

Device Modeling Report

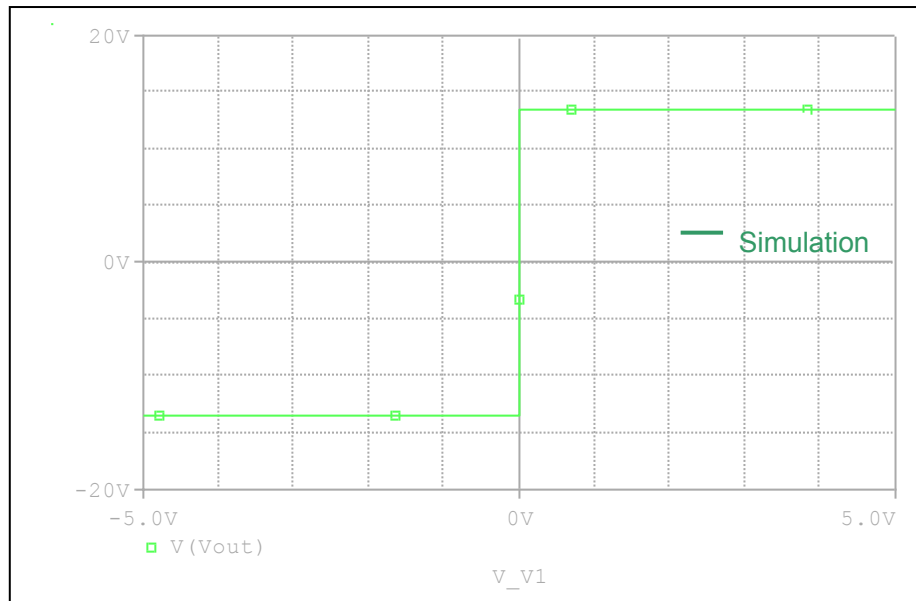
COMPONENTS : OPERATIONAL AMPLIFIER
PART NUMBER : NJM411
MANUFACTURER: NEW JAPAN RADIO



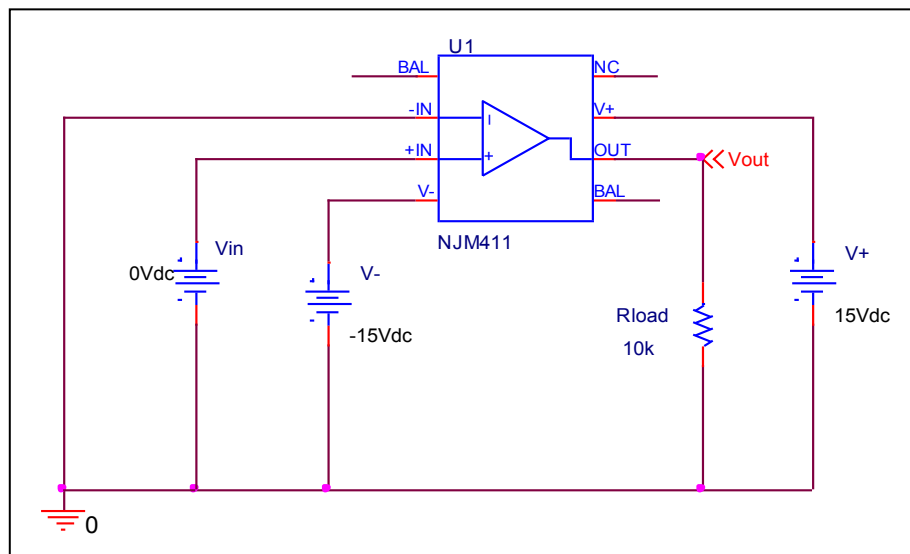
Bee Technologies Inc.

Output Voltage Swing

Simulation result



Evaluation circuit

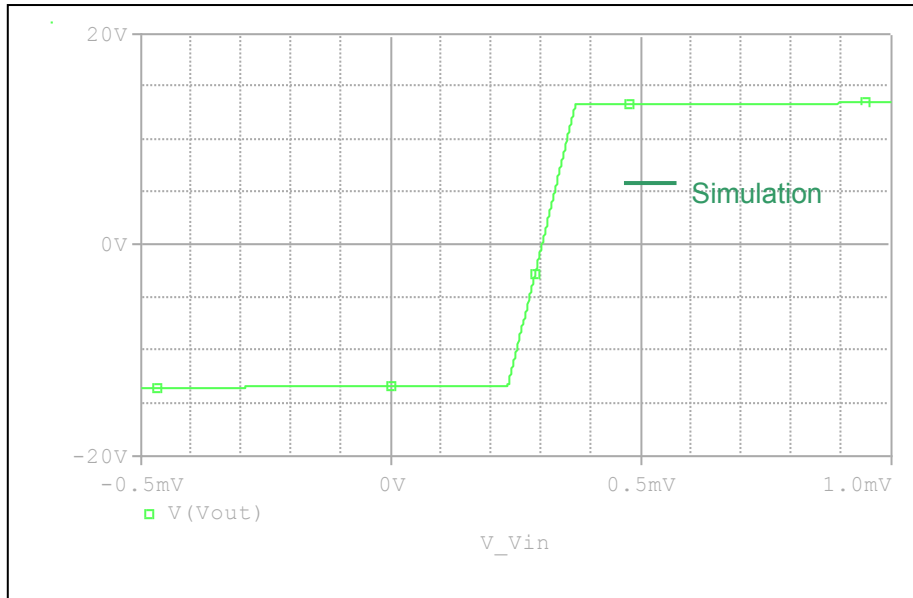


Comparison Table

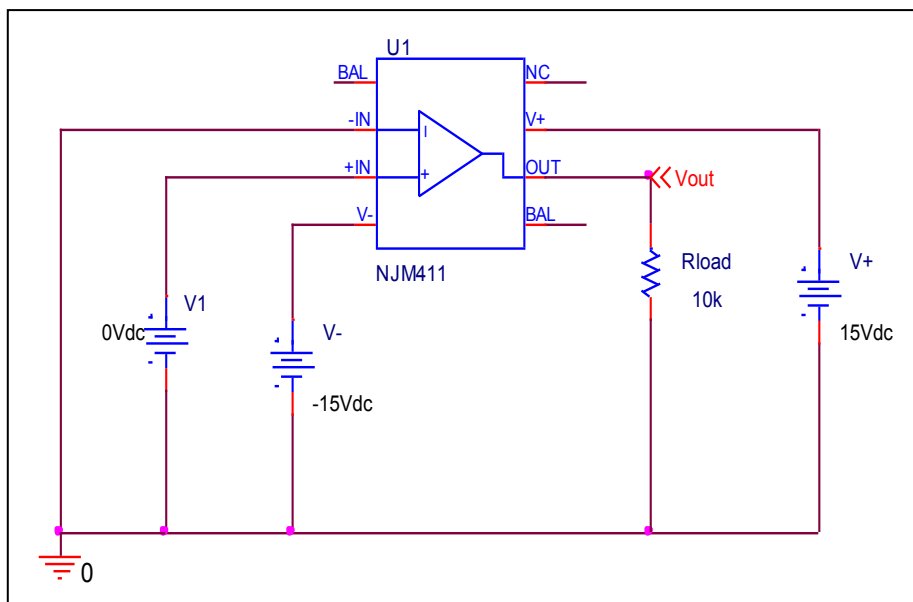
$R_L = 10\text{ k}\Omega$	Measurement	Simulation	%Error
+Vout(V)	13.5	13.499	-0.007
-Vout(V)	-13.5	-13.499	-0.007

Input Offset Voltage

Simulation result



Evaluation Circuit

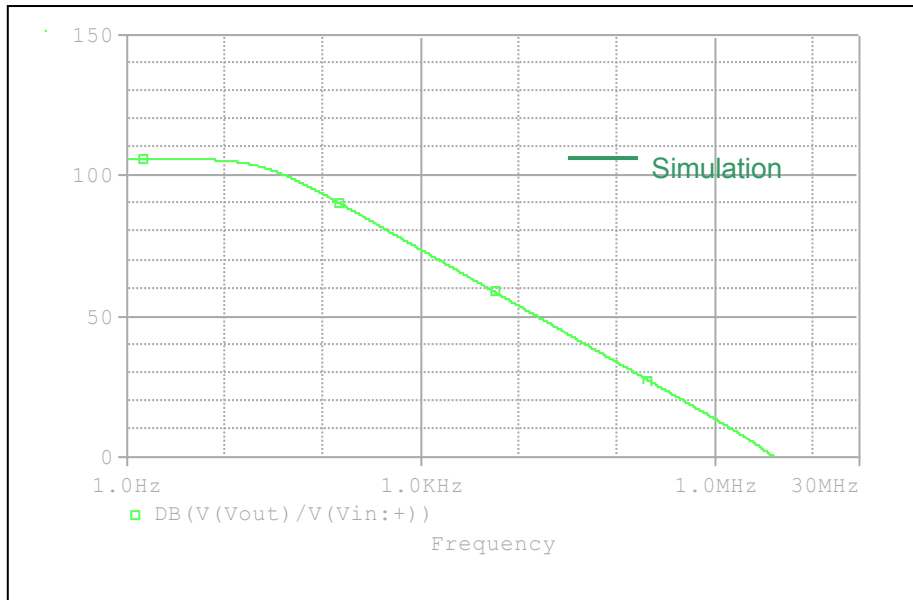


Comparison Table

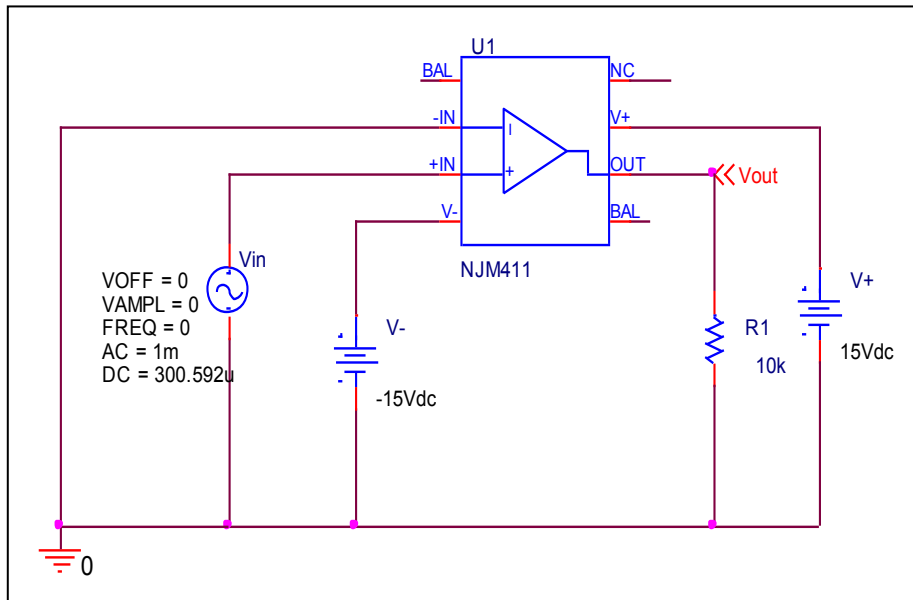
Input offset Voltage	Measurement	Simulation	%Error
V_{os} (mV)	0.3	0.300592	0.197

Open Loop Voltage Gain vs. Frequency

Simulation result



Evaluation Circuit

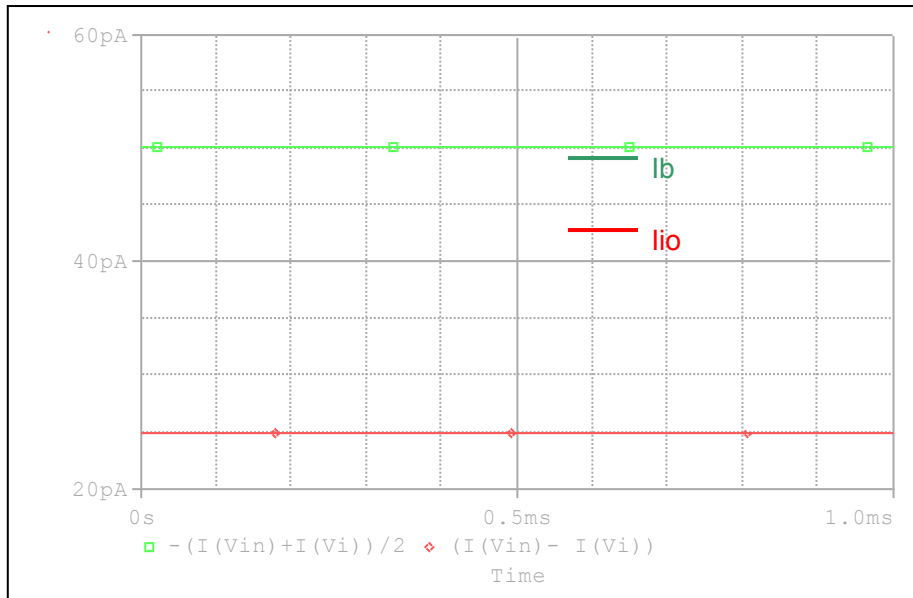


Comparison Table

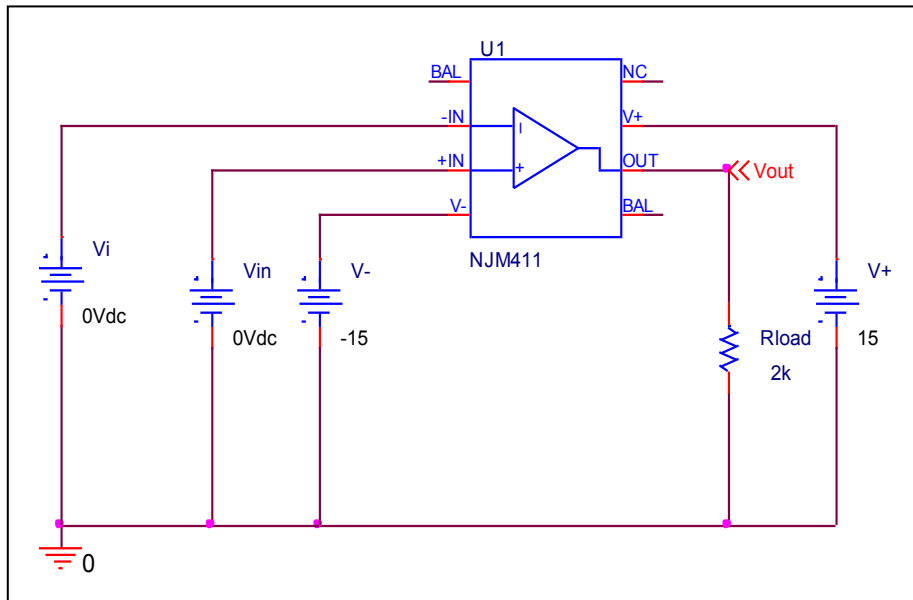
	Measurement	Simulation	% Error
Av (dB)	106	105.994	-0.006
f-0db (MHz)	4	4.0105	0.263

Input Current

Simulation result



Evaluation Circuit

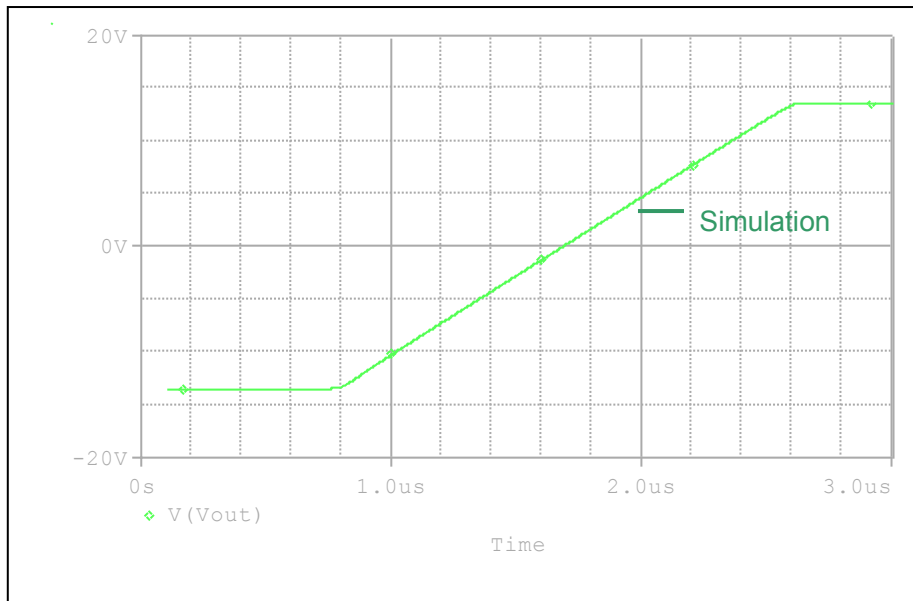


Comparison Table

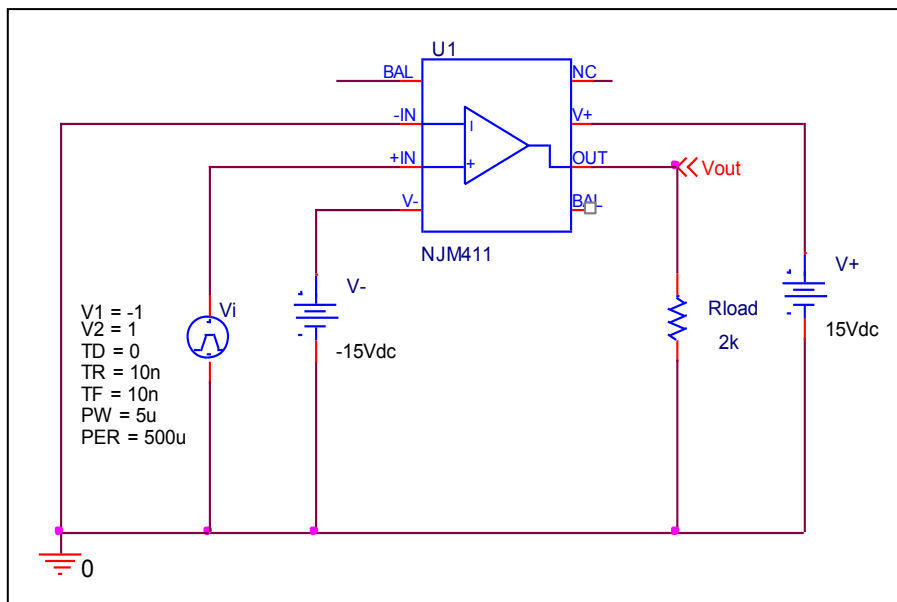
Input Current	Measurement	Simulation	% Error
I_b (pA)	50	50.146	0.292
I_{io} (pA)	25	25	0

Slew Rate

Simulation result



Evaluation Circuit



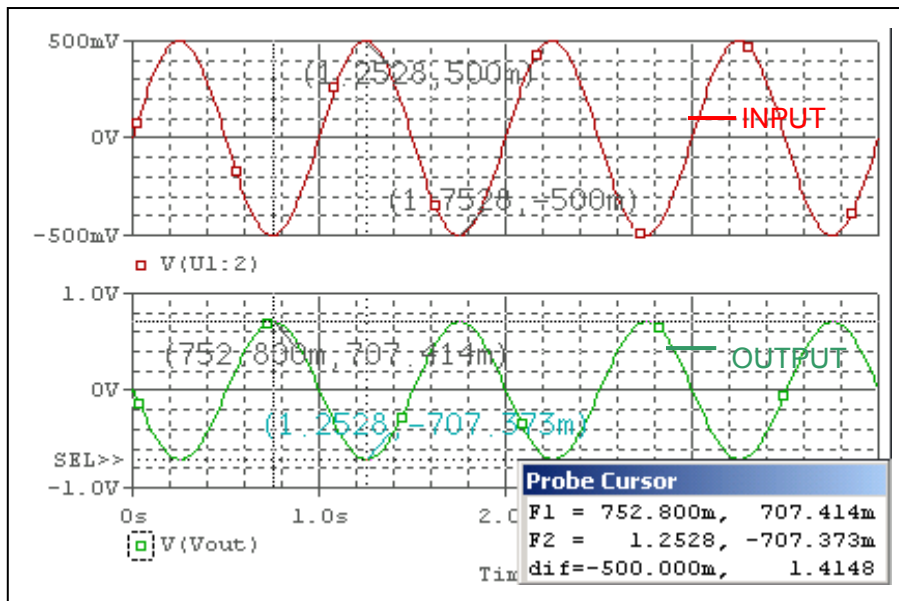
Comparison Table

Slew Rate	Measurement	Simulation	%Error
SR (V/us)	15	14.909	-0.607

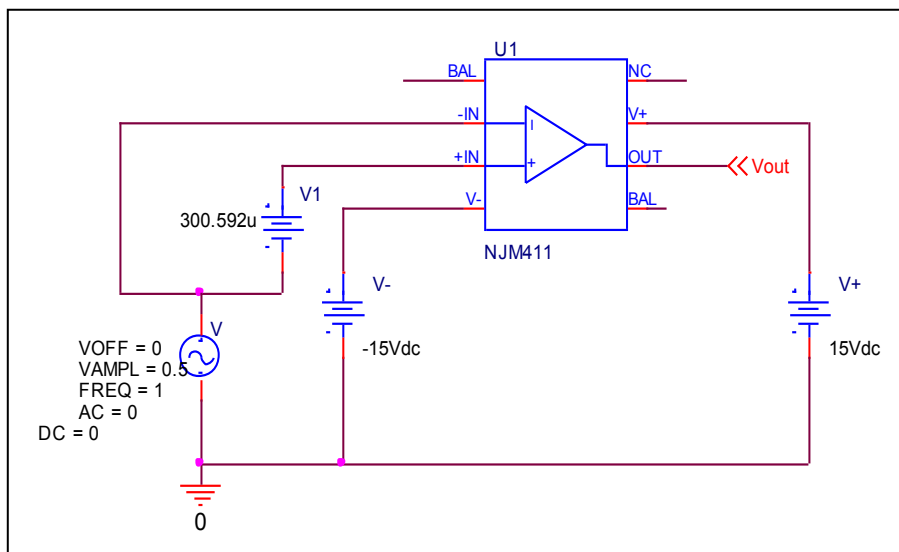
Co

Common-Mode Rejection Ratio

Simulation result



Evaluation Circuit



$$\begin{aligned} \text{CMRR} &= \text{AV}/\text{ACM} \\ &= 199388/(1.4148/1) \end{aligned}$$

Comparison Table

	Measurement	Simulation	% Error
CMRR (dB)	100	102.98	2.98