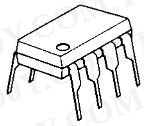
LOW OFFSET VOLTAGE,LOW DRIFT OPERATIONAL AMPLIFIER

■ GENERAL DESCRIPTION

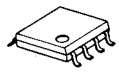
The NJM OP-07 is ultra-low input offset voltage and bias current, low drift and high gain operational amplifier with internal frequency compensation.

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

■ PACKAGE OUTLINE



NJMOP-07D

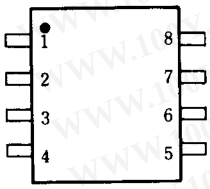


NJMOP-07M

■ FEATURES

- Low V_{IO} (60μV)
- Low I_B (1.8nA)
- Low Drift (unnull 0.5μV/˚C)
  (null 0.4μV/˚C)
  (0.4μV/M_o)
- Wide Operating Voltage (±3V~±22V)
- Package Outline DIP8,DMP8
- Bipolar Technology

■ PIN CONFIGURATION

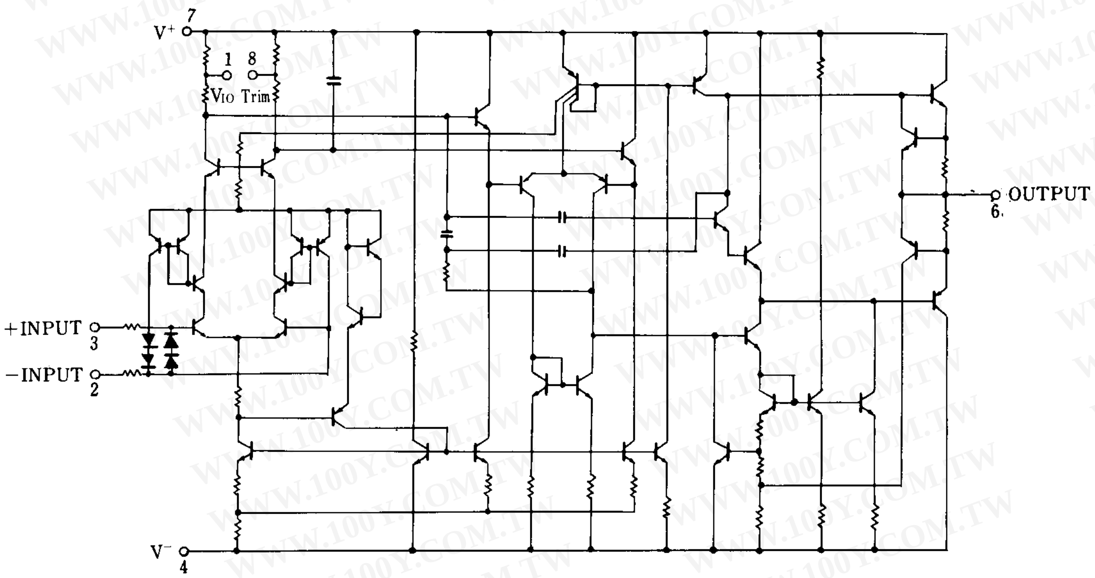


NJMOP-07D
NJMOP-07M

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^+/V^-	±22	V
Input Voltage	V_I	±22 (note1)	V
Differential Input Voltage	V_{ID}	±30	V
Power Dissipation	P_D	(DIP8) 500 (DMP8) 300	mW
Storage Temperature Range	T_{stg}	-40~+125	°C
Operating Temperature Range	T_{opr}	-40~+85	°C
Output Current		continuous	

(note1) For supply voltage less than ±22V. the absolute maximum input voltage is equal to the supply voltage.

■ ELECTRICAL CHARACTERISTICS

(Ta=+25°C,V⁺/V⁻=±15V)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V_{IO}		-	60	150	μV
Long Term Stability		(note1,2)	-	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 1	AV_1	R_L≥2kΩ,V_O=±10V	101.5	112.0	-	dB
Large Signal Voltage Gain 2	AV_2	R_L=500Ω,V_O=±0.5V,V^+/V^-=±3V	100.0	112.0	-	dB
Maximum Output Voltage 1	V_{OM1}	R_L≥10kΩ	±12	±13	-	V
Maximum Output Voltage 2	V_{OM2}	R_L>2kΩ	±11.5	±12.8	-	V
Maximum Output Voltage 3	V_{OM3}	R_L>1kΩ	-	±12	-	V
Slew Rate	SR	R_L≥2kΩ	-	0.17	-	V/μS
Unity Gain Bandwidth	f_T	A_{VCL}=1	-	0.5	-	MHz
Operating Current 1	I_{CC1}	V^+/V^-=±15V	-	2.7	5.0	mA
Operating Current 2	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 (note2)	-	0.38	0.65	$μV_{P-P}$
Equivalent Input Noise Voltage 1	e_{n1}	f_O=10Hz (note2)	-	10.5	20	nV/√Hz
Equivalent Input Noise Voltage 2	e_{n2}	f_O=100Hz (note2)	-	10.2	13.5	nV/√Hz
Equivalent Input Noise Voltage 3	e_{n3}	f_O=1kHz (note2)	-	9.8	11.5	nV/√Hz
Equivalent Input Noise Current	I_{NI}	0.1Hz~10Hz (note2)	-	15	35	pA_{P-P}
Equivalent Input Noise Current 1	i_{n1}	f_O=10Hz (note2)	-	0.35	0.9	pA/√Hz
Equivalent Input Noise Current 2	i_{n2}	f_O=100Hz (note2)	-	0.15	0.27	pA/√Hz
Equivalent Input Noise Current 3	i_{n3}	f_O=1kHz (note2)	-	0.13	0.18	pA/√Hz

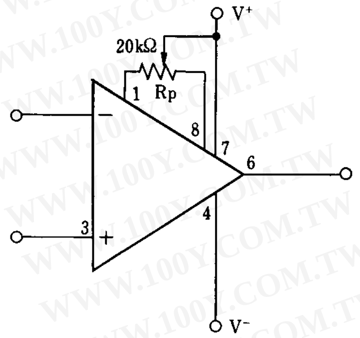
■ ELECTRICAL CHARACTERISTICS

(0˚C≤Ta≤70˚C,V^+/V^-=±15V)

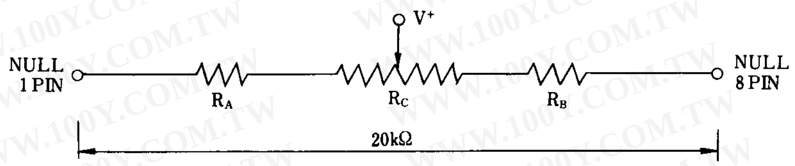
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V_{IO}		-	85	250	µV
Average V_{IO} Drift (unnull)			-	0.5	1.8	µV/˚C
Average V_{IO} Drift (null)		R_P=20kΩ	-	0.4	1.6	µV/˚C
Input Offset Current	I_{IO}		-	1.6	8	nA
Average I_{IO} Drift			-	12	50	pA/˚C
Input Bias Current	I_{IB}		-	± 2.2	± 9	nA
Average I_{IB} Drift			-	18	50	pA/˚C
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~±18V	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)

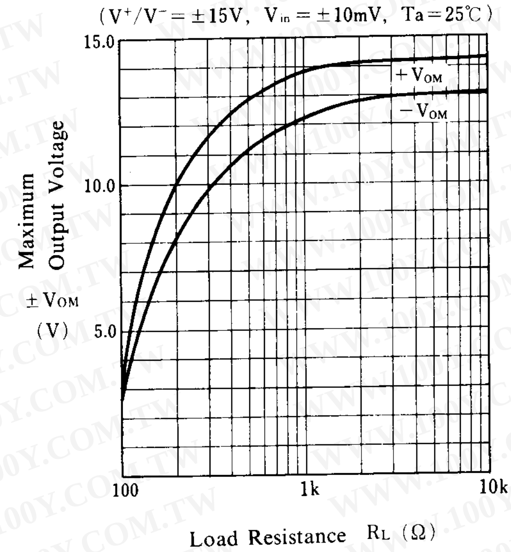


* R_A,R_B Fixed 7.5kΩ,R_C adjustable 5.0kΩ
* R_A,R_B,R_C are metalfilm resisters, R_C is more than 10 times winding.

■ TYPICAL CHARACTERISTICS

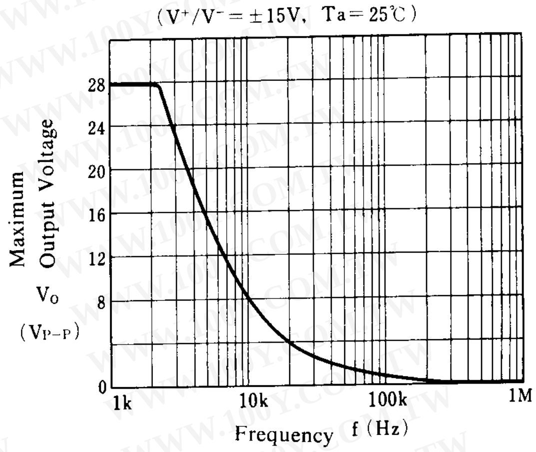
Maximum Output Voltage vs. Load Resistance

($V^+/V^- = \pm 15V$, $V_{in} = \pm 10mV$, $Ta = 25°C$)



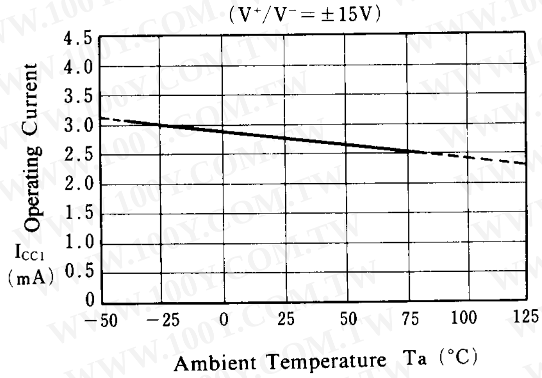
Maximum Output Voltage Swing vs. Frequency

($V^+/V^- = \pm 15V$, $Ta = 25°C$)



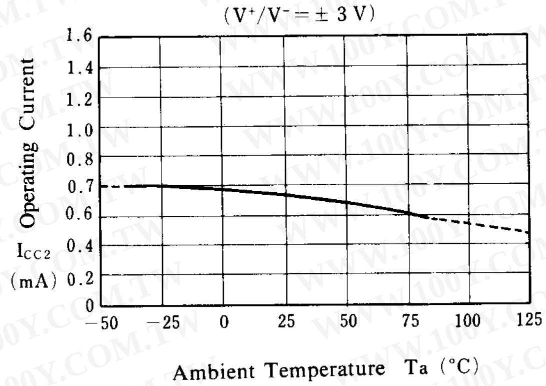
Operating Current vs. Temperature

($V^+/V^- = \pm 15V$)



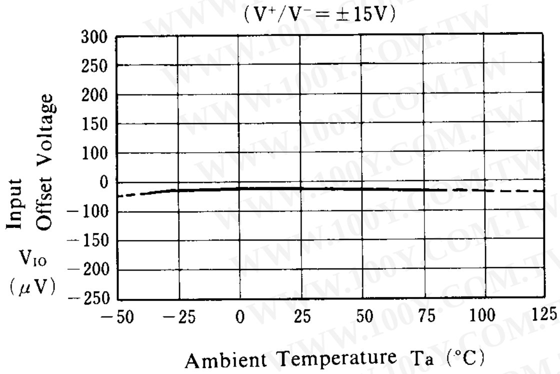
Operating current vs. Temperature

($V^+/V^- = \pm 3V$)



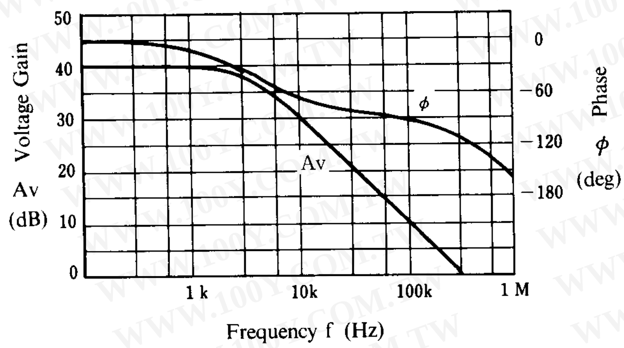
Input Offset Voltage vs. Temperature

($V^+/V^- = \pm 15V$)



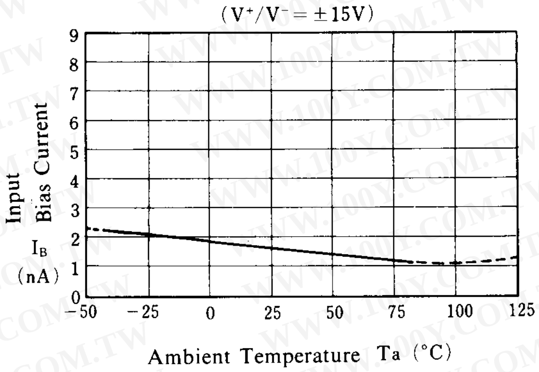
Voltage Gain, Phase vs. Frequency

($V^+/V^- = \pm 15V$, $R_L = 2k\Omega$, 40dB Amp. $Ta = 25°C$)

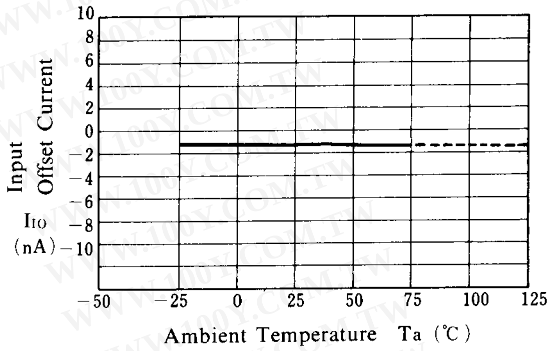


■ TYPICAL CHARACTERISTICS

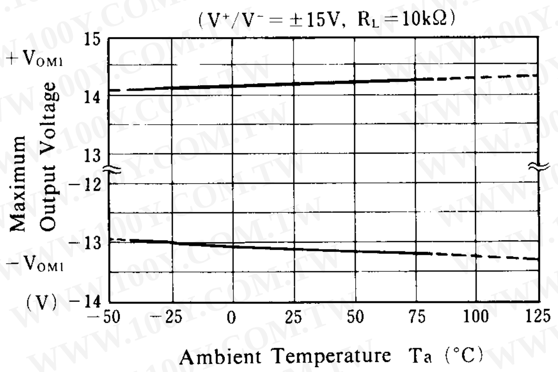
Input Bias Current vs. Temperature



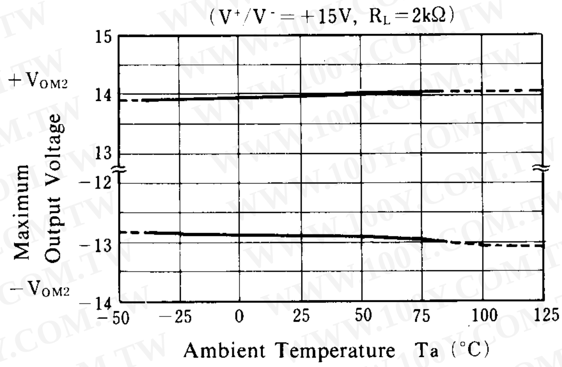
Input Offset Current vs. Temperarure



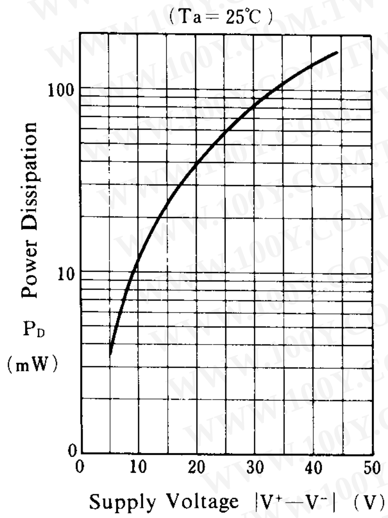
Maximum Output Voltage vs. Temperature



Maximum Output Voltage vs. Temperature



Power Dissipation vs. Supply Voltage



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