HIGH PERFORMANCE LOW-NOISE OPERATIONAL AMPLIFIER

■ GENERAL DESCRIPTION

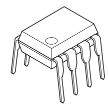
The NJM5534 is a high performance low noise operational amplifier. This amplifier features popular pin-out, superior noise performance, and high output drive capability. And also, features guaranteed noise performance with substantially higher gain-bandwidth product, power bandwidth, and slew rate which far exceeds that of the NJM741 type amplifiers.

The specially designed low noise input transistors allow the NJM5534 to be used in very low noise signal processing applications such as audio pre-amplifiers and servo error amplifiers.

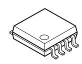
The NJM5534 is internally compensated for a gain of three or higher. Externally compensation for optimizing specific performance can be obtained by use of an external compensation capacitor between COMPENSATION(5PIN) and BALANCE/COMPENSATION(8PIN).

If very low noise characteristic is of prime importance, it is recommended D-Rank type products(NJM5534DD/MD). These have specified maximum limits for equivalent input noise voltage.

■ PACKAGE OUTLINE



NJM5534D (DIP8)



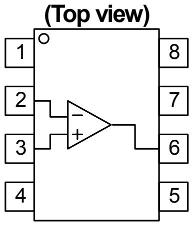
NJM5534M (DMP8)

■ FEATURES

- Operating Voltage ±3V~±22V
- Single Circuit
- With BALANCE Terminal
- Low Input Noise Voltage 3.3nV/√Hz typ.@1kHz
- Power Bandwidth 200kHz typ.
- Slew Rate 13V/µs typ.
- Package Outline DIP8, DMP8
- Bipolar Technology

■ PIN CONFIGURATION

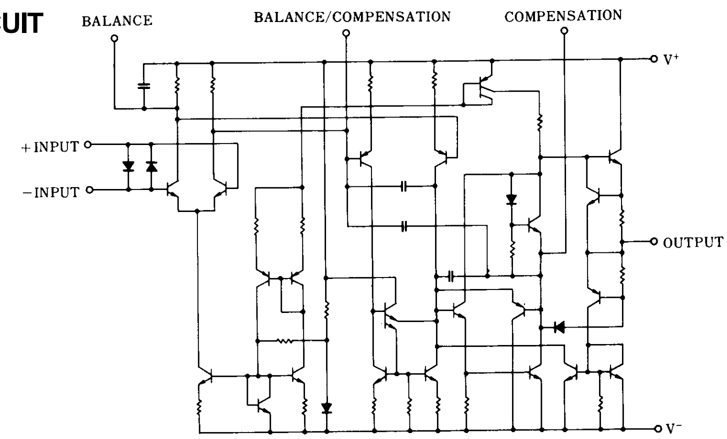
(Top view)



DIP8, DMP8 Package

PIN FUNCTION
1.BALANCE
2.–INPUT
3.+INPUT
4.V^-
5.COMPENSATION
6.OUTPUT
7.V^+
8.BALANCE/COMPENSATION

■ EQUIVALENT CIRCUIT



■ ABSOLUTE MAXIMUM RATINGS (Ta=25˚C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V^+/V^-	±22	V
Differential Input Voltage	V_{ID}	±0.5	V
Common Mode Input Voltage	V_{IC}	V^+/V^-	V
Power Dissipation	P_D	DIP8: 500 DMP8: 300	mW
Operating Temperature Range	T_{opr}	-20~+75	°C
Storage Temperature Range	T_{stg}	-40~+125	°C

■ RECOMMENDED OPERATING VOLTAGE (Ta=25˚C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V^+/V^-	±3~±22	V

■ ELECTRICAL CHARACTERISTICS (Ta=25˚C,V^+/V^-=±15V, unless otherwise noted.)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V_{IO}	R_S≤10kΩ	-	0.5	4	mV
Input Offset Current	I_{IO}		-	20	300	nA
Input Bias Current	I_B		-	500	1500	nA
Input Resistance	R_{IN}		30	100	-	kΩ
Large Signal Voltage Gain	A_V	R_L≥2kΩ, V_O=±10V	88	100	-	dB
Maximum Output Voltage	V_{OM}	R_L≥600Ω	±12	±13	-	V
Common Mode Input Voltage Range	V_{ICM}		±12	±13	-	V
Common Mode Rejection Ratio	CMR	R_S≤10kΩ	70	100	-	dB
Supply Voltage Rejection Ratio	SVR	R_S≤10kΩ	80	100	-	dB
Supply Current	I_{CC}	R_L=∞	-	4	8	mA
Trainsient Response Rise Time	t_R	V_{IN}=50mV, R_L=600Ω, C_L=100pF, Cc=22pF	-	35	-	ns
Overshoot		V_{IN}=50mV, R_L=600Ω, C_L=100pF, Cc=22pF	-	17	-	%
Slew Rate	SR	Cc=0	-	13	-	V/µs
Gain Bandwidth Product	GB	Cc=22pF, C_L=100pF	-	10	-	MHz
Power Bandwidth	W_{PG}	Vo=20V_{PP}, Cc=0	-	200	-	kHz
Equivalent Input Noise Voltage	V_{NI}	f=20Hz~20kHz	-	1	-	µVrms
Equivalent Input Noise Current	I_{NI}	f=20Hz~20kHz	-	25	-	pArms
Equivalent Input Noise Voltage	e_n	f_O=30Hz	-	5.5	-	nV/√Hz
		f_O=1kHz	-	3.3	-	nV/√Hz
Equivalent Input Noise Current	i_n	f_O=30Hz	-	1.5	-	pA/√Hz
		f_O=1kHz	-	0.4	-	pA/√Hz
Broadband Noise Figure	NF	f=10Hz~20kHz, R_S=5kΩ	-	0.9	-	dB

■ ELECTRICAL CHARACTERISTICS (D-rank type(Note1), V^+/V^-=±15V, Ta=25°C, unless otherwise noted.)

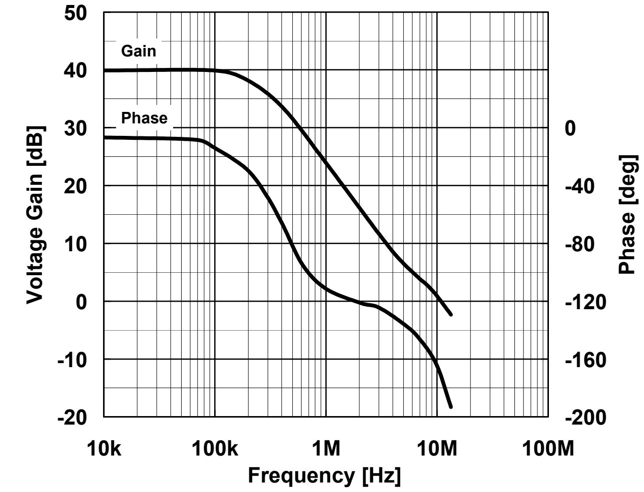
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Equivalent Input Noise Voltage	V_{NI}	RIAA, R_S=2.2kΩ	-	-	1.4	µVrms

(Note1)D-rank type is a Equivalent Input Noise Voltage selected product.

■ TYPICAL CHARACTERISTICS

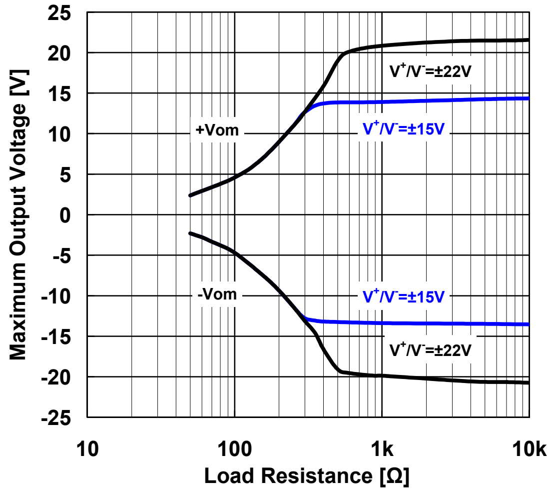
Gain/Phase vs. Frequency

Ta=25ºC



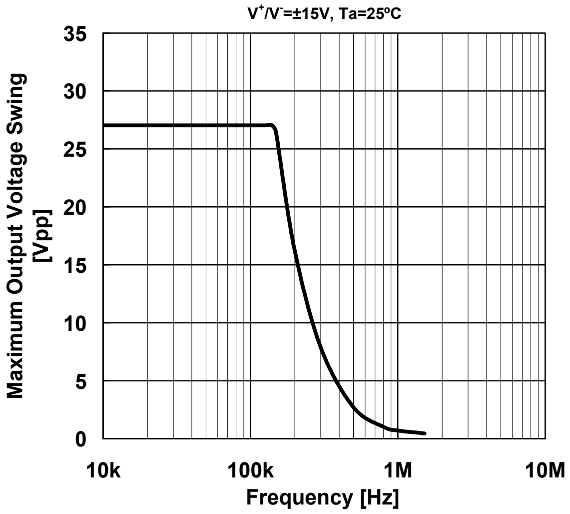
Maximum Output Voltage vs. Load Resistance

Ta=25ºC



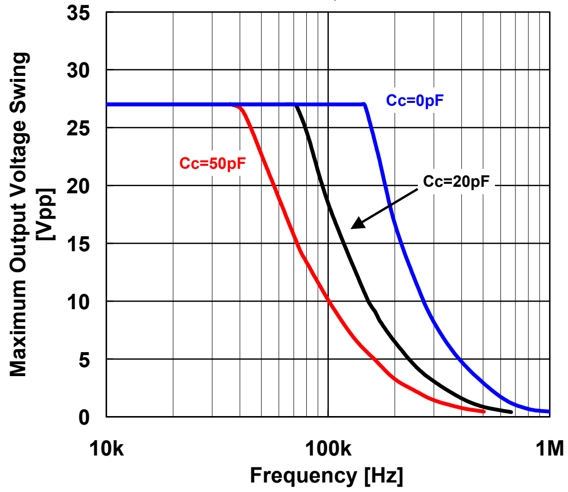
Maximum Output Voltage Swing vs. Frequency

V+/V-=±15V, Ta=25ºC



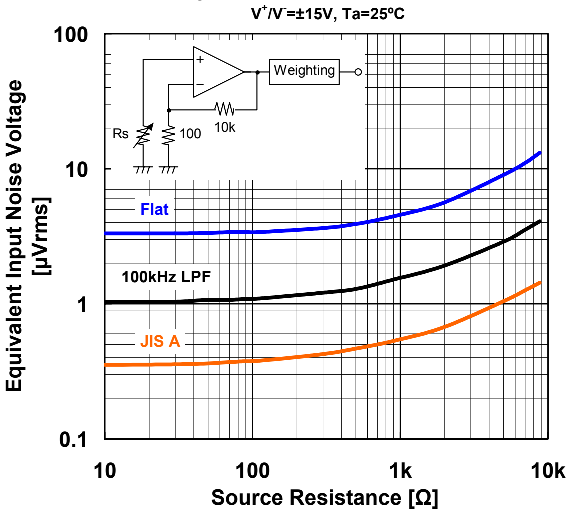
Maximum Output Voltage Swing vs. Frequency

V+/V-=±15V, Ta=25ºC



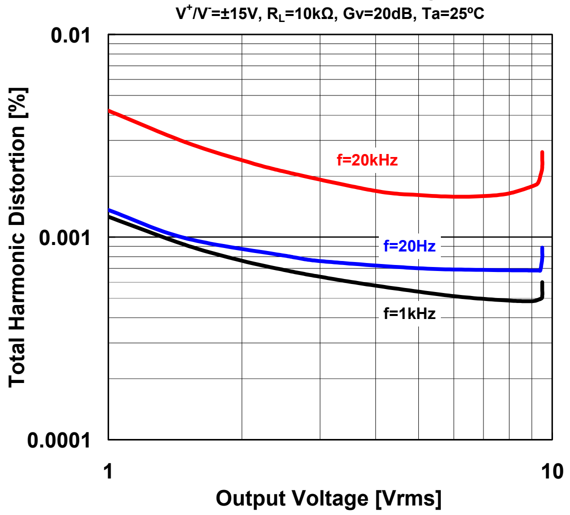
Voltage Noise vs. Source Resistance

V+/V-=±15V, Ta=25ºC

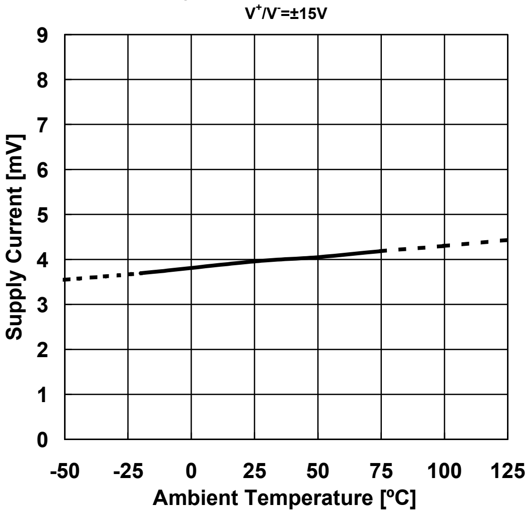


THD vs. Output Voltage

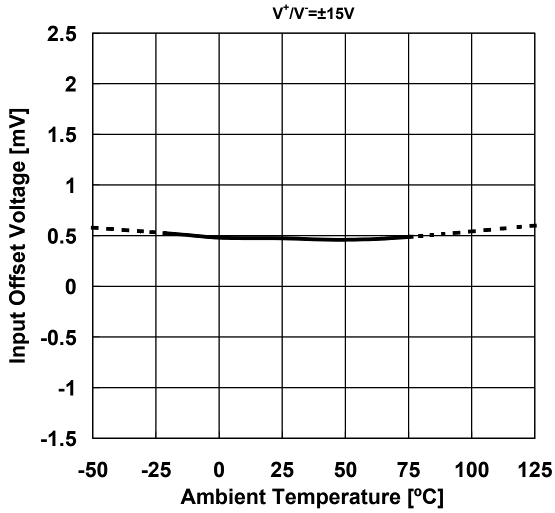
V+/V-=±15V, RL=10kΩ, Gv=20dB, Ta=25ºC



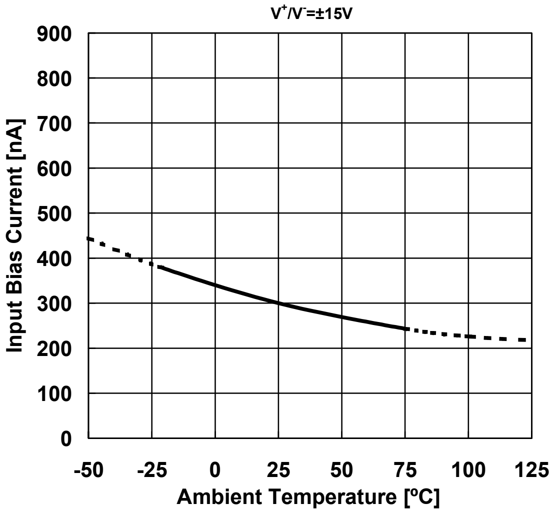
■ TYPICAL CHARACTERISTICS



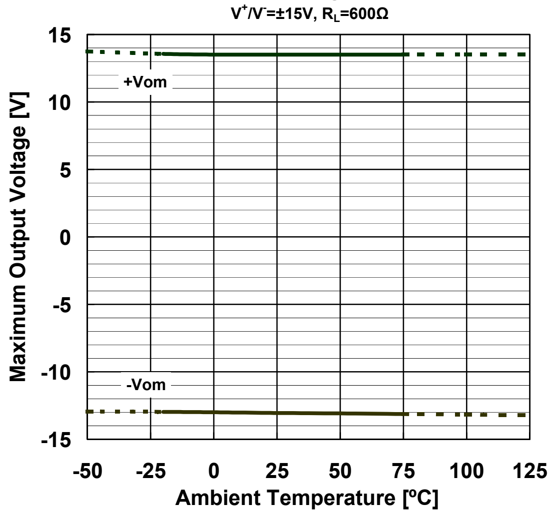
Supply Current vs. Temperature



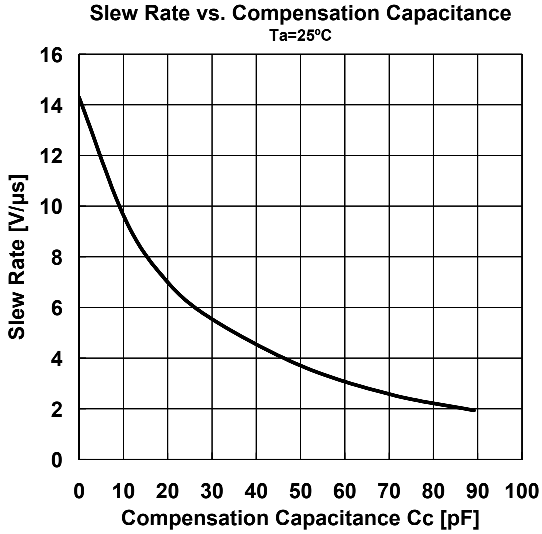
Input Offset Voltage vs. Temperature



Input Bias Current vs. Temperature



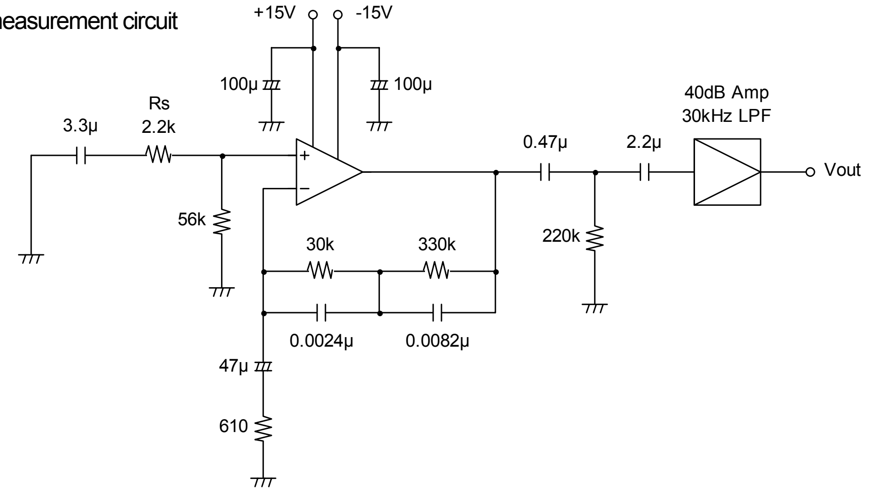
Maximum Output Voltage vs. Temperature



Slew Rate vs. Compensation Capacitance

■ TEST CIRCUIT

Noise Voltage (RIAA) measurement circuit



■ ADJUSTMENT METHOD

Fig.1-1, Fig.1-2 shows the input offset voltage adjustment circuit, and frequency compensation circuit. Without these features, the adjustment pins are open.

Fig.1-1 Input Offset Voltage Adjustment

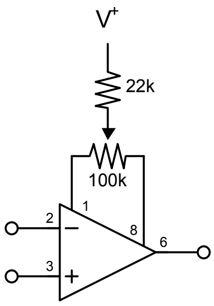
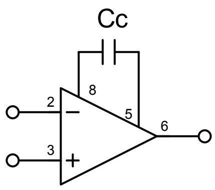


Fig.1-2 Frequency Compensation



■ NOTICE

When used in voltage follower circuit, put a current limit resistor into non-inverting input terminal in order to avoid inside input diode destruction when the power supply is turned on. (ref.Fig.2)

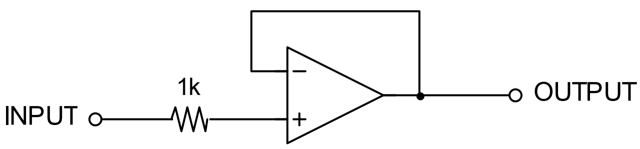


Fig.2