

## 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.

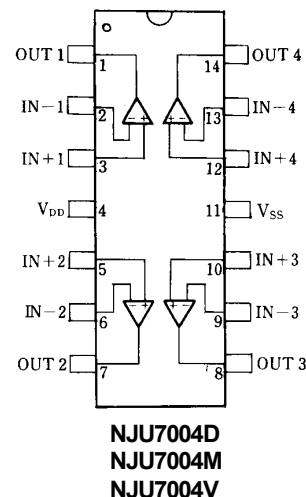
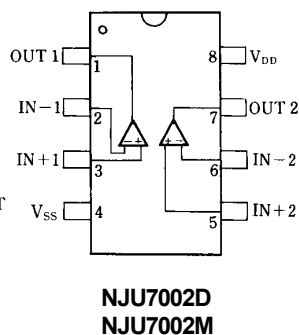
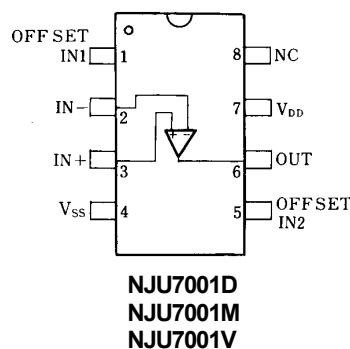
The input bias current is as low as less than 1pA, consequently the very small signal around the ground level can be amplified.

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

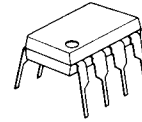
### ■ FEATURES

- Single-Power-Supply
- Wide Operating Voltage (  $V_{DD}=1\sim 16V$  )
- Wide Output Swing Range (  $V_{OM}=2.94V$  typ.at  $V_{DD}=3V$  )
- Low Operating Current (  $15\mu A/circuit$  )
- Low Bias Current (  $I_B=1pA$  )
- 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



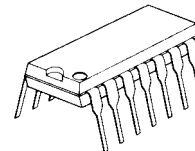
### ■ PACKAGE OUTLINE



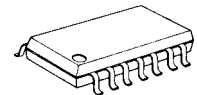
**NJU7001U  
NJU7002U**



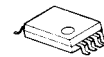
**NJU7001M  
NJU7002M**



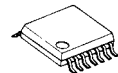
**NJU7004D**



**NJU7004M**

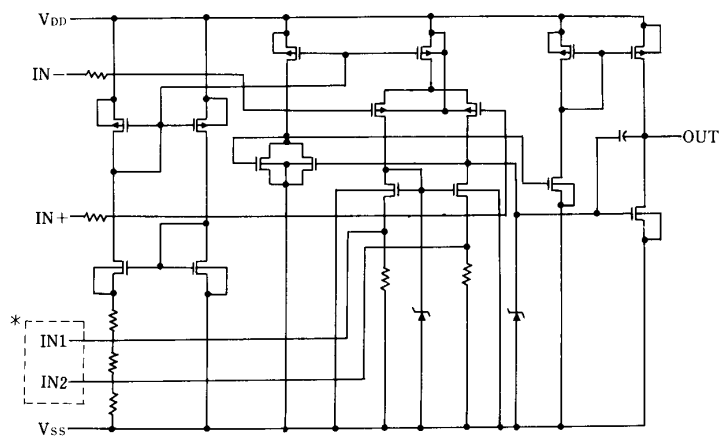


**NJU7001V**



**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	$V_{ID}$	$\pm 18$ ( note )	V
Common Mode Input Voltage	$V_{IC}$	-0.3~+18	V
Power Dissipation	$P_D$	( DIP14 ) 700 ( DIP8 ) 500 ( DMP8,14 ) 300 ( SSOP8,14 ) 300	mW
Operating Temperature Range	$T_{opr}$	-20~+75	°C
Storage Temperature Range	$T_{stg}$	-40~+125	°C

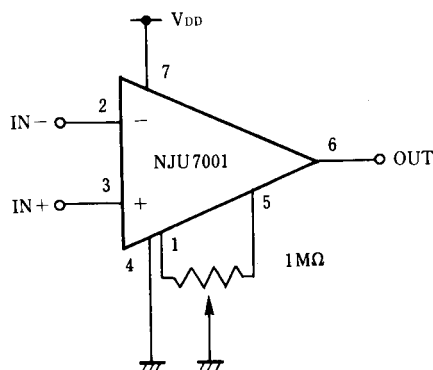
( note ) If the supply voltage (  $V_{DD}$  ) is less than 18V, the input voltage must not over the  $V_{DD}$  level though 18V is limit specified.

## ■ ELECTRICAL CHARACTERISTICS

( Ta=25°C,  $V_{DD}=3V, R_L=\infty$  )

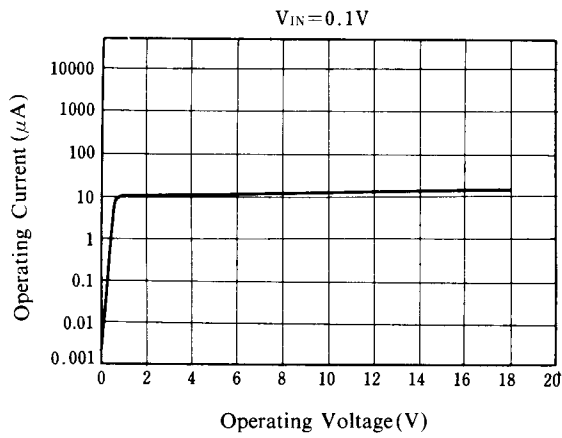
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	$V_{IO}$	$R_S=50\Omega$	-	-	10	mV
Input Offset Current	$I_{IO}$		-	1	-	pA
Input Bias Current	$I_{IB}$		-	1	-	pA
Input Impedance	$R_{IN}$		-	1	-	TΩ
Large Signal Voltage Gain	$A_V$		80	90	-	dB
Input Common Mode Voltage Range	$V_{ICM}$		0~2	-	-	V
Maximum Output Swing Voltage	$V_{OM}$	$R_L=1M\Omega$	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	$\mu A$
Slew Rate	SR		-	0.05	-	V/ $\mu s$
Unity Gain Bandwidth	$F_t$	$A_V=40dB, C_L=10pF$	-	0.1	-	MHz

## ■ OFFSET ADJUSTMENT CIRCUIT ( Only for NJU7001 )

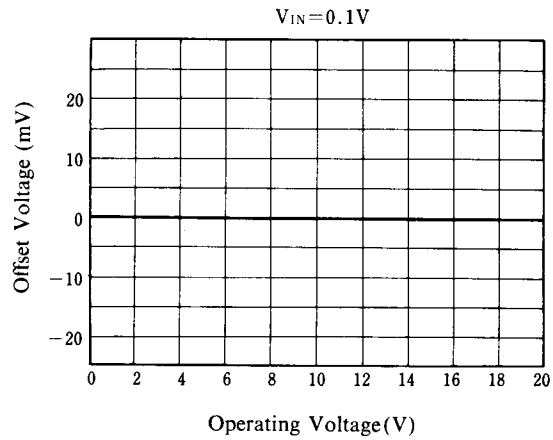


## ■ TYPICAL CHARACTERISTICS

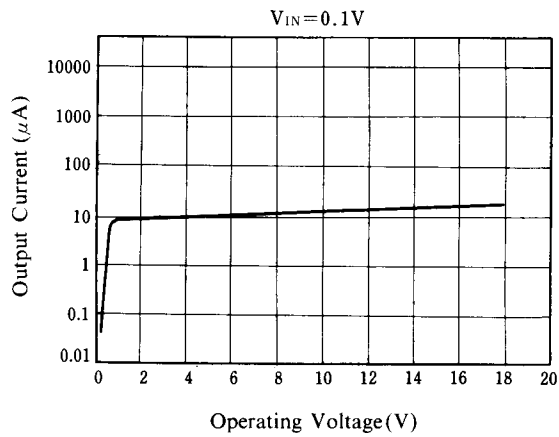
**Operating Current vs. Operating Voltage**



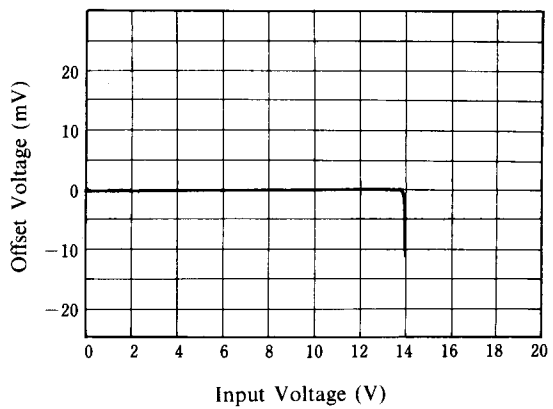
**Offset Voltage vs. Operating Voltage**



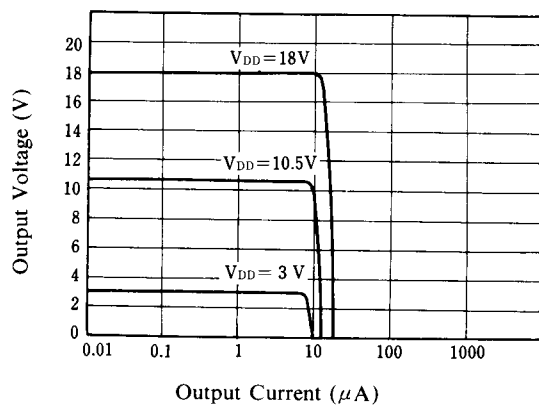
**Output Current vs. Operating Voltage**



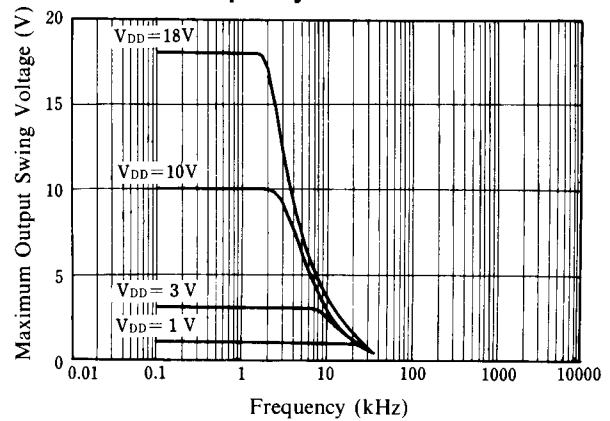
**Offset Voltage vs. Input Voltage**



**Output Voltage vs. Output Current**

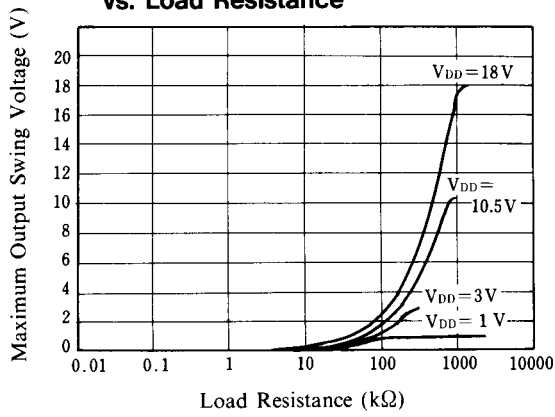


**Maximum Output Swing Voltage vs. Frequency**

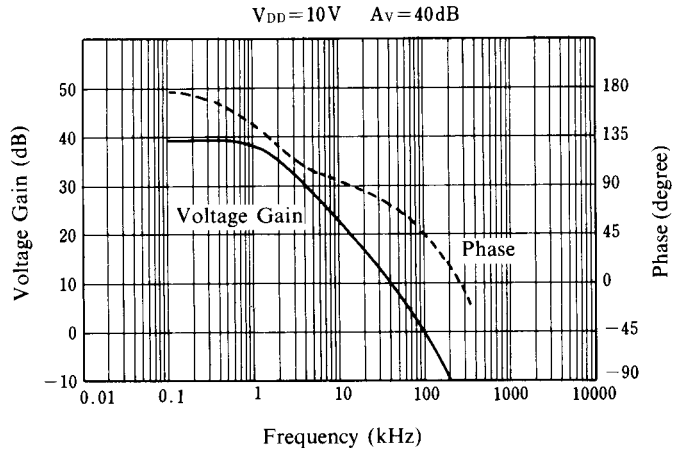


■ TYPICAL CHARACTERISTICS

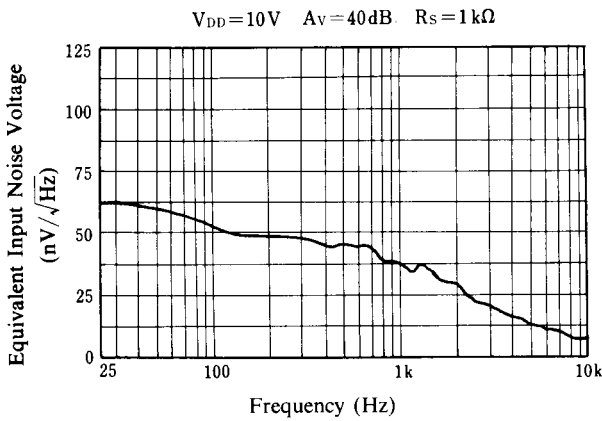
Maximum Output Swing Voltage vs. Load Resistance



Voltage Gain • Phase vs. Frequency



Equivalent Input Noise Voltage vs. Frequency



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