# Device Modeling Report

COMPONENTS: 1000V High Voltage Monitor IC

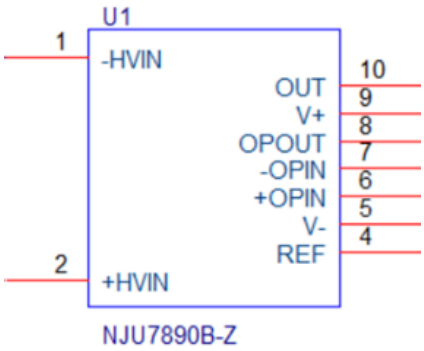
PART NUMBER: NJU7890B-Z

MANUFACTURER: NEW JAPAN RADIO CO., LTD

Version :1

新日本無線株式會社

## Spice Model




3, 11pin (COM) are omitted in the PSpice model. Please connect 3, 11pin(COM) to the lowest voltage (V-) in the actual circuit.

```
*$
*PART NUMBER:NJU7890B-Z
*1000V High Voltage Monitor IC
*Version:1
*3, 11pin (COM) are omitted in the PSpice model.
*Please connect 3,  11pin(COM) to the lowest voltage (V-) in the actual circuit.
*Please note that the inaccuracy is involved to it when you use this model.
*Please refrain from the model's resale.
**********************************************
*Model Generated by NEW JAPAN RADIO CO.,LTD*
*                  All Rights Reserved                  *
*     Commercial Use or Resale Restricted       *
**********************************************
.Subckt NJU7890B-Z -HVIN +HVIN REF V- +OPIN -OPIN OPOUT V+ OUT
X_U1 P10 P00 V+ V- OUT opamp
X_U2 +OPIN -OPIN V+ V- OPOUT opamp
C00 OUT P00 {C0}
R00 OUT P00 {R0}
C01 P00 V- {CP}
R01 P00 P01 {RP}
C02 P01 V- {CP}
R02 P01 P02 {RP}
C03 P02 V- {CP}
R03 P02 P03 {RP}
C04 P03 V- {CP}
R04 P03 P04 {RP}
C05 P04 V- {CP}
R05 P04 P05 {RP}
C06 P05 V- {CP}
R06 P05 -HVIN {RP}
C10 V- P10 {C0}
R10 REF P10 {R0}
C11 P10 V- {CP}
R11 P10 P11 {RP}
C12 P11 V- {CP}
R12 P11 P12 {RP}
C13 P12 V- {CP}
R13 P12 P13 {RP}
C14 P13 V- {CP}
R14 P13 P14 {RP}
C15 P14 V- {CP}
R15 P14 P15 {RP}
C16 P15 V- {CP}
R16 P15 +HVIN {RP}
```

```
.PARAM
+ C0= 12E-12
+ R0= 115.71429E+3
+ CP= 1.0E-12
+ RP= 6E+6
.ends NJU7890B-Z
*$
* connections:              non-inverting input
*                           | inverting input
*                           | | positive power supply
*                           | | | negative power supply
*                           | | | | output
*                           | | | | |
.subckt opamp          1 2 3 4 5
C1 11 12 {C1}
C2 15 16 {C2}
CS 13 0 {CS}
D1 16 17 DMOD1
D2 17 16 DMOD1
D3 5 18 DMOD2
D4 19 5 DMOD2
D5 10 20 DMOD2
VTL 3 20 {VTL}
GB 16 0 15 0 {GB}
GA 15 0 11 12 {GA}
GC 0 17 5 0 {GC}
GCM 0 15 10 0 {GCM}
ITL 3 10 {ITL}
M1 11 2 13 13 PMOS1
M2 12 NET1 14 14 PMOS2
RO1 16 5 {RO1}
RC 17 0 {RC}
RO2 16 0 {RO2}
R2 15 0 100E3
RD1 11 21 {RD1}
RD2 12 22 {RD2}
VRD1 21 4 {VRD}
VRD2 22 4 {VRD}
RS2 10 14 {RS2}
RS1 10 13 {RS1}
IDS 3 4 {IDS}
RP 3 4 {RP}
Vos 1 NET1 DC {VOS}
VS 19 4 DC {VS}
VD 3 18 DC {VD}
.MODEL DMOD1 D(T_MEASURED= 25 IS= 4.65E-56)
.MODEL DMOD2 D(T_MEASURED= 25 IS= 8.00E-16)
.MODEL PMOS1 PMOS(LEVEL=1 VTO= -4.89E-01
+ KP= 4.01E-05 L={L_VAL} W={W_VAL} TOX=1.30E-08 U0= 1.51E+02)
.MODEL PMOS2 PMOS(LEVEL=1 VTO=        -4.89E-01
+ KP= 4.01E-05 L={L_VAL} W={W_VAL} TOX=1.30E-08 U0= 1.51E+02)
*
.PARAM
+ C1= 5.3E-11
+ C2= 1.60E-10
+ CS= 0.00E+00
+ GCM= 4.77E-08
+ GA= 1.51E-03
+ GB= 843.66
+ GC= 192835.2031
+ ITL= 8.00E-05
+ RS= 2.50E+06
+ RD1= 663.15
+ RD2= 663.15
+ RC= 5.19E-06
+ RS1= 38.79
+ RS2= 38.79
```

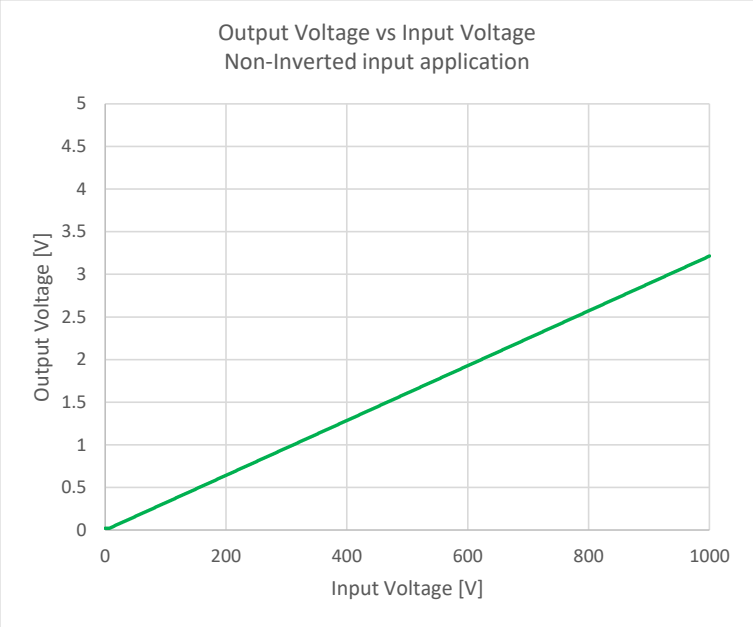
```
+ RO1= 50
+ RO2= 25
+ RP= 2.33E+04
+ VD= 0.828299
+ VS= 0.8282495
+ VOS= -76.81337E-06
+ IDS= 1.0E-3
+ VTL= 8.91E-01
+ VRD= 2.50E-01
+ L_VAL= 0.50E-06
+ W_VAL= 0.40E-03
.ends opamp
*$
```

MOSFET MODEL

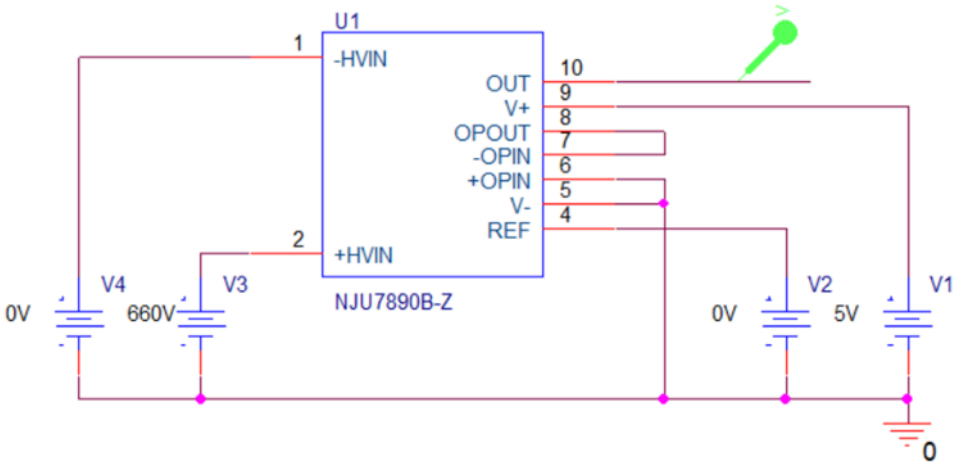
| Pspice model parameter | Model Description |
|---|---|
| T_MEASURED | Measured temperature |
| IS | Bulk Junction Saturation Current |
| VTO | Zero-bias Threshold Voltage |
| KP | Trans conductance |
| L | Channel Length |
| W | Channel Width |
| TOX | Gate Oxide Thickness |
| U0 | Surface Mobility |

Output Voltage vs Input Voltage(Non-Inverted Input)

## Simulation Result

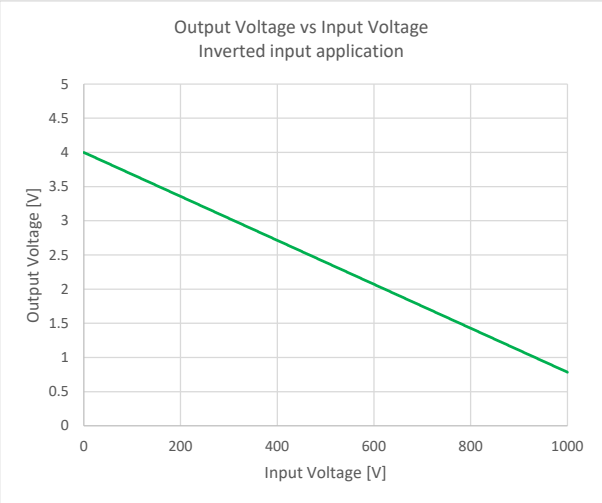


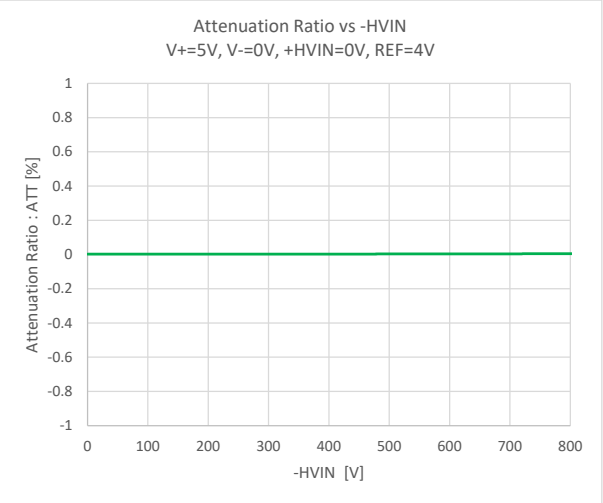

## Evaluation Circuit



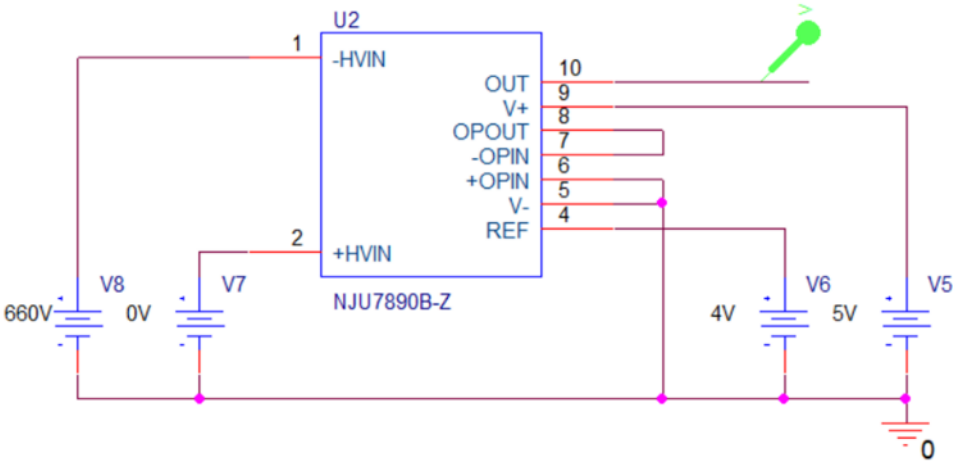
## Output Voltage vs Input Voltage(Inverted Input)

### Simulation Result



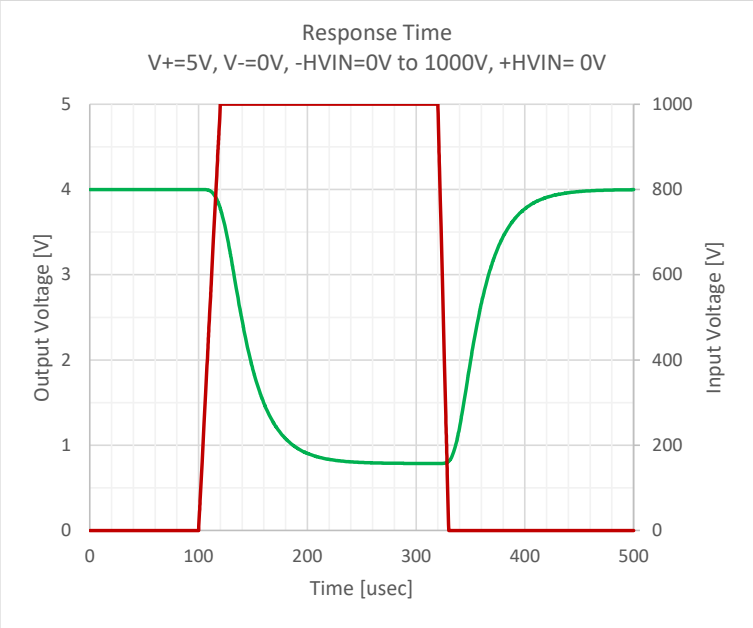




### Evaluation Circuit

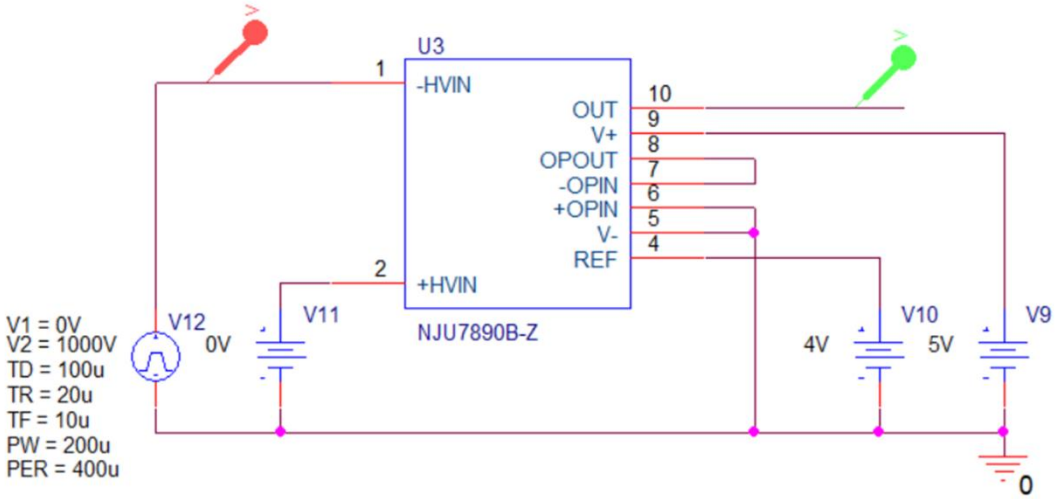


## Response time

### Simulation Result

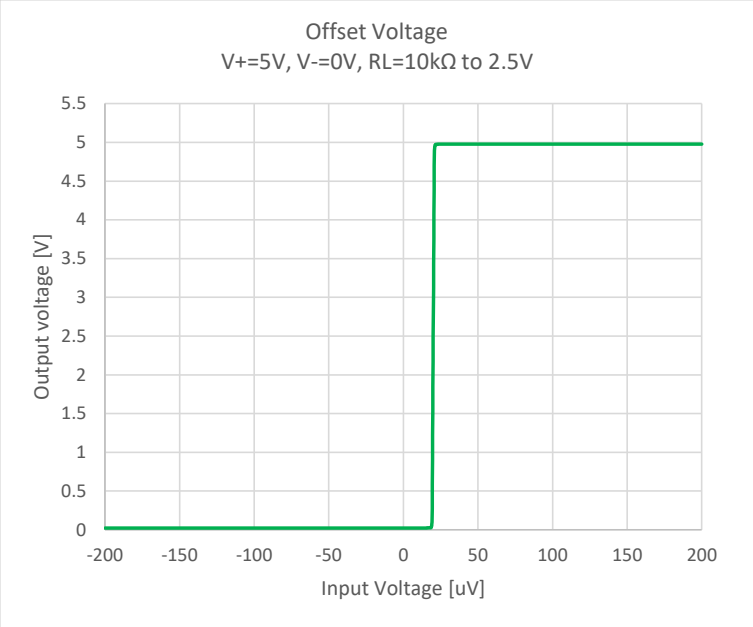



### Evaluation Circuit

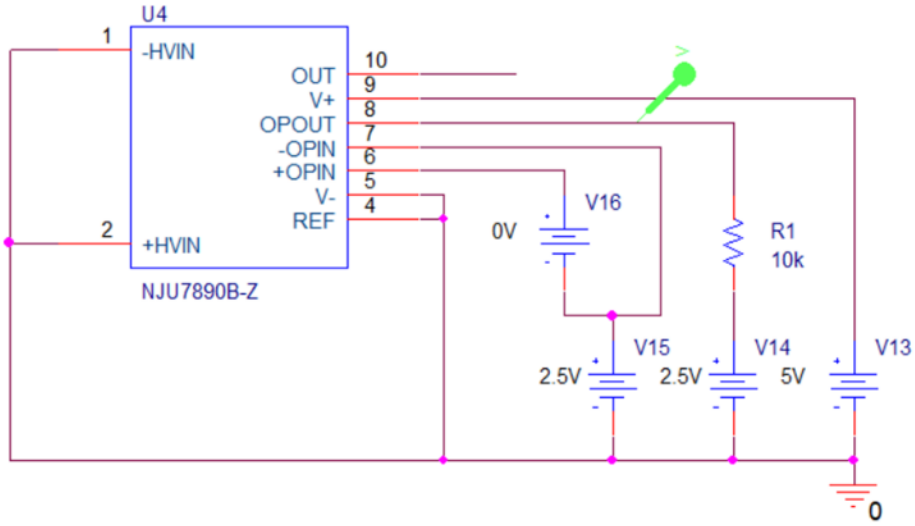


Input Offset Volgate(Opamp)

## Simulation Result

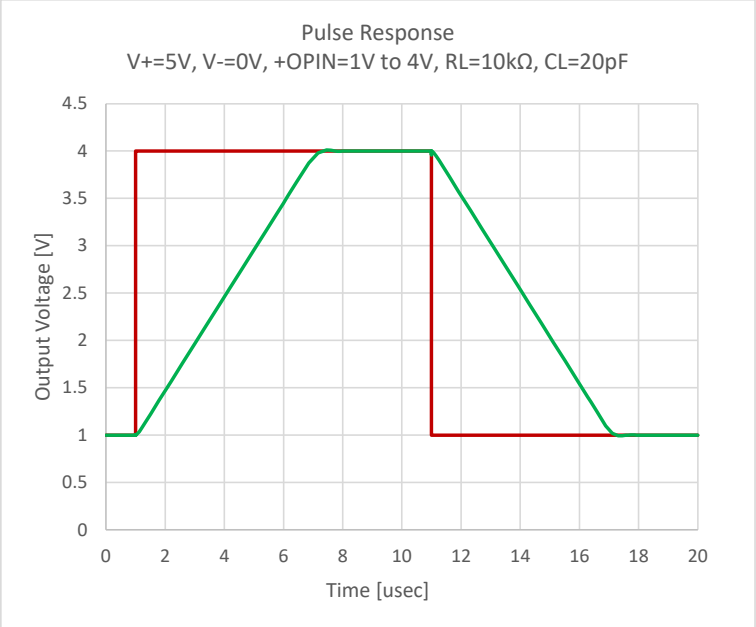



## Evaluation Circuit

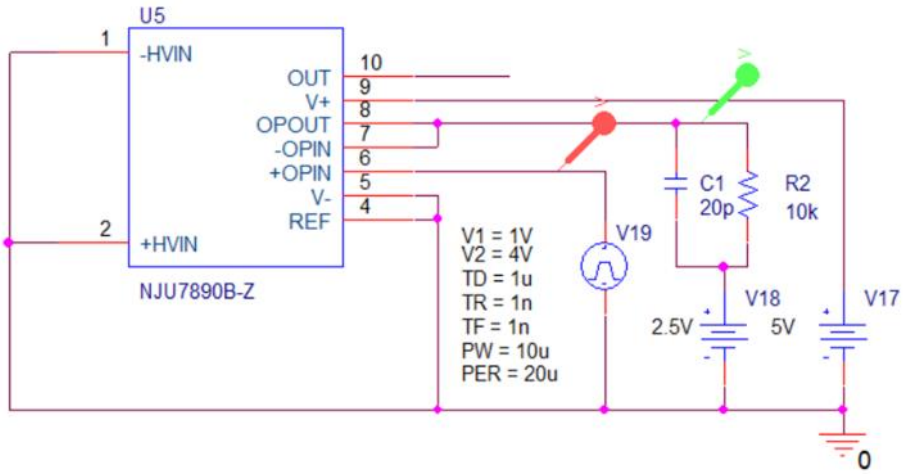


## Pulse Response (Opamp)

### Simulation Result

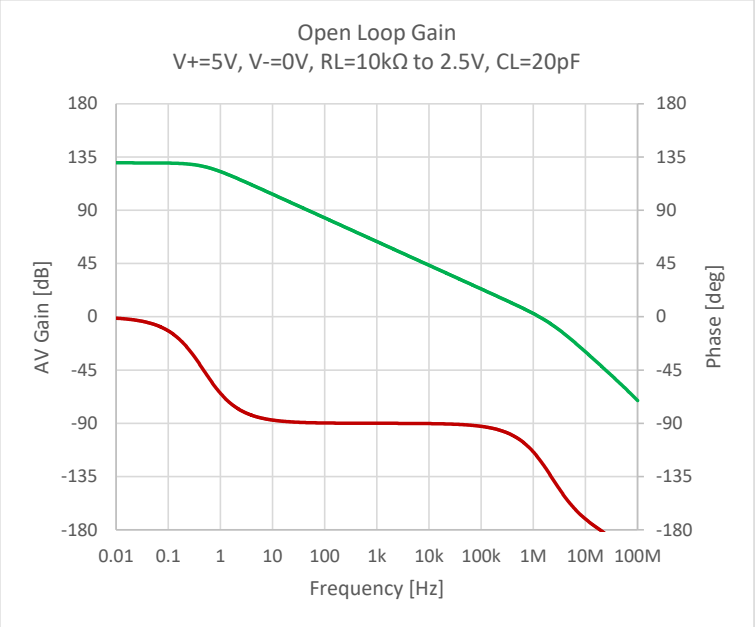



### Evaluation Circuit



## Open Loop Voltage Gain (Opamp)

### Simulation Result




### Evaluation Circuit