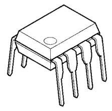
Low Noise, Rail-to-Rail Input/Output Dual Operational Amplifier

■ GENERAL DESCRIPTION

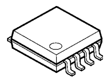
The NJM2737 is a Rail-to-Rail Input/Output single supply dual operational amplifier featuring low voltage operation, low power and low noise. It is designed to offer a low voltage operating from 1.8V with a 5nV/√Hz low noise of the conventional low noise operational amplifiers such as the NJM4580 and NJM 5532.

The Combination of Rail-to-Rail Input/Output, low voltage operation and low noise makes the NJM2737 well-suited for single supply low voltage operation applications such as PC audio, portable audio and others. The NJM2737 is available in a wide variety packages 8-lead DIP, and 8-lead surface-mount packages of SOP (DMP), SSOP and MSOP (TVSP).

■PACKAGE OUTLINE



NJM2737D (DIP8)



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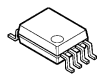
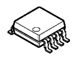


NJM2737V (SSOP8)



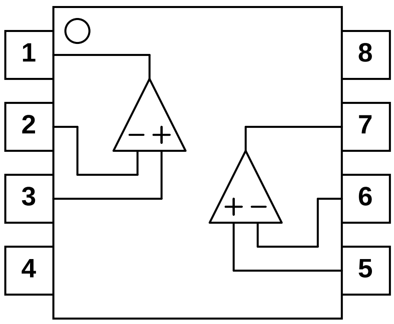
NJM2737RB1 (MSOP8 (TVSP8))

■ FEATURES

- Operating Voltage — 1.8 to 6V
- Low Input Voltage Noise — 5nV/√Hz typ.
- Gain Band Width product — 3.1MHz typ. (at V^+=5V, R_L=2kΩ)
- Slew Rate — 0.7V/µs typ. (at V^+=5V, R_L=2kΩ)
- Offset Voltage — 5mV max
- Rail-to-Rail Input — V_{ICM}= 0 to 5V (at V^+=5V)
- Maximum Output Voltage1 — $V_{OH1} \geq 4.9V$ / $V_{OL1} \leq 0.15V$ (at V^+=5V, R_L=20kΩ)
- Maximum Output Voltage2 — $V_{OH2} \geq 4.75V$ / $V_{OL2} \leq 0.25V$ (at V^+=5V, R_L=2kΩ)
- Bipolar Technology
- Package Outline — DIP8, DMP8, SSOP8, MSOP8 (TVSP8) MEET JEDEC MO-187-DA / THIN TYPE

■ PIN CONFIGURATION

(Top View)



PIN CONFIGURATION

1.OUTPUT1
2.-INPUT1
3.+INPUT1
4.GND(V^-)
5.+INPUT2
6.-INPUT2
7.OUTPUT2
8.V^+

■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V^+	7	V
Differential Input Voltage	V_{ID}	±1	V
Input Common Mode Voltage Range	V_{ICM}	0 to 7	V
Power Dissipation	P_D	500(DIP8) 300(DMP8) 250(SSOP8) 320(MSOP8 (TVSP8))	mW
Operating Temperature Range	Topr	-40 to 85	°C
Storage Temperature Range	Tstg	-40 to 125	°C

(Note1)If the supply voltage (V^+) is less than 7V, the input voltage must not over the V^+ level through 7V is limit specified.

■ RECOMMENDED OPERATING CONDITION

(Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V^+	1.8 to 6	V

■ ELECTRICAL CHARACTERISTICS

● DC CHARACTERISTICS

(V^+=5V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Operating Current	I_{CC}	No Signal	-	1200	1600	µA
Input Offset Voltage	V_{IO}		-	1	5	mV
Input Bias Current	I_B		-	200	800	nA
Input Offset Current	I_{IO}		-	5	100	nA
Voltage Gain	A_V	R_L=2kΩ	60	85	-	dB
Common Mode Rejection Ratio	CMR	CMR+:2.5V ≤ V_{CM} ≤ 5V, CMR-: 0 ≤ V_{CM} ≤ 2.5V(Note2)	55	70	-	dB
Supply Voltage Rejection Ratio	SVR	V^+/GND = ±2 to ±3V	70	85	-	dB
Maximum Output Voltage1	V_{OH1}	R_L=20kΩ	4.9	4.95	-	V
	V_{OL1}	R_L=20kΩ	-	0.1	0.15	
Maximum Output Voltage 2	V_{OH2}	R_L=2kΩ	4.75	4.85	-	V
	V_{OL2}	R_L=2kΩ	-	0.15	0.25	
Input Common Mode Voltage Range	V_{ICM}	CMR > 55dB	0	-	5	V

(Note2) CMR is represented by either CMR+ or CMR- which has lower value.
CMR+ is measured with 2.5V≤V_{CM} ≤5V and CMR- is measured with 0V≤ V_{CM} ≤ 2.5V .

● AC CHARACTERISTICS

(V^+=5V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Gain Bandwidth Product	GBW	R_L=2kΩ	-	3.1	-	MHz
Phase Margin	Φ_M	R_L=2kΩ	-	85	-	Deg
Equivalent Input Noise Voltage	V_{NI}	f=1kHz	-	5	-	nV/√Hz

● TRANSIENT CHARACTERISTICS (V^+=5V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Slew Rate	SR	R_L=2kΩ	-	0.7	-	V/µs

● DC CHARACTERISTICS (V^+=3V,Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Operating Current	I_{CC}	No Signal	-	1000	1500	µA
Input Offset Voltage	V_{IO}		-	1	5	mV
Input Bias Current	I_B		-	200	800	nA
Input Offset Current	I_{IO}		-	5	100	nA
Voltage Gain	A_V	R_L=2kΩ	60	85	-	dB
Common Mode Rejection Ratio	CMR	CMR+:1.5V ≤ V_{CM} ≤3V, CMR-: 0 ≤ V_{CM} ≤ 1.5V(Note3)	48	63	-	dB
Supply Voltage Rejection Ratio	SVR	V^+/GND = ±1.2 to ±2V	68	83	-	dB
Maximum Output Voltage1	V_{OH1}	R_L=20kΩ	2.9	2.95	-	V
	V_{OL1}	R_L=20kΩ	-	0.1	0.15	
Maximum Output Voltage 2	V_{OH2}	R_L=2kΩ	2.75	2.85	-	V
	V_{OL2}	R_L=2kΩ	-	0.15	0.25	
Input Common Mode Voltage Range	V_{ICM}	CMR > 48dB	0	-	3	V

(Note3) CMR is represented by either CMR+ or CMR- which has lower value.
CMR+ is measured with 1.5V≤V_{CM} ≤3V and CMR- is measured with 0V≤ V_{CM} ≤ 1.5V .

● AC CHARACTERISTICS (V^+=3V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Gain Bandwidth Product	GBW	R_L=2kΩ	-	2.6	-	MHz
Phase Margin	Φ_M	R_L=2kΩ	-	85	-	Deg
Equivalent Input Noise Voltage	V_{NI}	f=1kHz	-	5	-	nV/√Hz

● TRANSIENT CHARACTERISTICS (V^+=3V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Slew Rate	SR	R_L=2kΩ	-	0.6	-	V/µs

● **DC CHARACTERISTICS** (V^+=1.8V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Operating Current	I_{CC}	No Signal	-	1000	1500	µA
Input Offset Voltage	V_{IO}		-	1	5	mV
Input Bias Current	I_B		-	200	800	nA
Input Offset Current	I_{IO}		-	5	100	nA
Voltage Gain	A_V	R_L=2kΩ	60	85	-	dB
Common Mode Rejection Ratio	CMR	CMR+:0.9V ≤ V_{CM} ≤ 1.8V, CMR-: 0 ≤ V_{CM} ≤ 0.9V(Note4)	40	55	-	dB
Supply Voltage Rejection Ratio	SVR	V^+/GND = ±0.9 to ±1.2V	65	80	-	dB
Maximum Output Voltage1	V_{OH1}	R_L=20kΩ	1.7	1.75	-	V
	V_{OL1}	R_L=20kΩ	-	0.1	0.15	
Maximum Output Voltage 2	V_{OH2}	R_L=2kΩ	1.6	1.65	-	V
	V_{OL2}	R_L=2kΩ	-	0.15	0.25	
Input Common Mode Voltage Range	V_{ICM}	CMR > 40dB	0	-	1.8	V

(Note4) CMR is represented by either CMR+ or CMR- which has lower value.
CMR+ is measured with 0.9V≤V_{CM}≤1.8V and CMR- is measured with 0V≤ V_{CM} ≤ 0.9V .

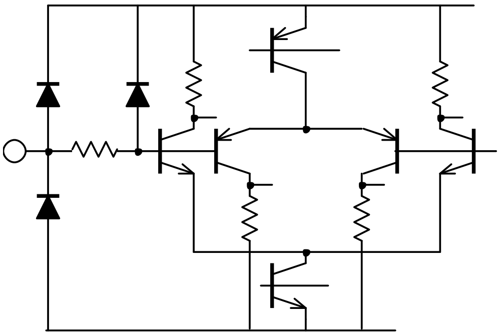
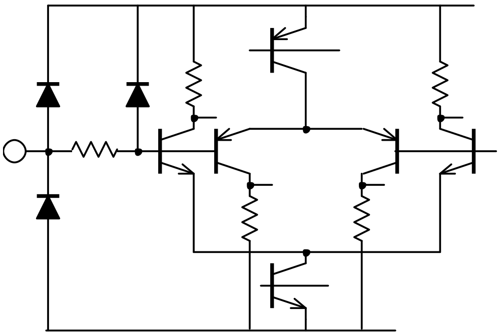
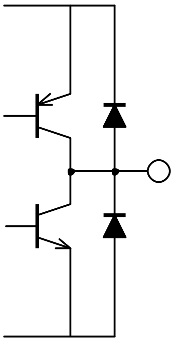
● **AC CHARACTERISTICS** (V^+=1.8V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Gain Bandwidth Product	GBW	R_L=2kΩ	-	2.3	-	MHz
Phase Margin	Φ_M	R_L=2kΩ	-	85	-	Deg
Equivalent Input Noise Voltage	V_{NI}	f=1kHz	-	5	-	nV/√Hz

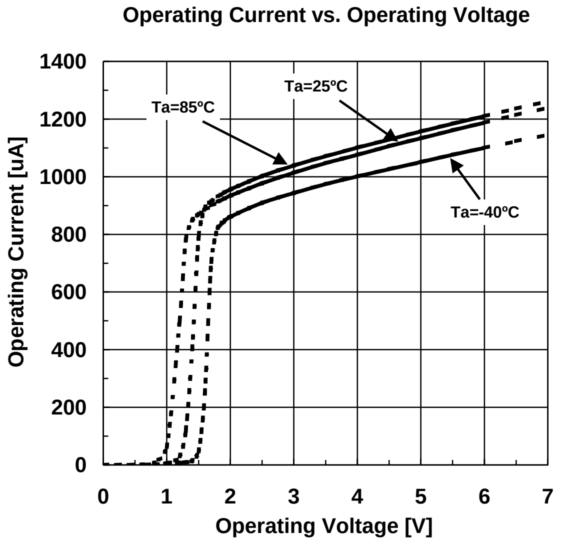
● **TRANSIENT CHARACTERISTICS** (V^+=1.8V, Ta=25°C)

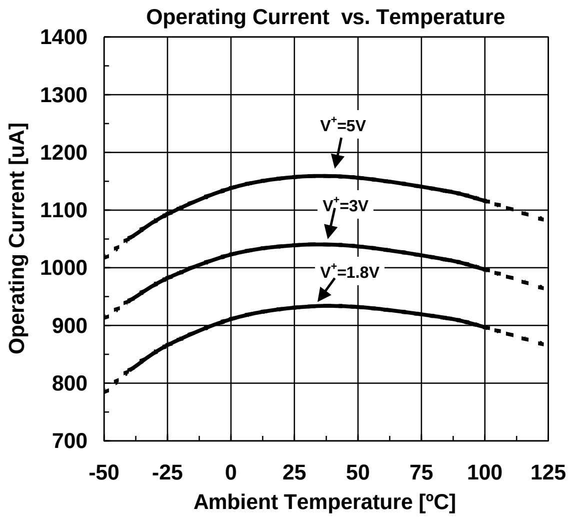
PARAMETER	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Slew Rate	SR	R_L=2kΩ	-	0.5	-	V/µs

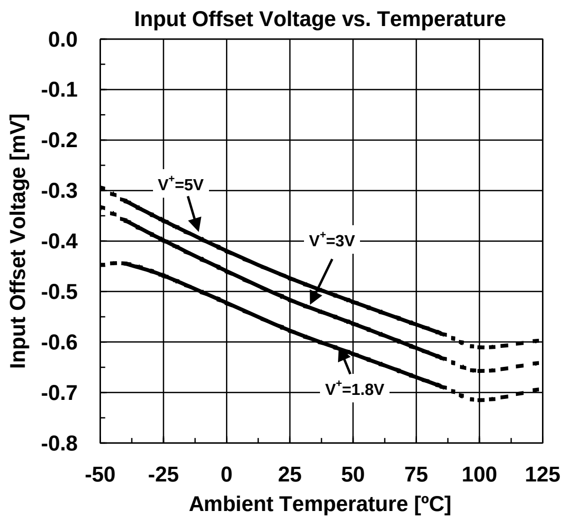
■ TERMINAL CHARACTERISTICS

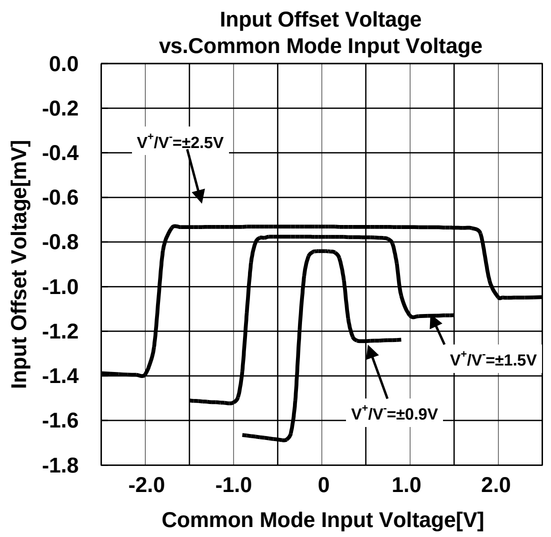
No.	Symbol	Equivalent Circuit	Typ.DC Voltage(V)	Function
3,5	+INPUT			non-inverting input
2,6	-INPUT			inverting input
1,7	VOUT			output

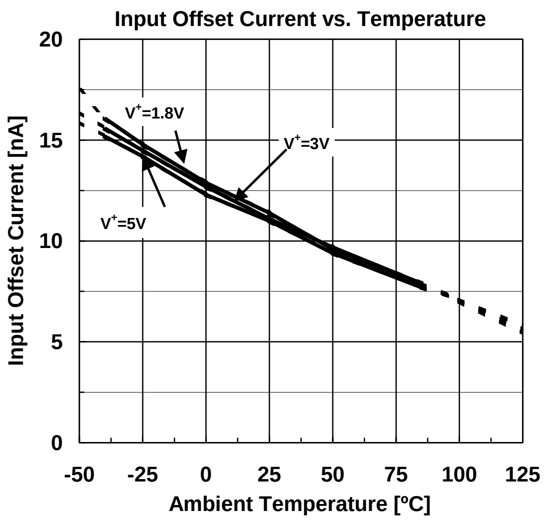
■ TYPICAL CHARACTERISTICS

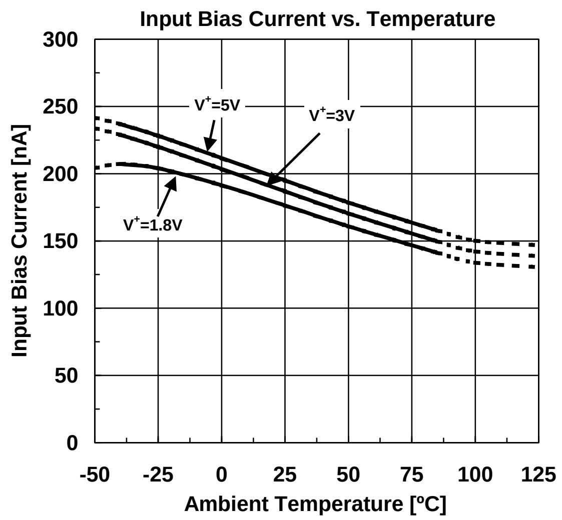




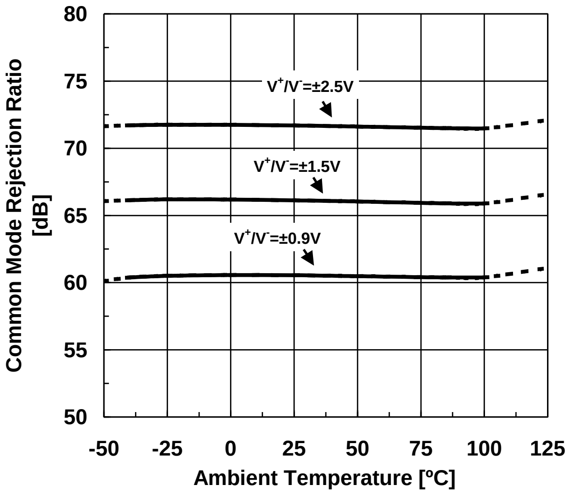




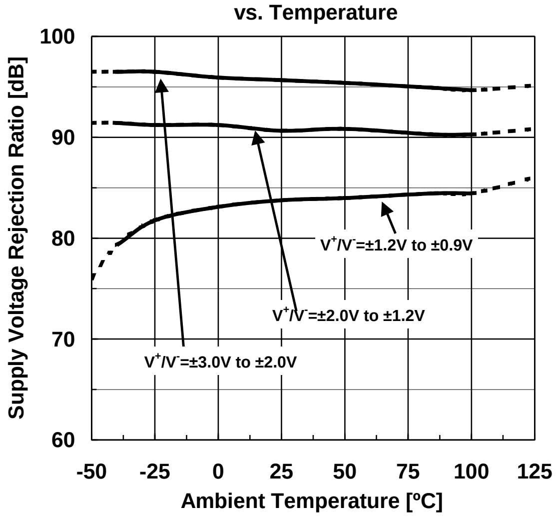




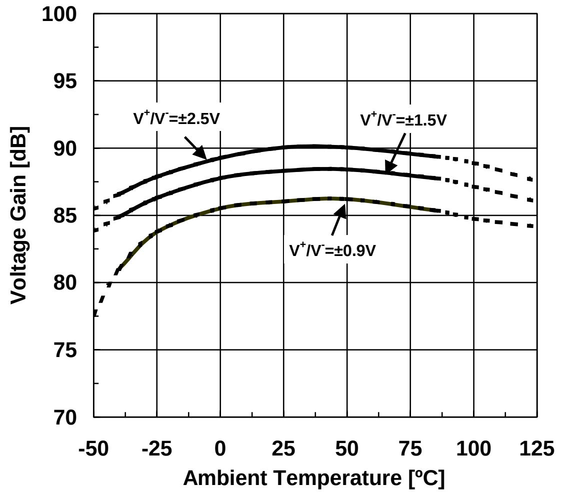
Common Mode Rejection Ratio vs. Temperature
$V_{IC}=V^+, 0, V^-$



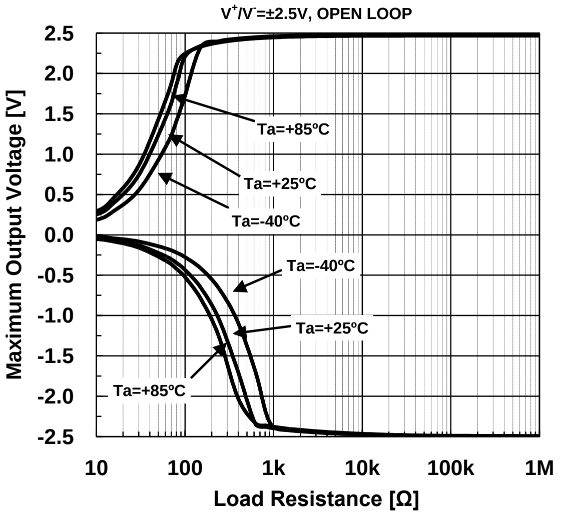
Supply Voltage Rejection Ratio vs. Temperature



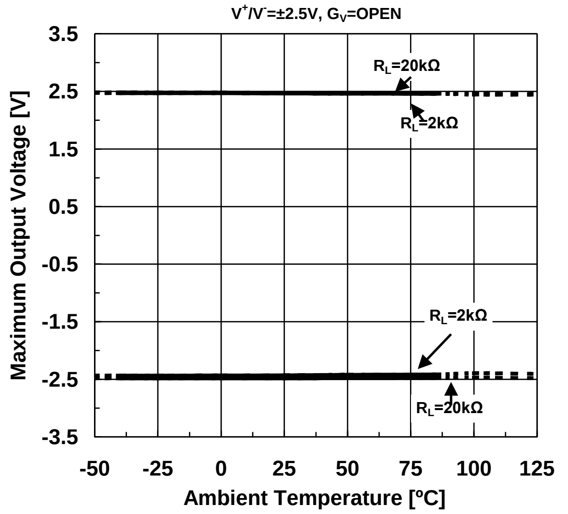
Voltage Gain vs. Temperature
$R_L=2k\Omega$



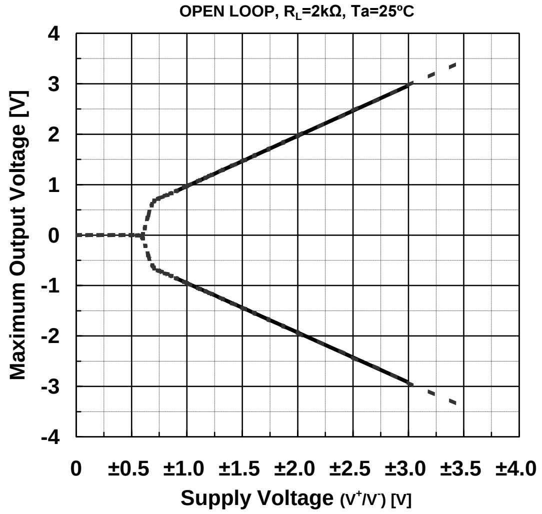
Maximum Output Voltage vs. Load Resistance
$V^+/V^-=\pm2.5V$, OPEN LOOP



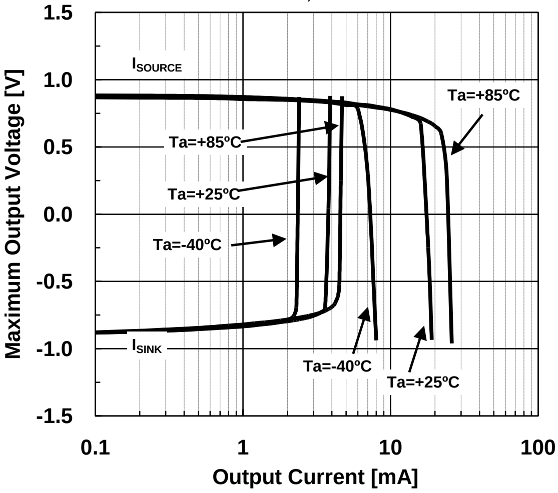
Maximum Output Voltage vs. Temperature
$V^+/V^-=\pm2.5V$, G_V=OPEN



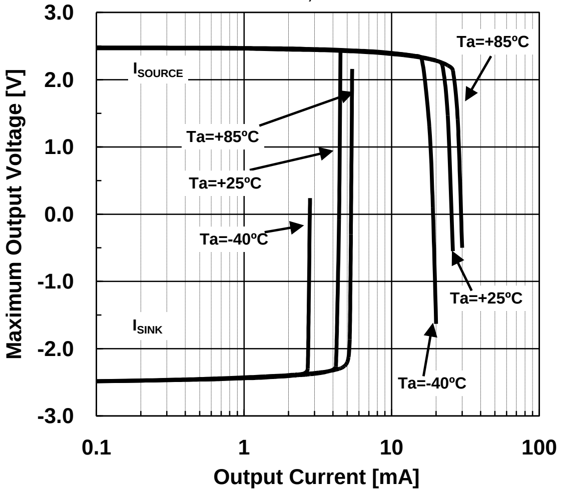
Maximum Output Voltage vs. Supply Voltage
OPEN LOOP, $R_L=2k\Omega$, Ta=25ºC



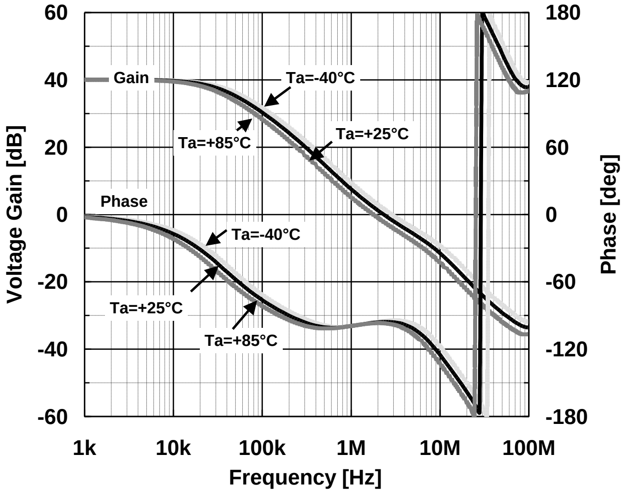
Maximum Output Voltage vs. Output Current
V^+/V^-=±0.9V, OPEN LOOP



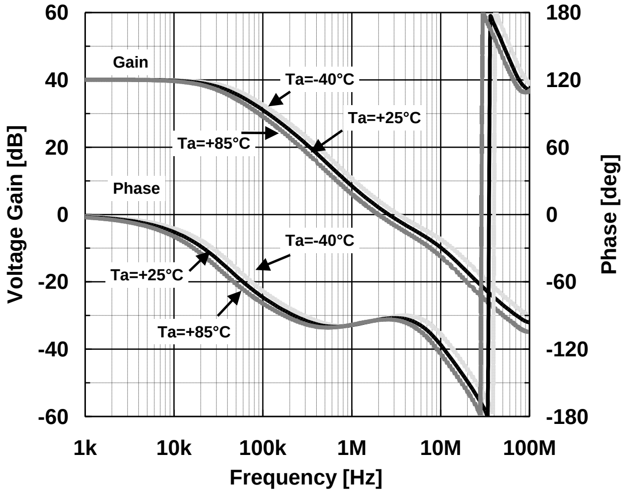
Maximum Output Voltage vs. Output Current
V^+/V^-=±2.5V, OPEN LOOP



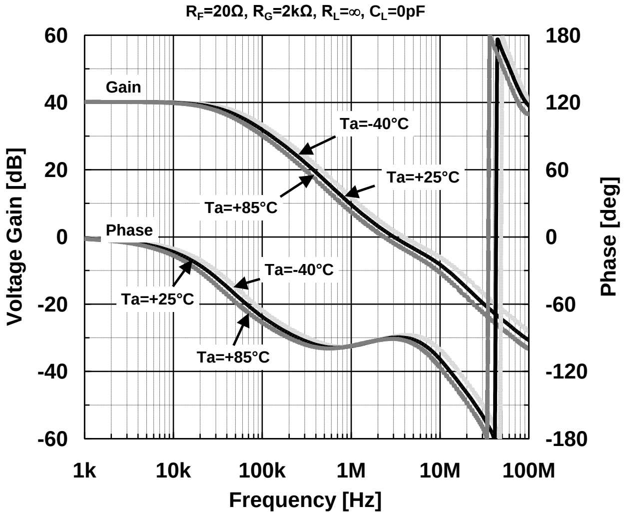
Voltage Gain・Phase vs. Frequency
V^+/V^-=±0.9V, G_V=40dB
R_F=20Ω, R_G=2kΩ, R_L=∞, C_L=0pF



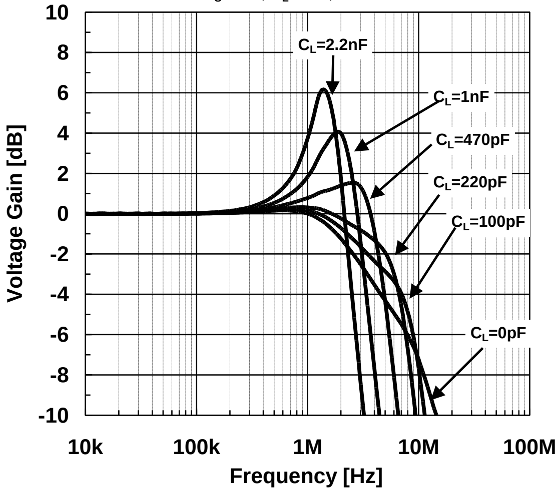
Voltage Gain・Phase vs. Frequency
V^+/V^-=±1.5V, G_V=40dB
R_F=20Ω, R_G=2kΩ, R_L=∞, C_L=0pF



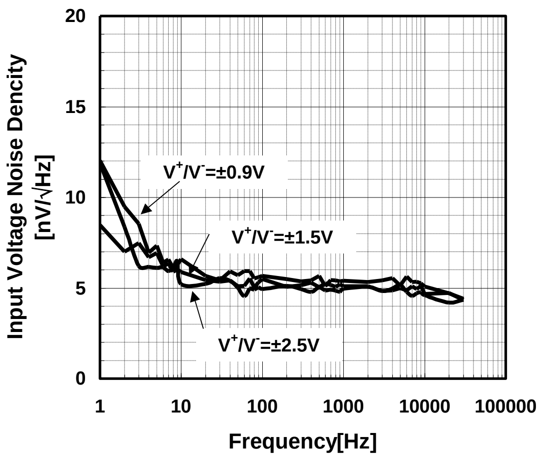
Voltage Gain・Phase vs. Frequency
V^+/V^-=±2.5V, G_V=40dB
R_F=20Ω, R_G=2kΩ, R_L=∞, C_L=0pF



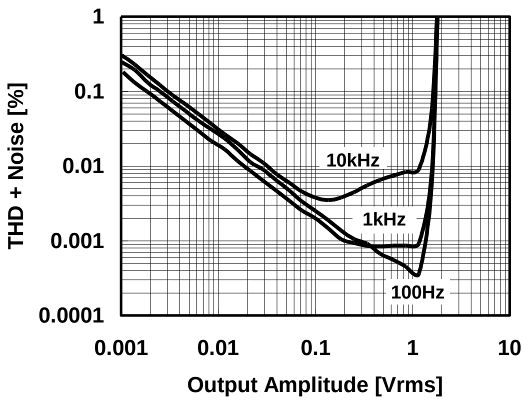
Peak Gain of Voltage Follower
V^+/V^-=±2.5V, G_V=0dB
R_S=50Ω, R_L=2kΩ, Ta=+25ºC



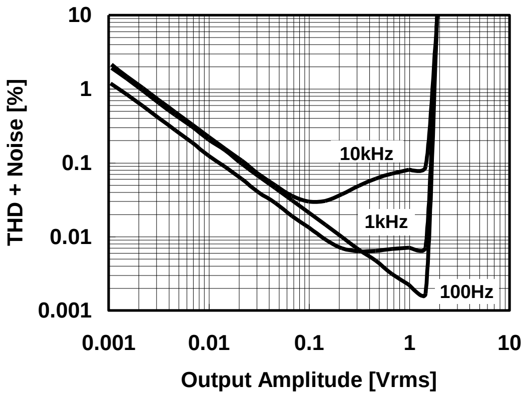
Input Voltage Noise Density vs. Frequency
GV=40dB,R_S=50Ω,R_G=20Ω,
R_F=2kΩ,CL=0pF,Ta=25°C



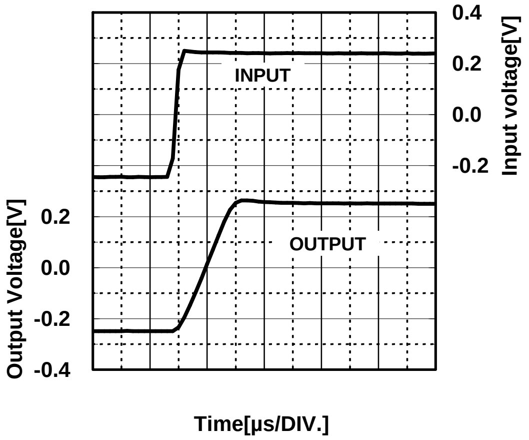
TOTAL HARMONIC DISTORTION + NOISE vs OUTPUT AMPLITUDE
(Voltage Follower)
V+/V−=±2.5V,Gv=20dB
R_L=2kΩ,Ta=25℃



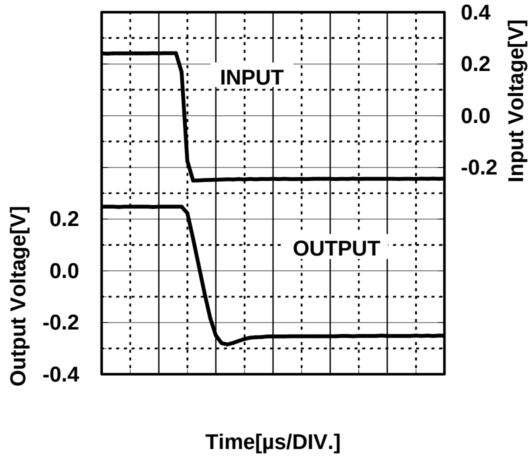
TOTAL HARMONIC DISTORTION + NOISE vs OUTPUT AMPLITUDE
(×10 Amplifier)
V+/V−=±2.5V,Gv=20dB
R_L=2kΩ,Ta=25℃



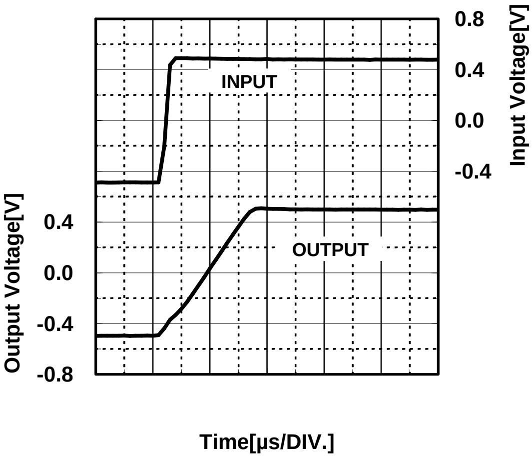
Positive Transient Response
$V^+/V^-=\pm 0.9V$,GV=0dB,f=10kHz,V_{IN}=0.5VPP
R_S=50Ω,RL=2kΩ,CL=0pF,Ta=+25°C



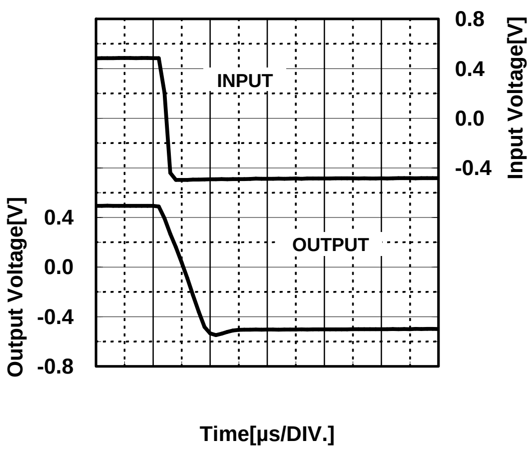
Negative Transient Response
$V^+/V^-=\pm 0.9V$,GV=0dB,f=10kHz,$V_{IN}=0.5V_{PP}$
R_S=50Ω,RL=2kΩ,CL=0pF,Ta=+25°C



Positive Transient Response
$V^+/V^-=\pm 1.5V$,GV=0dB,f=10kHz,$V_{IN}=1V_{PP}$
R_S=50Ω,RL=2kΩ,CL=0pF,Ta=+25°C



Negative Transient Response
$V^+/V^-=\pm 1.5V$,GV=0dB,f=10kHz,$V_{IN}=1V_{PP}$
R_S=50Ω,RL=2kΩ,CL=0pF,Ta=+25°C



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.

Как с нами связаться

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