

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.

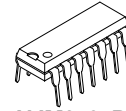
Rail-to-Rail Input/Output provides wide dynamic range, is from ground to power supply level. In addition to ground sensing applications, NJM2734 enable to be applied to Hi-side sensing applications.

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

■ PACKAGE OUTLINE



NJM2734D

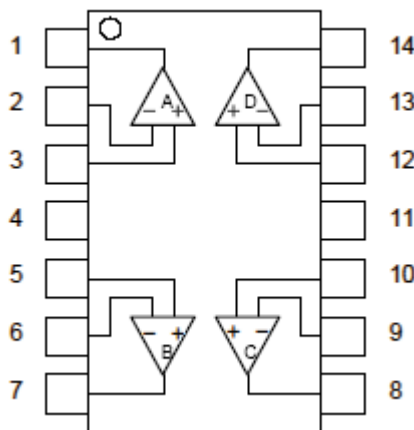


NJM2734M



NJM2734V

■ PIN CONFIGURATION



NJM2734D
NJM2734M
NJM2734V

PIN FUNCTION

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

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 (Note1) | V |
| Common Mode Input Voltage Range | V _{IC} | 0 ~ 7.0 (Note1) | V |
| Power Dissipation | P _D | (DIP14) 700 (DMP14) 520 (Note2) (SSOP14) 450 (Note2) | mW |
| Operating Temperature Range | T _{opr} | -40~+85 | °C |
| Storage Temperature Range | T _{stg} | -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 ⁺ | 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 (Note3) CMR -: 0V≤V _{CM} ≤2.5V (Note3) | 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 |

(Note3) 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+: $1.5V \leq V_{CM} \leq 3V$ (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 | 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+: $0.9 \leq V_{CM} \leq 1.8V$ (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

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

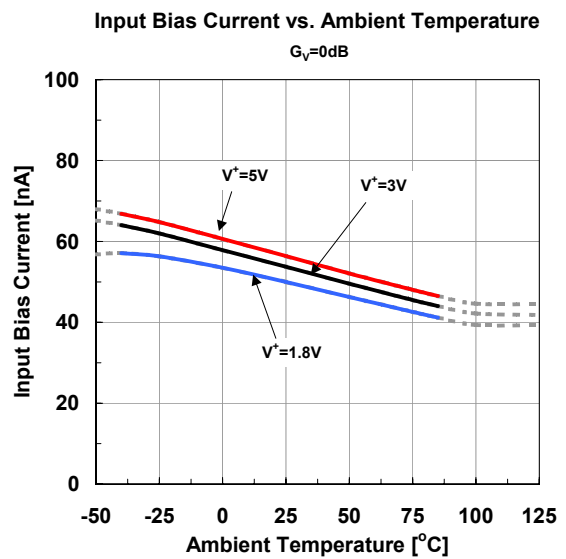
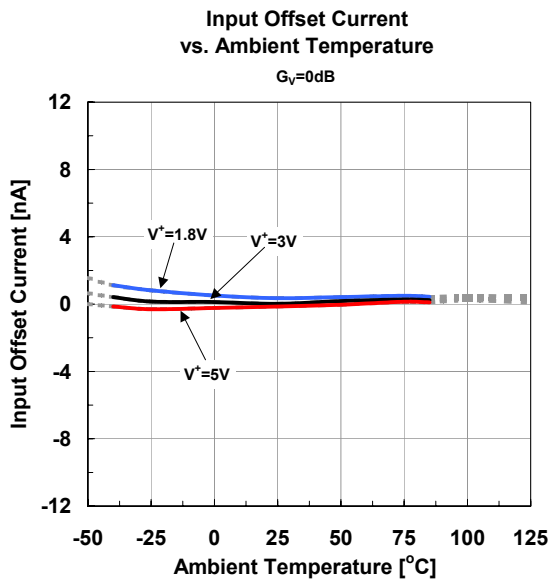
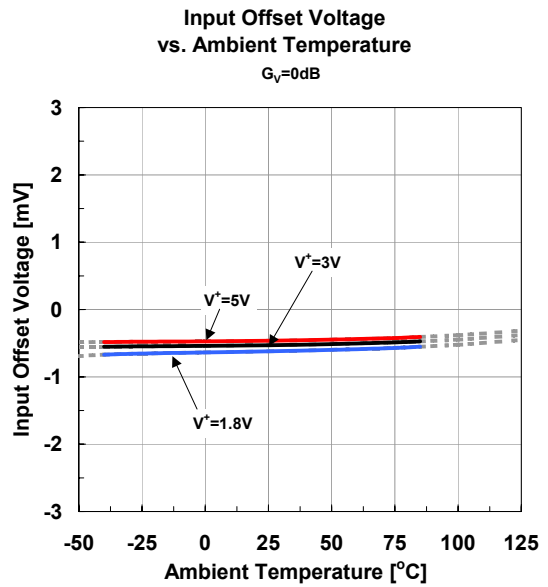
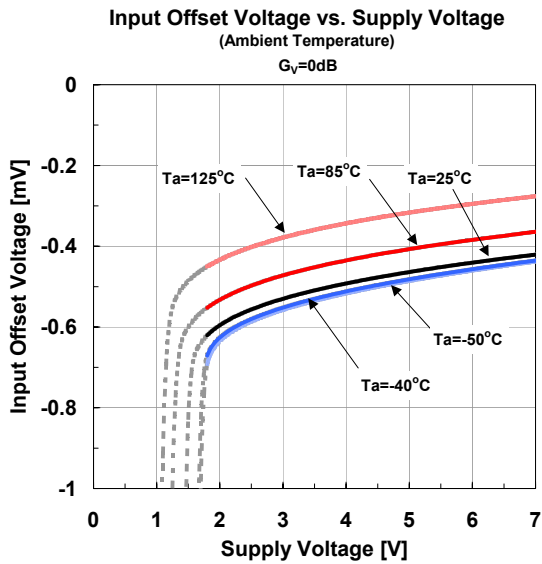
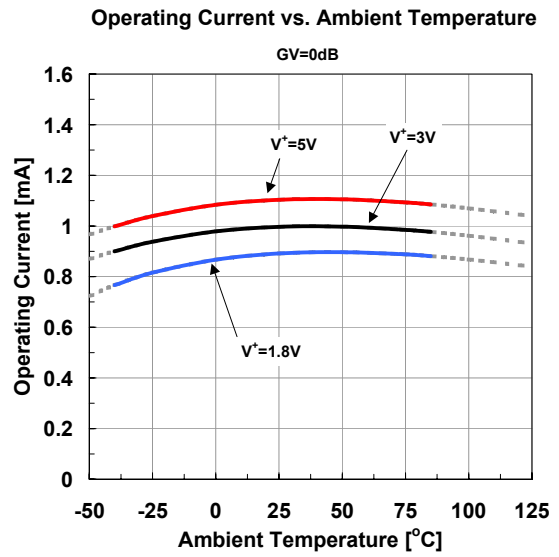
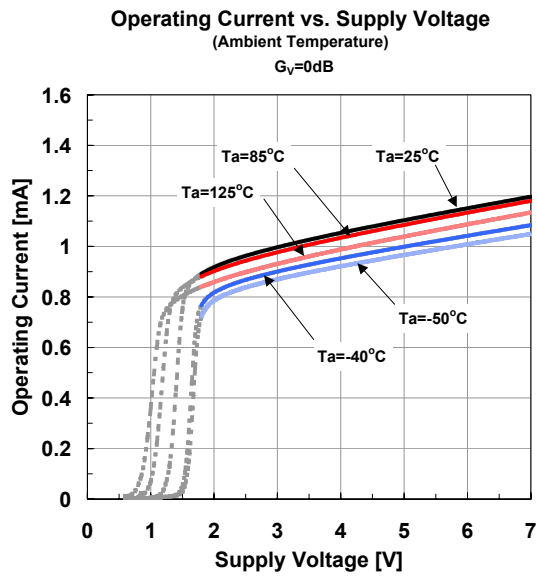
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|--------------------------------|----------|--|------|------|------|----------------|
| Unity Gain Bandwidth | GB | $R_L=2k\Omega$ to 0.9V | - | 1 | - | MHz |
| Phase Margin | Φ_M | $R_L=2k\Omega$ to 0.9V | - | 75 | - | Deg |
| Equivalent Input Noise 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

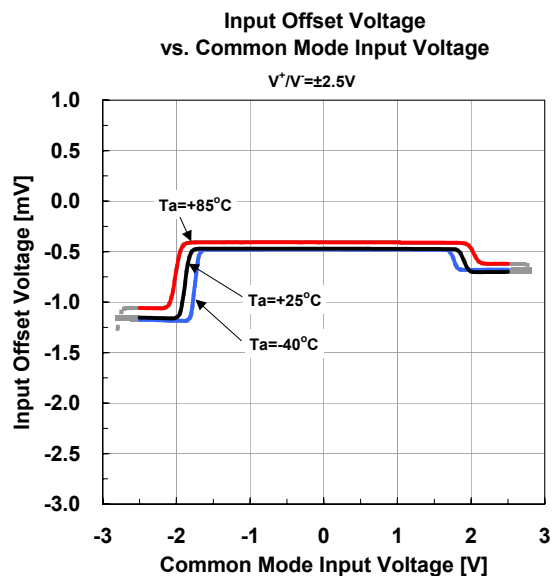
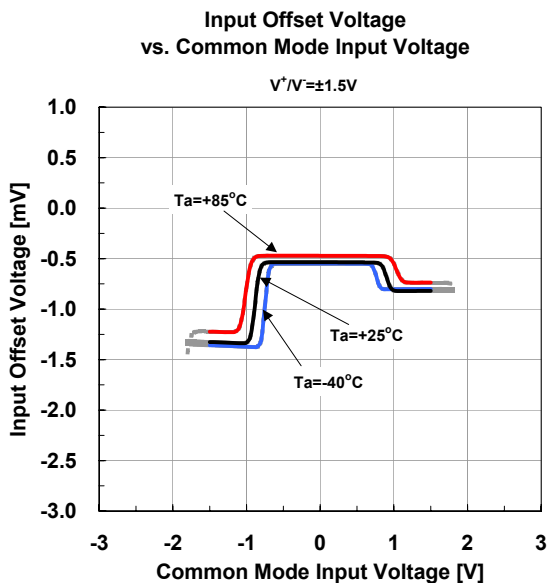
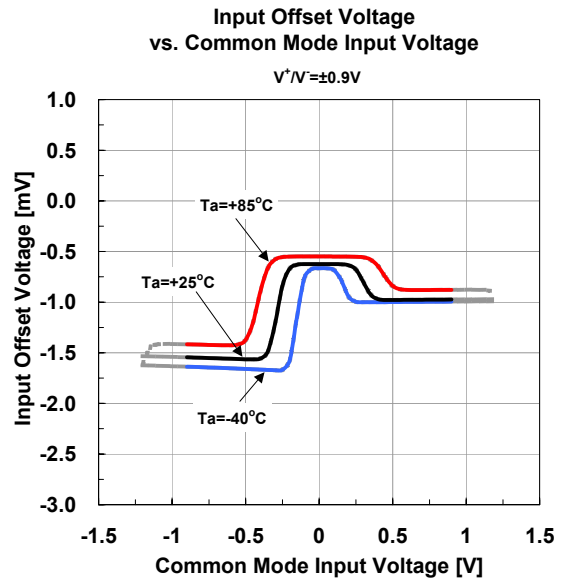
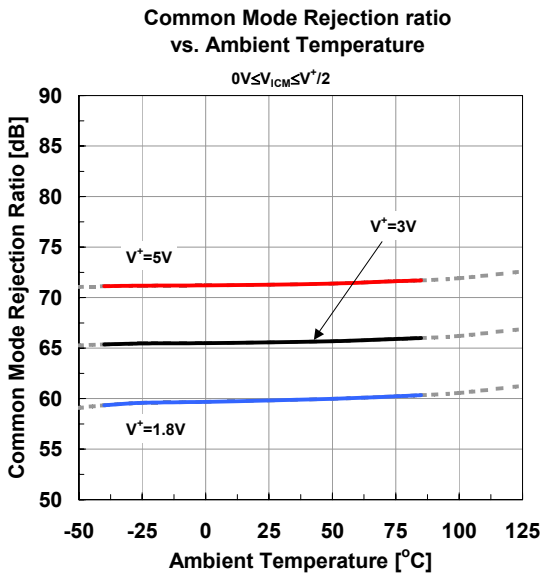
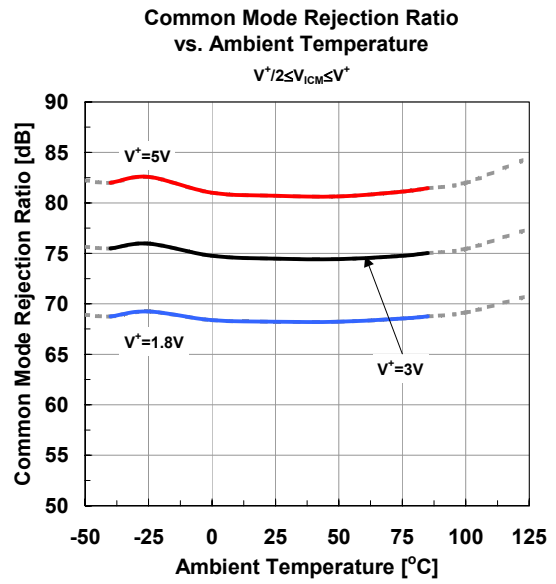
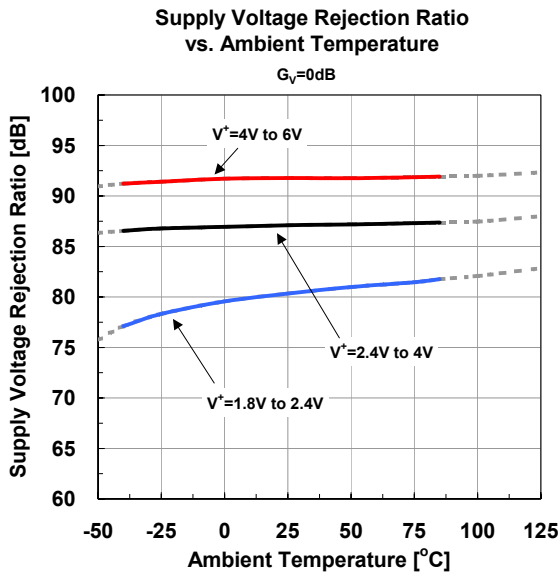
($V^+=1.8V$, $T_a=25^\circ C$)

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

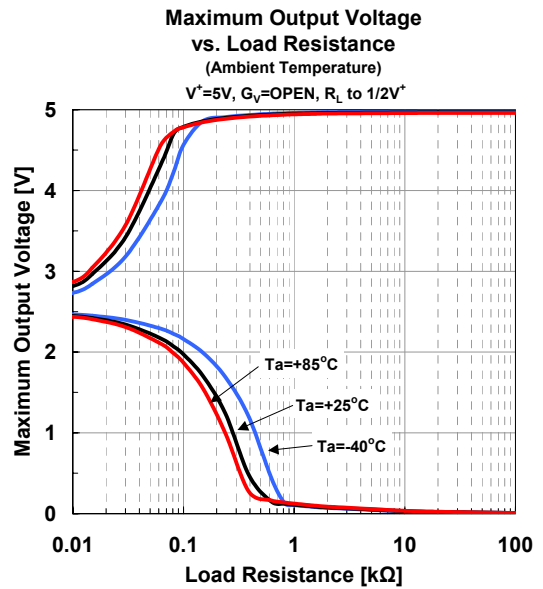
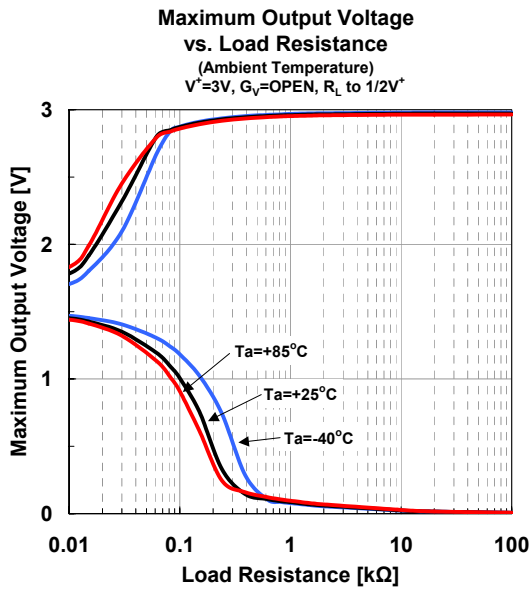
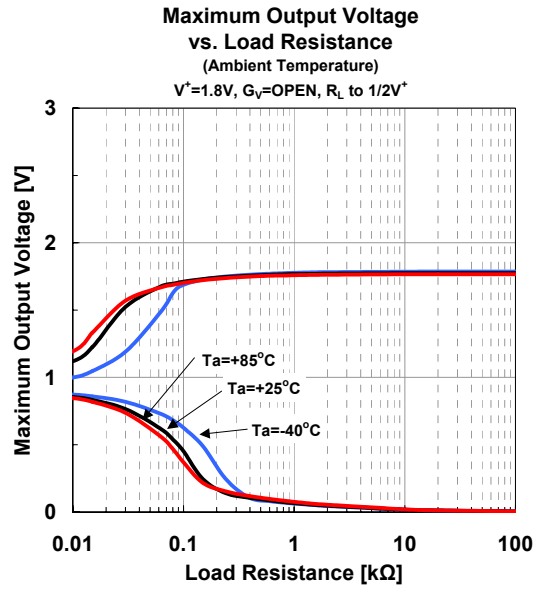
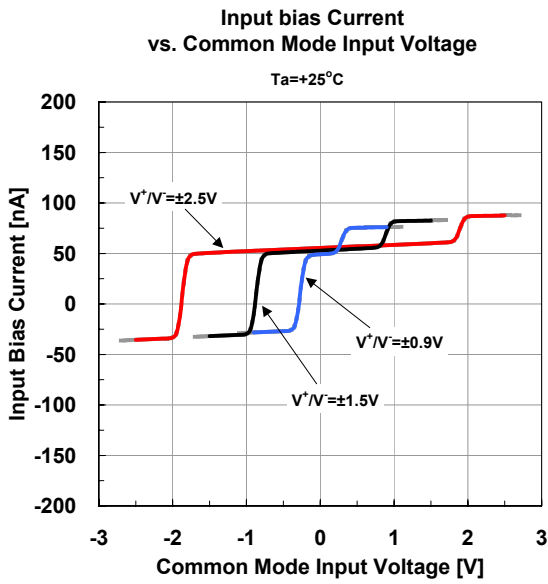
Typical Characteristics



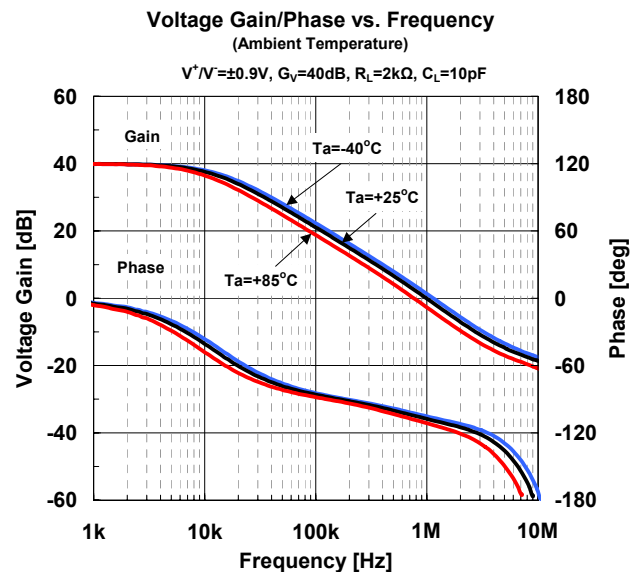
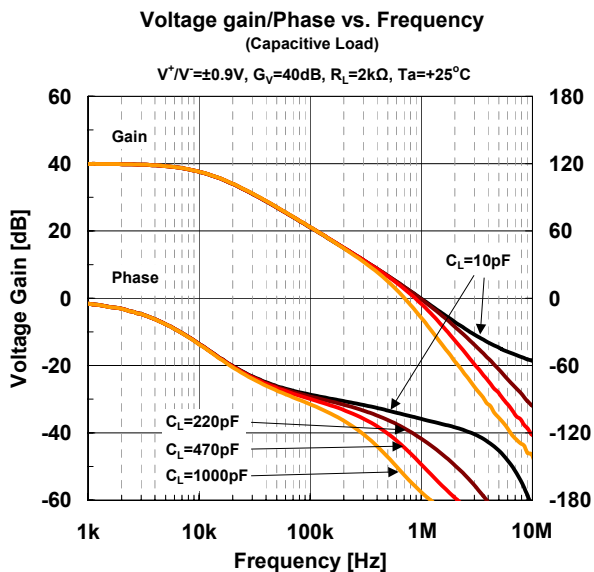
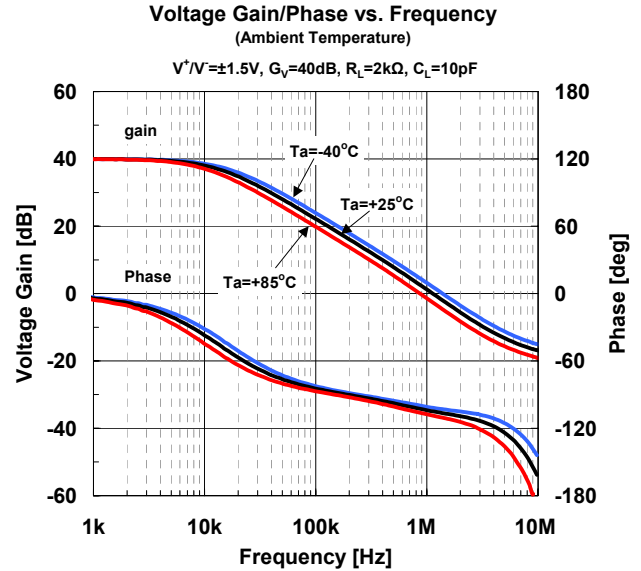
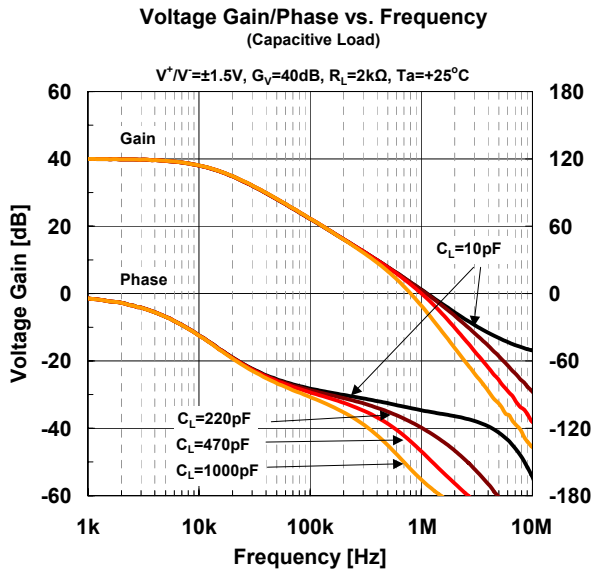
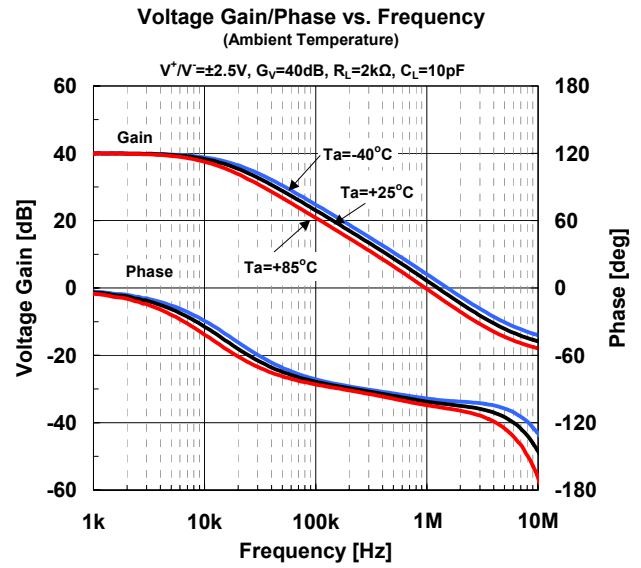
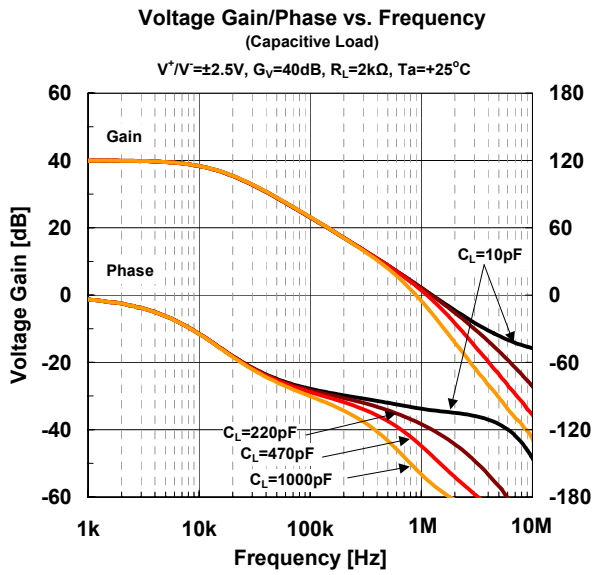
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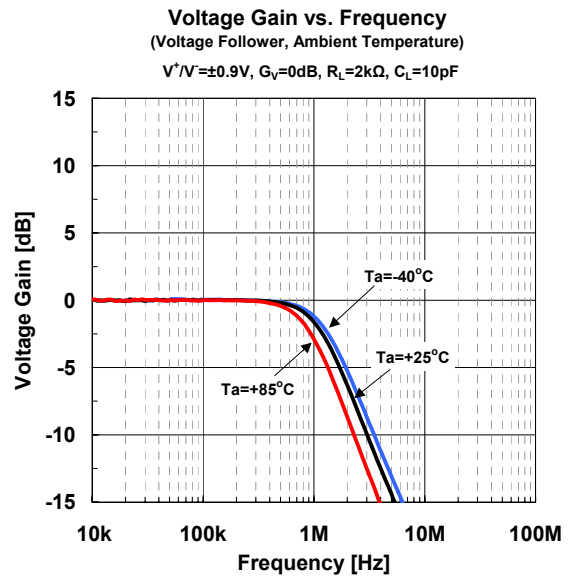
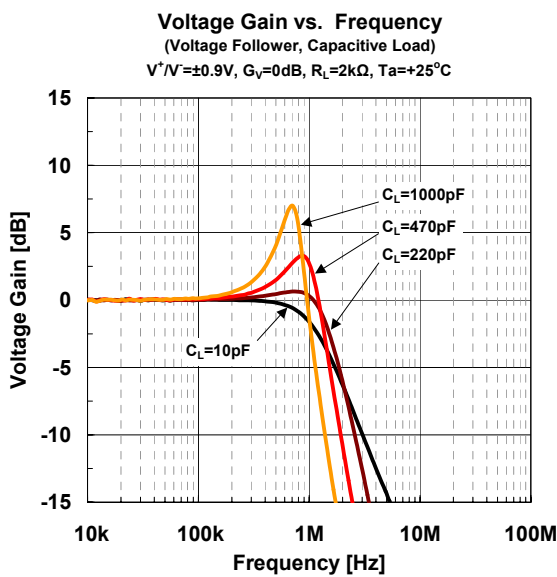
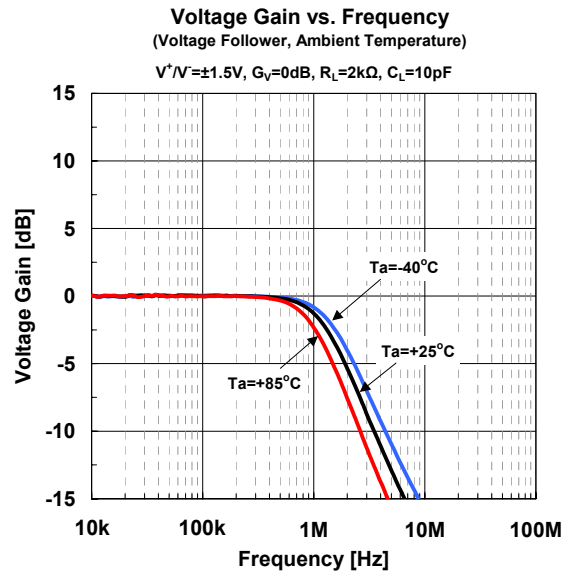
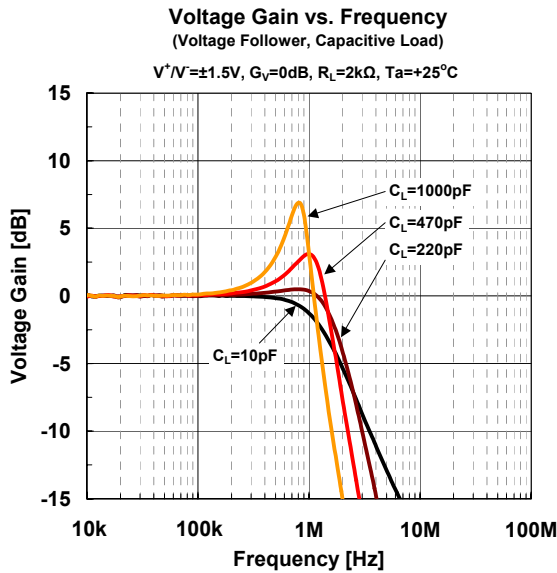
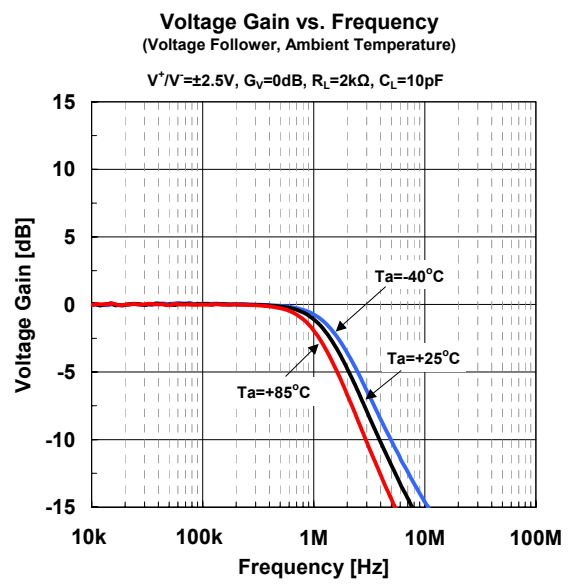
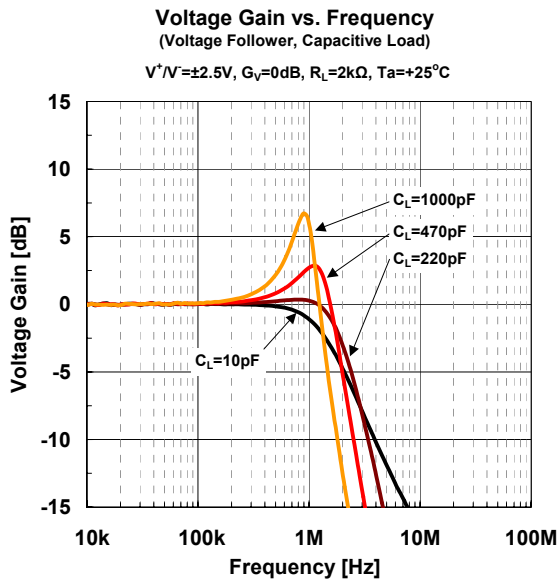
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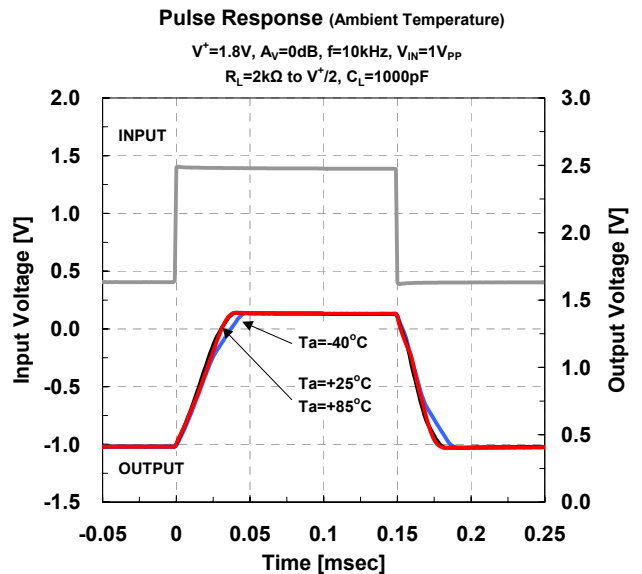
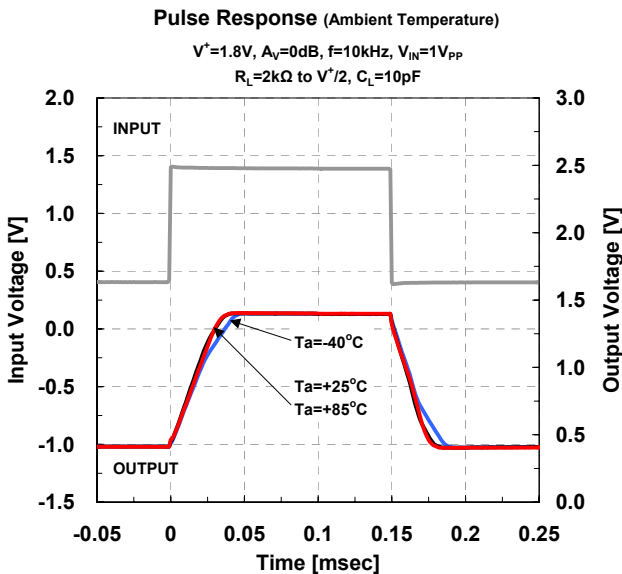
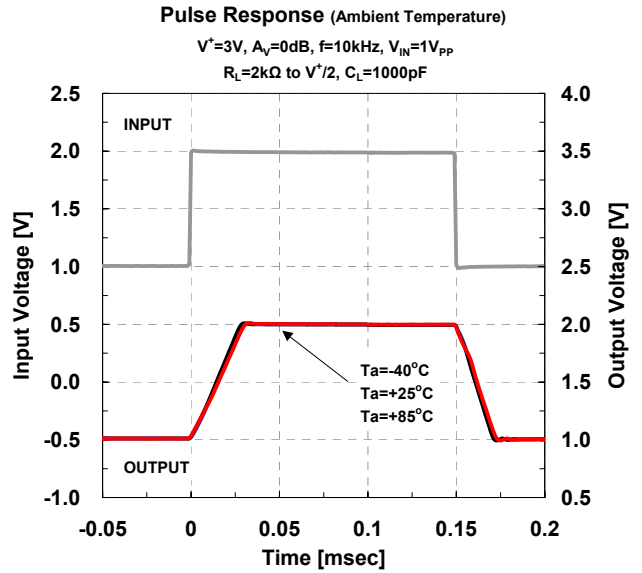
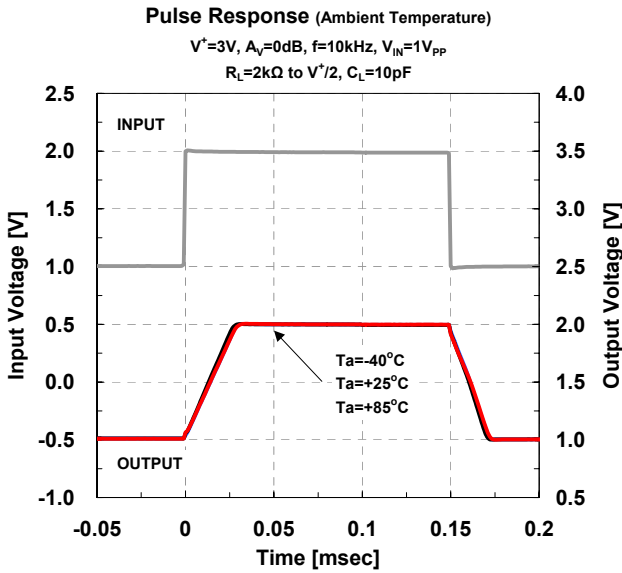
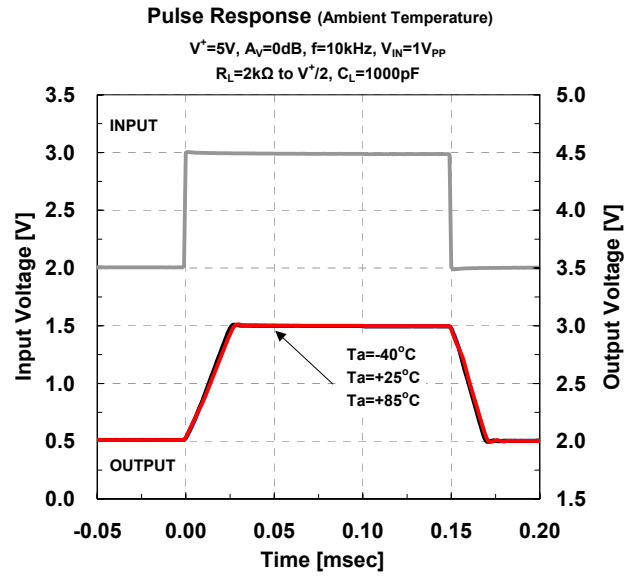
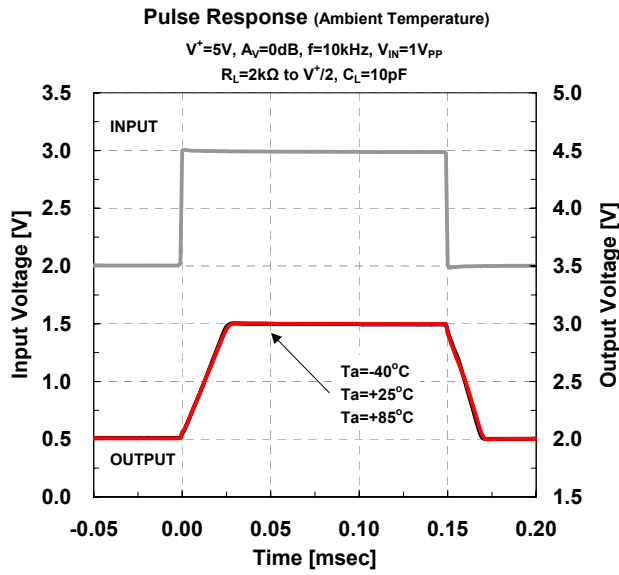
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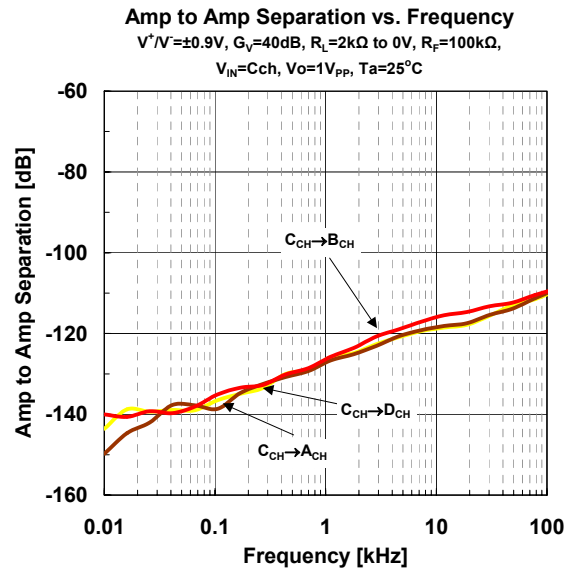
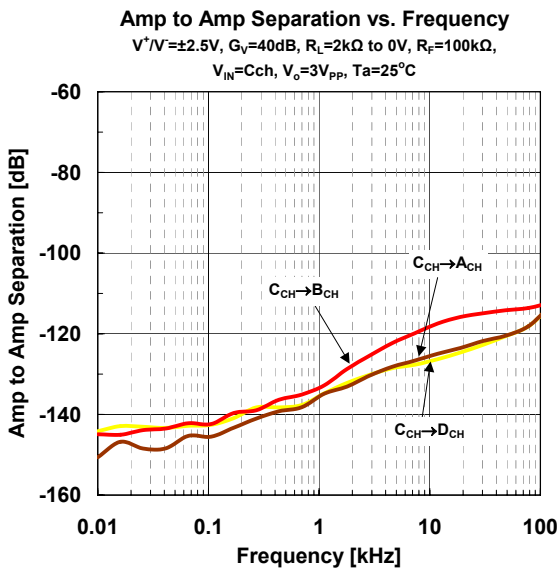
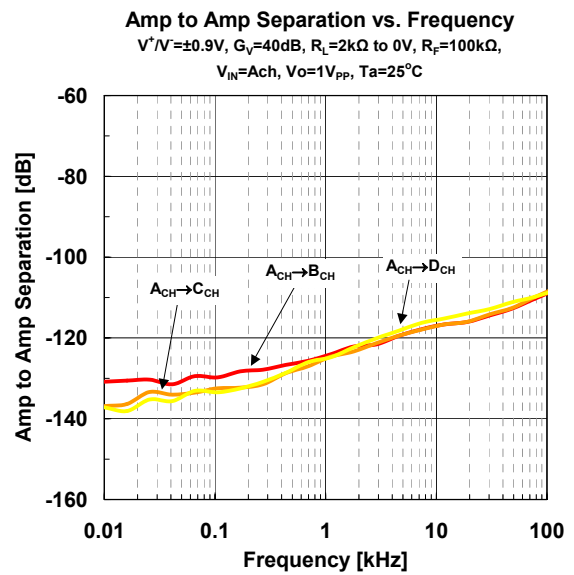
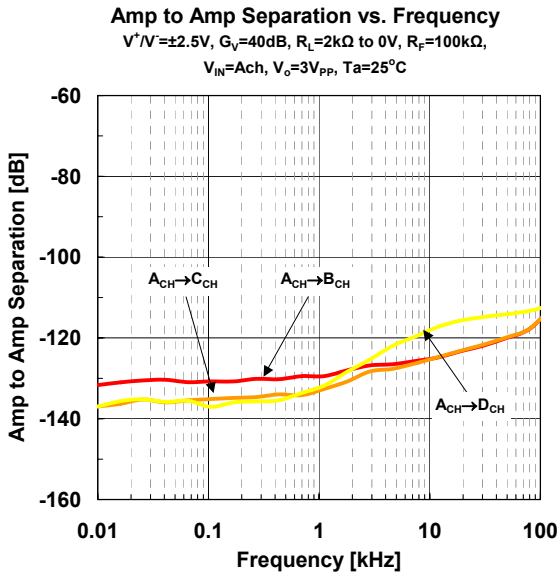
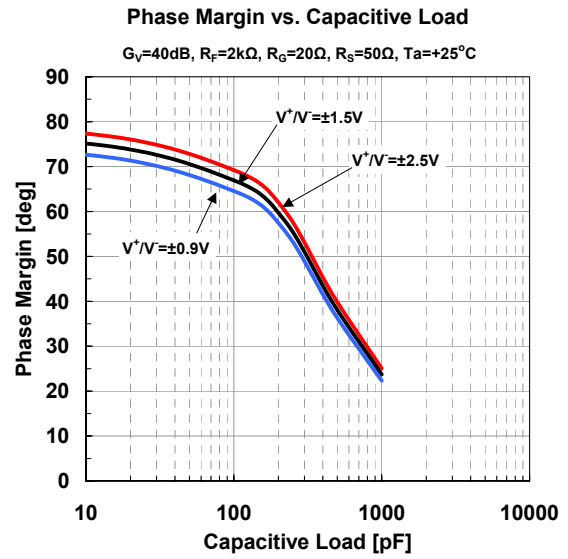
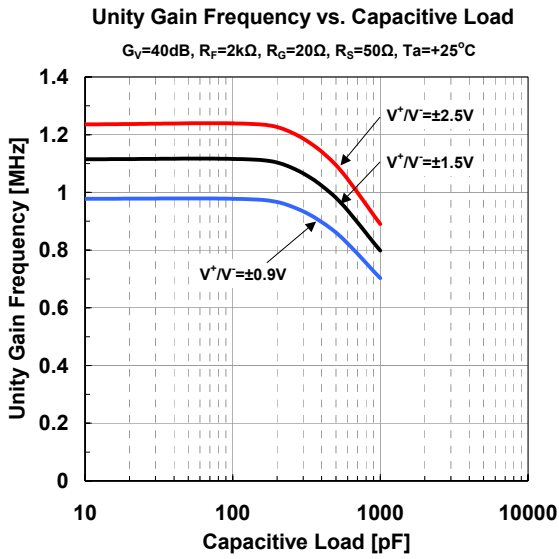
■ Typical Characteristics



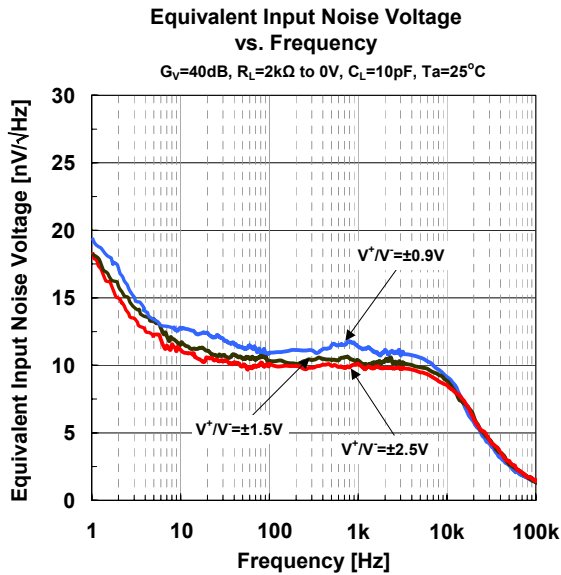
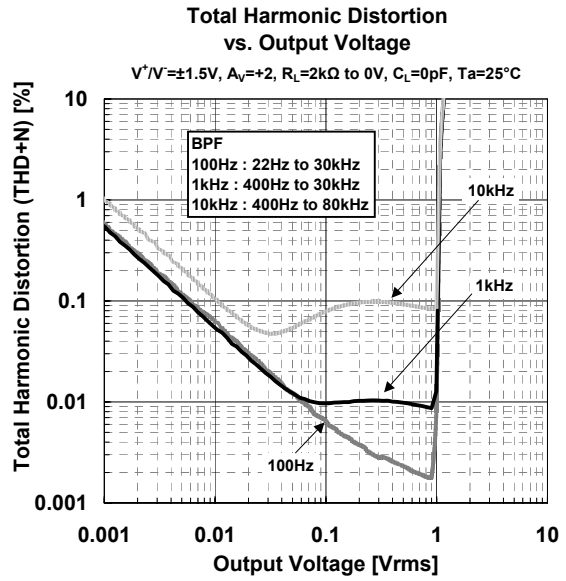
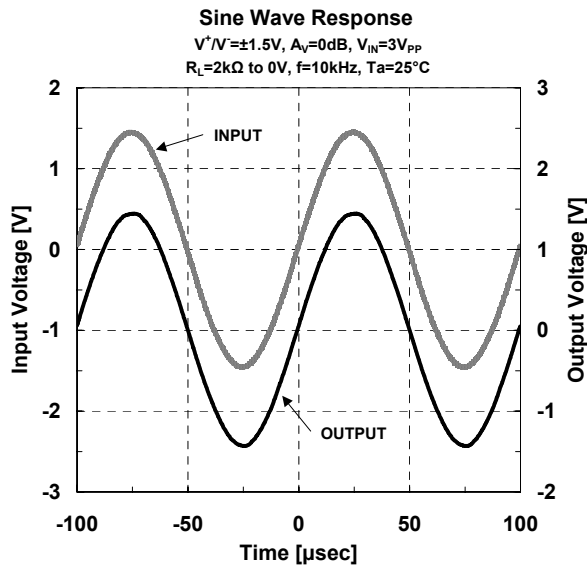
■ Typical Characteristics



■ Typical Characteristics



■ Typical Characteristics



[CAUTION]
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