

# **DUAL OPERATIONAL AMPLIFIER**

#### **■ GENERAL DESCRIPTION**

The NJM4560 integrated circuit is a high-gain, wide bandwidth, dual operational amplifier capable of driving 20V peak-to-peak into 400 $\Omega$  loads. The NJM4560 combines many of the features of the NJM4558 as well as providing the capability of wider bandwidth, and higher slew rate make the NJM4560 ideal for active filters, data and telecommunications, and many instrumentation applications. The availability of the NJM4560 in the surface mounted micro-package allows the NJM4560 to be used in critical applications requiring very high packing densities.

#### **■ PACKAGE OUTLINE**



NJM4560D ( DIP8)



NJM4560M ( DMP8 )



NJM4560E (SOP8)



NJM4560L (SIP8)

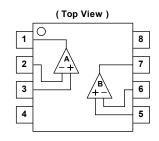
### **■ FEATURES**

Operating Voltage (±4V~±18V)
 Wide Gain Bandwidth Product (10MHz typ.)
 Slew Rate (4V/µs typ.)

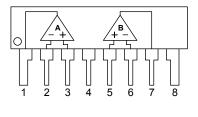
Package Outline
 DIP8, DMP8, SIP8, SOP8 JEDEC 150mil

Bipolar Technology

#### **■ PIN CONFIGURATION**



NJM4560D, NJM4560M, NJM4560E

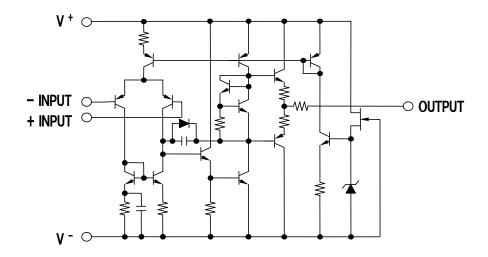


NJM4560L

### **PIN FUNCTION**

- 1. A OUTPUT
- 2. A INPUT
- 3. A +INPUT
- 4. V
- 5. B +INPUT
- 6. B INPUT
- 7. B OUTPUT
- 8. V<sup>+</sup>

### ■ EQUIVALENT CIRCUIT (1/2 Shown)



### ■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

SYMBOL	RATINGS	UNIT
V <sup>+</sup> √	± 18	V
V <sub>ID</sub>	± 30	V
V <sub>IC</sub>	± 15 (note)	V
P <sub>D</sub>	( DIP8 ) 500 ( DMP8 ) 300 ( SOP8 ) 300 ( SIP8 ) 800	mW
T <sub>opr</sub>	-40~+85	°C
T <sub>stg</sub>	-40~+125	°C
	V <sup>+</sup> /V V <sub>ID</sub> V <sub>IC</sub> P <sub>D</sub>	V*/V         ± 18           VID         ± 30           VIC         ± 15 (note)           (DIP8 ) 500         (DMP8 ) 300           (SOP8 ) 300         (SIP8 ) 800           Topr         -40~+85

( note ) For supply voltage less than  $\pm 15 \text{V}$ , the absolute maximum input voltage is equal to the supply voltage.

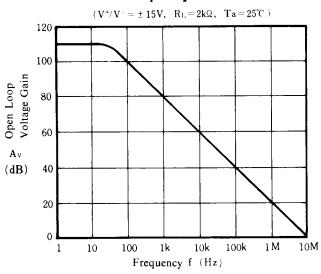
### **■ ELECTRICAL CHARACTERISTICS**

( Ta=25°C,V<sup>+</sup>/V<sup>-</sup>=±15V )

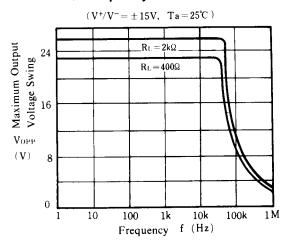
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V <sub>IO</sub>	R <sub>S</sub> ≤10kΩ	-	0.5	6	mV
Input Offset Current	I <sub>IO</sub>		-	5	200	nA
Input Bias Current	$I_{B}$		-	40	500	nA
Input Resistance	R <sub>IN</sub>		0.3	5	-	ΜΩ
Large Signal Voltage Gain	$A_{V}$	R <sub>L</sub> ≥2kΩ,V <sub>O</sub> =±10V	86	100	-	dB
Maximum Output Voltage Swing 1	$V_{OM1}$	R <sub>L</sub> ≥2kΩ	± 12	± 14	-	V
Maximum Output Voltage Swing 2	$V_{OM2}$	I <sub>O</sub> =25mA	± 10	± 11.5	-	V
Input Common Mode Voltage Range	$V_{ICM}$		± 12	± 14	-	V
Common Mode Rejection Ratio	CMR	R <sub>S</sub> ≤10kΩ	70	90	-	dB
Supply Voltage Rejection Ratio	SVR	R <sub>S</sub> ≤10kΩ	76.5	90	-	dB
Operating Current	I <sub>CC</sub>		-	4.3	5.7	mA
Slew Rate	SR		-	4	-	V/µs
Gain Bandwidth Product	GB		-	10	-	MHz
Equivalent Input Noise Voltage	$V_{NI}$	RIAA,R <sub>S</sub> =2kΩ,30kHz LPF	-	1.2	-	μVrms

### **■ TYPICAL CHARACTERISTICS**

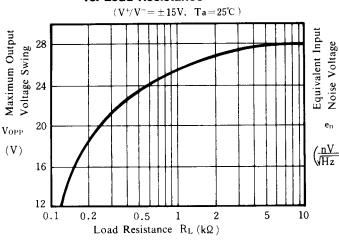
# Open Loop Voltage Gain vs. Frequency



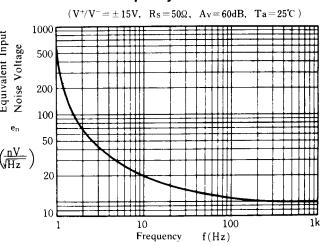
# Maximum Output Voltage Swing vs. Frequency



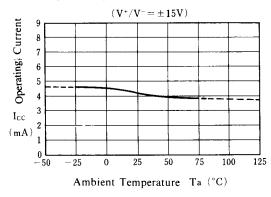
# Maximum Output Voltage Swing vs. Load Resistance



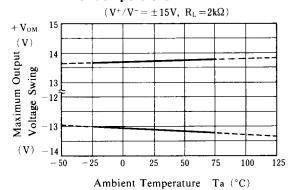
# Equivalent Input Noise Voltage vs. Frequency



### **Operating Current vs. Temperature**

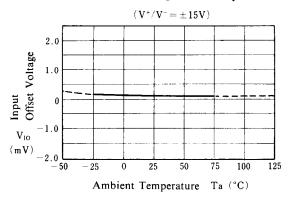


# Maximum Output Voltage Swing vs. Temperature

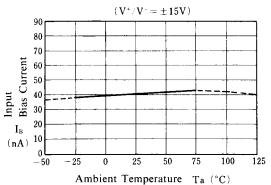


### **■ TYPICAL CHARACTERISTICS**

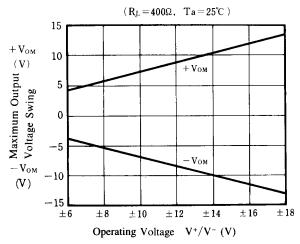
### Input Offset Voltage vs. Temperature



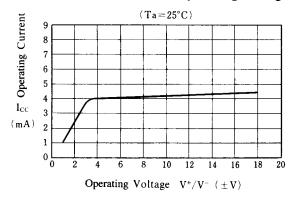
## Input Bias Current vs. Temperature



## **Maximum Output Voltage Swing** vs. Supply Voltage



# **Operating Current vs. Operating Voltage**



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