

## HIGH SPEED OPERATIONAL AMPLIFIER WITH SWITCH

### ■ GENERAL DESCRIPTION

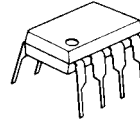
The NJM2121 is a dual operational amplifier of 2-INPUT and 1-OUTPUT with analog switch. The NJM2121 can be used as analog switch under the condition of  $G_v=0\text{dB}$ , as Switch + Amp in order that each gain (A or B) can be adjusted independently. Each amplifier of the NJM2121 has the same electrical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

The NJM2121 is suitable for Audio, Video, Electrical musical instrument...etc.

### ■ FEATURES

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

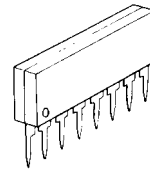
### ■ PACKAGE OUTLINE



NJM2121D

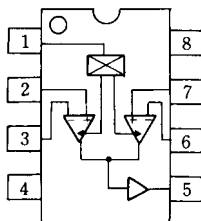


NJM2121M

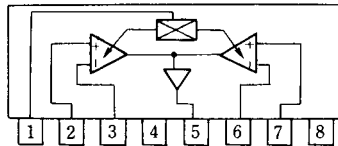


NJM2121L

### ■ PIN CONFIGURATION



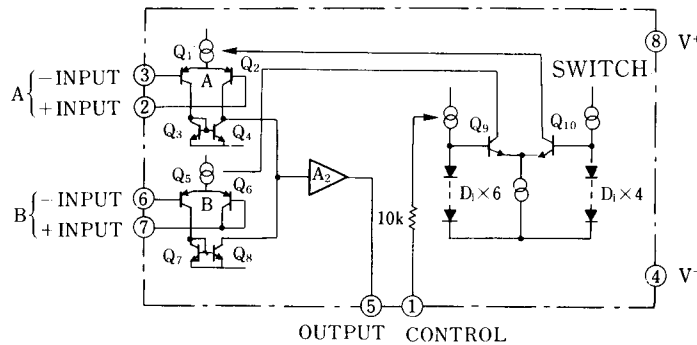
NJM2121D  
NJM2121M



NJM2121L

- PIN FUNCTION**
- 1.SW.CONTROL
  - 2.A +INPUT
  - 3.A -INPUT
  - 4.V<sup>-</sup>
  - 5.OUTPUT
  - 6.B -INPUT
  - 7.B +INPUT
  - 8.V<sup>+</sup>

### ■ EQUIVALENT CIRCUIT



# NJM2121

## ■ ABSOLUTE MAXIMUM RATINGS

( Ta=25°C )

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V^+ / V^-$	$\pm 18$ ( 36 )	V
Differential Input Voltage	$V_{ID}$	$\pm 30$	V
Input Voltage	$V_{IC}$	$\pm 15$	V
Output Current	$I_O$	$\pm 50$	mA
Power Dissipation	$P_D$	( DIP8 ) 500 ( DMP8 ) 300 ( SIP8 ) 800	mW
Operating Temperature Range	$T_{opr}$	-20~+75	°C
Storage Temperature Range	$T_{stg}$	-40~+125	°C

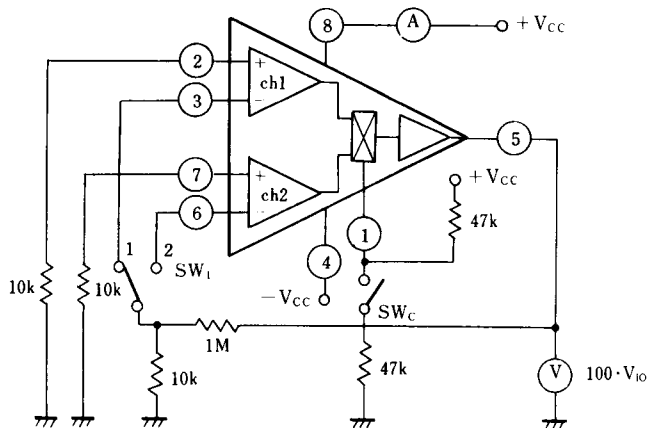
## ■ ELECTRICAL CHARACTERISTICS

(  $V^+ / V^- = \pm 15V, Ta = 25^\circ C$  )

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Current	$I_{CC}$	$V_{IN}$ SW ON	-	2.3	6.0	mA
		SW OFF	-	2.1	6.0	mA
Input Offset Voltage	$V_{IO}$	$R_S = 10k\Omega$	-	0.8	6.0	mV
Input Bias Current	$I_B$		-	0.2	1.0	$\mu A$
Large Signal Voltage Gain	$A_V$	$R_L = 2k\Omega$	-	110	-	dB
Maximum Output Voltage Swing	$V_{OM}$	$R_L \geq 10k\Omega$	$\pm 12$	$\pm 14$	-	V
Total Harmonic Distortion	THD	$f = 1kHz, V_O = 5V_{rms}, G_V = 20dB$	-	0.002	-	%
Supply Voltage Rejection Ratio	SVR		-	20	150	$\mu V/V$
Channel Separation	CS	$f = 1kHz$	-	82	-	dB
Unity Gain Bandwidth	$f_T$	$G_V = 0dB$	-	14	-	MHz
Slew Rate	SR	$G_V = 0dB, R_L = 2k\Omega // 100pF$	-	4	-	V/ $\mu s$
Equivalent Input Noise Voltage	$V_{NI}$	$R_S = 1k\Omega, BW = 10Hz \sim 30kHz, Flat$	-	2.0	-	$\mu V_{rms}$

## ■ TEST CIRCUIT

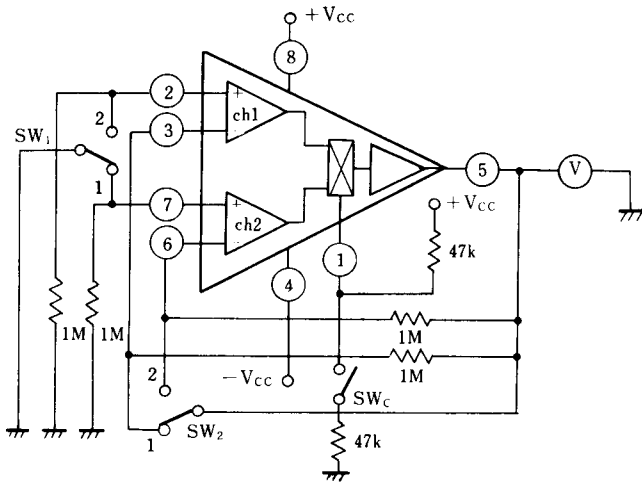
(1)  $I_{CC}$ ,  $V_{IO}$ , SVR



	SW <sub>C</sub>	SW <sub>1</sub>	Select ch
$I_{CC1}$ , $V_{IO1}$ , $SVR_1$	OFF	1	ch 1
$I_{CC2}$ , $V_{IO2}$ , $SVR_2$	ON	2	ch 2

Unit Resistance : Ω  
Capacity : F

(2)  $I_B$ ,  $I_O$



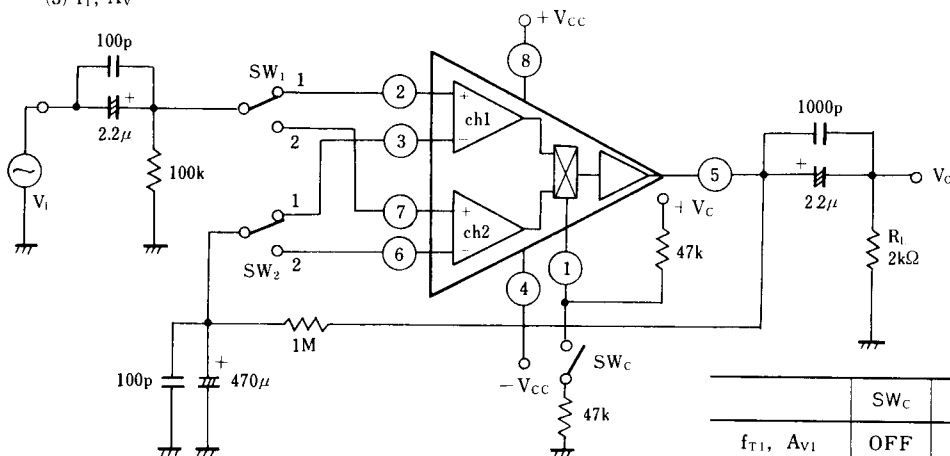
$$I_B^+ = V_{O1} / 1M\Omega$$

$$I_B^- = V_{O2} / 1M\Omega$$

$$I_{IO} = |I_B^+ - I_B^-|$$

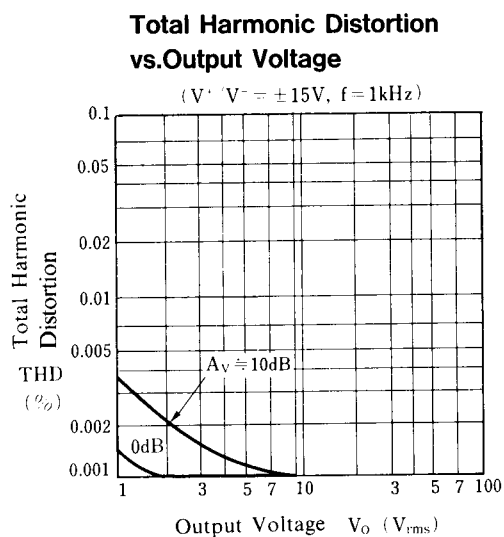
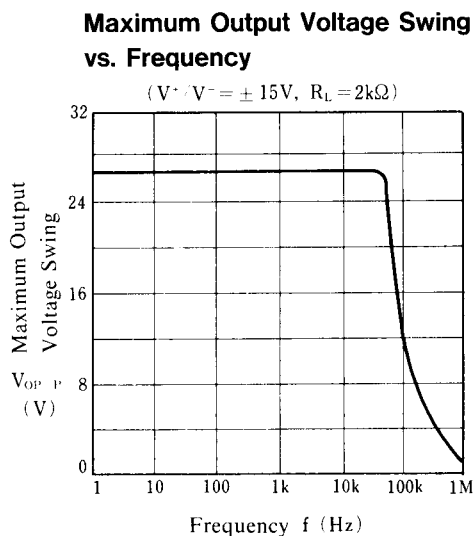
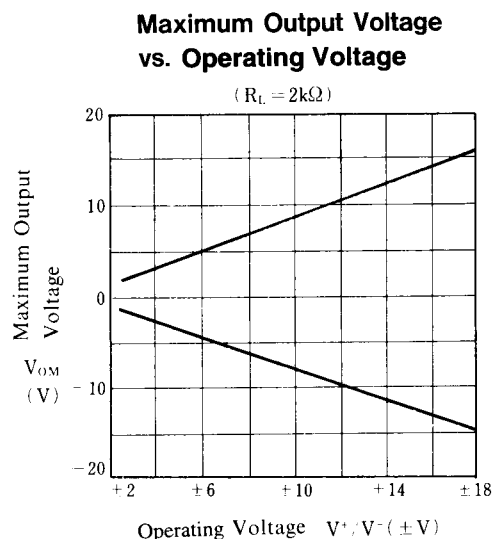
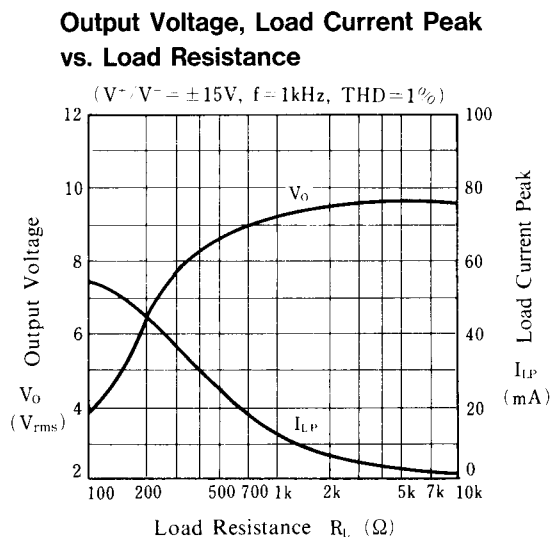
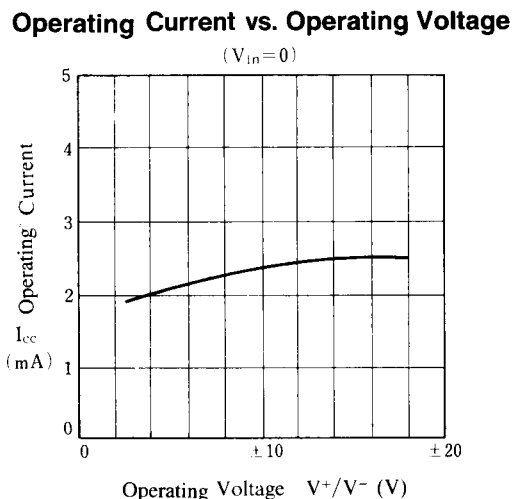
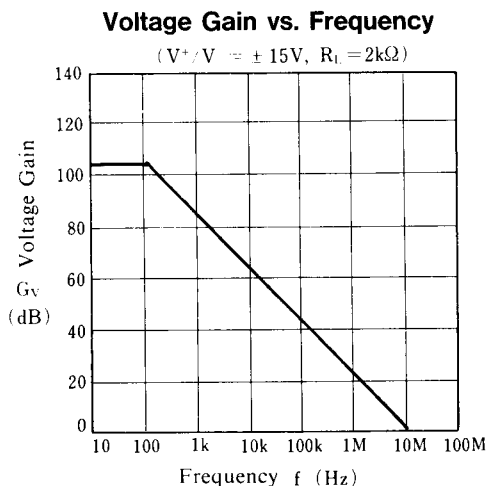
	SW <sub>C</sub>	SW <sub>1</sub>	SW <sub>2</sub>	Select ch
$V_{O1}$	OFF	1	1	ch 1
$V_{O1}$	OFF	2	2	ch 1
$V_{O2}$	ON	2	2	ch 2
$V_{O2}$	ON	1	1	ch 2

(3)  $f_T$ ,  $A_v$



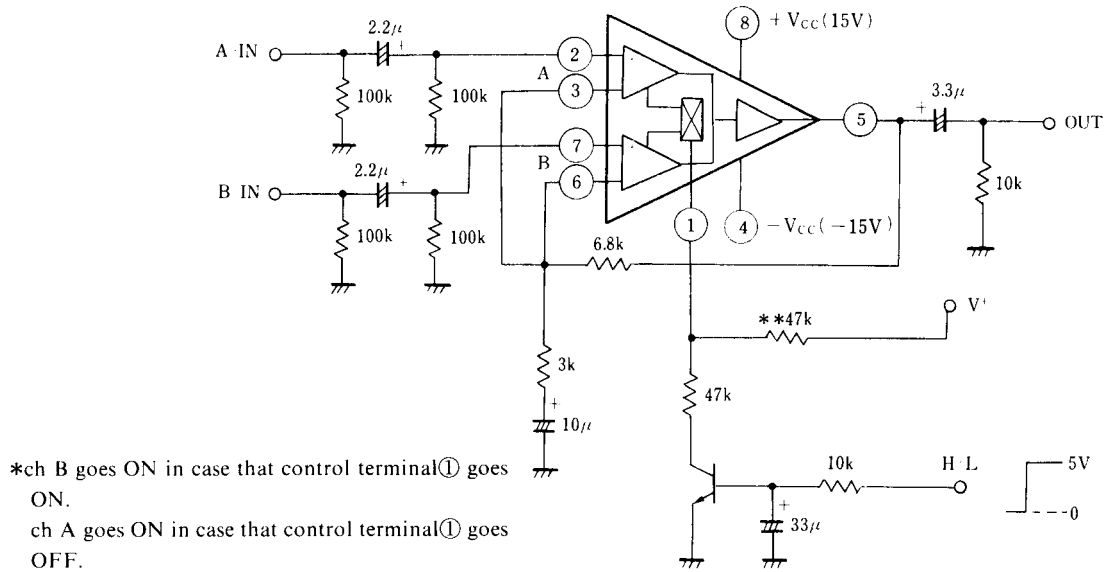
	SW <sub>C</sub>	SW <sub>1</sub>	SW <sub>2</sub>	Select ch
$f_{T1}$ , $A_{v1}$	OFF	1	1	ch 1
$f_{T2}$ , $A_{v2}$	ON	2	2	ch 2

## ■ TYPICAL CHARACTERISTICS

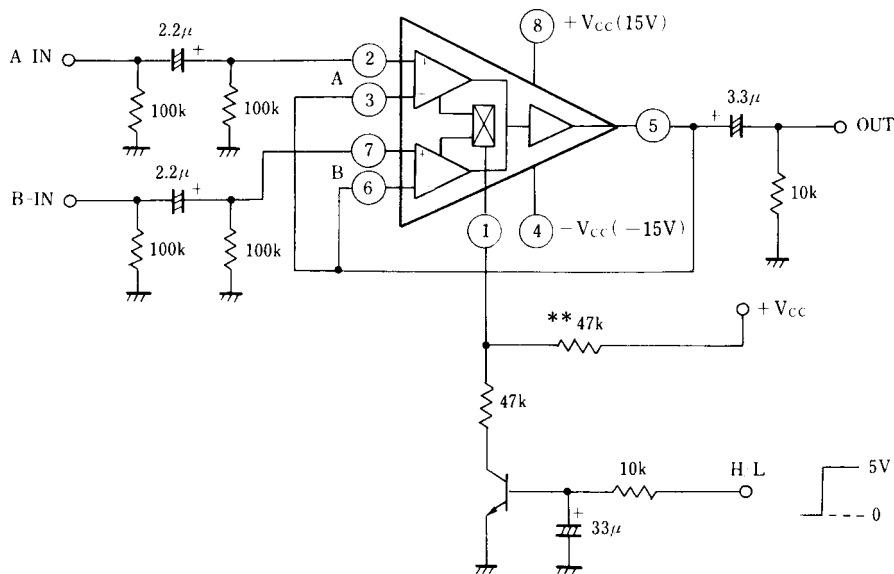


## APPLICATION CIRCUIT

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



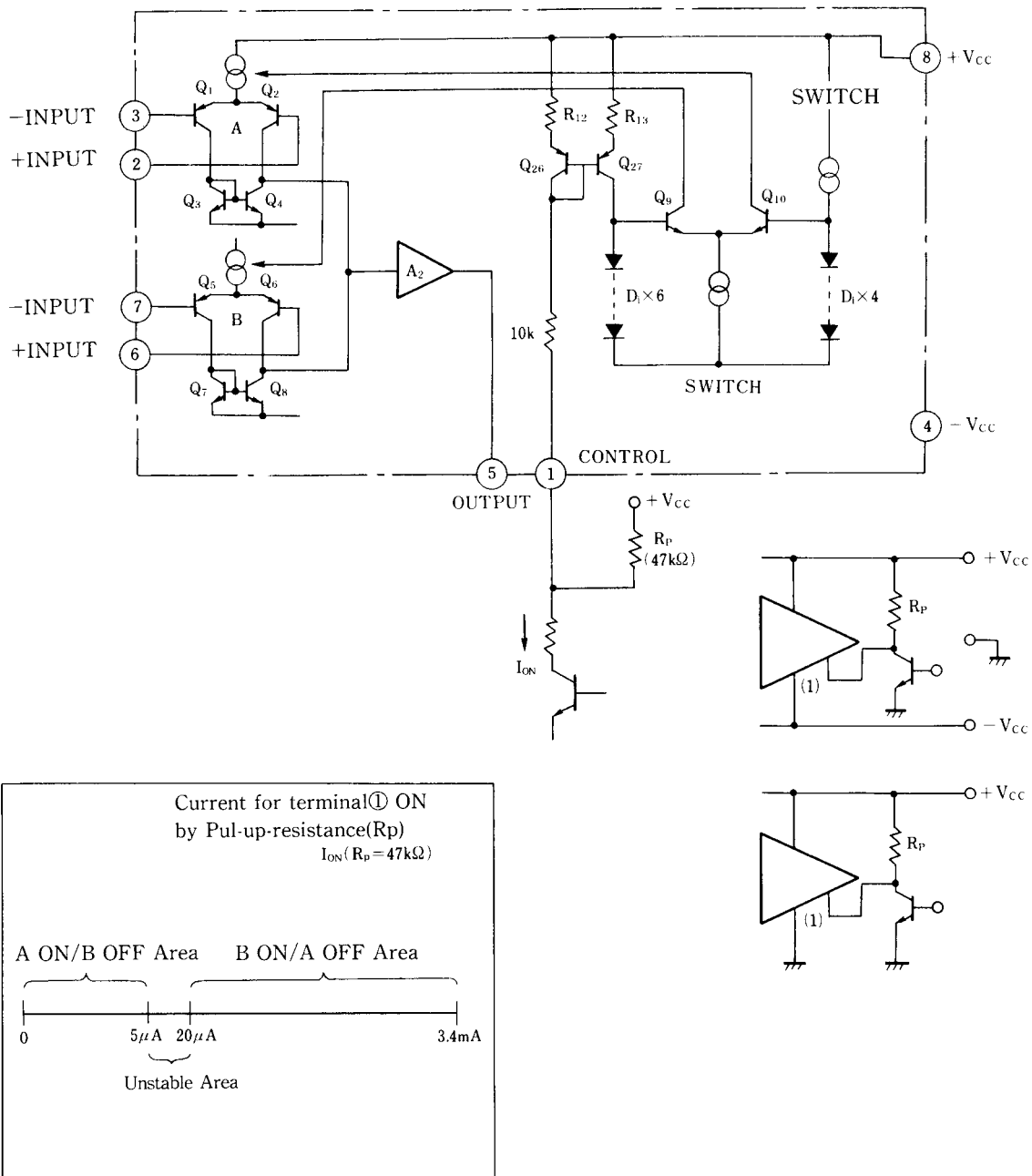
### (2) Analog Switch Circuit ( $G_V=0\text{dB}$ Voltage Follower Amp)



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

# NJM2121

## ■ 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 (  $R_p$  )

**[CAUTION]**

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