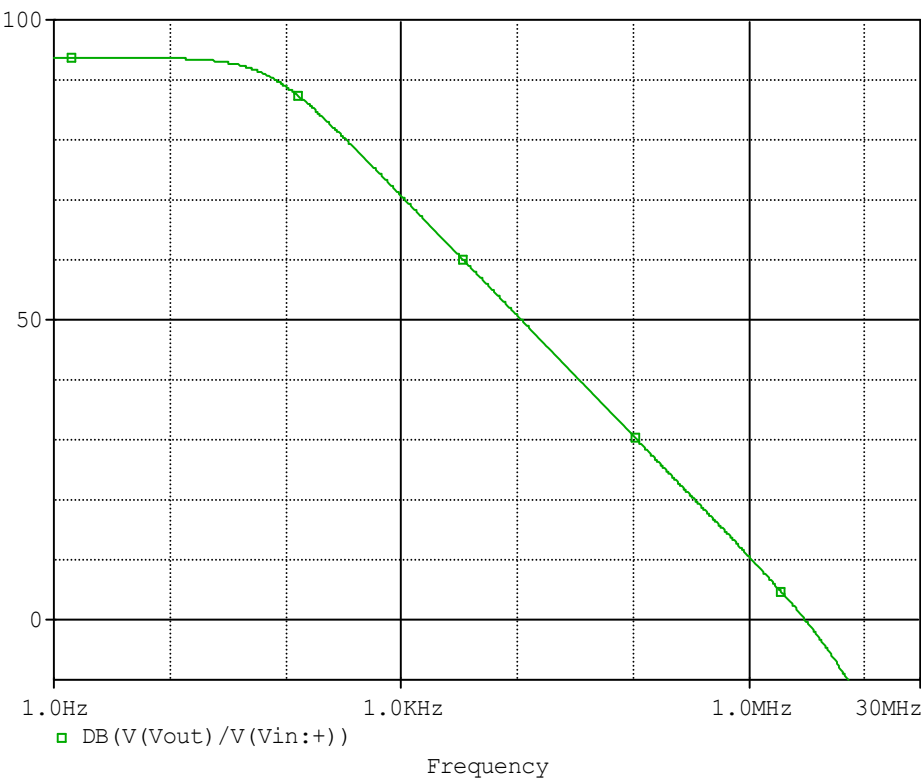
Evaluation circuit

	Measurement	Simulation	%Error
f-0dB(MHz)	3.000	3.041	1.367
Av-dc(dB)	94.000	93.660	-0.362

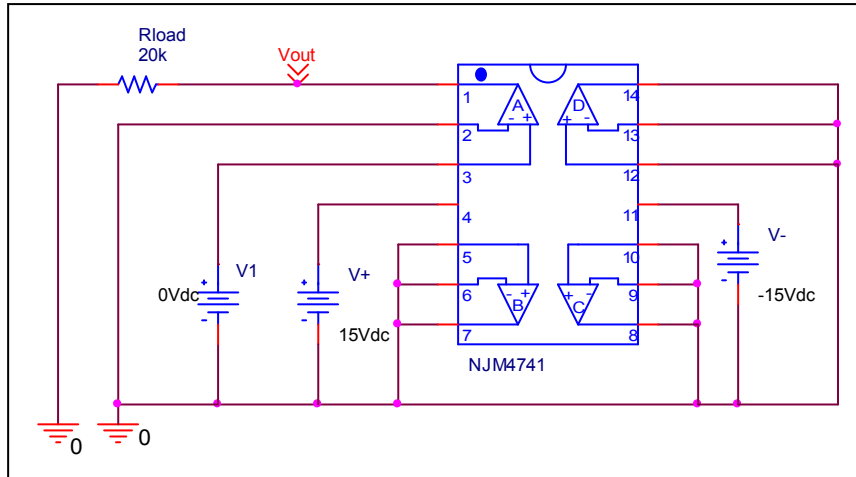# Common-Mode Rejection Voltage gain

Simulation result

□ V(Vout)

Time

Evaluation circuit
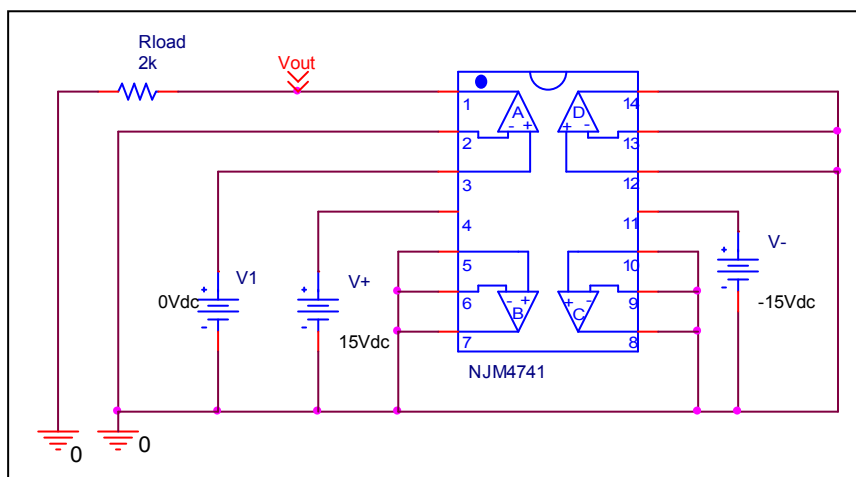

Common Mode Reject Ratio=68076.935/0.043=1583184.555

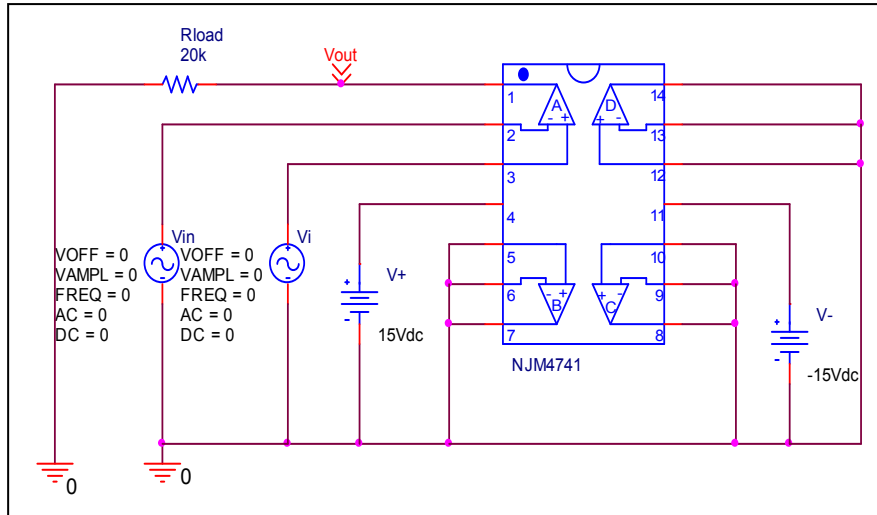|	Measurement	Simulation	%Error
CMRR	120.000	123.990	3.325

Remark   Output Voltage Swing

Before

After

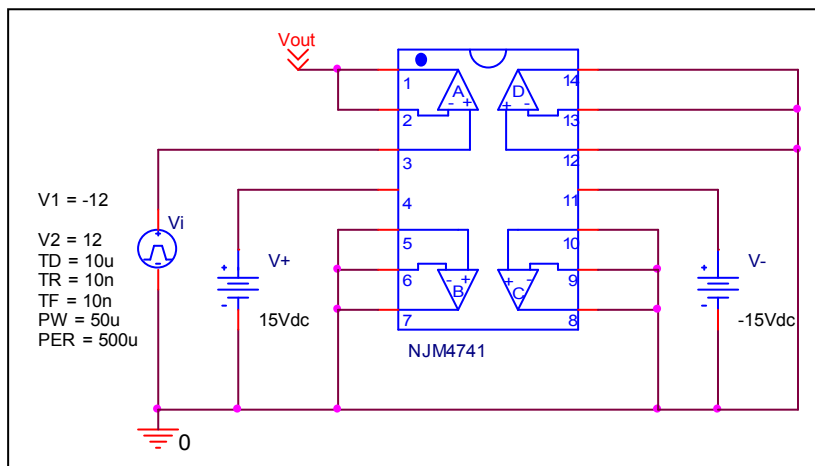## Remark   Input Offset Voltage

Before

After
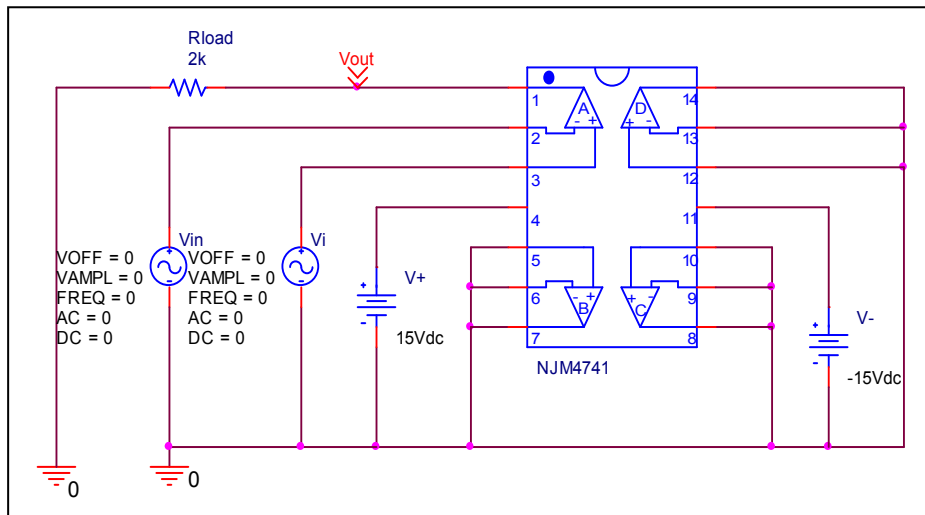
Remark   Slew Rate

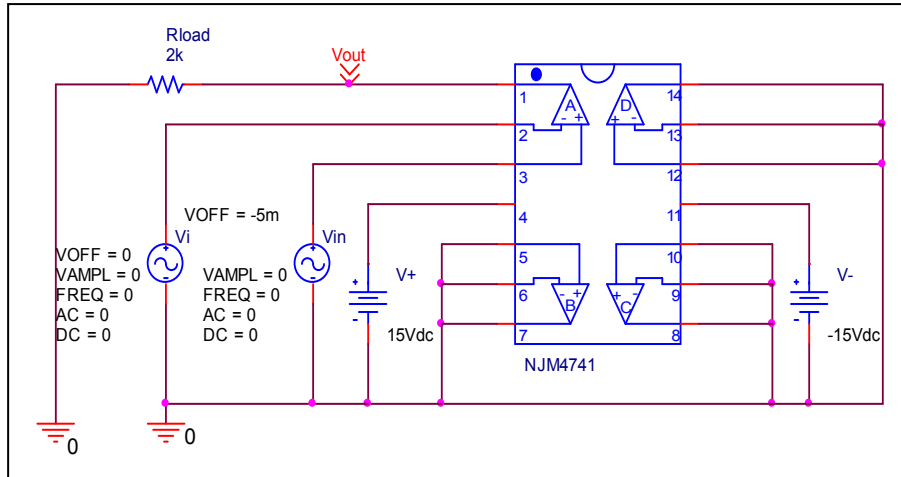## Before
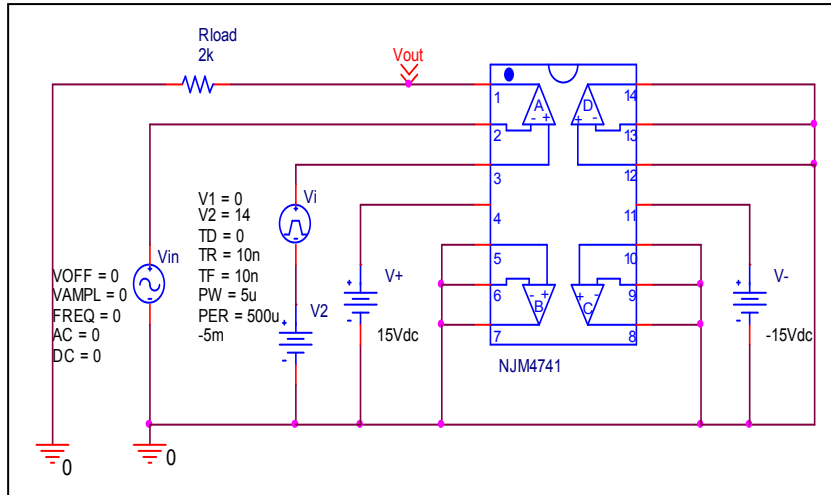
After

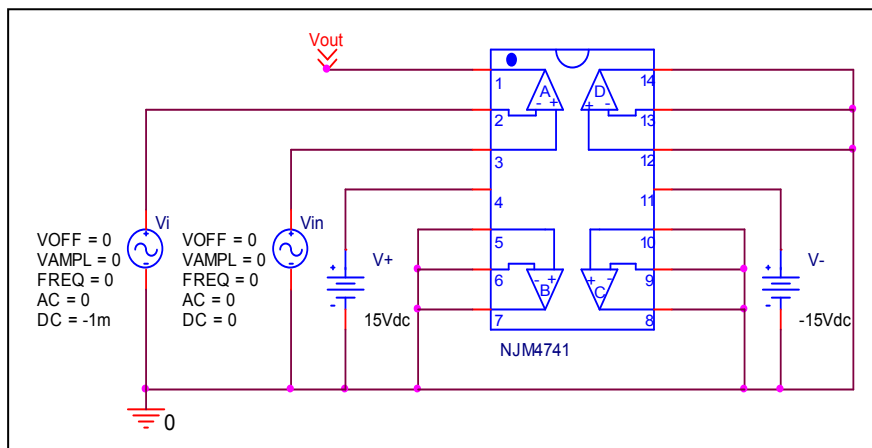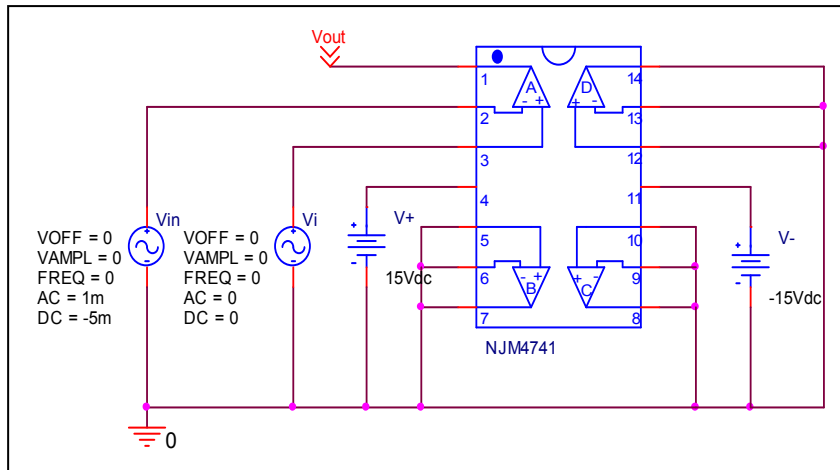# Remark   Input current

Before

After

Remark   Open Loop Voltage Gain vs. Frequency

Before

After

Remark   Common-Mode Rejection Voltage gain

Before

After