

Rail-to-Rail Input/Output Quad Operational Amplifier

■ GENERAL DESCRIPTION

NJM2734 is a Rail-to-Rail Input/Output quad operational amplifier featuring Low power, low noise and operation from 1.8V.

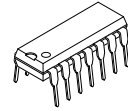
Rail-to-Rail Input/Output provides wide dynamic range, is from ground to power supply level. In addition to ground sensing applications, NJM2734 enable to be applied to Hi-side sensing applications.

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
- Rail-to-Rail Input $V_{ICM} = 0$ to 5.0V, at $V^+ = 5V$
- Rail-to-Rail Output $V_{OH} \geq 4.9V / V_{OL} \leq 0.1V$, 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/ μ s typ.
- Low Input Voltage Noise 10nV/ \sqrt{Hz} typ.
- Adequate phase margin $\Phi_M = 75$ deg. typ., at $R_L = 2k\Omega$
- Bipolar Technology
- Package Outline DIP14, DMP14, SSOP14, PCSP20-CC

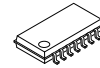
■ PACKAGE OUTLINE



NJM2734D



NJM2734V



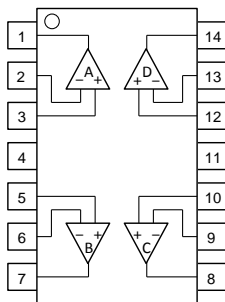
NJM2734M



NJM2734SCC

■ PIN CONFIGURATION

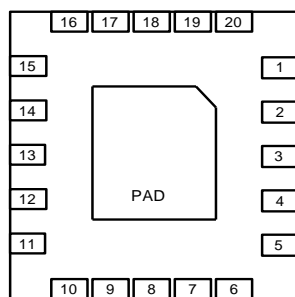
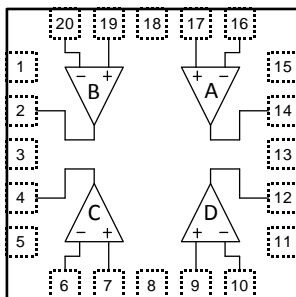
○ NJM2734D, NJM2734V, NJM2734M



PIN FUNCTION

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

○ NJM2734SCC



PIN FUNCTION

- | | | |
|-----------------|--------------|--------------|
| 1. NC | 9. D +INPUT | 17. A +INPUT |
| 2. B OUTPUT | 10. D -INPUT | 18. V^+ |
| 3. NC | 11. NC | 19. B +INPUT |
| 4. C OUTPUT | 12. D OUTPUT | 20. B -INPUT |
| 5. NC | 13. NC | |
| 6. C -INPUT | 14. A OUTPUT | |
| 7. C +INPUT | 15. NC | |
| 8. GND(V^-) | 16. A -INPUT | |

(Note1) The NC pin and the PAD should connect with a GND terminal.

(Note2) The NC pin is electrically not connected to the die in a package.

(Note3) The PAD is electrically not connected to the backside of the die. The PAD cannot be used as GND pin.

NJM2734

■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V ⁺	7.0	V
Differential Input Voltage Range	V _{ID}	±1.0 (Note4)	V
Common Mode Input Voltage Range	V _{IC}	0 ~ 7.0 (Note4)	V
Power Dissipation	P _D	(DIP14) 700 (DMP14) 520 (Note5) (SSOP14) 450 (Note5) (PCSP20-CC)400(Note5)	mW
Operating Temperature Range	T _{opr}	-40~+85	°C
Storage Temperature Range	T _{stg}	-40~+125	°C

(Note4) For supply voltage less than 7V, the absolute maximum input voltage is equal to the supply voltage.

(Note5) 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 ⁺	1.8 to 6.0	V

■ ELECTRICAL CHARACTERISTICS (V⁺=5V, Ta=25°C)

●DC CHARACTERISTICS

(V⁺=5V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Current	I _{CC}	No signal applied	-	1.2	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 =2kΩ to 2.5V	60	85	-	dB
Common Mode Rejection Ratio	CMR	CMR+: 2.5V ≤ V _{CM} ≤ 5V (Note6) CMR -: 0V ≤ V _{CM} ≤ 2.5V (Note6)	55	70	-	dB
Supply Voltage Rejection Ratio	SVR	V ⁺ /V = ±2.0V ~ ±3.0V	70	85	-	dB
Maximum Output Voltage 1	V _{OH1}	R _L =20kΩ to 2.5V	4.9	4.95	-	V
	V _{OL1}	R _L =20kΩ to 2.5V	-	0.05	0.1	V
Maximum Output Voltage 2	V _{OH2}	R _L =2kΩ to 2.5V	4.75	4.85	-	V
	V _{OL2}	R _L =2kΩ to 2.5V	-	0.15	0.25	V
Input Common Mode Voltage Range	V _{ICM}	CMR ≥ 55dB	0	-	5	V

(Note6) CMR is represented by either CMR+ or CMR- has lower value.

CMR+ is measured with 2.5V ≤ V_{CM} ≤ 5.0 and CMR- is measured with 0V ≤ V_{CM} ≤ 2.5V.

●AC CHARACTERISTICS

(V⁺=5V, Ta=25°C)

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

●TRANSIENT CHARACTERISTICS

(V⁺=5V, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate	SR	R _L =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+: $1.5V \leq V_{CM} \leq 3V$ (Note7) CMR -: $0V \leq V_{CM} \leq 1.5V$ (Note7)	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

(Note7) 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	Φ_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/ μs

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■ 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+: $0.9 \leq V_{CM} \leq 1.8V$ (Note8) CMR-: $0V \leq V_{CM} \leq 0.9V$ (Note8)	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

(Note8) 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

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

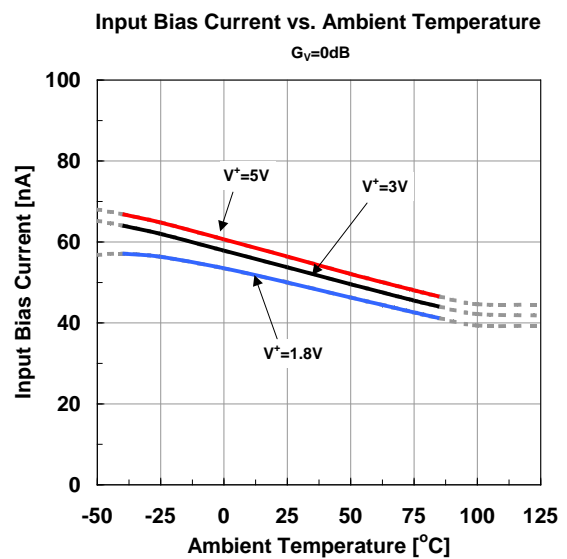
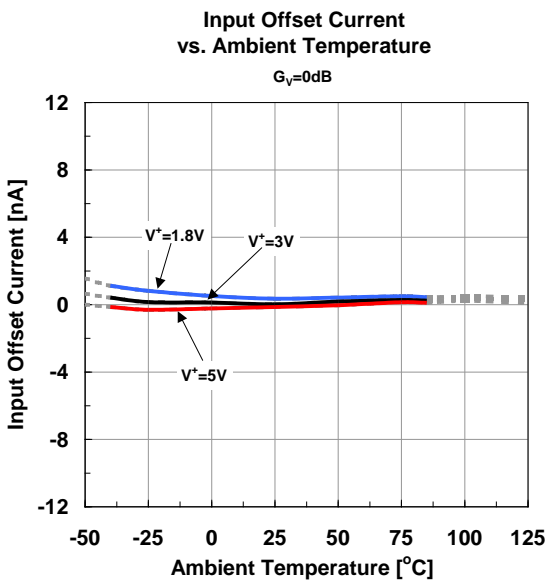
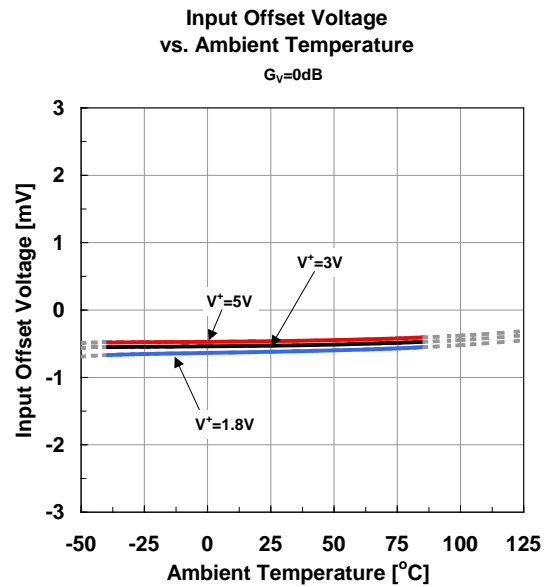
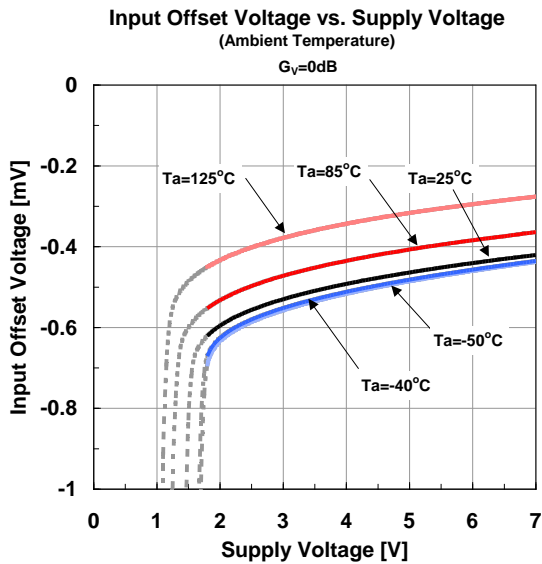
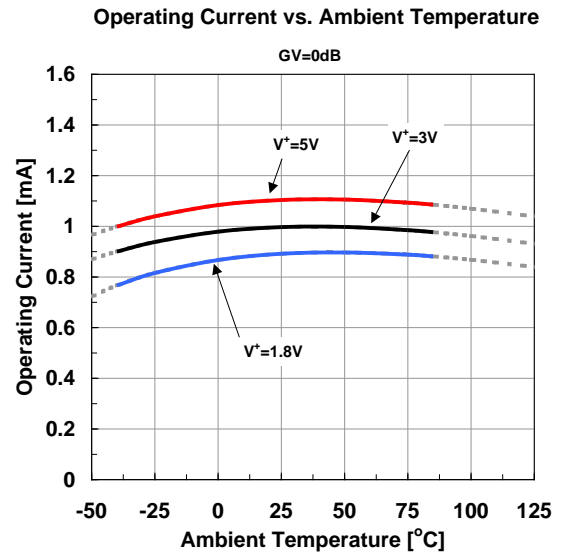
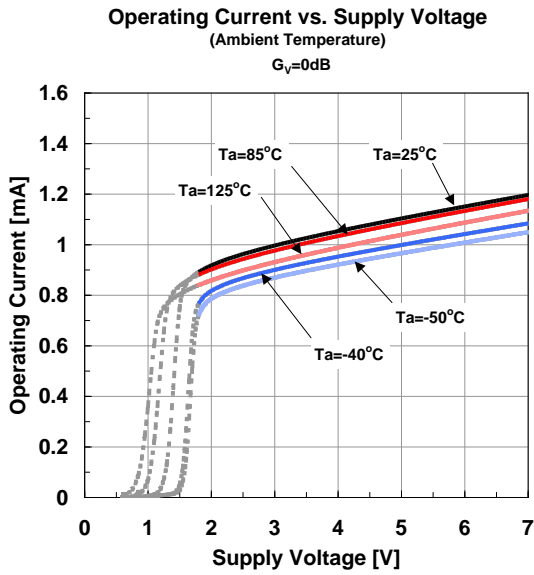
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Unity Gain Bandwidth	GB	$R_L=2k\Omega$ to 0.9V	-	1	-	MHz
Phase Margin	Φ_M	$R_L=2k\Omega$ to 0.9V	-	75	-	Deg
Equivalent Input Noise Voltage	V_{NI}	$f=1kHz$	-	10	-	nV/\sqrt{Hz}
Amp to Amp Separation	CS	$f=1kHz$ $R_L=2k\Omega$ to 0.9V, $V_o=0.4V_{rms}$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

●TRANSIENT CHARACTERISTICS

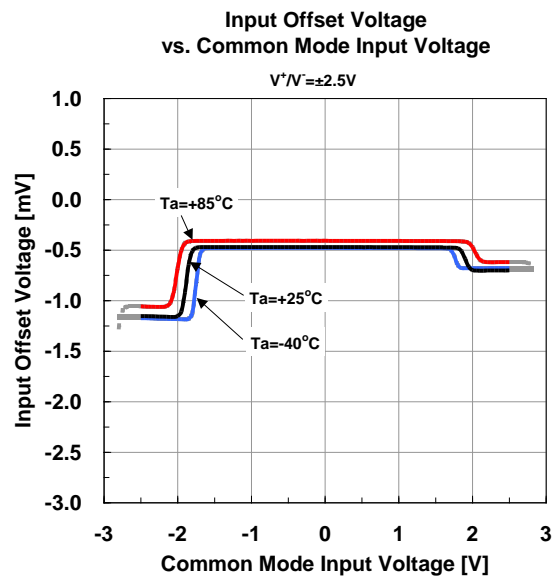
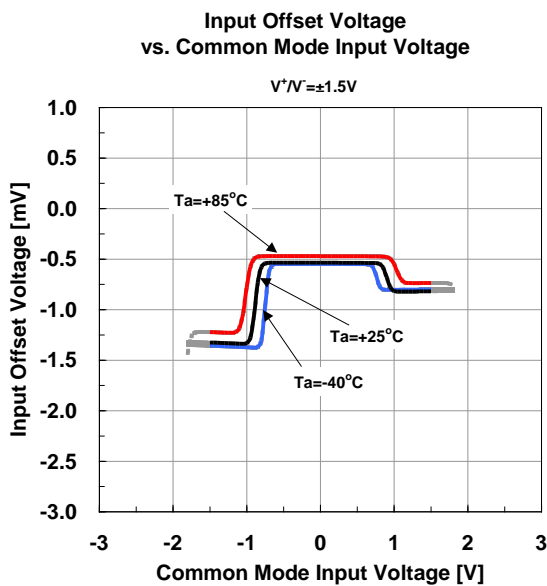
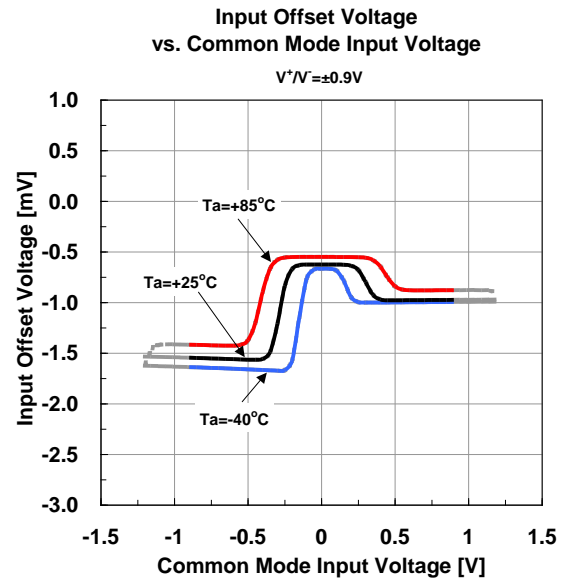
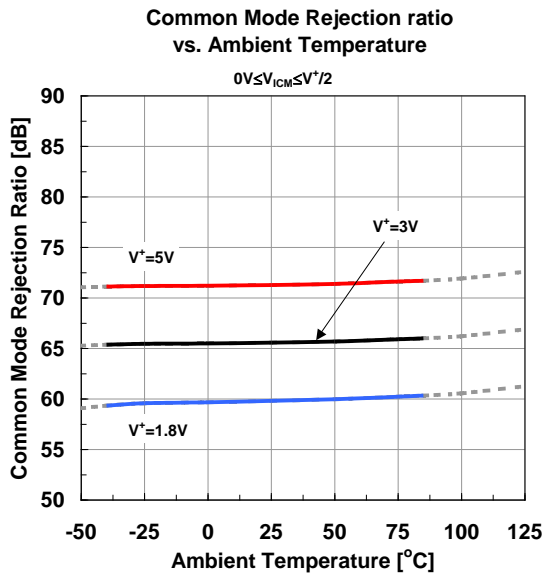
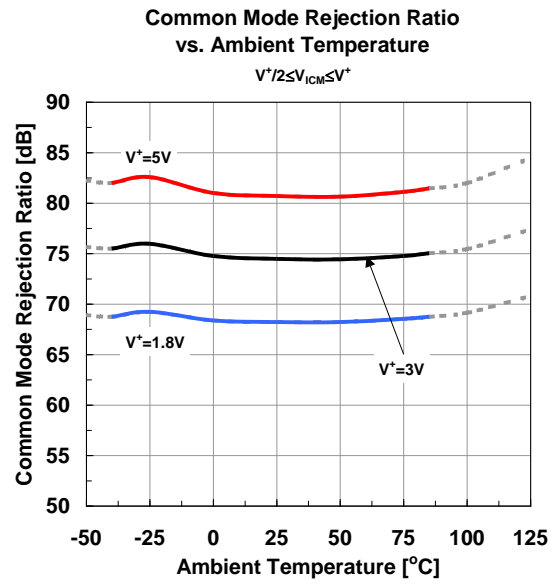
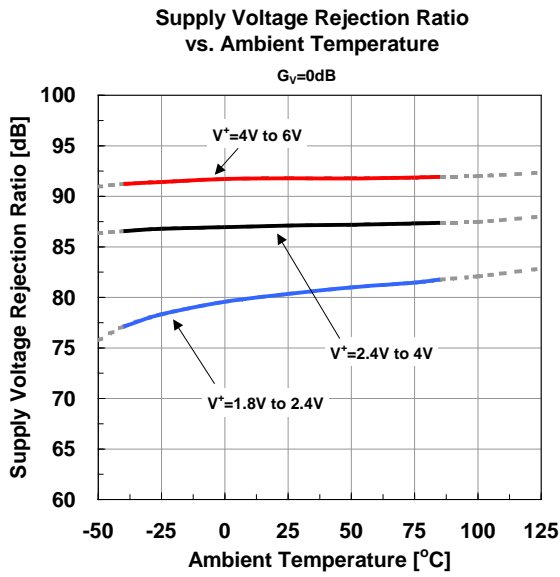
($V^+=1.8V$, $T_a=25^\circ C$)

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

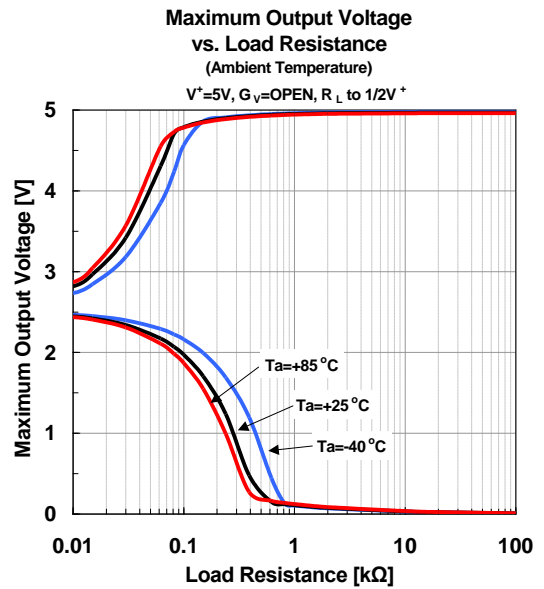
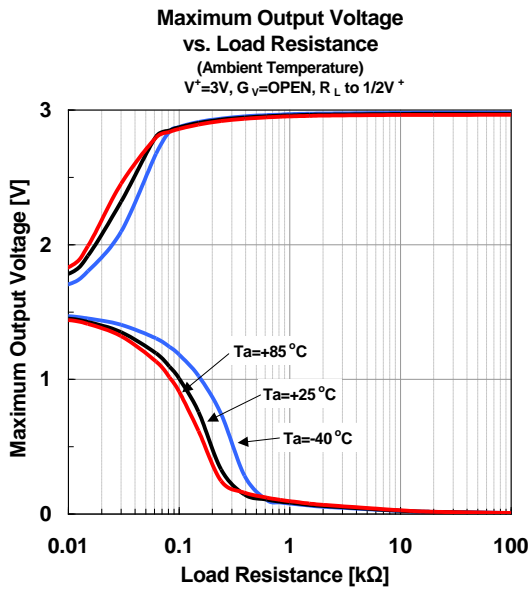
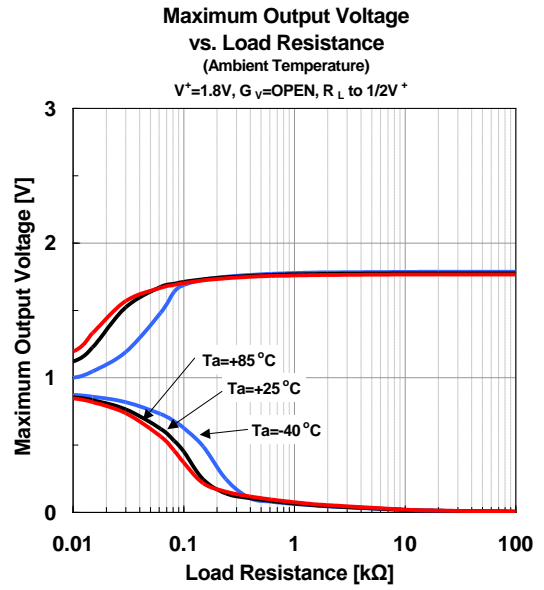
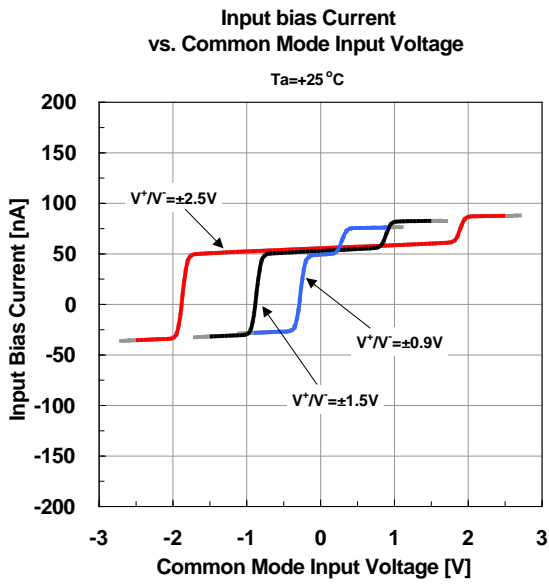
■ Typical Characteristics



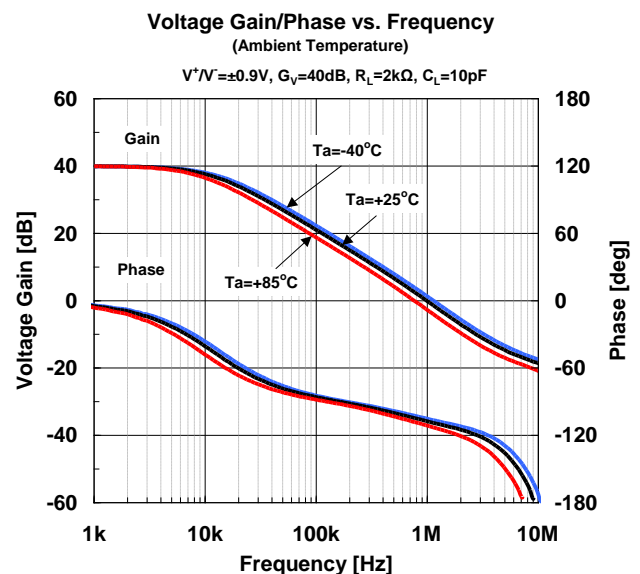
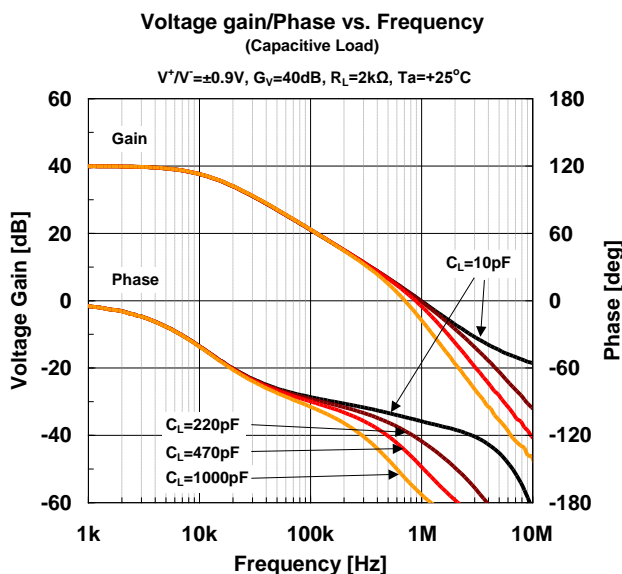
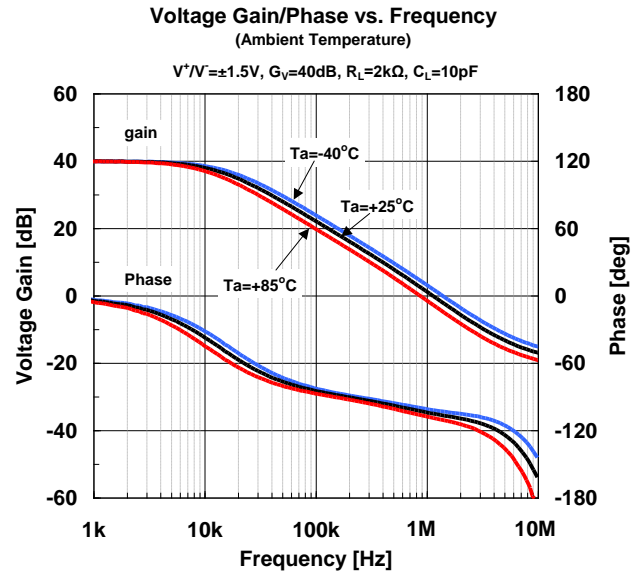
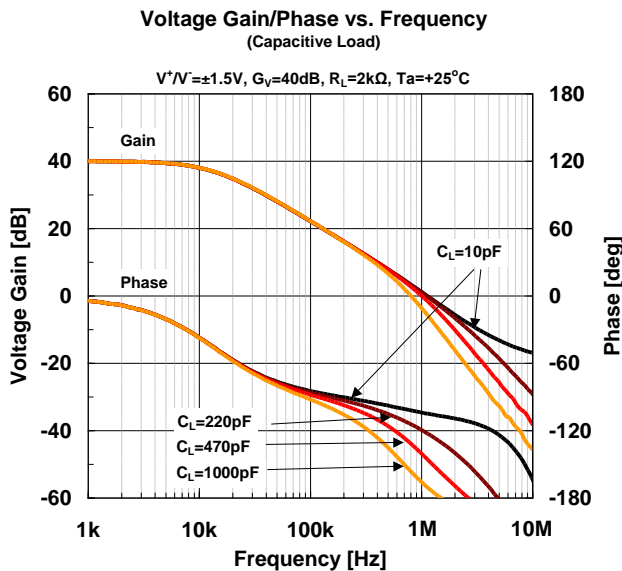
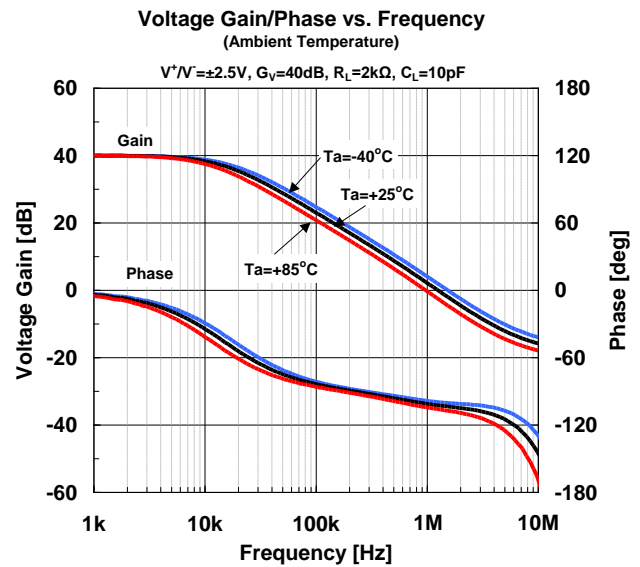
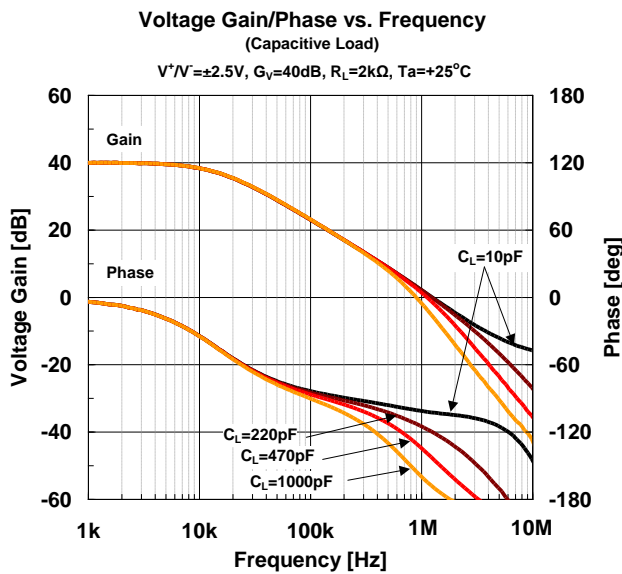
Typical Characteristics



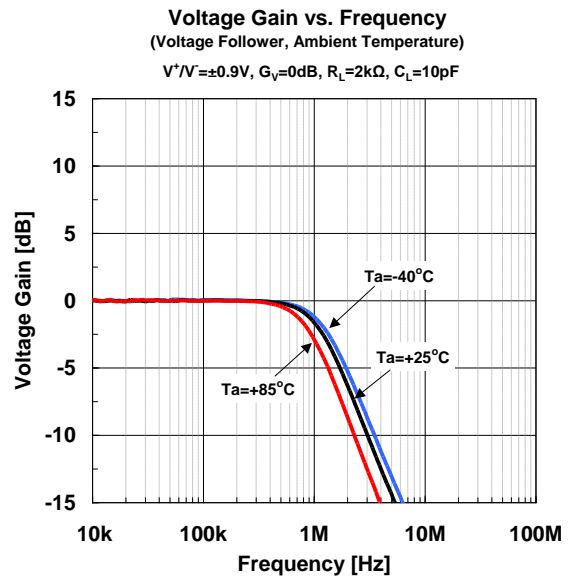
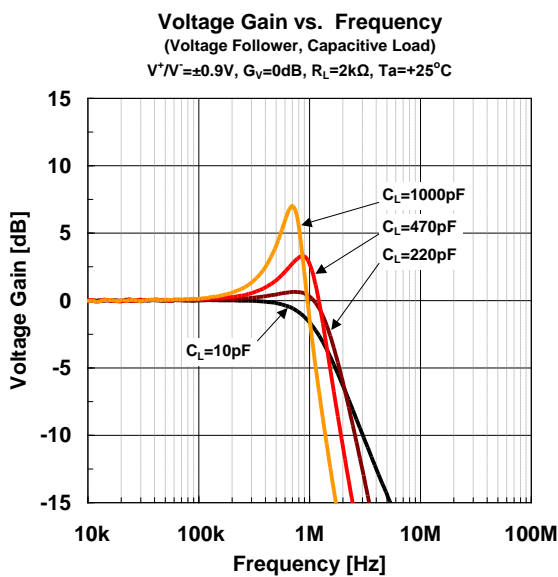
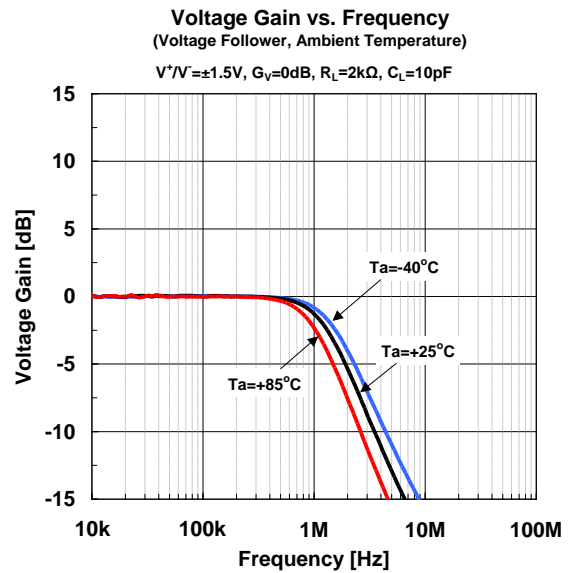
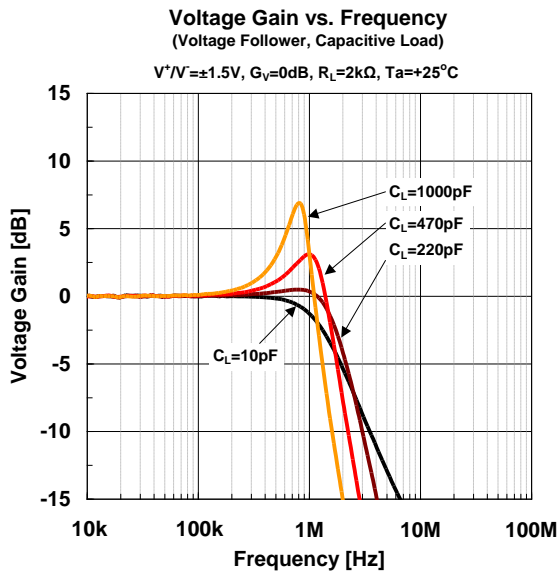
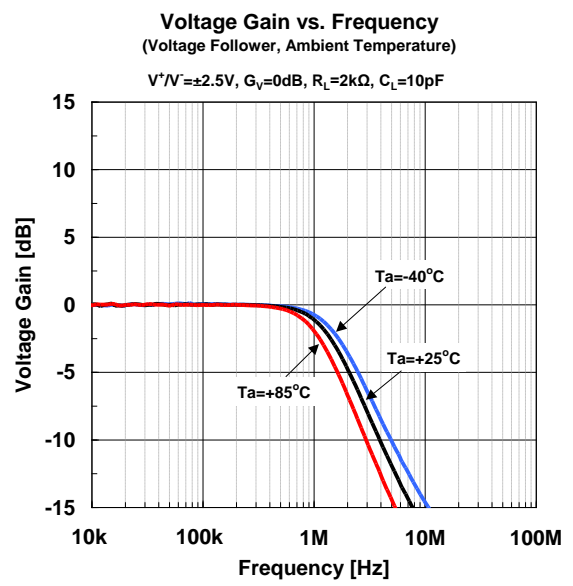
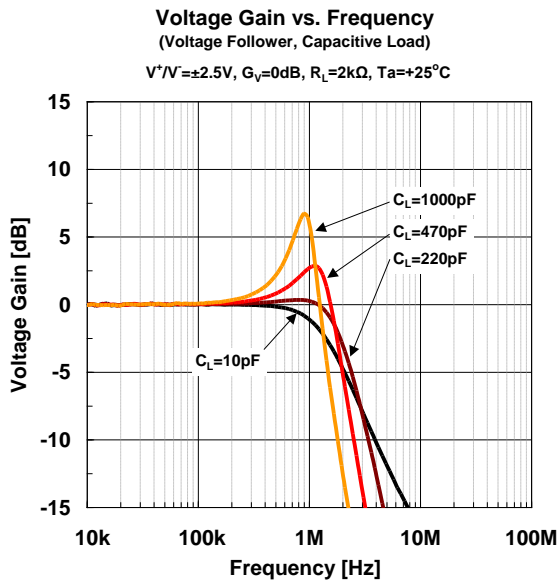
■ Typical Characteristics



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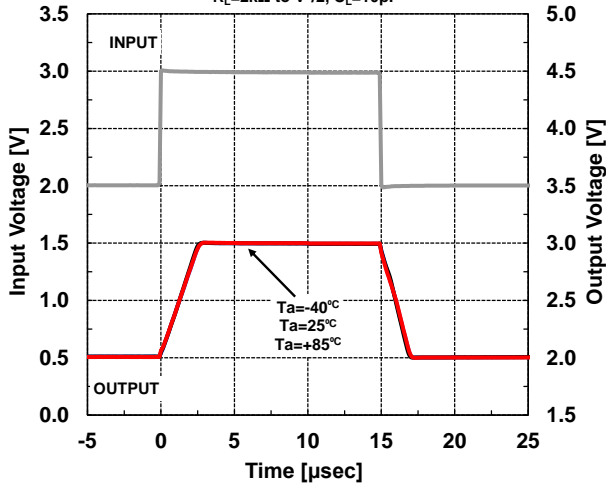
■ Typical Characteristics



Typical Characteristics

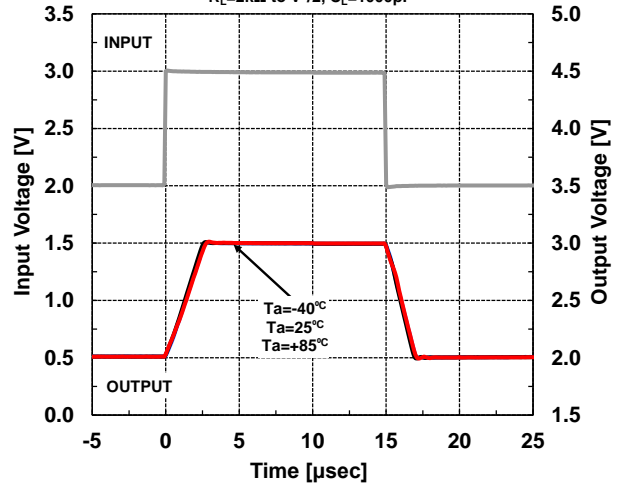
Pulse Response (Ambient Temperature)

$V^*=5V, A_v=0dB, V_{IN}=1V_{PP}$
 $R_L=2k\Omega$ to $V^*/2, C_L=10pF$



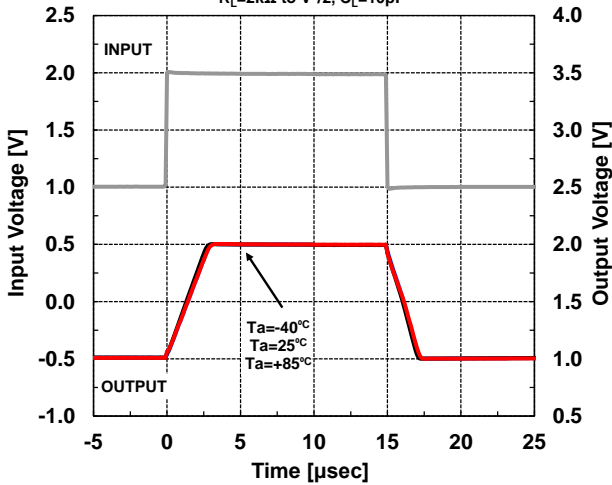
Pulse Response (Ambient Temperature)

$V^*=5V, A_v=0dB, V_{IN}=1V_{PP}$
 $R_L=2k\Omega$ to $V^*/2, C_L=1000pF$



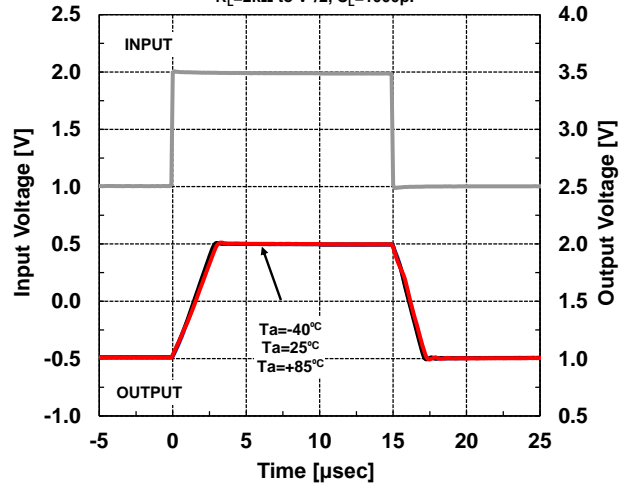
Pulse Response (Ambient Temperature)

$V^*=3V, A_v=0dB, V_{IN}=1V_{PP}$
 $R_L=2k\Omega$ to $V^*/2, C_L=10pF$



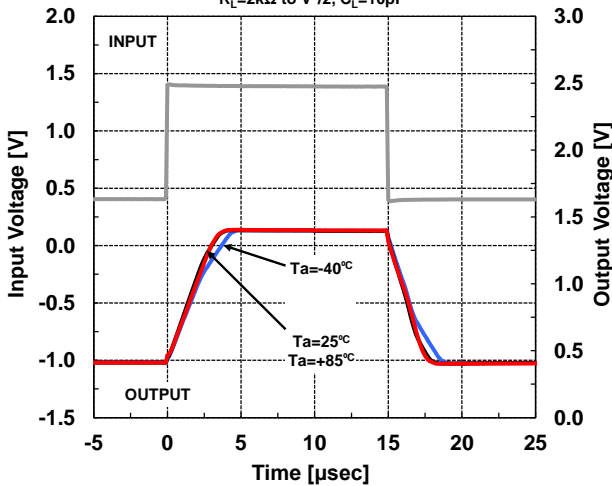
Pulse Response (Ambient Temperature)

$V^*=3V, A_v=0dB, V_{IN}=1V_{PP}$
 $R_L=2k\Omega$ to $V^*/2, C_L=1000pF$



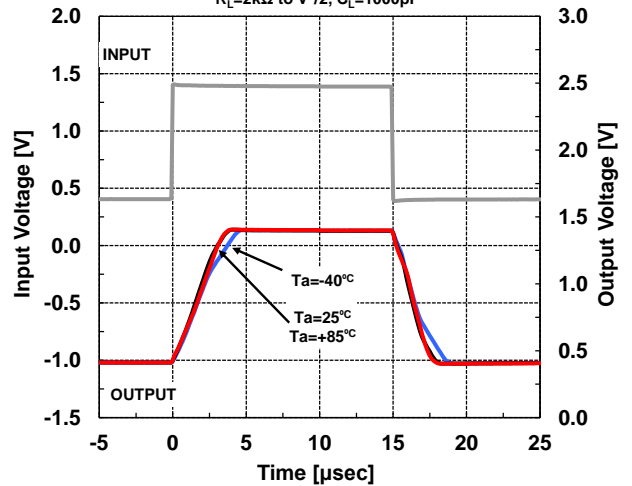
Pulse Response (Ambient Temperature)

$V^*=1.8V, A_v=0dB, V_{IN}=1V_{PP}$
 $R_L=2k\Omega$ to $V^*/2, C_L=10pF$

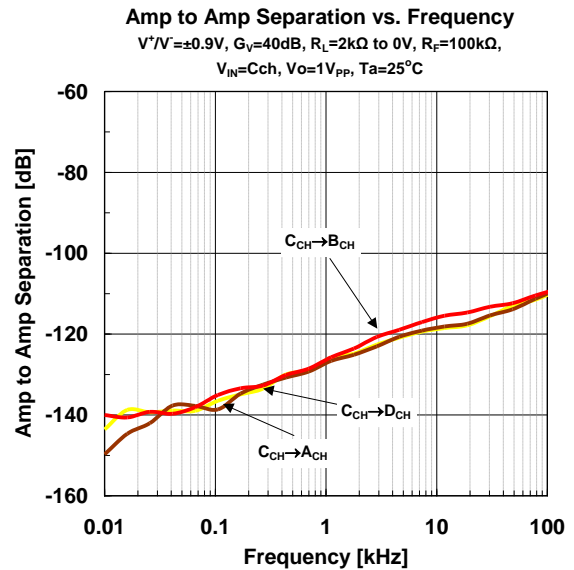
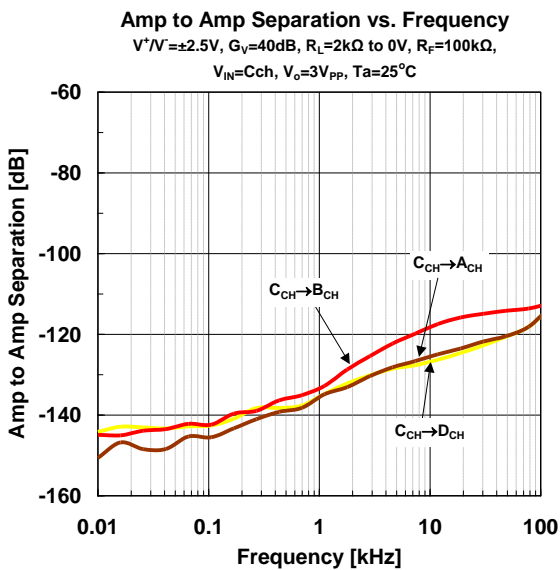
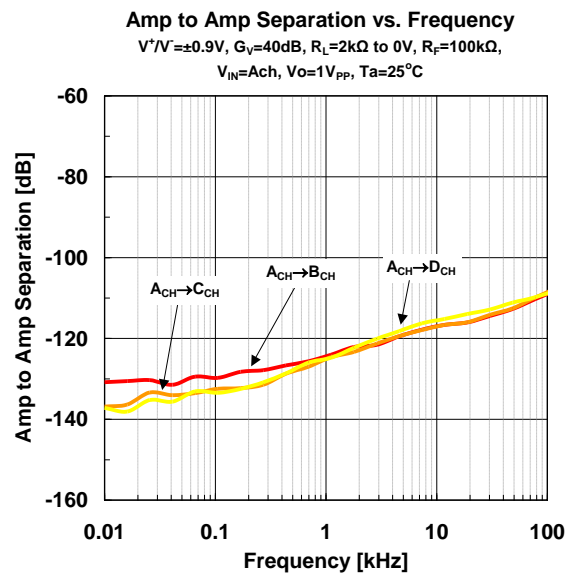
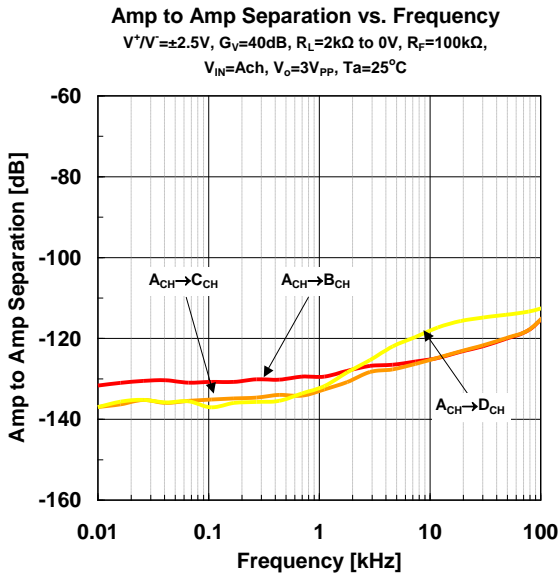
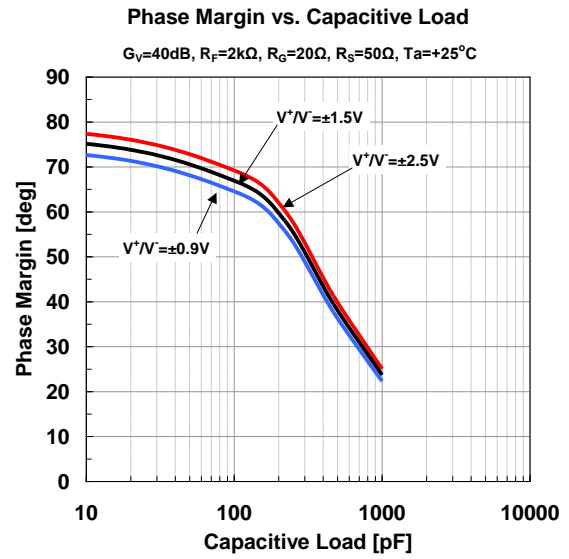
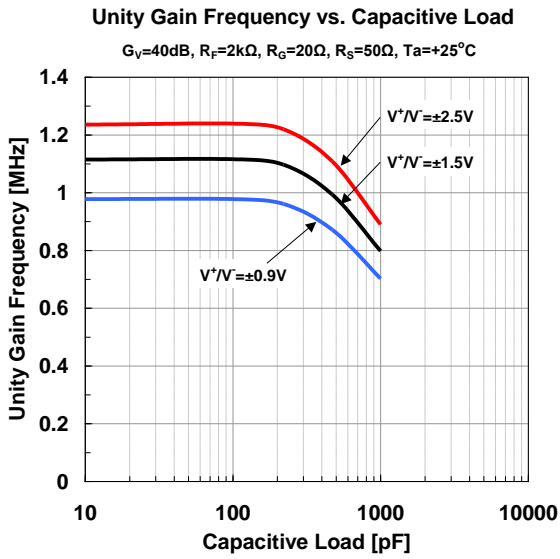


Pulse Response (Ambient Temperature)

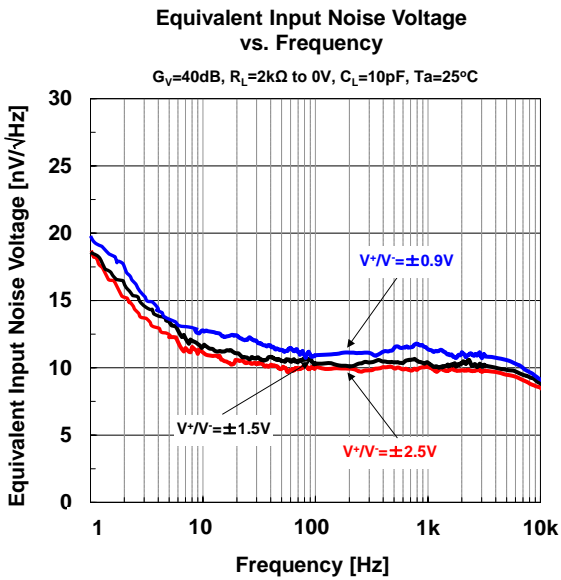
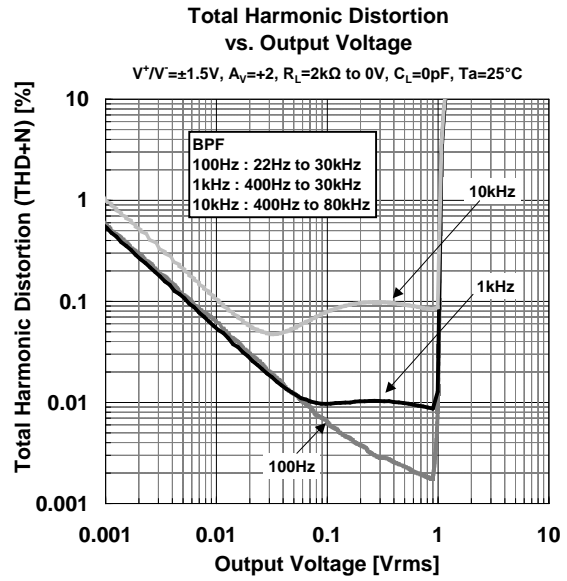
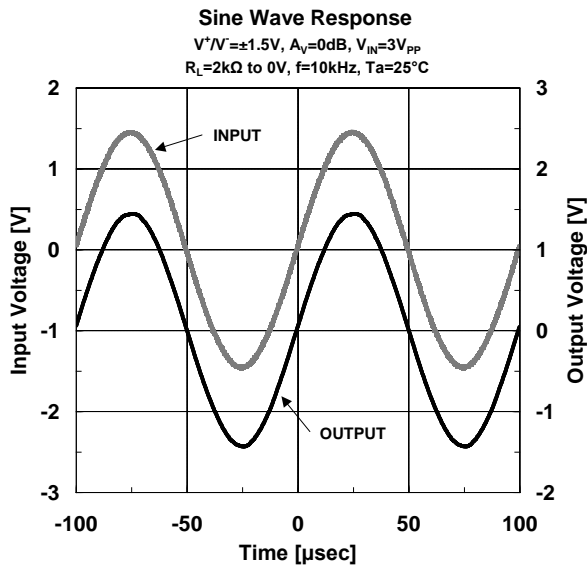
$V^*=1.8V, A_v=0dB, V_{IN}=1V_{PP}$
 $R_L=2k\Omega$ to $V^*/2, C_L=1000pF$



■ Typical Characteristics



■ Typical Characteristics



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