

QUAD SINGLE-SUPPLY OPERATIONAL AMPLIFIER

■ **GENERAL DESCRIPTION**

The NJM2902 consists of four independent high-gain operational amplifiers that are designed for single-supply operation.

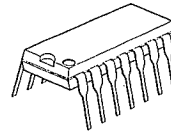
Operation from split power supplies is also possible and the low power supply drain is independent of the magnitude of the power supply voltage.

Used with a dual supply the circuit will operate over a wide range of supply voltages. However, a large amount of crossover distortion may occur with loads to ground. An external current-sinking resistor to $-V_s$ will reduce crossover distortion. There is no crossover distortion problem in single-supply operation if the load is direct-coupled to ground.

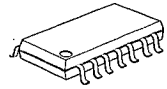
■ **FEATURES**

- Single Supply
- Operating Voltage (+3V ~ +30V)
- High Output Voltage ($V^+ - 2V$)
- Slew Rate ($0.5V/\mu s$ typ.)
- Low Operating Current (1mA typ.)
- Package Outline DIP14, DMP14, SSOP14
- Bipolar Technology

■ **PACKAGE OUTLINE**



NJM2902N

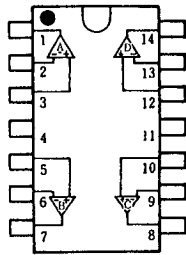


NJM2902M



NJM2902V

■ **PIN CONFIGURATION**

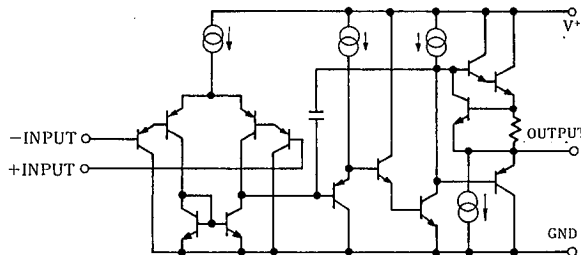


NJM2902N
NJM2902M
NJM2902V

PIN FUNCTION

- | | |
|--------------------|---------------|
| 1 . A OUTPUT | 8 . C OUTPUT |
| 2 . A -INPUT | 9 . C -INPUT |
| 3 . A +INPUT | 10 . C +INPUT |
| 4 . V ⁺ | 11 . GND |
| 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°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V ⁺ (V ⁺ /V ⁻)	32(or ±16)	V
Differential Input Voltage	V _{ID}	32	V
Input Voltage	V _{IC}	-0.3~+32 (note)	V
Power Dissipation	P _D	(DIP14) 570	mW
		(DMP14) 300	mW
		(SSOP14) 300	mW
Operating Temperature Range	T _{opr}	-40~+85	°C
Storage Temperature Range	T _{stg}	-50~+125	°C

■ ELECTRICAL CHARACTERISTICS

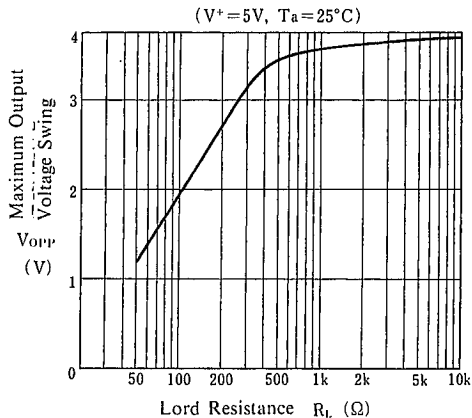
(Ta=25°C V⁺=5V)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V _{IO}	R _S =0Ω	—	2	10	mV
Input Offset Current	I _{IO}	I _{IN} ⁺ - I _{IN} ⁻	—	5	50	nA
Input Bias Current	I _B	I _{IN} ⁺ or I _{IN} ⁻	—	20	500	nA
Large Signal Voltage Gain	A _V	R _L ≥ 2kΩ	—	100	—	V/mV
Maximum Output Voltage Swing	V _{OM}	R _L =2kΩ	3.5	—	—	V
Input Common Mode Voltage Range	V _{ICM}		0~3.5	—	—	V
Common Mode Rejection Ratio	CMR		—	85	—	dB
Supply Voltage Rejection Ratio	SVR		—	100	—	dB
Output Source Current	I _{SOURCE}	V _{IN} ⁺ =1V, V _{IN} ⁻ =0V	20	40	—	mA
Output Sink Current	I _{SINK}	V _{IN} ⁺ =0V, V _{IN} ⁻ =1V	8	20	—	mA
Channel Separation	CS	f=1k~20kHz, Input Referred	—	120	—	dB
Operating Current	I _{CC}	R _L =∞	—	1	2	mA
Slew Rate	SR	V ⁺ /V ⁻ = ±15V	—	0.5	—	V/μs
Gain Bandwidth Product	GB	V ⁺ /V ⁻ = ±15V	—	0.5	—	MHz

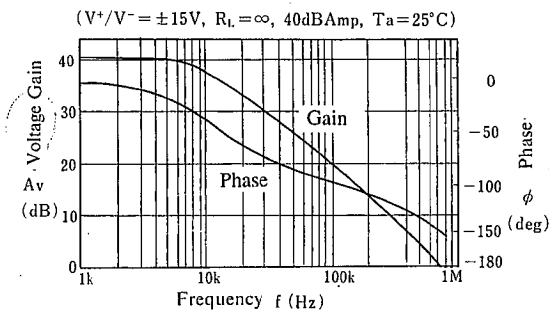
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TYPICAL CHARACTERISTICS

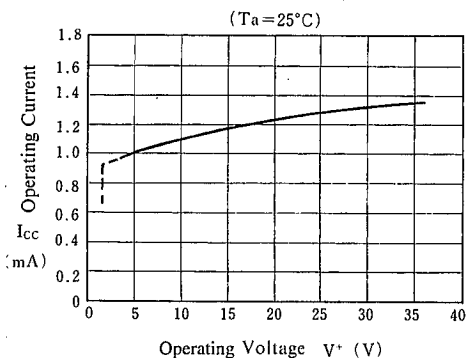
Maximum Output Voltage Swing vs. Load Resistance



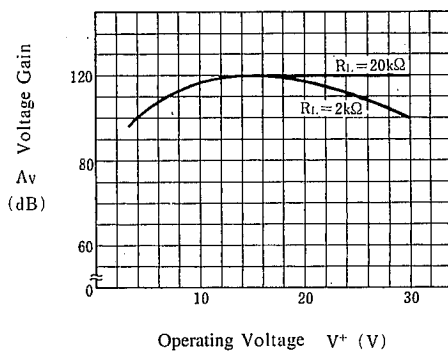
Voltage Gain, Phase vs. Frequency



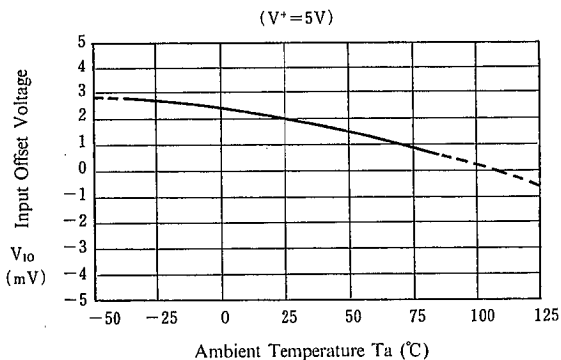
Operating Current vs. Operating Voltage



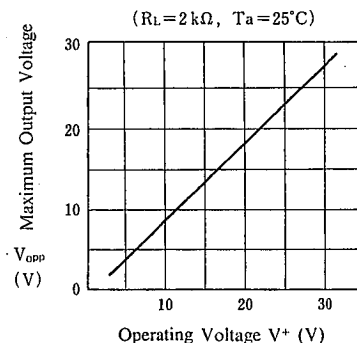
Voltage Gain vs. Operating Voltage



Input Offset Voltage vs. Temperature



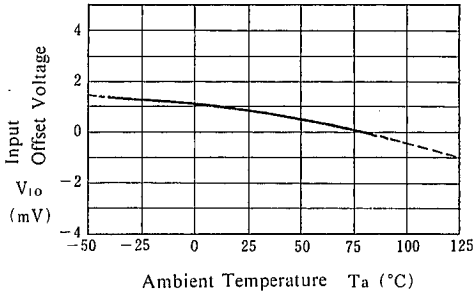
Maximum Output Voltage vs. Operating Voltage



■ TYPICAL CHARACTERISTICS

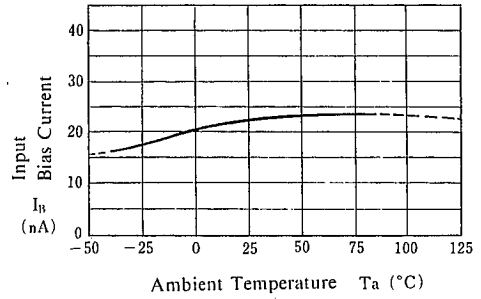
Input Offset Voltage vs. Temperature

($V^+ = 5\text{ V}$)



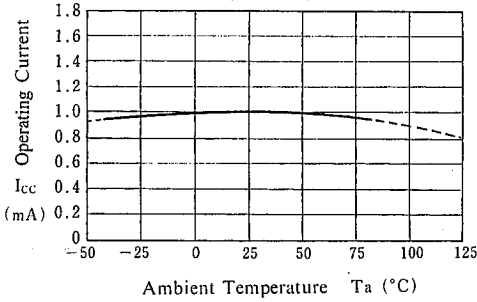
Input Bias Current vs. Temperature

($V^+ = 5\text{ V}$)



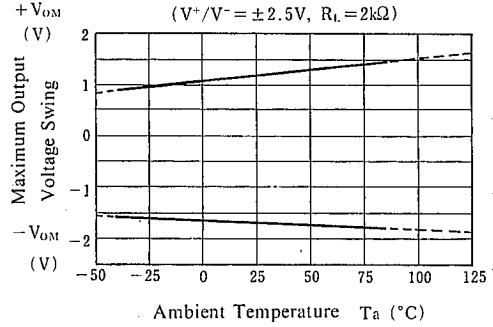
Operating Current vs. Temperature

($V^+ = 5\text{ V}$)



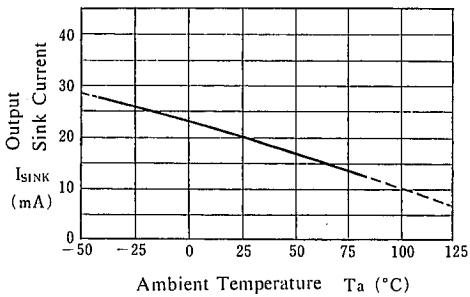
Maximum Output Voltage Swing vs. Temperature

($V^+/V^- = \pm 2.5\text{ V}$, $R_L = 2\text{ k}\Omega$)

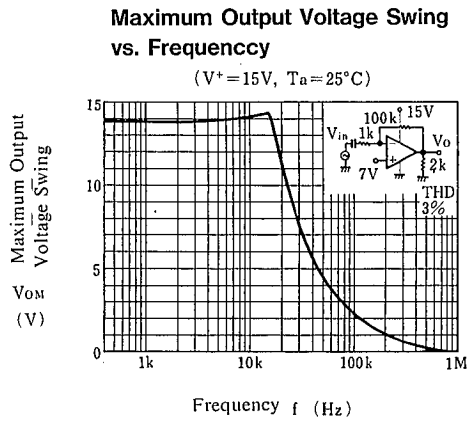
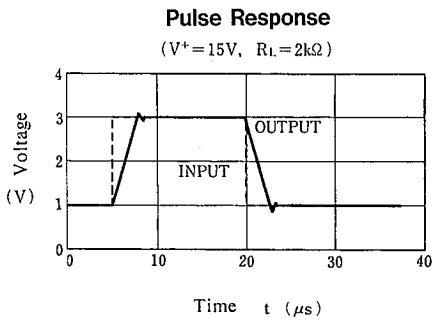
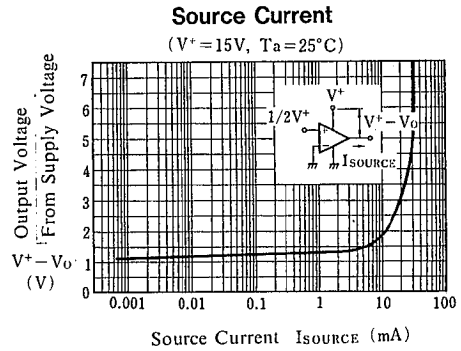
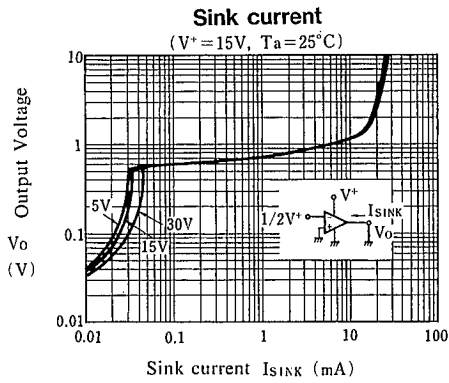


Output Sink Current vs. Temperature

($V^+ = 5\text{ V}$)

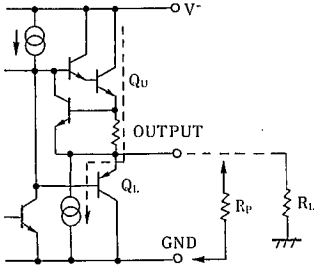


■ TYPICAL CHARACTERISTICS



■ APPLICATION

Improvement of Cross-over Distortion
Equivalent circuit at the output stage

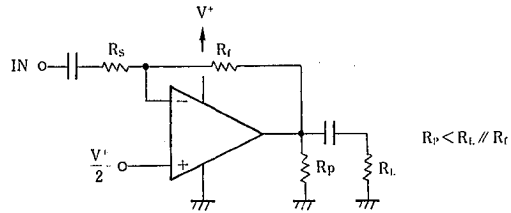
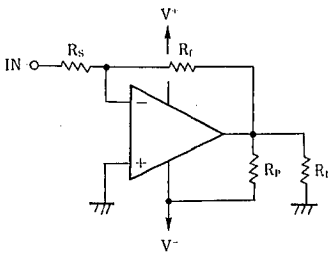


NJM2902, in its static state (No in and output condition) when design, Q_U being biased by constant current (breake down beam) yet, Q_L stays OFF.

While using with both power soure mode, the cross-over distortion might occure instantly when Q_L ON.

There might be cases when application for amplifier of audio signals, not only distortion but also the apparent frequency bandwidth being narrowed remarkably.

It is aduisable especially when using both power soure mode, constantly to use with higher current on Q_U than the load current (including feedback current), and then connect the pull-down resister R_P at the part between output and GND pins.



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MEMO

[CAUTION]

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