

SINGLE SUPPLY DUAL OPERATIONAL AMPLIFIER

■ GENERAL DESCRIPTION

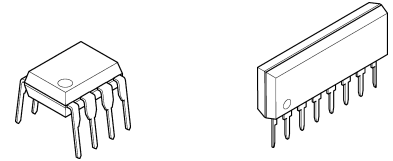
The NJM13404 is single-supply dual operational amplifier, which can operate from 2V supply. The features are low offset voltage, low bias current, high slew-rate, and free crossover distortion through the AB class output stage.

The package lineup is DIP, DMP and others compact, so that the NJM13404 is suitable for audio for low voltage operation and any other kind of signal amplifier.

■ FEATURES

- Operating Voltage +2V~+14V
- Slew Rate 1.2V/μs typ.
- Operating Current 2.0mA typ.
- Bipolar Technology
- Package Outline DIP8, SIP8, DMP8, SSOP8
SOP8 JEDEC 150mil
MSOP8 (VSP8)MEET JEDEC MO-187-DA
MSOP8 (TVSP8)MEET JEDEC MO-187-DA / thin type

■ PACKAGE OUTLINE



NJM13404D
(DIP8)

NJM13404L
(SIP8)



NJM13404M
(DMP8)



NJM13404E
(SOP8)



NJM13404V
(SSOP8)

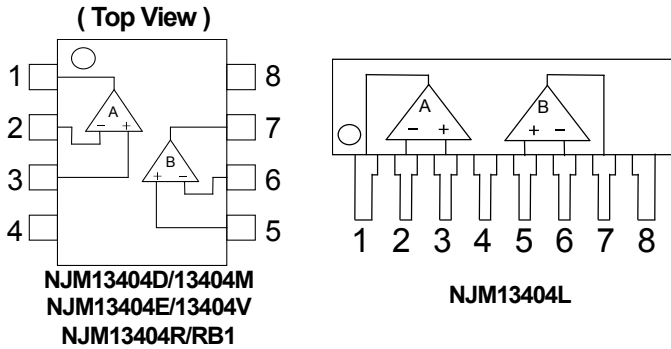


NJM13404R
(MSOP8(VSP8))



NJM13404RB1
(MSOP8(TVSP8))

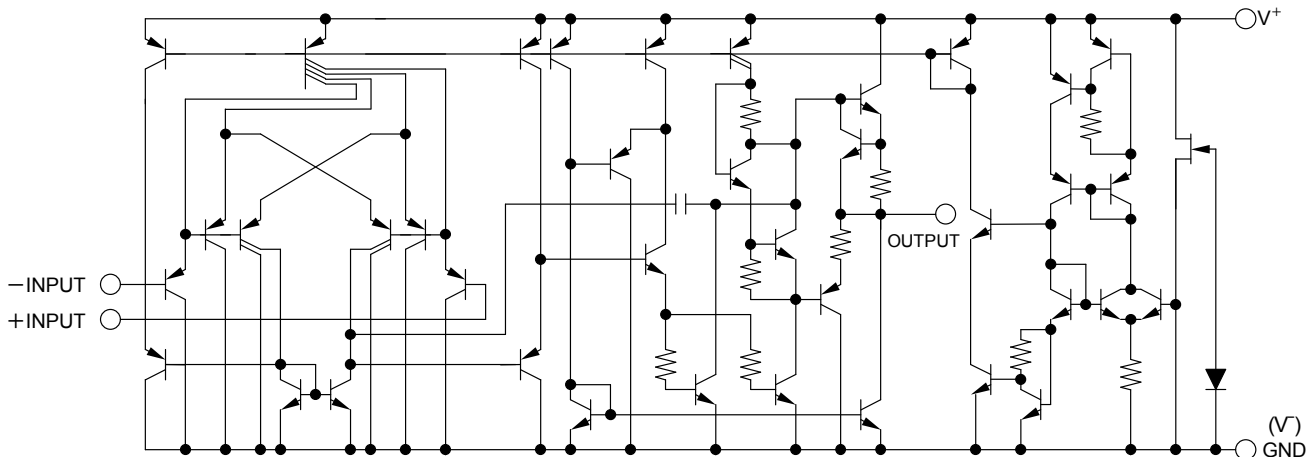
■ PIN CONFIGURATION



PIN FUNCTION

1. A OUTPUT
2. A-INPUT
3. A +INPUT
4. GND(V⁻)
5. B +INPUT
6. B-INPUT
7. B OUTPUT
8. V⁺

■ EQUIVALENT CIRCUIT (1/2 Shown)



NJM13404

■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

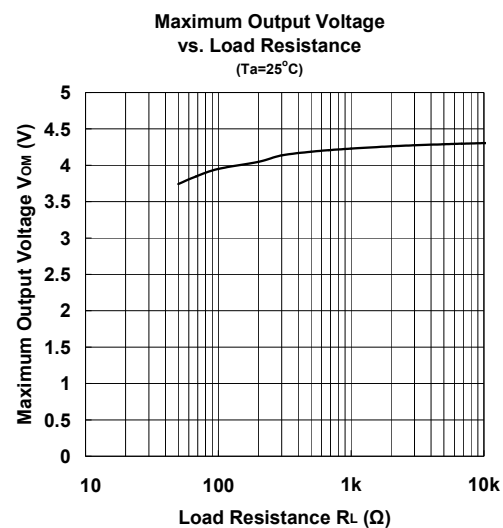
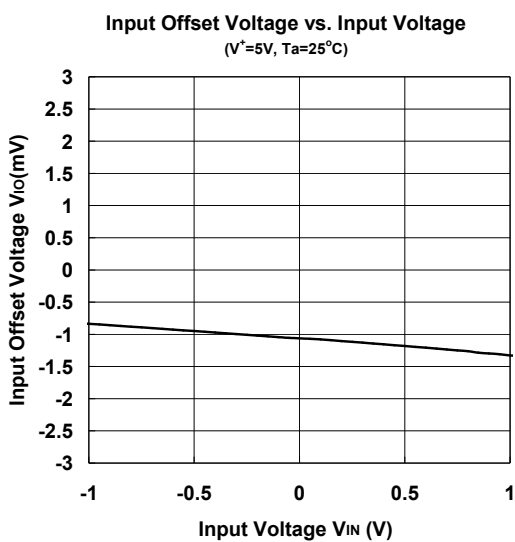
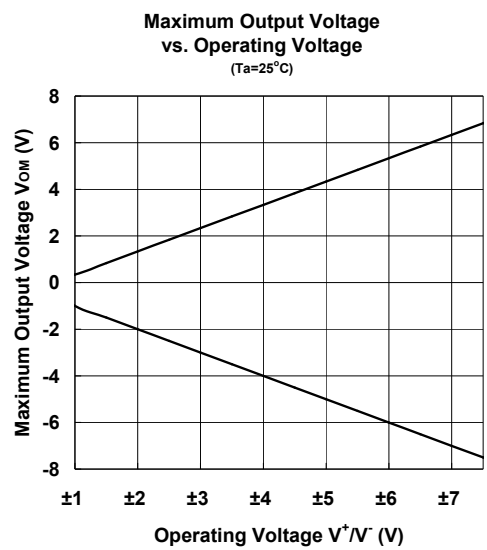
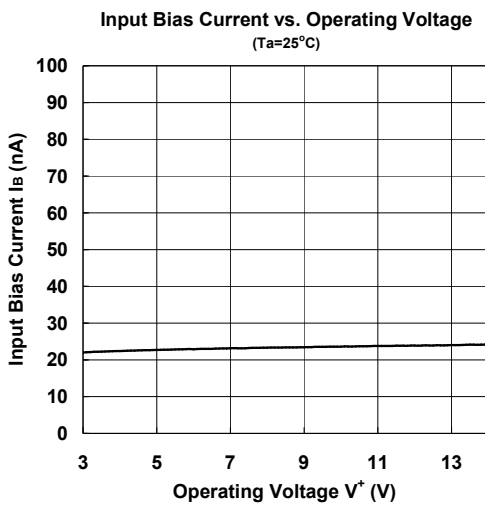
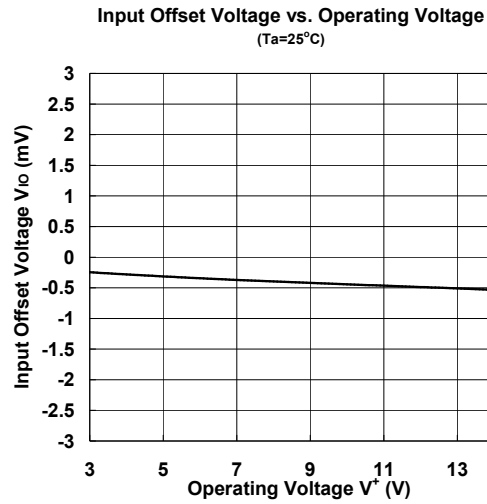
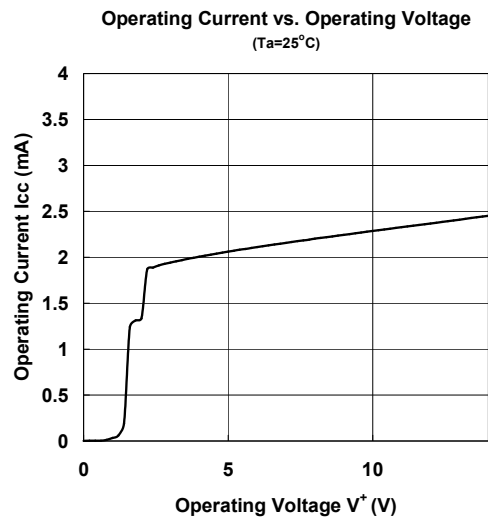
| PARAMETER | SYMBOL | RATINGS | UNIT |
|-----------------------------|-----------|--|------|
| Supply Voltage | V^+ | 15 | V |
| Differential Input Voltage | V_{ID} | 14 | V |
| Input Voltage | V_{IC} | -0.3~+14 | V |
| Power Dissipation | P_D | (DIP8) 500 (DMP8) 300 (EMP8) 300 (SSOP8) 250 (MSOP8(VSP8)) 320 (MSOP8(TVSP8)) 320 (SIP8) 800 | mW |
| Operating Temperature Range | T_{opr} | -40~+85 | °C |
| Storage Temperature Range | T_{stg} | -40~+125 | °C |

■ ELECTRICAL CHARACTERISTICS

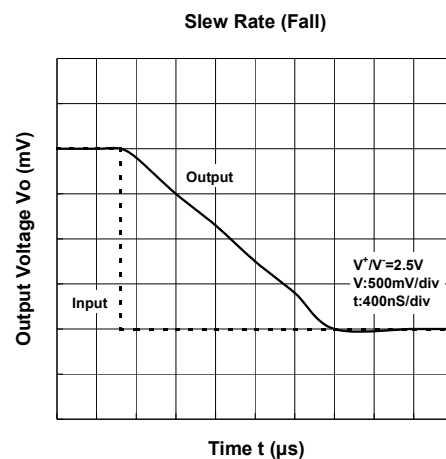
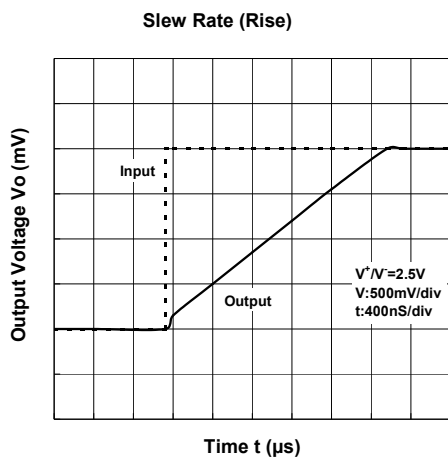
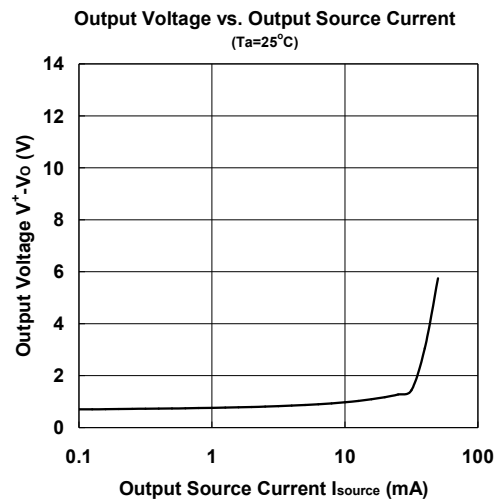
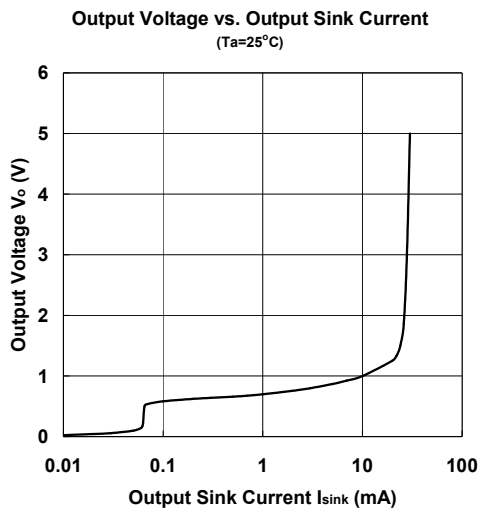
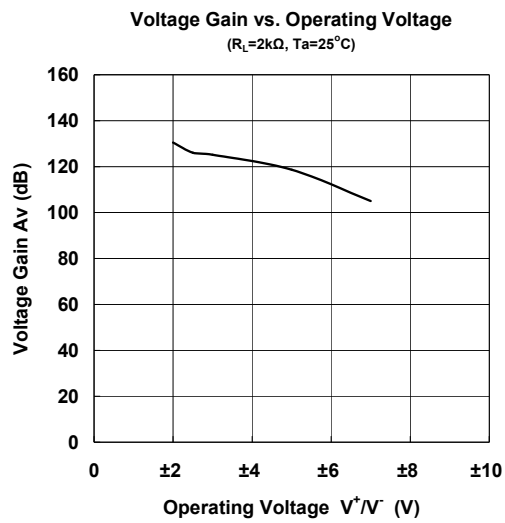
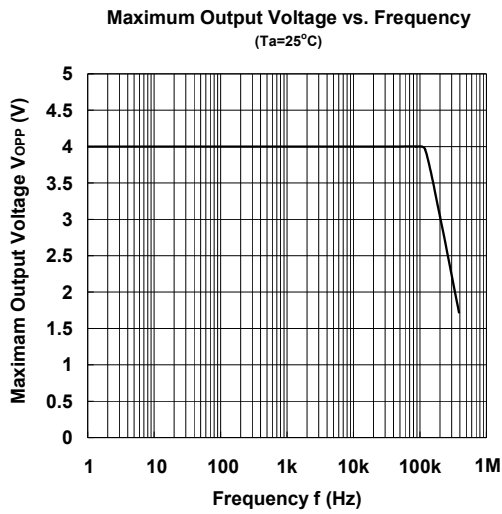
($V^+=5V, Ta=25°C$)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---------------------------------|--------------|--|-------|------|------|------------|
| Operating Voltage | V_{opr} | | 2 | - | 14 | V |
| Input Offset Voltage | V_{IO} | $R_S=0\Omega$ | - | 0.5 | 4 | mV |
| Input Offset Current | I_{IO} | | - | 5 | 50 | nA |
| Input Bias Current | I_B | | - | 25 | 150 | nA |
| Large Signal Voltage Gain | A_V | $R_L \geq 2k\Omega$ | 88 | 100 | - | dB |
| Maximum Output Voltage Swing | V_{OM} | $R_L=2k\Omega$ | 4.0 | 4.2 | - | V |
| Input Common Mode Voltage Range | V_{ICM} | | 0~3.5 | - | - | V |
| Common Mode Rejection Ratio | CMR | | 70 | 90 | - | dB |
| Supply Voltage Rejection Ratio | SVR | | 80 | 94 | - | dB |
| Output Source Current | I_{SOURCE} | $V_{IN}^+=1V, V_{IN}^-=0V$ | 20 | 35 | - | mA |
| Output Sink Current | I_{SINK} | $V_{IN}^+=0V, V_{IN}^-=1V$ | 10 | 30 | - | mA |
| Operating Current | I_{CC} | $R_L=\infty$ | - | 2.0 | 3.5 | mA |
| Slew Rate | SR | $V^+/V^-=\pm 2.5V, R_L=2k\Omega,$ $A_V=0dB, f=1kHz$ | - | 1.2 | - | V/ μ s |
| Unity Gain Bandwidth | f_T | $R_L=2k\Omega$ | - | 2.0 | - | MHz |
| Total Harmonic Distortion | THD | $R_L=2k\Omega, A_V=40dB,$ $f=20kHz, V_O=1V_{rms}$ | - | 0.2 | - | % |

■ TYPICAL CHARACTERISTICS

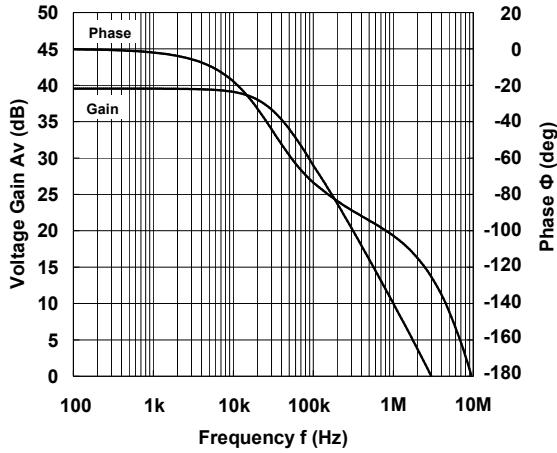


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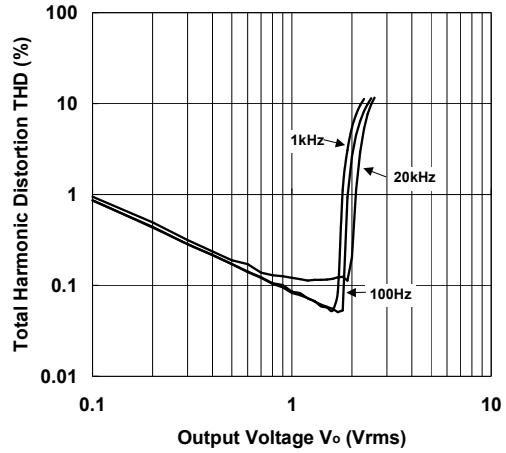


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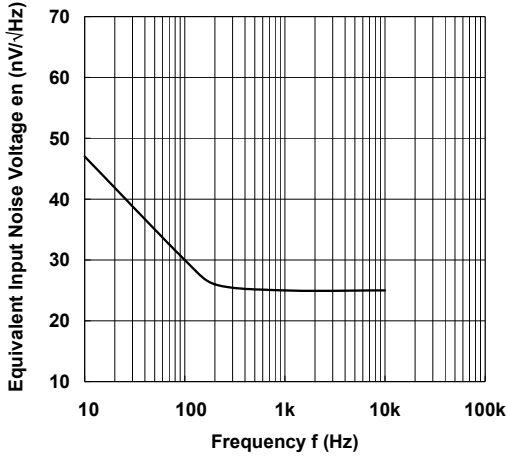
Voltage Gain / Phase vs. Frequency
($T_a=25^\circ\text{C}$)



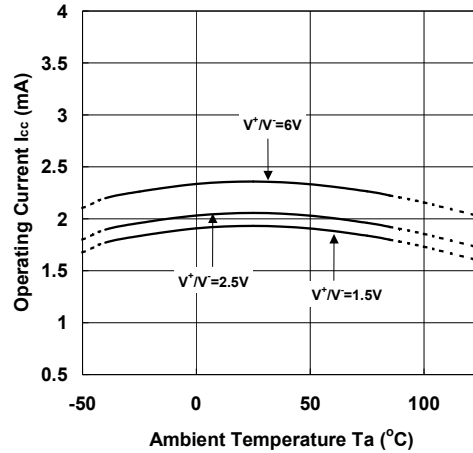
Total Harmonic Distortion vs. Output Voltage



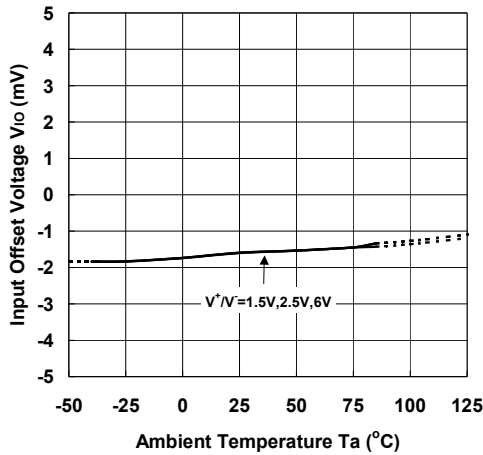
Equivalent Input Noise Voltage
v.s Frequency



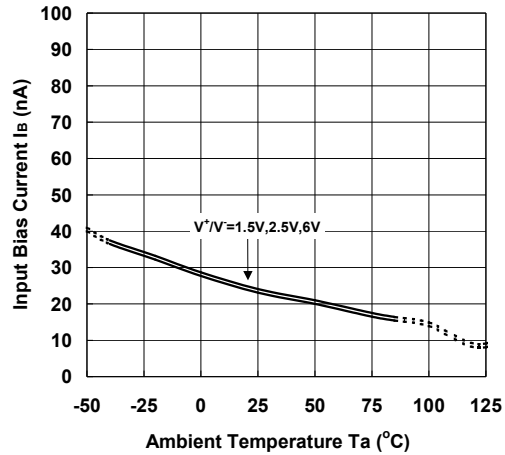
Operating Current vs. Ambient Temperature



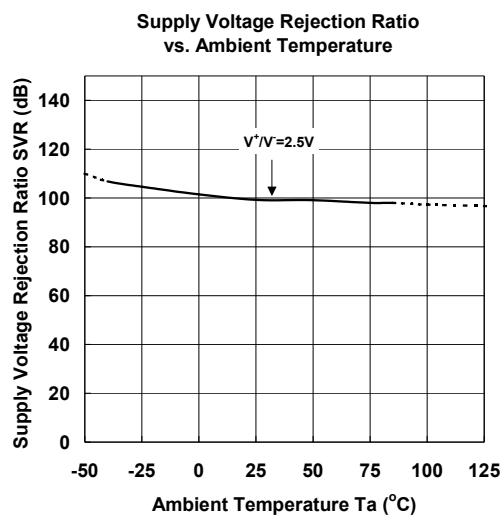
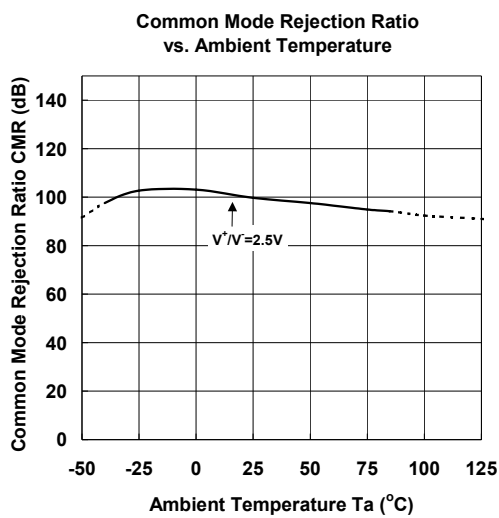
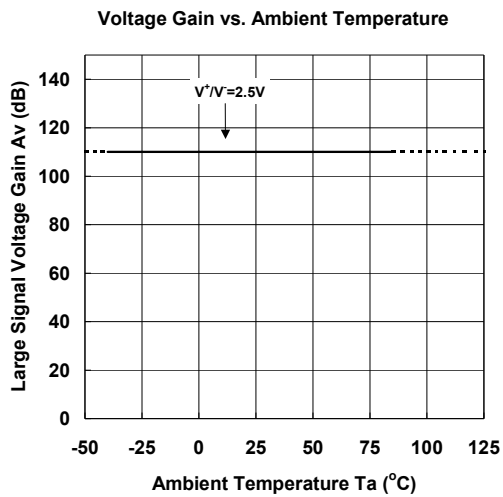
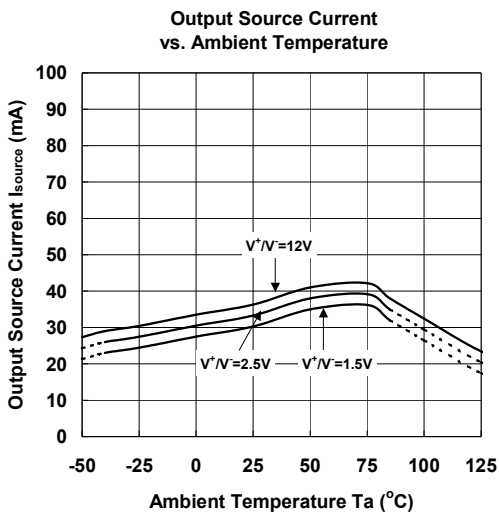
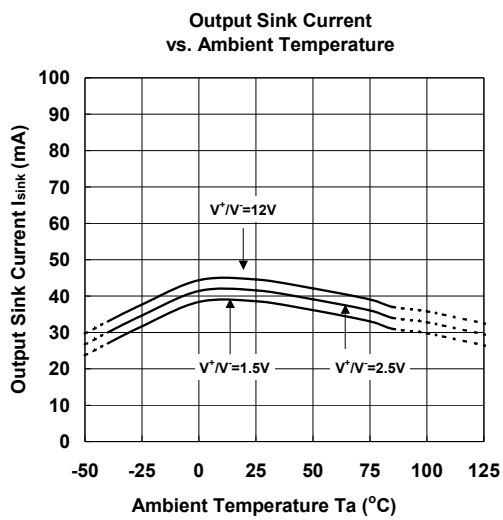
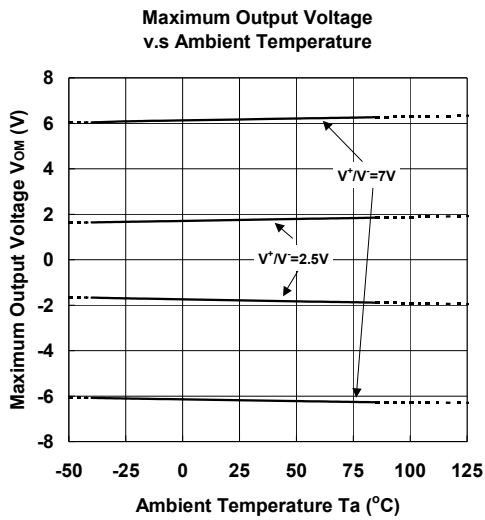
Input Offset Voltage
vs. Ambient Temperature



Input Bias Current vs. Ambient Temperature



■ TYPICAL CHARACTERISTICS



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