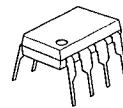


## HIGH SPEED OPERATIONAL AMPLIFIER WITH SWITCH

## ■ GENERAL DESCRIPTION

The NJM2121 is a dual operational amplifier of 2-INPUT and 1-OUTPUT with analog switch. The NJM2121 can be used as analog switch under the condition of  $G_v=0$  dB, as Switch + Amp in order that each gain (A or B) can be adjusted independently. Each amplifier of the NJM2121 has the same electrical characteristics as the NJM4560. The NJM2121 is suit for Audio. Video, Electrical musical instrument...etc.

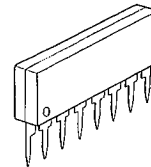
## ■ PACKAGE OUTLINE



NJM2121D



NJM2121M

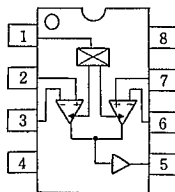
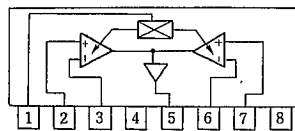


NJM2121L

## ■ FEATURES

- Analog Switch Function
- Operating Voltage  $(\pm 3V \sim \pm 18V)$
- Slew Rate  $(4V/\mu s \text{ typ.})$
- Wide Unity Gain Bandwidth  $(14MHz \text{ typ.})$
- Package Outline DIP8, DMP8, SIP8
- Bipolar Technology

## ■ PIN CONFIGURATION

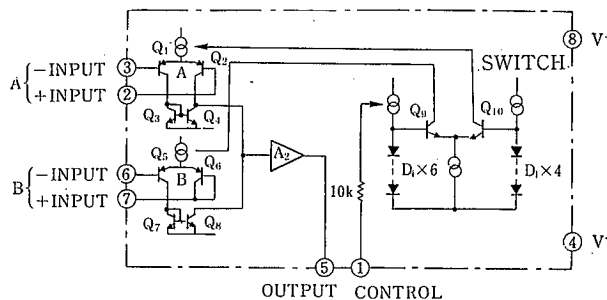
NJM2121D  
NJM2121M

NJM2121L

## PIN FUNCTION

1. SW. CONTROL
2. A +INPUT
3. A -INPUT
4. V-
5. OUTPUT
6. B -INPUT
7. B +INPUT
8. V+

## ■ EQUIVALENT CIRCUIT



## ■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

| PARAMETER                   | SYMBOL                         | RATINGS    | UNIT |
|-----------------------------|--------------------------------|------------|------|
| Supply Voltage              | V <sup>+</sup> /V <sup>-</sup> | ±18(36)    | V    |
| Differential Input Voltage  | V <sub>ID</sub>                | ±30        | V    |
| Input Voltage               | V <sub>IC</sub>                | ±15 (note) | V    |
| Output Current              | I <sub>O</sub>                 | ±50        | mA   |
| Power Dissipation           | P <sub>D</sub>                 | (DIP8) 500 | mW   |
|                             |                                | (DMP8) 300 | mW   |
|                             |                                | (SIP8) 800 | mW   |
| Operating Temperature Range | T <sub>opr</sub>               | -20~+75    | °C   |
| Storage Temperature Range   | T <sub>stg</sub>               | -40~+125   | °C   |

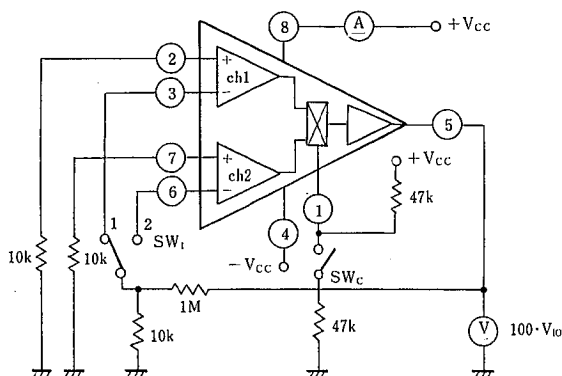
## ■ ELECTRICAL CHARACTERISTICS

(V<sup>+</sup>/V<sup>-</sup>=±15V, Ta=25°C)

| PARAMETER                      | SYMBOL          | TEST CONDITION                                                   | MIN. | TYP.  | MAX. | UNIT              |
|--------------------------------|-----------------|------------------------------------------------------------------|------|-------|------|-------------------|
| Operating Current              | I <sub>CC</sub> | V <sub>in</sub> SW ON                                            | —    | 2.3   | 6.0  | mA                |
|                                |                 | SW OFF                                                           | —    | 2.1   | 6.0  | mA                |
| Input Offset Voltage           | V <sub>IO</sub> | R <sub>S</sub> =10kΩ                                             | —    | 0.8   | 6.0  | mV                |
| Input Bias Current             | I <sub>B</sub>  |                                                                  | —    | 0.2   | 1.0  | μA                |
| Large Signal Voltage Gain      | A <sub>V</sub>  | R <sub>L</sub> =2kΩ                                              | —    | 110   | —    | dB                |
| Maximum Output Voltage Swing   | V <sub>OM</sub> | R <sub>L</sub> ≥10kΩ                                             | ±12  | ±14   | —    | V                 |
| Total Harmonic Distortion      | THD             | f=1kHz, V <sub>O</sub> =5V <sub>rms</sub> , G <sub>v</sub> =20dB | —    | 0.002 | —    | %                 |
| Supply Voltage Rejection Ratio | SVR             |                                                                  | —    | 20    | 150  | μV/V              |
| Channel Separation             | CS              | f=1kHz                                                           | —    | 82    | —    | dB                |
| Unity Gain Bandwidth           | f <sub>t</sub>  | G <sub>v</sub> =0dB                                              | —    | 14    | —    | MHz               |
| Slew Rate                      | SR              | G <sub>v</sub> =0dB, R <sub>L</sub> =2kΩ//100pF                  | —    | 4     | —    | V/μs              |
| Equivalent Input Noise Voltage | V <sub>NI</sub> | R <sub>S</sub> =1kΩ, BW=10Hz~30kHz, Flat                         | —    | 2.0   | —    | μV <sub>rms</sub> |

■ TEST CIRCUIT

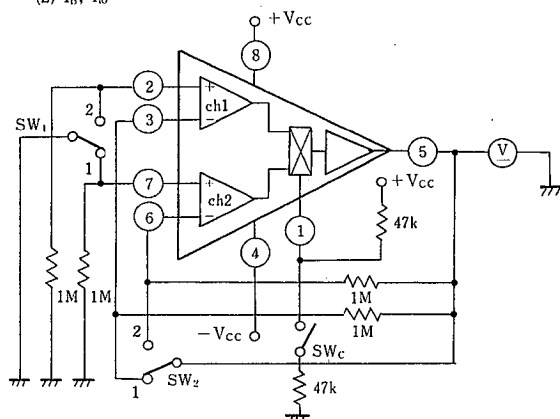
(1)  $I_{CC}$ ,  $V_{IO}$ , SVR



|                                          | SW <sub>c</sub> | SW <sub>1</sub> | Select ch |
|------------------------------------------|-----------------|-----------------|-----------|
| $I_{CC1}$ , $V_{IO1}$ , SVR <sub>1</sub> | OFF             | 1               | ch 1      |
| $I_{CC2}$ , $V_{IO2}$ , SVR <sub>2</sub> | ON              | 2               | ch 2      |

Unit Resistance :  $\Omega$   
Capacity : F

(2)  $I_B$ ,  $I_{IO}$



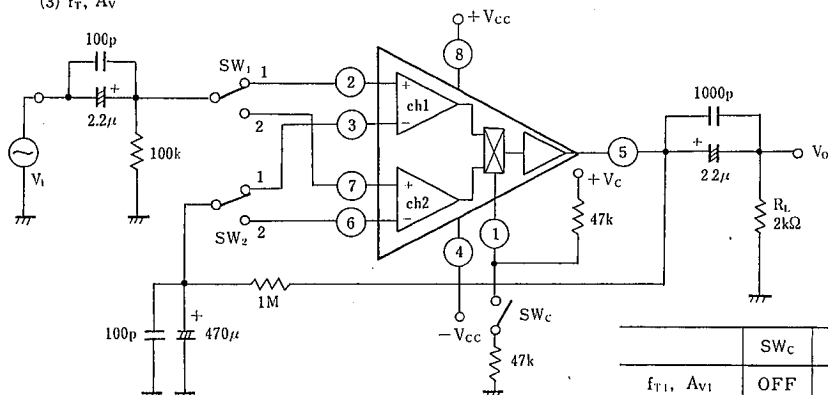
$$I_{B+} = V_{O+} / 1M\Omega$$

$$I_{B-} = V_{O-} / 1M\Omega$$

$$I_{IO} = |I_{B+} - I_{B-}|$$

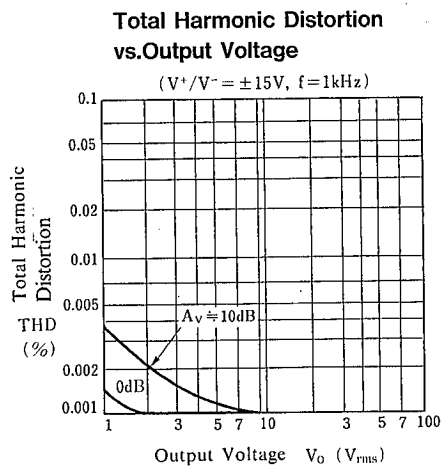
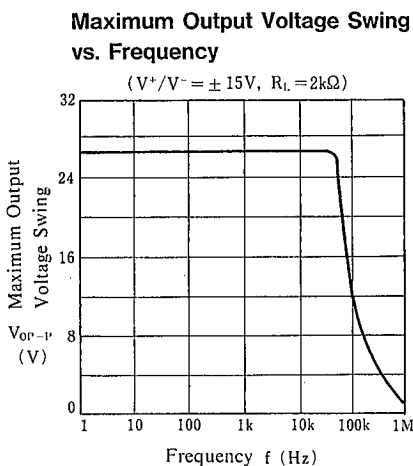
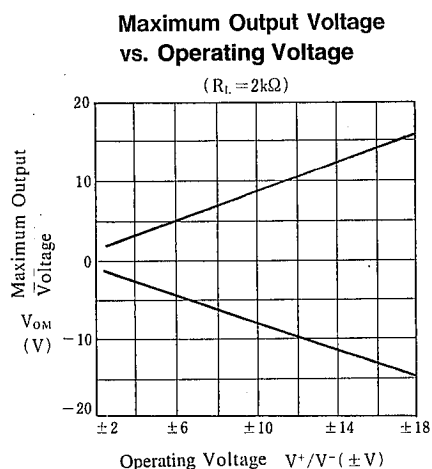
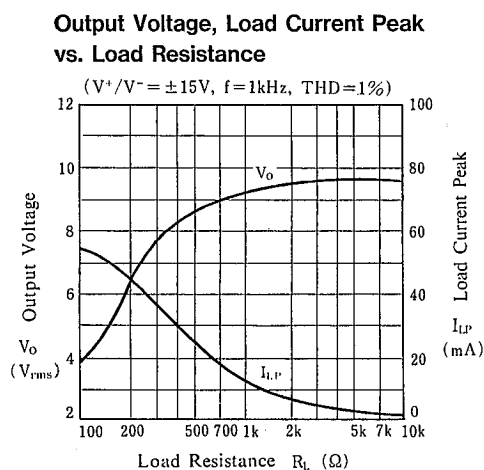
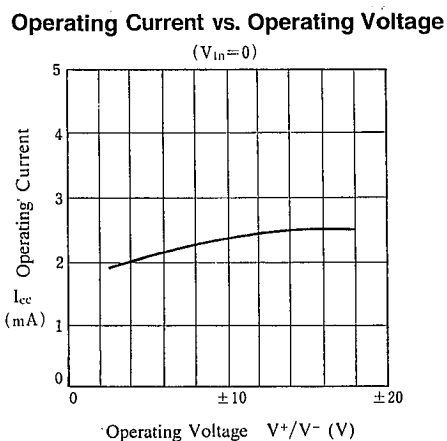
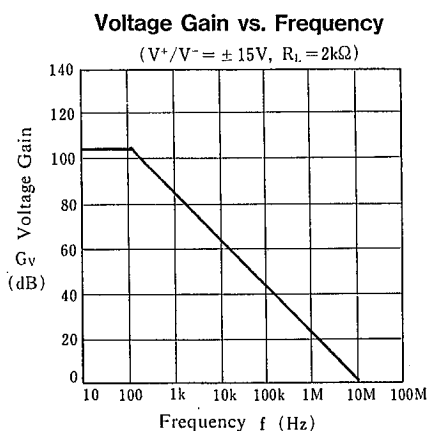
|          | SW <sub>c</sub> | SW <sub>1</sub> | SW <sub>2</sub> | Select ch |
|----------|-----------------|-----------------|-----------------|-----------|
| $V_{O1}$ | OFF             | 1               | 1               | ch 1      |
| $V_{O1}$ | OFF             | 2               | 2               | ch 1      |
| $V_{O2}$ | ON              | 2               | 2               | ch 2      |
| $V_{O2}$ | ON              | 1               | 1               | ch 2      |

(3)  $f_T$ ,  $A_v$



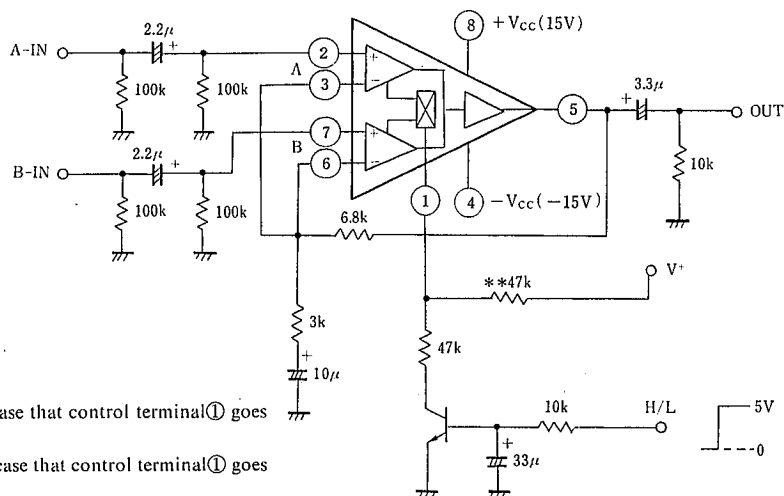
|                     | SW <sub>c</sub> | SW <sub>1</sub> | SW <sub>2</sub> | Select ch |
|---------------------|-----------------|-----------------|-----------------|-----------|
| $f_{T1}$ , $A_{v1}$ | OFF             | 1               | 1               | ch 1      |
| $f_{T2}$ , $A_{v2}$ | ON              | 2               | 2               | ch 2      |

## TYPICAL CHARACTERISTICS

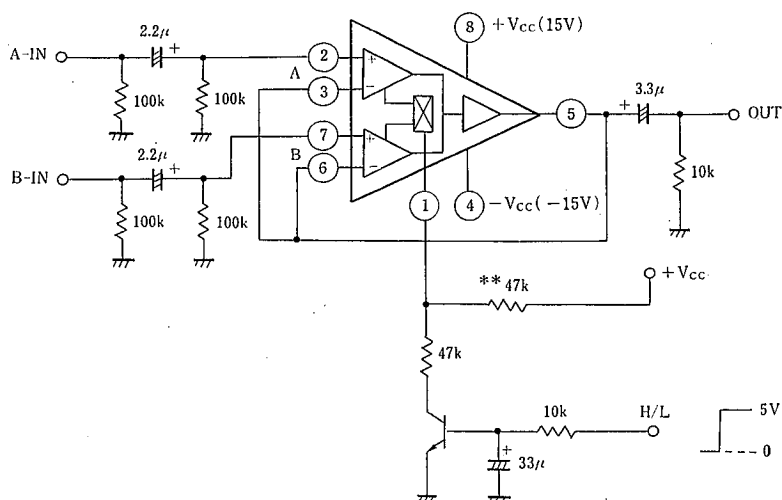


# APPLICATION CIRCUIT

(1)  $G_v=10\text{dB}$  FLAT Amp+ Analog Switch Circuit

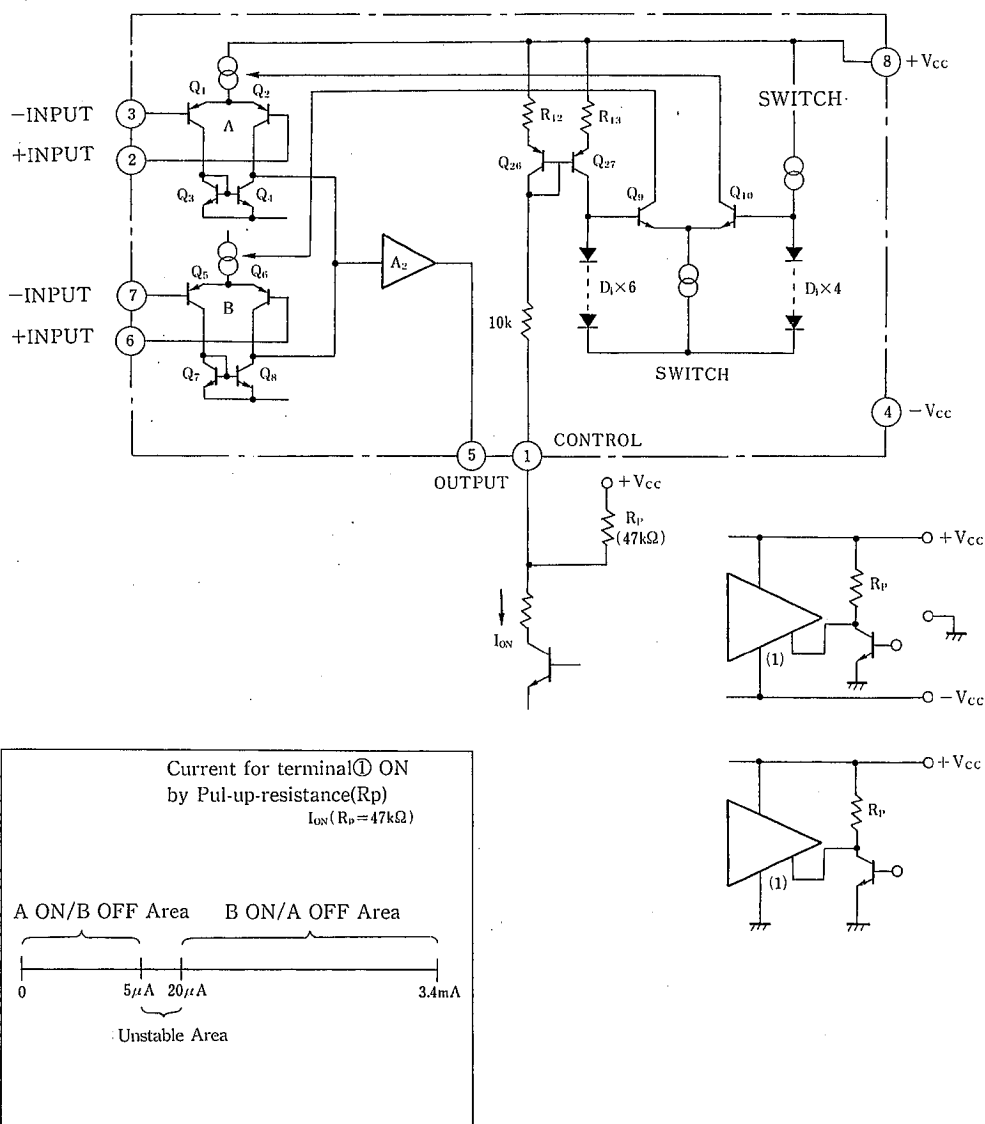


(2) Analog Switch Circuit ( $G_v=0\text{dB}$  Voltage Follower Amp)



\*Resistance(\*\*) is Pull-up resistance for prevent from switching terminal ① going ON by reakege of external circuit(TR...etc).

## SWITCHING MECHANISM



Switching Mechanism of NJM2121 is as follows.

Switch signal is communicated in case that  $V_F$  of Q26 goes ON on current mirror which is composed with Q26 and Q27. Q10 goes ON by 4 diodes of Q10 in case that terminal 1 goes OFF and Amp(ch A) goes active. Q9 goes ON by 6 diodes of Q9 in case that terminal 1 goes ON and Amp(ch B) goes active. So, NJM2121 have merit that drive system is controlled freely. Because drive system is not related to supply voltage system(Single supply type/Two supply type) in order that switch change by current ON/OFF.

But, this switch goes On by very little current because of signal communicate system which depend on ON of  $V_F$ . So, please use NJM2121 under the condition of lowering sensitivity for current ON/OFF by external Pull-up-resistance(Rp)

## MEMO

**[CAUTION]**

The specifications on this databook are only given for information , without any guarantee as regards either mistakes or omissions. The application circuits in this databook are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.