

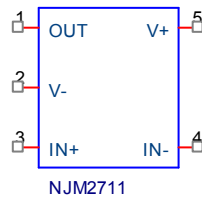
Device Modeling Report

COMPONENTS:MOSFET: OPERATIONAL AMPLIFIER
PART NUMBER:NJM2711
MANUFACTURER: NEW JAPAN RADIO CO.,LTD



Bee Technologies Inc.

Spice Model



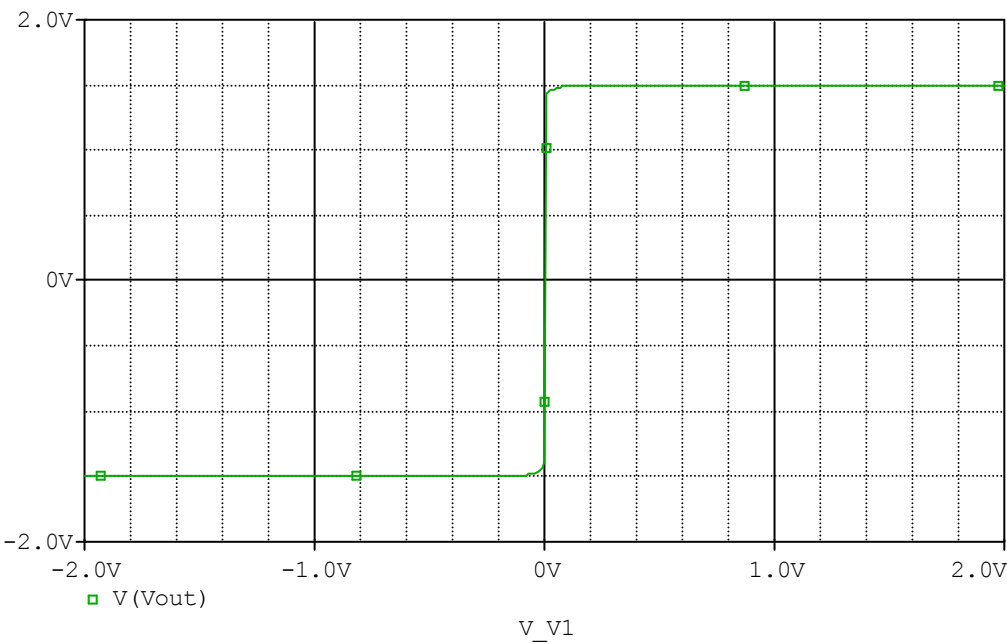
```

*$
* PART NUMBER:NJM2711
* MANUFACTURER: NEW JAPAN RADIO
* All Rights Reserved Copyright (c) Bee Technologies Inc. 2007
.Subckt NJM2711 OUT V- IN+ IN- V+
X_U1  IN+ IN- V+ V- OUT NJM2711_ME
.ends NJM2711
.subckt NJM2711_ME 1 2 3 4 5
c1  11 12 9.00E-12
c2  6 7 164.00E-13
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 6.6296E3 -1E3 1E3 6E3 -6E3
ga  6 0 11 12 33E-3
gcm 0 6 10 99 33E-6
iee 3 10 dc 7.8040E-3
hlim 90 0 vlim 1K
q1  11 2 13 qx1
q2  12 1 14 qx2
r2  6 9 100.00E3
rc1 4 11 29.473
rc2 4 12 29.473
re1 13 10 22.830
re2 14 10 22.830
ree 10 99 25.628E3
ro1 8 5 50
ro2 7 99 25
rp  3 4 155.29
vb  9 0 dc 0
vc  3 53 dc 1.7979
ve  54 4 dc 1.7979
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)
.model qx1 PNP(Is=800.00E-18 Bf=1.7967E3)
.model qx2 PNP(Is=836.3700E-18 Bf=2.1697E3)
.ends
*$

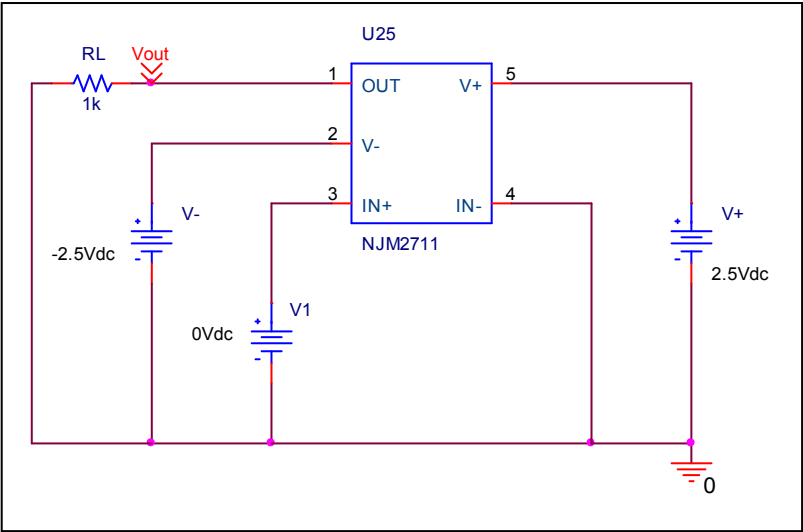
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Output Voltage Swing

Simulation result



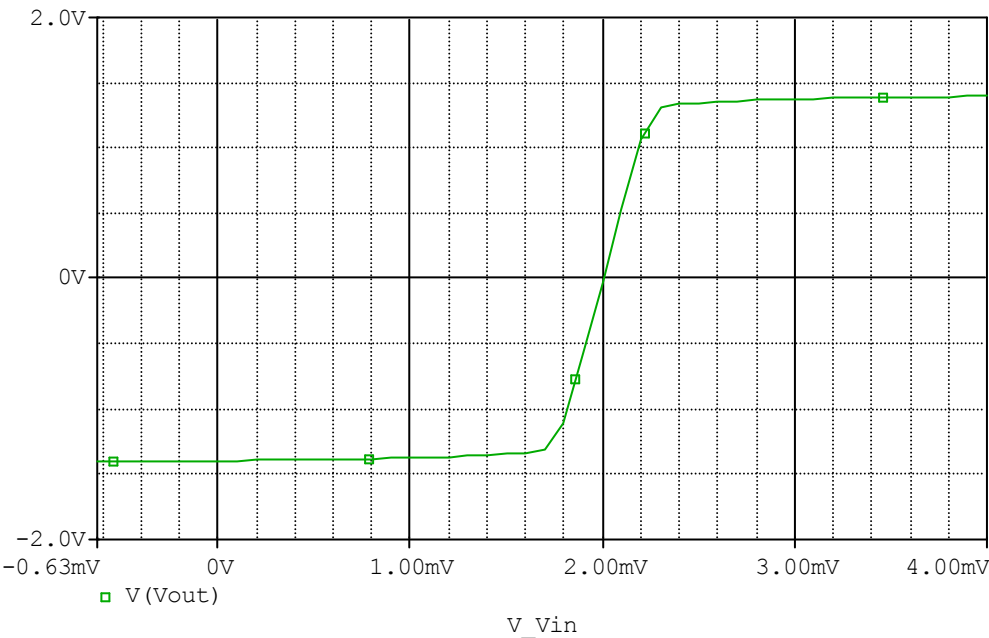
Evaluation circuit



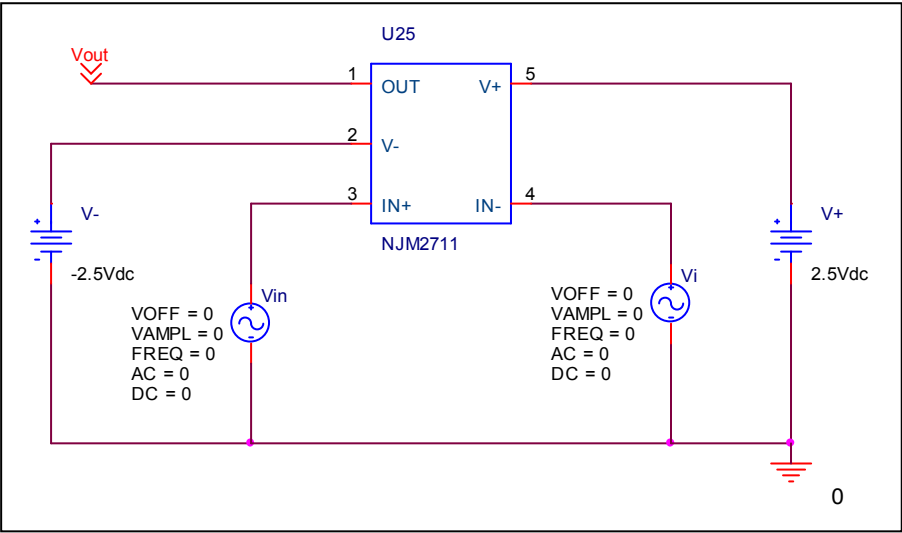
Output Voltage Swing	Measurement	Simulation	%Error
+Vout(V)	1.500	1.499	-0.067
-Vout(V)	-1.500	-1.499	-0.067

Input Offset Voltage

Simulation result



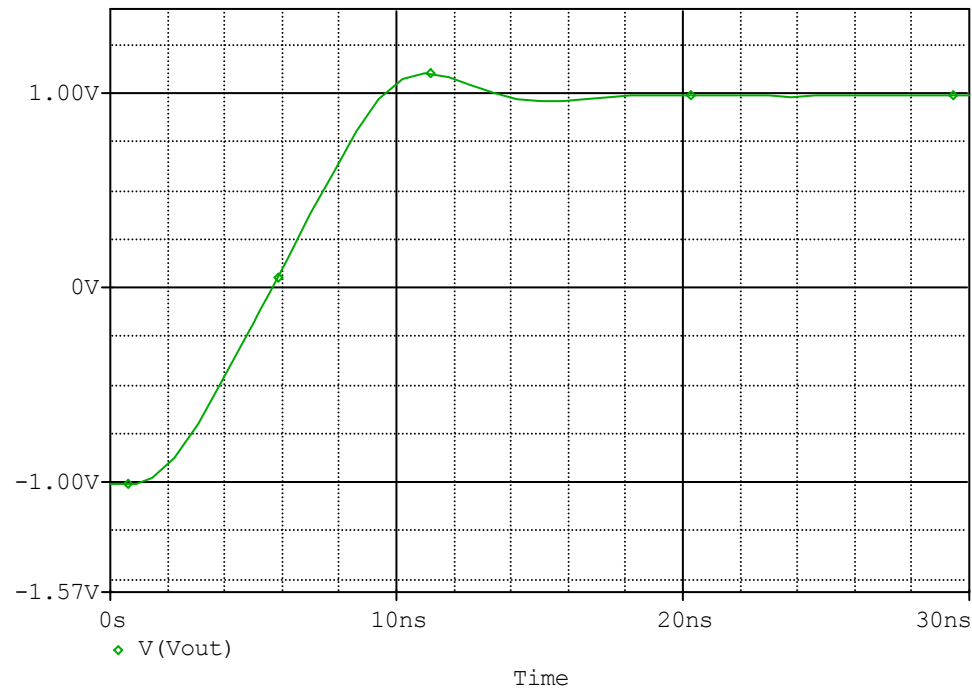
Evaluation circuit



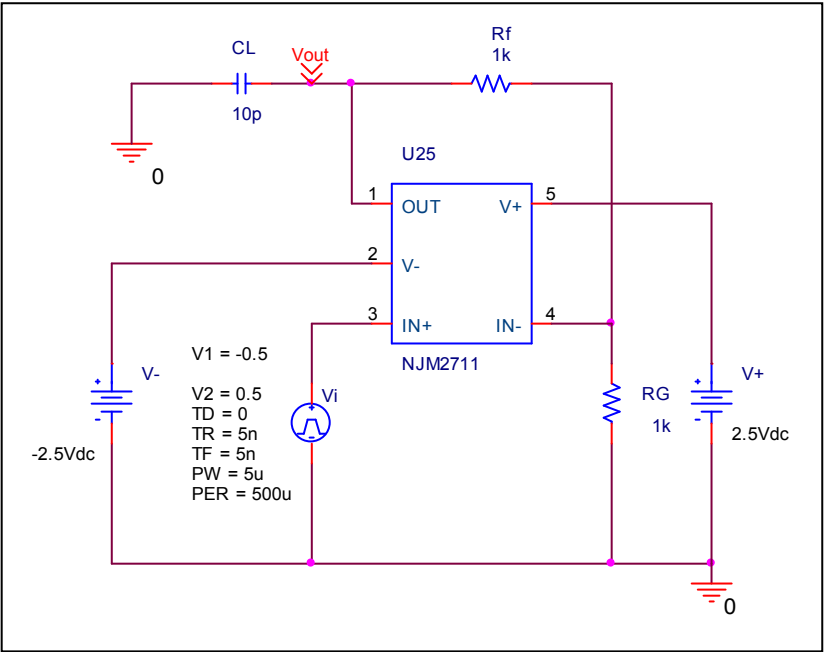
Vos	Measurement		Simulation		Error	
	2.000	mV	2.006	mV	-0.300	%

Slew Rate

Simulation result



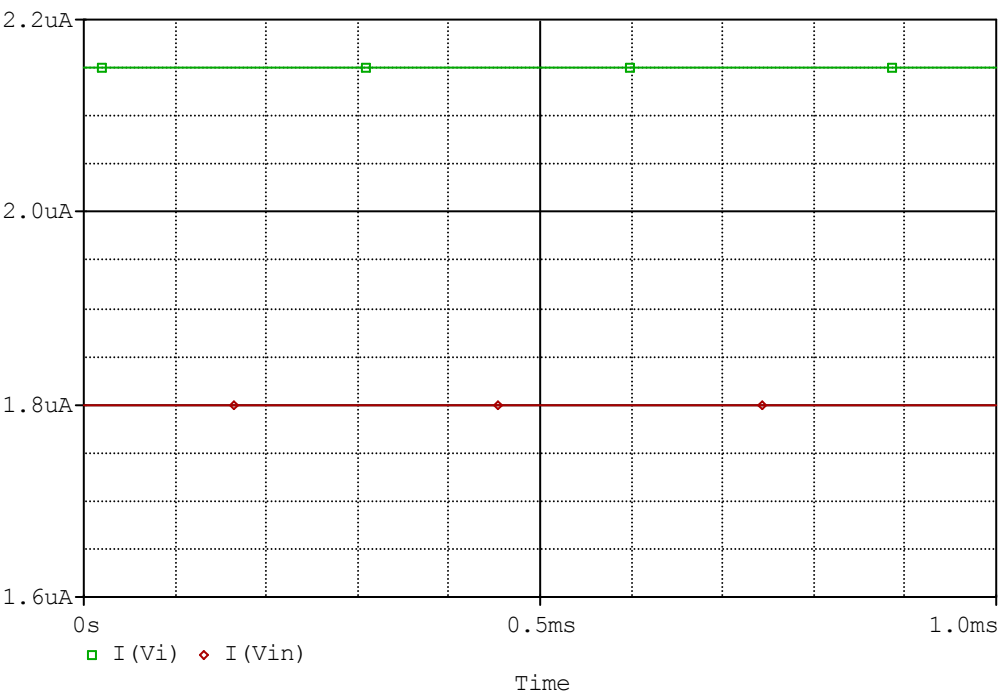
Evaluation circuit



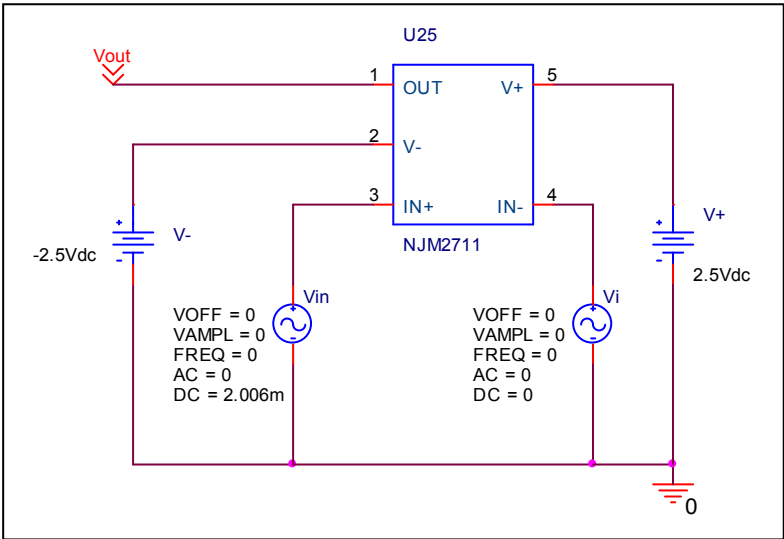
Slew Rate(v/us)	Measurement	Simulation	%Error
	260.000	254.552	-2.095

Input current Ib, Ibos

Simulation result



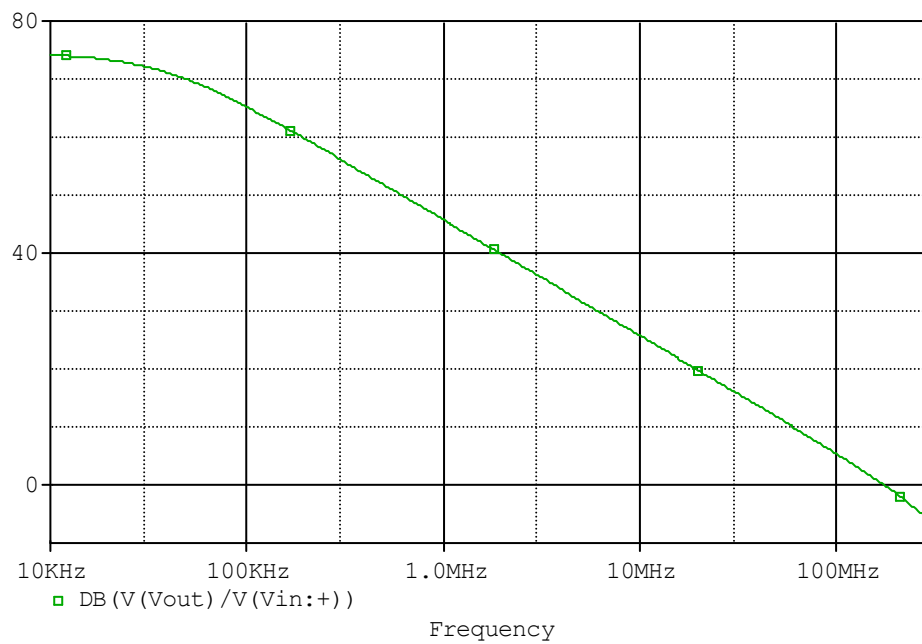
Evaluation circuit



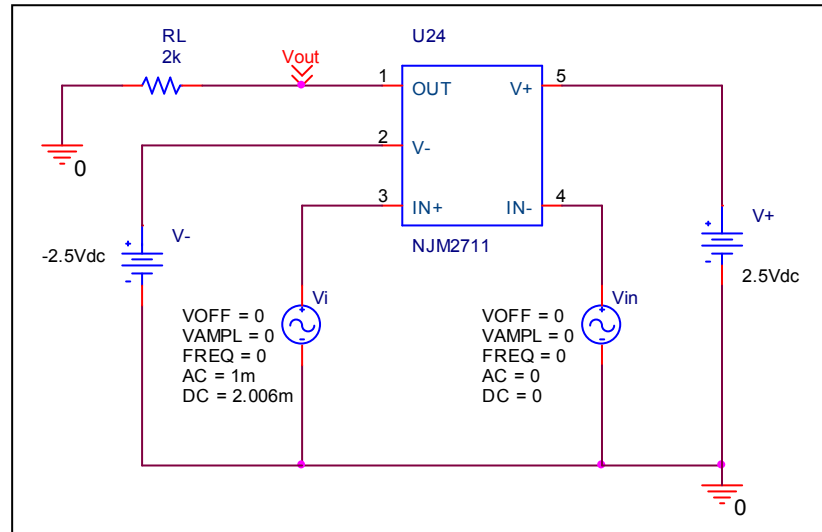
	Measurement	Simulation	%Error
Ib(uA)	2.000	1.974	-1.300
Ibos(nA)	350.000	351.615	0.461

Open Loop Voltage Gain vs. Frequency , Av-dc

Simulation result



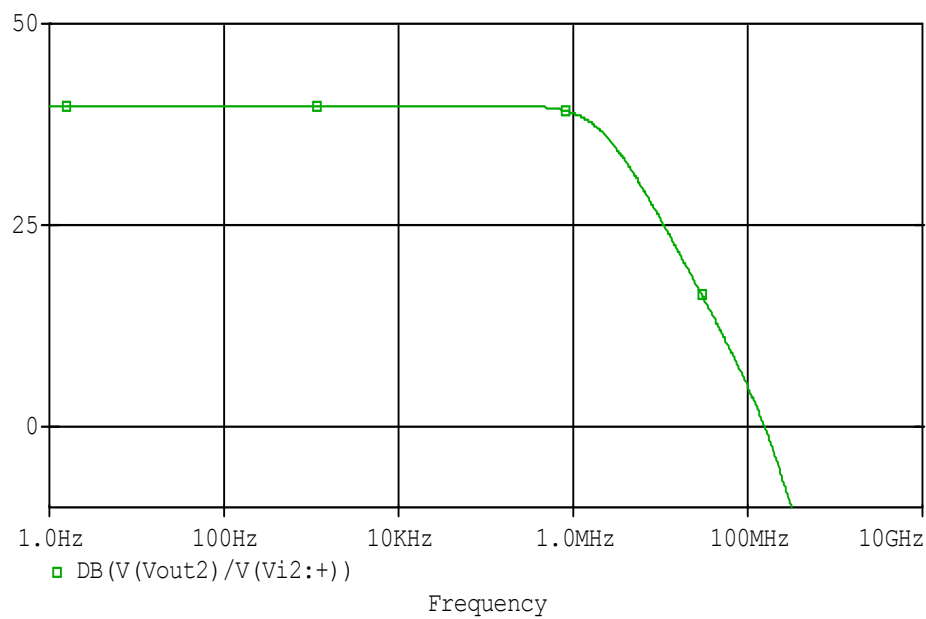
Evaluation circuit



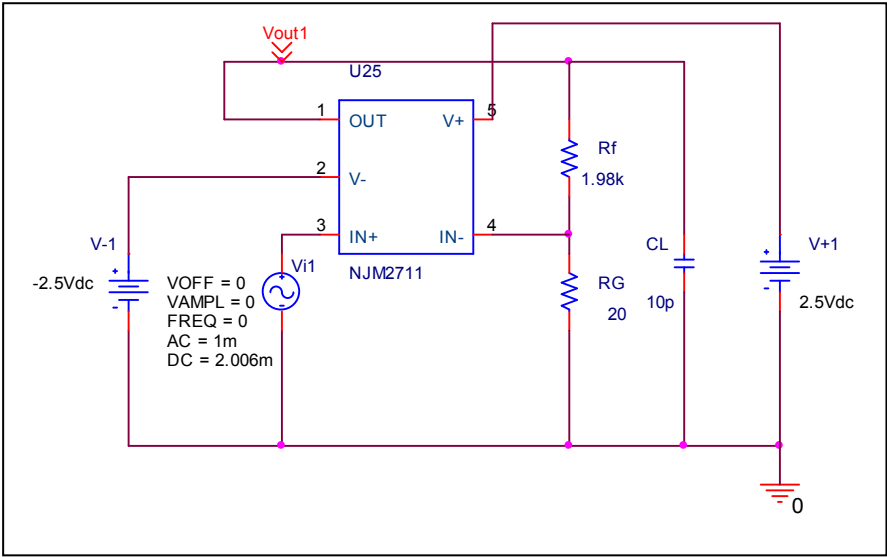
	Measurement	Simulation	%Error
Av-dc(dB)	75.000	74.129	1.161

Unity Gain Bandwidth

Simulation result



Evaluation circuit

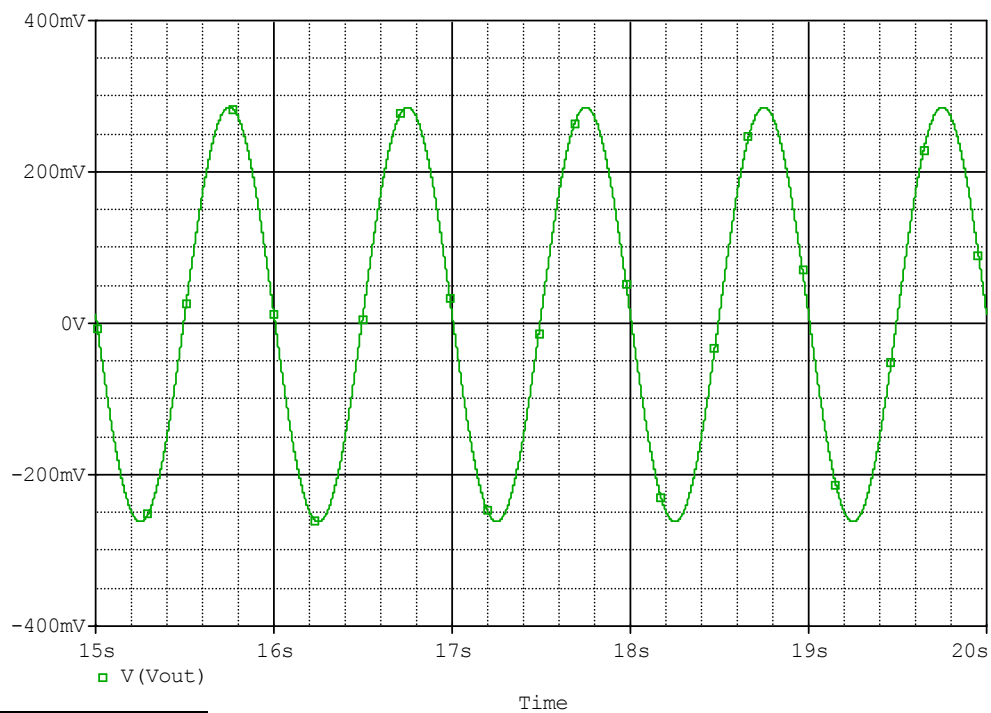


Comparison table

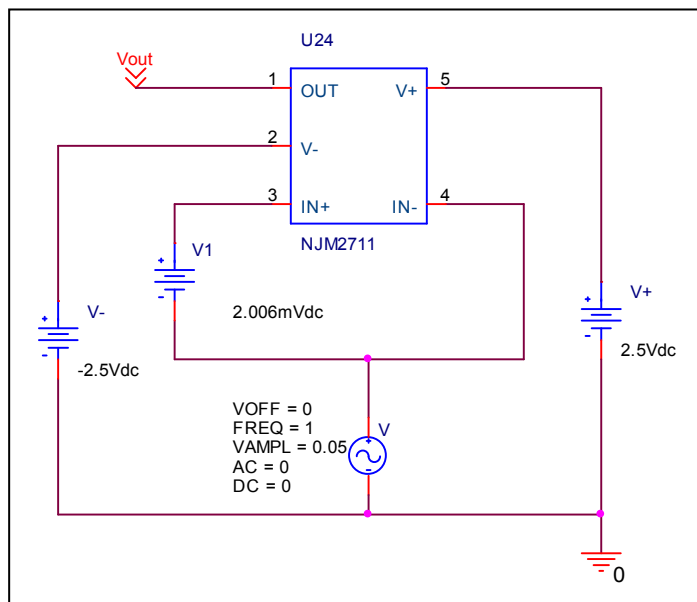
	Measurement	Simulation	%Error
f-0dB(MHz)	180.000	175.021	-2.766

Common-Mode Rejection Voltage gain

Simulation result



Evaluation circuit

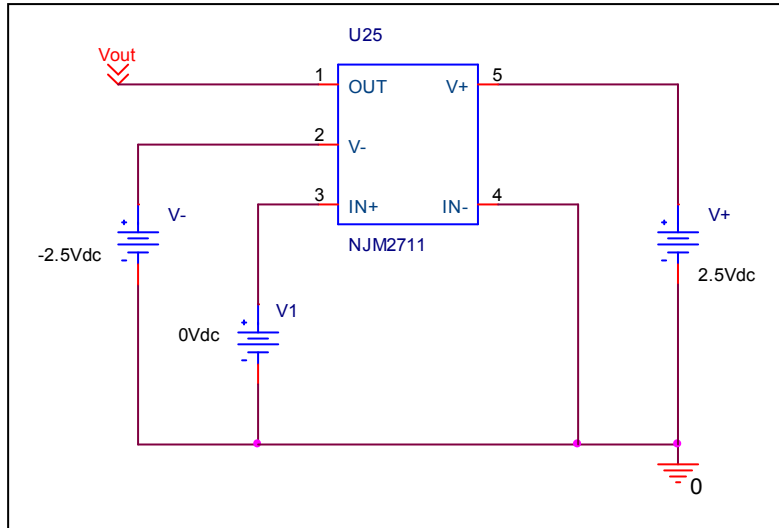


Common Mode Reject Ratio= $5109.75/5.463=935.3377$

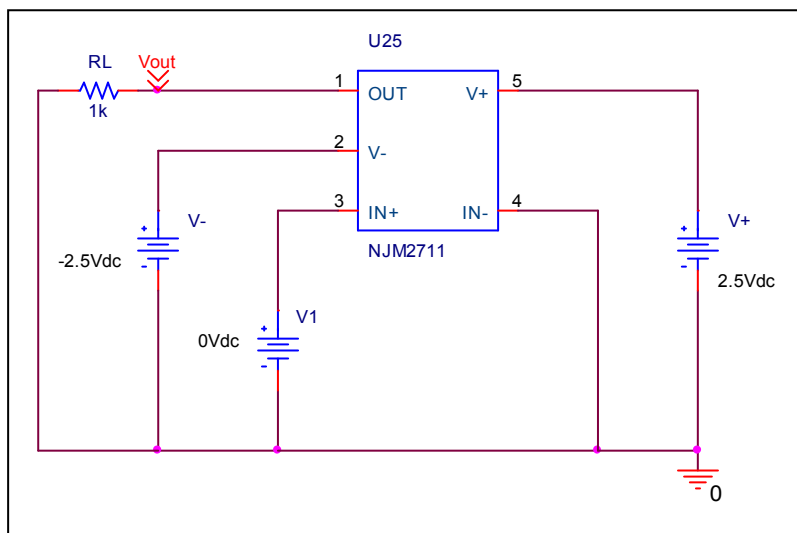
CMRR(dB)	Measurement	Simulation	%Error
	60.000	59.416	-0.968

Remark Output Voltage Swing

Before

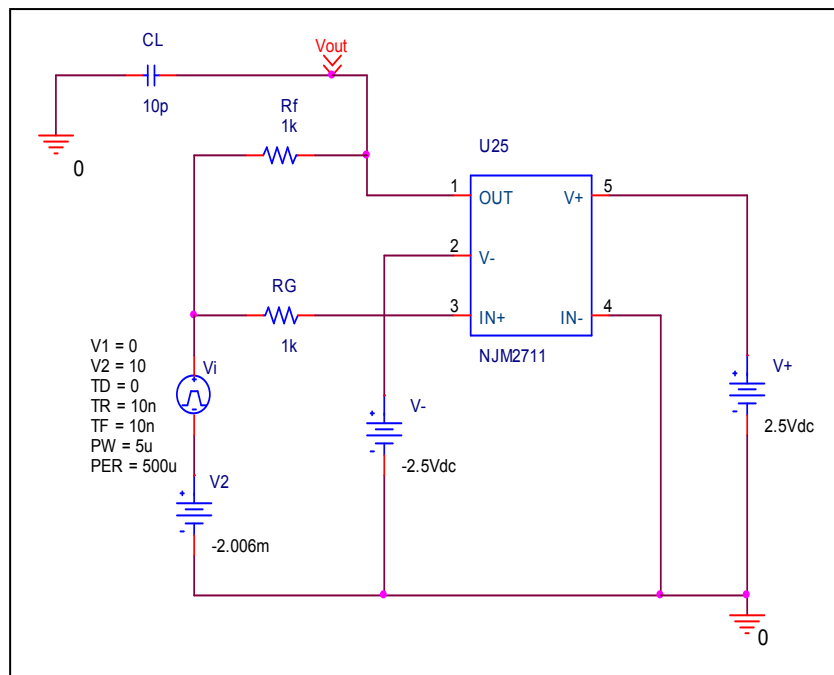


After

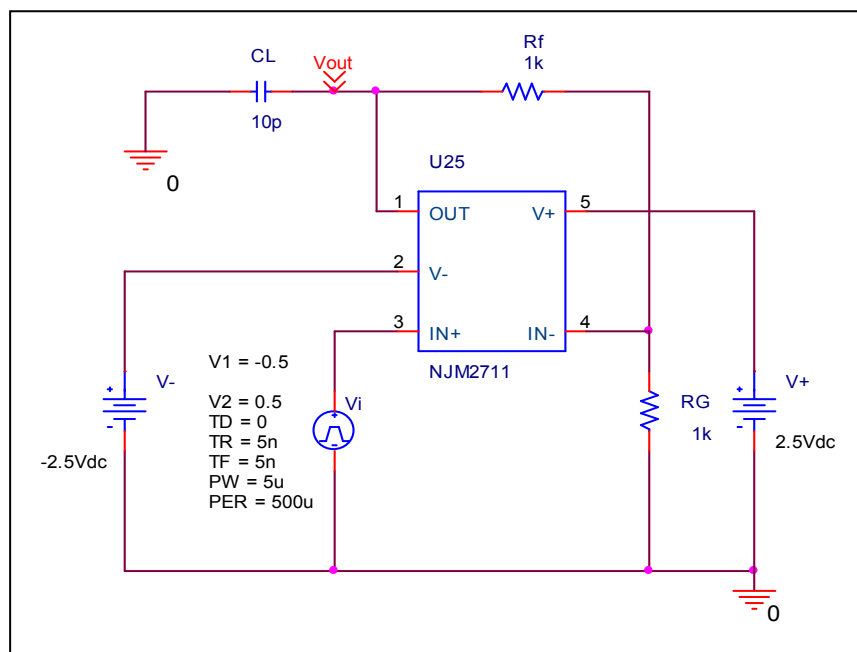


Remark Slew Rate

Before

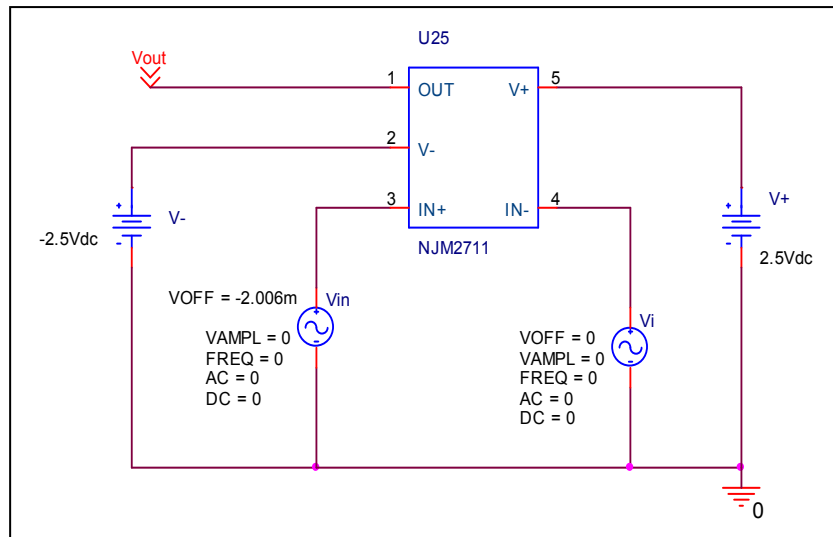


After

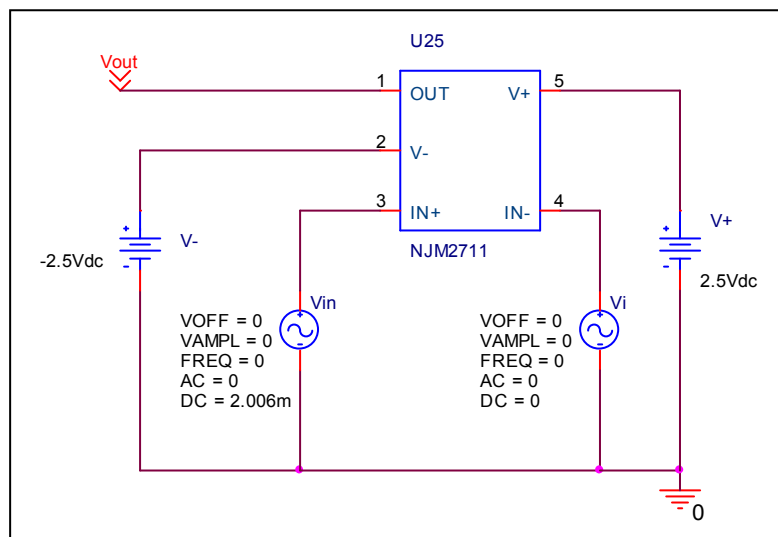


Remark Input current

Before

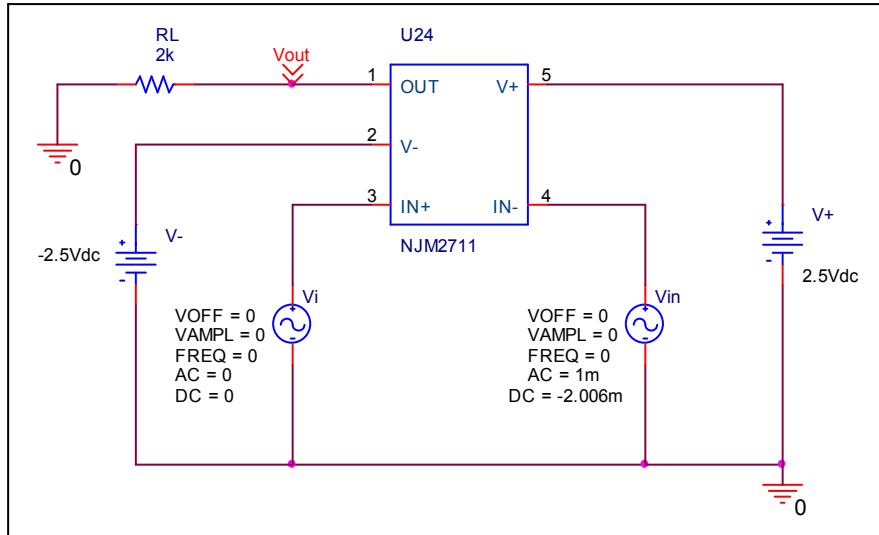


After

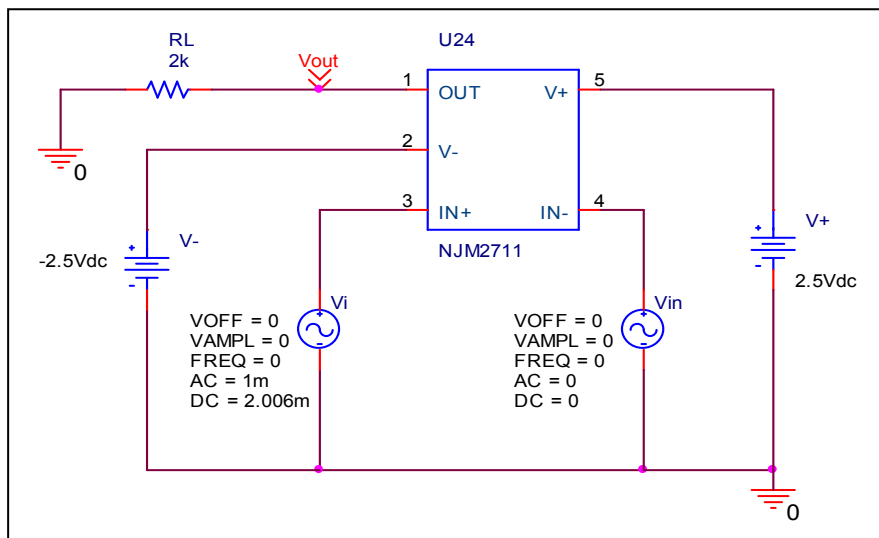


Remark Open Loop Voltage Gain vs. Frequency

Before

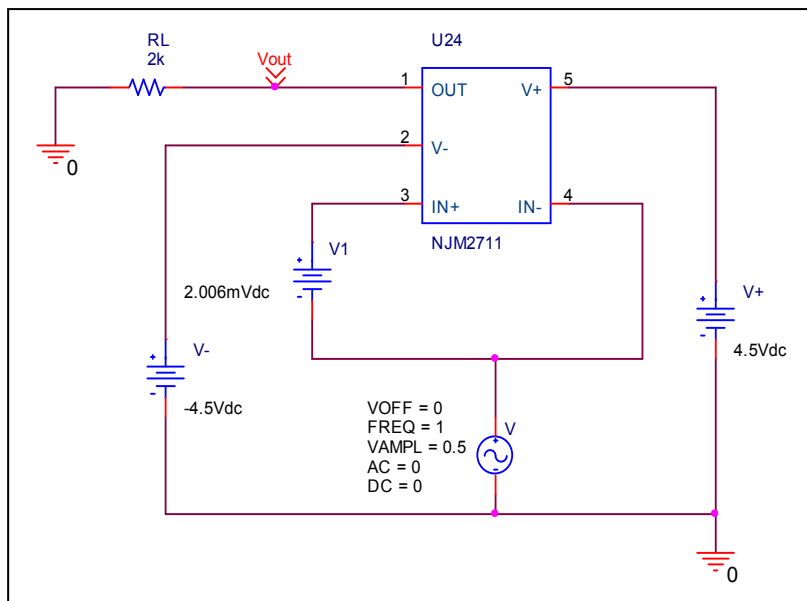


After



Remark Common-Mode Rejection Voltage gain

Before



After

