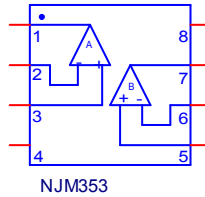# Device Modeling Report

COMPONENTS: OPERATIONAL AMPLIFIER
PART NUMBER:NJM353
MANUFACTURER: NEW JAPAN RADIO CO.,LTD

**Bee Technologies Inc.**

Spice Model

NJM353

```
*$
* PART NUMBER: NJM353
* MANUFACTURER: NEW JAPAN RADIO
* All Rights Reserved Copyright (c) Bee Technologies Inc. 2006
.Subckt NJM353 OUT1 -IN1 +IN1 VEE +IN2 -IN2 OUT2 VCC
X_U1    +IN1 -IN1 VCC VEE OUT1 NJM353_ME
X_U2    +IN2 -IN2 VCC VEE OUT2 NJM353_ME
.ends  NJM353
.subckt NJM353_ME   1 2 3 4 5
 c1   11 12 2.5981E-12
 c2    6  7 9.0000E-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 20.536E6 -1E3 1E3 21E6 -21E6
 ga    6  0 11 12 190.00E-6
 gcm   0  6 10 99 1.9000E-9
 iss   3 10 dc 120.00E-6
 hlim 90  0 vlim 1K
 j1   11  2 10 jx1
 j2   12  1 10 jx2
 r2    6  9 100.00E3
 rd1   4 11 5.1340E3
 rd2   4 12 5.1340E3
 ro1   8  5 50
 ro2   7 99 25
 rp    3  4 1.8000E3
 rss  10 99 1.6667E6
 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 3.0500
 vln   0 92 dc 3.0500
.model dx D(Is=800.00E-18)
.model dy D(Is=800.00E-18 Rs=1m Cjo=10p)
.model jx1 PJF(Is=23.750E-12 Beta=300.83E-6 Vto=-.995)
.model jx2 PJF(Is=11.250E-12 Beta=300.83E-6 Vto=-1.005000)
.ends
*$
```
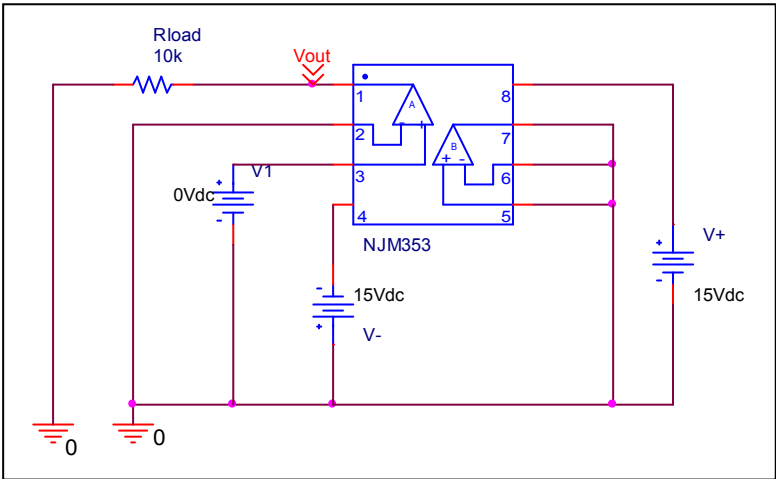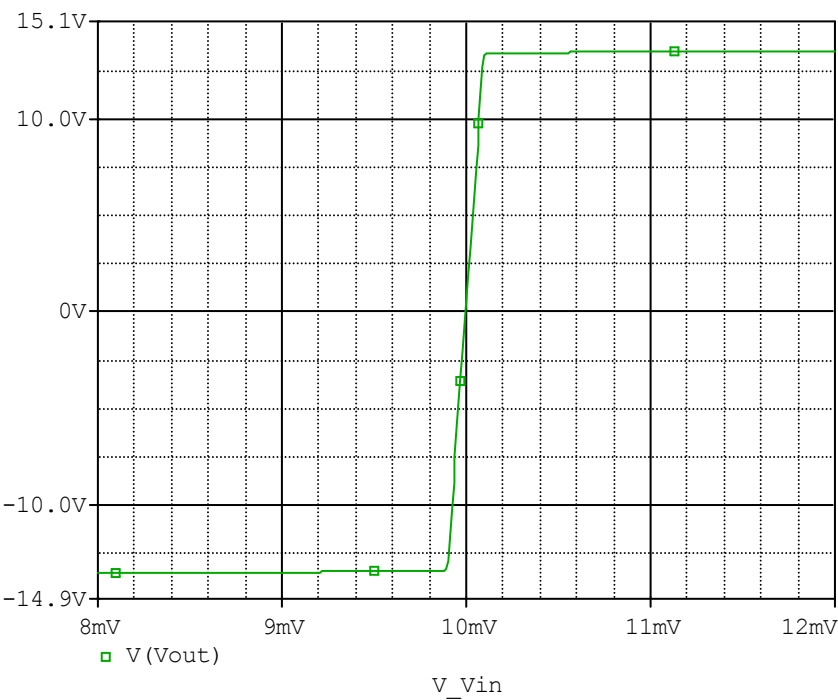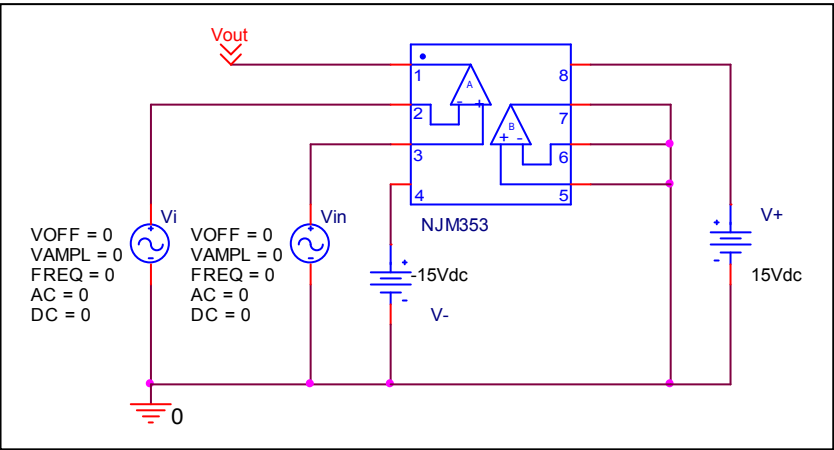
Output Voltage Swing

V(Vout)

V_V1
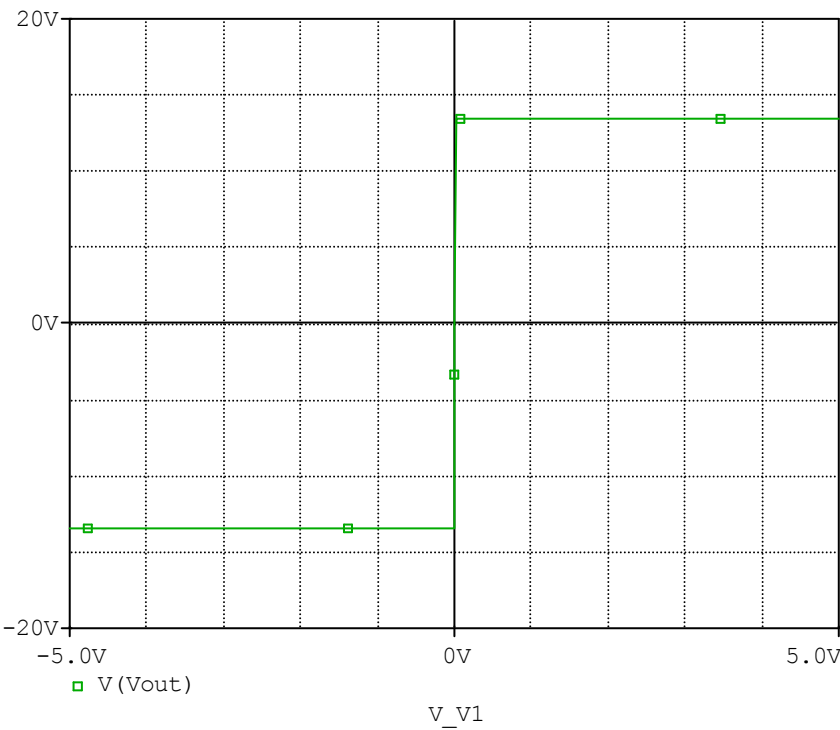
Output Voltage Swing	Data sheet	Simulation	%Error
+Vout(V)	13.500	13.445	-0.407
-Vout(V)	13.500	13.445	-0.407

Input Offset Voltage

V(Vout)

V_Vin

Vos	Measurement		Simulation		Error	
	10.000	mV	9.996	mV	0.040	%

Slew Rate

Simulation result
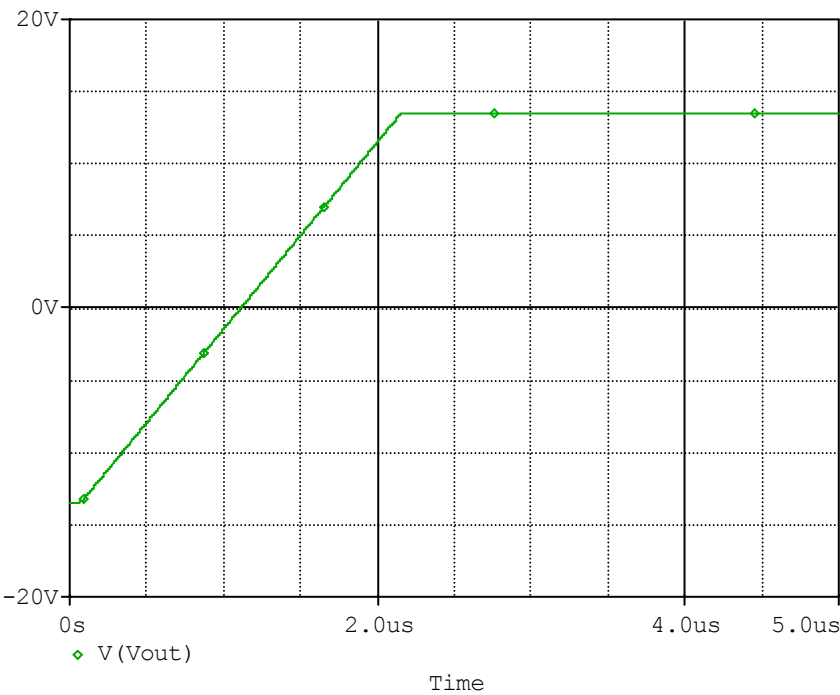
Evaluation circuit
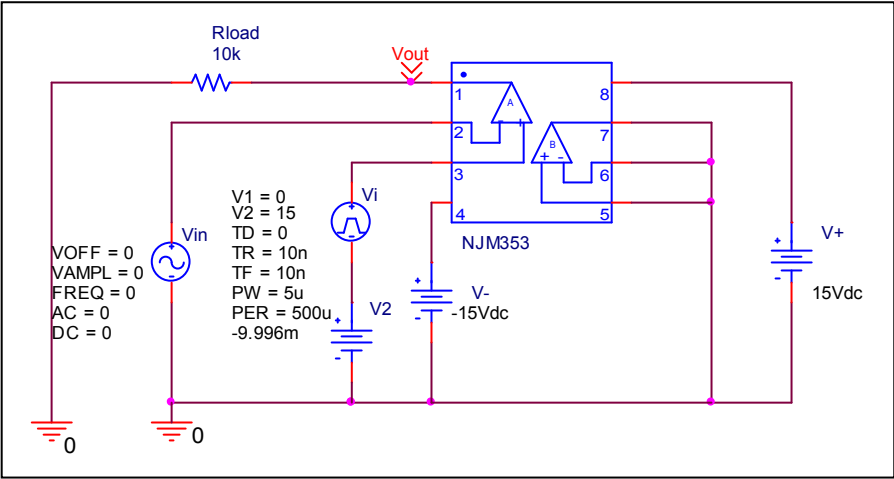
Slew Rate(v/us)	Data sheet	Simulation	%Error
	13.000	12.964	-0.276

Input current

```
      -20pA
      -40pA
      -60pA
      -80pA
         0s              0.5ms            1.0ms
         □ I(Vi)  ◇ I(Vin)
                    Time
```
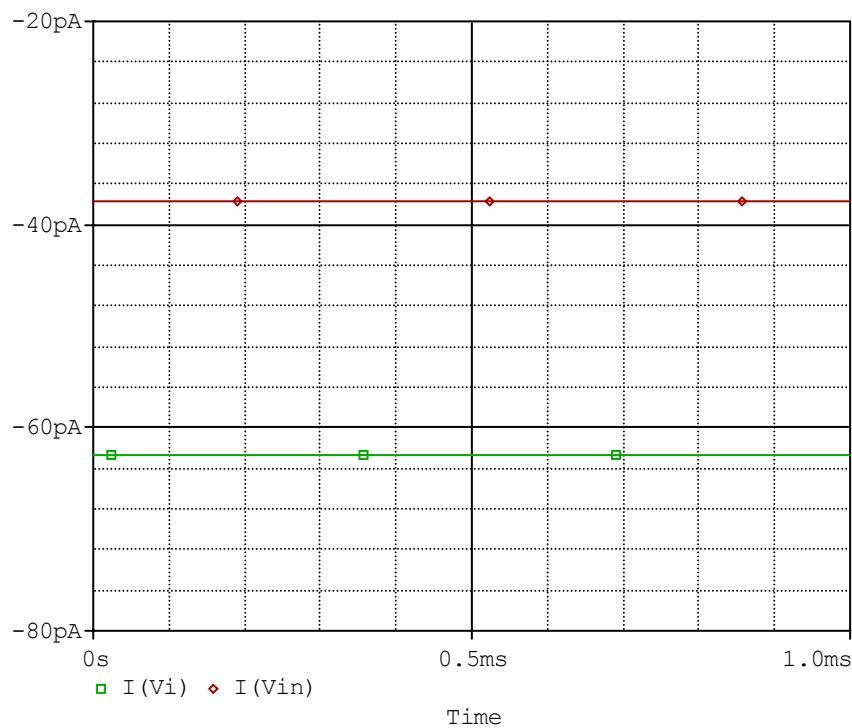
Evaluation circuit

	Data sheet	Simulation	%Error
Ib(nA)	50.000	50.207	0.414
Ibos(nA)	25.000	25.048	0.129

Open Loop Voltage Gain vs. Frequency

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

Frequency
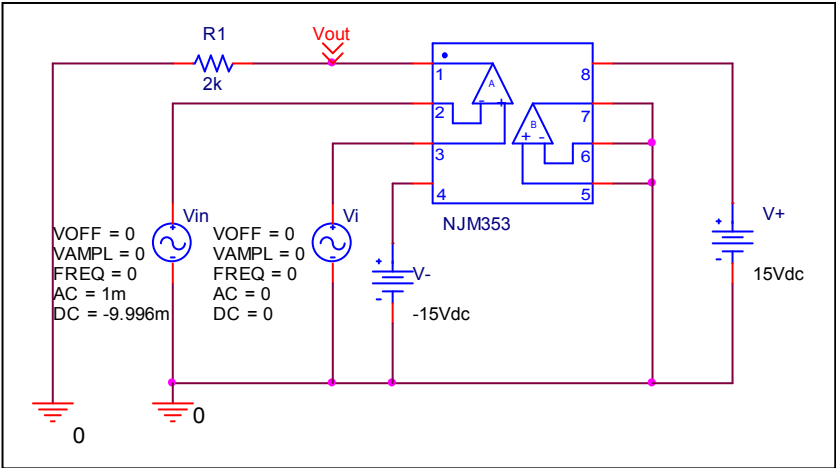
	Data sheet	Simulation	%Error
f-0dB(MHz)	4.000	3.870	-3.250
Av-dc	100.000	100.200	0.200

Common-Mode Rejection Voltage gain

▽ V(Vout)

Time
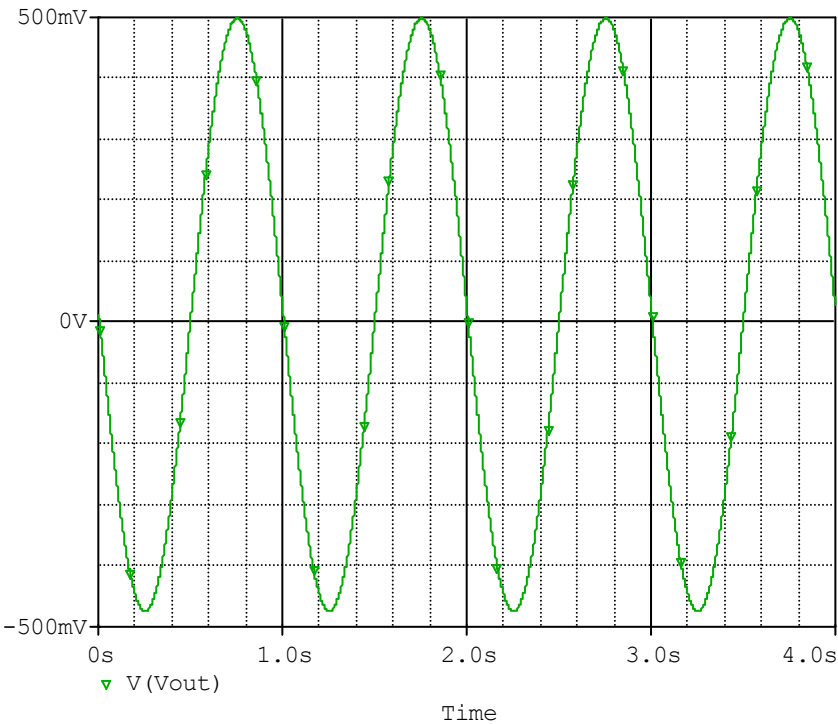
Evaluation circuit

Common Mode Reject Ratio=102329/0.972=105276

CMRR	Data sheet	Simulation	%Error
	100.000	100.446	0.446

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