QUAD OPERATIONAL AMPLIFIER

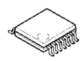
■ GENERAL DESCRIPTION

NJM2745 is quad operational amplifier with low voltage noise 5nV/√Hz(@f=1kHz) with high bandwidth and low distortion.

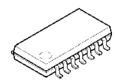
These features may be used in audio signal processing by high-level audio usages such as hi-end car audio, high-quality TV set and others.

In addition, these also suitable for audio mixer, studio-recording equipments, broadcasting equipments, and the usages in various professional sound equipments.

■ PACKAGE OUTLINE



NJM2745V

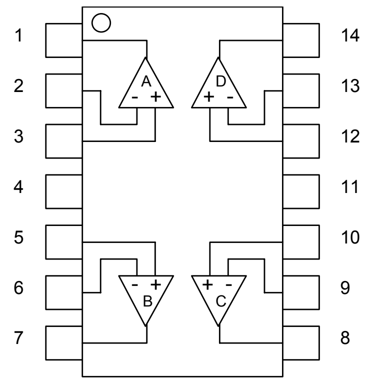


NJM2745M

■ FEATURES

● Low Input Noise Voltage	5nV/ √Hz typ
● Wide Gain Bandwidth Product	15MHz typ
● Low Distortion	0.0005% typ
● Slew Rate	5V/µs typ
● Operating Voltage	±2V to ±9.5V
● Package Outline	NJM2745M : DMP14
	NJM2745V : SSOP14
● Bipolar Technology	

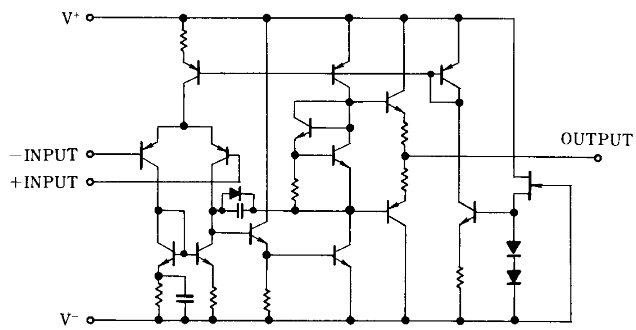
■ PIN CONFIGURATION



PIN ASIGNMENT

1. A OUTPUT	8. C OUTPUT
2. A -INPUT	9. C -INPUT
3. A +INPUT	10. C +INPUT
4. V+	11. V-
5. B +INPUT	12. D +INPUT
6. B -INPUT	13. D -INPUT
7. B OUTPUT	14. D OUTPUT

■ EQUIVALENT CIRCUIT (1/4 Shown)



■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V^+/V^-	±16	V
Common Mode Input Voltage Range	V_{ICM}	±13 (Note 1)	V
Differential Input Voltage Range	V_{ID}	±26 (Note 1)	V
Power Dissipation	P_D	700 [DMP14] (Note 2) 570 [SSOP14] (Note 2)	mW
Load Current	I_O	±50 (Note3, Note 4)	mA
Operating Temperature Range	Topr	-40~+85	°C
Storage Temperature Range	Tstg	-40~+150	°C

(Note 1) For supply voltages less than "Absolute Maximum Ratings", the absolute maximum input voltage is equal to the supply voltage.
(Note 2) Mounted on the EIA/JEDEC standard board (76.2 ×114.3 ×1.6mm, two layer FR-4).
(Note 3) It individually takes the absolute value of the sink current and the source current of each output terminal, and it is assumed the sum total. Calculation type: $I_O=|I_{AOUTPUT}| + |I_{BOUTPUT}| + |I_{COUTPUT}| + |I_{DOUTPUT}|$
(Note 4) Please note the supply current when the load is short-circuited.

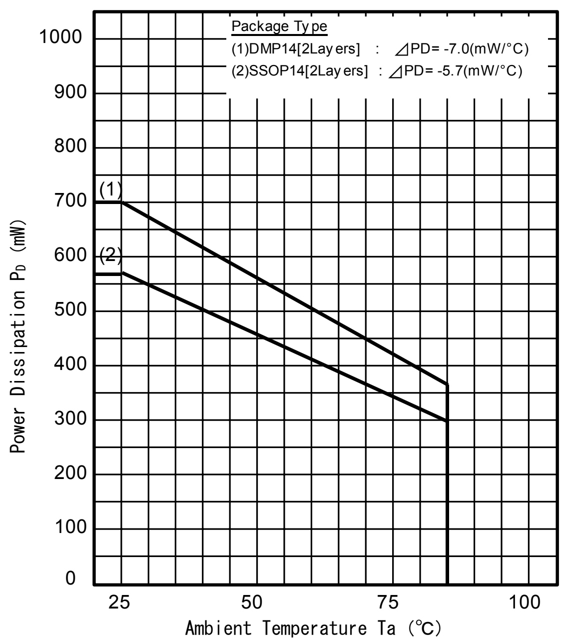
■ RECOMMENDATION OPERATING CONDITION

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V^+ / V^-	(Note 2, Note 5, Note 6) $R_L \geq 10k\Omega$	±2	-	±9.5	V

(Note 5) Do not exceed "Power dissipation: P_D" in which power dissipation in IC "Symbol: W" is shown by the absolute maximum rating.
Please use it under the system requirements of NJM2745 to always satisfy "Condition: $P_D \geq W$".
The calculation type when using it in dual supplies is "$W=Icc\times2\times V^+ + 1.62\times(V^+\times V+ \div(2\times R_L))$".
(Calculation type condition: Loads connected with an individual output terminal are this all characteristics, and it is assumed same resistance R_L)
(Note 6) Refer to following Figure 1 for a permissible loss when ambient temperature (Ta) is Ta≥25°C.

FIGURE1:Power Dissipation vs. Ambient Temperature



■ ELECTRIC CHARACTERISTICS

● DC CHARACTERISTICS

(V^+/V^-=±4.5V,Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current	Icc	No Signal	-	12	16	mA
Input Offset Voltage	V_{IO}	R_S≤10kΩ	-	0.3	3	mV
Input Bias Current	I_B		-	100	500	nA
Input Offset Current	I_{IO}		-	5	200	nA
Large Signal Voltage Gain	Av	R_L≥2kΩ, Vo=±1.5V	90	110	-	dB
Common Mode Rejection Ratio	CMR	R_S≤10kΩ, -2.5V≤V_{IC}≤+2.5V	70	110	-	dB
Supply Voltage Rejection Ratio	SVR	R_S≤10kΩ, V^+/V^-=±2~±7V	80	110	-	dB
Maximum Output Voltage	V_{OM}	R_L≥2kΩ	±2.5	±3	-	V
Input Common Mode Voltage Range	V_{ICM}	CMR≥70dB	-2.5	-	+2.5	V

● AC CHARACTERISTICS

(V^+/V^-=±4.5V,Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Unity Gain Bandwidth	GB	f=10kHz	-	15	-	MHz
Equivalent input Noise Voltage	V_{NI}	R_S=0Ω	-	5	-	nV/√Hz
Total Harmonic Distortion	THD	V^+/V^-=±9V, A_V=20dB, Vo=4Vrms R_L=2KΩ, f=1kHz	-	0.001	-	%
		V^+/V^-=±4.5V, A_V=20dB, Vo=1Vrms R_L=2kΩ, f=1kHz	-	0.005	-	

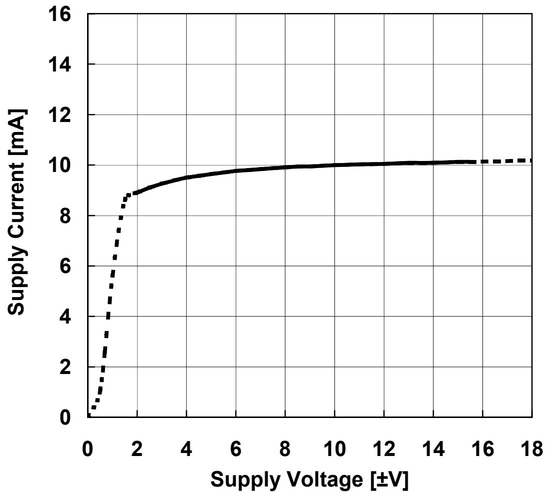
● TRANSIENT CHARACTERISTICS

(V^+/V^-=±4.5V,Ta=25°C)

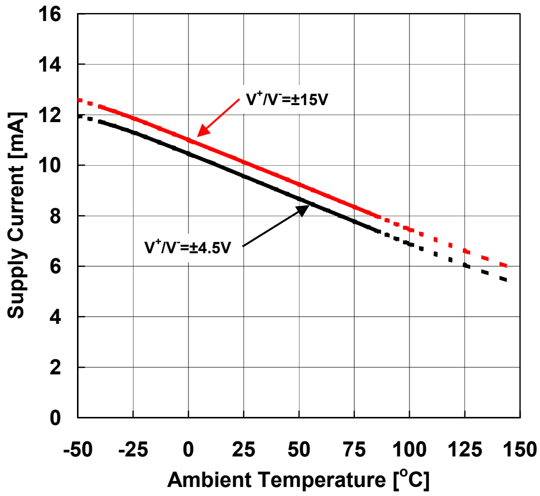
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate	SR	R_L≥2kΩ	-	5	-	V/μs

■ TYPICAL CHARACTERISTICS

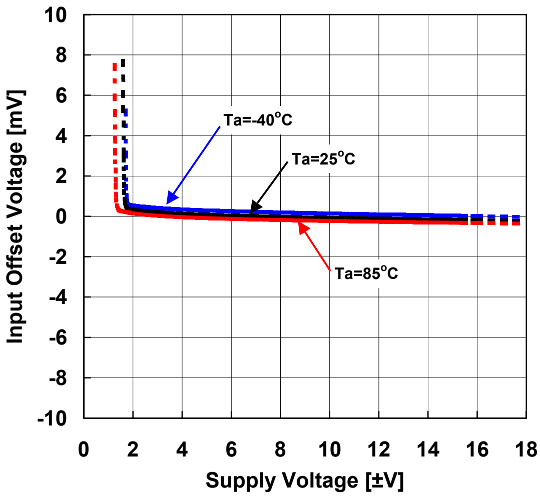
Supply Current vs. Supply Voltage
V_{IN}=0V, Ta=25°C



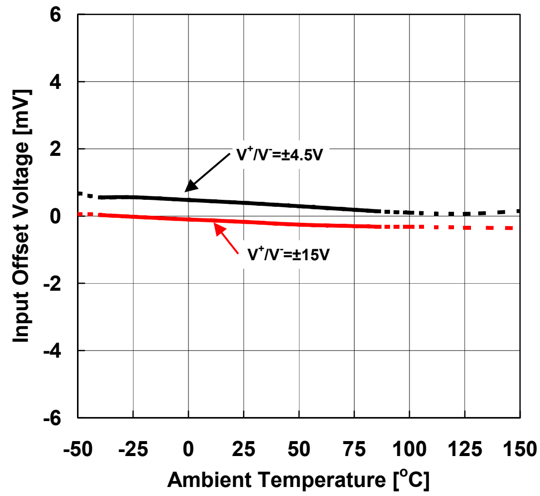
Supply Current vs. Ambient Temperature
(Supply Voltage)
V_{IN}=0V



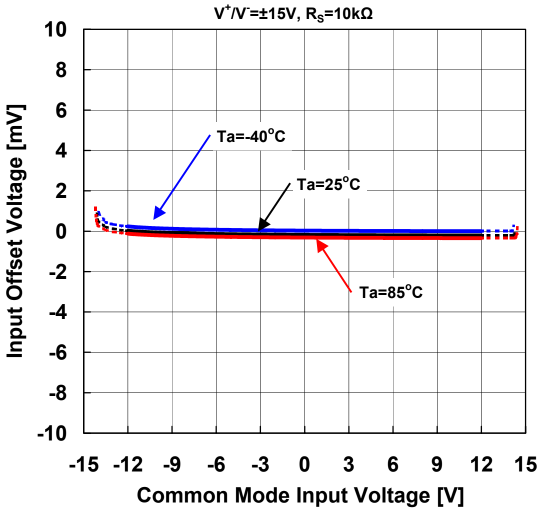
Input Offset Voltage vs. Supply Voltage
(Ambient Temperature)
V_{ICM}=0V, RS=10kΩ



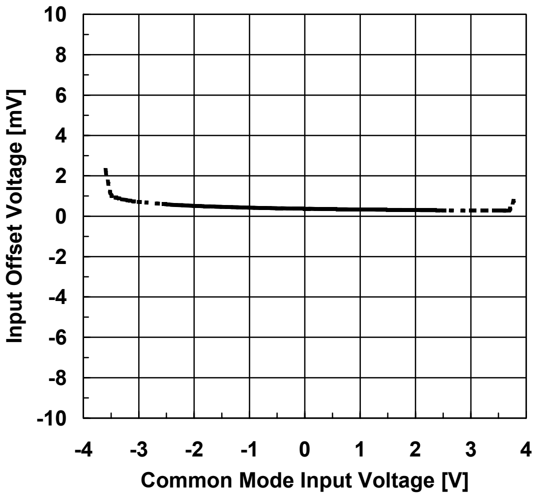
Input Offset Voltage vs. Ambient Temperature
V^+/V^-=±15V, V_{ICM}=0V



Input Offset Voltage
vs. Common Mode Input Voltage
(Ambient Temperature)
V^+/V^-=±15V, R_S=10kΩ

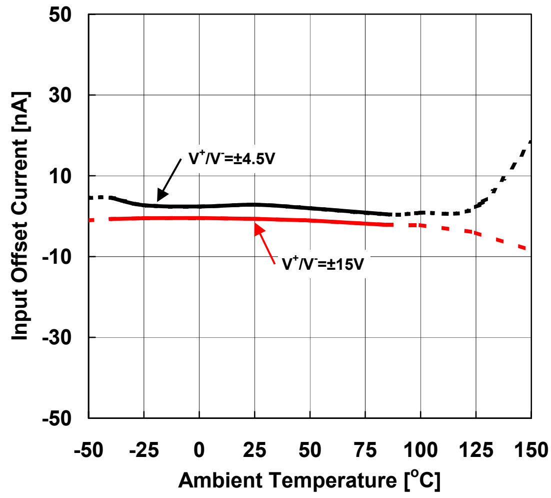


Input Offset Voltage
vs. Common Mode Input Voltage
V^+/V^-=±4.5V, R_S=10kΩ, Ta=25°C

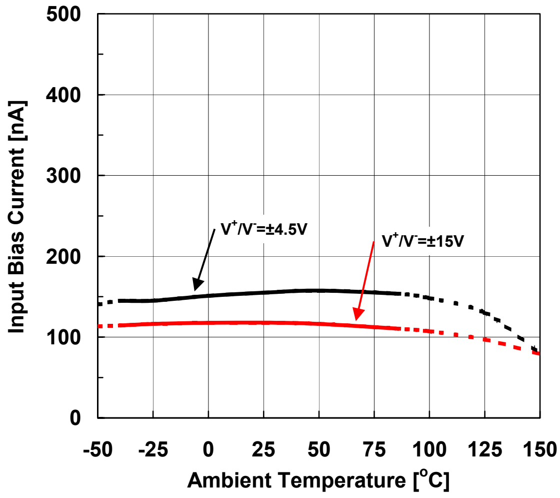


■ TYPICAL CHARACTERISTICS

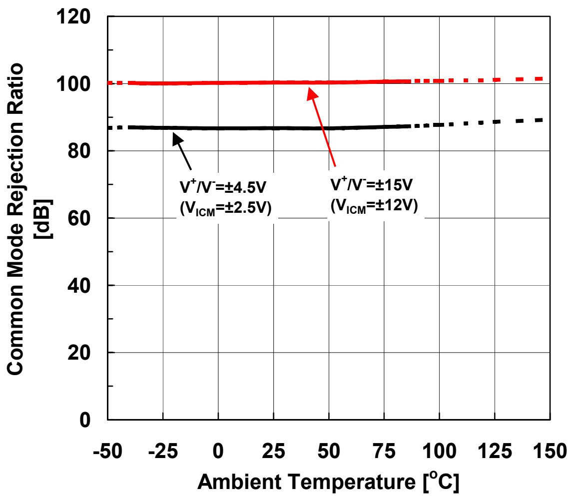
Input Offset Current vs. Ambient Temperature
V_{ICM}=0V, R_S=50kΩ



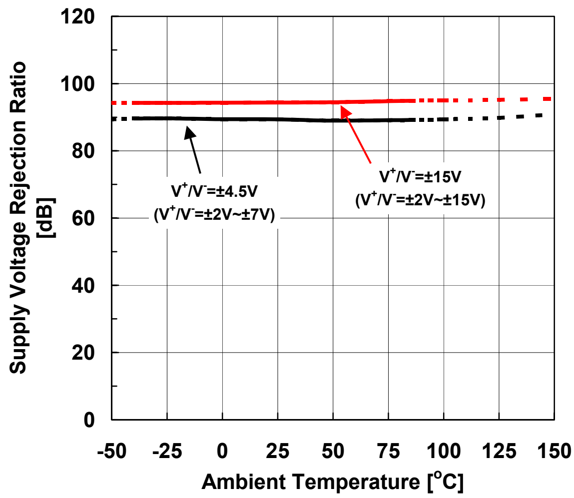
Input Bias Current vs. Ambient Temperature
V_{ICM}=0V, R_S=10kΩ



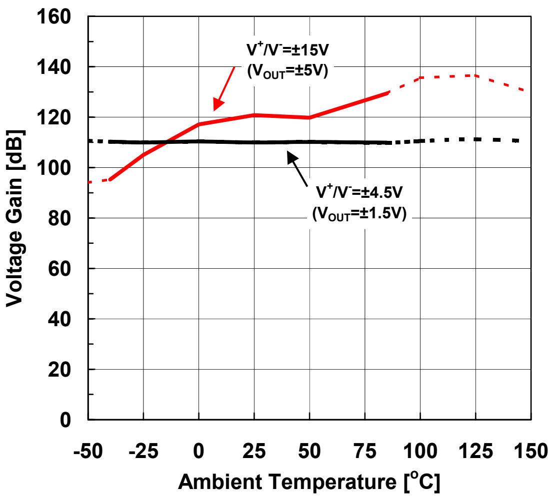
Common Mode Rejection Ratio vs. Ambient Temperature
R_S=10kΩ



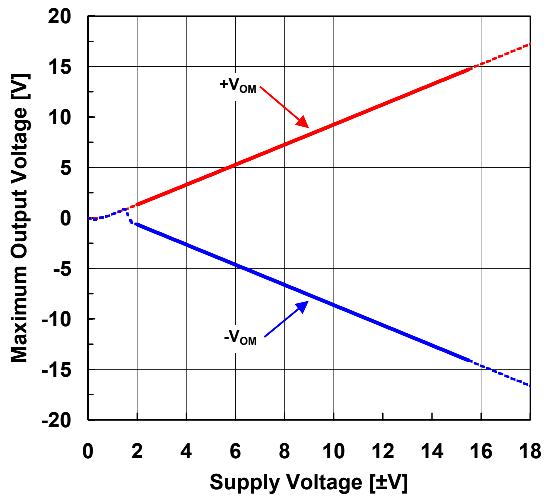
Supply Voltage Rejection Ratio vs. Ambient Temperature
R_S=10kΩ



Voltage Gain vs. Ambient Temperature
R_L=2kΩ

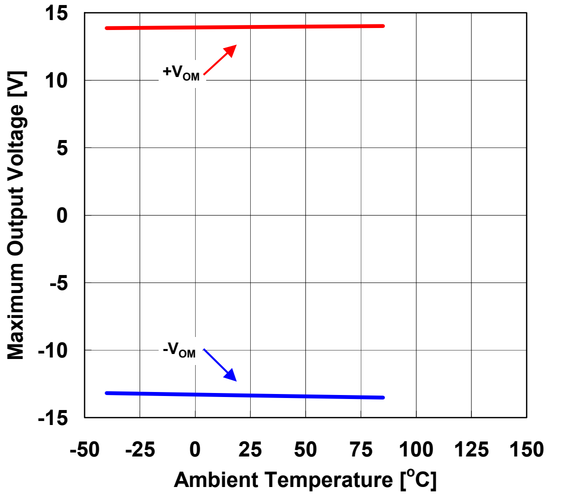


Maximum Output Voltage vs. Supply Voltage
$V_{IN}+$=±1V, $V_{IN}-$=0V, R_L=10kΩ, Ta=25°C

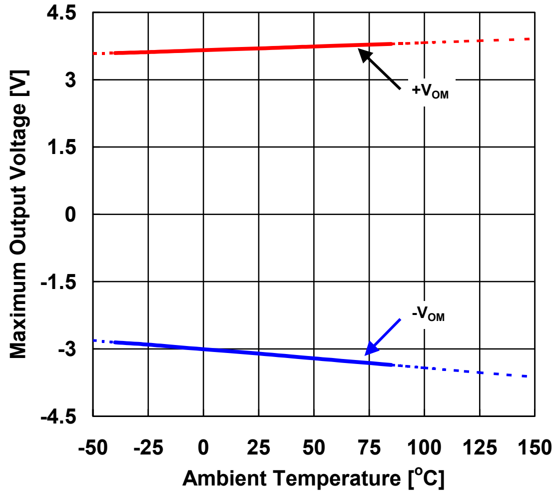


■ TYPICAL CHARACTERISTICS

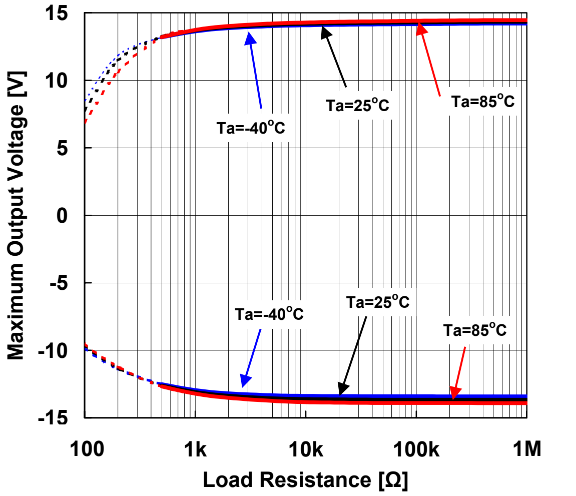
Maximum Output Voltage vs. Ambient Temperature
V^+/V^-=±15V, V_{IN}+=±1V, V_{IN}-=0V, R_L=2kΩ



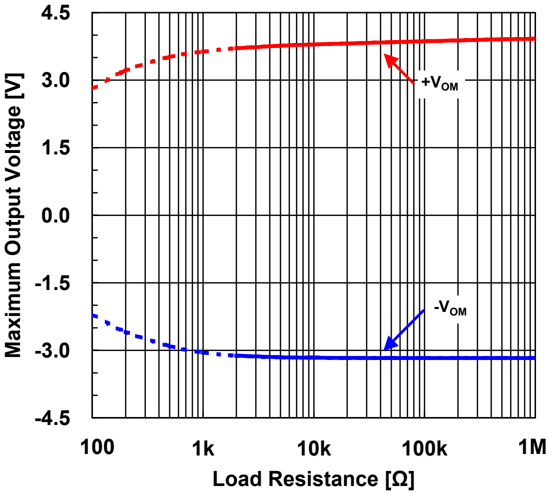
Maximum Output Voltage vs. Ambient Temperature
V^+/V^-=±4.5V, V_{IN}=±1V, R_L=2kΩ



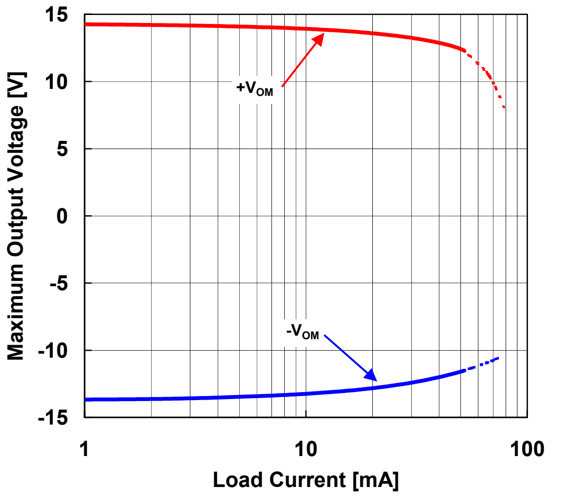
Maximum Output Voltage vs. Load Resistance
(Ambient Temperature)
V^+/V^-=±15V, V_{IN}+=±1V, V_{IN}-=0V



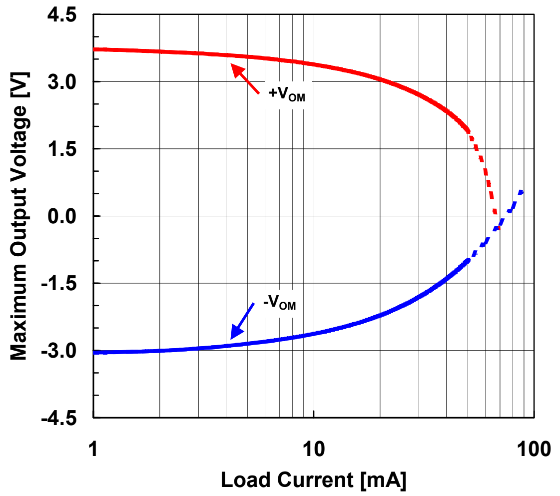
Maximum Output Voltage vs. Load Resistance
V^+/V^-=±4.5V, V_{IN}=±1V, Ta=25°C



Maximum Output Voltage vs. Load Current
V^+/V^-=±15V, V_{IN}+=1V, V_{IN}-=0V, Ta=25°C

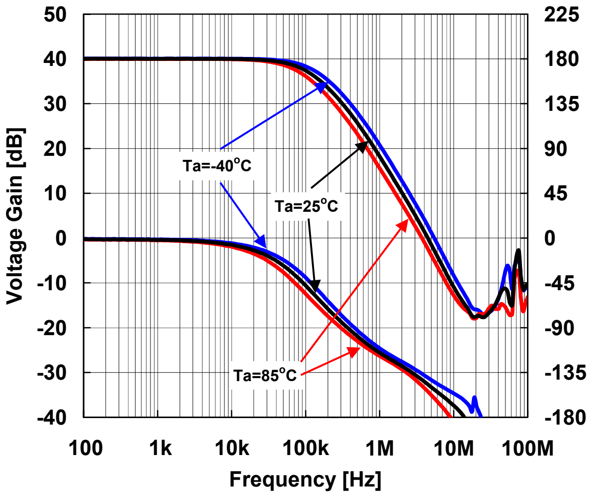


Maximum Output Voltage vs. Load Current
V^+/V^-=±4.5V, V_{IN}=±1V, Ta=25°C

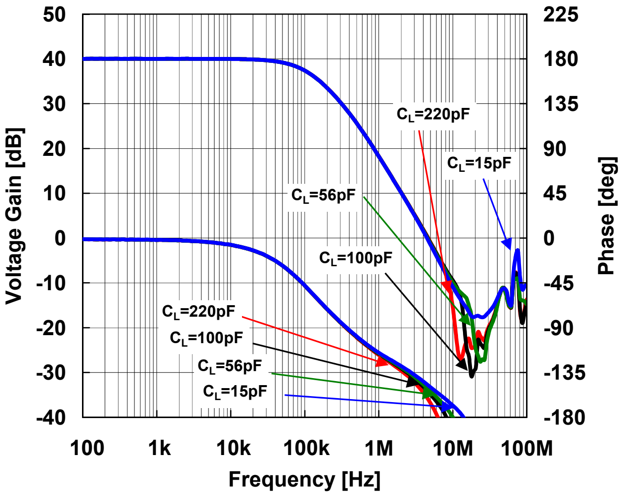


■ TYPICAL CHARACTERISTICS

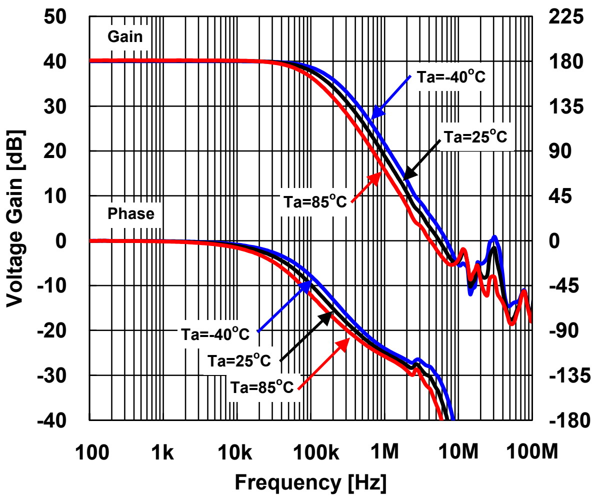
40dBGain/Phase vs. Frequency (Ambient Temperature)
V+/V-=±15V, GV=40dB, RT=50Ω, RL=2kΩ, CL=15pF



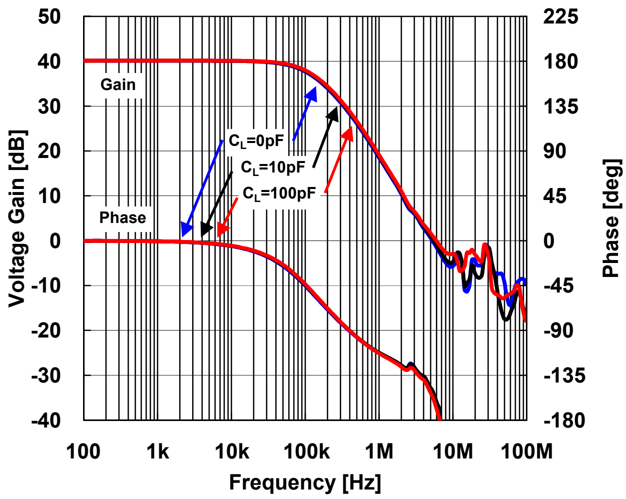
40dBGain/Phase vs. Frequency (Load Capacitance)
V+/V-=±15V, GV=40dB, RT=50Ω, RL=2kΩ, Ta=25°C



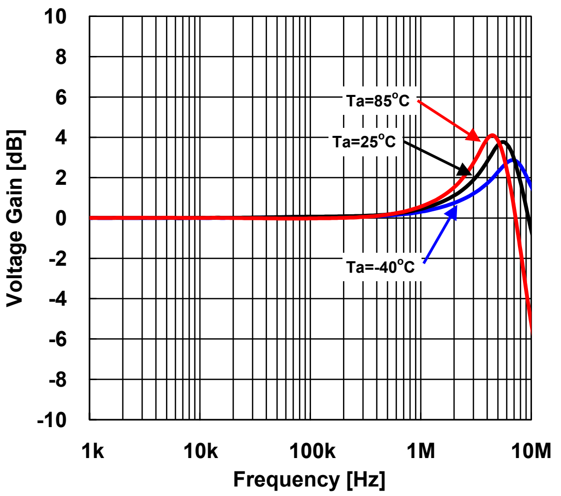
40dBGain/Phase vs. Frequency (Ambient Temperature)
V+/V-=±4.5V, GV=40dB, RL=2kΩ, CL=10pF



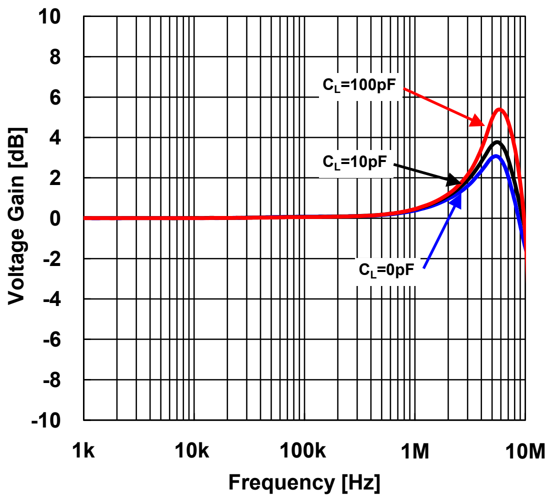
40dBGain/Phase vs. Frequency (Load Capacitance)
V+/V-=±4.5V, GV=40dB, RL=2kΩ, Ta=25°C



V.F.Peak vs. Frequency (Ambient Temperature)
V+/V-=±4.5V, GV=0dB, RL=2kΩ,CL=10pF



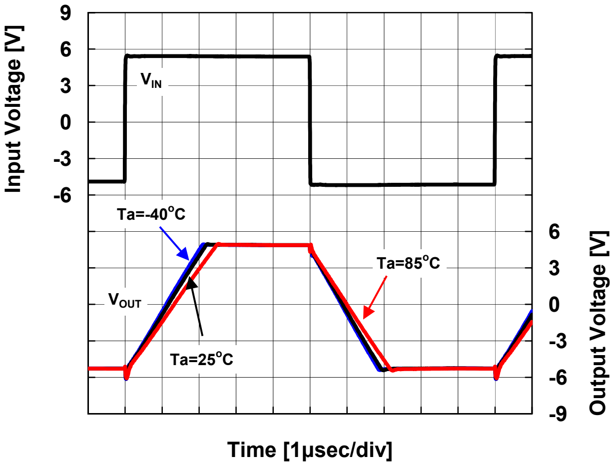
V.F.Peak vs. Frequency (Load Capacitance)
V+/V-=±4.5V, GV=0dB, RL=2kΩ, Ta=25°C



■ TYPICAL CHARACTERISTICS

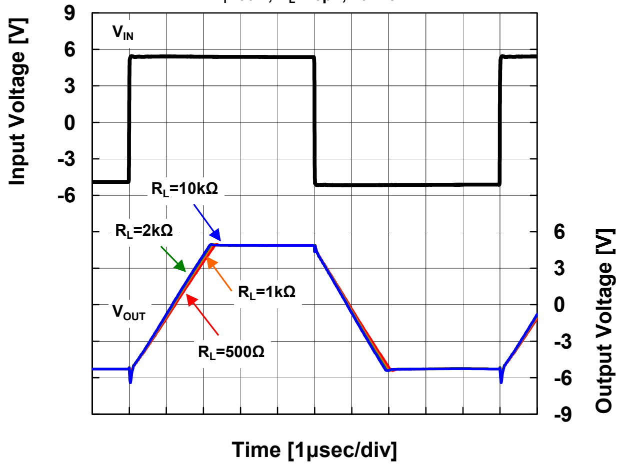
Pulse Response (Ambient Temperature)

V^+/V^-=±15V, V_{IN}=10V_{PP}, f_{IN}=1kHz, G_V=0dB,
R_T=50Ω, R_L=50kΩ, C_L=15pF



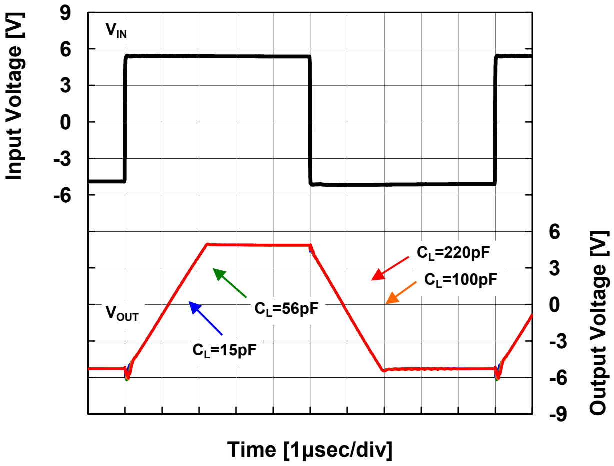
Pulse Response (Load Resistance)

V^+/V^-=±15V, V_{IN}=10V_{PP}, f_{IN}=1kHz, G_V=0dB,
R_T=50Ω, C_L=15pF, Ta=25°C



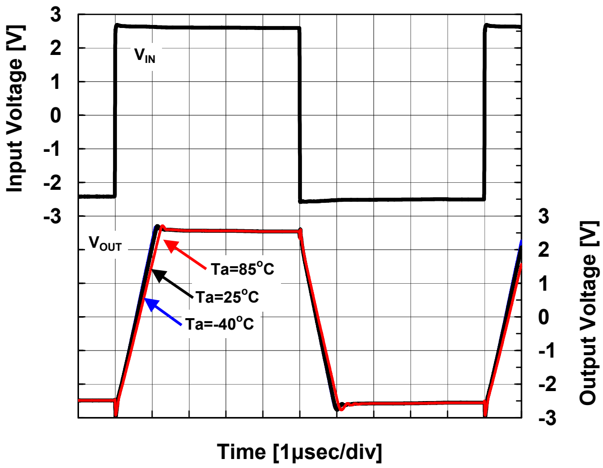
Pulse Response (Load Capacitance)

V^+/V^-=±15V, V_{IN}=10V_{PP}, f_{IN}=1kHz, G_V=0dB,
R_T=50Ω, R_L=50kΩ, Ta=25°C



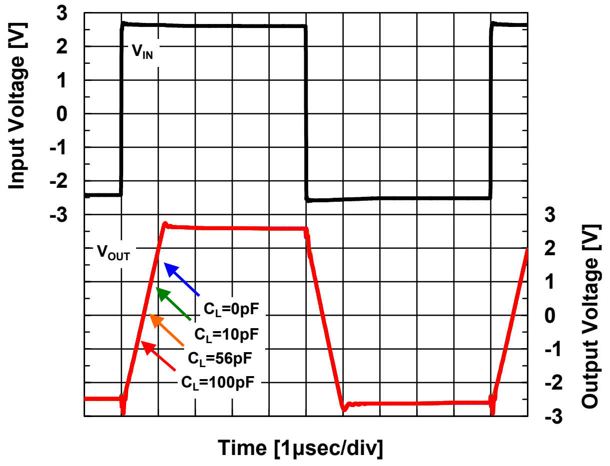
Pulse Response (Ambient Temperature)

V^+/V^-=±4.5V, V_{IN}=±2.5V,
f_{IN}=1kHz, G_V=0dB, R_L=2kΩ, C_L=10pF

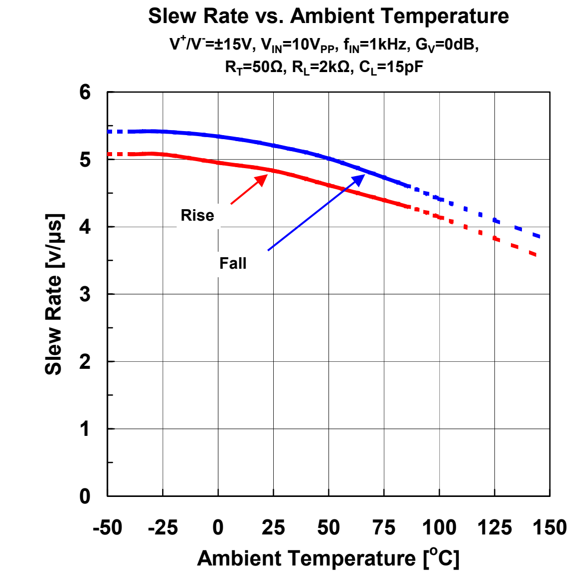


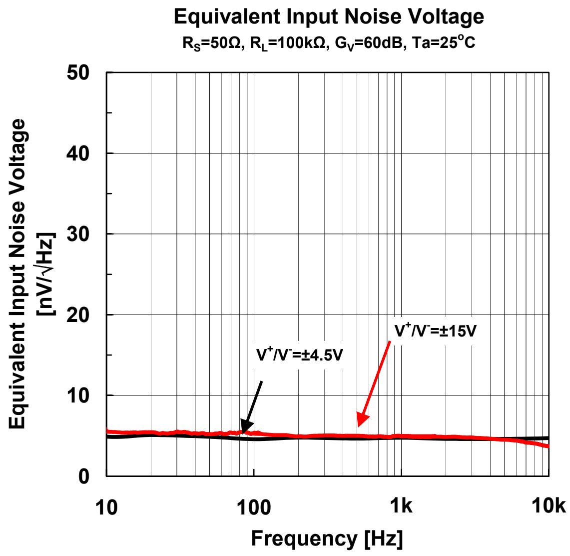
Pulse Response (Load Capacitance)

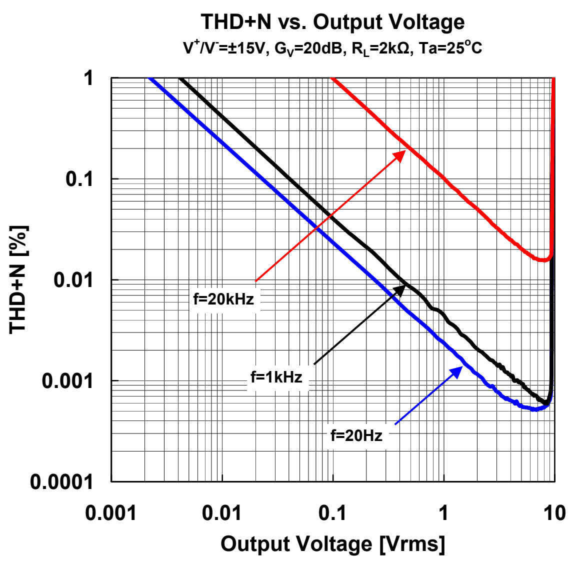
V^+/V^-=±4.5V, V_{IN}=±2.5V,
f_{IN}=1kHz, G_V=0dB,R_L=2kΩ, Ta=25°C

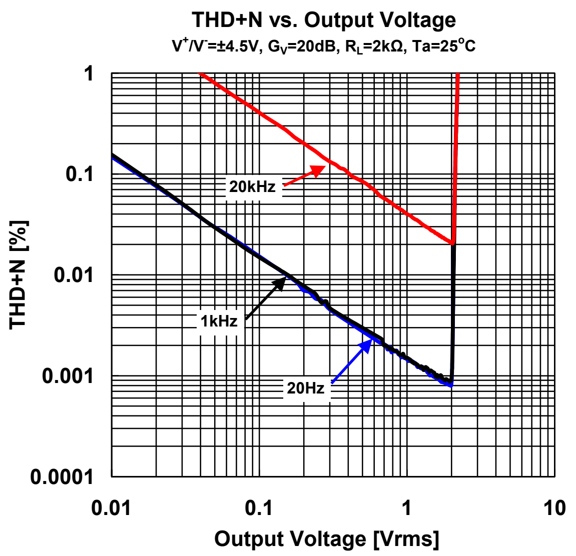


■ TYPICAL CHARACTERISTICS









■ **MEMO**