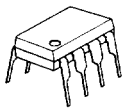
ULTRA-LOW OFFSET VOLTAGE, LOW DRIFT OPERATIONAL AMPLIFIER

■ 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.

■ PACKAGE OUTLINE



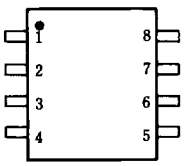
NJM0P-07D

NJM0P-07M

■ FEATURES

- Ultra-Low V_{IO} — 60 μV
- Ultra-Low I_B — 1.8nA
- Ultra-Low Drift — unnull 0.5 μV/℃; null 0.4 μV/℃
- Ultra-Stable — 0.4 μV/M$_\Omega$
- Wide Operting Voltage — ±3V～±22V
- Package Outline — DIP8, DMP8
- Bipolar Technology

■ PIN CONFIGURATION

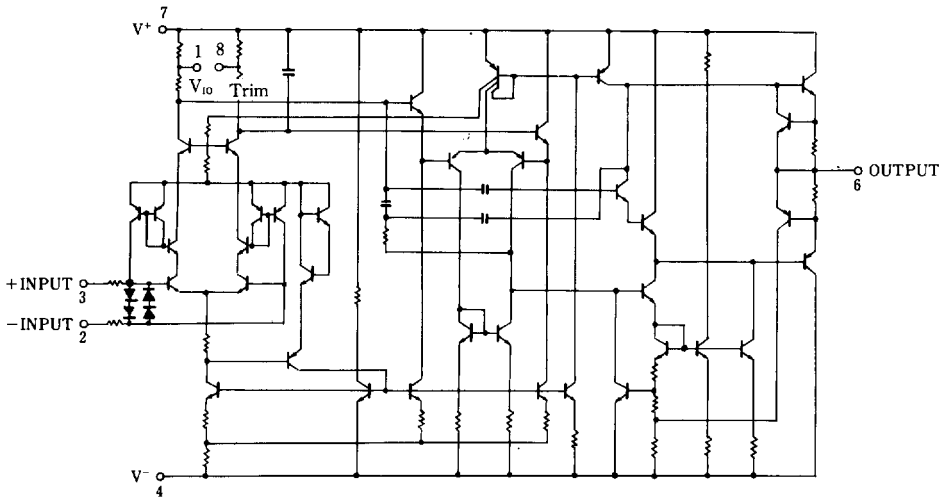


NJM0P-07D
NJM0P-07M

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℃)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V^+/V^-	±22	V
Input Voltage	V_I	±22(note 1)	V
Differential Input Voltage	V_{ID}	±30	V
Power Dissipation	P_D	(DIP8) 500	mW
		(DMP8) 300	mW
Storage Temperature Range	T_{stg}	−40～+125	℃
Operating Temperature Range	T_{opr}	−20～+75	℃
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℃, V^+/V^-=±15V)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V_{IO}		—	60	150	μV
Long Term Stability		(note 1,2)	—	0.4	2	μV/Mo
Input Offset Current	I_{IO}		—	0.8	6	nA
Input Bias Current	I_B		—	±1.8	±7	nA
Open Loop Output Resistance	R_O	V_O=0, I_O=0	—	60	—	Ω
Input Resistance	R_{ID}	(Differential Mode)	8	33	—	MΩ
Input Resistance	R_{IC}	(Common Mode)	—	120	—	GΩ
Input Common Mode Voltage Range	V_{ICM}		±13	±14	—	V
Common Mode Rejection Ratio	CMR	V_{CM}=±13V	100	120	—	dB
Supply Voltage Rejection Ratio	SVR	V^+/V^-=±3V～±18V	90	104	—	dB
Large Signal Voltage Gain	AV_1	R_L≧2kΩ, V_O=±10V	101.5	112.0	—	dB
Large Signal Voltage Gain	AV_2	R_L=500Ω, V_O= ±0.5V, V^+=±3V	100.0	112.0	—	dB
Maximum Output Voltage	V_{OM1}	R_L≧10kΩ	±12	±13	—	V
Maximum Output Voltage	V_{OM2}	R_L≧2kΩ	±11.5	±12.8	—	V
Maximum Output Voltage	V_{OM3}	R_L≧1kΩ	—	±12	—	V
Slew Rate	SR	R_L≧2kΩ	—	0.17	—	V/μS
Closed Loop Bandwidth	f_T	A_{VCL}=1	—	0.5	—	MHz
Operating Current	I_{CC1}	V^+/V^-=±15V	—	2.7	5.0	mA
Operating Current	I_{CC2}	V^+/V^-=±3V	—	0.67	1.3	mA
Offset Adjustment Range		R_P=20kΩ	—	±4	—	mV
Equivalent Input Noise Voltage	V_{NI}	0.1Hz～10Hz (note 2)	—	0.38	0.65	μV_{p-p}
Equivalent Input Noise Voltage	e_n	f_O=10Hz (note 2)	—	10.5	20	$nV/\sqrt{Hz}$
Equivalent Input Noise Voltage	e_n	f_O=100Hz (note 2)	—	10.2	13.5	$nV/\sqrt{Hz}$
Equivalent Input Noise Voltage	e_n	f_O=1kHz (note 2)	—	9.8	11.5	$nV/\sqrt{Hz}$
Equivalent Input Noise Current	I_{NI}	0.1Hz～10Hz (note 2)	—	15	35	pA_{P-P}
Equivalent Input Noise Current	i_n	f_O=10Hz (note 2)	—	0.35	0.9	$pA/\sqrt{Hz}$
Equivalent Input Noise Current	i_n	f_O=100Hz (note 2)	—	0.15	0.27	$pA/\sqrt{Hz}$
Equivalent Input Noise Current	i_n	f_O=1kHz (note 2)	—	0.13	0.18	$pA/\sqrt{Hz}$

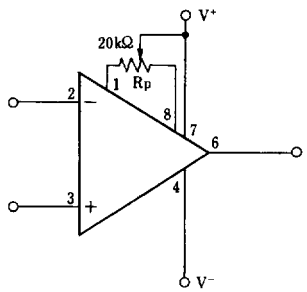
■ ELECTRICAL CHARACTERISTICS

(0℃≦Ta≦70℃, V^+/V^-=±15V)

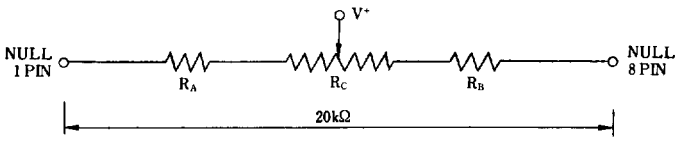
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V_{IO}		—	85	250	μV
Average V_{IO} Drift (unnull)			—	0.5	1.8	μV/℃
Average V_{IO} Drift (null)		R_P=20kΩ	—	0.4	1.6	μV/℃
Input Offset Current	I_{IO}		—	1.6	8	nA
Average I_{IO} Drift			—	12	50	pA/℃
Input Bias Current	I_{IB}		—	±2.2	±9	nA
Average I_{IB} Drift			—	18	50	pA/℃
Input Common Mode Voltage Range	V_{ICM}		±13	±13.5	—	V
Common Mode Rejection Ratio	CMR	V_{CM}=±13V	97	120	—	dB
Supply Voltage Rejection Ratio	SVR	V^+/V^-=±3V~±8V	86	120	—	dB
Voltage Gain	A_V	R_L≧2kΩ, V_O=±10V	100	400	—	V/mV
Maximum Output Voltage	V_{OM}	R_L≧2kΩ	±11	±12.6	—	V

(note 1) Long Term Stability refers to the average trend line of V_{IO} 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



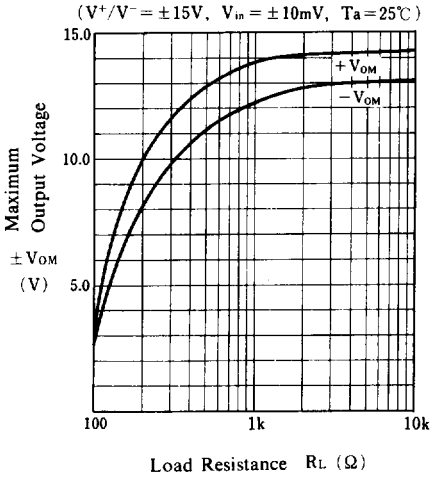
For making low sensitivity of change in the input offset voltage against resistance regulation of potentiometer (Easy case of offset adjustment)



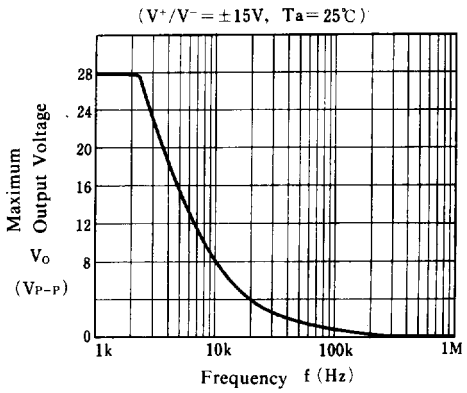
※R_A, R_B Fixed 7.5kΩ, R_C adjustable 5.0kΩ
※R_A, R_B, R_C are metalfilm resisters, RC is more than 10 times winding.

■ TYPICAL CHARACTERISTICS

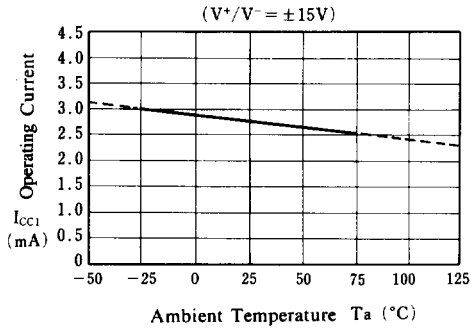
Maximum Output Voltage vs. Load Resistance



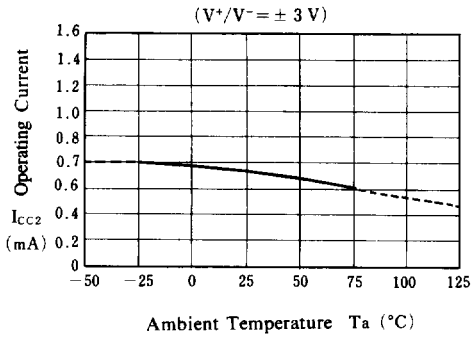
Maximum Output Voltage Swing vs. Frequency



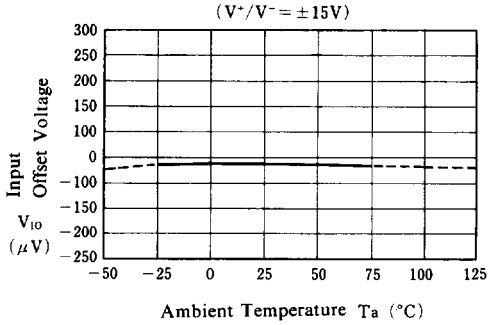
Operating Current vs. Temperature



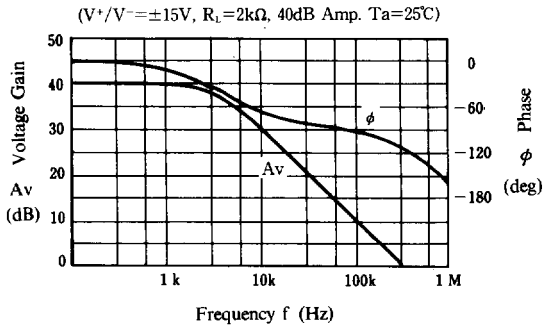
Operating current vs. Temperature



Input Offset Voltage vs. Temperature

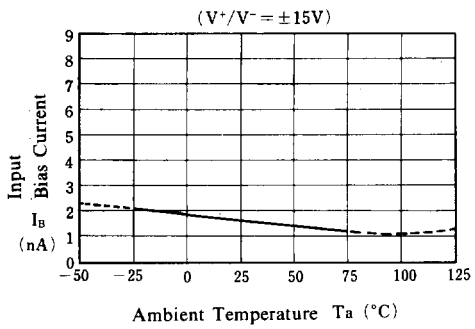


Voltage Gain, Phase vs. Frequency

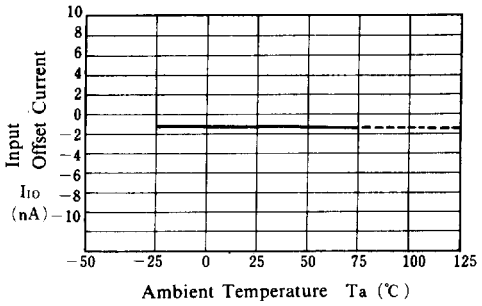


■ TYPICAL CHARACTERISTICS

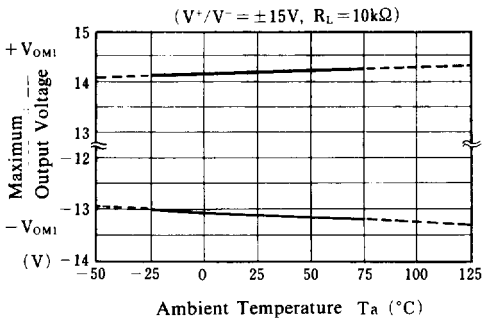
Input Bias Current vs. Temperature



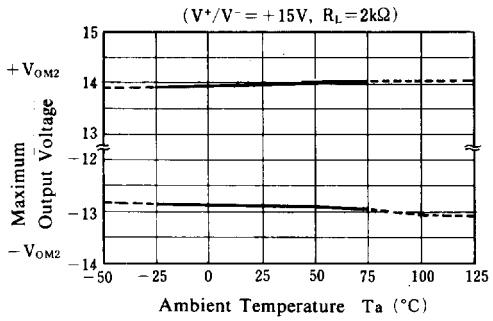
Input Offset Current vs. Temperarure



Maximum Output Voltage vs. Temperature



Maximum Output Voltage vs. Temperature



Power Dissipation vs. Supply Voltage