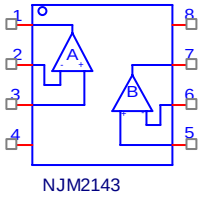
Device Modeling Report

COMPONENTS:MOSFET: OPERATIONAL AMPLIFIER
PART NUMBER:NJM2143
MANUFACTURER: NEW JAPAN RADIO CO.,LTD

Bee Technologies Inc.

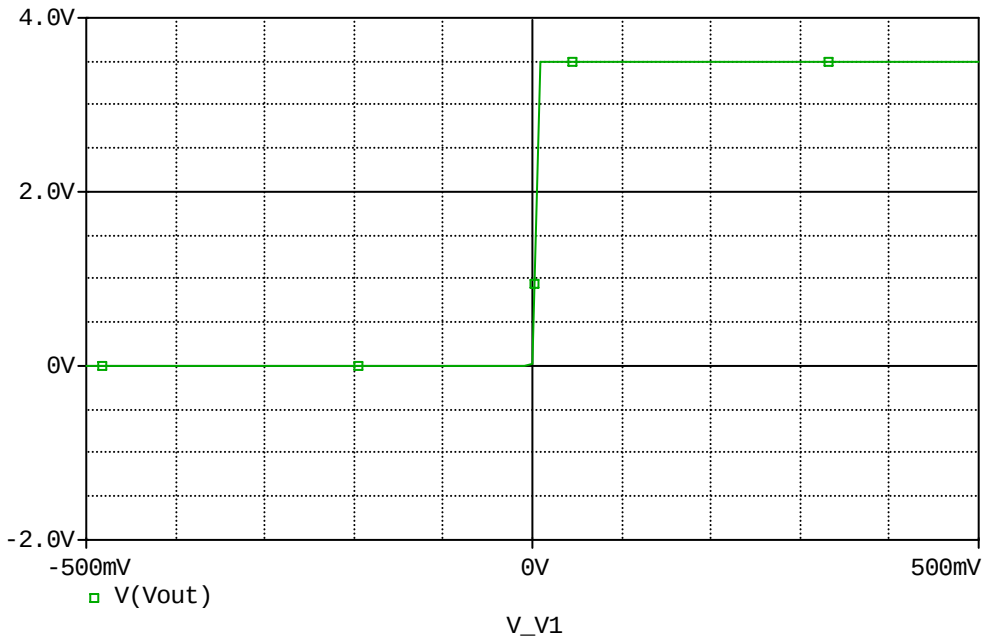
Spice Model



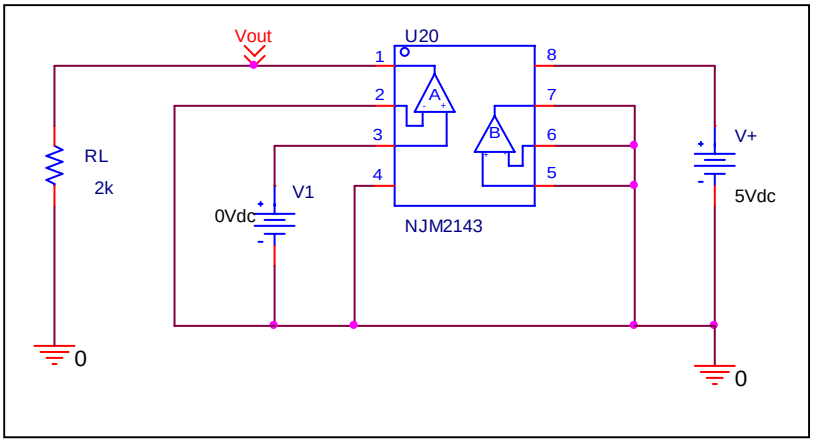

```
*$
* PART NUMBER: NJM2143
* MANUFACTURER: NEW JAPAN RADIO
* All Rights Reserved Copyright (c) Bee Technologies Inc. 2006
.Subckt NJM2143 AOUT A-IN A+IN GND B+IN B-IN BOUT V+
X_U1   A+IN A-IN V+ GND AOUT NJM2143_ME
X_U2   B+IN B-IN V+ GND BOUT NJM2143_ME
.ends  NJM2143
.subckt NJM2143_ME  1 2 3 4 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 30.755E6 -1E3 1E3 31E6 -31E6
  ga    6  0 11 12 130.06E-6
  gcm   0  6 10 99 6.0835E-9
  iee   3 10 dc 14.749E-6
  hlim 90  0 vlim 1K
  q1   11  2 13 qx1
  q2   12  1 14 qx2
  r2    6  9 100.00E3
rc1   4 11 7.6886E3
  rc2   4 12 7.6886E3
  re1  13 10 4.1560E3
  re2  14 10 4.1560E3
  ree  10 99 13.560E6
  ro1   8  5 50
  ro2   7 99 25
  rp    3  4 78.143
  vb    9  0 dc 0
  vc    3 53 dc 2.2979
  ve   54  4 dc .79791
  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 Cjo=10p)
.model qx1 PNP(Is=800.00E-18 Bf=272.22)
.model qx2 PNP(Is=867.6645E-18 Bf=334.09)
.ends
*$
```

Output Voltage Swing

Simulation result



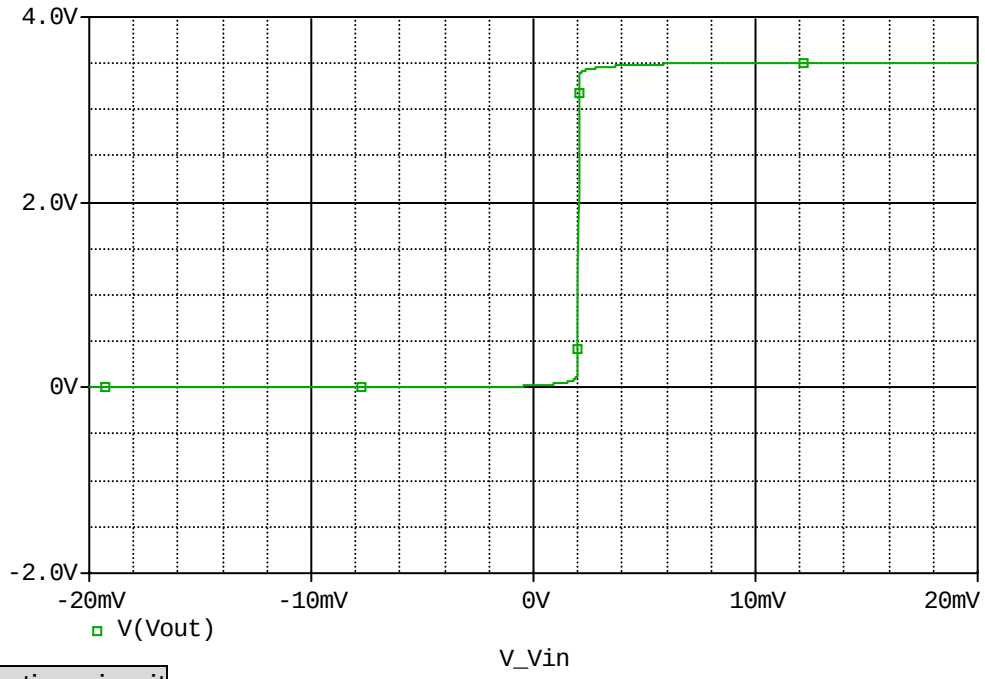
Evaluation circuit



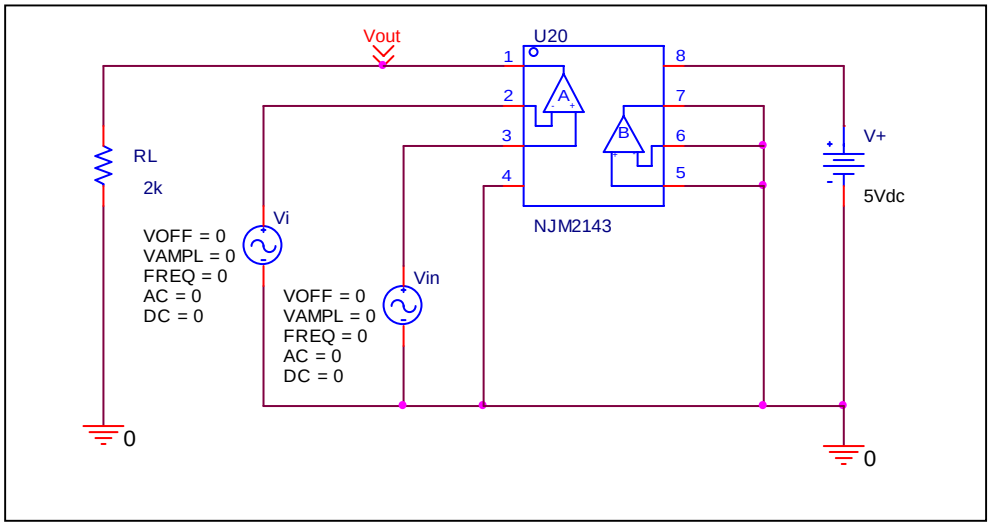
Output Voltage Swing	Data sheet	Simulation	%Error
+Vout(V)	3.500	3.498	-0.0571

Input Offset Voltage

Simulation result



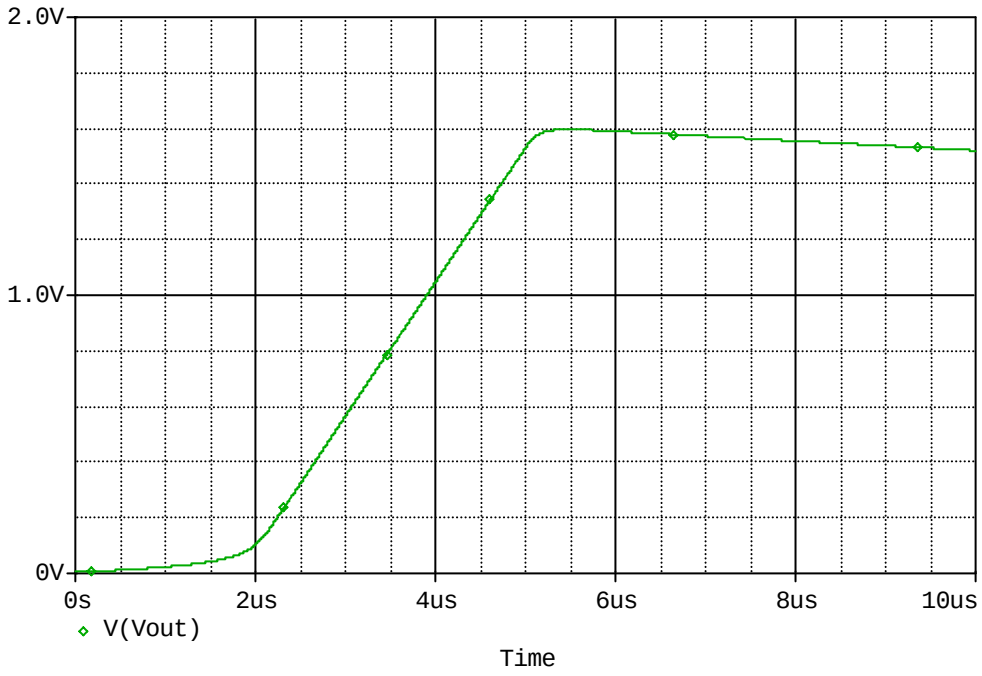
Evaluation circuit



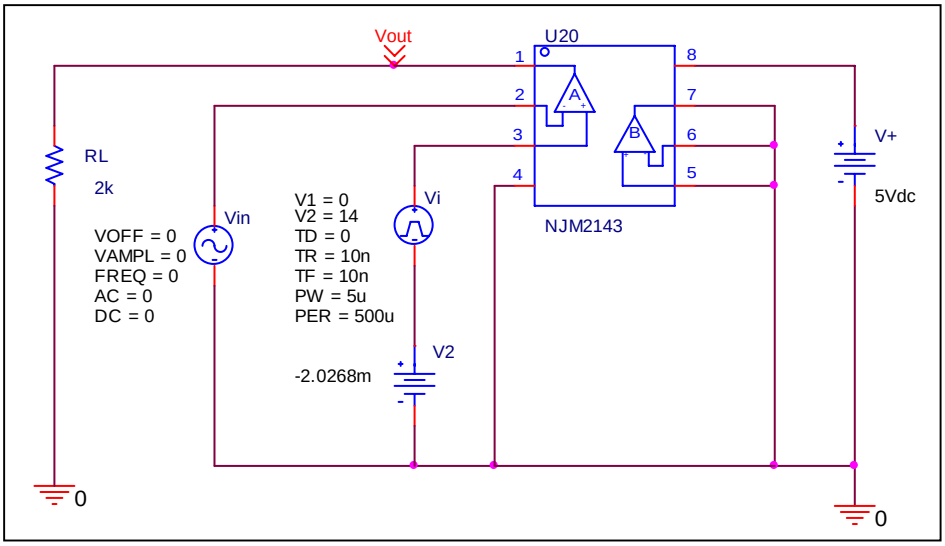
Vos	Measurement		Simulation		Error	
	2.000	mV	2.026	mV	1.300	%

Slew Rate

Simulation result



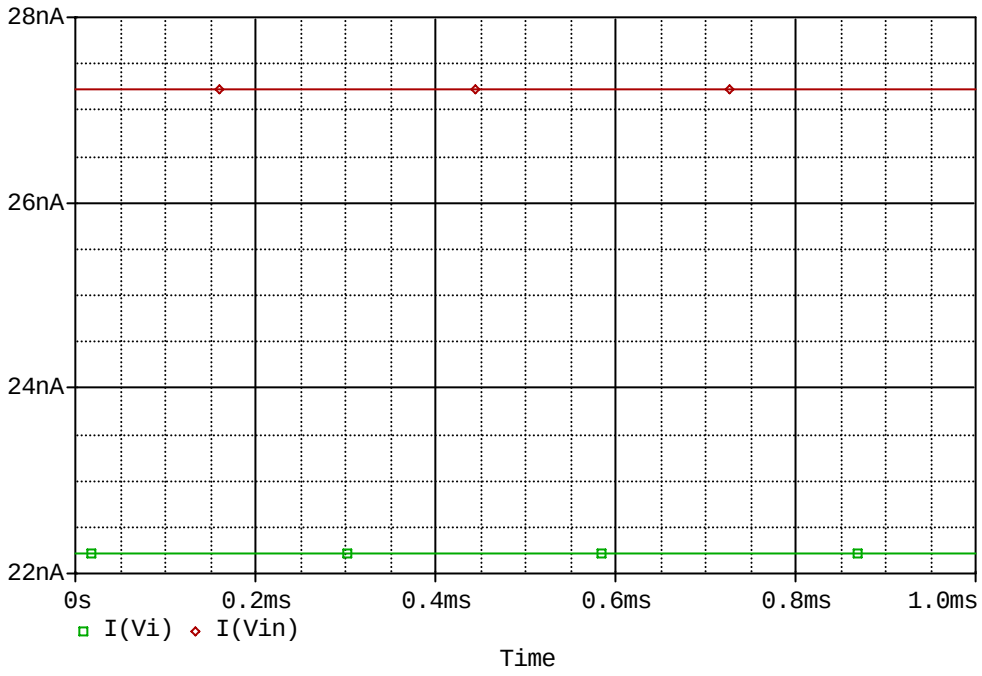
Evaluation circuit



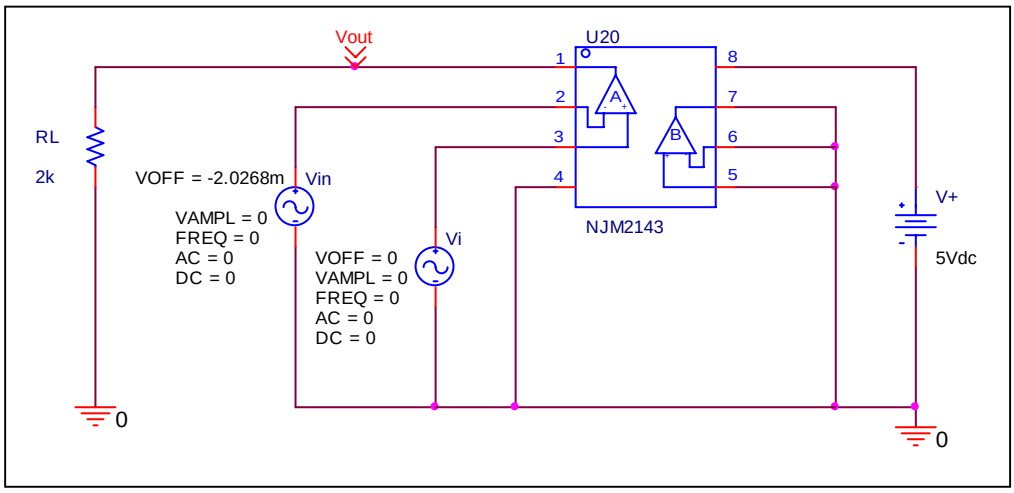
Slew Rate(v/us)	Data sheet	Simulation	%Error
	4V/us	3.978V/us	-0.550

Input current Ib, Ibos

Simulation result



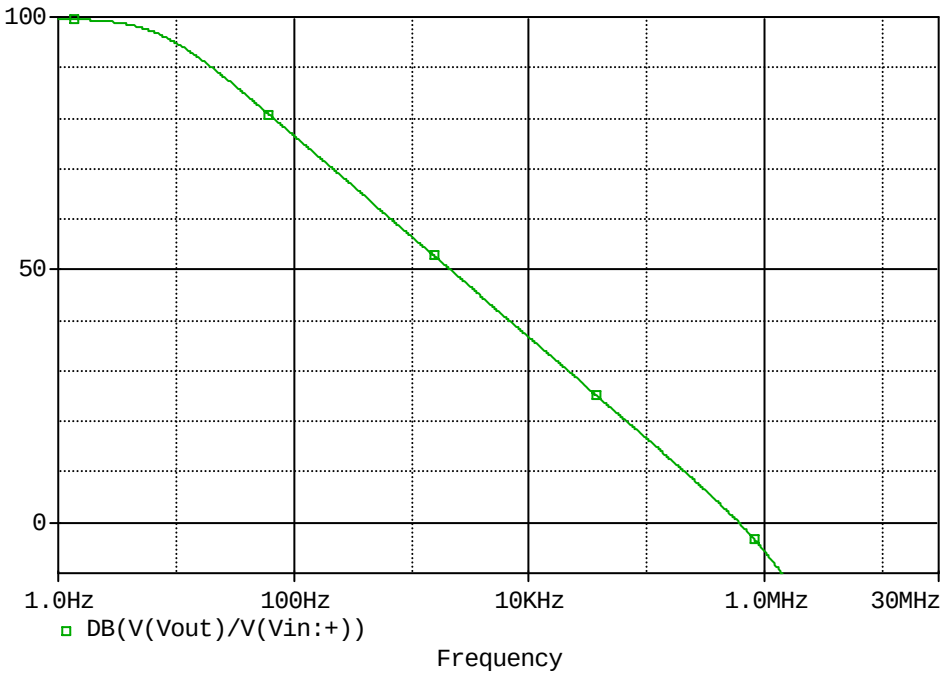
Evaluation circuit



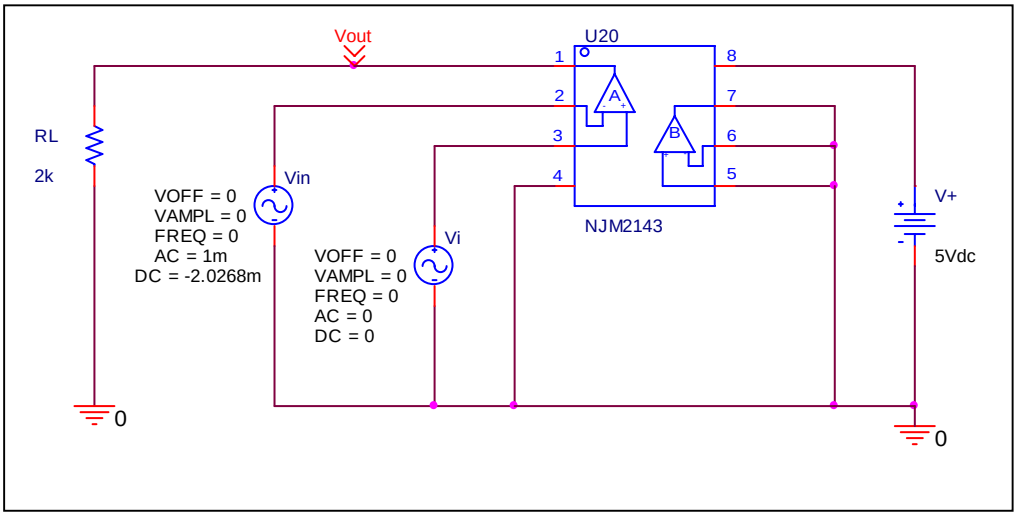
	Data sheet	Simulation	%Error
Ib(nA)	25.000	24.728	-1.088
Ibos(nA)	5.000	5.006	0.120

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

Simulation result



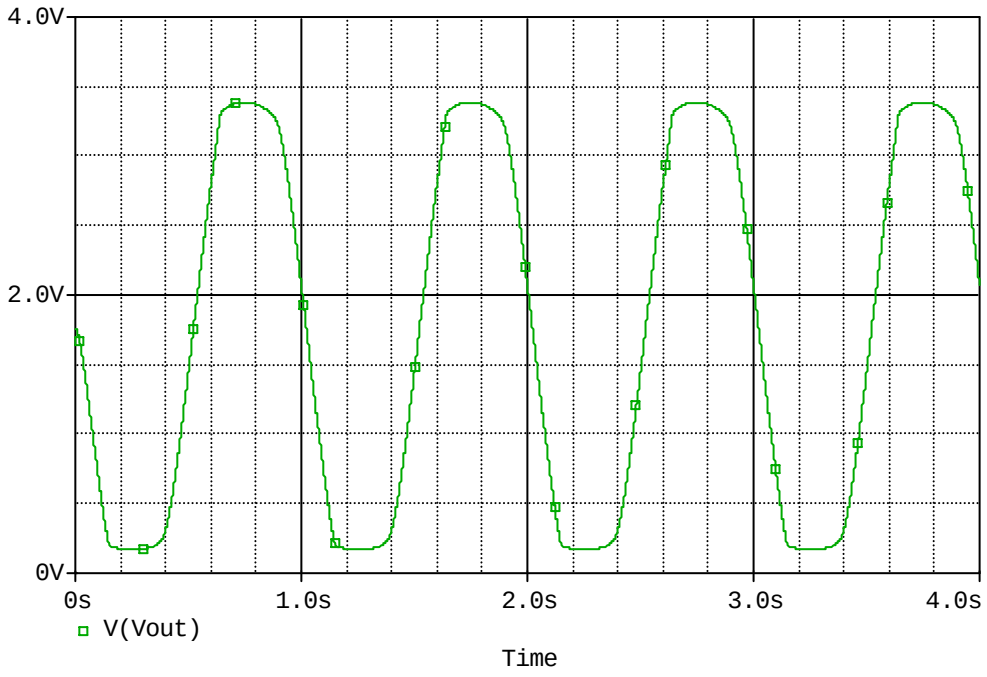
Evaluation circuit



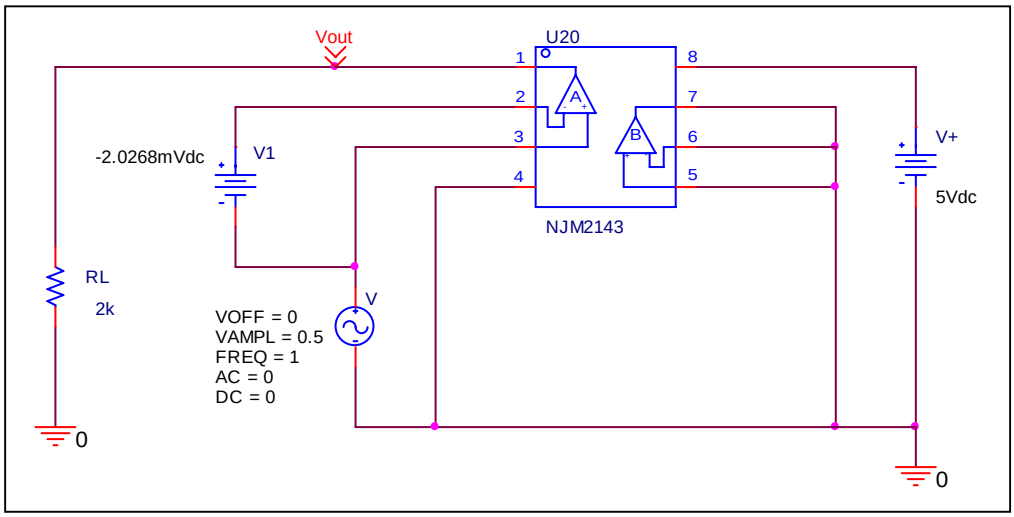
	Data sheet	Simulation	%Error
f-0dB(MHz)	0.600	0.609	1.500
Av-dc(dB)	100.000	99.629	-0.371

Common-Mode Rejection Voltage gain

Simulation result



Evaluation circuit



Common Mode Reject Ratio=95818/3.3852= 28,304.9

CMRR(dB)	Data sheet	Simulation	%Error
	85.000	89.036	4.7482