

SINGLE-SUPPLY QUAD OPERATIONAL AMPLIFIER

■ GENERAL DESCRIPTION

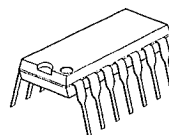
The NJM3403A is high performance ground sensing quad operational amplifier featuring the high slew rate and no cross-over distortion.

The NJM3403A is improved version of the NJM2902.

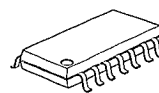
■ FEATURES

- Single Supply
- Operating Voltage (+4V ~ +36V)
- Low Operating Current (3mA typ.)
- Slow Rate (1.2V/μs typ.)
- Package Outline DIP14, DMP14, SSOP14
- Bipolar Technology

■ PACKAGE OUTLINE



NJM3403AD

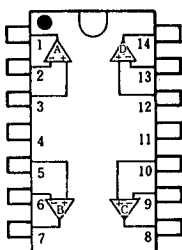


NJM3403AM



NJM3403AV

■ PIN CONFIGURATION



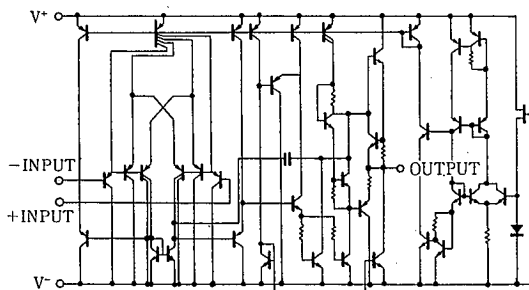
NJM3403AD
NJM3403AM
NJM3403AV

PIN FUNCTION

- | | |
|--------------------|---------------------|
| 1 . A OUTPUT | 8 . C OUTPUT |
| 2 . A - INPUT | 9 . C - INPUT |
| 3 . A + INPUT | 10 . C + INPUT |
| 4 . V ⁺ | 11 . V ⁻ |
| 5 . B + INPUT | 12 . D + INPUT |
| 6 . B - INPUT | 13 . D - INPUT |
| 7 . B OUTPUT | 14 . D OUTPUT |

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■ EQUIVALENT CIRCUIT (1/4 Shown)



■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V ⁺ (V ⁺ /V ⁻)	36(or ±18)	V
Differential Input Voltage	V _{id}	36	V
Input Voltage	V _{ic}	-0.3~+36	V
Power Dissipation	P _d	(DIP14) 500	mW
		(DMP14) 300	mW
		(SSOP14) 300	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)

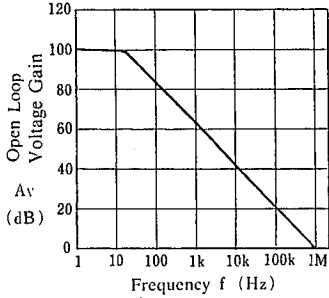
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V _{IO}	R _S =0Ω	—	2	5	mV
Input Offset Current	I _{IO}		—	5	50	nA
Input Bias Current	I _B		—	70	200	nA
Large Signal Voltage Gain	A _v	R _L >2kΩ	88	100	—	dB
Maximum Output Voltage Swing	V _{OM}	R _L =2kΩ	±13	±14	—	V
Input Common 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
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
Channel Separation	CS	f=1k~20kHz Input Referred	—	120	—	dB
Operating Current	I _{CC}	R _L =∞	—	3	5	mA
Slew Rate	SR		—	1.2	—	V/μS
Unity Gain Bandwidth	f _T		—	1.2	—	MHz
Total Harmonic Distortion	THD	f=20kHz, V _O =10V _{PP}	—	1	—	%

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TYPICAL CHARACTERISTICS

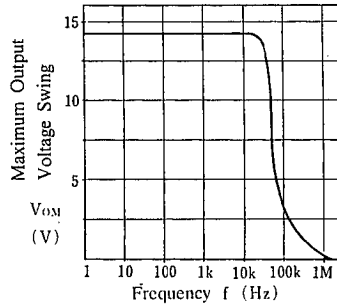
Open Loop Voltage Gain vs. Frequency

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



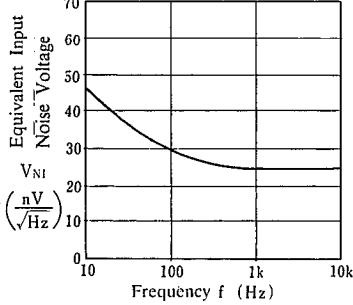
Maximum Output Voltage Swing vs. Frequency

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



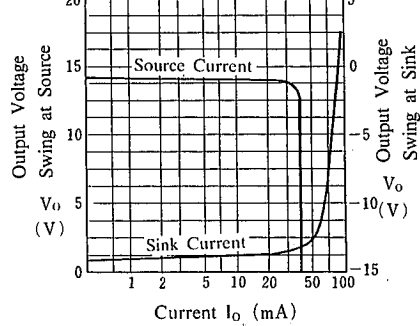
Equivalent Input Noise Voltage vs. Frequency

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



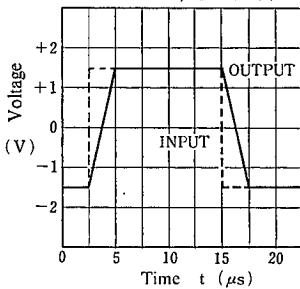
Output Source Current vs. Output Voltage Swing

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



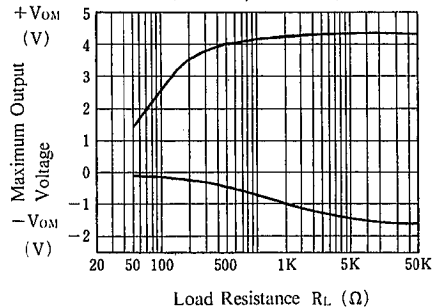
Square Wave Resps

($V^+/V^- = \pm 15V$, $R_L = 2k\Omega$, $A_v = 1$, $T_a = 25^\circ C$)



Maximum Output Voltage vs. Load Resistance

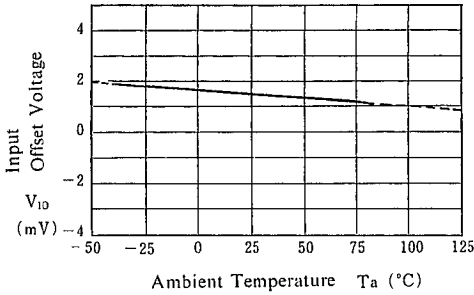
($V^+ = 5V$, $T_a = 25^\circ C$)



■ TYPICAL CHARACTERISTICS

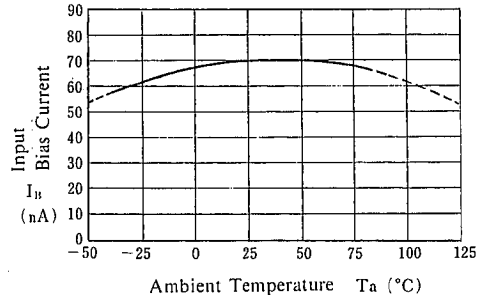
Input offset Voltage vs. Temperature

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



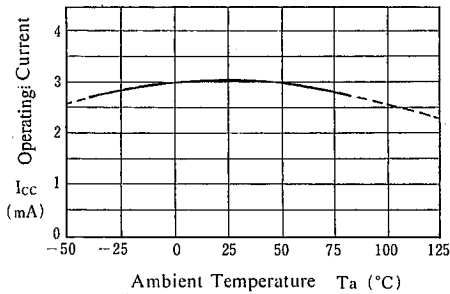
Input Bias Current vs. Temperature

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



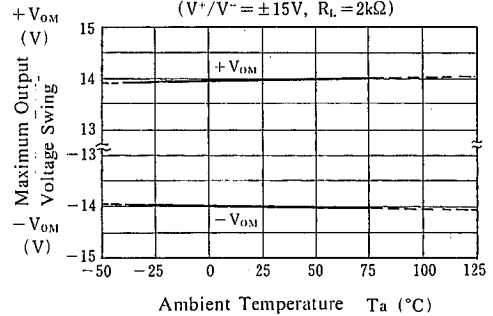
Operating Current vs. Temperature

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



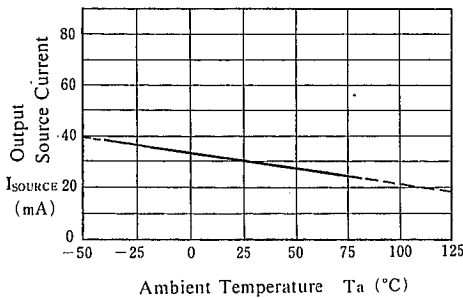
Maximum Output Voltage Swing vs. Temperature

($V^+/V^- = \pm 15V, R_L = 2k\Omega$)



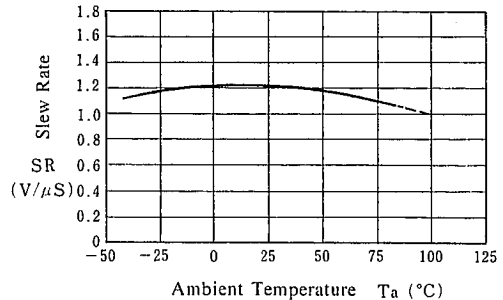
Output Source Current vs. Temperature

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



Slew Rate vs. Temperature

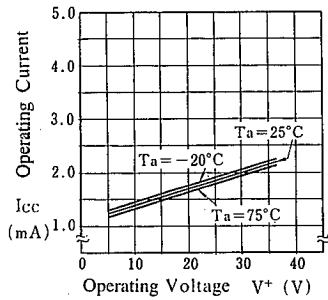
($V^+/V^- = \pm 15V, R_L = 2k\Omega$)



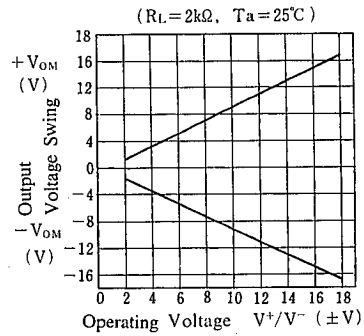
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■ TYPICAL CHARACTERISTICS

Operating Current vs. Operating Voltage

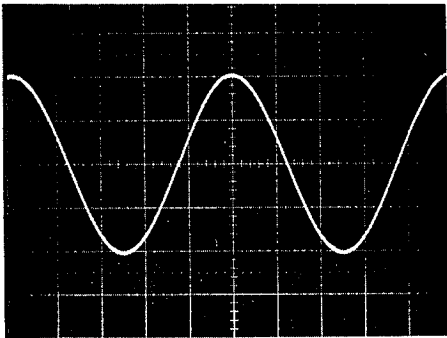


Output Voltage Swing vs. Operating Voltage

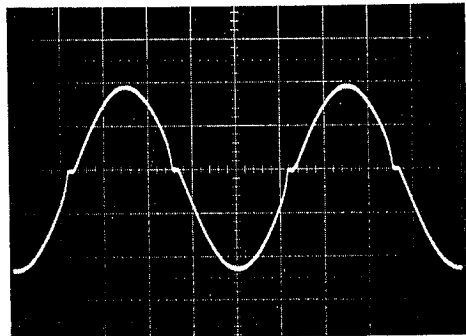


■ Crossover Distortion

Photos (1) and (2) show the output waveforms of NJM3403A and operational amplifier having crossover distortion. The NJM3403A eliminates the crossover distortion through the A, B class output stage as shown in the photo. NJM3403A IC has realized a wide band and a high slew rate in addition to the low distortion.



(1) NJM3403A Output Waveform



(2) Crossover Distortion Example

$f = 1\text{kHz}$, $R_L = 2\text{k}\Omega$, Vertical Axis: $2\text{V}/\text{div}$

MEMO

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