SINGLE SUPPLY DUAL AMPLIFIER

■ GENERAL DESCRIPTION

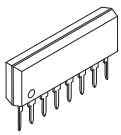
The NJM12904 is a single-supply dual operational amplifier, which can operate from 2V supply. The features are low offset voltage, low bias current.
The package lineup is DIP, SIP, DMP and others compact so that the NJM12904 is suitable for audio for low voltage operation and any other kind of signal amplifier.

■ FEATURES

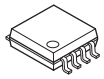
- Operating Voltage +2V to +14V
- Input Offset Voltage 5mV max.
- Slew Rate 0.7V/μs typ.
- Operating Current 0.7mA typ.
- Bipolar Technology
- Package Outline DIP8, SIP8, DMP8,
  SOP8 JEDEC 150mil, SSOP8
  MSOP8 (VSP8)MEET JEDEC MO-187-DA
  MSOP8 (TVSP8)MEET JEDEC MO-187-DA/THIN TYPE

■ PACKAGE OUTLINE

NJM12904D
(DIP8)



NJM12904L
(SIP8)



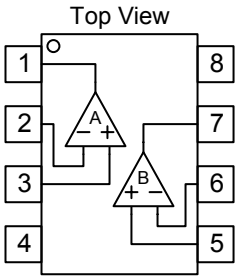
NJM12904M
(DMP8)

NJM12904E
(SOP8)

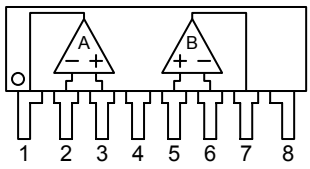
NJM12904V
(SSOP8)

NJM12904R/RB1
(MSOP8(VSP8))
(MSOP8(TVSP8))

■ PIN CONFIGURATION



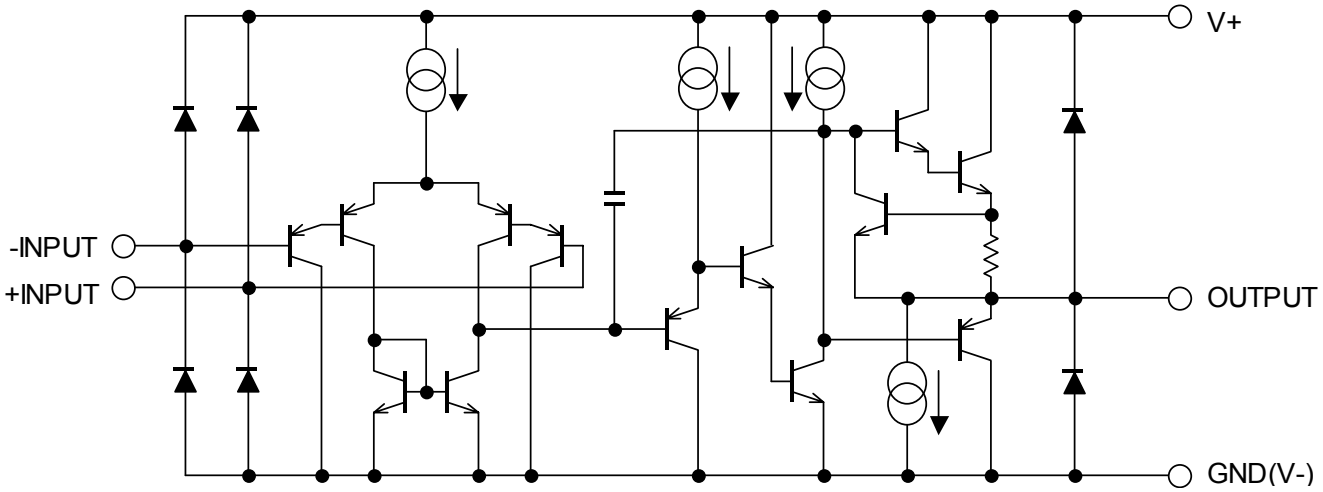
NJM12904D/12904M/12904E
NJM12904V/12904R/12904RB1



NJM12904L

PIN FUNCTION
1. A OUTPUT
2. A -INPUT
3. A +INPUT
4. GND(V^-)
5. B +INPUT
6. B -INPUT
7. B OUTPUT
8. V^+

■ EQUIVALENT CIRCUIT (1/2Shown)



■ **ABSOLUTE MAXIMUM RATING** (Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V^+	15	V
Differential Input Voltage	V_{ID}	14 (Note1)	V
Input Voltage	V_{IC}	-0.3~+14 (Note1)	V
Power Dissipation (stand alone)	P_D	DIP8: 500 DMP8: 300 SOP8: 300 SSOP8: 250 MSOP8(VSP8/TVSP8): 320 SIP8: 800	mW
Operating Temperature Range	Topr	-40~+85	ºC
Storage Temperature Range	Tstg	-50~+125	ºC

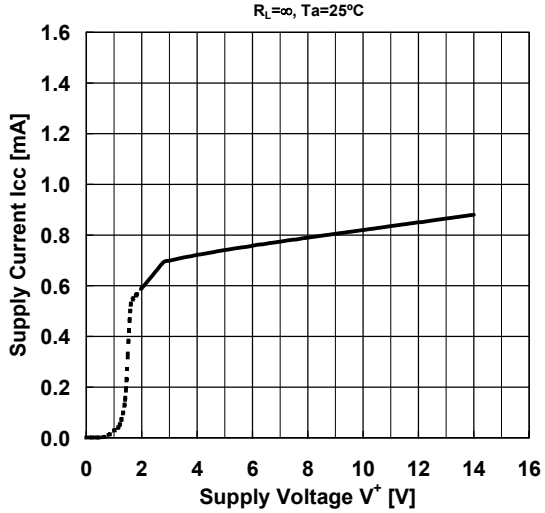
(Note1) For supply voltage less than 14V, the absolute maximum rating is equal to the supply voltage.

■ **ELECTRICAL CHARACTERISTICS** (V^+=5V, Ta=25°C)

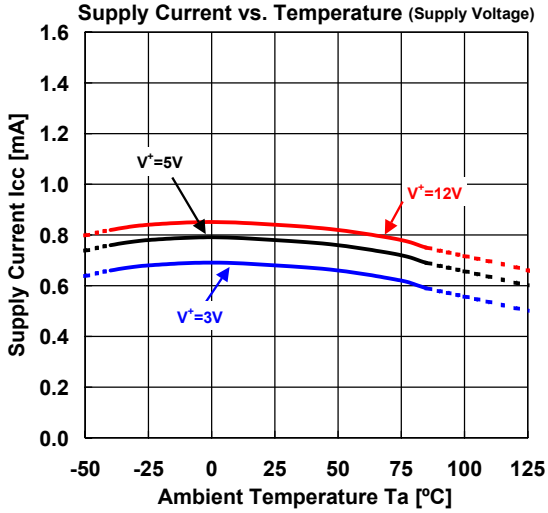
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V_{opr}		2	-	14	V
Input Offset Voltage	V_{IO}	R_S=0Ω	-	1	5	mV
Input Offset Current	I_{IO}		-	5	50	nA
Input Bias Current	I_B		-	20	150	nA
Large Signal Voltage Gain	A_V	R_L≥2kΩ	-	100	-	dB
Maximum Output Voltage Swing	V_{OPP}	R_L=2kΩ	3.5	-	-	V
Common Mode Input Voltage Range	V_{ICM}		0~3.5	-	-	V
Common Mode Rejection Ratio	CMR		-	85	-	dB
Supply Voltage Rejection Ratio	SVR		-	100	-	dB
Output Source Current	I_{SOURCE}	V_{IN}+=1V, V_{IN}-=0V	20	40	-	mA
Output Sink Current	I_{SINK}	V_{IN}+=0V, V_{IN}-=1V	8	30	-	mA
Channel Separation	CS	f=1k~20kHz	-	120	-	dB
Operating Current	I_{CC}	R_L=∞	-	0.7	1.2	mA
Slew Rate	SR	R_L=2kΩ, A_V=0dB, f=1kHz	-	0.7	-	V/μs
Gain Bandwidth Product	GB		-	1.5	-	MHz

■ TYPICAL CHARACTERISTICS

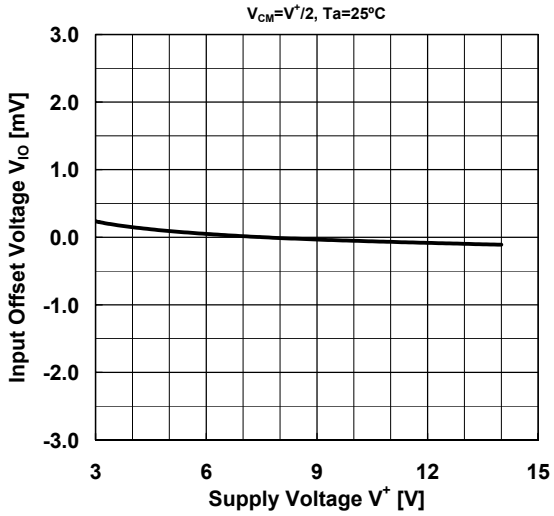
Supply Current vs. Supply Voltage
R_L=∞, Ta=25°C



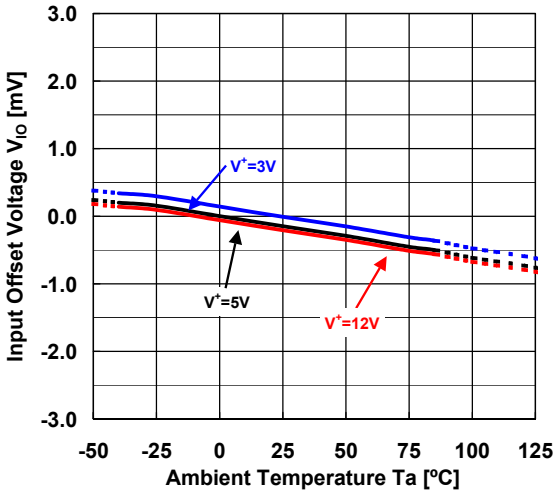
Supply Current vs. Temperature (Supply Voltage)



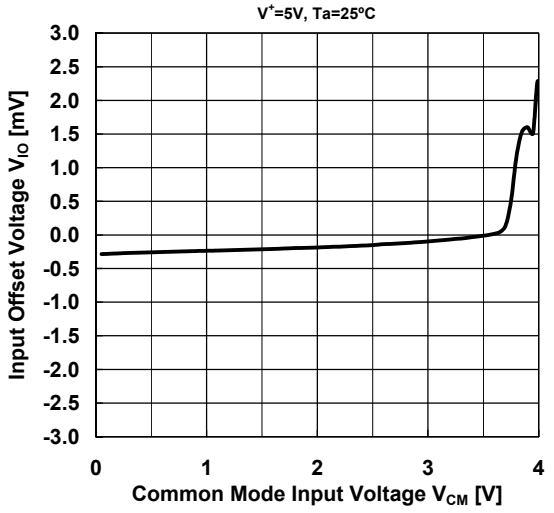
Input Offset Voltage vs. Supply Voltage
V_{CM}=V+/2, Ta=25°C



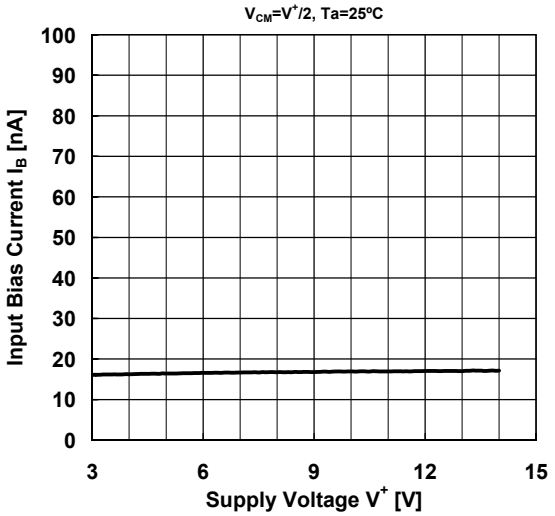
Input Offset Voltage vs. Temperature
(Supply Voltage)
V_{CM}=V+/2



Input Offset Voltage
vs. Common Mode Input Voltage
V+=5V, Ta=25°C

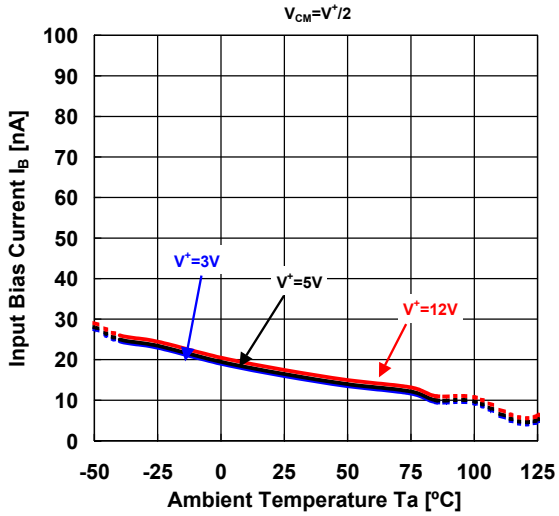


Input Bias Current vs. Supply Voltage
V_{CM}=V+/2, Ta=25°C

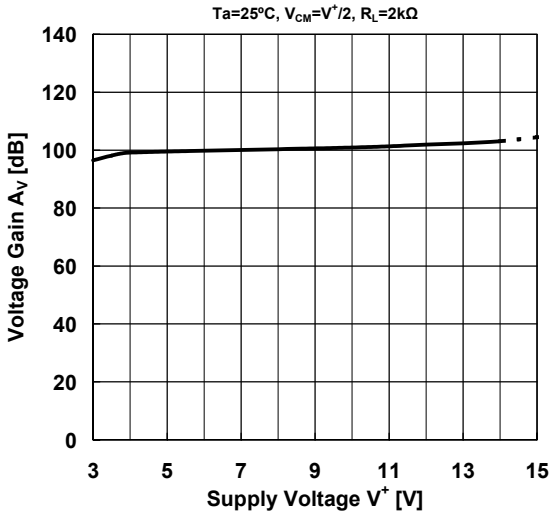


■ TYPICAL CHARACTERISTICS

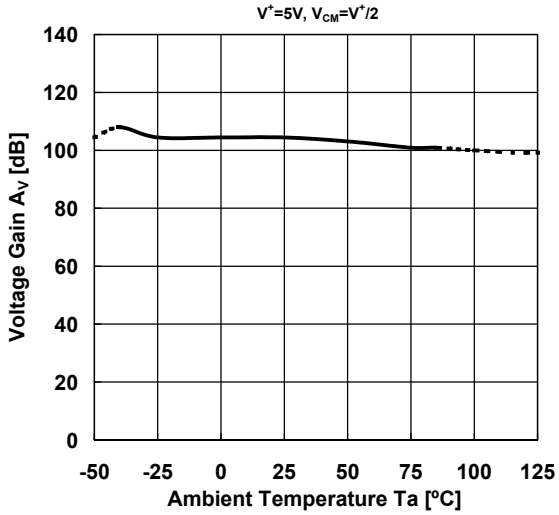
Input Bias Current vs. Temperature
(Supply Voltage)
$V_{CM}=V^+/2$



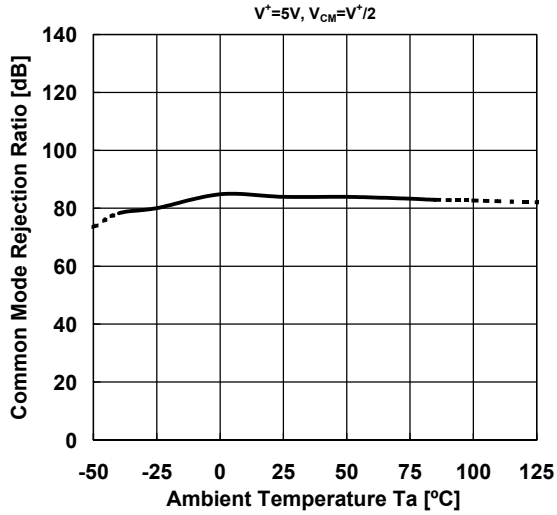
Gain vs. Supply Voltage
Ta=25ºC, $V_{CM}=V^+/2$, R_L=2kΩ



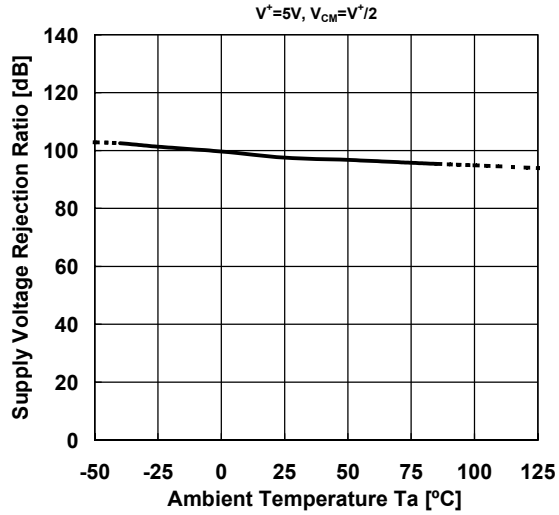
Gain vs. Temperature
V^+=5V, $V_{CM}=V^+/2$



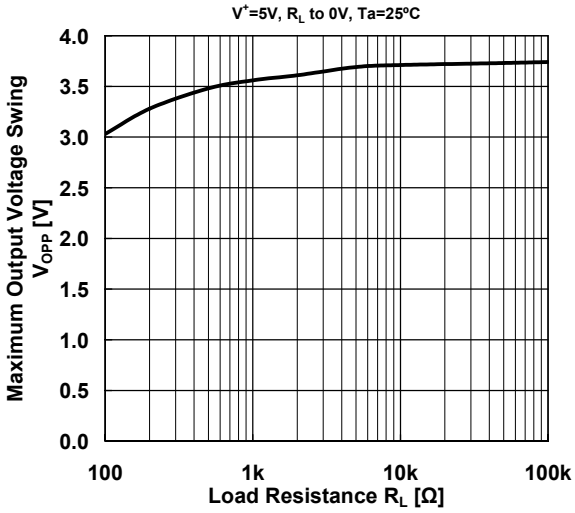
CMR vs. Temperature
V^+=5V, $V_{CM}=V^+/2$



SVR vs. Temperature
V^+=5V, $V_{CM}=V^+/2$

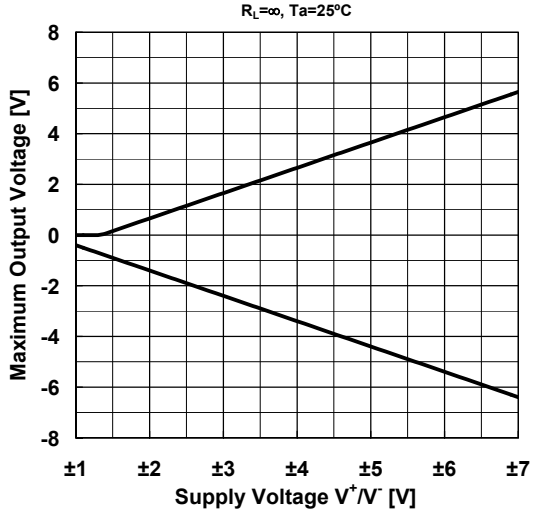


Maximum Output Voltage Swing
vs. Load Resistance
V^+=5V, R_L to 0V, Ta=25ºC

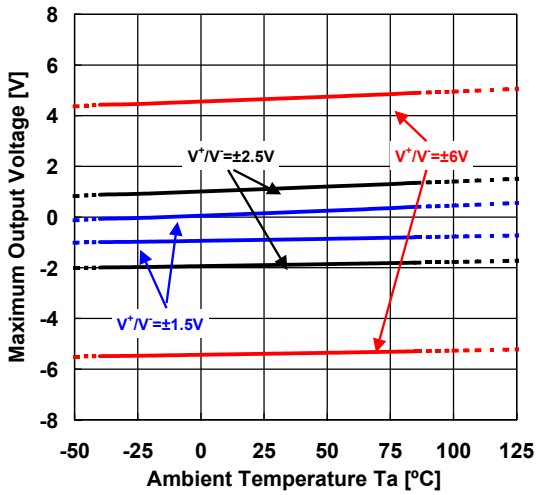


■ TYPICAL CHARACTERISTICS

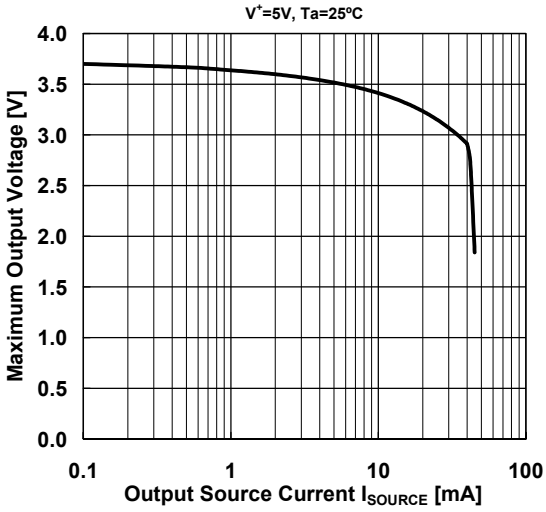
Maximum Output Voltage vs. Supply Voltage
R_L=∞, Ta=25ºC



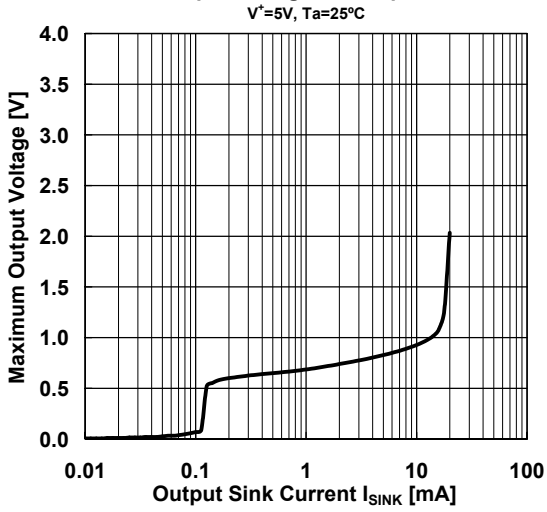
Maximum Output Voltage vs. Temperature
(Supply Voltage)
R_L=∞



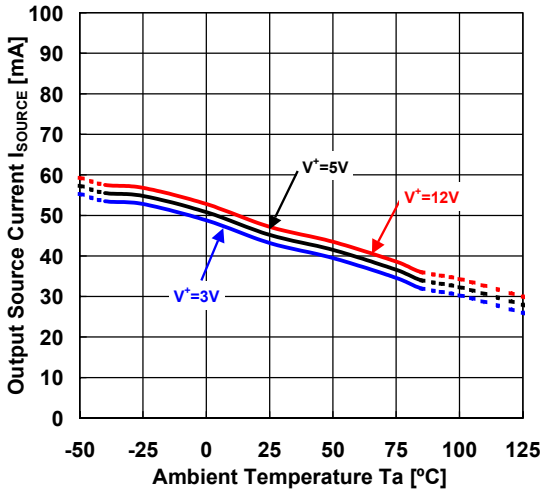
Maximum Output Voltage
vs. Output Source Current
V+=5V, Ta=25ºC



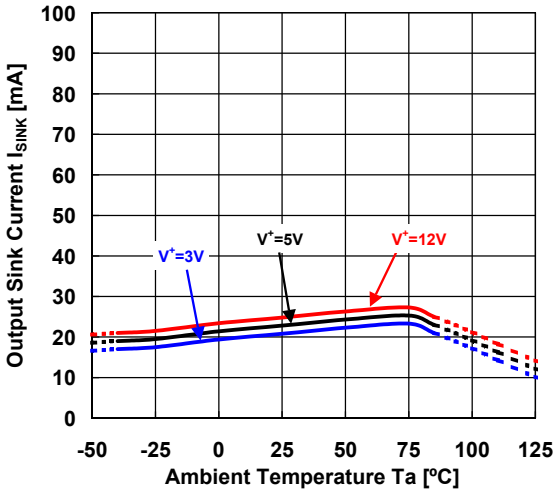
Maximum Output Voltage vs. Output Sink Current
V+=5V, Ta=25ºC



Output Source Current vs. Temperature
(Supply Voltage)
V_O=0V



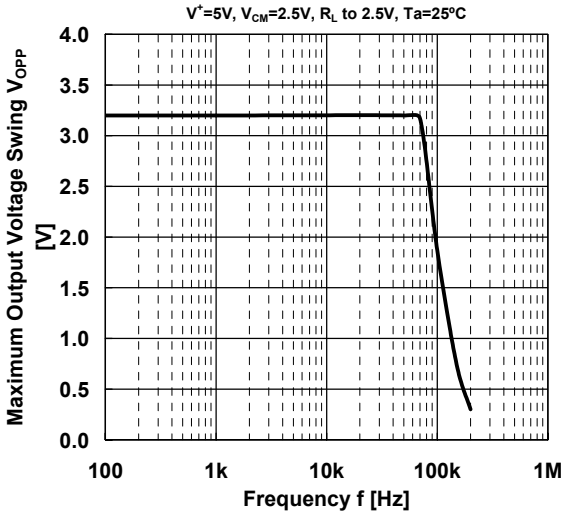
Output Sink Current vs. Temperature
(Supply Voltage)
V_O=V^+



■ TYPICAL CHARACTERISTICS

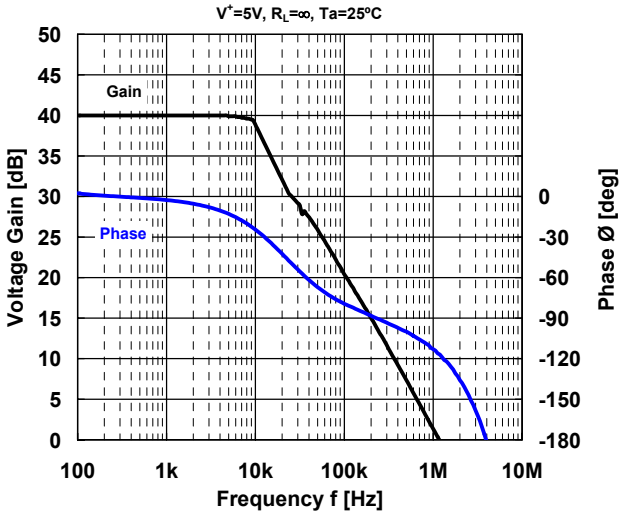
Maximum Output Voltage Swing vs. Frequency

V^+=5V, V_{CM}=2.5V, R_L to 2.5V, Ta=25ºC



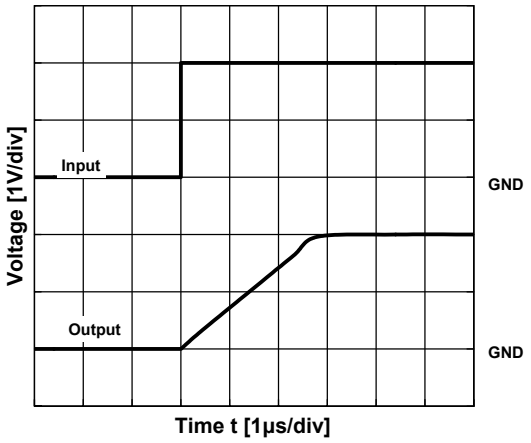
40dB Gain/Phase vs. Frequency

V^+=5V, R_L=∞, Ta=25ºC



Pulse Response (Rise)

V^+=5V, Ta=25ºC



Pulse Response (Fall)

V^+=5V, Ta=25ºC