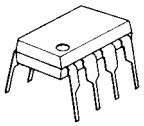
# DUAL LOW POWER OPERATIONAL AMPLIFIER

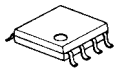
## ■ GENERAL DESCRIPTION

The NJM022B is a dual low-power operational amplifier.Like the NJM022,the NJM022B is the wide operating voltage range,high input inpedance,low operating current,low input noise voltage,internally frequency compensated,latch-up free,high slew rate amplifier with the short circuit protection.The NJM022B is twice the slew rate and half the input noise voltage comparing to the NJM022 with increased operating current.

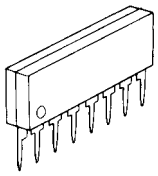
## ■ PACKAGE OUTLINE



NJM022BD



NJM022BM

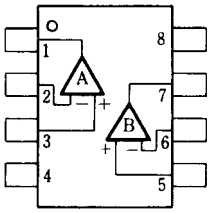


NJM022BL

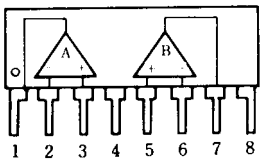
## ■ FEATURES

- Operating Voltage ( ±2V~±18V )
- Low Operating Current ( 250μA typ. )
- Slew Rate ( 1V/μs typ. )
- Short-Circuit Protection
- Package Outline DIP8,DMP8,SIP8
- Bipolar Technology

## ■ PIN CONFIGURATION



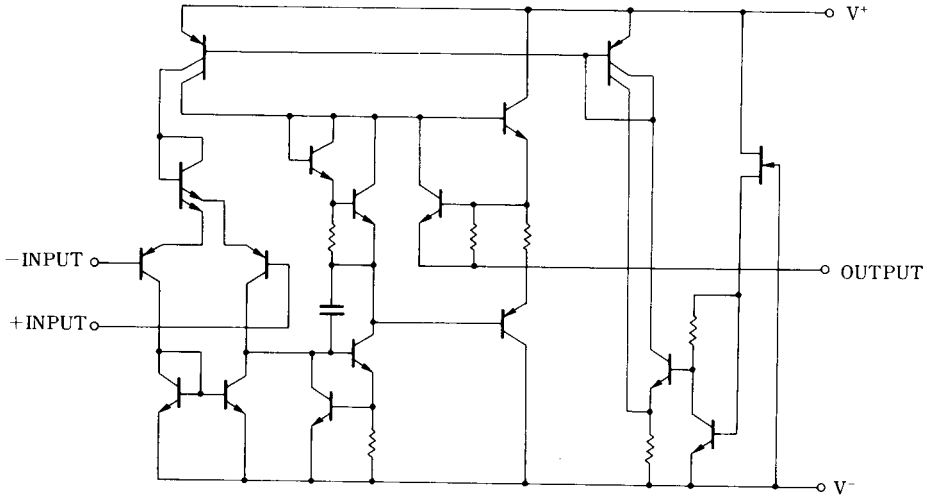

NJM022BD
NJM022BM




NJM022BL

**PIN FUNCTION**
**1.A OUTPUT**
**2.A -INPUT**
**3.A +INPUT**
**4.$V^-$**
**5.B +INPUT**
**6.B -INPUT**
**7.B OUTPUT**
**8.$V^+$**

## ■ EQUIVALENT CIRCUIT ( 1/2 Shown )



## ■ ABSOLUTE MAXIMUM RATINGS

( Ta=25°C )

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Supply Voltage | $V^+/V^-$ | ± 18 | V |
| Input Voltage | $V_{IC}$ | ± 15 | V |
| Differential Input Voltage | $V_{ID}$ | ± 30 | V |
| Power Dissipation | $P_D$ | ( DIP8 ) 500<br>( DMP8 ) 300<br>( SIP8 ) 800 | mW |
| Operating Temperature Range | $T_{opr}$ | -40~+85 | °C |
| Storage Temperature Range | $T_{stg}$ | -40~+125 | °C |

( note ) For supply voltage less than ±15V. the absolute maximum input voltage is equal to the supply voltage.

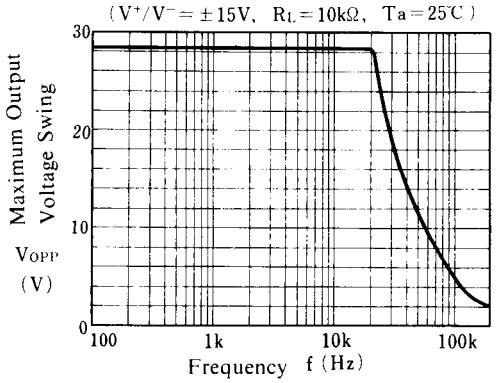
## ■ ELECTRICAL CHARACTERISTICS

( Ta=+25°C,$V^+/V^-$=±15V )

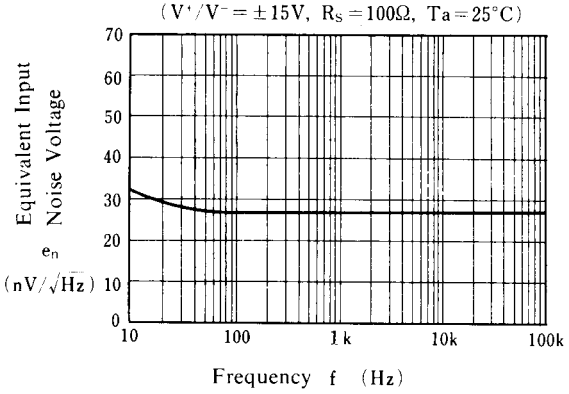
| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Input Offset Voltage | $V_{IO}$ | $R_S$≦10kΩ | - | 1 | 5 | mV |
| Input Offset Current | $I_{IO}$ | | - | 1 | 80 | nA |
| Input Bias Current | $I_B$ | | - | 20 | 250 | nA |
| Large Singal Voltage Gain | $A_V$ | $R_L$≧10kΩ,$V_O$=±10V | 60 | 88 | - | dB |
| Common Mode Rejection Ratio | CMR | $R_S$≦10kΩ | 60 | 92 | - | dB |
| Response Time ( Rise Time ) | $t_R$ | $V_{IN}$=20mV,$R_L$=10kΩ,$C_L$=100pF | - | 0.18 | - | μs |
| Slew Rate | SR | $V_{IN}$=10V,$R_L$=10kΩ,$C_L$=100pF | - | 1 | - | V/μs |
| Input Common Mode Voltage Range | $V_{ICM}$ | | ± 12 | ± 13 | - | V |
| Supply Voltage Rejection Ratio | SVR | $R_S$≦10kΩ | 74 | 110 | - | dB |
| Equivalent Input Noise Voltage | $e_n$ | $A_V$=20dB,f=1kHz | - | 25 | - | nV/√Hz |
| Short-circuit Output Current | $I_{OS}$ | | - | ± 8 | - | mA |
| Operating Current | $I_{CC}$ | | - | 250 | 500 | μA |
| Maximum Peak-to-Peak Output Voltage | $V_{OM}$ | $R_L$=10kΩ | ± 10 | ± 14 | - | V |

## ■ TYPICAL CHARACTERISTICS

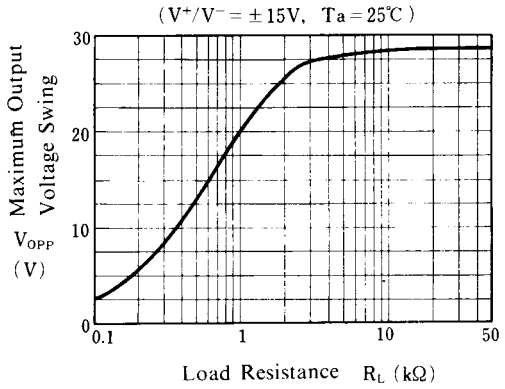
### Maximum Output Voltage Swing vs. Frequency



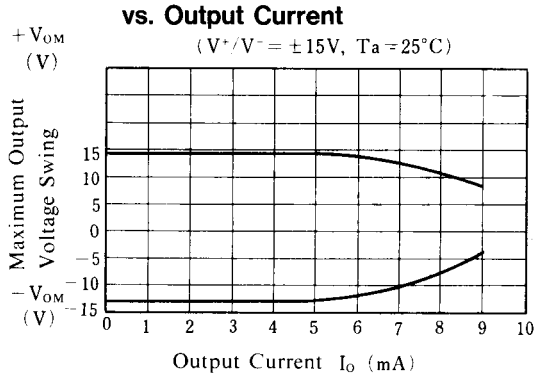

### Equivalent Input Noise Voltage vs. Frequency



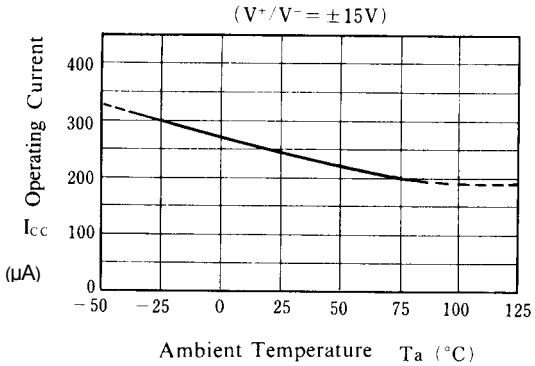

### Maximum Output Voltage Swing vs. Load Resistance



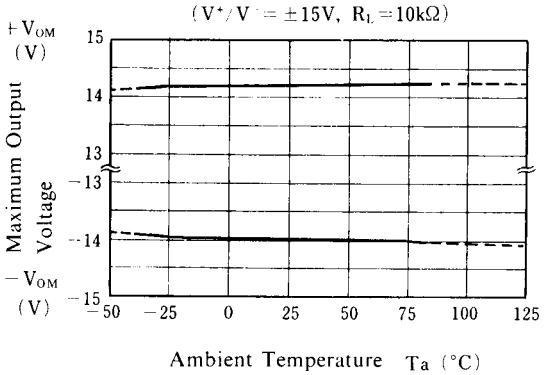

### Maximum Output Voltage Swing vs. Output Current




### Operating Current vs. Temperature

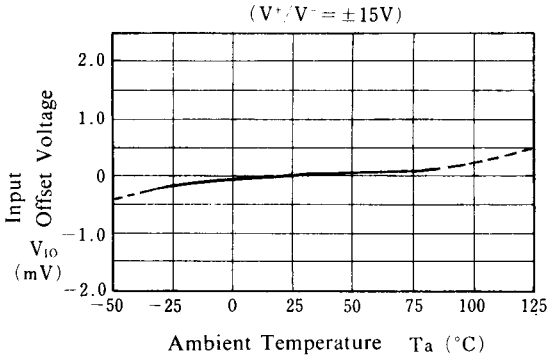



### Maximum Output Voltage vs. Temperature

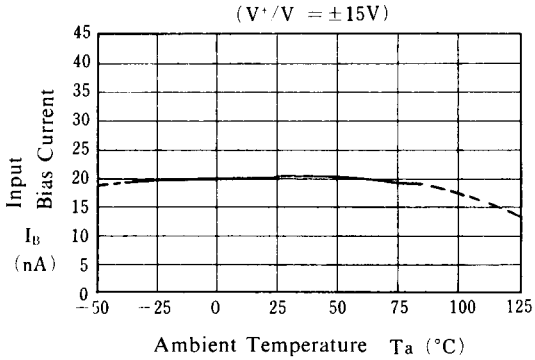


## ■ TYPICAL CHARACTERISTICS

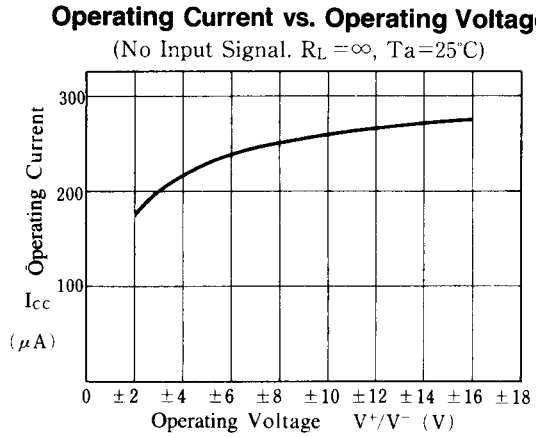
**Input Offset Voltage vs. Temperature**



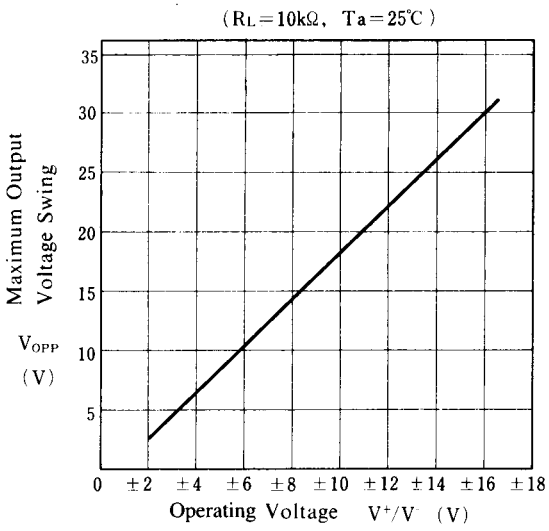

**Input Bias Current vs. Temperature**



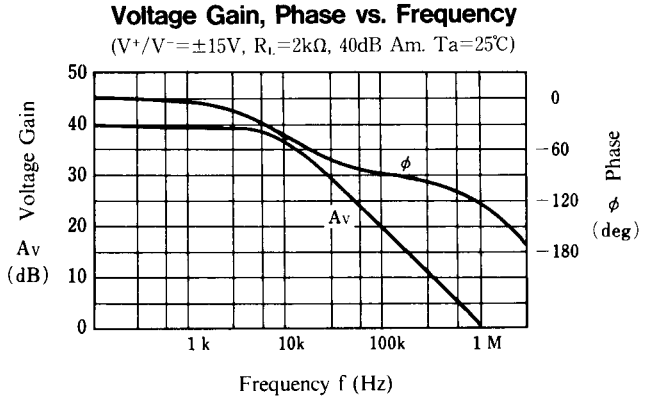

**Operating Current vs. Operating Voltage**




**Maximum Output Voltage Swing vs. Operating Voltage**




**Voltage Gain, Phase vs. Frequency**



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