

# Device Modeling Report

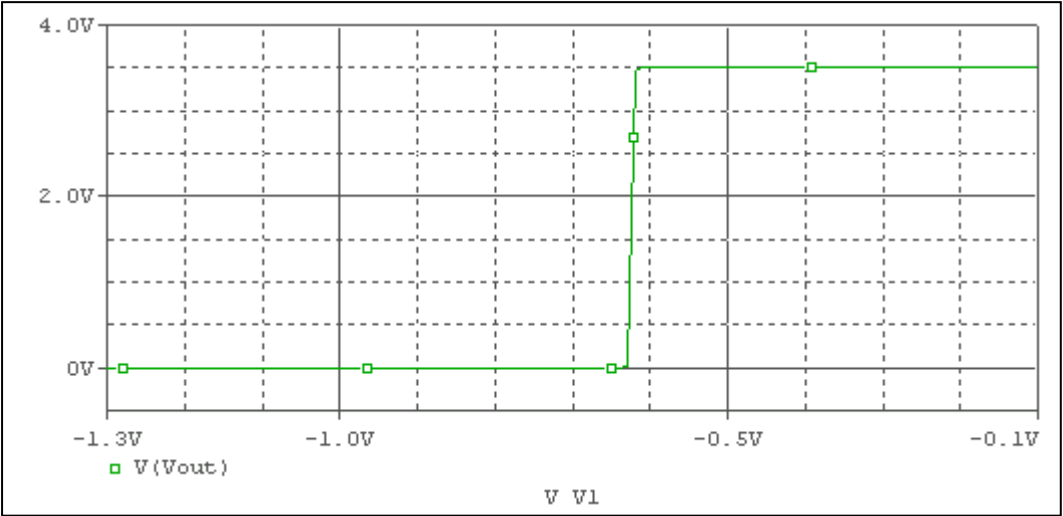
COMPONENTS:MOSFET: OPERATIONAL AMPLIFIER  
PART NUMBER:NJM12902  
MANUFACTURER: NEW JAPAN RADIO CO.,LTD



Bee Technologies Inc.

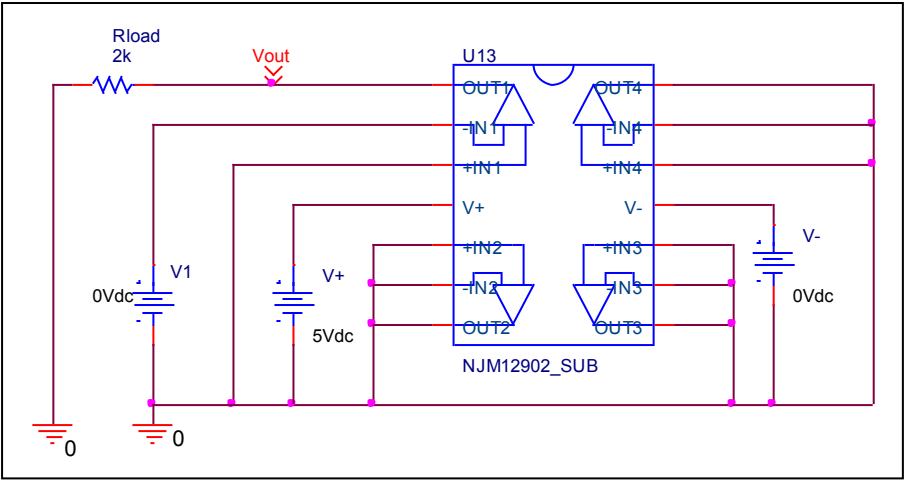
# Output Voltage Swing, +Vout and –Vout

## Simulation result



These simulation results are compared with  $\pm V_{out}$

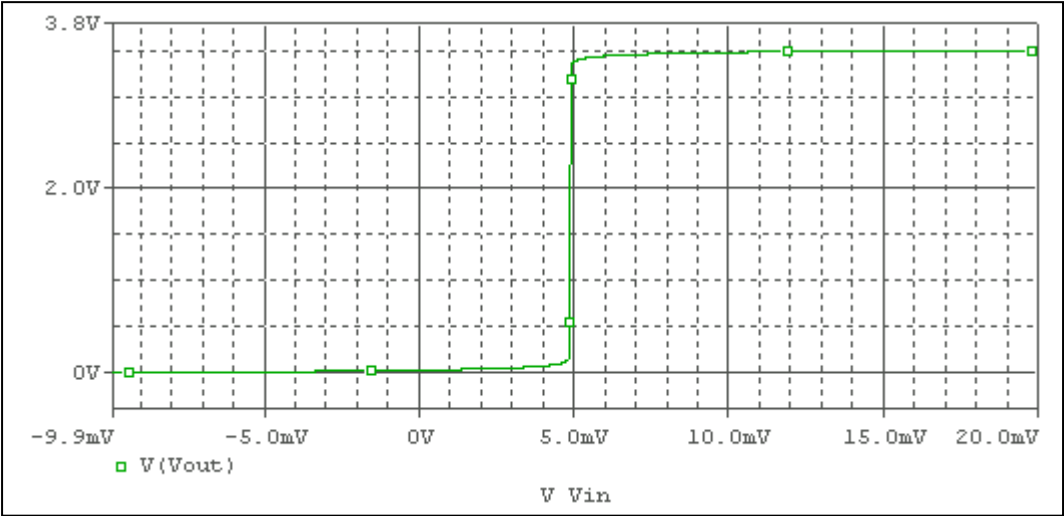
## Evaluation circuit



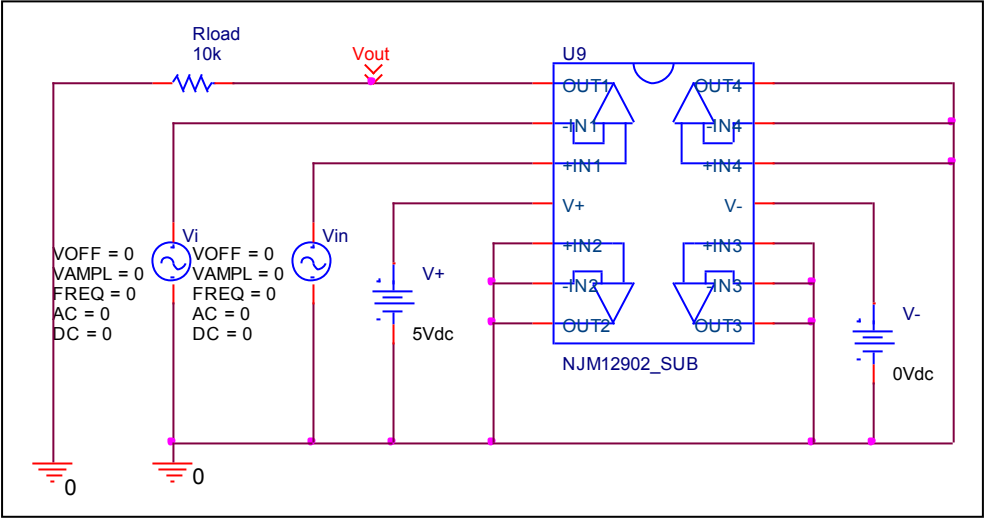
| Output Voltage Swing | Data sheet | Simulation | %Error |
|----------------------|------------|------------|--------|
| +Vout(V)             | 3.5        | 3.499      | 0.028  |

# Input Offset Voltage

## Simulation result



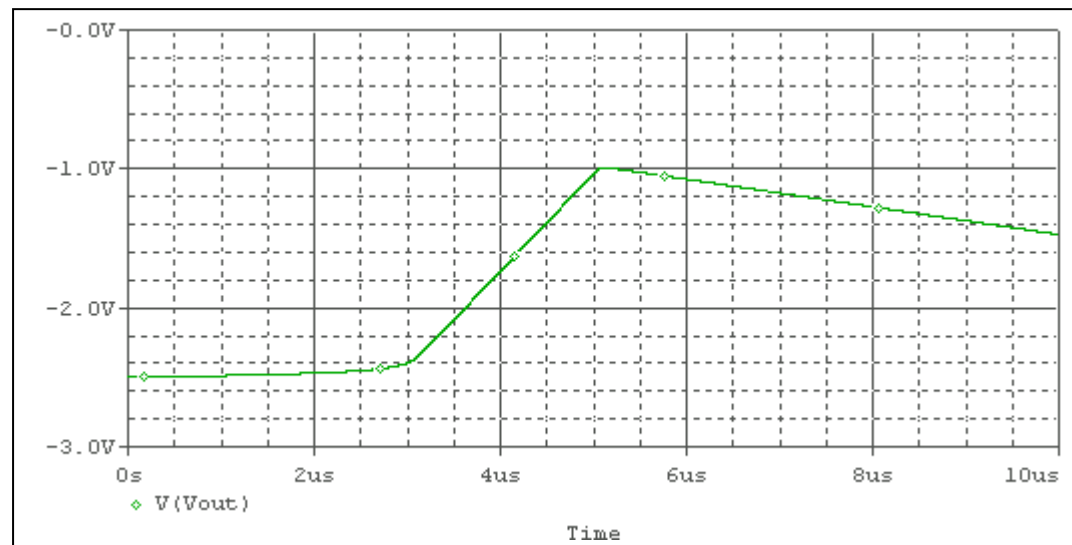
## Evaluation circuit



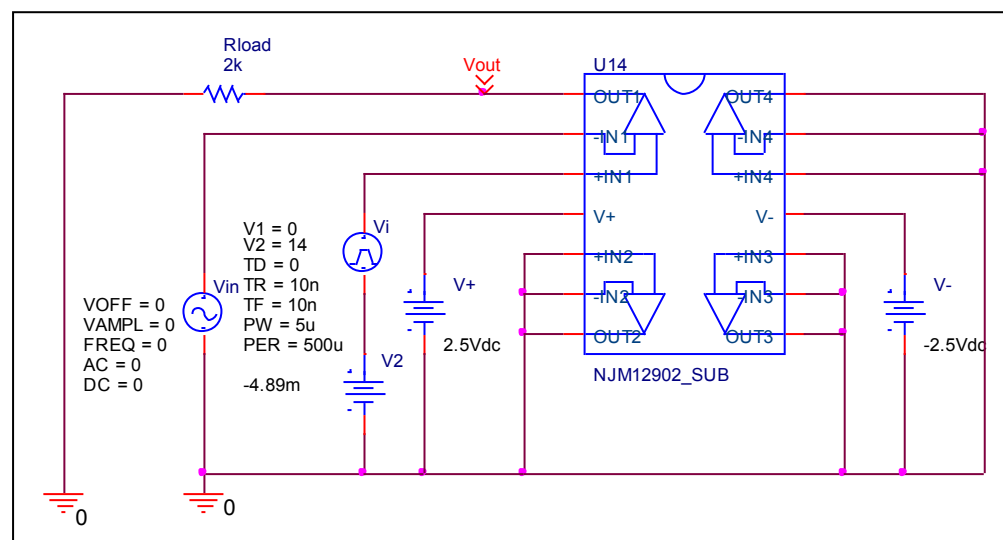
| Vos | Measurement |    | Simulation |    | Error |   |
|-----|-------------|----|------------|----|-------|---|
|     | 5           | mV | 4.89       | mV | 2.2   | % |

## Slew Rate, +SR, -SR

### Simulation result



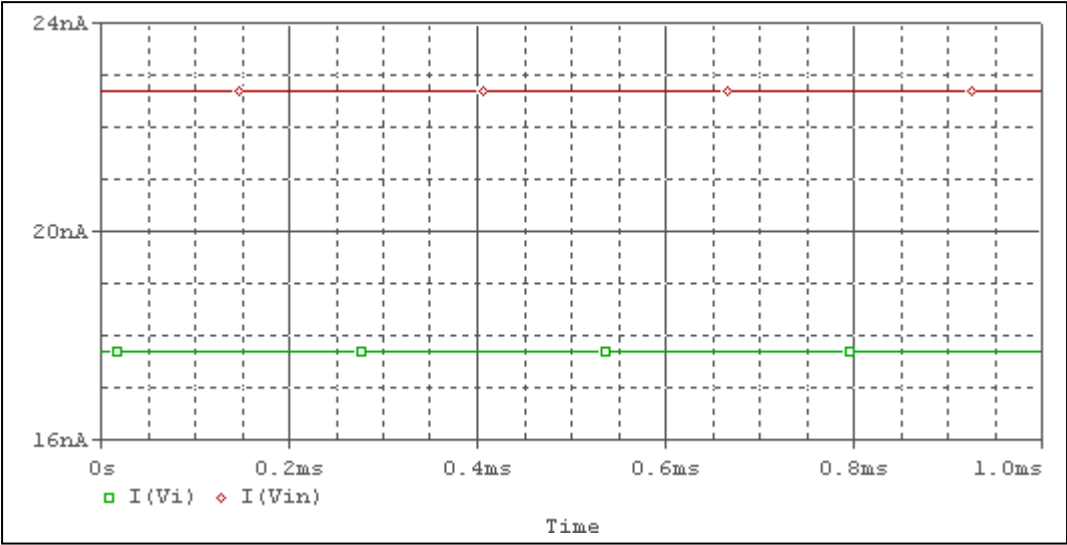
## Evaluation circuit



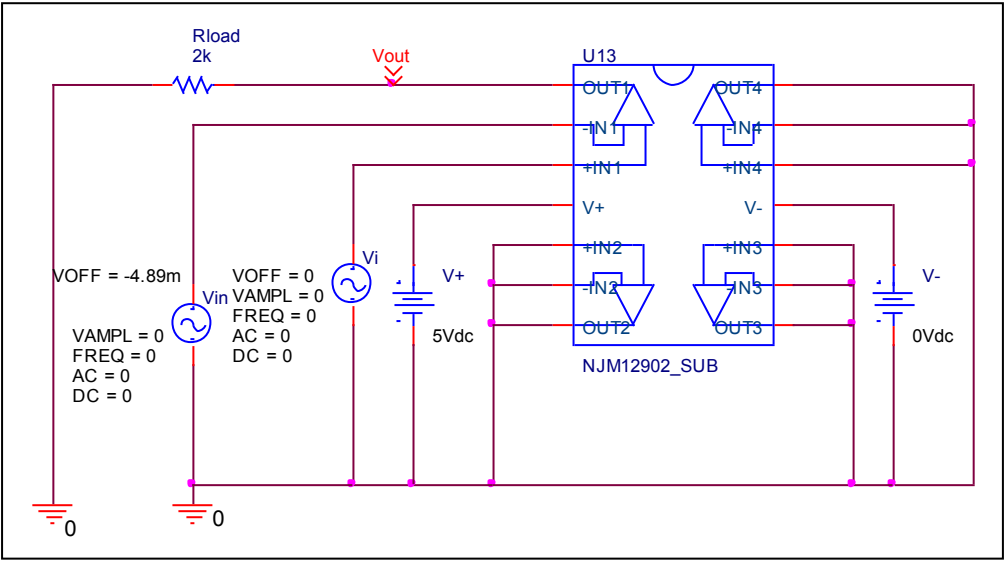
|                        |                   |                   |               |
|------------------------|-------------------|-------------------|---------------|
| <b>Slew Rate(v/us)</b> | <b>Data sheet</b> | <b>Simulation</b> | <b>%Error</b> |
|                        | 0.7V/us           | 0.7V/us           | 0             |

# Input current Ib, Ibos

## Simulation result



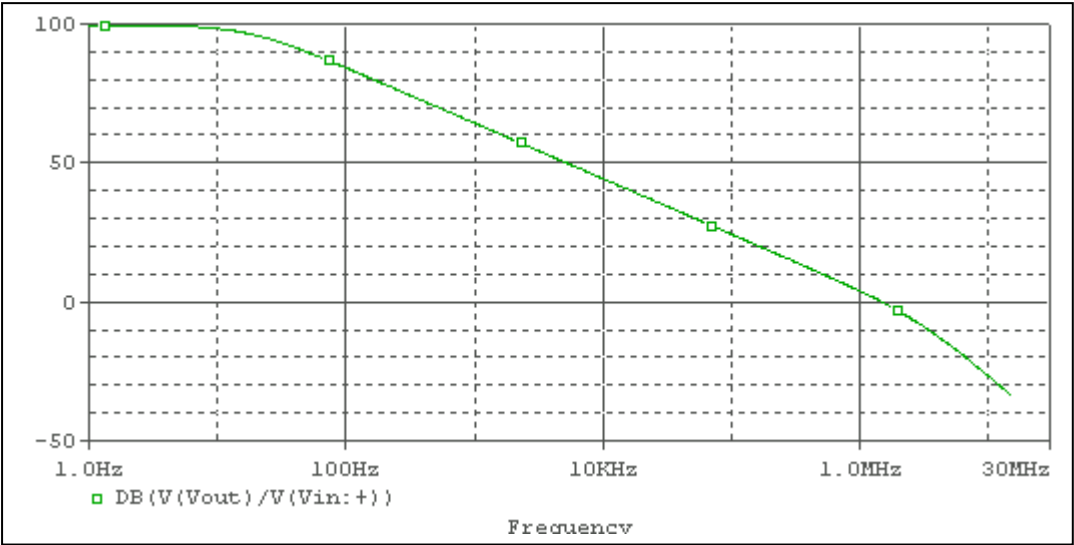
## Evaluation circuit



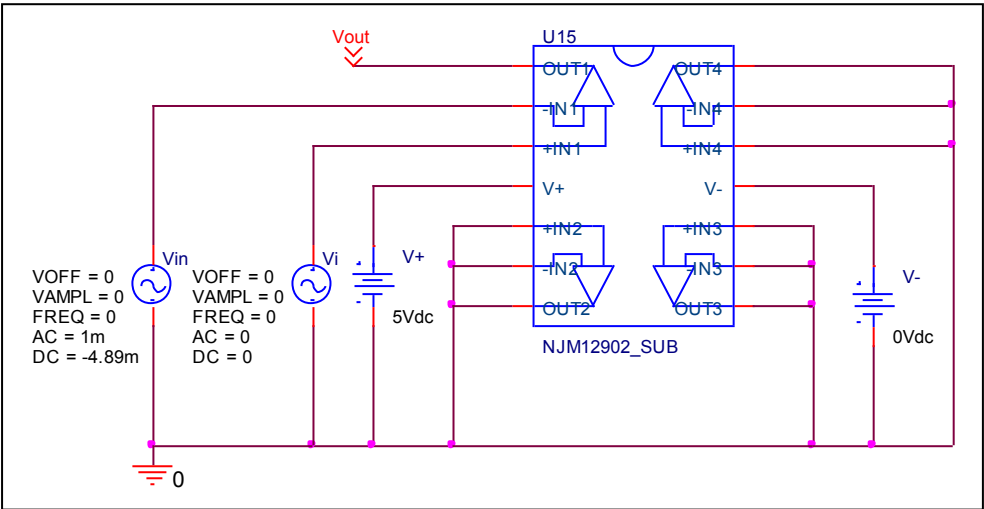
|          | Data sheet | Simulation | %Error |
|----------|------------|------------|--------|
| Ib(nA)   | 20         | 20.1       | 0.5    |
| Ibos(nA) | 5          | 4.98       | 0.4    |

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

## Simulation result



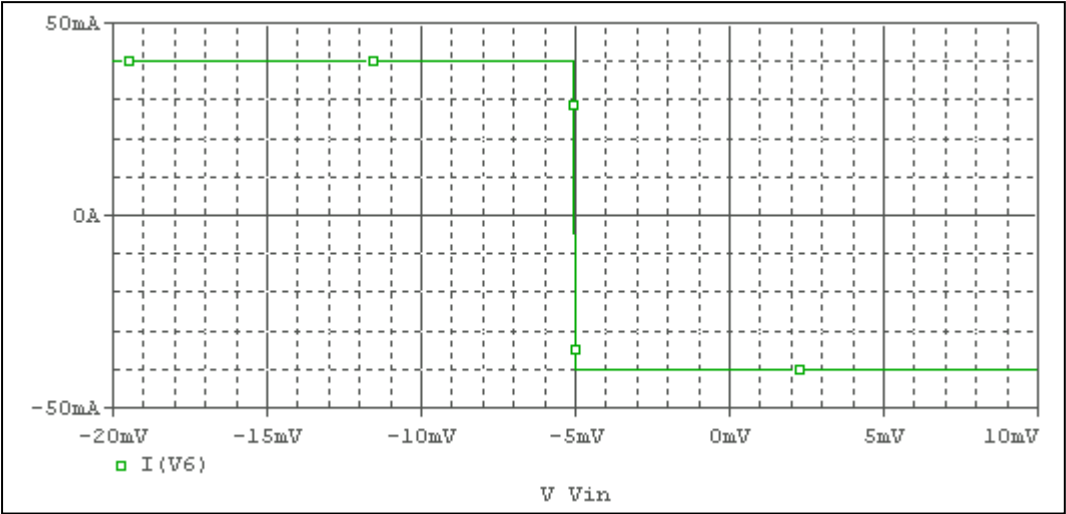
## Evaluation circuit



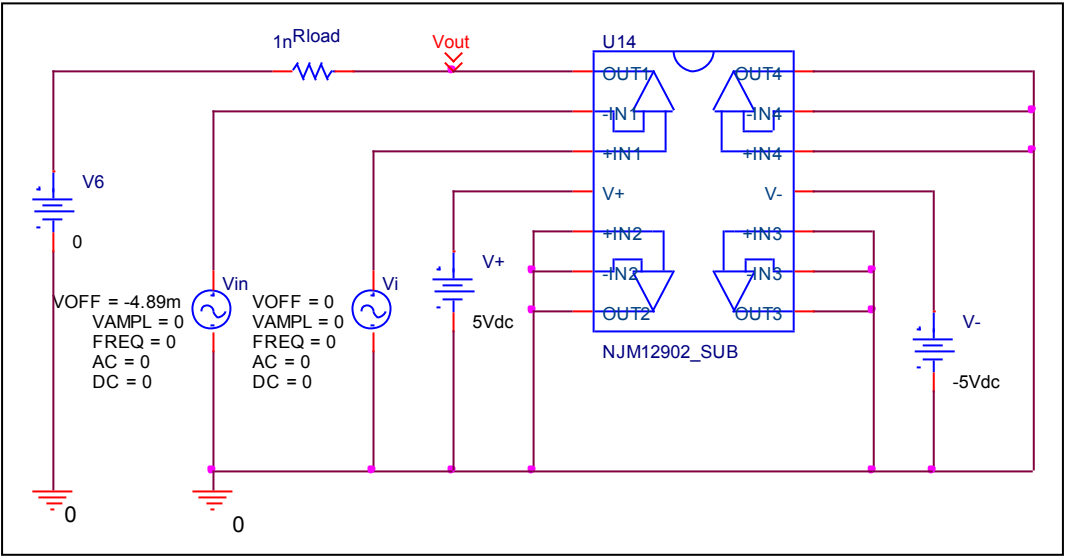
|            | Data sheet | Simulation | %Error |
|------------|------------|------------|--------|
| f-0dB(MHz) | 1.5        | 1.48       | 1.33   |
| Av-dc(dB)  | 100        | 99.57      | 0.43   |

# Output Short Circuit Current - Ios

## Simulation result



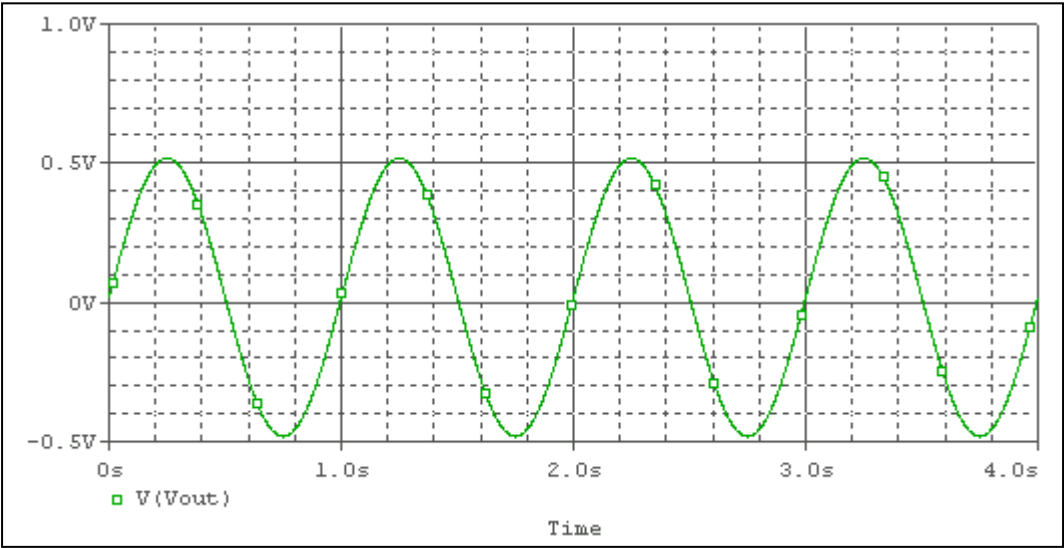
## Evaluation circuit



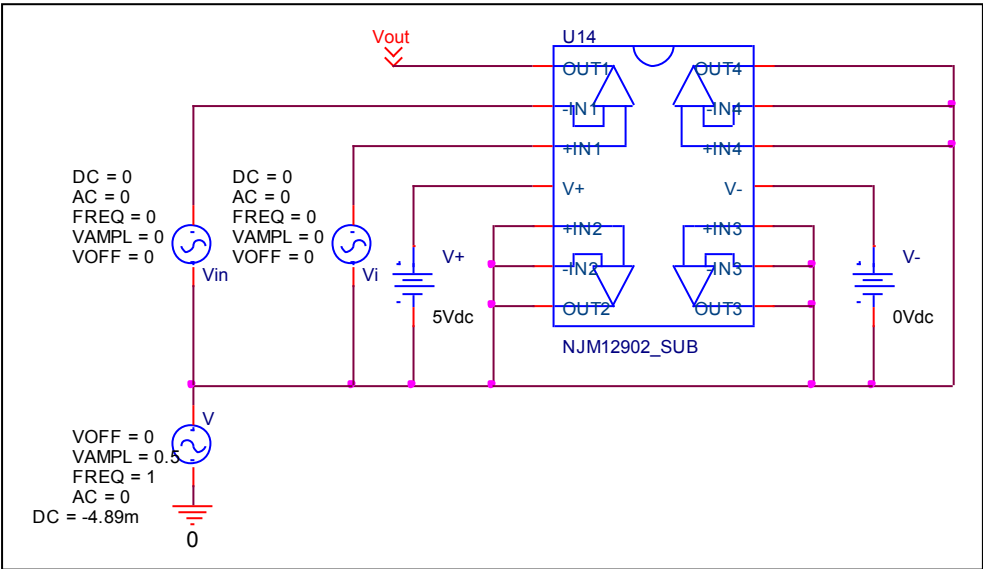
| Short Circuit Current | Data sheet | Simulation | %Error |
|-----------------------|------------|------------|--------|
|                       | 40mA       | 40.04mA    | 0.1    |

# Common-Mode Rejection Voltage gain

## Simulation result



## Evaluation circuit



Common mode gain=5.6236/1

Common Mode Reject Ratio=95169/5.6236=16923

| CMRR(dB) | Data sheet | Simulation | %Error |
|----------|------------|------------|--------|
|          | 85         | 84.56      | 0.517  |