

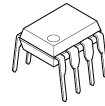
## LOW-NOISE DUAL OPERATIONAL AMPLIFIER

### ■ GENERAL DESCRIPTION

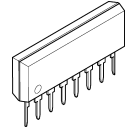
The NJM5532 is a high performance dual low noise operational amplifier. Compared to the standard dual operational amplifiers, such as the NJM1458, it shows better noise performance, improved output drive capability, and considerably higher small-signal and power bandwidths. It is compensated internally for voltage follower circuit. This makes the device especially suitable for application in high quality and professional audio equipment, instrumentation, control circuits, and telephone channel amplifiers.

If very low noise characteristic is of prime importance, it is recommended D-Rank type products (NJM5532DD/LD/MD). These have specified maximum limits for equivalent input noise voltage.

### ■ PACKAGE OUTLINE



NJM5532D  
(DIP8)



NJM5532L  
(SIP8)

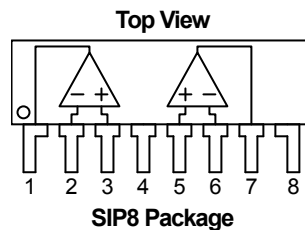
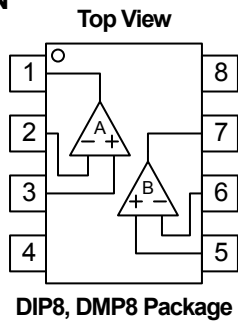


NJM5532M  
(DMP8)

### ■ FEATURES

- Operating Voltage                     $\pm 3V \sim \pm 22V$
- Small Signal Bandwidth            10MHz typ.
- Output Drive Capability            600Ω, 10Vrms typ.
- Input Noise Voltage                5nV/√Hz typ.
- Power Bandwidth                    140kHz typ.
- Slew Rate                             8V/μs typ.
- Bipolar Technology
- Package Outline                     DIP8, DMP8, SIP8

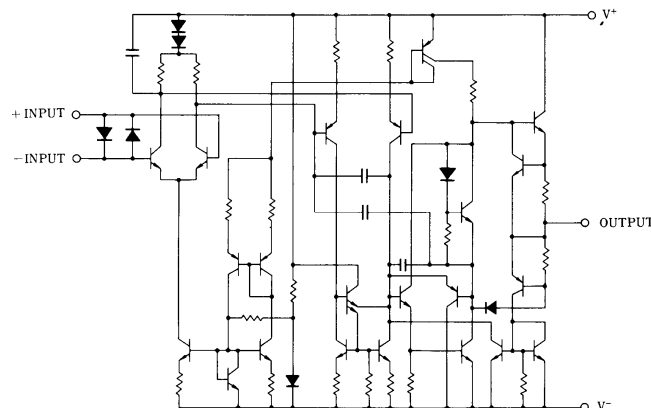
### ■ PIN CONFIGURATION



#### PIN FUNCTION

- 1.A OUTPUT
- 2.A -INPUT
- 3.A +INPUT
- 4.V<sup>-</sup>
- 5.B +INPUT
- 6.B -INPUT
- 7.B OUTPUT
- 8.V<sup>+</sup>

### ■ EQUIVALENT CIRCUIT ( 1/2 Shown )



# NJM5532

## ■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

| PARAMETER                        | SYMBOL    | RATING  | UNIT |
|----------------------------------|-----------|---|------|
| Supply Voltage                   | $V^+V^-$  | $\pm 22$                                      | V    |
| Common Mode Input Voltage Range  | $V_{ICM}$ | $V^+V^-$                                      | V    |
| Differential Input Voltage Range | $V_{ID}$  | $\pm 0.5$                                     | V    |
| Power Dissipation                | $P_D$     | DIP8 : 500<br>DMP8 : 600(Note1)<br>SIP8 : 800 | mW   |
| Operating Temperature Range      | $T_{opr}$ | -20~+75                                       | °C   |
| Storage Temperature Range        | $T_{stg}$ | -40~+125                                      | °C   |

(Note1) On the cermic PCB (10x20x0.635mm)

## ■ RECOMMENDED OPERATING VOLTAGE (Ta=25°C)

| PARAMETER      | SYMBOL   | RATING              | UNIT |
|----------------|----------|---------------------|------|
| Supply Voltage | $V^+V^-$ | $\pm 3 \sim \pm 22$ | V    |

## ■ ELECTRICAL CHARACTERISTICS ( $V^+V^- = \pm 15V$ , Ta=25°C, unless otherwise noted.)

### ● DC ELECTRICAL CHARACTERISTICS

| PARAMETER                       | SYMBOL    | TEST CONDITION                         | MIN.     | TYP.     | MAX. | UNIT       |
|---------------------------------|-----------|--|----------|----------|------|------------|
| Input Offset Voltage            | $V_{IO}$  | $R_S \leq 10k\Omega$                   | -        | 0.5      | 4    | mV         |
| Input Offset Current            | $I_{IO}$  |  | -        | 10       | 150  | nA         |
| Input Bias Current              | $I_B$     |  | -        | 200      | 800  | nA         |
| Supply Current                  | $I_{CC}$  | $R_L = \infty$                         | -        | 9        | 16   | mA         |
| Common Mode Input Voltage Range | $V_{ICM}$ |  | $\pm 12$ | $\pm 13$ | -    | V          |
| Common Mode Rejection Ratio     | CMR       | $R_S \leq 10k\Omega$                   | 70       | 100      | -    | dB         |
| Supply Voltage Rejection Ratio  | SVR       | $R_S \leq 10k\Omega$                   | 80       | 100      | -    | dB         |
| Voltage Gain1                   | $A_{V1}$  | $R_L \geq 2k\Omega, V_O = \pm 10V$     | 88       | 100      | -    | dB         |
| Voltage Gain2                   | $A_{V2}$  | $R_L \geq 600\Omega, V_O = \pm 10V$    | 83.5     | 94       | -    | dB         |
| Maximum Output Voltage1         | $V_{OM1}$ | $R_L \geq 600\Omega$                   | $\pm 12$ | $\pm 13$ | -    | V          |
| Maximum Output Voltage2         | $V_{OM2}$ | $R_L \geq 600\Omega, V^+V^- = \pm 18V$ | $\pm 15$ | $\pm 16$ | -    | V          |
| Input Resistance                | $R_{IN}$  |  | 30       | 300      | -    | k $\Omega$ |
| Short Circuit Output Current    | $I_{OS}$  |  | -        | 38       | -    | mA         |

### ● AC ELECTRICAL CHARACTERISTICS

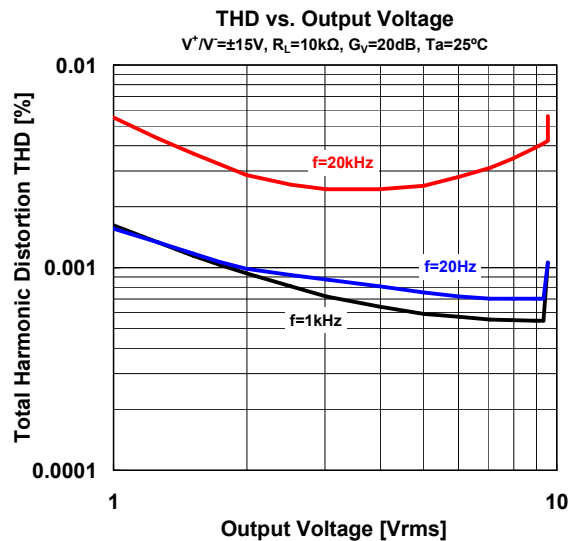
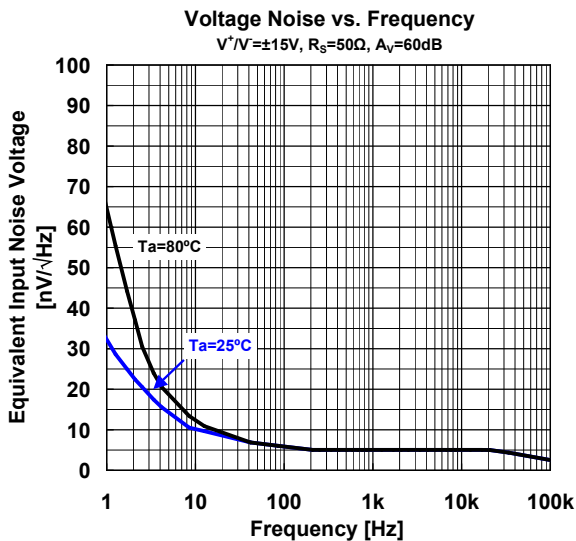
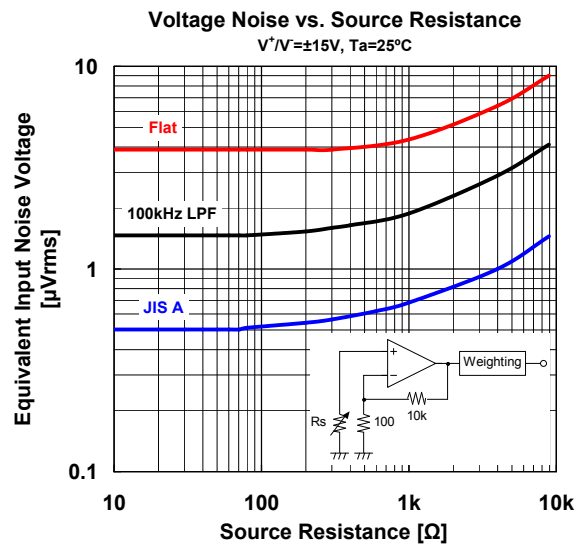
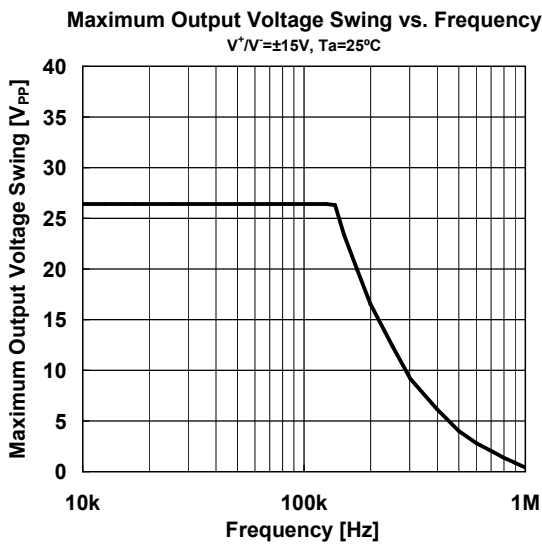
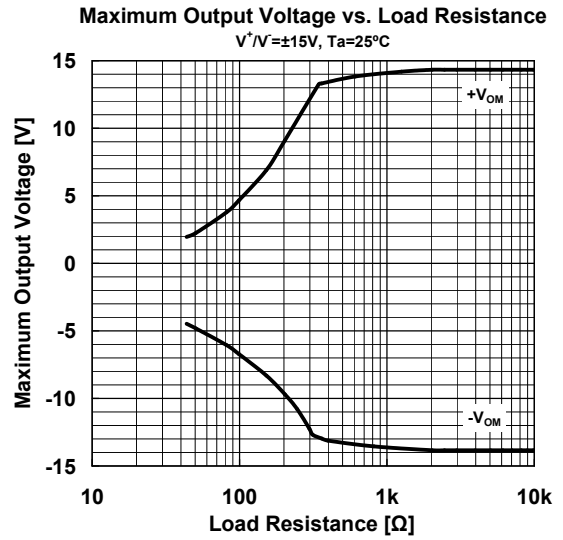
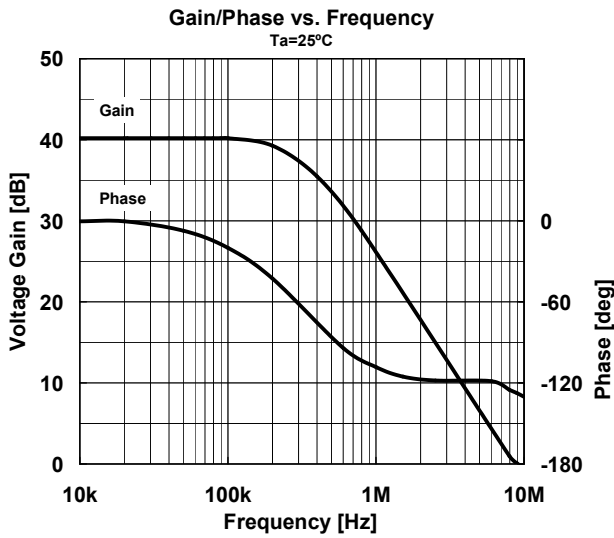
| PARAMETER                      | SYMBOL   | TEST CONDITION   | MIN. | TYP. | MAX. | UNIT            |
|--------------------------------|----------|--|------|------|------|-----------------|
| Output Resistance              | $R_O$    | $A_V = 30dB, f = 10kHz, R_L = 600\Omega$                     | -    | 0.3  | -    | $\Omega$        |
| Overshoot                      |          | $A_V = 1, V_{IN} = 100mV_{PP}, R_L = 100pF, R_L = 600\Omega$ | -    | 10   | -    | %               |
| Voltage Gain                   | $A_V$    | $f = 10kHz$  | -    | 67   | -    | dB              |
| Slew Rate                      | SR       |  | -    | 8    | -    | V/ $\mu s$      |
| Gain Bandwidth Product         | GB       | $C_L = 100pF, R_L = 600\Omega$                               | -    | 10   | -    | MHz             |
| Power Bandwidth                | $W_{PG}$ | $V_O = \pm 10V$  | -    | 140  | -    | kHz             |
|                                | $W_{PG}$ | $V_O = \pm 14V, R_L = 600\Omega, V^+V^- = \pm 18V$           | -    | 100  | -    | kHz             |
| Equivalent Input Noise Voltage | $e_n$    | $f_O = 30Hz$   | -    | 8    | -    | nV/ $\sqrt{Hz}$ |
|                                | $e_n$    | $f_O = 1kHz$   | -    | 5    | -    | nV/ $\sqrt{Hz}$ |
| Equivalent Input Noise Current | $i_n$    | $f_O = 30Hz$   | -    | 2.7  | -    | pA/ $\sqrt{Hz}$ |
|                                | $i_n$    | $f_O = 1kHz$   | -    | 0.7  | -    | pA/ $\sqrt{Hz}$ |
| Channel Separation             | CS       | $f = 1kHz, R_S = 5k\Omega$                                   | -    | 110  | -    | dB              |

## ■ ELECTRICAL CHARACTERISTICS (D-rank type(Note2), $V^+V^- = \pm 15V$ , Ta=25°C, unless otherwise noted.)

| PARAMETER                      | SYMBOL   | TEST CONDITION           | MIN. | TYP. | MAX. | UNIT          |
|--------------------------------|----------|--------------------------|------|------|------|---------------|
| Equivalent Input Noise Voltage | $V_{NI}$ | RIAA, $R_S = 2.2k\Omega$ | -    | -    | 1.4  | $\mu V_{rms}$ |

(Note2) D-rank type is a Equivalent Input Noise Voltage selected product.

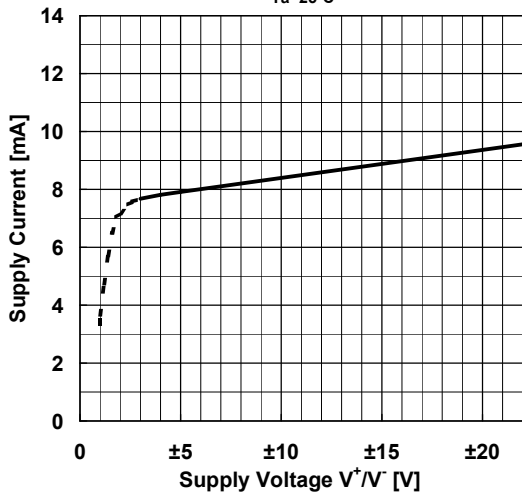
## ■ TYPICAL CHARACTERISTICS



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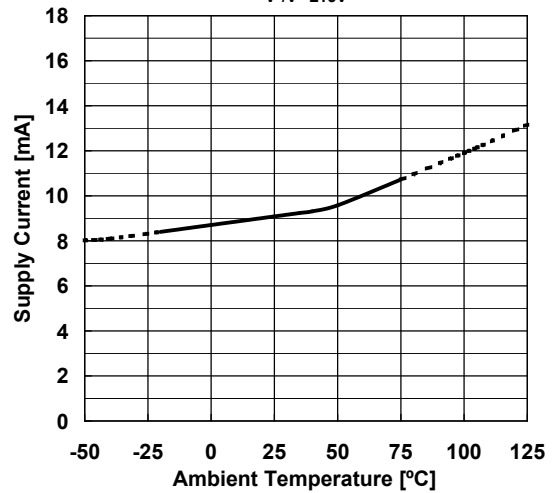
Supply Current vs. Supply Voltage

$T_a=25^\circ\text{C}$



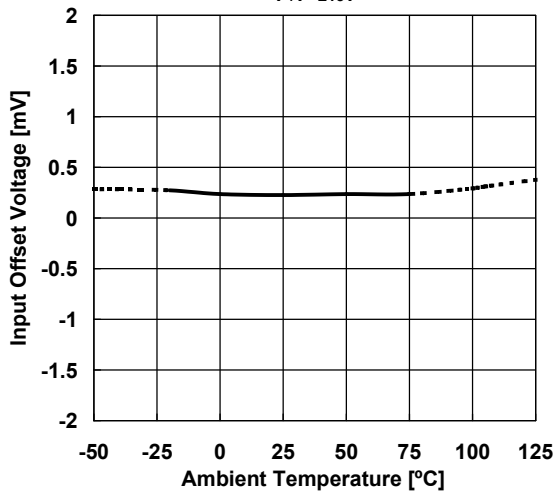
Supply Current vs. Temperature

$V^+/V^-=\pm 15\text{V}$



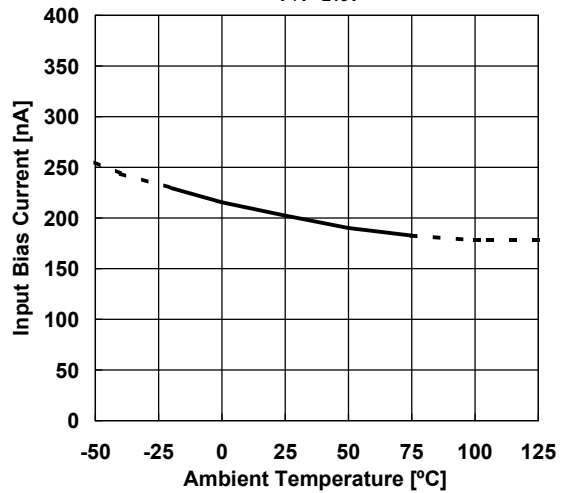
Input Offset Voltage vs. Temperature

$V^+/V^-=\pm 15\text{V}$



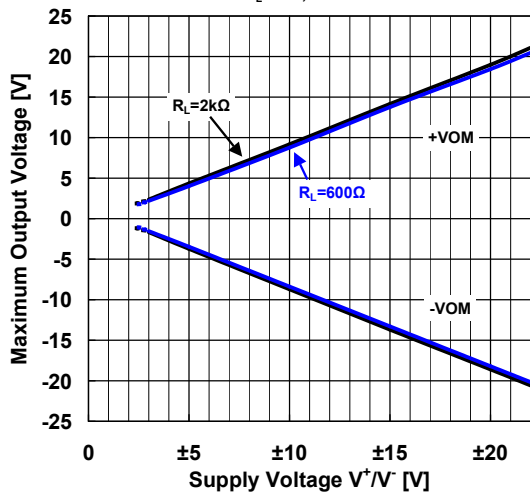
Input Bias Current vs. Temperature

$V^+/V^-=\pm 15\text{V}$



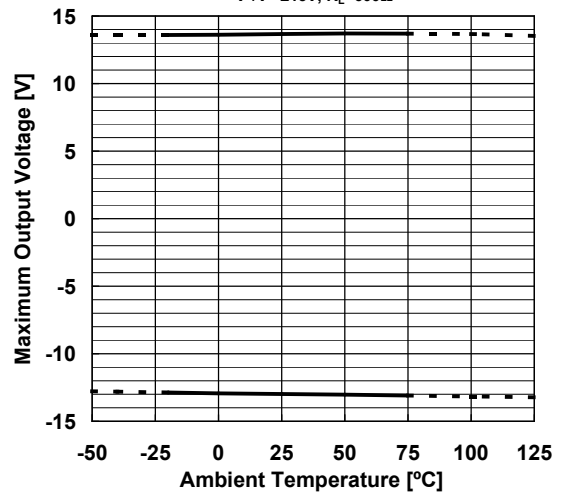
Maximum Output Voltage vs. Supply Voltage

$R_L=2\text{k}\Omega, T_a=25^\circ\text{C}$



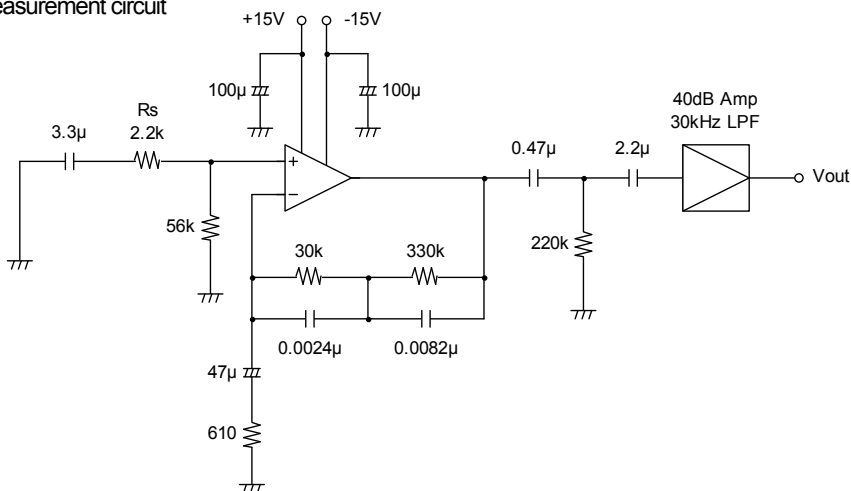
Maximum Output Voltage vs. Temperature

$V^+/V^-=\pm 15\text{V}, R_L=600\Omega$



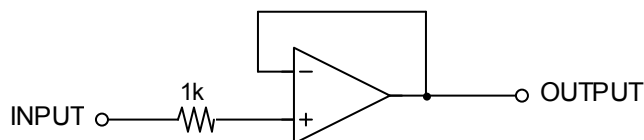
## ■ TEST CIRCUIT

Noise Voltage (RIAA) measurement circuit



## ■ NOTICE

When used in voltage follower circuit, put a current limit resistor into non-inverting input terminal in order to avoid inside input diode destruction when the power supply is turned on. ( ref.Fig.1 )





(Fig.1)

**[CAUTION]**

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