

M5201A/L/P/FP

GENERAL PURPOSE SWITCHING OPERATIONAL AMPLIFIER
(DUAL INPUT, SINGLE OUTPUT TYPE)

DESCRIPTION

The M5201A is a semiconductor integrated circuit designed for an operational amplifier with analog switching, dual A and B input, and a single output. The device comes in an 8-pin SIP, DIP or FP and contains input differential A and B circuits, single output circuit and operational amplifier switching circuit, and can be used as a conventional operational amplifier, activating on A or B input by externally setting the control pin level high or low. For a voltage follower condition where $G_v=0\text{dB}$, the device functions merely as an analog switch, but, for switching amplifier function, gain can be set independently for A and B input. The M5201A operational amplifier has basic characteristics similar to those of the M5218/M5R4558P and can be used in audio, video and musical instrument equipment.

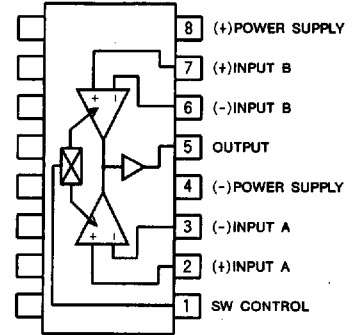
FEATURES

- Operational amplifier A and B input and gain can be set independently
- Applicable to both single and dual power supplies
- High gain, low distortion
..... $G_{vo}=100\text{dB}$, $\text{THD} = 0.002\%$ (typ.)
- High slew rate, high f_r $\text{SR} = 2.2\text{V}/\mu\text{s}$, $f_r = 7\text{MHz}$ (typ.)
- Low noise ($R_s=1\text{K}\Omega$) FLAT..... $V_{ni} = 2\mu\text{Vrms}$ (typ.)
- Low switching shock noise
- High load current, high power dissipation
..... $I_{LP} = \pm 50\text{mA}$, $P_d = 800\text{mW}$ (SIP)
 $P_d = 625\text{mW}$ (DIP)
 $P_d = 440\text{mW}$ (FP)

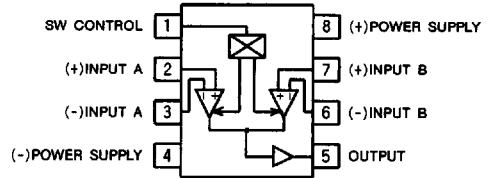
APPLICATION

Component audio equipment, VCR, Tape recorder unit, etc.

PIN CONFIGURATION (TOP VIEW)



Outline 8P5(AL)

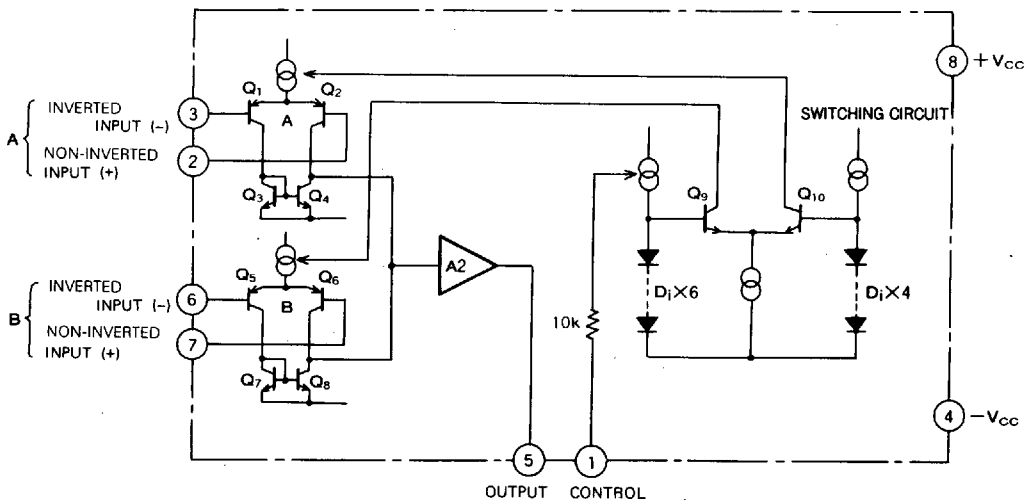


Outline 8P4 (AP)
8P2S-A (AFP)

RECOMMENDED OPERATING CONDITION

Supply voltage range..... $\pm 2.5 \sim \pm 16\text{V}$
Rated supply voltage..... $\pm 15\text{V}$

EQUIVALENT CIRCUIT

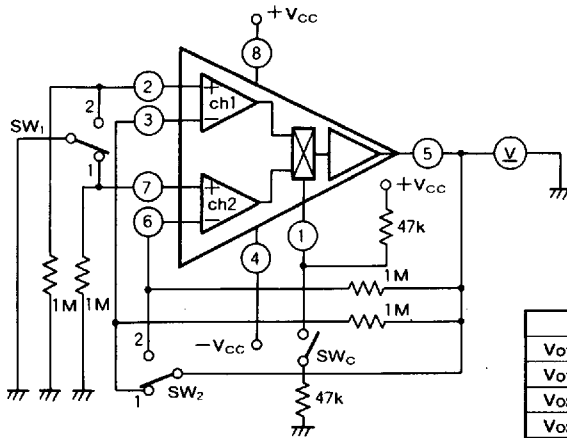


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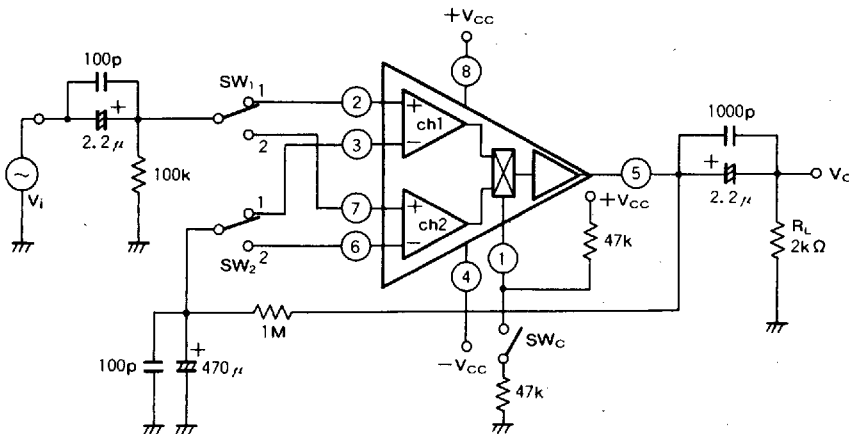
GENERAL PURPOSE SWITCHING OPERATIONAL AMPLIFIER (DUAL INPUT, SINGLE OUTPUT TYPE)

(2) I_b, I_o



	SW _c	SW ₁	SW ₂	Select ch
V _{o1}	OFF	1	1	ch1
V _{o1}	OFF	2	2	ch1
V _{o2}	ON	2	2	ch2
V _{o2}	ON	1	1	ch2

(3) f_t, G_v



Unit Resistance : Ω
Capacitance : F

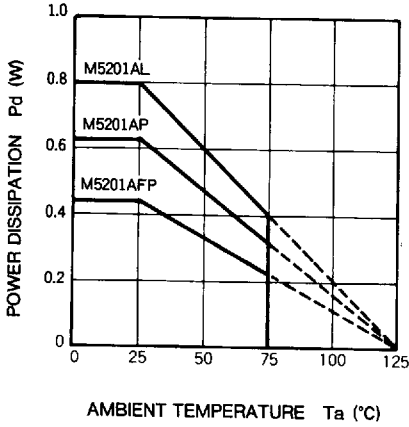
	SW _c	SW ₁	SW ₂	Select ch
f_{t1}, G_{v1}	OFF	1	1	ch1
f_{t2}, G_{v2}	ON	2	2	ch2

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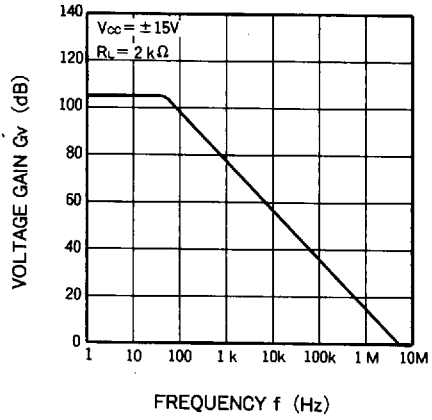
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TYPICAL CHARACTERISTICS

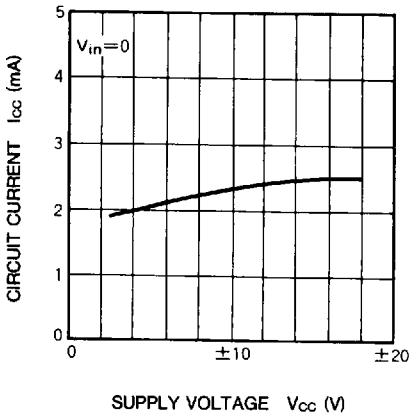
■ THERMAL DERATING (MAXIMUM RATING)



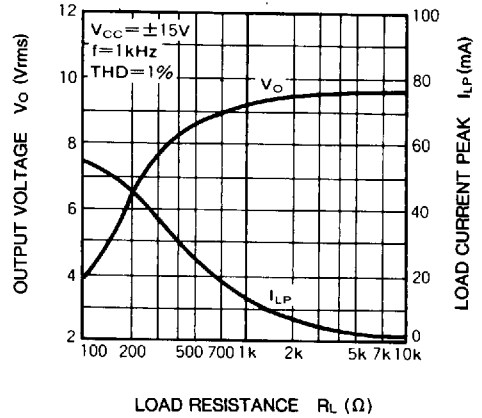
■ VOLTAGE GAIN VS. FREQUENCY RESPONSE



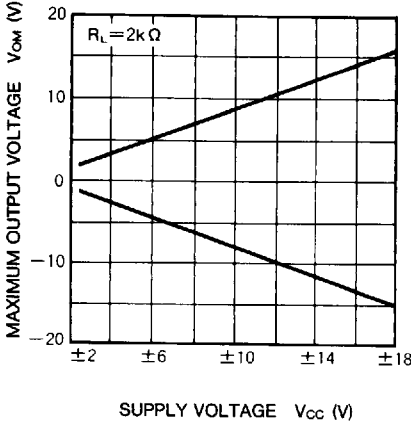
■ CIRCUIT CURRENT VS. SUPPLY VOLTAGE



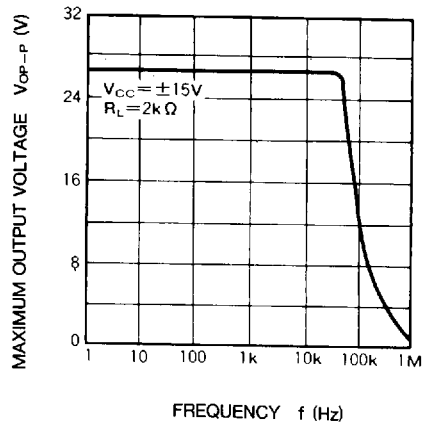
■ OUTPUT VOLTAGE/LOAD CURRENT PEAK VS. LOAD RESISTANCE



■ MAXIMUM OUTPUT VOLTAGE VS. SUPPLY VOLTAGE

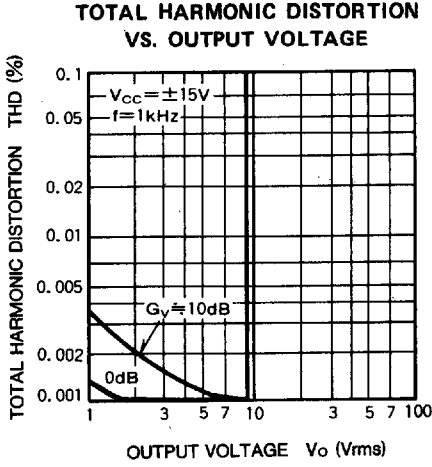


■ MAXIMUM OUTPUT VOLTAGE VS. FREQUENCY RESPONSE



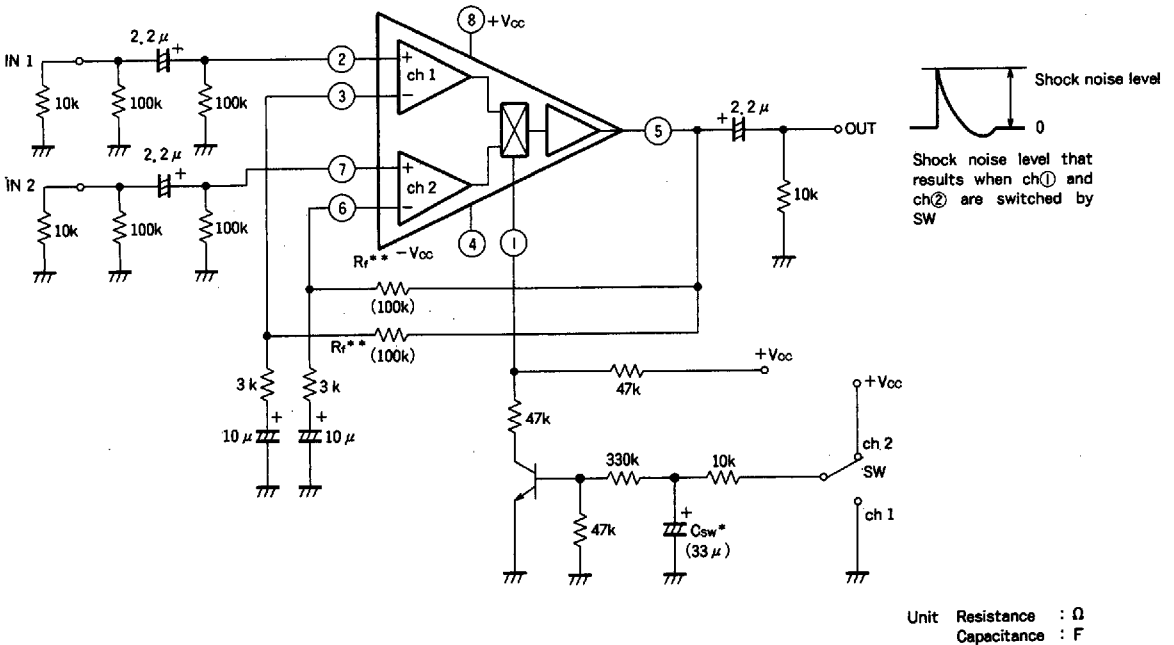
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SHOCK NOISE MEASUREMENT

TEST CIRCUIT



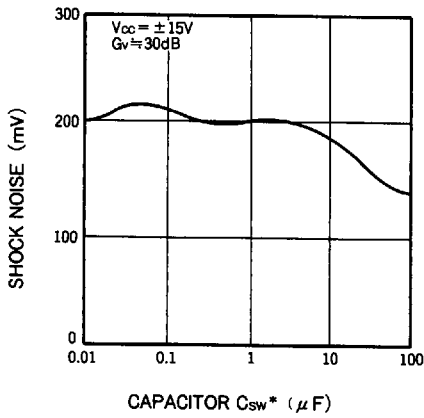
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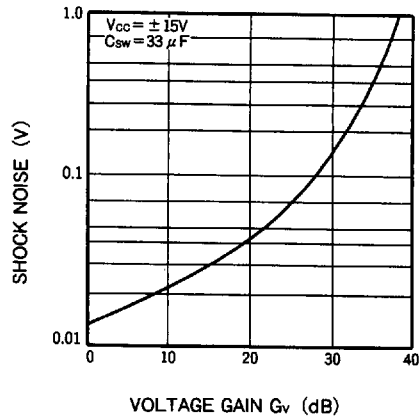
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SHOCK NOISE VS. CAPACITOR C_{sw}



* Characteristics of shock noise with respect to change of C_{sw}

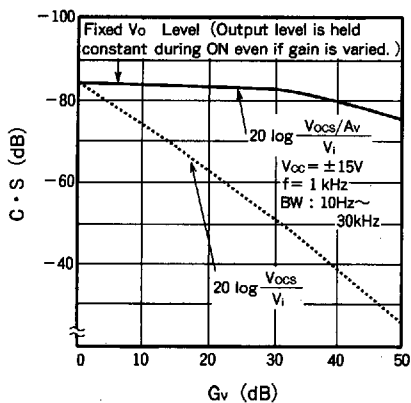
SHOCK NOISE VS. VOLTAGE GAIN



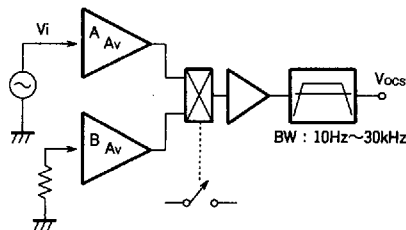
** Characteristics of shock noise with respect to voltage gain varied by R_1 .

GENERAL PURPOSE SWITCHING OPERATIONAL AMPLIFIER
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CHANNEL SEPARATION CHARACTERISTICS



(A : OFF / B : IN ON MODE)



$$C \cdot S = 20 \log \left[\frac{\text{INPUT LEAK LEVEL}}{\text{SIGNAL LEVEL}} \right] \text{ (dB)}$$

$$= 20 \log \frac{V_{ocs}/A_v}{V_i} \text{ (dB)}$$

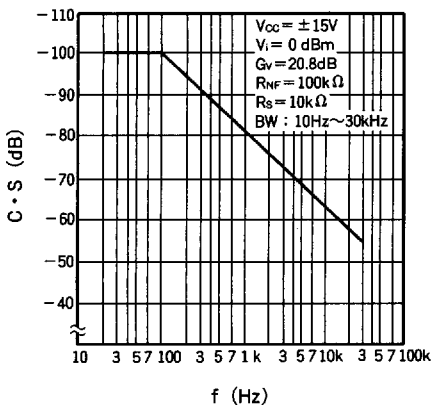
Channel separation is defined as ratio of leak signal (scaled on assumption it is present in input) to input signal.

$$\left(20 \log \frac{V_{ocs}/A_v}{V_i} \right)$$

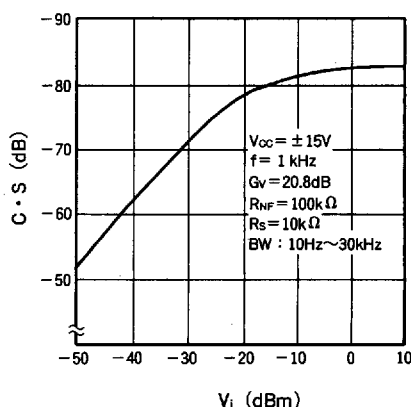
However, as indicated by above dashed line, if gain (A_v) is not scaled channel separation appears to deteriorate as much as amplified amount.

$$\left(20 \log \frac{V_{ocs}}{V_i} \right)$$

CHANNEL SEPARATION CHARACTERISTICS



CHANNEL SEPARATION CHARACTERISTICS

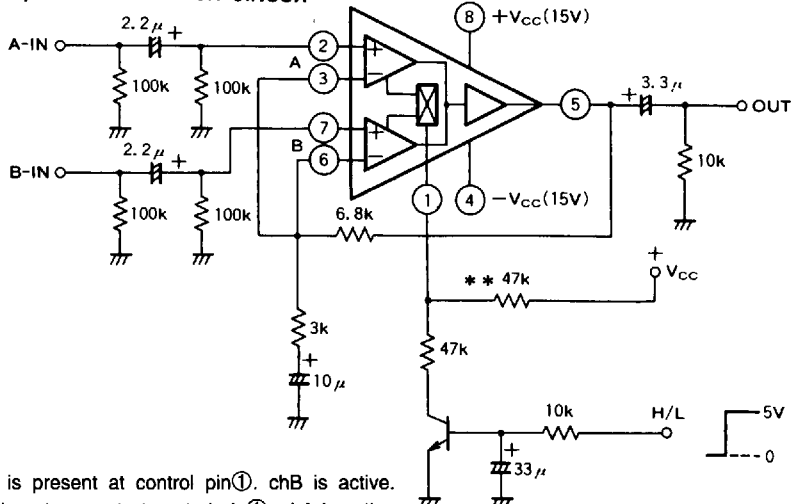


M5201AL/P/FP

GENERAL PURPOSE SWITCHING OPERATIONAL AMPLIFIER (DUAL INPUT, SINGLE OUTPUT TYPE)

APPLICATION EXAMPLE

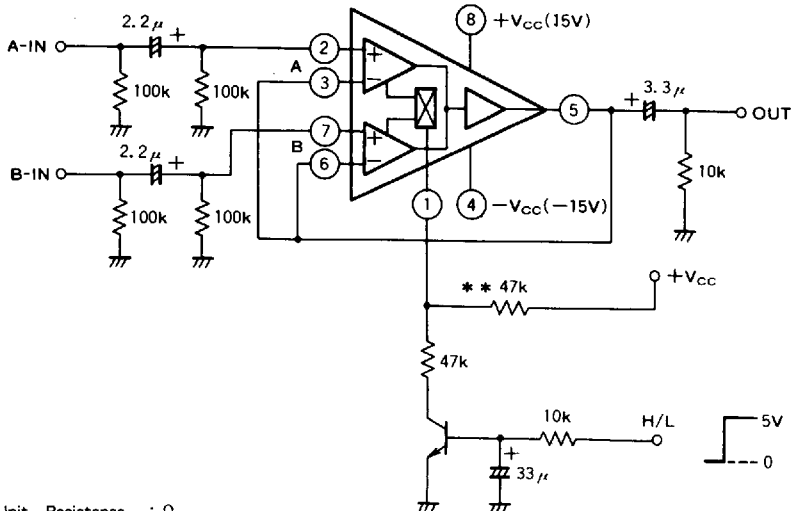
(1) FLAT AMPLIFIER ($G_v \approx 10\text{dB}$) + ANALOG SWITCH CIRCUIT



* When current is present at control pin ①, chB is active.
When current is not present at control pin ①, chA is active.

Unit Resistance : Ω
Capacitance : F

(2) ANALOG SWITCH CIRCUIT ($G_v = 0\text{dB}$, VOLTAGE FOLLOWER AMPLIFIER)

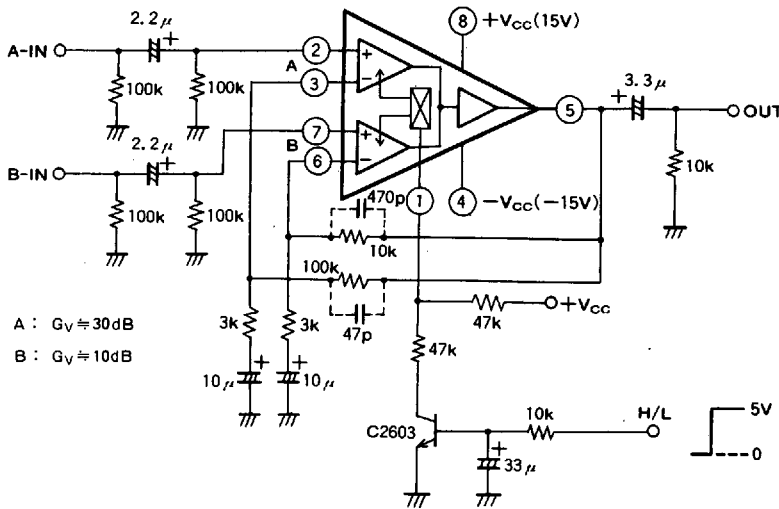


Unit Resistance : Ω
Capacitance : F

Resistor indicated by ** is a pull-up resistor to prevent switching pin ① from being activated by leak current from an external circuit.(i.e.TR).

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*When current is present at control pin①, chB is active.
When current is not present at control pin①, chA is active.

Unit Resistance : Ω
Capacitance : F

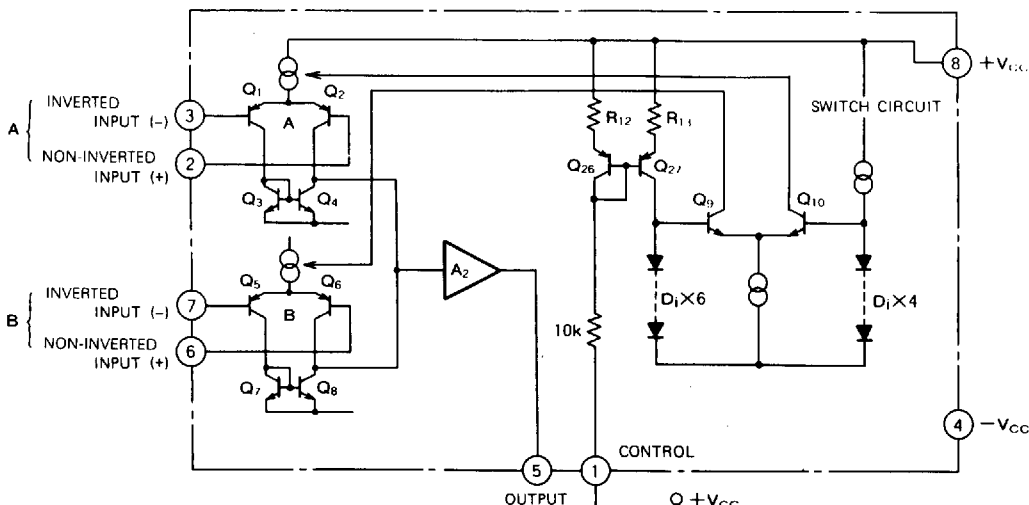
DESCRIPTION OF PIN

Pin No.	Name	Function
①	SW control	A/B channel select pin. By pulling current out from this pin, switching action is available.
②	(+) input A	Channel A op-amp (+) input pin
③	(-) input A	Channel A op-amp (-) input pin
④	(-) power supply	Negative power supply pin
⑤	Output	Output pin
⑥	(-) input B	Channel B op-amp (-) input pin
⑦	(+) input B	Channel B op-amp (+) input pin
⑧	(+) power supply	Positive power supply pin

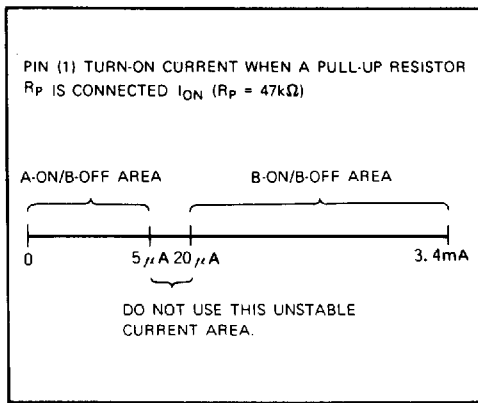
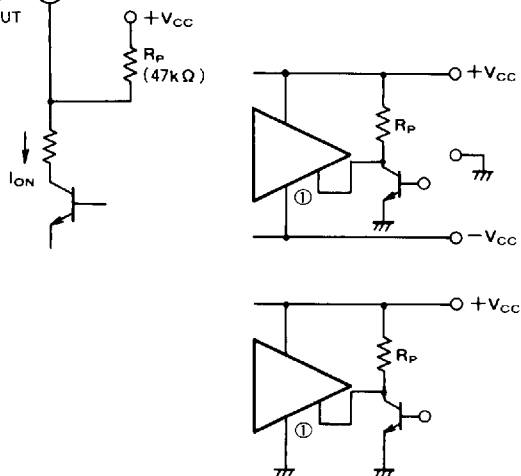
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SWITCHING MECHANISM



As shown in above figure, the M5201A transfers switching signals by externally feeding current to V_F on Q_{26} side of current mirror transistor circuit (which consists of transistors Q_{26} and Q_{27}). That is, when no current is fed to pin ①, Q_{10} is turned on by four diodes connected to Q_{10} to activate channel A amplifier. When current is fed to pin ①, collector current of Q_9 flows to turn on six diodes connected to Q_9 and channel B is activated. Thus, applying or removing current to/from pin ① switches an active channel. Therefore, M5203A can arbitrarily control drive method regardless of power supply type (single or dual). It is recommended that a pull-up resistor R_p be connected to pin ① to reduce current sensitivity of transistor Q_{26} since very little current can turn on V_F .

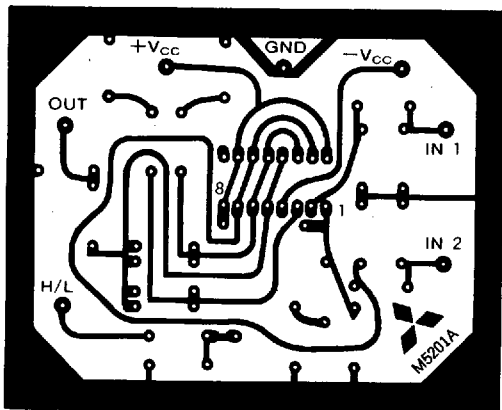


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GENERAL PURPOSE SWITCHING OPERATIONAL AMPLIFIER
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PCB FOR CIRCUIT TESTING

WIRING ON THE PCB



(PARTS INSERTION SIDE)

