

## Single Supply Quad Operational Amplifier with Full Swing Output

### ■ GENERAL DESCRIPTION

The NJM2747 is a quad low supply voltage operational amplifier with Full swing output.

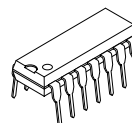
The output full swing function provides wide dynamic range, is from ground to power supply level. And Input range rails from ground level.

It is suitable for audio section of portable sets, PCs and any General-purpose use.

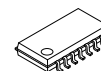
### ■ FEATURES

- Operating Voltage 2.5V to 14V
  - Output Full Swing  $V_{OH} \geq 4.9V$  Typ. (at  $V^+ = 5V, R_L = 5k\Omega$ )  
 $V_{OL} \leq 0.1V$  Typ. (at  $V^+ = 5V, R_L = 5k\Omega$ )
  - Offset Voltage 1mV Typ
  - Slew Rate 3.5V/ $\mu$ s Typ.
  - Low Distortion 0.001% typ. (at  $V^+ = 5V, f = 1kHz$ )
  - Low Input Voltage Noise 10nV/ $\sqrt{Hz}$  typ.
  - Bipolar Technology
  - Package Outline
- |          |        |
|----------|--------|
| NJM2747D | DIP14  |
| NJM2747M | DMP14  |
| NJM2747E | EMP14  |
| NJM2747V | SSOP14 |

### ■ PACKAGE OUTLINE



NJM2747D



NJM2747M

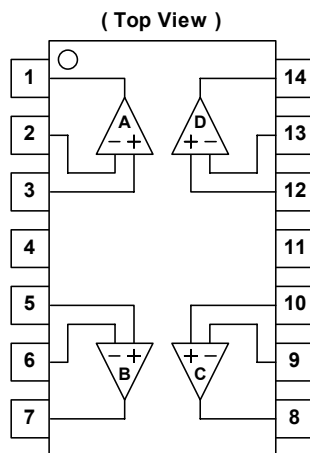


NJM2747E



NJM2747V

### ■ PIN CONFIGURATION



#### PIN FUNCTION

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

# NJM2747

## ■ ABSOLUTE MAXIMUM RATINGS

| PARAMETER                        | SYMBOL    | RATINGS   | UNIT               |
|----------------------------------|-----------|---|--------------------|
| Supply Voltage                   | $V^+$     | 15  | V                  |
| Differential Input Voltage Range | $V_{ID}$  | $\pm 15$ (Note1)  | V                  |
| Common Mode Input Voltage Range  | $V_{ICM}$ | 0 to 15 (Note1)   | V                  |
| Power Dissipation                | $P_D$     | DIP14 870<br>DMP14 450(Note2)<br>EMP14 720(Note2) 1200(Note4)<br>SSOP14 420(Note2) 520(Note4) | mW                 |
| Operating Temperature Range      | $T_{opr}$ | -40 to +85  | $^{\circ}\text{C}$ |
| Storage Temperature Range        | $T_{stg}$ | -50 to +125   | $^{\circ}\text{C}$ |

(Note1) For supply voltage less than 15V, the absolute maximum input voltage is equal to the supply voltage.

(Note2) On the PCB "EIA/JEDEC (76.2×114.3×1.6mm, two layers, FR-4)"

(Note3) On the PCB "EIA/JEDEC (76.2×114.3×1.6mm, four layers, FR-4)"

## ■ OPERATING VOLTAGE ( $T_a=25^{\circ}\text{C}$ )

| PARAMETER      | SYMBOL | RATINGS   | UNIT |
|----------------|--------|-----------|------|
| Supply Voltage | $V^+$  | 2.5 to 14 | V    |

## ■ ELECTRICAL CHARACTERISTICS

### ● DC CHARACTERISTICS ( $V^+=5\text{V}, T_a=25^{\circ}\text{C}$ )

| PARAMETER                       | SYMBOL    | TEST CONDITION  | MIN. | TYP. | MAX. | UNIT |
|---------------------------------|-----------|---|------|------|------|------|
| Operating Current               | $I_{CC}$  | $R_L=\infty, V_{IN}=2.5\text{V},$<br>No Signal Apply              | -    | 8    | 11   | mA   |
| Input Offset Voltage            | $V_{IO}$  | $R_S \leq 10\text{k}\Omega$                                       | -    | 1    | 6    | mV   |
| Input Bias Current              | $I_B$     |   | -    | 100  | 350  | nA   |
| Input Offset Current            | $I_{IO}$  |   | -    | 5    | 100  | nA   |
| Large Signal Voltage Gain       | $A_v$     | $R_L \geq 10\text{k}\Omega$ to 2.5V,<br>$V_o=0.5\text{V}$ to 4.5V | 65   | 85   | -    | dB   |
| Common Mode Rejection Ratio     | CMR       | $0\text{V} \leq V_{CM} \leq 4\text{V}$                            | 60   | 75   | -    | dB   |
| Supply Voltage Rejection Ratio  | SVR       | $V^+=2.5\text{V}$ to 14V  | 60   | 80   | -    | dB   |
| Output Voltage                  | $V_{OH}$  | $R_L=5\text{k}\Omega$ to 2.5V                                     | 4.75 | 4.9  | -    | V    |
|                                 | $V_{OL}$  | $R_L=5\text{k}\Omega$ to 2.5V                                     | -    | 0.1  | 0.25 | V    |
| Input Common Mode Voltage Range | $V_{ICM}$ | CMR $\geq 60\text{dB}$  | 0    | -    | 4    | V    |

### ● AC CHARACTERISTICS ( $V^+=5\text{V}, T_a=25^{\circ}\text{C}$ )

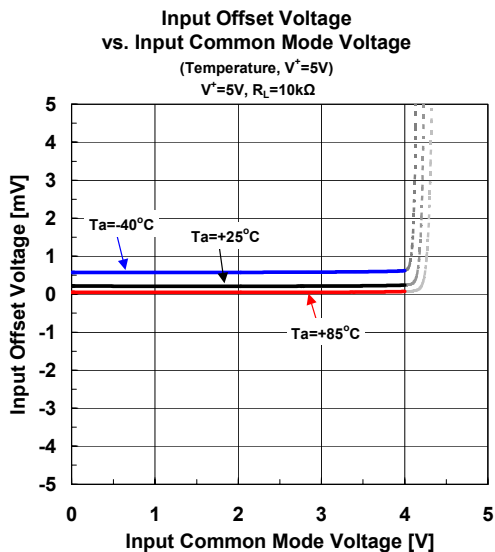
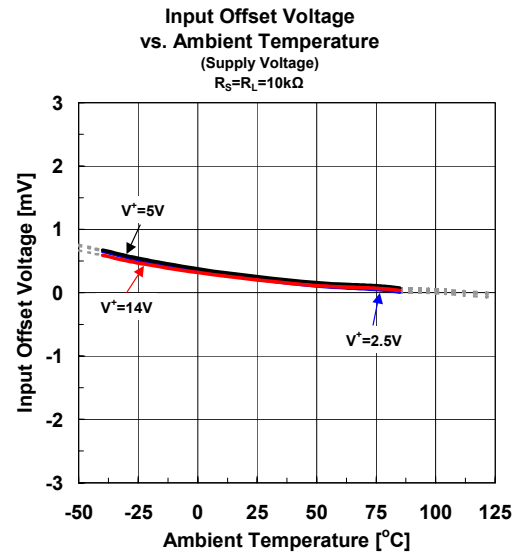
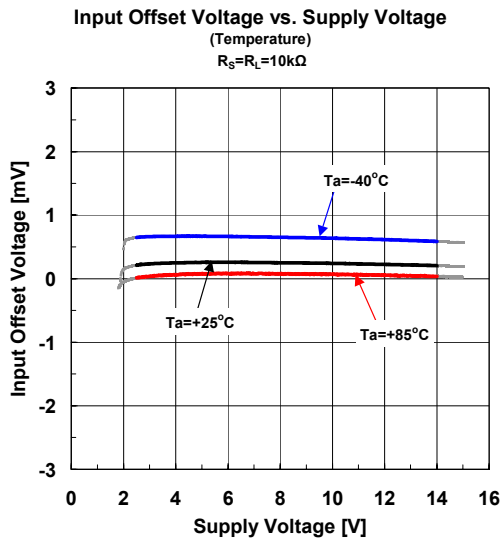
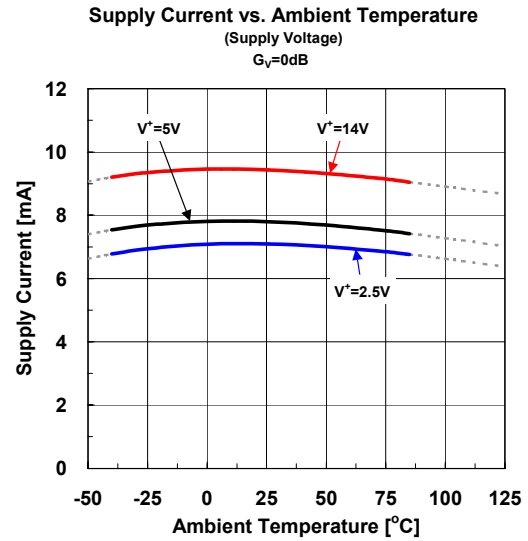
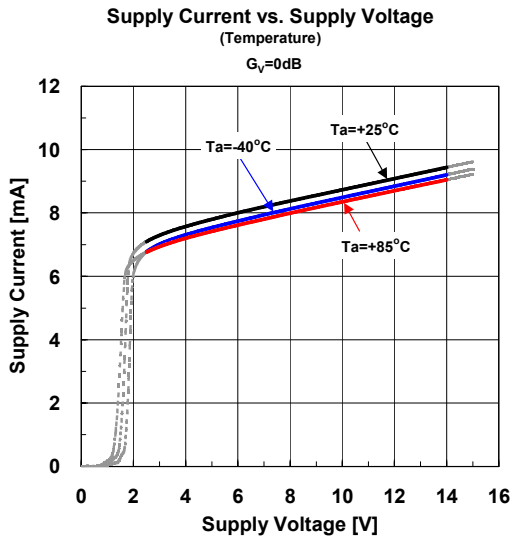
| PARAMETER                      | SYMBOL   | TEST CONDITION  | MIN. | TYP.  | MAX. | UNIT                   |
|--------------------------------|----------|---|------|-------|------|------------------------|
| Unity Gain Bandwidth           | GB       | $f=10\text{kHz}$  | -    | 10    | -    | MHz                    |
| Phase Margin                   | $\Phi_M$ | $R_L=10\text{k}\Omega, C_L=10\text{pF}$   | -    | 75    | -    | Deg                    |
| Equivalent Input Noise Voltage | $V_{NI}$ | $f=1\text{kHz}, V_{CM}=2.5\text{V}$   | -    | 10    | -    | nV/ $\sqrt{\text{Hz}}$ |
| Total Harmonic Distortion      | THD      | $f=1\text{kHz}, A_v=+2$<br>$R_L=10\text{k}\Omega$ to 2.5V, $V_o=1.5\text{Vrms}$ | -    | 0.001 | -    | %                      |
| Amp to Amp Separation          | CS       | $f=1\text{kHz}$<br>$R_L=10\text{k}\Omega$ to 2.5V, $V_o=1.5\text{Vrms}$         | -    | 120   | -    | dB                     |

### ● AC CHARACTERISTICS ( $V^+=5\text{V}, T_a=25^{\circ}\text{C}$ )

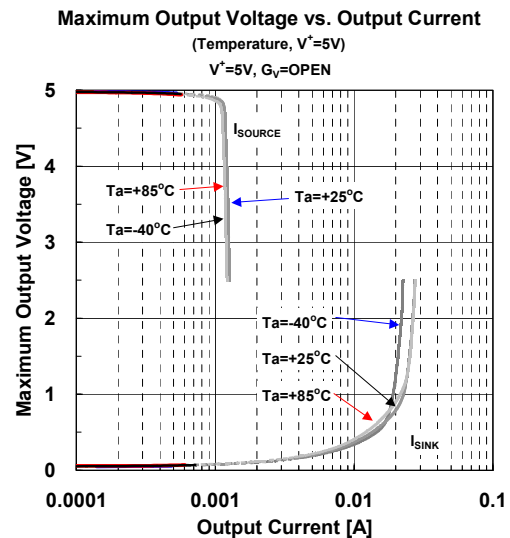
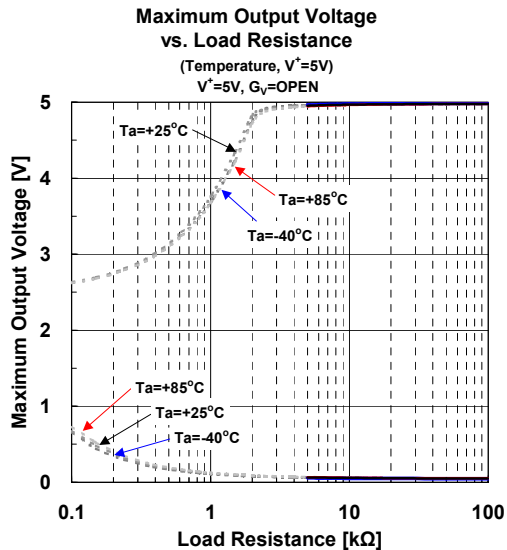
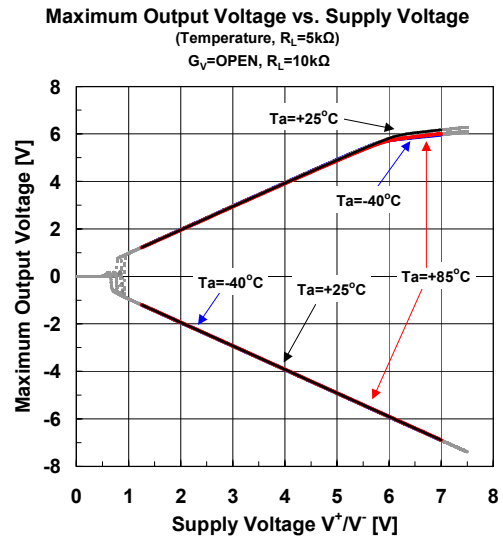
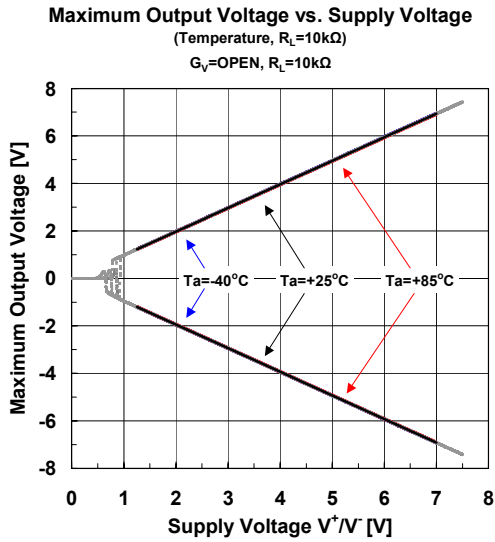
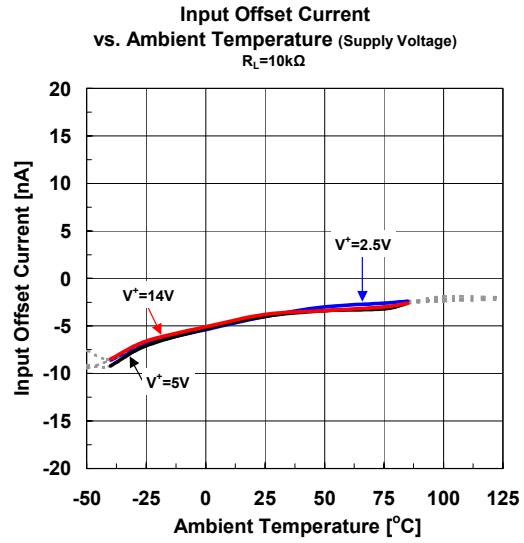
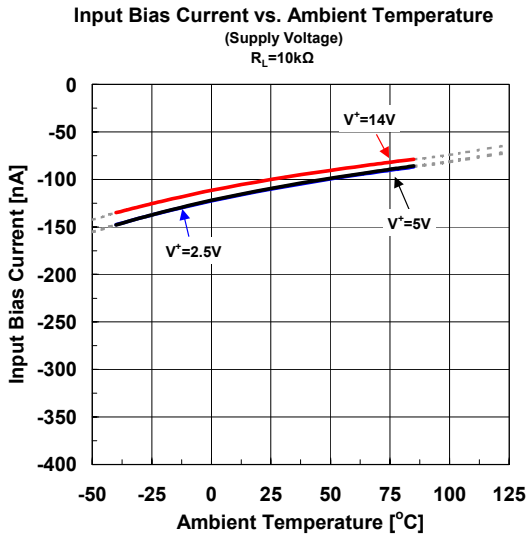
| PARAMETER | SYMBOL | TEST CONDITION   | MIN. | TYP. | MAX. | UNIT             |
|-----------|--------|--|------|------|------|------------------|
| Slew Rate | SR     | (Note 4), $A_v=1, V_{IN}=2\text{Vpp}$<br>$R_L=10\text{k}\Omega$ to 2.5V<br>$C_L=10\text{pF}$ to 2.5V | -    | 3.5  | -    | V/ $\mu\text{s}$ |

(Note 4) Number specified is the slower of the positive and negative slew rates.

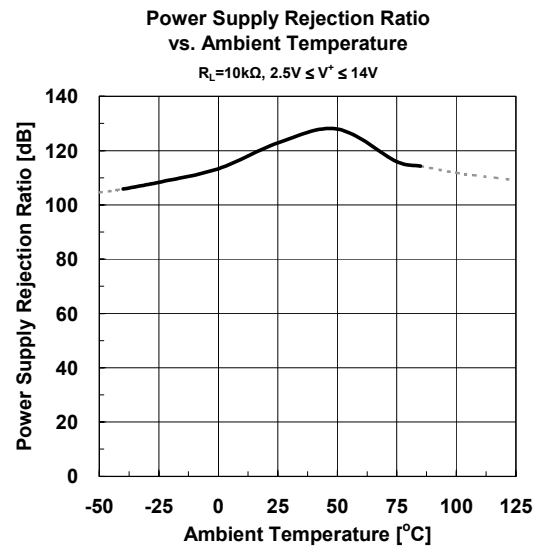
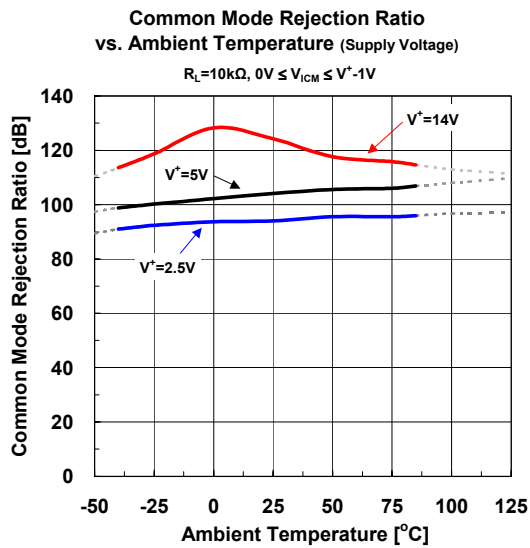
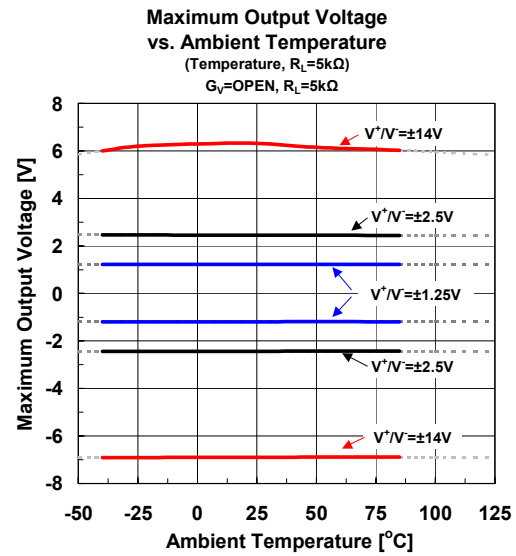
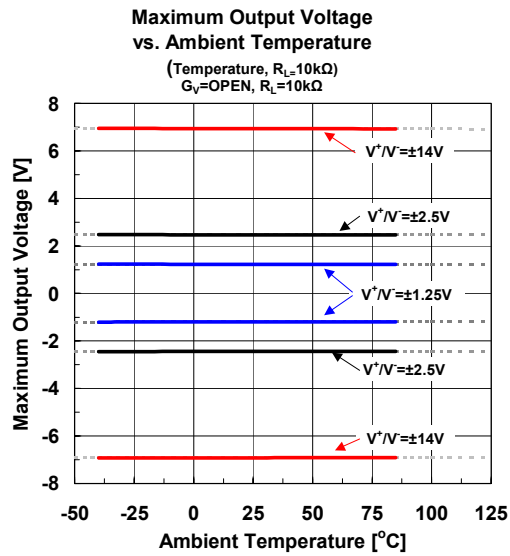
## TYPICAL CHARACTERISTICS



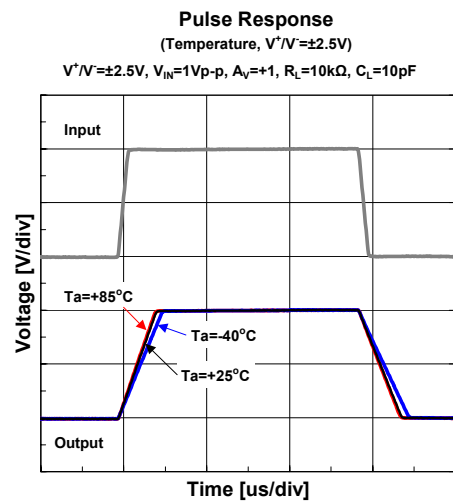
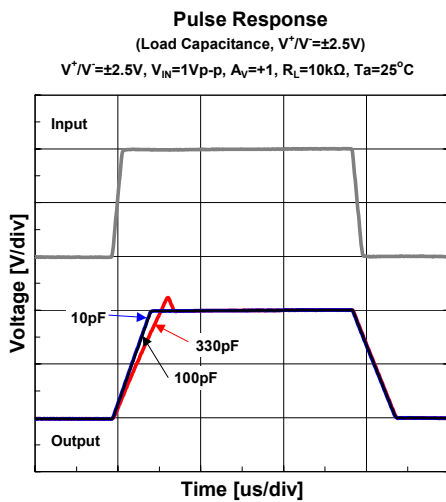
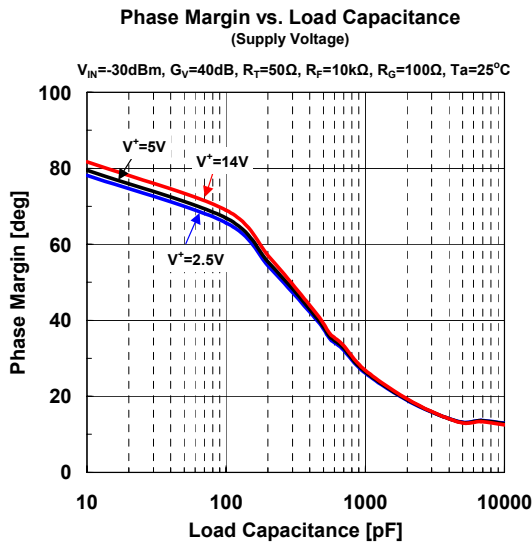
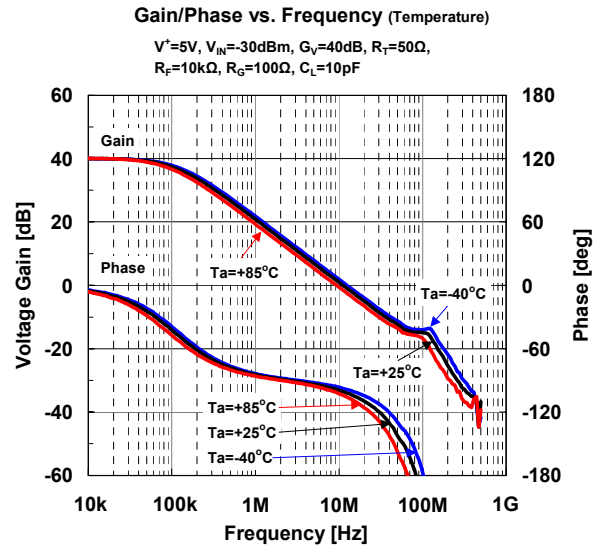
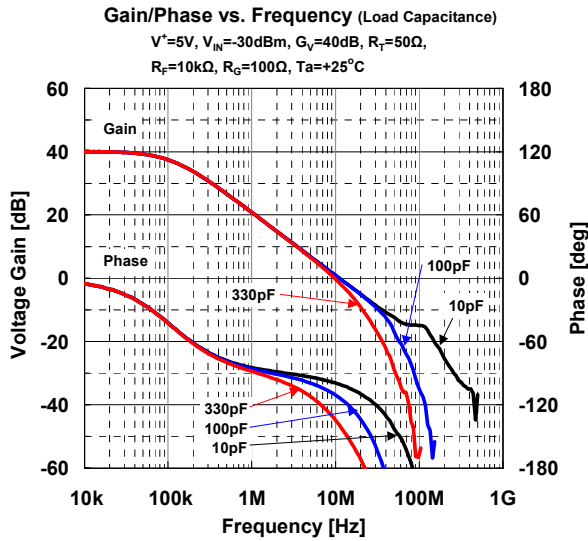
## ■ TYPICAL CHARACTERISTICS



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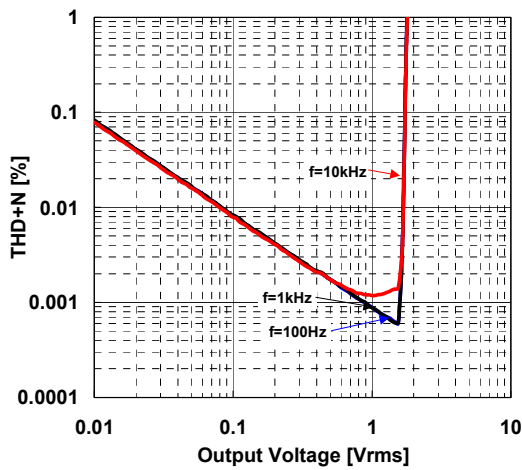
## TYPICAL CHARACTERISTICS



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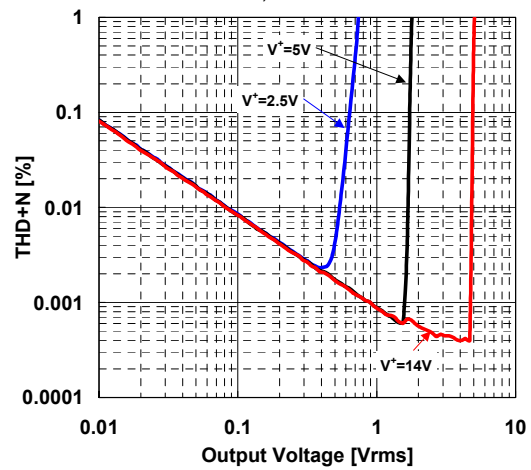
**THD+N vs. Output Voltage (Frequency)**

$V^+=5V$ ,  $A_v=+2$ ,  $R_G=600\Omega$ ,  $R_F=5k\Omega$ ,  $R_G=5k\Omega$ ,  
 $BW=10Hz-80kHz$ ,  $T_a=25^\circ C$



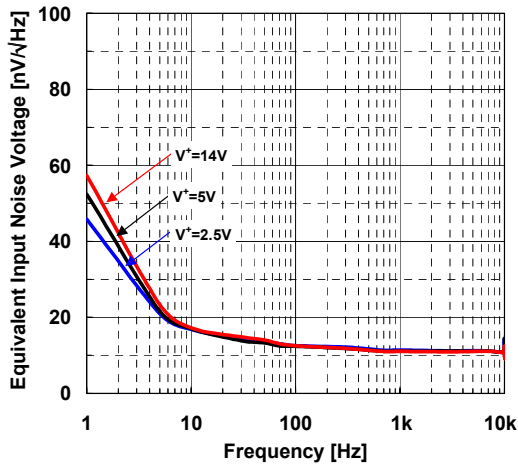
**THD+N vs. Output Voltage (Supply Voltage)**

$f=1kHz$ ,  $A_v=+2$ ,  $R_G=600\Omega$ ,  $R_F=5k\Omega$ ,  $R_G=5k\Omega$ ,  
 $BW=10Hz-80kHz$ ,  $T_a=25^\circ C$



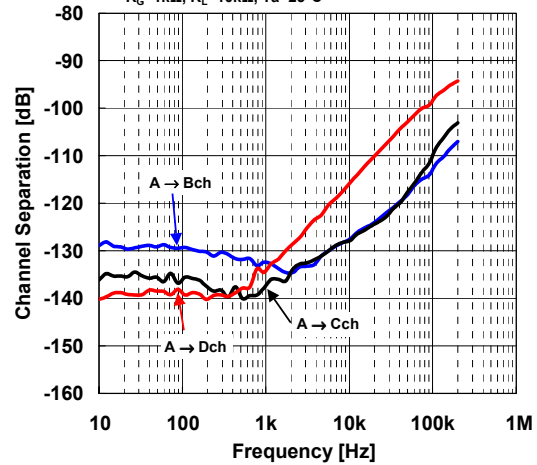
**Equivalent Input Noise Voltage vs. Frequency (Supply Voltage)**

$G_v=60dB$ ,  $R_i=600\Omega$ ,  $R_F=100k\Omega$ ,  $R_G=100\Omega$ ,  $T_a=25^\circ C$



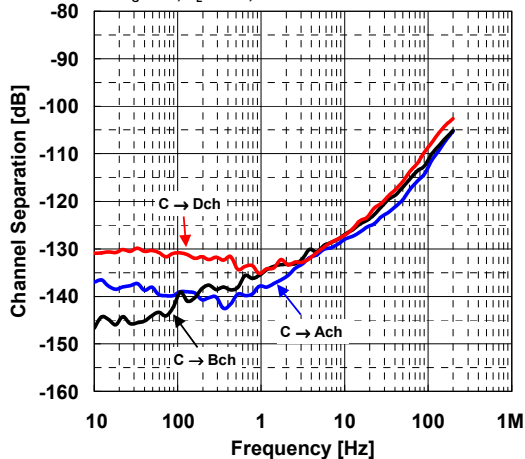
**Channel Separation vs. Frequency**

$V^+=5V$ , Ach Input,  $V_O=1.5Vrms$ ,  $G_v=40dB$ ,  $R_F=100k\Omega$ ,  
 $R_G=1k\Omega$ ,  $R_i=10k\Omega$ ,  $T_a=25^\circ C$



**Channel Separation vs. Frequency**

$V^+=5V$ , Cch Input,  $V_O=1.5Vrms$ ,  $G_v=40dB$ ,  $R_F=100k\Omega$ ,  
 $R_G=1k\Omega$ ,  $R_i=10k\Omega$ ,  $T_a=25^\circ C$



# NJM2747

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## ■ MEMO

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