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.

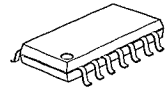The NJM3403A is improved version of the NJM2902.

■ FEATURES

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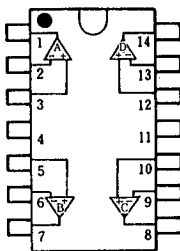- Bipolar Technology

■ PACKAGE OUTLINE
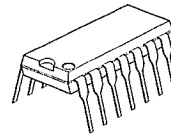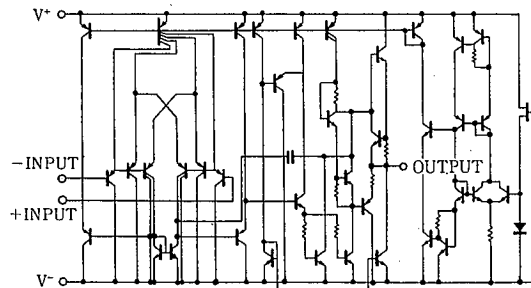
NJM3403AD NJM3403AM

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

■ EQUIVALENT CIRCUIT (1/4 Shown)

■ ABSOLUTE MAXIMUM RATINGS

(Ta=25℃)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V^+(V^+/V^-)$	36(or $\pm$18)	V
Differential Input Voltage	V_{ID}	36	V
Input Voltage	V_{IC}	$-0.3\sim+36$	V
Power Dissipation	P_D	(DIP14) 500	mW
		(DMP14) 300	mW
		(SSOP14) 300	mW
Operating Temperature Range	T_{opr}	$-40\sim+85$	℃
Storage Temperature Range	T_{stg}	$-40\sim+125$	℃

■ ELECTRICAL CHARACTERISTICS

(Ta=25℃, $V^+/V^-=\pm15V$)

| PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V_{IO}	$R_S=0\Omega$	—	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	$R_L>2k\Omega$	88	100	—	dB
Maximum Output Voltage Swing	V_{OM}	$R_L=2k\Omega$	±13	±14	—	V
Input Common Mode Voltage Range	V_{ICM}		$-15\sim+13$	—	—	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	$f=1k\sim20kHz$ Input Referred	—	120	—	dB
Operating Current	I_{CC}	$R_L=\infty$	—	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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NJM3403A

■ **TYPICAL CHARACTERISTICS**

Open Loop Voltage Gain vs. Frequency
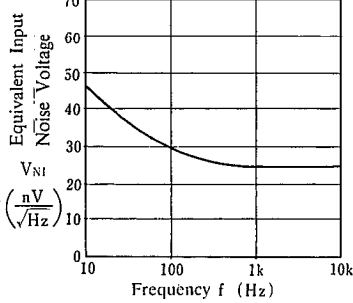
$(V^+/V^- = \pm 15V, R_L = 2k\Omega, Ta = 25°C)$
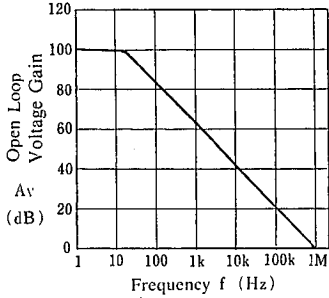
Maximum Output Voltage Swing vs. Frequency

$(V^+/V^- = \pm 15V, R_L = 2k\Omega, Ta = 25°C)$
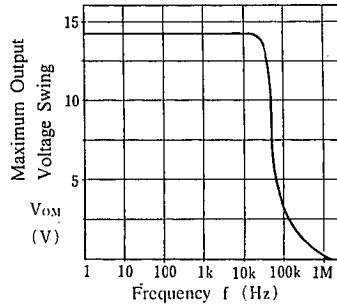
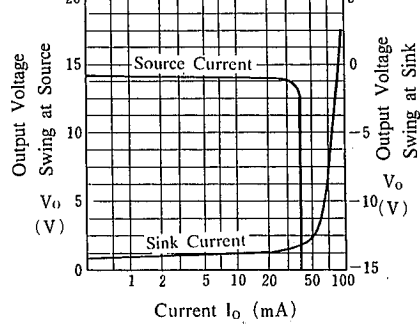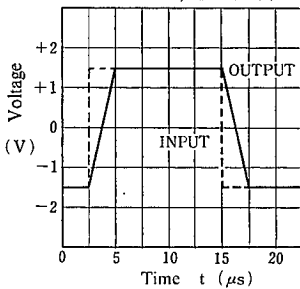### Equivalent Input Noise Voltage vs. Frequency

$(V^+/V^- = 15V, Ta = 25°C)$

Output Source Current Output Sink Current vs. Output Voltage Swing

$(V^+/V^- = \pm 15V, Ta = 25°C)$

Square Wave Respons

$(V^+/V^- = \pm 15V, R_L = 2k\Omega, Av = 1, Ta = 25°C)$

Maximum Output Voltage vs. Load Resistance

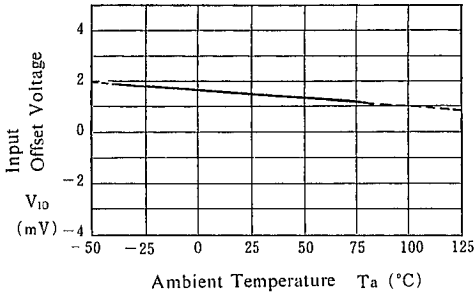$(V^+ = 5V, Ta = 25°C)$
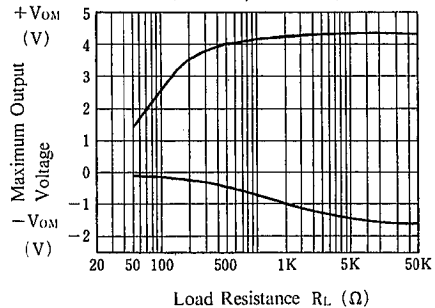
■ TYPICAL CHARACTERISTICS

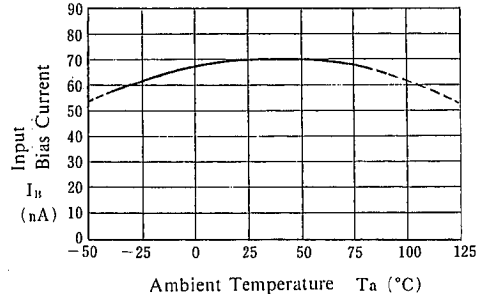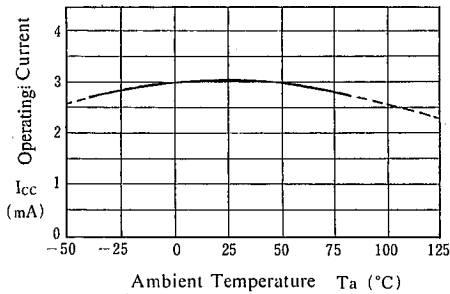### Input offset Voltage vs. Temperature
$(V^+/V^- = \pm 15V)$

Input Offset Voltage V_{IO} (mV)

Ambient Temperature Ta (°C)

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

Input Bias Current I_B (nA)

Ambient Temperature Ta (°C)

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

Operating Current I_{CC} (mA)

Ambient Temperature Ta (°C)

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

$+V_{OM}$ (V) $-V_{OM}$ (V)   Maximum Output Voltage Swing

$+V_{OM}$ $-V_{OM}$

Ambient Temperature Ta (°C)
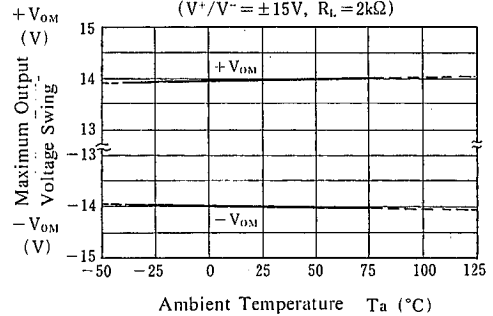
Output Source Current vs. Temperature
$(V^+/V^- = \pm 15V)$

Output Source Current I_{SOURCE} (mA)

Ambient Temperature Ta (°C)

Slew Rate vs. Temperatute
$(V^+/V^- = \pm 15V, R_L = 2k\Omega)$

Slew Rate SR (V/μS)

Ambient Temperature Ta (°C)
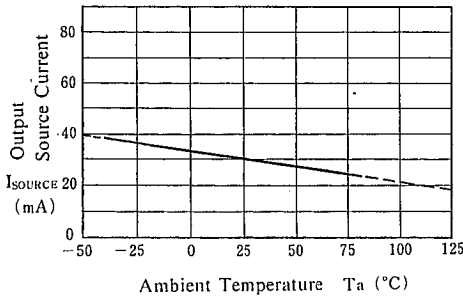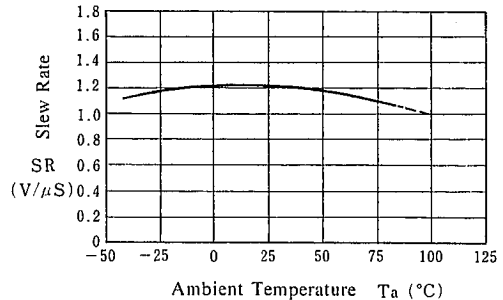
■ TYPICAL CHARACTERISTICS

Operating Current vs. Operating Voltage
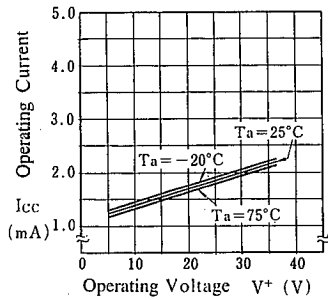
Output Voltage Swing vs. Operating Voltage

($R_L = 2k\Omega$, Ta = 25°C)
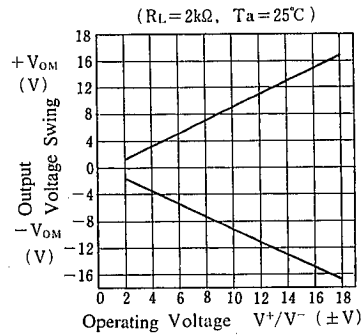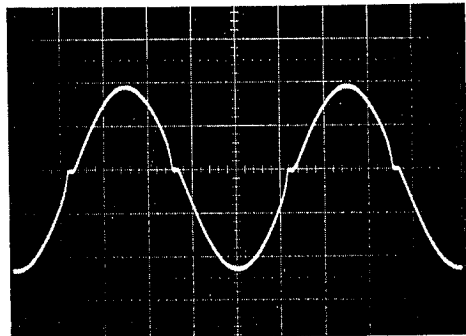

■ Crossover Distortion

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.
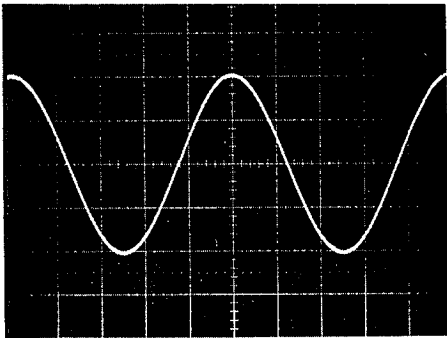
(1) NJM3403A Output Waveform

(2) Crossover Distortion Example

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

MEMO