Device Modeling Report
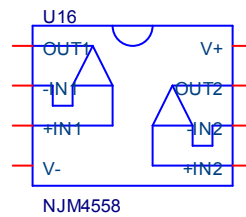
COMPONENTS:MOSFET: OPERATIONAL AMPLIFIER
PART NUMBER:NJM4558
MANUFACTURER: NEW JAPAN RADIO CO.,LTD

Bee Technologies Inc.

Spice Model

U16
OUT1　　V+
-IN1
+IN1　　OUT2
V-　　-IN2
　　+IN2

NJM4558

```
*$
* PART NUMBER:NJM4558
* MANUFACTURER: NEW JAPAN RADIO
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.Subckt NJM4558 OUT1 -IN1 +IN1 V- +IN2 -IN2 OUT2 V+
X_U1    +IN1 -IN1 V+ V- OUT1 NJM4558_SUB
X_U2    +IN2 -IN2 V+ V- OUT2 NJM4558_SUB
.ends  NJM4558
*$
.subckt NJM4558_SUB  1 2 3 4 5
 c1   11 12 7.7942E-12
 c2    6  7 27.000E-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 7.0736E6 -1E3 1E3 7E6 -7E6
 ga    6  0 11 12 575.49E-6
 gcm   0  6 10 99 18.198E-9
 iee   3 10 dc 30.051E-6
 hlim 90  0 vlim 1K
 q1   11  2 13 qx1
 q2   12  1 14 qx2
 r2    6  9 100.00E3
 rc1   4 11 1.7684E3
 rc2   4 12 1.7684E3
 re1  13 10 44.035
 re2  14 10 44.035
 ree  10 99 6.6553E6
 ro1   8  5 50
 ro2   7 99 25
 rp    3  4 1.8032E3
 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 2.9500
 vln   0 92 dc 2.9500
.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=519.03)
.model qx2 PNP(Is=1.008900E-15 Bf=666.67)
.ends
*$
```
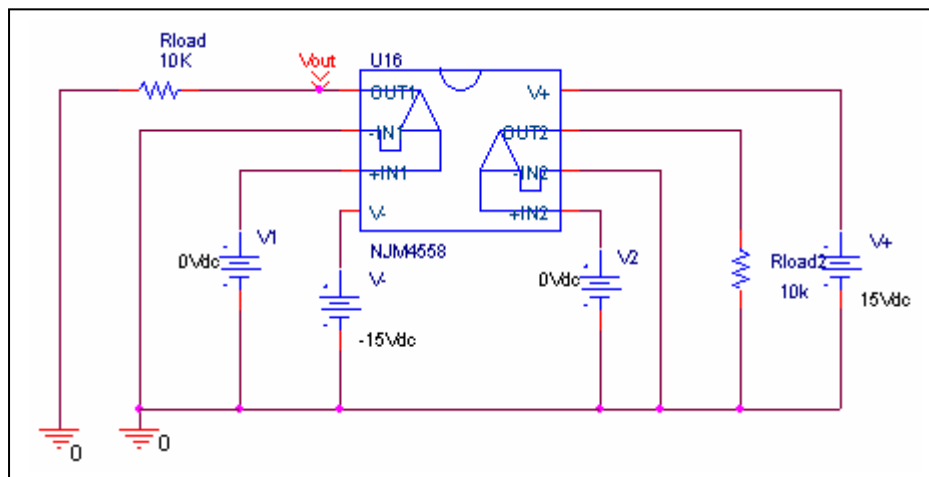
Output Voltage Swing, +Vout and –Vout
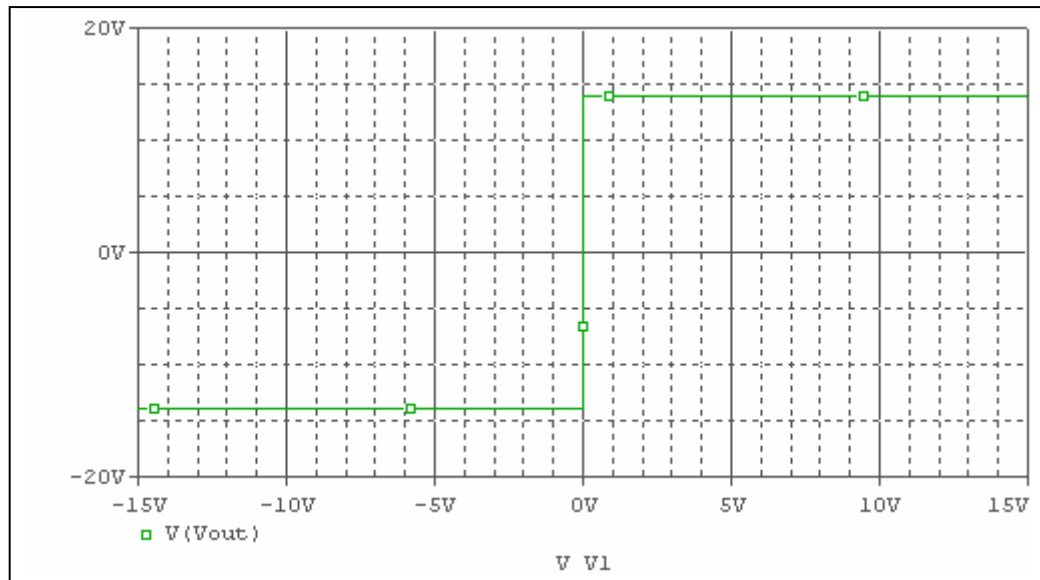
These simulation results are compared with ±Vout

Evaluation circuit

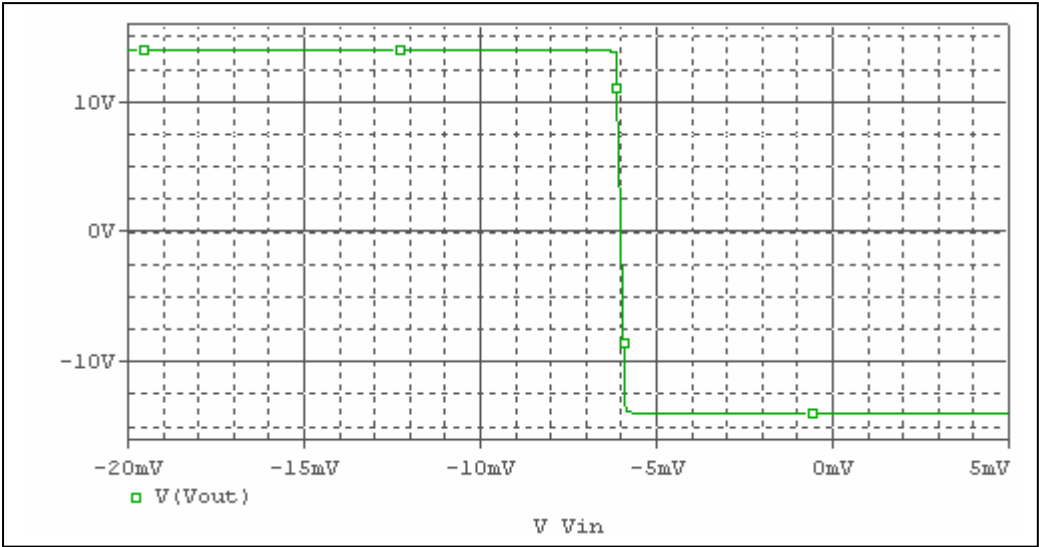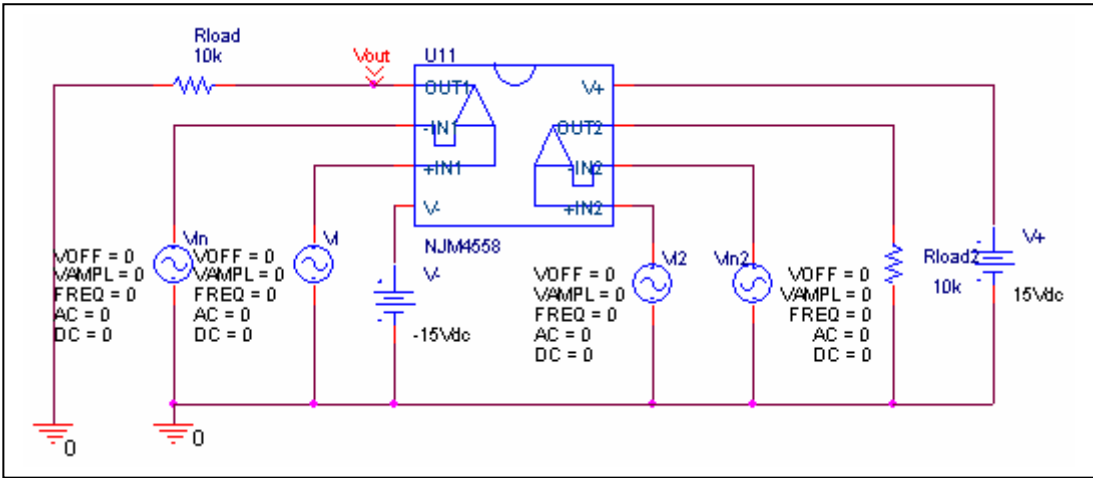
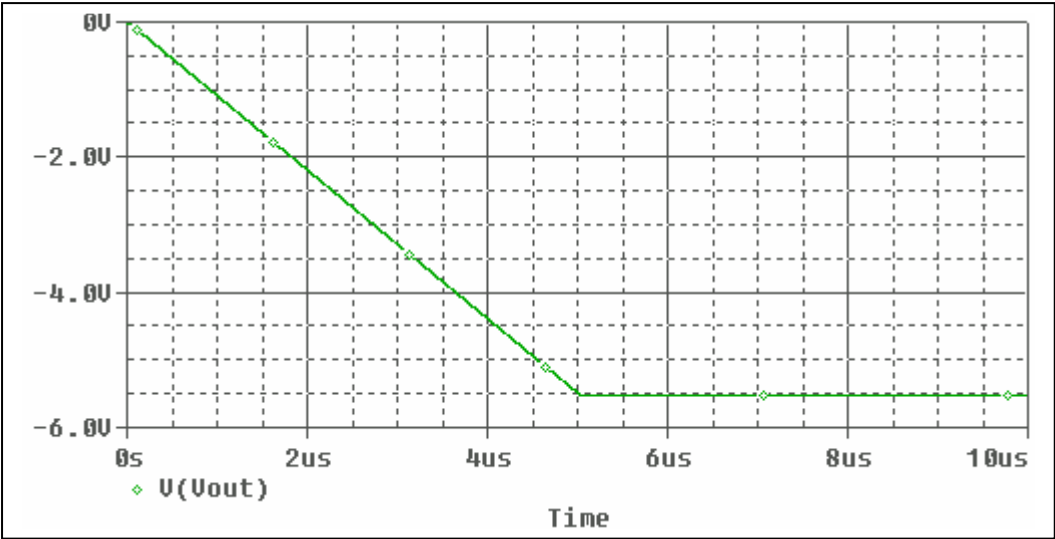| Output Voltage Swing	Data sheet	Simulation	%Error
+Vout(V)	+14	13.943	0.407
-Vout(V)	-14	-13.943	0.407

Input Offset Voltage
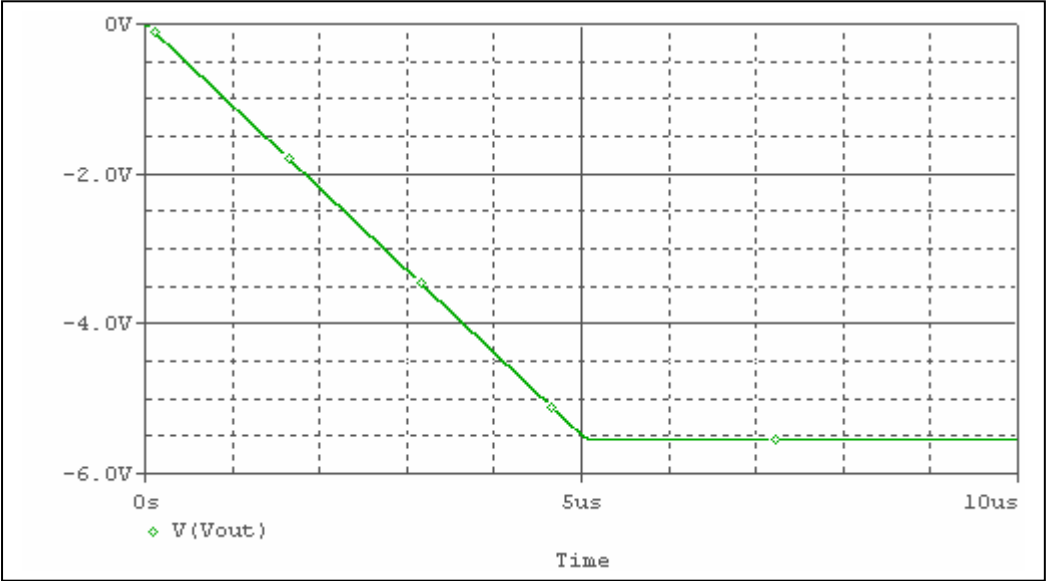
Simulation result

Evaluation circuit

Vos	Measurement		Simulation		Error	
	6	mV	6.0199	mV	0.331	%

Slew Rate, +SR, -SR

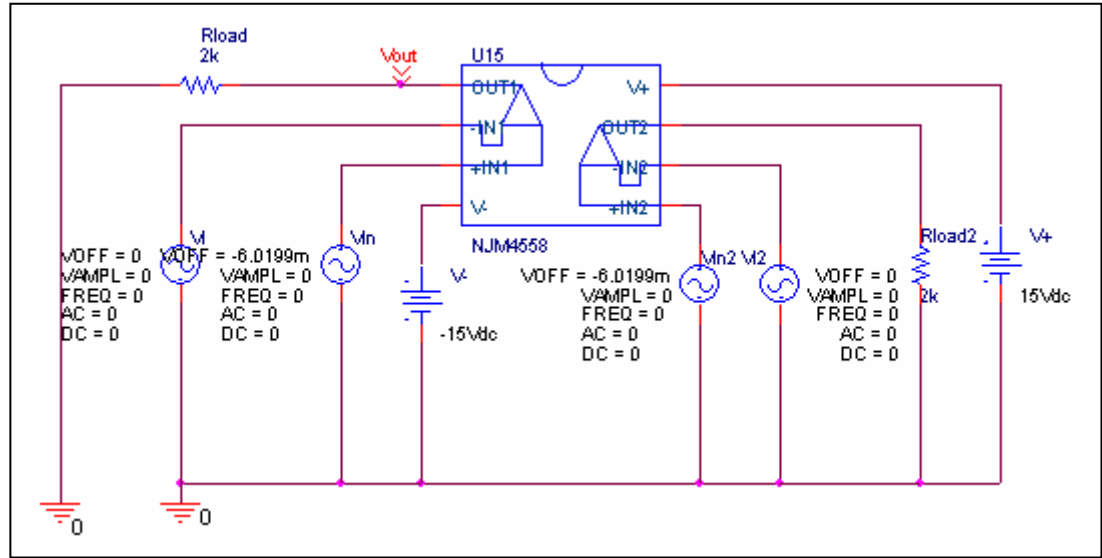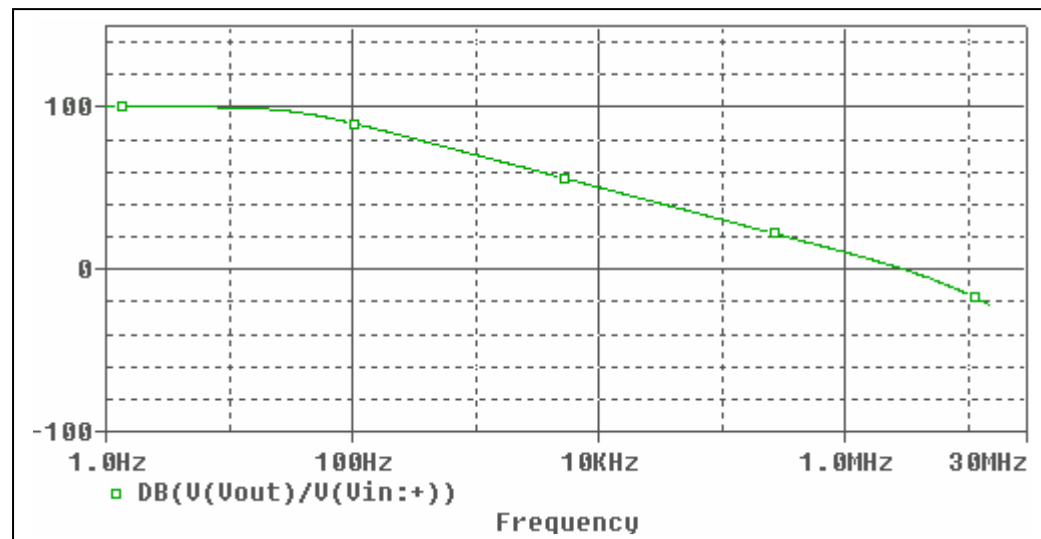| Slew Rate(v/us)	Data sheet	Simulation	%Error
	1V/us	1.045V/us	4.5

Input current Ib, Ibos

Simulation result
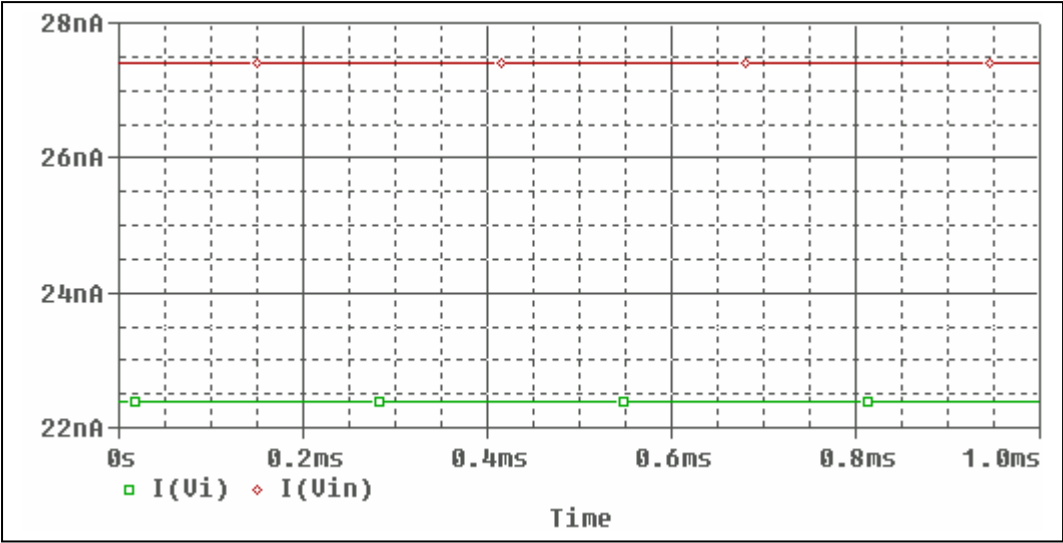
Evaluation circuit
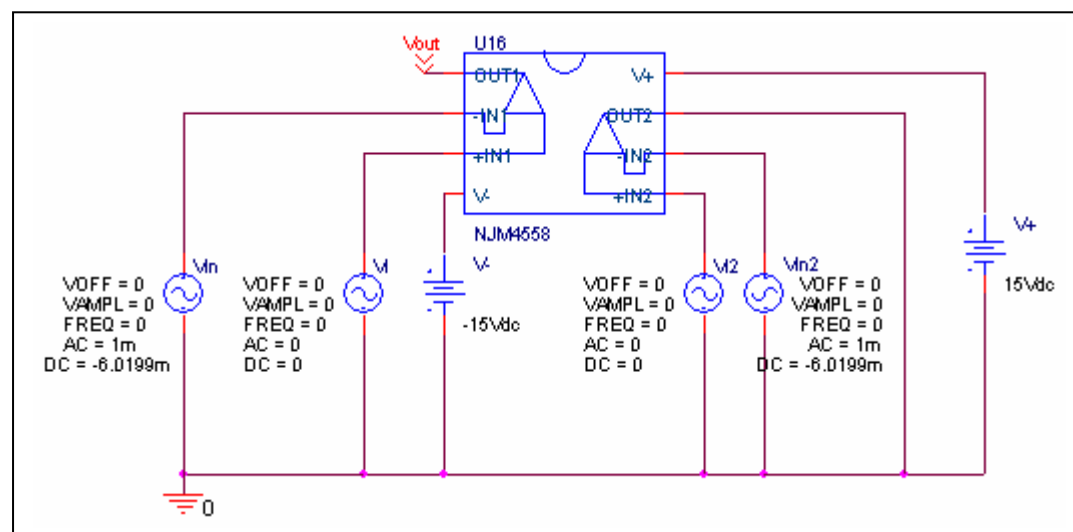

	Data sheet	Simulation	%Error
Ib(nA)	25	24.897	0.412
Ibos(nA)	5	5.04	0.8

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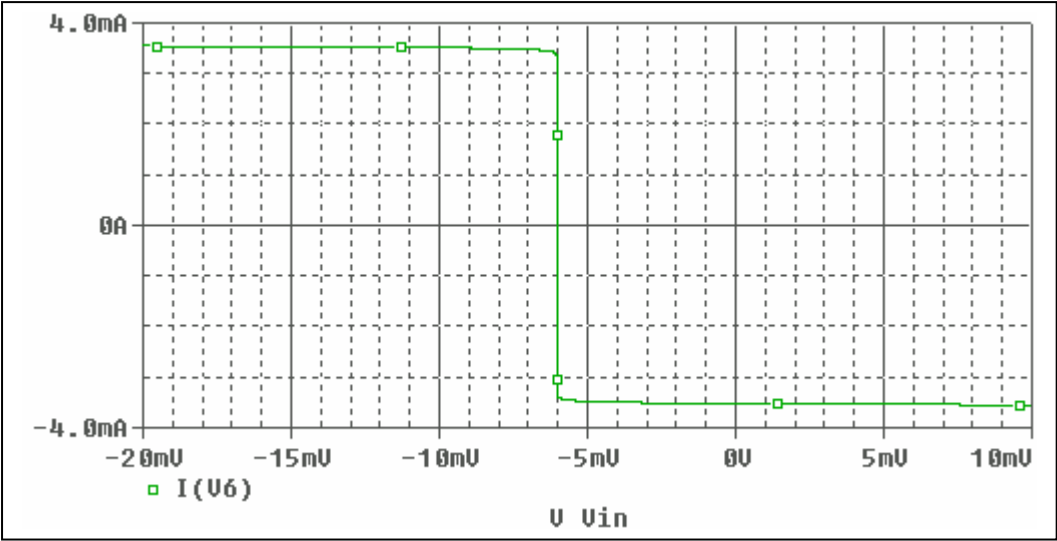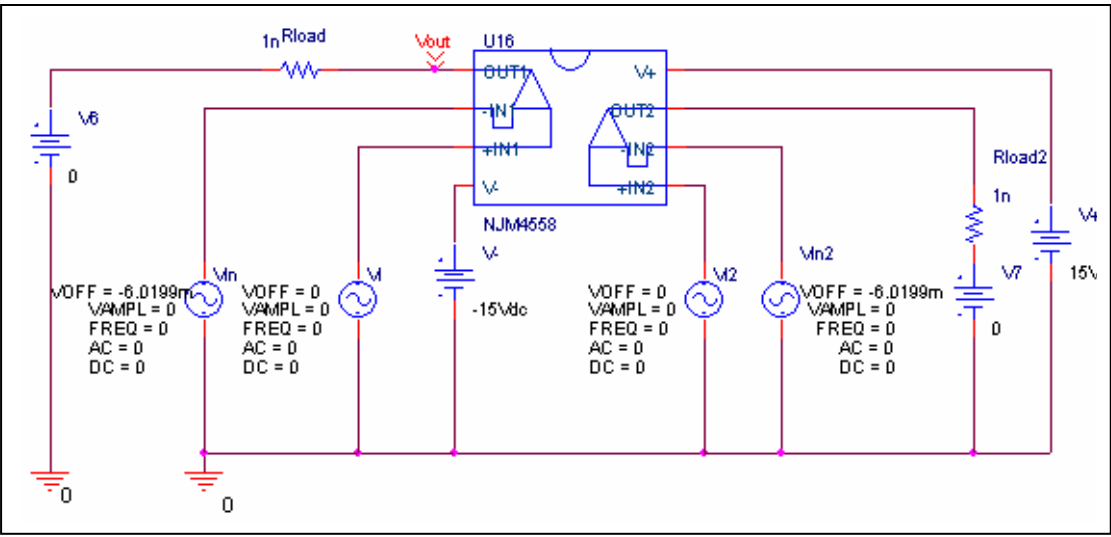
Simulation result

Evaluation circuit

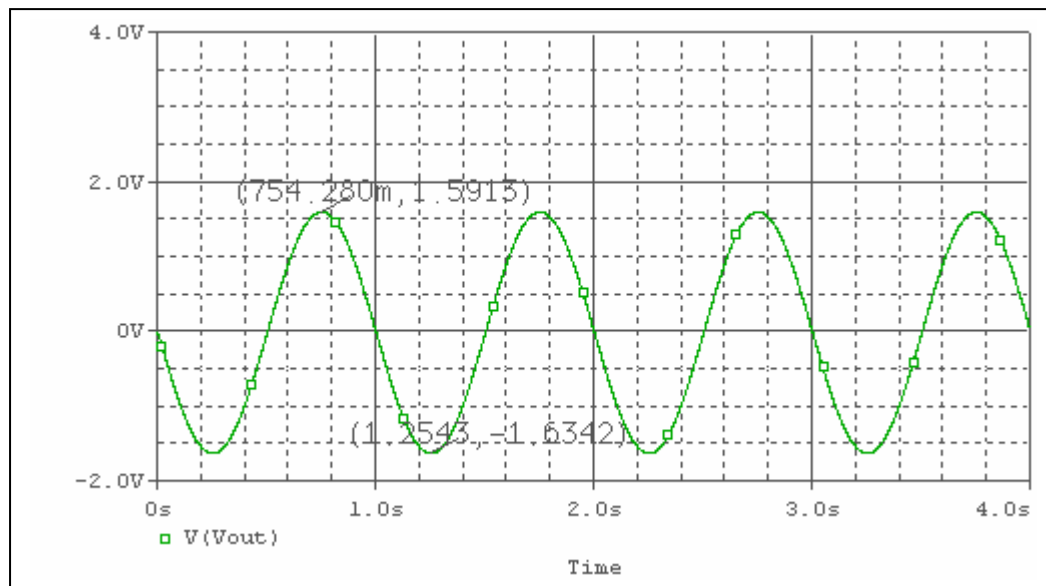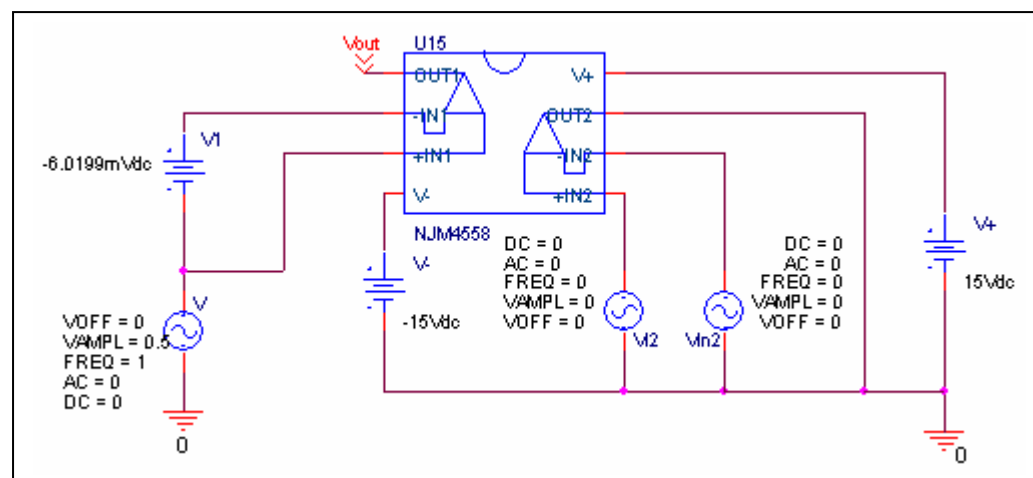|	Data sheet	Simulation	%Error
f-0dB(MHz)	3	2.9903	0.323
Av-dc(dB)	100	99.984	0.016

Output Short Circuit Current - Ios

	Data sheet	Simulation	%Error
Short Circuit Current	3.5mA	3.4998mA	0.005

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Common-Mode Rejection Voltage gain

Common mode gain=3.2255/1
Common Mode Reject Ratio=99815/3.2255 = 30945 = 90.3557 dB

	Data sheet	Simulation	%Error
CMRR(dB)	90	90.3557	0.3952