

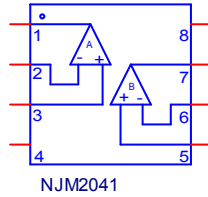
# Device Modeling Report

COMPONENTS: OPERATIONAL AMPLIFIER  
PART NUMBER: NJM2041  
MANUFACTURER: NEW JAPAN RADIO CO., LTD



**Bee Technologies Inc.**

## SPice Model



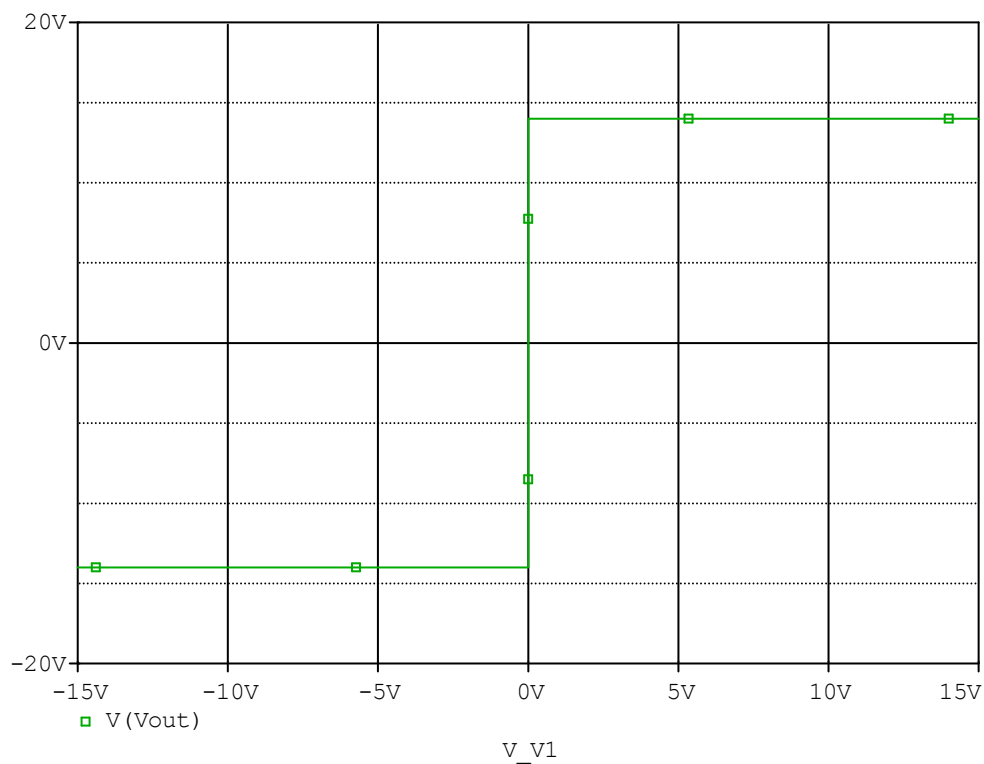
```

*$
* All Rights Reserved Copyright (C) Bee Technologies Inc. 2006
.Subckt NJM2041 OUT1 -IN1 +IN1 V- +IN2 -IN2 OUT2 V+
X_U1  +IN1 -IN1 V+ V- OUT1 NJM2041_ME
X_U2  +IN2 -IN2 V+ V- OUT2 NJM2041_ME
.ends NJM2041
.subckt NJM2041_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 9.5866E6 -1E3 1E3 9E6 -9E6
ga 6 0 11 12 1.4195E-3
gcm 0 6 10 99 14.195E-9
iee 3 10 dc 111.40E-6
hlim 90 0 vlim 1K
q1 11 2 13 qx1
q2 12 1 14 qx2
r2 6 9 100.00E3
rc1 4 11 589.46
rc2 4 12 589.46
re1 13 10 123
re2 14 10 123
ree 10 99 1.7953E6
ro1 8 5 50
ro2 7 99 25
rp 3 4 1.8121E3
vb 9 0 dc 0
vc 3 53 dc 1.7645
ve 54 4 dc 1.7645
vlim 7 8 dc 0
vlp 91 0 dc 5.5000
vln 0 92 dc 5.5000
.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=257.54)
.model qx2 PNP(Is=898.3882E-18 Bf=294.43)
.ends
*$

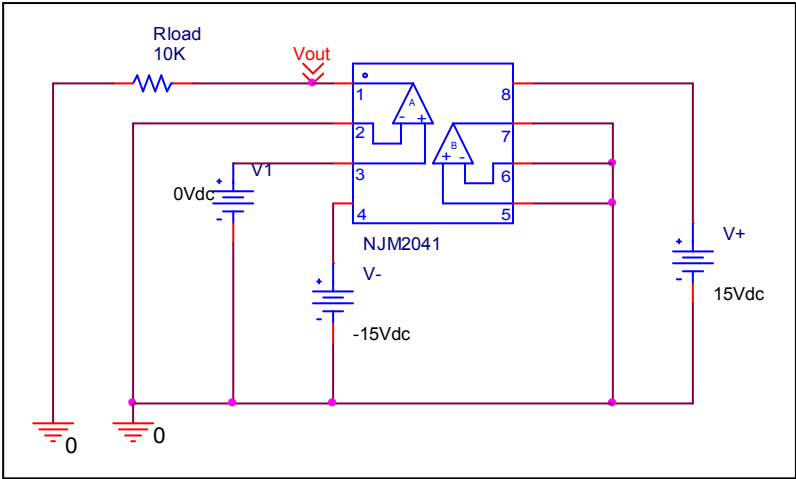
```

# Output Voltage Swing

## Simulation result



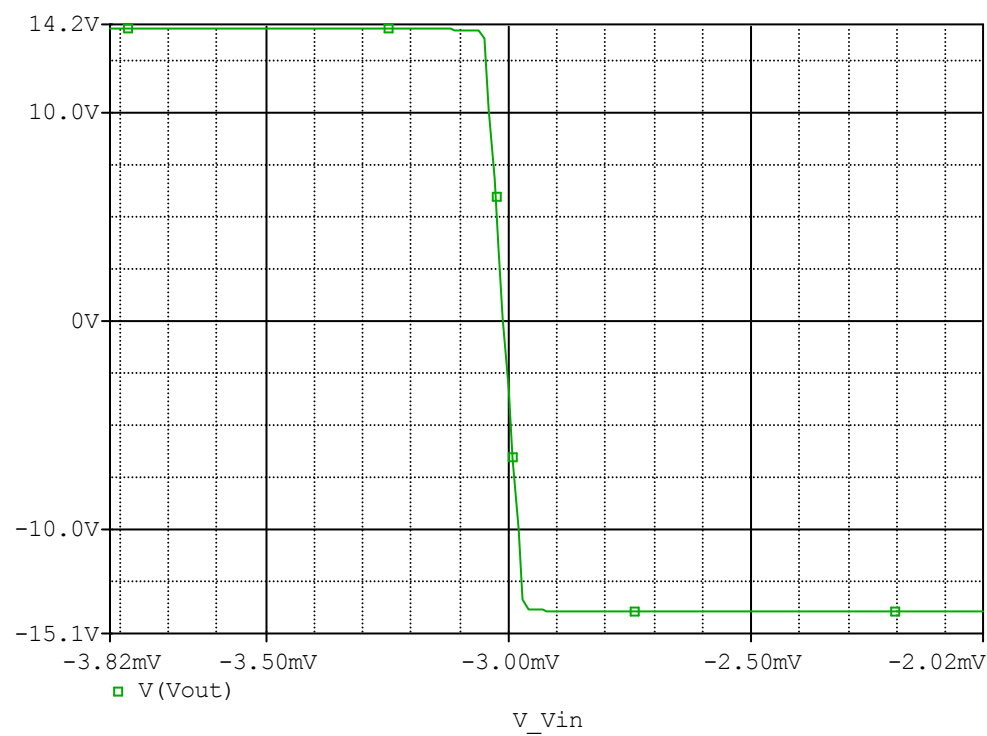
## Evaluation circuit



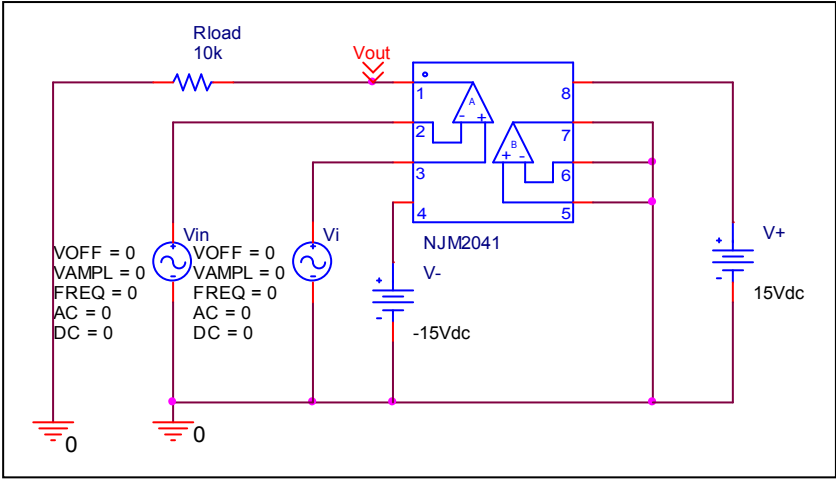
Output Voltage Swing	Data sheet	Simulation	%Error
+Vout(V)	+14.000	13.996	0.028
-Vout(V)	-14.000	-13.996	0.028

# Input Offset Voltage

## Simulation result



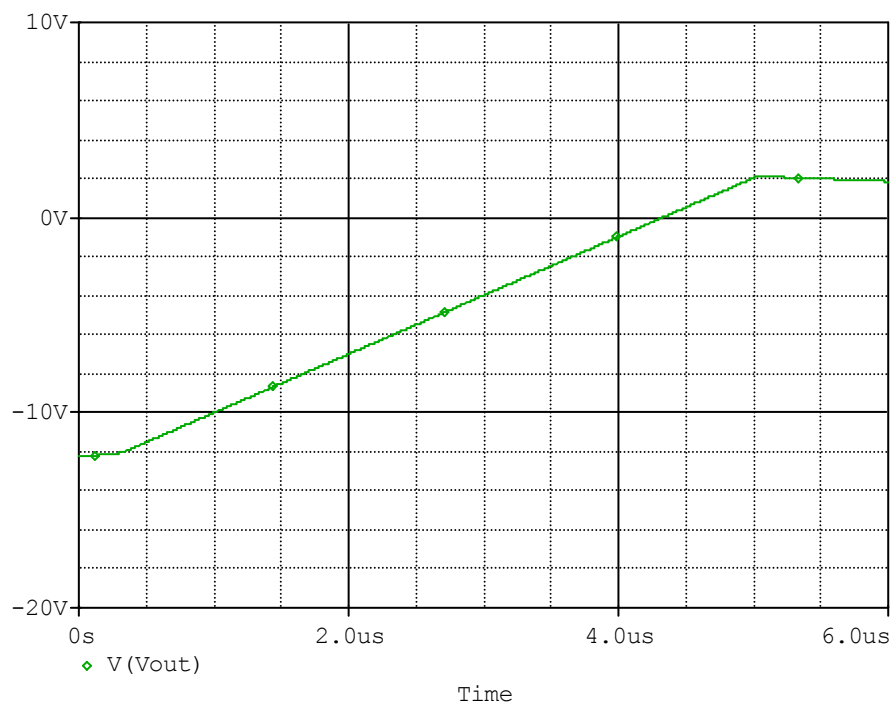
## Evaluation circuit



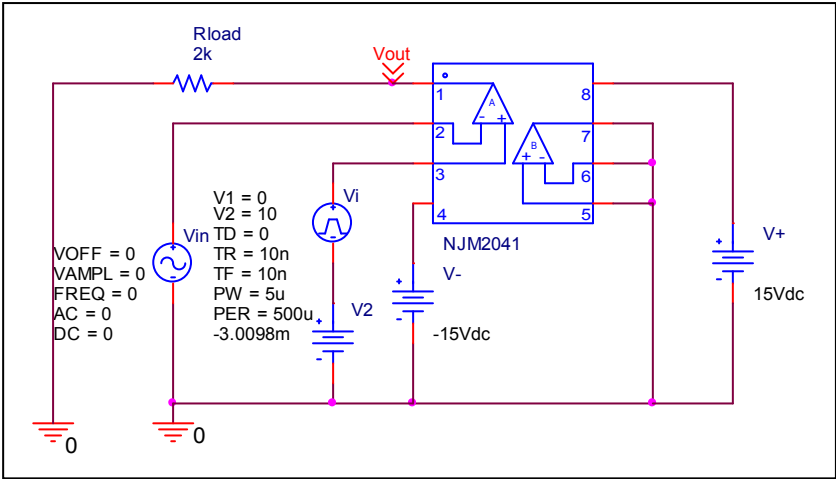
Vos	Measurement		Simulation		Error	
	3.000	mV	3.009	mV	0.326	%

# Slew Rate

## Simulation result



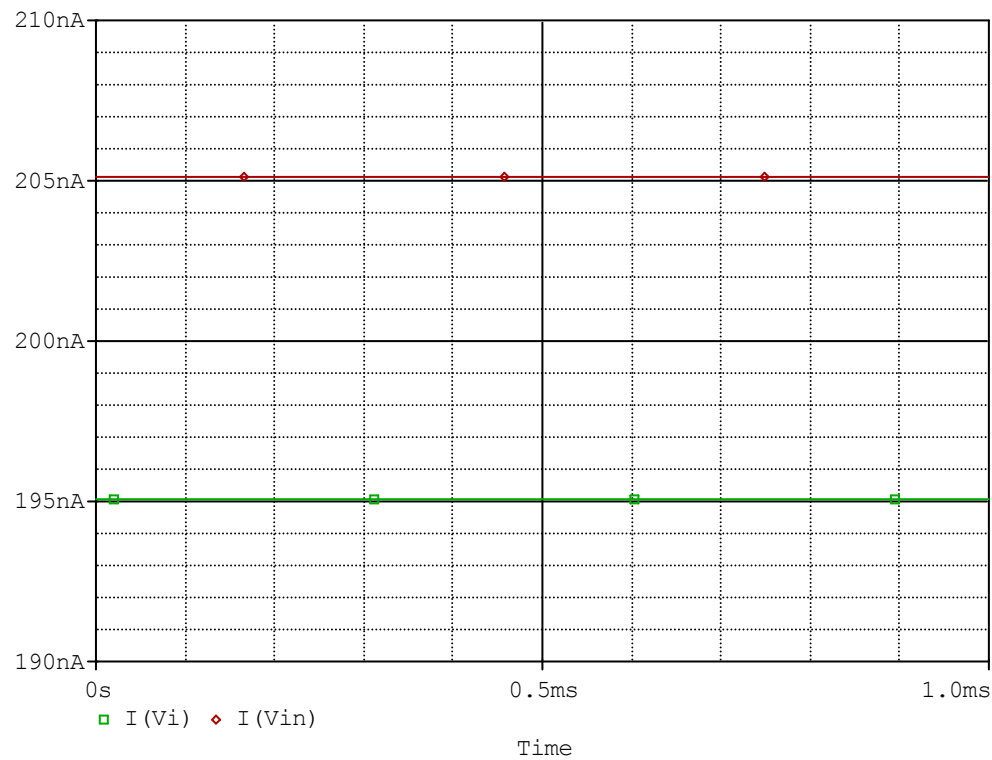
## Evaluation circuit



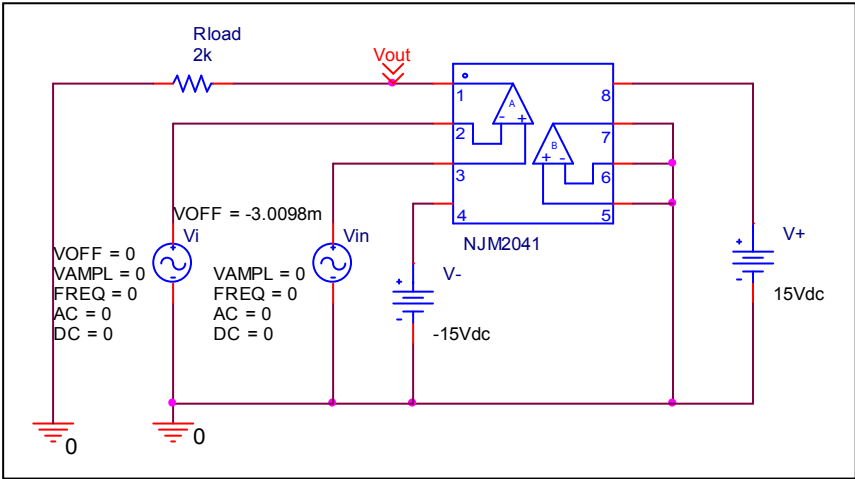
Slew Rate(v/us)	Data sheet	Simulation	%Error
	3.000	3.009	0.300

# Input current

## Simulation result



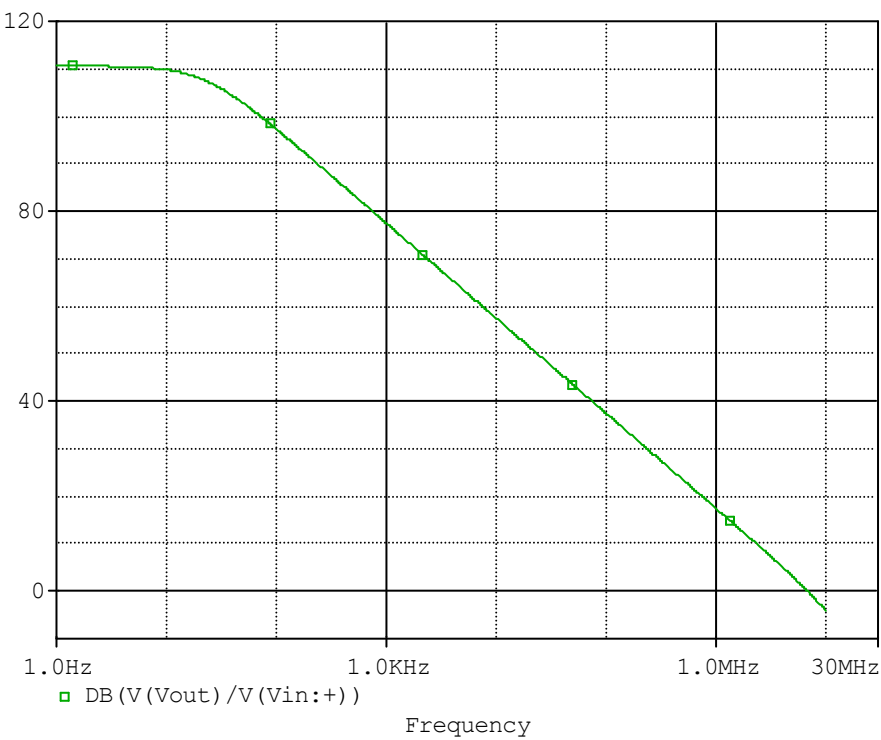
## Evaluation circuit



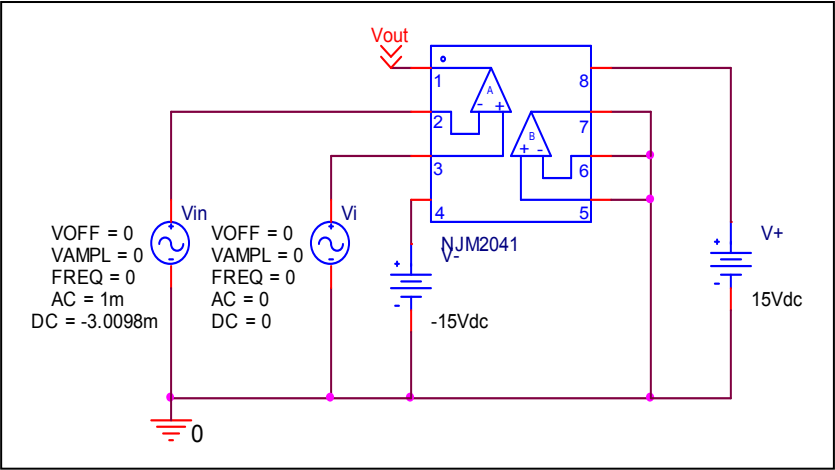
	Data sheet	Simulation	%Error
Ib(nA)	200.000	200.085	0.042
Ibos(nA)	10.000	10.037	0.370

# Open Loop Voltage Gain vs. Frequency

## Simulation result



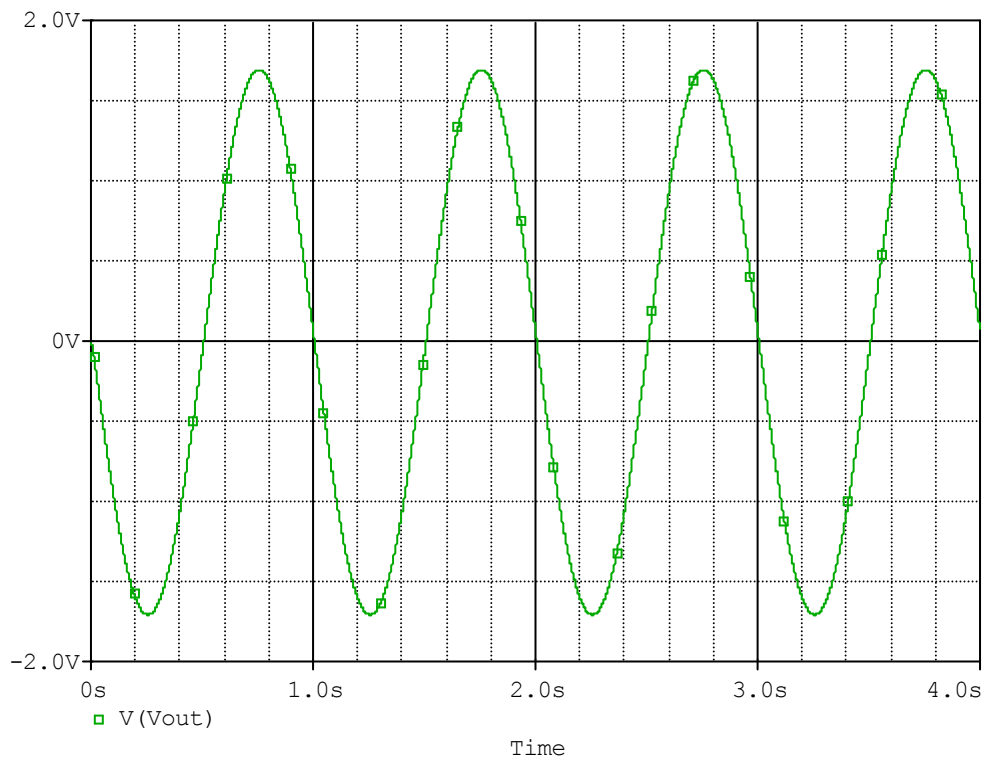
## Evaluation circuit



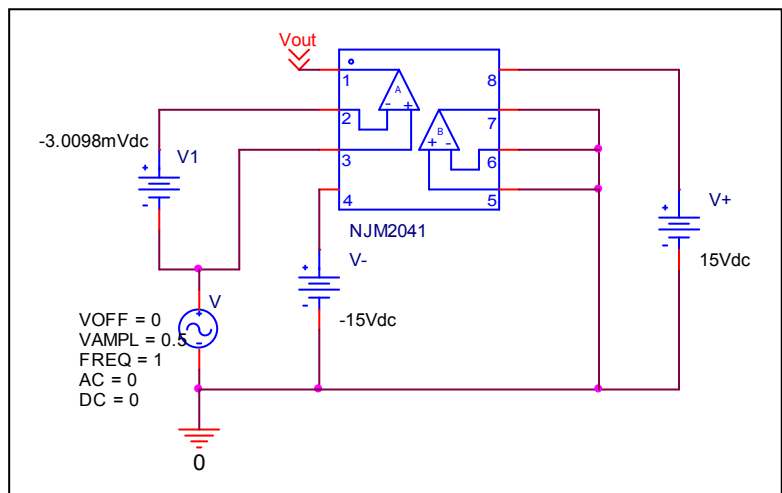
	Data sheet	Simulation	%Error
f-0dB(MHz)	7.000	6.960	0.571
Av-dc(dB)	110.000	110.062	0.056

# Common-Mode Rejection Voltage gain

## Simulation result



## Evaluation circuit



CMRR	Data sheet	Simulation	%Error
	100.000	99.417	-0.583