# LOW SATURATION DUAL OPERATIONAL AMPLIFIER

## ■ GENERAL DESCRIPTION

The NJM2140 is a low saturation output voltage dual operational amplifier in small packages. It features a low voltage operation of ±1.0V (min.) and low saturation output voltage of ±2.0Vp-p (at supply voltage ±2.5V). The NJM2140 is available in both 8-lead MSOP and thin type MSOP packages.

## ■ PACKAGE OUTLINE

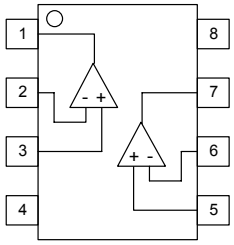
**NJM2140R**
**(MSOP8 (VSP8))**

**NJM2140RB1**
**(MSOP8 (TVSP8))**

## ■ FEATURES

- Operating Voltage ±1V to ±7V
- High Slew Rate 4V/μs typ.
- Wide Band 12MHz typ.
- Low Saturation Output Voltage ±2.4V typ. (at $V^+/V^-$=±2.5V,$R_L$=10kΩ)
- Package Outline MSOP8 (VSP8) MEET JEDEC MO-187-DA
  MSOP8 (TVSP8) MEET JEDEC MO-187-DA / THIN TYPE
- Bipolar Technology

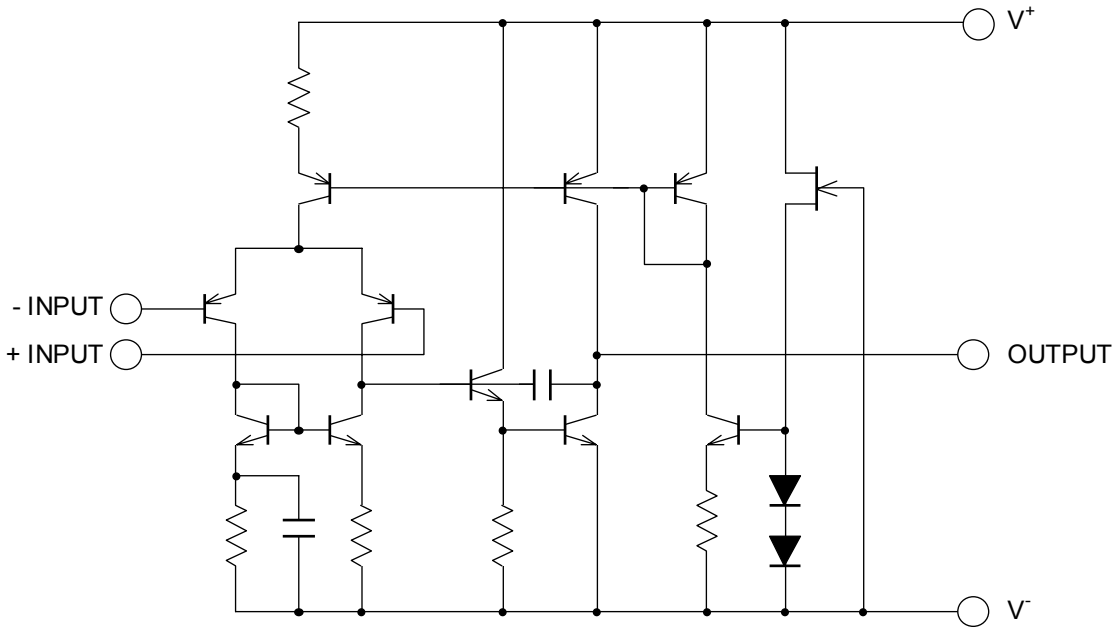
## ■ PIN CONFIGURATION




**NJM2140R/RB1**

**PIN FUNCTION**
**1.A OUTPUT**
**2.A –INPUT**
**3.A +INPUT**
**4.$V^-$**
**5.B +INPUT**
**6.B –INPUT**
**7.B OUTPUT**
**8.$V^+$**

## ■ EQUIVALENT CIRCUIT



## ■ ABSOLUTE MAXIMUM RATINGS

( Ta=25˚C )

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Supply Voltage | $V^+/V^-$ | ± 7.0 | V |
| Differential Input Voltage | $V_{ID}$ | ± 14 | V |
| Power Dissipation | $P_D$ | (MSOP8(VSP/TVSP8)) 320 | mW |
| Operating Temperature Range | $T_{opr}$ | -40~+85 | ˚C |
| Storage Temperature Range | $T_{stg}$ | -40~+125 | ˚C |

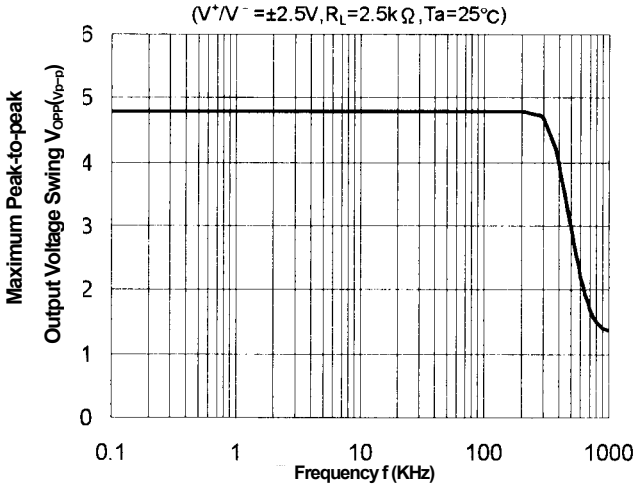
## ■ ELECTRICAL CHARACTERISTICS

( $V^+/V^-$=±2.5V,Ta=25˚C )

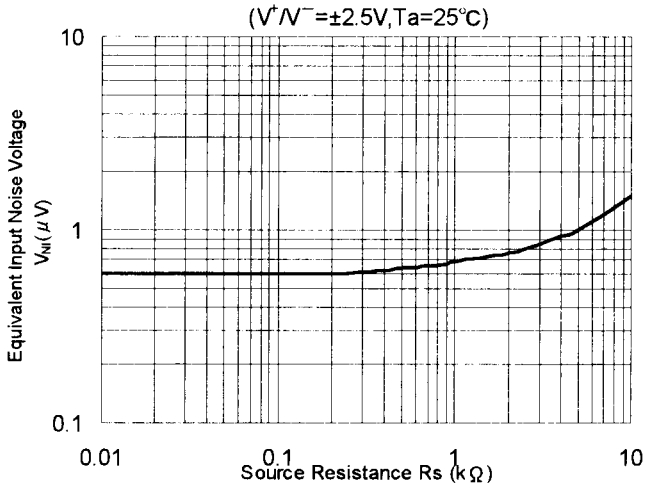
| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Input Offset Voltage | $V_{IO}$ | $R_S$≤10kΩ | - | 1 | 6 | mV |
| Input Offset Current | $I_{IO}$ | | - | 10 | 200 | nA |
| Input Bias Current | $I_B$ | | - | 100 | 300 | nA |
| Large Signal Voltage Gain | $A_V$ | $R_L$≥10kΩ | 60 | 80 | - | dB |
| Maximum Output Voltage Swings 1 | $V_{OM1}$ | $R_L$=2.5kΩ | ± 2.0 | ± 2.2 | - | V |
| Maximum Output Voltage Swings 2 | $V_{OM2}$ | $R_L$≥10kΩ | ± 2.3 | ± 2.4 | - | V |
| Input Common Mode Voltage Range | $V_{ICM}$ | | ± 1.5 | - | - | V |
| Common Mode Rejection Ratio | CMRR | | 60 | 74 | - | dB |
| Supply Voltage Rejection Ratio | PSRR | | 60 | 80 | - | dB |
| Operating Current | $I_{CC}$ | | - | 3.5 | 5 | mA |
| Slew Rate | SR | | - | 4 | - | V/μs |
| Unity Gain Frequency | $f_T$ | | - | 12 | - | MHz |

## ■ TYPICAL CHARACTERISTICS

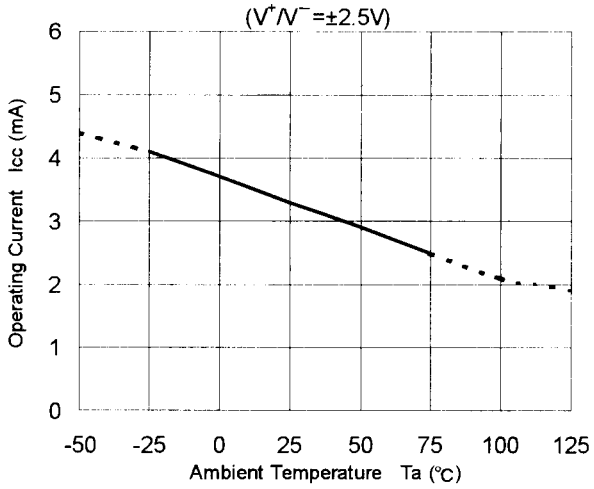
Maximum Peak-to-peak Output Voltage Swing vs. Frequency
($V^+/V^-$=±2.5V, $R_L$=2.5kΩ, Ta=25°C)



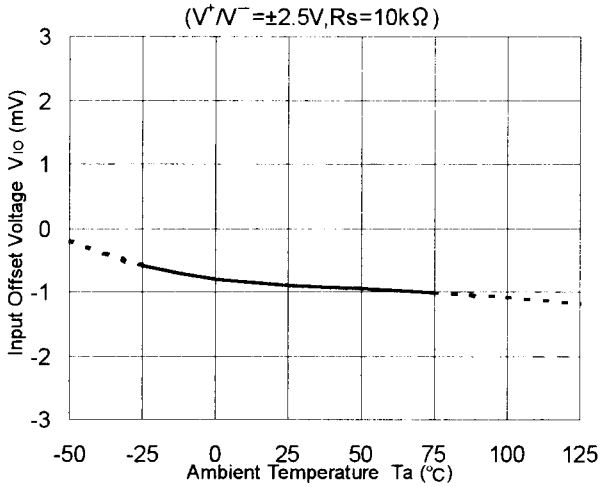

Equivalent Input Noise Voltage vs. Source Resistance
($V^+/V^-$=±2.5V, Ta=25°C)



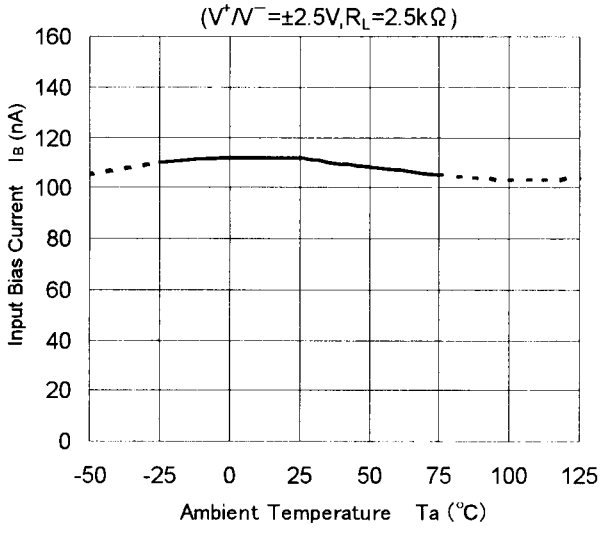

Operating Current vs. Temperature
($V^+/V^-$=±2.5V)



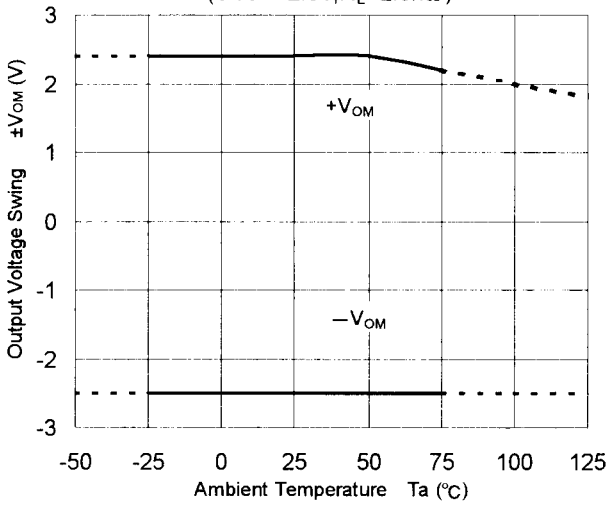

Input Offset Voltage vs. Temperature
($V^+/V^-$=±2.5V, Rs=10kΩ)




Input Bias Current vs. Temperature
($V^+/V^-$=±2.5V, $R_L$=2.5kΩ)

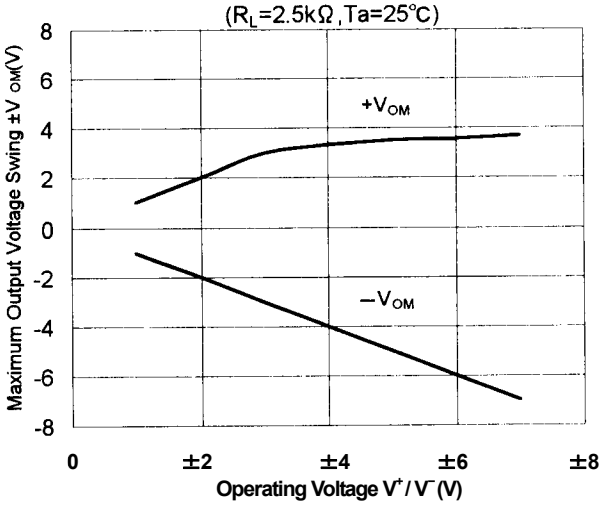



Output Voltage Swing vs. Temperature
($V^+/V^-$=2.5V, $R_L$=2.5kΩ)

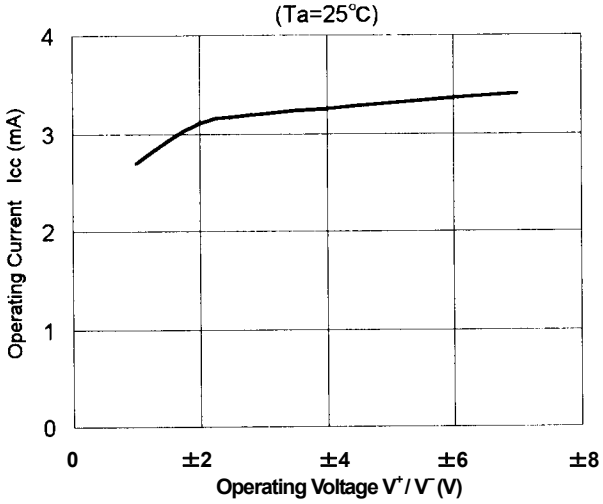


## ■ TYPICAL CHARACTERISTICS

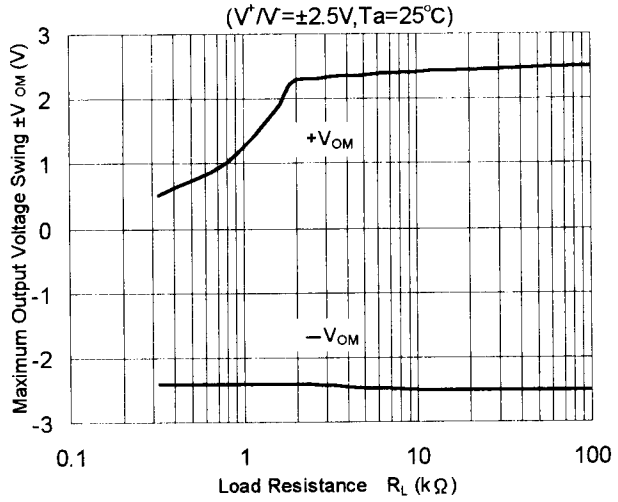
Maximum Output Voltage Swing vs.Operating Voltage
($R_L$=2.5kΩ,Ta=25°C)



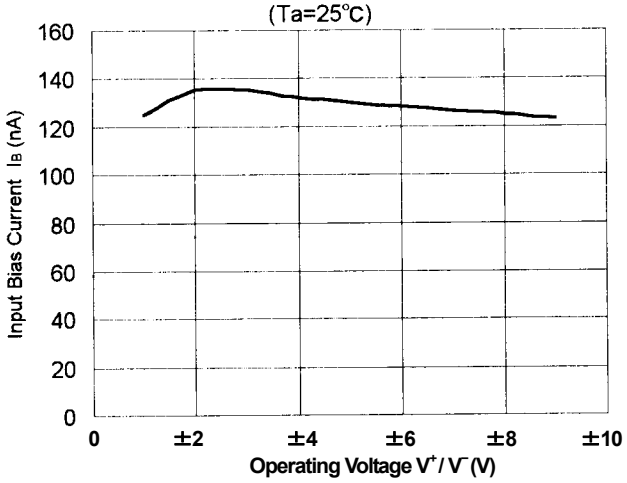

Operating Current vs. Operating Voltage
(Ta=25°C)



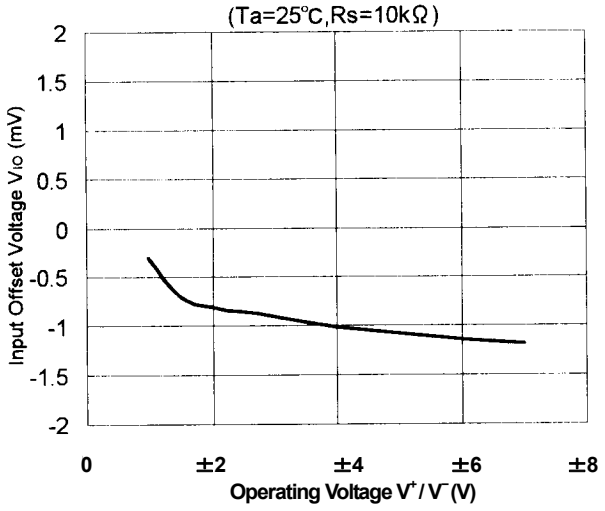

Maximum Output Voltage Swing vs. Load Resistance
($V^+/V^-$=±2.5V,Ta=25°C)



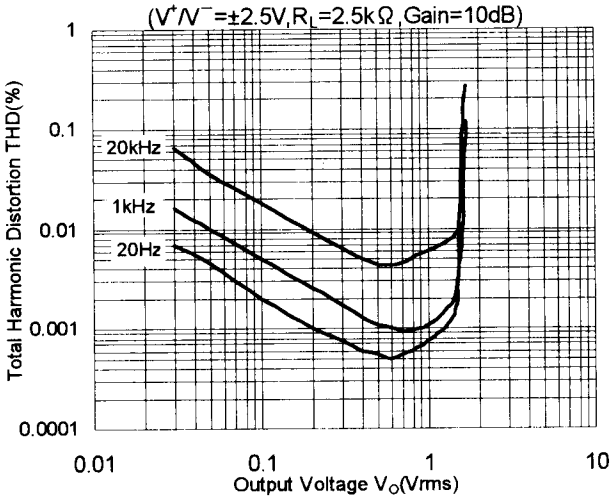

Input Bias Current vs. Operating Voltage
(Ta=25°C)




Input Offset Voltage vs. Operating Voltage
(Ta=25°C,Rs=10kΩ)




Total Harmonic Distortion vs. Output Voltage
($V^+/V^-$=±2.5V,$R_L$=2.5kΩ,Gain=10dB)

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