

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.

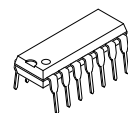
Rail-to-Rail Input/Output provides wide dynamic range, is from ground to power supply level. In addition to ground sensing applications, NJM2734 enable to be applied to Hi-side sensing applications.

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/ $\sqrt{\text{Hz}}$ typ.
- Adequate phase margin $\Phi_M = 75\text{deg.}$ typ., at $R_L = 2k\Omega$
- Bipolar Technology
- Package Outline DIP14, DMP14, SSOP14, PCSP20-CC

■ PACKAGE OUTLINE



NJM2734D



NJM2734V



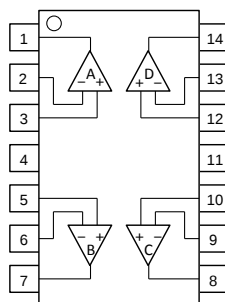
NJM2734M



NJM2734SCC

■ PIN CONFIGURATION

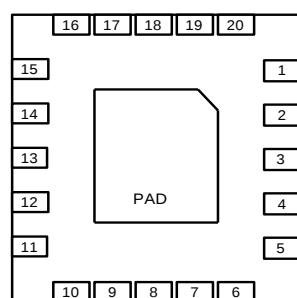
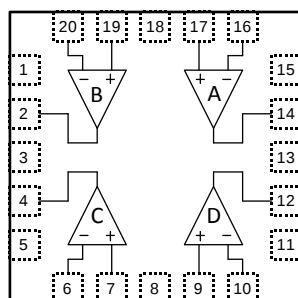
○NJM2734D, NJM2734V, NJM2734M



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	$R_L=2k\Omega$ to 2.5V	60	85	-	dB
Common Mode Rejection Ratio	CMR	CMR+: $2.5V \leq V_{CM} \leq 5V$ (Note6) CMR -: $0V \leq V_{CM} \leq 2.5V$ (Note6)	55	70	-	dB
Supply Voltage Rejection Ratio	SVR	$V^+/V^- = \pm 2.0V \sim \pm 3.0V$	70	85	-	dB
Maximum Output Voltage 1	V_{OH1}	$R_L=20k\Omega$ to 2.5V	4.9	4.95	-	V
	V_{OL1}	$R_L=20k\Omega$ to 2.5V	-	0.05	0.1	V
Maximum Output Voltage 2	V_{OH2}	$R_L=2k\Omega$ to 2.5V	4.75	4.85	-	V
	V_{OL2}	$R_L=2k\Omega$ to 2.5V	-	0.15	0.25	V
Input Common Mode Voltage Range	V_{ICM}	CMR ≥ 55 dB	0	-	5	V

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

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

●AC CHARACTERISTICS

($V^+=5V$, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Unity Gain Bandwidth	GB	$R_L=2k\Omega$ to 2.5V	-	1	-	MHz
Phase Margin	Φ_M	$R_L=2k\Omega$ to 2.5V	-	75	-	Deg
Equivalent Input Noise Voltage	V_{NI}	f=1kHz	-	10	-	nV/√Hz
Amp to Amp Separation	CS	f=1kHz $R_L=2k\Omega$ to 2.5V, $V_o=1.2V_{rms}$	-	133	-	dB

●TRANSIENT CHARACTERISTICS

($V^+=5V$, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Slew Rate	SR	$R_L=2k\Omega$ 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 ≥ 48 dB	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	$f=1kHz$	-	130	-	dB
		$R_L=2k\Omega$ to 1.5V, $V_o=0.7V_{rms}$				

●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+: $0.9V \leq V_{CM} \leq 1.8V$ (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 ≥ 40 dB	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

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

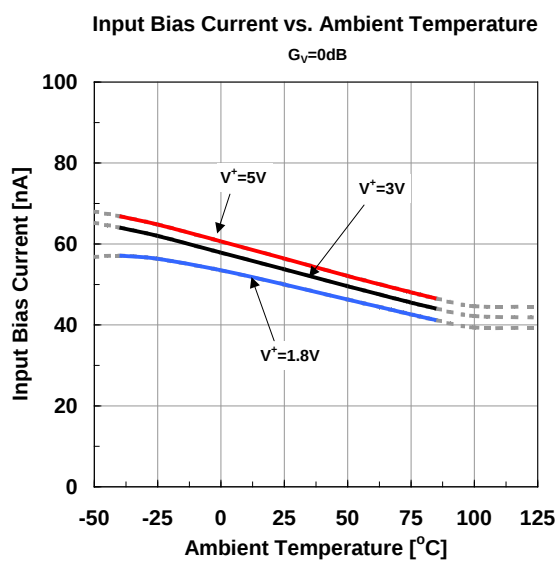
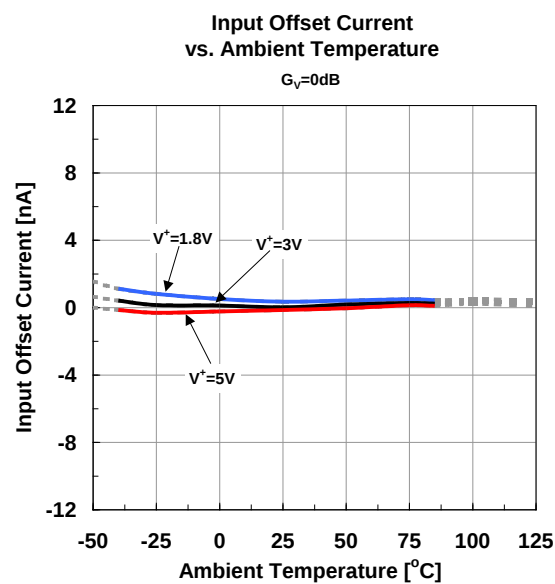
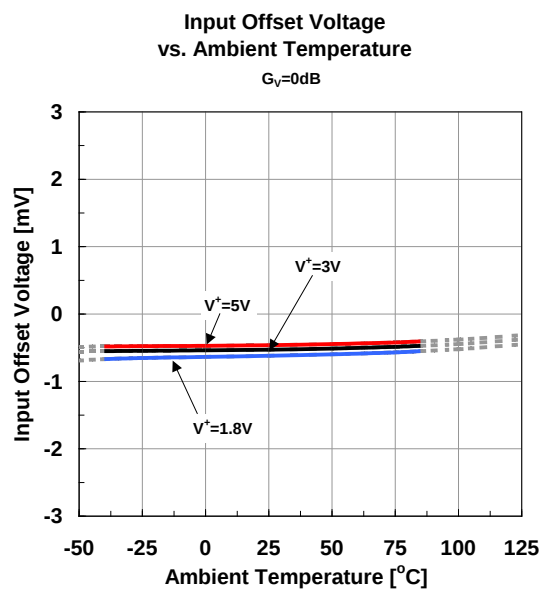
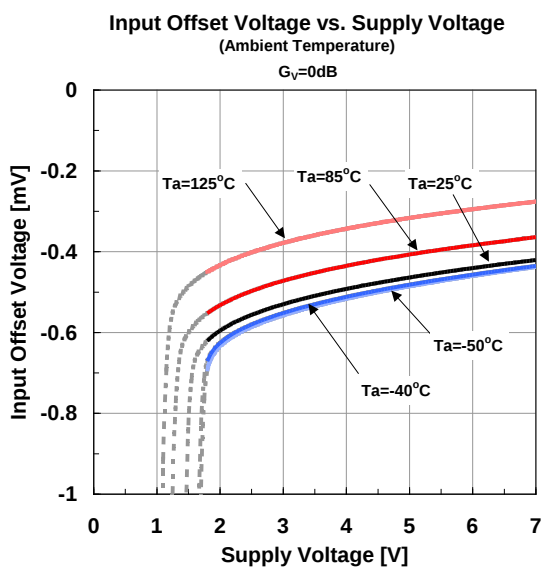
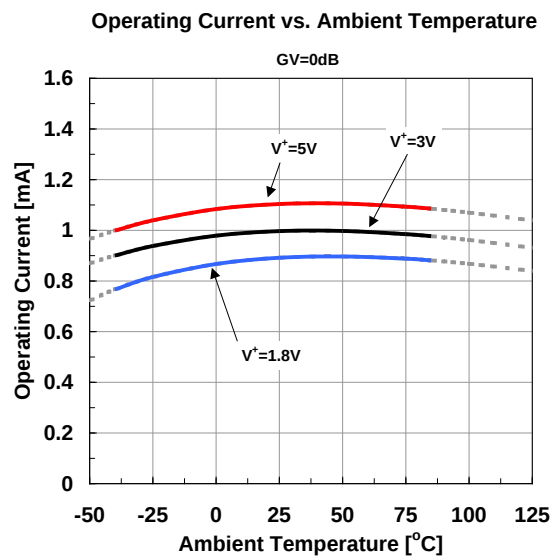
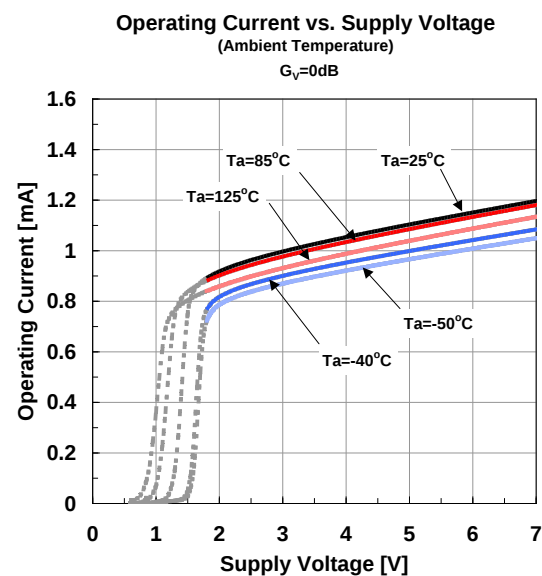
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Unity Gain Bandwidth	GB	$R_L=2k\Omega$ to 0.9V	-	1	-	MHz
Phase Margin	Φ_M	$R_L=2k\Omega$ to 0.9V	-	75	-	Deg
Equivalent Input Noise Voltage	V_{NI}	$f=1kHz$	-	10	-	nV/ $\sqrt{Hz}$
Amp to Amp Separation	CS	$f=1kHz$ $R_L=2k\Omega$ to 0.9V, $V_o=0.4V_{rms}$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

●TRANSIENT CHARACTERISTICS

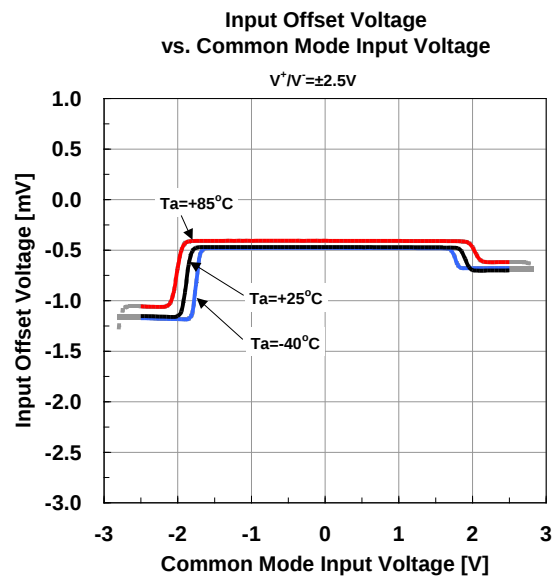
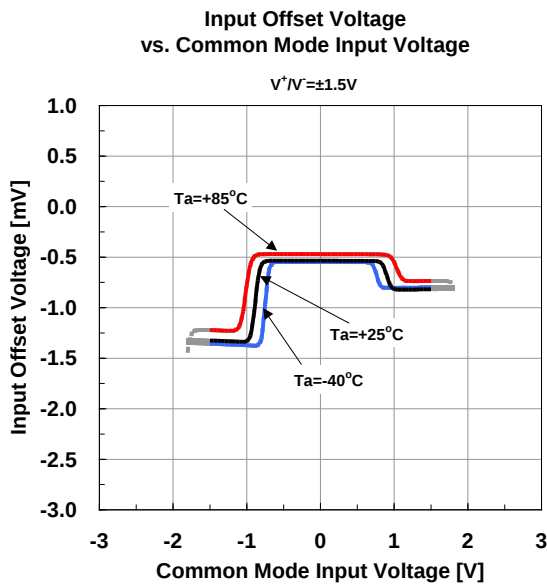
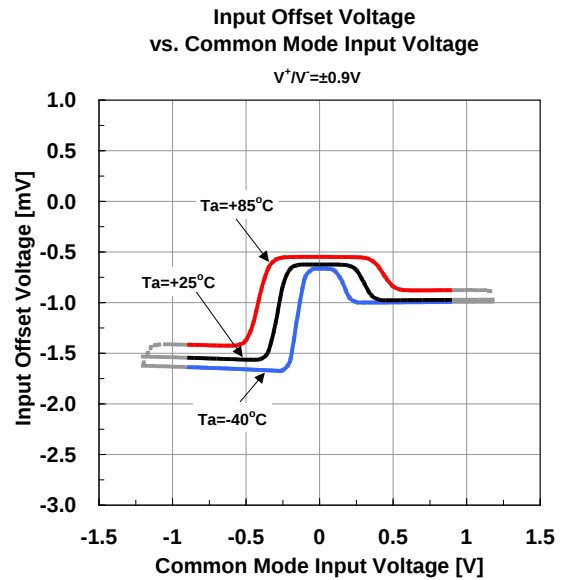
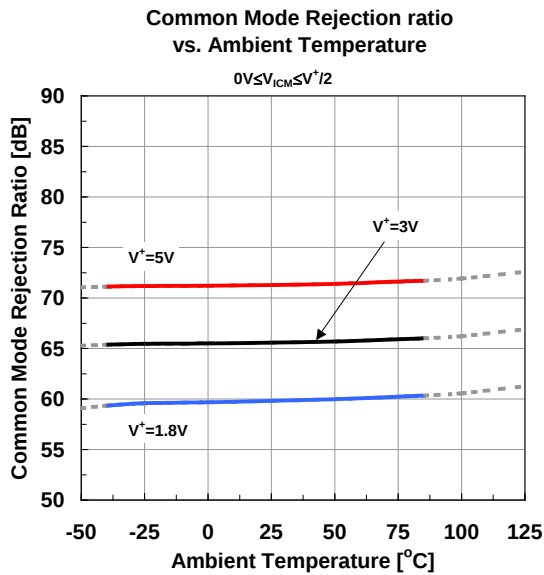
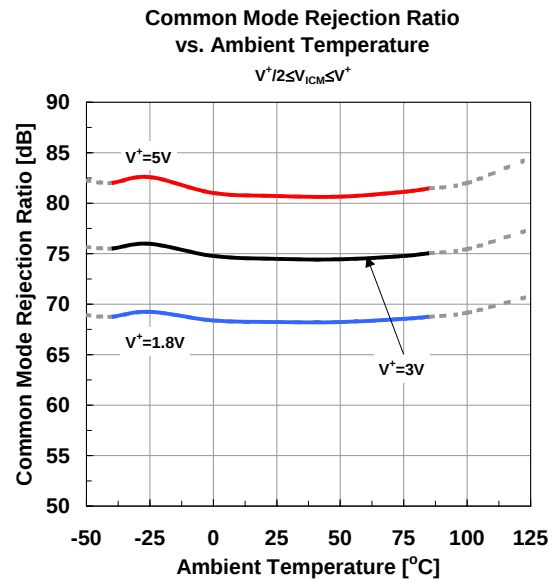
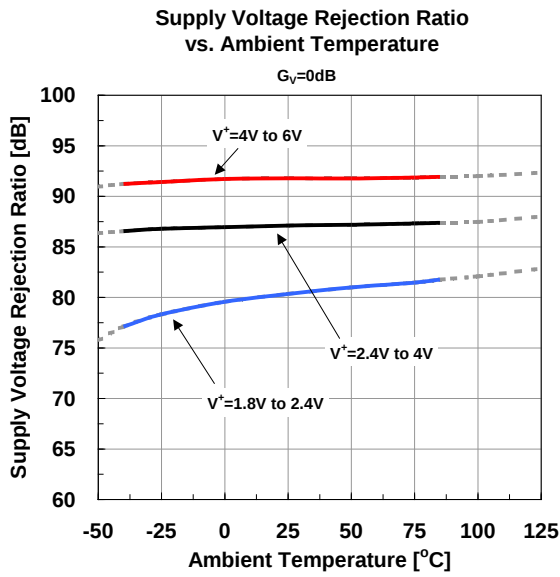
($V^+=1.8V$, $T_a=25^\circ C$)

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

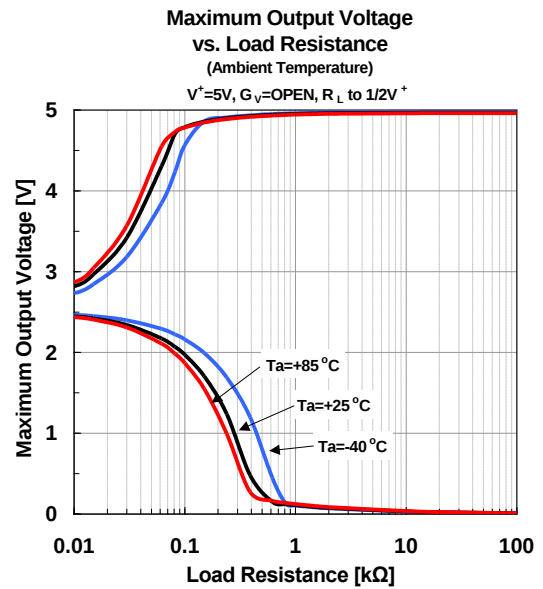
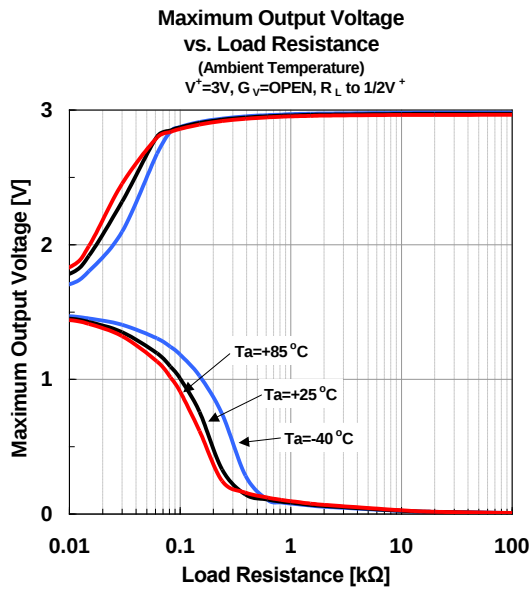
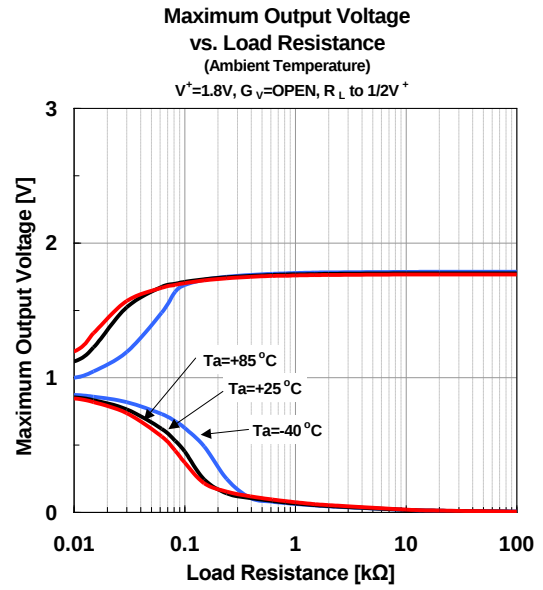
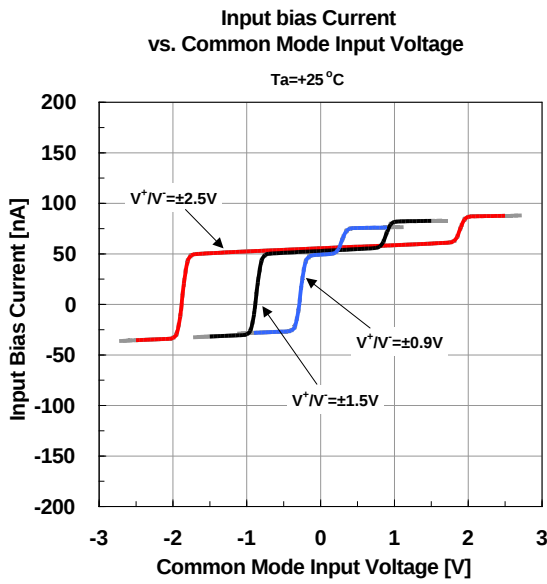
■ Typical Characteristics



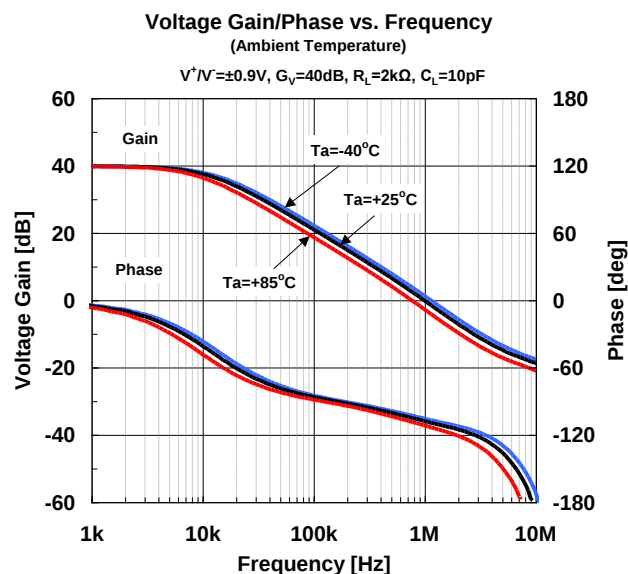
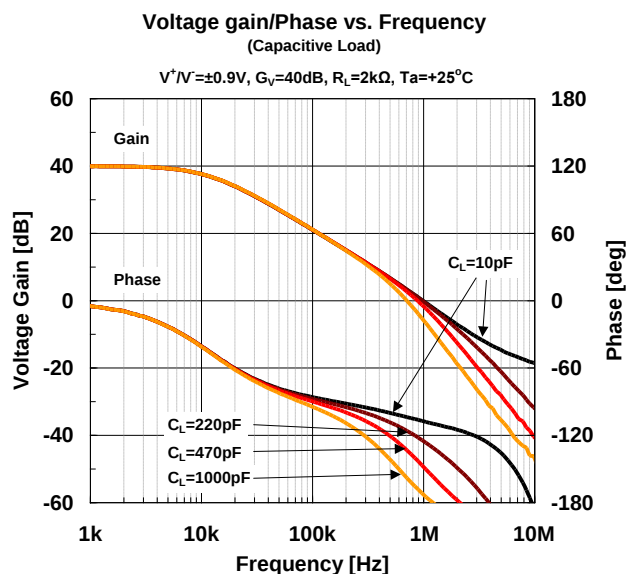
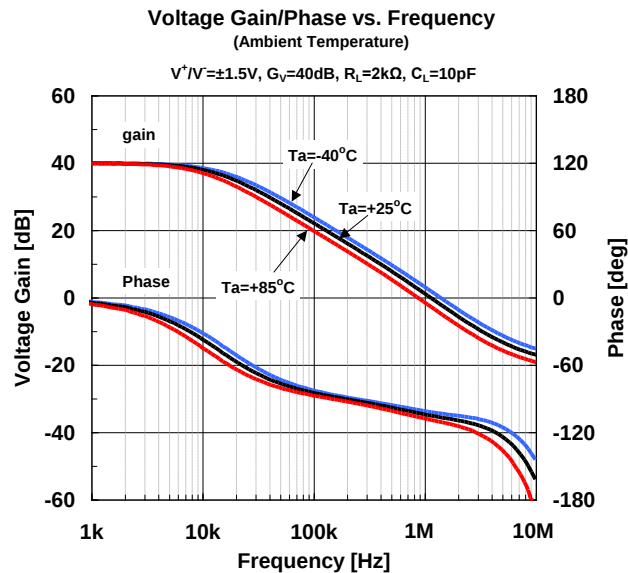
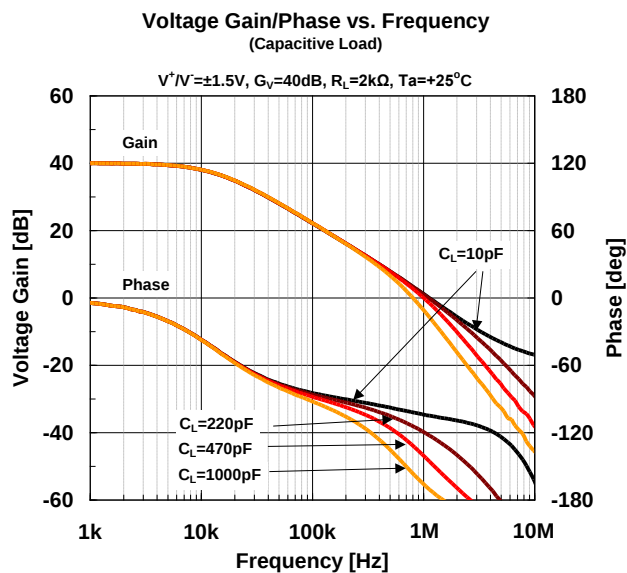
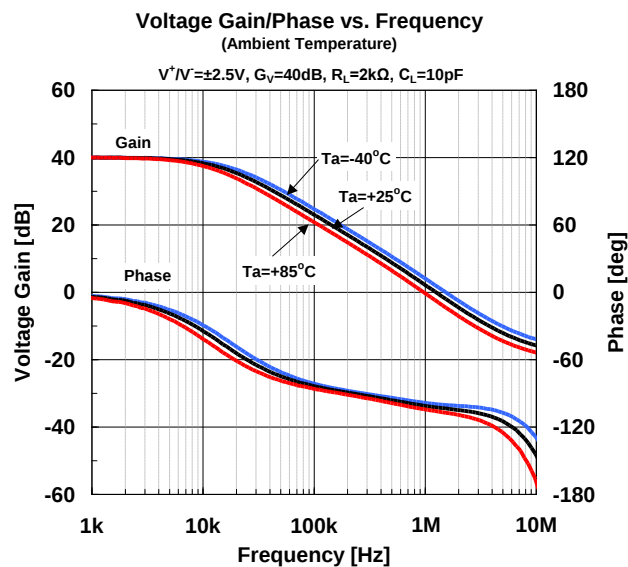
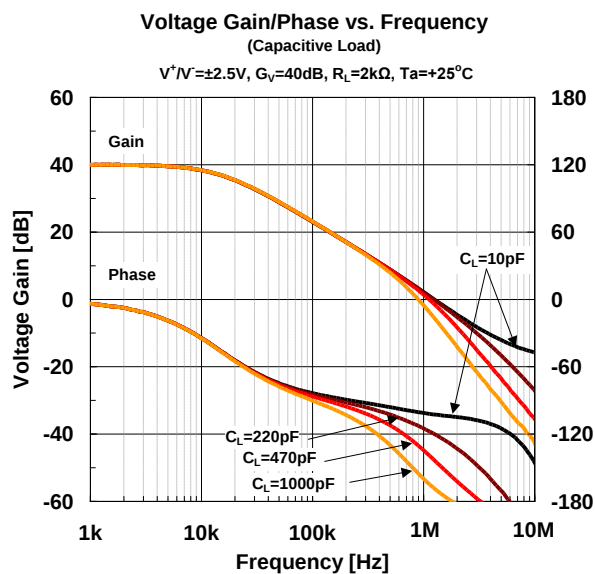
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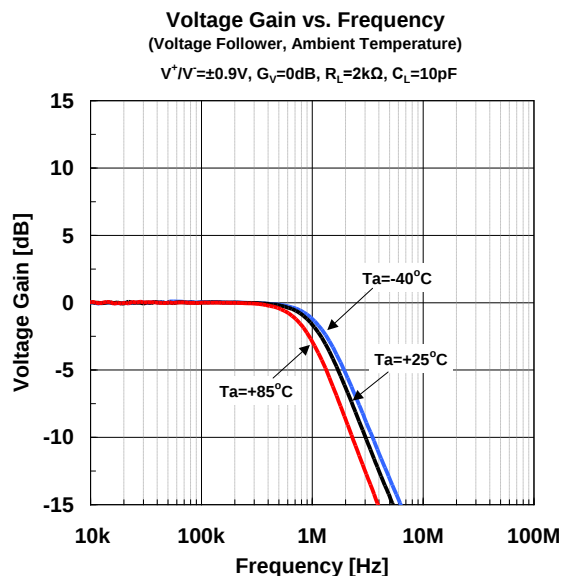
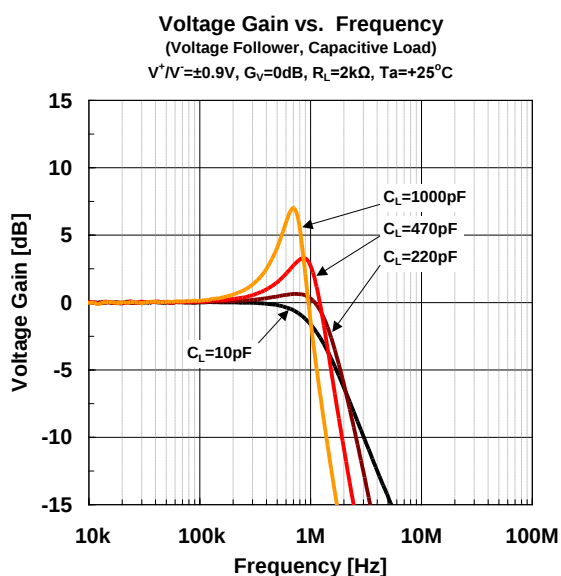
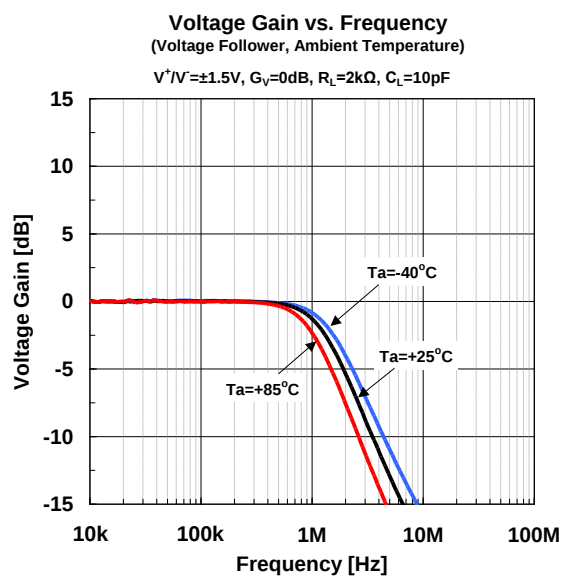
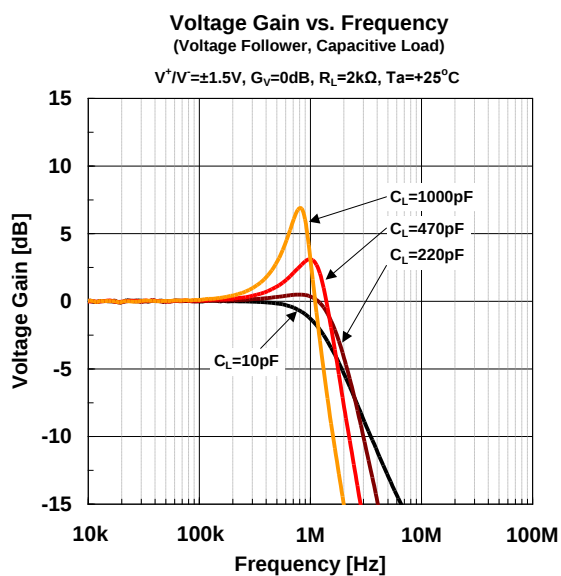
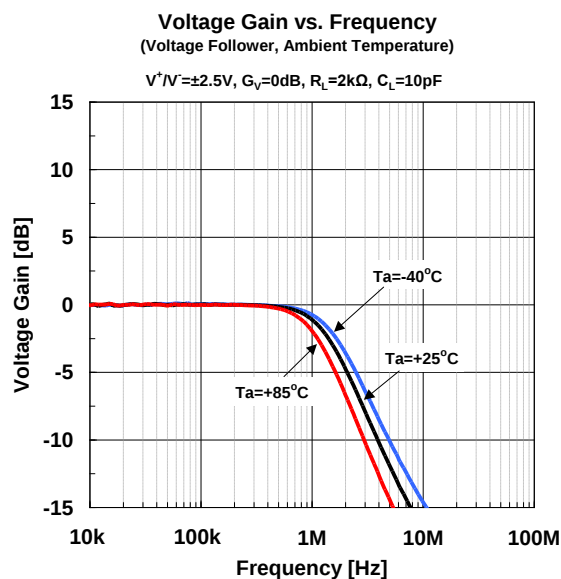
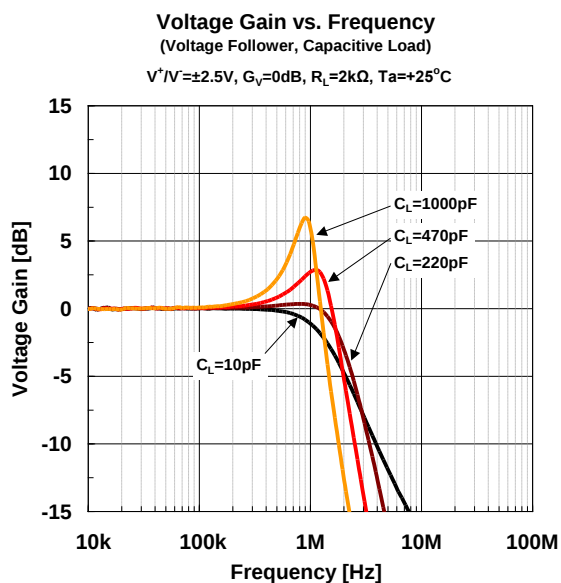
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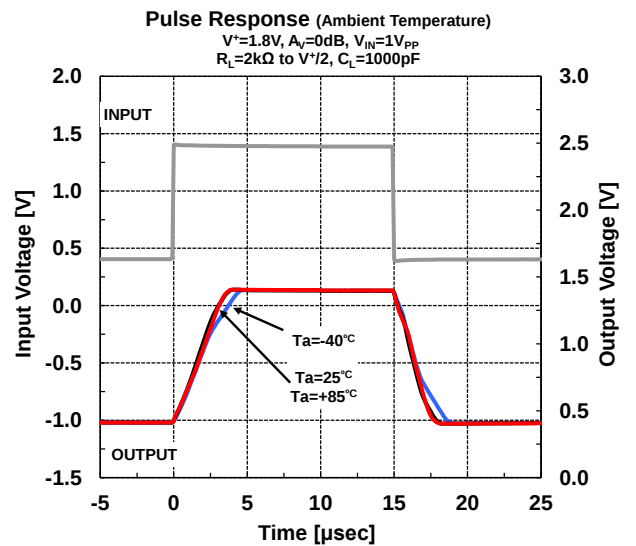
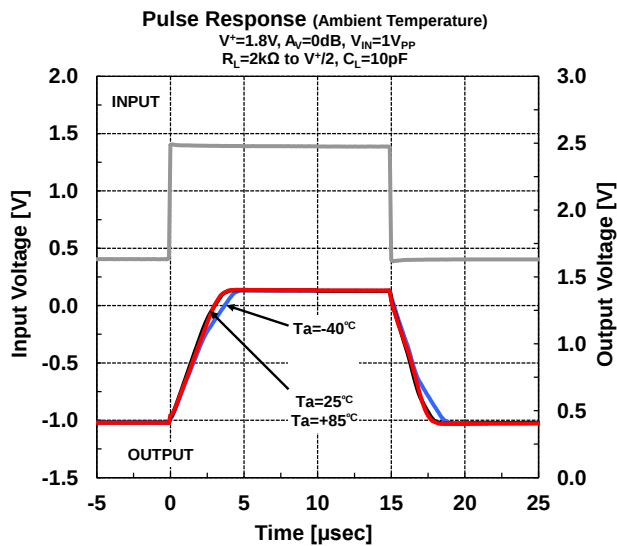
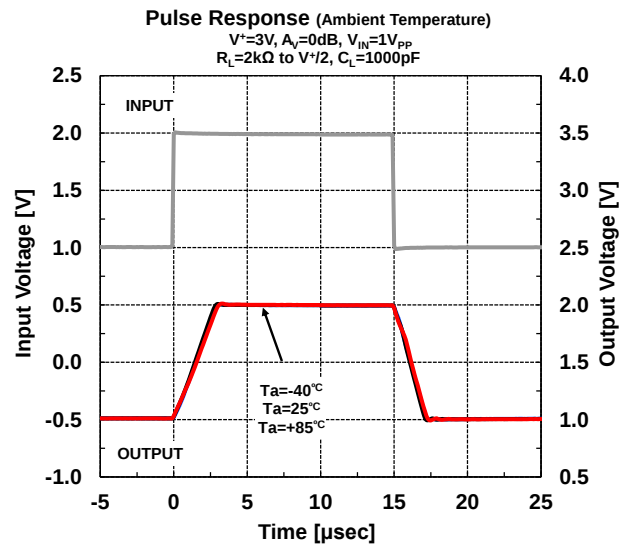
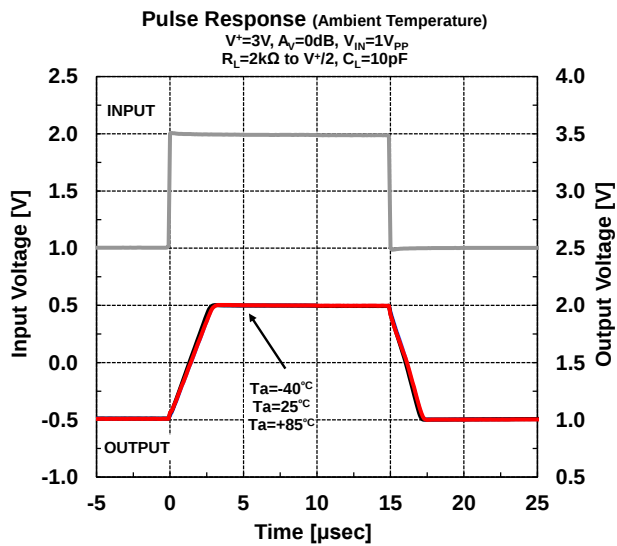
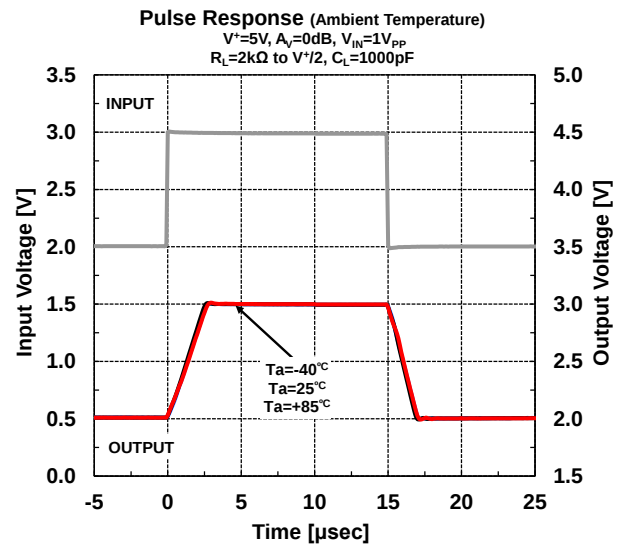
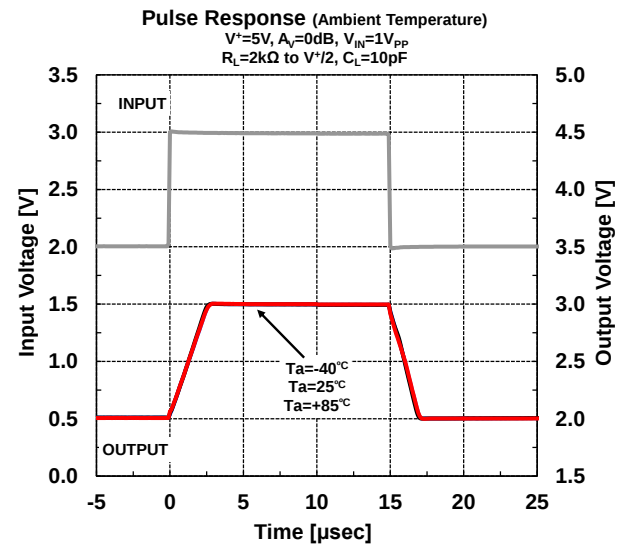
■ Typical Characteristics



■ Typical Characteristics

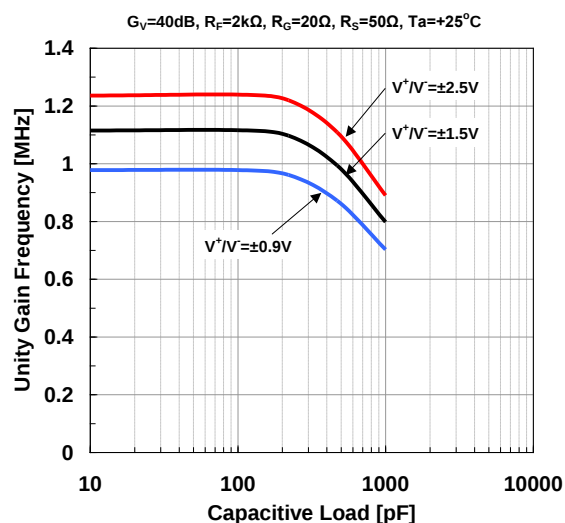


■ Typical Characteristics

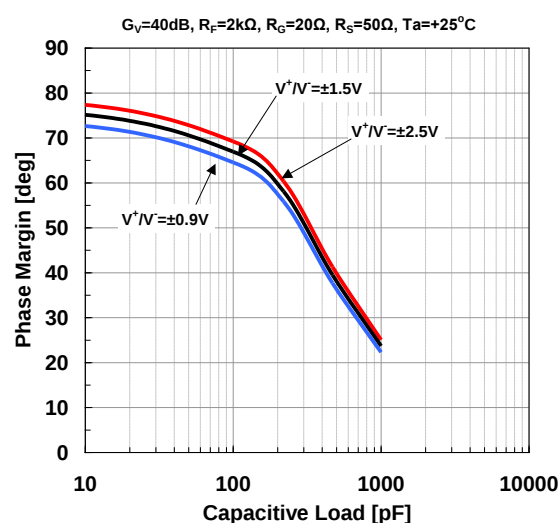


■ Typical Characteristics

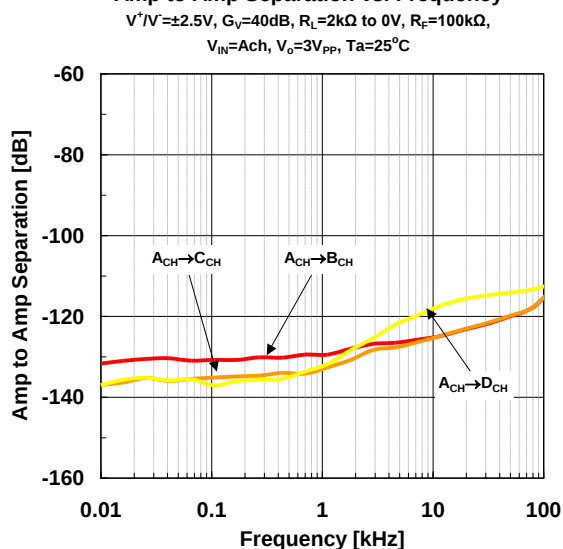
Unity Gain Frequency vs. Capacitive Load



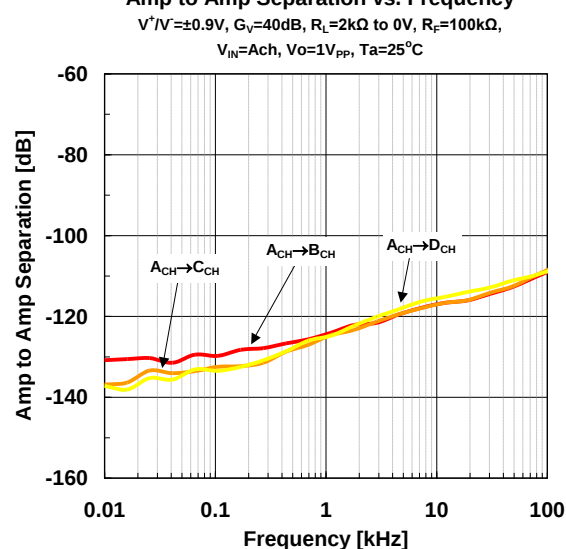
Phase Margin vs. Capacitive Load



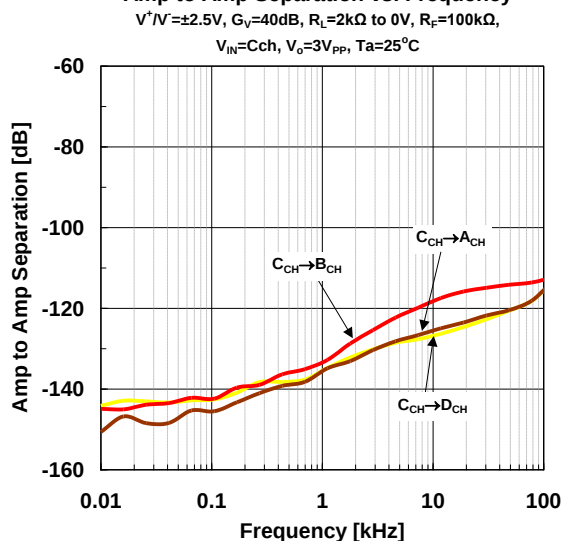
Amp to Amp Separation vs. Frequency



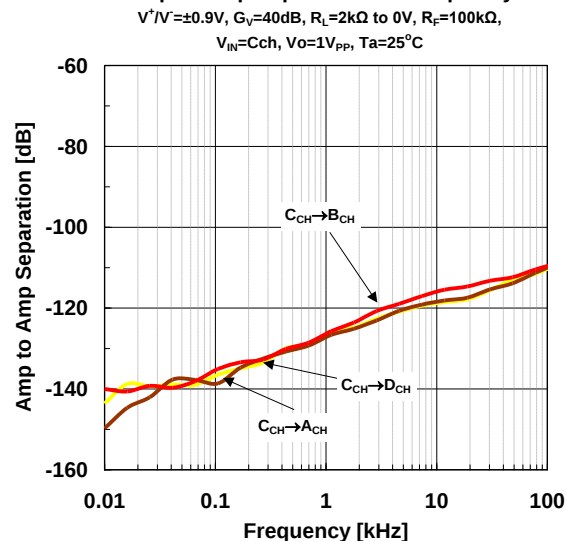
Amp to Amp Separation vs. Frequency



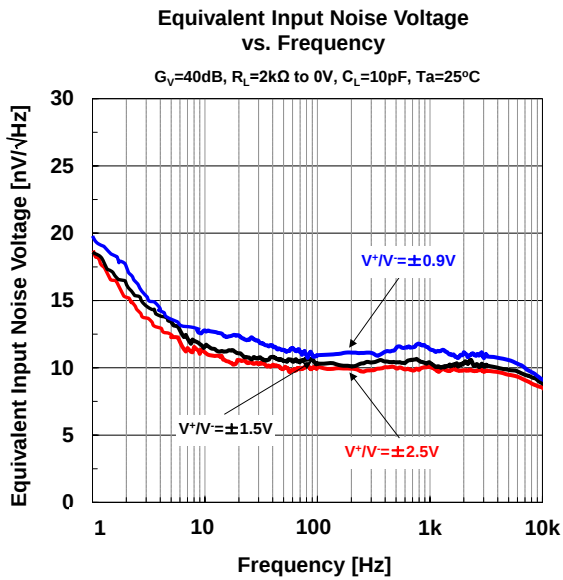
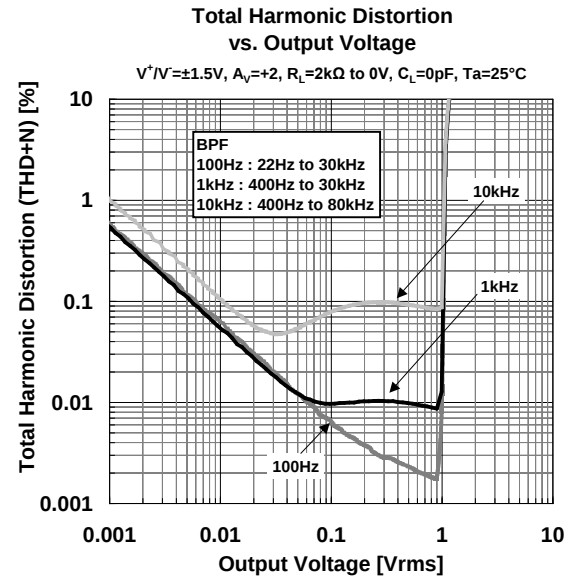
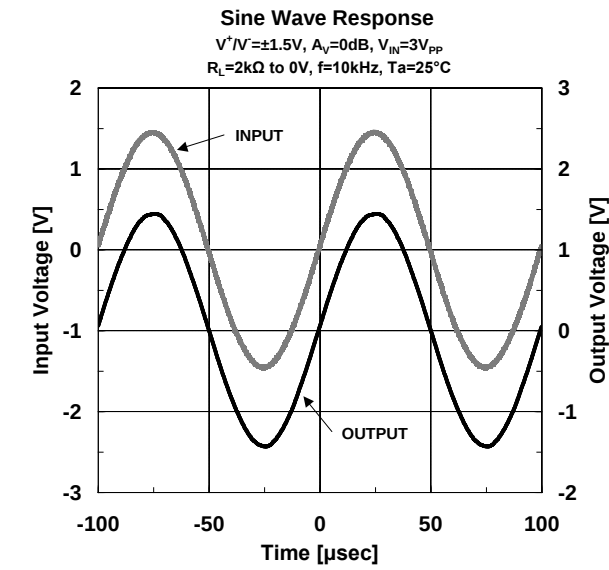
Amp to Amp Separation vs. Frequency



Amp to Amp Separation vs. Frequency



■ Typical Characteristics



[CAUTION]

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