# Single Ultra-High speed and Wide Band Operational Amplifier

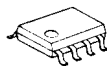
## ■ GENERAL DESCRIPTION

The **NJM2720** is single and ultra-high speed and wide band operational amplifier.

The NJM2720 is 250V/μs slew rate and 150ohm load drive is possible, at supply voltage of ±2.5V.

The NJM2720 is suitable for video signal processing, video line driver, video buffer, pulse amplifiers, ADC input buffer, measuring instrument, and digital communication.

## ■ PACKAGE OUTLINE



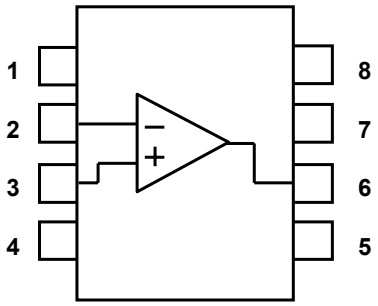
**NJM2720E**

## ■ FEATURES

| | |
|---|---|
| ●Operating Voltage | : ±2.5V to ±5.0V |
| ●Slew Rate | : 250V/μs Typ. (at $V^+/V^-$=±2.5V, $R_L$=150Ω) |
| ●Unity-Gain | : 120MHz Typ. |
| ●Output Voltage | : $V_{OH}$= +1.4V Typ. (at $V^+/V^-$=±2.5V, $R_L$=150Ω) |
| | : $V_{OL}$ = -1.4V Typ. (at $V^+/V^-$=±2.5V, $R_L$=150Ω) |
| ●Offset Voltage | : 1.5mV Typ. |
| ●Operating Current | : 9.0 mA Typ. |
| ●Adequate phase margin | : $\Phi_M$=60deg. Typ. (at $R_L$=2kΩ, voltage follower) |
| ●Bipolar Technology | |
| ●Package Outline | :EMP8 |

## ■ PIN CONFIGRATION

(Top View)




**EMP8**

PIN FUNCTION.

1. NC
2. -INPUT
3. +INPUT
4. $V^-$
5. NC
6. OUTPUT
7. $V^+$
8. NC

## ■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Supply Voltage | $V^+/V^-$ | ±5.5 | V |
| Power Dissipation | $P_D$ | EMP8 : 730 (Note1) | mW |
| Differential Input Voltage Range | $V_{ID}$ | ±3.0 | V |
| Common Mode Input Voltage Range | $V_{ICM}$ | ±5.5 (Note2) | V |
| Operating Temperature Range | $T_{opr}$ | -40 to +85 | °C |
| Storage Temperature Range | $T_{stg}$ | -40 to +125 | °C |

(Note 1) On the PCB " EIA/JEDEC (76.2x11.43x1.6mm, four layers, FR-4) "

(Note 2) For supply voltage less than ±5.5V,the absolute maximum input voltage is equal to the supply voltage.

## ■ RECOMMENDED OPERATING CONDITION

(Ta=25°C)

| PARAMETER | SYMBOL | RATING | UNIT |
|---|---|---|---|
| Supply Voltage | $V^+/V^-$ | ±2.5 to ±5.0 | V |

## ■ ELECTRICAL CHARACTERISTICS

●DC CHARACTERISTICS ($V^+/V^-$=±2.5V, Ta=25°C)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Operating Current | $I_{CC}$ | No Signal | - | 9.0 | 15.0 | mA |
| Input Offset Voltage | $V_{IO}$ | | - | 1.5 | 16.0 | mV |
| Input Bias Current | $I_B$ | | - | 7.5 | 30.0 | μA |
| Input Offset Current | $I_{IO}$ | | - | 100 | 900 | nA |
| Large Signal Voltage Gain | $A_V$ | $R_L$=2kΩ | 50 | 60 | - | dB |
| Input Common Mode Voltage Range | $V_{ICM}$ | | +1.7<br>-1.2 | +2.0<br>-1.5 | -<br>- | V<br>V |
| Common Mode Rejection Ratio | CMR | -1.2V≤$V_{ICM}$≤+1.7V | 60 | 80 | - | dB |
| Supply Voltage Rejection Ratio | SVR | ±2.5V≤$V^+/V^-$≤±5.0V | 55 | 65 | - | dB |
| Maximum Output Voltage Swing | $V_{OM}$ | $R_L$=150Ω | ±1.2 | ±1.4 | - | V |

●AC CHARACTERISTICS ($V^+/V^-$=±2.5V, Ta=25°C)

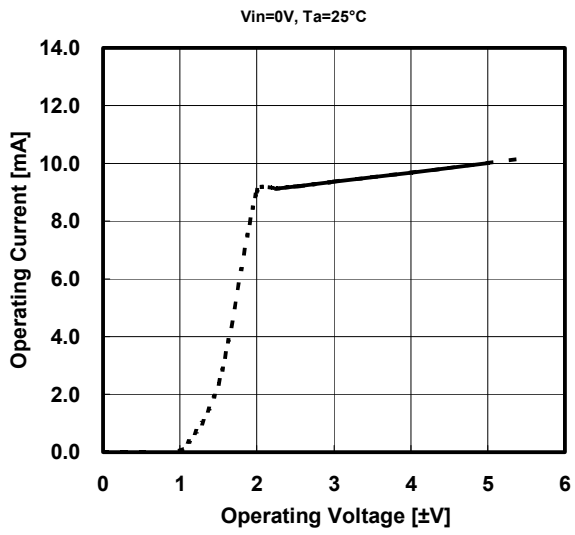
| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Unity Gain Frequency | $f_T$ | $A_V$=40dB, $R_F$=1.98kΩ<br>$R_G$=20Ω, $R_L$=∞, $C_L$=5pF | - | 120 | - | MHz |
| Phase Margin | $\Phi_M$ | $A_V$=40dB, $R_F$=1.98kΩ<br>$R_G$=20Ω, $R_L$=∞, $C_L$=5pF | - | 60.0 | - | Deg |

●AC CHARACTERISTICS ($V^+/V^-$=±2.5V, Ta=25°C)

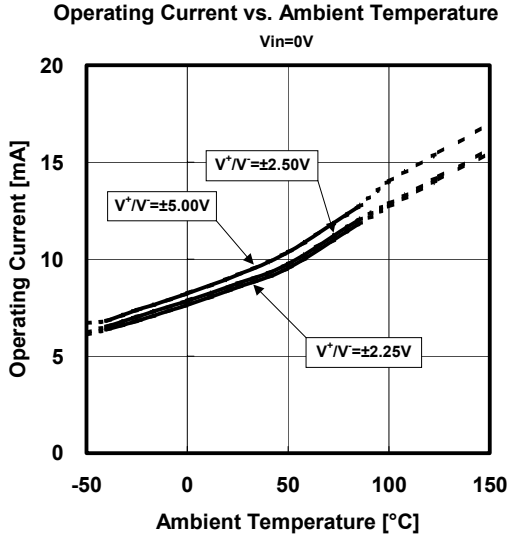
| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Slew Rate | SR | $A_V$=0dB, $R_F$=0Ω, $R_G$=∞<br>$R_L$=150Ω,$C_L$=5pF<br>$V_{IN}$=$2V_{PP}$ | - | 250 | - | V/μs |

## ■ TYPICAL CHARACTERISTICS

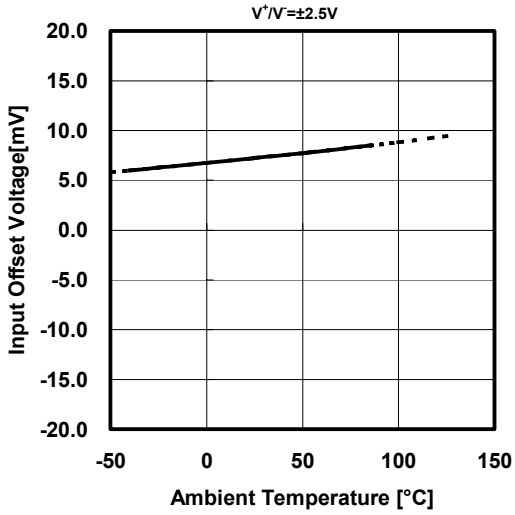
**Operating Current vs. Operating Voltage**



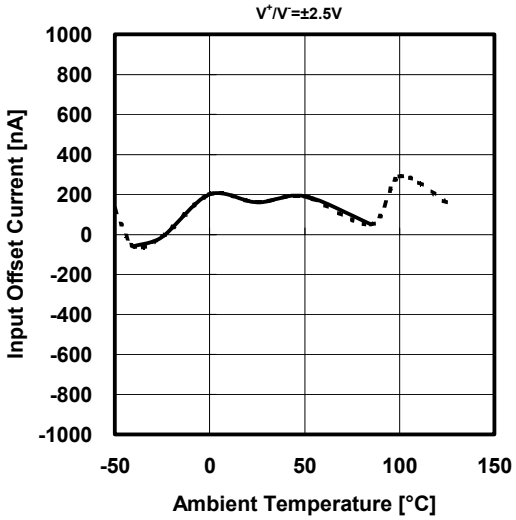

**Operating Current vs. Ambient Temperature**



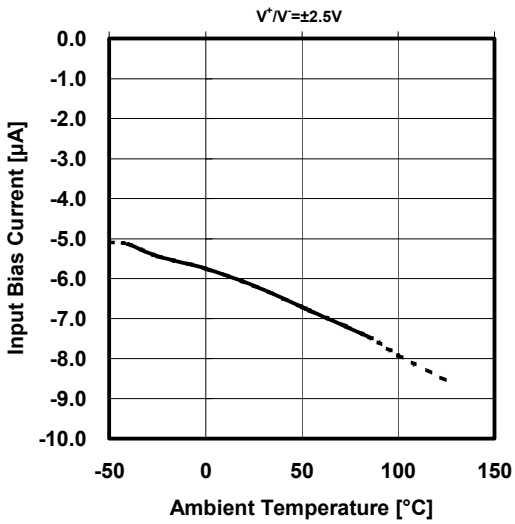

**Input Offset Voltage vs. Ambient Temperature**




**Input Offset Current vs. Ambient Temperature**



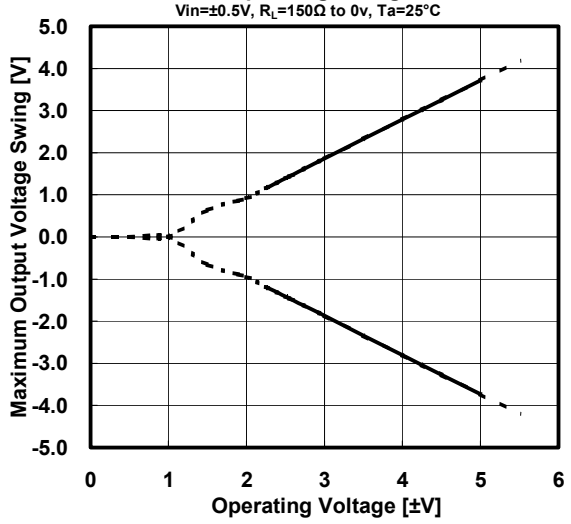

**Input Bias Current vs. Ambient Temperature**



## ■ TYPICAL CHARACTERISTICS

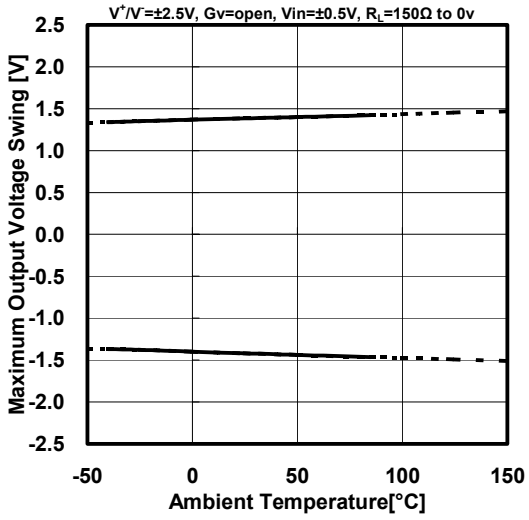
Maximum Output Voltage Swing vs Operating Voltage

Vin=±0.5V, $R_L$=150Ω to 0v, Ta=25°C



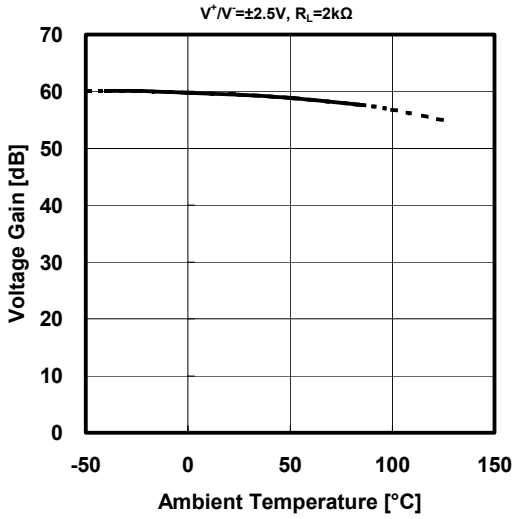

Maximum Output Voltage Swing vs. Ambient Temperature

$V^+/V^-$=±2.5V, Gv=open, Vin=±0.5V, $R_L$=150Ω to 0v



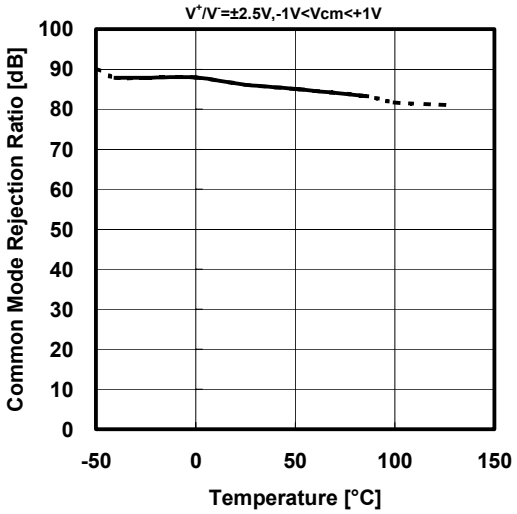

Voltage Gain vs. Ambient Temperature

$V^+/V^-$=±2.5V, $R_L$=2kΩ



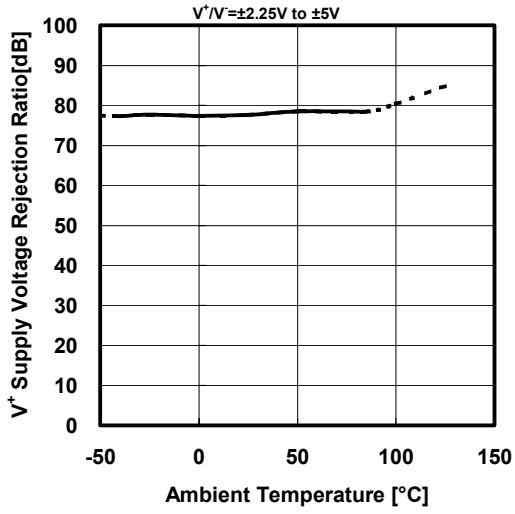

Common Mode Rejection Ratio vs. Ambient Temperature

$V^+/V^-$=±2.5V,-1V<Vcm<+1V



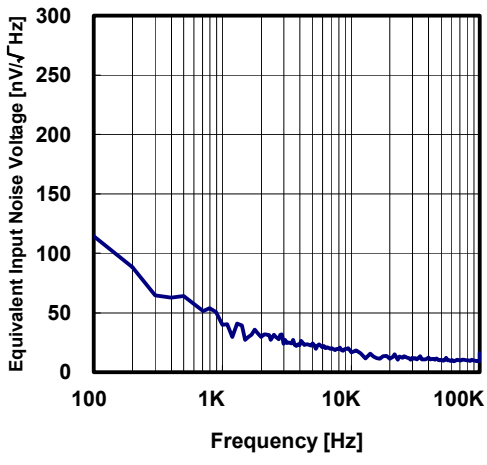

$V^+$ Supply Voltage Rejection Ratio vs. Ambient Temperature

$V^+/V^-$=±2.25V to ±5V




Equivalent Input Noise Voltage vs. Frequency

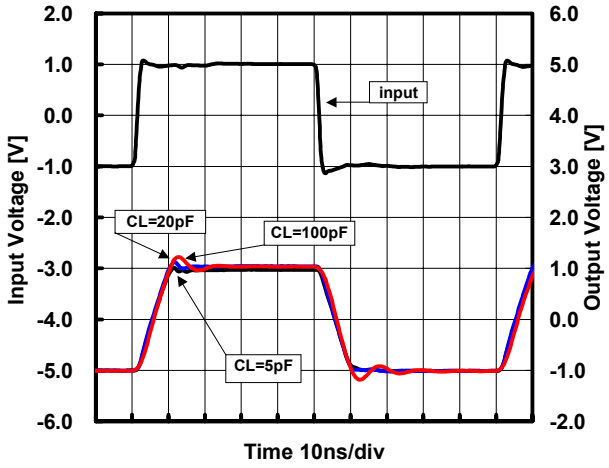
$V^+/V^-$=±2.5V, $V_{IN}$=50Ω to GND, $G_V$=100, $R_S$=50Ω
$R_F$=1.98kΩ, $R_G$=20Ω, $R_L$=∞, $C_L$=0pF, Ta=25°C



## ■ TYPICAL CHARACTERISTICS

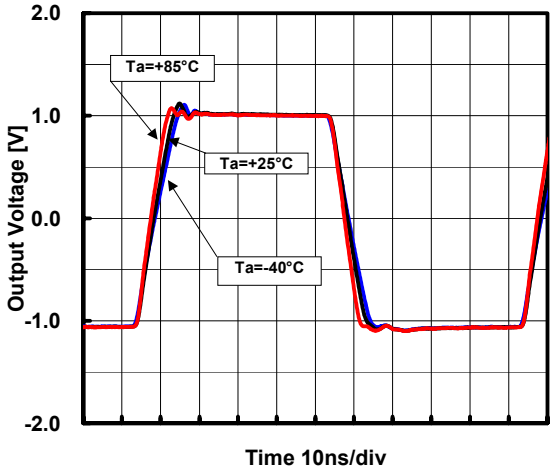
**Pulse Response (with Capacitive load)**

$V^+/V^-$=±2.5V, f=10MHz, $V_O$=2$V_{PP}$, $G_V$=0dB
$R_T$=50Ω, $R_F$=0Ω, $C_F$=0pF, $R_L$=150Ω to 0v, Ta=+25°C



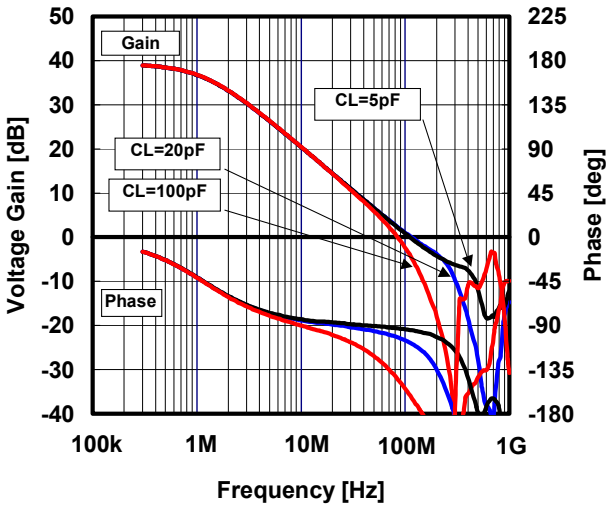

**Pulse Response (correlation with Ta)**

$V^+/V^-$=±2.5V, f=10MHz, $V_O$=2$V_{PP}$, $G_V$=0dB
$R_T$=50Ω, $R_F$=0Ω, $C_F$=0, $R_G$=∞Ω, $C_L$=5pF, $R_L$=150Ω to 0v



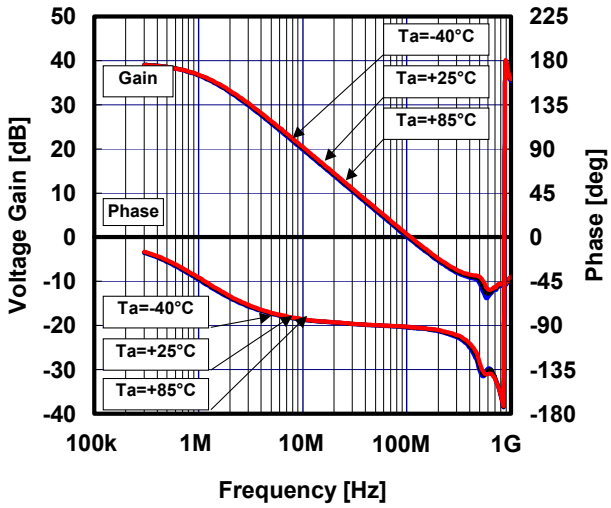

**Voltage Gain vs. Frequency (with Capacitive Load)**

$V^+/V^-$=±2.5V, $V_{IN}$=0.02Vpp, $G_V$=40dB, $R_T$=50Ω,
$R_F$=1.98kΩ, $R_G$=20Ω, $C_F$=0F, $R_L$=1kΩ, Ta=+25°C



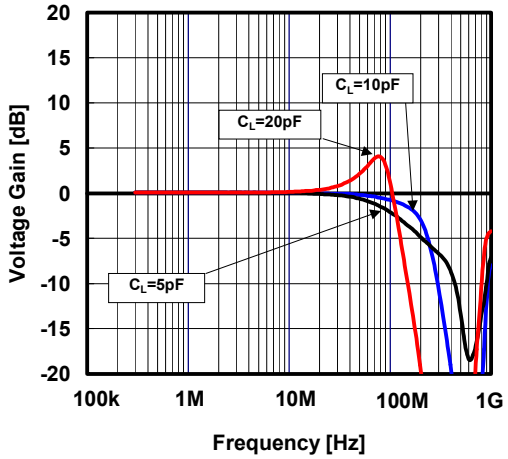

**Voltage Gain vs. Frequency (correlation with Ta)**

$V^+/V^-$=±2.5V, $V_{IN}$=0.02Vpp, $G_V$=40dB, $R_T$=50Ω
$R_F$=1.98kΩ, $R_G$=20Ω, $C_F$=0, $R_L$=150Ω, $C_L$=5pF



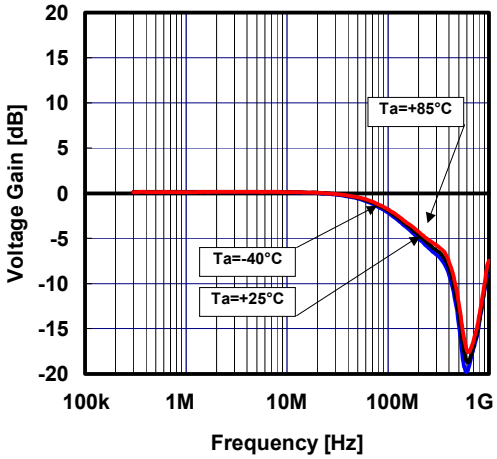

**Voltage Gain vs. Frequency (with Capacitive Load)**

$V^+/V^-$=±2.5V, $V_{IN}$=0.02Vpp, $G_V$=0dB, $R_T$=50Ω,
$R_F$=0Ω, RG=open, $C_F$=0pF, $R_L$=150Ω, Ta=+25°C




**Voltage Gain vs. Frequency (correlation with Ta)**

$V^+/V^-$=±2.5V, $V_{IN}$=0.02Vpp, $G_V$=0dB, $R_T$=50Ω
$R_F$=0Ω, $R_G$=open, $C_F$=0, $R_L$=150Ω, $C_L$=5pF



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