# LOW VOLTAGE C-MOS OPERATIONAL AMPLIFIER

## ■ GENERAL DESCRIPTION

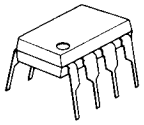
The NJU7001, 02 and 04 are single, dual and quad C-MOS Operational Amplifiers operated on a single-power-supply, low voltage and low operating current.

The minimum operating voltage is 1V and the output stage permits output signals to swing between both of the supply rails.

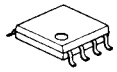
The input bias current is as low as less than 1pA,consequently the very small signal around the ground level can be amplified.

Furthermore, the operating current is also as low as 15μA ( typ ) per circuit, therefore it can be applied especially to battery-operated items.

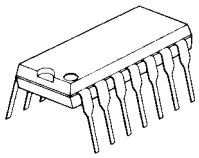
## ■ PACKAGE OUTLINE



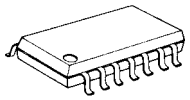
**NJU7001U**
**NJU7002U**



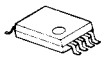
**NJU7001M**
**NJU7002M**



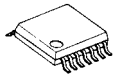
**NJU7004D**



**NJU7004M**



**NJU7001V**

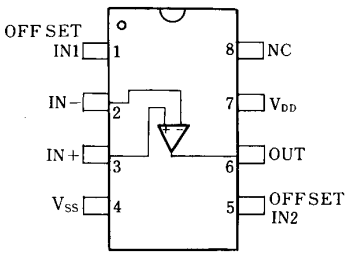


**NJU7004V**

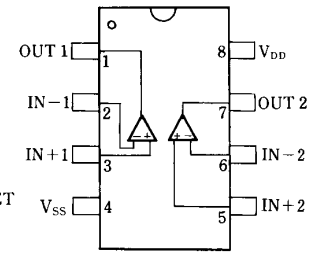
## ■ FEATURES

- Single-Power-Supply
- Wide Operating Voltage ( $V_{DD}$=1~16V )
- Wide Output Swing Range ( $V_{OM}$=2.94V typ.at $V_{DD}$=3V )
- Low Operating Current ( 15μA/circuit )
- Low Bias Current ( $I_{IB}$=1pA )
- Internal Compensation Capacitor
- External Offset Null Adjustment ( Only NJU7001 )
- Package Outline DIP/DMP/SSOP8 ( NJU7001 )
  DIP/DMP8 ( NJU7002 )
  DIP/DMP/SSOP14 ( NJU7004 )
- C-MOS Technology

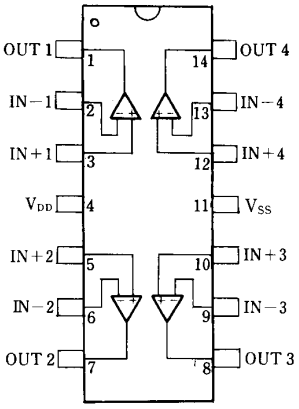
## ■ PIN CONFIGURATION




**NJU7001D**
**NJU7001M**
**NJU7001V**

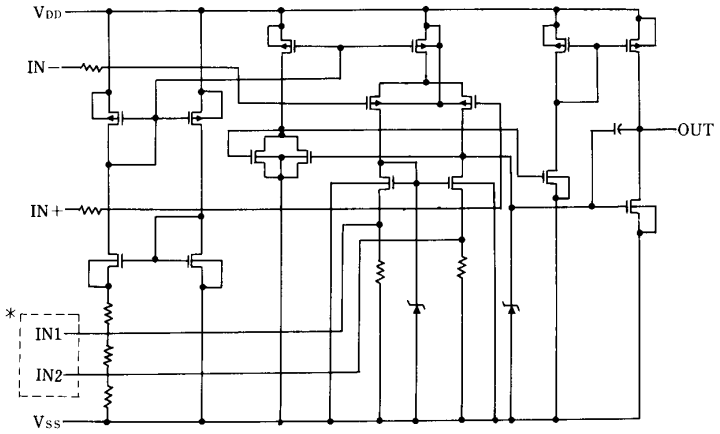



**NJU7002D**
**NJU7002M**




**NJU7004D**
**NJU7004M**
**NJU7004V**

## ■ EQUIVALENT CIRCUIT




*The terminals IN1, IN2 are only for NJU7001 ( NJU7002/7004 don't have these terminals ).

## ■ ABSOLUTE MAXIMUM RATINGS

( Ta=25˚C )

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Supply Voltage | $V_{DD}$ | 18 | V |
| Differential Input Voltage | $V_{ID}$ | ± 18 ( note ) | V |
| Common Mode Input Voltage | $V_{IC}$ | -0.3~+18 | V |
| Power Dissipation | $P_D$ | ( DIP14 ) 700<br>( DIP8 ) 500<br>( DMP8,14 ) 300<br>( SSOP8,14 ) 300 | mW |
| Operating Temperature Range | $T_{opr}$ | -20~+75 | ˚C |
| Storage Temperature Range | $T_{stg}$ | -40~+125 | ˚C |

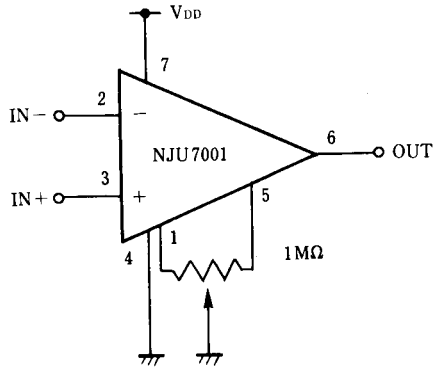
( note ) If the supply voltage ( $V_{DD}$ ) is less than 18V, the input voltage must not over the $V_{DD}$ level though 18V is limit specified.

## ■ ELECTRICAL CHARACTERISTICS

( Ta=25˚C,$V_{DD}$=3V,$R_L$=∞ )

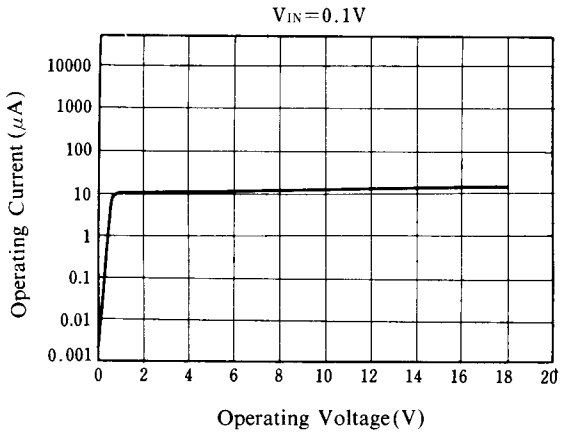
| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Input Offset Voltage | $V_{IO}$ | $R_S$=50Ω | - | - | 10 | mV |
| Input Offset Current | $I_{IO}$ | | - | 1 | - | pA |
| Input Bias Current | $I_{IB}$ | | - | 1 | - | pA |
| Input Impedance | $R_{IN}$ | | - | 1 | - | TΩ |
| Large Signal Voltage Gain | $A_V$ | | 80 | 90 | - | dB |
| Input Common Mode Voltage Range | $V_{ICM}$ | | 0~2 | - | - | V |
| Maximum Output Swing Voltage | $V_{OM}$ | $R_L$=1MΩ | 2.90 | 2.94 | - | V |
| Common Mode Rejection Ratio | CMR | | 60 | 70 | - | dB |
| Supply Voltage Rejection Ratio | SVR | | 60 | 70 | - | dB |
| Operating Current/Circuit | $I_{DD}$ | | - | 15 | 25 | μA |
| Slew Rate | SR | | - | 0.05 | - | V/μs |
| Unity Gain Bandwidth | $F_t$ | $A_V$=40dB,$C_L$=10pF | - | 0.1 | - | MHz |

## ■ OFFSET ADJUSTMENT CIRCUIT ( Only for NJU7001 )

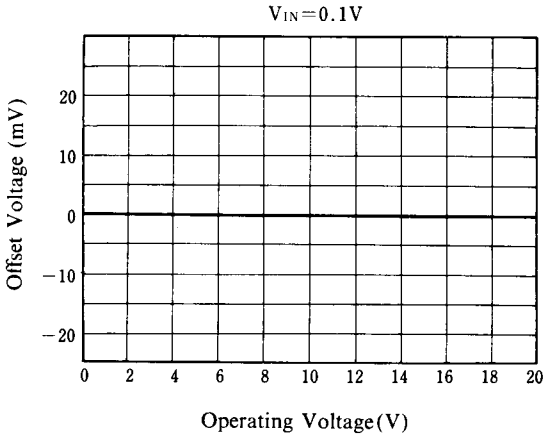


## ■ TYPICAL CHARACTERISTICS

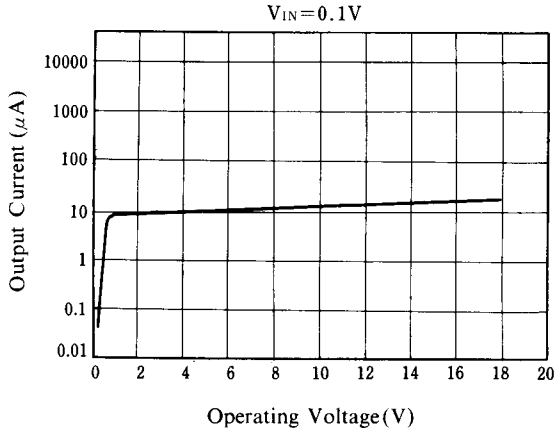
**Operating Current vs. Operating Voltage**



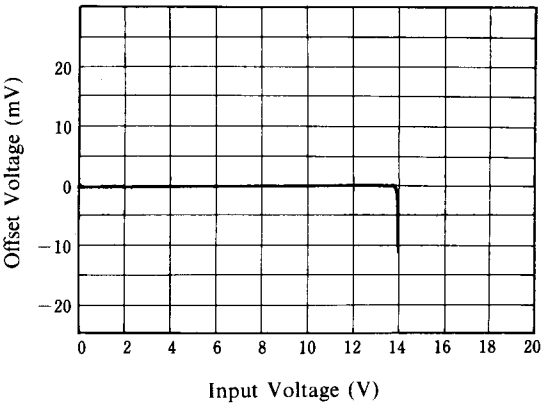

**Offset Voltage vs. Operating Voltage**



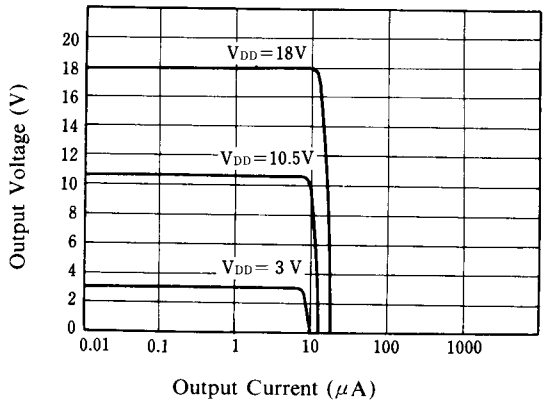

**Output Current vs. Operating Voltage**



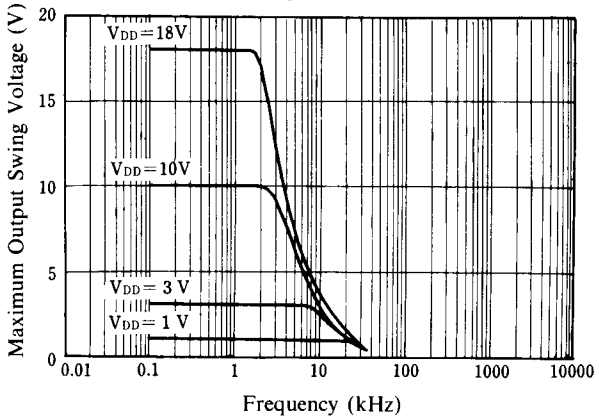

**Offset Voltage vs. Input Voltage**




**Output Voltage vs. Output Current**

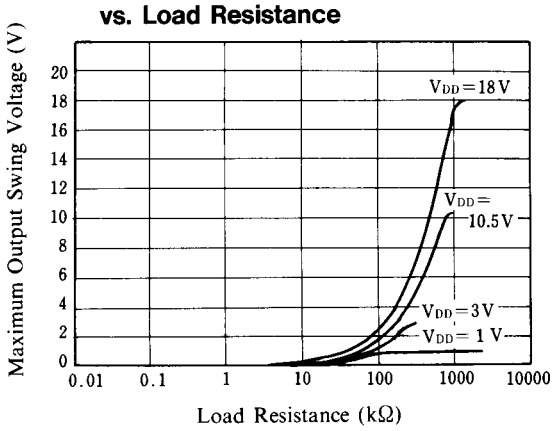



**Maximum Output Swing Voltage vs. Frequency**

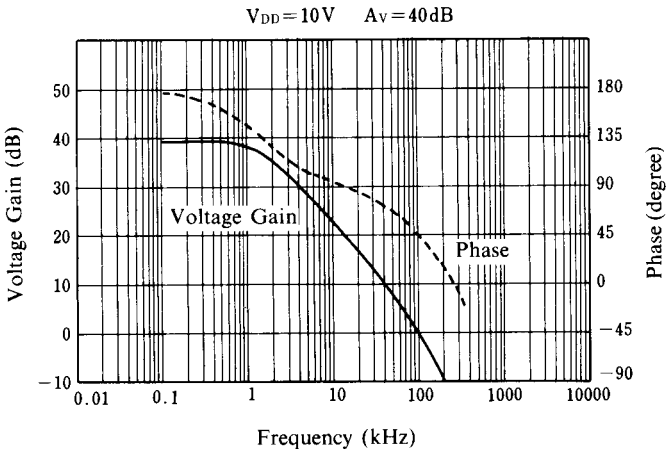


## ■ TYPICAL CHARACTERISTICS

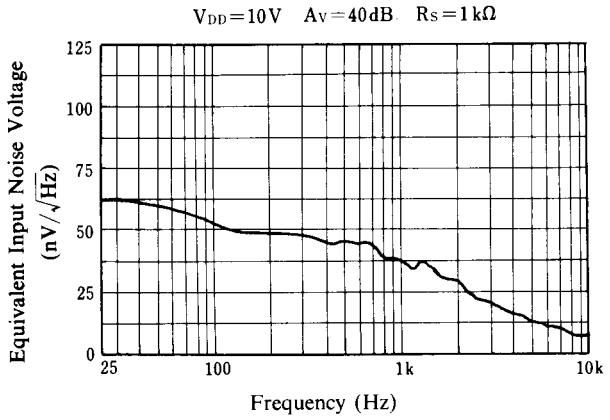
**Maximum Output Swing Voltage vs. Load Resistance**




**Voltage Gain · Phase vs. Frequency**




**Equivalent Input Noise Voltage vs. Frequency**




[CAUTION]
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