

## High Speed Single Supply Quad Operational Amplifier

### ■ GENERAL DESCRIPTION

The **NJM2744** is a high-speed single supply quad operational amplifier. The low  $V_{OL}$  enables to treat small output signal on a single supply.

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

The **NJM2744** is suitable for power supply and motor driver units.

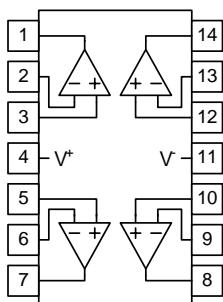
### ■ FEATURES

- Slew Rate 10V/ $\mu$ s typ.
- Capacitive Load Tolerance 1000pF typ.
- Output Voltage range 0.2V~3.7V at  $V^+=+5V$ ,  $R_L=2k\Omega$
- Operating Voltage 3V~32V
- Single Supply operation
- Bipolar Technology
- Package Outline DIP14, DMP14, SSOP14

### ■ APPLICATIONS

- Low side current sensing, Inverter motor control
- Power monitor module: UPS, PSU etc.
- Line driver, AD/DA buffer, FET driver

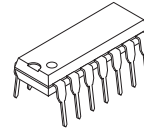
### ■ PIN CONFIGURATION



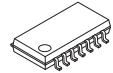
#### Pin Function

- |             |              |
|-------------|--------------|
| 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 |

### ■ PACKAGR OUTLINE



**NJM2744D**



**NJM2744M**



**NJM2744V**

# NJM2744

## ■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C, unless otherwise noted.)

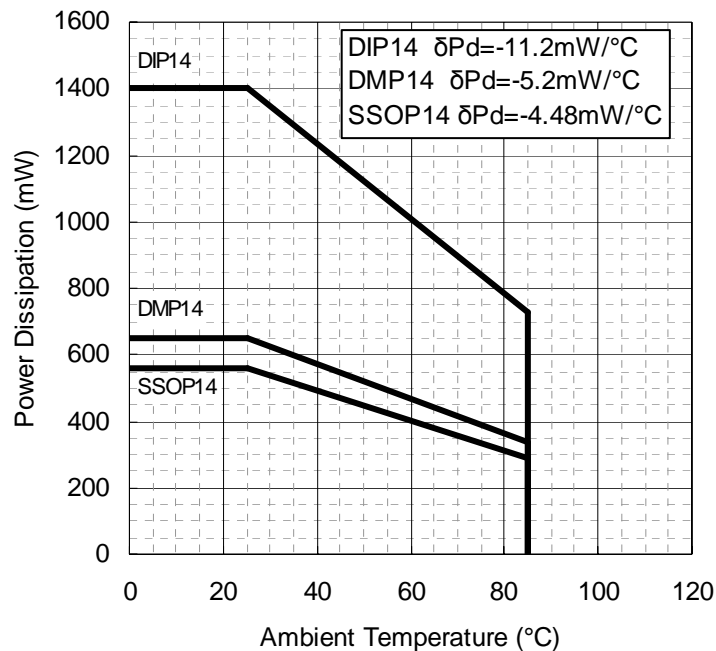
PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V <sup>+</sup>	+36	V
Common Mode Input Voltage Range	V <sub>ICM</sub>	-0.3 ~ +36(Note1)	V
Differential Input Voltage Range	V <sub>ID</sub>	±36(Note1)	V
Power Dissipation (Note3)	P <sub>D</sub>	1400(DIP14) (Note2) 650(DMP14) (Note2) 560(SSOP14) (Note2)	mW
Operating Temperature Range	Topr	-40~+85	°C
Storage Temperature Range	Tstg	-50~+150	°C

(Note1) For supply voltage less than +36V, the absolute maximum input voltage is equal to supply voltage.

(Note2) On the PCB "EIA/JEDEC (76.2x114.3x1.6mm, 2 layers, FR-4)"

(Note3) See Figure.1 "Power Dissipation Derating Curve" when ambient temperature is over 25°C.

Figure.1 Power Dissipation Derating Curve



## ■ RECOMMENDED OPERATING CONDITION (Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V <sup>+</sup>		3.0	-	32	V

## ■ ELECTRICAL CHARACTERISTICS

### ● DC CHARACTERISTICS ( $V^+/V^- = \pm 15V$ , $T_a = 25^\circ C$ , unless otherwise noted.)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current	$I_{CC}$	No Signal, $R_s = 50\Omega$	-	7.5	10	mA
Input Offset Voltage	$V_{IO}$	$R_s = 50\Omega$	-	2	12	mV
Input Bias Current	$I_B$	$R_s = 50\Omega$	-	80	400	nA
Input Offset Current	$I_{IO}$	$R_s = 50\Omega$	-	5	75	nA
Voltage Gain	$A_V$	$R_L \geq 2k\Omega$ , $V_o = \pm 10V$	80	110	-	dB
Common Mode Rejection Ratio	CMR	$-15V \leq V_{ICM} \leq 12.5V$	55	75	-	dB
Supply Voltage Rejection Ratio	SVR	$3V \leq V^+ \leq 32V$	70	90	-	dB
Maximum Output Voltage1	$V_{OM1}$	$R_L \geq 10k\Omega$ to GND	13.7 -13.7	14 -14.8	-	V
Maximum Output Voltage2	$V_{OM2}$	$R_L \geq 2k\Omega$ to GND	13.5 -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
Common Mode Input Voltage Range	$V_{ICM}$	CMR $\geq 55dB$	-15	-	12.5	V

### ● AC CHARACTERISTICS ( $V^+/V^- = \pm 15V$ , $T_a = 25^\circ C$ , unless otherwise noted.)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gain Bandwidth Product	GB		-	2	-	MHz
Slew Rate	SR		-	10	-	V/ $\mu s$
Equivalent Input Noise Voltage	$V_{NI}$	$f = 1kHz$	-	40	-	nV/ $\sqrt{Hz}$
Capacitive Load Tolerance	$C_L$		-	1000	-	pF

## ■ ELECTRICAL CHARACTERISTICS

### ● DC CHARACTERISTICS ( $V^+ = +5V$ , $V^- = 0V$ , $T_a = 25^\circ C$ , unless otherwise noted.)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current	$I_{CC}$	No Signal, $R_s = 50\Omega$	-	5.5	9	mA
Input Offset Voltage	$V_{IO}$	$R_s = 50\Omega$	-	2	12	mV
Input Bias Current	$I_B$	$R_s = 50\Omega$	-	80	400	nA
Input Offset Current	$I_{IO}$	$R_s = 50\Omega$	-	5	75	nA
Voltage Gain	$A_V$	$R_L = 2k\Omega$ , $V_o = \pm 1V$	80	110	-	dB
Common Mode Rejection Ratio	CMR	$0V \leq V_{ICM} \leq 2.8V$	50	60	-	dB
Supply Voltage Rejection Ratio	SVR	$3V \leq V^+ \leq 32V$	70	90	-	dB
Maximum Output Voltage1	$V_{OH}$	$R_L = 2k\Omega$ to GND	3.7	4	-	V
Maximum Output Voltage2	$V_{OL}$	$R_L = 2k\Omega$ to GND	-	0.1	0.2	V
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
Common Mode Input Voltage Range	$V_{ICM}$	CMR $\geq 50dB$	0	-	2.8	V

### ● AC CHARACTERISTICS ( $V^+ = +5V$ , $V^- = 0V$ , $T_a = 25^\circ C$ , unless otherwise noted.)

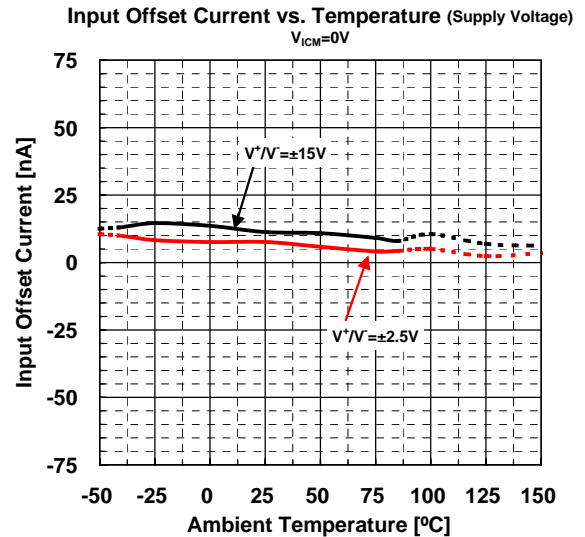
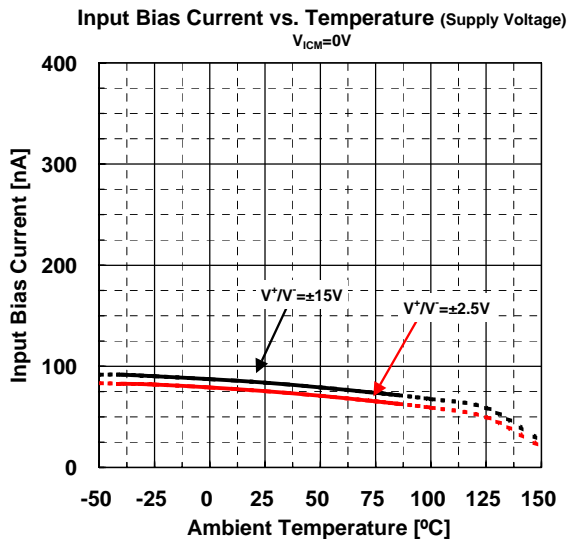
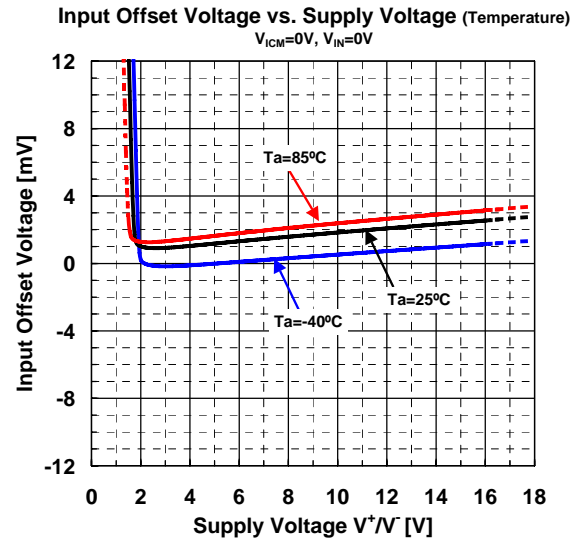
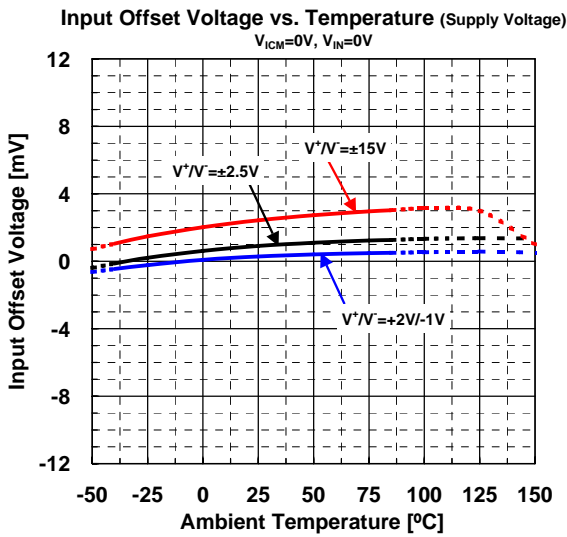
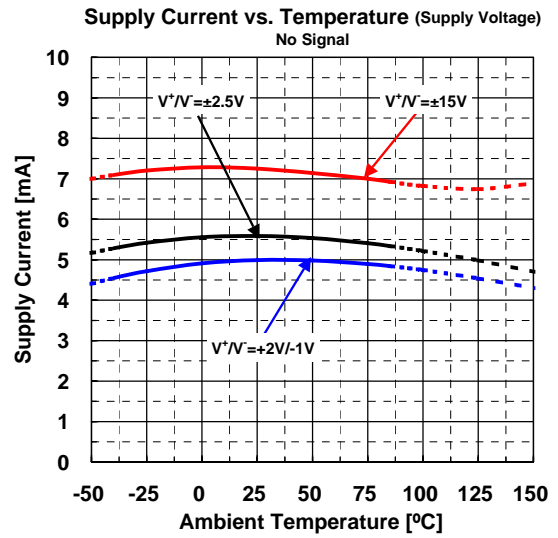
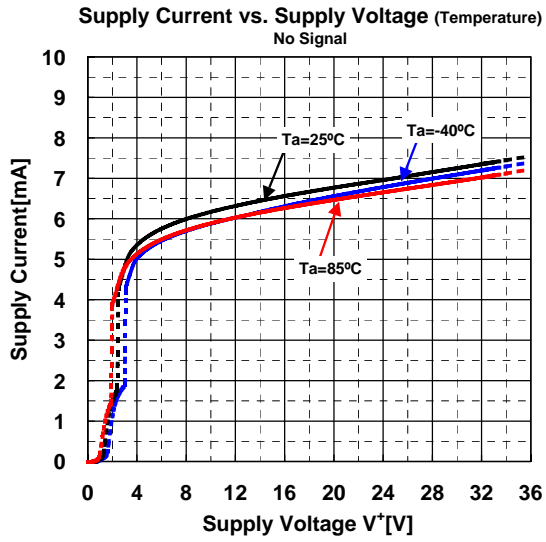
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gain Bandwidth Product	GB		-	2	-	MHz
Slew Rate	SR		-	7	-	V/ $\mu s$
Equivalent Input Noise Voltage	$V_{NI}$	$f = 1kHz$	-	40	-	nV/ $\sqrt{Hz}$
Capacitive Load Tolerance	$C_L$		-	1000	-	pF

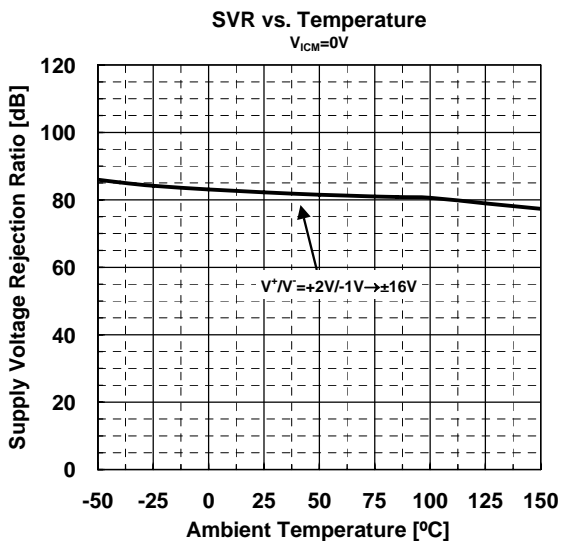
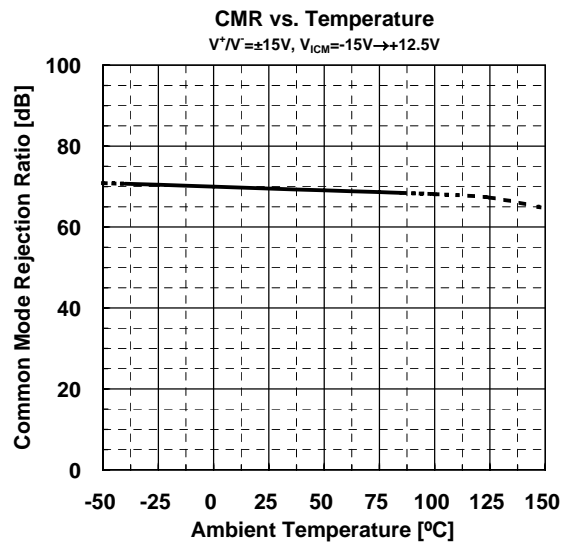
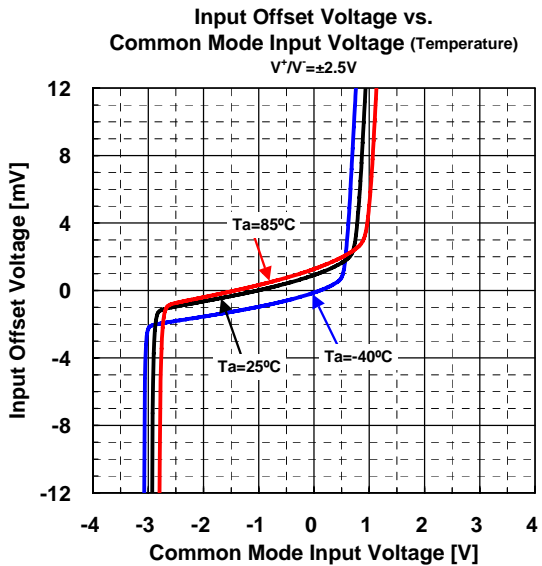
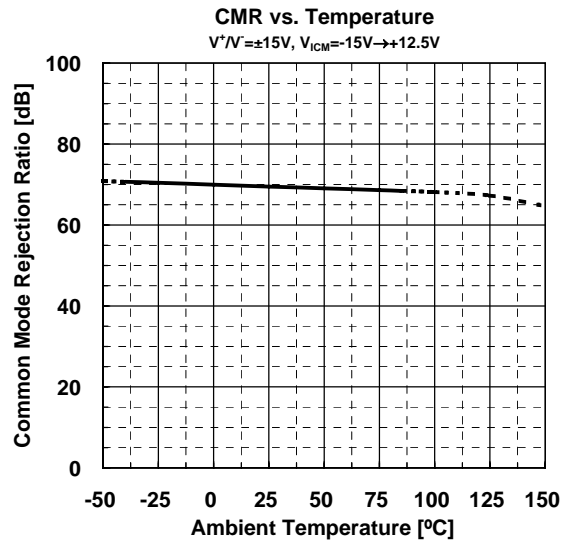
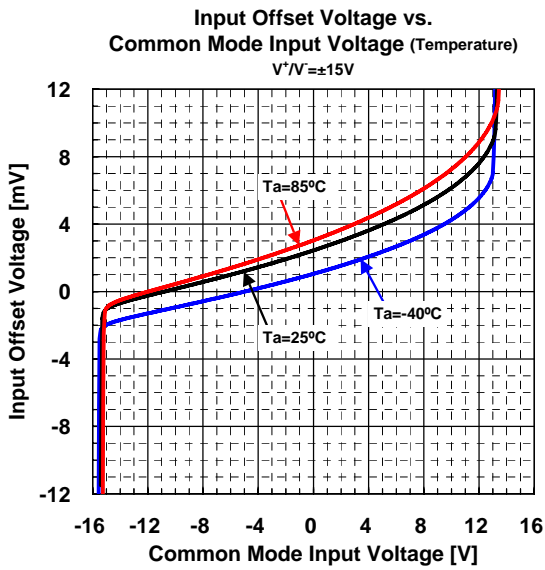
Note: The common mode input voltage range of NJM2744 is shifted toward the  $V^-$  for single supply use.

At the low operating voltage, the center potential of the  $V^+$  and  $V^-$  may be out of the common mode voltage range.

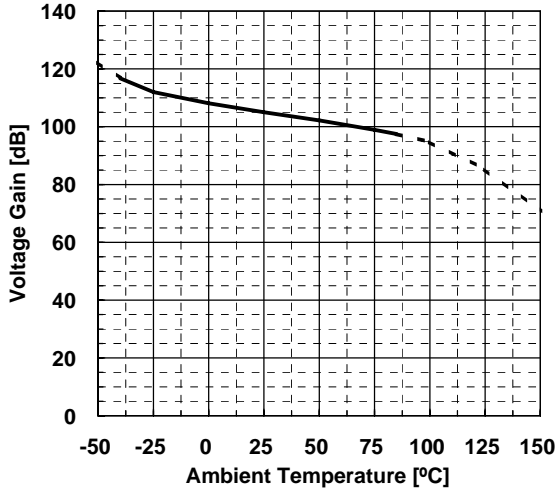
In this case, shift the common mode input voltage toward the  $V^-$ .

## ■ TYPICAL CHARACTERISTICS

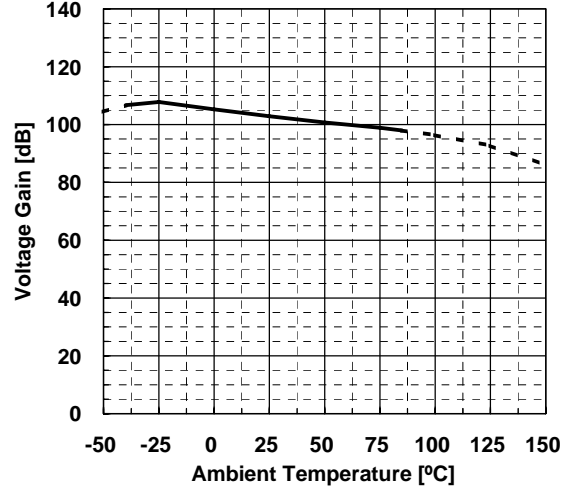




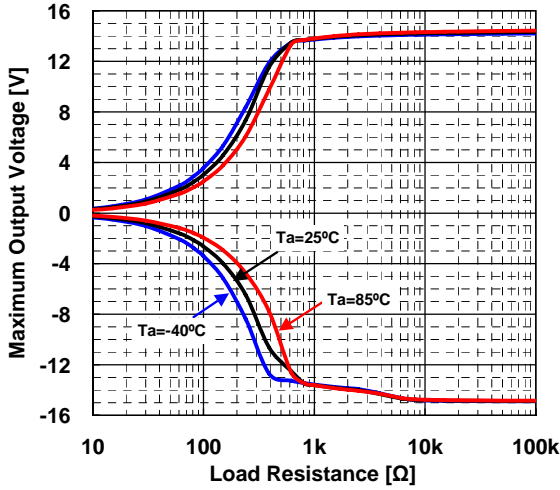
**Gain vs. Temperature**  
 $V^+V^- = \pm 15V$ ,  $R_L = 2k\Omega$  to  $0V$ ,  
 $C_L = 100p$  to  $0V$ ,  $V_O = -10V \rightarrow +10V$



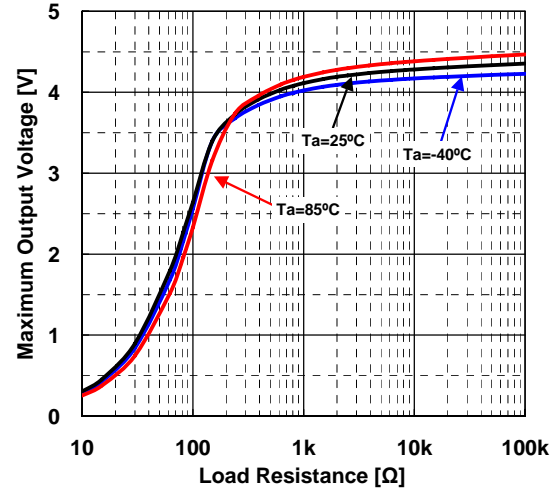
**Gain vs. Temperature**  
 $V^+V^- = \pm 2.5V$ ,  $R_L = 2k\Omega$  to  $0V$ ,  
 $C_L = 100p$  to  $0V$ ,  $V_O = -1V \rightarrow +1V$



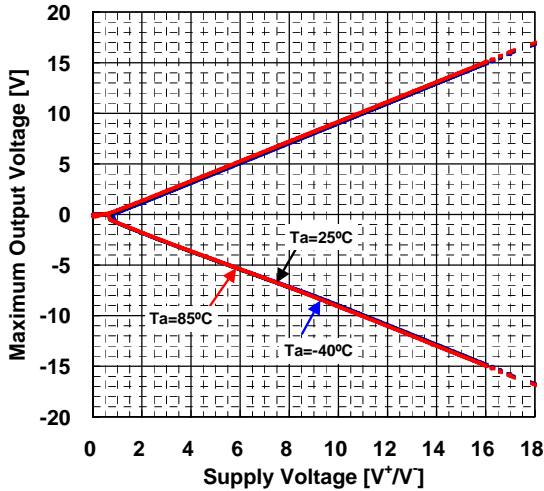
**Maximum Output Voltage vs. Load Resistance (Temperature)**  
 $V^+V^- = \pm 15V$ ,  $G_v = \text{open}$ ,  $R_L$  to  $0V$



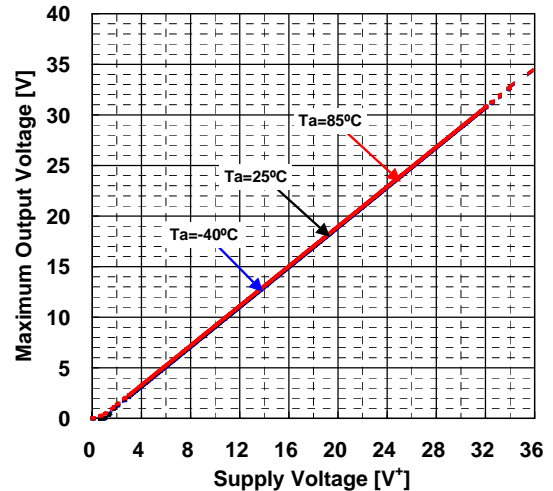
**Maximum Output Voltage vs. Load Resistance (Temperature)**  
 $V^+ = +5V$ ,  $R_L$  to  $0V$ ,  $G_v = \text{open}$

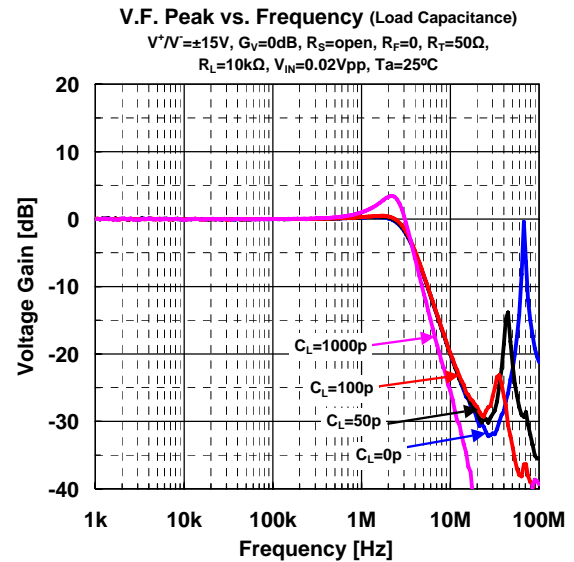
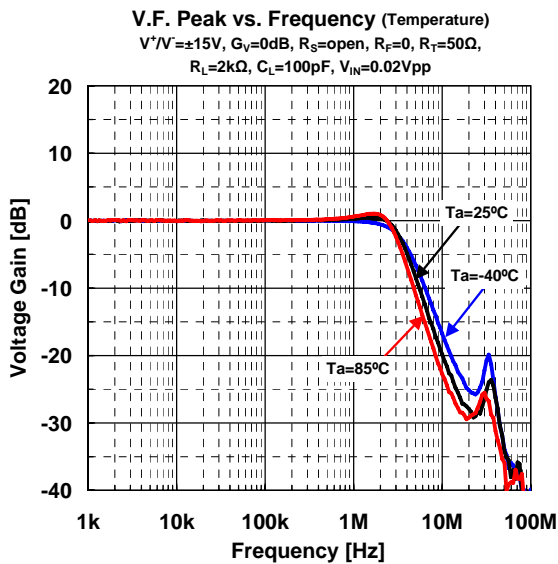
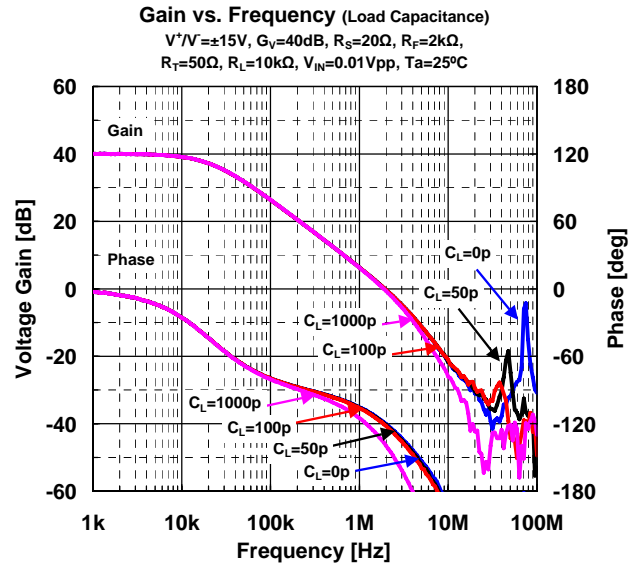
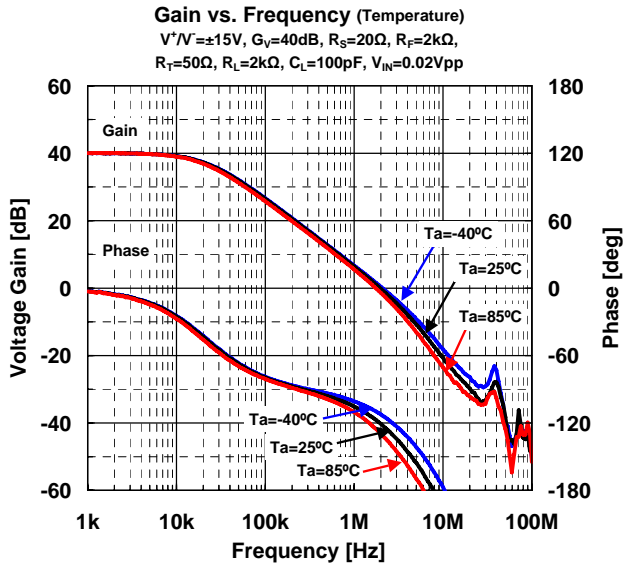
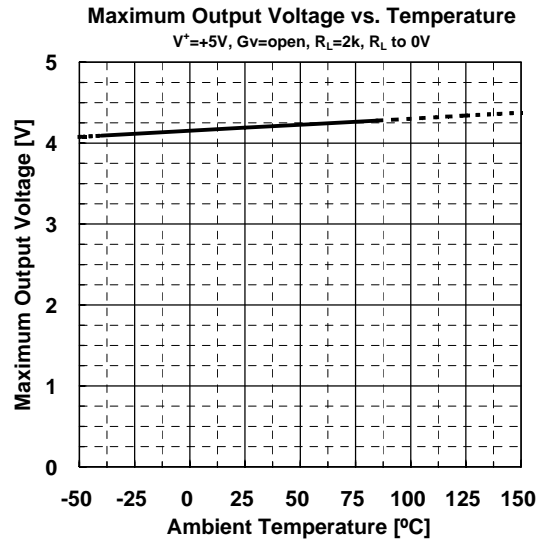
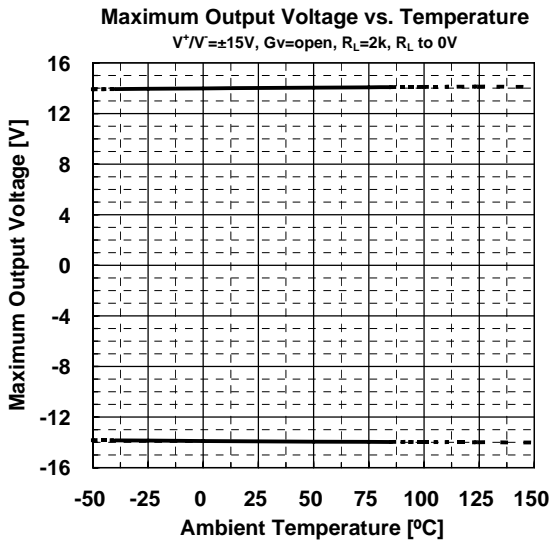


**Maximum Output Voltage vs. Supply Voltage (Temperature)**  
 $R_L = 2k$  to  $0V$



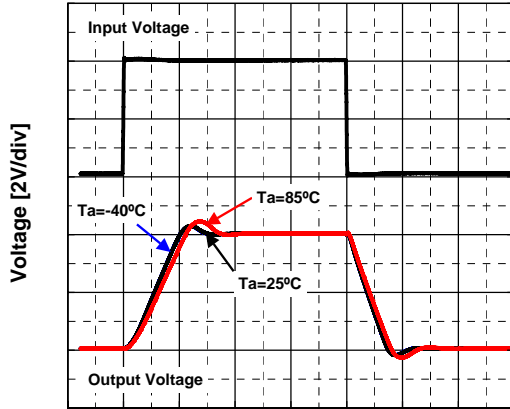
**Maximum Output Voltage vs. Supply Voltage (Temperature)**  
 $R_L = 2k$  to  $0V$





### Pulse Response (Temperature)

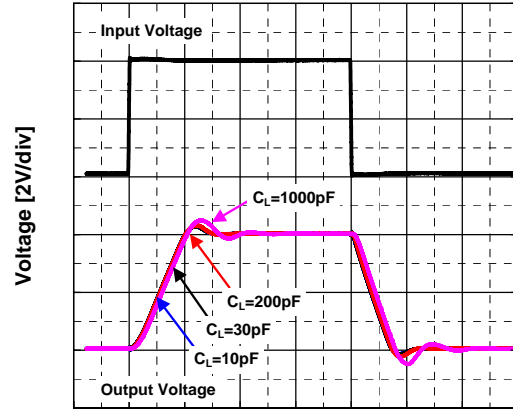
$V^*V = \pm 15V$ ,  $f = 250kHz$ ,  $V_{IN} = 4V_{p,p}$ ,  $Gv = 0dB$ ,  
 $R_T = 50\Omega$ ,  $R_F = 0\Omega$ ,  $R_G = open$ ,  $C_L = 100pF$ ,  $R_L = 10k\Omega$



Time[0.5 $\mu$ sec/div]

### Pulse Response (Load Capacitance)

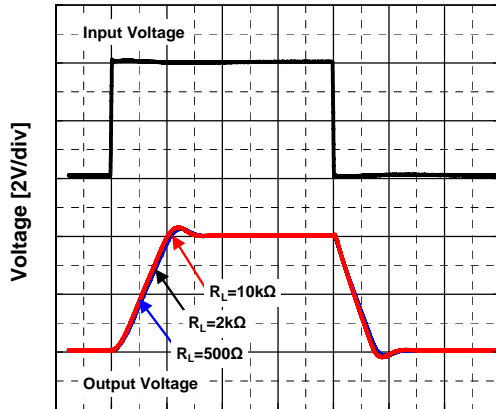
$V^*V = \pm 15V$ ,  $f = 250kHz$ ,  $V_{IN} = 4V_{p,p}$ ,  $Gv = 0dB$ ,  
 $R_T = 50\Omega$ ,  $R_F = 0\Omega$ ,  $R_G = open$ ,  $R_L = 10k\Omega$ ,  $Ta = 25^\circ C$



Time[0.5 $\mu$ sec/div]

### Pulse Response (Load Resistance)

$V^*V = \pm 15V$ ,  $f = 250kHz$ ,  $V_{IN} = 4V_{p,p}$ ,  $Gv = 0dB$ ,  
 $R_T = 50\Omega$ ,  $R_F = 0\Omega$ ,  $R_G = open$ ,  $C_L = 100pF$ ,  $Ta = 25^\circ C$



Time[0.5 $\mu$ sec/div]



## ■NOTE

**[CAUTION]**

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