

SINGLE SUPPLY QUAD OPERATIONAL AMPLIFIER

■ GENERAL DESCRIPTION

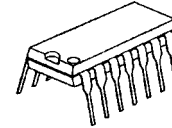
The NJM13403 is single-supply quad operational amplifier, which can operate from 2V supply. The features are low offset voltage, low bias current, high slew-rate, and free crossover distortion through the AB class output stage.

The package lineup is DIP, DMP and others compact, so that the NJM13403 is suitable for audio for low voltage operation and any other kind of signal amplifier.

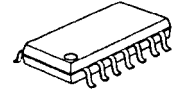
■ FEATURES

- Operating Voltage (+2V~+14V)
- Slew Rate (1.2V/μs typ.)
- Operating Current (3.0mA typ.)
- Bipolar Technology
- Package Outline DIP14,DMP14,EMP14,SSOP14

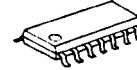
■ PACKAGE OUTLINE



NJM13403D1



NJM13403M

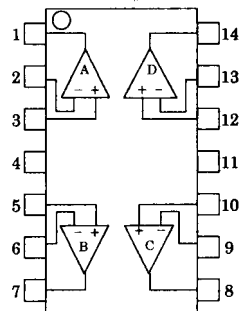


NJM13403E



NJM13403V

■ PIN CONFIGURATION

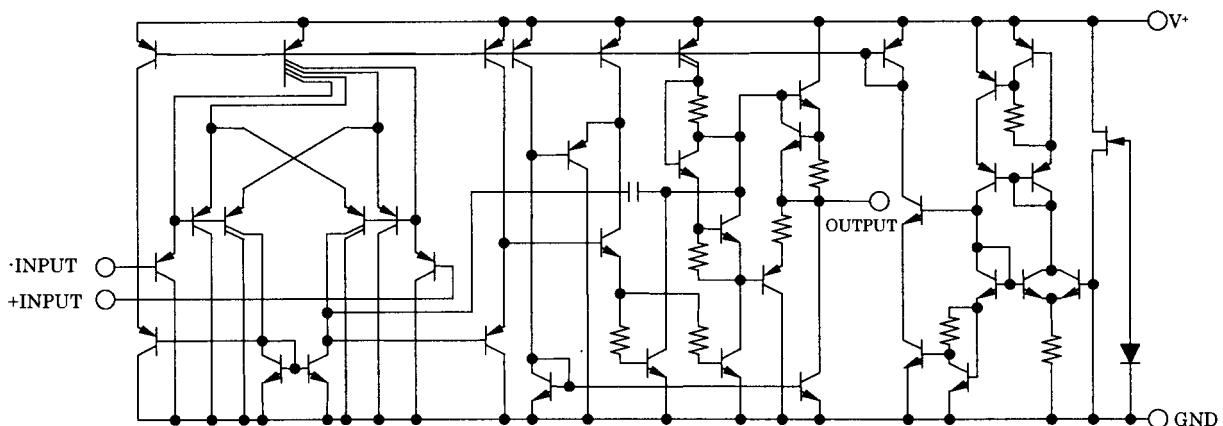


NJM13403D1/13403M
NJM13403E/13403V

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 |

■ EQUIVALENT CIRCUIT (1/4 Shown)



NJM13403

■ 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 | (DIP14) 700 (DMP14) 300 (EMP14) 300 (SSOP14) 300 | mW |
| Operating Temperature Range | T_{opr} | -40~+85 | °C |
| Storage Temperature Range | T_{stg} | -40~+125 | °C |

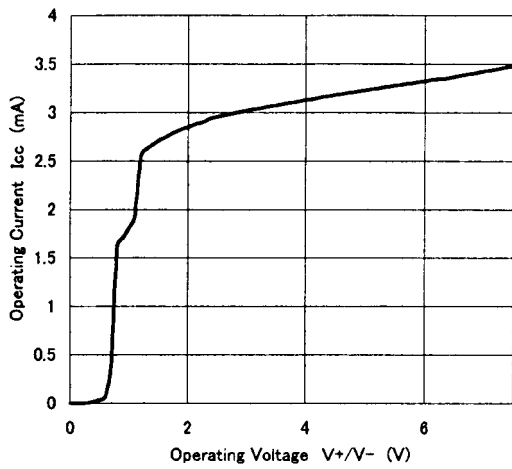
■ ELECTRICAL CHARACTERISTICS

($V^+=5V, T_a=25^\circ C$)

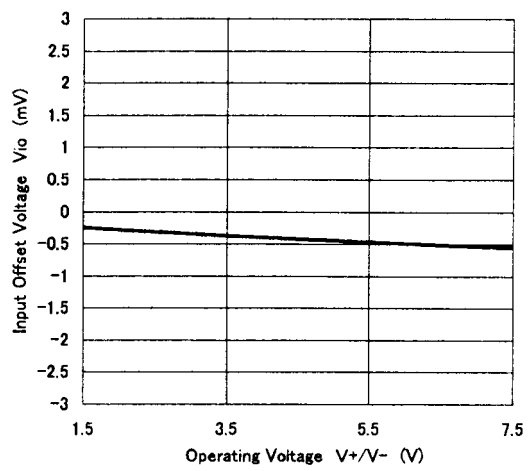
| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---------------------------------|--------------|--|-------|------|------|------------|
| Operating Voltage | V_{opr} | | 2 | - | 14 | V |
| Input Offset Voltage | V_{IO} | $R_S=0\Omega$ | - | 0.5 | 4 | mV |
| Input Offset Current | 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} | $R_L=\infty$ | - | 3.0 | 5.0 | mA |
| Slew Rate | SR | $V^+/V^-=\pm 2.5V, R_L=2k\Omega,$ $A_V=0dB, f=1kHz$ | - | 1.2 | - | V/ μs |
| Unity Gain Bandwidth | f_T | $R_L=2k\Omega$ | - | 2.0 | - | MHz |
| Total Harmonic Distortion | THD | $R_L=2k\Omega, A_V=40dB,$ $f=20kHz, V_O=1.0V_{rms}$ | - | 0.2 | - | % |

■ TYPICAL CHARACTERISTICS

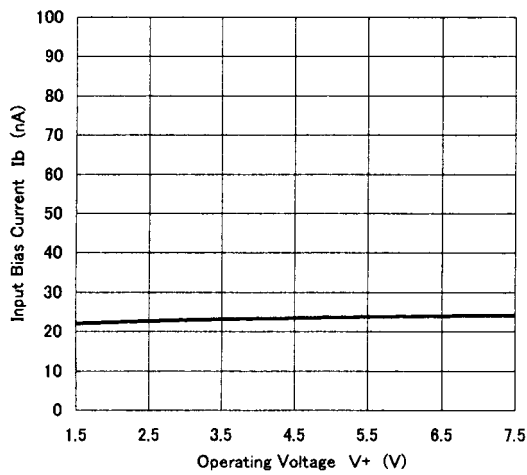
NJM13403 Operating Current vs. Operating Voltage



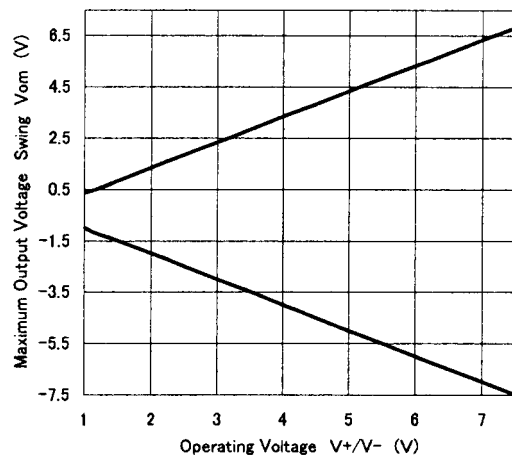
NJM13403 Input Offset Voltage vs. Operating Voltage



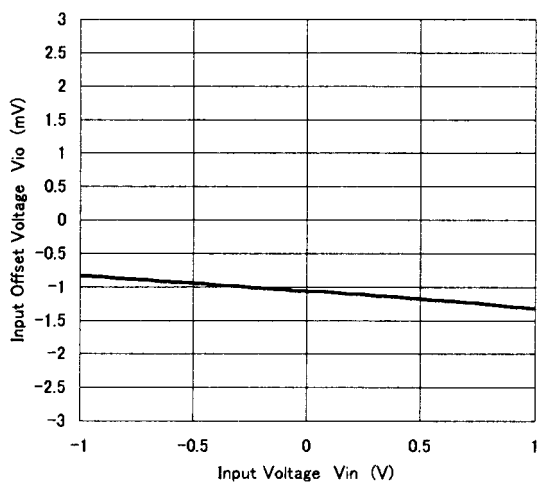
NJM13403 Input Bias Current vs. Operating Voltage



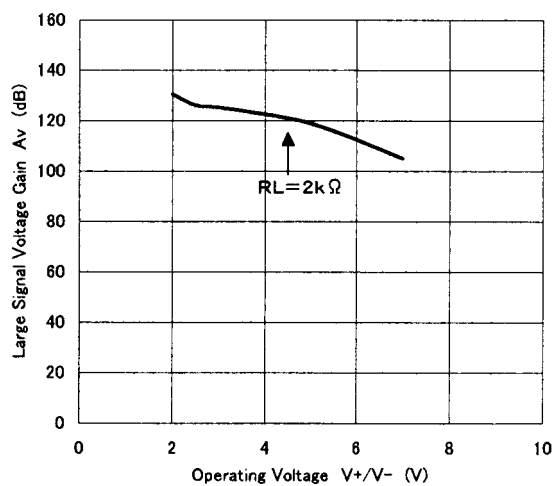
NJM13403 Maximum Output Voltage Swing vs. Operating Voltage



NJM13403 Input CommonMode Voltage Range



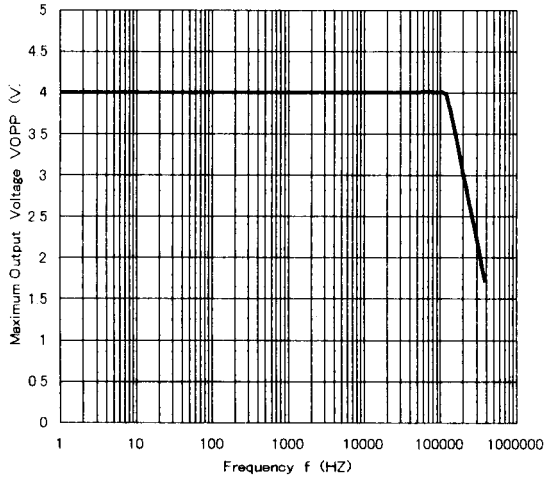
NJM13403 Large Signal Voltage Gain vs. Operating Voltage



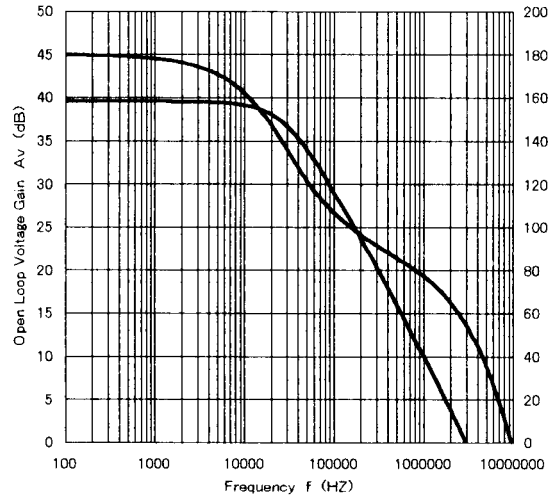
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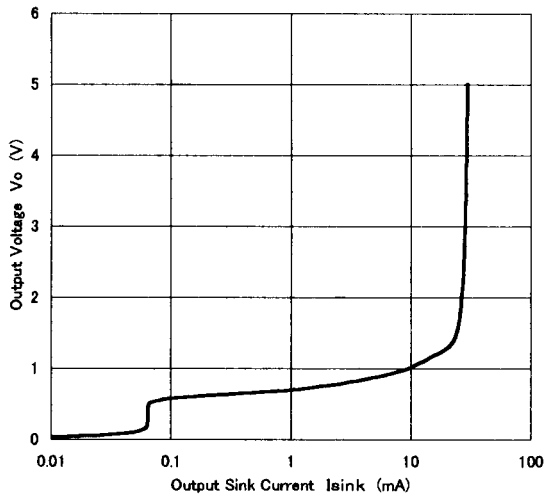
NJM13403 Maximum Output Voltage Swing vs. Frequency



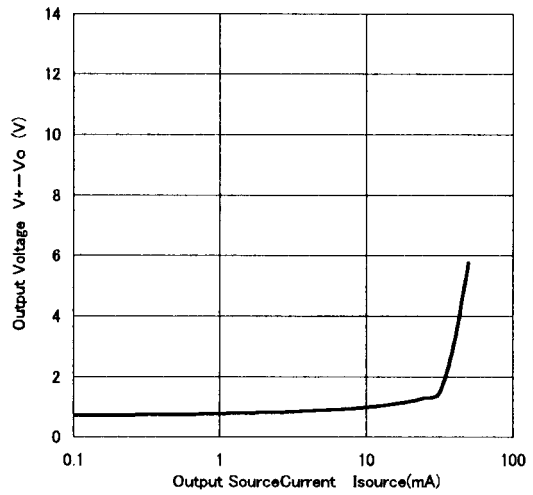
NJM13403 Open Loop Voltage Gain vs. Frequency



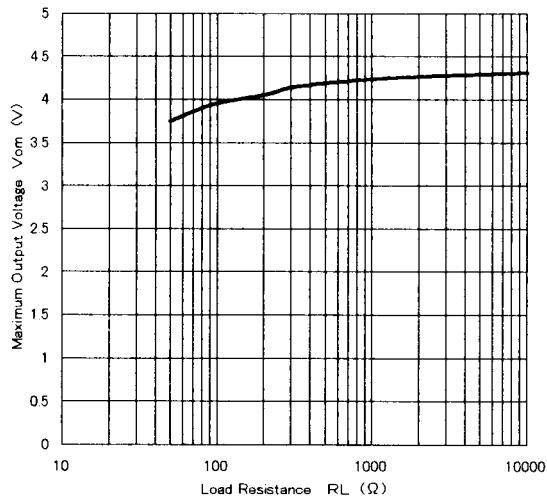
NJM13403 Output Voltage vs. Output Sink Current



NJM13403 Output Voltage vs. Output Source Current

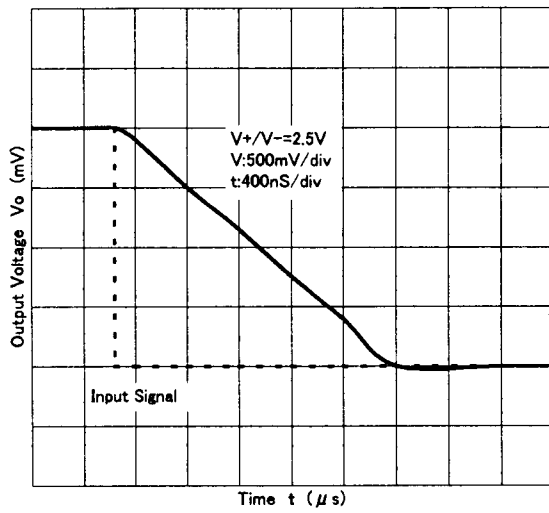


NJM13403 Maximum Output Voltage vs. Load Resistance

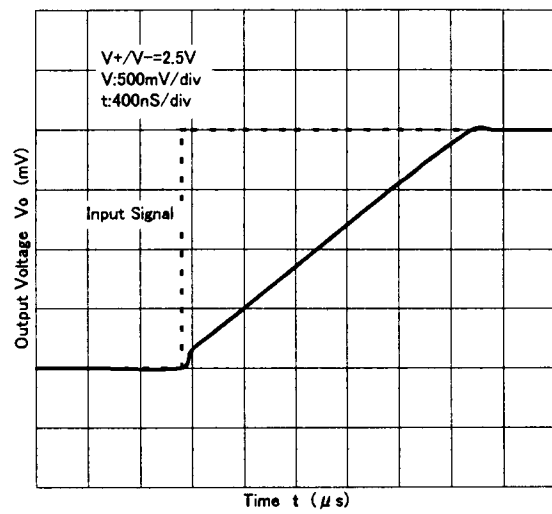


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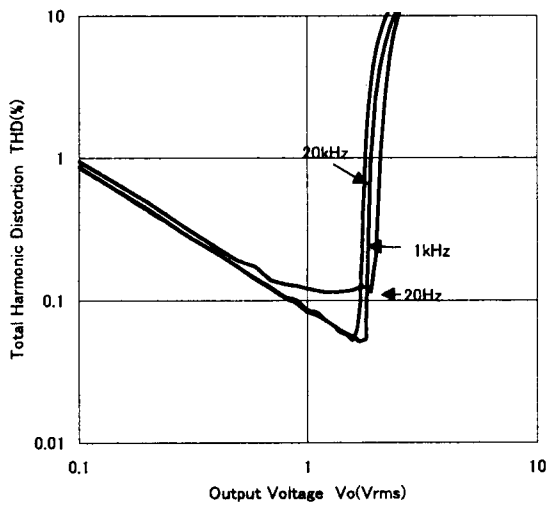
NJM13403 Slew Rate (Rise)



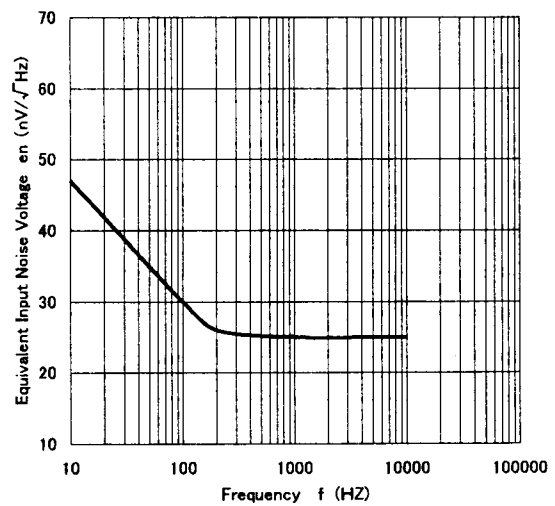
NJM13403 Slew Rate (Fall)



NJM13403 Total Harmonic Distortion



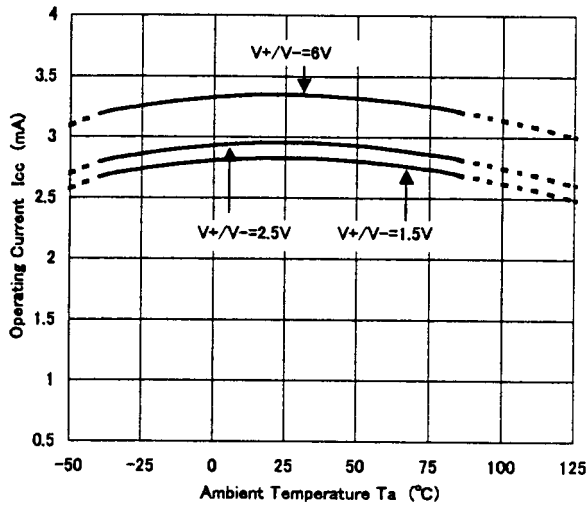
NJM13403 Equivalent Noise Voltage vs. Frequency



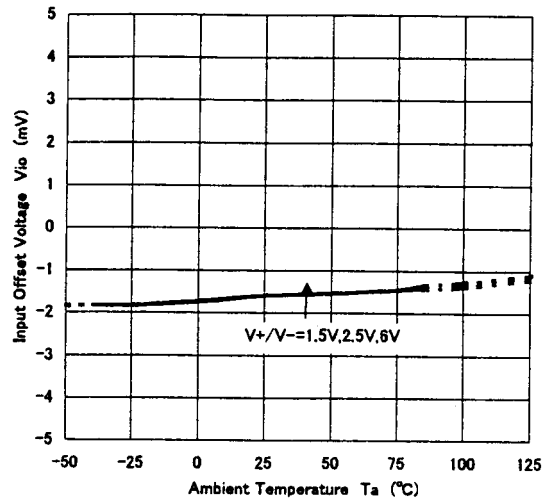
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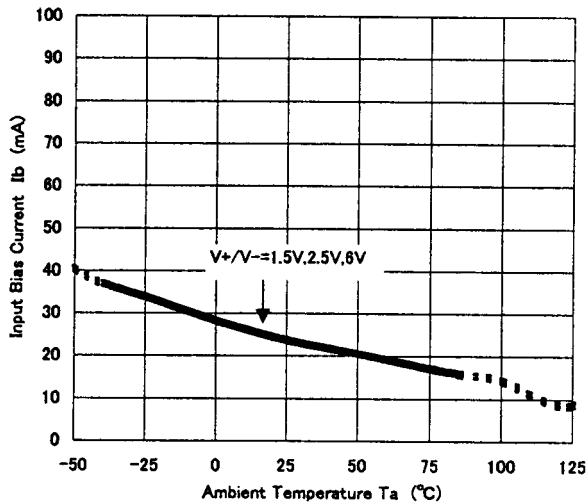
NJM13403 Operating Voltage vs. Temperature



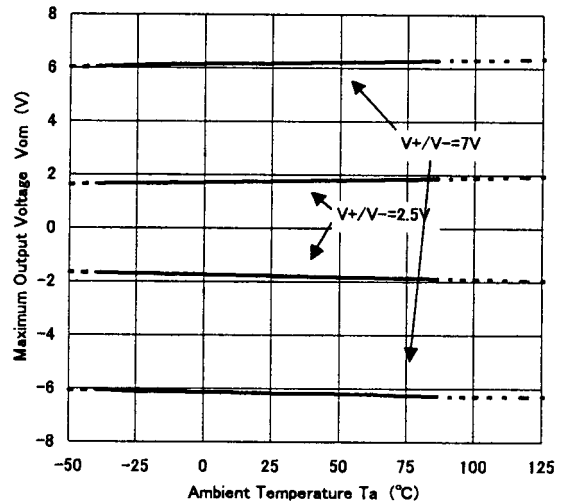
NJM13403 Input Offset Voltage vs. Temperature



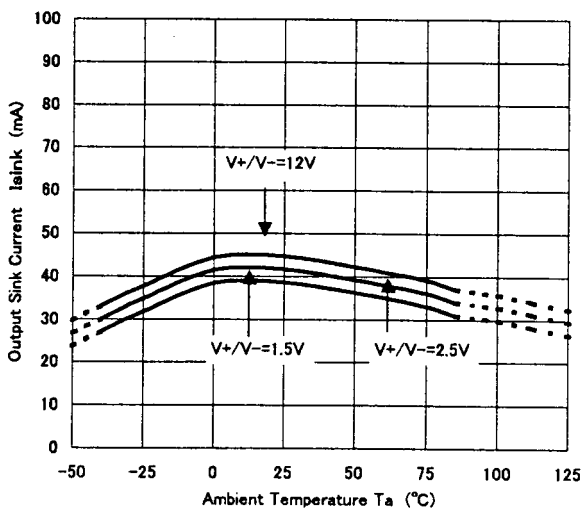
NJM13403 Input Bias Current vs. Temperature



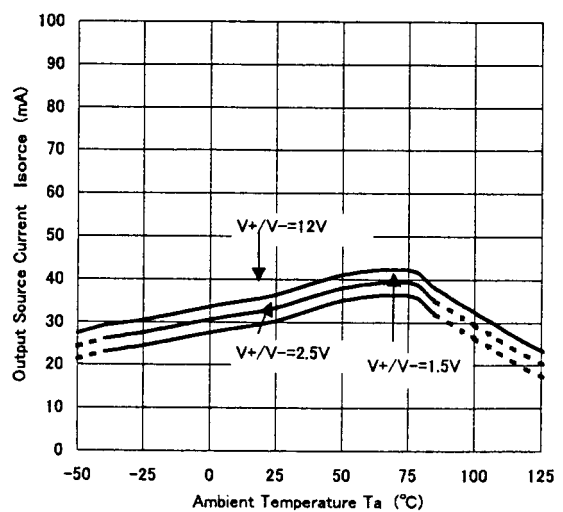
NJM13403 Maximum Output Voltage Swing vs. Temperature



NJM13404 Output Sink Current vs. Temperature

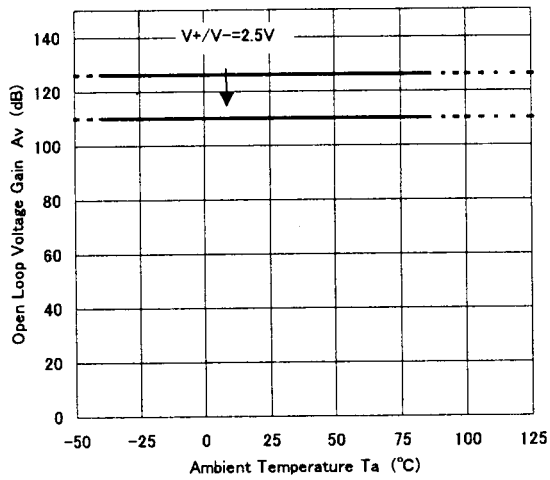


NJM13404 Output Source Current vs. Temperature

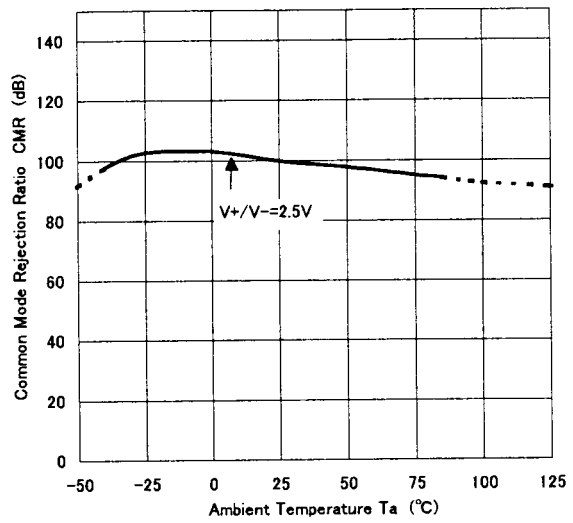


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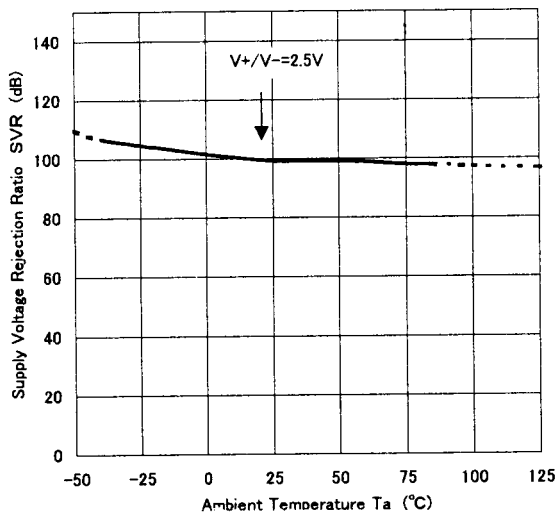
NJM13403 Open Loop Voltage Gain vs. Temperature



NJM13403 Common Mode Rejection Ratio vs. Temperature



NJM13403 Supply Voltage Rejection Ratio vs. Temperature



[CAUTION]

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