

## HIGH SPEED SINGLE SUPPLY OPERATIONAL AMPLIFIER

### ■ GENERAL DESCRIPTION

The **NJM2742** is a high speed single supply operational amplifier. The low  $V_{OL}$  enables to treat small output signal on a single supply.

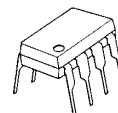
It has wide supply voltage range, +3 to +32 volt and high slew rate.

The **NJM2742** is suitable for power supply and motor driver units.

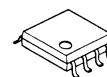
### ■ FEATURES

- Single Supply
- Operating Voltage (3 to 32V)
- Low Saturation Output Voltage ( $V_{OL} = 0.2V$  typ. at  $R_L = 2k\Omega, V^+ = 5V$ )
- High Slew Rate ( $10V/\mu s$  typ.)
- Bipolar Technology
- Package Outline DIP8, DMP8, SSOP8, TVSP8

### ■ PACKAGR OUTLINE



**NJM2742D**



**NJM2742M**

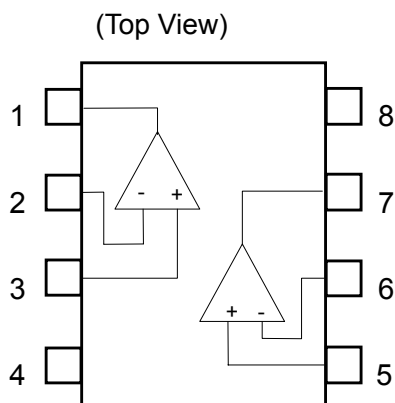


**NJM2742V**



**NJM2742RB1**

### ■ PIN CONFIGURATION



### PIN FUNCTION

- 1.A OUTPUT
- 2.A -INPUT1
- 3.A +INPUT1
- 4.V<sup>-</sup>
- 5.B +INPUT2
- 6.B -INPUT2
- 7.B OUTPUT2
- 8.V<sup>+</sup>

## ■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

| PARAMETER                   | SYMBOL   | RATINGS                                                | UNIT |
|-----------------------------|----------|--------------------------------------------------------|------|
| Supply Voltage              | $V^+$    | +36                                                    | V    |
| Differential Input Voltage  | $V_{ID}$ | $\pm 36$                                               | V    |
| Common Mode Input Voltage   | $V_{IC}$ | -0.3 to +36                                            | V    |
| Power Dissipation           | $P_D$    | 500 (DIP8)<br>300 (DMP8)<br>250 (SSOP8)<br>320 (TVSP8) | mW   |
| Operating Temperature Range | Topr     | -40 to +85                                             | °C   |
| Storage Temperature Range   | Tstg     | -40 to +150                                            | °C   |

## ■ RECOMMENDED OPERATING CONDITION

(Ta=25°C)

| PARAMETER               | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT |
|-------------------------|--------|----------------|-----|-----|-----|------|
| Operating Voltage Range | $V^+$  |                | 3.0 | -   | 32  | V    |

## ■ DC CHARACTERISTICS

( $V^+/V^- = \pm 15V$ , Ta=25°C)

| PARAMETER                       | SYMBOL       | TEST CONDITION                         | MIN             | TYP           | MAX  | UNIT |
|---------------------------------|--------------|----------------------------------------|-----------------|---------------|------|------|
| Operating Current               | $I_{CC}$     | No Signal                              | -               | 4.3           | 5.5  | mA   |
| Input Offset Voltage            | $V_{IO}$     |                                        | -               | 1.0           | 12   | mV   |
| Input Bias Current              | $I_B$        |                                        | -               | 80            | 400  | nA   |
| Input Offset Current            | $I_{IO}$     |                                        | -               | 5             | 75   | nA   |
| Open Loop Voltage Gain          | $A_v$        | $R_L > 2k\Omega$                       | 80              | 110           | -    | dB   |
| Common Mode Rejection           | CMR          | $-15V < V_{IC} < 12.5V$                | 55              | 75            | -    | dB   |
| Supply Voltage Rejection        | SVR          | $3V < V^+ < 32V$                       | 70              | 90            | -    | dB   |
| Maximum Output Voltage 1        | $V_{OM1}$    | $R_L > 10k\Omega$                      | +13.7<br>/-13.7 | +14<br>/-14.8 | -    | V    |
| Maximum Output Voltage 2        | $V_{OM2}$    | $R_L > 2k\Omega$                       | +13.5<br>/-13.5 | -             | -    | V    |
| Source Output Current           | $I_{SOURCE}$ | $V_{IN+} = 1V, V_{IN-} = 0V, V_O = 0V$ | 10              | 30            | -    | mA   |
| Sink Output Current             | $I_{SINK}$   | $V_{IN+} = 0V, V_{IN-} = 1V, V_O = 0V$ | 10              | 30            | -    | mA   |
| Input Common Mode Voltage Range | $V_{ICM}$    | CMR > 55dB                             | -15             | -             | 12.5 | V    |

## ■ AC CHARACTERISTICS

( $V^+/V^- = \pm 15V$ , Ta=25°C)

| PARAMETER                      | SYMBOL   | TEST CONDITION | MIN | TYP  | MAX | UNIT               |
|--------------------------------|----------|----------------|-----|------|-----|--------------------|
| Gain Bandwidth product         | GB       | f=10kHz        | -   | 2    | -   | MHz                |
| Equivalent Input Noise Voltage | $V_{NI}$ | f=1kHz         | -   | 40   | -   | nV/<br>$\sqrt{Hz}$ |
| Capacitive Load Tolerance      | CL       |                | -   | 1000 | -   | pF                 |

## ■ TRANSIENT CHARACTERISTICS

( $V^+/V^- = \pm 15V$ , Ta=25°C)

| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT       |
|-----------|--------|----------------|-----|-----|-----|------------|
| Slew Rate | SR     |                | -   | 10  | -   | V/ $\mu s$ |

## ■ DC CHARACTERISTICS

( $V^+=+5V$ ,  $T_a=25^\circ C$ )

| PARAMETER                       | SYMBOL       | TEST CONDITION                     | MIN | TYP | MAX | UNIT |
|---------------------------------|--------------|------------------------------------|-----|-----|-----|------|
| Operating Current               | $I_{CC}$     | No Signal                          | -   | 3.3 | 4.5 | mA   |
| Input Offset Voltage            | $V_{IO}$     |                                    | -   | 1.0 | 12  | mV   |
| Input Bias Current              | $I_B$        |                                    | -   | 80  | 400 | nA   |
| Input Offset Current            | $I_{IO}$     |                                    | -   | 5   | 75  | nA   |
| Open Loop Voltage Gain          | $A_v$        | $R_L > 2k\Omega$                   | 80  | 110 | -   | dB   |
| Common Mode Rejection           | CMR          | $0V < V_{IC} < 2.8V$               | 50  | 60  | -   | dB   |
| Supply Voltage Rejection        | SVR          | $3V < V^+ < 32V$                   | 70  | 90  | -   | dB   |
| Maximum Output Voltage          | $V_{OH}$     | $R_L = 2k\Omega$                   | 3.7 | 4.0 | -   | V    |
|                                 | $V_{OL}$     | $R_L = 2k\Omega$                   | -   | 0.1 | 0.2 |      |
| Source Output Current           | $I_{SOURCE}$ | $V_{IN+}=1V, V_{IN-}=0V, V_O=2.5V$ | 10  | 30  | -   | mA   |
| Sink Output Current             | $I_{SINK}$   | $V_{IN+}=0V, V_{IN-}=1V, V_O=2.5V$ | 10  | 30  | -   | mA   |
| Input Common Mode Voltage Range | $V_{ICM}$    | CMR > 50dB                         | 0   | -   | 2.8 | V    |

## ■ AC CHARACTERISTICS

( $V^+=+5V$ ,  $T_a=25^\circ C$ )

| PARAMETER                      | SYMBOL   | TEST CONDITION | MIN | TYP  | MAX | UNIT            |
|--------------------------------|----------|----------------|-----|------|-----|-----------------|
| Gain Bandwidth product         | GB       | $f=10kHz$      | -   | 2    | -   | MHz             |
| Equivalent Input Noise Voltage | $V_{NI}$ | $f=1kHz$       | -   | 40   | -   | nV/ $\sqrt{Hz}$ |
| Capacitive Load Tolerance      | CL       |                | -   | 1000 | -   | pF              |

## ■ TRANSIENT CHARACTERISTICS

( $V^+=+5V$ ,  $T_a=25^\circ C$ )

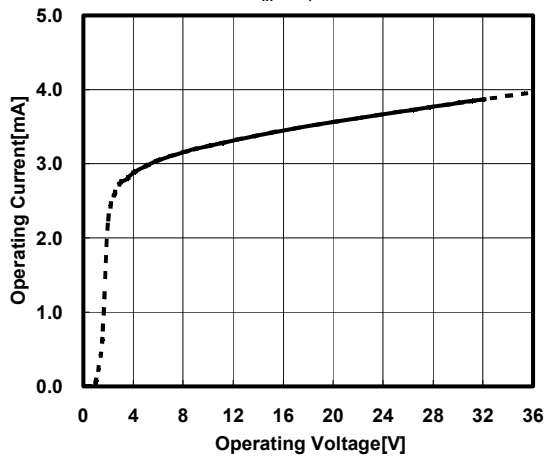
| PARAMETER | SYMBOL | TEST CONDITION | MIN | TYP | MAX | UNIT       |
|-----------|--------|----------------|-----|-----|-----|------------|
| Slew Rate | SR     |                | -   | 7   | -   | V/ $\mu s$ |

Note: The common mode input voltage range of NJM2742 is shifted toward the V- for single supply use.  
At the low operating voltage, the center potential of the V+ and V- may be out of the common mode voltage range. In this case, shift the common mode input voltage toward the V-.

## ■ TYPICAL CHARACTERISTICS

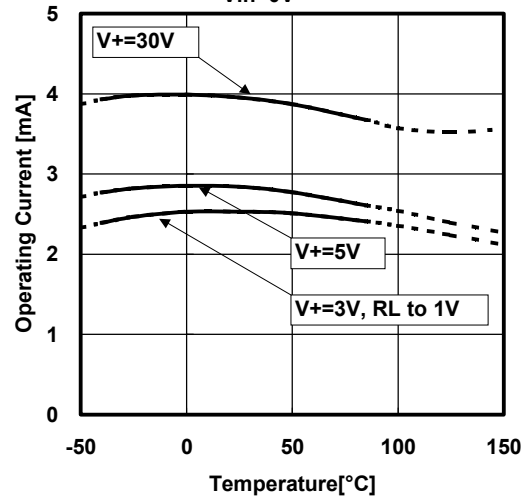
Operating Current vs. Operating Voltage

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



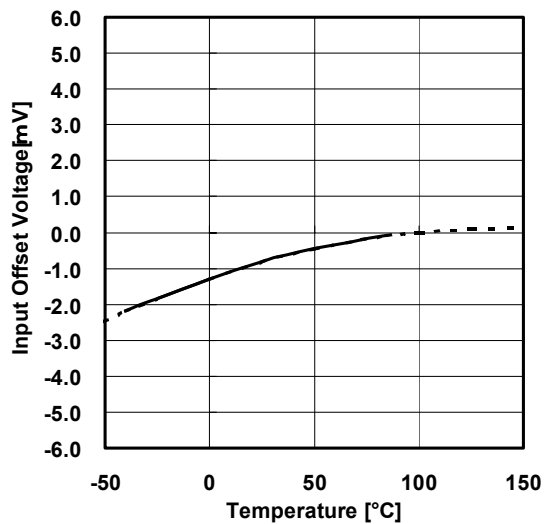
Operating Current vs. Temperature

$V_{in}=0V$



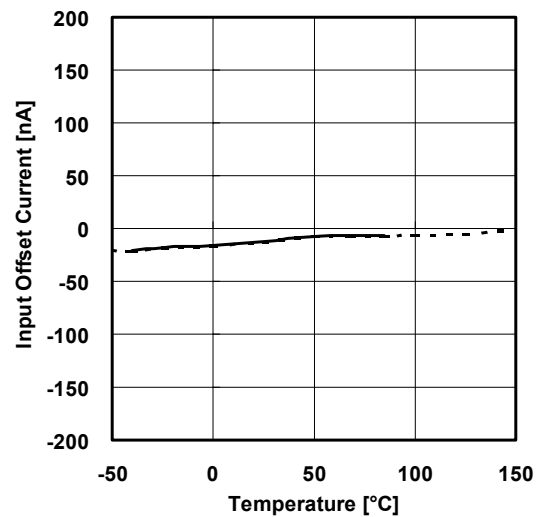
Input Offset Voltage vs. Temperature

$V+=5V$



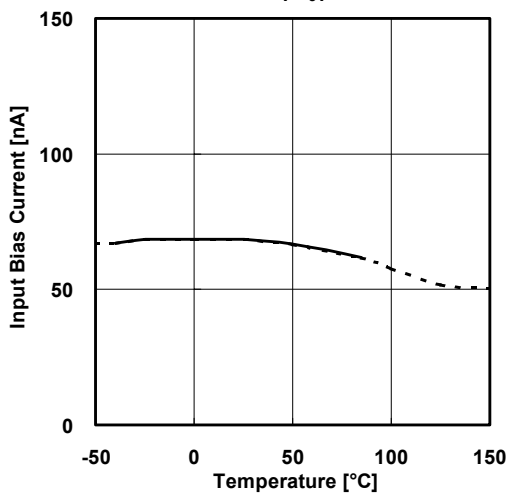
Input Offset Current vs. Temperature

$V+=5V$



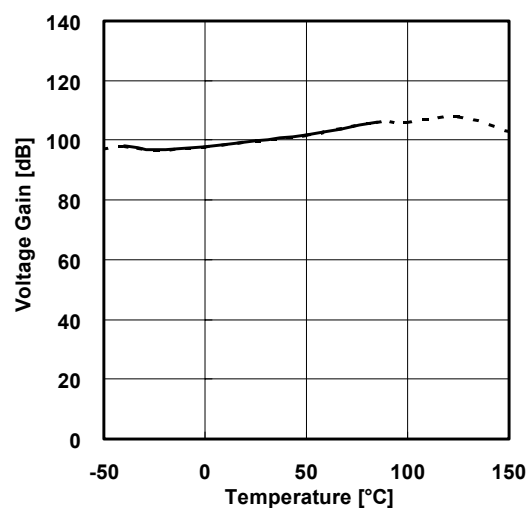
Input Bias Current vs. Temperature

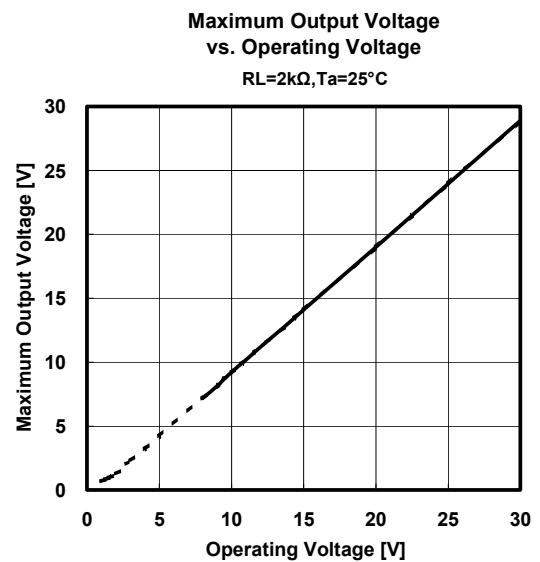
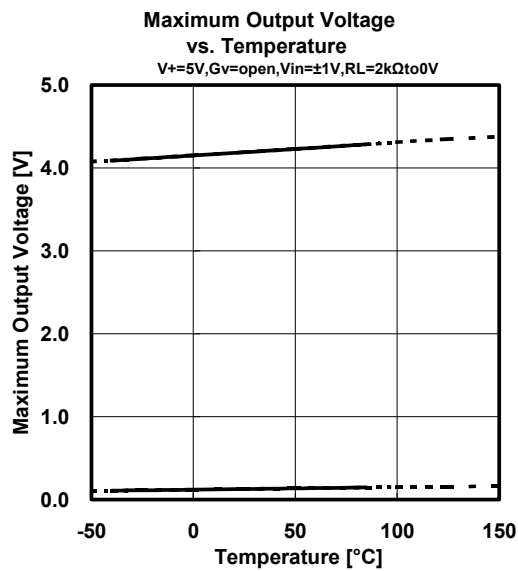
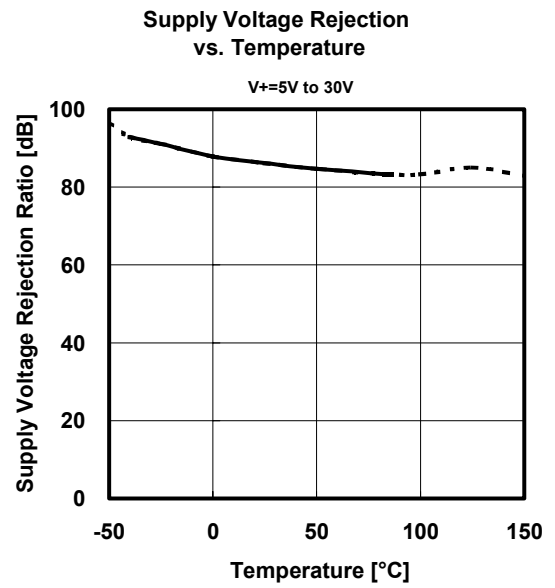
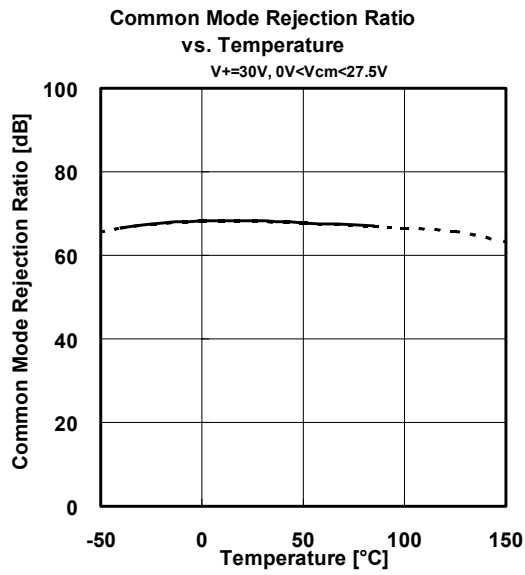
$V+=5V$



Voltage Gain vs. Temperature

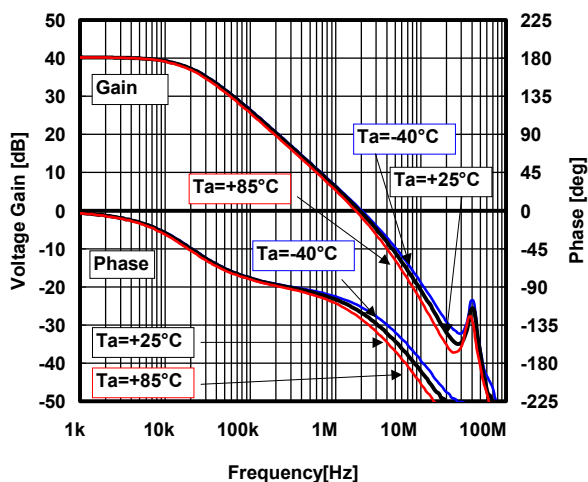
$V+=5V$





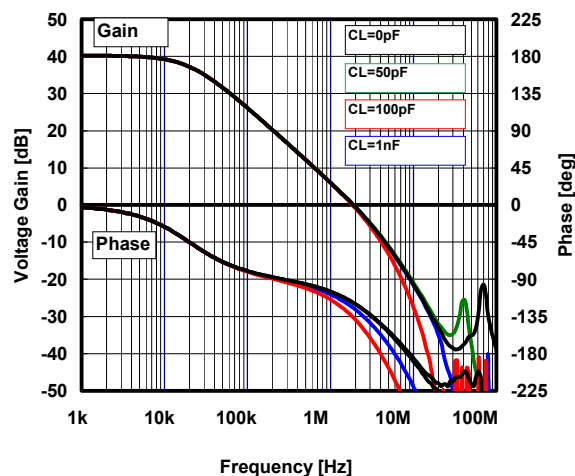
## Voltage Gain & Phase vs. Frequency

V+=5V, VIN=0.02Vpp, GV=40dB, RT=50Ω, RF=1.98kΩ, RG=20Ω, CF=0, RL=2kΩ, CL=50pF



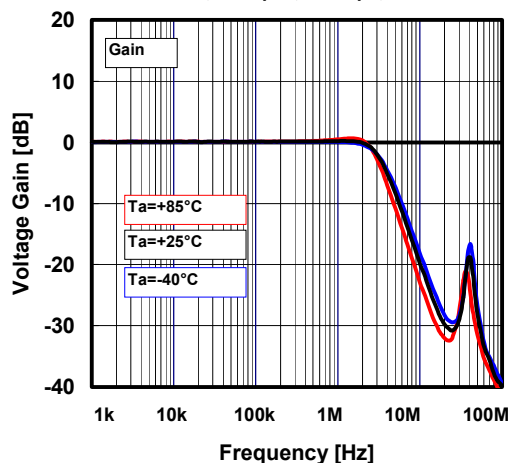
## Voltage Gain & Phase vs. Frequency

V+=5V, VIN=0.01Vpp, GV=40dB, RT=50Ω, RF=1.98kΩ, RG=20Ω, RL=10kΩ, Ta=+25°C



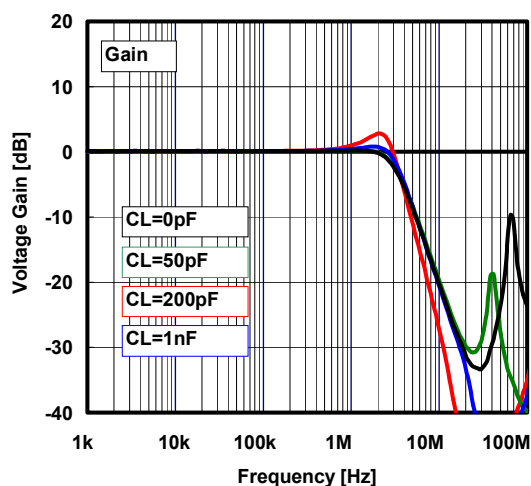
## Peak Gain of Voltage Follower

V+=5V, VIN=0.02Vpp, GV=0dB, RT=50Ω, RF=0Ω, RG=open, CL=50pF, RL=1kΩ



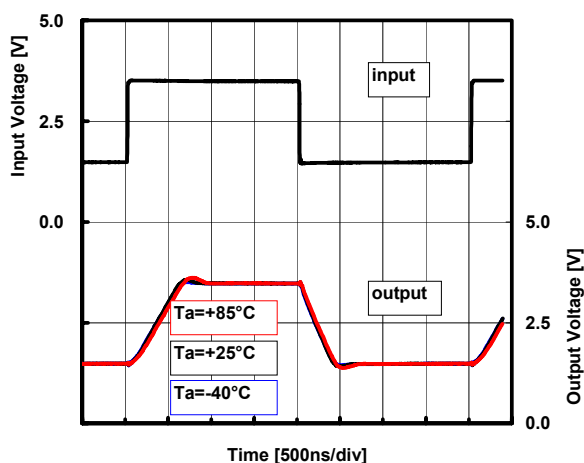
## Peak Gain of Voltage Follower

V+=5V, VIN=0.02Vpp, GV=0dB, RT=50Ω, RF=0Ω, RG=open, RL=1kΩ, Ta=+25°C



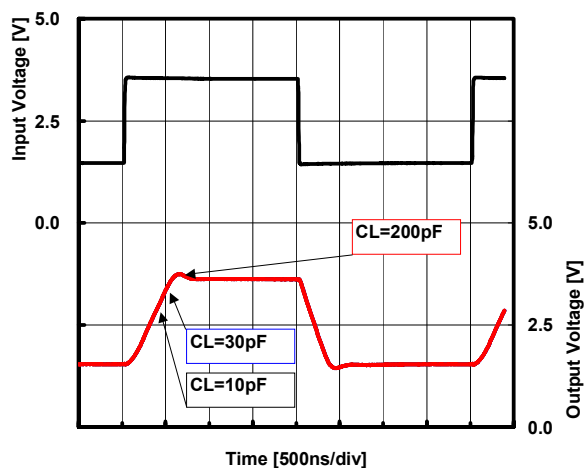
## Pulse Response

V+=5V, f=250kHz, VO=4VPP, GV=0dB, RT=50Ω, RF=0Ω, CL=10pF, RG=open, RL=10kΩ, Ta=25°C

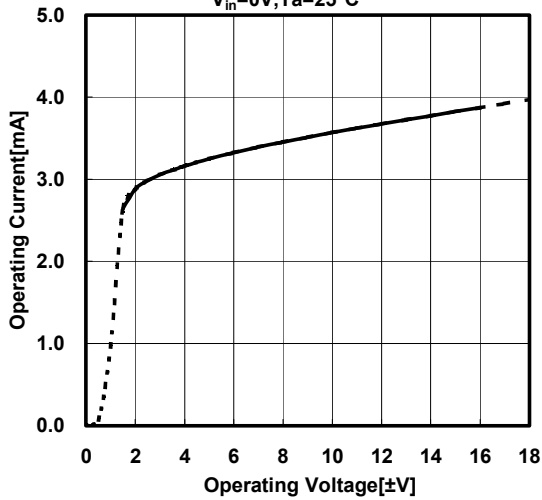


## Pulse Response

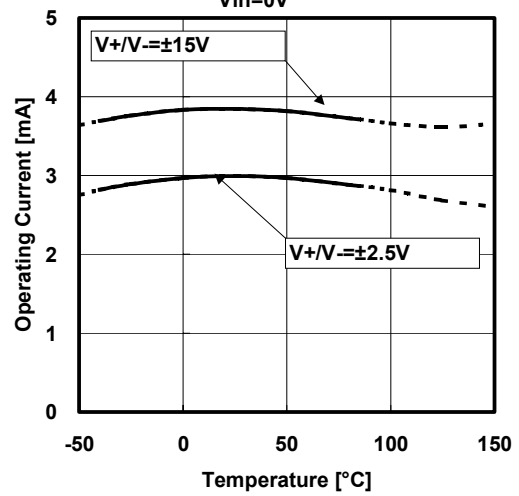
V+=5V, f=250kHz, VO=4VPP, GV=0dB, RT=50Ω, RF=0Ω, CF=0, RG=open, RL=2kΩ, Ta=25°C



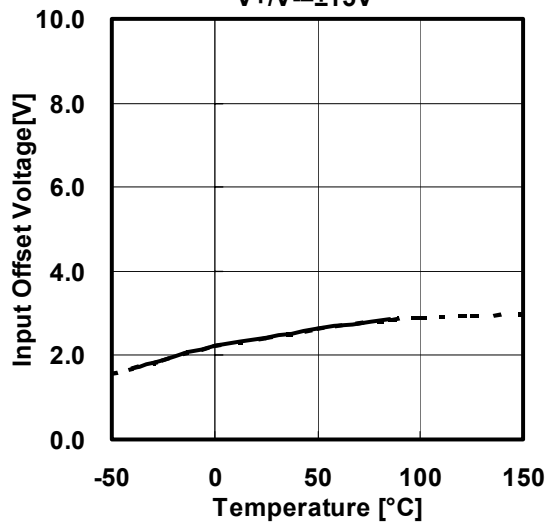
Operating Current vs. Operating Voltage  
 $V_{in}=0V, T_a=25^{\circ}C$



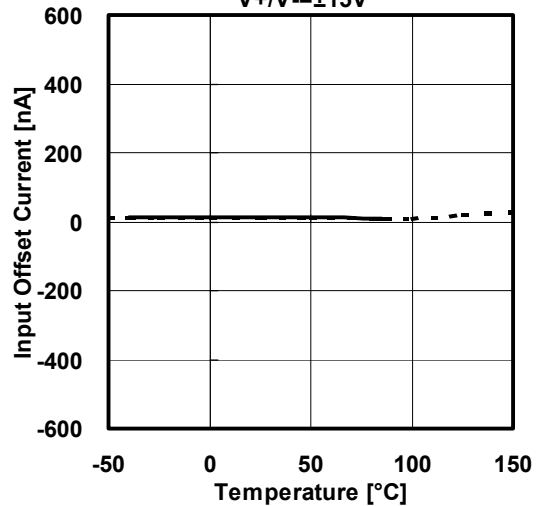
Operating Current vs. Temperature  
 $V_{in}=0V$



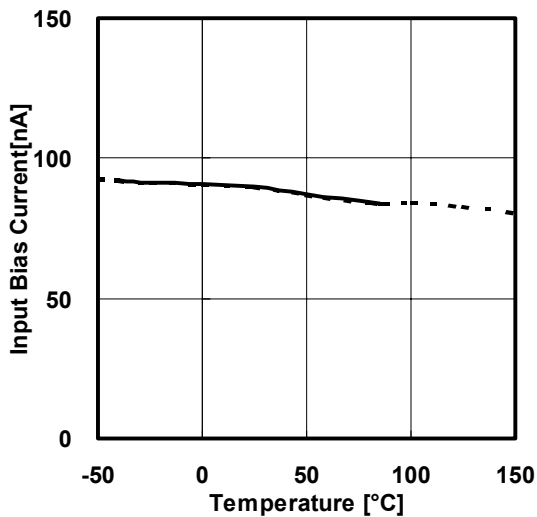
Input Offset Voltage vs. Temperature  
 $V+/V-=\pm 15V$



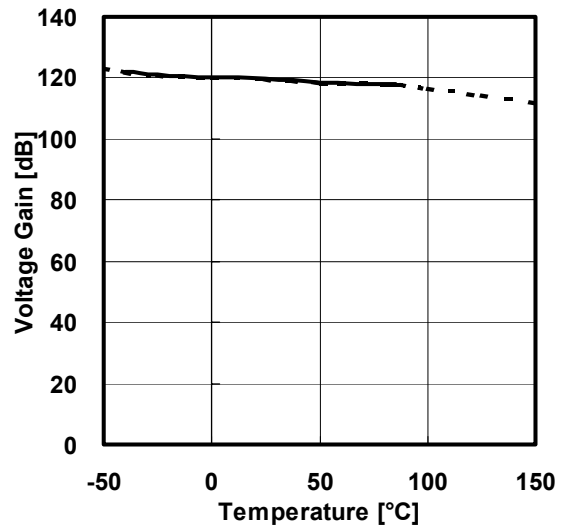
Input Offset Current vs. Temperature  
 $V+/V-=\pm 15V$



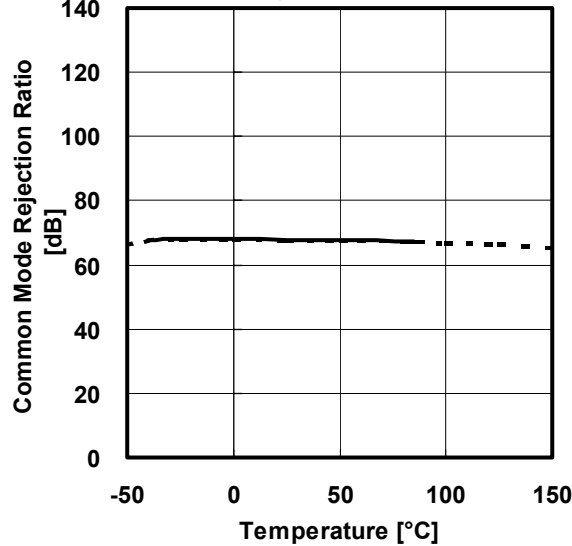
Input Bias Current vs. Temperature  
 $V+/V-=\pm 15V$



Voltage Gain vs. Temperature  
 $V+/V-=\pm 15V, R_L=2k\Omega$

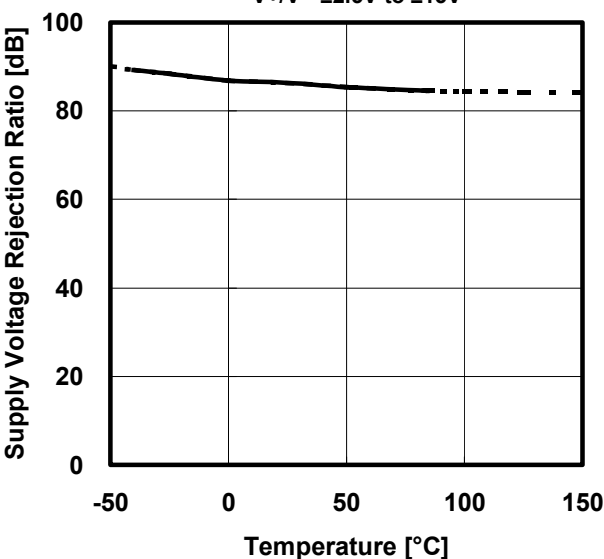


Common Mode Rejection Ratio  
vs. Temperature  
 $V_+/V_- = \pm 15V, -15V < V_{cm} < +12.5V$

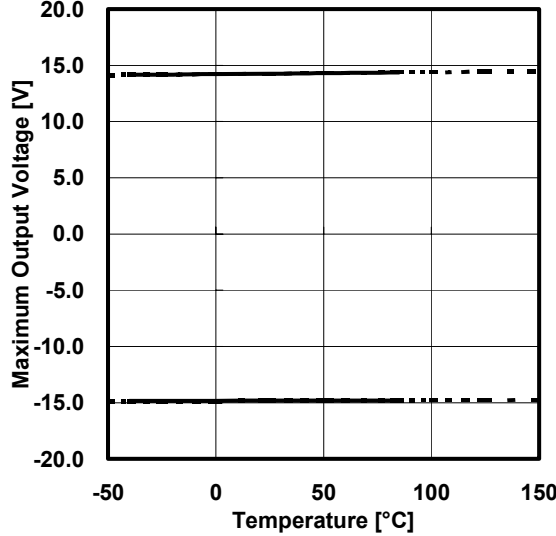


Supply Voltage Rejection Ratio  
vs. Temperature

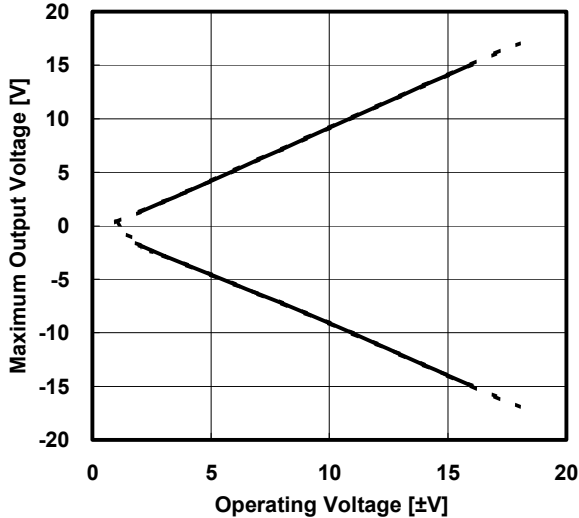
$V_+/V_- = \pm 2.5V$  to  $\pm 15V$



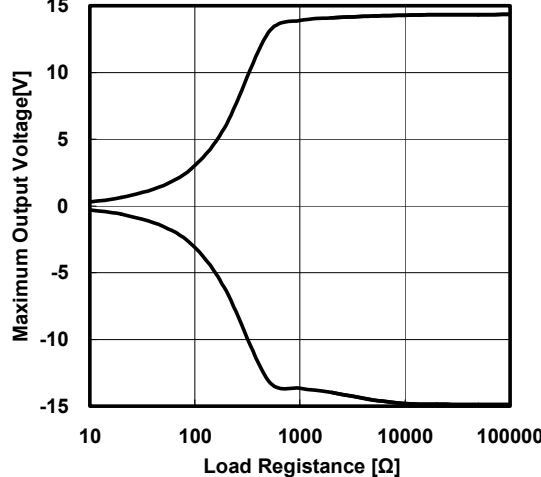
Maximum Output Voltage  
vs. Temperature  
 $V_+/V_- = \pm 15V, G_v = \text{open}, V_{in} = \pm 1V, R_L = 10k\Omega$



Maximum Output Voltage vs. Operating Voltage  
 $R_L = 2k\Omega, T_a = 25^\circ C$

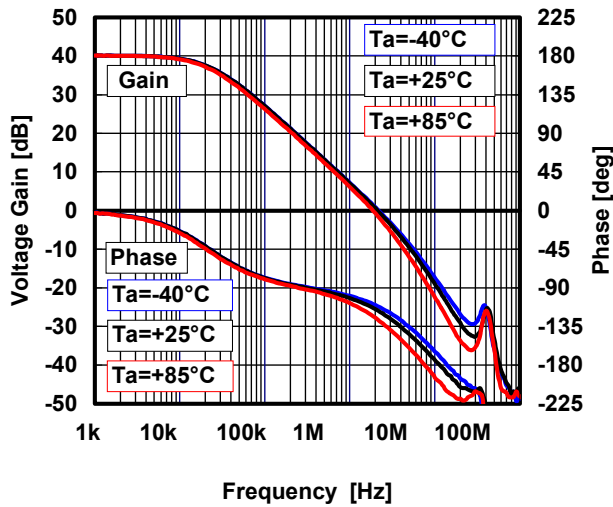


Maximum Output Voltage vs. Operating Current  
 $V_+/V_- = \pm 15V, T_a = 25^\circ C$



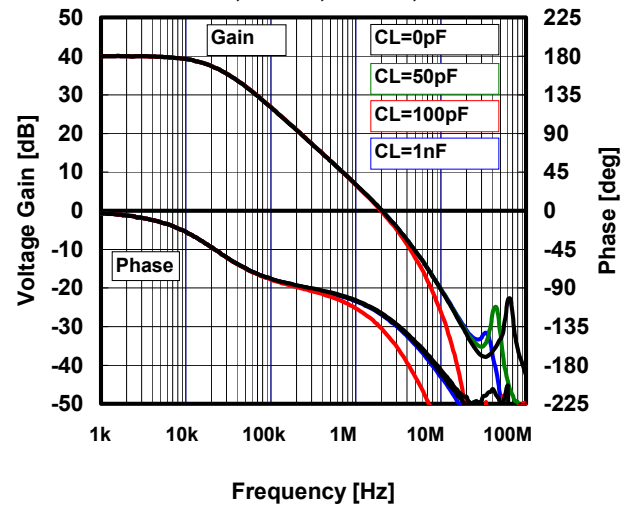
## Voltage Gain & Phase vs. Frequency

V+/V- = ±15V, VIN = 0.02Vpp, GV = 40dB, RT = 50Ω, RF = 1.98kΩ, RG = 20Ω, CF = 0, RL = 2kΩ, CL = 50pF



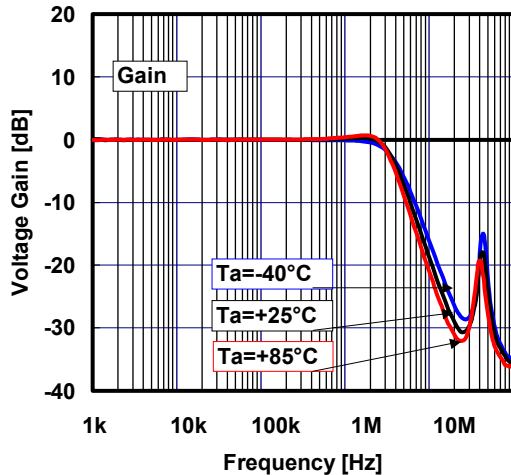
## Voltage Gain & Phase vs. Frequency

V+/V- = ±15V, VIN = 0.01Vpp, GV = 40dB, RT = 50Ω, RF = 1.98kΩ, RG = 20Ω, RL = 10kΩ, Ta = +25°C



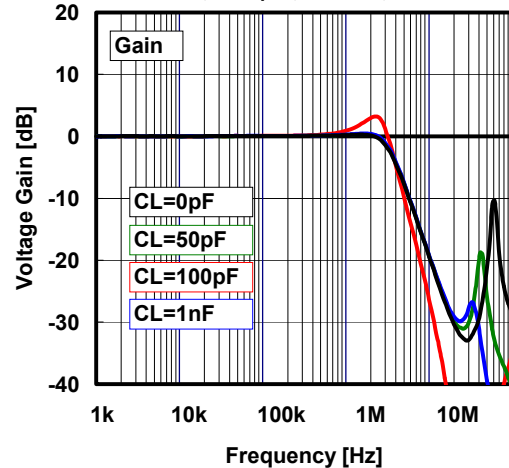
## Peak Gain of Voltage Follower

V+/V- = ±15V, VIN = 0.02Vpp, GV = 0dB, RT = 50Ω, RF = 0Ω, RG = open, CF = 0, RL = 2kΩ, CL = 50pF



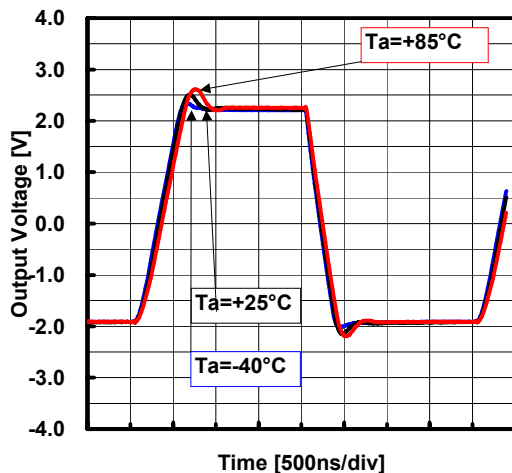
## Peak Gain of Voltage Follower

V+/V- = ±15V, VIN = 0.02Vpp, GV = 0dB, RT = 50Ω, RF = 0Ω, RG = open, RL = 10kΩ, Ta = +25°C



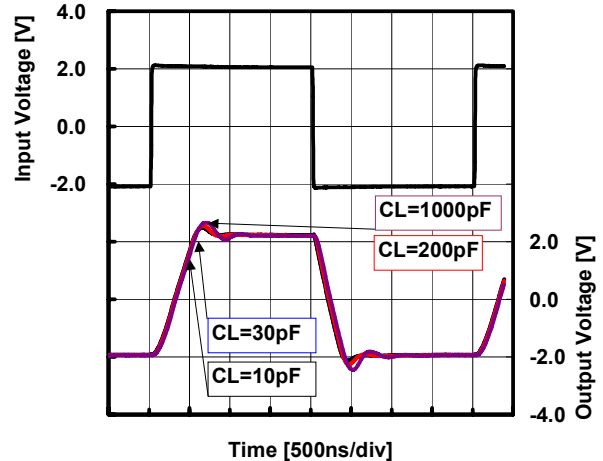
## Pulse Response

V+/V- = ±15V, f = 250kHz, VO = 4VPP, GV = 0dB, RT = 50Ω, RF = 0Ω, CF = 0, RG = open, CL = 50pF, RL = 10kΩ



## Pulse Response

V+/V- = ±15V, f = 250kHz, VO = 4VPP, GV = 0dB, RT = 50Ω, RF = 0Ω, CF = 0, RG = open, RL = 10kΩ, Ta = 25°C



[CAUTION]  
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