

## Full-Swing Input and Output type Quad Operational Amplifier

### ■ GENERAL DESCRIPTION

**NJM2734** is single supply quad operational amplifier with full swing input and output, operates from 1.8V.

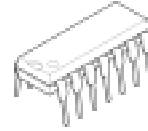
Input and Output Full Swing provides wide dynamic range, is from ground to power supply level. In addition to ground sensing applications, **NJM2734** enable to be applied to Hi-side sensing applications.

The features are low noise and low operating voltage for battery management, portable audio applications, and others.

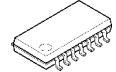
### ■ FEATURES

- Operating Voltage : 1.8 to 6.0V
- Input Full-Swing :  $V_{ICM} = 0$  to 5.0V, at  $V^+ = 5V$
- Output Full-Swing :  $V_{OH} \geq 4.9V / V_{OL} \leq 0.1V$ , at  $V^+ = 5V, R_L = 20k\Omega$
- Load Drivability :  $V_{OH} \geq 4.75V / V_{OL} \leq 0.25V$ , at  $V^+ = 5V, R_L = 2k\Omega$
- Offset Voltage : 5mV max.
- Slew Rate : 0.4V/ $\mu$ s typ.
- Low Input Voltage Noise : 10nV/ $\sqrt{Hz}$  typ.
- Adequate phase margin :  $\Phi_M = 75deg.$  typ., at  $R_L = 2k\Omega$
- Bipolar Technology
- Package Outline : DIP14, DMP14, EMP14, SSOP14

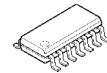
### ■ PACKAGE OUTLINE



**NJM2734D**



**NJM2734M**

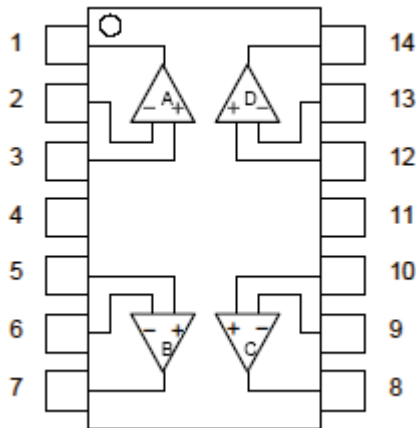


**NJM2734E**



**NJM2734V**

### ■ PIN CONFIGURATION



#### PIN FUNCTION

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

**NJM2734D**  
**NJM2734M**  
**NJM2734E**  
**NJM2734V**

# NJM2734

## ■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V <sup>+</sup>	7.0	V
Differential Input Voltage Range	V <sub>ID</sub>	±1.0 (Note1)	V
Common Mode Input Voltage Range	V <sub>IC</sub>	0 ~ 7.0 (Note1)	V
Power Dissipation	P <sub>D</sub>	(DIP14) 700 (DMP14) 520 (Note2) (EMP14) 720 (Note2) (SSOP14) 450 (Note2)	mW
Operating Temperature Range	T <sub>opr</sub>	-40~+85	°C
Storage Temperature Range	T <sub>stg</sub>	-40~+125	°C

(Note1) For supply voltage less than 7V, 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)”

## ■ RECOMMENDED OPERATING CONDITION

(Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V <sup>+</sup>	1.8 to 6.0	V

## ■ ELECTRICAL CHARACTERISTICS (V<sup>+</sup>=5V, Ta=25°C)

### ●DC CHARACTERISTICS

(V<sup>+</sup>=5V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Current	I <sub>CC</sub>	No signal applied	-	1.2	1.8	mA
Input Offset Voltage	V <sub>IO</sub>		-	1	5	mV
Input Bias Current	I <sub>B</sub>		-	50	250	nA
Input Offset Current	I <sub>IO</sub>		-	5	100	nA
Large Signal Voltage Gain	A <sub>V</sub>	R <sub>L</sub> =2kΩ to 2.5V	60	85	-	dB
Common Mode Rejection Ratio	CMR	CMR+: 2.5V ≤ V <sub>CM</sub> ≤ 5V (Note3) CMR -: 0V ≤ V <sub>CM</sub> ≤ 2.5V (Note3)	55	70	-	dB
Supply Voltage Rejection Ratio	SVR	V <sup>+</sup> N=±2.0V ~ ±3.0V	70	85	-	dB
Maximum Output Voltage 1	V <sub>OH1</sub>	R <sub>L</sub> =20kΩ to 2.5V	4.9	4.95	-	V
	V <sub>OL1</sub>	R <sub>L</sub> =20kΩ to 2.5V	-	0.05	0.1	V
Maximum Output Voltage 2	V <sub>OH2</sub>	R <sub>L</sub> =2kΩ to 2.5V	4.75	4.85	-	V
	V <sub>OL2</sub>	R <sub>L</sub> =2kΩ to 2.5V	-	0.15	0.25	V
Input Common Mode Voltage Range	V <sub>ICM</sub>	CMR ≥ 55dB	0	-	5	V

(Note3) CMR is represented by either CMR+ or CMR- has lower value.

CMR+ is measured with 2.5V ≤ V<sub>CM</sub> ≤ 5.0 and CMR- is measured with 0V ≤ V<sub>CM</sub> ≤ 2.5V.

### ●AC CHARACTERISTICS

(V<sup>+</sup>=5V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Unity Gain Bandwidth	GB	R <sub>L</sub> =2kΩ to 2.5V	-	1	-	MHz
Phase Margin	Φ <sub>M</sub>	R <sub>L</sub> =2kΩ to 2.5V	-	75	-	Deg
Equivalent Input Noise Voltage	V <sub>NI</sub>	f=1kHz	-	10	-	nV/√Hz
Amp to Amp Separation	CS	f=1kHz R <sub>L</sub> =2kΩ to 2.5V, V <sub>O</sub> =1.2Vrms	-	133	-	dB

### ●TRANSIENT CHARACTERISTICS

(V<sup>+</sup>=5V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate	SR	R <sub>L</sub> =2kΩ to 2.5V	-	0.4	-	V/μs

## ■ ELECTRICAL CHARACTERISTICS ( $V^+=3V, T_a=25^\circ C$ )

### ●DC CHARACTERISTICS

( $V^+=3V, T_a=25^\circ C$ )

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Current	$I_{CC}$	No signal applied	-	1	1.8	mA
Input Offset Voltage	$V_{IO}$		-	1	5	mV
Input Bias Current	$I_B$		-	50	250	nA
Input Offset Current	$I_{IO}$		-	5	100	nA
Large Signal Voltage Gain	$A_V$	$R_L=2k\Omega$ to 1.5V	60	84	-	dB
Common Mode Rejection Ratio	CMR	CMR+: $1.5V \leq V_{CM} \leq 3V$ (Note4) CMR -: $0V \leq V_{CM} \leq 1.5V$ (Note4)	48	63	-	dB
Supply Voltage Rejection Ratio	SVR	$V^+V^- = \pm 1.2V \sim \pm 2.0V$	68	83	-	dB
Maximum Output Voltage 1	$V_{OH1}$	$R_L=20k\Omega$ to 1.5V	2.9	2.95	-	V
	$V_{OL1}$	$R_L=20k\Omega$ to 1.5V	-	0.05	0.1	V
Maximum Output Voltage 2	$V_{OH2}$	$R_L=2k\Omega$ to 1.5V	2.75	2.85	-	V
	$V_{OL2}$	$R_L=2k\Omega$ to 1.5V	-	0.15	0.25	V
Input Common Mode Voltage Range	$V_{ICM}$	CMR $\geq$ 48dB	0	-	3	V

(Note4) CMR is represented by either CMR+ or CMR- has lower value.

CMR+ is measured with  $1.5V \leq V_{CM} \leq 3.0$  and CMR- is measured with  $0V \leq V_{CM} \leq 1.5V$ .

### ●AC CHARACTERISTICS

( $V^+=3V, T_a=25^\circ C$ )

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Unity Gain Bandwidth	GB	$R_L=2k\Omega$ to 1.5V	-	1	-	MHz
Phase Margin	$\Phi_M$	$R_L=2k\Omega$ to 1.5V	-	75	-	Deg
Equivalent Input Noise Voltage	$V_{NI}$	$f=1kHz$	-	10	-	$nV/\sqrt{Hz}$
Amp to Amp Separation	CS	$f=1kHz$ $R_L=2k\Omega$ to 1.5V, $V_o=0.7V_{rms}$	-	130	-	dB

### ●TRANSIENT CHARACTERISTICS

( $V^+=3V, T_a=25^\circ C$ )

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate	SR	$R_L=2k\Omega$ to 1.5V	-	0.35	-	V/ $\mu s$

# NJM2734

## ■ ELECTRICAL CHARACTERISTICS ( $V^+=1.8V$ , $T_a=25^\circ C$ )

### ●DC CHARACTERISTICS

( $V^+=1.8V$ ,  $T_a=25^\circ C$ )

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Current	$I_{CC}$	No signal applied	-	0.9	1.6	mA
Input Offset Voltage	$V_{IO}$		-	1	5	mV
Input Bias Current	$I_B$		-	50	250	nA
Input Offset Current	$I_{IO}$		-	5	100	nA
Large Signal Voltage Gain	$A_V$	$R_L=2k\Omega$ to 0.9V	60	83	-	dB
Common Mode Rejection Ratio	CMR	CMR+: $0.9 \leq V_{CM} \leq 1.8V$ (Note5) CMR-: $0V \leq V_{CM} \leq 0.9V$ (Note5)	40	55	-	dB
Supply Voltage Rejection Ratio	SVR	$V^+V^- = \pm 0.9V \sim \pm 1.2V$	65	80	-	dB
Maximum Output Voltage 1	$V_{OH1}$	$R_L=20k\Omega$ to 0.9V	1.7	1.75	-	V
	$V_{OL1}$	$R_L=20k\Omega$ to 0.9V	-	0.05	0.1	V
Maximum Output Voltage 2	$V_{OH2}$	$R_L=2k\Omega$ to 0.9V	1.55	1.65	-	V
	$V_{OL2}$	$R_L=2k\Omega$ to 0.9V	-	0.15	0.25	V
Input Common Mode Voltage Range	$V_{ICM}$	CMR $\geq$ 40dB	0	-	1.8	V

(Note5) CMR is represented by either CMR+ or CMR- has lower value.

CMR+ is measured with  $0.9V \leq V_{CM} \leq 1.8$  and CMR- is measured with  $0V \leq V_{CM} \leq 0.9V$ .

### ●AC CHARACTERISTICS

( $V^+=1.8V$ ,  $T_a=25^\circ C$ )

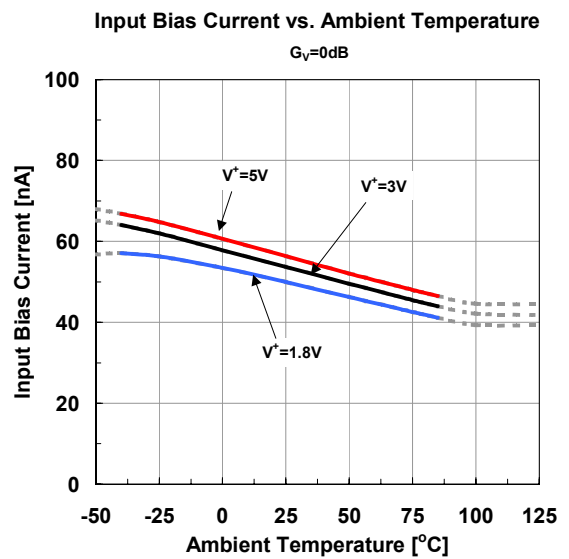
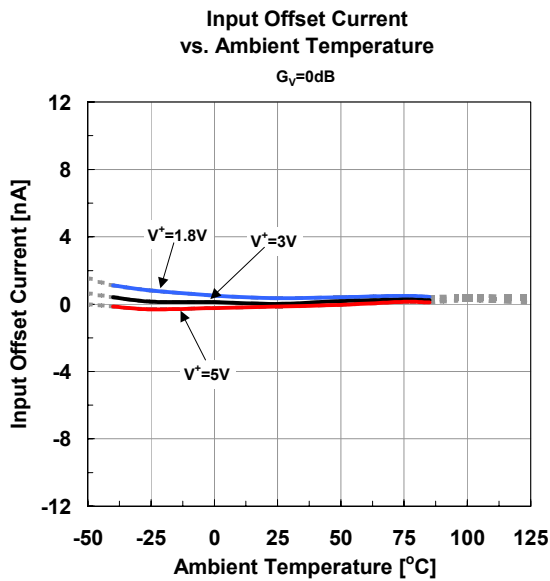
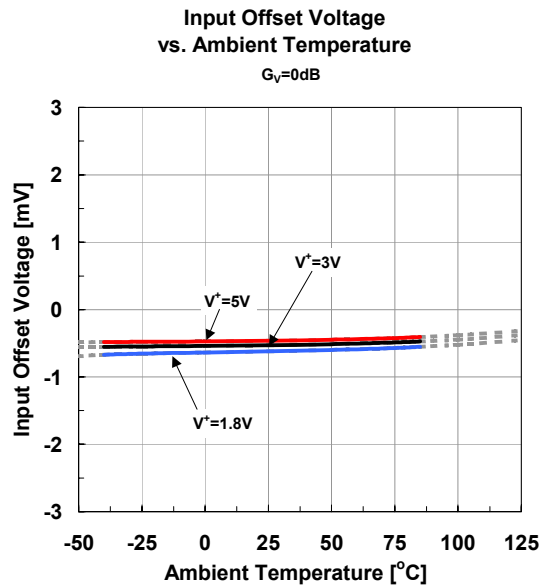
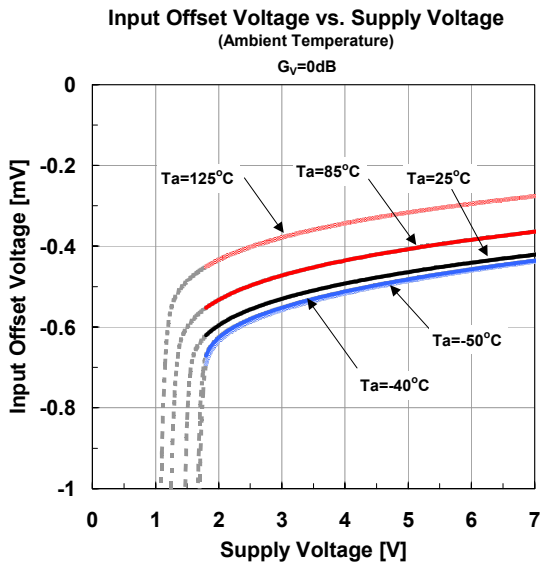
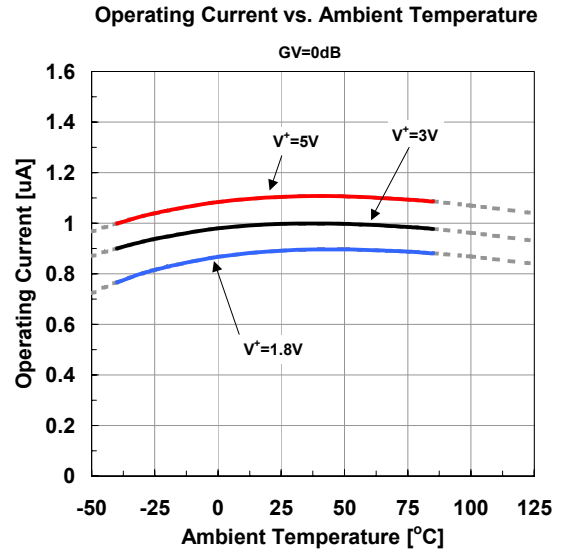
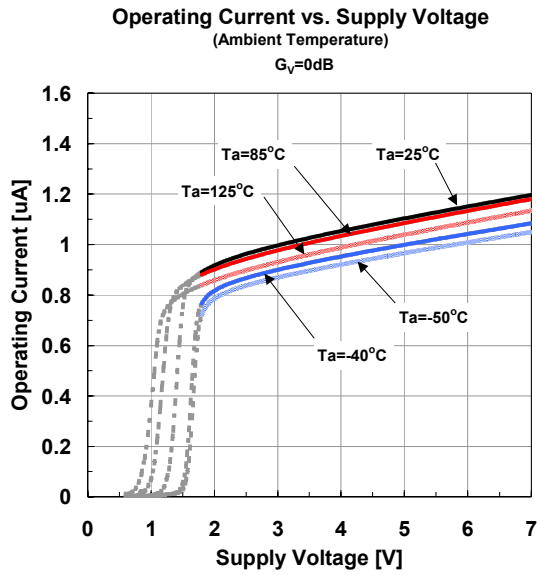
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Unity Gain Bandwidth	GB	$R_L=2k\Omega$ to 0.9V	-	1	-	MHz
Phase Margin	$\Phi_M$	$R_L=2k\Omega$ to 0.9V	-	75	-	Deg
Equivalent Input Noise Voltage	$V_{NI}$	$f=1kHz$	-	10	-	$nV/\sqrt{Hz}$
Amp to Amp Separation	CS	$f=1kHz$ $R_L=2k\Omega$ to 0.9V, $V_o=0.4V_{rms}$	-	125	-	dB

### ●TRANSIENT CHARACTERISTICS

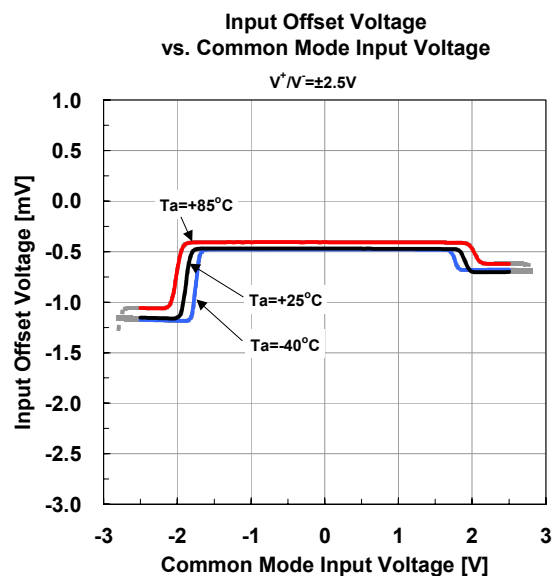
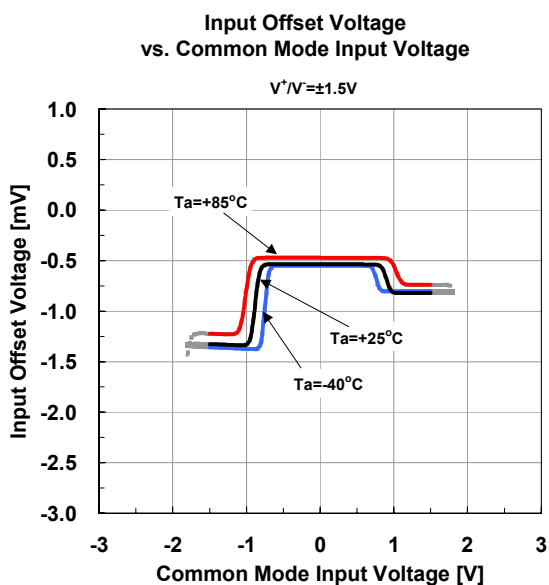
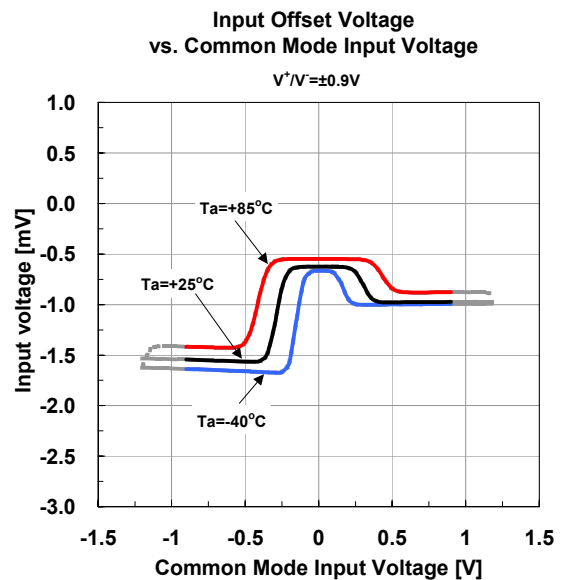
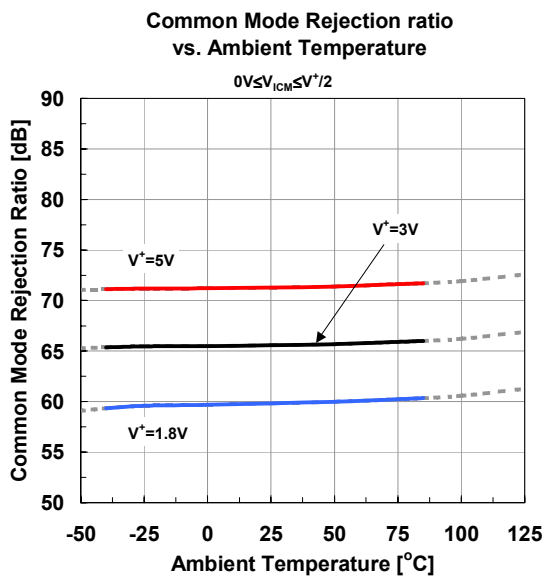
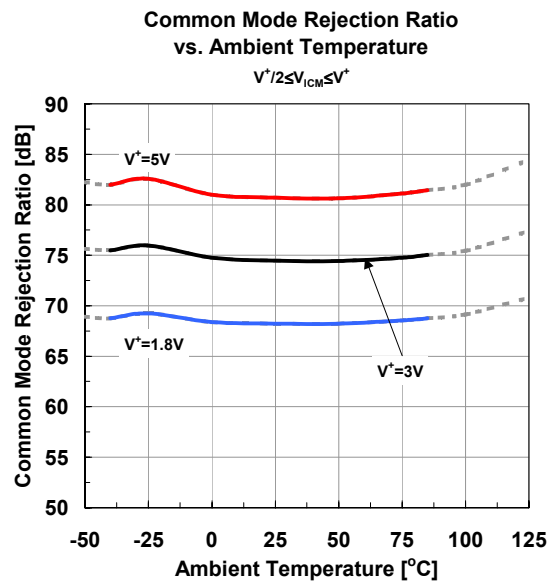
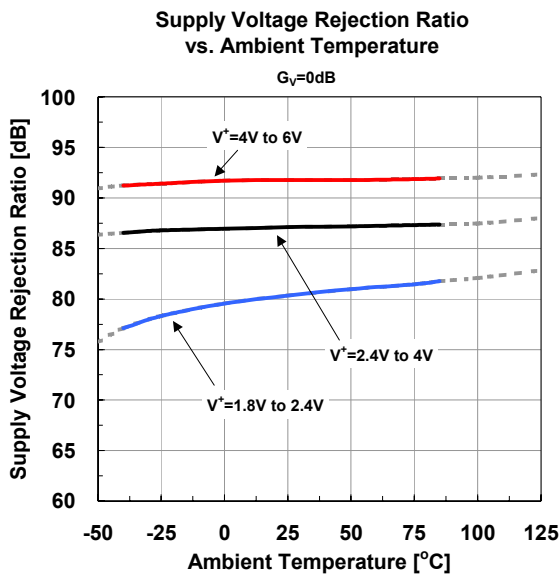
( $V^+=1.8V$ ,  $T_a=25^\circ C$ )

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate	SR	$R_L=2k\Omega$ to 0.9V	-	0.3	-	V/ $\mu s$

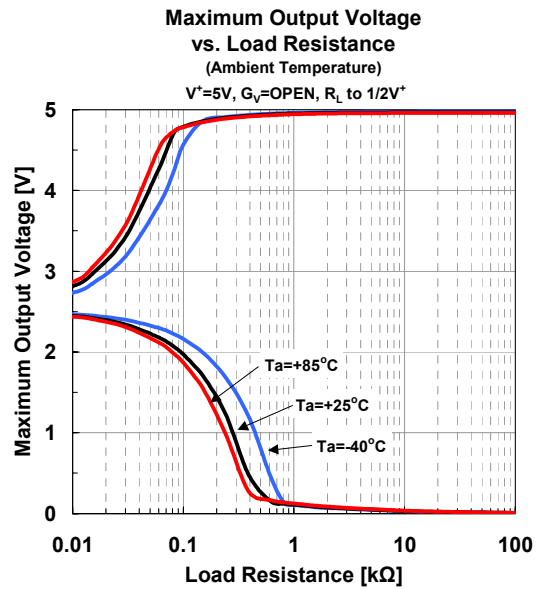
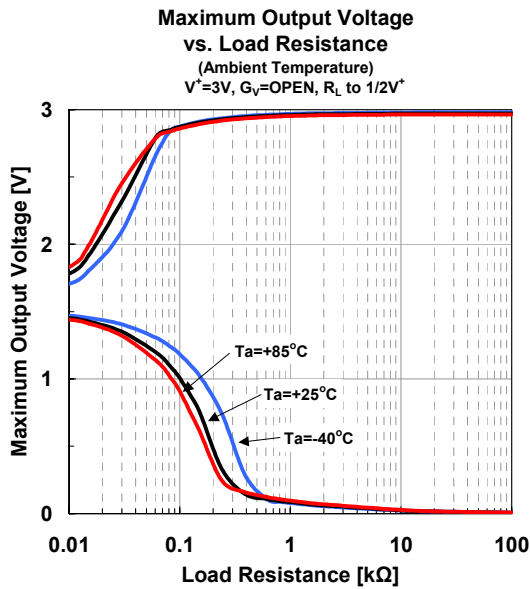
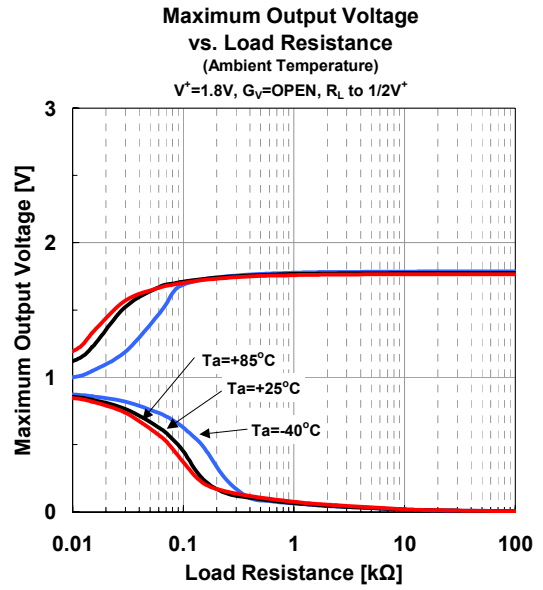
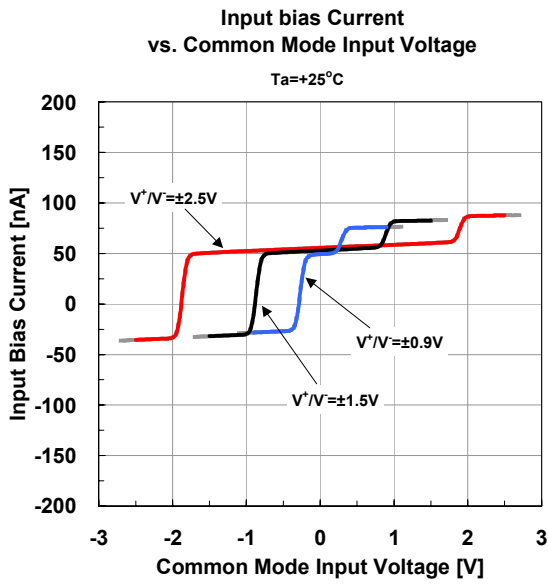
## Typical Characteristics



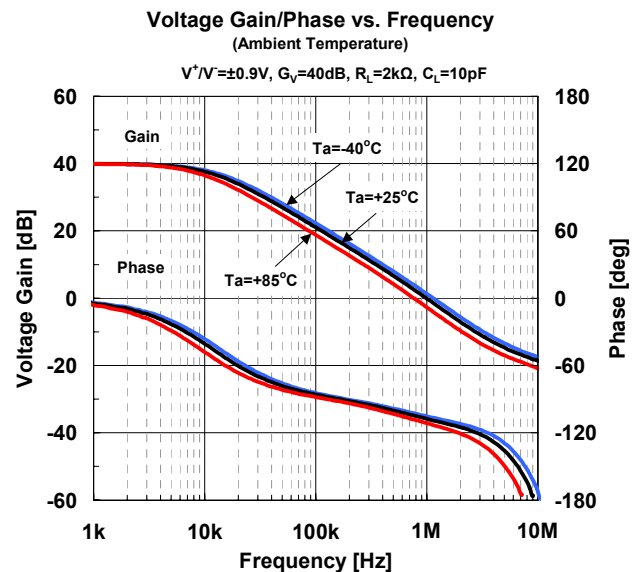
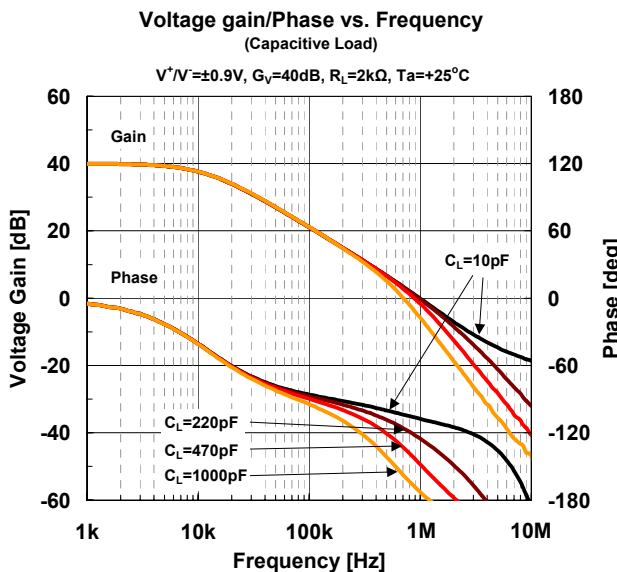
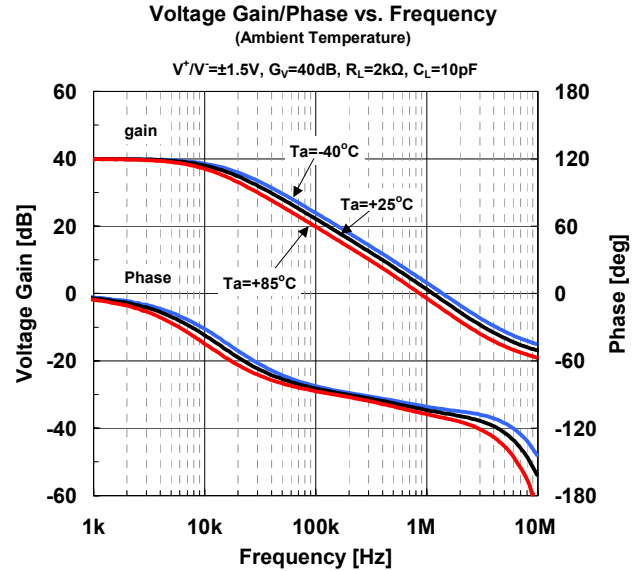
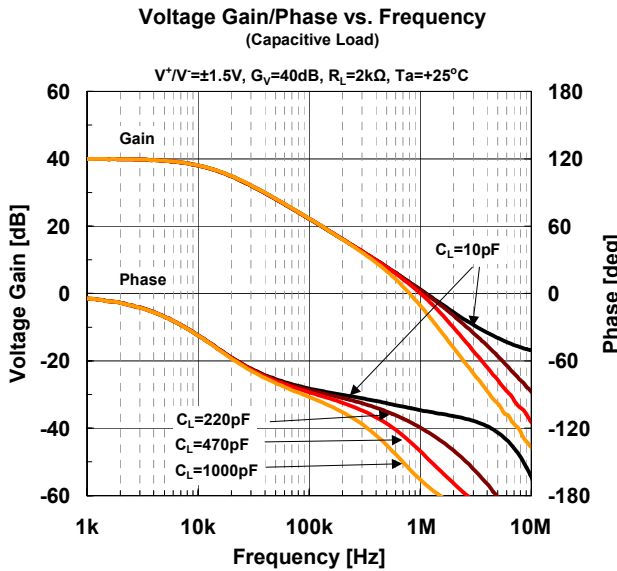
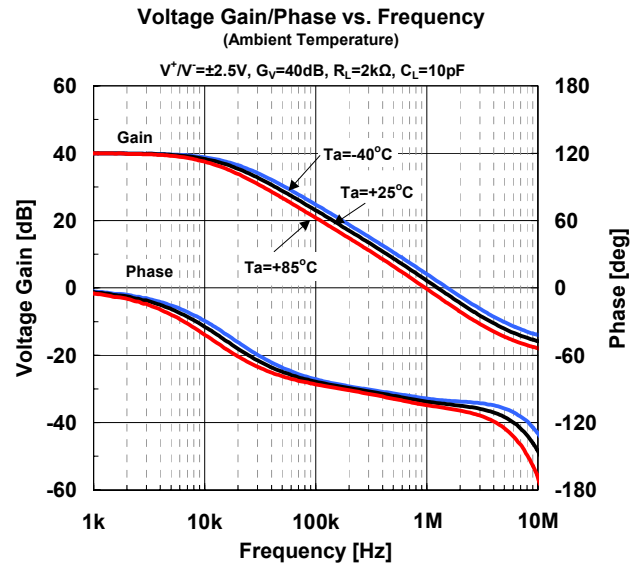
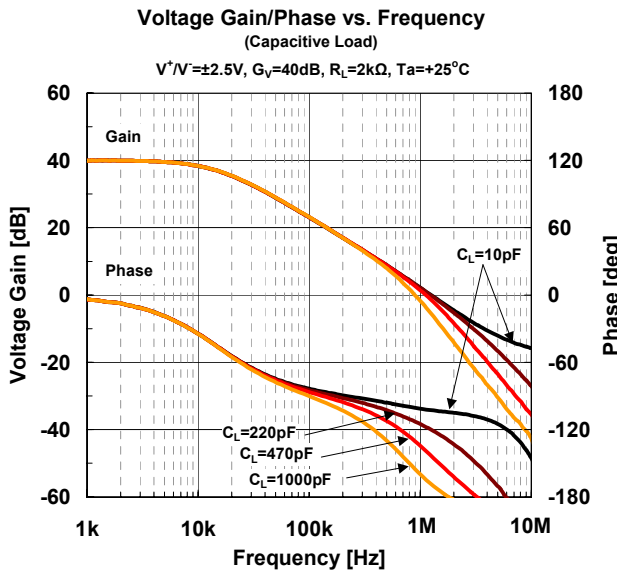
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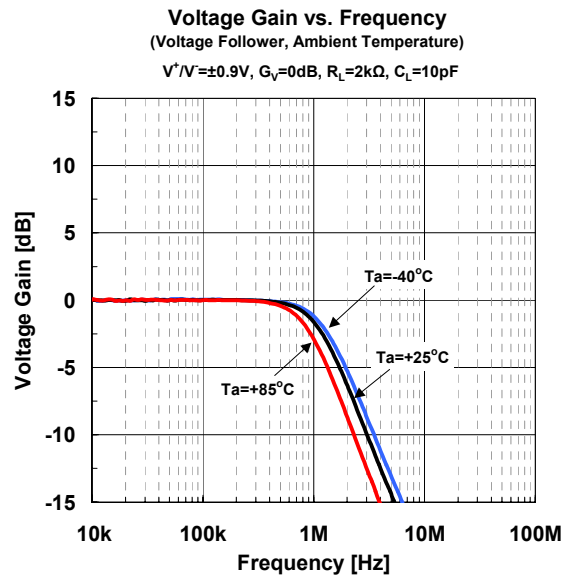
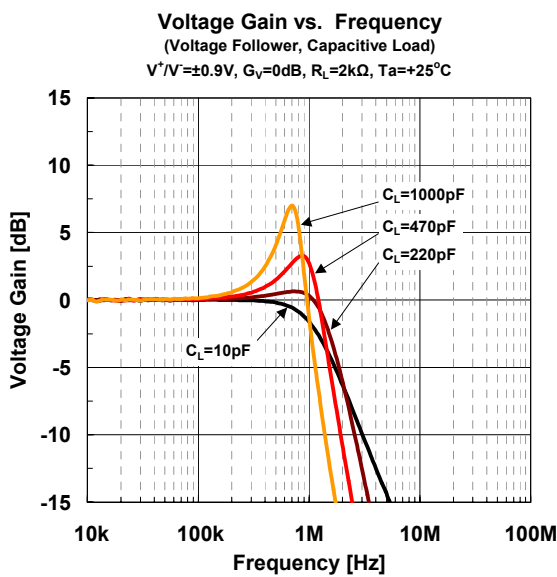
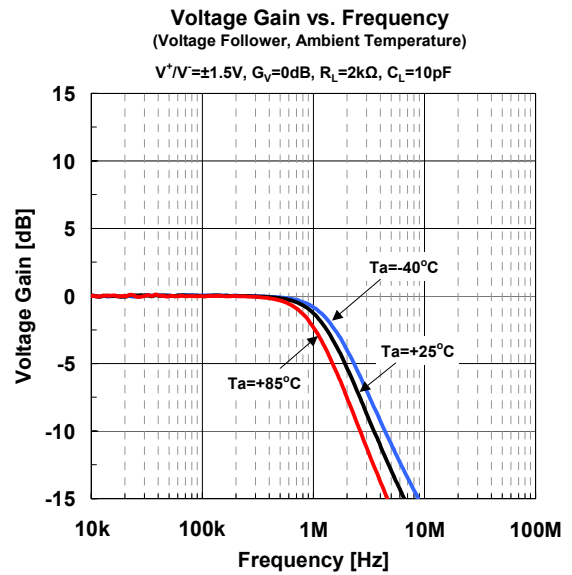
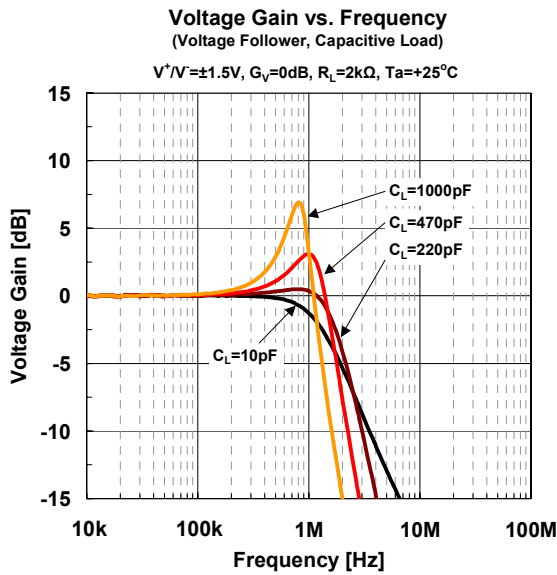
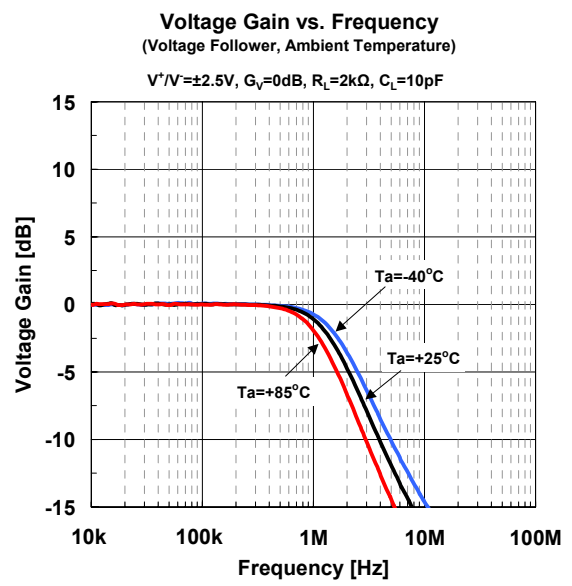
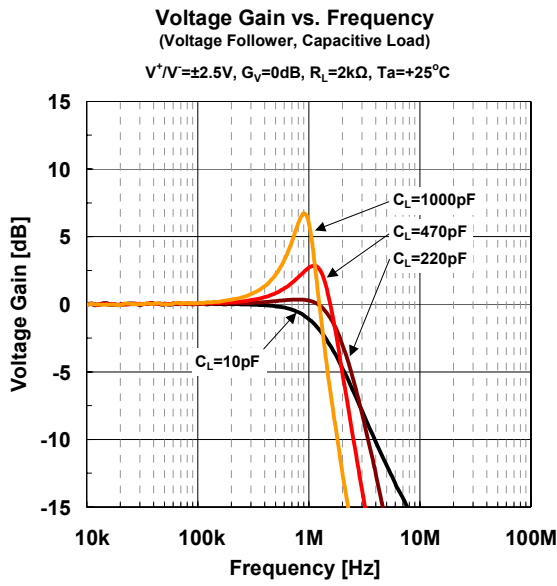


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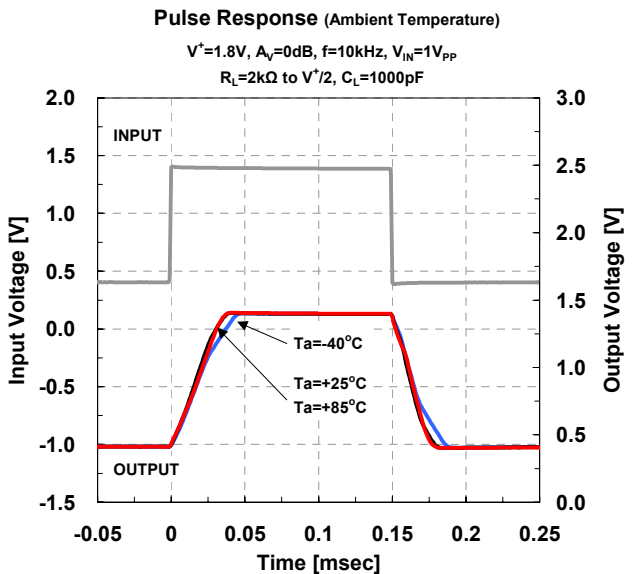
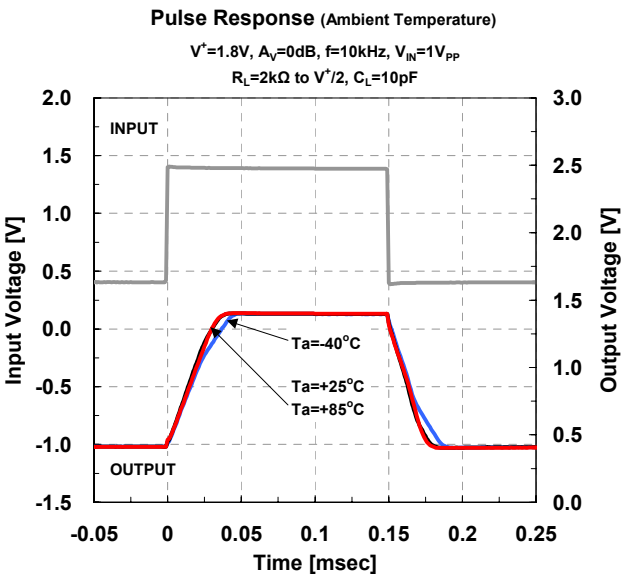
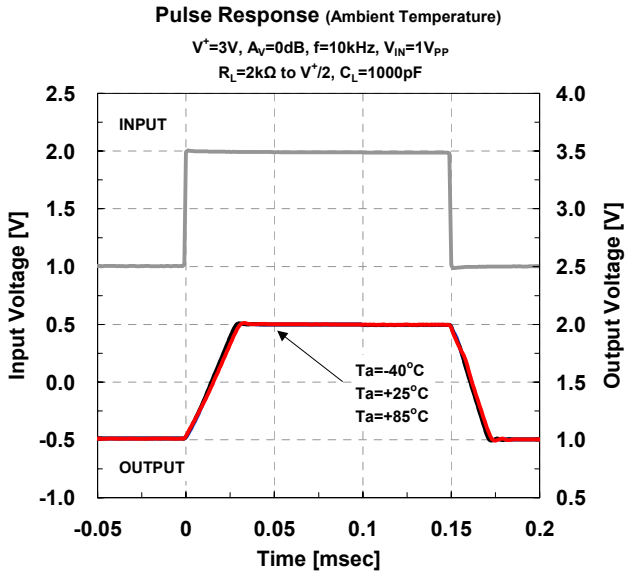
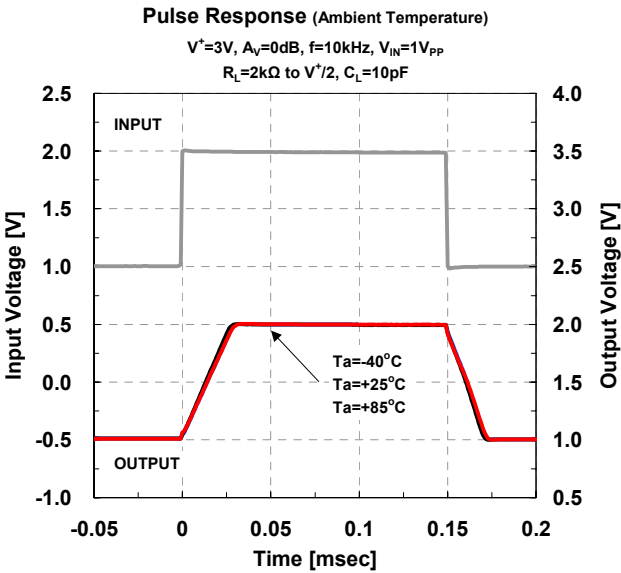
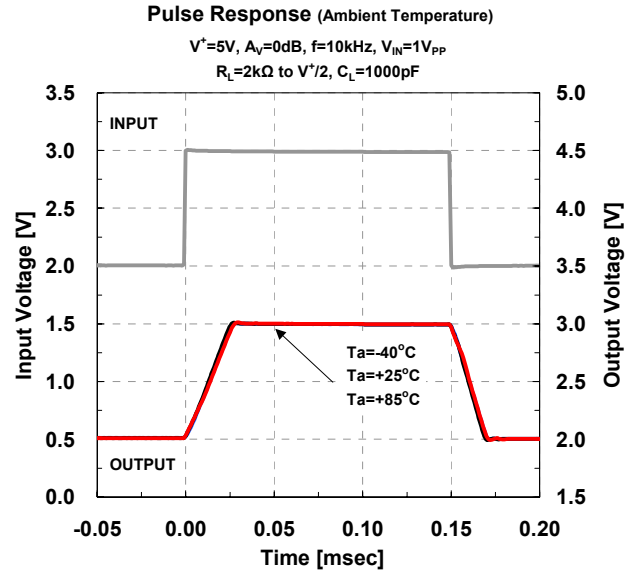
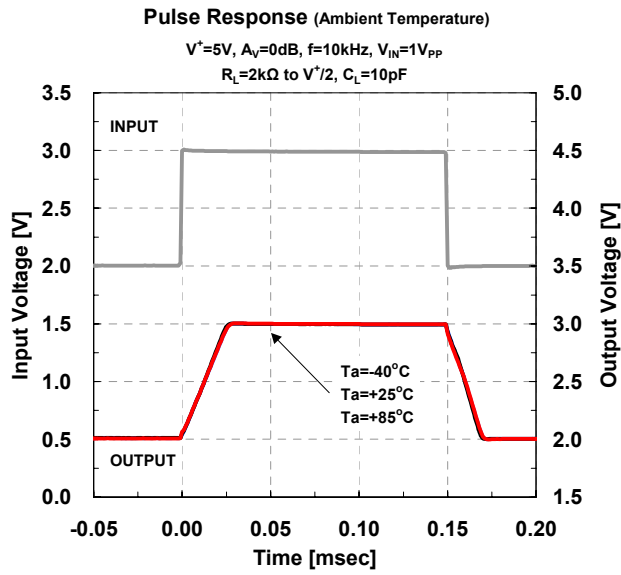




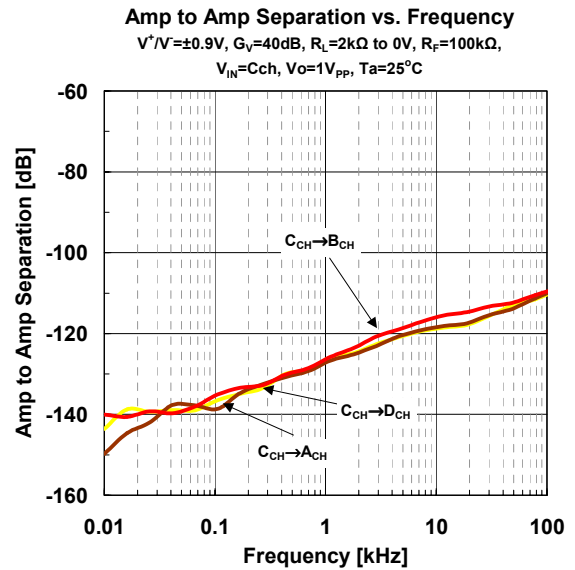
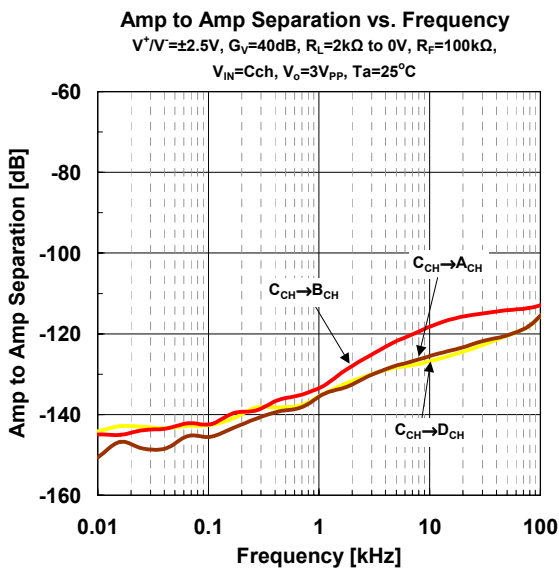
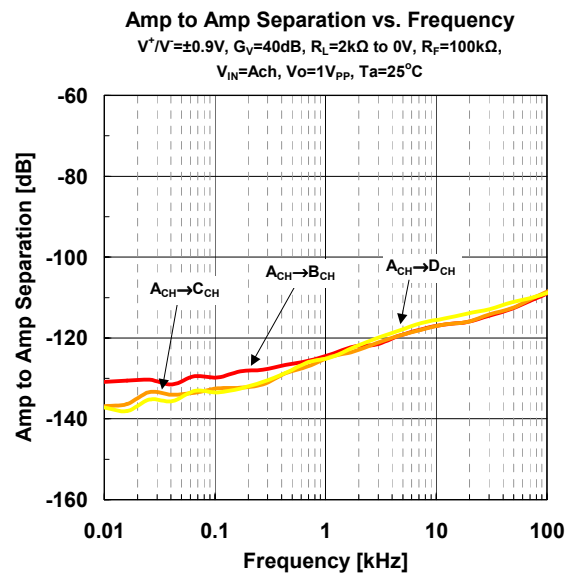
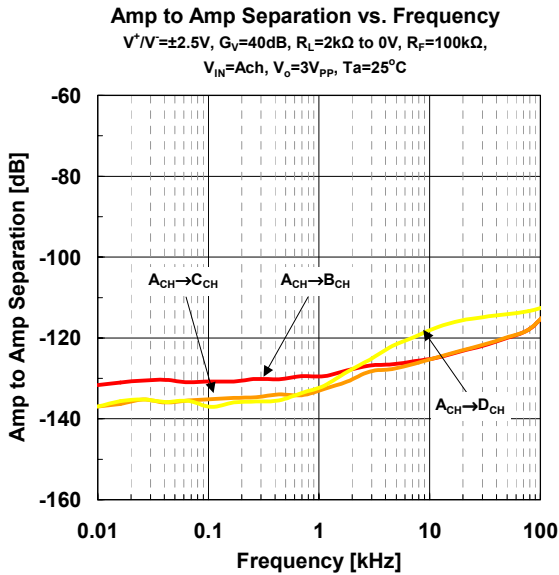
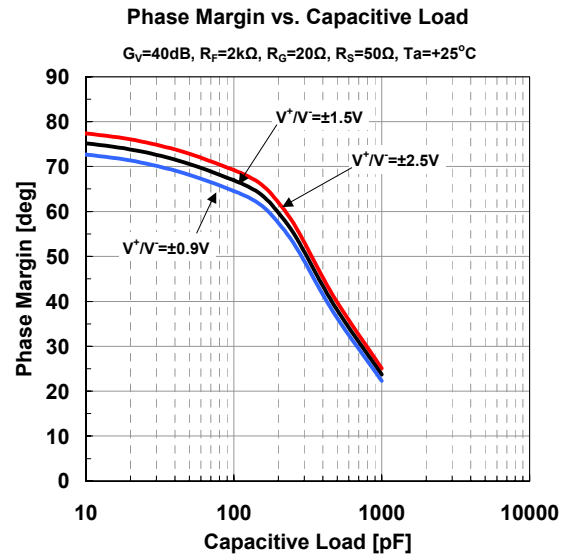
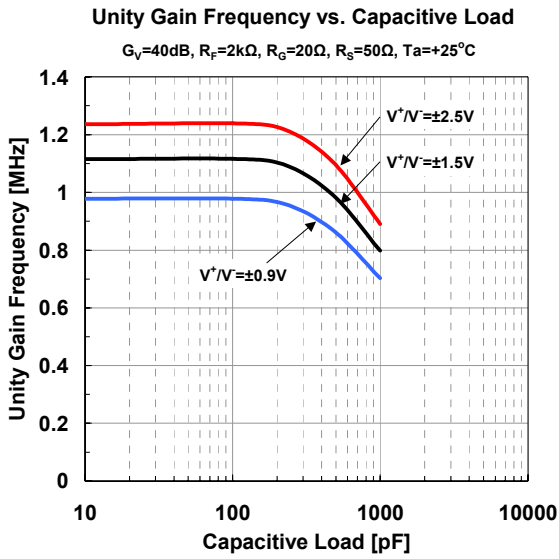
## ■ Typical Characteristics



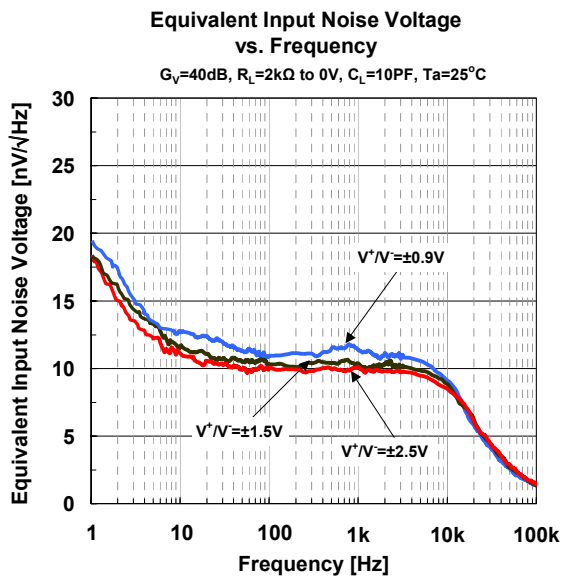
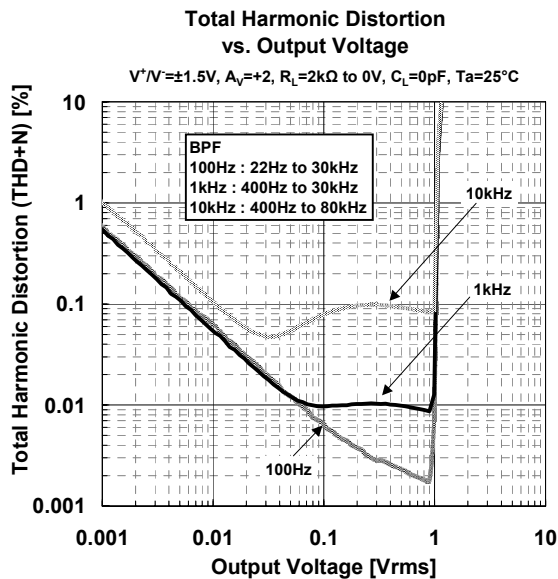
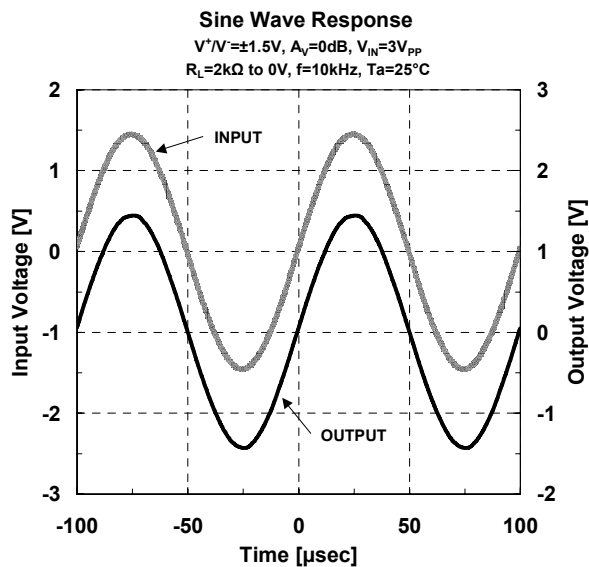
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**[CAUTION]**  
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