

## LOW-NOISE DUAL OPERATIONAL AMPLIFIER

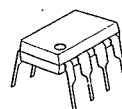
## ■ GENERAL DESCRIPTION

The NJM2068 is a high performance, low noise dual operational amplifier. This amplifier features popular pin-out, superior noise performance, and superior total harmonic distortion. This amplifier also features guaranteed noise performance with substantially higher gain-bandwidth product and slew rate which far exceeds that of the 4558 type amplifier. The specially designed low noise input transistors allow the NJM2068 to be used in very low noise signal processing applications such as audio preamplifiers and servo error amplifier.

## ■ FEATURES

- Operating Voltage  $(\pm 4V \sim \pm 18V)$
- Low Total Harmonic Distortion  $(0.001\% \text{ typ.})$
- Low Noise Voltage  $(\text{FLAT}+\text{JISA}, 0.56 \mu V \text{ typ.})$
- High Slew Rate  $(6V/\mu s \text{ typ.})$
- Unity Gain Bandwidth  $(27\text{MHz @ } f=10\text{kHz})$
- Package Outline DIP8, DMP8, SIP8, SSOP8
- Bipolar Technology

## ■ PACKAGE OUTLINE



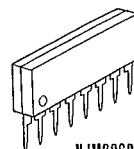
NJM2068D



NJM2068M

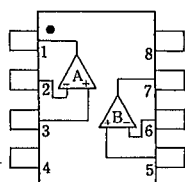


NJM2068V

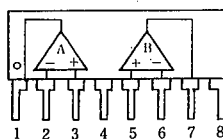


NJM2068L

## ■ PIN CONFIGURATION



NJM2068D  
NJM2068M  
NJM2068V

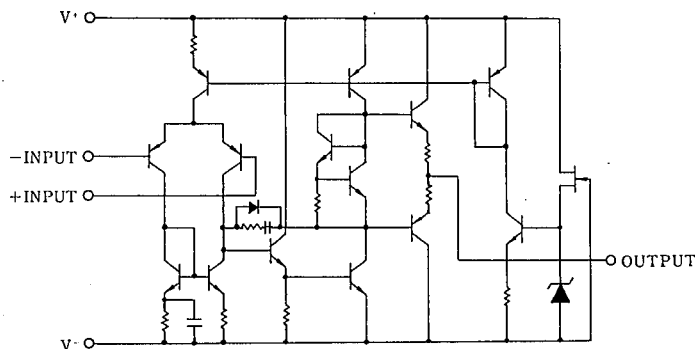


NJM2068L

## 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 <sup>+</sup> /V <sup>-</sup>	±18	V
Input Voltage	V <sub>IC</sub>	±15 (note)	V
Differential Input Voltage	V <sub>ID</sub>	±30	V
Power Dissipation	P <sub>D</sub>	(DIP8) 500	mW
		(DMP8) 300	mW
		(SSOP8) 250	mW
		(SIP8) 800	mW
Operating Temperature Range	T <sub>opr</sub>	-20~+75	°C
Storage Temperature Range	T <sub>stg</sub>	-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<sup>+</sup>/V<sup>-</sup>=±15V)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V <sub>IO</sub>	R <sub>S</sub> ≤10kΩ	—	0.3	3	mV
Input Offset Current	I <sub>IO</sub>		—	5	200	nA
Input Bias Current	I <sub>B</sub>		—	150	1000	nA
Input Resistance	R <sub>IN</sub>		50	300	—	kΩ
Large Signal Voltage Gain	A <sub>V</sub>	R <sub>L</sub> ≥2kΩ, V <sub>O</sub> =±10V	90	120	—	dB
Maximum Output Voltage Swing	V <sub>OM</sub>	R <sub>L</sub> ≥2kΩ	±12	±13.5	—	V
Input Common Mode Voltage Range	V <sub>ICM</sub>		±12	±13.5	—	V
Common Mode Rejection Ratio	CMR	R <sub>S</sub> ≤10kΩ	80	110	—	dB
Supply Voltage Rejection Ratio	SVR	R <sub>S</sub> ≤10kΩ	80	120	—	dB
Slew Rate	SR	R <sub>L</sub> ≤2kΩ	—	6	—	V/μs
Gain Bandwidth Product 1	GB1	f=10kHz	—	27	—	MHz
Gain Bandwidth Product 2	GB2	f=100kHz	—	19	—	MHz
Unity Gain Bandwidth	f <sub>T</sub>	A <sub>V</sub> =1	—	5.5	—	MHz
Total Harmonic Distortion	THD	A <sub>V</sub> =20dB, V <sub>O</sub> =5V, R <sub>L</sub> =2kΩ, f=1kHz	—	0.001	—	%
Equivalent Input Noise Voltage 1	V <sub>NI 1</sub>	FLAT+JISA, R <sub>S</sub> =300Ω	—	0.44	0.56	μV
Operating Current	I <sub>CC</sub>		—	5.0	8.0	mA

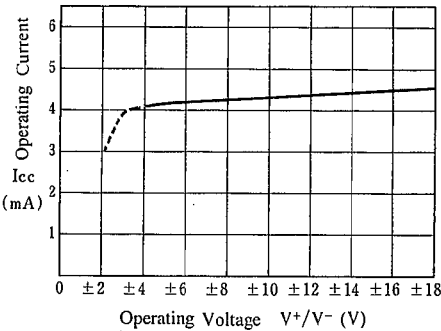
(note 1) Oscillation might be caused when capacitor type load were connected. It is recommendable to insert series resistor (about 50Ω) at the output for preventing oscillation.

(note 2) In regard to Noise Standard, NJRC is preparing for special D rank type products (R<sub>S</sub>=2.2kΩ, R<sub>IAA</sub>, V<sub>NI</sub>=1.4mV Max.)

■ TYPICAL CHARACTERISTICS

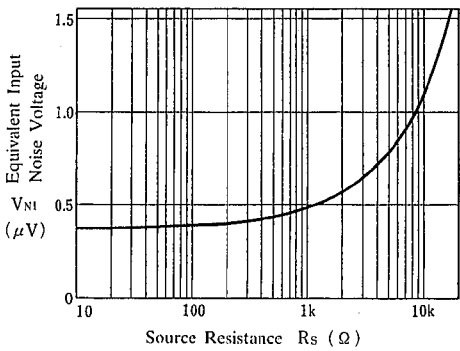
Operating Current vs. Operating Voltage

(No Input Signal,  $R_L = \infty$ ,  $T_a = 25^\circ\text{C}$ )



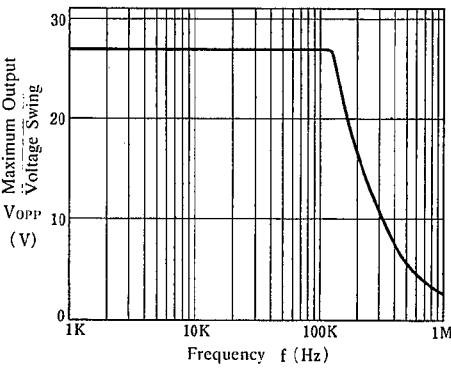
Equivalent Input Noise Voltage vs. Source Resistance

( $V^+/V^- = \pm 15\text{V}$ , JIS A,  $T_a = 25^\circ\text{C}$ )



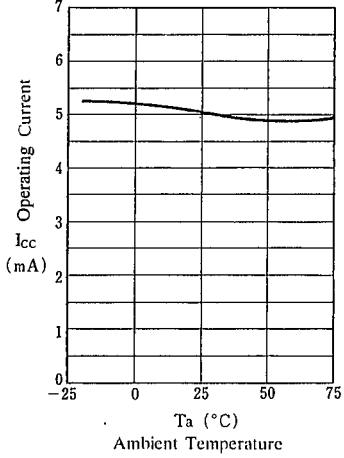
Maximum Output Voltage Swing vs. Frequency

( $V^+/V^- = \pm 15\text{V}$ ,  $R_L = 2\text{k}\Omega$ ,  $T_a = 25^\circ\text{C}$ )



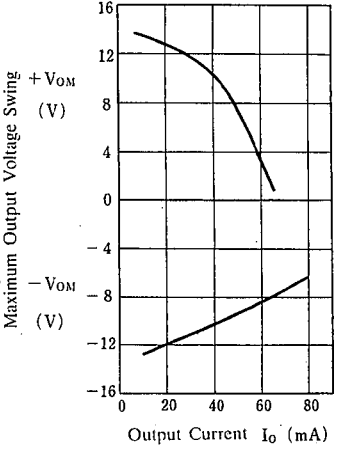
Operating Current vs. Temperature

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



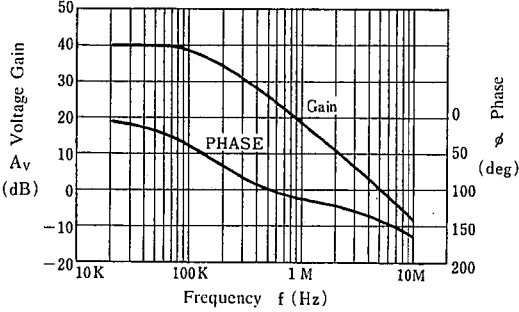
Maximum Output Voltage Swing

( $V^+/V^- = \pm 15\text{V}$ ,  $T_a = 25^\circ\text{C}$ )



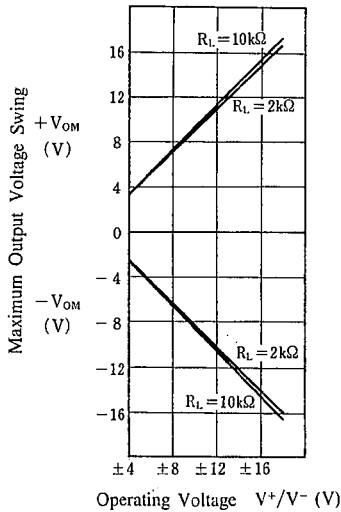
Voltage Gain, Phase vs. Frequency

( $V^+/V^- = \pm 15\text{V}$ ,  $R_L = 2\text{k}\Omega$ ,  $C_L = 100\text{pF}$ , 40dB Amp,  $T_a = 25^\circ\text{C}$ )

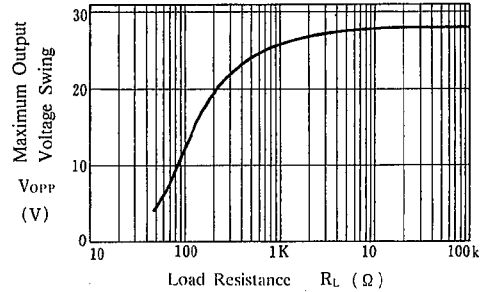


■ TYPICAL CHARACTERISTICS

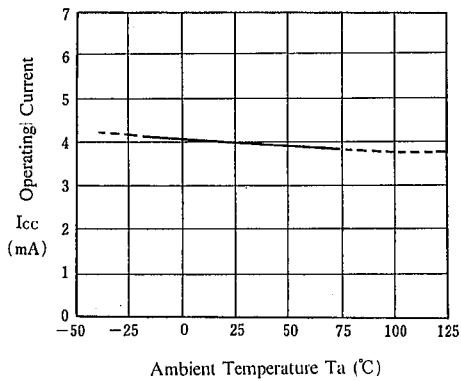
**Maximum Output Voltage Swing  
vs. Operating Voltage**  
( $T_a = 25^\circ\text{C}$ )



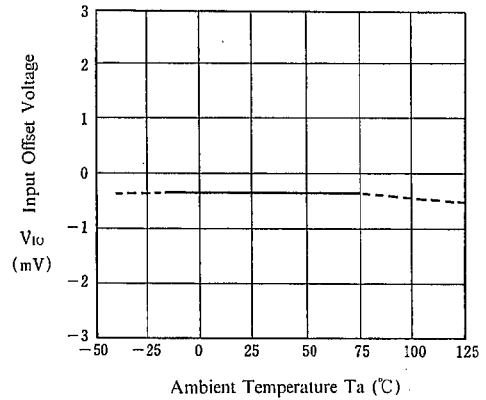
**Maximum Output Voltage Swing  
vs. Load Resistance**  
( $V^+/V^- = \pm 15\text{V}$ ,  $T_a = 25^\circ\text{C}$ )



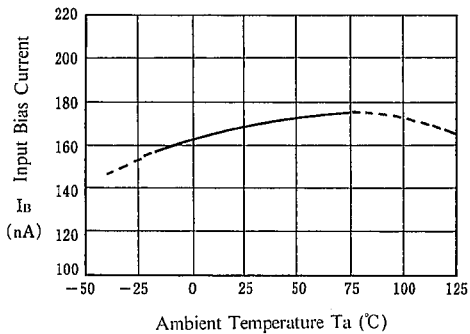
**Operating Current vs. Temperature**  
( $V^+/V^- = \pm 15\text{V}$ )



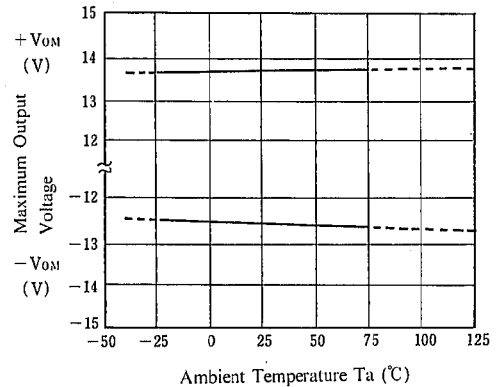
**Input Offset Voltage vs. Temperature**  
( $V^+/V^- = \pm 15\text{V}$ )



**Input Bias Current vs. Temperature**  
( $V^+/V^- = \pm 15\text{V}$ )



**Maximum Output Voltage vs. Temperature**  
( $V^+/V^- = \pm 15\text{V}$ ,  $R_L = 2k\Omega$ )



## MEMO

**[CAUTION]**

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