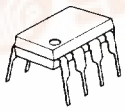
# DUAL J-FET INPUT OPERATIONAL AMPLIFIER

## ■ GENERAL DESCRIPTION

These devices are low cost, high speed, dual JFET input operational amplifiers with an internally trimmed input offset voltage. They require low supply current yet maintain a large gain bandwidth product and fast slew rate. In addtion, well matched high voltage JFET input devices provide very low input bias and offset currents.

These amplifiers may be used in applicationas such as high speed integrators, fast D/A converters, sample and hold circuits and many other circuits requiring low input offset voltage, low input bias current, high input impedance, high slew rate and wide bandwidth. The devices also exhibit low noise and offsset voltage drift.

## ■ PACKAGE OUTLINE



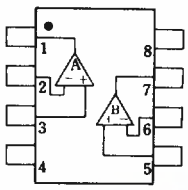
NJM353D

NJM353M

## ■ FEATURES

- Operating Voltage (±5V～±18V)
- J-FET Input
- Low Input Bias Current (50pA typ.)
- High Slew Rate (13V/μs typ.)
- Wide Unity Gain Bandwidth (4MHz typ.)
- Package Outline DIP8, DMP8
- Bipolar Technology

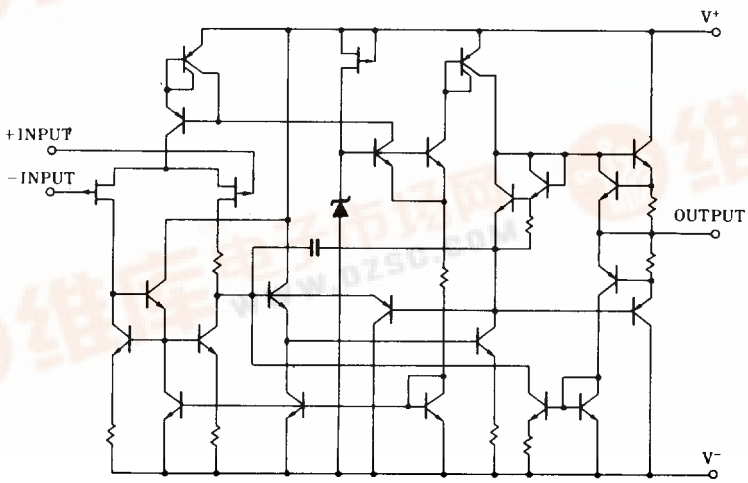
## ■ PIN CONFIGURATION




NJM353D
NJM353M

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℃)

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Supply Voltage | $V^+/V^-$ | ±18 | V |
| Differential Input Voltage | $V_{ID}$ | ±30 | V |
| Input Voltage | $V_I$ | ±15 | V |
| Power Dissipation | $P_D$ | (DIP8) 500 | mW |
| | | (DMP8) 300 | mW |
| Operating Temperature Range | $T_{opr}$ | −20～+75 | ℃ |
| Storage Temperature Range | $T_{stg}$ | −40～+125 | ℃ |

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

## ■ ELECTRICAL CHARACTERISTICS

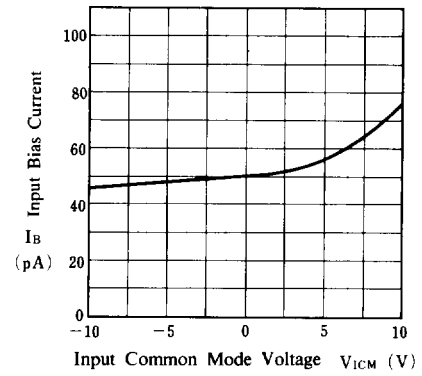
(Ta=25℃, $V^+/V^-$=±15V)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Input Offset Voltage | $V_{IO}$ | $R_S$=10kΩ | — | 5 | 10 | mV |
| Average TC of Input Offset Voltage | $\Delta V_{IO}/\Delta T$ | $R_S$=10kΩ | — | 10 | — | μV/℃ |
| Input Offset Current | $I_{IO}$ | | — | 25 | 100 | pA |
| Input Bias Current | $I_B$ | | — | 50 | 200 | pA |
| Input Resistance | $R_{IN}$ | | — | $10^{12}$ | — | Ω |
| Large-signal Voltage Gain | $A_V$ | $R_L$=2kΩ, $V_O$=±10V | 88 | 100 | — | dB |
| Maximum Peak-to-peak Output Voltage Swing | $V_{OM}$ | $R_L$=10kΩ | ±12 | ±13.5 | — | V |
| Input Common Mode Voltage Range | $V_{ICM}$ | | ±11 | +15, −12 | — | V |
| Common Mode Rejection Ratio | CMR | $R_S$≦10kΩ | 70 | 100 | — | dB |
| Supply Voltage Rejection Ratio | SVR | | 70 | 100 | — | dB |
| Operating Current | $I_{CC}$ | | — | 3.6 | 6.5 | mA |
| Channel Separate Ratio | CS | f=1Hz~20kHz | — | 120 | — | dB |
| Slew Ratio | SR | | — | 13 | — | V/μs |
| Unity Gain Bandwidth | $f_T$ | | — | 4 | — | MHz |
| Equivalent Input Noise Voltage | $e_n$ | $R_S$=100Ω, f=1kHz | — | 16 | — | nV/√Hz |
| Equivalent Input Noise Current | $i_n$ | f=1kHz | — | 0.01 | — | pA/√Hz |

## ■ TYPICAL CHARACTERISTICS

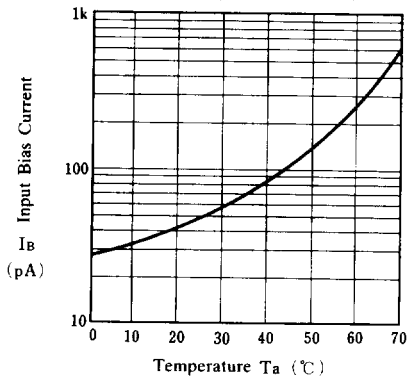
**Input Bias Current**

($V^+/V^-=\pm15V$, Ta=25℃)



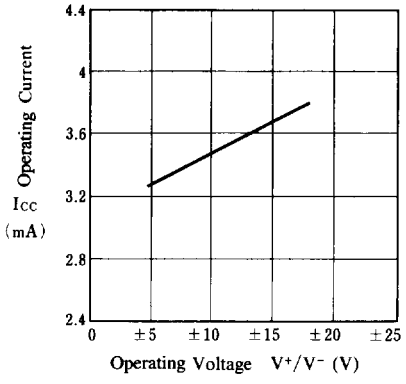

**Input Bias Current**

($V_{ICM}=0$, $V^+/V^-=\pm15V$)



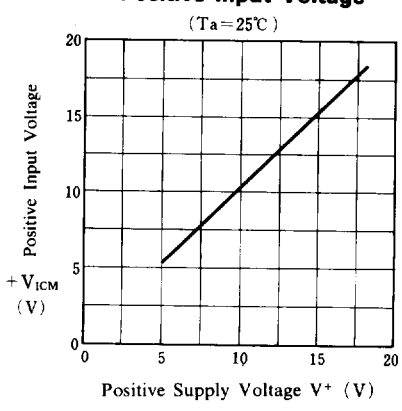

**Operating Current vs. Operating Voltage**

(Ta=25℃)



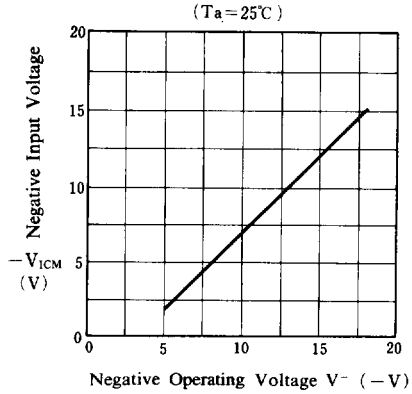

**Positive Input Voltage**

(Ta=25℃)

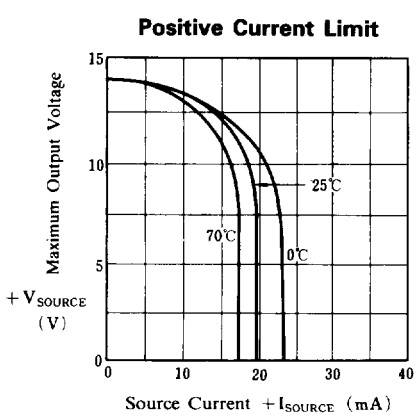



**Negative Input Voltage**

(Ta=25℃)

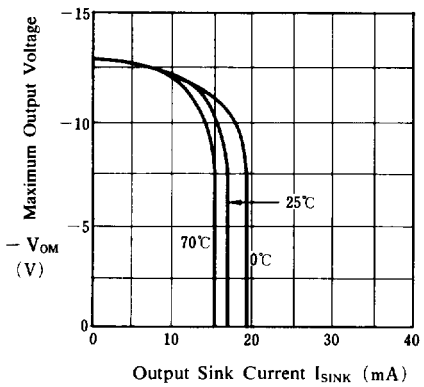



**Positive Current Limit**



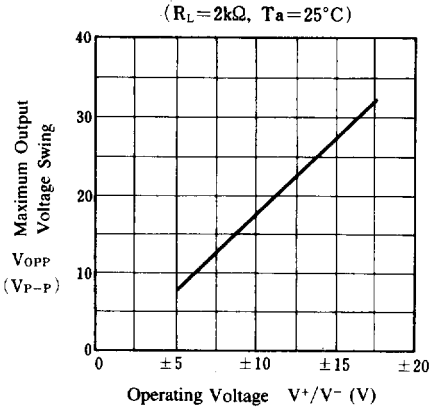
## ■ TYPICAL CHARACTERISTICS

### Negative Current Limit




### Maximum Output Voltage Swing vs. Operating Voltage

($R_L$=2kΩ, Ta=25°C)

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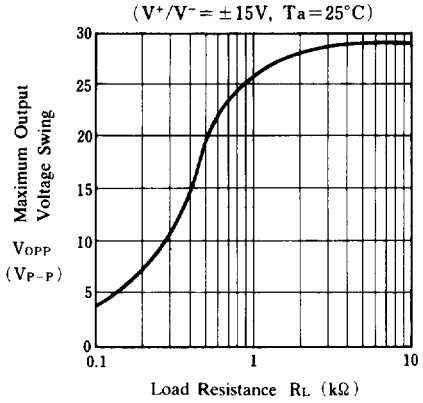
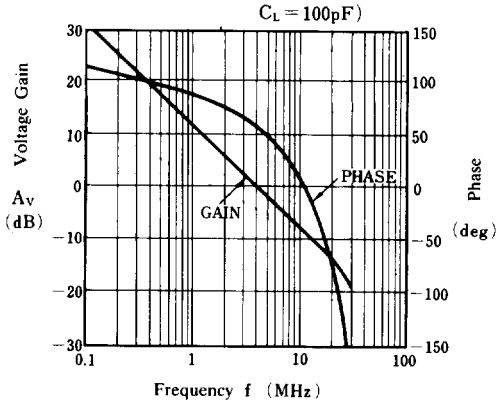
### Maximum Output Voltage Swing vs. Load Resistance

($V^+/V^-$=±15V, Ta=25°C)



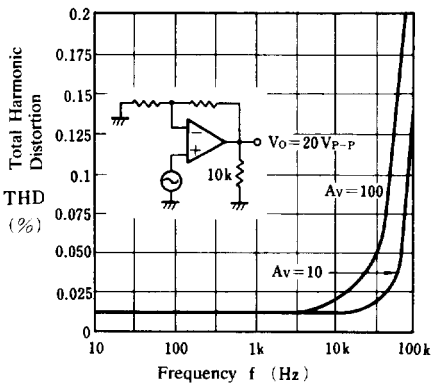

### Voltage Gain, Phase vs. Frequency

($V^+/V^-$=±15V, $R_L$=2kΩ, $C_L$=100pF)



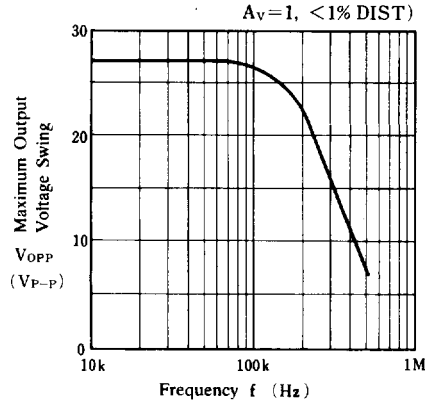

### Total Harmonic Distortion vs. Frequency

($V^+/V^-$=±15V, Ta=25°C)




### Maximum Output Voltage Swing vs. Frequency

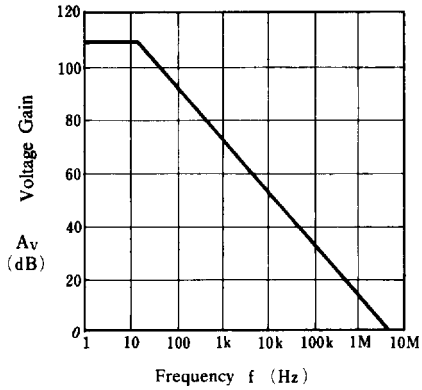
($V^+/V^-$=±15V, $R_L$=2kΩ, Ta=25°C, AV=1, <1% DIST)



## ■ TYPICAL CHARACTERISTICS

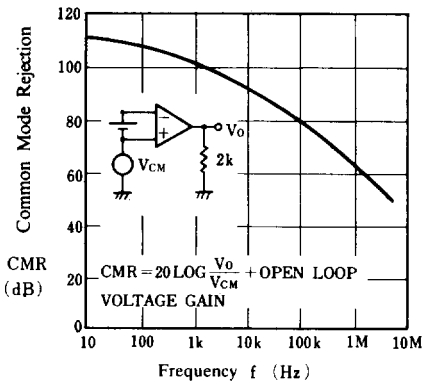
**Voltage Gain vs. Frequency vs. Frequency**

($R_L$=2kΩ, $V^+/V^-$=±15V, Ta=25°C)



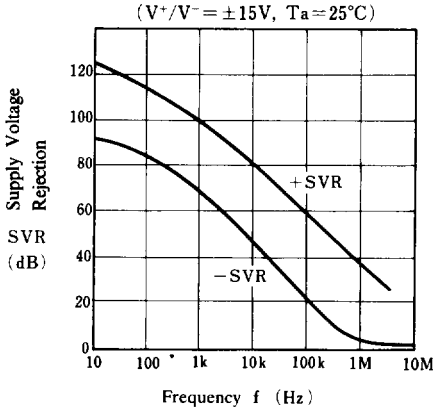

**Common Mode Rejection vs. Frequency**

($V^+/V^-$=±15V, $R_L$=2kΩ, Ta=25°C)



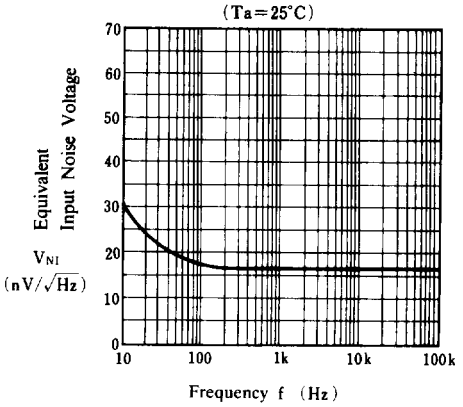

**Supply Voltage Rejection vs. Frequency**

($V^+/V^-$=±15V, Ta=25°C)



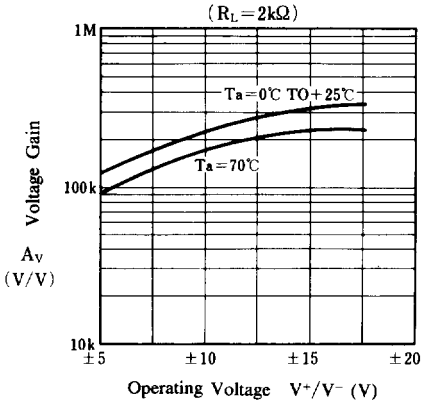

**Equivalent Input Noise Voltage vs. Frequency**

(Ta=25°C)



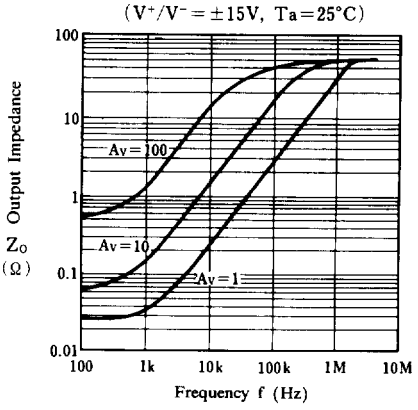

**Voltage Gain vs. Operating Voltage**

($R_L$=2kΩ)




**Output Impdedance vs. Frequency**

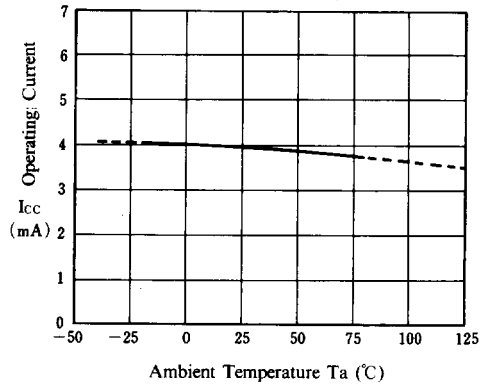
($V^+/V^-$=±15V, Ta=25°C)



## ■ TYPICAL CHARACTERISTICS

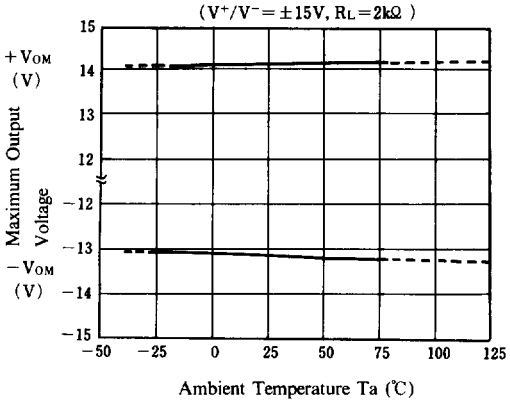
**Operating Current vs. Temperature**

($V^+/V^-=\pm15V$)




**Maximum Output Voltage vs. Temperature**

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

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**Input Offset Voltage vs. Temperature**

($V^+/V^-=\pm15V$)