

## SINGLE SUPPLY DUAL AMPLIFIER

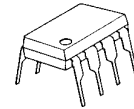
### ■ GENERAL DESCRIPTION

The **NJM12904** is single-supply dual operational amplifier, which can operate from 2V supply. The features are low offset voltage, low bias current, and drive TTL or DTL circuit directly. The package lineup is DIP, DMP and others compact, which is SON, so that the **NJM12904** is suitable for audio for low voltage operation and any other kind of signal amplifier.

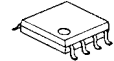
### ■ FEATURES

- Operating Voltage (+2V to +14V)
- Input Offset Voltage (5mV max.)
- Slew Rate (0.7V/ $\mu$ s typ.)
- Operating Current (0.7mA typ.)
- Bipolar Technology
- Package Outline DIP8,DMP8,EMP8, SSOP8,VSP8,SIP8

### ■ PACKAGE OUTLINE



NJM12904D



NJM12904M



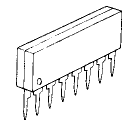
NJM12904E



NJM12904V

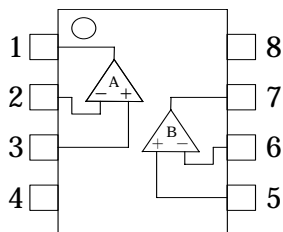


NJM12904R



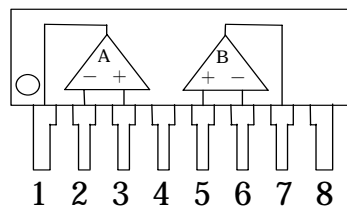
NJM12904L

### ■ PIN CONFIGURATION



NJM12904D/12904M

NJM12904E/12904V/12904R

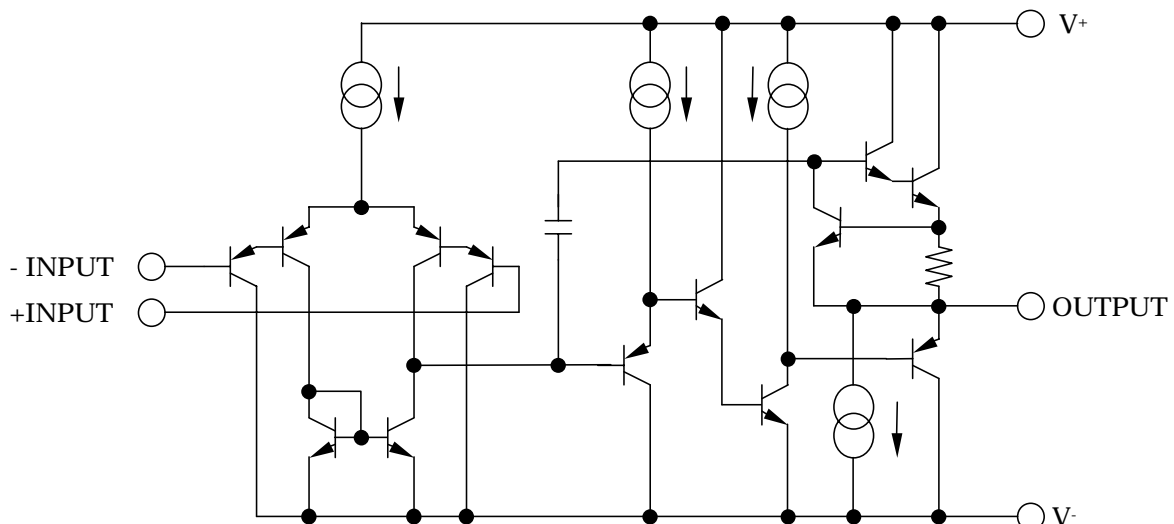


NJM12904L

### PIN FUNCTION

1. A OUTPUT
2. A -INPUT
3. A +INPUT
4. GND
5. B +INPUT
6. B -INPUT
7. B OUTPUT
8. V<sup>+</sup>

### ■ EQUIVALENT CIRCUIT (1/2Shown)



**■ ABSOLUTE MAXIMUM RATING**

(Ta=25°C)

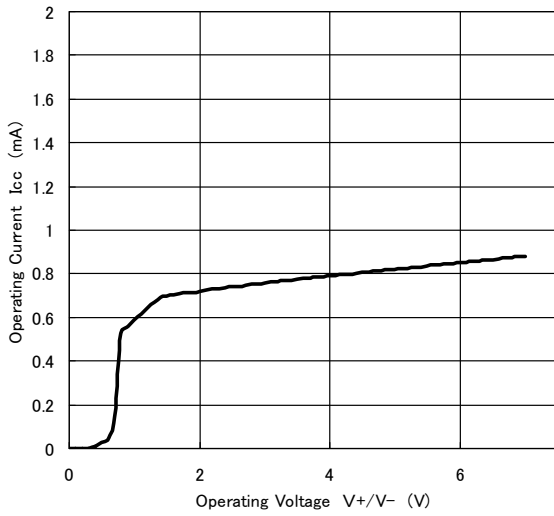
PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V <sup>+</sup>	15	V
Differential Input Voltage	V <sub>ID</sub>	14	V
Input Voltage	V <sub>IC</sub>	- 0.3 to +14	V
Power Dissipation	P <sub>D</sub>	(DIP8) 500 (DMP8) 300 (EMP8) 300 (SSOP8) 250 (VSP8) 320 (SIP8) 800	mW
Operating Temperature Range	T <sub>opr</sub>	- 40 to +85	°C
Storage Temperature Range	T <sub>stg</sub>	- 50 to +125	°C

**■ ELECTRICAL CHARACTERISTICS ( V<sup>+</sup>=5V, Ta=25°C)**

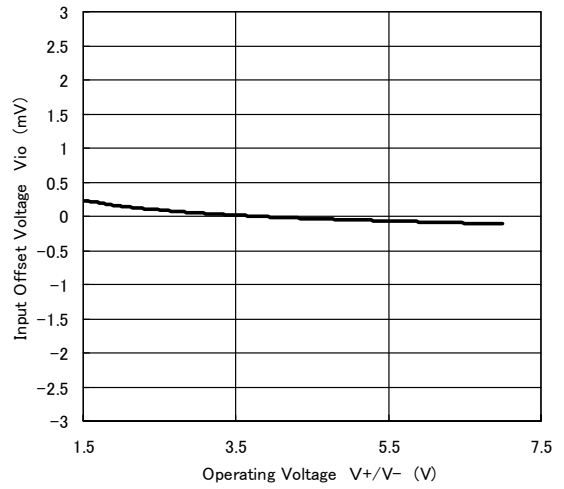
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V <sub>opr</sub>		2	-	14	V
Input Offset Voltage	V <sub>IO</sub>	R <sub>S</sub> =0Ω	-	1	5	mV
Input Offset Current	I <sub>IO</sub>		-	5	50	nA
Input Bias Current	I <sub>B</sub>		-	20	150	nA
Large Signal Voltage Swing	A <sub>V</sub>	R <sub>L</sub> ≥2kΩ	-	100	-	dB
Maximum Output Voltage Range	V <sub>OM</sub>	R <sub>L</sub> =2kΩ	3.5	-	-	V
Input Common Mode Voltage Range	V <sub>ICM</sub>		0 to 3.5	-	-	V
Common Mode Rejection Ratio	CMR		-	85	-	dB
Supply Voltage Rejection Ratio	SVR		-	100	-	dB
Output Source Current	I <sub>SOURCE</sub>	V <sub>IN</sub> <sup>+</sup> =1V, V <sub>IN</sub> <sup>-</sup> =0V	20	40	-	mA
Output Sink Current	I <sub>SINK</sub>	V <sub>IN</sub> <sup>+</sup> =0V, V <sub>IN</sub> <sup>-</sup> =1V	8	20	-	mA
Channel Separation	CS	f=1k to 20kHz	-	120	-	dB
Operating Current	I <sub>CC</sub>	R <sub>L</sub> =∞	-	0.7	1.2	mA
Slew Rate	SR		-	0.7	-	V/μs
Gain Bandwidth Product	GB		-	1.5	-	MHz

## ■ TYPICAL CHARACTERISTICS

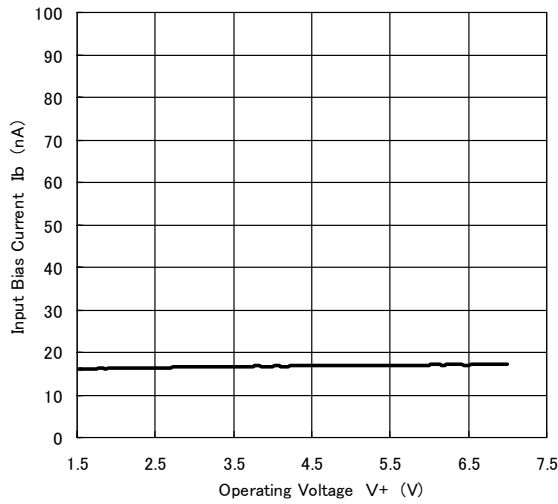
NJM12904 Operating Current v.s Operating Voltage



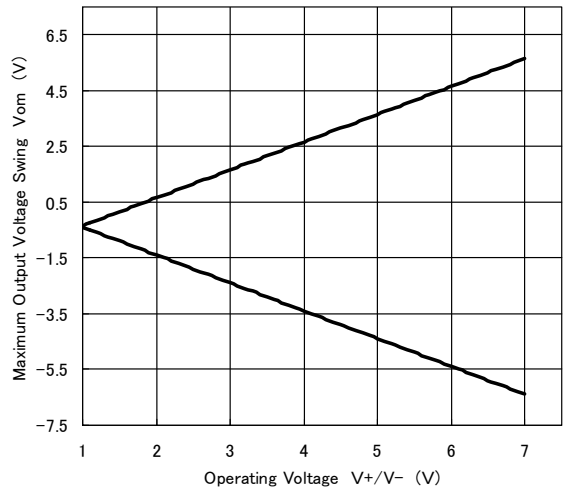
NJM12904 Input Offset Voltage v.s Operating Voltage



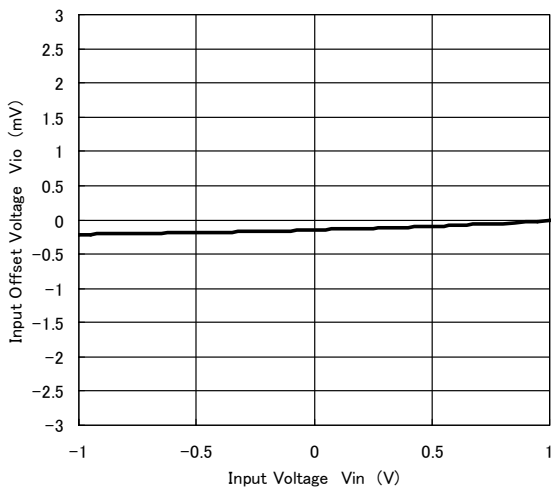
NJM12904 Input Bias Current v.s Operating Voltage



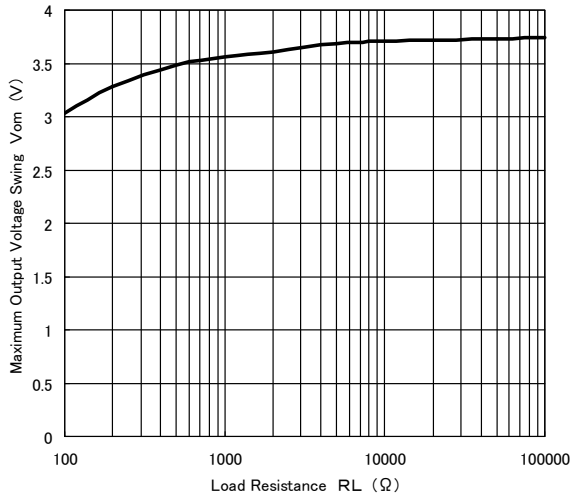
NJM12904 Maximum Output Voltage Swing v.s Operating Voltage



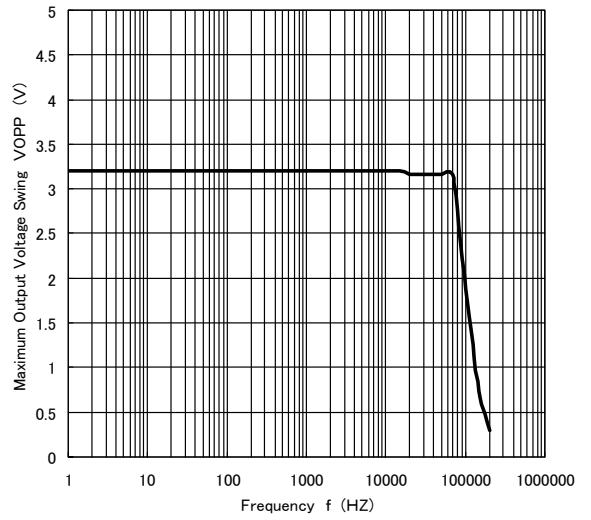
NJM12904 Input Offset Voltage v.s Input Voltage



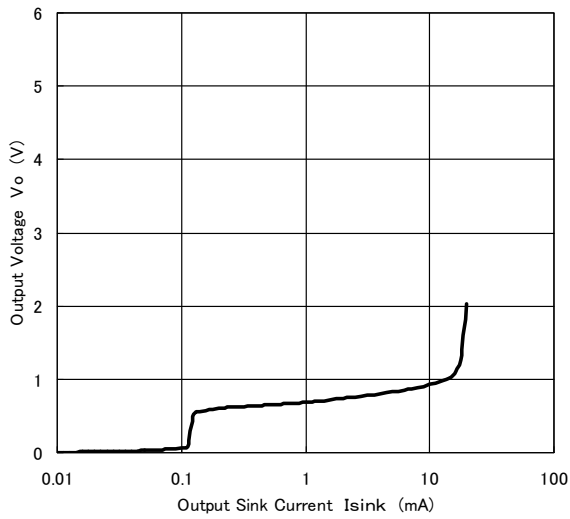
NJM12904 Maximum Output Voltage Swing  
v.s Load Resistance



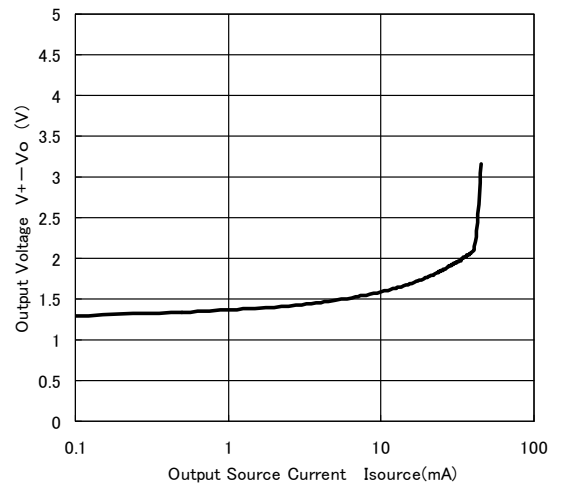
NJM12904 Maximum Output Voltage Swing v.s Frequency



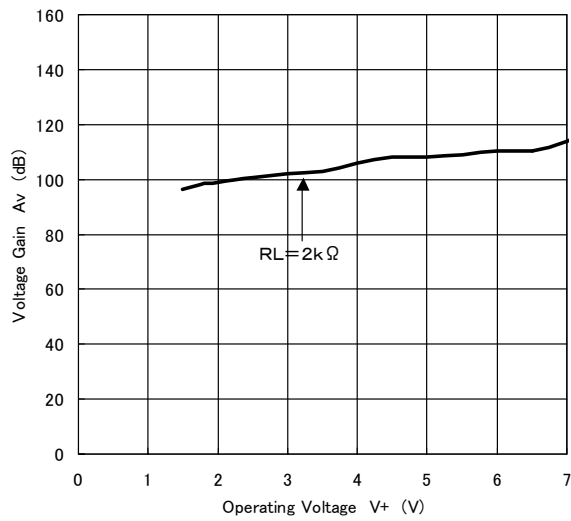
NJM12904 Output Voltage v.s Output Sink Current



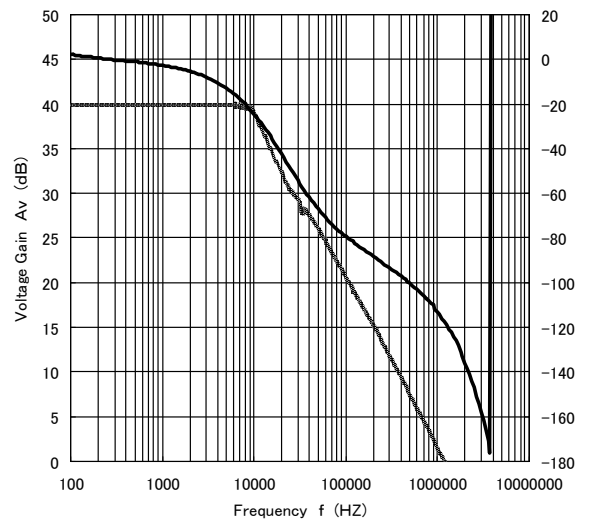
NJM12904 Output Voltage v.s Output Source Current



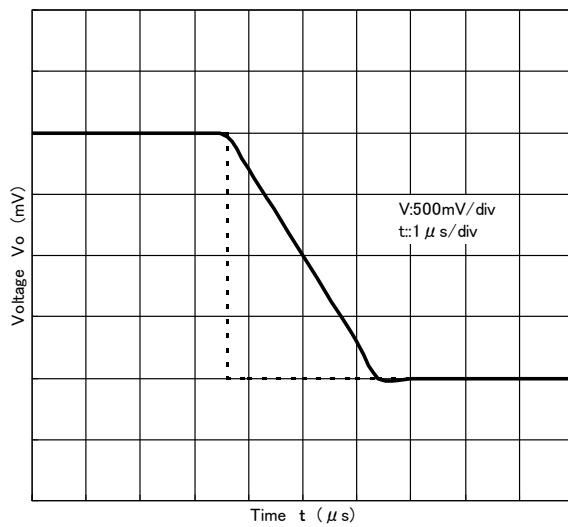
NJM12904 Voltage Gain v.s Operating Voltage



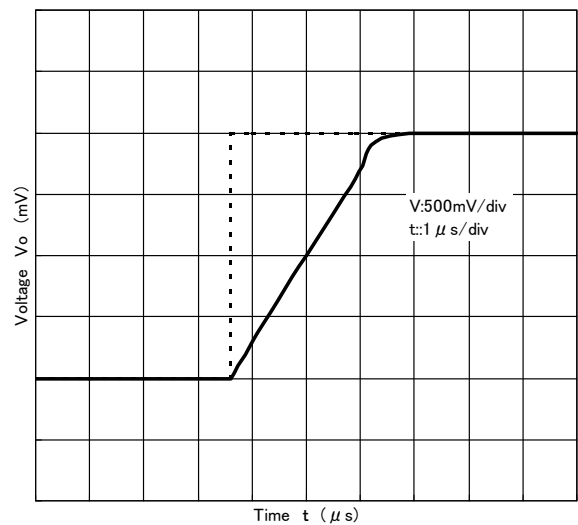
NJM12904 Voltage Gain v.s Frequency



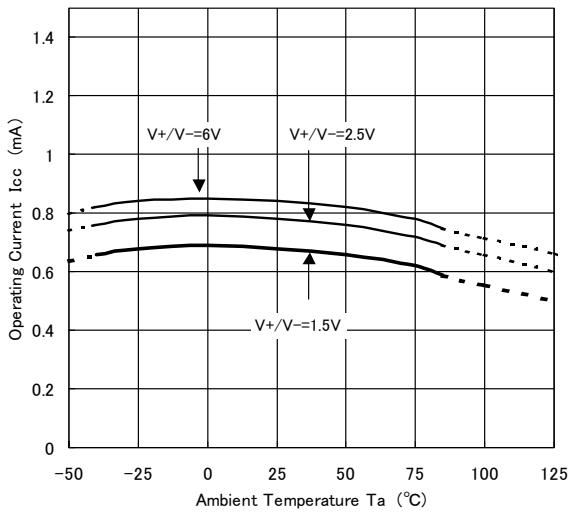
NJM12904 Slew Rate(Fall)



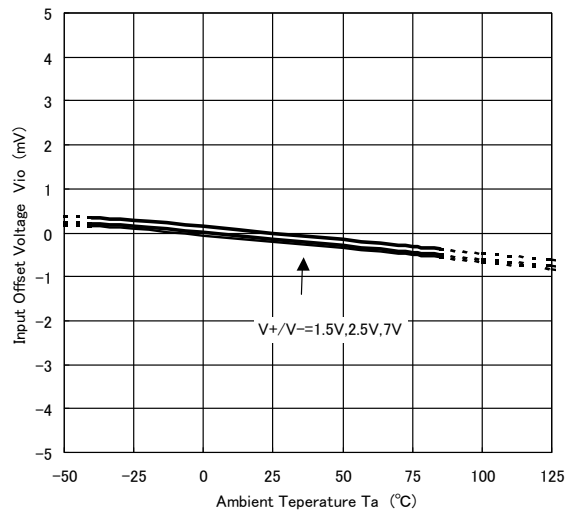
NJM12904 Slew Rate(Rise)



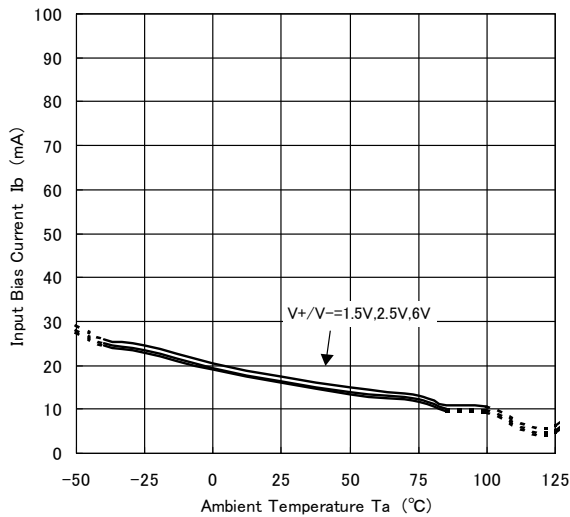
NJM12904 Operating Current v.s Ambient Temperature



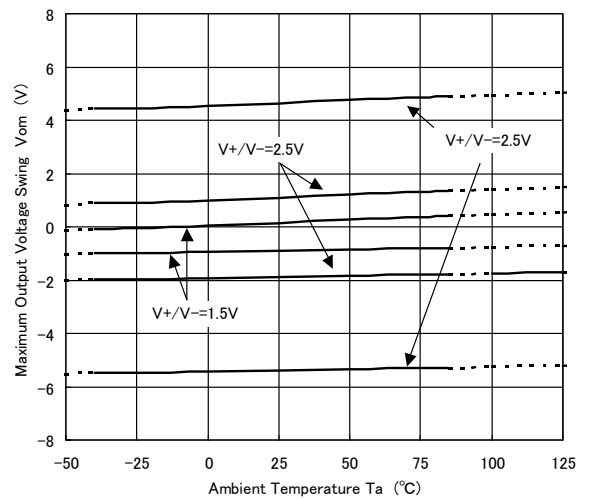
NJM12904 Input Offset Voltage v.s Ambient Temperature



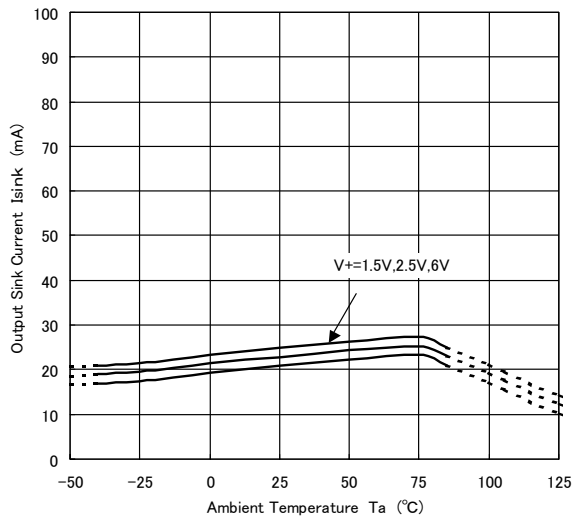
NJM12904 Input Bias Current v.s Ambient Temperature



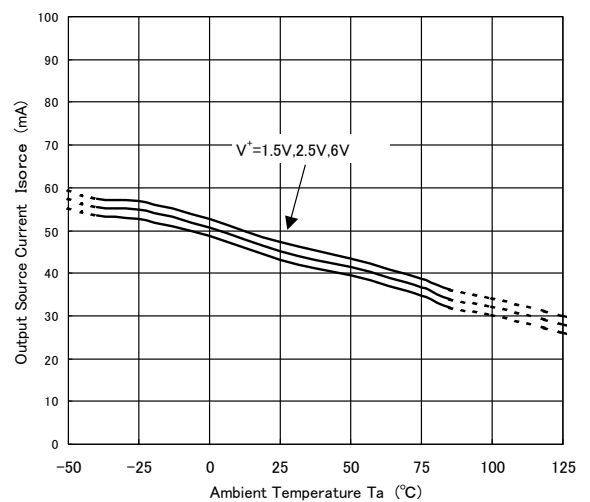
NJM12904 Maximum Output Voltage Swing v.s Ambient Temperature



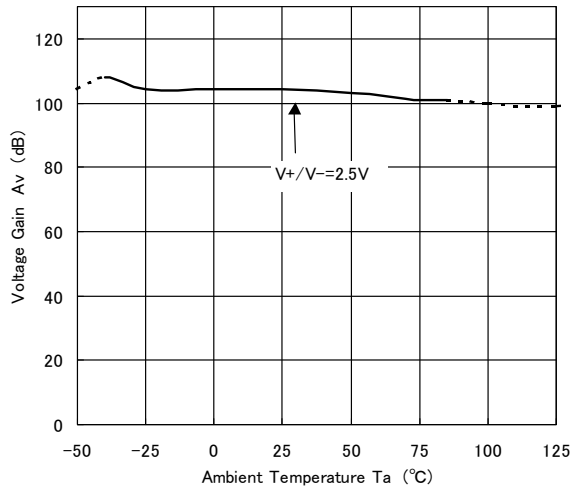
NJM12904 Output Sink Current v.s Ambient Temperature



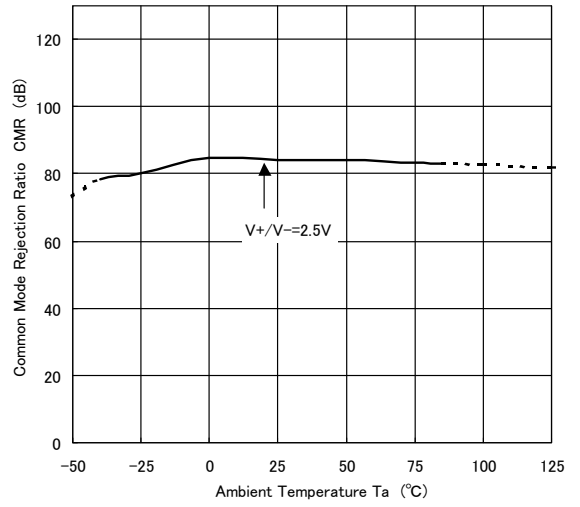
NJM12904 Output Source Current v.s Ambient Temperature



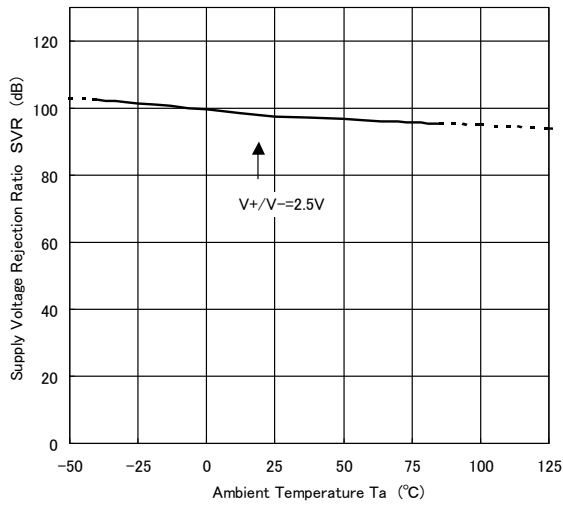
NJM12904 Voltage Gain v.s Ambient Temperature



NJM12904 Common Mode Rejection Ratio v.s Ambient Temperature



NJM12904 Supply Voltage Rejection Ratio v.s Ambient Temperature



# MEMO

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