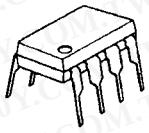
# SINGLE-SUPPLY DUAL OPERATIONAL AMPLIFIER

## ■ GENERAL DESCRIPTION

The NJM3404A is high performance single supply dual operational amplifier.The NJM3404A is a half type of the NJM3403A,quad operational amplifier.

The NJM3404A is improved version of the NJM2904 on slew rate & cross-over distortion.

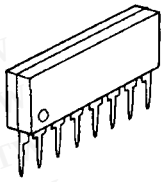
## ■ PACKAGE OUTLINE



NJM3404AD

NJM3404AM

NJM3404AV

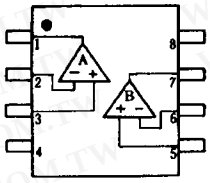


NJM3404AL

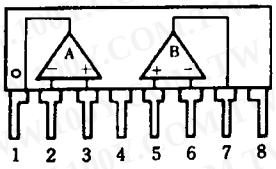
## ■ FEATURES

- Single Supply
- Operating Voltage ( +4V~+36V )
- Low Operating Current ( 2.0mA typ. )
- Slew Rate ( 1.2V/μs typ. )
- Package Outline DIP8,DMP8,SIP8,SSOP8
- Bipolar Technology

## ■ PIN CONFIGURATION




NJM3404AD
NJM3404AM
NJM3404AV

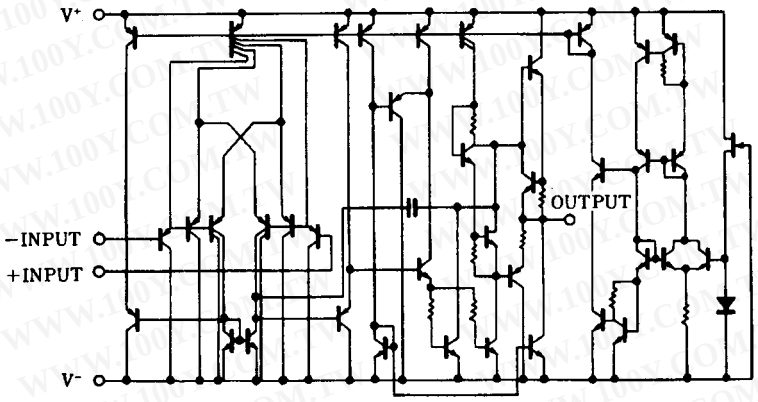



NJM3404AL

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 | $V^+(V^+/V^-)$ | 36V ( or ±18 ) | V |
| Differential Input Voltage | $V_{ID}$ | 36 | V |
| Input Voltage | $V_{IC}$ | -0.3~36 | V |
| Power Dissipation | $P_D$ | ( DIP8 ) 500<br>( DMP8 ) 300<br>( SSOP8 ) 250<br>( SIP8 ) 800 | mW |
| Operating Temperature Range | $T_{opr}$ | -40~+85 | ˚C |
| Storage Temperature Range | $T_{stg}$ | -40~+125 | ˚C |

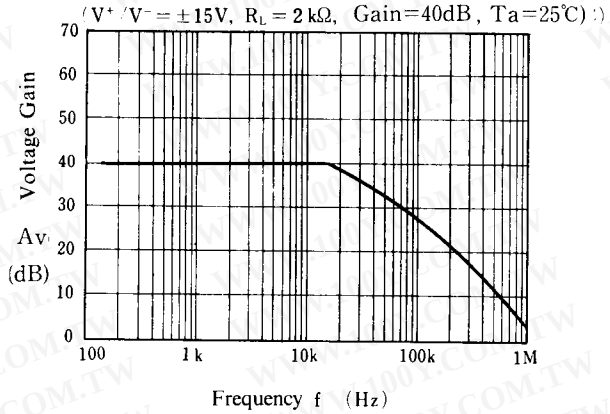
## ■ ELECTRICAL CHARACTERISTICS

( Ta=25˚C,$V^+/V^-$=±15V )

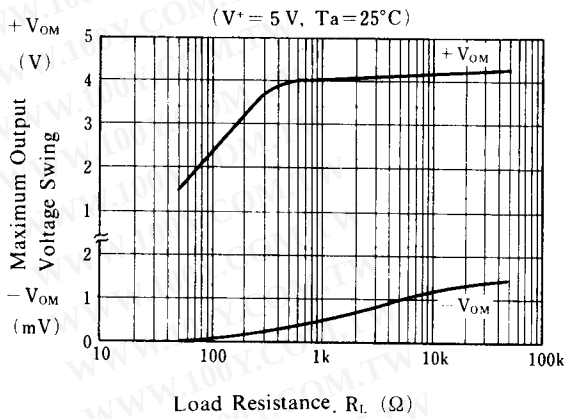
| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Input Offset Voltage | $V_{IO}$ | $R_S$=0Ω | - | 2 | 5 | mV |
| Input Offset Current | $I_{IO}$ | | - | 5 | 50 | nA |
| Input Bias Current | $I_B$ | | - | 70 | 200 | nA |
| Large Signal Voltage Gain | $A_V$ | $R_L$>2kΩ | 88 | 100 | - | dB |
| Maximum Output Voltage Swing | $V_{OM}$ | $R_L$=2kΩ | ± 13 | ± 14 | - | V |
| Input Common Mode Voltage Range | $V_{ICM}$ | | -15~+13 | - | - | V |
| Common Mode Rejection Ratio | CMR | DC | 70 | 90 | - | dB |
| Supply Voltage Rejection Ratio | SVR | | 80 | 94 | - | dB |
| Operating Current | $I_{CC}$ | $R_L$=∞ | - | 2.0 | 3.5 | mA |
| Output Source Current | $I_{SOURCE}$ | $V_{IN}^+$=1V,$V_{IN}^-$=0V | 20 | 30 | - | mA |
| Output Sink Current | $I_{SINK}$ | $V_{IN}^+$=0V,$V_{IN}^-$=1V | 10 | 20 | - | mA |
| Slew Rate | SR | | - | 1.2 | - | V/μs |
| Unity Gain Bandwidth | $f_T$ | - | - | 1.2 | - | MHz |

## ■ TYPICAL CHARACTERISTICS

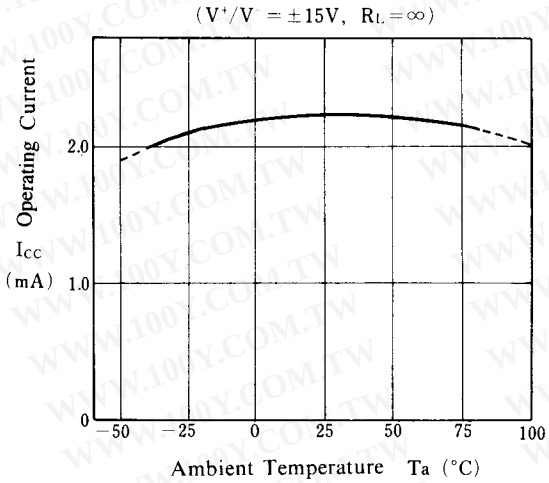
### Voltage Gain vs. Frequency



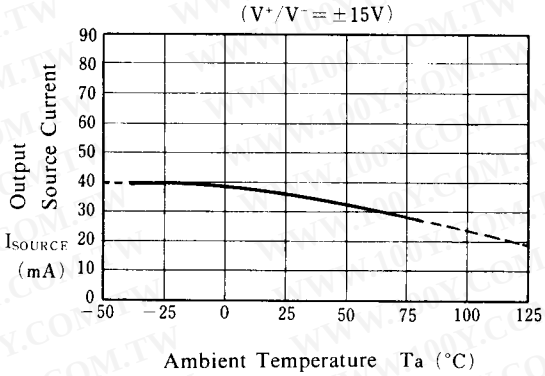

### Maximum Output Voltage Swing vs. Load Resistance



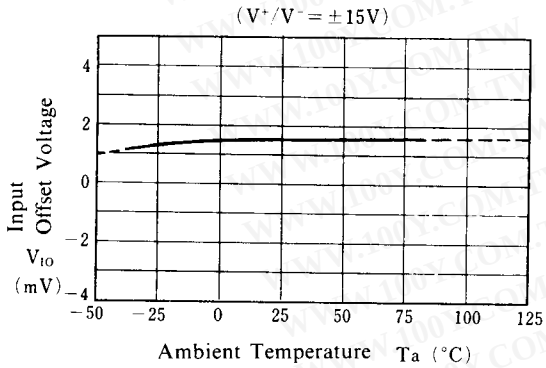

### Operating Current vs. Temperature



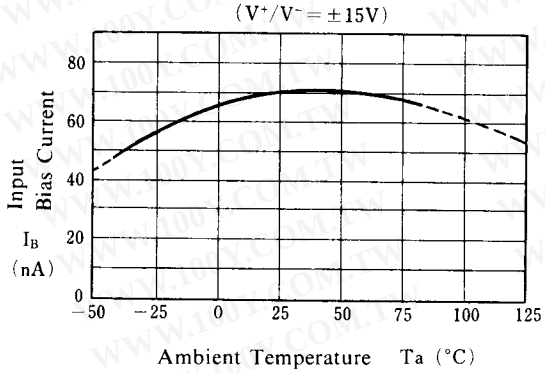

### Output Source Current vs. Temperature




### Input Offset Voltage vs. Temperature



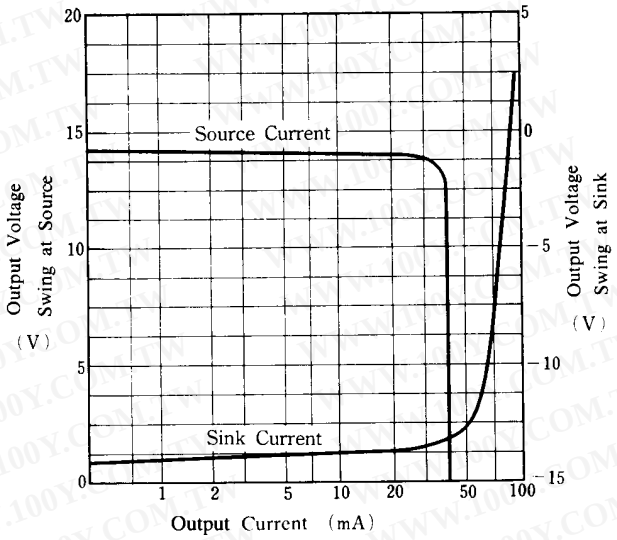

### Input Bias Current vs. Temperature



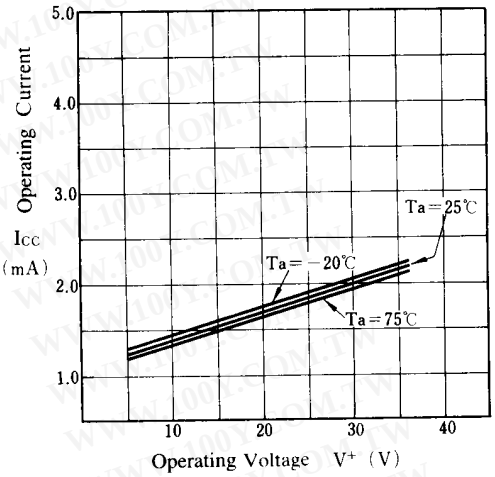
## ■ TYPICAL CHARACTERISTICS

**Output Source Current**
**Output Sink Current**
**vs. Output Voltage Swing**

($V^+/V^-=\pm15V$, $Ta=25℃$)

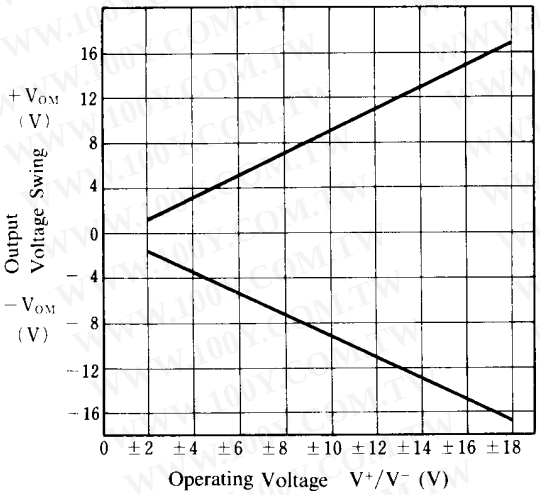



**Operating Current**
**vs. Operating Voltage**



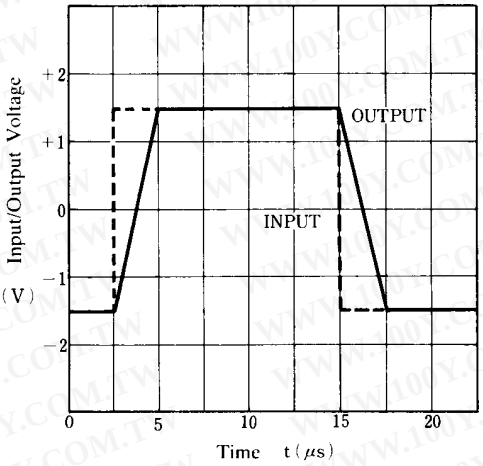

**Output Voltage Swing vs. Operating Voltage**

($R_L=2k\Omega$, $Ta=25℃$)



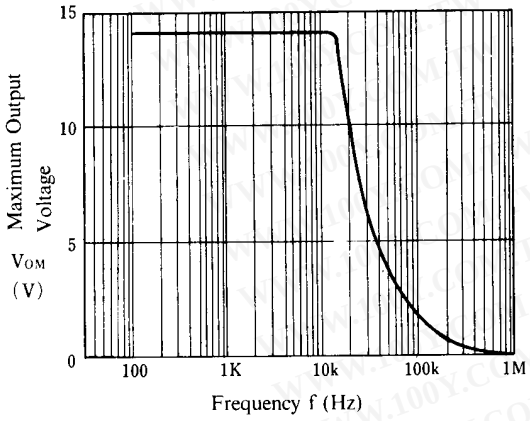

**Pulse Response**

($V^+/V^-=\pm15$, $R_L>2k\Omega$, $Av=1$, $Ta=25℃$)



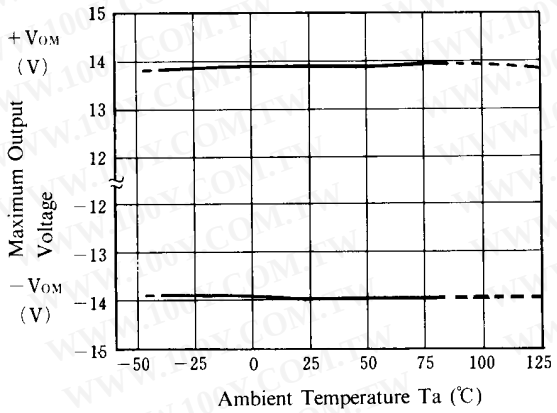

**Maximum Output Voltage vs. Frequency**

($V^+/V^-=\pm15V$, $R_L=2k\Omega$, $Ta=25°C$)



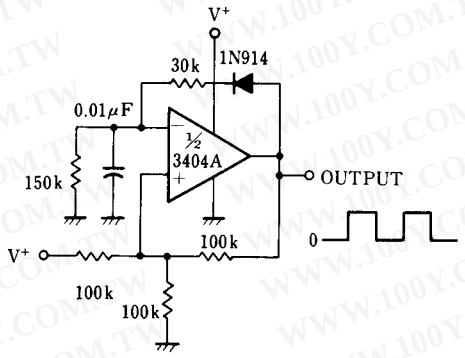

**Maximum Output Voltage vs. Temperature**

($V^+/V^-=\pm15V$, $R_L=2k\Omega$)



## ■ TYPICAL APPLICATIONS

**Square Wave Oscillator**




**Bandpass Filter**