

ULTRA-LOW OFFSET VOLTAGE, LOW DRIFT OPERATIONAL AMPLIFIER

■ GENERAL DESCRIPTION

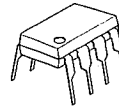
The NJM OP-07 is ultra-low input offset voltage and bias current, low drift and high gain operational amplifier with internal frequency compensation.

The NJM OP-07 is suitable for a high accurated instrumental amplifier.

■ FEATURES

- Ultra-Low  $V_{io}$  60  $\mu$ V
- Ultra-Low  $I_b$  1.8nA
- Ultra-Low Drift unnull 0.5  $\mu$ V/ $^{\circ}$ C  
null 0.4  $\mu$ V/ $^{\circ}$ C
- Ultra-Stable 0.4  $\mu$ V/ $M_o$
- Wide Operating Voltage  $\pm$ 3V ~  $\pm$ 22V
- Package Outline DIP8, DMP8
- Bipolar Technology

■ PACKAGE OUTLINE

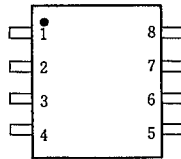


NJMOP-07D



NJMOP-07M

■ PIN CONFIGURATION



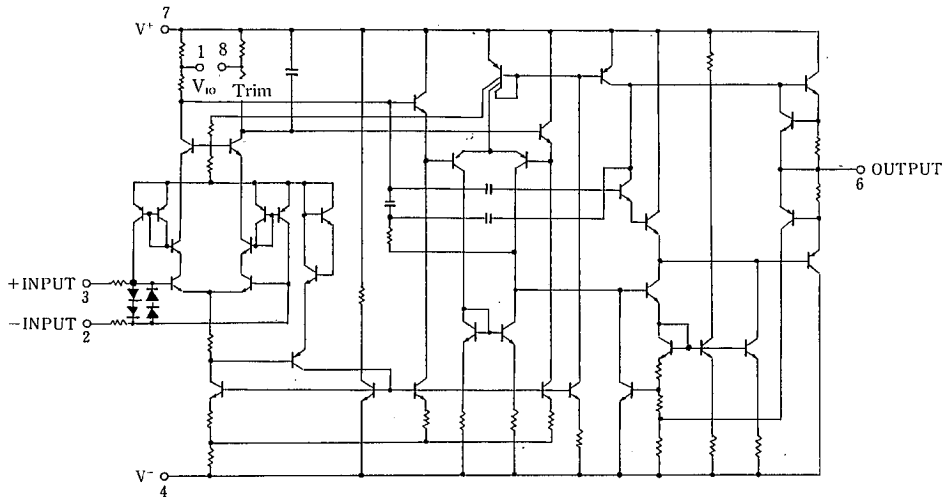
NJMOP-07D  
NJMOP-07M

PIN FUNCTION

1.  $V_{io}$  Trim
2. -INPUT
3. +INPUT
4.  $V^-$
5. NC
6. OUTPUT
7.  $V^+$
8.  $V_{io}$  Trim



■ EQUIVALENT CIRCUIT



## ■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V <sup>+</sup> /V <sup>-</sup>	±22	V
Input Voltage	V <sub>I</sub>	±22(note 1)	V
Differential Input Voltage	V <sub>ID</sub>	±30	V
Power Dissipation	P <sub>D</sub>	(DIP8) 500	mW
		(DMP8) 300	mW
Storage Temperature Range	T <sub>stg</sub>	-40~+125	°C
Operating Temperature Range	T <sub>opr</sub>	-40~+85	°C
Output Current		continuous	

(note) For supply voltage less than ±22V, 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>		—	60	150	μV
Long Term Stability		(note 1,2)	—	0.4	2	μV/Mo
Input Offset Current	I <sub>IO</sub>		—	0.8	6	nA
Input Bias Current	I <sub>B</sub>		—	±1.8	±7	nA
Open Loop Output Resistance	R <sub>O</sub>	V <sub>O</sub> =0, I <sub>O</sub> =0	—	60	—	Ω
Input Resistance	R <sub>ID</sub>	(Differential Mode)	8	33	—	MΩ
Input Resistance	R <sub>IC</sub>	(Common Mode)	—	120	—	GΩ
Input Common Mode Voltage Range	V <sub>ICM</sub>		±13	±14	—	V
Common Mode Rejection Ratio	CMR	V <sub>CM</sub> =±13V	100	120	—	dB
Supply Voltage Rejection Ratio	SVR	V <sup>+</sup> /V <sup>-</sup> =±3V~±18V	90	104	—	dB
Large Signal Voltage Gain 1	AV <sub>1</sub>	R <sub>L</sub> ≥2kΩ, V <sub>O</sub> =±10V	101.5	112.0	—	dB
Large Signal Voltage Gain 2	AV <sub>2</sub>	R <sub>L</sub> =500Ω, V <sub>O</sub> =±0.5V, V <sup>+</sup> /V <sup>-</sup> =±3V	100.0	112.0	—	dB
Maximum Output Voltage 1	V <sub>OM1</sub>	R <sub>L</sub> ≥10kΩ	±12	±13	—	V
Maximum Output Voltage 2	V <sub>OM2</sub>	R <sub>L</sub> >2kΩ	±11.5	±12.8	—	V
Maximum Output Voltage 3	V <sub>OM3</sub>	R <sub>L</sub> >1kΩ	—	±12	—	V
Slew Rate	SR	R <sub>L</sub> ≥2kΩ	—	0.17	—	V/μS
Unity Gain Bandwidth	f <sub>T</sub>	A <sub>VCL</sub> =1	—	0.5	—	MHz
Operating Current 1	I <sub>CC1</sub>	V <sup>+</sup> /V <sup>-</sup> =±15V	—	2.7	5.0	mA
Operating Current 2	I <sub>CC2</sub>	V <sup>+</sup> /V <sup>-</sup> =±3V	—	0.67	1.3	mA
Offset Adjustment Range		R <sub>p</sub> =20kΩ	—	±4	—	mV
Equivalent Input Noise Voltage	V <sub>NI</sub>	0.1Hz~10Hz (note 2)	—	0.38	0.65	μV <sub>p-p</sub>
Equivalent Input Noise Voltage 1	e <sub>n 1</sub>	f <sub>O</sub> =10Hz (note 2)	—	10.5	20	nV/√Hz
Equivalent Input Noise Voltage 2	e <sub>n 2</sub>	f <sub>O</sub> =100Hz (note 2)	—	10.2	13.5	nV/√Hz
Equivalent Input Noise Voltage 3	e <sub>n 3</sub>	f <sub>O</sub> =1kHz (note 2)	—	9.8	11.5	nV/√Hz
Equivalent Input Noise Current	I <sub>NI</sub>	0.1Hz~10Hz (note 2)	—	15	35	pA <sub>p-p</sub>
Equivalent Input Noise Current 1	i <sub>n 1</sub>	f <sub>O</sub> =10Hz (note 2)	—	0.35	0.9	pA/√Hz
Equivalent Input Noise Current 2	i <sub>n 2</sub>	f <sub>O</sub> =100Hz (note 2)	—	0.15	0.27	pA/√Hz
Equivalent Input Noise Current 3	i <sub>n 3</sub>	f <sub>O</sub> =1kHz (note 2)	—	0.13	0.18	pA/√Hz

## ■ ELECTRICAL CHARACTERISTICS

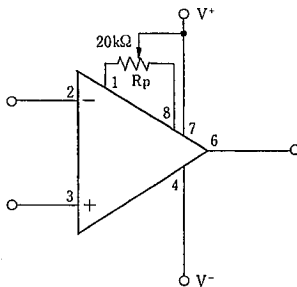
(0°C ≤ Ta ≤ 70°C, V<sup>+</sup>/V<sup>-</sup> = ±15V)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V <sub>IO</sub>		—	85	250	μV
Average V <sub>IO</sub> Drift (unnull)			—	0.5	1.8	μV/°C
Average V <sub>IO</sub> Drift (null)		R <sub>p</sub> = 20kΩ	—	0.4	1.6	μV/°C
Input Offset Current	I <sub>IO</sub>		—	1.6	8	nA
Average I <sub>IO</sub> Drift			—	12	50	pA/°C
Input Bias Current	I <sub>IB</sub>		—	±2.2	±9	nA
Average I <sub>IB</sub> Drift			—	18	50	pA/°C
Input Common Mode Voltage Range	V <sub>ICM</sub>		±13	±13.5	—	V
Common Mode Rejection Ratio	CMR	V <sub>CM</sub> = ±13V	97	120	—	dB
Supply Voltage Rejection Ratio	SVR	V <sup>+</sup> /V <sup>-</sup> = ±3V ~ ±8V	86	120	—	dB
Voltage Gain	A <sub>V</sub>	R <sub>L</sub> ≥ 2kΩ, V <sub>O</sub> = ±10V	100	400	—	V/mV
Maximum Output Voltage	V <sub>OM</sub>	R <sub>L</sub> ≥ 2kΩ	±11	±12.6	—	V

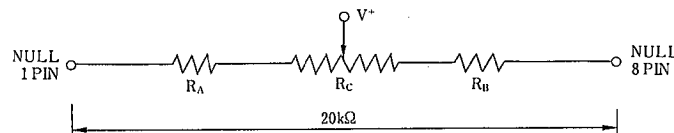
(note 1) Long Term Stability refers to the average trend line of V<sub>IO</sub> vs. time over extended periods after the first 30 days of operation.

(note 2) According to the evaluation by NJRC, more than 90% of all these products can be guaranteed.

## ■ OFFSET ADJUSTMENT METHOD



For making low sensitivity of change in the input offset voltage against resistance regulation of potentiometer (Easy case of offset adjustment)

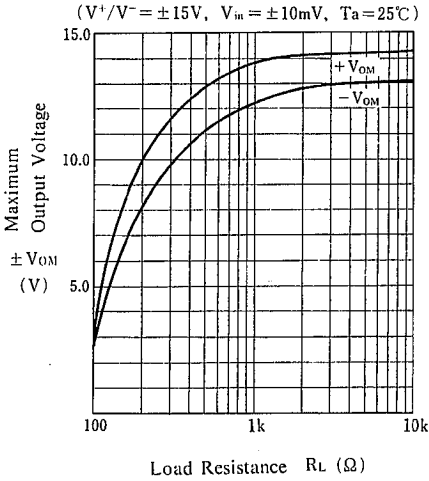


※R<sub>A</sub>, R<sub>B</sub> Fixed 7.5kΩ, R<sub>C</sub> adjustable 5.0kΩ

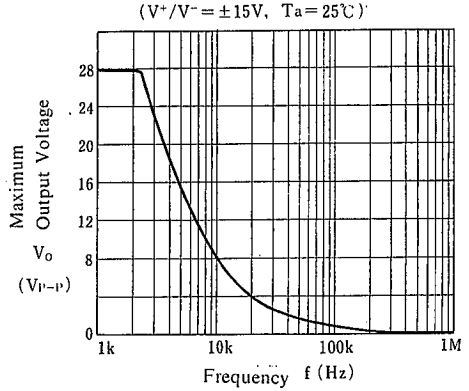
※R<sub>A</sub>, R<sub>B</sub>, R<sub>C</sub> are metalfilm resistors, R<sub>C</sub> is more than 10 times winding.

## TYPICAL CHARACTERISTICS

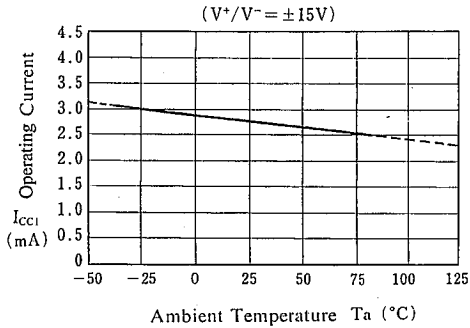
**Maximum Output Voltage vs. Load Resistance**



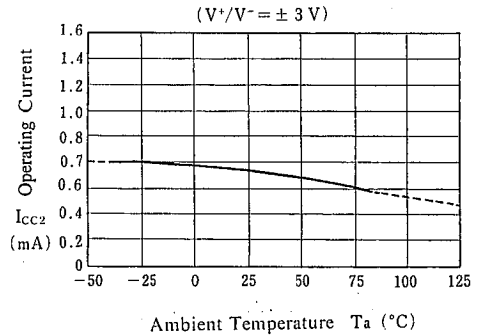
**Maximum Output Voltage Swing vs. Frequency**



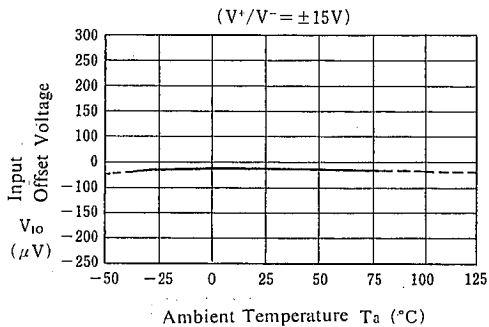
**Operating Current vs. Temperature**



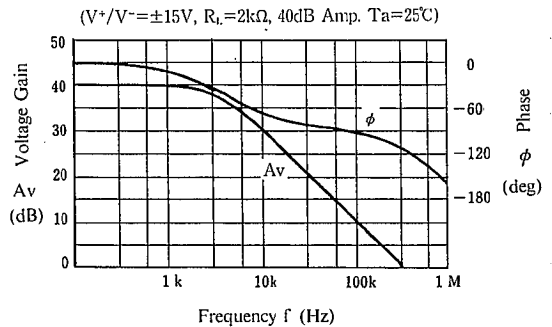
**Operating current vs. Temperature**



**Input Offset Voltage vs. Temperature**

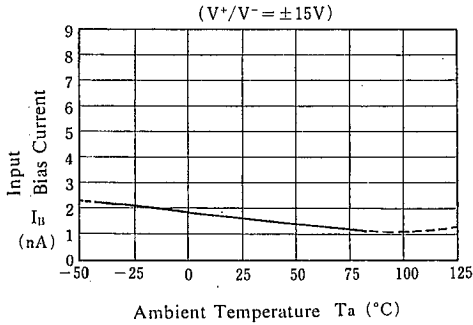


**Voltage Gain, Phase vs. Frequency**

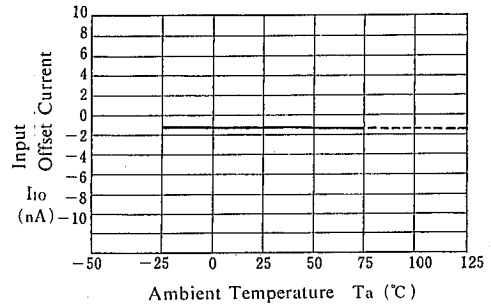


■ TYPICAL CHARACTERISTICS

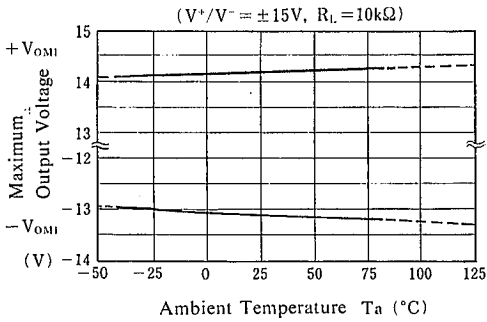
Input Bias Current vs. Temperature



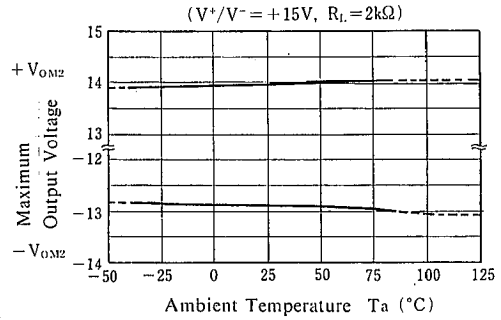
Input Offset Current vs. Temperature



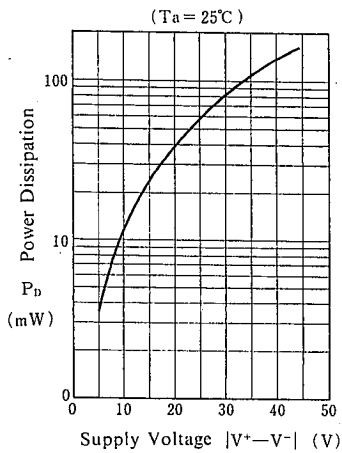
Maximum Output Voltage vs. Temperature



Maximum Output Voltage vs. Temperature



Power Dissipation vs. Supply Voltage



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## MEMO

**[CAUTION]**

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