LOW-POWER AND LOW-OFFSET-VOLTAGE TINY SINGLE C-MOS OPERATIONAL AMPLIFIER

■ GENERAL DESCRIPTION

The NJU7091A, 92A and 93A are single 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 very small MTP-5, therefore it can be especially applied to portable items.

■ PACKAGE OUTLINE

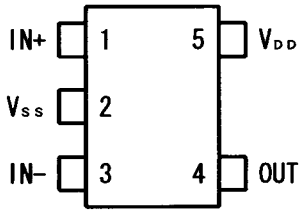
NJU709XAF

■ 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 MTP-5
- C-MOS Technology

■ PIN CONFIGURATION

(Top View)

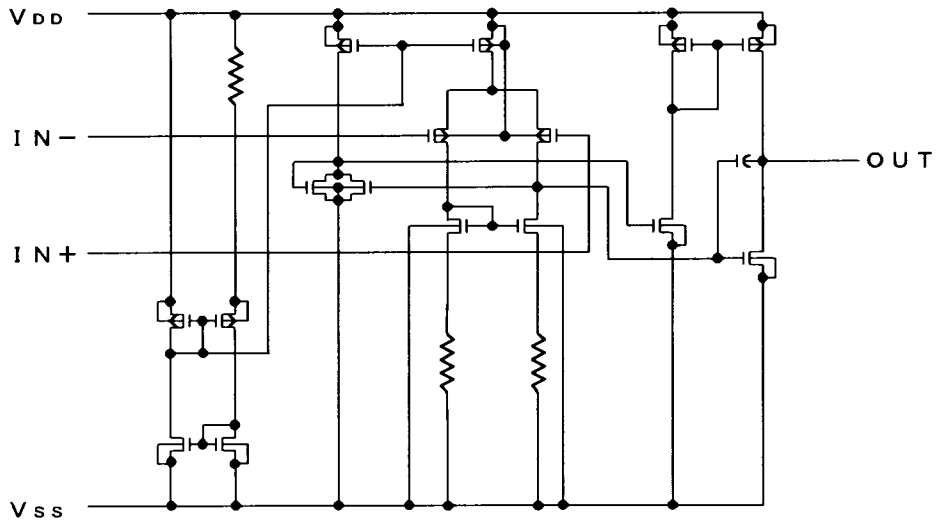


■ LINE-UP

(Ta=25°C, V_{DD}=3.0V)

PARAMETER	NJU7091A	NJU7092A	NJU7093A	UNIT
Operating Current	15	80	200	uA (typ)
Slew Rate	0.1	1.0	2.4	V/us (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}	6.5	V
Differential Input Voltage	V_{ID}	±6.5 Note1	V
Common Mode Input Voltage	V_{IC}	- 0.3 ~ 6.5	V
Power Dissipation	P_D	200	mW
Operating Temperature	Topr	- 40 ~ + 85	°C
Storage Temperature	Tstg	- 55 ~ +125	°C

Note1) If the supply voltage (V_{DD}) is less than 6.5V, the input voltage must not over the V_{DD} level though 6.5V is limit specified.

Note2) Decoupling capacitor should be connected between V_{DD} and V_{SS} due to the stabilized operation for the circuit.

■ ELECTRICAL CHARACTERISTICS

NJU7091A (Ta=25°C, V_{DD}=3.0V, R_L=∞)

PARAMETER	SYMBOL	CONDITIONS	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}		—	15	25	uA
Slew Rate	SR		—	0.1	—	V/us
Unity Gain Bandwidth	Ft	A_V=40dB, C_L=10pF	—	0.2	—	MHz

Note3) The source current is less than 2.9uA (at V_{OM}/R_L=2.9V/1MΩ).

NJU7092A (Ta=25°C, V_{DD}=3.0V, R_L=∞)

PARAMETER	SYMBOL	CONDITIONS	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}		–	80	160	uA
Slew Rate	SR		–	1.0	–	V/us
Unity Gain Bandwidth	Ft	A_V=40dB, C_L=10pF	–	1.0	–	MHz

Note4) The source current is less than 29uA (at V_{OM}/R_L=2.9V/100kΩ).

NJU7093A (Ta=25°C, V_{DD}=3.0V, R_L=∞)

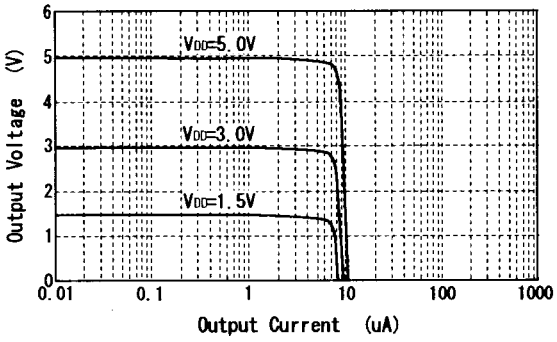
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Input Offset Voltage	V_{IO}	V_{IN}=1/2V_{DD}	–	–	2	mV
Input Offset Current	I_{IO}		–	1	–	pA
Input Bias Current	I_{IB}		–	1	–	pA
Input Impedance	R_{IN}		–	1	–	TΩ
Large Signal Voltage Gain	A_{VD}		60	70	–	dB
Input Common Mode Voltage Range	V_{ICM}		0~2.5	–	–	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}		–	200	400	uA
Slew Rate	SR		–	1.0	–	V/us
Unity Gain Bandwidth	Ft	A_V=40dB, C_L=10pF	–	1.0	–	MHz

Note5) The source current is less than 58uA (at V_{OM}/R_L=2.9V/50kΩ).

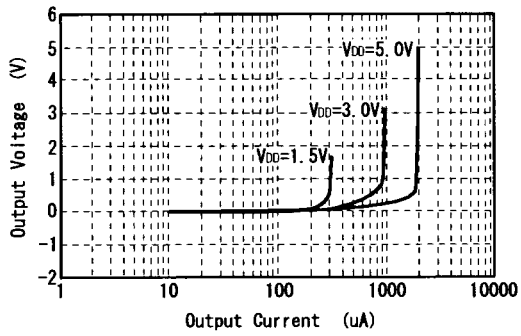
■ TYPICAL CHARACTERISTICS

(1) NJU7091A

Output Voltage vs. Output Current (SOURCE)

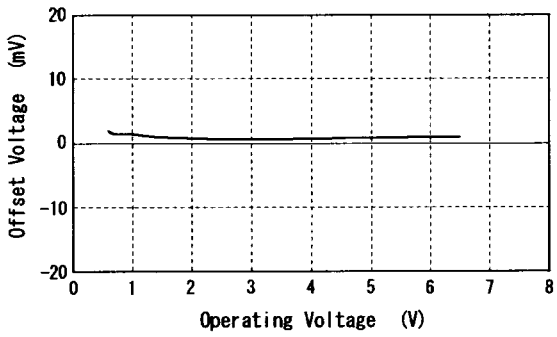


Output Voltage vs. Output Current (SINK)



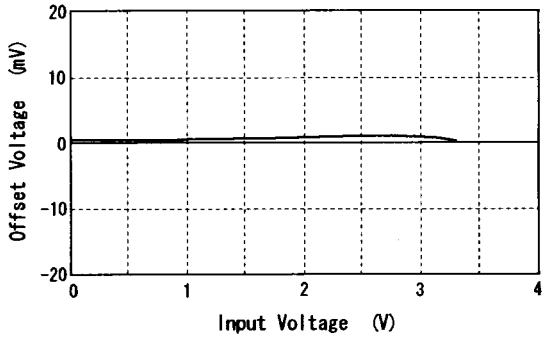
Offset Voltage vs. Operating Voltage

VIN=0.1V



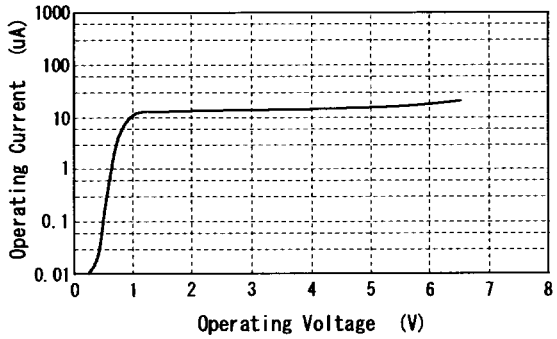
Offset Voltage vs. Input Voltage

VDD=3.0V



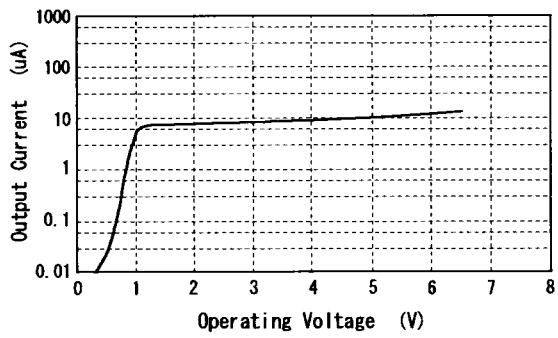
Operating Current vs. Operating Voltaga

VIN=0.1V

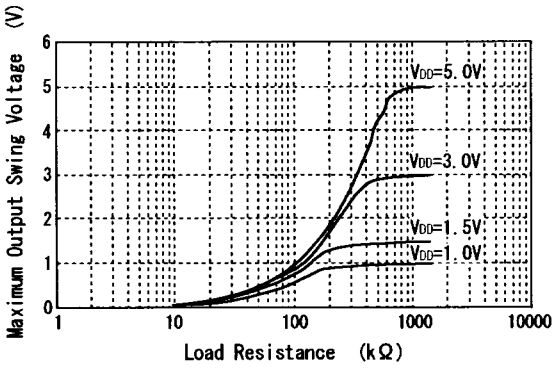


Output Current vs. Operating Voltage

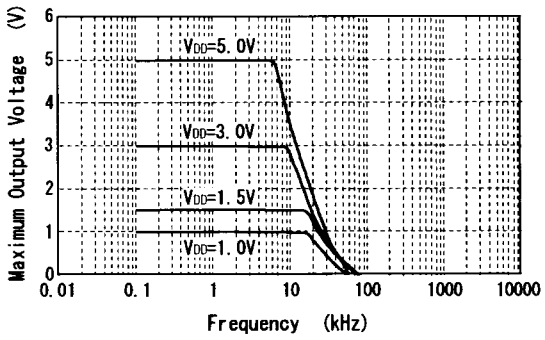
VIN=0.1V



Maximum Output Swing Voltage vs. Load Resistance

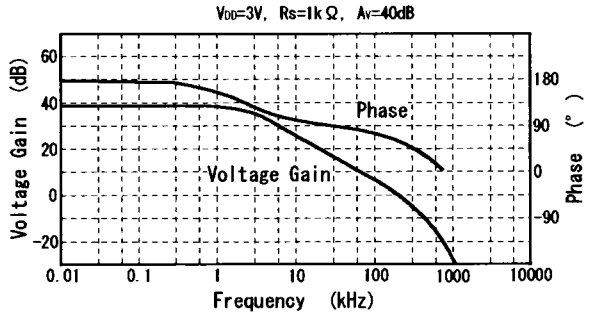


Maximum Output Swing Voltage vs. Frequency



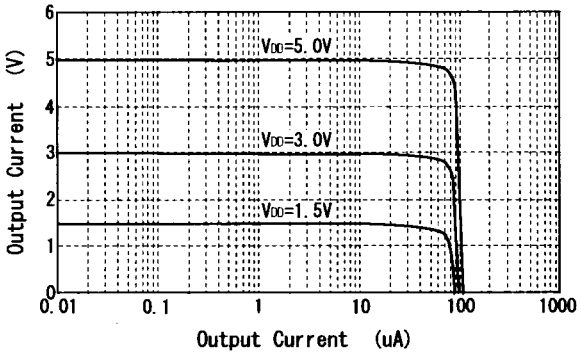
Voltage Gain·Phase vs. Frequency

VDD=3V, Rs=1kΩ, AV=40dB

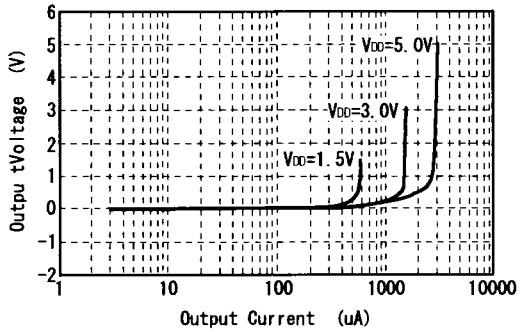


(2) NJU7092A

Output Voltage vs. Output Current (SOURCE)

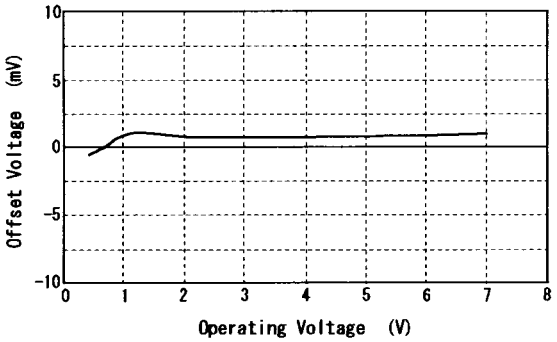


Output Voltage vs. Output Current (SINK)



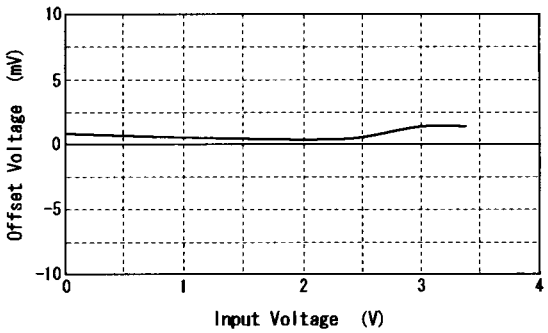
Offset Voltage vs. Operating Voltage

VIN=0.1V



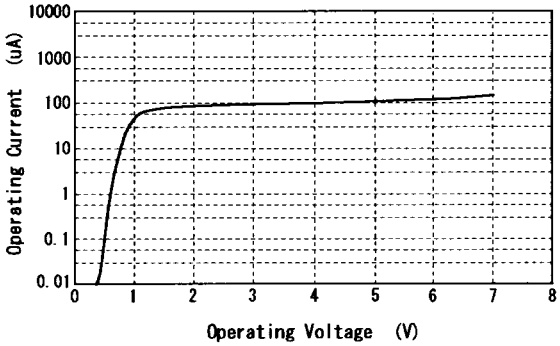
Offset Voltage vs. Input Voltage

VDD=3.0V



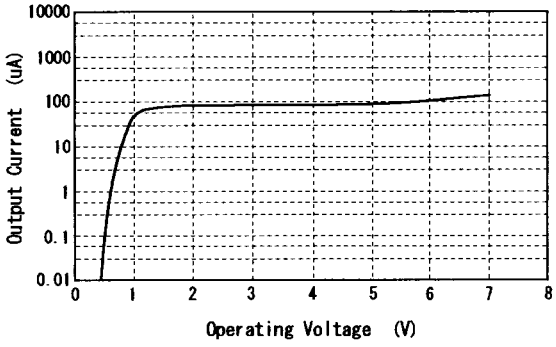
Operating Current vs. Operating Voltage

VIN=0.1V

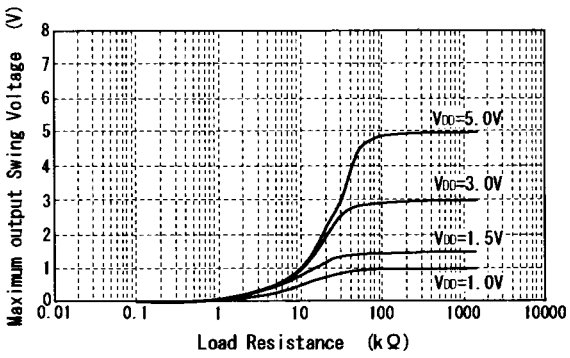


Output Current vs. Operating Voltage

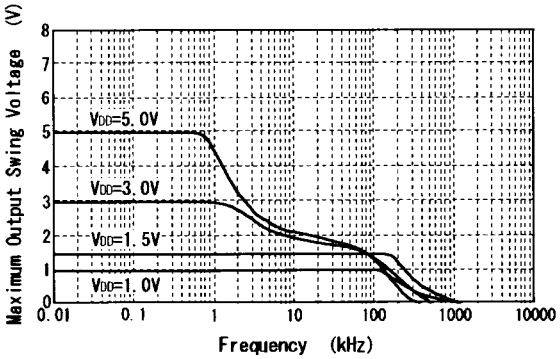
VIN=0.1V



Maximum Output Swing Voltage vs. Load Resistance

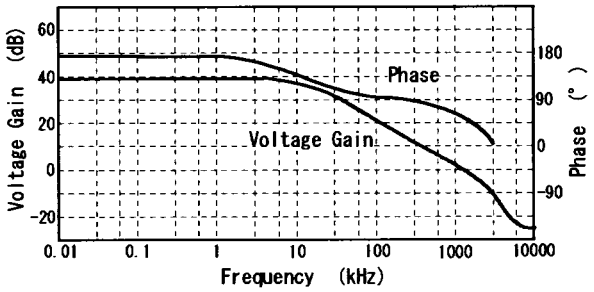


Maximum Output Swing Voltage vs. Frequency



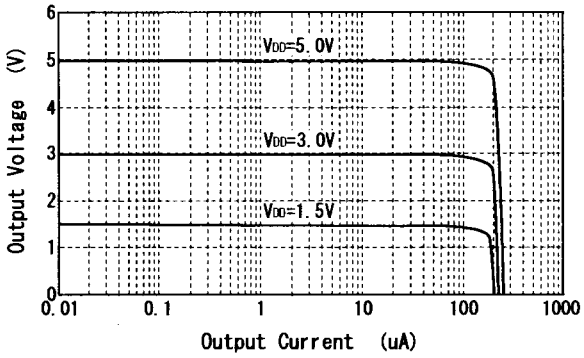
Voltage Gain-Phase vs. Frequency

VDD=3V, Rs=1kΩ, AV=40dB

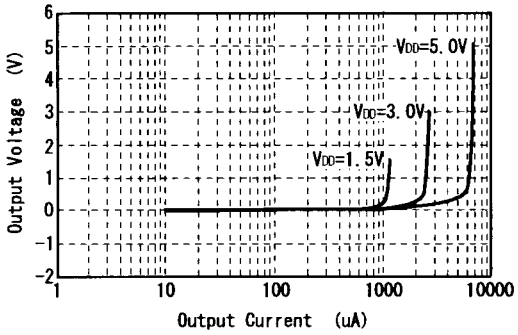


(3) NJU7093A

Output Voltage vs. Output Current (SOURCE)

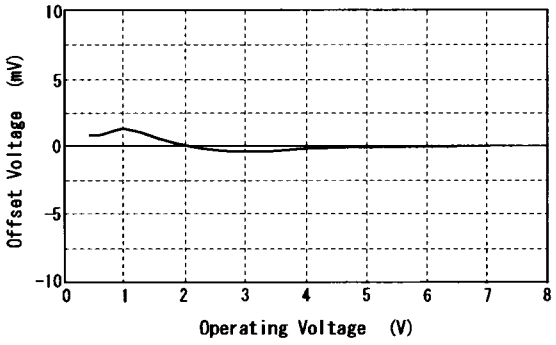


Output Voltage vs. Output Current (SINK)



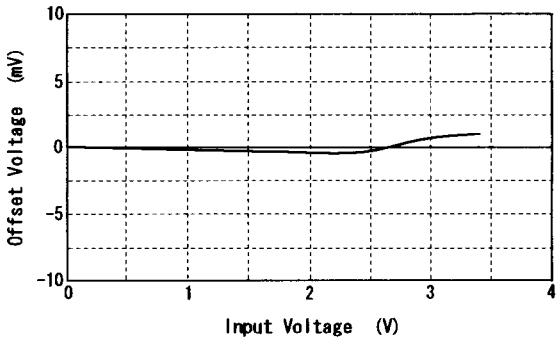
Offset Voltage vs. Operating Voltage

VIN=0.1V



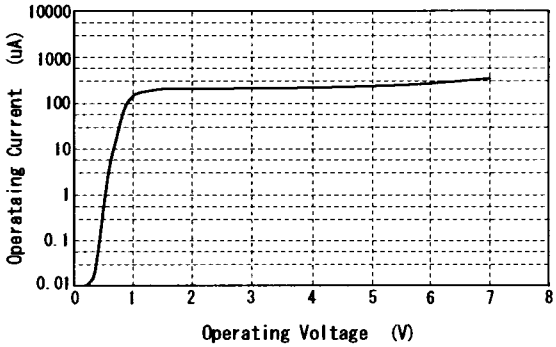
Offset Voltage vs. Input Voltage

VDD=3.0V



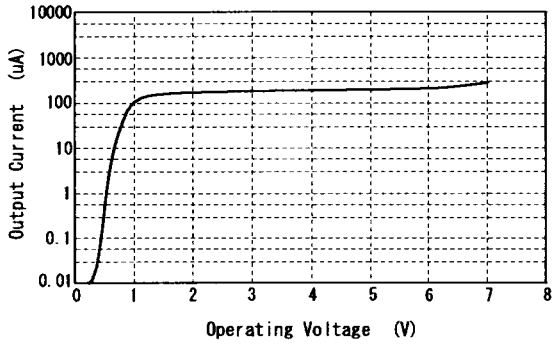
Operating Current vs. Operating Voltage

VIN=0.1V

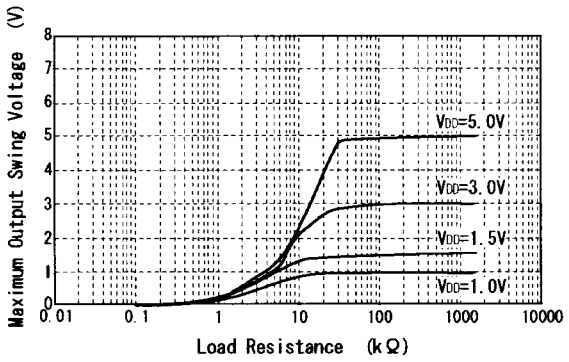


Output Current vs. Operating Voltage

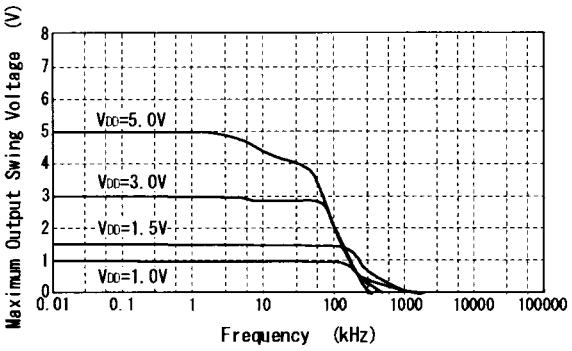
VIN=0.1V



Maximum Output Swing Voltage vs. Load Resistance

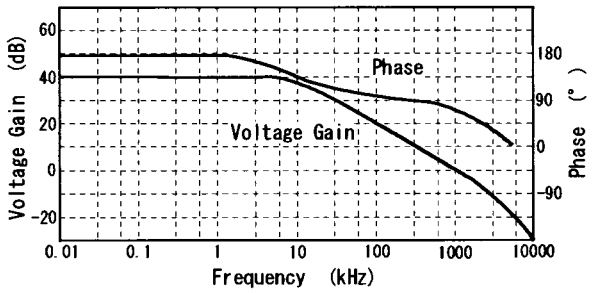


Maximum Output Swing Voltage vs. Frequency



Voltage Gain-Phase vs. Frequency

VDD=3V, Rs=1kΩ, Av=40dB



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