

QUAD OPERATIONAL AMPLIFIER

■ GENERAL DESCRIPTION

NJM2745 is quad operational amplifier with low voltage noise $5\text{nV}/\sqrt{\text{Hz}} (@f=1\text{kHz})$ with high bandwidth and low distortion.

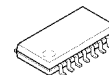
These features may be used in audio signal processing by high-level audio usages such as hi-end car audio, high-quality TV set and others.

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

■ PACKAGE OUTLINE



NJM2745V

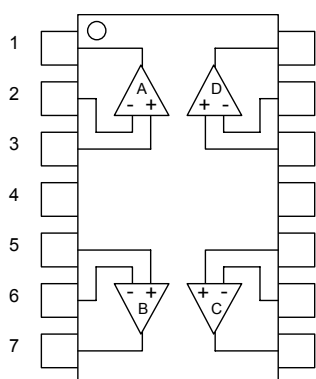


NJM2745M

■ FEATURES

- Low Input Noise Voltage $5\text{nV}/\sqrt{\text{Hz}}$ typ
- Wide Gain Bandwidth Product 15MHz typ
- Low Distortion 0.0005% typ
- Slew Rate $5\text{V}/\mu\text{s}$ typ
- Operating Voltage $\pm 2\text{V}$ to $\pm 9.5\text{V}$
- Package Outline
 NJM2745M : DMP14
 NJM2745V : SSOP14
- Bipolar Technology

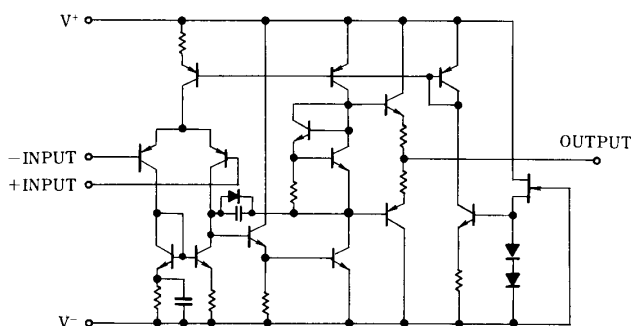
■ PIN CONFIGURATION



PIN ASSIGNMENT

- | | |
|-------------|--------------|
| 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	T_{opr}	-40~+85	°C
Storage Temperature Range	T_{stg}	-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.

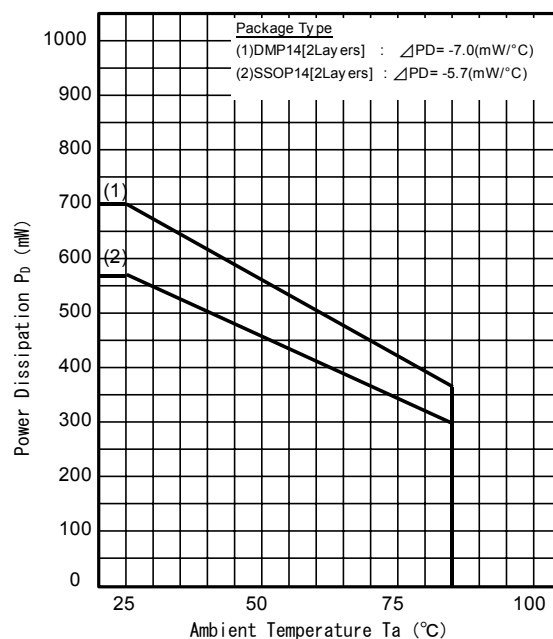
Please use it under the system requirements of NJM2745 to always satisfy "Condition: $P_D \geq W$ ".

The calculation type when using it in dual supplies is " $W = I_{CC} \times 2 \times V^+ + 1.62 \times (V^+ \times V^- + (2 \times R_L))$ ".

(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 (T_a) is $T_a \geq 25^\circ\text{C}$.

FIGURE1: Power Dissipation vs. Ambient Temperature



■ ELECTRIC CHARACTERISTICS

● DC CHARACTERISTICS

($V^+/V^- = \pm 4.5V, T_a = 25^\circ C$)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current	I_{CC}	No Signal	-	12	16	mA
Input Offset Voltage	V_{IO}	$R_S \leq 10k\Omega$	-	0.3	3	mV
Input Bias Current	I_B		-	100	500	nA
Input Offset Current	I_{IO}		-	5	200	nA
Large Signal Voltage Gain	A_v	$R_L \geq 2k\Omega, V_o = \pm 1.5V$	90	110	-	dB
Common Mode Rejection Ratio	CMR	$R_S \leq 10k\Omega, -2.5V \leq V_{IC} \leq +2.5V$	70	110	-	dB
Supply Voltage Rejection Ratio	SVR	$R_S \leq 10k\Omega, V^+/V^- = \pm 2 \sim \pm 7V$	80	110	-	dB
Maximum Output Voltage	V_{OM}	$R_L \geq 2k\Omega$	± 2.5	± 3	-	V
Input Common Mode Voltage Range	V_{ICM}	CMR $\geq 70dB$	-2.5	-	+2.5	V

● AC CHARACTERISTICS

($V^+/V^- = \pm 4.5V, T_a = 25^\circ C$)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Unity Gain Bandwidth	GB	$f = 10kHz$	-	15	-	MHz
Equivalent input Noise Voltage	V_{NI}	$R_S = 0\Omega$	-	5	-	nV/ $\sqrt{Hz}$
Total Harmonic Distortion	THD	$V^+/V^- = \pm 9V, A_v = 20dB, V_o = 4V_{rms}$ $R_L = 2k\Omega, f = 1kHz$ $V^+/V^- = \pm 4.5V, A_v = 20dB, V_o = 1V_{rms}$ $R_L = 2k\Omega, f = 1kHz$	-	0.001	-	%

● TRANSIENT CHARACTERISTICS

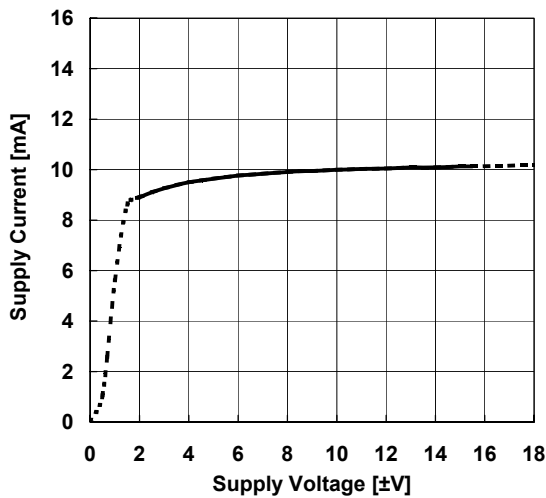
($V^+/V^- = \pm 4.5V, T_a = 25^\circ C$)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate	SR	$R_L \geq 2k\Omega$	-	5	-	V/ μs

■ TYPICAL CHARACTERISTICS

Supply Current vs. Supply Voltage

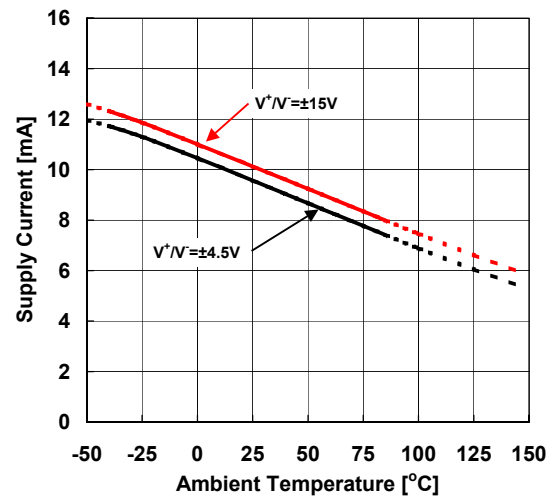
$V_{IN}=0V$, $T_a=25^{\circ}C$



Supply Current vs. Ambient Temperature

(Supply Voltage)

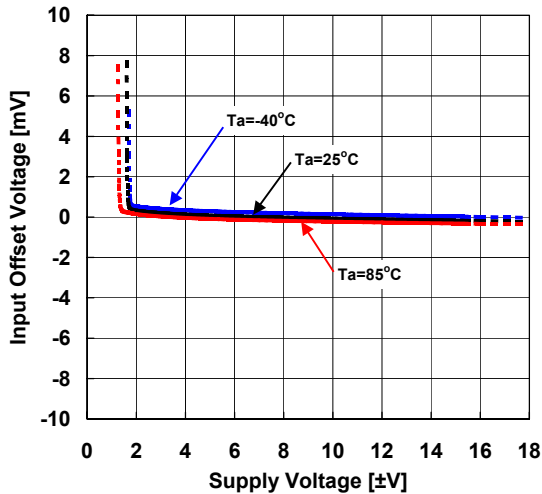
$V_{IN}=0V$



Input Offset Voltage vs. Supply Voltage

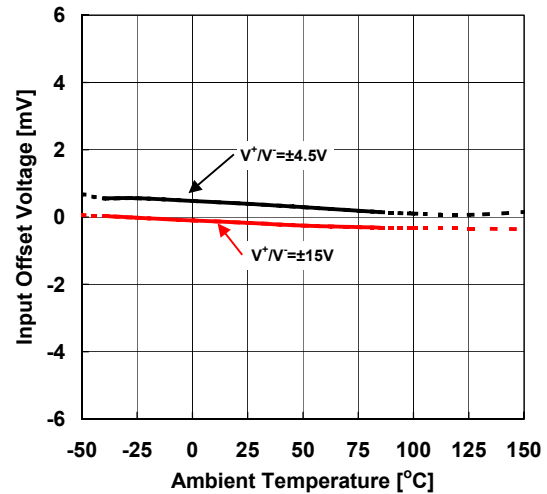
(Ambient Temperature)

$V_{ICM}=0V$, $R_S=10k\Omega$



Input Offset Voltage vs. Ambient Temperature

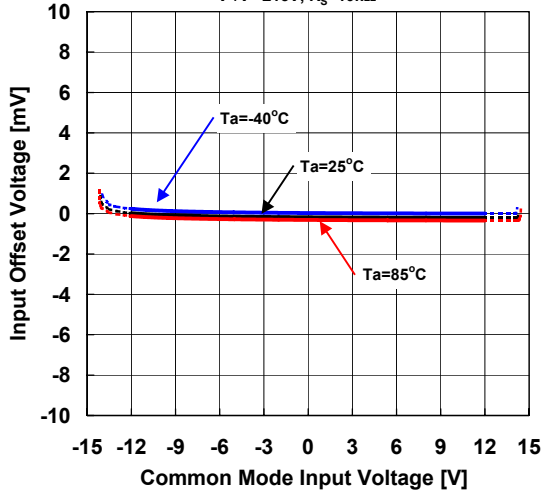
$V^+/V^-=\pm 15V$, $V_{ICM}=0V$



Input Offset Voltage vs. Common Mode Input Voltage

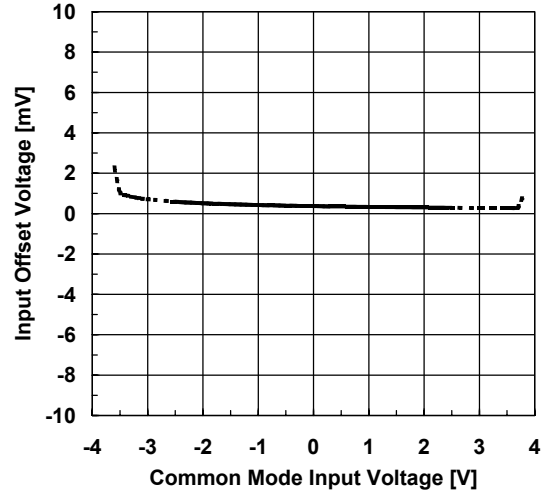
(Ambient Temperature)

$V^+/V^-=\pm 15V$, $R_S=10k\Omega$



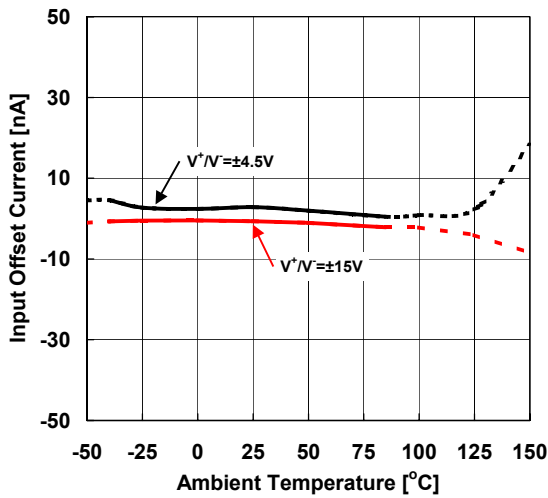
Input Offset Voltage vs. Common Mode Input Voltage

$V^+/V^-=\pm 4.5V$, $R_S=10k\Omega$, $T_a=25^{\circ}C$

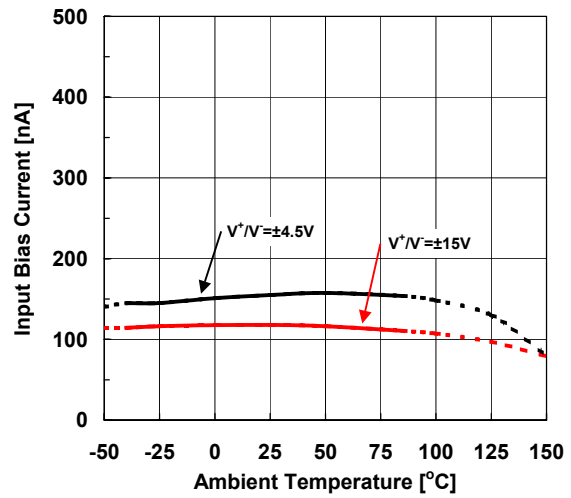


■ TYPICAL CHARACTERISTICS

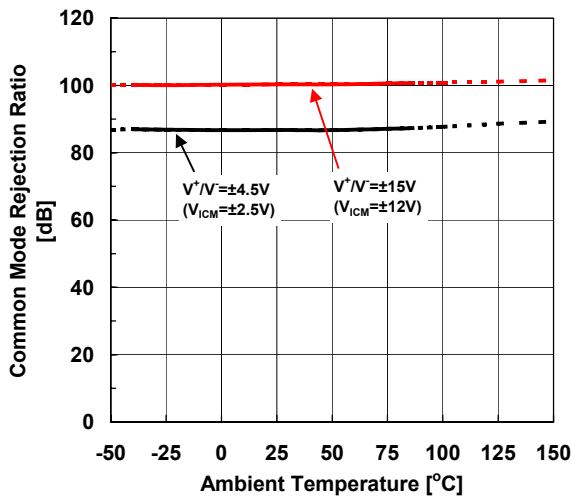
Input Offset Current vs. Ambient Temperature
 $V_{ICM}=0V$, $R_S=50k\Omega$



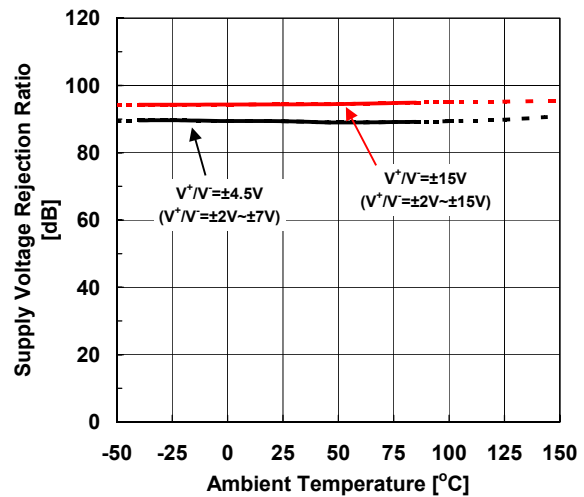
Input Bias Current vs. Ambient Temperature
 $V_{ICM}=0V$, $R_S=10k\Omega$



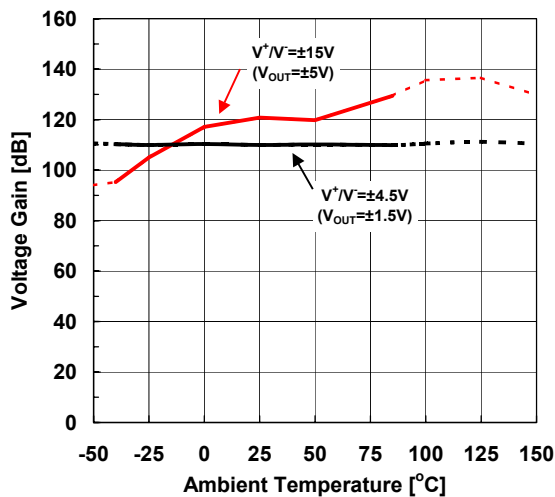
Common Mode Rejection Ratio
 vs. Ambient Temperature
 $R_S=10k\Omega$



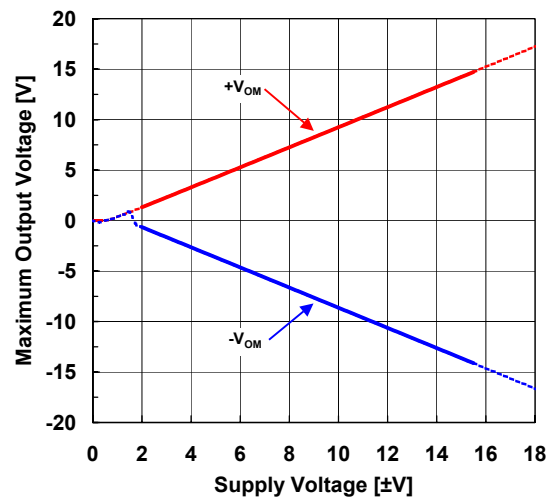
Supply Voltage Rejection Ratio
 vs. Ambient Temperature
 $R_S=10k\Omega$



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

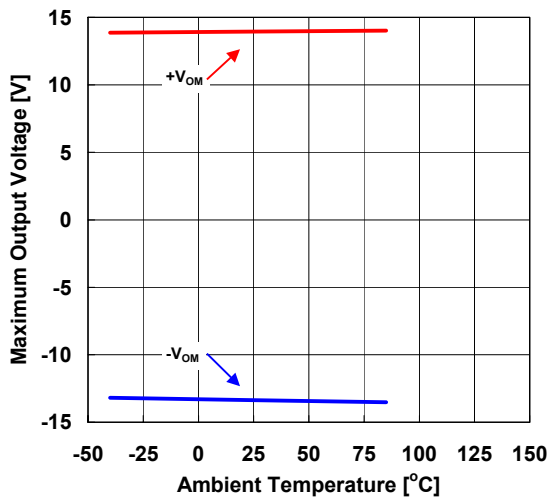


Maximum Output Voltage vs. Supply Voltage
 $V_{IN}=±1V$, $V_{IN}=0V$, $R_L=10k\Omega$, $T_a=25°C$

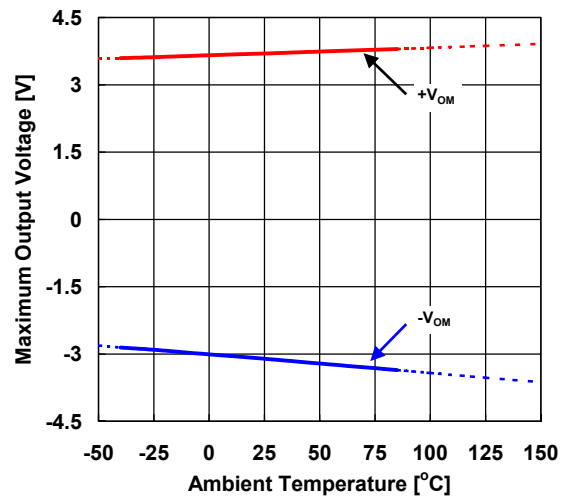


■ TYPICAL CHARACTERISTICS

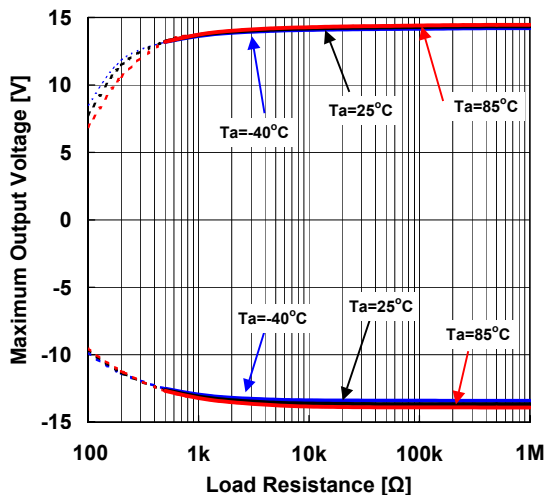
Maximum Output Voltage vs. Ambient Temperature
 $V^+/V^- = \pm 15V$, $V_{IN} = \pm 1V$, $V_{IN} = 0V$, $R_L = 2k\Omega$



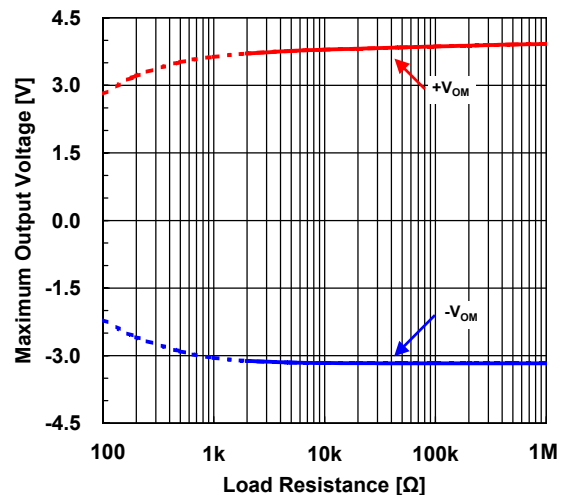
Maximum Output Voltage vs. Ambient Temperature
 $V^+/V^- = \pm 4.5V$, $V_{IN} = \pm 1V$, $R_L = 2k\Omega$



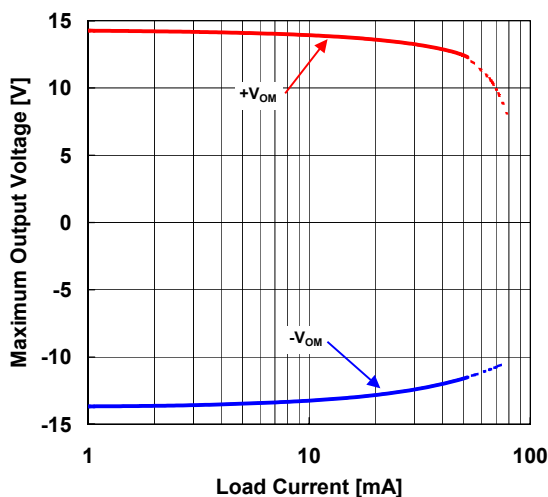
Maximum Output Voltage vs. Load Resistance
 (Ambient Temperature)
 $V^+/V^- = \pm 15V$, $V_{IN} = \pm 1V$, $V_{IN} = 0V$



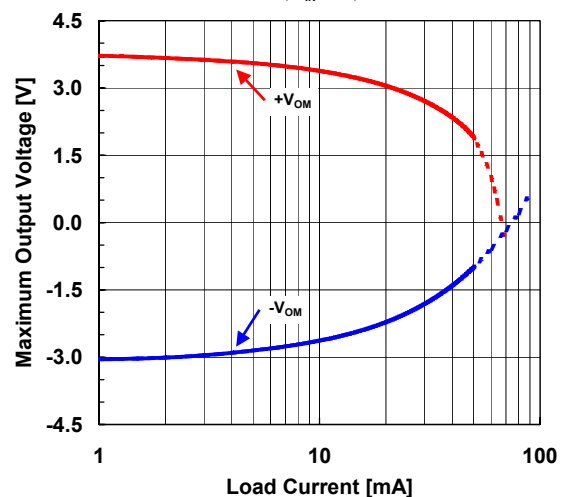
Maximum Output Voltage vs. Load Resistance
 $V^+/V^- = \pm 4.5V$, $V_{IN} = \pm 1V$, $T_a = 25^\circ C$



Maximum Output Voltage vs. Load Current
 $V^+/V^- = \pm 15V$, $V_{IN} = \pm 1V$, $V_{IN} = 0V$, $T_a = 25^\circ C$



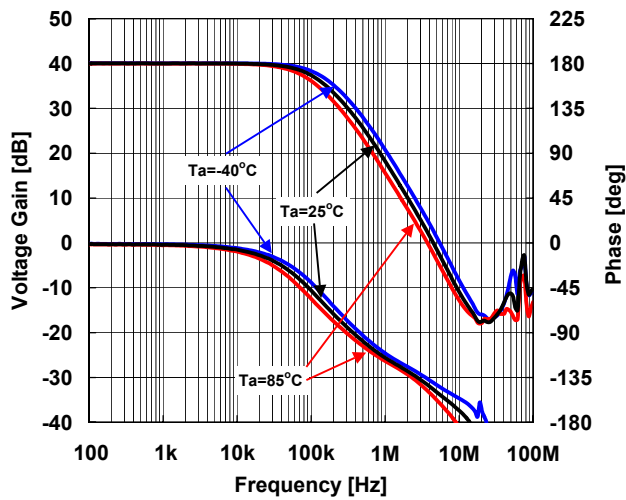
Maximum Output Voltage vs. Load Current
 $V^+/V^- = \pm 4.5V$, $V_{IN} = \pm 1V$, $T_a = 25^\circ C$



■ TYPICAL CHARACTERISTICS

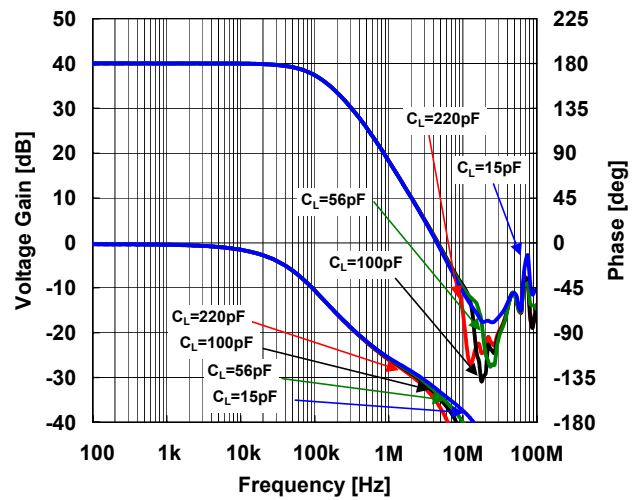
40dB Gain/Phase vs. Frequency (Ambient Temperature)

$V^+/V^- = \pm 15V$, $G_V = 40dB$, $R_I = 50\Omega$, $R_L = 2k\Omega$, $C_L = 15pF$



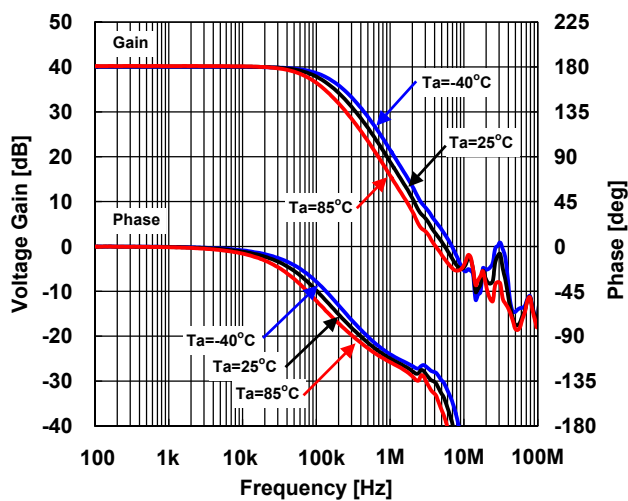
40dB Gain/Phase vs. Frequency (Load Capacitance)

$V^+/V^- = \pm 15V$, $G_V = 40dB$, $R_I = 50\Omega$, $R_L = 2k\Omega$, $T_a = 25^\circ C$



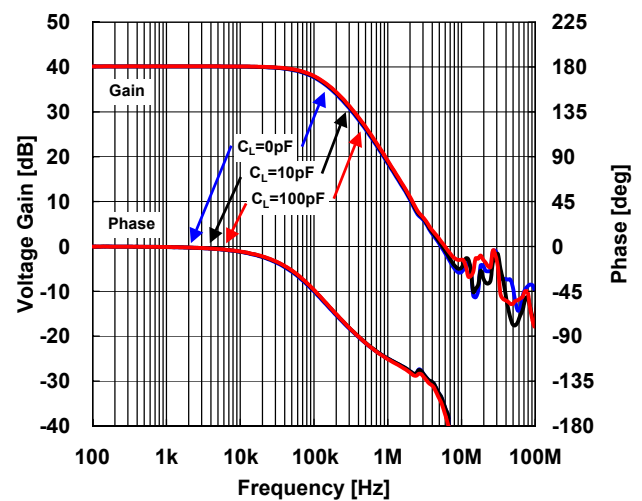
40dB Gain/Phase vs. Frequency (Ambient Temperature)

$V^+/V^- = \pm 4.5V$, $G_V = 40dB$, $R_L = 2k\Omega$, $C_L = 10pF$



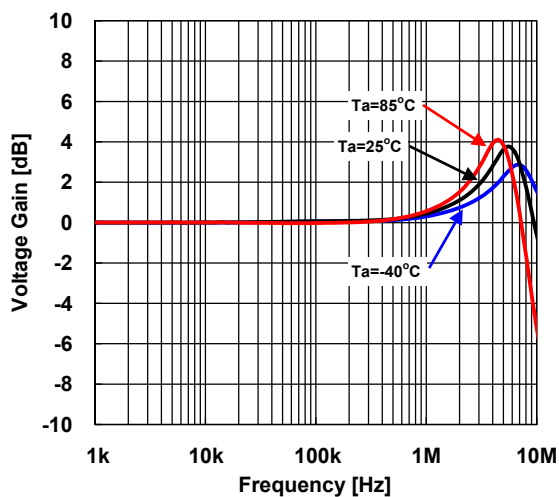
40dB Gain/Phase vs. Frequency (Load Capacitance)

$V^+/V^- = \pm 4.5V$, $G_V = 40dB$, $R_L = 2k\Omega$, $T_a = 25^\circ C$



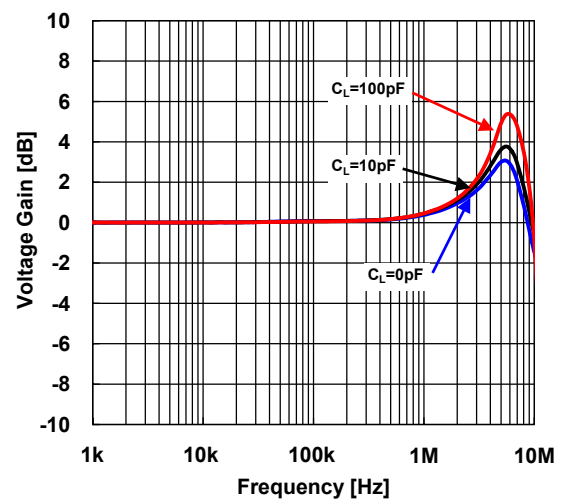
V.F. Peak vs. Frequency (Ambient Temperature)

$V^+/V^- = \pm 4.5V$, $G_V = 0dB$, $R_L = 2k\Omega$, $C_L = 10pF$



V.F. Peak vs. Frequency (Load Capacitance)

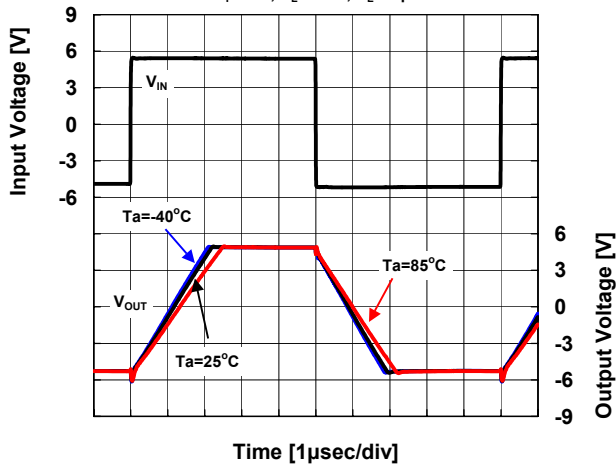
$V^+/V^- = \pm 4.5V$, $G_V = 0dB$, $R_L = 2k\Omega$, $T_a = 25^\circ C$



■ TYPICAL CHARACTERISTICS

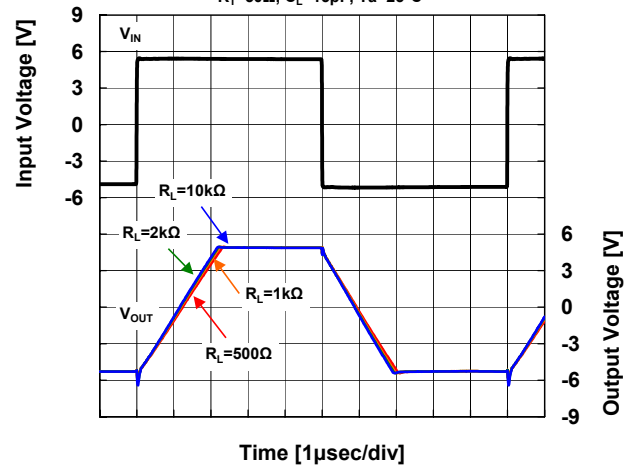
Pulse Response (Ambient Temperature)

$V^+/V^- = \pm 15V$, $V_{IN} = 10V_{PP}$, $f_{IN} = 1kHz$, $G_V = 0dB$,
 $R_T = 50\Omega$, $R_L = 50k\Omega$, $C_L = 15pF$



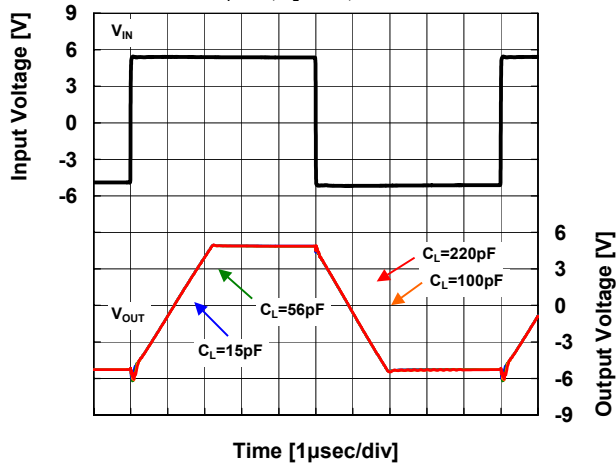
Pulse Response (Load Resistance)

$V^+/V^- = \pm 15V$, $V_{IN} = 10V_{PP}$, $f_{IN} = 1kHz$, $G_V = 0dB$,
 $R_T = 50\Omega$, $C_L = 15pF$, $Ta = 25^\circ C$



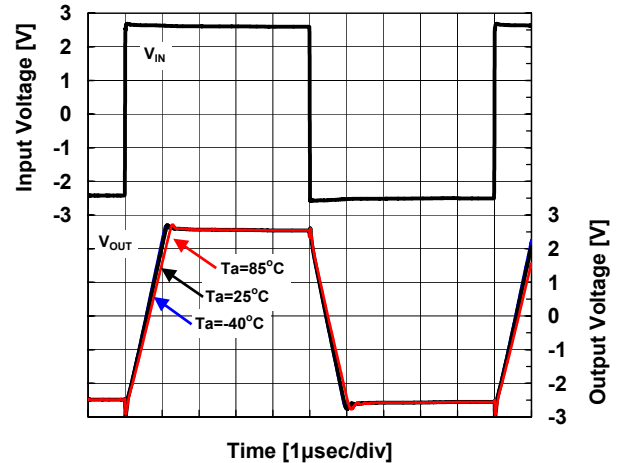
Pulse Response (Load Capacitance)

$V^+/V^- = \pm 15V$, $V_{IN} = 10V_{PP}$, $f_{IN} = 1kHz$, $G_V = 0dB$,
 $R_T = 50\Omega$, $R_L = 50k\Omega$, $Ta = 25^\circ C$



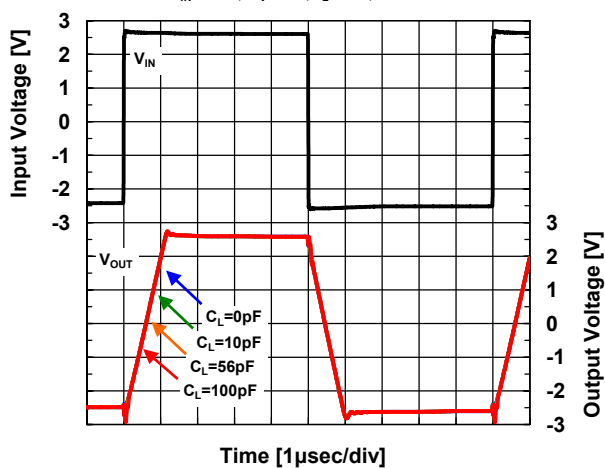
Pulse Response (Ambient Temperature)

$V^+/V^- = \pm 4.5V$, $V_{IN} = \pm 2.5V$,
 $f_{IN} = 1kHz$, $G_V = 0dB$, $R_L = 2k\Omega$, $C_L = 10pF$



Pulse Response (Load Capacitance)

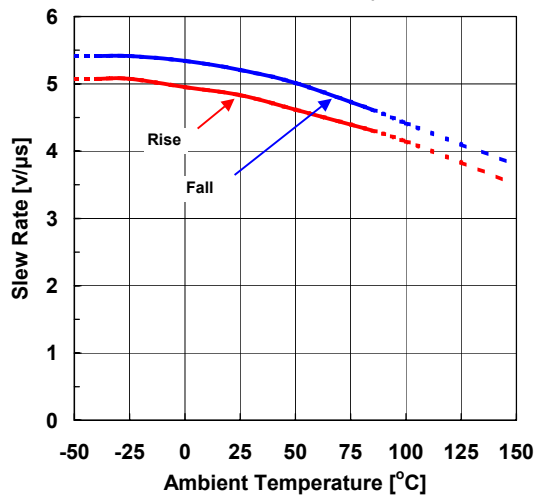
$V^+/V^- = \pm 4.5V$, $V_{IN} = \pm 2.5V$,
 $f_{IN} = 1kHz$, $G_V = 0dB$, $R_L = 2k\Omega$, $Ta = 25^\circ C$



■ TYPICAL CHARACTERISTICS

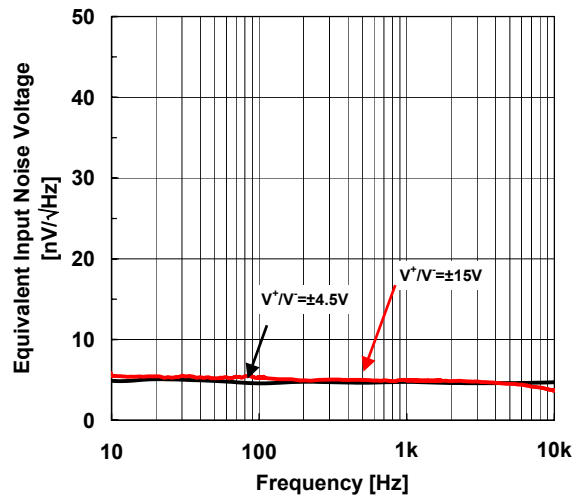
Slew Rate vs. Ambient Temperature

$V^+/V^- = \pm 15V$, $V_{in} = 10V_{pp}$, $f_{in} = 1kHz$, $G_v = 0dB$,
 $R_T = 50\Omega$, $R_L = 2k\Omega$, $C_L = 15pF$



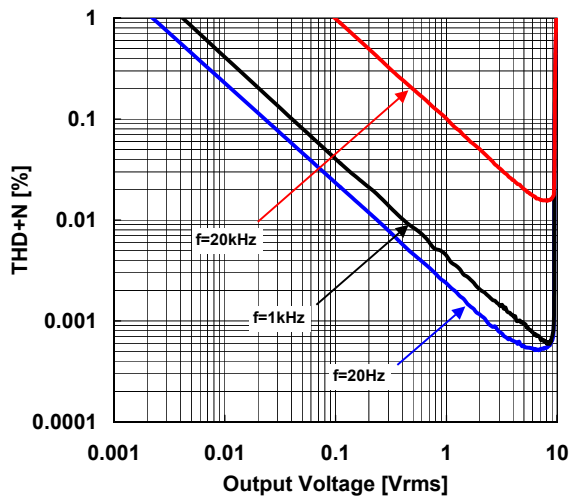
Equivalent Input Noise Voltage

$R_S = 50\Omega$, $R_L = 100k\Omega$, $G_v = 60dB$, $T_a = 25^\circ C$



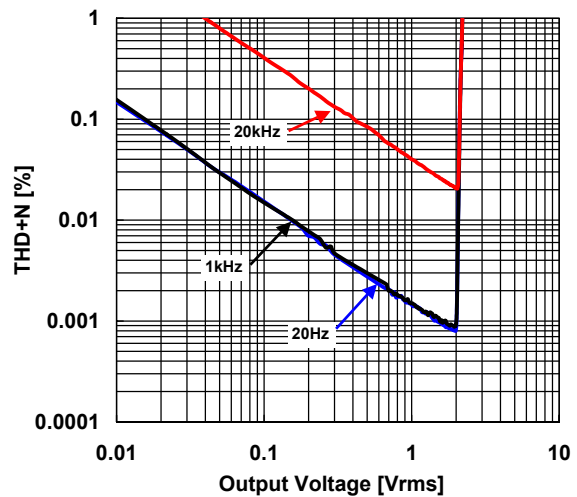
THD+N vs. Output Voltage

$V^+/V^- = \pm 15V$, $G_v = 20dB$, $R_L = 2k\Omega$, $T_a = 25^\circ C$



THD+N vs. Output Voltage

$V^+/V^- = \pm 4.5V$, $G_v = 20dB$, $R_L = 2k\Omega$, $T_a = 25^\circ C$



■ MEMO

[CAUTION]

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