LOW-POWER AND LOW-OFFSET-VOLTAGE DUAL C-MOS OPERATIONAL AMPLIFIER

■ GENERAL DESCRIPTION

The NJU7094,95 and 96 are dual C-MOS operational amplifiers operated on a single-power-supply, low voltage and low operating current.

The input offset voltage is lower than 2mV,and the input bias current is as low as than 1pA,consequently very small signal around the ground level can be amplified.

The minimum operating voltage is 1V and the output stage permits output signal to swing between both of the supply rails.

Furthermore, this series is packaged with a various small one therefore it can be especially applied to portable items.

■ PACKAGE OUTLINE

NJU709XD

NJU709XM

NJU709XV

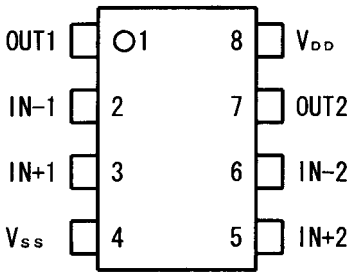
NJU709XR

NJU709XRB1

■ FEATURES

- Single-Power-Supply
- Low Offset Voltage (V_{IO}=2mV max)
- Wide Operating Voltage (V_{DD}=1~5.5V)
- Wide Output Swing Range (V_{OM}=2.9V min. @ 3.0V)
- Low Operating Current
- Low Bias Current (I_{IB}=1pA typ.)
- Compensation Capacitor Incorporated
- Package Outline DIP8,DMP8,SSOP8,VSP8,TVSP8
- C-MOS Technology

■ PIN CONFIGURATION

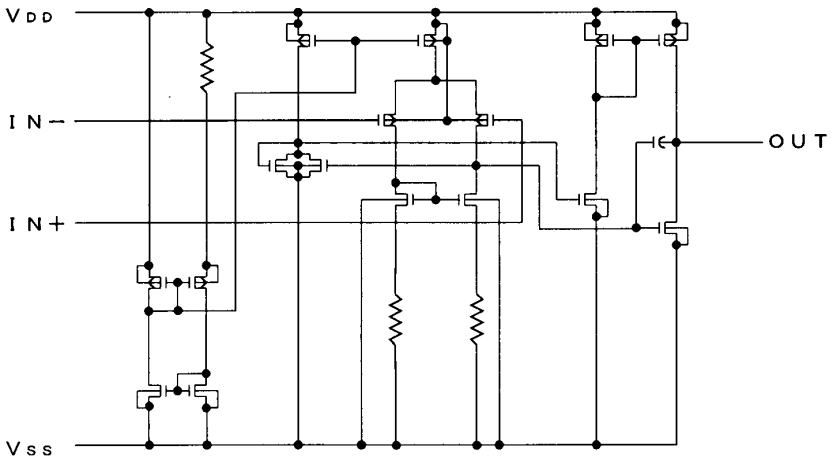


■ LINE-UP

(Ta=25°C,V_{DD}=3.0V,Per Circuit)

PARAMETER	NJU7094	NJU7095	NJU7096	UNIT
Operating Current	15	80	200	μA (typ)
Slew Rate	0.1	1.0	2.4	V/μs (typ)
Unity Gain Bandwidth	0.2	1.0	1.0	MHz (typ)

■ EQUIVALENT CIRCUIT



■ ABSOLUTE MAXIMUM RATINGS

(Ta=25˚C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V_{DD}	7	V
Differential Input Voltage	V_{ID}	±7 (note1)	V
Common Mode Input Voltage	V_{IC}	-0.3~7	V
Power Dissipation	P_D	(DIP8) 500 (DMP8) 300 (SSOP8) 250 (VSP8) 320 (TVSP8) 320	mW
Operating Temperature Range	T_{opr}	-40~+85	˚C
Storage Temperature Range	T_{stg}	-55~+125	˚C

(note1) If the supply voltage (V_{DD}) is less than 7V, the input voltage must not over the V_{DD} level though 7V is limit specified.

(note2) Decoupling capacitor should be connected between V_{DD} and V_{SS} for the stable operation.

■ ELECTRICAL CHARACTERISTICS

NJU7094 (Ta=25˚C,V_{DD}=3.0V,R_L=∞)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V_{IO}	V_{IN}=1/2V_{DD}	-	-	2	mV
Input Offset Current	I_{IO}		-	1	-	pA
Input Bias Current	I_{IB}		-	1	-	pA
Input Impedance	R_{IN}		-	1	-	TΩ
Large Signal Voltage Gain	A_{VD}		60	70	-	dB
Input Common Mode Voltage Range	V_{ICM}		0~2.5	-	-	V
Maximum Output Swing Voltage	V_{OM1}	R_L=1MΩ	V_{DD}-0.1	-	-	V
	V_{OM2}	R_L=1MΩ	-	-	V_{SS}+0.1	V
Common Mode Rejection Ratio	CMR	V_{IN}=1/2V_{DD}	55	65	-	dB
Supply Voltage Rejection Ratio	SVR	V_{DD}=1.5~5.5V	60	70	-	dB
Operating Current	I_{DD}	Per Circuit	-	15	25	μA
Slew Rate	SR		-	0.1	-	V/μs
Unity Gain Bandwidth	F_t	A_V=40dB,C_L=10pF	-	0.2	-	MHz

(note3) The source current is less than 2.9μA (at V_{OM}/R_L=2.9V/1MΩ).

NJU7095 (Ta=25°C, V_{DD}=3.0V, R_L=∞)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V_{IO}	V_{IN}=1/2V_{DD}	-	-	2	mV
Input Offset Current	I_{IO}		-	1	-	pA
Input Bias Current	I_{IB}		-	1	-	pA
Input Impedance	R_{IN}		-	1	-	TΩ
Large Signal Voltage Gain	A_{VD}		60	70	-	dB
Input Common Mode Voltage Range	V_{ICM}		0~2.5	-	-	V
Maximum Output Swing Voltage	V_{OM1}	R_L=100kΩ	V_{DD}-0.1	-	-	V
	V_{OM2}	R_L=100kΩ	-	-	V_{SS}+0.1	V
Common Mode Rejection Ratio	CMR	V_{IN}=1/2V_{DD}	55	65	-	dB
Supply Voltage Rejection Ratio	SVR	V_{DD}=1.5~5.5V	60	70	-	dB
Operating Current	I_{DD}	Per Circuit	-	80	160	μA
Slew Rate	SR		-	1.0	-	V/μs
Unity Gain Bandwidth	F_t	A_V=40dB, C_L=10pF	-	1.0	-	MHz

(note4) The source current is less than 29μA (at V_{OM}/R_L=2.9V/100kΩ).

NJU7096 (Ta=25°C, V_{DD}=3.0V, R_L=∞)

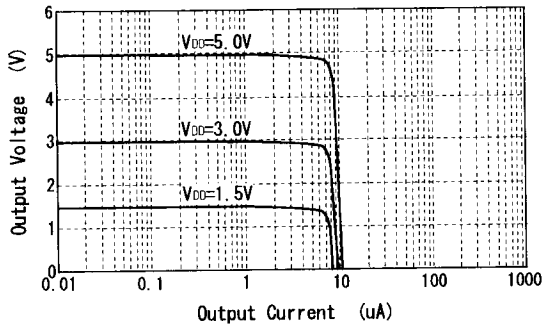
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V_{IO}	V_{IN}=1/2V_{DD}	-	-	2	mV
Input Offset Current	I_{IO}		-	1	-	pA
Input Bias Current	I_{IB}		-	1	-	pA
Input Impedance	R_{IN}		-	1	-	TΩ
Large Signal Voltage Gain	A_{VD}		60	70	-	dB
Input Common Mode Voltage Range	V_{ICM}		0~2.5	-	-	V
Maximum Output Swing Voltage	V_{OM1}	R_L=50kΩ	V_{DD}-0.1	-	-	V
	V_{OM2}	R_L=50kΩ	-	-	V_{SS}+0.1	V
Common Mode Rejection Ratio	CMR	V_{IN}=1/2V_{DD}	55	65	-	dB
Supply Voltage Rejection Ratio	SVR	V_{DD}=1.5~5.5V	60	70	-	dB
Operating Current	I_{DD}	Per Circuit	-	200	400	μA
Slew Rate	SR		-	1.0	-	V/μs
Unity Gain Bandwidth	F_t	A_V=40dB, C_L=10pF	-	1.0	-	MHz

(note5) The source current is less than 58μA (at V_{OM}/R_L=2.9V/50kΩ).

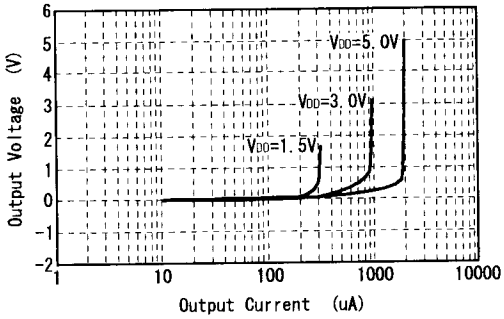
■ TYPICAL CHARACTERISTICS

(1) NJU7094

Output Voltage vs. Output Current (SOURCE)

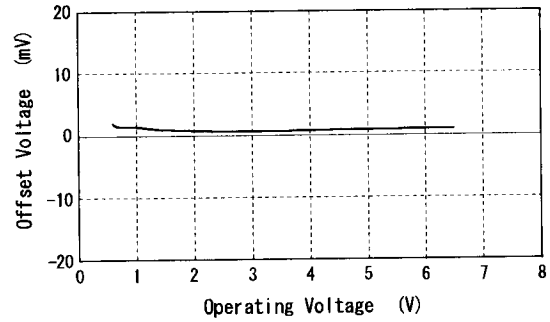


Output Voltage vs. Output Current (SINK)



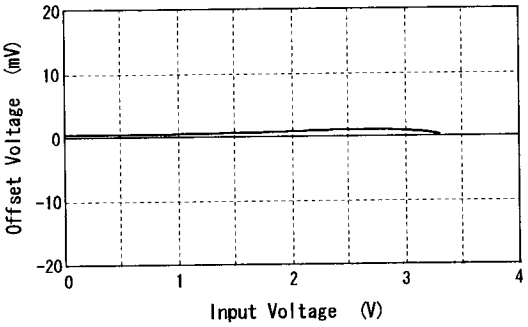
Offset Voltage vs. Operating Voltage

VIN=0.1V



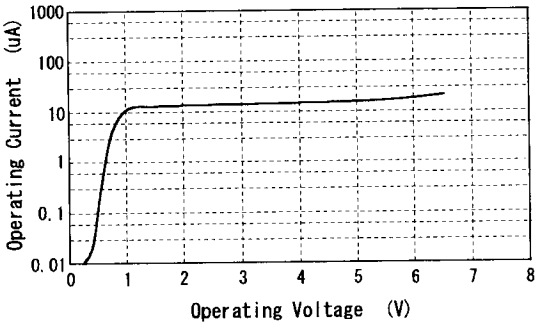
Offset Voltage vs. Input Voltage

VDD=3.0V



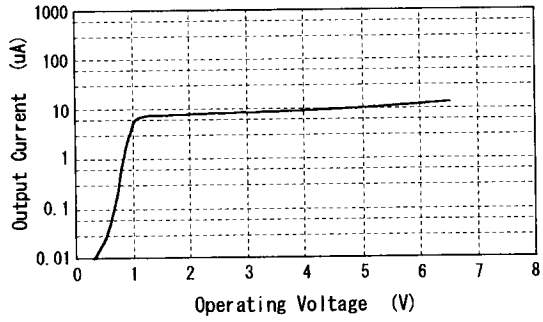
Operating Current vs. Operating Voltaga

VIN=0.1V

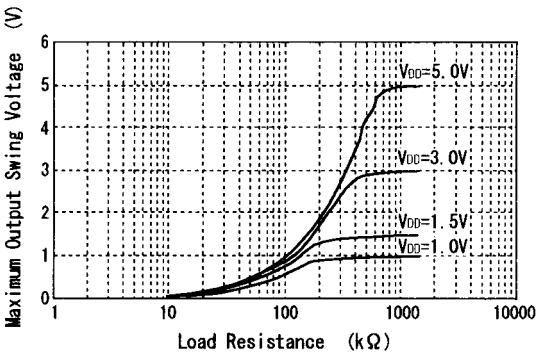


Output Current vs. Operating Voltage

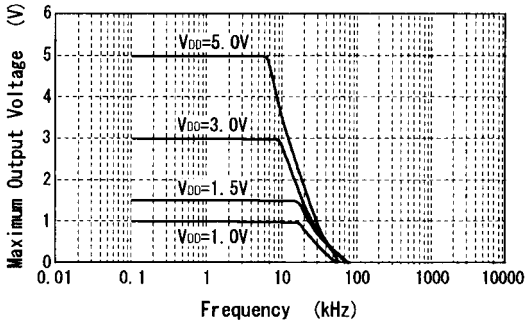
VIN=0.1V



Maximum Output Swing Voltage vs. Load Resistance

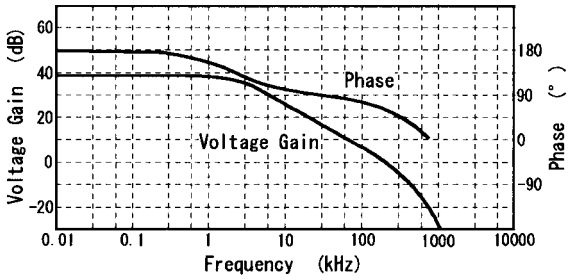


Maximum Output Swing Voltage vs. Frequency



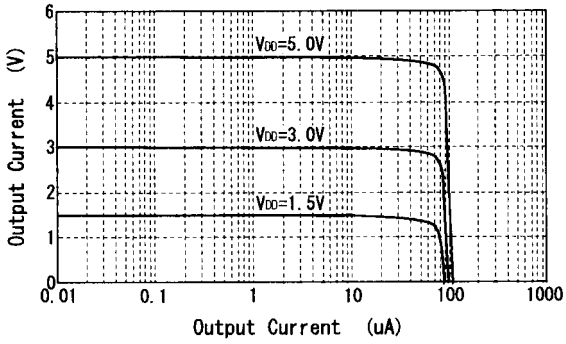
Voltage Gain·Phase vs. Frequency

VDD=3V, Rs=1kΩ, AV=40dB

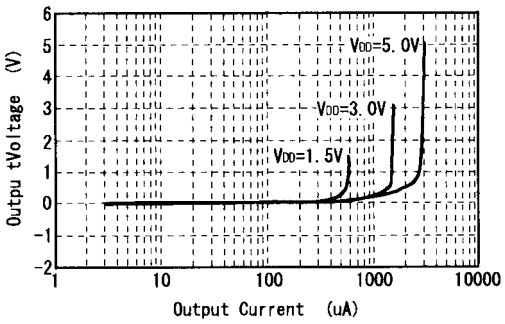


(2) NJU7095

Output Voltage vs. Output Current (SOURCE)

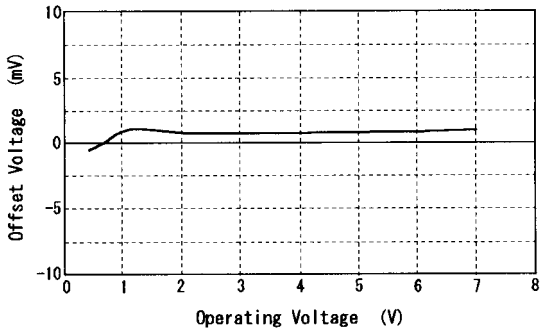


Output Voltage vs. Output Current (SINK)



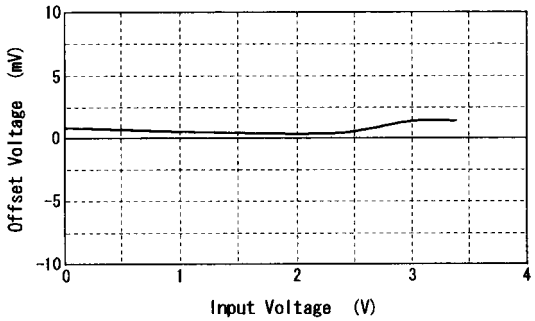
Offset Voltage vs. Operating Voltage

VIN=0.1V



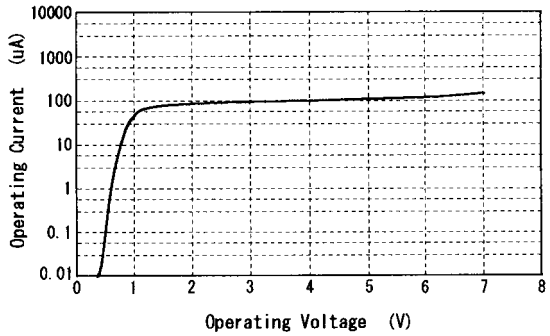
Offset Voltage vs. Input Voltage

VDD=3.0V



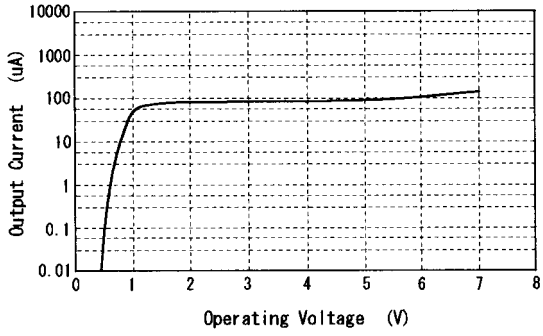
Operating Current vs. Operating Voltage

VIN=0.1V

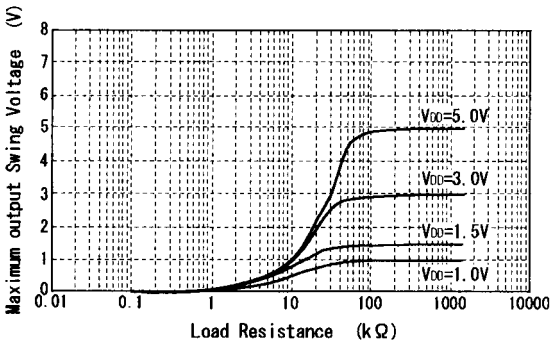


Output Current vs. Operating Voltage

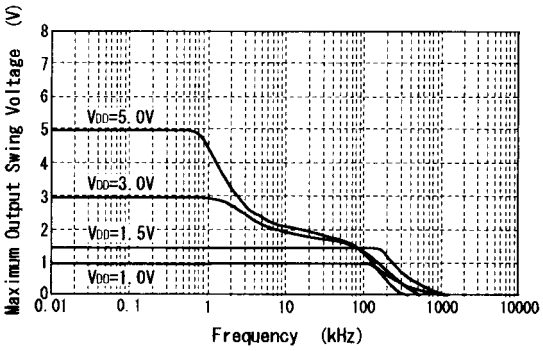
VIN=0.1V



Maximum Output Swing Voltage vs. Load Resistance

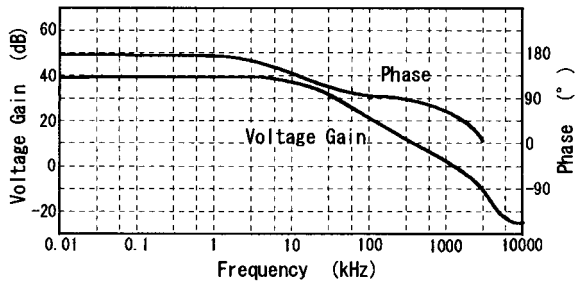


Maximum Output Swing Voltage vs. Frequency



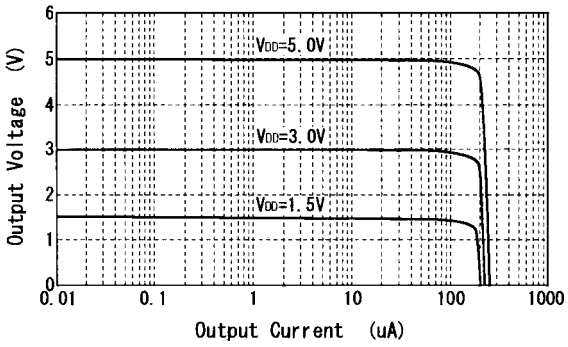
Voltage Gain·Phase vs. Frequency

VDD=3V, Rs=1kΩ, AV=40dB

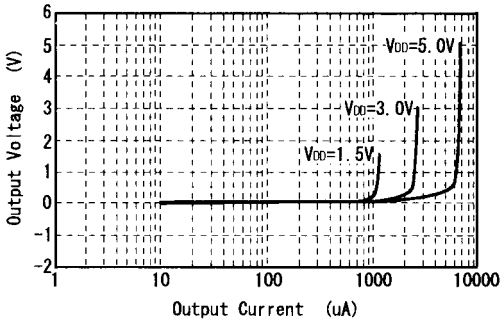


(3) NJU7096

Output Voltage vs. Output Current (SOURCE)

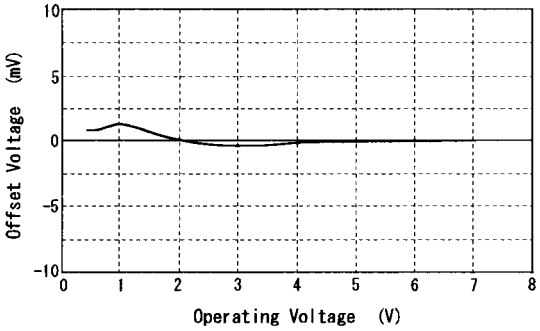


Output Voltage vs. Output Current (SINK)



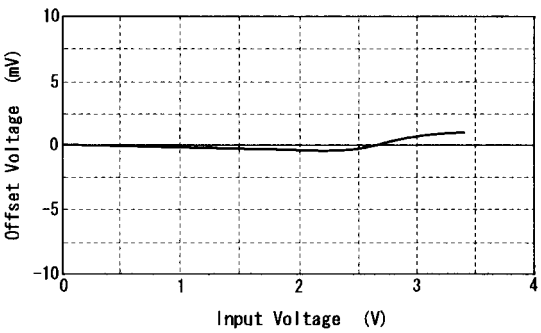
Offset Voltage vs. Operating Voltage

VIN=0.1V



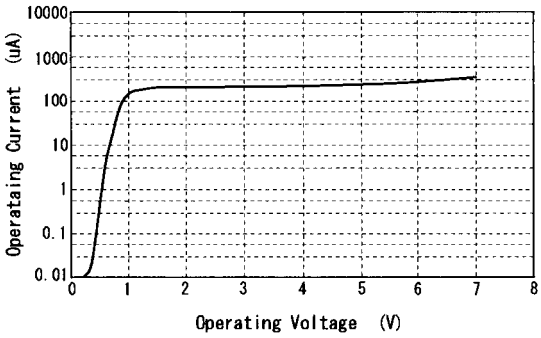
Offset Voltage vs. Input Voltage

VDD=3.0V



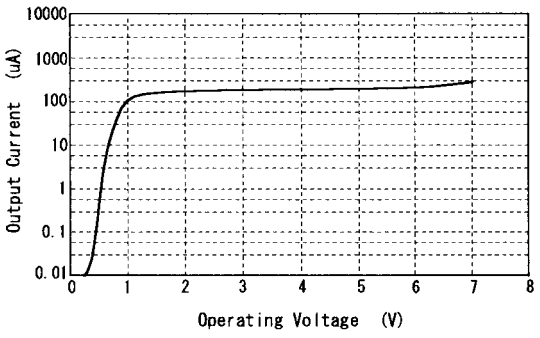
Operating Current vs. Operating Voltage

VIN=0.1V

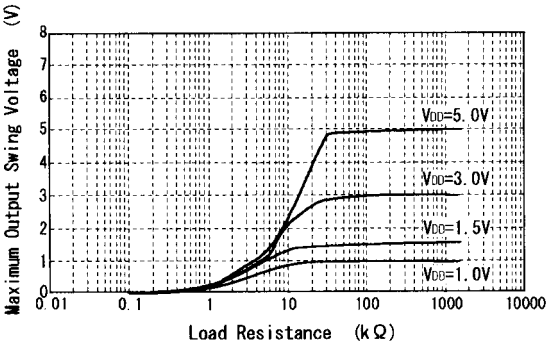


Output Current vs. Operating Voltage

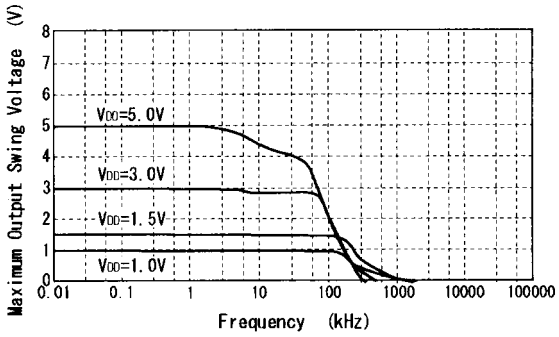
VIN=0.1V



Maximum Output Swing Voltage vs. Load Resistance

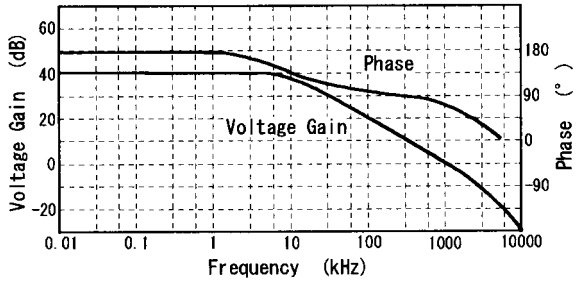


Maximum Output Swing Voltage vs. Frequency



Voltage Gain·Phase vs. Frequency

VDD=3V, Rs=1kΩ, AV=40dB



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