

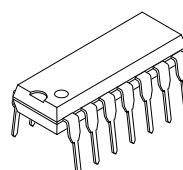
## SINGLE-SUPPLY QUAD OPERATIONAL AMPLIFIER

### ■ GENERAL DESCRIPTION

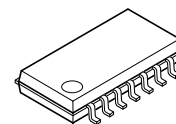
The NJM324 consists of four independent, high gain, internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage.

Application areas include transducer amplifiers, DC gain blocks and all the conventional op amp circuits which now can be more easily implemented in single power supply systems. For example, the NJM324 can be directly operated off of the standard  $+5V_{DC}$  power supply voltage which is used in digital systems and will easily provide the required interface electronics without requiring the additional  $\pm 15V_{DC}$  power supplies.

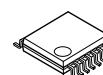
### ■ PACKAGE OUTLINE



NJM324D



NJM324M

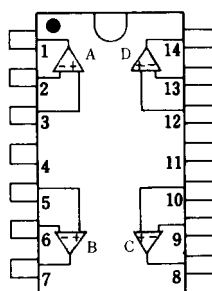


NJM324V

### ■ FEATURES

- Single Supply Operation
- Operating Voltage (  $+3V \sim +32V$  )
- Low Operating Current (  $0.7mA$  typ. )
- Package Outline DIP14,DMP14,SSOP14
- Bipolar Technology

### ■ PIN CONFIGURATION

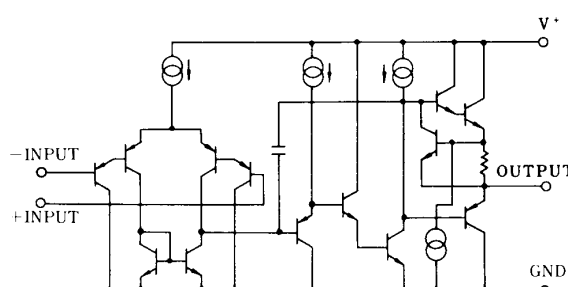


NJM324D  
NJM324M  
NJM324V

#### PIN FUNCTION

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

### ■ EQUIVALENT CIRCUIT ( 1/4 Shown )



## ■ ABSOLUTE MAXIMUM RATINGS

( Ta=25°C )

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V^+/V^-$	32 ( or $\pm 16$ )	V
Differential Input Voltage	$V_{ID}$	32	V
Input Voltage	$V_{IC}$	-0.3~+32 ( note )	V
Power Dissipation	$P_D$	( DIP14 ) 570 ( DMP14 ) 300 ( SSOP14 ) 300	mW
Operating Temperature Range	$T_{opr}$	-40~+85	°C
Storage Temperature Range	$T_{stg}$	-40~+125	°C

( note ) For supply voltage less than 32V, the absolute maximum input voltage is equal to the supply voltage.

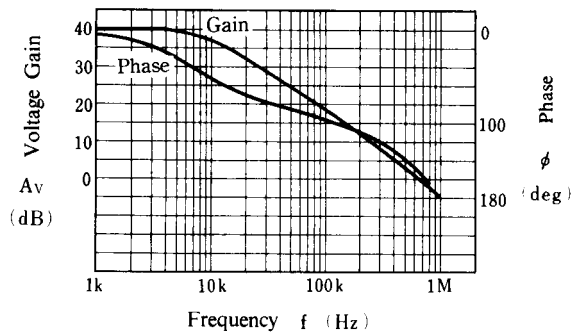
## ■ ELECTRICAL CHARACTERISTICS

( Ta=+25°C,  $V^+=5V$  )

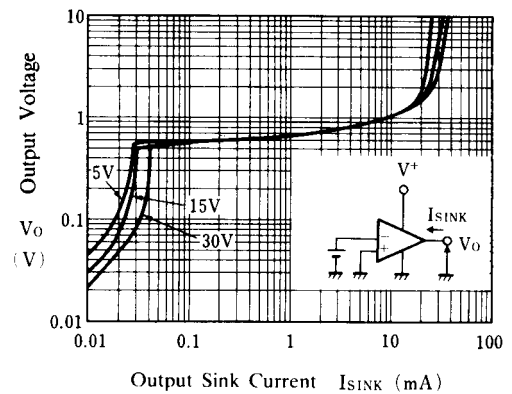
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	$V_{IO}$	$R_S=0\Omega, V^+=5\sim 30V_{DC}$	-	2	7	mV
Input Offset Current	$I_{IO}$		-	5	50	nA
Input Bias Current	$I_B$		-	20	250	nA
Input Common Mode Voltage Range	$V_{ICM}$		0~3.5	-	-	V
Operating Current	$I_{CC}$	$R_L=\infty$	-	0.7	1.2	mA
Large-signal Voltage Gain	$A_V$	$R_L \geq 2k\Omega, V^+=15V$	88	100	-	dB
Maximum Peak-to-peak Output Voltage Swing	$V_{OPP}$	$R_L=2k\Omega$	3.5	-	-	V
Common Mode Rejection Ratio	CMR	DC	65	70	-	dB
Supply Voltage Rejection Ratio	SVR	DC	65	100	-	dB
Output Source Current	$I_{SOURCE}$	$V_{IN}^+/V_{IN}^-=1/0V, V^+=15V$	20	40	-	mA
Output Sink Current 1	$I_{SINK1}$	$V_{IN}^+/V_{IN}^-=0/1V, V^+=15V$	10	20	-	mA
Output Sink Current 2	$I_{SINK2}$	$V_{IN}^+/V_{IN}^-=0/1V, V_o=200mV$	12	20	-	$\mu A$
Channel Separation	CS	$f=1kHz\sim 20kHz$ , Input Referred	-	120	-	dB

## TYPICAL CHARACTERISTICS

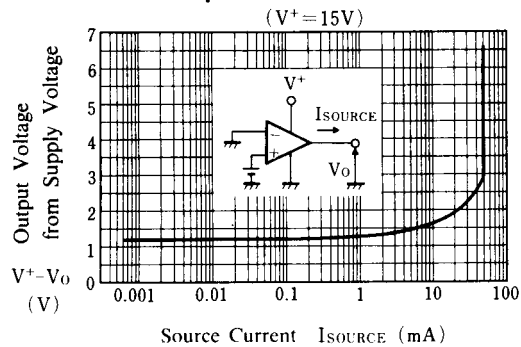
### Voltage Gain, Phase vs. Frequency



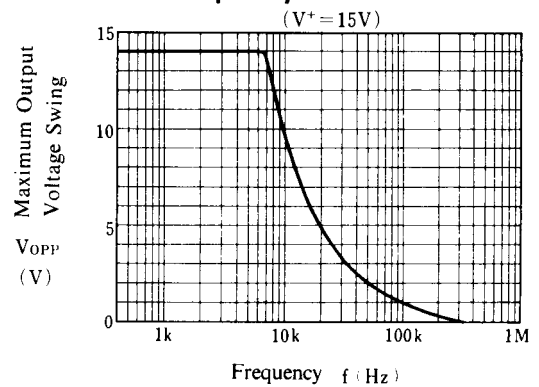
### Output Sink Current



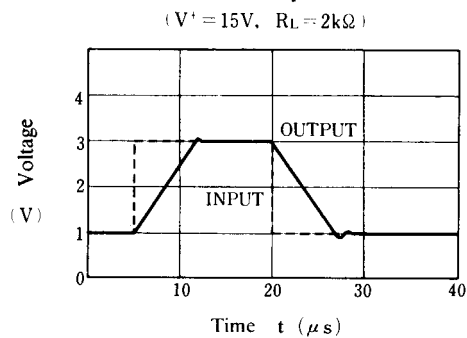
### Output Source Current



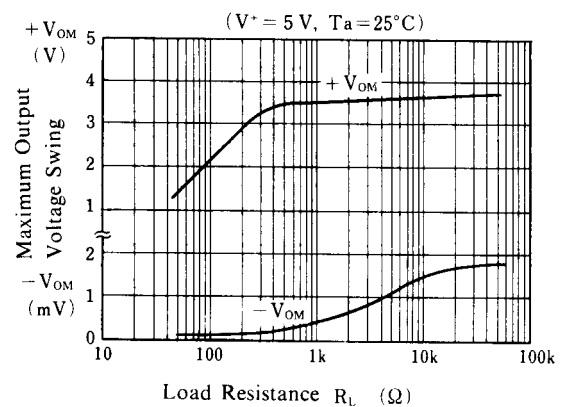
### Maximum Output Voltage Swing vs. Frequency



### Pulse Response

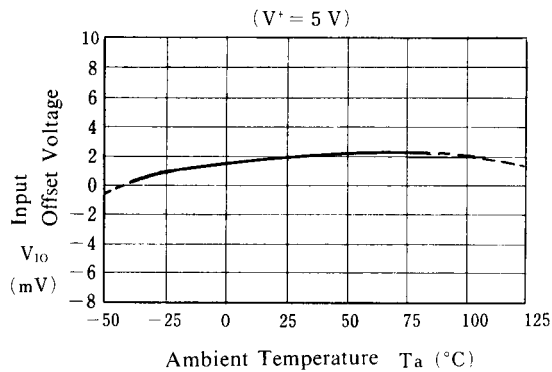


### Maximum Output Voltage Swing vs. Load Resistance

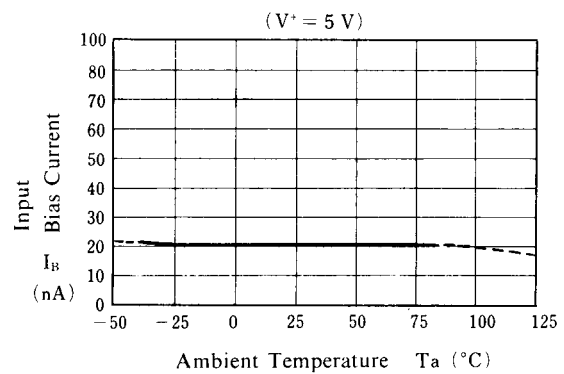


## ■ TYPICAL CHARACTERISTICS

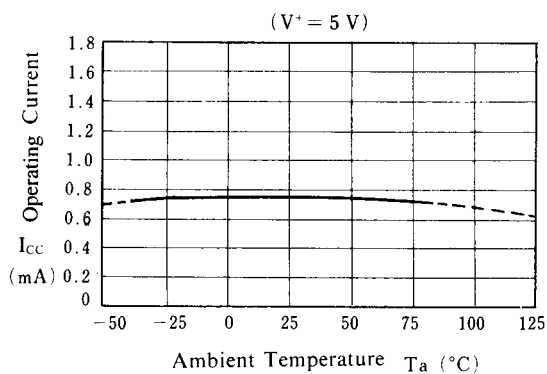
Input Offset Voltage vs. Temperature



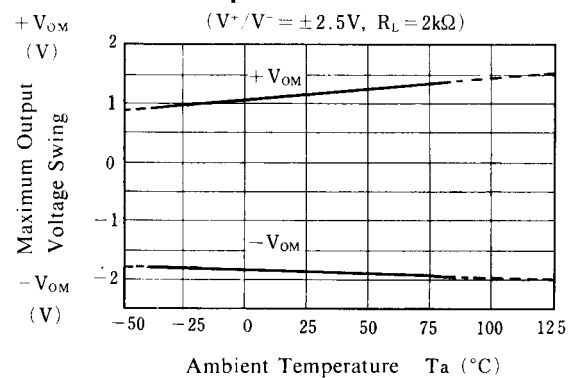
Input Bias Current vs. Temperature



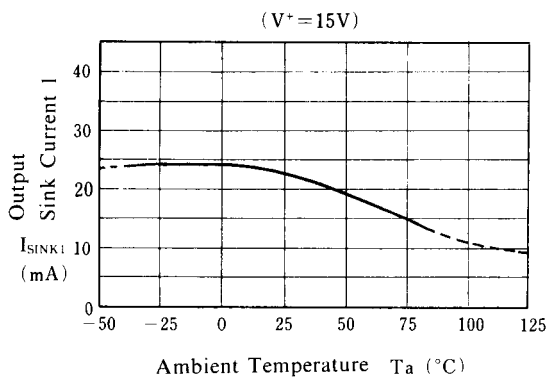
Operating Current vs. Temperature



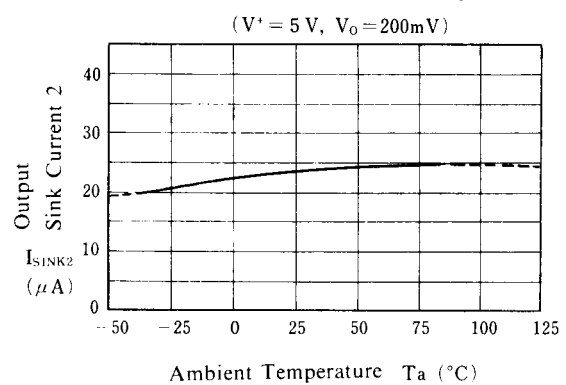
Maximum Output Voltage Swing vs. Temperature



Output Sink Current 1 vs. Temperature

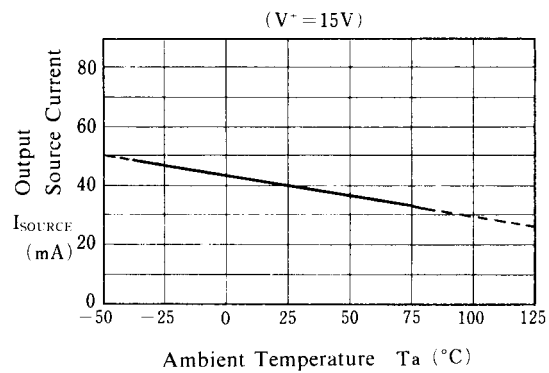


Output Sink Current 2 vs. Temperature

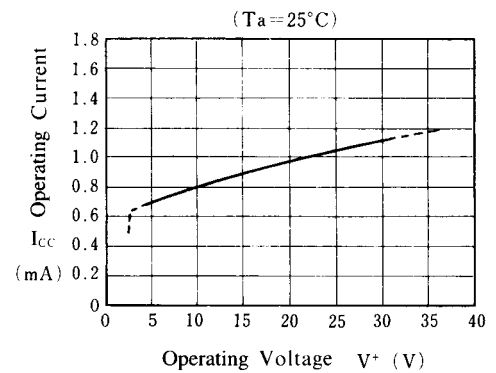


## ■ TYPICAL CHARACTERISTICS

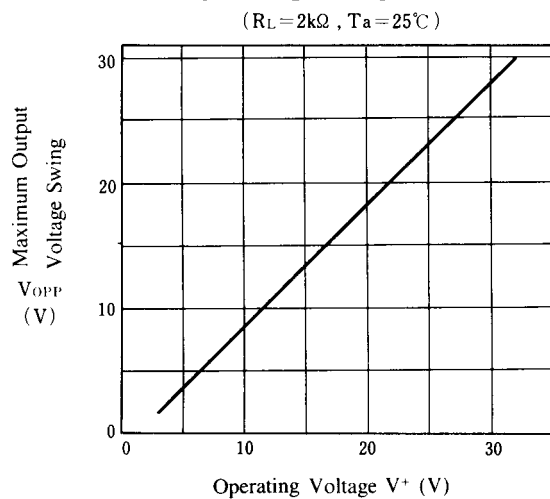
**Output Source Current vs. Temperature**



**Operating Current vs. Operating Voltage**



**Maximum Output Voltage Swing vs. Operating Voltage**



**[CAUTION]**

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